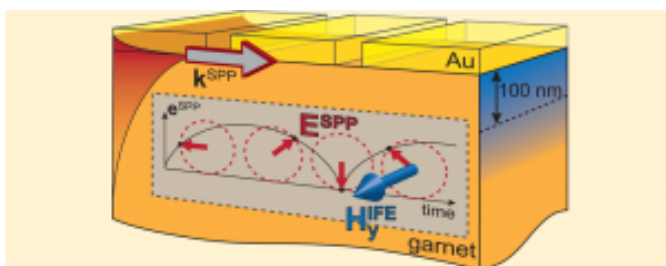


# Surface Plasmon-Mediated Nanoscale Localization of Laser-Driven sub-Terahertz Spin Dynamics in Magnetic Dielectrics

*We report spatial localization of the effective magnetic field generated via the inverse Faraday effect employing surface plasmon polaritons (SPPs) at Au/garnet interface. Analyzing both numerically and analytically the electric field of the SPPs at this interface, we corroborate our study with a proof-of-concept experiment showing efficient SPP-driven excitation of coherent spin precession with 0.41 THz frequency. We argue that the subdiffractive confinement of the SPP electric field enables strong spatial localization of the SPP-mediated excitation of spin dynamics. We demonstrate two orders of magnitude enhancement of the excitation efficiency at the surface plasmon resonance within a 100 nm layer of a dielectric garnet. Our findings broaden the horizons of ultrafast spin-plasmonics and open pathways toward nonthermal optomagnetic recording on the nanoscale.*



**KEYWORDS:** *Ultrafast spin dynamics, surface plasmon-polariton, inverse Faraday effect, rare-earth iron garnet, nonlinear optics, Magnetoplasmonics*

*Effective static magnetic field induced by a propagating SPP at the Au/magnetic garnet interface.*

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