

The second year after re-commissioning

Report from operations 2012



Further developments on the 25m dish

Measurements of the geometry revealed that the receiver was not optimally placed in the focus of the dish. Correcting this deficiency required some mechanical modifications but increased both sensitivity and resolution.

Also, the adjustment of the corrugated horn was optimized to get a better illumination of the dish which also resulted in an improvement of resolution.

Further intensive software developments were performed in order to increase capabilities and usability of the instrument.

This included the implementation of a web interface, by which external parties can initiate a number of predefined measurement tasks. This is intended for schools in the context of the EU program „Hands on Universe“.

Instabilities in the receiver which were detected last year could finally be attributed to a faulty component in the IF chains. Since spare parts were not available on short notice, the receiver was put back into the dish, however one of the IF boxes were replaced by a unit generously loaned by the Max Planck Institutes für Radioastronomie (MPIfR). We wish to express our special thanks for this.

Measurements on the 25m dish

As in the previous year the measurements were primarily aimed at learning the characteristics of the instrument in order to assess the potential for different applications.

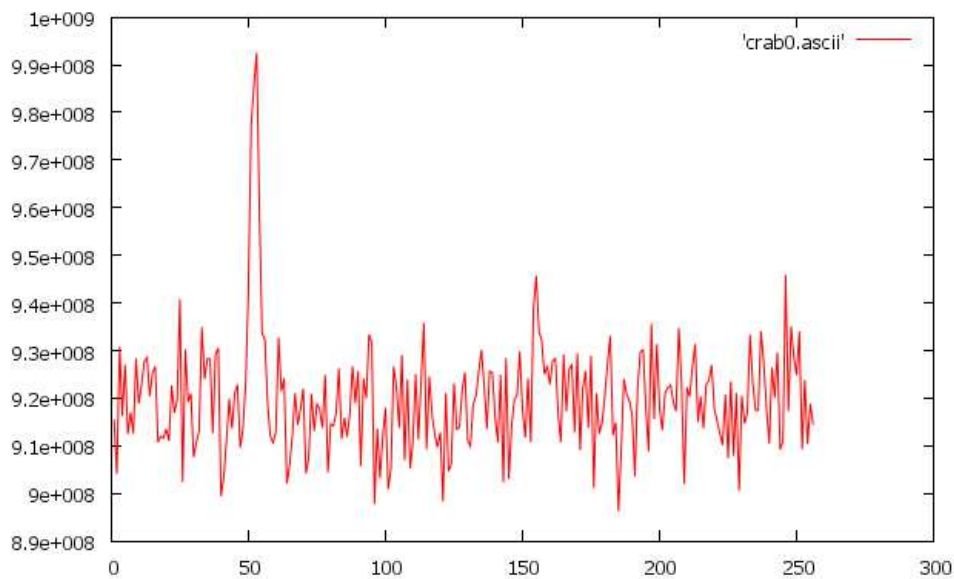
First pulsar measurements were performed back in 2011. This program was systematically expanded in order to determine the possibilities and limitation for pulsar measurements.

Furthermore we made a virtue out of necessity: Since the IF box loaned from MPIfR could be switched to the 18cm spectral range, we could use one of our polarizations for measurements of the OH Radical.

Pulsar measurements:

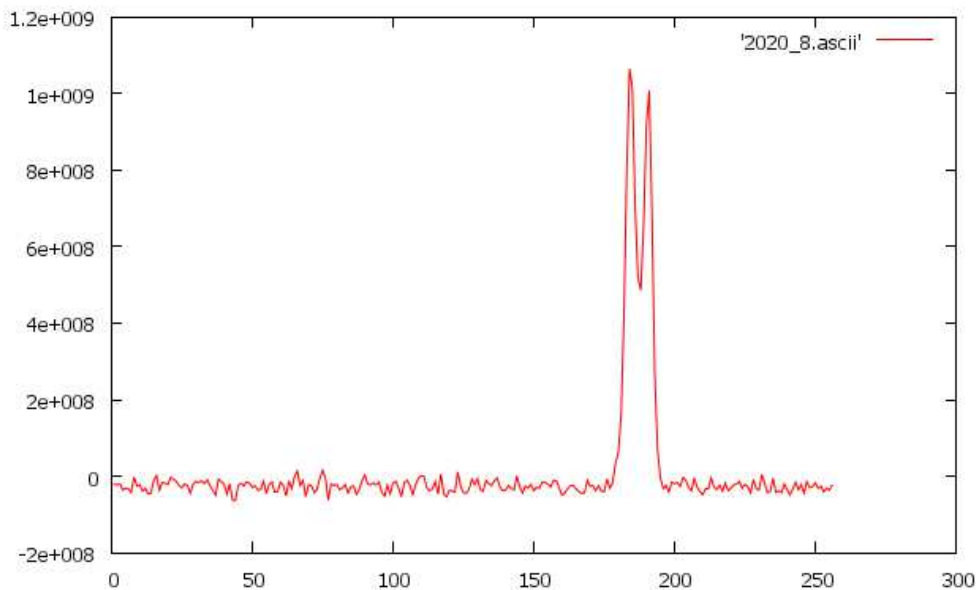
Until the end of 2012 a total of 38 pulsars could be observed. The weakest has a flux of 4 mJansky at 1420 MHz. Two of these pulsar observations are shown below as examples:

The fastest pulsar observed is the crab pulsar:



Signal of the „Crab“ pulsar B0531+21

A very distinct double pulse is emitted by pulsar B2020+28:

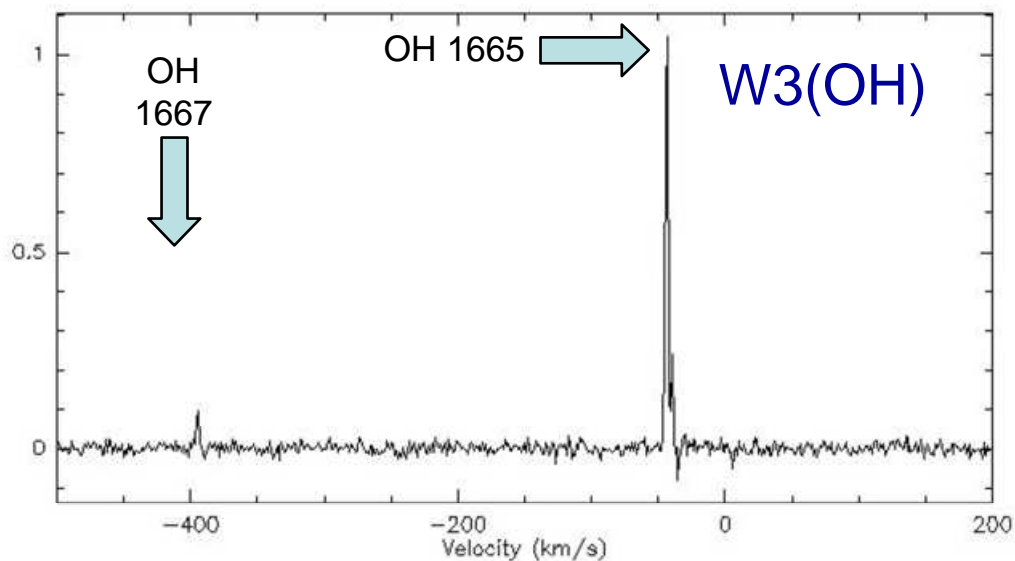


Signal of the B2020+28

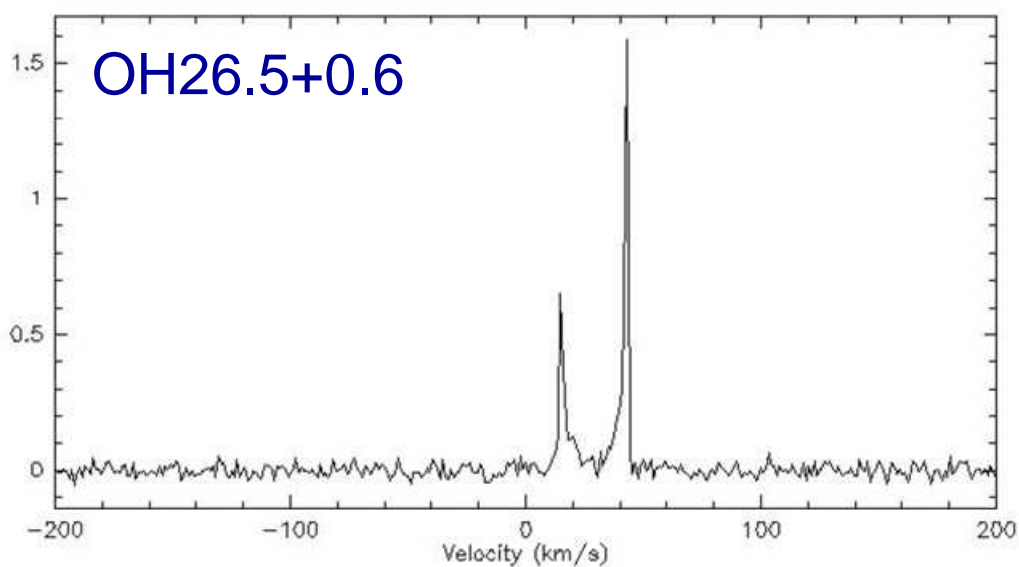
Maser:

The possibility to switch the receiver to 18cm was used to perform observations of the OH radical. Besides absorption lines (for example towards CAS-A), maser emission lines are a very prominent and rewarding subject for observations.

A total of 12 OH-Maserquellen could be observed so far. Again, two examples are shown below:



Maser emissions towards W3(OH)

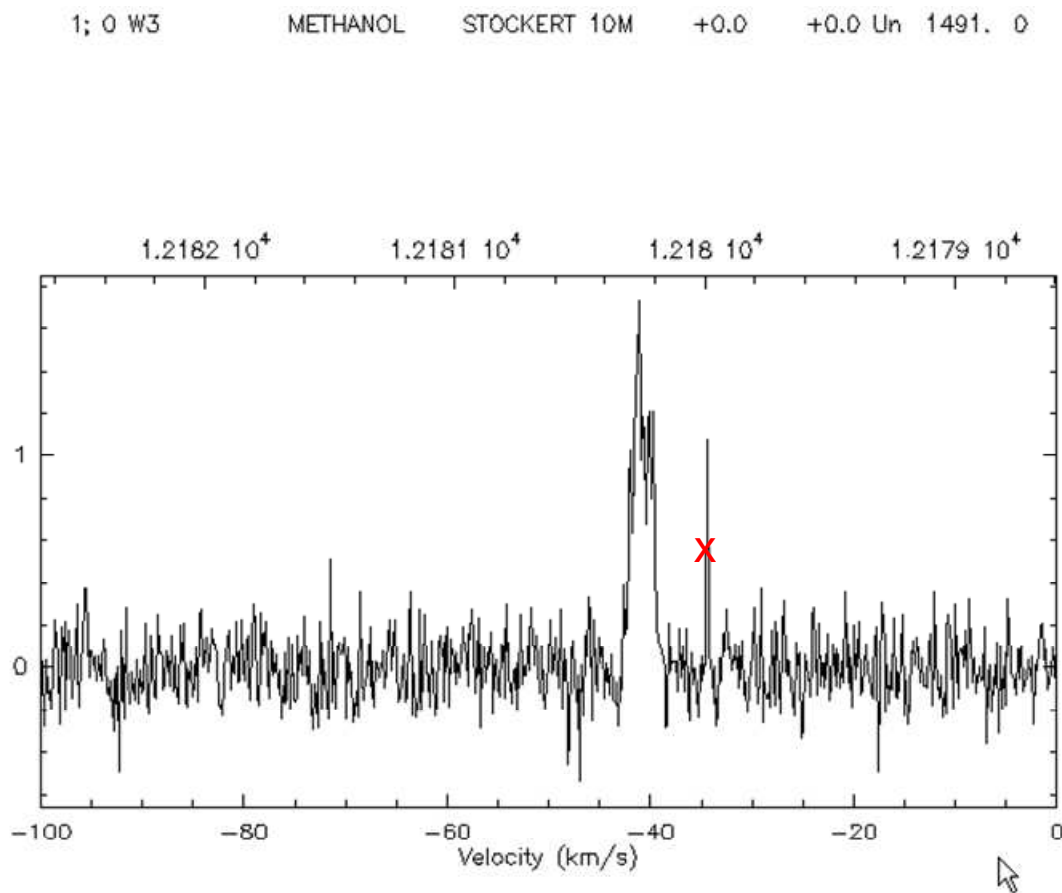


Maser emissions towards OH26.5+06

Measurements on the 10m dish

For the first time we tried in 2012 to use the 10m dish for radio astronomy again. As a first approach, a commercial satellite LNB was modified and complemented with a second IF stage so that it could be used for spectral observations at 12 GHz.

Even though the possibilities to control and steer the dish are limited and therefore the pointing is very uncertain, it was possible to detect the methanol maser emission towards W3.



Methanol maser emission towards W3 ¹

¹ Not corrected for LSR. Line crossed out in red is RFI

Practical courses for universities

The tradition to conduct practical courses for universities was taken up again in the previous year. This could be expanded, and as a result we were able to welcome students and their professors from the university of Bonn, the RWTH Aachen and the university of Dortmund.

„Jugend forscht“

One of our endeavours is to provide access to radio astronomy for young people and to promote the interest for physics and astronomy in general. Therefore we support projects in the context of the „Jugend forscht“ (research by young people contest).

One project investigating the radio properties of the moon, which was performed on the 10m dish, did make it into the federal contest in 2012. Measurements for the next years contest have now been completed and we are hoping for good results in the 2013 contest.

Outlook

Software development is likely to continue to take a significant role. However, since all basic functionalities are covered by now, the focus is shifted towards usability improvements and tools for demonstration of radio astronomy for visitors and possibly also in the internet.

Improvements in the pulsar tool chain and a transition of all system to a 64Bit environment are on the agenda.

Using the 18cm range has demonstrated which interesting possibilities can be addressed in other frequency ranges. Therefore studies for additional receivers are planned. Implementing these may take some time due to the limited financial and human resources available.

Besides the extension of practical courses to further universities, measurement of pulsars will be one of the focal points of the activities.

The first trials with the 10m dish were encouraging, therefore our association will investigate the further retrofitting of this instrument for radio astronomy, without giving up the usage as amateur radio station for earth-moon-earth operation.

Acknowledgements

Also this year the association was supported and promoted by different organizations. The further developments on the Stockert mountain are also attributed to these supporters.

The Nordrhein-Westfalen Stiftung as owner of the Astropeiler is firmly standing at ours side and is the basis on which all activities are founded.

As in the years before, we could at all times count on the advice of the members of the Max-Planck Institutes für Radioastronomie (MPIfR) and the Argelander institute for astronomy of the iniversity of Bonn. We are grateful that the Fraunhofer Gesellschaft für Hochfrequenzforschung (FHR) did take care of our problem with the receiver stability.

Astropeiler Stockert e.V., December 2012
Wolfgang Herrmann