

# Report of the Expert Meeting

## Electromagnetic Field Level and 5G Roll-out Expert Meeting

2-3 November 2017  
Rome, Italy

ITU Regional Initiative for Europe on Development of Broadband Access and Adoption of Broadband

Hosted by



*Ministero dello Sviluppo Economico*

BROADBAND POLICIES  
& STRATEGIES

FUTURE 5G NETWORKS  
INTERNET OF THINGS IoT

BASE STATIONS  
DEPLOYMENT COSTS

HEALTH ISSUES  
STAKEHOLDERS

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## 1. Introduction

This [meeting](#) was organized by the Telecommunication Development Bureau (BDT) of the International Telecommunication Union (ITU) in cooperation with the Ministry of Economic Development of Italy, within the framework of the **ITU Regional Initiative for Europe on Development of Broadband Access and Adoption of Broadband**, adopted by the World Telecommunication Development Conference 2014 (WTDC-14), Dubai, and in follow up to the Regional Seminar on Spectrum Management and Broadcasting held on 29-30 May 2017 in Rome. The outcomes of the Regional Seminar were a call for a collection of case studies of countries and a suggestion to assist countries in the adoption of policies and legislations that do not negatively affect the rollout of mobile broadband networks, in particular 5G networks.

## 2. Topic Definition

It is very probable that the national legislations on exposure to electromagnetic fields (EMF) intended for the protection of the health of the general public that do not follow World Health Organization (WHO)<sup>1</sup> guidance on limit values and the associated administrative procedures for the verification of compliance with the legislations prior to putting in operation (e.g. building, planning permission procedures) will have a significant impact on the pace of the roll-out of future 5G mobile networks, on the number/density of antenna sites, on the quality of future networks and on the costs of these networks.

It is worth highlighting from the onset that any recommendation regarding exposure levels or other risk management tools, including application of the precautionary principle, is beyond the scope of the ITU Regional Initiative. Nor will this report fill any gap in knowledge, notably on long- term exposure or make any statement on biological effects or health effects of exposure to EMF. This report merely aims at taking stock of some selected and basic aspects of national regulations on the protection from EMF. It will conclude, amongst other things, with some suggestions for further stocktaking of national experiences and areas for further cooperation.

## 3. Approach: Physical Meeting Preceded By Questionnaire

A [questionnaire](#) was sent to European administrations prior to the expert meeting in order to gather information about their experiences and analyses with respect to the impact of their policies and legislations relating to protection from EMF exposure on the rollout of mobile broadband networks, in particular 5G networks. Specific points of interest were whether these policies and legislations would aggravate the difficulties arising from bottlenecks for traffic on mobile networks and whether technical measures could alleviate possible regulatory obstacles. The following countries replied to the questionnaire: Croatia, Georgia, Hungary, Italy, Montenegro, Poland, Serbia, Switzerland, and Thailand<sup>2</sup>.

The Expert Meeting aimed at generating an exchange of views and experiences in order to take stock of the current practices and proposing future collaborative actions in relation with the protection of the general population from EMF exposure without slowing down 5G deployment. The meeting brought together stakeholders who presented country cases as well as specialized actors who presented perspectives such as the health, environmental and technological issues. The experts' deliberations were moderated by Mr Istvan Bozsoki from BDT and Mr Dirk-Oliver von der Emden from OFCOM

<sup>1</sup> <http://www.who.int/peh-emf/standards/en/>

<sup>2</sup> Please note that the country responses do not have the status of official statements by national authorities. The descriptions in this report should in not any way be considered as officially sanctioned.



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(Switzerland). The agenda and country presentations can be accessed from the event web page <http://www.itu.int/en/ITU-D/Regional-Presence/Europe/Pages/Events/2017/EMF/Electromagnetic-Field-Level-and-5G-Roll-out.aspx>

This document summarises the discussions held and presents the next steps that were proposed.

## 4. Country Case Studies

- a) **The first question was whether a country has any exposure limits that are more stringent than the ICNIRP values. An additional point of interest was whether the recommendations by the International Commission on Non-Ionizing Radiation Protection (ICNIRP) with respect to reference levels have been adopted in the national/regional/local legislation as the relevant EMF Exposure Limits or whether the regulation commands measures that in effect limit exposure of the general public to EMF to levels below the Reference Levels recommended by ICNIRP.**

Every country that has replied has enacted regulation that protects the health of the general public from exposure to electromagnetic fields ("environmental exposure"). Some adopted the guidelines of the International Commission on Non-Ionizing Radiation Protection (ICNIRP)<sup>3</sup> with respect to basic restrictions and reference levels as the relevant EMF exposure limits. Quite a few have a regulation that commands more restrictive measures that in effect intend to reduce exposure of the general public to EMF to levels below the Reference Levels of ICNIRP. All the more restrictive approaches chosen were different. Some had EMF levels that were a fraction of the ICNIRP recommendations and were applicable everywhere. Other had lower levels that were only applicable in determined locations (and not everywhere).

- b) **The second question enquired about whether the EMF exposure limits excessively constrain – now or in the future – the planning of sites and the construction and/or operation of antennas. In particular assessments obtained from operators in the replying countries on their ability to densify further their networks, to operate additional antennas at existing sites (e.g. upgrade of existing sites with more recent wireless technologies), to plan their networks without taking into consideration the sites in use and EMF generated by competitors in the neighbourhood, and to share sites were welcome.**

Countries that adopted the ICNIRP reference levels for the protection from EMF exposure have not identified a potential negative impact on the pace of the roll-out of present and future 5G mobile networks, on the number/density of antenna sites, on the quality of future networks and on the costs of these networks.

On the other hand, countries with a more restrictive approach than the one recommended by ICNIRP stated that several negative impacts have been identified: amongst others, networks are built in a not optimal manner, operators are facing increased capital expenditures (lower EMF levels require to build denser networks), and the development of NGN will be hampered due to the saturation of existing sites in particular in urban areas that is the consequence of the aggregation of the EMF level of different operators (i.e. the sites cannot accommodate new technologies unless major reconfigurations are undertaken at the sites). The aggregation has a further negative impact: it generates an unavailability of new sites for antennas in urban and sub-urban areas. It was however mentioned that some operators, knowing of this drawback, used it in order to gain a competitive advantage over their competitors: the theoretical saturation in urban areas of EMF levels can result

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<sup>3</sup> See Council of the European Union Recommendation of 12 July 1999 on the limitation of exposure of the general public to electromagnetic fields (0 Hz to 300 GHz) (1999/519/EC). Moreover, ICNIRP levels have been endorsed by the European Commission's Scientific Steering Committee.



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from the fact that operators tend to exaggerate the characteristics of base stations in order to prevent other operators to put antenna in the vicinity and thus gaining a prime mover advantage.

One country whose legislation defines extremely stringent EMF levels is also experiencing major difficulties in rural areas.

- c) **The approval procedures prior to building, planning permission procedures were the object of a third cluster of questions. It included questions about the number of permits required, which authority/authorities grant these permits for cellular antennas, the average duration of an authorization process, the appeal procedures, etc.**

With respect to the process of verification of compliance with the EMF exposure limits prior to delivery of the planning permission the principal issues identified as potentially slowing down roll-out and increasing costs were:

- Procedures as such (e.g. complexity, duration, appeal mechanisms). In some countries, exemptions for small installations or certain site upgrades have been implemented in order to limit procedural delays.
- Calculation, modelling methods (e.g. aggregation of all EMF sources of all operators in vicinity)

It was mentioned several times that a severe impediment flows from the fact there are significant local differences between the theoretical and the actual exposure levels. This is due to the cautious assumptions employed in the authorization process for the compliance verification. If this discrepancy is already an issue for 4G, it is likely to be one for 5G. One intervention mentioned that operators experiencing these difficulties with respect to compliance to EMF levels might have to shut down their 2G and 3G networks; in Japan and Korea this has been done in order to save infrastructure costs and free spectrum. This can also help but this may be delayed in countries where 2G provides service for legacy machine-to-machine connections, for example, Norway<sup>4</sup>.

- d) **Possible technical remedies to traffic bottlenecks which will become more acute in urban and suburban areas with time passing? Would the attribution of additional frequency bands to mobile bring a respite? Micro- and picocells and indoor coverage (e.g. femtocells)? WLAN-Hotspots (for traffic offload)? Introduction of MIMO-antennas (in particular „beamforming“)?**

Views were split between those knowing the situation in countries that adopted the ICNIRP recommendation and those knowing the situation in countries with more stringent EMF protection levels. The first group acquiesced that these technical remedies would facilitate the roll-out of 5G. The second group doubted that these remedies would bring any relief (in particular due to the above-mentioned saturation).

- e) **Which factors are in your view central for the acceptability by the public of mobile broadband networks? Any improvements which could be beneficial with a view to future densification of networks?**

Sanitary authorities should back evidence-based protection policies. Politicians and authorities should be more proactive in getting information to the general public.

One approach chosen in several countries is to rely on measurement campaigns as they are believed to be the best way to calm the concerns of the population but there are few evaluations of effectiveness. These campaigns have shown that EMF levels in the general environment accessible by the public are significantly below authorised levels. The results are sometimes published on GIS portals.

<sup>4</sup> <https://blog.telegeography.com/2g-is-fading-away-but-it-might-outlive-3g-in-europe>



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**f) Finally addressees of the questionnaire were asked about their experience with information campaigns (concluded/planned) regarding EMF protection.**

A core role accords to politicians and authorities in order to lower the concerns of the public. Public awareness campaigns coming from operators do not have the same credibility in the eyes of the public.

One aspect that was raised that the success of these campaigns was hard to assess. In particular the criteria defining when a campaign is successful or not is challenging to characterize.

Actions of national regulators and network operators must be accompanied to the greatest possible extent by transparency and communication with citizens.

## 5. Structuring Practices & Challenges

1. National approach for the protection against non-ionizing radiation (NIR)
  - a. If ICNIRP exposure limits
    - i. It is estimated that 5G roll-out will not be impeded
  - b. If more restrictive exposure limits (e.g. < 10% of ICNIRP)
    - i. 5G deployment negatively affected (ITA + SUI: urban; POL: also rural)
    - ii. Technical remedies (inter alia more spectrum, beamforming, MIMO) bring almost no relief
2. Planning permissions / Authorisations to put into operation
  - a. Calculation methods to assess human exposure
    - i. The approximation models, for calculating the critical distance from a base station, are based on unrealistic theoretical maximum power assumptions, which may never be encountered in practice, such as the EMF signal is calculated assuming free- space propagation, continuous transmission (no consideration of communications traffic) and signal in the main beams in elevation and azimuth. A more flexible model based on realistic output powers and other technical characteristics that is less detrimental for operators might have to be considered in some situations.
  - b. In support for efficient deployment of 5G: simplified procedures needed for
    - i. Small cells
      1. GSMA<sup>5</sup> Booklet «Improving wireless connectivity through small cell deployment»
      2. Small Cell Forum<sup>6</sup> «Simplifying small cell installation: Harmonized principles for RF compliance»
    - ii. Site modifications
    - iii. Site sharing
    - iv. Site access (e.g. public buildings and installations (street lighting posts))
3. Compliance (Measurement or calculation)
  - a. ITU-T Recommendations
    - i. K.61: Guidance on measurement and numerical prediction of electromagnetic fields for compliance with human exposure limits for telecommunication installations.
    - ii. K.83: Monitoring of electromagnetic field levels.
    - iii. K.100: Measurement of RF EMF to determine compliance with human exposure limits when a base stations.

<sup>5</sup> <https://www.gsma.com/publicpolicy/policy-recommendations-enable-small-cell-deployments-2>

<sup>6</sup> [http://scf.io/en/documents/182 Simplifying small cell installation Harmonized principles for RF compliance.php](http://scf.io/en/documents/182_Simplifying_small_cell_installation_Harmonized_principles_for_RF_compliance.php)





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- iv. K.Supp-5G\_EMF\_Impact: “5G technology and human exposure to RF EMF” has been accepted.
  - b. ITU-R Handbook on Spectrum Monitoring, Chapter 5.6 on “Non-ionizing radiation measurements”, including instruments for NIR measurements, associated measurement procedures and reporting.
  - c. IEC 62232:2017 «Determination of RF field strength, power density and SAR in the vicinity of radiocommunication base stations for the purpose of evaluating human exposure”
4. Communication
- a. Information for the General Public / Awareness campaigns
    - i. Building trust
    - ii. Transparency
    - iii. Cost/benefit analysis and define success measures including evaluation
    - iv. GSMA<sup>7</sup> Booklet “5G, the Internet of Things (IoT) and Wearable Devices: What do the new uses of wireless technologies mean for radio frequency exposure?”
  - b. Between authorities (health, environmental, ICTs, local city councils)
  - c. Consider EMF management in National roadmap for 5G roll-out
5. Regional harmonisation of EMF management (particularly limits and technical compliance)
- a. The draft European Electronic Communications Code contains many articles that recommend harmonization based on the ICNIRP limits.

## 6. Proposed Next Steps

1. The outcomes of this experts’ meeting will be brought to the attention of the study groups of ITU-D, ITU-R and ITU-T.
2. ITU possesses the expertise for compliance measurements and calculations. It is a joint effort of all the sectors of ITU and each has to contribute.
  - a. Academia should be urged to continue to contribute to discussion in ITU through any of the sector -R, -D, or -T)
  - b. Realistic methods for compliance assessment with EMF exposure limits
3. Establish mechanisms for future collaboration between countries, and country case studies.
4. Proposed studies to be included in ITU-D SG Question 7/2 (revised by WTDC-17)
  - a. Preparation of guidelines and case studies on public awareness on EMF issues
    - i. A guideline for a coherent approach for the standardized EMF levels across the ITU countries was called for.
    - ii. Suggestions for communication, education, and information strategies in order to address public concern regarding human exposure to EMF and possible health effects would be welcome.
    - iii. Compilation of good practices of local community communications and perception management.
  - b. Investigate utilization of ITU Interactive Transmission Map for EMF level

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<sup>7</sup> <https://www.gsma.com/publicpolicy/5g-internet-things-iot-wearable-devices>



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5. Request WHO8 to revise its backgrounder on EMF exposures from base stations and wireless networks in view of 5G Roll-out
  6. Meeting of relevant ITU and WHO experts in 2018
    - a. Pursuing contribution to the relevant WHO meetings
  7. ITU-T EMF guide update in view of 5G roll out
  8. Investigate possible avenues for adjusting compliance processes for EMF level in countries where there are significant local differences between the theoretical and the actual exposure levels
  9. Contribution to the on-going studies within ITU-R Working Party 1C in response to Question ITU-R 239/1 on “Electromagnetic field measurements to assess human exposure”

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<sup>8</sup> <http://www.who.int/entity/peh-emf/publications/facts/fs304/en/index.html>