

Workshop on Recent developments relevant to EMF policy formulation
8 May 2024 14:30 – 17:30 CET; Geneva

EMF policy/case study in Israel

Material can be included in ITU-D Q 7/2 Final Report Chapters 3 ‘Updates and Adoptions of national policies to limit exposure to radiofrequency fields’, 4 ‘Formulating national EMF policies on exposure limits’ & Annex 1 ‘Case studies, including national practices to ensure compliance with exposure limits’

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ITU-D Study Group 2 [rapporteur group meetings](#) (29 April - 10 May 2024)



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Compliance to EMF exposure limits in Israel; transmitters and 50 Hertz electricity

1. According the [Wireless Telegraphy Act](#) the ISR [Ministry of Communications](#) allocates frequencies to the to wireless services according to the [ITU Radio Regulations](#), issues licenses to every transmitting before operating wireless transmitters. NB: New Zealand is the first country to apply the Wireless Act in 1903; one year before the UK; see Mazar 2008, p. 47.
2. The [Ministry of Environmental Protection](#) MoEP is responsible to approve any wireless intended transmitters, prior to their installation and operation.
3. Application Forms to install:
 - 1) [Tx station](#);
 - 2) [Cellular](#) and radio transmission centers, equipment-type permit;
 - 3) [Broadcasting station](#);
 - 4) [50 Hertz electricity](#) networks, an operating permit for an electrical installation.
4. Prior to installation, MoEP approves the calculation, based on the
 - 1) technical parameters in the filled Forms;
 - 2) Free space propagation.
5. MoEP checks that the calculated contours don't exceed the general public and occupational limits and then issues the specific license.
6. Every station is monitored circa once a year; paid by the operators and performed by independent technician, trained and approved by MoEP.
7. Example of monitoring request number [20523845](#) of 30/08/2021, in Hebrew.

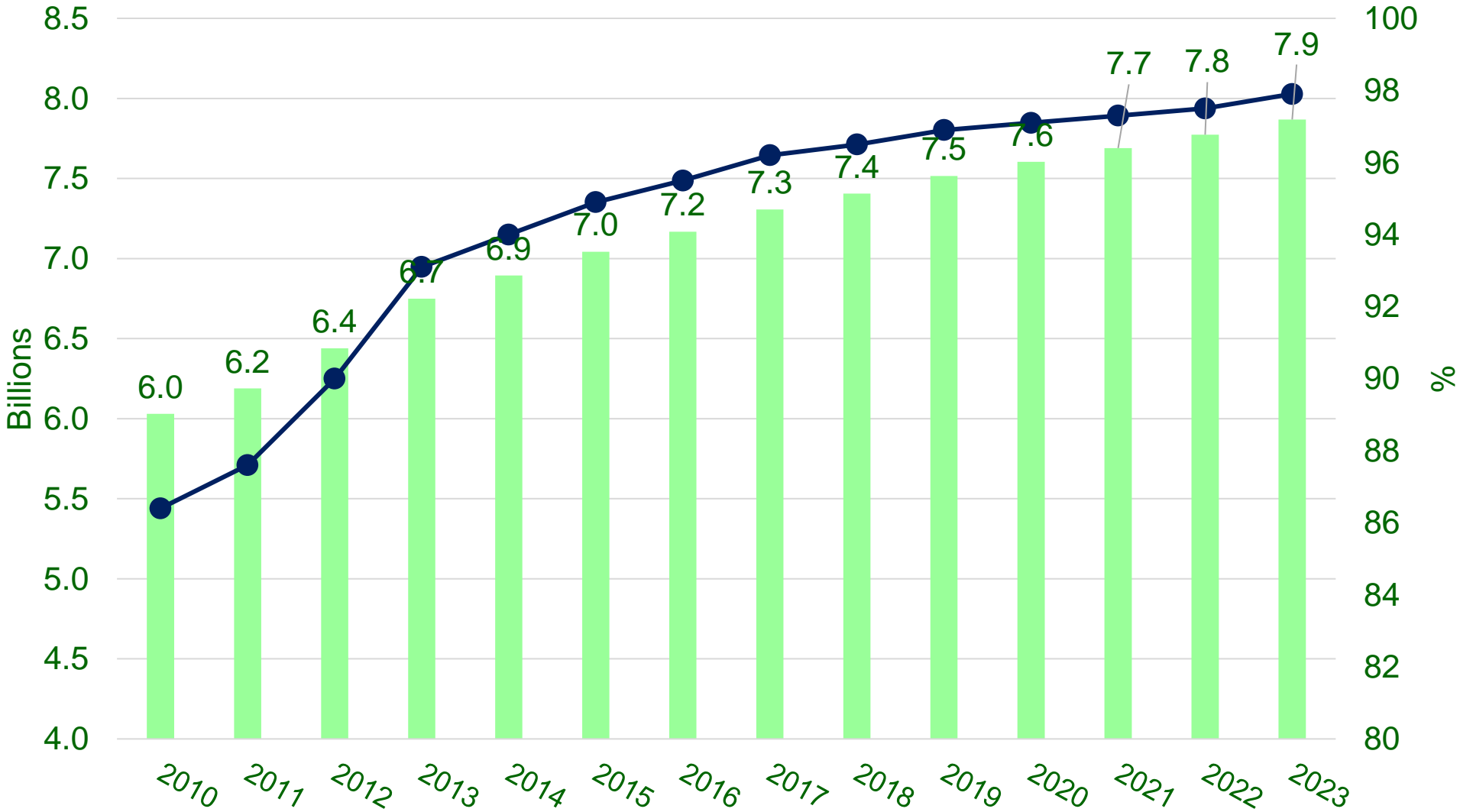
Compliance to EMF exposure limits in Israel; cellular handsets

see https://www.gov.il/he/Departments/Guides/radio_frequency_radiation?chapterIndex=3

1. The Specific Absorption Rate (SAR) describes the amount of energy absorbed per unit mass of biological material (for example: the human body). The units in which the SAR is measured are watts per kilogram or milliwatts per gram. SAR exposure levels are limited to avoid a local increase in body temperature of more than one degree Celsius (1°C).
2. There are two different SAR levels. One adopted by the FCC, is 1.6 watts per kg and the European Directive follows the ICNIRP 1998, where SAR level is 2 watts per kg.
3. Manufacturers of mobile phones must perform measurements of SAR levels for devices at maximum transmission power, and indicate the highest SAR level measured.
4. Devices manufactured in the USA are measured according to the American standard. Devices manufactured in Europe are measured according to the European standard.

Global mobile-cellular telephone subscriptions (billions) & subscriptions per 100 inhabitants, 2010-2022

source: <https://www.itu.int/en/ITU-D/Statistics/Pages/publications/wtid.aspx>, <https://datahub.itu.int/data/?i=178&e=ISR>

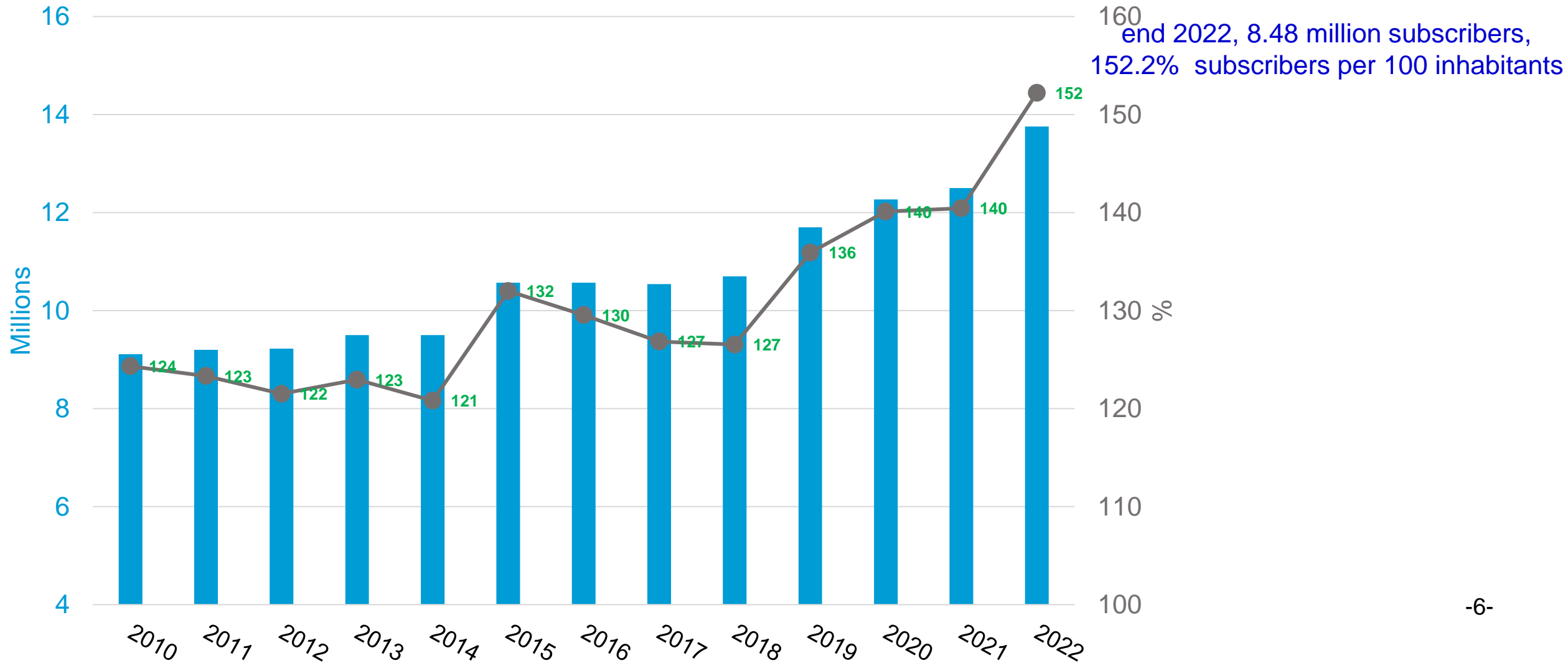


ITU Statistics, World Telecommunication/ICT Indicators Database 2023 (27th edition/ December 2023, depicting info till end 2022); downloaded on 1 March. 24

- Mobile-cellular telephone subscriptions (billions)
- Mobile-cellular telephone subscriptions per 100 inhabitants (right axis)

Israel mobile-cellular telephone subscriptions (millions) & subscriptions per 100 inhabitants, 2010-2022

source: <https://www.itu.int/en/ITU-D/Statistics/Pages/publications/wtid.aspx>, <https://datahub.itu.int/data/?i=178&e=ISR>



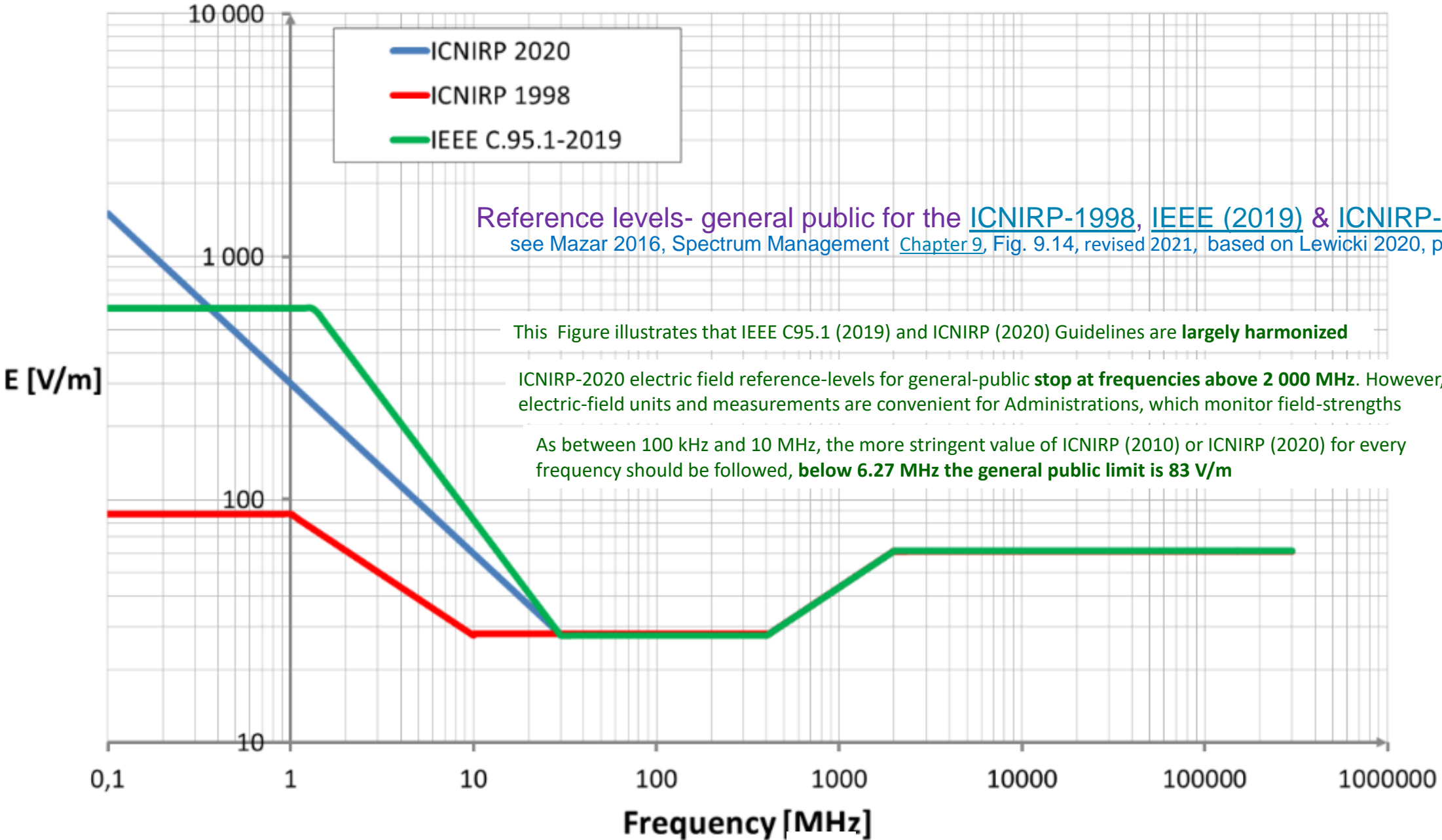
■ Mobile-cellular telephone subscriptions (millions)

● Mobile-cellular telephone subscriptions per 100 inhabitants (right axis)

ICNIRP-1998 Limits reference levels for occupational and general public exposure
see Mazar 2016, Table 9.2

Frequency range	Electric field-strength (V/m)		Equivalent plane wave power-density S_{eq} (W/m ²)	
	general public	occupational	general public	Occupationa
1-25 Hz	10,000	20,000	-	
0.025- 0.82 kHz	$250/f$ (kHz)	$500/f$ (kHz)		
0.82 -3 kHz	$250/f$ (kHz)	610		
3-1,000 kHz	87	610		
1-10 MHz	$87/f^{1/2}$ (MHz)	$610/f$ (MHz)		
10-400 MHz	28	61	2	10
400-2,000 MHz	$1.375f^{1/2}$ (MHz)	$3f^{1/2}$ (MHz)	$f/200$	$f/40$
2-300 GHz	61	137	10	50

Reference levels - general public



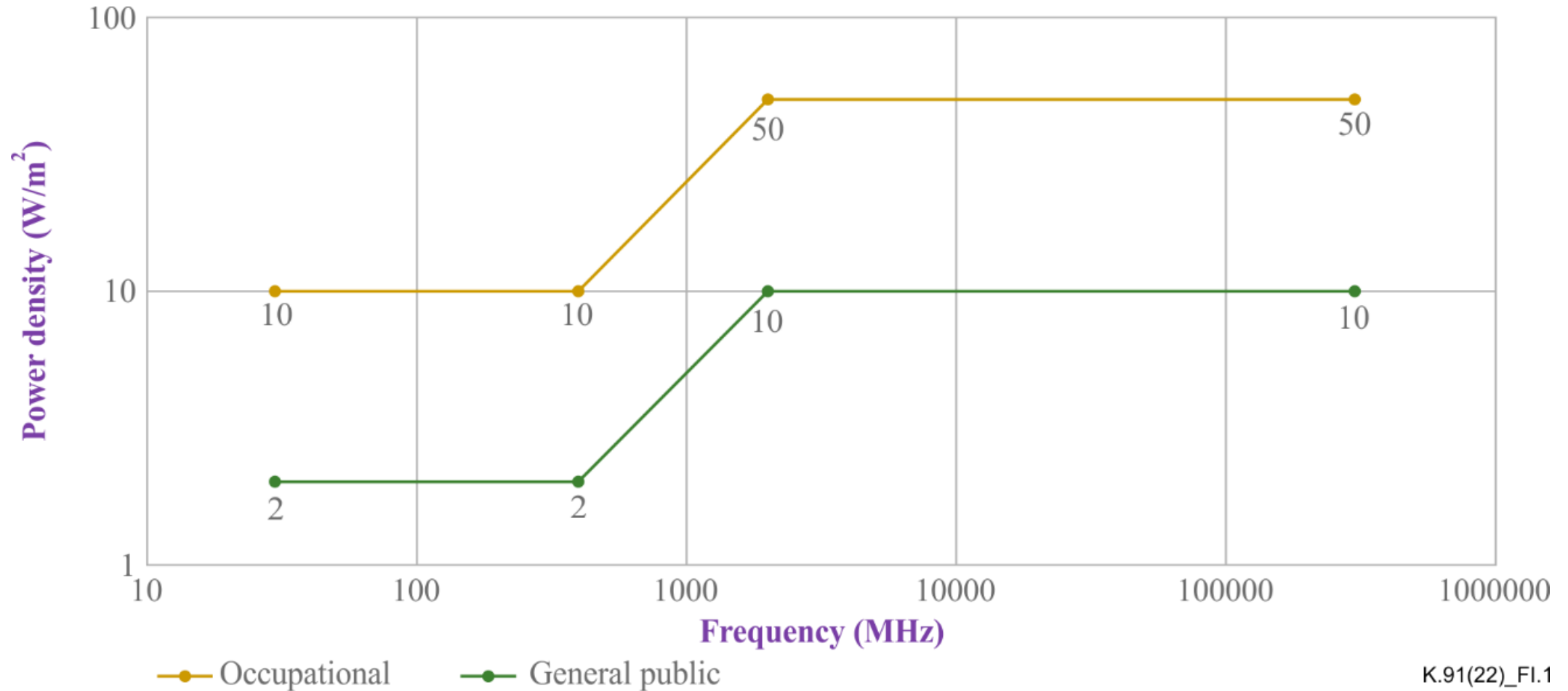
Reference levels- general public for the [ICNIRP-1998](#), [IEEE \(2019\)](#) & [ICNIRP-2020](#)
 see Mazar 2016, Spectrum Management Chapter 9, Fig. 9.14, revised 2021, based on Lewicki 2020, p. 13

This Figure illustrates that IEEE C95.1 (2019) and ICNIRP (2020) Guidelines are **largely harmonized**

ICNIRP-2020 electric field reference-levels for general-public **stop at frequencies above 2 000 MHz**. However, electric-field units and measurements are convenient for Administrations, which monitor field-strengths

As between 100 kHz and 10 MHz, the more stringent value of ICNIRP (2010) or ICNIRP (2020) for every frequency should be followed, **below 6.27 MHz the general public limit is 83 V/m**

The three ITU Sectors use this Figure, based on ICNIRP (2020) Table 5 ‘power density for occupational/ restricted versus general public exposures 30 MHz–300 GHz



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K.91(22)_FI.1

Recommendations ITU-T Rec. [K.91](#) (2022) Fig. I.1; ITU-R [BS.1698](#) (approved by R-SG6 on 17 March 2023) Fig. 35, [Q 7/2 Report](#) (2021) Fig. 6 refer to Mazar, Spectrum Management Fig 9.6, [Chapter 9](#), revised 2021

The figure depicts differences between the ICNIRP (2020) **power-density** levels of **occupational** and **general-public** exposure, averaged over **30 minutes** and the **whole body**. The power-density ratio of 5 in ICNIRP (2020) Table 5: e.g., above 2000 MHz (see brown arrows), ratio 50/10

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EMF limits in Israel (see comments in [next slide](#))

EMF upper compliant limits for continuous & prolonged exposure <u>רמות חשיפה מרביות מותרות לחשיפה רצופה וממושכת</u> (10% מסף החשיפה הבריאותי) 10% of the health exposure threshold			EMF upper compliant limits <u>רמות חשיפה מרביות מותרות</u> (30% מסף החשיפה הבריאותי) 30% of the health exposure threshold			Radiation derived from radiation source frequency band
<u>ז</u> <u>צפיפות הספק</u> (W/m ²) power density	<u>ו</u> <u>שדה מגנטי</u> (A/m) magnetic field	<u>ה</u> <u>שדה חשמלי</u> (V/m) electric field	<u>ד</u> <u>צפיפות הספק</u> (W/m ²) power density	<u>ג</u> <u>שדה מגנטי</u> (A/m) magnetic field	<u>ב</u> <u>שדה חשמלי</u> (V/m) electric field	<u>א</u> <u>הקרינה הנוצרת ממקור הקרינה תחום התדרים</u>
-	0.5	8.7	-	1.5	26.1	100kHz – 150kHz
-	0.073/f	8.7	-	0.219/f	26.1	0.15MHz – 1MHz
-	0.073/f	8.7/√f	-	0.219/f	26.1/√f	1MHz – 10MHz
0.2	0.023	8.85	0.6	0.04	15.33	10MHz – 400MHz
f/2000	0.00115√f	0.435√f	3f/2000	0.002√f	0.753√f	400MHz–2000MHz
1	0.051	19.29	3	0.0885	33.37	2GHz– 300GHz

EMF limits in Israel, comments of MoEP to the [previous slide](#)

1. For the 50 Hertz electricity networks, the standard 50 or 60 Hz alternating current (AC), electricity ELF The position of the World Health Organization is that the maximum magnetic field value for public exposure from the electricity grid is 1000 milligauss. Considering the existing information, the practice in some developed countries, and the radiation thresholds that electricity companies in the developed countries voluntarily commit to, the Ministry of Health and the Ministry of Environmental Protection proposed the value 4 milligauss - a threshold for the daily average under conditions of maximum typical electricity consumption.
2. The health threshold defines the exposure limit to guarantee no health damage. These thresholds take into account the known negative effects, and the potentially higher thermal sensitivity of populations such as children, patients and the elderly. The health threshold set by the Ministry of Environmental Protection is based on the ICNIRP 1998 guidelines. However, ICNIRP guidelines do not refer to negative phenomena whose existence is in scientific doubt, nor the risk-perception in each country. Moreover, the health threshold is based on acute (short-term) exposure, as these are the only established hazards.
3. The environmental threshold for exposure to non-ionizing radio frequency- As for areas where the exposure is not continuous and prolonged such as roofs, courtyards, sidewalks and parks, the MoEP health exposure threshold for transmitters emitting non-ionizing radiation that may temporarily expose people to more than 30% of the health threshold (Occupational, Haim Mazar). As for areas where the exposure is continuous and prolonged (a stay of 4 hours a day for five days a week) such as residences, offices and educational institutions, the MoEP does not approve the establishment of facilities that emit non-ionizing radiation that could expose people to more than 10% of the health threshold (General Public, Haim Mazar).

Discussion and Summary

1. MoEP explains 'Israel follows the ICNIRP 1998 and not ICNIRP-2020 as Europe didn't adopt it yet.
2. Equipment manufactured in America should confirm to SAR 1.6 watts per kg, and European handsets to SAR 2 watts per kg.
3. For the 50 Hertz electricity networks, ISR reduces the public exposure from 1000 milligauss to 4 milligauss - a threshold that electricity companies in some developed countries voluntarily commit to. This conservative value causes conflicts, when high voltage transformers and generators are close to offices and kinder schools.
4. ISR divides the ICNIRP 1998 power-density limit by 10, due to unknown risks and negative phenomena whose existence is in scientific doubt. This conservative value causes no problems, as around the world, the measurements show exposure levels below ICNIRP limits. MoEP tries to license each operator, independently of recent operations and future applications on the same station.
5. The reduction to 30% of the ICNIRP-98 (Occupational, Haim Mazar) instead of 30% and relating it to continuous and prolonged is not clear.

Policies, guidelines, regulations and assessments of human exposure to radio-frequency electromagnetic fields



Policies, guidelines, regulations and assessments of human exposure to radio-frequency electromagnetic fields Study period 2018-2021

The report focuses on science-based policies, guidelines, regulations and assessments in respect to human exposure to RF-EMF, based on updated international RF-EMF exposure limits defined by the **ICNIRP Guidelines 2020** and the IEEE C95.1-2019

‘The best practice for administrations that choose to use international RF-EMF exposure limits is to limit the exposure levels to the **thresholds specified in ICNIRP (2020) Guidelines.**’

The ICNIRP and IEEE limits are largely harmonized, and the power-density limits for **whole-body exposure to continuous fields are identical above 30 MHz**

[Video](#) , [2021 Report](#)



See also [Background Paper - Implementing 5G for good: Does EMF matter?](#) ITU Regional Forum for Europe: 5G strategies, policies, and implementation, 22-23 October 2020

References

1. Mazar 2008, [An Analysis of Regulatory Frameworks for Wireless Communications, Societal Concerns and Risk](#): The Case of Radio Frequency (RF) Allocation and Licensing.
2. [ICNIRP-1998](#) ICNIRP Guidelines for limiting exposure to time-varying electric, magnetic and electromagnetic fields (up to 300 GHz)
3. Mazar, Spectrum Management [Chapter 9](#) Fig 9.14, revised 2021.
4. [C95.1-2019](#) IEEE Standard for Safety Levels with Respect to Human Exposure to Electric, Magnetic, and Electromagnetic Fields, 0 Hz to 300 GHz
5. [ICNIRP-2020](#) Guidelines for limiting exposure to electromagnetic fields (100 KHz to 300 GHz)
6. Lewicki Fryderyk, 2020 Presentation at the ITU Regional Symposium for Europe and CIS on [Spectrum Management and Broadcasting](#), [Electromagnetic Fields and 5G Implementation](#)
7. Next slides refer to the two previous Q 7/2 EMF workshops



Geneva, ITU 2018 EMF Workshop 10 Oct. 2018; this presentation is found at https://www.itu.int/dms_pub/itu-d/oth/07/16/D07160000010001PDFE.pdf

Click [here](#) to download the April 2021 Chapter 9 on EMF exposure of Mazar Wiley book on [Spectrum Management](#)

Any Questions?



Workshop on international, regional and national policies concerning human exposure to electromagnetic fields

Geneva, ITU 2023 EMF **Workshop 25 May 2023**; this presentation is found at https://www.itu.int/dms_pub/itu-d/oth/07/2e/D072E0000D0007PDFE.pdf

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