2. Bands Available to OES between 0.1 and 400 GHz (Part 1 of 6)

Band	Low	High	OES Instruments Affected	Allocation	PRIMARY Services in the Band	Notes and References
P	0.137	0.138	*NOAA*	S-E	SPACE OPS, METSAT, SPACE RES	Obsolete
P	0.400	0.401	*NOAA*	S-E	METSAT, METAID, SPACE RES, MOBSAT	NOAA
P	0.401	0.402	**DORIS**	**E-S**	METAIDS, SPACE OPS(S-E)	{Upgraded at WRC-97}
P	0.402	0.403	*TT&C, old*	**E-S**	METAIDS	{Upgraded at WRC-97}
P	0.403	0.406	***NOAA***	**radiosonde**	METAIDS	NOAA
P	0.410	0.420	Manned Program	**EVA COMM.**	FXD, MOB	{Upgraded at WRC-97}
P	0.430	0.440	***PROPOSED SAR***	*ACTIVE?*	RADIOLOC., AMATEUR	{Deferred to WRC-99?}; Geology under vegetation
P	0.460	0.470	NOAA	*s-e*	FXD, MOB	NOAA
L	1.215	1.300	SAR(JERS-1 & SICH), SIR-C, TRAV. SAR, VSAR, [GPS]	**ACTIVE**	RADIOLOC., RADIONAV-S/C	Wave structure, geology GPS temporary L2 @ 1.228
L	1.370	1.400		passive	FXD, MOB, RADIOLOC.	Footnote 720; Salinity, soil moisture
L	1.400	1.427	MIRAS, (HYDROSTAR?, HYDROSAT?)	**PASSIVE**	RADIO AST., SPC RES.	Hydrogen line, salinity, soil moisture
L	1.427	1.429		**E-S**	FXD, MOB, SPC OPS	
L	1.525	1.535		s-e	FXD, MARITIME-SAT., MOB	
L	1.559	1.610	GPS	**RADIONAV-S/C S-E**	AERO-NAV	Want S-S in WRC-99 GPS L1 @ 1.575
L	1.661	1.668		**PASSIVE**	RADIO AST.	
L	1.668	1.670	NOAA	**radiosonde**	MET AIDS, FXD, MOB, RADIO AST	**NOAA - radiosondes**
L	1.670	1.710	NOAA	**S-E**	FXD, MET AIDS, METSATS (S-E), MOB	**NOAA**

2. Bands Available to OES between 0.1 and 400 GHz (Part 2 of 6)

Band	Low	High	OES Instruments Affected	Allocation	PRIMARY Services in the Band	Notes and References
S	2.025	2.110	Most TT&C, command links, incl. via TDRSS; DORIS	**E-S,S-S**	FXD, MOB, SPC OPS {High density MOB excluded at WRC-97}	Footnotes US90, US111, US219, US222, NG23, NG118
S	2.110	2.120	Deep Space, TT&C	**E-S**	FXD, MOB	
S	2.200	2.290	Most TT&C, return links, incl. via TDRSS	**S-S,S-E**	FXD, MOB, SPC OPS {High density MOB excluded at WRC-97}	
S	2.290	2.300	Deep Space, TT&C	**S-E**	FXD, MOB	Footnotes US303, 750A
S	2.640	2.655		passive	FXD, FXDSAT(S-E), MOB, BRDCST SAT	Footnote 720
S	2.655	2.670		passive	FXD, MOB, MOBSAT	Footnotes 765, 766, US269
S	2.670	2.690		**PASSIVE**	RADIO AST., SPC RES(PASS.)	Salinity, soil moisture
S	2.690	2.700		**PASSIVE**	RADIO AST., SPC RES(PASS.)	Footnotes 767, 768, 769; Salinity, soil moisture
S	3.100	3.300	***RA-2, SAR-10, TRAV. SAR***	active	RADIOLOC.	Geology {Upgraded to secondary at WRC-97}
C	4.200	4.400		passive	AERO.RADIONAV.	Footnote 789, Sea surface temperature
C	4.900	5.000	**R-600**	passive	FXD, MOB, RAD AST.	Footnote 720, Estuarine temperature
C	5.250	5.350	ALT, AMI, ASAR, ASCAT, IKAR, SAR(RADARSAT), SSALT, SIR-C	**ACTIVE**	RADIOLOC.	Soil Moisture {Upgraded at WRC-97}
C	5.350	5.460	RADARSAT-2?	**ACTIVE**	AERO.RADIONAV.	{Allocated at WRC-97}
C	6.425	7.075	**AMSR, AMSR-E, MIMR, MZOAS?, SMR?**	passive	FXD, FXDSAT(E-S), MOB	Footnote 809 - not even secondary - over oceans

2. Bands Available to OES between 0.1 and 400 GHz (Part 3 of 6)

Band	Low	High	OES Instruments Affected	Allocation	PRIMARY Services in the Band	Notes and References
C	7.075	7.250	**DELTA-2**	passive	FXD, FXDSAT(E-S), MOB	Footnote 809
C	7.145	7.235		**E-S**	FXD, MOB	**Footnote 811**
C	7.450	7.550	GSO MetSATs; R-400	**S-E**	METSAT(S-E), FXD, FXDSAT(S-E), MOBSAT(S-E)	**{Reallocated at WRC-97}**
C	7.750	7.850	NGSO MetSATs	**S-E**	FXD, MOB	(Allocated at WRC-97}
X	8.025	8.400	OES data downlinks SARs, ETM,...	**S-E**	FXD, FXDSAT(E-S), MOB. MET SAT(E-S)	{Upgraded to worldwide primary at WRC-97}
X	8.400	8.450	Deep Space Missions	**DSN S-E**	FXD, MOB, SPC RES(S-E)	Difficult out-of-band emission limits, also used by radio astronomers
X	8.550	8.650	SAR-3, SLR-3	**ACTIVE**	RADIOLOC.	Rain, wave structure {Upgraded at WRC-97}
X	9.500	9.800	RLSBO	**ACTIVE**	RADIOLOC., RADIONAV.	Rain, wave structure {Upgraded at WRC-97}
X	9.975	10.025	NOAA MetSAT radar	active	RADIOLOC.	Footnote 828
X	10.60	10.70	AMSR, AMSR-E, MIMR. MZOAS, SMR, TMI	**PASSIVE**	FXD, MOB, RADIO AST, SPC RES(PASS.)	Rain, snow, lake ice, sea state
Ku	13.25	13.40	Appended to 13.40 - 13.75 GHz	**ACTIVE**	AERO.RADIONAV.	{Allocated at WRC-97}
Ku	13.40	13.75	ALT, DELTA-2, IKAR, OKEAN-O, QuikSCAT, SeaWinds, SSALT	**ACTIVE**	RADIOLOC.	Wind, ice, geoid {Upgraded at WRC-97}
Ku	13.75	14.00	**NSCAT, PR, RA, RA-2,**	e-s, active	FXD, RADIOLOC.	Footnote 713, Wind, ice, geoid
Ku	13.75	14.00	TDRSS	**E-S**		TDRSS
Ku	15.20	15.35		passive	FXD, MOB	Footnote 720
Ku	15.35	15.40		**PASSIVE**	RADIO AST., SPC RES.(PASS.)	Water vapor, rain

2. Bands Available to OES between 0.1 and 400 GHz (Part 4 of 6)

Band	Low	High	OES Instruments Affected	Allocation	PRIMARY Services in the Band	Notes and References
Ku	17.20	17.30		**ACTIVE**	RADIOLOC.	Vegetation, snow
K	18.60	18.80	AMR, AMSR, AMSR-E, MIMR, MZOAS, SMR, TMR	**PASSIVE**	FXD, FXDSAT(S-E), MOB	Primary Region 2 only! Rain, sea state, ocean ice, water vapor {Deferred to WRC-99}
K	21.20	21.40	AMR, MIVZA, MTZA, TMI, TMR	**PASSIVE**	FXD, MOB, SPC RES(PASS.)	Water vapor, liquid
K	22.21	22.50	AMSU, DELTA-2, IKAR, MZOAS, SMR?	**PASSIVE**	FXD, MOB, RADIO AST, SPC RES(PASS.)	Water vapor, liquid
K	22.55	23.55	TDRSS to/from OES S/C	**S-S**	FXD, INTER-SAT, MOB	
K	23.60	24.00	AMR, AMSR, AMSR-E, AMSU-A, ATSR-2, MIMR, MSR, MWR	**PASSIVE**	RADIO AST., SPC RES(PASS.)	Water vapor, liquid
K	24.05	24.25		active	RADIOLOC.	Water vapor, liquid
Ka	25.25	25.50		s-s	FXD, INTER-SAT., MOB	
Ka	25.50	27.00	Wideband downlink	**S-E**	FXD, INTER-SAT., MOB	{Upgraded at WRC-97}
Ka	27.00	27.50		s-s	FXD, INTER-SAT., MOB	
Ka	28.50	30.00		e-s	FXD, FXD-SAT., MOB	
Ka	31.30	31.80	AMSU-A, MSR	**PASSIVE**	RADIO AST., SPC RES(PASS.)	Ocean ice, oil spills, clouds, water vapor/liquid
Ka	35.50	36.00		**ACTIVE**	MET.AIDS, RADIOLOC.	Snow {Upgraded at WRC-97}
Ka	36.00	37.00	AMR, AMSR,AMSR-E, ATSR-2, DELTA-2, IKAR, MIMR, MIVZA, MTZA, MWR, MZOAS, SMR, TMI, TMR	**PASSIVE**	FXD, MOB, SPC RES(PASS.)	Rain, snow, ocean ice, oil spills, clouds
Ka	37.50	40.00	RM-0,8	s-e	FXD, FXD-SAT., MOB,SPC RES(S-E)	

2. Bands Available to OES between 0.1 and 400 GHz (Part 5 of 6)

Band	Low	High	OES Instruments Affected	Allocation	PRIMARY Services in the Band	Notes and References
	40.00	40.50		**E-S**	FXD, FXD-SAT., MOB,SPC RES(E-S)	
	50.20	50.40	AMSR, AMSU-A, MSU	**PASSIVE**	{FXD to be deleted?}, MOB, SPC RES(PASS.)	O(Temperature) {WRC-97 proposal}
	51.40	52.60	MTZA	**PASSIVE {to be deleted?}**	SPC RES(PASS.)	O(Temperature) {WRC-97 proposal}
	52.60	54.25	AMSR, AMSU-A(2), MSU, MTZA	**PASSIVE**	SPC RES(PASS.)	O(Temperature)
	54.25	55.78	AMSU-A(3), MSU, MTZA	**PASSIVE**	{FXD to be deleted?}, {GSO INTER-SAT only?}, MOB, SPC RES(PASS.)	O(Temperature) {WRC-97 proposal}
	55.78	58.20	AMSU-A, MSU, MTZA	**PASSIVE**	FXD, {GSO INTER-SAT only, except 56.9-57.0 GHz), MOB, SPC RES(PASS.)	O(Temperature) {WRC-97 proposal}
	58.20	59.30	MTZA	**PASSIVE**	SPC RES(PASS.), {add FXD and MOB, sharing possible?}	O(Temperature) {WRC-97 proposal}
	64.00	65.00	MLS(UARS)	**PASSIVE**	SPC RES(PASS.)	O(Temperature)
	65.00	66.00		**S-E**	SPC RES	Downlink band
	78.00	79.00	CLOUD RADAR	**ACTIVE**	SPC RES(ACT.), RADIOLOC.	Footnote 912, Cloud monitoring.
	86.00	92.00	AMSR, AMSR-E, AMSU-A,-B, MHS, MIMR, MIVZA, MTZA, MZOAS, SMR, TMI	**PASSIVE**	RADIO AST., SPC RES(PASS.)	Clouds, oil spills, ice, snow
	94.0	94.1	Cloud Radar	**ACTIVE**	FXD, FXD-SAT, MOB, RADIOLOC.	{Allocated at WRC-97 for spaceborne cloud radars}
	100.0	102.0	IKAR	**PASSIVE**	FXD, MOB, SPC RES(PASS.)	NO@100.49
	105.0	116.0		**PASSIVE**	RADIO AST., SPC RES(PASS.)	O3@110.8, CO@115.27
	116.0	126.0	RADIOMETER (ODIN)	**PASSIVE**	FXD, INTER-SAT, MOB, SPC RES(PASS.)	O(Temperature)@118.8, NO@125.61
	150.0	151.0	AMSU-B, MHS	**PASSIVE**	FXD, FXDSAT(S-E), MOB, SPC RES(PASS.)	NO@150.74

2. Bands Available to OES between 0.1 and 400 GHz (Part 6 of 6)

Band	Low	High	OES Instruments Affected	Allocation	PRIMARY Services in the Band	Notes and References
	156.0	158.0		**PASSIVE**	FXD, FXD-SAT(S-E), MOB	
	164.0	168.0	MHS	**PASSIVE**	RADIO AST, SPC RES(PASS.)	ClO@164.38, 167.2
	174.5	176.5		**PASSIVE**	FXD, INTER-SAT, MOB, SPC RES(PASS.)	NO@175.86
	182.0	185.0	AMSU-B(3), MHS, MLS (UARS)	**PASSIVE**	RADIO AST., SPC RES(PASS.)	Water Vapor@183.31, O3@184.75
	200.0	202.0	MLS(UARS), MASTER	**PASSIVE**	FXD, MOB, SPC RES(PASS.)	NO@200.98
	217.0	231.0	MLS	**PASSIVE**	RADIO AST., SPC RES(PASS.)	NO@226.09, CO@230.54
	235.0	238.0		**PASSIVE**	FXD, FXDSAT(S-E), MOB, SPC RES(PASS.)	O3@235.71, 237.15
	250.0	252.0		**PASSIVE**	SPC RES(PASS.)	NO@251.21
	275.0	277.0		**(PASSIVE)**	UNDEFINED	Footnote 927, NO@276.33
	300.0	302.0	MLS, MASTER	**(PASSIVE)**	UNDEFINED	Footnote 927, NO@301.44
	324.0	326.0	MASTER	**(PASSIVE)**	UNDEFINED	Footnote 927, Water Vapor@325.1
	345.0	347.0	MASTER	**(PASSIVE)**	UNDEFINED, (RADIO AST.)	Footnote 927, CO@345.8
	363.0	365.0		**(PASSIVE)**	UNDEFINED	Footnote 927, O3@364.32
	379.0	381.0		**(PASSIVE)**	UNDEFINED	Footnote 927, Water Vapor@380.2

NOTES:

Band: The letter used to identify a particular frequency band**.**

Low: The lower edge of the band, in GHz.

High: The high edge of the band, in GHz

OES Instruments affected: Instruments of interest to OES using a particular band. Beware - BOLDED instruments have only a secondary allocation!

Allocation: Primary allocations (see below) are **BOLDED UPPER CASE**; secondary allocations are in lower case.

PRIMARY services in the Band: If we are also primary in the band, these services are equal users; if we are only secondary - or worse yet, just footnoted - we are at their mercy and good will.

Notes and References: Indicates which footnote applies (if any, see below), any absorption bands and areas of scientific interest to OES.

2. Bands Available to OES between 0.1 and 400 GHz (continued)

DEFINITIONS:

ACTIVE: A service using a transmitter, such as synthetic aperture radars, radar altimeters, scatterometers, etc.

(E-S) - Earth to Space: what we call an uplink, or forward link communications.

Earth Exploration Satellite Service: The OES label, plus meteorological services.

Footnotes: Additions to the allocation tables, may indicate primary or secondary allocations or just serve to notify potential users of current unprotected band users. Also used to indicate country-specific allocations. These provide the weakest form of protection in that they have been ignored in the past.

FXD - Fixed Service: point-to-point service, generally both points are on the ground.

FXDSAT - Fixed Satellite Service: A fixed service between fixed points on earth via a satellite.

INTER-SAT - Inter-satellite service: Service between two satellites, such as EOS AM-1 and TDRSS.

METSAT - Meteorological Satellite Service: Earth exploration satellite service for meteorological purposes.

METAIDS - Meteorological aids: A service for meteorological purposes, such as radiosondes.

MOB - Mobile Service: a radiocommunications service between mobile and land stations, or between two mobile stations.

PASSIVE: A service receiving only, such a radiometer.

PRIMARY (**UPPER CASE**): Primary services have equal rights to use a specified band, and are protected from secondary and other users.

2. Bands Available to OES between 0.1 and 400 GHz (continued)

DEFINITIONS (continued):

RADIO AST. - Radio Astronomy: Radio astronomy service, all passive allocations.

RADIOLOC. - Radiolocation: Radiodetermination used for other than navigation purposes.(e.g., Radars)

RADIONAV - Radionavigation Service: Radiodetermination used for navigation, including obstruction warning (e.g., Beacons).

Regions: Region 1 is Europe, Africa, and northern Asia;
Region 2 is the Americas; and,
Region 3 is Southeast Asia and the southern Pacific.

(S-E) - Space to Earth: What we call downlink or return link communications.

Secondary (lower case in table): Secondary services are on a non-interference basis to primary or permitted services, and cannot claim protection from harmful interference caused by primary/permitted users.

SPC OPS - Space Operations service: A radiocommunication service concerned exclusively with the operation of spacecraft, in particular, tracking, telemetry, and command operations.

SPC RES - Space Research service: A radiocommunications service in which spacecraft or other objects in space are used for scientific or technological research purposes.

SPC RES(PASS.): Same as space research service, only passive use (no transmitting)

TIME/FREQ - Time and/or Frequency service: Provides a time and/or frequency standard.

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