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Gravitational wave signatures of intermediate-mass black holes

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In this talk, we present a systematic study of potential gravitational wave signatures produced by binary black hole coalescence, resulting in the production of an intermediate-mass black hole (IMBH). The event GW190521 represents the first direct evidence of the existence of IMBHs and suggests that more IMBHs might be detected when more data are collected, especially when more sensitivity is achieved in the low-frequency region, which characterises this type of events. We investigate a few million simulated waveforms corresponding to coalescence events whose remnant mass falls in the range $100 < M_R < 400 M_\odot$ and examine the possibility for such events to happen with different orbit orientations, spin configurations, eccentricity, and higher order modes. We compare different wave approximants and study the residuals between different models, highlighting the importance of using appropriate waveform approximants when exploring events where higher-order mode effects become non-negligible. Finally, we provide preliminary sensitivities for ground-based GW detectors to detect this class of events in the investigated mass range.

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