

Appendix A – Licence conditions 900 MHz band

This document is a non-binding translation to English of the Swedish appendix (to the Open Invitation Part 2) published 26 April 2023

Area of use and technical conditions

1. The licence is national.
2. The licence shall be used for terrestrial systems which can provide mobile broadband services.
3. Frequency Division Duplex (FDD) technology shall be used as the duplex method for downlink and uplink transmission respectively.

Base stations are radio transmitters whose transmission shall be in the downlink direction in the frequency range 925–960 MHz (Downlink FDD).

Terminals are radio transmitters whose transmission shall be in the uplink direction in the 880–915 MHz frequency range (Uplink FDD).

Repeaters¹ shall comply with the respective conditions for base stations and terminals.

4. Within the assigned frequency block, the maximum mean EIRP² from base stations shall not exceed
 - a. 65 dBm/5 MHz per antenna in those directions where the effective antenna height³ is less than 50 metres, or
 - b. 68 dBm/5 MHz per antenna in those directions where the effective antenna height is 50 metres or higher.
5. In the frequency range 925–960 MHz, outside the assigned frequency block, base stations shall comply with power limits pursuant to Table 1.

¹ Repeaters are radio transmitters that transmit both in the downlink and uplink direction.

² EIRP – Equivalent Isotropically Radiated Power

³ Effective antenna height is calculated as antenna height above mean ground level, where mean ground level is mean height above sea level in a direction 0 to 3 km from the antenna.

Table 1 Power limits in the frequency range 925–960 MHz, outside the assigned frequency block

BEM⁴ element	Frequency range	Maximum mean EIRP per antenna
Transitional region	0 to 0.2 MHz outside the block edge	32.4 dBm/(0.2 MHz)
	0.2 to 1 MHz outside the block edge	13.8 dBm/(0.8 MHz)
	1 to 5 MHz outside the block edge	5 dBm/MHz
	5 to 10 MHz outside the block edge	12 dBm/(5 MHz)
Baseline	>10 MHz outside the block edge	3 dBm/MHz

6. If the licence holder has been assigned several contiguous frequency blocks, the restrictions on maximum average power under condition 5 above apply only outside the contiguous frequency blocks.
7. The licence holder may, by agreement with other licence holders in 880– 915/925–960 MHz, deviate from the conditions pursuant to condition 5 above, as far as the 925–960 MHz frequency range is concerned.
8. In the 915–925 MHz and 960–970 MHz frequency ranges, base stations shall comply with power limits as specified in Table 2.

Table 2 Power limits in the frequency ranges 915–925 MHz and 960– 970 MHz

BEM element	Frequency range	Maximum mean EIRP per antenna (*)
Additional baseline	0 to 0.2 MHz outside the block edge	32.4 dBm/(0.2 MHz)
	0.2 to 1 MHz outside the block edge	13.8 dBm/(0.8 MHz)
	1 to 5 MHz outside the block edge	5 dBm/MHz
	5 to 10 MHz outside the block edge	12 dBm/(5 MHz)
	>10 MHz outside the block edge(**)	3 dBm/MHz

⁴ BEM – Block Edge Mask. BEM is a spectrum mask that defines power limits as a function of the frequency distance from the edge of a frequency block assigned to a license holder.

(*) Upon application to PTS, the licence holder may be allowed to exceed the specified power limits, provided that neighbouring services, applications and networks remain protected.
(**) Beyond 10 MHz outside the band edge, *spurious limits* apply according to ERC Recommendation 74-01.

Alongside railway tracks, specific levels of maximum permitted signal strength apply within 919.4–925 MHz. See conditions 12 through 14 below.

9. The licence holder is responsible for planning the radio network.

Conditions for the protection of other use

10. Along railway lines where systems used for train communication (GSM-R⁵ and its successors), as defined in Commission Implementing Decision (EU) 2021/1730⁶, are deployed, conditions 11–14 apply. The stated maximum allowable received signal strength limits refers to a 0 dBi antenna 4 metres above the railway track, measured from the top of the rails (RÖK).
11. Base stations transmitting in the frequency range 925–960 MHz shall not generate a signal strength in the frequency range 925–960 MHz exceeding the levels specified in Table 3.

Table 3 Maximum allowable signal strength within 925–960 MHz

Frequency blocks within	Maximum allowable signal strength
925–930 MHz	-40 dBm/0.3 MHz within 925–925.3 MHz
	-13 dBm/4.7 MHz within 925.3–930 MHz
930–960 MHz	-13 dBm/5 MHz within 930–960 MHz

12. Base stations transmitting in the frequency range 925–960 MHz shall not generate a signal strength in the frequency range 919.4–925 MHz exceeding the level specified in Table 4, without first informing the relevant licence holder in the frequency range 919.4–925 MHz thereof.

Table 4 Maximum allowable signal strength within 919.4–925 MHz from frequency blocks within 925–960 MHz

Frequency blocks within	Maximum allowable signal strength
925–960 MHz	-107 dBm/200 kHz within 919.4–925 MHz

⁵ GSM-R - Global System for Mobile Communications for railways

⁶ Commission Implementing Decision (EU) 2021/1730 of 28 September 2021 on the harmonised use of the paired frequency bands 874,4–880,0 MHz and 919,4–925,0 MHz and of the unpaired frequency band 1900–1910 MHz for Railway Mobile Radio

13. Base stations transmitting in the frequency range 925–930 MHz may locally increase the signal strength above railway tracks in the frequency range 919.4–925 MHz to the levels specified in Table 5, provided that the relevant licence holder in the frequency range 919.4–925 MHz has been informed.

Table 5 Maximum allowable signal strength within 919.4–925 MHz from frequency blocks within 925–930 MHz

Frequency blocks within	Maximum allowable signal strength
925–930 MHz	-95 dBm/200 kHz within 919.4–925 MHz

From the time the licence holder in the 919.4–925 MHz frequency range receives the information, such an increase may be implemented after

- six (6) months within urban areas⁷,
- twenty-four (24) months outside urban areas
- or at an earlier date specified by the licence holder in the 919.4–925 MHz frequency range.

14. Base stations transmitting in the 930–960 MHz frequency range may locally increase the signal strength above railway tracks in the 919.4–925 MHz range to the level specified in Table 6, provided that the relevant licence holder in the 919.4–925 MHz range has been informed.

Table 6 Maximum allowable signal strength within 919.4–925 MHz from frequency blocks within 930–960 MHz

Frequency blocks within	Maximum allowable signal strength
930–960 MHz	-98 dBm/200 kHz within 919.4–925 MHz

From the time the licence holder in the 919.4–925 MHz frequency range receives the information, such an increase may be implemented after

- six (6) months within urban areas,
- twenty-four (24) months outside urban areas
- or at an earlier date specified by the licence holder in the 919.4–925 MHz frequency range.

⁷ According to the definition of urban areas used by Statistics Sweden.

Coverage and deployment conditions⁸

15. The licence holder shall provide coverage for mobile services in designated areas with coverage gaps. This coverage is to be created by the deployment of new masts.

For the purposes of these licence conditions, mast refers to both the structure that bears the antennas (the antenna bearer) and the structure that houses the radio equipment (the technical room). Radio equipment, antennas and other peripheral equipment required for the installation are also meant with the term mast.

In order to qualify as a new mast, pursuant to these licence conditions, the mast must:

- be built by the licence holder or by someone else on behalf of the licence holder
- not be built before 1 January 2024
- not be built as a measure to comply with coverage and deployment conditions of another radio licence held by the licence holder
- not be financed, wholly or in part, through public resources⁹

16. The deployment of new masts shall continue until at least 30,000 of the 100×100 m grid squares¹⁰ that contains coverage gaps have been covered. Grid squares containing coverage gaps (244,426 in total) can be found in Appendix A1.

Table 7 below indicates the number of 100×100 m grid squares containing coverage gaps to be covered for the three regions Götaland, Svealand and Norrland, with the included counties and county borders that were valid at the decision date for this licence.

⁸ The licence holder that wins the 2×10 MHz frequency block in the 900 MHz band subject to coverage and deployment conditions shall comply with these conditions

⁹ The term public resources is used here in the same way as when applying the Swedish Act (2016:534) on measures for the deployment of broadband networks, and includes resources from e.g. government, regional and municipal authorities and other public bodies.

¹⁰ Equivalent to at least 300 km²

Table 7 Number of 100×100 m grid squares containing coverage gaps to be covered per region

Region	Included counties	Number of 100×100 m grid squares to cover
Götaland	Blekinge County	7,000 (70 km ²)
	Gotland County	
	Halland County	
	Jönköping County	
	Kalmar County	
	Kronoberg County	
	Skåne County	
	Västra Götaland County	
	Östergötland County	
Svealand	Dalarna County	6,000 (60 km ²)
	Stockholm County	
	Södermanland County	
	Uppsala County	
	Värmland County	
	Västmanland County	
	Örebro County	
Norrland	Gävleborg County	17,000 (170 km ²)
	Jämtland County	
	Norrbotten County	
	Västerbotten County	
Kingdom		30,000 (300 km²)

17. Capacity and performance¹¹ within the coverage area for each new mast shall be at least equivalent to what can be achieved by using 2×10 MHz LTE¹² with 2×2 MIMO¹³.

18. Coverage for mobile services is deemed to exist if, with a handheld terminal, it is possible to transmit data at a rate of 128 kbit/s, under normal conditions.

¹¹ In terms of speed and latency

¹² LTE – Long Term Evolution: technical standard for wireless broadband services

¹³ MIMO – Multiple Input Multiple Output: technology for wireless digital data transmission in which both the transmitter and the receiver have multiple radio receivers and transmitters respectively

The signal strength level for coverage shall be based on the following assumptions:

- a. Base station receiver sensitivity of the equipment used in the network
 - b. Terminal output power of a "smartphone-type" hand-held terminal¹⁴
 - c. Terminal antenna gain: -4 dBi
 - d. The height of the terminal: 1.5 meters above ground
 - e. Margin of signal attenuation relative to a terminal free of body contact
 - i. For grid squares containing coverage gaps along road or railway sections, the signal shall be capable of attenuation of 16 dB
 - ii. For squares containing coverage gaps other than those along road or railway sections, the signal shall be capable of attenuation of 8 dB
 - f. Interference margin (load) in uplink: 2 dB
 - g. Lowest data speed in uplink: 128 kbit/s, under normal conditions
 - h. Coverage probability on the cell edge (edge of the coverage area): $\geq 80\%$
19. Coverage may also be achieved by the use of other frequency bands harmonised within the European Union for terrestrial systems capable of providing electronic communications services.
20. Of the 100×100 m grid squares containing coverage gaps, the following number shall be covered according to the schedule below:
- 7,500 by 31 December 2027
 - 15,000 by 31 December 2028
 - 22,500 by 31 December 2029
 - 30,000 by 31 December 2030
21. The new masts must be operational and comply with the coverage and deployment conditions for the remainder of the licence period.

Sharing conditions

22. The licence holder has, pursuant to this licence, priority in the assigned frequency range over licence holders who may be added later. The frequency range is shared with others provided that the licence holder, pursuant to this licence, is not subject to harmful interference.

¹⁴ If, for the technology used in the network, there is more than one standardised terminal class, which corresponds to a "smartphone-type" hand-held terminal, the one with the lowest output power shall be assumed.

Conditions on coordination

23. The licence holders shall obtain the consent from the Swedish Armed Forces for all new installations of radio transmitters and changes to existing installations of radio transmitters (e.g., updated technologies, directions/tilt, power, channel bandwidth) in the following municipalities: Ekerö, Gotland, Karlskrona, Kungsbacka, Marks, Simrishamn, Skurup, Trelleborg, Varberg, Vellinge and Ystad.
24. The licence holder shall comply with the conditions according to applicable coordination agreements between Sweden and other states.

Conditions regarding requirements that are of importance to the national security of Sweden

25. The licence holder shall take the technical and organizational measures required to ensure that the radio usage does not cause harm to the national security of Sweden.
26. Conditions 27–29 apply to central functions, i.e., functions in:
 - the radio access network,
 - the transmission networks,
 - the core network, and
 - the operation and maintenance networkthat are necessary to maintain overall network functionality and electronic communications services provided by the holder of the licence.
27. Central functions used for the provision of services in the 900 MHz, 2.1 GHz and 2.6 GHz frequency bands must not contain products from Huawei and ZTE.
28. If the primary source for the common time reference is reception of signals from satellite (GNSS), or if the source is otherwise located outside Sweden, then a redundant source located in Sweden shall be functionality-tested and ready to be put into service when needed.
29. Central functions must not be dependent on staff or functions located abroad.

Information

Notification obligation

Public communication networks of the type that are normally provided against payment or publicly available electronic communication services may only be provided after notification to PTS.

Information obligation

Anyone operating under the Electronic Communications Act is obliged to provide PTS, upon request, with the information and documents necessary for verifying compliance with the conditions imposed under the Act.

Changes of conditions

The licence conditions may be amended with regard to future changes in radio technology or changes in radio usage due to international agreements to which Sweden is a party or provisions adopted on the basis of the Treaty on the Functioning of the European Union.

Licence conditions may also be changed immediately if it can be assumed that the radio usage will cause harm to Sweden's security.

Coordination with the Swedish Armed Forces

Coordination with the Swedish Armed Forces regarding the expansion, deployment or modification of base stations in certain municipalities is initiated by filling out a form available on the Swedish Armed Forces website.¹⁵ The completed form is sent to the Armed Forces according to the instructions on the form. For questions, please contact the Swedish Armed Forces at fysplan@mil.se.

Existing coordination agreements

Information on existing coordination agreements for block licences can be found on PTS's website¹⁶.

¹⁵ <https://www.forsvarsmakten.se/sv/om-forsvarsmakten/dokument/remissblanketter/>

¹⁶ <https://www.pts.se/en/english-b/radio/coordination-agreements/>