Monthly Newsletter of International URSI Commission J – Radio Astronomy

November 2018

Officers

Chair:	Richard Bradley	ECRs:	Stefan Wijnholds
Vice-Chair:	Douglas Bock		Jacki Gilmore

Prepared by R. Bradley, Chair, Commission J, rbradley@nrao.edu

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News Items

Greetings Commission J Members!

The abstract deadline for the Pacific Radio Science Conference (AP-RASC) has passed. The Conference will be held in New Delhi, India from 09 – 15 March, 2019. A list of the Commission J sessions are given below. There are a total of 117 abstract submissions for Commission J. On behalf of URSI and the organizing committee, thank you for supporting AP-RASC 2019!

I'm continuing to solicit workshop and session ideas for the 2020 URSI General Assembly and Scientific Symposium in Rome. A working draft of the 2020 GASS Commission J program is given below – we will continue to modify it over the coming months. Your input is needed – consider convening a session!

Beginning with this issue, a new section for job postings will appear in the Newsletter. If your organization has an opening for a position that may be of interest to Commission J members please send me the title, short description, and link for additional information. I will only post positions by request from URSI members. It's also important to inform me when the position has been filled!

Detecting pulsars for a hobby? Yes! Our spotlight this month is on the impressive work of Hannes Fasching, OE5JFL, a radio amateur from Braunau, Austria who is doing just that for personal edification and enjoyment. In his own words, Hannes describes how he got started, the results of his observations, and what he has learned along the way. I thank Hannes for kindly sharing this fascinating story with us.

Martin Ewing (AA6E) and I (WB3DZC) invite anyone working in astronomy (all wavelengths), including students and retirees, who is or would like to be connected with the ham radio world to join our "Radioastronomy-hams" group at https://groups.io/g/radioastronomy-hams .

I kindly request your ideas, articles, news, photos, etc. for upcoming editions of Newsletter. Let's keep it interesting and informative! I thank all of you who have already contributed.

Submitted by R. Bradley

2019 URSI Pacific Radio Science Conference (2019 AP-RASC)

9 -15 March 2019, New Delhi, India

***** Abstract submission deadline has passed *****

See http://aprasc2019.com/ for details. The Commission J sessions are listed below.

J01: Evolution/Latest Results from uGMRT (Contributions and Felicitation of Govind Swarup)
Conveners: Subra Ananthakrishnan and Yashwant Gupta

J02: Updates from Existing Radio Astronomy Facilities – I
Conveners: Jayaram Chengalur and Douglas Bock

J03: Updates from Existing Radio Astronomy Facilities – II
Conveners: R Ramesh and Douglas Bock

J04: VLBI: Current Status and Future Prospects
Conveners: B C Joshi and Sergeyi Gulyaev

J05: Radio Astronomy Instrumentation & Techniques – I (Rcvr Systems: Analog/Digital/Optical Fibre)
Conveners: B Ramesh and S Srikant

J06: Radio Astronomy Instrumentation & Techniques - II (Data Processing: Imaging, Big Data)
Conveners: Dharam Vir Lal and Veeresh Singh

JGH7: Recent Scientific Results on Solar, Solar Wind and Space Weather Observations
Conveners: P Subramanian, Yihua Yan and P Janardhan

J08: Recent Scientific Results on Galactic, Extra-Galactic, Star Formation, Transients
Conveners: Ishwar Chandra and Kenta Fujisawa

J09: The Early Universe (EoR Experiments and Related Results)
Conveners: Abhirup Dutta and Tirthankar Roy Choudhury

J10: Future Radio Astronomy Facilities (including Square Kilometre Array)
Conveners: Divya Oberoi and Ramesh Bhat

EFGHJ-6: Upcoming Areas in Interference and Interference Mitigation
Conveners: Hanna Rothkaehl, Uttama Ghosh Dutta and Stefan Wijnholds

E07: RFI Mitigation in Radio Astronomy
Conveners: Subra Ananthakrishnan, Kaushal Buch and Tasso Tzioumis

EACFJ-8: EM Spectrum Allocation and Management
Conveners: Anjana Jain, Tasso Tzioumis and Jean-Benoit Agnani

JOS: Any Other Aspect of Radio Astronomy

2020 URSI General Assembly and Scientific Symposium (2020 URSI GASS)

Rome, Italy

We are now in the early stages of planning for the next URSI General Assembly and Scientific Symposium. Volunteer to convene a session or organize a one-day topical workshop around an important area of research. Let's work together to maintain the long tradition of excellence that the GASS provides to the radio science community.

***** Draft Program for Commission J – GASS 2020 *****

Sessions:

New Telescopes on the Frontier
Recent and Future Space Missions
Conveners: Joe Lazio
Single Dish Instruments
Very Long Baseline Interferometry
Millimeter/Submillimeter Arrays
Receivers and Radiometers: Design and Calibration
Digital Signal Processing: Algorithms and Platforms
Short-Duration Transients and Pulsars: Observations, Techniques, and Instrumentation
Solar, Planetary, and Heliospheric Radio Emissions (Commissions HJ)
Ionospheric Models and their Validation (Commissions JG)
Characterization and Mitigation of Radio Frequency Interference (Commissions JEFGH)
Spectrum Management (Commissions ECJ)
Historical Radio Astronomy
Conveners: Richard Schilizzi
Latest News and Observatory Reports
Conveners: Rich Bradley and Douglas Bock

Workshops:

Space Weather (Commissions GHJ)

Meeting and Workshop Announcements

**** Registration open for a meeting on the History of the SKA: 1980s to 2012 ****

Dear colleagues,
We would like to draw your attention to a meeting on the History of the SKA from the 1980s to 2012, to be held from 3 to 5 April 2019 at the SKA Organisation Headquarters at Jodrell Bank. More information, including a registration form, is available at
https://indico.skatelescope.org/event/518/

Richard Schilizzi, Ron Ekers, and Peter Hall
(Convenors)

1st International Cherenkov Telescope Array Symposium - Exploring the High-Energy Universe with CTA
May 6-9, 2019 - Bologna, Italy

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The first CTA Science Symposium will focus on the novel investigations CTA will bring to the field and its synergies with other wavebands and messengers. It will also cover instrument characteristics, analysis tools and opportunities for guest investigators and how coordinated observations with CTA will have a significant impact on the exciting new era of multi-wavelength and multi-messenger astrophysics. The symposium is a unique opportunity to gather the scientific community to stimulate discussion and promote collaboration in the study of the high-energy Universe.

CTA will be the largest and most advanced ground-based observatory for gamma-ray detection at the energies from 20 GeV up to 300 TeV, beyond the current energy frontier for gamma-ray astrophysics. With more than 100 telescopes located in the northern and southern hemispheres, CTA will use its unprecedented accuracy and sensitivity to reveal an entirely new and exciting view of the turbulent sky furthering our knowledge about the high-energy Universe. Learn more about CTA at http://www.cta-observatory.org .

- Join us!
Pre-register now to get further information about the meeting: http://www.cta-symposium.com
No payment is needed at this point. Feel free to forward this information to anyone who might be interested.

- Venue
The Symposium will be held at Bologna's magnificent Teatro Duse (http://www.teatrodusebologna.it/la-sala/), one of the oldest theatres in the city. Located in the historic centre and housed in the Palazzo del Giglio the theatre has been used since the mid-seventeenth century.

We look forward to seeing you in Bologna!

Stefan Funk and Jim Hinton for the SOC.

Activities Spotlight

Measuring Pulsars using Amateur Radio Equipment

Hannes Fasching, OE5JFL, Braunau, Austria

I made my radio amateur license back in 1970, and after starting activities on shortwave I went up in frequency to VHF/UHF and finally became interested in space communication. Since 35 years I am very active on EME (earth-moon-earth), means contacting other stations by signal reflection off the moon. For optimizing equipment it is essential to measure for example sun noise, radio galaxies and moon noise which is rather weak. This way I became interested in radio astronomy, and finally a couple of years ago radio amateur from Italy, Mario Natali, who developed pulsar observation planning software, convinced me to try to receive pulsars.

A massive star can collapse into a neutron star at the end of its life after a supernova explosion. The diameter is reduced to around 20km, and the rotation speeds up to a period of around one second or only milliseconds. If the direction of the magnetic axis is different from the rotational axis, a strong electromagnetic beam is radiated in direction of the magnetic axis. If the beam by accident hits the earth, we can observe a pulse on each rotation of the pulsar.

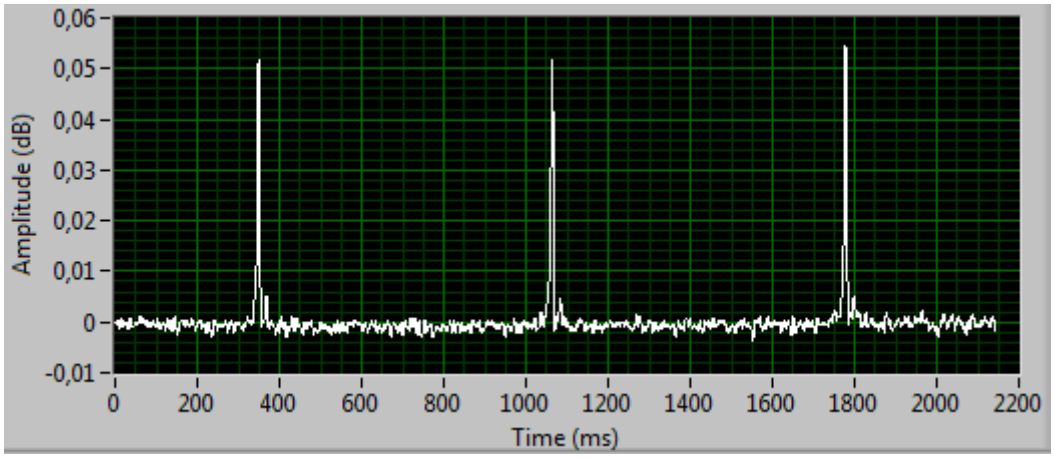
7,3m offset dish, used for receiving pulsars on 420MHz and 1292MHz

More detailed information can be found at: https://en.wikipedia.org/wiki/Pulsar
Because the pulsars are several thousands of light years away, their signals arriving at the earth are very weak. The unit of flux density is Jansky, 1 Jy=10-26 W/(m2*Hz). The strongest pulsar provides 1500 mJy on 400 MHz, this is about the same flux as a candle light up at the moon produces down on earth! To hear the pulses unprocessed in real time, a dish antenna with 100m

diameter would be necessary. To detect pulsars with amateur radio equipment (in my case a 7,3m diameter offset dish built by myself), the solution is to record the signal over a long time and large bandwidth, and afterwards make the pulses visible by special software using a procedure named folding.

While searching and reading a lot, I came across the webpage of Mr. Andrea Dell'Immagine, also a radio amateur. He is measuring the strong pulsar B0329+54 with a rather small antenna on a regular base, and provided me software he had written for recording and analyzing, and he was very helpful also for doing the first steps. His webpage: http://iw5bhy.altervista.org/

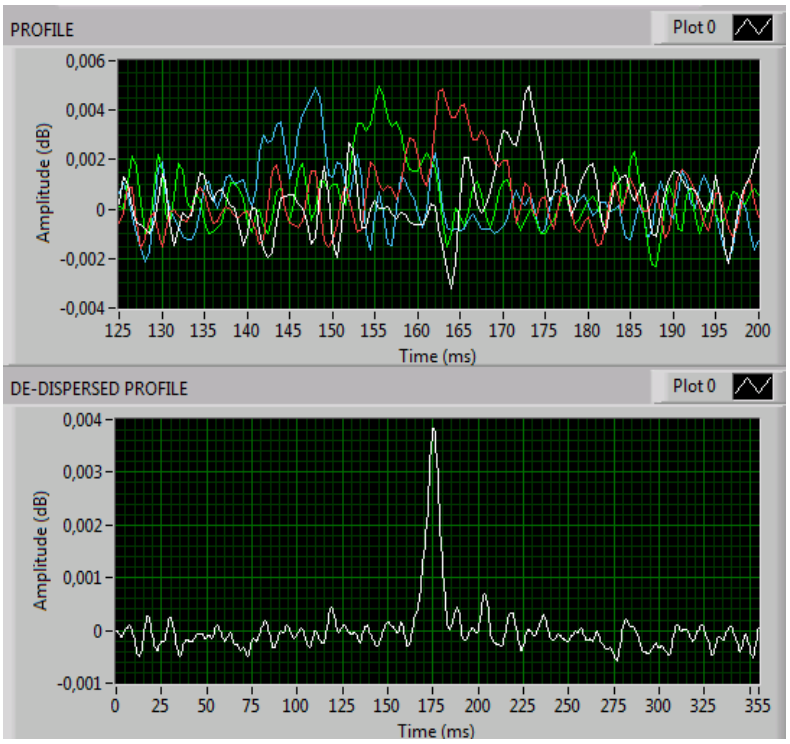
Two years ago I had the first success detecting B0329+54, both on 420MHz and on 1292MHz.



Three pulses of B0329+54, received on 420MHz

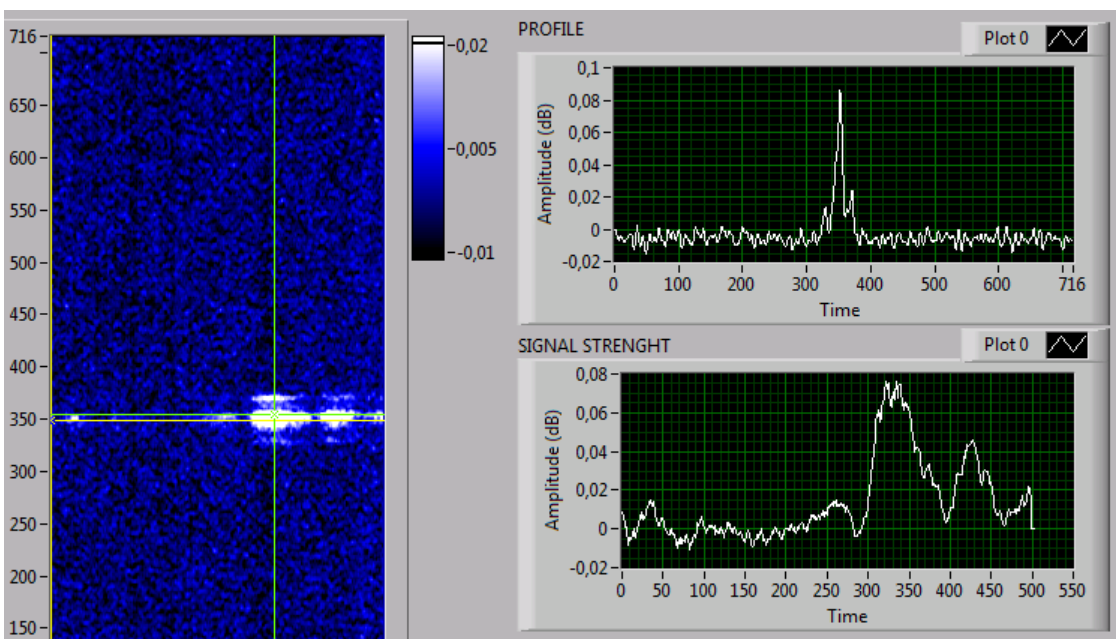
Step by step I detected more, following a list with candidates worth to try. Sometimes I had to be very patient, often the result was uncertain and I had to repeat the observation several times before I could consider the detection to be positive. Up to now I could detect 54 pulsars, the weakest on 420 MHz was B0626+24 with 31mJy, on 1292MHz B1845-01 with 8,6mJy only, that is 50 times lower radiation compared to the strongest.

For me it was very interesting to see and learn about the different characteristics of the various pulsars. The B1933+16 for example has remarkable high dispersion. This has to be taken into account by software during folding.



Separation of 4 frequency channels by dispersion of pulsar B1933+16

Especially on 1292MHz scintillation can wipe out the signal over hours, a little bit later we see enhancement, example B0329+54.



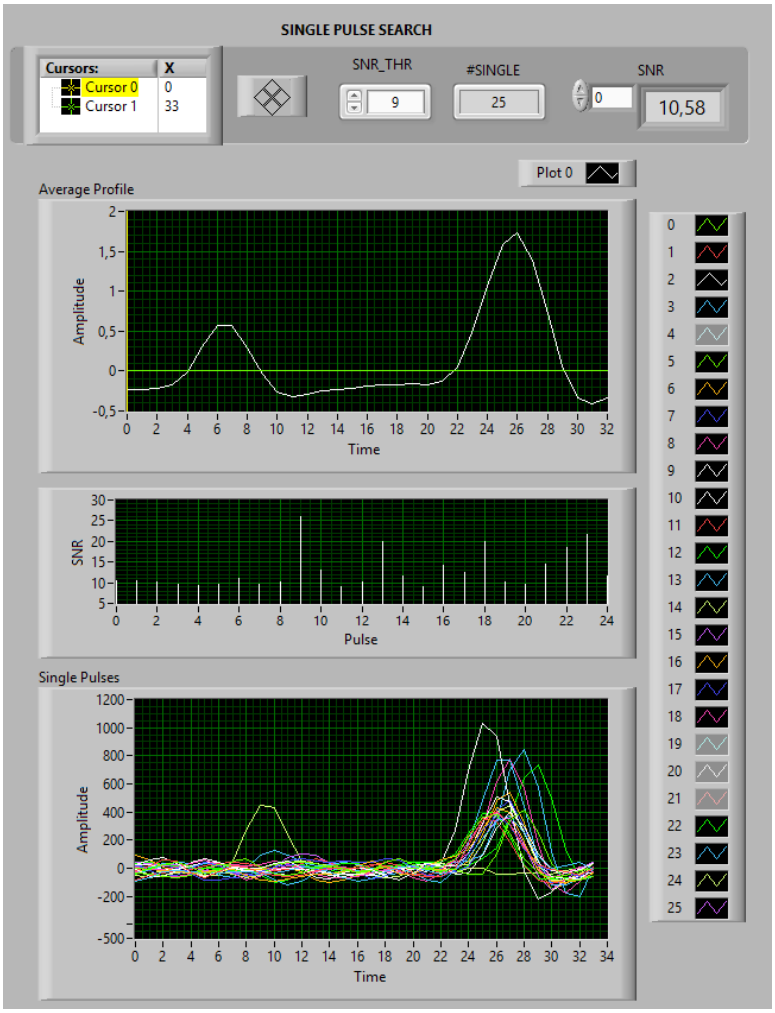
Scintillation of B0329+54 on 1292MHz, observation time 5 hours

The reception of the Crab-pulsar B0531+21 was one of the highlights! This young pulsar exists since a supernova explosion in 1054, which was observed on earth as a star even visible at daylight for about two years. It rotates 30 times per second, is highly dispersed (3 ms per channel is the same as the pulse width) and its slowdown in rotation speed is remarkable.

Beside the main pulse the Crab pulsar has an interpulse which is varying in strength.

The Crab pulsar is also known for its giant radio pulse emission. Andrea Dell'Immagine wrote very good software to search for giant pulses in recorded files. Analyzing a 6 hours observation with low interference, I found more than 20, and even one giant pulse at the phase of the interpulse was found, a very rare event. I estimate the peak flux level of the best observed giant pulse to be between 1000Jy and 2000Jy, means an increase of around 300 times above average!

Encouraged by the success with the 7,3m diameter dish, I gave my additional 3m dish a try as well. On 420MHz I could detect 4 pulsars, with positive result for the B0329+54 on every attempt, that pulsar was also detected on 1292MHz.



Crab pulsar B0531+21 giant pulses, received on 420 MHz

More detailed information can be found on my webpage: https://qsl.net/oe5jfl/pulsar/pulsar.htm

Submitted by Hannes Fasching

Job Postings – Radio Astronomy and Related Fields

Square Kilometer Array

Signal Processing Domain Specialist (Manchester, UK)
https://recruitment.skatelescope.org/domain-specialist-signal-processing/

Arizona State University – 3 Positions

Research professional with expertise in radio-frequency engineering:
https://jobregister.aas.org/ad/a67137b8

Postdoc in Radio Instrumentation and/or Signal Processing
https://jobregister.aas.org/ad/6f5685cb

Postdoc in 21cm Data Analysis
https://jobregister.aas.org/ad/e56bb558

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Photo from the Field

A 1.4 GHz 19-element, dual-polarization, cryogenic phased array feed (PAF) receiver for the Robert C. Byrd Green Bank Telescope (GBT), developed as part of FLAG (Focal L-band Array for the GBT) project. This receiver has the lowest reported beamformed system temperature normalized by aperture efficiency of any phased array receiver to date (see Roshi et al. 2018 for further details).

Submitted by A. Roshi

If you have an interesting photograph that you wouldn't mind sharing with others in the public domain I encourage you to send a copy to me along with a brief caption and the person's name or organization to whom I should credit.