# Giant photoresistance and a new class of microwave-induced resistance oscillations in GaAs/AlGaAs quantum wells

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We report on experimental study of microwave photoresistance in high-mobility two-dimensional electron systems in quantizing magnetic fields. As shown in Fig. 1(a), in addition to microwave-induced resistance oscillations [1], which persist to 20-th order, we observe a giant photoresistance effect which manifests itself as a series of narrow peaks [marked by ↓], occurring near the cyclotron resonance (cf. vertical line marked by 1). Some of these peaks are extremely strong, exceeding MIRO amplitude by more than an order of magnitude, and their relative strength depends on the sweeping direction of the magnetic field. Using lower radiation intensity allows to extend the measurements to considerably lower temperatures, a regime of strong Shubnikov-de Haas oscillations (SdHO). In contrast to higher-intensity, higher-temperature data shown in Fig. 1(a), giant photoresistance peaks are no longer observed [see Fig. 1(b)]. Instead, the data reveal strong suppression of the SdHO near the cyclotron resonance, and to a lesser extent, near its harmonics. Another interesting feature of the data in Fig. 1(b) is what at first glance appears as noise near the cyclotron resonance. However, this fine structure turned out to be highly reproducible and its strength was found to depend sensitively on microwave power. A closer look at this structure, presented in Fig. 1(c), reveals that it is a series of extrema, which are more pronounced near the SdHO maxima and are roughly equally spaced in magnetic field. In fact, there exist two series of radiation-induced minima; a series of "deep" minima, marked by vertical lines (separated by $\delta B = 0.26$ kG) and a series of "shallow" minima, marked by ↓, which appear roughly in the middle between the neighboring "deep" minima. Understanding the origin of these peculiar findings remains a subject of future experimental and theoretical studies.

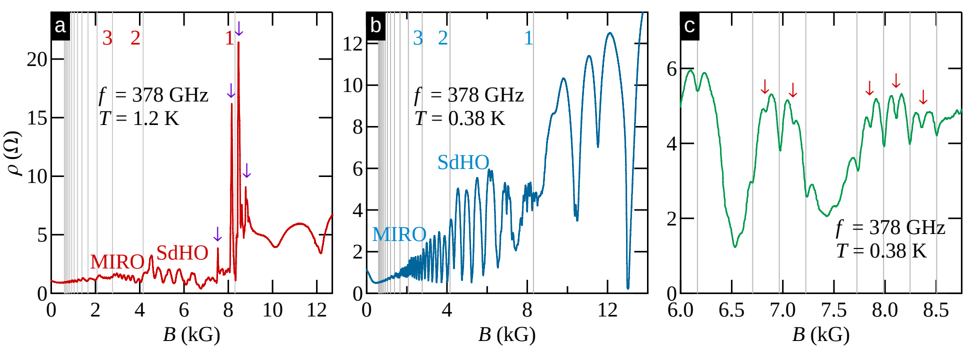


Figure 1: Magnetoresistivity $\rho(B)$ under microwave irradiation of frequency $f = 378$ GHz at (a) higher intensity and $T = 1.2$ K and (b,c) lower intensity and $T = 0.38$ K.

[1] M. A. Zudov, R. R. Du, J. A. Simmons, J. L. Reno, Phys. Rev. B **64**, 201311(R) (2001).