

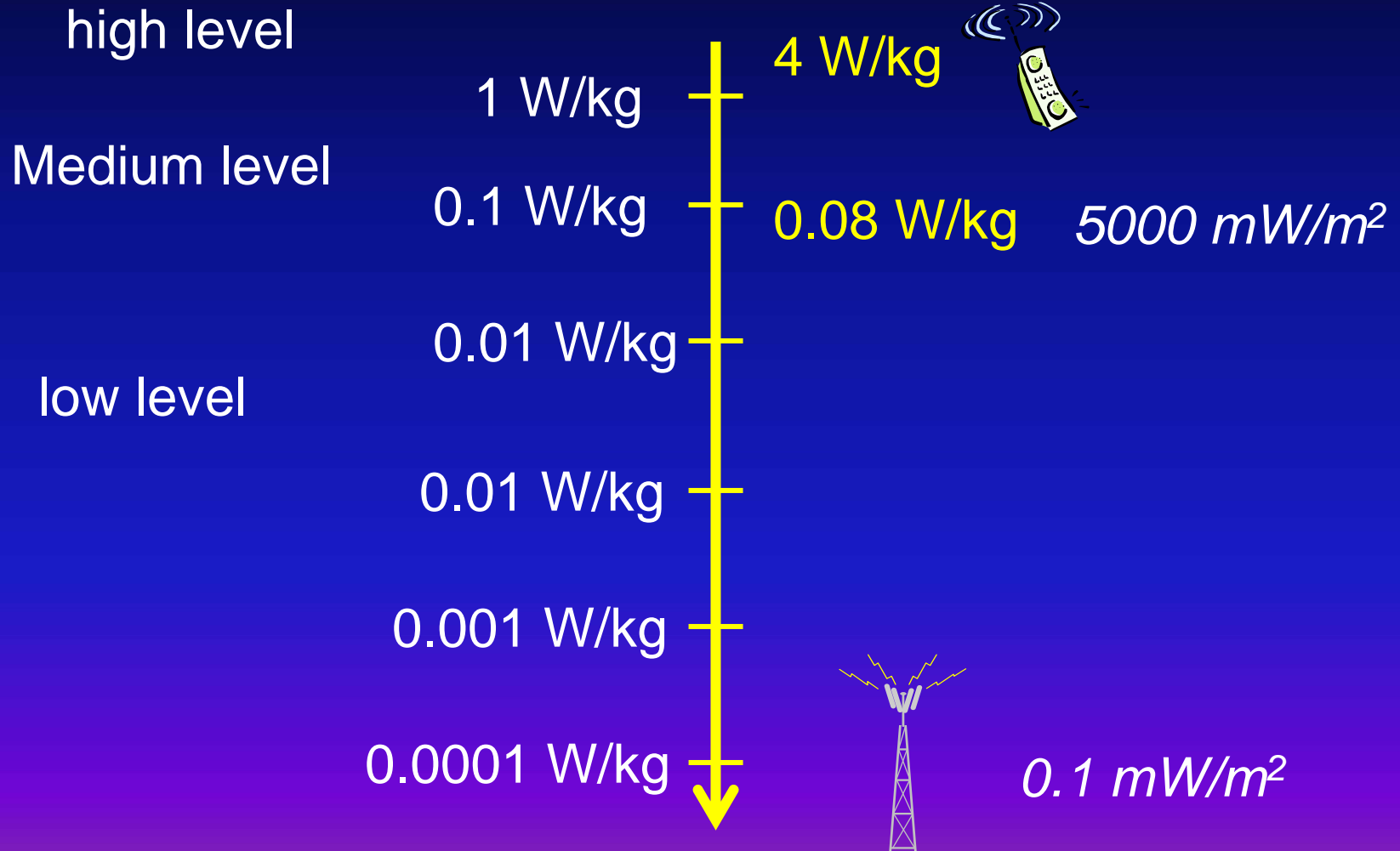
A review of non-thermal health effects from RF fields

b.veyret@enscpb.fr

Scope of the talk

- **Laboratory** studies on biological and health effects of “low-level” RF exposure
- All data re to **whole-body** exposure of humans and animals
- All data re to cellular systems
- All sources
(mobile telephony, WiFi, etc.)

Scope: levels of exposure



Characteristics of exposure

- Low-level
- Long-lasting
- Whole-body
- Intermittent
- Modulated signals
(+ time-varying amplitude)

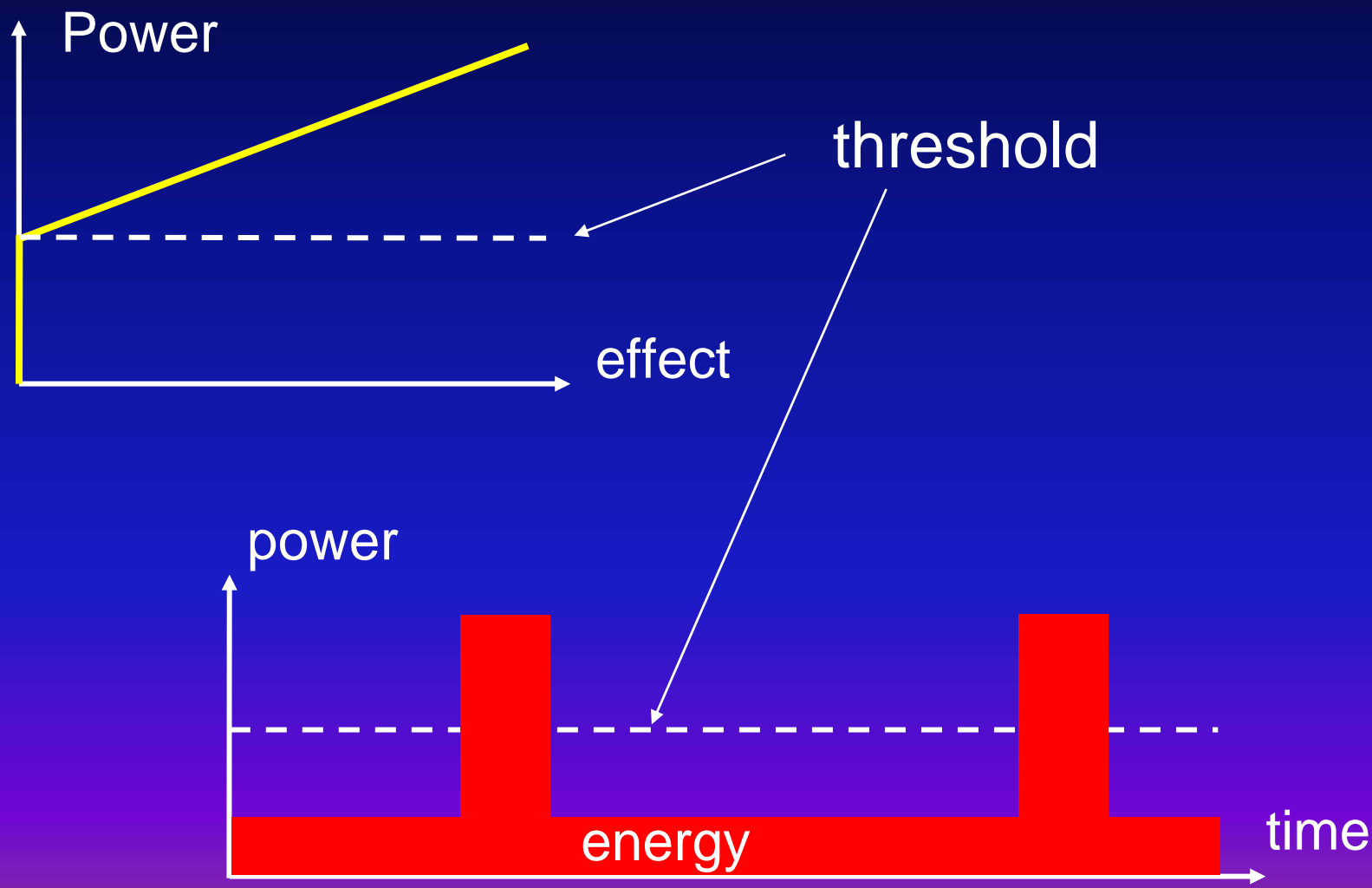
Characteristics of bioeffects

- Biological vs. Health
- Long-term vs. Delayed
- Reversible vs. Irreversible

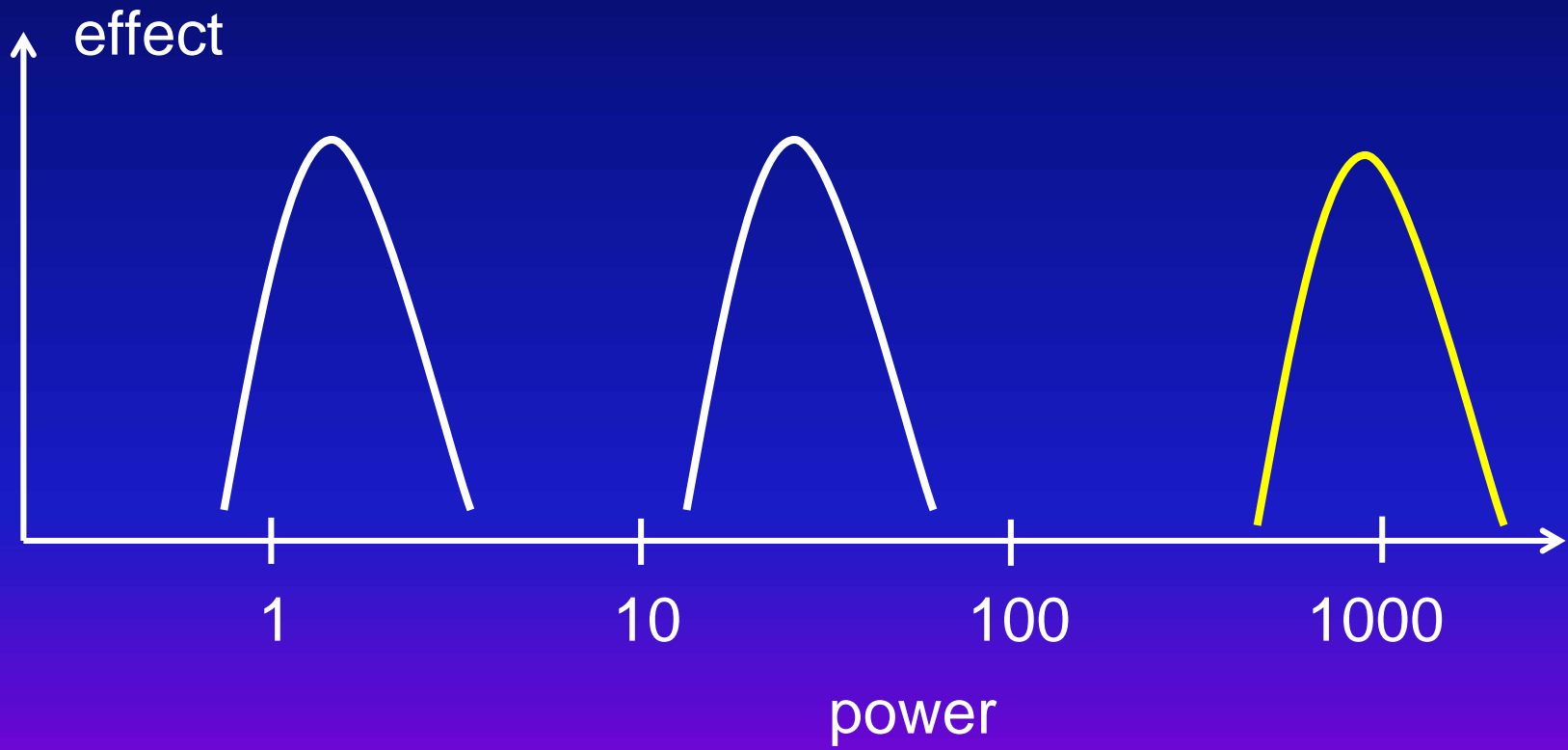
Mechanisms

- Thermal vs. Nonthermal?
- Threshold vs. Stochastic?
- Window vs. Continuous?
- Multiple windows vs. single window?

Threshold: power vs. energy



“Window” effect



Old data not re mobile telephony

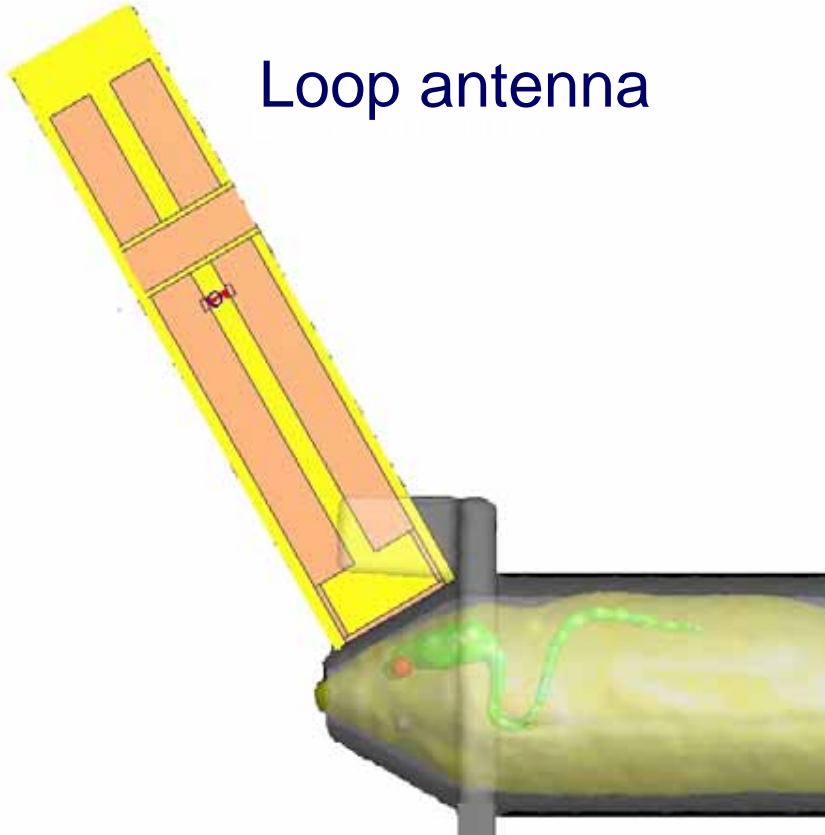
- i.e. reviewed in published books and review papers
- Across the frequency spectrum
- Mostly in the “high” to “medium” range

Recent data: methodology

- Much-improved exposure systems in terms of SAR uniformity
- 3 to 4 SAR levels + Sham
- ca. half of the investigations are replication experiments: most of them negative
 - ODC,
 - memory of rodents,
 - genotoxicity,
 - etc.

in vivo exposure systems

Loop antenna



Ferris' wheel

17 housing for rats.

Recent data: humans

- TNO study on well-being
- EEG, cerebral blood flow

Pulse modulation appears crucial for RF-EMF-induced alterations in brain physiology

P. Achermann*, R. Huber*, S. Regel*, V. Treyer**, Hans-Peter Landolt*, J. Schuderer***, N. Kuster***

Summary & Conclusion

- exposure to pulse-modulated RF EMF affects brain physiology (EEG, rCBF)
- effects outlast exposure
- pulse modulation appears crucial for RF EMF-induced effects
- **non-thermal biological action**
- underlying mechanisms unknown


Recent data: animals

- Cancer (Pim1, DMBA, bioassays)
- Blood-brain-barrier permeability

Recent data: cells


- Genotoxicity

Available online at www.sciencedirect.com

 **ELSEVIER**

SCIENCE @ DIRECT®

Mutation Research xxx (2005) xxx–xxx

 Genetic Toxicology and Environmental Mutagenesis

www.elsevier.com/locate/gentox
Community address: www.elsevier.com/locate/mutres

**Non-thermal DNA breakage by mobile-phone radiation
(1800 MHz) in human fibroblasts and in transformed
GFSH-R17 rat granulosa cells in vitro**

Elisabeth Diem^a, Claudia Schwarz^a, Franz Adlkofer^b,
Oswald Jahn^a, Hugo Rüdiger^{a,*}

- Heat shock proteins

Health risk assessment

- Weight-of-evidence approach
- 95% of research RF projects deal with mobile phones
- No established health effects at “medium level” of exposure
- Few biological effects at “medium level” of exposure
- None below guidelines (0.08 W/kg)

Conclusion

- Lab studies on effects of MW at very low level are:
 - Not necessary...
 - Difficult to perform
 - Difficult to extrapolate to human health
- All recent expert report have concluded that there are no **health effects** from exposure to very-low-level exposure