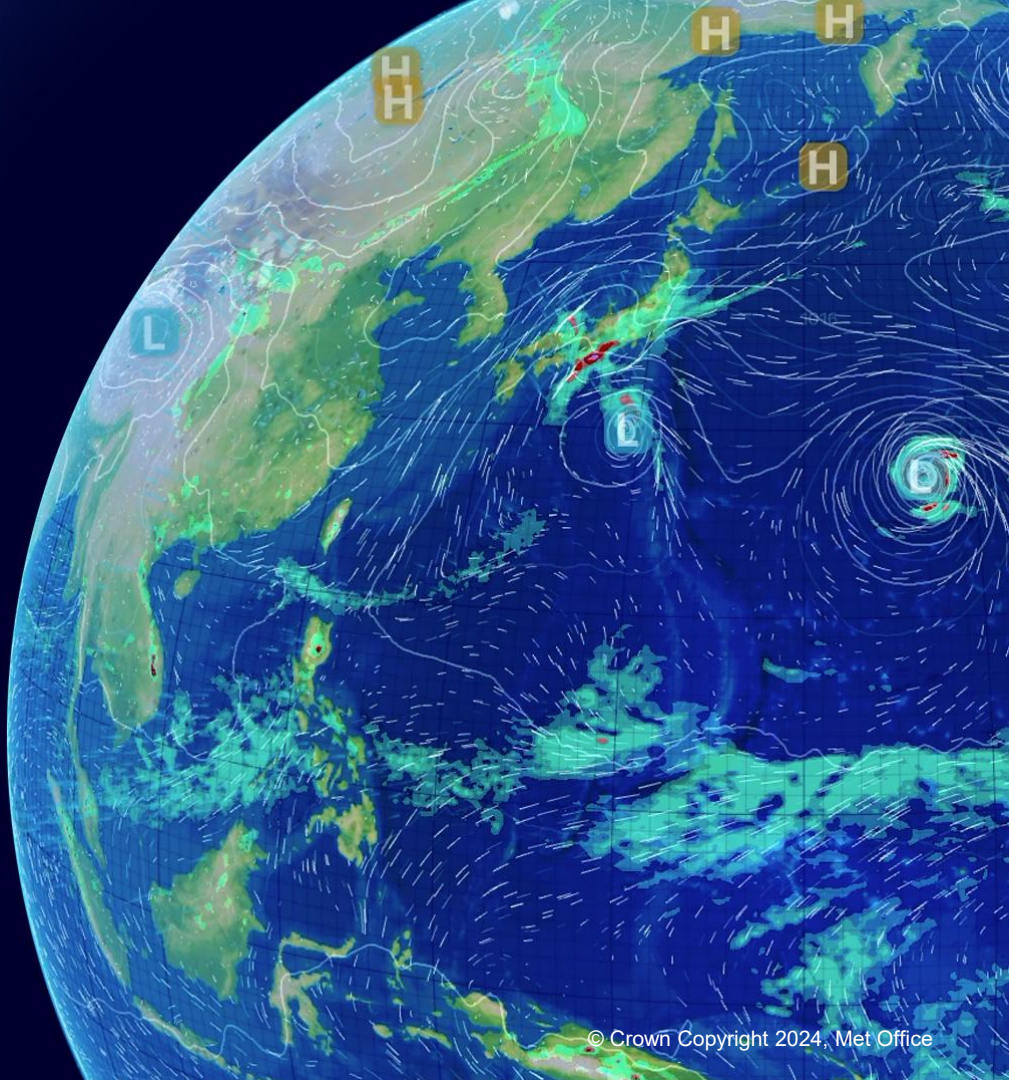![Met Office logo]

Meteorological interest in the Q/V band and WRC-27 agenda item 1.1

Kirsty McBeath, Spectrum Policy Manager
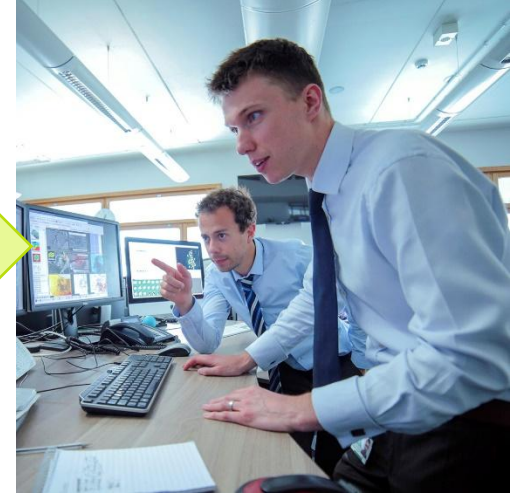
9 June 2025

Weather forecast process

Observations

Modelling & Computing

Meteorologists

Met Office

How we use Spectrum in the Met Office

Satellites

Weather radar

Satellites

Radiosondes

Buoys

Weather radar

Satellites

International data exchange

Passive Sensing
(EESS (passive))

Active Sensing
(Radiolocation/EESS (active))

Communications
(MetAids/MetSat/FSS)

Passive Sensing

Image of MetOp satellite, credit: ESA /AOES Medialab
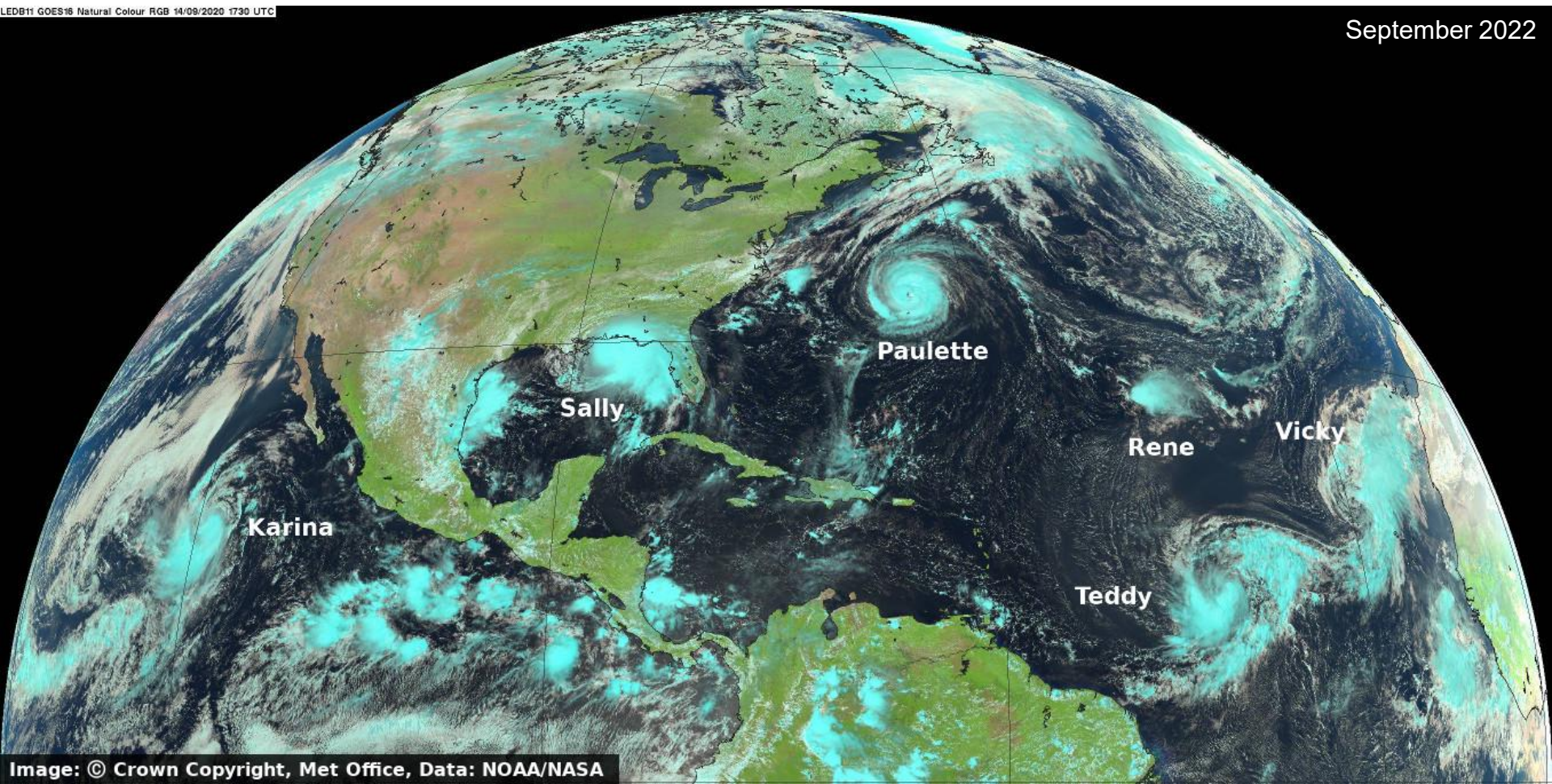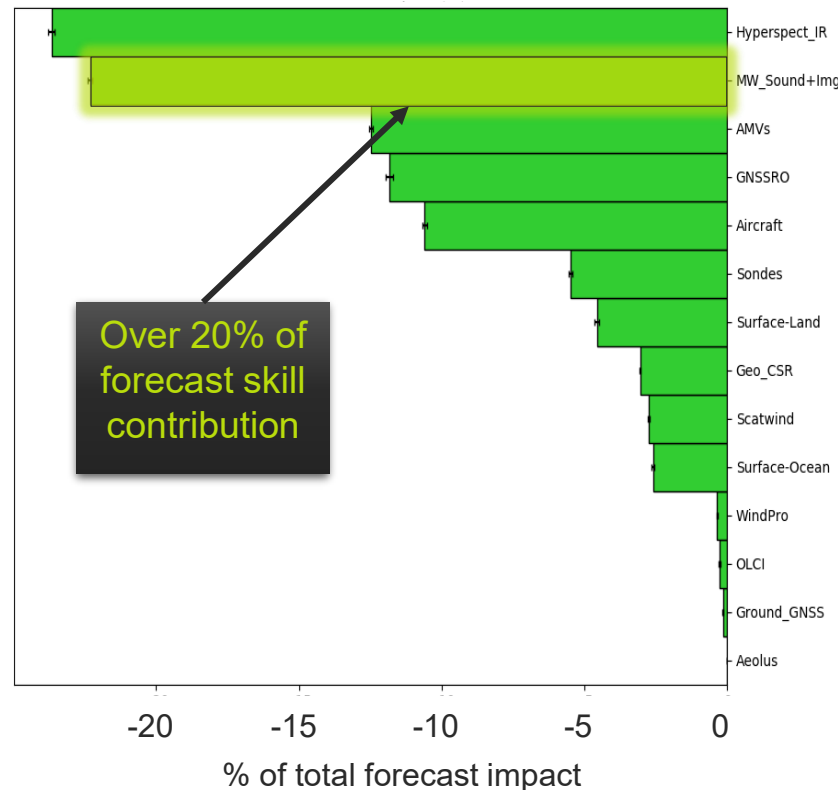
Passive remote sensing

Passive sensing uses highly sensitive instruments to measure differences in microwave radiation emitted by the Earth and atmosphere.

These **signals are used to calculate temperature and humidity through the atmosphere**. They provide valuable data over remote regions in a range of conditions.

Passive microwave sensing data make the 2nd largest contribution of any observing system to Met Office forecast skill.

In addition to supporting weather forecasts, satellites provide information about Essential Climate Variables.

Relative impact of observing systems on forecast skill

Over 20% of forecast skill contribution

% of total forecast impact

Hyperspect_IR
MW_Sound+Img
AMVs
GNSSRO
Aircraft
Sondes
Surface-Land
Geo_CSR
Scatwind
Surface-Ocean
WindPro
OLCI
Ground_GNSS
Aeolus

Weather forecast skill in the satellite era

ECMWF HRes
ACC 500hPa geopotential height (12-month running mean)
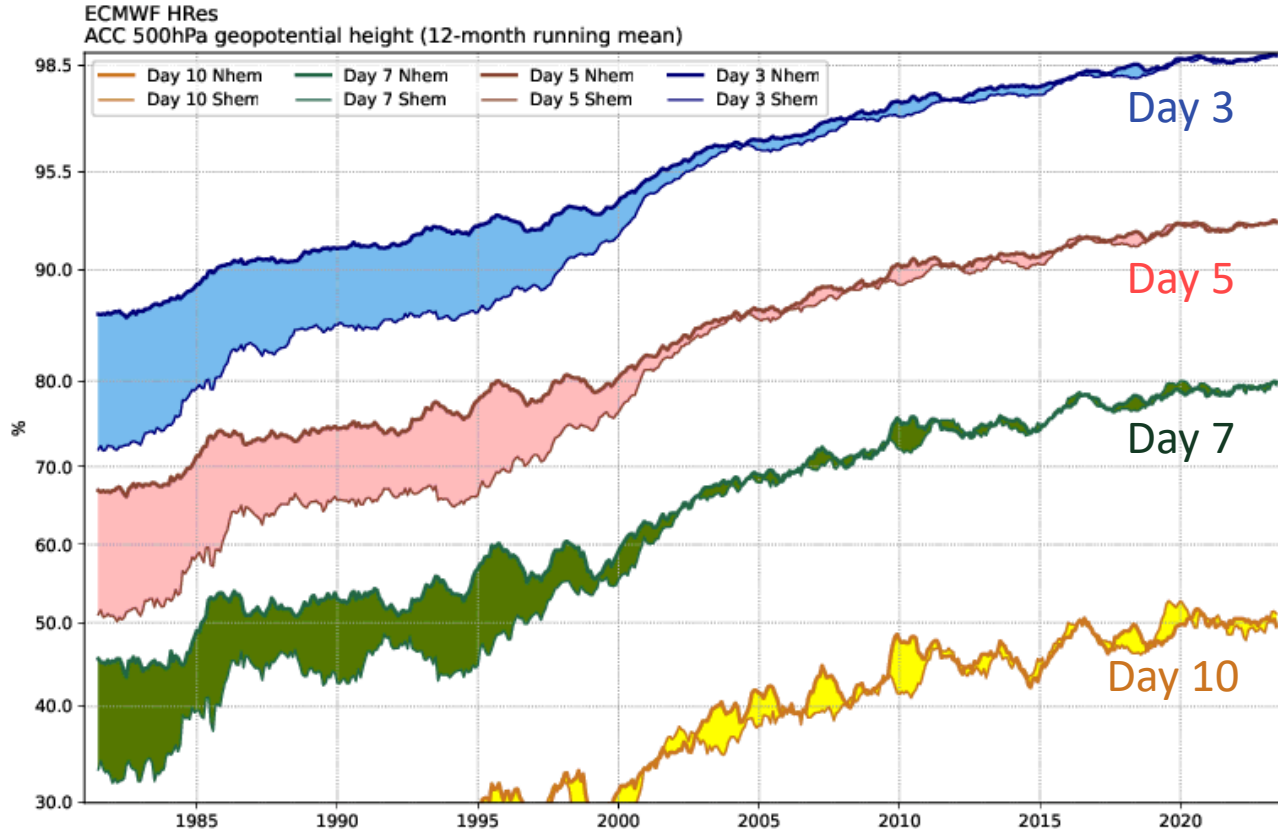
Forecast skill has improved by 1 day per decade.

Improvement is greatest in Southern hemisphere, where skill was very low before the satellite era.

Bands being actively used or prepared for by NWP centres (green = protected by RR5.340, blue = EESS in Radio Regulations, Red = No protection)

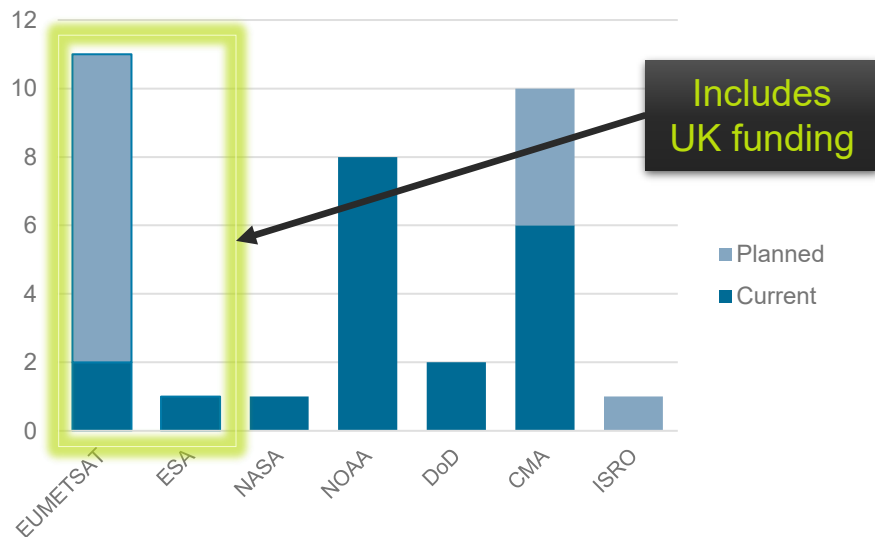| Frequency GHz	Instruments	Application area
1.4-1.427	SMOS (ESA), SMAP (NASA), Aquarius (NASA) , CIMR (ESA)	Soil moisture, salinity, thin sea ice
6.425-7.25	AMSR-2 (JAXA) , CIMR (ESA)	SST
10.6-10.68 10.68-10.7	AMSR-2 (JAXA), GMI (NASA), MWRI (CMA) , CIMR (ESA)	Heavy Precipitation
18.6-18.8	AMSR-2 (JAXA), GMI (NASA), AMR (NOAA), MWRI (CMA) , CIMR (ESA) , MWI (EUMETSAT)	Ocean near surface wind,
23.6-24	AMSU-A (NOAA/EUMETSAT), ATMS (NOAA), SSMIS (DOD), GMI (NASA), AMR (NOAA), MTVZA-GY (Roscosmos), MWRI (CMA), MWS+I (EUMETSAT), AMSR-2 (JAXA)	Total column water vapour
31.3-31.8	AMSU-A (NOAA/EUMETSAT), ATMS (NOAA), GMI (NASA), MTVZA-GY (Roscosmos), MWS+I (EUMETSAT)	Total column cloud liquid
36-37	SSMIS (DOD), GMI (NASA), AMSR-2 (JAXA), MWRI (CMA), CIMR (ESA)	Liquid water path and cloud detection on GMI
50.2-50.4 52.6-54.25 54.25-59.3 59.3-59.5 60.40-61.15 63-63.5	AMSU-A (NOAA/EUMETSAT), ATMS (NOAA), SSMIS (DOD), MWTS-2 (CMA), MTVZA-GY (Roscosmos), MWS (EUMETSAT)	Temperature profile
86-92	AMSU-A (NOAA/EUMETSAT), ATMS (NOAA), SSMIS (DOD), MWHS-2 (CMA), MTVZA-GY (Roscosmos), MWRI (CMA), MWS (EUMETSAT), AMSR-2 (JAXA)	Precipitation
100-102 109.5-111.8 114.25-116 116-122.25	MWHS-2 (CMA), TROPICS (NASA), MWI (EUMETSAT)	Temperature profile, cloud
148.5-151.5 155.5-158.5 164-167	ATMS (NOAA), GMI (NASA), MHS (EUMETSAT), MWHS-2 (CMA), MTVZA-GY (Roscosmos), SSMIS (DOD) , MWS+I (EUMETSAT)	Precipitation, water vapour
174.8-182.0 182-185 185.0-190.0 190.0- 191.8	AMSU-B (NOAA), MHS (EUMETSAT), ATMS (NOAA), SSMIS (DOD), MWHS-2 (CMA), GMI (NASA), SAPHIR (CNES-ISRO), TROPICS (NASA), MTVZA-GY (Roscosmos), MWS+I (EUMETSAT)	Water vapour
200-209 226-231.5	TROPICS (NASA), MWS (EUMETSAT)	Ice cloud

Agenda Item 1.1, meteorological interests

This agenda item introduces a potential for increased interference to the EESS (passive) in the frequency band **50.2–50.4 GHz** (where **RR 5.340** and Resolution **750 (Rev. WRC-19)** applies).

50.2–50.4 GHz corresponds to a reference window for atmospheric temperature measurement. It is essential for weather prediction and climate monitoring

![Met Office]

Meteorological satellites operating in 50.2-50.4 GHz

34 current or planned missions in this frequency band.

Includes UK funding

Planned
Current

▾ Earth observation MW frequencies

Export » Filter table

ⓘ Date range: 1960-2060 | Frequency range: MHz -   Remove filter

ID	Satellite	Space Agency	Launch	EOL	Service	Sensing mode	Frequency (GHz)	Bandwidth (MHz)	Polarisation	Comments
3863	DMSP-F18	DoD	2009-10-18	≥2025	SSMIS	passive	50.3	380	H or RC	Window channel
2213	NOAA-21	NOAA	2022-11-10	≥2036	ATMS	passive	50.3	180	QH	Window channels
2235	JPSS-3	NOAA	2032-12-31	≥2041	ATMS	passive	50.3	180	QH	Window channels
4621	OceanSat-3A	ISRO	≥2025	≥2030	MATHS	passive	50.3	180	-	Window channel
4473	EPS-Sterna-3	EUMETSAT	≥2029	≥2042	MWR	passive	50.3	180	QV	Window channel
4451	EPS-Sterna-2	EUMETSAT	≥2029	≥2042	MWR	passive	50.3	180	QV	Window channel
4429	EPS-Sterna-1	EUMETSAT	≥2029	≥2042	MWR	passive	50.3	180	QV	Window channel
4387	AWS PFM	ESA	2024-08-16	≥2029	MWR	passive	50.3	180	QV	Window channel
4356	FY-3I	CMA	≥2026	≥2032	MWRI-RM	passive	50.3	400	H&V	Temperature sounding channel
4350	FY-3H	CMA	≥2025	≥2033	MWRI-2	passive	50.3	400	H&V	Temperature sounding channel
4343	FY-3G	CMA	2023-04-16	≥2028	MWRI-RM	passive	50.3	400	H&V	Temperature sounding channel
4338	FY-3F	CMA	2023-08-03	≥2029	MWRI-2	passive	50.3	400	H&V	Window channel
3956	Metop-SG-A2	EUMETSAT	≥2032	≥2040	MWS	passive	50.3	180	H or V	Window channel
3950	Metop-SG-A1	EUMETSAT	≥2025	≥2033	MWS	passive	50.3	180	H or V	Window channel
2955	FY-3H	CMA	≥2025	≥2033	MWTS-3	passive	50.3	180	QV	Window channel
3856	DMSP-F17	DoD	2006-11-04	≥2025	SSMIS	passive	50.3	380	H or RC	Window channel
3750	FY-3D	CMA	2017-11-14	≥2025	MWTS-2	passive	50.3	180	QH	Window channel
2257	JPSS-4	NOAA	2027-12-31	≥2036	ATMS	passive	50.3	180	QH	Oxygen band, 13 channels
2448	SNPP	NOAA	2011-10-28	≥2028	ATMS	passive	50.3	180	QH	Window channels
2191	NOAA-20	NOAA	2017-11-18	≥2031	ATMS	passive	50.3	180	QH	Window channel

Showing 10 to 31 of 37 entries - filtered from 2,760 records

WMO OSCAR | Satellite frequencies for Earth Observation, data transfer and platform communications and control

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Agenda Item 1.1, meteorological interests

Res. 750 already contains mandatory unwanted emission limits applicable to FSS in the bands 49.7-50.2 GHz and 50.4-50.9 GHz for the protection of EESS (passive) in the band 50.2-50.4 GHz.

These limits were determined for traditional FSS Earth stations, and may not be appropriate for ESIMs.

In order to ensure that the EESS (passive) in the band 50.2-50.4 GHz is adequately protected, studies under WRC-27 agenda item 1.1 should determine **whether the current limits in Resolution 750 (Rev. WRC-19) need to be modified, taking into account the combination of ESIM and traditional FSS operations**.

Preliminary World Meteorological Organization (WMO) Position on WRC-27 Agenda Item 1.1

WMO does not oppose the operation of ESIMs in the bands 47.2–50.2 GHz and 50.4–51.4 GHz (Earth-to-space) provided that the protection of the EESS (passive) in the adjacent frequency band 50.2-50.4 GHz continues to be ensured through revision, if necessary, of existing mandatory unwanted emission limits in Resolution **750 (Rev. WRC-19)**.

WMO Position on the WRC-27 Agenda | World Meteorological Organization

Summary

Multiple satellite missions in frequency band 50.2-50.4 GHz provide vital temperature measurements for weather predictions and climate records.

The sensors used for these measurements need adequate protection to avoid interference from active services – including in adjacent frequency bands. This is currently provided by RR 5.340 and Res. 750.

Important to consider continued protection in Agenda Item 1.1, e.g. through revision of existing mandatory unwanted emission limits in Res. 750, taking into account the combination of ESIM and traditional FSS operations.

Questions

For more information please contact

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