3GPP TSG RAN#72 Meeting
Busan, South Korea, June 13 – 16th, 2016

RP-160888

Motivation for defining EMF related requirements

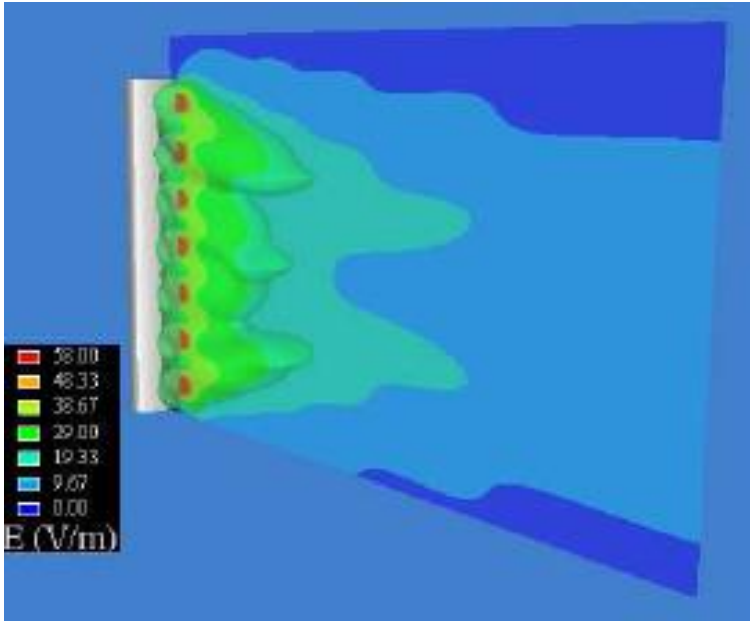
Orange

Exposure in a nutshell

- Human are exposed to various type of radio emission.

- different units could be used to measure the exposure
  - Watt/kg (close to sources)
  - V/m or w/m² (far from sources)

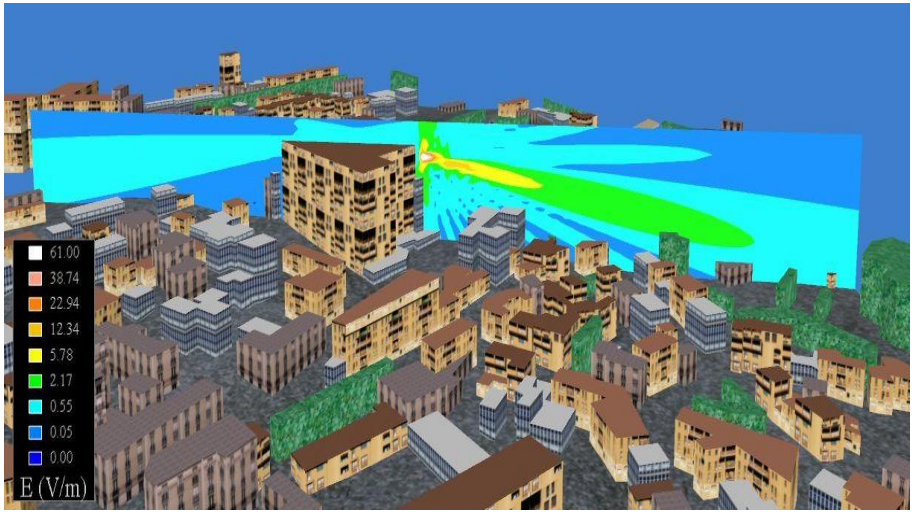
- Exposure is the sum of all the radio sources running in different frequency bands (FM, TV, GSM900, GSM1800, UMTS, WiFi, DECT, LTE etc… and 5G !



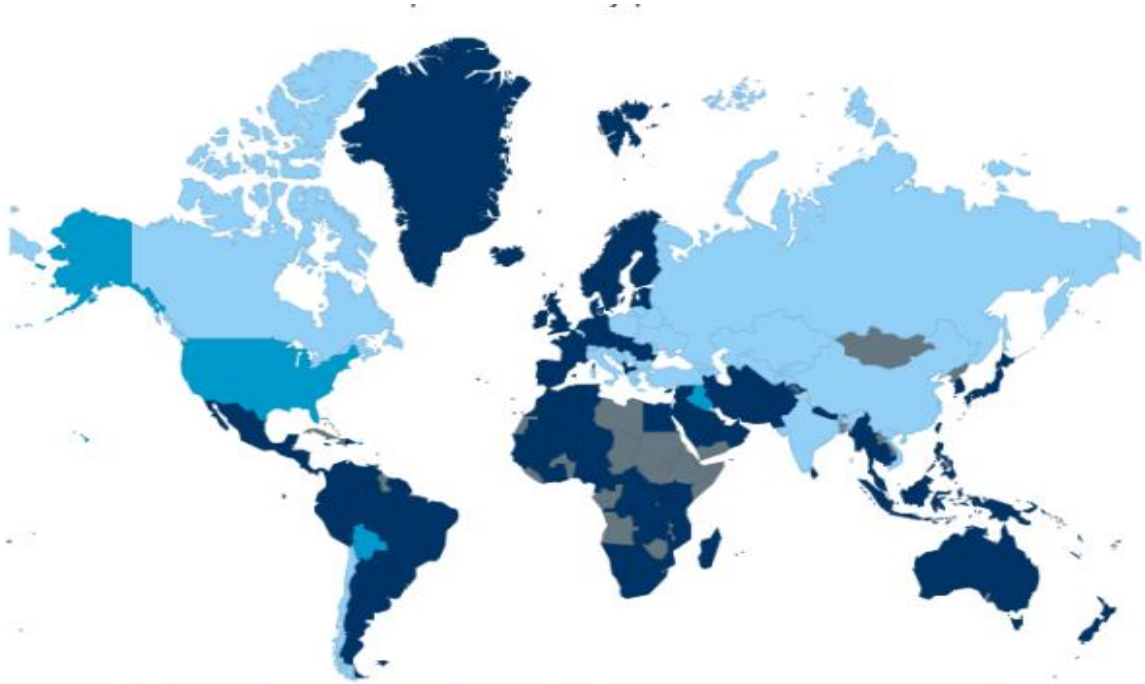
Introduction

- **For radio communication system, the exposure to radio systems is made of** :
  - UE emission
  - Base stations emission

- **exposure levels are depending on**
  - distance to the base station
  - received power at a given location
  - signal waveform
- **exposure limits depends on**
  - frequency carrier
  - frequency band



International limits



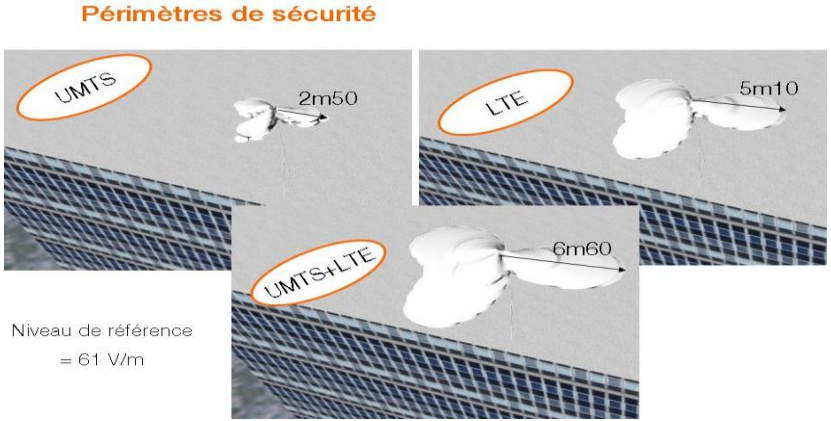
Note: Information from public sources except where indicated.

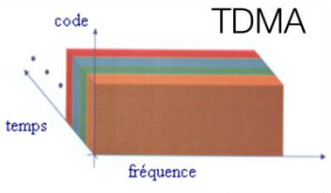
Last updated: 22 December 2015

There are two ways to measure exposure: living areas and security perimeters

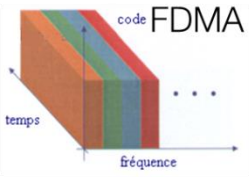
- **The exposure are measured with two different methods**:
  - In living areas : real public exposure
  - Close to base stations : security perimeters
- **The exposure is quantified for maximum traffic situation**

- **Reference level defined in Europe**
  - GSM 900 : 41 V/m
  - GSM 1800 : 58 V/m
  - UMTS 2100 : 61 V/m
  - LTE 2600 : 61 V/m
    (same value for frequencies above 2GHz)

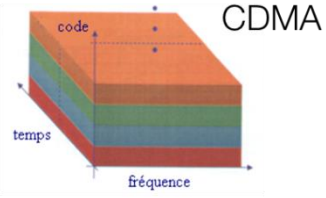




$x_1(t)$



$x_2(t)$



$x_3(t)$

5

Impact of 4G on global exposure

Exposure is still compliant with limits : average exposure is around 2 V/m

However

LTE has induced x2 exposure in living areas : not a problem of compliance but a real challenge for public risk perception

5G impact

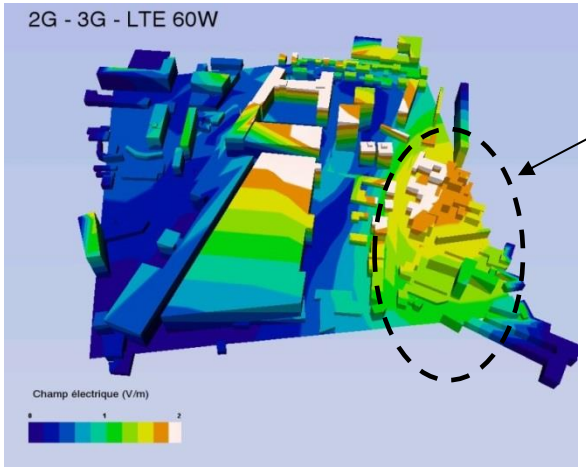
5G will most probably induce a higher exposure especially if 2G/3G and 4G networks are maintained with the same operating powers

5G challenges for exposure

High power : achieving x1000 capacity will probably induce a higher operating power. 3GPP needs to secure that exposure limits are respected with the New Radio technology.

Densification : massive installation of Radio nodes (e.g. small cells, relays etc) in living areas faces the problem of public acceptability

how to deal with moving beams (beamforming) – exposure should be measured at maximum level to avoid time variations and averaged in space to avoid fast fading effects => new methods should be introduced in future measurement protocols. The measurement methodologies to be defined might impact the power or densification constraints in 3GPP



security perimeters : what is the expected impact

it is most probably that actual limits will be revised by the WHO ! – the context is expected to be more constrained in +2016

Proposal

In order to ensure that the New Radio is compliant with the international regulations in terms of EMF exposure and in order to secure the public acceptability of such technology we propose to add the following requirement to existing section 10.4 from TR38.918:

---------- BEGIN TEXT PROPOSAL ----------

« 10.4 Control of EMF exposure levels requirements

The New Radio technology shall comply with international limits defined by the international regulation bodies (e.g. the World Health Organization) regarding exposure to Electro Magnetic Fields (EMF).

Also in order to enforce the New Radio technology public acceptability, It is highly recommended to lower as much as possible radiated fields without affecting the perceived quality of service and user experience in particular in for radio transmitters intended to be installed in living areas.”

---------- END TEXT PROPOSAL ----------