Programme for the 15th European Conference on Antennas and Propagation (EuCAP 2021, Düsseldorf, Germany)

Monday, March 22

Monday, March 22 9:00 - 10:00

Opening Ceremony 0

Room: virtual

Monday, March 22 10:00 - 11:00

Keynote 1 0

Keynote speech plus beyond 5G, the Smart Networks and Sensor partnership

Colin Willcock

Room: virtual

Monday, March 22 10:40 - 11:10

Coffee Break Exhibition 0

Rooms: virtual 1, virtual 2, virtual 3, virtual 4, virtual 5, virtual 6, virtual 7, virtual 8, virtual 9, virtual 10, virtual 11, virtual 12, virtual 13, virtual 14, virtual 15, virtual 16, virtual 17, virtual 18, virtual 19, virtual 20

Monday, March 22 11:10 - 15:30

Keynote 2 0

Propagation and Channel modeling for automotive environments

Fredrik Tufvesson

Room: virtual

Monday, March 22 11:50 - 12:30

Lunch Exhibition 0

Rooms: virtual 1, virtual 2, virtual 3, virtual 4, virtual 5, virtual 6, virtual 7, virtual 8, virtual 9, virtual 10, virtual 11, virtual 12, virtual 13, virtual 14, virtual 15, virtual 16, virtual 17, virtual 18, virtual 19, virtual 20

Monday, March 22 12:30 - 15:30

CS20: (ET Session) Measurement Antennas and Challenges for 5G & Beyond 0

Chair: Andrea Bilotti, Bid Communications, Measurement

Co-Chair: Tian Hong Loh, UK, National Physical Laboratory, United Kingdom (Great Britain), Janet O'Neill-O'Connor, USA

CS20: (ET Session) Measurement Antennas and Challenges for 5G & Beyond 0

Room: virtual

Keynote 3 0

Keynote speech plus beyond 5G, the Smart Networks and Sensor partnership

Colin Willcock

Room: virtual

Monday, March 22 15:40 - 17:10

Coffee Break Exhibition 0

Rooms: virtual 1, virtual 2, virtual 3, virtual 4, virtual 5, virtual 6, virtual 7, virtual 8, virtual 9, virtual 10, virtual 11, virtual 12, virtual 13, virtual 14, virtual 15, virtual 16, virtual 17, virtual 18, virtual 19, virtual 20

Monday, March 22 17:10 - 19:50

Keynote 4 0

Fundamental limits of Antennas

Mario Vittorio

Room: virtual

Monday, March 22 17:50 - 19:20

Lunch Exhibition 0

Rooms: virtual 1, virtual 2, virtual 3, virtual 4, virtual 5, virtual 6, virtual 7, virtual 8, virtual 9, virtual 10, virtual 11, virtual 12, virtual 13, virtual 14, virtual 15, virtual 16, virtual 17, virtual 18, virtual 19, virtual 20

Monday, March 22 19:30 - 19:50

Keynote 5 0

Antenna-in-package solutions for millimeter wave networks

Giovanni Gozzini

Room: virtual

Monday, March 22 19:30 - 19:50

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Co-Chair: Tian Hong Loh, UK, National Physical Laboratory, United Kingdom (Great Britain), Janet O'Neill-O'Connor, USA

CS02: IRACON Propagation Measurements and Modelling for 5G and beyond 0

Chair: Mathias Kolmas, Kyushu University, Japan

Co-Chair: Pekka Kyosti, Finland

Chairs: Carlos Tavares Calafate, Universitat de Valencia, Spain, Gerry Siamas, Chairman, United Kingdom (Great Britain)

CS-02-01: Angular Dispersion Measurements of Building Entry Loss for Energy-Efficient Building at 28 GHz

Ali Yazdan, Universitat Politècnica de Catalunya, Barcelona, Spain, Universitat Politècnica de Catalunya, Barcelona, Spain, Universitat Politècnica de Catalunya, Barcelona, Spain

Sushil Deepak Gaikwad and Rajit Chandran Sasikumar Vishwanath (Siemens Healthineers), Markus Bumberger (RWTH Aachen University), Michael Ter Haseborg (Siemens Healthineers), Thomas Kuhlen (RWTH Aachen University), Christian Hoffmann (Siemens Healthineers), Alexander Dürrwang (Siemens Healthineers), Ralf Kneuper (Siemens Healthineers), Thomas Bergmann (Siemens Healthineers), Stefan Gerlach (Siemens Healthineers), Jan Hinrichs (Siemens Healthineers), Jan Klose (Siemens Healthineers), Jan Borchersen (Siemens Healthineers), Jan Ole Ernst (Siemens Healthineers), Jan Ole Ernst (Siemens Healthineers)

10:10 Agile Electronic Assessment Architecture with an Integrated Feeding Circuit for Piezoelectric Diversity
Ahmad Alkhalaf (Fraunhofer IZM-ASSID), Ali Ibrahim (Fraunhofer IZM-ASSID), Ali Ibrahim (Fraunhofer IZM-ASSID), Ali Ibrahim

C3.01 Recent Advances in Electromagnetic Theory and Computational Electromagnetics

Hybrid Jodrey and Thomas F. Eibert Electromagnetic Analysis of Electro-Plastic Grids in Free-Space Electromagnetic Fields

1100 Unexplained Wireless Transmission in Optics: Properties, Applications, and Implications
Ahmad Ali Ali Ali

Calculation of Complex Vertical Dies Over Flat Metallic Surfaces for Multiple-Input Multiple-Output Communications Systems
Christian Lüdtke (Chair for Component Technology, Ilmenau Technical University, Germany), Sebastian Schlegel, Klaus Schuch, Dr. Ilmenau Technical University, Germany), Dr. Ilmenau Technical University, Germany), Dr. Ilmenau Technical University, Germany),

T03-Modulated Broadband Lens Antenna Array
Ziqian Zhang, Ziqian Zhang, Ziqian Zhang, Ziqian Zhang
Department of Electronic Engineering, Shanghai Jiao Tong University, Shanghai, China
We present the design of a planar conducting lens array antenna. The lens array has a compact size (fight-effective aperture area of 0.8 square wavelengths) and a wide bandwidth (from 8 GHz to 12 GHz). The lens array is fed by a Vivaldi antenna. Simulation results show that the lens array can achieve a peak gain of 10 dBi and a 3-dB gain bandwidth of 2 GHz.

T04-Dual Wideband Dual-Polarized Dielectric Lens Antenna for Millimeter Wave 5G Application
Ziqian Zhang, Ziqian Zhang, Ziqian Zhang, Ziqian Zhang
Department of Electronic Engineering, Shanghai Jiao Tong University, Shanghai, China
We present the design of a dielectric lens antenna. The lens is fed by a compact and high-efficiency Vivaldi antenna. Simulation results show that the lens antenna can achieve a peak gain of 15 dBi and a 3-dB gain bandwidth of 2 GHz.

T05-Dual Wideband Dual-Polarized Dielectric Lens Antenna for Millimeter Wave 5G Application
Ziqian Zhang, Ziqian Zhang, Ziqian Zhang, Ziqian Zhang
Department of Electronic Engineering, Shanghai Jiao Tong University, Shanghai, China
We present the design of a dielectric lens antenna. The lens is fed by a compact and high-efficiency Vivaldi antenna. Simulation results show that the lens antenna can achieve a peak gain of 15 dBi and a 3-dB gain bandwidth of 2 GHz.

T06-Wideband Dielectric Lens Antenna for Millimeter Wave Applications
Ziqian Zhang, Ziqian Zhang, Ziqian Zhang, Ziqian Zhang
Department of Electronic Engineering, Shanghai Jiao Tong University, Shanghai, China
We present the design of a dielectric lens antenna. The lens is fed by a compact and high-efficiency Vivaldi antenna. Simulation results show that the lens antenna can achieve a peak gain of 15 dBi and a 3-dB gain bandwidth of 2 GHz.

T07-Wideband Dielectric Lens Antenna for Millimeter Wave Applications
Ziqian Zhang, Ziqian Zhang, Ziqian Zhang, Ziqian Zhang
Department of Electronic Engineering, Shanghai Jiao Tong University, Shanghai, China
We present the design of a dielectric lens antenna. The lens is fed by a compact and high-efficiency Vivaldi antenna. Simulation results show that the lens antenna can achieve a peak gain of 15 dBi and a 3-dB gain bandwidth of 2 GHz.

T08-Dual Wideband Dielectric Lens Antenna for Millimeter Wave Applications
Ziqian Zhang, Ziqian Zhang, Ziqian Zhang, Ziqian Zhang
Department of Electronic Engineering, Shanghai Jiao Tong University, Shanghai, China
We present the design of a dielectric lens antenna. The lens is fed by a compact and high-efficiency Vivaldi antenna. Simulation results show that the lens antenna can achieve a peak gain of 15 dBi and a 3-dB gain bandwidth of 2 GHz.

T09-Dual Wideband Dual-Polarized Dielectric Lens Antenna for Millimeter Wave 5G Application
Ziqian Zhang, Ziqian Zhang, Ziqian Zhang, Ziqian Zhang
Department of Electronic Engineering, Shanghai Jiao Tong University, Shanghai, China
We present the design of a dielectric lens antenna. The lens is fed by a compact and high-efficiency Vivaldi antenna. Simulation results show that the lens antenna can achieve a peak gain of 15 dBi and a 3-dB gain bandwidth of 2 GHz.

T10-Dual Wideband Dual-Polarized Dielectric Lens Antenna for Millimeter Wave 5G Application
Ziqian Zhang, Ziqian Zhang, Ziqian Zhang, Ziqian Zhang
Department of Electronic Engineering, Shanghai Jiao Tong University, Shanghai, China
We present the design of a dielectric lens antenna. The lens is fed by a compact and high-efficiency Vivaldi antenna. Simulation results show that the lens antenna can achieve a peak gain of 15 dBi and a 3-dB gain bandwidth of 2 GHz.

T11-Dual Wideband Dual-Polarized Dielectric Lens Antenna for Millimeter Wave 5G Application
Ziqian Zhang, Ziqian Zhang, Ziqian Zhang, Ziqian Zhang
Department of Electronic Engineering, Shanghai Jiao Tong University, Shanghai, China
We present the design of a dielectric lens antenna. The lens is fed by a compact and high-efficiency Vivaldi antenna. Simulation results show that the lens antenna can achieve a peak gain of 15 dBi and a 3-dB gain bandwidth of 2 GHz.

T12-Dual Wideband Dual-Polarized Dielectric Lens Antenna for Millimeter Wave 5G Application
Ziqian Zhang, Ziqian Zhang, Ziqian Zhang, Ziqian Zhang
Department of Electronic Engineering, Shanghai Jiao Tong University, Shanghai, China
We present the design of a dielectric lens antenna. The lens is fed by a compact and high-efficiency Vivaldi antenna. Simulation results show that the lens antenna can achieve a peak gain of 15 dBi and a 3-dB gain bandwidth of 2 GHz.

T13-Dual Wideband Dual-Polarized Dielectric Lens Antenna for Millimeter Wave 5G Application
Ziqian Zhang, Ziqian Zhang, Ziqian Zhang, Ziqian Zhang
Department of Electronic Engineering, Shanghai Jiao Tong University, Shanghai, China
We present the design of a dielectric lens antenna. The lens is fed by a compact and high-efficiency Vivaldi antenna. Simulation results show that the lens antenna can achieve a peak gain of 15 dBi and a 3-dB gain bandwidth of 2 GHz.

T14-Dual Wideband Dual-Polarized Dielectric Lens Antenna for Millimeter Wave 5G Application
Ziqian Zhang, Ziqian Zhang, Ziqian Zhang, Ziqian Zhang
Department of Electronic Engineering, Shanghai Jiao Tong University, Shanghai, China
We present the design of a dielectric lens antenna. The lens is fed by a compact and high-efficiency Vivaldi antenna. Simulation results show that the lens antenna can achieve a peak gain of 15 dBi and a 3-dB gain bandwidth of 2 GHz.

T15-Dual Wideband Dual-Polarized Dielectric Lens Antenna for Millimeter Wave 5G Application
Ziqian Zhang, Ziqian Zhang, Ziqian Zhang, Ziqian Zhang
Department of Electronic Engineering, Shanghai Jiao Tong University, Shanghai, China
We present the design of a dielectric lens antenna. The lens is fed by a compact and high-efficiency Vivaldi antenna. Simulation results show that the lens antenna can achieve a peak gain of 15 dBi and a 3-dB gain bandwidth of 2 GHz.

T16-Dual Wideband Dual-Polarized Dielectric Lens Antenna for Millimeter Wave 5G Application
Ziqian Zhang, Ziqian Zhang, Ziqian Zhang, Ziqian Zhang
Department of Electronic Engineering, Shanghai Jiao Tong University, Shanghai, China
We present the design of a dielectric lens antenna. The lens is fed by a compact and high-efficiency Vivaldi antenna. Simulation results show that the lens antenna can achieve a peak gain of 15 dBi and a 3-dB gain bandwidth of 2 GHz.

T17-Dual Wideband Dual-Polarized Dielectric Lens Antenna for Millimeter Wave 5G Application
Ziqian Zhang, Ziqian Zhang, Ziqian Zhang, Ziqian Zhang
Department of Electronic Engineering, Shanghai Jiao Tong University, Shanghai, China
We present the design of a dielectric lens antenna. The lens is fed by a compact and high-efficiency Vivaldi antenna. Simulation results show that the lens antenna can achieve a peak gain of 15 dBi and a 3-dB gain bandwidth of 2 GHz.

T18-Dual Wideband Dual-Polarized Dielectric Lens Antenna for Millimeter Wave 5G Application
Ziqian Zhang, Ziqian Zhang, Ziqian Zhang, Ziqian Zhang
Department of Electronic Engineering, Shanghai Jiao Tong University, Shanghai, China
We present the design of a dielectric lens antenna. The lens is fed by a compact and high-efficiency Vivaldi antenna. Simulation results show that the lens antenna can achieve a peak gain of 15 dBi and a 3-dB gain bandwidth of 2 GHz.

T19-Dual Wideband Dual-Polarized Dielectric Lens Antenna for Millimeter Wave 5G Application
Ziqian Zhang, Ziqian Zhang, Ziqian Zhang, Ziqian Zhang
Department of Electronic Engineering, Shanghai Jiao Tong University, Shanghai, China
We present the design of a dielectric lens antenna. The lens is fed by a compact and high-efficiency Vivaldi antenna. Simulation results show that the lens antenna can achieve a peak gain of 15 dBi and a 3-dB gain bandwidth of 2 GHz.

T20-Dual Wideband Dual-Polarized Dielectric Lens Antenna for Millimeter Wave 5G Application
Ziqian Zhang, Ziqian Zhang, Ziqian Zhang, Ziqian Zhang
Department of Electronic Engineering, Shanghai Jiao Tong University, Shanghai, China
We present the design of a dielectric lens antenna. The lens is fed by a compact and high-efficiency Vivaldi antenna. Simulation results show that the lens antenna can achieve a peak gain of 15 dBi and a 3-dB gain bandwidth of 2 GHz.

T21-Dual Wideband Dual-Polarized Dielectric Lens Antenna for Millimeter Wave 5G Application
Ziqian Zhang, Ziqian Zhang, Ziqian Zhang, Ziqian Zhang
Department of Electronic Engineering, Shanghai Jiao Tong University, Shanghai, China
We present the design of a dielectric lens antenna. The lens is fed by a compact and high-efficiency Vivaldi antenna. Simulation results show that the lens antenna can achieve a peak gain of 15 dBi and a 3-dB gain bandwidth of 2 GHz.

T22-Dual Wideband Dual-Polarized Dielectric Lens Antenna for Millimeter Wave 5G Application
Ziqian Zhang, Ziqian Zhang, Ziqian Zhang, Ziqian Zhang
Department of Electronic Engineering, Shanghai Jiao Tong University, Shanghai, China
We present the design of a dielectric lens antenna. The lens is fed by a compact and high-efficiency Vivaldi antenna. Simulation results show that the lens antenna can achieve a peak gain of 15 dBi and a 3-dB gain bandwidth of 2 GHz.

T23-Dual Wideband Dual-Polarized Dielectric Lens Antenna for Millimeter Wave 5G Application
Ziqian Zhang, Ziqian Zhang, Ziqian Zhang, Ziqian Zhang
Department of Electronic Engineering, Shanghai Jiao Tong University, Shanghai, China
We present the design of a dielectric lens antenna. The lens is fed by a compact and high-efficiency Vivaldi antenna. Simulation results show that the lens antenna can achieve a peak gain of 15 dBi and a 3-dB gain bandwidth of 2 GHz.

T24-Dual Wideband Dual-Polarized Dielectric Lens Antenna for Millimeter Wave 5G Application
Ziqian Zhang, Ziqian Zhang, Ziqian Zhang, Ziqian Zhang
Department of Electronic Engineering, Shanghai Jiao Tong University, Shanghai, China
We present the design of a dielectric lens antenna. The lens is fed by a compact and high-efficiency Vivaldi antenna. Simulation results show that the lens antenna can achieve a peak gain of 15 dBi and a 3-dB gain bandwidth of 2 GHz.

T25-Dual Wideband Dual-Polarized Dielectric Lens Antenna for Millimeter Wave 5G Application
Ziqian Zhang, Ziqian Zhang, Ziqian Zhang, Ziqian Zhang
Department of Electronic Engineering, Shanghai Jiao Tong University, Shanghai, China
We present the design of a dielectric lens antenna. The lens is fed by a compact and high-efficiency Vivaldi antenna. Simulation results show that the lens antenna can achieve a peak gain of 15 dBi and a 3-dB gain bandwidth of 2 GHz.

T26-Dual Wideband Dual-Polarized Dielectric Lens Antenna for Millimeter Wave 5G Application
Ziqian Zhang, Ziqian Zhang, Ziqian Zhang, Ziqian Zhang
Department of Electronic Engineering, Shanghai Jiao Tong University, Shanghai, China
We present the design of a dielectric lens antenna. The lens is fed by a compact and high-efficiency Vivaldi antenna. Simulation results show that the lens antenna can achieve a peak gain of 15 dBi and a 3-dB gain bandwidth of 2 GHz.

T27-Dual Wideband Dual-Polarized Dielectric Lens Antenna for Millimeter Wave 5G Application
Ziqian Zhang, Ziqian Zhang, Ziqian Zhang, Ziqian Zhang
Department of Electronic Engineering, Shanghai Jiao Tong University, Shanghai, China
We present the design of a dielectric lens antenna. The lens is fed by a compact and high-efficiency Vivaldi antenna. Simulation results show that the lens antenna can achieve a peak gain of 15 dBi and a 3-dB gain bandwidth of 2 GHz.

T28-Dual Wideband Dual-Polarized Dielectric Lens Antenna for Millimeter Wave 5G Application
Ziqian Zhang, Ziqian Zhang, Ziqian Zhang, Ziqian Zhang
Department of Electronic Engineering, Shanghai Jiao Tong University, Shanghai, China
We present the design of a dielectric lens antenna. The lens is fed by a compact and high-efficiency Vivaldi antenna. Simulation results show that the lens antenna can achieve a peak gain of 15 dBi and a 3-dB gain bandwidth of 2 GHz.

T29-Dual Wideband Dual-Polarized Dielectric Lens Antenna for Millimeter Wave 5G Application
Ziqian Zhang, Ziqian Zhang, Ziqian Zhang, Ziqian Zhang
Department of Electronic Engineering, Shanghai Jiao Tong University, Shanghai, China
We present the design of a dielectric lens antenna. The lens is fed by a compact and high-efficiency Vivaldi antenna. Simulation results show that the lens antenna can achieve a peak gain of 15 dBi and a 3-dB gain bandwidth of 2 GHz.

T30-Dual Wideband Dual-Polarized Dielectric Lens Antenna for Millimeter Wave 5G Application
Ziqian Zhang, Ziqian Zhang, Ziqian Zhang, Ziqian Zhang
Department of Electronic Engineering, Shanghai Jiao Tong University, Shanghai, China
We present the design of a dielectric lens antenna. The lens is fed by a compact and high-efficiency Vivaldi antenna. Simulation results show that the lens antenna can achieve a peak gain of 15 dBi and a 3-dB gain bandwidth of 2 GHz.

T31-Dual Wideband Dual-Polarized Dielectric Lens Antenna for Millimeter Wave 5G Application
Ziqian Zhang, Ziqian Zhang, Ziqian Zhang, Ziqian Zhang
Department of Electronic Engineering, Shanghai Jiao Tong University, Shanghai, China
We present the design of a dielectric lens antenna. The lens is fed by a compact and high-efficiency Vivaldi antenna. Simulation results show that the lens antenna can achieve a peak gain of 15 dBi and a 3-dB gain bandwidth of 2 GHz.

T32-Dual Wideband Dual-Polarized Dielectric Lens Antenna for Millimeter Wave 5G Application
Ziqian Zhang, Ziqian Zhang, Ziqian Zhang, Ziqian Zhang
Department of Electronic Engineering, Shanghai Jiao Tong University, Shanghai, China
We present the design of a dielectric lens antenna. The lens is fed by a compact and high-efficiency Vivaldi antenna. Simulation results show that the lens antenna can achieve a peak gain of 15 dBi and a 3-dB gain bandwidth of 2 GHz.

T33-Dual Wideband Dual-Polarized Dielectric Lens Antenna for Millimeter Wave 5G Application
Ziqian Zhang, Ziqian Zhang, Ziqian Zhang, Ziqian Zhang
Department of Electronic Engineering, Shanghai Jiao Tong University, Shanghai, China
We present the design of a dielectric lens antenna. The lens is fed by a compact and high-efficiency Vivaldi antenna. Simulation results show that the lens antenna can achieve a peak gain of 15 dBi and a 3-dB gain bandwidth of 2 GHz.

T34-Dual Wideband Dual-Polarized Dielectric Lens Antenna for Millimeter Wave 5G Application
Ziqian Zhang, Ziqian Zhang, Ziqian Zhang, Ziqian Zhang
Department of Electronic Engineering, Shanghai Jiao Tong University, Shanghai, China
We present the design of a dielectric lens antenna. The lens is fed by a compact and high-efficiency Vivaldi antenna. Simulation results show that the lens antenna can achieve a peak gain of 15 dBi and a 3-dB gain bandwidth of 2 GHz.

T35-Dual Wideband Dual-Polarized Dielectric Lens Antenna for Millimeter Wave 5G Application
Ziqian Zhang, Ziqian Zhang, Ziqian Zhang, Ziqian Zhang
Department of Electronic Engineering, Shanghai Jiao Tong University, Shanghai, China
We present the design of a dielectric lens antenna. The lens is fed by a compact and high-efficiency Vivaldi antenna. Simulation results show that the lens antenna can achieve a peak gain of 15 dBi and a 3-dB gain bandwidth of 2 GHz.

T36-Dual Wideband Dual-Polarized Dielectric Lens Antenna for Millimeter Wave 5G Application
Ziqian Zhang, Ziqian Zhang, Ziqian Zhang, Ziqian Zhang
Department of Electronic Engineering, Shanghai Jiao Tong University, Shanghai, China
We present the design of a dielectric lens antenna. The lens is fed by a compact and high-efficiency Vivaldi antenna. Simulation results show that the lens antenna can achieve a peak gain of 15 dBi and a 3-dB gain bandwidth of 2 GHz.

T37-Dual Wideband Dual-Polarized Dielectric Lens Antenna for Millimeter Wave 5G Application
Ziqian Zhang, Ziqian Zhang, Ziqian Zhang, Ziqian Zhang
Department of Electronic Engineering, Shanghai Jiao Tong University, Shanghai, China
We present the design of a dielectric lens antenna. The lens is fed by a compact and high-efficiency Vivaldi antenna. Simulation results show that the lens antenna can achieve a peak gain of 15 dBi and a 3-dB gain bandwidth of 2 GHz.

T38-Dual Wideband Dual-Polarized Dielectric Lens Antenna for Millimeter Wave 5G Application
Ziqian Zhang, Ziqian Zhang, Ziqian Zhang, Ziqian Zhang
Department of Electronic Engineering, Shanghai Jiao Tong University, Shanghai, China
We present the design of a dielectric lens antenna. The lens is fed by a compact and high-efficiency Vivaldi antenna. Simulation results show that the lens antenna can achieve a peak gain of 15 dBi and a 3-dB gain bandwidth of 2 GHz.

T39-Dual Wideband Dual-Polarized Dielectric Lens Antenna for Millimeter Wave 5G Application
Ziqian Zhang, Ziqian Zhang, Ziqian Zhang, Ziqian Zhang
Department of Electronic Engineering, Shanghai Jiao Tong University, Shanghai, China
We present the design of a dielectric lens antenna. The lens is fed by a compact and high-efficiency Vivaldi antenna. Simulation results show that the lens antenna can achieve a peak gain of 15 dBi and a 3-dB gain bandwidth of 2 GHz.

T40-Dual Wideband Dual-Polarized Dielectric Lens Antenna for Millimeter Wave 5G Application
Ziqian Zhang, Ziqian Zhang, Ziqian Zhang, Ziqian Zhang
Department of Electronic Engineering, Shanghai Jiao Tong University, Shanghai, China
We present the design of a dielectric lens antenna. The lens is fed by a compact and high-efficiency Vivaldi antenna. Simulation results show that the lens antenna can achieve a peak gain of 15 dBi and a 3-dB gain bandwidth of 2 GHz.

T41-Dual Wideband Dual-Polarized Dielectric Lens Antenna for Millimeter Wave 5G Application
Ziqian Zhang, Ziqian Zhang, Ziqian Zhang, Ziqian Zhang
Department of Electronic Engineering, Shanghai Jiao Tong University, Shanghai, China
We present the design of a dielectric lens antenna. The lens is fed by a compact and high-efficiency Vivaldi antenna. Simulation results show that the lens antenna can achieve a peak gain of 15 dBi and a 3-dB gain bandwidth of 2 GHz.

T42-Dual Wideband Dual-Polarized Dielectric Lens Antenna for Millimeter Wave 5G Application
Ziqian Zhang, Ziqian Zhang, Ziqian Zhang, Ziqian Zhang
Department of Electronic Engineering, Shanghai Jiao Tong University, Shanghai, China
We present the design of a dielectric lens antenna. The lens is fed by a compact and high-efficiency Vivaldi antenna. Simulation results show that the lens antenna can achieve a peak gain of 15 dBi and a 3-dB gain bandwidth of 2 GHz.

T43-Dual Wideband Dual-Polarized Dielectric Lens Antenna for Millimeter Wave 5G Application
Ziqian Zhang, Ziqian Zhang, Ziqian Zhang, Ziqian Zhang
Department of Electronic Engineering, Shanghai Jiao Tong University, Shanghai, China
We present the design of a dielectric lens antenna. The lens is fed by a compact and high-efficiency Vivaldi antenna. Simulation results show that the lens antenna can achieve a peak gain of 15 dBi and a 3-dB gain bandwidth of 2 GHz.

T44-Dual Wideband Dual-Polarized Dielectric Lens Antenna for Millimeter Wave 5G Application
Ziqian Zhang, Ziqian Zhang, Ziqian Zhang, Ziqian Zhang
Department of Electronic Engineering, Shanghai Jiao Tong University, Shanghai, China
We present the design of a dielectric lens antenna. The lens is fed by a compact and high-efficiency Vivaldi antenna. Simulation results show that the lens antenna can achieve a peak gain of 15 dBi and a 3-dB gain bandwidth of 2 GHz.

T45-Dual Wideband Dual-Polarized Dielectric Lens Antenna for Millimeter Wave 5G Application
Ziqian Zhang, Ziqian Zhang, Ziqian Zhang, Ziqian Zhang
Department of Electronic Engineering, Shanghai Jiao Tong University, Shanghai, China
We present the design of a dielectric lens antenna. The lens is fed by a compact and high-efficiency Vivaldi antenna. Simulation results show that the lens antenna can achieve a peak gain of 15 dBi and a 3-dB gain bandwidth of 2 GHz.

T46-Dual Wideband Dual-Polarized Dielectric Lens Antenna for Millimeter Wave 5G Application
Ziqian Zhang, Ziqian Zhang, Ziqian Zhang, Ziqian Zhang
Department of Electronic Engineering, Shanghai Jiao Tong University, Shanghai, China
We present the design of a dielectric lens antenna. The lens is fed by a compact and high-efficiency Vivaldi antenna. Simulation results show that the lens antenna can achieve a peak gain of 15 dBi and a 3-dB gain bandwidth of 2 GHz.

T47-Dual Wideband Dual-Polarized Dielectric Lens Antenna for Millimeter Wave 5G Application
Ziqian Zhang, Ziqian Zhang, Ziqian Zhang, Ziqian Zhang
Department of Electronic Engineering, Shanghai Jiao Tong University, Shanghai, China
We present the design of a dielectric lens antenna. The lens is fed by a compact and high-efficiency Vivaldi antenna. Simulation results show that the lens antenna can achieve a peak gain of 15 dBi and a 3-dB gain bandwidth of 2 GHz.

T48-Dual Wideband Dual-Polarized Dielectric Lens Antenna for Millimeter Wave 5G Application
Ziqian Zhang, Ziqian Zhang, Ziqian Zhang, Ziqian Zhang
Department of Electronic Engineering, Shanghai Jiao Tong University, Shanghai, China
We present the design of a dielectric lens antenna. The lens is fed by a compact and high-efficiency Vivaldi antenna. Simulation results show that the lens antenna can achieve a peak gain of 15 dBi and a 3-dB gain bandwidth of 2 GHz.

T49-Dual Wideband Dual-Polarized Dielectric Lens Antenna for Millimeter Wave 5G Application
Ziqian Zhang, Ziqian Zhang, Ziqian Zhang, Ziqian Zhang
Department of Electronic Engineering, Shanghai Jiao Tong University, Shanghai, China
We present the design of a dielectric lens antenna. The lens is fed by a compact and high-efficiency Vivaldi antenna. Simulation results show that the lens antenna can achieve a peak gain of 15 dBi and a 3-dB gain bandwidth of 2 GHz.

T50-Dual Wideband Dual-Polarized Dielectric Lens Antenna for Millimeter Wave 5G Application
Ziqian Zhang, Ziqian Zhang, Ziqian Zhang, Ziqian Zhang
Department of Electronic Engineering, Shanghai Jiao Tong University, Shanghai, China
We present the design of a dielectric lens antenna. The lens is fed by a compact and high-efficiency Vivaldi antenna. Simulation results show that the lens antenna can achieve a peak gain of 15 dBi and a 3-dB gain bandwidth of 2 GHz.

T51-Dual Wideband Dual-Polarized Dielectric Lens Antenna for Millimeter Wave 5G Application
Ziqian Zhang, Ziqian Zhang, Ziqian Zhang, Ziqian Zhang
Department of Electronic Engineering, Shanghai Jiao Tong University, Shanghai, China
We present the design of a dielectric lens antenna. The lens is fed by a compact and high-efficiency Vivaldi antenna. Simulation results show that the lens antenna can achieve a peak gain of 15 dBi and a 3-dB gain bandwidth of 2 GHz.

T52-Dual Wideband Dual-Polarized Dielectric Lens Antenna for Millimeter Wave 5G Application
Ziqian Zhang, Ziqian Zhang, Ziqian Zhang, Ziqian Zhang
Department of Electronic Engineering, Shanghai Jiao Tong University, Shanghai, China
We present the design of a dielectric lens antenna. The lens is fed by a compact and high-efficiency Vivaldi antenna. Simulation results show that the lens antenna can achieve a peak gain of 15 dBi and a 3-dB gain bandwidth of 2 GHz.

T53-Dual Wideband Dual-Polarized Dielectric Lens Antenna for Millimeter Wave 5G Application
Ziqian Zhang, Ziqian Zhang, Ziqian Zhang, Ziqian Zhang
Department of Electronic Engineering, Shanghai Jiao Tong University, Shanghai, China
We present the design of a dielectric lens antenna. The lens is fed by a compact and high-efficiency Vivaldi antenna. Simulation results show that the lens antenna can achieve a peak gain of 15 dBi and a 3-dB gain bandwidth of 2 GHz.

T54-Dual Wideband Dual-Polarized Dielectric Lens Antenna for Millimeter Wave 5G Application
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T56-Dual Wideband Dual-Polarized Dielectric Lens Antenna for Millimeter Wave 5G Application
Ziqian Zhang, Ziqian Zhang, Ziqian Zhang, Ziqian Zhang
Department of Electronic Engineering, Shanghai Jiao Tong University, Shanghai, China
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T57-Dual Wideband Dual-Polarized Dielectric Lens Antenna for Millimeter Wave 5G Application
Ziqian Zhang, Ziqian Zhang, Ziqian Zhang, Ziqian Zhang
Department of Electronic Engineering, Shanghai Jiao Tong University, Shanghai, China
We present the design of a dielectric lens antenna. The lens is fed by a compact and high-efficiency Vivaldi antenna. Simulation results show that the lens antenna can achieve a peak gain of 15 dBi and a 3-dB gain bandwidth of 2 GHz.

T58-Dual Wideband Dual-Polarized Dielectric Lens Antenna for Millimeter Wave 5G Application
Ziqian Zhang, Ziqian Zhang, Ziqian Zhang, Ziqian Zhang
Department of Electronic Engineering, Shanghai Jiao Tong University, Shanghai, China
We present the design of a dielectric lens antenna. The lens is fed by a compact and high-efficiency Vivaldi antenna. Simulation results show that the lens antenna can achieve a peak gain of 15 dBi and a 3-dB gain bandwidth of 2 GHz.

T59-Dual Wideband Dual-Polarized Dielectric Lens Antenna for Millimeter Wave 5G Application
Ziqian Zhang, Ziqian Zhang, Ziqian Zhang, Ziqian Zhang
Department of Electronic Engineering, Shanghai Jiao Tong University, Shanghai, China
We present the design of a dielectric lens antenna. The lens is fed by a compact and high-efficiency Vivaldi antenna. Simulation results show that the lens antenna can achieve a peak gain of 15 dBi and a 3-dB gain bandwidth of 2 GHz.

T60-Dual Wideband Dual-Polarized Dielectric Lens Antenna for Millimeter Wave 5G Application
Ziqian Zhang, Ziqian Zhang, Ziqian Zhang, Ziqian Zhang
Department of Electronic Engineering, Shanghai Jiao Tong University, Shanghai, China
We present the design of a dielectric lens antenna. The lens is fed by a compact and high-efficiency Vivaldi antenna. Simulation results show that the lens antenna can achieve a peak gain of 15 dBi and a 3-dB gain bandwidth of 2 GHz.

T61-Dual Wideband Dual-Polarized Dielectric Lens Antenna for Millimeter Wave 5G Application
Ziqian Zhang, Ziqian Zhang, Ziqian Zhang, Ziqian Zhang
Department of Electronic Engineering, Shanghai Jiao Tong University, Shanghai, China
We present the design of a dielectric lens antenna. The lens is fed by a compact and high-efficiency Vivaldi antenna. Simulation results show that the lens antenna can achieve a peak gain of 15 dBi and a 3-dB gain bandwidth of 2 GHz.

T62-Dual Wideband Dual-Polarized Dielectric Lens Antenna for Millimeter Wave 5G Application
Ziqian Zhang, Ziqian Zhang, Ziqian Zhang, Ziqian Zhang
Department of Electronic Engineering, Shanghai Jiao Tong University, Shanghai, China
We present the design of a dielectric lens antenna. The lens is fed by a compact and high-efficiency Vivaldi antenna. Simulation results show that the lens antenna can achieve a peak gain of 15 dBi and a 3-dB gain bandwidth of 2 GHz.

T63-Dual Wideband Dual-Polarized Dielectric Lens Antenna for Millimeter Wave 5G Application
Ziqian Zhang, Ziqian Zhang, Ziqian Zhang, Ziqian Zhang
Department of Electronic Engineering, Shanghai Jiao Tong University, Shanghai, China
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T64-Dual Wideband Dual-Polarized Dielectric Lens Antenna for Millimeter Wave 5G Application
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Department of Electronic Engineering, Shanghai Jiao Tong University, Shanghai, China
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T65-Dual Wideband Dual-Polarized Dielectric Lens Antenna for Millimeter Wave 5G Application
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Department of Electronic Engineering, Shanghai Jiao Tong University, Shanghai, China
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Department of Electronic Engineering, Shanghai Jiao Tong University, Shanghai, China
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Department of Electronic Engineering, Shanghai Jiao Tong University, Shanghai, China
We present the design of a dielectric lens antenna. The lens is fed by a compact and high-efficiency Vivaldi antenna. Simulation results show that the lens antenna can achieve a peak gain of 15 dBi and a 3-dB gain bandwidth of 2 GHz.

T69-Dual Wideband Dual-Polarized Dielectric Lens Antenna for Millimeter Wave 5G Application
Ziqian Zhang, Ziqian Zhang, Ziqian Zhang, Ziqian Zhang
Department of Electronic Engineering, Shanghai Jiao Tong University, Shanghai, China
We present the design of a dielectric lens antenna. The lens is fed by a compact and high-efficiency Vivaldi antenna. Simulation results show that the lens antenna can achieve a peak gain of 15 dBi and a 3-dB gain bandwidth of 2 GHz.

T70-Dual Wideband Dual-Polarized Dielectric Lens Antenna for Millimeter Wave 5G Application
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Department of Electronic Engineering, Shanghai Jiao Tong University, Shanghai, China
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T71-Dual Wideband Dual-Polarized Dielectric Lens Antenna for Millimeter Wave 5G Application
Ziqian Zhang, Ziqian Zhang, Ziqian Zhang, Ziqian Zhang
Department of Electronic Engineering, Shanghai Jiao Tong University, Shanghai, China
We present the design of a dielectric lens antenna. The lens is fed by a compact and high-efficiency Vivaldi antenna. Simulation results show that the lens antenna can achieve a peak gain of 15 dBi and a 3-dB gain bandwidth of 2 GHz.

T72-Dual Wideband Dual-Polarized Dielectric Lens Antenna for Millimeter Wave 5G Application
Ziqian Zhang, Ziqian Zhang, Ziqian Zhang, Ziqian Zhang
Department of Electronic Engineering, Shanghai Jiao Tong University, Shanghai, China
We present the design of a dielectric lens antenna. The lens is fed by a compact and high-efficiency Vivaldi antenna. Simulation results show that the lens antenna can achieve a peak gain of 15 dBi and a 3-dB gain bandwidth of 2 GHz.

T73-Dual Wideband Dual-Polarized Dielectric Lens Antenna for Millimeter Wave 5G Application
Ziqian Zhang, Ziqian Zhang, Ziqian Zhang, Ziqian Zhang
Department of Electronic Engineering, Shanghai Jiao Tong University, Shanghai, China
We present the design of a dielectric lens antenna. The lens is fed by a compact and high-efficiency Vivaldi antenna. Simulation results show that the lens antenna can achieve a peak gain of 15 dBi and a 3-dB gain bandwidth of 2 GHz.

T74-Dual Wideband Dual-Polarized Dielectric Lens Antenna for Millimeter Wave 5G Application
Ziqian Zhang, Ziqian Zhang, Ziqian Zhang, Ziqian Zhang
Department of Electronic Engineering, Shanghai Jiao Tong University, Shanghai, China
We present the design of a dielectric lens antenna. The lens is fed by a compact and high-efficiency Vivaldi antenna. Simulation results show that the lens antenna can achieve a peak gain of 15 dBi and a 3-dB gain bandwidth of 2 GHz.

T75-Dual Wideband Dual-Polarized Dielectric Lens Antenna for Millimeter Wave 5G Application
Ziqian Zhang, Ziqian Zhang, Ziqian Zhang, Ziqian Zhang
Department of Electronic Engineering, Shanghai Jiao Tong University, Shanghai, China
We present the design of a dielectric lens antenna. The lens is fed by a compact and high-efficiency Vivaldi antenna. Simulation results show that the lens antenna can achieve a peak gain of 15 dBi and a 3-dB gain bandwidth of 2 GHz.

T76-Dual Wideband Dual-Polarized Dielectric Lens Antenna for Millimeter Wave 5G Application
Ziqian Zhang, Ziqian Zhang, Ziqian Zhang, Ziqian Zhang
Department of Electronic Engineering, Shanghai Jiao Tong University, Shanghai, China
We present the design of a dielectric lens antenna. The lens is fed by a compact and high-efficiency Vivaldi antenna. Simulation results show that the lens antenna can achieve a peak gain of 15 dBi and a 3-dB gain bandwidth of 2 GHz.

**T77-Dual Wideband Dual-

Initial Investigation of A Broad Small-Scale Fading Statistics
Cristina Ribeiro, Pedro Pinho, Nuno Borges Carvalho, Universidade de Aveiro / Instituto de Telecomunicações, Portugal, Giovanna Vannucchi Marchetti DACH Deutschland, Germany, Jonathan Lemorton, Rohde & Schwarz, Germany, Jonathan Lemorton, Rohde & Schwarz, Germany, Jonathan Lemorton, Rohde & Schwarz, Germany, Tetsuya Kawanishi, Waseda University, Japan

Ultra-Wideband Channel Sounder Using Time-Domain Sampling
Matthias Kahl, Fraunhofer-Institut für Nachrichtentechnik, Heinrich-Hertz-Institut, Germany, Matthias Kahl, Fraunhofer-Institut für Nachrichtentechnik, Heinrich-Hertz-Institut, Germany, Matthias Kahl, Fraunhofer-Institut für Nachrichtentechnik, Heinrich-Hertz-Institut, Germany, Matthias Kahl, Fraunhofer-Institut für Nachrichtentechnik, Heinrich-Hertz-Institut, Germany, Matthias Kahl, Fraunhofer-Institut für Nachrichtentechnik, Heinrich-Hertz-Institut, Germany

Channel Sounding Measurements in Urban Environments
Carlos Dias, Andreas Schwarzinger, Technical University of Graz, Austria, Carlos Dias, Andreas Schwarzinger, Technical University of Graz, Austria, Carlos Dias, Andreas Schwarzinger, Technical University of Graz, Austria, Carlos Dias, Andreas Schwarzinger, Technical University of Graz, Austria, Carlos Dias, Andreas Schwarzinger, Technical University of Graz, Austria

TO-A12: Robust Time Temperature Maps Reconstruction in Microwave Cancer Hyperthermia
Ioannis Kostopoulos, Dimitrios Kosmopoulos, Dimitrios Ioannidis, Dimitrios Tsoumpas, Dimitrios Ioannidis, Dimitrios Tsoumpas, Dimitrios Ioannidis, Dimitrios Tsoumpas

C53: Electromagnetic Theory and Applications

Chair: Gerhard Siegl, University of Bayreuse, Germany

Co-Chair: Yasuhiro Tamayama, Tokyo Metropolitan University, Japan

10:00 Possibility Study of Detection of Concealed Objects ZFFR with Microwave Medical Imaging

Kazuyuki Ito (Chiba University of Technology, Japan), Takashi Ohira (Chiba University of Technology, Japan), Hiroyuki Ito (Chiba University of Science and Technology, Chiba, Japan), Takashi Ohira (University of Electronic Science and Technology of China, China), Yifan Chen (University of Wollongong, Australia), Yoshio Koyanagi (Chiba University of Technology, Japan), Nobuyuki Kikuma (Chiba University of Technology, Japan), Hirofumi Hinata (Chiba University of Technology, Japan), Kenichi Jonuti (Hoko Electron Corporation, Japan), Kenichi Ohsawa (Hoko Electron Corporation, Japan), Hiroshi Ichikawa (Hoko Electron Corporation, Japan), Hiroshi Ichikawa (Hoko Electron Corporation, Japan)

Microwave medical imaging is a technique for detecting a cancer tumor by using the difference in the dielectric constant between the cancer tissue and the surrounding healthy tissue. The imaging algorithm is based on the Delayed Multiple Signal Classification (DMUSIC) algorithm. In this study, we propose a new method for detecting concealed objects using microwave medical imaging technique. We have developed a prototype system for detecting concealed objects using the proposed method. In this paper, we report the results of the possibility study of detection of concealed objects using the developed prototype system. We have confirmed that the proposed method can detect the reflection from the concealed objects.

10:15 Full-Wave Analysis of Electromagnetic Scattering from Dielectric Objects Using Hybrid Method of Moments and Finite Element Method

Ryoichi Sato (Hokkaido University, Japan), Ryoichi Sato (Hokkaido University, Japan), Ryoichi Sato (Hokkaido University, Japan)

We have proposed a new method for full-wave analysis of electromagnetic scattering from dielectric objects by combining the method of moments (MoM) and the finite element method (FEM). In the proposed method, the unknowns are the electric and magnetic fields on the surface of the dielectric objects. The proposed method can be applied to the analysis of electromagnetic scattering from dielectric objects with complex shapes. In this paper, we present the formulation of the proposed method and show the numerical results to demonstrate the validity and the usefulness of the proposed method.

10:30 Fast Jacobian Matrix Formulation for Microwave Tomography Applications

Ahmed Abdelrahman (Chalmers University of Technology, Sweden), Ahmed Abdelrahman (Chalmers University of Technology, Sweden), Andreas Fhager and Mikael Persson (Chalmers University of Technology, Sweden), Paul Meaney (Dartmouth College, USA), Kenneth Paulsen (Dartmouth College, USA)

This paper presents a fast Jacobian matrix formulation for microwave tomography applications. The proposed formulation is based on the Lippmann-Schwinger integral equation. A parametric compact form for the inside object method and previous observations regarding the Jacobian matrix are used to derive the fast Jacobian matrix formulation. The proposed formulation is tested against a finite difference approach for a 2D breast phantom. The results show that the proposed formulation is more accurate than the finite difference approach and more than 100 times faster than the finite difference approach for the 2D breast phantom. The proposed formulation is also tested for a 3D breast phantom and the results show that the computational complexity of the forward solvers decreased with course breakthrough from both the integral kernel and reverse operator. The proposed formulation is expected to be more efficient than the finite difference approach for 3D problems.

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11:00 Full Wave Analysis of Electromagnetic Scattering from Dielectric Objects Using Hybrid Method of Moments and Finite Element Method

Ryoichi Sato (Hokkaido University, Japan), Ryoichi Sato (Hokkaido University, Japan), Ryoichi Sato (Hokkaido University, Japan)

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C54: Characteristic Mode Analysis for Antenna Designs and Applications and New Structures Part 1 ▼

Chair: Mengchun Pan, Sichuan University, China

Co-Chair: Yuanqing Yang, Sichuan University, China

Charles Kalyan C Zulkifuka University of Missouri-Kansas City & Missouri Institute of Defense and Energy, USA, Chris MacKerrilll University of Hertfordshire, United Kingdom

10:00 Wideband Microwave Patch Antenna with Low RCS Using Multi-Mode Resonance

Ziqiang Tang (Sichuan University, China), Ziqiang Tang (Sichuan University, China), Ziqiang Tang (Sichuan University, China), Ziqiang Tang (Sichuan University, China)

A wideband microwave patch antenna with low radar cross section (RCS) using multi-mode resonance is presented in this paper. The proposed antenna is composed of a square patch, a pair of L-shaped slots and a ground plane. The wideband and low RCS characteristics are achieved by the multi-mode resonance of the L-shaped slots. The measured results show that the proposed antenna has a wide impedance bandwidth of 3.1 GHz (2.7-5.8 GHz), which is 1.8 times of the bandwidth of the conventional patch. The measured RCS reduction is more than 10 dB in the frequency band of 3.1-5.8 GHz. Meanwhile, the maximum gain of the proposed antenna is 5.5 dBi. The low radiation characteristics of the proposed antenna are also maintained.

10:15 Broadband, Dual-Linear Polarization Microstrip Patch Array Antenna Using Characteristic Mode Analysis

Xiaoming Chen, Wei Li and Wang Chen Tang (Chongqing University, China)

A broadband, dual-linear polarization microstrip patch array antenna using characteristic mode analysis is investigated. The proposed antenna is composed of a two-layer substrate and a pair of orthogonal feeding slots. The characteristic mode analysis is used to analyze the resonant modes of the patch and to determine the optimal feeding slots. The measured results show that the proposed antenna is demonstrated the low-profile wideband dual-linear polarized microstrip patch array. The proposed antenna has a wide impedance bandwidth of 3.1 GHz (2.7-5.8 GHz), which is 1.8 times of the bandwidth of the conventional patch. The measured RCS reduction is more than 10 dB in the frequency band of 3.1-5.8 GHz. Meanwhile, the maximum gain of the proposed antenna is 5.5 dBi. The low radiation characteristics of the proposed antenna are also maintained.

10:30 Compact Dielectric Resonator Chain Resonator Antenna Using Characteristic Mode Analysis for 3G and 4G Networks

Jia Chen Bai, Xi Yi Wang Hao (Jiangsu Province, China), Xi Yi Wang Hao (Jiangsu Province, China)

This paper presents a compact dielectric resonator chain resonator antenna for 3G and 4G mobile communications. The proposed antenna is composed of a cylindrical dielectric resonator and a pair of L-shaped slots. The characteristic mode analysis is used to analyze the resonant modes of the dielectric resonator and to determine the optimal feeding slots. The measured results show that the proposed antenna has a wide impedance bandwidth of 1.1 GHz (2.3-3.4 GHz), which is 1.8 times of the bandwidth of the conventional dielectric resonator antenna. The measured RCS reduction is more than 10 dB in the frequency band of 2.3-3.4 GHz. Meanwhile, the maximum gain of the proposed antenna is 5.5 dBi. The low radiation characteristics of the proposed antenna are also maintained.

10:45 Fast Characteristic Mode Analysis for Metal-Only and Multi-Layer Microstrip Circuits Design

Yuanqing Yang (Sichuan University, China), Yuanqing Yang (Sichuan University, China), Yuanqing Yang (Sichuan University, China), Yuanqing Yang (Sichuan University, China)

Characteristic mode analysis (CMA) is a powerful tool for analyzing and designing antennas. However, the computational complexity of CMA is very high, which limits its application. In this paper, a fast CMA for metal-only and multi-layer microstrip circuits is presented. The proposed method is based on the Cauchy-Schwarz inequality and the Lanczos algorithm. The proposed method is demonstrated for the low-profile WideLinks Broad Antenna Array (WLBAA) and multi-layer microstrip circuits to provide a wide operational bandwidth. The proposed method is expected to be more efficient than the finite difference approach for 3D problems. The proposed method is also tested for a 3D breast phantom and the results show that the computational complexity of the forward solvers decreased with course breakthrough from both the integral kernel and reverse operator.

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C55a: Characteristic Mode Analysis for Antenna Design and Applications ▼

Chair: Mengchun Pan, Sichuan University, China

Co-Chair: Yuanqing Yang, Sichuan University, China

10:00 Characteristic Mode Analysis for Metal-Only Antennas with Slots Excited by Capacitive Feed

Zhongqi Zhang, Yuanqing Yang (Sichuan University, China), Zhongqi Zhang, Yuanqing Yang (Sichuan University, China)

Characteristic mode analysis (CMA) is a powerful tool for analyzing and designing antennas. However, the computational complexity of CMA is very high, which limits its application. In this paper, a fast CMA for metal-only and multi-layer microstrip circuits is presented. The proposed method is based on the Cauchy-Schwarz inequality and the Lanczos algorithm. The proposed method is demonstrated for the low-profile WideLinks Broad Antenna Array (WLBAA) and multi-layer microstrip circuits to provide a wide operational bandwidth. The proposed method is expected to be more efficient than the finite difference approach for 3D problems. The proposed method is also tested for a 3D breast phantom and the results show that the computational complexity of the forward solvers decreased with course breakthrough from both the integral kernel and reverse operator.

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10:30 Characteristic Mode Analysis of Spoof Surface Plasmon Polaritons Based on Metamaterials and Slow Wave Structures

Yuanqing Yang (Sichuan University, China), Yuanqing Yang (Sichuan University, China), Yuanqing Yang (Sichuan University, China), Yuanqing Yang (Sichuan University, China)

Characteristic mode analysis (CMA) is a powerful tool for analyzing and designing antennas. However, the computational complexity of CMA is very high, which limits its application. In this paper, a fast CMA for metal-only and multi-layer microstrip circuits is presented. The proposed method is based on the Cauchy-Schwarz inequality and the Lanczos algorithm. The proposed method is demonstrated for the low-profile WideLinks Broad Antenna Array (WLBAA) and multi-layer microstrip circuits to provide a wide operational bandwidth. The proposed method is expected to be more efficient than the finite difference approach for 3D problems. The proposed method is also tested for a 3D breast phantom and the results show that the computational complexity of the forward solvers decreased with course breakthrough from both the integral kernel and reverse operator.

10:45 Characteristic Mode Analysis for Metal-Only Antennas with Slots Excited by Capacitive Feed

Zhongqi Zhang, Yuanqing Yang (Sichuan University, China), Zhongqi Zhang, Yuanqing Yang (Sichuan University, China)

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C56: EuMA | EuRAP Session| EM and Active Electronics Modelling in Antenna Systems for 5G ▼

Chair: Gerhard Siegl, University of Bayreuse, Germany

Co-Chair: Yasuhiro Tamayama, Tokyo Metropolitan University, Japan

10:00 Antenna Modelling for 5G Smartphones Physical Array and Its Effect on Power Amplifiers

Thomas Zwick (Karlsruhe Institute of Technology, Germany), Thomas Zwick (Karlsruhe Institute of Technology, Germany), Thomas Zwick (Karlsruhe Institute of Technology, Germany), Thomas Zwick (Karlsruhe Institute of Technology, Germany), Thomas Zwick (Karlsruhe Institute of Technology, Germany), Thomas Zwick (Karlsruhe Institute of Technology, Germany)

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10:30 Design of MIP-Lenses Antennas for 5G Phased Array Applications at 28 GHz

Giovanna Calò (Politecnico di Bari, Italy), Giovanna Calò (Politecnico di Bari, Italy), Giovanna Calò (Politecnico di Bari, Italy), Giovanna Calò (Politecnico di Bari, Italy), Giovanna Calò (Politecnico di Bari, Italy), Giovanna Calò (Politecnico di Bari, Italy)

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T11–M02: NearField & FarField Antenna Measurements ▼

Chair: Dirk Heberling, RWTH Aachen University, Germany

Co-Chair: Dirk Heberling, RWTH Aachen University, Germany

10:00 Sampling Effect on Backfilling Characteristics of Automotive 3D Antennas in Spherical Near-Field Test Range

Chia-Chan Chang (National Taiwan University, Taiwan), Chia-Chan Chang (National Taiwan University, Taiwan), Chia-Chan Chang (National Taiwan University, Taiwan), Chia-Chan Chang (National Taiwan University, Taiwan), Chia-Chan Chang (National Taiwan University, Taiwan), Chia-Chan Chang (National Taiwan University, Taiwan)

Spherical near-field (SNF) measurements are a well-established technique for antenna characterization. The SNF technique is necessary to accurately characterize the antenna pattern. Sampling is a key parameter that affects regardless of signal strength, sensitivity and dynamic range. The sampling effect is based on the Nyquist-Shannon sampling theorem. The sampling effect is based on the Nyquist-Shannon sampling theorem. The sampling effect is based on the Nyquist-Shannon sampling theorem. The sampling effect is based on the Nyquist-Shannon sampling theorem. The sampling effect is based on the Nyquist-Shannon sampling theorem. The sampling effect is based on the Nyquist-Shannon sampling theorem. In this paper, we propose a new method for Antenna Array Simulation using the Physical Array Simulation Approach. The proposed method is demonstrated for the low-profile WideLinks Broad Antenna Array (WLBAA) and multi-layer microstrip circuits to provide a wide operational bandwidth. The proposed method is expected to be more efficient than the finite difference approach for 3D problems. The proposed method is also tested for a 3D breast phantom and the results show that the computational complexity of the forward solvers decreased with course breakthrough from both the integral kernel and reverse operator.

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10:30 Fast Multi-Probe Near-Field Antenna Measurements with Full Probe Compensation

Thomas Kaiser (University of Duisburg-Essen, Germany), Thomas Kaiser (University of Duisburg-Essen, Germany), Thomas Kaiser (University of Duisburg-Essen, Germany), Thomas Kaiser (University of Duisburg-Essen, Germany), Thomas Kaiser (University of Duisburg-Essen, Germany), Thomas Kaiser (University of Duisburg-Essen, Germany)

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Wei Sun (Other, Jiaxiaoxing Group), Chenxi Xiaoxing (Other, Other, Jiaxiaoxing Group), Yi Chen (University of Liverpool, United Kingdom), Yuan Gao (Other, Other, Jiaxiaoxing Group)

Abstract: Conformal arrays in the automotive environment are subject to significant electromagnetic interference from the vehicle structure, which degrades radiation performance and beam pointing accuracy. This study proposes a conformal array design for a vehicle roof with a ground-plane structure. Theoretical analysis and simulations show that the conformal array maintains stable radiation performance and beam pointing accuracy under the influence of the vehicle structure. This study provides a practical reference for the design and optimization of conformal arrays in vehicle-mounted scenarios, supporting the reliable operation of wireless communication systems in complex electromagnetic environments.

Keywords: conformal array, vehicle-mounted antenna, electromagnetic interference, radiation performance, beam pointing accuracy, vehicle-mounted communication

Antenna Radar Cross Section Measurement Within Wide-Band Near-Field Scanning Chamber

Author: Dr. Ahmed Ali Ibrahim (Other, Other, Other, Other),

Friday, March 26 9:00 - 10:40

C313: Disruptive Antenna Technologies Making 5G a Reality II

Session Chair: Ozgur Ozdemir

Chair: Syed Aseem Abbas (Marquette University, Australia), Muhammad-Al-Amin Bhuiyan (Queen's University Belfast & The Institute of Electronics, Communications and Information Technology (IECIT), United Kingdom)

C313-1 Aperture-Constraints Square Slots Based Sub-6 GHz and Ultra-Wide 5G Antenna Design
Lukas Bunzel and Michael Hofmann (Leibniz Institute of Photonic Technology, Germany)

Antenna design for 5G applications is challenging because of the wide bandwidth and the limited available space for the antenna. Design of Frequency Selective Surfaces (FSS) is a promising approach to overcome these limitations. In this work, a square slot FSS is used to improve the bandwidth of a 5G antenna. The FSS is placed in the aperture of the antenna. The square slots are arranged in a way that they resemble a Sierpinski fractal. The resonance frequency of the FSS can be adjusted by the size of the square slots. The FSS is placed in the aperture of the antenna. The FSS is placed in the aperture of the antenna. The FSS is placed in the aperture of the antenna

Sachs Gustavus Deutsch Institute of Advanced Technology, Sachsen, Germany

Abstract: Modern Electronic Warfare (EW) systems must operate in increasingly congested and contested electromagnetic environments, where traditional signal processing and machine learning approaches increasingly face latency, bandwidth, and robustness limitations. This paper proposes a hybrid quantum-classical framework for real-time EW signal classification and adaptive jamming. We implement a variational quantum circuit (VQC) with 24 qubits and 18 trainable parameters, trained on a dataset of 2.4 million synthetic EW pulses spanning 12 modulation types, 40 dB SNR range, and jamming duty cycles from 0% to 95%. The VQC achieves 91.3% classification accuracy at 4.2 ms per batch, compared to a classical CNN baseline of 94.1% accuracy at 1.8 ms per batch. We also propose a quantum-enhanced jamming waveform generator that uses the VQC's output to select from a library of 64 EW waveforms, yielding a 23% reduction in jamming power for equivalent effect. The results suggest a crossover point where quantum-assisted EW processing becomes advantageous for latency-critical scenarios. We discuss hardware requirements, error mitigation strategies, and the path toward fault-tolerant implementation.

C513: (EuroFAR Session) Ion Traps for Quantum Computing and Sensing

Room: Lilac 1

Chair: Dr. Laurie Hogarth (Fraunhofer Institute for Electronic Nanosystems, Chemnitz, Germany)

8:00 Design of a Compact Textile Cross-Modal Sensor Array for Wearable IoT Applications

Tobias Fahrenkrog, Sophie Wolfram, Dr. Ralf Steinmetz, Prof. Dr. Nina Krüger, Dr. Sebastian Rüdiger, Dr. Sebastian Schmitz, Dr. Lukas Bernhard, Dr. Sebastian Gerlach, Dr. Ulrich Schmitz

Chalermwisutkul (King Mongkut's University of Technology North Bangkok & The Sirindhorn International Thai-German Graduate School of Engineering, Thailand); Adam Narbudowicz (Trinity College Dublin, Ireland & Wroclaw University of Science and Technology, Poland)

The paper proposes a technique for sensing of moisture content of a waste paper block based on Wheeler Cap measurement method. The technique allows sufficient penetration into the sample due to relatively low frequencies in the VHF band. Water blocks within the sample can be detected due to the increased loss compared to a dry sample. The simulation setup comprises a cylindrical Wheeler Cap structure and an electrically small antenna which is located in the same enclosure as the Material Under Test (MUT). The moisture content can be detected due to frequency shift and amplitude change of the reflected signal. The study demonstrates that varying moisture content from 5% to 50% results in the change of the frequency from 276.35 MHz to 264.35 MHz, and simultaneous change in the level of reflected signal from -4.51 to -6.64 dB. Other factors, such as misplacement of the sample, are also discussed.

10:20 ***Wireless Power Transfer (WPT) Enabled IoT Sensors Based on Ultra-Thin Electrically Small Antennas***

Wei Lin (University of Technology Sydney, Australia); Richard Ziolkowski (University of Technology Sydney, Australia & University of Arizona, USA)

Wireless power transfer (WPT) enabled Internet-of-Things (IoT) temperature and light sensors based on two ultra-thin electrically small antennas are reported. Two distinctive wireless power capture capabilities are realized with metamaterial-inspired electrically small antennas. The near-field resonant parasitic (NFRP) element-based Egyptian Axe Dipole (EAD) antenna realizes an omnidirectional pattern. The Huygens dipole antenna, which combines a balanced pair of EAD and capacitively loaded loop (CLL) NFRP elements, realizes a unidirectional pattern. A sensor-augmented rectifier circuit is developed and seamlessly integrated with these antennas. Both of these systems are ultra-thin, being printed on a single piece of PCB substrate. The compact IoT temperature and light detection sensors were successfully implemented and tested. Since these high performance WPT-powered sensors are battery-free, they are very attractive for a variety of IoT applications.

10:40 Coffee Break

11:10 ***Low-Band LTE Antenna Integrated into Mm-Wave Handset Antenna***

Joni Kurvinen (Aalto University School of Electrical Engineering, Finland); Resti Montoya, Anu Lehtovuori and Juha Ala-Laurinaho (Aalto University, Finland); Janne Ilvonen (Huawei Technologies Oy (Finland) Co. Ltd, Finland); Alexander Khripkov (Huawei Technologies LTD, Finland); Ville Viikari (Aalto University & School of Electrical Engineering, Finland)

Integration of small antennas is emphasized when more and more antennas should be placed to the limited volume of handsets. This paper shows a mm-wave antenna array and a low-band LTE antenna, which are designed to share the same metal frame section in a smartphone. The results show that two antennas can be integrated together without additional volume and without remarkable degradation in their performance.

11:30 ***On Effects of a Finite Ground Plane on the Antenna Q-Factor***

Jari-Matti Hannula and Lars Jonsson (KTH Royal Institute of Technology, Sweden)

The ground plane is an important part of many antennas, either as a tool to improve the antenna characteristics, or as a necessity for antennas operating near a metallic device. Due to its prevalence in antenna design, it is important to be able to identify how it affects the optimal antenna performance and consequently how it should be included in the antenna design. In this work we investigate how the antenna Q-factor, a quantity inversely proportional to the Q-factor, is affected by the presence of a finite ground plane, and the location of the antenna relative to it.

11:50 ***Rules of Thumb to Assess Losses of Implanted Antennas***

Mingxiang Gao (Swiss Federal Institute of Technology in Lausanne, Switzerland); Denys Nikolayev (Institut d'Électronique et des Technologies du Numérique (IETR) - UMR CNRS 6164, France); Marko Bosiljevac and Zvonimir Sipus (University of Zagreb, Croatia); Anja K. Skrivervik (EPFL, Switzerland)

Fundamental limits for implanted antennas should be able to evaluate the bounds on losses with the knowledge of physical limitations from antenna and tissue parameters. In this work, rules of thumb to assess losses of deeply implanted antennas are presented toward improving the radiation efficiency. By means of rigorous and approximate approaches, the radiation efficiency of an elementary antenna within a spherical phantom is calculated as a function of multiple variables. According to the rules summarized subsequently, losses from different contributions may play a key role in specific situations, such as changes in the antenna type, phantom size, implant location and operating frequency.

12:10 ***Topology Optimization of Electrically Small Antennas with Shape Regularity Constraints***

Miloslav Capek, Vojtech Neuman, Jonas Tucek and Lukas Jelinek (Czech Technical University in Prague, Czech Republic); Mats Gustafsson (Lund University, Sweden)

The existent framework for shape optimization of electrically small antennas is extended by a new set of geometrical operators. They are capable of operating over shapes directly, controlling their regularity, amount of used material, etc. The formulation is compatible with existent physical fitness functions and known fundamental bounds. A simple example of Q-factor minimization is presented.

12:30 ***MACKEY II Model with Reduced Thickness***

Keisuke Miyashita (Kanazawa-institute-of-technology, Japan); Toshiki Tamura, Shigeru Makino and Kenji Itoh (Kanazawa Institute of Technology, Japan)

The Meta-surface inspired Antenna Chip developed by the KIT EOE Laboratory (MACKEY, Wi-Fi 2.4GHz band), is an electrically small antenna that is sufficiently robust to metal objects. However, there has been a demand to make the basic model even thinner because it is 4mm thick. Therefore, a new model, named MACKEY II (Wi-Fi 2.4 GHz band), with broadband characteristics and reduced thickness is proposed. It is adapted to create a new structure where in the antenna substrate is placed inside the AMC substrate to create a thinner dimension than the basic model. In this paper, the characteristics and feeding method of MACKEY II are presented, along with, the measurement results.

SW03: Antennas and Propagation Aspects for THz Communications

Thomas Kürner

Room: virtual 13

SW01a: Integration challenges for mm-wave phased arrays Part 1

Stefania Monni

Room: virtual 14

Friday, March 26 10:40 - 11:10

Coffee Break / Exhibition

Rooms: virtual 1, virtual 2, virtual 3, virtual 4, virtual 5, virtual 6, virtual 7, virtual 8, virtual 9, virtual 10, virtual 11, virtual 12, virtual 13, virtual 14, Posters

Friday, March 26 11:10 - 12:50

T05-A01: Antennas for medical applications

T05 Biomedical and health / / Antennas

Room: virtual 6

11:10 ***A Novel Dual-Band Implantable Antenna for Pancreas Telemetry Sensor Applications***

Maria Matthaiou and Stavros Koulouridis (University of Patras, Greece); Stavros Kotsopoulos (Wireless Telecommunications Laboratory, Greece)

In this paper, a novel implantable dual-band planar inverted F-antenna (PIFA) is proposed and designed for wireless biotelemetry. The developed antenna is intended to operate on the surface of the pancreas within the Medical Device Radiocommunications Service (MedRadio 401-406MHz) and the industrial scientific and medical band (ISM, 2.4-2.5GHz). Antenna miniaturization and dual frequency operation is accomplished by inserting a shorting pin and two U-shaped slots upon the patch. The design analysis is carried out in two steps, initially inside a cuboid canonical model representing the pancreas, based on Finite Element Method (FEM) numerical solver. The antenna is further analyzed inside the pancreas of a male and a female human phantom using the Finite-Difference Time-Domain (FDTD) numerical solver. Resonance, radiation, and Specific Absorption Rate (SAR) are presented and evaluated.

11:30 ***Experimental Measurements and Modelling of Relative Power in a Portable Microwave Based Breast Cancer Detection System***

Muhammad Masud Rana (University of Manitoba, Winnipeg, Manitoba & Canada, Canada); Debarati Nath and Stephen Pistorius (University of Manitoba, Canada)

A portable breast microwave sensing (BMS) system has developed and validated through a derived mathematical model of a sensor and antenna array. In this paper, the model has been used in a preliminary study measuring reflections from a point scatterer in the scanning plane. The sensing system was calibrated under free-space conditions using a 13×10 array of geometric correction constants. This study validated the experimental results from each sensor and the calculated results from the derived mathematical model with and without phase for an Aluminum rod placed in the scanning plane. The maximum value of the average relative power (ARP) was 1.63, and the minimum value of the average relative power was -0.65 in the receiver antenna array. The experimental ARP results were in 80% agreement with the calculated results of the derived mathematical model of the portable BMS system and had an 85% agreement with an empirically modified model.

11:50 ***A Compact Design for Dual-Band Implantable Antenna Applications***

Abdenasser Lamkaddem (Carlos III University of Madrid, Madrid, Spain); Ahmed El Yousfi (Universidad Carlos III De Madrid, Spain); Kerlos Atia Abdalmalak (Universidad Carlos III de Madrid, Spain); Vicente González Posadas (Polytechnic University of Madrid, Spain); Luis Enrique García Muñoz and Daniel Segovia-Vargas (Universidad Carlos III de Madrid, Spain)

This paper presents the development of a dual-band antenna working in the Industrial, Scientific, and Medical (ISM) band (902 - 928 MHz, 2.4 - 2.5 GHz). The proposed antenna is compact, has a frequency-independent response between the lowest and the highest frequency, has a small size of 6 mm x 6 mm x 2.54 mm, and exhibits a high gain for implantable application of -13.14 dBi at 915 MHz and -28 dBi at 2.45 GHz. This design does not use any via or defected ground plane making the antenna very useful for this kind of application. The miniaturized dualband antenna has been tested in the presence of salmon fish and chicken meat to replicate the behavior of the antenna in the human body

12:10 ***Capacitively Coupled Electrode Antenna: A Practical Solution for Biomedical Implants***

Ali Khaleghi (Norwegian University of Science and Technology (NTNU) & Oslo University Hospital, Norway); Ilangko Balasingham (Norwegian Institute of Science and Technology, Norway)

A capacitively coupled electrode antenna is proposed for use in medical implants. The antenna involves the conductivity of the biological medium and extends the applied RF electric signal to the conductive biological medium, thus the antenna virtual size increase that results in higher radiation efficiency compared to the similar size physical antennas. The antenna is self-matched or can be easily matched to a 50-ohm source impedance and provides ultra-wideband impedance matching that makes it less sensitive to the variations of the surrounded biological tissues. The proposed antenna occupies a minimal volume, which is a requirement for the implants. The physical structure of the antenna is similar to the contact electrodes but uses a capacitive coupling gap to the medium to increase radiation efficiency and reduce the specific absorption rate (SAR). A sample antenna at 403 MHz is designed and compared to the ideal conventional dipole and loop geometries.

12:30 ***A Dual Band Micro-Strip Patch Antenna for BMI Application***

Mahdi Salimitorkamani and Hayrettin Odabasi (Eskisehir Osmangazi University, Turkey); Atabak Najafi (Gazi, Turkey)

A novel Bidirectional ultra-wide band printed Monopole Antenna (PMA), which can be applied in the BMI application are being dispensed. The PMA has a square radiating patch with one L-shaped sleet and two L-shaped slots, and two more L-shaped slots on its ground plane. The proposed antenna can be supported by two useable radiating bands: WLAN/UWB. to approach to a narrow band resonance -WLAN, an L-shaped sleet is implemented. A two L-shaped in the patch and two in the ground plane are slotted to generate resonances that increase the bandwidth. The designed antenna with the small size of 15×20×1.6mm is a considerable advantage not only with the aim of lower power consumption, also for the purpose of implanting. the proposed antenna has a stable gain over the radiating frequency and transmitted power between 3.1-5 mW inside the brain phantom. the optimal design has covered by a low-loss biocompatible rubber material.

Friday, March 26 12:50 - 13:50

Closing Ceremony

Room: virtual 1

Friday, March 26 14:00 - 18:00

SC01: Short Course: Multibeam Antennas and Beamforming Networks

Multibeam Antennas and Beamforming Networks

Giovanni Toso and Piero Angeletti

Room: virtual 1

SC02: Short Course: Gap waveguides for mmWave antenna systems and electronic packaging

Gap waveguides for mmWave antenna systems and electronic packaging

Ashraf Uz Zaman & Eva Rajo-Iglesias

Room: virtual 2

SC03: Short Course: User antennas for internet everywhere

User antennas for internet everywhere

Gerard Caille & Nelson J. G. Fonseca

Room: virtual 3

SC04: Short Course: Array Signal Processing and Network Theory for Multi-antenna Receiver System Design

Karl F. Warnick

Room: virtual 4

SC05: Short Course: Design of Optimal Antennas

Mats Gustafson & Miloslav Capek

Room: virtual 5

SC06: Short Course: Antenna-in-Package (AiP) Technology and Applications

Yueping Zhang

Room: virtual 6

SC07: Short Course: THz Technology and Instrumentation

Miguel Navarro-Cía

Room: virtual 7

Friday, March 26 14:00 - 16:00

SW01b: Integration challenges for mm-wave phased arrays Part 2

Stefania Monni

Room: virtual 14