

## Planned Capabilities of the SRT Interferometer

The SRT interferometer will consist of two SRT units that will be used in a Very Long Baseline style of interferometer – this means that the two units will not be physically connected but will have the ability to simultaneously record data from the astronomical source. These data will then be sent to a software correlator which will combine them and produce output that can be analyzed. The nature of the output will depend on the final design of the system.

Currently, the planned capabilities of such an interferometer system are given in the table below.

**Table 1: Proposed capabilities of the SRT receiver**

Antenna diameter	2.3m (7.5 feet)
Aperture efficiency	50%
Sensitivity	7e-4 K/Jy (from numbers above)
Frequency coverage	1400 - 1700 MHz
Tsys	50 K
VLBI sampling	2-bits/sample
Maximum VLBI bandwidth	4 MHz
maximum coherent integration in VLBI mode	100 seconds

The above capabilities can be used to calculate the signal to noise ratio (SNR) that can be expected. An SNR of over 10 ensures a good detection of the source.

**Table 2: Ability of an SRT interferometer to detect radio sources in the Universe.**

Source	Frequency	Size scales	Flux (Jy)	Bandwidth	SNR
Sun	1.4	~ 15''	$10^2 - 3 \times 10^4$	4 MHz	$40 - 7 \times 10^3$
3C273	1.4	< 1''	40	4 MHz	16
Cas A	1.4	30'' - 4'	~ 20 - 1000	4 MHz	8 - 400
Cyg. A	1.4	50 - 100'' +	~ 800	4 MHz	320

The SNR will scale down by the square root of the bandwidth, depending on the mode of observation.

The receiver for the new SRT interferometer system is currently under development and is planned to contain the following components:

1. A digital board which provides a total bandwidth of 4 MHz in the frequency range of 1400-1700 MHz.
2. An analog board that provides 1, 2 or 3 channels of output, depending on the mode of operation

Different modes of operation (**in order of development priority**):

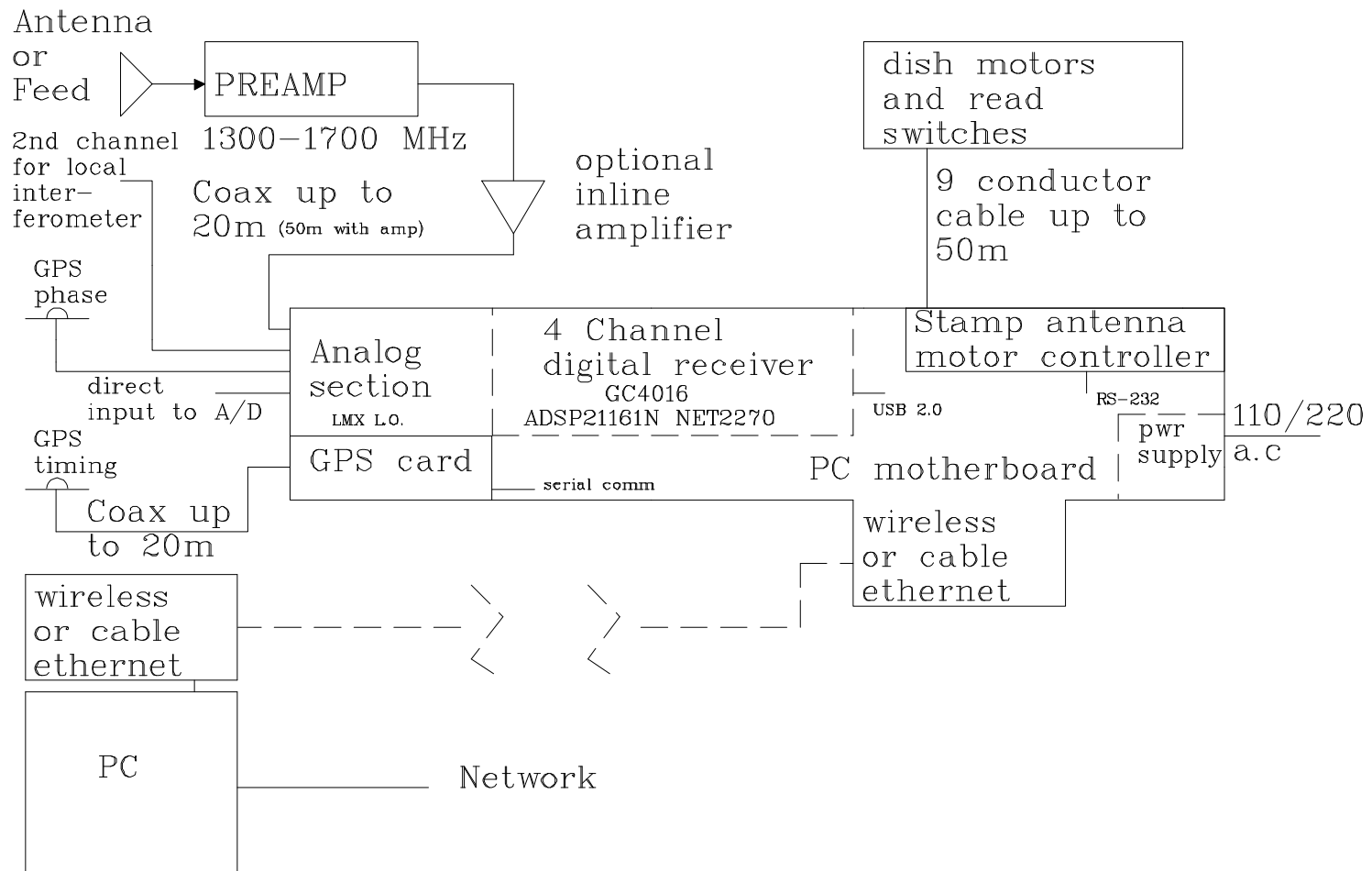
- a. Single dish mode, with full range of 1300-1700 MHz, increased sensitivity at OH maser frequencies

- b. VLBI mode with GPS timing but no carrier phase – full 4MHz bandwidth but coherence time limited by GPS (expect 30-100 seconds)
  - c. VLBI mode with GPS timing, 1 2MHz channel of data, one channel connected to an external GPS antenna for carrier phase information – unlimited coherence time
  - d. Connected element interferometer with cross correlation
3. A PC board inside the box that will have an RS232 connector to talk to the motor controller (which will remain the same as the current controller) and a USB interface to the receiver.
  4. An interface from the control PC board to the outside via Ethernet (cable or fiber). This Ethernet link can be connected to a router and talk to a wireless network or can be directly connected to a network.

In the case of the interferometer, the output of the PC will be data from each of the antennas that will be directed by the user into a software correlator. The correlator will produce preliminary data which can be put into a post processing software package. The idea is to use something that already exists such as AIPS or Miriad. The software can be run on a standalone computer at Haystack connected to the internet. Macros and procedures will be provided to produce basic outputs.

#### Planned Interferometer Receiver Block Diagram

The block diagram shown below is the current design for the new SRT receiver that will support interferometry. The capabilities that are described above are based on this design. Construction and testing of this new receiver are planned to start in January 2004.



Block diagram of new SRT receiver under development