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Exploring Dark Sector Mediators with Multimessenger Signals from EMRIs.

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The exploration of dark sector mediators by gravitational waves from binary inspirals has been a subject of recent interest. Dark mediators typically generate a Yukawa-like potential that either directly impacts the orbital decay through dipole radiation or indirectly through altering the effective gravitational constant. However, with the rescaling of the binary component's mass, the additional Yukawa term becomes indistinguishable from pure gravity for light mediators. Although probing ultralight mediators with binary inspirals is challenging, Extreme Mass Ratio Inspirals (EMRIs) provide proof of principle that advancements may be achieved in this area through multimessenger astronomy. The mass of the supermassive black hole (SMBH) can be precisely determined with Spectroscopic Reverberation Mapping or extremely large mass-ratio inspirals (XMRIs), where the interaction is purely gravitational. Once the mass of the supermassive black hole is determined, an EMRI signal can be used to study the dark forces between two black holes. We find that such a system would be sensitive to mediators with masses between 10^{-16} and 10^{-18} eV.

Mini Symposia (Invited Talks Only)

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