
CERN

CERN telecom sources

CERN seminar on Non-Ionizing Radiation

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Agenda

- Telecom services
- Emissions characteristics
- Protective measures

Services

mobile

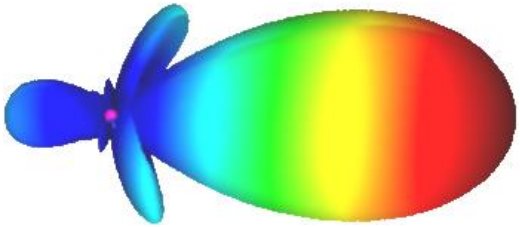
TETRA

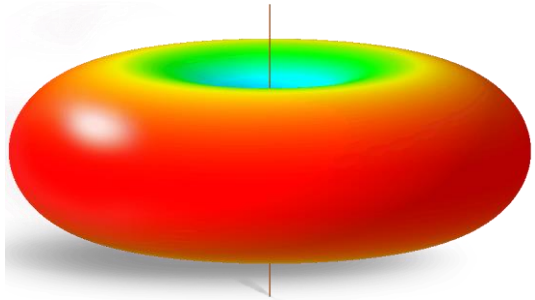
IoT

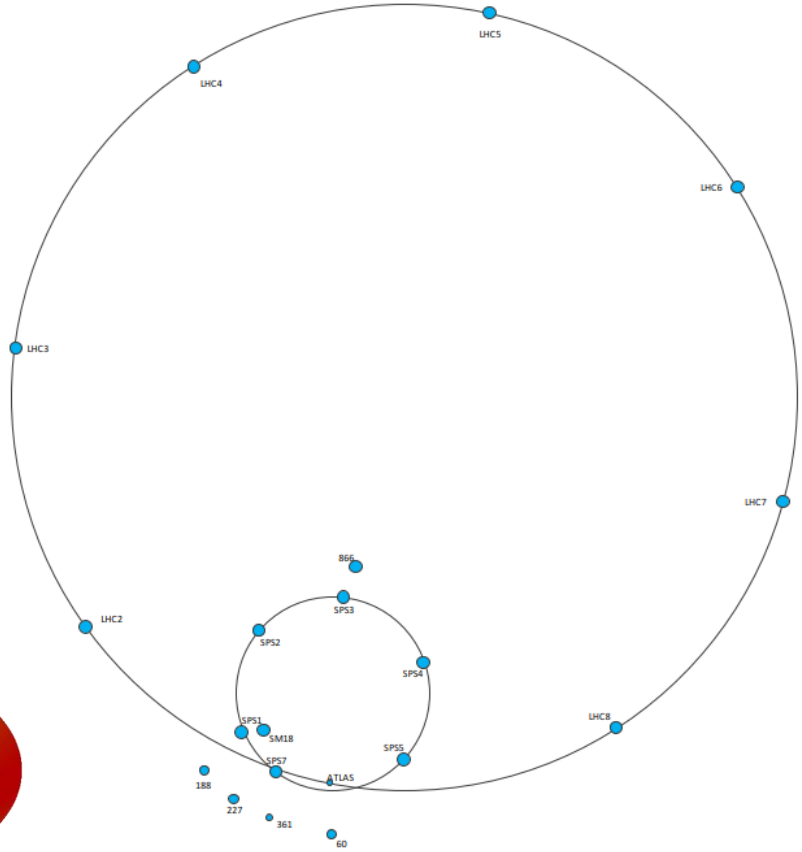
Wi-Fi

Outdoor network

- 15 mobile sites: 40W radiated power
- 6 TETRA sites: 4W radiated power

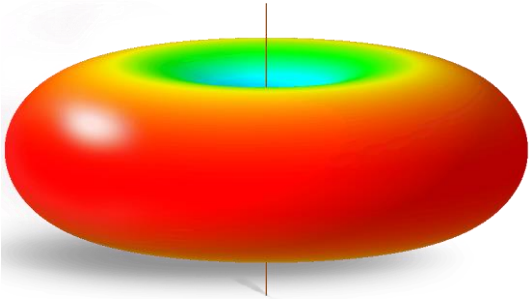




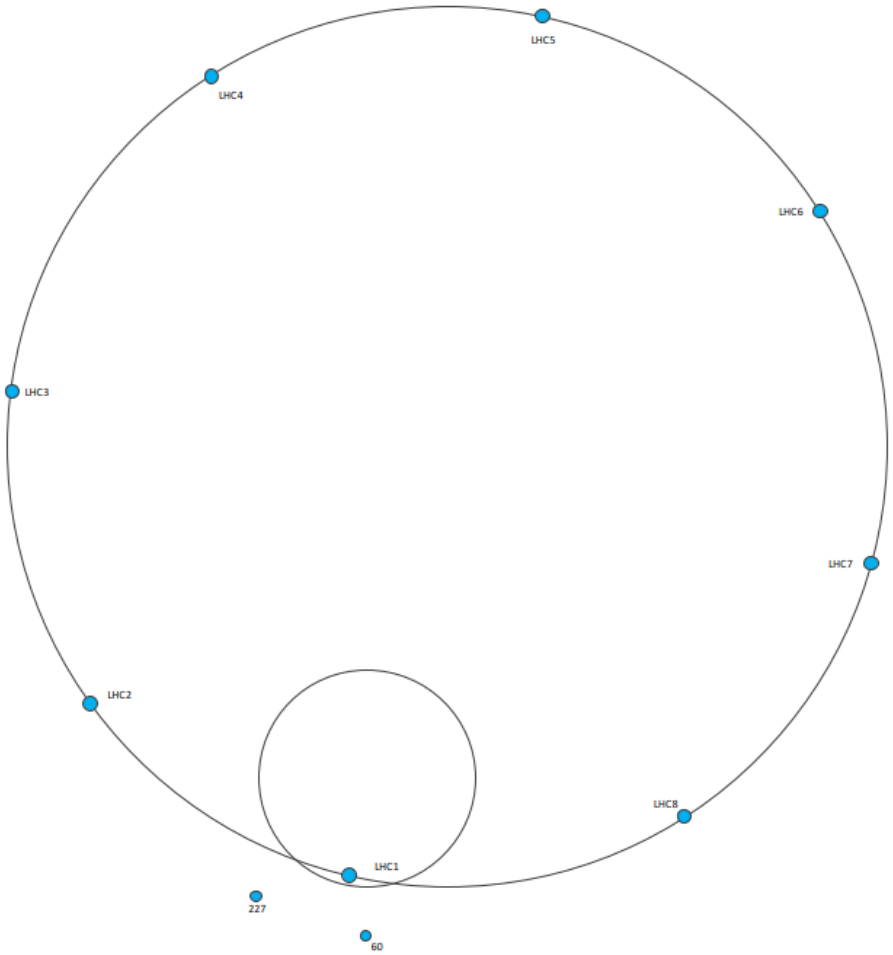


IoT

10 sites

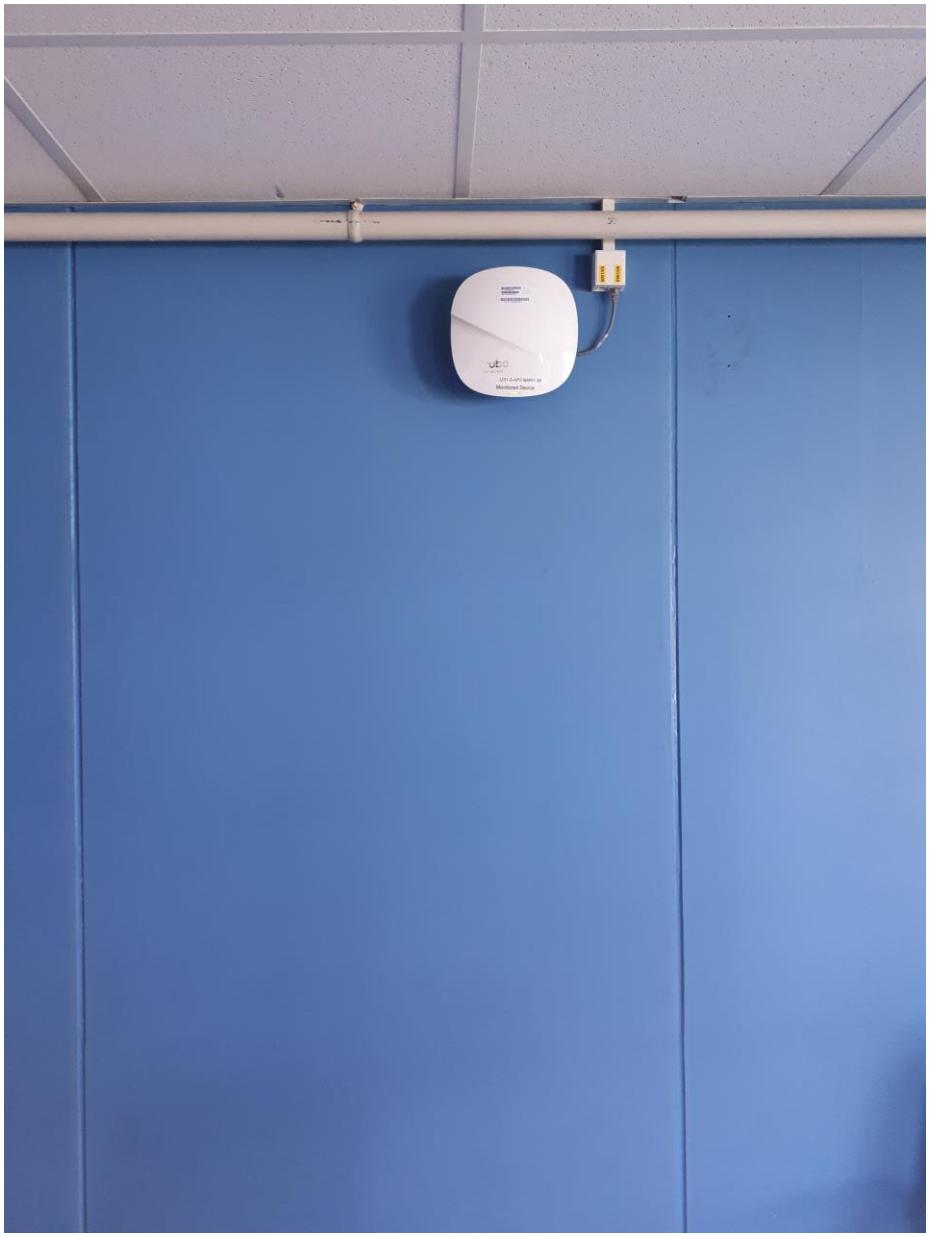


0.1 W radiated power



Wi-Fi

4000+ access points, everywhere
0.1 W radiated power



Regulations

Outdoor networks

International Commission on Non-Ionizing Radiation Protection (**ICNRP**) guidelines:

- Limits defined in terms of Specific Absorption Rate (SAR), leading to **limits on electrical field strength E**
- Each country adopts own limits (CH 10x stricter than FR)
- **Frequency dependent**
- **Length of stay dependent**
  - 800+ hours/year: Lieu à Utilization Sensible (LUS)
  - Otherwise: Lieu de Séjour Momentané (LSM)

e.g. GSM @1800 MHz
Emax = 6 V/m in LUS and 60 in LSM.

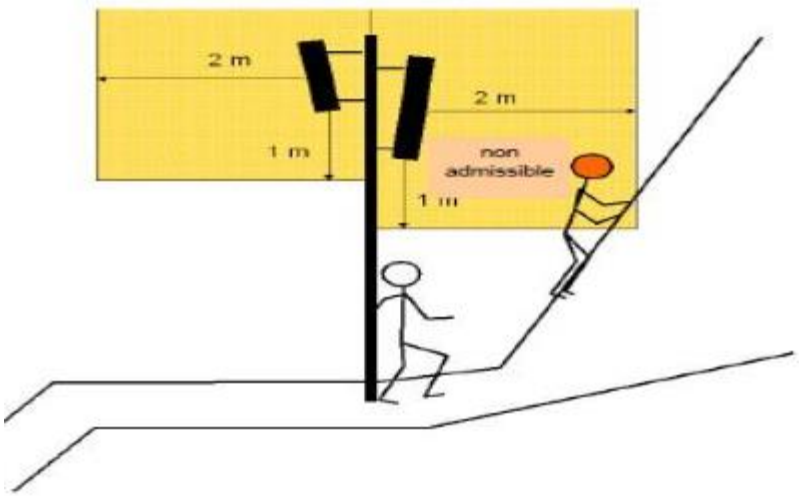
Protective measures

outdoor networks

Theoretical calculation during design

$$E_n = \frac{7}{d_n}\sqrt{\frac{ERP_n}{\gamma_n \delta_n}}$$

Safety fencing



Protective measures

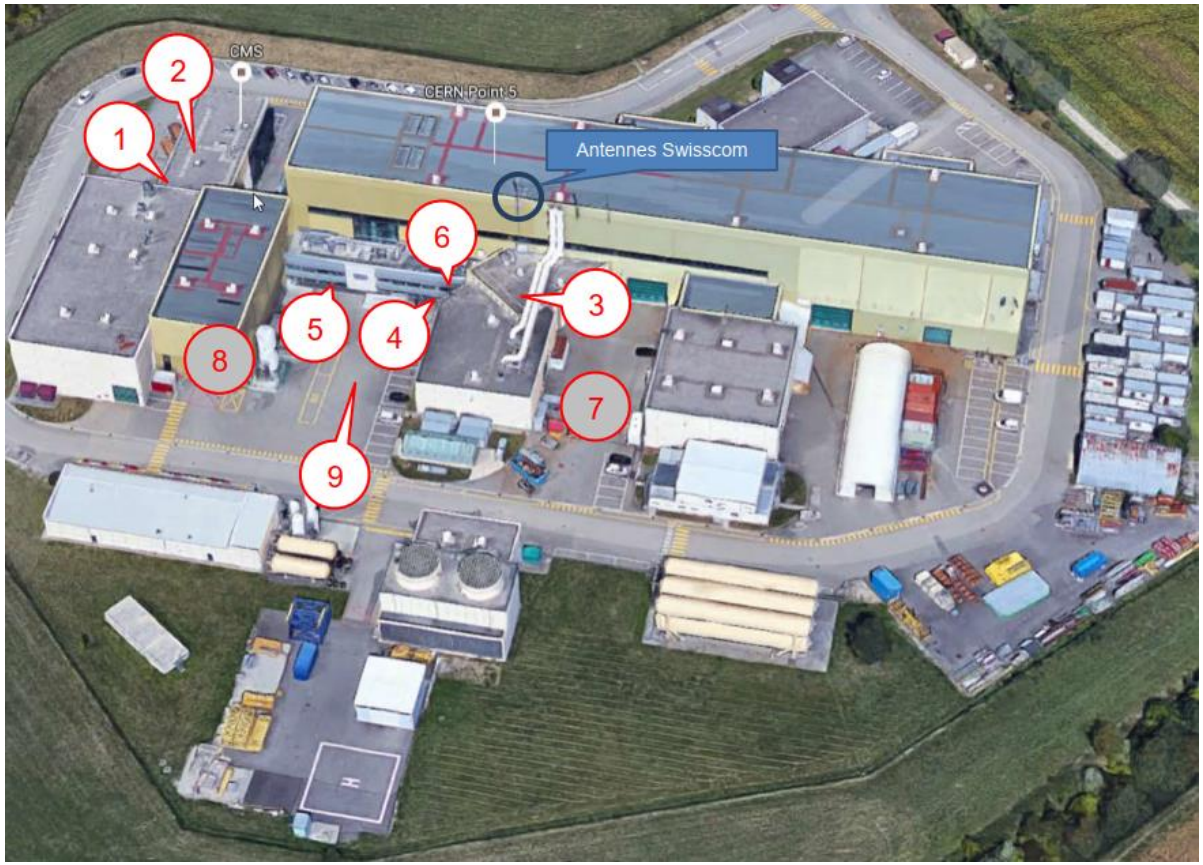
outdoor networks

In-house measurements

Protective measures

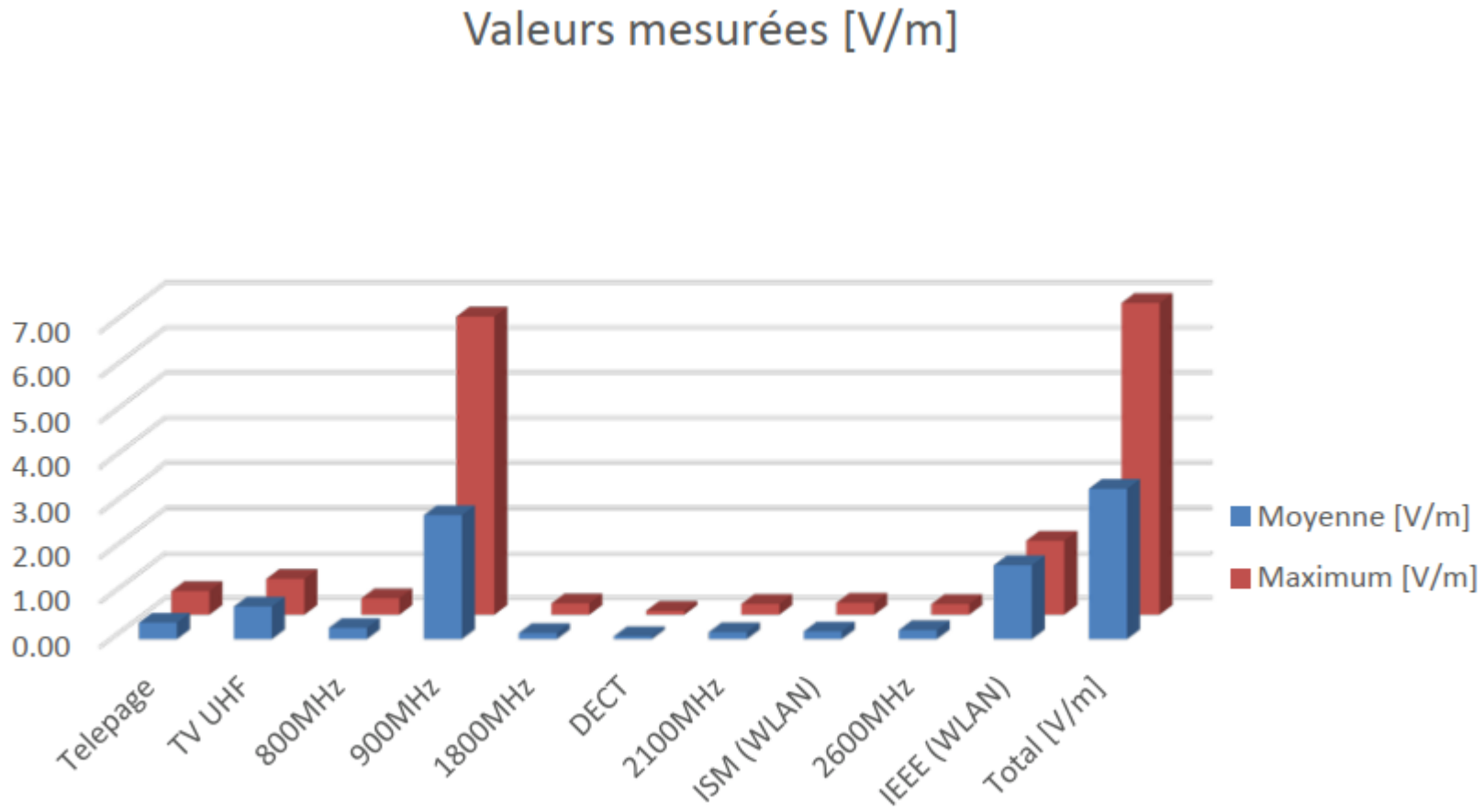
outdoor networks

3rd party measurements



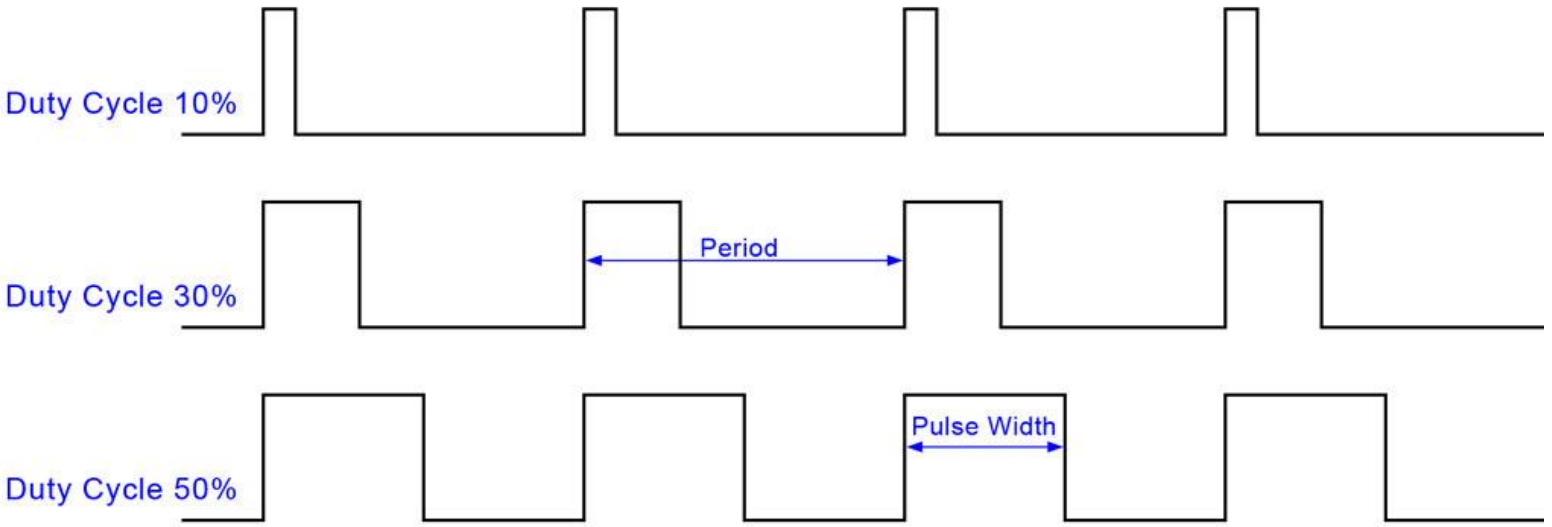
Protective measures

outdoor networks



Protective measures

Duty cycle



Protective measures

More reading

- French ANFR 2018 report
  median $E = 0.4\ V/m$, 90th percentile $E = 1.8\ V/m$
- Swisscom 5G fact check
- ICNIRP reports

Protective measures

Wi-Fi and IoT emitters comply with manufacturing standards on max emissions

www.cern.ch