Würzburg Riese radars as a basis of the solar radioastronomy at the Ondřejov Observatory

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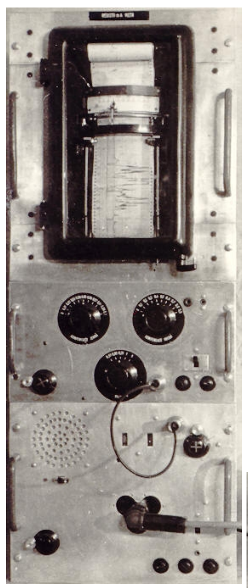
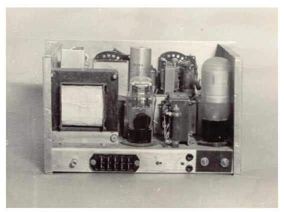
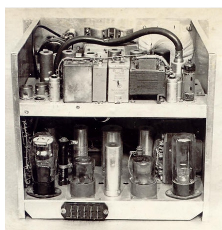
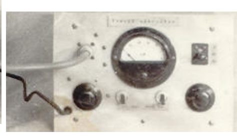
Building of the radiotelescope RT2.









Historical parts of the radiotelescopes.

Abstract: Historical aspects of a use of the Würzburg Riese radars at the Ondřejov Observatory are summarized. Technical parameters of these radars are mentioned. Their role for a development of the solar radio astronomy at the Ondřejov Observatory is expressed.

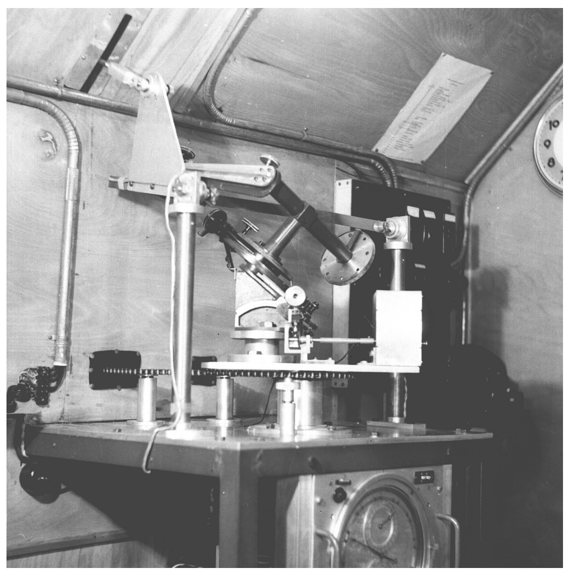
After second world war due to a global technical progress the radioastronomy as an independent research field rapidly evolved. In the field of the solar radioastronomy, systematic observations of the Sun started at various Observatories, especially in England, France, Australia and United States. Simultaneously the first theoretical models explaining a generation of the solar radio emission were proposed.

At this period also the scientists of the Ondřejov Observatory that were led by the director Prof. F. Link started to be interested in the solar radio astronomy. In fifties, after the second world war, they have found that in the Czechoslovak army there are two German radars of the the Würzburg Riese type. One of them was a groundbased construction and the second one was a mobile type placed on the train waggon. Prof. F. Link asked the army for these radars to use them for scientific purposes. Under a collaboration of workers of the Observatory the radars were transported to Ondřejov and builded on the concrete basements in the park of the Observatory . They were located along the line oriented in the east-west direction and designated as RT1 and RT2. Their distance is 230 m. A diameter of the parabolic mirror of both the radiotelescopes is 7.5 m, the depth of the mirror is 1.9 m, and the focus distance is 1.7 m. The mirrors were made from aluminium and other parts are from iron.

The first receiver for the measurement of the solar radio radiation was constructed from parts obtained from war equipments, mainly from military receivers. The receiver was operating in the decimetric frequency range, on the frequency 536 MHz, i.e. at the wavelength 56 cm. The receiver was placed in the radiotelescope RT 1 and it was in an operational regime since 1955. Later, in 1958 the observation by the RT1 was extended to the measurement on the frequency 260 MHz; the wavelength 115 cm. Mirrors of both the radiotelescopes RT1 and RT2 are mounted on original azimuthal mounting of radars. To follow a path of the Sun by these parabolic mirrors it was necessary to transform azimuthal coordinates into equatorial ones. For this purpose, it was used the same method as proposed by Laffineur (1954) for the same type of the radiotelescope (Würzburg Riese type) located at this time at Meudon Observatory, France. In the cabin of the radiotelescope RT 1 a small parallactic mounting was builded up, which drove the parabolic mirror to the Sun direction every 2 seconds. The second radiotelescope RT2 was moved by means of selsyn motors driven by the electronic signals from the radiotelescope RT1.

A full reconstruction of the radiotelescope RT1 was made by J. Budějovický in 1952-1954. The first observation by the radiotelescope RT1 was made in June 30, 1954 during the solar eclipse (Budějický 1955). The second radiotelescope RT2 was modified for the measurement of the dynamic radio spectrum in the decimetric and metric waves, in the 70-810 MHz frequency range (Tlamicha 1974). Using the radiotelescope RT1 a continuous series of daily solar radio flux on the frequency 260 MHz (115 cm) in the time interval of two 11-years solar cycles were recorded (Pap and Tlamicha 1992).

Although both these Würzburg Riese radiotelescopes (RT1 and RT2) are not used now, they played an essential role in a development of the solar radio astronomy at the Ondřejov Observatory. They not only measured solar radio fluxes and radio spectra for nearly 50 years, but they were a basis for a preparation of a new generation of solar radioastronomers at our Observatory. Now the new solar radiospectrograph RT5 is operating (Jiřička et al. 1993) and based on these new observations new types of research studies are made. For example, it was found that the flare ejected plasmoid is associated with the high-frequency drifting pulsating structure (Kliem, Karlický, Benz, 2000, Karlický 2004), the new type of the radio burst with rapid frequency variations called lace bursts was discovered (Karlický et al. 2001), and the radio diagnostics of the flare magnetic reconnection proposed (Bárta and Karlický, 2005).



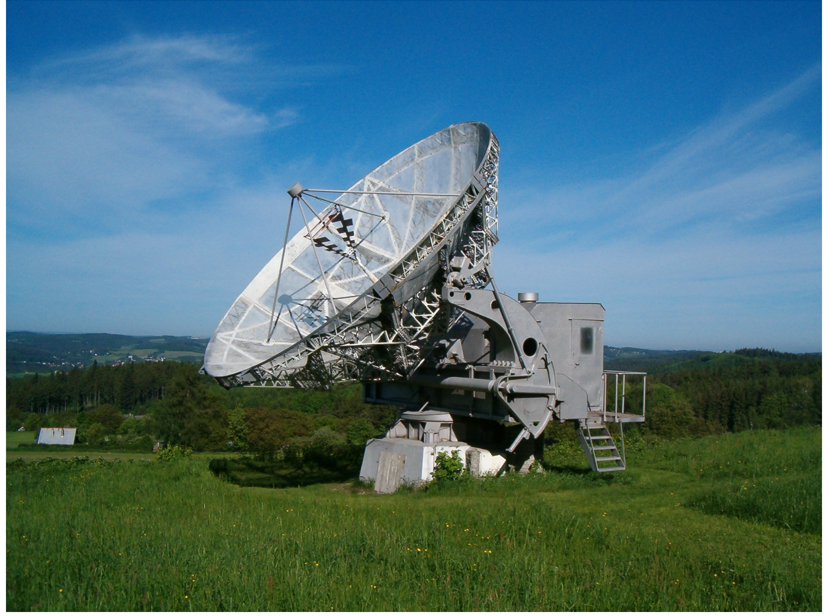
Parallactic mounting inside the cabin of the radiotelescope RT1.

Another view on the parallactic mounting.

References:

Bárta M and Karlický M. 2005, ApJ 631, 612
Jiřička K., Karlický M., Kepka O., and Tlamicha A. 1993, Solar Phys. 147, 203
Karlický M. 2004, A&A 417, 325
Karlický M., Bárta M,, Jiřička K., Mészárosová H., Sawant H.S., Fernandes F.C.R., And Cecatto J.R. 2001, A&A 375, 638
Kliem B., Karlický M., and Benz A.O. 2000, A&A 360, 715
Laffineur M. 1954, Bull. Astron. 18, 1, 1
Budějický J. 1955, Observation of the partial eclipse of the Sun on June 30th, 1954 by means of a radiotelescope, Bull. Astron. Inst. Czechosl. 7, No. 5, 99
Tlamicha A. 1974, Bull. Astron. Inst. Czechosl. 25, No. 3, 163
Pap J.M. and Tlamicha A. 1992, Solers 22, Space Environment Laboratory NOAA ERL, p. 76

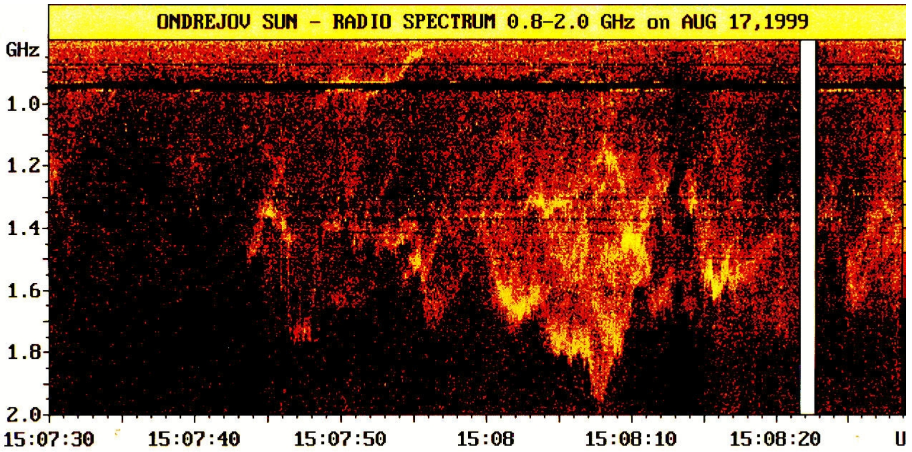
Present view on the radiotelescope RT1 with the Würsburg antenna.

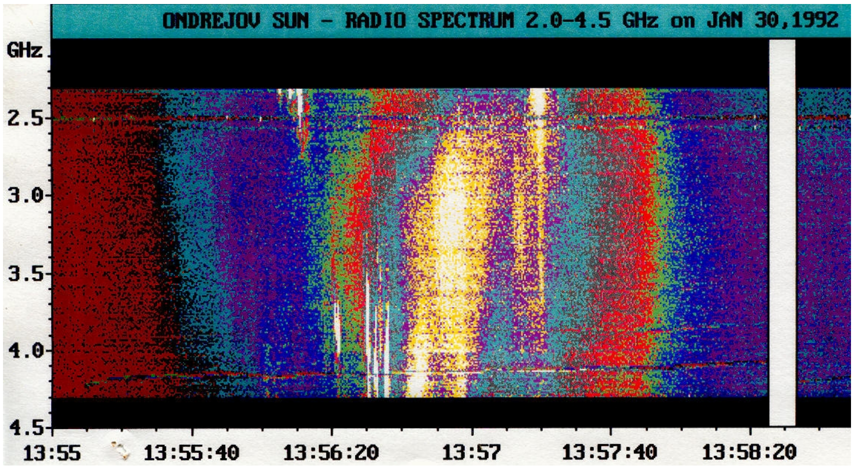


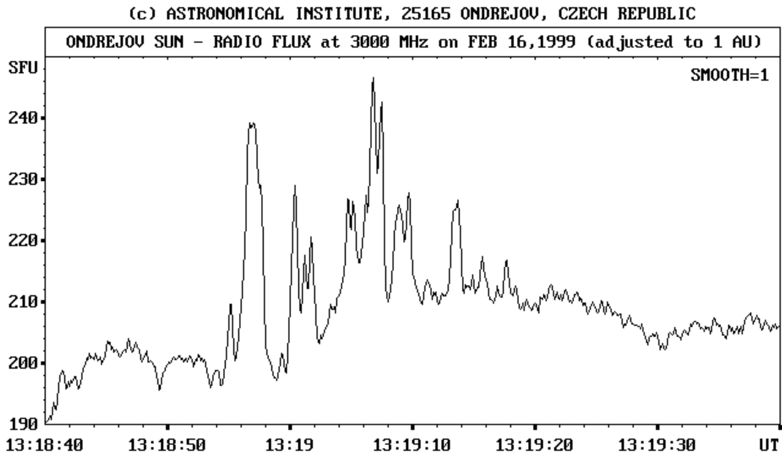
Present view on the radiotelescope RT2 with the Würsburg antenna.

Present view on the new radiotelescope RT5.

Present panoramatic view on three antennas for radio observations at the Ondřejov Observatory.







Examples of the radio spectra and radio flux observed by the Ondřejov radiotelescopes. For observed data, see http://www.asu.cas.cz/%7Eradio/.