



**Resolution SFCG 29-1**

**PASSIVE BANDS OF INTEREST ABOVE 275 GHz**

The SFCG,

CONSIDERING

- a) that due to the continuous technological and scientific development in the bands above 275 GHz, the requirements for passive sensing must be periodically reviewed;
- b) that the basic parameters related to requirements for EESS (passive) sensors are contained in Recommendation ITU-R RS.515;
- c) that any proposal for revision to this Recommendation ITU-R RS.515 requires a large consensus within the user community and a coherent approach in the parameters definition across all the passive bands;
- d) that three main categories of passive sensors can be identified for the use of these bands:
  - 1. 3-dimensional vertical atmosphere sounders requiring very high data reliability and medium resolution over multiple channels,
  - 2. imaging radiometers requiring high data reliability, medium resolution, integration over relatively large bandwidth single channels, and
  - 3. atmospheric limb sounders requiring medium data reliability at very high resolution over many small bandwidth channels.
- e) that any performance requirement has to be based on known scientific requirements for the measurement; the data resolution and availability levels must therefore be scientifically meaningful with respect to the applications for which they are used (e.g. forecasting, surface observations and climate monitoring);

- f) that due to the large number of spectral lines of interest to Earth observations in the 1-3 THz region, no attempt is made to define the individual bands;
- g) that the 1-3 THz region is so opaque that only limb-sounding observations from the top of the atmosphere are practical, adequate protection for passive sensing is essentially guaranteed and sharing is feasible with any terrestrial service.

#### RESOLVES

1. that Table 1 represents the EESS frequency bands of interest, their associated spectral lines, measurements, typical scan mode and existing or planned instruments for frequencies above 275 GHz,
2. that Member Agencies submit to the SFCG contributions to update the values contained in Table 1,
3. that Member Agencies use the information in Table 1 as a basis for contributions to the ITU-R to update appropriate Recommendations.

**Table 1: Passive bands of interest for EESS above 275 GHz**

Frequency band(s) (GHz)	Total Bandwidth required (MHz)	Spectral line(s) (GHz)	Measurement			Typical Scan Mode	Existing or planned Instrument(s)	Supporting information
			Meteorology – Climatology	Window	Chemistry			
275 – 285.4	10 400	276.33 ( <b>N<sub>2</sub>O</b> ), 278.6 ( <b>ClO</b> )		276.4-285.4	N <sub>2</sub> O, ClO, NO	Limb		<b>Window</b> (276.4-285.4), <b>Chemistry</b> (275-279.6)
296 – 306	10 000	Window for 325.1, 298.5 ( <b>HNO<sub>3</sub></b> ), 300.22 ( <b>HOCl</b> ), 301.44 ( <b>N<sub>2</sub>O</b> ), 303.57 ( <b>O<sub>3</sub></b> ), 305.2 ( <b>HNO<sub>3</sub></b> ), 304.5 ( <b>O<sup>17</sup>O</b> )	Wing channel for temperature sounding	296-306	OXYGEN, N <sub>2</sub> O, O <sub>3</sub> , O <sup>17</sup> O, HNO <sub>3</sub> , HOCl	Nadir, Limb	MASTER	<b>Window</b> (296-306 GHz), <b>Chemistry</b> (298-306)
313.5 – 355.6	42 100	{318.8, 345.8, 344.5} ( <b>HNO<sub>3</sub></b> ), 313.8 ( <b>HDO</b> ), {321.15, 325.15} ( <b>H<sub>2</sub>O</b> ), {321, 345.5, 352.3, 352.6, 352.8} ( <b>O<sub>3</sub></b> ), {322.8, 343.4} ( <b>HOCl</b> ), 345.8 ( <b>CO</b> ), {345.0, 345.4} ( <b>CH<sub>3</sub>Cl</b> ), 345.0 ( <b>O<sup>18</sup>O</b> ), 354.5 ( <b>HCN</b> ), 349.4 ( <b>CH<sub>3</sub>CN</b> ), {315.8, 346.9, 344.5, 352.9} ( <b>ClO</b> ), 351.67 ( <b>N<sub>2</sub>O</b> ), 346 ( <b>BrO</b> ),	WATER VAPOUR PROFILING, CLOUD, Wing channel for temperature sounding	339.5-348.5	H <sub>2</sub> O, CH <sub>3</sub> Cl, HDO, ClO, O <sub>3</sub> , HNO <sub>3</sub> , HOCl, CO, O <sup>18</sup> O, HCN, CH <sub>3</sub> CN, N <sub>2</sub> O, BrO	Nadir, Conical, Limb	PREMIER, CIWSIR, MASTER, MWI, GOMAS, GEM	<b>Water vapour line at 325.15</b> (BW: 3 GHz, max. offset: 9.5 GHz), <b>Cloud Measurements</b> (331.65-337.65, 314.14-348, 339-348, 320.45-324.45, 325.8-329.85, 336-344, 339-348)) <b>MWI cloud ice and cirrus</b> (313.95-317.35, 332.95-336.35), <b>Window</b> (339.5-348.5), <b>CIWSIR Water line</b> (314.15-336.15), <b>MASTER Chemistry</b> (321-326), <b>GEM/MASTER Chemistry</b> (342-346), <b>PREMIER Chemistry</b> (343.6-355.6, 313.5-325.5)

Frequency band(s) (GHz)	Total Bandwidth required (MHz)	Spectral line(s) (GHz)	Measurement			Typical Scan Mode	Existing or planned Instrument(s)	Supporting information
			Meteorology – Climatology	Window	Chemistry			
361-365	4 000	364.32 (O <sub>3</sub> )	Wing channel for water vapour profiling		O <sub>3</sub>	Nadir, Limb	GOMAS	<b>GOMAS Water vapour</b> (361-363), <b>Chemistry</b> (363-365)
369.2-391.2	22 000	380.2 (H <sub>2</sub> O)	WATER Vapour profiling			Nadir, Limb	GEM, GOMAS	<b>Water vapour line</b> (369.2-391.2, BW: 3 GHz, max. offset: 9.5 GHz), <b>GEM/GOMAS Water vapour sounding</b> (379-381), <b>Water vapour profiling</b> (371-389), Polar-orbiting and GSO satellites (FY4) for precipitation over snow-covered mountains and plains (380)
397-399	2000		WATER Vapour profiling				GOMAS	
409 – 411	2000		Temperature sounding			Limb		
416 – 433.46	17 460	424.7 (O <sub>2</sub> )	OXYGEN, Temperature profiling			Nadir, Limb	GEM, GOMAS	<b>Oxygen line</b> (416.06-433.46, BW: 3 GHz, max. offset: 7.2 GHz), <b>GEM/GOMAS Oxygen</b> (416-433)
439.1-466.3	27 200	{ 443.1, 448 } (H <sub>2</sub> O), 443.2 (O <sub>3</sub> ), 442 (HNO <sub>3</sub> )	WATER vapour profiling, CLOUD	458.5-466.3	O <sub>3</sub> , HNO <sub>3</sub> , N <sub>2</sub> O, CO	Nadir, Limb, Conical	MWI, CIWSIR,	<b>Water line</b> (439.3-456.7, BW: 3 GHz, max. offset: 7.2 GHz), <b>Cloud measurements</b> (452.2-458.2, 444-447.2, 448.8-452, 459-466), <b>MWI cloud ice and cirrus</b> (439.1-442.5, 453.5-456.9), GSO satellites (FY4) (424), <b>Window</b> (458.5-466.64), <b>Chemistry</b> (442-444)

Frequency band(s) (GHz)	Total Bandwidth required (MHz)	Spectral line(s) (GHz)	Measurement			Typical Scan Mode	Existing or planned Instrument(s)	Supporting information
			Meteorology – Climatology	Window	Chemistry			
477.75-496.75	19 000	487.25 ( <b>O<sub>2</sub></b> )	OXYGEN, Temperature profiling			Limb	ODIN	<b>Oxygen line</b> (477.75-496.75, BW: 3 GHz, max. offset: 8 GHz), <b>ODIN Oxygen</b> (486-489)
497 – 502	5000	497.9 ( <b>N<sub>2</sub><sup>18</sup>O</b> ), {497.6, 497.9} ( <b>BrO</b> ), 498.6 ( <b>O<sub>3</sub></b> )	Wing channel for water vapour profiling	498-502	O <sub>3</sub> , CH <sub>3</sub> Cl, N <sub>2</sub> <sup>18</sup> O, BrO, ClO	Limb, Nadir	SOPRANO, MASTER, ODIN	<b>Water window</b> (498-502), <b>Chemistry SOPRANO/ODIN/MASTER</b> (497-499)
523-527	4 000	Window for 556.9	Wing channel for water vapour profiling	523-527		Nadir		
538-581	43 000	{541.26, 542.35, 550.90, 556.98} ( <b>HNO<sub>3</sub></b> ), 556.93 ( <b>H<sub>2</sub>O</b> ), {544.99, 566.29, 571.0} ( <b>O<sub>3</sub></b> ), 575.4 ( <b>ClO</b> )	WATER vapour profiling	538-542	HNO <sub>3</sub> , O <sub>3</sub> , ClO	Nadir, Limb	ODIN	<b>Water window</b> (538-542), <b>ODIN water vapour profiling</b> (546-568), <b>ODIN water vapour sounding</b> (552-562), <b>Chemistry</b> (541-558), <b>ODIN Chemistry</b> (563-581)

Frequency band(s) (GHz)	Total Bandwidth required (MHz)	Spectral line(s) (GHz)	Measurement			Typical Scan Mode	Existing or planned Instrument(s)	Supporting information
			Meteorology – Climatology	Window	Chemistry			
611.7-629.7	18 000	620.7 ( <b>H<sub>2</sub>O</b> ), 624.27 ( <b>ClO<sub>2</sub></b> ), {624.34, 624.89, 625.84, 626.17} ( <b>SO<sub>2</sub></b> ), {624.48, 624.78} ( <b>HNO<sub>3</sub></b> ), 624.77 ( <b><sup>81</sup>BrO</b> ), 624.8 ( <b>CH<sub>3</sub>CN</b> ), 625.04 ( <b>H<sub>2</sub>O<sub>2</sub></b> ), 625.37 ( <b>O<sub>3</sub></b> ), 624.98 ( <b>H<sup>37</sup>Cl</b> ), 625.92 ( <b>H<sup>35</sup>Cl</b> ), 627.18 ( <b>CH<sub>3</sub>Cl</b> ), 627.77 ( <b>O<sup>18</sup>O</b> ), {625.07, 628.46} ( <b>HOCl</b> ), 625.66 ( <b>HO<sub>2</sub></b> )	WATER vapour profiling, OXYGEN		OXYGEN, ClO <sub>2</sub> , SO <sub>2</sub> , BrO, O <sub>3</sub> , H <sup>35</sup> Cl, CH <sub>3</sub> Cl, O <sup>18</sup> O, HOCl, HO <sub>2</sub> , HNO <sub>3</sub> , CH <sub>3</sub> CN, H <sub>2</sub> O <sub>2</sub>	Limb	MLS, SMILES, SOPRANO	<b>Water line</b> (611.7-629.7, BW: 3 GHz, max. offset: 7.5 GHz), <b>MLS/SMILES/SOPRANO Chemistry</b> (624-629)
634-654	20 000	635.87 ( <b>HOCl</b> ), 647.1 ( <b>H<sub>2</sub><sup>18</sup>O</b> ), 649.45 ( <b>ClO</b> ), 649.24 ( <b>SO<sub>2</sub></b> ), 649.7 ( <b>HO<sub>2</sub></b> ), 650.18 ( <b><sup>81</sup>BrO</b> ), 650.28 ( <b>HNO<sub>3</sub></b> ), 650.73 ( <b>O<sub>3</sub></b> ), 651.77 ( <b>NO</b> ), 652.83 ( <b>N<sub>2</sub>O</b> )	Wing channel for water vapour profiling	634.8-651	H <sub>2</sub> <sup>18</sup> O, HOCl, ClO, HO <sub>2</sub> , BrO, HNO <sub>3</sub> , O <sub>3</sub> , NO, N <sub>2</sub> O, SO <sub>2</sub>	Limb, Nadir	MLS, SMILES	<b>Window</b> (634.8-651), <b>MLS/SMILES Chemistry</b> (634-654)

Frequency band(s) (GHz)	Total Bandwidth required (MHz)	Spectral line(s) (GHz)	Measurement			Typical Scan Mode	Existing or planned Instrument(s)	Supporting information
			Meteorology – Climatology	Window	Chemistry			
656.9-692	35 100	658 ( <b>H<sub>2</sub>O</b> ), 660.49 ( <b>HO<sub>2</sub></b> ), 688.5 ( <b>CH<sub>3</sub>Cl</b> ), 691.47 ( <b>CO</b> ), 687.7 ( <b>ClO</b> )	WATER vapour profiling, CLOUD	676.5-689.5	HO <sub>2</sub> , ClO, CO, CH <sub>3</sub> Cl	Limb, Nadir, Conical	CIWSIR, MWI, MLS	<b>Water line</b> (669.7-676.5), <b>Cloud Measurements</b> (665.2-671.2, 677-692), <b>MWI cloud ice and cirrus</b> (656.9-662.7, 665.3-671.1), <b>Window</b> (658.3-669.7, 676.5-689.5), <b>MLS Chemistry</b> (659-661), <b>CIWSIR Chemistry</b> (677-692),
713.4-717.4	4000	715.4 ( <b>O<sub>2</sub></b> )	OXYGEN			Limb		
729-733	4000	731 ( <b>HNO<sub>3</sub></b> ), 731.18 ( <b>O<sup>18</sup>O</b> )	OXYGEN		O <sup>18</sup> O, HNO <sub>3</sub>	Limb		
750-754	4 000	752 ( <b>H<sub>2</sub>O</b> )	WATER			Limb		
771.8-775.8	4 000	773.8 ( <b>O<sub>2</sub></b> )	OXYGEN			Limb		
823.15-845.15	22 000	834.15 ( <b>O<sub>2</sub></b> )	OXYGEN					<b>Oxygen line</b> (823.15-845.15, BW: 3 GHz, max. offset: 9.5 GHz)
850-854	4 000	852 ( <b>NO</b> )			NO	Limb		
857.9-861.9	4 000	859.9 ( <b>H<sub>2</sub>O</b> )	WATER			Limb		
866-882	16 000		CLOUD, WINDOW			Conical	CIWSIR	<b>Cloud Measurements</b> (866.5-869.5, 868-881, 878.5-881.5), <b>Window</b> (866.9-881.9)
905.17-927.17	22 000	916.17 ( <b>H<sub>2</sub>O</b> )	WATER					
951-956	5 000	952 ( <b>NO</b> ), 955 ( <b>O<sup>18</sup>O</b> )	OXYGEN		O <sup>18</sup> O, NO	Limb	SOPRANO	
968.31-972.31	4 000	970.3 ( <b>H<sub>2</sub>O</b> )	WATER			Limb		
985.9-989.9	4 000	987.9 ( <b>H<sub>2</sub>O</b> )	WATER			Limb		