Erratum: Unconventional Spin Currents Generated by the Spin-Orbit Precession Effect in Perpendicularly Magnetized Co-Tb Ferrimagnetic System [Phys. Rev. Applied 17, 034026 (2022)]

Wenqiang Wang, Qingwei Fu, Kaiyuan Zhou, Lina Chen, Liupeng Yang, Zishuang Li, Zui Tao, Chunjie Yan, Like Liang, Xiang Zhan, Youwei Du, and Ronghua Liu*

(Received 9 October 2022; published 9 December 2022)

DOI: 10.1103/PhysRevApplied.18.069901

In this erratum, we correct an error in Eq. (9). In our work, we adopt the ratio of $\tau_{z,\mathrm{DL}}/\tau_{y,\mathrm{FL}}$ to calculate the out-of-plane spin-polarization efficiency θ_z^{eff}. Unlike Eqs. (7) and (8) calculating the in-plane torques, Eq. (9) should not need the correction factor of $\sqrt{1+(4\pi M_{\mathrm{eff}}/H_{\mathrm{res}})}$ related to the shape anisotropy-induced elliptical precession of magnetization because $\tau_{z,\mathrm{DL}}$ and $\tau_{y,\mathrm{FL}}$ both belong to the out-of-plane torques [1]. Equation (9) should read $\theta_z^{\mathrm{eff}} = \frac{\tau_{z,\mathrm{DL}}}{\tau_{y,\mathrm{FL}}}\frac{\zeta e\mu_0 M_s t_{\mathrm{Py}} t_{\mathrm{Co\text{-}Tb}}}{\hbar}$. Consequently, the values of θ_z^{eff} in Table I determined with Eq. (9) should be recalculated (be reduced by the correction factor). The erratum reported does not affect the main conclusions in our work.

With this correction, Table I now reads as given below.

TABLE I. The effective spin-torque efficiencies $\theta_x^{\mathrm{eff}}, \theta_y^{\mathrm{eff}}$, and θ_z^{eff} under $\pm M_{\mathrm{Co\text{-}Tb}}$ states, determined from the line shape ratio V_s/V_a and linewidth modulation (LWM) of angular-dependent ST-FMR spectra with the spacer Cu = 3, 5, and 7 nm samples.

		3 nm			5 nm			7 nm		
Magnetic state	Methods	θ_x^{eff}	θ_y^{eff}	θ_z^{eff}	θ_x^{eff}	θ_y^{eff}	θ_z^{eff}	θ_x^{eff}	θ_y^{eff}	θ_z^{eff}
$+M_{\mathrm{Co\text{-}Tb}}$	$V_{\mathrm{AMR}}^s/V_{\mathrm{AMR}}^a$	0.055	0.124	0.012	0.038	0.110	0.009	0.029	0.103	0.006
$-M_{\mathrm{Co\text{-}Tb}}$	$V_{\mathrm{AMR}}^s/V_{\mathrm{AMR}}^a$	−0.042	0.127	0.012	−0.040	0.111	0.010	−0.052	0.104	0.007
$+M_{\mathrm{Co\text{-}Tb}}$	$V_{\mathrm{GMR}}^s/V_{\mathrm{GMR}}^a$	0.049	0.141	0.011	0.037	0.130	0.009	0.026	0.121	0.005
$-M_{\mathrm{Co\text{-}Tb}}$	$V_{\mathrm{GMR}}^s/V_{\mathrm{GMR}}^a$	−0.050	0.142	0.010	−0.057	0.131	0.009	−0.040	0.142	0.006
$+M_{\mathrm{Co\text{-}Tb}}$	LWM	∼0.010	0.107	0.084	∼0.010	0.107	0.115	–	–	–
$-M_{\mathrm{Co\text{-}Tb}}$	LWM	∼−0.010	0.103	0.083	∼−0.01	0.108	0.116	–	–	–

In the main text, the relevant sentences describing the out-of-plane spin polarization θ_z^{eff} should also be revised, e.g., "*For example, the averaged* θ_z^{eff} *reduces to 0.009 from* 0.011 *with increasing the Cu layer to 5 nm from 3 nm, finally reaches* $\theta_z^{\mathrm{eff}} \sim 0.006$ *at Cu = 7 nm.*"; "We also find that *the unconventional SOT with out-of-plane spin polarization* $\theta_z^{\mathrm{eff}}, \ldots,$ *has approximately 0.009 of the effective spin torque efficiency for the Cu = 5 nm device.*"; " *we find a large SOPE-generated unconventional SOT with out-of-plane spin polarization* $\theta_z^{\mathrm{eff}} \sim 0.011$ *for the Cu = 3 nm sample,*"

We thank Daniel C. Ralph for pointing out this issue to us.

[1] J. C. Sankey, Y.-T. Cui, J. Z. Sun, J. C. Slonczewski, R. A. Buhrman, and D. C. Ralph, Measurement of the spin-transfer-torque vector in magnetic tunnel junctions, Nat. Phys. **4**, 67 (2008).

*rhliu@nju.edu.cn

