VEO/Laitinen Kaisa

Auction of the 700 MHz spectrum

1. 700 MHz spectrum

The spectrum 703–733 MHz and 758–788 MHz has been allocated to wireless broadband in Finland as of the beginning of 2017. The Ministry announced in February 2016 that frequency bands for commercial use in mainland Finland would be auctioned off at the end of 2016.

This spectrum can be used for building 4G networks. The frequency bands enable increased capacity for high-speed wireless broadband networks. It is probable that the frequencies now being auctioned off will be used to augment existing 4G networks, increasing their capacity and speed.

2. Organising the spectrum auction

FICORA will auction off the spectrum at the end of 2016. The purpose of the auction is to ensure effective use of the spectrum. Another aim is to improve the nationwide availability, quality and capacity of high-speed wireless broadband connections in Finland. Allocating more frequency bands to wireless broadband will help ensure the continued availability of high-quality wireless broadband throughout Finland.

The auction is governed by the Information Society Code (917/2014), the Government Decree on auctioning radio frequencies (Appendices 3–4) and the FICORA regulation on the auction procedure. The terms and conditions of the licences to be granted are outlined in the licence application notice (Appendix 5) and FICORA terms and conditions for radio licences. The auction also requires an amendment to the Government Decree on Radio Frequency Usage and the Frequency Plan (hereinafter the Government Frequency Decree) (Appendices 6–7).

The auction decree would provide for the following, in keeping with the Information Society Code: the number of frequencies to be allocated, the maximum number of frequencies to be allocated per enterprise, the auction procedure to be used, the starting price of the frequencies being auctioned, the auction entry fee and the licence fee payment schedule. It is proposed that the Government Frequency Decree be amended simultaneously so as to specify in more detail the frequencies being auctioned off.

FICORA will conduct the auction over the public Internet using electronic software acquired through an international competitive tender.

The plan is to conduct the auction as a simultaneous ascending auction applying the *Simultaneous Multiple Round Auction* (SMRA) model, where all frequency pairs are auctioned off at the same time through multiple rounds of bidding. This auction procedure was used in Finland's two previous spectrum auctions in 2009 and 2013. Detailed provisions on the auction procedure will be issued in a FICORA regulation as per the Information Society Code.

Ministry of Transport and Communications
Office: Eteläesplanadi 16 (Registry) FI-00100 Helsinki
Postal address: PO Box 31 FI-00023 Government Finland
Telephone: +358 295 16001
www.lvm.fi
firstname.lastname@lvm.fi
kirjaamo@lvm.fi

3. Frequency bands to be auctioned off

A total of 2 x 30 MHz frequencies may be allocated to broadband networks in the spectrum being auctioned.

These frequencies (2 x 30 MHz) will be auctioned off as 2 x 5 MHz frequency pairs, i.e. the auction will involve a total of six frequency pairs of 5 MHz each. Any individual enterprise may be allocated no more than two 5 MHz frequency pairs. The purpose of this limitation is to prevent restrictions on competition and concentrated control of frequency bands. There are thus sufficient frequency pairs for at least three enterprises. This would secure the future frequency needs of the currently existing national mobile communications networks, particularly outside urban areas. A 2 x 10 MHz frequency band may be effectively used by an enterprise to increase the capacity and speed of existing wireless broadband networks.

The spectrum (738–758 MHz) also contains four 5 MHz SDL channels (supplementary downlink), a total of 20 MHz in frequency bands that may be used for transmitting information (Internet content, images and video) from the network to terminal devices. SDL frequency bands provide additional future capacity for data transfer; this may be leveraged in offering better and faster connections to subscribers. However, current 4G networks cannot yet make use of SDL technology, and no compatible terminal devices are available at this time. No SDL frequencies have yet been allocated in any of the countries that have already conducted 700 MHz spectrum auctions. Therefore it is not feasible at this time to auction off the SDL frequency bands.

In Russia, the 700 MHz spectrum is used for aviation radio navigation and TV broadcasts. Frequency usage must be coordinated so that broadband use in Finland will not interfere with Russia's aforementioned usages of the spectrum, which are protected by international treaties. Finland and Russia have concluded a bilateral agreement on the coordination of aviation radio navigation and broadband usage. There is as yet no agreement to coordinate Russian TV broadcasts and Finnish broadband usage, and Russia has not indicated for how long it intends to use this spectrum for TV broadcasts.

Russian TV broadcasts impose restrictions on the use of this spectrum in Finland. The scope of these restrictions cannot yet be unambiguously defined, because there is no certainty as to the extent to which Russia will be using the spectrum for TV broadcasts. However, the disruptive effect can be mitigated in designing and building wireless broadband networks, particularly with the placement and orientation of base stations and their antennas.

The key security authorities have expressed their need for a wireless broadband service that would remain functional under all conceivable circumstances. The spectrum now being auctioned off is not sufficient in itself to secure the broadband needs of the public authorities, for reasons including but not limited to the usage restrictions referred to above. Therefore the spectrum is being auctioned off for commercial use.

Together with key security authorities and telecom operators the Ministry of Transport and Communications will start preparations in autumn 2016 to specify the requirements of the public authorities for network usage and to explore the required legislative amendments. The functions of certain public authorities could be secured with a broadband network that has sufficient capacity, is reliable and has comprehensive geographical coverage, being provided by one or more commercial telecom operators and using several frequency spectra and being cost-efficient for public finances; this could be in place around the year 2022. The aim is to create a mechanism where public authorities can, if necessary, cover the costs of a level of service exceeding commercial requirements. The necessary legislative

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firstname.lastname@lvm.fi
kirjaamo@lvm.fi

amendments would be implemented so that they would be in place during the next round of granting frequency licences.

In addition to the above, 2 x 5 MHz frequencies could be left in reserve in the spectrum below the spectrum now subject to auction (698–703/753–758 MHz) for potential future allocation to the public authorities if necessary.

There will also be 2 x 3 MHz frequency pairs above the spectrum subject to auction (733–736/788–791 MHz) that may in the future be allocated to communication between machines and devices (M2M).

4. Auction fees

Enterprises use allocated frequencies for conducting a profitable business. Auctioning off frequencies guarantees that the government will receive fair compensation for making highly valuable allocations from a limited range of frequencies to commercial use. In Finland, auction prices have in the past not been invoiced all at once but in several instalments over the licence period. In Finland, auctions have not affected service prices or other business investments by telecom operators.

FICORA will incur costs from the auction, for instance from the procurement of the auction software at about EUR 150,000. In order to cover the costs of the auction, enterprises signing up for the auction are required to pay an entry fee of EUR 50,000.

Also, any enterprise that successfully bids for frequencies in the auction shall be obliged to pay the licence fee, which will be equal to the highest accepted bid. The proposed starting price in the auction is EUR 15 million per each 5 MHz frequency pair. Therefore, if all frequencies are sold, the auction should return revenue of at least EUR 90 million. However, this amounts to only about one tenth of 1% of the annual turnover of the telecom operators, factored over the entire licence period.

The starting price was set taking into account parameters such as the estimated economic value of the frequencies, the usability of the frequencies in view of the restrictions caused by Russian usage, and the length of the licence period.

The starting price was set with reference to hammer prices in auctions of similar spectra (700 MHz and 800 MHz) elsewhere in Europe. These two spectra are virtually identical in their technical properties, although in the 700 MHz spectrum there is better penetration of building materials and broader base station coverage. Nevertheless, the technical differences between the spectra are negligible. On the other hand, the value of the 700 MHz is compromised by the fact that in practice its frequencies will mainly serve to add capacity to existing networks.

Also, current restrictions on use caused by Russian usage of the frequencies as described above reduce the current economical value of the frequencies in Finland. The aforementioned restrictions and the uncertainty in the timetable of the spectrum becoming available were taken into account in determining the starting price for the auction.

In European 700 MHz and 800 MHz spectrum auctions, the average hammer price has been EUR 0.51 per MHz per person in the country's population. Applying this average gives a starting price of EUR 28 million for one frequency pair in Finland. In view of the restrictions described above, the proposed starting price is EUR 15 million for one frequency pair. If the restrictions

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firstname.lastname@lvm.fi
kirjaamo@lvm.fi

caused by Russian usage were to be removed through frequency coordination before the adopting of the auction decree, the starting price might be increased accordingly.

Licence fees will be required to be paid in five equal annual instalments, as with the spectrum auction held in 2013.

5. Terms and conditions of the licence (Appendix 4)

Licence period

Operations in the spectrum as per the operating licence may begin on 1 January 2017 when other use of the spectrum has ceased. The spectrum is currently used for TV broadcasts. The auction is to be held towards the end of 2016 (probably in November or December), after which the Government will grant the licences based on the outcome of the auction. The licence period will begin on the date of granting the licences at the latest.

Under the Information Society Code, a licence may be issued for a fixed period of up to 20 years (section 16). It would be expedient if these licences were to expire at the same time as the 800 MHz licences granted in 2013; thus, the 700 MHz licences would be granted for a period ending on 31 December 2033, i.e. for 17 years. This would enable licences for several spectra to be granted concurrently in the future.

Licence holders would be required to begin operations in practice under the licence within two years of the beginning of the licence period, unless the Government orders otherwise on application from the licence holder due to technical advancements or the general economic situation.

Building obligations

The network pursuant to the licence would be required to be built so as to cover 99% of the population of mainland Finland within three years of the start of the licence period. The coverage requirement should be structured so as to ensure reasonable indoor coverage within the coverage area. ‘Reasonable indoor coverage’ means that the telecom operator’s services must be available without additional cost to users in normal circumstances of use in users' permanent residences or enterprises' places of business. The licence holder would be obliged to demonstrate availability of service if required. The network pursuant to the licence would be required to be built so that it covers all the main roads, secondary roads, regional roads and slip roads in mainland Finland and Finland's entire rail network. When calculating coverage, the broadband mobile communications networks previously built by the licence holder using the 2.6 GHz, 1800 MHz and 800 MHz spectra would be taken into account.

The 4G networks of the established telecom operators currently already cover about 97% of the population of mainland Finland. It is required in the licences granted for the 800 MHz spectrum on the basis of the auction in 2013 that the TeliaSonera network must cover 99% of the population by the end of 2018 and that the DNA and Elisa networks must each cover 97% of the population by the same date. According to statements from the operators themselves, their 4G networks will be quicker to build and more comprehensive than their 3G networks, which currently cover about 99% of the population. Therefore the requirement of 99% coverage for the 700 MHz network by the end of 2019 is reasonable, particularly considering that when calculating coverage, the broadband mobile communications networks previously built by the licence holders using the 2.6 GHz, 1800 MHz and 800 MHz spectra will be taken into account.

Ministry of Transport and Communications	Office	Postal address	Telephone	www.lvm.fi
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The 3G networks of the telecom operators (900 MHz spectrum) cover the road network of mainland Finland (main roads, secondary roads, regional roads and slip roads), according to information supplied by them to FICORA. The operators' 4G networks (800 MHz) do not yet fully cover the road network in northern and eastern Finland. However, telecom operators can build a 4G network covering the entire roadwork without unreasonable additional costs, because they can make use of existing masts and facilities.

It should be noted with regard to the requirement for coverage over the road network that it is not necessarily possible to get a signal inside a vehicle without an external antenna, because a vehicle chassis attenuates mobile network signals. Terrain and trees can also attenuate signal reception in a vehicle. Notwithstanding the above, including this licence condition would be essential for the purposes of future road traffic functions such as traffic automation, and it is very likely that vehicles of the future will contain components improving signal reception within the vehicle.

Established telecom operators already have 4G coverage over almost all of Finland's rail network. Their 3G networks (900 MHz) cover the rail network completely. Therefore requiring comprehensive coverage for their 4G networks would not impose unreasonable additional costs on them. It should be noted, however, that this requirement would only apply to outdoor coverage; signal reception on board trains requires the installation of repeaters, which is subject to separate agreement between the transport operator and the telecom operator. Data transmitted over the mobile communications network can be shared within a train through a WLAN. The rail network coverage requirement could prompt investments in the repeaters required for signal reception on board trains.

The coverage requirement would not apply to those geographical parts of mainland Finland where, for reasons due to Russian activities other than mobile communications, it is not at all possible to build a broadband mobile communications network. The requirement would be extended to all of mainland Finland as of such time as when the aforementioned restrictions are removed. However, telecom operators may build their networks using the 1800 MHz, 2.6 GHz and 800 MHz spectra.

FICORA may issue more detailed regulations concerning the calculating of coverage areas pursuant to the licence and the implementation of the licence terms and conditions in practice.

The licence terms and conditions would allow for joint building of networks. A telecom operator's own network would be required to cover at least 35% of the required population coverage, but joint use of a network outside the own network area would not be limited in any way. A similar condition was included in the licences for the 800 MHz spectrum auctioned off in 2013, and TeliaSonera and DNA accordingly went ahead and established a network joint venture, Suomen Yhteisverkko, which is building 4G networks in northern and eastern Finland. DNA and Sonera use the Yhteisverkko mobile communications network in providing their respective services to their subscribers. A joint network enables faster and more comprehensive telecom services for subscribers in sparsely populated areas. Taking into account Finland's large geographical area and how low the population density is in the majority of the country, it is not necessarily feasible from the perspective of the national economy to build redundant networks with comprehensive regional coverage. The Finnish Competition and Consumer Authority has approved the joint network project, under certain conditions.

Removing disruptions

Under the licence terms and conditions, licence holders would be required to remove disruptions caused by their operations to other regulation-compliant radio communications and to be liable for the labour and material costs of such removal of disruptions. 'Other regulation-compliant ra-

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kirjaamo@lvm.fi

dio communications' means TV broadcasts and their reception. A licence holder would be required, together with other licence holders in the same spectrum, to ensure that consumers are provided sufficient guidance and advisory services concerning the adoption of the broadband mobile communications network as regards potential disruptions to TV reception. Licence holders must publicise such advisory services in a sufficient and feasible way.

TV broadcasts occupy a spectrum below the 700 MHz wireless broadband. In the technical planning of frequency allocation, a protective frequency band between the TV broadcast spectrum and the wireless broadband spectrum was defined to ensure non-disruption of TV broadcasts. However, disruptions may occur in certain situations despite this, particularly in cases where a TV receiver is in close proximity to a base station. Disruptions may be removed for instance by using filters or by making adjustments to the LTE network. Consumers must be able to receive TV broadcasts without disruption even after the adjacent spectrum is taken into use for wireless broadband. A similar condition was included in the licences for the 800 MHz spectrum auctioned off in 2013. Licence holders are liable for the costs e.g. of signal filtration as referred to above and for any labour and material costs incurred in adjusting the TV reception system.

In 2014, DNA, Elisa and TeliaSonera set up a joint project entitled 'Taajuustalkoot' in accordance with the 800 MHz licence terms and conditions. This project provides an advisory service to consumers in situations where the building of a wireless broadband network has caused disruptions in TV reception. This advisory service has worked well, troubleshooting disruptions to TV reception by 800 MHz wireless broadband networks in individual households.

Other consumer advice

Licence holders should advise their subscribers in matters related to the licence terms and conditions such as network coverage and publicise information sufficiently and feasibly. Subscribers should be able to obtain information e.g. about network coverage both on the operator's website and from customer service. Operators must also publicise information on potential disruptions to TV reception as described above, their removal and any required solutions to ensure indoor coverage.

6. Impact of the auction

Auctions were previously conducted in Finland in 2009 (for the 2.5 GHz spectrum) and in 2013 (for the 800 MHz spectrum). The frequencies auctioned were mainly bid for and won by the established national telecom operators DNA, TeliaSonera and Elisa. In Finland, auctions have not had an impact on the market structure or competition situation in mobile communications services. Spectrum auctions have also not led to a decline in telecom operators' other business investments. Auctions are a market-driven means for allocating frequencies while generating revenue for the government and being a transparent procedure.

The introduction of the 800 MHz spectrum auctioned off in 2013 has improved the quality and availability of high-speed wireless broadband connections throughout Finland, particularly in sparsely populated areas. Mobile communications prices have not significantly changed following the auctions. In practice, therefore, consumers have received more and better services than before for the same price.

The three established telecom operators have used the 800 MHz spectrum auctioned off in 2013 to build 4G networks that enable high-speed wireless data transfer. The building and introduction of these networks have progressed rapidly. At the moment, the networks cover more than 97% of the population. The introduction of the 700 MHz spectrum now to be auctioned off from the

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firstname.lastname@lvm.fi
kirjaamo@lvm.fi

beginning of 2017 will further improve the availability, quality and speed of wireless broadband connections.

If all the frequencies are sold, the revenue generated for the government will be at least EUR 90 million. This represents only about three tenths of 1% of the annual mobile communications turnover of the telecom operators, factored over the licence period.

7. Publicity

The Ministry of Transport and Communications and FICORA will publicise the preparation, opening and closing of the auction in accordance with the auction rules. Auction notifications, documents and timetables will be published on the Ministry's website at www.lvm.fi/taajuushuutokauppa and on the FICORA website at www.viestintavirasto.fi/taajuudet/radiotaajuuksienkaytto/taajuushuutokauppa.

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kirjaamo@lvm.fi