

# Towards Precision Measurements of $H_0$ with Multi-band Gravitational Waves

*Tuesday, 12 May 2026 16:25 (15 minutes)*

In this talk, I will explore the potential of multi-band gravitational wave (GW) observations to constrain uncertainties in the Hubble parameter ( $H_0$ ), using primordial black holes (PBHs) as astrophysical sources. I will present a framework that combines scalar-induced and merger-induced GW signals and discuss forecasts for joint observations with the Square Kilometre Array (SKA) and the Einstein Telescope (ET), enabling a multi-band analysis. I will then show how statistical forecasts of PBH parameters,  $M_{\text{PBH}}$  and  $f_{\text{PBH}}$ , based on signal-to-noise ratio (SNR) and Fisher matrix techniques, allow us to identify the accessible parameter space and propagate uncertainties to  $H_0$ . For  $\delta\theta_i/\theta_i \leq 0.1$ , with  $\theta_i \equiv M_{\text{PBH}}(f_{\text{PBH}})$ , we obtain  $\delta H_0 \leq 2 \text{ km, s}^{-1}, \text{ Mpc}^{-1}$ , improving to  $\delta H_0 \leq \mathcal{O}(0.1) \text{ km, s}^{-1}, \text{ Mpc}^{-1}$  for  $\delta\theta_i/\theta_i \leq 0.01$ . Finally, I will highlight that these results are largely insensitive to the fiducial value of  $H_0$ , with only moderate dependence on the PBH collapse efficiency, demonstrating that multi-band GW observations provide a complementary, cosmic distance ladder-independent probe of the Hubble parameter.

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