Erratum: Spin dynamics in ferromagnets: Gilbert damping and two-magnon scattering [Phys. Rev. B 76, 104416 (2007)]

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The fits of the two-magnon contribution $\Delta B^{2\text{mag}}$ to the overall ferromagnetic resonance linewidth of $Fe_{100-x}Si_x$ (x=20 and 25) thin films with thicknesses of 8 nm and 40 nm presented in our paper are incorrect due to an erroneous conversion of M_{eff} that enters the quantity ω_0 [see Eq. (1)] from cgs to SI units and the omission of a prefactor $2/\sqrt{3}$ within Eq. (9). The missing prefactor converts the full width at half maximum linewidth used in theory into the peak-to-peak linewidth used in analyzing our experiments. The corrected Eq. (9) reads:

$$\Delta B^{2\text{mag}}(\omega,\psi_B) = \sum_{\langle x_i\rangle} \frac{2}{\sqrt{3}} \Gamma_{\langle x_i\rangle} f(\phi_B - \phi_{\langle x_i\rangle}) \times \arcsin\left[\sqrt{\frac{\sqrt{\omega^2 + (\omega_0/2)^2} - \omega_0/2}{\sqrt{\omega^2 + (\omega_0/2)^2} + \omega_0/2}}\right] U(\theta_{\text{eq}} - \theta_c) \tag{1}$$

The other damping parameters needed slight adjustment according to the new fits. Below, the corrected fits and figures are presented, and the resulting parameters are given in Table I. Figures 1 and 2 replace the respective figures of the original paper. The changes to the fit of the results obtained on the $Fe_{80}Si_{20}$ sample presented in Fig. 3 of the original paper are not visible in the plot and consequently only the correct fitting parameters are listed in Table I. Note that new data measured since publication on the same samples have been added to the plots. In detail, for the 8-nm-thick $Fe_{75}Si_{25}$ sample the in-plane angular dependence at 24 GHz was measured [see new Fig. 1(c)], while for the 40-nm-thick $Fe_{75}Si_{25}$ sample measurements at a frequency of 9 GHz were repeated and those at 49 GHz additionally performed [see the new Fig. 2(a)]. For the latter sample the use of the correct value of ω_0 results in a slight deviation of the fit of the frequency dependence at small frequencies, which consequently is accompanied by a deviation of the fit of the in-plane angular dependence at 9 GHz. As this deviation is obviously largest at 9 GHz we thus used—in addition to the fit of the frequency dependence—the in-plane angular dependent data measured at 24 GHz to extract the fitting parameters.

One may see that the correct fitting parameters yield systematically larger values for the two-magnon scattering rate given by $\gamma\Gamma$. The constant Γ is related to the exact geometry of defects within the sample, which, however, in our case is unknown.

The conclusion that two-magnon scattering is more effective along the [100]-as compared to the [110]-direction remains valid after the correction. Besides the magnitude of Γ, the correct fitting yields a Gilbert parameter for the 40-nm-thick $Fe_{75}Si_{25}$ sample which is about 20% reduced compared to the thinner 8 nm one. As the sample with higher Fe content ($Fe_{80}Si_{20}$) exhibits a larger Gilbert-parameter than even the 8-nm-thick $Fe_{75}Si_{25}$ sample, this indicates that bulk $Fe_{75}Si_{25}$ is a material with rather small intrinsic magnetic damping.

We would like to point out that the work on the present system (Fe-rich Fe_xSi_{1-x} films) demonstrates and supports earlier experiments by us,[1–3] that have revealed that the two dynamic mechanisms (Gilbert damping and magnon-magnon scattering within the magnetic subsystem) can be separated by means of frequency-dependent FMR. This offers a more specific and detailed analysis of spin dynamics in magnetic nanostructures.

TABLE I. The magnetic relaxation parameters: (a) 8 nm Fe_3Si annealed at 900 K for 1 h, (b) 40 nm Fe_3Si as-prepared, (c) 8 nm $Fe_{80}Si_{20}$ annealed at 900 K for 1 h. All samples were measured at ambient temperature.

Sample	ΔB^{inhom} (mT)	G (10^7 Hz)	$\gamma\Gamma_{\langle 100\rangle}$ (10^7 Hz)	$\gamma\Gamma_{\langle 110\rangle}$ (10^7 Hz)	$\Delta\phi_B$ (deg)	$\Delta\theta_B$ (deg)
(a) 8 nm Fe_3Si annealed	0.5(3)	4.7(5)	57(10)	25(15)	0.15	0.06
(b) 40 nm Fe_3Si as-prepared	1.4(3)	3.8(2)	102(5)	59(10)	0.50	0.20
(c) 8 nm $Fe_{80}Si_{20}$ annealed	0	5.8(2)	29.2(3)	19.2(4)	0.19	—

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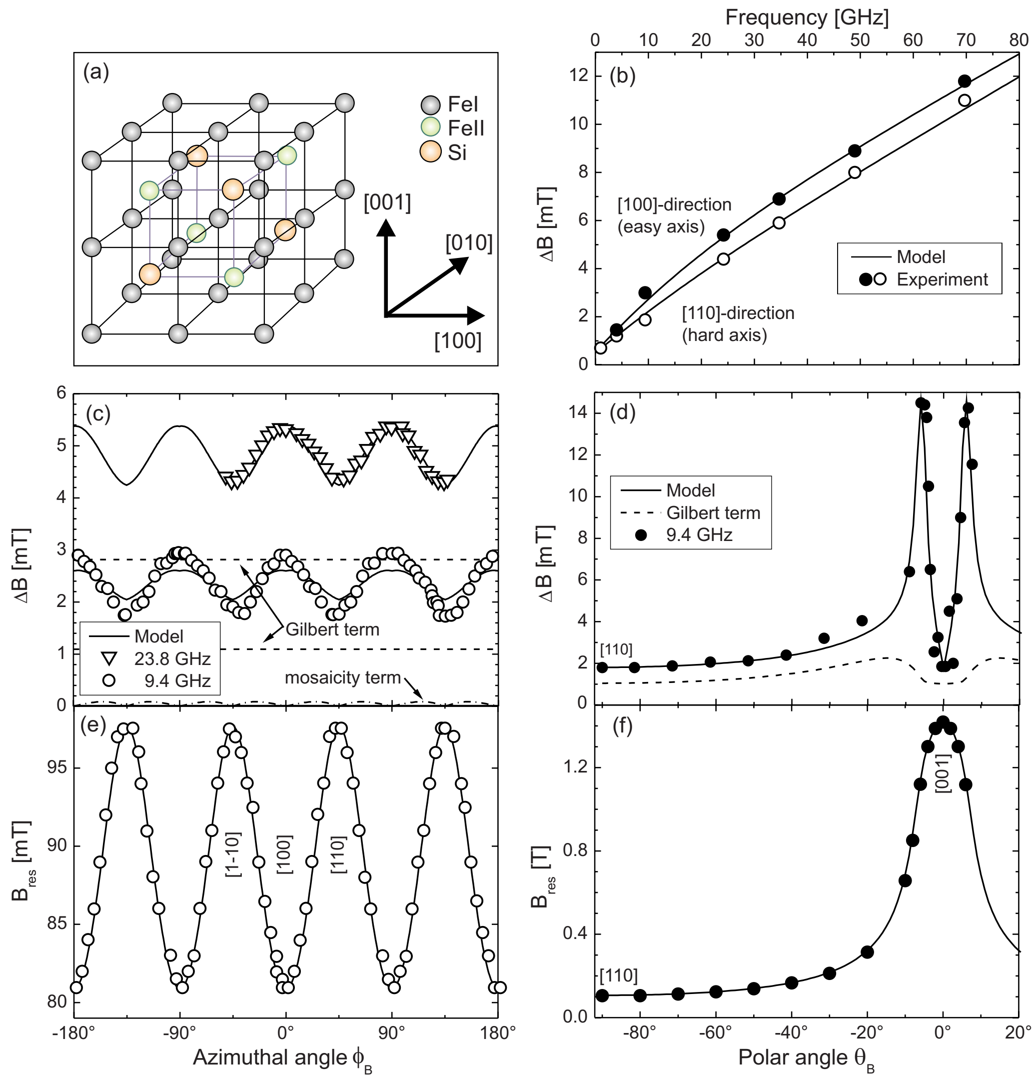

FIG. 1. (Color online) (a) Schematic representation of the $D0_3$ structure of Fe_3Si. (b) The frequency dependence of the FMR linewidth for 8 nm Fe_3Si annealed for 1 h at 900 K. (c) The azimuthal and (d) the polar angular dependence of the FMR linewidth measured at a microwave frequency of 9.4 (circles) and 24 GHz (triangles). (e) The azimuthal and (f) polar angular dependence of the FMR resonance field measured at 9.4 GHz. All FMR experiments were performed at RT.

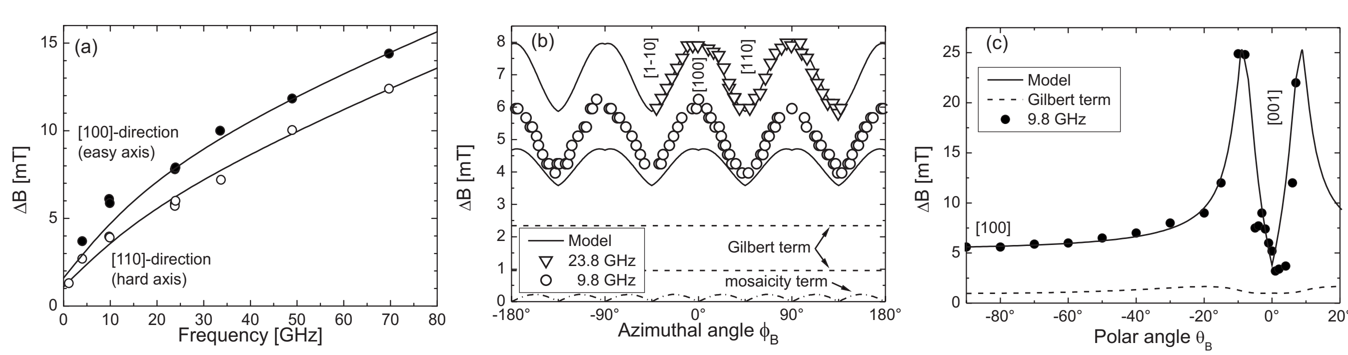

FIG. 2. (a) The frequency dependence of the FMR linewidth for 40 nm Fe_3Si as prepared. (b) The azimuthal and (c) the polar angular dependence of the resonance linewidth measured at 9.8 GHz (circles) and 23.8 GHz (triangles). All experiments were performed at RT. The error bars are smaller than the symbol size.

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