# Development of the Siberian Solar Radio Telescope

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The variety of generation mechanisms for radio emission and the dependence of their efficiency on parameters of emitting electrons makes the interpretation of observations difficult if spectral data of high spatial resolution are absent. Also, the dynamic range of solar phemomena is extremely wide. This is why a further development of the SSRT is required towards the extension of both the dynamic and the spectral range of observations.

The SSRT is a cross-shaped interferometer consisted of two 622 m long linear antenna arrays in the E-W and the N-S directions, each of which consists of 128 antennas. In solar activity cycle 23, observations started at the SSRT to provide with two-dimensional (2-D) solar maps at the frequency of 5.7 GHz at within 3–5 min with a spatial resolution of down to $22''$.

Our proposal is to expand the SSRT to multi-frequency capability. It can be achieved through the replacing of the existing in each dish narrow-band feeds with composite multi-wave feeds to ensure the receiving of signals in the range of 2–9.4 GHz, and through the equipping each antenna of the array with modules for amplification and conversion of the UHF signal.

At the focus of each dish (paraboloid of 2.5 m diameter) will be placed three incorporated feeds of V.N. Dikiy design (St. Petersburg State Technical University) which are inserted into each other. The phase centers of the three feeds can be easily brought into coincidence. The ranges of the working frequencies are 2–4, 5.6–5.8, and 7.4–9.4 GHz, respectively. The left- and right-hand circularly polarized components of the emission received by the antenna pass from each feed to the polarization modulators and then to low-noise 15 dB UHF amplifiers with the input noise temperature of 50–60 K.

The UHF modules serve to separate a discrete set of frequencies and to convert them to the frequency of the SSRT waveguide line of 5.7 GHz. The signals of different frequency channels will be received with temporal sharing.

A special advantage of the proposal is an almost total utilization of the existing equipment of the SSRT: antennas, the complex waveguide system with amplifiers, bridges and phase shifters, and receiving systems.

The parameters of the proposed telescope should be following:

- Frequencies: 2.1, 3.9, 5.7, 7.5, and 9.3 GHz
- Bandwidth of receivers: 100–200 MHz
- Integration time for image synthesis: 0.16–0.3 s
- Temporal resolution in the fast 1-D mode: 4 ms
- Renewal time of 2-D map: down to 1 min
- Renewal time of 1-D image: down to 20 ms

- Flux sensitivity: a few Yan

The implementation of this program on the basis of the SSRT will result in the creation of a substantially developed, actually new, multi-wave instrument.

Together with the Nobeyama Radio Heliograph whose observational daytime is almost the same, it promises significant progress in understanding physics of solar activity. The high spatial and temporal resolution data on bursts covering the layers from chromosphere up to corona will essentially improve the forecasting geoefficiency of solar events.

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