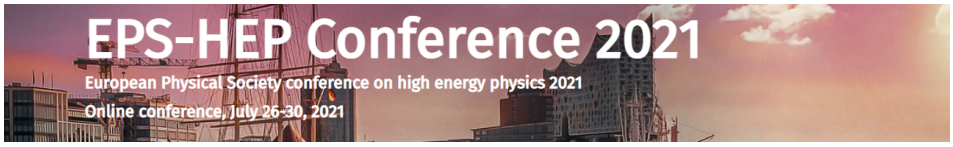

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GW170817 and AT2017gfo: Multi-messenger Bayesian analysis and constraints on neutron star equation of state

The joint detection of the gravitational wave GW170817, of the short γ-ray burst GRB170817A and of the kilonova AT2017gfo, generated by the the binary neutron star merger observed on August 17, 2017, is a milestone in multimessenger astronomy and provides new constraints on the neutron star equation of state. Employing a novel specialized pipeline, we perform Bayesian inference on GW170817 and its kilonova counterpart AT2017gfo. GW170817 is analyzed using effective-one-body, phenomenological and post-Newtonian models with different cutoff-frequencies of 1024Hz and 2048Hz. We find that the former choice minimizes systematics on the reduced tidal parameter, while a larger amount of tidal information is gained with the latter choice. We study AT2017gfo using semi-analytical, multi-components models that also account for non-spherical ejecta. Observational data favor anisotropic geometries to spherically symmetric profiles and favor multi-component models against single-component ones. Using the dynamical ejecta parameters inferred from the best-fitting model and numerical-relativity relations connecting the ejecta properties to the binary properties, we constrain the binary mass ratio and the reduced tidal parameter. Finally, we combine the predictions from AT2017gfo with those from GW170817, constraining the radius of a neutron star of 1.4 M⊙ to 12.2±0.5 km (1σ level).

Collaboration / Activity

FSUJena+Virgo/Data analysis

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