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An optimised PyCBC search for gravitational waves from intermediate-mass black hole mergers

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Current PyCBC-based searches detect gravitational-wave (GW) transients by matched-filtering the advanced LIGO-Virgo detector data with model waveforms. They have, to date, detected or confirmed more than 50 compact binary merger signals. But these searches perform poorly when it comes to identifying short-duration compact binary signals in Advanced LIGO-Virgo data. In this talk, we will present a new optimised PyCBC-based search that will help detect redshifted stellar-mass binary black holes and mergers producing low-range (100-1000 $M_{\odot}$) intermediate-mass black holes (IMBH). In the data collected during the first half of the third LIGO-Virgo observing (O3a) run, the search re-identified the putative IMBH binary event, GW190521, with a false alarm rate of 1 in 727 yrs, significantly lower than the previous estimate of 1 in 0.94 yr by a PyCBC-based search. Additionally, when searching for signals from simulated generically spinning binaries injected into O3a data, the search sensitivity at a false alarm rate of 1 in 100 years improves over the existing PyCBC broad parameter search by a factor of 1.2 to 3 depending on the system's total mass.

Primary author: CHANDRA, Koustav (Indian Institute of Technology Bombay)

Co-authors: Ms VILLA-ORTEGA, Veronica (IGFAE); Dr DENT, Thomas (IGFAE); Mr MCISAAC, Connor (University of Portsmouth); Prof. PAI, Archana (IIT Bombay); Dr HARRY, Ian (University of Portsmouth); Dr DAVIES, Gareth (University of Portsmouth); Ms SONI, Kanchan (IUCAA, India)

Presenter: CHANDRA, Koustav (Indian Institute of Technology Bombay)

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