

ICTS Seminar

- Title** : Search for Lensed Gravitational Waves from LIGO/Virgo Binary Black Hole Mergers: Intriguing Candidates in O2
- Speaker** : Liang Dai, University of California, Berkeley
- Date** : Friday, 28 August 2020
- Time** : 09:00 am (IST)
- Abstract** : Current and forthcoming observing runs at ground-based laser interferometry detectors are starting to uncover gravitational waves from binary black hole (BBH) mergers at cosmological distances, and a fraction of them are expected to be gravitationally lensed by intervening galaxy or cluster lenses with multiple images. Such strongly lensed events, if discovered, may offer a precious opportunity to localize BBH host galaxies and probe global and small-scale property of the lens mass profile. We investigate multiple BBH events showing parameter coincidence in the LIGO/Virgo O2 run, and search for additional sub-threshold signals that may be fainter lensed images. For the first time, we factor in the effect of the Morse phase shift in the analysis, and demonstrate how to measure the relative Morse phase via joint parameter inference. We confirm curiously high level of intrinsic and extrinsic parameter coincidence between GW170814 and GW170104, and uncover a third sub-threshold candidate lensed image, GWC170620, in a single-template search, which amounts to an estimated 10^{-4} overall chance of statistical fluke. The measured relative Morse phases among the three events, although consistent with ray-optics lensing, point toward a complicated and unexpected image topology with a magnified image at a local maximum of the Fermat potential, which however casts doubt on the lensing hypothesis. The long time delays on the order of months necessarily require a massive lens of galaxy cluster scale. If a genuine set of multiple lensed images, we localize the source to $\sim 16 \text{ deg}^2$ on the sky and suggest a range $0.4 < z < 0.7$ for its redshift. Optical follow-up observations are encouraged to collect any additional information that may further shed light on the case.
- Online seminar** : Please click on the below link to Join the Zoom Meeting
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