IC1301 - WiPE
Wireless Power Transmission for Sustainable Electronics

Working Group 3: Novel Materials and Technologies

Prof. Hendrik Rogier, Prof. Maurizio Bozzi
iMinds/Ghent University, Belgium
University of Pavia, Italy
Agenda

» Research Topics
  > Recent trends
  > Materials
  > Technologies

» Collaboration tools

» Past and planned activities
Research Topics: Recent trends

» Internet of Everything (IoE) and 5G requirements

> low-cost
  + for commercial reasons

> unobtrusive/invisible integration
  + for aesthetic reasons

> reliable
  + for security reasons

> autonomous
  + for practical reasons

> recyclable
  + for ecological reasons
Research Topics: Novel Materials

» Wearable WPT systems
  > Textile systems

» Implantable WPT systems
  > Biocompatible materials

» Flexible/conformable WPT systems
  > Plastics

» Recyclable/green WPT systems
  > Paper

» Low-cost/disposable WPT systems
  > Enhanced RFID tags
Research Topics: Novel Technologies

» Novel WPT topologies
  > Substrate Integrated Waveguide (SIW) technology
  > Novel active antenna topologies
  > Multi-antenna systems, reflectarrays
  > Metamaterials

» Novel CAD tools for WPT
  > Dedicated full-wave/circuit co-design and co-optimization
  > Dedicated fast radiative near-field and UWB modelling tools
  > Dedicated propagation tools, integrated frameworks
    + Body-centric environments
    + Assessment of health effects
  > Material characterization procedures

» 3D printing
» Smart leaky waveguides
» Liquid crystals
Collaboration tools

» Short-Time Scientific Missions (STSM)
  > Prime tool to initiate collaboration by exchanging ESRs
  > STSMs to date
    3. Ali Albu-Rghaif, “RF testbed to prove GNSS signal receive algorithms”, University of Buckingham to Ghent University, 10-11-2014 to 24-11-2014
    4. Maher Jassem, “RF testbed testing for multiplexed GNSS+Bluetooth signals”, University of Buckingham to Ghent University, 10-11-2014 to 24-11-2014
Collaboration tools

» Bilateral Erasmus+ Proposals

> Exchange of students, e.g. Master Thesis students
> New agreements up to date

1. Agreement University of Beira Interior (PT) and Ghent University (BE) signed, 2014
2. Agreement University of Perugia (IT) and Ghent University (BE) signed, 2014

> Master Thesis student exchanges up to date

1. Lorenzo Silvestri, “Design of reconfigurable textile Substrate Integrated Waveguides”, University of Pavia to Ghent University, Academic Year 2013-2014
Collaboration tools

» Synergetic research
  > Combining novel materials with novel technologies
    + Textile/paper/plastic + SIW technology
      – Example: UGent+Univ. Pavia: textile + SIW
    + Novel active antennas based on carbon/ferromagnetic materials
    + Validating new CAD tools based on realistic examples

» Sharing measurement tools
  > VNAs, anechoic chambers, wireless testbeds
    – Example: Univ. Buckingham +UGent: GNSS receiver + wireless testbed

» Joint measurement campaigns

» Database of available materials and technologies
Collaborations tools

» Joint book chapters

» Joint journal publications

» Joint conference publications

» Joint publications and awards
> Ghent University and University of Pavia received Best Paper Award 1st place at the IEEE Microwave Theory and Techniques Society Topical Conference on Wireless Sensors and Sensor Networks (WiSNet)
Collaborations tools

» Training Schools
  > International Spring School on Electromagnetics and emerging technologies for pervasive applications: Internet of Things, Health and Safety
    + 18th–20th April, 2016, Bologna, Italy
    Organizers: Prof. Alessandra Costanzo, Prof. Diego Masotti
Collaborations tools

» Joint European Projects
  > Horizon 2020
    » CTTC (ES), Ghent University (BE) and KU Leuven (BE) jointly participate in EC-H2020-ICT-2014-2: Research and Innovation Action “Flexible and efficient hardware/software platforms for 5G network elements and devices (Flex5Gware)”, 2015-2017

» Joint European Project proposals
  > Horizon 2020
    1. TU Brno (CZ), TU Graz (AT), Holon Institute of Technology (IL), Univ. Aveiro (PT) jointly participate in H2020-MG-2016-2017: Research and Innovation Action “Intelligent cover materials for airplane electronics (INCOME)”

> Czech-Israeli Cooperative Scientific Research
  1. TU Brno (CZ) and Holon Institute of Technology (IL), jointly participate in “Intelligent textile materials for home healthcare”
Past events

» EUCAP 2014 short course, Den Haag (NL)
  > Wearable Antenna Systems for Energy-Efficient Body-Centric Communication (lecturer H. Rogier)

» NEMO 2014 conference, May 14-16, Pavia (IT)
  > Numerical EM Modeling and Optimization
  > http://nemo-ieee.org/

» PIERS 2014 Special Session, Guangzhou (China)
  > SC4: Novel Materials and Technologies for Microwave Components (M. Bozzi, H. Rogier)
Past events

» URSI AT-RASC 2015
  > General lecture “Energy-efficient textile antenna systems for body-centric communication and sensing”, Tuesday May 19, 2015, Lecturer: H. Rogier

» URSI AT-RASC 2015
  > Special session S-AD “Wireless Power Transmission and Energy Harvesting (COST IC1301)”, May 2015, Organizers: P. Cruz, A. Georgiadis, H. Rogier
Upcoming events

» URSI Electromagnetic Theory Symposium 2016
  > Convened session “Wearable Antennas and Body-Centric Communications”, Tuesday May 19, 2015,
    Conveners: S. Agneessens, A. Kiourti, H. Rogier, J. Volakis
  > http://www.emts2016.org/