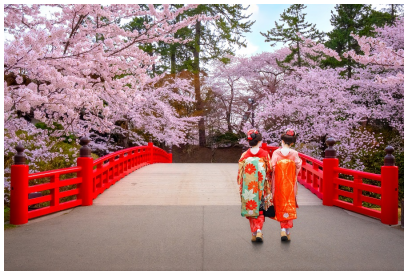

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New optical testing method using a power-tunable millimeter-wave source for laboratory characterization of TES detector systems for CMB observation

Observing the degree-scale polarization pattern called “B-mode”in the cosmic microwave background radiation (CMB) map is expected to be proof of primordial gravitational wave and a key to revealing the inflationary universe. Recently, CMB polarization observation experiments with higher experimental sensitivities are in progress or planned.
For such precise CMB polarization observations, it is essencial to control systematic effects caused by the instruments of the telescopes because the B-mode signal is very faint. Understanding the optical characteristic of the detector system carefully is one of the important points to mitigate such systematics. In highly sensitive CMB observation experiments, minor nonidealities in the optical characteristics may affect the observation over several years.
Measuring the optical characteristic so deeply that such minor nonidealities can be found requires a high dynamic range of the measurement. But the transition-edge sensor (TES), which is one major type of detector in the recent CMB observations, makes it difficult because of its low dynamic range.
In this poster presentation, I propose a new optical testing method that employs an artificial power-tunable millimeter-wave source and is feedback-controlled to extend the dynamic range of the measurement. I show the concept of the method, a demonstration in a laboratory using a room-temperature diode detector, and prospects for application to the actual CMB observation experiments.

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