Contribution ID: **35** Type: **not specified**

Gravitational Wave Constraints on Properties of Exotic Compact Objects

Tuesday, 7 November 2023 15:00 (20 minutes)

Gravitational waves from compact binary coalescences provide a unique laboratory to test properties of compact objects. As alternatives to the ordinary black holes in general relativity, various exotic compact objects have been proposed. Some of them have largely different values of the tidal deformability and spin-induced quadrupole moment from those of black holes, and their binaries could be distinguished from binary black hole by using gravitational waves emitted during their inspiral regime. We analyze gravitational waves from low-mass merger events in the GWTC-3 catalog events, detected by Advanced LIGO and Advanced Virgo. Focusing on the influence of tidal deformability and spin-induced quadrupole moment in the inspiral waveform, we provide model-independent constrains on deviations from the standard binary black hole case. We find that all events that we have analyzed are consistent with the waveform of binary black hole in general relativity. Bayesian model selection shows that the hypothesis that the binary is composed of exotic compact objects is disfavored by all events.

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Session Classification: Laser Interferometric GW observatories