Our view of the jet is affected by the relativistic motion of the jet towards us:

\[ \gamma = \frac{1}{\sqrt{1 - \frac{v^2}{c^2}}} \]

where the Lorentz factor \( \gamma \) is the ratio of the jet speed \( v \) to the speed of light \( c \).

The Faraday effect causes a rotation of the plane of polarisation, described by a cylindrical law: \( \Delta \chi = \frac{RM}{c} \), where the rotation measure (RM) is determined by the integral of the electron density and the dot product of the jet and the path length along the line of sight (LoS).

A positive/negative RM indicates that the LoS B-field is pointing towards/away from the observer.

The colour scale is in kilo-rad/m. The inner jet RM is a strong signature of the precessing nozzle.

The detection of a RM gradient across the jet of 0954+658 (Fig. 5) is a signature of the presence of a helical magnetic field surrounding the jet (for more on this see poster by Mahmud & Gabuzda).

The core region has a RM of -41 rad/m² from 7mm-1.9cm, but a RM of -2207 +386/ -41 ± 140 rad/m² at 6.5cm -2.3cm in Aug 2002 (Gabuzda et al. 2006). Our future work will attempt to reconstruct the 3D path of the jet through space using the combined information from different observational epochs.

Our view of the jet is affected by the relativistic motion of the jet towards us:

\[ \theta = \frac{v}{c} \]

where \( \theta \) is the angle between the jet and the line of sight.

A side-on view of a right-handed (RH) helical B-field will produce polarisation that will be equally strong on both sides of the jet, hence, a zero net RM will be observed for an RH B-field (e.g. BL Lac). A RH helical field (ie. B-field is pointing towards the observer) is more easily detectable because the low frequency RM is over-estimated due to the presence of the optically thick/thin transition in this range.

A head-on view of a RH helical B-field (ie. \( \theta = 0 \)) will be from the top half of the jet (Lystikov et al. 2005) and a negative RM will be observed because the dominant LoS B-field will be pointing away from us. (Assuming jet not fully resolved in the transverse direction).

For a tail-on view of a RH helical B-field (ie. \( \theta > 1 \)) the dominant polarisation will be from the bottom half of the jet (Lystikov et al. 2005) and a positive RM will be observed because the dominant LoS B-field will be pointing towards us. (Assuming jet not fully resolved in the transverse direction).

A further 3 sources also have their jet EVPAs aligned with the jet direction. 1749-096 does not show appreciable jet polarisation, Fig. 4 displays the RM distribution in this sample with jet polarisation perpendicular to the jet direction. This behaviour of the jet EVPAs is natural if the jets have helical B-fields (e.g. Lystikov et al. 2005). Polarisations perpendicular to the jet direction occurs when the poloidal component of the helical B-field dominates, which is observed less often because the toroidal component is boosted due to the rotational motion of the jet itself.

\[ \Delta \chi = \frac{RM}{c} \]

The fact that the Faraday corrected polarisation vectors for 2200+420 remain well aligned with the jet even as it goes through substantial bending can be understood if the implied transverse B-field represents the toroidal component of a helical magnetic field dominating in the observer’s rest frame (Lystikov et al. 2005).

\[ \Delta \chi = \frac{RM}{c} \]

The RM map of 2200+420 from 7mm-1.9cm (Fig. 3) displays a RM of -1144 rad/m² in the core, which is larger in magnitude and different in sign than the observed northermost RM for the lower frequency data; this may correspond to the region of negative RM in Fig. 1. The inner jet RM has a smaller value of -732 rad/m².

An interesting feature is the high positive RM detected in the region where the jet bends.

Region with different RM signs in the jets of AGN can be explained within a helical B-field model as places where the jet is observed at angles greater than or less than \( \theta \) due to bends in the jet. (A longitudinal jet B-field with a change in the angle of the line of sight could also cause a RM sign reversal, but this does not correspond to the observed B-field in most BL Lacs.) It’s important to note that VLBI resolution is usually not sufficient to completely resolve the true optically thick core, therefore, the VLBI “core” consists of emission from the true core and some of the optically thin inner jet. So, if bends occur on scales smaller than the observed VLBI core, “core” RM’s with different signs could be derived from observations at different frequencies (ie. probing different scales of the inner jet).

In our future work, we will attempt to reconstruct the 3D path of the jet through space using the combined information from the observed distributions of the total intensity, linear polarisation, spectral index and rotation measure.

\[ \Delta \chi = \frac{RM}{c} \]

For a RH helical B-field (ie. \( \theta < 1 \)) the dominant polarisation will be from the bottom half of the jet (O’Sullivan & Gabuzda 2006) and a negative RM will be observed because the dominant LoS B-field will be pointing away from us. (Assuming jet not fully resolved in the transverse direction).

\[ \Delta \chi = \frac{RM}{c} \]

A side-on view of a right-handed (RH) helical B-field will produce polarisation that will be equally strong on both sides of the jet, hence, a zero net RM will be observed for an RH B-field (e.g. BL Lac). Lystikov et al. (2005) shows this region to be most optically thick; a negative RM of -125 rad/m² is observed just south of this region, while the rest of the jet has a positively RM consistent with a much lower \( \gamma \) density in the optically thin jet.