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Cooperative resonances in light scattering from two-dimensional atomic arrays[1] EPHRAIM SHAHMOON, DOMINIK WILD, MIKHAIL LUKIN, SUSANNE YELIN, Harvard Univ — We consider light scattering off a two-dimensional (2D) dipolar array and show how it can be tailored by properly choosing the lattice constant of the order of the incident wavelength. In particular, we demonstrate that such arrays can shape the emission pattern from an individual quantum emitter into a well-defined, collimated beam, and operate as a nearly perfect mirror for a wide range of incident angles and frequencies. These results can be understood in terms of the cooperative resonances of the surface modes supported by the 2D array. Experimental realizations are discussed, using ultracold arrays of trapped atoms and excitons in 2D semiconductor materials, as well as potential applications ranging from atomically thin metasurfaces to single photon nonlinear optics and nanomechanics.

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