中華民國天文學會
The Astronomical Society of the Republic of China (Taiwan)

Contribution ID: **59** Type: **Oral**

Investigation of the scattered light noise in KAGRA interferometer

Saturday, May 17, 2025 5:45 PM (15 minutes)

The scattered light is the diffused light recoupling to the main optical beam inside the interferometers. In the KAGRA interferometer, the scattered light noise sometimes contaminated the sensitivity in the band of 30 ~ 100 Hz. It appeared in the time-frequency map with the characteristic arch-shape with a period of 2.5 seconds. With more understanding of scattering light, we may mitigate the loss of sensitivity at this frequency band. The previous research reported that the periodic motion frequency is close to the resonant frequency of Type-Bp suspension - 0.42 Hz and found the power recycling mirrors moved a lot at the same time.
In our research, we developed a new method to efficiently quantify the periodic behavior of scattered light in the strain or other channels by targeting and identifying the arch shapes in a time-frequency map, especially the Q-spectrogram. The benefit of using constant Q-transform is its variation of frequency resolution for different frequency bands. i.e. $Q = f/\delta f$. By adjusting the Q value, the pattern in the time-frequency map could be clearer.
Applying our method to the data would give us the time information of when scattered light noise can be seen in the time-frequency map and the period of the arch-shape pattern of the scattered light noise. By analyzing the data over several days, we found a positive correlation between the scattered light noise occurrence and the low-frequency seismic motion near the power recycling mirrors.

Section

Cosmology

Primary author: HSU, Shih-Hong (National Yang-Ming Chiao-Tung university)

Presenter: HSU, Shih-Hong (National Yang-Ming Chiao-Tung university)

Session Classification: Gravitational waves