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Radiation Pattern and Scattering Properties of Optical Antennas[1] ZEYAN XU, University of Texas at Dallas, KEVIN MESSER, ELI YABLONOVITCH, University of California, Berkeley — When light emitting devices (e.g. LEDs) are coupled with optical antennas of the same resonance frequency, their spontaneous emission rate can be enhanced drastically. The ultimate goal is to have the rate of spontaneous emission faster than the stimulated emission so that the LEDs would be as fast as lasers and enable us to achieve energy efficient interconnects for on-chip communication. In this project, we built multiple optical setups to experimentally measure the far field radiation pattern, light scattering properties and photoluminescence of a series of optical antennas. We also used Lumerical FDTD software to theoretically simulate the structure and found out that the simulated results agree with experimental values. As the longitudinal length increased, the spectrum shifted towards higher wavelengths on the spectrum. Also, by studying the radiation patterns of the optical antennas, we are able to understand their strengths as a function of direction, and how the geometrical shape contribute to the shape of radiation patterns. Understanding the radiation pattern and the scattering spectrum of optical antennas will enable us to design devices with specific requirements on radiational directions and resonance frequencies for optical antennas.

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Zeyan Xu
University of Texas Dallas

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