Tel Aviv University , Colloquium

Dr. Meir Shimon

TAU

Melamed Lecture Hall

CMB Polarization: Recent BICEP2 and POLARBEAR Measurements

The cosmic microwave background (CMB) radiation is uniquely important as a probe of the nature, structure, and evolution of the universe. Small perturbations in the intensity and polarization of the CMB that were induced in the very early universe have already been extensively measured by three cosmology satellites and a host of ground-based and stratospheric projects. The odd-parity B-mode polarization of the CMB can only be produced by primordial inflationary-induced gravitational waves or by conversion of the even-parity E-mode to B-mode via gravitational lensing induced by the intervening large scale structure a few billion years after the big bang. Nearly two decades of theoretical, experimental, and observational effort culminated recently by two announcements (made in the same week) by the BICEP2 and POLARBEAR teams, of the long-sought detection of the extremely faint B-mode signal. BICEP2 seems to have detected the primordial B-mode from inflation, when the energy scale was 2x10^{16} GeV. POLARBEAR found the first direct evidence for the CMB lensing by the large scale structure using the B-mode alone. Next generation CMB projects are likely to measure polarization at a precision level that will allow meaningful constraints on certain inflationary models, constrain neutrino masses, and probe the dark energy equation of state at moderate redshifts. I will review the basics of CMB polarization, theoretical implications of the recent B-mode detections, the challenge of controlling systematics, and near-future prospects for enhanced scientific yield.