

Copernicus Webinar and Colloquium Series



Contribution ID: 48

Type: **not specified**

Gravitational Collider Physics

Tuesday, March 16, 2021 2:00 PM (1 hour)

Gravitational wave astronomy will transform astrophysics in many ways; can it do the same for particle physics? In this talk, I will describe how the gravitational waves emitted by binary black holes offer a new window onto physics beyond the Standard Model. I will focus on probes of ultralight bosons such as axion-like particles and dark photons, which can spontaneously form bound states around rotating black holes. Remarkably, these bound states resemble the proton-electron structure of the hydrogen atom and are therefore often called the “gravitational atoms”. In addition, the dynamics of these atoms in binary systems can be formulated as scattering events which are quantified by a S-matrix. These dynamics would significantly backreact on the orbit, thereby affecting the gravitational waves emitted by the binary system. These gravitational wave signatures would also carry imprints of the masses and intrinsic spins of the ultralight bosons, making binary black holes novel detectors of these putative new fields and effectively “gravitational colliders”.

Presenter: Prof. CHIA, Horng Sheng (IAS)