

Hi people of this world

$$\mathcal{H}_{\text{iso}} = -\frac{1}{2} \sum_{i \neq j} J_{ij} \vec{S}_i \cdot \vec{S}_j \quad (1)$$

$$\omega = \frac{J}{\hbar} (1 - \cos(ka)) \quad (2)$$

$$\frac{d\vec{S}_i}{dt} = -\frac{\gamma}{(1 + \alpha^2)\mu_s} \vec{S}_i \times (\vec{H}_i(t) + \alpha \vec{S}_i \times \vec{H}_i(t)) \quad (3)$$

$$\vec{H}_i(t) = \vec{\xi}_i(t) - \frac{\partial \mathcal{H}}{\partial \vec{S}_i} \quad (4)$$

$$\begin{aligned} \mathcal{H} = & -\frac{1}{2} \sum_{i \neq j} \left[ \underbrace{J_{ij} \vec{S}_i \cdot \vec{S}_j}_{\text{ISO}} - \underbrace{\vec{D}_{ij} \cdot (\vec{S}_i \times \vec{S}_j)}_{\text{DMI}} + \underbrace{\vec{S}_i^T \mathcal{J}_{ij}^{\text{tia}} \vec{S}_j}_{\text{TIA}} \right. \\ & \left. + \underbrace{\frac{\mu_s^2 \mu_0}{4\pi} \left( \frac{3(\vec{S}_i \cdot \vec{r}_{ij})(\vec{r}_{ij} \cdot \vec{S}_j)}{|\vec{r}_{ij}|^5} - \frac{\vec{S}_i \cdot \vec{S}_j}{|\vec{r}_{ij}|^3} \right)}_{\text{DDI}} \right] \\ & - \sum_i \left[ \underbrace{\mu_s \vec{B} \cdot \vec{S}_i}_{\text{Zeeman}} + \underbrace{d_2 S_{i,z}^2}_{\text{MCA2}} + \underbrace{d_4 S_{i,z}^4}_{\text{MCA4}} \right] \end{aligned} \quad (5)$$

But implemented is the following equivalent HAMILTONian

$$\begin{aligned} \mathcal{H} = & -\frac{1}{2} \sum_{i \neq j} \vec{S}_i^T \tilde{\mathfrak{J}}_{ij} \vec{S}_j \\ & - d_2 \sum_i S_{i,z}^2 - d_4 \sum_i S_{i,z}^4 \\ & - \mu_S \sum_i \vec{S}_i \cdot \vec{B} \end{aligned} \quad (6)$$

$$\vec{n}(T) = \frac{1}{4} (\langle \vec{m}_A \rangle(T) - \langle \vec{m}_B \rangle(T) \langle \vec{m}_C \rangle(T) + \langle \vec{m}_D \rangle(T)) \quad (7)$$

old

$$\begin{aligned} d_2 &= 112.8 \, \mu\text{eV}, \\ d_4 &= 1.1 \, \mu\text{eV} \end{aligned} \quad (8)$$

new

$$\begin{aligned} d_2 &= 133.5 \text{ }\mu\text{eV}, \\ d_4 &= 1.3 \text{ }\mu\text{eV} \end{aligned} \tag{9}$$

$$\alpha(l) = \alpha_{\text{offset}} + \alpha_{\text{max}} \cdot \frac{1 - \alpha_{\text{offset}}}{2} \cdot \left[ \tanh \left( \frac{\frac{d}{2} - \Delta(l)}{w} \right) \right] \tag{10}$$

$$\vec{B}_{\text{ext}}(t) = \vec{B}_{\text{amp}} \cdot \begin{pmatrix} 0 \\ \sin(\omega \cdot t + \phi) \\ \cos(\omega \cdot t + \phi) \end{pmatrix} \tag{11}$$

$$\Delta\langle S_z(l)\rangle = \langle S_z(l)\rangle_T - \langle S_z(l)\rangle_0 \tag{12}$$

$$f_{\text{SL}}(\omega) = \left| \int [\langle S_{x,\text{SL}}(t) \rangle + \langle S_{y,\text{SL}}(t) \rangle] \exp(-i2\pi\omega t) \, dt \right| \tag{13}$$

$$f_{\text{SL}}(k,\omega) = \left| \int \int [\langle S_{x,\text{SL}}(x,t) \rangle + i\langle S_{y,\text{SL}}(x,t) \rangle] \exp(-2\pi i(\omega t + kx)) \, dt \, dx \right| \tag{14}$$

$$f_{\text{SL}}(k,\omega) = \left| \int \int [\langle S_{x,\text{SL}}(x,t) \rangle] \exp(-2\pi i(\omega t + kx)) \, dt \, dx \right| \tag{15}$$

**Theorem 1 (Shannons phrasing )** *If a function  $f(t)$  contains no frequencies higher than  $f_N$  Hz, it is completely determined by giving its ordinates at a series of points spaced  $\frac{1}{2f_N}$  seconds apart.*

$$f_N := \frac{1}{2} \cdot f_S = \frac{1}{2 \cdot t_S} \tag{16}$$

$$\begin{aligned} T_1 &\approx 24 \text{ K}, \\ T_0 &= 0 \text{ K} \end{aligned} \tag{17}$$

$\alpha$ -Fe<sub>2</sub>O<sub>3</sub>

$$B_{\text{Mf}} = g \cdot \lambda \cdot M \tag{18}$$

$$\hat{=} 8000 \text{ T} \quad (19)$$

$$\psi_1 \quad \psi_2 \quad (20)$$

$$\Psi \quad (21)$$

$$q_i = \vec{r}_i, s_i \quad i \in 1, 2 \quad (22)$$

$$\Psi(q_1, q_2) = \psi_1(q_1) \cdot \psi_2(q_2) \quad (23)$$

$$\Psi(q_1, q_2) = \phi(\vec{r}_1, \vec{r}_2) \cdot \chi(s_1, s_2) \quad (24)$$

$$\phi(\vec{r}_1, \vec{r}_2) = \phi(\vec{r}_2, \vec{r}_1) \Leftrightarrow \chi(s_1, s_2) = -\chi(s_2, s_1) \quad (25)$$

$$\phi(\vec{r}_1, \vec{r}_2) = -\phi(\vec{r}_2, \vec{r}_1) \Leftrightarrow \chi(s_1, s_2) = \chi(s_2, s_1) \quad (26)$$

$$(27)$$

$$|\uparrow\uparrow\rangle \quad (28)$$

$$\frac{1}{\sqrt{2}} (|\uparrow\downarrow\rangle + |\downarrow\uparrow\rangle) \quad (29)$$

$$|\downarrow\downarrow\rangle \quad (30)$$

$$\frac{1}{\sqrt{2}} (|\uparrow\downarrow\rangle - |\downarrow\uparrow\rangle) \quad (31)$$

$$(32)$$

$$\mathcal{H} = \mathcal{H}_1 + \mathcal{H}_2 + \mathcal{H}_{12} + \mathcal{H}_{\text{Mag}} \quad (33)$$

$$\mathcal{H}_{12} \propto \frac{e^2}{\vec{r}_{12}} \quad (34)$$

$$\Psi_S = \frac{1}{\sqrt{2}} [\phi(\vec{r}_1, \vec{r}_2) + \phi(\vec{r}_2, \vec{r}_1)] \cdot \chi_S \quad (35)$$

$$\Psi_T = \frac{1}{\sqrt{2}} [\phi(\vec{r}_1, \vec{r}_2) - \phi(\vec{r}_2, \vec{r}_1)] \cdot \chi_T \quad (36)$$

$$(37)$$

$$U = \int \Psi^* \mathcal{H} \Psi dV \quad (38)$$

$$U_S = I_1 + I_2 + K_{12} + J_{12} \quad (39)$$

$$U_T = I_1 + I_2 + K_{12} - J_{12} \quad (40)$$

$$U_S - U_T = 2 \cdot J_{12} = 2 \cdot \int \int \phi_1^*(\vec{r}_1) \phi_2^*(\vec{r}_2) \mathcal{H}_{12} \phi_1(\vec{r}_2) \phi_2(\vec{r}_1) dV_1 dV_2 \quad (41)$$

$$S^2 = (S_1 + S_2)^2 = \underbrace{S_1^2 + S_2^2}_{=\text{const.}} + 2S_1 \cdot S_2 \quad (42)$$

$$\mathcal{H}_{\text{eff.}} \left( S_1 \cdot S_2 = -\frac{3}{4} \right) = U_S \quad (43)$$

$$\mathcal{H}_{\text{eff.}} \left( S_1 \cdot S_2 = \frac{1}{4} \right) = U_T \quad (44)$$

$$\mathcal{H}_{\text{eff.}} = \frac{1}{4} (U_S + 3 \cdot U_T) - (U_S - U_T) \cdot S_1 \cdot S_2 \quad (45)$$

$$\mathcal{H}_{\text{eff.}} = \underbrace{\frac{1}{4} (U_S + 3 \cdot U_T)}_{=\text{const.}} - \underbrace{(U_S - U_T)}_{=2 \cdot J_{12}} \cdot S_1 \cdot S_2 \quad (46)$$

$$\mathcal{H}_{\text{eff.}} = -2J_{12} \cdot S_1 \cdot S_2 \quad (47)$$

$$\mathcal{H}_{\text{Heisenberg}} = -2 \cdot \sum_{i < j} J_{ij} \cdot S_i \cdot S_j \quad (48)$$

$$\mathcal{H}_{\text{Heisenberg}} = - \sum_{\langle i, j \rangle} J_{ij} \cdot S_i \cdot S_j \quad (49)$$

$$(50)$$

$$J > 0 \Leftrightarrow U_S > U_T \Leftrightarrow \text{FM Grundzustand} \quad (51)$$

$$J < 0 \Leftrightarrow U_S < U_T \Leftrightarrow \text{AFM Grundzustand} \quad (52)$$

$$\mathcal{T} : t \rightarrow -t \quad (53)$$

$$(54)$$

$$\mathcal{T} : v \rightarrow \frac{dx}{-dt} = -v \quad (55)$$

$$\mathcal{T} : j \rightarrow \frac{dq}{-dt} = -j \quad (56)$$

$$\mathcal{T} : B \rightarrow -B \quad (57)$$

$$\mathcal{T} : S \rightarrow -S \quad (58)$$

$$(59)$$

$$M \neq 0 \quad U_{\text{Hall}} \neq 0 \quad (60)$$

$$M = 0 \quad U_{\text{Hall}} = 0 \quad (61)$$

$$M = 0 \quad U_{\text{Hall}} \neq 0 \quad (62)$$

$$[E||\mathbf{G}] \quad (63)$$

$$[E||\mathbf{G}] + [C_2||\mathbf{G}] \quad (64)$$

$$[E||\mathbf{H}] + [C_2||\mathbf{AH}] \quad (65)$$

$$(66)$$

$$[C_2||\bar{E}] \text{ oder } [C_2||\mathfrak{t}] \tag{67}$$

$$[C_2||A] \tag{68}$$

$$[T_s||T_g] \tag{69}$$