



Contribution ID: 129

Type: **not specified**

Superradiance in rotating stars and implications for dark sectors

Monday 24 April 2017 17:45 (15 minutes)

Rotational superradiance was theoretically shown to occur in black hole spacetimes; in the presence of massive bosonic degrees of freedom, superradiance triggers an instability that leads to peculiar gravitational-wave signatures and black hole distribution in the spin-mass plane, which in turn can impose stringent constraints on ultralight fields. In this talk, I will demonstrate that a similar effect occurs with rotating conducting spheres, and I will discuss rotational superradiance effects around conducting stars. Our results can also be applied to understand the interaction of stars with massive hidden photons. In this case, the rotating stars are unstable on timescales that depend on the mass of the hidden photon, and on the rotation rate, compactness, and conductivity of the star.

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Session Classification: Afternoon session