

VLBI OBSERVATIONS OF SOUTHERN EGRET IDENTIFICATIONS

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We present high resolution VLBI images of three southern radio sources: PKS 0208–512, PKS 0521–365 and PKS 0537–441. These sources have been identified as > 100 MeV gamma-ray sources with the Energetic Gamma-Ray Telescope (EGRET) on board the *Compton Gamma-Ray Observatory* (Thompson *et al.* 1995). These are the first results in a continuing program of VLBI observations of southern EGRET identifications with the Southern Hemisphere VLBI Experiment (SHEVE) array of telescopes (Jauncey *et al.*, 1994).

Our observations of **PKS 0208–512** at 4.8 GHz (figure 1(left)) show that the radio source consists of a bright, unresolved core and a jet-like extension at a position angle of $233 \pm 5^\circ$. We estimate that the compact core has a brightness temperature of $> 1.2 \times 10^{12}$ K. This is at the inverse Compton limit for synchrotron radiation. Since we have only one epoch of VLBI data we cannot estimate any apparent motion of the jet-like feature relative to the core.

We observed **PKS 0521–365** at 4.8 GHz in November 1992, February 1993 and May 1993 and at 8.4 GHz in October 1993. The data from these four epochs have been used to estimate any apparent motion of the jet component relative to the core. The data are consistent with no motion over this 0.9 year period. The brightness temperature of the core, measured from our highest resolution image (figure 1(centre)) is 1.1×10^{11} K, well below the inverse Compton limit.

Our VLBI images of PKS 0537–441 at 4.8 and 8.4 GHz show that the source is dominated by a slightly resolved component, which we identify as the core together with a jet-like component extending towards the north. We infer a brightness temperature of 6.5×10^{11} K from the slightly resolved core component in our 4.8 GHz image (figure 1(right)).

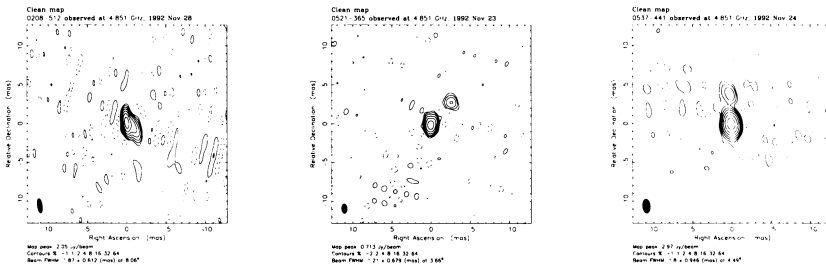


Figure 1. 4.8 GHz SHEVE images of PKS 0208–512 (left), PKS 0521–365 (centre) and PKS 0537–441 (right).

The images of PKS 0208–512, PKS 0521–365 and PKS 0537–441 show that these compact radio sources are dominated by > 1 Jy cores and resolved into core-jet morphologies. In each case the position angle of the milliarcsecond-scale structure seen with VLBI is aligned with the position angle of the arcsecond-scale radio structure.

The brightness temperatures of the cores suggest that PKS 0208–512 and PKS 0537–441 may be more highly beamed than PKS 0521–365. This difference in brightness temperature correlates with the strong statistical EGRET detection of PKS 0208–512 and PKS 0537–441 ($> 5\sigma$ significance) and the weak statistical detection of PKS 0521–365 (4σ to 5σ significance), even though PKS 0521–365 is much closer to us. Unfortunately, on the basis of the brightness temperatures for these three sources we cannot make a strong statement concerning the importance of relativistic beaming for EGRET detectability. Observations at later epochs will place more constraints on the properties of these sources.

VLBI observations of sources over the full range of gamma-ray strength will be required before we can find possible differences or similarities in VLBI properties between EGRET detections and non detections. The need for southern hemisphere observations of the weak EGRET detections is especially apparent since 7/11 lie south of $\delta = 0^\circ$ and only 1/11 lies north of $\delta = +20^\circ$. Our continuing VLBI observations are aimed at addressing this need.

References

- Jauncey, D.L. et al.: 1994 "Very High Angular Resolution Imaging", J.G. Roberston and W.J. Tango (eds), p 131-134
 Thompson, D.J. et al.: 1995, *Astrophys. J., Suppl. Ser.*, in press