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# R. Vicente: First constraints on binary black hole environments from LIGO-Virgo observations

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As of now, almost a hundred gravitational-wave (GW) signals have been observed and interpreted as resulting from the coalescence of compact binaries by LIGO-Virgo. While these signals seem to be in perfect agreement with the theory of general relativity (GR) in vacuum, it is crucial to quantify any possible small deviations. By looking at the GW signal, how sure are we that these binaries are evolving in vacuum? Both modifications to the theory of gravity and the presence of environments may manifest themselves by a shift in the evolution of the binary phase. Previous analysis have used this effect to quantify deviations of the observed GWs to vacuum GR waveforms by estimating the (inspiral) phase coefficients of PN order $\geq -1$. However, environmental effects (like dynamical friction and accretion) are responsible for coefficients at more negative PN orders. In this talk I will present the first estimation of these phase coefficients for several LIGO-Virgo signals, and translate them into constraints on the density of their environments.

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