



Report from the event supported by RadioNet

TITLE **The Big Impact of a Big Dish: Science with the Effelsberg 100-m telescope**

DATE: *20-21.2.2018*

LOCATION: *BONN, GERMANY*

MEETING WEBPAGE: *<https://events.mpifr-bonn.mpg.de/indico/event/48/>*

HOST INSTITUTE: *MAX-PLANCK-INSTITUT FÜR RADIOASTRONOMIE*

**RADIONET
BENEFICIARY / NO:** *MPIFR / 1*

Report:

1. SCIENTIFIC SUMMARY

The workshop “The Big Impact of a Big Dish: Science with the Effelsberg 100-m telescope” was held on February 20-21, 2018 at the Max-Planck-Institut für Radioastronomie in Bonn.

Even more than 40 years after its inauguration, the 100-m telescope is still one of the two largest fully-steerable radio telescopes in the world, and — due to continuous efforts by the institute and the Max Planck Society — in an excellent shape. It is heavily used for astronomical observations and accessible by users from all over the world due to its "Open Skies" policy. Observers who fulfil the eligibility criteria can be supported by the RadioNet’s Transnational Access program.

The intention of this workshop was to bring together various user groups of the 100-m telescope with the support staff of the observatory and the technical developers. The scientific results gained by observations with the 100-m telescope should be presented and discussed, as well as ideas for future research and current technical activities.

61 participants (see section 3 and the attached list of participants for more details) followed the invitation of the Max-Planck-Institut für Radioastronomie and came to Bonn to participate in this workshop.

Their contributions (30 talks and five poster presentations) covered a large range of topics (and also a broad range of frequencies) and included talks on Galactic and Extragalactic Maser observations (detection experiments as well as monitoring of variable maser emission), survey observations of the neutral hydrogen and their impact, Radio Recombination Line studies, and the search for more complex molecules.

The role of the 100-m telescope as cornerstone in various VLBI networks was illustrated by several talks covering observations within the European VLBI Network (EVN), the Global mm-VLBI array (GMVA) and together with the RadioAstron satellite telescope. Additionally, it was emphasized that the telescope is also important for supporting observations in total power and polarization; such measurements support the calibration of the VLBI data and allow to study the long-term evolution of these objects (see also below).

Pulsar observations cover nowadays a large part of the observing time of the 100-m telescope. That was reflected in three invited talks, which reported about Effelsberg’s participation in pulsar timing arrays like EPTA – the European Pulsar Timing Array – and LEAP – the Large European Array for Pulsars and the various scientific results emerging from these observations. Current research done on the phenomenon of Fast Radio Bursts with the 100-m telescope, and pulsar observations with the LOFAR station at Effelsberg (sometime simultaneously with observations of the 100-m telescope) were presented as well.

The Effelsberg telescope has a long history of doing continuum observations; that was also reflected in the various talks given in the workshop. Among the topics discussed here were historic and recent observations of the Andromeda Galaxy (M31), total intensity and polarization studies of nearby galaxies, studies of Supernova Remnants, measurements of high polarization degrees in galaxy cluster mergers, star-forming galaxies, and multi-frequency observations of Active Galactic Nuclei and X-ray binaries. Recent software developments like the *nod3*-package for the reduction of single-dish maps were discussed as well.

Finally, one session of the workshop was dedicated to current technical activities. That does not only cover current receiver and backend developments, but also recent work on calibration issues for simultaneous broad-band spectroscopic observations and for linear and circular polarimetry. In addition, recent “Out-of-focus” holography observations for the determination of the surface accuracy of the telescope were presented.

Summarizing, within the workshop it became clear that the 100-m telescope was and is successfully involved in a broad range of research which is done over the full frequency range covered by the various receivers available (300 MHz to 90 GHz). It was stressed out by the participants of the workshop that the telescope is of high importance for their future work.

The discussions led to a number of ideas about potential future research and desirable technical developments. A questionnaire, which was distributed among the participants beforehand, provided the support staff of the observatory with useful feedback concerning the operations of the telescope.

The presentations, the scientific conversations and also the user’s feedback will be of high impact for the planning of future activities by the staff at the Effelsberg observatory. Furthermore, the exchange of new scientific ideas and potential technological development (a noteworthy topic is here the development of new GPU-based flexible backends) is likely to have impact on other telescopes as well – there exist a lively exchange of information between the staff of the various European Radio Telescopes. Therefore, it will be of high value not only for the users of the 100-m telescope, but also for the whole RadioNet community.

The website of the workshop can be found at <https://events.mpifr-bonn.mpg.de/indico/event/48/>; the majority of the contributions are available there.

2. AGENDA OF THE EVENT

The workshop program was split into several sessions, which covered the main observing modes (Continuum, Spectroscopy, Pulsars and Transients and VLBI) of the 100-m telescope. In addition, on poster session was held, as well as one session about technical developments.

A good amount of time was reserved for discussions; for that reason, also lunch and dinner was served in the lobby of the institute, close to the auditorium.

The detailed agenda is attached to this report.

3. PARTICIPANTS

In total, 61 persons participated in the workshop. Naturally, the majority of participants came from institutes within Germany, namely 47 persons. The remaining 14 participants came from the Netherlands, Italy, Poland, Hungary, Canada, South Korea and the P.R. of China. 16 participants were women. About half of the participants were young researchers (students and post-docs).

There were nine invited talks; three of them were given by women. Three of the invited speakers received travel support via RadioNet.

The detailed list of participants is attached to this report.



Picture take by Aris Noutsos, MPIfR

4. RADIONET FINANCIAL CONTRIBUTION

The financial support from RadioNet (2500€) was used for the travel support of some participants (50% of the full amount; see the list of supported individuals below). Further money was used to organize the lunch on both days of the workshop, which was served in the vicinity of the auditorium. This way, not too much time was lost for moving to a restaurant and discussions between the participants were continuing over lunch. Finally, for interested people, a tour to the Effelsberg Radio Telescope was offered subsequent to the workshop. The bus for travelling to Effelsberg was also paid by the RadioNet contribution.

In summary, about 1300€ have been assigned to the travel support for some participants. 1190€ have been used for lunch, workshop dinner (refreshment) and the bus to Effelsberg.

The Big Impact of a Big Dish: Science with the Effelsberg 100-m telescope

Workshop at the Max-Planck-Institut für Radioastronomie, Bonn

Tuesday, 20.2.2018, 11:00 - Wednesday, 21.2.2018, 17:30

Schedule:

Tuesday, Feb 20

10:00 - 11:00 Registration, Coffee, Discussion
11:00 - 11:10 Welcome (M. Kramer, M. Kadler)

Session „Spectroscopy with the 100-m Telescope“, Chair: Andrei Lobanov

11:10 - 11:40 Andrea Tarchi: Extragalactic maser science with large radio telescopes ([invited](#))
11:40 - 11:55 L. Viktor Toth: Ammonia surveys of the Galactic cold interstellar medium
11:55 - 12:10 Silvia Leurini: The ATLASGAL catalogue of class I methanol masers
12:10 - 12:25 Busaba Kramer: Variability of Water Masers in W49N: Results from the Effelsberg Long-term monitoring programme (2014-2017)
12:25 - 12:40 Liu Xuchuan: Investigation of molecular outflow chemistry with carbon chain molecules

12:40 - 14:00 Lunch Break (MPIfR Entrance Hall)

14:00 - 14:15 Pedro Salas: Radio recombination lines: the synergy between a big dish and dipoles
14:15 - 14:45 Jürgen Kerp: “How to maintain the star formation of the Milky Way Galaxy?” - On the value of single dish HI full-sky surveys ([invited](#))
14:45 - 15:15 Jörn Wilms: X-rays and the Effelsberg telescope ([invited](#))

15:15 - 15:45 Coffee Break

Session „Effelsberg in VLBI networks“, Chair: Matthias Kadler

15:45 - 16:15 Eduardo Ros: Very long baseline interferometry with Effelsberg ([invited](#))
16:15 - 16:30 Sascha Trippe: The Inner Jet Structure of 3C84 from GMVA Mapping
16:30 - 16:45 Dhanya G. Nair: A Global mm-VLBI Array Survey of Compact Extragalactic Radio Sources at 86 GHz
16:45 - 17:15 Gabriele Bruni: From single-dish to space-VLBI: the pivotal role of Effelsberg in AGN studies ([invited](#))

17:15 - 18:00 Scientific discussion

18:00 - 19:00 Workshop dinner (buffet, MPIfR entrance hall)

19:00 - 20:00 Poster session, Scientific discussion

20:00 - 20:45 Movie presentation by L. Viktor Toth: *The Radio Universe*



This workshop has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 730562 [RadioNet].



Wednesday, Feb 21

Session “Technical activities / Future developments”, Chair: Alex Kraus

08:30 - 09:00 Coffee, Discussion

- 09:00 - 09:30 Gundolf Wieching New Receivers, Phased-Array-Feed, Spectropolarimeter: Technical developments for the 100-m telescope ([invited](#))
- 09:30 - 09:45 Benjamin Winkel: Broadband calibration for single-dish telescopes
- 09:45 - 10:00 Ioannis Myserlis: High precision polarimetry and sources with stable linear and circular polarization in the GHz regime
- 10:00 - 10:15 Tomas Cassanelli: Out-of-focus holography at the Effelsberg telescope

10:15 - 10:45 Coffee Break, Conference Picture

Session „Pulsar Observations at Effelsberg“, Chair: Olaf Wucknitz

- 10:45 - 11:15 David Champion: Pulsar Projects at the Effelsberg Telescope ([invited](#))
- 11:15 - 11:30 James McKee: Pulsar Science with the Large European Array for Pulsars
- 11:30 - 12:00 Laura Spitler: Fast Radio Burst Science with Effelsberg ([invited](#))
- 12:00 - 12:30 Caterina Tiburzi: Pulsar observations with German LOFAR stations ([invited](#))

12:30 - 13:30 Lunch Break (MPIfR Entrance Hall)

Session „Continuum observations with the 100-m Telescope“, Chair: Thomas Krichbaum

- 13:30 - 14:00 Marita Krause: Extragalactic Radio Continuum Observations with the Effelsberg 100-m telescope: Total Intensity and Linear Polarization ([invited](#))
- 14:00 - 14:15 Maja Kierdorf: Polarized emission of cluster merger shock fronts
- 14:15 - 14:30 Roland Kothes: Radio Continuum Studies of Supernova Remnants and Pulsar Wind Nebulae with the 100-m telescope
- 14:30 - 14:45 Blazej Nikiel-Wroczyński: Colliding Worlds Science with Effelsberg
- 14:45 - 15:00 Marisa Brienza: Single-dish observations for the study of the AGN duty cycle

15:00 - 15:30 Coffee Break

- 15:30 - 15:45 Emmanouil Angelakis: F-Gamma: Multi-frequency radio monitoring of Fermi blazars
- 15:45 - 16:00 Ulrich Klein: Radio synchrotron spectra of star-forming galaxies
- 16:00 - 16:15 Frederic Jaron: Detection of radio quasi-periodic oscillations in the gamma-ray-load X-ray binary LSI+61°303
- 16:15 - 16:30 Elly Berkhuisen, Rainer Beck: Forty years of M31 observations with the Effelsberg Telescope

16:30 - 16:50 Workshop Synopsis (A. Kraus)

16:50 - 17:00 Concluding remarks (M. Kramer)

Poster:

- Pawel Wolak: Discovery of Water Maser Superbursts with Effelsberg and Torun Radio Telescopes
- Charitharth Vyas: Fueling the Milky Way Galaxy: on the formation of high altitude molecular gas
- Michal Durjasz: Variability of 22 GHz water and 6.7 GHz methanol masers in G111.256-0.770
- Mateusz Olech: Multifrequency monitoring of periodic maser sources
- Diego Tuccillo: Multi-band studies on High-redshift BAL quasars



This workshop has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 730562 [RadioNet].

