Contribution ID: **63** Type: **Poster**

Gravitational wave memory from primordial black hole mergers

Gravitational waves below the merger frequency carry two distinct signatures: the chirping inspiral and the non-linear memory. But which one will detectors capture first? We address this question in the context of light primordial black hole binaries, where mergers occur above the peak sensitivity of current instruments. Our analysis shows that detectors are far more sensitive to the inspiral than to the memory, once the binary evolution history is taken into account. We also examine memory waveforms for ground- and space-based interferometers, highlighting the implications for matched-filtering searches. This comparison reveals how next-generation high-frequency detectors, tuned to the merger, stack up against existing interferometers and where each has the advantage.

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