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Many-Body Theory of Trion Absorption Features in Two-Dimensional Semiconductors DMITRY K. EFIMKIN, ALLAN H. MACDONALD, Univ of Texas, Austin — Recent optical studies of monolayer transition metal dechalcogenides have demonstrated that their excitonic absorption feature splits into two widely separated peaks at nite carrier densities. The additional peak is usually attributed to the presence of trions, bound states of two electrons and a hole or an electron and two holes. Here we argue that in the density range over which the trion peak is well resolved, it cannot be interpreted in terms of weakly coupled three-body systems, and that the appropriate picture is instead one in which excitons are dressed by interactions with a Fermi sea of excess carriers. This coupling splits the exciton spectrum into a lower energy attractive exciton-polaron branch, normally identied as a trion branch, and a higher energy repulsive exciton-polaron branch, normally identied as an exciton branch. We have calculated the frequency and doping dependence of the optical conductivity and found that: (i) the splitting varies linearly with the Fermi energy of the excess quasiparticles; (ii) the trion peak is dominant at high carrier densities; (iii) and the trion peak width is considerably smaller than that of the excitonic peak. Our results are in good agreement with recent experiments.

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