ITU EMF Guide

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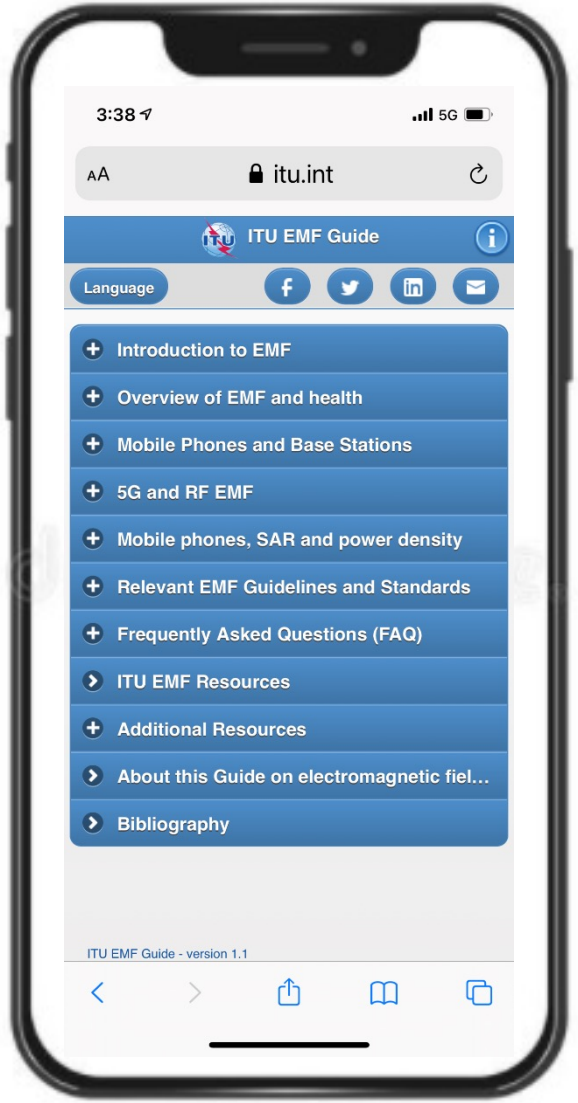


The ITU EMF Guide provides information and education resources on Electromagnetic Fields suitable for all communities, stakeholders and governments including 5G and the latest human exposure guidelines.

http://emfguide.itu.int

EMF Guide - Introduction

- Introduction to EMF
- Overview of EMF and health
- Mobile Phones and Base Stations
- 5G and RF EMF
- Mobile phones, SAR and power density
- Relevant EMF Guidelines and Standards
- Frequently Asked Questions (FAQ)
- ITU EMF Resources
- Additional Resources
- About this Guide on electromagnetic fields and health
- Bibliography

The electromagnetic spectrum

Electromagnetic fields (EMF) have existed in different forms since the birth of the universe. Electromagnetic fields differ from each other by in relation to frequency, and visible light is their most familiar form.

Electric and magnetic fields are part of the electromagnetic spectrum which extends from static electric and magnetic fields, through radio frequency (RF), infrared radiation, and visible light to X and gamma-rays.

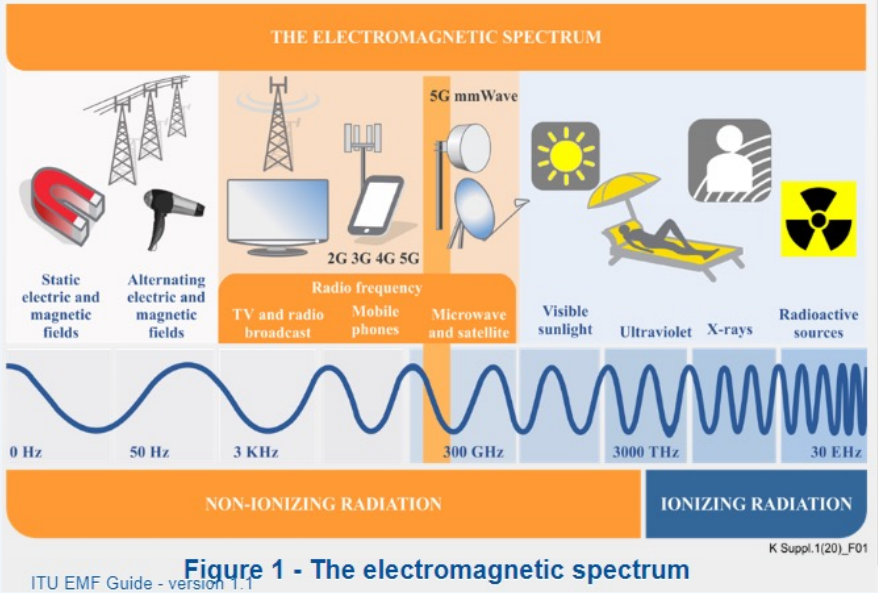
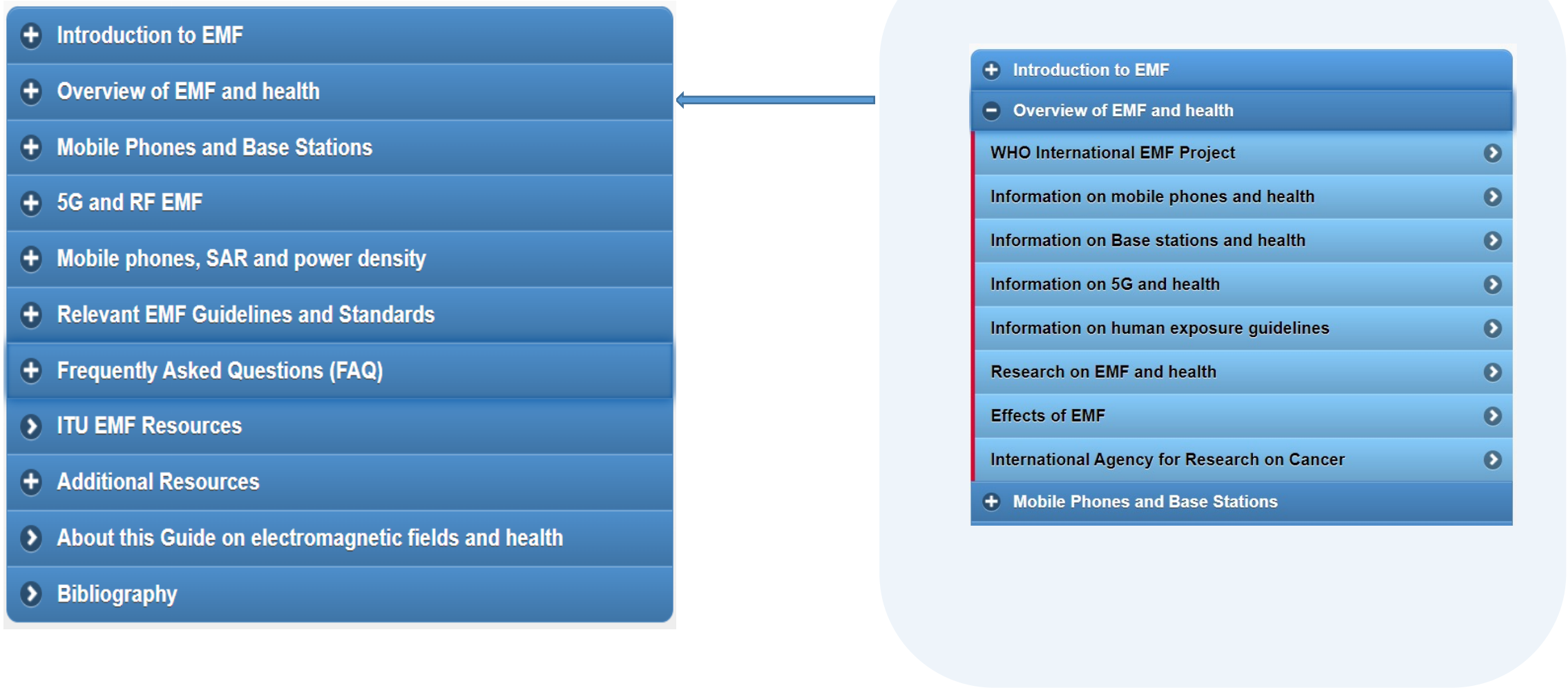


Figure 1 - The electromagnetic spectrum

EMF Guide – Overview of EMF and health



EMF Guide Update – FAQ

ITU EMF Guide

Frequently Asked Questions (FAQ)

Language

Mobile phones and EMF FAQ

- What are the health risks associated with mobile phones and their base stations?
- What is 5G?
- What are the main differences between 5G and previous technologies?
- What are the potential health risks from 5G?
- What are the International Exposure Guidelines?
- What is WHO doing?
- Do mobile phones emit radiation?
- How much power does a mobile phone transmit?
- How does Adaptive Power Control Work?
- Does the EMF from my mobile vary?
- What are the exposure levels from mobile phones?

What are the International Exposure Guidelines?

Two international bodies produce exposure guidelines on electromagnetic fields. Many countries currently adhere to the guidelines recommended by:

The International Commission on Non-Ionizing Radiation Protection and,

The Institute of Electrical and Electronics Engineers, through the International Committee on Electromagnetic Safety

These guidelines are not technology-specific. They cover radiofrequencies up to 300 GHz, including the frequencies under discussion for 5G.

Is there a safety margin built into the human exposure limits?

Yes. A safety margin is built into the limits recommended by the International Commission on Non-Ionizing Radiation Protection (ICNIRP). The ICNIRP applies a safety factor of 10 to derive EMF worker exposure limits, and a factor of 50 to obtain the guideline value for the general public.

The reduction factor is designed to account for any scientific uncertainties.

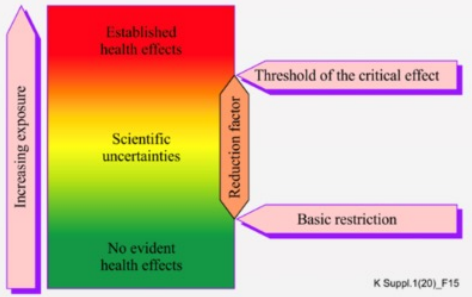


Figure 15 - ICNIRP exposure limits and reduction factor (ICNIRP 1998)

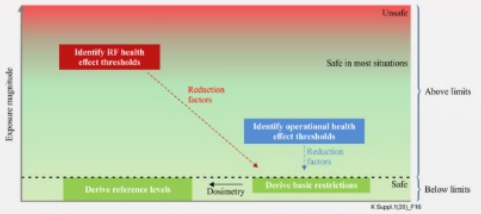
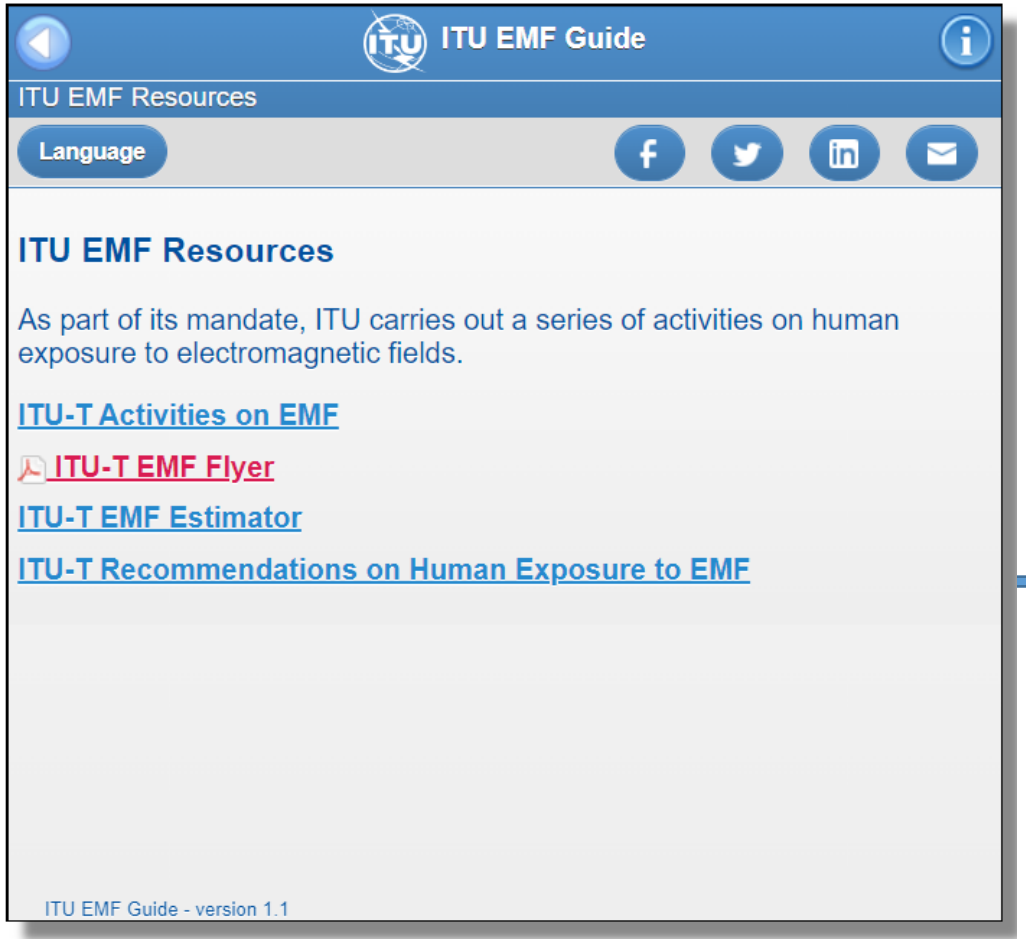


Figure 16 - ICNIRP exposure limits and reduction factor (ICNIRP 2020)

EMF Guide – ITU EMF Recommendations



ITU-T Recommendations

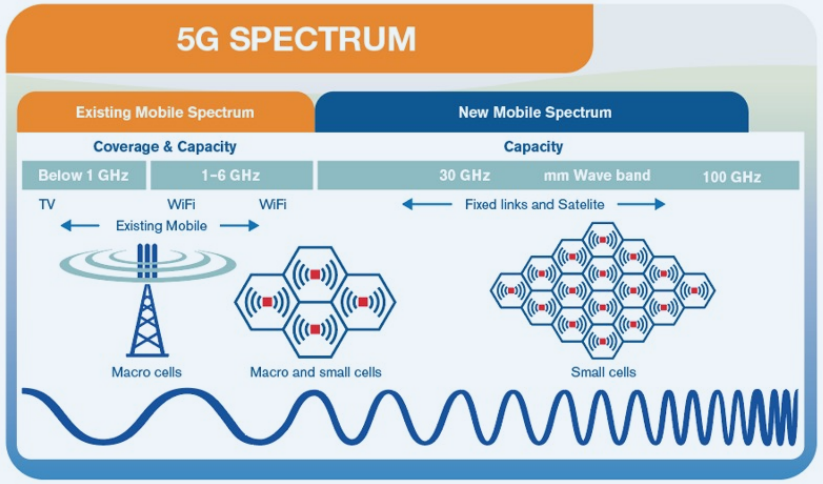
YOU ARE HERE: HOME > ITU-T > STUDY GROUPS > STUDY PERIOD 2017 - 2020 > SG5: ENVIRONMENT AND CLIMATE CHANGE > ITU-T RECOMMENDATIONS

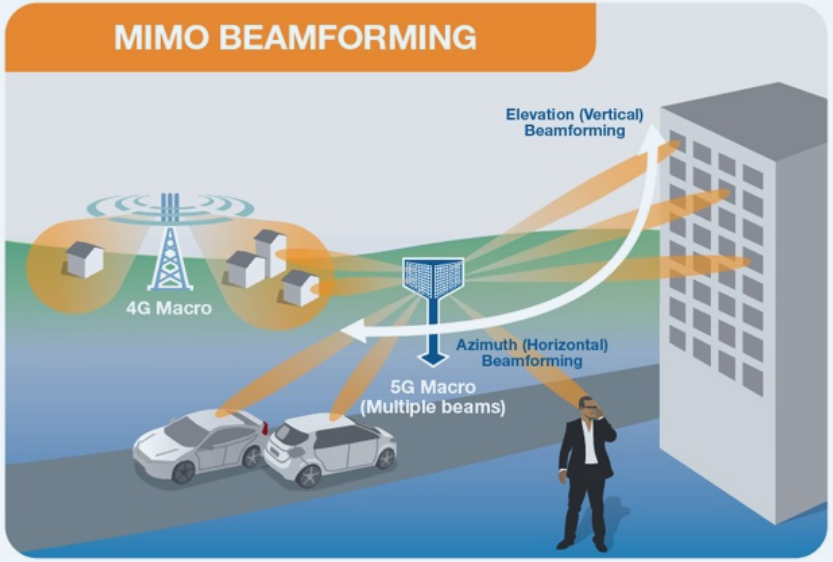
ITU-T Recommendations on Human Exposure to Electromagnetic Fields

Rec. No.	Title	Summary
K.83	**Monitoring of electromagnetic field levels**	Recommendation ITU-T K.83 gives guidance on how to make long-term measurements for the monitoring of electromagnetic fields (EMF) in the selected areas that are under public concern, in order to show that EMFs are under control and under the limits. The purpose of this Recommendation is to provide the general public, clear and easily available data concerning electromagnetic field levels in the form of results of continuous measurement.
K.91	**Guidance for assessment, evaluation and monitoring of human exposure to radio frequency electromagnetic fields**	There are many possible methods of exposure assessment and each of them has its own advantages and disadvantages. Recommendation ITU-T K.91 gives guidance on how to assess and monitor human exposure to radio frequency (RF) electromagnetic fields (EMFs) in areas with surrounding radiocommunication installations based on existing exposure and compliance standards in the 8.3 kHz to 300 GHz range. This includes procedures for evaluating exposure and how to show compliance with exposure limits with reference to existing standards. Recommendation ITU-T K.91 is oriented to the examination of the area accessible to people in the real environment of currently operated services with many different sources of RF EMF, but also gives references to standards and Recommendations related to EMF compliance of products. Recommendation ITU-T K.91 includes an electronic attachment containing an uncertainty calculator and the Watt guard modules.

EMF Guide - 5G Update

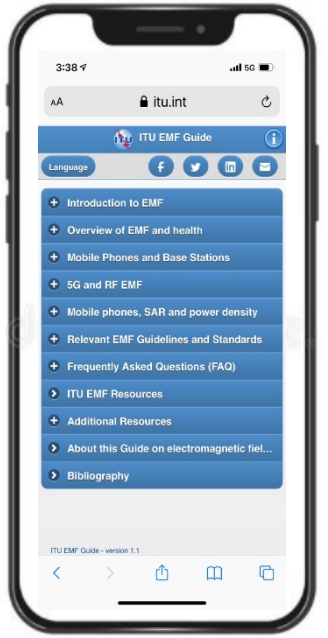
- Introduction to EMF
- Overview of EMF and health
- Mobile Phones and Base Stations
- 5G and RF EMF
  - What is 5G ?
  - What are the benefits of 5G ?
  - What frequencies does 5G use ?
  - What is MIMO beam steering ?
  - What are the EMF levels from 5G base s...
  - ITU information on 5G
- Mobile phones, SAR and power density
- Relevant EMF Guidelines and Standards
- Frequently Asked Questions (FAQ)





EMF Guide Update – Bring this to life

Let's explore the EMF Guide
and look at some practical 5G examples illustrating how 5G is working and what the EMF levels are like



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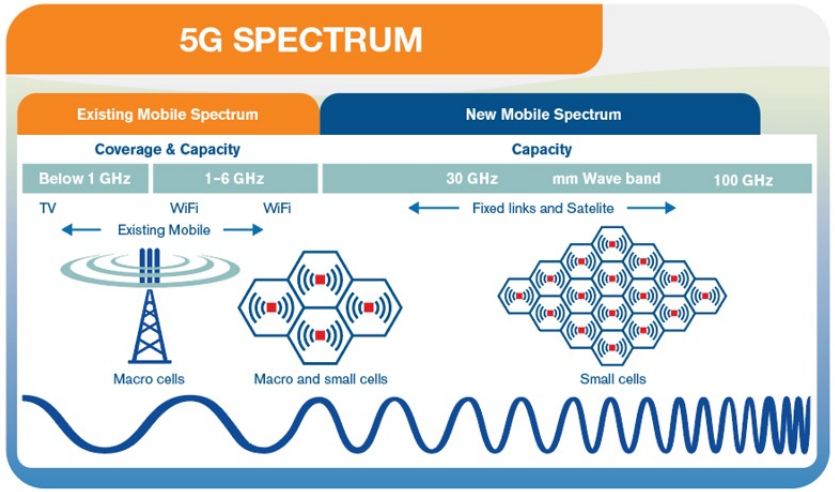
5G spectrum & EMF examples



Low Band – 850MHz (coverage)

EMF = 0.002% (ICNIRP 2020)

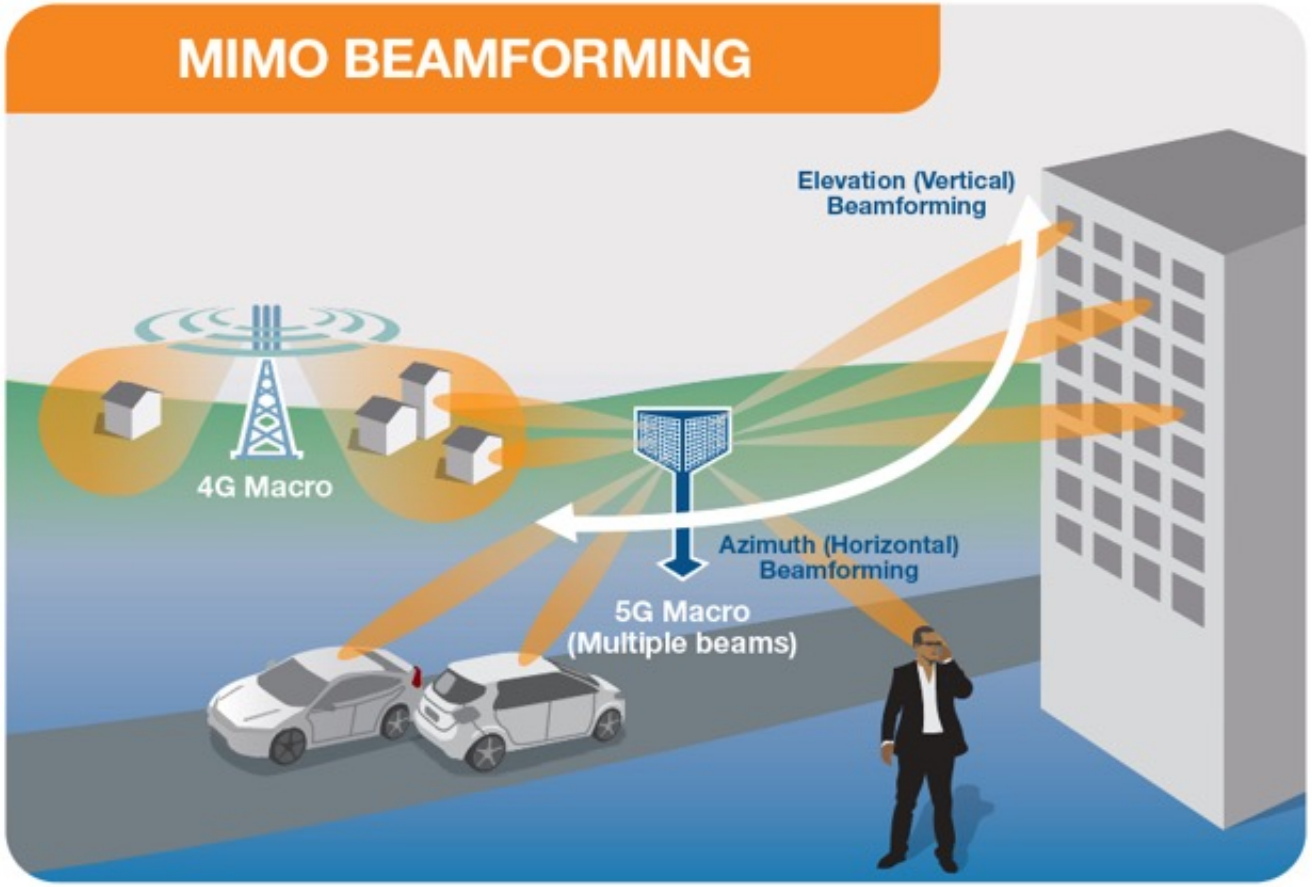
Mid Band – 3600MHz (coverage & capacity)

5G EMF = 0.06% (ICNIRP 2020)

High Band – 26GHz (capacity)

5G EMF = 0.00014% (ICNIRP 2020)

5G Beamforming example



- Dedicated radio signal towards the user

  A 4G signal is typically spread across a wide area
- Enabled by Massive MIMO technology
- Identifies most efficient signal path
- Improves connection reliability
- Reduces interference (unwanted signals)
- Efficient use of spectrum and power
- Allows more simultaneous data streams

5G Beamforming Demonstration

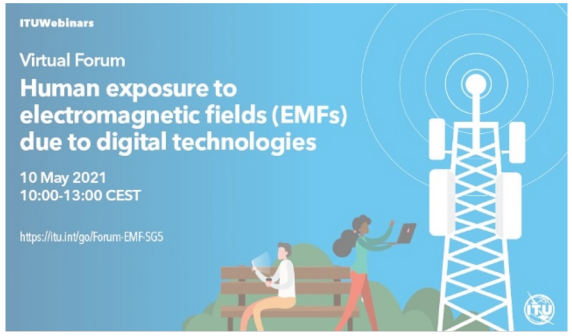
EMF Summary

- 5G is very efficient
- Measurements show 5G has low EMF – typically < 0.1% ICNIRP 2020
- Beamforming antennas minimize EMF – only send signal where its needed

Resources

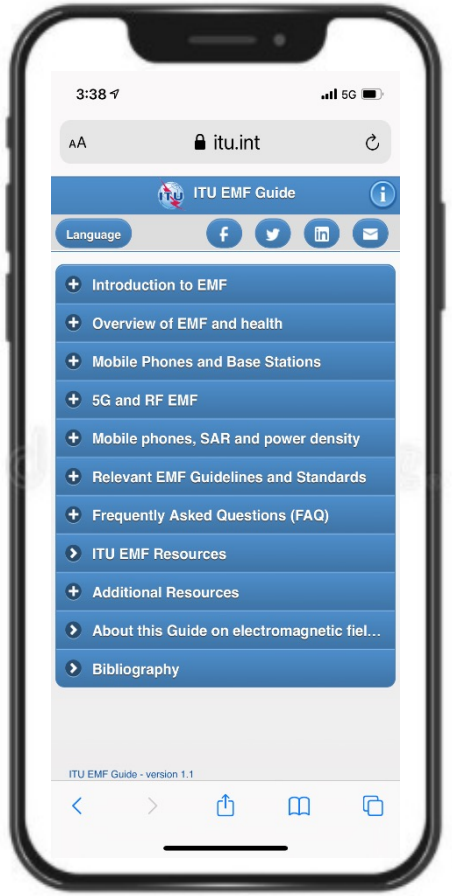
ITU EMF Presentation - 5G smart apartment with 50 devices – see the EMF testing presented to ITU in 2020

ITU Information on EMF - https://www.itu.int/en/ITU-T/emf/Pages/default.aspx



We hope you enjoy using the EMF Guide updated for 5G

Thank you - Questions ?



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