

INFO-COMMUNICATIONS AUTHORITY'S SPECTRUM  
PLAN  
FOR THE ISLAND OF MONTSERRAT

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FOR:

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Date:

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# DRAFT INFO-COMMUNICATIONS AUTHORITY'S SPECTRUM PLAN FOR THE ISLAND OF MONTSERRAT

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## 1. Introduction

1.1. This Spectrum Plan has been developed by the Info-communications Authority pursuant to section 36 of the Info-Communications Act (hereinafter referred to as “the Act”). It provides for efficient usage of the spectrum resources of Montserrat to the extent that the number of frequencies and spectrum used should correspond to what is absolutely essential to provide, in a satisfactory manner, a particular service. The Info-communications Authority, at material times, requires spectrum users to apply the latest technology and standards as soon as possible in the provision of services. This is consistent with Article No. 195 of the Constitution of the International Telecommunication Union (Geneva, 1992), the world’s governing body for coordination international spectrum allocation and use.

1.2. In using frequency bands for provision of wireless services, licensees shall bear in mind that radio frequencies and the geostationary-satellite orbit are limited natural resources and that they must be used rationally, efficiently and economically taking into account the development needs of Montserrat and its geographical situation, particularly in respect to neighbouring islands. Pursuant to section 71 of the Act all stations, whatever their purpose, are required to be established and operated in such a manner as not to cause harmful interference to the radio services or communications of other countries. This mandates licensees and other duly authorized agencies or persons to operate their equipment in Montserrat in accordance with the provisions of this Spectrum Plan.

## 2. Frequency and Wavelength Bands

2.1. The ITU has subdivided radio spectrum into frequency bands designated by progressive whole numbers as indicated at Table I. Frequency bands are defined in units of hertz (Hz), as follows:

- i. kilohertz (kHz), up to and including 3 000 kHz;
- ii. megahertz (MHz), above 3 MHz, up to and including 3 000 MHz;
- iii. gigahertz (GHz), above 3 GHz, up to and including 3000 GHz.

**Table I**  
**ITU Global Frequency Bands**

Band	Frequency Range	Waves
VLF	3 to 30 kHz	Myriametric waves
LF	30 to 300 kHz	Kilometric waves
MF	300 to 3 000 kHz	Hectometric waves
HF	3 to 30 MHz	Decametric waves
VHF	30 to 300 MHz	Metric waves
UHF	300 to 3 000 MHz	Decimetric waves
SHF	3 to 30 GHz	Centimetric waves
EHF	30 to 300 GHz	Millimetric waves
	300 to 3 000 GHz	Decimillimetric waves

NOTE : Prefix: k = kilo, M = mega, G = giga.

2.2. In the Radio Regulations, the Radio-communication Bureau of the ITU (the world body for management of spectrum) designates the following units:

- i. kHz for frequencies up to 28 000 kHz inclusive;
- ii. MHz for frequencies above 28 000 kHz up to 10 500 MHz inclusive; and
- iii. GHz for frequencies above 10 500 MHz.

2.3. In administering this Plan assignments of frequencies to stations will be done in accordance with the Tables of Frequency Allocations detailed hereinafter. Frequency assignment, shall not cause harmful interference to, and shall not claim protection from harmful interference caused by, a station operating in accordance with the Tables of Frequency Allocations. The frequency assigned to a station of a given service shall be separated from the limits of the band allocated to this service in such a way that, taking account of the frequency band assigned to a station, no harmful interference is caused to services to which frequency bands immediately adjoining are allocated.

2.4. Frequency may be assigned in a band allocated to the fixed service or allocated to the fixed-satellite service to a station authorized to transmit, unilaterally, from one specified fixed point to one or more specified fixed points provided that such transmissions are not intended to be received directly by the general public. Within this Plan a mobile station using an emission which satisfies the frequency tolerance applicable to the coast station with

which it is communicating may transmit on the same frequency as the coast station on condition that the latter requests such transmission and that no harmful interference is caused to other stations.

2.5. Aircraft stations are authorized to use frequencies in the bands allocated to the maritime mobile service for the purpose of communicating with stations of that service. Aircraft earth stations are authorized to use frequencies in the bands allocated to the maritime mobile-satellite service for the purpose of communicating, via the stations of that service, with the public telegraph and telephone networks. In exceptional cases, land mobile earth stations in the land mobile-satellite service may communicate with stations in the maritime mobile-satellite and aeronautical mobile-satellite services. This Plan shall not provide for any emission capable of causing harmful interference to distress, alarm, urgency or safety communications on the international distress and emergency frequencies established for these purposes by the ITU Radio Regulations.

### **3. Regions and Areas**

3.1. ITU frequency allocation has divided the World into Region 1, Region 2 and Region 3 as shown on the following map. Region 1 comprises the area delimited on the east by lines A, B and C on the map and on the west by line B, excluding any of the territory of the Islamic Republic of Iran which lies between these limits. It also includes the whole of the territory of Armenia, Azerbaijan, the Russian Federation, Georgia, Kazakhstan, Mongolia, Uzbekistan, Kyrgyzstan, Tajikistan, Turkmenistan, Turkey and Ukraine as well as the area to the north of Russian Federation which lies between lines A and C.

3.2. Region 2 includes the area limited on the east by line B and on the west by line C. Montserrat is in Region 2.

3.3. Region 3 includes the area limited on the east by line C and on the west by line A, except any of the territory of Armenia, Azerbaijan and the Russian Federation.



3.4. Region 3 also comprises Georgia, Kazakhstan, Mongolia, Uzbekistan, Kyrgyzstan, Tajikistan, Turkmenistan, Turkey and Ukraine and the area to the north of Russian Federation. It also includes that part of the territory of the Islamic Republic of Iran lying outside of those limits.

3.5. Line A extends from the North Pole along meridian 40° East of Greenwich to parallel 40° North; thence by great circle arc to the intersection of meridian 60° East and the Tropic of Cancer; thence along the meridian 60° East to the South Pole. Line B: Line B extends from the North Pole along meridian 10° West of Greenwich to its intersection with parallel 72° North; thence by great circle arc to the intersection of meridian 50° West and parallel 40° North; thence by great circle arc to the intersection of meridian 20° West and parallel 10° South; thence along meridian 20° West to the South Pole. Line C extends from the North Pole by great circle arc to the intersection of parallel 65° 30' North with the international boundary in Bering Strait; thence by great circle arc to the intersection of meridian 165° East of Greenwich and parallel 50° North; thence by great circle arc to the intersection of meridian 170° West and parallel 10° North; thence along parallel 10° North to its intersection with meridian 120° West; thence along meridian 120° West to the South Pole. The “Tropical Zone” comprises the whole Region 2 area which extends from the Tropic of Cancer to the Tropic of Capricorn.

## **4. Service Allocation By Category**

4.1. Primary services are those denoted in capitals (e.g. FIXED). Secondary services are denoted in normal characters (e.g. Mobile). Stations of a secondary service shall not cause harmful interference to stations of primary services to which frequencies are already assigned or to which frequencies may be assigned at a later date. Invariably, stations of a secondary service would not be able to claim protection from harmful interference from stations of a primary service to which frequencies are already assigned or may be assigned at a later date. The stations however, are entitled to claim protection from harmful interference from stations of the same or other secondary service(s) to which frequencies may be assigned at a later date.

4.2. Where this Plan permits, a service or stations in a service to operate in a specific frequency band, subject to not causing harmful interference to another service or to another station in the same service, it means also that the service which is subject to not causing harmful interference cannot claim protection from harmful interference caused by the other service or other station in the same service.

4.3. Except otherwise specified in this Plan, the term “fixed service” does not include systems using ionospheric scatter propagation.

## 5. Frequency Allocation Tables

**Table 1**  
**Spectrum Allocation in the (9-110 kHz) Band**

Allocation to Services	Allocation to Services
Below 9 kHz) (Not allocated)	(9-14) RADIONAVIGATION
(14-19.95) FIXED, MARITIME MOBILE	(19.95-20.05) STANDARD FREQUENCY AND TIME SIGNAL (20 kHz)
(20.05-70) FIXED, MARITIME MOBILE	(70-72) RADIONAVIGATION
(70-90) FIXED, MARITIME MOBILE MARITIME RADIONAVIGATION Radiolocation	(72-84) FIXED, MARITIME MOBILE RADIONAVIGATION
(84-86) RADIONAVIGATION Fixed, Maritime mobile	(86-90) FIXED, MARITIME MOBILE, RADIONAVIGATION
(90-110) RADIONAVIGATION, Fixed	

5.1. The Authority may assign frequencies below 9 kHz on the assurance that no harmful interference would be caused to the services to which the bands above 9 kHz are allocated. Where frequencies below 9 kHz are assigned for the purpose of conducting scientific research the Authority shall seek cooperation with neighbouring islands to ensure that such research is afforded all practicable protection from harmful interference.

5.2. It is a Region 2 requirement that operation of stations in the maritime radio-navigation service (bands 70-90 kHz) shall be subject to agreement obtained with countries' administrations whose services, operating in accordance with the Region 2 allocation, may be affected. However, any such agreement precludes stations of the fixed, maritime mobile and radiolocation services from causing harmful interference to stations in the maritime radio-navigation service. All operation of stations in the radio-navigation service in the band 90-110 kHz are required to coordinate technical and operating characteristics in such a way as to avoid harmful interference to the services provided by these stations.

**Table 2**  
**Spectrum Allocation in the (110-255 kHz) Band**

<b>Allocation to Services</b>	<b>Allocation to Services</b>
(110-112) FIXED, MARITIME MOBILE, RADIONAVIGATION	(112-115) RADIONAVIGATION
(115-117.6) RADIONAVIGATION Fixed, Maritime mobile	(117.6-126) FIXED, MARITIME MOBILE, RADIONAVIGATION
(126-129) RADIONAVIGATION, Fixed, Maritime mobile	(129-130) FIXED, MARITIME MOBILE, RADIONAVIGATION
(130-135.7) FIXED, MARITIME MOBILE	(135.7-137.8) FIXED, MARITIME MOBILE, RADIONAVIGATION Amateur
(137.8-160) FIXED, MARITIME MOBILE, RADIONAVIGATION	(160-190) FIXED, Aeronautical radio-navigation
(190-200) AERONAUTICAL RADIONAVIGATION	

5.3. Stations in the amateur service using frequencies in the band 135.7-137.8 kHz shall not exceed a maximum radiated power of 1 W (e.i.r.p.).

**Table 3**  
**Spectrum Allocation in the (200-495 kHz) Band**

Allocation to Services	Allocation to Services
(200-275) AERONAUTICAL RADIONAVIGATION, Aeronautical mobile	(275-285) AERONAUTICAL RADIONAVIGATION, Aeronautical mobile, Maritime radio-navigation (radio-beacons),
(283.5-315) AERONAUTICAL RADIONAVIGATION, MARITIME RADIONAVIGATION (radio-beacons)	(285-315) AERONAUTICAL RADIONAVIGATION, MARITIME RADIONAVIGATION (radio- beacons)
(315-325) AERONAUTICAL MARITIME, AERONAUTICAL RADIONAVIGATION, Maritime radio-navigation radio- beacons), MARITIME (radio-beacons) Aeronautical radio-navigation RADIONAVIGATION (radio-beacons)	(325-335) AERONAUTICAL RADIONAVIGATION, Aeronautical mobile, Maritime radio-navigation (radio-beacons)
(335-405) AERONAUTICAL RADIONAVIGATION, Aeronautical mobile	(405-415) RADIONAVIGATION, Aeronautical mobile
(415-435) MARITIME MOBILE, AERONAUTICAL RADIONAVIGATION	(435-495) MARITIME MOBILE, Aeronautical radio-navigation

5.4. Use of the band 435-495 kHz by the aeronautical radio-navigation service shall be limited to non-directional beacons not employing voice transmission. In the maritime mobile service, the frequency 490 kHz is to be used exclusively for the transmission by coast stations of navigational and meteorological warnings and urgent information to ships, by means of narrowband direct-printing telegraphy.

**Table 4**  
**Spectrum Allocation in the (495-1 800 kHz) Band**

<b>Allocation to Services</b>	<b>Allocation to Services</b>
(495-505) MOBILE	(505-510) MARITIME MOBILE
(510-525) MOBILE, AERONAUTICAL RADIONAVIGATION	(525-535) BROADCASTING AERONAUTICAL RADIONAVIGATION
(535-1 605) BROADCASTING	(1 605-1 625) BROADCASTING
(1 605-1 625) BROADCASTING	(1 625-1 635) RADIOLOCATION
(1 635-1 800) FIXED, MARITIME MOBILE, LAND MOBILE	

5.5. Where the Authority permits the use of frequencies in the band 505-510 kHz by services other than the maritime mobile service, the ITU requirement i.e. to ensure that no harmful interference is caused to the maritime mobile service in this band or to the services having allocations in the adjacent bands pursuant to specific conditions of use of the frequencies 490 kHz and 518 kHz prescribed in Articles 31 and 52. (WRC-07) shall be adhered.

5.6. In the band 525-535 kHz the carrier power of broadcasting stations shall not exceed 1 kW during the day and 250 W at night.

**Table 5**  
**Spectrum Allocation in the (1 800-2 194 kHz) Band**

<b>Allocation to Services</b>	<b>Allocation to Services</b>
(1 800-1 810) RADIOLOCATION	(1 810-1 850) AMATEUR
(1 850-2 000) FIXED, AMATEUR, MOBILE except aeronautical MOBILE, except aeronautical Mobile, RADIOLOCATION, RADIONAVIGATION	(2 000-2 025) FIXED, MOBILE except aeronautical mobile (R)
(2 000-2 065) FIXED, MOBILE	(2 065-2 107) MARITIME MOBILE
(2 107-2 170) FIXED, MOBILE	(2 107-2 170) FIXED, MOBILE
(2 170-2 173.5) MARITIME MOBILE	(2 170-2 173.5) MARITIME MOBILE
(2 173.5-2 190.5) MOBILE (distress and calling)	(2 190.5-2 194) MARITIME MOBILE
(2 190.5-2 194) MARITIME MOBILE	

5.7. Coast stations and ship stations using radiotelephony in the band 2 065-2 107 kHz shall be limited to class J3E emissions and to a peak envelope power not exceeding 1 kW. Preferably, the following carrier frequencies should be used: 2 065.0 kHz, 2 079.0 kHz, 2 082.5 kHz, 2 086.0 kHz, 2 093.0 kHz, 2 096.5 kHz, 2 100.0 kHz and 2 103.5 kHz. Provided no harmful interference is caused to the maritime mobile service, all frequencies between

2 065 kHz and 2 107 kHz may be used by stations of the fixed service communicating only within national borders and whose mean power does not exceed 50 W. The carrier frequency 2 182 kHz is an international distress and calling frequency for radiotelephony. The conditions for the use of the band 2 173.5-2 190.5 kHz shall conform to the relevant ITU prescription.

5.8. The frequency 2 187.5 kHz is among the international distress frequencies for digital selective calling. The conditions for the use of this frequency shall be that as prescribed by the ITU. This frequency is among the international distress frequencies for narrow-band direct-printing telegraphy. The conditions for its use shall be the same as that prescribed by the ITU. The carrier frequency 2 182 kHz may also be used, in accordance with the procedures in force for terrestrial radio-communication services, for search and rescue operations concerning manned space vehicles in accordance with the conditions prescribed by the ITU.

**Table 6**  
**Spectrum Allocation in the (2 194-3 230 kHz) Band**

(2 194-2 300) FIXED, MOBILE except aeronautical MOBILE, mobile (R)	(2 300-2 495) FIXED, MOBILE, BROADCASTING
(2 495-2 501) STANDARD FREQUENCY AND TIME SIGNAL (2 500 kHz)	(2 501-2 502) STANDARD FREQUENCY AND TIME SIGNAL Space Research
(2 502-2 625) FIXED, MOBILE except aeronautical mobile (R)	(2 625-2 650) MARITIME MOBILE, MARITIME RADIONAVIGATION
(2 650-2 850) FIXED, MOBILE except aeronautical mobile (R)	(2 850-3 025) AERONAUTICAL MOBILE (R)
(3 025-3 155) AERONAUTICAL MOBILE (OR)	(3 155-3 200) FIXED, MOBILE except aeronautical mobile (R)
(3 200-3 230) FIXED, MOBILE except aeronautical mobile (R), BROADCASTING	

5.9. The band 3 155-3 195 kHz will be assigned to provide a common worldwide channel for low power wireless hearing aids.

**Table 7**  
**Spectrum Allocation in the (3 230-5 003 kHz)Band**

Allocation to Services	Allocation to Services
(3 230-3 400) FIXED, MOBILE except aeronautical mobile, BROADCASTING	(3 400-3 500) AERONAUTICAL MOBILE (R)
(3 500-3 750) AMATEUR	(3 750-4 000) AMATEUR ,FIXED, MOBILE except aeronautical mobile (R)
(4 000-4 063) FIXED, MARITIME MOBILE	(4 063-4 438) MARITIME MOBILE
(4 438-4 650) FIXED, MOBILE except aeronautical mobile	(4 650-4 700) AERONAUTICAL MOBILE (R)
(4 700-4 750) AERONAUTICAL MOBILE (OR)	(4 750-4 850) FIXED, MOBILE except aeronautical mobile (R) BROADCASTING, Land mobile
(4 850-4 995) FIXED, LAND MOBILE, BROADCASTING	(4 995-5 003) STANDARD FREQUENCY AND TIME SIGNAL (5 000 kHz)

5.10. The use of the band 4 000-4 063 kHz by the maritime mobile service is limited to ship stations using radiotelephony. Frequencies in the bands 4 063-4 123 kHz and 4 130-4 438 kHz may be used exceptionally by stations in the fixed service, communicating only within the boundary of the Island of Montserrat with a mean power not exceeding 50 W, on condition that harmful interference is not caused to the maritime mobile service.

5.11. The frequency 4 210 kHz is designated among the international frequencies for the transmission of maritime safety information.

**Table 8**  
**Spectrum Allocation in the (5 003-7 450 kHz) Band**

Allocation to Services	Allocation to Services
(5 003-5 005) STANDARD FREQUENCY AND TIME SIGNAL , Space research	(5 005-5 060) FIXED, BROADCASTING
(5 060-5 250) FIXED, Mobile except aeronautical mobile	(5 250-5 450) FIXED, MOBILE except aeronautical mobile
(5 450-5 480) FIXED, AERONAUTICAL MOBILE (OR), LAND MOBILE	(5 480-5 680) AERONAUTICAL MOBILE (R)
(5 680-5 730) FIXED, LAND MOBILE, AERONAUTICAL MOBILE (OR)	(5 730-5 900) FIXED, MOBILE except aeronautical mobile (R)
(5 900-5 950) BROADCASTING	(5 950-6 200) BROADCASTING
(6 200-6 525) MARITIME MOBILE	(6 525-6 685) AERONAUTICAL MOBILE (R)
(6 685-6 765) AERONAUTICAL MOBILE (OR)	(6 765-7 000) FIXED, MOBILE except aeronautical mobile (R)
(7 000-7 100) AMATEUR, AMATEUR-SATELLITE	(7 100-7 200) AMATEUR
(7 200-7 300) BROADCASTING	(7 300-7 400) BROADCASTING, fixed
(7 400-7 450) BROADCASTING	

5.12. Preference shall be given for the use of the band 5 900-5 950 kHz by the broadcasting services using digitally modulated emissions in accordance with ITU specifications i.e. Resolution 517 (Rev.WRC-07). Frequencies in the band 5 900-5 950 kHz may be used by stations communicating only within the Island of Montserrat in respect of fixed service and mobile, except aeronautical mobile (R) service, on condition that harmful interference is not caused to the broadcast service. Where frequencies are assigned for these services the minimum power required should be used.

5.13. The 6 765-7 000 kHz band may be used for industrial, scientific and medical (ISM) applications. The use of this frequency band for ISM applications shall be subject to special

authorization by the Authority in agreement with neighbour administrations whose radio-communication services might be affected.

**Table 9**  
**Spectrum Allocation in the (7 450-13 360 kHz) Band**

<b>Allocation to Services</b>	<b>Allocation to Services</b>
(7 450-8 100) FIXED, MOBILE except aeronautical mobile (R)	(8 100-8 195) FIXED, MARITIME MOBILE
(8 195-8 815) MARITIME MOBILE	(8 815-8 965) AERONAUTICAL MOBILE (R)
(8 965-9 040) AERONAUTICAL MOBILE (OR)	(9 400-9 500) BROADCASTING
(9 500-9 995) BROADCASTING	(9 995-10 003) STANDARD FREQUENCY AND TIME SIGNAL (10 000 kHz)
(10 003-10 005) STANDARD FREQUENCY AND TIME SIGNAL Space research	(10 005-10 100) AERONAUTICAL MOBILE (R)
(10 100-10 150) FIXED, Amateur	(10 150-11 175) FIXED, Mobile except aeronautical mobile (R)
(11 175-11 275) AERONAUTICAL MOBILE (OR)	(11 275-11 400) AERONAUTICAL MOBILE (R)
(11 400-11 600) FIXED	(11 600-11 650) BROADCASTING
(11 650-12 050) BROADCASTING	(12 050-12 100) BROADCASTING
(12 100-12 230) FIXED	(12 230-13 200) MARITIME MOBILE
(13 200-13 260) AERONAUTICAL MOBILE (OR)	(13 260-13 360) AERONAUTICAL MOBILE (R)

5.14. Frequencies in the bands 9 400-9 500 kHz, 11 600-11 650 kHz AND 12 050-12 100 kHz may be assigned to stations in the fixed service on condition that harmful interference is not caused to the broadcast service. Such stations are required to use the minimum power required as prescribed in the Radio Regulations, (WRC-07).

**Table 10**  
**Spectrum Allocation in the (13 360-18 030 kHz) Band**

<b>Allocation to Services</b>	<b>Allocation to Services</b>
(13 360-13 410) FIXED, RADIO ASTRONOMY	(13 410-13 570) FIXED, Mobile except aeronautical mobile (R)
(13 570-13 600) BROADCASTING	(13 600-13 800) BROADCASTING
(13 800-13 870) BROADCASTING	(13 870-14 000) FIXED, Mobile except aeronautical mobile (R)
(14 000-14 250) AMATEUR AMATEUR-SATELLITE	(14 250-14 350) AMATEUR
(14 350-14 990) FIXED, Mobile except aeronautical mobile (R)	(14 990-15 005) STANDARD FREQUENCY AND TIME SIGNAL (15 000 kHz)
(15 005-15 010) STANDARD FREQUENCY AND TIME SIGNAL Space research	(15 010-15 100) AERONAUTICAL MOBILE (OR)
(15 100-15 600) BROADCASTING	(15 600-15 800) BROADCASTING
(15 800-16 360) FIXED	(16 360-17 410) MARITIME MOBILE
(17 410-17 480) FIXED	(17 480-17 550) BROADCASTING
(17 550-17 900) BROADCASTING	(17 900-17 970) AERONAUTICAL MOBILE (R)
(17 970-18 030) AERONAUTICAL MOBILE (OR)	

**Table 11**  
**Spectrum Allocation in the (18 030-23 350 kHz) Band**

<b>Allocation to Service</b>	<b>Allocation to Service</b>
(18 030-18 052) FIXED	(18 052-18 068) FIXED, Space research
(18 068-18 168) AMATEUR, AMATEUR-SATELLITE	(18 168-18 780) FIXED, Mobile except aeronautical mobile
(18 780-18 900) MARITIME MOBILE	(18 900-19 020) BROADCASTING
(19 020-19 680) FIXED	(19 680-19 800) MARITIME MOBILE
(19 800-19 990) FIXED	(19 990-19 995) STANDARD FREQUENCY AND TIME SIGNAL, Space research
(19 995-20 010) STANDARD FREQUENCY AND TIME SIGNAL (20 000 kHz)	(20 010-21 000) FIXED, Mobile
(21 000-21 450) AMATEUR, AMATEUR-SATELLITE	(21 000-21 450) AMATEUR, AMATEUR-SATELLITE
(21 450-21 850) BROADCASTING	(21 850-21 870) FIXED
(21 870-21 924) FIXED	(21 924-22 000) AERONAUTICAL MOBILE (R)
(22 000-22 855) MARITIME MOBILE	(22 855-23 000) FIXED
(23 000-23 200) FIXED, Mobile except aeronautical mobile (R)	(23 200-23 350) FIXED, AERONAUTICAL MOBILE (OR)

5.15. The bands 21 870-21 924 kHz and 23 200-23 350 kHz are reserved for fixed services applicable to aircraft flight safety.

**Table 12**  
**Spectrum Allocation in the (23 350-27 500 kHz) Band**

Allocation to Service	Allocation to Service
(23 350-24 000) FIXED, MOBILE except aeronautical mobile	(24 000-24 890) FIXED, LAND MOBILE
(24 890-24 990) AMATEUR AMATEUR-SATELLITE	(24 990-25 005) STANDARD FREQUENCY AND TIME SIGNAL (25 000 kHz)
(25 005-25 010) STANDARD FREQUENCY AND TIME SIGNAL, Space research	(25 010-25 070) FIXED, MOBILE except aeronautical mobile
(25 070-25 210) MARITIME MOBILE	(25 210-25 550) FIXED MOBILE except aeronautical mobile
(25 550-25 670) RADIO ASTRONOMY	(25 670-26 100) BROADCASTING
(26 100-26 175) MARITIME MOBILE	(26 175-27 500) FIXED, MOBILE except aeronautical mobile

5.16. Use of the band 23 350-24 000 kHz by the maritime mobile service shall be limited to inter-ship Radiotelegraphy.

**Table 13**  
**Spectrum Allocation in the (47-75.2 MHz)Band**

Allocation to Services	Allocation to Services
(47-68) BROADCASTING	( 47-50) FIXED, MOBILE, BROADCASTING
(50-54) AMATEUR	(54-68) BROADCASTING, FIXED, Fixed, MOBILE, Mobile,
(68-72) BROADCASTING, Fixed, Mobile	(72-73) FIXED, MOBILE
(72-73) FIXED, MOBILE	(73-74.6) RADIO ASTRONOMY
(74.6-74.8) FIXED, MOBILE	(74.8-75.2) AERONAUTICAL RADIONAVIGATION

5.17. The frequency 75 MHz is assigned to marker beacons. There will be no assignment of frequencies close to the limits of the guard-band to stations of other services which, because of their power or geographical position might cause harmful interference or otherwise place a constraint on marker beacons. The Authority requires that effort be made to improve further the characteristics of airborne receivers and to limit the power of transmitting stations close to the limits 74.8 MHz and 75.2 MHz.

**Table 14**  
**Spectrum Allocation in the (75.2-137.175 MHz) Band**

<b>Allocation to Services</b>	<b>Allocation to Services</b>
(75.2-75.4) FIXED, MOBILE	(75.4-76) FIXED, MOBILE
(76-88) BROADCASTING, Fixed, Mobile	(76-88) BROADCASTING, Fixed, Mobile
(88-100) BROADCASTING	(88-100) BROADCASTING
(100-108) BROADCASTING	(108-117.975) AERONAUTICAL RADIONAVIGATION
(117.975-137) AERONAUTICAL MOBILE	(137-137.025) SPACE OPERATION (space-to-Earth), METEOROLOGICAL-SATELLITE (space-to-Earth), MOBILE-SATELLITE (space-to-Earth) SPACE RESEARCH (space-to-Earth), Fixed, Mobile except aeronautical mobile (R)
(137.025-137.175) SPACE OPERATION (space-to-Earth), METEOROLOGICAL-SATELLITE (space-to-Earth), SPACE RESEARCH (space-to-Earth), Fixed, Mobile-satellite (space-to-Earth) Mobile except aeronautical mobile (R)	

5.18. Only systems operating in accordance with recognized international aeronautical standards as specified in Resolution 413 (Rev.WRC-07) shall be allowed to operate in the frequency band 108-117.975 MHz which is also allocated on a primary basis to the aeronautical mobile (R) service.

5.19. In the band 117.975-137 MHz, the frequency 121.5 MHz is the aeronautical emergency frequency and, where required, the frequency 123.1 MHz is the aeronautical frequency auxiliary to 121.5 MHz. Mobile stations of the maritime mobile service may communicate on these frequencies without prejudice to the conditions laid down by the ITU for distress and safety purposes in respect of aeronautical mobile service stations.

**Table 15**  
**Spectrum Allocation in the (137.175-148 MHz) Band**

<b>Allocation to Services</b>	<b>Allocation to Services</b>
(137.825-138) SPACE OPERATION (space-to-Earth), METEOROLOGICAL-SATELLITE (space-to-Earth), SPACE RESEARCH (space-to-Earth), Fixed, Mobile-satellite (space-to-Earth), Mobile except aeronautical mobile (R)	(138-143.6) FIXED, MOBILE, AERONAUTICAL MOBILE (OR)
(143.65-144) FIXED, MOBILE, Space research (space-to-Earth)	(144-146) AMATEUR, AMATEUR-SATELLITE
(146-148) FIXED MOBILE except aeronautical mobile (R), AMATEUR, FIXED, MOBILE	

**Table 16**  
**Spectrum Allocation in the (148-223 MHz) Band**

<b>Allocation to Service</b>	<b>Allocation to Service</b>
(148-149.9) FIXED, MOBILE except aeronautical mobile (R), MOBILE-SATELLITE (Earth-to-space)	(149.9-150.05) MOBILE-SATELLITE (Earth-to-space), RADIONAVIGATION-SATELLITE
(150.05-153) FIXED, MOBILE except aeronautical Mobile, RADIO ASTRONOMY	(153-154) FIXED, MOBILE except aeronautical mobile (R), Meteorological Aids
(154-156.4875) FIXED, MOBILE except aeronautical mobile (R)	(156.4875-156.5625) MARITIME MOBILE (distress and calling via DSC)
(156.5625-156.7625) FIXED, MOBILE	(156.7625-156.8375) MARITIME MOBILE (distress and calling
(156.8375-174) FIXED, MOBILE	(174-223) FIXED, MOBILE, BROADCASTING

5.20. The band 148-149.9 MHz is also allocated to the space operation service (Earth-to-space) on a primary basis. The bandwidth of any individual transmission shall not exceed  $\pm$  25 kHz.

5.21. The use of the band 148-149.9 MHz by mobile-satellite service is subject to coordination in accordance with ITU specifications. Mobile-satellite service in this band shall

not constrain the development and use of the fixed, mobile and space operation services in the band 148-149.9 MHz.

5.22. Use of the bands 149.9-150.05 MHz by the mobile-satellite service (Earth-to-space) is limited to the land mobile-satellite service (Earth-to-space) until 1 January 2015, subject to coordination pursuant to ITU specifications. The mobile-satellite service shall not constrain the development and use of the radio-navigation-satellite service in the bands 149.9-150.05 MHz. Emissions of the radio-navigation-satellite service in the bands 149.9-150.05 MHz may also be used by receiving earth stations of the space research service. Where it is established that use of the band 149.9-150.05 MHz by the fixed and mobile services may cause harmful interference to the radio-navigation-satellite service, such use is forbidden.

5.23. The frequency 156.525 MHz is the international distress, safety and calling frequency for the maritime mobile VHF radiotelephone service using digital selective calling (DSC). The conditions for the use of this frequency and the band 156.4875-156.5625 MHz are contained in Articles 31 and 52, and in Appendix 18 of the ITU Radio Regulations. The frequency 156.8 MHz is the international distress, safety and calling frequency for the maritime mobile VHF radiotelephone service. The conditions for the use of this frequency and the band 156.7625-156.8375 MHz are contained in Article 31 and Appendix 18 of same document.

5.24. In the band 156.5625-156.7625 MHz priority shall be given to the maritime mobile service only on frequencies that are assigned to stations to provide maritime mobile service. Any use of frequencies in this band by stations of other services to which they are allocated should be avoided in areas where such use might cause harmful interference to the maritime mobile VHF radio-communication service.

**Table 17**  
**Spectrum Allocation in the (220-335.4 MHz) Band**

Allocation to Services	Allocation to Services
(220-225) AMATEUR, FIXED MOBILE, Radiolocation	(225-235) FIXED, MOBILE
(235-267) FIXED, MOBILE	(267-272) FIXED, MOBILE, Space operation (space-to-Earth)
(272-273) SPACE OPERATION (space-to-Earth), FIXED, MOBILE	(273-312) FIXED, MOBILE
(312-315) FIXED, MOBILE, Mobile-satellite (Earth-to-space)	(315-322) FIXED, MOBILE
(322-328.6) FIXED, MOBILE RADIO ASTRONOMY	328.6-335.4) AERONAUTICAL RADIONAVIGATION

5.25. The band 267-272 MHz may be used for space telemetry on a primary basis, subject to agreement obtained from the ITU. Use of the band 328.6-335.4 MHz by the aeronautical radio-navigation service is limited to Instrument Landing Systems (glide path).

**Table 18**  
**Spectrum Allocation in the (335.4-410 MHz) Band**

<b>Allocation to Service</b>	<b>Allocation to Service</b>
(335.4-387) FIXED, MOBILE	(387-390) FIXED, MOBILE, Mobile-satellite (space-to-Earth)
(390-399.9) FIXED, MOBILE	(399.9-400.05) MOBILE-SATELLITE (Earth-to-space), RADIONAVIGATION-SATELLITE
(400.05-400.15) STANDARD FREQUENCY AND TIME SIGNAL- SATELLITE (400.1 MHz)	(400.15-401) METEOROLOGICAL AIDS, METEOROLOGICAL-SATELLITE (space-to-Earth), MOBILE-SATELLITE (space-to-Earth) SPACE RESEARCH (space-to-Earth) Space operation (space-to-Earth)
(401-402) METEOROLOGICAL AIDS, SPACE OPERATION (space-to-Earth), EARTH EXPLORATION-SATELLITE (Earth-to-space), METEOROLOGICAL-SATELLITE (Earth-to-space), Fixed, Mobile except aeronautical mobile	(402-403) METEOROLOGICAL AIDS, EARTH EXPLORATION-SATELLITE (Earth-to-space), METEOROLOGICAL-SATELLITE (Earth-to-space), Fixed, Mobile except aeronautical mobile
(403-406) METEOROLOGICAL AIDS, Fixed, Mobile except aeronautical mobile	(406-406.1) MOBILE-SATELLITE (Earth-to-space)
(406.1-410) FIXED, MOBILE except aeronautical mobile, RADIO ASTRONOMY	

5.26. Use of the band 399.9-400.05 MHz by the fixed and mobile services may cause harmful interference to the radio-navigation satellite service and therefore shall not be authorized. Emissions shall be confined in a band of  $\pm 25$  kHz about the standard frequency 400.1 MHz.

5.27. The band 400.15-401 MHz is also allocated to the space research service in the space-to-space direction for communications with manned space vehicles. In this application, the space research service will not be regarded as a safety service. Use of the band 400.15-401 MHz by the mobile-satellite service is subject to ITU coordination. The use of the band 406-406.1 MHz by the mobile-satellite service is limited to low power satellite emergency position-indicating radio-beacons. Any emission capable of causing harmful interference to the authorized users of the band 406-406.1 MHz is prohibited.

**Table 19**  
**Spectrum Allocation in the (410-460 MHz) Band**

Allocation to Services	Allocation to Services
(410-420) FIXED, MOBILE except aeronautical mobile, SPACE RESEARCH (space-to-space)	(420-430) FIXED, MOBILE except aeronautical mobile, Radiolocation
(430-432) AMATEUR RADIOLOCATION	(432-438) AMATEUR RADIOLOCATION Earth exploration-satellite (active)
(438-440) AMATEUR, RADIOLOCATION	(440-450) FIXED, MOBILE except aeronautical mobile Radiolocation
(450-455) FIXED, MOBILE	(450-455) FIXED, MOBILE
(455-456) FIXED, MOBILE, MOBILE-SATELLITE (Earth-to-space)	(456-459) FIXED, MOBILE
(459-460) FIXED, MOBILE MOBILE-SATELLITE (Earth-to-space)	

5.28. Use of the band 410-420 MHz by the space research service is limited to communications within 5 km of an orbiting, manned space vehicle. The power flux-density at the surface of the Earth produced by emissions from extra-vehicular activities shall not exceed  $-153 \text{ dB(W/m}^2\text{)}$  for  $0^\circ=d=5^\circ$ ,  $-153 + 0.077 (d - 5) \text{ dB(W/m}^2\text{)}$  for  $5^\circ=d=70^\circ$  and  $-148 \text{ dB(W/m}^2\text{)}$  for  $70^\circ=d=90^\circ$ , where  $d$  is the angle of arrival of the radio-frequency wave and the reference bandwidth is 4 kHz. No. 4.10 does not apply to extra-vehicular activities. In this frequency band, the space research (space-to-space) service shall not claim protection from, nor constrain the use and development of, stations of the fixed and mobile services.

5.29. Use of the band 455-456 MHz, 459-460 MHz by stations in the mobile-satellite service, shall not cause harmful interference to, or claim protection from, stations of the fixed or mobile services operating in accordance with ITU Table of Frequency Allocations.

**Table 20**  
**Spectrum Allocation in the (460-890 MHz) Band**

<b>Allocation to Services</b>	<b>Allocation to Services</b>
(460-470) FIXED, MOBILE, Meteorological-satellite (space-to-Earth)	(470-585) FIXED, MOBILE, BROADCASTING
(585-610) FIXED, MOBILE BROADCASTING, RADIONAVIGATION	(585-610) FIXED, MOBILE BROADCASTING, RADIONAVIGATION
(610-890) FIXED, MOBILE, BROADCASTING	

5.30. The Info-communications Authority may authorize earth exploration-satellite service applications, other than the meteorological-satellite service, in the bands 460-470 MHz for space-to-Earth transmissions subject to not causing harmful interference to stations operating in accordance with the Table.

**Table 21**  
**Spectrum Allocation in the (890-1 300 MHz) Band**

(890-902) FIXED, MOBILE except aeronautical mobile , Radiolocation	(902-928) FIXED, Amateur, Mobile except aeronautical mobile, Radiolocation
(928-942) FIXED, MOBILE except aeronautical mobile , Radiolocation	(942-960) FIXED, MOBILE except aeronautical mobile, BROADCASTING
(960-1 164) AERONAUTICAL RADIONAVIGATION, AERONAUTICAL MOBILE	(1 164-1 215) AERONAUTICAL, RADIONAVIGATION, RADIONAVIGATION-SATELLITE (space-to-Earth) (space-to-space)
(1 215-1 240) EARTH EXPLORATION-SATELLITE (active), RADIOLOCATION, RADIONAVIGATION-SATELLITE (space-to-Earth) (space-to-space) SPACE RESEARCH (active)	(1 240-1 300) EARTH EXPLORATION-SATELLITE (active), RADIOLOCATION, RADIONAVIGATION-SATELLITE (space-to-Earth) (space-to-space), SPACE RESEARCH (active), Amateur

5.31. Use of the band 960-1 215 MHz by the aeronautical radio-navigation service is reserved on a worldwide basis for the operation and development of airborne electronic aids to air navigation and any directly associated ground-based facilities. (WRC-2000). In consequence, stations in the radio-navigation-satellite service in the band 1 164-1 215 MHz shall operate in accordance with the provisions of Resolution 609 (Rev.WRC-07) and shall not claim protection from stations in the aeronautical radio-navigation service in the band 960-1 215 MHz.

5.32. In accordance with No. 5.329A, for systems and networks in the radio-navigation-satellite service (space-to-space) in the band 1 215-1 300 MHz and 1 559-1 610 MHz, the provisions of Nos. 9.7, 9.12, 9.12A and 9.13 shall only apply with respect to other systems and networks in the radio-navigation-satellite service (space-to-space). (WRC-07).

5.33. Use of the radio-navigation-satellite service in the band 1 215-1 300 MHz shall be subject to the condition that no harmful interference is caused to, and no protection is claimed from, the radio-navigation service authorized. Furthermore, the use of the radio-navigation-satellite service in the band 1 215-1 300 MHz shall be subject to the condition that no harmful interference is caused to the radiolocation service and Resolution 608 (WRC-03) shall apply.

5.34. Use of systems in the radio-navigation-satellite service (space-to-space) operating in frequencies in the bands 1 215-1 300 MHz is not intended to provide safety service applications, and shall not impose any additional constraints on radio-navigation-satellite service (space-to-Earth) systems or on other services operating in accordance with the Table of Frequency Allocations.

**Table 22**  
**Spectrum Allocation in the (1 300-1 525 MHz) Band**

<b>Allocation to Services</b>	<b>Allocation to Services</b>
(1 300-1 350) AERONAUTICAL RADIONAVIGATION, RADIOLOCATION, RADIONAVIGATION-SATELLITE (Earth-to-space)	(1 350-1 400) FIXED, MOBILE, RADIOLOCATION
(1 400-1 427) EARTH EXPLORATION-SATELLITE (passive), RADIO ASTRONOMY SPACE RESEARCH (passive)	(1 427-1 429) SPACE OPERATION (Earth-to-space), FIXED MOBILE except aeronautical mobile
(1 429-1 452) FIXED, MOBILE except aeronautical mobile	(1 452-1 492) FIXED MOBILE except aeronautical mobile, BROADCASTING BROADCASTING-SATELLITE
(1 492-1 518) FIXED MOBILE except aeronautical mobile	(1 518-1 525) FIXED, MOBILE except aeronautical mobile, MOBILE-SATELLITE (space-to-Earth)

5.35. Use of the band 1 300-1 350 MHz by aeronautical radio-navigation services is restricted to ground-based radars and to associated airborne transponders which transmit only on frequencies in these bands and only when actuated by radars operating in the same band. Use of this band by earth stations in the radio-navigation-satellite service and by stations in the radiolocation service shall not cause harmful interference to, nor constrain the operation and development of, the aeronautical-radio-navigation service.

5.36. All emissions are prohibited in the following band 1 400-1 427

5.37. Use of the band 1 518-1 525 MHz by the mobile-satellite service is subject to limitations set by the Info-communications Authority on the basis of Region 2 coordination provisions. In the band 1 518-1 525 MHz, stations in the mobile-satellite service shall not claim protection from the stations in the fixed service.

**Table 23**  
**Spectrum Allocation in the (1 525-1 610 MHz) Band**

<b>Allocation to Services</b>	<b>Allocation to Services</b>
(1 525-1 530) SPACE OPERATION, (space-to-Earth), FIXED, MOBILE-SATELLITE (space-to-Earth) Earth exploration-satellite, Mobile except aeronautical mobile	(1 530-1 535) SPACE OPERATION (space-to-Earth), MOBILE-SATELLITE (space-to-Earth) Earth exploration-satellite, Fixed, Mobile except aeronautical mobile
(1 535-1 559) MOBILE-SATELLITE (space-to-Earth)	(1 559-1 610) AERONAUTICAL RADIONAVIGATION RADIONAVIGATION-SATELLITE (space-to-Earth) (space-to-space)

5.38. In respect of mobile-satellite service in the band 1 530-1 535 MHz and 1 535-1 559, priority shall be given to accommodating the spectrum requirements for distress, urgency and safety communications of the Global Maritime Distress and Safety System (GMDSS). Maritime mobile-satellite distress, urgency and safety communications shall have priority access and immediate availability over all other mobile satellite communications operating within a network. Mobile-satellite systems shall not cause unacceptable interference to, or claim protection from, distress, urgency and safety communications of the GMDSS. Account shall be taken of the priority of safety-related communications in the other mobile-satellite services.

5.39. Use of the band 1 535-1 559 MHz by the mobile-satellite service (space-to-Earth) is limited to distress and safety communications. Transmissions this band from terrestrial aeronautical stations directly to aircraft stations, or between aircraft stations, in the aeronautical mobile (R) service are also authorized when such transmissions are used to extend or supplement the satellite-to-aircraft links.

**Table 24**  
**Spectrum Allocation in the (1 610-1 660 MHz ) Band**

Allocation to Services	Allocation to Services
(1 610-1 610.6) MOBILE-SATELLITE (Earth-to-space), AERONAUTICAL RADIONAVIGATION, RADIODETERMINATION-SATELLITE (Earth-to-space)	(1 610.6-1 613.8) MOBILE-SATELLITE (Earth-to-space) RADIO ASTRONOMY AERONAUTICAL RADIONAVIGATION RADIODETERMINATIONSATELLITE (Earth-to-space)
(1 613.8-1 626.5) MOBILE-SATELLITE (Earth-to-space), AERONAUTICAL RADIONAVIGATION Mobile-satellite (space-to-Earth) RADIODETERMINATION-SATELLITE	(1 626.5-1 660) MOBILE-SATELLITE (Earth-to-space), AERONAUTICAL RADIONAVIGATION Mobile-satellite (space-to-Earth) RADIODETERMINATION-SATELLITE

5.40. Use of the band 1 610-1 626.5 MHz by the mobile-satellite service (Earth-to-space) and by the radio-determination-satellite service (Earth-to-space) is subject to coordination as specified by the Info-communications Authority from time to time. A mobile earth station operating in either of the services in this band shall not produce a peak e.i.r.p. density in excess of -15 dB(W/4 kHz) in the part of the band used by systems operating in accordance with the ITU provisions unless otherwise agreed by the affected administrations. In the part of the band where such systems are not operating, the mean e.i.r.p. density of a mobile earth station shall not exceed -3 dB(W/4 kHz). Stations of the mobile-satellite service shall not claim protection from stations in the aeronautical radio-navigation service, stations operating in accordance with ITU provisions and stations in the fixed service operating in accordance with the ITU provisions.

5.41. The band 1 610-1 626.5 MHz is reserved on a worldwide basis for airborne electronic aids to air navigation services and any directly associated ground-based or satellite-borne facilities.

5.42. Harmful interference shall not be caused to stations in the radio astronomy service using frequencies in the band 1 610.6-1 613.8 MHz by stations of the radio-determination-satellite and mobile-satellite services.

5.43. Mobile earth stations in the mobile-satellite service operating in the bands 1 631.5-1 634.5 MHz and 1 656.5-1 660 MHz shall not cause harmful interference to stations in the fixed service operating in the countries listed by the Info-communications Authority from time to time.

5.44. Use of the band 1 645.5-1 646.5 MHz by the mobile-satellite service (Earth-to-space) and for inter-satellite links is limited to distress and safety communications. Transmissions in the band 1 646.5-1 656.5 MHz from aircraft stations in the aeronautical mobile (R) service directly to terrestrial aeronautical stations, or between aircraft stations, are also authorized when such transmissions are used to extend or supplement the aircraft-to-satellite links.

**Table 25**  
**Spectrum Allocation in the (1 660-1 710 MHz) Band**

<b>ITU Region 2 Allocation</b>	<b>Montserrat Allocation</b>
(1 660-1 660.5) MOBILE-SATELLITE (Earth-to-space) RADIO ASTRONOMY	(1 660.5-1 668) RADIO ASTRONOMY SPACE RESEARCH (passive) Fixed Mobile except aeronautical mobile
(1 668-1 668.4) MOBILE-SATELLITE (Earth-to-space) RADIO ASTRONOMY SPACE RESEARCH (passive), Fixed Mobile except aeronautical mobile	(1 668.4-1 670) METEOROLOGICAL AIDS, FIXED, MOBILE except aeronautical mobile MOBILE- SATELLITE (Earth-to-space) RADIO ASTRONOMY
(1 670-1 675) METEOROLOGICAL AIDS, FIXED, METEOROLOGICAL-SATELLITE (space-to-Earth), MOBILE, MOBILE-SATELLITE (Earth-to-space)	(1 675-1 690) FIXED, METEOROLOGICAL-SATELLITE (space- to-Earth) , MOBILE except aeronautical mobile
(1 690-1 700) METEOROLOGICAL AIDS, METEOROLOGICAL SATELLITE (space-to-Earth), Fixed, Mobile except aeronautical mobile	(1 700-1 710) FIXED, METEOROLOGICAL-SATELLITE (space- to-Earth), MOBILE except aeronautical mobile

5.45. Mobile earth stations operating in the band 1 660-1 660.5 MHz shall not cause harmful interference to stations in the radio astronomy service.

5.46. The Info-communications Authority or its agent shall give all practicable protection in the band 1 660.5-1 668.4 MHz for future research in radio astronomy, particularly by eliminating air-to-ground transmissions in the meteorological aids service in the band 1 664.4-1 668.4 MHz as soon as practicable.

5.47. Use of the band 1 668-1 675 MHz by the mobile-satellite service is subject to coordination pursuant to ITU regulations. In the band 1 668-1 668.4 MHz, Resolution 904 (WRC-07) shall apply. (WRC-07)

5.48. In order to protect the radio astronomy service in the band 1 668-1 670 MHz, the aggregate power flux-density values produced by mobile earth stations in a network of the mobile-satellite service operating in this band shall not exceed  $-181$  dB(W/m<sup>2</sup>) in 10 MHz and  $-194$  dB(W/m<sup>2</sup>) in any 20 kHz at any radio astronomy station recorded in the Master International Frequency Register, for more than 2% of integration periods of 2 000 s.

5.49. Where there is sharing of the band 1 668.4-1 675 MHz between the mobile-satellite service and the fixed and mobile services, Resolution 744 (Rev.WRC-07) shall apply.

5.50. In the band 1 670-1 675 MHz, stations in the mobile-satellite service shall not cause harmful interference to, nor constrain the development of, existing earth stations in the meteorological-satellite service. Any assignment to these earth stations in this band shall also be protected from harmful interference from stations in the mobile-satellite service.

**Table 26**  
**Spectrum Allocation in the (1 710-2 170 MHz) Band**

<b>Allocation to Services</b>	<b>Allocation to Services</b>
(1 710-1 930) FIXED, MOBILE	(1 930-1 970) FIXED, MOBILE, Mobile-satellite (Earth-to-space)
(1 970-1 980) FIXED, MOBILE	(1 980-2 010) FIXED, MOBILE MOBILE-SATELLITE (Earth-to-space)
(2 010-2 025) FIXED, MOBILE, FIXED, MOBILE-SATELLITE	(2 025-2 110) SPACE OPERATION (Earth-to-space) (space-to-space) EARTH EXPLORATION-SATELLITE (Earth-to-space) (space-to-space) FIXED MOBILE, SPACE RESEARCH (Earth-to-space) (space-to-space)
(2 110-2 120) FIXED, MOBILE SPACE RESEARCH (deep space) (Earth-to-space)	(2 120-2 160) FIXED, MOBILE, Mobile-satellite (space-to-Earth)
(2 160-2 170) FIXED, MOBILE, MOBILE-SATELLITE (space-to-Earth)	

5.51. The band, or portions of the band, 1 710-1 930 is/are identified for implementation of International Mobile Telecommunications (IMT) in accordance with Resolution 223 (Rev.WRC-07) of the ITU. However, the Info-communications Authority may authorize use of this band by any application of the services to which they are allocated and does not establish priority in the ITU Radio Regulations.

5.52. The bands 1 930-2 010 MHz and 2 110-2 025 MHz may be used by high altitude platform stations as base stations to provide International Mobile Telecommunications-2000 (IMT-2000), in accordance with Resolution 221. (Rev.WRC-03)\*. Their use by IMT-2000 applications using high altitude platform stations as base stations does not preclude the use of these bands by any station in the services to which they are allocated and does not establish priority in the Radio Regulations. (WRC-03) of the ITU.

5.53. Use of the band 2 160-2 170 MHz by the mobile-satellite service is subject to coordination in accordance with the relevant provisions of Resolution 716 (Rev.WRC-2000) of the ITU.

5.54. In making assignments to the mobile service in the bands 2 025-2 110 MHz and 2 200-2 290 MHz, users shall not operate high-density mobile systems, as described in Recommendation ITU-R SA.1154, and shall take that Recommendation into account for the introduction of any other type of mobile system. Where applicable, the Info-communications Authority shall take all practicable measures to ensure that space-to-space transmissions between two or more non-geostationary satellites, in the space research, space operations and earth exploration-satellite services in the band 2 025-2 110 MHz shall not impose any constraints on Earth-to-space, space-to-Earth and other space-to-space transmissions of those services and in those bands between geostationary and non-geostationary satellites.

**Table 27**  
**Spectrum Allocation in the (2 170-2 520 MHz) Band**

Allocation to Services	Allocation to Services
(2 170-2 200) FIXED, MOBILE MOBILE-SATELLITE (space-to-Earth)	(2 200-2 290) SPACE OPERATION (space-to-Earth) (space-to-space) EARTH EXPLORATION-SATELLITE (space-to-Earth) (space-to-space) FIXED, MOBILE, SPACE RESEARCH (space-to-Earth) (space-to-space)
(2 290-2 300) FIXED, MOBILE except aeronautical mobile, SPACE RESEARCH (deep space) (space-to-Earth) Amateur, Radiolocation	(2 300-2 450) FIXED, MOBILE, RADIOLOCATION, Amateur
(2 450-2 483.5) FIXED, MOBILE, Radiolocation	(2 483.5-2 500) FIXED, MOBILE, MOBILE-SATELLITE, (space-to-Earth) Radiolocation, RADIODETERMINATION- SATELLITE
(2 500-2 520) FIXED, FIXED-SATELLITE (space-to- Earth), MOBILE except aeronautical mobile, MOBILE-SATELLITE (space-to-Earth)	

5.55. Use of the band 2 483.5-2 500 MHz by the mobile-satellite and the radio-determination-satellite services is subject to the coordination in accordance with No. 9.11A of the ITU. The Info-communications Authority or its agent shall take all practicable steps to prevent harmful interference to the radio astronomy service from emissions in the 2 483.5-2 500 MHz band, especially those caused by second-harmonic radiation that would fall into the 4 990-5 000 MHz band allocated to the radio astronomy service worldwide.

5.56. Subject to agreement obtained under No. 9.21 of the ITU, the band 2 520-2 535 MHz may also be used for the mobile-satellite (space-to-Earth), except aeronautical mobile-satellite, service for operation limited to within Montserrat.

**Table 28**  
**Spectrum Allocation in the (2 520-2 700 MHz) Band**

Allocation to Services	Allocation to Services
(2 520-2 535) FIXED, FIXED-SATELLITE (space-to-Earth), MOBILE except aeronautical, mobile, BROADCASTING-SATELLITE	(2 535-2 655) FIXED, MOBILE except aeronautical mobile, BROADCASTING-SATELLITE
(2 655-2 670) FIXED, MOBILE except aeronautical mobile, BROADCASTING-SATELLITE, Earth exploration-satellite (passive), Radio astronomy, Space research (passive), FIXED-SATELLITE (Earth-to-space) (space-to-Earth)	(2 670-2 690) FIXED, MOBILE except aeronautical mobile, Earth exploration-satellite (passive), Radio astronomy Space research (passive), FIXED-SATELLITE (Earth-to-space) (space-to-Earth)
(2 690-2 700) EARTH EXPLORATION-SATELLITE (passive), RADIO ASTRONOMY, SPACE RESEARCH (passive)	

5.57. When introducing systems of the mobile-satellite service in the band 2 670-2 690 MHz, the Info-communications Authority shall take all necessary steps to protect the satellite systems operating in this band and coordination of mobile-satellite systems in this band shall be in accordance with No. 9.11A (WRC-07) of the ITU.

5.58. Where the band 2 655-2 670 MHz is used for the mobile-satellite (Earth-to-space), except aeronautical mobile-satellite, service operation shall be limited to within Montserrat and subject to agreement obtained under No. 9.21 (WRC-07) of the ITU.

**Table 29**  
**Spectrum Allocation in the (2 700-4 800 MHz) Band**

<b>Allocation to Services</b>	<b>Allocation to Services</b>
(2 700-2 900) AERONAUTICAL RADIONAVIGATION, Radiolocation	2 900-3 100 RADIOLOCATION, RADIONAVIGATION
(3 100-3 300) RADIOLOCATION Earth exploration-satellite (active) Space research (active)	(3 300-3 400)RADIOLOCATION Amateur, Fixed, Mobile
(3 400-3 500) FIXED FIXED-SATELLITE (space-to- Earth), Amateur Mobile, Radiolocation	(3 500-3 600) FIXED, FIXED-SATELLITE (space-to-Earth), MOBILE except aeronautical Mobile, Radiolocation
(3 600-3 700) FIXED, FIXED-SATELLITE (space-to- Earth), MOBILE except aeronautical Mobile, Radiolocation	(3 700-4 200) FIXED, FIXED-SATELLITE (space to-Earth), MOBILE except aeronautical mobile
(4 200-4 400) AERONAUTICAL RADIONAVIGATION	(4 400-4 500) FIXED, MOBILE
(4 500-4 800) FIXED, FIXED-SATELLITE (space-to-Earth), MOBILE	

5.59. In the band 2 700-2 900 MHz, ground-based radars used for meteorological purposes are only authorized to operate on a basis of equality with stations of the aeronautical radio-navigation service.

5.60. In the band 2 900-3 100 MHz, stations in the radiolocation service shall not cause harmful interference to, nor claim protection from, radar systems in the radio-navigation service. Use of ship-borne interrogator-transponder (SIT) system in this band shall be confined to the sub-band 2 930 -2 950 MHz.

5.61. Use of the band 2 900-3 100 MHz by the aeronautical radio-navigation service is limited to ground-based radars. In this band response from radar transponders shall not be capable

of being confused with the response from radar beacons (racons) and shall not cause interference to ship or aeronautical radars in the radio-navigation service.

5.62. In the band 3 400-3 500 MHz, the Info-communications Authority shall take all practicable steps to protect the fixed-satellite service and coordination requirements shall not be imposed on the fixed-satellite service.

5.63. Use of the band 4 200-4 400 MHz by the aeronautical radio-navigation service is reserved exclusively for radio altimeters installed on board aircraft and for the associated transponders on the ground. However, passive sensing in the earth exploration-satellite and space research services may be authorized in this band on a secondary basis (no protection is provided by the radio altimeters).

**Table 30**  
**Spectrum Allocation in the (4 800-5 570 MHz) Band**

Allocation to Services	Allocation to Services
(4 800-4 990) FIXED, MOBILE, Radio astronomy	(4 990-5 000) FIXED, MOBILE except aeronautical mobile RADIO ASTRONOMY Space research (passive)
(5 000-5 010) AERONAUTICAL RADIONAVIGATION, RADIONAVIGATION-SATELLITE (Earth-to-space)	(5 010-5 030) AERONAUTICAL RADIONAVIGATION, RADIONAVIGATION-SATELLITE (space-to-Earth) (space-to-space)
(5 030-5 091) AERONAUTICAL RADIONAVIGATION	(5 091-5 150) AERONAUTICAL RADIONAVIGATION, AERONAUTICAL MOBILE
(5 150-5 250) AERONAUTICAL RADIONAVIGATION, FIXED-SATELLITE (Earth-to-space), MOBILE except aeronautical mobile	(5 250-5 255) EARTH EXPLORATION-SATELLITE (active), RADIOLOCATION SPACE RESEARCH, MOBILE except aeronautical mobile
(5 255-5 350) EARTH EXPLORATION-SATELLITE (active) RADIOLOCATION SPACE RESEARCH (active), MOBILE except aeronautical mobile	(5 350-5 460) EARTH EXPLORATION-SATELLITE (active), SPACE RESEARCH (active), AERONAUTICAL RADIONAVIGATION, RADIOLOCATION
(5 460-5 470) RADIONAVIGATION, EARTH EXPLORATION-SATELLITE (active), SPACE RESEARCH (active)	(5 470-5 570) MARITIME RADIONAVIGATION, MOBILE except aeronautical mobile,

RADIOLOCATION	EARTH EXPLORATION-SATELLITE (active), SPACE RESEARCH (active), RADIOLOCATION
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5.64. In order avoid causing harmful interference to the microwave landing system operating above 5 030 MHz, the aggregate power flux-density produced at the Earth’s surface by all the space stations within any radio-navigation-satellite service system (space-to-Earth) operating in the band 5 010-5 030 MHz shall not exceed –124.5 dB(W/m2) in a 150 kHz band. In order not to cause harmful interference to the radio astronomy service in the band 4 990-5 000 MHz, radio-navigation-satellite service systems operating in the band 5 010-5 030 MHz shall comply with the limits in the band 4 990-5 000 MHz defined in Resolution 741 (WRC-03) of the ITU.

5.65. The band 5 030-5 091 MHz is to be used for the operation of the international standard system (microwave landing system) for precision approach and landing. In this band the requirements of this system shall take precedence over other uses.

5.66. In using the band 5091-5150 MHz, Resolution 114 (Rev.WRC-03) of the ITU shall apply. The band 5 091-5 150 MHz is also allocated to the fixed-satellite service (Earth-to-space) on a primary basis. This allocation is limited to feeder links of non-geostationary satellite systems in the mobile-satellite service and is subject to coordination under No. 9.11A of the ITU. In this band, the following conditions also apply: prior to 1 January 2018, the use of the band 5 091-5 150 MHz by feeder links of non-geostationary-satellite systems in the mobile-satellite service shall be made in accordance with Resolution 114 (Rev.WRC-03) of the ITU; after 1 January 2016, no new assignments shall be made to earth stations providing feeder links of non-geostationary mobile-satellite systems; after 1 January 2018, the fixed-satellite service will become secondary to the aeronautical radio-navigation service.

5.67. Use of the band 5 091-5 150 MHz by the aeronautical mobile service is limited to systems operating in the aeronautical mobile (R) service (in accordance with international aeronautical standards) and surface applications at airports. Such use shall be in accordance with Resolution 748 (WRC-07); aeronautical telemetry transmissions from aircraft stations (see No. 1.83) in accordance with Resolution 418 (WRC-07); and aeronautical security transmissions. Such use shall be in accordance with Resolution 419 (WRC-07) of the ITU.

5.68. In the band 5 150-5 250 MHz, stations in the mobile service shall not claim protection from earth stations in the fixed-satellite service. No. 5.43A of the ITU Radio Regulations does not apply to the mobile service with respect to fixed-satellite service earth stations. Fixed-satellite service networks in the band 5 150-5 250 MHz operated under Nos. 5.447A and 5.447B of the ITU Radio Regulations shall coordinate on an equal basis with administrations

responsible for relevant non-geostationary-satellite networks and shall not cause harmful interference to, stations of the fixed-satellite service.

5.69. In the band 5 250-5 350 MHz, stations in the mobile service shall not claim protection from the radiolocation service, the Earth exploration-satellite service (active) and the space research service (active). These services shall not impose on the mobile service more stringent protection criteria, based on system characteristics and interference criteria, than those stated in Recommendations ITU-R M.1638 and ITU-R RS.1632.

5.70. The space research service (active) operating in the band 5 350-5 460 MHz shall not cause harmful interference to nor claim protection from other services to which this band is allocated.

**Table 31**  
**Spectrum Allocation in the (5 570-7 250 MHz) Band**

<b>Allocation to Services</b>	<b>Allocation to Services</b>
(5 570-5 650) MARITIME RADIONAVIGATION, MOBILE except aeronautical mobile, RADIOLOCATION	(5 650-5 725) RADIOLOCATION, MOBILE except aeronautical mobile, Amateur, Space research (deep space)
(5 725-5 830) RADIOLOCATION, Amateur	(5 830-5 850) RADIOLOCATION Amateur, Amateur-satellite (space-to-Earth)
(5 850-5 925) FIXED, FIXED-SATELLITE (Earth-to-space), MOBILE, Amateur, Radiolocation	(5 925-6 700) FIXED, FIXED-SATELLITE (Earth-to-space), MOBILE
(6 700-7 075) FIXED, FIXED-SATELLITE (Earth-to-space) (space-to-Earth), MOBILE	(7 075-7 145) FIXED, MOBILE
(7 145-7 235) FIXED, MOBILE SPACE RESEARCH (Earth-to-space)	(7 235-7 250) FIXED, MOBILE

5.71. Between the frequencies 5 600 MHz and 5 650 MHz, ground-based radars used for meteorological purposes are authorized to operate on a basis of equality with stations of the maritime radio-navigation service. In the bands 5 925-6 425 MHz and 14-14.5 GHz, earth stations located on board vessels may communicate with space stations of the fixed-satellite service. Such use shall be in accordance with Resolution 902 (WRC-03) of the ITU.

5.72. The band 5 925-6 700 MHz may be used for aeronautical mobile telemetry for flight testing by aircraft stations. Such use shall be in accordance with Resolution 416 (WRC-07) of the ITU and shall not cause harmful interference to, or claim protection from, the fixed-satellite and fixed services. Use of these bands by other mobile service applications or by other services to which these bands are allocated on a co-primary basis is not precluded.

5.73. The space-to-Earth allocation to the fixed-satellite service in the band 6 700-7 075 MHz shall be limited to feeder links for non-geostationary satellite systems of the mobile-satellite service and is subject to coordination under No. 9.11A of the ITU Radio Regulations. The use of the band 6 700-7 075 MHz (space-to-Earth) by feeder links for non-geostationary satellite systems in the mobile-satellite service will not be restricted.

**Table 32**  
**Spectrum Allocation in the (7 250-8 500 MHz) Band**

Allocation to Services	Allocation to Services
(7 250-7 300) FIXED, FIXED-SATELLITE (space-to-Earth), MOBILE	(7 300-7 450) FIXED, FIXED-SATELLITE (space-to-Earth), MOBILE except aeronautical mobile
(7 450-7 550) FIXED, FIXED-SATELLITE (space-to-Earth), METEOROLOGICAL-SATELLITE (space-to-Earth), MOBILE except aeronautical mobile	(7 750-7 850) FIXED, METEOROLOGICAL-SATELLITE (space-to-Earth), MOBILE except aeronautical mobile
(7 850-7 900) FIXED MOBILE except aeronautical mobile	(7 900-8 025) FIXED, FIXED-SATELLITE (Earth-to-space), MOBILE
(8 025-8 175) EARTH EXPLORATION-SATELLITE (space-to-Earth), FIXED FIXED-SATELLITE (Earth-to-space), MOBILE	(8 175-8 215) EARTH EXPLORATION-SATELLITE (space-to-Earth), FIXED FIXED-SATELLITE (Earth-to-space) METEOROLOGICAL-SATELLITE (Earth-to-space), MOBILE
(8 215-8 400) EARTH EXPLORATION-SATELLITE (space-to-Earth), FIXED	(8 400-8 500) FIXED, MOBILE except aeronautical mobile,

FIXED-SATELLITE (Earth-to-space), MOBILE	SPACE RESEARCH (space-to-Earth)
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5.74. Use of the band 7 750-7 850 MHz by the meteorological-satellite service (space-to-Earth) is limited to non-geostationary satellite systems.

**Table 33**  
**Spectrum Allocation in the (8 500-10 000 MHz) Band**

<b>Allocation to Services</b>	<b>Allocation to Services</b>
(8 500-8 550) RADIOLOCATION	(8 550-8 650) EARTH EXPLORATION-SATELLITE (active), RADIOLOCATION SPACE RESEARCH (active)
(8 650-8 750) RADIOLOCATION	(8 750-8 850) RADIOLOCATION AERONAUTICAL RADIONAVIGATION
(8 850-9 000) RADIOLOCATION MARITIME RADIONAVIGATION	(9 000-9 200) AERONAUTICAL RADIONAVIGATION, RADIOLOCATION
(9 200-9 300) RADIOLOCATION MARITIME RADIONAVIGATION	9 300-9 500 RADIONAVIGATION EARTH EXPLORATION-SATELLITE (active),SPACE RESEARCH (active) RADIOLOCATION
(9 500-9 800) EARTH EXPLORATION-SATELLITE (active), RADIOLOCATION RADIONAVIGATION, SPACE RESEARCH (active)	(9 800-9 900) RADIOLOCATION Earth exploration-satellite (active), Space research (active),Fixed
(9 900-10 000) RADIOLOCATION, Fixed	

5.75. In the band 8 550-8 650 MHz, stations in the Earth exploration-satellite service (active) and space research service (active) shall not cause harmful interference to, or constrain the use and development of, stations of the radiolocation service.

5.76. The use of the band 8 750-8 850 MHz by the aeronautical radio-navigation service is limited to airborne Doppler navigation aids on a centre frequency of 8 800 MHz. In the bands 8 850-9 000 MHz the maritime radio-navigation services are limited to shore-based radars.

5.77. Use of the band 9 300-9 500 MHz by the aeronautical radio-navigation service is limited to airborne weather radars and ground-based radars. Use of the band 9 300-9 500 MHz by the Earth exploration-satellite service (active) and the space research service (active) is limited to systems requiring necessary bandwidth greater than 300 MHz that cannot be fully accommodated within the 9 500-9 800 MHz band. In this band stations operating in the radiolocation service shall not cause harmful interference to, nor claim protection from, radars operating in the radio-navigation service. Ground-based radars used for meteorological purposes have priority over other radiolocation uses. Use of the band by the aeronautical radio-navigation service is limited to airborne weather radars and ground-based radars.

**Table 34**  
**Spectrum Allocation in the (10-11.7 GHz) Band**

Allocation to Services	Allocation to Services
(10-10.45) FIXED, RADIOLOCATION MOBILE, Amateur MOBILE	10.45-10.5 ADIOLOCATION, Amateur, Amateur-satellite
(10.5-10.55)FIXED, MOBILE RADIOLOCATION	(10.55-10.6) FIXED, MOBILE except aeronautical mobile, Radiolocation
(10.6-10.68) EARTH EXPLORATION- SATELLITE (passive), FIXED, MOBILE except aeronautical mobile, RADIO ASTRONOMY SPACE RESEARCH (passive) Radiolocation	(10.68-10.7) EARTH EXPLORATION- SATELLITE (passive), RADIO ASTRONOMY, SPACE RESEARCH passive)
(10.7-11.7)FIXED, FIXED-SATELLITE (space-to-Earth) (Earth-to-space) MOBILE except aeronautical mobile	

5.78. In the band 10.6-10.68 GHz, the power delivered to the antenna of stations of the fixed and mobile, except aeronautical mobile, services shall not exceed ..3 dBW. This limit may be exceeded, subject to agreement obtained from the ITU.

**Table 35**  
**Spectrum Allocation in the (11.7-14 GHz) Band**

Allocation to Services	Allocation to Services
(11.7-12.2) FIXED, MOBILE except aeronautical mobile, BROADCASTING BROADCASTING-SATELLITE, FIXED-SATELLITE (space-to-Earth)	(12.2-12.5) FIXED, FIXED-SATELLITE (space-to-Earth), MOBILE except aeronautical mobile, BROADCASTING
(12.5-12.75) FIXED, FIXED-SATELLITE (space-to-Earth) MOBILE except aeronautical mobile, BROADCASTINGSATELLITE	(12.75-13.25) FIXED, FIXED-SATELLITE (Earth-to-space), MOBILE, Space research (deep space) (space-to-Earth)
(13.25-13.4) EARTH EXPLORATION-SATELLITE (active) AERONAUTICAL RADIONAVIGATION, SPACE RESEARCH (active)	(13.4-13.75) EARTH EXPLORATION-SATELLITE (active), RADIOLOCATION, SPACE RESEARCH, Standard frequency and time signal-satellite (Earth-to-space)
(13.75-14) FIXED-SATELLITE (Earth-to-space), RADIOLOCATION, Earth exploration-satellite Standard frequency and time signal-satellite (Earth-to-space) Space research	

5.79. In the band 11.7-12.2 GHz, transponders on space stations in the fixed-satellite service may be used additionally for transmissions in the broadcasting-satellite service, provided that such transmissions do not have a maximum e.i.r.p. greater than 53 dBW per television channel and do not cause greater interference or require more protection from interference than the coordinated fixed-satellite service frequency assignments. With respect to the space services, this band shall be used principally for the fixed-satellite service.

5.80. Use of the band 11.7-12.2 GHz by geostationary-satellite networks in the fixed-satellite service is subject to application of the provisions of No. 9.14 of the ITU Radio Regulations for coordination with stations of terrestrial services. Use of the band 12.2-12.7 GHz by the broadcasting-satellite service is detailed in Appendix 30, (WRC-03) of the ITU.

5.81. The Earth exploration-satellite (active) and space research (active) services operating in the band 13.25-13.4 GHz shall not cause harmful interference to, or constrain the use and development of, the aeronautical radio-navigation service.

5.82. In the band 13.4-13.75 GHz, the Earth exploration-satellite (active) and space research (active) services shall not cause harmful interference to, or constrain the use and development of, the radiolocation service.

5.83. In the band 13.75-14 GHz, an earth station of a geostationary fixed-satellite service network shall have a minimum antenna diameter of 1.2 m and an earth station of a non-geostationary fixed-satellite service system shall have a minimum antenna diameter of 4.5 m. In addition, the e.i.r.p., averaged over one second, radiated by a station in the radiolocation or radio-navigation services shall not exceed 59 dBW for elevation angles above 2° and 65 dBW at lower angles. Before an administration brings into use an earth station in a geostationary-satellite network in the fixed-satellite service in this band with an antenna diameter smaller than 4.5 m, it shall ensure that the power flux-density produced by this earth station does not exceed: -115 dB(W/(m<sup>2</sup> · 10 MHz)) for more than 1% of the time produced at 36 m above sea level at the low water mark, as officially recognized by the coastal State; -115 dB(W/(m<sup>2</sup> · 10 MHz)) for more than 1% of the time produced 3 m above ground at the border of the territory of an administration deploying or planning to deploy land mobile radars in this band, unless prior agreement has been obtained. Earth stations within the fixed-satellite service having an antenna diameter greater than or equal to 4.5 m, the e.i.r.p. of any emission should be at least 68 dBW and should not exceed 85 dBW.

**Table 36**  
**Spectrum Allocation in the (14-15.4 GHz) Band**

Allocation to Services	Allocation to Services
(14-14.25) FIXED-SATELLITE (Earth-to-space), RADIONAVIGATION, Mobile-satellite (Earth-to-space) Space research	(14.25-14.3) FIXED-SATELLITE (Earth-to-space), RADIONAVIGATION, Mobile-satellite (Earth-to-space) Space research
(14.3-14.4) FIXED, FIXED-SATELLITE (Earth-to-space), Mobile-satellite (Earth-to-space), MOBILE except aeronautical Radio-navigation-satellite	(14.4-14.47) FIXED, FIXED-SATELLITE (Earth-to-space) MOBILE except aeronautical mobile , Mobile-satellite (Earth-to-space), Space research (space-to-Earth)
(14.47-14.5) FIXED, FIXED-SATELLITE (Earth-to-space) MOBILE except aeronautical mobile, Mobile-satellite (Earth-to-space), Radio astronomy	(14.5-14.8) FIXED, FIXED-SATELLITE (Earth-to-space), MOBILE, Space research

(14.8-15.4) EARTH EXPLORATION-SATELLITE (passive), RADIO ASTRONOMY, SPACE RESEARCH (passive)	
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**Table 37**  
**Spectrum Allocation in the (15.4-18.4 GHz) Band**

<b>Allocation to Services</b>	<b>Allocation to Services</b>
(15.4-15.43) AERONAUTICAL, RADIONAVIGATION	(15.43-15.63) FIXED-SATELLITE (Earth-to-space) AERONAUTICAL, RADIONAVIGATION
(15.63-15.7) AERONAUTICAL RADIONAVIGATION	(15.7-16.6) RADIOLOCATION
(16.6-17.1) RADIOLOCATION Space research (deep space) (Earth-to-space)	(17.1-17.2) RADIOLOCATION
(17.2-17.3) EARTH EXPLORATION-SATELLITE (active), RADIOLOCATION SPACE RESEARCH (active)	(17.3-17.7) FIXED-SATELLITE (Earth-to-space) (space-to-Earth), Radiolocation, BROADCASTING-SATELLITE
(17.7-17.8) FIXED, FIXED-SATELLITE (space-to-Earth) (Earth-to-space) BROADCASTING-SATELLITE, Mobile	(17.8-18.1) FIXED, FIXED-SATELLITE (space-to-Earth) (Earth-to-space), MOBILE
(18.1-18.4) FIXED, FIXED-SATELLITE (space-to-Earth) (Earth-to-space), MOBILE	

5.84. Use of the band 15.43-15.63 GHz is reserved to the fixed-satellite service (space-to-Earth) on a primary basis and is limited to feeder links of non-geostationary systems in the mobile-satellite service, subject to coordination under No. 9.11A of the ITU Radio Regulations. In the space-to-Earth direction, the minimum earth station elevation angle above and gain towards the local horizontal plane and the minimum coordination distances to protect an earth station from harmful interference shall be in accordance with Recommendation ITU-R S.1341.

5.85. Stations operating in the aeronautical radio-navigation service shall limit the effective e.i.r.p. in accordance with Recommendation ITU-R S.1340. The minimum coordination distance required to protect the aeronautical radio-navigation stations (No. 4.10 applies) from harmful interference from feeder-link earth stations and the maximum e.i.r.p. transmitted towards the local horizontal plane by a feeder-link earth station shall be in accordance with Recommendation ITU-R S.1340.

5.86. Fixed-satellite service systems which complete information for advance publication may operate in the bands 15.4-15.43 GHz in the space-to-Earth direction. In the band 15.4-15.43 GHz emissions from a non-geostationary space station shall not exceed the power flux-density limits at the Earth's surface of  $-146 \text{ dB(W/(m}^2 \cdot \text{MHz))}$  for any angle of arrival.

5.87. The use of the band 17.3-17.7 GHz by systems in the fixed-satellite service (Earth-to-space) is limited to geostationary satellites and to provide feeder links for the broadcasting-satellite service in the band 12.212.7 GHz. Application of non-geostationary-satellite systems in the fixed-satellite service is subject to the provisions of No. 9.12 of the ITU Radio Regulations for coordination with other non-geostationary-satellite systems in the fixed-satellite service. Non-geostationary-satellite systems in the fixed-satellite service shall not claim protection from geostationary-satellite networks in the fixed-satellite service operating in accordance with the Radio Regulations.

5.88. The following bands are identified for use by high-density applications in the fixed-satellite service:

- i. 18.3-19.3 GHz (space-to-Earth),
- ii. 19.7-20.2 GHz (space-to-Earth),
- iii. 40-40.5 GHz (space-to-Earth),
- iv. 40.5-42 GHz (space-to-Earth),
- v. 28.35-28.45 GHz (Earth-to-space),
- vi. 28.45-28.94 GHz (Earth-to-space),
- vii. 28.94-29.1 GHz (Earth-to-space),
- viii. 29.25-29.46 GHz (Earth-to-space),
- ix. 29.46-30 GHz (Earth-to-space),
- x. 48.2-50.2 GHz (Earth-to-space).

5.89. Use of the band 18.1-18.4 GHz by the fixed-satellite service (Earth-to-space) is limited to feeder links of geostationary-satellite systems in the broadcasting-satellite service.

**Table 38**  
**Spectrum Allocation in the (18.4-22 GHz) Band**

Allocation to Services	Allocation to Services
(18.4-18.6) FIXED, FIXED-SATELLITE (space-to-Earth), MOBILE	(18.6-18.8) EARTH EXPLORATION-SATELLITE (passive), FIXED, FIXED-SATELLITE (space-to-Earth), MOBILE except aeronautical mobile, SPACE RESEARCH (passive)
(18.8-19.3) FIXED, FIXED-SATELLITE (space-to-Earth), MOBILE	(19.3-19.7) FIXED, FIXED-SATELLITE (space-to-Earth) (Earth-to-space), MOBILE
(19.7-20.1) FIXED-SATELLITE (space-to-Earth) Mobile-satellite (space-to-Earth)	(20.1-20.2) FIXED-SATELLITE (space-to-Earth), MOBILE-SATELLITE (space-to-Earth)
(20.2-21.2) FIXED-SATELLITE (space-to-Earth), MOBILE-SATELLITE (space-to-Earth) Standard frequency and time signal-satellite (space-to-Earth)	(21.2-21.4) EARTH EXPLORATION-SATELLITE (passive), FIXED, MOBILE SPACE RESEARCH (passive)
(21.4-22) FIXED, MOBILE, BROADCASTING-SATELLITE	

5.90. Emissions of the fixed service and the fixed-satellite service in the band 18.6-18.8 GHz are limited to the values specified in Nos. 21.5A and 21.16.2, respectively of the ITU (WRC-2000).

5.91. Use of the band 18.6-18.8 GHz by the fixed-satellite service is limited to geostationary systems and systems with an orbit of apogee greater than 20 000 km. The use of the band 19.3-19.7 GHz (Earth-to-space) by the fixed-satellite service is limited to feeder links for non-geostationary-satellite systems in the mobile-satellite service. Such use is only subject to the application of the provisions of No. 9.11A of the ITU Radio Regulations.

5.92. In the band 19.7-20.1 GHz and the band 20.1-20.2 GHz the Info-communications Authority shall take all practicable steps to ensure the continued availability of these bands for operating fixed and mobile systems in accordance with the relevant ITU regulations. Use

of the bands 19.7-20.1 GHz by the mobile-satellite service is limited to satellite networks which are both in the fixed-satellite service and in the mobile-satellite service.

**Table 39**  
**Spectrum Allocation in the (22-24.75 GHz) Band**

Allocation to Services	Allocation to Services
(22-22.21) FIXED, MOBILE except aeronautical mobile	(22.21-22.5) EARTH EXPLORATION-SATELLITE (passive), FIXED, MOBILE except aeronautical mobile RADIO ASTRONOMY, SPACE RESEARCH (passive)
(22.5-22.55) FIXED, MOBILE	(22.55-23.55) FIXED, INTER-SATELLITE MOBILE
(23.55-23.6) FIXED, MOBILE	(23.6-24) EARTH EXPLORATION-SATELLITE (passive), RADIO ASTRONOMY, SPACE RESEARCH (passive)
(24-24.05) AMATEUR, AMATEUR-SATELLITE	(24.05-24.25) RADIOLOCATION Amateur, Earth exploration-satellite (active)
(24.25-24.45) FIXED, MOBILE RADIONAVIGATION	(24.45-24.65) INTER-SATELLITE, RADIONAVIGATION
(24.65-24.75) INTER-SATELLITE, RADIOLOCATION- SATELLITE (Earth-to-space)	

5.93. The use of the band 22.21-22.5 GHz by the Earth exploration-satellite (passive) and space research (passive) services shall not impose constraints upon the fixed and mobile, except aeronautical mobile, services. The inter-satellite service shall not claim protection from harmful interference from airport surface detection equipment stations of the radio-navigation service.

**Table 40**  
**Spectrum Allocation in the (24.75-29.9 GHz) Band**

<b>Allocation to Services</b>	<b>Allocation to Services</b>
(24.75-25.25) FIXED FIXED-SATELLITE (Earth-to-space), MOBILE	(25.25-25.5) FIXED, INTER-SATELLITE MOBILE, Standard frequency and time signal-satellite (Earth-to-space)
(25.5-27) EARTH EXPLORATION-SATELLITE (space-to Earth), FIXED INTER-SATELLITE, MOBILE SPACE RESEARCH (space-to-Earth) Standard frequency and time signal-satellite (Earth-to-space)	(27-27.5) FIXED, FIXED-SATELLITE (Earth-to-space), INTER-SATELLITE, MOBILE
(27.5-28.5) FIXED, FIXED-SATELLITE (Earth-to-space), MOBILE	(28.5-29.5) FIXED, FIXED-SATELLITE (Earth-to-space), MOBILE, Earth exploration-satellite (Earth-to-space)
(29.5-29.9) FIXED-SATELLITE (Earth-to-space) Earth exploration-satellite (Earth-to-space), Mobile-satellite (Earth-to-space)	

5.94. In the band 24.75-25.25 GHz, feeder links to stations of the broadcasting-satellite service shall have priority over other uses in the fixed-satellite service (Earth-to-space). Such other uses shall protect and shall not claim protection from existing and future operating feeder-link networks to such broadcasting satellite stations.

**Table 41**  
**Spectrum Allocation in the (29.9-34.2 GHz) Band**

<b>Allocation to Services</b>	<b>Allocation to Services</b>
(29.9-30) FIXED-SATELLITE (Earth-to-space), MOBILE-SATELLITE (Earth-to-space), Earth exploration-satellite (Earth-to-space)	(30-31) FIXED-SATELLITE (Earth-to-space), MOBILE-SATELLITE (Earth-to-space) Standard frequency and time signal-satellite (space-to-Earth)
(31-31.3) FIXED, MOBILE, Standard frequency and time signal-satellite (space-to-Earth), Space research	(31.3-31.5) EARTH EXPLORATION-SATELLITE (passive), RADIO ASTRONOMY, SPACE RESEARCH (passive)
(31.5-31.8) EARTH EXPLORATION-SATELLITE (passive), RADIO ASTRONOMY, SPACE RESEARCH (passive)	(31.8-32) FIXED, RADIONAVIGATION SPACE RESEARCH (deep space) (space-to-Earth)
(32-32.3) FIXED, RADIONAVIGATION SPACE RESEARCH (deep space) (space-to-Earth)	(32.3-33) FIXED, INTER-SATELLITE, RADIONAVIGATION
(33-33.4) FIXED, RADIONAVIGATION	(33.4-34.2) RADIOLOCATION

5.95. The band 29.9-30 GHz may be used for space-to-space links in the Earth exploration-satellite service for telemetry, tracking, and control purposes, on a secondary basis. In designing systems for the inter-satellite service in the band 32.3-33 GHz, for the radio-navigation service in the band 32-33 GHz, and for the space research service (deep space) in the band 31.8-32 GHz, it is necessary to apply measures to prevent harmful interference between these services, bearing in mind the safety aspects of the radio-navigation service.

**Table 42**  
**Spectrum Allocation in the (34.2-40 GHz) Band**

<b>Allocation to Services</b>	<b>Allocation to Services</b>
(34.2-34.7) RADIOLOCATION, SPACE RESEARCH (deep space) (Earth-to-space)	(34.7-35.2) RADIOLOCATION, Space research
(35.2-35.5) METEOROLOGICAL AIDS, RADIOLOCATION	(35.5-36) METEOROLOGICAL AIDS, EARTH EXPLORATION-SATELLITE (active), RADIOLOCATION, SPACE RESEARCH (active)
(36-37) EARTH EXPLORATION-SATELLITE (passive), FIXED, MOBILE SPACE RESEARCH (passive)	(37-37.5) FIXED, MOBILE, SPACE RESEARCH (space-to-Earth)
(37.5-38) FIXED, FIXED-SATELLITE (space-to-Earth), MOBILE, SPACE RESEARCH (space-to-Earth), Earth exploration-satellite (space-to-Earth)	(38-39.5) FIXED, FIXED-SATELLITE (space-to-Earth), MOBILE, Earth exploration-satellite (space-to-Earth)
(39.5-40) FIXED, FIXED-SATELLITE (space-to-Earth), MOBILE-SATELLITE (space-to-Earth), Earth exploration-satellite (space-to-Earth)	

5.96. In the band 35.5-36.0 GHz, the mean power flux-density at the Earth’s surface, generated by any space-borne sensor in the Earth exploration-satellite service (active) or space research service (active), for any angle greater than 0.8° from the beam centre shall not exceed -73.3 dB(W/m<sup>2</sup>) in this band.

**Table 43**  
**Spectrum Allocation in the (40-47.5 GHz) Band**

<b>Allocation to Services</b>	<b>Allocation to Services</b>
(40-40.5) EARTH EXPLORATION-SATELLITE (Earth-to-space), FIXED FIXED-SATELLITE (space-to-Earth), MOBILE, MOBILE-SATELLITE (space-to-Earth), SPACE RESEARCH (Earth-to-space), Earth exploration-satellite (space-to-Earth)	(40.5-41) FIXED, FIXED-SATELLITE (space-to-Earth), BROADCASTING, BROADCASTING-SATELLITE, Mobile, Mobile-satellite (space-to-Earth)
(41-42.5) FIXED, FIXED-SATELLITE (space-to-Earth), BROADCASTING, BROADCASTING-SATELLITE, Mobile	(42.5-43.5) FIXED, FIXED-SATELLITE (Earth-to-space), MOBILE except aeronautical mobile, RADIO ASTRONOMY
(43.5-47) MOBILE, MOBILE-SATELLITE RADIONAVIGATION RADIONAVIGATION-SATELLITE	(47-47.2) AMATEUR, AMATEUR-SATELLITE
(47.2-47.5) FIXED, FIXED-SATELLITE (Earth-to-space), MOBILE	

5.97. The equivalent power flux-density (epfd) produced in the band 42.5-43.5 GHz by all space stations in any non-geostationary-satellite system in the fixed-satellite service (space-to-Earth) shall not exceed the following values at the site of any radio astronomy station for more than 2% of the time: ..230 dB(W/m<sup>2</sup>) in 1 GHz and –246 dB(W/m<sup>2</sup>) in any 500 kHz of the 42.5-43.5 GHz band at the site of any radio astronomy station registered as a single-dish telescope; and 209 dB(W/m<sup>2</sup>) in any 500 kHz of the 42.5-43.5 GHz band at the site of any radio astronomy station registered as a very long baseline interferometry station. These epfd values shall be evaluated using the methodology given in Recommendation ITU-R S. and the reference antenna pattern and the maximum gain of an antenna in the radio astronomy service given in Recommendation ITU-R RA.1631 and shall apply over the whole sky and for elevation angles higher than the minimum operating angle ..min of the radio-telescope (for which a default value of 5° should be adopted in the absence of notified information).

5.98. The band 47.2-47.5 GHz is designated for use by high altitude platform stations. Use of this band is subject to the provisions of Resolution 122 (Rev.WRC-07) (WRC-07) of the ITU. In

the bands 43.5-47 GHz and 66-71 GHz, stations in the land mobile service may be operated subject to not causing harmful interference to the space radio-communication services to which these bands are allocated.

5.99. In the bands 43.5-47 GHz satellite links connecting land stations at specified fixed points are also authorized when used in conjunction with the mobile-satellite service or the radio-navigation-satellite service.

**Table 44**  
**Spectrum Allocation in the (47.5-51.4 GHz) Band**

Allocation to Services	Allocation to Services
(47.5-47.9) FIXED, FIXED-SATELLITE (Earth-to-space), (space-to-Earth), MOBILE	(47.9-48.2) FIXED, FIXED-SATELLITE (Earth-to-space), MOBILE
(48.2-48.54) FIXED, FIXED-SATELLITE (Earth-to-space), (space-to-Earth), MOBILE	(48.54-49.44) FIXED, FIXED-SATELLITE (Earth-to-space), MOBILE
(49.44-50.2) FIXED, FIXED-SATELLITE (Earth-to-space), (space-to-Earth), MOBILE	(50.2-50.4) EARTH EXPLORATION-SATELLITE (passive), SPACE RESEARCH (passive)
(50.4-51.4) FIXED, FIXED-SATELLITE (Earth-to-space), MOBILE, Mobile-satellite (Earth-to-space)	

5.100. The use of the band 47.5-47.9 GHz by the fixed-satellite service (space-to-Earth) is limited to geostationary satellites. The power flux-density in the band produced by any geostationary space station in the fixed-satellite service (space-to-Earth) operating in the band 49.44-50.2 GHz shall not exceed  $-151.8$  dB(W/m<sup>2</sup>) in any 500 kHz band at the site of any radio astronomy station.

**Table 45**  
**Spectrum Allocation in the (51.4-55.78 GHz) Band**

<b>Allocation to Services</b>	<b>Allocation to Services</b>
(51.4-52.6) FIXED, MOBILE	(52.6-54.25) EARTH EXPLORATION-SATELLITE (passive), SPACE RESEARCH (passive)
(54.25-55.78) EARTH EXPLORATION-SATELLITE (passive), INTER-SATELLITE SPACE RESEARCH (passive)	

5.101. In the bands 52.6-54.25 GHz radio astronomy observations may be carried out under arrangements set out by the Info-communications Authority. Use of the bands 54.25-55.78 GHz, by inter-satellite service is limited to satellites in the geostationary-satellite orbit. The single-entry power flux-density at all altitudes from 0 km to 1 000 km above the Earth's surface produced by a station in the inter-satellite service, for all conditions and for all methods of modulation, shall not exceed  $-147 \text{ dB(W/(m}^2 \cdot 100 \text{ MHz))}$  for all angles of arrival.

**Table 46**  
**Spectrum Allocation in the (55.78-66 GHz) Band**

<b>Allocation to Services</b>	<b>Allocation to Services</b>
(55.78-56.9) EARTH EXPLORATION-SATELLITE (passive), FIXED, INTER-SATELLITE, MOBILE, SPACE RESEARCH (passive)	(56.9-57) EARTH EXPLORATION-SATELLITE (passive), FIXED INTER-SATELLITE, MOBILE SPACE RESEARCH (passive)
(57-58.2) EARTH EXPLORATION-SATELLITE (passive), FIXED INTER-SATELLITE, MOBILE SPACE RESEARCH (passive)	(58.2-59) EARTH EXPLORATION-SATELLITE (passive), FIXED, MOBILE, SPACE RESEARCH (passive)
(59-59.3) EARTH EXPLORATION-SATELLITE (passive), FIXED, INTER-SATELLITE, MOBILE RADIOLOCATION, SPACE RESEARCH (passive)	(59.3-64) FIXED, INTER-SATELLITE MOBILE, RADIOLOCATION
(64-65) FIXED, INTER-SATELLITE, MOBILE except aeronautical mobile	(65-66) EARTH EXPLORATION-SATELLITE, FIXED, INTER-SATELLITE MOBILE except aeronautical mobile, SPACE RESEARCH

5.102. In the band 59.3-64 GHz stations in the aeronautical mobile service may be operated subject to not causing harmful interference to the inter-satellite service. Use of the band 56.9-57 GHz by inter-satellite systems is limited to links between satellites in geostationary-satellite orbit and to transmissions from non-geostationary satellites in high-Earth orbit to those in low-Earth orbit. For links between satellites in the geostationary-satellite orbit, the single entry power flux-density at all altitudes from 0 km to 1 000 km above the Earth's surface, for all conditions and for all methods of modulation, shall not exceed  $-147$  dB(W/(m<sup>2</sup> · 100 MHz) for all angles of arrival.

5.103. In the band 59.3-64 GHz, airborne radars in the radiolocation service may be operated subject to not causing harmful interference to the inter-satellite service.

**Table 47**  
**Spectrum Allocation in the (66-81 GHz) Band**

Allocation to Services	Allocation to Services
(66-71) INTER-SATELLITE, MOBILE, MOBILE-SATELLITE, RADIONAVIGATION, RADIONAVIGATION-SATELLITE	(71-74) FIXED, FIXED-SATELLITE (space-to-Earth), MOBILE, MOBILE-SATELLITE (space-to-Earth)
(74-76) FIXED, FIXED-SATELLITE (space-to-Earth), MOBILE, BROADCASTING, BROADCASTING-SATELLITE, Space research (space-to-Earth)	(76-77.5) RADIO ASTRONOMY, RADIOLOCATION, Amateur Amateur-satellite, Space research (space-to-Earth)
(77.5-78) AMATEUR, AMATEUR-SATELLITE, Radio astronomy, Space research (space-to-Earth)	(78-79) RADIOLOCATION, Amateur, Amateur-satellite, Radio astronomy, Space research (space-to-Earth)
(79-81) RADIO ASTRONOMY, RADIOLOCATION, Amateur, Amateur-satellite, Space research (space-to-Earth)	

5.104. In the band 74-76 GHz, stations in the fixed, mobile and broadcasting services shall not cause harmful interference to stations in the fixed-satellite service or stations in the broadcasting-satellite service operating in accordance with the decisions of the appropriate frequency assignment planning conference for the broadcasting-satellite service.

5.105. In the band 78-79 GHz radars located on space stations may be operated on a primary basis in the Earth exploration-satellite service and in the space research service.

**Table 48**  
**Spectrum Allocation in the (81-86 GHz) Band**

<b>Allocation to Services</b>	<b>Allocation to Services</b>
(81-84) FIXED, FIXED-SATELLITE (Earth-to-space), MOBILE, MOBILE-SATELLITE (Earth-to-space), RADIO ASTRONOMY Space research (space-to-Earth)	(84-86) FIXED, FIXED-SATELLITE (Earth-to-space), MOBILE, RADIO ASTRONOMY

5.106. The sub-band 81-81.5 GHz is also allocated to the amateur and amateur-satellite services on a secondary basis.

**Table 49**  
**Spectrum Allocation in the (86-111.8 GHz) Band**

<b>Allocation to Services</b>	<b>Allocation to Services</b>
(86-92) EARTH EXPLORATION-SATELLITE (passive), RADIO ASTRONOMY, SPACE RESEARCH (passive)	(92-94) FIXED, MOBILE, RADIO ASTRONOMY, RADIOLOCATION
(94-94.1) EARTH EXPLORATION-SATELLITE (active), RADIOLOCATION SPACE RESEARCH (active), Radio astronomy	(94.1-95) FIXED, MOBILE, RADIO ASTRONOMY, RADIOLOCATION
(95-100) FIXED, MOBILE, RADIO ASTRONOMY, RADIOLOCATION RADIONAVIGATION, RADIONAVIGATION-SATELLITE	(100-102) EARTH EXPLORATION-SATELLITE (passive), RADIO ASTRONOMY, SPACE RESEARCH (passive)
(102-105) FIXED, MOBILE, RADIO ASTRONOMY	(105-109.5) FIXED, MOBILE RADIO ASTRONOMY SPACE RESEARCH (passive)
(109.5-111.8) EARTH EXPLORATION-SATELLITE (passive), RADIO ASTRONOMY, SPACE RESEARCH (passive)	

5.107. Use of the band 94-94.1 GHz by the Earth exploration-satellite (active) and space research (active) services is limited to space-borne cloud radars. In this band, transmissions from space stations of the Earth exploration-satellite service (active) that are directed into the main beam of a radio astronomy antenna have the potential to damage some radio astronomy receivers.

**Table 50**  
**Spectrum Allocation in the (111.8-119.98 GHz) Band**

Allocation to Services	Allocation to Services
(111.8-114.25) FIXED, MOBILE, RADIO ASTRONOMY, SPACE RESEARCH (passive)	(114.25-116) EARTH EXPLORATION-SATELLITE (passive), RADIO ASTRONOMY, SPACE RESEARCH (passive)
(116-119.98) EARTH EXPLORATION-SATELLITE (passive) INTER-SATELLITE SPACE RESEARCH (passive)	

**Table 51**  
**Spectrum Allocation in the (119.98-151.5 GHz) Band**

<b>Allocation to Services</b>	<b>Allocation to Services</b>
(119.98-122.25) EARTH EXPLORATION-SATELLITE (passive), INTER-SATELLITE, SPACE RESEARCH (passive)	(122.25-123) FIXED, INTER-SATELLITE MOBILE, Amateur
(123-130) FIXED-SATELLITE (space-to-Earth), MOBILE-SATELLITE (space-to-Earth), RADIONAVIGATION, RADIONAVIGATION-SATELLITE Radio astronomy	(130-134) EARTH EXPLORATION-SATELLITE (active), FIXED, INTER-SATELLITE, MOBILE, RADIO ASTRONOMY
(134-136) AMATEUR, AMATEUR-SATELLITE, Radio astronomy	(136-141) RADIO ASTRONOMY, RADIOLOCATION, Amateur Amateur-satellite
(141-148.5) FIXED, MOBILE RADIO ASTRONOMY, RADIOLOCATION	(148.5-151.5) EARTH EXPLORATION-SATELLITE (passive), RADIO ASTRONOMY, SPACE RESEARCH (passive)

**Table 52**  
**Spectrum Allocation in the (151.5-158.5 GHz) Band**

<b>Allocation to Services</b>	<b>Allocation to Services</b>
(151.5-155.5) FIXED, MOBILE RADIO ASTRONOMY, RADIOLOCATION	(155.5-158.5) EARTH EXPLORATION-SATELLITE (passive), FIXED, MOBILE RADIO ASTRONOMY, SPACE RESEARCH (passive)

5.108. In the band 155.5-158.5 GHz, the allocation to the Earth exploration-satellite (passive) and space research (passive) services shall terminate on 1 January, 2018, (WRC-2000). The date of entry into force of the allocation to the fixed and mobile services in the band 155.5-158.5 GHz shall be 1 January, 2018, (WRC-2000).

**Table 53**  
**Spectrum Allocation in the (158.5-202 GHz) Band**

<b>Allocation to Services</b>	<b>Allocation to Services</b>
(158.5-164) FIXED, FIXED-SATELLITE (space-to-Earth), MOBILE, MOBILE-SATELLITE (space-to-Earth)	(164-167) EARTH EXPLORATION-SATELLITE (passive), RADIO ASTRONOMY, SPACE RESEARCH (passive)
(167-174.5) FIXED, FIXED-SATELLITE (space-to-Earth), INTER-SATELLITE, MOBILE	(174.5-174.8) FIXED, INTER-SATELLITE MOBILE
(174.8-182) EARTH EXPLORATION-SATELLITE (passive), INTER-SATELLITE SPACE RESEARCH (passive)	(182-185) EARTH EXPLORATION-SATELLITE (passive), RADIO ASTRONOMY, SPACE RESEARCH (passive)
(185-190) EARTH EXPLORATION-SATELLITE (passive), INTER-SATELLITE SPACE RESEARCH (passive)	(190-191.8) EARTH EXPLORATION-SATELLITE (passive), SPACE RESEARCH (passive)
(191.8-200) FIXED, INTER-SATELLITE, MOBILE, MOBILE-SATELLITE RADIONAVIGATION RADIONAVIGATION-SATELLITE	(200-202) EARTH EXPLORATION-SATELLITE (passive), RADIO ASTRONOMY, SPACE RESEARCH (passive)

5.109. Use of the bands 174.8-182 GHz and 185-190 GHz by the inter-satellite service is limited to satellites in the geostationary-satellite orbit. The single-entry power flux-density produced by a station in the inter-satellite service, for all conditions and for all methods of modulation, at all altitudes from 0 to 1 000 km above the Earth’s surface and in the vicinity of all geostationary orbital positions occupied by passive sensors, shall not exceed -144 dB(W/(m<sup>2</sup> · MHz)) for all angles of arrival.

**Table 54**  
**Spectrum Allocation in the (202-248 GHz) Band**

<b>Allocation to Services</b>	<b>Allocation to Services</b>
(202-209) EARTH EXPLORATION-SATELLITE (passive), RADIO ASTRONOMY, SPACE RESEARCH (passive)	(209-217) FIXED, FIXED-SATELLITE (Earth-to-space), MOBILE, RADIO ASTRONOMY
(217-226) FIXED, FIXED-SATELLITE (Earth-to-space), MOBILE RADIO ASTRONOMY SPACE RESEARCH (passive)	(226-231.5) EARTH EXPLORATION-SATELLITE (passive), RADIO ASTRONOMY, SPACE RESEARCH (passive)
(231.5-232) FIXED, MOBILE, Radiolocation	(232-235) FIXED, FIXED-SATELLITE (space-to-Earth), MOBILE, Radiolocation
(235-238) EARTH EXPLORATION-SATELLITE (passive), FIXED-SATELLITE (space-to-Earth), SPACE RESEARCH (passive)	(238-240) FIXED, FIXED-SATELLITE (space-to-Earth), MOBILE, RADIOLOCATION, RADIONAVIGATION, RADIONAVIGATION-SATELLITE
(240-241) FIXED, MOBILE, RADIOLOCATION	(241-248) RADIO ASTRONOMY, RADIOLOCATION, Amateur Amateur-satellite

**Table 55**  
**Spectrum Allocation in the (248-1 000 GHz) Band**

Allocation to Services	Allocation to Services
248.1-250 AMATEUR, AMATEUR-SATELLITE, Radio astronomy	(250-252) EARTH EXPLORATION-SATELLITE (passive), RADIO ASTRONOMY, SPACE RESEARCH (passive)
(252-265) FIXED, MOBILE, MOBILE-SATELLITE (Earth-to-space), RADIO ASTRONOMY, RADIONAVIGATION, RADIONAVIGATION-SATELLITE	(265-275) FIXED, FIXED-SATELLITE (Earth-to-space), MOBILE, RADIO ASTRONOMY
(275-1 000) (Not allocated)	

5.110. The Info-communications Authority may permit use of the frequency band 275-1 000 GHz for experimentation with, and development of, various active and passive services taking into account the following spectral line measurements for passive services: radio astronomy service: 275-323 GHz, 327-371 GHz, 388-424 GHz, 426-442 GHz, 453-510 GHz, 623-711 GHz, 795-909 GHz and 926-945 GHz; Earth exploration-satellite service (passive) and space research service (passive): 275-277 GHz, 294-306 GHz, 316-334 GHz, 342-349 GHz, 363-365 GHz, 371-389 GHz, 416-434 GHz, 442-444 GHz, 496-506 GHz, 546-568 GHz, 624-629 GHz, 634-654 GHz, 659-661 GHz, 684-692 GHz, 730-732 GHz, 851-853 GHz and 951-956 GHz.

5.111. Other research in this largely unexplored spectral region may yield additional spectral lines and continuum bands of interest to the passive services. The Info-communications Authority shall take all practicable steps to protect these passive services from harmful interference until the date when an Allocation Table has been identified for the above-mentioned frequency bands.

## 6. Spectrum Allocation Specific to Broadband Services in the 2.3 GHz, 2.5 GHz and 3.5 GHz bands

6.1. The Info-communications Authority shall permit Broadband services in the 2.3 GHz, 2.5 GHz and 3.5 GHz bands including Multipoint Multi-channel Distribution Service (MMDS) in the 2.5 GHz band; Wireless DSL technology in the 2.3 GHz, 2.5 GHz and 3.5 GHz bands) using Wireless Interoperability of Microwave Access, (WiMAX). WiMAX is an IEEE 802.16d standard as amended IEEE 802.16e. The principal technical parameters of the WiMAX are set out at Table 56

**Table 56**  
**Technical Parameters of the WiMAX Standard**

Frequency Range of Operation	Below 6 GHz.
Nominal RF Channel Bandwidth	Flexible from 1.25 MHz up to 28 MHz. Typical bandwidths are: 3.5, 7 MHz (IEEE 802.16d); 5, 8.75, 10 and 20 MHz (IEEE 802.16e)
Peak Channel Transmission Rate per 5 MHz Channel Bandwidth	Up to 17.5 Mbit/s with Single Input Single Output (SISO). Up to 35 Mbit/s with (2 × 2) Multiple Input Multiple Output (MIMO). Up to 70 Mbit/s with (4 × 4) MIMO.
Spectral Efficiency	Up to 3.5 bits/s/Hz in SISO configuration
Frequency Re-use Factor	1
Duplex Method	Frequency Division Duplexing (FDD) [Fixed WiMAX] Time Division Duplexing (TDD) [Fixed and Mobile WiMAX]
Multiple Access Method	Time Division Multiple Access (TDMA) Orthogonal Frequency Division Multiple Access (OFDMA) Scalable OFDMA (SOFDMA)
Mobility Capabilities (Fixed/Nomadic/Mobile)	Fixed, Nomadic (IEEE 802.16d, IEEE 802.16e) Mobile (IEEE 802.16e)
Range	Up to 30 km (Line-of-Sight) (IEEE 802.16d) Up to 10 km (Non Line-of-Sight) (IEEE 802.16e)

**Table 57**  
**Broadband Allocation by Category of Service**

Frequency Band	Type of Info -Communications Services to be Provided
2.3 GHz: (2300 – 2360 MHz)	WAN <sup>1</sup> / VPN <sup>2</sup> services; private WAN / VPN; and Corporate Internet Acc
2.5 GHz: (2500 – 2690 MHz)	WAN / VPN services; private WAN / VPN; and Corporate Internet Access.
3.5 GHz:(3400 – 3600 MHz and 3600 – 3800 MHz )	WAN / VPN services; private WAN / VPN; and Corporate Internet Access; and Residential Internet Access

WAN<sup>1</sup> is the acronym for Wide Area Network and VPN<sup>2</sup> is the acronym for Virtual Private Network

**Table 58**  
**Frequency Assignment Plan for BWA<sup>1</sup> Wireless Communication Systems**  
**in the 2.3 GHz Band**

<u>TDD</u>						
<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>	<b>E</b>	<b>F</b>	
<b>2300</b>	<b>2305</b>	<b>2310</b>	<b>2315</b>	<b>2320</b>	<b>2325</b>	<b>2330</b>
						<b>MHz</b>
<b>G</b>	<b>H</b>	<b>I</b>	<b>J</b>	<b>K</b>	<b>L</b>	
<b>2330</b>	<b>2335</b>	<b>2340</b>	<b>2345</b>	<b>2350</b>	<b>2355</b>	<b>2360</b>
						<b>MHz</b>

<sup>1</sup> BWA is the acronym for Broad Band Wireless Access

6.2. The frequency range comprising 60 MHz is divided into twelve (12) spectrum blocks of 5 MHz each. This means there may not be sufficient Tx/Rx (duplex) spacing to accommodate FDD duplex mode of operation. Since the typical allocation of spectrum for WiMAX in this band is in TDD duplex mode, the duplex mode of operation of WiMAX in the 2.3 GHz band shall be limited to TDD.

**Table 59**  
**Frequency Assignment Plan for BWA<sup>1</sup> Wireless Communication Systems**  
**in the 2.5 GHz Band**

1	2	3	4	5	6	7	8	9	10	
2500	2505	2510	2515	2520	2525	2530	2535	2540	2545	2550
<b>MHz</b>										
11	12	13	14	15	16	17	18	19	20	
2550	2555	2560	2565	2570	2575	2580	2585	2590	2595	2600
<b>MHz</b>										
21	22	23	24	25	26	27	28	29		
2600	2605	2610	2615	2620	2625	2630	2635	2640	2645	
<b>MHz</b>										
30	31	32	33	34	35	36	37	38		
2645	2650	2655	2660	2665	2670	2675	2680	2685	2690	
<b>MHz</b>										

6.3. The 2.5 GHz band is divided into thirty eight 5MHz spectrum blocks. These blocks can be used for FDD and TDD duplex mode of operation. FDD operation shall apply a duplex spacing (Tx/Rx spacing) of 100 MHz (e.g. Block 1 paired with Block 21).

6.4. In order to minimize harmful interference a 5 MHz guard band is required between adjacent spectrum blocks where the duplex mode of operation are either FDD to TDD or vice versa.

6.5. The following spectrum cap shall apply in the 2.5 GHz band: 50 MHz the equivalence of ten spectrum blocks or five paired spectrum blocks of 5 MHz each.

**Table 60**  
**Frequency Assignment Plan for BWA<sup>1</sup> Wireless Communication Systems**  
**in the 3.5 GHz Band**

<u>TDD to FDD &amp; FDD to TDD</u>								
<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>	<b>E</b>	<b>F</b>	<b>G</b>	<b>H</b>	
<b>3400</b>	<b>3425</b>	<b>3450</b>	<b>3475</b>	<b>3500</b>	<b>3525</b>	<b>3550</b>	<b>3575</b>	<b>3600 MHz</b>
<b>I</b>	<b>J</b>	<b>K</b>	<b>L</b>	<b>M</b>	<b>N</b>	<b>O</b>	<b>P</b>	
<b>3600</b>	<b>3625</b>	<b>3650</b>	<b>3675</b>	<b>3700</b>	<b>3725</b>	<b>3750</b>	<b>3775</b>	<b>3800 MHz</b>

6.6. The frequency range 3400-3600 MHz comprises eight spectrum blocks of 25 MHz each with capacity to facilitate channel bandwidths such as 3.5 MHz, 5 MHz and 7 MHz which makes allowance for both TDD and FDD duplex mode of operation in this band. Duplex spacing in this band shall be 100 MHz (e.g. Block A paired with Block E).

6.7. Guard bands will not be required, unless absolutely necessary, between neighbouring spectrum blocks of duplex modes of operation such as FDD-to-TDD, TDD-to-FDD, TDD-to-TDD or FDD-to-FDD.

6.8. Public BWA services shall be restricted to the frequency range 3600-3700MHz. FDD operation in this frequency range shall maintain a duplex spacing (Tx/Rx spacing) of 50 MHz (e.g. Block I paired with Block K).

6.9. The effective spectrum cap for the 3.5 GHz band shall be 50 MHz or two paired spectrum blocks of 25 MHz each.

6.10. The band shall be used primarily for provision of BWA services for the entire island of Montserrat once there is demand for the service.

6.11. Except where so altered by the Info-communications Authority, the Spectrum Plan specific to Broadband Wireless Access services shall be:-

- i. 2.3 GHz band –30 MHz (6 x 5 MHz)
- ii. 2.5 GHz band –50 MHz (10 x 5 MHz)

iii. 3.5 GHz band –50 MHz (2 x 25 MHz)

## Appendix

### **Glossary of Radio-Communication Terms**

The following terms shall have the meanings defined hereafter and these terms and definitions are consistent with those ascribed by the International Telecommunication Union and the Act and shall apply to the Spectrum Plan and other radio-communication matters.

**Administration:** Any governmental department responsible for telecommunications or info-communications of a country.

**Telecommunication/info-communications:** 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.

**Radio:** A general term applied to the use of radio waves.

**Radio waves or hertzian waves:** Electromagnetic waves of frequencies arbitrarily lower than 3000 GHz, propagated in space without artificial guide.

**Radio-communication:** Telecommunication or info-communication by means of radio waves.

**Terrestrial radio-communication:** Any radio-communication other than space.

**space radio-communication:** Any radio-communication involving the use of one or more space stations or the use of one or more reflecting satellites or other objects in space.

**Radio-determination:** 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-navigation:** Radio-determination used for the purposes of navigation, including obstruction warning.

**Radiolocation:** Radio-determination used for purposes other than those of radio-navigation.

**Radio direction-finding:** Radio-determination using the reception of radio waves for the purpose of determining the direction of a station or object.

**Radio astronomy:** Astronomy based on the reception of radio waves of cosmic origin.

**Industrial, scientific and medical (ISM) applications (of radio frequency energy):** Operation of equipment or appliances designed to generate and use locally radio frequency energy for industrial, scientific, medical, domestic or similar purposes, excluding applications in the field of telecommunications.

**Allocation (of a frequency band):** Entry in the Table of Frequency Allocations of a given frequency band for the purpose of its use by one or more terrestrial or space radio-communication services or the radio astronomy service under specified conditions.

**Allotment (of a radio frequency or radio frequency channel):** Entry of a designated frequency channel in an agreed plan, adopted by a competent conference, for use by one or more administrations for a terrestrial or space radio-communication service in one or more identified countries or geographical areas and under specified conditions.

**Assignment (of a radio frequency or radio frequency channel):** Authorization given by an administration for a radio station to use a radio frequency or radio frequency channel under specified conditions.

**Radio-communication service:** A service as defined in this Section involving the transmission, emission and/or reception of radio waves for specific telecommunication/info-communications purposes.

**Fixed service:** A radio-communication service between specified fixed points.

**Fixed-satellite service:** A radio-communication service between earth stations at given positions, when one or more satellites are used; the given position may be a specified fixed point or any fixed point within specified areas; in some cases this service includes satellite-to-satellite links, which may also be operated in the inter-satellite service; the fixed-satellite service may also include feeder links for other space radio-communication services.

**Inter-satellite service:** A radio-communication service providing links between artificial satellites.

**Space operation service:** A radio-communication service concerned exclusively with the operation of spacecraft, in particular space tracking, space telemetry and space telecommand, functions which are reserved for provision within the service in which the space station is operating.

**Mobile service:** A radio-communication service between mobile and land stations, or between mobile stations.

**Mobile-satellite service:** A radio-communication service: – between mobile earth stations and one or more space stations, or between space stations used by this service; or between mobile earth stations by means of one or more space stations and may also include feeder links necessary for operation of the service.

**Land mobile service:** A mobile service between base stations and land mobile stations, or between land mobile stations.

**Land mobile-satellite service:** A mobile-satellite service in which mobile earth stations are located on land.

**Maritime mobile service:** A mobile service between coast stations and ship stations, or between ship stations, or between associated on-board communication stations; survival craft stations and emergency position-indicating radiobeacon stations may also participate in this service.

**Maritime mobile-satellite service:** A mobile-satellite service in which mobile earth stations are located on board ships; survival craft stations and emergency position, indicating radiobeacon stations may also participate in this service.

**Aeronautical mobile service:** A mobile service between aeronautical stations and aircraft stations, or between aircraft stations, in which survival craft stations may participate; emergency position-indicating radio-beacon stations may also participate in this service on designated distress and emergency frequencies.

**Aeronautical mobile (R)\* service:** An aeronautical mobile service reserved for communications relating to safety and regularity of flight, primarily along national or international civil air routes.

**Aeronautical mobile (OR)\*\* service:** An aeronautical mobile service intended for communications, including those relating to flight coordination, primarily outside national or international civil air routes.

**Aeronautical mobile-satellite service:** A mobile-satellite service in which mobile earth stations are located on board aircraft; survival craft stations and emergency position-indicating radio-beacon stations may also participate in this service.

**Info-communication broadcasting service/broadcasting service:** A radio-communication service in which the transmissions are intended for direct reception by the general public and may include sound transmissions, television transmissions or other types of transmission.

**Info-communication broadcasting-satellite service/ broadcasting-satellite service:** A radio-communication service in which signals transmitted or retransmitted by space stations are intended for direct reception by the general public. In this service, the term “direct reception” shall encompass both individual reception and community reception.

**Radio-determination service:** A radio-communication service for the purpose of radio-determination.

**Radio-determination-satellite service:** A radio-communication service for the purpose of radio-determination involving the use of one or more space stations and may also include feeder links necessary for its own operation.

**Radio-navigation service:** A radio-determination service for the purpose of radio-navigation.

**Radio-navigation-satellite service:** A radio-determination-satellite service used for the purpose of radio-navigation and may also include feeder links necessary for its operation.

**Maritime radio-navigation service:** A radio-navigation service intended for the benefit and for the safe operation of ships.

**Maritime radio-navigation-satellite service:** A radio-navigation-satellite service in which earth stations are located on board ships.

**Aeronautical radio-navigation service:** A radio-navigation service intended for the benefit and for the safe operation of aircraft.

**Aeronautical radio-navigation-satellite service:** A radio-navigation-satellite service in which earth stations are located on board aircraft.

**Meteorological aids service:** A radio-communication service used for meteorological, including hydrological, observations and exploration.

**Earth exploration-satellite service:** A radio-communication service between earth stations and one or more space stations, which may include links between space stations, in which:

- information relating to the characteristics of the Earth and its natural phenomena, including data relating to the state of the environment, is obtained from active sensors or passive sensors on Earth satellites;
- similar information is collected from airborne or Earth-based platforms;
- such information may be distributed to earth stations within the system concerned;
- platform interrogation may be included.

This service may also include feeder links necessary for its operation.

*Meteorological-satellite service:* An earth exploration-satellite service for meteorological purposes.

***Standard frequency and time signal service:*** A radio-communication service for scientific, technical and other purposes, providing the transmission of specified frequencies, time signals, or both, of stated high precision, intended for general reception.

***Standard frequency and time signal-satellite service:*** A radio-communication service using space stations on earth satellites for the same purposes as those of the standard frequency and time signal service and may also include feeder links necessary for its operation.

***Space research service:*** A radio-communication service in which spacecraft or other objects in space are used for scientific or technological research purposes.

***Amateur service:*** A radio-communication service for the purpose of self-training, intercommunication and technical investigations carried out by amateurs, that is, by duly authorized persons interested in radio technique solely with a personal aim and without pecuniary interest.

***Amateur-satellite service:*** A radio-communication service using space stations on earth satellites for the same purposes as those of the amateur service.

***Radio astronomy service:*** A service involving the use of radio astronomy.

***Safety service:*** Any radio-communication service used permanently or temporarily for the safeguarding of human life and property.

***Special service:*** A radio-communication service, not otherwise defined herein, carried on exclusively for specific needs of general utility, and not open to public correspondence.

***Station:*** 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 radio-communication service, or the radio astronomy service. Each station shall be classified by the service in which it operates permanently or temporarily.

***Terrestrial station:*** A station effecting terrestrial radio-communication and unless otherwise stated herein or in the Spectrum Rules, any station is a terrestrial station.

***Earth station:*** A station located either on the Earth's surface or within the major portion of the Earth's atmosphere and intended for communication:

- with one or more space stations; or

– with one or more stations of the same kind by means of one or more reflecting satellites or other objects in space.

**Space station:** A station located on an object which is beyond, is intended to go beyond, or has been beyond, the major portion of the Earth's atmosphere.

**Fixed station:** A station in the fixed service.

**Mobile station:** A station in the mobile service intended to be used while in motion or during halts at unspecified points.

**Mobile earth station:** An earth station in the mobile-satellite service intended to be used while in motion or during halts at unspecified points.

**Land station:** A station in the mobile service not intended to be used while in motion.

**Land earth station:** An earth station in the fixed-satellite service or, in some cases, in the mobile-satellite service, located at a specified fixed point or within a specified area on land to provide a feeder link for the mobile-satellite service.

**Coast station:** A land station in the maritime mobile service.

**Coast earth station:** An earth station in the fixed-satellite service or, in some cases, in the maritime mobile-satellite service, located at a specified fixed point on land to provide a feeder link for the maritime mobile-satellite service.

**Ship station:** A mobile station in the maritime mobile service located on board a vessel which is not permanently moored, other than a survival craft station.

**Ship earth station:** A mobile earth station in the maritime mobile-satellite service located on board ship.

**On-board communication station:** A low-powered mobile station in the maritime mobile service intended for use for internal communications on board a ship, or between a ship and its lifeboats and life-rafts during lifeboat drills or operations, or for communication within a group of vessels being towed or pushed, as well as for line handling and mooring instructions.

**Port station:** A coast station in the port operations service.

**Aeronautical station:** A land station in the aeronautical mobile service. In certain instances, an aeronautical station may be located, for example, on board ship or on a platform at sea.

*Aeronautical earth station:* An earth station in the fixed-satellite service, or, in some cases, in the aeronautical mobile-satellite service, located at a specified fixed point on land to provide a feeder link for the aeronautical mobile-satellite service.

***Aircraft station:*** A mobile station in the aeronautical mobile service, other than a survival craft station, located on board an aircraft.

***Aircraft earth station:*** A mobile earth station in the aeronautical mobile-satellite service located on board an aircraft.

***Broadcasting station:*** A station in the broadcasting service.

***Radio-determination Station:*** A station in the radio-determination service.

***Radio-navigation mobile station:*** A station in the radio-navigation service intended to be used while in motion or during halts at unspecified points.

***Radio-navigation land station:*** A station in the radio-navigation service not intended to be used while in motion.

***Radiolocation mobile station:*** A station in the radiolocation service intended to be used while in motion or during halts at unspecified points.

***Radiolocation land station:*** A station in the radiolocation service not intended to be used while in motion.

*Radio direction-finding station:* A radio-determination station using radio direction-finding.

***Radio-beacon station:*** A station in the radio-navigation service the emissions of which are intended to enable a mobile station to determine its bearing or direction in relation to the radio-beacon station.

***Emergency position-indicating radio-beacon station:*** A station in the mobile service the emissions of which are intended to facilitate search and rescue operations.

***Satellite emergency position-indicating radio-beacon:*** An earth station in the mobile-satellite service the emissions of which are intended to facilitate search and rescue operations.

***Standard frequency and time signal station:*** A station in the standard frequency and time signal service.

**Amateur station:** A station in the amateur service.

**Radio astronomy station:** A station in the radio astronomy service.

**Experimental station:** A station utilizing radio waves in experiments with a view to the development of science or technique and does not include amateur stations.

**Ship's emergency transmitter:** A ship's transmitter to be used exclusively on a distress frequency for distress, urgency or safety purposes.

**Radar:** A radio-determination system based on the comparison of reference signals with radio signals reflected, or retransmitted, from the position to be determined.

**Primary radar:** A radio-determination system based on the comparison of reference signals with radio signals reflected from the position to be determined.

**Secondary radar:** A radio-determination system based on the comparison of reference signals with radio signals retransmitted from the position to be determined.

**Radar beacon (racon):** A transmitter-receiver associated with a fixed navigational mark which, when triggered by a radar, automatically returns a distinctive signal which can appear on the display of the triggering radar, providing range, bearing and identification information.

**Instrument landing system (ILS):** A radio-navigation system which provides aircraft with horizontal and vertical guidance just before and during landing and, at certain fixed points, indicates the distance to the reference point of landing.

**Instrument landing system localizer:** A system of horizontal guidance embodied in the instrument landing system which indicates the horizontal deviation of the aircraft from its optimum path of descent along the axis of the runway.

**Marker beacon:** A transmitter in the aeronautical radio-navigation service which radiates vertically a distinctive pattern for providing position information to aircraft.

**Radio altimeter:** Radio-navigation equipment, on board an aircraft or spacecraft, used to determine the height of the aircraft or the spacecraft above the Earth's surface or another surface.

**Radiosonde:** An automatic radio transmitter in the meteorological aids service usually carried on an aircraft, free balloon, kite or parachute, and which transmits meteorological data.

**An adaptive system:** A radio-communication system which varies its radio characteristics according to channel quality.

**Space system:** Any group of cooperating earth stations and/or space stations employing space radio-communication for specific purposes.

**Satellite system:** A space system using one or more artificial earth satellites.

**Satellite network:** A satellite system or a part of a satellite system, consisting of only one satellite and the cooperating earth stations.

**Satellite link:** A radio link between a transmitting earth station and a receiving earth station through one satellite. A satellite link comprises one up-link and one down-link.

**Multi-satellite link:** A radio link between a transmitting earth station and a receiving earth station through two or more satellites, without any intermediate earth station. A multi-satellite link comprises one up-link, one or more satellite-to-satellite links and one down-link.

**Feeder link:** A radio link from an earth station at a given location to a space station, or vice versa, conveying information for a space radio-communication service other than for the fixed-satellite service. The given location may be at a specified fixed point, or at any fixed point within specified areas.

**Public correspondence:** Any info-communication/telecommunication which the offices and stations must, by reason of their being at the disposal of the public, accept for transmission.

**Telegraphy:** A form of info-communication/telecommunication in which the transmitted information is intended to be recorded on arrival as a graphic document; the transmitted information may sometimes be presented in an alternative form or may be stored for subsequent use (CS 1016).

**Telegram:** Written matter intended to be transmitted by telegraphy for delivery to the addressee. This term also includes radio-telegrams unless otherwise specified. In this definition the term telegraphy has the same general meaning as defined in the ITU Convention.

**Radio-telegram:** A telegram, originating in or intended for a mobile station or a mobile earth station transmitted on all or part of its route over the radio-communication channels of the mobile service or of the mobile-satellite service. A graphic document records information in a permanent form and is capable of being filed and consulted; it may take the form of written or printed matter or of a fixed image.

**Radio-telex call:** A telex call, originating in or intended for a mobile station or a mobile earth station, transmitted on all or part of its route over the radio-communication channels of the mobile service or the mobile-satellite service.

**Frequency-shift telegraphy:** Telegraphy by frequency modulation in which the telegraph signal shifts the frequency of the carrier between predetermined values.

**Facsimile:** A form of telegraphy for the transmission of fixed images, with or without half-tones, with a view to their reproduction in a permanent form.

**Telephony:** A form of info-communication/telecommunication primarily intended for the exchange of information in the form of speech.

**Radiotelephone call:** A telephone call, originating in or intended for a mobile station or a mobile earth station, transmitted on all or part of its route over the radio-communication channels of the mobile service or of the mobile-satellite service.

**Simplex operation:** Operating method in which transmission is made possible alternately in each direction of a info-communication/telecommunication channel, for example, by means of manual control.

**Duplex operation:** Operating method in which transmission is possible simultaneously in both directions of a info-communication/telecommunication channel.

**Semi-duplex operation:** A method which is simplex operation at one end of the circuit and duplex operation at the other.

**Television:** A form of info-communication/telecommunication for the transmission of transient images of fixed or moving objects.

**Individual reception (in the broadcasting-satellite service):** The reception of emissions from a space station in the broadcasting-satellite service by simple domestic installations and in particular those possessing small antennas.

**Community reception (in the broadcasting-satellite service):** The reception of emissions from a space station in the broadcasting-satellite service by receiving equipment, which in some

cases may be complex and have antennas larger than those used for individual reception, and intended for use:

- by a group of the general public at one location; or
- through a distribution system covering a limited area.

In general, duplex operation and semi-duplex operation require two frequencies in radio-communication; simplex operation may use either one or two.

**Telemetry:** The use of telecommunication for automatically indicating or recording measurements at a distance from the measuring instrument.

**Radio-telemetry:** Telemetry by means of radio waves.

**Space telemetry:** The use of telemetry for the transmission from a space station of results of measurements made in a spacecraft, including those relating to the functioning of the spacecraft.

**Telecommand:** The use of info-communication/telecommunication for the transmission of signals to initiate, modify or terminate functions of equipment at a distance.

**Space telecommand:** The use of radio-communication for the transmission of signals to a space station to initiate, modify or terminate functions of equipment on an associated space object, including the space station.

**Space tracking:** Determination of the orbit, velocity or instantaneous position of an object in space by means of radio-determination, excluding primary radar, for the purpose of following the movement of the object.

**Radiation:** The outward flow of energy from any source in the form of radio waves.

**Emission:** Radiation produced, or the production of radiation, by a radio transmitting station. For example, the energy radiated by the local oscillator of a radio receiver would not be an emission but a radiation.

**Class of emission:** The set of characteristics of an emission, designated by standard symbols, e.g. type of modulation of the main carrier, modulating signal, type of information to be transmitted, and also, if appropriate, any additional signal characteristics.

**Single-sideband emission:** An amplitude modulated emission with one sideband only.

**Full carrier single-sideband emission:** A single-sideband emission without reduction of the carrier.

**Reduced carrier single-sideband emission:** A single-sideband emission in which the degree of carrier suppression enables the carrier to be reconstituted and to be used for demodulation.

**Suppressed carrier single-sideband emission:** A single-sideband emission in which the carrier is virtually suppressed and not intended to be used for demodulation.

**Out-of-band emission\*:** Emission on a frequency or frequencies immediately outside the necessary bandwidth which results from the modulation process, but excluding spurious emissions.

**Spurious emission\*:** Emission on a frequency or frequencies which are outside the necessary bandwidth and the level of which may be reduced without affecting the corresponding transmission of information. Spurious emissions include harmonic emissions, parasitic emissions, inter-modulation products and frequency conversion products, but exclude out-of-band emissions.

**Unwanted emissions\*:** Consist of spurious emissions and out-of-band emissions.

**Out-of-band domain (of an emission):** The frequency range, immediately outside the necessary bandwidth but excluding the spurious domain, in which out-of-band emissions generally predominate. Out-of-band emissions, defined based on their source, occur in the out-of-band domain and, to a lesser extent, in the spurious domain. Spurious emissions likewise may occur in the out-of-band domain as well as in the spurious domain.

**Spurious domain (of an emission):** The frequency range beyond the out-of-band domain in which spurious emissions generally predominate.

**Assigned frequency band:** The frequency band within which the emission of a station is authorized; the width of the band equals the necessary bandwidth plus twice the absolute value of the frequency tolerance. Where space stations are concerned, the assigned frequency band includes twice the maximum Doppler shift that may occur in relation to any point of the Earth's surface.

**Assigned frequency:** The centre of the frequency band assigned to a station.

**Characteristic frequency:** A frequency which can be easily identified and measured in a given emission. A carrier frequency may, for example, be designated as the characteristic frequency.

**Reference frequency:** A frequency having a fixed and specified position with respect to the assigned frequency. The displacement of this frequency with respect to the assigned

frequency has the same absolute value and sign that the displacement of the characteristic frequency has with respect to the centre of the frequency band occupied by the emission.

**Frequency tolerance:** The maximum permissible departure by the centre frequency of the frequency band occupied by an emission from the assigned frequency or, by the characteristic frequency of an emission from the reference frequency. The frequency tolerance is expressed in parts in 10<sup>6</sup> or in hertz.

**Necessary bandwidth:** For a given class of emission, the width of the frequency band which is just sufficient to ensure the transmission of information at the rate and with the quality required under specified conditions.

**Occupied bandwidth:** The width of a frequency band such that, below the lower and above the upper frequency limits, the mean powers emitted are each equal to a specified percentage  $\beta/2$  of the total mean power of a given emission. Unless otherwise specified in an ITU-R Recommendation for the appropriate class of emission, the value of  $\beta/2$  should be taken as 0.5%.

**Power:** Whenever the power of a radio transmitter, etc. is referred to it shall be expressed in one of the following forms, according to the class of emission, using the arbitrary symbols indicated:

- peak envelope power (PX or pX);
- mean power (PY or pY);
- carrier power (PZ or pZ).

For different classes of emission, the relationships between peak envelope power, mean power and carrier power, under the conditions of normal operation and of no modulation, are contained in ITU-R Recommendations which may be used as a guide. For use in formulae, the symbol p denotes power expressed in watts and the symbol P denotes power expressed in decibels relative to a reference level.

**Peak envelope power (of a radio transmitter):** The average power supplied to the antenna transmission line by a transmitter during one radio frequency cycle at the crest of the modulation envelope taken under normal operating conditions.

**Mean power (of a radio transmitter):** The average power supplied to the antenna transmission line by a transmitter during an interval of time sufficiently long compared with the lowest frequency encountered in the modulation taken under normal operating conditions.

**Carrier power (of a radio transmitter):** The average power supplied to the antenna transmission line by a transmitter during one radio frequency cycle taken under the condition of no modulation.

**Gain of an antenna:** The ratio, usually expressed in decibels, of the power required at the input of a loss-free reference antenna to the power supplied to the input of the given antenna to produce, in a given direction, the same field strength or the same power flux-density at the same distance. When not specified otherwise, the gain refers to the direction of maximum radiation. The gain may be considered for a specified polarization. Depending on the choice of the reference antenna a distinction is made between:

- a) absolute or isotropic gain ( $G_i$ ), when the reference antenna is an isotropic antenna isolated in space;
- b) gain relative to a half-wave dipole ( $G_d$ ), when the reference antenna is a half-wave dipole isolated in space whose equatorial plane contains the given direction;
- c) gain relative to a short vertical antenna ( $G_v$ ), when the reference antenna is a linear conductor, much shorter than one quarter of the wavelength, normal to the surface of a perfectly conducting plane which contains the given direction.

**Equivalent isotropically radiated power (e.i.r.p.):** The product of the power supplied to the antenna and the antenna gain in a given direction relative to an isotropic antenna (absolute or isotropic gain).

**Effective radiated power (e.r.p.) (in a given direction):** The product of the power supplied to the antenna and its gain relative to a half-wave dipole in a given direction.

**Effective monopole radiated power (e.m.r.p.) (in a given direction):** The product of the power supplied to the antenna and its gain relative to a short vertical antenna in a given direction.

**tropospheric scatter:** The propagation of radio waves by scattering as a result of irregularities or discontinuities in the physical properties of the troposphere.

**Ionospheric scatter:** The propagation of radio waves by scattering as a result of irregularities or disc.

**Interference:** The effect of unwanted energy due to one or a combination of emissions, radiations, or inductions upon reception in a radio-communication system, manifested by any performance degradation, misinterpretation, or loss of information which could be extracted in the absence of such unwanted energy.

**Permissible interference:** Observed or predicted interference which complies with quantitative interference and sharing criteria contained in the Spectrum Rules or in ITU-R Recommendations

**Accepted interference:** Interference at a higher level than that defined as permissible interference and which has been agreed upon between two or more administrations without prejudice to other administrations.

**Harmful interference:** Interference which endangers the functioning of a radio-navigation service or of other safety services or seriously degrades, obstructs, or repeatedly interrupts a radio-communication service operating in accordance with the law.

**Protection ratio (R.F.):** The minimum value of the wanted-to-unwanted signal ratio, usually expressed in decibels, at the receiver input, determined under specified conditions such that a specified reception quality of the wanted signal is achieved at the receiver output.

**Coordination area:** When determining the need for coordination, the area surrounding an earth station sharing the same frequency band with terrestrial stations, or surrounding a transmitting earth station sharing the same bi-directionally allocated frequency band with receiving earth stations, beyond which the level of permissible interference will not be exceeded and coordination is therefore not required.

coordination contour: The line enclosing the coordination area.

**Coordination distance:** When determining the need for coordination, the distance on a given azimuth from an earth station sharing the same frequency band with terrestrial stations, or from a transmitting earth station sharing the same bi-directionally allocated frequency band with receiving earth stations, beyond which the level of permissible interference will not be exceeded and coordination is therefore not required.

**Equivalent satellite link noise temperature:** The noise temperature referred to the output of the receiving antenna of the earth station corresponding to the radio frequency noise power which produces the total observed noise at the output of the satellite link excluding noise due to interference coming from satellite links using other satellites and from terrestrial systems. In general, the terms “permissible interference” and “accepted interference” refer to coordination of frequency assignments between and among administrations.

**Effective boresight area** (of a steerable satellite beam): An area on the surface of the Earth within which the boresight of a steerable satellite beam is intended to be pointed. There may be more than one unconnected effective boresight area to which a single steerable satellite beam is intended to be pointed.

**Effective antenna gain contour (of a steerable satellite beam):** An envelope of antenna gain contours resulting from moving the boresight of a steerable satellite beam along the limits of the effective boresight area.

**Deep space:** Space at distances from the Earth equal to, or greater than,  $2 \times 10^6$  km.

**Spacecraft:** A man-made vehicle which is intended to go beyond the major portion of the Earth's atmosphere.

**Satellite:** A body which revolves around another body of preponderant mass and which has a motion primarily and permanently determined by the force of attraction of that other body.

**Active satellite:** A satellite carrying a station intended to transmit or retransmit radio-communication signals.

**Reflecting satellite:** A satellite intended to reflect radio-communication signals.

**Active sensor:** A measuring instrument in the earth exploration-satellite service or in the space research service by means of which information is obtained by transmission and reception of radio waves.

**Passive sensor:** A measuring instrument in the earth exploration-satellite service or in the space research service by means of which information is obtained by reception of radio waves of natural origin.

**Orbit:** The path, relative to a specified frame of reference, described by the centre of mass of a satellite or other object in space subjected primarily to natural forces, mainly the force of gravity.

**Inclination of an orbit (of an earth satellite):** The angle determined by the plane containing the orbit and the plane of the Earth's equator measured in degrees between  $0^\circ$  and  $180^\circ$  and in counter-clockwise direction from the Earth's equatorial plane at the ascending node of the orbit.

**Period (of a satellite):** The time elapsing between two consecutive passages of a satellite through a characteristic point on its orbit.

**Geosynchronous satellite:** An earth satellite whose period of revolution is equal to the period of rotation of the Earth about its axis.

**Geostationary satellite:** A geosynchronous satellite whose circular and direct orbit lies in the plane of the Earth's equator and which thus remains fixed relative to the Earth; by extension, a geosynchronous satellite which remains approximately fixed relative to the Earth.

**Geostationary-satellite orbit:** The orbit of a geosynchronous satellite whose circular and direct orbit lies in the plane of the Earth's equator.

**Steerable satellite beam:** A satellite antenna beam that can be re-pointed.