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# Harmful Interference and Infringements of the Radio Regulations

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# Introduction

- All countries have equal right to use the radio-frequency spectrum;
- To use this resource without causing interference among its users, the ITU Constitution, Convention and the Radio Regulations define the rights and the obligations of each ITU member States when using this resources;
- Member States must enforce the provisions of these instruments so that radiocommunication systems installed on their territory operate without causing harmful interference;
- This presentation relates to the measures to prevent interference and the procedures to be followed for resolving problems of harmful interference and infringements.

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# Definitions

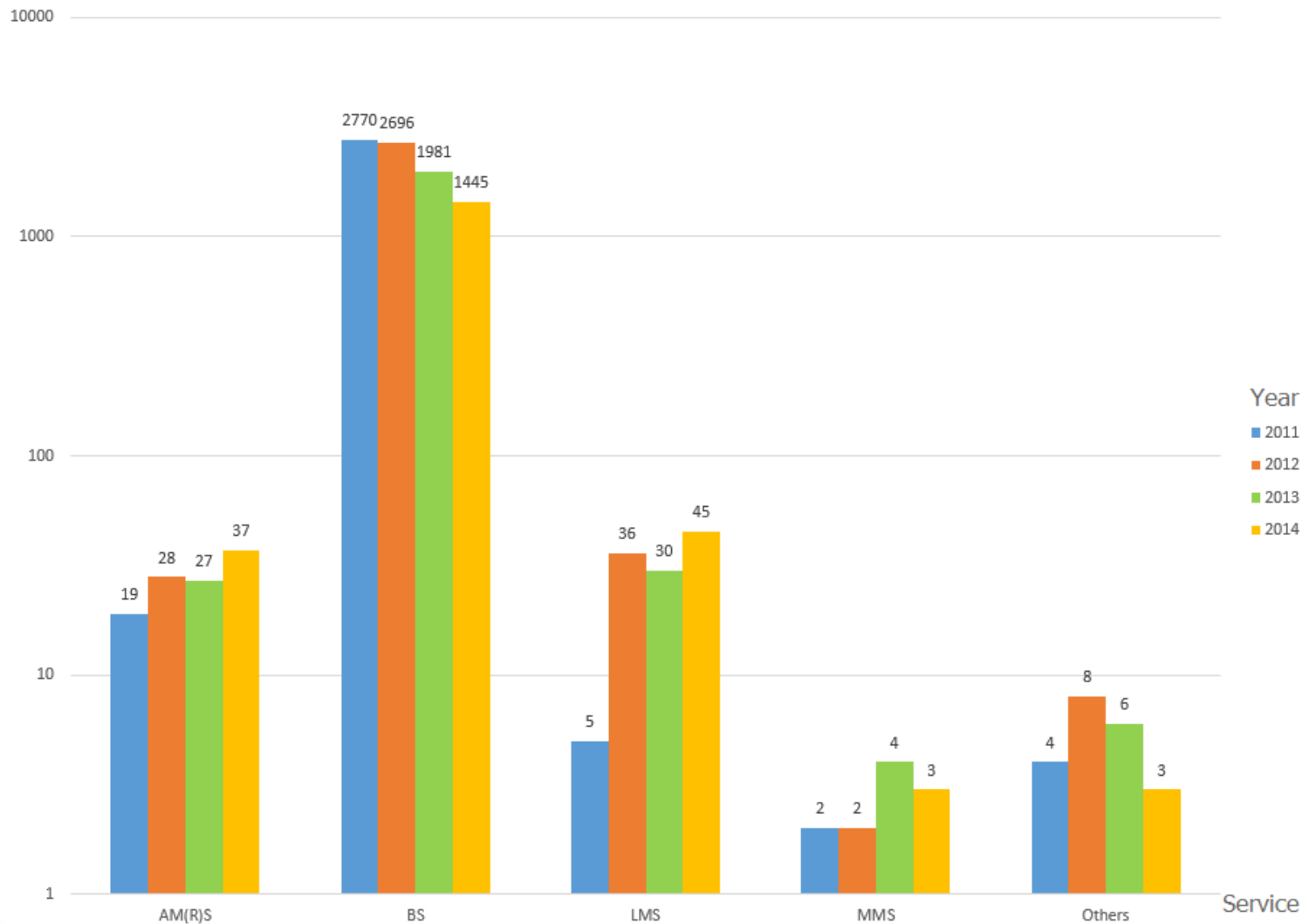
- Radio Regulations (RR1.166 to RR1.169) define interference as follows:
  - ❑ **Interference:** the effect of unwanted energy due to one or a combination of emissions, radiations, or inductions upon reception in a radiocommunication system, manifested by any performance degradation, misinterpretation, 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 these Regulations or in ITU-R Recommendations or in special agreements as provided for in these Regulations.
  - ❑ **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 radionavigation service or of other safety services or seriously degrades, obstructs, or repeatedly interrupts a radiocommunication service operating in accordance with Radio Regulations.

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# Statistics of Harmful interference

- 92 cases of harmful interference received in 2014:
  - ❑ 14 cases concerning space services
    - ❖ 6 requests for assistance of the Bureau
    - ❖ 8 cases for information
- 78 cases concerning terrestrial services
  - ❑ 33 cases related to safety services
  - ❑ 24 request for assistance of the Bureau
  - ❑ 21 cases for information
- 6 cases of infringement of the Radio Regulations (4 terrestrial services and 2 space services)

Total reports received



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# Causes of Harmful interference/Infringement

- Out of band emissions
- Operation of non-coordinated frequency assignments (Broadcasting service and land mobile service)
- Non-observance of limits of frequency tolerances or maximum permitted power levels for spurious emissions
- Operating with different technical parameters from those recorded in Plans or the Master Register
- Unnecessary transmissions
- Unauthorised emissions, etc.

# Example of Out-of-band emissions

## Broadcasting station operating in band 7 100-7 200 kHz

7 100-7 200 kHz

Allocation to services		
Region 1	Region 2	Region 3
7 100-7 200	AMATEUR 5.141A 5.141B	

**5.141A** *Additional allocation:* in Uzbekistan and Kyrgyzstan, the bands 7 000-7 100 kHz and 7 100-7 200 kHz are also allocated to the fixed and land mobile services on a secondary basis. (WRC-03)

**5.141B** *Additional allocation:* in Algeria, Saudi Arabia, Australia, Bahrain, Botswana, Brunei Darussalam, China, Comoros, Korea (Rep. of), Diego Garcia, Djibouti, Egypt, United Arab Emirates, Eritrea, Indonesia, Iran (Islamic Republic of), Japan, Jordan, Kuwait, Libya, Morocco, Mauritania, Niger, New Zealand, Oman, Papua New Guinea, Qatar, the Syrian Arab Republic, Singapore, Sudan, South Sudan, Tunisia, Viet Nam and Yemen, the band 7 100-7 200 kHz is also allocated to the fixed and the mobile, except aeronautical mobile (R), services on a primary basis. (WRC-12)

- The band is exclusively allocated to amateur service
- ➡ Operation of the broadcasting station is not in conformity with Article 5 of the RR
- When assigning frequency, the Table of Frequency Allocations (Article 5 of the Radio Regulations shall be considered).

# Example of Spurious emissions

Intermodulation on 110.3 MHz due to two broadcasting stations on 88.5 MHz and 99.4 MHz (110.3 MHz = 88.5 MHz + 2\*99.4 MHz)

108-117.975 MHz

Allocation to services		
Region 1	Region 2	Region 3
108-117.975	AERONAUTICAL RADIONAVIGATION 5.197 5.197A	

**5.197** *Additional allocation:* in the Syrian Arab Republic, the band 108-111.975 MHz is also allocated to the mobile service on a secondary basis, subject to agreement obtained under No. **9.21**. In order to ensure that harmful interference is not caused to stations of the aeronautical radionavigation service, stations of the mobile service shall not be introduced in the band until it is no longer required for the aeronautical radionavigation service by any administration which may be identified in the application of the procedures invoked under No. **9.21**. (WRC-12)

**5.197A** *Additional allocation:* the band 108-117.975 MHz is also allocated on a primary basis to the aeronautical mobile (R) service, limited to systems operating in accordance with recognized international aeronautical standards. Such use shall be in accordance with Resolution **413 (Rev.WRC-07)**. The use of the band 108-112 MHz by the aeronautical mobile (R) service shall be limited to systems composed of ground-based transmitters and associated receivers that provide navigational information in support of air navigation functions in accordance with recognized international aeronautical standards. (WRC-07)

Safety services require special measures to ensure their protection from harmful interference (RR4.10).

Maximum permitted power levels for unwanted emissions in the spurious domain (RR Appendix 3)

➔ Administrations responsible of the station causing harmful interference to a safety service shall promptly investigate the matter and take necessary remedial action and respond in a timely manner (RR15.37)



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# Example of non-coordinated use of frequencies (broadcasting)

A FM station (A) recorded in the GE84 Plan on behalf of Administration (A), it is interfered by another FM station (B) belonging to Administration B, which is using technical parameters that are different from those recorded in the GE84 Plan.

1. Administration A should have notified to the ITU the assignment to station A for its recording in the Master Register in order to benefit from international recognition from other administrations (No. 7.1 of the GE84 Agreement).
2. Before assigning to station B a frequency with different technical parameters from those in the GE84 Plan, Administration B should have initiated the procedure of modification of the Plan in order to modify the characteristics of the assignment.
3. Once all the required coordination obtained, Administration B has to request the BR to publish the frequency assignment in Part B of the GE84 Special Section.

Thereafter, the frequency will be recorded in the GE84 Plan and Administration B will be in a position to assign the frequency without any risk of harmful interference from other stations operating in conformity with the GE84 Plan.

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# Example of non-coordinated use of frequencies (land mobile)

Two land mobile networks belonging to two different countries are operating on the same frequencies at the border of the two countries.

1. Administrations have to coordinate before issuing the license to operators.
2. Any frequency assignment to a land station and to its associated receiving stations shall be notified to the BR, if the use of that assignment is capable of causing harmful interference to any service of another administration (RR11.2 and RR11.3).

➡ Right to international recognition (RR8.3).

The case of harmful interference may be dealt with directly by direct coordination between their operating organizations (RR11.26).

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# Unnecessary transmissions

## All stations are forbidden to carry out unnecessary transmissions (RR15.1)

- Transmitting stations shall radiate only as much power as is necessary to ensure a satisfactory service (RR15.2).

Radiation in and reception from unnecessary directions shall be minimized by taking the maximum practical advantage of the properties of directional antennas whenever the nature of the service permits (RR15.5).

# Example of unauthorized emissions

## Unauthorized emissions in band 406-406.1 MHz

**406-406.1 MHz**

Allocation to services		
Region 1	Region 2	Region 3
<b>406-406.1</b>	MOBILE-SATELLITE (Earth-to-space) 5.266 5.267	

**5.266** The use of the band 406-406.1 MHz by the mobile-satellite service is limited to low power satellite emergency position-indicating radiobeacons (see also Article **31**). (WRC-07)

**5.267** Any emission capable of causing harmful interference to the authorized uses of the band 406-406.1 MHz is prohibited.

- The frequency band 406 – 406.1 MHz is exclusively allocated to mobile-satellite service for search and rescue activities.
- Resolution 205 – Protection of the systems operating in the mobile-satellite service in the band 406 – 406.1 MHz.
- Monitoring programme organized by the BR (COSPAS-SARSAT), see <http://www.itu.int/en/ITU-R/terrestrial/monitoring/Pages/Resolution205.aspx>

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# Measures prevent interference

## ➤ Constitution

- All stations established or operated by Administrations or operating agencies which are capable of causing harmful interference to stations of other countries shall be in conformity with the provisions of the Constitution, the Convention and the Radio Regulations (Article 6, Nos. 37 and 38).
- All stations must be established and operated by Administrations or operating agencies in such a manner as not to cause harmful interference to the stations of other Administrations (Article 45, Nos. 197 and 198).

## ➤ Radio Regulations

- RR0.4 referring to No. 197 of the Constitution.
- The equipment to be used shall satisfy the Radio Regulations (RR3.1).
- No assignment shall be made in derogation of the Radio Regulations (RR4.4).
- Edge frequencies, for example 87.6 MHz with 300 kHz bandwidth (RR4.5).
- Stations of a secondary service shall not cause harmful interference to stations of a primary service and cannot claim protection from harmful interference from stations of a primary service (RR5.28).
- No transmitting station may be established or operated without a license in conformity with the Radio Regulations (RR18.1).

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# Procedure in a case of Harmful interference

- The procedure in a case of harmful interference is set forth in Section VI of Article 15 of the Radio Regulations.
- The problems of harmful interference are to be resolved on the basis of goodwill and mutual assistance, as stipulated in provision No. 15.22.
- Administrations shall cooperate in the detection and elimination of harmful interference, employing where appropriate the facilities described in Article 16 - The international monitoring system.
- Where practicable, the case of harmful interference may be dealt with directly by their monitoring stations or between the operators.

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# Actions to be taken by administrations

- The administration responsible of the affected station (Administration A) shall send to the administration responsible for the station causing the harmful interference (Administration B), full particulars relating to the harmful interference in the form indicated in Appendix 10 (RR15.27).

# Report of Harmful interference (Appendix 10 to the Radio Regulations)

APPENDIX 10 (Rev.WRC-07)

## Report of harmful interference

(See Article 15, Section VI)

### Particulars concerning the station causing the interference:

- a* Name, call sign or other means of identification .....
- b* Frequency measured .....
- Date: .....
- Time (UTC): .....
- c* Class of emission<sup>1</sup> .....
- d* Bandwidth (indicate whether measured or estimated) .....
- e* Measured field strength or power flux-density<sup>2</sup> .....
- Date: .....
- Time (UTC): .....
- f* Observed polarization .....
- g* Class of station and nature of service .....
- h* Location/position/area/bearing (QTE<sup>3</sup>) (WRC-07) .....
- i* Location of the facility which made the above measurements .....
- Particulars concerning the transmitting station interfered with:*
- j* Name, call sign or other means of identification .....
- k* Frequency assigned .....

<sup>1</sup> The class of emission shall contain the basic characteristics listed in Appendix 1. If any characteristic cannot be determined, indicate the unknown symbol with a dash. However, if a station is not able to identify unambiguously whether the modulation is frequency or phase modulation, indicate frequency modulation (F).

<sup>2</sup> When measurements are not available, signal strength according to the QSA scale should be provided.

<sup>3</sup> See the most recent version of Recommendation ITU-R M.1172. (WRC-07)

AP10-1

AP10-2

- l* Frequency measured .....
- Date: .....
- Time (UTC): .....
- m* Class of emission<sup>4</sup> .....
- n* Bandwidth (indicate whether measured or estimated, or indicate the necessary bandwidth notified to the Radiocommunication Bureau) .....
- o* Location/position/area .....
- p* Location of the facility which made the above measurements .....
- Particulars furnished by the receiving station experiencing the interference:*
- q* Name of station .....
- r* Location/position/area .....
- s* Dates and times (UTC) of occurrence of harmful interference .....
- t* Bearings (QTE<sup>5</sup>) or other particulars (WRC-07) .....
- u* Nature of interference .....
- v* Field strength or power flux-density of the wanted emission at the receiving station experiencing the interference<sup>6</sup> .....
- Date: .....
- Time (UTC): .....
- w* Polarization of the receiving antenna or observed polarization .....
- x* Action requested .....

NOTE - For convenience and brevity, telegraphic reports shall be in the format above, using the letters in the order listed in lieu of the explanatory titles, but only those letters for which information is provided should be used. However, sufficient information shall be provided to the administration receiving the report, so that an appropriate investigation can be conducted.

<sup>4</sup> See footnote 1.

<sup>5</sup> See footnote 3.

<sup>6</sup> See footnote 2.



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# Actions to be taken by administrations

- When informed that a station under its jurisdiction is causing harmful interference, Administration B shall acknowledge receipt of that information as soon as possible (RR15.35).
- Administration B shall investigate the matter and take action in order to eliminate the harmful interference if it is confirmed that the interfering station is located on its territory.
- Immediate reaction of Administration B (in terms of investigation, remedial action and response to the administration responsible of the station affected) is required when one of its stations is causing harmful interference to a safety service (RR11.37).
- If the cooperation between Administrations A and B has not produced satisfactory results, Administration A may forward details of the case to the BR for its information (RR15.41).
- In such a case, a request of assistance may also be sent to the BR with all the technical and operational details and copies of the correspondence (RR15.42).

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# What does the BR do?

➤ The BR studies :

- the Appendix 10 Report;
- the content of the Master Register (status of the two assignments, the results of the examination carried out at that time with respect to these assignments, etc.);
- the frequency assignment notices submitted;
- the content of the relevant Plan if the concerned band is subject to a plan;
- the causes of the interference, taking into account all the facts communicated and any information received concerning the characteristics effectively used and the conditions of operation of the stations concerned.

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# What does the BR do?

- If necessary, the BR may also request the cooperation of stations on the International Monitoring List that may be able to help in identifying the source of harmful interference.
- The Bureau will forward to the two administrations its findings and recommendations for the solution of the problem.
- If the harmful interference persists, the Bureau prepares a report for consideration by the Radio Regulations Board. The Bureau transmits the decisions of the Board to the administrations concerned.

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# Process in a case of Infringement

- Infringement of the Constitution, Convention or Radio Regulations shall be reported to its Administration in the form indicated in Appendix 9 (RR15.19).
- Afterwards, the Administration may inform the administration responsible of the station causing the Infringement (RR15.20).
- RR15.21 stipulates that “if an administration has information of an infringement of the Constitution, the Convention or the Radio Regulations (in particular Article 45 of the Constitution and No. 15.1 of the Radio Regulations) committed by a station under its jurisdiction, the administration shall ascertain the facts and take the necessary actions”.

# Report of an irregularity or infringement (Appendix 9 to the RR)

**APPENDIX 9**

**Report of an irregularity or infringement**

(See Article 15, Section V)

*Particulars concerning the station infringing the Radio Regulations:*

1 Name<sup>1</sup> if known (in BLOCK letters) .....

2 Call sign or other identification (in BLOCK letters) .....

3 Nationality, if known .....

4 Frequency used (kHz, MHz, GHz or THz) .....

5 Class of emission<sup>2</sup> .....

6 Class of station and nature of service, if known .....

7 Location<sup>3, 4, 5</sup> .....

*Particulars concerning the station, the centralizing office or inspection service reporting the irregularity or infringement:*

8 Name (in BLOCK letters) .....

9 Call sign or other identification (in BLOCK letters) .....

10 Nationality .....

11 Location<sup>3, 4</sup> .....

*Particulars of the irregularity or infringement:*

12 Name<sup>6</sup> of the station (in BLOCK letters) in communication with the station committing the irregularity or infringement .....

13 Call sign or other identification (in BLOCK letters) of the station in communication with the station committing the irregularity or infringement .....

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**AP9-1**

**AP9-2**

14 Date and time<sup>7</sup> .....

15 Nature of the irregularity or infringement<sup>8</sup> .....

16 Extracts from ship log or other information supporting the report .....

*Particulars concerning the transmitting station interfered with<sup>9</sup>:*

17 Name of the station (in BLOCK letters) .....

18 Call sign or other identification (in BLOCK letters) .....

19 Frequency assigned (kHz, MHz, GHz or THz) .....

20 Frequency measured at the time of the interference .....

21 Class of emission<sup>2</sup> and bandwidth (indicate whether measured or estimated, or indicate the necessary bandwidth notified to the Radiocommunication Bureau) .....

22 Receiving location<sup>3, 4</sup> (in BLOCK letters) where the interference was experienced .....

23 Certificate:

I certify that the foregoing report represents, to the best of my knowledge, a complete and accurate account of what took place. ....

Signatures<sup>10</sup> ..... Date: .....

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# Conclusions

- The main objective of the RR is to prevent harmful interference between stations. Members are obliged to adhere strictly to the provisions of the RR for all stations under their responsibility.
- The main objective of the Radio Regulations is to prevent harmful interference between stations. Members are obliged to adhere strictly to the provisions of the Radio Regulations for all stations under their responsibility.
- While it is true that spectrum management is a sovereign matter for each Member, the fact remains that radio waves are able to cross borders. In order to avoid harmful interference, it is necessary to coordinate the use of radio-frequency spectrum at the borders.

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*Thank you for  
your attention!*

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