

# **28th International Symposium on Space Terahertz Technology (ISSTT 2017)**

Cologne, Germany  
13-15 March 2017

ISBN: 978-1-5108-5972-2

**Printed from e-media with permission by:**

Curran Associates, Inc.  
57 Morehouse Lane  
Red Hook, NY 12571



**Some format issues inherent in the e-media version may also appear in this print version.**

Copyright© (2017) by International Symposium on Space Terahertz Technology  
All rights reserved. ISSTT proceedings are open access; available for free online:  
<http://www.nrao.edu/meetings/isstt/index.shtml>

Printed by Curran Associates, Inc. (2018)

For permission requests, please contact International Symposium on Space Terahertz Technology  
at the address below.

International Symposium on Space Terahertz Technology  
c/o NRAO Headquarters  
520 Edgemont Road  
Charlottesville, VA 22903-2475  
USA

Phone: (434) 296-0254  
Fax: (434) 296-0278

[mbishop@nrao.edu](mailto:mbishop@nrao.edu)

**Additional copies of this publication are available from:**

Curran Associates, Inc.  
57 Morehouse Lane  
Red Hook, NY 12571 USA  
Phone: 845-758-0400  
Fax: 845-758-2633  
Email: [curran@proceedings.com](mailto:curran@proceedings.com)  
Web: [www.proceedings.com](http://www.proceedings.com)

# Symposium schedule

## Sunday, March 12

6:00 PM **Welcome Reception and Registration** Wolkenburg, Mauritiussteinweg 59  
9:00 PM End

## Monday, March 13

8:00 AM **Registration** seminar rooms in front of lecture hall  
9:00 AM **Welcome** lecture hall  
"Großer Hörsaal Botanik" Gyrhofstr. 15

---

**Session M1 Receivers 1** Chair: Edward Tong

9:30 AM The upGREAT THz heterodyne arrays for SOFIA:  
1.9 THz and 4.7 THz first results 1  
Christophe Risacher Max-Planck-Institute for Radio Astronomy

9:50 AM Demonstration and stabilization of a 4x2 HEB array receiver at 1.4 THz  
based on a Fourier phase grating LO 2  
José Silva SRON

10:10 AM The Ice Cloud Imager Front End Receivers onboard MetOp-SG satellite -  
Preliminary Design and Results 5  
Bertrand Thomas Radiometer Physics GmbH

10:30 AM Stratospheric Terahertz Observatory 2016, Sub-orbital flight from  
McMurdo, Antarctica 6  
Abram Young University of Arizona

10:50 AM **Morning Coffee Break, 30 min**  
seminar rooms in front of lecture hall

---

**Session M2 Mixers & Backends** Chair: Christopher Groppi

11:20 AM A High-Performance 650 GHz Sideband-Separating Mixer — Design and  
Results 7  
Ronald Hesper University of Groningen

- 11:40 AM 67-116 GHz receiver development for ALMA Band 2+3 9  
Pavel Yagoubov European Southern Observatory (ESO)
- 12:00 PM Achieving Ultra-High Sideband Separation in Millimeter and Sub-Millimeter Receivers 10  
Patricio Mena Universidad de Chile
- 12:20 PM Back-ends for THz systems: Fast Fourier Transform Spectrometer 11  
Bernd Klein Max-Planck-Institute for Radio Astronomy
- 12:40 PM **Lunch Break, 100 min**  
walk to University "Mensa" dining hall (for those with lunch tickets)

---

**Invited talk 1**

Chair: Imran Mehdi

- 2:00 PM SOFIA, the First Three Years of Full Operation  
Alfred Krabbe Deutsches SOFIA Institut,  
University of Stuttgart

---

**Session M3**

**Space & calibration**

Chair: Andrey Baryshev

- 2:30 PM The Far Infrared Spectroscopic Explorer: probing the lifecycle of the ISM in the Universe 12  
Dimitra Rigopoulou University of Oxford
- 2:50 PM Spaceborne superconducting sounder (SMILES-2) for the upper-atmosphere observation 13  
Satoshi Ochiai NICT
- 3:10 PM RF and thermal aspects of the ground calibration system for the Microwave Sounder Instrument 17  
Manju Henry RAL Space
- 3:30 PM Development of Calibration Targets for MetOp-SG Microwave Instruments 18  
Arne Schröder University of Bern
- 3:50 PM 165-229 GHz Front End Receivers for the Microwave Sounder and Microwave Imager Instruments onboard MetOp-SG satellites - Preliminary Design and Results 20  
Simon Rea STFC RAL Space
- 4:10 PM **Afternoon Coffee Break, 30 min, and start of**  
seminar rooms in front of lecture hall

**Poster Session**

seminar rooms in front of lecture hall

---

note: posters can stay up until noon Wednesday

- P01 withdrawn
- P02 A 350 GHz waveguide coupled MKID design 21  
Florian Blauth University of Cologne
- P03 Design of simply structured metamaterial filters at sub-THz frequencies 24  
Johanna Böhm University of Cologne
- P04 1.9 THz balanced superconducting Hot Electron Bolometer mixer fully  
integrated on chip 27  
Sina Fathi University of Cologne
- P05 Schottky components for ESA MetOp SG space mission 30  
Oleg Cojocari ACST GmbH
- P06 Design and optimization of wideband micro-patterned quasi-optical  
matching structures 31  
Jake Connors Harvard University
- P07 Micro-Machined Integrated Waveguide Transformers in THz Pickett-Potter  
Feedhorn Blocks 33  
Kristina Davis Arizona State University
- P08 The SAFARI grating spectrometer for SPICA 35  
Gerhard de Lange SRON
- P09 Design of Planar Antenna Arrays for Heterodyne Receivers 36  
Duccio Delfini Paris Observatory, PSL
- P10 Spectral Domain Simulation of SIS Frequency Multiplication 40  
John Garrett University of Oxford
- P11 Wideband waveguide power combiner for ALMA Band 7+8 (275-500 GHz)  
Local Oscillator 44  
Alvaro Gonzalez National Astronomical Observatory of  
Japan
- P12 withdrawn
- P13 Modelling proximity effects in x-ray Transition Edge Sensors (TESs) for  
space-based applications 46  
Rebecca Harwin University of Cambridge

- P14 A Four Pixel Smooth Walled Feed Horn Array Operating at 1.4 THz 47  
Andre Hector University of Oxford
- P15 Evaluation of aperture efficiency by using ray-tracing software in designing  
a wide field-of-view telescope 51  
Hiroaki Imada ISAS / JAXA
- P16 Simultaneous phase-locking of two THz-QCLs using an HEBM and a  
comb generator 55  
Yoshihisa Irimajiri NICT
- P17 Development of Quantum Cascade Lasers at 2.7 THz for Heterodyne  
detection 58  
Francois Joint Paris Observatory, LERMA
- P18 A 4.745 THz Local Oscillator for the upGREAT receiver 60  
Matthias Justen University of Cologne
- P19 Superconducting diamond films as perspective material for direct THz  
detectors 61  
Anna Kardakova Moscow State University of Education
- P20 Measurement of THz performance of plasmonic absorbers made of bulk  
aluminum 62  
Irmantas Kasalynas Center for Physical Sciences &  
Technology
- P21 Study of mid infrared hot electron bolometer mixers 63  
Akira Kawakami NICT
- P22 Performance of SIS mixers for upgrade of CHAMP+ 7-pixel arrays 66  
Andrey Khudchenko University of Groningen / NOVA
- P23 The Advanced Microwave Radiometer – Climate Quality (AMR-C)  
Instrument for Sentinel-6 70  
Jenna Kloosterman Jet Propulsion Laboratory
- P24 Performance of a wide IF SIS-mixer-amplifier module for ALMA band 8  
(385-500 GHz) 76  
Takafumi Kojima National Astronomical Observatory of  
Japan
- P25 Material Study for a THz SIS Mixer 78  
Matthias Kroug National Astronomical Observatory of  
Japan
- P26 A Terahertz Time-Domain Reflectometer 79  
Bram Lap University of Groningen

- P27 withdrawn
- P28 Feasibility Studies on Photon Counting Terahertz Interferometry 80  
Hiroshi Matsuo National Astronomical Observatory Japan
- P29 Dielectric deposition for tuning the frequency of THz quantum cascade lasers 81  
Behnam Mirzaei Delft University of Technology
- P30 4 and 8-pixel THz Fourier phase gratings 83  
Behnam Mirzaei Delft University of Technology
- P31 Design of an Optical Beam Combiner for Dual Band Observation with ALMA 85  
Daniel Montofre University of Groningen
- P32 As grown ultra-thin MgB2 films for superconducting detectors 89  
Evgenii Novoselov Chalmers University of Technology
- P33 InGaAs Schottky technology for THz mixers 90  
Diego Pardo STFC-Rutherford Appleton Laboratory
- P34 Frequency triplers at 94 GHz and 300 GHz for millimeter-wave radars 94  
Carlos Pérez-Moreno Technical University of Madrid
- P35 A cryogenic solid state LO source at 1.9THz 96  
Nicolas Reyes Universidad de Chile
- P36 A 211-275 GHz receiver prototype 98  
Kirill Rudakov University of Groningen
- P37 AC-Biased Superconducting Hot-Electron Bolometric Direct Detector for Frequency-Domain Multiplexing 99  
Sergey Seliverstov Moscow State Pedagogical University
- P38 Design and Fabrication of a Dual-Polarization, Balanced SIS Mixer Integrated Circuit 102  
Wenlei Shan National Astronomical Observatory of Japan
- P39 Design of Large-Band Room-Temperature On-Chip Diplexed Schottky Receivers for Planetary Science 103  
Jose V. Siles NASA Jet Propulsion Laboratory
- P40 Millimetron Space Observatory 104  
Andrei Smirnov Lebedev Physical Institute

presenter: Thijs de Graauw

- P41 withdrawn
- P42 Cryogenic IF Balanced LNAs Based on Superconducting Hybrids for Wideband 2SB THz receivers 105  
Erik Sundin Chalmers University of Technology
- P43 An 8-Pixel Compact Focal Plane Array with Integrated LO Distribution Network 108  
Boon Kok Tan University of Oxford
- P44 An All Solid-State Receiver at 2 THz for Atmospheric Sounding 111  
Jeanne Treutel, Jet Propulsion Laboratory  
presenter: Imran Mehdi
- P45 Theoretical consideration of SIS up-converters for frequency division multiplexing 112  
Yoshinori Uzawa NICT
- P46 Pre-prototype ALMA Band 2+3 Down-Converter & Local Oscillator System 113  
Hui Wang STFC-Rutherford Appleton Laboratory
- P47 Noise Temperature of a Wideband Superconducting HEB mixer 114  
Kangmin Zhou Purple Mountain Observatory
- P48 GREAT's Internal Beam Scanner 116  
Urs Graf University of Cologne
- P49 Resonant Modes in Parallel Josephson Junction Arrays for Submm Oscillator Applications 117  
Faouzi Boussaha Observatoire de Paris

---

**Tour of institute (part 1)**

I. Physikalisches Institut, Zülpicher Str. 77

- 6:00 PM Walk to institute  
7:30 PM End



**Tuesday, March 14**

**Invited talk 2**

Chair: Gregory Goltsman

9:00 AM Engineering the physics of superconducting hot-electron bolometer mixers  
Teun Klapwijk Kavli Institute of Nanoscience,  
Delft University of Technology

**Session T1 Superconductor devices**

Chair: Sergey Cherednichenko

9:30 AM THz Heterodyne Sensors Using Superconducting MgB2 119  
Boris Karasik Jet Propulsion Laboratory

9:50 AM Shot Noise in NbN/AlN/NbN Superconducting Tunneling Junctions 120  
Dong Liu Purple Mountain Observatory

10:10 AM Effect of local non-uniformities of the tunnel barrier on the specific  
capacitance of Nb/Al-AlOx/Nb SIS junctions with extremely low RnA  
product 121  
Parisa Yadranjee Aghdam Chalmers University of Technology

10:30 AM Titanium nitride for kinetic-inductance detectors: a problematic material or  
an engineering opportunity? 124  
Eduard Driessen IRAM

10:50 AM **Morning Coffee Break, 30 min**  
seminar rooms in front of lecture hall

**Session T2 HEB device development**

Chair: Boris Karasik

11:20 AM MgB2 THz HEB mixer with an 11GHz bandwidth 125  
Sergey Cherednichenko Chalmers University of Technology

11:40 AM IF bandwidth of NbN HEB mixers on GaN buffer layer at 2 THz local  
oscillator frequency 126  
Sergey Antipov, Moscow State Pedagogical University  
presenter: Gregory Goltsman

12:00 PM Design of a wideband balanced waveguide HEB mixer employing a GaN  
buffer-layer for the 1-1.5 THz band 128  
Sascha Krause Earth and Space Science, Chalmers

12:20 PM MgB2 THz HEB mixer operation from 5K till 20K 132  
Evgenii Novoselov Chalmers University of Technology

12:40 PM **Lunch Break, 100 min**  
walk to University "Mensa" dining hall (for those with lunch tickets)

---

**Session T3 Receivers 2** Chair: Jacob Kooi

---

- 2:00 PM The wSMA receivers - a new wideband receiver system for the Submillimeter Array 133  
Paul Grimes Harvard-Smithsonian Center for Astrophysics
- 2:20 PM NOEMA Receivers: Upgrade for simultaneous dual band observations 134  
Anne Laure Fontana IRAM
- 2:40 PM A Cartridge-type Multi-pixel Receiver for the 1.5 THz Frequency Band of GLT 135  
Yen-Ru Huang ASIAA
- 3:00 PM 4GREAT: A multiband extension of GREAT from 490 GHz to 2.7 THz 138  
Carlos Duran Max-Planck-Institute for Radioastronomy
- 3:20 PM Results from the Kilopixel Array Pathfinder Project (KAPPa): a 6mm × 6mm 650 GHz Heterodyne Mixer Pixel with Integrated SiGe LNA and Permanent Magnet 143  
Christopher Groppi Arizona State University
- 3:40 PM **Afternoon Coffee Break, 30 min**  
seminar rooms in front of lecture hall

---

**Session T4 Supra-THz mixers** Chair: Sheng-Cai Shi

---

- 4:10 PM Development of a 16-pixel monolithic 1.9 THz superconducting waveguide HEB mixer 144  
Jonathan Kawamura Jet Propulsion Laboratory
- 4:30 PM 4.7 THz flight mixers for upGREAT 145  
Patrick Pütz University of Cologne
- 4:50 PM 4-Pixel Heterodyne Receiver at 1.9 THz using a CMOS Spectrometer 146  
Jenna Kloosterman Jet Propulsion Laboratory
- 5:10 PM Performance of NbN and NbTiN HEB waveguide mixers for GREAT and upGREAT 152  
Denis Büchel University of Cologne
- 5:30 PM Silicon Micromachined Integrated 4-Pixel Heterodyne Receiver at 1.9 THz 153  
Goutam Chattopadhyay NASA-JPL/Caltech

**Conference dinner**

Wolkenburg, Mauritiussteinweg 59

---

7:00 PM	Reception	walk from institute
8:00 PM	Dinner	
Midnight	End	

**Wednesday, March 15**

**Invited talk 3**

Chair: Netty Honingh

---

9:00 AM	Application of Terahertz Technologies in Laboratory Astrophysics Stephan Schlemmer	I. Physikalisches Institut, University of Cologne
---------	---	--

**Session W1 MKID**

Chair: Karl Jacobs

---

9:30 AM	Performance and surface wave reduction in large monolithic kinetic inductance detector arrays 154 Andrey Baryshev	University of Groningen
9:50 AM	Deep Neural Networks for Tuning MKID Digital Readouts 155 Rupert Dodkins	University of Oxford
10:10 AM	The effects of changes in bath temperature on Kinetic Inductance Detectors 159 Tejas Guruswamy	University of Cambridge
10:30 AM	Photon-Counting with KID Resonators for THz/Submillimeter Space Spectroscopy 160 Omid Noroozian	NRAO / NASA GSFC
10:50 AM	<b>Morning Coffee Break, 30 min</b> seminar rooms in front of lecture hall, <b>note: please remove posters</b>	

**Session W2 Optics & Waveguide**

Chair: Ghassan Yassin

---

11:20 AM	Compact diffractive optics for THz imaging 161 Linus Minkevicius	Center for Physical Sciences and Tech.
11:40 AM	Complex Beam Mapping of Large MKID Focal Plane Arrays 163 Kristina Davis	Arizona State University

- 12:00 PM A spline-profile diagonal horn with low cross-polarization and reduced side lobes, suitable for integration into waveguide split-block THz devices. 166  
Hugh Gibson Gibson Microwave Design EURL
- 12:20 PM Measurement and design of a waveguide probe based WR3.4 optically controlled modulator 168  
Jake Connors Harvard University
- 12:40 PM **Lunch Break, 100 min**  
walk to University "Mensa" dining hall (for those with lunch tickets)

---

**Session W3 Sources**

Chair: Jiang-Rong Gao

- 2:00 PM Ultra-Compact THz Multi-Pixel Local Oscillator Systems for Balloon-borne, Airborne and Space Instruments 174  
Jose V. Siles NASA Jet Propulsion Laboratory
- 2:20 PM A continuous wave terahertz molecular laser pumped by a quantum cascade laser 175  
Jean-Francois Lampin IEMN/CNRS
- 2:40 PM Local Oscillator for a 4.7-THz Multi-Pixel Heterodyne Receiver Based on a Quantum-Cascade Laser 176  
Heiko Richter German Aerospace Center (DLR)  
presenter:  
Heinz-Wilhelm Hübers
- 3:00 PM A single-mode BCB-embedded antenna-integrated continuous wave quantum cascade laser for heterodyne measurement at 4.745 THz 177  
Lorenzo Bosco ETH Zürich
- 3:20 PM Solid State Terahertz Sources 178  
Thomas Crowe Virginia Diodes, Inc.
- 3:40 PM **Afternoon Coffee Break, 30 min**  
seminar rooms in front of lecture hall

---

**Session W4 Semiconductor devices and receivers**

Chair: Jeffrey Hessler

- 4:10 PM Local oscillator requirements and noise performance of a cryogenic 360 GHz Schottky diode subharmonic mixer 179  
Diego Pardo RAL Space
- 4:30 PM Spectroscopy around 245 GHz based on a SiGe Transmitter and

- Heterodyne Receiver 183  
Nick Rothbart German Aerospace Center
- 4:50 PM The diode heterostructures for THz devices 184  
Dmitry Pavelyev Lobachevsky State University  
N. Novgorod
- 5:10 PM Qualification of Direct Detection Technology for ESA MetOp-SG Space  
Mission 186  
Matthias Hoefle ACST GmbH
- 5:30 PM **Wrap-up & Farewell**

**Tour of institute (part 2)**

I. Physikalisches Institut, Zülpicher Str. 77

---

- 6:00 PM Walk to institute  
7:30 PM End

**Thursday, March 16**

**Excursion to Effelsberg Radio Telescope**

---

- 12:15 PM departure behind Physics building, see map
- 6:00 PM approx. return

