

Consultation

Assignment of frequencies in the frequency range 450 MHz

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**Rundfunk und Telekom
Regulierungs-GmbH**

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1 Introduction

Federal Minister for Traffic, Innovation and Technology has asked the Telekom-Control-Commission to assign the frequency ranges 451,300-455,740 and 461,300-465,740. A search for interested parties has shown that demand is higher than the offer in this frequency range.

According to the law, Telekom-Control-Commission is responsible to assign the frequencies.

Coordination with neighbor states with respect to the specific usage of the spectrum is expected to be finalized mid 2005. Thereafter the allocation process will be started.

As preparation for the spectrum allocation RTR has initiated this consultation process.

The consultation is intended as a first approach to the topic. The proposed contents are without obligation and precedent.

The spectrum to be allocated has some 2x4.44 MHz in the frequency range 451,300/461,300 – 455,740/465,740 MHz and was formerly used for analogue mobile communication (NMT450, in Austria called C-NET).

According to the frequency usage plan the spectrum is intended to be used for mobile communication.

There are a number of possible technologies for this frequency range which are already used in other European countries. There is usage of narrow band trunking systems (as f.e. TETRA 25kHz channels, TETRA2-TAPS 200 kHz channels) and broadband technologies (as f.e. CDMA450 and FLASH-OFDM).

To achieve an efficient and market relevant usage of the frequencies, RTR is consulting publicly and is opening a discussion on essential parameters of the usage.

2 Frequency use

2.1 Services

For the establishment of which kind of network infrastructure these frequencies are particularly suitable (if allowed according to the usage conditions)?

- for fixed subscriber-connection
- for mobile subscriber-connection
- for backhaul-infrastructure
- others

which ones?

Lucent Technologies Response

The 450 MHz band is currently used in many countries for mobile and fixed applications. While the 450 MHz band is heavily used in some urban areas, the introduction of IMT-2000 technologies will enable more efficient use of this spectrum by providing significant increase in capacity, quality of service and cost efficiencies. Commercial broadband IMT-2000 wireless technologies such as CDMA2000 can offer standards-based, secure, interoperable voice and high-speed data communications. The architecture and product platforms for CDMA solutions operating at the 450MHz band are the same as for the rest of CDMA2000. This technology is used by over 98 network operators worldwide supporting over 250 million subscribers (source: CDMA Development Group). Originally developed for the public cellular systems, these technologies can also provide dedicated wireless communications to fixed subscribers. Extensions to the technology, both within the standard and in support of the standard, allow this commercial technology to meet the unique needs of the fixed and mobile user communities. Furthermore, the IP-based core network technologies employed by cellular technologies such as CDMA2000 provide an open standards platform for interoperability with legacy systems. CDMA2000 is standardized to operate in 13 different bands globally, one of which is the 450MHz.

Lucent Technologies agrees with the decision to award spectrum in the 450 MHz frequency range.

What type of services would be offered typically by using these frequencies?

- narrowband data services (f.e. fleet management) –
- broadband data services (f.e. broadband internet access)
- voice services
- for fixed subscriber-connection
- others

which ones?

Lucent Technologies Response

The 450 MHz band can support a wide range of services as indicated above. The regulatory oversight prescribed by the RTR should be sufficiently flexible to allow licensees to offer their subscribers any of the above listed services.

CDMA 450 is an extremely flexible technology and can be used for a variety of applications. As well as CDMA 2000 technology being used for Broadband data and voice services, CDMA 2000 can also be used for Narrow band applications and for other Telematic services.

CDMA2000 is an open, mainstream commercial broadband wireless technology that provides a variety of different services such as voice, data, high-speed broadband, and advanced multimedia data services over 2x1.25 MHz¹ channels (called “CDMA carriers”). CDMA2000 is comprised of the following technology families:

CDMA2000 1xEV-DO Revision 0 and Revision A (1x EVolution for Data Optimized): This high-speed wireless multimedia technology is currently in use in commercial cellular and fixed networks worldwide, with additional networks underway. 1xEV-DO Revision 0 networks offer peak data rates of up to 2.4Mbps on the forward link (base station to mobile), and up to 153 Kbps on the reverse link (mobile to base station).

With the introduction of 1xEV-DO Revision A the peak data rate on the Forward link will increase to 3.1 Mbps, and the reverse link will increase to 1.8 Mbps. Backward-compatible air interface enhancements currently being standardized will further increase the capacity, boosting 1xEV-DO multimedia data rates on both the forward and the reverse links.

CDMA2000 1x: This technology is currently in use in many commercial cellular networks worldwide, with additional networks planned for 2005. 1X offers integrated support of circuit-mode voice and packet data services. CDMA2000 1x networks in the 450 MHz range deployed in the field today deliver peak forward and reverse data rates of 307 kbps and 24 Erlangs of voice service per single 2x1.25MHz carrier.

Which customer segments could be addressed primarily by using these frequencies?

- consumer
- small and medium businesses
- large enterprises

Lucent Technologies Response

The 450 MHz band can be used to support the needs of all the above listed market segments.

CDMA2000 is a mainstream commercial technology that provides high quality voice, data, and broadband wireless services to all segments of the market, including consumer, small and medium business, and large enterprises. CDMA2000 deployed at the 450MHz frequency provides services that are similar to those that are provided by CDMA2000 deployed at higher frequency bands, such as 850MHz and 1900MHz band. Re-banding (transposing) CDMA2000 air interfaces to the 450MHz frequency to provide services to the above mentioned consumer segments allows the operator(s) to harness the large economies of scale present in CDMA2000. Since, such re-banding involves comparatively minor changes to the RF front ends of base stations and handsets, while the majority of the core network infrastructure remains unchanged, the costs of CDMA2000 network can be significantly less than that of any other non-standard based technologies deployed in the 450MHz band.

Are suitable technologies in this frequency range competitive or complementary to existing access technologies?

Technology	Substitute	Complementary product
XDSL and CATV	<input type="checkbox"/>	<input checked="" type="checkbox"/>

¹ 1.25 MHz of airlink spectrum is used by the base station to send a physical layer bitstream to mobiles, while 1.25 MHz of airlink spectrum is used by mobiles to send a physical layer bitstream to a basestation.

GPRS (EDGE)	<input checked="" type="checkbox"/>	<input type="checkbox"/>
UMTS (HSDPA)	<input type="checkbox"/>	<input checked="" type="checkbox"/>
WLAN	<input type="checkbox"/>	<input checked="" type="checkbox"/>
WiMax	<input type="checkbox"/>	<input checked="" type="checkbox"/>

Others (please state, which)?

Technology	Substitute	Complementary product
	<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>

Lucent Technologies Response

Due to the nature of the CDMA 2000 technology, the technology can be used as complementary to other technologies that exist within the market place. In areas where it is not possible to serve rural areas due to economic reasons, CDMA 450 with it's high cell range can be used to offer these services. Lucent is aware of a few other non-standard technologies, such as FLARION, and that can be deployed in the 450MHz band. CDMA2000 is much superior to these technologies since it can provide standards based, secure, interoperable voice, data, and high-speed data communications in an efficient manner. We believe leveraging commercial standardized cellular technologies provide faster introduction of new features, a wider range of user applications, wider range of terminals, as well as economies of scale. The issue of selecting a Standards-Based network is very important to the operator if they wish to be able to take advantage of the economies of scale provided by the worldwide deployment of CDMA systems. Non Standards Based technologies, such as Flarion, will force the operator to rely on a single vendor, will reduce the variety of handsets available and will potentially keep the operator out of the mainstream product development loop.

2.2 Potential for (mobile) broadband access in rural areas

Frequencies at 450 MHz allow a comparable cost efficient area coverage (small number of base stations). On the other hand the spectrum is small compared with other wireless access technologies, which is a competitive disadvantage in (rural) areas with high traffic density.

Do you agree that these frequencies have a high potential for the provision of (mobile) broadband access in rural areas?

Lucent Technologies Response

Lucent agrees that the 450 MHz band does indeed have the potential for the successful provision of broadband access in rural areas.

A major advantage derived from the use of the 450 MHz band is the potentially wide coverage afforded by base stations operating in the low 450MHz frequencies in comparison with cellular systems in the 800MHz, 900MHz, 1900MHz or 2100MHz bands. The wide coverage provided by base stations operating in this band is the result of the propagation characteristics of the low frequency radio signals – which can travel farther before dissipating, which means that each cell can cover a larger area and thus fewer cell sites are needed to provide geographical coverage of a given area than for cellular systems operating at higher frequencies. This situation is particularly beneficial for rural, sub-urban and sparsely populated areas, where

mobile broadband services can be cost-effectively introduced to meet the telecommunication needs of the region.

The spectrally efficient CDMA-450 technology provides large voice capacity and high user data throughput(s) that make it ideal for providing fixed and mobile services to rural and sparsely populated areas, especially where the amount of spectrum is limited. The voice capacity of the CDMA-450 is around 72 Erlangs per base station with one carrier in each sector of a 3-sectored cell. The estimated CDMA2000 1X average aggregate throughput per base station with three sectors is 450 kbps with a single carrier. The estimation is based on a "full buffer" traffic model. Downlink and uplink data capacities are symmetric.

The estimated CDMA2000 1xEV-DO average aggregate throughput per base station with three sectors is 480 kbps on the uplink and 1800 kbps on the downlink with a single carrier. Both estimations assume a "full-buffer" traffic model. With CDMA2000 Standards Revision A improvements, the uplink throughput is expected to improve and reach approximately 720 kbps. With the introduction of dual antenna user terminals the forward link throughput is expected to reach 2700 kbps.

The deployment of the spectrally efficient technology, CDMA2000, in the lower frequency bands makes it a highly scalable technology: an operator can initially launch a new network with just a few base stations that will provide adequate coverage, if limited capacity. The operator can then increase the number of base stations in line with increases in capacity requirements. This is in contrast to operators deploying new networks at higher frequencies that have to start with a larger number of base stations even if subscriber numbers are initially very low.

CDMA 2000 in the 450 MHz spectrum also provides the ability to cover the rough and mountainous terrain where the improved propagation at lower frequencies is particularly important.

Standards and Technologies

The intended use according to the frequency usage plan is **mobile communication**. As a restriction to a specific technology / standard only makes sense in case of an internationally agreed approach – maximum use of offer and demand driven economy of scales – which is not expected to happen for this frequency range, the advantages of a technology neutral request for quotation are predominant (selection of the most efficient technology).

Do you agree that these frequencies should be tendered as technologically neutral as possible?

- Agree
Reasoning:
 Disagree

Which restriction should be taken? Please argue why:

Lucent Technologies Response

Lucent Technologies strongly believes that regulation should not dictate technology choices. A technology neutral position will allow operators to choose an appropriate IMT-2000 technology, subject only to their business needs and the needs of their customers. Such flexibility allows the operator to use state-of-the art equipment, and thereby best meet the present and future needs of its customers.

3 Fragmentation

To enable a technologically neutral allocation as far as possible, a channel spacing of 1,25 MHz is necessary.

- Agree
 Disagree

Reasoning:

Lucent Technologies Response

Lucent Technologies agrees that in order for an administration to license a spectrum band in a technology neutral manner, the minimum channel spacing required is 2x1.25MHz. The spacing allows an operator to deploy one carrier of the CDMA2000 system.

2 x 4,44 MHz are available. With a channel spacing of 1,25 MHz there are 3 options possible. Which one would you prefer?

- 3 packages with some 2x1,25 MHz each
 2 packages with some 2x1,25 MHz each and 1 package with some 2x2,5 MHz
 1 package with some 2x4,44 MHz

What is the technically necessary minimum to build an efficient network?

Reasoning?

Should the maximum amount of spectrum for a single operator be limited?

- no

Reasoning:

- yes

To which extent? Please argue why:

Lucent Technologies Response

. Lucent suggests the following two approaches:

1. Allocate three licenses, for e.g. three carriers of 2x1.25MHz, and allow operators to bid for more than one license.
2. Allocate the entire 2x4.44MHz band to a single operator and allow operators to bid for the license.

Appropriate amount of spectrum will provide an operator with increased flexibility for the provision of services and permit the operator to better meet the needs of its subscribers. This will allow the operator to evolve its network in a rapid and efficient manner, while meeting the critical needs of its customers. A multi-carrier CDMA2000 network will sustain a more dynamic marketplace and further enhance the rapid deployment of advanced technology and the provision of innovative services.

4 Licensing conditions

4.1 *Objective and Purpose*

Licensing conditions are used to guarantee an efficient frequency usage. By means of these obligations it should be avoided that allocated spectrum is hoarded because of competitive reasons or used only very limited - in some parts of the licensing area

only -. On the other hand licensing conditions should not constrain an efficient network deployment and a profitable business case.

Given existing broadband infrastructure (in urban areas) and frequency economic properties of 450 MHz frequencies, an undifferentiated supply obligation of the entire country or the entire population seems unreasonable.

Do you agree that supply obligations should be targeted in particular to improve the broadband availability in rural areas (taking technological neutrality into account)?

yes

Reasoning:

no

Why and which regulatory targets the supply obligations should be based upon?

Lucent Technologies Response

Lucent agrees that licensees should be obligated to deploy infrastructure in their designated license areas within a reasonable timeframe. Such performance (build-out) requirements are consistent with the goal to effectively provide quality wireless services to all of Austria, including rural environments. Lucent believes that specific licensing conditions relative to supply obligations (build-out) should be developed through discussions between potential licensees (service providers) and the RTR.

4.2 Promotion of broadband supply in Austria

In Austria, in particular in rural areas, broadband access is only available very limited (green in figure 4-1 means broadband services are available, red Not available). The correlation between broadband service areas and population density is shown below (in figure 4-2 yellow means population density > 80 persons/squarekm, blue means population density < 80 persons/squarekm

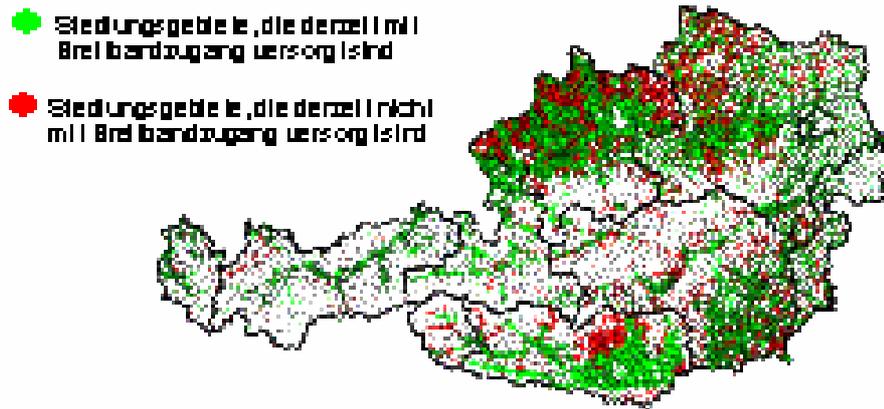


Abbildung 4-1. Breitbandversorgung in Österreich (Quelle: BTR)

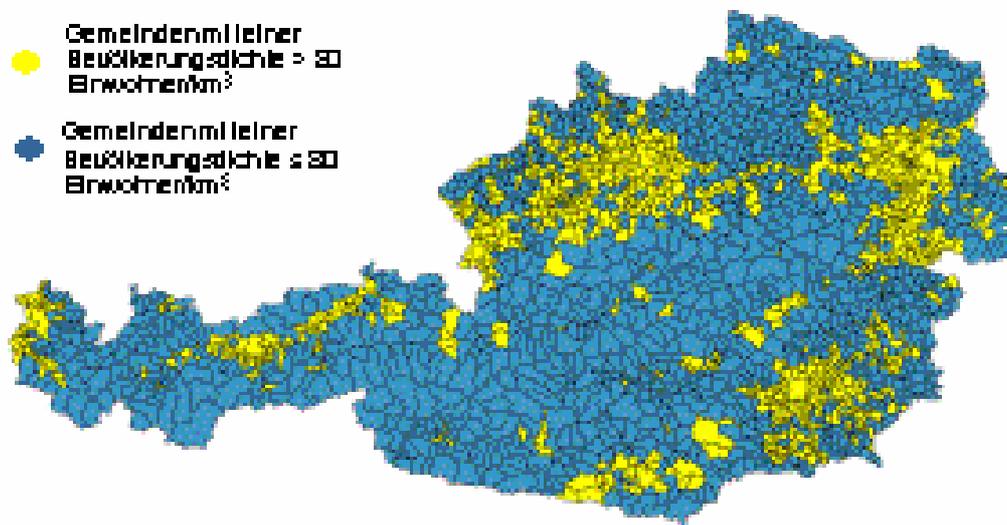


Abbildung 4-2. Gemeinden mit Bevölkerungsdichte größer 30 Einwohner/km²

In order to achieve a focused improvement of broadband availability in Austria, a minimum obligation should be requested for communities below a certain population density. Specifically the licensing condition could read like: “within a certain timeframe the service should be available for at least $Y=30\%$ of communities with a population density of less than or equal $X=80$ persons/squarekm. A community would be considered to be covered in case the central point of the community is covered.

- This licensing condition is focused and useful

Reasoning:

- This licensing condition is basically not suited

Reasoning (alternative concept):

- I propose a different value X

Reasoning:

- I propose a different value Y

Reasoning:

Lucent Technologies Response

Lucent Technologies chooses not to respond to this question.

4.3 Datarates

A technologically neutral allocation of frequencies requires to differentiate between (narrowband) trunking services and broadband services.

Does a minimum transmission rate of 144 kBit/s make sense for broadband services (channel spacing > 200 kHz)?

yes

no

Why:

Does a minimum transmission rate of 9,6 kBit/s make sense for narrowband services (channel spacing less than or equal 200 kHz)?

yes

no

Why:

Is it necessary to require additional things beyond a minimum transmission rate (e.g. grade of service)

yes

no

Which:

Lucent Technologies Response

Lucent suggests that a directive for minimum transmission rates for the proposed licenses is unnecessary. Rather, a competitive marketplace will demand that a service provider deploy technology that offers data rates that satisfy its subscribers' needs, up to and including rates that are state-of-the-art. Even if the available spectrum can only support a single license, potential alternatives to wireless broadband services (e.g., DSL) should compel the licensee to offer attractive, competitive data rates.

Further, the use of a regulatory mandate for minimum data rates requires a detailed description of the methodology and conditions under which such a mandate will be assessed and measured. The necessary specifications would include whether the minimum rate was a peak or average designation, whether measurements should be made near to a base station or at a cell edge (or both), and whether measurements should be made for a given system traffic demand. Consequently, the ability to develop acceptable measured data for use in assessing compliance with a minimum data rate requirement could be problematic.

The RTR should therefore refrain from dictating a minimum data rate, and continue to support regulatory oversight that is truly technology neutral, with a reliance on marketplace forces to provide quality services and superior performance.

4.4 Time plan

Are the technologies for this spectrum mature and commercially available to enable a relatively fast network deployment?

- Agree
 Disagree

Reasoning (remarks to time plan for availability and roll-out):

Lucent Technologies Response

The architecture and product platforms for CDMA solutions operating at the 450Mhz band are the same as for the rest of CDMA2000. This technology is used by over 98 network operators worldwide supporting over 250 million subscribers (source: CDMA Development Group).

CDMA450 is the latest version within the CDMA family. The first CDMA450 network was launched by Telemobile Romania, under the brand name Zapp in December 2001 . CDMA450 is such a compelling solution for 450 licence-holders that already 27 CDMA450 networks are today in operation supporting between 2 and 2.5M subscribers worldwide (source: Spectrum Advantage).

Furthermore, in the last year, over 6 new licenses for 450Mhz have been issued and regulators in 9 other countries are currently investigating the issue of 450MHz licences. (source: Spectral Advantage)

Clearly the proliferation and rapid growth of the number of operators and subscribers in such a short period of time is a powerful reference on the CDMA450 value proposition leveraging the well-established and well-proven CDMA2000 technology

CDMA handset manufacturers have also responded positively to the growth of the technology in the 450MHz band. There are now over 15 separate manufacturers of at least 27 models of CDMA450 terminals (source: CDMA Development Group). Many other manufacturers are anticipated to enter the market, given the clear acceptance of CDMA450 as a recognised new growth market.

Can you comment on the following 2-phased time plan with respect to service obligations?

- To achieve 66% of the service obligations 12 months after licensing award
- To achieve 100% of the service obligations 24 months after licensing award

- Agree
 Disagree

Reasoning:

Lucent Technologies Response

CDMA 450 is a mature technology, which is already deployed all around the world. With the coverage benefits of the 450 MHz spectrum, coupled together with the commercial availability of CDMA 2000 1x and CDMA 2000 EV-DO Rev 0 and with a

wide range of terminals ranging from hand held devices to PC modems, there is no reason why an operator could not offer Broadband data services and voice services, both fixed and mobile to the marketplace.

5 Participant

Who are you?

name/company (address):

Lucent Technologies Network Systems GmbH z.Hd. Dr. Werner Irler Thurn-und-Taxis-Strasse 10, D-90411 Nürnberg, Deutschland
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Are you interested to use the spectrum?

yes

no

Lucent Technologies Response

As a vendor of wireless telecommunications infrastructure, Lucent is not a direct provider of wireless services and does not seek wireless licenses. As described above, however, Lucent does manufacturer third generation wireless technology that is designed to operate in the 450 MHz band (CDMA450). Lucent is therefore interested, able, and eager to work with an Austrian licensee to quickly deploy the necessary infrastructure that would provide the benefits of wireless communications in the 450 MHz band to Austrian subscribers.

6 Request for comments

With this document RTR is starting the discussion on licensing conditions for 450 MHz frequencies and invites all interested parties to comment.

Please deliver comments as text or PDF file electronically via email to:

<mailto:Konsultationen@rtr.at>

If not explicitly stated otherwise, the comments will be published at RTR GmbH's Web-site.