THz spintronics using Magnetic Heterostructures and Topological Materials

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A breakthrough on THz spintronics is the generation of THz current via laser driven picosecond spin to charge conversion. This opens up a route not only to novel THz emitters [1,2], but also potential spintronic devices manipulating the magnetization on a picosecond timescale. By integrating our spin based THz emitter with a photoconductive antenna, 2–3 order enhancement of the THz signals in a lower THz frequency range (0.1–0.5 THz) is achieved [3]. The emitted THz waves from magnetic heterostructures also help to characterize various materials, such as 2D materials, topological insulators, and Weyl semimetal [4-6]. Not much is known for the propagation of magnons in antiferromagnetic materials so far. Using THz emission measurements sub-picosecond magnon currents can be identified through the antiferromagnetic NiO layer, which can even manipulate the magnetization [7].

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