Contribution ID: **54** Type: **Seminar**

Hannah O'Brennan - Predicting the number density of heavy-seed massive black holes due to an intense Lyman-Werner field

Friday 8 September 2023 10:10 (20 minutes)

A plausible origin of supermassive black holes (M ≥ 1e6 solar masses) which fuel bright active galactic nuclei (L > 1e47 erg /s) at galactic centres are so-called heavy-seed black holes that have formed in the early Universe (z>15). These heavy seeds are theorised to have masses of 1e3 to 1e5 solar masses.
Gravitational waves (GWs) from their mergers would have a frequency range of 1e-4 to 1e-2 Hz, outside the frequency range of current generation GW detectors LIGO/Virgo. Detection of these low-frequency GWs will be one of the goals of LISA (due to launch in 2034).Thus modelling their number density and merger rate is a matter of considerable urgency.
In this talk, I provide an updated estimate of the number density of these heavy seeds as a function of redshift z. I consider the influences of Lyman-Werner radiation emitted by the earliest generations of stars, metal pollution from their supernovae and genetic metal pollution from previous episodes of star formation. In future, I will use the Renaissance simulation suite to derive a new Lyman-Werner luminosity function for the number density computation.

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