



Monthly Newsletter of International URSI Commission J – Radio Astronomy
February 2020

Officers

Chair: Richard Bradley
Vice-Chair: Douglas Bock

ECRs: Stefan Wijnholds
Jacki Gilmore

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

News Items - Greetings from the Chair!

- **PAPER SUBMISSION FOR THE 2020 URSI GASS IS NOW CLOSED!!**
Commission J received 208 submissions!! The total number of abstracts received for the entire GASS is 1,903 with Commission J providing about 11% of the total. Thank you for supporting URSI GASS 2020 – it is shaping up to be a very interesting, well-attended conference!
- We are currently in the process of reviewing abstracts. **It is important for the session conveners to provide the reviews by the deadline, Monday March 9 so the organizational process can proceed in a timely manner.** After the reviewing is completed, time slots for the oral presentations will be assigned to Commission J. I will keep you informed as the process proceeds.
- **Nominations for Commission J Vice-Chair and Early Career Representative (ECR) is open.** An official invitation mailing was distributed that provided additional information and a nomination form. I will resend these materials again, shortly. **Nominations must be received by me no later than March 1, 2020.**
- Two URSI Council statements are being considered. One is in regard to the leap second and the other is a suggestion that the Auger effect be renamed the Auger-Meitner effect. Details are provided in this Newsletter.
- Looking for a past issue of the “J” Newsletter? The Newsletters and other URSI Commission J documents are archived at <http://www.ursi.org/commission.php?id=J#tab-section4> .



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

Rome, Italy 29 August - 5 September 2020

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

General Sessions

J01: New Telescopes on the Frontier

Conveners: Nipanjana Patra, Jeff Wagg, Arnold van Ardenne, Pietro Bolli

We have entered a golden age for radio astronomy, with new facilities coming online around the globe. During the next several years, these telescopes will pave the way for the two SKA1 telescopes to be built in Western Australia and South Africa. Collectively, they work at the frontier of technology and science. This session will highlight new and upgraded cm-to-m wavelength interferometers that will be operating before SKA1 early science begins.

J02: Recent and Future Space Missions

Conveners: Joseph Lazio, Heino Falcke, Yuri Kovalev

Space missions have enhanced VLBI capabilities and are close to opening up the radio window below 30 MHz by (swarms of) small satellites in space. These developments are facilitated by the advent of the standard CubeSat platform, which reduces mission costs significantly.

J03: Single Dish Instruments

Conveners: Alex Kraus, Anish Roshi, Jin Chengjin

Even in the age of interferometers, single-dish telescopes are important instruments for radio astronomical research, either for the detection of diffuse emission (sometimes in combination with interferometers to provide “zero spacings”), for observing pulsars or monitoring variability of flux density or line emission. New technology like Phased-Array-Feeds may greatly enhance the ability and efficiency of single-dish telescopes, e.g. by providing a FoV an order of magnitude larger than with conventional receivers. This session should be dedicated to the discussion of new or planned single-dish telescopes as well as to their instrumentation.

J04: Very Long Baseline Interferometry

Conveners: Francisco Colomer, Taehyun Jung, Chris Jacobs, Tiziana Venturi

Very Long Baseline radio Interferometry (VLBI) is a mature technique, whose applications in astronomy, geodesy and planetary sciences are unique now that the need for milliarcsecond angular resolution and for extremely accurate localisation are the ultimate frontiers for some of the hottest scientific areas. For this reason, VLBI is in the heart of some of the most advanced present and future instruments and developments (EHT, ngVLA, SKA, VGOS). This session will bring together experts in each field of application, to provide a view of the state-of-the-art and the desired developments, and to assess the central relevance of VLBI in the continuously evolving landscape of astrophysics, Earth and planetary sciences.

J05: Millimeter/Submillimeter Arrays

Conveners: Sheng-Cai Shi, Raymond Blundell

This session will focus on results and developments in (sub-)millimeter instrumentation covering the following broad areas:

- Current performance and future capabilities of major interferometric arrays. A few science results should be included that demonstrate performance.
- Design and/or development of heterodyne instrumentation for radio telescopes, both interferometric arrays and single-dish. A summary of the scientific rationale for any developments should be included.

J06: Antennas and Receivers: Simulation, Design and Calibration

Convener: Jacki Gilmore, Douglas Hayman, Pietro Bolli, David Davidson

In this session we address the antenna and receiver technologies which enable new radio telescopes. We focus on the importance of practical calibration for detailed system design, including how advances in simulation enable the new calibration strategies needed for all-sky instruments. We also highlight advances in single components of the receiving chain such as low noise amplifiers.

J07: Digital Signal Processing: Algorithms and Platforms

Conveners: Grant Hampson, Albert-Jan Boonstra

Beam forming, spectral filtering, online RFI mitigation, FPGAs and other hardware platforms

J08: Short-Duration Transients, FRBs, and Pulsars: Observations, Techniques, and Instrumentation

Conveners: Jason Hessels

Gravity wave detections, coordination in transient events, FRBs, pulsars

J09: The Impact of Radio Astronomy on Technology and Society

Conveners: Richard Schilizzi, Leonid Gurvits, Ken Kellermann, Richard Wielebinski

This session is being organized by the URSI-IAU WG on Historical Radio Astronomy and will comprise invited talks and contributed posters that focus on a number of the developments and inventions in the history of radio astronomy that have directly or indirectly impacted society. The invited talks will cover The story of Wi-Fi; VLBI, navigation and geodesy; Radio interferometry and medical imaging; Cold-war diplomacy and related activities at Jodrell Bank Observatory; Deep space navigation; and Parkes and Apollo 11. Posters are welcomed on these topics as well as others that fit within the subject of the session.

The invited talks and speakers are:

- 1) The Story of Wi-Fi - David Skellern (RoZetta Institute, Sydney)
- 2) VLBI, Navigation, and Geodesy - Megan Johnson (USNO)
- 3) Cold-war diplomacy at the Jodrell Bank Observatory – Simon Garrington and Tim O’Brien (JBCA)

- 4) Radio Interferometry and Medical Imaging – Ilana Feain (CASS)
- 5) Deep Space Navigation – Les Deutsch (JPL)
- 6) Parkes and Apollo 11 - Jasper Wall (UBC)

J10: Latest News and Observatory Reports

Conveners: Rich Bradley, Douglas Bock

This session will retain the traditional reports from the observatories. In addition, it will include a section for the latest news / results - allowing for very brief, last minute presentations.

J11: Big data: Algorithms and Platforms

Conveners: Stefan Wijnholds, Maxim Voronkov, Urvashi Rau

Given the ever increasing data volumes produced by current and future radio interferometers (LOFAR, ASKAP, SKA, ngVLA, ...), radio astronomy has entered the Big Data era. New data processing methods need to be developed that effectively exploit the capabilities of new hardware technologies to keep up with the deluge of data. This session aims to provide a forum to present and discuss the (co-)development of algorithms and computing platforms to deal with the Big Data challenges posed by current and future radio astronomical instruments. It intends to cover a broad range of astronomical applications, including (but not limited to):

- calibration and imaging algorithms at scale (designing scalability into the algorithms, adapting existing algorithms to new frameworks, etc.);
- real-time analysis for transient science, pulsars, RFI excision, SETI (voltage streams and in-correlator, handling algorithms at high data rates);
- pipeline operations, algorithm automation and HTC (the concept of science-ready-data-products and what it takes);
- software paradigms and compute frameworks (optimized code on dedicated hardware versus generic high level code and cloud platforms)

Workshops and Shared Sessions

Workshop: Characterization and Mitigation of Radio Frequency Interference

(Commissions JEF GH)

Conveners: Amit K. Mishra (F), David M. Levine (F), Frank Gronwald (E), Richard Bradley (J)

Radio Frequency Interference (RFI) has become a critical issue for many users of the electromagnetic spectrum. This is especially true for observational sciences such as radio astronomy, microwave remote sensing of the Earth, and Solar and ionospheric studies where highly sensitive measurements are necessary. The move of the observational sciences toward non-traditional (i.e. unprotected) frequencies to increase bandwidth and improve observations, only makes the problem worse. In addition, the advent of new-age telecommunication standards (like 5G and 6G) to enable new applications will make the already scarce bandwidth more scarce. This session invites papers that document and characterize RFI and describe the methodology to operate in an environment with unavoidable RFI.

Workshop: Some aspects of radio science in space weather

(Commissions GHJ)

Conveners: Iwona Stanislawska (G), Richard Fallows (J), Patricia Doherty (G), Mauro Messerotti (H/J), Baptiste Cecconi (H/J), Vivianne Pierard (H), Janos Lichtenberger (H), Willem Baan (J)

Goal: write a “white paper” on radio science, space weather and relevant services

Format: 3 panels of experts and related open discussion towards 3 topics:

- New radio science tools for space weather
- Radio science challenges for space weather services
- Radio science in planetary exploration

Rapporteurs will be identified in order to highlight the key aspects, gaps and pitfalls that will drive the white paper. It is intended to prepare a note on the 3 topics to be made available for the Radio Science community in advance in order to inform and get feedback useful for the best preparation of the 3 panels of experts.

J-ITU: Next Generation Radio Astronomy Science and Technologies

(Joint URSI/IAU Session)

Conveners: Anthony Beasley, Carole Jackson, Gabriele Giovannini, Melissa Soriano

In this session we bring together URSI and IAU Commission B4 (radio astronomy) to explore how frontier astronomy is pushing radio astronomy technologies. This astronomy will exploit the major instruments of the next decade and beyond i.e. SKA, ALMA2030, ngVLA and many others. This session will be wide-ranging, looking to major trends in photonics, computing and multi-messenger physics, but also the raw reality of increasing billion-dollar telescopes. How will these mega-instruments keep pace, how early do they need to foresight revolutions in technologies, and how does science drive these to fruition?

Mutual benefit between radio astronomy and ionospheric science

(Commissions JG)

Conveners: Claudio Cesaroni (G), Maaijke Mevius (J)

The ionized atmosphere significantly affects radio waves propagation and this can lead to misinterpretations of data of radio astronomical observations. Astronomical science studies using radio waves acquired at ground, especially at the lowest frequencies (e.g. LOFAR/MWA, and in the future the SKA), should therefore definitely take up-to-date atmospheric parameters into account. On other hand, radio signals disturbances can be used to retrieve information about the morphology and dynamics of the ionosphere. Typically, radio astronomical observations are sensitive to small scale disturbances in the ionosphere, with scales ranging from 100s of meters to 100s of kilometers and second to minute timescales.

To pose a solid bridge between the ionospheric and radio astronomical scientific communities, this session solicits contributions to facilitate exchange of information on their respective states of the art as well as on their future needs.

Contributions are welcome from both communities:

- Scientists studying the ionosphere presenting climatology studies, small scale disturbances like TIDs and scintillation and abnormal behaviors of the ionosphere during extreme events are welcome.
- Scientists dealing with radio astronomy that need to remove or mitigate the ionospheric contribution from their measurements or that can contribute to the understanding the ionospheric physics with their studies.

Spectrum Management

(Commissions ECJ)

Conveners: Amir Zaghloul (C), Tasso Tzioumis (J), Jose Borrego (E)

Solar, Planetary, and Heliospheric Radio Emissions

(Commissions HJ)

Conveners: Patrick Galopeau (H), G. Mann (H) and H.O. Rucker (H), Pietro Zucca (J)

As the space weather workshop will consist of overview presentations and panel discussions, this session should also provide room to present results related to space weather as obtained by radio observatories around the globe. To accommodate this, I have increased the number of available slots.

The Polar Environment and Geospace

(Commissions GHJ)

Conveners: Lucilla Alfonsi (G), Nicolas Bergeot (G), Mark Cliverd (H), Stefan Lotz (H)

URSI Resolution

URSI Resolution to be passed at the GASS2020

Statements from URSI on the need for continuous UTC

The URSI Council,

considering

- a) that the current practice of maintaining the Coordinated Universal Time (UTC) in agreement within 0.9 seconds with the Earth rotational angle time scale, UT1, by occasional leap second adjustments has been under discussion since late 1990s,
- b) that the International Telecommunication Union (ITU) discussed the realization of time scale and dissemination of time signals via radiocommunication systems during its World Radio Conference 2015 (WRC-15) and resolved in Resolution 655 of WRC-15 to further and more widely study the various aspects of current and potential future reference time scales, including their impacts and applications, in cooperation with URSI and other relevant international organizations,
- c) that in 2018 the 26th General Conference of Weights and Measures formally confirmed the definition of International Atomic Time and Coordinated Universal Time and asked all relevant unions and organizations to work together to develop a common understanding on reference time scales, their realization and dissemination with a view to consider the present limitation on the maximum magnitude of UT1 – UTC so as to meet the needs of the current and future user communities

noting

- d) that the introduction of leap seconds has led to serious problems and breakdowns in modern worldwide applications such as satellite navigation and computer networks which require of a continuous time reference. In an attempt to minimize these problems, several alternatives have been put into practice by different users, either using a non-standard continuous time reference (i.e. GPS time) or adopting different procedures to synchronize to UT1. These actions have in turn caused confusion and errors to the users

recognizing

- e) that URSI passed the URSI Resolution of Strengthening the URSI and ITU relationship in its General Assembly in Lille, 1996, and resolved that the board shall work with ITU in the identification of precise topic areas of mutual concern, and prepare URSI statements on such topics in an appropriate form,
- f) that a URSI-wide working group was formed in 2002 and the risks of the occasional leap second adjustments might cause were identified,
- g) that the Commission A (Electromagnetic Metrology) of URSI expressed its opinion in 1999 that the procedure of leap second insertions should be stopped and thus UTC should become a continuous reference time scale, and that this position was confirmed in 2014 by a Resolution of Commission A,

resolves for URSI to make the following statements,

Radioscientists of the International Union of Radio Science (URSI) have identified various risks caused by the insertion of leap seconds, that are not predictable over the long term. It was also found that a unique and continuous reference time scale is essential for the scientific research and the related activities in Radio Science. They also concluded that technological concerns associated to the need of adapting systems and software can be solved, and that the challenge is justified compared to the scientific and operational benefits of a continuous reference time scale. Therefore, it is the position of URSI that the tolerance of the difference $|\text{UT1-UTC}|$ should be released, after a suitable period of public notice.

The URSI Council,
Considering

1. that Dr. Lise Meitner has made many fundamental contributions to our knowledge of atomic physics, including but far from limited to the discovery nuclear fission,
2. that without her insights, physics would never have developed to the level wherein atomic frequency standards have become the most precise tools to realize the SI second, and that she also did some of the early work determining the nature of cosmic rays
3. that in 1922, she discovered and published the fact that electrons could be expelled from their orbitals as a byproduct of losing their lowest-energy electrons,
4. that one year later, Dr. Pierre Auger discovered the same effect, which was named after him, along with related terms Auger electrons and Auger peaks,
5. that the Auger effect is routinely used by URSI scientists in their work,
6. that a resolution was passed by Commission A in 2018, supporting the consideration of renaming the Auger effect to include Meitner's name,
7. And that in September 2019 a letter was published in Physics Today suggesting that the Auger effect be renamed the Auger-Meitner effect,

resolves

That it shall communicate to the appropriate professional organizations, including but not limited to the American and European Physics Societies, the suggestion that they consider actions to rename the Auger effect as the Auger-Meitner effect.

