



Contribution ID: 65

Type: **not specified**

Ultralight vector dark matter search using KAGRA

Monday, 14 June 2021 14:10 (20 minutes)

Gravitational wave detectors are extremely sensitive to the differential arm length changes and they can be used for measuring the small displacement of the test masses due to the ultralight vector dark matter (DM). However, especially for the mirrors made of the same material, the effects of the vector DM to the different mirrors are mostly common and the sensitivity is largely attenuated. In this situation, auxiliary length channels are quite useful to extract the signature of DM by making use of the asymmetric configuration of the interferometer. We would like to emphasize that KAGRA employs sapphire test masses and fused silica auxiliary mirrors. Such a difference in materials drastically enhances the sensitivity of the auxiliary length channels and enables us to probe the unexplored parameter region of, for example, the $U(1)_{B-L}$ gauge boson. In this talk, we present the current status of the pipeline for ultralight vector DM search with KAGRA and discuss the prospects of our analysis using the data from KAGRA's first observing run in 2020.

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Session Classification: Session 1