

KMI Colloquium

The search for primordial gravitational waves from cosmic inflation with CMB experiments in the Atacama desert and space



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+zoom

Abstract:

Searching for primordial gravitational waves is one of the most exciting topics in cosmology because it could be smoking gun evidence from the creation of the universe. Primordial gravitational waves leave a characteristic imprint on the cosmic microwave background radiation (CMB) in the form of B-mode polarization. In March 2014, two experiments, POLARBEAR and BICEP2, announced a measurement/detection of "B-mode" signals. In fact, the POLARBEAR experiment in the Atacama desert reported a measurement of B-modes at sub-degree scales, which was NOT created by primordial gravitational waves BUT created by gravitational lensing effects. The BICEP2 experiment claimed to detect primordial B-modes, but it has been confirmed that the signal is emitted from DUST in our galaxy. Since then no experiment has detected primordial B-modes yet, we are actively observing CMB polarization and developing/building several future experiments.

In this seminar, I talk about the scientific motivation of B-mode measurements first, then summarize the status of the measurements and POLARBEAR's achievements. Next I show the progress of the Simons Array experiment, which is upgraded from POLARBEAR starting in 2019. Since controlling/mitigating various systematics in measurements and data analysis is getting critical to detect primordial B-modes, I explain the current development, e.g. galactic foreground removal, instrumental systematics, low frequency noise, E-to-B leakage due to time-order data processing, human bias and so on. At the end of my talk, I will introduce the next generation CMB experiment in the Atacama desert, which is designed to consist of small telescopes and a large telescope, and a satellite mission by Japan.