

## A Summary

# Exposure Limits: The underestimation of absorbed cellphone radiation, especially in children

This paper describes how cellphones are certified to meet the Federal Communications Commission's (FCC) exposure limit for the maximum amount of microwave cellphone radiation that will be absorbed in the head or other parts of the body of a cellphone user. The only trouble is that the *industry-designed* certification process so under-estimates the actual absorption of cellphone radiation that *all* cellphone users who keep their cellphone in their pockets absorb cellphone radiation above the FCC exposure limit. Further, even if not kept in pockets, when held next to the head, 97% of the population will exceed the certified level of absorbed radiation, and even more so for children who will absorb more than two times the certified cellphone radiation.

That's the bad news. The good news is that this paper describes an alternative FCC approved process already used extensively within the Food and Drug Administration (FDA). The alternative process uses MRI-scans of a set of real human beings to determine the amount of radiation absorbed in every tissue. It is called, the "Virtual Family" and includes a 5-year old girl, a 6-year old boy, an 8-year old girl, an 11-year old girl, a 14-year old boy, a 26-year old female, a 35-year old male, an obese male adult and 3 pregnant women at 3<sup>rd</sup>, 7<sup>th</sup> and 9<sup>th</sup> months of gestation, allowing for appropriate cellphone certifications for the most vulnerable cellphone users.

In contrast, the existing cellphone certification process uses a plastic mannequin head, SAM,<sup>1</sup> of a very large man with a liquid inside the mannequin which assumes all tissues in the head are identical. A robot positions a sensor within the liquid and calculates the maximum Specific Absorption Rate (SAR)<sup>2</sup> with a tolerance of  $\pm 30\%$ . The FCC exposure limit is SAR=1.6 Watts per kilogram of tissue (1.6 W/kg). Because of the wide tolerance range, SAR values can be as large as 2.08 W/kg, 30% higher than FCC exposure limit.

The paper provides a history of how exposure limits have been developed over several decades and continues with an exposition of chronic cellphone health effects (humans, animals and human cells) reported in science papers. It then describes the two FCC-approved processes for cellphone certification: the existing cellphone process (exclusively used) and the MRI-based computer simulation

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<sup>1</sup> SAM, Specific Anthropomorphic Mannequin

<sup>2</sup> SAR is the amount of cellphone radiation power (Watts) absorbed per unit weight of tissue (kilogram).

process (never used for certification). Next it compares the efficacy of the two processes.

The paper explains in detail that the existing exposure limit process is so far from the original intent that we can only wonder what happened! Here are some examples:

1. The intent of the ANSI standard was to protect everyone, “from small infant to large adult,” but the FCC exposure limit only protects large adult males.
2. There has been no change in the standard since 1991. Sadly, the 1991 standard allowed for a 5-fold higher exposure for workers “as a concomitant of [their] employment,” while pretending to increase the “safety” factor for the general public. However, this change allowed for the general public to be exposed 5-times longer than workers, thus nullifying any difference between workers and the general public.
3. The original intent of the exposure limit was to protect those with “greater sensitivity (infants, the aged, the ill, and disabled), [from] greater exposures (24 hr/day vs. 8 hr/day . . . [and] voluntary vs. involuntary exposures.” Today, this is totally ignored. Everyone is exposed involuntarily 24/7, including infants and even fetuses in the womb.
4. The current cellphone certification process was designed by industry. A single cellphone is brought to a certification facility with no knowledge how this particular cellphone was chosen (randomly, or selected from many because its radiation levels were lower). Though millions of “certified” cellphones may be sold, no further testing is ever done! Is this enforcement of the regulation, or is it turning a blind eye to enforcement?
5. In those countries that use the ICNIRP exposure guidelines, there is no oversight to protect the citizens whatsoever. For example, the UK’s Health Protection Agency makes this very clear when it states, “There is no explicit UK legislation that limits people’s exposure.”
6. It is clear that sperm is being damaged by cellphones when men keep cellphones in trouser pockets, but no warnings have been given to the public about this quite common practice.
7. The higher risk to children is clear: Children absorb twice that cellphone radiation to the heads, up to triple in the their brain’s hippocampus and hypothalamus, greater absorption in their eyes, and as much as 10-times more in their bone marrow when compared to adults.

The paper concludes:

- Because the SAM-based cellphone certification process substantially underestimates the SAR for 97% of the population, especially for children, the SAM-based certification process should be *discontinued forthwith*.
- An alternative FDTD computer simulation cellphone certification process is immediately available and provides 3-orders of magnitude higher resolution than the SAM-based system for the head.
- The anatomically based “Virtual Family” includes sensitive groups such as small children, pregnant women and the fetus.
- Advisories found in cellphone manuals violate the FCC compliance guidelines, because they do not take into account customary use of phones in pockets and held directly next to the head.
- The SAM-based cellphone certification process is unable to address exposure to sensitive tissues such as the testes or the eyes, while the FDTD method can address exposures to such sensitive tissues.
- Because billions of young children and adults with heads smaller than SAM are now using cellphones extensively, and because they absorb proportionally greater cellphone radiation, *it is essential and urgent* that governments around the world revise approaches to setting standards for cellphone radiation, to include sufficient protection of children.
- Cellphones for which SAR values were certified prior to June 2001 were not required to be replicatable between different certification facilities, and therefore a cellphone’s certified SAR level cannot be trusted if certified prior to June 2001.