



Patterns and risk factors of mobile communication

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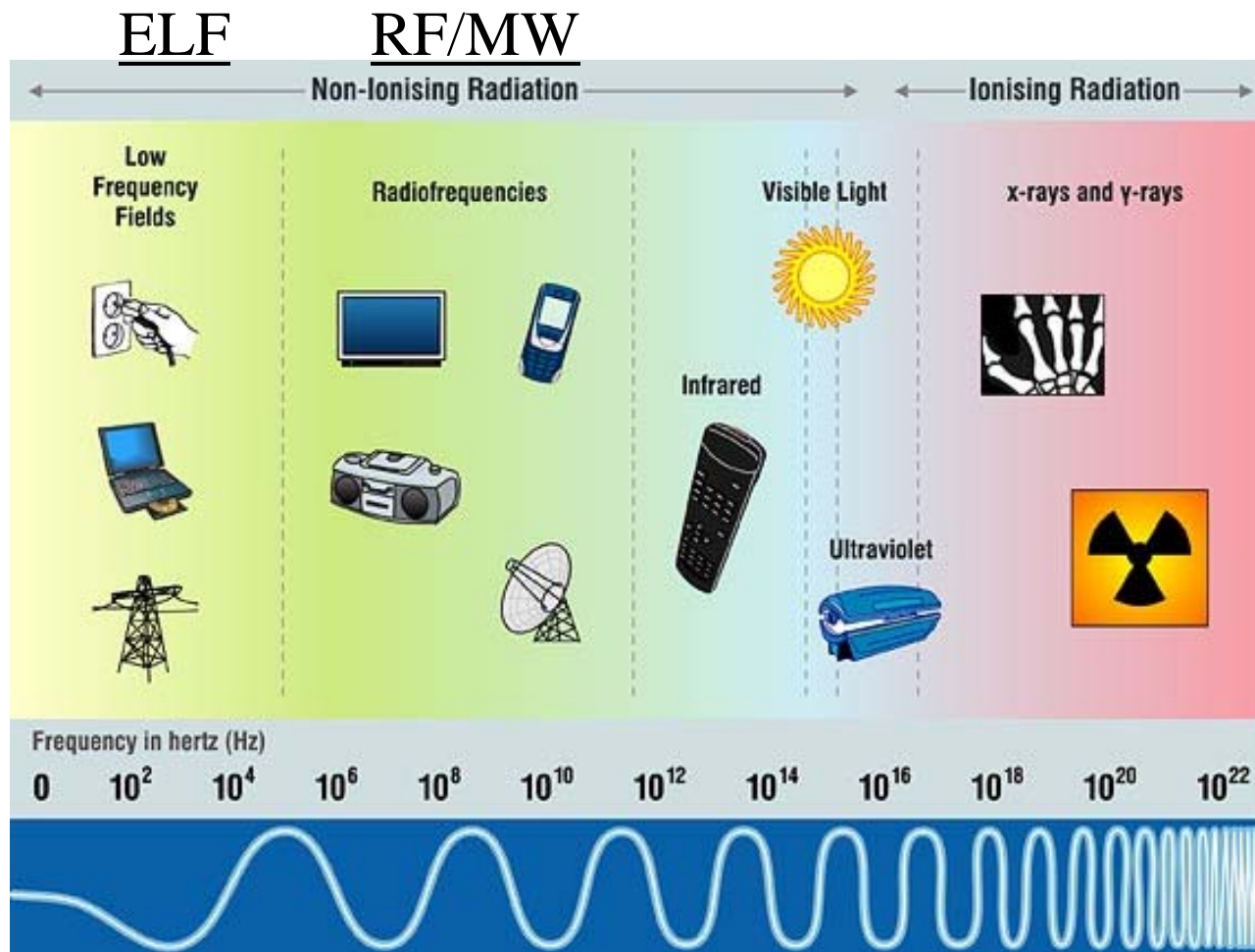


Outline



- Electromagnetic spectrum
- Exposure to mobile phone radiation
- Health effects
- Outlook here and there

The Electromagnetic Spectrum





Use of mobile phones



- Number of mobile telephone users in 2009: 4,400 million.
- Around two-thirds of the world population now use mobile telecommunications.
- strong growths in newly industrialised countries e.g. an estimated 684 million in PR China (+12%) and 457 million in India (+32%).

The European Information Technology Observatory, 2009

RF-EMF: Two types of exposure

**close to body
(near field)**



**environmental
(far field)**



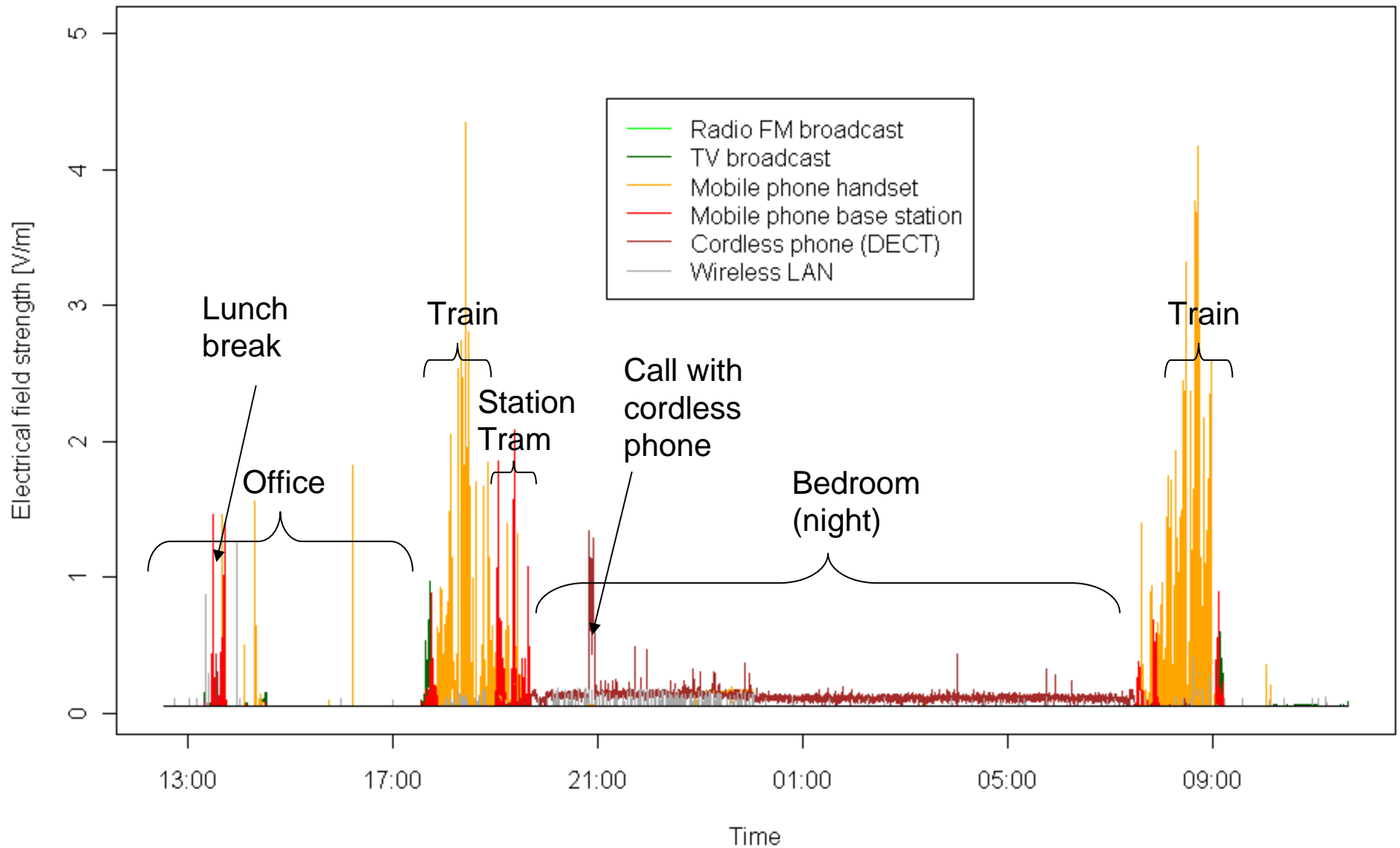
mobile phone
cordless phone

W-LAN

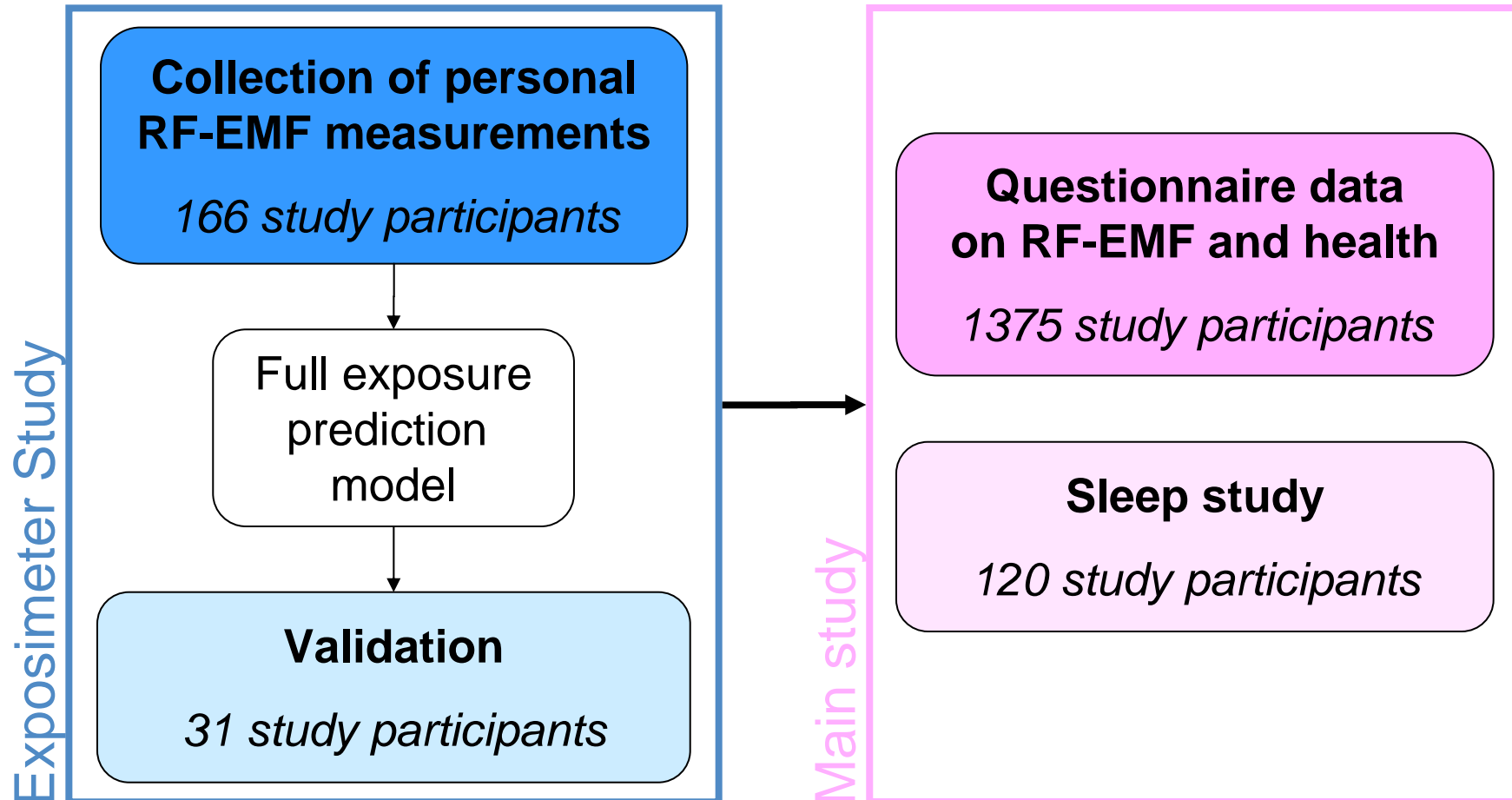
broadcast transmitter
mobile phone base station
mobile and cordless phones



Example of a daily exposure pattern



Qualifex: Study design



Qualifex: data collection

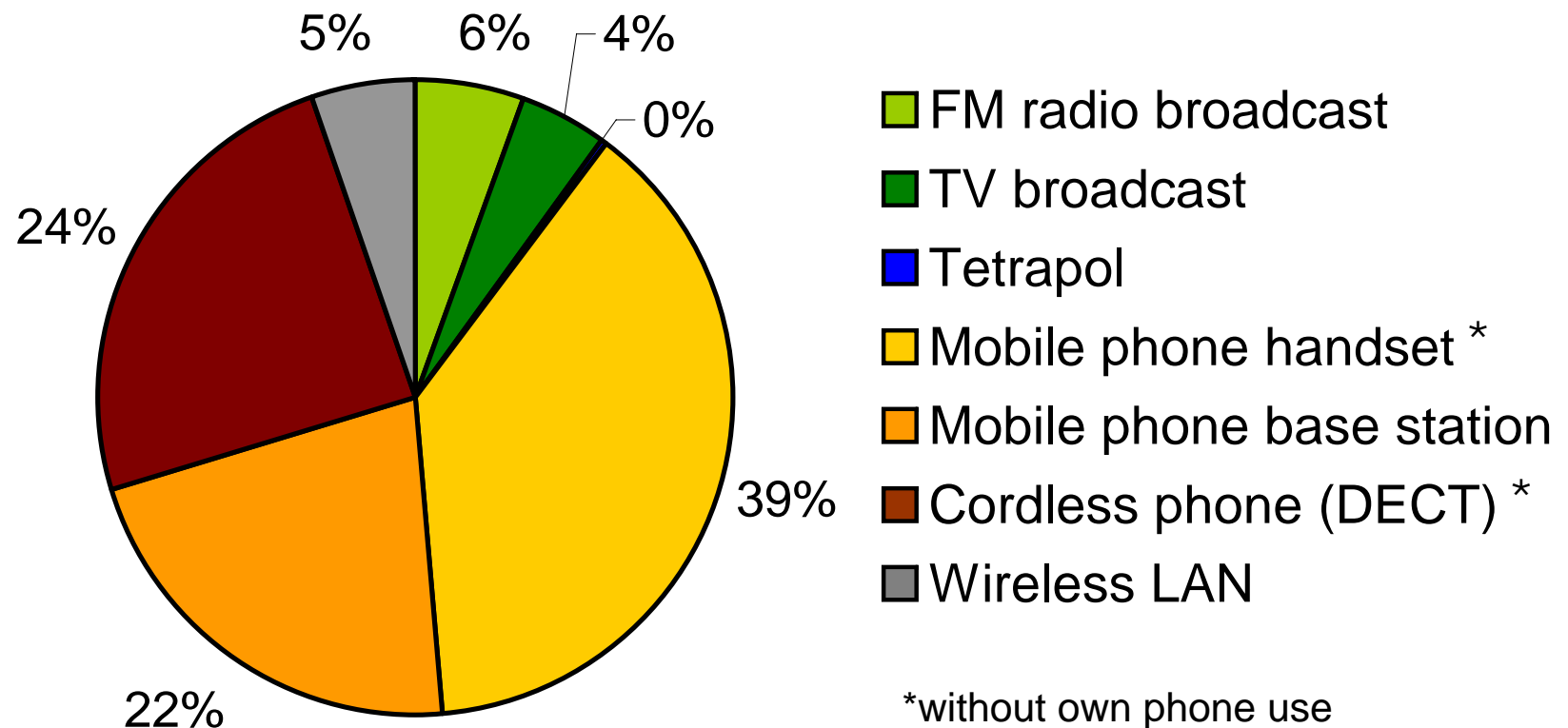
- **Exposimeter:**
 - Measurement of RF-EMF every 90 seconds during 1 week (ca. 6500 measurements per participant)
- **Time activity diary:**
 - Activity, place of stay
 - Use of mobile and cordless phone
- **collective:**
 - 166 participants from Basel and surrounding
 - 74 men and 92 women
 - mean age: 43 years (18 to 78 y)

Exposimeter



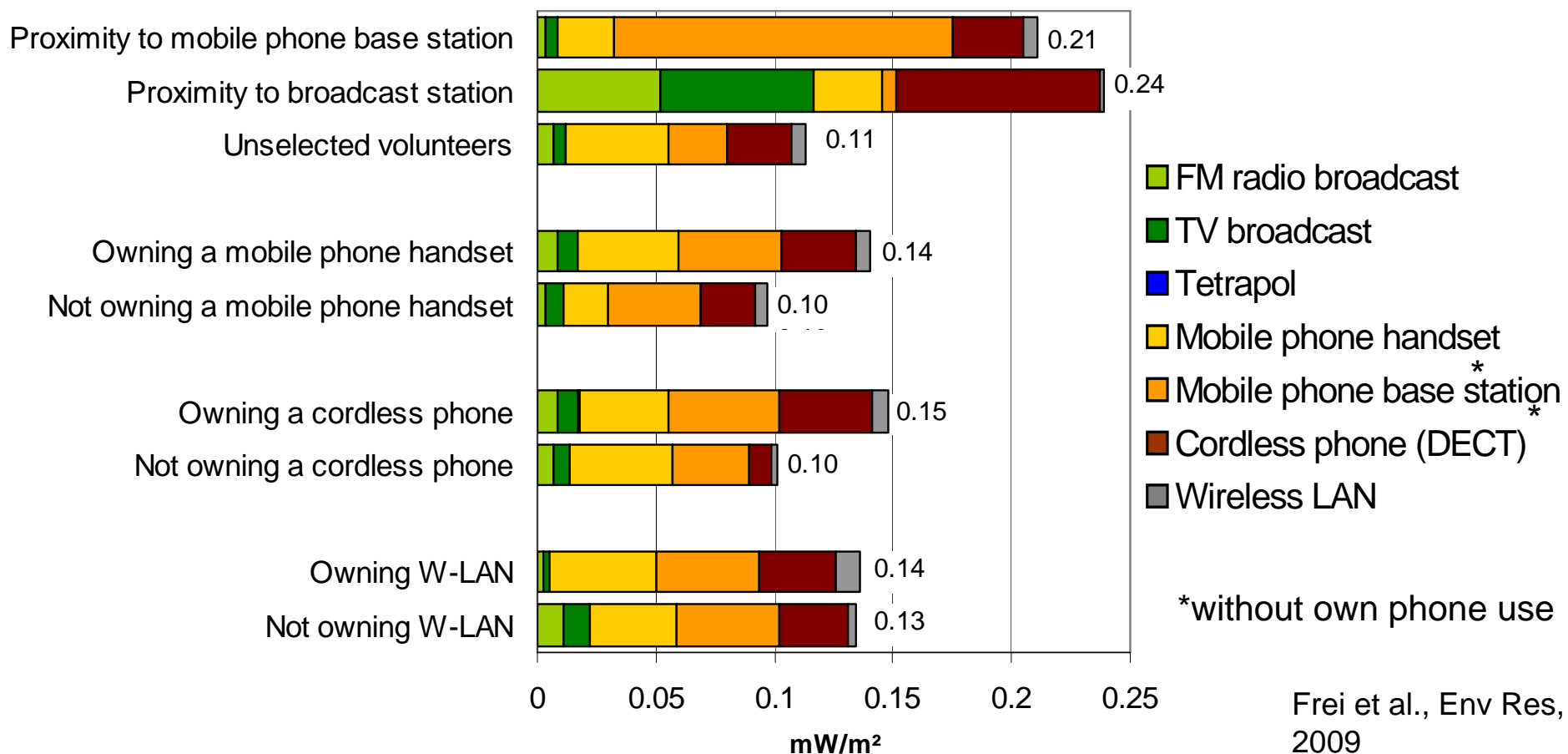
Environmental RF-EMF: exposure contribution

convenient sample (n=131)
mean=0.21 V/m



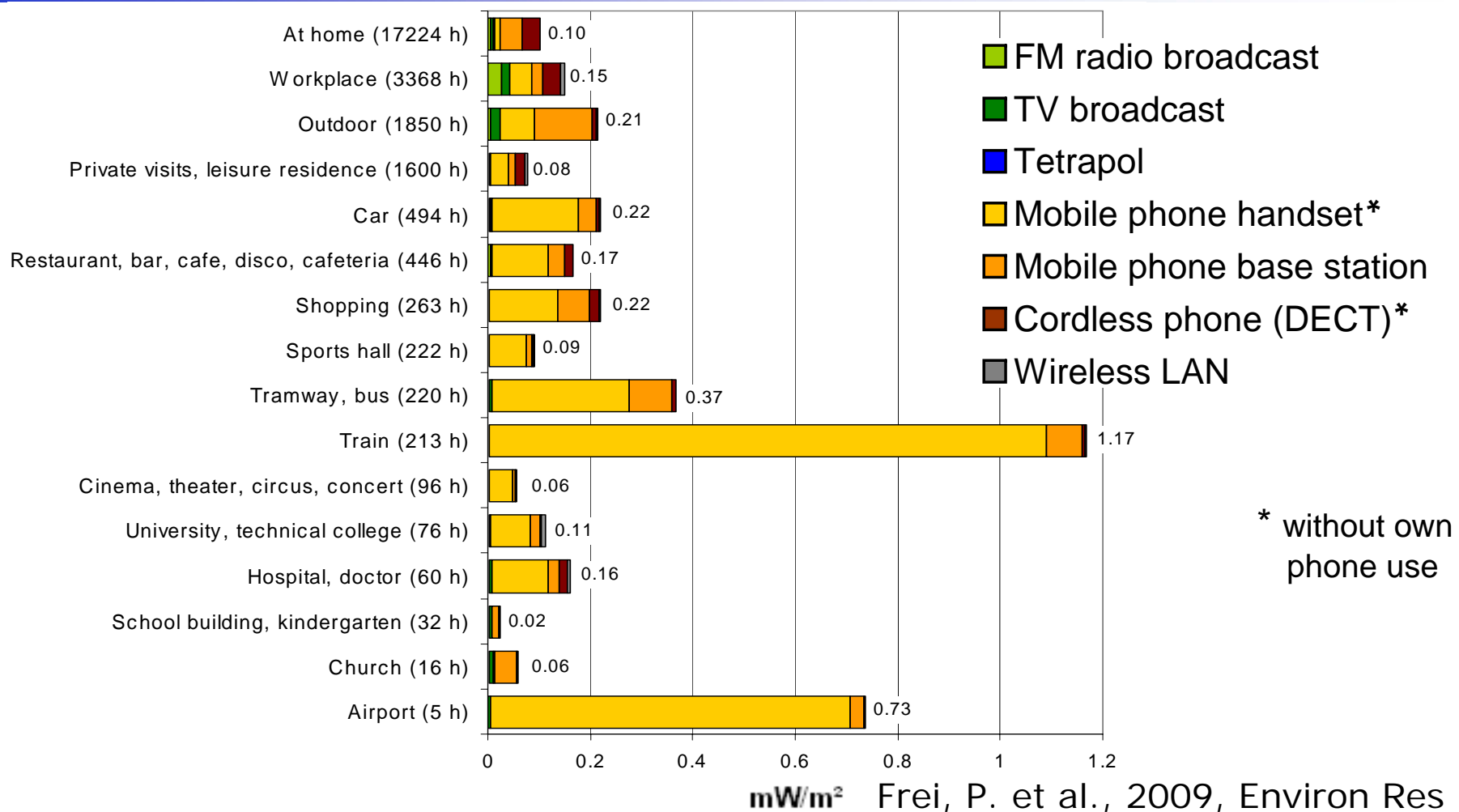


Mean exposure of various subgroups





Qualifex: Exposure at different places





Environmental vs. mobile phone exposure

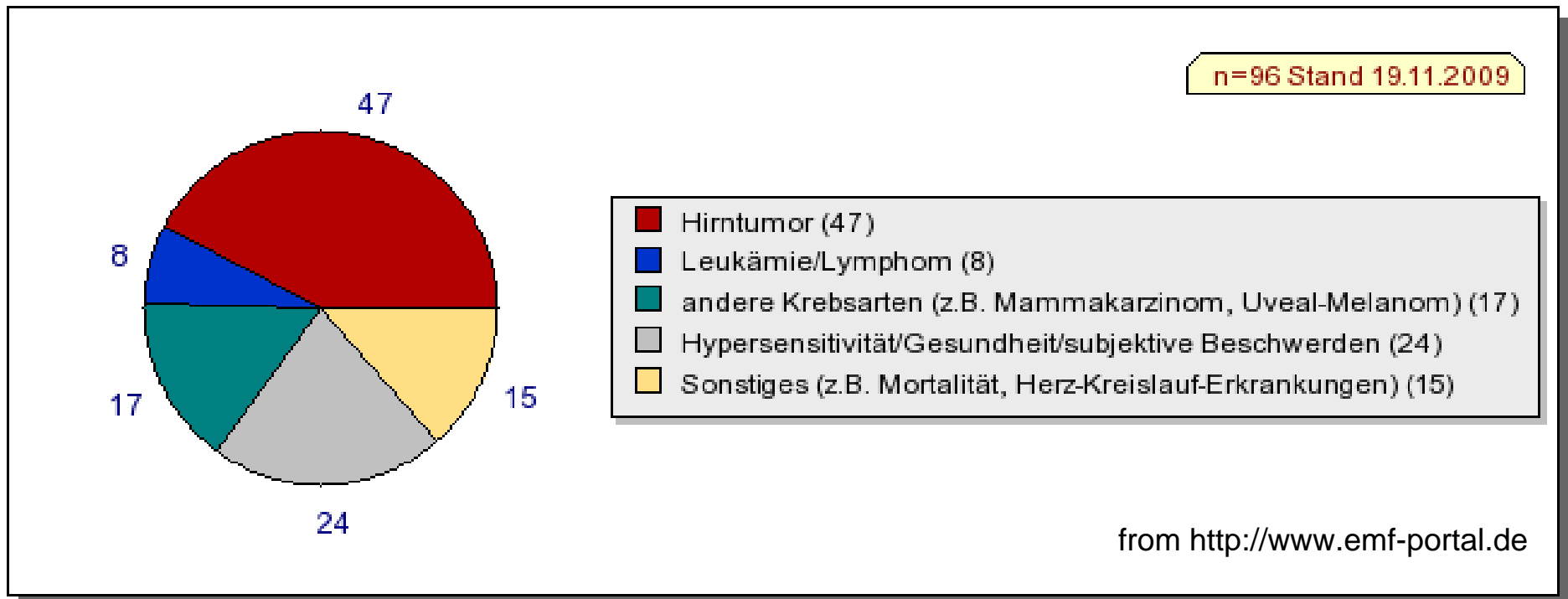


SAR (Specific absorption rate)	Base station ($E_{\text{Feld}}=0.6 \text{ V/m}$)	Mobile phone ($\text{SAR}=0.2 \text{ W/kg}$)	Ratio Base station to handset
Head (highest exposed part)	0.02 mW/kg	200 mW/kg	1:10,000 ($\pm 200\%$)
Whole body	0.002 mW/kg	0.2 mW/kg	1:100 ($\pm 200\%$)

adapted from Dale & Wiart, 2004
and Regel et al., 2006

What has been done?

➤ Mobile phone exposure:



➤ Other sources: non-specific symptoms (n=7)



Where has it been done?



- Here
 - Europe
 - North America
 - Australia
 - Asia (Japan, South Korea)

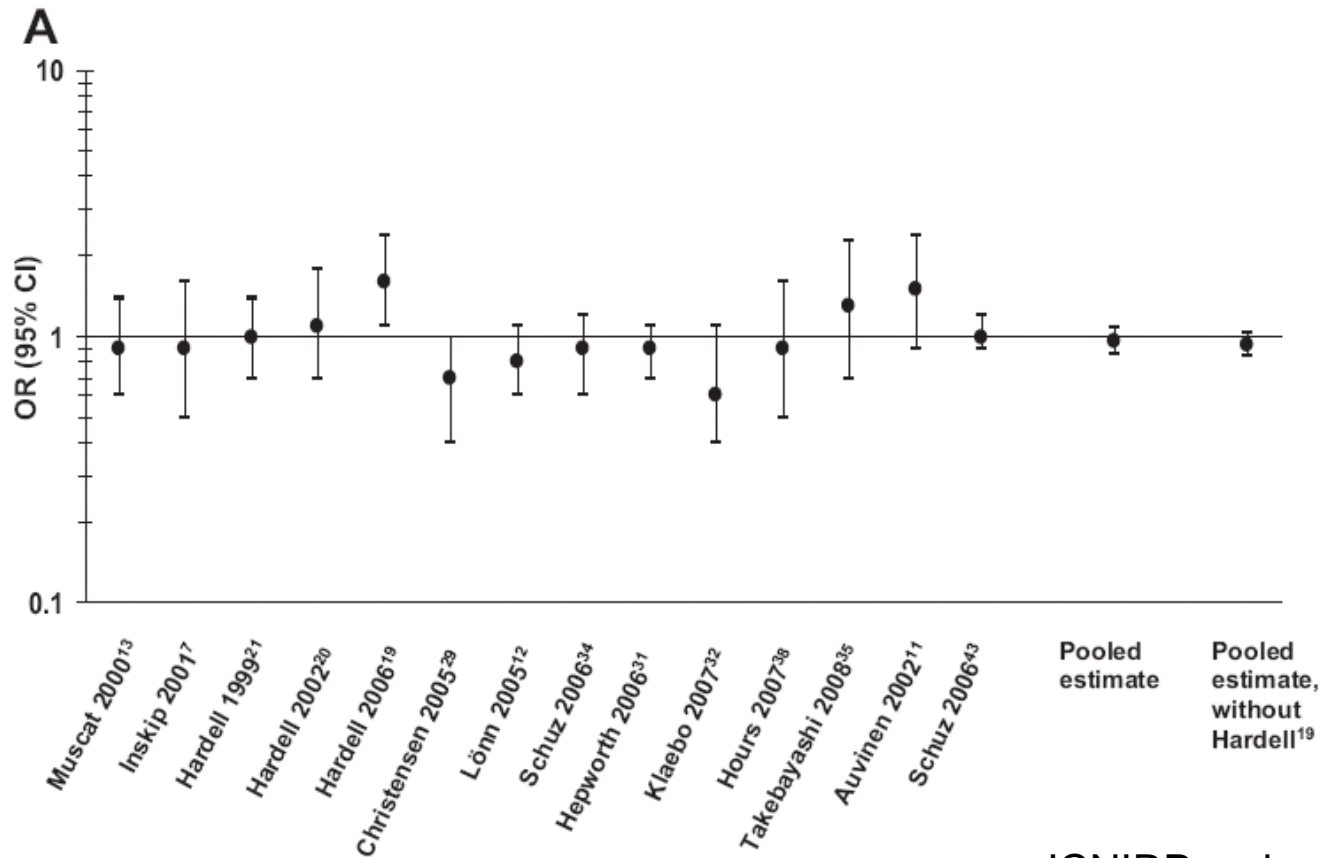


Why brain tumour?



- No direct DNA damage (non-ionizing radiation)
- Hypothetical biological mechanisms discussed (e.g. free radicals, DNA repair mechanism) but no mechanism established for radio- and microwave frequency radiation
- Head is most exposed part of the body when using a mobile phone

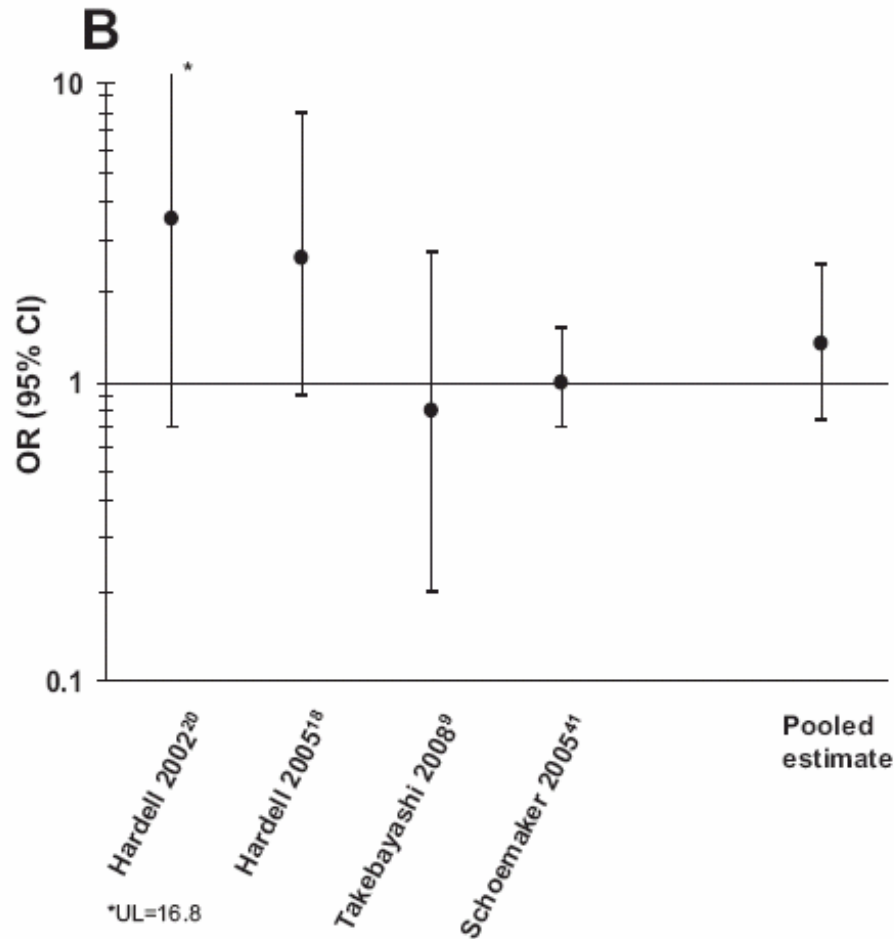
Meta-Analysis: Glioma and regular use



ICNIRP review: Ahlbom et al., 2009



Meta-Analysis: Acoustic neuroma and long-term use



ICNIRP review: Ahlbom et al., 2009



Conclusion ICNIRP



- Epidemiology, 2009; 20(5), p. 639: “Despite the methodologic shortcomings and the limited data on long latency and long-term use, the available data **do not suggest a causal** association between mobile phone use and **fast-growing tumours** such as malignant glioma in adults (at least for tumours with short induction periods). For **slow-growing tumours** such as **meningioma** and **acoustic neuroma**, as well as for glioma among long-term users, the absence of association reported thus far is **less conclusive** because the observation period has been too short.”



Is it public health relevant?



- Many persons exposed -> even a small risk results in a lot of cases.
- Even concerns can result in substantial health and economic burden.



Is it *there* public health relevant?



- Even more!
- In resource limited countries: few communication alternatives
- Strong growth rate in use of wireless technology
- The sparser the transmitter network, the higher the output power of phones (Lönn, et al. 2004)



Is it of interest?

|resource|strategies|inc.
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Second East African Workshop on EMF Exposure and Health: Harmonizing EMF Risk Communication and EMF Policy.

2-3 November 2009

Arusha, Tanzania

Organized by the Tanzania Atomic Energy Commission (TAEC) and [REDACTED], the Second East African Workshop on EMF Exposure and Health: Harmonizing EMF Risk Communication and EMF Policy will include the presentations on "Establishing a Dialogue on Risks from EMF" (presented by Emilie van Deventer of WHO), "ICNIRP," "Standardization and Implementation of EMF Policies" in a variety of East African countries, "Mobile Networks -- [REDACTED]"

Event website: http://www.taec.or.tz/news_and_events.htm

- Ressource limited countries may be more vulnerable to conflict of interests



Outlook: Exposure will increase

- RF-EMF Exposure will increase (Eu Inf Tech Obs, 2009):
 - Predicted transmitted data volume in 2014: 1.6 Exabytes per month (in the year 2008: 1.3 Exabytes).
 - By then around 73% of the world's mobile data traffic will be from Web and Internet access, 26% will come from audio and video streaming whilst peer-to-peer file sharing and VoIP traffic will fall to less than 1%.
- Other applications (RFID, etc)

MIT demos wireless power transmission

Research could free cell phones, portable electronics from wired recharging

Franklin Hadley
MIT Institute for Soldier Nanotechnologies

Imagine a future when cell phones, household robots, laptop computers and other portable electronics recharge themselves wirelessly, free from today's ubiquitous power cord.

Last year MIT physicists presented one theoretical approach to such a future. Now

they have demonstrated it, lighting a 60-watt light bulb from a power source seven feet (more than two meters) away.

The researchers say that their concept, which they refer to as WiTricity (as in wireless electricity), could lead to reduced reliance on batteries in some electronic devices. For example, a laptop in a room equipped with such a wireless power system could run without a battery.

The work was reported in the June

7 issue of Science Express, the advance online publication of the journal Science.

It is led by Assistant Professor Marin Soljacic of the Department of Physics with colleagues from the same department and the Department of Electrical Engineering and Computer Science (EECS) through the Institute for Soldier Nanotechnologies (ISN). They are graduate students Andre Kurs (physics) and Aristeidis Karalis (EECS); Robert Moffatt, a junior in physics;

Professor Peter Fisher of physics; and John Joannopoulos, the Francis Wright Davis Professor of Physics and director of the ISN.

The story begins one late night a few years ago, with Soljacic (pronounced Soul-ya-cheech) standing in his pajamas, staring at his cell phone on the kitchen

See **WIRELESS**

Page 8



Conclusions



- Exposure from mobile communication is a global phenomenon with relatively similar exposure patterns.
- Newly industrialised countries and resource limited countries:
 - are stronger affected if EMF is a health risk
 - are interested and need knowledge on the topic in order to act adequately with the public and with stakeholders
 - may offer appealing research settings (e.g. large exposure gradients)