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Terahertz emission from ultrafast spin-charge current at a Rashba interface QI ZHANG, MATTHIAS BENJAMIN JUNGFLEISCH, Argonne Natl Lab, WEI ZHANG, Oakland University, JOHN E. PEARSON, HAIDAN WEN, AXEL HOFFMANN, Argonne Natl Lab — Ultrafast broadband terahertz (THz) radiation is highly desired in various fields from fundamental research in condensed matter physics to bio-chemical detection. Conventional ultrafast THz sources rely on either nonlinear optical effects or ultrafast charge currents in semiconductors. Recently, however, it was realized that ultrabroad-band THz radiation can be produced highly effectively by novel spintronics-based emitters that also make use of the electron's spin degree of freedom [1]. Those THz-emitters convert a spin current flow into a terahertz electromagnetic pulse via the inverse spin-Hall effect. In contrast to this bulk conversion process, we demonstrate here that a femtosecond spin current pulse launched from a CoFeB layer can also generate terahertz transients efficiently at a two-dimensional Rashba interface between two non-magnetic materials, i.e., Ag/Bi. Those interfaces have been proven to be efficient means for spin- and charge current interconversion [2,3].

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[2]W. Zhang et al., J. Appl. Phys. 117, 17C727 (2015).
[3]M. B. Jungfleisch et al., Phys. Rev. B 93, 224419 (2016).

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