

Optical Antenna Enhanced Spontaneous Emission from Transition Metal Dichalcogenide Monolayers
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Abstract: Optical antennas can be used to dramatically increase the rate at which semiconductors spontaneously emit photons. While traditional LEDs are limited in bandwidth due to the "slow" rate of spontaneous emission, antenna enhanced LEDs have the potential to be the fast, efficient, nanoscale light emitter for on-chip optical interconnects. The high quantum efficiency of transition metal dichalcogenide (TMDC) monolayer materials make them candidates for the active material in such an antenna enhanced LED. The first part of this talk will cover the fundamentals of optical antennas, and how they can be used to modify the spontaneous emission rate of semiconductors in terms of classic antenna theory. A circuit model analysis of optical antennas will be presented showing enhancement $>1000x$ can be achieved while maintaining greater than 50% efficiency. The second portion of the talk will detail our progress in experimentally demonstrating over 200x enhancement of spontaneous emission from TMDC monolayers.