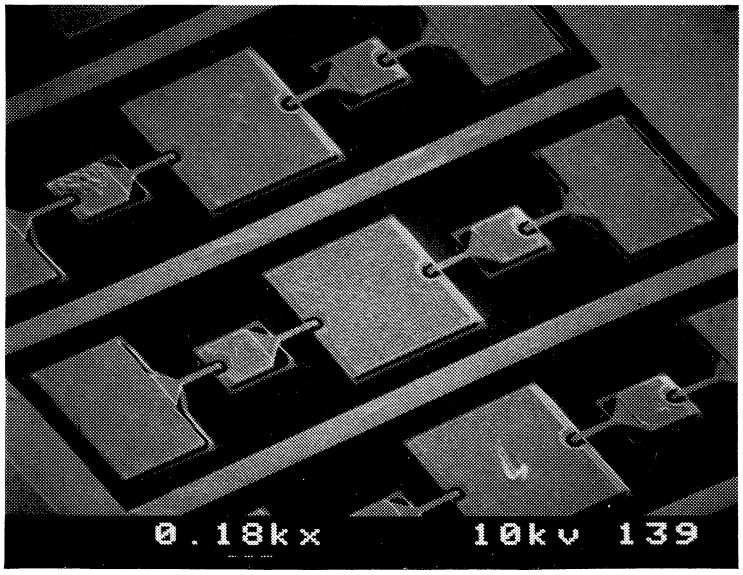
Seventh International Symposium on Space Terahertz Technology

March 12-14, 1996

On the Grounds of the
University of Virginia
Charlottesville, Virginia

PROCEEDINGS



Planar Schottky Varactor Diodes

Sponsored by: JPL Center for Space Microelectronics Technology, (CSMT) NASA Office of Space Access and Technology (OSAT)

Organized Jointly by: The University of Virginia Semiconductor Device Laboratory and The University of Michigan NASA Center for Space Terahertz Technology.

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of the

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Organizing Committee

Robert M. Weikle, University of Virginia
Gabriel M. Rebeiz, University of Michigan
Thomas W. Crowe, University of Virginia

PREFACE

The Seventh International Symposium on Space Terahertz Technology was held on the Grounds of the University of Virginia, Charlottesville, Virginia, on March 12-14, 1996. Fifty-three technical papers were presented covering all aspects of terahertz technology, but with emphasis on mixer technology (Schottky, SIS and Hot electron Bolometric) and sources (Multipliers, Oscillators and Lasers). There were two invited plenary speakers. Dr. Hans-Peter Röser described the plans for the new DLR Institute for Space Sensor Research in Berlin, Germany and Dr. John Carlstrom gave an update on the Millimeter Array. There was also a special session on Dielectric Lens Antennas which was organized by Dr. Gabriel Rebeiz and chaired by Dr. Robert Mattauch.

The symposium papers were contributed by authors from ten of the United States and eleven countries. Of the fifty-three papers, the primary author on twenty-five came from overseas. Of the one hundred and twenty registered participants, roughly twenty-five percent were from outside the US. Thus, this remains a very "international" symposium.

The Eighth International Symposium on Space Terahertz Technology will be hosted by the Harvard-Smithsonian Center fo Astrophysics. For further information, please contact:

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The organizing committee would like to thank all of the symposium participants, especially the authors and session chairs. The papers were very exciting and well presented and the sessions ran very smoothly. This is a truly exciting and dynamic field and the caliber and friendliness of the international group of researchers is unmatched. We look forward to seeing you all next year in Massachusetts.

Robert M. Weikle
Gabriel M. Rebeiz
Thomas W. Crowe

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DAY 1 - TUESDAY, MARCH 12

Opening Session - Rotunda Dome Room

Chair: Bobby Weikle

Welcoming Remarks	Carl Kukkonen	JPL	(8)
THz Research at the DLR Institute for Space Sensor Research	H.-P. Röser	DLR-Berlin, GERMANY	(*)
The Millimeter Array	J. Carlstrom	U. Chicago	(17)

Session 1: SIS Mixers I - Rotunda Dome Room

Chair: Pete Smith

Low-Noise Micromachined SIS-Mixers for Millimeter-Wave Imaging Arrays	G. de Lange, B.R. Jacobson, A. Rahman, E. Duerr and Q. Hu	MIT	29
Quasi-Optical Submillimeter Wave SIS Mixers with NbN/AlN/NbN Tunnel Junctions	Y. Uzawa, Z. Wang, A. Kawakami	Kansai Advanced Research Center, Kobe, JAPAN	37
Sub-Millimeter Distributed Quasiparticle Receiver Employing A Non-Linear Transmission Line	C.-Y.E. Tong, R. Blundell, B. Bumble, J.A. Stern, H.G. LeDuc	Harvard-CfA; JPL	47
Fixed Tuned Waveguide Mixers Around 450 GHz, 670 GHz and 810 GHz for a Dual Channel Receiver	C.E. Honingh, S. Haas, D. Hottgenroth, K. Jacobs, J. Stutzki	U. Köln, GERMANY	63
A 665 GHz Waveguide Receiver Using a Tuned 0.5 μm^2 Nb/AlO_x/Nb SIS Tunnel Junction	J.W. Kooi, M.S. Chan, H.G. LeDuc, T.G. Phillips	CSO; JPL	76
An 850 GHz Waveguide Receiver Using a Tuned Nb SIS Tunnel Junction Fabricated on a 1μm Si_3N_4 Membrane	J.W. Kooi, M.S. Chan, P. Schaffer, B. Bumble, H.G. LeDuc, C.K. Walker, T.G. Phillips	CSO; JPL; U.AZ.	86

DAY 2 - WEDNESDAY, MARCH 13

Special Session: Dielectric Lens Antennas		**Chair: Bob Mattauch**	
The Dielectric-Filled Parabola: Concept and Applications Review	P.H. Siegel, R. Dengler, M. Kim and P. Stimson	JPL	251
Internal Reflections of, and Matching Layers for, Integrated Lens Antennas	P.J.I. de Maagt, M.J.M. van der Vorst, M.H.A.J. Herben	ESTEC & Eindhoven U. Tech., NETHERLANDS	282
Off-Axis Performance of Dielectric Lens Antennas	D.F. Filipovic and G.M. Rebeiz	U. Mich	288
Antireflection-Coated Silicon Lenses for Low-Noise 400-1040 GHz Quasioptical SIS Mixers	M. Bin, M. Gaidis, H.G. LeDuc, D. Miller, J. Zmuidzinas	Caltech; JPL	289

Session 4: HEB Mixers I		**Chair: Mark Lee**	
The Bandwidth of HEB Mixers Employing Ultrathin NbN Films on Sapphire Substrate	P. Yagoubov, G.N. Gol'tsman, B. Voronov, L. Seidman, V. Siomash, S. Cherednichenko, E. Gershenzon	Moscow State Pedagogical U., RUSSIA	290
Quasioptical Phonon-Cooled NbN Hot-Electron Bolometer Mixer at THz Frequencies	P. Yagoubov, G. Gol'tsman, B. Voronov, S. Svechnikov, S. Cherednichenko, E. Gershenzon, V. Belitsky, H. Ekström, E. Kollberg, A.D. Semenov, Yu.P. Gousev, K.F. Renk	Moscow State Pedagogical U., RUSSIA; Chalmers, SWEDEN; U. Regensberg, GERMANY	303
Spectrum of Output Noise in Diffusion and Phonon Cooled Hot Electron Superconducting Mixers	R.J. Schoelkopf, P.J. Burke, D.E. Prober, A. Skalare, W.R. McGrath, B. Bumble, H.G. LeDuc	Yale; JPL	318
Superconductive NbN Hot-Electron Bolometric Mixer Performance at 250 GHz	J. Kawamura, R. Blundell, C.-Y.E. Tong, G. Gol'tsman, E. Gershenzon, B. Voronov	Harvard-CfA; Moscow State Pedagogical U., RUSSIA	331
9.6 μm Wavelength Mixing in a Patterned $YBa^2Cu_3O_{7-\delta}$ Thin Film	V.A. Trifonov, B.S. Karasik, M.A. Zorin, G.N. Gol'tsman, E.M. Gershenzon, M. Lindgren, M. Danerud, D. Winkler	Moscow State Pedagogical U., RUSSIA; Chalmers, SWEDEN	337

DAY 3 - THURSDAY, MARCH 14

Session 7: Schottky Mixers I	**Chair: Victor Lubecke**		
A Quasi-Optical, Subharmonically Pumped Double Slot Mixer	J.P. DeLap, T.M. Cunningham, R.M. Weikle, T.W. Crowe	UVA	442
200 GHz Waveguide Based Subharmonically Pumped Mixers with Planar Schottky Diodes	I. Mehdi, T. Lee, R. Dengler, A. Pease, J. Oswald, D. Humphrey, S. Martin, R.P. Smith, P.H. Siegel	JPL	450
Submillimeter Wavelength Waveguide Mixers using Planar Schottky Barrier Diodes	J.L. Hesler, W.R. Hall, T.W. Crowe, R.M. Weikle, B.S.Deaver, R.F. Bradley, S.-K. Pan	UVA; NRAO	462
A Mixer up to 300 GHz with Whiskerless Schottky Diodes for Spaceborne Radiometers	I. Galin	Gencorp-Aerojet	474
A Design Approach for Planar Waveguide Launching Structures	J. Thornton and C.M. Mann	RAL, UK	477

Session 8: Schottky Mixers II: THz		**Chair: Israel Galin**	
Quasi-Planar Schottky Diode Design	R. Nitsche, R.U. Titz, E.M. Biebl	DLR-Oberpfaffenhofen and T.U. Munich, GERMANY	488
First Results for a 2.5 THz Schottky Diode Waveguide Mixer	B.N. Ellison, B.J. Maddison, C.M. Mann, D.N. Matheson, M.L. Oldfield, S.M. Marazita, T.W. Crowe, P. Maaskant, W.M. Kelly	RAL & U. Kent; UK, UVA; U. College, Cork, Ireland	494
A Practical Schottky Mixer for 5 THz (Part II)	A. Betz and R. Boreiko	U. Colorado	503
A Novel Structure and Fabrication Process for Sub-Quarter-Micron THz Diodes	W.L. Bishop, S.M. Marazita, P.A.D. Wood, T.W. Crowe	UVA	511