National Radio Rules and Regulations 2021

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Bhutan InfoComm and Media Authority
Royal Government of Bhutan

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Content

Chapter 1: Preliminary

1.1 Legal Basis

These Rules are issued as per sections 155 to 177 and 459 of Information, Communications and Media Act of Bhutan 2018 ("the Act") by the Bhutan InfoComm and Media Authority (the "Authority") for management and regulations of radio frequency spectrum.

1.2 Title and Commencement

These Rules shall be called as the "National Radio Rules and Regulations" and shall come into force on 1st day of January month of 2021, corresponding to the 17th day of the Eleventh Month of the Bhutanese Male Iron Rat Year.

1.3 Scope of Application

These Rules shall apply to:

(i) Any individuals, entity and organizations involved in the use and management of radio frequencies in Bhutan, and

(ii) All matters by any individuals, entity and organizations related to the radiocommunications within or from the territory of Bhutan, its atmosphere, and its outer space, to stations and devices using radio frequency spectrum.

And shall be read in conjunction with all other existing Codes of practice, Rules and Regulations established by the Authority.

1.4 Amendment

Amendment to these Rules shall be made according to the needs and changes in national priorities, policies, and industry trends. The amendment of these Rules by way of addition, variation or repeal may be affected by the Authority as and when required.

1.5 Repeal

With the commencement of these Rules, the National Radio Rules 2011 are repealed.

1.6 Interpretation

The power to interpret these Rules shall vest with the Authority who may issue such instruction as may be necessary to give effect to and carry out the provisions of these Rules.

1.7 Definitions

In addition to the following terms, or unless the context requires otherwise, the words and terms used in these Rules shall have the same meaning as assigned in the Act. Besides, the technical terms used in these Rules but not defined below shall have the same meaning as contained in the Article 1 Sections I–VIII of the International Telecommunication Union (ITU) Radio Regulations (Edition 2020).

Alternative Dispute Resolution Centre means the Bhutan Alternative Dispute Resolution Centre established as per Alternative Dispute Resolution Act 2013.

Authority means the Bhutan InfoComm and Media Authority established as per the provision of the Act.

Band plan means a national frequency or spectrum plan to identify usage of frequency bands and its specific channel arrangements.

Device means an apparatus capable to transmit and/or receive radio waves for the purpose of intentional radiocommunication application.

ICT system means an Information and Communication technology used by a person to provide ICT services.

Industrial, Scientific and Medical (ISM) applications means the operation of equipment or appliances designed to generate and use local radio frequency energy for industrial, scientific, medical, domestic or similar purposes, excluding applications in the field of telecommunications.

License means an authorization that is issued to a person to establish, to own, to install and to deploy frequency, operate a radiocommunication station or device under the specified terms and conditions.

Permit means a formal permission granted by the Authority.

Person means any individual, partnership, company, unincorporated organization, Government, Governmental agency, trustee, executor, administrator or other legal representative.

Radio frequency identification (RFID) means a technology that uses communication via electromagnetic waves to exchange data between a terminal and an object such as a product, animal, or person for the purpose of automatic identification and tracking.

Spectrum plan means a plan to allocate radio frequency spectrum into several frequency bands for certain radiocommunication services and applications.

Spectrum redeployment (spectrum ref-arming) means a combination of administrative, financial and technical measures aimed at removing users or equipment of the existing frequency assignments either completely or partially from a particular frequency band and the frequency band may then be allocated to the same or different service(s).

Station means one or more transmitters or receivers or a combination of transmitters and receivers, including the accessory equipment, necessary at one location for carrying on a radiocommunication service or the radio astronomy service. Station is different from the device, as it may include additional parameters such as geographical coordinates of the site, altitude of site above sea level, altitude of center antenna above ground level etc.

Telecommunication means any transmission, emission or reception of signs, signals, writings, images and sounds or intelligence of any nature by wire, radio, optical or other electromagnetic systems.

Chapter 2: General Provisions

2.1 The radio frequency shall be a national resource and no licensee shall claim the ownership of these resources. The licensee shall be only authorized to use the assigned frequency.

2.2 Unless a person has been granted by the Authority a valid license or permit, it shall be unlawful for any such person to:

(i) Use or deploy any portion of radio frequency, or

(ii) Establish and operate any radiocommunication station, or

(iii) Install and operate any radiocommunication devices, or

(iv) Test or experiment any radiocommunication devices or services, or

(v) Have an item of radiocommunication devices in his or her possession for the purpose of operating the same.

2.3 Any use of radio frequency by person shall be as per the National Radio Frequency Allocations Plan (NRFAP) of Bhutan.

2.4 The frequency assigned to the licensee shall not be leased or transferred to a third party in any case by the licensee.

2.5 The licensee shall ensure that the radio equipment is tuned to the assigned frequency.

2.6 The licensee shall not hoard the frequency and the assigned frequency shall be put into use by the licensee within three months from the date of assignment by the Authority.

2.7 The licensee shall maintain radio station and device in good technical condition as per the requirements of the Authority, particularly concerning power, and unwanted emissions.

2.8 The licensee shall prevent or minimize any form of radio frequency interference to other radio services within the same or different bands and to other licensed users.

2.9 A licensee assigned with frequency by the Authority shall be required to keep up-to-date records of radio communication equipment and corresponding network elements.

2.10 The radio frequency and equipment shall not be used against the country or to the detriment of national defense, security, social order and safety or cause damage to the interests of the state and legitimate rights and interests of the organizations and individuals.

2.11 The Authority shall determine or reserve certain frequency or the band of frequency for specific purposes or services as per the need to align with the national needs, regional and international trends.

2.12 A person shall not use the radio frequencies which are exclusively reserved for emergency, safety, search, rescue, salvage, national defense, and security.

2.13 The following sections shall be a part of these Rules and it shall be modified by the Authority from time to time to align with the international and regional trends and national needs:

(i) Schedule A**,** Services and Applications, of these Radio Rules, and

(ii) National Radio Frequency Allocations Plan (NRFAP)

Chapter 3: Radio Frequency Planning

3.1 Spectrum Plan

(a) As per the section 155 of the Act, the Authority shall prepare a spectrum plan.

(b) A spectrum plan shall:

(i) Divide into such number of frequency bands and such amount of the RF spectrum as the Authority thinks necessary for the purpose of regulating radiocommunications use.

(ii) Specify the general purpose or purposes for which each of the allocated bands may be used or reserved.

(iii) Be consistent with the policy directives issued by the Ministry in accordance with Section 155 of the Act, and

(iv) Be consistent with the existing utilization, international and regional spectrum plans.

(c) The spectrum plan shall be prepared and published in accordance with section 3.3 of this chapter.

(d) The spectrum plan in force at the date of publication of these Radio Rules is contained in Schedule A**,** Services and Applications of these Rules. Any new spectrum plan published by the Authority shall also be an addendum to Schedule A**,** Services and Applications of these Rules.

3.2 Frequency Band Plan

(a) The Authority shall, by written instrument, prepare frequency band allocation plans, each relating to one or more frequency bands or channels after due consideration of international and regional trends and the national needs.

(b) A frequency band plan shall be consistent with the spectrum plan adopted pursuant to section 3.1.

(c) A frequency band plan shall:

(i) Make provision in relation to the purpose or purposes for which the radio frequency band or bands may be used or reserved, and

(ii) Without limiting paragraph (i), may provide for one or more services or applications for which any part of a band (including any particular frequency or frequency channel) may be used or reserved, and

(iii) May be of general service or may be limited to specific application as provided in the plan, and

(iv) Without limiting paragraph (iii), may apply with respect to a specified area (an allotment plan) and with respect to a specified period, and

(v) Have specific terms and conditions for the use of the frequency bands,

(vi) Have specific qualification and quantification criteria to be met by applicants,

(vii) Have detailed frequency channeling arrangements, and

(viii) Indicate the license assignment methodology, and

(ix) Include any other requirement that the Authority may deem necessary,

(d) A frequency band plan shall be published in accordance with section 3.3 of these Rules.

(e) A frequency band plan shall not confer an exclusive right or a monopoly or continued tenure to use frequencies on any particular ICT facility or service.

(f) The frequency band plans in various frequency bands in force at the date of publication of these Rules shall be as contained in Schedule A**,** Services and Applications of these Rules.

3.3 Publishing Plans

(a) The Authority shall by written notice publish a spectrum plan or frequency band plan for public consultation in any form and shall:

(i) Invite interested parties to submit their written representations or comments to the Authority and within such period as may be specified in such notice, and

(ii) After the consultation period specified in the notice has elapsed, and due consideration has been given if required, to any representations received, the Authority shall adopt the plan in question, with or without amendment.

(b) Any spectrum plan or frequency band plan adopted in accordance with paragraph (a) (ii) shall be published as part of the Schedule A**,** Services and Applications of these Rules.

3.4 Revocation and Variation of Plans

(a) The Authority shall, at any time, revoke or vary a spectrum plan or frequency band plan if it feels that there is a need to.

(b) Any revocation and variations of plans shall be published as per the Section 3.3 of this section.

3.5 Spectrum Redeployment (spectrum re-farming)

(a) Depending upon the need, the Authority shall evaluate spectrum redeployment in a holistic approach focusing on the long-term socio-economic impact.

(b) The Authority shall by written instrument prepare a spectrum redeployment plan for issuing spectrum licenses that authorize the operation of radiocommunications station or devices:

(i) At frequencies within that part, or those parts, of the spectrum, and

(ii) Within the area or areas specified in the declaration with respect to that part or those parts.

(c) The spectrum redeployment plan shall be consistent with the spectrum plan or with a frequency band plan that relates, wholly or partly, to the part or parts of the spectrum to which the spectrum redeployment plan relates.

(d) The spectrum redeployment applies to spectrum licenses with respect to that part or those parts that might be issued as provided for in section 3.5

(e) In indicating the procedures to be followed for issuing spectrum licenses, the plan shall also indicate the license assignment methodology.

(f) Any spectrum redeployment plan and frequency band plan shall be published in accordance with section 3.3 of these Rules.

Chapter 4: Radio communications License

4.1 Types of Licenses

The Authority shall issue the following types of radiocommunications license under these Rules:

(i) Spectrum license

(ii) Apparatus license

(iii)Amateur Radio license.

4.2 Spectrum Licenses

The Authority shall allocate a specified part, or band of the radio frequency spectrum by assigning and issuing spectrum licenses.

4.2.1 Issuing spectrum licenses

(a) The Authority shall specify, in writing, the procedure to be applied for assignment of spectrum licenses by:

(i) Auctioning or tendering (having determined at least: auction/tender type, entry fee for prospective bidders, method of payment for licenses and advertising), when the radio frequency spectrum supply is lower than the demand, or

(ii) Comparative evaluation method or 'beauty contest' using these criteria Quality of Service (QoS)- coverage (geographical) and capacity, network implementation objectives, technology to achieve the efficient use of the frequencies, etc or

(iii) First come First Serve basis, specifying a pre-determined price based on pricing mechanism (having specified at least: the method of determining the prices and the method of payment for licenses), or

(iv) By any other methods which will be determined by the Authority,

(b) In determining the procedure under subsection (a), the Authority may impose limits on the aggregate of the parts of the spectrum that, as a result of the assignment of spectrum licenses may be used. A limit may be expressed to apply in relation to a specified part of the spectrum, and/or, a specified area, and/or a specified population reach, and/or capacity.

(c) The spectrum licenses to be issued under this section shall:

(i) Be consistent with any policy directives promulgated in accordance with the subsections 155 of the Act, and

(ii) Comply or take into consideration with the relevant marketing plan to the extent possible.

(d) The Authority shall issue the spectrum license of assigned frequency only after:

(i) The payment of spectrum access fee, application fee and the spectrum utilization fee for the assigned spectrum, and

(ii) Reaching an agreement on the terms and conditions of spectrum license and meeting the requirements of subsection 100 of the Act.

4.2.2 Content of spectrum licenses

The spectrum license shall contain:

(a) The band of frequency or the specific assigned frequency,

(b) The geographical area within which the operation of radiocommunication station or devices using the assigned spectrum and the coverage area of services.

(c) The maximum permitted power, equivalent isotropically radiated power (e.i.r.p), polarization and altitude above ground level of radiocommunications station or device which uses the assigned spectrum under the license.

(d) The maximum permitted levels of spurious domain emissions, in terms of power level, of any unwanted component supplied by a transmitter to the antenna transmission line as defined in Table 1 in Schedule A**,** Services and Applications of these Rules.

(e) Any other conditions that the Authority considers are necessary to meet the requirements of the Act.

4.2.3 Duration of spectrum licenses

(a) The spectrum license shall be issued for any period not exceeding fifteen years. In the event that a parent "ICT" system and service license is granted, then the spectrum license period shall be co-terminus with such "ICT system or service" license.

4.2.4 Conditions of Spectrum Licenses

(a) The licensee shall provide to the Authority any information on the stations or devices using the assigned spectrum.

(b) The information in subsection (a) shall consist of station or technical details of devices but not limited to the following:

(i) Type of station or devices and the use of frequencies,

(ii) Frequencies used by the station or devices,

(iii)Geographical coordinates of stations,

(iv) Altitude above ground level and antenna height,

(v) Maximum power emission and antenna gain,

(vi) Any other information as required by the Authority.

4.2.5 Variation of spectrum license

(a) The Authority may, with the written agreement of the holder of a spectrum license, vary the license by including additional conditions, or varying, or revoking any existing requirements.

(b) In the event that the Ministry issues a recommendation pursuant to subsection 109 of the Act for reasons concerning the security of Bhutan, the Authority shall, by written notice to the licensee, set out the proposed variations to give effect to the Minister's recommendation while describing relevant reasons for the proposed variations.

(c) Notwithstanding that the agreement of the Licensee is not required in respect of variations proposed under this sub-section (b) the Licensee shall be given thirty days from the date of the notice in which to make representations about the proposed variation.

(d) The Authority may vary the spectrum license, if, after considering and having regard to all representations made under sub-section (c) the Authority considers the license should be modified:

(i) In the manner set out in the notice, or

(ii) In some other manner consistent with the representations made by the licensee which the Authority is satisfied are applicable.

(e) If the Licensee is aggrieved by a variation made pursuant to sub-section (d) he or she may within ten (10) days of the receipt of the information under sub-section (d) appeal against the decision of the Authority to the Alternative Dispute Resolution Center in accordance with section 112 of the Act.

4.2.6 Re-issuing spectrum license

(a) The Authority may reallocate and issue a spectrum license as determined under section 4.2.1, except in case of sub-section (d).

(b) The Authority shall frequently publish notices containing core information of those spectrum licenses that are due to expire within one year following the date of publication of the notice and shall invite expressions of interest from those who wish to apply for a spectrum license in the related spectrum.

(c) During the year preceding the expiry of a spectrum license, the Authority shall issue a new spectrum license that may wholly or partially replace the license that is due to expire.

(d) Where the Authority has reasonable grounds for not renewing a spectrum license, it shall inform the licensee by written notice as soon as possible of its intention not to renew the license.

(e) A licensee to whom a notice is served as under sub-section (d), the licensee may make written representations to the Authority, not later than thirty (30) days after the date on which the refusal notice was sent by the Authority.

(f) The Authority shall consider any written representation made under sub-section (e) and shall inform the licensee within fifteen (15) days of the receipt of the representations of its decision on the matter.

(g) The licensee, if aggrieved by the decision under sub-section (d), may appeal against such decision of the Authority to the Alternative Dispute Resolution Center within ten (10) days of the receipt of the information under sub-section (f).

(h) In those cases where the Authority re-issues a spectrum license under sub-section (c) the Authority shall inform the licensee by written notice, as soon as possible, of its probable intention to re-issue the spectrum license, subject to the inclusion of new conditions or the modification of existing conditions and provide the licensee with details of such new or modified conditions.

(i) Within fifteen (15) days of receipt of notice under sub-section (h), the licensee shall inform the Authority whether, or not it will accept the proposed conditions. In the event of disagreement, the Authority will apply sub-section (a).

4.2.7 Transferring spectrum license

The spectrum license shall not be transferable.

4.3 Apparatus License

(a) The Authority shall issue Apparatus license for operating radiocommunication equipment or devices which requires a spot frequency.

(b) The Apparatus licenses will be issued for the operation of specified radiocommunication transmitters which uses frequencies other than those assigned or will be assigned as a spectrum license.

(c) The Authority shall categorize any radiocommunication and frequency application received from the applicants as Apparatus license, if it fits to be issued under Apparatus licenses category.

(d) The operations of radiocommunication devices under this license shall comply with the standards specified by the Authority while licensing.

(e) Different types of radiocommunication devices which fall in this license category shall be as set out in Schedule A**,** Services and Applications of these Rules. This category of device transmitters shall be subject to change from time to time if the Authority sees fit.

(f) The licensee shall not authorize a third party to operate such radiocommunication apparatus.

4.3.1 Issuing Apparatus license

The Authority shall issue a license of the type applied for under sub-section 4.3 (e). An application under this section shall be made by the applicant in a form approved by the Authority.

4.3.2 Duration of Apparatus license

The Apparatus license shall be issued for a period of maximum one year. This license shall be renewed annually.

4.3.3 Conditions of Apparatus license

The Apparatus license shall contain:

(a) The assigned spot or carrier frequency,

(b) The type of radio service application,

(c) geographical area of operation and coverage of the devices,

(d) The maximum permitted power and antenna gain of the device,

(e) The details of the licensee,

(f) Any other conditions that the Authority considers are necessary to meet the requirements of the Act.

(g) Compliance on radiocommunication apparatus with specific standards

4.3.4 Transfer of Apparatus License

This license shall not be transferable.

4.4 Amateur Radio License

4.4.1 Types of Amateur Radio license

The Authority shall issue the amateur radio license based on the following two categories:

(i) Bhutanese, and

(ii) Foreign Nationals.

4.4.2 Issuing Amateur Radio licenses to Bhutanese

(a) A person shall not operate a radiocommunications station or device in amateur service or in amateur satellite service frequency bands without a license issued by the Authority.

(b) If the Authority is satisfied that the applicant is a qualified operator, the Authority shall:

(i) Issue an amateur radio license,

(ii) Assign a call sign from the Schedule A**,** Services and Applications of these Rules to any amateur radio station, and

(iii) Register the particulars of the license in the Register of the Authority.

4.4.3 Issuing amateur licenses for foreign national

(a) While issuing the amateur radio license to the foreign nationals, the section 4.4.2 shall apply wherever applicable.

(b) The issuance of amateur radio license to the foreign nationals visiting Bhutan shall be subject to any conditions set by the Authority, but not limited to the following:

(i) Complete submission of the application to the Authority in an approved application form,

(ii) Holding an amateur license, qualification and call sign, issued by the administration of another country, that has been recognized by the Authority for the purpose of operating the amateur station in Bhutan, and

(iii) Submission of detailed specification of the amateur radio equipment to be used.

(c) The foreign national amateur licensee shall ensure that the related amateur radio equipment is re-exported.

4.4.4 Communication by an amateur station

(a) The licensee may communicate with other amateur radio stations for intercommunications and solely for the purpose of:

(i) Self-training in radiocommunications, or

(ii) Technical investigations into radiocommunications, or

(iii) Transmitting news and information services related to the operation of amateur stations, as a means of facilitating intercommunication, and

(iv) In cases of Public Protection and Disaster Relief (PPDR).

(b) In the course of any transmission from an amateur station, the licensee shall transmit the call sign of any station being called, or communicated with, followed by the call sign of the licensee's amateur station at least every fifteen (15) minutes.

(c) The licensee shall be permitted to retransmit a signal originating from another amateur station, only subject to the consent of that station and transmit its call sign at the beginning and the end of each transmission.

4.4.5 Restrictions

(a) The licensee shall not:

(i) Communicate by an amateur station for financial gain, or

(ii) Transmit a message that is, or includes, an advertisement, or

(iii) Transmit any form of entertainment.

(b) The licensee shall not transmit a message on behalf of a third party:

(i) Enabling any person to obtain a financial gain or other reward, directly or indirectly, or

(ii) Relating to the commercial or financial affairs of any person.

(c) The licensee shall not transmit messages to an amateur station in a foreign country if the Authority has published a notice that the government of that country objects to the transmission and reception of messages between amateur stations in the country and amateur stations of that country.

(d) On becoming aware that operation of an amateur station causes harmful interference to other radiocommunications services the licensee shall immediately cease transmission.

(e) Except for the control of an unattended amateur station, the licensee shall not operate an amateur station to transmit signals that are encoded for the purpose of encrypting the signals.

(f) The licensee shall not, whether manually or automatically, connect the station to a public telecommunications network such as the internet, unless:

(i) The licensee is a General amateur, and

(ii) The licensee has implemented a reasonable procedure to ensure that only licensed persons access the station for operation. In this case the licensee shall advise the person being connected that his or her transmissions may be overheard by other persons and connection shall be disconnected if there is no intention to proceed with the connection.

(h) The licensee of an amateur station shall not authorize another person to operate the station if the other person is not a qualified operator unless a more highly qualified operator is always present during operation of the station.

(i) No person shall transmit by way of an amateur radio station, using a mode of emission or at a power level, other than authorized by the Authority and that indicated in the Schedule A, Services and Applications of these Rules,

4.4.6 Content of an amateur station license

The amateur radio license shall contain:

(a) The assigned call sign and the details of the licensee.

(b) The date on which license is issued and the date on which the license validity terminates.

(c) Serial number of the relevant Certificate and name of issuing body.

(d) Technical conditions based on Schedule A, Services and Application including:

(i) Permitted frequency bands,

(ii) Permitted emissions,

(iii)Permitted power ranges.

(e) A condition specifying the main location of operation of the amateur station.

4.4.7 Duration of amateur Radio License

The amateur radio license shall be issued for any period of one year which shall be renewed annually. In the event of foreign nationals visiting the country for a short period of time, the period of license shall be for the duration of the stay in the country.

Chapter 5: Radiocommunications Permits

5.1 Types of Permit

The Authority shall issue the following types of permits only for transmitting stations. However, there is no limitation on the number of permit types that may be established by the Authority by amendments to these Rules.

(i) Permit for research and educational experiments,

(ii) Permit for trial/demonstration/testing of radiocommunication devices/services.

5.1.1 Permit for research and educational experiment

(a) The Authority shall issue a permit to a person for research and educational experiments solely within the boundaries of the relevant educational establishment or research laboratory or an organization.

(b) This section shall not apply to anything done or omitted to be done by the security agencies, in the performance of their functions or duties which relates to defense; or

(c) A permit holder under the sub-section (a) shall take all practical measures to avoid causing any interference with the licensed users while conducting this experiment.

5.1.2 Permit for trial, testing or demonstration

(a) The Authority shall issue a permit for trial and testing of any telecommunications technology and services before the launch or demonstration of radiocommunications device in an exhibition centre.

(b) This permit shall be used solely for testing of telecommunication technology and services and not for the commercial launch of technology or services.

(c) A permit holder under the sub-section (a) shall take all practical measures to avoid causing any interference to other radiocommunications services and ensure the emission safety to the environment and lives.

5.2 Procedure for Issuance of Permit

5.2.1 Issuing a permit

(a) A person shall apply to the Authority for a permit mentioned in section 5.1, in a form approved by the Authority. The permit issued shall not be transferable.

(b) The Authority shall consider the RF exposure to electromagnetic fields or safety of persons who:

(i) Operate devices, or

(ii) Work on devices, or

(iii) Use services supplied by means of devices, or

(iv) Live or work near the transmitting station or device, or

(v) Are otherwise reasonably likely to be affected by the operation of the stations or devices.

(c) A person applying for a permit under sub-section (a) shall pay the permit fee in accordance with Schedule A**,** Services and Applications of these Rules to the Authority before the grant of permit.

(d) If the Authority refuses to issue the permit, it shall give the person a written notice of the refusal, together with a statement of its reasons.

5.2.2 Duration of permit

(a) A permit shall be for the duration not exceeding more than three months; however the Authority may extend the duration of a permit up to a maximum of one (1) year, provided the Authority is convinced that such an extension is reasonable.

5.2.3 Cancellation of permit

(a) The Authority may, by written notice, cancel the permit. However, the notice shall provide reasons for cancelling the permit.

(b) In deciding whether to cancel a permit, the Authority:

(i) Shall refer to all matters that it considers relevant, and

(ii) Shall have received and reviewed the records of the permit holder, and

(iii) Shall refer to whether or not the holder of the permit or an agent of the holder has been convicted of an offence because of contravention of a condition of the permit.

Chapter 6: Radiocommunication License Exemption

6.1 A person using or possessing the following radiocommunication devices shall be exempted from obtaining a license from the Authority:

(i) Any Short-Range Devices (SRD) mentioned in the Schedule A**,** Services and Applications of these Rules, and

(ii) Any devices for the purpose of providing emergency response and services to the public in case of disaster and emergency, and

(iii) Any industrial scientific and medical (ISM) equipment operating in the ISM frequency bands as mentioned in the Schedule A, Services and Applications of these Rules, and

(iv) Any radio equipment which receives frequency mode,

(v) The frequencies for distress and safety communications by Radio Regulations Footnotes 5.511, 5.356 and 5.375 of the ITU Radio Regulations (Edition 2020): 2 182 kHz, 3 023 kHz, 5 680 kHz, 8 364 kHz, 121.5 MHz, 156.525 MHz, 156.8 MHz, 243 MHz, 1 544–1 545 MHz and 1 645.5–1 646.5 MHz

6.2 However the license exempt radiocommunication devices SRDs and the frequency spectrum users shall comply with the specifications and standards stated in Schedule A**,** Services and Applications of these Rules.

6.3 Any devices and frequencies which are exempted in obtaining the license from the Authority shall not be protected nor claim protection from any interference caused from the radiocommunication services operated by any licensed users except the services on distress and safety communications under 6.1 (ii) and (v).

Chapter 7: Compliant and Monitoring

7.1 The Authority shall carry out periodic monitoring of radio frequency usage in the country.

7.2 The licensee or any individual shall submit any radio interference issues and complaints related to radiocommunications to the Authority in the prescribed form.

7.3 The interference complaints submitted to the Authority by licensees or any individual shall contain a detailed interference report including the frequency interfered, source of the interference if known, location and time or duration of interference.

7.4 The licensee shall permit an authorized officer of the Authority to inspect station records, read and measure emission power levels and make copies of the records of a radio station.

Chapter 8: Renewal of License

8.1 The licensee shall apply for the renewal of license to the Authority on or before the expiry of the license.

8.2 The spectrum license shall be renewed annually and upon the payment of the spectrum utilization fees determined by the Authority.

8.3 The Apparatus licenses shall be renewed annually and upon payment of prescribed or any renewal fees determined by the Authority.

8.4 The national amateur radio license shall be renewed annually and upon payment of fees prescribed by the Authority. In the case of foreign national's amateur radio licensees, the Authority shall determine the renewal of amateur radio license on a case-by-case basis.

8.5 In the event the permit holders intend to extend their permits, the permit holders shall apply to the Authority and the Authority shall determine for extension on a case-by-case basis.

8.6 A fine of Nu. 50 per day shall be levied for late renewal after the expiry of the grace period of 30 days and up to a maximum period of 90 days after which the license shall be cancelled automatically.

8.7 The licensee's compliance with the license terms and conditions, Rules, standards, orders, and any other directives and notifications shall be a prerequisite for renewal.

8.8 In the event if the renewal or extension of the license is denied by the Authority then such decisions shall be conveyed in writing.

Chapter 9: Enforcement and Penalties

9.1 If the Authority is of the opinion that any person or licensee is in use of unauthorized frequency, or the station or device does not comply with the requirements applicable to it under a condition of license granted, or the operation of the device is likely to cause or causing interference with any radiocommunications used for any purpose, the Authority shall carry out the inspection of the frequency usage and its station.

9.2 A person shall be guilty of an offence if he or she operates a transmitter or uses any other device without a license or if the licensed operation is in a way likely to interfere with other radiocommunications services.

9.3 The Authority may in any violation of these Rules, subject to the degree of violation, impose the following penalties to the licensee or offender:

(i) Issue a written warning letter for the first violation and get legally signed undertaking for not repeating such offence again;

(ii) For second violation, impose a penalty equivalent to a maximum of six (6) months daily minimum wage depending on the gravity of the offence;

(iii) For third violation, suspend the operation of the establishment of two months or impose a penalty equivalent to six (6) months daily minimum wage or both depending on the gravity of the offence;

(iv) The license shall be cancelled upon the fourth violation;

(v) Notwithstanding the above provisions, if the violation is proven to be severe, the Authority may impose a penalty up to one (1) year daily minimum wage or suspend or cancel the license even for the first violation;

(vi) In the event, if the license is cancelled, the defaulter shall not be eligible to apply for the same license for a period of three (3) years. However, if the same license gets cancelled for the second time, then the licensee shall not be eligible to apply for the same license in future.

9.4 If aggrieved by the decision of the Authority, the licensee may appeal against such decision to the Alternative Dispute Resolution within ten (10) days of the receipt of the information of such decisions.

Chapter 10: Pricing

10.1 General

10.1.1 The following fees are payable to the Authority under these Rules:

(i) Spectrum access fee,

(ii) Application fee,

(iii)Spectrum utilization fee,

(iv)Permit fee,

10.1.2 The Authority may exempt any international organization from the fees payable under these Rule, based on a bilateral agreement.

10.1.3 Any radio services which fall under the license exempt in chapter 6 shall be exempted from payment of fees.

10.1.4 A person is obliged to provide the Authority the detail of radio frequency and any other information in written which are required for the calculation of fees payable under these Rules. In the event that the person fails to do so the Authority is permitted to use such other information to calculate the fees.

10.1.5 The Authority may review, revise, or add the contents of the tables and fees under these Rules on an annual basis if required.

10.2 Spectrum Access Fee

(a) These fees shall be payable for the Spectrum license when the Authority opens or assigns a part of the radio frequency spectrum under the sections 4.2.

(b) These fees are payable for one time during the issuance of the license by the Authority.

(c) The Authority shall, by written instrument or in website, make determinations:

(i) Fixing spectrum access fees payable by licensees for issuing spectrum licenses, and

(ii) Specifying the times when spectrum access fees are payable.

10.3 Application Fee

(a) An application fee shall be paid to the Authority during the application for:

(i) Spectrum license,

(ii) Apparatus license,

(iii) Amateur radio license,

(iv) Modification of any valid license,

(iv) Permit,

(vii) Duplication of a permit or a license,

(b) The application fee for obtaining a license to utilize a transmitting radio frequency bandwidth in a station is given in Schedule A**,** Services and Applications of these Rules.

(c) The application fee for obtaining a permit is given in Schedule A**,** Services and Applications.

(d) The application fee for the qualification of an operator shall be determined by the Authority.

10.4 Permit Fee

(a) The Authority shall specify a permit fee to be paid to the Authority before the delivery of permit under the sub-section 5.1.

(b) The permit fee is mentioned in Schedule A**,** Services and Applications of these Rules.

(c) A person authorised by a permit granted under section 5.1.2 (Permits for a trial testing) is exempt from the payment of a spectrum utilization fee for the testing of any radiocommunications device.

(d) A person authorized by a permit granted under section 5.1.1 (Permit for research and educational experiments) is exempt from the payment of a spectrum utilization fee for testing of any radiocommunications device provided that he or she complies with sub-section 5.1.1 (c).

10.5 Spectrum Utilization Fee

10.5.1 Any person holding a valid:

(i) Spectrum license, or

(ii) Apparatus license, or

(iii)Amateur radio license.

under these Rules shall be obliged to pay the Authority annually or part there of a spectrum utilization fee as determined under section 10.5.3.

10.5.2 The spectrum utilization fee for the first year shall be paid to the Authority prior to the issuance of a license.

10.5.3 The spectrum utilization fee for Spectrum license, Apparatus license and amateur radio license shall be as follows:

(a) The spectrum utilization fee for Spectrum license shall be based on per MHz basis as per the formula:

$$\frac{\text{Cost}}{B} = \alpha \times F \times \rho \times \sigma \times l \times M_{pub}$$

Except *Cost* (BTN), α (BTN/MHz) and *B* (MHz) all parameters serve as modifiers and are usually 1 or less,

***Cost* (BTN):**	Spectrum Cost
***α* (Nu/MHz):**	Basic price unit equals Nu. **60,000.00**
***F*:**	Depends solely on center frequency (the determination of F for different radio services are mentioned in Schedule A, Services and Applications)
***B* (MHz):**	Total assigned bandwidth in MHz,
***ρ*:**	Regional factor; equals to 1 for national license, and 0.05, which is (1/20) for one District,
***σ*:**	Operator sharing factor; equals to one for exclusive RF; as PtP links of two or more Operators may share the same RF, σ might be less than 1; 1/2 for two users sharing same RF, 1/3 for three…σ is equal or smaller than 1. It will it be collected from all those who shared,
***l*:**	Site location: Urban or Rural areas. *l* equals 1 for Urban and 0.25 for Rural. If both urban and rural includes, the value of *l* shall be 1,
M_{pub}**:**	is the publicity factor of respective radiocommunication services and the value of M_{pub} are mentioned in Schedule A, Services and Application.

(b) For Apparatus licenses except for Public Land Mobile Radio, the Spectrum Utilization Fee mentioned in (a) will be further multiplied by the number of stations N_s as shown below:

$$\text{Cost} = B \text{ x } \alpha \text{ x } F \text{ x } \rho \text{ x } \sigma \text{ x } l \text{ x } M_{pub} \text{ x } N_s$$

(c) The Spectrum utilization fee for public land mobile frequency shall be fixed value as below:

(i) Nu.3750.00 per frequency channel per Dzongkhag.

(ii) If the same frequency channel is spot frequency and is used in more than one Dzongkhag, an incremental fee of twenty percent of the spectrum utilization fee (Nu. 0.20% of Nu. 3750.00) per Dzongkhag shall be charged for the remaining Dzongkhags.

(d) The Spectrum utilization fee for amateur radio license shall be fixed value as below:

- For Bhutanese:

(i) Nu.3000.00 for individual license

(ii) Nu. 6000.00 for group/club license

- For Foreign Nationals:

(i) Nu.6000.00 for individual license

(ii) Nu. 12000.00 for group license

However, an additional fee of Nu.3000.00 shall be charged for amateur radio transmitters operating above 400watts for both Nationals and Foreign Nationals.

Schedule A – Services and Applications

1. Frequency Band Plans

(a) The following are the frequency band plans in different radio services for Bhutan and as was in force on the day of approval of this Rule. This section is subject to change from time to time if the Authority decides to do so.

(j) Digital cellular mobile networks, and
(ii) Simplex duplex, trunk, and
(iii) Land mobile, and
(iv) Broadcasting audio and video, and
(v) Point to Point (PtP), and
(vi) Broadband Wireless Access (BWA), and
(vii) Short Range Devices.

(b) The maximum permitted levels of spurious domain emissions, in terms of power level, of any unwanted component supplied by a transmitter to the antenna transmission line is defined in *Table 1 Category B limits, Recommendation ITU-R SM.329*.

Table 1: maximum permitted levels of spurious domain emissions

Type of equipment	**Limits**
Fixed service [1], [2]	–50 dBm for 30 MHz ≤ *f* < 21.2 GHz[3] –30 dBm for 21.2 GHz ≤ *f* < (see *recommends* 2.5)[3]
Fixed service – Terminal station (out station with subscriber equipment interfaces)[1]	– 40 dBm for 30 MHz ≤ *f* < 21.2 GHz[3] –30 dBm for 21.2 GHz ≤ *f* < (see *recommends* 2.5)[3]
Broadband wireless access (BWA)[10] systems operating between 1 GHz and 6 GHz (all transmitting stations)	–36 dBm for 9 kHz ≤ *f* < 1 GHz[4] –30 dBm for 1 GHz ≤ *f* < (see *recommends* 2.5)[4]
Land mobile service (mobiles and base stations)	–36 dBm for 9 kHz ≤ *f* < 30 MHz –36 dBm for 30 MHz ≤ *f* < 1 GHz[4] –30 dBm for 1 GHz ≤ *f* < (see *recommends* 2.5)[4]
VSAT (very small aperture terminal)	See limits in Recommendation ITU-R S.726
FM broadcasting	87.5 MHz ≤ *f* ≤ 137 MHz: –36 dBm for *P* < 9 dBW 75 dBc for 9 dBW ≤ *P* < 29 dBW –16 dBm for 29 dBW ≤ *P* < 39 dBW 85 dBc for 39 dBW ≤ *P* < 50 dBW –5 dBm for 50 dBW ≤ *P* 30 MHz < *f* < 87.5 MHz and 137 MHz < *f* < (see *recommends* 2.5): –36 dBm for *P* < 4 dBW 70 dBc for 4 dBW ≤ *P* < 40 dBW 0 dBm for 40 dBW ≤ *P*
Radar systems in the radiodetermination service[5], [6]: Fixed radiodetermination stations[7] (except multifrequency, active array radars[8] and meteorological radars) Meteorological radars (except wind profiler radars)	Absolute levels (dBm in PEP in the reference bandwidth) or attenuation (dB) below the power (PEP) (whichever is less stringent): –30 dBm or 100 dB –30 dBm or 100 dB, for PEP ≤ 150 kW; –30 dBm or 90 dB, for PEP > 150 kW[9]

Short range devices operating below 30 MHz	29 – 10 log(f (kHz)/9) dB(μA/m) at 10 m for 9 kHz < f < 10 MHz –1 dB□μA/m) at 10 m for 10 MHz < f < 30 MHz –36 dBm for 30 MHz ≤ except frequencies below < 1 GHz –54 dBm for f within the bands 47-74 MHz, 87.5-118 MHz, 174-230 MHz, 470-862 MHz –30 dBm for 1 GHz ≤f < (see *recommends* 2.5)
Short range device above 30 MHz, Radio local area networks (RLAN), Citizens band (CB), cordless telephones, and radio microphones	–36 dBm for 9 kHz ≤ except frequencies below< 1 GHz –54 dBm for f within the bands 47-74 MHz, 87.5-118 MHz, 174-230 MHz, 470-862 MHz –30 dBm for 1 GHz ≤f < (see *recommends* 2.5)

***Notes to the Table**:*

P: mean power (W) at the antenna transmission line, in accordance with RR No. 1.158. When burst transmission is used, the mean power, P and the mean power of any spurious domain emissions are measured using power averaging over the burst duration.

Spurious domain emissions should be evaluated in terms of mean power except for the radiodetermination service where spurious domain emission should be evaluated in terms of PEP. However, when measurement of spurious domain emission in terms of PEP is difficult due to the nature of spurious domain emission (e.g. Gaussian noise), it is allowed to evaluate both power supplied to the antenna transmission line and spurious domain emission power in terms of mean power.

***f*:** frequency of the spurious domain emissions.

(1) Fixed wireless access (FWA) systems using cellular type mobile technologies, described in Recommendation ITU-R F.757, when administrations allow their usage in the same bands locally assigned to land mobile systems or to FWA using a specific land mobile technology, should be subjected to the land mobile service spurious domain emission limits.

(2) Category A limits apply to HF fixed service.

(3) A reduced reference bandwidth is allowed on both sides of the emission from 250% of the necessary bandwidth.

(4) A reduced reference bandwidth is allowed on both sides of the emission from 250% of the necessary bandwidth.

(5) For radiodetermination systems (radar as defined by RR No. 1.100), spurious domain emission attenuation (dB) shall be determined for radiated emission levels, and not at the antenna transmission line. The measurement method for determining the radiated spurious domain emission levels from radar systems should be guided by Recommendation ITU-R M.1177.

(6) European and some other countries have determined that insofar as they are concerned, Category B spurious domain emission limits for radar systems should apply to transmitters used

in those countries and installed after 1 January 2006 except for the limits for meteorological radars for which an application date is 1st January 2012.

(7)On a site-by-site basis, administrations may permit the use of maritime mobile radar equipment in fixed installations (e.g. vessel traffic services radar), using the appropriate limits for mobile radars.

(8)Further study is to be undertaken by the relevant regional body, any interference will be handled on a case-by-case basis.

(9)On a site-by-site basis, an administration may decide, taking into account potential cross-border compatibility issues where relevant, to deploy meteorological radars in the band 2 700-2 900 MHz with a peak power above 750 kW with relaxed spurious emission limits. Further studies are required to determine the possible relaxation relative to the 90 dB spurious emission limit.

(10) Broadband wireless access (BWA) systems are used for the deployment of radio access networks in both the fixed service and the mobile service on the same platform. They typically operate at frequencies up to 6 GHz and are considered to use terminal stations with antenna gain less than about 20 dBi.

(c) The maximum e.i.r.p. from all base stations allowed in this plan, must comply with the human exposure to electromagnetic radiation that the Authority approves. The current reference levels to time-varying electric and magnetic fields (unperturbed rms values) are specified in Table 2: Reference levels for electric and magnetic fields for occupational and general public exposure in Bhutan (i.e. one tenth power density of ICNIRP 2020 table 5 reference levels for occupational and general public exposure).

Table 2: Reference levels for electric and magnetic fields for occupational and general public exposure in Bhutan

Frequency range	**Electric field-strength (V/m)**		**Equivalent plane wave power-density S_{eq}(W/m^2)**	
	general public	**occupational**	**general public**	**Occupational**
0.1 - 30 Hz	$300/(10^{0.5}*f^{0.7})$ MHz)	$600/(10^{0.5}*f^{0.7}$MHz)	NA	NA
>30 – 400 MHz	$27.7/10^{0.5}$	$61/10^{0.5}$	0.2	1
>400 - 2000 MHz	$(1.375f^{0.5}$(MHz) $)/10^{0.5}$	$(3f^{0.5}$ (MHz))$/10^{0.5}$	(f/2000)	(f/400)
>2 - 300 GHz	NA	NA	1	5

(d) The Bhutan's maximum allowed power from handsets and other user equipment shall be one tenth(1/10) of ICNIRP 2020 reference levels for occupational and general public exposure of Table 3 "Basic restrictions for time varying electric and magnetic fields for frequencies up to 300 GHz" and IEEE C95.1-2006 which is given in ICNIRP Guidelines

2020. The Specific Absorption Rate (SAR), from 10 MHz to 10 GHz, for the localized SAR (head and trunk), equals 2.0(W/kg), averaged over 10g tissue.

1.1 Frequency band plan for digital cellular mobile networks

(a) This band plan divides the following bands into sub-bands in accordance with Table 3 below.

(b) This plan does not permit a person to utilize any part of frequency bands mentioned in sub-section (a) to operate digital cellular mobile networks except that the:

(i) Person authorized by an appropriate parent ICT license to provide public telecommunications service, granted by Authority, and

(ii) Frequency band included in that parent ICT license, and

(iii) Operation complies with all conditions provided in this plan.

(c) Conditions stipulated in this section assure technology neutrality of relevant public telecommunications network (PTN) license that shall be granted by the Authority for operation of licensed PTN in Bhutan.

(d) For the protection of receivers operating in bands adjacent to the bands concerned in this plan, the power of any spurious emission should not exceed the limits specified in Table 1 maximum permitted levels of spurious domain emissions.

(e) The radiocommunications equipment must comply with any standard applicable to it as in force on the equipment compliance day.

Table 3: The band plan for 703–1,880 (MHz)

Frequency Band	Up Link (UL)	Down Link (DL)
IMT	703–748	758–803
850MHz	824–849	869–894
GSM-900	890–915	935–960
GSM-1800	1 710–1 785	1 805–1 880

1.2 Land mobile frequency band plan

(a) The assigned frequencies to the simplex and duplex transmitters of base stations in the land mobile service are from 138.00MHz to 149.9MHz, 150.05MHz - 174MHz in VHF frequency band and 230MHz to 272MHz, 273MHz – 328.6MHz, 332.42MHz – 399.9, 406.12MHz - 430MHz in UHF frequency band.

(b) The preferred channel spacing in all above bands shall be integer multiple of 12.5 KHz, as far as practical and efficient.

(c) Utilization of any channel in these plans by the radiocommunications stations is not allowed unless having a valid Apparatus license issued by the Authority.

1.3 Broadcasting Audio and Video Frequency plan

The following Table 4 designates the broadcasting audio and video RF bands.

Table 4: Designation of VHF Broadcasting Bands

Band	RF (MHz)	FM and TV Channels' number, starting at (MHz)	Channel separation
Band II	87.5-108	FM Sound broadcasting	300 KHz
Band III	174-230	Channel 5 (174-180) MHz, Channel 6 (181-187) MHz, Channel 7 (188- 194) MHz, Channel 8 (195-201) MHz, Channel 9 (202-208) MHz, Channel 10 (209-215) MHz, Channel 11 (216-222) MHz, Channel 12 (223-229) MHz	7 MHz

1.4 Point to Point (PtP) Frequency plan

The following Table 5 shows the fixed service channel arrangements and blocks derived from Recommendation ITU-R F series. The channel arrangement for point-to-point application may be in alignment with fixed service channel arrangement and blocks from Recommendation ITU-R F series.

Table 5: Fixed Service Channel Arrangements (CA) and Blocks

	RF Band	Rec. ITU-R		RF Band	Rec ITU-R		RF Band	Rec. ITU-R
	406.1 – 450 MHz	F.1567		5925 – 6425 MHz	F.383		21.2 – 23.6 GHz	F.637
	1350 – 1530 MHz	F.1242		6425 – 7125 MHz	F.384		25, 26 & 28 GHz	F.748
	1350 – 2690 MHz	F.701		7110 – 7900 MHz	F.385		31.8 – 33.4 GHz	F.1520
	1900 – 2300 MHz	F.1098		7725 – 8500 MHz	F.386		36 – 40.5 GHz	F.749
	2290 – 2670 MHz	F.1243		10.0 – 10.68 GHz	F.747		CA & blocks at 40.5 – 43.5 GHz	F.2005
	2 and 4 GHz	F.382		blocks at 10.15–10.3 and 10.5–10.65	F.1568		51.4 – 52.6 GHz	F.1496

	RF Band	Rec. ITU-R		RF Band	Rec ITU-R		RF Band	Rec. ITU-R
				GHz				
	Blocks at 3400 – 3800 MHz	F.1488		10.7 – 11.7 GHz	F.387		CA & blocks at 71–76 & 81–86 GHz	F.2006
	3400 – 4200 MHz	F.635		14.4 – 15.35 GHz	F.636		92 – 95 GHz	F.2004
	4400 – 5000 MHz	F.1099		17.7 – 19.7 GHz	F.595			

1.5 Frequency band plan for Broadband Wireless Access (BWA)

(a) This band plan divides the following bands into sub bands in accordance with Table 6.

(i) 2.3GHz (2300 to 2395) MHz

(ii) 2.6GHz (2500 to 2690) MHz,

(iii) 3.5GHz (3410 to 3600) MHz,

(b) This plan does not permit a person to utilize any part of frequency bands mentioned in subsection (a) to operate a point to multipoint fixed Broadband Wireless Access (BWA) network except that the:

(i) Person authorized by an appropriate parent ICT license to provide public telecommunications service, granted by Authority subject to market demand, and

(ii) Frequency band included in that parent ICT license, and

(iii) Operation complies with all conditions provided in this plan.

(c) Conditions stipulated in this section assure technology neutrality of relevant public telecommunications network (PTN) license that shall be granted by the Authority for operation of licensed PTN in Bhutan.

(d) The radiocommunications equipment shall comply with any standard applicable to it as in force on the equipment compliance day.

(e) The spectrum utilization in the band planned in this section shall not cause any interference to the earth stations operating in adjacent frequency band.

Table 6: The frequency band plan arrangements in 2.3GHz, 2.5GHz, and 3.5GHz

Frequency arrangements	Paired arrangements				Un-paired arrangements (e.g. for TDD) (MHz)
	Mobile station transmitter (MHz)	Centre gap (MHz)	Base station transmitter (MHz)	Duplex separation (MHz)	
F1	2300-2395	10			2300-2395
F2	2500-2690	10			2545-2645
F3	3410–3600	10			3410-3600

2. Applicable Fees under National Radio Rules

2.1 Table of Application Fees

(a) The application fee in price unit, for any licenses shall be calculated in accordance with Table 7 below. The value of one (1) price unit shall be Nu. 60.00.

(b) For any duplication and modification of License, an administrative cost of Nu. 500 shall be charged.

Table 7: Table of application fee

Station Type		**Application fee in price unit**
Terrestrial sound or TV broadcasting station, base station and repeater station in land mobile service below 28 MHz, on-board cell phone base station		Fifty
Ground station in aeronautical mobile service, VSAT station, radar station, metrological aids station, point to point and central point to multipoint fixed stations, station for standard frequency and time signal, base station and repeater station in radio trunk system, base station and repeater station and mobile station in land mobile service above 29.7 MHz, base station and repeater station in paging system, radio amateur station		Ten
Space research station, space operation station, radio astronomy station, broadcasting satellite station, VSAT hubs		Fifty
fixed earth stations and mobile stations in all space services except VSAT station		Twenty-Five
Mobile user equipment in a network with or without base station (in land mobile service).	One to thirty mobile user equipment (UE)	Ten
	Thirty-one to seventy mobile UE	Twenty
	More than seventy mobile UE	Twenty plus (+) ten for

Station Type		Application fee in price unit
		each additional of 50 UE
Permits for testing and experiments		Ten
Other station		Thirty

2.2 Table of Permitting Fee

(a) The permit fees for annually/specified duration of permit shall be in accordance with the Table 8 below. The value of one (1) price unit shall be Nu. 60.00

Table 8: Permitting fees

Purpose of permit	Permit fee (in price unit)
Testing of radiocommunications device	25
Conducting experiments for research and education	20

2.3 Spectrum Access Fee

(a) The spectrum access fees shall be determined by the Authority on a case by case depending upon the value of the spectrum applied.

2.4 Spectrum Utilization Fee

(a) The spectrum utilization fee for spectrum license shall be based on per MHz basis as per the formula:

$$\frac{\text{Cost}}{B} = \alpha \times F \times \rho \times \sigma \times l \times M_{pub}$$

Except *Cost* (BTN), α (BTN/MHz) and B (MHz) all parameters serve as modifiers and are usually 1 or less,

***Cost* (BTN):** Spectrum Cost

***α* (Nu/MHz):** basic price unit equals **60,000.00**

***F*:** depends solely on centre frequency (the determination of F for different radio services are explained in section (b) below)

***B* (MHz):** total assigned bandwidth,

***ρ*:** regional factor; equals to one for national license, and 0.05 (1/20) for 1 District,

***σ*:** operator sharing factor; equals to one for exclusive RF; as PtP links of two or more Operators may share the same RF, σ might be less than 1; 1/2 for two users sharing same RF, 1/3 for three…σ is equal or smaller than 1. It will it be collected from all those who shared,

***l*:** site location: Urban or Rural areas. l equals 1 for Urban and 0.25 for Rural. If both urban and rural includes, the value of l shall be 1,

***M_{pub}*:** is the publicity factor of respective radiocommunication services and the value of M_{pub} are mentioned in the table below:

Sl. No	**Types of Services**	**M_{pub} Value**
1.	Cellular services	1
2.	Sound Broadcasting	0.8
3.	Television Broadcasting	0.6
4.	Others	0.5
5.	ISP (Broadband Wireless Access)	0.4
6.	Point to Point	0.2

The value of F depends on the radio services and its radio frequency as mentioned below;

(i) The value of F for cellular services, C Band earth stations and other wireless applications is determined from the formula shown below;

$$F(f) = \frac{0.001 + 0.06 \times 10^{-6\left(\log\left(\frac{f}{900}\right)\right)^2}}{0.0611}$$

The F shall equal 1 for frequencies and services above 400MHz and below 1,000 MHz, and for C Band earth stations.

The F shall equal 0.85 for frequencies and services below 400MHz and equals 0.3 for frequencies above 1000MHz.

(ii) The value of *F* for ISPs operating the broadband wireless access services is determined from the formula shown below;

$$F(f_{GHz}) = \frac{2.3}{f_{GHz}}$$

The equation provides this relative coefficient for the different Broad Wireless Access (BWA) bands:

- F(2.3GHz) = F_{max}=1 for 2.3 GHz
- F(2.6GHz) = 0.88 for 2.3GHz ≤ F ≤ 2.6 GHz
- F(3.5GHz) = 0.66 for 2.6GHz ≤ F ≤ 3.5 GHz
- F(5.4GHz) = 0.43 for 3.5GHz ≤ F ≤ 5.4 GHz
- F(10.5 GHz) = 0.22 for 5.4 ≤ F ≤ 10.5 GHz.

As the ISPs may operate at RF below 2.3 GHz and above 12GHz, the equation shall be used.

(iii) The value of *F* for Point-to-Point services is determined from the formula shown below;

$$f_{GHz} = \frac{1.5}{f_{GHz}}$$

The equation provides this relative coefficient for the different microwave frequency bands:

- F(1.5 GHz) = F_{max}=1 for 1.5 GHz links
- *F(6GHz)* = 0.25 for 6 GHz links
- F(7 GHz) = 0.21 for 7 GHz links
- F(8 GHz) = 0.19 for 8 GHz links
- F(13 GHz)= 0.12 for 13 GHz links
- F(15 GHz)= 0.10 for 15 GHz links
- F(17 GHz)= 0.09 for 17 GHz links
- F(23 GHz)= 0.07 for 23 GHz links

As PtP may operate at RF till 86 GHz and more, the equation shall be used to calculate the value of F.

(b) For Apparatus licenses except for Public Land Mobile Radio, the Spectrum Utilization Fee mentioned in (a) will be further multiplied by the number of stations N_s as shown below:

$$\textbf{Cost} = \boldsymbol{B} \times \boldsymbol{\alpha} \times \boldsymbol{F} \times \boldsymbol{\rho} \times \boldsymbol{\sigma} \times \boldsymbol{l} \times \boldsymbol{M_{pub}} \times \boldsymbol{N_s}$$

(c) The Spectrum utilization fee for public land mobile frequency shall be fixed value as below:

(i) Nu.3750.00 per frequency channel per Dzongkhag.

If the same frequency channel is spot frequency and is used in more than one Dzongkhag, an incremental fee of twenty percent of the spectrum utilization fee (Nu. 0.20% of Nu. 3750.00) per Dzongkhag shall be charged for the remaining Dzongkhags.

(d) The Spectrum utilization fee for amateur radio license shall be fixed value as below:

- For Bhutanese:

(i) Nu.3000.00 for individual license

(ii) Nu. 6000.00 for group/club license

- For Foreign Nationals:

(i) Nu.6000.00 for individual license

(ii) Nu. 12000.00 for group license

However, an additional fee of Nu.3000.00 shall be charged for amateur radio transmitters operating above 400watts for both Nationals and Foreign Nationals.

3. Table of Call Signs

3.1 General

(a) A call sign to an amateur radio station shall be assigned at the time of issuing an amateur radio license.

(b) A call sign assigned is not subject to change unless:

(i) A characteristic of corresponding valid license changed that requires call sign modification, or

(ii) The license cancelled.

(c) In case of more than one transmitting frequency assignment to a single station, the Authority must assign a call sign to each group of frequencies that is going to be utilized in the same radiocommunications service.

(d) The method of call sign assignment, established by this section in case of station belongs to the defense sector, is valid only in peace. In the event of national conflict or war, the assigned call signs may be changed by the defense sector itself. If happened, the Authority shall be provided with enough information for prevention of call sign conflicts.

(e) For construction of call signs:

(i) The three-character identifier of districts, wherein the transmitting station is operated, shall be in accordance with Table 9 below, and

(ii) The one letter of identifier of dedicated spectrum users shall be in accordance with the Table 10 below, and

(iii) The three-character identifier of the group of districts, wherein the transmitting station is operated, shall be in accordance with Table 11 below.

Table 9: The three-character identifier of districts

No.	District	Identifier	No.	District	Identifier
1	Bumthang	A5B	11	SamdrupJongkhar	A5J
2	Chukha	A5C	12	Samtse	A5S
3	Dagana	A5D	13	Sarpang	A5V
4	Gasa	A5G	14	Thimphu	A5T
5	Haa	A5H	15	Trashigang	A5I
6	Lhuntse	A5L	16	Trashiyangste	A5Y
7	Mongar	A5M	17	Trongsa	A5R
8	Paro	A5P	18	Tsirang	A5O
9	Pemagatshel	A5E	19	WangduePhodrang	A5W
10	Punakha	A5U	20	Zhemgang	A5Z

Table 10: The character identifier of major spectrum users

No.	Entity	Identifier
1	Road Safety & Transport Authority of Bhutan	A
2	Ministry of Health	B
3	Ministry of Home & Cultural Affairs	C
4	Ministry of Labour & Human Resources	D
5	Ministry of Works & Human Settlements	E
6	Ministry of Education	F
7	Ministry of Agriculture	G

No.	Entity	Identifier
8	Ministry of Economic Affairs	H
9	Ministry of Finance	I
10	Royal Bhutan Army	J
11	Royal Bhutan Police	K
12	Royal Bhutan Guard	L
13	Bhutan Broadcasting Service	M
14	Bhutan Post	N
15	Thimphu City Corporation	O
16	Druk Air	P
17	Royal	Q
18	Others (*Reserved by the Authority*)	R to Z

Table 11: The three-character identifier of districts

No.	Districts	Identifier
1	Bumthang, Sarpang, Trongsa, Zhemgang	A5K
2	Chukha, Haa, Paro, Samtse, Thimphu	A5A
3	Dagana, Gasa, Punakha, Tsirang, WangduePhodrang	A5Q
4	Lhuntse, Mongar, Pemagatshel, SamdrupJongkhar, Trashigang, Trashiyangste	A5F
5	Nationwide	A5N
6	Other combination of districts	A5X

3.2 Call sign of mobile station in land mobile service

(a) The call sign of a mobile station in land mobile service is the combination of three character of Table 9 followed by a letter of Table 10 followed by a four digit from '**2000**' to '**9999**'.

(b) If a mobile station is in use in more than one district, the Authority assigns the combination of three characters of Table 11 followed by a letter of Table **10** followed by a four digit from '**2000**' to '**9999**'.

3.3 Call sign of land station or fixed station

(a) The call sign of a land station is the combination of three characters of Table 9 followed by a three digit from '**250**' to '**999**'.

(b) If the location of a land station is unknown to the Authority, the Authority assigns the '**A5X**' followed by a three digit from '**250**' to '**999**'.

3.4 Call sign of aeronautical station

The Authority shall assign a call sign to an aeronautical station from the range **A5AAB** to **A5AZZ**.

3.5 Call sign of Aircraft survival craft stations

The Authority assigns a call sign to an aircraft survival craft station as the complete call sign of the parent aircraft, followed by a single digit other than **0** or**1**.

3.6 Call sign of broadcasting stations

(a) The call sign of a broadcasting station is the combination of three character of Table **9** followed by a three digit from:
   (i) '**200**' to '**205**' in case of short-wave sound broadcasting,
   (ii) '**206**' to '**225**' in case of FM sound broadcasting,
   (iii) '**226**' to '**249**' in case of TV broadcasting.

3.7 Call sign of amateur stations

(a) The call sign of an amateur station is the combination of:
   (i) '**A5**' followed by,
   (ii) digit '0' or '1' or '2' for 'Clubs', 'Bhutanese' and 'Foreign National' certificate types, respectively, followed by,
   (iii) "AA" to "ZZ"

(b) The Authority may provide special call sign for special events using digit '**4**' or '**8**' in position of subsection **3.7**(**a**)(**ii**). Such identification needs to be published by the Authority in advance if made.

4. Short Range Devices (SRDs)

SRDs are regulated according to the ITU Region 3 allocations. SRDs are unprotected and do not need a specific license but need a type-approval. These devices do not need to pay spectrum utilization fees. All transmitters emitting less than the electric field-strength detailed in the following table shall be allowed.

Table 12: Maximal electric field-strength 3 m distant from transmitter

Frequency band	Electric field-strength (μV/m)
f≤ 322 MHz	500
322 MHz <*f*≤ 10 GHz	35
10 GHz < f ≤ 150 GHz	3.5 × f(GHz)*

*The maximal field-strength is 500 μV/m; therefore, above 143 GHz the field-strength is steady 500 μV/m.

In Bhutan, the frequency band 824–844 MHz paired with 869–889 MHz has been marked for cellular telecommunication systems. So those frequencies are not proposed as SRDs. In addition to APT Recommendations on SRDs, Bhutan follows in general the European Radiocommunications Committee (ERC) Recommendation *70-03*' Relating to the use of Short Range Devices (SRD)'. This Recommendation describes the spectrum management requirements for SRDs relating to allocated frequency bands, maximum power levels, channel spacing or modulation/maximum occupied bandwidth (BW) and duty cycle. The following annexes define the regulatory parameters as well as additional information about harmonized standards, frequency issues and important technical parameters. Other technical parameters are indicated in the relevant standard.

- Non-specific Short-Range Devices
- Tracking, Tracing and Data Acquisition
- Wideband Data Transmission systems
- Railway applications
- Transport and Traffic Telematics (TTT)
- Radiodetermination applications
- Alarms
- Model control
- Inductive applications
- Radio microphone applications including assistive listening device (ALD)
- Radio frequency identification applications
- Active Medical Implants and their associated peripherals
- Informative Annex covering the applications operating under general authorization regime which are not covered by the annexes 1 to 12 of this Recommendation.

4.1 Non-Specific Short Range Devices

Scope: This covers frequency bands and regulatory as well as informative parameters recommended primarily for Telemetry, Telecommand, Alarms and Data in general and other similar applications. Video applications should be preferably used above 2.4 GHz. This annex also includes references to the generic UWB regulation which was primarily developed to allow communication applications using UWB technology in bands below 10.6 GHz; but enables also other types of radio applications.

Notes to the following Table:

Note 1: When either duty cycle, Listen Before Talk (LBT) or equivalent technique applies then it shall not be user dependent/adjustable and shall be guaranteed by appropriate technical

means. For LBT devices without Adaptive Frequency Agility (AFA), or equivalent techniques, the duty cycle limit applies. For any type of frequency agile device, the duty cycle limit applies to the total transmission unless LBT or equivalent technique is used.

Note 2: The preferred channel spacing is 100 kHz allowing for a subdivision into 50 kHz or 25 kHz.

Note 3: Sub-bands for alarms are excluded (see ERC/REC 70-03 Annex 7).

Note 4: Audio and video applications are allowed provided that a digital modulation method is used with a max. bandwidth of 300 kHz. Analogue and digital voice applications are allowed with a max. bandwidth ≤ 25 kHz. In sub-band 863–865 MHz voice and audio conditions of Annexes 10 and 13 of ERC/REC 70-03 apply respectively.

Note 5: Duty cycle may be increased to 1% if the band is limited to 865–868 MHz.

Note 6: For wide-band techniques, other than FHSS, operating with a bandwidth of 200 kHz to 3 MHz, the duty cycle can be increased to 1% if the band is limited to 865–868 MHz and power to ≤10 mW e.r.p.

Note 7: The power density can be increased to +6.2 dBm/100 kHz and -0.8 dBm/100 kHz, if the band of operation is limited to 865–868 MHz and 865–870 MHz respectively.

Note 8: These limits should be measured with an rms detector and an averaging time of 1 ms or less.

Note 9: The available channel centre frequencies are 916.3 MHz, 917.5 MHz, 918.7 MHz and 919.9 MHz. The channel bandwidth is 400 kHz.

Note 10: RFID tag emissions responding to RFID interrogators operating on centre frequencies 916.3 MHz, 917.5 MHz, 918.7 MHz and 919.9 MHz are not duty cycle limited.

Note 11: Audio and video applications are excluded. Voice applications (analogue or digital) are allowed with a maximum bandwidth of ≤ 25 kHz, and with spectrum access techniques such as LBT or equivalent and shall include a power output sensor controlling the transmitter to a maximum transmit period of 1 minute for each transmission.

Table 13: Regulatory parameters related to Non-Specific SRDs

Frequency Band		Power / Magnetic Field	Spectrum access and mitigation requirements	maximum occupied bandwidth	ECC/ERC deliverable	Notes
B	13.553–13.567 MHz	42 dBµA/m at 10m	No requirement	Not specified		
C	26.957–27.283 MHz	10 mW e.r.p	No requirement	Not specified		
c1.1	26.990–27.000 MHz	100 mW e.r.p	≤ 0.1 % duty cycle (note 1)	≤10 kHz		
c1.2	27.040–27.050 MHz	100 mW e.r.p	≤ 0.1 % duty cycle (note 1)	≤10 kHz		
c.1.3	27.090–27.100 MHz	100 mW e.r.p	≤ 0.1 % duty cycle (note 1)	≤10 kHz		
c1.4	27.140–27.150 MHz	100 mW e.r.p	≤ 0.1 % duty cycle (note 1)	≤10 kHz		
c1.5	27.190–27.200 MHz	100 mW e.r.p	≤ 0.1 % duty cycle (note 1)	≤10 kHz		

Frequency Band		Power / Magnetic Field	Spectrum access and mitigation requirements	maximum occupied bandwidth	ECC/ERC deliverable	Notes
D	40.660–40.700 MHz	10 mW e.r.p.	No requirement	Not specified		
E	138.20–138.45 MHz	10 mW e.r.p.	≤1.0 % duty cycle (note 1)	Not specified		
f1	169.4000–169.4750 MHz	500 mW e.r.p.	≤ 1.0 % duty cycle (note 1)	≤ 50 kHz	ECC/DEC/(05) 02	
f2	169.4000–169.4875 MHz	10 mW e.r.p.	≤ 0.1 % duty cycle (note 1)	Not specified	ECC/DEC/(05) 02	
f3	169.4875–169.5875 MHz	10 mW e.r.p.	≤ 0.001% duty cycle except for 00:00 h to 06:00 h local time where the duty cycle limit is ≤ 0.1% (note 1)	Not specified	ECC/DEC/(05) 02	Equipment that concentrates or multiplexes individual equipment is excluded.
f4	169.5875–169.8125 MHz	10 mW e.r.p.	≤ 0.1 % duty cycle(note 1)	Not specified	ECC/DEC/(05) 02	

Frequency Band		Power / Magnetic Field	Spectrum access and mitigation requirements	maximum occupied bandwidth	ECC/ERC deliverable	Notes
g1	433.050–434.790 MHz	10 mW e.r.p.	≤ 10 % duty cycle (note 1)	Not specified		
g2	433.050–434.790 MHz	1 mW e.r.p. -13 dBm/10 kHz	No requirement except for (note 11)	Not specified		Power density limited to -13 dBm/10 kHz for wide band modulation with BW > than 250 kHz
g3	434.040–434.790 MHz	10 mW e.r.p.	No requirement except for (note 11)	≤ 25 kHz		
h0	862–863 MHz	25 mW e.r.p.	≤ 0.1% duty cycle	≤ 350 kHz		
h1.1	863–870 MHz (notes 3 and 4)	25 mW e.r.p.	≤ 0.1% duty cycle or LBT (notes 1and 5)	≤ 100 kHz for 47 or more channels (note 2)		FHSS
h1.2	863–870 MHz (notes 3 and 4)	25 mW e.r.p. Power density -4.5 dBm/100 kHz (note 7)	≤ 0.1% duty cycle or LBT+AFA (notes 1, 5 and 6)	Not specified		DSSS and other wideband techniques other than FHSS.

Frequency Band		Power / Magnetic Field	Spectrum access and mitigation requirements	maximum occupied bandwidth	ECC/ERC deliverable	Notes
h1.3	863–870 MHz (notes 3 and 4)	25 mW e.r.p.	≤ 0.1% duty cycle or LBT+AFA (notes 1 and 5)	≤ 100 kHz, for 1 or more channels modulation BW ≤ 300kHz (note 2)		Narrow /wide-band modulation
h1.4	868.000–868.600 MHz (note 4)	25 mW e.r.p.	≤ 1% duty cycle or LBT+AFA (note 1)	Not specified, for 1 or more channels (note 2)		Narrow / wide-band modulation. No channel spacing, however the whole stated frequency band may be used
h1.5	868.700–869.200 MHz (note 4)	25 mW e.r.p.	≤ 0.1% duty cycle or LBT+AFA (note 1)	Not specified, for 1 or more channels (note 2)		Narrow / wide-band modulation. No channel spacing, however the whole stated frequency band may be used
h1.6	869.400–869.650 MHz	500 mW e.r.p.	≤ 10% duty cycle or LBT+AFA (note 1)	Not specified, for 1 or more		Narrow / wide-band modulation The whole stated frequency band may be used as 1 channel for high speed

Frequency Band		Power / Magnetic Field	Spectrum access and mitigation requirements	maximum occupied bandwidth	ECC/ERC deliverable	Notes
				channels		data transmission
h1.7	869.700–870.000 MHz (note 11)	5 mW e.r.p. 25 mW e.r.p.	No requirement ≤1% duty cycle or LBT+AFA (note 1)	Not specified for 1 or more channels		Narrow / wide-band modulation. No channel spacing, however the whole stated frequency band may be used
h2	870–876 MHz	25 mW e.r.p.	≤ 0.1% duty cycle For ER-GSM protection (873–876 MHz, where applicable), the duty cycle is limited to ≤ 0.01% and limited to a maximum transmit on-time of 5ms/1s	≤ 200 kHz		
h2.1	870.000–875.800 MHz	25 mW e.r.p.	≤ 1% duty cycle. For ER-GSM protection (873–875.8 MHz,	≤ 600 kHz		

Frequency Band		Power / Magnetic Field	Spectrum access and mitigation requirements	maximum occupied bandwidth	ECC/ERC deliverable	Notes
			where applicable), the duty cycle is limited to ≤ 0.01% and limited to a maximum transmit on time of 5ms/1s			
h3	915–921 MHz	25 mW e.r.p.	≤ 0.1% duty cycle. For ER-GSM protection (918–921 MHz, where applicable), the duty cycle is limited to ≤ 0.01% and limited to a maximum transmit on-time of 5ms/1s	≤ 200 kHz		
h3.1	915.200–920.800 MHz	25 mW e.r.p. except for the 4 channels	≤ 1% duty cycle (note 10). For ER-GSM	≤ 600 kHz except for the		

Frequency Band		Power / Magnetic Field	Spectrum access and mitigation requirements	maximum occupied bandwidth	ECC/ERC deliverable	Notes
		identified in note 9 where100 mW e.r.p. applies	protection (918–920.8 MHz, where applicable), the duty cycle is limited to ≤ 0.01% and limited to a maximum transmit on-time of 5ms/1s	4 channels identified in note 9 where ≤ 400 kHz applies		
I	2400.0–2483.5 MHz	10 mW e.i.r.p.	No requirement	Not specified		
J	5725–5875 MHz	25 mW e.i.r.p.	No requirement	Not specified		
k1	3.1–4.8 GHz	*	*	*	ECC/DEC/(06)04	Generic UWB regulation. * See detailed requirements in the related ECC Decision
k2	6 – 9 GHz	*	*	*	ECC/DEC/(06)04	
L	6.0–8.5 GHz	*	*	*	ECC/DEC/(12)	UWB on-board aircraft regulation. * See detailed requirements in the

Frequency Band		Power / Magnetic Field	Spectrum access and mitigation requirements	maximum occupied bandwidth	ECC/ERC deliverable	Notes
					03	related ECC Decision
M	24.00–24.25 GHz	100 mW e.i.r.p.	No requirement	Not specified		
n1	57–64 GHz	100 mW e.i.r.p., a max. transmitter output power of 10 mW, and a power density limited to 13 dBm/MHz e.i.r.p. applies	No requirement	Not specified		
n2	61.0–61.5 GHz	100 mW e.i.r.p.	No requirement	Not specified		
o1	122.0–122.25 GHz	10 dBm e.i.r.p/ 250MHz and -48 dBm/MHz at >30° elevation	(note 8)	Not specified		
o2	122.25–123.0 GHz	100 mW e.i.r.p.	No requirement	Not specified		
P	244–246 GHz	100 mW e.i.r.p.	No requirement	Not specified		

Harmonized Standards: EN 300 220 sub-bands c) to h3.1); EN 300 330sub-bands b) to c); EN 300 440sub-bands i), j) and m); EN 305 550 sub-bands n1), n2), o1), o2) and p); EN 302 065sub-bands k1) and k2)

Technical parameters also referred to in the harmonized standard: Listen before talk (LBT) with Adaptive Frequency Agility (AFA) technique feature may be used instead of duty cycle. LBT is defined in EN 300 220.Audio and voice are defined in EN 300 220.

Frequency issues: The bands in Annex 1 b), c), c1.1) to c1.5), d), g1), g2), g3), i), j), m), n1), n2), o1), o2), p) and p are also designated for industrial, scientific and medical (ISM) applications as defined in ITU Radio Regulations. Band h1.1) to h1.3): Certain channels may be occupied by RFID operating at higher powers (See Annex 11 for further details). To minimise the risk of interference from RFID, SRDs should use LBT with AFA or observe suitable separation distances. (In the high power RFID channels typically these may vary from 918 m (indoor) to 3.6 km (rural outdoor). In the remaining 2.2 MHz, where tags at 20 dBm e.r.p. occupy the spectrum, this may vary from 24 m (indoor) to 58 m (rural outdoor)). The adjacent frequency bands below 862 MHz and above 870 MHz may be used by high power systems. Manufacturers should take this into account in the design of equipment and choice of power levels. Sub-bands h2) to h3.1): Use of all or part of sub-bands h2) to h3.1) may be denied in some European countries that use all or part of these sub-bands for defence/governmental systems. In other countries that use sub-bands 873–876 / 918–921 MHz for GSM for railways, extended band (ER-GSM), access to the part 873–876 / 918–921 MHz by non-specific SRD applications require implementing additional mitigation measures such as transmission timing limitations as set out in ECC Report 200. The adjacent frequency bands below 915 MHz and above 876 MHz as well as 921 MHz may be used by high power systems. Manufacturers should take this into account in the design of equipment and choice of power levels. Sub-band new): SRD vendors wishing to use the band 862–863 MHz should weigh the risks and accept responsibility for deciding themselves whether their specific applications shall be capable of operating in the presence of comparatively high ambient noise levels from LTE UEs' out-of-band emissions and design their products accordingly.

4.2 Tracking, Tracing and Data Acquisition

Scope: This covers frequency bands and regulatory as well as informative parameters recommended for a number of specific devices including:

- Emergency detection of buried victims and items such as detecting avalanche victims;
- Meter Reading;
- Sensors (water, gas and electricity; meteorological instruments; pollution measurement; environmental data, such as levels of allergens (pollen, dust), electromagnetic pollution (solar activity), noise) and actuators (controlling devices such as street or traffic lights);
- Medical Body Area Network Systems (MBANS), used for medical data acquisition, are intended to be used in healthcare facilities and patients' homes. They are low power area network systems used for the transmission of non-voice data to and from medical devices for the purposes of monitoring, diagnosing and treating patients as prescribed by duly authorised healthcare professionals and are defined in the context of medical applications only;
- Ultra-Low Power Wireless Medical Capsule Endoscopy (ULP-WMCE) application designed for use in medical doctor-patient scenarios with the aim of acquiring high resolution optical internal images of human digestive tract and thus providing a tool for non-invasive diagnosis and treatment of gastrointestinal diseases;
- Wireless Industrial Applications (WIA) to be used for wireless links in industrial environments including monitoring and worker communications, wireless sensors and actuators;
- Data networks, such as for utilities or other applications for the purpose of data acquisition.

Table 14: Regulatory parameters related to Tracking, Tracing and Data Acquisition

Frequency Band		**Power / Magnetic Field**	**Spectrum access and mitigation requirements**	**Modulation/ max occupied BW**	**Notes**
A	456.9–457.1 kHz	7 dBμA/m at 10 m	No requirement	Continuous wave (CW) – no modulation	Emergency detection of buried victims and valuable items. Note: Centre frequency is 457 kHz
B	169.400–169.475 MHz**	500 mW e.r.p.	≤ 10% duty cycle	≤ 50 kHz	Meter Reading.
New	430.000– 440.00 MHz	-50 dBm/100 kHz max e.r.p. density but not exceeding a total power of -40 dBm/10 MHz***	No requirement	≤ 10 MHz	This application is for Ultra-Low Power Wireless Medical Capsule Endoscopy
c1	865–868MHz	500 mW e.r.p.	≤ 0% duty cycle for access points (notes 6 and 7) ≤ 2.5% duty cycle otherwise	≤ 200 kHz	

Frequency Band		Power / Magnetic Field	Spectrum access and mitigation requirements	Modulation/ max occupied BW	Notes
d1	2483.5–2500 MHz	1 mW e.i.r.p.	Adequate spectrum sharing mechanisms (e.g. Listen-Before-Talk and Adaptive Frequency Agility) shall be implemented by the equipment and ≤ 10% duty cycle	≤ 3 MHz	The application is for MBANS, indoor only within healthcare facilities
d2	2483.5–2500 MHz	10 mW e.i.r.p.	Adequate sharing mechanisms (e.g. Listen-Before-Talk and Adaptive Frequency Agility) shall be implemented by the equipment and≤ 2% duty cycle	≤ 3 MHz	The RF band is also identified in Annex 12. The application is for MBANS, indoor only within the patient's home
E	5725–5875 MHz	≤ 400 mW e.i.r.p.	APC required Adequate spectrum sharing mechanisms (e.g. DFS and DAA) shall be implemented (note 3)	≥ 1 MHz and ≤ 20 MHz	Wireless Industrial Applications (WIA). Registration and/or notification may be required. The Adaptive Power Control able to reduce the e.i.r.p. to ≤ 25 mW.

** ECC/ERC deliverable (ECC/DEC/(05)02);

*** (both limits are intended for measurement outside of the patient's body)

Note 1: A duty cycle of up to 10% may be allowed for network relay points forming part of metropolitan/rural area networks such as for utilities or other applications for the purpose of data acquisition. Network relay points should be individually licensed. National regulatory authorities may consider the provision of general authorisations (options as defined in ECC Report 132) for network relay points forming part of metropolitan/rural area networks which have implemented additional Listen-Before-Talk (LBT) and frequency/channel agility/adaptivity mitigation techniques and/or coordination in geographic areas of a high number of network relay points.

Note 3: DFS is required in the frequency range 5725–5850 MHz to ensure an appropriate protection to the radiolocation service (including frequency hopping radars), DAA is required in the frequency range 5855–5875 MHz for the protection of ITS, in the frequency range 5725–5875 MHz for the protection of BFWA, and in the frequency range 5795–5815 MHz for the protection of TTT applications.

Note 6: A network access point in a data network is a fixed terrestrial short range device that acts as a connection point for the other short range devices in the data network to service platforms located outside of that data network. The term data network refers to several short range devices, including the network access point, as network components and to the wireless connections between them.

Note 7: Network access points may be individually licensed, e.g. in geographical areas of a high number of network access points.

Harmonised Standards: EN 300 718 sub-band a); EN 300 220 sub-band b); EN 303 204 sub-band c); EN 303 203 sub-bands d1) and d2); EN 303 258 sub-band e) for WIA systems is under development.

Frequency issues:

Sub-bands d1) and d2): MBANS equipment shall implement a spectrum access mechanism as described in the applicable harmonised European standard EN 303 203 or an equivalent spectrum access mechanism. Based on the ECC Report 201 assumptions, the modulation bandwidth for MBANS shall not exceed 3 MHz.

Sub-band c2): Use of all or part of sub-band d may be denied in some European countries that use all or part of these sub-bands for defence/governmental systems. In other countries that use sub-band 873–876 MHz for GSM for railways, extended band (ER-GSM), access to the part 873–876 MHz by non-specific SRD applications require implementing additional mitigation measures such as transmission timing limitations as set out in ECC Report 200.

4.3 Wideband Data Transmission systems

Scope: This covers frequency bands and regulatory as well as informative parameters recommended for Wideband Data Transmission Systems and Wireless Access Systems including Radio Local Area Networks (WAS/RLANs) within the bands 2400–2483.5 MHz and for Multiple-Gigabit WAS/RLAN Systems within the band 57–66 GHz.

Modulation/ maximum occupied bandwidth and ECC/ERC deliverables: Not specified

Table 15: Regulatory parameters related to Wideband Data Transmission systems

Frequency Band		**Power**	**Spectrum access and mitigation requirements**	**Notes**
A	2400.0–2483.5 MHz	100 mW e.i.r.p.	Adequate spectrum sharing mechanism (e.g. Listen-before-Talk, Detect-And-Avoid) shall be implemented by the equipment	For wide band modulations other than FHSS, the maximum e.i.r.p. density is limited to 10 mW/MHz
B	57–66 GHz	40 dBm mean e.i.r.p. This refers to the highest power level of the transmitter power control range during the transmission burst if transmitter power control is implemented	Adequate spectrum sharing mechanism (e.g. Listen-before-Talk, Detect-And-Avoid) shall be implemented by the equipment.	Fixed outdoor installations are not allowed. The maximum mean e.i.r.p density is limited to 13 dBm/MHz. Point-to-point links of the Fixed Service are regulated by ECC/REC/(05)02 and ECC/REC/(09)01

Harmonised Standards: EN 300 328 sub-band a) and EN 302 567sub-band b).

4.4 Railway applications

Scope: This covers frequency bands and regulatory as well as informative parameters recommended for applications specifically intended for use in a railway environment if necessary.

Table 16: Regulatory parameters related to Railway applications

Frequency Band		Power	Spectrum access and mitigation requirement	Channel spacing	Notes
A	27.090 – 27.100 MHz	42 dBµA/m at 10 m	No requirement	No spacing	Tele-powering and Down-link signal for Balise / Eurobalise. May also be optionally used for the activation of the Loop / Euroloop. Note: Center frequency is 27.095 MHz
B	984 – 7484 kHz	9 dBµA/m at 10m	<1% duty cycle	No spacing	Transmitting only on receipt of a Balise / Eurobalise tele-powering signal from a train. Note: Center frequency is 4234 kHz
C	7.3 – 23.0 MHz	-7 dBµA/m at 10m	No requirement	No spacing	Maximum field strength specified in a bandwidth of 10 kHz, spatially averaged over any 200m length of the loop. Transmitting only in presence of trains. Spread Spectrum Signal, Code Length: 472 Chips. Note: Center frequency is 13.547 MHz
D	76–77 GHz	55 dBm peak e.i.r.p.	No requirement	No spacing	Obstruction/Vehicle detection via radar Sensor at railway level crossings 50 dBm average power or 23.5 dBm average power for pulse radar.

Harmonised Standards:

EN 302 608sub-bands a) and b); EN 302 609sub-band c); EN 301 091sub-band d) (under revision)

4.5 Transport and Traffic Telematics (TTT)

Scope: This covers frequency bands and regulatory as well as informative parameters recommended for radio systems used in the field of transport and traffic telematics (road, rail and water depending on the relevant technical restrictions), traffic management, and navigation and mobility management. Typical applications are used for interfaces between different modes of transport, communication between vehicles (e.g. car-to-car), between vehicles and fixed locations (e.g. car-to-infrastructure), communication from and to users as well as radar system installations. Automotive radar is defined as a moving radar device supporting functions of the vehicle. Entry f2) is limited to obstacle detection radars for rotorcraft use.

Table 17: Regulatory parameters related to Transport and Traffic Telematics

Frequency Band		Power / Magnetic Field	Spectrum access and mitigation requirements	ECC/ERC deliverable	Notes
b1	5795–5805 MHz	2 We.i.r.p. / 8 W e.i.r.p.	No requirement		Individual license may be required for the higher power of 8 W systems
b2	5805–5815 MHz	2 We.i.r.p. / 8 W e.i.r.p.	No requirement		Individual license may be required
c1	21.65–26.65 GHz	*	*	ECC/DEC/(04)10	For automotive Short Range Radars (SRR). * See detailed requirements in related ECC Decision. New SRR equipment shall not be placed onto the market as of 1 July 2013
c2	24.25 –26.65 GHz	*	*	ECC/DEC/(04)10	For automotive Short Range Radars (SRR). See detailed requirements in related ECC Decision. SRR equipment may only be placed onto the market until 1 January 2018. This date is extended by 4 years for SRR equipment mounted on motor vehicles for which vehicle conformity compliance has been granted before 1 January 2018
d1	24.050–24.075	100 mW e.i.r.p.	No requirement		For automotive radars

Frequency Band		Power / Magnetic Field	Spectrum access and mitigation requirements	ECC/ERC deliverable	Notes
	GHz				
d2	24.075–24.150 GHz	0.1 mW e.i.r.p.	No requirement		For automotive radars
d3	24.075–24.150 GHz	100 mW e.i.r.p.	≤ 4μs/40 kHz dwell time every 3ms		For automotive radars (road vehicles only). The spectrum access and mitigation requirement is given for devices mounted behind a bumper. If mounted without a bumper, the requirement should be 3μs/40kHz maximum dwell time every 3ms.A requirement for minimum frequency modulation range (applicable to FMCW or step frequency signals) or minimum instantaneous bandwidth (applicable to pulsed signal) of 250 kHz applies in addition to the requirement on maximum dwell time
d4	24.075–24.150 GHz	100 mW e.i.r.p.	≤ 1ms/40 kHz dwell time every 40ms		For automotive radars (road vehicles only). The spectrum access and mitigation requirement is given for devices mounted either behind a bumper or mounted without a bumper. A requirement for minimum frequency modulation range (applicable to FMCW or step frequency signals) or minimum instantaneous bandwidth (applicable to pulsed signal) of 250 kHz applies in addition to the

Frequency Band		Power / Magnetic Field	Spectrum access and mitigation requirements	ECC/ERC deliverable	Notes
					requirement on maximum dwell time
d5	24.150–24.250 GHz	100 mW e.i.r.p.	No requirement		For automotive radars (road vehicles only)
e1	24.250–24.495 GHz	-11 dBm e.i.r.p.	≤0.25%/s/25 MHz duty cycle		For automotive radars. The activity of the Wideband Low Activity Mode (WLAM) is limited to avoid the risk of interference and this mode is only activated in specific configurations as a complementary to designation d1 to d5 as described in ECC Report 164
e2	24.250–24.500 GHz	+20 dBm e.i.r.p. / +16 dBm e.i.r.p.	≤ 5.6%/s/25 MHz duty cycle /≤ 2.3%/s/25 MHz duty cycle		
e3	24.495–24.500 GHz	-8 dBm e.i.r.p.	≤ 1.5%/s/5 MHz duty cycle		
f1	76–77 GHz	55 dBm peak e.i.r.p.	(note 1)	ECC Report 262	50 dBm average power or 23.5 dBm average power for pulse radar only. For ground based vehicle and infrastructure systems only.
f2	76–77 GHz	*	*	ECC/DEC/(16)01	For obstacle detection radars for rotorcraft use. Use is not possible in specific areas of some European countries due to exclusion zones implementation around RAS observatories.* See

Frequency Band		Power / Magnetic Field	Spectrum access and mitigation requirements	ECC/ERC deliverable	Notes
					detailed requirements in related ECC Decision
G	77–81 GHz	*	*	ECC/DEC/(04)03	For automotive Short Range Radars (SRR). * See detailed requirements in related ECC Decision

Note 1: Fixed transportation infrastructure radars have to be of a scanning nature in order to guarantee a maximum dwell time and a minimum silent time to support the coexistence with automotive radar systems.

Harmonised Standards: EN 300 674 sub-bands b1), b2); EN 301 091 sub-band f); EN 302 288 sub-bands c1), c2); EN 302 264 sub-band g); EN 302 858 sub-bands d1) to d5) and e1) to e3); EN 303 360 sub-band f2)

Frequency issues: Sub-bands d1) to d5) as well as c1), c2). Note that the regulation in the bands d1) to d5) for the band 24.05-24.25 GHz for automotive radars is without any plans for a time limit within CEPT (see document ECC (15)058). Only the bands c1), and c2) for Short Range Radar (SRR) are time limited.

4.6 Radiodetermination Applications

This covers frequency bands and regulatory as well as informative parameters recommended for SRD radio determination applications including Equipment for Detecting Movement and Alert. Radio determination is defined as the determination of the position, velocity and/or other characteristics of an object, or the obtaining of information relating to these parameters, by means of the propagation properties of radio waves. Radio determination equipment typically conducts measurements to obtain such characteristics. Any kind of point-to-point or point-to-multipoint radio communications is outside of this definition.

Table 18: Regulatory parameters related to Radio determination Applications

Frequency Band		**Power**	**ECC deliverable**	**Notes**
A	30 MHz–12.4 GHz	*	ECC/DEC/(06)08	For Ground and Wall Probing Radar (GPR/WPR) imaging systems, subject to an appropriate licensing regime. * See detailed requirements in related ECC Decision
B	2200–8000 MHz		ECC/DEC/(07)01	For Material Sensing Devices. * See detailed requirements in related ECC Decision
C	2400.0–2483.5 MHz	25 mW e.i.r.p.	ERC/DEC/(01)08	
D	3.1–4.8 GHz	*	ECC/REC/(11)09	For UWB Location Tracking Systems Type 2 (LT2), subject to an appropriate licensing regime.* See detailed requirements in related ECC Recommendation
E	3.1–4.8 GHz		ECC/REC/(11)10	For UWB Location tracking application for emergency and disaster situations (LAES), subject to an appropriate licensing regime. * See detailed requirements in related ECC Recommendation
f1	4.5–7.0 GHz	-41.3 dBm/MHz e.i.r.p. outside the enclosed test tank structure		For Tank Level Probing Radar (TLPR)
f2	8.5–10.6 GHz			For Tank Level Probing Radar (TLPR). The radiated unwanted emissions within the frequency band 10.6–10.7 GHz outside the test tank enclosure shall be less than

Frequency Band		Power	ECC deliverable	Notes
				-60 dBm/MHz e.i.r.p.
f3	24.05–27.00 GHz			For Tank Level Probing Radar (TLPR)
f4	57–64 GHz			
f5	75–85 GHz			
g1	6.0–8.5 GHz	*	ECC/DEC/(11)02	For Industrial Level Probing Radar (LPR). *See detailed requirements in related ECC Decision
g2	24.05–26.5 GHz			
g3	57–64 GHz			
g4	75–85 GHz			
H	9200–9500 MHz	25 mW e.i.r.p.		
I	9500–9975 MHz			
J	10.5–10.6 GHz	500 mWe.i.r.p.		
K	13.4–14.0 GHz	25 mWe.i.r.p.		
L	17.1–17.3 GHz	26 dBm e.i.r.p.		For Ground Based Synthetic Aperture Radar (GBSAR). Specific requirements for the radar antenna pattern and for the implementation of Detect And Avoid (DAA) technique apply as described in EN 300 440
M	24.05–24.25 GHz	100 mWe.i.r.p.		The frequency band 24.0–24.25 GHz is identified with the same emission parameters in Annex 1 band m

For all these applications: Spectrum access and mitigation requirements: No requirement. Modulation/ maximum occupied bandwidth: Not specified.

Harmonised Standards: EN 300 440 sub-bands c), h), i), j), k), l), m); EN 302 372 sub-bands f1), f2), f3), f4), f5); EN 302 729 sub-bands g1), g2), g3), g4);EN 302 066 sub-band a); EN 302 435 sub-band b); EN 302 065 sub-bands d), e)

4.7 Alarms (non-available in Bhutan)

Scope: This covers frequency bands and regulatory as well as informative parameters recommended exclusively for alarm systems including social alarms and alarms for security and safety.

In Bhutan, the frequency band 824–844 MHz paired with 869–889 MHz has been marked for cellular telecommunication systems. As the European Alarms operate are at 868.600–868.700; 869.200–869.250; 869.250–869.300; 869.300–869.400; 869.650–869.700 MHz, the Table is blank.

Table 19: Regulatory parameters related to Alarms

Frequency Band		**Power /**	**Spectrum access and mitigation requirements**
A	868.600–868.700 MHz	10 mW e.r.p.	≤ 1.0 % duty cycle

Note: Strikes refer to European equipment not allowed in Bhutan.

4.8 Model Control

Scope: This covers frequency bands and regulatory as well as informative parameters recommended for the application of model control equipment, which is solely for the purpose of controlling the movement of the model, in the air, on land or over or under the water surface. It should be noted that the bands are not exclusive for this type of application.

Table 20: Regulatory parameters related to Model Control

Frequency Band		**ERC deliverable**	**Notes**
a1	26.990–27.000 MHz		
a2	27.040–27.050 MHz		
a3	27.090–27.100 MHz		
a4	27.140–27.150 MHz		
a5	27.190–27.200 MHz		
B	34.995–35.225 MHz	ERC/DEC/(01)11	Only for flying models
c1	40.660–40.670 MHz	ERC/DEC/(01)12	
c2	40.670–40.680 MHz	ERC/DEC/(01)12	

Frequency Band		ERC deliverable	Notes
c3	40.680–40.690 MHz	ERC/DEC/(01)12	
c4	40.690–40–700 MHz	ERC/DEC/(01)12	

The maximal power equals 100mW e.r.p. The maximum occupied bandwidth is 10 kHz. There are no requirements for the spectrum access and mitigation requirements.

Harmonised Standards: EN 300 220 all sub-bands

4.9 Inductive Applications

Scope: This covers frequency bands and regulatory as well as informative parameters recommended for inductive applications including for example car immobilisers, radio frequency identification (RFID) applications including for example automatic article identification, asset tracking, alarm systems, waste management, personal identification, access control, proximity sensors, anti-theft systems, location systems, data transfer to handheld devices (e.g. NFC) and wireless control systems, animal identification, cable detection, wireless voice links, automatic road tolling and anti-theft systems including RF anti-theft induction systems (e.g. EAS).It should be noted that other types of anti-theft systems can be operated in accordance with other relevant annexes.

Table 21: Regulatory parameters related to Inductive applications

Frequency Band		Magnetic Field	Notes
a1	9 – 90 kHz	72 dBµA/m at 10m	In case of external antennas only loop coil antennas may be employed. Magnetic field strength level descending 3dB/oct at 30 kHz
a2	90–119 kHz	42 dBµA/m at 10m	In case of external antennas only loop coil antennas may be employed
a3	119–135 kHz*	66 dBµA/m at 10m The limit is reduced according to Table 9bis	In case of external antennas only loop coil antennas may be employed. Magnetic field strength level descending 3 dB/oct at 119 kHz
B	135–140 kHz	42 dBµA/m at 10m	In case of external antennas only loop coil antennas may be employed
C	140–148.5 kHz	37.7 dBµA/m at 10m	
D	400 – 600 kHz	-8 dBµA/m at 10 m	For RFID only. In case of external antennas only loop coil antennas may be employed. The maximum magnetic field strength is specified

Frequency Band		Magnetic Field	Notes
			in a BW of 10 kHz. The max. allowed total field strength is -5dBµA/m at 10 m for systems operating at bandwidths larger than 10 kHz measured at the centre frequency whilst keeping the density limit (-8dBµA/m in a BW of 10 kHz.) These systems should operate with a minimum operating BW of 30 kHz
E	3155–3400 kHz	13.5 dBµA/m at 10m	In case of external antennas only loop coil antennas may be employed
F	6765–6795 kHz	42 dBµA/m at 10m	
G	7400–8800 kHz	9 dBµA/m at 10m	
H	10.200–11.000 MHz	9 dBµA/m at 10m	
j**	13.553–13.567 MHz	42 dBµA/m at 10m	
j1**	13.553–13.567 MHz***	60 dBµA/m at 10m	For RFID only
k1	148.5 kHz – 5 MHz	-15 dBµA/m at 10 m	In case of external antennas only loop coil antennas may be employed. The max. magnetic field strength is specified in a BW of 10 kHz. The max. allowed total magnetic field strength is -5 dBµA/m at 10 m for systems operating at bandwidths larger than 10 kHz whilst keeping the density limit (-15 dBµA/m in a bandwidth of 10 kHz)
k2	5 – 30 MHz	-20 dBµA/m at 10 m	In case of external antennas only loop coil antennas may be employed. The max. field strength is specified in a BW of 10 kHz. The max. allowed total field strength is -5 dBµA/m at 10 m for systems operating at bandwidths larger than 10 kHz whilst keeping the density limit (-20 dBµA/m in a bandwidth of 10 kHz)

* See note 1; **See note 2 *** ECC deliverable ECC Report 208

Harmonised Standards: EN 300 330 all sub-bands; EN 302 536 Sub-band k1); EN 300 330 Sub-band k2)

Technical parameters also referred to in the harmonised standard:

Note 1: Sub-band a3): RFIDs operating in the frequency sub-band 119–135 kHz shall meet the spectrum mask given in EN 300 330. This will permit a simultaneous use of the various sub-bands within the range 90–148.5 kHz.
Note 2: Sub-bands j) and j1): Devices operating in the 13.56 MHz band shall meet the transmission mask and antenna requirements for all combined frequency segments (including the limits in the sub-bands k1) and k2)) as described in harmonised standard EN 300 330. This will permit the simultaneous use of the sub-bands j) or j1) together with the limits of the sub-bands k1) and k2).

Frequency issues:
Users should be aware that emissions from inductive applications could cause interference to nearby receivers of other radio services. In case of loop antennas used within bands a1) and a3) integral or dedicated within an area between 0.05 m^2 and 0.16 m^2, the magnetic field strength is reduced by 10 * log (area/0.16 m^2); for an antenna area less than 0.05 m^2 the magnetic field strength is reduced by 10 dB. Particular attention should also be paid to the more stringent protection requirements identified by the ITU for global distress and safety communications frequencies in the same or adjacent bands.

4.10 Radio microphone applications including ALD, wireless audio and multimedia streaming systems

Scope: This covers frequency bands and regulatory as well as informative parameters recommended for radio microphone applications (also referred to as wireless microphones or cordless microphones), Assistive Listening Devices (ALD) (also referred to as aids for the hearing impaired) and wireless audio and multimedia streaming systems. It covers professional and consumer radio microphones, both hand-held and body-worn, in-ear monitoring devices and ALD. Radio microphones are small, low power (typically 50 mW or less) transmitters designed to be worn on the body, or hand held, for the transmission of sound. The receivers are tailored to specific uses and may range from small and portable to rack mounted modules as part of a multichannel system. ALDs are specific radio microphone applications which capture an acoustic signal that is transmitted by radio to the hearing aid receivers. The Annex covers wireless audio and multimedia streaming systems used for audio/video transmissions and audio/video synchronisation signals including cordless loudspeakers; cordless headphones; Band II low power FM transmitters operating in the FM Broadcast band 87,5 MHz to 108 MHz are used for the provision of an RF link between a personal audio device, including mobile phone, and the in-car or home entertainment system etc. Assistive Listening Systems (ALS) are for use by the hearing impaired in public spaces such as airports, railway stations, churches and theatres, where the transmitter is connected to the audio programme or public address system and the receiver is worn by hearing-impaired users, or integrated into users' hearing aids. Frequency band limits for radio microphones should be regarded as tuning ranges within which a device can be designated to operate. In the broadcasting bands 174–216 MHz and 470–862 MHz, national geographical and licensing restrictions are likely to exist and the BICMA should be contacted.
The sub-bands below are intended for the following applications:

- ALDs: sub-bands b), c1), c2), d), g),
- Radio microphones: sub-bands a), e), f1), f2), f3), f4), g), i1), i2), i3), j1), j2), j3),
- Wireless audio and multimedia streaming systems: sub-bands g), and j2),
- Band II low power FM transmitters: sub-band a1),
- ALS: sub-band new).

Table 22: Regulatory parameters related to Radio microphone applications

Frequency Band		**Power**	**Notes**
a*	29.7–47.0 MHz	10 mW e.r.p.	Radio microphones. On a tuning range basis. Frequency bands 30.3–30.5 MHz, 32.15–32.45 MHz and 41.015–47.00 MHz are harmonised military bands. Individual license may be required
a1**	87.5–108.0 MHz	50 nW e.r.p.	Band II low power FM transmitters
b*	169.4–174.0 MHz	10 mW e.r.p.	Assistive Listening Device (ALD). On a tuning range basis
c1*,^	169.400–169.475 MHz	500 mW e.r.p.	Assistive Listening Device (ALD)
c2*,^	169.4875–169.5875MHz	500 mW e.r.p.	Assistive Listening Device (ALD)
d*,^^	173.965–216 MHz	10 mW e.r.p.	See Notes 1 and 2. Assistive Listening Device (ALD). On a tuning range basis. Individual license may be required
E	174–216 MHz	50 mW e.r.p.	Radio microphones. On a tuning range basis. Individual license may be required
f1	470–786 MHz	50 mW e.r.p.	
f2	786–789 MHz	12 mW e.r.p.	Radio microphones. On a tuning range basis. Individual license may be required. See technical conditions for PMSE in Annex 3 of Decision ECC/DEC/(09)03 section 3.1
f3**	823–826 MHz	20 mW e.i.r.p./ 100 mW e.i.r.p.	Radio microphones. Individual license may be required. 100 mW restricted to body worn equipment. See technical conditions for PMSE (including radio microphones) in Annex 3 of Decision ECC/DEC/(09)03 section 3.1
f4**	826–832 MHz	100 mW e.i.r.p.	Radio microphones. Individual license may be required.

Frequency Band		Power	Notes
			See technical conditions for PMSE in Annex 3 of Decision ECC/DEC/(09)03 section 3.1
G	863–865 MHz	10 mW e.r.p.	Radio microphones, wireless audio and multimedia streaming devices.
i1	1350–1400 MHz	20 mW e.i.r.p./ 50 mW e.i.r.p.	Radio microphones. Individual license may be required. 50 mW restricted to body worn equipment or equipment with Spectrum Scanning Procedure (SSP) implemented for the 1350–1400 MHz band
i2	1492–1518 MHz	50 mW e.i.r.p	Radio microphones. On a tuning range basis. Individual license required. Restricted to indoor use
i3	1518–1525 MHz	50 mW e.i.r.p	Radio microphones. On a tuning range basis. Individual license required. Restricted to indoor use
New	1656.5–1660.5 MHz	2 mW/600 kHz e.i.r.p	Assistive Listening Systems. Individual license may be required.
j1	1785–1795 MHz	20 mW e.i.r.p./ 50 mW e.i.r.p.	Radio microphones. Individual license may be required. 50 mW restricted to body worn equipment or equipment with SSP implemented for the 1785–1804.8 MHz band
j2	1795–1800 MHz	20 mW e.i.r.p./ 50 mW e.i.r.p.	Radio microphones, wireless audio and multimedia streaming devices. Individual license may be required.50 mW restricted to body worn equipment or equipment with SSP implemented for the 1785–1804.8 MHz band
j3	1800–1804.8 MHz	20 mW e.i.r.p./ 50 mW e.i.r.p.	Radio microphones. Individual license may be required. 50 mW restricted to body worn equipment or equipment with SSP implemented for the 1785–1804.8 MHz band

* Maximum occupied bandwidth ≤ 50 kHz; ** maximum occupied bandwidth 200 kHz

^ECC ECC/DEC/(05)02; ^^ECC Report 230

Note 1: A threshold of 35 dBµV/m is required to ensure the protection of a DAB receiver located at 1.5m from the ALD device, subject to DAB signal strength measurements taken around the ALD operating site.

Note 2: The ALD device should operate under all circumstances at least 300 kHz away from the channel edge of an occupied DAB channel.

Harmonised Standards: EN 300 422all sub–bands except a1); EN 301 357 sub–bands a1), g) and j2). Systems using ETSI EN 301 357 should be designed so that when not in use there should be no transmission of an RF carrier, where indicated in the frequency issues.

Frequency Issues

Sub–band a1): The user interface of SRD shall permit as a minimum the selection of any and all possible frequencies within the 88.1 MHz to 107.9 MHz and as a maximum 87.6 MHz to 107.9 MHz. When audio signals are not present, apparatus must employ a transmission time out facility. Pilot tones that ensure continuity of transmission are not permitted.

Sub–band d): ECC Report 230 provides information on ALD frequency issues in the frequency band 174–216 MHz including an example for an on–site measurement procedure. It should be noted that ALD applications may need to move in frequency if changes in the use of the broadcast radio service take place.

Sub–bands f1) and f2): ECC/DEC/(15)01 identifies the band 703–733 MHz uplink758–788 MHz downlink for the introduction of mobile/fixed communication networks (MFCN); such as digital dividend 2 already allocated by BICMA. Bhutan may use 694–703733–758 788–790MHz for radio microphones.

Sub–bands f2), f3), f4): Bhutan has not introduced yet digital dividend 1 832–862MHz uplink and 791–821 downlink for mobile/fixed communication networks (MFCN) in accordance with Decision ECC/DEC/(09)03.The band 786–862 MHz can be used by radio microphones.

Sub–band i2): This frequency band is identified for the introduction of mobile/fixed communication networks (MFCN) in the future. National administrations may authorise radio microphones in the band as long as they will not have introduced mobile/fixed communication networks (MFCN).

4.11 Radio Frequency Identification Applications

Scope: This covers frequency bands and regulatory as well as informative parameters recommended for radio frequency identification (RFID) applications including for example automatic article identification, asset tracking, alarm systems, waste management, personal identification, access control, proximity sensors, anti-theft systems, location systems, data transfer to handheld devices and wireless control systems. It should be noted that other types of RFID systems can be operated in accordance with other relevant annexes.

Table 23: Regulatory parameters related to RFID

Frequency Band		Power	Spectrum access and mitigation requirements	Notes
a1*	865.0–865.6 MHz	100 mW e.r.p.	No requirement	(note 3)
a2*	865.6–867.6 MHz	2 W e.r.p.	No requirement	(note 3)
a3*	867.6–868.0 MHz	500 mW e.r.p.	No requirement	(note 3)
a*	865–868 MHz	2 W e.r.p. (note1)	(note 4)	Operation only when necessary to perform the intended operation, i.e. when RFID tags are expected to be present
b**	915–921 MHz	4 W e.r.p. (note 2)	For ER-GSM protection (918–921 MHz, where applicable), DAA is required	The frequency band is also identified in Annexes 1 and 10. Operation only when necessary to perform the intended operation, i.e. when RFID tags are expected to be present
c1	2446–2454 MHz	≤ 500 mW e.i.r.p.	No requirement	
c2	2446–2454 MHz	> 500 mW to 4 W e.i.r.p	≤ 15% duty cycle FHSS techniques should be used	Power levels above 500 mW are restricted to be used inside the boundaries of a building and the duty cycle of all transmissions shall in this case be ≤15 % in any 200 ms period (30 ms on /170 ms off)

* Maximum occupied bandwidth BW 200 kHz;

** Maximum occupied bandwidth BW 400 kHz

Note 2: Interrogator transmissions in band b at 4 W e.r.p, are only permitted within the four channels centred at 916.3 MHz, 917.5 MHz, 918.7 MHz and 919.9 MHz; each with a maximum bandwidth of 400 kHz.

Note 3: RFID interrogator devices placed on the market before the repeal date of EC Decision 2006/804/EC are 'grandfathered', i.e. they are continuously permitted to be used in

line with the provisions set out in EC Decision 2006/804/EC (see sub-bands a1), a2), and a3)) before the repeal date.
Note 4: The maximum period of continuous interrogator transmission on a channel shall not exceed 4s and the period between consecutive transmissions of an interrogator on the same channel shall be at least 100ms in order to ensure most efficient use of available channels for the general benefit of all users.

Harmonised Standards: EN 300 440Sub-bands c1) and c2); EN 302 208Sub-bands a), a1), a2), a3) and b)

Technical parameters also referred to in the harmonised standard:

Sub-band c2):In addition, antenna beamwidth limits shall be observed as described in the standard EN 300 440.

In addition, for an RFID device which can exceed 500 mW, the device should be fitted with an automatic power control to reduce the radiated power below 500 mW; this automatic power control shall guarantee the reduction of the power to a maximum of 500 mW in cases where the device is moved and used outside the boundary of the user's building or premises as described above.

Frequency issues:
Sub-band b): Use of all or part of sub-band b) may be denied in some European countries that use all or part of these sub-bands for defence/governmental systems. In other countries that use sub-band 918–921 MHz for GSM for railways, extended band (ER-GSM), access to the part 918–921 MHz by UHF RFID applications requires implementation of additional mitigation measures such as Detect-And-Avoid (DAA) as set out in ECC Report 200.

Sub-band c2): To assist enforcement authorities any emissions from an RFID device when measured outside of the building at a distance of 10 metres shall not exceed the field strength from a 500 mW RFID device mounted outside the building when measured at the same distance. Where a building consists of a number of premises, such as shops within a shopping arcade or Mall then the measurements shall be referenced to the boundary of the user's premises within the building.

4.12 Active Medical Implants and their associated peripherals

Scope: This annex covers frequency bands and regulatory as well as informative parameters recommended for Active Medical Implants and their associated peripherals.

Table 24: Regulatory parameters related to Medical Implants

Frequency Band		**Power / Magnetic Field**	**Spectrum access and mitigation requirements**	**Notes**
A	9–315 kHz	30 dBµA/m at	≤ 10% duty cycle	The application is for Ultra Low Power Active Medical Implant

Frequency Band		Power / Magnetic Field	Spectrum access and mitigation requirements	Notes
		10m		systems using inductive loop techniques for telemetry purposes
D	30.0–37.5 MHz	1 mW e.r.p.	≤ 10% duty cycle	The application is for Ultra Low Power medical membrane implants for blood pressure measurements
e*	2483.5–2500 MHz	10 dBm e.i.r.p.	LBT+AFA and≤ 10% duty cycle. The equipment shall implement a spectrum access mechanism as described in the applicable harmonised standard or an equivalent spectrum access mechanism	For Low Power Active Medical Implants and associated peripherals, covered by the applicable harmonised standard. Individual transmitters may combine adjacent channels on a dynamic basis for increased bandwidth higher than 1 MHz. Peripheral units are for indoor use only.

* Maximum occupied bandwidth1 MHz

Harmonised Standards: EN 302 195 Sub-band a); EN 302 510Sub-band d); EN 301 559Sub-band e)

4.13 Applications operating under General Authorization Regime

Scope: This covers information about terrestrial applications which are not included in Annexes 1 to 12 and for which frequency ranges are designated in ERC/ECC Decision. The regulatory status of these radio applications, which may be different to the regulatory status of SRDs, are defined by the relevant ERC/ECC Decisions.

Table 25: Regulatory parameters related to General Authorisation Regime

Frequency Band		ECC/ERC deliverable	Notes
A	26.960– 27.410 MHz	ECC Decision(11)03	For Citizens' Band (CB) radio equipment * See detailed requirements in the related ECC Decision
B	401–406 MHz	ERC Decision	For Ultra Low Power Active Medical Implant

Frequency Band		ECC/ERC deliverable	Notes
		(01)17	(ULP-AMI) communication systems * See detailed requirements in the related ERC Decision
C	446.0–446.2 MHz	ECC Decision (15)05	For analogue and digital PMR 446 applications * See detailed requirements in the related ECC Decision
D	1880–1900 MHz	ERC Decision (94)03 ERC Decision (98)22	For DECT (Digital European Cordless Telecommunications) systems * See detailed requirements in the related ERC Decisions
e1	5150–5350 MHz	ECC Decision (04)08	For Wireless Access Systems including Radio Local Area Networks (WAS/RLANs) * See detailed requirements in the related ECC Decision
e2	5470–5725 MHz	ECC Decision (04)08	For Wireless Access Systems including Radio Local Area Networks (WAS/RLANs) * See detailed requirements in the related ECC Decision
F	5875–5905 MHz	ECC Decision (08)01	For Intelligent Transportation Systems (traffic safety applications) * See detailed requirements in the related ECC Decision
G	63–64 GHz	ECC Decision (09)01	For Intelligent Transportation Systems * See detailed requirements in the related ECC Decision
H	77–81 GHz	ECC Decision (04)03	For Automotive Short-Range Radars * See detailed requirements in the related ECC Decision

Harmonised Standards:
EN 300 433 Sub-band a); EN 301 839 and EN 302 537Sub-band b); EN 303 405Sub-band c); EN 301 406Sub-band d); EN 301 893Sub-bands e1) and e2); EN 302 571Sub-band f); EN 302 686Sub-band g); EN 302 264Sub-band h)

5. Different Types of Apparatus Licenses

(a) The Authority may issue an apparatus license from six kinds – 18 categories – specified in Table **26** in this schedule.

(b) Any application shall be issued as an Apparatus license only in accordance with the section 4.3 of these Radio Rules, in particular if it is not issued as Spectrum license.

Table 26 – Apparatus license kinds

1	**2**	**3**
Item	**Type of apparatus license**	**Category**
1	Aeronautical	Aeronautical Radio Navigation (Aircraft/Ground Station). Aeronautical Mobile (Aircraft/Ground Station)
2	Earth	Fixed earth station in any space service Mobile earth station in any space service
3	Fixed	Long range point to point (below 30 MHz) Point-to-point Point-to-multipoint Wireless local loop Outside Broadcasting (TV) Outside Broadcasting (Sound).
4	Land mobile	Long range land mobile (below 30 MHz) Land mobile (above 30 MHz) Public land mobile radio Paging
5	Radiodetermination	Radar
6	Others	Other necessary services