MONITORING OF SOUTHERN QSOs AT 843 MHz

W.B.McAdam
School of Physics
University of Sydney
N.S.W. 2006
Australia

ABSTRACT. A sample of more than 100 southern QSOs is being monitored for flux density variations by the Molonglo Observatory Synthesis Telescope (MOST). Provisional results for an interval of 4 years shows that the variability at 843 MHz is less than at 408 MHz. There seems to be a real 'mid-frequency gap' with little variability near 1 GHz.

A large fraction of the unresolved radio sources at decimetre wavelength are found to have variations in flux density on a timescale of months or years. These same sources are also likely to be variable at higher radio frequencies, be optically violent variables or be highly polarised QSOs. Thus *low-frequency variability* (LFV) is another observational indicator of an active nucleus in a QSO or BL Lac source (Fanti *et al.*, 1983).

After the early recognition of variability in Molonglo calibration sources (Hunstead, 1972) a large number of point sources was monitored with the Cross Telescope at 408 MHz (McAdam, 1976). The sample, which increased from 100 to 254 between 1968 and 1978, was observed in a strict transit sequence. In the year from March 1975, the full sample was observed over 3 - 6 days every 4 weeks. The results from this program for 9 QSOs having the greatest variability, are included in table 1. The long-term change is the difference between the mean over the full year 1975/76 and the mean for 1969. The short-term variability gives the maximum range for the mean flux density (in a session of 3 - 6 days) within the year. At 408 MHz it was found that 30% of the sample had short or long-term variations exceeding 6% (McAdam, 1980). The time-scales, in the rest frame of the QSO, were short and implied brightness temperatures up to 10^{17} K if interpreted as light-crossing times in the nucleus.

Between 1978 and 1981 the telescope was converted to an earth-rotation synthesis telescope (MOST). It observes at 843 MHz and can make short scans of 2 - 6 minutes on strong sources. Such scans have been used since 1982 for monitoring a new sample that includes all LFV and suspects from the 408 MHz results as well as calibrators for MOST, possible variables in lists from Italy, USA, India and Finland, where the declination limit of +18 to −90 allows.

The current sample has 278 sources observed at irregular intervals but approximately 2 days every month. There are 110 QSO or BL Lac sources from the Hewitt & Burbidge catalog. Many other sources are not identified: they are selected as 'unresolved point' calibrators, mainly for positional accuracy and tend to be QSO candidates.

Provisional results are given for sources in the RA interval 14^h to 15^h 30^m. The group was selected to include 1504−166 which showed the most rapid LFV (McAdam, 1978), and 1510−089 which had large long-term changes.

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TABLE 1 Flux Density Variability in QSO and BL Lac Sources

source	redshift	% at 408 MHz long-term 69-75/76	% at 408 MHz short-term 75/76	% at 843 MHz long-term 84-87/88	% at 843 MHz short-term 84 or 87/88
0537−441	.894		30.5		
0736+017	.191	+ 9.5	34.7		
1055+018	.890	− 0.8	14.9		
1148−001	1.982	+ 6.1	14.2		
1413+135	BL Lac			+2.0	9.7
1416+067	1.436			+4.0	14.0
1453−109	.938			+0.9	8.6
1454−060	1.249			+3.7	4.3
1504−166	.876	−18.0	35.3	−2.7	15.4
1508−055	1.185			+0.8	9.4
1510−089	.361	−35.8	14.4	−2.9	6.2
1514−241	BL Lac			−2.8	19.1
1524−136	1.687	+12.9	9.7	+9.2	9.9
2251+158	.859	+24.1	12.8		
2345−167	.576	+53.0			

None of the sources showed variability at 843 MHz as great as at 408 MHz (Table 1). Comparison of the mean flux densities in 1984 and 1987/88 gives changes from -2.9% to +9.2%. The rms change for the whole group of sources is 4.0%. There are greater changes for short-term variability - up to 19.1% for 1514-241.

It is certain that some sources have LFV at 843 MHz, but at a level smaller than is found at 408 MHz.

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