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Shedding light on the geometry of neutron star mergers with kilonova polarimetry

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The detection of an electromagnetic counterpart to the gravitational-wave source GW170817 marked year zero of the multi-messenger gravitational-wave era. This event was generated by the merger of two neutron stars and gave rise to an electromagnetic transient, dubbed a “kilonova”, which was intensively monitored with all the main ground-based and space-borne facilities. The general agreement between existing models and data is remarkable. However, critical parameters like the inclination of the system and the distribution and composition of the ejecta components are still uncertain despite their being crucial to e.g. calculate kilonova rates, compare yields to cosmic abundances and estimate the Hubble constant. In this talk, I will show how linear polarimetry can unveil some of these properties, which are not easily constrained through the analysis of light curves and spectra alone. I will focus on a detailed analysis of the linear polarization expected from kilonovae resulting from both binary neutron star and neutron star - black hole mergers. I will highlight how the detection of a signal in future events will place constraints on the system inclination, unambiguously reveal the ejecta composition and unveil its spatial and angular distribution.

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