Spectrum over the next four years

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20th International TOVS Study Conference (ITSC-20)

World Radiocommunication Conference 2015

Geneva, Switzerland

2 – 27 November

- review/revise Radio Regulations
- the international treaty governing the use of the radio-frequency spectrum and the geostationary-satellite and non-geostationary-satellite orbits.

460-470 MHz data collection system

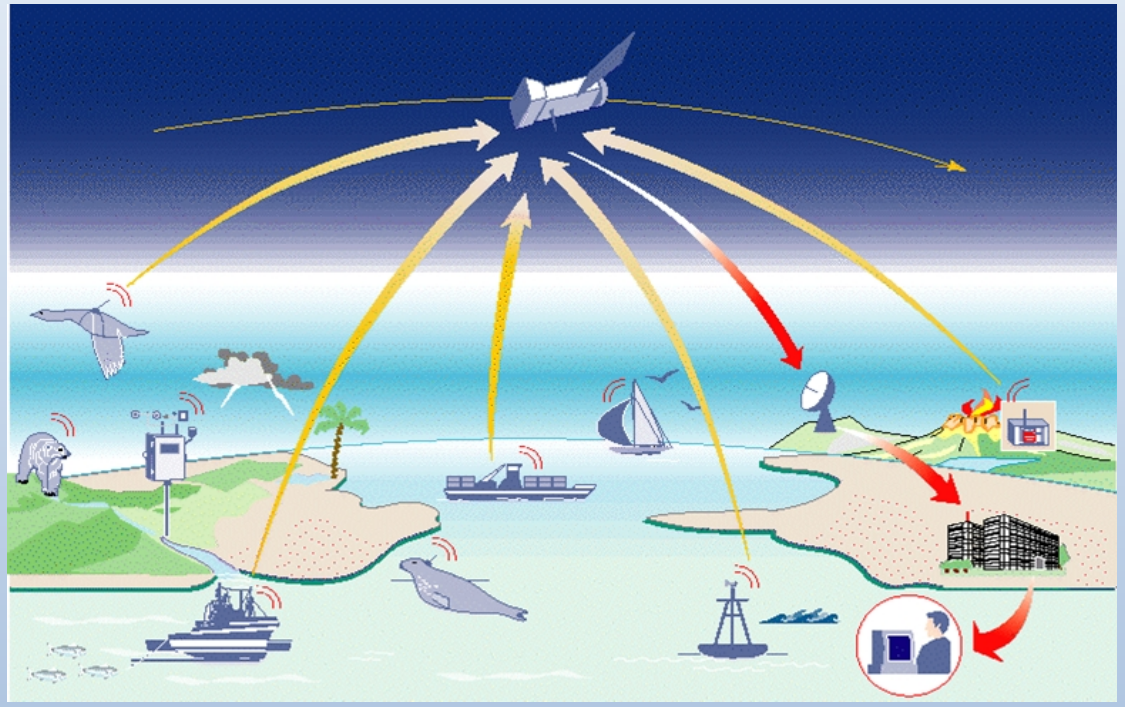
Elevate Meteorological-satellite (space-to-Earth) service to co-primary allocation.

Currently allocated:

FIXED MOBILE Meteorological-satellite

To be used for data collection downlinks

By future GEOS and LEOS



Stations of a secondary service:
5.29 *a)* 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;
5.30 *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;
5.31 *c)* can claim protection, however, from harmful interference from stations of the same or at a later date

5 GHz RLANs

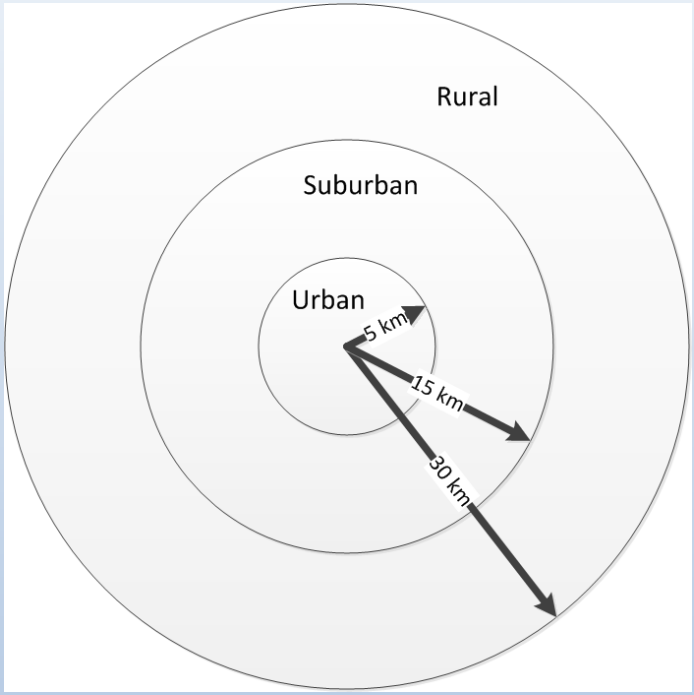
One ITU study says RLAN needs estimated 880 MHz of spectrum

RLAN sponsors are looking at the band 5 350-5 470 MHz (now used by SAR and altimeters)

Radio Local Area Networks (RLANs), also known as Wi-Fi. Now at “hotspots” (airports, hotels, coffee shops, etc.)

Propose using RLAN networks for Internet services to complement cellular and residential broadband or across municipal or Wireless Internet Service Provider networks

One RLAN Model



baseline of 5.25 million people

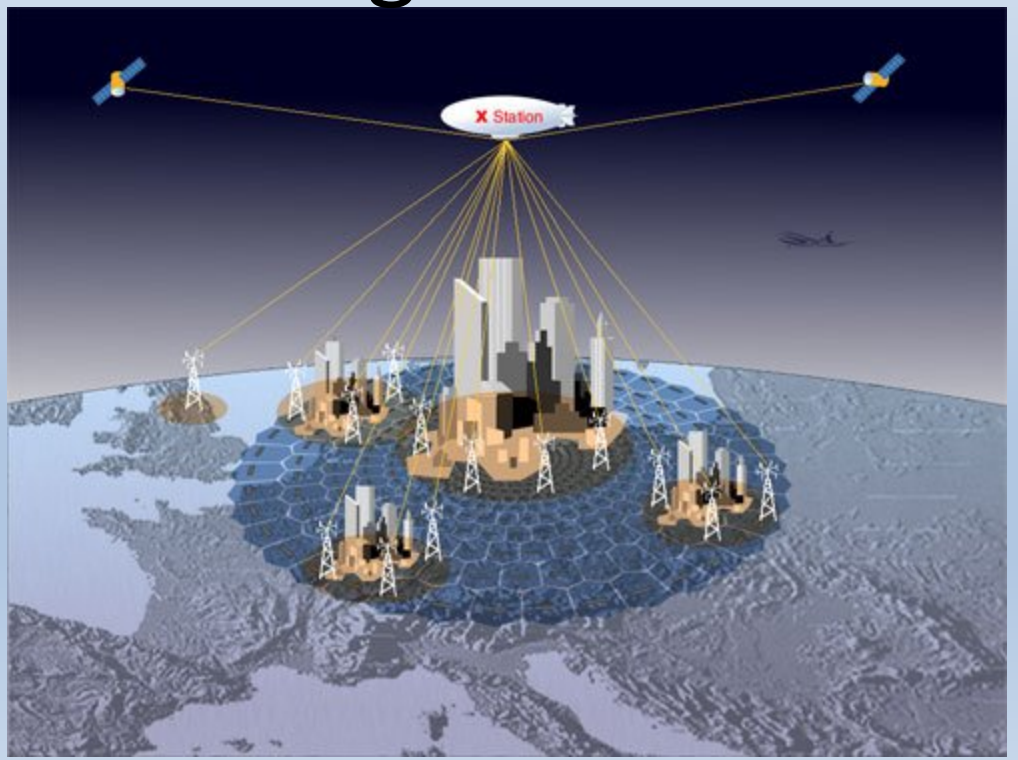
Population distribution

Total Pop.	Population split	Percent	Pop. In Zone
5250000	Urban	30%	1575000
	Suburban	50%	2625000
	Rural	20%	1050000

ITU Regions

High altitude platform stations (HAPS) for mobile broadband communications
31.0 – 31.3 GHz (ground-to-HAPS) outside Region 2

31.0 -31.3 GHz adjacent to EESS (passive) in 31.3-31.8 GHz



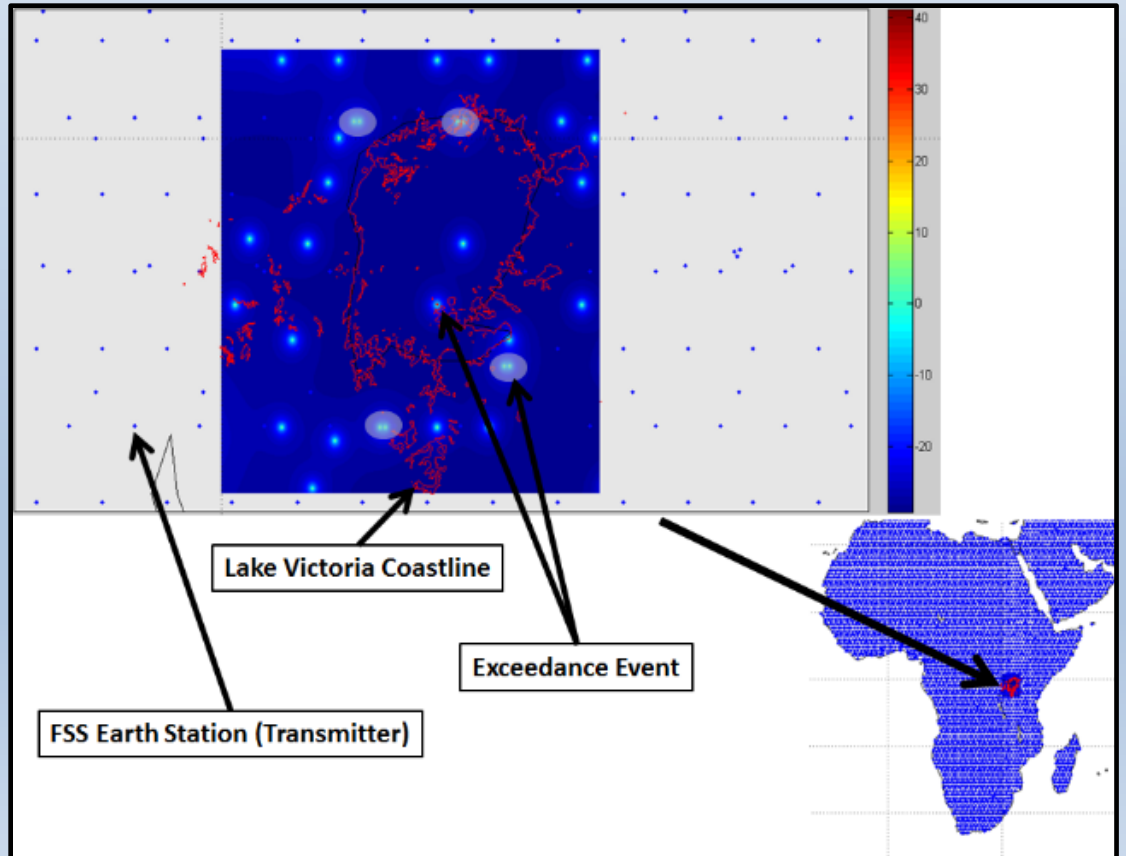
additional 250 MHz primary allocations in the range 10-17 GHz to Fixed Satellite Service in Region 1

13.25-13.75 GHz band that is allocated to EESS (active). This band is used for active remote sensing (altimeters, precipitations radars and scatterometers) by missions such as Cryosat, Jason-2, -3, Jason-CS, Sentinel-3, and HY-2.

Analysis (10-17 GHz in Region 1)

FSS deployment (FRF 1.2, mean PSD) to JASON Altimeter measurements over Lake Victoria and its surrounding flood plains in Africa

- numerous incidents exceed data availability protection criteria for the EESS altimeter.
- Individual events in turquoise
- aggregate events (main beam overlap from multiple FSS earth stations - grey ovals
- FSS earth stations based on expected deployment



additional allocations for Mobile Satellite Service in the Earth-to-space and space-to-Earth directions

of interest to ITSC

- **The allocations to EESS (passive) in the bands 23.6-24 GHz (purely passive, RR No. 5.340, but to be protected against unwanted emissions taking into account interference apportionment and the levels contained in ITU Resolution 750 (rev. WRC-12)) as well as the band 22.21 – 22.5 GHz**
- **The first 500 MHz of the EESS/SRS space-to-Earth band 25.5 – 27.0 GHz**

regulatory aspects for nanosatellites and picosatellites

- many satellites operate in amateur-satellite service bands now
- increasing demand to operate in other satellite services.
- Many launched for scientific, experimental or educational purposes, sometimes in the form of constellations
- growing interest for commercial non-scientific applications

RFI reporting for sensors

- RFI instances have been reported to administrations
  - requesting actions to resolve RFI
  - not reported to the ITU-R Radiocommunication Bureau (BR) for the purposes of providing information or requesting assistance.
- BR is not aware of the magnitude of RFI instances affecting EESS passive sensors and has inaccurately reported that EESS is not as greatly impacted by RFI as other space services.
- First step - common form for reporting interference to EESS passive sensors developed within the ITU-R as an ITU-R Recommendation to facilitate the reporting of such RFI

IMT

International mobile telecommunications

Global Demand for IMT

GSM Association (**GSMA**, or Groupe Speciale Mobile Association)

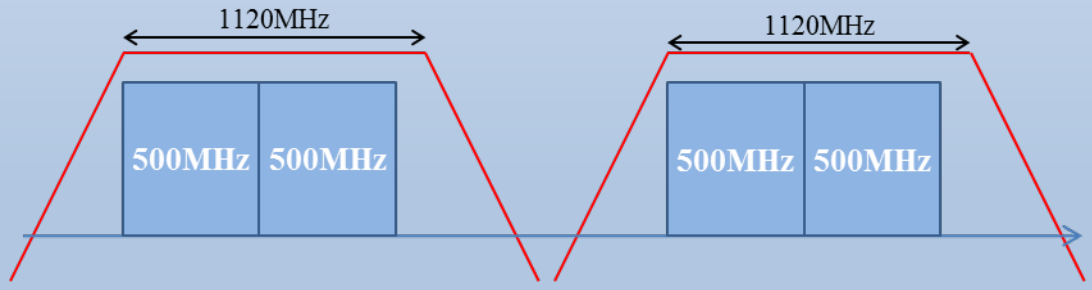
"… GSMA has calculated, based on traffic growth estimates, 600-800MHz of additional spectrum will need to be made available for mobile broadband use by 2020. Given it can take up to 10 years for new internationally-harmonised spectrum for mobile to be licensed and used to deliver services, it is vital that governments and regulators act now in order to meet the expected mobile data demands in 2020 and beyond. At the World Radiocommunication Conference 2015 (WRC-15), policy makers need to ensure that adequate spectrum is identified for mobile broadband services."
http://www.gsma.com/spectrum/wp-content/uploads/2014/07/GSMA-Data-Demand-Explained-June2014-ENGLISH.pdf

"Today, it's all about mobile, mobile, mobile. And to me that means spectrum, spectrum, spectrum. To keep pace with a transforming mobile sector, expanding ecosystem, and soaring consumer demand for data, we need to release more airwaves for new broadband data use – and use the airwaves we have more efficiently. Spectrum, after all, is the lifeblood of mobile broadband."
Commissioner Jessica Rosenworcel, FCC.

ITU IMT study

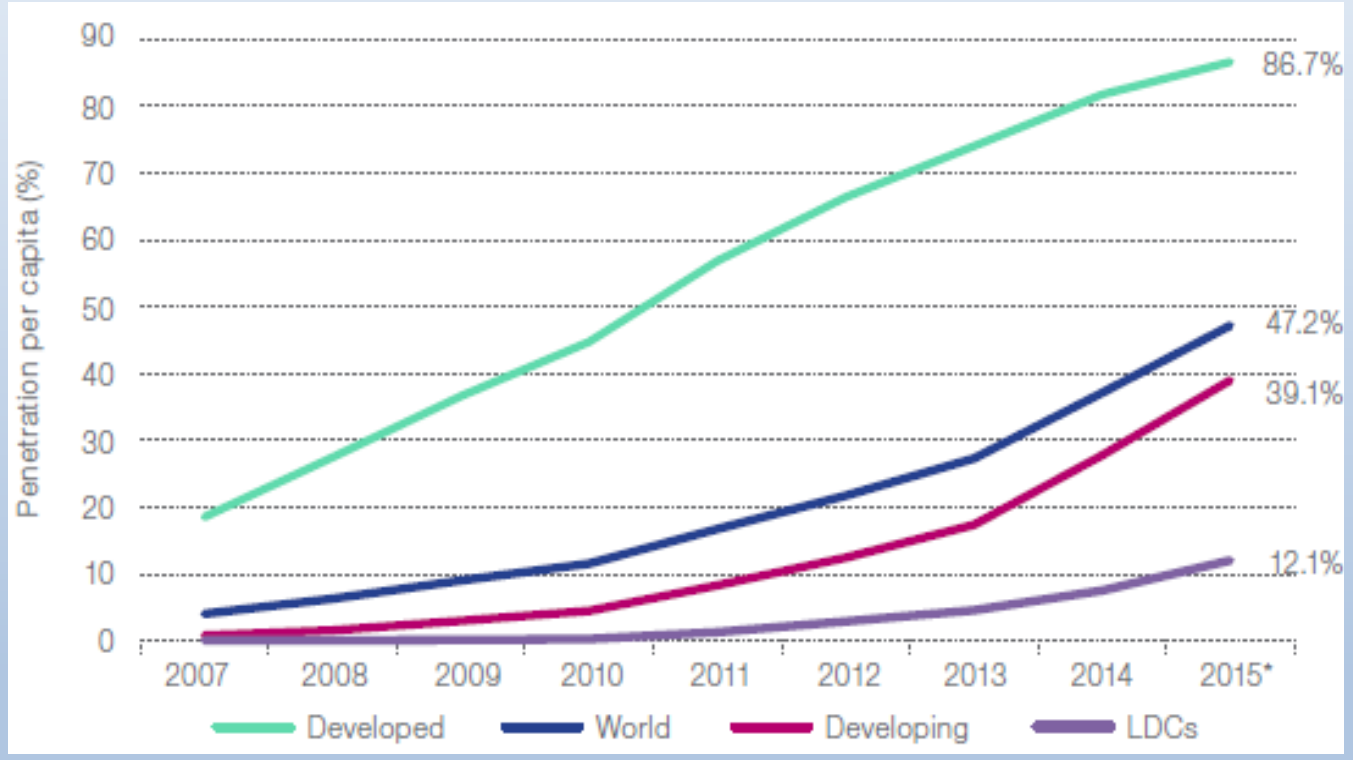
In June ITU study group 5 approved a report on technical feasibility of IMT between 6 and 100 GHz.

One benefit of adopting higher frequency for mobile communication is a capability to implement wide channel bandwidths with a bandpass filter



duplex filter to cover BW to meet required data rate

Growth in Mobile Broadband



ITU/UNESCO report http://www.broadbandcommission.org/publications/Pages/SOB-2015.aspx

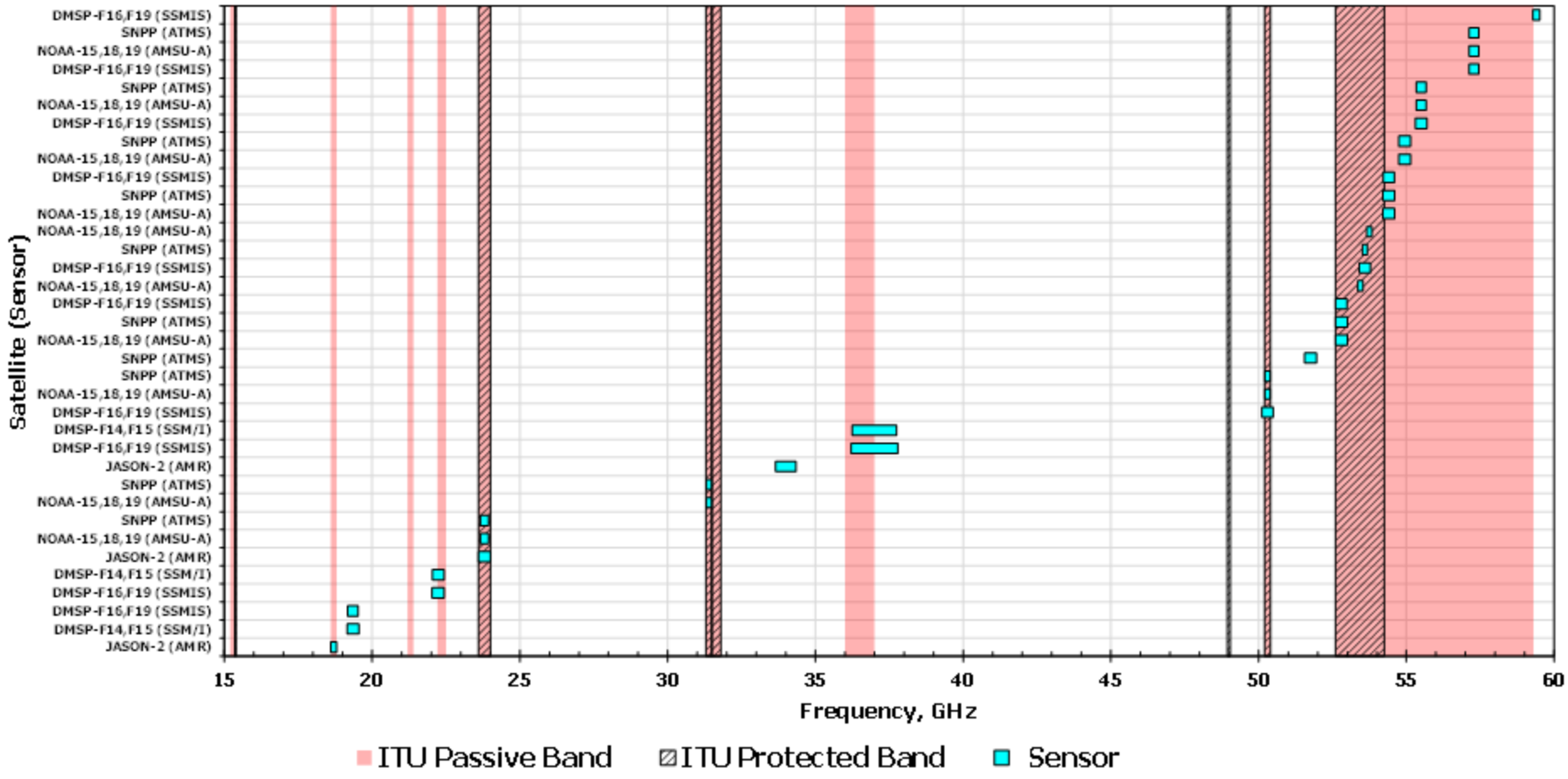
Passive bands
15 GHz to 60 GHz

Satellite (Sensor)	Start Frequency, GHz	Stop Frequency, GHz	Satellite (Sensor)	Start Frequency, GHz	Stop Frequency, GHz
JASON-2 (AMR)	18.6	18.8	SNPP (ATMS)	52.6	53
DMSP-F14,F15 (SSM/I)	19.15	19.55	DMSP- (SSMIS)	52.6055	52.9945
DMSP- (SSMIS)	19.172	19.528	NOAA polars (AMSU-A)	53.361	53.531
DMSP- (SSMIS)	22.0315	22.4385	DMSP- (SSMIS)	53.406	53.786
DMSP-F14,F15 (SSM/I)	22.035	22.435	SNPP (ATMS)	53.511	53.681
JASON-2 (AMR)	23.6	24	NOAA polars (AMSU-A)	53.661	53.831
NOAA polars (AMSU-A)	23.665	23.935	NOAA polars (AMSU-A)	54.2	54.6
SNPP (ATMS)	23.665	23.935	SNPP (ATMS)	54.2	54.6
NOAA polars (AMSU-A)	31.31	31.49	DMSP- (SSMIS)	54.209	54.591
SNPP (ATMS)	31.31	31.49	NOAA polars (AMSU-A)	54.74	55.14
JASON-2 (AMR)	33.65	34.35	SNPP (ATMS)	54.74	55.14
DMSP- (SSMIS)	36.21	37.79	DMSP- (SSMIS)	55.3045	55.6955
DMSP-F14,F15 (SSM/I)	36.25	37.75	NOAA polars (AMSU-A)	55.335	55.665
DMSP- (SSMIS)	50.11	50.49	SNPP (ATMS)	55.335	55.665
NOAA polars (AMSU-A)	50.21	50.39	DMSP- (SSMIS)	57.125	57.455
SNPP (ATMS)	50.21	50.39	NOAA polars (AMSU-A)	57.125	57.455
SNPP (ATMS)	51.56	51.96	SNPP (ATMS)	57.125	57.455
NOAA polars (AMSU-A)	52.6	53	DMSP- (SSMIS)	59.2805	59.5195

Passive bands
60 GHz to 200 GHz

Satellite (Sensor)	Start Frequency, GHz	Stop Frequency, GHz	Satellite (Sensor)	Start Frequency, GHz	Stop Frequency, GHz
DMSP-F16,F19 (SSMIS)	60.737	60.843	SNPP (ATMS)	179.81	180.81
DMSP-F16,F19 (SSMIS)	63.27865	63.28135	DMSP-F16,F19 (SSMIS)	180.784	183.836
DMSP-F14,F15 (SSM/I)	84	87	SNPP (ATMS)	181.01	182.01
NOAA-15,18,19 (AMSU-A)	86	92	SNPP (ATMS)	182.06	182.56
SNPP (ATMS)	87	92	DMSP-F16,F19 (SSMIS)	182.784	185.836
DMSP-F16,F19 (SSMIS)	90.2405	93.0695	SNPP (ATMS)	184.06	184.56
DMSP-F16,F19 (SSMIS)	148.358	151.642	SNPP (ATMS)	184.61	185.61
SNPP (ATMS)	164	167	DMSP-F16,F19 (SSMIS)	185.291	187.329
SNPP (ATMS)	175.31	177.31	SNPP (ATMS)	185.81	186.81
DMSP-F16,F19 (SSMIS)	176.1975	177.2225	SNPP (ATMS)	186.81	188.81
SNPP (ATMS)	177.81	179.81	SNPP (ATMS)	189.31	191.31
DMSP-F16,F19 (SSMIS)	179.291	181.329	DMSP-F16,F19 (SSMIS)	189.3975	190.4225

Current Passive Microwave Band Use (15 to 60 GHz)



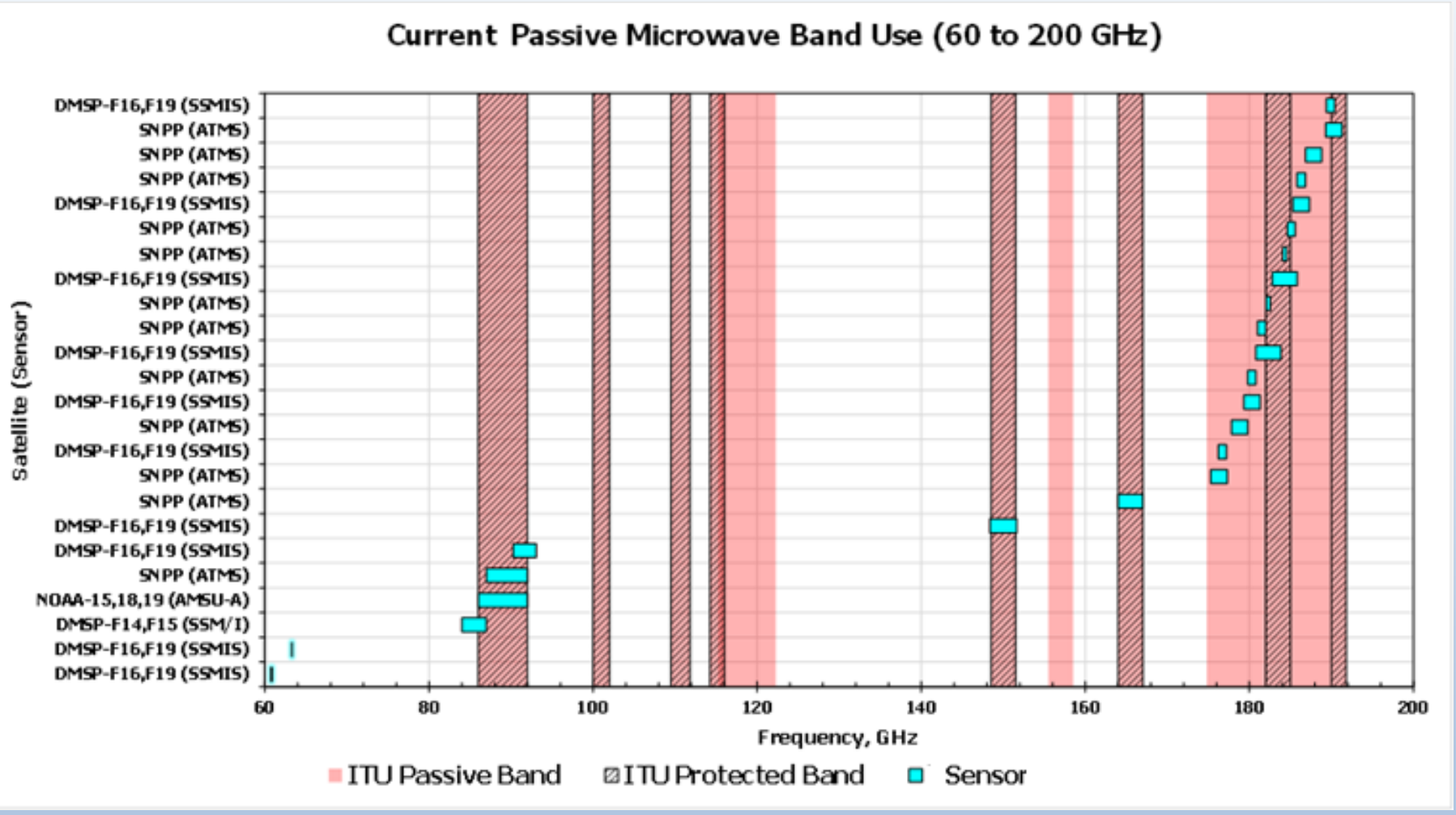
ITU Passive Bands: Per Rec. ITU-R RS.515-5. 1-Water Vapor, Rain Rate; 2-Rain Rates, Sea State, Sea Ice, Water Vapor, Ocean Wind Speed, Soil Emissivity and Humidity; 3-Water Vapor, Liquid Water; 4-Water Vapor, Liquid Water; 5-Water Vapor, Liquid Water, associated channel for Atmospheric Sounding; 6-Sea Ice, Water Vapor, Oil Spills, Clouds, Liquid Water, Surface Temperature, reference window for 50-60 GHz; 7-Rain Rates, Snow, Sea Ice, Clouds; 8-Reference window for atmospheric temperature profiling (Surface Temperature); 9-Atmospheric temperature profiling (O2 Absorption)

ITU Protected Bands: All emissions are prohibited, per ITU Radio Regulations Article 5.340.

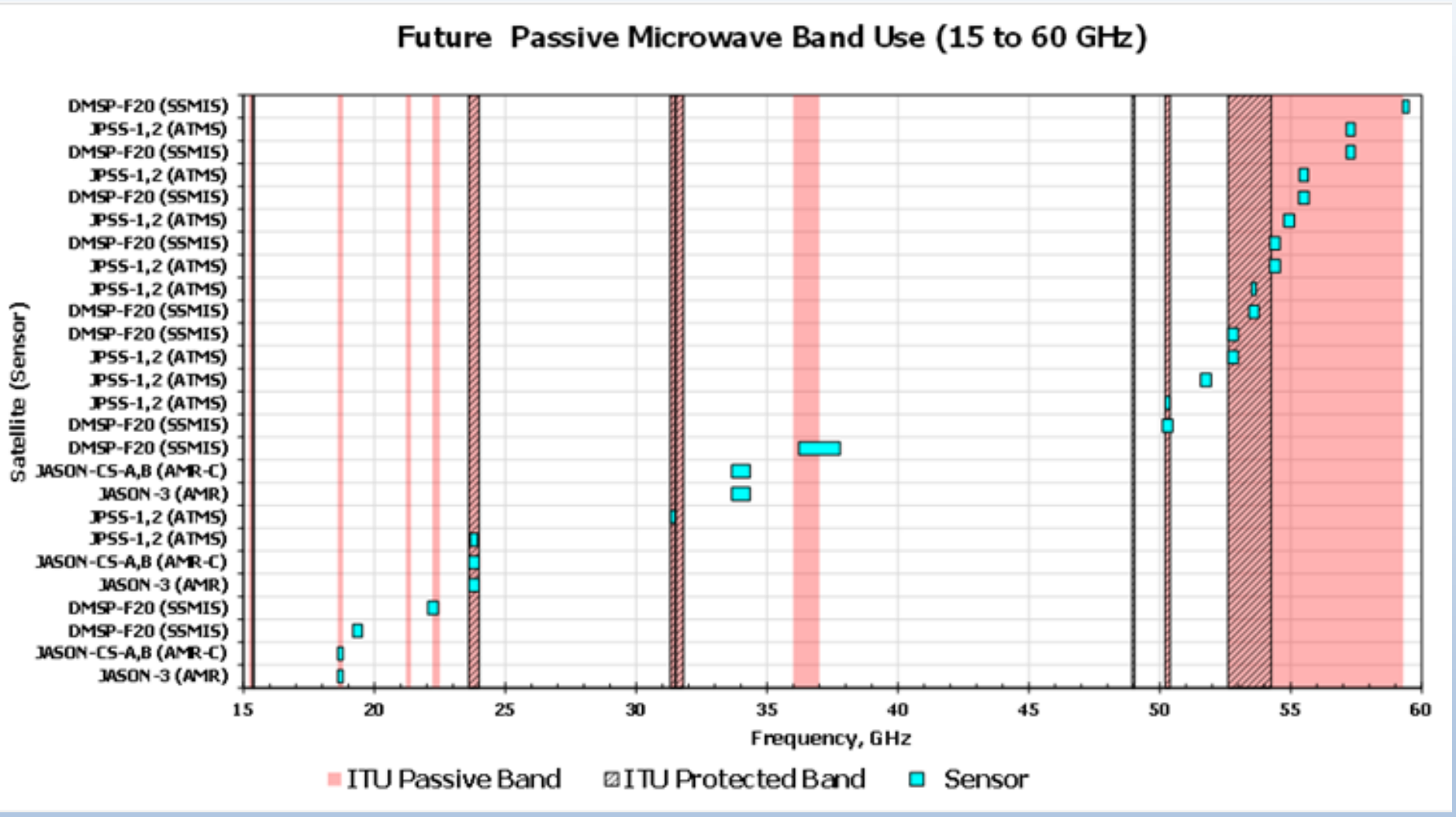
+ Exception: In Saudi Arabia, Bahrain, Cameroon, Egypt, the United Arab Emirates, Guinea, Iran (Islamic Republic of), Iraq, Israel, Kuwait, Lebanon, Oman, Pakistan, Qatar, the Syrian Arab Republic and Somalia, the band 15.35-15.4 GHz is also allocated to the fixed and mobile services on a secondary basis.

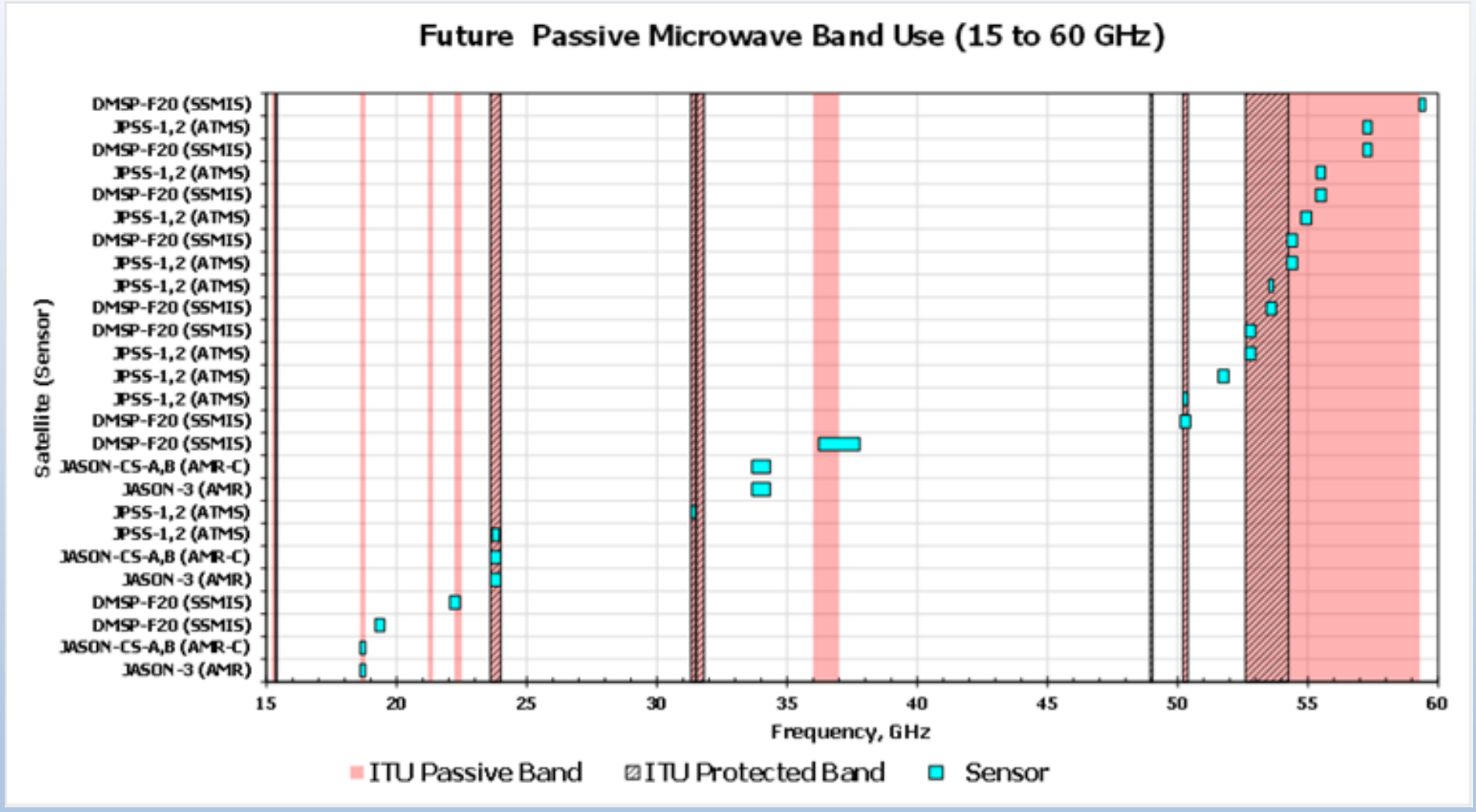
++ Exception: In the band 31.5-31.8 GHz, emissions prohibited only in ITU Region 2 (North America and South America).

* Exception: In the band 48.94-49.04 GHz, emissions prohibited only from airborne stations.



Data source – WMO OSCAR
http://www.wmo-sat.info/oscar/observingmissions


Future Passive Microwave Band Use (15 to 60 GHz)
Satellite (Sensor)
DMSP-F20 (SSMIS)
JPSS-1,2 (ATMS)
DMSP-F20 (SSMIS)
JPSS-1,2 (ATMS)
DMSP-F20 (SSMIS)
JPSS-1,2 (ATMS)
DMSP-F20 (SSMIS)
JPSS-1,2 (ATMS)
JPSS-1,2 (ATMS)
DMSP-F20 (SSMIS)
DMSP-F20 (SSMIS)
JPSS-1,2 (ATMS)
JPSS-1,2 (ATMS)
JPSS-1,2 (ATMS)
DMSP-F20 (SSMIS)
DMSP-F20 (SSMIS)
JASON-CS-A,B (AMR-C)
JASON-3 (AMR)
JPSS-1,2 (ATMS)
JPSS-1,2 (ATMS)
JASON-CS-A,B (AMR-C)
JASON-3 (AMR)
DMSP-F20 (SSMIS)
DMSP-F20 (SSMIS)
JASON-CS-A,B (AMR-C)
JASON-3 (AMR)
15
20
25
30
35
40
45
50
55
60
Frequency, GHz
ITU Passive Band
ITU Protected Band
Sensor


Future Passive Microwave Band Use (15 to 60 GHz)
Satellite (Sensor)
DMSP-F20 (SSMIS)
JPSS-1,2 (ATMS)
DMSP-F20 (SSMIS)
JPSS-1,2 (ATMS)
DMSP-F20 (SSMIS)
JPSS-1,2 (ATMS)
DMSP-F20 (SSMIS)
JPSS-1,2 (ATMS)
JPSS-1,2 (ATMS)
DMSP-F20 (SSMIS)
DMSP-F20 (SSMIS)
JPSS-1,2 (ATMS)
JPSS-1,2 (ATMS)
JPSS-1,2 (ATMS)
DMSP-F20 (SSMIS)
DMSP-F20 (SSMIS)
JASON-CS-A,B (AMR-C)
JASON-3 (AMR)
JPSS-1,2 (ATMS)
JPSS-1,2 (ATMS)
JASON-CS-A,B (AMR-C)
JASON-3 (AMR)
DMSP-F20 (SSMIS)
DMSP-F20 (SSMIS)
JASON-CS-A,B (AMR-C)
JASON-3 (AMR)
15
20
25
30
35
40
45
50
55
60
Frequency, GHz
ITU Passive Band
ITU Protected Band
Sensor

Spectrum representatives in remote sensing systems (WP7C)

(click below to see document)

Radiocommunication Study Groups

INTERNATIONAL TELECOMMUNICATION UNION

Document 7C/344-E
25 May 2015 English only

FINAL LIST OF PARTICIPANTS

Working Party 7C
Geneva, 20-25 May 2015

This list includes the following sections:

I. Member States

II. Regional and other International Organizations

III. Intergovernmental Organizations Operating Satellite Systems

IV. International Telecommunication Union

The following symbols are used:

H: Head of Delegation
DH: Deputy Head of Delegation
D: Delegate

Other items of interest at WRC

- additional 250 MHz (Region 2) and 300 MHz (Region 3) primary allocations to FSS in the range 13-17 GHz
- new allocations to FSS in the frequency bands 7 150-7 250 MHz (space-to-Earth) and 8 400-8 500 MHz (Earth-to-space)
- allocating the bands 7 375-7 750 MHz and 8 025-8 400 MHz to maritime mobile satellite system
- a primary allocation for the EESS (Earth-to-space) in the 7-8 GHz range
- protection of the systems operating in the mobile-satellite service in the band 406-406.1 MHz