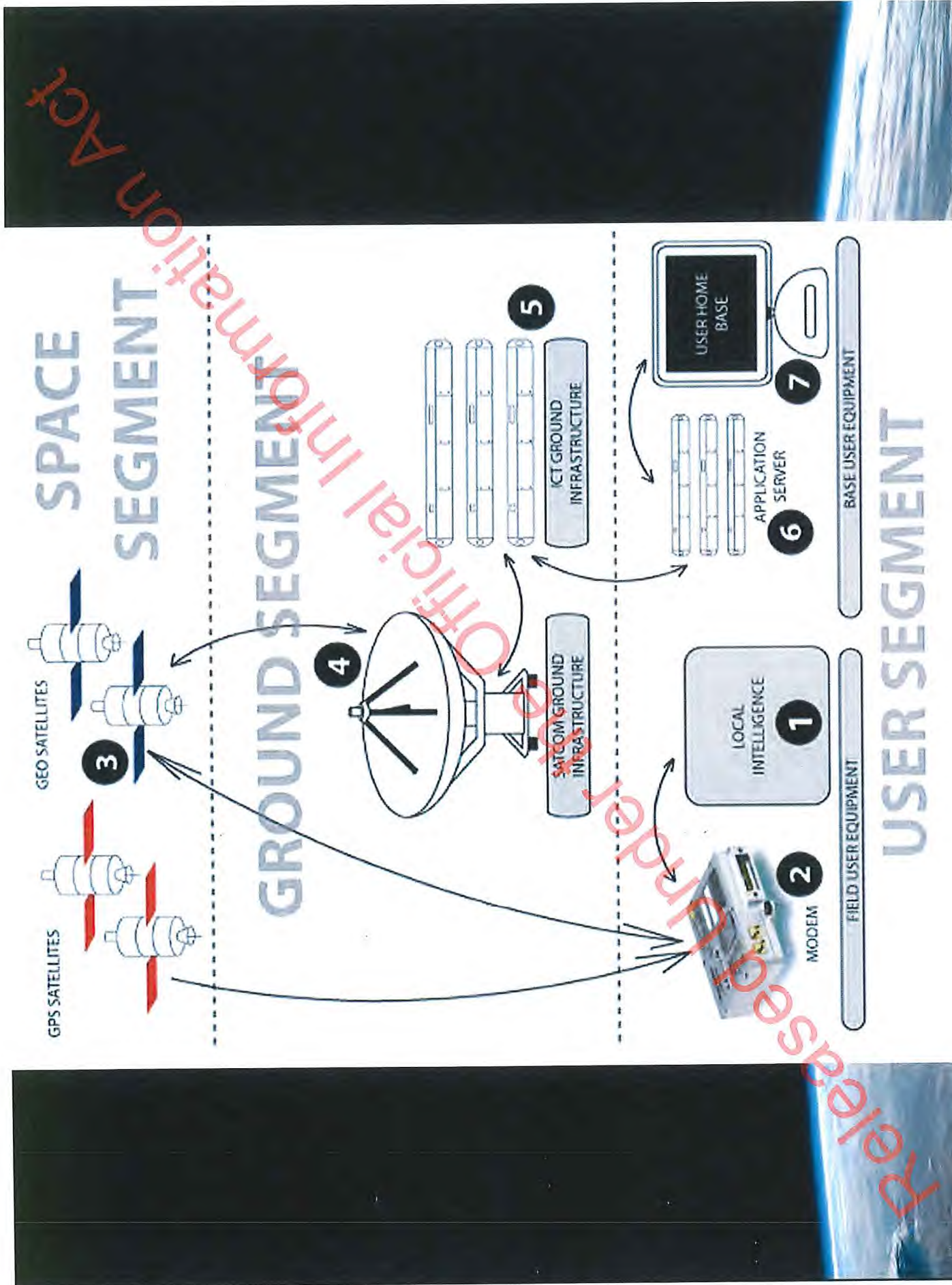


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REGULATION OF ELECTRO-MAGNETIC SPECTRUM

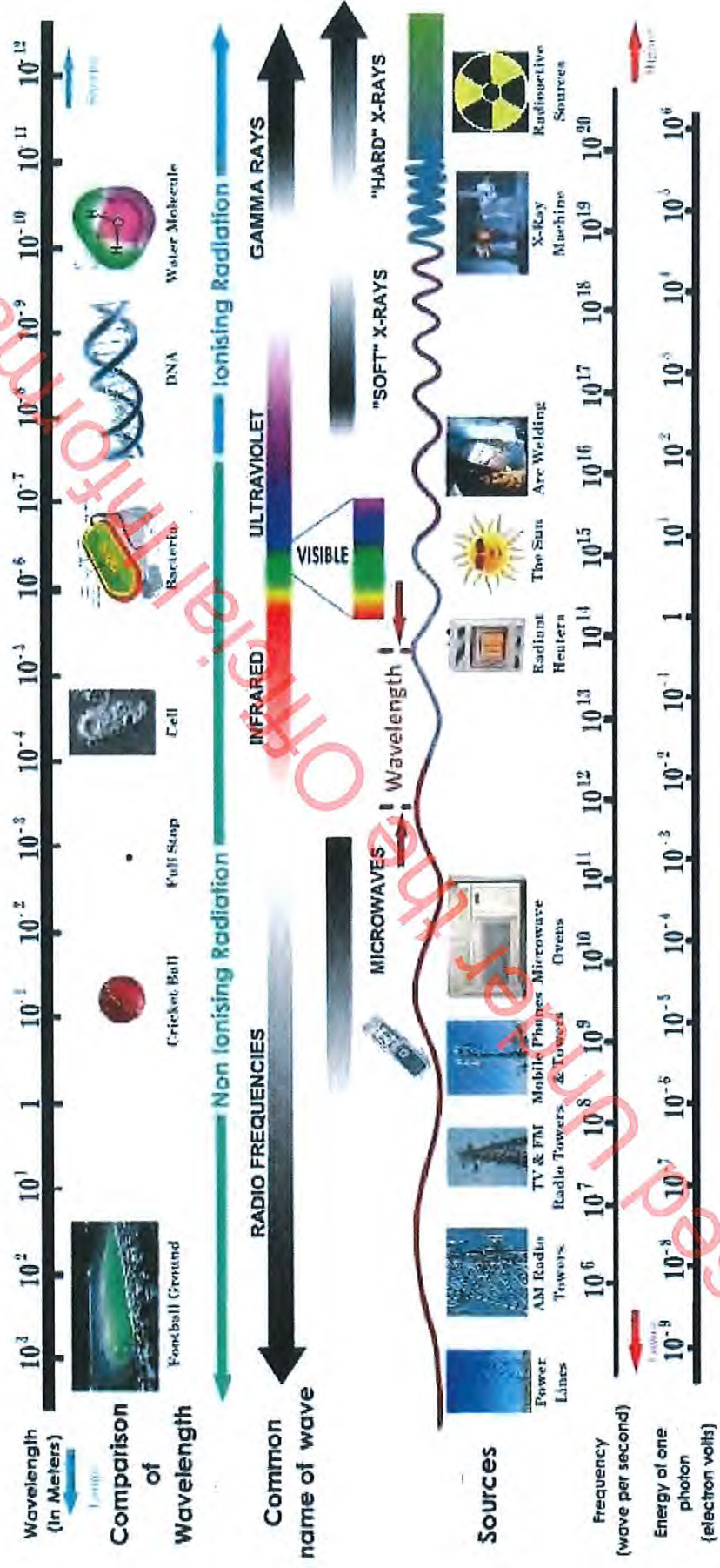
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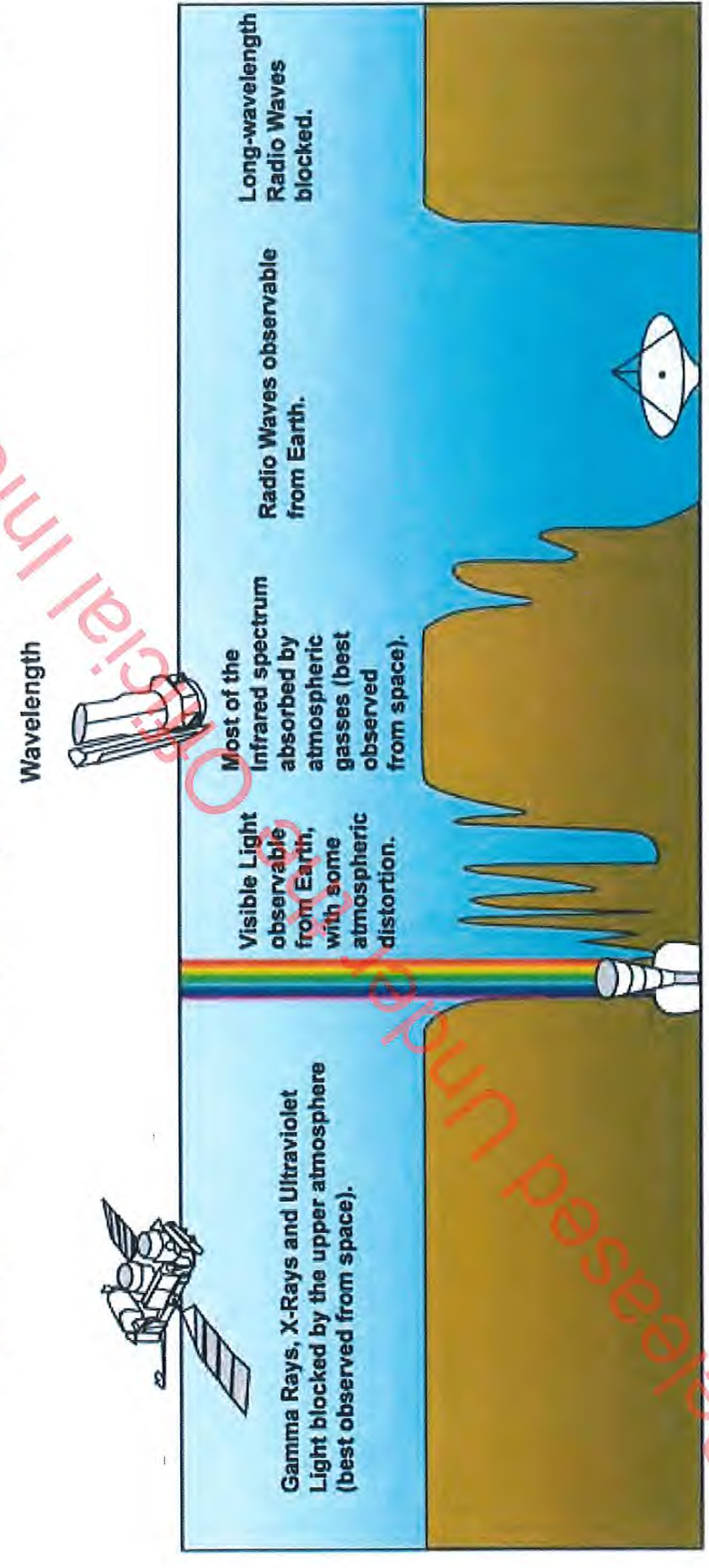
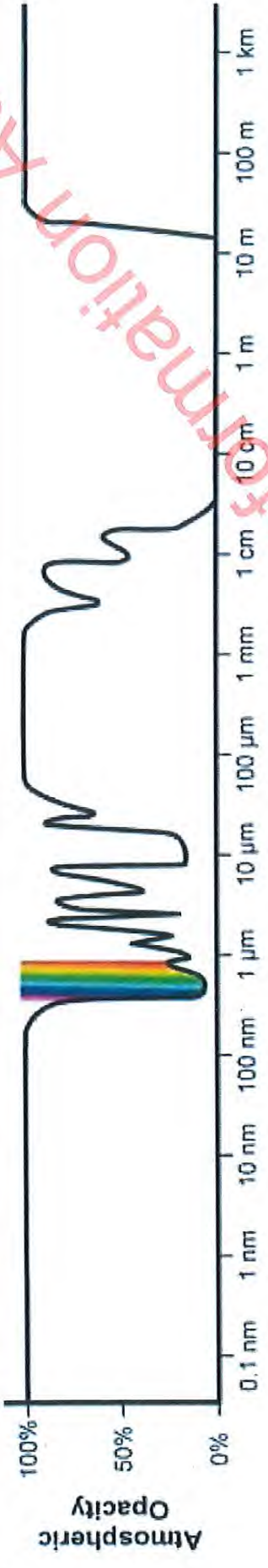


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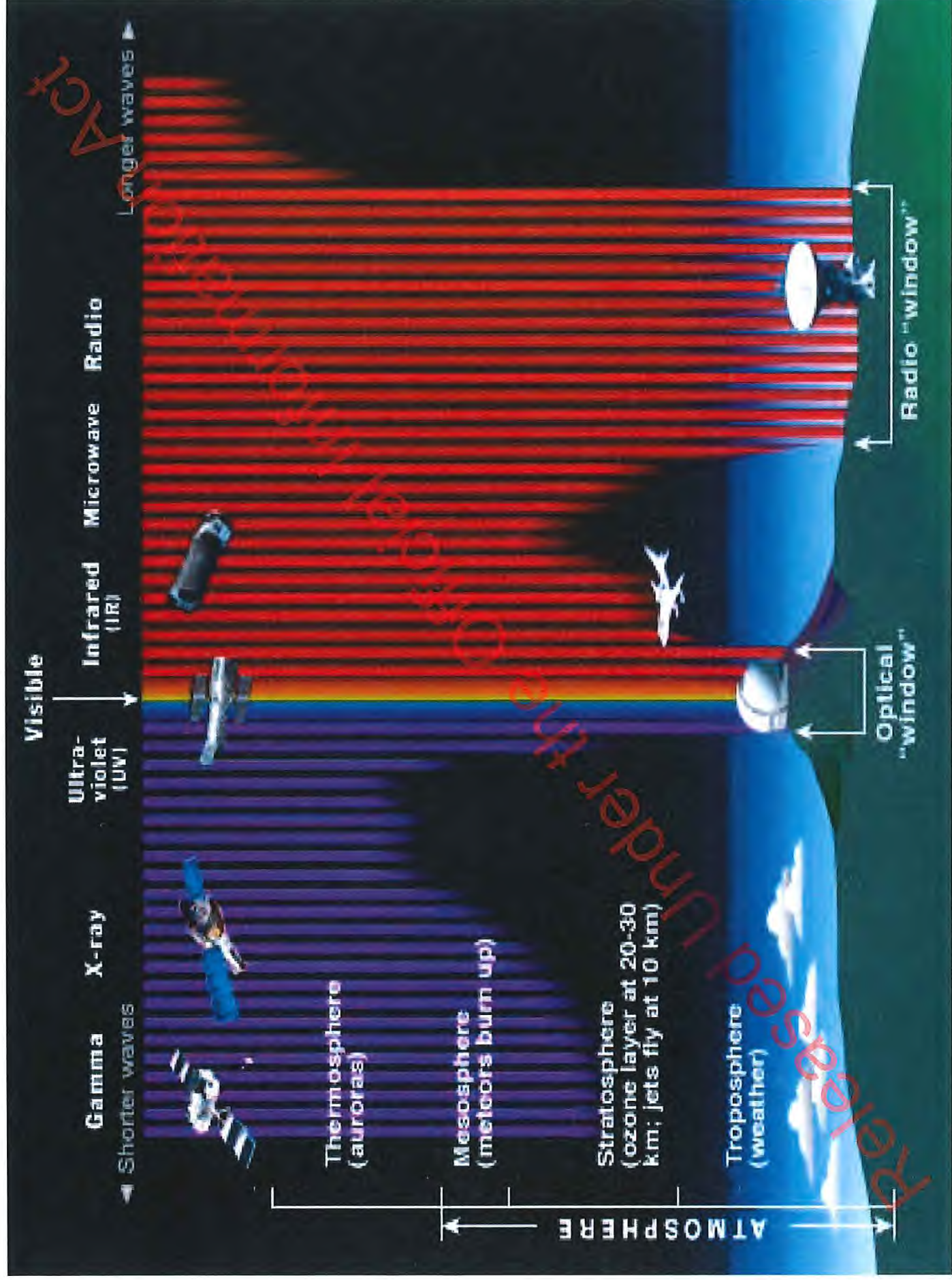
THE ELECTROMAGNETIC SPECTRUM



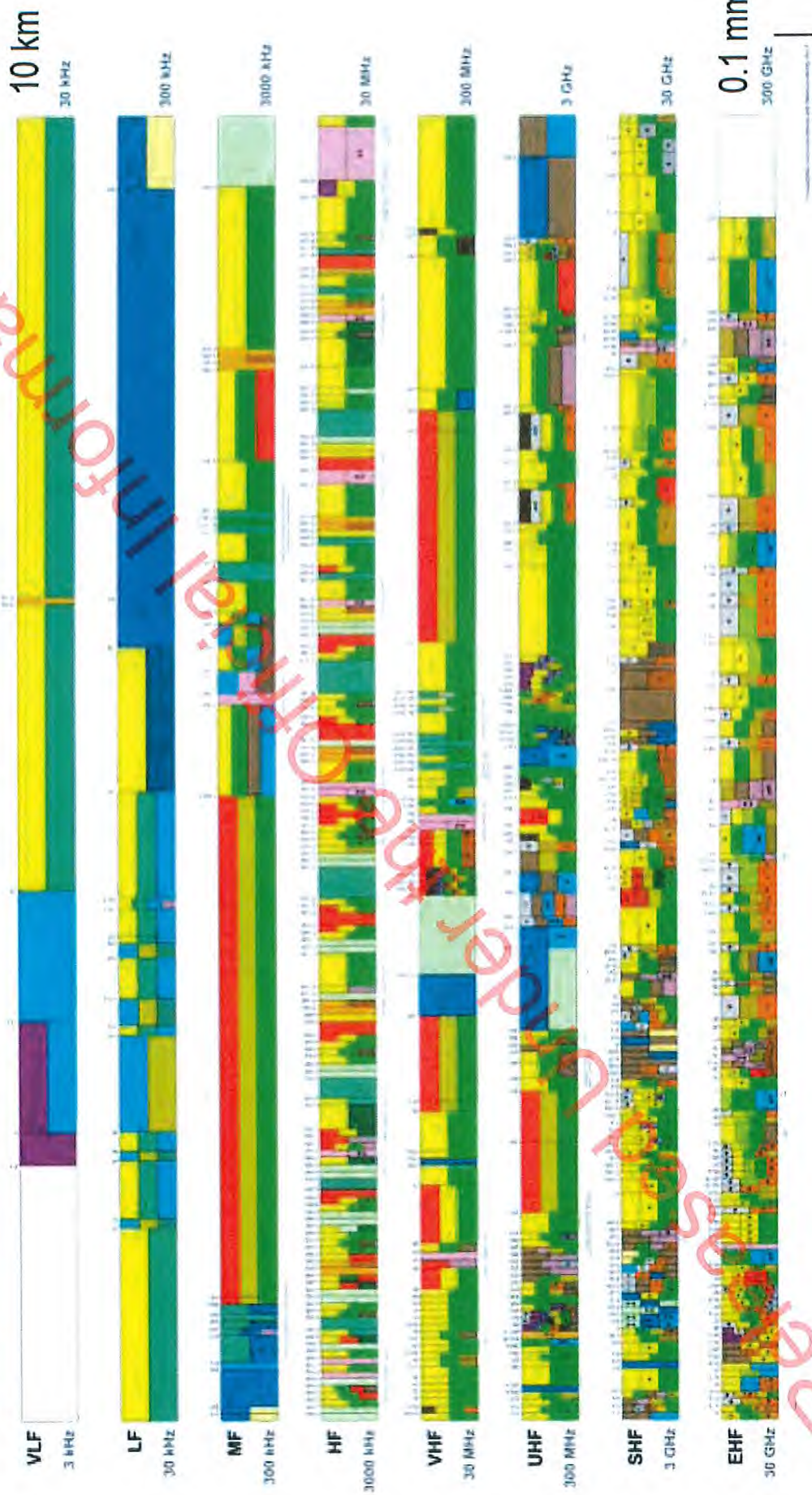
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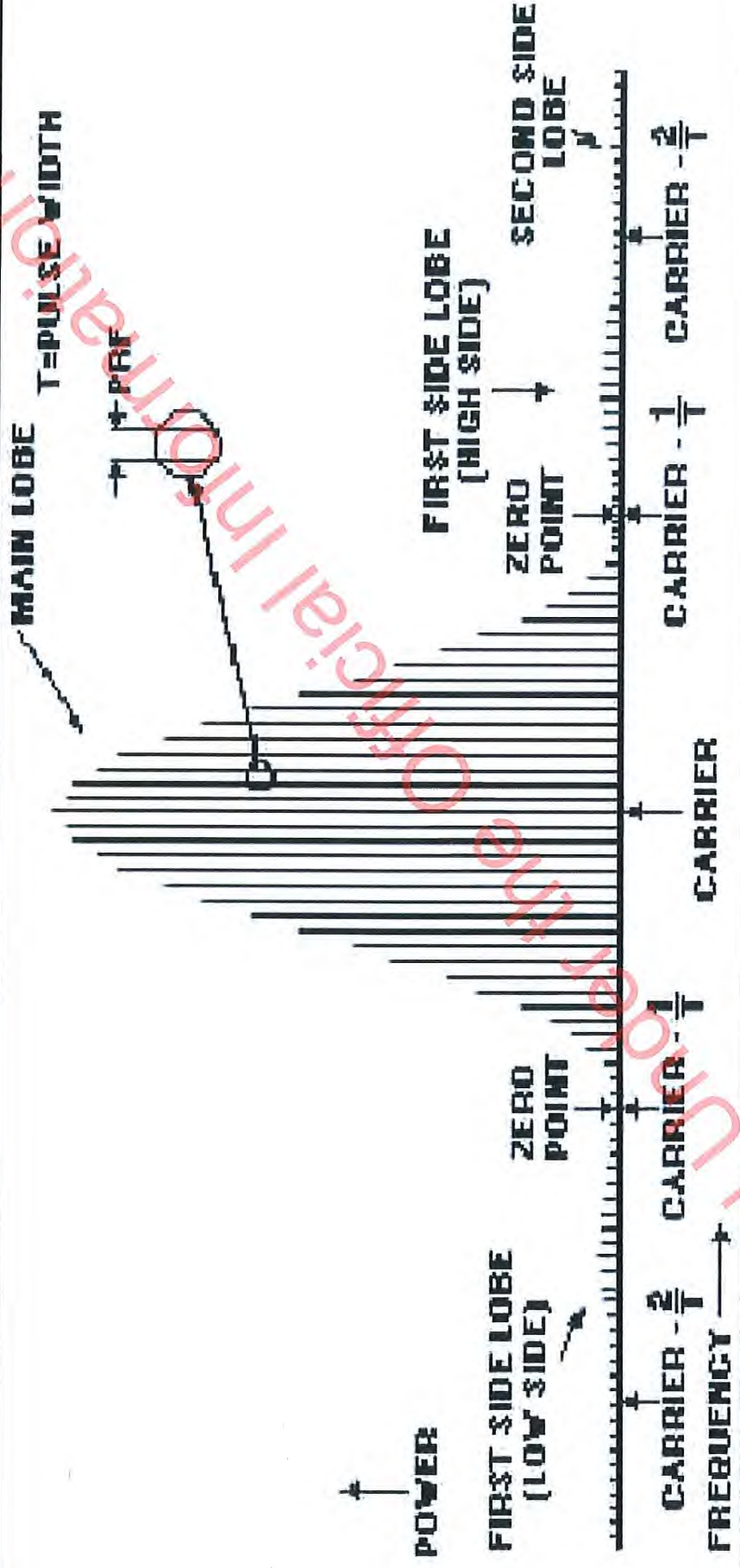


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Australian radiofrequency spectrum allocations chart





MANAGEMENT OF THE RADIO FREQUENCY SPECTRUM

- The radio frequency spectrum is a limited resource.
- Frequency allocation and use of the spectrum requires coordination to minimize interference between users.
- The International Telecommunication Union (ITU), originally named the International Telegraph Union, was created in 1885 and is responsible for worldwide spectrum regulation.
- Since that time the ITU has been involved in the evolution of communications – from telegraphy through to the modern world of satellites, mobile phones and the Internet.



THE ITU AND SPACE

- On 1 January 1949 the United Nations formally recognized the ITU as the specialized agency for telecommunications.
- With the launch of Sputnik-1 in 1957 satellites quickly became used for telecommunications.
- In 1963, ITU held an Extraordinary Administrative Conference for space communications
- The ITU has numerous functions relating to satellites and telecommunications:
 - Coordination and allocation of the global radio spectrum used by satellites;
 - Assignment of orbital slots to satellites stationed in the GEO orbit;
 - Prohibits intentional interference with satellite signals on the basis of reciprocity
 - Develops worldwide technical standards for the use, assignment and allocation of radio frequencies



ITU COMPOSITION

- THE ITU is comprised of 193 Member States who are signatories and parties to the Constitution, Convention and Administrative Regulations of the ITU.
- These basic texts establish a binding global framework for international telecommunications and establish the structure of the Union.
- In addition to member states, over 700 private sector and academic institutions are members of the ITU



Structure



PURPOSE OF THE UNION

- Article 1 of the Constitution sets out the purposes of the ITU which includes:
 - “The Union shall effect allocation of bands of the radio-frequency spectrum, the allotment of radio frequencies and the registration of radio frequency assignments and, for space services, of any associated orbital position in the geostationary-satellite orbit or any associated characteristics of satellite in other orbits, in order to avoid harmful interference between radio stations of different countries.”



STATES ARE BOUND

- ITU member States are obligated to respect the ITU Constitution, Convention and regulations:

• ARTICLE 6

- The Member States are bound to abide by the provisions of this Constitution, the Convention and the Administrative Regulations in all telecommunication offices and stations established or operated by them....
- The Member States are also bound to take the necessary steps to impose the observance of the provisions of this Constitution, the Convention and the Administrative Regulations upon operating agencies authorized by them to establish and operate telecommunications ...



ITU RADIO REGULATIONS(RR)

- ITU Radio Regulations (RR) are the primary regulatory document on international spectrum management.
- The RR are founded on the following key principles:
 - Members shall endeavour to limit the number of frequencies and the spectrum used to the **minimum essential** to provide in a satisfactory manner the necessary services;
 - Members 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**, in conformity with the provisions of these Regulations, so that countries or groups of countries may have equitable access to both, taking into account the special needs of the developing countries and the geographical situation of particular countries
 - All stations, whatever their purpose, must be established and operated in such a manner as **not to cause harmful interference** to the radio services or communications of other agencies or of recognized operating agencies, or of other duly authorized operating agencies which carry on a radio service, and which operate in accordance with the provisions of these Regulations



ITU RADIO REGULATIONS(RR)

- The RR advance the following objectives:
 - to facilitate equitable access to and rational use of the natural resources of the radio-frequency spectrum and the geostationary-satellite orbit;
 - to ensure the availability and protection from harmful interference of the frequencies provided for distress and safety purposes;
 - assist in the prevention and resolution of cases of harmful interference between the radio services of different administrations;
 - facilitate the efficient and effective operation of all radio communication services;
 - provide for and, where necessary, regulate new applications of radio communication technology.



INTERFERENCE

- Some degree of frequency interference can be expected and must be accepted and tolerated.
- However interference that endangers the functioning of a radio service or seriously degrades, obstructs or repeatedly interrupts a radio communication service operating in accordance with ITU Radio Regulations is "Harmful interference"
- **Harmful Interference is prohibited by Article 45 of the ITU Constitution:**
 - "All stations... must be established and operated in such a manner as not to cause harmful interference to the radio services or communications of other Member States or of recognized operating agencies, or of other duly authorized operating agencies which carry on a radio service, and which operate in accordance with the provisions of the Radio Regulations."



NATIONAL DEFENCE AND SECURITY

- The ITU regime does not seek to restrict State action and activity in the military context:
- ARTICLE 48
 - 1. Member States retain their **entire freedom** with regard to **military radio** installations.
 - 2. Nevertheless, these installations must, **so far as possible**, observe statutory provisions relative to **giving assistance in case of distress** and to the measures to be taken to **prevent harmful interference**, and the provisions of the Administrative Regulations concerning the types of emission and the frequencies to be used, according to the nature of the service performed by such installations.
 - 3. Moreover, when these installations take part in the service of public correspondence or other services governed by the Administrative Regulations, they must, in general, comply with the regulatory provisions for the conduct of such services.
- Despite the Article 48 exemption most states abide by ITU Administrative Regulations as a matter of policy.



NATIONAL DEFENCE AND SECURITY

- The ITU Constitution also provides for Member States to suspend services.
- ARTICLE 34
 - 1. Member States reserve the **right to stop**, in accordance with their national law, the **transmission of any private telegram which may appear dangerous to the security of the State** or contrary to its laws, to public order or to decency, provided that they immediately notify the office of origin of the stoppage of any such telegram or any part thereof, except when such notification may appear dangerous to the security of the State.
 - 2. Member States also reserve the right to cut off, in accordance with their national law, any other private telecommunications which may appear dangerous to the security of the State or contrary to its laws, to public order or to decency.
- ARTICLE 35
 - Each Member State reserves **the right to suspend** the international telecommunication service, either generally or only for certain relations and/or for certain kinds of correspondence, outgoing, incoming or in transit, provided that it immediately notifies such action to each of the other Member States through the Secretary-General.



RESPONDING TO HARMFUL INTERFERENCE

- Harmful interference is primarily addressed through bilateral negotiations between concerned States (Article 15 of the RRs).
- Harmful interference concerns can ultimately be referred to the Secretariat by member states under the RRs (Articles 15 and 13) but the Secretariat only makes recommendations to the concerned States.
- Article 56 of the Constitution provides for Dispute resolution by:
 - Providing that disputes are to be resolved bi-laterally;
 - Making available a voluntary arbitration process under Article 41 of the Constitution;
 - Relying on an Optional Protocol on Compulsory Dispute resolution that makes the Article 41 arbitration process compulsory for signatories.
- In practice, neither Article 41 of the Convention nor the Optional Protocol has been used.
- The ITU does not possess any mechanism to impose a solution or take action against the violators of its rules and regulations.



UNINTENTIONAL INTERFERENCE

- Unintentional interference accounts for a large percentage of satellite interference and usually does not generate protracted challenges or difficulties between states and commercial actors.
- Causes include:
 - human error
 - system failure
 - deficient equipment
 - design failures
 - failure to respect regulatory requirements and industry standards...



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INTENTIONAL INTERFERENCE

- Satellite signals have become increasingly attractive targets for intentional interference
- Intentional Interference amounts to the deliberate targeting and disruption of satellite signals intended to interrupt, degrade or limit the performance of the targeted signal
- This frequently takes the form of active jamming

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INTENTIONAL INTERFERENCE

- Interference and disruptive jamming effects are accomplished non-kinetically and disturb the communications of the satellites (radio waves or links) on Earth and to and from space based satellites
- It has been reported that more than 80 percent of satellite jamming incidents historically have been precipitated by diplomatic and political differences
- Jamming is often crude and indiscriminate



EUTELSAT

- In the Spring of 2009 BBC World Service's Persian programming carried on EUTELSAT's Hot Bird 6 satellite stationed at 13 degrees east experienced jamming
- The jamming corresponded with Iran's 2009 elections, and it continued intermittently, particularly during the broadcaster's coverage of politically sensitive events in Iran
- After consultation with other operators in the region and prolonged testing EUTELSAT concluded that the jamming signals were coming from Iranian territory

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EUTELSAT

- EUTELSAT actively moved the affected programming to different transponders on the satellite in an attempt to determine whether the harmful interference being experienced was intentional or accidental
- The jamming continued regardless of the transponder being used which lead EUTELSAT to conclude that the jamming was intentional and targeted
- Once it was determined beyond a reasonable doubt that the interference was coming from Iran, EUTELSAT contacted France's Agence Nationale des Fréquences Française, which then contacted Iran
- Iran responded advising that after investigating and exploring the areas specified by France, it had not been able to trace any such sources of interference



EUTELSAT

- Solutions involving the use of replacement capacity on EUTELSAT satellites, whose beams were not subject to Iranian interference, and the shifting of programming to other systems were pursued by BBC and EUTELSAT
- In February 2010 BBC World Service, Deutsche Welle, and Voice of America issued a joint statement in which they condemned any jamming of their channels and called on "satellite operators and those who regulate them to take urgent action to put pressure on Iran to stop this activity"
- In a mid-March 2010 press release EUTELSAT refers to two complaints being filed the first to France's Agence Nationale des Fréquences Française (ANFR) and then later with the ITU's Radio Regulations Board



EUTELSAT

- On 26 March 2010 the ITU Radio Regulations Board issued the following statement:
 - ...the RRB determined that EUTELSAT satellite networks... are receiving harmful interference. The Board noted that "the interfering signals appear to be of a nature that is prohibited under Radio Regulations No. 15.1"... The Radio Regulations Board concluded that the interference appeared to be emanating from the territory of Iran... The interference is reported to have persisted for some time, adversely affecting the operation of several EUTELSAT satellite... The Radio Regulations Board urged the Administration of Iran to continue its effort in locating the source of interference and to eliminate it as a matter of the highest priority... The Administration of France and the ITU Radio communication Bureau have been called upon to assist the Administration of Iran in identifying the source of the interference.



EUTELSAT

- In October 2012 EUTELSAT ceased carrying Iranian broadcast channels on their Hotbird service.
- The removal of these channels was reported to be partly in response to escalated and ongoing electronic jamming of EUTELSAT satellites, jamming that had been ongoing since 2009.

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EUTELSAT

- At the 2012 World Radio Communication Conference (WRC), the ITU amended portions of the ITU Constitution and RRs. The changes declare violations of Article 45 of the ITU Constitution and Article 15.1 of the RRs as acts requiring necessary actions by national administrations.
 - ITU Radio Regulation Article 15.21 §13 (as modified by WRC-12): "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 over which it may exercise authority, under its jurisdiction, the administration shall ascertain the facts, fix the responsibility and take the necessary actions."
- Of the 193 member States, 165 approved the change.



RESPONSE TO INTENTIONAL INTERFERENCE

- Intentional long term harmful interference is unquestionably harmful to the business interests of a commercial satellite operator.
- The EUTELSAT example highlights this and flags the response options available to commercial entities, states and the ITU in such circumstances:
 - Application of political pressure on States where interference activities originate
 - Reliance on technology to combat jamming
 - Attempts to strengthen international regulatory regimes.
- All three mechanisms were pursued in the EUTELSAT example but nothing has permanently resolved the interference EUTELSAT has experienced
- Presumably demonstrations of the relative ineffectiveness of compliance regimes creates commercial uncertainty and may well lead to longer term damage or weakness to the industry

OTHER QUESTIONS

- Does Iran have a right to jam the broadcasts into its territory under Article 34 of the ITU Constitution?
- Does EUTELSAT have a duty to demonstrate it is operating in a manner consistent with ITU RRs, specifically Article 23.13 § 4?
 - In devising the characteristics of a space station in the broadcasting-satellite service, all technical means available shall be used to reduce, to the maximum, the radiation over the territory of other countries unless an agreement has been previously reached with such countries.



QUESTIONS / COMMENTS

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