Torun (Tr) Station Report

(April 10th, 2013)

Brief Report of Recent EVN Session Problems

The Oct/Nov 2012 session passed without any major problem. All 32 experiments scheduled were carried out. In three experiments (EP076D, ES069B and ES069D) there were data losses due to problems with telescope control or recording. During the K-band part of this session we joined ftp fringe test of N12K4 to see, for the first time, fringes to Tr with our new receiving system (they were present in all sub-bands, although were quite weak because the telescope pointing offsets for these off-axis feeds were not yet properly determined).

The last session, Feb/Mar 2013, was a little less successful since as many as 8 (out 35) experiments were affected by minor problems (such as hang-up of telescope control system, operator's fault, bad disk-pack). In this session for the first time Tr participated in the K-band part.

Post-session calibration results (Tcal and Tsys) are presented graphically under these links:

http://www.astro.uni.torun.pl/~kb/Reports/Cal2012-3/Sesja12-3.html
http://www.astro.uni.torun.pl/~kb/Reports/Cal2013-1/Sesja13-1.html

e-VLBI

Our station has participated, without major problems, in all regular and a few testing experiments organized by JIVE.

RadioAstron Observations

In January 2013 Tr joined VLBI observations in the RadioAstron mission at K, C and L band and continued to observe in the following months.

Changes/Upgrades Made to Hardware/Software

Current software versions

- Mark5A OS is Debian "Etch" version 4.0 with the package mark5a_1.0.2-i386.deb
- Mark5A application code is Mark5A2007y.225d
- The StreamStor driver version is 9.21
- FS 9.10.4 version is used since session 3/2011.
- e-VLBI jive5ab version is jive5a-2.0.4-SDK8 since February 2013.

Mark5B upgrade and DBBC

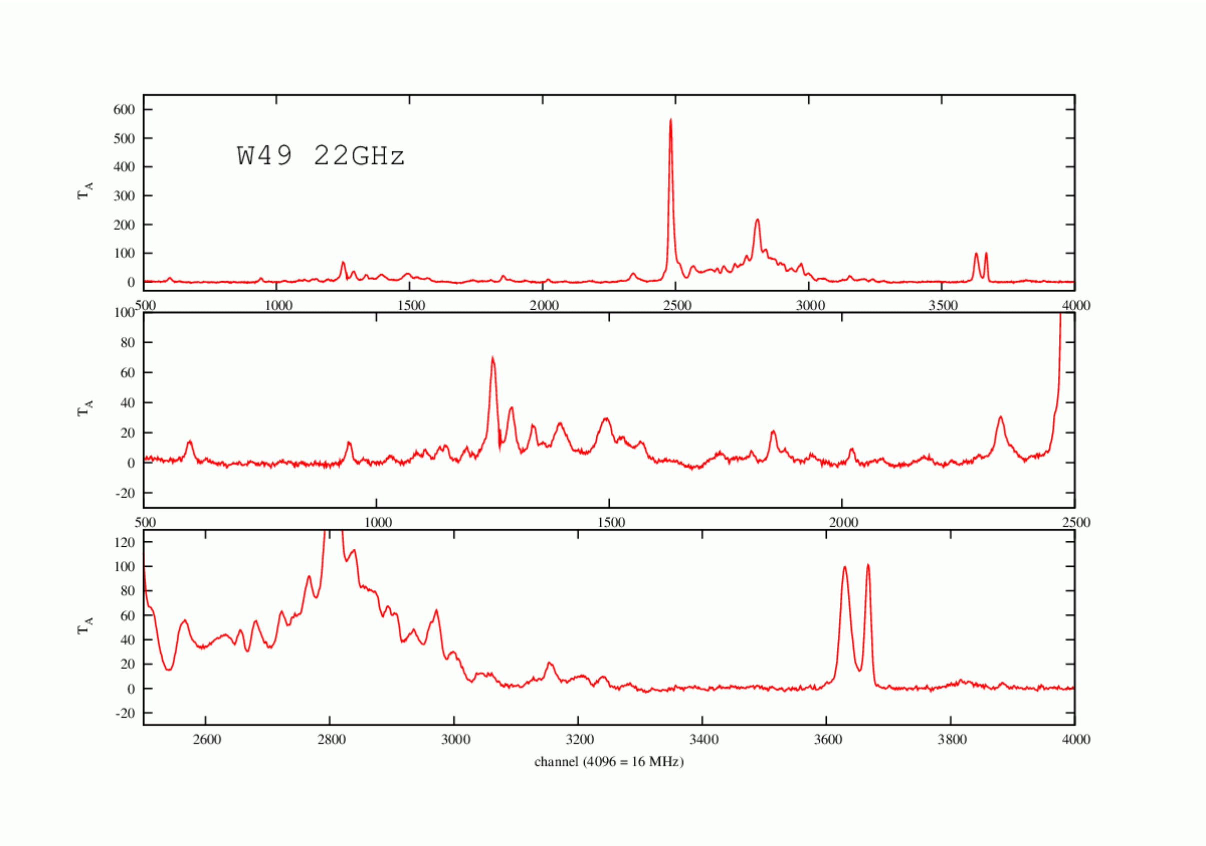
An arrangement was made with JIVE to borrow their Mark5 for recording parallel with our Mark5A to be soon upgraded to Mark5B plus DBBC.

22 GHz System

A new twin horn 22 GHz receiver system has been installed on the antenna in the second half of 2012. It receives the two circular polarizations. Measurements made in January 2013 using Jupiter indicate that the system equivalent flux density is about 500 Jy.

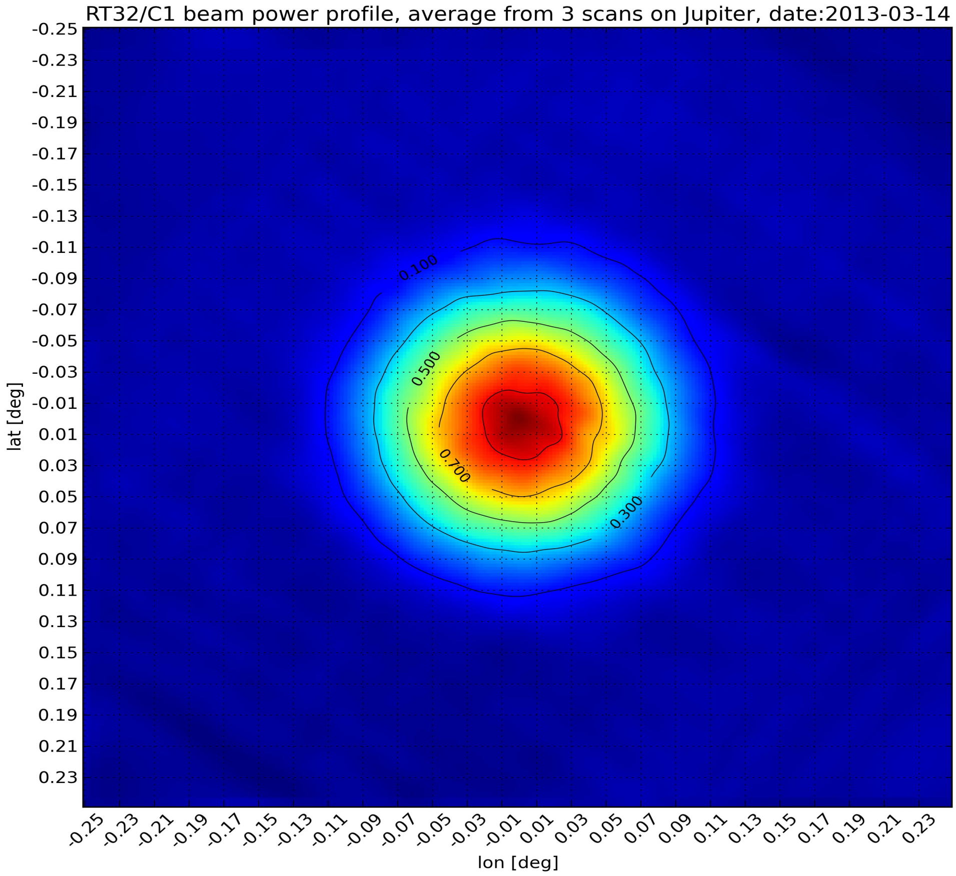
The 22 GHz horns are housed inside the middle (shining) cylinder

In the first tests performed in September 2012 we were able to clearly see a strong water maser source, as shown in the figure below.



Later, first fringes were detected during Oct/Nov Session of 2012 (see the above session problems report). Further confirmation came from RadioAstron experiment of 2 February 2013, wherein quite strong fringes were obtained at the Tr-to-satellite baseline and in the NME experiment of February 27, 2013 (see ftp fringes here http://www.evlbi.org/tog/ftp_fringes/N13K1/index.html).

Beam shape of Torun 32m dish



Normalized beam power pattern of the 32-metre radio telescope in Toruń obtained with C band receiver (with central frequency of ν=4.85 GHz). The beam pattern is the average from three reconstructed beam maps corresponding to three zig-zag type scans (in right-ascension and declination) on Jupiter, performed at average scan elevations of 24°,32° and 43° respectively. We subtracted from the time ordered data a template for atmosphere induced brightness temperature fluctuations and low-pass filtered to mitigate high-frequency noise and possible RFI. We project a set of (Jupiter-peculiar-motion-corrected) directions onto a tangent plane via stereographic projection and interpolate using standard SPH (smoothed particle hydrodynamics) methods using truncated-gaussian kernel with a point-dependent smoothing length. Realistic simulations of the performed observations prove the reliability of such reconstructed beam profiles and provide an estimate of the uncertainties on the extracted HPBW (half-power-beam-width) for the used observational setup. The estimated HPBW is 0.129±0.020° which quite well agrees with the theoretical prediction for the 32-m Cassegrain antenna with sub-reflector 3.2 metre (0.127°) at the central receiver frequency. With the current observations we do not observe elevation-dependent systematical effects on the axially-averaged value of HPBW.

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