



Contribution ID: 96

Type: **Parallel Talk**

Gravitational waves propagation as a probe of new fundamental physics

Saturday, 9 July 2022 15:45 (15 minutes)

The direct detection of gravitational waves opened an unprecedented channel to probe fundamental physics. Several alternative theories of gravitation have been proposed with various motivations, including accounting for the accelerated expansion of the Universe and the unification of fundamental forces. The study of gravitational waves propagation enables to put several predictions from those proposed theories to test, with the advantages of presenting deviations that are source-independent and tractable over the complete waveform signal. This talk present an overview of the recent searches for anomalous propagation effects using the events detecting by the LIGO-Virgo-KAGRA collaboration during the three observational runs. Several proposals, such as massive gravity and unified theories, predict a frequency-dependent dispersion of the gravitational waves breaking local CPT and/or Lorentz symmetry. Constraints on the dispersion coefficients are obtained from the analysis of the gravitational waveform signals using an effective field theory framework. Using inferred wave and source properties from candidate multimessenger events, constraints are independently obtained on the speed of gravity, the presence of large extra dimensions and scalar-tensor gravitation theories parameterisations.

In-person participation

No

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