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**Plasmons in the metallic nanoparticle-film system as a tunable impurity problem** F. LE, N.Z. LWIN, N.J. HALAS, P. NORDLANDER, Rice University — We show that the plasmon resonances of a metallic nanoparticle interacting with a metallic film is an electromagnetic analog of the spinless Anderson-Fano model [1]. The three characteristic regimes of this model are realized here, where the energy of the nanoparticle plasmon resonance lies above, within, or below the energy band of surface plasmon states. The latter regime is experimentally observed and identified. Our approach [1] is generalized to describe a nanoshell on a metallic film and to account for the screening effects caused dielectric backgrounds. These three interaction regimes are controlled by film thickness and the aspect ratio of the nanoshell. The results are compared with Finite-Difference Time-Domain (FDTD) simulations using realistic dielectric functions.

[1] F. Le, N. Z. Lwin, J.M. Steele, M. Kall, N.J. Halas, and P. Nordlander, Nano Lett. 5(2005)2009-2013.

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