

# 5G - Evolution of the Smartphone



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## Opinion

The mobile communications had started in the late 1980s with bulky devices that quickly became popular and further public demand and industry interest led to transfer of bulky telephone to small device and later to smart phone. Today smartphones are portable, powerful computers which are “on” immediately after the battery is installed. The unit is “on” 24/7 receiving and emitting information, data, images. For less than 10 years smartphones change the way of communications between individuals in their everyday and business use. They became universal controller of household and business facilities. Even new term was created IoT (Internet of Things), bringing the business people, retiree and even small children in this miracle world of wireless communication.

It is clear now that the future of the mobile communications belongs to the smart phones and their future developments. If in the 2015 there were 3.5 billion subscribers, and for 2022 the prediction is for 6.8 billion. It is expected that the data used by single smartphone will rise 8 times up to 1 GB/month [1]. To handle this increase of the mobile data network providers offer 2G, 3G, 4G and coming 5G generations which elevate the carrier frequency bands. Not going into technicality, I should point that peak to average power ratio will exceed 4.5 dB and will be introduced new power standard that elevate output power to 26 dBm to overcome the greater losses at high frequency bands. Thermal performance becomes critical at this higher power and the dissipating of the additional heat becomes very important [1]. So far the industry does not speak to which extent this technical issue potentially will elevate biological importance and hazard.

During the years of development of wireless broadband technology the manufacturers were able to upgrade and adapt to necessary changes in their products. Today, the situation is different – the problem is not to upgrade – any new generation is basically new technology, especially 5G is a step deep in the millimeter range of electromagnetic spectrum. In addition to the new frequency range, the distribution of the signal requires a large number of antenna elements which need to be integrated into advanced device packaging. It is clear now that the standards for 5G are not yet available. Therefore – it is another jump in

developing technology which will lead the entire biosphere and civilization to be exposed to new levels of electromagnetic pollution which are not defined, for which has no standard and methods of control. Like entire development of wireless communication, the industry is pushing to first develop mobile devices and networks and further developed the standards [2].

## We Had Been On this Avenue for About A Quarter of Century. Didn't We Learn Something?

The industry is pushing for development of controversial legislation to expedite the distribution of this new technology. It is related to the fact that local governments and private citizens can not oppose the dense installations of antennas (at every 20 houses in urban area). As result, the potential health risk for population is ignored. Since the distribution of millimeter waves is blocked by buildings and even walls, it may happened that at any school or office building several transmitters will need to be placed in each floor of the building.

The FCC (Federal communication commission in USA) in 1996 introduced a limit for thermal effects from EMF of 1.5 to 100 GHz to be 1 mW/cm<sup>2</sup> for 30 min use. This limit was set 20 years ago and is related only to thermal effects. The engineering community up today continue claiming that nonthermal effects of EMF do not exist. This statement is absolutely incorrect and negate hundreds of publications reporting nonthermal effects of EMF. I would emphasize here that most of reports of effects of millimeter waves have reported short term exposure while practically there is no information about long term exposure.

The attempt of more than 200 scientists with experience in evaluation of the hazard of wireless communications demonstrates that scientific assessment of the development of this new way of communication learned from past experience.

## References

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