Contribution ID: **147** Type: **not specified**

Constraints on f(R) gravity using gravitational wave emissions in pulsars

Thursday 26 September 2024 17:02 (16 minutes)

Pulsar observations were the beginning of gravitational wave measurements. They recently came into the focus again with the publications from pulsar timing array organisations. But not only the transmission of gravitational waves, also their emission can be investigated using these systems. With the growing number of very precise observations of pulsars in binary systems it became possible to measure their masses as well as the change of their orbital periods to high accuracy. This makes them prefect astrophysical laboratories to test general relativity as well as modifications of it via the total radiated power.

For this using $f(R)$ gravity with a general shape is a practical way to look for a broad range of high curvature corrections to GR. Over the dynamical equivalence to a GR plus a massive scalar field it also enables the search for dark matter in form of a large family of models of light scalar particles. The observations determining the sum of tensor radiation also present in GR and scalar radiation introduced by these models enables constraining them on many orders of magnitude for their masses with competitive results especially at the lower end of feasible mass range.

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Session Classification: Parallel Thursday Cosmo 2

Track Classification: Cosmology & Astroparticle Physics