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Fano Resonance in an Electrically Driven Plasmonic Device YUVAL VARDI, EYAL COHEN-HOSHEN, GUY SHALEM, ISRAEL BAR-JOSEPH, Department of Condensed Matter Physics, Weizmann Institute of Science, Rehovot 76100, Israel — Electrically driven plasmonic devices offer unique opportunities as a research tool and for practical applications. In such devices, current that flows across a metallic tunnel junction excites a plasmon, which gives rise to light emission. This local nature of the excitation allows access into "dark" modes, which are not easily excited by far field illumination. We present an electrically driven plasmonic device, based on a gold nanoparticle single-electron-transistor, and investigate the light emission due to the tunneling current. The applied voltage determines the emitted spectral lineshape, enables an excellent control of the plasmonic spectrum. We show that the use of this structure allows us to characterize the electrical properties of the two tunnel barriers, and determine their role in the light emission process. Furthermore, we find a Fano resonance, resulting from interference between the nanoparticle and electrodes dipoles. This resonance is seen due to the local nature of the excitation, and is manifested as a sharp asymmetrical spectral dip. We show that the spectral position of this resonance can be conveniently controlled by the design of the structural parameters. Such devices may be a step toward the realization of an on-chip nano-optical emitters and sensors.

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