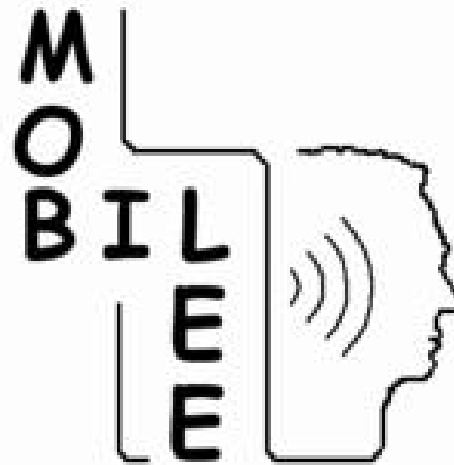


Mobile phone exposure and well-being in children and adolescents



**Katja Radon,
Sabine Heinrich, Anja Kühnlein, Silke Thomas,
Rüdiger von Kries, Dennis Nowak**

Funded by the BfS and the Bavarian Ministry of Public Health

Why mobile phones?

Why children and adolescents?

- ~93% of children (age 6-9 years) use mobile phones
- Public concern that mobile phones and base-stations might affect well-being
- Children might be more vulnerable to health effects of mobile phone frequencies
- Life-time exposure higher among children



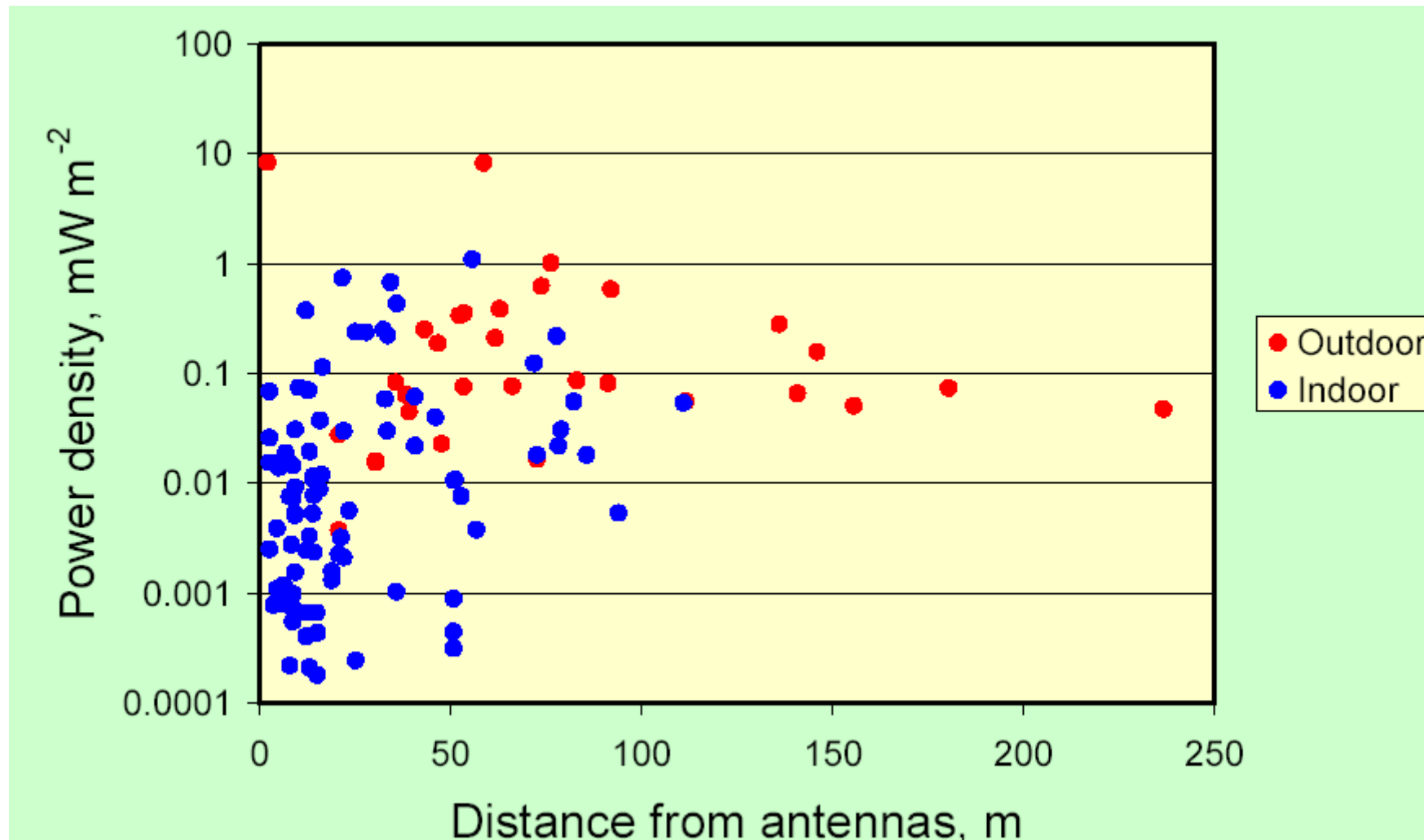
Aim

To study the association between

- personal exposure to mobile phone frequencies (dosimetry)
- and
- well-being in children and adolescents

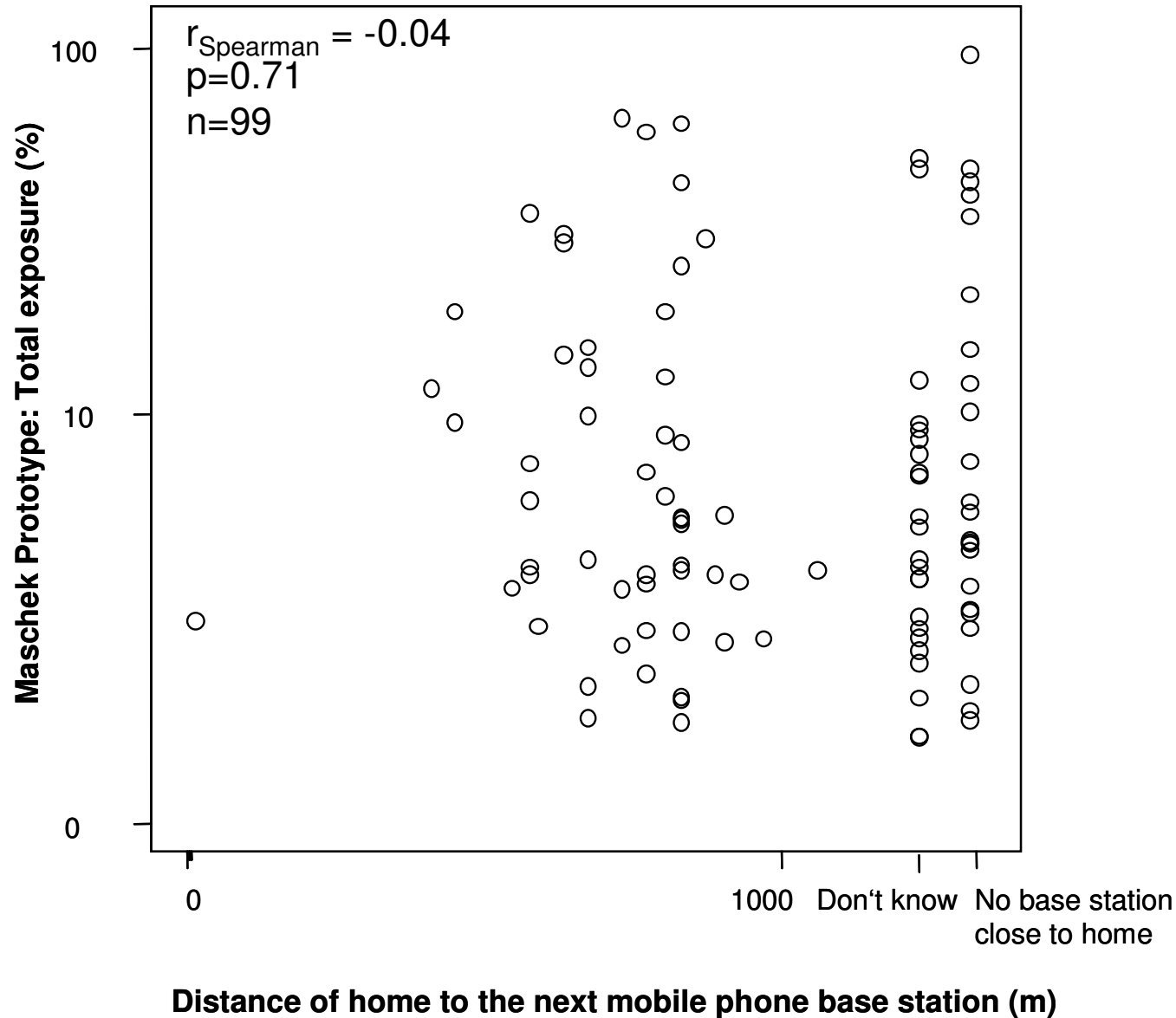


Why personal exposure assessment?



Quelle: Mann, National Radiological Protection Board (NRPB)

Self-reported exposure vs. dosimetry



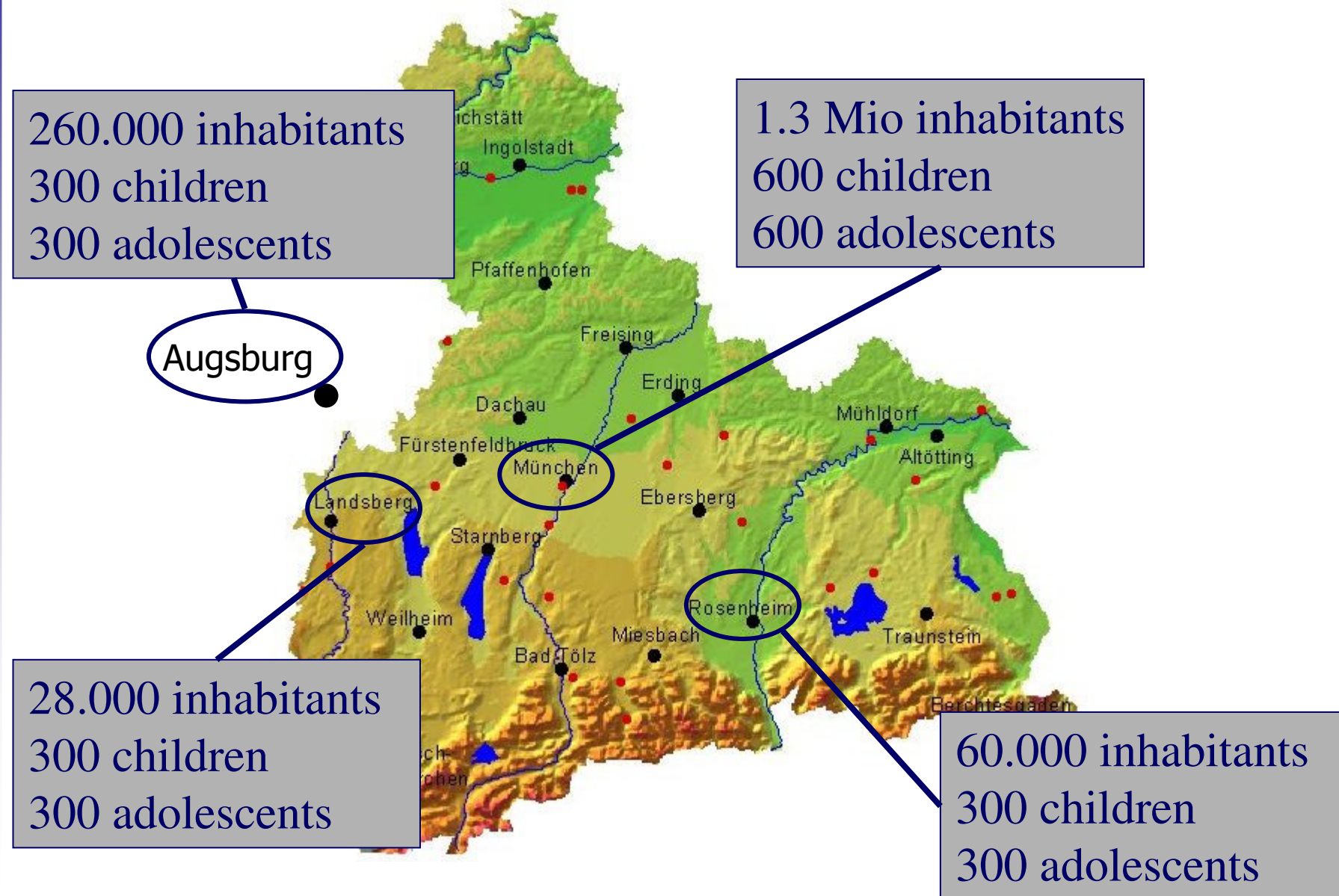
Study design

- Population-based cross-sectional study (random selection of the population registry)
- Personal exposure assessment over 24 hours using dosimeters

Study population

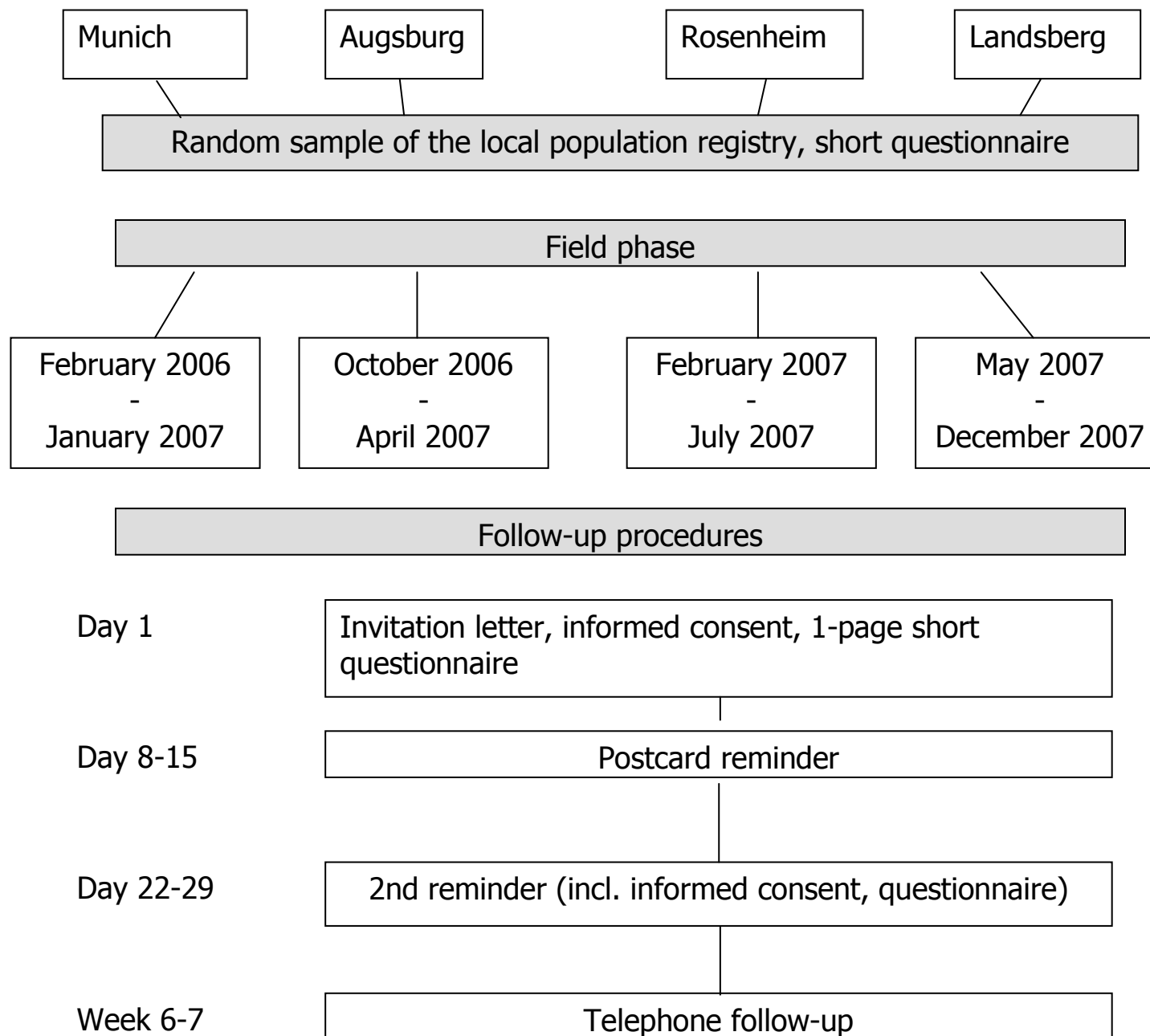
- 1500 children (8-12 years)
- 1500 teenagers (13-17 years)

Study regions



2-Stage Procedure

1. Contact phase:
Letter of invitation, 1 page questionnaire,
n~50-100 at a time
2. Field phase:
 - Personal dosimetry over 24-h
 - Computer-Assisted Personal Interview (CAPI) (at regional study centre or at home)
 - Symptom diary



Day 1 (local study centre):

- CAPI
- Start of 24-h exposure measurement

24-hour measurement:

- Exposure diary
- Symptom diary

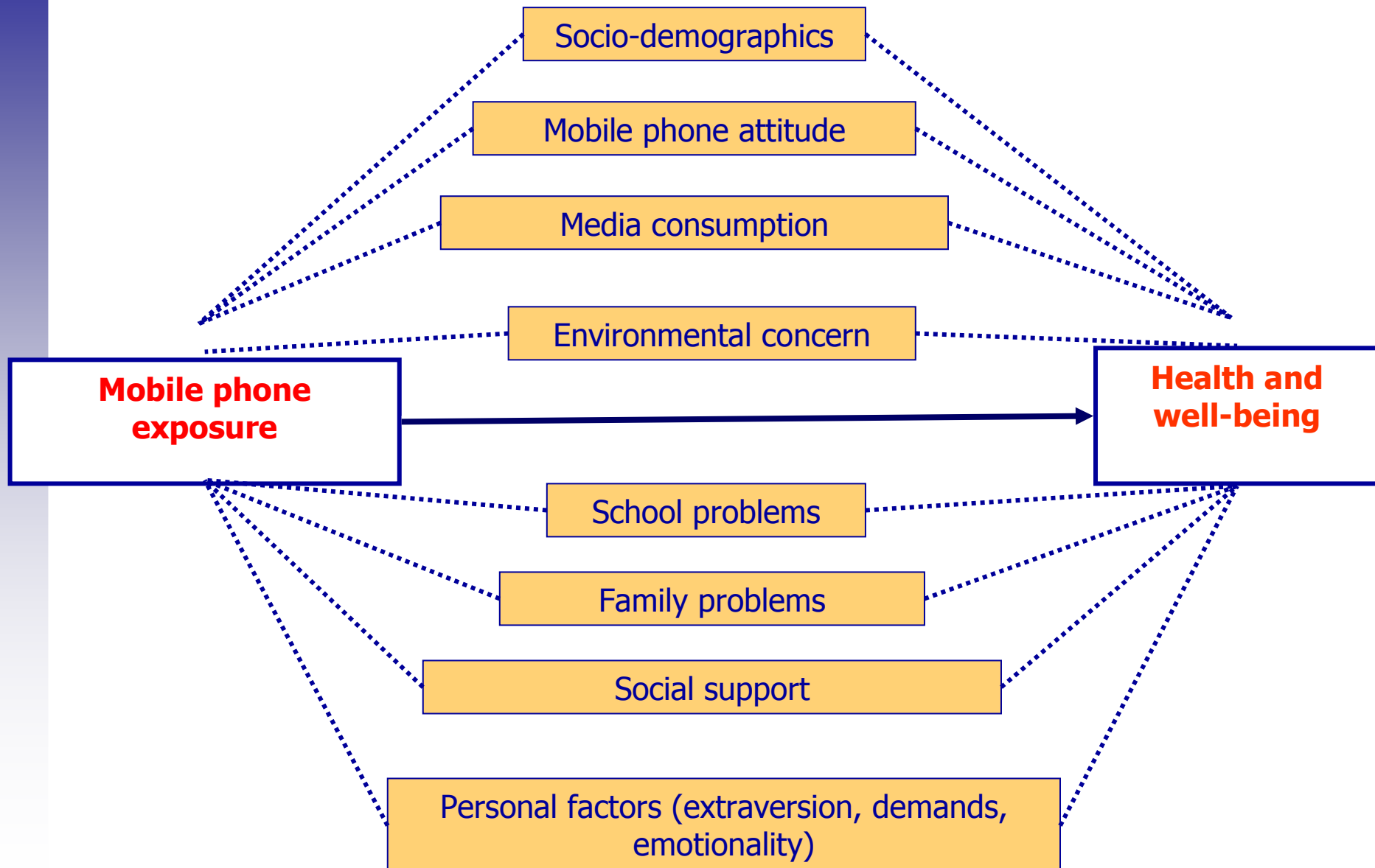
Day 2 (local study centre):

- Hand-back dosimeter
- Print out of the results
- Check of diaries
- Voucher

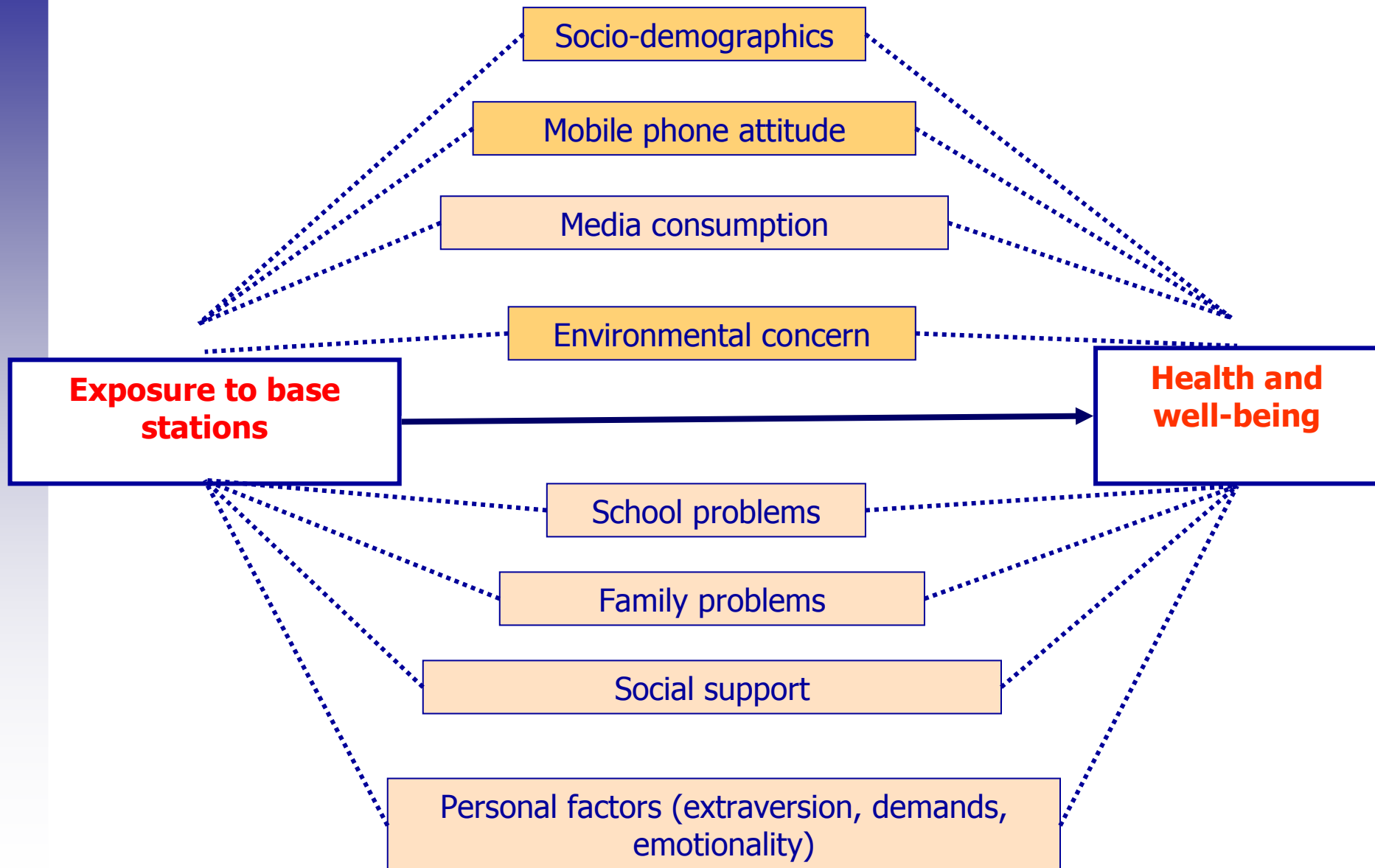
Instruments

- Computer-assisted personal interview (CAPI) including well-being and potential confounders
- Symptoms (3x daily)
 - headache
 - stomach ache
 - back pain
 - neck/shoulder pain
 - nervousness
 - dizziness
 - anxiety
 - tiredness, exhaustion

Potential confounders?



Potential confounders?



Personal Dosimetry

- Maschek personal dosimeter
- Overall exposure to frequencies 800-2400 MHz + 3 frequency bands
- 1 measurement every second over 24 h



What is important for the dosimetry?

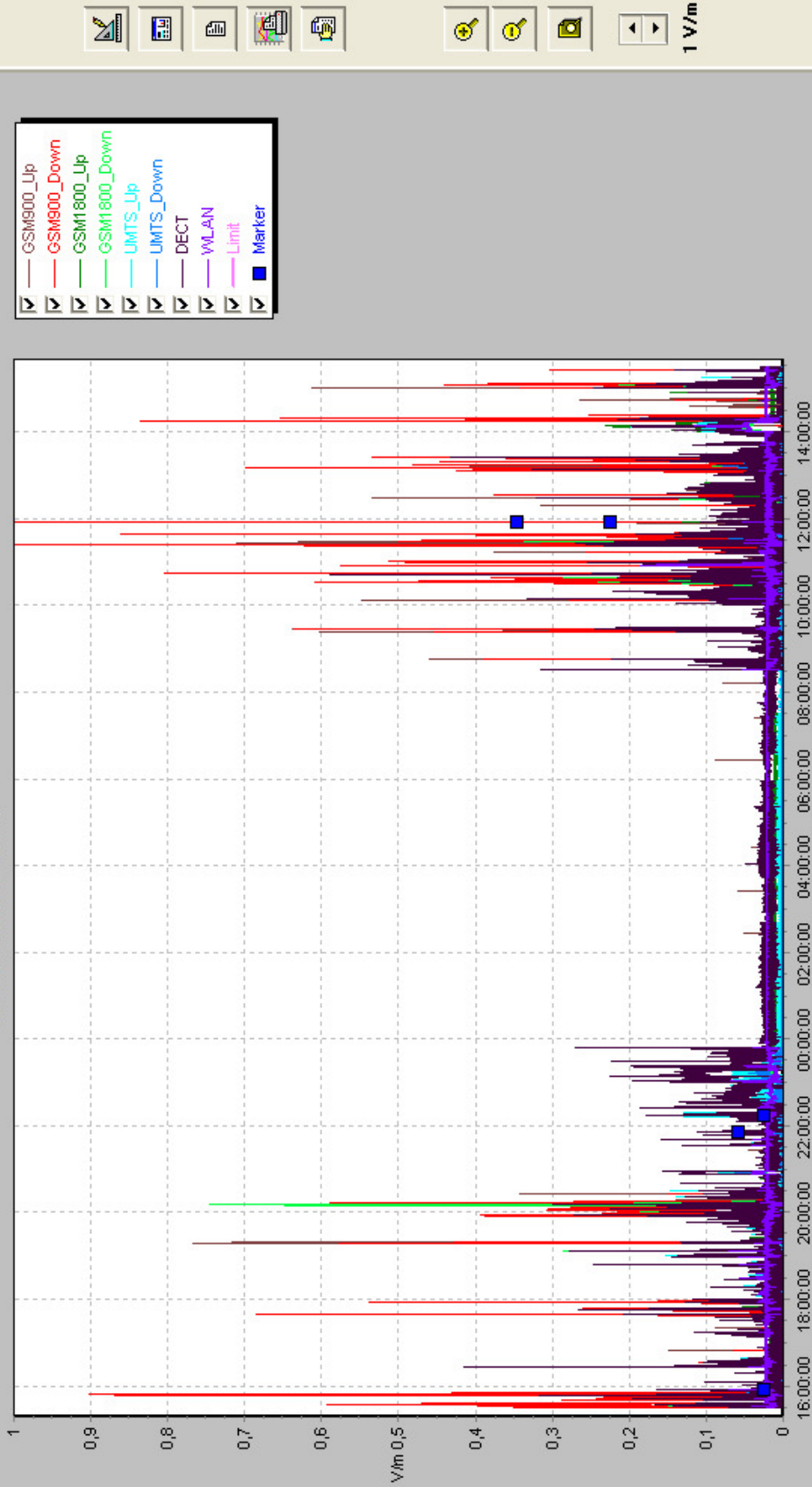
Important	Less important
All mobile phone frequencies	TV / Radio frequencies
Low limit of detection	Frequency selectivity
Valid, reliable	Comparison with stationary measurements
Robust	
Well accepted	

Dosimetry

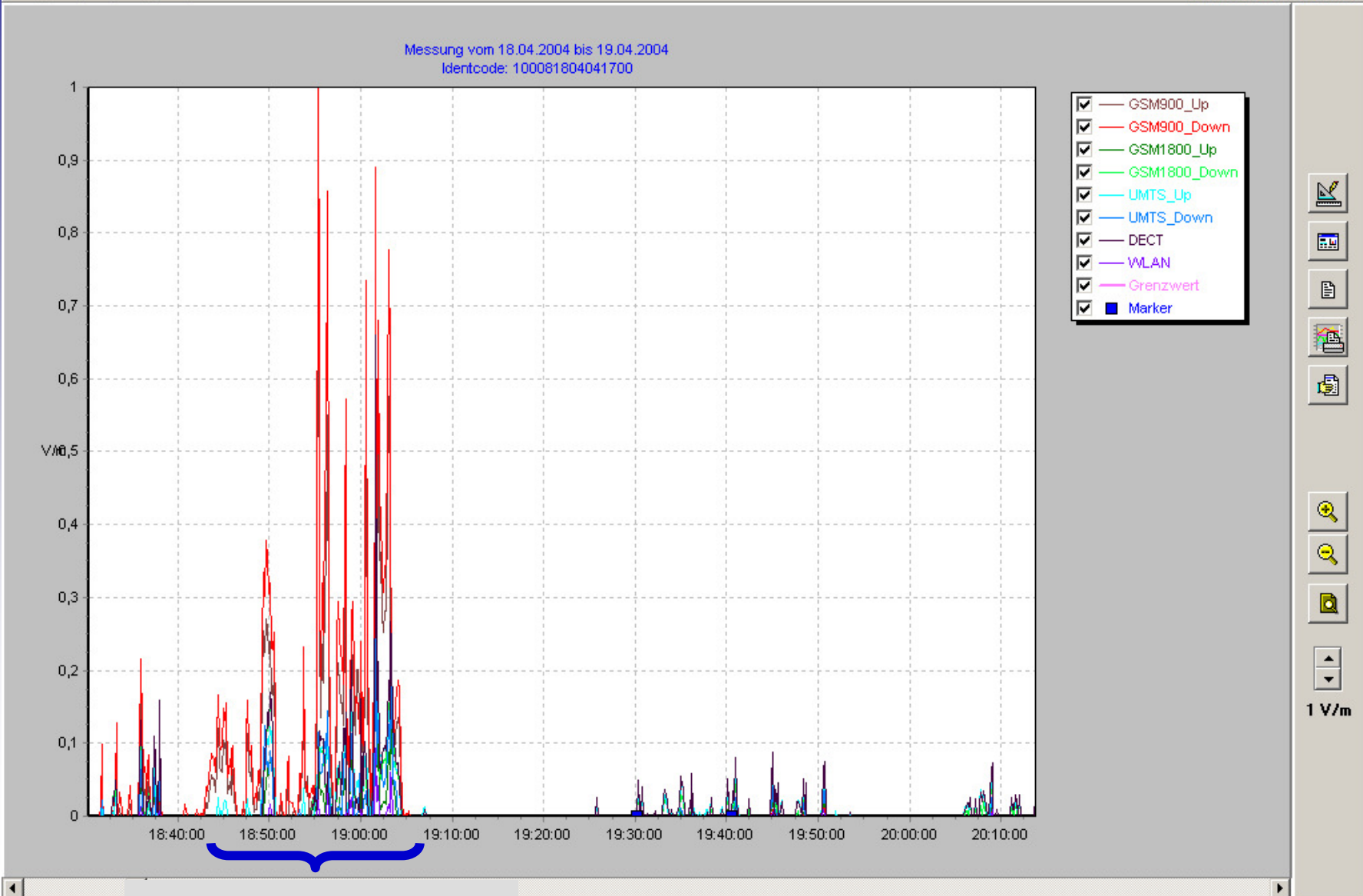
Some examples

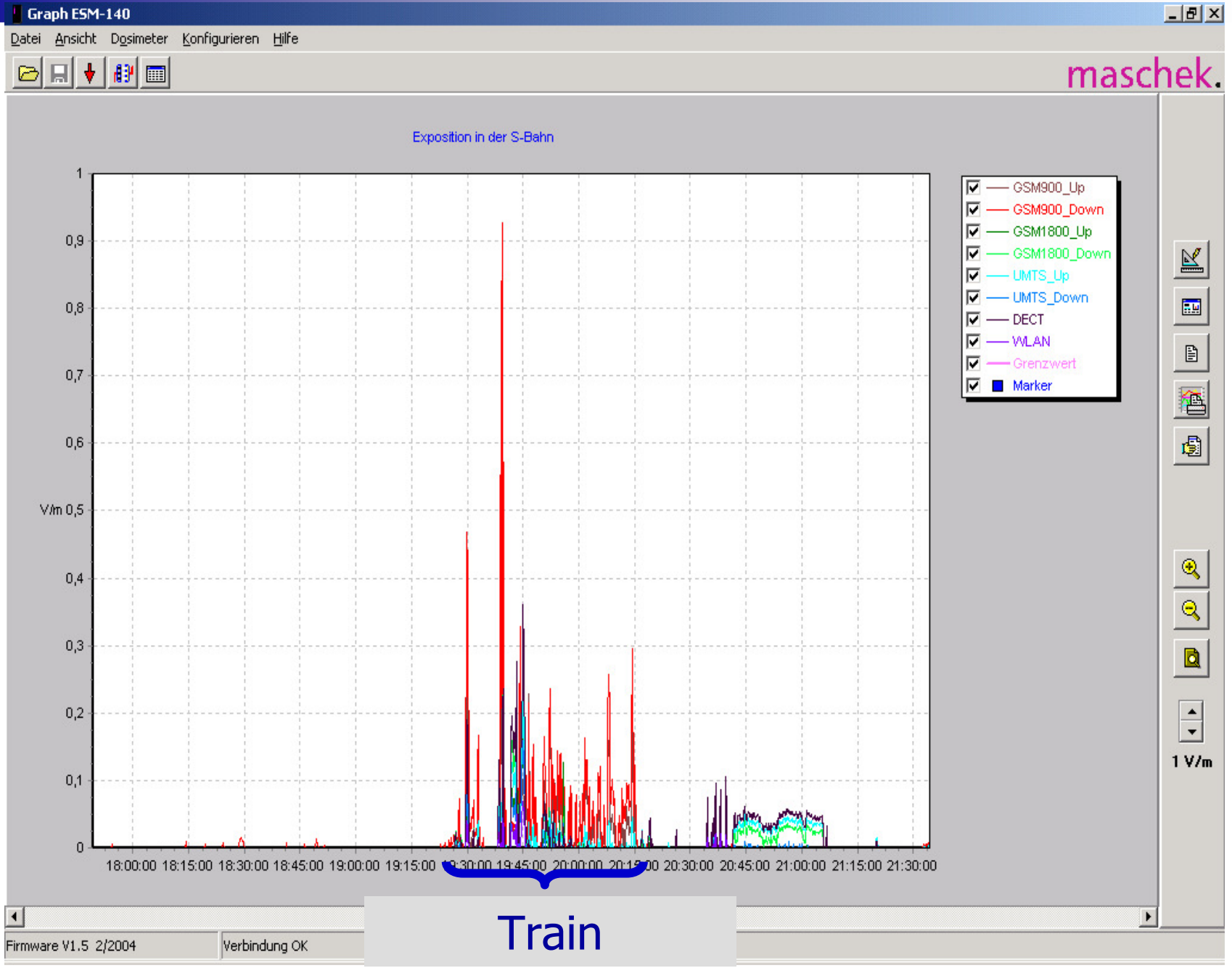


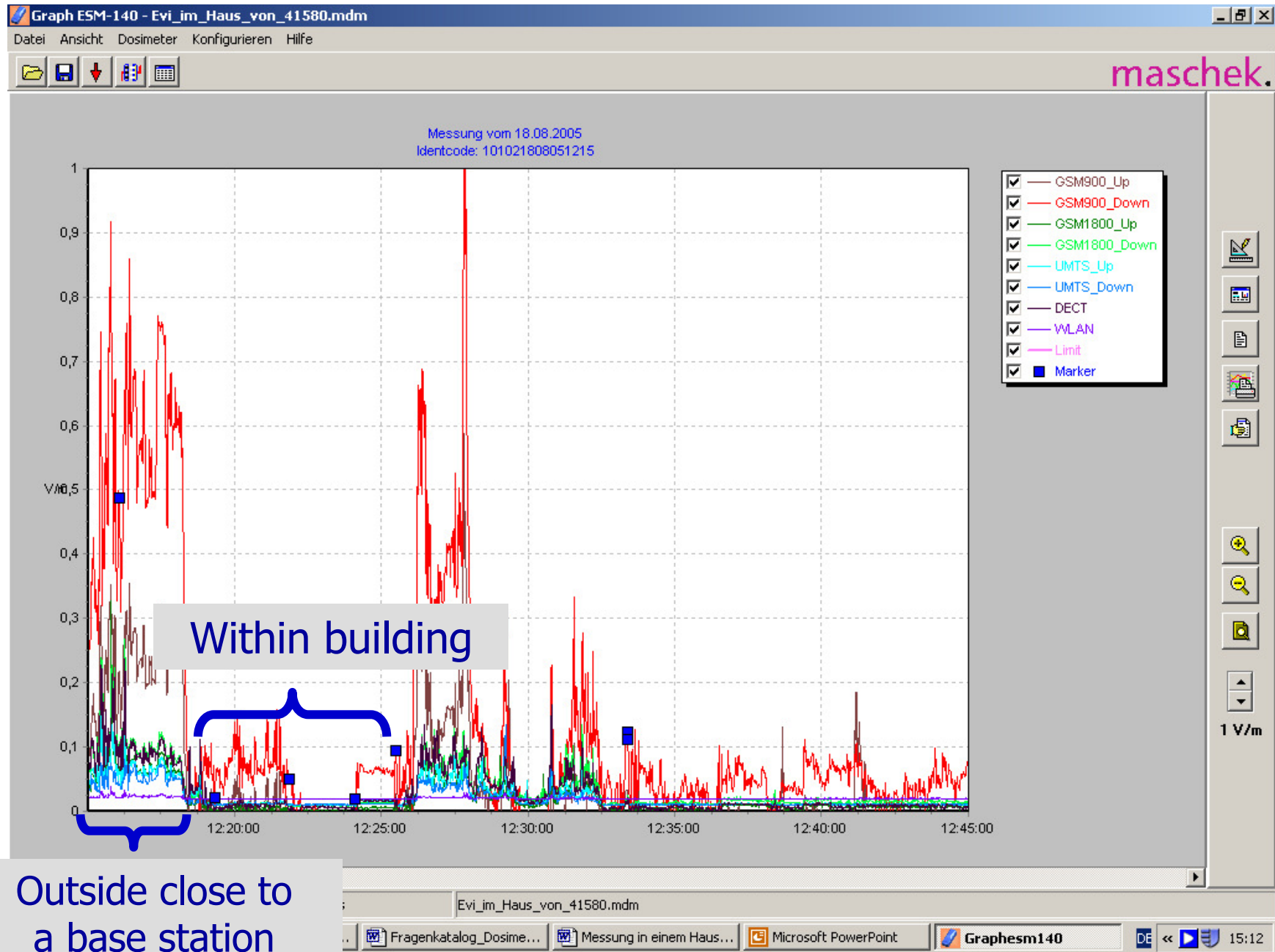
Messung vom 19.08.2005 bis 20.08.2005
Identcode: 101091908051530



1 V/m

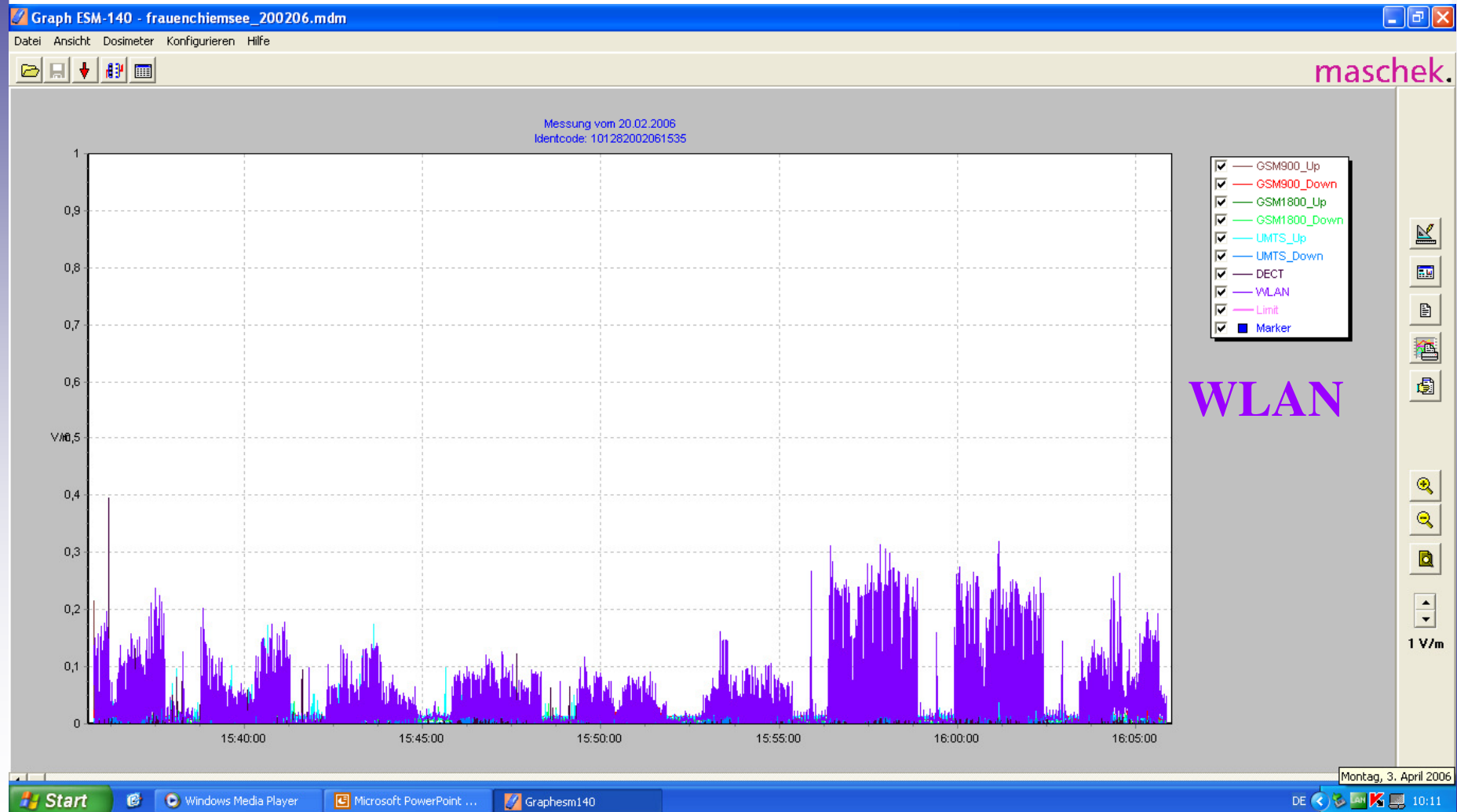






Island Frauenchiemsee

Seminar room, 10 notebooks with Wireless Lan



Comparison of the Antennessa and Maschek Dosimeter



Radon et al. Bioelectromagnetics 1/2006

Comparison-1

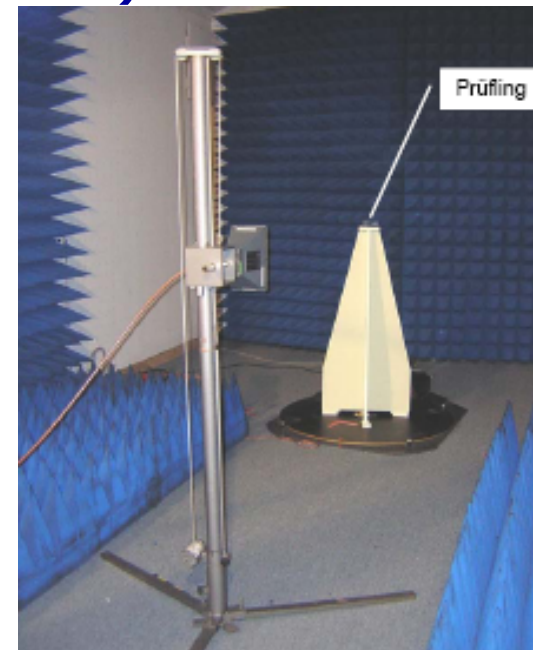
Dosimeter Antennas	Maschek Folded	Antennessa Isotrop
Frequency range		
FM	Not included	88 – 108 MHz
TV3	Not included	174 – 223 MHz
TV 4&5	Not included	470 – 830 MHz
GSM 900 Uplink	890 – 915	880 – 915 MHz
GSM 900 Downlink	935 – 960	Not selective
GSM 1800 Uplink	1725 – 1780	1710 – 1785 MHz
GSM 1800 Downlink	1820 – 1875	1805 – 1880 MHz
DECT	1880 – 1900	
UMTS Uplink	1920 – 1980	1920 – 1980 MHz
UMTS Downlink	2110 – 2170	2120 – 2150 MHz
WLAN	2400 – 2485	Nicht erfasst
Measurement range	0,05-5 V/m	0,05 – 5,0 V/m

Comparison-2

Dosimeter	Maschek	Antennessa
Dimension (L*W*H)	Ca. 100 * 45 * 20 mm	193 * 95,6 * 69,4 mm
Weight	70 g	450 g
Weatherproof protection	Yes	No
Measurement cycle	0,5 s - 30 s	0,5 s –2 min
Battery autonomy	>1 day (measurement cycle 1s)	>1 day (measurement cycle 13s)
Memory autonomy	ca. 86,400 * 8 frequency ranges	7.000 * 9 frequency ranges
Fastening for carry-on use	Upper arm	Waist band using belt clip / backpack

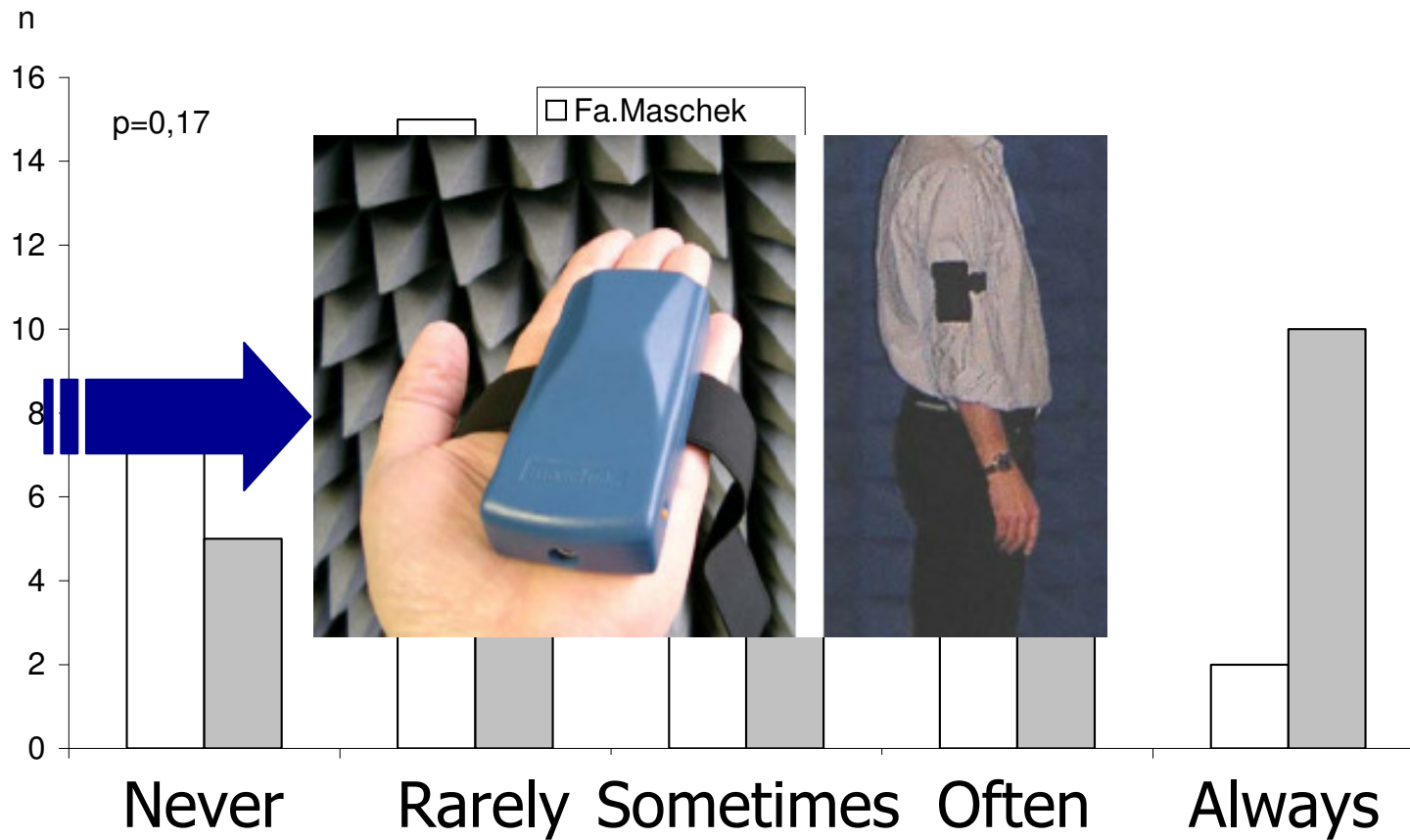
Technical check of the Maschek device in an EMF lab

- Linearity up to 5 V/m sufficient
- Lower limit of detection <0.015 V/m
(limit of quantification <0.05 V/m)
- Direction might be a problem
(subjects should move around)
⇒ Problem at night



Acceptance

Did the device limit your daily activities?



Montag, 13.02.2006



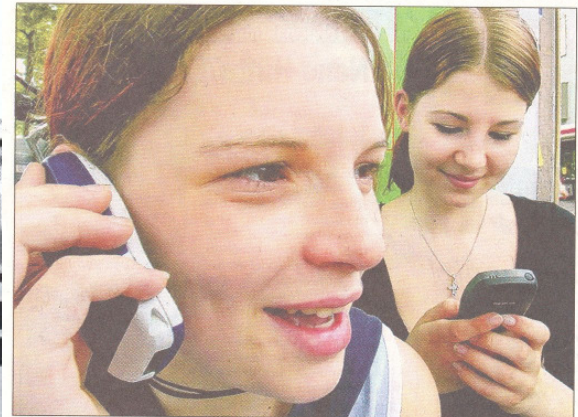
KLICKEN SIE AUF DIE ÜBERSCHRIFTEN



Wie krank machen Handy-Strahlen? Uni sucht 3000 bayerische Kinder als Test-Personen!

Seit es Handys gibt, wird es zwischen
Gesund und Gefährlich: Sind die
und Augenlicht schadet diese Strahlen
wie wenig es interessiert, so einem
Jetzt gibt eine Arbeitsgruppe der Uni
München den Finger nach, ob es von
Handy-Strahlung gesundheitlich
geht. Für die große Studie werden 3000
Kinder in München, Augsburg und Ulm
ausgewählt. Eltern der Teilnehmer

tz Montag, 13. Februar 2006 • München 5



Handys sind für Joana und Janina (beide 15) nicht mehr wegzudenken – doch schaden die hochfrequenten Strahlen der Geräte Ihrer Gesundheit? Foto: dpa

Handy-Strahlen Machen sie Kinder krank?

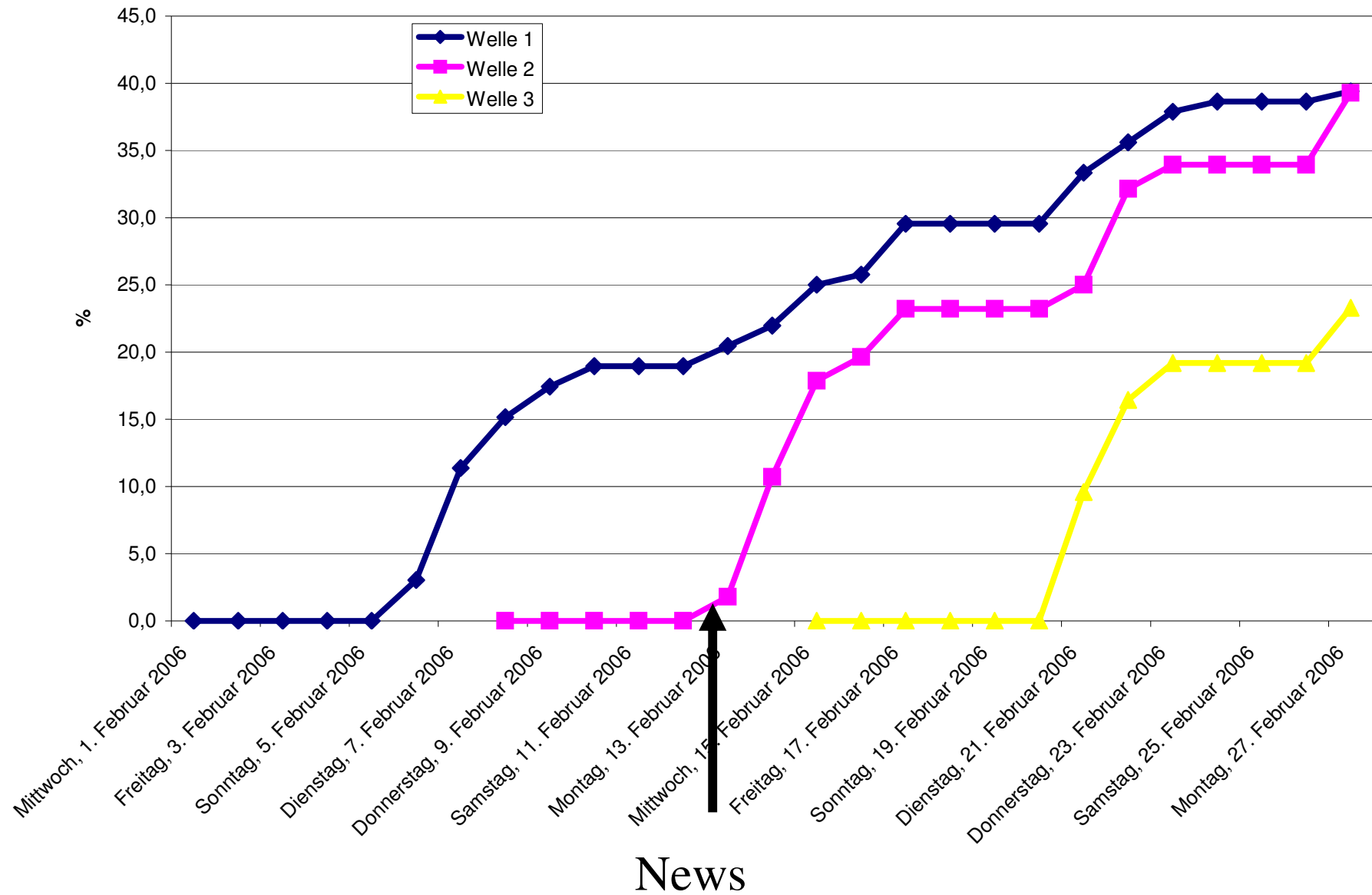
tz heute
Handy
Uni Mü

University of Munich starts large research project
Munich – Does mobile phone exposure affect health of children and adolescents? Are these high frequencies a time bomb for health? The Institute for Occupational and Environmental Medicine, University of Munich, starts a large research project to answer the question. ...

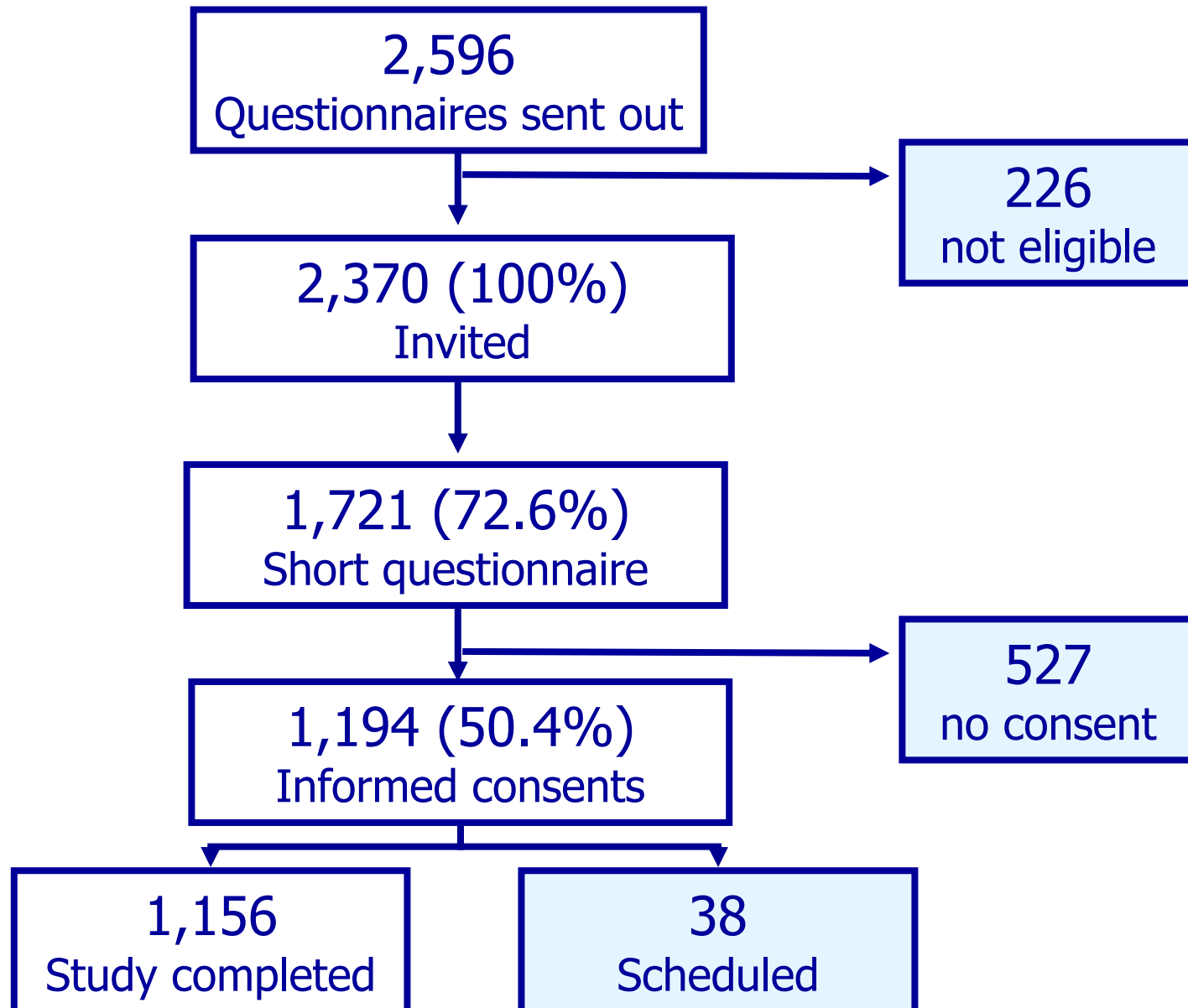
To take part in the study please contact K.R.

TZ 13/02/2006

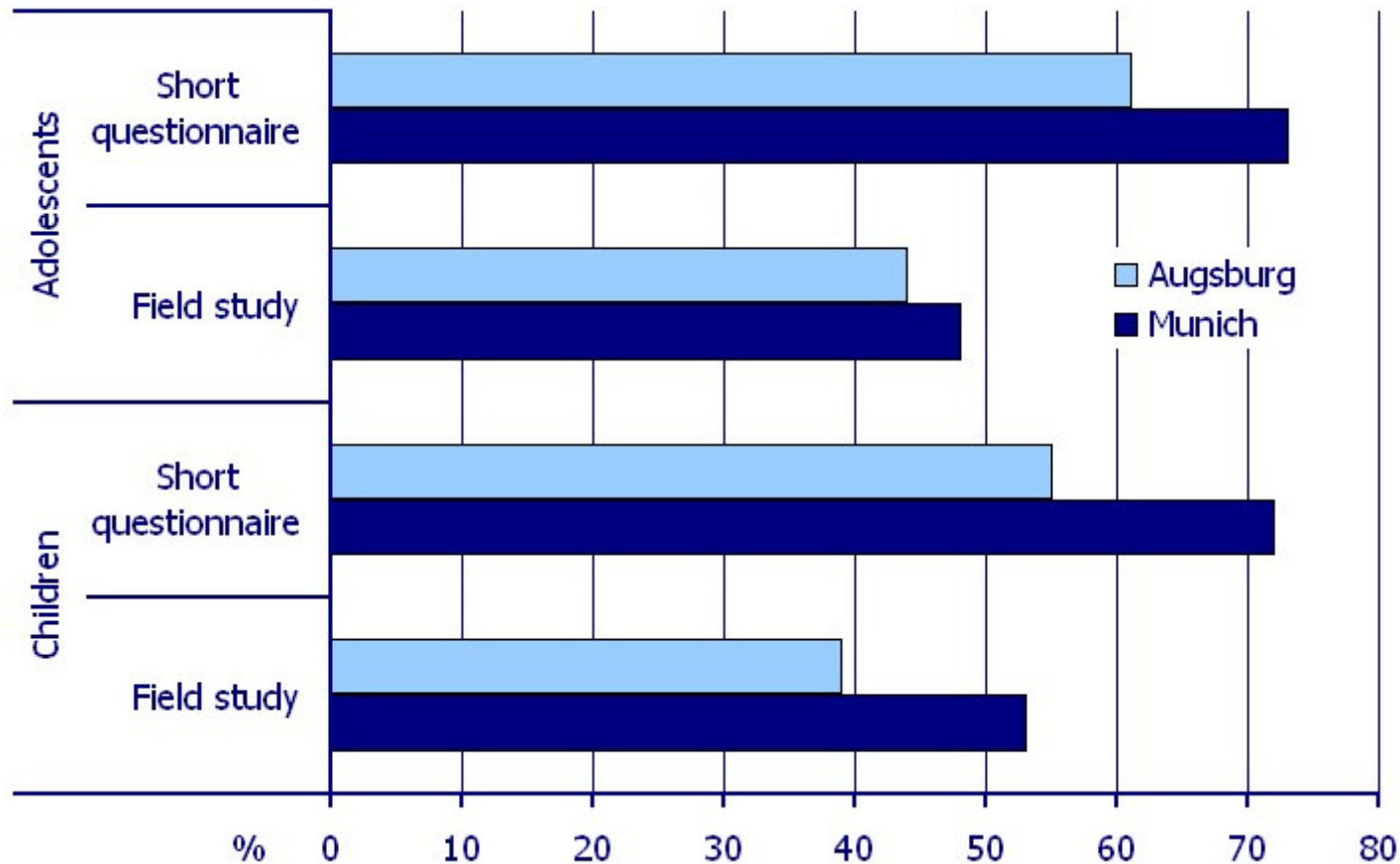
Response after headline



Overall response – Munich 12/06



Response by study region and age group 12/06



Conclusions

- Study design is feasible
- Response is acceptable
- Dosimetry is not easy and devices have to be selected carefully base on the study question
- **Final results: 2008**



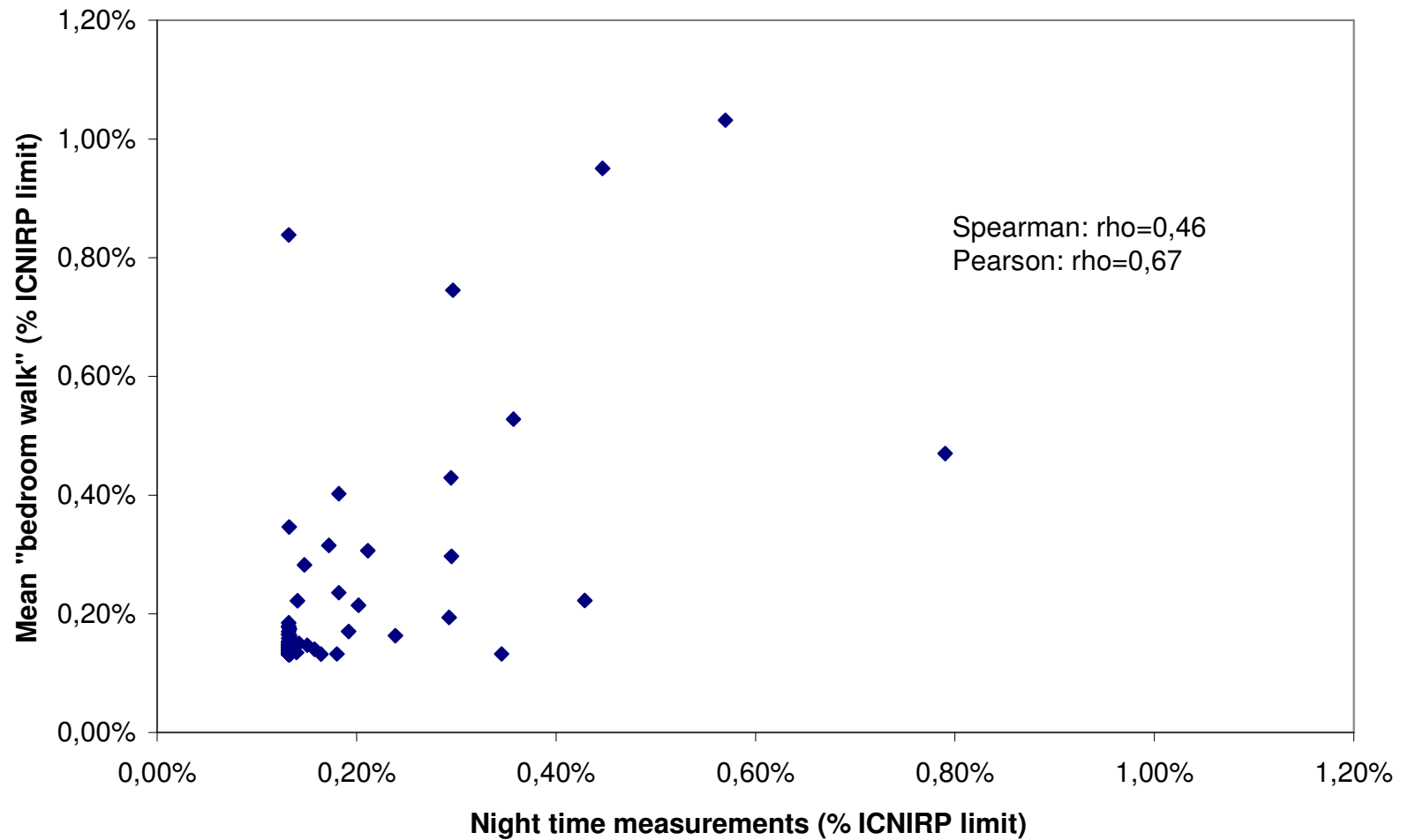
Some preliminary data



Exposure by population size

- Mean daytime exposure between 0,13% (detection limit) and 0,45% ICNIRP limit
- Exposure significantly higher in larger cities
- Mobile phone use not associated with mean exposure
- Problem: Night measurements

Night time measurements



Thank you!



We can talk now:
Mum has reluctantly agreed to give me some privacy