Impact of pump wavelength on terahertz emission of a cavity-enhanced spintronic trilayer

We systematically study the pump-wavelength dependence of terahertz pulse generation in thin-film spintronic THz emitters composed of a ferromagnetic Fe layer between adjacent nonmagnetic W and Pt layers. We find that the efficiency of THz generation is essentially flat for excitation by 150 fs pulses with center wavelengths ranging from 900 to 1500 nm, demonstrating that the spin current does not depend strongly on the pump photon energy. We show that the inclusion of dielectric overlayers of TiO2 and SiO2, designed for a particular excitation wavelength, can enhance the terahertz emission by a factor of of up to two in field.

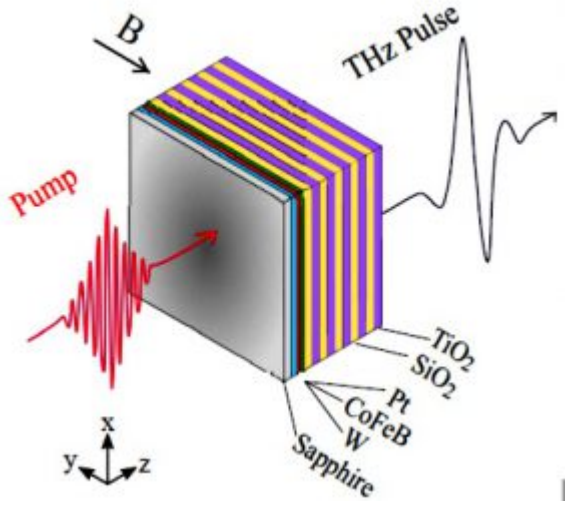

FIG. 1: Schematic of a spintronic trilayer with added dielectric cavity, grown on 0.5 mm of sapphire (Al2O3). The near-infrared pump pulse, incident through the substrate, is partially absorbed in the metallic layers, launching a spin current from the ferromagnetic (FM) layer into the nonmagnetic (NM) layers. The inverse spin Hall effect converts this

ultrashort out-of-plane spin current into an in-plane charge current resulting in the emission of THz radiation into the optical far-field. A weak in plane magnetic field (B) determines the magnetization direction, and the linear polarization of the emitted THz field.

For more information: https://arxiv.org/abs/1808.00746