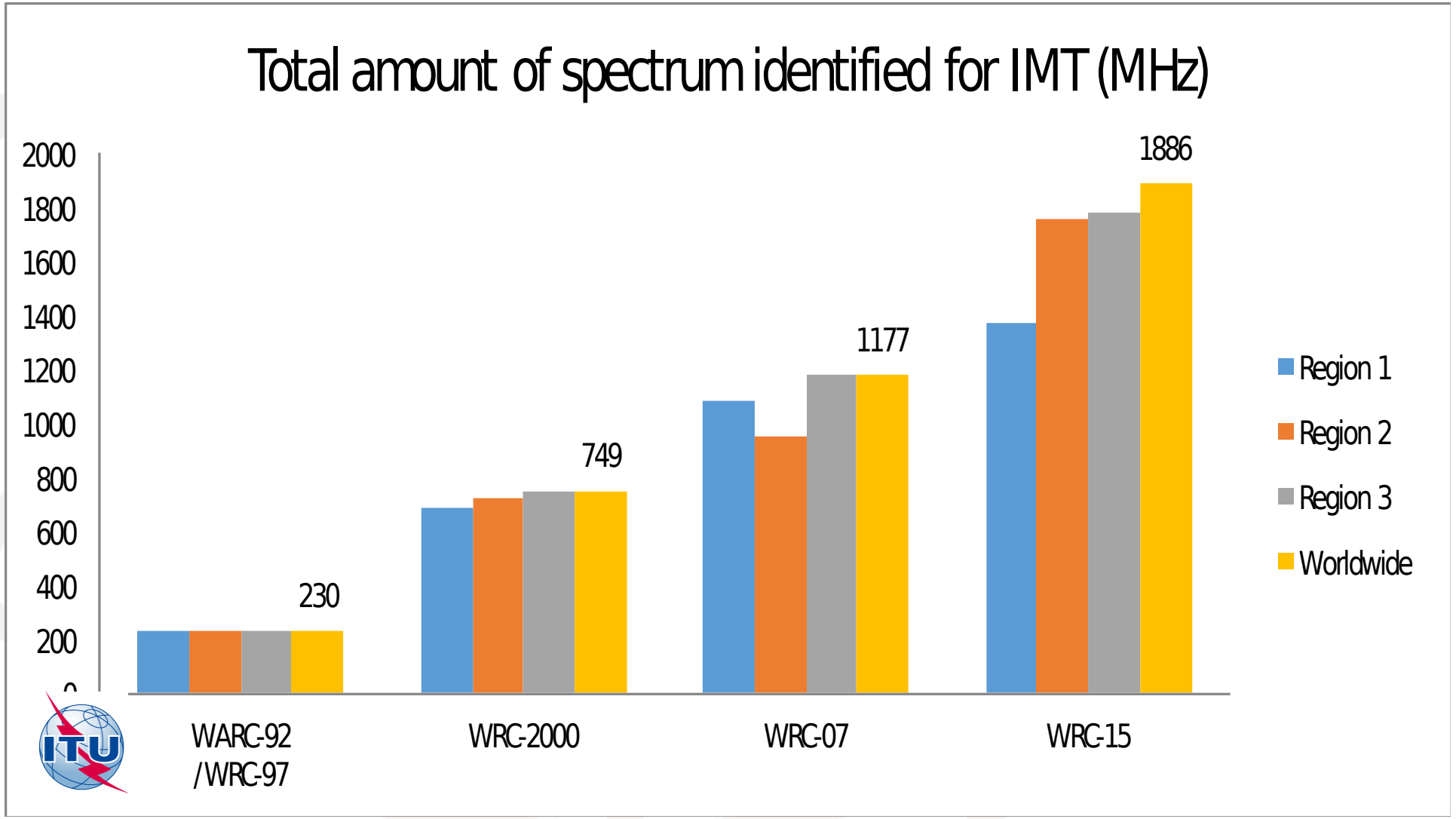
Outcome of World Radiocommunication Conference, 2015

Radiocommunication Bureau,
International Telecommunication Union

WRC-15 results for specific bands

agenda items 1.1 and 1.2

- **470–698 MHz**: IMT identification of parts of this band for 14 Regions 2, 3 countries (9.21, non-interference basis). For R1: consideration at WRC-23
- **1 427 – 1 518 MHz**: IMT identification in R2 and 3. Also in R1, except 1452–1492 MHz that identified only in 54 R1 countries (9.21 for R.1, 3)
- **3 300 – 3 400 MHz**: allocation to, or upgrade of MS in 36 countries worldwide. IMT identification in 33 R1, 6 R2 and 6 R3 countries
- **3 400 – 3 600 MHz**: upgrade of MS and identification for entire R.1, 2 and for 11 R3 countries (subject to 9.17, 9.18, 9.21 and pfd limit)
- **3 600 – 3 700 MHz**: IMT identification in 4 Region 2 countries subject to coordination under 9.17, 9.18, 9.21 and a pfd limit
- **4800–4990 MHz** IMT identification in 1 Region 2 and 3 Region 3 countries
- **694 – 790 MHz in Region 1**: allocation to MS and identification for IMT. **In force from 28.11.2015**. Provides harmonized worldwide allocation of this band. Ensures compatibility with broadcasting and ARNS (Res. 224, 760). Accommodates applications ancillary to broadcasting in 470 – 694 MHz


Total amount of spectrum identified for IMT (MHz)
2000
1800
1600
1400
1200
1000
800
600
400
200
0
230
749
1177
1886
WARC-92 /WRC-97
WRC-2000
WRC-07
WRC-15
Region 1
Region 2
Region 3
Worldwide

Public protection and disaster relief (1)

agenda items 1.3, 9.1.1 and 9.1.7

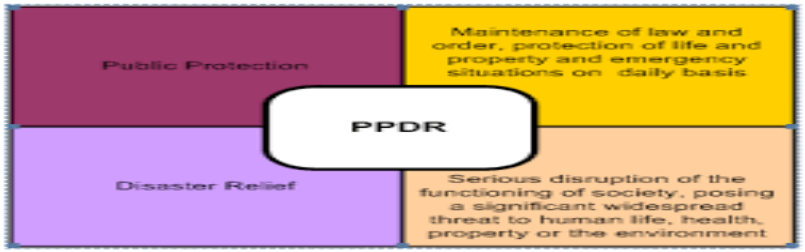
- **Background:** there were requirements to
  - identify harmonized PPDR bands to benefit from economies of scale, interoperability, cross-border equipment circulation
  - review Res. 647 on emergency and disaster relief communication
  - ensure better protection of 406 – 406.1 MHz (Cospas-Sarsat)
- **WRC-15 results**
  - **Revision of Resolution 646** -> resulted in harmonization of PPDR bands and at the same time providing flexibility for administrations
  - encouragement to use harmonized bands, especially for broadband:
    - 694 – 894 MHz – on a global basis
    - 380-470 MHz – in Region 1
    - 406.1-430 MHz, 440-470 MHz and 4 940-4 990 MHz – in Region 3
  - administrations to use Rec. ITU-R M.2015 for national planning
  - PPDR applications must not cause unacceptable interference to services to which these ranges are already allocated

Public protection and disaster relief (2)

agenda items 9.1.1 and 9.1.7

- **Revision of Resolution 647** on emergency and disaster relief radio communications. Reinforcement of main ideas of this Resolution:
  - reiterates the importance of available emergency frequencies
  - BR to continue to maintain database on contact information of administrations and frequency bands (optional) relevant to disaster relief www.itu.int/ITU-R/go/res647
  - administrations encouraged to submit information to the database
- **Protection of 406-406.1 MHz** (MSS reception of Cospas-Sarsat) via review Res. **205** to reinforce protection from out-of-band emissions:
  - request not to assign frequencies to FS and MS in adjacent bands
  - BR to organize monitoring programs on impact from systems in 405.9-406 MHz, 406.1-406.2 MHz (in addition to the current program in the band)
  - administrations to take into account frequency drift of radiosondes above 405 MHz to avoid transmitting in the 406-406.1 MHz.

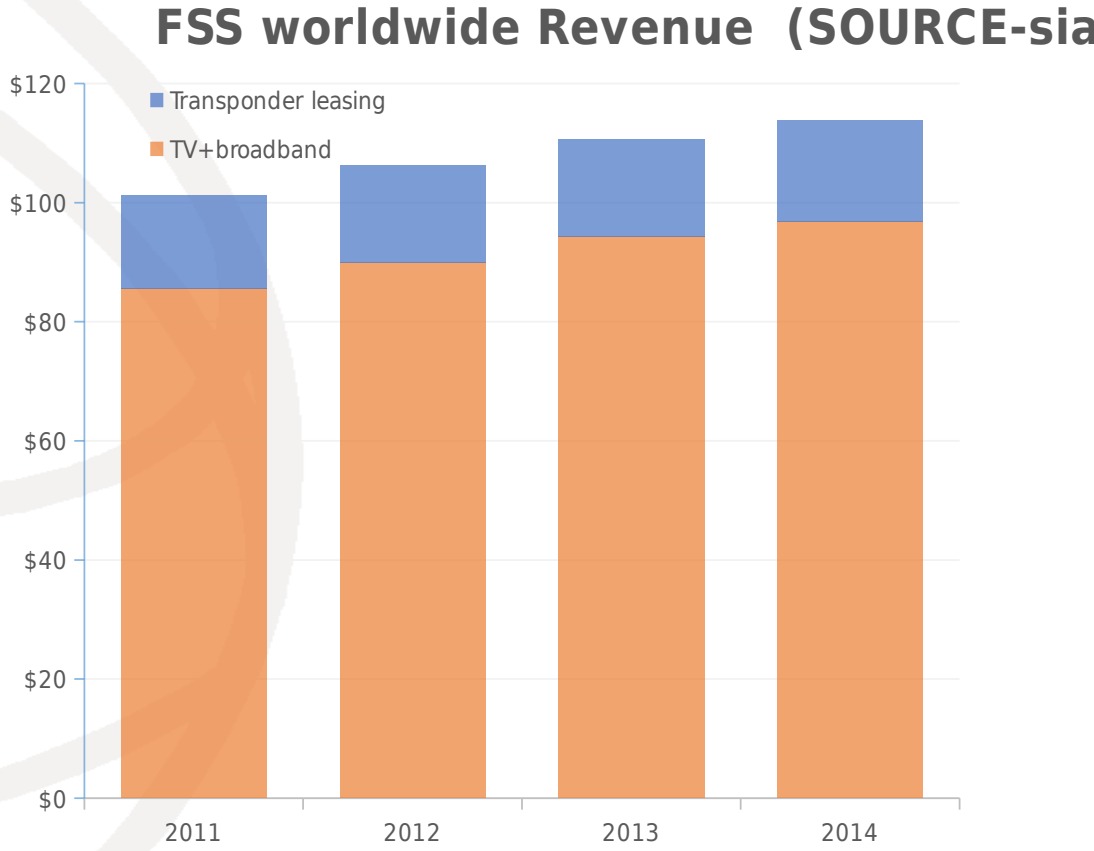
Mobile services (summary)



	Broadband mobile	PPDR
Issue	New applications, growing requirements for high data rate	New requirements for high data rate (video)
Economic effect	Worldwide annual revenue ≅3 trillion US$ (***GSMA,2015***) 7.1 billion users, 2015 (***ITU,2015***)	1980- 2005, 7000 natural disasters, 2 million lives, economic losses 1.2 trillion US$.
WRC-15 decision	Identification of harmonized additional 318 MHz in more than 80% countries (total 1228 MHz) +10% in Region 3 (total 976 MHz)	Encouragement to use harmonized bands 694 – 894 MHz – Global 4 940-4 990 MHz – Region 3 Use Rec. ITU-R M.2015 for national planning
Impact	Economy of scale, increase number and quality of service, interoperability	Economy of scale, interoperability, cross-border circulation

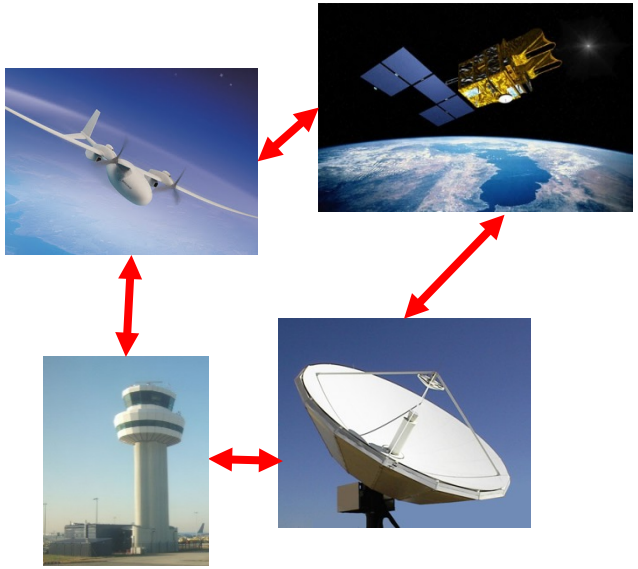
FSS allocations

- ***Issue***: Spectrum/GSO overloading. About 480 existing satellites. 18 satellites to be launched each year . Difference in up/down link allocations for symmetric traffic
- ***Economic effect***: FSS revenue in 2014 - 112 billion US$ ***WRC-15 decision***:
  - ✓ 250 MHz up-link in Region 1,
  - ✓ 250 MHz up-link in 30 countries of Regions 1 and 2
  - ✓ 200 MHz in 10 countries of Region 3
- ***Impact***: Enhance satellite access and service delivery, competition, reduced cost per transponder



FSS applications

Issues	Use FSS band for UAS (Unmanned Aircraft Systems)	Operational restrictions for ESVs (Earth stations on Board Vessel)	Use FSS bands for ESOMPs (Earth Station on Mobile Platform)
Economic effect	Future use for civil aviation	Annual revenue 1.8 billions US$	Use of existing infrastructure
WRC decision	Possibility to use Ku band: 970 MHz globally, 1520 MHz regionally, Ka band: 1000 MHz globally Antenna pattern specification	Min 1.2m antenna in C-band (2.4m before) Increasing of coordination distance- from 300 to 320 km	Use of 500 MHz in Ka-band under defined technical conditions ITU-R studies
Impact	Framework for new ICAO standard and ITU studies up to 2023	Simplification operation and installation, ↓ service cost	New ICT services for all kind transport



FSS regulation

- ***Issue:*** Complexity, length and recourse consuming satellite frequency registration procedures
- ***Economic effect***: up to 15-20% cost of satellite project
- ***WRC decisions:***
  - ✓ Suppression of API (Advanced Publication Information)
  - ✓ Reduction of coordination arc
  - ✓ Reduce regulatory period of suspension day-by-day
  - ✓ Increase transparency when one space station is used to bring into use assignments to GSO networks at different orbital locations within a short period of time
  - ✓ BR is requested to provide a reason for query on orbit use
- ***Impact:*** Facilitation of spectrum/orbit access for new comers, decreasing of transactional cost

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Radiolocation service

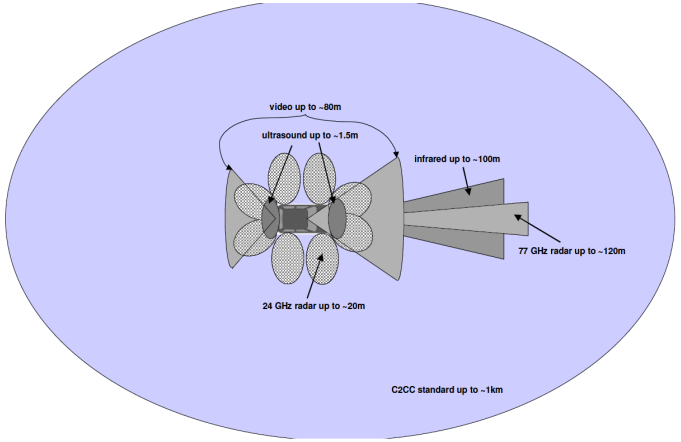
Issue: Introduction of Intelligent Transport System- safe, efficient user-friendly and green road transport

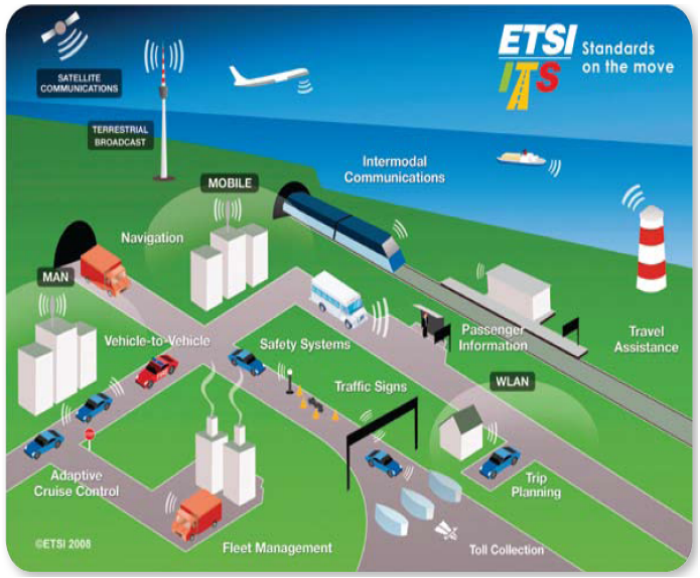
Economic effect: Annual turnover 2.9 trillion US$ (***European Union Road Federation)***

WRC decisions: Allocation of 500 MHz for ground based radar application- 4 GHz (77-81 GHz) worldwide continuous band for automotive radars

Impact: in EU in 2020 reduction up to 3250 fatalities and 52000 injuries after car accidents ***(eImpact)***

Reduction of traffic congestion costs -EU 100 billion in 2013 (wasted fuel, insurance, delivery delay, damage of cargo)





Maritime services

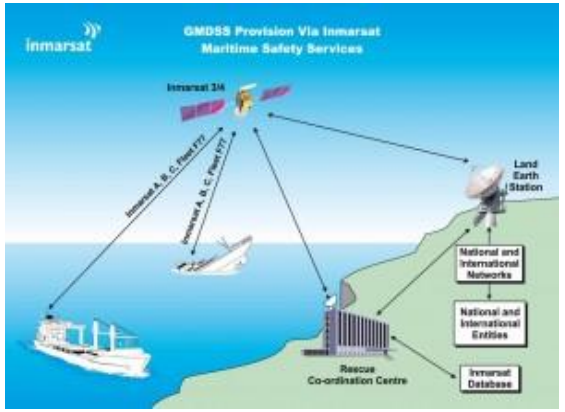
Issue: Overloading existing maritime spectrum, introduction of broadband applications, safety of life requirements

Economic effect: 0,5 trillion US$ (***UNCTAD, 2014***)

WRC decisions:

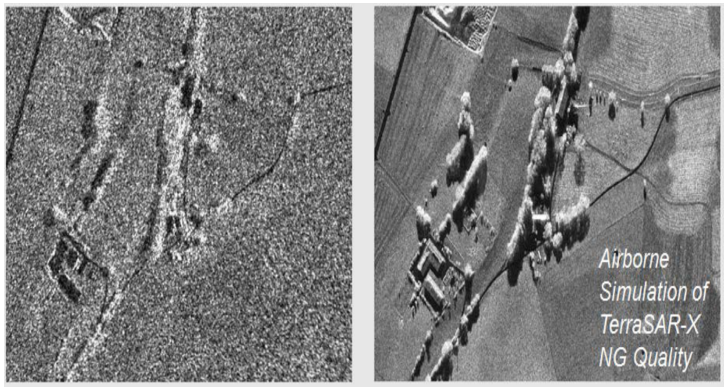
- new channel arrangement for on-board communications- introduction of digital modulation, mod App
- 161.9375-161.9625 MHz and 161.9875-162.0125 MHz for MMSS (Earth-space) – satellite receipt of AIS (automatic identification system)
- 400 MHz allocation for MMSS (space-Earth)- new broadband

Impact: increase safety and efficiency of maritime transport, global coverage, introduction of new broadband services on ships



EESS allocations

	TT&C (telemetry, tracking and command systems)	Active sensing
Issue:	Only TT&C 2 025-2 110 MHz and 2 200-2 290 MHz. About 100 existing and up to 90 new satellites to be launched until 2019 (***FAA***). High-speed data for operations and software modifications. Existing TT&C 8 025−8 400 MHz allocation.	Existing EESS (active) allocation in 8-9 GHz 600 MHz. Higher resolution (less than 0.2 m) requires continuous 1200 MHz
Economic benefit	in EU decreasing of economic losses caused by natural disasters up to €61.5 billion/year (***Eumetsat***)	
WRC-15 results	Primary EESS up-link allocation of 80 MHz	Primary EESS(active) allocation of 600 MHz (RR No. 9.21 in 8 countries)
Impact	Simplification operation and maintenance, ↓ service cost	New high resolution scanning service



Aeronautical services

	GFT (Global flight Tracking)	WAIC (Wireless Avionics Intra-communications)
Issue	Lack of global tracking , e.g tragedy of MH370	Wire lines-up to 30% plane weight
Economic effect	2,4 trillion US$ or 3,4% global GDP (***ATAG:*** Air Transport Action Group) supported by aviation	
WRC-15 decision	New allocation of 4.6 MHz for ↑AMS(R)S	Allocation of 200 MHz for AMS(R)
Impact	Improving safety of flight and rescue operations	Producer's surplus 21 billion US$/year, ↓$CO_2$

Future Universal Time

- ***Issue:*** UTC adjusts atomic time UT1 and ephemeris time TAI based on Earth rotation time by the insertion of leap seconds. Digital systems are highly dependent on keeping very precise time synchronization
- ***Economic Benefits:*** to prevent discontinuities that can lead to serious financial consequences in case of time maintenance or failure
- ***WRC-15 decision***: Keep current UTC until WRC-23
- ***Impact:*** *Currently, there are* ***4 billion GNSS devices*** *in use worldwide and the number will* ***triple by 2023*** ***(GNSS Market Report)***

  7% of EU GDP GNSS dependent (***Munich SatNav Summit 16***)

WRC-19

- ***Future broadband***- RLAN (6 GHz), pico- femto- cells (24.25-86 GHz,) IoT (Internet of Things), HAPS, global NGSO FSS (>30 GHz) , identification in 275-450 GHz for land-mobile and fixed services
- ***ITS (Intellignet Transport Systems) and unmanned transport***- M2M for maritime, railway, road transport
- ***Green economy***- wireless power transmission
- ***Pico- nano- satellites***- specific band and protection of existing services
- ***Safety of life***- development of Global Aeronautical and Maritime distress and safety systems (GADSS and GDMSS)

- Thank you