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Rashba effect and beating patterns in the THz magneto-photoresponse of a HgTe-based two-dimensional electron gas[1] MEHDI PAKMEHR, University at Buffalo, CHRISTOPH BRUENE, HARTMUT BUHMANN, LAURENS MOLENKAMP, University of Wuerzburg, BRUCE MCCOMBE, University at Buffalo — HgTe quantum wells with a gapped single Dirac cone electronic dispersion relation have been investigated by THz magneto-photoresponse (PR) and magneto-transport measurements. The HgTe has the conventional band alignment at well thickness of 6.1 nm, slightly smaller than the critical thickness for the topological phase transition. The effective gap is roughly 10 meV, and the large sheet density of electrons ($n_S \approx 1.5\times 10^{12}$ cm^{-2}) results in a very large Fermi energy ($E_F \sim 160$ meV). We have found several interesting effects at these high densities. We focus here on an observed beating of quantum oscillations in the PR signal (at 1.83 THz) and compare it with direct measurements of oscillations in the longitudinal magneto-resistance (R_{xx}). The mechanism for the PR is cyclotron resonance absorption heating of the electrons (an electron bolometric effect). We attribute the beating to Rashba splitting of the spin states, which is barely observable in direct R_{xx} measurements even under strong gate-induced electric fields. We will discuss the origin of the enhanced visibility of the Rashba effect in the PR and the magnitude of the Rashba coefficient (α_R) from these data.

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