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Long-range interaction of single atoms through nanowires with nontrivial topology of couplings[1] DAVID DZSOTJAN, Universitaet Kaiserslautern, Germany; RMKI-KFKI Budapest, Hungary, MICHAEL FLEISCHHAUER, Universitaet Kaiserslautern, Germany — We investigate the long-range coupling of individual atoms placed close to metallic nanowires. Putting the emitter close to the surface of the wire, a strong Purcell effect can be observed: the emitter will decay into guided surface plasmon modes of the wire with a rate exceeding that of free space by a large factor. This strong coupling is due to the extremely small mode volume of the surface plasmon modes, their being tightly confined near the wire surface. There is an optimal, sub-wavelength emitter-wire distance where the coupling is maximal due to the losses originating from local circulating currents. Placing two emitters along the wire, we observe a strong, wire-mediated long-range interaction between the emitters. As a result, super- and subradiance can occur over distances large compared to the resonant wavelength. The states with enhanced or suppressed decay rate are the symmetric or anti-symmetric Dicke states. Coupling more atoms to a wire network with a nontrivial coupling topology leads to interesting entangled subradiant states of the system.

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