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Tainted Love: Systematic biases from ignoring environmental tidal effects in gravitational wave observations

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Binary black hole systems are typically assumed to evolve in vacuum. However, the environment surrounding the binary components can influence their properties, such as their tidal deformability, affecting the gravitational waveform produced by the binary and its interpretation in gravitational wave data analysis.

In this talk, focusing on next-generation experiments, such as the Einstein Telescope and LISA, we quantify the systematic biases in gravitational wave observations that arise when tidally deformed binaries are interpreted as occurring in vacuum. We consider binaries over a range of masses and compare different phenomenological models for the dynamical evolution of the tidal deformability. We find that systematic biases could significantly affect the measurability of the binary parameters if tidal effects are not carefully modeled.

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