



SAR Measurement Conservativeness & Separation Distance

The SAR value¹ is a time-averaged measure of the amount of RF power absorbed by body tissue when using a mobile or wireless device. The SAR limits in many countries are based on guidelines developed by the International Commission on Non-Ionizing Radiation Protection (ICNIRP)² or standards of the Institute of Electrical and Electronics Engineers (IEEE)³ both of which incorporate significant reduction factors in limit values to account for any uncertainties and provide an additional safety margin. To demonstrate compliance with these limits, devices are tested under laboratory conditions according to international measurement standards⁴, which prescribe the testing positions and all operational characteristics of the device, including testing using the maximum possible transmit power.

As a result of the conservativeness of the measurement standards, SAR values reported for each model significantly overstate real-life exposure levels. In reality, devices operate at significantly lower power levels, constantly adapting to use the minimum transmit time and power required to make and maintain a connection to maximize battery life and efficiency. Additionally, many current devices utilize proximity sensors that cap the maximum transmit power when it detects the device is close to the user's body. Several studies of mobile phones in everyday use around the world have shown that phones typically operate at a very small fraction of the phone's maximum power output^{5,6,7}.

While this is the case, some stakeholders have called for testing in the body-worn position at zero separation distance based on a highly unrealistic assumption that a device could transmit indefinitely at maximum power, under the worst signal conditions and while being hard pressed or immovable against the user's body. This reduces the small distance used today that reflects the presence of clothing, phone covers, etc. and is an additional level of conservativeness that fails to take account of real-life exposure conditions. The continued failure to take account of the documented, realistic transmit power of devices among other elements, as part of reasonably foreseeable conditions of use, as required by the European Union's Radio Equipment Directive, is disappointing.

The industry actively participates in the international standards-setting process and has contributed much in the way of research to initiate, develop and enhance appropriate standards across various areas. We also recognize that we are just one voice and that standards are developed based on the views of many striving to reach a consensus. As such, while we will continue to advocate for SAR testing to reflect all reasonably foreseeable conditions, we will also adhere to the final protocols that are derived as a result of the consensus and science-based international standards-setting process.

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¹ SAR stands for Specific Absorption Rate (SAR). Detailed information on SAR can be found at <http://www.sartick.com>

² ICNIRP Guidelines For limiting exposure to electromagnetic fields (100 kHz - 300 GHz) *Health Physics* 118(5): 483–524; 2020 <https://www.icnirp.org/cms/upload/publications/ICNIRPrfgdl2020.pdf>

³ IEEE Std C95.1™-2019 "IEEE Standard for Safety Levels With Respect to Human Exposure to Electric, Magnetic, and Electromagnetic Fields, 0 Hz to 300 GHz" <https://ieeexplore.ieee.org/document/8859679>

⁴ SAR compliance testing of mobile phones is carried out using the standardized protocol described in IEEE/IEC 62209-1528:2020, which is part of the safety standards being reviewed every few years to ensure that they remain relevant in face of new technological developments. The International Electrotechnical Commission (IEC) is the world's leading organization that develops and publishes international standards for all electrical, electronics and related technologies. The IEC standards are developed by nominated experts of national committees - from research labs, governmental agencies, academia, industry, commerce, and consumer groups. IEEE is the world's largest technical professional organization dedicated to advancing technology for the benefit of humanity. This dual logo standard was developed by members from both IEEE and IEC.

⁵ P. Joshi, D. Colombi, B. Thors, L. E. Larsson and C. Törnevik, "Output Power Levels of 4G User Equipment and Implications on Realistic RF EMF Exposure Assessments," in *IEEE Access*, vol. 5, no., pp. 4545-4550, 2017. doi: 10.1109/ACCESS.2017.2682422

⁶ Persson et al., Output power distributions of terminals in a 3G mobile communication network. *Bioelectromagnetics* 33: 320 - 325, 2012

⁷ Dragan Jovanovic et al, Mobile telephones: A comparison of radiated power between 3G VoIP calls and 3G VoCS calls, *Journal of Exposure Science and Environmental Epidemiology* 25: 80–83, 2015