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Experimental Chiral Plasmonics Using Quasi-Bound States in the Continuum

The detection of chiral properties via circular dichroism (CD) is attracting significant attention, with plasmonic metasurfaces providing essential signal enhancement through tailored symmetry breaking. This work reports the experimental characterization of the chiral optical response from a gold metasurface featuring asymmetric oval nanoholes, supporting both surface plasmon polariton (SPP) and quasi-Bound State in the Continuum (quasi-BIC) modes. Our results, in both reflection and transmission, show excellent agreement with theoretical predictions, demonstrating that these strongly coupled modes, termed plasmonic polariton BICs, exhibit unambiguous chiral behavior with a significant CD sign change. Detailed analysis reveals a strong coupling to the left circular polarization state, maximized at an optimal angle of incidence around 7°, and a clear Fano line shape. Furthermore, a direct comparison confirms the substantial chirality of the BIC mode, in sharp contrast to the response from the SPP one. These findings establish a robust experimental platform for advanced chiroptical sensing.

Primary author: FLORIS, FRANCESCO (Dipartimento di Fisica)

Co-authors: Ms ALI, Hanan (Università degli studi di Pavia); ANDREANI, LUCIO (University of Pavia); Dr ADAMO, Giorgio (NTU Singapore); Dr DUBROVKIN, Alexander (NTU Singapore); Dr MARANGI, Marco (NTU Singapore); Prof. SOCI, Cesare (NTU Singapore); MARABELLI, FRANCO

Presenter: FLORIS, FRANCESCO (Dipartimento di Fisica)

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