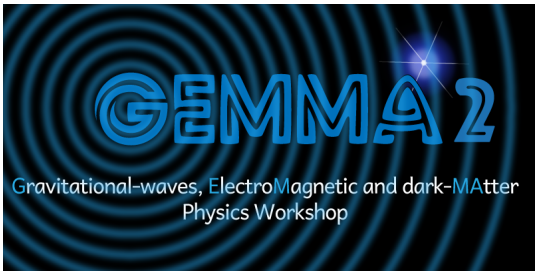

Contribution ID: **21** Type: **Invited Talk**

Searching for particle dark matter with gravitational waves

Tuesday, 17 September 2024 09:55 (25 minutes)

LISA, the space-based gravitational wave detector which was recently adopted, is due to fly in the mid 2030s. An entire new frequency range will be opened up for discovering gravitational wave sources, including intermediate and extreme mass ratio black hole binaries which will remain in band for up to weeks, months or even years. This offers an exciting new avenue for fundamental physics discoveries because the environment of the binaries will have an effect on the gravitational waveform over this long period of time, and we will be able to measure the properties of the environments from the gravitational wave observations alone.

I will demonstrate that we can distinguish the presence of different dark matter environments with a Bayesian model comparison approach and argue the importance of including environmental effects in the data analysis pipelines. I will address some ongoing challenges with modelling both the signals and the noise for these types of systems, and how simulation-based inference methods may help to overcome some barriers that traditional parameter estimation techniques may face.

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Session Classification: Dark Matter

Track Classification: Dark Matter