VLA Observing Programs in 1990's

T. S. Bastian

Most effective use of the VLA through campaign observing

e.g. Sept. 1988* (IAU Int'l Solar Month
June 1989* (First Max '91 campaign)
Dec. 1990† (Second " " ")

VLA	*SMM	· BBSO
OVRO	GOES	KPNO
BIMA	†"HIREGS"	Sac. Peak
RSTN	⋮	⋮
⋮		

Solar Observing With the VLA: 1990 – 2000

Review of Solar Observing with the VLA

In general, $T_{ant} \ll T_{rx}$. For the Sun, however, $T_{ant} >> T_{rx}$. Hence, in order to observe the Sun with the VLA, two hardware modifications are required

1) Insertion of 20-30 dB phase-constant attenuators

2) Injection of high-amplitude calibration signal

Neither the attenuators nor the CAL signals are adjustable. Therefore accurate calibration of solar radio bursts limited to those which are no more than about 13 dB above quiet Sun power levels. Less accurate calibration results for bursts up to 20 dB above quiet Sun levels. Even stronger bursts saturate the online calibration system.

2 cm: $S < 100$ (500) sfu
6 cm: $S < 250$ (1200) sfu
20 cm: $S < 1200$ (6000) sfu

$$T_{sys} \propto \frac{V_{CAL}}{V_{TP}} T_{CAL}$$

Solar Observing With the VLA: 1990 – 2000

Recent Improvements

1) Three new receiver systems have been added to the array during the past several years:
   a) 8.4 GHz (completed 1988)
   b) 333 MHz (completed 1988)
   c) 75 MHz (8 systems; scheduled completion 1992)

2) The minimum integration time has been reduced to 0.4 s; through use of hardware designed to gate the correlator, a minimum effective integration time of 0.2 s is anticipated by the end of this year, a factor of 50 improvement over the last solar maximum.

3) "Saturation" problems have been greatly reduced
   a) The new online system scales each baseline independently
   b) Solar visibilty data normalized to sfu, thus avoiding overflowing the array processor

4) A solar observing mode is now supported by the VLA; all hardware and software changes necessary for using the instrument to observe the Sun are automatically enabled.

5) A package of menu-driven software which employs the JPL ephemeris has been written which allows the user to quickly schedule solar observing programs of arbitrary complexity.

Solar Observing With the VLA: 1990 – 2000

Future Improvements

1) Fast T_{sys} measurements; currently done once every 10 s - will change once per second.

2) In the longer term, the current online calibration system may be bypassed altogether and a parallel system developed for solar work.

3) Even shorter integration times may be possible within 2-5 years
   a) New correlator interface and array processor will allow snapshot imaging every 52 ms (1 waveguide cycle)
   b) Support of the Galileo mission possible. If so, optical fibe will replace waveguide and integrations less than 50 ms poss

4) A small number of frequency agile receivers and feed may be placed the field.