Effelsberg Newsletter Volume 4 ◆ Issue 2 ◆ May 2013

Effelsberg Newsletter

May 2013

Technology News:

The first 64k-channel spectrometer at Effelsberg has its first light.

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Call for Proposals:

Deadline June 5, 2013, 15.00 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/effelsberg/for_astronomers

*** Observers are especially encouraged to visit the wiki page! ***

Content

Icon Images: Norbert Tacken

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. NorthStar is reachable at

https://northstar.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/proposals.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) (e.g. to NRAO for the VLBA).

After June, the next deadline will be on October 9, 2013, 15.00 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

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

Technology News

First light of a 64k-channel spectrometer at the 100-m Telescope

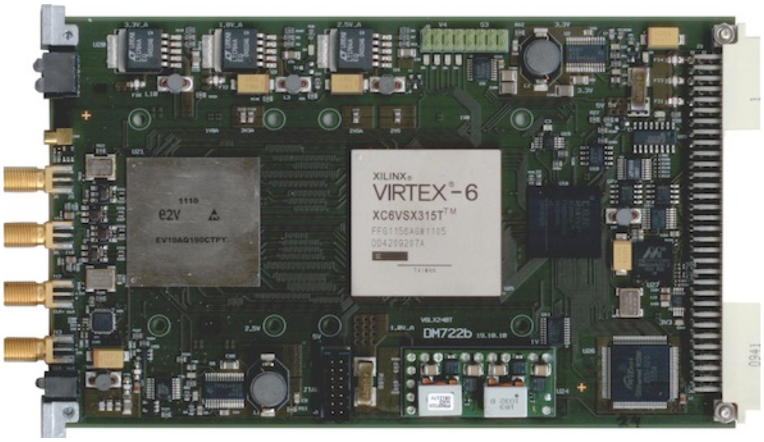
S. Hochgürtel, B. Klein, B. Winkel and A. Kraus

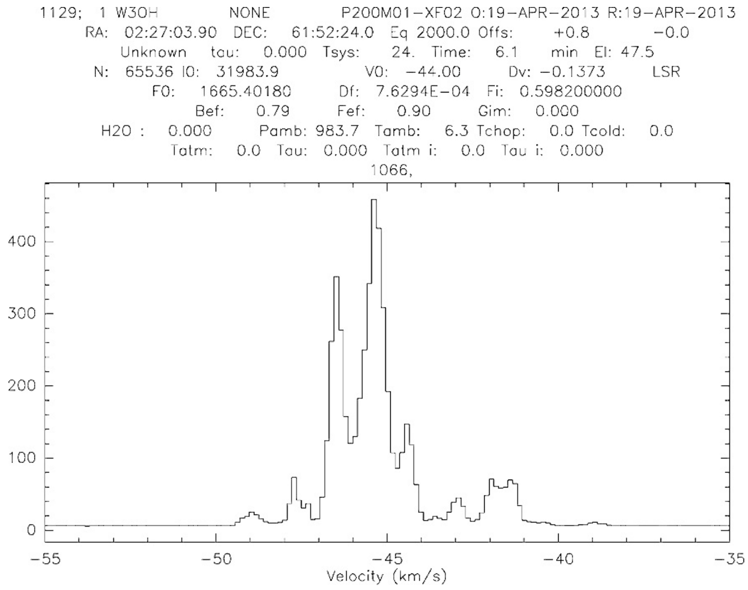
Recently, in April 2013, we successfully tested a new digital FFT spectrometer with 65536 (64k) spectral channels at the 100-m telescope. This new backend is the latest version of our spectroscopy "workhorse", the XFFTS backend (utilizing 32k; see Klein et al., A&A 542, L3, 2012). It comes along with a brand new 50 MHz core allowing for the highest spectral resolution ever since at Effelsberg of 763 Hz, enabling accurate studies of the Zeeman effect but also allowing to "zoom into" the narrowest lines in decimeter wavelength regime.

Of course the new spectrometer also retains the 100, 500 and 2000 MHz bandwidth cores. Especially, for the latter the increased spectral resolution means a huge advantage, allowing largest-bandwidth observations while not loosing too much spectral resolution.

But even for observations not necessarily demanding for such extreme numbers of channels, it can still be beneficial to store full-resolution data in the first place. An example would be radio frequency interference mitigation: there one often encounters narrow-band RFI spikes usually not resolved by our backends. Higher resolution not only means increased interference-to-noise ratios – making detection easier – but also the fraction of polluted data in the spectrum gets smaller.

We expect the new 64k FFTS to be available for regular observations in fall this year.





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      N:  65536 I0:   31983.9            V0:   -44.00       Dv: -0.1373      LSR
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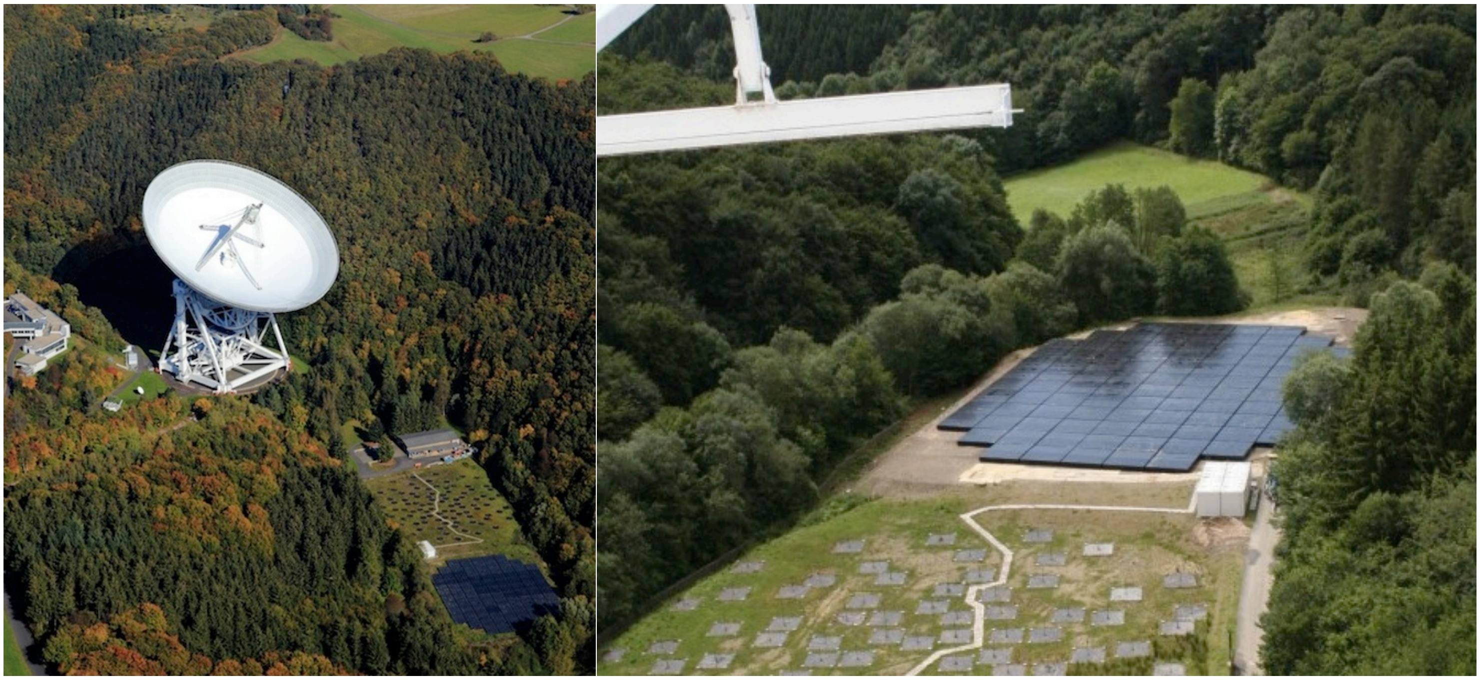
Science Highlights

Pulsar Observations with the Effelsberg LOFAR Station

Joris Verbiest



LOFAR (the LOw Frequency ARray) is an interferometric radio telescope that operates in the frequency range between 10 and 240 MHz as a pathfinder to the Square Kilometre Array. Since the opening of the Effelsberg LOFAR station (DE601 or the first LOFAR station outside of the Netherlands), LOFAR is also an international telescope. Meanwhile, seven more international stations have been built and the ninth international station should start construction near Hamburg later this year. These international stations are useful for high-resolution interferometric observations, but many other projects only require short spacings between stations, leaving the international LOFAR stations unused. Over the last several months, we have commenced a census of the pulsar sky with the Effelsberg LOFAR station, providing the first solid scientific indications of what types of (pulsar) science can be done with these "stand-alone" stations when they are not being used by the International LOFAR Telescope (ILT).

Station Stability Monitoring

The first pulsar experiment that was undertaken with the Effelsberg LOFAR station, is really mostly a system check and commissioning effort. In order to evaluate the station sensitivity across the sky (and thereby verify the beam shape or correct phasing of the various station antennas), the very bright circumpolar pulsar B0329+54 was tracked with a day-long sequence of hourly observations lasting a few minutes each. Initially these observations demonstrated the lack of correct station calibration -- where the station's sensitivity changed dramatically (and often unpredictably) depending on the elevation and hour angle pointed at, but because the pulsar was so bright (and the station beam relatively large at these frequencies), typically a detection was still made, albeit at variable signal-to-noise ratios. These observations were started in the spring of 2011 and have been ongoing ever since.

In addition to providing a measure of raw station sensitivity and the beam shape, these pulsar observations could of course be timed and thereby gave a measure of the timing stability of the station -- which was the first test of LOFAR's useability for pulsar timing, since even the LOFAR core in the Netherlands (where most of the technical and scientific commissioning has been focussed on), does not have timing data going back this far in time. As can be seen in Figure 1, this test was successful, proving the absolute stability of LOFAR's infrastructure well below the millisecond level, even in the face of all the trouble and technical failures that the Effelsberg station has been plagued with over the years.

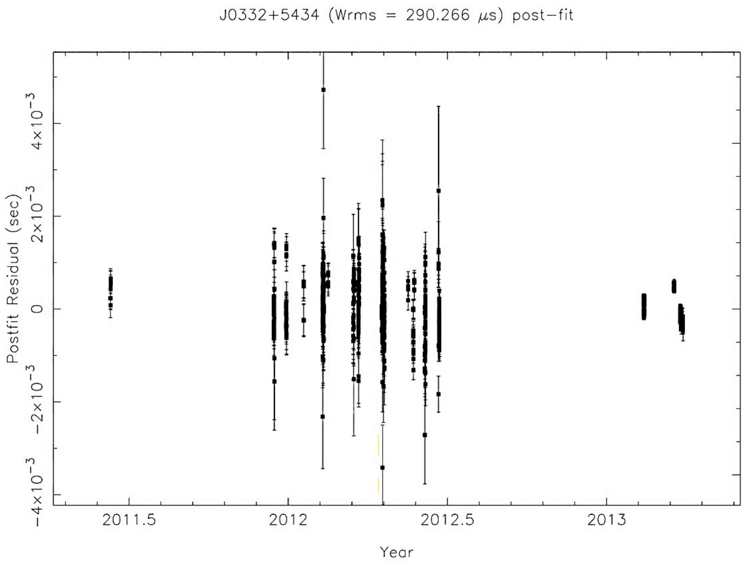


Fig. 1 Timing residuals derived from commissioning observations of PSR B0329+54. This data set has the longest uninterrupted timing baseline of any LOFAR pulsar timing data set. It was the first demonstration of timing potential for LOFAR as a whole; and for single international stations in particular. The same data are now being used to investigate the single pulse variability of this pulsar and whether there is any correlation between the pulsar's timing behaviour and its pulse shapes. Courtesy: Kuniyoshi (MPIfR)

Sensitivity to (Millisecond) Pulsars

Since autumn last year, the Effelsberg LOFAR station seems to have overcome its long slew of teething problems and has (finally) reached full sensitivity, in large part due to the relentless efforts of the Effelsberg LOFAR team. This meant that at the time the ILT commenced its first "cycle" of scientific observations, the Effelsberg LOFAR station also began its work as a fully functional telescope. Since then we have started a large campaign to evaluate the station's sensitivity and the observability of pulsars at these low frequencies. While pulsar astronomy has its roots at frequencies near the FM band (the first pulsar was discovered at 81.5 MHz observing frequency), pulsar astronomy quickly moved to shorter wavelengths and consequently rather little is known about pulsar emission at LOFAR frequencies.

Before the full commissioning of LOFAR, it was feared that the RFI environment in North-Western Europe along with strongly enhanced scattering of pulsar radiation off density gradients in the interstellar space, would conspire against low-frequency pulsar astronomy by making the pulses of most pulsars entirely invisible. Indications of turnovers in pulsar spectra at frequencies close to the FM band, further worsened the prospects of LOFAR for pulsar astronomy. All of these fears are now being laid to rest, both with the highly sensitive core in the Netherlands; and by our own recent observations with the Effelsberg station, which all show that roughly two thirds of all pulsars of interest, can be easily detected. The detectability of such a large fraction of pulsars in fact turns these earlier worries into great opportunities, because "what doesn't kill us, makes us stronger". We now have an unprecedented chance to make highly detailed investigations of interstellar inhomogeneities and their temporal variations; and the potential presence of sharp drops in the brightness of pulsars at the lowest frequencies, can also finally be investigated in much detail.

Possibly the most important application of our sensitivity to pulsars, however, may come in the form of a combined analysis of the higher-frequency observations from the 100-m telescope and those from the LOFAR field.

LOFAR's Applicability to High-Precision Timing

While pulsars in themselves are enigmatic objects of study, they can also be used as (poorly understood but quite functional) tools to study a variety of other aspects of the Universe. In particular high-precision measurements of when pulses from fast-spinning pulsars arrive at the Earth, have recently led to a series of innovative experiments; with the best yet to come. One prime strength of pulsar timing, is that the sensitivity to many weak signals increases dramatically over time, as the unmitigated effect on the pulse arrival times, accumulates in time; an example of this is the energy loss due to gravitational-wave emission in binary neutron star systems, the detection of which left Joe Taylor and Andrew Hulse with the Nobel prize in 1993. A second class of signals doesn't necessarily accumulate in time, but has an inherently low-frequency (or "red") spectrum. The most exciting example of such a signal is the background of gravitational waves, which is predicted to arise from the mergers of supermassive binary black holes at the centers of galaxies and such mergers are bound to happen relatively regularly in a universe that is built through hierarchical galaxy formation.

The main problem with detecting such faint, low-frequency signals, is that they are not unique: whether one is looking for a gravitational-wave background or for orbital decay, other low-frequency signals will corrupt or simply obstruct the measurement. In present-day timing of millisecond pulsars, the clearest red signal in the data, is that of the time-varying interstellar medium. As perturbations in the ionised component of the interstellar medium cross the various lines of sight to our pulsars, the integrated electron density changes and thereby the dispersive delay that the pulses undergo on their way to Earth, changes as well. Because of the turbulent character of the ionised interstellar medium, these changes in dispersive delays have a primarily red spectrum -- meaning any long-term pulsar timing campaign will need to correct for said dispersive delays -- at high precision!

Until now, those corrections have made use of the frequency-dependence of interstellar dispersion by comparing observations at intermediate (typically 21cm wavelength) and "highish" (typically 11cm wavelength) frequencies. While this does give some measure of dispersive variations, these data can only ever be corrected at the level of their own uncertainty, thereby causing self-noise to replace the low-frequency dispersive variations with broad-band white noise. In other words: the situation is improved, but not as much as one might hope.

This is where LOFAR has a chance to shine brightly. Given that interstellar dispersion is strongly frequencydependent and because of the very low frequencies of LOFAR observations, even a relatively insensitive LOFAR observation may be used to correct dispersive effects in higher-frequency data at a level well below the noise floor. An example is given in Figure 2: if the red measurements are to be taken at face value, there could be a great many low-frequency variations in the high-frequency timing data. Sadly, though, the measurement precision is insufficient to tell for sure and interpolating the highly variable measurement points can be a dangerous business, since the distinction between random Gaussian noise and actual interstellar variations, is not trivial. The LOFAR points, however, with an order of magnitude better sensitivity, could easily identify what part of these trends is real; and what part is noise. On the few-month baseline we have so far covered, no significant variations in interstellar dispersion have been measured (which is -- not surprisingly -- consistent with the higher-frequency measurements), but as time goes on, these highly precise data points will allow correction for the slowly varying interstellar dispersion, removing effects that are currently the primary obstacle between us and a positive detection of the gravitational-wave background.

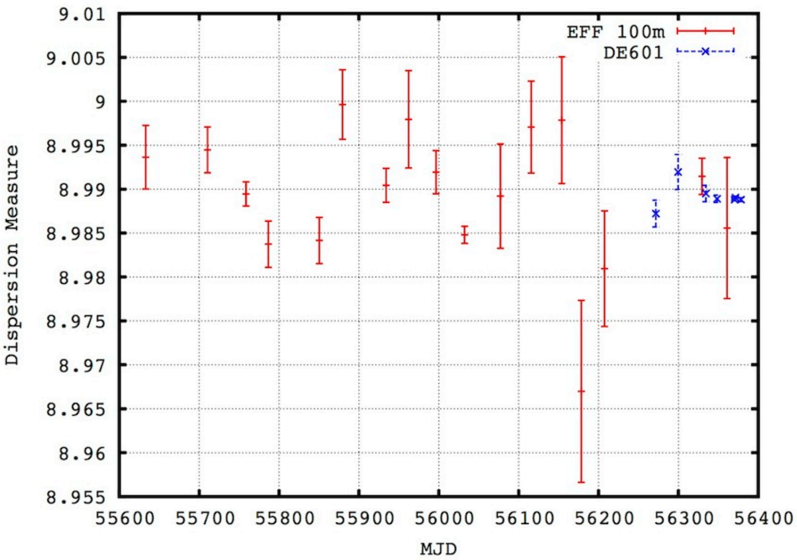


Fig. 2 Measurements of interstellar dispersion to the pulsar J2145-0750. The red points are the current best-practice measurement points, based on a comparison of 100-m observations at 21 and 11 centimeter wavelength. While some structure seems evident, the significance of these variations is marginal at best, making correction for dispersion variations a statistical nightmare. The measurements from the Effelsberg LOFAR station (in blue) are an order of magnitude better and will therefore avoid these complications in the future, since they will unequivocally identify any variability in the interstellar medium between us and the pulsar, from 2013 onwards.

A heavyweight for Einstein

Probing gravity where no one has done it before

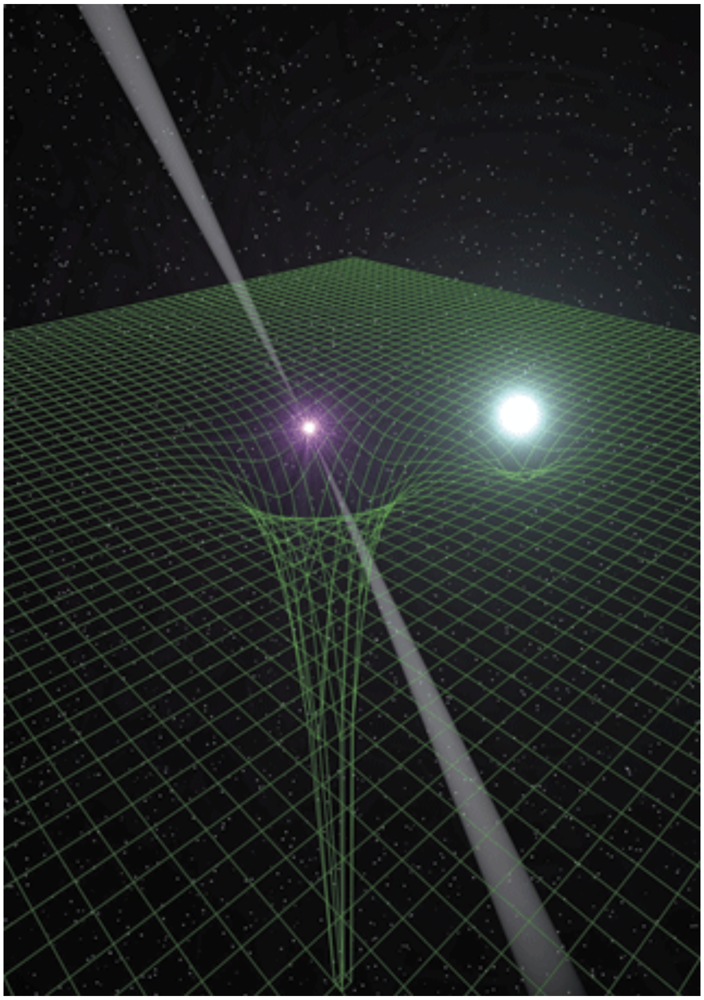


Figure 1: *An artist's impression of the PSR J0348+0432 binary system. The pulsar (with radio beams) is extremely compact, leading to a strong distortion of space-time (illustrated by the green mesh). The white-dwarf companion is shown in light-blue.*

Credit: *Science / J. Antoniadis (MPIfR)*

An international research team led by astronomers from the Max Planck Institute for Radio Astronomy (Bonn, Germany) used a collection of large radio and optical telescopes to investigate PSR J0348+0432, a newly discovered pulsar, and its white dwarf companion. The observations revealed a system with unusual properties: weighing twice as much as the Sun, making it the most massive neutron star measured to date. This, in combination with its short orbital period of only 2.5 hours, provides insight into binary stellar evolution and makes this system a strong emitter of gravitational radiation. The energy loss through this radiation has already been detected in the radio observations of the pulsar, making it a laboratory for General Relativity in extreme conditions not accessible before. The findings are in excellent agreement with Einstein's theory.

The results are published in an extended report in "Science" (Science Online, April 26, 2013).

Imagine half a million Earths packed into a sphere 20 kilometers in diameter, spinning faster than an industrial kitchen blender. These extreme conditions, almost unimaginable by human standards, are met in a neutron star - a type of stellar remnant formed in the aftermath of a supernova explosion. Neutron stars often catch the attention of astronomers because they offer the opportunity to test physics under unique conditions. They were first discovered almost half a century ago as pulsars which emit radio pulses like a lighthouse. Pulsar research has been honored with two Nobel prizes, one for their discovery (1974) and one for the first indirect detection of gravitational waves (1993) - a consequence of Einstein's theory of General Relativity.

PSR J0348+0432 is a pulsar in orbit with a white-dwarf, recently discovered using the Green-Bank radio telescope in an ongoing global effort to find more of these exciting pulsars. With a separation of just 830,000 km, the pulsar and the white dwarf in this system are close enough to emit a significant amount of gravitational waves. This should make the orbital size and period shrink, as predicted by General Relativity. To verify this prediction, one needs to know both the mass of the pulsar and its companion.

"I was observing the system with ESO's Very Large Telescope in Chile, trying to detect changes in the light emitted from the white dwarf caused by its two million km/h motion around the pulsar." says John Antoniadis, IMPRS student at the Max Planck Institute for Radio Astronomy (MPIfR) in Bonn and leading author of the paper. "This allows us to weigh both, the white dwarf and the pulsar. After a quick on-the-spot analysis I realized that the pulsar was quite a heavyweight: a mass twice that of the Sun, making it the most massive neutron star we know of."

With these masses at hand, one can calculate the amount of energy taken away from the system by gravitational waves, causing the orbital period to shrink. The team immediately realized that this change in the orbital period should be visible in the radio signals of the pulsar and turned its full attention to PSR J0348+0432, using the three largest single-dish radio telescopes on Earth (Fig. 2). "Our radio observations with the Effelsberg and Arecibo telescopes were so precise that by the end of 2012 we could already measure a change in the orbital period of 8 microseconds per year, exactly what Einstein's theory predicts", states Paulo Freire, scientist at MPIfR. "Such measurements are so important that the European Research Council has recently funded BEACON, a new state-of-the-art system for the Effelsberg radio telescope."

In terms of gravity, PSR J0348+0432 is a truly extreme object, even compared to other pulsars which have been used in high precision tests of Einstein's general relativity. At its surface, for example, it has a gravitational strength that is more than 300 billion times stronger than that on Earth. In the center of that pulsar, more than one billion tons of matter is squeezed into a volume of a sugar cube. These numbers nearly double the ones found in other 'pulsar gravity labs'. In the language of general relativity, astronomers were able for the first time to precisely investigate the motion of an object with such a strong space-time curvature (see Fig. 1). "The most exciting result for us was, that general relativity still holds true for such an extreme object", says Norbert Wex, a theoretical astrophysicist in MPIfR's fundamental physics research group. In fact, there are alternative theories that make different predictions, and therefore are now ruled out. In this sense, PSR J0348+0432 is taking our understanding of gravity even beyond the famous 'Double Pulsar', J0737-3039A/B, which was voted as one of the top ten scientific breakthroughs of 2004 by the 'Science' journal.

"Such extreme physical conditions are impossible to replicate in laboratories on Earth," says Thomas Tauris from the Argelander-Institut für Astronomie of Bonn University and MPIfR. "We would certainly like to learn how nature built such systems for us. For the J0348+0432 system, however, our formation theories are stretched to the limit. The system has a peculiar combination of properties: the tight orbital period and the pulsar's high mass, relatively slow rotation and strong magnetic field. It therefore poses an interesting challenge to the understanding of binary evolution."

Last but not least, these findings are also important for scientists who search for gravitational waves. On Earth, they are using large detectors, like the laser interferometers GEO600, LIGO and VIRGO. One of the key signals they are looking for in their data are the gravitational waves emitted by two neutron stars during those last few minutes when they quickly spiral towards each other and finally collide.

Decades of mathematical research in general relativity were necessary to calculate the expected gravitational waves from such a collision. Those equations are needed to identify them in the detectors' recordings. The first such identification is expected within the next five years. "Our results on J0348+0432 provide added confidence in these equations for the whole range of neutron star masses observed in nature", says Michael Kramer, director at MPIfR and head of its fundamental physics research group. "Given the great effort involved in deriving these equations, Einstein's theory passing this test is good news for our colleagues in gravitational wave astronomy."

Figure 2: *The radio and optical telescopes used to observe the pulsar-white dwarf binary system PSR J0348+0432. Upper row (from left): Radio telescopes: Green Bank (GBT), Arecibo and Effelsberg; Lower row (from left): Optical Telescopes: ESO Very Large Telescope (VLT), William-Herschel Telescope (WHT).*

Credit: *NRAO / NAIC /MPIfR / ESO / IAC.*

Original paper:

Antoniadis, J. et al., A massive pulsar in a compact relativistic binary, Science, April 26, 2013, Vol. 340, No. 6331

http://www.sciencemag.org/content/340/6131/1233232

The Telescopes: *ESO's Very Large Telescope (VLT) in Chile was used to measure the masses of both, the pulsar and the white dwarf. The William-Herschel Telescope (WHT) on La Palma was used to monitor the stability of the white dwarf. The Green-Bank telescope (GBT) discovered the pulsar in 2007. The Arecibo and Effelsberg telescopes were used to measure the orbital period variation of the system.*

BEACON: *The Effelsberg observations were part of "BEACON", a 1.9-million-Euro project funded by the European Research Council aimed to push tests of gravity theories into new territories. Paulo Freire/MPIfR is the principal investigator of BEACON. The project has funded a state-of-the-art instrument to be installed at Effelsberg in the coming months that will target the pulsar with the aim to substantially improve the accuracy of the published results.*

Responses from The Press:

by Norbert Junkes

Parallel press releases were issued by MPIfR and a number of partner institutes, including ESO, NRAO and NAIC. Bonn University, Max Planck Society and the European Research Council were also participating with press releases. The story was widely distributed in the news, including a number of German newspapers and news magazines like “Der Spiegel”, “Die Welt” and “Handelsblatt”, but also international magazines like “Wall Street Journal”, “LA Times”, “Telegraph” and “The Australian”. It was covered in a number of languages, in newspapers, radio, TV and online media. The following URL presents a (very uncomplete) collection:

http://www3.mpifr-bonn.mpg.de/public/pr/links-science-mar2013.html

Who is Who in Effelsberg ?

Klaus Schlich – Telescope Operator

I was born in 1956 in Essen in the Ruhr area and grew up there. As a working-class child I went to school for ten years and started an apprenticeship afterwards. This was common and it was not discussed.

For my twelfth birthday I got a "Radio-Mann" experimental box and that infected with the virus of wireless technology. At 14, I radioed on short wave (somewhat illegally) and two years later, I got the official license as a radio amateur. After training as a telecommunications technician I worked with different employers in the area, on telephone, radio and radar technology. On the second chance I acquired part-time and full-time study in my current professional qualifications. Early on I married my high school sweetheart, with whom I have three children.

After many years in Northern Germany, I moved in 1988 – for professional reasons –into the Eifel region, where I could rent a house with a view to the Effelsberg Radio Telescope. When I got to a village festival, I met a telescope operator at the bar by chance who suggested me to apply for such a position myself. In 1992 I became a member of the staff of the MPIfR as operator for the 100-meter telescope. I'm still here is because it's an interesting and many-sided job with good working conditions. In addition to my duties as operator, I'm around the observatory also with measuring gear and tools doing various things necessary to run a big radio telescope.

In 2006, I spent some time in the LOFAR roll out team at ASTRON where I learned a lot about building and operating a LOFAR station. Consequently, I was very active in the construction of the Effelsberg station as well. Since last year I am Chairman of employees council of the Institute.

On a staff excursion we went to the Astropeiler Stockert (the old 25-meter radio telescope of the University of Bonn), which fascinated me so much that I got involved into the preservation of the old telescope. Meanwhile, I live on the Stockert and radio astronomy has become not only my job but also a hobby of mine.

Besides being an amateur radio operator, being active on the Stockert and motorcycling I like to go sailing – either in my little dinghy on "my pond" in Zülpich or offshore, e.g. on the bark "Alexander von Humboldt II" where I belong to the permanent crew as volunteer engineer. Yes, even as a large sailing ship has engines, generators, ventilation and air conditioning, and a lot of technology and does not work without a computer. Virtually the same as the radio telescope, only much nicer and on the water ;-).

Public Outreach and Other Activities

Astronomy Day in Effelsberg : March 16, 2013

Once a year astronomical institutions in Germany are celebrating an "Astronomy Day" with a number of specific events like Open Days, special observations, public talks etc. In 2013 we participated with an astronomical walking tour along the topical walks near Effelsberg Radio observatory.

The top-left image shows an aerial view of the telescope with the villages Effelsberg, Kirchsahr and Binzenbach in direct neighbourhood. All three astronomical walks are labelled in the map (Planetary walk in green, Milky Way walk in red and Galaxy walk in blue). The tour started at the visitors' parking near Effelsberg with the first 800 meters along the stations of the Planetary walk from Pluto (park site) to the Sun (visitors' pavilion). From there it is a steep way down to a viewing spot directly in front of the 100m radio telescope. The viewing spot includes the final station of the Milky Way walk ("Center of the Milky Way"), the walk continues from there to the back side of the radio observatory with the start of the Galaxy walk (top-right image).

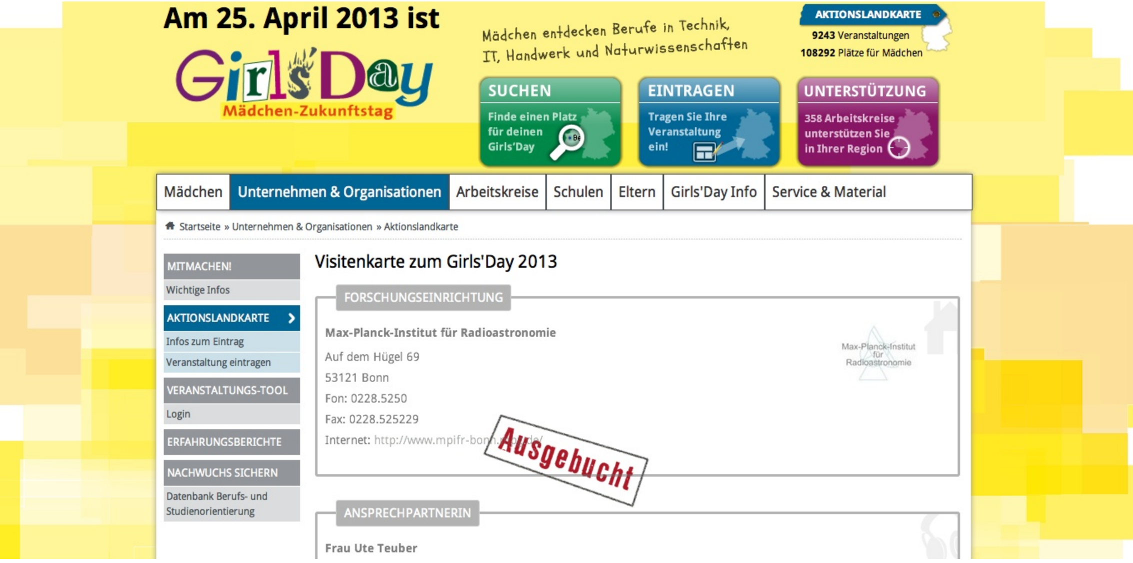
Saturday, March 16, 2013 was a very snowy day in the Eifel mountains. We had to change the original route of the walk which would have led down to Binzenbach along a steep ridge ("Martinssteig"), probably to dangerous for snow and a bit of ice. The tour included the complete Galaxy walk with all 14 stations. Its stations lead from nearby galaxies like M31, M82 and M87 to quasars like 3C 273, 3C 48 and 3C 286. The terminal station, J1148+5251, corresponds to a light travel time of almost 13 billion years, leading way back in the history of the Universe. The "Martinshütte" marks the end of that walk, the "hut at the end of the Universe". The tour continued from there to the village of Binzenbach, and back to the telescope along a number of stations of the Milky Way

walk. Close to Binzenbach in the forest, the Milky Way walk shows the Sun and nearby stars (Alpha Centauri, Sirius, Vega) in short distance (4.3 light years correspond to 43 cm in the scale of that walk). But it is still another 2.5 km (or 25,000 light years) back to the center of the Milky Way form there…

The complete walk of that day was marked with GPS and is available as follows.

Link:

http://www.gpsies.com/map.do?fileId=lssrzkqjhcigfcpi



Visitenkarte zum Girls'Day 2013

FORSCHUNGSEINRICHTUNG

Max-Planck-Institut für Radioastronomie

Auf dem Hügel 69
53121 Bonn
Fon: 0228.5250
Fax: 0228.525229
Internet: http://www.mpifr-bonn.mpg.de/

ANSPRECHPARTNERIN

Frau Ute Teuber

Girls' Day : April 25, 2013

The Max Planck Institute for Radio Astronomy in Bonn called upon female students to discover the Universe. With the motto "Girls, reach for the stars", the students were given a view into the world of astronomy and physics and were motivated to choose a career in these fields.

The Girls' Day attracted forty-five students interested in astronomy to the Max Planck Institute for Radio Astronomy in Bonn and Argelander Institute of the University of Bonn. Every year on the April 25th, various businesses and institutes offer a Girls Day in the hopes of encouraging more women to choose careers in technical or scientific fields. "Girls' Day is open to female students between the ages of twelve and sixteen, and the available spots for Girls' Day fill up within a few days", says Ute Teuber, Girls' Day organizer at the Max Planck Institute for Radio Astronomy.


The program began with an official welcome from Michael Kramer, a director at the Max Planck Institute for Radio Astronomy. From the beginning he made it clear how important it is to have women in technical careers and that they are as capable as men. As an example he described the British radio astronomer Jocelyn Bell Burnell, who discovered the first known radio pulsars in 1968 as a graduate student.



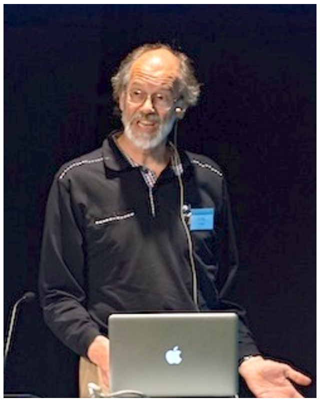
The physicist Nadya Ben Bekhti described a typical work day as an astronomer. Her presentation illustrated to the students how adventurous astronomy can be. As soon as Nadya Ben Bekhti asked the students a few questions, it was clear that many of the girls already knew a lot about astronomy. This knowledge also came into play during a conference call to the control room of the Effelsberg radio telescope. The girls toured five different technical labs, and afterward had homemade ice cream cooled with liquid nitrogen.

The girls then chose one of six different hands-on workshops. For example the students worked in the machine shop and made hose clamps from sheet metal. Three girls got to solder their own electronic circuit. Another workshop took the girls on “a trip through the Galaxy”, where they learned about various kinds of stars and how they are born. Students also the learned how to find planets outside of our solar system using the transit detection method.

After they finished with their workshops, the girls took an astronomical quiz, which tested their knowledge of astronomy with questions like “which planets have rings?” or “how do the planets orbit the Sun?”. The top-scorer won a guided tour of the Effelsberg radio telescope. At the end the students were asked if they could see themselves choosing a career in a science or engineering, and most of the girls raised their hand. Volunteers from all departments within the Max Planck Institute participated in Girls’ Days, and everyone had fun.

Modern Radio Universe 2013

From 22 to 26 April, 2013, more than 200 colleagues from around the world met in Bonn for the "Modern Radio Universe 2013" conference. A similar conference was held in 2007 in Manchester, celebrating the 50 year anniversary of the Lovell telescope. Hence, it was a fitting occasion after we had celebrated the 40 year anniversary of Effelsberg last year. But it was also 80 years ago, in spring 1933, when Karl Jansky published his discovery of cosmic radio emission. This paved the way not only for a new discipline, radio astronomy, but also for an exploration of the universe that now encompasses almost the entire electromagnetic window. Today, radio astronomy is about to enter into yet another new era with a number of new or upgraded radio facilities coming online and major new initiatives, like the Square Kilometre Array (SKA), progressing well. Indeed, it was exciting to see so many new results from LOFAR, ALMA, JVLA, and eMERLIN, and from many other established instruments. This week really demonstrated how vibrant, active and young(!) radio astronomy has become, again. We would like to thank all participants, and also in particular Hans-Rainer Klöckner and Gabi Breuer for the organisation of this wonderful conference. Let's hope that it does not take another six years for the next "MRU" conference to take place somewhere in the world!



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