

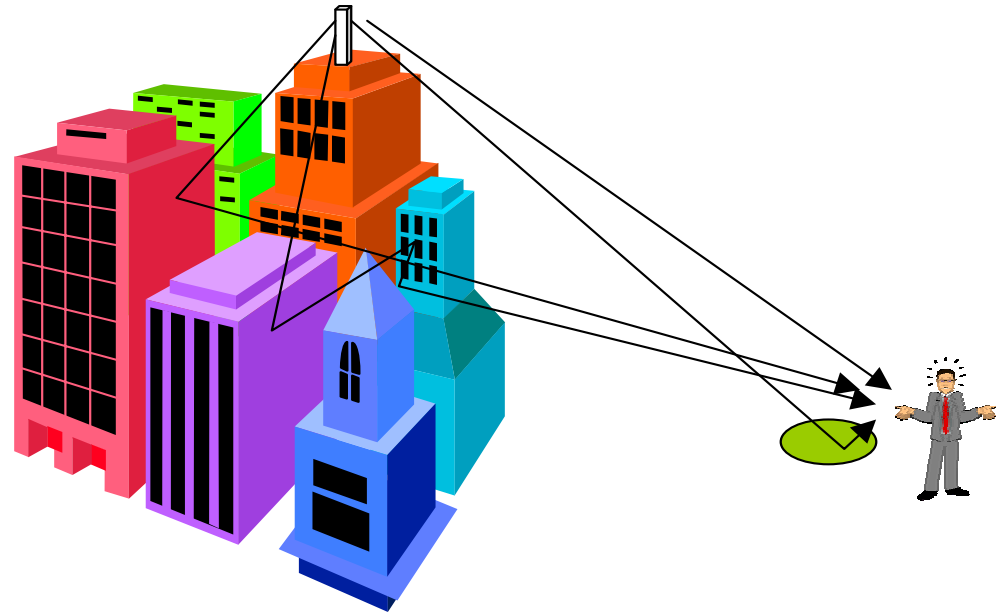
# STUDY ON THE FEASIBILITY OF FUTURE EPIDEMIOLOGICAL STUDIES ON HEALTH EFFECTS OF MOBILE TELEPHONE BASE STATIONS: DOSIMETRIC CRITERIA FOR AN EPIDEMIOLOGICAL BASE STATION STUDY

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# Background (1)

- Concerns and complaints on emissions of base stations resulted in the demand on epidemiological studies on potential health effects
- Base stations are almost ubiquitous – therefore need to inform the population on exposure and possible health effects

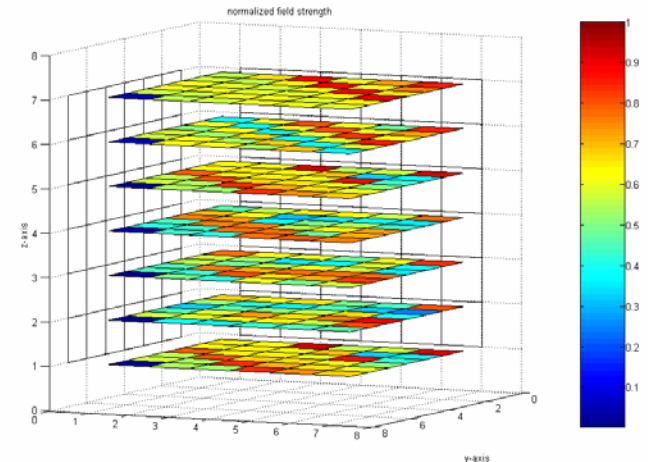


## Background (2)

- Feasibility depends on finding solutions to scientific problems, e.g. reliable estimate of exposure, control for bias and confounding, health outcomes to be investigated
- 2002 request of BAG on Swiss Research Foundation Mobile Communication on feasibility of epi studies on base stations – 2002 & 2003 intense scientific debates –initial trigger for the project
- 4 epidemiologists and 4 RF experts submitted a project on the feasibility of such studies to the Research Foundation, BAG and BUWAL

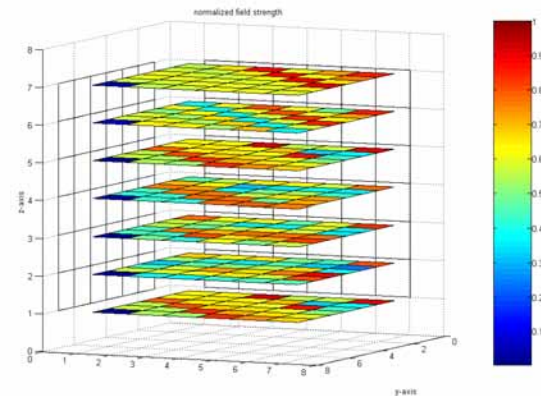
# Objective

Address the feasibility of future epidemiological studies on health effects of mobile phone base stations including well being by evaluating existing studies and dosimetric concepts and to develop recommendations and specifications for future studies



# Methods: Analysis of existing study designs

- Residential RF exposure assessment concepts: surrogate distance, analytical calculations, spot measurements (e.g. Dolk et al 1997a and b, Cooper et al 2001, Hocking et al 1996, Mc Kenzie et al 1998, Maskarinec et al 1994, Hutter et al 2002, Navarro et al 2002..)
- Dosimetric problems: retrospective exposure assessment, exposure misclassification due to other RF sources, long term exposure variations in time, exposure variation in space.....



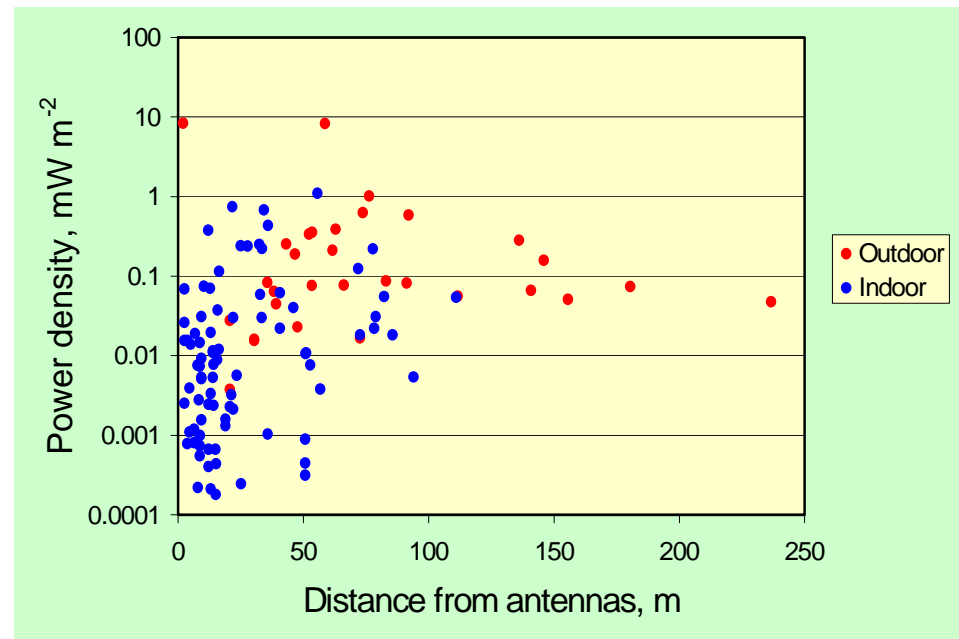
## Problems

- Estimation of Exposure
  - Uncertainty of measurements
  - Variations in time and space
  - Unknown what exposure circumstances might be biological relevant or critical
  - Contributions from other sources and their relevance
- Effect: No specific outcome driven from scientific evidence, but outcomes driven from anecdotal reports and analogies from ELF research (power lines – broadcast stations)

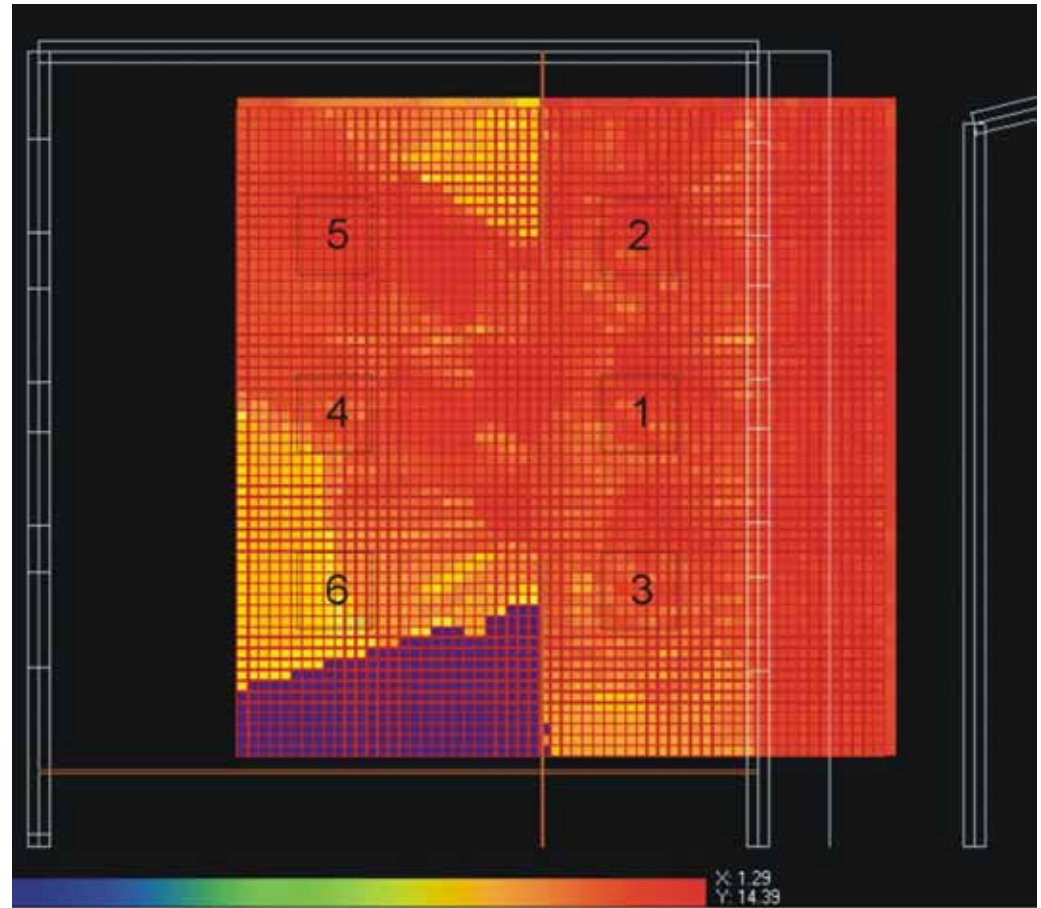


# Problem: Exposure estimation

- Exposure due base station rather low compared to other sources, whole body exposure, continuous
- Large variations: to what extent can we reproduce measurements, what is the actual exposure?
- Suited measure (Proxy)? (e.g. distance, analytical measurements, spot measurement...)

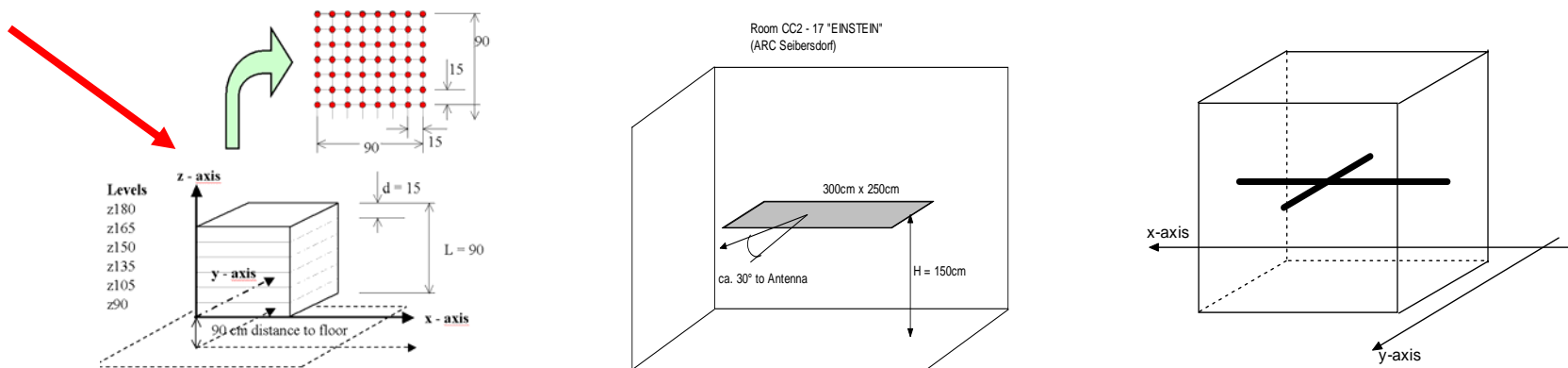


# Field variations in local areas



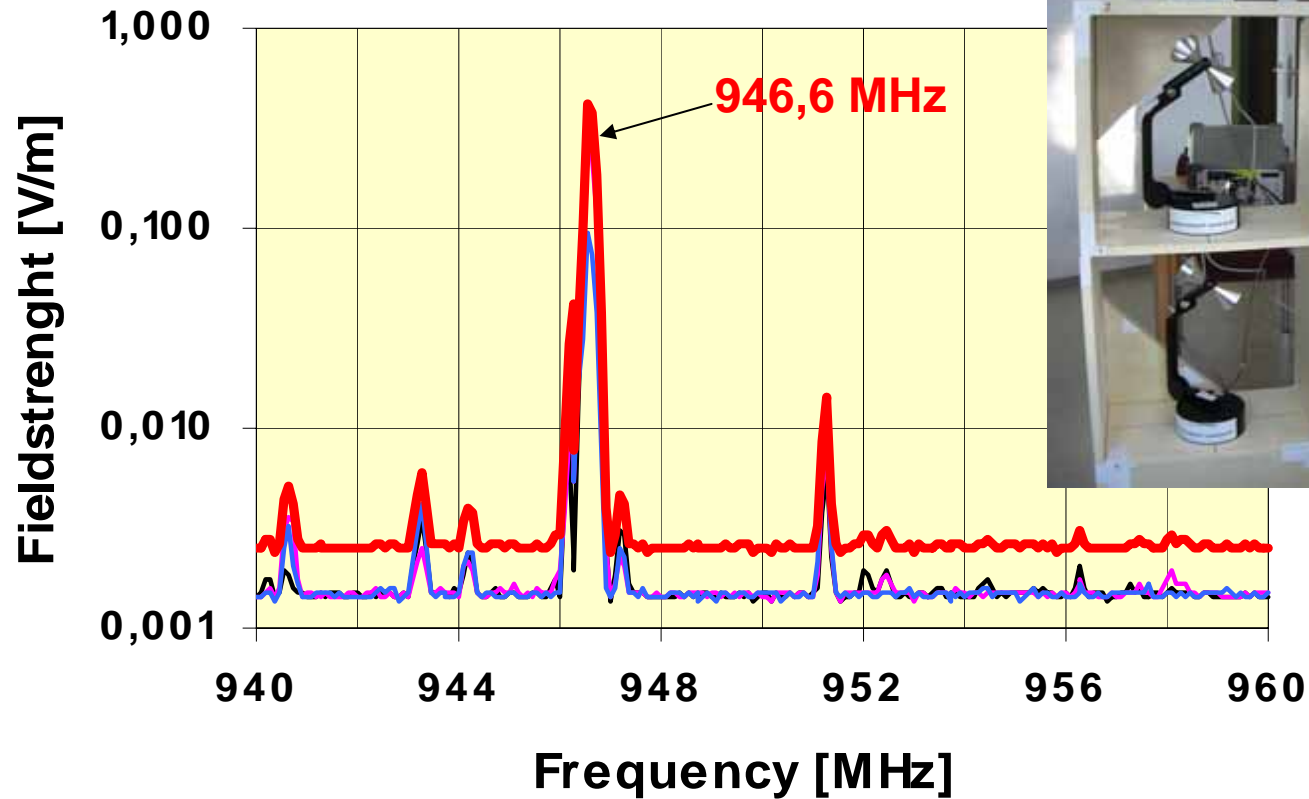
# Variations of field levels measured in cubes

Band	$E_{MAX}/E_{MEAN}$	$E_{10\%}/E_{MAX}$	$E_{25\%}/E_{MAX}$	$E_{50\%}/E_{MAX}$	$E_{75\%}/E_{MAX}$	$E_{90\%}/E_{MAX}$
		[%]	[%]	[%]	[%]	[%]
GSM 900 (6)	2-3,2	16-33	20-39	27-48	37-59	49-67
DCS 1800 (3)	2,2-4,9	7,2-31	15-36	19-44	24-55	32-65
UMTS (1)	1,8	41	48	55	63	71
FM (1)	1,7	47	54	61	66	73
TV (2)	1,9-2,1	30,4-30,6	37,1-38,2	45,7-49,5	55,2-64,3	66,2-74,7

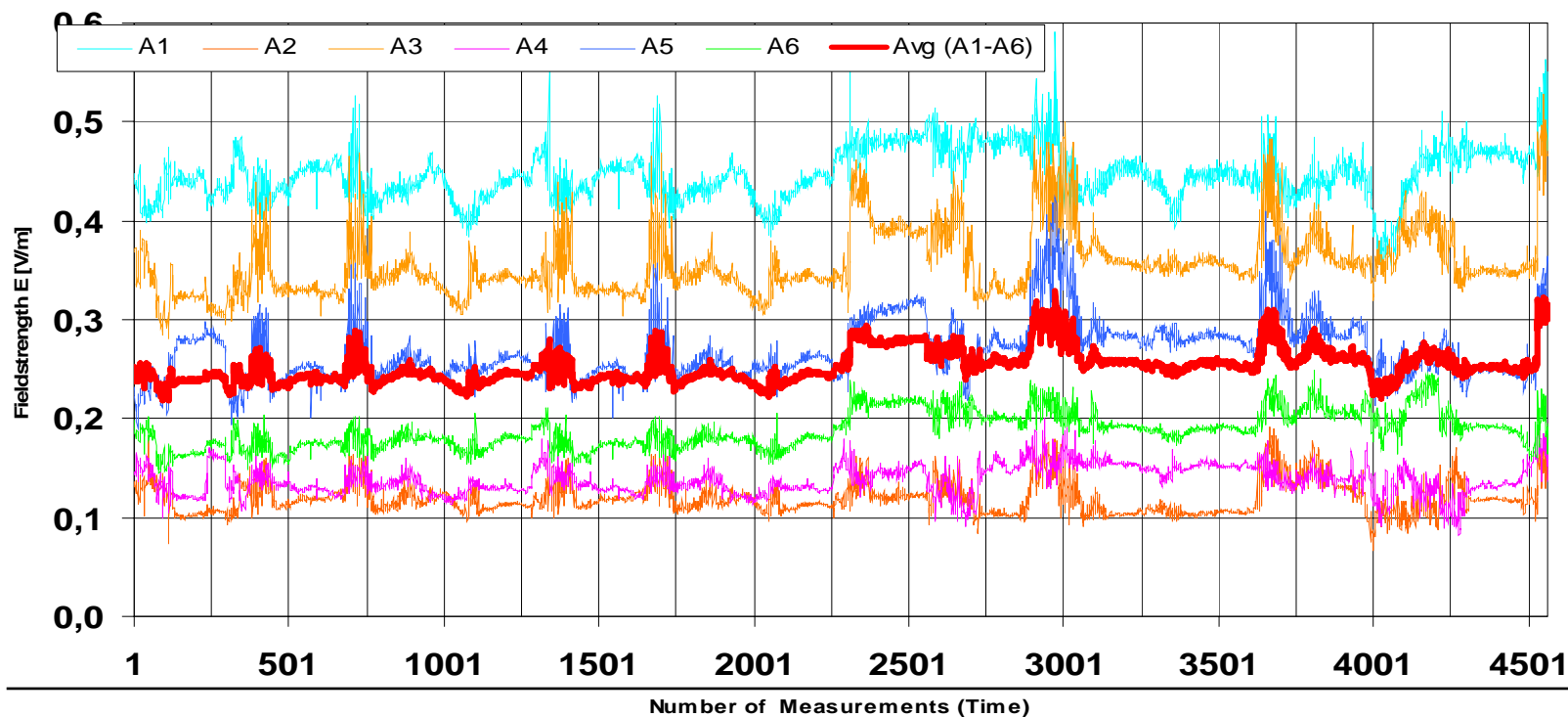


## Variations versus time

(8 day measurement, Haider 2004)



Antenna	A1	A2	A3	A4	A5	A6	Ages
Average [V/m]	0.446	0.119	0.356	0.138	0.268	0.188	0.253
Maximum [V/m]	0.591	0.192	0.528	0.199	0.423	0.248	0.329
Minimum [V/m]	0.354	0.065	0.280	0.082	0.190	0.145	0.218
Max. Variation [%]	32.58	61.00	48.50	44.80	57.85	32.03	30.20
Max. Variation [dB]	2.45	4.14	3.43	3.22	3.97	2.41	2.29



## Comparison exposure base station – mobile phone: an estimation

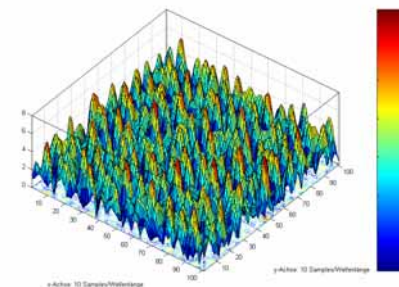
- 24 hours CNS exposure of 1 V/m due BS corresponds to around 1 second due to mobile phone
- 24 hours whole body exposure at 1 V/m due BS corresponds to around 3 minutes due to mobile phone
- 24 hours CNS exposure at 1 V/m due BS corresponds to around 14 minutes exposure due to mobile phone in 1m distance
- 24 hours whole body exposure at 1 V/m due BS corresponds to around 1 hour exposure due to mobile phone in 1m distance

# Proxys

- Crucial: Possibility to distinguish between low and high exposed groups
- Possible proxys in the RF range: distance, analytical calculations, spot measurements, monitoring, dosimeters

# Available Methods and Equipment

- Numerical methods
- Measurement methods
  - Spot measurements
  - Dosimeters
  - Monitoring systems

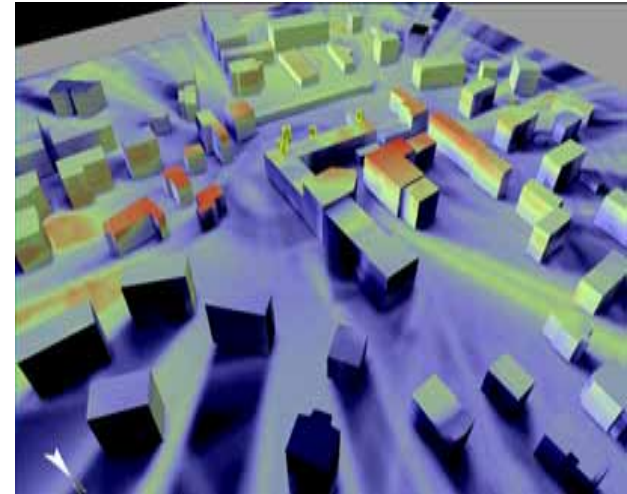


## Conclusions – Base station exposure

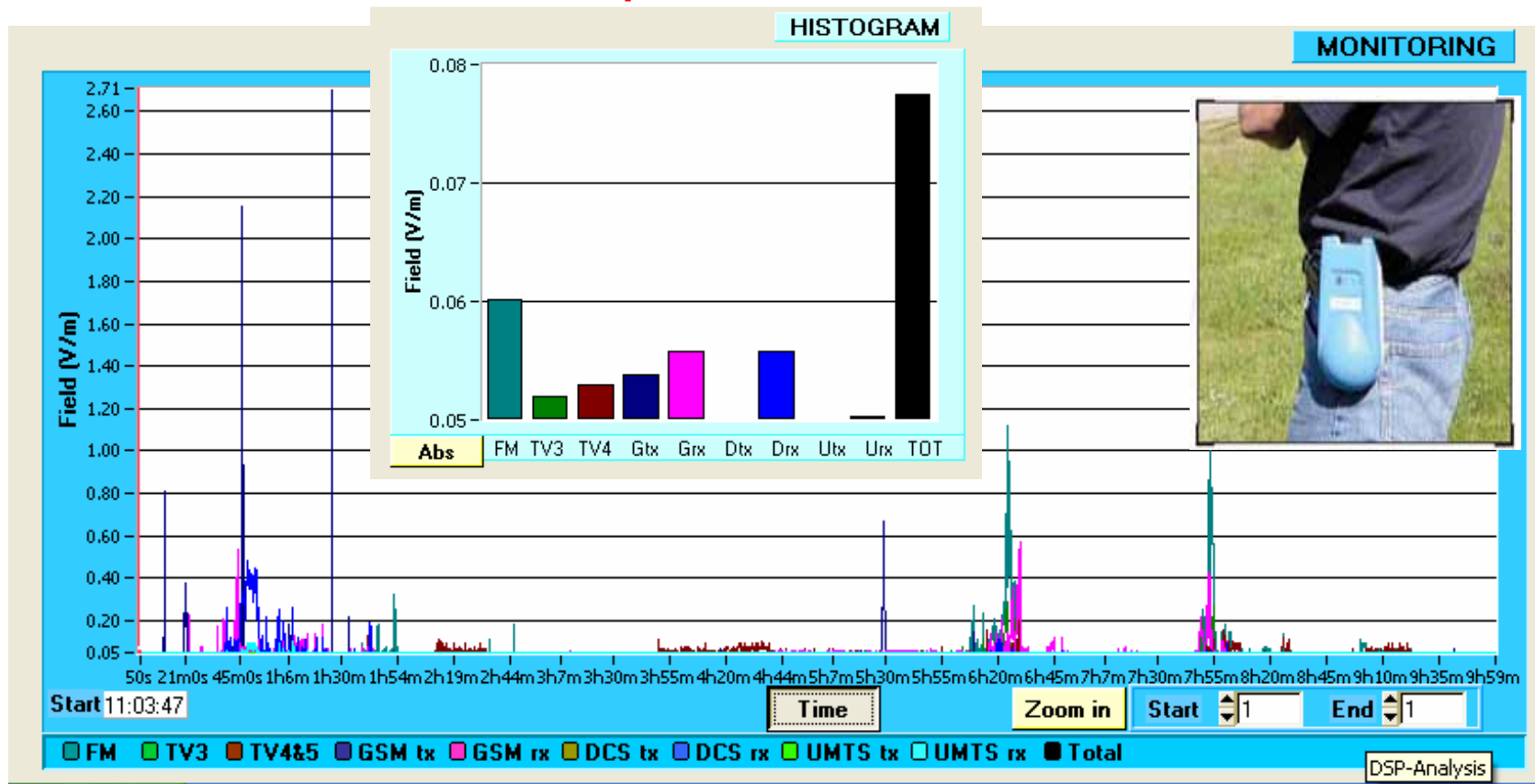
- Biological relevant exposure circumstances are unknown
- If
  - exposure above relatively low thresholds
  - or whole body exposure
  - or frequency and/or signal specific exposure turns out to be relevant, than exposure due base stations might be relevant
- Contributions from other sources have to be taken into account
- Nocebo effects should be taken into account

# Conclusions – Studies to assess the exposure of the population

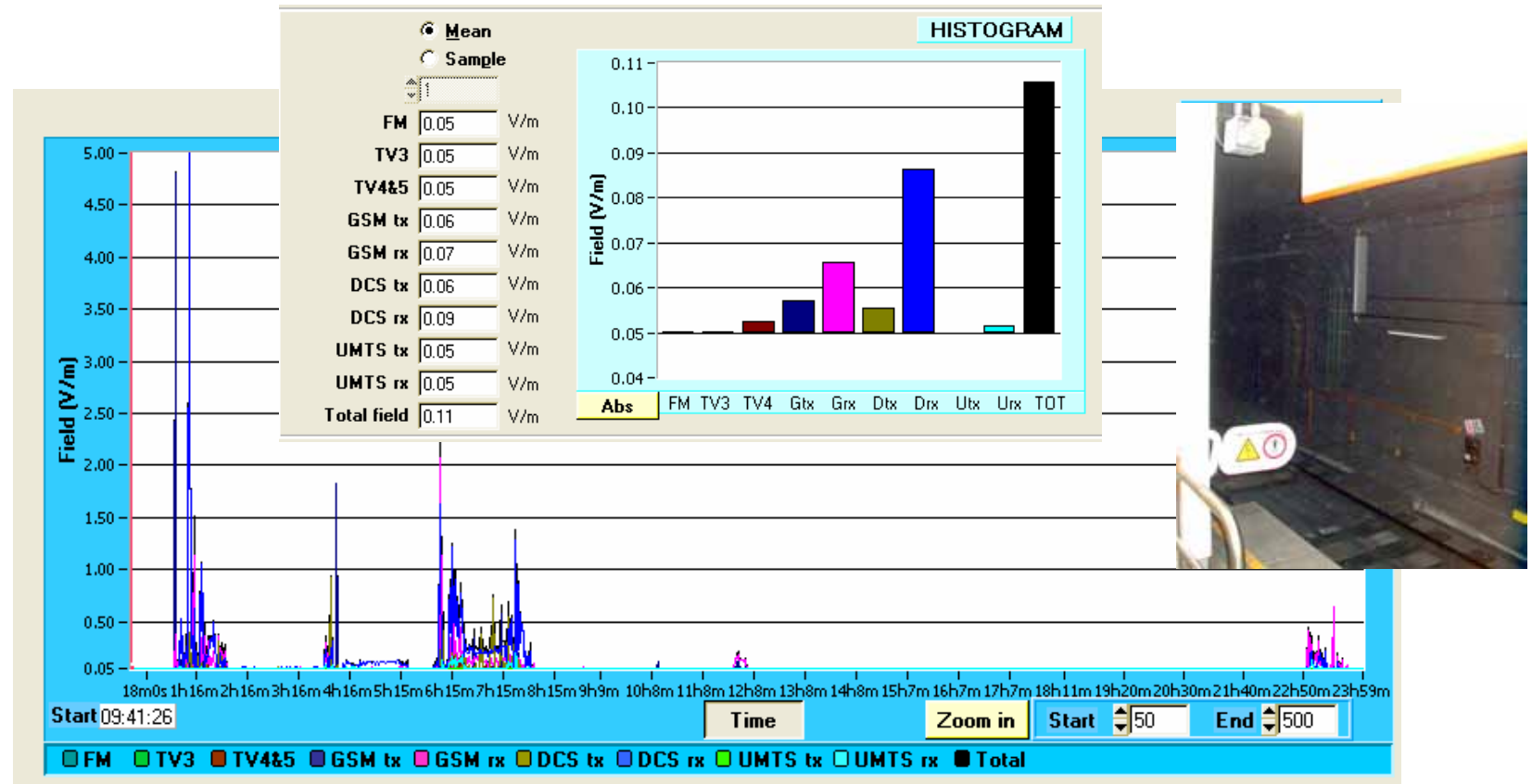
- Systematic studies to evaluate individual exposure of different parts of the population are needed
- Is there relevant variability between subjects exposure in respect of overall exposure and exposure above thresholds? – The answer to this question is relevant for the feasibility of epidemiological studies on base stations
- Is the time of exposure above a certain cumulative level relevant?
- Each proxy used in the frame of epidemiological studies needs to be validated



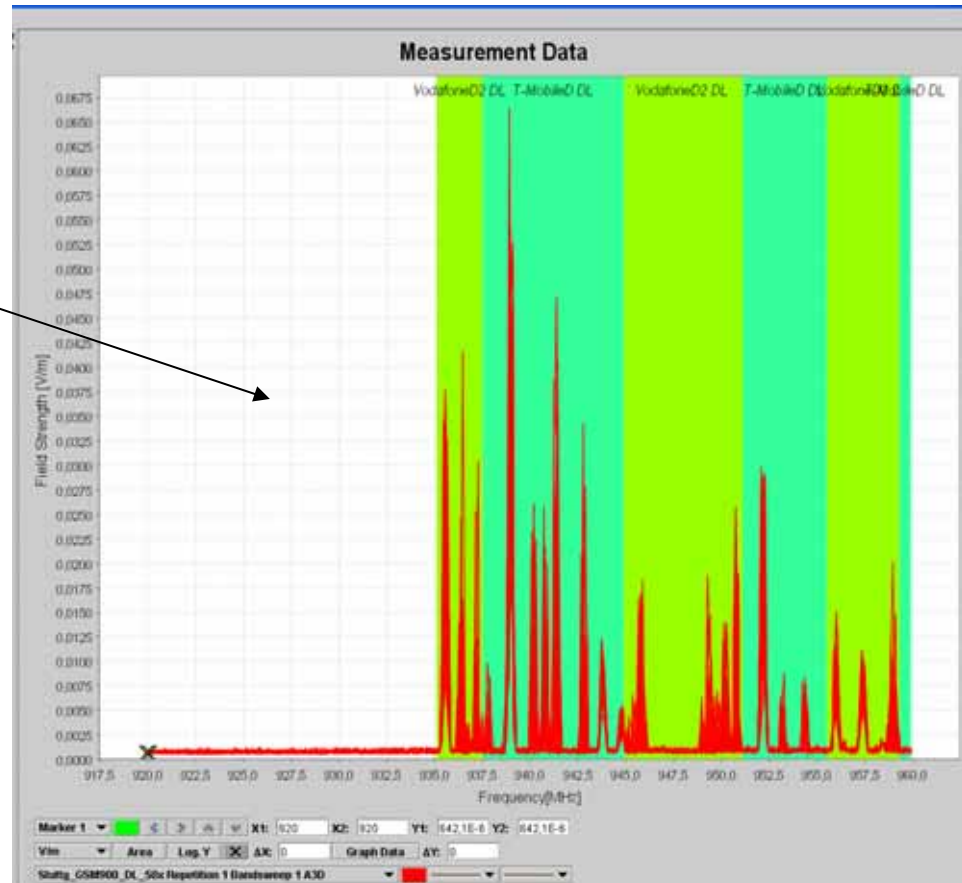
# Further Activities: Assessment of Individual Exposure (Project VALEX) Use of Exposimeter (Antennassa)



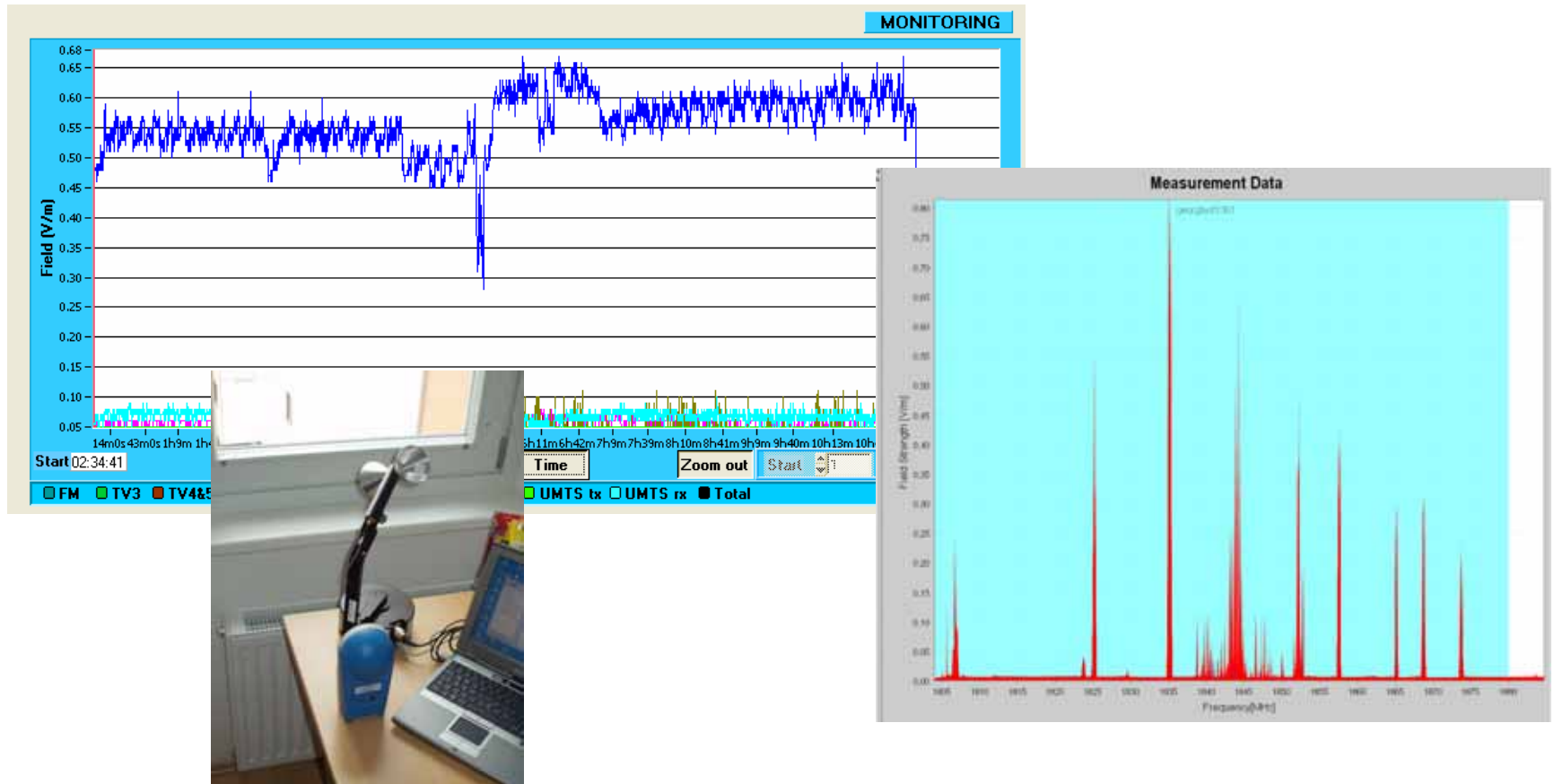
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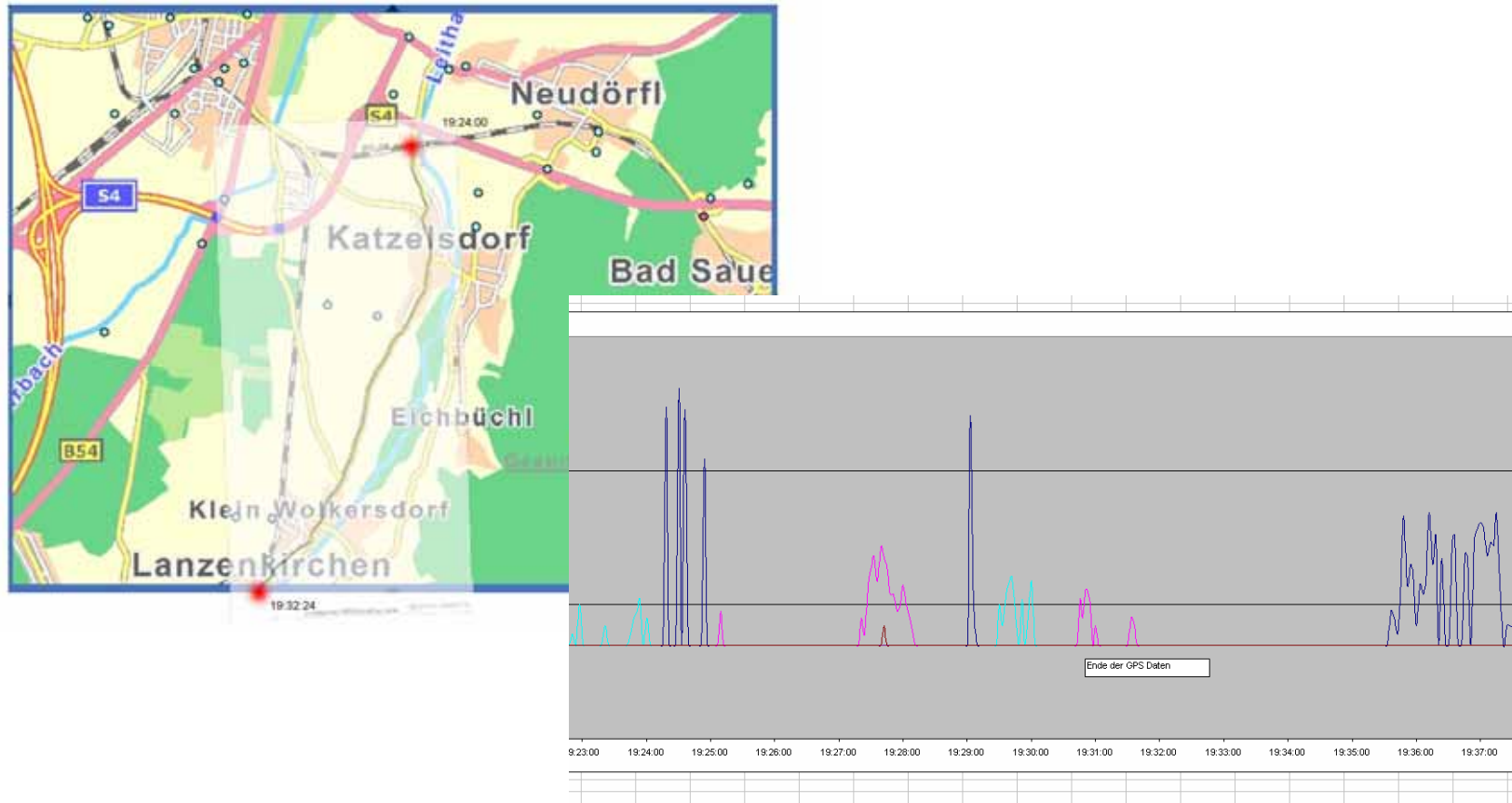
# Monitoring System from ARCS (Field Nose)



# Comparison Monitoring System with Exposimeter



# Test: Combination of GPS and Exposimeter



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