

COSMOLOGICAL STUDIES FROM THE MRC/1JY RADIO GALAXY SAMPLE: THE SPECTRAL INDEX – REDSHIFT CORRELATION

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The MRC/1Jy sample of 559 radio sources with $S_{408 \text{ MHz}} \geq 0.95 \text{ Jy}$ (McCarthy et al. 1996; Kapahi et al. in preparation) is a factor of 5 to 6 times deeper than the 3CRR sample; it is therefore, well suited for disentangling the redshift (z) and luminosity (P) dependence of several properties of extragalactic radio sources. Here we present results on the spectral index – redshift correlation for radio galaxies, based on a comparison of the well documented radio spectra (in the rest frame frequency range of about 1 to 16 GHz) of the following two matched-luminosity samples. (a) 14 high redshift radio galaxies (HRRG) from MRC with $2.0 < z < 3.2$ and linear size $l > 10 \text{ kpc}$, and (b) 21 intermediate z radio galaxies (IRRG) from 3CRR with $0.85 < z < 1.7$ and $l > 10 \text{ kpc}$. Both samples have $P_{1.4\text{GHz}}$ in the range 10^{28} and $10^{28.8} \text{ WHz}^{-1}$.

We find that the median spectral indices (α_{med}), estimated at different rest frame frequencies are consistently steeper for the HRRG sample compared to the IRRG sample. Since the two samples are matched in P we conclude that α depends primarily on z in the range of P considered here. The best fit $\alpha - z$ correlation is found to be of the form $\alpha_{1.4\text{GHz}} = 0.82 + 0.40 \log(1 + z)$.

We also find that there is no statistically significant difference in the distributions of spectral curvature for the two samples. This suggests that the steeper values of α at higher z may be related to a steeper energy distribution of electrons at injection, unlike other explanations based on a more rapid steepening of the radio spectra (Athreya & Kapahi 1997).

References

- Athreya, R.M. & Kapahi, V.K. (1997), *submitted to JAA*
McCarthy, P.J. et al. (1996), *ApJS*, **107**, 19