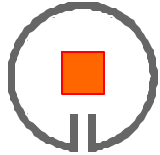




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Lessons from the REFLEX* study on biological effects of radiofrequency electromagnetic fields

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Verum Foundation
Munich Germany

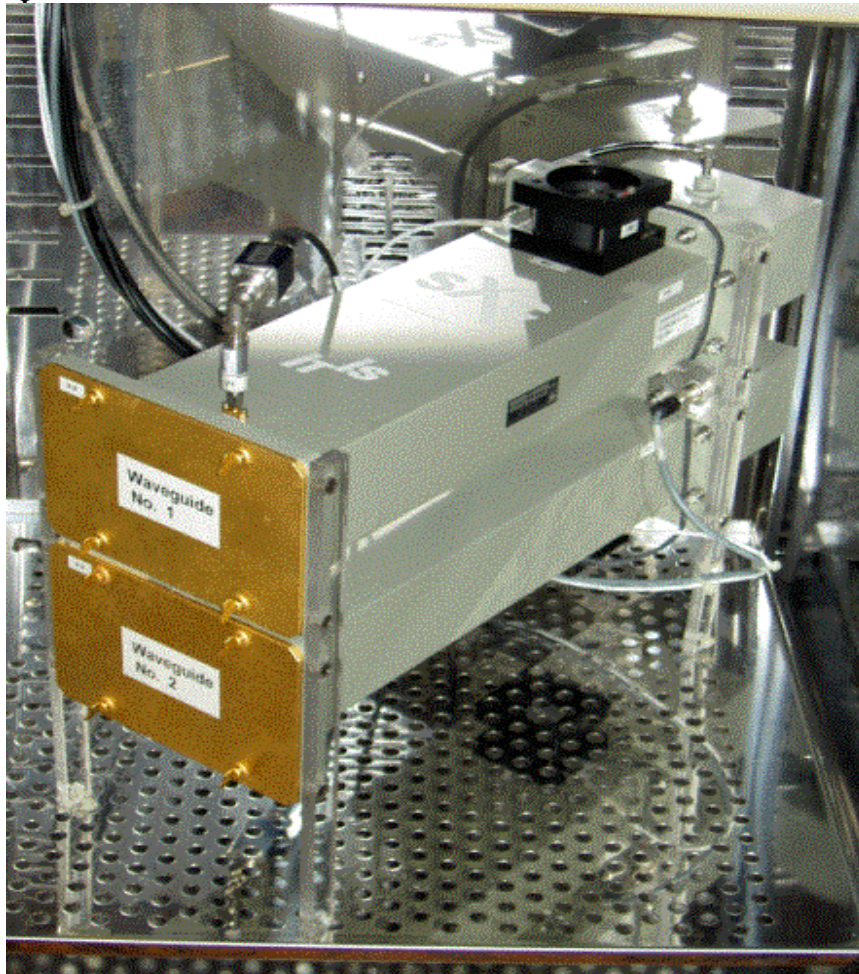
*Risk evaluation of potential environmental hazards from low energy electromagnetic field exposure using sensitive *in vitro* methods



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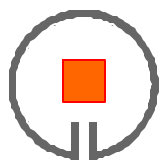
Computer controlled exposure setup (Kuster et al., IT'IS Foundation, Zurich, Switzerland.)

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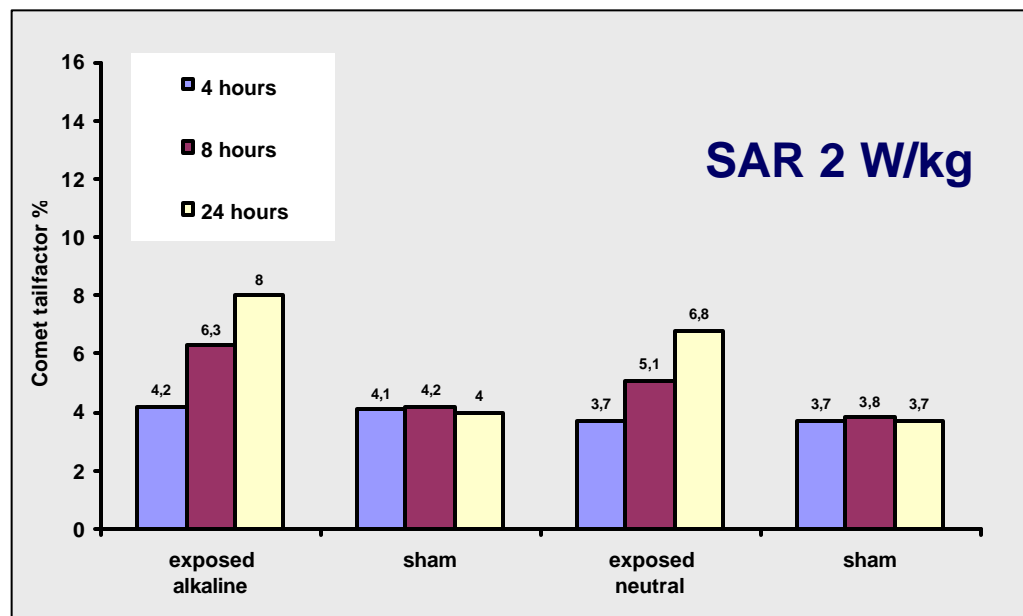
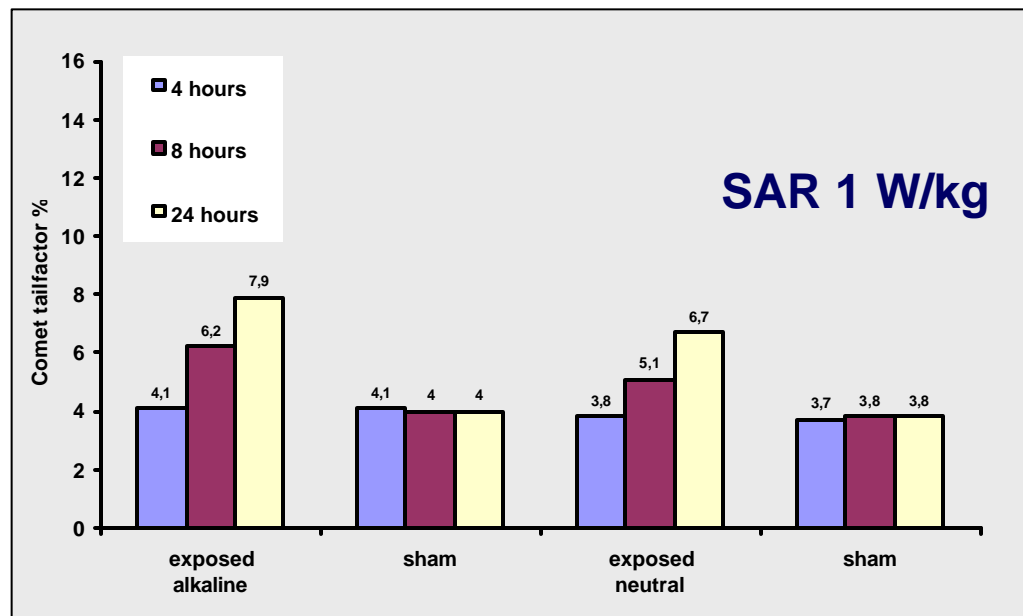


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Increase in DNA strand breaks in human fibroblasts after intermittent RF-EMF exposure for 4, 8 and 24 hours (1950 MHz, 5 min on/10 min off) at a SAR value of 1 and 2 W/kg (Rüdiger et al.).

Session 4 - 2nd June 2006



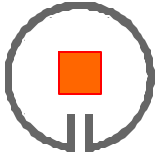
RFID Workshop

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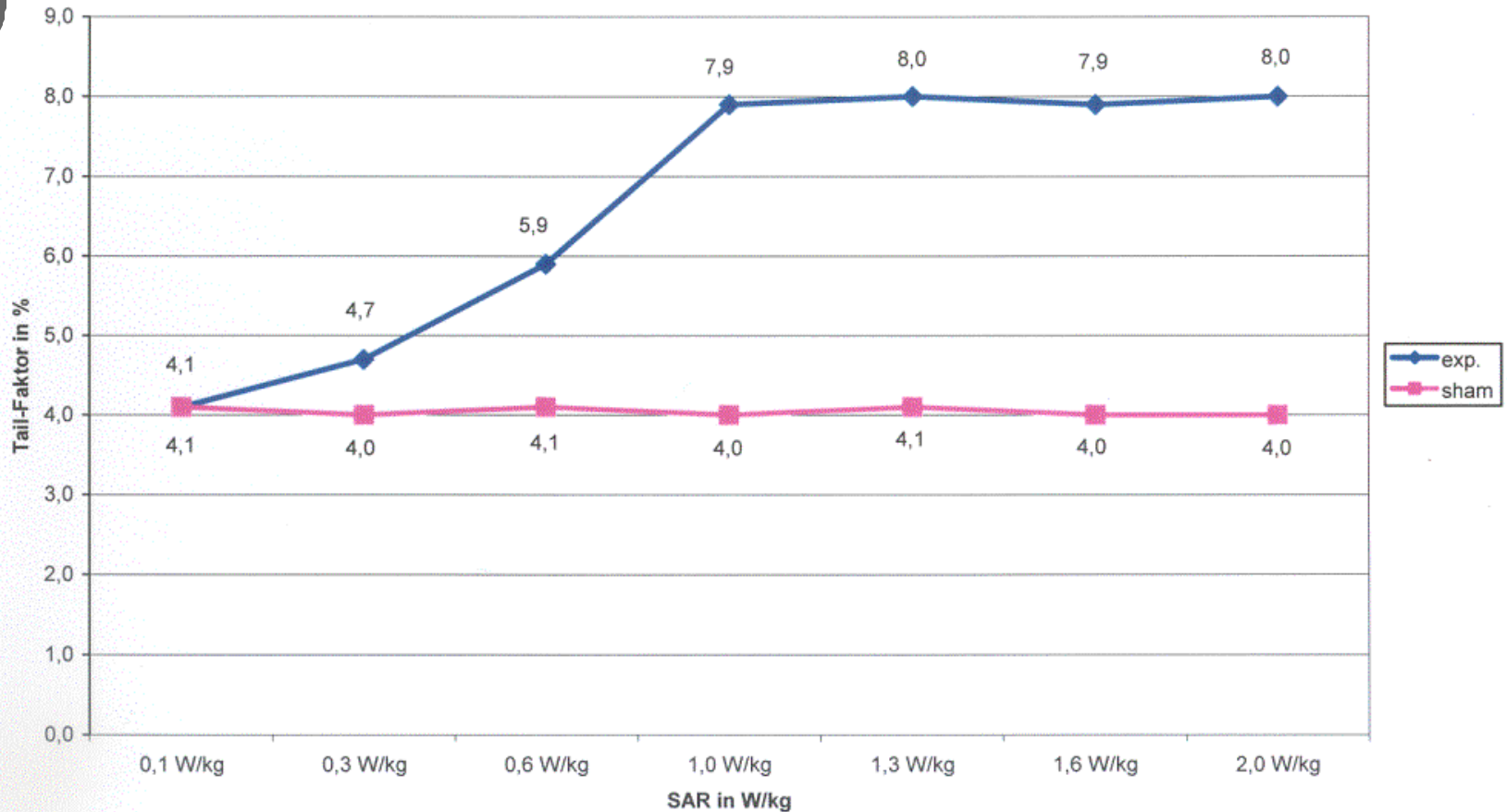


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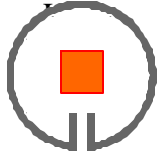
Increase in DNA strand breaks in human fibroblasts after intermittent RF-EMF exposure (1950 MHz, 5 min on/10 min off, 24 hrs) at increasing SAR values (0 – 2 W/kg) (Rüdiger et al.).



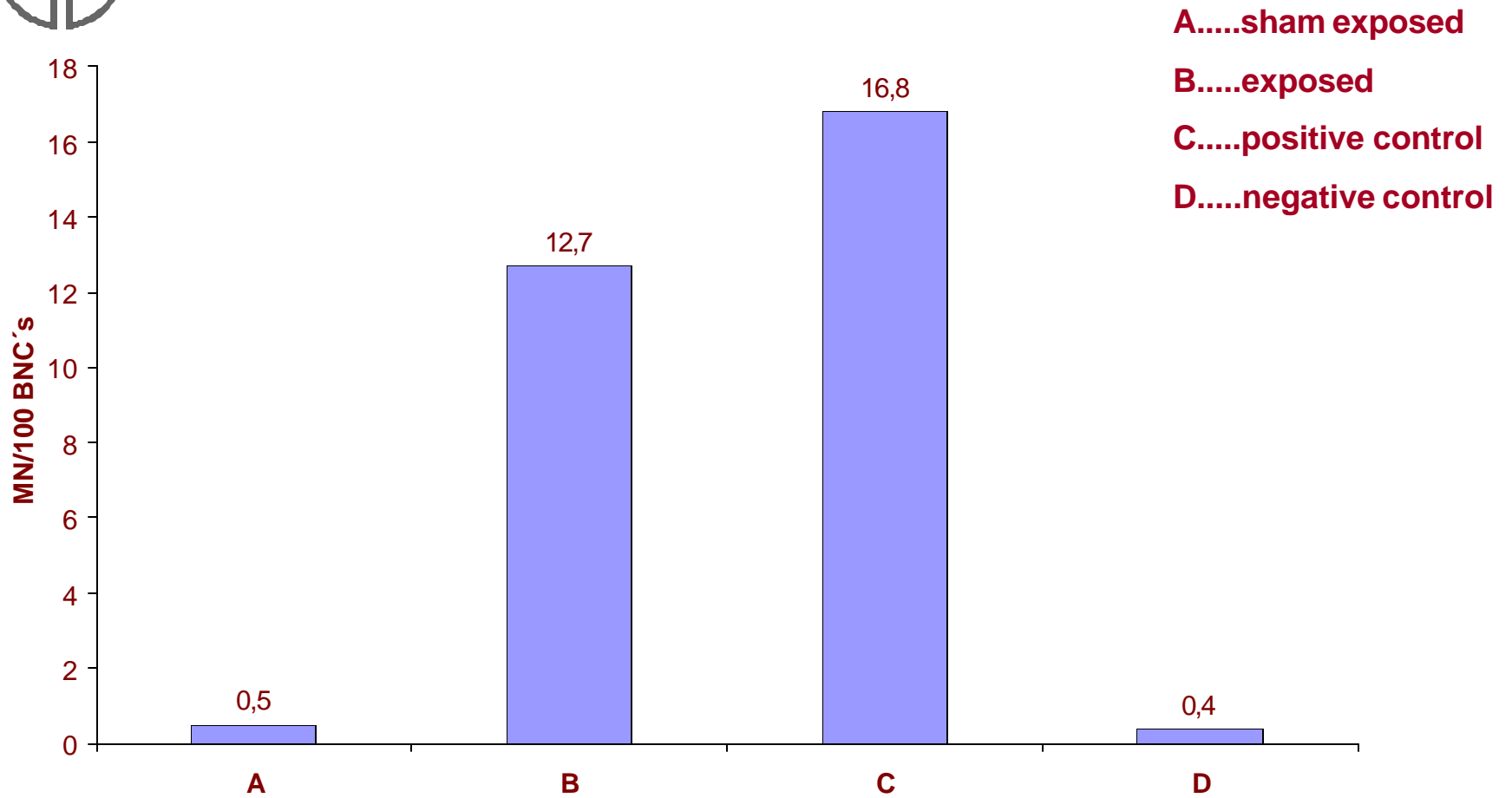


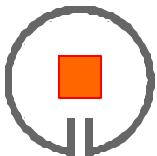
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Increase in micronuclei in human fibroblasts after intermittent RF-EMF exposure (1950 MHz, 5 min on/10 min off, 24 hrs) at a SAR value of 2 W/kg (Rüdiger et al.).





Increase in chromosomal aberrations in human fibroblasts after RF-EMF exposure (1950 MHz, 5 min on/10 min off, 2 W/kg, 24 hrs) (Rüdiger et al.)

aberrations	exposed	sham
break	8.5 ± 0.7 %	1.7 ± 0.1 %
ring	---	----
DIC	4.5 ± 0.7%	---
ACF	1.5 ± 0.7 %	---

in addition to these aberrations also gaps were detected:

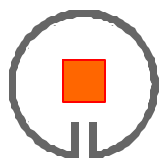
exposed: 57,5 ± 2,1% **sham: 4,8 ± 1,6%**



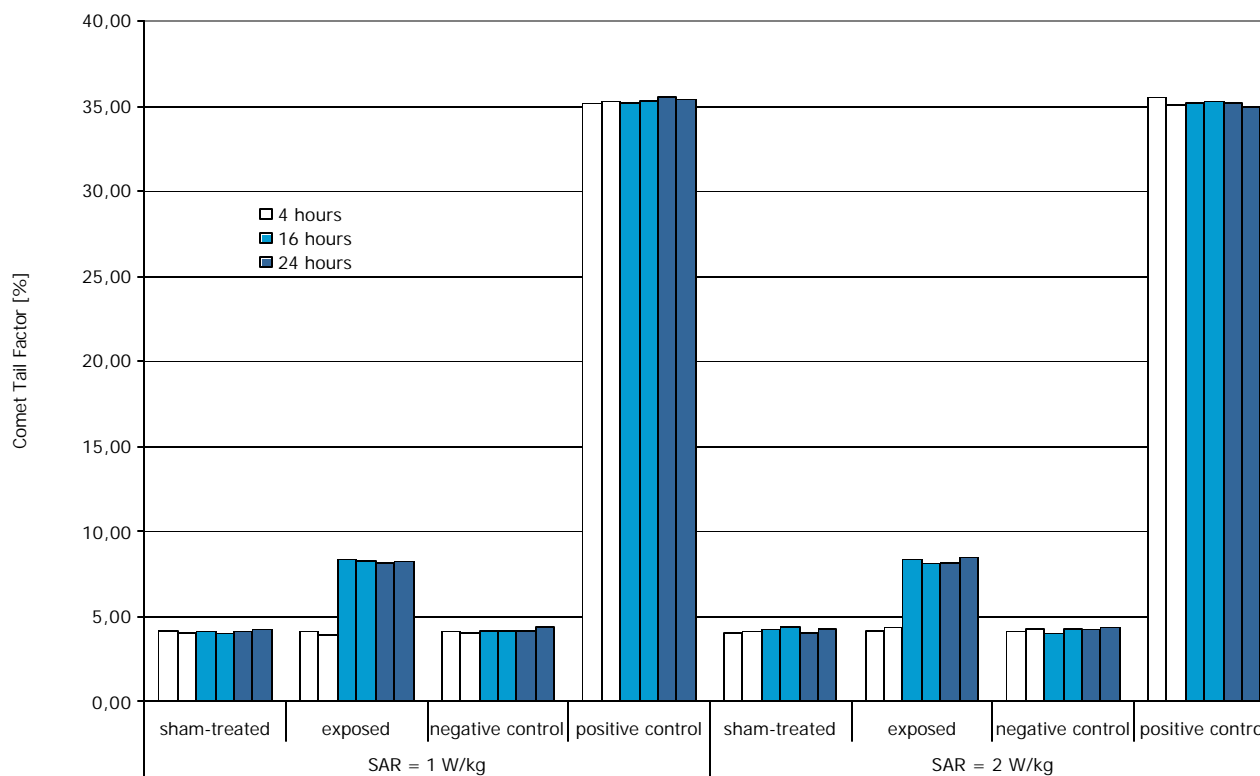
scored metaphases: 5 X 1000



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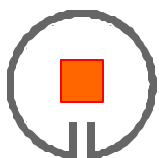


Increase in DNA strand breaks in human fibroblasts after continuous exposure to UMTS test signals for 4, 16 and 24 hours at a SAR value of 1 and 2 W/kg. Each exposure condition was tested in duplicate (Rüdiger et al.).

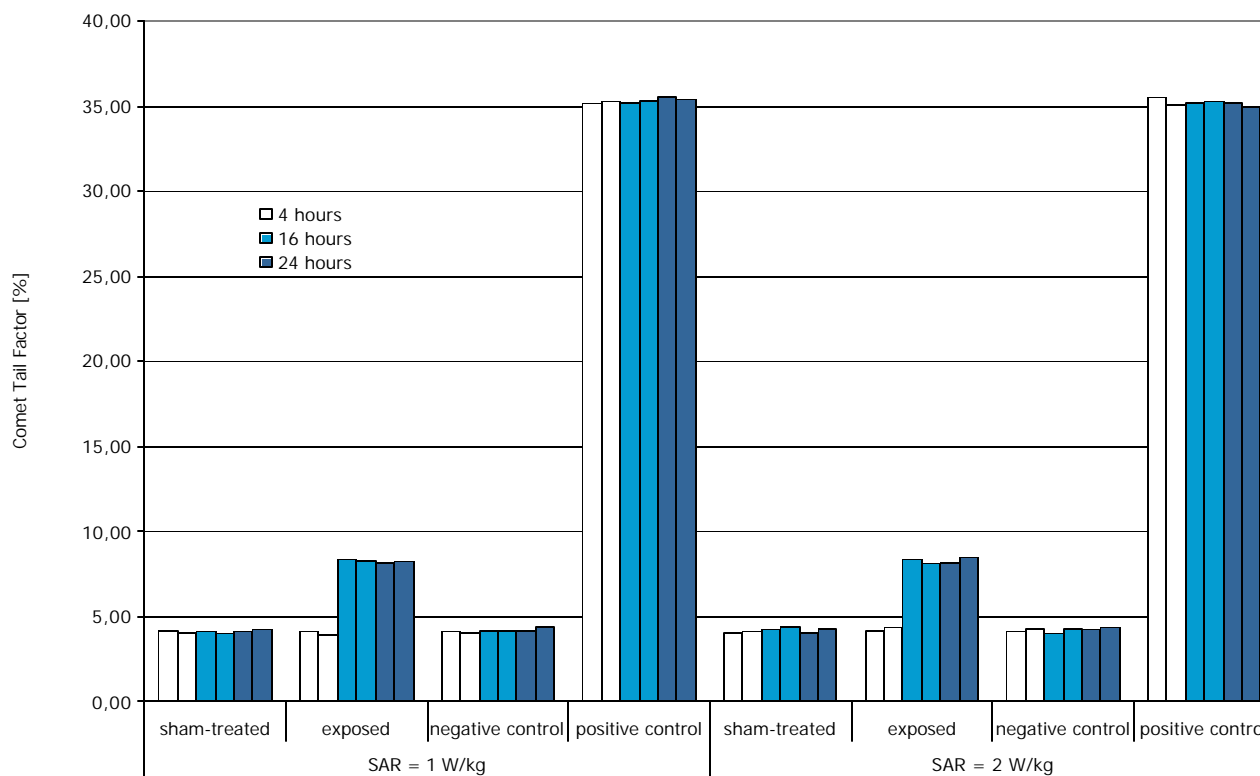


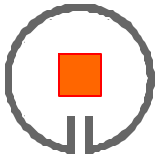


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Increase in micronuclei in human fibroblasts after continuous exposure to UMTS test signals for 4, 16 and 24 hours at a SAR value of 1 and 2 W/kg. Each exposure condition was tested in duplicate (Rüdiger et al.)



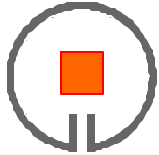


Summary

- ➔ Intermittent and to a lesser extent also continuous *in vitro* exposure of human fibroblasts to RF-EMF below the safety limit of 2 W/kg for more than 4 hours produced genotoxic effects in various cell types as measured by
 - an increase in DNA single and double strand breaks,
 - an increase in micronuclei and
 - an increase in chromosomal aberrations.
- ➔ A significant increase in DNA strand breaks was observed in human fibroblasts at a SAR value as low as 0,3 W/kg.
- ➔ Exposure of human fibroblasts to UMTS at and below the safety limit of 2 W/kg resulted in an increase in the rate of DNA strand breaks and micronuclei, thus suggesting a genotoxic potential of UMTS, too.



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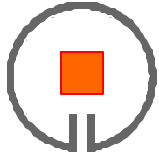


Conclusions I

- 1. From the scientific point of view, the REFLEX data do not prove a causal link between EMF exposure and any adverse health effects, but may in connection with other findings speak more in favour of than against such an assumption.**
- 2. Further research is needed a) to confirm the REFLEX results by additional laboratories, b) to extend the investigations to other EMF frequency ranges such as used e.g. for RFID, and c) to find out whether or not comparable results can be obtained in appropriate animal models and human volunteers.**



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Conclusions II

With this message it should be made clear to politicians, to health officials in governmental administrations and also to the leaders of industrial companies

- 1) that a potential risk to the health of people through EMF exposure can in no way with some certainty be excluded at present,**
- 2) that help to escape the existing dilemma can only be expected from scientific research,**
- 3) that it is their responsibility to provide the necessary financial means, so that science can do what has to be done, and**
- 3) that the acceptance of the pre-cautionary principle at least in its softest form, especially for children, is certainly justified already now.**