National Media and Infocommunications Authority • Hungary

Experiences and the development plan of the Hungarian RF EMF Monitoring System

Electromagnetic field
and the future of telecommunication
Warsaw, 6 December 2018

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spectrum monitoring engineer

10-Year Anniversary of the monitoring system

Case studies from Hungary

Despite compliance with ICNIRP level and other regulations,
more factor can cause depreciation of a real estate near a mobile base station and **neighbours may obtain compensation.**
Constitutional Court (2015)

⇨ More lawsuits against mobile operators initialized by citizens

Mandatory Measurement EIRP > 1kW
Ministry decree (2017)

- Decree text confusing: e.g. theoretical maximum or average power?
- Only administrative viewpoint, lack of risk management
- New base stations installation administration costs higher

⇨ **Operators resist**

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Background

Public concern, doubtful media information

⇨ Provide information about the topic

vs.

ELEKTROSZMOG-MÉRŐPROGRAM

NMHH Nemzeti Média- és Hírközlési Hatóság

NMIAH

- Represent of telecommunications service consumer and provider
- Issues construction permits and radio licenses
- Database of radio stations
- Wireless measurements (e.g. coverage, mobile internet speed)
- Accredited EMF measurement process (EN 50492 Standard)

Activities in relation to EMF (RF) measurement

Continuous measurement programs

Block of flats, educational institutes

Public website

- Information about EMF (with english subtitle video)
- Measurement results
- Application form for program

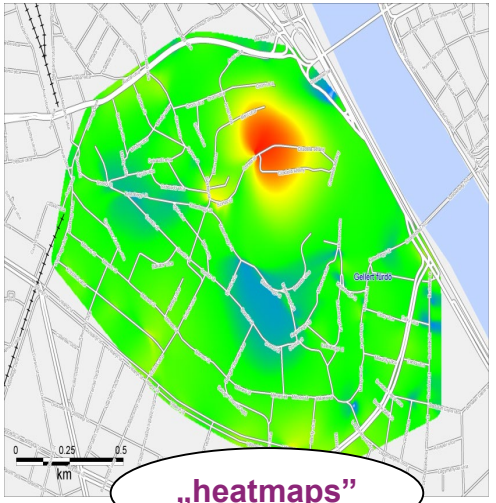
Future plans on website

- Automatic statistics based on individual measurements
- Publication system upgrade
- Mobil application?

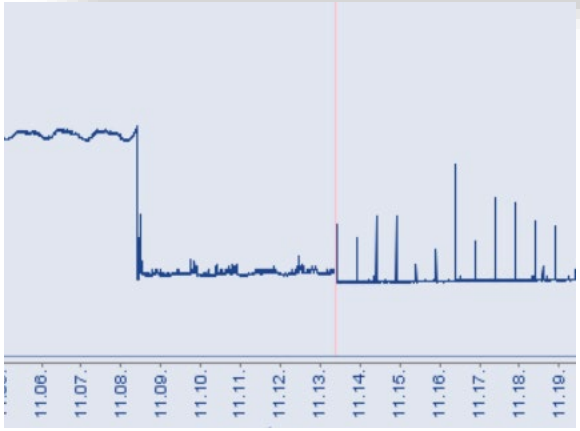
Publication on website

site information

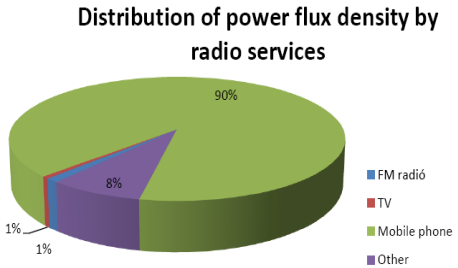
maps with emission source

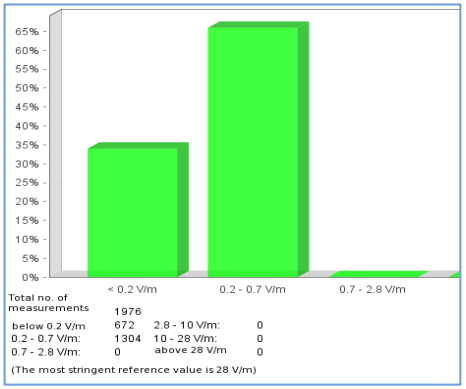


„heatmaps”

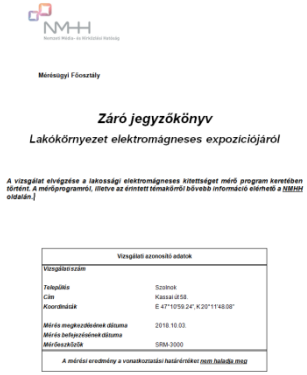


time diagram of electric field





statistical distribution of the measured field strength levels



test report

Types of the measurements and applied instruments

Hand held

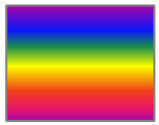
Deployed

Broadband

Quick control of the compliance

Get whole picture, observing daily/weekly variations

Selective



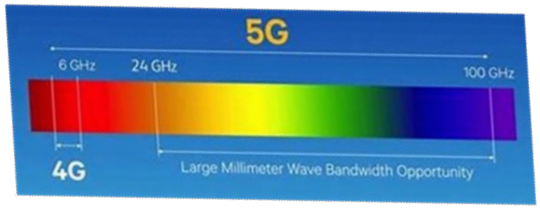
Detailed analysis of the sources

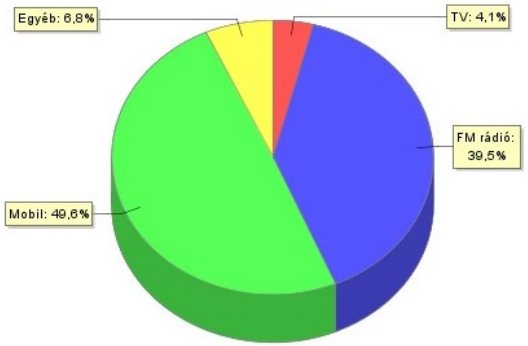
Planned radio monitoring device integration

Individual Personal Exposure Assessment

Hand held measurements

- Wide broadband frequency range (100 kHz – 90 GHz)
- Detailed analysis of most typical source (27 MHz – 6 GHz)





- When operating modes for evaluating pilot signal should be used?
- Should the frequency range of selective measurement be extended because of 5G frequencies?

Hand held measurements II.

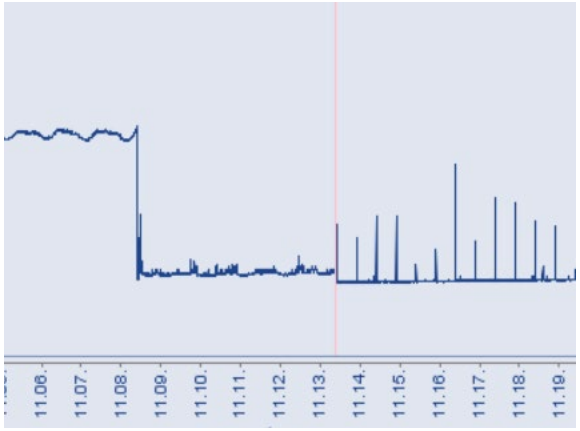
Simultan wideband and frequency selective measurement

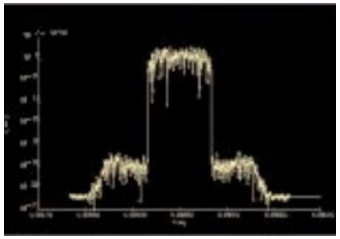
- Decreases measurement error
- Determination of important source outside frequency range of the selective instrument

- Yearly comparative measurement at same places
- Test before and after 5G implementation

Deployed measurements

- Observe daily/weekly variations
- Larger sample
- People feel more comfortable with long term measurement





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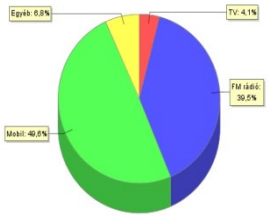
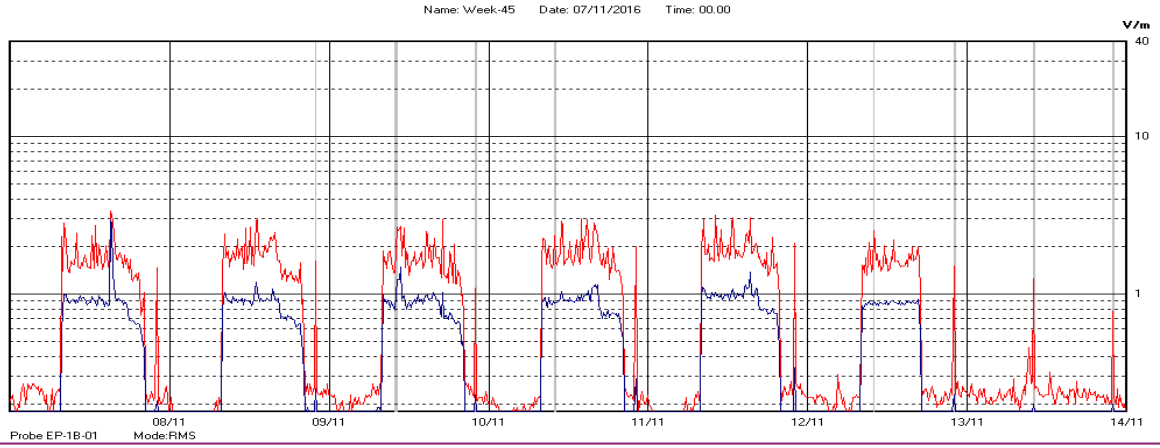
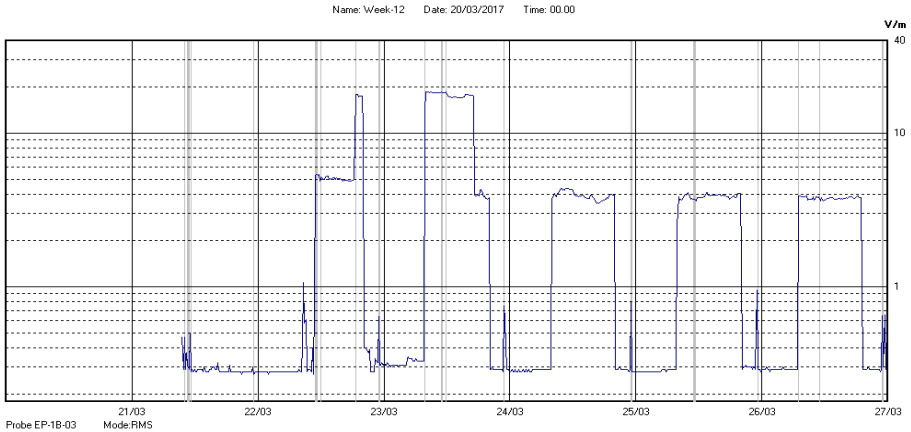


- Alternative solution for large frequency selective deployed instrument?
- Possible use instrument in the radio monitoring and also in EMF measurement field?

Deployed measurments II.



In a school room with WLAN router,
base station on the building roof (maximum: 1 V/m)



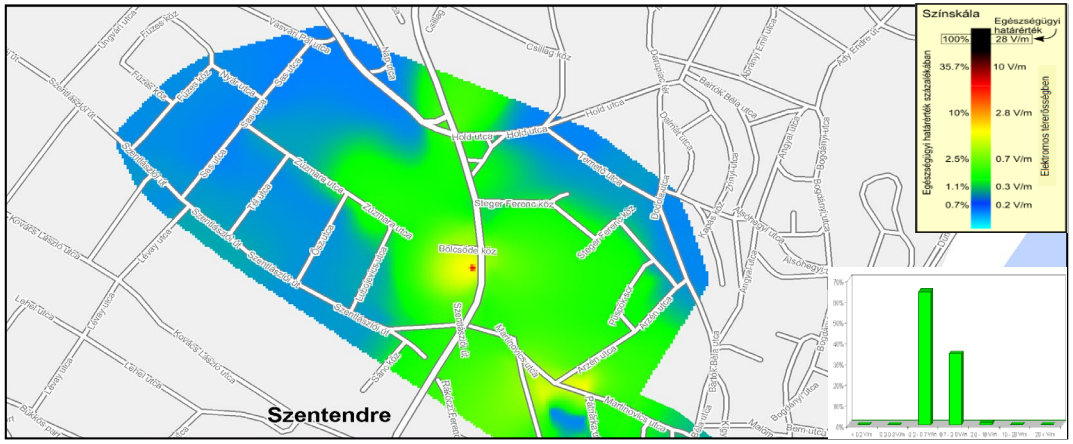
In a block of flat, 2 km away from AM transmitter (maximum: 20 V/m)

Along the route measurements

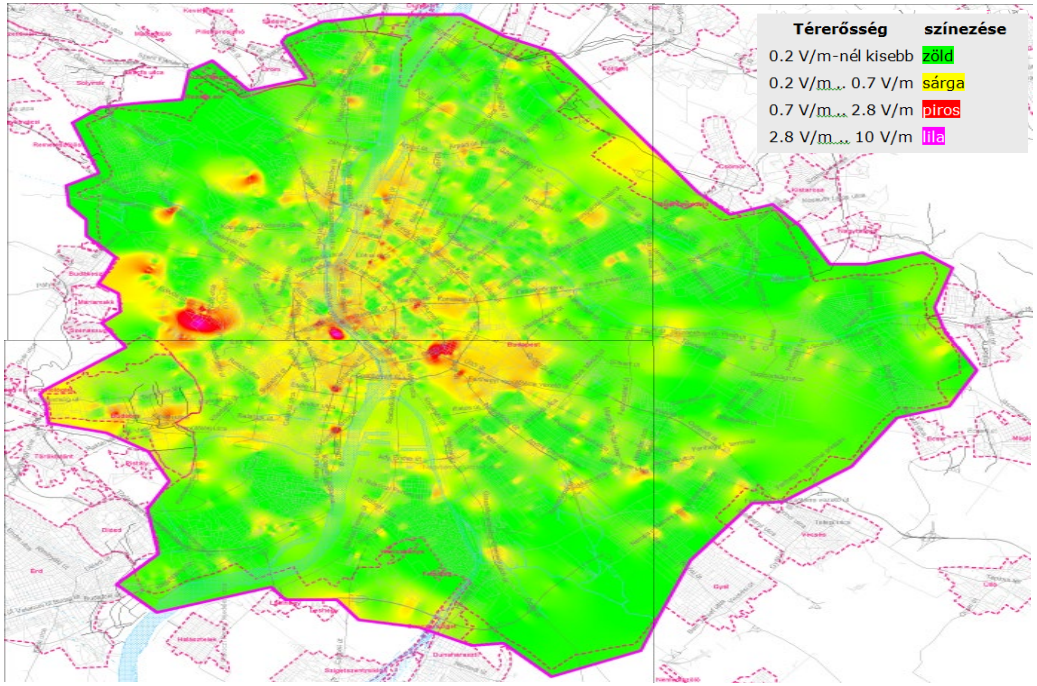
- To give general overview
- Non standard measurement type

- Instruments position, car speed?
- Map generalisation techniques?
- How to colour the „heatmap”?
- Application of mobile phone signal strength tests?

Publication on website – „heatmaps”



Small scale (neighbourhood)



Large scale (city)

EMF Measurement with Drone – The Maiden Flight

Validation of simulation model

Creating educational video

- Heatmap of typical block of flat near mobile base station
- Showing how the field strength decreases with distance

- Handheld instrument 100kHz–3GHz and exposimeter 87MHz–6GHz
- RF Noise from drone → frequency selective and control measurement
- Non sufficient GPS accuracy → position near office-windows

Measurement with exposimeter

- Microenvironmental and individual measurement
- by feasible frequency selective instrument
- Connection with the involved persons

	Frequency MIN (MHz)	Frequency MAX (MHz)
FM	87	107
TV3	174	223
TETRA I	380	400
TETRA II	410	430
TETRA III	450	470
TV4&5	470	770
LTE 800 (DL)	791	821
LTE 800 (UL)	832	862
GSM + UMTS 900 (UL)	880	915
GSM + UMTS 900 (DL)	925	960
GSM 1800 (UL)	1710	1785
GSM 1800 (DL)	1805	1880
DECT	1880	1900
UMTS 2100 (UL)	1920	1980
UMTS 2100 (DL)	2110	2170
WiFi 2G	2400	2483.5
LTE 2600 (UL)	2500	2570
LTE 2600 (DL)	2620	2690
WiMax	3300	3900
WiFi 5G	5150	5850

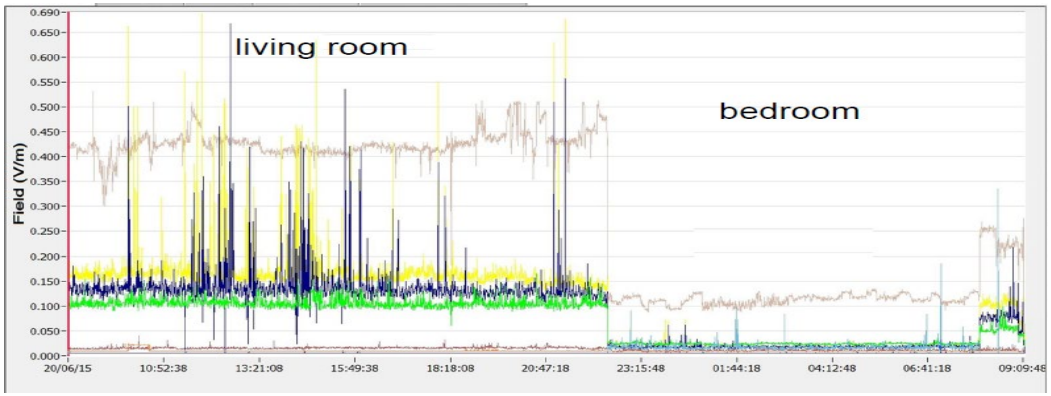
Factor of reliability

- Less precise than a spectrum analyzer measurement
- Position of the instrument
- Involved people

Study I: Indoor microenvironmental and individual RF exposure measurement (2015-16)

In the first 24h the exposimeter was placed in the indoor environment of 37 volunteers' apartments

while during the second 24h hours the exposimeter was carrying by the persons participated in the study.



The indoor downlink (DL) RF exposure level is still higher than the averaged exposure from indoor wireless devices over 24h.

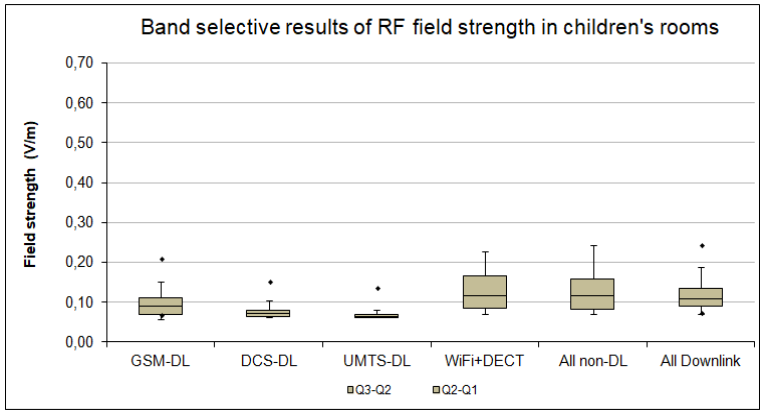
All recorded data were essentially below the Hungarian (ICNIRP/EU) public exposure limits (41-60 V/m)

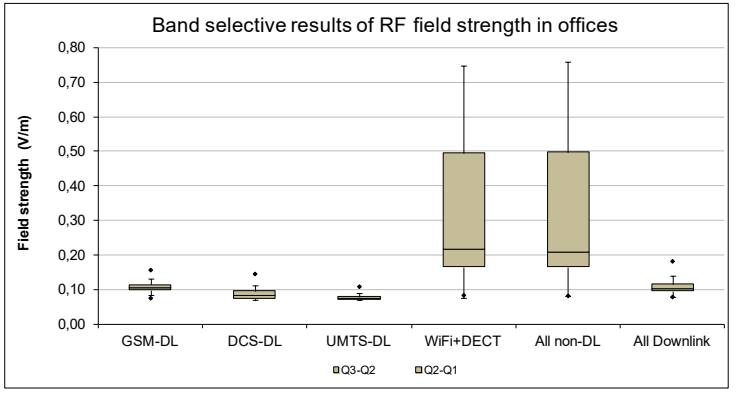
Source: https://www.itu.int/en/ITU-D/Regional-Presence/Europe/Documents/Events/2018/5GHungary/S5%20Thuroczy.pdf

Study II: Kindergartens RF Assessment (2017)

To compare the exposure levels between the teachers' room (office) and the children's room

the exposimeter was placed for 24 hours in the teachers' room (office) and for 24 hours in each children's room.



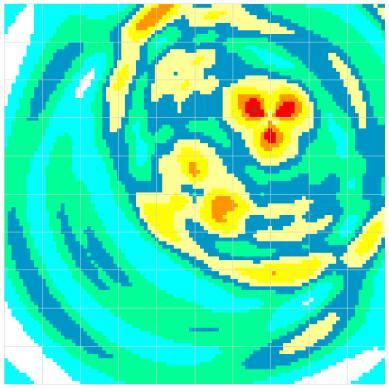


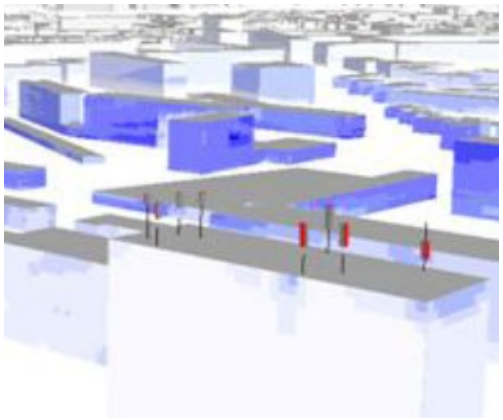
In the teachers' room the exposure coming from indoor wireless sources are significantly higher than the exposure from outdoor sources' such mobile base stations.

In the children's room the exposure from indoor RF sources is much lower, while the average field strength of external sources (mainly downlink-DL of mobile base stations) is similar in both type of rooms.

Simulation aided measurements

- Efficient selection of the test point
- Facilitating the licencing procedure of base stations





- Based on ITU K.70 Recommendation
- Automatic simulation result with NMIAH radio station database
- First phase start in 2020

Experience / Recommendation / Discussion topics

- Combination of measurement types provide more precise overview
- Availability of free reliable measurement is important for many people - independently the predictable test result
- The on sight measurements provide good opportunity to educate people directly on EMF
- Important to give useful information about reliable protection techniques
- Published test results should be a part of a widely accepted communication strategy
- The roll out of 5G will increase request for measurements

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Thank you for your attention.

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