# Can 5G cause cancer?

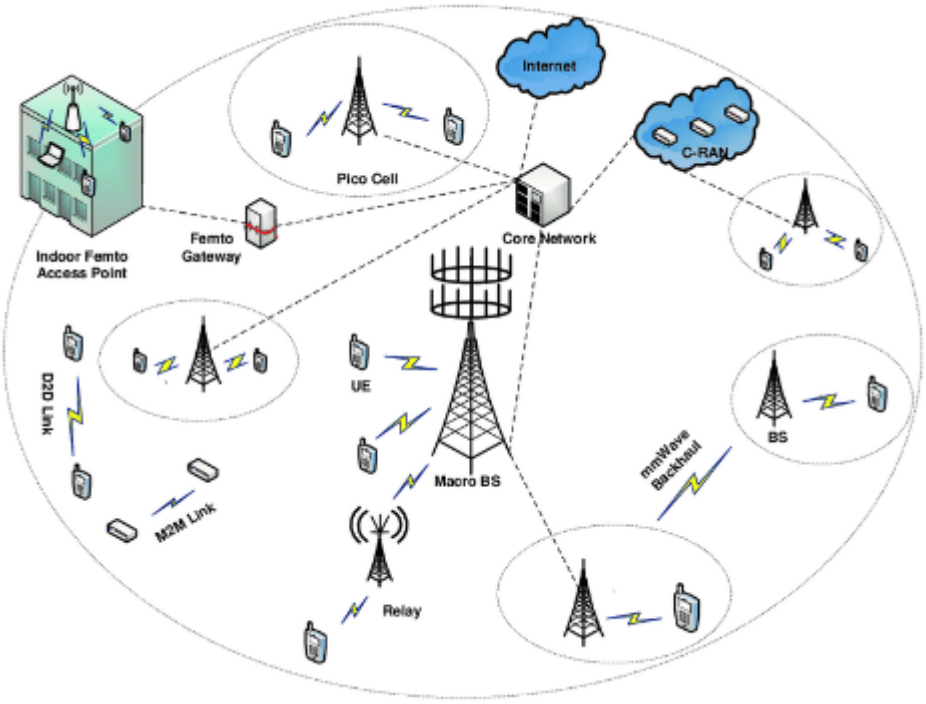
Very often friends or various people I come into contact with ask me the question „can this 5G network really be dangerous?”. Below is one of my old studies on the subject.

The introduction of the 5G network was launched in July 2016 from then on many providers around the world started to deploy the 5G network in their infrastructure. It is a network that, among those who are not familiar with the topic, causes concern as if it is dangerous to life and health in this post I will try to dispel this myth.

Let's start with the parameters of this network compared to 4G:

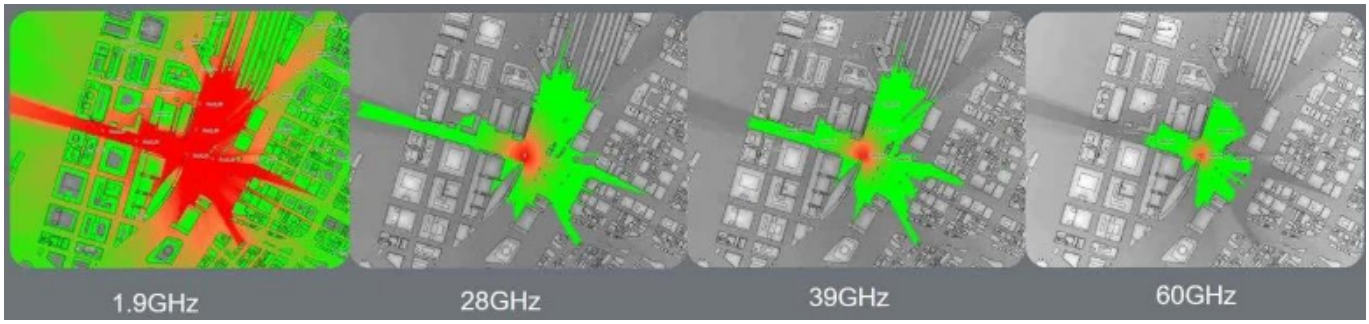
- The 4G/LTE network is used on frequencies from 700 to 3600 MHz, while in Poland the highest used band is 2600 MHz. In the case of the 5G network, it is even possible to use frequencies up to 26GHz. The connection can be used by many more users at the same time.
- The maximum theoretical speed of 4G is 300Mbps, but in practice it may be lower due to various interferences, e.g. dense buildings, unfavourable terrain or a large number of users. The average actual download speed for internet in the 4G network in Poland is 20-30 Mbps and upload 10-15 Mbps.
- The 5G network will make it possible to achieve much higher bandwidths than 4G. It already allows download speeds of 600 Mbps and this should increase to 20Gbps in the future.
- 5G also makes it possible to reduce transmission delays. In 4G, ping averaged 30-40ms. In 5G, the ping is 1-4ms.

## 5G infrastructure




As can be seen in the illustration, the 5G network is not oriented towards simplicity of design, it is instead focused on modularity and short distances between end devices and infrastructure. The diagram shows that for buildings, so-called femtocells - the smallest possible cell type in a 5G network - are envisaged, allowing only one building or floor to be covered by a 5G network. The diagram also shows that a 5G network requires relays (Relays) in its network that feed data to the Macro base station and then it is fed into the core of the network and then through some kind of gateway to the Internet. We can also see that the 5G network will allow for D2D (device-to-device) or M2M (machine-to-machine) connections. The 5G network was also supposed to support the C-RAN solution, a centralised network for managing 2G, 3G, 4G and 5G networks, which was based on the cloud, but American companies had some problems with patenting the solution, which makes it difficult to say whether it has come to fruition. As we can see, the femtocell also requires its own gateway to 5G networks.

## 5G frequency



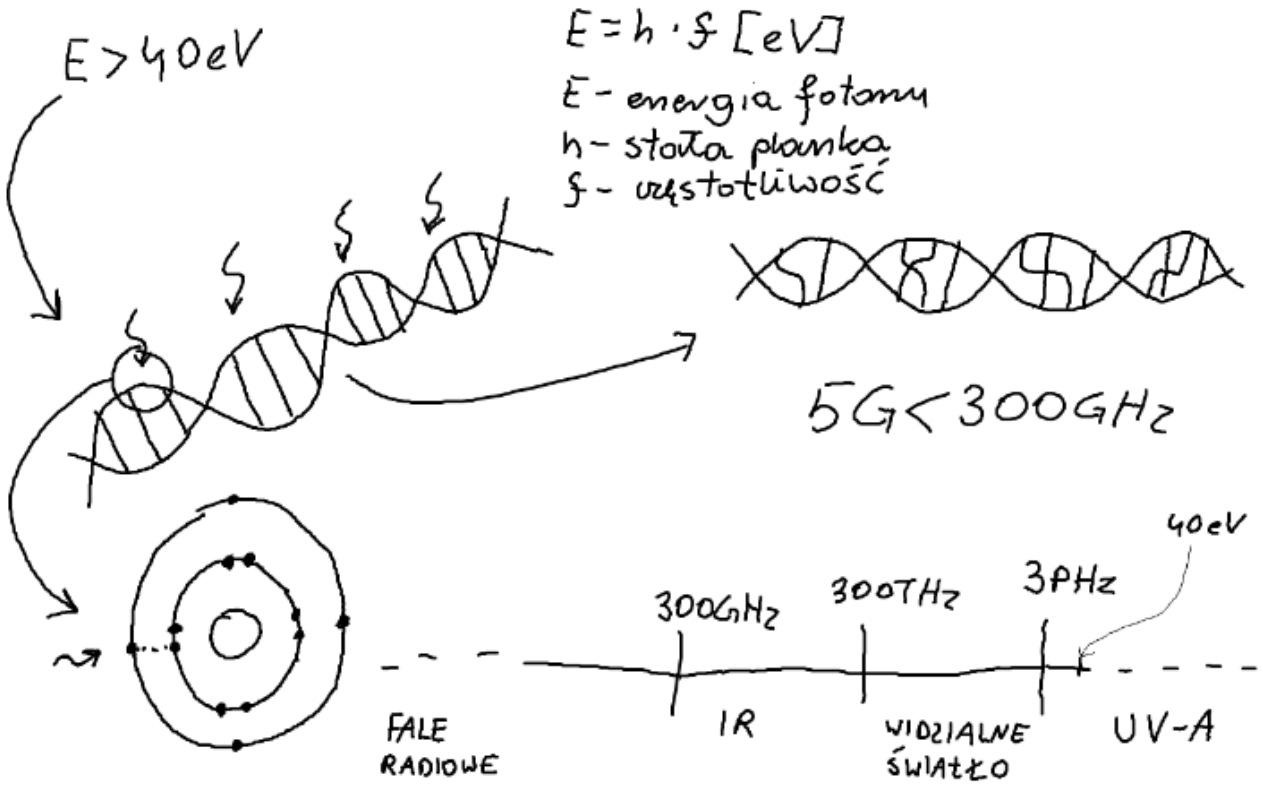

In the diagram we have radio waves described on a city plan, as we can see as the frequency increases the propagation of our wave decreases. Let's try to consider two variants where we have an isotropic antenna transmitting two frequencies 2GHz and 60 GHz let's calculate the signal drop 10 metres from these antennas in a vacuum. For this I used an online calculator to calculate the signal drop over a specific distance and the results are as follows.

- The signal from the 2GHz antenna dropped by 58.5 dB after 10 metres.
- The signal from the 60Ghz antenna dropped by 88.0 dB after 10 metres.

Conclusion: a 5G network requires much more frequently deployed transmitters which coincides with the analysis in the previous section (see 5G infrastructure)

## Features of 5G

In this section, we will dispel the common myth that 5G can cause cancer and the virus mutations that caused the COVID-19 pandemic. In the infographic below, I have outlined the principle of cancer cell formation in the human body




Photons have a certain energy described by the formula E=h•f, in order for cancer to form in our body it is necessary for the photons to collide with the vital atoms and, more specifically, with the electrons on the valence shells of the atoms in order for the entries in the DNA to change, it must happen ideally in such places for the cell to switch off the „self-destruction” system, divert resources in its direction, switch off detection by the immune system and switch on rapid division. If all of these mutations arise in the DNA then we can talk about a cancer cell, the chance of such a mutation arising is negligible but if we count all the radiation bombarding us from space and all the X-rays or plane flights we have had then the probability rises to relatively high numbers. 5G does not cause cancer because the frequency of the photons emitted by 5G antennas is too low for the energy of a single photon to exceed the threshold at which it will be able to knock electrons off the valence shells of atoms in DNA causing mutations.