

MINUTES OF THE WSRT USERS MEETING HELD ON 4 JUNE 2008, AMERSFOORT

- A list of participants is attached to these minutes.
- The presentations made during the WSRT users meeting can be found on the WSRT Operations wiki: <http://www.astron.nl/wsrt/wiki/doku.php?id=public:usermeeting>

1. Welcome

Rene Vermeulen welcomes the participants to this first WSRT users meeting since 2002. The purpose of the meeting is to bring the community up to speed with the current status of the Radio Observatory at ASTRON and to discuss highlights and options for the future of the WSRT.

2. Report from the WSRT Programme committee Chairman (M. Verheijen) – see wiki

Verheijen mentions that not only the scientific merit is important for allocating time to a project, but also the telescope schedule is important: the mean oversubscription is around 1.5, but some regions of sky are much more heavily in demand. Verheijen shows slides of submitted/accepted proposals, user statistics, and use of various receivers. The numbers of submitted proposals from The Netherlands and from abroad are roughly equal. 2/3 of the time allocated is for the 21/18 cm receivers.

Future of the Programme committee: LOFAR will issue a Call for Proposals as well.

The PC will be split up into an internationally composed Radio-PC for LOFAR and WSRT and an Island-PC for Dutch time on WHT/INT and JCMT. This will come into effect in autumn 2008.

Verheijen mentions the high efficiency of the WSRT, also thanks to the flexibility of the MFFEs.

3. Views and perspectives on the future course for the WSRT

a. Introduction (Vermeulen) – see wiki

Vermeulen outlines ASTRON's Radio Observatory (RO) organization which is now an integrated LOFAR and WSRT Observatory. All operations have moved to Dwingeloo, including the control room for WSRT and LOFAR. It is inevitable that the RO staff will predominantly focus attention on LOFAR and LOFAR commissioning. It is important to ensure that WSRT operates smoothly and with routine attention. Project specifications/schedules will mostly be prepared at the start of each semester. The data will be retrievable online for the PI immediately after observation, without data quality inspection by RO. The expanded Service proposal scheme (may request up to 24 hrs any time, no guarantees) is mentioned.

Vermeulen presents the current WSRT facilities and possible paths towards the future for the WSRT. In the short term a mix of WSRT projects will have to be sought to optimise scheduling with limited attention. In the longer term, several development projects are conceivable, of which Apertif is foremost on our minds. Vermeulen emphasizes that the input of the user community is highly valued and important to make decisions; user commitments to future fundraising and development efforts will also be indispensable.

b. WSRT in perspective of EVN2015 vision (Van Langevelde) – see wiki

This presentation is brought forward in the agenda as Van Langevelde cannot be present this afternoon.

Van Langevelde shows why e-VLBI is exciting for astronomy. The e-VLBI policy was presented. The EVN 2015 science case is available on the web. Current highlights are

presented as well as the technology path for the correlator. VLBI input changes, calls for a hundredfold more powerful correlator.

The community is preparing to build SKA. The e-EVN is of a similar size as some (other) SKA pathfinders.

Future of WSRT in future EVN: currently the WSRT is a key element in collecting area at 18 cm and 6 cm. But has limited bandwidth to follow EVN upgrades.

With APERTIF, the EVN would lose 6 cm phased array capability. Long term future: coverage of higher frequencies.

Q: with current upgrade plans, what fraction of a primary beam could EVN map?

Van Langevelde: now limited by correlator space, this will be taken into account for new correlator, is driving the frequency modes.

c. European Pulsar Timing Array and WSRT pulsar capabilities (Hessels, Karuppusamy) – see wiki

(Ramesh).

Karuppusamy shows the WSRT-pulsar advantage. An overview is given of the current PuMa-II capabilities together with two science results. The future prospects of PuMa-II were brought forward.

Hessels presented the development and capabilities of the European Pulsar Timing Array
Conclusion: the European Pulsar Timing Array will ultimately combine the pulsar timing data from 5 telescopes (WSRT, Lovell, Nançay, Effelsberg and SRT).

Q: 350 MHz WSRT is very important. How well can you do with LOFAR? A: not very well. The Sardinia telescope will hopefully have dual frequency beam.

d. Prospects for a Focal Plane Array: Apertif (Oosterloo) – see wiki

A discussion document was distributed to the community prior to the WSRT users meeting. Oosterloo explains that Apertif is a possible upgrade of WSRT. The main aim is to significantly enlarge the field of view of the WSRT by large factor (25) by replacing single-pixel feeds by focal-plane arrays and to increase the bandwidth to 300 MHz. With Apertif, observations in other bands than L band will not be possible anymore with the full WSRT. WSRT will become a survey instrument (SKA pathfinder). The survey speed will be ~ 20 times that of WSRT: Apertif will be able to do in a few weeks, what WSRT is now doing in one year. Also single-dish modes will become interesting again. But a lot of the current use of WSRT will not be possible any more. The aim of Oosterloo's presentation is to start a discussion in the users community what to do with Apertif, how to use it etc. The various slides of his presentation, Oosterloo shows the options and the line and continuum performance with Apertif. Science-wise, the performance of Apertif for H I, continuum, magnetism, pulsars and transients is presented. Overall, Apertif will greatly improve the capabilities of the WSRT in these science areas.

Next to all that is gained, there are also losses:

- because Apertif only works in L band, current observations in other bands will not be possible anymore.
- Pulsars. WSRT timing is done at 92 cm. Maybe the Sardinia telescope can take over.
- VLBI will lose a 6-cm phased array, maybe only two dishes available for VLBI at non L band.
- Deep H I. Currently this is a niche application of WSRT. EVLA will not do really better, the current WSRT results will last until 10% SKA is realized.
- WSRT is not available for non L-band LOFAR follow up.

Open issues: there is no money yet for the correlator and backends, maybe a combination with e-VLBI and LOFAR will be possible. Other issues: how will time on WSRT+Apertif be allocated? The surveys are likely to take up a lot of the time.

Who will do surveys - key project like LOFAR? Or legacy mode (sort of free data model).

If Apertif will be installed, what has to be observed with MFFE's before Apertif?

What is future of WSRT if Apertif will not happen?

R. Vermeulen remarks that many capabilities can only be recovered once 10% SKA is available.

R. Vermeulen mentions that Alexander van der Horst regrets not to be able to attend the meeting. Van der Horst wants to express a voice towards preserving a multi-frequency capability given his GRB science. He stresses that it has been valuable to get a spectral coverage over a very broad range, given that there are only a few telescopes that can offer that broad spectral coverage with required sensitivity. Van der Horst would regret when this would not be possible any more with WSRT.

M. Garrett wonders if WSRT is competitive compared to eMERLIN and eVLA. R.

Vermeulen answers that it is relatively easy to get 10% of time on WSRT while this will probably not be the case for Van der Horst for eMERLIN and eVLA.

Q: is it feasible to maintain MFFE's on part of the array and Apertif on others? A Vermeulen: there is a cost aspect involved. MFFE's require cryogenic maintenance, also if only 1 or 2 MFFE's are used we need to have an entire maintenance system.

R. Strom mentions that for VLBI, having two WSRT dishes does not help very much.

Probably four dishes are necessary before it makes sense to have a Phased Array. T.

Oosterloo: the same is true for pulsar. What is the minimum no. of dishes for optimum science with Apertif.

This was followed by a discussion about costs. M. Garrett remarks that the science case of apertif is very good. But the situation with VLBI is worrying. A possibility could be that WSRT operates in VLBI as single dish, also in eMERLIN.

H. van Woerden asks whether it would affect JIVE if WSRT becomes one dish in VLBI.

According to Paragi and Garrett this would not affect JIVE, the most important issue for them is to build a new correlator. There is a good synergy between ASTRON and JIVE, even if WSRT is reduced and no longer is one of the main instruments in the EVN. There are also projects that demand a single dish rather than a phased array. Phased array also brings problems to VLBI. Single dish also has advantages for bright objects. R. Vermeulen remarks that many EVN science cases are for weak objects.

The consequences for the pulsar machines were briefly discussed.

4. WSRT projects: recent science highlights and ambitions for the future.

a. The very extended rotation curve of NGC 3741 (Gentile) – see wiki

Gentile is not sure whether this kind of science benefits more from the current situation with WSRT than it would with Apertif. There is a short discussion; opinions differ on this.

b. Gas and the formation of early-type galaxies: SAURON + WSRT (Cappellari) – see wiki

Cappellari: Apertif will not prevent any of this kind of science as the observations are not extremely deep. Apertif will probably drive the science.

c. Gamma-Ray Bursts (Strom) – see wiki

R. Strom gives a presentation on Gamma-Ray Bursts on behalf of A. van der Horst, R. Wijers et al.

d. WSRT Polarisation imaging (Katgert) – see wiki

Katgert mentions that the WSRT is the only system that is able to do these detailed studies. A significant part of this work is done in the 92cm band.

e. WSRT for EVN calibration, polarization, transients (Paragi) – see wiki

Paragi summarizes that the introduction of Apertif will limit the EVN capabilities in all bands except for L-band. However it could be very useful for supplying triggers to the (e-)EVN. Best would be a solution that brings new opportunities, but allows to do a variety of science with the WSRT.

f. Future Large Surveys with the WSRT (Heald) – see wiki

Heald's presentation is focusing on deep H I surveys, emphasizing that at present, the WSRT is a unique instrument to perform these surveys. With Apertif, the capabilities for targeted observations will be diminished. The 'take home message' is: do deep H I work now before Apertif is realized.

g. APERTIF en continuum surveys (Röttgering, extra presentation) – see wiki

H. Rottgering presents some key topics for combined LOFAR/APERTIF continuum surveys.

Slide: "Apertif – assume for a moment we'll go for it" (put up by Vermeulen to explore parameter space and design choices possible within the Apertif concept).

M. Brentjens argues that Faraday tomography is best done between 600 and 1400 MHz.

W. van Capellen has technical worries about the strong RFI at these frequencies: more expensive filters may be needed, and more linear LNAs before them, which however will have a higher system temperature.

G. de Bruyn argues for maintaining an 18cm band that is fully compatible with other telescopes (i.e. up to 1800 MHz, where GSM RFI starts).

J. Hessels and J. van Leeuwen also argue for going to the high part of L-band, but generally also favour access to a wide range of frequencies.

Bandwidth at least 300 MHz is the consensus, more would be better.

W. van Capellen points out that costs go up because of the beamformer and the correlator.

J. van Leeuwen asks if this could be expanded in the future, but W. van Capellen thinks this would be complicated since it happens so deeply in the hardware.

The consensus is that 10 arcsec beam spacing is adequate for all purposes.

G. de Bruyn would like to see examples worked out of science applications, and technical teams to ensure that all aspects are feasible.

R. Vermeulen says today is for open discussion/brainstorming, just to get people thinking.

R. le Poole points out that an implementation decision should in the end be based on a full technical understanding of feasibility of the approach. But of course the current WSRT is also the result of 40 years of ongoing development.

What is timeline for implementation? Looking at FPA aspects, in 3-4 years Apertif could be ready. Correlator capacity is a different issue, should be ready too on similar timescales.

R. Vermeulen stresses that the science cases must indeed support the investment.

H. Rottgering: should be in line with other ambitions of the Dutch community. Vermeulen replies that it should also be seen in the international context of instruments used by NL astronomers and conversely users interested in Apertif are spread into Europe and the world. Many at the meeting agree that covering a wide range of frequencies with WSRT may not be competitive in the future international field (GMRT, eVLA, eMERLIN, LOFAR, Sardinia), and that WSRT-Apertif as L-band survey facility would have an important place in the available list of telescopes. S. Trager points out that funding agencies may appreciate a statement/choice w.r.t. the WSRT. H. Rottgering adds that the perspective towards 10% SKA as a limit should also be given.

G. de Bruyn then expresses his view that the capabilities of EMBRACE or an extended version of it for similar kinds of science should also not be overlooked. He recognizes that this is to be discussed on the European scale, SKADS, more than WSRT. M. Garrett replies that we have to start thinking more globally, in the SKA context, after completion of LOFAR. Apertif is a well-delimited initiative on an existing instrument, on right timescale and with a good science case. It will be an important SKA science demonstrator. EMBRACE-2 will be in 5 years, EMBRACE is still pre-science demonstration technology.

5. Demonstrations of online interfaces for user project tracking and data/archive access (Holties) – see wiki

Holties gave a presentation about proposal preparation tools, tools for management of measurements (MoM) and WSRT archive disclosure.

After this presentation, R. Vermeulen thanked all present for the constructive discussions. ASTRON will continue to inform the community about Apertif, the WSRT and LOFAR. This was the last distinct WSRT users meeting since in the future there will be integrated Radio Observatory Users Meetings.

Participants WSRT Users Meeting 4 June 2008

Name	Institute
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