

EU project METIS-II technical findings on 5G spectrum above 6 GHz

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The World Radiocommunication Conference 2015 (WRC-15) will recommend items to the ITU Council for inclusion in the agenda for the next WRC which will be held in 2019 (WRC-19). It is important that consideration of additional spectrum allocations to the mobile service and identification of additional frequency bands for International Mobile Telecommunications (IMT) is included in the WRC-19 agenda, aiming in particular at frequency bands above 6 GHz.

The variety of 5G services, scenarios and use cases puts high demands on future mobile networks with regard to coverage, capacity and reliability, for which the availability of a spectrum amount of several GHz is required, to be sought in a combination of different suitable frequency bands in different spectrum parts in the whole range up to 100 GHz. Firstly, an example analysed by METIS-II with an assumed traffic increase of Extreme Mobile Broadband application 4K video – up to 70 Gbps/km² in the year 2025, shows that bandwidth of at least 500 MHz per operator is needed if, as an example, the 10 GHz band is used. Secondly, another example shows that ultra-reliable Machine Type Communication also needs bandwidths in the order of several hundreds of MHz, due to the overall impact of latency and reliability requirements and the amount of devices at the same time.

The capacity of wireless networks can be basically increased by network densification, higher spectrum efficiency (e.g. multi-antenna techniques), and larger spectrum bandwidth. Based on METIS-II analysis, these three elements are exchangeable in macro-cell environments. However, in dense networks, spectrum becomes the most effective solution for providing high capacity.

METIS-II concluded that contiguous spectrum bandwidth offer advantages with regard to device complexity, signalling, guard bands and interference.

The suitability of bands above 6 GHz in different scenarios was demonstrated by channel and propagation measurements. Due to the fact that building penetration depth strongly decreases with increasing frequency, the lower part of the spectrum between 6-30 GHz is suitable for outdoor to indoor coverage. Outdoor to outdoor mobile coverage, on the other hand, is worthwhile to be investigated across the full range of spectrum up to 100 GHz. For instance, channel and propagation measurements performed at 28 GHz have demonstrated the suitability of centimetric wave spectrum for outdoor mobile communications.

Furthermore, current wireless technology implementations enable the use of millimetric waves, e.g. for ultra-high capacity point-to-point/low mobility applications in line of sight conditions.

Based on METIS-II technical findings, spectrum in the order of several GHz is required to cope with the expected traffic demand of various use cases of 5G. In order to enable efficient service provision for all 5G scenarios, frequencies in the whole range up to 100 GHz should be investigated.

Details of the technical findings summarized above can be found in METIS-II Report “Preliminary spectrum scenarios and justification for WRC Agenda Item for 5G bands above 6 GHz”. METIS-II continues to study 5G spectrum aspects.

METIS-II Report “Preliminary spectrum scenarios and justification for WRC Agenda Item for 5G bands above 6 GHz”: https://metis-ii.5g-ppp.eu/wp-content/uploads/deliverables/METIS-II_R3.1_V1.0.pdf

PPT slides summarizing the main findings of METIS-II Report: https://metis-ii.5g-ppp.eu/wp-content/uploads/deliverables/METIS-II_R3.1_Slides.pdf

METIS-II is a project with 23 partners co-funded in the European H2020 research programme with a budget of 8 M€. Ericsson is the project coordinator and Nokia Networks is the technical coordinator. Further partners are Alcatel Lucent, Deutsche Telekom, Huawei, iDate, Intel, ITRI, Janmedia Interactive, KTH, NTT DOCOMO, NYU, Orange, Samsung, Telecom Italia, Telefónica, University of Kaiserslautern, Universitat Politècnica de València and WINLAB.