

Loughborough Antennas & Propagation Conference (LAPC 2017)

IET Conference Publications 732

Loughborough, United Kingdom
13 – 14 November 2017

ISBN: 978-1-5108-6224-1

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 the Institution of Engineering and Technology
All rights reserved.

Printed by Curran Associates, Inc. (2018)

For permission requests, please contact the Institution of Engineering and Technology
at the address below.

Institution of Engineering and Technology
P. O. Box 96
Stevenage, Hertfordshire
U.K. SG1 2SD

Phone: 01-441-438-767-328-328
Fax: 01-441-438-767-328-375

www.theiet.org

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
Web: www.proceedings.com

TABLE OF CONTENTS

A LOW-COST VECTOR NETWORK ANALYZER: DESIGN AND REALIZATION	1
<i>J. Verhaevert, P. Van Torre</i>	
PORTABLE AND LOW COST CHANNEL SOUNDING PLATFORM FOR VHF / UHF IOT PROPAGATION RESEARCH	6
<i>E. A. Ball</i>	
METAL LENS FOR COLLIMATION OF ORBITAL ANGULAR MOMENTUM RADIO MODES	11
<i>T. D. Drysdale, B. Allen</i>	
RELIABLE EM-DRIVEN SIZE REDUCTION OF ANTENNAS USING FEASIBLE REGION BOUNDARY SEARCH	15
<i>D. O. Johannesson, S. Koziel</i>	
CONCEPTS FOR RADAR TARGET SIMULATION	20
<i>A. R. Diewald, C. Culotta-Lopez</i>	
LABORATORY TESTING OF A SVD-BASED APPROACH TO RECOVER THE NONREDUNDANT BI-POLAR NF DATA FROM THE POSITIONING ERROR AFFECTED ONES	25
<i>F. D'Agostino, F. Ferrara, C. Gennarelli, R. Guerriero, M. Migliozi</i>	
MULTIBAND HYBRID LOOP-NOTCH ANTENNAS	30
<i>B. S. Collins</i>	
WIRELESS POWER TRANSFER IN THE PRESENCE OF A CONDUCTING INTERFACE: AN ANALYTICAL SOLUTION	34
<i>A. Vallecchi, C. Stevens, E. Shamonina</i>	
A LOW-LOSS RECONFIGURABLE FREQUENCY SELECTIVE SURFACE BASED ANTENNA FOR DIRECT ANTENNA MODULATION	39
<i>S. Henthorn, K. L. Ford, T. O'Farrell</i>	
SPECIFIC ABSORPTION RATE AND EFFICIENCY OF A WIDEBAND WEARABLE MONOPOLE ANTENNA NEAR THE HUMAN BODY	43
<i>P. M. Rayner, W. G. Whittow</i>	
RADIATION EFFICIENCY ANALYSIS OF BALANCED-IMPEDANCE HEXAFERRITE SUBSTRATE FOR ANTENNA MINIATURISATION	48
<i>O. N. James, S. Hilton, M. A. Beach</i>	
KA-BAND VIVALDI ANTENNA WITH NOVEL CORE ELEMENT FOR HIGH-GAIN	53
<i>Manh-Ha Hoang, Kansheng Yang, M. John, P. McEvoy, M. Ammann</i>	
AN INKJET-PRINTED MMW FREQUENCY-RECONFIGURABLE ANTENNA ON A FLEXIBLE PET SUBSTRATE FOR 5G WIRELESS SYSTEMS	57
<i>S. F. Jilani, A. Alomainy</i>	
VALIDATION OF A VOLUME INTEGRAL EQUATION METHOD FOR INDOOR PROPAGATION MODELLING	60
<i>I. Kavanagh, C. Brennan</i>	
SATCOM ON-THE-MOVE ANTENNA WITH MECHANICALLY SWITCHABLE CIRCULAR POLARIZATION	65
<i>M. Ferrando-Rocher, J. I. Herranz-Herruzo, A. Valero-Nogueira, B. Bernardo-Clemente</i>	
COMPARATIVE STUDY ON THE DIVERSITY PERFORMANCE BETWEEN DIFFERENT MICROSTRIP ANTENNA ARRAYS	69
<i>A. H. Radhi, R. Nilavalan, H. S. Al-Raweshidy, N. Ab Aziz</i>	
BEAM STEERING ANTENNA ARRAYS FOR 28-GHZ APPLICATIONS	74
<i>M. A. Nassar, H. Y. Soliman, A. Ghoneim, S. Abuelenin</i>	
COMPACT AND PLANAR SLOT ANTENNA ARRAY FOR X-BAND APPLICATIONS	78
<i>S. Alkaraki, Yue Gao</i>	
DUAL-BAND COMPACT-SIZE ANTENNA ARRAY FOR ANGLE OF ARRIVAL ESTIMATION	81
<i>M. A. G. Al-Sadoon, I. M. Danjuma, F. M. Abdussalam, I. T. E. Elfergani, J. Rodriguez, R. A. Abd-Alhameed, S. M. R. Jones</i>	
3D PRINTED PERIODIC STRUCTURES IN A HORN ANTENNA FOR SIDE-LOBE REDUCTION USING DIRECT METAL LASER SINTERING	86
<i>D. Shamvedi, C. Danilenkoff, S. Karam, P. O'Leary, R. Raghavendra</i>	
VANADIUM DIOXIDE SWITCHES FOR A RECONFIGURABLE BANDWIDTH ANTENNA	90
<i>D. E. Anagnostou, D. Torres, N. Sepulveda</i>	
A 2.4 GHZ TO 27 MHZ NON-LINEAR RFID TOPOLOGY IN FLEXIBLE ELECTRONICS	92
<i>G. Gentile, R. Ishihara</i>	

ANALYTICAL FORMULATION FOR THE CAPACITANCE OF 3D SQUARE SPLIT RING RESONATORS	97
<i>A. Vallecchi, C. Stevens, E. Shamonina</i>	
EQUIVALENT CIRCUIT ANALYSIS FOR 3D METAMATERIALS WITH FRINGING FIELD CORRECTION FACTOR	100
<i>T. Whittaker, W. Whittow, Y. Vardaxoglou</i>	
HIGH GAIN FLAT ANTENNAS FOR KA BAND SATCOM	102
<i>F. Caminita, G. Minatti, E. Martini, S. Maci</i>	
A RECONFIGURABLE CAPACITIVE IMPEDANCE SURFACE FOR 1.5T MAGNETIC RESONANCE IMAGING APPLICATIONS	104
<i>I. Issa, K. L. Ford, M. Rao, J. Wild</i>	
FULLY 3D PRINTED GPS ANTENNA USING A LOW-COST OPEN-SOURCE 3D PRINTER	108
<i>A. Elibinary, W. Oakey, S. Jun, B. Sanz-Izquierdo, D. Bird, A. McClelland</i>	
MINIATURE ON SKIN PASSIVE UHF RFID ANTENNA STICKER	112
<i>V. Makarovaite, A. Hillier, S. J. Holder, C. W. Gourlay, J. C. Batchelor</i>	
DESIGN AND CHARACTERIZATION OF A THREE MATERIAL ANATOMICAL BONE PHANTOM FOR IMPLANTED ANTENNA APPLICATIONS	114
<i>S. Symeonidis, W. G. Whittow, C. Panagamuwa</i>	
DESIGN OF A MINIATURIZED BONE IMPLANTABLE ANTENNA FOR A WIRELESS IMPLANT MONITORING DEVICE	119
<i>R. P. Khokle, K. P. Esselle, M. Heimlich, D. Bokor</i>	
EFFECT OF SMALL WEARABLE DEVICE ANTENNA LOCATION ON ITS IMPEDANCE, BANDWIDTH POTENTIAL AND RADIATION EFFICIENCY	121
<i>J. Chen, M. Berg, H. Y. Amin, A. Pärssinen</i>	
ROBUSTNESS OF 7T-MRI FLEXIBLE ARRAY COIL BEHAVIOUR	126
<i>A. Melis, S. Casu, C. Puddu, A. Fanti, N. Djuric, G. Mazzarella, F. Maggiorelli, A. Retico, G. Tiberi</i>	
TILT AND TAMPER SENSING UHF RFID SECURITY TAG	130
<i>M. A. Ziai, J. C. Batchelor</i>	
ANTENNA CHARACTERISATION AND CHANNEL EFFECTS ON DIGITAL SYSTEMS	135
<i>M. A. Almotery, M. I. Sobhy, J. C. Batchelor</i>	
RECOGNISING PEOPLE USING SMART PHONE ANTENNAS: A FUZZY BIOMETRIC	140
<i>S. R. Heyes, R. M. Edwards</i>	
A PASSIVE UHF RFID PH SENSOR (SMART POLYMERS FOR WIRELESS MEDICAL SENSING DEVICES)	146
<i>A. Hillier, V. Makarovaite, S. J. Holder, C. W. Gourlay, J. C. Batchelor</i>	
PRINTED YAGI-HELIX ANTENNAS	148
<i>W. Alshrafi, A. Al-Bassam, C. Culotta-Lopez, D. Heberling</i>	
ANTENNAS THAT SUPPORT MULTI-MODE EXCITATION	152
<i>C. Min, N. Howland, N. R. Potts</i>	
MATLAB-BASED MULTI-OBJECTIVE OPTIMIZATION OF BROADBAND CIRCULARLY POLARIZED ANTENNAS	156
<i>D. Warmowska, M. Marek, Z. Raida</i>	
COMBINED ENERGY HARVESTER INTEGRATED INTO CAR	161
<i>M. Kokolia, J. Lacik, Z. Raida</i>	
A CAD-ORIENTED TECHNIQUE TO DESIGN AN OPTIMUM LOAD IMPEDANCE WITH MULTI-COUPLER NETWORK FOR CLASS-F POWER AMPLIFIER	166
<i>B. A. Mohammed, R. A. Abd-Alhameed, N. A. Abduljabbar, I. M. Danjuma, I. T. E. Elfergani, A. S. Hussaini, J. Rodriguez</i>	
ENGINEERED GROUP DELAY TRANSMISSION LINES BASED ON NOVEL NEGATIVE GROUP DELAY NETWORKS	171
<i>T. Thatapudi, P. Gardner, A. Feresidis</i>	
AN INVESTIGATION ON FREQUENCY SELECTIVE ANTENNA INTERFACE BASED ON OPTIMIZATION APPROACH	173
<i>H. Y. Amin, Jiangcheng Chen, M. Berg, A. Pärssinen</i>	
LTCC-BASED MILLIMETRE-WAVE MICROSTRIP GRID ARRAY ANTENNAS	178
<i>Y. P. Zhang</i>	
IMPLEMENTATION OF A QUASIOPTICAL SYSTEM FOR FREE-SPACE MEASUREMENTS: APPLICATIONS TO RADIO ASTRONOMY	180
<i>O. García-Pérez, F. Tercero, S. López-Ruiz, B. Vaquero, J. M. Serna</i>	
HF URBAN NOISE LEVEL IN VARIABLE CHANNELS OF 3-24 KHZ: A PRELIMINARY EXPERIMENTAL APPROACH	185
<i>P. Bechet, A. C. Bechet, S. Miclaus</i>	

TESTING OF LOW-POWER WIDE-AREA TECHNOLOGIES IN CONTROLLED PROPAGATION ENVIRONMENTS.....	190
<i>I. Rodriguez, M. Lauridsen, K. Arvidsson, J. Kvarnstrand, M. Andersson, P. Mogensen</i>	
HIGH DYNAMIC RANGE FREQUENCY CONVERTERS FOR HF AND VHF PROPAGATION MEASUREMENTS.....	192
<i>S. M. Feeney</i>	
CHANNEL CHARACTERISATION FOR WEARABLE LORAWAN MONITORS.....	197
<i>P. A. Catherwood, S. McComb, M. Little, J. A. D. McLaughlin</i>	
AN EMPIRICAL STUDY OF LINK QUALITY ASSESSMENT IN WIRELESS SENSOR NETWORKS APPLICABLE TO TRANSMISSION POWER CONTROL PROTOCOLS.....	201
<i>J. B. Hughes, P. Lazaridis, I. Glover, A. Ball</i>	
MILLIMETRE-WAVE PROPAGATION IN URBAN CLUTTER FOR 5G SYSTEMS.....	206
<i>R. F. Rudd, M. Nekovee</i>	
EXAMINATION OF THE EFFECT OF COMMON CATR QUIET ZONE SPECIFICATIONS ON ANTENNA PATTERN MEASUREMENT UNCERTAINTIES.....	208
<i>S. F. Gregson, C. G. Parini</i>	
COST/PERFORMANCE TRADE-OFF OF DOMAIN SEGMENTATION FOR EM-DRIVEN SURROGATE-ASSISTED MULTI-OBJECTIVE ANTENNA DESIGN.....	213
<i>A. Bekasiewicz, S. Koziel</i>	
ANTENNA DESIGN EXPLORER: A GUI SOFTWARE TOOL FOR EFFICIENT ANTENNA DESIGN OPTIMIZATION.....	217
<i>M. O. Akinsolu, F. M. Abdussalam, O. Arabi, Bo Liu, R. A. Abd-Alhameed, N. Ali, G. Ibrahim, T. Rashid</i>	
PARAMETRIC ANALYSIS AND BANDWIDTH OPTIMISATION OF HYBRID LINEAR-EXPONENTIAL TAPERED SLOT VIVALDI ANTENNAS.....	222
<i>I. K. Ukaegbu, K. A. A. Gamage</i>	
STUDY OF MM-WAVE MICROSTRIP PATCH ARRAY ON CURVED SUBSTRATE.....	227
<i>Z. Ahmed, Kansheng Yang, P. McEvoy, M. J. Ammann</i>	
MILLIMETRE WAVE REFLECTARRAY ANTENNA UNIT CELL MEASUREMENTS.....	231
<i>G. Ahmad, T. W. C. Brown, C. I. Underwood, T. H. Loh</i>	
A NEW THZ CORRUGATED-GROUND ANTENNA.....	236
<i>D. Kampouridou, A. Feresidis</i>	
SUPERDIRECTIVE META-ARRAYS AT TELECOMMUNICATION WAVELENGTHS.....	238
<i>A. Vallecchi, C. Stevens, E. Shamonina</i>	
CHARACTERISATION OF A QUASI-OPTICAL TRANSMISSOMETER FOR PRECISE MEASUREMENT OF A SUB-THZ MULTENNA.....	242
<i>A. S. Andy, P. Alizadeh, O. Sushko, M. M. Torrico, T. Kreouzis, R. Donnan, C. Parini, R. Dubrovka</i>	
ROLE OF SURFACE WAVES IN THE REFLECTION PROPERTIES OF A MILLIMETRE WAVE REFLECTARRAY UNIT CELL.....	246
<i>G. Ahmad, C. I. Underwood, T. W. C. Brown, T. H. Loh</i>	
DESIGN OF ULTRA WIDEBAND VIVALDI NANOANTENNA FOR SOLAR ENERGY COLLECTION.....	251
<i>W. Amara, N. Eltresy, A. Yahyaoui, H. Rmili, T. Aguilu, J. M. Floch</i>	
A COST-EFFECTIVE TECHNIQUE FOR CONCURRENT IQ STREAM CAPTURE FOR PROTOTYPING PHASED ARRAYS.....	255
<i>A. Vasileiadis, E. A. Ball</i>	
SINGLE SHOT DOA ESTIMATION FOR LARGE-ARRAY BASE STATION SYSTEMS IN MULTI-USER ENVIRONMENTS.....	259
<i>T. A. H. Bressner, U. Johannsen, A. B. Smolders</i>	
DUAL-ELEMENT ANTENNA SYSTEM FOR HEXA-BAND SMARTPHONE MIMO APPLICATIONS.....	263
<i>S. S. Alja'afreh, Yi Huang, Qian Xu, Lei Xing, O. A. Saraereh</i>	
IMAGE TRANSMISSION USING OSTBC-ENCODED 16-QAM OVER MIMO TIME-SELECTIVE FADING CHANNELS.....	268
<i>M. Lodro, S. Greedy, A. Vukovic, C. Smart, D. W. P. Thomas</i>	
COMPARATIVE STUDY OF "PHOENIX" REFLECTARRAY PHASE-SHIFTING CELLS.....	273
<i>T. Makdissy, R. Gillard</i>	
THE ULTRA-THIN RECONFIGURABLE META-SURFACE.....	277
<i>Xin Liu, Ai Xin Chen</i>	
HIGH GAIN CIRCULARLY POLARIZED META-SURFACE ANTENNA.....	281
<i>Aixin Chen, Xin Liu</i>	
OPTIMISATION OF THE Q FACTOR OF A COMPLEMENTARY FREQUENCY SELECTIVE SURFACE.....	285
<i>C. K. Lee, S. S. Bukhari, J. C. Vardaxoglou, W. G. Whittow</i>	

ARTIFICIALLY ANISOTROPIC CYLINDER TO CONVERT OMNIDIRECTIONAL LINEAR POLARIZATION INTO CIRCULAR POLARIZATION	289
<i>E. Kaivanto, E. Salonen, M. Berg</i>	
DEMONSTRATING A LOW TEMPERATURE ORGANIC DENSE DIELECTRIC PATCH ANTENNA	293
<i>R. J. Espley-Jones, F. Tong, J. E. J. Dalley, D. S. Langley</i>	
METASURFACE SYNTHESIS USING SUSCEPTIBILITY TENSORS AND HOLOGRAPHIC TECHNIQUE	295
<i>M. Cervený, K. L. Ford, A. Tennant</i>	
ANALYSIS AND DESIGN OF METASURFACE ANTENNAS	299
<i>G. Minatti, F. Caminita, E. Martini, S. Maci</i>	
PROPERTIES OF ANTENNAS MADE WITH SPRAYED SELECTIVE SILVER METALLIZATION	301
<i>A. Jammes, M. Petisme, K. Staelens</i>	
ON THE INTRODUCTION OF LUMPED INDUCTORS FOR OPTIMIZING UHF BAND AMCS IN TERMS OF SIZE AND ANGULAR STABILITY	305
<i>H. F. Alvarez, M. E. De Cos, F. Las-Heras</i>	
ASSEMBLY CONFORMAL ANTENNA ARRAY FOR WEARABLE MICROWAVE BREAST IMAGING APPLICATION	310
<i>F. Wang</i>	
MICROWAVE APPARATUS FOR TESTING BREAST INTEGRITY BASED ON HUYGENS PRINCIPLE: CLINICAL VALIDATION ON 16 SUBJECTS	315
<i>L. Sani, M. Paoli, G. Raspa, A. Vispa, N. Ghavami, G. Tiberi, A. Saracini, S. Ercolani, E. Vannini, M. Duranti</i>	
MINIATURIZATION OF A BROADBAND MONOPOLE ANTENNA USING LOW LOSS MAGNETO-DIELECTRIC MATERIALS IN VHF BAND	320
<i>A. Kabalan, A.-C. Tarot, A. Sharaiha</i>	
A WIDEBAND CIRCULARLY POLARISED CROSS-SLOT ANTENNA WITH AN L-SHAPED FEED-LINE	324
<i>M. G. Aly, Yi Wang</i>	
A FEASIBILITY STUDY ON THE EXTENSION OF THE POINT SCATTERER FORMULATION TO INCLUDE WIND INDUCED DYNAMICS	328
<i>N. Leonor, R. Caldeirinha, M. Sanchez, T. Fernandes, S. Morgadinho</i>	
A CHANNEL MODEL FOR THE PROPAGATION OF X-BAND RADIO WAVES THROUGH THE SOLAR CORONA	333
<i>A. J. Stocker, D. R. Siddle, E. M. Warrington, G. Mariotti, D. Silvestri, A. Zeqai, P. Tortora, A. Argyriou, J. De Vicente, R. Abello, M. Mercolino</i>	
HIGH APERTURE EFFICIENT CORRUGATED PLATE ANTENNA AT X-BAND	335
<i>S. Alkaraki, Yue Gao</i>	
OPTIMIZATION OF LOG-PERIODIC DIPOLE ANTENNA WITH LTE BAND-REJECTION	338
<i>K. K. Mistry, P. I. Lazaridis, Z. D. Zaharis, T. D. Xenos, I. A. Glover</i>	
SIZE REDUCTION OF MULTI-BAND ANTENNAS USING FEATURE-BASED OPTIMIZATION	343
<i>S. Koziel, A. Bekasiewicz</i>	
A COMPACT MULTIBAND ANTENNA FOR MOBILE HANDSET USING CHARACTERISTIC MODES OPTIMIZATION	347
<i>H. Jaafar, S. Collardey, A. Sharaiha</i>	
CHARACTERISATION OF FLEXIBLE, THERMAL TRANSFER PRINTED UWB ANTENNA UNDER STATIC BENDING	351
<i>M. Kgwadi, T. D. Drysdale</i>	
EVIDENCE OF MAINBEAM STEERING CAPABILITY OF A PATCH ANTENNA WITH AN ANISOTROPIC DIELECTRIC REALISED USING A TRANSMISSION LINE MODEL	356
<i>W. Kahirun, P. Boonek, W. Silabut</i>	
DESIGN OF MECHANICALLY RECONFIGURABLE MEANDER ANTENNA USING THE GALINSTAN LIQUID METAL	361
<i>J. M. Floc'H, I. Ben Trad</i>	
DEVELOPMENT OF A RECONFIGURABLE MODULAR GPS BEAMFORMER FOR DESIGN AND TEST	365
<i>E. M. Lloyd, R. J. Watson</i>	
Author Index	