Contribution ID: **27** Type: **Oral presentation**

Multimessenger constraints on the neutron-star equation of state and the Hubble constant

Friday, 26 March 2021 10:20 (20 minutes)

Summary

Observations of neutron-star mergers based on distinct messengers, including gravitational waves and electromagnetic signals, can be used to study the behavior of matter denser than an atomic nucleus, and to measure the expansion rate of the Universe described by the Hubble constant. We perform a joint analysis of the gravitational-wave signal GW170817 with its electromagnetic counterparts AT2017gfo and GRB170817A, and the gravitational-wave signal GW190425, both originating from neutron-star mergers. We combine these with previous measurements of pulsars using X-ray and radio observations, and nuclear-theory computations using chiral effective field theory to constrain the neutron-star equation of state. We find that the radius of a 1.41.4 solar mass neutron star is $11.75^{+0.86}_{-0.81}$ km at 90% confidence and the Hubble constant is $66.2^{+4.4}_{-4.2}\,\mathrm{km\,Mpc^{-1}\,s^{-1}}$ at 1σ uncertainty.

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Session Classification: Contributed talks