

LEXNET

Low EMF Exposure Future Networks

<http://www.lexnet-project.eu/>



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Orange lab, Whist lab
19 Dec 2012

- *Lexnet Context*
- *Parameters influencing the Exposure.*
- *LEXNET Objectives*

EMF and Health: where we are?

- Protections limits exist
 - ICNIRP guidelines
 - EU recommendations and directives
- Large research effort conducted since 15 years
 - W.H.O EMF project
 - Worldwide Research effort
 - Several EU and National projects and programs
 - ✓ Interphone, Reflex, Perform, Mobikids, Seawind, Arrimora, Cosmos, Cephalo
 - ✓ national funding: MTHR, BFS, ANR, NR57, NL..
- To date:
 - No evidence of sanitary effects below ICNIRP limits
 - Question about long term use: Possible biais do not allow definitive conclusion: (Classification 2B)

- Mast

- 33 % of respondents believe these masts have a major effect on people's health.
- 37 % say that mobile phone masts have some effects on health.
- 24 % say that mobile phone masts have no effect on their health
- 6 % cannot form an opinion on this issue.

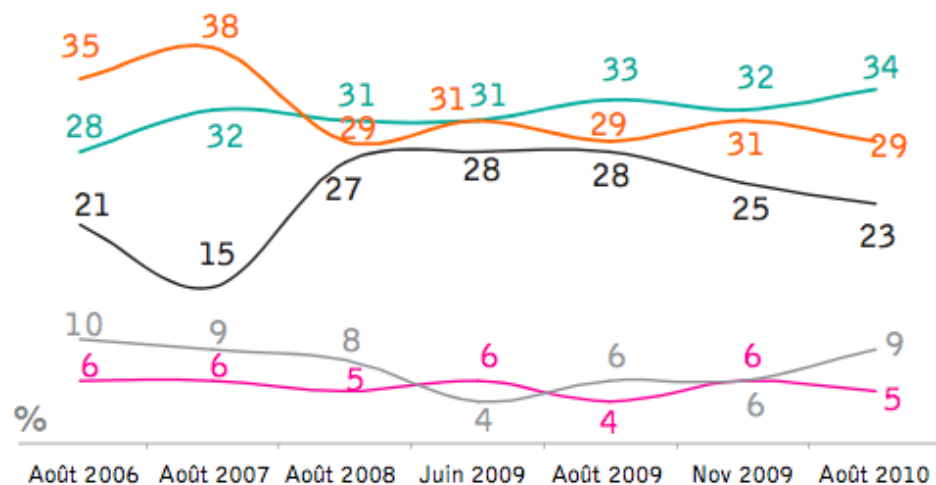


- Mobile:

- 26 % say that mobile phones affect citizens' health to a major extent.
- 41 % think that mobile telephones have some effects on their health.
- 28 % see no link between health and this item.



Stable concern. Eg in France



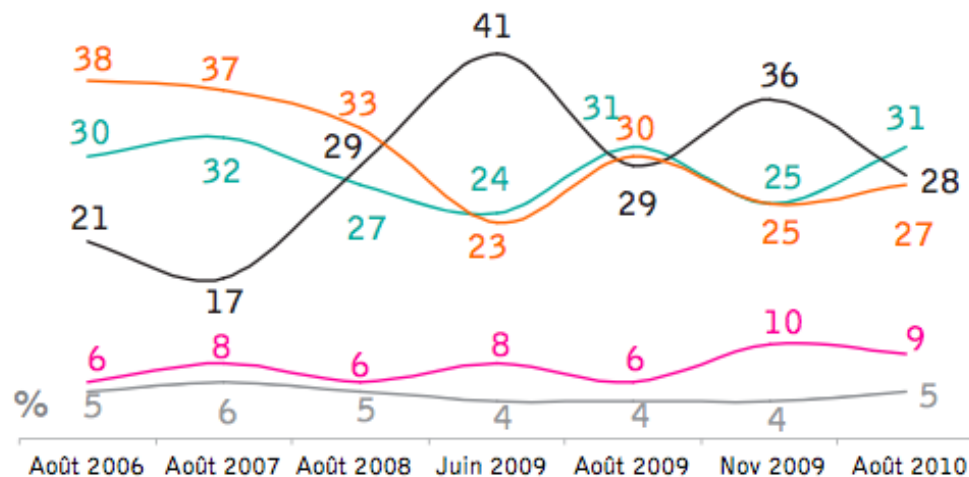
ON NE SAIT PAS vraiment car des scientifiques disent que les antennes-relais sont dangereuses pour la santé et d'autres disent qu'elles ne le sont pas

ON N'A PAS aujourd'hui LA PREUVE d'un DANGER, mais on MANQUE de RECUL sur ce sujet
Il est DANGEREUX pour la santé de vivre près d'une antenne-relais

Sans opinion
Il n'y a PAS DE DANGER pour la santé à vivre près d'une antenne-relais⁽¹⁾



(1) Position des autorités sanitaires



ON NE SAIT PAS vraiment car des scientifiques disent que le téléphone mobile est dangereux pour la santé et d'autres disent qu'il ne l'est pas

Les téléphones mobiles sont DANGEREUX pour la santé
ON N'A PAS aujourd'hui LA PREUVE d'un DANGER, mais on MANQUE de RECUL sur ce sujet⁽¹⁾

Les téléphones mobiles ne sont PAS DANGEREUX pour la santé
Sans opinion



(1) Position des autorités sanitaires

Challenge 1.1 a) in Call 8 of the 7th Framework Program:

- *“LTE-Advanced and post-LTE systems; with focus in the longer term, R&D targeting new radio transmission paradigms and system designs taking into account the **need for lower electromagnetic field exposure....Novel radio network topologies, taking into account the need for low EMF radio exposure**”*

RF Total Exposure.

2G, 3G, LTE
Cellular base station



Wifi Box



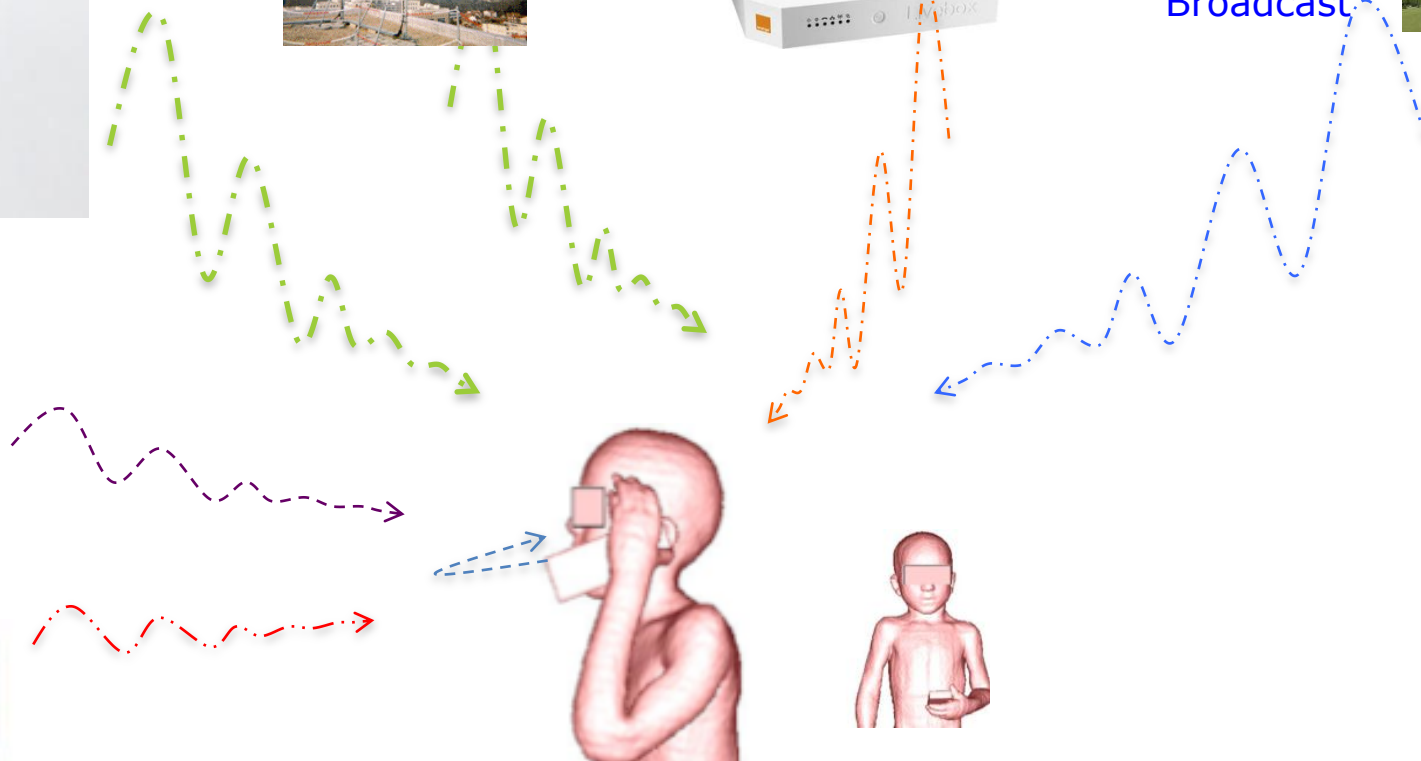
FM
&
Broadcast



Femto cell



DECT



**How assess?
What are the main contributors?**

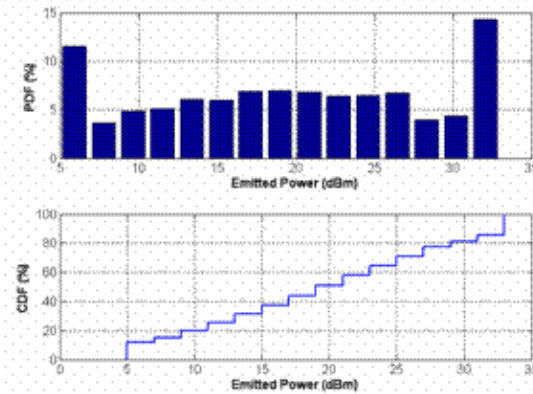
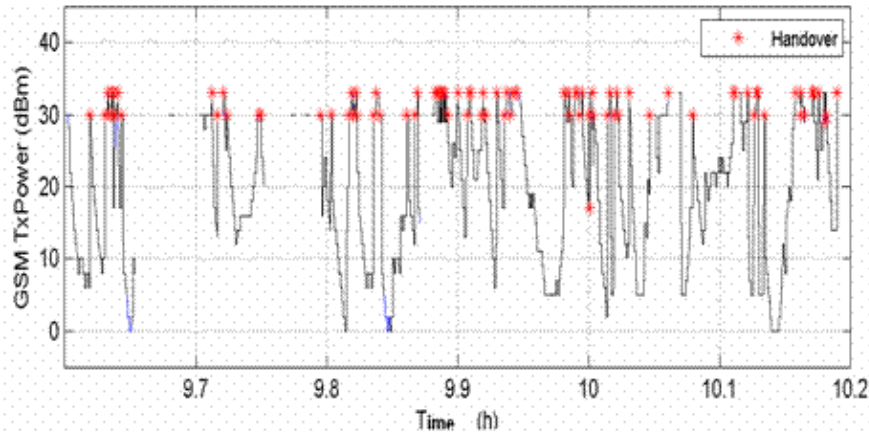
- Consider separately exposure induced by mobile phone and base station.
- Mainly dedicated to over-estimation and compliance.
 - ✓ Compliance boundaries
 - ✓ Put on the market.
 - ✓ Extrapolation to the maximum traffic ...

What is the real exposure?

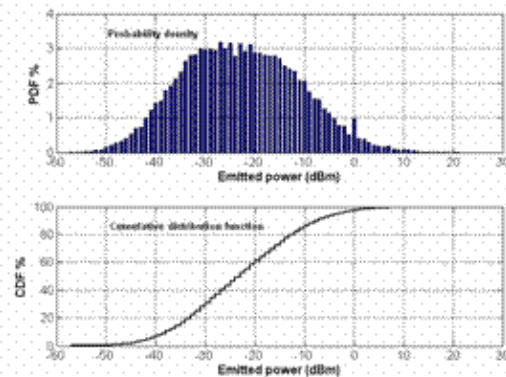
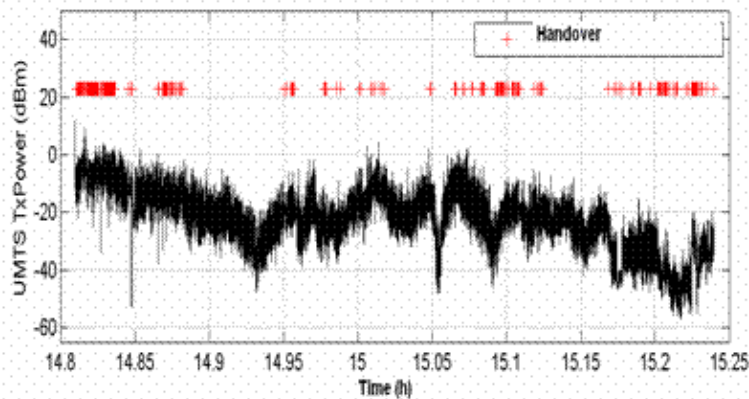


RF systems do not emit at max all the time

GSM

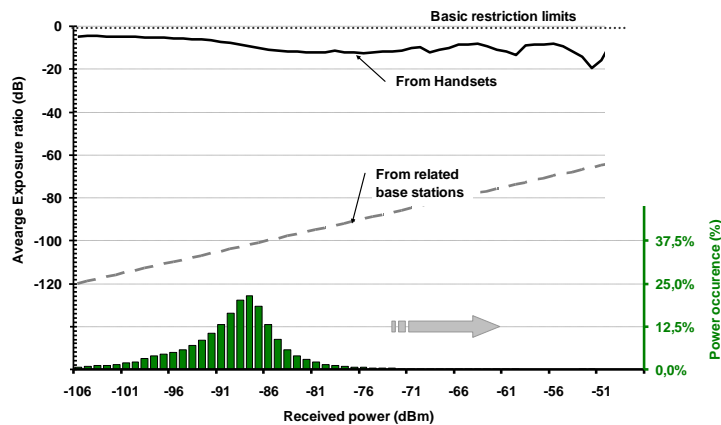


UMTS

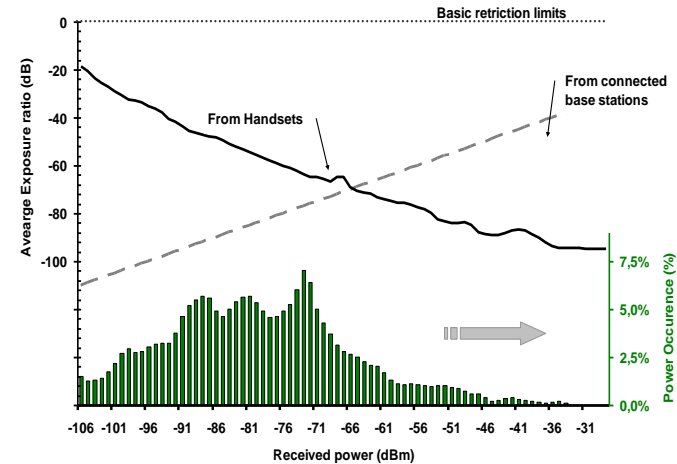


Network influence the power emitted by the phone

2G

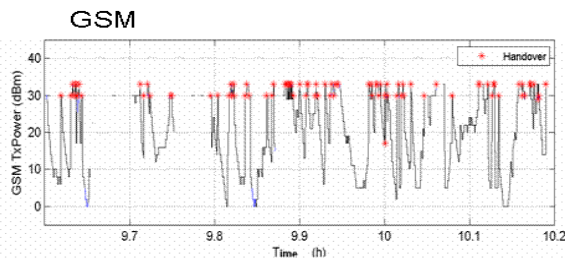


3G



○ GSM

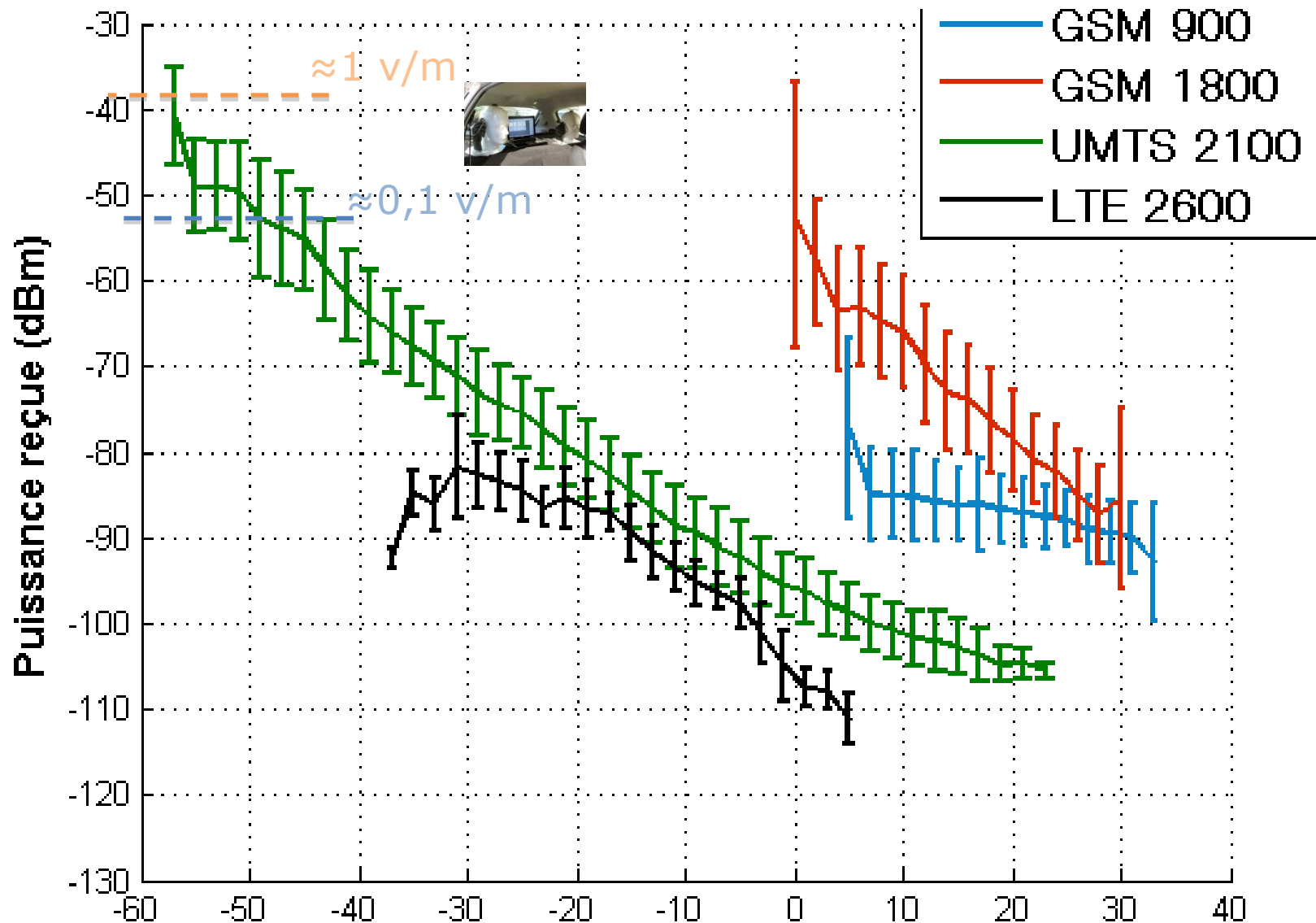
- Handovers in 2G have a large influence
- mean 50% of the max



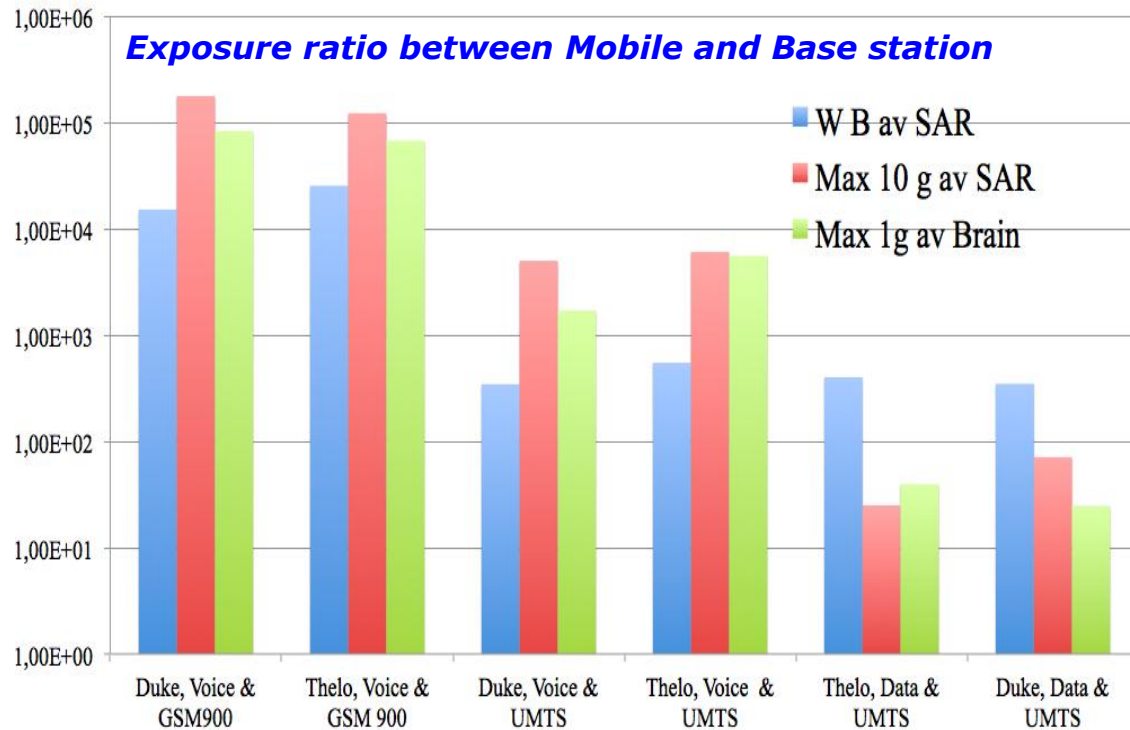
○ 3G

- median value 1% of the max
- mean value 0.1% of the max
- Be close to a base station can reduce the power emitted by the phone

TX and RX are correlated.



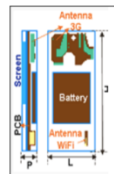
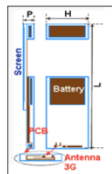
Human Exposure induced by RF mobile phones and base stations



- Mean Environmental E Field strength induced by base stations: 0.1 V/m



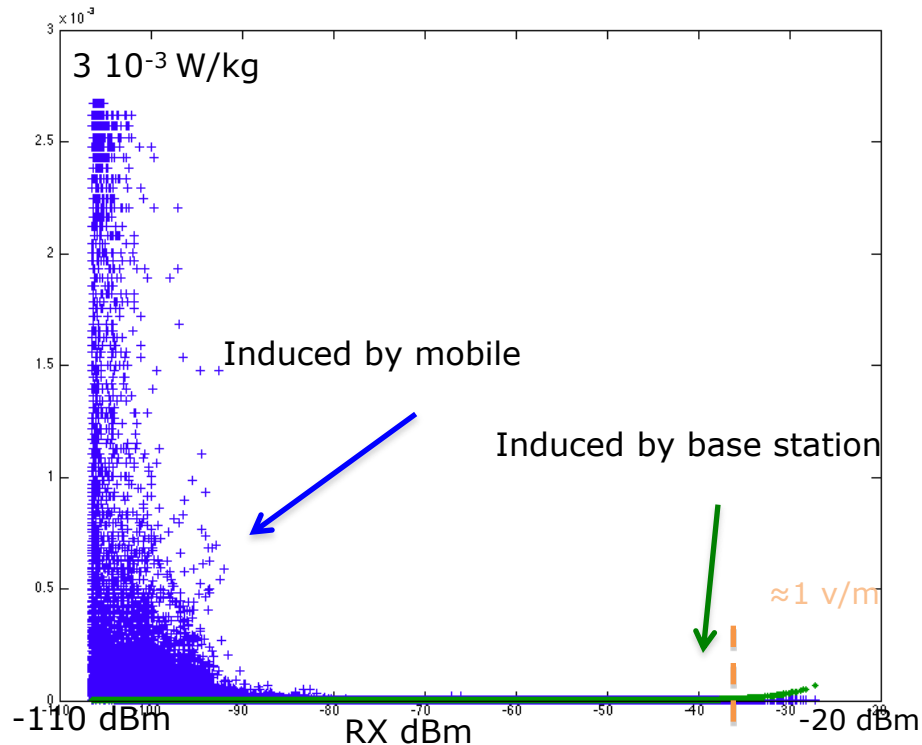
- Mean power emitted by phones:
 - GSM: 50 % of the max
 - UMTS: 1 % of the max



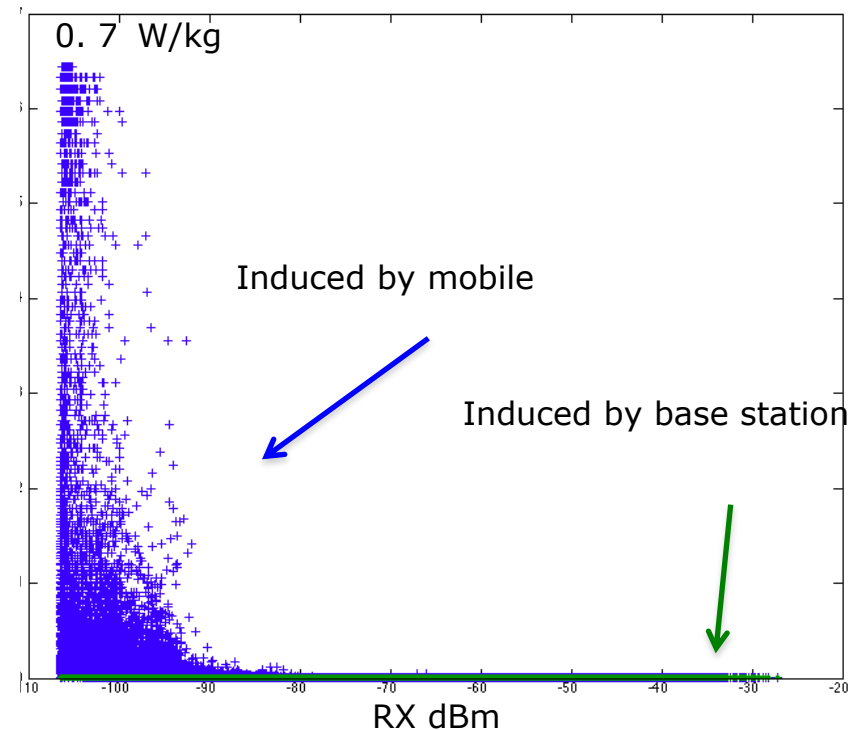
Exposure vs Rx - UMTS case -

RX= level received from the transmitter with which the mobile is connected

Whole body exposure vs Rx

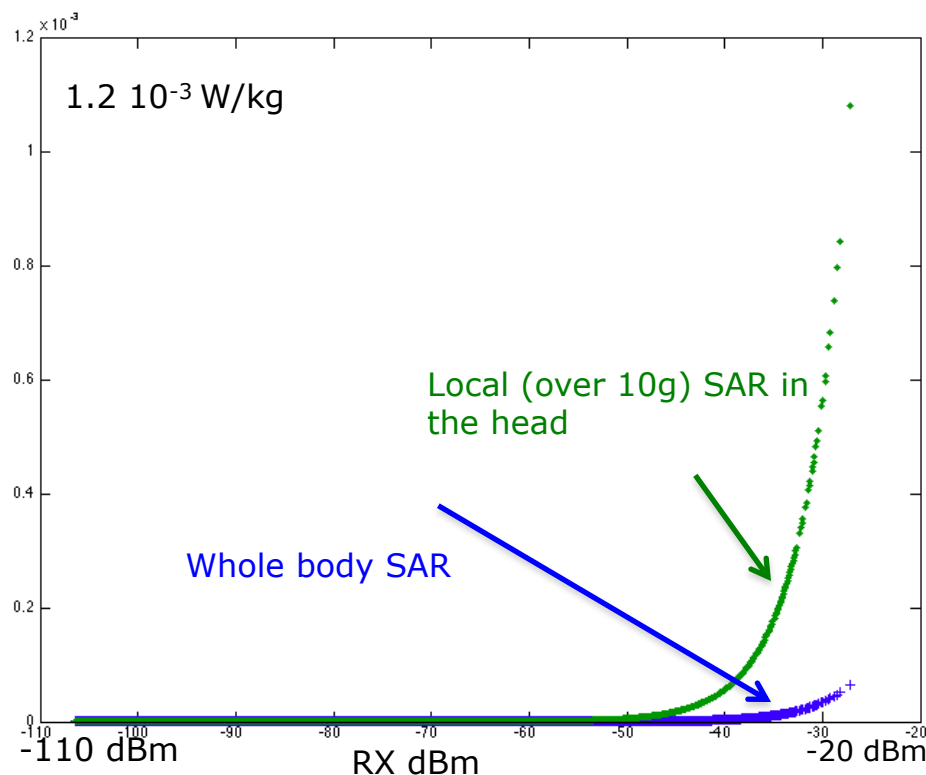


Local exposure vs Rx

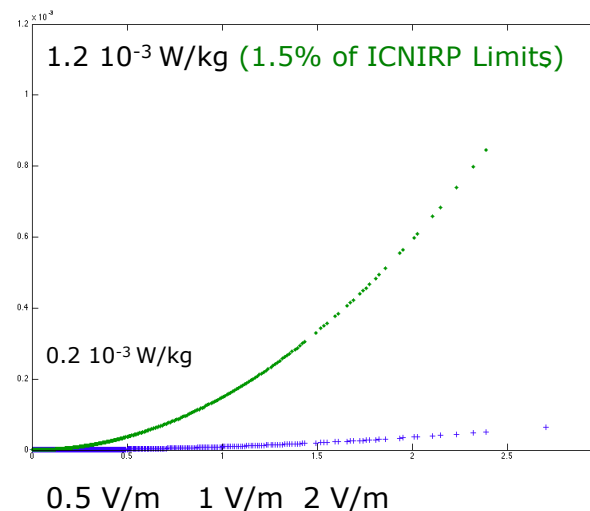


Human model: Duke (adult)
Usage : Voice

Whole body exposure vs level received from the transmitter with which the mobile is connected

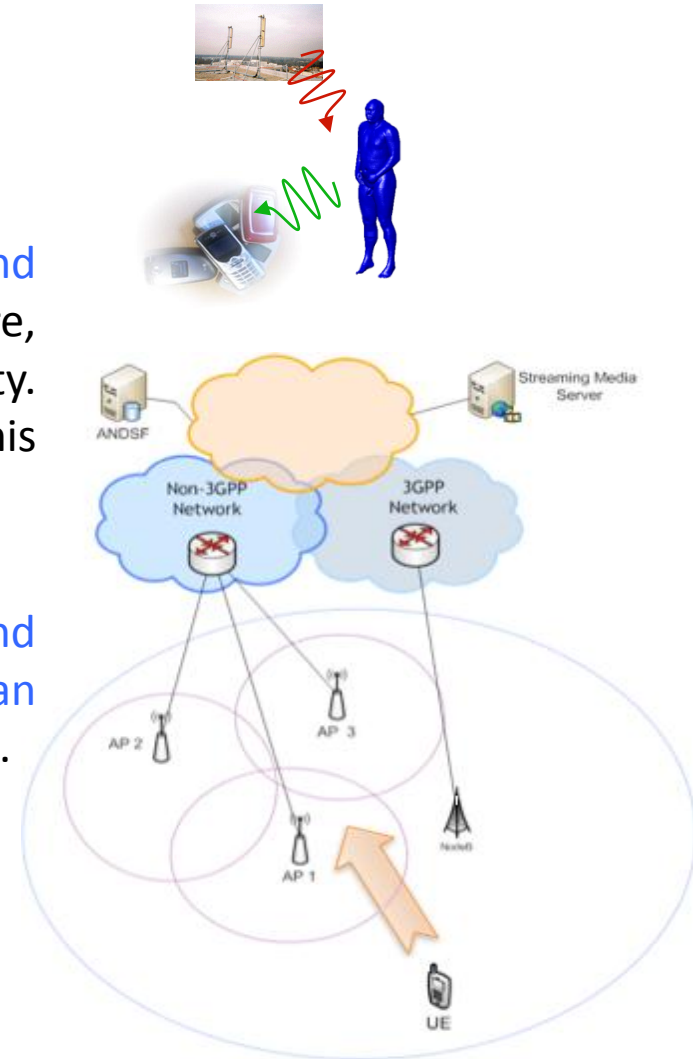


Linear scaling



LEXNET Objectives

- The main goal of the project is to investigate methods, technologies and architecture able to support network inducing reduced total exposure
 - Defining of an exposure index composed of up and down link exposure representing the real exposure, discussing within focus group its acceptability. Developing methods to measure and predict this index.
 - investigating and proposing architecture and effective mechanisms to reduce EMF human exposure without compromising quality of services.
 - Experimental testing of proposed solutions



LEXNET project

9 countries
17 partners

- Research labs:

- ✓ CEA-LETI (FR)
- ✓ IBBT (B)
- ✓ KIT (DE)
- ✓ CWC (FI)

- Universities :

- ✓ UNICAN (ES)
- ✓ Inst Mines Telecom (PT)
- ✓ UniS (UK)
- ✓ Univ. Montenegro & Belgrade

- Equipment manuf.:

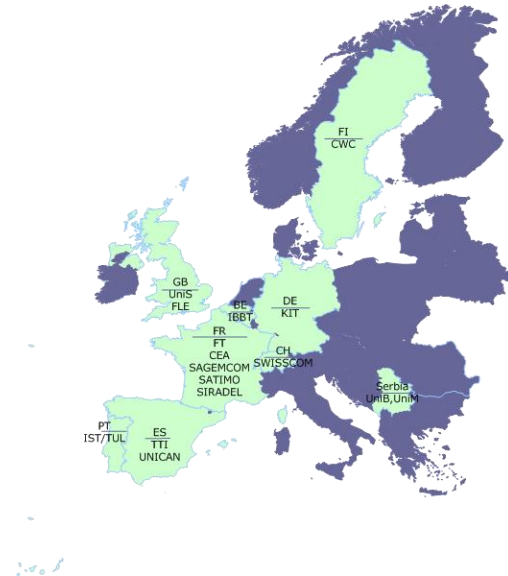
- ✓ SAGEMCOM (FR)
- ✓ Fujitsu Labs Europe (UK)

- Operators:

- ✓ France Telecom (FR)
- ✓ Telekom Serbia

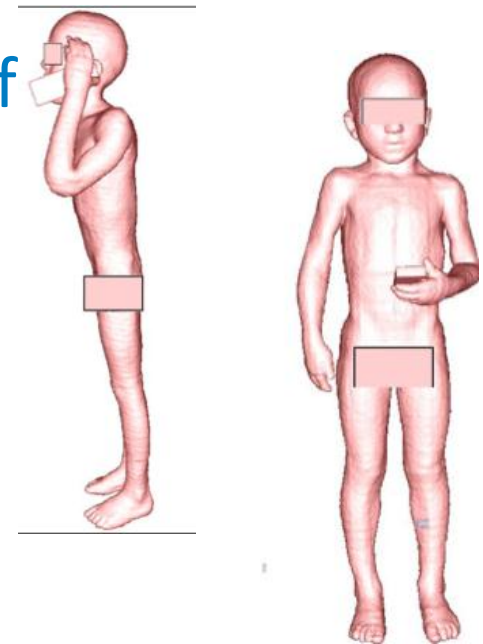
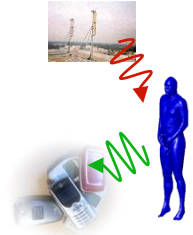
- SMEs (3)

- TTI (ES)
- SATIMO (FR)
- SIRADEL (FR)



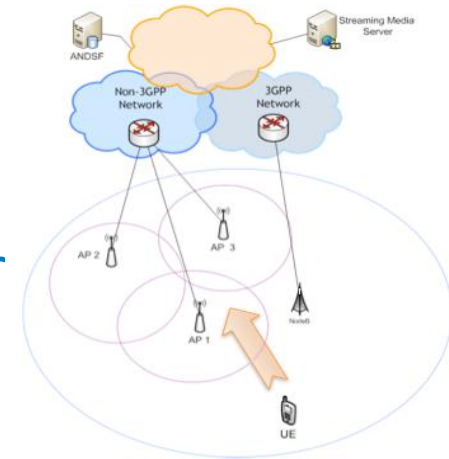
Define an index of exposure

- Up and down exposure
 - induced by base station
 - induced by the mobile
- taking into account realistic pattern(s) of usage
 - Location : At home, at work, traveling...
 - posture: Close to the head, talk mode..
 - Usage: voice, receiving, emitting data...
 - ...



- Technologies able to minimise the index of exposure
 - reduce the power emitted by base stations and mobile phones without compromising quality of services.
 - ✓ Eg increase sensibility, share broadcast channel, novel Sleep/Wake-up, new RRM, Power Control
 - ✓ reduce the exposure induced by the mobile

- Investigate architectures
 - E.g heterogeneous networks, intelligent positioning of the access points ...
 - E.g A dense network induced large number of handovers. If the power is set up at the max at each handover...
 - ✓ closer is the access point higher is the exposure induced by the access point
 - ✓ Densification vs complexity
- Network management solutions



Out of clutter find simplicity
From discord find harmony
In the middle of difficulty lies opportunity.

Albert Einstein,
Trois règles de travail