東京大学大学院理学系研究科附属 ビッグバン宇宙国際研究センター
日本学術振興会 研究拠点形成事業
宇宙マイクロ波背景放射研究拠点 ~物質と時空の起源と進化を探る~

共催セミナー

日時 : 2024 年 10 月 3 日 15:00~16:00
場所 : 理学部4号館1階 1116 セミナー室・zoom (ハイブリッド) [当日の都合で場所が変更になる可能性があります。その際は 1116 入り口に掲示します]
講師 : Dr. Patricia Diego Palazuelos (Max Planck Institute for Astrophysics)

Cosmic birefringence: searching for parity-violating physics with the CMB polarization
(宇宙複屈折 : CMB偏光を用いたパリティ非対称な物理の探索)

The cross-correlation of the cosmic microwave background (CMB) E- and B-mode polarization can be used to probe parity-violating physics in the Universe. Parity-violating processes such as a Chern-Simons coupling to axion-like particles or the Faraday rotation induced by primordial magnetic fields are expected to rotate the plane of linear polarization and produce a non-null EB correlation. We commonly refer to that rotation as cosmic birefringence.

Past attempts at measuring isotropic cosmic birefringence have been dominated by systematic uncertainties, particularly, the limited precision on polarization angle calibration. Recently, a novel methodology has overcome the limitations imposed by insufficient instrument calibration by re-calibrating against Galactic foreground emission. When applied to Planck and WMAP data, this technique hints at the existence of an isotropic $\beta \approx 0.34° \pm 0.09°$ birefringence angle. Although it is still under scrutiny for its dependence on the modeling of Galactic dust emission, these results currently exclude $\beta=0$ with a statistical significance of 3.6σ.

In this talk, I will review the current state of birefringence measurements from CMB polarization data, commenting on the impact of instrumental systematics and Galactic dust on the analysis. As the significance of the measurement continues to increase, I will also discuss the potential physical origin of the signal, focusing on axion-like particles as the most likely candidate.

ご所属・学年等を問わず、興味を持たれた方の聴講を歓迎いたします。
Zoom リンクなどご質問・ご要望はお気軽にビッグバン宇宙国際研究センターの
直川 (fumihiro.naokawa@resceu.s.u-tokyo.ac.jp) まで。