北 京 师 范 大 学
引力波与宇宙学实验室

讲座预告

Stochastic Gravitational Wave Background from Stellar Compact Binaries and Gravitational Wave Multiband Observations from Stellar Binary Black Holes

Dr. Yuetong Zhao (赵悦同)

Zhao Yuetong's research interests mainly focus on gravitational wave astrophysics including the compact binary objects, background, and multiband observations.
2023.7-present, postdoc in BNU, supervisor: Cao Zhoujian
2015 – 2023, PhD in NAOC, supervisor: Lu Youjun

Abstract

The detection of gravitational wave (GW) signals from merging stellar compact binary objects by aLIGO starts a new era of gravitational wave astronomy. The cosmic stellar compact binaries in their inspiral-merger-ringdown stages radiate GWs in the low-, middle- and high-frequency (10^{-3}-10^{-1}-1000Hz) bands and produce a stochastic GW background (GWB), which is an important scientific target for the low-frequency (e.g. LISA/Taiji/TianQin) and high-frequency (e.g. aLIGO/Virgo/KAGRA/ET/CE) GW detectors. The multiband observations of the compact binaries provide us more information about their intrinsic physical properties and extrinsic configuration parameters compared to single-band observations. The GWB from both dynamically formed BBHs in dense stellar environment and those BBHs formed from the evolution of massive binary stars (EMBS) channel in the field shows different characteristics. The eccentric stellar compact binaries form a double power law GWB spectrum, which is different from the one with canonical power index 2/3 predicated from circular ones. Besides, we estimate the detectability and parameter estimation accuracy of BBHs in low-frequency band, middle-frequency band, and multiband observations. Combing the low-frequency (LISA-Taiji network, i.e., LT) and middle-frequency (AMIGO) band observations, LT-AMIGO will detect 5-33 multiband BBHs. The multiband observations will improve the estimation of localization and other parameter measurement precision for multiband BBHs. For example, compared with LT/AMIGO/ET-CE, LT- AMIGO-ET-CE may improve the localization by a factor ~ $10^5/10^6/10^2$ and the redshifted chirp mass measurement precision by a factor ~ 100/15/4. The high precision of localizations and luminosity distance measurements for some BBHs via the LT-AMIGO-ET-CE multiband observations may help to identify their host galaxies directly from GW observations.

时间：　2023年12月27日 (星期三) 9:00

地点：　北京师范大学物理楼402