Beyond 5G Networks operating in the Millimetre Wavebands enabled by Joint Analogue-digital Signal Processing

Instituto de Telecomunicações, Instituto Superior Técnico

March 5th-9th, 2018

The School on Beyond 5G Networks operating in the Millimetre Wavebands enabled by Joint Analogue-digital Signal Processing will be held at the Instituto de Telecomunicações, Instituto Superior Técnico (Alameda Campus) in the framework of VTS Portugal Chapter and COST-CA15104 IRACON.

These 4.5 days training period will address recent advances in antennas, RF, signal and multi-antenna processing, making use of information theoretic concepts, and designing the necessary modulation and coding schemes as well as spectrum management strategies, to achieve implementable Massive Antenna Array Systems (MAAS) technologies at mmW frequencies, with the ultimate goal of providing mobile communication systems that approach 1 Tbit/s data rate on a per link basis.

Business aspects, cost/revenue trade-off, standardization, public policies for spectrum sharing, entrepreneurship and IPR protection will also be central parts of the training. The event also includes training on research, as it foresees a poster session that will allow the students to share their recent findings ideas with their colleagues and tutors, who will give feedback, suggestions. Academic vision will be complemented by industry/services experience and “hands-on” part of the training (simulation, programming).

Course fees: University Student (full time Master or Ph. D. student): 150 €
Any other participant: 225 €

Location: Instituto de Telecomunicações, Instituto Superior Técnico
Torre Norte, 10th-11th floor
Av. Rovisco Pais, 1
1049-001 Lisboa, Portugal

Contact: Prof. Fernando J. Velez, fjv@lx.it.pt
+351275329953
Course Schedule (provisional)

MONDAY, 5th
2:00pm Overview on 5G / B5G: Scenarios, Standardization and Calendar
Ana Garcia Armada, UC3M, Madrid, Spain
2:35pm From 5G / B5G scenarios to Body Area Networks Channel Models
Luís M. Correia, IST/INESC-ID, University of Lisbon, Lisbon, Portugal
3:45pm Coffee-break
4:00pm From 5G / B5G scenarios to Body Area Networks Channel Models (cont.)
Luís M. Correia, IST/INESC-ID, University of Lisbon, Lisbon, Portugal
5:45pm End of the day

TUESDAY, 6th
9:00am mmWave Channels, radiation, propagation, modelling
Wim Kotterman, Technische Universität Ilmenau, Institut für Informationstechnik. Ilmenau, Germany
10:45 Coffee-break
11:00am Antennas and RF Technologies for the Millimeter Wavebands
Luís Pessoa, INESC-TEC, Porto, Portugal
12:45pm Lunch time
2:00pm Introduction to MIMO
Dirk T. M. Slock, EURECOM, Sophie Antipolis, France
3:45pm Coffee-break
4:00pm mMIMO
Dirk T. M. Slock, EURECOM, Sophie Antipolis, France
5:45pm End of the day

WEDNESDAY, 7th
9:00-10:45am Prototyping with Open Air Interface (HANDS ON) half of the students
Kun Chen, UC3M, Madrid, Spain
10:30-11:00am The FLEXICELL C-RAN Lab Testbed, the other half of the students
 Arnaldo Oliveira, Instituto de Telecomunicações & Universidade de Aveiro, Aveiro, Portugal
10:45am Coffee-break
11:00am Prototyping with Open Air Interface (HANDS ON) half of the students
Kun Chen, UC3M, Madrid, Spain
(Student helper: Rooderson Andrade)
12:15-12:45pm The FLEXICELL C-RAN Lab Testbed, the other half of the students
 Arnaldo Oliveira, Instituto de Telecomunicações & Universidade de Aveiro, Aveiro, Portugal
12:45pm Lunch time
2:00 pm Visit to the Antenna and Propagation Labs - presentation and discussion of mm-wave antennas for 5G
Carlos Fernandes and Jorge Costa, Instituto de Telecomunicações, Lisbon, Portugal

3:45pm Coffee-break

4:00pm Business Plan in Beyond 5G Networks
Rui Ferreira, ISCTE-IUL, Lisbon, Portugal, and Pedro Sebastião, Instituto de Telecomunicações and ISCTE-IUL, Lisbon, Portugal

5:45pm Team Work / Brain Storm – Ideas for the Business Plan (Beyond 5G Networking Product / Service)

7:15pm End of the day

THURSDAY, 8th (Workshop on MAAS for Millimeter Wavebands B5G Networks)

9:00am Waveform Contenders Beyond 5G
Javier Lorca, Telefonica, Madrid, Spain

9:45am Interference exploitation and applications to hybrid analogue-digital precoding
Christos Massouros, UCL, London, UK

10:30am Coffee-break

10:45am Multiple antenna techniques for 5G systems
Inkyu Lee, Korea University, Seoul, Korea (VTS Distinguished Lecturer)

11:35am System Level Design/Large-scale Distributed-Antenna System (L-DAS) for Energy-and Spectrum-Efficient 5G Communication
Sumei Sun, Institute for Infocomm Research (I2R), Singapore (VTS Distinguished Lecturer)

12:30pm Lunch break

2:00pm Cloud RAN, fronthaul/backhaul and virtualization
Atílio Gameiro, Instituto de Telecomunicações & Universidade de Aveiro, Aveiro, Portugal

2:45pm Technical, business, and policy issues in 5G Mobile Networking
Jon M. Peha, Carnegie Mellon University

3:35pm Coffee-break and poster session

4:10pm Panel on Trends on Beyond 5G Research
Moderated by Luíz M. Correia, IST/INESC-ID, University of Lisbon, Lisbon, Portugal
Participants:
• Christos Masouros (University College London, London, UK)
• Inkyu Lee (Korea University, Seoul, Korea)
• Jon M. Peha (Carnegie Mellon University, Pittsburgh, PA, USA)
• Sumei Sun (Institute for Infocomm Research, Singapore, Singapore)

6:00pm End of the day

FRIDAY, 9th

9:00pm Parasitic Antennas for mMIMO
Constantinos Papadias, Athens Information Technology (AIT), Greece

10:45am Coffee-break

11:00pm Business Aspects, IPR Protection and Innovation
Pedro Sebastião, Instituto de Telecomunicações and ISCTE-IUL Lisbon, Portugal, Fernando J. Velez, Instituto de Telecomunicações and Universidade da Beira interior, Covilhã, Portugal

12:45 Lunch time

2:00pm Business Aspects, IPR Protection and Innovation (cont.)

Pedro Sebastião, Instituto de Telecomunicações and ISCTE-IUL Lisbon, Portugal, Fernando J. Velez, Instituto de Telecomunicações and Universidade da Beira interior, Covilhã, Portugal

3:45pm Farewell

Accommodation

Suggestions for accommodation are as follows:

- **Hotel NH Lisboa Campo Grande**
- **Hotel 3K Europa**
- **VIP Executive Villa Rica Hotel**
- **VIP Inn Berna**
- **Holiday Inn Lisboa** (please send email to Elsa Conceição, reservashil@grupo-continental.com, and mention the agreement with Instituto Superior Técnico and include “Winter School” in the subject)
- **Turim Alameda Hotel**
- **Jupiter Lisbon Hotel** (please send the form available [HERE](#) to patricia.correia@jupiterhoteis.com until February 15th, 2018)
- **Hotel IBIS Parque das Nações**
- **Zenit Lisboa Hotel**

(The Organizing Committee is establishing agreements with some of these Hotels – information will be available soon)