Overview of UMRAO CP Program

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Science Goals of the UMRAO Program

From the UMRAO data directly:

Determine the range of behavior of CP: amplitude and timescale for variability in Stokes V; its relation to total flux density and linear polarization; and polarity--link between jet and central engine?)

In combination with modeling & complementary VLBA program:

1. determine the particle distribution's low energy cutoff from the spectral info
2. set limits on the jet's particle composition (electron/proton or electron/positron gas?) from the amount of Faraday rotation
3. identify the direction of the global B field and the fraction of energy in an ordered component of the field from the sign and amplitude of Stokes V respectively; Are HELICAL fields required?

VLBA program BH 152: 6 frequency imaging in collaboration with Homan, Lister, and Wardle. Two epochs approved. First epoch measurements obtained Jan 2009; key file in queue for second epoch. (8 to 24 GHz).

THE DATA

TIME SPAN of DATA:

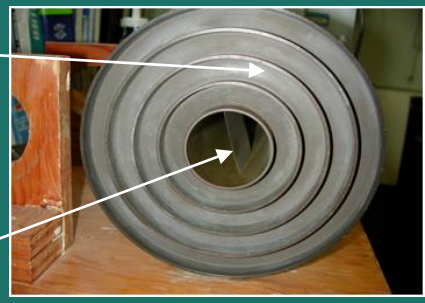
T1: 1977-1983 (4.8, 8.0 GHz)

T2: 2001-2010 (4.8, 8.0; 14.5 GHz added in late 2003)

SAMPLING during T2:

initially 25% of telescope time; increased to 60%

4.8 GHz Circular polarimeter



UMRAO 26-m paraboloid

DISADVANTAGE:
Stokes V weak + small collecting area
Long integration times, multi-day averaging are required for adequate signal-to-noise

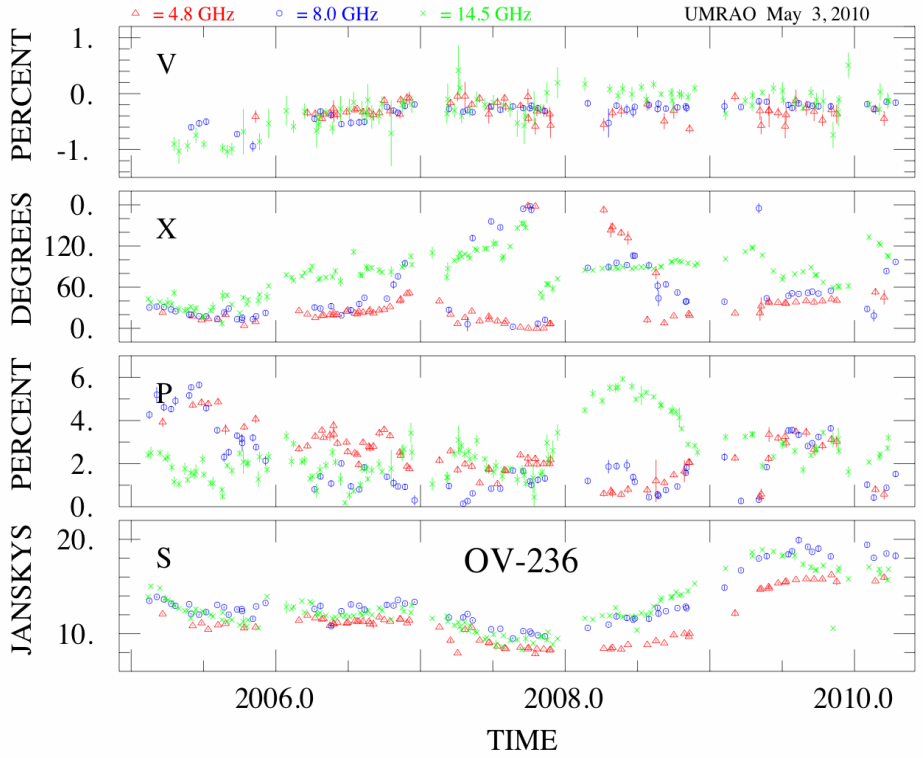
ADVANTAGE:
Guaranteed telescope time

Program sources (spring 2010)

0059+581	3C 120	0736+017	1156+295	1741-038	OX 161
DA 55	0420-014	0748+126	**3C 273***	**OT 081**	2145+067
0235+641	0607-157	OJ 287	**3C 279***	3C 380*	BL Lac
3C 84*	0642+449	**4C 39.25**	1335-127	OV-236	**3C 446***
NRAO 150	0716+714	1055+018	1510-089	1928+738	CTA 102
3C 111	**0727-115**	1127-145	**3C 345**	2134+004	**3C 454.3**

Objects in yellow are currently being intensively monitored based on their average CP strength and/or current total flux density. * denotes targets in the Homan et al. VLBA 4-Stokes imaging program.

Example of the data: OV-236
persistent negative polarity; fractional LP ranges from 0 to 1%



Monthly averages

UMRAO Results on Stokes V

- The time scale of the variability in Stokes V amplitude is several months to years.
- There are preferred polarities in each source, but polarity changes (flips in handedness) have clearly occurred at 4.8 GHz and/or 8.0 GHz in several sources.
- In ONE source they have repeated (3C 279).
- The only source in our program with a persistent polarity on time scales of decades is OV-236.
- The changes in polarity occur at epochs when there is evidence for self-absorption in the emitting region from the Stokes I spectrum.
- Combined UMRAO monitoring and VLBA 4 Stokes imaging are needed for unraveling the nature of the emission & the emitting region. [are the polarity flips `noise' on a true jet/central engine connection?]
- Measurements from Effelsberg will be very important for investigating CP properties in non-flare phase, short term variability, and the CP properties of weak sources.