MiWaveS results

MiWaveS just completed its first year and achieved key milestones on the path towards project objectives; the development and demonstration of key technologies for millimetre-Wave (mmW) wireless access and backhaul needed in future 5th Generation heterogeneous cellular mobile networks.

Among the main achievements reached so far:

♦ Typical use cases for 5G mmW access and backhaul were defined and we specified these links at V or E band frequencies.
♦ We investigated new network procedures enabling communication establishment both at access and backhaul levels.
♦ We reviewed the state of the art on EMF exposure at mmW and started specific studies on the exposure of mobile user to their terminal.
♦ We specified and started the design of radio transceivers and antennas for the mobile terminal, access point and backhaul nodes.
♦ We specified the demonstrations planned by the end of the project and reached a first implementation of the baseband platform.

The main objectives of this second year will be to finalize the network-level studies, the beamsteering algorithms and the design of radio transceivers and beam-steering antennas. By the end of the year, the first demonstration of high data-rate communications in V-band and E-band shall be completed.

Save the dates

♦ **April 12-17th 2015**: several MiWaveS partners will present their work at the 9th European Conference on Antennas and Propagation in Lisbon, Portugal.

♦ **April 28-29th 2015**: the 5th plenary meeting of MiWaveS consortium will take place in Guildford, UK.

♦ **May 12th-13th 2015**: VTC-Spring 2015, Glasgow, UK. MiWaveS organizes a workshop on “Massive MIMO and Millimeter-waves for 5G Networks Workshop” (mmW5G-WS).

♦ **June 29-July 2nd, 2015**: MiWaveS will host a special session on “5G scenarios and use cases: how new mm-Waves technologies can lead to an immersive user experience?” and will present its work in the exhibition of EuCNC 2015 in Paris, France.

♦ **Sept. 6-11th, 2015**: MiWaveS will host a workshop on “Millimeter-Wave Technologies for 5G Mobile Networks” at the European Microwave Week in Paris, France.
Dosimetric Aspects Related to the Human Body Exposure to Millimeter Waves

In the context of fast-developing mmW technologies and concerns related to their possible impact on human health, our deliverable D1.3 provides a state-of-the-art study of human body electromagnetic field exposure at mmW frequencies (target tissues, interaction at the air / skin interface, power absorption, and propagation), mainly in V- and E-bands. This document is available for downloading on our web site (www.miwaves.eu).

The report describes the most important aspects of the mmW interactions with the human body in terms of reflection, transmission and power absorption. The ICNIRP guidelines and IEEE, CENELEC standards are reviewed as well as the most recent studies on the mmW dosimetry. The numerical analysis performed in V- and E-bands provides a preliminary overview of the plane wave interaction with the human-body from an electromagnetic point of view, with results on reflection and transmission quantities. Our numerical results confirm that the maximum power density occurs at the skin surface. At 1 mm beneath the skin surface, the absorbed power is attenuated by more than 98%. This finding suggests that a few mm-thick skin model is sufficient for dosimetric assessment at these frequencies. In V-band, the power transmission coefficient is about 62 % (for the normal incidence) and increases in E-band to about 68%. Transmission in the skin depends of course on polarization and angle of incidence.

A more detailed dosimetry study is ongoing in the frame of Task 4.5. In particular, the study and analysis of exposure levels induced in the most exposed parts of the human body under a representative use-case is investigated in the 60-GHz band. Numerical analysis is conducted mainly using CST Microwave Studio®.

The first scenario consists in studying numerically the human body exposure induced by a mobile handset in phone call or browsing positions. Exposure due to an Access Point (AP) will be also studied analytically based on AP data (radiated power, antenna gain, distance to the user) and the expected output results will be presented in terms of power density, E-field, and SAR. Moreover, for the downlink scenario an alternative approach will be addressed to estimate the incident power density needed to get a reliable QoS between the AP and the user.
MiWaveS demonstrations

The MiWaveS demonstrator platform has been specified in WP6. Based on the initial work in WP1 and WP2 as well as the available hardware information of WP3, WP4 and WP5, the mmW use-cases were mapped to the intended MiWaveS transmission setups. We have prepared a detailed description of how the different hardware components can be integrated into the final demonstrator system as well as the specification of the functional requirements to run the intended experiments and KPI measurements. The focus of the experiments is in the backhaul links in E-band and V-band as well as the access link in V-band only. This information now serves as guidelines for all WPs for the planning of the demonstrations in the project timeframe.

The demonstrations will be based on a digital platform developed by National Instruments; it is based on a NI PXI chassis along with a real-time host controller, a FPGA processing module on which the signal processing algorithms will be implemented, and high-throughput DAC and ADC modules. It will be interfaced with the radio transceivers and reconfigurable antennas currently under development by the partners.

A demonstration of the digital platform was performed at the third plenary meeting (Espoo, Oct. 1st 2014) of the consortium for the first time and then at the Globecom conference (Austin, TX, Dec. 2014) and the Mobile World Congress (Barcelona, March 2015).
A white paper was published on Jan. 14th, 2015 and is available for downloading on our web site (www.miwaves.eu); it outlines the vision of MiWaveS consortium, as well as the objectives and the work performed.

Exhibitions: MiWaveS was represented at the Mobile World Congress in Barcelona in March 2015 on the booths of Nokia and National Instruments with contributions of SiversIMA and Optiprint.

Regulation: MiWaveS presented a contribution to the report on IMT feasibility above 6GHz at the last ITU-R WP5D meeting (January 2015).


Conference papers and workshop presentations:

Panels: MiWaveS partners organized the following panel sessions in Globecom and ICUWB conferences in 2014:
Meetings

MiWaveS consortium met in Espoo, Finland (Sept. 30th-Oct. 2nd, 2014, host: Nokia) and in Munich, Germany (Jan. 27th-29th, 2015, host: Intel Mobile Communications).

A workshop was held on Oct. 1st with the Industrial Advisory Board, this board is composed of five prominent experts:

♦ Dr Maziar Nekovee (Chief engineer 5G, Samsung Electronics UK)
♦ Dr Hermann Brand (Director of Innovation, ETSI)
♦ Dr Guillaume Vivier (Director Advanced Technology, Sequans)
♦ Dr Ralf Irmer (Manager Wireless Access Innovation, Vodafone)
♦ Dr Evangelia Georgiadou (Telecommunication Engineer, OTE)

The next plenary meetings will be held in Guildford, UK (April 28th-29th, 2015, host: Univ. of Surrey) and in Crolles, France (Oct. 13th-15th, 2015, host: STMicroelectronics).