

Monday 10 December 2018

12:00 Registration

13:00 **Opening Ceremony**

Session 1: Invited Talks

Chairs: V. Valenta (ESA), J. Stake (Chalmers)

13:15 Sub-Millimeter-Wave Devices and Circuits for Space, Communication and Sensing
Applications Using Advanced III/V mHEMT Technology

Schlechtweg M

Fraunhofer IAF

14:50 MILLIMETER WAVE SOLID-STATE POWER AMPLIFIERS FOR SPACE-BASED COMMUNICATIONS
AND REMOTE SENSING

Deo N¹

¹Quinstar Technology

14:25 MetOp Second Generation mm-Wave Instruments and Technologies

Kangas, V

ESA

15:00 *Coffee Break & Poster set-up*

Session 2: Invited Talks II

Chairs: P. Piironen (ESA), M. Schlechtweg (IAF)

15:20 Millimeter & sub-millimeter wave radiometer front end for the Ice Cloud Imager on next
generation polar orbiting meteorological satellites – MetOp-SG EQM Integration and Test
results

*Brandt M¹, Thomas B¹, Kilian A¹, Walber A¹, Gibson H¹, Philipp M¹, Sonnabend G¹, Stangier T¹,
Krause P¹, Bauer W¹, Goliash J¹, Gonzalez R², Bergada M², Perichaud M³, Piironen P³, Klein
U³, d'Addio S³, Kangas V³, Ellision B⁴, Rea S⁴, Moyna B⁴*

*¹Radiometer Physics GmbH, ²Airbus Defence and Space Madrid ASE, ³European Space Agency,
ESTEC, ⁴RAL Space, STFC Rutherford Appleton Laboratory*

15:55 Schottky and HBV Technology for Submillimeter wave Instruments in Space

Stake, J.

Chalmers

16:30 SiGe BiCMOS Technology and MMICs for Space

Scholz R¹, Krstic M¹, Kissinger D¹

¹Ihp GmbH

17:05 Millimetre-wave GaAs and GaN Circuits

Mayock, J

Viper RF

17:40-19:30 *Poster Session & Welcome Reception*

Tuesday 11 December 2018

For the remainder of the workshop, the sessions will run in parallel.

Session 3a: Instruments for Space Science and Radio Astronomy

Room: Newton 1

Chairs: E. Saenz (ESA), M. Brandt (RPG)

- 09:00 Wideband 67-116 GHz cryogenic receiver development for ALMA Band 2
Yagoubov P¹, Mroczkowski T¹, Testi L¹, Gonzalez A², Kaneko K², Uzawa Y², Molina R³, Reyes N³, Mena P³, Nesti R⁴, Cuttaia F⁵, Villa F⁵, Murk A⁶, Kotiranta M⁶, Mcgenn W⁷, Fuller G⁷, George D⁷, Gallego J⁸, Lapkin I⁹, Fredrixon M⁹, Belitsky V⁹, S. Ricciardi S⁵, Sandri M⁵, Terenzi L⁵, Cuadrado-Calle D⁷, Tapia V³
¹European Southern Observatory, ²National Astronomical Observatory of Japan (NAOJ), ³Universidad de Chile, ⁴Istituto Nazionale di Astrofisica (INAF/OAA), ⁵Istituto Nazionale di Astrofisica (INAF/OAS), ⁶Institute of Applied Physics, ⁷The University of Manchester, ⁸Observatorio de Yebes, ⁹GARD, Chalmers University of Technology
- 09:20 Science cases for the Event Horizon Imager, a multi-satellite high-frequency space VLBI system
Brinkerink C¹, Roelofs F¹, Kudriashov V^{1,3}, Martin-Neira M³, Falcke H^{2,4}, Young A¹, Moscibrodzka M², Pourshaghaghghi H¹, Baryshev A⁵
¹Radboud Radio Lab, department of Astrophysics/IMAPP, Radboud University, ²department of Astrophysics/IMAPP, Radboud University, ³ESTEC, ⁴Max Planck Institute for Radio Astronomy, ⁵Kapteyn Astronomical Institute, University of Groningen
- 09:40 System design of the Event Horizon Imager using sub-millimeter space interferometry based on the PECMEO concept
Kudriashov V¹, Martin-Neira M², Falcke H^{1,3}, Tilanus R^{1,4}, Klein Wolt M¹, Brinkerink C¹, Roelofs F¹, Young A¹, Pourshaghaghghi H¹, Baryshev A⁵
¹Radboud University, ²ESTEC, ³Max Planck Institute for Radio Astronomy, ⁴Leiden University, ⁵University of Groningen
- 10:00 The 1200GHz receiver front-end of the Submillimeter Wave Instrument of ESA Jupiter ICy moons Explorer
Maestrini A^{1,2}, Gatilova L^{1,3}, Treuttel J¹, Jin Y³, Moro-Melgar D¹, Vacelet T¹, Féret A¹, Caroopen S¹, Valentin J¹, Gay G¹, Cavana A³, Mignoni S¹, Krieg J¹, Thomas B⁴, Goldstein C⁵, De Maagt P⁶
¹Observatoire de Paris, ²Sorbonne Université, ³CNRS-C2N, ⁴Radiometer Physics GmbH., ⁵CNES, ⁶ESTEC
- 10:20 Superconducting MM-Wave and Terahertz Receiver Technology for Radio Astronomy
Belitsky V¹, Desmaris V¹, Ermakov A¹, Fredrixon M¹, Ferm S¹, Krause S¹, Lapkin I¹, Meledin D¹, Pavolotsky A¹, Rashid H¹, Strandberg M¹, Sundin E¹
¹Group For Advanced Receiver Development

Session 3b: Millimetre-Wave and THz Communications

Room: Newton 2

Chairs: I. Davies (ESA), J. Mayock (VIPER RF)

09:00 TERALINKS Project: Integrating a THz-generating photodiode in high-capacity communication systems.

Biurrun-Quel C¹, del-Río C^{1,2}

¹Universidad Pública De Navarra, ²Institute of Smart Cities

09:20 Flexible Ka-Band Down-Converter for Satellite Communication

Kulke R¹, Günner C¹, Kassner J¹, Möllenbeck G¹, Uhlig P¹, Schmid M², Deckert A²

¹IMST GmbH, ²Astro- und Feinwerktechnik Adlershof GmbH

09:40 V-band Low-Noise Amplifier Module for High Throughput Satellite Applications

Vitulli F¹

¹Thales Alenia Space Italia

10:00 Front-End Active Components for Millimetre-Wave and THz Communications in InP DHBT Technology

Hossain M¹, Shivan T¹, Hrobak M^{2,1}, Al-Sawaf T^{3,1}, Rämmer A¹, Heinrich W¹, Krozer V^{4,1}

¹Ferdinand-braun-institut, ²now with Continental, ADC Automotive Distance Control Systems GmbH, ³now with Gemalto M2M, ⁴Goethe University of Frankfurt am Main

10:20 Lens-Based Beamformers for Low-Complexity Millimeter-Wave Cellular Systems

Abbasi M¹, Fusco V¹, Tataria H¹, Matthaïou M¹

¹Centre of Wireless Innovation, Queen's University Belfast

10:40 Coffee Break

Session 4a: Instruments for Space Science and Radio Astronomy II

Room: Newton 1

Chairs: F. Deborgies (ESA), A. Baryshev (NOVA-RUG)

11:00 Progress in the development of large aperture and deployable mirror for the Millimetron Space Observatory

Golubev E¹, Smirnov A¹, Arkhipov M¹, Dvirniy G², Filina E¹, Fedorchuk S¹, Mikhalkin V², Kuklin V², Pyshnov V¹, Khalimanovich V²

¹Astro Space Center of P.N. Lebedev Physical Institute, ²JSC Academician M.F. Reshetnev Information Satellite Systems

11:20 Numerical analysis of the effect of material properties and geometrical parameters on the primary mirror performance of the Millimetron Space Observatory

Filina E¹, Golubev E¹, Lyakhovets A¹, Arkhipov M¹, Pyshnov V¹, Smirnov A¹

¹Astro Space Center of P.N. Lebedev Physical Institute

11:40 Comprehensive Description of Image Rejection Ratio Pattern of Submillimeter 2SB Receiver based on SIS mixers

Khudchenko A¹, Hesper R¹, Barkhof J¹, Mena F², Baryshev A¹

¹University of Groningen / NOVA, ²Electrical Engineering Department, University of Chile

- 12:00 Cooled silicon microbolometers for millimeter-wave detection
*Dusopt L¹, Aliane A¹, Goudon V¹, Vialle C¹, Rabaud W¹, Pocas S¹, Kaya H¹, Torrecillas R¹,
Ouvrier-Bufferet J¹, Agnese P¹, Becker S¹, Bounissou S², Adami O², Revéret V², Sauvageot J²,
Rodriguez L²*
¹CEA-LETI, ²CEA-IRFU
- 12:20 Superconducting thin-film THz structures development based on SIS junctions
*Rudakov K^{1,2,3}, Baryshev A¹, Hesper R¹, Kinev N², Khudchenko A^{1,2}, Bekema M¹, Dmitriev P²,
Filippenko L², Koshelets V²*
¹Kapteyn Astronomical Institute / RUG, ²Kotel'nikov Institute of Radio Engineering and
Electronics RAS, ³Moscow Institute of Physics and Technology
- 12:40 Millimeter wave Insight: The drivers beyond the millimeter wave frequency race
Allart X¹, Gabela K¹
¹Keysight Technologies, Inc.

Session 4b: Millimetre-Wave and THz Active Devices and Ics

Room: Newton 2

Chairs: P. de Maagt (ESA), Dr. Weimann (FBH)

- 11:00 Multichip dual polarisation THz MMIC receivers for future weather and climate research
Small/Cube-sat missions
Sobis P^{1,2}, Drakinskiy V², Hammar A¹, Schleeh J³, Wadefalk N³, Emrich A¹, Saenz E⁴, Stake J²
¹Omnisys Instruments AB, ²Chalmers University of Technology, ³Low Noise Factory AB,
⁴European Space Agency – ESA/ESTEC
- 11:20 THz InP integrated heterobipolar transistor technology for mmWave beam steering
applications
*Weimann N^{1,2}, Boppel S², Hossein M², Ostinelli O³, Bolognesi C³, Johansen T⁴, Krozer V²,
Heinrich W²*
¹University of Duisburg-Essen, ²Ferdinand-Braun-Institute, ³ETHZ, ⁴DTU
- 11:40 Radiated Power Enhancement of Pulsed Photoconductive Antennas in the Submillimeter
Wavelength Band via Coherent Connected Array Sources
*Garufo A¹, Sberna P¹, Carluccio G¹, Freeman J³, Bacon D³, Bueno J², Baselmans J², Linfield E³,
Davies A³, Llombart N¹, Neto A¹*
¹Delft University of Technology, ²SRON, ³Univeristy of Leeds
- 12:00 Reliability and Reproducibility of Discrete Schottky Diodes-Based-Doublers up to 370 GHz
Moro Melgar D¹, Cojocari O¹, Oprea I¹, Hoefle M¹, Rickes M¹
¹Acst GmbH
- 12:20 European Schottky Technology for MM&Sub-MM wave Receiver and Transceiver Systems
Hoefle M¹, Cojocari O¹, Moro-Melgar D¹, Oprea I¹, Rickes M¹
¹ACST GmbH

- 12:40 Performance comparison of 332 GHz fundamental balanced GaAs and InGaAs Schottky barrier diode mixers
Pardo D¹, Ellison B¹, Wang H¹, Merrit M¹, Alderman B¹, Valavanis A², Savini G³, Saenz E⁴
¹STFC-UKRI, ²School of Electronic and Electrical Engineering, University of Leeds, ³University College London, ⁴Radio Frequency Payloads & Technology Division, European Space Agency

13:00 Lunch Break

Session 5a: Instruments for Space Science and Radio Astronomy III

Room: Newton 1

Chairs: V. Valenta (ESA), B. Ellison (RAL Space)

- 14:00 Superconducting Filterbank Spectrometers for Hyperspectral Microwave Atmospheric Sounding
Thomas C¹, Goldie D¹, Withington S¹, Hargrave P², Orlando A², Sudiwala R², Dongre P²
¹Cavendish Laboratory, University Of Cambridge, ²School of Physics and Astronomy, Cardiff University
- 14:20 Application of mode-matching theory to lossy walled cavities and absorber layers with a novel approach to modelling an absorber layer using a virtual port.
Brennan J¹, Gradziel M¹, Trappe N¹, van der Vorst M²
¹Maynooth University, Department of Experimental Physics, ²European Space Agency
- 14:40 MS2760A – a new approach for mm-wave and 5G spectrum measurements
van der Burg P
Anritsu
- 15:00 Simulation of mm wave devices using full hybrid solver workflow in CST STUDIO SUITE®
Creed J¹
¹Hitech RF & Microwave Solutions /Dassault Systemes Simulia

Session 5b: Millimetre-Wave and THz Technologies

Room: Newton 2

Chairs: P. Piironen (ESA), N. Deo (QuinStar)

- 14:00 Survey of Millimeter Wave Omnidirectional and Broadbeam Antennas- Designs, Construction, Performance and Applications
Deo N¹
¹QuinStar Technology
- 14:20 Silicon micromachined integration for millimetre and sub-millimetre systems
Ermolov V¹, Lamminen A¹, Saarilahti J¹, Kantanen M¹, Pursula P¹
¹Vtt
- 14:40 A silicon micromachined 220-330 GHz turnstile orthomode transducer (OMT) in a low loss micromachining fabrication platform
Gomez-Torrent A¹, Shah U¹, Oberhammer J¹
¹KTH Royal Institute Of Technology

15:00 Technical/Commercial Presentation
Rohde & Schwarz

15:25 *Coffee Break*

Session 6a: Millimetre-Wave and THz Sensing

Room: Newton 1

Chairs: *E. Saenz (ESA), J. Hassel (VTT)*

16:00 History and Status of Millimeter Wave and THz Imaging

Deo N¹

¹*Quinstar Technology*

16:20 Kinetic inductance bolometers for radiometric sub-millimeter wave imaging

Hassel J¹, Sipola H¹, Grönberg L¹, Mäyrä A¹, Aikio M¹, Timofeev A¹, Rautiainen A², Tappura K¹, Luomahaara J¹, Vesterinen V¹, Leivo M², Gao F¹, Vasama H¹, Saenz E³, Luukanen A²

¹*VTT Technical Research Centre Of Finland, ²Asqella Oy, ³ESA European Space Agency, ESTEC*

16:40 Design, development and measured performance of a new HYper-Spectral Microwave
Sounder (HYMS) instrument

*Henry M¹, Auriacombe O¹, Parow-Souchon K¹, Ellison B¹, Charlton J², Parkes S³, Brownsword
C⁴, Rosch M⁵*

¹*STFC, UKRI, ²JCR Systems Ltd, ³STAR-Dundee Ltd., ⁴Centre for Earth Observation and
Instrumentation, ⁵Fraunhofer Institute for Applied Solid State Physics IAF*

17:00 Broadband millimetre-wave to optical up-conversion for room-temperature high sensitivity
radiometers

*Santamaria Botello G¹, Sedlmeir F², Rueda A², Segovia Vargas D¹, García Muñoz L¹, Popovic Z⁴,
G. L. Schwefel H³*

¹*Universidad Carlos III de Madrid, ²Max Planck Institute for the Science of Light, ³University of
Otago, ⁴University of Colorado, Boulder*

17:20 Design and Qualification of mm-wave Feed Chains for MetOp-SG MWI Radiometer Antenna

Maiarelli D¹, Pascale V¹

¹*Space Engineering S.p.a.*

Session 6b: Millimetre-Wave and THz Technologies I

Room: Newton 2

Chairs: *M. v. d. Vorst (ESA), Tauno Vähä-Heikkilä (VTT)*

16:00 Development of metamaterial flat lenses for the next generation of compact radiometers.

Moseley P¹, Ade P¹, Savini G², Tun S, Wylde R, Charlton J, Hardgrave P¹

¹*Cardiff University, ²UCL*

16:20 Integration and testing of a scatterometer for operation from 50 to 750 GHz

Appleby R¹, Wylde R², Froud S², Cappellin C³, Heighwood Nielsen P³, Atkin P⁴, Mrnka M⁵, Saenz E⁵

¹*Roger Appleby MMW Consulting Ltd, ²Thomas Keating Ltd, ³TICRA, ⁴Pixel Analytics Ltd, ,
⁵ESA/ESTEC,*

- 16:40 A Very High Isolation (>50 dB) and Low Insertion Loss (<0.55 dB) 140-220 GHz MEMS Waveguide Switch
Shah U¹, Oberhammer J¹
¹Kth Royal Institute Of Technology
- 17:00 Nonconductive graphene-based plastics for total sub-terahertz radiation shielding
Zeranska-Chudek K¹, Zdrojek M¹, Bomba J¹, Lapinska A¹, Duzynska A¹, Suszek J¹, Stobinski L², Taube A^{1,3}, Sypek M¹, Judek J¹
¹Faculty of Physics, Warsaw University Of Technnology, ²Faculty of Chemical and Process Engineering, Warsaw University of Technology, ³Institute of Microelectronics and Optoelectronics, Warsaw University of Technology
- 17:20 Loaded Epoxy For Microwave Applications
Ghigna T^{1,2}, Zannoni M³, Jones M¹, Simonetto S⁴
¹University Of Oxford, ²Kavli IPMU, University Of Tokyo, ³University Of Milano Bicocca, ⁴Istituto di Fisica del Plasma (IFP-CNR)
- 18:00 *Workshop Dinner*

Wednesday 12 December 2018

Session 7a: Millimetre-Wave and THz Frequency Conversion and LO generation

Room: Newton 1

Chairs: M. Peca (ESA), A. Khudchenko (NOVA-RUG)

- 09:30 Sub-mm-wave and THz frequency conversion: LO waveform control and sampling technologies
Martens J¹
¹Anritsu
- 09:50 Towards a terahertz local oscillator for space applications with a quantum-cascade laser
Hübers H¹, Hagelschuer T¹, Richter H¹, Wienold M¹, Schrottke L², Lü X², Röben B², Biermann K², Grahn H²
¹German Aerospace Center (DLR), Institute of Optical Sensor Systems, ²Paul-Drude-Institut für Festkörperelektronik
- 10:10 Quantum Cascade Lasers: High Performance Terahertz Sources
Schoenhuber S^{1,2}, Kainz M^{1,2}, Andrews A^{2,3}, Detz H⁴, Strasser G^{2,3}, Unterrainer K^{1,2}
¹Photonics Institute, TU Wien, ²Center of Micro- and Nanostructures, TU Wien, ³Institute for Solid-State Electronics, TU Wien, ⁴Central European Institute of Technology
- 10:30 Coffee Break & Poster Session
- 11:00 Overview of Techniques for THz QCL Phase-locking
Khudchenko A¹, Pavelev D², Vaks V³, Gao J^{4,5}, Baryshev A¹
¹University Of Groningen / Nova, ²Lobachevsky State University, ³Institute for Physics of Microstructures RAS, ⁴SRON Netherlands Institute for Space Research, ⁵Kavli Institute of NanoScience, Delft University of Technology
- 11:20 Optical Breadboard Integration of a 3.5-THz Quantum-Cascade Laser Local-Oscillator for the LOCUS Atmospheric Sounder
Valavanis A¹, Auriacombe O², Rawlings T², Han Y¹, Rea S², Crook M², Arena C³, Walker D⁴, Brooks D³, Yu G⁴, Li L¹, Davies G¹, Savini G³, Linfield E¹, Ellison B², Saenz E⁵
¹School of Electronic and Electrical Engineering, University Of Leeds, ²STFC Rutherford Appleton Laboratory, ³Department of Physics and Astronomy, University College London, ⁴National Facility for Ultra Precision Surfaces, OpTIC Centre,, ⁵ESA-ESTEC

Session 7b: Advanced Technologies and Techniques

Room: Newton 2

Chairs: V. Valenta (ESA), Giuseppe Addamo (CNR - IEIIT)

- 09:30 Platelet Designs of Millimeter-Wave Passive Components
Peverini O¹, Addamo G¹, Virone G¹, Ponessa F¹, Dressler M²
¹CNR - IEIIT, ²Fraunhofer-IFAM

- 09:50 Reflectometry Measurements of the Loss Tangent in Silicon at Millimeter Wavelengths
Chesmore G¹, Mroczkowski T², McMahon J¹, Sutariya S^{1,3}, Josaitis A^{1,4}, Jensen L⁵
*¹University Of Michigan, ²European Southern Observatory, ³Wayne State University
Department of Physics, ⁴University of Cambridge Department of Physics, ⁵Topsil
Semiconductor Materials A/S*
- 10:10 Complex beam pattern measurements with a wide field Microwave Kinetic Inductance
Detector camera
Yates S¹, Davis K², Jellema W^{1,3}, Baselmans J^{4,5}, Baryshev A³
*¹SRON Netherlands Institute for Space Research, ²University of California Santa Barbara,
³Kapteyn Institute, University of Groningen, ⁴SRON Netherlands Institute for Space Research,
⁵Terahertz Sensing Group, Delft University of Technology*
- 10:30 *Coffee Break & Poster Session*
- 11:00 Low-loss millimetre wave ferrite switches for remote sensing and telecommunication
Kainulainen J¹, Nguyen H¹, Ruokokoski T¹, Lahtinen J¹
¹Harp Technologies Oy
- 11:20 Integrated E-Band Photonic Transmitter employing UTC-PD and Endfire Antenna
Ali M¹, Guzmán R¹, Garcia Muñoz L¹, van Dijk F², Carpintero G¹
¹Universidad Carlos III de Madrid, ²III-V Lab
- 11:40 **Closing Ceremony**

Poster Presentations

- P1 A 300 GHz SIS receiver utilizing a balanced IF circuitry
Desmaris V¹, Belitsky V¹, Ermakov A¹, Ferm S¹, Fredrixon M¹, Krause S¹, Lapkin I¹, Meledin D¹, Pavolotsky A¹, Rashid H¹, Strandberg M¹, Sundin E¹, Gallego J², Lopez I², Diaz C²
¹Chalmers University of Technology, ²Observatorio de Yebes, CDT (IGN)
- P2 A 60 GHz experimental transmission of post-OFDM waveforms
Pospisil M¹, Waldecker M¹, Marsalek R¹, Gotthans T¹, Urbanec T¹
¹Brno University Of Technology
- P3 A comprehensive approach for accurate large signal characterization at (sub)mm-waves
Galatro L¹, De Martino C², Spirito M²
¹Vertigo Technologies B.V., ²Delft University of Technology
- P4 Design of an Optical Beam Combiner for Dual Band Observation with ALMA
Montofre D^{1,2}, Baryshev A¹, Mena P²
¹Kapteyn Institute, ²Facultad de Ciencias Fisicas y Matematicas, Departamento de Ingenieria Electrica
- P5 Model driven standing wave filtering in compact free space millimetre wave Vector Network Analyser driven measurement systems.
Gradziel M¹, Yurchenko V², Trappe N¹, van der Vorst M³
¹Maynooth University Department of Experimental Physics, ²Engitek Engineering Technologies Ltd, ³ESA/ESTEC
- P6 Pattern Measurement Setup for Integrated Antennas in the mmW-Range
Klein B¹, Plettemeier D¹
¹Technische Universität Dresden, Chair for RF and Photonics Engineering, SFB 912 - HAEC
- P7 Superconducting THz mixer and multiplier technologies for radio astronomy applications
Pavolotsky A¹, Belitsky V¹, Desmaris V¹, Ermakov A¹, Fredrixon M¹, Ferm S¹, Krause S¹, Lapkin I¹, Meledin D¹, Rashid H¹, Strandberg M¹, Sundin E¹
¹Chalmers University of Technology / GARD
- P8 TeraFET detectors for THz quantum cascade laser power monitoring
Lisauskas A¹, Čibiraitė D², Ikamas K¹, Richter H³, Hagelschuer T³, Matukas J¹, Krozer V², Hübers H³, Roskos H²
¹Vilnius University, ²Goethe-University Frankfurt, ³German Aerospace Center
- P9 Wideband passive components for 2SB or balanced receivers operating at mm-wave frequencies.
Desmaris V¹, Belitsky V¹, Bylund M¹, Ermakov A¹, Ferm S¹, Fredrixon M¹, Krause S¹, Lapkin I¹, Meledin D¹, Pavolotsky A¹, Rashid H¹, Shafiee S¹, Strandberg M¹, Sundin E¹
¹Chalmers University of Technology