

## Technical licence conditions for 25 100 - 27 500 MHz

### Definitions

**Active antenna systems (AAS)** means a base station and an antenna system where the amplitude and/or phase between antenna elements is continually adjusted resulting in an antenna pattern that varies in response to short term changes in the radio environment. This excludes long-term beam shaping such as fixed electrical down tilt. In AAS base stations the antenna system is integrated as part of the base station system or product.

**Synchronised operation** means that simultaneous uplink (UL) and downlink (DL) transmissions do not occur in time division duplex (TDD) networks on frequency blocks assigned to licence holders in the 25 100 - 27 500 MHz frequency band, that is at any given moment in time either all networks transmit in downlink or all networks transmit in uplink. This requires the alignment of all DL and UL transmissions for all TDD networks involved as well as synchronising the beginning of the frame across all networks.

**Unsynchronised operation** means operation of different TDD networks on frequency blocks assigned to licence holders in the 25 100 - 27 500 MHz frequency band, where at any given moment in time at least one network transmits in DL while at least one network transmits in UL. This might happen if the TDD networks either do not align all DL and UL transmissions or do not synchronise at the beginning of the frame.

**Semi-synchronised operation** means operation of all different TDD networks on frequency blocks assigned to licence holders in the 25 100 - 27 500 MHz frequency band, where part of the frame is consistent with synchronised operation, while the remaining portion of the frame is consistent with unsynchronised operation. This requires the adoption of a frame structure for all TDD networks involved, including slots where the UL/DL direction is not specified, as well as synchronising the beginning of the frame across all networks.

**Total radiated power, (TRP)**, means how much power a composite antenna radiates. It equals the total conducted power input into the antenna array system less any losses in the antenna array system. TRP means the integral of the power transmitted in different directions over the entire radiation sphere as shown in the formula:

$$TRP \stackrel{\text{def}}{=} \frac{1}{4\pi} \int_0^{2\pi} \int_0^{\pi} P(\vartheta, \varphi) \sin(\vartheta) d\vartheta d\varphi$$

where  $P(\vartheta, \varphi)$  is the power radiated by an antenna array system in direction  $(\vartheta, \varphi)$  given by the

formula

$$P(\vartheta, \varphi) = P_{TX} g(\vartheta, \varphi)$$

where  $P_{TX}$  denotes the conducted power (measured in Watts), which is input into the array system, and  $g(\vartheta, \varphi)$  denotes the array systems directional gain along the  $(\vartheta, \varphi)$  direction.

## Technical licence conditions

1.

The frequency band 25 100 - 27 500 MHz uses Time-Division Duplex (TDD), both base station transmitters and terminal station radio transmitters use the band.

2. Radio networks operating in the 25 100 - 27 500 MHz frequency band must be synchronised. However, the networks need not to be synchronised if they do not cause harmful interference to each other.

3. The total radiated power (TRP) for a base station transmitter outside the frequency block assigned for a licence holder is in table 1.

Frequency band	Maximum TRP	Measurement bandwidth
Up to 50 MHz below or above a licence holder's block	12 dBm	50 MHz

*Table 1: The maximum radiated power (TRP) for a base station transmitter outside a licence holder's frequency block*

4. The total radiated power (TRP) for a base station transmitter outside the frequency block assigned for a licence holder in the 24 250 - 27 500 MHz frequency band is in table 2.

Frequency band	Maximum TRP	Measurement bandwidth
More than 50 MHz below or above a licence holder's block	4 dBm	50 MHz

*Table 2: The maximum radiated power (TRP) for a base station transmitter outside a licence holder's frequency block in the 24 250 - 27 500 MHz frequency band*

5. The total radiated power (TRP) for a base station transmitter in the 23 600 - 24 000 MHz frequency band is in table 3.

Maximum TRP	Measurement bandwidth	Entry into force
- 33 dBW	200 MHz	Entry into force of this Decision
- 39 dBW	200 MHz	1 January 2024*

\*This limit applies to base stations brought into use after 1 January 2024. This limit does not apply to base stations that have been brought into use prior to that date. For those base stations, the limit of – 33 dBW/200 MHz continues to apply after 1 January 2024.

*Table 3: The maximum radiated power (TRP) for a base station transmitter in the 23 600 - 24 000 MHz frequency band*

6. The total radiated power (TRP) for a terminal station in the 23 600 - 24 000 MHz frequency band is in table 4.

Maximum TRP	Measurement bandwidth	Entry into force
- 29 dBW	200 MHz	Entry into force of this Decision
- 35 dBW	200 MHz	1 January 2024*
*This limit applies to terminal stations brought into use after 1 January 2024. This limit does not apply to terminal stations that have been brought into use prior to that date. For those terminal stations, the limit of – 29 dBW/200 MHz continues to apply after 1 January 2024.		

*Table 4: The maximum radiated power (TRP) for a terminal station in the 23 600 - 24 000 MHz frequency band*

7. A licence holder shall ensure that each antenna is normally transmitting only with the main beam pointing below the horizon and in addition, the antenna shall have mechanical pointing below the horizon except when the base station is only receiving.
8. A licence holder may deviate from the conditions in sections 3 and 4, provided that they continue to meet the technical requirements applied to the protection of other services, applications or networks, and that the licence holders meet the coordination requirements, if the Finnish Transport and Communications Agency and the affected licence holders accept it.
9. Use of the 25 100 - 27 500 MHz frequency band for communications with unmanned aerial vehicles shall be limited to the communication link from the terminal station on board the unmanned aerial vehicle to a base station of the terrestrial wireless broadband electronic communications network.
10. A licence holder must comply with separate coordination agreements provided by the Finnish Transport and Communications Agency on the use of frequencies concluded with the telecommunications administrations of neighbouring countries.
11. Details of base station transmitters in the 25 100 - 27 500 MHz frequency band operating within a maximum distance of 90 kilometres from the border of a neighbouring country must be provided to the Finnish Transport and Communications Agency for coordination valuation before deployment, unless there is a separate coordination agreement on the use of the frequencies with the country in question.
12. A licence holder must provide the most updated technical information of the base stations and repeaters in the system as well as their locations to the Finnish Transport and Communications Agency as agreed separately. The provided technical information must comprise the frame structure for the synchronised operation and the source of the synchronisation signal (clock). The Finnish Transport and Communications Agency must be informed of any changes to synchronisation well before their adoption.

13. A licence holder has the right to share the use of mobile network base stations with another licence holder in frequencies for which the other licence holder has a radio licence. A licence holder must notify the Finnish Transport and Communications Agency of the use of the shared network and frequencies before deployment of the network. A licence holder must also notify the Agency if the use of the shared network ends partially or completely.

## INFORMATION FOR THE LICENCE HOLDER

1. Radio transmitters, using the UWB technology, and exempted from licensing operate in the 24.05–27 GHz band. Further information on UWB equipment is available in the Annex to Regulation 4 of the Finnish Transport and Communications Agency.
2. Short Range Radars (SRR) operate in the 21,650 - 26,650 GHz frequency band. Further information on Short Range Radars is available in the Annex to Regulation 4 of the Finnish Transport and Communications Agency.
3. In the Radio Regulations, the 24.45 - 24.75 GHz and 25.25 - 27.5 GHz frequency bands have been assigned for inter-satellite communications on a primary basis. In the Radio Regulations, the 24.65 - 25.25 GHz frequency band has been assigned for earth-to-space communications in the Fixed Satellite Service (FSS) on a primary basis. In the Radio Regulations, the 24.25 - 27.5 GHz frequency band has been assigned for the Fixed Service on a primary basis. The 25.5 - 27 GHz frequency band has, in the Radio Regulations and in Regulation 4 of the Finnish Transport and Communications Agency, been assigned for space-to-earth communication to earth stations in the Earth Exploration Satellite Service (EESS) and in the Space Research Service (SRS) on a primary basis. Further information on these services is available in the Radio Regulations.
4. A licence holder must expect constraints for the protection of licensed operation in the 25 100 - 25 250 MHz frequency band against emissions of the Fixed Satellite Service (earth to satellite).
5. A licence holder must expect constraints for the protection of space-to-earth communication to earth stations in the Earth Exploration Satellite Service (EESS) and for the Space Research Service (SRS) in the 25 000 - 27 000 MHz frequency band against emissions of the licensed operation.
6. A licence holder must expect constraints for the protection of individual radio astronomy stations operating in the 23.6-24.0 GHz frequency band.
7. These technical licence conditions are based on the Commission implementing decision (EU) 2019/784. As the technical conditions in the Commission implementing decision are based on certain assumptions and case-specific approval of base station transmitters, it is possible that these technical licence conditions do not prevent harmful interference in all cases.

8. The WRC-19 Conference adopted following conditions that are not in line with the decision (EU) 2019/784 regarding the use of the 24.25 - 27.50 GHz frequency band:
- a) According to the revised Radio Regulations, the base station transmitters to be deployed in the 24.25 - 27.5 GHz frequency band as of 1 January 2021 may generate a power level of max -33 dBW/200 MHz, and the terminal stations to be deployed may generate a power level of max -29 dBW/200 MHz on frequency band 23.6 - 24.0 GHz. The base station transmitters to be deployed after 1 September 2027 may generate a power level of max -39 dBW/200 MHz and the terminal stations to be deployed may generate a power level of max -35 dBW/200 MHz on the frequency band in question. These power levels are measured at the transmitter antenna port; however, for IMT base stations or terminal stations, the total radiated power (TRP) is used.
    - i. For these parameters, the European Commission has started technical investigation work aiming at amending the implementing decision.
  - b) According to the revised Radio Regulations, sites for IMT base stations within the frequency band 24.25 - 27.5 GHz employing values of equivalent isotropically radiated power (e.i.r.p.) per beam exceeding 30 dBW/200 MHz should be pointed so that the direction of maximum radiation of any antenna will be separated from the geostationary-satellite orbit, within the line-of-sight of the IMT base station, by at least  $\pm 7.5$  degrees.
- This requirement in the Radio Regulations enters into force on 1 January 2021.
9. The Finnish Transport and Communications Agency may amend the technical licence terms without the consent of the licence holder if this is essential because of a change in the confirmed allocation plan for a radio frequency, regulations on frequencies or international treaty obligations, or if it is justified for the prevention or removal of interference in radio communications or on the basis of the radio frequency band's primary purpose of use.
10. A radio licence holder must expect that the other base station transmitters in radio networks in the 24.25 - 27.50 GHz band may, outside their own frequency band, transmit power in accordance with sections 3 and 4 of these technical licence conditions.
11. The Finnish Transport and Communications Agency will inform the licence holders separately of any new or amended coordination agreements.
12. A licence holder must also note that the parameters starting the coordination process as defined in section 10 of the licence conditions are, in the absence of a national border, interpreted to apply to the neighbouring countries' islands and continent. In section 11 of the licence conditions, the coordination distance is, in the absence of a national border, calculated to the neighbouring country's islands or continent.