

Mobile communication and infrastructure

Simply A1.



The next step into the mobile future

The majority of the Austrian population consider their mobile phone as essential. But do we want to be accessible everywhere? Can we always orient ourselves in a flood of information and do we still have enough time for the things that are important to us?

To us it is important that technology gives time and does not cost time. Even with new mobile technologies, it's not the technical progress that is in the foreground, but the benefits it brings to people.

We work responsibly towards a positive future in which mobile communication makes our lives easier instead of just faster.

In this brochure, you will find everything about mobile technology: how LTE/UMTS/HSDPA/HSUPA/HSPA+ work and what advantages the individual technologies can offer you.

As a technology leader, A1 keeps preparing for the future: Since 2010, we have been investing heavily in the latest mobile phone generation "4G" (4th generation) or "LTE" (Long Term Evolution).

With high data transfer speeds achievable, data services are possible in a completely new quality. And with the development of LTE Advanced, the next technological leap is becoming a reality.

Hannes Ametsreiter
CEO of A1 Telekom Austria AG

Content

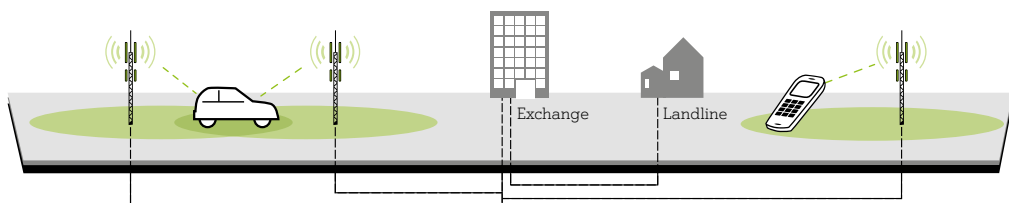
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That's how mobile phone calls work

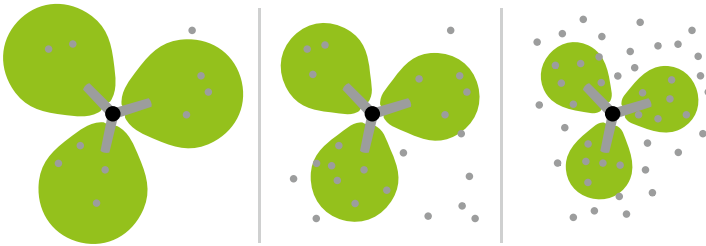
Wherever we make a call on our mobile phone, it sends weak signals to the antennas of the nearest base station, which then forwards the call. If we move, for example by car, we always leave the reception area of a base station and have to be forwarded with our conversation to the next base station. The organization of ten to a hundred of these base stations is a technically complicated task that the mobile phone exchange has to make.

If we want to make calls to a landline or to a subscriber of another mobile network, the mobile phone exchange steps in. The exchange also provides the connection between several subscribers. In order to establish a connection quickly, the information about the current location of all active mobile phones are saved by the exchange.



Network expansion

Radio waves propagate differently in the city than in the countryside. A flat landscape has different requirements to the mountains. Therefore, a functioning mobile network has to match the environment. But it is not only important to adjust the base station antennas to the terrain and buildings. The different call numbers also have a direct impact on network expansion: In the countryside, for example, fewer people make calls at the same time than in urban areas.



• Mobile phone user

The more calls that are made via UMTS base stations, the smaller the area in which a mobile phone can establish a good connection.

The nodes of the mobile network are the base stations. There are different types of base station, each with different ranges. The range for an inhouse base station is around 50 metres, 300 metres average if it is in an urban area and in rural areas it can be up to 10 kilometres.



Planning base stations

An optimum location allows an area to be supplied with the best possible mobile phone reception while keeping exposure to a minimum. Therefore, the following points are observed during planning:

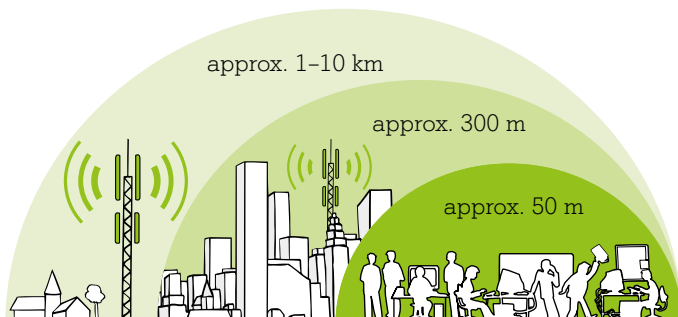
1. Base stations have to be located where people make calls

Building base stations outside of villages or towns – for example in the surrounding forests – increases the emissions of mobile phones and the base station itself due to the distance.

Overall, the emissions are higher than if the base station was in the village or town. Existing buildings, the number of customers and the terrain are of course taken into account when choosing a location.

2. The range of a base station is limited

The range of a base station depends on the number of phone calls. The more people use a base station to make calls, the lower the range. In urban areas, the range of a base station is approx. 300 metres.



These are ranges of typical base stations in built-up areas. UMTS-plants have less range than GSM-plants.

3. The transmitting power of a mobile phone is regulated automatically

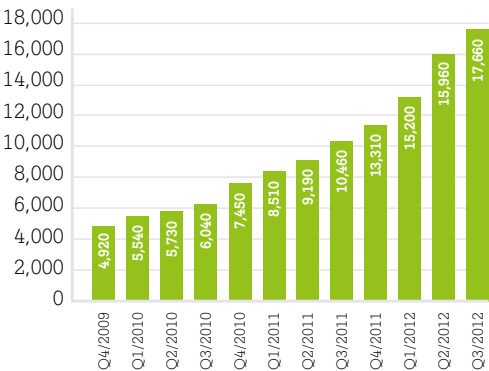
A mobile phone only transmits at the strength necessary. The better the connection between a mobile phone and a base station, the less transmitting power the phone needs. This happens using an automatic power control. Emissions are thus reduced.

Why are base stations still being built?

Mobile networks offer more possible uses today than just a few years back. It is now possible to conveniently surf the mobile internet all over Austria. This led to a rapid increase of data traffic. Thus, there are also new demands regarding the planning of the mobile network.

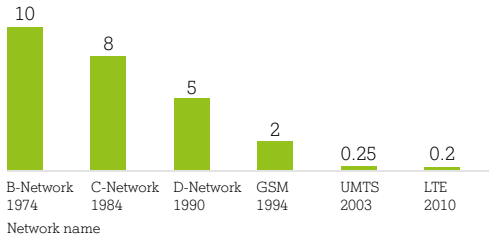
More conversations with less transmitting power – the new mobile network technologies make it possible. Due to the lower transmitting power of modern mobile phones there is a significant reduction in emissions. It is important to carefully and precisely plan the mobile network.

Volume in terabytes



Used up- and download volumes in the mobile phone end user market in terabytes; Source: RTR Telekom Monitor 01/2013

Transmitting power in watts



This is how maximum transmitting power has changed for mobile phones

Rights for neighbours during the approval procedures

The construction of base stations is handled according to statutory provisions of the Federal State. Rights for neighbours are taken into account as well as stability, regional planning and landscape protection. The approval of radio plants (e.g. engineering parameters such as frequency ranges, transmitting equipment and transmitting power) is, like health protection, subject to federal jurisdiction.

“With the authorization for the installation of a base station also comes the approval for installing transmitting equipment. ... The approval by the Telecommunication Authority to install transmitting equipment is not without limitations, but is granted in accordance with all relevant laws and also on condition of compliance with the applicable RF field exposure limits.”

Source: OFB Information Letter 1/2006 of BMVIT

Compliance with the WHO exposure limits for emissions (1:1 adopted in ÖVE/ÖNORM E 8850) is checked regularly using RF measurements; the Telecommunications Authority may also make a request for a measurement. In addition, all mobile phone providers have agreed with the Association of Municipalities to inform the population about the construction of base stations. This agreement states that the mobile phone providers have to give comprehensive information to the community about planned base stations.

How we get the best possible reception

The antennas of base stations transmit their radio waves like a lighthouse transmits light: The light has to be seen from afar. It is similar for a base station but instead of light it is radio waves. Similar to the light beam of a lighthouse, very few radio waves reach directly under the antennas of a base station.

Your safety is important to us

At A1, safety and the health of people is at the heart of what we do. We are guided by the internationally valid guidelines by the World Health Organization (WHO), adopted by ÖVE/ÖNORM E 8850, and therefore also applicable in Austria. The limits specified for base

stations are scientifically recognized and form the basis for our safety. For more information on this topic, please consult our folder "Mobile Communications and Health".

The permissible limits are expressed in watts per square metre (W/m^2). These values fall significantly below the limit values from a distance of about 2–8 metres away from the antenna.

The following exposure limit values are not exceeded:

4 W/m^2	at 800 MHz	LTE
4.5 W/m^2	at 900 MHz	GSM
9 W/m^2	at 1,800 MHz	GSM
10 W/m^2	over 2,000 MHz	UMTS, LTE

With AirToFiber into the Internet

Fiber-optic technology is essential for fast connections when mobile applications are accessing the internet. AirToFiber connects the mobile network with the largest fibre optic network in Austria, even in rural areas where more and more people use mobile internet. Currently 2.9 million Austrians use mobile internet access – mobile working is the trend.

Especially in the countryside, the number of people who use the mobile A1 network for mobile internet access has risen sharply. In the last three years all traffic in mobile networks has quadrupled.

UMTS, GSM and LTE in comparison

UMTS, GSM and LTE in comparison	GSM/EDGE (900/1,800 MHz)	UMTS/HSDPA/HSUPA/HSPA+ DC (2,000 MHz)	LTE (800/2,800 MHz)
Maximum transmitting power of the mobile phone or smartphone	2 watts	0.125–0.25 watts	0.2 watts
Transmitting power of the base station per channel	approx. 13 watts	2–30 watts, depending on the workload	2 x 40 watts
Data transmission rates (bit/s = characters per second)	up to 236.8 kbit/s	up to 7.2 Mbit/s with HSPA+ up to 21 Mbit/s with HSPA+ DC up to 42 Mbit/s	up to 150 Mbit/s

Even more speed with UMTS/HSDPA/HSUPA

HSDPA/HSUPA is a further development of UMTS-technology, increasing the efficiency of base stations. Using HSDPA and HSUPA, data is transmitted even faster than ever with up to 7.2 Mbit/s.

HSPA+ – the high speed connection into the internet

Since 2009, UMTS base stations were expanded with HSPA+ in order to transmit large data quantities. Especially in urban areas, UMTS base stations with HSPA+ reach top speeds of up to 21 Mbit/s.

The new LTE mobile network

The future of A1’s high-speed mobile network: for downloads at up to 150 Mbit/s on a laptop, tablet and smartphone.

FAQs

Why are base stations still being built?

Modern mobile networks such as UMTS and LTE are based on a better technical principle and are more efficient in the transmission of data than GSM mobile technology.

What kinds of mobile phone can I use to make calls in 3G/UMTS-mobile networks?

To use the full range of the 3G/UMTS, a corresponding mobile phone is needed. Ask what mobile phone technology is available in your area when purchasing a mobile phone. An existing UMTS network is indicated with "3G" displayed on the mobile phone's screen.

Does UMTS transmit a stronger signal?

No! With 0.125 to 0.25 watts, the maximum transmitting power of a mobile phone is far less than that of a GSM mobile phone with 1 – 2 watts.

There are already two networks – why is there now another with the LTE mobile network?

LTE is based on a better technical principle than any previous mobile technologies. Many social media applications and apps on the smart-phone need fast mobile networks to work reliably.

How safe is LTE technology?

Radio waves have been used to transmit data for over 100 years. Throughout this time, a lot of research has been done about the possible effects on humans. However, no adverse health effects have been found so far. The limit values by the World Health Organization apply to LTE.

The EMF-Team is happy to answer your questions:

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Phone: 050 664-0

Further information can be found at:

A1.net/gesundheit

A1.net

TAG-EMF:

www.telekomaustria.com/en/csr/emf

Federal Ministry of Transport, Innovation and Technology:

www.bmvit.gv.at

Austrian Standards Institute:

www.austrian-standards.at

Mobile communication test series:

www.messwerte.fmk.at

Forum Mobilkommunikation:

www.fmk.at/en

Institute of Telecommunications
der Technischen Universität Wien:

www.ibk.tuwien.ac.at

Register of all public broadcast- and mobile base stations
in Austria:

www.senderkataster.at

Austrian Regulatory Authority for Broadcasting and
Telecommunications:

www.rtr.at

About this site

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