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# Cosmological polarised radiative transfer for probing the evolving magnetised Universe

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## Résumé

Faraday rotation measure (RM), which is based on the polarised radiative transfer theory, is commonly used to probe magnetic fields on galactic scales and beyond. However, its form restricts it from capturing certain crucial essences of the magnetic fields it aims to investigate, thereby limiting its applications. In this talk, I will present the cosmological polarised radiative transfer (CPRT) formulation that self-consistently and explicitly accounts for Faraday rotation and conversion effects and the emission and absorption processes along the radiation propagation path. I will highlight how we can use the CPRT formalism to assess the physical basis of magnetic-field diagnostics using RM\* and demonstrate how it can be applied to calculate the polarised sky for simulated structures such as a galaxy cluster and (up to an all-sky coverage for) an evolving magnetised universe. The CPRT formulation is derived from the conservation laws in physics. It provides a solid theoretical foundation to generate reliable model templates for interpreting observational polarised data, such as those to be collected by SKA.

(\*A more detailed discussion about the assessment of RM methods as diagnostics of large-scale magnetic fields can be referred to the sibling's talk abstract by Alvina Y. L. On)

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