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## Parts of an impact assessment concerning the National Post and Telecom Agency Regulations on licences to use radio transmitters in the 2500–2690 MHz band

The National Post and Telecom Agency (PTS) has chosen to only translate the essential parts of the chapter dealing with the consultation carried out. The entire document has been published in Swedish on the PTS website, [www.pts.se](http://www.pts.se), under Documents and statutes and Consultations. This corresponds to Section 4.2 of the Swedish document.

### 1 Consultation carried out

In connection with the interest survey, PTS has carried out a consultation concerning use of the 2500–2690 MHz frequency band. All in all, 15 responses were received on the basis of the consultation, comprising a total of 12 areas concerning:

- Point in time for the auction (for assignment)
- The geographical area of licences
- Technology and service neutrality
- Distribution between FDD (Frequency Division Duplex) and TDD (Time Division Duplex)
- The scope of the licences
- Requirements for rollout and/or coverage
- Spectrum cap
- Technical conditions

These areas are discussed in more detail below together with justification for cases where amendments have or have not been made despite the views presented in relation to the proposals contained in the consultation.

Documents regarding the consultation and the responses to the consultation published by PTS can be found on the authority's website, [www.pts.se](http://www.pts.se).

## **1.1 Point in time for assignment**

### *PTS's proposal for the relevant regulations*

PTS proposes that the assignment take place during the first half of 2008.

It has not been possible to establish an optimal point in time for assignment that fully meets the interests of all parties. For this reason, an assessment of reasonability must be made. In the assessment of PTS, the entire frequency band should be assigned at the same time, as both the FDD and TDD categories demonstrate a certain interchangeability (see also 1.4).

It is appropriate for the auction to be held during the first half of 2008, as some stakeholders are interested in the assignment of frequencies taking place as soon as possible. PTS is of the opinion that technological progress can be accelerated if the frequencies is made available. If assignment does not take place as soon as possible, there is a risk that the stakeholders currently needing spectrum will be unable to enter the market or risk being put out of business. All interested parties may apply for the frequencies in question. If 3G licence holders need frequencies for 3G services, they may thus participate in the auction and purchase frequencies. Thus, the auction enables both the expansion of 3G as well as other use.

The European Commission is currently working on harmonisation of, among other things, the frequency band in question. As part of this work, the Commission has given CEPT<sup>1</sup>, the European regional organisation within the postal and telecommunications sector, the task of drawing up technology-neutral technical conditions for, among other things, the 2500–2690 MHz frequency band.

As a Member State of the European Union, Sweden is obliged to comply with a possible decision from the Commission. The licence conditions now proposed may need to be amended for this reason if such a decision is taken.

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<sup>1</sup> European Conference of Postal and Telecommunications Administrations

## 1.2 National licences

*PTS's proposal for the relevant regulations*

PTS proposes that the licences be national.

The relevant frequencies are internationally harmonised for mobile communications systems, which is why there is good potential for international roaming. The fact that the frequencies can be used for mobile communications systems indicates that the licences should not cover very small geographical areas.

The possibility of transferring part of a licence<sup>2</sup> following approval by PTS means that a national licence can be divided into several regional licences after the auction.

## 1.3 Technology- and service-neutral licences

*PTS's proposal for the relevant regulations*

PTS proposes that the frequency band be assigned in such a manner that is as technology- and service-neutral as possible.

PTS's Spectrum Policy states that licences for use of radio transmitters should be as technology- and service-neutral as possible. Technology- and service-neutral licences give the licence holder the flexibility to choose which service is to be produced and with which technology.

In this case, there are no international decisions preventing an assignment that is technology neutral. Also, such use does not give rise to interference vis-à-vis neighbouring countries.

Technology-neutral licences in the present frequency bands will mean that coexistence between licence holders will become more complicated compared to a situation where the licences were assigned exclusively for one technology. The consultation shows that there is interest in using several technologies in the band. In the assessment of PTS, problems related to coexistence can be dealt with through technical licence conditions that enable the use of several different technologies simultaneously and minimise the risk of harmful interference. PTS has drawn up the licences to enable the use of UMTS/IMT-2000 as well as other technologies.

All interested parties can apply for a licence to use radio transmitters in the 2500–2690 MHz band. PTS's proposal to assign technology-neutral licences means freedom of choice for licence holders when choosing a technical solution. Thus, the auction enables both the expansion of 3G as well as other use.

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<sup>2</sup> Chapter 3, Section 23 of the Electronic Communications Act

## 1.4 Distribution between FDD and TDD in the 2500–2690 MHz frequency band

*PTS's proposal for the relevant regulations*

PTS proposes that the 2570–2620 MHz frequency band be assigned for TDD use and that the 2500–2570 and 2620–2690 MHz frequency bands be assigned for FDD use.

As equipment manufacturers are likely to use ECC decision ECC/DEC/(05)05 as their point of departure when developing equipment for the frequency band, it is appropriate that Sweden should comply with this part of the decision. For Sweden, another distribution between FDD and TDD would mean that use of this band would be made difficult. This is because a distribution between FDD and TDD that does not follow the decision of the ECC is very likely to mean that certain equipment (mainly FDD equipment) must be adapted to the Swedish market. This applies to both base station and terminal equipment. Problems with base stations could probably be solved by supplementing the base stations with special filters. The terminal problem is much more complicated and means that these terminals must be adapted to the Swedish market. In a country such as Sweden, it is advantageous to comply with international harmonisation decisions rather than to develop own solutions.

Furthermore, an assignment method which means that the distribution between FDD and TDD is decided in advance entails a much simpler and more cost effective auction than if the distribution were decided through the auction.

A high spectrum cap is proposed (140 MHz) to increase the level of flexibility of the auction somewhat. The proposed spectrum cap enables a stakeholder to purchase either the entire FDD band or the entire TDD band in addition to parts of the FDD band. If a stakeholder is assigned the entire FDD band, PTS may, following an application from this party, permit use of these frequencies for TDD. Similarly, an application from the party that has been assigned the entire TDD band may mean that PTS allows the band to be used for FDD. These types of amendment presuppose that other licence holders will not be subjected to harmful interference or accept such interference. Licence holders applying for amended conditions must, as necessary, use own frequencies as guard bands in order to prevent harmful interference.

In PTS's preliminary assessment, the implementation of TDD *in parts of the frequency bands* 2500–2570 and 2620–2690 MHz will – with the present equipment specifications – give rise to interference for the remaining FDD licence holders. After this, if all of the parties that have been assigned FDD licences wish to use these frequencies for TDD, PTS may, however, following application, allow the amendment of licence conditions.

## 1.5 Scope of the licences

### *PTS's proposal for the relevant regulations*

PTS proposes that a frequency block be assigned in the 2570–2620 MHz frequency band and that 14 frequency blocks, each comprising 2x5 MHz, should be assigned in 2500–2570 and 2620–2690 MHz.

According to ECC/DEC/(05)05, the guard band between FDD and TDD should be taken within the 2570–2620 MHz frequency band, i.e. the TDD band. This means that it will not be possible to use the entire TDD band effectively. In the 2570–2580 MHz frequency band, the transmitter power shall be considerably limited according to PTS's proposal. Furthermore, it is likely that the frequency range will have a much higher level of interference. It is also likely that the 2610–2620 MHz frequency band will also have a much higher level of interference. In practice, this means that it will only be possible to use approximately 30 MHz of the TDD band effectively. If the result of the auction is two licence holders instead, each with 25 MHz, there is a risk that the usable frequency band will be reduced further. If the two licence holders do not use the same technical solution and cannot coordinate their use, a maximum of 10 MHz of useable frequencies will remain per licence holder.

Those parties that have notified their interest in the TDD frequencies have stated that they require a frequency band of 30–50 MHz each.

After the auction, if there is interest in dividing the licence, this may be granted following approval by PTS.

As regards the FDD band (2500–2570 and 2620–2690 MHz), PTS considers that it is inappropriate to determine the scope of the licences in advance. It is preferable to allow the bidders themselves to determine how much spectrum they need by placing bids. PTS proposes that auction bids are to refer to a specific FDD frequency block. This is because the 14 frequency blocks may have a different market value depending on their position in the frequency band.

If licence holders wish to exchange frequency blocks after the auction (through transfer) so that each licence holder can obtain consecutive frequency blocks, PTS may allow such transfers under Chapter 3, Section 23 of the Electronic Communications Act.

## 1.6 Requirements for rollout and/or coverage

### *PTS's proposal for the relevant regulations*

PTS proposes that the licences should not be associated with rollout requirements.

There are two main and closely related reasons as to why rollout requirements were to be introduced to the licence conditions. The first reason is to counteract hoarding and the second is to promote use of the licence. However, one problem related to rollout requirements is that if they are set too low, it is likely to result in

a rollout that only fulfils the requirements and nothing more. If the requirements are set too high, demand for the licences will be reduced and there may then be no interest in them, even at a price approaching zero.

Assignment effected through an auction is considered to make frequency hoarding less attractive, since the party intending to hoard licences must then surpass the willingness to pay of the competitors who actually want to use the licences from the auction. This means that the value of excluding competitors from the market must exceed the cost of the licence.

Following the auction, the auction price has no effect on whether or not hoarding takes place. On the other hand, the authorisation of secondary trading after the auction gives rise to reduced incentives for hoarding if the alternative of selling the frequencies is more attractive than returning the licence to the licence authority.

Another reason is the fact that these licences will be service neutral and, as far as possible, technology neutral. This makes the imposition of rollout requirements inappropriate, as PTS does not know whether or not the licence holder will use the licence for fixed or mobile communications services. For this reason, it is not possible to impose rollout requirements without making assumptions about the licence holder's future use of the frequency band.

Thus, PTS considers that rollout requirements will not directly counteract the risk of hoarding or that the licences will not be used. Instead, PTS considers that an auction is in itself sufficient to avoid the risk of hoarding. There may also be reason to wait with rollout until technological progress has advanced further and licence holders are prepared to invest in such rollout. For this reason, rollout requirements shall not be introduced for the licences in question.

PTS wishes to state the following in terms of the comments made concerning the possibility of competition being distorted in relation to other licence holders providing mobile services, unless the licences are associated with rollout requirements. There are no grounds for assuming that any future licences should be associated with same rollout requirements as licences assigned previously. When the Electronic Communications Act entered into force in July 2003, PTS was given the opportunity to also apply auction procedures as an alternative to a beauty contest. An auction procedure means that the operator that values a frequency block the most may purchase it, as opposed to a beauty contest, where the operator submitting the best application receives the frequency block. PTS can then convert the promises of the applicant into binding licence conditions. However, the final result may be perceived as equivalent regardless of the assignment method. The operator receiving the frequency block is the party that values it the most and is willing to pay either with money or, for example, by means of commitments for investments (rollout), which can be converted into binding conditions.

## **1.7 Spectrum cap**

*PTS's proposal for the relevant regulations*

PTS proposes the introduction of a 140 MHz spectrum cap for the auction.

The reason for introducing a spectrum cap for an auction is to ensure that the frequency band is assigned to several stakeholders. The spectrum cap proposed for the regulation also ensures that licences are assigned to at least two stakeholders. There would be a risk of a licence holder being assigned the entire or virtually the entire frequency band available if there were no spectrum cap in the present assignment. Such an outcome could impair competition. For this reason, PTS has decided to introduce a spectrum cap that regulates the total amount of spectrum that can be assigned to a stakeholder from the auction. This spectrum cap has been set at a high level in order to give interested parties maximum freedom and not limit future use of the band.

PTS noted that the design of the auction was unnecessarily complicated by the previously proposed (asymmetric) spectrum cap of 110 MHz for parties applying for both FDD and TDD frequencies. For this reason, PTS proposes the introduction of a symmetrical spectrum cap of 140 MHz instead.

This spectrum cap still ensures that the frequencies available are assigned to at least two stakeholders. This also preserves the flexibility of the auction since the spectrum cap now proposed also enables a stakeholder to purchase at least the entire TDD band or the entire FDD band and then apply for a possible change in use (see above 1.4).

It should be pointed out that the 2500–2690 MHz band should not be viewed as an isolated market. Use in the band is likely to contribute to competition in several different market segments.

## **1.8 Technical licence conditions**

PTS will associate the licences with technical conditions that aim to prevent harmful interference for other licence holders in the 2500–2690 MHz band as well as licence holders in other frequency bands. The technical licence conditions restrict maximum permitted radiated power from the base station within and outside the frequency block assigned.

### *PTS's proposed technical licence conditions*

PTS proposes technical licence conditions that are mainly based on the following documents:

- 3GPP 25.101: Technical Specification Group Radio Access Network. User Equipment (UE) radio transmission and reception (FDD);
- 3GPP 25.104: Technical Specification Group Radio Access Network; Base Station (BS) radio transmission and reception (FDD); and
- Working Draft ETSI EN 302 544: Broadband Data Transmission Systems in 2500–2690 MHz, Harmonized EN covering essential requirements of article 3.2 of the R&TTE Directive 1999/5/EC.

The following assumptions were also made when drawing up the conditions:

- Effective antenna gain for a base station in FDD and TDD frequency blocks: +17 dBi;
- The maximum radiated power (e.i.r.p.) for a base station in FDD and TDD frequency blocks: 54 dBm/MHz.

PTS's proposed technical conditions are based on the coexistence of both TDD and FDD use in the 2500–2690 MHz frequency band.

According to PTS's proposed technical conditions, it is stated that the radiated power from base stations in the FDD frequency blocks may not exceed –59 dBm/MHz in the 2500–2610 MHz frequency band. This level has been set on the basis of the 3GPP specification for a micro base station for UMTS FDD in the 2500–2570 MHz frequency band. The aim of the restriction in the 3GPP specification is to protect FDD terminals from interference from FDD base stations. However, in the 2570–2610 MHz frequency band, PTS's proposed licence conditions differ from the 3GPP specification, which states that radiated power from base stations in the FDD frequency blocks shall not exceed –35 dBm/MHz.

PTS considers it justifiable to allow terminals in the TDD frequency block to have the same protection against harmful interference as applies to terminals in the FDD frequency blocks. However, PTS considers that the technical licence conditions must be worded so that licence holders have to coordinate their radio use with each other as little as possible.

When drawing up the licence conditions regarding use of the terminals connected to the networks of licence holders, PTS has taken into consideration that harmful interference should not arise. Licence conditions for transmissions from terminals (which are controlled by licence holders) are based on the levels prescribed in the draft for the future harmonised standard for broadband systems in the 2500–2690 MHz band, Working Draft ETSI EN 302 544.

Parties that are interested in having several consecutive FDD frequency blocks or the TDD frequency block in order to utilise broadband systems, for example with 20 MHz bandwidth, should take particular note of the fact that the licence conditions entail that it may not be possible to introduce such systems in the frequencies adjacent to the border between the FDD and TDD frequency blocks. If PTS were to formulate technical licence conditions that permit such use, this would result in large parts of the TDD and FDD frequency blocks being subject to harmful interference.

PTS's proposed technical licence conditions in the TDD frequency block means that some frequencies are required in the 2570–2620 MHz frequency band in order to safeguard FDD use from harmful interference. Among other things, radiated power from the base station will be greatly restricted in the 2570–2580 MHz frequency band. The restrictions of PTS's proposed spectrum masks corresponds to the restriction of the 3GPP specification regarding radiated power from FDD terminals in the 2570–2575 MHz frequency band and from FDD micro base stations in the 2575–2580 MHz frequency band.

Furthermore, it is likely that the level of interference in the 2570–2580 and 2610–2620 MHz frequency bands will be considerably higher than in the central part of the TDD frequency block. In practice, this means that it will only be possible to use approximately 30 MHz in the 2570–2620 MHz band with maximum transmitter power.

The restrictions for the licence holder in the TDD frequency block which are stated above are ultimately the result of the channel plan established by the ECC (ECC/DEC/(05)05). The decision states that any guard bands needed for interoperability between FDD and TDD use shall be taken within the 2570–2620 MHz band. Current and future equipment specifications and standards are to be drawn up on the basis of the assumptions identified in this decision. In this respect, PTS does not consider that this is appropriate with a national regulation that differs from the ECC/DEC/(05)05 decision.

It is possible for licence holders to deviate from certain technical requirements in the licence conditions subject to the precondition that the licence holders affected by the deviations agree to these. The use of the frequencies can be made more efficient if licence holders coordinate their use of radio transmitters. This particularly applies between base stations for TDD and FDD licences in adjacent frequencies. The risk of interference between TDD and FDD base stations can be minimised by coordinating the location of the base stations. As stated above, the basis of the technical conditions is that all licence holders must be able to establish their operations and use the frequencies without having to coordinate this with other users first. In the assessment of PTS, this reduces barriers to entry and facilitates the establishment of new stakeholders. However, as it is likely that more effective use can be achieved through coordination with other users, licence holders are urged to strive for such solutions.