



## Monthly Newsletter of International URSI Commission J – Radio Astronomy

August 2019

### Officers

Chair: Richard Bradley  
Vice-Chair: Douglas Bock

ECRs: Stefan Wijnholds  
Jacki Gilmore

Prepared by R. Bradley, Chair, Commission J, [rbradley@nrao.edu](mailto:rbradley@nrao.edu)

---

### News Items

Greetings Commission J Members!

- Planning for the 2020 URSI General Assembly and Scientific Symposium continues. For those who volunteered to serve as conveners – thank you! We are still searching for conveners – we would like at least three per session. The latest version of the Commission J program is included in the Newsletter. I should also mention that, in addition to the oral sessions, there will be at least one combined poster session.
- The International Astronomical Union (IAU) is also celebrating its centennial this year - we have confirmed joint session J-IAU: “Technologies for the SKA, ngVLA, and ALMA2030” at the 2020 URSI GASS. Special thank you to Carole Jackson and Tony Beasley for leading the effort to make this unique session possible.
- The Activities Spotlight this month is an interesting article about the Microfabrication Laboratories and the Far Infrared and Terahertz Laboratory at the University of Virginia that has served the radio astronomy community for nearly 50 years. I thank lab directors Arthur Lichtenberger and Robert Weikle for your contribution to the URSI-J 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> .

*Submitted by R. Bradley*



---

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

*Rome, Italy 29 August - 5 September 2020*

### **\*\*\* Tentative Program for Commission J – GASS 2020 \*\*\***

#### **Sessions:**

J01: New Telescopes on the Frontier

*Conveners: Nipanjana Patra, Jeff Wagg*

J02: Recent and Future Space Missions

*Conveners: Joseph Lazio, Heino Falcke, Yuri Kovalev*

J03: Single Dish Instruments

*Conveners: Alex Kraus, Anish Roshi, Jin Chengjin*

J04: Very Long Baseline Interferometry

*Conveners: Francisco Colomer, Taehyun Jung, Chris Jacobs*

J05: Millimeter/Submillimeter Arrays

*Conveners: Sheng-Cai Shi, Raymond Blundell*

J06: Antennas, Receivers and Radiometers: Simulation, Design and Calibration

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

J07: Digital Signal Processing: Algorithms and Platforms

*Conveners: Grant Hampsom, Albert-Jan Boonstra*

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

*Conveners: Jason Hessels*

J09: The Impact of Radio Astronomy on Technology and Society

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

J10: Latest News and Observatory Reports

*Conveners: Rich Bradley, Douglas Bock*

J11: Big data: Algorithms and Platforms

*Conveners: Stefan Wijnholds, Maxim Voronkov*

#### **Workshops and Shared Sessions**

Workshop: Characterization and Mitigation of Radio Frequency Interference (Commissions JEFGH)

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

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)*

J-ITU: Technologies for the SKA, ngVLA, and ALMA2030 (Joint URSI/IAU Session)

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

Mutual benefit between radio astronomy and ionospheric science (Commissions JG)

*Conveners: Claudio Cesaroni (G), Maaike Mevius (J)*

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)*

The polar Environment and Geospace (Commissions GHJ)

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

---

## **Workshop Announcements**

### **RFI2019: Coexisting with Radio Frequency Interference**

Dear URSI Colleagues:

The URSI-sponsored workshop RFI2019: Coexisting with Radio Frequency Interference will be held in Toulouse, France from 23 - 26 September, 2019. This meeting will bring together researchers from Remote Sensing, Space Physics, Ionospheric Research and Radio Astronomy in order to discuss RFI issues and methods to combat the RFI in our data. The website for RFI2019 is simply <http://rfi2019.org> and the author registration deadline is August 15, 2019. Late papers may be acceptable.

Kind regards,  
Willem Baan  
Paolo di Matthaeis

-----

### **High-Resolution Radio Interferometry in Space: Second International Meeting**

Following the spectacular images from the Event Horizon Telescope and the successful Space VLBI missions HALCA and RadioAstron, there is growing interest in the next set of Space VLBI technical concepts, including next-generation constellations and millimeter-wavelength systems. This meeting is a second in a series of international meetings, the first of which was held at Noordwijk in 2018, <URL: <https://www.ru.nl/astrophysics/@1164989/future-high-resolution-radio-interferometry-space/> >. The focus of this second meeting is to review black hole and other Space VLBI science cases, and begin to assess the maturity of the relevant technologies and needed technology developments and roadmaps.

*Date: 2020 January 27–29 (TBC)*

*Venue: NRAO, Charlottesville, VA*

---

## Activities Spotlight

### Charlottesville Virginia USA Has Emerged as a World Hub for THz Materials, Devices, and Circuits

The University of Virginia Microfabrication Laboratories (UVML) and the Far Infrared and Terahertz Laboratory (FIRTL) has a long-standing internationally recognized program of excellence in THz materials, devices, circuits, and metrology, with its original roots focused on realizing detectors and sources for radio astronomy. This effort began in 1970 (under the previous facility name, Semiconductor Device Laboratory) with the pioneering work of Professor Robert Mattauch, in a historic collaboration with NRAO, to develop semiconductor Schottky barrier diodes and later, with Professor Lichtenberger, to research and develop superconducting detectors for submillimeter-wave astronomy. The Schottky detector effort at UVA (Mattauch, Crowe and Weikle) and the spin off high tech company Virginia Diodes (founded by Tom Crowe and Bill Bishop) has and continues to have significant impact on radio astronomy, plasma diagnostics and scaled radar range systems. These include the original mapping of the ozone hole, and component development for a number of major facilities, including the Very Large Array, Kitt Peak 12 meter Telescope, Submillimeter Wave Astronomy Satellite, Microwave Instrument for the Rosetta Orbiter, US Advanced Microwave Sounding Unit, ODIN, ALMA, IceCube Cubesat, the US Defense Meteorological Satellite Program and a number of forecasting satellites in the US Defense Metrological Satellite Program.

The UVML maintains a sophisticated thin film fabrication processes for GaAs, superconducting and photodiode devices and circuits and is well positioned for the investigation and development of new materials and chip architectures. The UVML was the first group to develop, in collaboration with Tony Kerr at NRAO, tunerless SIS mixers with low output capacitance and inductance, the first single chip balanced SIS mixer, the first superconducting 180° IF Hybrid, the “SOI” mixer architecture for superconducting circuits with ultra-thin Si chips and Au beam leads (**Fig. 1**) and the first group to develop inductively coupled plasma (ICP) grown AlN tunnel barriers that have led to the highest quality Nb/Al-AlN/Nb and Nb/Al-AlN/NbTiN SIS devices. The UVML, in collaboration with the NRC Herzberg Institute of Astrophysics (NRC-HIA), the

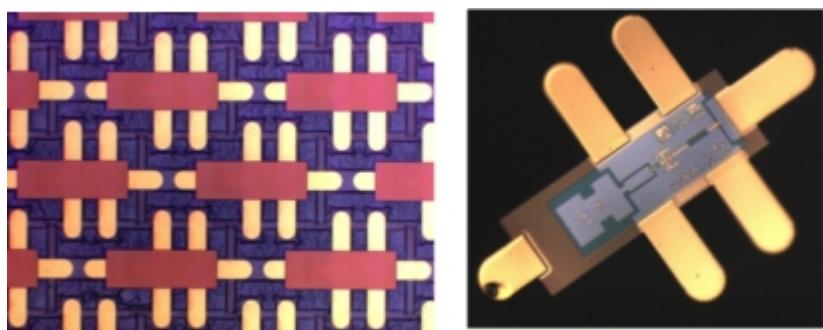


Figure 1: (Left) SIS mixer chips with 3um thick Si substrate and Au beamleads still mounted face down to its carrier wafer, and (Right) one chip dismounted.

NRAO, the University of Arizona, and the Institut de Radioastronomie Millimétrique (IRAM) has demonstrated SIS mixers that exceed the design specifications of the largest land-based radio

astronomical facility in the world (Atacama Large Millimeter Array (ALMA) for bands 3, 6, 7 & 8 respectively, and is the SIS foundry for all Band3 and Band6 SIS mixer circuits. Our SOI architecture and AlN barrier technologies are currently being exploited for more sensitive and wider bandwidth receivers.

Our superconducting detector technology (**Fig. 2**) played an important role in the recent first-ever imaging of a black hole approximately 55 million light-years from Earth by an international team of astronomers and engineers. This achievement captivated the world, as previously the evidence for black holes had been obtained indirectly, for example by measuring their gravitational effect on the path of other celestial bodies and more recently by detection of gravity waves from the collision of black holes using the Laser Interferometer Gravitational-Wave Observatory (LIGO) in 2015. **However, very excitingly for the astronomical community, a black hole has now been imaged using superconducting detectors at radio astronomy observatories around the world in a remarkable and common-culture captivating discovery.** The Event Horizon global network of eight observatories relied on ultra low-noise SIS detectors, most of which were developed over several decades by engineers and scientists at NRAO and UVA, operating at 230 GHz, about 100 times higher frequency than Wi-Fi. The largest and most sensitive millimeter radio telescope facility in the world, the Atacama Large Millimeter/submillimeter Array (ALMA) in Chile, utilized 132 of detectors, while the Arizona Submillimeter Telescope, the UMass Large Millimeter Telescope in Mexico and the South Pole Telescope also each made use of two of the NRAO-UVA detectors.



Figure 2: Picture of an NRAO-UVA Band6 ALMA receiver

This mapping of the gas ring swirling around and violently captured by the black hole also provided further confirmation of Einstein's theories on relativity and enabled astronomers to measure its mass (6.5 billion times heavier than our own sun!). This feat is remarkable on many levels. The black hole was chosen for imaging because it had the clearest sight-lines from earth, yet it is 55 million light years, or

three hundred quintillion miles away. The imaged gas emission ring surrounding the black hole's event horizon is only on order of the size of a single large star. And as if the task couldn't get more challenging, the electromagnetic signal that transverses the heavens is attenuated and distorted by gas clouds and ionized particles along its 55-million-year journey. While it took an international cast of scientists and engineers working together to accomplish this feat, this discovery could not have been accomplished without the heart of the telescope- the Superconducting Insulating Superconducting (SIS) detectors that first greeted each photon after its long journey through the heavens.

The UVML and FIRTL are the state's flagship university nano-micro fabrication and measurement facilities spearheading multidisciplinary research and educational activities that span high-speed THz and infrared (IR) systems, high performance photodiodes for RF photonics and communications, biotechnology and nanotechnology. As a result, we are developing state-of-the-art electronic, photonic and superconducting devices, circuits and micromachined components that are transcending the limits of conventional electronics, impacting a variety of technologies, including emerging 5G networks, radar sensors for autonomous vehicles, wireless Internet of Things platforms, quantum computing, and future-generations of communication systems. With \$10 million in recent investment from the University of Virginia's Strategic Investment Fund for critical equipment, and more than \$15 million from UVA and the School of Engineering for a cleanroom renovation and expansion (which includes Multifunctional Materials Integration and Nano-Bio initiatives) that is currently underway, the UVML is well positioned for the future.

Shaping ground-breaking technology and catalyzing innovation at a systems level is only possible with the collaboration and support of cross-sector entities that include, government organizations, businesses and other research agencies. For nearly 50 years, UVA and the NRAO have joined together to establish world-renowned low-noise detectors which have first detected many of the known interstellar molecules. In addition to our UVA group, there is an unprecedented, internationally recognized level of high frequency expertise in the Charlottesville region. This includes the UVA THz-FIR group (Lichtenberger, Weikle, Barker, Cyberey, Campbell, Beling, Bowers), the National Radio Astronomy Observatory (Tony Kerr, S.-K. Pan, Marion Pospieszalski - headquartered in Charlottesville), Virginia Diodes Inc (a UVA spin off company - Tom Crowe, Jeffrey Hesler, ~ 100 employees and internationally recognized as the source for commercial THz components and systems with sales to over fifty countries), National Ground Intelligence Center (NGIC, focused on THz scaled radar systems), and Dominion MicroProbes Inc (DMPI, a UVA spin-off company - Lichtenberger, Barker and Weikle for THz wafer measurements).

***Submitted by Arthur Lichtenberger (director of the UVA Microfabrication Laboratories) and Robert Weikle (director of the UVA Far Infrared and THz Laboratory)- both professors of electrical and computer engineering at the University of Virginia School of Engineering.***

---

## **Job Postings – Radio Astronomy and Related Fields**

### **Science Manager - Arecibo Observatory**

The Science Manager will have overall management responsibility over the onsite science team at Arecibo. This position is responsible for administratively managing staff work, making assignments, evaluating performance and providing guidance and direction. The candidate will work directly with the scientists in developing performance plans and metrics aligned with short- and long-term objectives of the facility. Responsible for managing team budget, hiring and reporting requirements. For further information see <https://jobs.ucf.edu/en-us/job/497580/science-manager-arecibo-observatory>

### **Observatory Scientist or Senior Observatory Scientist at Arecibo (Radio Astronomy, Interferometry)**

The Arecibo Observatory (AO), part of the University of Central Florida (UCF), is seeking a talented observatory scientist or senior observatory scientist in Interferometry Radioastronomy in Puerto Rico. The Arecibo Observatory (AO) is famous for its outstanding research in radio astronomy, solar-system studies, and space and atmospheric sciences, is home to the world's second largest radio/radar telescope. AO invites applicants to apply for the observatory scientist positions in observational radio astronomy, preferably with Very Long Baseline Interferometry (VLBI) experience. The selected applicants will be expected to participate in enabling Arecibo's user community to obtain the best possible scientific results from the telescope, and pursue their own cutting-edge research programs. Development of novel observational techniques as well as the commissioning of new observing equipment are of importance. Overall, these positions are expected to be 75% service and 25% independent research. The selected candidate will be encouraged to apply for grant funding.

For further details see <https://jobs.ucf.edu/en-us/job/497173/observatory-scientist-or-senior-observatory-scientist-interferometry-radioastronomy> .

**UC Berkeley Radio Astronomy Lab** - seeking a highly motivated individual to conduct research in radio astronomy, designing advanced radio astronomy instrumentation for HERA (the Hydrogen Epoch of Reionization Array) and several other radio telescope arrays, as well as further the Collaboration for Astronomy Signal Processing and Electronics Research (CASPER) by developing open-source software and hardware for the radio-astronomy community.

For more information, please visit the following link: <https://aprecruit.berkeley.edu/JPF02148>

**July 31, 1919 - July 31, 2019**

---



## **Celebrating 100 Years of URSI !**



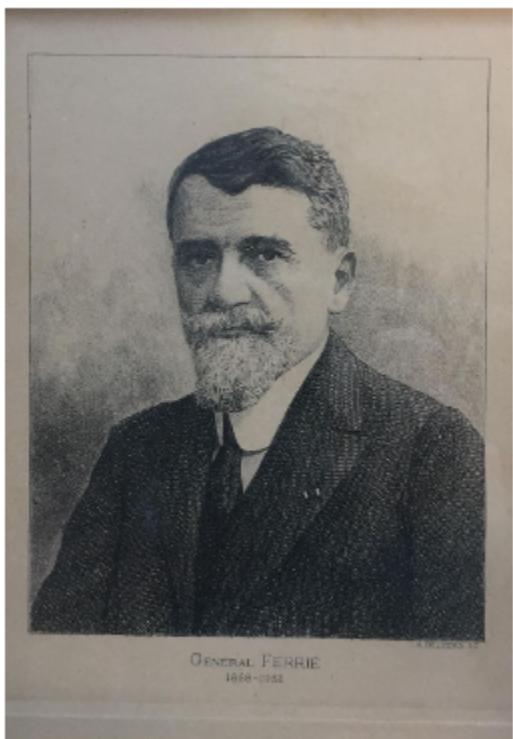
Exactly 100 years ago, URSI was founded in Brussels under the name 'Union internationale de radiotélégraphie scientifique' during the 'Conseil international de Recherches'.

URSI's 100th Birthday will be celebrated at several occasions the next three years.

We will keep you updated with our latest activities by mailings and through our Social Media platforms !



The Founding Fathers of URSI



General Ferrié, first President of URSI

du Conseil international de Recherches.

D. — Union internationale de Radiotélégraphie scientifique.

Les séances sont présidées par M. Schuster.

M. le commandant Philippson remplit les fonctions de Secrétaire.

M. le major Wibier rappelle qu'il a été créé à Bruxelles, en 1913, par un groupe de physiciens et de spécialistes de la radiotélégraphie, une Commission internationale de télégraphie sans fil scientifique, à laquelle étaient rattachés des Comités nationaux privés, fondés dans divers pays et notamment en Angleterre, en Belgique et en France. Cette Commission avait déjà exécuté avant la guerre des études et des expériences intéressantes. Elle dispose encore d'une somme de 40,000 francs environ, reçue au nom de M. R. Goldschmidt.

La proposition faite par la délégation belge, au sujet de la transformation de cette commission en association rattachée au Conseil international de Recherches, est adoptée à l'unanimité.

Le projet de statuts élaboré pour cette Union figure comme annexe XVII au présent compte rendu.

Le Bureau de cette Union a été composé comme il suit :

Président : le général Fenné;

Vice-Présidents : MM. AUSTIN, ECOLES et VANNI;

Secrétaire général : M. R. GOUDSCHMIDT.

L'Assemblée décide enfin que le siège de l'Union sera établi à Bruxelles,

Proceedings of the Assembly of the 'Conseil international de Recherches' held in July 2019



Copyright © 2019 URSI, All rights reserved.

Our mailing address is:

URSI Secretariat  
Ghent University /INTEC  
Technologiepark-Zwijnaarde 126  
B-9052 Gent, BELGIUM

[info@ursi.org](mailto:info@ursi.org)