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Section 3. Radio Astronomy

The multi-correlator backend or RSIP, for Real-time Solar Image Processor, is operated every day on routine basis since March, 1986 with the lambda 8-cm Radioheliograph at Toyokawa to synthesize two-dimensional images of the Sun. Examples are illustrated of daily maps and synoptic maps superposed from daily maps for the solar rotations between Carrington number 1773 and 1783 (Enome et al., 1987). Description and performance of the RSIP are given elsewhere (Nishio met al., 1987), where an estimation is shown on the quality of the present radio maps to be 30:1 or 15 dB after a self calibration procedure using the redundancy of the fundamental antenna pairs.

Another improvement of the lambda 8-cm Radioheliograph has been done in the fiscal year 1986 on the replacement of the frontend receivers by new low-noise amplifiers. The noise temperature of the new amplifiers is less than 100^{o}, which will guarantee us the over-all system noise temperature of 200^{o} or less. This low-noise performance will enable us to detect possible variable radio sources by a long integration time of observation during night with the advantage of a wide field of view.

A design and assembly of a new correlator backend have been completed using Australia Telescope correlator chips. This new correlator backend will replace the old one with much less electric power consumption and also with much smaller volume compared with the old one, which are both owing to very high integration of the AT chip (Kobayashi, 1987). It is in the stage of final tuning for operation.

Another course of observations is arranged to observe polarized mm-wave Sun with the 45-m radio telescope at Nobeyama Radio Observatory to distinguish possible interpretations for the excess brightness in mm waves at polar regions. At 3.5 mm the polar cap brightening was also detected as previous observations at 8.6 or 7 mm (Kosugi et al., 1986), which is largely due to the surface readjustment using holography technique done by the NRO group. Interpretation of the polar cap brightening is in progress in combination of radio, optical and magnetic field data.

A proposal is being prepared for the fiscal year 1988-1990 to construct a New 17-GHz Radioheliograph at Nobeyama in the next solar maximum as a joint project of solar radio astronomy groups at Nobeyama and at Toyokawa. The main performance specifications are 10-arcsec or higher spatial resolution, 1-sec or higher temporal resolution, and full Sun field of view with high image quality of 100:1 or better. The New 17-GHz Radioheliograph consists of 139 80-cm diameter alt-azimuth mounting paraboloid antennas, 139 channel receiver and transmission systems, a digital correlator backend of about 20,000 channels, and a data acquisition and image synthesis system. The antenna configuration is a quadra-multiple T's with equal antenna separations of $1d_o$, $2d_o$, 4_o, $8d_o$, where d_o is 90 wavelenghs. The allocated numbers of antenna for each T are 32X16, 32X16, 32X16, 32X16, and 44X22. The 17-GHz Radioheliograph is used for the observations of solar flares at a short centimeter in snap shot mode. It is also used for the studies of active regions in pre-flare activities, evolution and flare build-up, for which earth-rotation super-synthesis mode will be employed for about 15-45 minutes. During periods of quiet solar activities a full synthesis map will enable us to investigate fine and low-contrast structures in the chromosphere and/or low-corona such as coronal holes, dark filaments, networks. It is farther used during night for monitoring and survey of radio sources to detect possible variations of their intensities taking the advantage of the wide field of view.

S. Enome was invited to SibIZMIR in Irkutsk for about three weeks in June, 1986 as a visitor of the program for exchange of scientists between U.S.S.R. and Japan.

March 13, 1987
- Shinzo ENOME -

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