

First ITU/WMO Seminar

**Use of Radio Spectrum for Meteorology:
Weather, Water and Climate Monitoring and Prediction**

**WMO Headquarters
Geneva, Switzerland, 16-18 September 2009**

www.itu.int/ITU-R/go/seminar-itu-wmo/



**World
Meteorological
Organization**



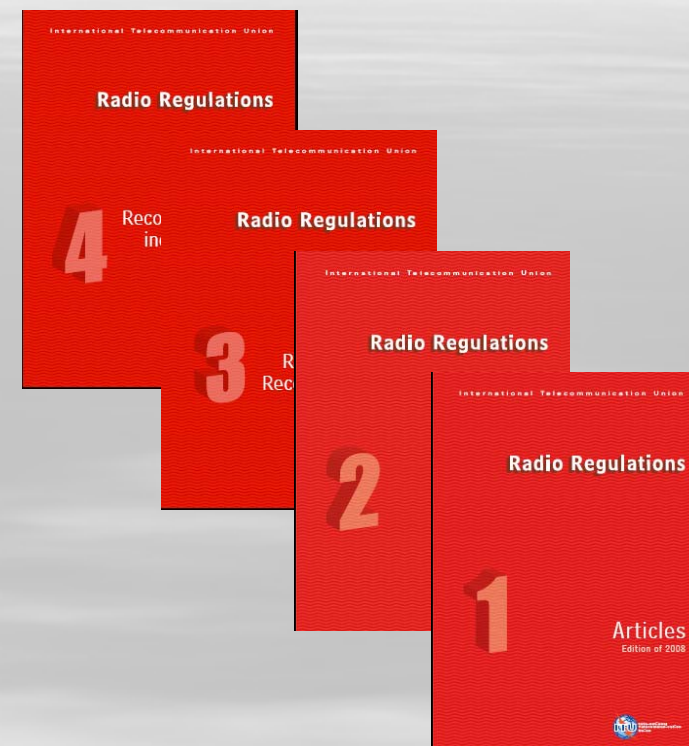
**International
Telecommunication
Union**



THE FIRST ITU/WMO SEMINAR



ITU Radio Regulations and World Radiocommunication Conferences



*Albert Nalbandian,
CPM Chairman for WRC-12*



Purpose of the ITU in relation to spectrum



The ITU mission is to ensure rational, equitable, efficient and economical use of the limited spectrum/orbit resource by all radio services for the greatest benefit to all people

The ITU RR define 39 radio_{communication} services

The success of any system of these services depends critically on availability of frequency bands and suitable standards

Most technically suitable bands are already in use



Historical facts (WRC and RR)



The ITU has provided a forum for setting standards for radiocommunication systems since 1906 when the limited nature of spectrum was recognized and the first Radio Regulations (RR) were approved.

The first frequency allocations to radio services have been done by ITU in 1927.



Historical facts (WRC and RR)



1906 (Berlin)	International Radiotelegraph Convention - 1st Radio Regulations
1927 (Washington DC)	Radio Regulations (complete revision, 1st allocations) Creation of the CCIR
1932 (Madrid)	Radio Regulations (complete revision) International Telecommunication Union (new name)
1947 (Atlantic City)	Radio Regulations (complete revision, MetAids service) ITU is UN specialized agency, creation of the IFRB
1958 (Geneva)	Radio Regulations (complete revision)
1979 (Geneva)	Radio Regulations (complete revision)
1988 (Nice)	Creation of the VGE (Res.8 (Nice, 1988))
1992 (Geneva)	ITU Radiocommunication Sector (ITU-R)



ITU Radiocommunication Sector (ITU-R)



Since 1993 ITU work in the field of radio are consolidated in the Radiocommunication Sector (ITU-R).



ITU Radiocommunication Sector



Radiocommunication Sector (ITU-R) since 1 March 1993 works through:

- ❖ **World Radiocommunication Conference (WRC)**
- ❖ Radiocommunication Assembly (RA)
- ❖ Regional Radiocommunication Conference (RRC)
- ❖ Radio Regulations Board (RRB)
- ❖ Radiocommunication Advisory Group (RAG)
- ❖ Radiocommunication Study Groups (ITU-R SG)
- ❖ Radiocommunication Bureau



ITU Radio Regulations (Edition 2008)



Based on the results of the VGE studies WRC-95 approved the “simplified version” of the RR, which have been modified by WRC-97, WRC-2000, WRC-03 and WRC-07.

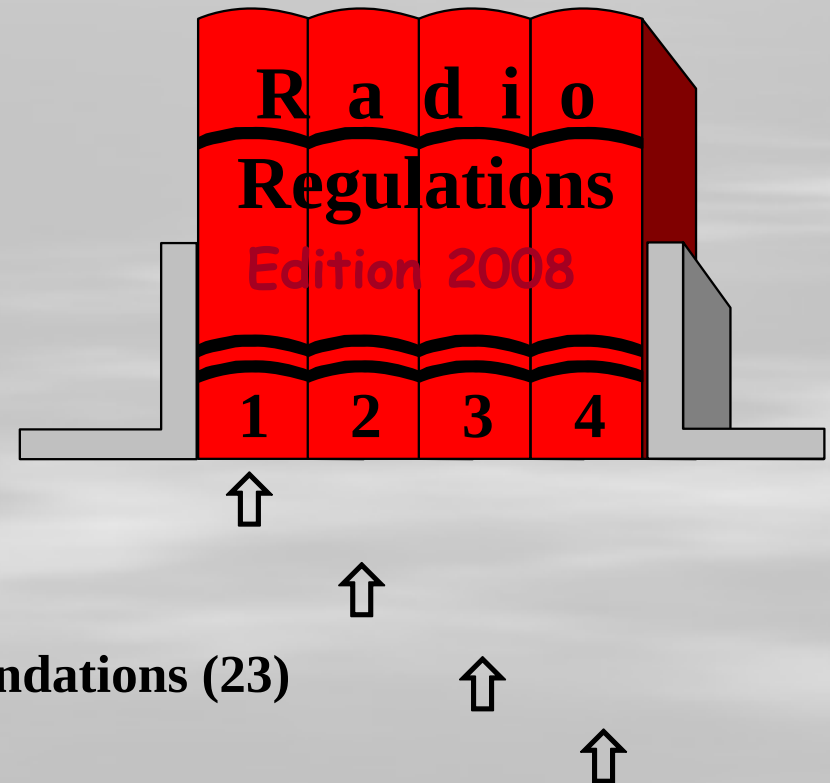
The current 2008 edition of the RR consists of four volumes:

Articles (59)

Appendices (23)

WRC Resolutions (146) and Recommendations (23)

Recommendations ITU-R (34)





ITU Radio Regulations (Volume 1)



Volume 1 of the Radio Regulations contains 59 Articles, including:

Article 1 - Terms and definitions

Article 5 - Frequency allocations with Table of Frequency Allocations

Article 59 - Entry into force and provisional application of the RR



Radio Regulations Fundamentals



According to RR Nos.1.16, 1.17, 1.18

- *allocation* of a frequency band to one or more terrestrial or space *radiocommunication services*
- *allotment* of a radio frequency (RF) or RF channel for use by one or more administrations for a terrestrial or space *radiocommunication service* in one or more countries or geographical areas
- *assignment* of a RF or RF channel given by an administration for a radio *station* to use a RF or RF channel



Terrestrial service for meteorology

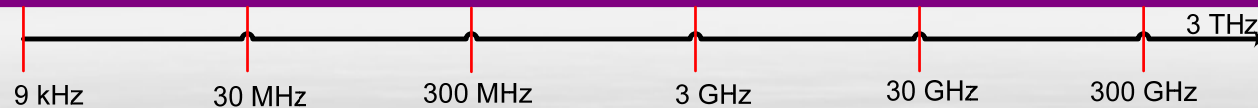


According to RR Nos. 1.50 and 1.109

- *meteorological aids service is a service used for meteorological, including hydrological, observations and exploration.*
- ✓ *radiosonde is an automatic radio transmitter in the MetAids service usually carried on an aircraft, free balloon, kite or parachute, and which transmits meteorological data.*



Terrestrial radiocommunication services



Mobile



Fixed

Broadcasting

Amateur

Radio Astronomy

Meteorological Aids

Standard Frequency and Time Signals



Space services for meteorology

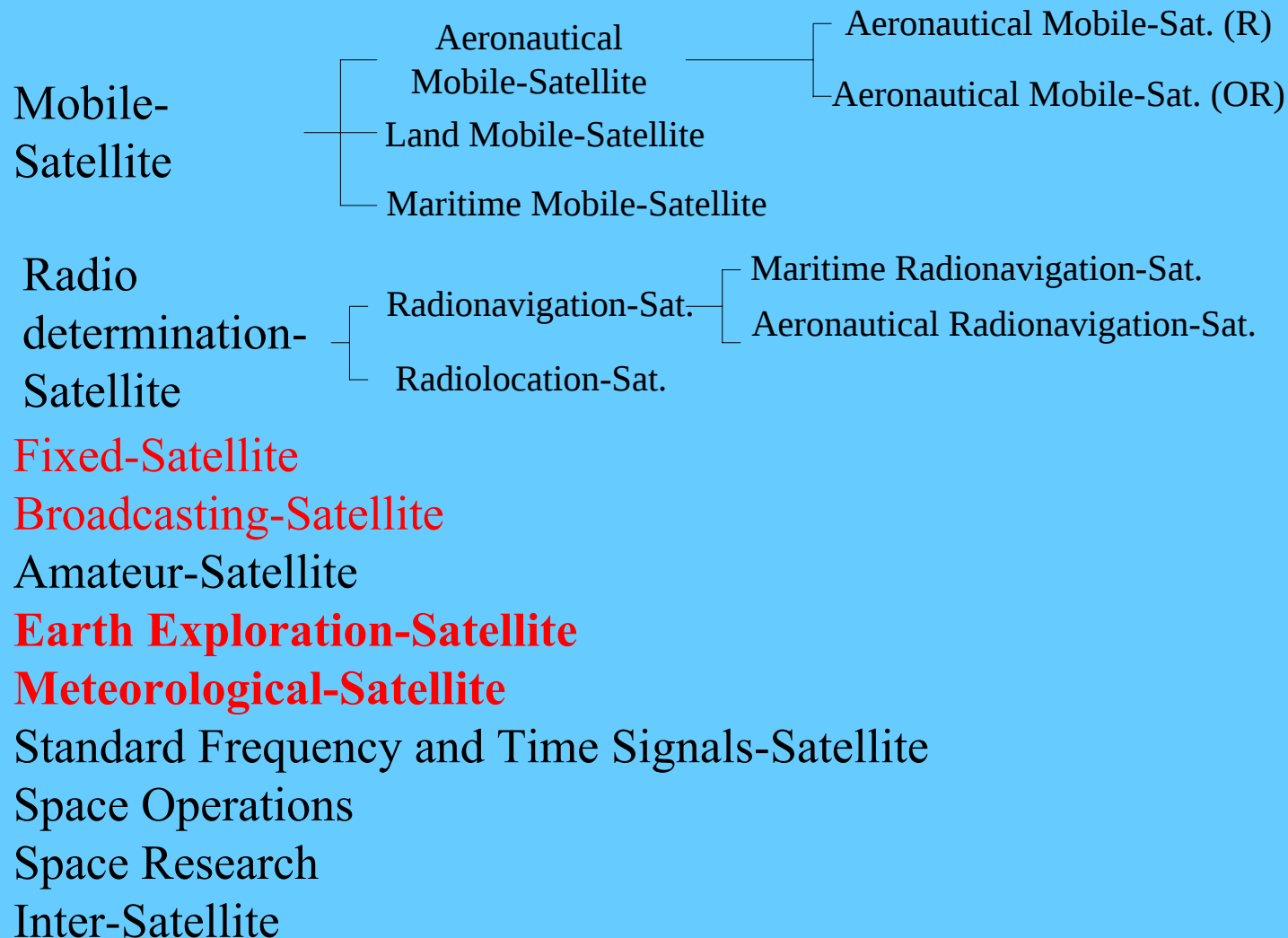
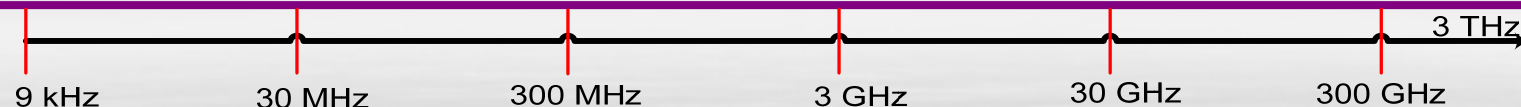


According to RR No. 1.51 and 1.52

- *Met-Sat service is an EESS for meteorological purposes.*
 - *EESS is a service between ES 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 ES within the system concerned;
 - ✓ platform interrogation may be included.
- This service may also include feeder links necessary for its operation.*



Space radiocommunication services





Space instruments for meteorology



According to RR No. 1.182 and 1.182

- ✓ *active sensor is a measuring instrument in the EESS or in the SRS by means of which information is obtained by transmission and reception of radio waves.*
- ✓ *passive sensor is a measuring instrument in the EESS or in the SRS by means of which information is obtained by reception of radio waves of natural origin.*



Radio Regulations Fundamentals



PRIMARY and Secondary services (RR No.5.23)

Stations of a Secondary service:

- a) shall not cause harmful interference to stations of PRIMARY services to which frequencies are already assigned or may be assigned at a later date;
- b) cannot 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;
- c) can 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.



Table of the Frequency Allocations (9 kHz to 1000 GHz)



- ✓ spectrum from 9 kHz to 275 GHz is segmented into smaller frequency bands
- ✓ these bands is allocated to 39 services defined in Art.1
- ✓ the band 275-1 000 GHz for experimentation with various active and passive services
- ✓ ITU Regions 1-3 for the World_{wide} or Reg_{ional} allocations
- ✓ Footnotes to the Table are used to alter, limit or change the relevant allocations
- ✓ Footnotes have same legal status as the Table
- ✓ For some services and frequency bands the Table is supplemented by Allotment and/or Assignment Plans
- ✓ services are identified as PRIMARY or Secondary



Table of the Frequency Allocations (fragment)



335.4-410 MHz		
Allocation to services		
Region 1	Region 2	Region 3
400.15-401	METEOROLOGICAL AIDS METEOROLOGICAL-SATELLITE (space-to-Earth) MOBILE-SATELLITE (space-to-Earth) 5.208A 5.208B 5.209 SPACE RESEARCH (space-to-Earth) 5.263 Space operation (space-to-Earth) 5.262 5.264	
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	



Table of the Frequency Allocations (fragment)



460-890 MHz		
Allocation to services		
Region 1	Region 2	Region 3
460-470	FIXED MOBILE 5.286AA Meteorological-satellite (space-to-Earth) 5.287 5.288 5.289 5.290	

5.289 Earth exploration-satellite service applications, other than the meteorological-satellite service, may also be used in the bands 460-470 MHz and 1 690-1 710 MHz for space-to-Earth transmissions subject to not causing harmful interference to stations operating in accordance with the Table .



Additional allocation



RR Nos. 5.156, 5.162A, 5.379, 5.387 and 5.519

5.156 *Additional allocation:* in Nigeria, the band 22 720-23 200 kHz is also allocated to the meteorological aids service (radiosondes) on a primary basis.

5.162A *Additional allocation:* in [33 countries] the band 46-68 MHz is also allocated to the radiolocation service on a secondary basis. This use is limited to the operation of wind profiler radars in accordance with Resolution **217 (WRC-97)**. (WRC-07)

5.379 *Additional allocation:* in [5 countries], the band 1 660.5-1 668.4 MHz is also allocated to the meteorological aids service on a second. basis.

5.519 *Additional allocation:* the bands 18-18.3 GHz in Region 2 and 18.1-18.4 GHz in Regions 1 and 3 are also allocated to the meteorological-satellite service (space-to-Earth) on a primary basis. Their use is limited to geostationary satellites. (WRC-07)



Different category of service



No alternative allocation concerns MetAids, Met-Sat and EES services

5.290 *Different category of service:* in [12 countries], the allocation of the band 460-470 MHz to the meteorological-satellite service (space-to-Earth) is on a primary basis (see No. 5.33), subject to agreement obtained under No. 9.21. (WRC-07)



ITU Radio Regulations (*Volume 2*)



Volume 2 of the Radio Regulations contains 24 Appendices, including:

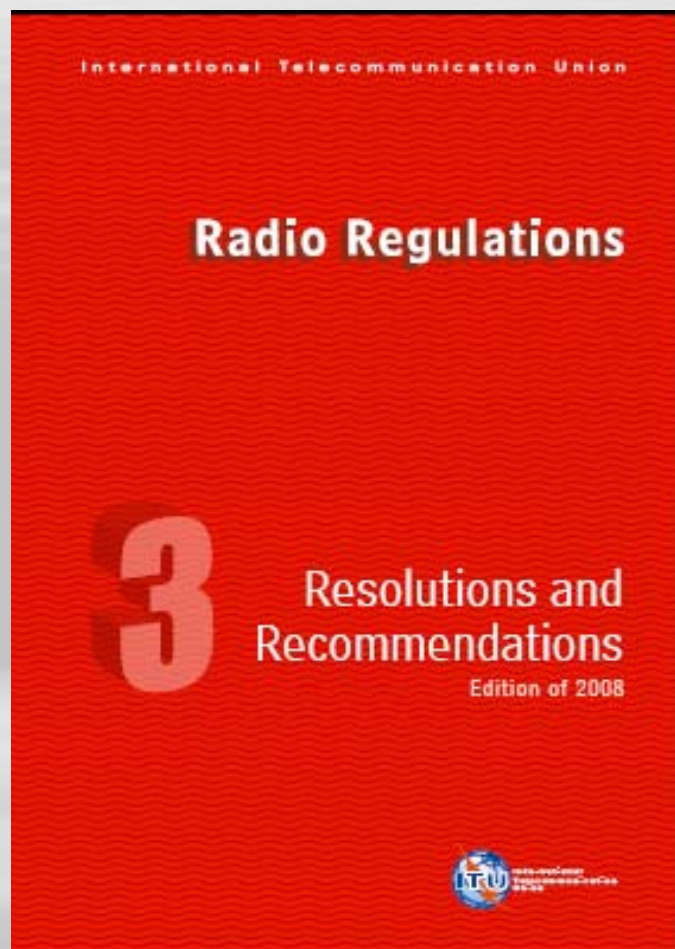
App. 5 (Rev.WRC-07) - Identification of admin. with which coordination is to be effected or agreement sought under the provisions of Article 9

App. 7 (Rev.WRC-07) - Methods for the determination of the coordination area around an earth station in frequency bands between 100 MHz and 105 GHz,

App. 8 (Rev.WRC-03) - Method of calculation for determining if coordination is required between geostationary-satellite networks sharing the same frequency bands



ITU Radio Regulations (*Volume 3*)



Volume 3 of the Radio Regulations contains 146 WRC Resolutions and 23 WRC Recommendations

6 WRC Resolutions and 1 WRC Recommendation concern meteorology



WRC Res & Rec



Res. 217 (WRC-97) on implementation of wind profiler radars

Res. 612 (WRC-07) on use of the RLS between 3 and 50 MHz to support high-frequency oceanographic radar operations

Res. 671 (WRC-07) on recognition of systems in the MetAids service in the frequency range below 20 kHz

Res. 672 (WRC-07) on extension of the allocation to the Met-Sat service in the band 7 750-7 850 MHz

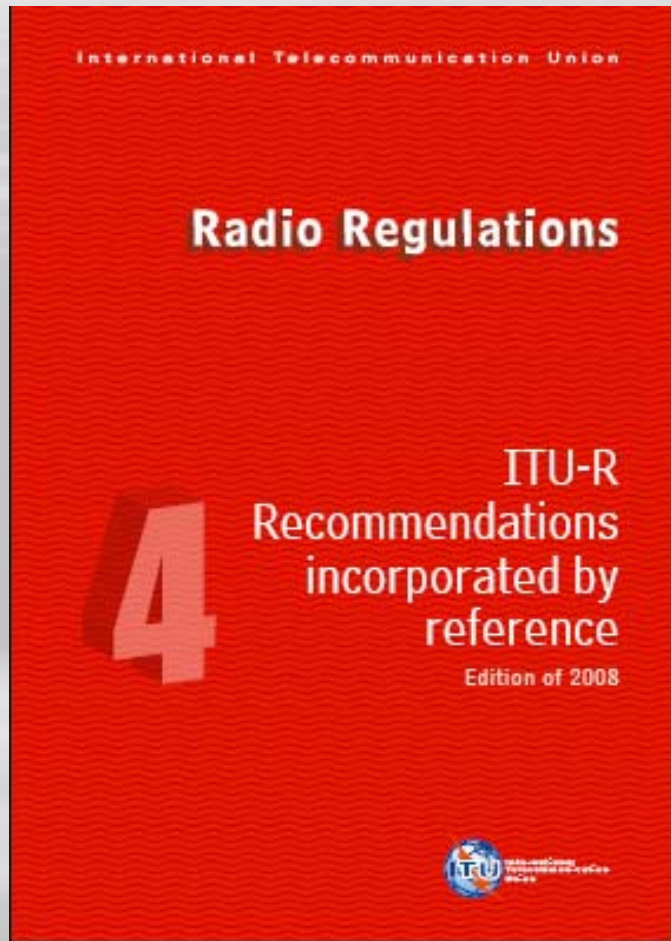
Res. 673 (WRC-07) on use for Earth observation applications

Res. 750 (WRC-07) on compatibility between the EESS (passive) and relevant active services

Rec. 622 (WRC-97) on use of the frequency bands 2 025-2 110 MHz and 2 200-2 290 MHz by the SRS, SOS, EESS, FS and MS



ITU Radio Regulations (*Volume 4*)



Volume 4 of the Radio Regulations contains 38 ITU-R Recommendations incorporated by reference into RR and have the treaty status

Some of these ITU-R Recommendations concern meteorology



ITU Radio Regulations (*Volume 4*)



ITU-R Recommendations in interest of meteorology

P.525-2	Calculation of free-space attenuation
P.526-10	Propagation by diffraction
P.838-3	Specific attenuation model for rain for use in prediction methods
SA.1154	Provisions to protect the SRS, SOS and EESS and to facilitate sharing with the MS in the 2 025-2 110 MHz and 2 200-2 290 MHz bands
RS.1260-1	Feasibility of sharing between active space-borne sensors and other services in the range 420-470 MHz
F.1613	Operational and deployment requirements for WAS systems in the FS in Region 3 to ensure the protection of systems in the EESS (active) and the SRS (active) in the band 5 250-5 350 MHz
RS.1632	Sharing in the band 5 250-5 350 MHz between the EESS (active) and WAS (including RLAN) in the MS
M.1638	Characteristics of and protection criteria for sharing studies for radiolocation, aeronautical radionavigation and meteorological radars

Albert Nalbandian

Chairman CPM for WRC-12

phone: +41 79 772 11 80

e-почта: albert.nalbandian@ties.itu.int