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Theory of Fermi polaron polaritons in transition metal dichalcogenide monolayers embedded in a cavity[1] IMAMOGLU ATAC, OVIDIU COTLET, ETH - Zurich, EUGENE DEMLER , Harvard University — We present a theoretical study of Fermi polaron polaritons in monolayer transition metal dichalcogenides [1]. The Fermi polaron has received considerable attention in cold atom systems, where it results from the interaction of an impurity with a fermionic bath. We show that a similar theoretical framework can be used to understand the interaction of excitons with conduction band electrons in transition metal dichalcogenides monolayers. We show that, by embedding the monolayer into a cavity, the emerging quasi particles, which we call Fermi polaron polaritons, can also be understood using the tools developed for understanding Fermi polarons. To this end we first analyze the microscopic exciton-electron interaction in these materials and show that it can be approximated by a contact interaction. Then, we show that truncating the Hilbert space to a single electron hole pair, the many-body problem can be solved analytically and quantitative agreement with experiments can be obtained. We briefly comment on different methods that can be used to solve the Fermi polaron problem. and on the generalization of our results to different physical systems, like the excitons formed in GaAs quantum wells. [1] M. Sidler, et. al. Nat. Phys. 2016, doi:10.1038/nphys3949

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