

Administrative rules for spectrum assignments

**for local broadband spectrum usages in the
24.25-27.5 GHz band**

**(Administrative rules for local
broadband applications at 26 GHz)**

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Courtesy translation

Administrative rules for local broadband applications at 26 GHz

1 Scope of the administrative rules

Under the terms of section 91 TKG [1] each spectrum usage requires prior spectrum assignment. Spectrum will be assigned in line with the Frequency Plan [4].

With a view to facilitating technical progress and swiftly implementing international harmonisation decisions, the Frequency Plan only sets out the framework conditions that ensure efficient and interference-free spectrum use. These framework conditions are supplemented by more detailed administrative rules to ensure a uniform administrative practice.

The following administrative rules apply to spectrum assignments for local broadband spectrum usages in the 24.25-27.5 GHz band ("Administrative rules for local broadband applications at 26 GHz").

These administrative rules, including the spectrum usage conditions, can be amended at a later date, particularly if this is necessary to ensure efficient and interference-free spectrum use or as a result of international harmonisation measures.

The Bundesnetzagentur reserves the right to review and, if necessary, amend the administrative rules for the 24.25-27.5 GHz band one year after the application process has begun, with a view to ensuring efficient and interference-free spectrum use.

2 Spectrum usage conditions

2.1 General

In Germany, the whole of the 24.25-27.5 GHz band ("26 GHz band") is designated for local broadband spectrum usages and can be used within the framework of MFCN.

Spectrum in the 26 GHz band will be assigned for MFCN on a technology-neutral and service-neutral basis, enabling the implementation of retail telecommunications services and applications such as infrastructure links, industry 4.0 and IoT.

General assignments in this band are not possible because of the radio compatibility situation. Existing use by various radiocommunication services and the associated need for protection mean that coordination with existing usages is necessary when making new assignments for local broadband applications.

To ensure efficient and interference-free spectrum use, the spectrum will be assigned by means of individual administrative acts, section 91(3) TKG. Provision by means of area-related individual assignments with an application process makes it possible to carry out the necessary coordination between the radiocommunication services and flexibly adapt assignments for local broadband applications to applicants' requirements with respect to bandwidth and area of use.

The Bundesnetzagentur assumes that sufficient spectrum in the millimetre wave bands will be available for MFCN into the future. Work is already in progress at European level to provide the 42 GHz spectrum harmonised at WRC-19 (40.5-43.3 GHz). The European Commission has issued a relevant mandate to CEPT to develop harmonised technical conditions. The work under the mandate is to be completed by July 2021. The Bundesnetzagentur anticipates that the harmonisation measure will be implemented soon afterwards in the form of a Commission implementing decision.

For the purposes of the application process, there will therefore be no spectrum cap and no upper limit on the size of the area applied for. The Bundesnetzagentur is not setting a limit on the bandwidth that can be applied for, but it assumes that the largest bandwidth applied for will be 800 MHz because of the parameters of the equipment currently available. The more bandwidth applied for, the more detailed the reasoning for the requirements must be. If more than 800 MHz is applied for at a later date, detailed proof of the requirement must be given in the spectrum usage concept. If particular sub-bands in the 26 GHz band are applied for, clear reasoning must also be given in the spectrum usage concept. It is important to ensure that efficient spectrum use is guaranteed. The Bundesnetzagentur would like to draw attention to section 102(1) TKG and the possibility of revoking all or part of a spectrum assignment after 12 months (use it or lose it procedure). The spectrum usage concept must include in particular a clear and detailed account of how the spectrum applied for will be used efficiently in the area applied for within 12 months. The Bundesnetzagentur must be updated on the progress of roll-out for cross-boundary applications after 6, 9 and 12 months.

If no spectrum for local campus networks has been awarded for a particular area and an application for cross-boundary spectrum usage is received that would reduce the spectrum available in the 26 GHz band to less than 800 MHz, the Bundesnetzagentur will give potential users of spectrum for local applications within property boundaries the opportunity to state their interest in acquiring spectrum for their own use. This does not, however, constitute a right to reserve spectrum for assignment at a later date for local applications within property boundaries.

To ensure that sufficient spectrum resources are still available to companies at a later date, all operators concerned of applications within or across property boundaries are subject to a negotiation requirement. The negotiation requirement covers not only starting contractual negotiations but also negotiating the conditions with the user(s) concerned. The aim of the requirement is for an agreement to be reached in negotiations conducted under the freedom of contract enabling applications within property boundaries to be implemented even after cross-boundary assignments have been made.

All operators of MFCN applications concerned are also subject to a negotiation requirement for operator agreements. The Bundesnetzagentur welcomes every opportunity for agreement among the operators.

Spectrum is assigned taking account of the specific local radio compatibility situation. Spectrum for MFCN can only be assigned if interference-free operation of the existing applications of other services as specified in section 2.9 is ensured.

Any natural person or legal entity has the right to apply.

2.2 Permissible block emissions and out-of-band emissions

The usage conditions serve to ensure coexistence between different applications in the 24.25-27.5 GHz band and the adjacent bands. Compliance with the spectrum/block edge masks and other technical conditions in the Commission decisions referred to below is generally necessary to ensure coexistence.

The 24.25-27.5 GHz band is subject to the spectrum usage conditions laid down in the Commission Implementing Decision (EU) 2019/784 of 14 May 2019 on harmonisation of the 24,25-27,5 GHz frequency band for terrestrial systems capable of providing wireless broadband electronic communications services in the Union ([5]), as amended by Commission Implementing Decision (EU) 2020/590 of 24 April 2020 amending Decision (EU) 2019/784 as regards an update of relevant technical conditions applicable to the 24,25-27,5 GHz frequency band ([6]).

Annex 1 contains the technical conditions set out in the implementing decisions

2.3 Ensuring radio compatibility between adjacent areas

Spectrum must be used in the assignment areas in such a way that no significant interference is caused to spectrum usages in adjacent geographic areas. Operator agreements are necessary to improve coverage while still ensuring compatible as well as efficient and interference-free use for assignments for local broadband spectrum usages in adjacent geographic areas or adjacent spectrum. The aim of these operator agreements is to enable unrestricted use for adjacent assignment holders and contribute to efficient spectrum use.

Cologne Administrative Court specifically said the following (21 K 8149/09, 14 September 2011):

"The legal requirement imposed on the Bundesnetzagentur to ensure efficient and interference-free spectrum use (section 2(2) para 7, section 52(1), section 53(2), section 55(5) para 4, and section 60(1) and (2) TKG) presents an objective involving a conflict of interests between efficiency and freedom from interference; this conflict is to be resolved not by maximising one interest at the expense of the other but by balancing the two in line with demand. The requirement of efficient and interference-free spectrum use

therefore does not oblige the Bundesnetzagentur to ensure maximum freedom from interference but to reduce radio interference to an acceptable level in terms of creating maximum possible freedom from interference together with maximum efficiency in spectrum use. Where the requirement to ensure efficient and interference-free spectrum use is also imposed on the spectrum user (section 55(5) para 4 and section 60(1) and (2) TKG), it comprises on the one hand the right and duty to use the assigned spectrum efficiently and on the other hand the duty not to cause interference to other spectrum usages. Even if it is assumed that the latter duty corresponds to a defensive claim to be asserted by the spectrum users affected by interference vis-à-vis the Bundesnetzagentur, it does not include absolute protection from interference "at any price" but merely the right to defence against unacceptable degradation as a result of the balancing of interests referred to above, irrespective of which spectrum usage was in operation first and which came into operation later. [...]"

In the case of synchronised networks, no spectrum-related guard band is generally needed between the frequency block of one network operator using TDD and the frequency block of an adjacent network operator. In the case of unsynchronised and semi-synchronised networks, the European studies on synchronisation in the 26 GHz band can be taken into account (ECC Report 307 [8]). Any necessary guard bands should be agreed on between the adjacent operators of local applications and should be implemented using equal amounts of spectrum from the operators' assignments. Any deviations require bilateral or multilateral agreements between the network operators concerned. Such agreements must be notified to the Bundesnetzagentur before operation.

Synchronised network operation between adjacent assignment holders makes sense for reasons of spectrum efficiency. On account of the complexity of the various applications, however, the Bundesnetzagentur does not consider it possible to make a general stipulation.

Assignment holders are free in the planning of their networks within the property boundaries. The Bundesnetzagentur will not generally define a maximum permissible field strength at the assignment area border. Assignment holders are, however, required to ensure efficient and interference-free use of their networks, for instance to design and build their networks in such a way as to minimise the interference ranges of their spectrum usages. This can be achieved for instance with low transmit powers, low antenna heights and appropriate antenna directional patterns.

Operators of wireless networks in adjacent geographic areas and adjacent spectrum are subject to a **negotiation requirement for operator agreements**. Optimal spectrum planning taking account of the relevant local conditions (such as topography and buildings) must be carried out on location and agreed among the operators. The Bundesnetzagentur assumes that the operators will find an appropriate solution among themselves.

Guidance on drawing up operator agreements can be found in Annex 2.

In particular if the adjacent operators should not reach an agreement, the Bundesnetzagentur can lay down measures to ensure efficient spectrum use with the minimum of interference for all operators concerned. The Bundesnetzagentur will define a field strength limit of 65 dB μ V/m/200 MHz¹ at a height of 3 metres at and beyond the border of the assignment area.

¹ ECC PT 1 is currently examining this limit for cross-border coordination. The Bundesnetzagentur may change this limit, depending on the outcome of the ECC PT 1 examination.

Costs for any necessary reconfiguration of the wireless networks must be borne by the assignment holders.

The limits for public exposure to electromagnetic fields from radio equipment must be met.

2.4 Spectrum packages and spectrum usage concept

Applicants must set out their spectrum requirements in a spectrum usage concept. Applicants must provide a plausible account of their spectrum requirements based on the planned spectrum usage. In particular, applicants must show that they will ensure efficient spectrum use.

Further guidance on drawing up a spectrum usage concept can be found in Annex 3. The Bundesnetzagentur would again like to draw attention to section 102 TKG. This states that a spectrum assignment can be revoked if use of the spectrum has not begun within one year of the assignment, or if the spectrum has not been used for the purpose for which it has been assigned for more than one year (use it or lose it procedure).

The Bundesnetzagentur can request reports on the status of network roll-out and spectrum utilisation for the purposes of evaluation. The Bundesnetzagentur's radio monitoring and inspection service can also carry out relevant measurements on location.

Spectrum will be assigned for TDD as a rule with blocks in multiples of 200 MHz. The Bundesnetzagentur is not setting a limit on the bandwidth that can be applied for, but it assumes that the largest bandwidth applied for will be 800 MHz because of the parameters of the equipment currently available.

Blocks in multiples of 50 MHz up to 150 MHz will be assigned for individual spectrum usages requiring less bandwidth. Clear reasoning for both the amount of the spectrum applied for and any particular sub-bands applied for must be given in the spectrum usage concept.

2.5 Spectrum assignment area

There is no upper limit on the size of the area that can be applied for. The Bundesnetzagentur would however like to draw attention to the requirement for a transparent spectrum usage concept. The spectrum usage concept must clearly show that it will be possible to use the spectrum in the whole of the area applied for within one year. Efficient spectrum use must be ensured in the whole of the area applied for.

If no spectrum for local campus networks has been awarded for a particular area and an application for cross-boundary spectrum usages is received that would reduce the spectrum available in the 26 GHz band to less than 800 MHz, the Bundesnetzagentur will give potential users of spectrum for local applications within property boundaries the opportunity to use a spectrum usage themselves. This does not, however, constitute a right to reserve spectrum for assignment at a later date for local applications within property boundaries.

To ensure that sufficient spectrum resources are still available to companies at a later date, all operators concerned are subject to a negotiation requirement. The negotiation requirement covers not only starting contractual negotiations but also negotiating the conditions with the user(s) concerned. The aim of the requirement is for an agreement to be reached in negotiations conducted under the freedom of contract enabling applications within property boundaries to be implemented even after cross-boundary assignments have been made.

All operators of MFCN applications concerned are also subject to a negotiation requirement for operator agreements. The Bundesnetzagentur welcomes every opportunity for agreement among the operators.

2.6 Carrier aggregation

Numerous fixed link applications are operated in the 24.5-26.5 GHz band. The Bundesnetzagentur will make every effort to provide contiguous spectrum for new local broadband spectrum usages. This may, however, not be possible in every case.

It is possible that, depending on the planned usage for a specific location, the bandwidth applied for may not be available as contiguous spectrum because of existing assignments. If this is the case, the Bundesnetzagentur assumes that applicants will use carrier aggregation, which is available in modern mobile systems.

The application planning can take account of the fact that the use of carrier aggregation may lead to small reductions in the transmission capacity of the systems used.

If necessary, further spectrum (one 50 MHz block) in addition to the bandwidth originally planned can be assigned upon subsequent application.

2.7 Indoor spectrum usages

Assignments for indoor spectrum usages within property boundaries (assuming sufficient electromagnetic shielding from the building to avoid interference) are still possible even if the area is already covered by a cross-boundary spectrum assignment. This is also subject to a negotiation requirement for operator agreements between the operators concerned.

If it is planned to use more than one base station indoors, it is sufficient for the purposes of the application to give just one reference base station. This must be the base station with the highest transmit power. The application must also give the planned maximum indoor antenna height. The coordinates of the centre of the building must also be given. This enables flexible use of the base stations within buildings, details of which must be given in the spectrum usage concept.

2.8 Spectrum assignment revocation

The Bundesnetzagentur would like to draw specific attention to section 63 TKG. This states that a spectrum assignment can be revoked if use of the spectrum has not begun within one year of the assignment, or if the spectrum has not been used for the purpose for which the assignment has been granted for more than one year (use it or lose it procedure).

2.9 Spectrum coordination for the protection of radio applications within the band

To ensure interference-free use of the spectrum applied for, radio compatibility calculations are used to provide protection for other radio applications. The parameters of the local broadband applications are required at the application stage for the radio compatibility calculations. The radio compatibility calculations are made independently of the operator agreements referred to in section 2.3 of these administrative rules.

The known sites requiring protection are listed in Annex 4.

2.9.1 Radio monitoring stations of the Bundesnetzagentur's radio monitoring and inspection service

The Bundesnetzagentur's radio monitoring stations are fixed stations that use direction finders or monitoring receivers on rotatable antenna systems to identify interfering emissions in the 20-3000 MHz frequency range.

To ensure that spectrum usage can be monitored effectively in accordance with section 103 TKG, spectrum usages must not cause interference to these radio monitoring stations. Electromagnetic fields from transmitters operated in the vicinity of these receivers can lead to desensitisation and overloading, thus impairing the reception of the Bundesnetzagentur's monitoring equipment (see Bundesnetzagentur Official Gazette No 17/2012, Communication No 613/2012).

In order to protect the fixed radio monitoring stations operated and planned by the Bundesnetzagentur's radio monitoring and inspection service in Germany, the field strength from emissions in the band above 3 GHz may not exceed 120 dB μ V/m at the sites (see Bundesnetzagentur Official Gazette No 23/2019, Communication No 646/2019).

2.9.2 Bundesnetzagentur's monitoring station for space radiocommunication services (Leeheim satellite monitoring station)

The Bundesnetzagentur's monitoring station in Riedstadt-Leeheim is the central monitoring station for space services, covering satellite, radio astronomy and Earth exploration services.

This site has been coordinated at national and international level for the reception of satellite communications and must be given particular protection. To ensure that spectrum usage can be monitored effectively in accordance with section 103 TKG, spectrum usages must not cause interference to the Bundesnetzagentur's space services monitoring station in Leeheim.

The receiving equipment is designed to be able to monitor the whole frequency range from 130 MHz to 55 GHz with high sensitivity. All of the antennas can track both the geostationary orbit and non-geostationary satellites.

The protection requirements for Leeheim satellite monitoring station have still to be defined.

The compatibility of mobile base station sites with the space services monitoring station needs to be assessed on a case-by-case basis. Various measures can be taken at the mobile base station sites to prevent constraints on the monitoring station, such as:

- restricting the transmit power;
- reducing the antenna height;
- adjusting the antenna elevation angle;
- adjusting the pointing of the antenna (so that the side lobes do not point towards Leeheim either);
- providing shielding at the rear of antennas pointing towards Leeheim.

2.9.3 Geodetic Observatory Wettzell (GOW)

The Geodetic Observatory Wettzell carries out geodetic measurements in cooperation with other stations worldwide operating on the same frequencies. Protection must be given pursuant to Resolution A/RES/69/266 [9].

The compatibility of base stations with the observatory needs to be assessed on a case-by-case basis. Various measures can be taken at the mobile base station sites to minimise constraints on the observatory, such as:

- restricting the transmit power;
- reducing the antenna height;
- adjusting the antenna elevation angle;
- adjusting the pointing of the antenna (not towards the observatory).

2.9.4 Radio astronomy service at the Effelsberg site

The Max Planck Institute for Radio Astronomy (MPIfR) operates a highly sensitive radio telescope at Bad Münstereifel-Effelsberg. The use of spectrum by the mobile service in the vicinity of the observatory may lead to interference to the operation of the radio telescope for measurements.

If broadband wireless applications in the 24.25-27.5 GHz band cause harmful interference to radio astronomy reception at the Effelsberg site, the Bundesnetzagentur will advocate a mutually acceptable solution, taking account of the legal, technical and economic aspects. In this case, the Bundesnetzagentur would expect the MFCN assignment holders to show a willingness to work out acceptable solutions with the MPIfR.

2.9.5 EESS receivers

Receivers in the EESS (space-to-Earth) use the 25.5-27.0 GHz band at several sites in Germany and are protected on the basis of frequency sub-plan 407, entry no 407001 and frequency sub-plan 408, entry no 408001 of the Frequency Plan for the Federal Republic of Germany [4] as published in the Bundesnetzagentur Official Gazette, Administrative Order No 127/2019 [10]. The Bundesnetzagentur gives consideration to the sites listed in Annex 4 as well as other receivers used for security-related communications, and the associated limits, when carrying out spectrum coordination. Annex 4 may be supplemented to include new sites. Sites must be protected against harmful interference caused by emissions from subsequently assigned local applications.

New EESS earth stations in the 25.5-27 GHz band are generally possible and must be coordinated with existing mobile assignments.

2.9.6 Inter-satellite communications

To ensure protection for receivers on board satellites, when deploying base stations it must be ensured that each antenna normally transmits only with the main beam pointing below the horizon and has mechanical pointing below the horizon, except when the base station is only receiving.

The use of UAVs such as drones within the framework of local broadband spectrum usages in the 26 GHz band could affect existing usages such as satellite receivers in the FSS (Earth-

to-space) and in the ISS in sub-bands at 26 GHz. Use of the 26 GHz band for communications from base stations to terminal stations on board UAVs is therefore not allowed. Communications from terminal stations on board UAVs to base stations are generally allowed given compliance with the applicable provisions for air traffic management and taking into account the effect on earth stations.

2.9.7 Fixed links

The existing fixed link applications must be protected. Fixed links are operated throughout the Federal Republic of Germany, with a concentration in urban areas.

The Bundesnetzagentur will take account of the options set out in ECC Report 303 [7] for the introduction of new broadband applications sharing the 24.25-26.5 GHz band with the FS. New fixed links in the 24.25-26.5 GHz band are generally possible and must be coordinated with existing mobile assignments. Assignments for existing fixed links can generally be extended upon application.

2.9.8 FSS (Earth-to-space)

Use of the 24.65-25.25 GHz band by the FSS (Earth-to-space) is limited to earth stations using a minimum antenna diameter of 4.5 m (usage condition D532B). In future, such uplink stations will be possible and must be coordinated on an individual basis with existing local broadband MFCN spectrum usages in the 24.65-25.25 GHz band.

2.10 Radio applications of the federal armed forces

The 26.5-27.5 GHz band is designated in the FreqV and the Frequency Plan for civil and military usages. Coordination with radio applications of the federal armed forces is therefore required.

Civil and military usages are coordinated on a first come, first served basis as is usual for shared frequency bands.

2.11 Spectrum coordination for radio stations in border areas

The amount of spectrum available for use in the border areas of the Federal Republic of Germany is limited because of the need for coordination with neighbouring countries. Restrictions with respect to spectrum and scope will vary from area to area, depending on whether one, two, three or possibly four countries need to be included in the coordination process. The necessary coordination is carried out on the basis of contracts and agreements concluded by the Federal Republic of Germany with its neighbouring countries and the ECC Recommendation on the cross-border coordination of broadband applications in the 26 GHz band, which is still under development.

2.12 Time limit

The Bundesnetzagentur will assign spectrum for a limited period of time upon application; attention is drawn to the possibility of extending an assignment under the terms of section 92(2) TKG.

All assignments will be limited to not beyond 31 December 2040. This is a regulatory means of ensuring that a decision can be made on the use of the band from 1 January 2041 onwards.

2.13 Information about assignments

Details of the assignment areas together with details of the assigned spectrum and the names of the assignment holders will be provided to third parties with a justified interest (for example geographically neighbouring usages, cross-boundary spectrum usages).

This ensures that efficient and interference-free spectrum use for local applications can be optimised by means of the negotiation requirement and operator agreements.

2.14 Fees and contributions

A fee as set out in the BNetzA BGebV-FreqZut will be imposed for spectrum assignment on the basis of section 223(1) TKG. In addition, spectrum usage contribution charges in accordance with section 224(1) TKG and contributions in accordance with section 31 EMVG and section 35 FuAG will be imposed.

Information about the fee as set out in the BNetzA BGebV-FreqZut can be found in Annex 5.

The spectrum usage contribution charges and the EMVG and FuAG contributions will be recalculated annually. The contributions will be calculated in accordance with the FSBeitrV, as amended.

2.15 Protection for telecommunications infrastructure

Assignment holders are themselves responsible for protecting their telecommunications infrastructure against attacks and bear the risks to the availability of their telecommunications services. The "Catalogue of security requirements for the operation of telecommunications and data processing systems and for the processing of personal data" (available (in German) at www.bundesnetzagentur.de/sicherheitsanforderungen) can be used as guidance for achieving protection; it is mandatory for public wireless networks.

3 Application documents

The following documents are required for processing applications:

- application for area assignment/definition of the site-related technical parameters for the base stations
- spectrum usage concept
- confirmation of specialist knowledge, financial capacity and reliability (Annex 6)
- operator agreements (if applicable)
- extract from the commercial register (if applicable).

4 Application process

The web portal for applications is currently not yet available.

Spectrum assignment applications can only be processed quickly if sent in electronic form by email.

Applications must be sent to the following central email address:

226.lokalesbreitband@bnetza.de.

5 References

[1]	Telecommunications Act of 23 June 2021 (TKG) (Federal Law Gazette I page 1858)
[2]	Act concerning the electromagnetic compatibility of equipment (Electromagnetic Compatibility of Equipment Act – EMVG) of 14 December 2016 (Federal Law Gazette I page 2879), as last amended on 23 June 2021 (Federal Law Gazette I page 1858)
[3]	Act on making Radio Equipment available on the Market (Radio Equipment Act – FuAG) of 27 June 2017 (Federal Law Gazette I page 1947), as last amended on 23 June 2021 (Federal Law Gazette I page 1858)
[4]	Frequency Plan on the basis of section 90 TKG; conclusion of the process to update the Frequency Plan – general plan update, notice of publication in Administrative Order No 127/2019
[5]	Commission Implementing Decision (EU) 2019/784 of 14 May 2019 on harmonisation of the 24,25-27,5 GHz frequency band for terrestrial systems capable of providing wireless broadband electronic communications services in the Union (notified under document C(2019) 3450)
[6]	Commission Implementing Decision (EU) 2020/590 of 24 April 2020 amending Decision (EU) 2019/784 as regards an update of relevant technical conditions applicable to the 24,25-27,5 GHz frequency band (notified under document C(2020) 2542)
[7]	ECC Report 303: Guidance to administrations for Coexistence between 5G and Fixed Links in the 26 GHz band (Toolbox), Approved 05 July 2019
[8]	ECC Report 307: Toolbox for the most appropriate synchronisation regulatory framework including coexistence of MFCN in 24.25-27.5 GHz in unsynchronised and semi-synchronised mode, approved 6 March 2020
[9]	Resolution (A/RES/69/266) of 26 February 2015 "A global geodetic reference frame for sustainable development" adopted at the sixty-ninth session of the General Assembly of the United Nations (agenda item 9) and Directive 2007/2/EC of the European Parliament and of the Council of 14 March 2007 establishing an Infrastructure for Spatial Information in the European Community (INSPIRE), EU Official Journal L 108 of 25 April 2007
[10]	Bundesnetzagentur Official Gazette, Administrative Order No 127/2019: Frequency Plan for the Federal Republic of Germany: frequency sub-plan 407, entry no 407001 and frequency sub-plan 408, entry no 408001 for the EARTH EXPLORATION-SATELLITE SERVICE (space-to-Earth)

**Annexes to the administrative rules for local
broadband applications at 26 GHz**

Courtesy translation

Annex 1: Technical conditions

The technical conditions for the operation of local broadband spectrum usages are set out in Commission Implementing Decisions (EU) 2019/784 and (EU) 2020/590 and, in part, below. Compliance with the technical conditions is essential for coexistence with the radio applications and services specified in section 2.9.

General parameters

1. The mode of operation in the 24.25-27.5 GHz band is TDD.
2. The assigned block sizes are in multiples of 200 MHz up to a bandwidth of 800 MHz. A smaller block size of 50 MHz, 100 MHz or 150 MHz is also possible if this enables more efficient use of the band.
3. The upper frequency limit of an assigned block is aligned with or spaced at a multiple of 200 MHz from the upper band edge of 27.5 GHz. Any change in the frequency position of the blocks is always a multiple of 10 MHz. This may be necessary in particular if a frequency separation is needed to protect other existing applications.
4. The coexistence of terrestrial wireless broadband communication applications with systems in the EESS (passive) is ensured by means of limits on unwanted emissions into the 23.6-24 GHz band. Protection for the operation of space station receivers is ensured by means of restrictions on the elevation of the main beam of active antennas of outdoor base stations. Further measures may be imposed to ensure coexistence with other services and applications (see also Table 5).
5. Use of the 24.25-27.5 GHz band for communications with UAVs is limited to the link between the UAV and a base station of the terrestrial wireless broadband electronic communications network.
6. Base station and terminal station transmission within the 24.25-27.5 GHz band must be in compliance with the BEM in this Annex.

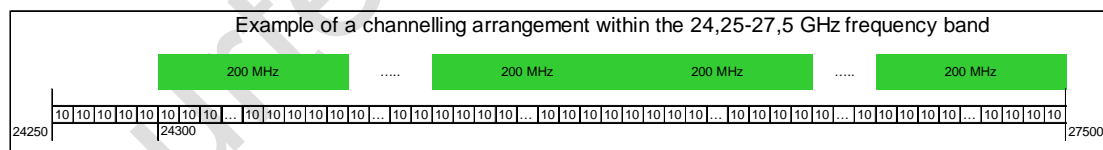


Figure 1: Example of a possible channelling arrangement within the 24.25-27.5 GHz band

Technical conditions for base stations: BEM

Compliance with the BEM for base stations ensures coexistence between neighbouring wireless broadband communication applications in the absence of agreements between the operators. Operators of such applications may agree among themselves on less stringent requirements provided that they comply with the technical conditions applicable for the protection of other applications, including cross-border obligations.

A BEM defines power limits as a function of frequency relative to the edge of the frequency block for the wanted signal of an application. The BEM consists of several elements as shown in Figure 2.

These power limits ensure that other spectrum usages are protected.

The additional baseline power limit (out-of-band limit) ensures that the spectrum for services and applications outside the 24.25-27.5 GHz band is protected.

The transitional region power limit enables a roll-off of power levels from the in-block to the baseline power limit and ensures coexistence with other operators in adjacent blocks.

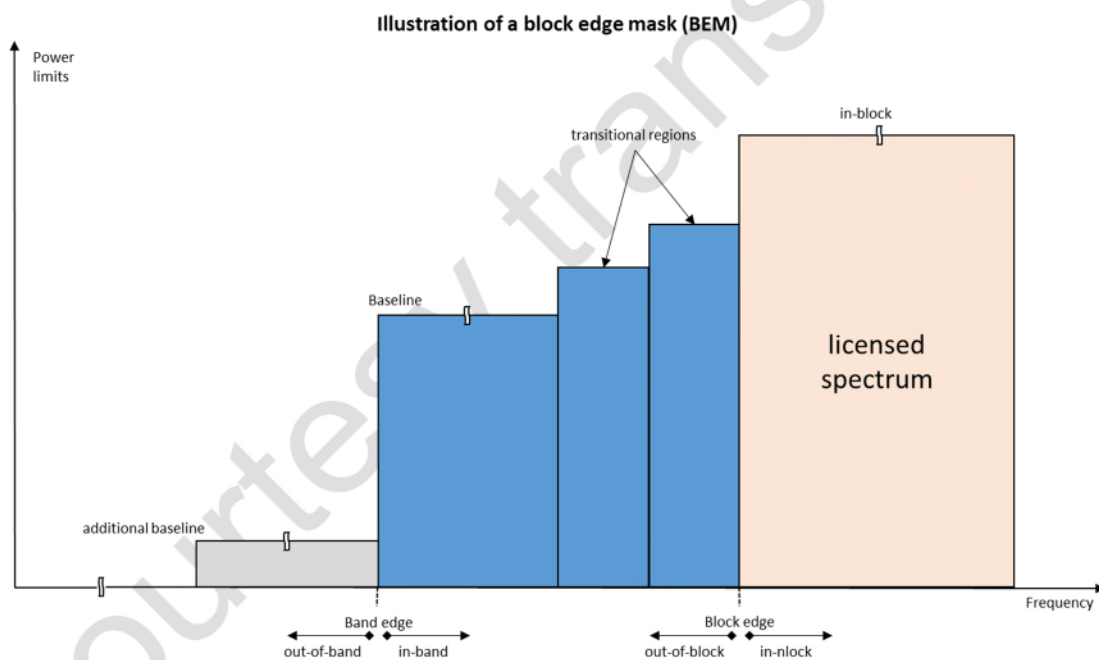


Figure 2: General BEM applicable to the 26 GHz band

No generally applicable in-block power limit for the wanted signal is specified.

Tables 2 and 3 assume synchronised operation. Unsynchronised or semi-synchronised operation may necessitate the geographical separation of neighbouring networks. Tables 4 and 6 specify out-of-band power limits for base stations and terminal stations respectively to ensure the protection of the EESS (passive) in the 23.6-24.0 GHz band. Table 5 provides an additional technical condition for base stations to facilitate coexistence with satellite systems in the FSS (Earth-to-space) and in the ISS.

BEM element	Definition
In-block	Assigned spectrum block for which the BEM is derived
Baseline	Spectrum within the 24.25-27.5 GHz band used for terrestrial wireless broadband electronic communications services, not including the operator's block under consideration and corresponding transitional regions.
Transitional region	Spectrum adjacent to an operator's block.
Additional baseline	Spectrum within bands adjacent to the 24.25-27.5 GHz band, where specific power limits apply with respect to other services or applications.

Table 1: Definition of BEM elements

Frequency range	Maximum TRP	Measurement bandwidth
Up to 50 MHz below or above an operator's block	12 dBm	50 MHz

Table 2: Base station transitional region power limit for synchronised operation

The limit ensures coexistence between wireless broadband electronic communications networks in adjacent blocks within the 26 GHz frequency band and in synchronised operation.

Frequency range	Maximum TRP	Measurement bandwidth
Baseline	4 dBm	50 MHz

Table 3: Base station baseline power limit for synchronised operation

The limit ensures coexistence between wireless broadband electronic communications networks in non-adjacent blocks within the 26 GHz frequency band and in synchronised operation.

Frequency range	Maximum TRP	Measurement bandwidth	Entry into force
23.6-24.0 GHz	-33 dBW	200 MHz	24 April 2020 ^(a)
	-39 dBW	200 MHz	1 January 2024 ^(b)
<p>(a) <i>New deployments of terrestrial systems capable of providing wireless broadband electronic communications services in the 22-23.6 GHz band are not allowed in order to ensure the appropriate protection of the EESS (passive) and the radio astronomy service in the 23.6-24 GHz band in conjunction with the limit applicable after 1 January 2024.</i></p> <p>(b) <i>This limit applies to base stations brought into use from 1 January 2024. For base stations brought into use prior to that date, the limit specified in (a) (-33 dBW/200 MHz) continues to apply after 1 January 2024. Additional measures may be required to assess and mitigate the aggregate interference from the base stations in relation to the EESS (passive), see Article 3(a) in [5]. Such measures include adaptation of the size of assigned blocks, the antenna configuration, the in-block power or the penetration of the systems.</i></p>			
<i>Table 4: Base station additional baseline power limit</i>			

The out-of-band limit applies to the maximum emissions in the 23.6-24.0 GHz band for the protection of the EESS (passive) in all stipulated modes of base station operation (that is to say maximum in-band power, electrical pointing, carrier configurations).

The main beam and mechanical pointing of the transmitting antennas of outdoor base stations must be below the horizon.

Table 5: Additional condition applying to AAS outdoor base stations

The condition applies to the protection of space station receivers such as in the FSS (Earth-to-space) and in the ISS.

Technical conditions for terminal stations

Frequency range	Maximum TRP	Measurement bandwidth	Entry into force
23.6-24.0 GHz	-29 dBW	200 MHz	24 April 2020
	-35 dBW	200 MHz	1 January 2024 ^(a)
<p>(a) <i>This limit applies to terminal stations brought into use from 1 January 2024. For terminal stations brought into use prior to that date, the limit of -29 dBW/200 MHz) continues to apply after 1 January 2024.</i></p>			
<i>Table 6: Terminal station additional baseline power limit</i>			

The out-of-band limit applies to the maximum emissions in the 23.6-24.0 GHz band for the protection of the EESS (passive) for all stipulated modes of terminal station operation (that is to say maximum in-band power, electrical pointing, carrier configurations).

Annex 2: Guidance on drawing up operator agreements

To ensure radio compatibility, applicants of adjacent properties must hold talks among themselves to agree on coordinating measures with the aim of mutually avoiding interference. This contributes to improving both spectrum use efficiency and signal coverage in the planned area of operation.

The operation of the wireless application may affect more than one other operator, depending on the planned location of operation. The required operator agreements must specify the exact names of the areas concerned. The same names as given in the spectrum assignment applications must be used. The terms of the operator agreements must be specific, detailed and transparent.

The Bundesnetzagentur will provide details of the assignment areas together with details of the assigned spectrum and the names of the assignment holders to third parties with a justified interest (for example geographically neighbouring usages) on request. This enables efficient and interference-free spectrum use for adjacent applications to be optimised by means of operator agreements.

For reasons of efficient spectrum use, the Bundesnetzagentur would expect assignment holders to coordinate with adjacent users with respect to the network codes and subscriber identities used, taking account of the existing legal provisions.

Sufficient decoupling enabling the operation of adjacent wireless applications as planned can be achieved for example with the following measures:

1	Frequency synchronisation f	Coordination of spectrum blocks actually used
2	Frequency and phase synchronisation (f, φ)	As 1, and additionally common carrier frequency generation
3	Frequency, phase and time synchronisation (f, φ, t)	As 2, and additionally common phase clock reference
4	Transmit power reduction	Joint planning
5	Beamforming antennas	Joint planning
6	Transmitting antenna tilting	Joint planning
7	Signal strength in coverage area	Joint planning
8	Terrain obstruction	Joint planning
9	Morphological obstruction	Joint planning
10	Indoor operation	Joint planning, shielding measurements

f - frequency

φ - phase

t - time

Annex 3: Guidance on drawing up a spectrum usage concept

Applicants must explain the planned usage in a spectrum usage concept. Applicants must in particular provide a plausible account of their spectrum requirements based on the planned spectrum usage. Applicants must also show how they will ensure efficient spectrum use.

The Bundesnetzagentur would like to draw specific attention to section 102 TKG. This states that a spectrum assignment can be revoked if use of the spectrum has not begun within one year of the assignment, or if the spectrum has not been used for the purpose for which the assignment has been granted for more than one year (use it or lose it procedure). Here, account is taken in particular of the use of the full bandwidth applied for.

The spectrum usage concept must include the following in particular:

- What is the coverage area? (Coordinates, geographical map, etc)
- Which type of application and which purpose of use is planned? (For example hotspot, FWA, industrial, etc)
- What is the bandwidth required for the planned purpose of use? (Please provide a detailed explanation of the bandwidth requirements applied for and any particular sub-bands applied for; if more than 800 MHz is applied for at a later date, detailed proof of the requirement must be given.)
- What is the signal level and protection required for the purpose of use? (Details of the technology used and network build, number and technical characteristics of base stations, etc)
- Which measures will be taken to ensure efficient spectrum use with regard to compliance with the interference ranges? (Description of interference mitigation techniques, for example details of the antennas to be used (type, location, height, directional pattern), shielding measures, indoor/outdoor operation)
- What is the timescale for the network build and network roll-out?
- How long is the planned usage period?
- Which equipment will be used? What is the operational frequency range of the equipment?

Annex 4: List of sites requiring protection

The Bundesnetzagentur gives consideration to the following sites when carrying out spectrum coordination:

Coordinates	Location	Permissible field strength [dB μ V/m/MHz]
08° 23' 52" E 49° 51' 12" N	Leeheim	24
13° 04' 09" E 53° 19' 47" N	Neustrelitz	25
11° 16' 47" E 48° 05' 10" N	Oberpfaffenhofen	53
11° 04' 51" E 47° 52' 55" N	Weilheim	25
12° 52' 39" E 49° 08' 42" N	Wetzell	14

Table 7: Sites requiring protection

The Bundesnetzagentur also gives consideration to earth stations used for security-related communications in addition to the sites listed above.

The list does not include the fixed link sites and the radio monitoring stations of the Bundesnetzagentur's radio monitoring and inspection service that also require protection.

Annex 5: Explanatory notes on the calculation of the fees

The Bundesnetzagentur set the fee for spectrum in the 24.25-27.5 GHz band for local broadband applications with the BNetzA BGebV-FreqZut of 01 October 2021 (Federal Law Gazette I page 4515).

Each fee will be calculated using the following formula:

$$Fee (\text{€}) = 1000 + B \cdot t \cdot 0.63 \cdot (6 \cdot a_1 + a_2)$$

1000:	base amount in euros (€)
B:	bandwidth in megahertz (MHz) (at least 50 MHz)
t:	assignment period in years (for example 15 years)
a:	the surface area in square kilometres (km ²)
a ₁ :	settlement and transport land
a ₂ :	other types of land

Details of the elements of the fee for the 24.25-27.5 GHz band

The formula for the assignment fee is designed to ensure optimum and efficient use of the spectrum. The larger the bandwidth applied for, the higher the fee.

The base amount of €1,000 has been chosen to enable business models such as those of start-ups or SMEs as well. The base amount creates incentives for professional spectrum planning and use and increases interest in cooperation between very small-scale, adjacent usages for which individually it would be difficult to ensure radio compatibility.

The longer the assignment period, the higher the fee as well. This creates an incentive for applicants to apply for assignments only for the period in which they actually intend to use the spectrum. This discourages applicants from hoarding spectrum because, apart from the threat of an assignment being revoked if spectrum is not used, assignment holders would be paying part of the fees for a period without economic use, which would lead to financial disadvantages for the assignment holders.

The basic factor of €0.63 was set in line with the fees set for local spectrum usages in the 3.7-3.8 GHz band, taking account of the different bandwidth requirements and propagation conditions. It was assumed that settlement and transport land in the Federal Republic of Germany is particularly suitable for 5G applications. On this basis, a basic factor of €0.63 was set for the 26 GHz band, taking into account the technical innovations of 5G applications in practice.

The assignment fee is higher, the larger the size of the area in which spectrum is to be used. The settlement density is also a decisive factor here: the density of buildings in rural areas tends to be lower. By contrast, plots used in developed areas are closer together and the

density of buildings is usually higher. The probability of adjacent local usages that need to be coordinated and may lead to mutual restrictions is higher in developed areas.

The formula takes account of these differences by making a distinction between settlement and transport land and other types of land. Spectrum assignments for areas classed as settlement and transport land are therefore six times more expensive than for other areas. The fact is also taken into account that rural areas also have land classed as settlement and transport land, for example industrial estates. Efficient spectrum use is encouraged if fees for assignments in rural or undeveloped areas are lower. The definitions for categorising land are based on those used by the Umweltbundesamt²⁾. For offshore projects as well as underground areas (e.g. mines, subways), the fee calculation is based on the allocation to other types of land (a_2).

Fee calculation examples:

Area	Bandwidth (MHz)	Period (years)	Area a_1 (km ²)	Area a_2 (km ²)	Fee [€]
Campus – example 1	200	10	0.3		3268,-€
Campus – example 2	800	10	0.3		10072,-€
Industry – example 1	400	10	1	5	28720,-€
Industry – example 2	400	10	3		46360,-€
FWA urban district – example 1	800	10	4		121960,-€
FWA urban district – example 2	800	20	4		242920,-€

²⁾ See statistics on land use published by the Umweltbundesamt at www.umweltbundesamt.de "CORINE Land Cover - CLC".

Annex 6: radio engineering knowledge, financial capacity and reliability

A form (in German) for declaring specialist knowledge, financial capacity and reliability as required by section 91(4) sentence 3 TKG can be downloaded from the Bundesnetzagentur website at www.bundesnetzagentur.de/lokalesbreitband.

Courtesy translation

Annex 7: Information about applications

The web portal for applications is currently not yet available.

Information and documents (in German) for applications can be downloaded from the Bundesnetzagentur website at www.bundesnetzagentur.de/lokalesbreitband.

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Annex 8: List of abbreviations

Abbreviation	Meaning
5G	fifth generation of mobile communications
BEM	block edge mask
BNetzA BGebV-Zut	Special Fee Ordinance Bundesnetzagentur - Frequency Assignments
CEPT	European Conference of Postal and Telecommunications Administrations
dB μ V/m	decibel relative to one microvolt per metre
dBm	decibel relative to one milliwatt
dBW	decibel relative to one watt
E	east
ECC	Electronic Communications Committee
ECC PT 1	ECC Project Team 1
EESS	Earth exploration satellite service
EMVG	Electromagnetic Compatibility of Equipment Act
EU	European Union
FreqV	Frequency Ordinance
FSBeitrV	Frequency Protection Contributions Ordinance
FSS	fixed satellite service
FuAG	Radio Equipment Act
FWA	fixed wireless access
GHz	gigahertz
GOW	Geodetic Observatory Wettzell

IoT	Internet of Things
ISS	inter-satellite service
MFCN	mobile/fixed communications networks
MHz	megahertz
MPIfR	Max Planck Institute for Radio Astronomy
N	North
TDD	time division duplex
TKG	Telecommunications Act
TRP	total radiated power
UAV	unmanned aerial vehicle
WRC-19	World Radiocommunication Conference 2019

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