Highlights

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Observation of hybrid Tamm-plasmon exciton-polaritons with GaAs quantum wells and a MoSe2 monolayer

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Solid state cavity quantum electrodynamics is a rapidly advancing field which explores the frontiers of light-matter coupling. Metal-based approaches are of particular interest in this field, since they carry the potential to squeeze optical modes to spaces significantly below the diffraction limit enhancing light-matter coupling. At the same time, transition metal dichalcogenides are ideally suited as the active material in solid state cavity quantum electrodynamics as they interact strongly with light at the ultimate monolayer limit. Here, we implement a Tamm-plasmon polariton structure, and study the coupling to a monolayer of WSe2, hosting highly stable excitons. Exciton-Polariton formation at room temperature is manifested in the characteristic energy momentum dispersion relation studied in photoluminescence, featuring an anti-crossing between the exciton and photon modes with a Rabi-splitting of 23.5 meV. Creating polaritonic quasi particles in monolithic, compact architectures with atomic monolayers under ambient conditions is a crucial step towards the exploration of non-linearities, macroscopic coherence and advanced spinor physics with novel, low mass bosons.

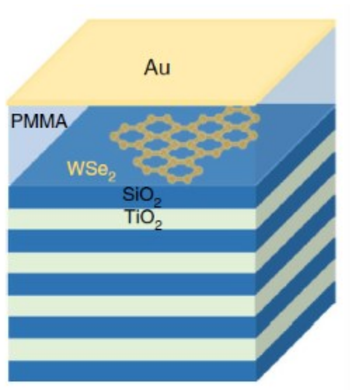

Fig.1: The Tamm cavity with an embedded TMDC monolyer

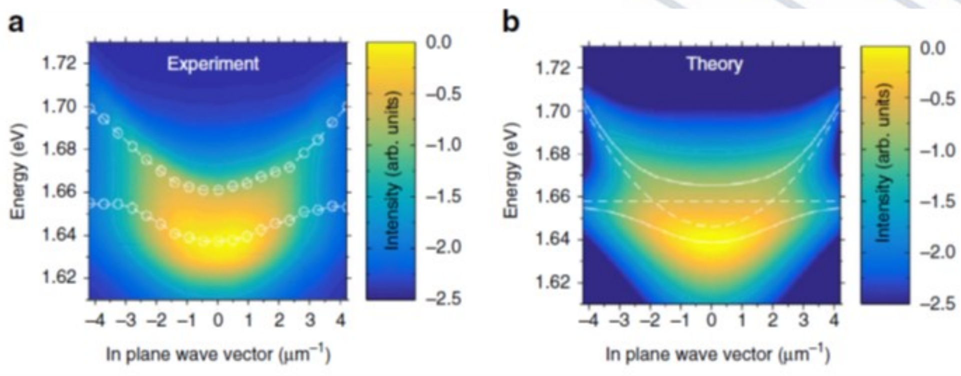

Fig.2: Experimental (a) and theoretical (b) angle-resolved photoluminescence spectra of the studied Tamm structure