Fano resonant plasmonic systems: Functioning principles and applications for sensing

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We show how to develop a generalization of Fano formula that includes the intrinsic losses associated with metals. This comprehensive approach can be used to retrieve the underlying modal structure that produces Fano resonances from the interference between a bright and a dark mode in a plasmonic system. This way, it is possible to determine the most efficient plasmonic system for a specific application by tuning its mode of operation from weak coupling to best energy storage or strong coupling. Examples from sensing at the nanoscale are used to illustrate this approach.