Effelsberg Newsletter

January 2012

Call for Proposals

Deadline for Effelsberg Proposals is February 8, 2012, 13.00 UT.

Page 2

Greetings from the Director

It is a pleasure to wish you a very happy new year 2012! It has been a very busy last year, with lots of changes and new instrumentation described in the past issues of this newsletter. Even more interesting changes lie ahead of us, and as usual, we will keep you posted about all the progress being made. We will also continue to give you a glimpse of the science highlights achieved with the 100-m telescope, and it is also a pleasure to introduce you to further members of staff and to report on our outreach activities.

The output and the performance of the telescope is going strong, underlining its superb capabilities even 40 years after its inauguration. This is not surprising, given that the telescope and its instruments are constantly upgraded. Still, we are only half-way through our activities celebrating these 40 years. Further highlights are still to follow - stay tuned! We will give you further details in the upcoming issues of this newsletter, which now has a new look. We hope that you like it.

Michael Kramer

Content

Happy New Year 2012 !

Call for Proposals:
Deadline February 8, 2012, 13.00 UT

Observing proposals are invited for the Effelsberg 100-meter Radio Telescope of the Max Planck Institute for Radio Astronomy (MPIfR).

The Effelsberg telescope is one of the World's largest fully steerable instruments. This extreme-precision antenna is used exclusively for research in radio astronomy, both as a stand-alone instrument as well as for Very Long Baseline Interferometry (VLBI) experiments.

Access to the telescope is open to all qualified astronomers. Use of the instrument by scientists from outside the MPIfR is strongly encouraged. The institute can provide support and advice on project preparation, observation, and data analysis.

The directors of the institute make observing time available to applicants based on the recommendations of the Program Committee for Effelsberg (PKE), which judges the scientific merit (and technical feasibility) of the observing requests.

Information about the telescope, its receivers and backends and the Program Committee can be found at

http://www.mpifr-bonn.mpg.de/english/radiotelescope/index.html

Observing modes

Possible observing modes include spectral line, continuum, pulsar, and VLBI. Available backends are a FFT spectrometer (with 32768 channels), a digital continuum backend, a pulsar system (coherent and incoherent dedispersion), and two VLBI terminals (MK4/5 and VLBA/RDBE type).

Receiving systems cover the frequency range from 0.3 to 96 GHz. The actual availability of the receivers depends on technical circumstances and proposal pressure. For a description of the receivers see the web pages.

How to submit

Applicants should use the new NorthStar proposal tool for preparation and submission of their observing requests. North Star is reachable at

https://proposal.mpifr-bonn.mpg.de

For VLBI proposals special rules apply. For proposals which request Effelsberg as part of the European VLBI Network (EVN) see:

http://www.evlbi.org/proposals/prop.html

Information on proposals for the Global mm-VLBI network can be found at

http://www.mpifr-bonn.mpg.de/div/vlbi/globalmm/index.html

Other proposals which ask for Effelsberg plus (an)other antenna(s) should be submitted twice, one to the MPIfR and a second to the institute(s) operating the other telescope(s) (eg. to NRAO for the VLBA).

After February, the next deadline will be on June 6, 2012, 13.00 UT.

by Alex Kraus

RadioNet Transnational Access Programme

RadioNet (see http://www.radionet-eu.org) includes a coherent set of Transnational Access programmes aimed at significantly improving the access of European astronomers to the major radio astronomical infrastructures that exist in, or are owned and run by, European organizations. Observing time at Effelsberg is available to astronomers from EU Member States (except Germany) and Associated States that meet certain criteria of eligibility. For more information:

http://www.radionet-eu.org/transnational-access.html

Time on these facilities is awarded following standard selection procedures for each TNA site, mainly based on scientific merits and feasibility. New users, young researchers and users from countries with no similar research infrastructure, are specially encouraged to apply. User groups who are awarded observing time under this contract, following the selection procedures and meeting the criteria of eligibility, will gain free access to the awarded facility, including infrastructure and logistical support, scientific and technical support usually provided to internal users and travel and subsistence grants for one of the members of the research team.

by Alex Kraus

Key Science Projects for the 100-m telescope

The MPIfR invites scientists to submit Key Science Proposals (KSPs) for the 100-m telescope at Effelsberg. This kind of proposals should obey the following rules:

1. The proposed project should address high-quality and high-impact science that requires significant observing efforts.

2. The observations should utilize the core strength of the 100-m telescope.

3. KSPs should be large projects that cannot be realized (or only with difficulties) with standard observing proposals, i.e. projects requiring between 150 and 500 hours of observing time per year. (The exact amount of time available for KSPs may be limited depending on proposal pressure and requested observing frequency).

4. The project should also have a strong potential for outreach.

Key Science Projects can only be submitted to the February proposal deadline for the 100-m telescope.

They should be submitted using the North Star Tool as normal proposals accompanied by a more extensive justification (up to 10 pages) explaining the

- Scientific background
- Observing procedure
- Data analysis plan and data release policy
- Publication strategy

The proposals will be judged by the Effelsberg PC (PKE) and by the directors of the MPIfR who might consult external referees. The MPIfR expects progress reports periodically and a quick publication of the data (preferably online).

In case absentee-observations are desired, clear instructions for the execution of the project (observing strategy, acceptable weather conditions, etc.) have to be given.

by Alex Kraus

Science Highlights

First results of the Effelsberg-Bonn HI Survey

by Jürgen Kerp
& Benjamin Winkel

Since winter 2008/2009 the 100-m telescope is used to perform an HI 21-cm survey of the complete northern hemisphere - the Effelsberg-Bonn HI Survey (EBHIS). Both, the Milky Way and the extragalactic sky are observed simultaneously using state-of-the-art FPGA-based backends developed at the MPIfR (see also Effelsberg Newsletter September 2010).

While the first coverage is close to completion, the EBHIS team used the early data in combination with its southern-hemisphere complement - the Galactic All-Sky Survey, made with the Parkes telescope (operated by ATNF/CSIRO) - to demonstrate the scientific potential of the new measurements. A direct comparison of the scientific data between EBHIS and the famous Leiden/Argentine/Bonn (LAB) survey can be seen in Fig. 1.

A large fraction of the neutral gas in the Milky Way halo is organized in the form of clouds with radial velocities inconsistent with simple galactic rotation models. These so-called intermediate- and high-velocity clouds (IVCs, HVCs) are partly isolated, but most of them form large-scale complexes. They are considered to play an important role in the complex interplay of the Milky Way disk and its halo.

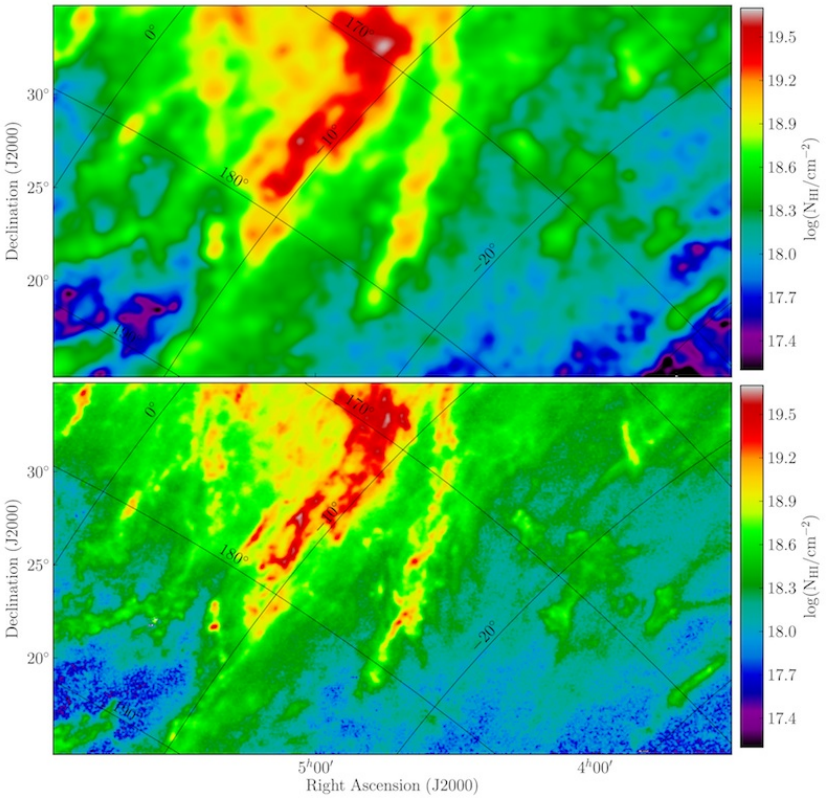


Figure 1: Comparison of the column density distribution of a large portion of the sky between the LAB survey from 2005 (top) with the new EBHIS (bottom). Both data sets show consistent results, but new Effelsberg 100-m telescope yields a much better angular resolution. The plot shows a channel map at v_{lsr} = - 40 kms^{-1}, mostly containing intermediate-velocity gas.

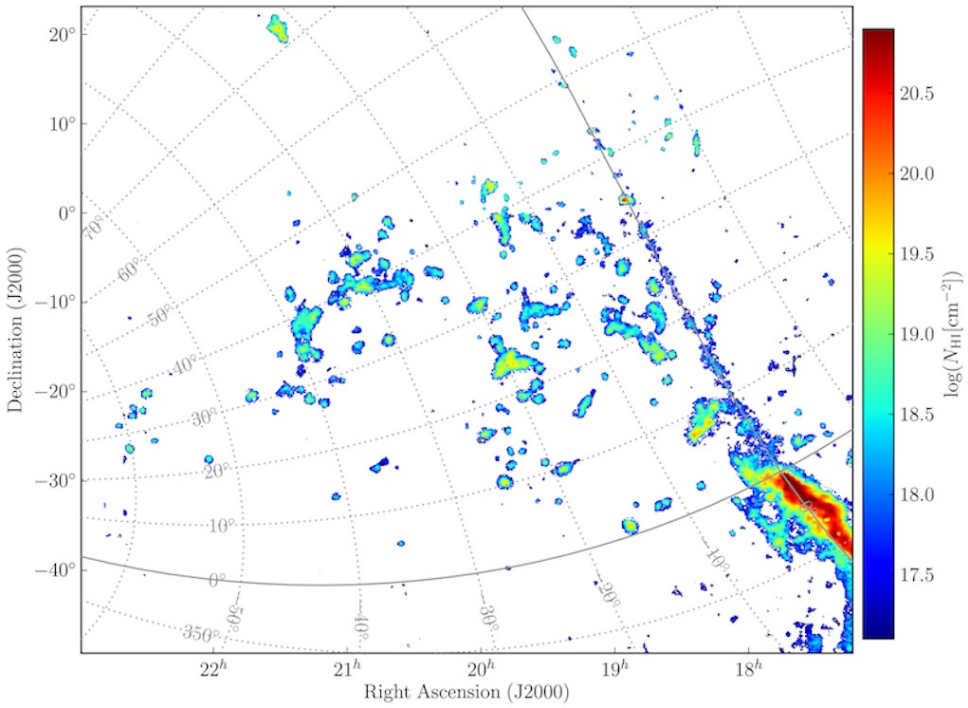


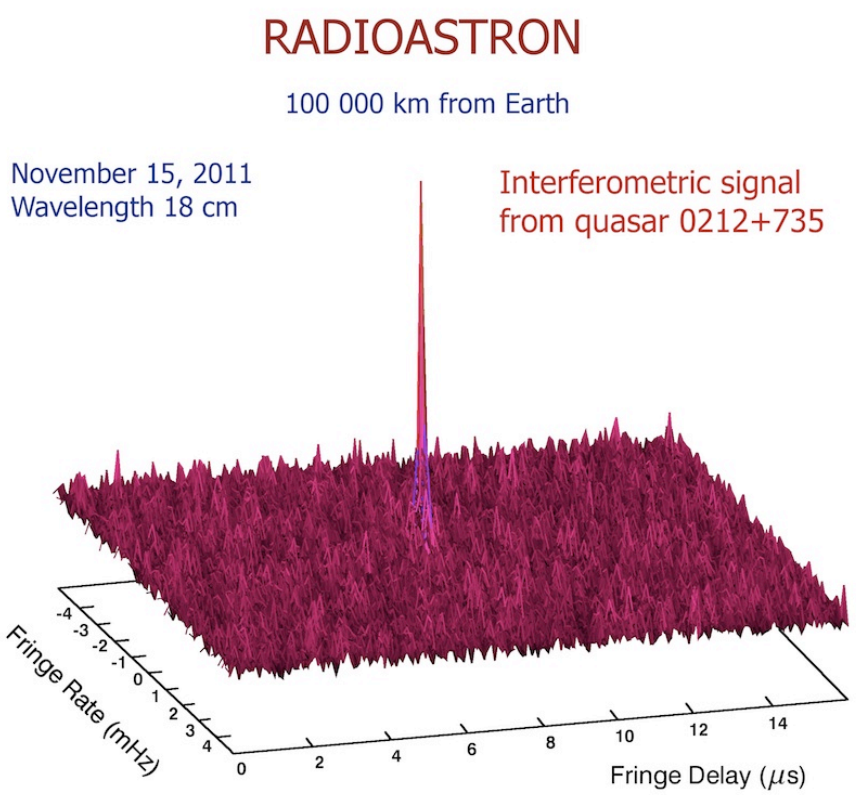
Figure 2: High-velocity cloud complex ``Galactic center negative" (GCN) as seen by EBHIS and GASS. The much better angular resolution and full-sampling of the new surveys allows to resolve GCN into hundreds of small clouds, the statistical analysis of which led to new results regarding the nature of GCN (Figure from Winkel et al. 2011, A&A, 533, 105).

Focusing at the HVC complex ``Galactic center negative" (GCN) with EBHIS and GASS, reveals the advantage of high angular resolution and full-sampling of the new surveys. In contrast to previous studies, it was now feasible to resolve GCN into hundreds of tiny little clouds, consisting mostly of warm HI gas (see Fig. 2). This finding is really very exceptional. Usually a significant fraction of cold gas, being embedded within warmer envelopes, is observed. Furthermore, no diffuse extended emission could be detected between the individual cloud cores. Another interesting observational fact is the huge velocity scatter even within small patches of the sky of less than few square degrees. The publication of Winkel et al. 2011, A&A, 533, 105 was highlighted by Astronomy & Astrophysics and found its way onto the cover page (see Fig. 2). Winkel et al. conclude that GCN might be a prime example for ongoing warm gas accretion, where a stream of neutral clouds enters the Milky Way halo and is subject to ram-pressure interaction dissolving the clouds. The resulting ionized gas would eventually be accreted onto the Milky Way disk.

Effelsberg delivers first fringes with Radioastron: Space VLBI sets a new world-record in radio interferometry.

by Andrei Lobanov
& J. Anton Zensus

Space VLBI research has begun already in the 1980-es with early experiments using a communication satellite TDRSS and entered its maturity with the VSOP mission operated in 1997-2007. On the 18th July 2011, a 10-meter Spektr-R antenna of the Russian Radioastron project (led by the Astro Space Center of the P.N. Lebedev Physical Institute in Moscow, Russia) was launched, signalling the next step in space VLBI developments. Radioastron is operating at wavelengths of 1.3, 6, 18, and 92 centimetres, promising to reach the highest resolution achieved in astronomical observations. The orbit of Spektr-R is extremely elongated, with the apogee reaching up to 360,000 kilometres and enabling a resolution of about 10 microarcsecond at a wavelength of 1.3 centimetres.



The initial in-orbit checkout period of the Spektr-R antenna is presently nearing its completion, and Radioastron is engaging now in the first interferometric tests performed in combination with ground-based antennas. The Effelsberg telescope is taking the most active role in these tests, providing the much needed sensitivity on extremely long baselines to the space-borne antenna of Radioastron.

On the 15th November and the 1st December 2011, the Effelsberg 100-meter antenna, together with three Russian and one Ukrainian radio telescopes, took part in the first interferometric observations with Spektr-R. The observations were made at wavelengths of 6 (Dec. 1) and 18 (Nov. 15) centimetres, targeting bright and compact radio sources 0212+735 (at 18 cm) and BL Lac (at 6 cm). Interferometric

fringes have been successfully detected for both radio sources between Spektr-R and the ground antennas when the satellite was separated from the Earth by more than 100,000 kilometres. This detection sets a new world record for the size of a radio interferometer and opens a new era in interferometric studies of cosmic radio emission.

The fringe searches are now continuing at the other two operational wavelengths of Radioastron. Following their completion, anticipated for the first quarter of 2012, early science observations would begin. The early science program is planned to last for about six months and it would be followed up by key science programs and general observing time observations. Observations with Radioastron promise to help answering several of the most puzzling problems in astrophysics, including the origin of the most energetic particles in the Universe and the works of the cosmic black holes.

Who is Who in Effelsberg ?

Peter Vogt

After 10 years at the radio observatory in Effelsberg, it is now time for me to introduce myself to the general public. Where do I come from and what am I doing here?

Let's start at the beginning. I was born between railway, steel and coal in the beautiful area of the Ruhr, which was then very grey. After growing up big and strong, the big wide world called. With good qualifications as an electrical technician, the doors of the world were opened for me to gain a variety of experience. Planning boilers for the chemical industry in Wiesbaden was as interesting as the later additional tasks: writing offers and auditing with a small company in Taunus. Planning and certifying of the produced switchboards was one thing, dealing with fittings, armatures and piping the other. In Stuttgart, I calculated the costs for waterworks, sewage plants and tunnel lights. Then came the time of the PC (386 - who knows what that is anymore?), and I went back to school. Programming and CAD experiences opened new doors and I ran a department planning CAD electronics within the shortest time.

Then I wanted to conquer the rest of the world. Balancing on the equator, I wasn't sure whether to head North or South. I decided to start deep sea research at the Alfred Wegner Institute. After two years, I went first to the polar bears in the Arctic and then to the penguins in the Antarctic. And what now? Building, testing and commissioning weather radar stations made me look upwards. It should not be too surprising that the universe was next in my sights. As is it pretty big, I have not yet finished with it. In order not to loose contact with the ground, I have started driving off-road with quad bikes and four wheel drive cars in my free time. Here in Effelsberg, you can find me in the control room as an operator.

Public Outreach

Extension of the Effelsberg Milky Way Walk

by Norbert Junkes

The Effelsberg Milky Way Walk was recently extended to a total distance of 250 km. It is one of the three topical astronomy walks near the 100-m radio telescope which cover distances in the Universe on increasing scales – from our cosmic neighbourhood, the Solar System, to galaxies and quasars several billion light years away.

The original Milky Way Walk has a scale of 1 : 10^{17}, corresponding to 10,000 light years per kilometre. Stations of that walk comprise a wealth of astronomical sources ranging from star forming regions to supernova remnants, the corpses of giant stellar explosions. They also include a number of well-known stars in the solar neighbourhood, like Vega, Sirius or Betelgeuse. The walk covers a total distance of 4 kilometres or 40,000 light years within our Milky Way, starting with IC 410 in the outer zones towards the Galactic anticentre. From there the walk reaches the sun after 1.5 km or 15,000 light years and continues to the central area of the Milky Way. Another 2.5 km or 25,000 light years lead hikers to the final plate, labelled "Centre of the Milky Way" which is situated at a viewing spot less than 100 meters away from the Effelsberg radio telescope.

Our third astronomy walk, the Galaxy Walk, starts at the other side of the radio telescope. Scaled 1 : 5 x 10^{22}, a kilometre corresponds to 5 billion light years. First station of the Galaxy Walk is our Milky Way and, only 50 cm away, its great neighbour, the Andromeda galaxy M31 as second station. These two galaxies provide an opportunity to connect both walks. M31 has a distance of

approximately 2.5 million light years. On the scale of the Milky Way Walk this corresponds to a distance of 250 km. It is a really nice coincidence that our sister institute (Max-Planck-Institut für Astronomie) at the "Königstuhl" near Heidelberg is almost exactly 250 km away from Effelsberg. The newly-built "Haus der Astronomie" (HdA) for Astronomy Education and Outreach at Königstuhl (Fig. 1) provides an ideal site to host the final station of our Milky Way Walk.

Plate 19 of the Milky Way Walk is labelled "Andromeda-Galaxie M31". It was presented to Markus Pössel, the manager of the HdA during the annual meeting of the German Astronomical Society in Heidelberg in September 2011 (Fig. 2). The inauguration of the HdA took place on December 16, 2011, with Michael Kramer, director at MPIfR, presenting a lecture on the cosmos as a laboratory for extreme physics. The HdA was founded by the Klaus Tschira Foundation and the Max Planck Society; it hosts the editorial office of the astronomy magazine "Sterne und

Weltraum" and also the non-profit outreach organization "Astronomieschule e.V."

The Königstuhl site has provided an excellent opportunity to link both our Milky Way and Galaxy walks at Effelsberg. What remains is to connect the Milky Way Walk to the Planetary Walk which leads from the park site to the visitors' pavilion at the Effelsberg Radio Observatory. The next neighbours to the Sun on the Milky Way Walk are Toliman (Alpha Centauri) 43 cm or 4.3 light years to the left and Sirius 90 cm or 9 light years to the right. On the scale of the Planetary Walk ($1 : 7.7 \times 10^9$) this corresponds to 5600 km (Toliman) and 11700 km (Sirius), the latter is almost exactly the linear distance between Effelsberg and ESO/La Silla. We are working on it.

Web Links:

Astronomical Walks near the Effelsberg 100-m radio telescope:

http://www.mpifr-bonn.mpg.de/public/walks_e.html

Haus der Astronomie:

http://www.haus-der-astronomie.de/en/

Fig. 1: *"Haus der Astronomie" (House of Astronomy) at the MPIA campus (Königstuhl/Heidelberg). The official opening took place on December 16, 2011. Photo: Doris Anders (MPIA).*

Fig. 2: *Presentation of Plate 19 of the Milky Way Walk ("Andromeda Galaxy") to Markus Pössel (right) from the "House of Astronomy" during the annual meeting of the "Astronomische Gesellschaft" (September 2011 in Heidelberg). Photo: Daniel Fischer.*

Contact the Editor: Busaba Hutawarakorn Kramer
Max-Planck-Institut für Radioastronomie, Auf dem Hügel 69, 53121-Bonn, Germany
Email: bkramer@mpifr-bonn.mpg.de
Website: http://www.mpifr-bonn.mpg.de