Table S1: Collinear antiferromagnets in MAGNDATA with second-order transport tensors triggered by magnetic geometry. Note that without SOC, IMD- and QMD-contributions are forbidden.

No.	Materials (ID)	Spin space group	without SOC	with SOC		
			BCD	IMD	QMD	BCD
1	$ZnFe_2O_4$ (1.761)	I^{1}-$4^{1}2^{1}d^{-1}(1/2\ \ 1/2\ \ 0)^{\infty m}1$	$\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{xyz}=\sigma_{xzy}=\sigma_{yxz}=\sigma_{yzx}$	×	×	$\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{yxz}=\sigma_{yzx}$, $\sigma_{xyz}=\sigma_{xzy}$
2	YMn_2 (1.746)	$P^{1}4_3{}^{1}2^{1}2^{-1}(1/2\ \ 1/2\ \ 1/2)^{\infty m}1$	$\sigma_{xyz}=\sigma_{xzy}=-\sigma_{yxz}=-\sigma_{yzx}$	×	×	$\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zyy}/2$, $\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{xxz}=\sigma_{xzx}=-\sigma_{zxx}/2$, $\sigma_{yxz}=\sigma_{yzx}$, $\sigma_{xyz}=\sigma_{xzy}$
3	$GeNi_2O_4$ (1.563)	$R^{1}3^{1}m^{-1}(1/3\ \ 2/3\ \ 1/6)^{\infty m}1$	$\sigma_{xxz}=\sigma_{xzx}=\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zxx}/2=-\sigma_{zyy}/2$	×	×	$\sigma_{yzz}=-2\sigma_{zyz}=-2\sigma_{zzy}$, $\sigma_{xzz}=-2\sigma_{zxz}=-2\sigma_{zzx}$, $\sigma_{xyy}=-2\sigma_{yxy}=-2\sigma_{yyx}$, $\sigma_{xxy}=\sigma_{xyx}=-\sigma_{yxx}/2$
4	$GeNi_2O_4$ (1.561)	$R^{1}3^{1}m^{-1}(1/3\ \ 2/3\ \ 1/6)^{\infty m}1$	$\sigma_{xxz}=\sigma_{xzx}=\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zxx}/2=-\sigma_{zyy}/2$	×	×	$\sigma_{yzz}=-2\sigma_{zyz}=-2\sigma_{zzy}$, $\sigma_{xzz}=-2\sigma_{zxz}=-2\sigma_{zzx}$, $\sigma_{xyy}=-2\sigma_{yxy}=-2\sigma_{yyx}$, $\sigma_{xxy}=\sigma_{xyx}=-\sigma_{yxx}/2$
5	Ce_4Ge_3 (0.448)	I^{1}-$4^{-1}2^{-1}d^{\infty m}1$	$\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{xyz}=\sigma_{xzy}=\sigma_{yxz}=\sigma_{yzx}$	$\sigma_{xyz}=\sigma_{xzy}=\sigma_{yxz}=\sigma_{yzx}=\sigma_{zxy}=\sigma_{zyx}$	$\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{xyz}=\sigma_{xzy}=\sigma_{yxz}=\sigma_{yzx}$	$\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{xyz}=\sigma_{xzy}=\sigma_{yxz}=\sigma_{yzx}$
6	Ce_4Sb_3 (0.681)	I^{-1}-$4^{-1}2^{1}d^{\infty m}1$	$\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{xyz}=\sigma_{xzy}=\sigma_{yxz}=\sigma_{yzx}$	×	$\sigma_{xyz}=\sigma_{xzy}=-\sigma_{yxz}=-\sigma_{yzx}$	$\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{xyz}=\sigma_{xzy}=\sigma_{yxz}=\sigma_{yzx}$
7	Tb_2C_3 (0.345)	$F^{m_{001}}d^{m_{001}}d^{1}2^{\infty m}1$	$\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zyy}/2$, $\sigma_{xxz}=\sigma_{xzx}=-\sigma_{zxx}/2$	$\sigma_{xzz}=\sigma_{zxz}=\sigma_{zzx}$, $\sigma_{xyy}=\sigma_{yxy}=\sigma_{yyx}$, σ_{xxx}	$\sigma_{zxz}=\sigma_{zzx}$, $\sigma_{yxy}=\sigma_{yyx}$, σ_{xzz}, σ_{xyy}, σ_{xxx}	$\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zyy}/2$, $\sigma_{xxz}=\sigma_{xzx}=-\sigma_{zxx}/2$
8	$GdInCu_4$ (1.699)	I^{1}-$4^{1}2^{1}m^{-1}(1/2\ \ 1/2\ \ 0)^{\infty m}1$	$\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{xyz}=\sigma_{xzy}=\sigma_{yxz}=\sigma_{yzx}$	×	×	$\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{xyz}=\sigma_{xzy}=\sigma_{yxz}=\sigma_{yzx}$

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Table S1 : (continued) Collinear antiferromagnets in MAGNDATA with second-order transport tensors triggered by magnetic geometry.

No.	Materials (ID)	Spin space group	without SOC	with SOC		
			BCD	IMD	QMD	BCD
9	$HoInCu_4$ (1.700)	I^1-$4^1 2^1 m^{-1}(1/2\ \ 1/2\ \ 0)^{\infty m}1$	$\sigma_{zxy} = \sigma_{zyx}$, $\sigma_{xyz} = \sigma_{xzy} = \sigma_{yxz} = \sigma_{yzx}$	×	×	$\sigma_{zxy} = \sigma_{zyx}$, $\sigma_{yxz} = \sigma_{yzx}$, $\sigma_{xyz} = \sigma_{xzy}$
10	NdBiPt (1.574)	P^1-$4^1 m^1 2^{-1}(1/2\ \ 1/2\ \ 1/2)^{\infty m}1$	$\sigma_{zxy} = \sigma_{zyx}$, $\sigma_{xyz} = \sigma_{xzy} = \sigma_{yxz} = \sigma_{yzx}$	×	×	$\sigma_{zxy} = \sigma_{zyx}$, $\sigma_{xyz} = \sigma_{xzy} = \sigma_{yxz} = \sigma_{yzx}$
11	GeV_4S_8 (1.86)	$P^1 m^1 n^1 2_1^{-1}(0\ \ 1/2\ \ 0)^{\infty m}1$	$\sigma_{yyz} = \sigma_{yzy} = -\sigma_{zyy}/2$, $\sigma_{xxz} = \sigma_{xzx} = -\sigma_{zxx}/2$	×	×	$\sigma_{yyz} = \sigma_{yzy} = -\sigma_{zyy}/2$, $\sigma_{xxz} = \sigma_{xzx} = -\sigma_{zxx}/2$
12	GdBiPt (1.111)	$R^1 3^1 m^{-1}(1/3\ \ 2/3\ \ 1/6)^{\infty m}1$	$\sigma_{xxz} = \sigma_{xzx} = \sigma_{yyz} = \sigma_{yzy} = -\sigma_{zxx}/2 = -\sigma_{zyy}/2$	×	×	$\sigma_{yzz} = -2\sigma_{zyz} = -2\sigma_{zzy}$, $\sigma_{xzz} = -2\sigma_{zxz} = -2\sigma_{zzx}$, $\sigma_{xyy} = -2\sigma_{yxy} = -2\sigma_{yyx}$, $\sigma_{xxy} = \sigma_{xyx} = -\sigma_{yxx}/2$
13	CuMnSb (1.232)	$R^1 3^1 m^{-1}(1/3\ \ 2/3\ \ 1/6)^{\infty m}1$	$\sigma_{xxz} = \sigma_{xzx} = \sigma_{yyz} = \sigma_{yzy} = -\sigma_{zxx}/2 = -\sigma_{zyy}/2$	×	×	$\sigma_{yzz} = -2\sigma_{zyz} = -2\sigma_{zzy}$, $\sigma_{xzz} = -2\sigma_{zxz} = -2\sigma_{zzx}$, $\sigma_{xyy} = -2\sigma_{yxy} = -2\sigma_{yyx}$, $\sigma_{xxy} = \sigma_{xyx} = -\sigma_{yxx}/2$
14	CuMnSb (1.233)	$R^1 3^1 m^{-1}(1/3\ \ 2/3\ \ 1/6)^{\infty m}1$	$\sigma_{xxz} = \sigma_{xzx} = \sigma_{yyz} = \sigma_{yzy} = -\sigma_{zxx}/2 = -\sigma_{zyy}/2$	×	×	$\sigma_{xxz} = \sigma_{xzx} = \sigma_{yyz} = \sigma_{yzy} = -\sigma_{zxx}/2 = -\sigma_{zyy}/2$
15	CuMnSb (1.265)	$R^1 3^1 m^{-1}(1/3\ \ 2/3\ \ 1/6)^{\infty m}1$	$\sigma_{xxz} = \sigma_{xzx} = \sigma_{yyz} = \sigma_{yzy} = -\sigma_{zxx}/2 = -\sigma_{zyy}/2$	×	×	$\sigma_{xxz} = \sigma_{xzx} = \sigma_{yyz} = \sigma_{yzy} = -\sigma_{zxx}/2 = -\sigma_{zyy}/2$
16	UCu_5 (1.424)	$R^1 3^1 m^{-1}(1/3\ \ 2/3\ \ 1/6)^{\infty m}1$	$\sigma_{xxz} = \sigma_{xzx} = \sigma_{yyz} = \sigma_{yzy} = -\sigma_{zxx}/2 = -\sigma_{zyy}/2$	×	×	$\sigma_{xxz} = \sigma_{xzx} = \sigma_{yyz} = \sigma_{yzy} = -\sigma_{zxx}/2 = -\sigma_{zyy}/2$

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Table S1 : (continued) Collinear antiferromagnets in MAGNDATA with second-order transport tensors triggered by magnetic geometry.

No.	Materials (ID)	Spin space group	without SOC	with SOC		
			BCD	IMD	QMD	BCD
17	$HoCdCu_4$ (1.701)	$R^{1}3^{1}m^{-1}(1/3\ \ 2/3\ \ 1/6)^{\infty m}1$	$\sigma_{xxz}=\sigma_{xzx}=\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zxx}/2=-\sigma_{zyy}/2$	×	×	$\sigma_{yzz}=-2\sigma_{zyz}=-2\sigma_{zzy}$, $\sigma_{xzz}=-2\sigma_{zxz}=-2\sigma_{zzx}$, $\sigma_{xyy}=-2\sigma_{yxy}=-2\sigma_{yyx}$, $\sigma_{xxy}=\sigma_{xyx}=-\sigma_{yxx}/2$
18	UCu_5 (1.721)	$R^{1}3^{1}m^{-1}(1/3\ \ 2/3\ \ 1/6)^{\infty m}1$	$\sigma_{xxz}=\sigma_{xzx}=\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zxx}/2=-\sigma_{zyy}/2$	×	×	$\sigma_{xxz}=\sigma_{xzx}=\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zxx}/2=-\sigma_{zyy}/2$
19	MnS_2 (1.18)	$P^{1}n^{1}a^{1}2_1{}^{-1}(0\ \ 1/2\ \ 0)^{\infty m}1$	$\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zyy}/2$, $\sigma_{xxz}=\sigma_{xzx}=-\sigma_{zxx}/2$	×	×	$\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zyy}/2$, $\sigma_{xxz}=\sigma_{xzx}=-\sigma_{zxx}/2$
20	$MnSe_2$ (1.0.48)	$P^{-1}c^{-1}a^{1}2_1{}^{\infty m}1$	$\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zyy}/2$, $\sigma_{xxz}=\sigma_{xzx}=-\sigma_{zxx}/2$	$\sigma_{xzz}=\sigma_{zxz}=\sigma_{zzx}$, $\sigma_{xyy}=\sigma_{yxy}=\sigma_{yyx}$, σ_{xxx}	$\sigma_{zxz}=\sigma_{zzx}$, $\sigma_{yxy}=\sigma_{yyx}$, σ_{xzz}, σ_{xyy}, σ_{xxx}	$\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zyy}/2$, $\sigma_{xxz}=\sigma_{xzx}=-\sigma_{zxx}/2$
21	$Na_2Ni_2TeO_6$ (1.646)	$I^{1}m^{1}a^{1}2^{-1}(1/2\ \ 0\ \ 0)^{\infty m}1$	$\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zyy}/2$, $\sigma_{xxz}=\sigma_{xzx}=-\sigma_{zxx}/2$	×	×	$\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zyy}/2$, $\sigma_{xxz}=\sigma_{xzx}=-\sigma_{zxx}/2$
22	TbNiAl (2.99)	$C^{1}m^{-1}(1/2\ \ 0\ \ 0)^{\infty m}1$	$\sigma_{yzz}=-2\sigma_{zyz}=-2\sigma_{zzy}$, $\sigma_{xzz}=-2\sigma_{zxz}=-2\sigma_{zzx}$, $\sigma_{xyy}=-2\sigma_{yxy}=-2\sigma_{yyx}$, $\sigma_{xxy}=\sigma_{xyx}=-\sigma_{yxx}/2$	×	×	$\sigma_{yzz}=-2\sigma_{zyz}=-2\sigma_{zzy}$, $\sigma_{xzz}=-2\sigma_{zxz}=-2\sigma_{zzx}$, $\sigma_{xyy}=-2\sigma_{yxy}=-2\sigma_{yyx}$, $\sigma_{xxy}=\sigma_{xyx}=-\sigma_{yxx}/2$
23	TbNiAl (1.738)	$I^{1}m^{1}m^{1}2^{-1}(0\ \ 1/2\ \ 1/2)^{\infty m}1$	$\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zyy}/2$, $\sigma_{xxz}=\sigma_{xzx}=-\sigma_{zxx}/2$	×	×	$\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zyy}/2$, $\sigma_{xxz}=\sigma_{xzx}=-\sigma_{zxx}/2$
24	$Co_2Mo_3O_8$ (0.332)	$P^{-1}6_3{}^{1}m^{-1}c^{\infty m}1$	$\sigma_{xxz}=\sigma_{xzx}=\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zxx}/2=-\sigma_{zyy}/2$	$\sigma_{xxx}=-\sigma_{xyy}=-\sigma_{yxy}=-\sigma_{yyx}$	$\sigma_{xxx}=-\sigma_{xyy}=-\sigma_{yxy}=-\sigma_{yyx}$	$\sigma_{xxz}=\sigma_{xzx}=\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zxx}/2=-\sigma_{zyy}/2$

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Table S1 : (continued) Collinear antiferromagnets in MAGNDATA with second-order transport tensors triggered by magnetic geometry.

No.	Materials (ID)	Spin space group	without SOC	with SOC		
			BCD	IMD	QMD	BCD
25	$Fe_2Mo_3O_8$ (0.331)	$P^{-1}6_3{}^1\mathrm{m}^{-1}\mathrm{c}^{\infty\mathrm{m}}1$	$\sigma_{xxz}=\sigma_{xzx}=\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zxx}/2=-\sigma_{zyy}/2$	$\sigma_{xxx}=-\sigma_{xyy}=-\sigma_{yxy}=-\sigma_{yyx}$	$\sigma_{xxx}=-\sigma_{xyy}=-\sigma_{yxy}=-\sigma_{yyx}$	$\sigma_{xxz}=\sigma_{xzx}=\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zxx}/2=-\sigma_{zyy}/2$
26	$Co_2Mo_3O_8$ (0.338)	$P^{-1}6_3{}^1\mathrm{m}^{-1}\mathrm{c}^{\infty\mathrm{m}}1$	$\sigma_{xxz}=\sigma_{xzx}=\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zxx}/2=-\sigma_{zyy}/2$	$\sigma_{xxx}=-\sigma_{xyy}=-\sigma_{yxy}=-\sigma_{yyx}$	$\sigma_{xxx}=-\sigma_{xyy}=-\sigma_{yxy}=-\sigma_{yyx}$	$\sigma_{xxz}=\sigma_{xzx}=\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zxx}/2=-\sigma_{zyy}/2$
27	ErAuGe (1.33)	$P^1\mathrm{m}^1\mathrm{c}^1{2_1}^{-1}(1/2\ \ 1/2\ \ 0)^{\infty\mathrm{m}}1$	$\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zyy}/2$, $\sigma_{xxz}=\sigma_{xzx}=-\sigma_{zxx}/2$	×	×	$\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zyy}/2$, $\sigma_{xxz}=\sigma_{xzx}=-\sigma_{zxx}/2$
28	GdCuSn (1.504)	$P^1\mathrm{m}^1\mathrm{c}^1{2_1}^{-1}(1/2\ \ 1/2\ \ 0)^{\infty\mathrm{m}}1$	$\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zyy}/2$, $\sigma_{xxz}=\sigma_{xzx}=-\sigma_{zxx}/2$	×	×	$\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zyy}/2$, $\sigma_{xxz}=\sigma_{xzx}=-\sigma_{zxx}/2$
29	GdAgSn (1.505)	$P^1\mathrm{m}^1\mathrm{c}^1{2_1}^{-1}(1/2\ \ 1/2\ \ 0)^{\infty\mathrm{m}}1$	$\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zyy}/2$, $\sigma_{xxz}=\sigma_{xzx}=-\sigma_{zxx}/2$	×	×	$\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zyy}/2$, $\sigma_{xxz}=\sigma_{xzx}=-\sigma_{zxx}/2$
30	CaOFeS (1.472)	$P^1\mathrm{m}^1\mathrm{n}^1{2_1}^{-1}(1/2\ \ 1/2\ \ 0)^{\infty\mathrm{m}}1$	$\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zyy}/2$, $\sigma_{xxz}=\sigma_{xzx}=-\sigma_{zxx}/2$	×	×	$\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zyy}/2$, $\sigma_{xxz}=\sigma_{xzx}=-\sigma_{zxx}/2$
31	GdAuSn (1.506)	$P^1\mathrm{m}^1\mathrm{c}^1{2_1}^{-1}(1/2\ \ 1/2\ \ 0)^{\infty\mathrm{m}}1$	$\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zyy}/2$, $\sigma_{xxz}=\sigma_{xzx}=-\sigma_{zxx}/2$	×	×	$\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zyy}/2$, $\sigma_{xxz}=\sigma_{xzx}=-\sigma_{zxx}/2$
32	$Na_2Co_2TeO_6$ (1.184)	$P^1{2_1}^1{2_1}^1{2}^{-1}(0\ \ 1/2\ \ 1/2)^{\infty\mathrm{m}}1$	$\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{yxz}=\sigma_{yzx}$, $\sigma_{xyz}=\sigma_{xzy}$	×	×	$\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{yxz}=\sigma_{yzx}$, $\sigma_{xyz}=\sigma_{xzy}$
33	$AgNiO_2$ (1.50)	$P^1{2_1}^1{2_1}^1{2}^{-1}(0\ \ 1/2\ \ 1/2)^{\infty\mathrm{m}}1$	$\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{yxz}=\sigma_{yzx}$, $\sigma_{xyz}=\sigma_{xzy}$	×	×	$\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{yxz}=\sigma_{yzx}$, $\sigma_{xyz}=\sigma_{xzy}$
34	$CoNb_3S_6$ (1.349)	$P^1{2_1}^1{2}^1{2_1}^{-1}(1/2\ \ 1/2\ \ 0)^{\infty\mathrm{m}}1$	$\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{yxz}=\sigma_{yzx}$, $\sigma_{xyz}=\sigma_{xzy}$	×	×	$\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{yxz}=\sigma_{yzx}$, $\sigma_{xyz}=\sigma_{xzy}$

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Table S1 : (continued) Collinear antiferromagnets in MAGNDATA with second-order transport tensors triggered by magnetic geometry.

No.	Materials (ID)	Spin space group	without SOC	with SOC		
			BCD	IMD	QMD	BCD
35	$Fe_{0.32}NbS_2$ (1.676)	$P^{1}2^{1}2^{1}2_{1}^{-1}(1/2\ \ 1/2\ \ 0)^{\infty m}1$	$\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{yxz}=\sigma_{yzx}$, $\sigma_{xyz}=\sigma_{xzy}$	×	×	$\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{yxz}=\sigma_{yzx}$, $\sigma_{xyz}=\sigma_{xzy}$
36	VNb_3S_6 (0.712)	$P^{-1}6_3^{-1}2^{1}2^{\infty m}1$	$\sigma_{xyz}=\sigma_{xzy}=-\sigma_{yxz}=-\sigma_{yzx}$	σ_{zzz}, $\sigma_{yyz}=\sigma_{yzy}=\sigma_{zyy}$, $\sigma_{xxz}=\sigma_{xzx}=\sigma_{zxx}$	σ_{zzz}, σ_{zyy}, σ_{zxx}, $\sigma_{yyz}=\sigma_{yzy}$, $\sigma_{xxz}=\sigma_{xzx}$	$\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{yxz}=\sigma_{yzx}$, $\sigma_{xyz}=\sigma_{xzy}$
37	$Fe_{0.967}Nb_3S_6$ (1.589)	$P^{1}2_1^{1}2_1^{1}2_1^{-1}(0\ \ 0\ \ 1/2)^{\infty m}1$	$\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{yxz}=\sigma_{yzx}$, $\sigma_{xyz}=\sigma_{xzy}$	×	×	$\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{yxz}=\sigma_{yzx}$, $\sigma_{xyz}=\sigma_{xzy}$
38	$Fe_{0.35}NbS_2$ (1.677)	$P^{1}2_1^{1}2_1^{1}2_1^{-1}(0\ \ 0\ \ 1/2)^{\infty m}1$	$\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{yxz}=\sigma_{yzx}$, $\sigma_{xyz}=\sigma_{xzy}$	×	×	$\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{yxz}=\sigma_{yzx}$, $\sigma_{xyz}=\sigma_{xzy}$
39	$Ca_3Co_{2-x}Mn_xO_6$ (0.13)	$R^{1}3^{-1}c^{\infty m}1$	$\sigma_{xxz}=\sigma_{xzx}=\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zxx}/2=-\sigma_{zyy}/2$	σ_{zzz}, $\sigma_{xxz}=\sigma_{xzx}=\sigma_{yyz}=\sigma_{yzy}=\sigma_{zxx}=\sigma_{zyy}$, $\sigma_{xxx}=-\sigma_{xyy}=-\sigma_{yxy}=-\sigma_{yyx}$	σ_{zzz}, $\sigma_{zxx}=\sigma_{zyy}$, $\sigma_{xxz}=\sigma_{xzx}=\sigma_{yyz}=\sigma_{yzy}$, $\sigma_{xxx}=-\sigma_{xyy}=-\sigma_{yxy}=-\sigma_{yyx}$	$\sigma_{xxz}=\sigma_{xzx}=\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zxx}/2=-\sigma_{zyy}/2$
40	$PbNiO_3$ (0.21)	$R^{1}3^{-1}c^{\infty m}1$	$\sigma_{xxz}=\sigma_{xzx}=\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zxx}/2=-\sigma_{zyy}/2$	σ_{zzz}, $\sigma_{xxz}=\sigma_{xzx}=\sigma_{yyz}=\sigma_{yzy}=\sigma_{zxx}=\sigma_{zyy}$, $\sigma_{xxx}=-\sigma_{xyy}=-\sigma_{yxy}=-\sigma_{yyx}$	σ_{zzz}, $\sigma_{zxx}=\sigma_{zyy}$, $\sigma_{xxz}=\sigma_{xzx}=\sigma_{yyz}=\sigma_{yzy}$, $\sigma_{xxx}=-\sigma_{xyy}=-\sigma_{yxy}=-\sigma_{yyx}$	$\sigma_{xxz}=\sigma_{xzx}=\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zxx}/2=-\sigma_{zyy}/2$
41	$GaFeO_3$ (0.306)	$R^{1}3^{-1}c^{\infty m}1$	$\sigma_{xxz}=\sigma_{xzx}=\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zxx}/2=-\sigma_{zyy}/2$	σ_{zzz}, $\sigma_{yyz}=\sigma_{yzy}=\sigma_{zyy}$, $\sigma_{xyz}=\sigma_{xzy}=\sigma_{yxz}=\sigma_{yzx}=\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{xxz}=\sigma_{xzx}=\sigma_{zxx}$	σ_{zzz}, σ_{zyy}, $\sigma_{zxy}=\sigma_{zyx}$, σ_{zxx}, $\sigma_{yyz}=\sigma_{yzy}$, $\sigma_{yxz}=\sigma_{yzx}$, $\sigma_{xyz}=\sigma_{xzy}$, $\sigma_{xxz}=\sigma_{xzx}$	$\sigma_{yzz}=-2\sigma_{zyz}=-2\sigma_{zzy}$, $\sigma_{xzz}=-2\sigma_{zxz}=-2\sigma_{zzx}$, $\sigma_{xyy}=-2\sigma_{yxy}=-2\sigma_{yyx}$, $\sigma_{xxy}=\sigma_{xyx}=-\sigma_{yxx}/2$

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Table S1 : (continued) Collinear antiferromagnets in MAGNDATA with second-order transport tensors triggered by magnetic geometry.

No.	Materials (ID)	Spin space group	without SOC	with SOC		
			BCD	IMD	QMD	BCD
42	$MnTiO_3$ (0.50)	$R^{1}3^{-1}c^{\infty m}1$	$\sigma_{xxz}=\sigma_{xzx}=\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zxx}/2=-\sigma_{zyy}/2$	σ_{zzz}, $\sigma_{yyz}=\sigma_{yzy}=\sigma_{zyy}$, $\sigma_{xyz}=\sigma_{xzy}=\sigma_{yxz}=\sigma_{yzx}=\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{xxz}=\sigma_{xzx}=\sigma_{zxx}$	σ_{zzz}, σ_{zyy}, $\sigma_{zxy}=\sigma_{zyx}$, σ_{zxx}, $\sigma_{yyz}=\sigma_{yzy}$, $\sigma_{yxz}=\sigma_{yzx}$, $\sigma_{xyz}=\sigma_{xzy}$, $\sigma_{xxz}=\sigma_{xzx}$	$\sigma_{yzz}=-2\sigma_{zyz}=-2\sigma_{zzy}$, $\sigma_{xzz}=-2\sigma_{zxz}=-2\sigma_{zzx}$, $\sigma_{xyy}=-2\sigma_{yxy}=-2\sigma_{yyx}$, $\sigma_{xxy}=\sigma_{xyx}=-\sigma_{yxx}/2$
43	$Ho_{0.1}Bi_{0.9}FeO_3$ (0.556)	$R^{1}3^{-1}c^{\infty m}1$	$\sigma_{xxz}=\sigma_{xzx}=\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zxx}/2=-\sigma_{zyy}/2$	σ_{zzz}, $\sigma_{xxz}=\sigma_{xzx}=\sigma_{yyz}=\sigma_{yzy}=\sigma_{zxx}=\sigma_{zyy}$, $\sigma_{xxx}=-\sigma_{xyy}=-\sigma_{yxy}=-\sigma_{yyx}$	σ_{zzz}, $\sigma_{zxx}=\sigma_{zyy}$, $\sigma_{xxz}=\sigma_{xzx}=\sigma_{yyz}=\sigma_{yzy}$, $\sigma_{xxx}=-\sigma_{xyy}=-\sigma_{yxy}=-\sigma_{yyx}$	$\sigma_{xxz}=\sigma_{xzx}=\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zxx}/2=-\sigma_{zyy}/2$
44	$Ho_{0.05}Bi_{0.95}FeO_3$ (0.555)	$R^{1}3^{-1}c^{\infty m}1$	$\sigma_{xxz}=\sigma_{xzx}=\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zxx}/2=-\sigma_{zyy}/2$	σ_{zzz}, $\sigma_{xxz}=\sigma_{xzx}=\sigma_{yyz}=\sigma_{yzy}=\sigma_{zxx}=\sigma_{zyy}$, $\sigma_{xxx}=-\sigma_{xyy}=-\sigma_{yxy}=-\sigma_{yyx}$	σ_{zzz}, $\sigma_{zxx}=\sigma_{zyy}$, $\sigma_{xxz}=\sigma_{xzx}=\sigma_{yyz}=\sigma_{yzy}$, $\sigma_{xxx}=-\sigma_{xyy}=-\sigma_{yxy}=-\sigma_{yyx}$	$\sigma_{xxz}=\sigma_{xzx}=\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zxx}/2=-\sigma_{zyy}/2$
45	$ScFeO_3$ (0.57)	$R^{1}3^{-1}c^{\infty m}1$	$\sigma_{xxz}=\sigma_{xzx}=\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zxx}/2=-\sigma_{zyy}/2$	σ_{zzz}, $\sigma_{yyz}=\sigma_{yzy}=\sigma_{zyy}$, $\sigma_{xyz}=\sigma_{xzy}=\sigma_{yxz}=\sigma_{yzx}=\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{xxz}=\sigma_{xzx}=\sigma_{zxx}$	σ_{zzz}, σ_{zyy}, $\sigma_{zxy}=\sigma_{zyx}$, σ_{zxx}, $\sigma_{yyz}=\sigma_{yzy}$, $\sigma_{yxz}=\sigma_{yzx}$, $\sigma_{xyz}=\sigma_{xzy}$, $\sigma_{xxz}=\sigma_{xzx}$	$\sigma_{yzz}=-2\sigma_{zyz}=-2\sigma_{zzy}$, $\sigma_{xzz}=-2\sigma_{zxz}=-2\sigma_{zzx}$, $\sigma_{xyy}=-2\sigma_{yxy}=-2\sigma_{yyx}$, $\sigma_{xxy}=\sigma_{xyx}=-\sigma_{yxx}/2$
46	$AgCrS_2$ (1.136)	$C^{1}m^{-1}(0\ \ 0\ \ 1/2)^{\infty m}1$	$\sigma_{yzz}=-2\sigma_{zyz}=-2\sigma_{zzy}$, $\sigma_{xzz}=-2\sigma_{zxz}=-2\sigma_{zzx}$, $\sigma_{xyy}=-2\sigma_{yxy}=-2\sigma_{yyx}$, $\sigma_{xxy}=\sigma_{xyx}=-\sigma_{yxx}/2$	×	×	$\sigma_{yzz}=-2\sigma_{zyz}=-2\sigma_{zzy}$, $\sigma_{xzz}=-2\sigma_{zxz}=-2\sigma_{zzx}$, $\sigma_{xyy}=-2\sigma_{yxy}=-2\sigma_{yyx}$, $\sigma_{xxy}=\sigma_{xyx}=-\sigma_{yxx}/2$

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Table S1 : (continued) Collinear antiferromagnets in MAGNDATA with second-order transport tensors triggered by magnetic geometry.

No.	Materials (ID)	Spin space group	without SOC	with SOC		
			BCD	IMD	QMD	BCD
47	$CeFe_3(BO_3)_4$ (1.459)	$R^{1}3^{1}2^{-1}(1/3\ \ 2/3\ \ 1/6)^{\infty m}1$	$\sigma_{xyz}=\sigma_{xzy}=$ $-\sigma_{yxz}=-\sigma_{yzx}$	×	×	$\sigma_{yyz}=\sigma_{yzy}=$ $-\sigma_{zyy}/2$, $\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{xxz}=$ $\sigma_{xzx}=-\sigma_{zxx}/2$, $\sigma_{yxz}=\sigma_{yzx}$, $\sigma_{xyz}=\sigma_{xzy}$
48	$NdFe_3B_4O_{12}$ (1.7)	$R^{1}3^{1}2^{-1}(1/3\ \ 2/3\ \ 1/6)^{\infty m}1$	$\sigma_{xyz}=\sigma_{xzy}=$ $-\sigma_{yxz}=-\sigma_{yzx}$	×	×	$\sigma_{yyz}=\sigma_{yzy}=$ $-\sigma_{zyy}/2$, $\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{xxz}=$ $\sigma_{xzx}=-\sigma_{zxx}/2$, $\sigma_{yxz}=\sigma_{yzx}$, $\sigma_{xyz}=\sigma_{xzy}$
49	$YFe_3(BO_3)_4$ (1.90)	$P^{1}3_2{}^{1}2^{1}1^{-1}(0\ \ 0\ \ 1/2)^{\infty m}1$	$\sigma_{xyz}=\sigma_{xzy}=$ $-\sigma_{yxz}=-\sigma_{yzx}$	×	×	$\sigma_{yyz}=\sigma_{yzy}=$ $-\sigma_{zyy}/2$, $\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{xxz}=$ $\sigma_{xzx}=-\sigma_{zxx}/2$, $\sigma_{yxz}=\sigma_{yzx}$, $\sigma_{xyz}=\sigma_{xzy}$
50	$TbFe_3(BO_3)_4$ (1.91)	$P^{1}3_2{}^{1}2^{1}1^{-1}(0\ \ 0\ \ 1/2)^{\infty m}1$	$\sigma_{xyz}=\sigma_{xzy}=$ $-\sigma_{yxz}=-\sigma_{yzx}$	×	×	$\sigma_{xyz}=\sigma_{xzy}=$ $-\sigma_{yxz}=-\sigma_{yzx}$
51	Ni_3TeO_6 (1.165)	$R^{1}3^{-1}(1/3\ \ 2/3\ \ 1/6)^{\infty m}1$	$\sigma_{xxz}=\sigma_{xzx}=\sigma_{yyz}=$ $\sigma_{yzy}=-\sigma_{zxx}/2=$ $-\sigma_{zyy}/2$, $\sigma_{xyz}=\sigma_{xzy}=$ $-\sigma_{yxz}=-\sigma_{yzx}$	×	×	$\sigma_{xxz}=\sigma_{xzx}=\sigma_{yyz}=$ $\sigma_{yzy}=-\sigma_{zxx}/2=$ $-\sigma_{zyy}/2$, $\sigma_{xyz}=\sigma_{xzy}=$ $-\sigma_{yxz}=-\sigma_{yzx}$
52	$NiCr_2O_4$ (1.685)	$C^{1}2^{1}2^{1}2_1{}^{-1}(0\ \ 1/2\ \ 1/2)^{\infty m}1$	$\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{yxz}=\sigma_{yzx}$, $\sigma_{xyz}=\sigma_{xzy}$	×	×	$\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{yxz}=\sigma_{yzx}$, $\sigma_{xyz}=\sigma_{xzy}$
53	ZnV_2O_4 (1.24)	$P^{1}4_3{}^{1}2^{1}2^{-1}(1/2\ \ 1/2\ \ 1/2)^{\infty m}1$	$\sigma_{xyz}=\sigma_{xzy}=$ $-\sigma_{yxz}=-\sigma_{yzx}$	×	×	$\sigma_{xyz}=\sigma_{xzy}=$ $-\sigma_{yxz}=-\sigma_{yzx}$

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Table S1 : (continued) Collinear antiferromagnets in MAGNDATA with second-order transport tensors triggered by magnetic geometry.

No.	Materials (ID)	Spin space group	without SOC	with SOC		
			BCD	IMD	QMD	BCD
54	$La_2O_2Fe_2OSe_2$ (1.58)	$C^{1}\mathrm{m}^{-1}(0\ \ 0\ \ 1/2)^{\infty\mathrm{m}}1$	$\sigma_{yzz}=-2\sigma_{zyz}=-2\sigma_{zzy}$, $\sigma_{xzz}=-2\sigma_{zxz}=-2\sigma_{zzx}$, $\sigma_{xyy}=-2\sigma_{yxy}=-2\sigma_{yyx}$, $\sigma_{xxy}=\sigma_{xyx}=-\sigma_{yxx}/2$	×	×	$\sigma_{yzz}=-2\sigma_{zyz}=-2\sigma_{zzy}$, $\sigma_{xzz}=-2\sigma_{zxz}=-2\sigma_{zzx}$, $\sigma_{xyy}=-2\sigma_{yxy}=-2\sigma_{yyx}$, $\sigma_{xxy}=\sigma_{xyx}=-\sigma_{yxx}/2$
55	$NiTa_2O_6$ (1.172)	$A^{1}\mathrm{m}^{1}\mathrm{a}^{1}2^{-1}(0\ \ 1/2\ \ 0)^{\infty\mathrm{m}}1$	$\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zyy}/2$, $\sigma_{xxz}=\sigma_{xzx}=-\sigma_{zxx}/2$	×	×	$\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zyy}/2$, $\sigma_{xxz}=\sigma_{xzx}=-\sigma_{zxx}/2$
56	$CeAuSb_2$ (1.740)	$A^{1}\mathrm{m}^{1}\mathrm{m}^{1}2^{-1}(0\ \ 1/2\ \ 0)^{\infty\mathrm{m}}1$	$\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zyy}/2$, $\sigma_{xxz}=\sigma_{xzx}=-\sigma_{zxx}/2$	×	×	$\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zyy}/2$, $\sigma_{xxz}=\sigma_{xzx}=-\sigma_{zxx}/2$
57	$CuFeS_2$ (0.802)	$I^{1}\text{-}4^{-1}2^{-1}\mathrm{d}^{\infty\mathrm{m}}1$	$\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{xyz}=\sigma_{xzy}=\sigma_{yxz}=\sigma_{yzx}$	$\sigma_{xyz}=\sigma_{xzy}=\sigma_{yxz}=\sigma_{yzx}=\sigma_{zxy}=\sigma_{zyx}$	$\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{xyz}=\sigma_{xzy}=\sigma_{yxz}=\sigma_{yzx}$	$\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{xyz}=\sigma_{xzy}=\sigma_{yxz}=\sigma_{yzx}$
58	Cu_2MnSnS_4 (1.100)	$C^{1}2^{-1}(0\ \ 0\ \ 1/2)^{\infty\mathrm{m}}1$	$\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zyy}/2$, $\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{xxz}=\sigma_{xzx}=-\sigma_{zxx}/2$, $\sigma_{yxz}=\sigma_{yzx}$, $\sigma_{xyz}=\sigma_{xzy}$	×	×	$\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zyy}/2$, $\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{xxz}=\sigma_{xzx}=-\sigma_{zxx}/2$, $\sigma_{yxz}=\sigma_{yzx}$, $\sigma_{xyz}=\sigma_{xzy}$
59	Cu_2MnSnS_4 (1.732)	$C^{1}2^{-1}(0\ \ 0\ \ 1/2)^{\infty\mathrm{m}}1$	$\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zyy}/2$, $\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{xxz}=\sigma_{xzx}=-\sigma_{zxx}/2$, $\sigma_{yxz}=\sigma_{yzx}$, $\sigma_{xyz}=\sigma_{xzy}$	×	×	$\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zyy}/2$, $\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{xxz}=\sigma_{xzx}=-\sigma_{zxx}/2$, $\sigma_{yxz}=\sigma_{yzx}$, $\sigma_{xyz}=\sigma_{xzy}$

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Table S1 : (continued) Collinear antiferromagnets in MAGNDATA with second-order transport tensors triggered by magnetic geometry.

No.	Materials (ID)	Spin space group	without SOC	with SOC		
			BCD	IMD	QMD	BCD
60	Cu_2FeGeS_4 (1.734)	$C^{1}2^{-1}(0\ \ 0\ \ 1/2)^{\infty m}1$	$\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zyy}/2$, $\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{xxz}=\sigma_{xzx}=-\sigma_{zxx}/2$, $\sigma_{yxz}=\sigma_{yzx}$, $\sigma_{xyz}=\sigma_{xzy}$	×	×	$\sigma_{yzz}=-2\sigma_{zyz}=-2\sigma_{zzy}$, $\sigma_{xzz}=-2\sigma_{zxz}=-2\sigma_{zzx}$, $\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zyy}/2$, $\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{xxz}=\sigma_{xzx}=-\sigma_{zxx}/2$, $\sigma_{yxz}=\sigma_{yzx}$, $\sigma_{xyy}=-2\sigma_{yxy}=-2\sigma_{yyx}$, $\sigma_{xxy}=\sigma_{xyx}=-\sigma_{yxx}/2$, $\sigma_{xyz}=\sigma_{xzy}$
61	$CsCoF_4$ (0.405)	$I^{-1}\text{-}4^{\infty m}1$	$\sigma_{xxz}=\sigma_{xzx}=-\sigma_{yyz}=-\sigma_{yzy}=-\sigma_{zxx}/2=\sigma_{zyy}/2$, $\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{xyz}=\sigma_{xzy}=\sigma_{yxz}=\sigma_{yzx}$	σ_{zzz}, $\sigma_{xxz}=\sigma_{xzx}=\sigma_{yyz}=\sigma_{yzy}=\sigma_{zxx}=\sigma_{zyy}$	σ_{zzz}, $\sigma_{zxx}=\sigma_{zyy}$, $\sigma_{xxz}=\sigma_{xzx}=\sigma_{yyz}=\sigma_{yzy}$, $\sigma_{xyz}=\sigma_{xzy}=-\sigma_{yxz}=-\sigma_{yzx}$	$\sigma_{xxz}=\sigma_{xzx}=-\sigma_{yyz}=-\sigma_{yzy}=-\sigma_{zxx}/2=\sigma_{zyy}/2$, $\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{xyz}=\sigma_{xzy}=\sigma_{yxz}=\sigma_{yzx}$
62	$Ba_2FeSi_2O_7$ (1.641)	$P^{1}\text{-}4^{1}2_1{}^{1}c^{-1}(0\ \ 0\ \ 1/2)^{\infty m}1$	$\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{xyz}=\sigma_{xzy}=\sigma_{yxz}=\sigma_{yzx}$	×	×	$\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zyy}/2$, $\sigma_{xxz}=\sigma_{xzx}=-\sigma_{zxx}/2$
63	$Ba_2MnSi_2O_7$ (0.229)	$P^{1}\text{-}4^{-1}2_1{}^{-1}m^{\infty m}1$	$\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{xyz}=\sigma_{xzy}=\sigma_{yxz}=\sigma_{yzx}$	$\sigma_{xyz}=\sigma_{xzy}=\sigma_{yxz}=\sigma_{yzx}=\sigma_{zxy}=\sigma_{zyx}$	$\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{xyz}=\sigma_{xzy}=\sigma_{yxz}=\sigma_{yzx}$	$\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{xyz}=\sigma_{xzy}=\sigma_{yxz}=\sigma_{yzx}$
64	$Ba_2CoGe_2O_7$ (0.56)	$P^{1}\text{-}4^{-1}2_1{}^{-1}m^{\infty m}1$	$\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{xyz}=\sigma_{xzy}=\sigma_{yxz}=\sigma_{yzx}$	$\sigma_{xzz}=\sigma_{zxz}=\sigma_{zzx}$, $\sigma_{xyy}=\sigma_{yxy}=\sigma_{yyx}$, σ_{xxx}	$\sigma_{zxz}=\sigma_{zzx}$, $\sigma_{yxy}=\sigma_{yyx}$, σ_{xzz}, σ_{xyy}, σ_{xxx}	$\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zyy}/2$, $\sigma_{xxz}=\sigma_{xzx}=-\sigma_{zxx}/2$
65	$SrMn_2V_2O_8$ (0.62)	$I^{-1}4_1{}^{1}c^{-1}d^{\infty m}1$	$\sigma_{xxz}=\sigma_{xzx}=\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zxx}/2=-\sigma_{zyy}/2$	$\sigma_{xzz}=\sigma_{zxz}=\sigma_{zzx}$, $\sigma_{xyy}=\sigma_{yxy}=\sigma_{yyx}$, σ_{xxx}	$\sigma_{zxz}=\sigma_{zzx}$, $\sigma_{yxy}=\sigma_{yyx}$, σ_{xzz}, σ_{xyy}, σ_{xxx}	$\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zyy}/2$, $\sigma_{xxz}=\sigma_{xzx}=-\sigma_{zxx}/2$
66	$BaMn_2V_2O_8$ (0.967)	$I^{-1}4_1{}^{1}c^{-1}d^{\infty m}1$	$\sigma_{xxz}=\sigma_{xzx}=\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zxx}/2=-\sigma_{zyy}/2$	$\sigma_{xzz}=\sigma_{zxz}=\sigma_{zzx}$, $\sigma_{xyy}=\sigma_{yxy}=\sigma_{yyx}$, σ_{xxx}	$\sigma_{zxz}=\sigma_{zzx}$, $\sigma_{yxy}=\sigma_{yyx}$, σ_{xzz}, σ_{xyy}, σ_{xxx}	$\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zyy}/2$, $\sigma_{xxz}=\sigma_{xzx}=-\sigma_{zxx}/2$

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Table S1 : (continued) Collinear antiferromagnets in MAGNDATA with second-order transport tensors triggered by magnetic geometry.

No.	Materials (ID)	Spin space group	without SOC	with SOC		
			BCD	IMD	QMD	BCD
67	$SrCo_2V_2O_8$ (1.71)	$P^1c^1a^12_1{}^{-1}(1/2\ \ 1/2\ \ 1/2)^{\infty m}1$	$\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zyy}/2$, $\sigma_{xxz}=\sigma_{xzx}=-\sigma_{zxx}/2$	×	×	$\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zyy}/2$, $\sigma_{xxz}=\sigma_{xzx}=-\sigma_{zxx}/2$
68	$CeRhGe_3$ (1.743)	$P^14^1m^1m^{-1}(0\ \ 0\ \ 1/2)^{\infty m}1$	$\sigma_{xxz}=\sigma_{xzx}=\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zxx}/2=-\sigma_{zyy}/2$	×	×	$\sigma_{xxz}=\sigma_{xzx}=\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zxx}/2=-\sigma_{zyy}/2$
69	$YBaCuFeO_5$ (1.281)	$I^14^1m^1m^{-1}(1/2\ \ 1/2\ \ 0)^{\infty m}1$	$\sigma_{xxz}=\sigma_{xzx}=\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zxx}/2=-\sigma_{zyy}/2$	×	×	$\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zyy}/2$, $\sigma_{xxz}=\sigma_{xzx}=-\sigma_{zxx}/2$
70	PrFeAsO (1.586)	$P^1m^1a^12^{-1}(1/2\ \ 0\ \ 1/2)^{\infty m}1$	$\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zyy}/2$, $\sigma_{xxz}=\sigma_{xzx}=-\sigma_{zxx}/2$	×	×	$\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zyy}/2$, $\sigma_{xxz}=\sigma_{xzx}=-\sigma_{zxx}/2$
71	Fe_4O_5 (0.999)	$C^1m^{-1}c^{-1}2_1{}^{\infty m}1$	$\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zyy}/2$, $\sigma_{xxz}=\sigma_{xzx}=-\sigma_{zxx}/2$	$\sigma_{xzz}=\sigma_{zxz}=\sigma_{zzx}$, $\sigma_{xyy}=\sigma_{yxy}=\sigma_{yyx}$, σ_{xxx}	$\sigma_{zxz}=\sigma_{zzx}$, $\sigma_{yxy}=\sigma_{yyx}$, σ_{xzz}, σ_{xyy}, σ_{xxx}	$\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zyy}/2$, $\sigma_{xxz}=\sigma_{xzx}=-\sigma_{zxx}/2$
72	$SmNiO_3$ (1.353)	$C^1m^1c^12_1{}^{-1}(1/2\ \ 0\ \ 0)^{\infty m}1$	$\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zyy}/2$, $\sigma_{xxz}=\sigma_{xzx}=-\sigma_{zxx}/2$	×	×	$\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zyy}/2$, $\sigma_{xxz}=\sigma_{xzx}=-\sigma_{zxx}/2$
73	$EuNiO_3$ (1.354)	$C^1m^1c^12_1{}^{-1}(1/2\ \ 0\ \ 0)^{\infty m}1$	$\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zyy}/2$, $\sigma_{xxz}=\sigma_{xzx}=-\sigma_{zxx}/2$	×	×	$\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zyy}/2$, $\sigma_{xxz}=\sigma_{xzx}=-\sigma_{zxx}/2$
74	$PrNiO_3$ (1.43)	$C^1m^1c^12_1{}^{-1}(1/2\ \ 0\ \ 0)^{\infty m}1$	$\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zyy}/2$, $\sigma_{xxz}=\sigma_{xzx}=-\sigma_{zxx}/2$	×	×	$\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zyy}/2$, $\sigma_{xxz}=\sigma_{xzx}=-\sigma_{zxx}/2$
75	$NdNiO_3$ (1.45)	$C^1m^1c^12_1{}^{-1}(1/2\ \ 0\ \ 0)^{\infty m}1$	$\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zyy}/2$, $\sigma_{xxz}=\sigma_{xzx}=-\sigma_{zxx}/2$	×	×	$\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zyy}/2$, $\sigma_{xxz}=\sigma_{xzx}=-\sigma_{zxx}/2$

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Table S1 : (continued) Collinear antiferromagnets in MAGNDATA with second-order transport tensors triggered by magnetic geometry.

No.	Materials (ID)	Spin space group	without SOC	with SOC		
			BCD	IMD	QMD	BCD
76	$BaFe_2Se_3$ (1.120)	$C^1c^{-1}(1/2\ \ 0\ \ 0)^{\infty m}1$	$\sigma_{yzz} = -2\sigma_{zyz} = -2\sigma_{zzy}$, $\sigma_{xzz} = -2\sigma_{zxz} = -2\sigma_{zzx}$, $\sigma_{xyy} = -2\sigma_{yxy} = -2\sigma_{yyx}$, $\sigma_{xxy} = \sigma_{xyx} = -\sigma_{yxx}/2$	×	×	$\sigma_{yzz} = -2\sigma_{zyz} = -2\sigma_{zzy}$, $\sigma_{xzz} = -2\sigma_{zxz} = -2\sigma_{zzx}$, $\sigma_{xyy} = -2\sigma_{yxy} = -2\sigma_{yyx}$, $\sigma_{xxy} = \sigma_{xyx} = -\sigma_{yxx}/2$
77	$NaMn_2O_4$ (1.723)	$C^1c^{-1}(1/2\ \ 0\ \ 0)^{\infty m}1$	$\sigma_{yzz} = -2\sigma_{zyz} = -2\sigma_{zzy}$, $\sigma_{xzz} = -2\sigma_{zxz} = -2\sigma_{zzx}$, $\sigma_{xyy} = -2\sigma_{yxy} = -2\sigma_{yyx}$, $\sigma_{xxy} = \sigma_{xyx} = -\sigma_{yxx}/2$	×	×	$\sigma_{yzz} = -2\sigma_{zyz} = -2\sigma_{zzy}$, $\sigma_{xzz} = -2\sigma_{zxz} = -2\sigma_{zzx}$, $\sigma_{xyy} = -2\sigma_{yxy} = -2\sigma_{yyx}$, $\sigma_{xxy} = \sigma_{xyx} = -\sigma_{yxx}/2$
78	$BaFe_2Se_3$ (1.429)	$C^1m^{-1}(1/2\ \ 0\ \ 0)^{\infty m}1$	$\sigma_{yzz} = -2\sigma_{zyz} = -2\sigma_{zzy}$, $\sigma_{xzz} = -2\sigma_{zxz} = -2\sigma_{zzx}$, $\sigma_{xyy} = -2\sigma_{yxy} = -2\sigma_{yyx}$, $\sigma_{xxy} = \sigma_{xyx} = -\sigma_{yxx}/2$	×	×	$\sigma_{yzz} = -2\sigma_{zyz} = -2\sigma_{zzy}$, $\sigma_{xzz} = -2\sigma_{zxz} = -2\sigma_{zzx}$, $\sigma_{xyy} = -2\sigma_{yxy} = -2\sigma_{yyx}$, $\sigma_{xxy} = \sigma_{xyx} = -\sigma_{yxx}/2$
79	$Pb_2Mn_{0.6}Co_{0.4}WO_6$ (2.17)	$P^1m^{-1}c^{-1}2_1{}^{\infty m}1$	$\sigma_{yyz} = \sigma_{yzy} = -\sigma_{zyy}/2$, $\sigma_{xxz} = \sigma_{xzx} = -\sigma_{zxx}/2$	$\sigma_{xzz} = \sigma_{zxz} = \sigma_{zzx}$, $\sigma_{xyy} = \sigma_{yxy} = \sigma_{yyx}$, σ_{xxx}	$\sigma_{zxz} = \sigma_{zzx}$, $\sigma_{yxy} = \sigma_{yyx}$, σ_{xzz}, σ_{xyy}, σ_{xxx}	$\sigma_{yyz} = \sigma_{yzy} = -\sigma_{zyy}/2$, $\sigma_{xxz} = \sigma_{xzx} = -\sigma_{zxx}/2$
80	$Na_2CuSO_4Cl_2$ (1.682)	$P^1m^1n^12_1{}^{-1}(0\ \ 1/2\ \ 0)^{\infty m}1$	$\sigma_{yyz} = \sigma_{yzy} = -\sigma_{zyy}/2$, $\sigma_{xxz} = \sigma_{xzx} = -\sigma_{zxx}/2$	×	×	$\sigma_{yyz} = \sigma_{yzy} = -\sigma_{zyy}/2$, $\sigma_{xxz} = \sigma_{xzx} = -\sigma_{zxx}/2$
81	$LuMnO_3$ (1.101)	$P^1n^1a^12_1{}^{-1}(1/2\ \ 0\ \ 0)^{\infty m}1$	$\sigma_{yyz} = \sigma_{yzy} = -\sigma_{zyy}/2$, $\sigma_{xxz} = \sigma_{xzx} = -\sigma_{zxx}/2$	×	×	$\sigma_{yyz} = \sigma_{yzy} = -\sigma_{zyy}/2$, $\sigma_{xxz} = \sigma_{xzx} = -\sigma_{zxx}/2$
82	$HoMnO_3$ (1.20)	$P^1n^1a^12_1{}^{-1}(1/2\ \ 0\ \ 0)^{\infty m}1$	$\sigma_{yyz} = \sigma_{yzy} = -\sigma_{zyy}/2$, $\sigma_{xxz} = \sigma_{xzx} = -\sigma_{zxx}/2$	×	×	$\sigma_{yyz} = \sigma_{yzy} = -\sigma_{zyy}/2$, $\sigma_{xxz} = \sigma_{xzx} = -\sigma_{zxx}/2$

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Table S1 : (continued) Collinear antiferromagnets in MAGNDATA with second-order transport tensors triggered by magnetic geometry.

No.	Materials (ID)	Spin space group	without SOC	with SOC		
			BCD	IMD	QMD	BCD
83	$TmMnO_3$ (1.341)	$P^1n^1a^12_1{}^{-1}(1/2\ \ 0\ \ 0)^{\infty m}1$	$\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zyy}/2$, $\sigma_{xxz}=\sigma_{xzx}=-\sigma_{zxx}/2$	×	×	$\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zyy}/2$, $\sigma_{xxz}=\sigma_{xzx}=-\sigma_{zxx}/2$
84	HoNiGe (1.374)	$P^1m^{-1}(0\ \ 1/2\ \ 0)^{\infty m}1$	$\sigma_{yzz}=-2\sigma_{zyz}=-2\sigma_{zzy}$, $\sigma_{xzz}=-2\sigma_{zxz}=-2\sigma_{zzx}$, $\sigma_{xyy}=-2\sigma_{yxy}=-2\sigma_{yyx}$, $\sigma_{xxy}=\sigma_{xyx}=-\sigma_{yxx}/2$	×	×	$\sigma_{yzz}=-2\sigma_{zyz}=-2\sigma_{zzy}$, $\sigma_{xzz}=-2\sigma_{zxz}=-2\sigma_{zzx}$, $\sigma_{xyy}=-2\sigma_{yxy}=-2\sigma_{yyx}$, $\sigma_{xxy}=\sigma_{xyx}=-\sigma_{yxx}/2$
85	$BaCdVO(PO_4)_2$ (1.298)	$P^1c^1a^12_1{}^{-1}(0\ \ 1/2\ \ 0)^{\infty m}1$	$\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zyy}/2$, $\sigma_{xxz}=\sigma_{xzx}=-\sigma_{zxx}/2$	×	×	$\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zyy}/2$, $\sigma_{xxz}=\sigma_{xzx}=-\sigma_{zxx}/2$
86	$FeNb_2O_6$ (1.655)	$P^12_1{}^12_1{}^12^{-1}(0\ \ 0\ \ 1/2)^{\infty m}1$	$\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{yxz}=\sigma_{yzx}$, $\sigma_{xyz}=\sigma_{xzy}$	×	×	$\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{yxz}=\sigma_{yzx}$, $\sigma_{xyz}=\sigma_{xzy}$
87	$Sr_2Fe_3Se_2O_3$ (1.463)	$C^1m^1c^12_1{}^{-1}(1/2\ \ 0\ \ 0)^{\infty m}1$	$\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zyy}/2$, $\sigma_{xxz}=\sigma_{xzx}=-\sigma_{zxx}/2$	×	×	$\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zyy}/2$, $\sigma_{xxz}=\sigma_{xzx}=-\sigma_{zxx}/2$
88	$Sr_2Fe_3Se_2O_3$ (1.626)	$C^1m^1c^12_1{}^{-1}(1/2\ \ 0\ \ 0)^{\infty m}1$	$\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zyy}/2$, $\sigma_{xxz}=\sigma_{xzx}=-\sigma_{zxx}/2$	×	×	$\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zyy}/2$, $\sigma_{xxz}=\sigma_{xzx}=-\sigma_{zxx}/2$
89	$SmMn_2O_5$ (1.192)	$P^1m^1c^12_1{}^{-1}(1/2\ \ 0\ \ 0)^{\infty m}1$	$\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zyy}/2$, $\sigma_{xxz}=\sigma_{xzx}=-\sigma_{zxx}/2$	×	×	$\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zyy}/2$, $\sigma_{xxz}=\sigma_{xzx}=-\sigma_{zxx}/2$
90	$Tb_5Pd_2In_4$ (1.697)	$P^1m^1c^12_1{}^{-1}(1/2\ \ 0\ \ 0)^{\infty m}1$	$\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zyy}/2$, $\sigma_{xxz}=\sigma_{xzx}=-\sigma_{zxx}/2$	×	×	$\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zyy}/2$, $\sigma_{xxz}=\sigma_{xzx}=-\sigma_{zxx}/2$

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Table S1 : (continued) Collinear antiferromagnets in MAGNDATA with second-order transport tensors triggered by magnetic geometry.

No.	Materials (ID)	Spin space group	without SOC	with SOC		
			BCD	IMD	QMD	BCD
91	$PrMn_2O_5$ (1.325)	$P^{1}\mathrm{m}^{-1}(0\ \ 1/2\ \ 0)^{\infty\mathrm{m}}1$	$\sigma_{yzz}=-2\sigma_{zyz}=-2\sigma_{zzy}$, $\sigma_{xzz}=-2\sigma_{zxz}=-2\sigma_{zzx}$, $\sigma_{xyy}=-2\sigma_{yxy}=-2\sigma_{yyx}$, $\sigma_{xxy}=\sigma_{xyx}=-\sigma_{yxx}/2$	×	×	$\sigma_{yzz}=-2\sigma_{zyz}=-2\sigma_{zzy}$, $\sigma_{xzz}=-2\sigma_{zxz}=-2\sigma_{zzx}$, $\sigma_{xyy}=-2\sigma_{yxy}=-2\sigma_{yyx}$, $\sigma_{xxy}=\sigma_{xyx}=-\sigma_{yxx}/2$
92	$BiFe_{0.5}Sc_{0.5}O_3$ (0.67)	$I^{-1}\mathrm{m}^{-1}\mathrm{a}^{1}2^{\infty\mathrm{m}}1$	$\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zyy}/2$, $\sigma_{xxz}=\sigma_{xzx}=-\sigma_{zxx}/2$	$\sigma_{xzz}=\sigma_{zxz}=\sigma_{zzx}$, $\sigma_{xyy}=\sigma_{yxy}=\sigma_{yyx}$, σ_{xxx}	$\sigma_{zxz}=\sigma_{zzx}$, $\sigma_{yxy}=\sigma_{yyx}$, σ_{xzz}, σ_{xyy}, σ_{xxx}	$\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zyy}/2$, $\sigma_{xxz}=\sigma_{xzx}=-\sigma_{zxx}/2$
93	Sr_2MnGaO_5 (0.823)	$I^{-1}\mathrm{m}^{-1}\mathrm{a}^{1}2^{\infty\mathrm{m}}1$	$\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zyy}/2$, $\sigma_{xxz}=\sigma_{xzx}=-\sigma_{zxx}/2$	$\sigma_{xzz}=\sigma_{zxz}=\sigma_{zzx}$, $\sigma_{xyy}=\sigma_{yxy}=\sigma_{yyx}$, σ_{xxx}	$\sigma_{zxz}=\sigma_{zzx}$, $\sigma_{yxy}=\sigma_{yyx}$, σ_{xzz}, σ_{xyy}, σ_{xxx}	$\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zyy}/2$, $\sigma_{xxz}=\sigma_{xzx}=-\sigma_{zxx}/2$
94	$Sr_2Co_2O_5$ (0.799)	$P^{1}\mathrm{m}^{1}\mathrm{a}^{1}2^{-1}(1/2\ \ 1/2\ \ 1/2)^{\infty\mathrm{m}}1$	$\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zyy}/2$, $\sigma_{xxz}=\sigma_{xzx}=-\sigma_{zxx}/2$	×	×	$\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zyy}/2$, $\sigma_{xxz}=\sigma_{xzx}=-\sigma_{zxx}/2$
95	$MnCl_2(CO(NH_2)_2)_2$ (1.659)	$P^{1}\mathrm{b}^{1}\mathrm{a}^{1}2^{-1}(1/2\ \ 1/2\ \ 1/2)^{\infty\mathrm{m}}1$	$\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zyy}/2$, $\sigma_{xxz}=\sigma_{xzx}=-\sigma_{zxx}/2$	×	×	$\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zyy}/2$, $\sigma_{xxz}=\sigma_{xzx}=-\sigma_{zxx}/2$
96	$ZnFeF_5(H_2O)_2$ (0.575)	$I^{-1}\mathrm{m}^{1}\mathrm{m}^{-1}2^{\infty\mathrm{m}}1$	$\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zyy}/2$, $\sigma_{xxz}=\sigma_{xzx}=-\sigma_{zxx}/2$	σ_{zzz}, $\sigma_{yyz}=\sigma_{yzy}=\sigma_{zyy}$, $\sigma_{xxz}=\sigma_{xzx}=\sigma_{zxx}$	σ_{zzz}, σ_{zyy}, σ_{zxx}, $\sigma_{yyz}=\sigma_{yzy}$, $\sigma_{xxz}=\sigma_{xzx}$	$\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zyy}/2$, $\sigma_{xxz}=\sigma_{xzx}=-\sigma_{zxx}/2$
97	$Cu_2V_2O_7$ (0.137)	$F^{-1}\mathrm{d}^{1}\mathrm{d}^{-1}2^{\infty\mathrm{m}}1$	$\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zyy}/2$, $\sigma_{xxz}=\sigma_{xzx}=-\sigma_{zxx}/2$	$\sigma_{xyz}=\sigma_{xzy}=\sigma_{yxz}=\sigma_{yzx}=\sigma_{zxy}=\sigma_{zyx}$	$\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{yxz}=\sigma_{yzx}$, $\sigma_{xyz}=\sigma_{xzy}$	$\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zyy}/2$, $\sigma_{xxz}=\sigma_{xzx}=-\sigma_{zxx}/2$
98	$ErGe_{1.83}$ (0.344)	$C^{1}\mathrm{m}^{-1}\mathrm{c}^{-1}2_1{}^{\infty\mathrm{m}}1$	$\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zyy}/2$, $\sigma_{xxz}=\sigma_{xzx}=-\sigma_{zxx}/2$	σ_{zzz}, $\sigma_{yyz}=\sigma_{yzy}=\sigma_{zyy}$, $\sigma_{xxz}=\sigma_{xzx}=\sigma_{zxx}$	σ_{zzz}, σ_{zyy}, σ_{zxx}, $\sigma_{yyz}=\sigma_{yzy}$, $\sigma_{xxz}=\sigma_{xzx}$	$\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zyy}/2$, $\sigma_{xxz}=\sigma_{xzx}=-\sigma_{zxx}/2$
99	$Ca_3Mn_2O_7$ (0.23)	$C^{-1}\mathrm{m}^{-1}\mathrm{c}^{1}2_1{}^{\infty\mathrm{m}}1$	$\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zyy}/2$, $\sigma_{xxz}=\sigma_{xzx}=-\sigma_{zxx}/2$	$\sigma_{xzz}=\sigma_{zxz}=\sigma_{zzx}$, $\sigma_{xyy}=\sigma_{yxy}=\sigma_{yyx}$, σ_{xxx}	$\sigma_{zxz}=\sigma_{zzx}$, $\sigma_{yxy}=\sigma_{yyx}$, σ_{xzz}, σ_{xyy}, σ_{xxx}	$\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zyy}/2$, $\sigma_{xxz}=\sigma_{xzx}=-\sigma_{zxx}/2$

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Table S1 : (continued) Collinear antiferromagnets in MAGNDATA with second-order transport tensors triggered by magnetic geometry.

No.	Materials (ID)	Spin space group	without SOC	with SOC		
			BCD	IMD	QMD	BCD
100	$Ca_3Ru_2O_7$ (1.263)	$P^1\mathrm{m}^1\mathrm{c}^1{2_1}^{-1}(1/2\ \ 1/2\ \ 0)^{\infty\mathrm{m}}1$	$\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zyy}/2$, $\sigma_{xxz}=\sigma_{xzx}=-\sigma_{zxx}/2$	×	×	$\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zyy}/2$, $\sigma_{xxz}=\sigma_{xzx}=-\sigma_{zxx}/2$
101	$BaCoF_4$ (1.439)	$P^1\mathrm{n}^1\mathrm{a}^1{2_1}^{-1}(0\ \ 1/2\ \ 0)^{\infty\mathrm{m}}1$	$\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zyy}/2$, $\sigma_{xxz}=\sigma_{xzx}=-\sigma_{zxx}/2$	×	×	$\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zyy}/2$, $\sigma_{xxz}=\sigma_{xzx}=-\sigma_{zxx}/2$
102	$BaFe_2O_4$ (1.754)	$P^1\mathrm{n}^1\mathrm{a}^1{2_1}^{-1}(1/2\ \ 1/2\ \ 0)^{\infty\mathrm{m}}1$	$\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zyy}/2$, $\sigma_{xxz}=\sigma_{xzx}=-\sigma_{zxx}/2$	×	×	$\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zyy}/2$, $\sigma_{xxz}=\sigma_{xzx}=-\sigma_{zxx}/2$
103	$BaCoF_4$ (1.438)	$P^1{2_1}^{-1}(0\ \ 0\ \ 1/2)^{\infty\mathrm{m}}1$	$\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zyy}/2$, $\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{xxz}=\sigma_{xzx}=-\sigma_{zxx}/2$, $\sigma_{yxz}=\sigma_{yzx}$, $\sigma_{xyz}=\sigma_{xzy}$	×	×	$\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zyy}/2$, $\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{xxz}=\sigma_{xzx}=-\sigma_{zxx}/2$, $\sigma_{yxz}=\sigma_{yzx}$, $\sigma_{xyz}=\sigma_{xzy}$
104	$BaNiF_4$ (1.64)	$P^1{2_1}^{-1}(0\ \ 0\ \ 1/2)^{\infty\mathrm{m}}1$	$\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zyy}/2$, $\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{xxz}=\sigma_{xzx}=-\sigma_{zxx}/2$, $\sigma_{yxz}=\sigma_{yzx}$, $\sigma_{xyz}=\sigma_{xzy}$	×	×	$\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zyy}/2$, $\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{xxz}=\sigma_{xzx}=-\sigma_{zxx}/2$, $\sigma_{yxz}=\sigma_{yzx}$, $\sigma_{xyz}=\sigma_{xzy}$
105	$La_{1.5}Ca_{0.5}CoO_4$ (1.583)	$A^1\mathrm{m}^1\mathrm{a}^1{2}^{-1}(0\ \ 1/2\ \ 0)^{\infty\mathrm{m}}1$	$\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zyy}/2$, $\sigma_{xxz}=\sigma_{xzx}=-\sigma_{zxx}/2$	×	×	$\sigma_{yzz}=-2\sigma_{zyz}=-2\sigma_{zzy}$, $\sigma_{xzz}=-2\sigma_{zxz}=-2\sigma_{zzx}$, $\sigma_{xyy}=-2\sigma_{yxy}=-2\sigma_{yyx}$, $\sigma_{xxy}=\sigma_{xyx}=-\sigma_{yxx}/2$

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Table S1 : (continued) Collinear antiferromagnets in MAGNDATA with second-order transport tensors triggered by magnetic geometry.

No.	Materials (ID)	Spin space group	without SOC	with SOC		
			BCD	IMD	QMD	BCD
106	Li_2CoSiO_4 (1.79)	$C^1c^{-1}(1/2\ \ 0\ \ 0)^{\infty m}1$	$\sigma_{yzz} = -2\sigma_{zyz} = -2\sigma_{zzy}$, $\sigma_{xzz} = -2\sigma_{zxz} = -2\sigma_{zzx}$, $\sigma_{xyy} = -2\sigma_{yxy} = -2\sigma_{yyx}$, $\sigma_{xxy} = \sigma_{xyx} = -\sigma_{yxx}/2$	×	×	$\sigma_{yzz} = -2\sigma_{zyz} = -2\sigma_{zzy}$, $\sigma_{xzz} = -2\sigma_{zxz} = -2\sigma_{zzx}$, $\sigma_{xyy} = -2\sigma_{yxy} = -2\sigma_{yyx}$, $\sigma_{xxy} = \sigma_{xyx} = -\sigma_{yxx}/2$
107	$Y_2Cu_2O_5$ (0.241)	$P^{-1}n^1a^{-1}2_1{}^{\infty m}1$	$\sigma_{yyz} = \sigma_{yzy} = -\sigma_{zyy}/2$, $\sigma_{xxz} = \sigma_{xzx} = -\sigma_{zxx}/2$	σ_{zzz}, $\sigma_{yyz} = \sigma_{yzy} = \sigma_{zyy}$, $\sigma_{xxz} = \sigma_{xzx} = \sigma_{zxx}$	σ_{zzz}, σ_{zyy}, σ_{zxx}, $\sigma_{yyz} = \sigma_{yzy}$, $\sigma_{xxz} = \sigma_{xzx}$	$\sigma_{yyz} = \sigma_{yzy} = -\sigma_{zyy}/2$, $\sigma_{xxz} = \sigma_{xzx} = -\sigma_{zxx}/2$
108	$[C(ND_2)_3]Cu(DCOO)_3$ (0.254)	$P^{-1}n^1a^{-1}2_1{}^{\infty m}1$	$\sigma_{yyz} = \sigma_{yzy} = -\sigma_{zyy}/2$, $\sigma_{xxz} = \sigma_{xzx} = -\sigma_{zxx}/2$	σ_{zzz}, $\sigma_{yyz} = \sigma_{yzy} = \sigma_{zyy}$, $\sigma_{xxz} = \sigma_{xzx} = \sigma_{zxx}$	σ_{zzz}, σ_{zyy}, σ_{zxx}, $\sigma_{yyz} = \sigma_{yzy}$, $\sigma_{xxz} = \sigma_{xzx}$	$\sigma_{yyz} = \sigma_{yzy} = -\sigma_{zyy}/2$, $\sigma_{xxz} = \sigma_{xzx} = -\sigma_{zxx}/2$
109	$[C(ND_2)_3]Cu(DCOO)_3$ (0.255)	$P^{-1}n^1a^{-1}2_1{}^{\infty m}1$	$\sigma_{yyz} = \sigma_{yzy} = -\sigma_{zyy}/2$, $\sigma_{xxz} = \sigma_{xzx} = -\sigma_{zxx}/2$	$\sigma_{xyz} = \sigma_{xzy} = \sigma_{yxz} = \sigma_{yzx} = \sigma_{zxy} = \sigma_{zyx}$	$\sigma_{zxy} = \sigma_{zyx}$, $\sigma_{yxz} = \sigma_{yzx}$, $\sigma_{xyz} = \sigma_{xzy}$	$\sigma_{yyz} = \sigma_{yzy} = -\sigma_{zyy}/2$, $\sigma_{xxz} = \sigma_{xzx} = -\sigma_{zxx}/2$
110	$BaCrF_5$ (0.303)	$P^{-1}2_1{}^{-1}2_1{}^12_1{}^{\infty m}1$	$\sigma_{zxy} = \sigma_{zyx}$, $\sigma_{yxz} = \sigma_{yzx}$, $\sigma_{xyz} = \sigma_{xzy}$	σ_{zzz}, $\sigma_{yyz} = \sigma_{yzy} = \sigma_{zyy}$, $\sigma_{xxz} = \sigma_{xzx} = \sigma_{zxx}$	σ_{zzz}, σ_{zyy}, σ_{zxx}, $\sigma_{yyz} = \sigma_{yzy}$, $\sigma_{xxz} = \sigma_{xzx}$	$\sigma_{zxy} = \sigma_{zyx}$, $\sigma_{yxz} = \sigma_{yzx}$, $\sigma_{xyz} = \sigma_{xzy}$
111	Lu_2MnCoO_6 (1.32)	$P^12_1{}^{-1}(0\ \ 0\ \ 1/2)^{\infty m}1$	$\sigma_{yyz} = \sigma_{yzy} = -\sigma_{zyy}/2$, $\sigma_{zxy} = \sigma_{zyx}$, $\sigma_{xxz} = \sigma_{xzx} = -\sigma_{zxx}/2$, $\sigma_{yxz} = \sigma_{yzx}$, $\sigma_{xyz} = \sigma_{xzy}$	×	×	$\sigma_{yyz} = \sigma_{yzy} = -\sigma_{zyy}/2$, $\sigma_{zxy} = \sigma_{zyx}$, $\sigma_{xxz} = \sigma_{xzx} = -\sigma_{zxx}/2$, $\sigma_{yxz} = \sigma_{yzx}$, $\sigma_{xyz} = \sigma_{xzy}$
112	Na_2MnF_5 (1.55)	$P^1c^{-1}(0\ \ 1/2\ \ 0)^{\infty m}1$	$\sigma_{yzz} = -2\sigma_{zyz} = -2\sigma_{zzy}$, $\sigma_{xzz} = -2\sigma_{zxz} = -2\sigma_{zzx}$, $\sigma_{xyy} = -2\sigma_{yxy} = -2\sigma_{yyx}$, $\sigma_{xxy} = \sigma_{xyx} = -\sigma_{yxx}/2$	×	×	$\sigma_{yzz} = -2\sigma_{zyz} = -2\sigma_{zzy}$, $\sigma_{xzz} = -2\sigma_{zxz} = -2\sigma_{zzx}$, $\sigma_{xyy} = -2\sigma_{yxy} = -2\sigma_{yyx}$, $\sigma_{xxy} = \sigma_{xyx} = -\sigma_{yxx}/2$

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Table S1 : (continued) Collinear antiferromagnets in MAGNDATA with second-order transport tensors triggered by magnetic geometry.

No.	Materials (ID)	Spin space group	without SOC	with SOC		
			BCD	IMD	QMD	BCD
113	Pb_2CoOsO_6 (1.565)	$P^{1}c^{-1}(0\ \ 1/2\ \ 0)^{\infty m}1$	$\sigma_{yzz} = -2\sigma_{zyz} = -2\sigma_{zzy}$, $\sigma_{xzz} = -2\sigma_{zxz} = -2\sigma_{zzx}$, $\sigma_{xyy} = -2\sigma_{yxy} = -2\sigma_{yyx}$, $\sigma_{xxy} = \sigma_{xyx} = -\sigma_{yxx}/2$	×	×	$\sigma_{yzz} = -2\sigma_{zyz} = -2\sigma_{zzy}$, $\sigma_{xzz} = -2\sigma_{zxz} = -2\sigma_{zzx}$, $\sigma_{xyy} = -2\sigma_{yxy} = -2\sigma_{yyx}$, $\sigma_{xxy} = \sigma_{xyx} = -\sigma_{yxx}/2$
114	Pb_2NiOsO_6 (1.592)	$P^{1}c^{-1}(0\ \ 1/2\ \ 0)^{\infty m}1$	$\sigma_{yzz} = -2\sigma_{zyz} = -2\sigma_{zzy}$, $\sigma_{xzz} = -2\sigma_{zxz} = -2\sigma_{zzx}$, $\sigma_{xyy} = -2\sigma_{yxy} = -2\sigma_{yyx}$, $\sigma_{xxy} = \sigma_{xyx} = -\sigma_{yxx}/2$	×	×	$\sigma_{yzz} = -2\sigma_{zyz} = -2\sigma_{zzy}$, $\sigma_{xzz} = -2\sigma_{zxz} = -2\sigma_{zzx}$, $\sigma_{xyy} = -2\sigma_{yxy} = -2\sigma_{yyx}$, $\sigma_{xxy} = \sigma_{xyx} = -\sigma_{yxx}/2$
115	$Mn_4Nb_2O_9$ (0.722)	$C^{-1}c^{\infty m}1$	$\sigma_{yzz} = -2\sigma_{zyz} = -2\sigma_{zzy}$, $\sigma_{xzz} = -2\sigma_{zxz} = -2\sigma_{zzx}$, $\sigma_{xyy} = -2\sigma_{yxy} = -2\sigma_{yyx}$, $\sigma_{xxy} = \sigma_{xyx} = -\sigma_{yxx}/2$	$\sigma_{yzz} = \sigma_{zyz} = \sigma_{zzy}$, $\sigma_{xzz} = \sigma_{zxz} = \sigma_{zzx}$, σ_{yyy}, $\sigma_{xyy} = \sigma_{yxy} = \sigma_{yyx}$, $\sigma_{xxy} = \sigma_{xyx} = \sigma_{yxx}$, σ_{xxx}	$\sigma_{zyz} = \sigma_{zzy}$, $\sigma_{zxz} = \sigma_{zzx}$, σ_{yzz}, σ_{yyy}, $\sigma_{yxy} = \sigma_{yyx}$, σ_{yxx}, σ_{xzz}, σ_{xyy}, $\sigma_{xxy} = \sigma_{xyx}$, σ_{xxx}	$\sigma_{yzz} = -2\sigma_{zyz} = -2\sigma_{zzy}$, $\sigma_{xzz} = -2\sigma_{zxz} = -2\sigma_{zzx}$, $\sigma_{xyy} = -2\sigma_{yxy} = -2\sigma_{yyx}$, $\sigma_{xxy} = \sigma_{xyx} = -\sigma_{yxx}/2$
116	Li_2FeGeS_4 (1.735)	$C^{1}c^{-1}(1/2\ \ 0\ \ 0)^{\infty m}1$	$\sigma_{yzz} = -2\sigma_{zyz} = -2\sigma_{zzy}$, $\sigma_{xzz} = -2\sigma_{zxz} = -2\sigma_{zzx}$, $\sigma_{xyy} = -2\sigma_{yxy} = -2\sigma_{yyx}$, $\sigma_{xxy} = \sigma_{xyx} = -\sigma_{yxx}/2$	×	×	$\sigma_{yzz} = -2\sigma_{zyz} = -2\sigma_{zzy}$, $\sigma_{xzz} = -2\sigma_{zxz} = -2\sigma_{zzx}$, $\sigma_{xyy} = -2\sigma_{yxy} = -2\sigma_{yyx}$, $\sigma_{xxy} = \sigma_{xyx} = -\sigma_{yxx}/2$

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Table S1 : (continued) Collinear antiferromagnets in MAGNDATA with second-order transport tensors triggered by magnetic geometry.

No.	Materials (ID)	Spin space group	without SOC	with SOC		
			BCD	IMD	QMD	BCD
117	$LuFe_2O_4$ (0.965)	$P^{1}1^{-1}(1/2\ \ 0\ \ 0)^{\infty m}1$	$\sigma_{yzz} = -2\sigma_{zyz} = -2\sigma_{zzy}$, $\sigma_{xzz} = -2\sigma_{zxz} = -2\sigma_{zzx}$, $\sigma_{yyz} = \sigma_{yzy} = -\sigma_{zyy}/2$, $\sigma_{zxy} = \sigma_{zyx}$, $\sigma_{xxz} = \sigma_{xzx} = -\sigma_{zxx}/2$, $\sigma_{yxz} = \sigma_{yzx}$, $\sigma_{xyy} = -2\sigma_{yxy} = -2\sigma_{yyx}$, $\sigma_{xxy} = \sigma_{xyx} = -\sigma_{yxx}/2$, $\sigma_{xyz} = \sigma_{xzy}$	×	×	$\sigma_{yzz} = -2\sigma_{zyz} = -2\sigma_{zzy}$, $\sigma_{xzz} = -2\sigma_{zxz} = -2\sigma_{zzx}$, $\sigma_{yyz} = \sigma_{yzy} = -\sigma_{zyy}/2$, $\sigma_{zxy} = \sigma_{zyx}$, $\sigma_{xxz} = \sigma_{xzx} = -\sigma_{zxx}/2$, $\sigma_{yxz} = \sigma_{yzx}$, $\sigma_{xyy} = -2\sigma_{yxy} = -2\sigma_{yyx}$, $\sigma_{xxy} = \sigma_{xyx} = -\sigma_{yxx}/2$, $\sigma_{xyz} = \sigma_{xzy}$
118	$CrPS_4$ (1.440)	$C^{1}2^{-1}(0\ \ 0\ \ 1/2)^{\infty m}1$	$\sigma_{yyz} = \sigma_{yzy} = -\sigma_{zyy}/2$, $\sigma_{zxy} = \sigma_{zyx}$, $\sigma_{xxz} = \sigma_{xzx} = -\sigma_{zxx}/2$, $\sigma_{yxz} = \sigma_{yzx}$, $\sigma_{xyz} = \sigma_{xzy}$	×	×	$\sigma_{yyz} = \sigma_{yzy} = -\sigma_{zyy}/2$, $\sigma_{zxy} = \sigma_{zyx}$, $\sigma_{xxz} = \sigma_{xzx} = -\sigma_{zxx}/2$, $\sigma_{yxz} = \sigma_{yzx}$, $\sigma_{xyz} = \sigma_{xzy}$
119	$CrPS_4$ (1.708)	$C^{1}2^{-1}(0\ \ 0\ \ 1/2)^{\infty m}1$	$\sigma_{yyz} = \sigma_{yzy} = -\sigma_{zyy}/2$, $\sigma_{zxy} = \sigma_{zyx}$, $\sigma_{xxz} = \sigma_{xzx} = -\sigma_{zxx}/2$, $\sigma_{yxz} = \sigma_{yzx}$, $\sigma_{xyz} = \sigma_{xzy}$	×	×	$\sigma_{yyz} = \sigma_{yzy} = -\sigma_{zyy}/2$, $\sigma_{zxy} = \sigma_{zyx}$, $\sigma_{xxz} = \sigma_{xzx} = -\sigma_{zxx}/2$, $\sigma_{yxz} = \sigma_{yzx}$, $\sigma_{xyz} = \sigma_{xzy}$
120	$LiFeP_2O_7$ (0.83)	$P^{-1}2_1{}^{\infty m}1$	$\sigma_{yyz} = \sigma_{yzy} = -\sigma_{zyy}/2$, $\sigma_{zxy} = \sigma_{zyx}$, $\sigma_{xxz} = \sigma_{xzx} = -\sigma_{zxx}/2$, $\sigma_{yxz} = \sigma_{yzx}$, $\sigma_{xyz} = \sigma_{xzy}$	σ_{zzz}, $\sigma_{yyz} = \sigma_{yzy} = \sigma_{zyy}$, $\sigma_{xyz} = \sigma_{xzy} = \sigma_{yxz} = \sigma_{yzx} = \sigma_{zyx}$, $\sigma_{xxz} = \sigma_{xzx} = \sigma_{zxx}$	σ_{zzz}, σ_{zyy}, $\sigma_{zxy} = \sigma_{zyx}$, σ_{zxx}, $\sigma_{yyz} = \sigma_{yzy}$, $\sigma_{yxz} = \sigma_{yzx}$, $\sigma_{xyz} = \sigma_{xzy}$, $\sigma_{xxz} = \sigma_{xzx}$	$\sigma_{yyz} = \sigma_{yzy} = -\sigma_{zyy}/2$, $\sigma_{zxy} = \sigma_{zyx}$, $\sigma_{xxz} = \sigma_{xzx} = -\sigma_{zxx}/2$, $\sigma_{yxz} = \sigma_{yzx}$, $\sigma_{xyz} = \sigma_{xzy}$

Table S2: Coplanar antiferromagnets in MAGNDATA with second-order transport tensors triggered by magnetic geometry. Note that without SOC, IMD- and QMD-contributions are forbidden.

No.	Materials (ID)	Spin space group	without SOC	with SOC		
			BCD	IMD	QMD	BCD
1	$ZnFe_2O_4$ (1.760)	I^1-$4^{\mathrm{m}_{110}}\mathrm{m}^{\mathrm{m}_{110}}2\vert(2_{001}, 2_{001}, 2_{001}; 4^3_{001})^m1$	$\sigma_{zxy} = \sigma_{zyx}$, $\sigma_{xyz} = \sigma_{xzy} = \sigma_{yxz} = \sigma_{yzx}$	×	×	$\sigma_{zxy} = \sigma_{zyx}$, $\sigma_{xyz} = \sigma_{xzy} = \sigma_{yxz} = \sigma_{yzx}$
2	$CsCrF_4$ (1.709)	$C^1\mathrm{m}^{2_{001}}(1/2\ \ 0\ \ 0)^m1$	$\sigma_{yzz} = -2\sigma_{zyz} = -2\sigma_{zzy}$, $\sigma_{xzz} = -2\sigma_{zxz} = -2\sigma_{zzx}$, $\sigma_{xyy} = -2\sigma_{yxy} = -2\sigma_{yyx}$, $\sigma_{xxy} = \sigma_{xyx} = -\sigma_{yxx}/2$	×	×	$\sigma_{yzz} = -2\sigma_{zyz} = -2\sigma_{zzy}$, $\sigma_{xzz} = -2\sigma_{zxz} = -2\sigma_{zzx}$, $\sigma_{xyy} = -2\sigma_{yxy} = -2\sigma_{yyx}$, $\sigma_{xxy} = \sigma_{xyx} = -\sigma_{yxx}/2$
3	$CsCr_{0.98}Al_{0.02}F_4$ (1.712)	$C^1\mathrm{m}^{2_{001}}(1/2\ \ 0\ \ 0)^m1$	$\sigma_{yzz} = -2\sigma_{zyz} = -2\sigma_{zzy}$, $\sigma_{xzz} = -2\sigma_{zxz} = -2\sigma_{zzx}$, $\sigma_{xyy} = -2\sigma_{yxy} = -2\sigma_{yyx}$, $\sigma_{xxy} = \sigma_{xyx} = -\sigma_{yxx}/2$	×	×	$\sigma_{yzz} = -2\sigma_{zyz} = -2\sigma_{zzy}$, $\sigma_{xzz} = -2\sigma_{zxz} = -2\sigma_{zzx}$, $\sigma_{xyy} = -2\sigma_{yxy} = -2\sigma_{yyx}$, $\sigma_{xxy} = \sigma_{xyx} = -\sigma_{yxx}/2$
4	$CsCr_{0.98}Al_{0.02}F_4$ (1.713)	$C^1\mathrm{m}^{2_{001}}(1/2\ \ 0\ \ 0)^m1$	$\sigma_{yzz} = -2\sigma_{zyz} = -2\sigma_{zzy}$, $\sigma_{xzz} = -2\sigma_{zxz} = -2\sigma_{zzx}$, $\sigma_{xyy} = -2\sigma_{yxy} = -2\sigma_{yyx}$, $\sigma_{xxy} = \sigma_{xyx} = -\sigma_{yxx}/2$	×	×	$\sigma_{yzz} = -2\sigma_{zyz} = -2\sigma_{zzy}$, $\sigma_{xzz} = -2\sigma_{zxz} = -2\sigma_{zzx}$, $\sigma_{xyy} = -2\sigma_{yxy} = -2\sigma_{yyx}$, $\sigma_{xxy} = \sigma_{xyx} = -\sigma_{yxx}/2$
5	TmPtIn (1.67)	$P^{2_{001}}\mathrm{m}^1\mathrm{m}^{2_{001}}2\vert(2_{010}, 2_{010}, 1)^m1$	$\sigma_{yyz} = \sigma_{yzy} = -\sigma_{zyy}/2$, $\sigma_{xxz} = \sigma_{xzx} = -\sigma_{zxx}/2$	×	×	$\sigma_{yyz} = \sigma_{yzy} = -\sigma_{zyy}/2$, $\sigma_{xxz} = \sigma_{xzx} = -\sigma_{zxx}/2$
6	$Ni_2Mo_3O_8$ (1.768)	$C^1\mathrm{m}^{\mathrm{m}_{100}}\mathrm{c}^{\mathrm{m}_{100}}2_1\vert(1, 1, 1; 2_{001})^m1$	$\sigma_{yyz} = \sigma_{yzy} = -\sigma_{zyy}/2$, $\sigma_{xxz} = \sigma_{xzx} = -\sigma_{zxx}/2$	×	×	$\sigma_{yyz} = \sigma_{yzy} = -\sigma_{zyy}/2$, $\sigma_{xxz} = \sigma_{xzx} = -\sigma_{zxx}/2$

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Table S2 : (continued) Coplanar antiferromagnets in MAGNDATA with second-order transport tensors triggered by magnetic geometry.

No.	Materials (ID)	Spin space group	without SOC	with SOC		
			BCD	IMD	QMD	BCD
7	HoAuGe (1.34)	$P^{1}\mathrm{m}^{2_{001}}(1/2\ \ 1/2\ \ 0)^{m}1$	$\sigma_{yzz}=-2\sigma_{zyz}=-2\sigma_{zzy}$, $\sigma_{xzz}=-2\sigma_{zxz}=-2\sigma_{zzx}$, $\sigma_{xyy}=-2\sigma_{yxy}=-2\sigma_{yyx}$, $\sigma_{xxy}=\sigma_{xyx}=-\sigma_{yxx}/2$	×	×	$\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zyy}/2$, $\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{xxz}=\sigma_{xzx}=-\sigma_{zxx}/2$, $\sigma_{yxz}=\sigma_{yzx}$, $\sigma_{xyz}=\sigma_{xzy}$
8	$InMnO_3$ (1.525)	$P^{3^{1}_{001}}3^{1}1^{\mathrm{m}_{\frac{5}{6}\pi}}\mathrm{m}\vert(1,1,2_{001})^{m}1$	$\sigma_{xxz}=\sigma_{xzx}=\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zxx}/2=-\sigma_{zyy}/2$	×	×	$\sigma_{xxz}=\sigma_{xzx}=\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zxx}/2=-\sigma_{zyy}/2$
9	$InMnO_3$ (1.524)	$P^{3^{1}_{001}}3^{1}1^{\mathrm{m}_{\frac{5}{6}\pi}}\mathrm{m}\vert(1,1,2_{001})^{m}1$	$\sigma_{xxz}=\sigma_{xzx}=\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zxx}/2=-\sigma_{zyy}/2$	×	×	$\sigma_{xxz}=\sigma_{xzx}=\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zxx}/2=-\sigma_{zyy}/2$
10	$YbMnO_3$ (0.30)	$P^{3^{2}_{001}}6_{3}{}^{\mathrm{m}_{\frac{1}{6}\pi}}\mathrm{c}^{\mathrm{m}_{\frac{5}{6}\pi}}\mathrm{m}^{m}1$	$\sigma_{xxz}=\sigma_{xzx}=\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zxx}/2=-\sigma_{zyy}/2$	$\sigma_{xxx}=-\sigma_{xyy}=-\sigma_{yxy}=-\sigma_{yyx}$	$\sigma_{xxx}=-\sigma_{xyy}=-\sigma_{yxy}=-\sigma_{yyx}$	$\sigma_{xxz}=\sigma_{xzx}=\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zxx}/2=-\sigma_{zyy}/2$
11	$YMnO_3$ (0.44)	$P^{3^{2}_{001}}6_{3}{}^{\mathrm{m}_{\frac{1}{6}\pi}}\mathrm{c}^{\mathrm{m}_{\frac{5}{6}\pi}}\mathrm{m}^{m}1$	$\sigma_{xxz}=\sigma_{xzx}=\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zxx}/2=-\sigma_{zyy}/2$	$\sigma_{xxy}=\sigma_{xyx}=\sigma_{yxx}=-\sigma_{yyy}$, $\sigma_{xxx}=-\sigma_{xyy}=-\sigma_{yxy}=-\sigma_{yyx}$	$\sigma_{xxy}=\sigma_{xyx}=\sigma_{yxx}=-\sigma_{yyy}$, $\sigma_{xxx}=-\sigma_{xyy}=-\sigma_{yxy}=-\sigma_{yyx}$	$\sigma_{xxz}=\sigma_{xzx}=\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zxx}/2=-\sigma_{zyy}/2$, $\sigma_{xyz}=\sigma_{xzy}=-\sigma_{yxz}=-\sigma_{yzx}$
12	$HoMnO_3$ (0.32)	$P^{6^{1}_{001}}6_{3}{}^{\mathrm{m}_{\frac{1}{6}\pi}}\mathrm{c}^{\mathrm{m}_{\frac{1}{3}\pi}}\mathrm{m}^{m}1$	$\sigma_{xxz}=\sigma_{xzx}=\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zxx}/2=-\sigma_{zyy}/2$	σ_{zzz}, $\sigma_{xxz}=\sigma_{xzx}=\sigma_{yyz}=\sigma_{yzy}=\sigma_{zxx}=\sigma_{zyy}$	σ_{zzz}, $\sigma_{zxx}=\sigma_{zyy}$, $\sigma_{xxz}=\sigma_{xzx}=\sigma_{yyz}=\sigma_{yzy}$	$\sigma_{xxz}=\sigma_{xzx}=\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zxx}/2=-\sigma_{zyy}/2$
13	$YMnO_3$ (0.6)	$P^{6^{1}_{001}}6_{3}{}^{\mathrm{m}_{\frac{1}{6}\pi}}\mathrm{c}^{\mathrm{m}_{\frac{1}{3}\pi}}\mathrm{m}^{m}1$	$\sigma_{xxz}=\sigma_{xzx}=\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zxx}/2=-\sigma_{zyy}/2$	σ_{zzz}, $\sigma_{xxz}=\sigma_{xzx}=\sigma_{yyz}=\sigma_{yzy}=\sigma_{zxx}=\sigma_{zyy}$	σ_{zzz}, $\sigma_{zxx}=\sigma_{zyy}$, $\sigma_{xxz}=\sigma_{xzx}=\sigma_{yyz}=\sigma_{yzy}$	$\sigma_{xxz}=\sigma_{xzx}=\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zxx}/2=-\sigma_{zyy}/2$
14	$LuFeO_3$ (0.117)	$P^{6^{1}_{001}}6_{3}{}^{\mathrm{m}_{\frac{1}{6}\pi}}\mathrm{c}^{\mathrm{m}_{\frac{1}{3}\pi}}\mathrm{m}^{m}1$	$\sigma_{xxz}=\sigma_{xzx}=\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zxx}/2=-\sigma_{zyy}/2$	×	$\sigma_{xyz}=\sigma_{xzy}=-\sigma_{yxz}=-\sigma_{yzx}$	$\sigma_{xxz}=\sigma_{xzx}=\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zxx}/2=-\sigma_{zyy}/2$

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Table S2 : (continued) Coplanar antiferromagnets in MAGNDATA with second-order transport tensors triggered by magnetic geometry.

No.	Materials (ID)	Spin space group	without SOC	with SOC		
			BCD	IMD	QMD	BCD
15	$HoMnO_3$ (0.31)	$P^{6^1_{001}}6_3{}^{\mathrm{m}_{\frac{1}{6}\pi}}\mathrm{c}^{\mathrm{m}_{\frac{1}{3}\pi}}\mathrm{m}^m1$	$\sigma_{xxz}=\sigma_{xzx}=\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zxx}/2=-\sigma_{zyy}/2$	$\times$	$\sigma_{xyz}=\sigma_{xzy}=-\sigma_{yxz}=-\sigma_{yzx}$	$\sigma_{xxz}=\sigma_{xzx}=\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zxx}/2=-\sigma_{zyy}/2$
16	$ScMnO_3$ (0.7)	$P^{6^1_{001}}6_3{}^{\mathrm{m}_{\frac{1}{6}\pi}}\mathrm{c}^{\mathrm{m}_{\frac{1}{3}\pi}}\mathrm{m}^m1$	$\sigma_{xxz}=\sigma_{xzx}=\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zxx}/2=-\sigma_{zyy}/2$	$\times$	$\sigma_{xyz}=\sigma_{xzy}=-\sigma_{yxz}=-\sigma_{yzx}$	$\sigma_{xxz}=\sigma_{xzx}=\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zxx}/2=-\sigma_{zyy}/2$
17	$ScMnO_3$ (0.8)	$P^{6^1_{001}}6_3{}^{\mathrm{m}_{\frac{1}{6}\pi}}\mathrm{c}^{\mathrm{m}_{\frac{1}{3}\pi}}\mathrm{m}^m1$	$\sigma_{xxz}=\sigma_{xzx}=\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zxx}/2=-\sigma_{zyy}/2$	σ_{zzz}, $\sigma_{xxz}=\sigma_{xzx}=\sigma_{yyz}=\sigma_{yzy}=\sigma_{zxx}=\sigma_{zyy}$	σ_{zzz}, $\sigma_{zxx}=\sigma_{zyy}$, $\sigma_{xyz}=\sigma_{xzy}=-\sigma_{yxz}=-\sigma_{yzx}$, $\sigma_{xxz}=\sigma_{xzx}=\sigma_{yyz}=\sigma_{yzy}$	$\sigma_{xxz}=\sigma_{xzx}=\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zxx}/2=-\sigma_{zyy}/2$, $\sigma_{xyz}=\sigma_{xzy}=-\sigma_{yxz}=-\sigma_{yzx}$
18	$Na_2Co_2TeO_6$ (1.645)	$C^{\mathrm{m}_{100}}2^1 2^{\mathrm{m}_{100}}2_1\vert(1,1,1;2_{001})^m1$	$\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{yxz}=\sigma_{yzx}$, $\sigma_{xyz}=\sigma_{xzy}$	$\times$	$\times$	$\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{yxz}=\sigma_{yzx}$, $\sigma_{xyz}=\sigma_{xzy}$
19	$BaCoSiO_4$ (0.724)	$P^{6^1_{001}}6_3{}^m1$	$\sigma_{xxz}=\sigma_{xzx}=\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zxx}/2=-\sigma_{zyy}/2$, $\sigma_{xyz}=\sigma_{xzy}=-\sigma_{yxz}=-\sigma_{yzx}$	σ_{zzz}, $\sigma_{xxz}=\sigma_{xzx}=\sigma_{yyz}=\sigma_{yzy}=\sigma_{zxx}=\sigma_{zyy}$	σ_{zzz}, $\sigma_{zxx}=\sigma_{zyy}$, $\sigma_{xyz}=\sigma_{xzy}=-\sigma_{yxz}=-\sigma_{yzx}$, $\sigma_{xxz}=\sigma_{xzx}=\sigma_{yyz}=\sigma_{yzy}$	$\sigma_{xxz}=\sigma_{xzx}=\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zxx}/2=-\sigma_{zyy}/2$, $\sigma_{xyz}=\sigma_{xzy}=-\sigma_{yxz}=-\sigma_{yzx}$
20	$BaCoSiO_4$ (1.0.49)	$P^{6^1_{001}}6_3{}^m1$	$\sigma_{xxz}=\sigma_{xzx}=\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zxx}/2=-\sigma_{zyy}/2$, $\sigma_{xyz}=\sigma_{xzy}=-\sigma_{yxz}=-\sigma_{yzx}$	σ_{zzz}, $\sigma_{xxz}=\sigma_{xzx}=\sigma_{yyz}=\sigma_{yzy}=\sigma_{zxx}=\sigma_{zyy}$	σ_{zzz}, $\sigma_{zxx}=\sigma_{zyy}$, $\sigma_{xyz}=\sigma_{xzy}=-\sigma_{yxz}=-\sigma_{yzx}$, $\sigma_{xxz}=\sigma_{xzx}=\sigma_{yyz}=\sigma_{yzy}$	$\sigma_{xxz}=\sigma_{xzx}=\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zxx}/2=-\sigma_{zyy}/2$, $\sigma_{xyz}=\sigma_{xzy}=-\sigma_{yxz}=-\sigma_{yzx}$

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Table S2 : (continued) Coplanar antiferromagnets in MAGNDATA with second-order transport tensors triggered by magnetic geometry.

No.	Materials (ID)	Spin space group	without SOC	with SOC		
			BCD	IMD	QMD	BCD
21	$SmFe_3(BO_3)_4$ (1.266)	$R^{1}3^{1}2^{2_{001}}(1/3\ \ 2/3\ \ 1/6)^{m}1$	$\sigma_{xyz}=\sigma_{xzy}=-\sigma_{yxz}=-\sigma_{yzx}$	×	×	$\sigma_{yzz}=-2\sigma_{zyz}=-2\sigma_{zzy}$, $\sigma_{xzz}=-2\sigma_{zxz}=-2\sigma_{zzx}$, $\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zyy}/2$, $\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{xxz}=\sigma_{xzx}=-\sigma_{zxx}/2$, $\sigma_{yxz}=\sigma_{yzx}$, $\sigma_{xyy}=-2\sigma_{yxy}=-2\sigma_{yyx}$, $\sigma_{xxy}=\sigma_{xyx}=-\sigma_{yxx}/2$, $\sigma_{xyz}=\sigma_{xzy}$
22	$HoFe_3(BO_3)_4$ (1.93)	$P^{1}3_2{}^{1}2^{1}1^{2_{001}}(0\ \ 0\ \ 1/2)^{m}1$	$\sigma_{xyz}=\sigma_{xzy}=-\sigma_{yxz}=-\sigma_{yzx}$	×	×	$\sigma_{yzz}=-2\sigma_{zyz}=-2\sigma_{zzy}$, $\sigma_{xzz}=-2\sigma_{zxz}=-2\sigma_{zzx}$, $\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zyy}/2$, $\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{xxz}=\sigma_{xzx}=-\sigma_{zxx}/2$, $\sigma_{yxz}=\sigma_{yzx}$, $\sigma_{xyy}=-2\sigma_{yxy}=-2\sigma_{yyx}$, $\sigma_{xxy}=\sigma_{xyx}=-\sigma_{yxx}/2$, $\sigma_{xyz}=\sigma_{xzy}$
23	$BaCu_3V_2O_8(OD)_2$ (3.17)	$P^{3^{1}_{001}}3_1{}^{\mathrm{m}\frac{1}{6}\pi}2^{1}1^{m}1$	$\sigma_{xyz}=\sigma_{xzy}=-\sigma_{yxz}=-\sigma_{yzx}$	σ_{zzz}, $\sigma_{xxz}=\sigma_{xzx}=\sigma_{yyz}=\sigma_{yzy}=\sigma_{zxx}=\sigma_{zyy}$, $\sigma_{xxy}=\sigma_{xyx}=\sigma_{yxx}=-\sigma_{yyy}$	σ_{zzz}, $\sigma_{zxx}=\sigma_{zyy}$, $\sigma_{xxz}=\sigma_{xzx}=\sigma_{yyz}=\sigma_{yzy}$, $\sigma_{xxy}=\sigma_{yxx}=-\sigma_{yyy}$	$\sigma_{xyz}=\sigma_{xzy}=-\sigma_{yxz}=-\sigma_{yzx}$

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Table S2 : (continued) Coplanar antiferromagnets in MAGNDATA with second-order transport tensors triggered by magnetic geometry.

No.	Materials (ID)	Spin space group	without SOC	with SOC		
			BCD	IMD	QMD	BCD
24	$RuCl_3$ (1.726)	$P^{1}1^{2_{001}}(1/2\ \ 0\ \ 0)^{m}1$	$\sigma_{yzz}=-2\sigma_{zyz}=-2\sigma_{zzy}$, $\sigma_{xzz}=-2\sigma_{zxz}=-2\sigma_{zzx}$, $\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zyy}/2$, $\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{xxz}=\sigma_{xzx}=-\sigma_{zxx}/2$, $\sigma_{yxz}=\sigma_{yzx}$, $\sigma_{xyy}=-2\sigma_{yxy}=-2\sigma_{yyx}$, $\sigma_{xxy}=\sigma_{xyx}=-\sigma_{yxx}/2$, $\sigma_{xyz}=\sigma_{xzy}$	×	×	$\sigma_{yzz}=-2\sigma_{zyz}=-2\sigma_{zzy}$, $\sigma_{xzz}=-2\sigma_{zxz}=-2\sigma_{zzx}$, $\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zyy}/2$, $\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{xxz}=\sigma_{xzx}=-\sigma_{zxx}/2$, $\sigma_{yxz}=\sigma_{yzx}$, $\sigma_{xyy}=-2\sigma_{yxy}=-2\sigma_{yyx}$, $\sigma_{xxy}=\sigma_{xyx}=-\sigma_{yxx}/2$, $\sigma_{xyz}=\sigma_{xzy}$
25	Cu_4O_3 (1.418)	$I^{1}\text{-}4^{\mathrm{m}_{110}}\mathrm{m}^{\mathrm{m}_{110}}2\vert(2_{001},2_{001},2_{001};4^{3}_{001})^{m}1$	$\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{xyz}=\sigma_{xzy}=\sigma_{yxz}=\sigma_{yzx}$	×	×	$\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{xyz}=\sigma_{xzy}=\sigma_{yxz}=\sigma_{yzx}$
26	$NiCr_2O_4$ (1.688)	$I^{\mathrm{m}_{010}}2_1{}^{2_{001}}2_1{}^{\mathrm{m}_{100}}2_1\vert(1,1,1;2_{001})^{m}1$	$\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{yxz}=\sigma_{yzx}$, $\sigma_{xyz}=\sigma_{xzy}$	×	×	$\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{yxz}=\sigma_{yzx}$, $\sigma_{xyz}=\sigma_{xzy}$
27	$GeCu_2O_4$ (1.185)	$I^{1}\text{-}4^{\mathrm{m}_{110}}\mathrm{m}^{\mathrm{m}_{110}}2\vert(2_{001},2_{001},2_{001};4^{3}_{001})^{m}1$	$\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{xyz}=\sigma_{xzy}=\sigma_{yxz}=\sigma_{yzx}$	×	×	$\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{xyz}=\sigma_{xzy}=\sigma_{yxz}=\sigma_{yzx}$
28	$DyFe_4Ge_2$ (1.98)	$P^{1}\mathrm{m}^{\mathrm{m}_{100}}\mathrm{m}^{\mathrm{m}_{100}}2\vert(1,1,2_{001})^{m}1$	$\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zyy}/2$, $\sigma_{xxz}=\sigma_{xzx}=-\sigma_{zxx}/2$	×	×	$\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zyy}/2$, $\sigma_{xxz}=\sigma_{xzx}=-\sigma_{zxx}/2$
29	NdSbTe (1.764)	$P^{1}\mathrm{m}^{2_{001}}(0\ \ 1/2\ \ 0)^{m}1$	$\sigma_{yzz}=-2\sigma_{zyz}=-2\sigma_{zzy}$, $\sigma_{xzz}=-2\sigma_{zxz}=-2\sigma_{zzx}$, $\sigma_{xyy}=-2\sigma_{yxy}=-2\sigma_{yyx}$, $\sigma_{xxy}=\sigma_{xyx}=-\sigma_{yxx}/2$	×	×	$\sigma_{yzz}=-2\sigma_{zyz}=-2\sigma_{zzy}$, $\sigma_{xzz}=-2\sigma_{zxz}=-2\sigma_{zzx}$, $\sigma_{xyy}=-2\sigma_{yxy}=-2\sigma_{yyx}$, $\sigma_{xxy}=\sigma_{xyx}=-\sigma_{yxx}/2$
30	Pb_2MnO_4 (0.552)	$P^{4^{1}_{001}}\text{-}4^{\mathrm{m}_{\text{-}110}}2_1{}^{\mathrm{m}_{100}}\mathrm{c}^{m}1$	$\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{xyz}=\sigma_{xzy}=\sigma_{yxz}=\sigma_{yzx}$	×	$\sigma_{xyz}=\sigma_{xzy}=-\sigma_{yxz}=-\sigma_{yzx}$	$\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{xyz}=\sigma_{xzy}=\sigma_{yxz}=\sigma_{yzx}$
31	$Pr_2PdAl_7Ge_4$ (1.757)	$P^{1}\text{-}4^{\mathrm{m}_{100}}2_1{}^{\mathrm{m}_{100}}\mathrm{m}\vert(1,1,2_{001})^{m}1$	$\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{xyz}=\sigma_{xzy}=\sigma_{yxz}=\sigma_{yzx}$	×	×	$\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{yxz}=\sigma_{yzx}$, $\sigma_{xyz}=\sigma_{xzy}$

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Table S2 : (continued) Coplanar antiferromagnets in MAGNDATA with second-order transport tensors triggered by magnetic geometry.

No.	Materials (ID)	Spin space group	without SOC	with SOC		
			BCD	IMD	QMD	BCD
32	$Pr_2PdAl_7Ge_4$ (1.772)	P^{1}-$4^{\mathrm{m}_{100}}2_1{}^{\mathrm{m}_{100}}\mathrm{m}\vert(1,1,2_{001})^{m}1$	$\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{xyz}=\sigma_{xzy}=\sigma_{yxz}=\sigma_{yzx}$	×	×	$\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{yxz}=\sigma_{yzx}$, $\sigma_{xyz}=\sigma_{xzy}$
33	$Ho_2Ge_2O_7$ (0.107)	$P^{4^{1}_{001}}4_1{}^{\mathrm{m}_{\text{-}110}}2_1{}^{\mathrm{m}_{100}}2^{m}1$	$\sigma_{xyz}=\sigma_{xzy}=-\sigma_{yxz}=-\sigma_{yzx}$	×	$\sigma_{xyz}=\sigma_{xzy}=-\sigma_{yxz}=-\sigma_{yzx}$	$\sigma_{xyz}=\sigma_{xzy}=-\sigma_{yxz}=-\sigma_{yzx}$
34	Er_2Pt (1.444)	$P^{1}\mathrm{m}^{\mathrm{m}_{100}}\mathrm{n}^{\mathrm{m}_{100}}2_1\vert(1,2_{001},1)^{m}1$	$\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zyy}/2$, $\sigma_{xxz}=\sigma_{xzx}=-\sigma_{zxx}/2$	×	×	$\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zyy}/2$, $\sigma_{xxz}=\sigma_{xzx}=-\sigma_{zxx}/2$
35	Gd_2BaCuO_5 (1.443)	$P^{1}\mathrm{m}^{\mathrm{m}_{100}}\mathrm{c}^{\mathrm{m}_{100}}2_1\vert(1,2_{001},1)^{m}1$	$\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zyy}/2$, $\sigma_{xxz}=\sigma_{xzx}=-\sigma_{zxx}/2$	×	×	$\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zyy}/2$, $\sigma_{xxz}=\sigma_{xzx}=-\sigma_{zxx}/2$
36	$DyFeO_3$ (0.10)	$P^{\mathrm{m}_{100}}2_1{}^{\mathrm{m}_{010}}2_1{}^{2_{001}}2_1{}^{m}1$	$\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{yxz}=\sigma_{yzx}$, $\sigma_{xyz}=\sigma_{xzy}$	$\sigma_{xyz}=\sigma_{xzy}=\sigma_{yxz}=\sigma_{yzx}=\sigma_{zxy}=\sigma_{zyx}$	$\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{yxz}=\sigma_{yzx}$, $\sigma_{xyz}=\sigma_{xzy}$	$\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{yxz}=\sigma_{yzx}$, $\sigma_{xyz}=\sigma_{xzy}$
37	$Cu_3Mo_2O_9$ (0.129)	$P^{\mathrm{m}_{100}}2_1{}^{\mathrm{m}_{010}}2_1{}^{2_{001}}2_1{}^{m}1$	$\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{yxz}=\sigma_{yzx}$, $\sigma_{xyz}=\sigma_{xzy}$	σ_{zzz}, $\sigma_{yyz}=\sigma_{yzy}=\sigma_{zyy}$, $\sigma_{xxz}=\sigma_{xzx}=\sigma_{zxx}$	σ_{zzz}, σ_{zyy}, σ_{zxx}, $\sigma_{yyz}=\sigma_{yzy}$, $\sigma_{xxz}=\sigma_{xzx}$	$\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{yxz}=\sigma_{yzx}$, $\sigma_{xyz}=\sigma_{xzy}$
38	$La_{0.333}Ca_{0.667}MnO_3$ (1.175)	$P^{2_{001}}\mathrm{m}^{\mathrm{m}_{100}}\mathrm{n}^{\mathrm{m}_{010}}2_1\vert(1,2_{001},1)^{m}1$	$\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zyy}/2$, $\sigma_{xxz}=\sigma_{xzx}=-\sigma_{zxx}/2$	×	×	$\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zyy}/2$, $\sigma_{xxz}=\sigma_{xzx}=-\sigma_{zxx}/2$
39	$La_{0.333}Ca_{0.667}MnO_3$ (1.174)	$P^{2_{001}}\mathrm{m}^{\mathrm{m}_{100}}\mathrm{c}^{\mathrm{m}_{010}}2_1\vert(1,2_{001},1)^{m}1$	$\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zyy}/2$, $\sigma_{xxz}=\sigma_{xzx}=-\sigma_{zxx}/2$	×	×	$\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zyy}/2$, $\sigma_{xxz}=\sigma_{xzx}=-\sigma_{zxx}/2$
40	$La_{0.375}Ca_{0.625}MnO_3$ (1.173)	$P^{2_{001}}\mathrm{m}^{\mathrm{m}_{100}}\mathrm{c}^{\mathrm{m}_{010}}2_1\vert(1,2_{001},1)^{m}1$	$\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zyy}/2$, $\sigma_{xxz}=\sigma_{xzx}=-\sigma_{zxx}/2$	×	×	$\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zyy}/2$, $\sigma_{xxz}=\sigma_{xzx}=-\sigma_{zxx}/2$
41	$LuMnO_3$ (1.340)	$P^{\mathrm{m}_{100}}\mathrm{m}^{\mathrm{m}_{100}}\mathrm{n}^{1}2_1\vert(1,2_{001},1)^{m}1$	$\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zyy}/2$, $\sigma_{xxz}=\sigma_{xzx}=-\sigma_{zxx}/2$	×	×	$\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zyy}/2$, $\sigma_{xxz}=\sigma_{xzx}=-\sigma_{zxx}/2$

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Table S2 : (continued) Coplanar antiferromagnets in MAGNDATA with second-order transport tensors triggered by magnetic geometry.

No.	Materials (ID)	Spin space group	without SOC	with SOC		
			BCD	IMD	QMD	BCD
42	$TbFeO_3$ (0.353)	$P^{\mathrm{m}_{100}}2_1{}^{\mathrm{m}_{010}}2_1{}^{2_{001}}2_1{}^m1$	$\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{yxz}=\sigma_{yzx}$, $\sigma_{xyz}=\sigma_{xzy}$	σ_{zzz}, $\sigma_{yyz}=\sigma_{yzy}=\sigma_{zyy}$, $\sigma_{xxz}=\sigma_{xzx}=\sigma_{zxx}$	σ_{zzz}, σ_{zyy}, σ_{zxx}, $\sigma_{yyz}=\sigma_{yzy}$, $\sigma_{xxz}=\sigma_{xzx}$	$\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{yxz}=\sigma_{yzx}$, $\sigma_{xyz}=\sigma_{xzy}$
43	$NdNiO_3$ (1.44)	$P^{\mathrm{m}_{100}}\mathrm{m}^{\mathrm{m}_{100}}\mathrm{c}^1 2_1\vert(2_{001},1,1)^m1$	$\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zyy}/2$, $\sigma_{xxz}=\sigma_{xzx}=-\sigma_{zxx}/2$	×	×	$\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zyy}/2$, $\sigma_{xxz}=\sigma_{xzx}=-\sigma_{zxx}/2$
44	$CoNb_2O_6$ (1.224)	$P^{\mathrm{m}_{100}}2_1{}^{\mathrm{m}_{100}}2_1{}^1 2\vert(1,1,2_{001})^m1$	$\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{yxz}=\sigma_{yzx}$, $\sigma_{xyz}=\sigma_{xzy}$	×	×	$\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{yxz}=\sigma_{yzx}$, $\sigma_{xyz}=\sigma_{xzy}$
45	$Tm_5Ni_2In_4$ (1.170)	$C^1\mathrm{m}^{2_{001}}(1/2\ \ 0\ \ 0)^m1$	$\sigma_{yzz}=-2\sigma_{zyz}=-2\sigma_{zzy}$, $\sigma_{xzz}=-2\sigma_{zxz}=-2\sigma_{zzx}$, $\sigma_{xyy}=-2\sigma_{yxy}=-2\sigma_{yyx}$, $\sigma_{xxy}=\sigma_{xyx}=-\sigma_{yxx}/2$	×	×	$\sigma_{yzz}=-2\sigma_{zyz}=-2\sigma_{zzy}$, $\sigma_{xzz}=-2\sigma_{zxz}=-2\sigma_{zzx}$, $\sigma_{xyy}=-2\sigma_{yxy}=-2\sigma_{yyx}$, $\sigma_{xxy}=\sigma_{xyx}=-\sigma_{yxx}/2$
46	$HoMn_2O_5$ (1.109)	$C^1\mathrm{m}^{2_{001}}(1/2\ \ 0\ \ 0)^m1$	$\sigma_{yzz}=-2\sigma_{zyz}=-2\sigma_{zzy}$, $\sigma_{xzz}=-2\sigma_{zxz}=-2\sigma_{zzx}$, $\sigma_{xyy}=-2\sigma_{yxy}=-2\sigma_{yyx}$, $\sigma_{xxy}=\sigma_{xyx}=-\sigma_{yxx}/2$	×	×	$\sigma_{yzz}=-2\sigma_{zyz}=-2\sigma_{zzy}$, $\sigma_{xzz}=-2\sigma_{zxz}=-2\sigma_{zzx}$, $\sigma_{xyy}=-2\sigma_{yxy}=-2\sigma_{yyx}$, $\sigma_{xxy}=\sigma_{xyx}=-\sigma_{yxx}/2$
47	$TbMn_2O_5$ (1.108)	$C^1\mathrm{m}^{2_{001}}(1/2\ \ 0\ \ 0)^m1$	$\sigma_{yzz}=-2\sigma_{zyz}=-2\sigma_{zzy}$, $\sigma_{xzz}=-2\sigma_{zxz}=-2\sigma_{zzx}$, $\sigma_{xyy}=-2\sigma_{yxy}=-2\sigma_{yyx}$, $\sigma_{xxy}=\sigma_{xyx}=-\sigma_{yxx}/2$	×	×	$\sigma_{yzz}=-2\sigma_{zyz}=-2\sigma_{zzy}$, $\sigma_{xzz}=-2\sigma_{zxz}=-2\sigma_{zzx}$, $\sigma_{xyy}=-2\sigma_{yxy}=-2\sigma_{yyx}$, $\sigma_{xxy}=\sigma_{xyx}=-\sigma_{yxx}/2$
48	$PrMn_2O_5$ (1.19)	$P^1\mathrm{m}^{\mathrm{m}_{100}}\mathrm{c}^{\mathrm{m}_{100}}2_1\vert(1,2_{001},1)^m1$	$\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zyy}/2$, $\sigma_{xxz}=\sigma_{xzx}=-\sigma_{zxx}/2$	×	×	$\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zyy}/2$, $\sigma_{xxz}=\sigma_{xzx}=-\sigma_{zxx}/2$

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Table S2 : (continued) Coplanar antiferromagnets in MAGNDATA with second-order transport tensors triggered by magnetic geometry.

No.	Materials (ID)	Spin space group	without SOC	with SOC		
			BCD	IMD	QMD	BCD
49	$DyMn_2O_5$ (1.324)	$P^1\mathrm{m}^{\mathrm{m}_{100}}\mathrm{c}^{\mathrm{m}_{100}}2_1\vert(1,2_{001},1)^m1$	$\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zyy}/2$, $\sigma_{xxz}=\sigma_{xzx}=-\sigma_{zxx}/2$	×	×	$\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zyy}/2$, $\sigma_{xxz}=\sigma_{xzx}=-\sigma_{zxx}/2$
50	$GdMn_2O_5$ (1.54)	$P^1\mathrm{m}^{\mathrm{m}_{100}}\mathrm{c}^{\mathrm{m}_{100}}2_1\vert(1,2_{001},1)^m1$	$\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zyy}/2$, $\sigma_{xxz}=\sigma_{xzx}=-\sigma_{zxx}/2$	×	×	$\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zyy}/2$, $\sigma_{xxz}=\sigma_{xzx}=-\sigma_{zxx}/2$
51	$DyMn_2O_5$ (1.76)	$P^1\mathrm{m}^{\mathrm{m}_{100}}\mathrm{c}^{\mathrm{m}_{100}}2_1\vert(1,2_{001},1)^m1$	$\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zyy}/2$, $\sigma_{xxz}=\sigma_{xzx}=-\sigma_{zxx}/2$	×	×	$\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zyy}/2$, $\sigma_{xxz}=\sigma_{xzx}=-\sigma_{zxx}/2$
52	$DyMn_2O_5$ (1.599)	$P^1\mathrm{m}^{2_{001}}(0\ \ 1/2\ \ 0)^m1$	$\sigma_{yzz}=-2\sigma_{zyz}=-2\sigma_{zzy}$, $\sigma_{xzz}=-2\sigma_{zxz}=-2\sigma_{zzx}$, $\sigma_{xyy}=-2\sigma_{yxy}=-2\sigma_{yyx}$, $\sigma_{xxy}=\sigma_{xyx}=-\sigma_{yxx}/2$	×	×	$\sigma_{yzz}=-2\sigma_{zyz}=-2\sigma_{zzy}$, $\sigma_{xzz}=-2\sigma_{zxz}=-2\sigma_{zzx}$, $\sigma_{xyy}=-2\sigma_{yxy}=-2\sigma_{yyx}$, $\sigma_{xxy}=\sigma_{xyx}=-\sigma_{yxx}/2$
53	$BiMn_2O_5$ (1.74)	$P^1\mathrm{m}^{\mathrm{m}_{100}}\mathrm{c}^{\mathrm{m}_{100}}2_1\vert(2_{001},2_{001},1)^m1$	$\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zyy}/2$, $\sigma_{xxz}=\sigma_{xzx}=-\sigma_{zxx}/2$	×	×	$\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zyy}/2$, $\sigma_{xxz}=\sigma_{xzx}=-\sigma_{zxx}/2$
54	$Ca_2Cr_2O_5$ (1.227)	$P^1\mathrm{m}^1\mathrm{a}^1 2^{2_{001}}(1/2\ \ 1/2\ \ 1/2)^m1$	$\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zyy}/2$, $\sigma_{xxz}=\sigma_{xzx}=-\sigma_{zxx}/2$	×	×	$\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zyy}/2$, $\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{xxz}=\sigma_{xzx}=-\sigma_{zxx}/2$, $\sigma_{yxz}=\sigma_{yzx}$, $\sigma_{xyz}=\sigma_{xzy}$
55	$BaNiTe_2O_7$ (1.763)	$C^{2_{001}}2\vert(1,1,1;2_{010})^m1$	$\sigma_{yzz}=-2\sigma_{zyz}=-2\sigma_{zzy}$, $\sigma_{xzz}=-2\sigma_{zxz}=-2\sigma_{zzx}$, $\sigma_{xyy}=-2\sigma_{yxy}=-2\sigma_{yyx}$, $\sigma_{xxy}=\sigma_{xyx}=-\sigma_{yxx}/2$	×	×	$\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zyy}/2$, $\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{xxz}=\sigma_{xzx}=-\sigma_{zxx}/2$, $\sigma_{yxz}=\sigma_{yzx}$, $\sigma_{xyz}=\sigma_{xzy}$

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Table S2 : (continued) Coplanar antiferromagnets in MAGNDATA with second-order transport tensors triggered by magnetic geometry.

No.	Materials (ID)	Spin space group	without SOC	with SOC		
			BCD	IMD	QMD	BCD
56	$HoCrWO_6$ (0.716)	$P^{2_{001}}\mathrm{n}^{\mathrm{m}_{100}}\mathrm{a}^{\mathrm{m}_{010}}2_1{}^m1$	$\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zyy}/2$, $\sigma_{xxz}=\sigma_{xzx}=-\sigma_{zxx}/2$	σ_{zzz}, $\sigma_{yyz}=\sigma_{yzy}=\sigma_{zyy}$, $\sigma_{xxz}=\sigma_{xzx}=\sigma_{zxx}$	σ_{zzz}, σ_{zyy}, σ_{zxx}, $\sigma_{yyz}=\sigma_{yzy}$, $\sigma_{xxz}=\sigma_{xzx}$	$\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zyy}/2$, $\sigma_{xxz}=\sigma_{xzx}=-\sigma_{zxx}/2$
57	$Na_2CoP_2O_7$ (0.425)	$P^{\mathrm{m}_{010}}\mathrm{n}^{2_{001}}\mathrm{a}^{\mathrm{m}_{100}}2_1{}^m1$	$\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zyy}/2$, $\sigma_{xxz}=\sigma_{xzx}=-\sigma_{zxx}/2$	$\sigma_{xzz}=\sigma_{zxz}=\sigma_{zzx}$, $\sigma_{xyy}=\sigma_{yxy}=\sigma_{yyx}$, σ_{xxx}	$\sigma_{zxz}=\sigma_{zzx}$, $\sigma_{yxy}=\sigma_{yyx}$, σ_{xzz}, σ_{xyy}, σ_{xxx}	$\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zyy}/2$, $\sigma_{xxz}=\sigma_{xzx}=-\sigma_{zxx}/2$
58	$Yb_2Cu_2O_5$ (1.280)	$P^{\mathrm{m}_{100}}\mathrm{c}\vert(2_{001},1,1)^m1$	$\sigma_{yzz}=-2\sigma_{zyz}=-2\sigma_{zzy}$, $\sigma_{xzz}=-2\sigma_{zxz}=-2\sigma_{zzx}$, $\sigma_{xyy}=-2\sigma_{yxy}=-2\sigma_{yyx}$, $\sigma_{xxy}=\sigma_{xyx}=-\sigma_{yxx}/2$	×	×	$\sigma_{yzz}=-2\sigma_{zyz}=-2\sigma_{zzy}$, $\sigma_{xzz}=-2\sigma_{zxz}=-2\sigma_{zzx}$, $\sigma_{xyy}=-2\sigma_{yxy}=-2\sigma_{yyx}$, $\sigma_{xxy}=\sigma_{xyx}=-\sigma_{yxx}/2$
59	Cu_2MnSiS_4 (1.730)	$P^{\mathrm{m}_{100}}\mathrm{c}\vert(2_{001},1,1)^m1$	$\sigma_{yzz}=-2\sigma_{zyz}=-2\sigma_{zzy}$, $\sigma_{xzz}=-2\sigma_{zxz}=-2\sigma_{zzx}$, $\sigma_{xyy}=-2\sigma_{yxy}=-2\sigma_{yyx}$, $\sigma_{xxy}=\sigma_{xyx}=-\sigma_{yxx}/2$	×	×	$\sigma_{yzz}=-2\sigma_{zyz}=-2\sigma_{zzy}$, $\sigma_{xzz}=-2\sigma_{zxz}=-2\sigma_{zzx}$, $\sigma_{xyy}=-2\sigma_{yxy}=-2\sigma_{yyx}$, $\sigma_{xxy}=\sigma_{xyx}=-\sigma_{yxx}/2$
60	Li_2MnGeO_4 (1.484)	$P^{\mathrm{m}_{100}}\mathrm{c}\vert(2_{001},1,1)^m1$	$\sigma_{yzz}=-2\sigma_{zyz}=-2\sigma_{zzy}$, $\sigma_{xzz}=-2\sigma_{zxz}=-2\sigma_{zzx}$, $\sigma_{xyy}=-2\sigma_{yxy}=-2\sigma_{yyx}$, $\sigma_{xxy}=\sigma_{xyx}=-\sigma_{yxx}/2$	×	×	$\sigma_{yzz}=-2\sigma_{zyz}=-2\sigma_{zzy}$, $\sigma_{xzz}=-2\sigma_{zxz}=-2\sigma_{zzx}$, $\sigma_{xyy}=-2\sigma_{yxy}=-2\sigma_{yyx}$, $\sigma_{xxy}=\sigma_{xyx}=-\sigma_{yxx}/2$
61	Cu_2MnGeS_4 (1.733)	$P^{\mathrm{m}_{100}}\mathrm{c}\vert(2_{001},1,1)^m1$	$\sigma_{yzz}=-2\sigma_{zyz}=-2\sigma_{zzy}$, $\sigma_{xzz}=-2\sigma_{zxz}=-2\sigma_{zzx}$, $\sigma_{xyy}=-2\sigma_{yxy}=-2\sigma_{yyx}$, $\sigma_{xxy}=\sigma_{xyx}=-\sigma_{yxx}/2$	×	×	$\sigma_{yzz}=-2\sigma_{zyz}=-2\sigma_{zzy}$, $\sigma_{xzz}=-2\sigma_{zxz}=-2\sigma_{zzx}$, $\sigma_{xyy}=-2\sigma_{yxy}=-2\sigma_{yyx}$, $\sigma_{xxy}=\sigma_{xyx}=-\sigma_{yxx}/2$

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Table S2 : (continued) Coplanar antiferromagnets in MAGNDATA with second-order transport tensors triggered by magnetic geometry.

No.	Materials (ID)	Spin space group	without SOC	with SOC		
			BCD	IMD	QMD	BCD
62	Cu_2FeSiS_4 (1.731)	$P^{\mathrm{m}_{100}}\mathrm{c}\vert(2_{001},1,1)^m1$	$\sigma_{yzz}=-2\sigma_{zyz}=-2\sigma_{zzy}$, $\sigma_{xzz}=-2\sigma_{zxz}=-2\sigma_{zzx}$, $\sigma_{xyy}=-2\sigma_{yxy}=-2\sigma_{yyx}$, $\sigma_{xxy}=\sigma_{xyx}=-\sigma_{yxx}/2$	×	×	$\sigma_{yzz}=-2\sigma_{zyz}=-2\sigma_{zzy}$, $\sigma_{xzz}=-2\sigma_{zxz}=-2\sigma_{zzx}$, $\sigma_{xyy}=-2\sigma_{yxy}=-2\sigma_{yyx}$, $\sigma_{xxy}=\sigma_{xyx}=-\sigma_{yxx}/2$
63	$Mn_3B_7O_{13}I$ (0.134)	$P^{\mathrm{m}_{010}}\mathrm{c}^{2_{001}}\mathrm{a}^{\mathrm{m}_{100}}2_1{}^m1$	$\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zyy}/2$, $\sigma_{xxz}=\sigma_{xzx}=-\sigma_{zxx}/2$	$\sigma_{xzz}=\sigma_{zxz}=\sigma_{zzx}$, $\sigma_{xyy}=\sigma_{yxy}=\sigma_{yyx}$, σ_{xxx}	$\sigma_{zxz}=\sigma_{zzx}$, $\sigma_{yxy}=\sigma_{yyx}$, σ_{xzz}, σ_{xyy}, σ_{xxx}	$\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zyy}/2$, $\sigma_{xxz}=\sigma_{xzx}=-\sigma_{zxx}/2$
64	$YbLuCoMnO_6$ (1.329)	$P^12_1{}^{2_{001}}(0\ \ 0\ \ 1/2)^m1$	$\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zyy}/2$, $\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{xxz}=\sigma_{xzx}=-\sigma_{zxx}/2$, $\sigma_{yxz}=\sigma_{yzx}$, $\sigma_{xyz}=\sigma_{xzy}$	×	×	$\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zyy}/2$, $\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{xxz}=\sigma_{xzx}=-\sigma_{zxx}/2$, $\sigma_{yxz}=\sigma_{yzx}$, $\sigma_{xyz}=\sigma_{xzy}$
65	Yb_2CoMnO_6 (1.328)	$P^12_1{}^{-1}(0\ \ 0\ \ 1/2)^m1$	$\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zyy}/2$, $\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{xxz}=\sigma_{xzx}=-\sigma_{zxx}/2$, $\sigma_{yxz}=\sigma_{yzx}$, $\sigma_{xyz}=\sigma_{xzy}$	×	×	$\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zyy}/2$, $\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{xxz}=\sigma_{xzx}=-\sigma_{zxx}/2$, $\sigma_{yxz}=\sigma_{yzx}$, $\sigma_{xyz}=\sigma_{xzy}$
66	Lu_2CoMnO_6 (1.330)	$P^12_1{}^{2_{001}}(0\ \ 0\ \ 1/2)^m1$	$\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zyy}/2$, $\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{xxz}=\sigma_{xzx}=-\sigma_{zxx}/2$, $\sigma_{yxz}=\sigma_{yzx}$, $\sigma_{xyz}=\sigma_{xzy}$	×	×	$\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zyy}/2$, $\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{xxz}=\sigma_{xzx}=-\sigma_{zxx}/2$, $\sigma_{yxz}=\sigma_{yzx}$, $\sigma_{xyz}=\sigma_{xzy}$
67	$HoNiO_3$ (1.48)	$P^12_1{}^{2_{001}}(0\ \ 0\ \ 1/2)^m1$	$\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zyy}/2$, $\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{xxz}=\sigma_{xzx}=-\sigma_{zxx}/2$, $\sigma_{yxz}=\sigma_{yzx}$, $\sigma_{xyz}=\sigma_{xzy}$	×	×	$\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zyy}/2$, $\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{xxz}=\sigma_{xzx}=-\sigma_{zxx}/2$, $\sigma_{yxz}=\sigma_{yzx}$, $\sigma_{xyz}=\sigma_{xzy}$

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Table S2 : (continued) Coplanar antiferromagnets in MAGNDATA with second-order transport tensors triggered by magnetic geometry.

No.	Materials (ID)	Spin space group	without SOC	with SOC		
			BCD	IMD	QMD	BCD
68	$LuNiO_3$ (1.657)	$P^{1}2_1{}^{2_{001}}(0\ \ 0\ \ 1/2)^{m}1$	$\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zyy}/2$, $\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{xxz}=\sigma_{xzx}=-\sigma_{zxx}/2$, $\sigma_{yxz}=\sigma_{yzx}$, $\sigma_{xyz}=\sigma_{xzy}$	×	×	$\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zyy}/2$, $\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{xxz}=\sigma_{xzx}=-\sigma_{zxx}/2$, $\sigma_{yxz}=\sigma_{yzx}$, $\sigma_{xyz}=\sigma_{xzy}$
69	$NiPS_3$ (1.231)	$P^{1}2^{2_{001}}(1/2\ \ 1/2\ \ 0)^{m}1$	$\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zyy}/2$, $\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{xxz}=\sigma_{xzx}=-\sigma_{zxx}/2$, $\sigma_{yxz}=\sigma_{yzx}$, $\sigma_{xyz}=\sigma_{xzy}$	×	×	$\sigma_{yzz}=-2\sigma_{zyz}=-2\sigma_{zzy}$, $\sigma_{xzz}=-2\sigma_{zxz}=-2\sigma_{zzx}$, $\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zyy}/2$, $\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{xxz}=\sigma_{xzx}=-\sigma_{zxx}/2$, $\sigma_{yxz}=\sigma_{yzx}$, $\sigma_{xyy}=-2\sigma_{yxy}=-2\sigma_{yyx}$, $\sigma_{xxy}=\sigma_{xyx}=-\sigma_{yxx}/2$, $\sigma_{xyz}=\sigma_{xzy}$
70	$NaNdFeWO_6$ (1.68)	$P^{1}1^{2_{001}}(1/2\ \ 0\ \ 0)^{m}1$	$\sigma_{yzz}=-2\sigma_{zyz}=-2\sigma_{zzy}$, $\sigma_{xzz}=-2\sigma_{zxz}=-2\sigma_{zzx}$, $\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zyy}/2$, $\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{xxz}=\sigma_{xzx}=-\sigma_{zxx}/2$, $\sigma_{yxz}=\sigma_{yzx}$, $\sigma_{xyy}=-2\sigma_{yxy}=-2\sigma_{yyx}$, $\sigma_{xxy}=\sigma_{xyx}=-\sigma_{yxx}/2$, $\sigma_{xyz}=\sigma_{xzy}$	×	×	$\sigma_{yzz}=-2\sigma_{zyz}=-2\sigma_{zzy}$, $\sigma_{xzz}=-2\sigma_{zxz}=-2\sigma_{zzx}$, $\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zyy}/2$, $\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{xxz}=\sigma_{xzx}=-\sigma_{zxx}/2$, $\sigma_{yxz}=\sigma_{yzx}$, $\sigma_{xyy}=-2\sigma_{yxy}=-2\sigma_{yyx}$, $\sigma_{xxy}=\sigma_{xyx}=-\sigma_{yxx}/2$, $\sigma_{xyz}=\sigma_{xzy}$
71	$YBaFe_4O_7$ (1.124)	$P^{\mathrm{m}_{100}}2_1\vert(2_{001},1,1)^{m}1$	$\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zyy}/2$, $\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{xxz}=\sigma_{xzx}=-\sigma_{zxx}/2$, $\sigma_{yxz}=\sigma_{yzx}$, $\sigma_{xyz}=\sigma_{xzy}$	×	×	$\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zyy}/2$, $\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{xxz}=\sigma_{xzx}=-\sigma_{zxx}/2$, $\sigma_{yxz}=\sigma_{yzx}$, $\sigma_{xyz}=\sigma_{xzy}$

Table S3: Noncoplanar antiferromagnets in MAGNDATA with second-order transport tensors triggered by magnetic geometry.

No.	Materials (ID)	Spin space group	without SOC			with SOC		
			IMD	QMD	BCD	IMD	QMD	BCD
1	$Ca_2LaZr_2Fe_3O_{12}$ (0.754)	$R^{-3^1_{001}}\text{-}3^{2\frac{1}{6}\pi}\text{c}$	σ_{zzz}, $\sigma_{xxz}=\sigma_{xzx}=\sigma_{yyz}=\sigma_{yzy}=\sigma_{zxx}=\sigma_{zyy}$, $\sigma_{xxy}=\sigma_{xyx}=\sigma_{yxx}=-\sigma_{yyy}$	σ_{zzz}, $\sigma_{zxx}=\sigma_{zyy}$, $\sigma_{xxz}=\sigma_{xzx}=\sigma_{yyz}=\sigma_{yzy}$, $\sigma_{xxy}=\sigma_{xyx}=\sigma_{yxx}=-\sigma_{yyy}$	×	σ_{zzz}, $\sigma_{xxz}=\sigma_{xzx}=\sigma_{yyz}=\sigma_{yzy}=\sigma_{zxx}=\sigma_{zyy}$, $\sigma_{xxy}=\sigma_{xyx}=\sigma_{yxx}=-\sigma_{yyy}$	σ_{zzz}, $\sigma_{zxx}=\sigma_{zyy}$, $\sigma_{xxz}=\sigma_{xzx}=\sigma_{yyz}=\sigma_{yzy}$, $\sigma_{xxy}=\sigma_{xyx}=\sigma_{yxx}=-\sigma_{yyy}$	×
2	$Ca_2YZr_2Fe_3O_{12}$ (0.752)	$R^{-3^1_{001}}\text{-}3^{2\frac{1}{6}\pi}\text{c}$	σ_{zzz}, $\sigma_{xxz}=\sigma_{xzx}=\sigma_{yyz}=\sigma_{yzy}=\sigma_{zxx}=\sigma_{zyy}$, $\sigma_{xxy}=\sigma_{xyx}=\sigma_{yxx}=-\sigma_{yyy}$	σ_{zzz}, $\sigma_{zxx}=\sigma_{zyy}$, $\sigma_{xxz}=\sigma_{xzx}=\sigma_{yyz}=\sigma_{yzy}$, $\sigma_{xxy}=\sigma_{xyx}=\sigma_{yxx}=-\sigma_{yyy}$	×	σ_{zzz}, $\sigma_{xxz}=\sigma_{xzx}=\sigma_{yyz}=\sigma_{yzy}=\sigma_{zxx}=\sigma_{zyy}$, $\sigma_{xxy}=\sigma_{xyx}=\sigma_{yxx}=-\sigma_{yyy}$	σ_{zzz}, $\sigma_{zxx}=\sigma_{zyy}$, $\sigma_{xxz}=\sigma_{xzx}=\sigma_{yyz}=\sigma_{yzy}$, $\sigma_{xxy}=\sigma_{xyx}=\sigma_{yxx}=-\sigma_{yyy}$	×
3	$Ca_2YZr_2Fe_3O_{12}$ (0.751)	$R^{-3^1_{001}}\text{-}3^{2\frac{1}{6}\pi}\text{c}$	σ_{zzz}, $\sigma_{xxz}=\sigma_{xzx}=\sigma_{yyz}=\sigma_{yzy}=\sigma_{zxx}=\sigma_{zyy}$, $\sigma_{xxy}=\sigma_{xyx}=\sigma_{yxx}=-\sigma_{yyy}$	σ_{zzz}, $\sigma_{zxx}=\sigma_{zyy}$, $\sigma_{xxz}=\sigma_{xzx}=\sigma_{yyz}=\sigma_{yzy}$, $\sigma_{xxy}=\sigma_{xyx}=\sigma_{yxx}=-\sigma_{yyy}$	×	σ_{zzz}, $\sigma_{xxz}=\sigma_{xzx}=\sigma_{yyz}=\sigma_{yzy}=\sigma_{zxx}=\sigma_{zyy}$, $\sigma_{xxy}=\sigma_{xyx}=\sigma_{yxx}=-\sigma_{yyy}$	σ_{zzz}, $\sigma_{zxx}=\sigma_{zyy}$, $\sigma_{xxz}=\sigma_{xzx}=\sigma_{yyz}=\sigma_{yzy}$, $\sigma_{xxy}=\sigma_{xyx}=\sigma_{yxx}=-\sigma_{yyy}$	×
4	$Ca_2LaZr_2Fe_3O_{12}$ (0.753)	$R^{-3^1_{001}}\text{-}3^{2\frac{1}{6}\pi}\text{c}$	σ_{zzz}, $\sigma_{xxz}=\sigma_{xzx}=\sigma_{yyz}=\sigma_{yzy}=\sigma_{zxx}=\sigma_{zyy}$, $\sigma_{xxy}=\sigma_{xyx}=\sigma_{yxx}=-\sigma_{yyy}$	σ_{zzz}, $\sigma_{zxx}=\sigma_{zyy}$, $\sigma_{xxz}=\sigma_{xzx}=\sigma_{yyz}=\sigma_{yzy}$, $\sigma_{xxy}=\sigma_{xyx}=\sigma_{yxx}=-\sigma_{yyy}$	×	σ_{zzz}, $\sigma_{xxz}=\sigma_{xzx}=\sigma_{yyz}=\sigma_{yzy}=\sigma_{zxx}=\sigma_{zyy}$, $\sigma_{xxy}=\sigma_{xyx}=\sigma_{yxx}=-\sigma_{yyy}$	σ_{zzz}, $\sigma_{zxx}=\sigma_{zyy}$, $\sigma_{xxz}=\sigma_{xzx}=\sigma_{yyz}=\sigma_{yzy}$, $\sigma_{xxy}=\sigma_{xyx}=\sigma_{yxx}=-\sigma_{yyy}$	×
5	$Co_3Al_2Si_3O_{12}$ (0.388)	$I^{4^1_{001}}4_1/^{\text{m}_{001}}\text{a}^{2_{100}}\text{c}^{2_{110}}\text{d}$	σ_{zzz}, $\sigma_{xxz}=\sigma_{xzx}=\sigma_{yyz}=\sigma_{yzy}=\sigma_{zxx}=\sigma_{zyy}$	σ_{zzz}, $\sigma_{zxx}=\sigma_{zyy}$, $\sigma_{xxz}=\sigma_{xzx}=\sigma_{yyz}=\sigma_{yzy}$	×	σ_{zzz}, $\sigma_{xxz}=\sigma_{xzx}=\sigma_{yyz}=\sigma_{yzy}=\sigma_{zxx}=\sigma_{zyy}$	σ_{zzz}, $\sigma_{zxx}=\sigma_{zyy}$, $\sigma_{xxz}=\sigma_{xzx}=\sigma_{yyz}=\sigma_{yzy}$	×
6	$MgCr_2O_4$ (3.4)	$I^{2_{\text{-}110}}\text{-}4^{\text{m}_{\text{-}110}}\text{m}^{-1}2\vert(2_{001},2_{001},1;2_{100})$	$\sigma_{xxz}=\sigma_{xzx}=-\sigma_{yyz}=-\sigma_{yzy}=\sigma_{zxx}=-\sigma_{zyy}$	$\sigma_{zxx}=-\sigma_{zyy}$, $\sigma_{xxz}=\sigma_{xzx}=-\sigma_{yyz}=-\sigma_{yzy}$	$\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{xyz}=\sigma_{xzy}=\sigma_{yxz}=\sigma_{yzx}$	$\sigma_{xxz}=\sigma_{xzx}=-\sigma_{yyz}=-\sigma_{yzy}=\sigma_{zxx}=-\sigma_{zyy}$	$\sigma_{zxx}=-\sigma_{zyy}$, $\sigma_{xxz}=\sigma_{xzx}=-\sigma_{yyz}=-\sigma_{yzy}$	$\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{xyz}=\sigma_{xzy}=\sigma_{yxz}=\sigma_{yzx}$

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Table S3 : (continued) Noncoplanar antiferromagnets in MAGNDATA with second-order transport tensors triggered by magnetic geometry.

No.	Materials (ID)	Spin space group	without SOC			with SOC		
			IMD	QMD	BCD	IMD	QMD	BCD
7	$Gd_2Ti_2O_7$ (3.16)	$P^{4^{3}_{100}}$-$4^{3^{1}_{\text{-}11\text{-}1}}3^{2_{1\text{-}10}}\text{m}\vert$(-1,-1,-1)	×	×	$\sigma_{xyz}=\sigma_{xzy}=\sigma_{yxz}=\sigma_{yzx}=\sigma_{zxy}=\sigma_{zyx}$	×	×	$\sigma_{xyz}=\sigma_{xzy}=\sigma_{yxz}=\sigma_{yzx}=\sigma_{zxy}=\sigma_{zyx}$
8	$ZnFe_2O_4$ (1.759)	$P^{4^{1}_{001}}$-$4^{\text{m}_{100}}\text{n}^{\text{m}_{110}}2\vert$(-1,-1,-1)	×	×	$\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{xyz}=\sigma_{xzy}=\sigma_{yxz}=\sigma_{yzx}$	×	×	$\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{xyz}=\sigma_{xzy}=\sigma_{yxz}=\sigma_{yzx}$
9	Mn (1.85)	$I^{4^{1}_{001}}$-$4^{\text{m}_{100}}2^{\text{m}_{110}}\text{m}\vert$(1,1,1;-1)	×	×	$\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{xyz}=\sigma_{xzy}=\sigma_{yxz}=\sigma_{yzx}$	×	×	$\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{xyz}=\sigma_{xzy}=\sigma_{yxz}=\sigma_{yzx}$
10	$BaCuTe_2O_6$ (0.658)	$P^{\text{-}4^{3}_{010}}4_1{}^{3^{2}_{\text{-}11\text{-}1}}3^{\text{m}_{1\text{-}10}}2$	$\sigma_{xyz}=\sigma_{xzy}=\sigma_{yxz}=\sigma_{yzx}=\sigma_{zxy}=\sigma_{zyx}$	$\sigma_{xyz}=\sigma_{xzy}=\sigma_{yxz}=\sigma_{yzx}=\sigma_{zxy}=\sigma_{zyx}$	×	$\sigma_{xyz}=\sigma_{xzy}=\sigma_{yxz}=\sigma_{yzx}=\sigma_{zxy}=\sigma_{zyx}$	$\sigma_{xyz}=\sigma_{xzy}=\sigma_{yxz}=\sigma_{yzx}=\sigma_{zxy}=\sigma_{zyx}$	×
11	Mn_3RhGe (0.1005)	$P^{2_{100}}2_1{}^{3^{1}_{111}}3$	$\sigma_{xyz}=\sigma_{xzy}=\sigma_{yxz}=\sigma_{yzx}=\sigma_{zxy}=\sigma_{zyx}$	$\sigma_{xyz}=\sigma_{xzy}=\sigma_{yxz}=\sigma_{yzx}=\sigma_{zxy}=\sigma_{zyx}$	×	$\sigma_{xyz}=\sigma_{xzy}=\sigma_{yxz}=\sigma_{yzx}=\sigma_{zxy}=\sigma_{zyx}$	$\sigma_{xyz}=\sigma_{xzy}=\sigma_{yxz}=\sigma_{yzx}=\sigma_{zxy}=\sigma_{zyx}$	×
12	Mn_3IrGe (0.1006)	$P^{2_{100}}2_1{}^{3^{1}_{111}}3$	$\sigma_{xyz}=\sigma_{xzy}=\sigma_{yxz}=\sigma_{yzx}=\sigma_{zxy}=\sigma_{zyx}$	$\sigma_{xyz}=\sigma_{xzy}=\sigma_{yxz}=\sigma_{yzx}=\sigma_{zxy}=\sigma_{zyx}$	×	$\sigma_{xyz}=\sigma_{xzy}=\sigma_{yxz}=\sigma_{yzx}=\sigma_{zxy}=\sigma_{zyx}$	$\sigma_{xyz}=\sigma_{xzy}=\sigma_{yxz}=\sigma_{yzx}=\sigma_{zxy}=\sigma_{zyx}$	×
13	Mn_3IrSi (0.898)	$P^{2_{100}}2_1{}^{3^{1}_{111}}3$	$\sigma_{xyz}=\sigma_{xzy}=\sigma_{yxz}=\sigma_{yzx}=\sigma_{zxy}=\sigma_{zyx}$	$\sigma_{xyz}=\sigma_{xzy}=\sigma_{yxz}=\sigma_{yzx}=\sigma_{zxy}=\sigma_{zyx}$	×	$\sigma_{xyz}=\sigma_{xzy}=\sigma_{yxz}=\sigma_{yzx}=\sigma_{zxy}=\sigma_{zyx}$	$\sigma_{xyz}=\sigma_{xzy}=\sigma_{yxz}=\sigma_{yzx}=\sigma_{zxy}=\sigma_{zyx}$	×
14	Mn_3IrGe (0.899)	$P^{2_{100}}2_1{}^{3^{1}_{111}}3$	$\sigma_{xyz}=\sigma_{xzy}=\sigma_{yxz}=\sigma_{yzx}=\sigma_{zxy}=\sigma_{zyx}$	$\sigma_{xyz}=\sigma_{xzy}=\sigma_{yxz}=\sigma_{yzx}=\sigma_{zxy}=\sigma_{zyx}$	×	$\sigma_{xyz}=\sigma_{xzy}=\sigma_{yxz}=\sigma_{yzx}=\sigma_{zxy}=\sigma_{zyx}$	$\sigma_{xyz}=\sigma_{xzy}=\sigma_{yxz}=\sigma_{yzx}=\sigma_{zxy}=\sigma_{zyx}$	×
15	Mn_3CoGe (0.900)	$P^{2_{100}}2_1{}^{3^{1}_{111}}3$	$\sigma_{xyz}=\sigma_{xzy}=\sigma_{yxz}=\sigma_{yzx}=\sigma_{zxy}=\sigma_{zyx}$	$\sigma_{xyz}=\sigma_{xzy}=\sigma_{yxz}=\sigma_{yzx}=\sigma_{zxy}=\sigma_{zyx}$	×	$\sigma_{xyz}=\sigma_{xzy}=\sigma_{yxz}=\sigma_{yzx}=\sigma_{zxy}=\sigma_{zyx}$	$\sigma_{xyz}=\sigma_{xzy}=\sigma_{yxz}=\sigma_{yzx}=\sigma_{zxy}=\sigma_{zyx}$	×
16	CrSe (2.35)	$P^{2_{010}}6_3/^{\text{-}1}\text{m}^{\text{m}_{010}}\text{m}^{\text{-}1}\text{c}\vert(3^2_{001},3^2_{001},1)$	×	$\sigma_{xyz}=\sigma_{xzy}=-\sigma_{yxz}=-\sigma_{yzx}$	×	$\sigma_{xxy}=\sigma_{xyx}=\sigma_{yxx}=-\sigma_{yyy}$	$\sigma_{xyz}=\sigma_{xzy}=-\sigma_{yxz}=-\sigma_{yzx}$, $\sigma_{xxy}=\sigma_{xyx}=\sigma_{yxx}=-\sigma_{yyy}$	$\sigma_{xxz}=\sigma_{xzx}=\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zxx}/2=-\sigma_{zyy}/2$

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Table S3 : (continued) Noncoplanar antiferromagnets in MAGNDATA with second-order transport tensors triggered by magnetic geometry.

No.	Materials (ID)	Spin space group	without SOC			with SOC		
			IMD	QMD	BCD	IMD	QMD	BCD
17	Mn_5Si_3 (1.307)	$P^{1}\mathrm{m}^{1}\mathrm{c}^{1}2_{1}{}^{-1}(0\ \ 1/2\ \ 1/2)$	×	×	$\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zyy}/2$, $\sigma_{xxz}=\sigma_{xzx}=-\sigma_{zxx}/2$	×	×	$\sigma_{yzz}=-2\sigma_{zyz}=-2\sigma_{zzy}$, $\sigma_{xzz}=-2\sigma_{zxz}=-2\sigma_{zzx}$, $\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zyy}/2$, $\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{xxz}=\sigma_{xzx}=-\sigma_{zxx}/2$, $\sigma_{yxz}=\sigma_{yzx}$, $\sigma_{xyy}=-2\sigma_{yxy}=-2\sigma_{yyx}$, $\sigma_{xxy}=\sigma_{xyx}=-\sigma_{yxx}/2$, $\sigma_{xyz}=\sigma_{xzy}$
18	CaCoSO (1.595)	$P^{1}3^{1}1^{2_{001}}\mathrm{m}\vert(1,1,\text{-}1)$	×	×	$\sigma_{xxz}=\sigma_{xzx}=\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zxx}/2=-\sigma_{zyy}/2$	×	×	$\sigma_{yzz}=-2\sigma_{zyz}=-2\sigma_{zzy}$, $\sigma_{xzz}=-2\sigma_{zxz}=-2\sigma_{zzx}$, $\sigma_{xyy}=-2\sigma_{yxy}=-2\sigma_{yyx}$, $\sigma_{xxy}=\sigma_{xyx}=-\sigma_{yxx}/2$
19	$Co_6(OH)_3(TeO_3)_4(OH)_{0.9}(H_{20})$ (0.381)	$P^{\text{-}3^{2}_{001}}6_3{}^{2_{\frac{2}{3}\pi}}\mathrm{m}^{\mathrm{m}_{\frac{1}{3}\pi}}\mathrm{c}$	$\sigma_{xxx}=-\sigma_{xyy}=-\sigma_{yxy}=-\sigma_{yyx}$	$\sigma_{xxx}=-\sigma_{xyy}=-\sigma_{yxy}=-\sigma_{yyx}$	$\sigma_{xxz}=\sigma_{xzx}=\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zxx}/2=-\sigma_{zyy}/2$	$\sigma_{xxx}=-\sigma_{xyy}=-\sigma_{yxy}=-\sigma_{yyx}$	$\sigma_{xxx}=-\sigma_{xyy}=-\sigma_{yxy}=-\sigma_{yyx}$	$\sigma_{xxz}=\sigma_{xzx}=\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zxx}/2=-\sigma_{zyy}/2$
20	$HoMnO_3$ (0.33)	$P^{6^{1}_{001}}6_3{}^{2_{\frac{2}{3}\pi}}\mathrm{c}^{2_{\frac{5}{6}\pi}}\mathrm{m}$	σ_{zzz}, $\sigma_{xxz}=\sigma_{xzx}=\sigma_{yyz}=\sigma_{yzy}=\sigma_{zxx}=\sigma_{zyy}$	σ_{zzz}, $\sigma_{zxx}=\sigma_{zyy}$, $\sigma_{xxz}=\sigma_{xzx}=\sigma_{yyz}=\sigma_{yzy}$	$\sigma_{xxz}=\sigma_{xzx}=\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zxx}/2=-\sigma_{zyy}/2$	σ_{zzz}, $\sigma_{xxz}=\sigma_{xzx}=\sigma_{yyz}=\sigma_{yzy}=\sigma_{zxx}=\sigma_{zyy}$	σ_{zzz}, $\sigma_{zxx}=\sigma_{zyy}$, $\sigma_{xxz}=\sigma_{xzx}=\sigma_{yyz}=\sigma_{yzy}$	$\sigma_{xxz}=\sigma_{xzx}=\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zxx}/2=-\sigma_{zyy}/2$

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Table S3 : (continued) Noncoplanar antiferromagnets in MAGNDATA with second-order transport tensors triggered by magnetic geometry.

No.	Materials (ID)	Spin space group	without SOC			with SOC		
			IMD	QMD	BCD	IMD	QMD	BCD
21	$HoMnO_3$ (0.43)	$P^{-3^2_{001}}6_3{}^{2\frac{2}{3}\pi}\mathrm{c}^{\mathrm{m}\frac{1}{3}\pi}\mathrm{m}$	$\sigma_{xxx}=-\sigma_{xyy}=-\sigma_{yxy}=-\sigma_{yyx}$	$\sigma_{xxx}=-\sigma_{xyy}=-\sigma_{yxy}=-\sigma_{yyx}$	$\sigma_{xxz}=\sigma_{xzx}=\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zxx}/2=-\sigma_{zyy}/2$	$\sigma_{xxx}=-\sigma_{xyy}=-\sigma_{yxy}=-\sigma_{yyx}$	$\sigma_{xxx}=-\sigma_{xyy}=-\sigma_{yxy}=-\sigma_{yyx}$	$\sigma_{xxz}=\sigma_{xzx}=\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zxx}/2=-\sigma_{zyy}/2$
22	$HoMn_{0.95}Fe_{0.05}O_3$ (0.654)	$P^{-3^2_{001}}6_3{}^{2\frac{2}{3}\pi}\mathrm{c}^{\mathrm{m}\frac{1}{3}\pi}\mathrm{m}$	$\sigma_{xxx}=-\sigma_{xyy}=-\sigma_{yxy}=-\sigma_{yyx}$	$\sigma_{xxx}=-\sigma_{xyy}=-\sigma_{yxy}=-\sigma_{yyx}$	$\sigma_{xxz}=\sigma_{xzx}=\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zxx}/2=-\sigma_{zyy}/2$	$\sigma_{xxx}=-\sigma_{xyy}=-\sigma_{yxy}=-\sigma_{yyx}$	$\sigma_{xxx}=-\sigma_{xyy}=-\sigma_{yxy}=-\sigma_{yyx}$	$\sigma_{xxz}=\sigma_{xzx}=\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zxx}/2=-\sigma_{zyy}/2$
23	$HoMnO_3$ (0.652)	$P^{-3^2_{001}}6_3{}^{2\frac{2}{3}\pi}\mathrm{c}^{\mathrm{m}\frac{1}{3}\pi}\mathrm{m}$	$\sigma_{xxx}=-\sigma_{xyy}=-\sigma_{yxy}=-\sigma_{yyx}$	$\sigma_{xxx}=-\sigma_{xyy}=-\sigma_{yxy}=-\sigma_{yyx}$	$\sigma_{xxz}=\sigma_{xzx}=\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zxx}/2=-\sigma_{zyy}/2$	$\sigma_{xxx}=-\sigma_{xyy}=-\sigma_{yxy}=-\sigma_{yyx}$	$\sigma_{xxx}=-\sigma_{xyy}=-\sigma_{yxy}=-\sigma_{yyx}$	$\sigma_{xxz}=\sigma_{xzx}=\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zxx}/2=-\sigma_{zyy}/2$
24	$HoMn_{0.99}Fe_{0.01}O_3$ (0.653)	$P^{-3^2_{001}}6_3{}^{2\frac{2}{3}\pi}\mathrm{c}^{\mathrm{m}\frac{1}{3}\pi}\mathrm{m}$	$\sigma_{xxx}=-\sigma_{xyy}=-\sigma_{yxy}=-\sigma_{yyx}$	$\sigma_{xxx}=-\sigma_{xyy}=-\sigma_{yxy}=-\sigma_{yyx}$	$\sigma_{xxz}=\sigma_{xzx}=\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zxx}/2=-\sigma_{zyy}/2$	$\sigma_{xxx}=-\sigma_{xyy}=-\sigma_{yxy}=-\sigma_{yyx}$	$\sigma_{xxx}=-\sigma_{xyy}=-\sigma_{yxy}=-\sigma_{yyx}$	$\sigma_{xxz}=\sigma_{xzx}=\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zxx}/2=-\sigma_{zyy}/2$
25	$HoMn_{0.9}Fe_{0.1}O_3$ (0.655)	$P^{-3^2_{001}}6_3{}^{2\frac{2}{3}\pi}\mathrm{c}^{\mathrm{m}\frac{1}{3}\pi}\mathrm{m}$	$\sigma_{xxx}=-\sigma_{xyy}=-\sigma_{yxy}=-\sigma_{yyx}$	$\sigma_{xxx}=-\sigma_{xyy}=-\sigma_{yxy}=-\sigma_{yyx}$	$\sigma_{xxz}=\sigma_{xzx}=\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zxx}/2=-\sigma_{zyy}/2$	$\sigma_{xxx}=-\sigma_{xyy}=-\sigma_{yxy}=-\sigma_{yyx}$	$\sigma_{xxx}=-\sigma_{xyy}=-\sigma_{yxy}=-\sigma_{yyx}$	$\sigma_{xxz}=\sigma_{xzx}=\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zxx}/2=-\sigma_{zyy}/2$
26	$HoMnO_3$ (0.42)	$P^{-3^2_{001}}6_3{}^{\mathrm{m}\frac{1}{3}\pi}\mathrm{c}^{2_{100}}\mathrm{m}$	$\sigma_{xxx}=-\sigma_{xyy}=-\sigma_{yxy}=-\sigma_{yyx}$	$\sigma_{xxx}=-\sigma_{xyy}=-\sigma_{yxy}=-\sigma_{yyx}$	$\sigma_{xxz}=\sigma_{xzx}=\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zxx}/2=-\sigma_{zyy}/2$	$\sigma_{xxx}=-\sigma_{xyy}=-\sigma_{yxy}=-\sigma_{yyx}$	$\sigma_{xxx}=-\sigma_{xyy}=-\sigma_{yxy}=-\sigma_{yyx}$	$\sigma_{xxz}=\sigma_{xzx}=\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zxx}/2=-\sigma_{zyy}/2$
27	$YbMnO_3$ (0.488)	$P^{-3^2_{001}}6_3{}^{\mathrm{m}\frac{1}{3}\pi}\mathrm{c}^{2_{100}}\mathrm{m}$	$\sigma_{xxx}=-\sigma_{xyy}=-\sigma_{yxy}=-\sigma_{yyx}$	$\sigma_{xxx}=-\sigma_{xyy}=-\sigma_{yxy}=-\sigma_{yyx}$	$\sigma_{xxz}=\sigma_{xzx}=\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zxx}/2=-\sigma_{zyy}/2$	$\sigma_{xxx}=-\sigma_{xyy}=-\sigma_{yxy}=-\sigma_{yyx}$	$\sigma_{xxx}=-\sigma_{xyy}=-\sigma_{yxy}=-\sigma_{yyx}$	$\sigma_{xxz}=\sigma_{xzx}=\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zxx}/2=-\sigma_{zyy}/2$
28	$YbMnO_3$ (0.489)	$P^{-3^2_{001}}6_3{}^{\mathrm{m}\frac{1}{3}\pi}\mathrm{c}^{2_{100}}\mathrm{m}$	$\sigma_{xxx}=-\sigma_{xyy}=-\sigma_{yxy}=-\sigma_{yyx}$	$\sigma_{xxx}=-\sigma_{xyy}=-\sigma_{yxy}=-\sigma_{yyx}$	$\sigma_{xxz}=\sigma_{xzx}=\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zxx}/2=-\sigma_{zyy}/2$	$\sigma_{xxx}=-\sigma_{xyy}=-\sigma_{yxy}=-\sigma_{yyx}$	$\sigma_{xxx}=-\sigma_{xyy}=-\sigma_{yxy}=-\sigma_{yyx}$	$\sigma_{xxz}=\sigma_{xzx}=\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zxx}/2=-\sigma_{zyy}/2$

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Table S3 : (continued) Noncoplanar antiferromagnets in MAGNDATA with second-order transport tensors triggered by magnetic geometry.

No.	Materials (ID)	Spin space group	without SOC			with SOC		
			IMD	QMD	BCD	IMD	QMD	BCD
29	$Tb_{14}Ag_{51}$ (1.0.52)	$P^{\text{-}6^5_{001}}$-6	σ_{zzz}, $\sigma_{xxz}=\sigma_{xzx}=\sigma_{yyz}=\sigma_{yzy}=\sigma_{zxx}=\sigma_{zyy}$	σ_{zzz}, $\sigma_{zxx}=\sigma_{zyy}$, $\sigma_{xyz}=\sigma_{xzy}=-\sigma_{yxz}=-\sigma_{yzx}$, $\sigma_{xxz}=\sigma_{xzx}=\sigma_{yyz}=\sigma_{yzy}$	×	σ_{zzz}, $\sigma_{xxz}=\sigma_{xzx}=\sigma_{yyz}=\sigma_{yzy}=\sigma_{zxx}=\sigma_{zyy}$	σ_{zzz}, $\sigma_{zxx}=\sigma_{zyy}$, $\sigma_{xyz}=\sigma_{xzy}=-\sigma_{yxz}=-\sigma_{yzx}$, $\sigma_{xxz}=\sigma_{xzx}=\sigma_{yyz}=\sigma_{yzy}$	×
30	$La_{0.33}Sr_{0.67}FeO_3$ (1.0.15)	$R^1 3^{2_{100}} 2\vert(1,1,1;3^1_{001},3^2_{001})$	$\sigma_{xxx}=-\sigma_{xyy}=-\sigma_{yxy}=-\sigma_{yyx}$	$\sigma_{xyz}=\sigma_{xzy}=-\sigma_{yxz}=-\sigma_{yzx}$, $\sigma_{xxx}=-\sigma_{xyy}=-\sigma_{yxy}=-\sigma_{yyx}$	$\sigma_{xyz}=\sigma_{xzy}=-\sigma_{yxz}=-\sigma_{yzx}$	$\sigma_{xxx}=-\sigma_{xyy}=-\sigma_{yxy}=-\sigma_{yyx}$	$\sigma_{xyz}=\sigma_{xzy}=-\sigma_{yxz}=-\sigma_{yzx}$, $\sigma_{xxx}=-\sigma_{xyy}=-\sigma_{yxy}=-\sigma_{yyx}$	$\sigma_{xyz}=\sigma_{xzy}=-\sigma_{yxz}=-\sigma_{yzx}$
31	$PrFe_3(BO_3)_4$ (1.161)	$R^{3^1_{001}} 3^{\mathrm{m}\frac{1}{6}\tau} 2\vert(1,1,\text{-}1;\text{-}1,1)$	×	×	$\sigma_{xyz}=\sigma_{xzy}=-\sigma_{yxz}=-\sigma_{yzx}$	×	×	$\sigma_{xyz}=\sigma_{xzy}=-\sigma_{yxz}=-\sigma_{yzx}$
32	$DyFe_3(BO_3)_4$ (1.89)	$P^{\text{-}3^1_{001}} 3_1{}^{\mathrm{m}\frac{1}{6}\tau} 2^1 1\vert(1,1,\text{-}1)$	×	×	$\sigma_{xyz}=\sigma_{xzy}=-\sigma_{yxz}=-\sigma_{yzx}$	×	×	$\sigma_{xyz}=\sigma_{xzy}=-\sigma_{yxz}=-\sigma_{yzx}$
33	$HoFe_3(BO_3)_4$ (1.92)	$P^{\text{-}3^1_{001}} 3_1{}^{\mathrm{m}\frac{1}{6}\tau} 2^1 1\vert(1,1,\text{-}1)$	×	×	$\sigma_{xyz}=\sigma_{xzy}=-\sigma_{yxz}=-\sigma_{yzx}$	×	×	$\sigma_{xyz}=\sigma_{xzy}=-\sigma_{yxz}=-\sigma_{yzx}$
34	Yb_3Pt_4 (0.430)	$R^{\text{-}3^1_{001}}$-3	σ_{zzz}, $\sigma_{xxz}=\sigma_{xzx}=\sigma_{yyz}=\sigma_{yzy}=\sigma_{zxx}=\sigma_{zyy}$, $\sigma_{xxy}=\sigma_{xyx}=\sigma_{yxx}=-\sigma_{yyy}$, $\sigma_{xxx}=-\sigma_{xyy}=-\sigma_{yxy}=-\sigma_{yyx}$	σ_{zzz}, $\sigma_{zxx}=\sigma_{zyy}$, $\sigma_{xyz}=\sigma_{xzy}=-\sigma_{yxz}=-\sigma_{yzx}$, $\sigma_{xxz}=\sigma_{xzx}=\sigma_{yyz}=\sigma_{yzy}$, $\sigma_{xxy}=\sigma_{xyx}=\sigma_{yxx}=-\sigma_{yyy}$, $\sigma_{xxx}=-\sigma_{xyy}=-\sigma_{yxy}=-\sigma_{yyx}$	×	σ_{zzz}, $\sigma_{xxz}=\sigma_{xzx}=\sigma_{yyz}=\sigma_{yzy}=\sigma_{zxx}=\sigma_{zyy}$, $\sigma_{xxy}=\sigma_{xyx}=\sigma_{yxx}=-\sigma_{yyy}$, $\sigma_{xxx}=-\sigma_{xyy}=-\sigma_{yxy}=-\sigma_{yyx}$	σ_{zzz}, $\sigma_{zxx}=\sigma_{zyy}$, $\sigma_{xyz}=\sigma_{xzy}=-\sigma_{yxz}=-\sigma_{yzx}$, $\sigma_{xxz}=\sigma_{xzx}=\sigma_{yyz}=\sigma_{yzy}$, $\sigma_{xxy}=\sigma_{xyx}=\sigma_{yxx}=-\sigma_{yyy}$, $\sigma_{xxx}=-\sigma_{xyy}=-\sigma_{yxy}=-\sigma_{yyx}$	×

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Table S3 : (continued) Noncoplanar antiferromagnets in MAGNDATA with second-order transport tensors triggered by magnetic geometry.

No.	Materials (ID)	Spin space group	without SOC			with SOC		
			IMD	QMD	BCD	IMD	QMD	BCD
35	TbSbTe (2.102)	$P^{\mathrm{m}_{001}}2\vert(\text{-}1,1,1)$	×	×	$\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zyy}/2$, $\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{xxz}=\sigma_{xzx}=-\sigma_{zxx}/2$, $\sigma_{yxz}=\sigma_{yzx}$, $\sigma_{xyz}=\sigma_{xzy}$	×	×	$\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zyy}/2$, $\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{xxz}=\sigma_{xzx}=-\sigma_{zxx}/2$, $\sigma_{yxz}=\sigma_{yzx}$, $\sigma_{xyz}=\sigma_{xzy}$
36	TbSbTe (2.101)	$P^{\mathrm{m}_{001}}2\vert(\text{-}1,1,1)$	×	×	$\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zyy}/2$, $\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{xxz}=\sigma_{xzx}=-\sigma_{zxx}/2$, $\sigma_{yxz}=\sigma_{yzx}$, $\sigma_{xyz}=\sigma_{xzy}$	×	×	$\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zyy}/2$, $\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{xxz}=\sigma_{xzx}=-\sigma_{zxx}/2$, $\sigma_{yxz}=\sigma_{yzx}$, $\sigma_{xyz}=\sigma_{xzy}$
37	CuB_2O_4 (0.431)	$C^{\text{-}1}\mathrm{c}$	$\sigma_{xxy}=\sigma_{xyx}=\sigma_{xyy}=\sigma_{yxx}=\sigma_{yxy}=\sigma_{yyx}$, $\sigma_{xxx}=\sigma_{yyy}$, $\sigma_{xxz}=\sigma_{xzx}=-\sigma_{yyz}=-\sigma_{yzy}=\sigma_{zxx}=-\sigma_{zyy}$, $\sigma_{xzz}=\sigma_{yzz}=\sigma_{zxz}=\sigma_{zyz}=\sigma_{zzx}=\sigma_{zzy}$	$\sigma_{xyy}=\sigma_{yxx}$, $\sigma_{xxy}=\sigma_{xyx}=\sigma_{yxy}=\sigma_{yyx}$, $\sigma_{xyz}=\sigma_{xzy}=-\sigma_{yxz}=-\sigma_{yzx}$, $\sigma_{xxx}=\sigma_{yyy}$, $\sigma_{xxz}=\sigma_{xzx}=-\sigma_{yyz}=-\sigma_{yzy}$, $\sigma_{xzz}=\sigma_{yzz}$, $\sigma_{zxx}=-\sigma_{zyy}$, $\sigma_{zxz}=\sigma_{zyz}=\sigma_{zzx}=\sigma_{zzy}$	$\sigma_{xxy}=\sigma_{xyx}=\sigma_{xyy}/2=-\sigma_{yxx}/2=-\sigma_{yxy}=-\sigma_{yyx}$, $\sigma_{xyz}=\sigma_{xzy}=\sigma_{yxz}=\sigma_{yzx}$, $\sigma_{xxz}=\sigma_{xzx}=\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zxx}/2=-\sigma_{zyy}/2$, $\sigma_{xzz}=-\sigma_{yzz}=-2\sigma_{zxz}=2\sigma_{zyz}=-2\sigma_{zzx}=2\sigma_{zzy}$, $\sigma_{zxy}=\sigma_{zyx}$	σ_{xxx}, $\sigma_{xxy}=\sigma_{xyx}=\sigma_{xzz}=\sigma_{zxz}$, $\sigma_{xyy}=\sigma_{yxy}=\sigma_{yyx}$, $\sigma_{xyz}=\sigma_{xzy}=\sigma_{yxz}=\sigma_{yzx}=\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{xzz}=\sigma_{zxz}=\sigma_{zzx}$, σ_{yyy}, $\sigma_{yyz}=\sigma_{yzy}=\sigma_{zyy}$, $\sigma_{yzz}=\sigma_{zyz}=\sigma_{zzy}$, σ_{zzz}	σ_{xxx}, $\sigma_{xxy}=\sigma_{xyx}$, $\sigma_{xxz}=\sigma_{xzx}$, σ_{xyy}, $\sigma_{xyz}=\sigma_{xzy}$, σ_{xzz}, σ_{yxx}, $\sigma_{yxy}=\sigma_{yyx}$, $\sigma_{yxz}=\sigma_{yzx}$, σ_{yyy}, $\sigma_{yyz}=\sigma_{yzy}$, σ_{yzz}, σ_{zxx}, $\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{zxz}=\sigma_{zzx}$, σ_{zyy}, $\sigma_{zyz}=\sigma_{zzy}$, σ_{zzz}	$\sigma_{xxy}=\sigma_{xyx}=-\sigma_{yxx}/2$, $\sigma_{xxz}=\sigma_{xzx}=-\sigma_{zxx}/2$, $\sigma_{xyy}=-2\sigma_{xyy}=-2\sigma_{yyx}$, $\sigma_{xyz}=\sigma_{xzy}$, $\sigma_{xzz}=-2\sigma_{zxz}=-2\sigma_{zzx}$, $\sigma_{yxz}=\sigma_{yzx}$, $\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zyy}/2$, $\sigma_{yzz}=-2\sigma_{zyz}=-2\sigma_{zzy}$, $\sigma_{zxy}=\sigma_{zyx}$
38	MgV_2O_4 (1.138)	$F^{\mathrm{m}_{100}}2^{2_{001}}2^{\mathrm{m}_{010}}2\vert(1,1,1;\text{-}1,\text{-}1,1)$	×	×	$\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{yxz}=\sigma_{yzx}$, $\sigma_{xyz}=\sigma_{xzy}$	×	×	$\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{yxz}=\sigma_{yzx}$, $\sigma_{xyz}=\sigma_{xzy}$

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Table S3 : (continued) Noncoplanar antiferromagnets in MAGNDATA with second-order transport tensors triggered by magnetic geometry.

No.	Materials (ID)	Spin space group	without SOC			with SOC		
			IMD	QMD	BCD	IMD	QMD	BCD
39	$Er_2Ge_2O_7$ (0.419)	$P^{-4^3_{001}}4_1{}^{2_{110}}2_1{}^{\mathrm{m}_{100}}2$	$\sigma_{xyz}=\sigma_{xzy}=\sigma_{yxz}=\sigma_{yzx}=\sigma_{zxy}=\sigma_{zyx}$	$\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{xyz}=\sigma_{xzy}=\sigma_{yxz}=\sigma_{yzx}$	$\sigma_{xyz}=\sigma_{xzy}=-\sigma_{yxz}=-\sigma_{yzx}$	$\sigma_{xyz}=\sigma_{xzy}=\sigma_{yxz}=\sigma_{yzx}=\sigma_{zxy}=\sigma_{zyx}$	$\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{xyz}=\sigma_{xzy}=\sigma_{yxz}=\sigma_{yzx}$	$\sigma_{xyz}=\sigma_{xzy}=-\sigma_{yxz}=-\sigma_{yzx}$
40	$Er_2Ge_2O_7$ (0.942)	$P^{-4^3_{001}}4_1{}^{2_{110}}2_1{}^{\mathrm{m}_{100}}2$	$\sigma_{xyz}=\sigma_{xzy}=\sigma_{yxz}=\sigma_{yzx}=\sigma_{zxy}=\sigma_{zyx}$	$\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{xyz}=\sigma_{xzy}=\sigma_{yxz}=\sigma_{yzx}$	$\sigma_{xyz}=\sigma_{xzy}=-\sigma_{yxz}=-\sigma_{yzx}$	$\sigma_{xyz}=\sigma_{xzy}=\sigma_{yxz}=\sigma_{yzx}=\sigma_{zxy}=\sigma_{zyx}$	$\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{xyz}=\sigma_{xzy}=\sigma_{yxz}=\sigma_{yzx}$	$\sigma_{xyz}=\sigma_{xzy}=-\sigma_{yxz}=-\sigma_{yzx}$
41	$Ba(TiO)Cu_4(PO_4)_4$ (1.235)	$P^{-4^3_{001}}4^{\mathrm{m}_{100}}2_1{}^{2_{\text{-}110}}2\vert(1,1,\text{-}1)$	×	×	$\sigma_{xyz}=\sigma_{xzy}=-\sigma_{yxz}=-\sigma_{yzx}$	×	×	$\sigma_{xyz}=\sigma_{xzy}=-\sigma_{yxz}=-\sigma_{yzx}$
42	$Dy_2Co_3Al_9$ (1.267)	$A^{\mathrm{m}_{100}}\mathrm{m}^{2_{001}}\mathrm{m}^{\mathrm{m}_{010}}2\vert(\text{-}1,1,1;1)$	×	×	$\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zyy}/2$, $\sigma_{xxz}=\sigma_{xzx}=-\sigma_{zxx}/2$	×	×	$\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zyy}/2$, $\sigma_{xxz}=\sigma_{xzx}=-\sigma_{zxx}/2$
43	Er_2ReC_2 (0.347)	$P^{2_{001}}\mathrm{n}^{1}\mathrm{m}^{\mathrm{m}_{001}}\mathrm{a}$	$\sigma_{xzz}=\sigma_{zxz}=\sigma_{zzx}$, $\sigma_{xyy}=\sigma_{yxy}=\sigma_{yyx}$, σ_{xxx}	$\sigma_{zxz}=\sigma_{zzx}$, $\sigma_{yxy}=\sigma_{yyx}$, σ_{xzz}, σ_{xyy}, σ_{xxx}	×	$\sigma_{yzz}=\sigma_{zyz}=\sigma_{zzy}$, $\sigma_{xzz}=\sigma_{zxz}=\sigma_{zzx}$, σ_{yyy}, $\sigma_{xyy}=\sigma_{yxy}=\sigma_{yyx}$, $\sigma_{xxy}=\sigma_{xyx}=\sigma_{yxx}$, σ_{xxx}	$\sigma_{zyz}=\sigma_{zzy}$, $\sigma_{xzz}=\sigma_{zzx}$, σ_{yzz}, σ_{yyy}, $\sigma_{yxy}=\sigma_{yyx}$, σ_{yxx}, σ_{xzz}, σ_{xyy}, $\sigma_{xxy}=\sigma_{xyx}$, σ_{xxx}	×
44	Tb_5Ge_4 (0.141)	$P^{2_{010}}\mathrm{n}^{\mathrm{m}_{010}}\mathrm{m}^{2_{100}}\mathrm{a}$	$\sigma_{xzz}=\sigma_{zxz}=\sigma_{zzx}$, $\sigma_{xyy}=\sigma_{yxy}=\sigma_{yyx}$, σ_{xxx}	$\sigma_{zxz}=\sigma_{zzx}$, $\sigma_{yxy}=\sigma_{yyx}$, σ_{xzz}, σ_{xyy}, σ_{xxx}	×	$\sigma_{xzz}=\sigma_{zxz}=\sigma_{zzx}$, $\sigma_{xyy}=\sigma_{yxy}=\sigma_{yyx}$, σ_{xxx}	$\sigma_{zxz}=\sigma_{zzx}$, $\sigma_{yxy}=\sigma_{yyx}$, σ_{xzz}, σ_{xyy}, σ_{xxx}	×
45	Tb_5Ge_4 (0.412)	$P^{2_{010}}\mathrm{n}^{\mathrm{m}_{010}}\mathrm{m}^{2_{100}}\mathrm{a}$	$\sigma_{xzz}=\sigma_{zxz}=\sigma_{zzx}$, $\sigma_{xyy}=\sigma_{yxy}=\sigma_{yyx}$, σ_{xxx}	$\sigma_{zxz}=\sigma_{zzx}$, $\sigma_{yxy}=\sigma_{yyx}$, σ_{xzz}, σ_{xyy}, σ_{xxx}	×	$\sigma_{xzz}=\sigma_{zxz}=\sigma_{zzx}$, $\sigma_{xyy}=\sigma_{yxy}=\sigma_{yyx}$, σ_{xxx}	$\sigma_{zxz}=\sigma_{zzx}$, $\sigma_{yxy}=\sigma_{yyx}$, σ_{xzz}, σ_{xyy}, σ_{xxx}	×
46	Tb_5Ge_4 (0.411)	$P^{2_{010}}\mathrm{n}^{\mathrm{m}_{010}}\mathrm{m}^{2_{100}}\mathrm{a}$	$\sigma_{xzz}=\sigma_{zxz}=\sigma_{zzx}$, $\sigma_{xyy}=\sigma_{yxy}=\sigma_{yyx}$, σ_{xxx}	$\sigma_{zxz}=\sigma_{zzx}$, $\sigma_{yxy}=\sigma_{yyx}$, σ_{xzz}, σ_{xyy}, σ_{xxx}	×	$\sigma_{xzz}=\sigma_{zxz}=\sigma_{zzx}$, $\sigma_{xyy}=\sigma_{yxy}=\sigma_{yyx}$, σ_{xxx}	$\sigma_{zxz}=\sigma_{zzx}$, $\sigma_{yxy}=\sigma_{yyx}$, σ_{xzz}, σ_{xyy}, σ_{xxx}	×

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Table S3 : (continued) Noncoplanar antiferromagnets in MAGNDATA with second-order transport tensors triggered by magnetic geometry.

No.	Materials (ID)	Spin space group	without SOC			with SOC		
			IMD	QMD	BCD	IMD	QMD	BCD
47	$TbCrO_3$ (2.62)	$P^{\mathrm{m}_{010}}\mathrm{m}^{\mathrm{m}_{001}}\mathrm{n}^{2_{100}}2_1\vert(1,2_{010},1)$	$\sigma_{xyz}=\sigma_{xzy}=\sigma_{yxz}=\sigma_{yzx}=\sigma_{zxy}=\sigma_{zyx}$	$\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{yxz}=\sigma_{yzx}$, $\sigma_{xyz}=\sigma_{xzy}$	$\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zyy}/2$, $\sigma_{xxz}=\sigma_{xzx}=-\sigma_{zxx}/2$	$\sigma_{xyz}=\sigma_{xzy}=\sigma_{yxz}=\sigma_{yzx}=\sigma_{zxy}=\sigma_{zyx}$	$\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{yxz}=\sigma_{yzx}$, $\sigma_{xyz}=\sigma_{xzy}$	$\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zyy}/2$, $\sigma_{xxz}=\sigma_{xzx}=-\sigma_{zxx}/2$
48	$CoGeO_3$ (0.311)	$P^{2_{100}}\mathrm{b}^{\mathrm{m}_{001}}\mathrm{c}^{2_{010}}\mathrm{a}$	$\sigma_{xzz}=\sigma_{zxz}=\sigma_{zzx}$, $\sigma_{xyy}=\sigma_{yxy}=\sigma_{yyx}$, σ_{xxx}	$\sigma_{zxz}=\sigma_{zzx}$, $\sigma_{yxy}=\sigma_{yyx}$, σ_{xzz}, σ_{xyy}, σ_{xxx}	×	$\sigma_{xzz}=\sigma_{zxz}=\sigma_{zzx}$, $\sigma_{xyy}=\sigma_{yxy}=\sigma_{yyx}$, σ_{xxx}	$\sigma_{zxz}=\sigma_{zzx}$, $\sigma_{yxy}=\sigma_{yyx}$, σ_{xzz}, σ_{xyy}, σ_{xxx}	×
49	$Fe_2Se_2O_7$ (0.807)	$P^{2_{100}}\mathrm{c}^{\mathrm{m}_{001}}\mathrm{c}^{2_{010}}\mathrm{n}$	$\sigma_{xzz}=\sigma_{zxz}=\sigma_{zzx}$, $\sigma_{xyy}=\sigma_{yxy}=\sigma_{yyx}$, σ_{xxx}	$\sigma_{zxz}=\sigma_{zzx}$, $\sigma_{yxy}=\sigma_{yyx}$, σ_{xzz}, σ_{xyy}, σ_{xxx}	×	$\sigma_{xzz}=\sigma_{zxz}=\sigma_{zzx}$, $\sigma_{xyy}=\sigma_{yxy}=\sigma_{yyx}$, σ_{xxx}	$\sigma_{zxz}=\sigma_{zzx}$, $\sigma_{yxy}=\sigma_{yyx}$, σ_{xzz}, σ_{xyy}, σ_{xxx}	×
50	$Fe_2Se_2O_7$ (0.808)	$P^{2_{100}}\mathrm{c}^{\mathrm{m}_{001}}\mathrm{c}^{2_{010}}\mathrm{n}$	$\sigma_{xzz}=\sigma_{zxz}=\sigma_{zzx}$, $\sigma_{xyy}=\sigma_{yxy}=\sigma_{yyx}$, σ_{xxx}	$\sigma_{zxz}=\sigma_{zzx}$, $\sigma_{yxy}=\sigma_{yyx}$, σ_{xzz}, σ_{xyy}, σ_{xxx}	×	$\sigma_{xzz}=\sigma_{zxz}=\sigma_{zzx}$, $\sigma_{xyy}=\sigma_{yxy}=\sigma_{yyx}$, σ_{xxx}	$\sigma_{zxz}=\sigma_{zzx}$, $\sigma_{yxy}=\sigma_{yyx}$, σ_{xzz}, σ_{xyy}, σ_{xxx}	×
51	$Fe_2Se_2O_7$ (0.806)	$P^{2_{100}}\mathrm{c}^{\mathrm{m}_{001}}\mathrm{c}^{2_{010}}\mathrm{n}$	$\sigma_{xzz}=\sigma_{zxz}=\sigma_{zzx}$, $\sigma_{xyy}=\sigma_{yxy}=\sigma_{yyx}$, σ_{xxx}	$\sigma_{zxz}=\sigma_{zzx}$, $\sigma_{yxy}=\sigma_{yyx}$, σ_{xzz}, σ_{xyy}, σ_{xxx}	×	$\sigma_{xzz}=\sigma_{zxz}=\sigma_{zzx}$, $\sigma_{xyy}=\sigma_{yxy}=\sigma_{yyx}$, σ_{xxx}	$\sigma_{zxz}=\sigma_{zzx}$, $\sigma_{yxy}=\sigma_{yyx}$, σ_{xzz}, σ_{xyy}, σ_{xxx}	×
52	$Sr_2Fe_3Se_2O_3$ (2.55)	$C^{1}\mathrm{m}^{-1}(0\ \ 0\ \ 1/2)^{\mathrm{m}_{001}}(1/2\ \ 0\ \ 0)$	×	×	$\sigma_{yzz}=-2\sigma_{zyz}=-2\sigma_{zzy}$, $\sigma_{xzz}=-2\sigma_{zxz}=-2\sigma_{zzx}$, $\sigma_{xyy}=-2\sigma_{yxy}=-2\sigma_{yyx}$, $\sigma_{xxy}=\sigma_{xyx}=-\sigma_{yxx}/2$	×	×	$\sigma_{yzz}=-2\sigma_{zyz}=-2\sigma_{zzy}$, $\sigma_{xzz}=-2\sigma_{zxz}=-2\sigma_{zzx}$, $\sigma_{xyy}=-2\sigma_{yxy}=-2\sigma_{yyx}$, $\sigma_{xxy}=\sigma_{xyx}=-\sigma_{yxx}/2$

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Table S3 : (continued) Noncoplanar antiferromagnets in MAGNDATA with second-order transport tensors triggered by magnetic geometry.

No.	Materials (ID)	Spin space group	without SOC			with SOC		
			IMD	QMD	BCD	IMD	QMD	BCD
53	$Sr_2Fe_3Se_2O_3$ (2.76)	$C^{1}\mathrm{m}^{-1}(0\ \ 0\ \ 1/2)^{\mathrm{m}_{001}}(1/2\ \ 0\ \ 0)$	×	×	$\sigma_{yzz} = -2\sigma_{zyz} = -2\sigma_{zzy}$, $\sigma_{xzz} = -2\sigma_{zxz} = -2\sigma_{zzx}$, $\sigma_{xyy} = -2\sigma_{yxy} = -2\sigma_{yyx}$, $\sigma_{xxy} = \sigma_{xyx} = -\sigma_{yxx}/2$	×	×	$\sigma_{yzz} = -2\sigma_{zyz} = -2\sigma_{zzy}$, $\sigma_{xzz} = -2\sigma_{zxz} = -2\sigma_{zzx}$, $\sigma_{xyy} = -2\sigma_{yxy} = -2\sigma_{yyx}$, $\sigma_{xxy} = \sigma_{xyx} = -\sigma_{yxx}/2$
54	$BiMn_2O_5$ (1.75)	$P^{\mathrm{m}_{001}}\mathrm{m}\vert(-1,1,1)$	×	×	$\sigma_{yzz} = -2\sigma_{zyz} = -2\sigma_{zzy}$, $\sigma_{xzz} = -2\sigma_{zxz} = -2\sigma_{zzx}$, $\sigma_{xyy} = -2\sigma_{yxy} = -2\sigma_{yyx}$, $\sigma_{xxy} = \sigma_{xyx} = -\sigma_{yxx}/2$	×	×	$\sigma_{yzz} = -2\sigma_{zyz} = -2\sigma_{zzy}$, $\sigma_{xzz} = -2\sigma_{zxz} = -2\sigma_{zzx}$, $\sigma_{xyy} = -2\sigma_{yxy} = -2\sigma_{yyx}$, $\sigma_{xxy} = \sigma_{xyx} = -\sigma_{yxx}/2$
55	$NdCrTiO_5$ (0.162)	$P^{2_{001}}\mathrm{b}^{2_{010}}\mathrm{a}^{\mathrm{m}_{100}}\mathrm{m}$	$\sigma_{xzz} = \sigma_{zxz} = \sigma_{zzx}$, $\sigma_{xyy} = \sigma_{yxy} = \sigma_{yyx}$, σ_{xxx}	$\sigma_{zxz} = \sigma_{zzx}$, $\sigma_{yxy} = \sigma_{yyx}$, σ_{xzz}, σ_{xyy}, σ_{xxx}	×	$\sigma_{xzz} = \sigma_{zxz} = \sigma_{zzx}$, $\sigma_{xyy} = \sigma_{yxy} = \sigma_{yyx}$, σ_{xxx}	$\sigma_{zxz} = \sigma_{zzx}$, $\sigma_{yxy} = \sigma_{yyx}$, σ_{xzz}, σ_{xyy}, σ_{xxx}	×
56	$GdMn_2O_5$ (1.299)	$P^{\mathrm{m}_{100}}\mathrm{m}^{2_{001}}\mathrm{c}^{\mathrm{m}_{010}}2_1\vert(1,-1,1)$	×	×	$\sigma_{yyz} = \sigma_{yzy} = -\sigma_{zyy}/2$, $\sigma_{xxz} = \sigma_{xzx} = -\sigma_{zxx}/2$	×	×	$\sigma_{yyz} = \sigma_{yzy} = -\sigma_{zyy}/2$, $\sigma_{xxz} = \sigma_{xzx} = -\sigma_{zxx}/2$
57	$GdMn_2O_5$ (1.300)	$P^{\mathrm{m}_{100}}\mathrm{m}^{2_{001}}\mathrm{c}^{\mathrm{m}_{010}}2_1\vert(1,-1,1)$	×	×	$\sigma_{yyz} = \sigma_{yzy} = -\sigma_{zyy}/2$, $\sigma_{xxz} = \sigma_{xzx} = -\sigma_{zxx}/2$	×	×	$\sigma_{yyz} = \sigma_{yzy} = -\sigma_{zyy}/2$, $\sigma_{xxz} = \sigma_{xzx} = -\sigma_{zxx}/2$
58	Tb_3Ge_5 (0.342)	$F^{2_{100}}\mathrm{d}^{2_{010}}\mathrm{d}^{2_{001}}2$	σ_{zzz}, $\sigma_{yyz} = \sigma_{yzy} = \sigma_{zyy}$, $\sigma_{xxz} = \sigma_{xzx} = \sigma_{zxx}$	σ_{zzz}, σ_{zyy}, σ_{zxx}, $\sigma_{yyz} = \sigma_{yzy}$, $\sigma_{xxz} = \sigma_{xzx}$	$\sigma_{yyz} = \sigma_{yzy} = -\sigma_{zyy}/2$, $\sigma_{xxz} = \sigma_{xzx} = -\sigma_{zxx}/2$	σ_{zzz}, $\sigma_{yyz} = \sigma_{yzy} = \sigma_{zyy}$, $\sigma_{xxz} = \sigma_{xzx} = \sigma_{zxx}$	σ_{zzz}, σ_{zyy}, σ_{zxx}, $\sigma_{yyz} = \sigma_{yzy}$, $\sigma_{xxz} = \sigma_{xzx}$	$\sigma_{yyz} = \sigma_{yzy} = -\sigma_{zyy}/2$, $\sigma_{xxz} = \sigma_{xzx} = -\sigma_{zxx}/2$

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Table S3 : (continued) Noncoplanar antiferromagnets in MAGNDATA with second-order transport tensors triggered by magnetic geometry.

No.	Materials (ID)	Spin space group	without SOC			with SOC		
			IMD	QMD	BCD	IMD	QMD	BCD
59	$Ho_2Cu_2O_5$ (1.279)	$P^{\mathrm{m}_{001}}2_1\vert$(-1, 1, 1)	×	×	$\sigma_{yyz} = \sigma_{yzy} = -\sigma_{zyy}/2$, $\sigma_{zxy} = \sigma_{zyx}$, $\sigma_{xxz} = \sigma_{xzx} = -\sigma_{zxx}/2$, $\sigma_{yxz} = \sigma_{yzx}$, $\sigma_{xyz} = \sigma_{xzy}$	×	×	$\sigma_{yyz} = \sigma_{yzy} = -\sigma_{zyy}/2$, $\sigma_{zxy} = \sigma_{zyx}$, $\sigma_{xxz} = \sigma_{xzx} = -\sigma_{zxx}/2$, $\sigma_{yxz} = \sigma_{yzx}$, $\sigma_{xyz} = \sigma_{xzy}$
60	$DyFeWO_6$ (1.274)	$P^{\mathrm{m}_{001}}\mathrm{c}\vert(1,-1,1)$	×	×	$\sigma_{yzz} = -2\sigma_{zyz} = -2\sigma_{zzy}$, $\sigma_{xzz} = -2\sigma_{zxz} = -2\sigma_{zzx}$, $\sigma_{xyy} = -2\sigma_{yxy} = -2\sigma_{yyx}$, $\sigma_{xxy} = \sigma_{xyx} = -\sigma_{yxx}/2$	×	×	$\sigma_{yzz} = -2\sigma_{zyz} = -2\sigma_{zzy}$, $\sigma_{xzz} = -2\sigma_{zxz} = -2\sigma_{zzx}$, $\sigma_{xyy} = -2\sigma_{yxy} = -2\sigma_{yyx}$, $\sigma_{xxy} = \sigma_{xyx} = -\sigma_{yxx}/2$
61	$DyCrWO_6$ (0.316)	$P^{-1}\mathrm{n}^{\mathrm{m}_{001}}\mathrm{a}^{2_{001}}2_1$	$\sigma_{xyz} = \sigma_{xzy} = \sigma_{yxz} = \sigma_{yzx} = \sigma_{zxy} = \sigma_{zyx}$	$\sigma_{zxy} = \sigma_{zyx}$, $\sigma_{yxz} = \sigma_{yzx}$, $\sigma_{xyz} = \sigma_{xzy}$	$\sigma_{yyz} = \sigma_{yzy} = -\sigma_{zyy}/2$, $\sigma_{xxz} = \sigma_{xzx} = -\sigma_{zxx}/2$	σ_{zzz}, $\sigma_{yyz} = \sigma_{yzy} = \sigma_{zyy}$, $\sigma_{xyz} = \sigma_{xzy} = \sigma_{yxz} = \sigma_{yzx} = \sigma_{zxy} = \sigma_{zyx}$, $\sigma_{xxz} = \sigma_{xzx} = \sigma_{zxx}$	σ_{zzz}, σ_{zyy}, $\sigma_{zxy} = \sigma_{zyx}$, σ_{zxx}, $\sigma_{yyz} = \sigma_{yzy}$, $\sigma_{yxz} = \sigma_{yzx}$, $\sigma_{xyz} = \sigma_{xzy}$, $\sigma_{xxz} = \sigma_{xzx}$	$\sigma_{yyz} = \sigma_{yzy} = -\sigma_{zyy}/2$, $\sigma_{zxy} = \sigma_{zyx}$, $\sigma_{xxz} = \sigma_{xzx} = -\sigma_{zxx}/2$, $\sigma_{yxz} = \sigma_{yzx}$, $\sigma_{xyz} = \sigma_{xzy}$
62	$Er_2Cu_2O_5$ (0.240)	$P^{2_{100}}\mathrm{n}^{2_{010}}\mathrm{a}^{2_{001}}2_1$	σ_{zzz}, $\sigma_{yyz} = \sigma_{yzy} = \sigma_{zyy}$, $\sigma_{xxz} = \sigma_{xzx} = \sigma_{zxx}$	σ_{zzz}, σ_{zyy}, σ_{zxx}, $\sigma_{yyz} = \sigma_{yzy}$, $\sigma_{xxz} = \sigma_{xzx}$	$\sigma_{yyz} = \sigma_{yzy} = -\sigma_{zyy}/2$, $\sigma_{xxz} = \sigma_{xzx} = -\sigma_{zxx}/2$	σ_{zzz}, $\sigma_{yyz} = \sigma_{yzy} = \sigma_{zyy}$, $\sigma_{xxz} = \sigma_{xzx} = \sigma_{zxx}$	σ_{zzz}, σ_{zyy}, σ_{zxx}, $\sigma_{yyz} = \sigma_{yzy}$, $\sigma_{xxz} = \sigma_{xzx}$	$\sigma_{yyz} = \sigma_{yzy} = -\sigma_{zyy}/2$, $\sigma_{xxz} = \sigma_{xzx} = -\sigma_{zxx}/2$
63	$HoCrWO_6$ (0.715)	$P^{2_{100}}\mathrm{n}^{2_{010}}\mathrm{a}^{2_{001}}2_1$	σ_{zzz}, $\sigma_{yyz} = \sigma_{yzy} = \sigma_{zyy}$, $\sigma_{xxz} = \sigma_{xzx} = \sigma_{zxx}$	σ_{zzz}, σ_{zyy}, σ_{zxx}, $\sigma_{yyz} = \sigma_{yzy}$, $\sigma_{xxz} = \sigma_{xzx}$	$\sigma_{yyz} = \sigma_{yzy} = -\sigma_{zyy}/2$, $\sigma_{xxz} = \sigma_{xzx} = -\sigma_{zxx}/2$	σ_{zzz}, $\sigma_{yyz} = \sigma_{yzy} = \sigma_{zyy}$, $\sigma_{xxz} = \sigma_{xzx} = \sigma_{zxx}$	σ_{zzz}, σ_{zyy}, σ_{zxx}, $\sigma_{yyz} = \sigma_{yzy}$, $\sigma_{xxz} = \sigma_{xzx}$	$\sigma_{yyz} = \sigma_{yzy} = -\sigma_{zyy}/2$, $\sigma_{xxz} = \sigma_{xzx} = -\sigma_{zxx}/2$

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Table S3 : (continued) Noncoplanar antiferromagnets in MAGNDATA with second-order transport tensors triggered by magnetic geometry.

No.	Materials (ID)	Spin space group	without SOC			with SOC		
			IMD	QMD	BCD	IMD	QMD	BCD
64	Pb_2MnWO_6 (2.38)	$P^{1}\mathrm{m}^{2_{001}}\mathrm{c}^{2_{001}}2_1\vert(2_{010},1,1)$	σ_{zzz}, $\sigma_{yyz}=\sigma_{yzy}=\sigma_{zyy}$, $\sigma_{xxz}=\sigma_{xzx}=\sigma_{zxx}$	σ_{zzz}, σ_{zyy}, σ_{zxx}, $\sigma_{yyz}=\sigma_{yzy}$, $\sigma_{xxz}=\sigma_{xzx}$	$\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zyy}/2$, $\sigma_{xxz}=\sigma_{xzx}=-\sigma_{zxx}/2$	σ_{zzz}, $\sigma_{yyz}=\sigma_{yzy}=\sigma_{zyy}$, $\sigma_{xxz}=\sigma_{xzx}=\sigma_{zxx}$	σ_{zzz}, σ_{zyy}, σ_{zxx}, $\sigma_{yyz}=\sigma_{yzy}$, $\sigma_{xxz}=\sigma_{xzx}$	$\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zyy}/2$, $\sigma_{xxz}=\sigma_{xzx}=-\sigma_{zxx}/2$
65	Co_3TeO_6 (0.145)	$C^{\mathrm{m}_{001}}2/^{2_{001}}\mathrm{c}$	$\sigma_{yzz}=\sigma_{zyz}=\sigma_{zzy}$, $\sigma_{xzz}=\sigma_{zxz}=\sigma_{zzx}$, σ_{yyy}, $\sigma_{xyy}=\sigma_{yxy}=\sigma_{yyx}$, $\sigma_{xxy}=\sigma_{xyx}=\sigma_{yxx}$, σ_{xxx}	$\sigma_{zyz}=\sigma_{zzy}$, $\sigma_{zxz}=\sigma_{zzx}$, σ_{yzz}, σ_{yyy}, $\sigma_{yxy}=\sigma_{yyx}$, σ_{yxx}, σ_{xzz}, σ_{xyy}, $\sigma_{xxy}=\sigma_{xyx}$, σ_{xxx}	×	$\sigma_{yzz}=\sigma_{zyz}=\sigma_{zzy}$, $\sigma_{xzz}=\sigma_{zxz}=\sigma_{zzx}$, σ_{yyy}, $\sigma_{xyy}=\sigma_{yxy}=\sigma_{yyx}$, $\sigma_{xxy}=\sigma_{xyx}=\sigma_{yxx}$, σ_{xxx}	$\sigma_{zyz}=\sigma_{zzy}$, $\sigma_{zxz}=\sigma_{zzx}$, σ_{yzz}, σ_{yyy}, $\sigma_{yxy}=\sigma_{yyx}$, σ_{yxx}, σ_{xzz}, σ_{xyy}, $\sigma_{xxy}=\sigma_{xyx}$, σ_{xxx}	×
66	$Co_2V_2O_7$ (0.281)	$P^{2_{001}}2_1/^{\mathrm{m}_{001}}\mathrm{c}$	σ_{zzz}, $\sigma_{yyz}=\sigma_{yzy}=\sigma_{zyy}$, $\sigma_{xyz}=\sigma_{xzy}=\sigma_{yxz}=\sigma_{yzx}=\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{xxz}=\sigma_{xzx}=\sigma_{zxx}$	σ_{zzz}, σ_{zyy}, $\sigma_{zxy}=\sigma_{zyx}$, σ_{zxx}, $\sigma_{yyz}=\sigma_{yzy}$, $\sigma_{yxz}=\sigma_{yzx}$, $\sigma_{xyz}=\sigma_{xzy}$, $\sigma_{xxz}=\sigma_{xzx}$	×	σ_{zzz}, $\sigma_{yyz}=\sigma_{yzy}=\sigma_{zyy}$, $\sigma_{xyz}=\sigma_{xzy}=\sigma_{yxz}=\sigma_{yzx}=\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{xxz}=\sigma_{xzx}=\sigma_{zxx}$	σ_{zzz}, σ_{zyy}, $\sigma_{zxy}=\sigma_{zyx}$, σ_{zxx}, $\sigma_{yyz}=\sigma_{yzy}$, $\sigma_{yxz}=\sigma_{yzx}$, $\sigma_{xyz}=\sigma_{xzy}$, $\sigma_{xxz}=\sigma_{xzx}$	×
67	$Cu_2CdB_2O_6$ (0.394)	$P^{2_{001}}2_1/^{\mathrm{m}_{001}}\mathrm{c}$	σ_{zzz}, $\sigma_{yyz}=\sigma_{yzy}=\sigma_{zyy}$, $\sigma_{xyz}=\sigma_{xzy}=\sigma_{yxz}=\sigma_{yzx}=\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{xxz}=\sigma_{xzx}=\sigma_{zxx}$	σ_{zzz}, σ_{zyy}, $\sigma_{zxy}=\sigma_{zyx}$, σ_{zxx}, $\sigma_{yyz}=\sigma_{yzy}$, $\sigma_{yxz}=\sigma_{yzx}$, $\sigma_{xyz}=\sigma_{xzy}$, $\sigma_{xxz}=\sigma_{xzx}$	×	σ_{zzz}, $\sigma_{yyz}=\sigma_{yzy}=\sigma_{zyy}$, $\sigma_{xyz}=\sigma_{xzy}=\sigma_{yxz}=\sigma_{yzx}=\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{xxz}=\sigma_{xzx}=\sigma_{zxx}$	σ_{zzz}, σ_{zyy}, $\sigma_{zxy}=\sigma_{zyx}$, σ_{zxx}, $\sigma_{yyz}=\sigma_{yzy}$, $\sigma_{yxz}=\sigma_{yzx}$, $\sigma_{xyz}=\sigma_{xzy}$, $\sigma_{xxz}=\sigma_{xzx}$	×
68	Fe_2WO_6 (0.809)	$P^{2_{001}}2_1/^{\mathrm{m}_{001}}\mathrm{c}$	σ_{zzz}, $\sigma_{yyz}=\sigma_{yzy}=\sigma_{zyy}$, $\sigma_{xyz}=\sigma_{xzy}=\sigma_{yxz}=\sigma_{yzx}=\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{xxz}=\sigma_{xzx}=\sigma_{zxx}$	σ_{zzz}, σ_{zyy}, $\sigma_{zxy}=\sigma_{zyx}$, σ_{zxx}, $\sigma_{yyz}=\sigma_{yzy}$, $\sigma_{yxz}=\sigma_{yzx}$, $\sigma_{xyz}=\sigma_{xzy}$, $\sigma_{xxz}=\sigma_{xzx}$	×	σ_{zzz}, $\sigma_{yyz}=\sigma_{yzy}=\sigma_{zyy}$, $\sigma_{xyz}=\sigma_{xzy}=\sigma_{yxz}=\sigma_{yzx}=\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{xxz}=\sigma_{xzx}=\sigma_{zxx}$	σ_{zzz}, σ_{zyy}, $\sigma_{zxy}=\sigma_{zyx}$, σ_{zxx}, $\sigma_{yyz}=\sigma_{yzy}$, $\sigma_{yxz}=\sigma_{yzx}$, $\sigma_{xyz}=\sigma_{xzy}$, $\sigma_{xxz}=\sigma_{xzx}$	×

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Table S3 : (continued) Noncoplanar antiferromagnets in MAGNDATA with second-order transport tensors triggered by magnetic geometry.

No.	Materials (ID)	Spin space group	without SOC			with SOC		
			IMD	QMD	BCD	IMD	QMD	BCD
69	$BaFe_2Se_3$ (1.710)	$P^{\mathrm{m}_{001}}\mathrm{m}\vert(\text{-}1,1,1)$	×	×	$\sigma_{yzz} = -2\sigma_{zyz} = -2\sigma_{zzy}$, $\sigma_{xzz} = -2\sigma_{zxz} = -2\sigma_{zzx}$, $\sigma_{xyy} = -2\sigma_{yxy} = -2\sigma_{yyx}$, $\sigma_{xxy} = \sigma_{xyx} = -\sigma_{yxx}/2$	×	×	$\sigma_{yzz} = -2\sigma_{zyz} = -2\sigma_{zzy}$, $\sigma_{xzz} = -2\sigma_{zxz} = -2\sigma_{zzx}$, $\sigma_{xyy} = -2\sigma_{yxy} = -2\sigma_{yyx}$, $\sigma_{xxy} = \sigma_{xyx} = -\sigma_{yxx}/2$

Table S4: Antiferromagnets in MAGNDATA without second-order transport tensors triggered by magnetic geometry.

No.	Materials (ID)	Configuration	Spin space group	with SOC		
				IMD	QMD	BCD
1	$NpCo_2$ (0.126)	Collinear	$F^{-1}d^{-1}$-$3^1m^{\infty m}1$	$\sigma_{xyz}=\sigma_{xzy}=$ $\sigma_{yxz}=\sigma_{yzx}=$ $\sigma_{zxy}=\sigma_{zyx}$	$\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{xyz}=\sigma_{xzy}=$ $\sigma_{yxz}=\sigma_{yzx}$	×
2	$MnAl_2O_4$ (0.462)	Collinear	$F^{-1}d^{-1}$-$3^1m^{\infty m}1$	$\sigma_{xyz}=\sigma_{xzy}=$ $\sigma_{yxz}=\sigma_{yzx}=$ $\sigma_{zxy}=\sigma_{zyx}$	$\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{xyz}=\sigma_{xzy}=$ $\sigma_{yxz}=\sigma_{yzx}$	×
3	$CoRh_2O_4$ (0.461)	Collinear	$F^{-1}d^{-1}$-$3^1m^{\infty m}1$	$\sigma_{xyz}=\sigma_{xzy}=$ $\sigma_{yxz}=\sigma_{yzx}=$ $\sigma_{zxy}=\sigma_{zyx}$	$\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{xyz}=\sigma_{xzy}=$ $\sigma_{yxz}=\sigma_{yzx}$	×
4	Co_3O_4 (0.463)	Collinear	$F^{-1}d^{-1}$-$3^1m^{\infty m}1$	$\sigma_{xyz}=\sigma_{xzy}=$ $\sigma_{yxz}=\sigma_{yzx}=$ $\sigma_{zxy}=\sigma_{zyx}$	$\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{xyz}=\sigma_{xzy}=$ $\sigma_{yxz}=\sigma_{yzx}$	×
5	$CsFeO_2$ (0.458)	Collinear	$F^{-1}d^{-1}$-$3^1m^{\infty m}1$	$\sigma_{xyz}=\sigma_{xzy}=$ $\sigma_{yxz}=\sigma_{yzx}=$ $\sigma_{zxy}=\sigma_{zyx}$	$\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{xyz}=\sigma_{xzy}=$ $\sigma_{yxz}=\sigma_{yzx}$	×
6	$RbFeO_2$ (0.456)	Collinear	$F^{-1}d^{-1}$-$3^1m^{\infty m}1$	$\sigma_{xyz}=\sigma_{xzy}=$ $\sigma_{yxz}=\sigma_{yzx}=$ $\sigma_{zxy}=\sigma_{zyx}$	$\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{xyz}=\sigma_{xzy}=$ $\sigma_{yxz}=\sigma_{yzx}$	×
7	$CoAl_2O_4$ (0.58)	Collinear	$F^{-1}d^{-1}$-$3^1m^{\infty m}1$	$\sigma_{xyz}=\sigma_{xzy}=$ $\sigma_{yxz}=\sigma_{yzx}=$ $\sigma_{zxy}=\sigma_{zyx}$	$\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{xyz}=\sigma_{xzy}=$ $\sigma_{yxz}=\sigma_{yzx}$	×
8	Bi_2RuMnO_7 (0.153)	Collinear	$I^{-1}4_1/^1a^1m^{-1}d^{\infty m}1$	×	×	×
9	CoO (1.69)	Collinear	$C^12/^1m^{-1}(0\ \ 0\ \ 1/2)^{\infty m}1$	×	×	×
10	$Mn_3Ni_{20}P_6$ (1.145)	Collinear	$P^14/^1m^1m^1m^{-1}(1/2\ \ 1/2\ \ 1/2)^{\infty m}1$	×	×	×
11	UP (1.160)	Collinear	$P^14/^1m^1m^1m^{-1}(1/2\ \ 1/2\ \ 1/2)^{\infty m}1$	×	×	×
12	UAs (1.208)	Collinear	$P^14/^1m^1m^1m^{-1}(1/2\ \ 1/2\ \ 1/2)^{\infty m}1$	×	×	×
13	UN (1.428)	Collinear	$P^14/^1m^1m^1m^{-1}(1/2\ \ 1/2\ \ 1/2)^{\infty m}1$	×	×	×
14	Ba_2YRuO_6 (1.433)	Collinear	$P^14/^1m^1m^1m^{-1}(1/2\ \ 1/2\ \ 1/2)^{\infty m}1$	×	×	×

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Table S4 : (continued) Antiferromagnets in MAGNDATA without second-order transport tensors triggered by magnetic geometry.

No.	Materials (ID)	Configuration	Spin space group	with SOC		
				IMD	QMD	BCD
15	Ba_2LuRuO_6 (1.432)	Collinear	$P^{1}4/^{1}m^{1}m^{1}m^{-1}(1/2\ \ 1/2\ \ 1/2)^{\infty m}1$	×	×	×
16	Ba_2TmRuO_6 (1.567)	Collinear	$P^{1}4/^{1}m^{1}m^{1}m^{-1}(1/2\ \ 1/2\ \ 1/2)^{\infty m}1$	×	×	×
17	Ba_2YbRuO_6 (1.566)	Collinear	$P^{1}4/^{1}m^{1}m^{1}m^{-1}(1/2\ \ 1/2\ \ 1/2)^{\infty m}1$	×	×	×
18	Ba_2MnTeO_6 (1.706)	Collinear	$P^{1}4/^{1}m^{1}m^{1}m^{-1}(1/2\ \ 1/2\ \ 1/2)^{\infty m}1$	×	×	×
19	$Mn_6Ni_{16}Si_7$ (1.454)	Collinear	$P^{1}4_2/^{1}m^{1}n^{1}m^{-1}(1/2\ \ 1/2\ \ 1/2)^{\infty m}1$	×	×	×
20	CrN (1.28)	Collinear	$P^{1}m^{1}m^{1}n^{-1}(0\ \ 0\ \ 1/2)^{\infty m}1$	×	×	×
21	CrN (1.678)	Collinear	$P^{1}m^{1}m^{1}n^{-1}(0\ \ 0\ \ 1/2)^{\infty m}1$	×	×	×
22	MnO (1.31)	Collinear	$R^{1}\text{-}3^{1}m^{-1}(1/3\ \ 2/3\ \ 1/6)^{\infty m}1$	×	×	×
23	CoO (1.618)	Collinear	$R^{1}\text{-}3^{1}m^{-1}(1/3\ \ 2/3\ \ 1/6)^{\infty m}1$	×	×	×
24	NiO (1.6)	Collinear	$R^{1}\text{-}3^{1}m^{-1}(1/3\ \ 2/3\ \ 1/6)^{\infty m}1$	×	×	×
25	Ba_2MnWO_6 (1.707)	Collinear	$R^{1}\text{-}3^{1}m^{-1}(1/3\ \ 2/3\ \ 1/6)^{\infty m}1$	×	×	×
26	HoBi (1.753)	Collinear	$R^{1}\text{-}3^{1}m^{-1}(1/3\ \ 2/3\ \ 1/6)^{\infty m}1$	×	×	×
27	$KNiF_3$ (1.250)	Collinear	$F^{1}m^{1}\text{-}3^{1}m^{-1}(1/2\ \ 0\ \ 0)^{\infty m}1$	×	×	×
28	$Pb_{0.8}Bi_{0.2}Fe_{0.728}W_{0.264}O_3$ (1.590)	Collinear	$F^{1}m^{1}\text{-}3^{1}m^{-1}(1/2\ \ 0\ \ 0)^{\infty m}1$	×	×	×
29	$Pb_{0.7}Bi_{0.3}Fe_{0.762}W_{0.231}O_3$ (1.591)	Collinear	$F^{1}m^{1}\text{-}3^{1}m^{-1}(1/2\ \ 0\ \ 0)^{\infty m}1$	×	×	×
30	$SrFeO_2F$ (1.84)	Collinear	$F^{1}m^{1}\text{-}3^{1}m^{-1}(1/2\ \ 0\ \ 0)^{\infty m}1$	×	×	×
31	NdMg (1.162)	Collinear	$P^{1}4/^{1}m^{1}m^{1}m^{-1}(0\ \ 0\ \ 1/2)^{\infty m}1$	×	×	×
32	UPb_3 (1.423)	Collinear	$P^{1}4/^{1}m^{1}m^{1}m^{-1}(0\ \ 0\ \ 1/2)^{\infty m}1$	×	×	×
33	$LaMn_3Cr_4O_{12}$ (1.156)	Collinear	$P^{1}2^{1}3^{-1}(1/2\ \ 1/2\ \ 1/2)^{\infty m}1$	×	×	$\sigma_{xxz}=\sigma_{xzx}=\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zxx}/2=-\sigma_{zyy}/2$, $\sigma_{xyz}=\sigma_{xzy}=-\sigma_{yxz}=-\sigma_{yzx}$

Continued on next page

Table S4 : (continued) Antiferromagnets in MAGNDATA without second-order transport tensors triggered by magnetic geometry.

No.	Materials (ID)	Configuration	Spin space group	with SOC		
				IMD	QMD	BCD
34	$CaCo_3V_4O_{12}$ (2.106)	Collinear	$P^{1}\mathrm{m}^{1}\mathrm{m}^{-1}\mathrm{n}^{\infty\mathrm{m}}1$	$\sigma_{xyz}=\sigma_{xzy}=\sigma_{yxz}=\sigma_{yzx}=\sigma_{zxy}=\sigma_{zyx}$	$\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{yxz}=\sigma_{yzx}$, $\sigma_{xyz}=\sigma_{xzy}$	×
35	UNiGa (2.88)	Collinear	$P^{-1}\text{-}6^{-1}2^{1}\mathrm{m}^{\infty\mathrm{m}}1$	×	$\sigma_{xyz}=\sigma_{xzy}=-\sigma_{yxz}=-\sigma_{yzx}$	×
36	$CeRh_{0.25}Pd_{0.75}Sn$ (1.737)	Collinear	$P^{1}\text{-}6^{1}2^{1}\mathrm{m}^{-1}(0\ \ 0\ \ 1/2)^{\infty\mathrm{m}}1$	×	×	×
37	$Ba_6Co_6ClO_{15.5}$ (1.275)	Collinear	$P^{1}\text{-}6^{1}\mathrm{m}^{1}2^{-1}(0\ \ 0\ \ 1/2)^{\infty\mathrm{m}}1$	×	×	×
38	$PbMn_2Ni_6Te_3O_{18}$ (0.1001)	Collinear	$P^{1}6_3/^{-1}\mathrm{m}^{\infty\mathrm{m}}1$	σ_{zzz}, $\sigma_{xxz}=\sigma_{xzx}=\sigma_{yyz}=\sigma_{yzy}=\sigma_{zxx}=\sigma_{zyy}$	σ_{zzz}, $\sigma_{zxx}=\sigma_{zyy}$, $\sigma_{xyz}=\sigma_{xzy}=-\sigma_{yxz}=-\sigma_{yzx}$, $\sigma_{xxz}=\sigma_{xzx}=\sigma_{yyz}=\sigma_{yzy}$	×
39	$K_2Mn_3(VO_4)_2CO_3$ (1.0.21)	Collinear	$P^{-1}6_3/^{1}\mathrm{m}^{\infty\mathrm{m}}1$	$\sigma_{xxy}=\sigma_{xyx}=\sigma_{yxx}=-\sigma_{yyy}$, $\sigma_{xxx}=-\sigma_{xyy}=-\sigma_{yxy}=-\sigma_{yyx}$	$\sigma_{xxy}=\sigma_{xyx}=\sigma_{yxx}=-\sigma_{yyy}$, $\sigma_{xxx}=-\sigma_{xyy}=-\sigma_{yxy}=-\sigma_{yyx}$	×
40	$U_{14}Au_{51}$ (0.282)	Collinear	$P^{-1}6/^{1}\mathrm{m}^{\infty\mathrm{m}}1$	$\sigma_{xxy}=\sigma_{xyx}=\sigma_{yxx}=-\sigma_{yyy}$, $\sigma_{xxx}=-\sigma_{xyy}=-\sigma_{yxy}=-\sigma_{yyx}$	$\sigma_{xxy}=\sigma_{xyx}=\sigma_{yxx}=-\sigma_{yyy}$, $\sigma_{xxx}=-\sigma_{xyy}=-\sigma_{yxy}=-\sigma_{yyx}$	×
41	Cr_2O_3 (0.110)	Collinear	$R^{-1}\text{-}3^{1}\mathrm{c}^{\infty\mathrm{m}}1$	$\sigma_{yzz}=\sigma_{zyz}=\sigma_{zzy}$, $\sigma_{xzz}=\sigma_{zxz}=\sigma_{zzx}$, σ_{yyy}, $\sigma_{xyy}=\sigma_{yxy}=\sigma_{yyx}$, $\sigma_{xxy}=\sigma_{xyx}=\sigma_{yxx}$, σ_{xxx}	$\sigma_{zyz}=\sigma_{zzy}$, $\sigma_{zxz}=\sigma_{zzx}$, σ_{yzz}, σ_{yyy}, $\sigma_{yxy}=\sigma_{yyx}$, σ_{yxx}, σ_{xzz}, σ_{xyy}, $\sigma_{xxy}=\sigma_{xyx}$, σ_{xxx}	×
42	Cr_2O_3 (0.59)	Collinear	$R^{-1}\text{-}3^{1}\mathrm{c}^{\infty\mathrm{m}}1$	$\sigma_{xxx}=-\sigma_{xyy}=-\sigma_{yxy}=-\sigma_{yyx}$	$\sigma_{xyz}=\sigma_{xzy}=-\sigma_{yxz}=-\sigma_{yzx}$, $\sigma_{xxx}=-\sigma_{xyy}=-\sigma_{yxy}=-\sigma_{yyx}$	×

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Table S4 : (continued) Antiferromagnets in MAGNDATA without second-order transport tensors triggered by magnetic geometry.

No.	Materials (ID)	Configuration	Spin space group	with SOC		
				IMD	QMD	BCD
43	$AgRuO_3$ (0.733)	Collinear	R^{-1}-3^1c$^{\infty m}1$	$\sigma_{xxx} = -\sigma_{xyy} = -\sigma_{yxy} = -\sigma_{yyx}$	$\sigma_{xyz} = \sigma_{xzy} = -\sigma_{yxz} = -\sigma_{yzx}$, $\sigma_{xxx} = -\sigma_{xyy} = -\sigma_{yxy} = -\sigma_{yyx}$	×
44	MoP_3SiO_{11} (0.728)	Collinear	R^{-1}-3^1c$^{\infty m}1$	σ_{zzz}, $\sigma_{yyz} = \sigma_{yzy} = \sigma_{zyy}$, $\sigma_{xyz} = \sigma_{xzy} = \sigma_{yxz} = \sigma_{yzx} = \sigma_{zxy} = \sigma_{zyx}$, $\sigma_{xxz} = \sigma_{xzx} = \sigma_{zxx}$	σ_{zzz}, σ_{zyy}, $\sigma_{zxy} = \sigma_{zyx}$, σ_{zxx}, $\sigma_{yyz} = \sigma_{yzy}$, $\sigma_{yxz} = \sigma_{yzx}$, $\sigma_{xyz} = \sigma_{xzy}$, $\sigma_{xxz} = \sigma_{xzx}$	×
45	MoP_3SiO_{11} (0.804)	Collinear	R^{-1}-3^1c$^{\infty m}1$	σ_{zzz}, $\sigma_{yyz} = \sigma_{yzy} = \sigma_{zyy}$, $\sigma_{xyz} = \sigma_{xzy} = \sigma_{yxz} = \sigma_{yzx} = \sigma_{zxy} = \sigma_{zyx}$, $\sigma_{xxz} = \sigma_{xzx} = \sigma_{zxx}$	σ_{zzz}, σ_{zyy}, $\sigma_{zxy} = \sigma_{zyx}$, σ_{zxx}, $\sigma_{yyz} = \sigma_{yzy}$, $\sigma_{yxz} = \sigma_{yzx}$, $\sigma_{xyz} = \sigma_{xzy}$, $\sigma_{xxz} = \sigma_{xzx}$	×
46	$CuFeO_2$ (1.348)	Collinear	$C^1$2/^{1}m^{-1}(0 0 1/2)$^{\infty m}1$	×	×	×
47	$KCeS_2$ (1.627)	Collinear	$C^1$2/^{1}m^{-1}(0 0 1/2)$^{\infty m}1$	×	×	×
48	$CoCl_2$ (1.246)	Collinear	R^1-3^1m^{-1}(1/3 2/3 1/6)$^{\infty m}1$	×	×	×
49	$NiBr_2$ (1.248)	Collinear	R^1-3^1m^{-1}(1/3 2/3 1/6)$^{\infty m}1$	×	×	×
50	$NiCl_2$ (1.247)	Collinear	R^1-3^1m^{-1}(1/3 2/3 1/6)$^{\infty m}1$	×	×	×
51	$Fe_2Co_2Nb_2O_9$ (0.770)	Collinear	C^{-1}2/^{1}c$^{\infty m}1$	σ_{zzz}, $\sigma_{yyz} = \sigma_{yzy} = \sigma_{zyy}$, $\sigma_{xyz} = \sigma_{xzy} = \sigma_{yxz} = \sigma_{yzx} = \sigma_{zxy} = \sigma_{zyx}$, $\sigma_{xxz} = \sigma_{xzx} = \sigma_{zxx}$	σ_{zzz}, σ_{zyy}, $\sigma_{zxy} = \sigma_{zyx}$, σ_{zxx}, $\sigma_{yyz} = \sigma_{yzy}$, $\sigma_{yxz} = \sigma_{yzx}$, $\sigma_{xyz} = \sigma_{xzy}$, $\sigma_{xxz} = \sigma_{xzx}$	×

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Table S4 : (continued) Antiferromagnets in MAGNDATA without second-order transport tensors triggered by magnetic geometry.

No.	Materials (ID)	Configuration	Spin space group	with SOC		
				IMD	QMD	BCD
52	$Co_4Nb_2O_9$ (0.111)	Collinear	P^{-1}-$3^1c^11^{\infty m}1$	$\sigma_{xxx} = -\sigma_{xyy} = -\sigma_{yxy} = -\sigma_{yyx}$	$\sigma_{xyz} = \sigma_{xzy} = -\sigma_{yxz} = -\sigma_{yzx}$, $\sigma_{xxx} = -\sigma_{xyy} = -\sigma_{yxy} = -\sigma_{yyx}$	×
53	$Fe_4Nb_2O_9$ (0.443)	Collinear	P^{-1}-$3^1c^11^{\infty m}1$	σ_{zzz}, $\sigma_{yyz} = \sigma_{yzy} = \sigma_{zyy}$, $\sigma_{xyz} = \sigma_{xzy} = \sigma_{yxz} = \sigma_{yzx} = \sigma_{zxy} = \sigma_{zyx}$, $\sigma_{xxz} = \sigma_{xzx} = \sigma_{zxx}$	σ_{zzz}, σ_{zyy}, $\sigma_{zxy} = \sigma_{zyx}$, σ_{zxx}, $\sigma_{yyz} = \sigma_{yzy}$, $\sigma_{yxz} = \sigma_{yzx}$, $\sigma_{xyz} = \sigma_{xzy}$, $\sigma_{xxz} = \sigma_{xzx}$	×
54	$Mn_4Ta_2O_9$ (0.477)	Collinear	P^{-1}-$3^1c^11^{\infty m}1$	$\sigma_{xxx} = -\sigma_{xyy} = -\sigma_{yxy} = -\sigma_{yyx}$	$\sigma_{xyz} = \sigma_{xzy} = -\sigma_{yxz} = -\sigma_{yzx}$, $\sigma_{xxx} = -\sigma_{xyy} = -\sigma_{yxy} = -\sigma_{yyx}$	×
55	$Mn_4Nb_2O_9$ (0.507)	Collinear	P^{-1}-$3^1c^11^{\infty m}1$	$\sigma_{xxx} = -\sigma_{xyy} = -\sigma_{yxy} = -\sigma_{yyx}$	$\sigma_{xyz} = \sigma_{xzy} = -\sigma_{yxz} = -\sigma_{yzx}$, $\sigma_{xxx} = -\sigma_{xyy} = -\sigma_{yxy} = -\sigma_{yyx}$	×
56	$Mn_4Ta_2O_9$ (0.526)	Collinear	P^{-1}-$3^1c^11^{\infty m}1$	$\sigma_{xxx} = -\sigma_{xyy} = -\sigma_{yxy} = -\sigma_{yyx}$	$\sigma_{xyz} = \sigma_{xzy} = -\sigma_{yxz} = -\sigma_{yzx}$, $\sigma_{xxx} = -\sigma_{xyy} = -\sigma_{yxy} = -\sigma_{yyx}$	×
57	FeI_2 (1.209)	Collinear	$C^12/^1m^{-1}(0\ \ 0\ \ 1/2)^{\infty m}1$	×	×	×
58	Dy_2O_2S (1.211)	Collinear	$C^12/^1m^{-1}(0\ \ 0\ \ 1/2)^{\infty m}1$	×	×	×
59	Dy_2O_2Se (1.212)	Collinear	$C^12/^1m^{-1}(0\ \ 0\ \ 1/2)^{\infty m}1$	×	×	×
60	Pu_2O_3 (1.367)	Collinear	$C^12/^1m^{-1}(0\ \ 0\ \ 1/2)^{\infty m}1$	×	×	×
61	Tb_2O_2Se (1.417)	Collinear	$C^12/^1m^{-1}(0\ \ 0\ \ 1/2)^{\infty m}1$	×	×	×
62	Tb_2O_2S (1.416)	Collinear	$C^12/^1m^{-1}(0\ \ 0\ \ 1/2)^{\infty m}1$	×	×	×

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Table S4 : (continued) Antiferromagnets in MAGNDATA without second-order transport tensors triggered by magnetic geometry.

No.	Materials (ID)	Configuration	Spin space group	with SOC		
				IMD	QMD	BCD
63	$SrMn_2As_2$ (0.482)	Collinear	P^{-1}-$3^1\mathrm{m}^1 1^{\infty\mathrm{m}}1$	$\sigma_{yzz} = \sigma_{zyz} = \sigma_{zzy}$, $\sigma_{xzz} = \sigma_{zxz} = \sigma_{zzx}$, σ_{yyy}, $\sigma_{xyy} = \sigma_{yxy} = \sigma_{yyx}$, $\sigma_{xxy} = \sigma_{xyx} = \sigma_{yxx}$, σ_{xxx}	$\sigma_{yzz} = \sigma_{zzy}$, $\sigma_{zxz} = \sigma_{zzx}$, σ_{yzz}, σ_{yyy}, $\sigma_{yxy} = \sigma_{yyx}$, σ_{yxx}, σ_{xzz}, σ_{xyy}, $\sigma_{xxy} = \sigma_{xyx}$, σ_{xxx}	×
64	$YbMn_2Sb_2$ (0.483)	Collinear	P^{-1}-$3^1\mathrm{m}^1 1^{\infty\mathrm{m}}1$	σ_{zzz}, $\sigma_{yzz} = \sigma_{zyz} = \sigma_{zzy}$, $\sigma_{xzz} = \sigma_{zxz} = \sigma_{zzx}$, $\sigma_{yyz} = \sigma_{yzy} = \sigma_{zyy}$, $\sigma_{xyz} = \sigma_{xzy} = \sigma_{yxz} = \sigma_{yzx} = \sigma_{zxy} = \sigma_{zyx}$, $\sigma_{xxz} = \sigma_{xzx} = \sigma_{zxx}$, σ_{yyy}, $\sigma_{xyy} = \sigma_{yxy} = \sigma_{yyx}$, $\sigma_{xxy} = \sigma_{xyx} = \sigma_{yxx}$, σ_{xxx}	σ_{zzz}, $\sigma_{zyz} = \sigma_{zzy}$, $\sigma_{zxz} = \sigma_{zzx}$, σ_{zyy}, $\sigma_{zxy} = \sigma_{zyx}$, σ_{zxx}, σ_{yzz}, $\sigma_{yyz} = \sigma_{yzy}$, $\sigma_{yxz} = \sigma_{yzx}$, σ_{yyy}, $\sigma_{yxy} = \sigma_{yyx}$, σ_{yxx}, σ_{xzz}, $\sigma_{xyz} = \sigma_{xzy}$, $\sigma_{xxz} = \sigma_{xzx}$, σ_{xyy}, $\sigma_{xxy} = \sigma_{xyx}$, σ_{xxx}	×
65	U_2N_2S (0.484)	Collinear	P^{-1}-$3^1\mathrm{m}^1 1^{\infty\mathrm{m}}1$	$\sigma_{xxx} = -\sigma_{xyy} = -\sigma_{yxy} = -\sigma_{yyx}$	$\sigma_{xyz} = \sigma_{xzy} = -\sigma_{yxz} = -\sigma_{yzx}$, $\sigma_{xxx} = -\sigma_{xyy} = -\sigma_{yxy} = -\sigma_{yyx}$	×
66	U_2N_2Se (0.485)	Collinear	P^{-1}-$3^1\mathrm{m}^1 1^{\infty\mathrm{m}}1$	$\sigma_{xxx} = -\sigma_{xyy} = -\sigma_{yxy} = -\sigma_{yyx}$	$\sigma_{xyz} = \sigma_{xzy} = -\sigma_{yxz} = -\sigma_{yzx}$, $\sigma_{xxx} = -\sigma_{xyy} = -\sigma_{yxy} = -\sigma_{yyx}$	×

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Table S4 : (continued) Antiferromagnets in MAGNDATA without second-order transport tensors triggered by magnetic geometry.

No.	Materials (ID)	Configuration	Spin space group	with SOC		
				IMD	QMD	BCD
67	$CaMn_2Sb_2$ (0.523)	Collinear	P^{-1}-$3^1\mathrm{m}^1 1^{\infty\mathrm{m}}1$	σ_{zzz}, $\sigma_{yzz} = \sigma_{zyz} = \sigma_{zzy}$, $\sigma_{xzz} = \sigma_{zxz} = \sigma_{zzx}$, $\sigma_{yyz} = \sigma_{yzy} = \sigma_{zyy}$, $\sigma_{xyz} = \sigma_{xzy} = \sigma_{yxz} = \sigma_{yzx} = \sigma_{zxy} = \sigma_{zyx}$, $\sigma_{xxz} = \sigma_{xzx} = \sigma_{zxx}$, σ_{yyy}, $\sigma_{xyy} = \sigma_{yxy} = \sigma_{yyx}$, $\sigma_{xxy} = \sigma_{xyx} = \sigma_{yxx}$, σ_{xxx}	σ_{zzz}, $\sigma_{zyz} = \sigma_{zzy}$, $\sigma_{zxz} = \sigma_{zzx}$, σ_{zyy}, $\sigma_{zxy} = \sigma_{zyx}$, σ_{zxx}, σ_{yzz}, $\sigma_{yyz} = \sigma_{yzy}$, $\sigma_{yxz} = \sigma_{yzx}$, σ_{yyy}, $\sigma_{yxy} = \sigma_{yyx}$, σ_{yxx}, σ_{xzz}, $\sigma_{xyz} = \sigma_{xzy}$, $\sigma_{xxz} = \sigma_{xzx}$, σ_{xyy}, $\sigma_{xxy} = \sigma_{xyx}$, σ_{xxx}	×
68	$CaMn_2Sb_2$ (0.92)	Collinear	P^{-1}-$3^1\mathrm{m}^1 1^{\infty\mathrm{m}}1$	$\sigma_{yzz} = \sigma_{zyz} = \sigma_{zzy}$, $\sigma_{xzz} = \sigma_{zxz} = \sigma_{zzx}$, σ_{yyy}, $\sigma_{xyy} = \sigma_{yxy} = \sigma_{yyx}$, $\sigma_{xxy} = \sigma_{xyx} = \sigma_{yxx}$, σ_{xxx}	$\sigma_{zyz} = \sigma_{zzy}$, $\sigma_{zxz} = \sigma_{zzx}$, σ_{yzz}, σ_{yyy}, $\sigma_{yxy} = \sigma_{yyx}$, σ_{yxx}, σ_{xzz}, σ_{xyy}, $\sigma_{xxy} = \sigma_{xyx}$, σ_{xxx}	×
69	Yb_2O_2Se (1.214)	Collinear	P^1-$3^1\mathrm{m}^1 1^{-1}(0\ \ 0\ \ 1/2)^{\infty\mathrm{m}}1$	×	×	×
70	$CoBr_2$ (1.245)	Collinear	P^1-$3^1\mathrm{m}^1 1^{-1}(0\ \ 0\ \ 1/2)^{\infty\mathrm{m}}1$	×	×	×
71	Ag_2CrO_2 (1.0.1)	Collinear	$C^1 2/^{\mathrm{m}_{001}}\mathrm{m}^{\infty\mathrm{m}}1$	$\sigma_{yzz} = \sigma_{zyz} = \sigma_{zzy}$, $\sigma_{xzz} = \sigma_{zxz} = \sigma_{zzx}$, σ_{yyy}, $\sigma_{xyy} = \sigma_{yxy} = \sigma_{yyx}$, $\sigma_{xxy} = \sigma_{xyx} = \sigma_{yxx}$, σ_{xxx}	$\sigma_{zyz} = \sigma_{zzy}$, $\sigma_{zxz} = \sigma_{zzx}$, σ_{yzz}, σ_{yyy}, $\sigma_{yxy} = \sigma_{yyx}$, σ_{yxx}, σ_{xzz}, σ_{xyy}, $\sigma_{xxy} = \sigma_{xyx}$, σ_{xxx}	×

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Table S4 : (continued) Antiferromagnets in MAGNDATA without second-order transport tensors triggered by magnetic geometry.

No.	Materials (ID)	Configuration	Spin space group	with SOC		
				IMD	QMD	BCD
72	$MnGeO_3$ (0.125)	Collinear	R^{-1}-3$^{\infty m}$1	σ_{zzz}, $\sigma_{xxz}=\sigma_{xzx}=\sigma_{yyz}=\sigma_{yzy}=\sigma_{zxx}=\sigma_{zyy}$, $\sigma_{xxy}=\sigma_{xyx}=\sigma_{yxx}=-\sigma_{yyy}$, $\sigma_{xxx}=-\sigma_{xyy}=-\sigma_{yxy}=-\sigma_{yyx}$	σ_{zzz}, $\sigma_{zxx}=\sigma_{zyy}$, $\sigma_{xyz}=\sigma_{xzy}=-\sigma_{yxz}=-\sigma_{yzx}$, $\sigma_{xxz}=\sigma_{xzx}=\sigma_{yyz}=\sigma_{yzy}$, $\sigma_{xxy}=\sigma_{xyx}=\sigma_{yxx}=-\sigma_{yyy}$, $\sigma_{xxx}=-\sigma_{xyy}=-\sigma_{yxy}=-\sigma_{yyx}$	×
73	$MnPSe_3$ (0.180)	Collinear	R^{-1}-3$^{\infty m}$1	σ_{zzz}, $\sigma_{yzz}=\sigma_{zyz}=\sigma_{zzy}$, $\sigma_{xzz}=\sigma_{zxz}=\sigma_{zzx}$, $\sigma_{yyz}=\sigma_{yzy}=\sigma_{zyy}$, $\sigma_{xyz}=\sigma_{xzy}=\sigma_{yxz}=\sigma_{yzx}=\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{xxz}=\sigma_{xzx}=\sigma_{zxx}$, σ_{yyy}, $\sigma_{xyy}=\sigma_{yxy}=\sigma_{yyx}$, $\sigma_{xxy}=\sigma_{xyx}=\sigma_{yxx}$, σ_{xxx}	σ_{zzz}, $\sigma_{zyz}=\sigma_{zzy}$, $\sigma_{zxz}=\sigma_{zzx}$, σ_{zyy}, $\sigma_{zxy}=\sigma_{zyx}$, σ_{zxx}, σ_{yzz}, $\sigma_{yyz}=\sigma_{yzy}$, $\sigma_{yxz}=\sigma_{yzx}$, σ_{yyy}, $\sigma_{yxy}=\sigma_{yyx}$, σ_{yxx}, σ_{xzz}, $\sigma_{xyz}=\sigma_{xzy}$, $\sigma_{xxz}=\sigma_{xzx}$, σ_{xyy}, $\sigma_{xxy}=\sigma_{xyx}$, σ_{xxx}	×
74	$MnTiO_3$ (0.19)	Collinear	R^{-1}-3$^{\infty m}$1	σ_{zzz}, $\sigma_{xxz}=\sigma_{xzx}=\sigma_{yyz}=\sigma_{yzy}=\sigma_{zxx}=\sigma_{zyy}$, $\sigma_{xxy}=\sigma_{xyx}=\sigma_{yxx}=-\sigma_{yyy}$, $\sigma_{xxx}=-\sigma_{xyy}=-\sigma_{yxy}=-\sigma_{yyx}$	σ_{zzz}, $\sigma_{zxx}=\sigma_{zyy}$, $\sigma_{xyz}=\sigma_{xzy}=-\sigma_{yxz}=-\sigma_{yzx}$, $\sigma_{xxz}=\sigma_{xzx}=\sigma_{yyz}=\sigma_{yzy}$, $\sigma_{xxy}=\sigma_{xyx}=\sigma_{yxx}=-\sigma_{yyy}$, $\sigma_{xxx}=-\sigma_{xyy}=-\sigma_{yxy}=-\sigma_{yyx}$	×

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Table S4 : (continued) Antiferromagnets in MAGNDATA without second-order transport tensors triggered by magnetic geometry.

No.	Materials (ID)	Configuration	Spin space group	with SOC		
				IMD	QMD	BCD
75	$BaNi_2P_2O_8$ (0.215)	Collinear	R^{-1}-$3^{\infty m}1$	σ_{zzz}, $\sigma_{yzz} = \sigma_{zyz} = \sigma_{zzy}$, $\sigma_{xzz} = \sigma_{zxz} = \sigma_{zzx}$, $\sigma_{yyz} = \sigma_{yzy} = \sigma_{zyy}$, $\sigma_{xyz} = \sigma_{xzy} = \sigma_{yxz} = \sigma_{yzx} = \sigma_{zxy} = \sigma_{zyx}$, $\sigma_{xxz} = \sigma_{xzx} = \sigma_{zxx}$, σ_{yyy}, $\sigma_{xyy} = \sigma_{yxy} = \sigma_{yyx}$, $\sigma_{xxy} = \sigma_{xyx} = \sigma_{yxx}$, σ_{xxx}	σ_{zzz}, $\sigma_{zyz} = \sigma_{zzy}$, $\sigma_{zxz} = \sigma_{zzx}$, σ_{zyy}, $\sigma_{zxy} = \sigma_{zyx}$, σ_{zxx}, σ_{yzz}, $\sigma_{yyz} = \sigma_{yzy}$, $\sigma_{yxz} = \sigma_{yzx}$, σ_{yyy}, $\sigma_{yxy} = \sigma_{yyx}$, σ_{yxx}, σ_{xzz}, $\sigma_{xyz} = \sigma_{xzy}$, $\sigma_{xxz} = \sigma_{xzx}$, σ_{xyy}, $\sigma_{xxy} = \sigma_{xyx}$, σ_{xxx}	×
76	$MgMnO_3$ (0.277)	Collinear	R^{-1}-$3^{\infty m}1$	σ_{zzz}, $\sigma_{xxz} = \sigma_{xzx} = \sigma_{yyz} = \sigma_{yzy} = \sigma_{zxx} = \sigma_{zyy}$, $\sigma_{xxy} = \sigma_{xyx} = \sigma_{yxx} = -\sigma_{yyy}$, $\sigma_{xxx} = -\sigma_{xyy} = -\sigma_{yxy} = -\sigma_{yyx}$	σ_{zzz}, $\sigma_{zxx} = \sigma_{zyy}$, $\sigma_{xyz} = \sigma_{xzy} = -\sigma_{yxz} = -\sigma_{yzx}$, $\sigma_{xxz} = \sigma_{xzx} = \sigma_{yyz} = \sigma_{yzy}$, $\sigma_{xxy} = \sigma_{xyx} = \sigma_{yxx} = -\sigma_{yyy}$, $\sigma_{xxx} = -\sigma_{xyy} = -\sigma_{yxy} = -\sigma_{yyx}$	×

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Table S4 : (continued) Antiferromagnets in MAGNDATA without second-order transport tensors triggered by magnetic geometry.

No.	Materials (ID)	Configuration	Spin space group	with SOC		
				IMD	QMD	BCD
77	$MnPSe_3$ (0.524)	Collinear	R^{-1}-$3^{\infty m}1$	σ_{zzz}, $\sigma_{yzz} = \sigma_{zyz} = \sigma_{zzy}$, $\sigma_{xzz} = \sigma_{zxz} = \sigma_{zzx}$, $\sigma_{yyz} = \sigma_{yzy} = \sigma_{zyy}$, $\sigma_{xyz} = \sigma_{xzy} = \sigma_{yxz} = \sigma_{yzx} = \sigma_{zxy} = \sigma_{zyx}$, $\sigma_{xxz} = \sigma_{xzx} = \sigma_{zxx}$, σ_{yyy}, $\sigma_{xyy} = \sigma_{yxy} = \sigma_{yyx}$, $\sigma_{xxy} = \sigma_{xyx} = \sigma_{yxx}$, σ_{xxx}	σ_{zzz}, $\sigma_{zyz} = \sigma_{zzy}$, $\sigma_{zxz} = \sigma_{zzx}$, σ_{zyy}, $\sigma_{zxy} = \sigma_{zyx}$, σ_{zxx}, σ_{yzz}, $\sigma_{yyz} = \sigma_{yzy}$, $\sigma_{yxz} = \sigma_{yzx}$, σ_{yyy}, $\sigma_{yxy} = \sigma_{yyx}$, σ_{yxx}, σ_{xzz}, $\sigma_{xyz} = \sigma_{xzy}$, $\sigma_{xxz} = \sigma_{xzx}$, σ_{xyy}, $\sigma_{xxy} = \sigma_{xyx}$, σ_{xxx}	×
78	$FeTiO_3$ (1.581)	Collinear	R^{1}-$3^{-1}(1/3\ \ 2/3\ \ 1/6)^{\infty m}1$	×	×	×
79	Ca_2MnO_4 (0.211)	Collinear	$I^{-1}4_1/^{-1}a^{-1}c^{1}d^{\infty m}1$	$\sigma_{xyz} = \sigma_{xzy} = \sigma_{yxz} = \sigma_{yzx} = \sigma_{zxy} = \sigma_{zyx}$	$\sigma_{zxy} = \sigma_{zyx}$, $\sigma_{xyz} = \sigma_{xzy} = \sigma_{yxz} = \sigma_{yzx}$	×
80	$GdVO_4$ (0.198)	Collinear	$I^{-1}4_1/^{-1}a^{1}m^{-1}d^{\infty m}1$	$\sigma_{xyz} = \sigma_{xzy} = \sigma_{yxz} = \sigma_{yzx} = \sigma_{zxy} = \sigma_{zyx}$	$\sigma_{zxy} = \sigma_{zyx}$, $\sigma_{xyz} = \sigma_{xzy} = \sigma_{yxz} = \sigma_{yzx}$	×
81	$TbPO_4$ (0.467)	Collinear	$I^{-1}4_1/^{-1}a^{1}m^{-1}d^{\infty m}1$	$\sigma_{xyz} = \sigma_{xzy} = \sigma_{yxz} = \sigma_{yzx} = \sigma_{zxy} = \sigma_{zyx}$	$\sigma_{zxy} = \sigma_{zyx}$, $\sigma_{xyz} = \sigma_{xzy} = \sigma_{yxz} = \sigma_{yzx}$	×
82	$NaCeO_2$ (0.525)	Collinear	$I^{-1}4_1/^{-1}a^{1}m^{-1}d^{\infty m}1$	$\sigma_{xyz} = \sigma_{xzy} = \sigma_{yxz} = \sigma_{yzx} = \sigma_{zxy} = \sigma_{zyx}$	$\sigma_{zxy} = \sigma_{zyx}$, $\sigma_{xyz} = \sigma_{xzy} = \sigma_{yxz} = \sigma_{yzx}$	×
83	$MnSn_2$ (1.558)	Collinear	$C^{1}m^{1}m^{1}e^{-1}(0\ \ 1/2\ \ 1/2)^{\infty m}1$	×	×	×
84	$EuTiO_3$ (0.16)	Collinear	$I^{-1}4/^{-1}m^{-1}c^{1}m^{\infty m}1$	$\sigma_{xzz} = \sigma_{zxz} = \sigma_{zzx}$, $\sigma_{xyy} = \sigma_{yxy} = \sigma_{yyx}$, σ_{xxx}	$\sigma_{zxz} = \sigma_{zzx}$, $\sigma_{yxy} = \sigma_{yyx}$, σ_{xzz}, σ_{xyy}, σ_{xxx}	×
85	$NdNi_2B_2C$ (1.293)	Collinear	$C^{1}2/^{1}m^{-1}(0\ \ 0\ \ 1/2)^{\infty m}1$	×	×	×

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Table S4 : (continued) Antiferromagnets in MAGNDATA without second-order transport tensors triggered by magnetic geometry.

No.	Materials (ID)	Configuration	Spin space group	with SOC		
				IMD	QMD	BCD
86	$BaFe_2As_2$ (1.16)	Collinear	$C^1c^1c^1m^{-1}(1/2\ \ 0\ \ 1/2)^{\infty m}1$	×	×	×
87	$KCuMnS_2$ (1.392)	Collinear	$C^1c^1c^1m^{-1}(1/2\ \ 0\ \ 1/2)^{\infty m}1$	×	×	×
88	$CaFe_2As_2$ (1.52)	Collinear	$C^1c^1c^1m^{-1}(1/2\ \ 0\ \ 1/2)^{\infty m}1$	×	×	×
89	CeMgPb (1.142)	Collinear	$C^1m^1c^1m^{-1}(0\ \ 1/2\ \ 1/2)^{\infty m}1$	×	×	×
90	Gd_2CuO_4 (1.104)	Collinear	$C^1m^1m^1m^{-1}(0\ \ 1/2\ \ 1/2)^{\infty m}1$	×	×	×
91	Pr_2CuO_4 (1.106)	Collinear	$C^1m^1m^1m^{-1}(0\ \ 1/2\ \ 1/2)^{\infty m}1$	×	×	×
92	Sm_2CuO_4 (1.107)	Collinear	$C^1m^1m^1m^{-1}(0\ \ 1/2\ \ 1/2)^{\infty m}1$	×	×	×
93	$CeRh_2Si_2$ (1.188)	Collinear	$C^1m^1m^1m^{-1}(0\ \ 1/2\ \ 1/2)^{\infty m}1$	×	×	×
94	K_2NiF_4 (1.249)	Collinear	$C^1m^1m^1m^{-1}(0\ \ 1/2\ \ 1/2)^{\infty m}1$	×	×	×
95	$CeRh_2Si_2$ (1.290)	Collinear	$C^1m^1m^1m^{-1}(0\ \ 1/2\ \ 1/2)^{\infty m}1$	×	×	×
96	$CePd_2Si_2$ (1.288)	Collinear	$C^1m^1m^1m^{-1}(0\ \ 1/2\ \ 1/2)^{\infty m}1$	×	×	×
97	$CePd_2Ge_2$ (1.289)	Collinear	$C^1m^1m^1m^{-1}(0\ \ 1/2\ \ 1/2)^{\infty m}1$	×	×	×
98	$LaSrFeO_4$ (1.29)	Collinear	$C^1m^1m^1m^{-1}(0\ \ 1/2\ \ 1/2)^{\infty m}1$	×	×	×
99	HFe_2Ge_2 (1.369)	Collinear	$C^1m^1m^1m^{-1}(0\ \ 1/2\ \ 1/2)^{\infty m}1$	×	×	×
100	Pr_2CuO_4 (1.399)	Collinear	$C^1m^1m^1m^{-1}(0\ \ 1/2\ \ 1/2)^{\infty m}1$	×	×	×
101	Pr_2CuO_4 (1.398)	Collinear	$C^1m^1m^1m^{-1}(0\ \ 1/2\ \ 1/2)^{\infty m}1$	×	×	×
102	$NdCeBaCu_{0.9}Co_{1.1}O_7$ (1.396)	Collinear	$C^1m^1m^1m^{-1}(0\ \ 1/2\ \ 1/2)^{\infty m}1$	×	×	×
103	$TbAg_2$ (1.400)	Collinear	$C^1m^1m^1m^{-1}(0\ \ 1/2\ \ 1/2)^{\infty m}1$	×	×	×
104	$NdCeBaCuFeO_7$ (1.395)	Collinear	$C^1m^1m^1m^{-1}(0\ \ 1/2\ \ 1/2)^{\infty m}1$	×	×	×
105	$Sr_2CuO_2Cl_2$ (1.404)	Collinear	$C^1m^1m^1m^{-1}(0\ \ 1/2\ \ 1/2)^{\infty m}1$	×	×	×
106	Nd_2CuO_4 (1.408)	Collinear	$C^1m^1m^1m^{-1}(0\ \ 1/2\ \ 1/2)^{\infty m}1$	×	×	×
107	Nd_2CuO_4 (1.407)	Collinear	$C^1m^1m^1m^{-1}(0\ \ 1/2\ \ 1/2)^{\infty m}1$	×	×	×
108	$SrNdFeO_4$ (1.40)	Collinear	$C^1m^1m^1m^{-1}(0\ \ 1/2\ \ 1/2)^{\infty m}1$	×	×	×

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Table S4 : (continued) Antiferromagnets in MAGNDATA without second-order transport tensors triggered by magnetic geometry.

No.	Materials (ID)	Configuration	Spin space group	with SOC		
				IMD	QMD	BCD
109	Nd_2CuO_4 (1.406)	Collinear	$C^1\mathrm{m}^1\mathrm{m}^1\mathrm{m}^{-1}(0\ \ 1/2\ \ 1/2)^{\infty\mathrm{m}}1$	×	×	×
110	$SrNdFeO_4$ (1.41)	Collinear	$C^1\mathrm{m}^1\mathrm{m}^1\mathrm{m}^{-1}(0\ \ 1/2\ \ 1/2)^{\infty\mathrm{m}}1$	×	×	×
111	$TbNi_2Si_2$ (1.511)	Collinear	$C^1\mathrm{m}^1\mathrm{m}^1\mathrm{m}^{-1}(0\ \ 1/2\ \ 1/2)^{\infty\mathrm{m}}1$	×	×	×
112	UGeSe (0.413)	Collinear	$I^1 4/^{-1}\mathrm{m}^1\mathrm{m}^1\mathrm{m}^{\infty\mathrm{m}}1$	×	$\sigma_{xyz} = \sigma_{xzy} = -\sigma_{yxz} = -\sigma_{yzx}$	×
113	Mn_2Au (0.639)	Collinear	$I^1 4/^{-1}\mathrm{m}^1\mathrm{m}^1\mathrm{m}^{\infty\mathrm{m}}1$	$\sigma_{xzz} = \sigma_{zxz} = \sigma_{zzx}$, $\sigma_{xyy} = \sigma_{yxy} = \sigma_{yyx}$, σ_{xxx}	$\sigma_{zxz} = \sigma_{zzx}$, $\sigma_{yxy} = \sigma_{yyx}$, σ_{xzz}, σ_{xyy}, σ_{xxx}	×
114	Mn_2Au (0.640)	Collinear	$I^1 4/^{-1}\mathrm{m}^1\mathrm{m}^1\mathrm{m}^{\infty\mathrm{m}}1$	$\sigma_{xzz} = \sigma_{zxz} = \sigma_{zzx}$, $\sigma_{xyy} = \sigma_{yxy} = \sigma_{yyx}$, σ_{xxx}	$\sigma_{zxz} = \sigma_{zzx}$, $\sigma_{yxy} = \sigma_{yyx}$, σ_{xzz}, σ_{xyy}, σ_{xxx}	×
115	$BaMn_2As_2$ (0.18)	Collinear	$I^{-1}4/^{-1}\mathrm{m}^1\mathrm{m}^{-1}\mathrm{m}^{\infty\mathrm{m}}1$	$\sigma_{xyz} = \sigma_{xzy} = \sigma_{yxz} = \sigma_{yzx} = \sigma_{zxy} = \sigma_{zyx}$	$\sigma_{zxy} = \sigma_{zyx}$, $\sigma_{xyz} = \sigma_{xzy} = \sigma_{yxz} = \sigma_{yzx}$	×
116	$Sr_2Mn_3As_2O_2$ (0.212)	Collinear	$I^{-1}4/^{-1}\mathrm{m}^1\mathrm{m}^{-1}\mathrm{m}^{\infty\mathrm{m}}1$	$\sigma_{xyz} = \sigma_{xzy} = \sigma_{yxz} = \sigma_{yzx} = \sigma_{zxy} = \sigma_{zyx}$	$\sigma_{zxy} = \sigma_{zyx}$, $\sigma_{xyz} = \sigma_{xzy} = \sigma_{yxz} = \sigma_{yzx}$	×
117	$BaCrFeAs_2$ (0.366)	Collinear	$I^{-1}4/^{-1}\mathrm{m}^1\mathrm{m}^{-1}\mathrm{m}^{\infty\mathrm{m}}1$	$\sigma_{xyz} = \sigma_{xzy} = \sigma_{yxz} = \sigma_{yzx} = \sigma_{zxy} = \sigma_{zyx}$	$\sigma_{zxy} = \sigma_{zyx}$, $\sigma_{xyz} = \sigma_{xzy} = \sigma_{yxz} = \sigma_{yzx}$	×
118	$SrCr_2As_2$ (0.364)	Collinear	$I^{-1}4/^{-1}\mathrm{m}^1\mathrm{m}^{-1}\mathrm{m}^{\infty\mathrm{m}}1$	$\sigma_{xyz} = \sigma_{xzy} = \sigma_{yxz} = \sigma_{yzx} = \sigma_{zxy} = \sigma_{zyx}$	$\sigma_{zxy} = \sigma_{zyx}$, $\sigma_{xyz} = \sigma_{xzy} = \sigma_{yxz} = \sigma_{yzx}$	×
119	$BaCr_2As_2$ (0.365)	Collinear	$I^{-1}4/^{-1}\mathrm{m}^1\mathrm{m}^{-1}\mathrm{m}^{\infty\mathrm{m}}1$	$\sigma_{xyz} = \sigma_{xzy} = \sigma_{yxz} = \sigma_{yzx} = \sigma_{zxy} = \sigma_{zyx}$	$\sigma_{zxy} = \sigma_{zyx}$, $\sigma_{xyz} = \sigma_{xzy} = \sigma_{yxz} = \sigma_{yzx}$	×
120	$EuMnBi_2$ (0.426)	Collinear	$I^{-1}4/^{-1}\mathrm{m}^1\mathrm{m}^{-1}\mathrm{m}^{\infty\mathrm{m}}1$	$\sigma_{xyz} = \sigma_{xzy} = \sigma_{yxz} = \sigma_{yzx} = \sigma_{zxy} = \sigma_{zyx}$	$\sigma_{zxy} = \sigma_{zyx}$, $\sigma_{xyz} = \sigma_{xzy} = \sigma_{yxz} = \sigma_{yzx}$	×

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Table S4 : (continued) Antiferromagnets in MAGNDATA without second-order transport tensors triggered by magnetic geometry.

No.	Materials (ID)	Configuration	Spin space group	with SOC		
				IMD	QMD	BCD
121	$BaMn_2P_2$ (0.464)	Collinear	$I^{-1}4/^{-1}m^1m^{-1}m^{\infty m}1$	$\sigma_{xyz} = \sigma_{xzy} = \sigma_{yxz} = \sigma_{yzx} = \sigma_{zxy} = \sigma_{zyx}$	$\sigma_{zxy} = \sigma_{zyx}$, $\sigma_{xyz} = \sigma_{xzy} = \sigma_{yxz} = \sigma_{yzx}$	×
122	$ThCr_2Si_2$ (0.466)	Collinear	$I^{-1}4/^{-1}m^1m^{-1}m^{\infty m}1$	$\sigma_{xzz} = \sigma_{zxz} = \sigma_{zzx}$, $\sigma_{xyy} = \sigma_{yxy} = \sigma_{yyx}$, σ_{xxx}	$\sigma_{zxz} = \sigma_{zzx}$, $\sigma_{yxy} = \sigma_{yyx}$, σ_{xzz}, σ_{xyy}, σ_{xxx}	×
123	$HoCr_2Si_2$ (0.465)	Collinear	$I^{-1}4/^{-1}m^1m^{-1}m^{\infty m}1$	$\sigma_{xyz} = \sigma_{xzy} = \sigma_{yxz} = \sigma_{yzx} = \sigma_{zxy} = \sigma_{zyx}$	$\sigma_{zxy} = \sigma_{zyx}$, $\sigma_{xyz} = \sigma_{xzy} = \sigma_{yxz} = \sigma_{yzx}$	×
124	$BaMn_2Sb_2$ (0.470)	Collinear	$I^{-1}4/^{-1}m^1m^{-1}m^{\infty m}1$	$\sigma_{xyz} = \sigma_{xzy} = \sigma_{yxz} = \sigma_{yzx} = \sigma_{zxy} = \sigma_{zyx}$	$\sigma_{zxy} = \sigma_{zyx}$, $\sigma_{xyz} = \sigma_{xzy} = \sigma_{yxz} = \sigma_{yzx}$	×
125	$EuMn_2Ge_2$ (0.474)	Collinear	$I^{-1}4/^{-1}m^1m^{-1}m^{\infty m}1$	$\sigma_{xyz} = \sigma_{xzy} = \sigma_{yxz} = \sigma_{yzx} = \sigma_{zxy} = \sigma_{zyx}$	$\sigma_{zxy} = \sigma_{zyx}$, $\sigma_{xyz} = \sigma_{xzy} = \sigma_{yxz} = \sigma_{yzx}$	×
126	$LaMn_2Si_2$ (0.472)	Collinear	$I^{-1}4/^{-1}m^1m^{-1}m^{\infty m}1$	$\sigma_{xyz} = \sigma_{xzy} = \sigma_{yxz} = \sigma_{yzx} = \sigma_{zxy} = \sigma_{zyx}$	$\sigma_{zxy} = \sigma_{zyx}$, $\sigma_{xyz} = \sigma_{xzy} = \sigma_{yxz} = \sigma_{yzx}$	×
127	$Ba_2Mn_3Sb_2O_2$ (0.471)	Collinear	$I^{-1}4/^{-1}m^1m^{-1}m^{\infty m}1$	$\sigma_{xyz} = \sigma_{xzy} = \sigma_{yxz} = \sigma_{yzx} = \sigma_{zxy} = \sigma_{zyx}$	$\sigma_{zxy} = \sigma_{zyx}$, $\sigma_{xyz} = \sigma_{xzy} = \sigma_{yxz} = \sigma_{yzx}$	×
128	$ErCr_2Si_2$ (0.486)	Collinear	$I^{-1}4/^{-1}m^1m^{-1}m^{\infty m}1$	$\sigma_{xyz} = \sigma_{xzy} = \sigma_{yxz} = \sigma_{yzx} = \sigma_{zxy} = \sigma_{zyx}$	$\sigma_{zxy} = \sigma_{zyx}$, $\sigma_{xyz} = \sigma_{xzy} = \sigma_{yxz} = \sigma_{yzx}$	×
129	$LaMn_2Si_2$ (0.498)	Collinear	$I^{-1}4/^{-1}m^1m^{-1}m^{\infty m}1$	$\sigma_{xyz} = \sigma_{xzy} = \sigma_{yxz} = \sigma_{yzx} = \sigma_{zxy} = \sigma_{zyx}$	$\sigma_{zxy} = \sigma_{zyx}$, $\sigma_{xyz} = \sigma_{xzy} = \sigma_{yxz} = \sigma_{yzx}$	×
130	$TbCr_2Si_2$ (0.518)	Collinear	$I^{-1}4/^{-1}m^1m^{-1}m^{\infty m}1$	$\sigma_{xyz} = \sigma_{xzy} = \sigma_{yxz} = \sigma_{yzx} = \sigma_{zxy} = \sigma_{zyx}$	$\sigma_{zxy} = \sigma_{zyx}$, $\sigma_{xyz} = \sigma_{xzy} = \sigma_{yxz} = \sigma_{yzx}$	×

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Table S4 : (continued) Antiferromagnets in MAGNDATA without second-order transport tensors triggered by magnetic geometry.

No.	Materials (ID)	Configuration	Spin space group	with SOC		
				IMD	QMD	BCD
131	$HoCr_2Si_2$ (0.519)	Collinear	$I^{-1}4/^{-1}m^1m^{-1}m^{\infty m}1$	$\sigma_{xyz}=\sigma_{xzy}=$ $\sigma_{yxz}=\sigma_{yzx}=$ $\sigma_{zxy}=\sigma_{zyx}$	$\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{xyz}=\sigma_{xzy}=$ $\sigma_{yxz}=\sigma_{yzx}$	×
132	$CaMn_2Ge_2$ (0.603)	Collinear	$I^{-1}4/^{-1}m^1m^{-1}m^{\infty m}1$	$\sigma_{xyz}=\sigma_{xzy}=$ $\sigma_{yxz}=\sigma_{yzx}=$ $\sigma_{zxy}=\sigma_{zyx}$	$\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{xyz}=\sigma_{xzy}=$ $\sigma_{yxz}=\sigma_{yzx}$	×
133	$CaMn_2Ge_2$ (0.604)	Collinear	$I^{-1}4/^{-1}m^1m^{-1}m^{\infty m}1$	$\sigma_{xyz}=\sigma_{xzy}=$ $\sigma_{yxz}=\sigma_{yzx}=$ $\sigma_{zxy}=\sigma_{zyx}$	$\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{xyz}=\sigma_{xzy}=$ $\sigma_{yxz}=\sigma_{yzx}$	×
134	$BaMn_2Ge_2$ (0.605)	Collinear	$I^{-1}4/^{-1}m^1m^{-1}m^{\infty m}1$	$\sigma_{xyz}=\sigma_{xzy}=$ $\sigma_{yxz}=\sigma_{yzx}=$ $\sigma_{zxy}=\sigma_{zyx}$	$\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{xyz}=\sigma_{xzy}=$ $\sigma_{yxz}=\sigma_{yzx}$	×
135	$BaMn_2Ge_2$ (0.606)	Collinear	$I^{-1}4/^{-1}m^1m^{-1}m^{\infty m}1$	$\sigma_{xyz}=\sigma_{xzy}=$ $\sigma_{yxz}=\sigma_{yzx}=$ $\sigma_{zxy}=\sigma_{zyx}$	$\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{xyz}=\sigma_{xzy}=$ $\sigma_{yxz}=\sigma_{yzx}$	×
136	$BaMnSb_2$ (0.611)	Collinear	$I^{-1}4/^{-1}m^1m^{-1}m^{\infty m}1$	$\sigma_{xyz}=\sigma_{xzy}=$ $\sigma_{yxz}=\sigma_{yzx}=$ $\sigma_{zxy}=\sigma_{zyx}$	$\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{xyz}=\sigma_{xzy}=$ $\sigma_{yxz}=\sigma_{yzx}$	×
137	$SrMnBi_2$ (0.73)	Collinear	$I^{-1}4/^{-1}m^1m^{-1}m^{\infty m}1$	$\sigma_{xyz}=\sigma_{xzy}=$ $\sigma_{yxz}=\sigma_{yzx}=$ $\sigma_{zxy}=\sigma_{zyx}$	$\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{xyz}=\sigma_{xzy}=$ $\sigma_{yxz}=\sigma_{yzx}$	×
138	$BaMn_2Bi_2$ (0.89)	Collinear	$I^{-1}4/^{-1}m^1m^{-1}m^{\infty m}1$	$\sigma_{xyz}=\sigma_{xzy}=$ $\sigma_{yxz}=\sigma_{yzx}=$ $\sigma_{zxy}=\sigma_{zyx}$	$\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{xyz}=\sigma_{xzy}=$ $\sigma_{yxz}=\sigma_{yzx}$	×
139	$EuMnBi_2$ (0.919)	Collinear	$I^{-1}4/^{-1}m^1m^{-1}m^{\infty m}1$	$\sigma_{xyz}=\sigma_{xzy}=$ $\sigma_{yxz}=\sigma_{yzx}=$ $\sigma_{zxy}=\sigma_{zyx}$	$\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{xyz}=\sigma_{xzy}=$ $\sigma_{yxz}=\sigma_{yzx}$	×
140	$TbNi_2Ge_2$ (1.510)	Collinear	$P^14/^1m^1m^1m^{-1}(0\ \ 0\ \ 1/2)^{\infty m}1$	×	×	×
141	PrScSb (0.454)	Collinear	$P^14/^1m^1m^1m^{-1}(1/2\ \ 1/2\ \ 1/2)^{\infty m}1$	×	×	×
142	$TbRh_2Si_2$ (1.187)	Collinear	$P^14/^1m^1m^1m^{-1}(1/2\ \ 1/2\ \ 1/2)^{\infty m}1$	×	×	×

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Table S4 : (continued) Antiferromagnets in MAGNDATA without second-order transport tensors triggered by magnetic geometry.

No.	Materials (ID)	Configuration	Spin space group	with SOC		
				IMD	QMD	BCD
143	$DyCo_2Si_2$ (1.21)	Collinear	$P^1 4/^1m^1m^1m^{-1}(1/2\ \ 1/2\ \ 1/2)^{\infty m}1$	×	×	×
144	$CeAu_2Si_2$ (1.291)	Collinear	$P^1 4/^1m^1m^1m^{-1}(1/2\ \ 1/2\ \ 1/2)^{\infty m}1$	×	×	×
145	$HoNi_2B_2C$ (1.292)	Collinear	$P^1 4/^1m^1m^1m^{-1}(1/2\ \ 1/2\ \ 1/2)^{\infty m}1$	×	×	×
146	$HoNi_2B_2C$ (1.294)	Collinear	$P^1 4/^1m^1m^1m^{-1}(1/2\ \ 1/2\ \ 1/2)^{\infty m}1$	×	×	×
147	$DyNi_2B_2C$ (1.295)	Collinear	$P^1 4/^1m^1m^1m^{-1}(1/2\ \ 1/2\ \ 1/2)^{\infty m}1$	×	×	×
148	$PrNi_2B_2C$ (1.296)	Collinear	$P^1 4/^1m^1m^1m^{-1}(1/2\ \ 1/2\ \ 1/2)^{\infty m}1$	×	×	×
149	$HoNi_2B_2C$ (1.312)	Collinear	$P^1 4/^1m^1m^1m^{-1}(1/2\ \ 1/2\ \ 1/2)^{\infty m}1$	×	×	×
150	$NdCo_2P_2$ (1.251)	Collinear	$P^1 4/^1m^1m^1m^{-1}(0\ \ 0\ \ 1/2)^{\infty m}1$	×	×	×
151	$Sr_2MnO_2Ag_{1.5}Se_2$ (1.372)	Collinear	$P^1 4/^1m^1m^1m^{-1}(1/2\ \ 1/2\ \ 1/2)^{\infty m}1$	×	×	×
152	$La_{0.25}Pr_{0.75}Co_2P_2$ (1.316)	Collinear	$P^1 4/^1m^1m^1m^{-1}(0\ \ 0\ \ 1/2)^{\infty m}1$	×	×	×
153	$NdRh_2Si_2$ (1.421)	Collinear	$P^1 4/^1m^1m^1m^{-1}(1/2\ \ 1/2\ \ 1/2)^{\infty m}1$	×	×	×
154	$HoCo_2Ge_2$ (1.427)	Collinear	$P^1 4/^1m^1m^1m^{-1}(1/2\ \ 1/2\ \ 1/2)^{\infty m}1$	×	×	×
155	URu_2Si_2 (1.442)	Collinear	$P^1 4/^1m^1m^1m^{-1}(1/2\ \ 1/2\ \ 1/2)^{\infty m}1$	×	×	×
156	$TbCo_2Si_2$ (1.512)	Collinear	$P^1 4/^1m^1m^1m^{-1}(1/2\ \ 1/2\ \ 1/2)^{\infty m}1$	×	×	×
157	$HoCo_2Si_2$ (1.513)	Collinear	$P^1 4/^1m^1m^1m^{-1}(1/2\ \ 1/2\ \ 1/2)^{\infty m}1$	×	×	×
158	$HoCo_2Si_2$ (1.514)	Collinear	$P^1 4/^1m^1m^1m^{-1}(1/2\ \ 1/2\ \ 1/2)^{\infty m}1$	×	×	×
159	CeC_2 (1.530)	Collinear	$P^1 4/^1m^1m^1m^{-1}(1/2\ \ 1/2\ \ 1/2)^{\infty m}1$	×	×	×
160	PrC_2 (1.531)	Collinear	$P^1 4/^1m^1m^1m^{-1}(1/2\ \ 1/2\ \ 1/2)^{\infty m}1$	×	×	×
161	NdC_2 (1.532)	Collinear	$P^1 4/^1m^1m^1m^{-1}(1/2\ \ 1/2\ \ 1/2)^{\infty m}1$	×	×	×
162	UPd_2Si_2 (1.536)	Collinear	$P^1 4/^1m^1m^1m^{-1}(1/2\ \ 1/2\ \ 1/2)^{\infty m}1$	×	×	×
163	URh_2Si_2 (1.537)	Collinear	$P^1 4/^1m^1m^1m^{-1}(1/2\ \ 1/2\ \ 1/2)^{\infty m}1$	×	×	×
164	$ErFe_2Si_2$ (1.635)	Collinear	$P^1 4/^1n^1m^1m^{-1}(0\ \ 0\ \ 1/2)^{\infty m}1$	×	×	×

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Table S4 : (continued) Antiferromagnets in MAGNDATA without second-order transport tensors triggered by magnetic geometry.

No.	Materials (ID)	Configuration	Spin space group	with SOC		
				IMD	QMD	BCD
165	$EuMnBi_2$ (2.50)	Collinear	$P^{-1}4_2/^{-1}m^1m^{-1}c^{\infty m}1$	$\sigma_{xyz} = \sigma_{xzy} = \sigma_{yxz} = \sigma_{yzx} = \sigma_{zxy} = \sigma_{zyx}$	$\sigma_{zxy} = \sigma_{zyx}$, $\sigma_{xyz} = \sigma_{xzy} = \sigma_{yxz} = \sigma_{yzx}$	×
166	$EuMnBi_2$ (2.98)	Collinear	$P^{-1}4_2/^{-1}m^1m^{-1}c^{\infty m}1$	$\sigma_{xyz} = \sigma_{xzy} = \sigma_{yxz} = \sigma_{yzx} = \sigma_{zxy} = \sigma_{zyx}$	$\sigma_{zxy} = \sigma_{zyx}$, $\sigma_{xyz} = \sigma_{xzy} = \sigma_{yxz} = \sigma_{yzx}$	×
167	$CeRh_2Si_2$ (2.30)	Collinear	$P^1m^1m^1a^{-1}(1/2\ \ 1/2\ \ 0)^{\infty m}1$	×	×	×
168	$NdPd_5Al_2$ (1.507)	Collinear	$P^1m^1m^1n^{-1}(0\ \ 0\ \ 1/2)^{\infty m}1$	×	×	×
169	Cr_2TeO_6 (0.143)	Collinear	$P^14_2/^{-1}m^1n^1m^{\infty m}1$	$\sigma_{xzz} = \sigma_{zxz} = \sigma_{zzx}$, $\sigma_{xyy} = \sigma_{yxy} = \sigma_{yyx}$, σ_{xxx}	$\sigma_{zxz} = \sigma_{zzx}$, $\sigma_{yxy} = \sigma_{yyx}$, σ_{xzz}, σ_{xyy}, σ_{xxx}	×
170	Fe_2TeO_6 (0.142)	Collinear	$P^14_2/^{-1}m^1n^1m^{\infty m}1$	×	$\sigma_{xyz} = \sigma_{xzy} = -\sigma_{yxz} = -\sigma_{yzx}$	×
171	Cr_2TeO_6 (0.76)	Collinear	$P^14_2/^{-1}m^1n^1m^{\infty m}1$	$\sigma_{xzz} = \sigma_{zxz} = \sigma_{zzx}$, $\sigma_{xyy} = \sigma_{yxy} = \sigma_{yyx}$, σ_{xxx}	$\sigma_{zxz} = \sigma_{zzx}$, $\sigma_{yxy} = \sigma_{yyx}$, σ_{xzz}, σ_{xyy}, σ_{xxx}	×
172	Cr_2TeO_6 (0.959)	Collinear	$P^14_2/^{-1}m^1n^1m^{\infty m}1$	$\sigma_{xzz} = \sigma_{zxz} = \sigma_{zzx}$, $\sigma_{xyy} = \sigma_{yxy} = \sigma_{yyx}$, σ_{xxx}	$\sigma_{zxz} = \sigma_{zzx}$, $\sigma_{yxy} = \sigma_{yyx}$, σ_{xzz}, σ_{xyy}, σ_{xxx}	×
173	Fe_2TeO_6 (0.960)	Collinear	$P^14_2/^{-1}m^1n^1m^{\infty m}1$	×	$\sigma_{xyz} = \sigma_{xzy} = -\sigma_{yxz} = -\sigma_{yzx}$	×
174	$K_2CoP_2O_7$ (0.230)	Collinear	$P^{-1}4_2/^{-1}m^1n^{-1}m^{\infty m}1$	$\sigma_{xzz} = \sigma_{zxz} = \sigma_{zzx}$, $\sigma_{xyy} = \sigma_{yxy} = \sigma_{yyx}$, σ_{xxx}	$\sigma_{zxz} = \sigma_{zzx}$, $\sigma_{yxy} = \sigma_{yyx}$, σ_{xzz}, σ_{xyy}, σ_{xxx}	×
175	Cr_2WO_6 (0.144)	Collinear	$P^{-1}4_2/^{-1}m^{-1}n^1m^{\infty m}1$	$\sigma_{xzz} = \sigma_{zxz} = \sigma_{zzx}$, $\sigma_{xyy} = \sigma_{yxy} = \sigma_{yyx}$, σ_{xxx}	$\sigma_{zxz} = \sigma_{zzx}$, $\sigma_{yxy} = \sigma_{yyx}$, σ_{xzz}, σ_{xyy}, σ_{xxx}	×
176	Cr_2WO_6 (0.75)	Collinear	$P^{-1}4_2/^{-1}m^{-1}n^1m^{\infty m}1$	$\sigma_{xzz} = \sigma_{zxz} = \sigma_{zzx}$, $\sigma_{xyy} = \sigma_{yxy} = \sigma_{yyx}$, σ_{xxx}	$\sigma_{zxz} = \sigma_{zzx}$, $\sigma_{yxy} = \sigma_{yyx}$, σ_{xzz}, σ_{xyy}, σ_{xxx}	×

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Table S4 : (continued) Antiferromagnets in MAGNDATA without second-order transport tensors triggered by magnetic geometry.

No.	Materials (ID)	Configuration	Spin space group	with SOC		
				IMD	QMD	BCD
177	V_2WO_6 (0.966)	Collinear	$P^{-1}4_2/^{-1}m^{-1}n^1m^{\infty m}1$	$\sigma_{xzz} = \sigma_{zxz} = \sigma_{zzx}$, $\sigma_{xyy} = \sigma_{yxy} = \sigma_{yyx}$, σ_{xxx}	$\sigma_{zxz} = \sigma_{zzx}$, $\sigma_{yxy} = \sigma_{yyx}$, σ_{xzz}, σ_{xyy}, σ_{xxx}	×
178	Ce_2PdGe_3 (0.166)	Collinear	$P^{-1}4_2/^{-1}m^1m^{-1}c^{\infty m}1$	$\sigma_{xyz} = \sigma_{xzy} = \sigma_{yxz} = \sigma_{yzx} = \sigma_{zxy} = \sigma_{zyx}$	$\sigma_{zxy} = \sigma_{zyx}$, $\sigma_{xyz} = \sigma_{xzy} = \sigma_{yxz} = \sigma_{yzx}$	×
179	Bi_2CuO_4 (0.348)	Collinear	$P^14/^{-1}n^1c^1c^{\infty m}1$	×	$\sigma_{xyz} = \sigma_{xzy} = -\sigma_{yxz} = -\sigma_{yzx}$	×
180	Bi_2CuO_4 (0.694)	Collinear	$P^14/^{-1}n^1c^1c^{\infty m}1$	×	$\sigma_{xyz} = \sigma_{xzy} = -\sigma_{yxz} = -\sigma_{yzx}$	×
181	Bi_2CuO_4 (0.695)	Collinear	$P^14/^{-1}n^1c^1c^{\infty m}1$	$\sigma_{xzz} = \sigma_{zxz} = \sigma_{zzx}$, $\sigma_{xyy} = \sigma_{yxy} = \sigma_{yyx}$, σ_{xxx}	$\sigma_{zxz} = \sigma_{zzx}$, $\sigma_{yxy} = \sigma_{yyx}$, σ_{xzz}, σ_{xyy}, σ_{xxx}	×
182	UPt_2Si_2 (0.194)	Collinear	$P^14/^{-1}n^1m^1m^{\infty m}1$	×	$\sigma_{xyz} = \sigma_{xzy} = -\sigma_{yxz} = -\sigma_{yzx}$	×
183	CuMnAs (0.222)	Collinear	$P^14/^{-1}n^1m^1m^{\infty m}1$	$\sigma_{xzz} = \sigma_{zxz} = \sigma_{zzx}$, $\sigma_{xyy} = \sigma_{yxy} = \sigma_{yyx}$, σ_{xxx}	$\sigma_{zxz} = \sigma_{zzx}$, $\sigma_{yxy} = \sigma_{yyx}$, σ_{xzz}, σ_{xyy}, σ_{xxx}	×
184	UBi_2 (0.378)	Collinear	$P^14/^{-1}n^1m^1m^{\infty m}1$	×	$\sigma_{xyz} = \sigma_{xzy} = -\sigma_{yxz} = -\sigma_{yzx}$	×
185	TbRuAsO (0.452)	Collinear	$P^14/^{-1}n^1m^1m^{\infty m}1$	$\sigma_{xzz} = \sigma_{zxz} = \sigma_{zzx}$, $\sigma_{xyy} = \sigma_{yxy} = \sigma_{yyx}$, σ_{xxx}	$\sigma_{zxz} = \sigma_{zzx}$, $\sigma_{yxy} = \sigma_{yyx}$, σ_{xzz}, σ_{xyy}, σ_{xxx}	×
186	CuMnAs (0.881)	Collinear	$P^14/^{-1}n^1m^1m^{\infty m}1$	$\sigma_{xzz} = \sigma_{zxz} = \sigma_{zzx}$, $\sigma_{xyy} = \sigma_{yxy} = \sigma_{yyx}$, σ_{xxx}	$\sigma_{zxz} = \sigma_{zzx}$, $\sigma_{yxy} = \sigma_{yyx}$, σ_{xzz}, σ_{xyy}, σ_{xxx}	×
187	CeMnAsO (0.186)	Collinear	$P^{-1}4/^{-1}n^1m^{-1}m^{\infty m}1$	$\sigma_{xyz} = \sigma_{xzy} = \sigma_{yxz} = \sigma_{yzx} = \sigma_{zxy} = \sigma_{zyx}$	$\sigma_{zxy} = \sigma_{zyx}$, $\sigma_{xyz} = \sigma_{xzy} = \sigma_{yxz} = \sigma_{yzx}$	×

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Table S4 : (continued) Antiferromagnets in MAGNDATA without second-order transport tensors triggered by magnetic geometry.

No.	Materials (ID)	Configuration	Spin space group	with SOC		
				IMD	QMD	BCD
188	$YbMnBi_2$ (0.267)	Collinear	$P^{-1}4/^{-1}n^{1}m^{-1}m^{\infty m}1$	$\sigma_{xyz} = \sigma_{xzy} = \sigma_{yxz} = \sigma_{yzx} = \sigma_{zxy} = \sigma_{zyx}$	$\sigma_{zxy} = \sigma_{zyx}$, $\sigma_{xyz} = \sigma_{xzy} = \sigma_{yxz} = \sigma_{yzx}$	×
189	CaMnSi (0.599)	Collinear	$P^{-1}4/^{-1}n^{1}m^{-1}m^{\infty m}1$	$\sigma_{xyz} = \sigma_{xzy} = \sigma_{yxz} = \sigma_{yzx} = \sigma_{zxy} = \sigma_{zyx}$	$\sigma_{zxy} = \sigma_{zyx}$, $\sigma_{xyz} = \sigma_{xzy} = \sigma_{yxz} = \sigma_{yzx}$	×
190	CaMnGe (0.601)	Collinear	$P^{-1}4/^{-1}n^{1}m^{-1}m^{\infty m}1$	σ_{zzz}, $\sigma_{yyz} = \sigma_{yzy} = \sigma_{zyy}$, $\sigma_{xyz} = \sigma_{xzy} = \sigma_{yxz} = \sigma_{yzx} = \sigma_{zxy} = \sigma_{zyx}$, $\sigma_{xxz} = \sigma_{xzx} = \sigma_{zxx}$	σ_{zzz}, σ_{zyy}, $\sigma_{zxy} = \sigma_{zyx}$, σ_{zxx}, $\sigma_{yyz} = \sigma_{yzy}$, $\sigma_{yxz} = \sigma_{yzx}$, $\sigma_{xyz} = \sigma_{xzy}$, $\sigma_{xxz} = \sigma_{xzx}$	×
191	CaMnSi (0.600)	Collinear	$P^{-1}4/^{-1}n^{1}m^{-1}m^{\infty m}1$	$\sigma_{xyz} = \sigma_{xzy} = \sigma_{yxz} = \sigma_{yzx} = \sigma_{zxy} = \sigma_{zyx}$	$\sigma_{zxy} = \sigma_{zyx}$, $\sigma_{xyz} = \sigma_{xzy} = \sigma_{yxz} = \sigma_{yzx}$	×
192	CaMnGe (0.602)	Collinear	$P^{-1}4/^{-1}n^{1}m^{-1}m^{\infty m}1$	σ_{zzz}, $\sigma_{yyz} = \sigma_{yzy} = \sigma_{zyy}$, $\sigma_{xyz} = \sigma_{xzy} = \sigma_{yxz} = \sigma_{yzx} = \sigma_{zxy} = \sigma_{zyx}$, $\sigma_{xxz} = \sigma_{xzx} = \sigma_{zxx}$	σ_{zzz}, σ_{zyy}, $\sigma_{zxy} = \sigma_{zyx}$, σ_{zxx}, $\sigma_{yyz} = \sigma_{yzy}$, $\sigma_{yxz} = \sigma_{yzx}$, $\sigma_{xyz} = \sigma_{xzy}$, $\sigma_{xxz} = \sigma_{xzx}$	×
193	NdMnAsO (0.623)	Collinear	$P^{-1}4/^{-1}n^{1}m^{-1}m^{\infty m}1$	$\sigma_{xyz} = \sigma_{xzy} = \sigma_{yxz} = \sigma_{yzx} = \sigma_{zxy} = \sigma_{zyx}$	$\sigma_{zxy} = \sigma_{zyx}$, $\sigma_{xyz} = \sigma_{xzy} = \sigma_{yxz} = \sigma_{yzx}$	×
194	KMnBi (0.618)	Collinear	$P^{-1}4/^{-1}n^{1}m^{-1}m^{\infty m}1$	$\sigma_{xyz} = \sigma_{xzy} = \sigma_{yxz} = \sigma_{yzx} = \sigma_{zxy} = \sigma_{zyx}$	$\sigma_{zxy} = \sigma_{zyx}$, $\sigma_{xyz} = \sigma_{xzy} = \sigma_{yxz} = \sigma_{yzx}$	×
195	KMnSb (0.617)	Collinear	$P^{-1}4/^{-1}n^{1}m^{-1}m^{\infty m}1$	$\sigma_{xyz} = \sigma_{xzy} = \sigma_{yxz} = \sigma_{yzx} = \sigma_{zxy} = \sigma_{zyx}$	$\sigma_{zxy} = \sigma_{zyx}$, $\sigma_{xyz} = \sigma_{xzy} = \sigma_{yxz} = \sigma_{yzx}$	×

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Table S4 : (continued) Antiferromagnets in MAGNDATA without second-order transport tensors triggered by magnetic geometry.

No.	Materials (ID)	Configuration	Spin space group	with SOC		
				IMD	QMD	BCD
196	LaMnAsO (0.624)	Collinear	$P^{-1}4/^{-1}n^{1}m^{-1}m^{\infty m}1$	$\sigma_{xyz}=\sigma_{xzy}=$ $\sigma_{yxz}=\sigma_{yzx}=$ $\sigma_{zxy}=\sigma_{zyx}$	$\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{xyz}=\sigma_{xzy}=$ $\sigma_{yxz}=\sigma_{yzx}$	×
197	LaMnAsO (0.619)	Collinear	$P^{-1}4/^{-1}n^{1}m^{-1}m^{\infty m}1$	$\sigma_{xyz}=\sigma_{xzy}=$ $\sigma_{yxz}=\sigma_{yzx}=$ $\sigma_{zxy}=\sigma_{zyx}$	$\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{xyz}=\sigma_{xzy}=$ $\sigma_{yxz}=\sigma_{yzx}$	×
198	NdMnAsO (0.620)	Collinear	$P^{-1}4/^{-1}n^{1}m^{-1}m^{\infty m}1$	$\sigma_{xyz}=\sigma_{xzy}=$ $\sigma_{yxz}=\sigma_{yzx}=$ $\sigma_{zxy}=\sigma_{zyx}$	$\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{xyz}=\sigma_{xzy}=$ $\sigma_{yxz}=\sigma_{yzx}$	×
199	NaMnP (0.628)	Collinear	$P^{-1}4/^{-1}n^{1}m^{-1}m^{\infty m}1$	$\sigma_{xyz}=\sigma_{xzy}=$ $\sigma_{yxz}=\sigma_{yzx}=$ $\sigma_{zxy}=\sigma_{zyx}$	$\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{xyz}=\sigma_{xzy}=$ $\sigma_{yxz}=\sigma_{yzx}$	×
200	NaMnP (0.626)	Collinear	$P^{-1}4/^{-1}n^{1}m^{-1}m^{\infty m}1$	$\sigma_{xyz}=\sigma_{xzy}=$ $\sigma_{yxz}=\sigma_{yzx}=$ $\sigma_{zxy}=\sigma_{zyx}$	$\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{xyz}=\sigma_{xzy}=$ $\sigma_{yxz}=\sigma_{yzx}$	×
201	NaMnAs (0.630)	Collinear	$P^{-1}4/^{-1}n^{1}m^{-1}m^{\infty m}1$	$\sigma_{xyz}=\sigma_{xzy}=$ $\sigma_{yxz}=\sigma_{yzx}=$ $\sigma_{zxy}=\sigma_{zyx}$	$\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{xyz}=\sigma_{xzy}=$ $\sigma_{yxz}=\sigma_{yzx}$	×
202	NaMnP (0.627)	Collinear	$P^{-1}4/^{-1}n^{1}m^{-1}m^{\infty m}1$	$\sigma_{xyz}=\sigma_{xzy}=$ $\sigma_{yxz}=\sigma_{yzx}=$ $\sigma_{zxy}=\sigma_{zyx}$	$\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{xyz}=\sigma_{xzy}=$ $\sigma_{yxz}=\sigma_{yzx}$	×
203	NaMnSb (0.631)	Collinear	$P^{-1}4/^{-1}n^{1}m^{-1}m^{\infty m}1$	$\sigma_{xyz}=\sigma_{xzy}=$ $\sigma_{yxz}=\sigma_{yzx}=$ $\sigma_{zxy}=\sigma_{zyx}$	$\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{xyz}=\sigma_{xzy}=$ $\sigma_{yxz}=\sigma_{yzx}$	×
204	NaMnSb (0.632)	Collinear	$P^{-1}4/^{-1}n^{1}m^{-1}m^{\infty m}1$	$\sigma_{xyz}=\sigma_{xzy}=$ $\sigma_{yxz}=\sigma_{yzx}=$ $\sigma_{zxy}=\sigma_{zyx}$	$\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{xyz}=\sigma_{xzy}=$ $\sigma_{yxz}=\sigma_{yzx}$	×
205	NaMnAs (0.629)	Collinear	$P^{-1}4/^{-1}n^{1}m^{-1}m^{\infty m}1$	$\sigma_{xyz}=\sigma_{xzy}=$ $\sigma_{yxz}=\sigma_{yzx}=$ $\sigma_{zxy}=\sigma_{zyx}$	$\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{xyz}=\sigma_{xzy}=$ $\sigma_{yxz}=\sigma_{yzx}$	×

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Table S4 : (continued) Antiferromagnets in MAGNDATA without second-order transport tensors triggered by magnetic geometry.

No.	Materials (ID)	Configuration	Spin space group	with SOC		
				IMD	QMD	BCD
206	NaMnBi (0.634)	Collinear	$P^{-1}4/^{-1}n^{1}m^{-1}m^{\infty m}1$	$\sigma_{xyz}=\sigma_{xzy}=$ $\sigma_{yxz}=\sigma_{yzx}=$ $\sigma_{zxy}=\sigma_{zyx}$	$\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{xyz}=\sigma_{xzy}=$ $\sigma_{yxz}=\sigma_{yzx}$	×
207	NaMnBi (0.635)	Collinear	$P^{-1}4/^{-1}n^{1}m^{-1}m^{\infty m}1$	$\sigma_{xyz}=\sigma_{xzy}=$ $\sigma_{yxz}=\sigma_{yzx}=$ $\sigma_{zxy}=\sigma_{zyx}$	$\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{xyz}=\sigma_{xzy}=$ $\sigma_{yxz}=\sigma_{yzx}$	×
208	CeMnSbO (0.665)	Collinear	$P^{-1}4/^{-1}n^{1}m^{-1}m^{\infty m}1$	$\sigma_{xyz}=\sigma_{xzy}=$ $\sigma_{yxz}=\sigma_{yzx}=$ $\sigma_{zxy}=\sigma_{zyx}$	$\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{xyz}=\sigma_{xzy}=$ $\sigma_{yxz}=\sigma_{yzx}$	×
209	LaMnSbO (0.667)	Collinear	$P^{-1}4/^{-1}n^{1}m^{-1}m^{\infty m}1$	$\sigma_{xyz}=\sigma_{xzy}=$ $\sigma_{yxz}=\sigma_{yzx}=$ $\sigma_{zxy}=\sigma_{zyx}$	$\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{xyz}=\sigma_{xzy}=$ $\sigma_{yxz}=\sigma_{yzx}$	×
210	$CaMnBi_2$ (0.72)	Collinear	$P^{-1}4/^{-1}n^{1}m^{-1}m^{\infty m}1$	$\sigma_{xyz}=\sigma_{xzy}=$ $\sigma_{yxz}=\sigma_{yzx}=$ $\sigma_{zxy}=\sigma_{zyx}$	$\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{xyz}=\sigma_{xzy}=$ $\sigma_{yxz}=\sigma_{yzx}$	×
211	$YbMnSb_2$ (0.766)	Collinear	$P^{-1}4/^{-1}n^{1}m^{-1}m^{\infty m}1$	$\sigma_{xyz}=\sigma_{xzy}=$ $\sigma_{yxz}=\sigma_{yzx}=$ $\sigma_{zxy}=\sigma_{zyx}$	$\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{xyz}=\sigma_{xzy}=$ $\sigma_{yxz}=\sigma_{yzx}$	×
212	$YbMnBi_2$ (0.769)	Collinear	$P^{-1}4/^{-1}n^{1}m^{-1}m^{\infty m}1$	$\sigma_{xyz}=\sigma_{xzy}=$ $\sigma_{yxz}=\sigma_{yzx}=$ $\sigma_{zxy}=\sigma_{zyx}$	$\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{xyz}=\sigma_{xzy}=$ $\sigma_{yxz}=\sigma_{yzx}$	×
213	ThMnPN (0.920)	Collinear	$P^{-1}4/^{-1}n^{1}m^{-1}m^{\infty m}1$	$\sigma_{xyz}=\sigma_{xzy}=$ $\sigma_{yxz}=\sigma_{yzx}=$ $\sigma_{zxy}=\sigma_{zyx}$	$\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{xyz}=\sigma_{xzy}=$ $\sigma_{yxz}=\sigma_{yzx}$	×
214	ThMnPN (0.921)	Collinear	$P^{-1}4/^{-1}n^{1}m^{-1}m^{\infty m}1$	$\sigma_{xyz}=\sigma_{xzy}=$ $\sigma_{yxz}=\sigma_{yzx}=$ $\sigma_{zxy}=\sigma_{zyx}$	$\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{xyz}=\sigma_{xzy}=$ $\sigma_{yxz}=\sigma_{yzx}$	×
215	ThMnAsN (0.922)	Collinear	$P^{-1}4/^{-1}n^{1}m^{-1}m^{\infty m}1$	$\sigma_{xyz}=\sigma_{xzy}=$ $\sigma_{yxz}=\sigma_{yzx}=$ $\sigma_{zxy}=\sigma_{zyx}$	$\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{xyz}=\sigma_{xzy}=$ $\sigma_{yxz}=\sigma_{yzx}$	×

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Table S4 : (continued) Antiferromagnets in MAGNDATA without second-order transport tensors triggered by magnetic geometry.

No.	Materials (ID)	Configuration	Spin space group	with SOC		
				IMD	QMD	BCD
216	ThMnAsN (0.923)	Collinear	$P^{-1}4/^{-1}n^{1}m^{-1}m^{\infty m}1$	$\sigma_{xyz} = \sigma_{xzy} = \sigma_{yxz} = \sigma_{yzx} = \sigma_{zxy} = \sigma_{zyx}$	$\sigma_{zxy} = \sigma_{zyx}$, $\sigma_{xyz} = \sigma_{xzy} = \sigma_{yxz} = \sigma_{yzx}$	×
217	Fe_2As (1.131)	Collinear	$P^{1}4/^{1}n^{1}m^{1}m^{-1}(0\ \ 0\ \ 1/2)^{\infty m}1$	×	×	×
218	Mn_2As (1.132)	Collinear	$P^{1}4/^{1}n^{1}m^{1}m^{-1}(0\ \ 0\ \ 1/2)^{\infty m}1$	×	×	×
219	NdCoAsO (1.179)	Collinear	$P^{1}4/^{1}n^{1}m^{1}m^{-1}(0\ \ 0\ \ 1/2)^{\infty m}1$	×	×	×
220	DyOCl (1.643)	Collinear	$P^{1}4/^{1}n^{1}m^{1}m^{-1}(0\ \ 0\ \ 1/2)^{\infty m}1$	×	×	×
221	DySbTe (1.765)	Collinear	$P^{1}4/^{1}n^{1}m^{1}m^{-1}(0\ \ 0\ \ 1/2)^{\infty m}1$	×	×	×
222	$NdNiMg_{15}$ (1.457)	Collinear	$P^{1}m^{1}m^{1}a^{-1}(1/2\ \ 1/2\ \ 0)^{\infty m}1$	×	×	×
223	CeMnAsO (0.187)	Collinear	$P^{1}m^{1}m^{-1}n^{\infty m}1$	$\sigma_{xzz} = \sigma_{zxz} = \sigma_{zzx}$, $\sigma_{xyy} = \sigma_{yxy} = \sigma_{yyx}$, σ_{xxx}	$\sigma_{zxz} = \sigma_{zzx}$, $\sigma_{yxy} = \sigma_{yyx}$, σ_{xzz}, σ_{xyy}, σ_{xxx}	×
224	NdMnAsO (0.621)	Collinear	$P^{1}m^{1}m^{-1}n^{\infty m}1$	$\sigma_{xzz} = \sigma_{zxz} = \sigma_{zzx}$, $\sigma_{xyy} = \sigma_{yxy} = \sigma_{yyx}$, σ_{xxx}	$\sigma_{zxz} = \sigma_{zzx}$, $\sigma_{yxy} = \sigma_{yyx}$, σ_{xzz}, σ_{xyy}, σ_{xxx}	×
225	NdMnAsO (0.622)	Collinear	$P^{1}m^{1}m^{-1}n^{\infty m}1$	$\sigma_{xzz} = \sigma_{zxz} = \sigma_{zzx}$, $\sigma_{xyy} = \sigma_{yxy} = \sigma_{yyx}$, σ_{xxx}	$\sigma_{zxz} = \sigma_{zzx}$, $\sigma_{yxy} = \sigma_{yyx}$, σ_{xzz}, σ_{xyy}, σ_{xxx}	×
226	PrMnSbO (0.668)	Collinear	$P^{1}m^{1}m^{-1}n^{\infty m}1$	$\sigma_{xzz} = \sigma_{zxz} = \sigma_{zzx}$, $\sigma_{xyy} = \sigma_{yxy} = \sigma_{yyx}$, σ_{xxx}	$\sigma_{zxz} = \sigma_{zzx}$, $\sigma_{yxy} = \sigma_{yyx}$, σ_{xzz}, σ_{xyy}, σ_{xxx}	×
227	CeMnSbO (0.666)	Collinear	$P^{1}m^{1}m^{-1}n^{\infty m}1$	$\sigma_{xzz} = \sigma_{zxz} = \sigma_{zzx}$, $\sigma_{xyy} = \sigma_{yxy} = \sigma_{yyx}$, σ_{xxx}	$\sigma_{zxz} = \sigma_{zzx}$, $\sigma_{yxy} = \sigma_{yyx}$, σ_{xzz}, σ_{xyy}, σ_{xxx}	×
228	Cr_2As (1.130)	Collinear	$P^{1}m^{1}m^{1}n^{-1}(0\ \ 0\ \ 1/2)^{\infty m}1$	×	×	×
229	DyB_4 (0.22)	Collinear	$P^{1}b^{-1}a^{1}m^{\infty m}1$	$\sigma_{xzz} = \sigma_{zxz} = \sigma_{zzx}$, $\sigma_{xyy} = \sigma_{yxy} = \sigma_{yyx}$, σ_{xxx}	$\sigma_{zxz} = \sigma_{zzx}$, $\sigma_{yxy} = \sigma_{yyx}$, σ_{xzz}, σ_{xyy}, σ_{xxx}	×

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Table S4 : (continued) Antiferromagnets in MAGNDATA without second-order transport tensors triggered by magnetic geometry.

No.	Materials (ID)	Configuration	Spin space group	with SOC		
				IMD	QMD	BCD
230	TbB_4 (0.469)	Collinear	$P^{1}\mathrm{b}^{-1}\mathrm{a}^{1}\mathrm{m}^{\infty\mathrm{m}}1$	$\sigma_{xyz}=\sigma_{xzy}=\sigma_{yxz}=\sigma_{yzx}=\sigma_{zxy}=\sigma_{zyx}$	$\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{yxz}=\sigma_{yzx}$, $\sigma_{xyz}=\sigma_{xzy}$	×
231	ErB_4 (0.468)	Collinear	$P^{1}\mathrm{b}^{-1}\mathrm{a}^{1}\mathrm{m}^{\infty\mathrm{m}}1$	$\sigma_{xzz}=\sigma_{zxz}=\sigma_{zzx}$, $\sigma_{xyy}=\sigma_{yxy}=\sigma_{yyx}$, σ_{xxx}	$\sigma_{zxz}=\sigma_{zzx}$, $\sigma_{yxy}=\sigma_{yyx}$, σ_{xzz}, σ_{xyy}, σ_{xxx}	×
232	Nd_2Pd_2In (1.335)	Collinear	$P^{1}\mathrm{m}^{1}\mathrm{m}^{1}\mathrm{a}^{-1}(1/2\ \ 0\ \ 1/2)^{\infty\mathrm{m}}1$	×	×	$\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zyy}/2$, $\sigma_{xxz}=\sigma_{xzx}=-\sigma_{zxx}/2$
233	$UNiGa_5$ (1.254)	Collinear	$I^{1}4/^{1}\mathrm{m}^{1}\mathrm{m}^{1}\mathrm{m}^{-1}(1/2\ \ 1/2\ \ 0)^{\infty\mathrm{m}}1$	×	×	×
234	$CeIr(In_{0.97}Cd_{0.03})_5$ (1.598)	Collinear	$I^{1}4/^{1}\mathrm{m}^{1}\mathrm{m}^{1}\mathrm{m}^{-1}(1/2\ \ 1/2\ \ 0)^{\infty\mathrm{m}}1$	×	×	×
235	$UPdGa_5$ (1.683)	Collinear	$I^{1}4/^{1}\mathrm{m}^{1}\mathrm{m}^{1}\mathrm{m}^{-1}(1/2\ \ 1/2\ \ 0)^{\infty\mathrm{m}}1$	×	×	×
236	Dy_2CoGa_8 (1.80)	Collinear	$I^{1}4/^{1}\mathrm{m}^{1}\mathrm{m}^{1}\mathrm{m}^{-1}(1/2\ \ 1/2\ \ 0)^{\infty\mathrm{m}}1$	×	×	×
237	Nd_2RhIn_8 (1.82)	Collinear	$I^{1}4/^{1}\mathrm{m}^{1}\mathrm{m}^{1}\mathrm{m}^{-1}(1/2\ \ 1/2\ \ 0)^{\infty\mathrm{m}}1$	×	×	×
238	Tb_2CoGa_8 (1.87)	Collinear	$I^{1}4/^{1}\mathrm{m}^{1}\mathrm{m}^{1}\mathrm{m}^{-1}(1/2\ \ 1/2\ \ 0)^{\infty\mathrm{m}}1$	×	×	×
239	$UPtGa_5$ (1.255)	Collinear	$P^{1}4/^{1}\mathrm{m}^{1}\mathrm{m}^{1}\mathrm{m}^{-1}(0\ \ 0\ \ 1/2)^{\infty\mathrm{m}}1$	×	×	×
240	$NpRhGa_5$ (1.261)	Collinear	$P^{1}4/^{1}\mathrm{m}^{1}\mathrm{m}^{1}\mathrm{m}^{-1}(0\ \ 0\ \ 1/2)^{\infty\mathrm{m}}1$	×	×	×
241	$CeRhAl_4Si_2$ (1.486)	Collinear	$P^{1}4/^{1}\mathrm{m}^{1}\mathrm{m}^{1}\mathrm{m}^{-1}(0\ \ 0\ \ 1/2)^{\infty\mathrm{m}}1$	×	×	×
242	$CeIrAl_4Si_2$ (1.487)	Collinear	$P^{1}4/^{1}\mathrm{m}^{1}\mathrm{m}^{1}\mathrm{m}^{-1}(0\ \ 0\ \ 1/2)^{\infty\mathrm{m}}1$	×	×	×
243	$NpCoGa_5$ (1.671)	Collinear	$P^{1}4/^{1}\mathrm{m}^{1}\mathrm{m}^{1}\mathrm{m}^{-1}(0\ \ 0\ \ 1/2)^{\infty\mathrm{m}}1$	×	×	×
244	$YBaCo_2O_5$ (1.703)	Collinear	$P^{1}\mathrm{m}^{1}\mathrm{m}^{1}\mathrm{a}^{-1}(0\ \ 1/2\ \ 0)^{\infty\mathrm{m}}1$	×	×	×
245	$TaBaFe_2O_5$ (1.704)	Collinear	$P^{1}\mathrm{m}^{1}\mathrm{m}^{1}\mathrm{a}^{-1}(0\ \ 1/2\ \ 0)^{\infty\mathrm{m}}1$	×	×	×

Continued on next page

Table S4 : (continued) Antiferromagnets in MAGNDATA without second-order transport tensors triggered by magnetic geometry.

No.	Materials (ID)	Configuration	Spin space group	with SOC		
				IMD	QMD	BCD
246	$KRuO_4$ (0.285)	Collinear	$I^{-1}4_1/^{-1}a^{\infty m}1$	$\sigma_{xxz} = \sigma_{xzx} = -\sigma_{yyz} = -\sigma_{yzy} = \sigma_{zxx} = -\sigma_{zyy}, \sigma_{xyz} = \sigma_{xzy} = \sigma_{yxz} = \sigma_{yzx} = \sigma_{zxy} = \sigma_{zyx}$	$\sigma_{zxx} = -\sigma_{zyy}, \sigma_{zxy} = \sigma_{zyx}, \sigma_{xxz} = \sigma_{xzx} = -\sigma_{yyz} = -\sigma_{yzy}, \sigma_{xyz} = \sigma_{xzy} = \sigma_{yxz} = \sigma_{yzx}$	×
247	$KOsO_4$ (0.284)	Collinear	$I^{-1}4_1/^{-1}a^{\infty m}1$	$\sigma_{xxz} = \sigma_{xzx} = -\sigma_{yyz} = -\sigma_{yzy} = \sigma_{zxx} = -\sigma_{zyy}, \sigma_{xyz} = \sigma_{xzy} = \sigma_{yxz} = \sigma_{yzx} = \sigma_{zxy} = \sigma_{zyx}$	$\sigma_{zxx} = -\sigma_{zyy}, \sigma_{zxy} = \sigma_{zyx}, \sigma_{xxz} = \sigma_{xzx} = -\sigma_{yyz} = -\sigma_{yzy}, \sigma_{xyz} = \sigma_{xzy} = \sigma_{yxz} = \sigma_{yzx}$	×
248	$DyCrO_4$ (0.372)	Collinear	$I^{-1}4_1/^{-1}a^{\infty m}1$	$\sigma_{yzz} = \sigma_{zyz} = \sigma_{zzy}, \sigma_{xzz} = \sigma_{zxz} = \sigma_{zzx}, \sigma_{yyy}, \sigma_{xyy} = \sigma_{yxy} = \sigma_{yyx}, \sigma_{xxy} = \sigma_{xyx} = \sigma_{yxx}, \sigma_{xxx}$	$\sigma_{zyz} = \sigma_{zzy}, \sigma_{zxz} = \sigma_{zzx}, \sigma_{yzz}, \sigma_{yyy}, \sigma_{yxy} = \sigma_{yyx}, \sigma_{yxx}, \sigma_{xzz}, \sigma_{xyy}, \sigma_{xxy} = \sigma_{xyx}, \sigma_{xxx}$	×
249	$Mn_3Ta_2O_8$ (0.734)	Collinear	$I^{-1}4_1/^{-1}a^{\infty m}1$	$\sigma_{yzz} = \sigma_{zyz} = \sigma_{zzy}, \sigma_{xzz} = \sigma_{zxz} = \sigma_{zzx}, \sigma_{yyy}, \sigma_{xyy} = \sigma_{yxy} = \sigma_{yyx}, \sigma_{xxy} = \sigma_{xyx} = \sigma_{yxx}, \sigma_{xxx}$	$\sigma_{zyz} = \sigma_{zzy}, \sigma_{zxz} = \sigma_{zzx}, \sigma_{yzz}, \sigma_{yyy}, \sigma_{yxy} = \sigma_{yyx}, \sigma_{yxx}, \sigma_{xzz}, \sigma_{xyy}, \sigma_{xxy} = \sigma_{xyx}, \sigma_{xxx}$	×
250	Sr_2CuTeO_6 (1.168)	Collinear	$C^12/^1m^{-1}(0\ \ 0\ \ 1/2)^{\infty m}1$	×	×	×
251	Sr_2CoOsO_6 (1.72)	Collinear	$C^12/^1m^{-1}(0\ \ 0\ \ 1/2)^{\infty m}1$	×	×	×
252	$TlFe_{1.6}Se_2$ (0.208)	Collinear	$I^14/^{-1}m^{\infty m}1$	$\sigma_{yzz} = \sigma_{zyz} = \sigma_{zzy}, \sigma_{xzz} = \sigma_{zxz} = \sigma_{zzx}, \sigma_{yyy}, \sigma_{xyy} = \sigma_{yxy} = \sigma_{yyx}, \sigma_{xxy} = \sigma_{xyx} = \sigma_{yxx}, \sigma_{xxx}$	$\sigma_{zyz} = \sigma_{zzy}, \sigma_{zxz} = \sigma_{zzx}, \sigma_{yzz}, \sigma_{yyy}, \sigma_{yxy} = \sigma_{yyx}, \sigma_{yxx}, \sigma_{xzz}, \sigma_{xyy}, \sigma_{xxy} = \sigma_{xyx}, \sigma_{xxx}$	×

Continued on next page

Table S4 : (continued) Antiferromagnets in MAGNDATA without second-order transport tensors triggered by magnetic geometry.

No.	Materials (ID)	Configuration	Spin space group	with SOC		
				IMD	QMD	BCD
253	$TlFe_{1.6}Se_2$ (0.209)	Collinear	$I^{1}4/^{-1}m^{\infty m}1$	σ_{zzz}, $\sigma_{xxz}=\sigma_{xzx}=\sigma_{yyz}=\sigma_{yzy}=\sigma_{zxx}=\sigma_{zyy}$	σ_{zzz}, $\sigma_{zxx}=\sigma_{zyy}$, $\sigma_{xxz}=\sigma_{xzx}=\sigma_{yyz}=\sigma_{yzy}$, $\sigma_{xyz}=\sigma_{xzy}=-\sigma_{yxz}=-\sigma_{yzx}$	×
254	$K_{0.8}Fe_{1.8}Se_2$ (0.418)	Collinear	$I^{1}4/^{-1}m^{\infty m}1$	σ_{zzz}, $\sigma_{xxz}=\sigma_{xzx}=\sigma_{yyz}=\sigma_{yzy}=\sigma_{zxx}=\sigma_{zyy}$	σ_{zzz}, $\sigma_{zxx}=\sigma_{zyy}$, $\sigma_{xxz}=\sigma_{xzx}=\sigma_{yyz}=\sigma_{yzy}$, $\sigma_{xyz}=\sigma_{xzy}=-\sigma_{yxz}=-\sigma_{yzx}$	×
255	$Rb_yFe_{2-x}Se_2$ (0.54)	Collinear	$I^{1}4/^{-1}m^{\infty m}1$	σ_{zzz}, $\sigma_{xxz}=\sigma_{xzx}=\sigma_{yyz}=\sigma_{yzy}=\sigma_{zxx}=\sigma_{zyy}$	σ_{zzz}, $\sigma_{zxx}=\sigma_{zyy}$, $\sigma_{xxz}=\sigma_{xzx}=\sigma_{yyz}=\sigma_{yzy}$, $\sigma_{xyz}=\sigma_{xzy}=-\sigma_{yxz}=-\sigma_{yzx}$	×
256	$K_yFe_{2-x}Se_2$ (0.55)	Collinear	$I^{1}4/^{-1}m^{\infty m}1$	σ_{zzz}, $\sigma_{xxz}=\sigma_{xzx}=\sigma_{yyz}=\sigma_{yzy}=\sigma_{zxx}=\sigma_{zyy}$	σ_{zzz}, $\sigma_{zxx}=\sigma_{zyy}$, $\sigma_{xxz}=\sigma_{xzx}=\sigma_{yyz}=\sigma_{yzy}$, $\sigma_{xyz}=\sigma_{xzy}=-\sigma_{yxz}=-\sigma_{yzx}$	×
257	$BaNd_{0.9}Y_{0.1}MoO_6$ (1.12)	Collinear	$P^{1}4/^{1}m^{-1}(1/2\ \ 1/2\ \ 1/2)^{\infty m}1$	×	×	×
258	Sr_2FeOsO_6 (1.47)	Collinear	$P^{1}4/^{1}m^{-1}(1/2\ \ 1/2\ \ 1/2)^{\infty m}1$	×	×	×
259	$CeCu_2$ (0.290)	Collinear	$I^{1}m^{1}m^{-1}a^{\infty m}1$	$\sigma_{xyz}=\sigma_{xzy}=\sigma_{yxz}=\sigma_{yzx}=\sigma_{zxy}=\sigma_{zyx}$	$\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{yxz}=\sigma_{yzx}$, $\sigma_{xyz}=\sigma_{xzy}$	×
260	$Tm_3Cu_4Ge_4$ (1.727)	Collinear	$P^{1}m^{1}m^{1}n^{-1}(0\ \ 0\ \ 1/2)^{\infty m}1$	×	×	×
261	$Eu_{0.5}Ca_{0.5}Fe_2As_2$ (1.483)	Collinear	$C^{1}c^{1}c^{1}m^{-1}(1/2\ \ 0\ \ 1/2)^{\infty m}1$	×	×	×
262	PrFeAsO (1.585)	Collinear	$P^{1}c^{1}c^{1}m^{-1}(1/2\ \ 0\ \ 1/2)^{\infty m}1$	×	×	×

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Table S4 : (continued) Antiferromagnets in MAGNDATA without second-order transport tensors triggered by magnetic geometry.

No.	Materials (ID)	Configuration	Spin space group	with SOC		
				IMD	QMD	BCD
263	$DyGe_{1.75}$ (0.341)	Collinear	$C^{1}\mathrm{m}^{-1}\mathrm{m}^{1}\mathrm{m}^{\infty\mathrm{m}}1$	$\sigma_{xzz}=\sigma_{zxz}=\sigma_{zzx}$, $\sigma_{xyy}=\sigma_{yxy}=\sigma_{yyx}$, σ_{xxx}	$\sigma_{zxz}=\sigma_{zzx}$, $\sigma_{yxy}=\sigma_{yyx}$, σ_{xzz}, σ_{xyy}, σ_{xxx}	×
264	$TbGe_2$ (0.343)	Collinear	$C^{1}\mathrm{m}^{-1}\mathrm{m}^{1}\mathrm{m}^{\infty\mathrm{m}}1$	$\sigma_{xzz}=\sigma_{zxz}=\sigma_{zzx}$, $\sigma_{xyy}=\sigma_{yxy}=\sigma_{yyx}$, σ_{xxx}	$\sigma_{zxz}=\sigma_{zzx}$, $\sigma_{yxy}=\sigma_{yyx}$, σ_{xzz}, σ_{xyy}, σ_{xxx}	×
265	$GdNiSi_3$ (0.406)	Collinear	$C^{1}\mathrm{m}^{-1}\mathrm{m}^{1}\mathrm{m}^{\infty\mathrm{m}}1$	$\sigma_{xzz}=\sigma_{zxz}=\sigma_{zzx}$, $\sigma_{xyy}=\sigma_{yxy}=\sigma_{yyx}$, σ_{xxx}	$\sigma_{zxz}=\sigma_{zzx}$, $\sigma_{yxy}=\sigma_{yyx}$, σ_{xzz}, σ_{xyy}, σ_{xxx}	×
266	$Sr_2Fe_{1.9}Co_{0.1}O_{5.5}$ (0.400)	Collinear	$C^{1}\mathrm{m}^{-1}\mathrm{m}^{1}\mathrm{m}^{\infty\mathrm{m}}1$	$\sigma_{xyz}=\sigma_{xzy}=\sigma_{yxz}=\sigma_{yzx}=\sigma_{zxy}=\sigma_{zyx}$	$\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{yxz}=\sigma_{yzx}$, $\sigma_{xyz}=\sigma_{xzy}$	×
267	$Sr_4Fe_4O_{11}$ (0.401)	Collinear	$C^{1}\mathrm{m}^{-1}\mathrm{m}^{1}\mathrm{m}^{\infty\mathrm{m}}1$	$\sigma_{xyz}=\sigma_{xzy}=\sigma_{yxz}=\sigma_{yzx}=\sigma_{zxy}=\sigma_{zyx}$	$\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{yxz}=\sigma_{yzx}$, $\sigma_{xyz}=\sigma_{xzy}$	×
268	$Ba_4Ru_3O_{10}$ (0.693)	Collinear	$C^{1}\mathrm{m}^{1}\mathrm{c}^{-1}\mathrm{e}^{\infty\mathrm{m}}1$	$\sigma_{xzz}=\sigma_{zxz}=\sigma_{zzx}$, $\sigma_{xyy}=\sigma_{yxy}=\sigma_{yyx}$, σ_{xxx}	$\sigma_{zxz}=\sigma_{zzx}$, $\sigma_{yxy}=\sigma_{yyx}$, σ_{xzz}, σ_{xyy}, σ_{xxx}	×
269	$Ba_4Ru_3O_{10}$ (0.692)	Collinear	$C^{1}\mathrm{m}^{1}\mathrm{c}^{-1}\mathrm{e}^{\infty\mathrm{m}}1$	$\sigma_{xzz}=\sigma_{zxz}=\sigma_{zzx}$, $\sigma_{xyy}=\sigma_{yxy}=\sigma_{yyx}$, σ_{xxx}	$\sigma_{zxz}=\sigma_{zzx}$, $\sigma_{yxy}=\sigma_{yyx}$, σ_{xzz}, σ_{xyy}, σ_{xxx}	×
270	Er_2PtGe_6 (0.909)	Collinear	$C^{1}\mathrm{m}^{1}\mathrm{c}^{-1}\mathrm{e}^{\infty\mathrm{m}}1$	$\sigma_{xzz}=\sigma_{zxz}=\sigma_{zzx}$, $\sigma_{xyy}=\sigma_{yxy}=\sigma_{yyx}$, σ_{xxx}	$\sigma_{zxz}=\sigma_{zzx}$, $\sigma_{yxy}=\sigma_{yyx}$, σ_{xzz}, σ_{xyy}, σ_{xxx}	×
271	Er_2PtGe_6 (0.932)	Collinear	$C^{1}\mathrm{m}^{1}\mathrm{c}^{-1}\mathrm{e}^{\infty\mathrm{m}}1$	$\sigma_{xzz}=\sigma_{zxz}=\sigma_{zzx}$, $\sigma_{xyy}=\sigma_{yxy}=\sigma_{yyx}$, σ_{xxx}	$\sigma_{zxz}=\sigma_{zzx}$, $\sigma_{yxy}=\sigma_{yyx}$, σ_{xzz}, σ_{xyy}, σ_{xxx}	×
272	DyGe (1.361)	Collinear	$C^{1}2/^{1}\mathrm{m}^{-1}(0\ \ 0\ \ 1/2)^{\infty\mathrm{m}}1$	×	×	×

Continued on next page

Table S4 : (continued) Antiferromagnets in MAGNDATA without second-order transport tensors triggered by magnetic geometry.

No.	Materials (ID)	Configuration	Spin space group	with SOC		
				IMD	QMD	BCD
273	$ErGe_3$ (0.330)	Collinear	$C^1\mathrm{m}^{-1}\mathrm{c}^1\mathrm{m}^{\infty\mathrm{m}}1$	σ_{zzz}, $\sigma_{yyz} = \sigma_{yzy} = \sigma_{zyy}$, $\sigma_{xyz} = \sigma_{xzy} = \sigma_{yxz} = \sigma_{yzx} = \sigma_{zxy} = \sigma_{zyx}$, $\sigma_{xxz} = \sigma_{xzx} = \sigma_{zxx}$	σ_{zzz}, $\sigma_{zyy} = \sigma_{zxy} = \sigma_{zyx}$, σ_{zxx}, $\sigma_{yyz} = \sigma_{yzy}$, $\sigma_{yxz} = \sigma_{yzx}$, $\sigma_{xyz} = \sigma_{xzy}$, $\sigma_{xxz} = \sigma_{xzx}$	×
274	$DyCoSi_2$ (0.453)	Collinear	$C^1\mathrm{m}^{-1}\mathrm{c}^1\mathrm{m}^{\infty\mathrm{m}}1$	$\sigma_{xzz} = \sigma_{zxz} = \sigma_{zzx}$, $\sigma_{xyy} = \sigma_{yxy} = \sigma_{yyx}$, σ_{xxx}	$\sigma_{zxz} = \sigma_{zzx}$, $\sigma_{yxy} = \sigma_{yyx}$, σ_{xzz}, σ_{xyy}, σ_{xxx}	×
275	$TbNiGe_2$ (0.566)	Collinear	$C^1\mathrm{m}^{-1}\mathrm{c}^1\mathrm{m}^{\infty\mathrm{m}}1$	$\sigma_{xzz} = \sigma_{zxz} = \sigma_{zzx}$, $\sigma_{xyy} = \sigma_{yxy} = \sigma_{yyx}$, σ_{xxx}	$\sigma_{zxz} = \sigma_{zzx}$, $\sigma_{yxy} = \sigma_{yyx}$, σ_{xzz}, σ_{xyy}, σ_{xxx}	×
276	$HoNi_{0.64}Ge_2$ (0.567)	Collinear	$C^1\mathrm{m}^{-1}\mathrm{c}^1\mathrm{m}^{\infty\mathrm{m}}1$	$\sigma_{xzz} = \sigma_{zxz} = \sigma_{zzx}$, $\sigma_{xyy} = \sigma_{yxy} = \sigma_{yyx}$, σ_{xxx}	$\sigma_{zxz} = \sigma_{zzx}$, $\sigma_{yxy} = \sigma_{yyx}$, σ_{xzz}, σ_{xyy}, σ_{xxx}	×
277	$TbNi_{0.4}Ge_2$ (0.568)	Collinear	$C^1\mathrm{m}^{-1}\mathrm{c}^1\mathrm{m}^{\infty\mathrm{m}}1$	$\sigma_{xzz} = \sigma_{zxz} = \sigma_{zzx}$, $\sigma_{xyy} = \sigma_{yxy} = \sigma_{yyx}$, σ_{xxx}	$\sigma_{zxz} = \sigma_{zzx}$, $\sigma_{yxy} = \sigma_{yyx}$, σ_{xzz}, σ_{xyy}, σ_{xxx}	×
278	$TbCu_{0.4}Ge_2$ (0.569)	Collinear	$C^1\mathrm{m}^{-1}\mathrm{c}^1\mathrm{m}^{\infty\mathrm{m}}1$	$\sigma_{xzz} = \sigma_{zxz} = \sigma_{zzx}$, $\sigma_{xyy} = \sigma_{yxy} = \sigma_{yyx}$, σ_{xxx}	$\sigma_{zxz} = \sigma_{zzx}$, $\sigma_{yxy} = \sigma_{yyx}$, σ_{xzz}, σ_{xyy}, σ_{xxx}	×
279	$TbNiSi_2$ (0.910)	Collinear	$C^1\mathrm{m}^{-1}\mathrm{c}^1\mathrm{m}^{\infty\mathrm{m}}1$	$\sigma_{xzz} = \sigma_{zxz} = \sigma_{zzx}$, $\sigma_{xyy} = \sigma_{yxy} = \sigma_{yyx}$, σ_{xxx}	$\sigma_{zxz} = \sigma_{zzx}$, $\sigma_{yxy} = \sigma_{yyx}$, σ_{xzz}, σ_{xyy}, σ_{xxx}	×
280	ErNiGe (1.379)	Collinear	$P^1 2_1/{}^1\mathrm{c}^{-1}(1/2\ \ 0\ \ 0)^{\infty\mathrm{m}}1$	×	×	×
281	Y_2BaCuO_5 (1.445)	Collinear	$P^1 2_1/{}^1\mathrm{c}^{-1}(1/2\ \ 0\ \ 0)^{\infty\mathrm{m}}1$	×	×	×
282	PrPdSn (1.744)	Collinear	$P^1 2_1/{}^1\mathrm{c}^{-1}(1/2\ \ 0\ \ 0)^{\infty\mathrm{m}}1$	×	×	×

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Table S4 : (continued) Antiferromagnets in MAGNDATA without second-order transport tensors triggered by magnetic geometry.

No.	Materials (ID)	Configuration	Spin space group	with SOC		
				IMD	QMD	BCD
283	$EuZrO_3$ (0.147)	Collinear	$P^{1}\mathrm{n}^{1}\mathrm{m}^{-1}\mathrm{a}^{\infty\mathrm{m}}1$	$\sigma_{xyz}=\sigma_{xzy}=\sigma_{yxz}=\sigma_{yzx}=\sigma_{zxy}=\sigma_{zyx}$	$\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{yxz}=\sigma_{yzx}$, $\sigma_{xyz}=\sigma_{xzy}$	×
284	$EuZrO_3$ (0.146)	Collinear	$P^{1}\mathrm{n}^{1}\mathrm{m}^{-1}\mathrm{a}^{\infty\mathrm{m}}1$	$\sigma_{xzz}=\sigma_{zxz}=\sigma_{zzx}$, $\sigma_{xyy}=\sigma_{yxy}=\sigma_{yyx}$, σ_{xxx}	$\sigma_{zxz}=\sigma_{zzx}$, $\sigma_{yxy}=\sigma_{yyx}$, σ_{xzz}, σ_{xyy}, σ_{xxx}	×
285	$Cu_{0.95}MnAs$ (0.223)	Collinear	$P^{1}\mathrm{n}^{1}\mathrm{m}^{-1}\mathrm{a}^{\infty\mathrm{m}}1$	$\sigma_{xzz}=\sigma_{zxz}=\sigma_{zzx}$, $\sigma_{xyy}=\sigma_{yxy}=\sigma_{yyx}$, σ_{xxx}	$\sigma_{zxz}=\sigma_{zzx}$, $\sigma_{yxy}=\sigma_{yyx}$, σ_{xzz}, σ_{xyy}, σ_{xxx}	×
286	Fe_3BO_5 (0.386)	Collinear	$P^{1}\mathrm{n}^{1}\mathrm{m}^{-1}\mathrm{a}^{\infty\mathrm{m}}1$	$\sigma_{xzz}=\sigma_{zxz}=\sigma_{zzx}$, $\sigma_{xyy}=\sigma_{yxy}=\sigma_{yyx}$, σ_{xxx}	$\sigma_{zxz}=\sigma_{zzx}$, $\sigma_{yxy}=\sigma_{yyx}$, σ_{xzz}, σ_{xyy}, σ_{xxx}	×
287	$GdAlO_3$ (0.410)	Collinear	$P^{1}\mathrm{n}^{1}\mathrm{m}^{-1}\mathrm{a}^{\infty\mathrm{m}}1$	$\sigma_{xyz}=\sigma_{xzy}=\sigma_{yxz}=\sigma_{yzx}=\sigma_{zxy}=\sigma_{zyx}$	$\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{yxz}=\sigma_{yzx}$, $\sigma_{xyz}=\sigma_{xzy}$	×
288	$CaCr_{0.86}Fe_{3.14}As_3$ (0.429)	Collinear	$P^{1}\mathrm{n}^{1}\mathrm{m}^{-1}\mathrm{a}^{\infty\mathrm{m}}1$	$\sigma_{xzz}=\sigma_{zxz}=\sigma_{zzx}$, $\sigma_{xyy}=\sigma_{yxy}=\sigma_{yyx}$, σ_{xxx}	$\sigma_{zxz}=\sigma_{zzx}$, $\sigma_{yxy}=\sigma_{yyx}$, σ_{xzz}, σ_{xyy}, σ_{xxx}	×
289	$Tl_3Fe_2S_4$ (0.801)	Collinear	$P^{1}\mathrm{n}^{-1}\mathrm{m}^{1}\mathrm{a}^{\infty\mathrm{m}}1$	$\sigma_{xzz}=\sigma_{zxz}=\sigma_{zzx}$, $\sigma_{xyy}=\sigma_{yxy}=\sigma_{yyx}$, σ_{xxx}	$\sigma_{zxz}=\sigma_{zzx}$, $\sigma_{yxy}=\sigma_{yyx}$, σ_{xzz}, σ_{xyy}, σ_{xxx}	×
290	$YCr_{0.5}Fe_{0.5}O_3$ (0.946)	Collinear	$P^{1}\mathrm{n}^{-1}\mathrm{m}^{-1}\mathrm{a}^{\infty\mathrm{m}}1$	×	×	×
291	Gd_5Ge_4 (0.14)	Collinear	$P^{-1}\mathrm{n}^{1}\mathrm{m}^{1}\mathrm{a}^{\infty\mathrm{m}}1$	$\sigma_{xzz}=\sigma_{zxz}=\sigma_{zzx}$, $\sigma_{xyy}=\sigma_{yxy}=\sigma_{yyx}$, σ_{xxx}	$\sigma_{zxz}=\sigma_{zzx}$, $\sigma_{yxy}=\sigma_{yyx}$, σ_{xzz}, σ_{xyy}, σ_{xxx}	×
292	$LiCoPO_4$ (0.193)	Collinear	$P^{-1}\mathrm{n}^{1}\mathrm{m}^{1}\mathrm{a}^{\infty\mathrm{m}}1$	$\sigma_{xzz}=\sigma_{zxz}=\sigma_{zzx}$, $\sigma_{xyy}=\sigma_{yxy}=\sigma_{yyx}$, σ_{xxx}	$\sigma_{zxz}=\sigma_{zzx}$, $\sigma_{yxy}=\sigma_{yyx}$, σ_{xzz}, σ_{xyy}, σ_{xxx}	×

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Table S4 : (continued) Antiferromagnets in MAGNDATA without second-order transport tensors triggered by magnetic geometry.

No.	Materials (ID)	Configuration	Spin space group	with SOC		
				IMD	QMD	BCD
293	$SrEr_2O_4$ (0.216)	Collinear	$P^{-1}n^1m^1a^{\infty m}1$	$\sigma_{xzz} = \sigma_{zxz} = \sigma_{zzx}$, $\sigma_{xyy} = \sigma_{yxy} = \sigma_{yyx}$, σ_{xxx}	$\sigma_{zxz} = \sigma_{zzx}$, $\sigma_{yxy} = \sigma_{yyx}$, σ_{xzz}, σ_{xyy}, σ_{xxx}	×
294	$LiMnPO_4$ (0.24)	Collinear	$P^{-1}n^1m^1a^{\infty m}1$	$\sigma_{xyz} = \sigma_{xzy} = \sigma_{yxz} = \sigma_{yzx} = \sigma_{zxy} = \sigma_{zyx}$	$\sigma_{zxy} = \sigma_{zyx}$, $\sigma_{yxz} = \sigma_{yzx}$, $\sigma_{xyz} = \sigma_{xzy}$	×
295	Tb_2ReC_2 (0.346)	Collinear	$P^{-1}n^1m^1a^{\infty m}1$	$\sigma_{xzz} = \sigma_{zxz} = \sigma_{zzx}$, $\sigma_{xyy} = \sigma_{yxy} = \sigma_{yyx}$, σ_{xxx}	$\sigma_{zxz} = \sigma_{zzx}$, $\sigma_{yxy} = \sigma_{yyx}$, σ_{xzz}, σ_{xyy}, σ_{xxx}	×
296	$RbFeCl_5(D_2O)$ (0.362)	Collinear	$P^{-1}n^1m^1a^{\infty m}1$	$\sigma_{xyz} = \sigma_{xzy} = \sigma_{yxz} = \sigma_{yzx} = \sigma_{zxy} = \sigma_{zyx}$	$\sigma_{zxy} = \sigma_{zyx}$, $\sigma_{yxz} = \sigma_{yzx}$, $\sigma_{xyz} = \sigma_{xzy}$	×
297	$KFeCl_5(D_2O)$ (0.363)	Collinear	$P^{-1}n^1m^1a^{\infty m}1$	$\sigma_{xyz} = \sigma_{xzy} = \sigma_{yxz} = \sigma_{yzx} = \sigma_{zxy} = \sigma_{zyx}$	$\sigma_{zxy} = \sigma_{zyx}$, $\sigma_{yxz} = \sigma_{yzx}$, $\sigma_{xyz} = \sigma_{xzy}$	×
298	$LiCoPO_4$ (0.383)	Collinear	$P^{-1}n^1m^1a^{\infty m}1$	$\sigma_{xzz} = \sigma_{zxz} = \sigma_{zzx}$, $\sigma_{xyy} = \sigma_{yxy} = \sigma_{yyx}$, σ_{xxx}	$\sigma_{zxz} = \sigma_{zzx}$, $\sigma_{yxy} = \sigma_{yyx}$, σ_{xzz}, σ_{xyy}, σ_{xxx}	×
299	$LiMnPO_4$ (0.382)	Collinear	$P^{-1}n^1m^1a^{\infty m}1$	$\sigma_{xyz} = \sigma_{xzy} = \sigma_{yxz} = \sigma_{yzx} = \sigma_{zxy} = \sigma_{zyx}$	$\sigma_{zxy} = \sigma_{zyx}$, $\sigma_{yxz} = \sigma_{yzx}$, $\sigma_{xyz} = \sigma_{xzy}$	×
300	$LiCoPO_4$ (0.384)	Collinear	$P^{-1}n^1m^1a^{\infty m}1$	$\sigma_{yzz} = \sigma_{zyz} = \sigma_{zzy}$, $\sigma_{xzz} = \sigma_{zxz} = \sigma_{zzx}$, σ_{yyy}, $\sigma_{xyy} = \sigma_{yxy} = \sigma_{yyx}$, $\sigma_{xxy} = \sigma_{xyx} = \sigma_{yxx}$, σ_{xxx}	$\sigma_{zyz} = \sigma_{zzy}$, $\sigma_{zxz} = \sigma_{zzx}$, σ_{yyz}, σ_{yyy}, $\sigma_{yxy} = \sigma_{yyx}$, σ_{yxx}, σ_{xzz}, σ_{xyy}, $\sigma_{xxy} = \sigma_{xyx}$, σ_{xxx}	×
301	FeOOH (0.399)	Collinear	$P^{-1}n^1m^1a^{\infty m}1$	$\sigma_{xzz} = \sigma_{zxz} = \sigma_{zzx}$, $\sigma_{xyy} = \sigma_{yxy} = \sigma_{yyx}$, σ_{xxx}	$\sigma_{zxz} = \sigma_{zzx}$, $\sigma_{yxy} = \sigma_{yyx}$, σ_{xzz}, σ_{xyy}, σ_{xxx}	×

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Table S4 : (continued) Antiferromagnets in MAGNDATA without second-order transport tensors triggered by magnetic geometry.

No.	Materials (ID)	Configuration	Spin space group	with SOC		
				IMD	QMD	BCD
302	$EuMnSb_2$ (0.421)	Collinear	$P^{-1}n^{1}m^{1}a^{\infty m}1$	$\sigma_{xyz} = \sigma_{xzy} = \sigma_{yxz} = \sigma_{yzx} = \sigma_{zxy} = \sigma_{zyx}$	$\sigma_{zxy} = \sigma_{zyx}$, $\sigma_{yxz} = \sigma_{yzx}$, $\sigma_{xyz} = \sigma_{xzy}$	×
303	$EuMnSb_2$ (0.423)	Collinear	$P^{-1}n^{1}m^{1}a^{\infty m}1$	$\sigma_{xyz} = \sigma_{xzy} = \sigma_{yxz} = \sigma_{yzx} = \sigma_{zxy} = \sigma_{zyx}$	$\sigma_{zxy} = \sigma_{zyx}$, $\sigma_{yxz} = \sigma_{yzx}$, $\sigma_{xyz} = \sigma_{xzy}$	×
304	$MnPd_2$ (0.798)	Collinear	$P^{-1}n^{1}m^{1}a^{\infty m}1$	$\sigma_{xzz} = \sigma_{zxz} = \sigma_{zzx}$, $\sigma_{xyy} = \sigma_{yxy} = \sigma_{yyx}$, σ_{xxx}	$\sigma_{zxz} = \sigma_{zzx}$, $\sigma_{yxy} = \sigma_{yyx}$, σ_{xzz}, σ_{xyy}, σ_{xxx}	×
305	$SrGd_2O_4$ (0.821)	Collinear	$P^{-1}n^{1}m^{1}a^{\infty m}1$	$\sigma_{xzz} = \sigma_{zxz} = \sigma_{zzx}$, $\sigma_{xyy} = \sigma_{yxy} = \sigma_{yyx}$, σ_{xxx}	$\sigma_{zxz} = \sigma_{zzx}$, $\sigma_{yxy} = \sigma_{yyx}$, σ_{xzz}, σ_{xyy}, σ_{xxx}	×
306	$NaFePO_4$ (0.87)	Collinear	$P^{-1}n^{1}m^{1}a^{\infty m}1$	$\sigma_{xzz} = \sigma_{zxz} = \sigma_{zzx}$, $\sigma_{xyy} = \sigma_{yxy} = \sigma_{yyx}$, σ_{xxx}	$\sigma_{zxz} = \sigma_{zzx}$, $\sigma_{yxy} = \sigma_{yyx}$, σ_{xzz}, σ_{xyy}, σ_{xxx}	×
307	$KMn_4(PO_4)_3$ (0.86)	Collinear	$P^{-1}n^{1}m^{1}a^{\infty m}1$	$\sigma_{xzz} = \sigma_{zxz} = \sigma_{zzx}$, $\sigma_{xyy} = \sigma_{yxy} = \sigma_{yyx}$, σ_{xxx}	$\sigma_{zxz} = \sigma_{zzx}$, $\sigma_{yxy} = \sigma_{yyx}$, σ_{xzz}, σ_{xyy}, σ_{xxx}	×
308	$LiFePO_4$ (0.95)	Collinear	$P^{-1}n^{1}m^{1}a^{\infty m}1$	$\sigma_{xzz} = \sigma_{zxz} = \sigma_{zzx}$, $\sigma_{xyy} = \sigma_{yxy} = \sigma_{yyx}$, σ_{xxx}	$\sigma_{zxz} = \sigma_{zzx}$, $\sigma_{yxy} = \sigma_{yyx}$, σ_{xzz}, σ_{xyy}, σ_{xxx}	×
309	$CaFe_2O_4$ (0.969)	Collinear	$P^{-1}n^{1}m^{1}a^{\infty m}1$	$\sigma_{xzz} = \sigma_{zxz} = \sigma_{zzx}$, $\sigma_{xyy} = \sigma_{yxy} = \sigma_{yyx}$, σ_{xxx}	$\sigma_{zxz} = \sigma_{zzx}$, $\sigma_{yxy} = \sigma_{yyx}$, σ_{xzz}, σ_{xyy}, σ_{xxx}	×
310	$NdMnO_3$ (0.609)	Collinear	$P^{-1}n^{-1}m^{1}a^{\infty m}1$	×	×	×
311	$RbFeO_2$ (0.455)	Collinear	$P^{1}b^{1}c^{-1}a^{\infty m}1$	$\sigma_{xyz} = \sigma_{xzy} = \sigma_{yxz} = \sigma_{yzx} = \sigma_{zxy} = \sigma_{zyx}$	$\sigma_{zxy} = \sigma_{zyx}$, $\sigma_{yxz} = \sigma_{yzx}$, $\sigma_{xyz} = \sigma_{xzy}$	×

Continued on next page

Table S4 : (continued) Antiferromagnets in MAGNDATA without second-order transport tensors triggered by magnetic geometry.

No.	Materials (ID)	Configuration	Spin space group	with SOC		
				IMD	QMD	BCD
312	$CsFeO_2$ (0.457)	Collinear	$P^{1}\mathrm{b}^{1}\mathrm{c}^{-1}\mathrm{a}^{\infty\mathrm{m}}1$	$\sigma_{xyz} = \sigma_{xzy} = \sigma_{yxz} = \sigma_{yzx} = \sigma_{zxy} = \sigma_{zyx}$	$\sigma_{zxy} = \sigma_{zyx}$, $\sigma_{yxz} = \sigma_{yzx}$, $\sigma_{xyz} = \sigma_{xzy}$	×
313	$KFeO_2$ (0.459)	Collinear	$P^{1}\mathrm{b}^{1}\mathrm{c}^{-1}\mathrm{a}^{\infty\mathrm{m}}1$	$\sigma_{xzz} = \sigma_{zxz} = \sigma_{zzx}$, $\sigma_{xyy} = \sigma_{yxy} = \sigma_{yyx}$, σ_{xxx}	$\sigma_{zxz} = \sigma_{zzx}$, $\sigma_{yxy} = \sigma_{yyx}$, σ_{xzz}, σ_{xyy}, σ_{xxx}	×
314	$KFeO_2$ (0.460)	Collinear	$P^{1}\mathrm{b}^{1}\mathrm{c}^{-1}\mathrm{a}^{\infty\mathrm{m}}1$	$\sigma_{xzz} = \sigma_{zxz} = \sigma_{zzx}$, $\sigma_{xyy} = \sigma_{yxy} = \sigma_{yyx}$, σ_{xxx}	$\sigma_{zxz} = \sigma_{zzx}$, $\sigma_{yxy} = \sigma_{yyx}$, σ_{xzz}, σ_{xyy}, σ_{xxx}	×
315	$Li_{1.5}Fe(SO_4)_2$ (0.245)	Collinear	$P^{1}\mathrm{b}^{1}\mathrm{c}^{-1}\mathrm{a}^{\infty\mathrm{m}}1$	$\sigma_{yzz} = \sigma_{zyz} = \sigma_{zzy}$, $\sigma_{xzz} = \sigma_{zxz} = \sigma_{zzx}$, σ_{yyy}, $\sigma_{xyy} = \sigma_{yxy} = \sigma_{yyx}$, $\sigma_{xxy} = \sigma_{xyx} = \sigma_{yxx}$, σ_{xxx}	$\sigma_{zyz} = \sigma_{zzy}$, $\sigma_{zxz} = \sigma_{zzx}$, σ_{yzz}, σ_{yyy}, $\sigma_{yxy} = \sigma_{yyx}$, σ_{yxx}, σ_{xzz}, σ_{xyy}, $\sigma_{xxy} = \sigma_{xyx}$, σ_{xxx}	×
316	$LiFe(SO_4)_2$ (0.246)	Collinear	$P^{1}\mathrm{b}^{1}\mathrm{c}^{-1}\mathrm{a}^{\infty\mathrm{m}}1$	$\sigma_{xyz} = \sigma_{xzy} = \sigma_{yxz} = \sigma_{yzx} = \sigma_{zxy} = \sigma_{zyx}$	$\sigma_{zxy} = \sigma_{zyx}$, $\sigma_{yxz} = \sigma_{yzx}$, $\sigma_{xyz} = \sigma_{xzy}$	×
317	$Li_2Co(SO_4)_2$ (0.244)	Collinear	$P^{1}\mathrm{b}^{1}\mathrm{c}^{-1}\mathrm{a}^{\infty\mathrm{m}}1$	$\sigma_{xyz} = \sigma_{xzy} = \sigma_{yxz} = \sigma_{yzx} = \sigma_{zxy} = \sigma_{zyx}$	$\sigma_{zxy} = \sigma_{zyx}$, $\sigma_{yxz} = \sigma_{yzx}$, $\sigma_{xyz} = \sigma_{xzy}$	×
318	$Li_2Fe(SO_4)_2$ (0.243)	Collinear	$P^{1}\mathrm{b}^{1}\mathrm{c}^{-1}\mathrm{a}^{\infty\mathrm{m}}1$	$\sigma_{yzz} = \sigma_{zyz} = \sigma_{zzy}$, $\sigma_{xzz} = \sigma_{zxz} = \sigma_{zzx}$, σ_{yyy}, $\sigma_{xyy} = \sigma_{yxy} = \sigma_{yyx}$, $\sigma_{xxy} = \sigma_{xyx} = \sigma_{yxx}$, σ_{xxx}	$\sigma_{zyz} = \sigma_{zzy}$, $\sigma_{zxz} = \sigma_{zzx}$, σ_{yzz}, σ_{yyy}, $\sigma_{yxy} = \sigma_{yyx}$, σ_{yxx}, σ_{xzz}, σ_{xyy}, $\sigma_{xxy} = \sigma_{xyx}$, σ_{xxx}	×
319	$Li_2Ni(SO_4)_2$ (0.71)	Collinear	$P^{1}\mathrm{b}^{1}\mathrm{c}^{-1}\mathrm{a}^{\infty\mathrm{m}}1$	$\sigma_{xyz} = \sigma_{xzy} = \sigma_{yxz} = \sigma_{yzx} = \sigma_{zxy} = \sigma_{zyx}$	$\sigma_{zxy} = \sigma_{zyx}$, $\sigma_{yxz} = \sigma_{yzx}$, $\sigma_{xyz} = \sigma_{xzy}$	×
320	$CoNb_2O_6$ (1.656)	Collinear	$P^{1}2_{1}/^{1}\mathrm{c}^{-1}(1/2\ \ 0\ \ 0)^{\infty\mathrm{m}}1$	×	×	×

Continued on next page

Table S4 : (continued) Antiferromagnets in MAGNDATA without second-order transport tensors triggered by magnetic geometry.

No.	Materials (ID)	Configuration	Spin space group	with SOC		
				IMD	QMD	BCD
321	Fe_2WO_6 (0.814)	Collinear	$P^{1}\mathrm{b}^{-1}\mathrm{c}^{1}\mathrm{n}^{\infty\mathrm{m}}1$	$\sigma_{xzz} = \sigma_{zxz} = \sigma_{zzx}$, $\sigma_{xyy} = \sigma_{yxy} = \sigma_{yyx}$, σ_{xxx}	$\sigma_{zxz} = \sigma_{zzx}$, $\sigma_{yxy} = \sigma_{yyx}$, σ_{xzz}, σ_{xyy}, σ_{xxx}	×
322	$CoSe_2O_5$ (0.161)	Collinear	$P^{-1}\mathrm{b}^{-1}\mathrm{c}^{-1}\mathrm{n}^{\infty\mathrm{m}}1$	$\sigma_{xzz} = \sigma_{zxz} = \sigma_{zzx}$, $\sigma_{xyy} = \sigma_{yxy} = \sigma_{yyx}$, σ_{xxx}	$\sigma_{zxz} = \sigma_{zzx}$, $\sigma_{yxy} = \sigma_{yyx}$, σ_{xzz}, σ_{xyy}, σ_{xxx}	×
323	$MnTa_2O_6$ (0.816)	Collinear	$P^{-1}\mathrm{b}^{-1}\mathrm{c}^{-1}\mathrm{n}^{\infty\mathrm{m}}1$	$\sigma_{xzz} = \sigma_{zxz} = \sigma_{zzx}$, $\sigma_{xyy} = \sigma_{yxy} = \sigma_{yyx}$, σ_{xxx}	$\sigma_{zxz} = \sigma_{zzx}$, $\sigma_{yxy} = \sigma_{yyx}$, σ_{xzz}, σ_{xyy}, σ_{xxx}	×
324	$MnNb_2O_6$ (0.815)	Collinear	$P^{-1}\mathrm{b}^{-1}\mathrm{c}^{-1}\mathrm{n}^{\infty\mathrm{m}}1$	$\sigma_{xzz} = \sigma_{zxz} = \sigma_{zzx}$, $\sigma_{xyy} = \sigma_{yxy} = \sigma_{yyx}$, σ_{xxx}	$\sigma_{zxz} = \sigma_{zzx}$, $\sigma_{yxy} = \sigma_{yyx}$, σ_{xzz}, σ_{xyy}, σ_{xxx}	×
325	DyRuAsO (0.451)	Collinear	$P^{1}\mathrm{m}^{1}\mathrm{m}^{-1}\mathrm{n}^{\infty\mathrm{m}}1$	$\sigma_{xzz} = \sigma_{zxz} = \sigma_{zzx}$, $\sigma_{xyy} = \sigma_{yxy} = \sigma_{yyx}$, σ_{xxx}	$\sigma_{zxz} = \sigma_{zzx}$, $\sigma_{yxy} = \sigma_{yyx}$, σ_{xzz}, σ_{xyy}, σ_{xxx}	×
326	$[C(ND_2)_3]Mn(DCOO)_3$ (0.256)	Collinear	$P^{1}\mathrm{n}^{-1}\mathrm{n}^{-1}\mathrm{a}^{\infty\mathrm{m}}1$	×	×	×
327	$CaMnGe_2O_6$ (0.155)	Collinear	$C^{1}2/^{-1}\mathrm{c}^{\infty\mathrm{m}}1$	σ_{zzz}, $\sigma_{yzz} = \sigma_{zyz} = \sigma_{zzy}$, $\sigma_{xzz} = \sigma_{zxz} = \sigma_{zzx}$, $\sigma_{yyz} = \sigma_{yzy} = \sigma_{zyy}$, $\sigma_{xyz} = \sigma_{xzy} = \sigma_{yxz} = \sigma_{yzx} = \sigma_{zxy} = \sigma_{zyx}$, $\sigma_{xxz} = \sigma_{xzx} = \sigma_{zxx}$, σ_{yyy}, $\sigma_{xyy} = \sigma_{yxy} = \sigma_{yyx}$, $\sigma_{xxy} = \sigma_{xyx} = \sigma_{yxx}$, σ_{xxx}	σ_{zzz}, $\sigma_{zyz} = \sigma_{zzy}$, $\sigma_{zxz} = \sigma_{zzx}$, σ_{zyy}, $\sigma_{zxy} = \sigma_{zyx}$, σ_{zxx}, σ_{yzz}, $\sigma_{yyz} = \sigma_{yzy}$, $\sigma_{yxz} = \sigma_{yzx}$, σ_{yyy}, $\sigma_{yxy} = \sigma_{yyx}$, σ_{yxx}, σ_{xzz}, $\sigma_{xyz} = \sigma_{xzy}$, $\sigma_{xxz} = \sigma_{xzx}$, σ_{xyy}, $\sigma_{xxy} = \sigma_{xyx}$, σ_{xxx}	×

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Table S4 : (continued) Antiferromagnets in MAGNDATA without second-order transport tensors triggered by magnetic geometry.

No.	Materials (ID)	Configuration	Spin space group	with SOC		
				IMD	QMD	BCD
328	$CaMnGe_2O_6$ (0.156)	Collinear	$C^{1}2/^{-1}c^{\infty m}1$	$\sigma_{yzz} = \sigma_{zyz} = \sigma_{zzy}$, $\sigma_{xzz} = \sigma_{zxz} = \sigma_{zzx}$, σ_{yyy}, $\sigma_{xyy} = \sigma_{yxy} = \sigma_{yyx}$, $\sigma_{xxy} = \sigma_{xyx} = \sigma_{yxx}$, σ_{xxx}	$\sigma_{zyz} = \sigma_{zzy}$, $\sigma_{zxz} = \sigma_{zzx}$, σ_{yzz}, σ_{yyy}, $\sigma_{yxy} = \sigma_{yyx}$, σ_{yxx}, σ_{xzz}, σ_{xyy}, $\sigma_{xxy} = \sigma_{xyx}$, σ_{xxx}	×
329	$MnGeO_3$ (0.312)	Collinear	$C^{1}2/^{-1}c^{\infty m}1$	$\sigma_{yzz} = \sigma_{zyz} = \sigma_{zzy}$, $\sigma_{xzz} = \sigma_{zxz} = \sigma_{zzx}$, σ_{yyy}, $\sigma_{xyy} = \sigma_{yxy} = \sigma_{yyx}$, $\sigma_{xxy} = \sigma_{xyx} = \sigma_{yxx}$, σ_{xxx}	$\sigma_{zyz} = \sigma_{zzy}$, $\sigma_{zxz} = \sigma_{zzx}$, σ_{yzz}, σ_{yyy}, $\sigma_{yxy} = \sigma_{yyx}$, σ_{yxx}, σ_{xzz}, σ_{xyy}, $\sigma_{xxy} = \sigma_{xyx}$, σ_{xxx}	×
330	$NaCrSi_2O_6$ (0.504)	Collinear	$C^{1}2/^{-1}c^{\infty m}1$	σ_{zzz}, $\sigma_{yzz} = \sigma_{zyz} = \sigma_{zzy}$, $\sigma_{xzz} = \sigma_{zxz} = \sigma_{zzx}$, $\sigma_{yyz} = \sigma_{yzy} = \sigma_{zyy}$, $\sigma_{xyz} = \sigma_{xzy} = \sigma_{yxz} = \sigma_{yzx} = \sigma_{zxy} = \sigma_{zyx}$, $\sigma_{xxz} = \sigma_{xzx} = \sigma_{zxx}$, σ_{yyy}, $\sigma_{xyy} = \sigma_{yxy} = \sigma_{yyx}$, $\sigma_{xxy} = \sigma_{xyx} = \sigma_{yxx}$, σ_{xxx}	σ_{zzz}, $\sigma_{zyz} = \sigma_{zzy}$, $\sigma_{zxz} = \sigma_{zzx}$, σ_{zyy}, $\sigma_{zxy} = \sigma_{zyx}$, σ_{zxx}, σ_{yzz}, $\sigma_{yyz} = \sigma_{yzy}$, $\sigma_{yxz} = \sigma_{yzx}$, σ_{yyy}, $\sigma_{yxy} = \sigma_{yyx}$, σ_{yxx}, σ_{xzz}, $\sigma_{xyz} = \sigma_{xzy}$, $\sigma_{xxz} = \sigma_{xzx}$, σ_{xyy}, $\sigma_{xxy} = \sigma_{xyx}$, σ_{xxx}	×
331	$KFeSe_2$ (0.637)	Collinear	$C^{1}2/^{-1}c^{\infty m}1$	σ_{zzz}, $\sigma_{yyz} = \sigma_{yzy} = \sigma_{zyy}$, $\sigma_{xyz} = \sigma_{xzy} = \sigma_{yxz} = \sigma_{yzx} = \sigma_{zxy} = \sigma_{zyx}$, $\sigma_{xxz} = \sigma_{xzx} = \sigma_{zxx}$	σ_{zzz}, σ_{zyy}, $\sigma_{zxy} = \sigma_{zyx}$, σ_{zxx}, $\sigma_{yyz} = \sigma_{yzy}$, $\sigma_{yxz} = \sigma_{yzx}$, $\sigma_{xyz} = \sigma_{xzy}$, $\sigma_{xxz} = \sigma_{xzx}$	×

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Table S4 : (continued) Antiferromagnets in MAGNDATA without second-order transport tensors triggered by magnetic geometry.

No.	Materials (ID)	Configuration	Spin space group	with SOC		
				IMD	QMD	BCD
332	$RbFeSe_2$ (0.638)	Collinear	$C^{1}2/^{-1}c^{\infty m}1$	σ_{zzz}, $\sigma_{yyz} = \sigma_{yzy} = \sigma_{zyy}$, $\sigma_{xyz} = \sigma_{xzy} = \sigma_{yxz} = \sigma_{yzx} = \sigma_{zxy} = \sigma_{zyx}$, $\sigma_{xxz} = \sigma_{xzx} = \sigma_{zxx}$	σ_{zzz}, σ_{zyy}, $\sigma_{zxy} = \sigma_{zyx}$, σ_{zxx}, $\sigma_{yyz} = \sigma_{yzy}$, $\sigma_{yxz} = \sigma_{yzx}$, $\sigma_{xyz} = \sigma_{xzy}$, $\sigma_{xxz} = \sigma_{xzx}$	×
333	$KFeS_2$ (0.633)	Collinear	$C^{1}2/^{-1}c^{\infty m}1$	$\sigma_{yzz} = \sigma_{zyz} = \sigma_{zzy}$, $\sigma_{xzz} = \sigma_{zxz} = \sigma_{zzx}$, σ_{yyy}, $\sigma_{xyy} = \sigma_{yxy} = \sigma_{yyx}$, $\sigma_{xxy} = \sigma_{xyx} = \sigma_{yxx}$, σ_{xxx}	$\sigma_{zyz} = \sigma_{zzy}$, $\sigma_{zxz} = \sigma_{zzx}$, σ_{yzz}, σ_{yyy}, $\sigma_{yxy} = \sigma_{yyx}$, σ_{yxx}, σ_{xzz}, σ_{xyy}, $\sigma_{xxy} = \sigma_{xyx}$, σ_{xxx}	×
334	$RbFeS_2$ (0.636)	Collinear	$C^{1}2/^{-1}c^{\infty m}1$	$\sigma_{yzz} = \sigma_{zyz} = \sigma_{zzy}$, $\sigma_{xzz} = \sigma_{zxz} = \sigma_{zzx}$, σ_{yyy}, $\sigma_{xyy} = \sigma_{yxy} = \sigma_{yyx}$, $\sigma_{xxy} = \sigma_{xyx} = \sigma_{yxx}$, σ_{xxx}	$\sigma_{zyz} = \sigma_{zzy}$, $\sigma_{zxz} = \sigma_{zzx}$, σ_{yzz}, σ_{yyy}, $\sigma_{yxy} = \sigma_{yyx}$, σ_{yxx}, σ_{xzz}, σ_{xyy}, $\sigma_{xxy} = \sigma_{xyx}$, σ_{xxx}	×
335	$Cs_2FeCl_5{\cdot}D_2O$ (0.252)	Collinear	$C^{-1}2/^{1}c^{\infty m}1$	$\sigma_{yzz} = \sigma_{zyz} = \sigma_{zzy}$, $\sigma_{xzz} = \sigma_{zxz} = \sigma_{zzx}$, σ_{yyy}, $\sigma_{xyy} = \sigma_{yxy} = \sigma_{yyx}$, $\sigma_{xxy} = \sigma_{xyx} = \sigma_{yxx}$, σ_{xxx}	$\sigma_{zyz} = \sigma_{zzy}$, $\sigma_{zxz} = \sigma_{zzx}$, σ_{yzz}, σ_{yyy}, $\sigma_{yxy} = \sigma_{yyx}$, σ_{yxx}, σ_{xzz}, σ_{xyy}, $\sigma_{xxy} = \sigma_{xyx}$, σ_{xxx}	×
336	$Fe_4Nb_2O_9$ (0.442)	Collinear	$C^{-1}2/^{1}c^{\infty m}1$	σ_{zzz}, $\sigma_{yyz} = \sigma_{yzy} = \sigma_{zyy}$, $\sigma_{xyz} = \sigma_{xzy} = \sigma_{yxz} = \sigma_{yzx} = \sigma_{zxy} = \sigma_{zyx}$, $\sigma_{xxz} = \sigma_{xzx} = \sigma_{zxx}$	σ_{zzz}, σ_{zyy}, $\sigma_{zxy} = \sigma_{zyx}$, σ_{zxx}, $\sigma_{yyz} = \sigma_{yzy}$, $\sigma_{yxz} = \sigma_{yzx}$, $\sigma_{xyz} = \sigma_{xzy}$, $\sigma_{xxz} = \sigma_{xzx}$	×

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Table S4 : (continued) Antiferromagnets in MAGNDATA without second-order transport tensors triggered by magnetic geometry.

No.	Materials (ID)	Configuration	Spin space group	with SOC		
				IMD	QMD	BCD
337	$Cs_2[FeCl_5(H_2O)]$ (0.476)	Collinear	$C^{-1}2/^{1}c^{\infty m}1$	$\sigma_{yzz} = \sigma_{zyz} = \sigma_{zzy}$, $\sigma_{xzz} = \sigma_{zxz} = \sigma_{zzx}$, σ_{yyy}, $\sigma_{xyy} = \sigma_{yxy} = \sigma_{yyx}$, $\sigma_{xxy} = \sigma_{xyx} = \sigma_{yxx}$, σ_{xxx}	$\sigma_{zyz} = \sigma_{zzy}$, $\sigma_{zxz} = \sigma_{zzx}$, σ_{yzz}, σ_{yyy}, $\sigma_{yxy} = \sigma_{yyx}$, σ_{yxx}, σ_{xzz}, σ_{xyy}, $\sigma_{xxy} = \sigma_{xyx}$, σ_{xxx}	×
338	CuO (1.62)	Collinear	$P^{1}2_1/^{1}c^{-1}(1/2\ \ 0\ \ 0)^{\infty m}1$	×	×	×
339	$LiCrGe_2O_6$ (0.217)	Collinear	$P^{1}2_1/^{-1}c^{\infty m}1$	$\sigma_{yzz} = \sigma_{zyz} = \sigma_{zzy}$, $\sigma_{xzz} = \sigma_{zxz} = \sigma_{zzx}$, σ_{yyy}, $\sigma_{xyy} = \sigma_{yxy} = \sigma_{yyx}$, $\sigma_{xxy} = \sigma_{xyx} = \sigma_{yxx}$, σ_{xxx}	$\sigma_{zyz} = \sigma_{zzy}$, $\sigma_{zxz} = \sigma_{zzx}$, σ_{yzz}, σ_{yyy}, $\sigma_{yxy} = \sigma_{yyx}$, σ_{yxx}, σ_{xzz}, σ_{xyy}, $\sigma_{xxy} = \sigma_{xyx}$, σ_{xxx}	×
340	$Pb_2VO(PO_4)_2$ (0.505)	Collinear	$P^{1}2_1/^{-1}c^{\infty m}1$	σ_{zzz}, $\sigma_{yyz} = \sigma_{yzy} = \sigma_{zyy}$, $\sigma_{xyz} = \sigma_{xzy} = \sigma_{yxz} = \sigma_{yzx} = \sigma_{zxy} = \sigma_{zyx}$, $\sigma_{xxz} = \sigma_{xzx} = \sigma_{zxx}$	σ_{zzz}, σ_{zyy}, $\sigma_{zxy} = \sigma_{zyx}$, σ_{zxx}, $\sigma_{yyz} = \sigma_{yzy}$, $\sigma_{yxz} = \sigma_{yzx}$, $\sigma_{xyz} = \sigma_{xzy}$, $\sigma_{xxz} = \sigma_{xzx}$	×
341	$LiCrGe_2O_6$ (0.961)	Collinear	$P^{1}2_1/^{-1}c^{\infty m}1$	$\sigma_{yzz} = \sigma_{zyz} = \sigma_{zzy}$, $\sigma_{xzz} = \sigma_{zxz} = \sigma_{zzx}$, σ_{yyy}, $\sigma_{xyy} = \sigma_{yxy} = \sigma_{yyx}$, $\sigma_{xxy} = \sigma_{xyx} = \sigma_{yxx}$, σ_{xxx}	$\sigma_{zyz} = \sigma_{zzy}$, $\sigma_{zxz} = \sigma_{zzx}$, σ_{yzz}, σ_{yyy}, $\sigma_{yxy} = \sigma_{yyx}$, σ_{yxx}, σ_{xzz}, σ_{xyy}, $\sigma_{xxy} = \sigma_{xyx}$, σ_{xxx}	×
342	$LiCrGe_2O_6$ (0.962)	Collinear	$P^{1}2_1/^{-1}c^{\infty m}1$	$\sigma_{yzz} = \sigma_{zyz} = \sigma_{zzy}$, $\sigma_{xzz} = \sigma_{zxz} = \sigma_{zzx}$, σ_{yyy}, $\sigma_{xyy} = \sigma_{yxy} = \sigma_{yyx}$, $\sigma_{xxy} = \sigma_{xyx} = \sigma_{yxx}$, σ_{xxx}	$\sigma_{zyz} = \sigma_{zzy}$, $\sigma_{zxz} = \sigma_{zzx}$, σ_{yzz}, σ_{yyy}, $\sigma_{yxy} = \sigma_{yyx}$, σ_{yxx}, σ_{xzz}, σ_{xyy}, $\sigma_{xxy} = \sigma_{xyx}$, σ_{xxx}	×

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Table S4 : (continued) Antiferromagnets in MAGNDATA without second-order transport tensors triggered by magnetic geometry.

No.	Materials (ID)	Configuration	Spin space group	with SOC		
				IMD	QMD	BCD
343	$LiCrGe_2O_6$ (0.963)	Collinear	$P^{1}2_{1}/^{-1}c^{\infty m}1$	$\sigma_{yzz}=\sigma_{zyz}=\sigma_{zzy}$, $\sigma_{xzz}=\sigma_{zxz}=\sigma_{zzx}$, σ_{yyy}, $\sigma_{xyy}=\sigma_{yxy}=\sigma_{yyx}$, $\sigma_{xxy}=\sigma_{xyx}=\sigma_{yxx}$, σ_{xxx}	$\sigma_{zyz}=\sigma_{zzy}$, $\sigma_{zxz}=\sigma_{zzx}$, σ_{yzz}, σ_{yyy}, $\sigma_{yxy}=\sigma_{yyx}$, σ_{yxx}, σ_{xzz}, σ_{xyy}, $\sigma_{xxy}=\sigma_{xyx}$, σ_{xxx}	×
344	$LiCrGe_2O_6$ (0.964)	Collinear	$P^{1}2_{1}/^{-1}c^{\infty m}1$	$\sigma_{yzz}=\sigma_{zyz}=\sigma_{zzy}$, $\sigma_{xzz}=\sigma_{zxz}=\sigma_{zzx}$, σ_{yyy}, $\sigma_{xyy}=\sigma_{yxy}=\sigma_{yyx}$, $\sigma_{xxy}=\sigma_{xyx}=\sigma_{yxx}$, σ_{xxx}	$\sigma_{zyz}=\sigma_{zzy}$, $\sigma_{zxz}=\sigma_{zzx}$, σ_{yzz}, σ_{yyy}, $\sigma_{yxy}=\sigma_{yyx}$, σ_{yxx}, σ_{xzz}, σ_{xyy}, $\sigma_{xxy}=\sigma_{xyx}$, σ_{xxx}	×
345	$Fe_3(PO_4)_2$ (0.264)	Collinear	$P^{-1}2_{1}/^{1}c^{\infty m}1$	σ_{zzz}, $\sigma_{yyz}=\sigma_{yzy}=\sigma_{zyy}$, $\sigma_{xyz}=\sigma_{xzy}=\sigma_{yxz}=\sigma_{yzx}=\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{xxz}=\sigma_{xzx}=\sigma_{zxx}$	σ_{zzz}, σ_{zyy}, $\sigma_{zxy}=\sigma_{zyx}$, σ_{zxx}, $\sigma_{yyz}=\sigma_{yzy}$, $\sigma_{yxz}=\sigma_{yzx}$, $\sigma_{xyz}=\sigma_{xzy}$, $\sigma_{xxz}=\sigma_{xzx}$	×
346	Na_2MnPO_4F (0.827)	Collinear	$P^{-1}2_{1}/^{1}c^{\infty m}1$	σ_{zzz}, $\sigma_{yyz}=\sigma_{yzy}=\sigma_{zyy}$, $\sigma_{xyz}=\sigma_{xzy}=\sigma_{yxz}=\sigma_{yzx}=\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{xxz}=\sigma_{xzx}=\sigma_{zxx}$	σ_{zzz}, σ_{zyy}, $\sigma_{zxy}=\sigma_{zyx}$, σ_{zxx}, $\sigma_{yyz}=\sigma_{yzy}$, $\sigma_{yxz}=\sigma_{yzx}$, $\sigma_{xyz}=\sigma_{xzy}$, $\sigma_{xxz}=\sigma_{xzx}$	×
347	Na_2MnPO_4F (0.828)	Collinear	$P^{-1}2_{1}/^{1}c^{\infty m}1$	σ_{zzz}, $\sigma_{yyz}=\sigma_{yzy}=\sigma_{zyy}$, $\sigma_{xyz}=\sigma_{xzy}=\sigma_{yxz}=\sigma_{yzx}=\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{xxz}=\sigma_{xzx}=\sigma_{zxx}$	σ_{zzz}, σ_{zyy}, $\sigma_{zxy}=\sigma_{zyx}$, σ_{zxx}, $\sigma_{yyz}=\sigma_{yzy}$, $\sigma_{yxz}=\sigma_{yzx}$, $\sigma_{xyz}=\sigma_{xzy}$, $\sigma_{xxz}=\sigma_{xzx}$	×

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Table S4 : (continued) Antiferromagnets in MAGNDATA without second-order transport tensors triggered by magnetic geometry.

No.	Materials (ID)	Configuration	Spin space group	with SOC		
				IMD	QMD	BCD
348	Na_2MnPO_4F (0.830)	Collinear	$P^{-1}2_1/^1c^{\infty m}1$	σ_{zzz}, $\sigma_{yyz} = \sigma_{yzy} = \sigma_{zyy}$, $\sigma_{xyz} = \sigma_{xzy} = \sigma_{yxz} = \sigma_{yzx} = \sigma_{zxy} = \sigma_{zyx}$, $\sigma_{xxz} = \sigma_{xzx} = \sigma_{zxx}$	σ_{zzz}, σ_{zyy}, $\sigma_{zxy} = \sigma_{zyx}$, σ_{zxx}, $\sigma_{yyz} = \sigma_{yzy}$, $\sigma_{yxz} = \sigma_{yzx}$, $\sigma_{xyz} = \sigma_{xzy}$, $\sigma_{xxz} = \sigma_{xzx}$	×
349	Na_2MnPO_4F (0.829)	Collinear	$P^{-1}2_1/^1c^{\infty m}1$	σ_{zzz}, $\sigma_{yyz} = \sigma_{yzy} = \sigma_{zyy}$, $\sigma_{xyz} = \sigma_{xzy} = \sigma_{yxz} = \sigma_{yzx} = \sigma_{zxy} = \sigma_{zyx}$, $\sigma_{xxz} = \sigma_{xzx} = \sigma_{zxx}$	σ_{zzz}, σ_{zyy}, $\sigma_{zxy} = \sigma_{zyx}$, σ_{zxx}, $\sigma_{yyz} = \sigma_{yzy}$, $\sigma_{yxz} = \sigma_{yzx}$, $\sigma_{xyz} = \sigma_{xzy}$, $\sigma_{xxz} = \sigma_{xzx}$	×
350	Na_2RuO_4 (0.933)	Collinear	$P^{-1}2_1/^1c^{\infty m}1$	σ_{zzz}, $\sigma_{yyz} = \sigma_{yzy} = \sigma_{zyy}$, $\sigma_{xyz} = \sigma_{xzy} = \sigma_{yxz} = \sigma_{yzx} = \sigma_{zxy} = \sigma_{zyx}$, $\sigma_{xxz} = \sigma_{xzx} = \sigma_{zxx}$	σ_{zzz}, σ_{zyy}, $\sigma_{zxy} = \sigma_{zyx}$, σ_{zxx}, $\sigma_{yyz} = \sigma_{yzy}$, $\sigma_{yxz} = \sigma_{yzx}$, $\sigma_{xyz} = \sigma_{xzy}$, $\sigma_{xxz} = \sigma_{xzx}$	×
351	Sc_2NiMnO_6 (1.199)	Collinear	$P^12_1/^1c^{-1}(1/2\ \ 0\ \ 0)^{\infty m}1$	×	×	×
352	$Na_{0.5}Li_{0.5}FeGe_2O_6$ (1.276)	Collinear	$P^12_1/^1c^{-1}(1/2\ \ 0\ \ 0)^{\infty m}1$	×	×	×
353	$CuFe_2(P_2O_7)_2$ (1.297)	Collinear	$P^12_1/^1c^{-1}(1/2\ \ 0\ \ 0)^{\infty m}1$	×	×	×
354	$Li_{0.31}Na_{0.69}FeGe_2O_6$ (1.331)	Collinear	$P^12_1/^1c^{-1}(1/2\ \ 0\ \ 0)^{\infty m}1$	×	×	×
355	La_2CoPtO_6 (1.462)	Collinear	$P^12_1/^1c^{-1}(1/2\ \ 0\ \ 0)^{\infty m}1$	×	×	×
356	Mn_3TeO_6 (1.485)	Collinear	$P^12_1/^1c^{-1}(1/2\ \ 0\ \ 0)^{\infty m}1$	×	×	×
357	$LiCoF_4$ (1.526)	Collinear	$P^12_1/^1c^{-1}(1/2\ \ 0\ \ 0)^{\infty m}1$	×	×	×
358	$MnPb_4Sb_6S_{14}$ (1.63)	Collinear	$P^12_1/^1c^{-1}(1/2\ \ 0\ \ 0)^{\infty m}1$	×	×	×

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Table S4 : (continued) Antiferromagnets in MAGNDATA without second-order transport tensors triggered by magnetic geometry.

No.	Materials (ID)	Configuration	Spin space group	with SOC		
				IMD	QMD	BCD
359	Li_2MnSiO_4 (1.78)	Collinear	$P^{1}2_{1}/^{1}c^{-1}(1/2\ \ 0\ \ 0)^{\infty m}1$	×	×	×
360	$NiWO_4$ (1.194)	Collinear	$P^{1}2/^{1}c^{-1}(1/2\ \ 0\ \ 0)^{\infty m}1$	×	×	×
361	$Mn_{0.81}Cu_{0.19}WO_4$ (1.315)	Collinear	$P^{1}2/^{1}c^{-1}(1/2\ \ 0\ \ 0)^{\infty m}1$	×	×	×
362	$FeWO_4$ (1.653)	Collinear	$P^{1}2/^{1}c^{-1}(1/2\ \ 0\ \ 0)^{\infty m}1$	×	×	×
363	$MnPS_3$ (0.163)	Collinear	$C^{1}2/^{-1}m^{\infty m}1$	$\sigma_{yzz}=\sigma_{zyz}=\sigma_{zzy}$, $\sigma_{xzz}=\sigma_{zxz}=\sigma_{zzx}$, σ_{yyy}, $\sigma_{xyy}=\sigma_{yxy}=\sigma_{yyx}$, $\sigma_{xxy}=\sigma_{xyx}=\sigma_{yxx}$, σ_{xxx}	$\sigma_{zyz}=\sigma_{zzy}$, $\sigma_{zxz}=\sigma_{zzx}$, σ_{yzz}, σ_{yyy}, $\sigma_{yxy}=\sigma_{yyx}$, σ_{yxx}, σ_{xzz}, σ_{xyy}, $\sigma_{xxy}=\sigma_{xyx}$, σ_{xxx}	×
364	$YbCl_3$ (0.444)	Collinear	$C^{1}2/^{-1}m^{\infty m}1$	$\sigma_{yzz}=\sigma_{zyz}=\sigma_{zzy}$, $\sigma_{xzz}=\sigma_{zxz}=\sigma_{zzx}$, σ_{yyy}, $\sigma_{xyy}=\sigma_{yxy}=\sigma_{yyx}$, $\sigma_{xxy}=\sigma_{xyx}=\sigma_{yxx}$, σ_{xxx}	$\sigma_{zyz}=\sigma_{zzy}$, $\sigma_{zxz}=\sigma_{zzx}$, σ_{yzz}, σ_{yyy}, $\sigma_{yxy}=\sigma_{yyx}$, σ_{yxx}, σ_{xzz}, σ_{xyy}, $\sigma_{xxy}=\sigma_{xyx}$, σ_{xxx}	×
365	$Er_2Si_2O_7$ (0.527)	Collinear	$C^{1}2/^{-1}m^{\infty m}1$	$\sigma_{yzz}=\sigma_{zyz}=\sigma_{zzy}$, $\sigma_{xzz}=\sigma_{zxz}=\sigma_{zzx}$, σ_{yyy}, $\sigma_{xyy}=\sigma_{yxy}=\sigma_{yyx}$, $\sigma_{xxy}=\sigma_{xyx}=\sigma_{yxx}$, σ_{xxx}	$\sigma_{zyz}=\sigma_{zzy}$, $\sigma_{zxz}=\sigma_{zzx}$, σ_{yzz}, σ_{yyy}, $\sigma_{yxy}=\sigma_{yyx}$, σ_{yxx}, σ_{xzz}, σ_{xyy}, $\sigma_{xxy}=\sigma_{xyx}$, σ_{xxx}	×
366	$YbCl_3$ (0.585)	Collinear	$C^{1}2/^{-1}m^{\infty m}1$	$\sigma_{yzz}=\sigma_{zyz}=\sigma_{zzy}$, $\sigma_{xzz}=\sigma_{zxz}=\sigma_{zzx}$, σ_{yyy}, $\sigma_{xyy}=\sigma_{yxy}=\sigma_{yyx}$, $\sigma_{xxy}=\sigma_{xyx}=\sigma_{yxx}$, σ_{xxx}	$\sigma_{zyz}=\sigma_{zzy}$, $\sigma_{zxz}=\sigma_{zzx}$, σ_{yzz}, σ_{yyy}, $\sigma_{yxy}=\sigma_{yyx}$, σ_{yxx}, σ_{xzz}, σ_{xyy}, $\sigma_{xxy}=\sigma_{xyx}$, σ_{xxx}	×

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Table S4 : (continued) Antiferromagnets in MAGNDATA without second-order transport tensors triggered by magnetic geometry.

No.	Materials (ID)	Configuration	Spin space group	with SOC		
				IMD	QMD	BCD
367	$Er_2Si_2O_7$ (0.650)	Collinear	$C^{1}2/^{-1}\mathrm{m}^{\infty\mathrm{m}}1$	$\sigma_{yzz} = \sigma_{zyz} = \sigma_{zzy}$, $\sigma_{xzz} = \sigma_{zxz} = \sigma_{zzx}$, σ_{yyy}, $\sigma_{xyy} = \sigma_{yxy} = \sigma_{yyx}$, $\sigma_{xxy} = \sigma_{xyx} = \sigma_{yxx}$, σ_{xxx}	$\sigma_{zyz} = \sigma_{zzy}$, $\sigma_{zxz} = \sigma_{zzx}$, σ_{yzz}, σ_{yyy}, $\sigma_{yxy} = \sigma_{yyx}$, σ_{yxx}, σ_{xzz}, σ_{xyy}, $\sigma_{xxy} = \sigma_{xyx}$, σ_{xxx}	×
368	$YbCl_3$ (0.723)	Collinear	$C^{1}2/^{-1}\mathrm{m}^{\infty\mathrm{m}}1$	$\sigma_{yzz} = \sigma_{zyz} = \sigma_{zzy}$, $\sigma_{xzz} = \sigma_{zxz} = \sigma_{zzx}$, σ_{yyy}, $\sigma_{xyy} = \sigma_{yxy} = \sigma_{yyx}$, $\sigma_{xxy} = \sigma_{xyx} = \sigma_{yxx}$, σ_{xxx}	$\sigma_{zyz} = \sigma_{zzy}$, $\sigma_{zxz} = \sigma_{zzx}$, σ_{yzz}, σ_{yyy}, $\sigma_{yxy} = \sigma_{yyx}$, σ_{yxx}, σ_{xzz}, σ_{xyy}, $\sigma_{xxy} = \sigma_{xyx}$, σ_{xxx}	×
369	$Fe_{0.48}TiSe_2$ (1.268)	Collinear	$C^{1}2/^{1}\mathrm{m}^{1}(0\ \ 0\ \ 1/2)^{\infty\mathrm{m}}1$	×	×	×
370	$Fe_{0.48}TiSe_2$ (1.269)	Collinear	$C^{1}2/^{1}\mathrm{m}^{1}(0\ \ 0\ \ 1/2)^{\infty\mathrm{m}}1$	×	×	×
371	Ag_2NiO_2 (1.49)	Collinear	$C^{1}2/^{1}\mathrm{m}^{1}(0\ \ 0\ \ 1/2)^{\infty\mathrm{m}}1$	×	×	×
372	$CoV_2O_{6-alpha}$ (1.17)	Collinear	$C^{1}2/^{1}\mathrm{m}^{1}(0\ \ 0\ \ 1/2)^{\infty\mathrm{m}}1$	×	×	×
373	$Fe_{0.25}TiSe_2$ (1.270)	Collinear	$C^{1}2/^{1}\mathrm{m}^{1}(0\ \ 0\ \ 1/2)^{\infty\mathrm{m}}1$	×	×	×
374	UCr_2Si_2 (1.470)	Collinear	$C^{1}2/^{1}\mathrm{m}^{1}(0\ \ 0\ \ 1/2)^{\infty\mathrm{m}}1$	×	×	×
375	CoV_2O_6 (1.70)	Collinear	$C^{1}2/^{1}\mathrm{m}^{1}(0\ \ 0\ \ 1/2)^{\infty\mathrm{m}}1$	×	×	×
376	$GeCo_2O_4$ (1.564)	Coplanar	$R^{\mathrm{m}_{100}}\text{-}3^{1}\mathrm{m}\vert(1,1,2_{001};2_{001},1)^{m}1$	×	×	$\sigma_{yyz} = \sigma_{yzy} = -\sigma_{zyy}/2$, $\sigma_{zxy} = \sigma_{zyx}$, $\sigma_{xxz} = \sigma_{xzx} = -\sigma_{zxx}/2$, $\sigma_{yxz} = \sigma_{yzx}$, $\sigma_{xyz} = \sigma_{xzy}$

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Table S4 : (continued) Antiferromagnets in MAGNDATA without second-order transport tensors triggered by magnetic geometry.

No.	Materials (ID)	Configuration	Spin space group	with SOC		
				IMD	QMD	BCD
377	$GeNi_2O_4$ (1.562)	Coplanar	$R^{\mathrm{m}_{100}}$-$3^1\mathrm{m}\vert(1,1,2_{001};2_{001},1)^m1$	×	×	$\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zyy}/2$, $\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{xxz}=\sigma_{xzx}=-\sigma_{zxx}/2$, $\sigma_{yxz}=\sigma_{yzx}$, $\sigma_{xyz}=\sigma_{xzy}$
378	$DyBe_{13}$ (1.517)	Coplanar	$I^14/^{\mathrm{m}_{100}}\mathrm{m}^{2_{001}}\mathrm{c}^{2_{001}}\mathrm{m}\vert(1,1,1;2_{001})^m1$	×	×	$\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{yxz}=\sigma_{yzx}$, $\sigma_{xyz}=\sigma_{xzy}$
379	$TbBe_{13}$ (1.518)	Coplanar	$I^14/^{\mathrm{m}_{100}}\mathrm{m}^{2_{001}}\mathrm{c}^{2_{001}}\mathrm{m}\vert(1,1,1;2_{001})^m1$	×	×	$\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{yxz}=\sigma_{yzx}$, $\sigma_{xyz}=\sigma_{xzy}$
380	$CaMn_3V_4O_{12}$ (1.758)	Coplanar	$R^{3^1_{001}}$-$3\vert(1,1,2_{001};2_{001},1)^m1$	×	×	×
381	$LaMn_3V_4O_{12}$ (1.119)	Coplanar	$I^1\mathrm{m}^{3^1_{001}}$-$3\vert(1,1,1;2_{001})^m1$	×	×	×
382	$U_3Ru_4Al_{12}$ (0.12)	Coplanar	$C^{\mathrm{m}_{010}}\mathrm{m}^{\mathrm{m}_{100}}\mathrm{c}^1\mathrm{m}^m1$	$\sigma_{xzz}=\sigma_{zxz}=\sigma_{zzx}$, $\sigma_{xyy}=\sigma_{yxy}=\sigma_{yyx}$, σ_{xxx}	$\sigma_{zxz}=\sigma_{zzx}$, $\sigma_{yxy}=\sigma_{yyx}$, σ_{xzz}, σ_{xyy}, σ_{xxx}	×
383	$EuIn_2As_2$ (1.0.31)	Coplanar	$P^{2_{001}}6_3/^{\mathrm{m}_{100}}\mathrm{m}^1\mathrm{m}^{2_{001}}\mathrm{c}^m1$	σ_{zzz}, $\sigma_{yyz}=\sigma_{yzy}=\sigma_{zyy}$, $\sigma_{xxz}=\sigma_{xzx}=\sigma_{zxx}$	σ_{zzz}, σ_{zyy}, σ_{zxx}, $\sigma_{yyz}=\sigma_{yzy}$, $\sigma_{xxz}=\sigma_{xzx}$	$\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{yxz}=\sigma_{yzx}$, $\sigma_{xyz}=\sigma_{xzy}$
384	$RbFeCl_3$ (1.0.40)	Coplanar	$P^{\mathrm{m}_{010}}6_3/^1\mathrm{m}^{\mathrm{m}_{010}}\mathrm{m}^1\mathrm{c}\vert(3^1_{001},3^1_{001},1)^m1$	×	$\sigma_{xyz}=\sigma_{xzy}=-\sigma_{yxz}=-\sigma_{yzx}$	×
385	$Ba_3CoSb_2O_9$ (1.0.44)	Coplanar	$P^{\mathrm{m}_{100}}6_3/^{2_{001}}\mathrm{m}^{\mathrm{m}_{010}}\mathrm{m}^{2_{001}}\mathrm{c}\vert(3^2_{001},3^2_{001},1)^m1$	$\sigma_{xzz}=\sigma_{zxz}=\sigma_{zzx}$, $\sigma_{xyy}=\sigma_{yxy}=\sigma_{yyx}$, σ_{xxx}	$\sigma_{zxz}=\sigma_{zzx}$, $\sigma_{yxy}=\sigma_{yyx}$, σ_{xzz}, σ_{xyy}, σ_{xxx}	$\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zyy}/2$, $\sigma_{xxz}=\sigma_{xzx}=-\sigma_{zxx}/2$
386	$CsMnI_3$ (1.0.36)	Coplanar	$P^{\mathrm{m}_{010}}6_3/^{2_{001}}\mathrm{m}^{2_{001}}\mathrm{c}^{\mathrm{m}_{100}}\mathrm{m}^m1$	$\sigma_{xzz}=\sigma_{zxz}=\sigma_{zzx}$, $\sigma_{xyy}=\sigma_{yxy}=\sigma_{yyx}$, σ_{xxx}	$\sigma_{zxz}=\sigma_{zzx}$, $\sigma_{yxy}=\sigma_{yyx}$, σ_{xzz}, σ_{xyy}, σ_{xxx}	$\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zyy}/2$, $\sigma_{xxz}=\sigma_{xzx}=-\sigma_{zxx}/2$

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Table S4 : (continued) Antiferromagnets in MAGNDATA without second-order transport tensors triggered by magnetic geometry.

No.	Materials (ID)	Configuration	Spin space group	with SOC		
				IMD	QMD	BCD
387	$RbNiCl_3$ (1.0.34)	Coplanar	$P^{\mathrm{m}_{010}}6_3/^{2_{001}}\mathrm{m}^{2_{001}}\mathrm{c}^{\mathrm{m}_{100}}\mathrm{m}^m1$	$\sigma_{xzz}=\sigma_{zxz}=\sigma_{zzx}$, $\sigma_{xyy}=\sigma_{yxy}=\sigma_{yyx}$, σ_{xxx}	$\sigma_{zxz}=\sigma_{zzx}$, $\sigma_{yxy}=\sigma_{yyx}$, σ_{xzz}, σ_{xyy}, σ_{xxx}	$\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zyy}/2$, $\sigma_{xxz}=\sigma_{xzx}=-\sigma_{zxx}/2$
388	$CsMnI_3$ (1.0.37)	Coplanar	$P^{\mathrm{m}_{010}}6_3/^{2_{001}}\mathrm{m}^{2_{001}}\mathrm{c}^{\mathrm{m}_{100}}\mathrm{m}^m1$	$\sigma_{xzz}=\sigma_{zxz}=\sigma_{zzx}$, $\sigma_{xyy}=\sigma_{yxy}=\sigma_{yyx}$, σ_{xxx}	$\sigma_{zxz}=\sigma_{zzx}$, $\sigma_{yxy}=\sigma_{yyx}$, σ_{xzz}, σ_{xyy}, σ_{xxx}	$\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zyy}/2$, $\sigma_{xxz}=\sigma_{xzx}=-\sigma_{zxx}/2$
389	$CsCoBr_3$ (1.0.3)	Coplanar	$P^{\mathrm{m}_{010}}6_3/^{2_{001}}\mathrm{m}^{2_{001}}\mathrm{c}^{\mathrm{m}_{100}}\mathrm{m}^m1$	$\sigma_{xzz}=\sigma_{zxz}=\sigma_{zzx}$, $\sigma_{xyy}=\sigma_{yxy}=\sigma_{yyx}$, σ_{xxx}	$\sigma_{zxz}=\sigma_{zzx}$, $\sigma_{yxy}=\sigma_{yyx}$, σ_{xzz}, σ_{xyy}, σ_{xxx}	$\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zyy}/2$, $\sigma_{xxz}=\sigma_{xzx}=-\sigma_{zxx}/2$
390	$ThMn_2$ (1.0.24)	Coplanar	$P^{\mathrm{m}_{010}}6_3/^{1}\mathrm{m}^{\mathrm{m}_{100}}\mathrm{m}^{2_{001}}\mathrm{c}\vert(3^2_{001},3^2_{001},1)^m1$	σ_{zzz}, $\sigma_{xxz}=\sigma_{xzx}=\sigma_{yyz}=\sigma_{yzy}=\sigma_{zxx}=\sigma_{zyy}$	σ_{zzz}, $\sigma_{zxx}=\sigma_{zyy}$, $\sigma_{xxz}=\sigma_{xzx}=\sigma_{yyz}=\sigma_{yzy}$	×
391	$CsFeCl_3$ (1.0.14)	Coplanar	$P^{\mathrm{m}_{010}}6_3/^{1}\mathrm{m}^{\mathrm{m}_{010}}\mathrm{m}^{1}\mathrm{c}\vert(3^1_{001},3^1_{001},1)^m1$	σ_{zzz}, $\sigma_{xxz}=\sigma_{xzx}=\sigma_{yyz}=\sigma_{yzy}=\sigma_{zxx}=\sigma_{zyy}$	σ_{zzz}, $\sigma_{zxx}=\sigma_{zyy}$, $\sigma_{xxz}=\sigma_{xzx}=\sigma_{yyz}=\sigma_{yzy}$	×
392	$CsNiCl_3$ (1.0.4)	Coplanar	$P^{\mathrm{m}_{010}}6_3/^{2_{001}}\mathrm{m}^{2_{001}}\mathrm{c}^{\mathrm{m}_{100}}\mathrm{m}^m1$	σ_{zzz}, $\sigma_{yyz}=\sigma_{yzy}=\sigma_{zyy}$, $\sigma_{xxz}=\sigma_{xzx}=\sigma_{zxx}$	σ_{zzz}, σ_{zyy}, σ_{zxx}, $\sigma_{yyz}=\sigma_{yzy}$, $\sigma_{xxz}=\sigma_{xzx}$	$\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{yxz}=\sigma_{yzx}$, $\sigma_{xyz}=\sigma_{xzy}$
393	$CsMnBr_3$ (1.0.35)	Coplanar	$P^{\mathrm{m}_{100}}6_3/^{2_{001}}\mathrm{m}^{\mathrm{m}_{010}}\mathrm{m}^{2_{001}}\mathrm{c}\vert(3^2_{001},3^2_{001},1)^m1$	$\sigma_{xxy}=\sigma_{xyx}=\sigma_{yxx}=-\sigma_{yyy}$	$\sigma_{xxy}=\sigma_{xyx}=\sigma_{yxx}=-\sigma_{yyy}$	×
394	$Ba_3CoSb_2O_9$ (1.0.45)	Coplanar	$P^{\mathrm{m}_{100}}6_3/^{2_{001}}\mathrm{m}^{\mathrm{m}_{010}}\mathrm{m}^{2_{001}}\mathrm{c}\vert(3^2_{001},3^2_{001},1)^m1$	$\sigma_{xxx}=-\sigma_{xyy}=-\sigma_{yxy}=-\sigma_{yyx}$	$\sigma_{xxx}=-\sigma_{xyy}=-\sigma_{yxy}=-\sigma_{yyx}$	×
395	$EuIn_2As_2$ (1.0.32)	Coplanar	$P^{6^5_{001}}6_3/^{\mathrm{m}\frac{1}{3}\pi}\mathrm{m}^{1}\mathrm{m}^{6^5_{001}}\mathrm{c}\vert(1,1,3^2_{001})^m1$	σ_{zzz}, $\sigma_{xxz}=\sigma_{xzx}=\sigma_{yyz}=\sigma_{yzy}=\sigma_{zxx}=\sigma_{zyy}$	σ_{zzz}, $\sigma_{zxx}=\sigma_{zyy}$, $\sigma_{xxz}=\sigma_{xzx}=\sigma_{yyz}=\sigma_{yzy}$	$\sigma_{xyz}=\sigma_{xzy}=-\sigma_{yxz}=-\sigma_{yzx}$

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Table S4 : (continued) Antiferromagnets in MAGNDATA without second-order transport tensors triggered by magnetic geometry.

No.	Materials (ID)	Configuration	Spin space group	with SOC		
				IMD	QMD	BCD
396	$RbNiCl_3$ (1.0.41)	Coplanar	$P^{\mathrm{m}_{100}}6_3/^{2_{001}}\mathrm{m}^{\mathrm{m}_{010}}\mathrm{m}^{2_{001}}\mathrm{c}\vert(3^2_{001},3^2_{001},1)^m1$	σ_{zzz}, $\sigma_{yyz}=\sigma_{yzy}=\sigma_{zyy}$, $\sigma_{xxz}=\sigma_{xzx}=\sigma_{zxx}$	σ_{zzz}, σ_{zyy}, σ_{zxx}, $\sigma_{yyz}=\sigma_{yzy}$, $\sigma_{xxz}=\sigma_{xzx}$	$\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{yxz}=\sigma_{yzx}$, $\sigma_{xyz}=\sigma_{xzy}$
397	$CsNiCl_3$ (1.0.42)	Coplanar	$P^{\mathrm{m}_{100}}6_3/^{2_{001}}\mathrm{m}^{\mathrm{m}_{010}}\mathrm{m}^{2_{001}}\mathrm{c}\vert(3^2_{001},3^2_{001},1)^m1$	σ_{zzz}, $\sigma_{yyz}=\sigma_{yzy}=\sigma_{zyy}$, $\sigma_{xxz}=\sigma_{xzx}=\sigma_{zxx}$	σ_{zzz}, σ_{zyy}, σ_{zxx}, $\sigma_{yyz}=\sigma_{yzy}$, $\sigma_{xxz}=\sigma_{xzx}$	$\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{yxz}=\sigma_{yzx}$, $\sigma_{xyz}=\sigma_{xzy}$
398	TmAgGe (3.1)	Coplanar	$P^{3^2_{001}}\text{-}6^{\mathrm{m}_{\frac{1}{6}\pi}}2^{\mathrm{m}_{\frac{5}{6}\pi}}\mathrm{m}^m1$	×	$\sigma_{xyz}=\sigma_{xzy}=-\sigma_{yxz}=-\sigma_{yzx}$	×
399	$CsCr_{0.94}Fe_{0.06}F_4$ (1.711)	Coplanar	$P^{3^2_{001}}\text{-}6^{\mathrm{m}_{\frac{1}{6}\pi}}2^{\mathrm{m}_{\frac{5}{6}\pi}}\mathrm{m}\vert(1,1,2_{001})^m1$	×	×	×
400	ErAuIn (1.747)	Coplanar	$P^{3^2_{001}}\text{-}6^{\mathrm{m}_{\frac{1}{6}\pi}}2^{\mathrm{m}_{\frac{5}{6}\pi}}\mathrm{m}\vert(1,1,2_{001})^m1$	×	×	×
401	TbAuIn (1.748)	Coplanar	$P^{3^2_{001}}\text{-}6^{\mathrm{m}_{\frac{1}{6}\pi}}2^{\mathrm{m}_{\frac{5}{6}\pi}}\mathrm{m}\vert(1,1,2_{001})^m1$	×	×	×
402	TmPdIn (1.163)	Coplanar	$P^{3^2_{001}}\text{-}6\vert(1,1,2_{001})^m1$	×	×	×
403	$U_{14}Au_{51}$ (0.283)	Coplanar	$P^{6^1_{001}}6/^1\mathrm{m}^m1$	σ_{zzz}, $\sigma_{xxz}=\sigma_{xzx}=\sigma_{yyz}=\sigma_{yzy}=\sigma_{zxx}=\sigma_{zyy}$	σ_{zzz}, $\sigma_{zxx}=\sigma_{zyy}$, $\sigma_{xyz}=\sigma_{xzy}=-\sigma_{yxz}=-\sigma_{yzx}$, $\sigma_{xxz}=\sigma_{xzx}=\sigma_{yyz}=\sigma_{yzy}$	×
404	$Cu_{0.82}Mn_{1.18}As$ (0.278)	Coplanar	$P^{3^2_{001}}\text{-}6^m1$	σ_{zzz}, $\sigma_{xxz}=\sigma_{xzx}=\sigma_{yyz}=\sigma_{yzy}=\sigma_{zxx}=\sigma_{zyy}$	σ_{zzz}, $\sigma_{zxx}=\sigma_{zyy}$, $\sigma_{xyz}=\sigma_{xzy}=-\sigma_{yxz}=-\sigma_{yzx}$, $\sigma_{xxz}=\sigma_{xzx}=\sigma_{yyz}=\sigma_{yzy}$	×
405	$Ba_2Co_9O_{14}$ (1.343)	Coplanar	$R^1\text{-}3^1\mathrm{m}^{2_{001}}(1/3\ \ 2/3\ \ 1/6)^m1$	×	×	×

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Table S4 : (continued) Antiferromagnets in MAGNDATA without second-order transport tensors triggered by magnetic geometry.

No.	Materials (ID)	Configuration	Spin space group	with SOC		
				IMD	QMD	BCD
406	$Co_4Nb_2O_9$ (0.196)	Coplanar	$P^{2_{001}}$-$3^1\mathrm{c}^1 1^m 1$	σ_{zzz}, $\sigma_{yyz} = \sigma_{yzy} = \sigma_{zyy}$, $\sigma_{xyz} = \sigma_{xzy} = \sigma_{yxz} = \sigma_{yzx} = \sigma_{zxy} = \sigma_{zyx}$, $\sigma_{xxz} = \sigma_{xzx} = \sigma_{zxx}$	σ_{zzz}, σ_{zyy}, $\sigma_{zxy} = \sigma_{zyx}$, σ_{zxx}, $\sigma_{yyz} = \sigma_{yzy}$, $\sigma_{yxz} = \sigma_{yzx}$, $\sigma_{xyz} = \sigma_{xzy}$, $\sigma_{xxz} = \sigma_{xzx}$	×
407	$Co_4Ta_2O_9$ (0.511)	Coplanar	$P^{2_{001}}$-$3^{\mathrm{m}_{010}}\mathrm{c}^1 1^m 1$	$\sigma_{yzz} = \sigma_{zyz} = \sigma_{zzy}$, $\sigma_{xzz} = \sigma_{zxz} = \sigma_{zzx}$, σ_{yyy}, $\sigma_{xyy} = \sigma_{yxy} = \sigma_{yyx}$, $\sigma_{xxy} = \sigma_{xyx} = \sigma_{yxx}$, σ_{xxx}	$\sigma_{yzz} = \sigma_{zzy}$, $\sigma_{zxz} = \sigma_{zzx}$, σ_{yzz}, σ_{yyy}, $\sigma_{yxy} = \sigma_{yyx}$, σ_{yxx}, σ_{xzz}, σ_{xyy}, $\sigma_{xxy} = \sigma_{xyx}$, σ_{xxx}	×
408	$Co_4Nb_2O_9$ (0.197)	Coplanar	$P^{2_{001}}$-$3^{\mathrm{m}_{010}}\mathrm{c}^1 1^m 1$	σ_{zzz}, $\sigma_{yyz} = \sigma_{yzy} = \sigma_{zyy}$, $\sigma_{xyz} = \sigma_{xzy} = \sigma_{yxz} = \sigma_{yzx} = \sigma_{zxy} = \sigma_{zyx}$, $\sigma_{xxz} = \sigma_{xzx} = \sigma_{zxx}$	σ_{zzz}, σ_{zyy}, $\sigma_{zxy} = \sigma_{zyx}$, σ_{zxx}, $\sigma_{yyz} = \sigma_{yzy}$, $\sigma_{yxz} = \sigma_{yzx}$, $\sigma_{xyz} = \sigma_{xzy}$, $\sigma_{xxz} = \sigma_{xzx}$	×
409	$Fe_4Nb_2O_9$ (0.441)	Coplanar	$P^{2_{001}}$-$3^{\mathrm{m}_{010}}\mathrm{c}^1 1^m 1$	σ_{zzz}, $\sigma_{yyz} = \sigma_{yzy} = \sigma_{zyy}$, $\sigma_{xyz} = \sigma_{xzy} = \sigma_{yxz} = \sigma_{yzx} = \sigma_{zxy} = \sigma_{zyx}$, $\sigma_{xxz} = \sigma_{xzx} = \sigma_{zxx}$	σ_{zzz}, σ_{zyy}, $\sigma_{zxy} = \sigma_{zyx}$, σ_{zxx}, $\sigma_{yyz} = \sigma_{yzy}$, $\sigma_{yxz} = \sigma_{yzx}$, $\sigma_{xyz} = \sigma_{xzy}$, $\sigma_{xxz} = \sigma_{xzx}$	×

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Table S4 : (continued) Antiferromagnets in MAGNDATA without second-order transport tensors triggered by magnetic geometry.

No.	Materials (ID)	Configuration	Spin space group	with SOC		
				IMD	QMD	BCD
410	$Co_4Nb_2O_9$ (0.529)	Coplanar	$P^{2_{001}}$-$3^{\mathrm{m}_{010}}\mathrm{c}^1 1^m 1$	σ_{zzz}, $\sigma_{yyz} = \sigma_{yzy} = \sigma_{zyy}$, $\sigma_{xyz} = \sigma_{xzy} = \sigma_{yxz} = \sigma_{yzx} = \sigma_{zxy} = \sigma_{zyx}$, $\sigma_{xxz} = \sigma_{xzx} = \sigma_{zxx}$	σ_{zzz}, σ_{zyy}, $\sigma_{zxy} = \sigma_{zyx}$, σ_{zxx}, $\sigma_{yyz} = \sigma_{yzy}$, $\sigma_{yxz} = \sigma_{yzx}$, $\sigma_{xyz} = \sigma_{xzy}$, $\sigma_{xxz} = \sigma_{xzx}$	×
411	$Ba_3MnNb_2O_9$ (1.0.8)	Coplanar	$P^{\mathrm{m}_{010}}$-$3^{\mathrm{m}_{010}}\mathrm{m}^1 1\vert(3^1_{001}, 3^1_{001}, 1)^m 1$	σ_{zzz}, $\sigma_{xxz} = \sigma_{xzx} = \sigma_{yyz} = \sigma_{yzy} = \sigma_{zxx} = \sigma_{zyy}$, $\sigma_{xxx} = -\sigma_{xyy} = -\sigma_{yxy} = -\sigma_{yyx}$	σ_{zzz}, $\sigma_{zxx} = \sigma_{zyy}$, $\sigma_{xxz} = \sigma_{xzx} = \sigma_{yyz} = \sigma_{yzy}$, $\sigma_{xxx} = -\sigma_{xyy} = -\sigma_{yxy} = -\sigma_{yyx}$	$\sigma_{xxz} = \sigma_{xzx} = \sigma_{yyz} = \sigma_{yzy} = -\sigma_{zxx}/2 = -\sigma_{zyy}/2$
412	$Ba_3Nb_2NiO_9$ (1.13)	Coplanar	$P^{\mathrm{m}_{010}}$-$3^{\mathrm{m}_{010}}\mathrm{m}^1 1\vert(3^2_{001}, 3^2_{001}, 2_{001})^m 1$	×	×	$\sigma_{xxz} = \sigma_{xzx} = \sigma_{yyz} = \sigma_{yzy} = -\sigma_{zxx}/2 = -\sigma_{zyy}/2$
413	$Ba_3NiTa_2O_9$ (1.725)	Coplanar	$P^{\mathrm{m}_{010}}$-$3^{\mathrm{m}_{010}}\mathrm{m}^1 1\vert(3^2_{001}, 3^2_{001}, 2_{001})^m 1$	×	×	$\sigma_{xxz} = \sigma_{xzx} = \sigma_{yyz} = \sigma_{yzy} = -\sigma_{zxx}/2 = -\sigma_{zyy}/2$
414	VCl_2 (1.237)	Coplanar	$P^{\mathrm{m}_{010}}$-$3^{\mathrm{m}_{010}}\mathrm{m}^1 1\vert(3^2_{001}, 3^2_{001}, 2_{001})^m 1$	×	×	$\sigma_{xxz} = \sigma_{xzx} = \sigma_{yyz} = \sigma_{yzy} = -\sigma_{zxx}/2 = -\sigma_{zyy}/2$
415	VBr_2 (1.238)	Coplanar	$P^{\mathrm{m}_{010}}$-$3^{\mathrm{m}_{010}}\mathrm{m}^1 1\vert(3^2_{001}, 3^2_{001}, 2_{001})^m 1$	×	×	$\sigma_{xxz} = \sigma_{xzx} = \sigma_{yyz} = \sigma_{yzy} = -\sigma_{zxx}/2 = -\sigma_{zyy}/2$

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Table S4 : (continued) Antiferromagnets in MAGNDATA without second-order transport tensors triggered by magnetic geometry.

No.	Materials (ID)	Configuration	Spin space group	with SOC		
				IMD	QMD	BCD
416	$Ba_3CoNb_2O_9$ (1.665)	Coplanar	$P^{\mathrm{m}_{010}}$-$3^{\mathrm{m}_{010}}\mathrm{m}^{1}1\vert(3^2_{001}, 3^2_{001}, 2_{001})^m1$	×	×	$\sigma_{xxz} = \sigma_{xzx} = \sigma_{yyz} = \sigma_{yzy} = -\sigma_{zxx}/2 = -\sigma_{zyy}/2$
417	Na_2MnTeO_6 (1.0.51)	Coplanar	$R^{\text{-}3^1_{001}}$-$3^{\mathrm{m}\frac{2}{3}\pi}\mathrm{c}^m1$	$\sigma_{xxx} = -\sigma_{xyy} = -\sigma_{yxy} = -\sigma_{yyx}$	$\sigma_{xyz} = \sigma_{xzy} = -\sigma_{yxz} = -\sigma_{yzx}$, $\sigma_{xxx} = -\sigma_{xyy} = -\sigma_{yxy} = -\sigma_{yyx}$	×
418	$CsFe(MoO_4)_2$ (1.499)	Coplanar	$P^{\mathrm{m}_{010}}$-$3\vert(3^2_{001}, 3^2_{001}, 2_{001})^m1$	×	×	$\sigma_{xxz} = \sigma_{xzx} = \sigma_{yyz} = \sigma_{yzy} = -\sigma_{zxx}/2 = -\sigma_{zyy}/2$, $\sigma_{xyz} = \sigma_{xzy} = -\sigma_{yxz} = -\sigma_{yzx}$
419	$KFe(PO_3F)_2$ (1.669)	Coplanar	$P^{\mathrm{m}\frac{1}{3}\pi}$-$3\vert(3^1_{001}, 3^1_{001}, 4^1_{001})^m1$	×	×	$\sigma_{xxz} = \sigma_{xzx} = \sigma_{yyz} = \sigma_{yzy} = -\sigma_{zxx}/2 = -\sigma_{zyy}/2$, $\sigma_{xyz} = \sigma_{xzy} = -\sigma_{yxz} = -\sigma_{yzx}$
420	$FeSn_2$ (2.66)	Coplanar	$I^{1}4/^{\mathrm{m}_{010}}\mathrm{m}^{\mathrm{m}_{010}}\mathrm{c}^{\mathrm{m}_{010}}\mathrm{m}\vert(1,1,1;m_{100})^m1$	$\sigma_{xzz} = \sigma_{zxz} = \sigma_{zzx}$, $\sigma_{xyy} = \sigma_{yxy} = \sigma_{yyx}$, σ_{xxx}	$\sigma_{zxz} = \sigma_{zzx}$, $\sigma_{yxy} = \sigma_{yyx}$, σ_{xzz}, σ_{xyy}, σ_{xxx}	×
421	$FeGe_2$ (2.68)	Coplanar	$I^{1}4/^{\mathrm{m}_{010}}\mathrm{m}^{\mathrm{m}_{010}}\mathrm{c}^{\mathrm{m}_{010}}\mathrm{m}\vert(1,1,1;m_{100})^m1$	$\sigma_{xzz} = \sigma_{zxz} = \sigma_{zzx}$, $\sigma_{xyy} = \sigma_{yxy} = \sigma_{yyx}$, σ_{xxx}	$\sigma_{zxz} = \sigma_{zzx}$, $\sigma_{yxy} = \sigma_{yyx}$, σ_{xzz}, σ_{xyy}, σ_{xxx}	×
422	$Ba_2Mn_3Sb_2O_2$ (2.53)	Coplanar	$F^{\mathrm{m}_{010}}\mathrm{m}^{\mathrm{m}_{010}}\mathrm{m}^{\mathrm{m}_{010}}\mathrm{m}\vert(1,1,1;m_{100},m_{100},1)^m1$	$\sigma_{xzz} = \sigma_{zxz} = \sigma_{zzx}$, $\sigma_{xyy} = \sigma_{yxy} = \sigma_{yyx}$, σ_{xxx}	$\sigma_{zxz} = \sigma_{zzx}$, $\sigma_{yxy} = \sigma_{yyx}$, σ_{xzz}, σ_{xyy}, σ_{xxx}	×
423	$Sr_2Mn_3Sb_2O_2$ (2.27)	Coplanar	$F^{\mathrm{m}_{010}}\mathrm{m}^{\mathrm{m}_{010}}\mathrm{m}^{\mathrm{m}_{010}}\mathrm{m}\vert(1,1,1;m_{100},m_{100},1)^m1$	$\sigma_{xzz} = \sigma_{zxz} = \sigma_{zzx}$, $\sigma_{xyy} = \sigma_{yxy} = \sigma_{yyx}$, σ_{xxx}	$\sigma_{zxz} = \sigma_{zzx}$, $\sigma_{yxy} = \sigma_{yyx}$, σ_{xzz}, σ_{xyy}, σ_{xxx}	×

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Table S4 : (continued) Antiferromagnets in MAGNDATA without second-order transport tensors triggered by magnetic geometry.

No.	Materials (ID)	Configuration	Spin space group	with SOC		
				IMD	QMD	BCD
424	$La_{0.73}Tb_{0.27}Mn_2Si_2$ (2.58)	Coplanar	$I^{\mathrm{m}_{100}}4/^{2_{001}}\mathrm{m}^1\mathrm{m}^{\mathrm{m}_{100}}\mathrm{m}\vert(1,1,1;m_{010})^m1$	$\sigma_{xzz}=\sigma_{zxz}=\sigma_{zzx}$, $\sigma_{xyy}=\sigma_{yxy}=\sigma_{yyx}$, σ_{xxx}	$\sigma_{zxz}=\sigma_{zzx}$, $\sigma_{yxy}=\sigma_{yyx}$, σ_{xzz}, σ_{xyy}, σ_{xxx}	×
425	$GdMn_2Si_2$ (2.96)	Coplanar	$I^{\mathrm{m}_{100}}4/^{2_{001}}\mathrm{m}^1\mathrm{m}^{\mathrm{m}_{100}}\mathrm{m}\vert(1,1,1;m_{010})^m1$	$\sigma_{xzz}=\sigma_{zxz}=\sigma_{zzx}$, $\sigma_{xyy}=\sigma_{yxy}=\sigma_{yyx}$, σ_{xxx}	$\sigma_{zxz}=\sigma_{zzx}$, $\sigma_{yxy}=\sigma_{yyx}$, σ_{xzz}, σ_{xyy}, σ_{xxx}	×
426	$Sr_2CuO_2Cu_2S_2$ (1.456)	Coplanar	$I^{\mathrm{m}_{110}}4/^{\mathrm{m}_{\text{-}110}}\mathrm{m}^{\mathrm{m}_{110}}\mathrm{m}^1\mathrm{m}\vert(2_{001},2_{001},2_{001};4^1_{001})^m1$	×	×	$\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{xyz}=\sigma_{xzy}=\sigma_{yxz}=\sigma_{yzx}$
427	$La_{0.25}Pr_{0.75}Co_2P_2$ (1.317)	Coplanar	$P^1 4/^1\mathrm{m}^1\mathrm{m}^1\mathrm{m}^{2_{001}}(0\ \ 0\ \ 1/2)^m1$	×	×	×
428	TbC_2 (1.533)	Coplanar	$P^1\mathrm{m}^1\mathrm{m}^{\mathrm{m}_{100}}\mathrm{m}\vert(1,1,2_{001})^m1$	×	×	$\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{yxz}=\sigma_{yzx}$, $\sigma_{xyz}=\sigma_{xzy}$
429	$LuFe_4Ge_2$ (0.140)	Coplanar	$P^{\mathrm{m}_{010}}\mathrm{n}^{\mathrm{m}_{100}}\mathrm{n}^1\mathrm{m}^m1$	$\sigma_{xyz}=\sigma_{xzy}=\sigma_{yxz}=\sigma_{yzx}=\sigma_{zxy}=\sigma_{zyx}$	$\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{yxz}=\sigma_{yzx}$, $\sigma_{xyz}=\sigma_{xzy}$	×
430	$FePbBiO_4$ (0.214)	Coplanar	$P^{2_{001}}4_2/^{\mathrm{m}_{010}}\mathrm{m}^{\mathrm{m}_{100}}\mathrm{b}^{\mathrm{m}_{010}}\mathrm{c}^m1$	σ_{zzz}, $\sigma_{yyz}=\sigma_{yzy}=\sigma_{zyy}$, $\sigma_{xxz}=\sigma_{xzx}=\sigma_{zxx}$	σ_{zzz}, σ_{zyy}, σ_{zxx}, $\sigma_{yyz}=\sigma_{yzy}$, $\sigma_{xxz}=\sigma_{xzx}$	$\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zyy}/2$, $\sigma_{xxz}=\sigma_{xzx}=-\sigma_{zxx}/2$
431	CeMnAsO (0.188)	Coplanar	$P^1\mathrm{m}^1\mathrm{m}^{2_{001}}\mathrm{n}^m1$	$\sigma_{yzz}=\sigma_{zyz}=\sigma_{zzy}$, $\sigma_{xzz}=\sigma_{zxz}=\sigma_{zzx}$, σ_{yyy}, $\sigma_{xyy}=\sigma_{yxy}=\sigma_{yyx}$, $\sigma_{xxy}=\sigma_{xyx}=\sigma_{yxx}$, σ_{xxx}	$\sigma_{zyz}=\sigma_{zzy}$, $\sigma_{zxz}=\sigma_{zzx}$, σ_{yzz}, σ_{yyy}, $\sigma_{yxy}=\sigma_{yyx}$, σ_{yxx}, σ_{xzz}, σ_{xyy}, $\sigma_{xxy}=\sigma_{xyx}$, σ_{xxx}	×

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Table S4 : (continued) Antiferromagnets in MAGNDATA without second-order transport tensors triggered by magnetic geometry.

No.	Materials (ID)	Configuration	Spin space group	with SOC		
				IMD	QMD	BCD
432	CeNiAsO (1.272)	Coplanar	$P^{\mathrm{m}_{100}}2_1/^1\mathrm{m}\vert(1,1,2_{001})^m1$	×	×	$\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zyy}/2$, $\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{xxz}=\sigma_{xzx}=-\sigma_{zxx}/2$, $\sigma_{yxz}=\sigma_{yzx}$, $\sigma_{xyz}=\sigma_{xzy}$
433	DySbTe (2.105)	Coplanar	$P^{2_{001}}2_1/^1\mathrm{m}\vert(1,1,m_{010})^m1$	σ_{zzz}, $\sigma_{yyz}=\sigma_{yzy}=\sigma_{zyy}$, $\sigma_{xyz}=\sigma_{xzy}=\sigma_{yxz}=\sigma_{yzx}=\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{xxz}=\sigma_{xzx}=\sigma_{zxx}$	σ_{zzz}, σ_{zyy}, $\sigma_{zxy}=\sigma_{zyx}$, σ_{zxx}, $\sigma_{yyz}=\sigma_{yzy}$, $\sigma_{yxz}=\sigma_{yzx}$, $\sigma_{xyz}=\sigma_{xzy}$, $\sigma_{xxz}=\sigma_{xzx}$	×
434	Sr_2FeO_3Cl (1.380)	Coplanar	$P^{\mathrm{m}_{110}}4/^{\mathrm{m}_{100}}\mathrm{n}^{\mathrm{m}_{110}}\mathrm{m}^1\mathrm{m}\vert(2_{001},2_{001},1)^m1$	×	×	$\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{xyz}=\sigma_{xzy}=\sigma_{yxz}=\sigma_{yzx}$
435	Sr_2FeO_3Br (1.381)	Coplanar	$P^{\mathrm{m}_{110}}4/^{\mathrm{m}_{100}}\mathrm{n}^{\mathrm{m}_{110}}\mathrm{m}^1\mathrm{m}\vert(2_{001},2_{001},1)^m1$	×	×	$\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{xyz}=\sigma_{xzy}=\sigma_{yxz}=\sigma_{yzx}$
436	Ca_2FeO_3Br (1.383)	Coplanar	$P^{\mathrm{m}_{110}}4/^{\mathrm{m}_{100}}\mathrm{n}^{\mathrm{m}_{110}}\mathrm{m}^1\mathrm{m}\vert(2_{001},2_{001},1)^m1$	×	×	$\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{xyz}=\sigma_{xzy}=\sigma_{yxz}=\sigma_{yzx}$
437	Ca_2FeO_3Cl (1.382)	Coplanar	$P^{\mathrm{m}_{110}}4/^{\mathrm{m}_{100}}\mathrm{n}^{\mathrm{m}_{110}}\mathrm{m}^1\mathrm{m}\vert(2_{001},2_{001},1)^m1$	×	×	$\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{xyz}=\sigma_{xzy}=\sigma_{yxz}=\sigma_{yzx}$
438	Sr_2FeO_3F (1.385)	Coplanar	$P^{\mathrm{m}_{110}}4/^{\mathrm{m}_{100}}\mathrm{n}^{\mathrm{m}_{110}}\mathrm{m}^1\mathrm{m}\vert(2_{001},2_{001},1)^m1$	×	×	$\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{xyz}=\sigma_{xzy}=\sigma_{yxz}=\sigma_{yzx}$
439	Sr_2FeO_3F (1.387)	Coplanar	$P^{\mathrm{m}_{110}}4/^{\mathrm{m}_{100}}\mathrm{n}^{\mathrm{m}_{110}}\mathrm{m}^1\mathrm{m}\vert(2_{001},2_{001},1)^m1$	×	×	$\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{xyz}=\sigma_{xzy}=\sigma_{yxz}=\sigma_{yzx}$

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Table S4 : (continued) Antiferromagnets in MAGNDATA without second-order transport tensors triggered by magnetic geometry.

No.	Materials (ID)	Configuration	Spin space group	with SOC		
				IMD	QMD	BCD
440	Sr_2FeO_3F (1.386)	Coplanar	$P^{\mathrm{m}_{110}}4/^{\mathrm{m}_{100}}\mathrm{n}^{\mathrm{m}_{110}}\mathrm{m}^{1}\mathrm{m}\vert(2_{001},2_{001},2_{001})^{m}1$	$\times$	$\times$	$\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{xyz}=\sigma_{xzy}=\sigma_{yxz}=\sigma_{yzx}$
441	NdB_4 (0.491)	Coplanar	$P^{4^{1}_{001}}4/^{1}\mathrm{m}^{\mathrm{m}_{110}}\mathrm{b}^{\mathrm{m}_{010}}\mathrm{m}^{m}1$	σ_{zzz}, $\sigma_{xxz}=\sigma_{xzx}=\sigma_{yyz}=\sigma_{yzy}=\sigma_{zxx}=\sigma_{zyy}$	σ_{zzz}, $\sigma_{zxx}=\sigma_{zyy}$, $\sigma_{xxz}=\sigma_{xzx}=\sigma_{yyz}=\sigma_{yzy}$, $\sigma_{xyz}=\sigma_{xzy}=-\sigma_{yxz}=-\sigma_{yzx}$	$\times$
442	GdB_4 (0.9)	Coplanar	$P^{4^{1}_{001}}4/^{1}\mathrm{m}^{\mathrm{m}_{110}}\mathrm{b}^{\mathrm{m}_{010}}\mathrm{m}^{m}1$	$\times$	$\sigma_{xyz}=\sigma_{xzy}=-\sigma_{yxz}=-\sigma_{yzx}$	$\times$
443	U_2Pd_2In (0.320)	Coplanar	$P^{4^{1}_{001}}4/^{1}\mathrm{m}^{\mathrm{m}_{110}}\mathrm{b}^{\mathrm{m}_{010}}\mathrm{m}^{m}1$	$\sigma_{xyz}=\sigma_{xzy}=\sigma_{yxz}=\sigma_{yzx}=\sigma_{zxy}=\sigma_{zyx}$	$\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{xyz}=\sigma_{xzy}=\sigma_{yxz}=\sigma_{yzx}$	$\times$
444	U_2Pd_2Sn (0.321)	Coplanar	$P^{4^{1}_{001}}4/^{1}\mathrm{m}^{\mathrm{m}_{110}}\mathrm{b}^{\mathrm{m}_{010}}\mathrm{m}^{m}1$	$\sigma_{xyz}=\sigma_{xzy}=\sigma_{yxz}=\sigma_{yzx}=\sigma_{zxy}=\sigma_{zyx}$	$\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{xyz}=\sigma_{xzy}=\sigma_{yxz}=\sigma_{yzx}$	$\times$
445	U_2Pd_2In (0.625)	Coplanar	$P^{4^{1}_{001}}4/^{1}\mathrm{m}^{\mathrm{m}_{110}}\mathrm{b}^{\mathrm{m}_{010}}\mathrm{m}^{m}1$	$\sigma_{xyz}=\sigma_{xzy}=\sigma_{yxz}=\sigma_{yzx}=\sigma_{zxy}=\sigma_{zyx}$	$\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{xyz}=\sigma_{xzy}=\sigma_{yxz}=\sigma_{yzx}$	$\times$
446	U_2Pd_2In (0.80)	Coplanar	$P^{4^{1}_{001}}4/^{1}\mathrm{m}^{\mathrm{m}_{110}}\mathrm{b}^{\mathrm{m}_{010}}\mathrm{m}^{m}1$	$\sigma_{xyz}=\sigma_{xzy}=\sigma_{yxz}=\sigma_{yzx}=\sigma_{zxy}=\sigma_{zyx}$	$\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{xyz}=\sigma_{xzy}=\sigma_{yxz}=\sigma_{yzx}$	$\times$
447	U_2Pd_2Sn (0.81)	Coplanar	$P^{4^{1}_{001}}4/^{1}\mathrm{m}^{\mathrm{m}_{110}}\mathrm{b}^{\mathrm{m}_{010}}\mathrm{m}^{m}1$	$\sigma_{xyz}=\sigma_{xzy}=\sigma_{yxz}=\sigma_{yzx}=\sigma_{zxy}=\sigma_{zyx}$	$\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{xyz}=\sigma_{xzy}=\sigma_{yxz}=\sigma_{yzx}$	$\times$
448	NdB_4 (0.492)	Coplanar	$P^{\mathrm{m}_{010}}\mathrm{b}^{\mathrm{m}_{100}}\mathrm{a}^{1}\mathrm{m}^{m}1$	$\sigma_{yzz}=\sigma_{zyz}=\sigma_{zzy}$, $\sigma_{xzz}=\sigma_{zxz}=\sigma_{zzx}$, σ_{yyy}, $\sigma_{xyy}=\sigma_{yxy}=\sigma_{yyx}$, $\sigma_{xxy}=\sigma_{xyx}=\sigma_{yxx}$, σ_{xxx}	$\sigma_{zyz}=\sigma_{zzy}$, $\sigma_{zxz}=\sigma_{zzx}$, σ_{yzz}, σ_{yyy}, $\sigma_{yxy}=\sigma_{yyx}$, σ_{yxx}, σ_{xzz}, $\sigma_{xyy}=\sigma_{xyx}$, σ_{xxy}	$\times$

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Table S4 : (continued) Antiferromagnets in MAGNDATA without second-order transport tensors triggered by magnetic geometry.

No.	Materials (ID)	Configuration	Spin space group	with SOC		
				IMD	QMD	BCD
449	$Pb_2BaCuFeO_5Br$ (2.45)	Coplanar	$P^{1}4/^{1}\mathrm{n}^{1}\mathrm{m}^{1}\mathrm{m}^{2_{001}}(1/2\ \ 1/2\ \ 0)^{m}1$	×	×	$\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zyy}/2$, $\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{xxz}=\sigma_{xzx}=-\sigma_{zxx}/2$, $\sigma_{yxz}=\sigma_{yzx}$, $\sigma_{xyz}=\sigma_{xzy}$
450	$Pb_2BaCuFeO_5Cl$ (2.46)	Coplanar	$P^{1}4/^{1}\mathrm{n}^{1}\mathrm{m}^{1}\mathrm{m}^{2_{001}}(1/2\ \ 1/2\ \ 0)^{m}1$	×	×	$\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zyy}/2$, $\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{xxz}=\sigma_{xzx}=-\sigma_{zxx}/2$, $\sigma_{yxz}=\sigma_{yzx}$, $\sigma_{xyz}=\sigma_{xzy}$
451	Ho_2BaNiO_5 (1.14)	Coplanar	$C^{1}2/^{1}\mathrm{m}^{2_{001}}(0\ \ 0\ \ 1/2)^{m}1$	×	×	×
452	Er_2BaNiO_5 (1.15)	Coplanar	$C^{1}2/^{1}\mathrm{m}^{2_{001}}(0\ \ 0\ \ 1/2)^{m}1$	×	×	×
453	Nd_2BaNiO_5 (1.216)	Coplanar	$C^{1}2/^{1}\mathrm{m}^{2_{001}}(0\ \ 0\ \ 1/2)^{m}1$	×	×	×
454	Tb_2BaNiO_5 (1.217)	Coplanar	$C^{1}2/^{1}\mathrm{m}^{2_{001}}(0\ \ 0\ \ 1/2)^{m}1$	×	×	×
455	Nd_2BaCoO_5 (1.350)	Coplanar	$C^{1}2/^{1}\mathrm{m}^{2_{001}}(0\ \ 0\ \ 1/2)^{m}1$	×	×	×
456	Dy_2BaNiO_5 (1.36)	Coplanar	$C^{1}2/^{1}\mathrm{m}^{2_{001}}(0\ \ 0\ \ 1/2)^{m}1$	×	×	×
457	Er_2BaNiO_5 (1.53)	Coplanar	$C^{1}2/^{1}\mathrm{m}^{2_{001}}(0\ \ 0\ \ 1/2)^{m}1$	×	×	×
458	PrFeAsO (1.584)	Coplanar	$C^{\mathrm{m}_{100}}\mathrm{m}^{1}\mathrm{m}^{\mathrm{m}_{010}}\mathrm{e}\vert(1,1,1;2_{001})^{m}1$	×	×	×
459	Dy_2PdGe_6 (0.906)	Coplanar	$C^{\mathrm{m}_{010}}\mathrm{m}^{\mathrm{m}_{010}}\mathrm{c}^{2_{001}}\mathrm{e}^{m}1$	$\sigma_{xzz}=\sigma_{zxz}=\sigma_{zzx}$, $\sigma_{xyy}=\sigma_{yxy}=\sigma_{yyx}$, σ_{xxx}	$\sigma_{zxz}=\sigma_{zzx}$, $\sigma_{yxy}=\sigma_{yyx}$, σ_{xzz}, σ_{xyy}, σ_{xxx}	×
460	Tb_2PdGe_6 (0.905)	Coplanar	$C^{\mathrm{m}_{010}}\mathrm{m}^{\mathrm{m}_{010}}\mathrm{c}^{2_{001}}\mathrm{e}^{m}1$	$\sigma_{xzz}=\sigma_{zxz}=\sigma_{zzx}$, $\sigma_{xyy}=\sigma_{yxy}=\sigma_{yyx}$, σ_{xxx}	$\sigma_{zxz}=\sigma_{zzx}$, $\sigma_{yxy}=\sigma_{yyx}$, σ_{xzz}, σ_{xyy}, σ_{xxx}	×

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Table S4 : (continued) Antiferromagnets in MAGNDATA without second-order transport tensors triggered by magnetic geometry.

No.	Materials (ID)	Configuration	Spin space group	with SOC		
				IMD	QMD	BCD
461	Ho_2PdGe_6 (0.907)	Coplanar	$C^{\mathrm{m}_{010}}\mathrm{m}^{\mathrm{m}_{010}}\mathrm{c}^{2_{001}}\mathrm{e}^{m}1$	$\sigma_{xzz}=\sigma_{xxz}=\sigma_{zxx}$, $\sigma_{xyy}=\sigma_{yxy}=\sigma_{yyx}$, σ_{xxx}	$\sigma_{xzz}=\sigma_{zxx}$, $\sigma_{yxy}=\sigma_{yyx}$, σ_{xzz}, σ_{xyy}, σ_{xxx}	×
462	Tb_2PtGe_6 (0.908)	Coplanar	$C^{\mathrm{m}_{010}}\mathrm{m}^{\mathrm{m}_{010}}\mathrm{c}^{2_{001}}\mathrm{e}^{m}1$	$\sigma_{xzz}=\sigma_{xxz}=\sigma_{zxx}$, $\sigma_{xyy}=\sigma_{yxy}=\sigma_{yyx}$, σ_{xxx}	$\sigma_{xzz}=\sigma_{zxx}$, $\sigma_{yxy}=\sigma_{yyx}$, σ_{xzz}, σ_{xyy}, σ_{xxx}	×
463	Tb_2PdGe_6 (0.929)	Coplanar	$C^{\mathrm{m}_{010}}\mathrm{m}^{\mathrm{m}_{010}}\mathrm{c}^{2_{001}}\mathrm{e}^{m}1$	$\sigma_{xzz}=\sigma_{xxz}=\sigma_{zxx}$, $\sigma_{xyy}=\sigma_{yxy}=\sigma_{yyx}$, σ_{xxx}	$\sigma_{xzz}=\sigma_{zxx}$, $\sigma_{yxy}=\sigma_{yyx}$, σ_{xzz}, σ_{xyy}, σ_{xxx}	×
464	Dy_2PdGe_6 (0.928)	Coplanar	$C^{\mathrm{m}_{010}}\mathrm{m}^{\mathrm{m}_{010}}\mathrm{c}^{2_{001}}\mathrm{e}^{m}1$	$\sigma_{xzz}=\sigma_{xxz}=\sigma_{zxx}$, $\sigma_{xyy}=\sigma_{yxy}=\sigma_{yyx}$, σ_{xxx}	$\sigma_{xzz}=\sigma_{zxx}$, $\sigma_{yxy}=\sigma_{yyx}$, σ_{xzz}, σ_{xyy}, σ_{xxx}	×
465	Tb_2PtGe_6 (0.931)	Coplanar	$C^{\mathrm{m}_{010}}\mathrm{m}^{\mathrm{m}_{010}}\mathrm{c}^{2_{001}}\mathrm{e}^{m}1$	$\sigma_{xzz}=\sigma_{xxz}=\sigma_{zxx}$, $\sigma_{xyy}=\sigma_{yxy}=\sigma_{yyx}$, σ_{xxx}	$\sigma_{xzz}=\sigma_{zxx}$, $\sigma_{yxy}=\sigma_{yyx}$, σ_{xzz}, σ_{xyy}, σ_{xxx}	×
466	Ho_2PdGe_6 (0.930)	Coplanar	$C^{\mathrm{m}_{010}}\mathrm{m}^{\mathrm{m}_{010}}\mathrm{c}^{2_{001}}\mathrm{e}^{m}1$	$\sigma_{xzz}=\sigma_{xxz}=\sigma_{zxx}$, $\sigma_{xyy}=\sigma_{yxy}=\sigma_{yyx}$, σ_{xxx}	$\sigma_{xzz}=\sigma_{zxx}$, $\sigma_{yxy}=\sigma_{yyx}$, σ_{xzz}, σ_{xyy}, σ_{xxx}	×
467	Cs_2CoCl_4 (1.51)	Coplanar	$P^{1}2_1/^{\mathrm{m}_{100}}\mathrm{c}\vert(2_{001},1,1)^{m}1$	×	×	$\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zyy}/2$, $\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{xxz}=\sigma_{xzx}=-\sigma_{zxx}/2$, $\sigma_{yxz}=\sigma_{yzx}$, $\sigma_{xyz}=\sigma_{xzy}$
468	$LiFePO_4$ (0.152)	Coplanar	$P^{\mathrm{m}_{100}}\mathrm{n}^{1}\mathrm{m}^{\mathrm{m}_{010}}\mathrm{a}^{m}1$	σ_{zzz}, $\sigma_{yyz}=\sigma_{yzy}=\sigma_{zyy}$, $\sigma_{xyz}=\sigma_{xzy}=\sigma_{yxz}=\sigma_{yzx}=\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{xxz}=\sigma_{xzx}=\sigma_{zxx}$	σ_{zzz}, σ_{zyy}, $\sigma_{zxy}=\sigma_{zyx}$, σ_{zxx}, $\sigma_{yyz}=\sigma_{yzy}$, $\sigma_{yxz}=\sigma_{yzx}$, $\sigma_{xyz}=\sigma_{xzy}$, $\sigma_{xxz}=\sigma_{xzx}$	×

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Table S4 : (continued) Antiferromagnets in MAGNDATA without second-order transport tensors triggered by magnetic geometry.

No.	Materials (ID)	Configuration	Spin space group	with SOC		
				IMD	QMD	BCD
469	$LaCa_2Fe_3O_9$ (1.0.30)	Coplanar	$P^{2_{010}}\mathrm{n}^{2_{100}}\mathrm{m}^{1}\mathrm{a}^{m}1$	σ_{zzz}, $\sigma_{yyz} = \sigma_{yzy} = \sigma_{zyy}$, $\sigma_{xxz} = \sigma_{xzx} = \sigma_{zxx}$	σ_{zzz}, σ_{zyy}, σ_{zxx}, $\sigma_{yyz} = \sigma_{yzy}$, $\sigma_{xxz} = \sigma_{xzx}$	$\sigma_{yyz} = \sigma_{yzy} = -\sigma_{zyy}/2$, $\sigma_{xxz} = \sigma_{xzx} = -\sigma_{zxx}/2$
470	$EuMnSb_2$ (0.422)	Coplanar	$P^{2_{001}}\mathrm{n}^{1}\mathrm{m}^{1}\mathrm{a}^{m}1$	σ_{zzz}, $\sigma_{yyz} = \sigma_{yzy} = \sigma_{zyy}$, $\sigma_{xyz} = \sigma_{xzy} = \sigma_{yxz} = \sigma_{yzx} = \sigma_{zxy} = \sigma_{zyx}$, $\sigma_{xxz} = \sigma_{xzx} = \sigma_{zxx}$	σ_{zzz}, σ_{zyy}, $\sigma_{zxy} = \sigma_{zyx}$, σ_{zxx}, $\sigma_{yyz} = \sigma_{yzy}$, $\sigma_{yxz} = \sigma_{yzx}$, $\sigma_{xyz} = \sigma_{xzy}$, $\sigma_{xxz} = \sigma_{xzx}$	×
471	$FePO_4$ (0.17)	Coplanar	$P^{2_{001}}\mathrm{n}^{1}\mathrm{m}^{\mathrm{m}_{100}}\mathrm{a}^{m}1$	$\sigma_{xyz} = \sigma_{xzy} = \sigma_{yxz} = \sigma_{yzx} = \sigma_{zxy} = \sigma_{zyx}$	$\sigma_{zxy} = \sigma_{zyx}$, $\sigma_{yxz} = \sigma_{yzx}$, $\sigma_{xyz} = \sigma_{xzy}$	$\sigma_{zxy} = \sigma_{zyx}$, $\sigma_{yxz} = \sigma_{yzx}$, $\sigma_{xyz} = \sigma_{xzy}$
472	$BaNd_2O_4$ (1.96)	Coplanar	$P^{\mathrm{m}_{100}}2_1/^{\mathrm{m}_{100}}\mathrm{c}\vert(2_{001},1,1)^{m}1$	×	×	×
473	$BaNd_2O_4$ (1.95)	Coplanar	$P^{\mathrm{m}_{100}}2_1/^{\mathrm{m}_{100}}\mathrm{c}\vert(2_{001},1,1)^{m}1$	×	×	×
474	Dy_2TiO_5 (1.698)	Coplanar	$P^{\mathrm{m}_{100}}2_1/^{\mathrm{m}_{100}}\mathrm{c}\vert(2_{001},1,1)^{m}1$	×	×	×
475	$SrHo_2O_4$ (2.8)	Coplanar	$P^{2_{001}}2_1/^{1}\mathrm{c}\vert(m_{010},1,1)^{m}1$	σ_{zzz}, $\sigma_{yyz} = \sigma_{yzy} = \sigma_{zyy}$, $\sigma_{xyz} = \sigma_{xzy} = \sigma_{yxz} = \sigma_{yzx} = \sigma_{zxy} = \sigma_{zyx}$, $\sigma_{xxz} = \sigma_{xzx} = \sigma_{zxx}$	σ_{zzz}, σ_{zyy}, $\sigma_{zxy} = \sigma_{zyx}$, σ_{zxx}, $\sigma_{yyz} = \sigma_{yzy}$, $\sigma_{yxz} = \sigma_{yzx}$, $\sigma_{xyz} = \sigma_{xzy}$, $\sigma_{xxz} = \sigma_{xzx}$	×
476	NbMnP (0.803)	Coplanar	$P^{\mathrm{m}_{010}}\mathrm{n}^{1}\mathrm{m}^{2_{001}}\mathrm{a}^{m}1$	$\sigma_{xzz} = \sigma_{zxz} = \sigma_{zzx}$, $\sigma_{xyy} = \sigma_{yxy} = \sigma_{yyx}$, σ_{xxx}	$\sigma_{zxz} = \sigma_{zzx}$, $\sigma_{yxy} = \sigma_{yyx}$, σ_{xzz}, σ_{xyy}, σ_{xxx}	$\sigma_{yyz} = \sigma_{yzy} = -\sigma_{zyy}/2$, $\sigma_{xxz} = \sigma_{xzx} = -\sigma_{zxx}/2$
477	CsO_2 (0.1004)	Coplanar	$P^{\mathrm{m}_{100}}\mathrm{n}^{1}\mathrm{m}^{\mathrm{m}_{010}}\mathrm{a}^{m}1$	$\sigma_{xyz} = \sigma_{xzy} = \sigma_{yxz} = \sigma_{yzx} = \sigma_{zxy} = \sigma_{zyx}$	$\sigma_{zxy} = \sigma_{zyx}$, $\sigma_{yxz} = \sigma_{yzx}$, $\sigma_{xyz} = \sigma_{xzy}$	×

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Table S4 : (continued) Antiferromagnets in MAGNDATA without second-order transport tensors triggered by magnetic geometry.

No.	Materials (ID)	Configuration	Spin space group	with SOC		
				IMD	QMD	BCD
478	$DyCoO_3$ (0.159)	Coplanar	$P^{\mathrm{m}_{100}}\mathrm{n}^{1}\mathrm{m}^{\mathrm{m}_{010}}\mathrm{a}^{m}1$	$\sigma_{xyz}=\sigma_{xzy}=\sigma_{yxz}=\sigma_{yzx}=\sigma_{zxy}=\sigma_{zyx}$	$\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{yxz}=\sigma_{yzx}$, $\sigma_{xyz}=\sigma_{xzy}$	×
479	$TbCoO_3$ (0.160)	Coplanar	$P^{\mathrm{m}_{100}}\mathrm{n}^{1}\mathrm{m}^{\mathrm{m}_{010}}\mathrm{a}^{m}1$	$\sigma_{xzz}=\sigma_{zxz}=\sigma_{zzx}$, $\sigma_{xyy}=\sigma_{yxy}=\sigma_{yyx}$, σ_{xxx}	$\sigma_{zxz}=\sigma_{zzx}$, $\sigma_{yxy}=\sigma_{yyx}$, σ_{xzz}, σ_{xyy}, σ_{xxx}	×
480	$DyScO_3$ (0.171)	Coplanar	$P^{\mathrm{m}_{100}}\mathrm{n}^{1}\mathrm{m}^{\mathrm{m}_{010}}\mathrm{a}^{m}1$	$\sigma_{xyz}=\sigma_{xzy}=\sigma_{yxz}=\sigma_{yzx}=\sigma_{zxy}=\sigma_{zyx}$	$\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{yxz}=\sigma_{yzx}$, $\sigma_{xyz}=\sigma_{xzy}$	×
481	$TbAlO_3$ (0.350)	Coplanar	$P^{\mathrm{m}_{100}}\mathrm{n}^{1}\mathrm{m}^{\mathrm{m}_{010}}\mathrm{a}^{m}1$	$\sigma_{xyz}=\sigma_{xzy}=\sigma_{yxz}=\sigma_{yzx}=\sigma_{zxy}=\sigma_{zyx}$	$\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{yxz}=\sigma_{yzx}$, $\sigma_{xyz}=\sigma_{xzy}$	×
482	$LiCoPO_4$ (0.385)	Coplanar	$P^{\mathrm{m}_{100}}\mathrm{n}^{1}\mathrm{m}^{\mathrm{m}_{010}}\mathrm{a}^{m}1$	σ_{zzz}, $\sigma_{yyz}=\sigma_{yzy}=\sigma_{zyy}$, $\sigma_{xyz}=\sigma_{xzy}=\sigma_{yxz}=\sigma_{yzx}=\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{xxz}=\sigma_{xzx}=\sigma_{zxx}$	σ_{zzz}, σ_{zyy}, $\sigma_{zxy}=\sigma_{zyx}$, σ_{zxx}, $\sigma_{yyz}=\sigma_{yzy}$, $\sigma_{yxz}=\sigma_{yzx}$, $\sigma_{xyz}=\sigma_{xzy}$, $\sigma_{xxz}=\sigma_{xzx}$	×
483	$EuMnSb_2$ (0.424)	Coplanar	$P^{\mathrm{m}_{100}}\mathrm{n}^{1}\mathrm{m}^{\mathrm{m}_{010}}\mathrm{a}^{m}1$	$\sigma_{xyz}=\sigma_{xzy}=\sigma_{yxz}=\sigma_{yzx}=\sigma_{zxy}=\sigma_{zyx}$	$\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{yxz}=\sigma_{yzx}$, $\sigma_{xyz}=\sigma_{xzy}$	×
484	$TbCoO_3$ (0.520)	Coplanar	$P^{\mathrm{m}_{100}}\mathrm{n}^{1}\mathrm{m}^{\mathrm{m}_{010}}\mathrm{a}^{m}1$	$\sigma_{xzz}=\sigma_{zxz}=\sigma_{zzx}$, $\sigma_{xyy}=\sigma_{yxy}=\sigma_{yyx}$, σ_{xxx}	$\sigma_{zxz}=\sigma_{zzx}$, $\sigma_{yxy}=\sigma_{yyx}$, σ_{xzz}, σ_{xyy}, σ_{xxx}	×
485	$DyCoO_3$ (0.521)	Coplanar	$P^{\mathrm{m}_{100}}\mathrm{n}^{1}\mathrm{m}^{\mathrm{m}_{010}}\mathrm{a}^{m}1$	$\sigma_{xyz}=\sigma_{xzy}=\sigma_{yxz}=\sigma_{yzx}=\sigma_{zxy}=\sigma_{zyx}$	$\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{yxz}=\sigma_{yzx}$, $\sigma_{xyz}=\sigma_{xzy}$	×
486	$NdInO_3$ (0.783)	Coplanar	$P^{\mathrm{m}_{100}}\mathrm{n}^{1}\mathrm{m}^{\mathrm{m}_{010}}\mathrm{a}^{m}1$	$\sigma_{xzz}=\sigma_{zxz}=\sigma_{zzx}$, $\sigma_{xyy}=\sigma_{yxy}=\sigma_{yyx}$, σ_{xxx}	$\sigma_{zxz}=\sigma_{zzx}$, $\sigma_{yxy}=\sigma_{yyx}$, σ_{xzz}, σ_{xyy}, σ_{xxx}	×

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Table S4 : (continued) Antiferromagnets in MAGNDATA without second-order transport tensors triggered by magnetic geometry.

No.	Materials (ID)	Configuration	Spin space group	with SOC		
				IMD	QMD	BCD
487	$NdScO_3$ (0.782)	Coplanar	$P^{\mathrm{m}_{100}}\mathrm{n}^{1}\mathrm{m}^{\mathrm{m}_{010}}\mathrm{a}^{m}1$	$\sigma_{xzz}=\sigma_{zxz}=\sigma_{zzx}$, $\sigma_{xyy}=\sigma_{yxy}=\sigma_{yyx}$, σ_{xxx}	$\sigma_{zxz}=\sigma_{zzx}$, $\sigma_{yxy}=\sigma_{yyx}$, σ_{xzz}, σ_{xyy}, σ_{xxx}	×
488	$DyAlO_3$ (0.842)	Coplanar	$P^{\mathrm{m}_{100}}\mathrm{n}^{1}\mathrm{m}^{\mathrm{m}_{010}}\mathrm{a}^{m}1$	$\sigma_{xyz}=\sigma_{xzy}=\sigma_{yxz}=\sigma_{yzx}=\sigma_{zxy}=\sigma_{zyx}$	$\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{yxz}=\sigma_{yzx}$, $\sigma_{xyz}=\sigma_{xzy}$	×
489	$RbRuO_4$ (0.924)	Coplanar	$P^{\mathrm{m}_{100}}\mathrm{n}^{1}\mathrm{m}^{\mathrm{m}_{010}}\mathrm{a}^{m}1$	$\sigma_{xyz}=\sigma_{xzy}=\sigma_{yxz}=\sigma_{yzx}=\sigma_{zxy}=\sigma_{zyx}$	$\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{yxz}=\sigma_{yzx}$, $\sigma_{xyz}=\sigma_{xzy}$	×
490	$KCrF_4$ (0.182)	Coplanar	$P^{\mathrm{m}_{010}}\mathrm{n}^{2_{001}}\mathrm{m}^{\mathrm{m}_{010}}\mathrm{a}^{m}1$	$\sigma_{xzz}=\sigma_{zxz}=\sigma_{zzx}$, $\sigma_{xyy}=\sigma_{yxy}=\sigma_{yyx}$, σ_{xxx}	$\sigma_{zxz}=\sigma_{zzx}$, $\sigma_{yxy}=\sigma_{yyx}$, σ_{xzz}, σ_{xyy}, σ_{xxx}	×
491	$NdCrO_3$ (0.589)	Coplanar	$P^{\mathrm{m}_{100}}\mathrm{n}^{\mathrm{m}_{010}}\mathrm{m}^{2_{001}}\mathrm{a}^{m}1$	×	×	×
492	$ErCrO_3$ (0.590)	Coplanar	$P^{\mathrm{m}_{100}}\mathrm{n}^{\mathrm{m}_{010}}\mathrm{m}^{2_{001}}\mathrm{a}^{m}1$	×	×	×
493	$HoBaCuO_5$ (2.85)	Coplanar	$P^{\mathrm{m}_{100}}2_1/^{\mathrm{m}_{010}}\mathrm{c}^{m}1$	$\sigma_{yzz}=\sigma_{zyz}=\sigma_{zzy}$, $\sigma_{xzz}=\sigma_{zxz}=\sigma_{zzx}$, σ_{yyy}, $\sigma_{xyy}=\sigma_{yxy}=\sigma_{yyx}$, $\sigma_{xxy}=\sigma_{xyx}=\sigma_{yxx}$, σ_{xxx}	$\sigma_{zyz}=\sigma_{zzy}$, $\sigma_{zxz}=\sigma_{zzx}$, σ_{yzz}, σ_{yyy}, $\sigma_{yxy}=\sigma_{yyx}$, σ_{yxx}, σ_{xzz}, σ_{xyy}, $\sigma_{xxy}=\sigma_{xyx}$, σ_{xxx}	×
494	$SrNd_2O_4$ (1.577)	Coplanar	$P^{\mathrm{m}_{100}}2_1/^{\mathrm{m}_{100}}\mathrm{c}\vert(2_{001},1,1)^{m}1$	×	×	×
495	$DyBaCuO_5$ (1.650)	Coplanar	$P^{\mathrm{m}_{100}}2_1/^{\mathrm{m}_{100}}\mathrm{c}\vert(2_{001},1,1)^{m}1$	×	×	×
496	$HoBaCuO_5$ (1.651)	Coplanar	$P^{\mathrm{m}_{100}}2_1/^{\mathrm{m}_{100}}\mathrm{c}\vert(2_{001},1,1)^{m}1$	×	×	×
497	$DyBaCuO_5$ (0.805)	Coplanar	$P^{\mathrm{m}_{100}}\mathrm{n}^{1}\mathrm{m}^{\mathrm{m}_{010}}\mathrm{a}^{m}1$	$\sigma_{xzz}=\sigma_{zxz}=\sigma_{zzx}$, $\sigma_{xyy}=\sigma_{yxy}=\sigma_{yyx}$, σ_{xxx}	$\sigma_{zxz}=\sigma_{zzx}$, $\sigma_{yxy}=\sigma_{yyx}$, σ_{xzz}, σ_{xyy}, σ_{xxx}	×
498	$LiNiPO_4$ (0.88)	Coplanar	$P^{\mathrm{m}_{100}}\mathrm{n}^{1}\mathrm{m}^{\mathrm{m}_{010}}\mathrm{a}^{m}1$	$\sigma_{xzz}=\sigma_{zxz}=\sigma_{zzx}$, $\sigma_{xyy}=\sigma_{yxy}=\sigma_{yyx}$, σ_{xxx}	$\sigma_{zxz}=\sigma_{zzx}$, $\sigma_{yxy}=\sigma_{yyx}$, σ_{xzz}, σ_{xyy}, σ_{xxx}	×

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Table S4 : (continued) Antiferromagnets in MAGNDATA without second-order transport tensors triggered by magnetic geometry.

No.	Materials (ID)	Configuration	Spin space group	with SOC		
				IMD	QMD	BCD
499	Ag_2RuO_4 (0.918)	Coplanar	$P^{\mathrm{m}_{100}}\mathrm{n}^{1}\mathrm{m}^{\mathrm{m}_{010}}\mathrm{a}^{m}1$	$\sigma_{xzz}=\sigma_{zxz}=\sigma_{zzx}$, $\sigma_{xyy}=\sigma_{yxy}=\sigma_{yyx}$, σ_{xxx}	$\sigma_{zxz}=\sigma_{zzx}$, $\sigma_{yxy}=\sigma_{yyx}$, σ_{xzz}, σ_{xyy}, σ_{xxx}	×
500	$MnGeO_3$ (0.313)	Coplanar	$P^{\mathrm{m}_{010}}\mathrm{b}^{\mathrm{m}_{010}}\mathrm{c}^{2_{001}}\mathrm{a}^{m}1$	$\sigma_{xzz}=\sigma_{zxz}=\sigma_{zzx}$, $\sigma_{xyy}=\sigma_{yxy}=\sigma_{yyx}$, σ_{xxx}	$\sigma_{zxz}=\sigma_{zzx}$, $\sigma_{yxy}=\sigma_{yyx}$, σ_{xzz}, σ_{xyy}, σ_{xxx}	×
501	$CoSe_2O_5$ (0.119)	Coplanar	$P^{\mathrm{m}_{010}}\mathrm{b}^{2_{001}}\mathrm{c}^{\mathrm{m}_{010}}\mathrm{n}^{m}1$	$\sigma_{xzz}=\sigma_{zxz}=\sigma_{zzx}$, $\sigma_{xyy}=\sigma_{yxy}=\sigma_{yyx}$, σ_{xxx}	$\sigma_{zxz}=\sigma_{zzx}$, $\sigma_{yxy}=\sigma_{yyx}$, σ_{xzz}, σ_{xyy}, σ_{xxx}	×
502	$Mn(Nb_{0.5}Ta_{0.5})_2O_6$ (0.817)	Coplanar	$P^{\mathrm{m}_{010}}\mathrm{b}^{2_{001}}\mathrm{c}^{\mathrm{m}_{010}}\mathrm{n}^{m}1$	$\sigma_{xzz}=\sigma_{zxz}=\sigma_{zzx}$, $\sigma_{xyy}=\sigma_{yxy}=\sigma_{yyx}$, σ_{xxx}	$\sigma_{zxz}=\sigma_{zzx}$, $\sigma_{yxy}=\sigma_{yyx}$, σ_{xzz}, σ_{xyy}, σ_{xxx}	×
503	$MnNb_2O_6$ (0.819)	Coplanar	$P^{\mathrm{m}_{010}}\mathrm{b}^{2_{001}}\mathrm{c}^{\mathrm{m}_{010}}\mathrm{n}^{m}1$	$\sigma_{xzz}=\sigma_{zxz}=\sigma_{zzx}$, $\sigma_{xyy}=\sigma_{yxy}=\sigma_{yyx}$, σ_{xxx}	$\sigma_{zxz}=\sigma_{zzx}$, $\sigma_{yxy}=\sigma_{yyx}$, σ_{xzz}, σ_{xyy}, σ_{xxx}	×
504	$MnTa_2O_6$ (0.818)	Coplanar	$P^{\mathrm{m}_{010}}\mathrm{b}^{2_{001}}\mathrm{c}^{\mathrm{m}_{010}}\mathrm{n}^{m}1$	$\sigma_{xzz}=\sigma_{zxz}=\sigma_{zzx}$, $\sigma_{xyy}=\sigma_{yxy}=\sigma_{yyx}$, σ_{xxx}	$\sigma_{zxz}=\sigma_{zzx}$, $\sigma_{yxy}=\sigma_{yyx}$, σ_{xzz}, σ_{xyy}, σ_{xxx}	×
505	Fe_2WO_6 (0.812)	Coplanar	$P^{\mathrm{m}_{100}}\mathrm{b}^{\mathrm{m}_{010}}\mathrm{c}^{\mathrm{m}_{100}}\mathrm{n}^{m}1$	$\sigma_{xzz}=\sigma_{zxz}=\sigma_{zzx}$, $\sigma_{xyy}=\sigma_{yxy}=\sigma_{yyx}$, σ_{xxx}	$\sigma_{zxz}=\sigma_{zzx}$, $\sigma_{yxy}=\sigma_{yyx}$, σ_{xzz}, σ_{xyy}, σ_{xxx}	$\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zyy}/2$, $\sigma_{xxz}=\sigma_{xzx}=-\sigma_{zxx}/2$
506	MnV_2O_6 (1.196)	Coplanar	$P^{\mathrm{m}_{100}}2_1/^{\mathrm{m}_{100}}\mathrm{c}\vert(2_{001},1,1)^{m}1$	×	×	×
507	$SrFe_2S_2O$ (0.762)	Coplanar	$P^{\mathrm{m}_{100}}\mathrm{m}^{1}\mathrm{m}^{\mathrm{m}_{010}}\mathrm{n}^{m}1$	$\sigma_{xyz}=\sigma_{xzy}=\sigma_{yxz}=\sigma_{yzx}=\sigma_{zxy}=\sigma_{zyx}$	$\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{yxz}=\sigma_{yzx}$, $\sigma_{xyz}=\sigma_{xzy}$	×
508	$SrFe_2Se_2O$ (0.761)	Coplanar	$P^{\mathrm{m}_{100}}\mathrm{m}^{1}\mathrm{m}^{\mathrm{m}_{010}}\mathrm{n}^{m}1$	$\sigma_{xyz}=\sigma_{xzy}=\sigma_{yxz}=\sigma_{yzx}=\sigma_{zxy}=\sigma_{zyx}$	$\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{yxz}=\sigma_{yzx}$, $\sigma_{xyz}=\sigma_{xzy}$	×

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Table S4 : (continued) Antiferromagnets in MAGNDATA without second-order transport tensors triggered by magnetic geometry.

No.	Materials (ID)	Configuration	Spin space group	with SOC		
				IMD	QMD	BCD
509	$BaFe_2S_2O$ (0.987)	Coplanar	$P^{\mathrm{m}_{100}}\mathrm{m}^{1}\mathrm{m}^{\mathrm{m}_{010}}\mathrm{n}^{m}1$	$\sigma_{xyz}=\sigma_{xzy}=\sigma_{yxz}=\sigma_{yzx}=\sigma_{zxy}=\sigma_{zyx}$	$\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{yxz}=\sigma_{yzx}$, $\sigma_{xyz}=\sigma_{xzy}$	×
510	$BaFe_2Se_2O$ (0.988)	Coplanar	$P^{\mathrm{m}_{100}}\mathrm{m}^{1}\mathrm{m}^{\mathrm{m}_{010}}\mathrm{n}^{m}1$	$\sigma_{xyz}=\sigma_{xzy}=\sigma_{yxz}=\sigma_{yzx}=\sigma_{zxy}=\sigma_{zyx}$	$\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{yxz}=\sigma_{yzx}$, $\sigma_{xyz}=\sigma_{xzy}$	×
511	YFe_4Ge_2 (0.27)	Coplanar	$P^{\mathrm{m}_{010}}\mathrm{n}^{\mathrm{m}_{100}}\mathrm{n}^{1}\mathrm{m}^{m}1$	$\sigma_{xyz}=\sigma_{xzy}=\sigma_{yxz}=\sigma_{yzx}=\sigma_{zxy}=\sigma_{zyx}$	$\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{yxz}=\sigma_{yzx}$, $\sigma_{xyz}=\sigma_{xzy}$	×
512	$Ba_3MnSb_2O_9$ (1.0.46)	Coplanar	$C^{\mathrm{m}_{100}}2/^{2_{001}}\mathrm{c}\vert(3^1_{001},1,1;3^2_{001})^{m}1$	σ_{zzz}, $\sigma_{yyz}=\sigma_{yzy}=\sigma_{zyy}$, $\sigma_{xyz}=\sigma_{xzy}=\sigma_{yxz}=\sigma_{yzx}=\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{xxz}=\sigma_{xzx}=\sigma_{zxx}$	σ_{zzz}, σ_{zyy}, $\sigma_{zxy}=\sigma_{zyx}$, σ_{zxx}, $\sigma_{yyz}=\sigma_{yzy}$, $\sigma_{yxz}=\sigma_{yzx}$, $\sigma_{xyz}=\sigma_{xzy}$, $\sigma_{xxz}=\sigma_{xzx}$	$\sigma_{yyz}=\sigma_{yzy}=-\sigma_{zyy}/2$, $\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{xxz}=\sigma_{xzx}=-\sigma_{zxx}/2$, $\sigma_{yxz}=\sigma_{yzx}$, $\sigma_{xyz}=\sigma_{xzy}$
513	$BaFeO_{2.5}$ (1.83)	Coplanar	$P^{1}2_1/^{1}\mathrm{c}^{2_{001}}(1/2\ \ 0\ \ 0)^{m}1$	×	×	×
514	$LiFeGe_2O_6$ (1.39)	Coplanar	$P^{\mathrm{m}_{100}}2_1/^{\mathrm{m}_{100}}\mathrm{c}\vert(2_{001},1,1)^{m}1$	×	×	×
515	Ba_2CoO_4 (1.302)	Coplanar	$P^{\mathrm{m}_{100}}2_1/^{\mathrm{m}_{100}}\mathrm{c}\vert(2_{001},1,1)^{m}1$	×	×	×
516	$LiFeSi_2O_6$ (0.28)	Coplanar	$P^{\mathrm{m}_{100}}2_1/^{\mathrm{m}_{010}}\mathrm{c}^{m}1$	σ_{zzz}, $\sigma_{yyz}=\sigma_{yzy}=\sigma_{zyy}$, $\sigma_{xyz}=\sigma_{xzy}=\sigma_{yxz}=\sigma_{yzx}=\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{xxz}=\sigma_{xzx}=\sigma_{zxx}$	σ_{zzz}, σ_{zyy}, $\sigma_{zxy}=\sigma_{zyx}$, σ_{zxx}, $\sigma_{yyz}=\sigma_{yzy}$, $\sigma_{yxz}=\sigma_{yzx}$, $\sigma_{xyz}=\sigma_{xzy}$, $\sigma_{xxz}=\sigma_{xzx}$	×
517	$NaMnF_4$ (1.345)	Coplanar	$P^{\mathrm{m}_{100}}2_1/^{\mathrm{m}_{100}}\mathrm{c}\vert(2_{001},1,1)^{m}1$	×	×	×
518	$GdPO_4$ (1.118)	Coplanar	$P^{\mathrm{m}_{100}}2_1/^{\mathrm{m}_{100}}\mathrm{c}\vert(2_{001},1,1)^{m}1$	×	×	×
519	$BiNiO(PO_4)$ (1.127)	Coplanar	$P^{\mathrm{m}_{100}}2_1/^{\mathrm{m}_{100}}\mathrm{c}\vert(2_{001},1,1)^{m}1$	×	×	×
520	$BiCoO(PO_4)$ (1.128)	Coplanar	$P^{\mathrm{m}_{100}}2_1/^{\mathrm{m}_{100}}\mathrm{c}\vert(2_{001},1,1)^{m}1$	×	×	×

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Table S4 : (continued) Antiferromagnets in MAGNDATA without second-order transport tensors triggered by magnetic geometry.

No.	Materials (ID)	Configuration	Spin space group	with SOC		
				IMD	QMD	BCD
521	$BiMnTeO_6$ (1.301)	Coplanar	$P^{\mathrm{m}_{100}}2_1/^{\mathrm{m}_{100}}\mathrm{c}\vert(2_{001},1,1)^m1$	×	×	×
522	$C_{10}H_6MnN_4O_4$ (0.1010)	Coplanar	$P^{\mathrm{m}_{100}}2_1/^{\mathrm{m}_{010}}\mathrm{c}^m1$	$\sigma_{yzz}=\sigma_{zyz}=\sigma_{zzy}$, $\sigma_{xzz}=\sigma_{zzx}=\sigma_{zxx}$, σ_{yyy}, $\sigma_{xyy}=\sigma_{yxy}=\sigma_{yyx}$, $\sigma_{xxy}=\sigma_{yxx}=\sigma_{xyx}=\sigma_{xxx}$	$\sigma_{zyz}=\sigma_{zzy}$, $\sigma_{zxz}=\sigma_{zzx}$, σ_{yzz}, σ_{yyy}, $\sigma_{yxy}=\sigma_{yyx}$, σ_{yxx}, σ_{xzz}, σ_{xyy}, $\sigma_{xxy}=\sigma_{xyx}$, σ_{xxx}	×
523	Ba_2CoO_4 (1.476)	Coplanar	$P^{\mathrm{m}_{100}}2_1/^{\mathrm{m}_{100}}\mathrm{c}\vert(2_{001},1,1)^m1$	×	×	×
524	Ba_2CoO_4 (1.477)	Coplanar	$P^{\mathrm{m}_{100}}2_1/^{\mathrm{m}_{100}}\mathrm{c}\vert(2_{001},1,1)^m1$	×	×	×
525	$FePb_4Sb_6S_{14}$ (1.660)	Coplanar	$P^{\mathrm{m}_{100}}2_1/^{\mathrm{m}_{100}}\mathrm{c}\vert(2_{001},1,1)^m1$	×	×	×
526	Sr_2MnMoO_6 (1.716)	Coplanar	$P^{\mathrm{m}_{100}}2_1/^{\mathrm{m}_{100}}\mathrm{c}\vert(2_{001},1,1)^m1$	×	×	×
527	Sr_2MnWO_6 (1.717)	Coplanar	$P^{\mathrm{m}_{100}}2_1/^{\mathrm{m}_{100}}\mathrm{c}\vert(2_{001},1,1)^m1$	×	×	×
528	$CuSb_2O_6$ (1.133)	Coplanar	$P^{\mathrm{m}_{100}}2_1/^{\mathrm{m}_{100}}\mathrm{c}\vert(2_{001},1,1)^m1$	×	×	×
529	$Li_2Fe(SO_4)_2$ (1.147)	Coplanar	$P^{\mathrm{m}_{100}}2_1/^{\mathrm{m}_{100}}\mathrm{c}\vert(2_{001},1,1)^m1$	×	×	×
530	$CrReO_4$ (1.202)	Coplanar	$C^{\mathrm{m}_{100}}2/^{\mathrm{m}_{010}}\mathrm{m}\vert(1,1,1;2_{001})^m1$	×	×	×
531	TbOOH (2.21)	Coplanar	$P^{2_{001}}2_1/^1\mathrm{m}\vert(1,1,m_{010})^m1$	σ_{zzz}, $\sigma_{yyz}=\sigma_{yzy}=\sigma_{zyy}$, $\sigma_{xyz}=\sigma_{xzy}=\sigma_{yxz}=\sigma_{yzx}=\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{xxz}=\sigma_{xzx}=\sigma_{zxx}$	σ_{zzz}, σ_{zyy}, $\sigma_{zxy}=\sigma_{zyx}$, σ_{zxx}, $\sigma_{yyz}=\sigma_{yzy}$, $\sigma_{yxz}=\sigma_{yzx}$, $\sigma_{xyz}=\sigma_{xzy}$, $\sigma_{xxz}=\sigma_{xzx}$	×
532	CoO (3.19)	Noncoplanar	$P^{4^1_{001}}4_2/^{2_{001}}\mathrm{n}^{\mathrm{m}_{100}}\mathrm{n}^{2_{110}}\mathrm{m}\vert$(-1,-1,-1)	×	×	×
533	Ce_3NIn (1.152)	Noncoplanar	$P^{4^1_{001}}4/^1\mathrm{m}^{\mathrm{m}_{010}}\mathrm{m}^{\mathrm{m}_{-110}}\mathrm{m}\vert$(1,1,-1)	×	×	$\sigma_{zxy}=\sigma_{zyx}$, $\sigma_{xyz}=\sigma_{xzy}=\sigma_{yxz}=\sigma_{yzx}$
534	$SrCuTe_2O_6$ (0.440)	Noncoplanar	$P^{4^1_{100}}{4_1}^{3^1_{111}}3^{2_{110}}2$	×	×	×
535	$SrCuTe_2O_6$ (0.530)	Noncoplanar	$P^{4^1_{100}}{4_1}^{3^1_{111}}3^{2_{110}}2$	×	×	×

Continued on next page

Table S4 : (continued) Antiferromagnets in MAGNDATA without second-order transport tensors triggered by magnetic geometry.

No.	Materials (ID)	Configuration	Spin space group	with SOC		
				IMD	QMD	BCD
536	Yb_2O_3 (1.720)	Noncoplanar	$I^{2_{100}}\mathrm{a}^{3^{2}_{\bar{1}1\bar{1}}}\bar{3}\vert(1,1,1;\bar{1})$	×	×	×
537	$CaCu_3Ti_4O_{12}$ (1.775)	Noncoplanar	$I^{1}\mathrm{m}^{3^{1}_{001}}\bar{3}\vert(1,1,1;\bar{1})$	×	×	×
538	$Dy_3Ru_4Al_{12}$ (1.115)	Noncoplanar	$C^{\mathrm{m}_{001}}2/^{\mathrm{m}_{001}}\mathrm{m}\vert(1,1,1;\bar{1})$	×	×	×
539	$Cu_6(SiO_3)_6(H_2O)_6$ (1.498)	Noncoplanar	$R^{3^{1}_{001}}\bar{3}\vert(1,1,\bar{1};\bar{1},1)$	×	×	×
540	Cr_2ReO_6 (1.201)	Noncoplanar	$P^{\mathrm{m}_{001}}2_1/^{\mathrm{m}_{001}}\mathrm{c}\vert(\bar{1},1,1)$	×	×	×
541	$FeSb_2O_4$ (0.97)	Noncoplanar	$P^{2_{001}}4_2/^{2_{010}}\mathrm{m}^{2_{100}}\mathrm{b}^{2_{010}}\mathrm{c}$	σ_{zzz}, $\sigma_{yyz} = \sigma_{yzy} = \sigma_{zyy}$, $\sigma_{xxz} = \sigma_{xzx} = \sigma_{zxx}$	σ_{zzz}, σ_{zyy}, σ_{zxx}, $\sigma_{yyz} = \sigma_{yzy}$, $\sigma_{xxz} = \sigma_{xzx}$	$\sigma_{yyz} = \sigma_{yzy} = -\sigma_{zyy}/2$, $\sigma_{xxz} = \sigma_{xzx} = -\sigma_{zxx}/2$
542	$Co_3(PO_4)_2$ (1.342)	Noncoplanar	$P^{\mathrm{m}_{001}}2_1/^{\mathrm{m}_{001}}\mathrm{c}\vert(\bar{1},1,1)$	×	×	×
543	CaV_2O_4 (1.73)	Noncoplanar	$P^{\mathrm{m}_{001}}2_1/^{\mathrm{m}_{001}}\mathrm{c}\vert(\bar{1},1,1)$	×	×	×