

# Personal Magnetic Field Exposure by Electronic Article Surveillance (EAS) Devices

G. Schmid, Hirtl R., R. Überbacher, S. Cecil

# EAS Systems



# EAS Systems



# EAS Technologies (1)

**Electro-  
magnetic (EM)**

typ. up to 20 kHz

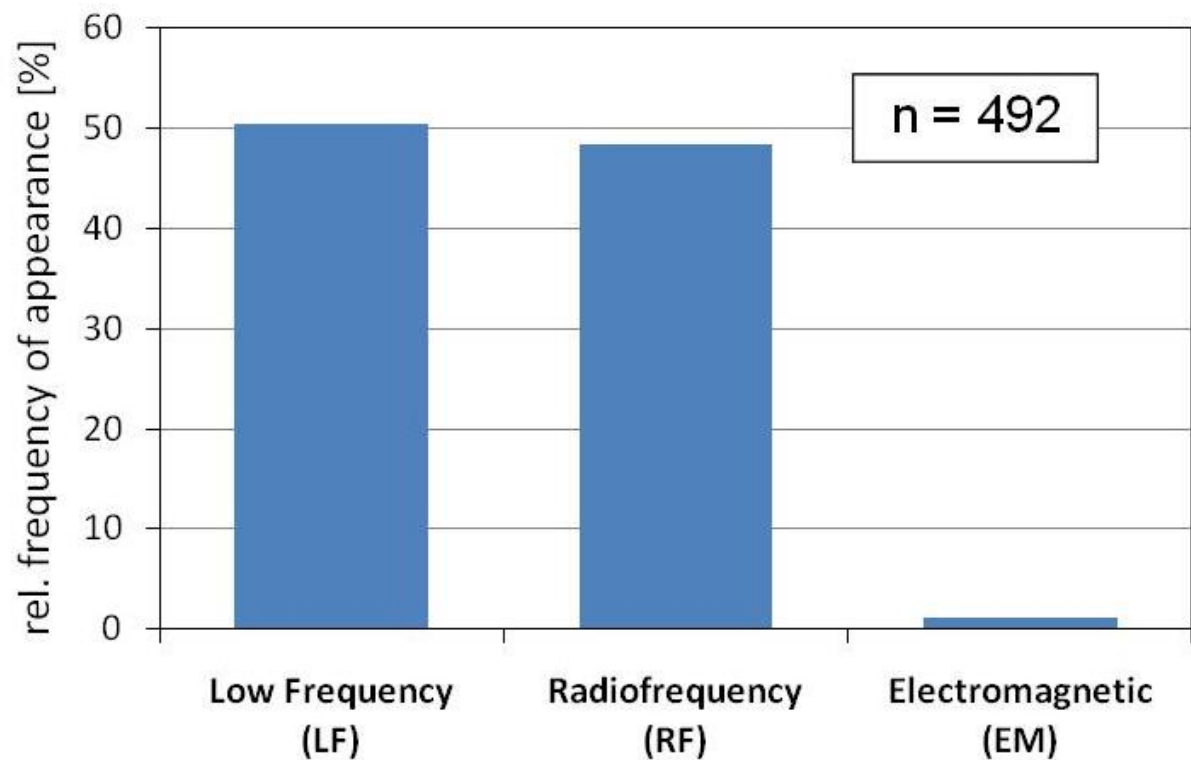
**Low-  
frequency (LF):**

typ. 58 kHz

**Radio-  
frequency (RF):**

typ. 8.2 MHz

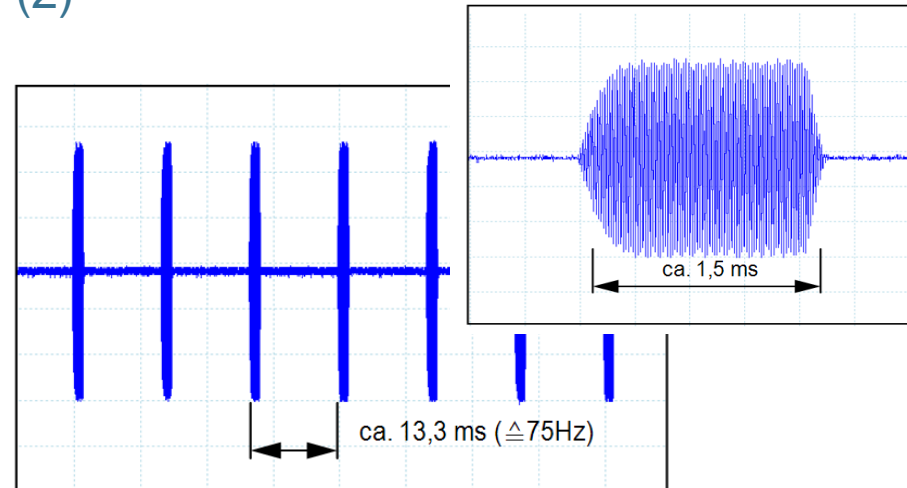
*Survey in Germany and Austria*



# EAS Technologies (2)

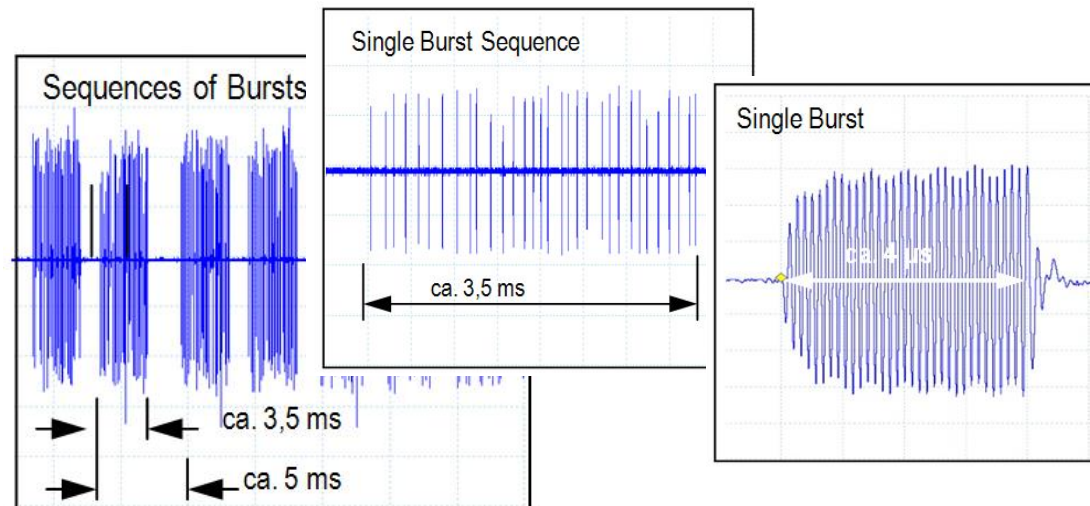
## *Low Frequency (LF):*

typ. 58 kHz,  
pulsed magnetic field



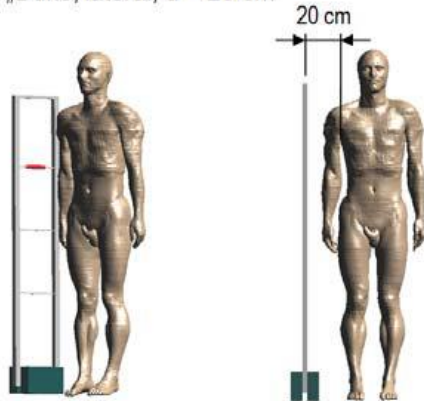
## *Radiofrequency (RF):*

typ. 8.2 MHz  
„pulse-listen“ or  
„sweep“ (typ. 7.5-8.7 MHz,  
pulsed or CW)

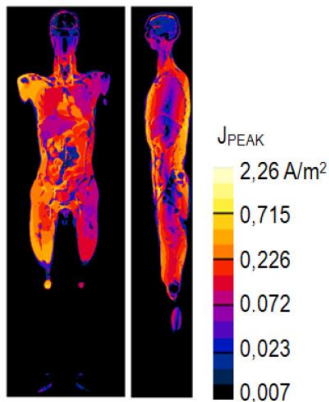


# Numerical computations of induced current density and electric field strength inside the tissues

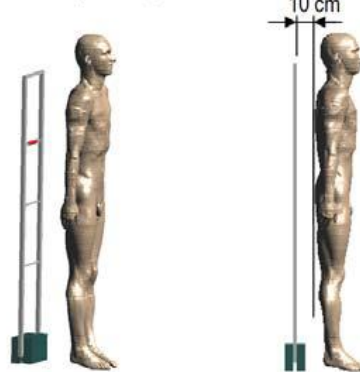
„Duke, lateral, d = 20 cm”



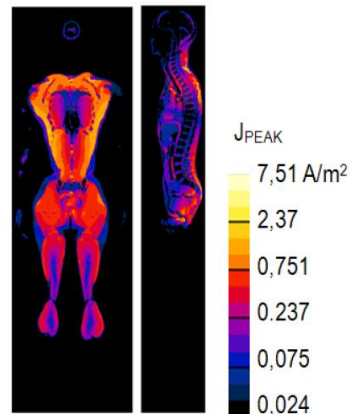
„Duke, lateral, d = 20 cm”



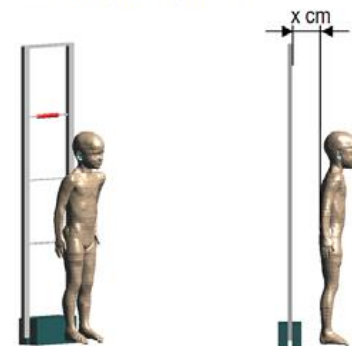
„Duke, dorsal, d = 10 cm”



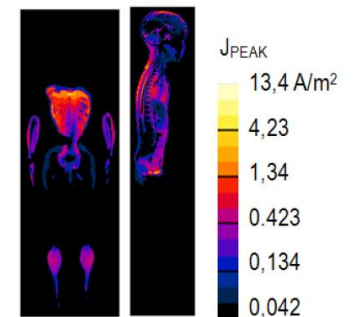
„Duke, dorsal, d = 10 cm”



„Roberta, dorsal, d = x cm”



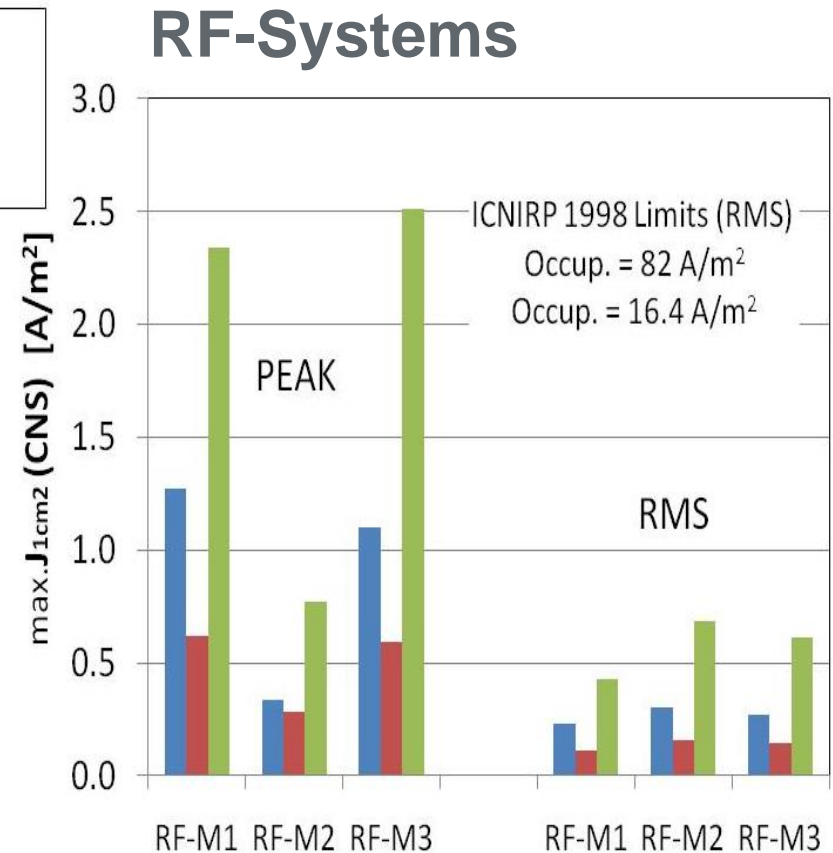
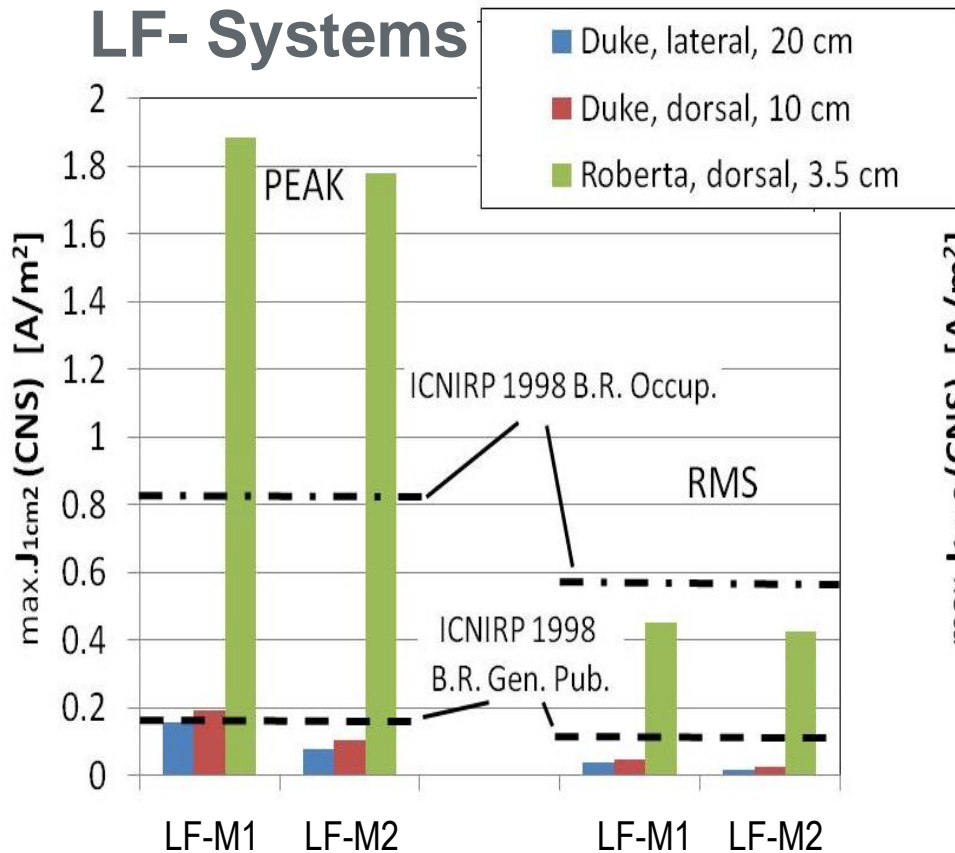
„Roberta, dorsal, d = 3,5 cm”





# Computational Results (1)

comparison with ICNIRP 1998 Basic Restrictions

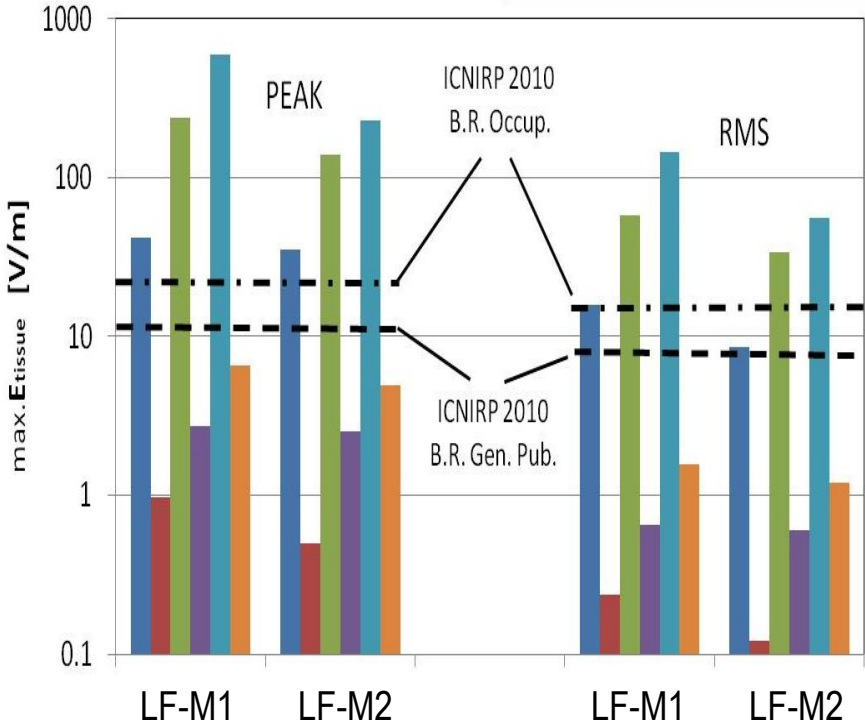


# Computational Results (2)

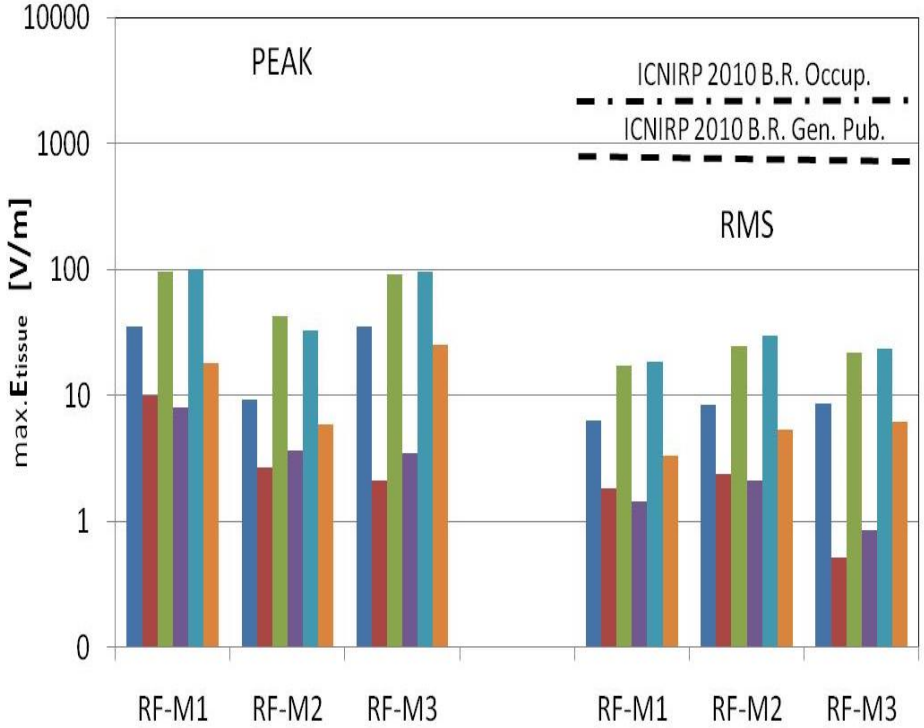
## comparison with ICNIRP 2010 Basic Restrictions



### LF- Systems



### RF-Systems

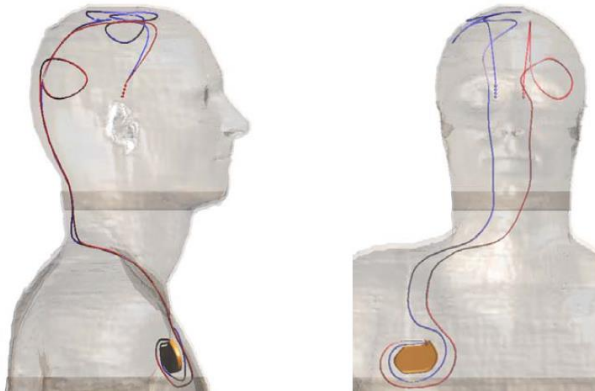




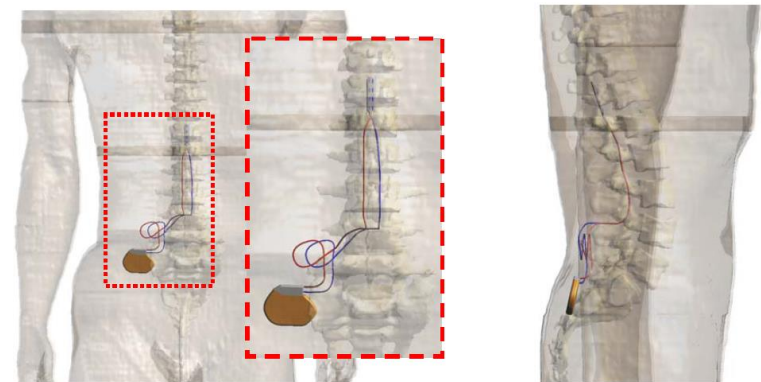
# Concerning Implants

- Potential of functional interference for Pacemakers and ICDs known
- What about concentration of induced currents close to metallic parts?

**Deep Brain Stimulator**



**Spinal Cord Stimulator**



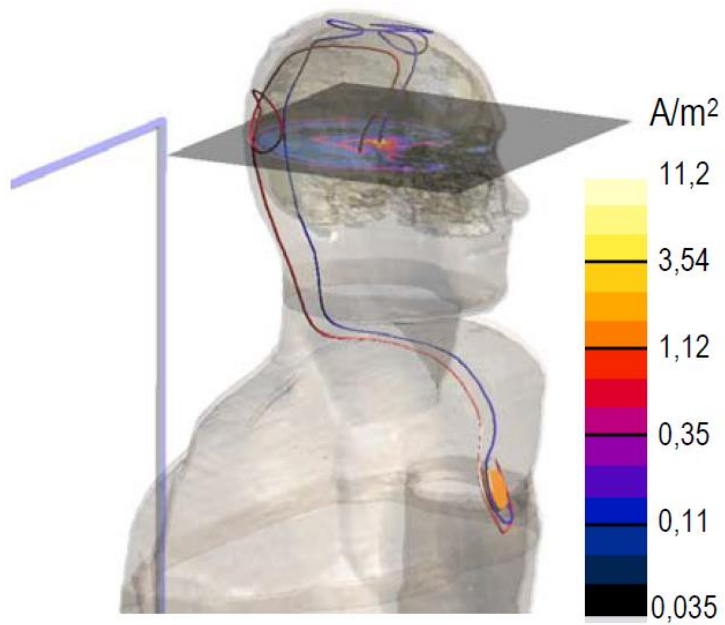
**Hip Joint**



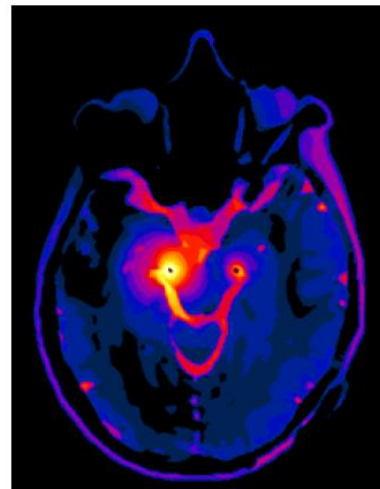
**Cochlea Implant**



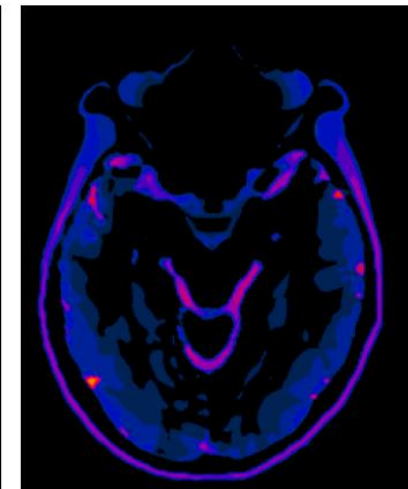
# Concerning Implants



MIT Implantat



OHNE Implantat

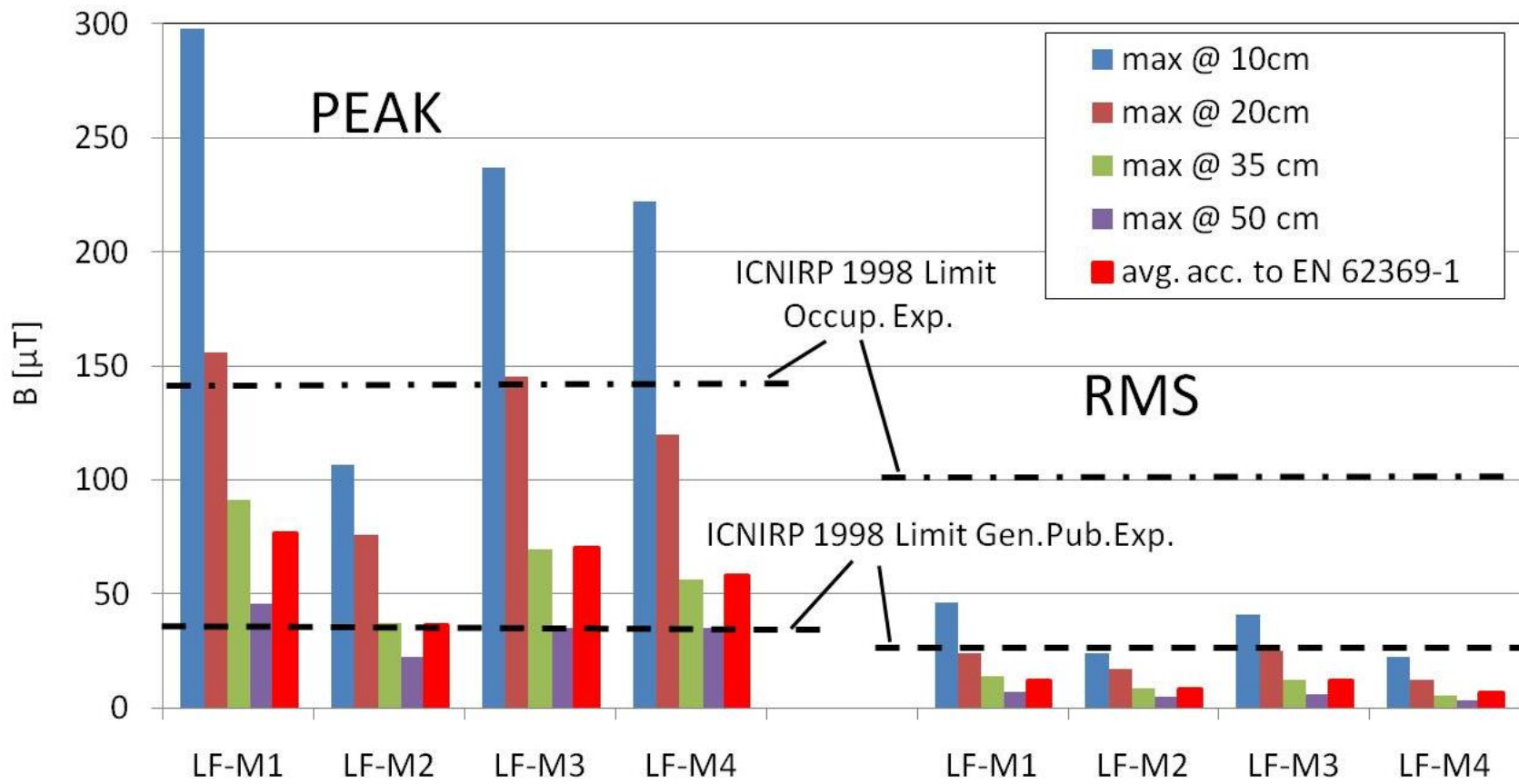


# Thank You!

This study was sponsored by the German Federal Office for Radiation Protection (BfS)

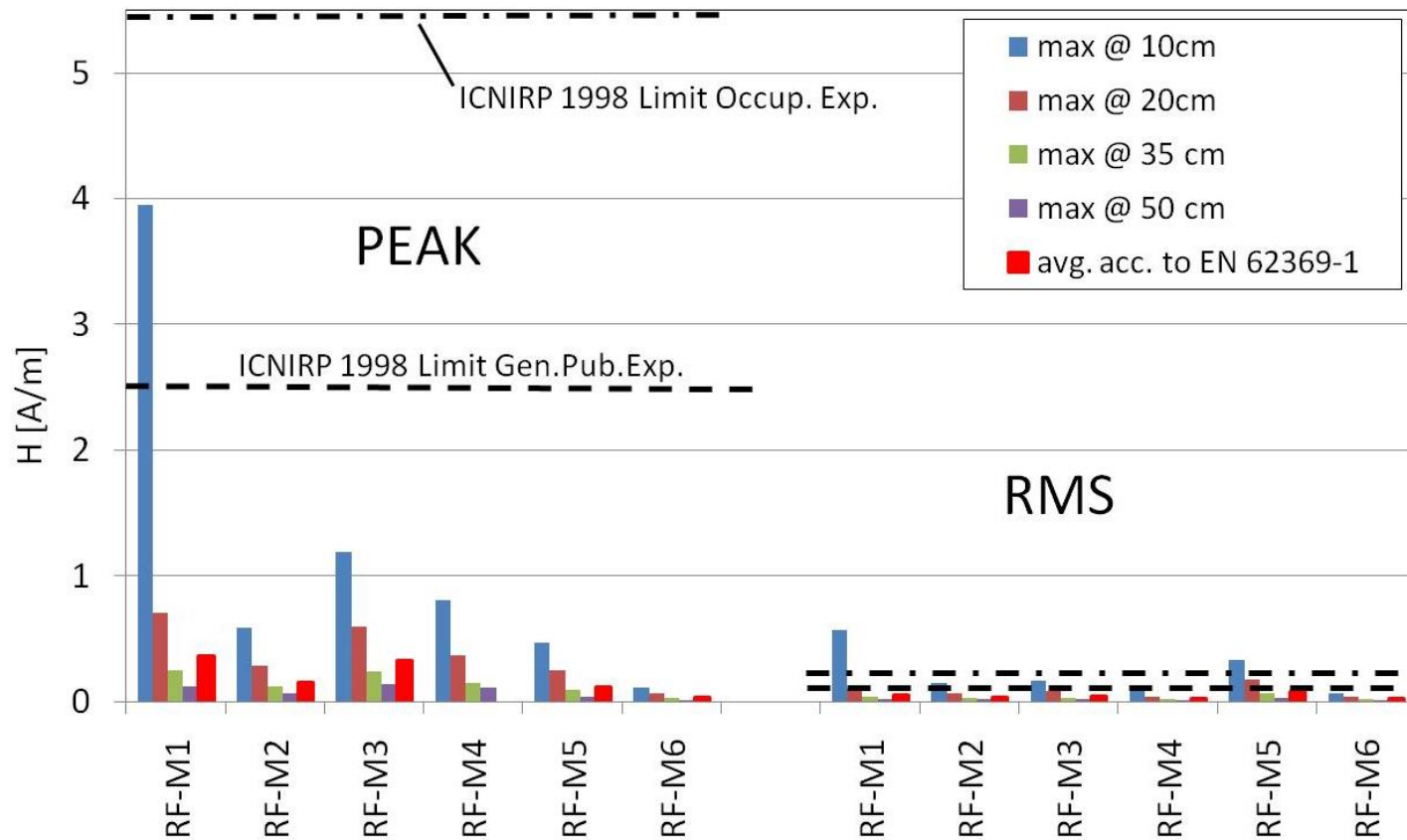
# Measurement Results (1)

## LF-Systems



# Measurement Results (2)

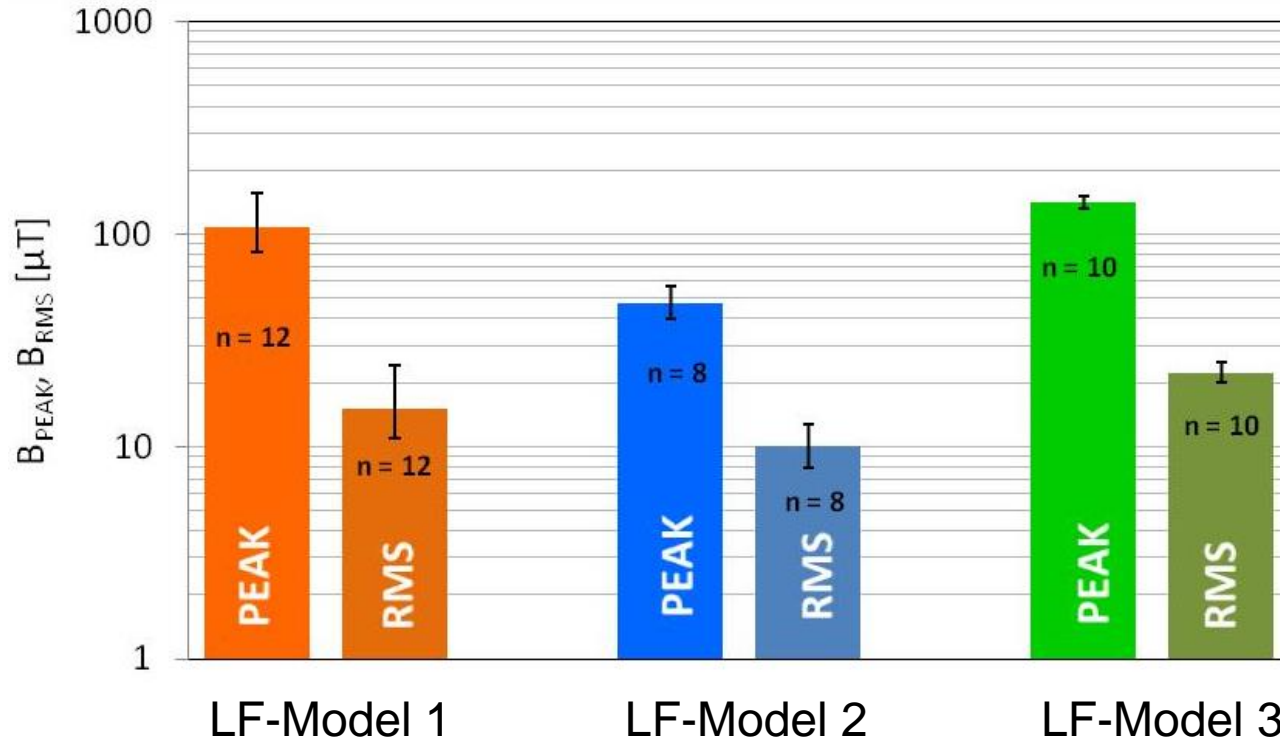
## RF-Systems



# Measurement Results (3)

## LF-Systems

Variations between different installations:  
measured at reference point  $h=85$  cm,  $d = 20$  cm





# Measurement Results (4)

## RF-Systems

Variations between different installations:  
measured at reference point  $h=85$  cm,  $d = 20$  cm

