

Background regarding technical restrictions of use in the 26 GHz band

1 Other primary service in the band

Earth stations in the Earth Exploration satellite Service (e.g. weather satellites) and earth stations in the Space Research Service in the 25,5-27 GHz frequency band (EESS/SRS receiving earth stations)

For the time being, there are no such stations in Finland. It is mentioned in the licence application notification that operators must expect for deployment of such earth stations during the licence period. The Finnish Transport and Communications Agency seeks to carry out the procedure for the potential deployment of earth stations in a way that causes as little interference to 5G networks in the 26 GHz band as possible (e.g. location). The Finnish Transport and Communications Agency will make a decision on interference protection according to section 50 in the Act on Electronic Communications Services. Based on the decision, the station is surrounded by a protection area, the size of which is specified on a case-by-case basis. Below are some examples for the required protection area based on various examination results.

| Protection distance | CEPT Report 68 | ECC Rec (19)01 | Other results |
|---------------------|----------------|----------------|---------------|
| EESS NGSO | ~4 km | 0,1-12 km | 0,2-6 km |
| EESS GSO | ~10 km | 0,1-7 km | 3-7 km |
| SRS | 25-70 km | | 0,8-90 km |

Earth stations in the Fixed Satellite Service in the 24,65-25,25 GHz frequency band (FSS transmitting stations)

For the time being, there are no such stations in Finland. It is mentioned in the licence application notification that operators must expect for deployment of such earth stations during the licence period. The Finnish Transport and Communications Agency seeks to carry out the procedure for the potential deployment of earth stations in a way that causes as little interference to 5G networks in the 26 GHz band as possible (e.g. location). According to simulations, transmitting earth stations may cause harmful interference to 5G base station receivers and terminal station receivers so that the necessary protection area is from a few hundred metres up to 10 kilometres. The risk for interference may be reduced by optimizing the antenna directions in the 5G network.

For these stations, the purpose of preamble 16 in the Commission implementing decision (EU 2019/784), as laid down in Article 5 shall be followed:

“Co-existence between terrestrial wireless broadband electronic communications services (including 5G) and earth stations in the EESS, SRS and FSS operating in the 26 GHz frequency band can be ensured by applying, where appropriate, technical constraints to the deployment of terrestrial services in a limited geographical area around a satellite earth station. In this regard, deploying new earth stations preferably away from locations with high population density or high human activity may represent a proportionate approach to facilitating such co-existence.”

2 Protection of the receiving passive band 23,6-24 GHz

According to the Commission implementing decision, the Member States shall ensure that **Earth Exploration Satellite receivers** (e.g. weather satellites) and **radio astronomy reception** in the frequency band are appropriately protected.

The valid protection values for **Earth Exploration Satellite Systems** in the Commission and ECC decisions are:

- **-42 dBW/200 MHz** (base stations) and **-38 dBW/200 MHz** (terminal stations)

Such protection values had not been specified anywhere in the world until the World Radiocommunication Conference (WRC-19) decided on it in November 2019. The Conference decided on values, which would be introduced in two phases, thus enabling an early-stage global 5G equipment ecosystem and ensuring a sufficient long transition period for manufacturers before moving to stricter protection values. The less strict early stage protection value is based on the fact that there will not be a large amount of 5G equipment in this frequency band in the beginning, as 5G services are concentrated in lower frequency bands, e.g. 3400-3800 MHz. This enables the prerequisites for future operating conditions for Earth Exploration Satellites.

The values according to the WRC-19 decision are:

- **-33 dBW/200 MHz** (base stations) and **-29 dBW/200 MHz** (terminal stations) before 1 September 2027, and
- **-39 dBW/200 MHz** (base stations) and **-35 dBW/200 MHz** (terminal stations) after 1 September 2027.

The WRC-19 decision is in conflict with the current protection values in the Commission implementing decision. Therefore, the Commission has initiated a process to amend the decision. Further information about these will be available in April 2020.

Protection of **radio astronomy reception** in this frequency band is based on footnote 5.340 in the Radio Regulations, according to which all emissions are prohibited in the 23,6-24 GHz frequency band in line with protection thresholds given in recommendation ITU-R RA.769 with regard to the Radio Astronomy Service. For the time being, there is one radio observatory¹ in the millimeter-wave band in Finland, but it does not have any receivers in this frequency band. It is mentioned in the licence application notification that operators must expect for deployment of such radio astronomy reception during the licence period. The Finnish Transport and Communications Agency seeks to carry out the procedure for the potential deployment in a way that causes as little interference to 5G networks in the 26 GHz band as possible (e.g. antenna directions, restriction of network coverage near the station, etc.). The required protection distance varies according to terrain (terrain obstacles make the situation easier).

¹ Aalto University's Metsähovi Radio Observatory in Kirkkonummi

3 Other general restrictions of use

The technical licence conditions for radio licences also include other restrictions of use, most of which are technical. They improve the shared use of the frequency band in relation to other use and enhance the efficient use of 5G network spectrum by different operators.

Synchronization - in principle, networks operating in the 26 GHz frequency band must be synchronized in order to avoid guard bands between different networks. There may be case-specific exceptions for indoors use or other corresponding implementations.

Direction of base station antenna - antennas shall normally be directed so that each antenna is 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.

Coordination obligation within 90 km from the border - It may be impossible to conclude bilateral coordination agreements in this frequency band due to different purposes of use. Therefore, individual base station transmitters shall, in principle, be coordinated with the neighbouring country before deployment because the neighbouring country uses radio links in this frequency band and this use may increase in the future. Appendix 7 to the ITU Radio Regulations includes a method to calculate the coordination distances between a satellite earth station and fixed service (radio links and mobile networks). The calculation method contains a separate method to define the minimum coordination distance, which no longer can cause long-term interference between the systems. In the 26 GHz band, this coordination distance is 90 kilometres. When there is no coordination agreement between the mobile network base stations and the use in the neighbouring countries (links, mobile networks and transmitting FSS earth stations), Traficom will apply this value so that if the base station is closer than 90 kilometres from the border, the coordination need shall be estimated separately for mobile network base stations. Exceptions are possible in case of indoors use or if the terrain obstacles towards the border give sufficient protection, etc.

Protection of geostationary orbit - sites for 5G 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 ± 7.5 degrees. This requirement in the Radio Regulations enters into force on 1 January 2021.

The amendment will probably be added also in the Commission implementing decision and in the ECC harmonisation decision during 2020 as the decisions from the WRC-19 are taken into account.