

UMTS and Radio Frequency Radiation

by Paul C. Eijkemans

Mobile phones produce radio frequency (RF) radiation, that's a fact. But the scientists do not agree with one another in which degree this radiation is damaging to the user's health. It is for this reason that American and European governmental organizations try to come up with a uniform set of rules, such as the European ES 59005 document, but in general these documents fail to go beyond the aspect of tissue heating generated by RF radiation. Other possible impacts on our body, that mainly functions on electromagnetic processes such as heart beat and brain activity, are neglected and will take years of careful research to draw a well founded conclusion. But rather than starting an endless discussion here whether the RF radiation produced by mobile phones is a health risk or not, I would like to focus on the public awareness of the possible health risks. What can be done without much scientific hassle is informing the public on the amount of radiation that is produced by a mobile phone and have people decide for themselves whether they want to buy a certain mobile phone. Probably prompted by possible future claims the Cellular Telecommunications Industry Association (CTIA) in the USA recently issued a decree that orders manufacturers of mobile phones to indicate on the package how much radiation is produced by the phone. The European manufacturers have volunteered to also make this Specific Absorption Rate (SAR), that determines the amount of energy produced per unit of body weight, available to the public. Probably the amount of RF radiation will become another part of the marketing mix in the future, just as size, colour and other features are at this moment.

But it is not only the cellular phones that produce RF radiation. Within a mobile phone network the antenna that is hosted by the Base Station Transceiver (BST) transmits with a far greater power than the about one watt produced by the mobile phones you can buy in the shops nowadays. It is for this reason that in most countries the same rules for radar systems such as on ships apply to mobile network antenna's. But what about those antenna's that are put on apartment buildings, just over the heads of those that live on the top floor? Fortunate for these people the antenna's mainly have a horizontal radiation pattern in which little radiation is produced above and beneath the antenna. Nevertheless, those that live near these sites are expressing their concern over the possible effect of RF radiation on their health and municipal and other local governments are hesitant to issue permits for building the antenna sites in highly populated areas. And this is becoming more and more of a problem to the network operators since highly populated areas are just the areas where antenna's are needed to replenish the already congested networks. Therefore the discussion of placing antenna's on apartment building goes beyond the esthetic question that has already been answered by disguising antenna's as trees or building antenna's in neon signs.

At the same time most European governments are cashing billions of euro's by auctioning or just selling the frequencies at which the Universal Mobile Telecommunications System (UMTS) operates. UMTS is the umbrella name of new broadband wireless communication technologies that will enable data transfer speeds ranging from 64Kbit/s in a moving car up to 2Mbit/s when a user is stationary in-house. UMTS will require a new network and estimates are that for rolling out a third generation UMTS network in a

highly populated area, a network operator needs about three to four times the number of antenna's than a second generation network needs. With the public's distrust against mobile network antenna's it is questionable whether the process of building UMTS antenna sites will be as easy as it was to build the mobile networks currently in use. Which is somewhat paradoxical since UMTS mobile phones will transmit a lower amount of RF radiation than the mobile phones of first and second generation networks. But a public opinion that reads 'Antenna's are bad news' will maybe not distinguish between various technologies. How would the network operator market the UMTS phones, as being 'less damaging' for a consumer's health? This sounds quite like a cigarette that is marketed with a thicker filter. As always money will probably ease the pain of the home-owners but it also means that network operators have to dig deep into their pockets to compensate. The average costs of putting up an average BST are already about US \$175.000, depending on the size and power of the antenna, without this compensation. A side-effect could be that competing network operators will cluster together when it comes to using each others antenna sites but in the highly competitive wireless communication markets this kind of cooperative behavior will not be commonplace, unless it will be forced by law.

The costs for compensation adds to the billions of euro's or dollars that are already paid for using the air as a transport medium. On top of that, the tedious process of finding suitable sites with less demanding home-owners near will probably slow down a speedy network rollout. This will not be a problem in the early stages of UMTS when there are only a few users and network capacity will be enough to give the early adopters and innovators a reasonable data throughput. But it may become a problem when the growth in popularity of UMTS exceeds the growth in the number of antenna sites and users will not reach the data throughput levels that were promised or get no connection to the network at all. A saturated network is an operator's worst nightmare since it will not only affect the customer satisfaction of it's current users but it will also have an effect on the buying habits of potential customers. And these potential customers are definitely needed to earn back the interest on and redemption of the UMTS billions. On a larger scale it could damage the image of a whole industry since it is not only the network operators that will be affected by a large scale rejection of UMTS by the public, it will also affect all the companies that have invested in building portals and services hoping to catch their share of the UMTS goldrush.

In my opinion there is no solution to this problem. Should the network operators ask for concessions from the national governments to place antenna's wherever these antenna's are needed? The national governments will probably leave the problem to the local governments and home-owners, afraid of possible claims if they force an antenna roll out program onto the public. These local governments and home-owners will in their turn demand compensation, knowing that the network operators were also willing to pay national government billions for only getting a license to use the frequencies for a period of several years. The problem of public apathy against RF radiation produced by antenna's combined with the fact that network operators paid billions for UMTS frequencies that may be difficult to exploit, gives another meaning to the term fried air.