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Safety Advice for Electromagnetic Fields (PDF)
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Health Precautions Science

The Specific Absorption Rating Standard

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What is the SAR?

For mobile phones, the safety standard in the USA is based, not on power density, but on the Specific Absorption Rating (SAR) measurement. The SAR measurement is a very complex system based on thermal effects only. It is based on the concept that radiofrequency energy, in **milli-Watts**, is absorbed within **grams** of biological tissues.

Concerns Regarding the SAR standard

Unrealistic Human Model

Manufacturers themselves provide the SAR ratings, but their assumption does not necessarily fit the average human, but rather someone of height 6 foot 2, weighing over 200 pounds, with an 11 pound head. In practice, however, different SAR ratings may be measured for an adult versus a child, and depending upon the part of the body that is being measured. For more information, read Devra Davis, *Disconnect:The Truth About Cell Phone Radiation, What the Industry Has Done to Hide It, and How to Protect Your Family*.

Averaging Out the Hot Spots Over Space and Time

Manufacturer measurements may assume a homogenous laboratory model, which does not account for energy absorption "hot spots". Furthermore, they may conduct their measurements at different distances from the head/body.

Because SAR measures absorption over 1 gram of tissue (or 10 grams in Europe), this may effectively average out hot spots. Additionally, because of the pulsed nature of the signals, the average power can remain low whereas the individual bursts are very high.

Addressing only Thermal Effects

The other flaw in the SAR standard is its focus on thermal effects only. For more information on non-thermal effects, read the **Science Overview**. With respect to call duration, Robert C. Kane notes that most of the temperature rise due to the energy absorption occurs in the first 60-90 seconds of exposure. Hence, if energy absorption were the major concern, then a short call would have to be defined as being less than a minute (Kane, 12).

Lack of Strict Guidelines on How SAR is measured

According to Devra Davis, a phone's SAR rating can be off by a factor of 2 to 4, due to differences in measurement by manufacturers, which may test the radiation at different distances from the body/head. Hence, the SAR rating is not the most reliable way to measure a phone. In fact, Devra Davis points out that some of the newer smart phones come with warnings to keep the phone a distance from the body.

Where did we get our SAR standard?

For mobile phones, the SAR standard is **1.6 W/kg** for the general public, for the partial body limit. This standard is based on behavioral disturbances observed in monkeys at 4 W/kg.

The Environmental Protection Agency (EPA), however, has noted data showing evidence for biological effects at a SAR of 1W/kg, indicating that our current standard is not protective enough. Other independent scientists have found evidence of harmful effects at even lower SAR's. For example, harmful effects are seen in rat brains after only 2 hours at **0.2 W/kg**. To give you an idea of how high 1.6 W/kg is, note that the SAR can already reach 0.001 W/kg at 150-200 meters from a mobile phone mast (cell tower), and health effects have been observed up to 300-400 meters or more from a cell tower. See **Table of Effects by Power**.

Choosing a Phone by SAR ratings?

Choosing a phone by SAR is most likely to give people a false sense of security that their phone is safer. The RNCNIRP 2011 states that "The Specific Absorption Rate (SAR) used for declaration of a mobile phone safety, equal to 2 W/kg averaged over ten grams of brain tissue, in the opinion of the RNCNIRP, cannot be viewed as sufficiently scientifically grounded in this case, and its use does not guarantee protection of childhood and juvenile health."

The following considerations could turn out to be more important factors than the SAR rating:

UMTS vs. GSM vs. CDMA

Franz Adlkofer says his lab found 10 times the rate of broken DNA with new 3G phones (UMTS system) compared to GSM, as reported in the *International Archives of Occupational and Environmental Health, 2008*. Other studies suggest that GSM may be more dangerous than CDMA in the tested phone models. However, these studies are not completely independent, and further independent research would be needed to confirm and clarify these findings. Newer technologies are also being developed such as 4G, so these previous studies may quickly become outdated.

Continuous pulse waves

The Council of Europe raised concerns on "continuous pulse waves" which may be more dangerous than non-pulsed waves.

Smart Phones vs. Old-fashioned Phones: Duration of Signals

Perhaps another more important consideration is how frequently a phone is sending signals when one is not actively on a call. Many smart phones (e.g., iPhone, Blackbery, Android), depending upon one's service subscriptions and configured options, may be constantly "connected", continually "polling" the network for new e-mails or instant messages. Hence, just leaving a smart phone with internet/data mode enabled can constitute heavy usage.

Old-fashioned phones tend not to be constantly "connected" when one is not on a call, and may send a "hello" signal on the order of once an hour or once a half-hour. In contrast, some smart phones are sending signals at least once a minute or every few minutes, even when one is not on a call.

Further Reading

- **Mercola** on FCC's recommendation for precaution and on the limitations of the SAR rating system
- Devra Davis, *Disconnect:The Truth About Cell Phone Radiation, What the Industry Has Done to Hide It, and How to Protect Your Family*.
- Robert C. Kane, *Cellular Telephone Russian Roulette: A Historical and Scientific Perspectivie*
- Check the following **Table of Effects** to see the SAR levels at which various effects have been reported (table #2).

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