THE VLBA CALIBRATOR SURVEY

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1. Phase-referencing

Using phase-referencing, the coherent integration time of VLBI observations can be substantially increased, permitting observations of weaker ($\sim$mJy) target sources (see e.g. Beasley & Conway 1995). The position of a source can also be accurately measured relative to a reference source, allowing absolute and proper-motion measurements, optical-radio image alignment, and alignment of images made at different frequencies.

To make phase-referencing routinely available to the VLBI community, a suitable grid of phase-reference calibrators is needed. We have begun a VLBA survey of $\sim$3000 flat-spectrum radio sources, selected from the Jodrell Bank–VLA Astrometric Survey (JVAS; Patnaik et al. 1992), in order to derive an "all-sky" catalog of phase-reference calibrators (see Figure 1). When complete, all JVAS sources detected above 100 mJy at 8.4 GHz on VLA A-array scales will be observed with the VLBA S/X dual-frequency system, using a geodetic-style frequency setup of four IFs at 2.3 GHz spanning 100 MHz and four IFs at 8.4 GHz spanning 400 MHz. Each source is observed at three separated hour-angles for 100 s, i.e. a total of 300 s. Approximately 25% of the observing time is spent observing geodetic-grade calibrators. After amplitude and delay calibration in the NRAO AIPS software package, fringe solutions are transferred to GSFC CALC/SOLVE geodetic package to derive source positions. The calibrated data are also automatically imaged using AIPS and the Caltech Difmap package.

2. Scientific Impact

Our sample is statistically complete, and will be the largest set of sources surveyed with VLBI to date. Potential scientific returns from this survey include: (1) the detection of compact gravitational lenses, probing the existence of massive compact lensing objects such as 10^6 $M_\odot$ black holes; (2)

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structural information and the brightness temperature distribution at 8.4 and 2.3 GHz for a large sample of AGNs; (3) in combination with optical identifications and redshifts, this structural information will contribute to θ-z and μ-z studies.

3. Current Status

Three of fourteen epochs have been observed to date (11/95), a total of 648 sources in the declination ranges 0–22° and 50–79°. The mean positional accuracy achieved is ~0.7–1 mas rms, sufficient for most phase-referencing purposes. Images from the survey data have typically a 2–3 mJy rms, with a 100:1 dynamic range or better. At present, the plan is to complete all JVAS sources above 200 mJy during 1996, with the entire survey complete by late 1997. The survey positions, images and UV-data will be available online from the NRAO WWW server from early 1996. Special requests to survey selected regions to lower flux densities near important targets will be considered.

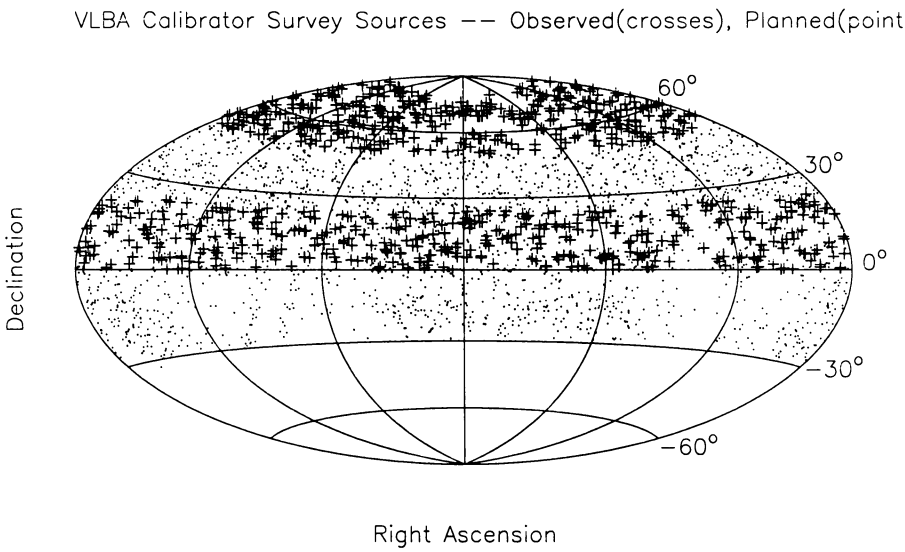

Figure 1.

References

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