

ITU Workshop on "5G, EMF & Health" (Warsaw, Poland, 5 December 2017)

ATDI Coverage & EMF contours, around 5G base stations

Dr. Haim Mazar (Madjar)

ITU-D, R and T intersectoral activities on RF-EMF
ATDI- RF spectrum and licensing

The logo for ATDI, consisting of the letters 'ATDI' in a bold, sans-serif font. The letter 'A' is stylized with a horizontal bar that has a gradient from orange to grey.

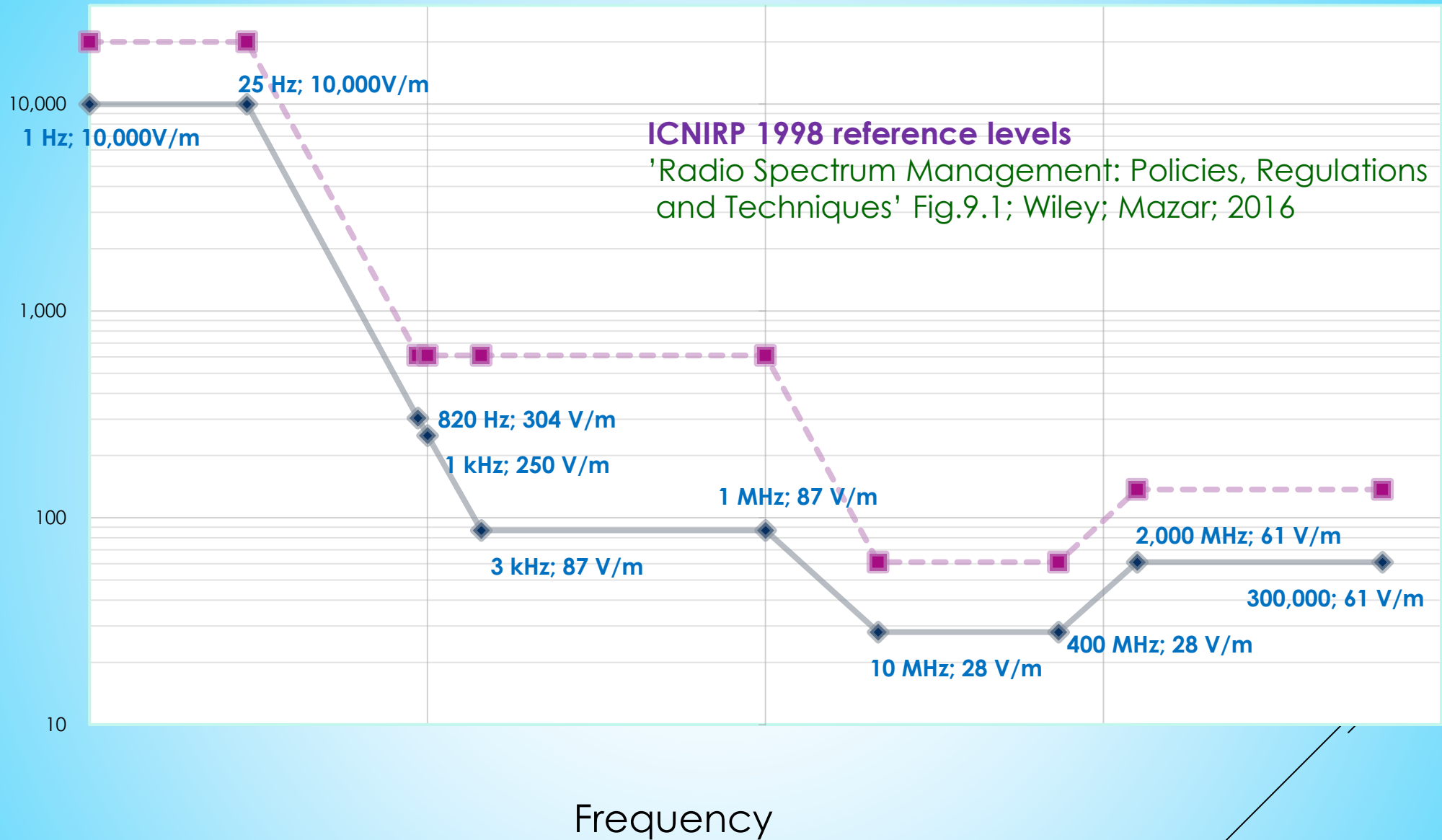
Ministerstwo
Cyfryzacji



Session 3: What are the implications of 5G of EMF limits for 5G Network Rollout?

ATDI's calculation method to present precisely exposure and predicting field strength levels, relative to national limits

Electric field-strength (V/m)

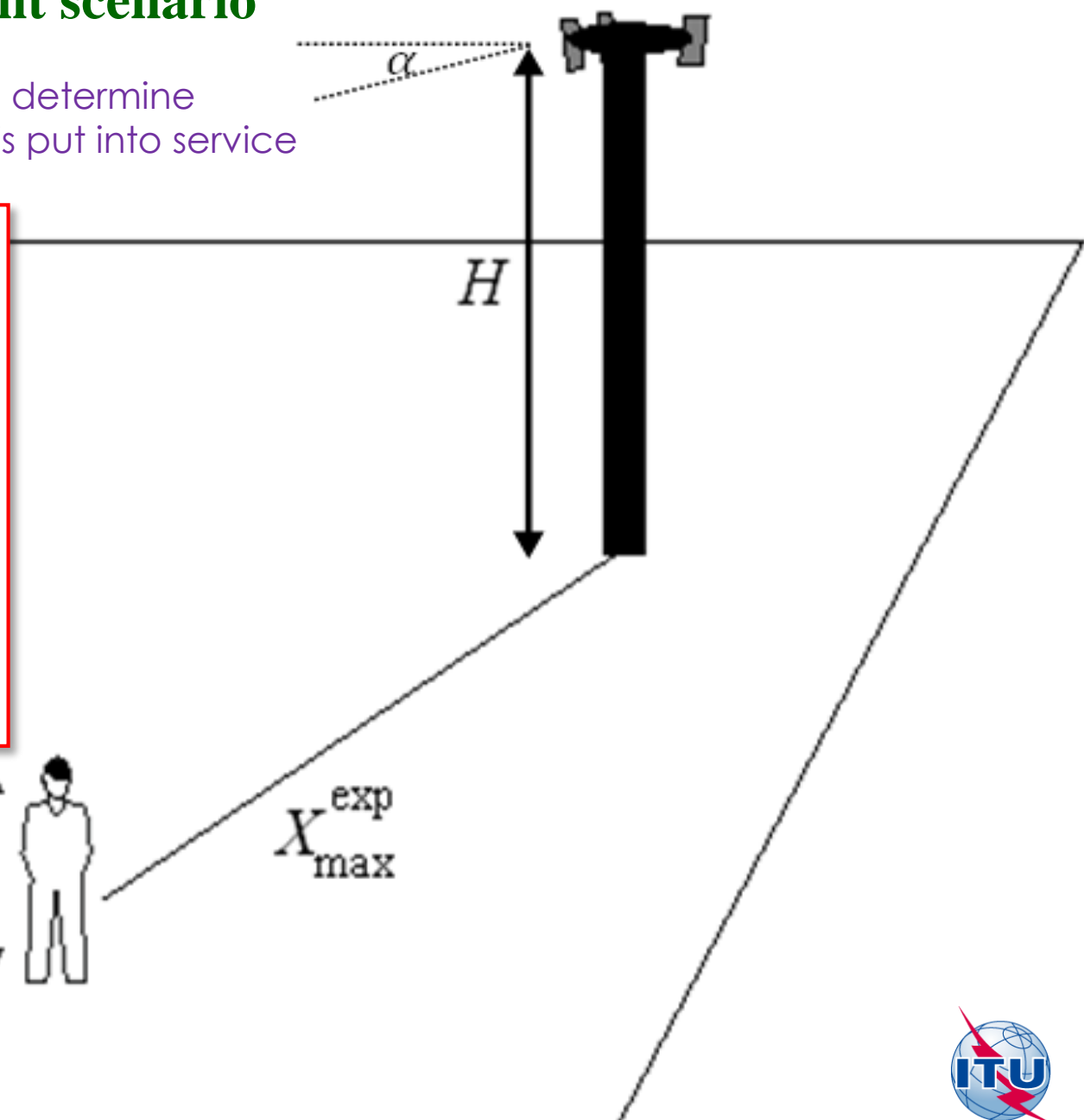
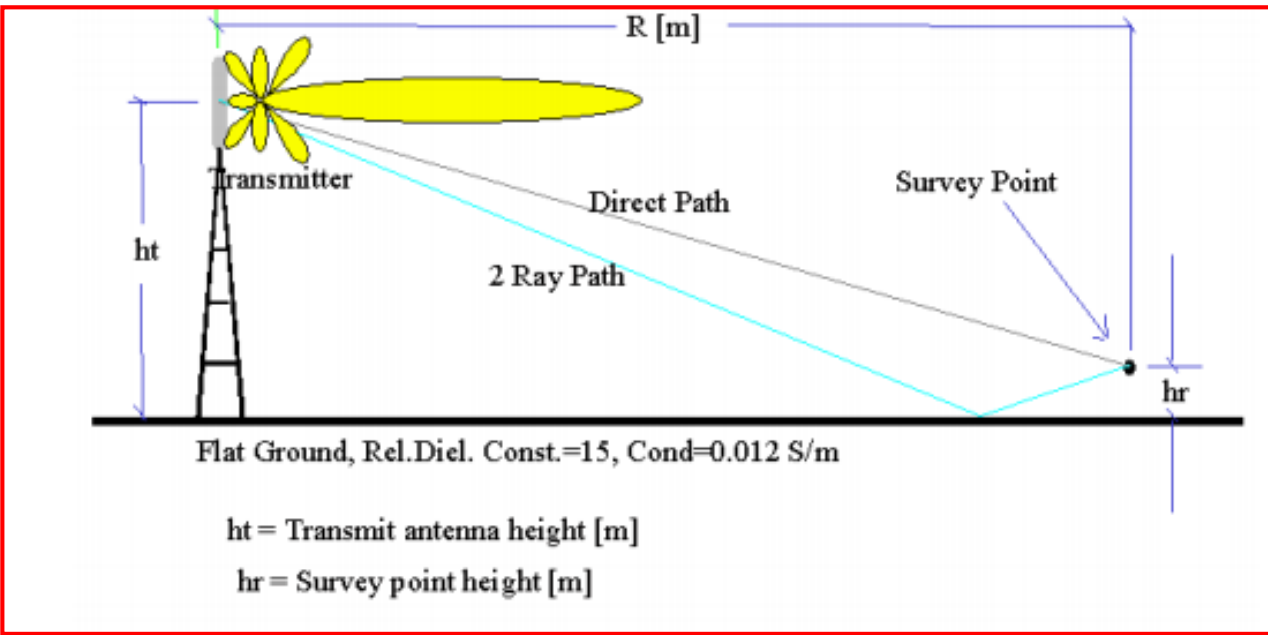


◆ ICNIRP1998 reference levels (V/m); general public

■ ICNIRP1998 reference levels (V/m); occupational exposure

Figure III.1 – Geometry set-up for a line of sight scenario

Recommendation ITU-T [K.100](#) 7/2017 RF Measurement EMF to determine compliance with human exposure limits when a base station is put into service



Exposure distance assuming free-space, main beam

- P_t : transmitter power (watts),
 g_t : transmitter antenna gain (numeric)
 $eirp$: equivalent isotropically radiated power (watts)
 d : distance from transmitter (meter)
 e : electric field-strength (FS) Volt/meter (V/M)

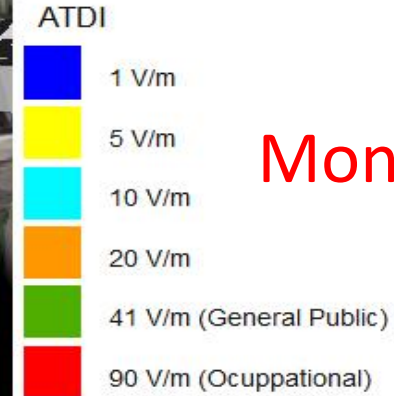
$$e = \frac{\sqrt{30 eirp}}{d} \quad \text{and} \quad d = \frac{\sqrt{30 eirp}}{e}$$

At 900 MHz, max downlink power 100 W, ant. gain (including losses) 17 dBi, $eirp$ is 5 Kw.
ICNIRP 1998 general-public reference-level is 41 V/m. Therefore, the exposure distance d

$$d = \frac{\sqrt{30 eirp}}{e} = \frac{\sqrt{30 \times 5,000}}{41} = 9.5 \text{ m.}$$

Mobile Composite Coverage

Buildings impacted in 3D view



Monaco

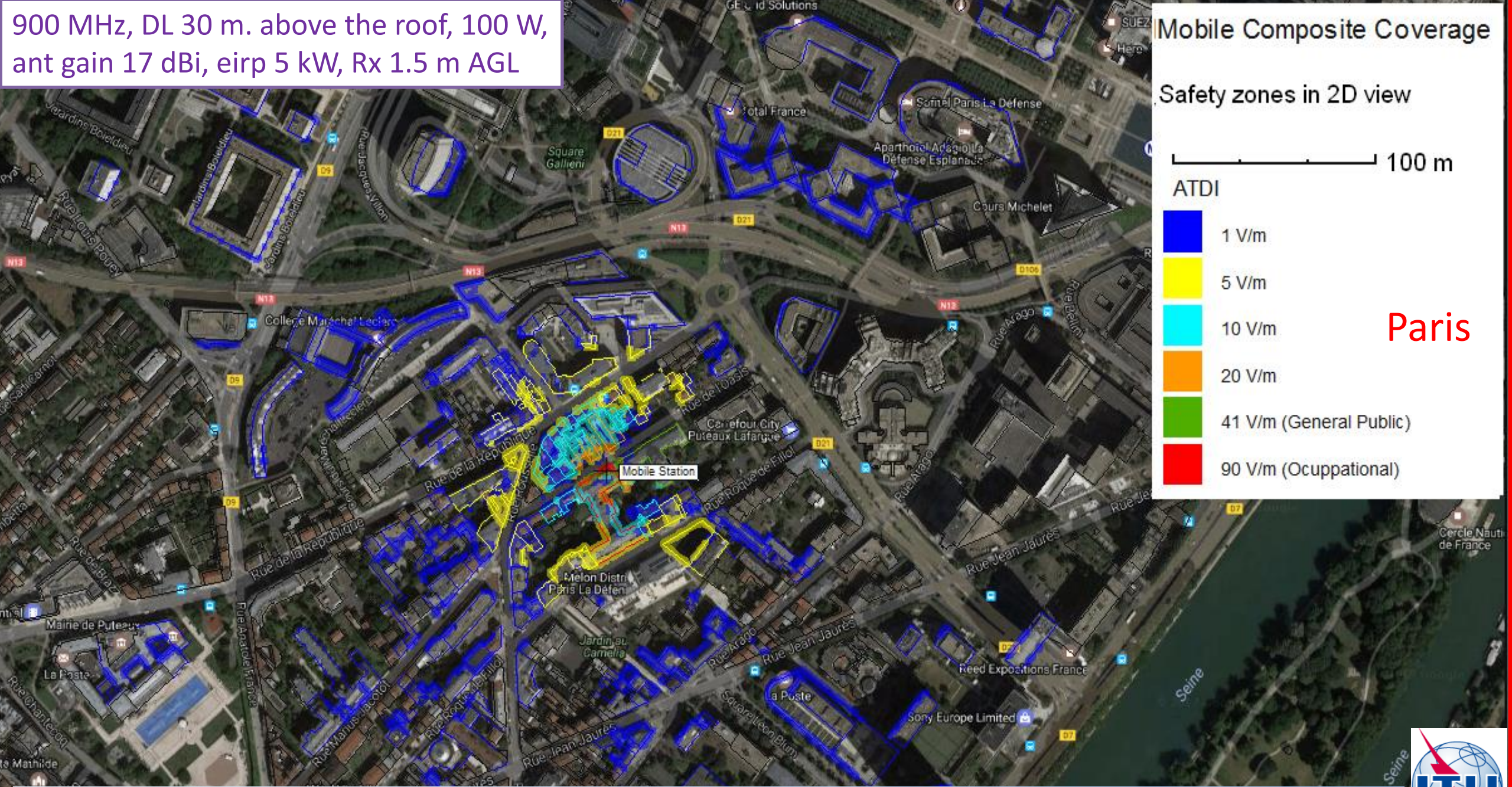
900 MHz, ICNIRP general-public reference-level 41 V/m & occupational $3f^{1/2}$ (MHz) = 90 V/M. See scales

considering also wall attenuation
Tx 30 meters above roof; Rx mobile 1.5m above ground

Environmental levels: 3D cellular contours, showing buildings impacted; preliminary draft new Report ITU-R SM.[EMF-MON] 'EMF measurements to assess human exposure' Fig. 6



900 MHz, DL 30 m. above the roof, 100 W,
ant gain 17 dBi, eirp 5 kW, Rx 1.5 m AGL



Environmental levels: 2 D satellite view of cellular, Report ITU-R SM.[EMF-MON] Fig. 7



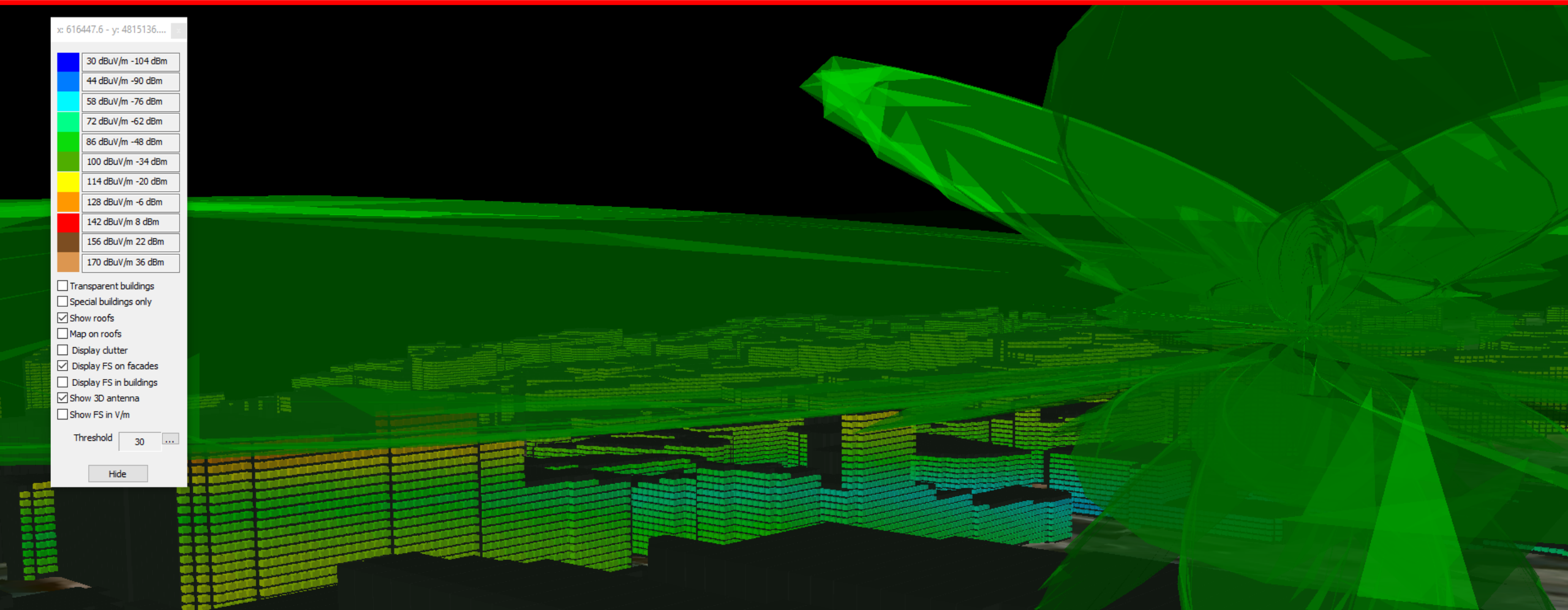
x: 616447.6 - y: 4815136....

30 dBuV/m -104 dBm
44 dBuV/m -90 dBm
58 dBuV/m -76 dBm
72 dBuV/m -62 dBm
86 dBuV/m -48 dBm
100 dBuV/m -34 dBm
114 dBuV/m -20 dBm
128 dBuV/m -6 dBm
142 dBuV/m 8 dBm
156 dBuV/m 22 dBm
170 dBuV/m 36 dBm

- Transparent buildings
- Special buildings only
- Show roofs
- Map on roofs
- Display clutter
- Display FS on facades
- Display FS in buildings
- Show 3D antenna
- Show FS in V/m

Threshold ...

Hide



Calculating safety-zones using elevation ant. pattern, ant. tilt 0 degrees
 Even the azimuth ant. is analysed; typically in 3 sectors 5G, an azimuth overlap:
 6dB attenuation in $\pm 60^\circ$ & 3dB around $\pm 45^\circ$ around mainbeam

ITU Workshop on "5G, EMF & Health" (Warsaw, Poland, 5 December 2017)

The presentation is found at ITU website

https://www.itu.int/en/ITU-T/Workshops-and-Seminars/20171205/Documents/S3_Haim%20Mazar.PDF

The film of workshop is found at

<https://pem.itl.waw.pl/aktualno%C5%9Bci/transmisja-warsztat-itu/>

See the presentation 44–56 minutes, panel 1:39–1:49



ITU Workshop on "5G, EMF & Health" (Warsaw, Poland, 5 December 2017)

Panel: what are the implications of 5G of EMF Limits for 5G Network Rollout?

The film of workshop is found at <https://pem.itl.waw.pl/aktualno%C5%9Bci/transmisja-warsztat-itu/> the presentation 44–56 minutes; panel 1:39–1:49

→
Dr Jack Rowley
remote participant

Dr. Jafar
Keshvari Mazar

Christer
Törnevik

Kamil Bechta

Moderator: Mike Wood



Related author's presentations on EMF

- [A Global Survey and Comparison of Different Regulatory Approaches to Non-Ionizing RADHAZ and Spurious Emissions](#), IEEE TelAviv, [COMCAS](#), November 2009. Hyperlink to the [slides presentation](#); 9 November 2009
- [A Comparison Between European and North American Wireless Regulations](#), presentation at the 'Technical Symposium at ITU Telecom World 2011' [www.itu.int/worl2011 on 27 October 2011](#); hyperlink to the [slides presentation](#), 27 October 2011
- [Technical limits of Human Exposure to RF from Cellular Base Stations and Handsets](#), Jerusalem, 11 April 2013. Professional presentation of the Ministry of Communications to the experts of Ministry of Environmental Protection, human-exposure monitoring laboratories and cellular operators
- [Technical limits of Human Exposure to RF from Broadcasting Emitters, Cellular Base Stations and Handsets](#), at '[Holon institute of technology](#)', 30 January 2014
- [Smart Cities RF Human Exposure Ministries of Comms Energy.pdf](#); presentation at intra-ministerial commission, on 21 January 2015
- January 2016, [presentations in Singapore, Beijing, Chengdu and Shenzhen](#)
- [January2016 Human Hazards Mazar SRTC in Chinese.pdf](#)
- [Human Hazards Mazar AsiaPacific BKK 25April16.pdf](#)
- [EMC Europe2016 Wroclaw Sep 2016 Mazar 20April16 EMF.pdf](#)
- 5 December 2017, this presentation is found also in the ITU [workshop link](#). The workshop' video is found at <https://pem.itl.waw.pl/aktualno%C5%9Bci/transmisja-warsztat-itu/>; See the presentation 44–56 minutes, panel 1:39–1:49

Questions to be asked: how exactly to calculate exposure-contours by inserting additional losses derived from wall penetration, non free-space propagation model, & antenna patterns- mainly in elevation, including sidelobes of smart antennas