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Vertical collimation of optical antenna coupled quantum dot emission YOUNG CHUL JUN, Stanford University — We present our optical measurement results on semiconductor quantum dot (QD) emission in metal slit-groove structures. First, we show that the lifetime and polarization of QD emission in metal nanoslits are strongly modified due to surface plasmon coupling of QD emission. As a slit width gets smaller, the QD exciton lifetime gradually decreases, and its emission becomes polarized normal to the slit, as expected for plasmon coupled light emission. Its out-coupled light can be also collimated vertically into a narrow angle with optimized side grooves. We experimentally demonstrate and visualize this vertical beaming, using a confocal scanning of QD emission. Our metal slit-groove structure works as an optical antenna, sourced by QD in the center nanoslit. These experimental demonstrations may open the door to novel applications in spectroscopy, sensing, and optoelectronic devices.

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