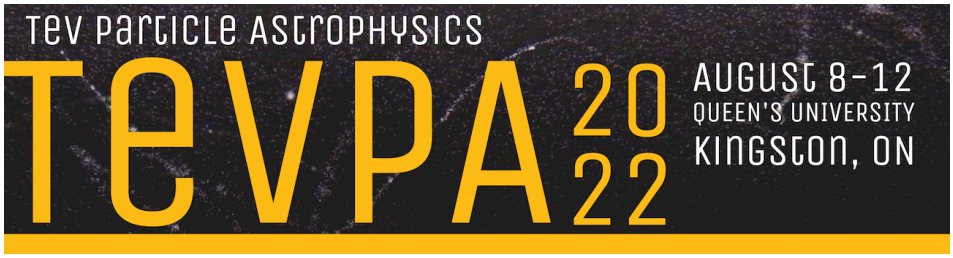

Contribution ID: **42** Type: **Parallel Talk**

Galactic halo magnetic fields and UHECRs deflections

Wednesday, August 10, 2022 2:40 PM (20 minutes)

The paths of cosmic rays are deflected upon passing through the Galactic magnetic field structure. The strength of the deflections that these cosmic rays undergo is dependent on the strength and structure of the Galactic magnetic field. Unfortunately, our knowledge of the Galactic magnetic field is very limited, especially when considering the fields present in the Galactic halo region. In this talk, I wish to motivate the importance of the Galactic halo magnetic fields not only from the point of view of radio observations but also for ultra high energy cosmic ray propagation.

The observations from eROSITA and FERMI-LAT show clear evidence of large extended structures out in the Galactic halo region, with a total energy of up to ˜1056ergs seen in thermal X-rays. However, most of the widely used Galactic magnetic field models focus predominantly on the Galactic disc rather than the halo. In Ref.˜[1] we motivate a toy magnetic field model for the Galactic halo. We use this model, in combination with an analytic expression for the non-thermal electron distribution, to generate synthetic polarised synchrotron maps and compare them with 30 GHz Planck data. By enforcing equipartition between the magnetic field and non-thermal particles, we obtain constraints on the parameters of our model and utilise these constraints to create arrival direction maps for ultra high energy cosmic rays. We conclude that present uncertainties in the field strengths can have major consequences on the arrival directions of the cosmic rays and thereby the source localisation.

[1] V. Shaw, A. van Vliet, A. M. Taylor, arXiv:2202.06780

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Session Classification: Extragalactic Sources

Track Classification: Cosmic Rays