

Facts and Gaps in EMF Risk Assessment

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What do we know?

- ***EMF's physical nature***
ELF fields and RF waves are different!
- ***physical interaction mechanisms***
no molecular damage!
- ***biological mechanisms***
threshold- effects!



What are the consequences?

separate risk assessment of ***ELF*** and ***RF*** fields

extrapolation to other exposure conditions

with regard to ***frequency***, ***amplitude*** and ***time course***

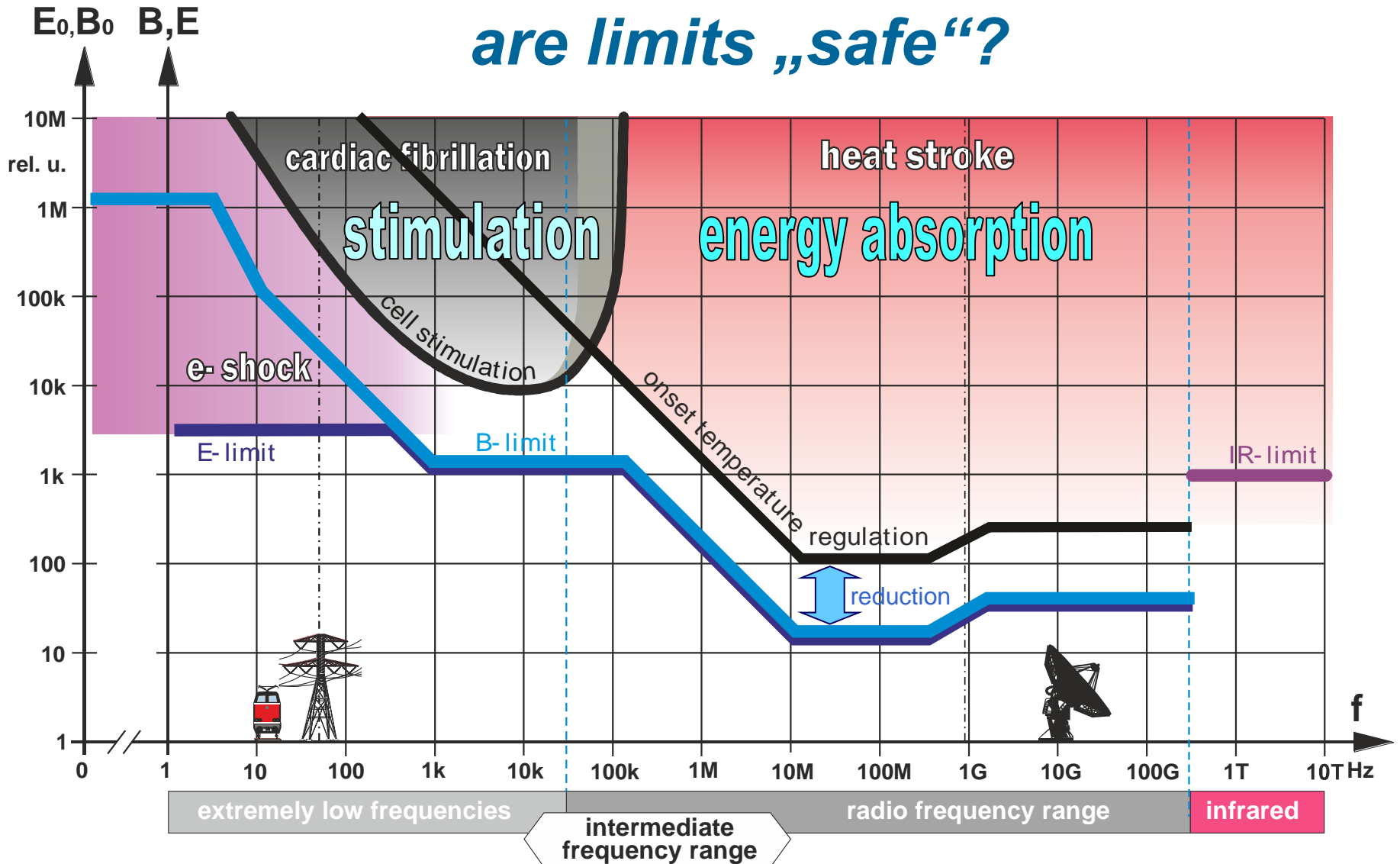
same level of protection over the entire frequency range

exclusion of threshold effects

in the ***ELF*** range: ***cellular excitation***

in the ***RF*** range: ***onset of thermoregulation***

EMF are limited are limits „safe“?





key (political) questions

how safe is safe enough?

*safety = freedom from unacceptable risks
rather than no risk at all !*

how much evidence is needed?

how much residual uncertainty is acceptable?

Are there *long-term risks* (below thresholds)?

no, based on mechanical effects



no, based on thermal effects





Are there long-term risks *(below thresholds)?*

→ **hypothetical risks !**

if so, such **hypothetical risks** would require

→ **long- transient or biological changes**

lasting **beyond exposure**,

→ **accumulation** of (rather than adaption to) effects

no evidence from established knowledge

→ **no accumulative effects** *(instead: adaption, e.g. to heat)*

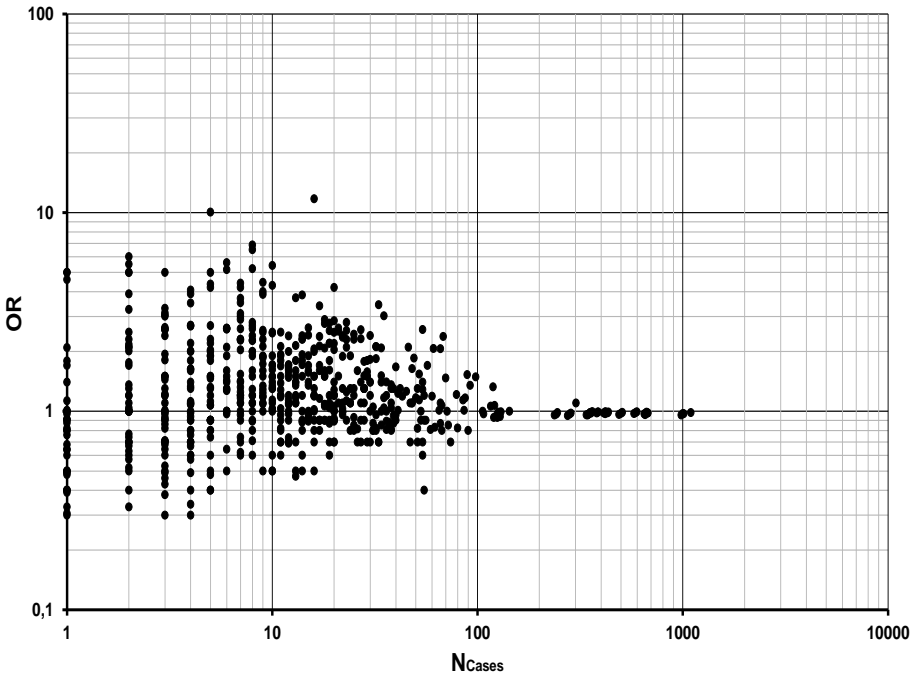
→ **no crossover- effects** *at intermittend exposures*

if so, based on **hypothetical yet unknown effects !**

Are there long-term risks (below thresholds)?

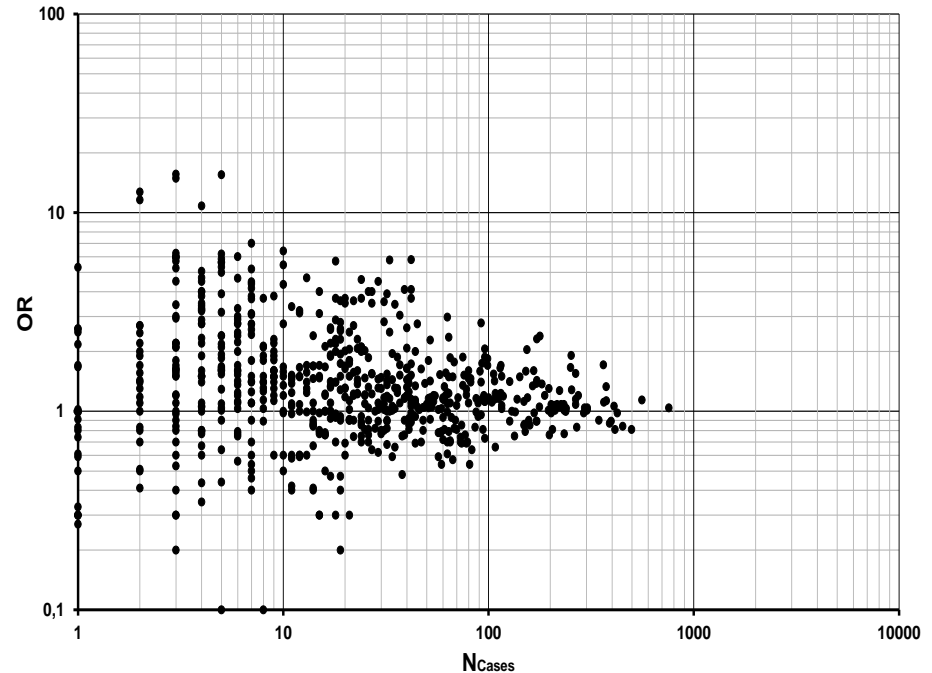
indicated by ELF-MF epi studies ... is this convincing?

childhood solid cancer



no evidence

childhood leukemia



IARC: MF possibly carcinogenic (2B)

if there were (hypothetical) ***accumulative effects,***
health risk assessment would need focusing on

- ➔ ***chronic exposure*** (e.g. from power lines)
- ➔ ***and intermittend exposure*** (e.g. from electric appliances)

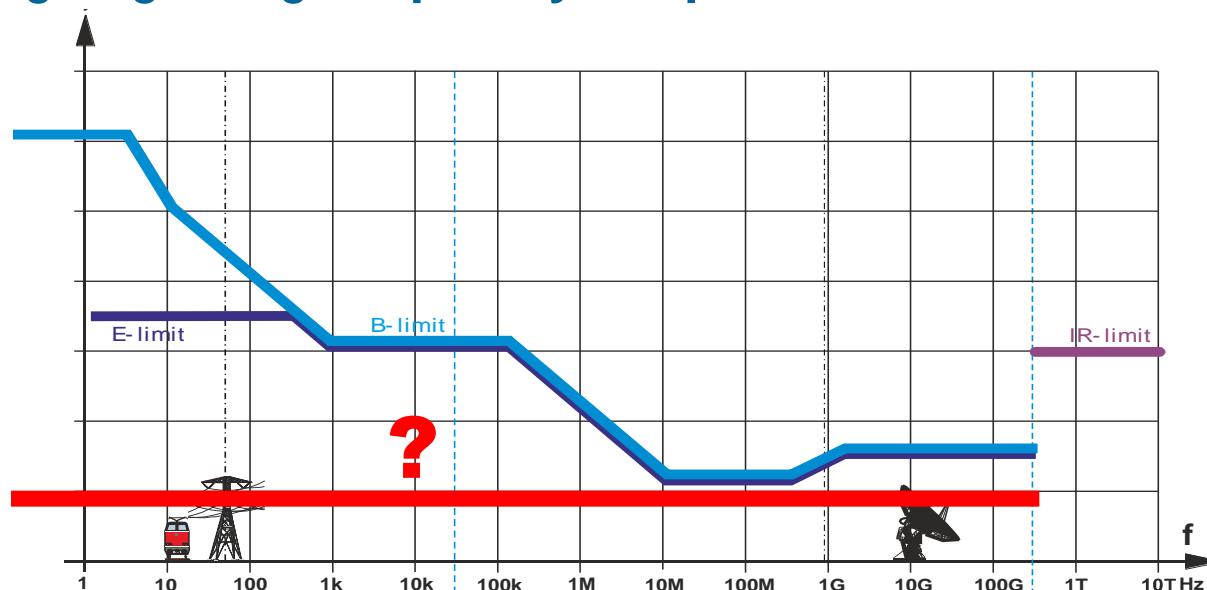
... but no blinder view!



if there were (hypothetical) **accumulative effects,**

then caused by **yet unknown mechanisms,**
therefore,

→ how to **extrapolate** to other exposures?
e.g. regarding **frequency, amplitude, time course**

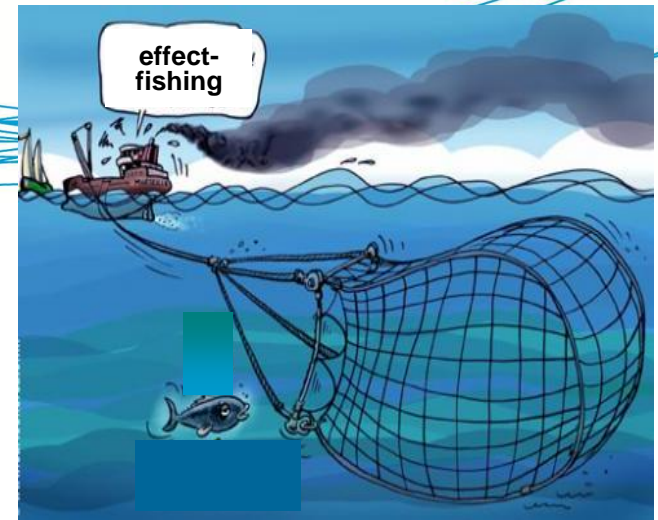


Do we know enough?

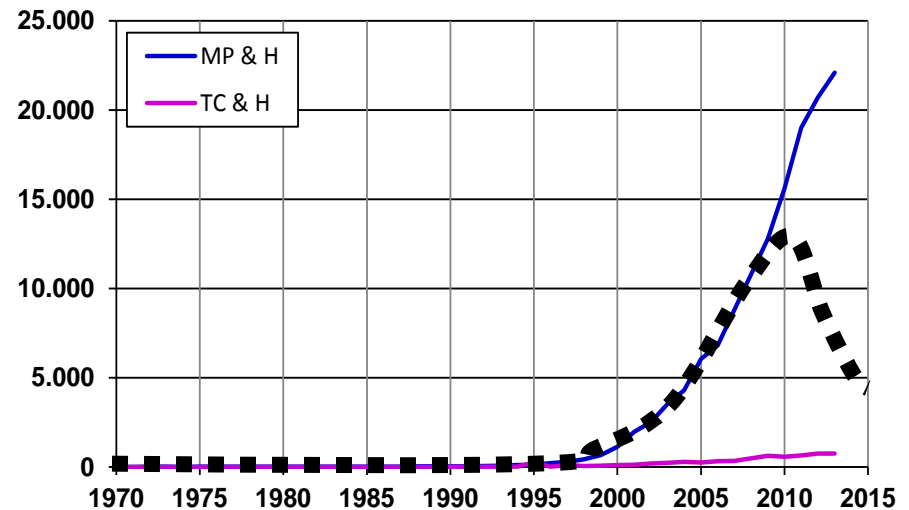
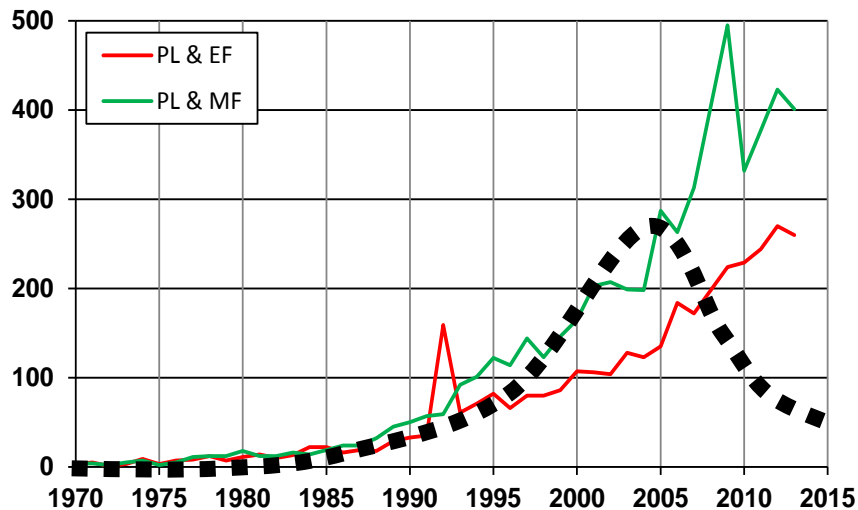
effect fishing: „look and see“

(WHO research agenda: mechanisms no priority!)

instead of „think and look“

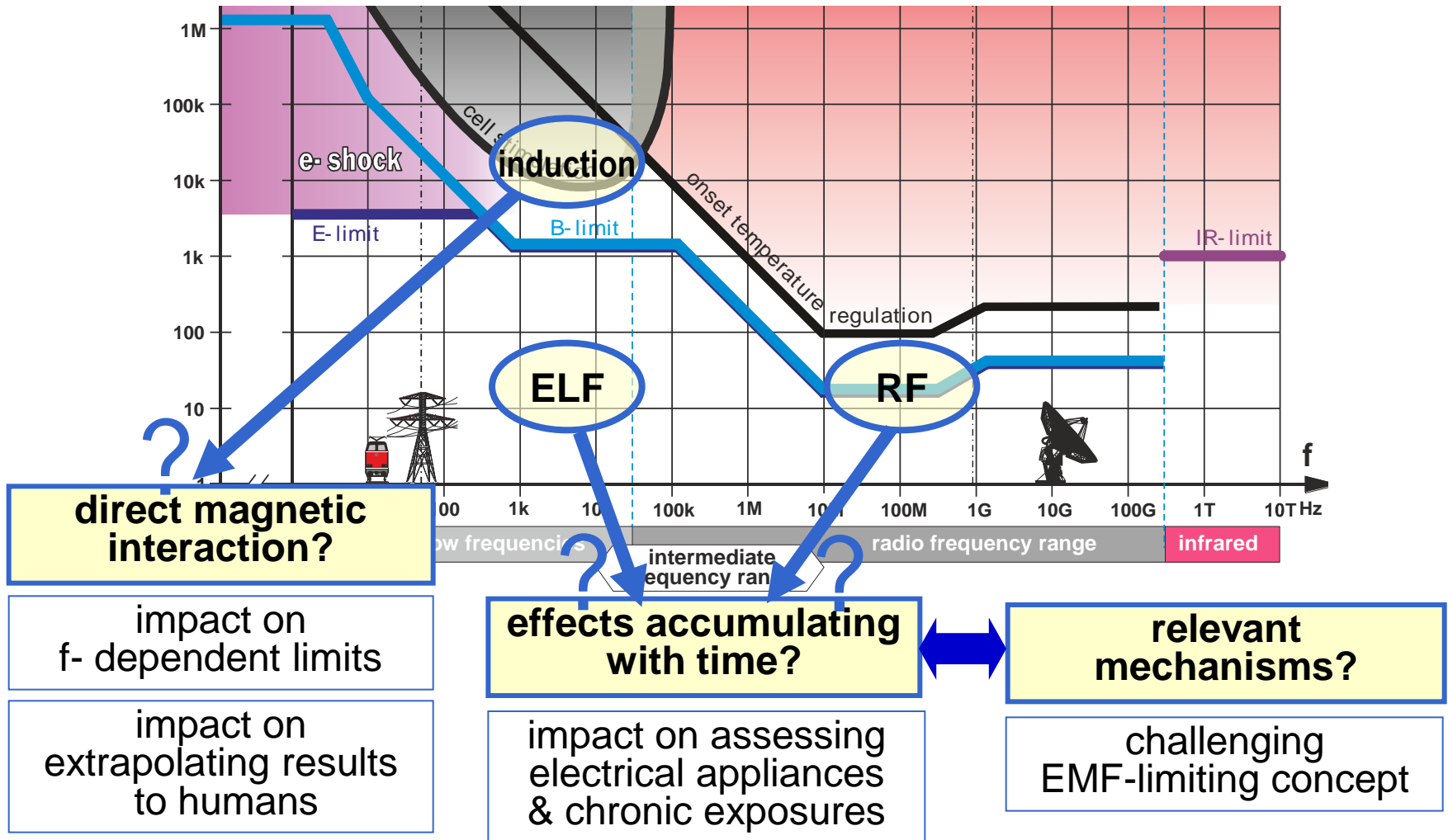


EMF publications per year:

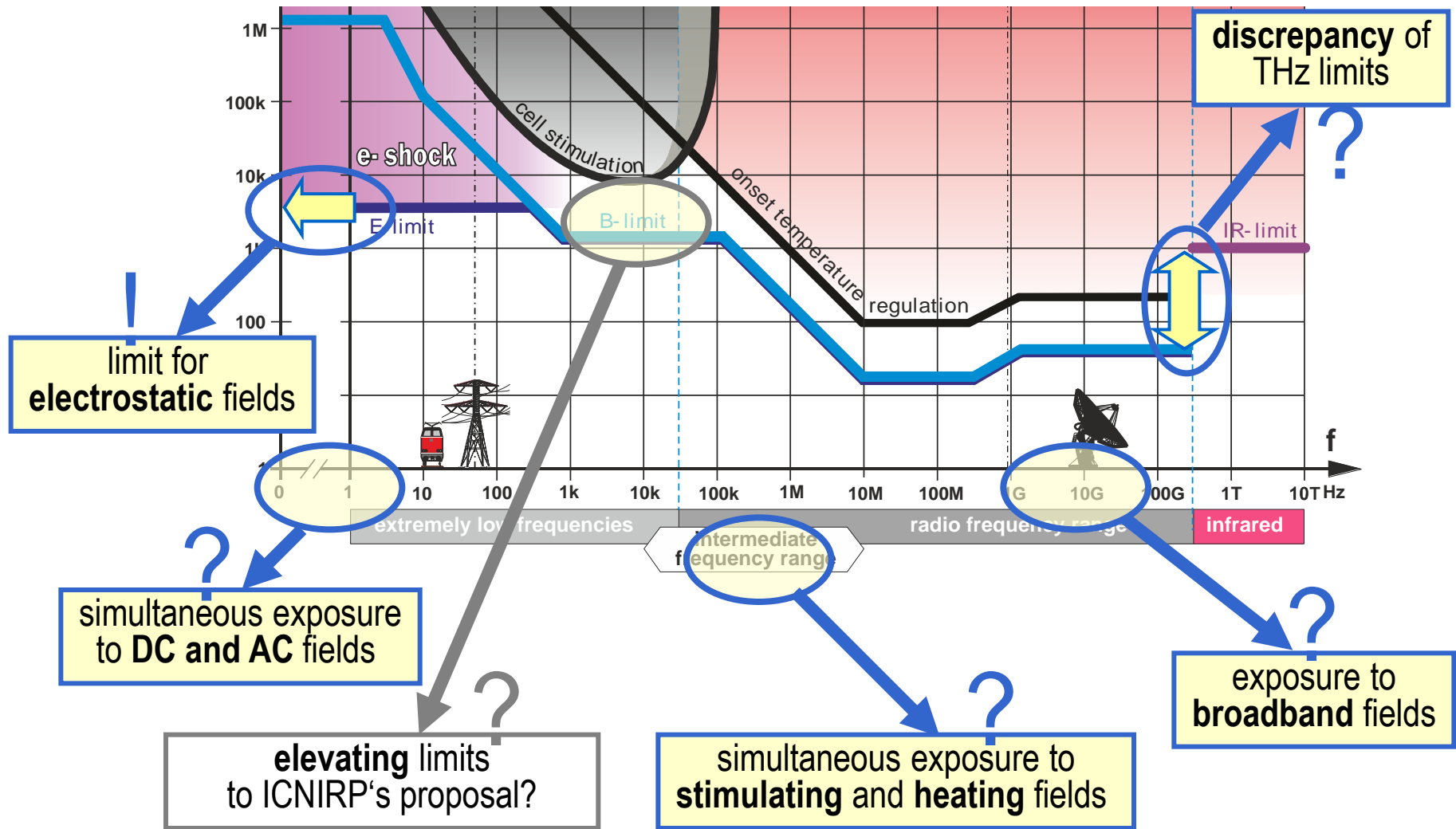


what is going wrong?

What are the open questions?



With regard to emerging technologies: challenges in limiting exposures





key (political) **issues**

how much evidence is needed?

how safe is safe enough?

risk communication !

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