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Large Enhancement of Nonlinear Terahertz Absorption in Intrinsic GaAs by Plasmonic Nano Antennas MICHAEL PAUL, Oregon State University, YOUNG-GYUN JEONG, Seoul National University, SEUNG-HYUN KIM, KI-JU YEE, Chungnam National University, DAI-SIK KIM, Seoul National University, YUN-SHIK LEE, Oregon State University — We present our preliminary study on nonlinear THz effects in GaAs and their huge enhancement by plasmonic nano-antennas. We fabricated nano-antenna arrays on a 500-μ m-thick, intrinsic (100) GaAs wafer, using an electron beam lithography technique. THz pulses were generated by tilted-pulse-front optical rectification in $LiNbO_3$. The THz field amplitude (central frequency, 1 THz; bandwidth, 1 THz) varies from 20 to 120 kV/cm. We measured the transmitted THz pulses using a L-He cooled Si:Bolometer to obtain either spectrally-integrated total THz transmitted power or transmission spectra via Michelson interferometry. We observe (1) a transmission decrease (ΔT/T) of about 5 % at around 100 kV/cm incident field strength in bare GaAs wafers and (2) a transmission decrease of more than 30 % over the incident field amplitude range from 40 to 120 kV/cm in nano-antenna-on-GaAs samples. Our experimental study demonstrates that strong THz pulses induce nonlinear THz absorption in intrinsic GaAs. The nonlinear THz effects are intensified by the field enhancement in a nano-antenna array.

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