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COLLOQUIUM

Absolute Measurements of the Cosmic Microwave Background Frequency Spectrum: New Horizons and Experimental Challenges

Prof Martin Bucher (Université Paris Cité and Stellenbosch University)

DATE: Monday, 12 August 2024 | 16h00–17h00 SAST

VENUES:
- Neelsie Cinema, Stellenbosch University
- Online

ABSTRACT

Observations of the CMB have revolutionised cosmology by providing us with a glimpse of the initial conditions of the universe emanating from the Big Bang. While most attention has focused on the CMB angular anisotropies, which are measured differentially, absolute measurements of the frequency spectrum also contain a wealth of potential information. It is noteworthy that while the COBE DMR measurements have long been superseded by much better measurements from numerous ground and balloon experiments and from WAMP and Planck, the COBE FIRAS measurement remains to date the best measurement of the CMB frequency spectrum in the microwave bands where the CMB dominates. I will discuss some of the challenges of measuring the CMB frequency spectrum, the new physics that could be discovered, and proposed initiatives to improve on FIRAS. I will also discuss measurements of the extreme low frequency tail of the blackbody, where 21 cm distortions from the first generation of stars and quasars are predicted to superimpose features on the initially nearly perfect blackbody spectrum. The EDGES experiment has reported an anomalous result that is challenging to explain theoretically, and a number of experiments including the REACH experiment in the Karoo are in the process of making follow up measurements to check their claim.

REACH antenna in the Karoo near the SKA site. REACH is a joint University of Cambridge/Stellenbosch experiment co-led by Prof Eloy de Lera Acedo (Cambridge) and Prof Dirk De Villiers (Stellenbosch).

BIOGRAPHY

Prof Martin Bucher is Directeur de recherche au CNRS in Paris, France, based at the Université Paris Cité. He is also Fractional Professor of Physics and Data Science at Stellenbosch University. He is a NITheCS Associate and an elected member of the Academy of Science of South Africa (ASSAf). He has made numerous contributions to theoretical particle physics and cosmology and to observational cosmology. He shared the 2018 Gruber Prize in Cosmology as part of the Planck Team.

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