

# **2015 IEEE 11th International Conference on Wireless and Mobile Computing, Networking and Communications (WiMob 2015)**

**Abu Dhabi, United Arab Emirates  
19-21 October 2015**



**IEEE Catalog Number: CFP15609-POD  
ISBN: 978-1-4673-7702-7**

**Copyright © 2015 by the Institute of Electrical and Electronic Engineers, Inc  
All Rights Reserved**

*Copyright and Reprint Permissions:* Abstracting is permitted with credit to the source. Libraries are permitted to photocopy beyond the limit of U.S. copyright law for private use of patrons those articles in this volume that carry a code at the bottom of the first page, provided the per-copy fee indicated in the code is paid through Copyright Clearance Center, 222 Rosewood Drive, Danvers, MA 01923.

For other copying, reprint or republication permission, write to IEEE Copyrights Manager, IEEE Service Center, 445 Hoes Lane, Piscataway, NJ 08854. All rights reserved.

***\*\*\*This publication is a representation of what appears in the IEEE Digital Libraries. Some format issues inherent in the e-media version may also appear in this print version.***

IEEE Catalog Number:	CFP15609-POD
ISBN 13:	978-1-4673-7702-7
ISSN:	2160-4886

**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  
E-mail: [curran@proceedings.com](mailto:curran@proceedings.com)  
Web: [www.proceedings.com](http://www.proceedings.com)

CURRAN ASSOCIATES INC.  
**proceedings**  
.com

## Table of Contents

### 2015 IEEE 11th International Conference on Wireless and Mobile Computing, Networking and Communications (WiMob)

### BCWNets 2015: 2015 The First International Workshop on Advances in Body-Centric Wireless Communications and Networks and Their Applications

#### BCWNEts: Emerging Wireless Body-to-Body Networks

##### *Data Dissemination Strategies for Emerging Wireless Body-to-Body Networks based Internet of Humans*

Dhafer Ben Arbia (Qatar Mobility Innovations Center & SERCOM Lab, Polytechnic School of Tunisia, University of Carthage- Tunisia, Qatar), Muhammad Mahtab Alam (Qatar Mobility Innovation Center, Qatar), Rabah Attia (SERCOM Labs EPT Université de Carthage La Marsa Tunis, Tunisia), Elyes Ben Hamida (Qatar Mobility Innovations Center (QMIC), Qatar) .....	1
<i>Internet of Nano-Things Healthcare Applications: Requirements, Opportunities, and Challenges</i>	
Najah A. Abu Ali (UAEU, UAE), Mervat Abu-Elkheir (Mansoura University, Egypt) .....	9
<i>Terahertz Signal Propagation Analysis Inside The Human Skin</i>	
Aya Abdelaziz (Qatar University, Qatar), Qammer Hussain Abbasi (Texas A & M University, Qatar), Ke Yang (Queen Mary University Of London, United Kingdom), Khalid A. Qaraqe (Texas A&M University at Qatar, USA), Yang Hao (Queen Mary, University of London, United Kingdom), Akram Alomainy (Queen Mary University of London, United Kingdom) .....	15

### STWiMob'2015: 2015 Eight International Workshop on Selected Topics in Mobile and Wireless Computing

#### Seventh International Workshop on Selected Topics in Mobile and Wireless Computing

##### *Location-Aware Data Replication in Cloud Computing Systems*

Ismaeel Al Ridhawi (American University of the Middle East & University of Ottawa, Kuwait), Nour Mostafa (American University of the Middle East, Kuwait), Wassim Masri (American University of the Middle East, Kuwait) .....	20
<i>Indoor Mapping for Location-based Policy Tooling using Bluetooth Low Energy Beacons</i>	
Senan Sharhan (Technische Universität Berlin, Germany), Sebastian Zickau (Technische Universität Berlin & Service-centric Networking, Germany) .....	28
<i>Exploiting RFID for Real Time Accessing and Translation of Public Advertisements</i>	
Sonia Hashish (Umm Al-Qura University, Saudi Arabia), Shaleeza Sohail (Umm Al Qura University, Saudi Arabia) .....	37

#### Seventh International Workshop on Selected Topics in Mobile and Wireless Computing

##### *A Semi-Distributed LTE-WiFi System Design for Future LTE-Unlicensed Deployments in Small-cell Environments*

Rasha Al-Khansa (American University of Beirut, Lebanon), Hassan A. Artail (American University of Beirut, Lebanon) .....	43
<i>A QoE-Driven Vertical Handover Algorithm based on Media Independent Handover Framework</i>	
Li Liu (Plymouth University, United Kingdom), Lingfen Sun (University of Plymouth, United Kingdom), Emmanuel Ifeachor (University of Plymouth, United Kingdom) .....	51

<i>Mobile Relay Node in Public Transportation for Serving Outside LTE Cell Edge Users</i>	
Malak Charaf (AUB, Lebanon), Hassan A. Artail (American University of Beirut, Lebanon), Youssef Nasser (American University of Beirut, Lebanon) .....	59

## 2015 EN4PPDR: The IEEE WiMob 2015 Workshop on Emergency Networks for Public Protection and Disaster Relief

### PPDR economics and management

<i>Economic Feasibility of Mobile Broadband Network for Public Safety and Security</i>	
Matti Peltola (Aalto University, Finland), Heikki Hämmäinen (Aalto University, Finland) .....	67
<i>Performance Evaluation and Economic Modelling of PPDR Communication Systems</i>	
Carlo Augusto Grazia (University of Modena and Reggio Emilia, Italy), Martin Klapez (University of Modena and Reggio Emilia, Italy), Natale Patriciello (University of Modena and Reggio Emilia, Italy), Maurizio Casoni (University of Modena and Reggio Emilia, Italy), Henryk Gierszal (Adam Mickiewicz University, Poland), Piotr Tyczka (ITTI Ltd., Poland), Karina Pawlina (ITTI Ltd., Poland), Angelos Amditis (Institute of Communication and Computer Systems, Greece), Evangelos Sdongos (Institute of Communication and Computer Systems & National Technical University of Athens, Greece) .....	75
<i>Operator Placement for Efficient Distributed Complex Event Processing in MANETs</i>	
Fabrice Starks (University of Oslo, Norway), Thomas Plagemann (University of Oslo, Norway) .....	83
<i>Lifetime enhancement of Disaster Recovery Systems based on IEEE 802.11s Wireless Mesh Networks</i>	
Christopher Hepner (Hochschule Ulm - University of Applied Sciences, Germany), Roland Münzner (Hochschule Ulm, Germany) .....	91

## BCWNets 2015: 2015 The First International Workshop on Advances in Body-Centric Wireless Communications and Networks and Their Applications

### BCWNets: Wireless communications body networks

<i>Millimeter-Wave Frequency Reconfigurable T-shaped Antenna for 5G Networks</i>	
Syeda Fizzah Jilani (Queen Mary University of London, United Kingdom), Syed Muzahir Abbas (Macquarie University, Australia), Karu Esselle (Macquarie University, Australia), Akram Alomainy (Queen Mary University of London, United Kingdom) .....	100
<i>A Circular Patch Frequency Reconfigurable Antenna for Wearable Applications</i>	
Waqas Farooq (University of Bedfordshire, United Kingdom), Masood Ur Rehman (University of Bedfordshire, United Kingdom), Qammer Hussain Abbasi (Texas A & M University, Qatar), Khalid A. Qaraqe (Texas A&M University at Qatar, USA) .....	103
<i>Optimal On-body Relay Placement for Energy Efficient In Vivo Communications</i>	
Muhammad Ismail (Texas A&M University at Qatar, Qatar), Marwa Qaraqe (Texas A & M University, USA), Qammer Hussain Abbasi (Texas A & M University, Qatar), Erchin Serpedin (Texas A&M University, USA) .....	107
<i>Study of a Novel Multi-band Antenna for Body- Centric Wireless Networks</i>	
Waqas Farooq (University of Bedfordshire, United Kingdom), Masood Ur Rehman (University of Bedfordshire, United Kingdom), Xiaodong Yang (Xidian University, P.R. China), Qammer Hussain Abbasi (Texas A & M University, Qatar) .....	112

# 2015 EN4PPDR: The IEEE WiMob 2015 Workshop on Emergency Networks for Public Protection and Disaster Relief

## Algorithms and models

<i>Behavior of Wireless Body-to-Body Networks Routing Strategies for Public Protection and Disaster Relief</i>	
Dhafer Ben Arbia (Qatar Mobility Innovations Center & SERCOM Lab, Polytechnic School of Tunisia, University of Carthage- Tunisia, Qatar), Muhammad Mahtab Alam (Qatar Mobility Innovation Center, Qatar), Rabah Attia (SERCOM Labs EPT Université de Carthage La Marsa Tunis, Tunisia), Elyes Ben Hamida (Qatar Mobility Innovations Center (QMIC), Qatar)	117
<i>Performance Evaluation of Wireless Ad-hoc Network for Post-Disaster Recovery using Linux Live USB Nodes</i>	
Vaibhav Garg (Indian Institute of Technology Hyderabad, India), Kotaro Kataoka (Indian Institute of Technology Hyderabad, India), Siva Subramanya Rohith Talluri (Manipal Institute of Technology, India)	125
<i>PINK: Proactive INjection into ack, a queue manager to impose fair resource allocation among TCP flows</i>	
Carlo Augusto Grazia (University of Modena and Reggio Emilia, Italy), Martin Klapez (University of Modena and Reggio Emilia, Italy), Natale Patriciello (University of Modena and Reggio Emilia, Italy), Maurizio Casoni (University of Modena and Reggio Emilia, Italy)	132
<i>On modeling epidemics in networks using linear time-invariant dynamics</i>	
Goran Muric (Dresden University of Technology & Leibniz Institute of Ecological and Regional Development, Germany), Christian Scheunert (TU Dresden, Germany), Eduard Jorswieck (TU Dresden, Germany)	138

## STWiMob'2015: 2015 Eight International Workshop on Selected Topics in Mobile and Wireless Computing

### Seventh International Workshop on Selected Topics in Mobile and Wireless Computing

<i>A Framework for Cooperative Intranet of Things Wireless Sensor Network Applications</i>	
Yasser Gadallah (The American University in Cairo, Egypt), Mostafa elTager (Cairo University, Egypt), Ehab Elalamy (Cairo University, Egypt)	147
<i>Bluetooth Smart: An Enabling Technology for the Internet of Things</i>	
Shahid Raza (SICS Swedish ICT, Sweden), Prasant Misra (Indian Institute of Science, Bangalore, India), Zhitao He (SICS, Sweden), Thiemo Voigt (Swedish Institute of Computer Science & Uppsala University, Sweden)	155
<i>Network-Level Security and Privacy Control for Smart-Home IoT Devices</i>	
Vijay Sivaraman (University of New South Wales, Australia), Hassan Habibi Gharakheili (University of New South Wales, Australia), Arun Vishwanath (IBM Research, Australia), Roksana Boreli (National ICT Australia & University of NSW, Australia), Olivier Mehani (NICTA, Australia)	163

### Seventh International Workshop on Selected Topics in Mobile and Wireless Computing

<i>Fast Detection of Coherent Signals Using Pre-Conditioned Root-Music Based on Toeplitz Matrix Reconstruction</i>	
Abdulrahman Goian (Khalifa University, UAE), Mohamed Ibrahim AlHajri (Khalifa University, UAE), Raed Shubair (MIT, USA), Luis Weruaga (Khalifa University of Science, Technology & Research, UAE), Ahmed Kulaib (Khalifa University, UAE), Rashid AlMemari (Khalifa University, UAE), Muna Darweesh (Khalifa University, UAE)	168

<i>Use of Cell-site diversity to mitigate rain attenuation in 10-66 GHz Fixed WiMAX</i>	
Sharmini Enoch (University of Wollongong in Dubai, UAE) .....	175
<i>DISCUE: Distributed Caching Framework at the User Equipment (UE) in LTE Networks</i>	
Hassan A. Artail (American University of Beirut, Lebanon), Salim Mansour (American University of Beirut, Lebanon), Hasanin Harkous (American University of Beirut, Lebanon) .....	181
<i>Performance comparison of retransmission mechanisms for multi-hop relay networks</i>	
Alexander Sayenko (Nokia Networks, Finland), Timo Hämäläinen (University of Jyväskylä, Finland) .....	189

## **CWN'15: The Second International Workshop on Cooperative Wireless Networks - 2015**

### **Second International Workshop on Cooperative Wireless Networks**

<i>Multi-objective optimization of CoMP-based MIMO-OFDMA networks with frequency reuse</i>	
Javier Pastor-Pérez (University of the Balearic Islands, Spain), Felip Riera-Palou (University of the Balearic Islands, Spain), Guillem Femenias (University of the Balearic Islands, Spain) .....	195
<i>Entropy Based Cooperative Sensing in Cognitive Radio with Nakagami Fading</i>	
Usama Y. Mohamad (University of Kassel, Germany), Dirk Dahlhaus (University of Kassel, Germany) .....	203
<i>TSA: Terminal-Supported 5G Network Optimization</i>	
Carlos Giraldo-Rodríguez (University of Vigo, Spain), Jorge Fontenla-Gonzalez (University of Vigo, Spain), Carlos Pérez-Garrido (University of Vigo, Spain), Saber Mhiri (University of Vigo, Spain), Felipe Gil-Castiñeira (University of Vigo, Spain), Francisco J. González-Castaño (Universidad de Vigo, Spain) .....	209
<i>Formal Reliability Analysis of Wireless Sensor Network Data Transport Protocols using HOL</i>	
Waqar Ahmad (National University of Sciences and Technology, Pakistan), Osman Hasan (National University of Sciences and Technology, Pakistan), Sofiene Tahar (Concordia University, Canada) .....	217

## **eHPWAS'15: e-Health Pervasive Wireless Applications and Services (eHPWAS'15)**

### **Sensor-based e-Health Frameworks**

<i>Smart Carpet using differential piezoresistive pressure sensors for elderly fall detection</i>	
Kabalan Chaccour (Antonine University, Lebanon), Rony Darazi (Antonine University, Lebanon) .....	225
<i>Medication intake adherence with real time activity recognition on IoT</i>	
Kemal Serdaroglu (Yeditepe University & Institute of Natural Sciences, Turkey), Gamze Uslu (Yeditepe University, Turkey), Sebnem Baydere (Yeditepe University, Turkey) .....	230
<i>An Integrated Caregiver-focused mHealth Framework for Elderly Care</i>	
Mohammed Ghazal (Abu Dhabi University, UAE), Yasmina Al Khalil (Abu Dhabi University, UAE), Fatemeh Dehbozorgi (Abu Dhabi University, UAE), Marah Alhalabi (Abu Dhabi University, UAE) .....	238
<i>NFC-based Asset Management for Medical Equipment</i>	
Hani Ragab Hassen (Heriot-Watt University, United Kingdom), Nikhil Shetty (Heriot-Watt University, UAE) .....	246

# STWiMob'2015: 2015 Eight International Workshop on Selected Topics in Mobile and Wireless Computing

## Seventh International Workshop on Selected Topics in Mobile and Wireless Computing

<i>SSMBP: A Secure SMS-based Mobile Banking Protocol with Formal Verification</i> Sriramulu Bojjagani (INSTITUTE FOR DEVELOPMENT AND RESEARCH IN BANKING TECHNOLOGY, UNIVERSITY OF HYDERABAD, India), Sastry (IDRBT, India) .....	252
<i>TROUVE: a Trusted ROUTing Protocol for Urban Vehicular Environments</i> Chaker abdelaziz Kerrache (Université Amar Thelidji de Laghouat, Algeria), Nasreddine Lagraa (Amar Thelidji University, Laghouat & LIM Laboratory, Algeria), Carlos T. Calafate (Universidad Politécnica de Valencia, Spain), Abderrahmane Lakas (UAE University, UAE) .....	260
<i>Performance Impact of Security on Cooperative Awareness in Dense Urban Vehicular Networks</i> Mohamed Ben Brahim (Qatar Mobility Innovations Center (QMIC), Qatar), Elyes Ben Hamida (Qatar Mobility Innovations Center (QMIC), Qatar), Fethi Filali (QMIC, Qatar), Nouredine Hamdi (INSAT, Carthage University & ENIT SYSCOM Laboratory, Tunisia) .....	268
<i>Mitigating SSDF Attack using K-Medoids Clustering in Cognitive Radio Networks</i> Shikhamoni Nath (North Eastern Regional Institute of Science and Technology, India), Ningrinla Marchang (North Eastern Regional Institute of Science and Technology, Arunachal Pradesh, India), Amar Taggu (NERIST, India) .....	275

## Seventh International Workshop on Selected Topics in Mobile and Wireless Computing

<i>Performance Analysis of Physical Layer Security of Chaos-based Modulation Schemes</i> Long Kong (ETS & University of Quebec, Canada), Georges Kaddoum (ETS Engineering School, University of Québec, Canada), Mostafa Taha (Assiut University, Egypt) .....	283
<i>Coordinated Multipoint in Heterogeneous Networks with Overlapping Microcell Expanded Regions</i> Jessica Khoriaty (American University of Beirut, Lebanon), Hassan A. Artail (American University of Beirut, Lebanon) .....	289
<i>Blind Deconvolution using Compressed Sensing in Time Dispersive MIMO OFDM Systems</i> Daniela Valente (Dalhousie University, Canada), Jacek Ilow (Dalhousie University, Canada), Michael Cada (Dalhousie University, Canada) .....	296
<i>C-RAN Simulator: A Tool for Evaluating 5G Cloud-Based Networks System-Level Performance</i> Norhan Mohsen (German University in Cairo (GUC), Egypt), Khaled Mohamed Shawky Hassan (German University in Cairo (GUC), Egypt) .....	302
<i>Cyclostationarity-Based Versus Eigenvalues-Based Algorithms for Spectrum Sensing in Cognitive Radio Systems: Experimental Evaluation Using GNU Radio and USRP</i> Amor Nafkha (CentraleSupélec, France), Babar Aziz (IFSTTAR, LEOST, Villeneuve D'Ascq, France), Malek Naoues (CentraleSupélec, France), Adrian Kliks (Poznan University of Technology, Poland) .....	310

# GROWN'2015: 2015 The Third International Workshop on GReen Optimized Wireless Networks

## GReen Optimized Wireless Networks Workshsop -1

<i>Energy-efficient Traffic Bypassing in LTE HetNets with Mobile Relays</i> George T. Karetos (Technology Education Institute of Thessaly, Greece), Angelos Rouskas (University of Piraeus, Greece), Fotis Foukalas (Qatar University, Qatar) .....	316
--	-----

<i>A 2.4 GHz-868 MHz Dual-Band Wake-Up Radio for Wireless Sensor Network and IoT</i> Michele Magno (ETH Zurich and University of Bologna, Switzerland), Massimo Del prete (University of Bologna, Italy), Diego Masotti (University of Bologna, Italy), Alessandra Costanzo (DEIS, University of Bologna, Italy), Luca Benini (Swiss Federal Institute of Technology (ETH), Switzerland) .....	322
<i>Energy Efficiency Metrics for Low-Power Near Ground Level Wireless Sensors</i> Jalawi Alshudukhi (Oxford Brookes University, United Kingdom), Shumao Ou (Oxford Brookes University, United Kingdom), Peter Ball (Oxford Brookes University, United Kingdom), Liqiang Zhao (Xidian University, P.R. China), Guogang Zhao (Xidian University, P.R. China) .....	329
<i>Compensation of EE Degradation Due to Antenna-Muting in DAS for a Green Cellular Network</i> Mehran Behjati (National University of Malaysia (UKM), Malaysia), Rosdiadee Nordin (Universiti Kebangsaan Malaysia, Malaysia), Mahamod Ismail (Universiti Kebangsaan Malaysia, Malaysia) .....	336

## **eHPWAS'15: e-Health Pervasive Wireless Applications and Services (eHPWAS'15)**

### **e-Health Architectures and Services**

<i>Privacy and Security Concerns for Health Data Collected</i> Husain Subedar (University of Ontario Institute of Technology (UOIT), Canada), Khalil El- Khatib (University of Ontario Institute of Technology, Canada) .....	341
<i>Design and Deployment of eHealth Interventions using Behavior Change Techniques, BPMN2 and OpenEHR</i> Mate Bestek (University of Ljubljana & University of Primorska, Ministry of Health of Republic of Slovenia, Slovenia), Kristina Curtis (Coventry University, United Kingdom), Andrej Brodnik (University of Ljubljana & Faculty of Computer and Information Science, Slovenia) .....	349
<i>Cloud Semantic-based Dynamic Multimodal Platform for Building mHealth Context-aware Services</i> Alti Adel (University of setif & Algeria, Algeria), Philippe Roose (University of Pau - IUT de Bayonne & LIUPPA Research Lab, France), Sébastien Laborie (Université de Pau et des Pays de l'Adour & IUT de Bayonne et du Pays Basque, France) .....	357

## **STWiMob'2015: 2015 Eight International Workshop on Selected Topics in Mobile and Wireless Computing**

### **Seventh International Workshop on Selected Topics in Mobile and Wireless Computing**

<i>Optimizing Diversity Gain for Non-Coherent Wireless Multimedia Sensor Networks</i> Nnamdi Nwanekezie (University of Hertfordshire, United Kingdom), Oluyomi Simpson (University of Hertfordshire, United Kingdom), Yusuf Idris Abdulkadir (University of Hertfordshire, United Kingdom), Yichuang Sun (University of Hertfordshire, United Kingdom) .....	365
<i>Towards Exploiting a Synergy between Cognitive and Multi-Radio Networking</i> Tanvir Ahmed Khan (Bangladesh University of Engineering and Technology, Bangladesh), Chowdhury Hyder (Michigan State University, USA), A. B. M. Alim Al Islam (Bangladesh University of Engineering and Technology, Bangladesh) .....	370
<i>Stochastic Dynamic Programming Model for Revenue Optimization in Social Networks</i> Patrick Hosein (The University of the West Indies, Trinidad and Tobago), Trisha Lawrence (University of the West Indies, Trinidad and Tobago) .....	378
<i>Microtext Normalization using Probably-Phonetically-Similar Word Discovery</i> Richard Khoury (Lakehead University, Canada) .....	384



# WiMob'2015: 2015 IEEE 11th International Conference on Wireless and Mobile Computing, Networking and Communications (WiMob)

## Network Performance Evaluation and Optimization

<i>An Optimal MIMO Mode Selection Method for D2D Transmission in Cellular Networks</i> Armin Morattab (Ecole de Technologie Supérieure, University of Quebec, Canada), Zbigniew Dziong (École de technologie supérieure, University of Quebec, Canada), Kazem Sohraby (South Dakota School of Mines and Technology, USA), MD. Habul Islam (Southern Alberta Institute of Technology, Canada) .....	392
<i>Performance Analysis of Energy Detection over Mixture Gamma based Fading Channels with Diversity Reception</i> Omar Alhussein (Simon Fraser University, Canada), Ahmed Al Hammadi (Khalifa University, UAE), Paschalis C. Sofotasios (Tampere University of Technology & Aristotle University of Thessaloniki, Finland), Sami Muhaidat (Khalifa University, UAE), Jie Liang (Simon Fraser University, Canada), Mahmoud Al-Qutayri (Khalifa University, UAE), George K. Karagiannidis (Aristotle University of Thessaloniki, Greece) .....	399
<i>Effective Capacity in Multiple Access Channels with Arbitrary Inputs</i> Marwan Hammouda (Leibniz Universität Hannover, Germany), Sami Akin (Leibniz Universität Hannover, Germany), Jürgen Peissig (Leibniz Universität Hannover, Germany) .....	406
<i>Outage Probability Analysis of Dual-hop Full-Duplex Decode-and-Forward Relaying over Generalized Multipath Fading Conditions</i> Mulugeta K Fikadu (Tampere University of Technology, Finland), Paschalis C. Sofotasios (Tampere University of Technology & Aristotle University of Thessaloniki, Finland), Mikko Valkama (Tampere University of Technology, Finland), Sami Muhaidat (Khalifa University, UAE), Qimei Cui (Beijing University of Posts and Telecommunications, P.R. China), George K. Karagiannidis (Aristotle University of Thessaloniki, Greece) .....	414

## mmWave and Massive MIMO for 5G Communications

<i>A comparative Analysis of mmWave vs LTE technology for 5G Moving Networks</i> Antonio Mastro Simone (University of Catania, Italy), Daniela Panno (University of Catania, Italy) .....	422
<i>Performance of Distributed Compressive Sensing Channel Feedback in Multi-User Massive MIMO</i> Khaled Mohamed Shawky Hassan (German University in Cairo (GUC), Egypt), Martin Kurras (Fraunhofer Heinrich Hertz Institute & Fraunhofer, Germany), Lars Thiele (Fraunhofer Heinrich Hertz Institute, Germany) .....	430
<i>Sum-rate Maximizing in Downlink Massive MIMO Systems with Circuit Power Consumption</i> Ramí Hamdi (École de Technologie Supérieure (ÉTS) & Université du Québec à Montréal (UQÀM), Canada), Wessam Ajib (Université du Québec à Montréal, Canada) .....	437

## Routing for Wireless Networking, Mobility and Nomadicity

<i>Low Overhead Loop-Free Routing in Wireless Sensor Networks</i> Henry-Joseph Audéoud (Grenoble Informatics Laboratory, France), Michal Krol (Grenoble Informatics Laboratory, France), Martin Heusse (Grenoble Informatics Laboratory & Grenoble INP, France), Andrzej Duda (Grenoble Institute of Technology, France) .....	443
<i>RPL-Based Routing Protocols For Multi-Sink Wireless Sensor Networks</i> Muhammad Umer Farooq (University College Cork, Ireland), Cormac J. Sreenan (University College Cork, Ireland), Kenneth N Brown (University College Cork, Ireland), Thomas Kunz (Carleton University, Canada) .....	452

<i>Augur: A Delay Aware Forwarding Protocol for Delay-Tolerant Networks</i>	
Ahmad El Shoghri (The University of Queensland & Commonwealth Scientific Industrial and Research Organization, Australia), Branislav Kusy (Commonwealth Scientific and Industrial Research Organisation (CSIRO) ICT Centre, Australia), Raja Jurdak (Commonwealth Scientific and Industrial Research Organisation (CSIRO) ICT Centre, Australia), Neil W Bergmann (University of Queensland, Australia) .....	460
<i>Routing algorithm to fairly distribute the exposure to electromagnetic fields over wireless mesh networks</i>	
Luis Diez (University of Cantabria, Spain), Julian Igareda (University of Cantabria, Spain), Voichita Iancu (University Politehnica of Bucharest, Romania), Emil I Slusanschi (University Politehnica of Bucharest, Romania), Ramón Agüero (University of Cantabria, Spain) .....	468

## Optimizations for Multimedia Applications

<i>Mobile Video Streaming with Video Quality and Streaming Performance Guarantees</i>	
King Ching Wu (The Chinese University of Hong Kong, Hong Kong), Yan Liu (The Chinese University of Hong Kong, Hong Kong), Jack Y. B. Lee (The Chinese University of Hong Kong, Hong Kong) .....	474
<i>Large-scale Intrusion Detection with Low-cost Multi-camera wireless image sensors</i>	
CongDuc Pham (University of Pau, France) .....	484
<i>Ranging Explosion Events Using Smartphones</i>	
Srinivas Chakravarthi Thandu (Missouri University of Science and Technology, USA), Sriram Chellappan (University of South Florida, USA), Zhaozheng Yin (Missouri University of Science and Technology, USA) .....	492
<i>RADE: Resource-aware Distributed Browser-to-browser 3D Graphics Delivery in the Web</i>	
Timo Koskela (University of Oulu, Finland), Arto Heikkinen (University of Oulu, Finland), Erkki Harjula (University of Oulu, Finland), Mikko Levanto (University of Oulu, Finland), Mika Ylianttila (University of Oulu, Finland) .....	500

## New Schemes for 5G Communications

<i>Physical-Layer Security for Multi-Antenna Wiretap Channel in the Wideband Regime</i>	
Mustafa El-halabi (American University of Science & Technology, Lebanon), Roger Achkar (American University of Science and Technology, Lebanon) .....	509
<i>KLT-Based PAPR Reduction Technique for LTE-Advanced Uplink with Carrier Aggregation</i>	
Abdel-karim Ajami (American University of Beirut (AUB), Lebanon), Hassan A. Artail (American University of Beirut, Lebanon) .....	514
<i>Spatial Interference Management with Hierarchical Precoding in Ultra-Dense Heterogeneous Networks</i>	
Martin Kurras (Fraunhofer Heinrich Hertz Institute, Germany), Mohamed Shehata (Fraunhofer Heinrich Hertz Institute, Germany), Khaled Mohamed Shawky Hassan (German University in Cairo (GUC), Egypt), Lars Thiele (Fraunhofer Heinrich Hertz Institute, Germany) .....	520
<i>Effective Secrecy-SINR Analysis of Time Reversal-Employed Systems over Correlated Multi-path Channel</i>	
Ha-Vu Tran (University of Québec, Canada), Hung Tran (ETS, Canada), Georges Kaddoum (ETS Engineering School, University of Québec, Canada), Dung Tran (Duy Tan University, Vietnam), Duc-Binh Ha (Duy Tan University, Vietnam) .....	527

## MAC for Wireless Networking, Mobility and Nomadicity

<i>On Modeling Single-cell IEEE 802.11 Ad-Hoc Network with Power Saving Mode</i> Wei Zhang (Texas A&M University, USA), Yuhan Zhou (Texas A&M University, USA), Mahima Agumbe Suresh (Texas A&M University, USA), Radu Stoleru (Texas A&M University, USA) .....	533
<i>Performance Evaluation of MIMO-based MAC/PHY cross-layer design in multi-hop ad hoc networks</i> Abderrezak Rachedi (University Paris-Est Marne-la-Vallée, France), Hakim Badis (Institut Gaspard-Monge, France) .....	542
<i>Direction Aware Cluster-Based multi channel MAC Protocol for Vehicular Ad Hoc Networks</i> Aboobeker sidhik Koyamparambil mammu (University Of Deusto, Spain), Unai Hernández-Jayo (University of Deusto, Spain), Nekane Sainz (University of Deusto, Spain) .....	549
<i>Buffer Management in Wireless Full-Duplex Systems</i> Nader Bouacida (King Abdullah University of Science and Technology, Tunisia), Ahmad Showail (KAUST, Saudi Arabia), Basem Shihada (KAUST, Saudi Arabia) .....	557

## Performance evaluation and resource allocation

<i>Mobile-to-Mobile Opportunistic Task Splitting and Offloading</i> Gerardo Calice (Sapienza University of Rome, Italy), Abderrahmen Mtibaa (Texas A&M University, USA), Roberto Beraldi ("Sapienza" Università di Roma, Italy), Hussein Alnuweiri (Texas A&M University, Qatar) .....	565
<i>Increasing the Efficiency of Code Offloading through Remote-side Caching</i> Florian Berg (University of Stuttgart, Germany), Frank Dürr (University of Stuttgart, Germany), Kurt Rothermel (University of Stuttgart, Germany) .....	573
<i>Comparison of in-App Ads Traffic in Different Ad Networks</i> Riwa Mouawi (American University of Beirut, Lebanon), Imad H Elhajj (American University of Beirut, Lebanon), Ali Chehab (American University of Beirut, Lebanon), Ayman Kayssi (American University of Beirut, Lebanon) .....	581
<i>What Matters is an Application: on the Excessive I/Os in Smartphones</i> Myungsik Kim (Hanyang University, Korea), Seongjin Lee (Hanyang univ, Korea), Youjip Won (Hanyang University, Korea) .....	588
<i>Leveraging CDR datasets for Context-Rich Performance Modeling of Large-Scale Mobile Pub/Sub Systems</i> Georgios Bouloukakis (Inria, France), Rachit Agarwal (Inria Rocquencourt, France), Nikolaos Georgantas (INRIA, France), Animesh Pathak (Inria Paris-Rocquencourt, France), Valerie Issarny (INRIA, France) .....	596

## Antennas and Channel Propagation

<i>Hexagonal Dielectric Loaded Nantenna for Optical ITU-T C-Band Communication</i> Waleed Tariq Sethi (King Saud University, Saudi Arabia), Hamsakutty Vettikalladi (King Saud University, Saudi Arabia), Habib Fathallah (King Saud University, Saudi Arabia), Mohamed Himdi (Université de Rennes 1, France) .....	604
<i>Single-Band PIFA MIMO Antenna System Design for Future 5G Wireless Communication Applications</i> Osama Haraz (Assiut University, Egypt), Muhammad Ashraf (College of Engineering, King Saud University, Saudi Arabia), Saleh A Alshebeili (King Saud University, Saudi Arabia) .....	608
<i>Enhanced Gain Compact Size Switched Beam Conformal Antipodal Tapered Slot Antenna System for 5G MIMO Wireless Communication</i> Muhammad Ashraf (College of Engineering, King Saud University, Saudi Arabia), Osama Haraz (Assiut University, Egypt), Saleh A Alshebeili (King Saud University, Saudi Arabia) .....	613

*Cluster-based Mobile-to-Mobile Channel Characterization for Realistic Modelling of Multipath-Components*

Jochen Martin-Creuzburg (Fraunhofer Institute for Integrated Circuits IIS, Germany), Jörg Fischer (Fraunhofer Institute for Integrated Circuits IIS, Germany), Robert Koch (Fraunhofer IIS, Germany), Markus Landmann (Fraunhofer Institute for Integrated Circuits IIS, Germany), Reiner S. Thomä (Ilmenau University of Technology, Germany) .....	619
--	-----

## **Security and Privacy for Wireless Networking, Mobility and Nomadicity**

*An Efficient Pairwise Key Establishment Scheme for Ad-hoc Mobile Clouds*

Subhajit Mandal (Texas A&M University, USA), Chen Yang (Texas A&M University, USA), Ala Altaweel (Texas A&M University, USA), Radu Stoleru (Texas A&M University, USA) .....	627
--	-----

*Secret Key Generation from Static Channels with Untrusted Relays*

Rene Guillaume (University of Duisburg-Essen & Robert Bosch GmbH, Germany), Stephan Ludwig (Robert Bosch GmbH, Germany), Andreas Mueller (Robert Bosch GmbH, Germany), Andreas Czulwik (Universität Duisburg-Essen, Germany) .....	635
--	-----

*A Two Level Privacy Preserving Pseudonymous Authentication Protocol for VANET*

Ubaidullah Rajput (Hanyang University,ERICA Campus, South Korea, Korea), Fizza Alvi, Engr. (Hanyang University, South Korea, Korea), Hasoo Eun (Hanyang University, Korea), Rasheed Hussain (Innopolis University & Information Security and Privacy Lab, Russia), Heekuck Oh (Hanyang University, Korea) .....	643
---	-----

*Real-World Evaluation of an Anonymous Authenticated Key Agreement Protocol for Vehicular Ad-Hoc Networks*

Carsten Büttner (Adam Opel AG and Technische Universität Darmstadt, Germany), Friederike Bartels (Adam Opel AG, Germany), Sorin A. Huss (Technische Universität Darmstadt, Germany) .....	651
---	-----

## **Scheduling and coordinating wireless mobile devices**

*Programmable Orchestration of Time-Synchronized Events Across Decentralized Android Ensembles*

Edmund Lam (Carnegie Mellon University & Qatar Campus, Qatar), Iliano Cervesato (Carnegie Mellon University - Qatar Campus, Qatar), Ali Elgazar (Carnegie Mellon University, Qatar) .....	659
---	-----

*Deploying a Pool of Long-Range Wireless Image Sensor with Shared Activity Time*

CongDuc Pham (University of Pau, France) .....	667
--	-----

*Heterogeneous Scheduling in Wireless Networks Machine to Machine case study*

Konstantinos Lizos (University of Oslo, Norway) .....	675
---	-----

*An Unobtrusive Interaction Interface for Multiple Co-located Mobile Devices*

Seung Eun Chung (North Carolina State University, USA), Injong Rhee (North Carolina State University, USA) .....	683
--	-----

## **Modulation and Coding**

*Iterative receiver cancellation of nonlinear power amplifier distortion in FBMC/OQAM system*

Bouhadda Hanen (Innov'Com Sup'Com, Tunisia), Rafik Zayani (Innov'COM Lab, Sup'Com, Tunisia), Hmaied Shaiek (CNAM, France), Daniel Roviras (Cnam, France), Ridha R. Bouallegue, B. (Ecole Supérieure des Communications de Tunis, Tunisia) .....	691
---	-----

<i>An Implementation of a Fountain Code-Based MIMO-OFDM Receiver for Real-Time Wireless Video Streaming</i>	
Yi-Pin Lu (National Taiwan University, Taiwan), Wei Lan (National Taiwan University, Taiwan), Yi-Feng Cheng (National Taiwan University, Taiwan), Tzi-Dar Chiueh (National Taiwan University, Taiwan) .....	696
<i>Analytic Symbol Error Rate Evaluation of M-PSK Based Regenerative Cooperative Networks Over Generalized Fading Channels</i>	
Mulugeta K Fikadu (Tampere University of Technology, Finland), Paschalis C. Sofotasios (Tampere University of Technology & Aristotle University of Thessaloniki, Finland), Mikko Valkama (Tampere University of Technology, Finland), Qimei Cui (Beijing University of Posts and Telecommunications, P.R. China), Sami Muhaidat (Khalifa University, UAE), George K. Karagiannidis (Aristotle University of Thessaloniki, Greece) .....	704
<i>Space Time Block Coded Cooperative Spatial Modulation</i>	
Hasan Kartlak (Istanbul University & Akdeniz University, Turkey), Niyazi Odabasioglu (Istanbul University, Turkey), Aydin Akan (Istanbul University, Turkey) .....	712

## Wireless Sensor Networking, Mobility and Nomadicity

<i>Remote Inference Energy Model for Internet of Things Devices</i>	
Vilen Looga (Aalto University, Finland), Zhonghong Ou (Aalto University, Finland), Yang Deng (Aalto University, Finland), Antti Ylä-Jääski (Helsinki University of Technology, Finland) .....	716
<i>Optimized Trajectories of Multi-Robot Deploying Wireless Sensor Nodes</i>	
Ines Khoufi (Inria, France), Mohamed Hadded (TELECOM SudParis, France), Pascale Minet (INRIA, France), Anis Laouiti (TELECOM SudParis, France) .....	724
<i>Tracking and Monitoring Horses in the Wild using Wireless Sensor Networks</i>	
Ion Emilian Radoi (The University of Edinburgh, United Kingdom), Janek Mann (University of Edinburgh, United Kingdom), DK Arvind (University of Edinburgh, United Kingdom) .....	732
<i>Green Smartphone GPUs: Optimizing Energy Consumption using GPUFreq Scaling Governors</i>	
Enas Ahmad (KAUST, Saudi Arabia), Basem Shihada (KAUST, Saudi Arabia) .....	740

## Security, privacy and authentication in mobile applications

<i>Secure and Privacy-Preserving AMI-Utility Communications via LTE-A Networks</i>	
Zaher Haddad (Alaqa University & Cairo University, Palestine), Mohamed M E A Mahmoud (Tennessee Tech University, USA), Sanaa Taha (Cairo University, Egypt), Imane A. Saroit (Cairo University, Egypt) .....	748
<i>ProbeTags: Privacy-Preserving Proximity Detection Using Wi-Fi Management Frames</i>	
Marco Maier (Ludwig-Maximilians-Universität München, Germany), Lorenz Schauer (LMU Munich, Germany), Florian Dorfmeister (LMU Munich, Germany) .....	756
<i>Jamming Detection on 802.11p under Multi-channel Operation in Vehicular Networks</i>	
Huong Nguyen-Minh (University of Avignon, France), Abderrahim Benslimane (University of Avignon & LIA/CERI, France), Abderrezak Rachedi (University Paris-Est Marne-la-Vallée, France) .....	764
<i>Gesture-Based Soft Authentication</i>	
Alan Ferrari (University of Applied Sciences and Arts of Southern Switzerland (SUPSI), Switzerland), Daniele Puccinelli (University of Applied Sciences and Arts of Southern Switzerland (SUPSI), Switzerland), Silvia Giordano (University of Applied Sciences and Arts of Southern Switzerland (SUPSI), Switzerland) .....	771

## Radio Resource Management

### *Joint Scheduling and Power Control in Multi-Cell Networks for Inter-Cell Interference Coordination*

Bilal Maaz (University of Versailles, France), Kinda Khawam (Université de Versailles, France), Samer Lahoud (IRISA, University of Rennes 1, France), Steven Martin (Paris-Sud University, France), Jad Nasreddine (Rafik Hariri University, Lebanon), Samir Tohme (University of Versailles, France) ..... 778

### *On the Analysis of Channel-Aware Schedulers in OFDMA-Based Networks using FFR*

Jan Garcia Morales (University of the Balearic Islands, Spain), Guillem Femenias (University of the Balearic Islands, Spain), Felip Riera-Palou (University of the Balearic Islands, Spain) ..... 786

### *Joint Multi-user Resource Scheduling and Computation Offloading in Small Cell Networks*

Wael Labidi (CEA-List, France), Mireille Sarkiss (CEA LIST, France), Mohamed Kamoun (Huawei France, France) ..... 794

### *Wait-to-Pick-As-Available (W2PAA): a New MAC Protocol for Uplink Multi-Users Transmissions in WLAN*

Btissam Er-rahmadi (University Rennes 1 & Orange Labs, France), Adlen Ksentini (University of Rennes 1 / IRISA Lab, France), Djamal-Eddine Meddour (Orange Labs, France) ..... 802

## Cellular Wireless Networking, Mobility and Nomadicity

### *Cross-layer approach enabling communication of high number of devices in 5G mobile networks*

Jan Plachy (Czech Technical University in Prague, Czech Republic), Zdenek Becvar (Czech Technical University in Prague, Czech Republic), Emilio Calvanese Strinati (CEA-LETI, France) ..... 809

### *On Efficient Power Allocation Modeling in Virtualized Uplink 3GPP-LTE Systems*

Mohamed Hussein (University of Western, Canada), Abdallah Moubayed (University of Western Ontario, Canada), Serguei Primak (University of Western Ontario, Canada), Abdallah Shami (The University of Western Ontario, Canada) ..... 817

### *General-Purpose Multi-Objective Vertical Hand-off Mechanism Exploiting Network Dynamics*

Novia Nurain (Bangladesh University of Engineering and Technology, Bangladesh), Taslima Akter (Bangladesh University of Engineering and Technology (BUET), Bangladesh), Hafsa Zannat (Bangladesh University of Engineering & Technology (BUET), Bangladesh), Monira Akter (Bangladesh University of Engineering and Technology, Bangladesh), A. B. M. Alim Al Islam (Bangladesh University of Engineering and Technology, Bangladesh), Md. Humayun Kabir (University of Victoria, Canada) ..... 825

## Channel Estimation and Equalization

### *DFE for AF-PNC over Frequency-Selective Multipath Channels*

Alaa Ahmed (Newcastle University, School of Electrical and Electronic Engineering, United Kingdom), Charalampos C. Tsimenidis (Newcastle University, United Kingdom), Jeffrey A. Neasham (Newcastle University, United Kingdom), Bayan S Sharif (Khalifa University, UAE) ..... 833

### *Sparse NLMS Adaptive Algorithms for Multipath Wireless Channel Estimation*

Abdullah Al-Shabli (Khalifa University, UAE), Bilal Taha (Khalifa University, UAE), Hadeel Elayan (Khalifa University, UAE), Fatimah Al-Ogaili (Khalifa University, UAE), Leen AlHalabi (Khalifa University, UAE), Luis Weruaga (Khalifa University of Science, Technology & Research, UAE), Shihab Jimaa (Khalifa University, UAE) ..... 839

### *Leveraging the l1-LS Criterion for OFDM Sparse Wireless Channel Estimation*

Fatimah Al-Ogaili (Khalifa University, UAE), Hadeel Elayan (Khalifa University, UAE), Leen AlHalabi (Khalifa University, UAE), Abdullah Al-Shabli (Khalifa University, UAE), Bilal Taha (Khalifa University, UAE), Luis Weruaga (Khalifa University of Science, Technology & Research, UAE), Shihab Jimaa (Khalifa University, UAE) ..... 845

## Future Wireless Networking, Mobility and Nomadicity

### *Mobility as a First Class Function*

- Ditchaphong Phoomikiattisak (University of St Andrews, United Kingdom), Saleem N Bhatti (University of St Andrews, United Kingdom) ..... 850

### *Taming the Densification Challenge in Next Generation Wireless LANs: An Investigation into the Use of Dynamic Sensitivity Control*

- Parag Kulkarni (Toshiba Research Europe Ltd., United Kingdom), Fengming Cao (Toshiba Europe Research Telecommunication Lab, United Kingdom) ..... 860

### *Exploiting Social Information For Dynamic Tuning in Cluster Based WiFi Localization*

- Abderrahmen Mtibaa (Texas A&M University, USA), Khaled A. Harras (Carnegie Mellon University, USA), Mohamed Abdellatif (Carnegie Mellon University, Qatar) ..... 868

### *An Efficient Elastic Distributed SDN Controller for Follow-Me Cloud*

- Abdelkader Aissioui (University of Versailles St Quentin en Yvelines, France), Adlen Ksentini (University of Rennes 1 / IRISA Lab, France), Abdelhak (Mourad) Gueroui (University of Versailles, France) ..... 876

### *Planning the Communication Infrastructure for Vehicular Networks Without Tracking Vehicles*

- Cristiano M. Silva (Universidade Federal de São João Del-Rei, Brazil), João Sarubbi (Centro Federal de Educação Tecnológica de Minas Gerais - CEFETMG, Brazil), Wagner Meira, Jr. (Universidade Federal de Minas Gerais, Brazil) ..... 882