

2023-09-25



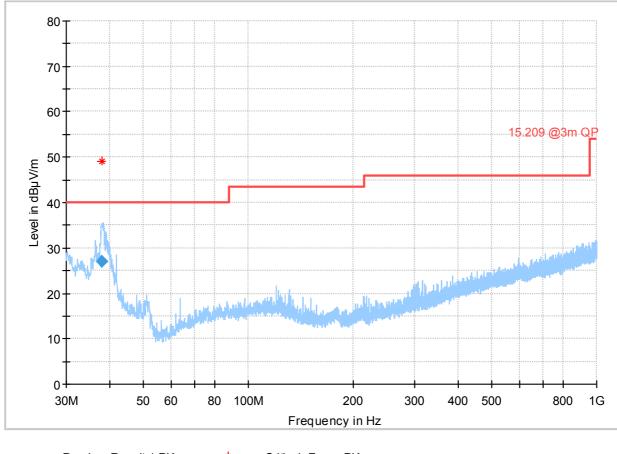
Final_Result

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
30.480500	22.11	40.00	17.89	100.0	120.000	100.0	V	250.0
37.685000	27.95	40.00	12.05	100.0	120.000	100.0	V	24.0
921.497500	15.84	46.00	30.16	100.0	120.000	250.0	н	78.0

(continuation of the '	"Final_Result"	table from column	15)

Frequency (MHz)	Corr. (dB/m)	Comment
30.480500	20.2	13:40:15 - 24.07.2023
37.685000	16.2	13:38:12 - 24.07.2023
921.497500	23.4	13:36:06 - 24.07.2023





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— Preview Result 1-PK+ ★ 15.209 @3m QP	Critical_Freqs PK+ Final_Result QPK
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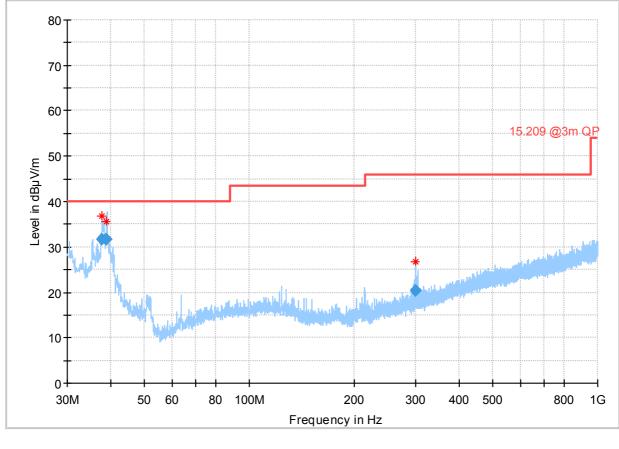
Final_Result

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
38.065500	27.01	40.00	12.99	100.0	120.000	116.0	V	113.0

(continuation of the "Final_Result" table from column 15 ...)

Frequency (MHz)	Corr. (dB/m)	Comment
38.065500	16.0	13:58:59 - 24.07.2023





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Preview Result 1-PK+ * Critical_Freqs PK+ 15.209 @3m QP • Final_Result QPK

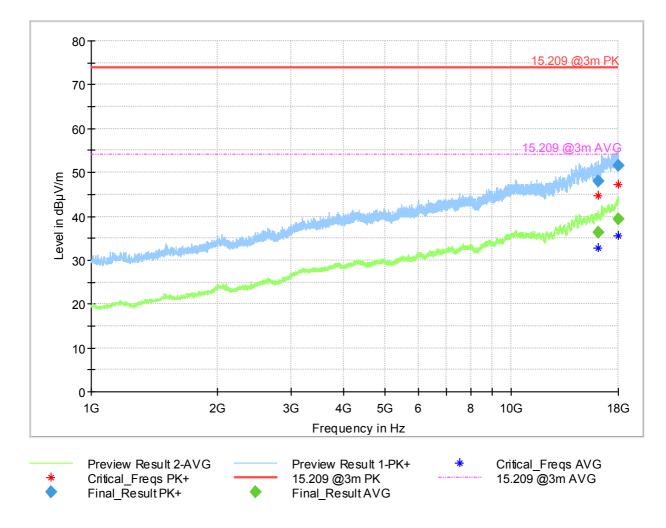
Final_Result

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
37.736500	31.73	40.00	8.27	100.0	120.000	103.0	V	99.0
38.796000	31.70	40.00	8.30	100.0	120.000	100.0	V	178.0
299.999500	20.26	46.00	25.74	100.0	120.000	116.0	н	120.0

(continuation of the "Fir	al_Result" table from column	15)
(,

Frequency (MHz)	Corr. (dB/m)	Comment
37.736500	16.2	14:19:59 - 24.07.2023
38.796000	15.5	14:21:47 - 24.07.2023
299.999500	13.3	14:18:04 - 24.07.2023





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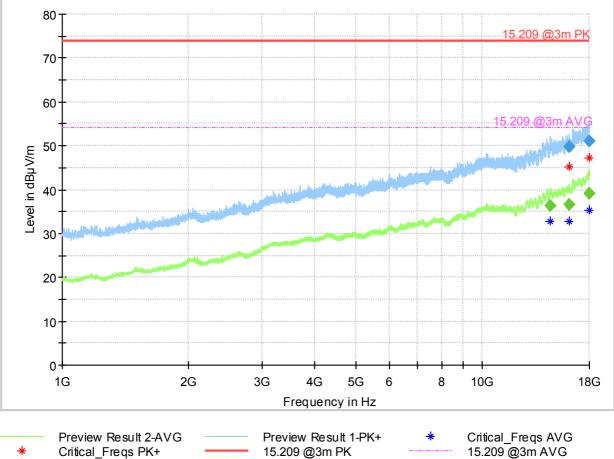


Final_Result

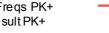
Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol
16087.680556	47.99		74.00	26.01	100.0	1000.000	150.0	н
16116.372222		36.38	54.00	17.62	100.0	1000.000	150.0	Н

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Final_Result PK+



15.209 @3m PK Final_ResultAVG

Final_Result

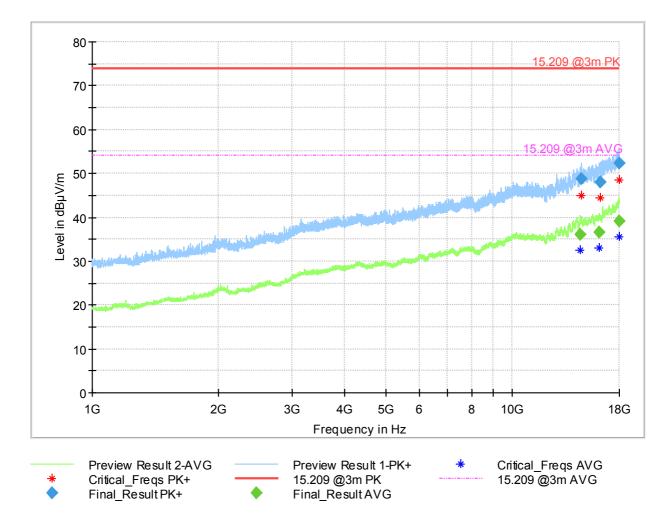
Frequency	MaxPeak	Average	Limit	Margin	Meas. Time	Bandwidth	Height	Pol
(MHz)	(dBµV/m)	(dBµV/m)	(dBµV/m)	(dB)	(ms)	(kHz)	(cm)	
14564.666667		36.36	54.00	17.64	100.0	1000.000	150.0	н
16123.088889	49.90		74.00	24.10	100.0	1000.000	150.0	н
16128.650000		36.51	54.00	17.49	100.0	1000.000	150.0	Н
17967.500000		38.99	54.00	15.01	100.0	1000.000	150.0	v
17987.391667	51.05		74.00	22.95	100.0	1000.000	150.0	н

(continuation of the "Final_Result" table from column 14 ...)

Frequency (MHz)	Azimuth (deg)	Elevation (deg)	Corr. (dB/m)	Comment
14564.666667	185.0	14.0	18.0	10:36:15 - 24.07.2023
16123.088889	50.0	67.0	17.9	10:32:23 - 24.07.2023
16128.650000	20.0	1.0	17.9	10:38:14 - 24.07.2023
17967.500000	162.0	76.0	22.6	10:40:27 - 24.07.2023
17987.391667	202.0	109.0	22.7	10:34:22 - 24.07.2023







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Final_Result

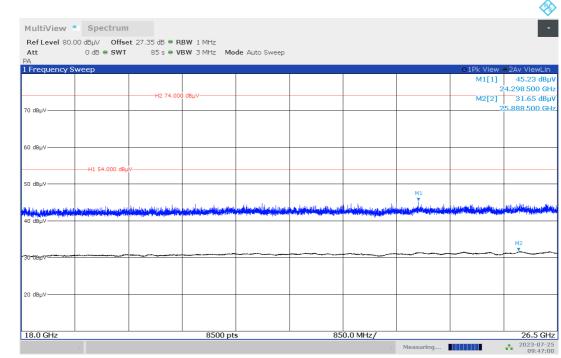
Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol
14557.111111		36.13	54.00	17.87	100.0	1000.000	150.0	V
14577.063889	48.65		74.00	25.35	100.0	1000.000	150.0	Н
16101.261111		36.56	54.00	17.44	100.0	1000.000	150.0	v
16209.033333	48.03		74.00	25.97	100.0	1000.000	150.0	v
17994.588889		39.20	54.00	14.80	100.0	1000.000	150.0	н
17998.725000	52.43		74.00	21.57	100.0	1000.000	150.0	н

(continuation of the "Final_Result" table from column 14 ...)

Frequency (MHz)	Azimuth (deg)	Elevation (deg)	Corr. (dB/m)	Comment
14557.111111	209.0	3.0	18.0	12:21:57 - 24.07.2023
14577.063889	302.0	89.0	18.0	12:15:31 - 24.07.2023
16101.261111	2.0	85.0	17.8	12:24:08 - 24.07.2023
16209.033333	336.0	26.0	18.1	12:17:35 - 24.07.2023
17994.588889	343.0	1.0	22.7	12:26:39 - 24.07.2023
17998.725000	147.0	91.0	22.8	12:19:53 - 24.07.2023



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Plot no. 55: radiated emissions 18 GHz - 26.5 GHz, mode 7, polarization vertical / horizontal

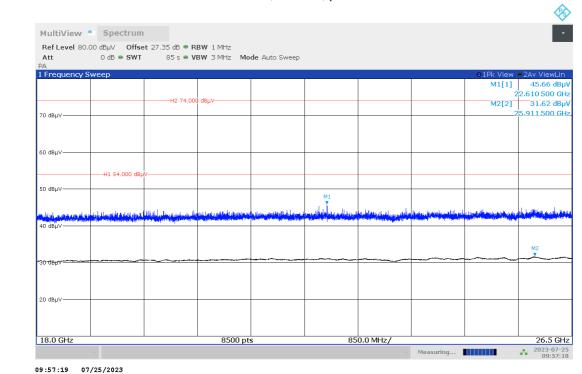
09:47:00 07/25/2023

Plot no. 56: radiated emissions 18 GHz – 26.5 GHz, mode 8, polarization vertical / horizontal

tt	0 dBµV Offset 0 dB ● SWT		BW 3 MHz Mo	de Auto Sweep					
\									
requency Sv	weep							• 1Pk View M1[1]	
									43.80 0
		H2 74.000) dBµV					M2[2]	
dBµV									5.908 500 (
dBµ∨									
	——H1 54.000 dBµ\	/							
dBµ∨									
							M1		
1	a second second	محيدا فالمقاد والملاح	والالالالالية والمراد والمرادية	and the later of the	والمسالح ومراجعا والالتربين	فالقيم والمعاملية والأرا	Alabara Materia and	بريد أنشط فسيع فعال الشقب	- harnbarnedari
والأرداد المطالبة والمرابط	اللبين الباطنة بابتار بالشاطعان								
			and the second	lither density of the second strange with the	Contract Contraction		and the provident of the property of the providence of the property of the providence of the providenc	and the second	al sur a surger de
dBµV-		ana da baharan canada ta ta da		(it) is a low to find particular to a strange of the providence of the second strange of			ang salah Pangang pang pang pang pang pang pang pan	a pi gana mili sinta di su ana di su a sereni ng pangan	and a second second second
		ana di kilo na siya di kata di sa ka	yn dy medin fyl y new draf y fer f	(illing a booth (a top of the part of the			a se a stad di su a su	a ga ga an think di ka ya an da ƙa ƙasar ƙas	M2
dвµ∨			, and by the distribution of the distributiono					eti jaan konstaa aa dadaa taashaa taa	M2
dвµ∨			n and g a sea directly a point of a sea						M2
dвµ∨									M2
dвµ∨									M2
dBµV									M2
dвµv									M2
									M2



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Plot no. 57: radiated emissions 18 GHz - 26.5 GHz, mode 9, polarization vertical / horizontal

Plot no. 58: radiated emissions 26.5 GHz - 40 GHz, mode 7, polarization vertical / horizontal

AultiView	Spectrum								
Ref Level 80.	00 dBµV Offset	31.67 dB 🖷 RI	BW 1 MHz						
Att			3W 3 MHz Mo	de Auto Sweep					
4 Frequency S	woon							O 1 Diz View	e 2Av ViewLir
Trequency a	weep							M1[1]	
									39.213 500 G
		H2 74.000	dBµV					M2[2]	
) dBµV									39.392 500 G
) dBµV									
	H1 54.000 dBµV-								M1
) dBµV	ر. بار بدواریش به در به افزو به (د			and the first states		a di dana ditin	dishikata tu ta likita di biyan	Inc. in the initial kinet of	سالما والطآلي والماسي
interpolation and and	والمتروب والمراجع والمراجعين	والمراجع والمتلك والتكار				and the present of the second strength of the second states of the second strength of the s	and the logical problem in the problem.	As a filling of the second data second s	The second s
									M2
∣ dBµV ———									man
~~~~~			~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~				
ι dBµ∨									
ι dΒμ∨ ————									
5.5 GHz			13500 pt		1	.35 GHz/			40.0 G
			13300 pt		1.	.JJ GHZ/			2023-07- 10:16:

10:16:14 07/25/2023



2023-09-25

#### Ø\$ MultiView Spectrum RefLevel 80.00 dBµV Offset 31.67 dB ● RBW 1 MHz 135 s 🖷 VBW 3 MHz 🛛 Mode Auto Sweep Att 0 dB 🖷 SWT 1 Frequency Sy M1[1] 51.47 dB .391 500 GH H2 74.0 M2[2] 38.37 dBµ\ .385 500 GH 70 dBµV 60 dBµ\ -H1 54.000 ( المناقبه والمعا 50 dBµV— 40 dBµ∨ 30 dBµV 20 dBµV 40.0 GHz 1.35 GHz/ 26.5 GHz 13500 pts 2023-07-25 10:11:07 Measuring...

Plot no. 59: radiated emissions 26.5 GHz - 40 GHz, mode 8, polarization vertical / horizontal

10:11:08 07/25/2023

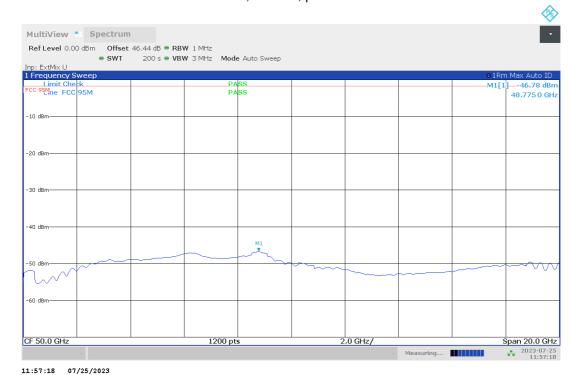
Plot no. 60: radiated emissions 26.5 GHz - 40 GHz, mode 9, polarization vertical / horizontal

									~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
MultiView	Spectrum								•
Ref Level 80.00	OdBµV Offset	: 31.67 dB 🖷 RI	3W 1 MHz						
Att	O dB 🖷 SWT	135 s 👄 VI	3W 3 MHz Mo	de Auto Sweep					
PA 1 Frequency Sw	10.00							o 10k View	● 2Av ViewLin
L Frequency Sw	veep							M1[1]	52.37 dBµ
									9.321 500 GH
		H2 74.000	dBµV					M2[2]	38.44 dBµ
70 dBµ∨									9.390 500 GH
60 dBµV									
oo dop :									
									M1
50.dBµV	المحلق الارغام والمام المتعصيفين	ومعالله ورارا وماسلهما	وساليوار فوالالاستما ألاب	المرسا والألطان أعسروها		and the second second	All the second second second second		
Section of the sectio	n a la taine a statistica transferio d	The second s	all of surface and surface		an an a				
40 dBµV									M2
~~~~			~	~~~~~	~~~~	~~~~~			
30 dBµV									
20 dBµV									
26.5 GHz			13500 pt	S	1.	35 GHz/			40.0 GHz
							Measuring		2023-07-25 10:05:55

10:05:55 07/25/2023



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### Plot no. 61: radiated emissions 40 GHz - 60 GHz, mode 7, polarization vertical / horizontal

Plot no. 62: radiated emissions 40 GHz – 60 GHz, mode 8, polarization vertical / horizontal

MultiView Spectrum			
Ref Level 0.00 dBm Offset 46.4 SWT	44 dB • RBW 1 MHZ 200 s • VBW 3 MHz Mode Auto Sweep		
np: ExtMix U			
Frequency Sweep	PASS		• 1Rm Max Auto ID
CC 95Mne FCC 95M	PASS		M1[1]46.79 dB
			48.742 0 GH
10 dBm			
20 dBm			
30 dBm			
40 dBm			
	M1		
50 dBm		+	
$\sim$			
60 dBm			
F 50.0 GHz	1200 pts	2.0 GHz/	Span 20.0 GH
		Measu	uring <b>2023-07-2</b> 11:50:1





Plot no. 63: radiated emissions 40 GHz – 60 GHz, mode 9, polarization vertical / horizontal

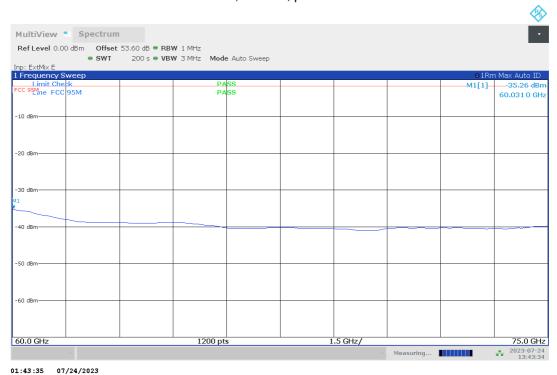
#### Plot no. 64: radiated emissions 60 GHz - 75 GHz, mode 7, polarization vertical / horizontal

MultiView	Spectrum								•
Ref Level 0.0	0 dBm Offset	53.60 dB - RB	N 1 MHz						
	● SWT	200 s 🖷 VBV	V 3 MHz Mode	e Auto Sweep					
Inp: ExtMix E 1 Frequency S								O 1 Dec	n Max Auto ID
Limit Che	ck		PA	SS				M1[1]	-35.27 dBm
FCC 95Mne FCC	95M		PA					witti	60.006 0 GHz
-10 dBm									
-20 dBm									
-20 uBm									
-30 dBm									
M1									
-40 dBm									
-50 dBm									
-60 dBm									
-oo usm									
60.0 GHz	I		1200 pt	S	1	.5 GHz/	1		75.0 GHz
	~					~	Measuring		2023-07-25 02:39:33
									02:39:33

02:39:34 07/25/2023



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Plot no. 65: radiated emissions 60 GHz - 75 GHz, mode 8, polarization vertical / horizontal

Plot no. 66: radiated emissions 60 GHz - 75 GHz, mode 9, polarization vertical / horizontal

Ref Level 0.00 dBm Offs						
e SWT p: ExtMix E	200 s 🖷 VBW 3	MHz Mode Auto Swe	ep			
Frequency Sweep				1		•1Rm Ma
Limit Check ^{CC 95} Mne FCC 95M		PASS PASS			M1[1]	
Line FCC 95M		PA55				60.006 0 G
0 dBm						
) dBm					 	
) dBm						
5 dbin						
) dBm					 	
) dBm						
) dBm						
0.0 GHz		1200 pts	15	GHz/		75.0 G





ef Level 0.00 dBm Offset 53.60			
• SWT 13 : ExtMix E	32 s 🖷 VBW 3 MHz 🛛 Mode Auto Sweep		
requency Sweep			01Rm V
95Mne FCC 95M	PASS PASS		M1[1] -39.19
The FCC95M	PASS		75.990 500
dBm			
dBm			
asm			
dBm			
dBm			
dBm			
asm			
dBm			
.0 GHz	1000 pts	100.0 MHz/	76.0

#### Plot no. 67: radiated emissions, Band edge Low, mode 7, polarization vertical / horizontal

Plot no. 68: radiated emissions, Band edge Low, mode 8, polarization vertical / horizontal

IultiView Spectrum Ref Level 0.00 dBm Offset 53.6	50 dB • RBW 1 MHz		SG
	132 s 🖷 VBW 3 MHz 🛛 Mode Auto Sweep		
Frequency Sweep			•1Rm Viev
Limit Check ^{IC 95} Mne FCC 95M	PASS		M1[1]39.34 dE
Eme FCC 95M	PASS		75.998 500 G
) dBm			
) dBm			
) dBm			
D dBm			
) dBm			
) dBm			
5.0 GHz	1000 pts	100.0 MHz/	76.0 G



2023-09-25



Plot no. 69: radiated emissions, Band edge Low, mode 9, polarization vertical / horizontal

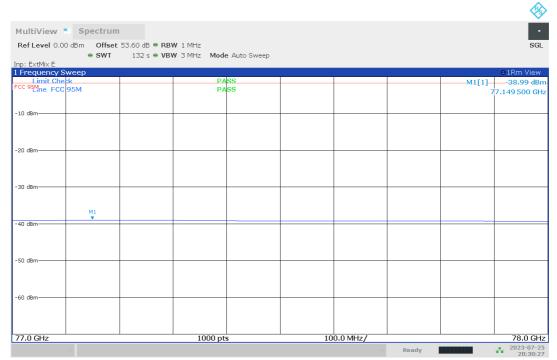
## Plot no. 70: radiated emissions, Band edge High, mode 7, polarization vertical / horizontal

1ultiView Spectrum			
Ref Level 0.00 dBm Offset 53.60 dB	• RBW 1 MHz		SO
	VBW 3 MHz Mode Auto Sweep		
p: ExtMix E Frequency Sweep			o 1Rm Vie
Limit Check	PASS		M1[1] -38.80 di
^{C 95} Mne FCC 95M	PASS		77.015 500 G
0 dBm			
) dBm			
0 dBm			
1 0 dBm			
) dBm			
dBm			
	1000 - 1		
7.0 GHz	1000 pts	100.0 MHz/	78.0 G 2023-07- 02:51:

02:51:07 07/25/2023



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#### Plot no. 71: radiated emissions, Band edge High, mode 8, polarization vertical / horizontal

08:30:28 07/25/2023

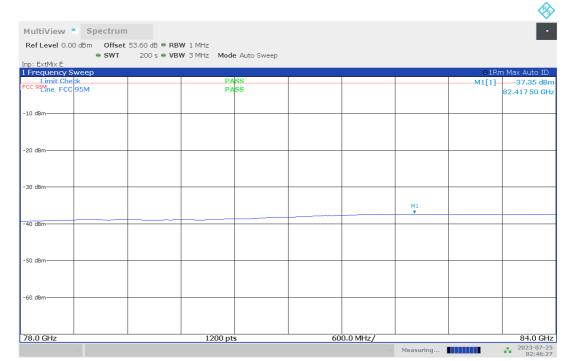
## Plot no. 72: radiated emissions, Band edge High, mode 9, polarization vertical / horizontal

Ref Level 0.00		3.60 dB • RBW							so
o: ExtMix E		132 s 🖷 VBW	3 MHZ MODE	e Auto Sweep					
Frequency Sw Limit Check	/eep		PA	22					O1Rm Viet
^{C 95M} ne FCC 9	95M			SS				M1[1]	-38.88 df 7.164 500 G
								· · · · · · · · · · · · · · · · · · ·	7.104.500 0
0 dBm									
) dBm									
0 dBm									
	Mi								
) dBm						· · · · ·			
0 dBm									
) dBm									
o aon									
7.0 GHz			1000 pt	S	10	0.0 MHz/	I		





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Plot no. 73: radiated emissions 78 GHz - 84 GHz, mode 7, polarization vertical / horizontal

02:46:27 07/25/2023

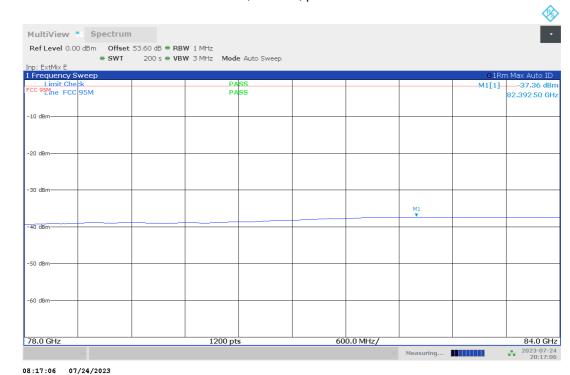
Plot no. 74: radiated emissions 78 GHz – 84 GHz, mode 8, polarization vertical / horizontal

lultiView Spectrum				
ef Level 0.00 dBm Offset 53.60				_
	Dis  VBW 3 MHz Mode Auto Sweep			
: ExtMix E				
Frequency Sweep	PASS			●1Rm Max Auto II
^{C 95} Mne FCC 95M	PASS			
Ellie 1 00 550	1 1 1 2 3			82.397 50 G
0 dBm				
) dBm				
) dBm				
			M1	
) dBm				
, dem				
) dBm				
dBm				
ubiii				
.0 GHz	1200 pts	600.0 MHz/		84.0 G
	1200 pts	50010 (11112)	- Measuring	

01:50:29 07/24/2023



INGENIEURBÜRO



Plot no. 75: radiated emissions 78 GHz - 84 GHz, mode 9, polarization vertical / horizontal

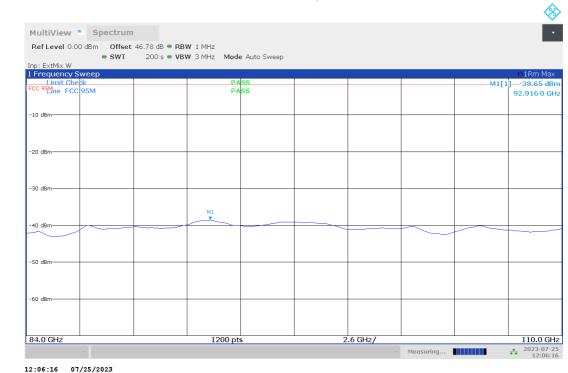
#### Plot no. 76: radiated emissions 84 GHz - 110 GHz, mode 7, polarization vertical / horizontal

IultiView Spectrum			
Ref Level 0.00 dBm Offset 46			
SWT	200 s  VBW 3 MHz Mode Auto Sweep		
p: ExtMix W			
Frequency Sweep	PASS		●1Rm Ma M1[1]
Limit Check C 95Mne FCC 95M	PASS		92.8940 G
0 dBm			
D dBm			
) dBm			
	M1		
) dBm		+	
) dBm			
) dBm			
4.0 GHz	1200 pts	2.6 GHz/	110.0 G 2023-07- 12:02

12:02:36 07/25/2023



2023-09-25



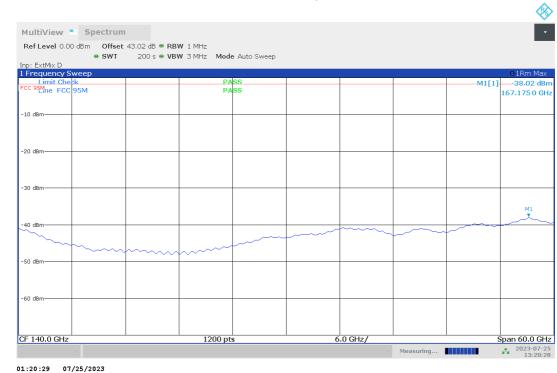
Plot no. 77: radiated emissions 84 GHz - 110 GHz, mode 8, polarization vertical / horizontal

#### Plot no. 78: radiated emissions 84 GHz - 110 GHz, mode 9, polarization vertical / horizontal

ultiView 🗧 Spect	trum							
ef Level 0.00 dBm O		N 1 MHz						
• S'		N/3 MHz Mod	e Auto Sweep					
: ExtMix W requency Sweep								●1Rm Ma
Limit Check			SS				M1[1	]
^{95M} ne FCC 95M		PA	ss				-	92.82906
dBm								
dBm								
dBm								
abiii								
		M1						
		MI V						
dBm		~ ~						
dBm								
dBm								
		1005		<u>_</u>				
.0 GHz		1200 pt	S	2	2.6 GHz/	Measuring		110.0 C 2023-07 12:10







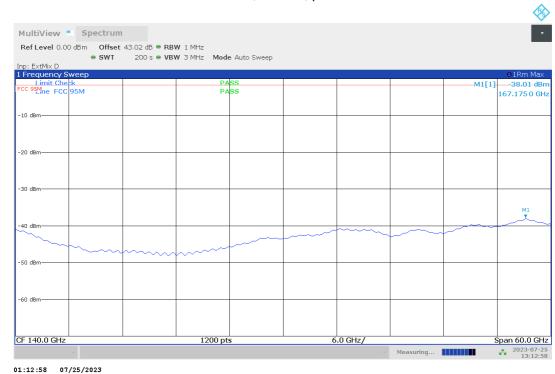
Plot no. 79: radiated emissions 110 GHz - 170 GHz, mode 7, polarization vertical / horizontal

Plot no. 80: radiated emissions 110 GHz - 170 GHz, mode 8, polarization vertical / horizontal

IultiView 📒 Spectru	um				
	set 43.02 dB • RBW 1 MHz				_
• SW1		Mode Auto Sweep			
p: ExtMix D					o 1Rm Ma
Frequency Sweep Limit Check		PASS			M1[1]38.01 dE
^{C 95M} ne FCC 95M		PASS			167.1750 G
0 dBm					
0 dBm					
IO dBm					
					M1
0 dBm					
		~~			
0 dBm					
0 dBm					
140.0 GHz	11	200 pts	6.0 GHz/		Span 60.0 Gl
				- Measuring	2023-07- 13:16:





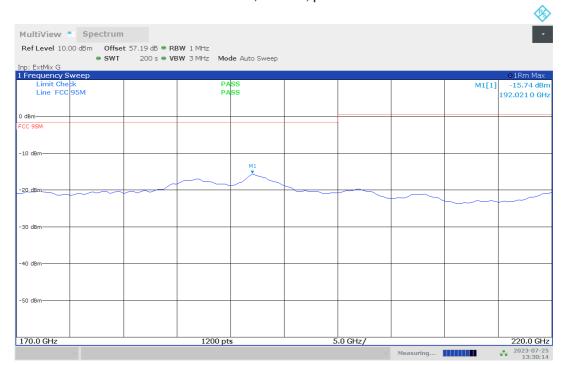


Plot no. 81: radiated emissions 110 GHz - 170 GHz, mode 9, polarization vertical / horizontal

## Plot no. 82: radiated emissions 170 GHz - 220 GHz, mode 7, polarization vertical / horizontal

ef Level 10.00 dBm Offset 57.1	9 dB 🖷 RBW 1 MHz			
• SWT 2 : ExtMix G	00 s ● VBW 3 MHz Mode Auto Sweep			
requency Sweep				•1Rm Ma
Limit Check	PASS		M1[	
Line FCC 95M	PASS			192.021 0 G
Bm				
: 95M				
dBm				
	M1			
	I I I I I I I I I I I I I I I I I I I			
dBm	~		~	
				~~~
dBm				
dBm				
dBm				
0.0 GHz	1200 pts	5.0 GHz/		220.0 GH





Plot no. 83: radiated emissions 170 GHz - 220 GHz, mode 8, polarization vertical / horizontal

01:30:15 07/25/2023

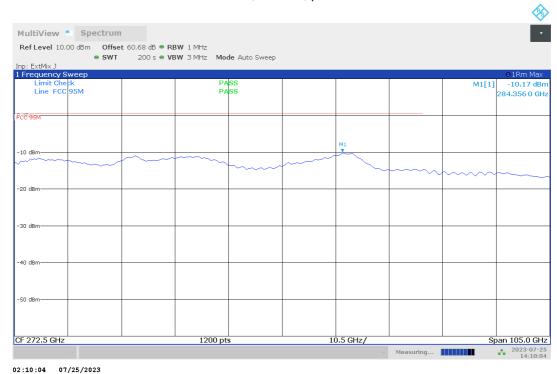
Plot no. 84: radiated emissions 170 GHz – 220 GHz, mode 9, polarization vertical / horizontal

MultiView Spectrum							
Ref Level 10.00 dBm Offset 57.19 dE	🗧 🖷 RBW 1 MHz						_
	s 🗢 VBW 3 MHz 🛛 Mo	de Auto Sweep					
ip: ExtMix G Frequency Sweep							• 1Rm Ma
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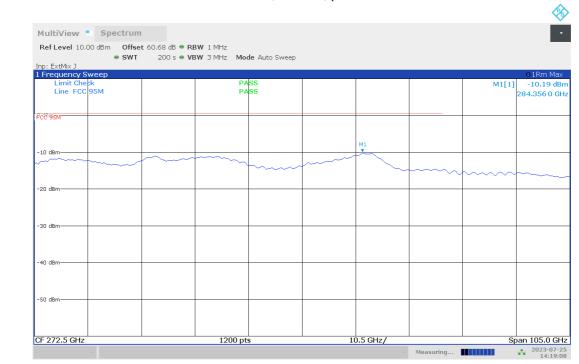
Plot no. 85: radiated emissions 220 GHz - 325 GHz, mode 7, polarization vertical / horizontal

Plot no. 86: radiated emissions 220 GHz – 325 GHz, mode 8, polarization vertical / horizontal

ip: ExtMix J Frequency Sweep							o1Rm Max
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#### Plot no. 87: radiated emissions 220 GHz - 325 GHz, mode 9, polarization vertical / horizontal

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# 7.5 Frequency stability (§2.1055 & §95.3379(b))

#### Description

- §2.1055 Measurements required: Frequency stability.
- (a) The frequency stability shall be measured with variation of ambient temperature as follows:
- (1) From -30° to + 50° centigrade for all equipment except that specified in paragraphs (a) (2) and (3) of this section.
- (b) Frequency measurements shall be made at the extremes of the specified temperature range and at intervals of not more than 10° centigrade through the range. A period of time sufficient to stabilize all of the components of the oscillator circuit at each temperature level shall be allowed prior to frequency measurement. The short term transient effects on the frequency of the transmitter due to keying (except for broadcast transmitters) and any heating element cycling normally occurring at each ambient temperature level also shall be shown. Only the portion or portions of the transmitter containing the frequency determining and stabilizing circuitry need be subjected to the temperature variation test.
- (d) The frequency stability shall be measured with variation of primary supply voltage as follows:
- (1) Vary primary supply voltage from 85 to 115 percent of the nominal value for other than hand carried battery equipment.
- (2) For hand carried, battery powered equipment, reduce primary supply voltage to the battery operating end point which shall be specified by the manufacturer.
- (3) The supply voltage shall be measured at the input to the cable normally provided with the equipment, or at the power supply terminals if cables are not normally provided. Effects on frequency of transmitter keying (except for broadcast transmitters) and any heating element cycling at the nominal supply voltage and at each extreme also shall be shown.

#### Limits

§95.3379 76-81 GHz Band Radar Service unwanted emissions limits.

(b) Fundamental emissions must be contained within the frequency bands specified in this section during all conditions of operation. Equipment is presumed to operate over the temperature range −20 to +50 degrees Celsius with an input voltage variation of 85% to 115% of rated input voltage, unless justification is presented to demonstrate otherwise.

## Test procedure

#### ANSI C63.26, 5.4.4

The occupied bandwidth is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers are each equal to 0.5% of the total mean power of the given emission.

The following procedure shall be used for measuring 99% power bandwidth:

- a) The instrument center frequency is set to the nominal EUT channel center frequency. The frequency span for the spectrum analyzer shall be between 1.5 times and 5.0 times the OBW.
- b) The nominal IF filter bandwidth (3 dB RBW) shall be in the range of 1% to 5% of the OBW, and VBW shall be approximately three times the RBW, unless otherwise specified by the applicable requirement.
- c) Set the reference level of the instrument as required, keeping the signal from exceeding the maximum input mixer level for linear operation. In general, the peak of the spectral envelope shall be more than [10 log (OBW/RBW)] below the reference level. Specific guidance is given in 4.1.5.2.
- Note: Step a) through step c) may require iteration to adjust within the specified tolerances.
- d) Set the detection mode to peak, and the trace mode to max-hold.
- e) If the instrument does not have a 99% OBW function, recover the trace data points and sum directly in linear power terms. Place the recovered amplitude data points, beginning at the lowest frequency, in a running sum until 0.5% of the total is reached. Record that frequency as the lower OBW frequency. Repeat the process until 99.5% of the total is reached and record that frequency as the upper OBW frequency. The 99% power OBW can be determined by computing the difference these two frequencies.
- f) The OBW shall be reported and plot(s) of the measuring instrument display shall be provided with the test report. The frequency and amplitude axis and scale shall be clearly labeled. Tabular data can be reported in addition to the plot(s)



#### KDB 653005 D01 76-81 GHz Radars v01r02, 4. d)

The occupied bandwidth of the radar device shall be measured, reported, and shown to be fully contained within the designated 76-81 GHz frequency band under normal operating conditions as well as under those extreme ambient temperature and input voltage conditions as described in Section 2.1057.

The OBW measurement of an FMCW radar shall be performed with the transmitter operating in normal mode (i.e., with frequency sweep or step active).

#### Note

Measurements with the peak detector are also suitable to demonstrate compliance of an EUT, as long as the required resolution bandwidth is used, because peak detection will yield amplitudes equal to or greater than amplitudes measured with RMS detector. The measurement data from a spectrum analyser peak detector will represent the worst-case results (see ANSI C63.26, chapter D2: general considerations).

Test setup: 8.3, 8.4

#### Test results / Note

Please see measurement results for occupied bandwidth.



# 8 Test Setup Description

Typically, the calibrations of the test apparatus are commissioned to and performed by an accredited calibration laboratory. The calibration intervals are determined in accordance with the DIN EN ISO/IEC 17025. In addition to the external calibrations, the laboratory executes comparison measurements with other calibrated test systems or effective verifications. Cyclic chamber inspections and range calibrations are performed. Where possible, RF generating and signalling equipment as well as measuring receivers and analysers are connected to an external high-precision 10 MHz reference (GPS-based or rubidium frequency standard).

In order to simplify the identification of the equipment used at some special tests, some items of test equipment and ancillaries can be provided with an identifier or number in the equipment list below (Lab/Item).

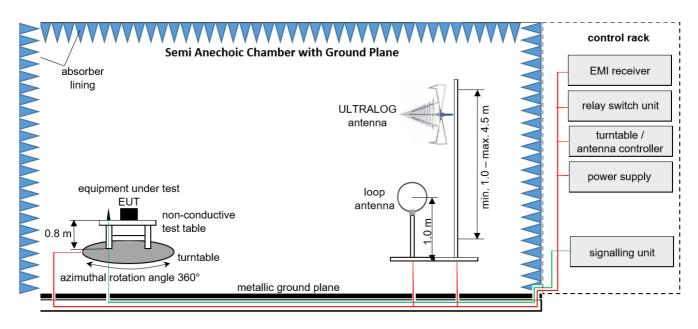
#### Kind of calibration (abbreviations):

- C = calibrated
- CM = cyclic maintenance
- NR = not required
- L = locked

# 8.1 Semi Anechoic Chamber with Ground Plane

Radiated measurements are performed in vertical and horizontal plane in the frequency range 30 MHz to 1 GHz in a Semi Anechoic Chamber with a metallic ground plane. The EUT is positioned on a non-conductive test table with a height of 0.80 m above the metallic ground plane that covers the whole chamber. The receiving antennas conform to specification ANSI C63.26-2015, American National Standard for Testing Unlicensed Wireless Devices. These antennas can be moved over the height range between 1.0 m and 4.5 m in order to search for maximum field strength emitted from the EUT. The measurement distances between EUT and receiving antennas are indicated in the test setups for the various frequency ranges. For each measurement, the EUT is rotated in all three axes until the maximum field strength is received. The wanted and unwanted emissions are received by a spectrum analyzer where the detector modes and resolution bandwidths over various frequency ranges are set according to requirement ANSI C63.

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Measurement distance: ULTRALOG antenna at 3 m; loop antenna at 3 m EMC32 software version: 11.20.00

# FS = UR + CL + AF

(FS-field strength; UR-voltage at the receiver; CL-loss of the cable; AF-antenna factor)

# Example calculation:

FS  $[dB\mu V/m] = 12.35 [dB\mu V/m] + 1.90 [dB] + 16.80 [dB/m] = 31.05 [dB\mu V/m] (35.69 \mu V/m)$ 



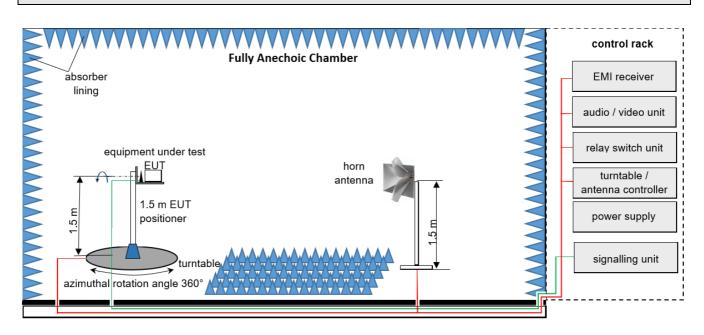
### List of test equipment used:

No.	Equipment	Manufacturer	Туре	Serial No.	IBL No.	Kind of Calibration	Last / Next Calibration
1	Power Supply	Elektro-Automatik GmbH & Co. KG	EA-PSI 9080-40 T	2000230001	LAB000313	NR	-
2	Test table	innco systems GmbH	PT1208-080-RH	-	LAB000306	NR	-
3	Power Supply	Chroma	61604	616040005416	LAB000285	NR	-
4	Positioner	maturo GmbH	TD 1.5-10KG		LAB000258	NR	-
5	Compressed Air	Implotex	1-850-30	-	LAB000256	NR	-
6	EMI Test Receiver	Rohde & Schwarz	ESW26	101481	LAB000236	С	$2023\text{-}07\text{-}04 \rightarrow 12 M \rightarrow 2024\text{-}07\text{-}04$
7	Semi/Fully Anechoic Chamber (SFAC)	Albatross Projects GmbH	Babylon 5 (SAC 5)	20168.PRB	LAB000235	NR	-
8	Measurement Software	Rohde & Schwarz	EMC32 V11.20		LAB000226	NR	-
9	Turntable	maturo GmbH	TT2.0-2t	TT2.0-2t/921	LAB000225	NR	-
10	Antenna Mast	maturo GmbH	CAM4.0-P	CAM4.0-P/316	LAB000224	NR	-
11	Antenna Mast	maturo GmbH	BAM4.5-P	BAM4.5-P/272	LAB000223	NR	-
12	Controller	maturo GmbH	FCU 3.0	10082	LAB000222	NR	-
13	Power Supply	Elektro-Automatik GmbH & Co. KG	EA-PS 2042-10 B	2878350292	LAB000191	NR	_
14	Pre-Amplifier	Schwarzbeck Mess- Elektronik OHG	BBV 9718 C	84	LAB000169	NR	_
15	Antenna	Rohde & Schwarz	HF907	102899	LAB000151	С	$\textbf{2023-05-15} \rightarrow \textbf{36M} \rightarrow \textbf{2026-05-15}$
16	Antenna	Rohde & Schwarz	HL562E	102005	LAB000150	С	$\textbf{2022-12-22} \rightarrow \textbf{36M} \rightarrow \textbf{2025-12-22}$
17	Open Switch and Control Platform	Rohde & Schwarz	OSP200 Base Unit 2HU	101748	LAB000149	NR	_
18	Antenna	Rohde & Schwarz	HF907	102898	LAB000124	С	$\textbf{2023-06-13} \rightarrow \textbf{36M} \rightarrow \textbf{2026-06-13}$
19	Antenna	Rohde & Schwarz	HL562E	102001	LAB000123	С	$\texttt{2023-04-05} \rightarrow \texttt{36M} \rightarrow \texttt{2026-04-05}$
20	Antenna	Rohde & Schwarz	HFH2-Z2E - Active Loop Antenna	100954	LAB000108	С	$2023\text{-}05\text{-}05 \rightarrow 36\text{M} \rightarrow 2026\text{-}05\text{-}05$

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# 8.2 Fully Anechoic Chamber



Measurement distance: horn antenna at 3 m EMC32 software version: 11.20.00

FS = UR + CA + AF (FS-field strength; UR-voltage at the receiver; CA-loss of the signal path; AF-antenna factor)

#### Example calculation:

FS  $[dB\mu V/m] = 40.0 [dB\mu V/m] + (-35.8) [dB] + 32.9 [dB/m] = 37.1 [dB\mu V/m] (71.61 \mu V/m)$ 

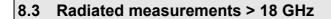


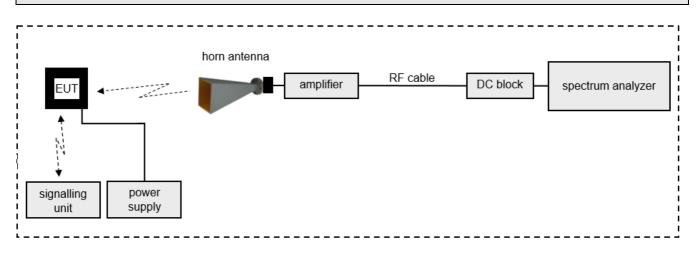
### List of test equipment used:

No.	Equipment	Manufacturer	Туре	Serial No.	IBL No.	Kind of Calibration	Last / Next Calibration
1	Power Supply	Elektro-Automatik GmbH & Co. KG	EA-PSI 9080-40 T	2000230001	LAB000313	NR	_
2	Test table	innco systems GmbH	PT1208-080-RH	-	LAB000306	NR	_
3	Power Supply	Chroma	61604	616040005416	LAB000285	NR	-
4	Positioner	maturo GmbH	TD 1.5-10KG		LAB000258	NR	-
5	Compressed Air	Implotex	1-850-30	-	LAB000256	NR	-
6	EMI Test Receiver	Rohde & Schwarz	ESW26	101481	LAB000236	С	$2023\text{-}07\text{-}04 \rightarrow 12 M \rightarrow 2024\text{-}07\text{-}04$
7	Semi/Fully Anechoic Chamber (SFAC)	Albatross Projects GmbH	Babylon 5 (SAC 5)	20168.PRB	LAB000235	NR	_
8	Measurement Software	Rohde & Schwarz	EMC32 V11.20		LAB000226	NR	-
9	Turntable	maturo GmbH	TT2.0-2t	TT2.0-2t/921	LAB000225	NR	-
10	Antenna Mast	maturo GmbH	CAM4.0-P	CAM4.0-P/316	LAB000224	NR	_
11	Antenna Mast	maturo GmbH	BAM4.5-P	BAM4.5-P/272	LAB000223	NR	-
12	Controller	maturo GmbH	FCU 3.0	10082	LAB000222	NR	-
13	Power Supply	Elektro-Automatik GmbH & Co. KG	EA-PS 2042-10 B	2878350292	LAB000191	NR	-
14	Pre-Amplifier	Schwarzbeck Mess- Elektronik OHG	BBV 9718 C	84	LAB000169	NR	-
15	Antenna	Rohde & Schwarz	HF907	102899	LAB000151	С	$2023-05-15 \rightarrow 36M \rightarrow 2026-05-15$
16	Antenna	Rohde & Schwarz	HL562E	102005	LAB000150	С	$2022\text{-}12\text{-}22 \rightarrow 36\text{M} \rightarrow 2025\text{-}12\text{-}22$
17	Open Switch and Control Platform	Rohde & Schwarz	OSP200 Base Unit 2HU	101748	LAB000149	NR	-
18	Antenna	Rohde & Schwarz	HF907	102898	LAB000124	С	$2023\text{-}06\text{-}13 \to 36\text{M} \to 2026\text{-}06\text{-}13$
19	Antenna	Rohde & Schwarz	HL562E	102001	LAB000123	С	$2023\text{-}04\text{-}05 \rightarrow 36\text{M} \rightarrow 2026\text{-}04\text{-}05$
20	Antenna	Rohde & Schwarz	HFH2-Z2E - Active Loop Antenna	100954	LAB000108	С	$2023-05-05 \rightarrow 36M \rightarrow 2026-05-05$

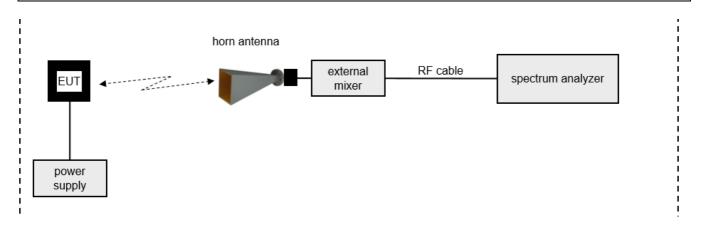


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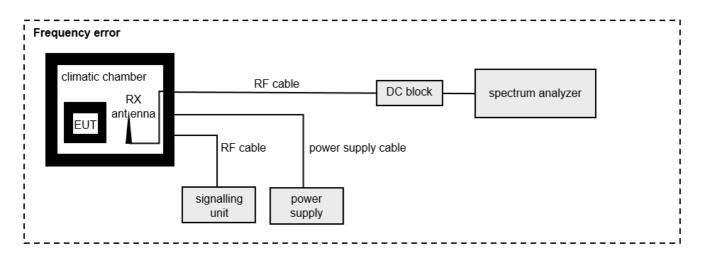




# 8.4 Radiated measurements > 50 GHz



## 8.5 Radiated measurements under extreme conditions





# ROP = AV + D - G

(ROP-rad. output power; AV-analyzer value; D-free field attenuation of measurement distance; G-antenna gain)

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<u>Example calculation:</u> ROP [dBm] = -54.0 [dBm] + 64.0 [dB] - 20.0 [dBi] = -10 [dBm] (100 μW)

Note: conversion loss of mixer is already included in analyzer value.

# List of test equipment used:

No.	Equipment	Manufacturer	Туре	Serial No.	IBL No.	Kind of Calibration	Calibration
1	Test table	innco systems GmbH	PT0707-RH light	-	LAB000303	NR	-
2	Power Supply	Elektro-Automatik GmbH & Co. KG	EA-PS 2042-10 B	2878350255	LAB000189	NR	-
3	WG-Coax-Adapter	Flann Microwave Ltd	23373-TF30 UG383/U	273385	LAB000185	СМ	$2023-09-01 \rightarrow 36M \rightarrow 2024-09-01$
4	WG-Coax-Adapter	Flann Microwave Ltd	22093-TF30 UG599/U	273263	LAB000183	СМ	$2023\text{-}09\text{-}01 \rightarrow 36\text{M} \rightarrow 2024\text{-}09\text{-}01$
5	WG-Coax-Adapter	Flann Microwave Ltd	20093-TF30 UBR220	273374	LAB000181	СМ	$2023-09-01 \rightarrow 36M \rightarrow 2024-09-01$
6	Antenna	Flann Microwave Ltd	30240-20	273390	LAB000178	CM	$\text{2023-09-01} \rightarrow \text{36M} \rightarrow \text{2024-09-01}$
7	Coaxial Cable	Huber & Suhner	SF101/1.0m	503990/1	LAB000164	CM	$2023\text{-}07\text{-}17 \rightarrow 12 \text{M} \rightarrow 2024\text{-}07\text{-}17$
8	Coaxial Cable	Rosenberger	LU7-022-1000	34	LAB000154	NR	-
9	Coaxial Cable	Rosenberger	LU7-022-1000	33	LAB000153	NR	-
10	Antenna	Flann Microwave Ltd	32240-20	273469	LAB000152	CM	$2023\text{-}09\text{-}01 \rightarrow 36\text{M} \rightarrow 2024\text{-}09\text{-}01$
11	Antenna	Flann Microwave Ltd	29240-20	273382	LAB000139	CM	$2023\text{-}09\text{-}01 \rightarrow 36\text{M} \rightarrow 2024\text{-}09\text{-}01$
12	Antenna	Flann Microwave Ltd	28240-20	273371	LAB000176	СМ	$2023\text{-}09\text{-}01 \rightarrow 36\text{M} \rightarrow 2024\text{-}09\text{-}01$
13	Antenna	Flann Microwave Ltd	27240-20	273367	LAB000137	CM	$2023\text{-}09\text{-}01 \to 36\text{M} \to 2024\text{-}09\text{-}01$
14	Antenna	Flann Microwave Ltd	26240-20	273417	LAB000135	CM	$2023\text{-}09\text{-}01 \rightarrow 36\text{M} \rightarrow 2024\text{-}09\text{-}01$
15	Antenna	Flann Microwave Ltd	25240-20	272860	LAB000133	CM	$2023\text{-}09\text{-}01 \rightarrow 36\text{M} \rightarrow 2024\text{-}09\text{-}01$
16	Antenna	Flann Microwave Ltd	23240-20	273430	LAB000132	CM	$2023\text{-}09\text{-}01 \rightarrow 36\text{M} \rightarrow 2024\text{-}09\text{-}01$
17	Antenna	Flann Microwave Ltd	22240-20	270448	LAB000130	К	$2023\text{-}07\text{-}17 \to 12\text{M} \to 2024\text{-}07\text{-}17$
18	Antenna	Flann Microwave Ltd	20240-20	266403	LAB000128	К	$2023\text{-}07\text{-}17 \to 12\text{M} \to 2024\text{-}07\text{-}17$
19	Harmonic Mixer	Rohde & Schwarz	FS-Z170	100996	LAB000126	K	$2023\text{-}04\text{-}26 \rightarrow 12\text{M} \rightarrow 2024\text{-}04\text{-}26$
20	Harmonic Mixer	Rohde & Schwarz	FS-Z325	101015	LAB000117	К	$2023-04-11 \rightarrow 12M \rightarrow 2024-04-11$
21	Harmonic Mixer	Rohde & Schwarz	FS-Z220	101039	LAB000116	К	$2023\text{-}04\text{-}06 \rightarrow 12\text{M} \rightarrow 2024\text{-}04\text{-}06$
22	Harmonic Mixer	Rohde & Schwarz	FS-Z140	101144	LAB000115	к	$2023\text{-}05\text{-}23 \to 12\text{M} \to 2024\text{-}05\text{-}23$
23	Harmonic Mixer	Rohde & Schwarz	FS-Z110	102000	LAB000114	K	$2023\text{-}05\text{-}02 \to 12\text{M} \to 2024\text{-}05\text{-}02$
24	Harmonic Mixer	Rohde & Schwarz	FS-Z090	102020	LAB000113	K	$2023\text{-}04\text{-}06 \to 12\text{M} \to 2024\text{-}04\text{-}06$
25	Harmonic Mixer	Rohde & Schwarz	FS-Z075	102015	LAB000112	К	$2023\text{-}05\text{-}03 \to 12\text{M} \to 2024\text{-}05\text{-}03$
26	Spectrum Analyser	Rohde & Schwarz	FSW50	101450	LAB000111	К	$2023\text{-}07\text{-}26 \rightarrow 12\text{M} \rightarrow 2024\text{-}07\text{-}26$
27	Climatic Chamber	CTS GmbH	T-65/50	204002	LAB000110	CM	$2023\text{-}05\text{-}11 \rightarrow 12\text{M} \rightarrow 2024\text{-}05\text{-}11$
28	Antenna Mast	Schwarzbeck Mess- Elektronik OHG	AM 9104	99	LAB000109	NR	-



# **9** Measurement procedures

## 9.1 Radiated spurious emissions from 9 kHz to 30 MHz

#### **Test setup**

- The EUT is set up according to its intended use, as described in the user manual or as defined by the manufacturer.
- In case of floor standing equipment, it is placed in the middle of the turn table.
- In case of tabletop equipment it is placed on a non-conductive table with a height of 80 cm.
- Additional equipment, cables, ... necessary for testing, are positioned like under normal operation.
- Interface cables, e.g. power supply, network, ... are connected to the connection box in the turn table.
- EUT is powered on and set into operation.

#### Pre-scan

- Turntable performs an azimuthal rotation from 0° to 315° in 45° steps.
- For each turntable step the EMI-receiver/spectrum analyser performs a positive-peak/max-hold sweep (=worst-case). Data is transferred to EMI-software and recorded. EMI-software will show the maximum level of all single sweeps as the final result for the pre-scan.

#### Final measurement

- Significant emissions found during the pre-scan will be maximized by the EMI-software by rotating the turntable from 0° to 360°.
- Loop antenna is rotated with special 3D adapter set to find maximum level of emissions.
- Plot of the pre-scan with frequencies of identified emissions including levels, correction factors, turn table
  position and settings of measuring equipment is recorded.

#### **Distance correction (extrapolation)**

- When performing measurements on test distances other than defined in the rules, the results shall be extrapolated to the specified distance by conservatively presuming that the field strength decays at 40 dB/decade of distance in the region closer than  $\lambda$  in m divided by  $2\pi$  (i.e.,  $\lambda/2\pi$ ), and at 20 dB/decade of distance beyond that, using the measurement of a single point at the radial angle that produces the maximum emission.

This correction is already included in the limit line of corresponding measurement plots.



# 9.2 Radiated spurious emissions from 30 MHz to 1 GHz

#### **Test setup**

- The EUT is set up according to its intended use, as described in the user manual or as defined by the manufacturer.
- In case of floor standing equipment, it is placed in the middle of the turn table. In case of tabletop equipment it is placed on a non-conductive table with a height of 80 cm.
- Additional equipment, cables, ... necessary for testing, are positioned like under normal operation.
- Interface cables, e.g. power supply, network, ... are connected to the connection box in the turn table.
- EUT is powered on and set into operation.

#### Pre-scan

- Turntable performs an azimuthal rotation from 0° to 360° continuously.
- Antenna polarisation is changed (H-V / V-H) and antenna height is changed from 1 meter to 4 meters.
- For each turntable position / antenna polarisation / antenna height the EMI-receiver/spectrum analyser performs a positive-peak/max-hold sweep (=worst-case). Data is transferred to EMI-software and recorded. EMI-software will show the maximum level of all single sweeps as the final result for the pre-scan.

#### **Final measurement**

- Significant emissions found during the pre-scan will be maximized by the EMI-software based on evaluated data during the pre-scan by rotating the turntable and changing antenna height and polarisation.
- Final measurement will be performed with measuring equipment settings as defined in the applicable test standards (e.g. ANSI C6.4).
- Plot of the pre-scan with frequencies of identified emissions including levels, correction factors, turn table position, antenna polarisation and settings of measuring equipment is recorded.

#### **Distance correction (extrapolation)**

When performing measurements on test distances other than defined in the rules, the results shall be extrapolated to the specified distance by conservatively presuming that the field strength decays at 20 dB/decade of distance beyond the region λ in m divided by 2π (i.e., λ/2π), using the measurement of a single point at the radial angle that produces the maximum emission. This correction is already included in the corresponding measurement plots.



# 9.3 Radiated spurious emissions from 1 GHz to 18 GHz

#### **Test setup**

- The EUT is set up according to its intended use, as described in the user manual or as defined by the manufacturer.
- In case of floor standing equipment, it is placed in the middle of the turn table. In case of tabletop equipment it is placed on a non-conductive table with a height of 80 cm.
- Additional equipment, cables, ... necessary for testing, are positioned like under normal operation.
- Interface cables, e.g. power supply, network, ... are connected to the connection box in the turn table.
- EUT is powered on and set into operation.

#### Pre-scan

- Turntable performs an azimuthal rotation from 0° to 360° continuously.
- Antenna polarisation is changed (H-V / V-H) and antenna height is changed from 1 meter to 4 meters.
- For each turntable position / antenna polarisation / antenna height the EMI-receiver/spectrum analyser performs a positive-peak/max-hold sweep (=worst-case). Data is transferred to EMI-software and recorded. EMI-software will show the maximum level of all single sweeps as the final result for the pre-scan.

#### **Final measurement**

- Significant emissions found during the pre-scan will be maximized by the EMI-software based on evaluated data during the pre-scan by rotating the turntable and changing antenna height and polarisation.
- Final measurement will be performed with measuring equipment settings as defined in the applicable test standards (e.g. ANSI C6.4).
- Plot of the pre-scan with frequencies of identified emissions including levels, correction factors, turn table position, antenna polarisation and settings of measuring equipment is recorded.

#### **Distance correction (extrapolation)**

When performing measurements on test distances other than defined in the rules, the results shall be extrapolated to the specified distance by conservatively presuming that the field strength decays at 20 dB/decade of distance beyond the region λ in m divided by 2π (i.e., λ/2π), using the measurement of a single point at the radial angle that produces the maximum emission. This correction is already included in the corresponding measurement plots.



# 9.4 Radiated spurious emissions above 18 GHz

#### **Test setup**

- The EUT is set up according to its intended use, as described in the user manual or as defined by the manufacturer.
- Additional equipment, cables, ... necessary for testing, are positioned like under normal operation.
- EUT is powered on and set into operation.
- Test distance depends on EUT size and test antenna size (far field conditions shall be met).

#### Pre-scan

 The test antenna is handheld and moved carefully over the EUT to cover the EUT's whole sphere and for different polarizations of the antenna.

#### **Final measurement**

- Significant emissions found during the pre-scan will be maximized, i.e. position and antenna orientation causing the highest emissions with Peak and RMS detector
- Final measurement will be performed with measuring equipment settings as defined in the applicable test standards (e.g. ANSI C63.4 / C63.26).
- Final plot showing measurement data, levels, frequency, measuring time, bandwidth, correction factor, margin to the limit and limit is recorded.

#### Note

- In case of measurements with external harmonic mixers (e.g. above 50 GHz) special care is taken to avoid possible overloading of the external mixer's input.
- As external harmonic mixers may generate false images, care is taken to ensure that any emission measured by the spectrum analyzer is indeed radiated from the EUT and not internally generated by the external harmonic mixer. Signal identification feature of spectrum analyzer is used to eliminate/reduce images of the external harmonic mixer.

#### **Distance correction (extrapolation)**

When performing measurements on test distances other than defined in the rules, the results shall be extrapolated to the specified distance by conservatively presuming that the field strength decays at 20 dB/decade of distance beyond the region λ in m divided by 2π (i.e., λ/2π), using the measurement of a single point at the radial angle that produces the maximum emission. This correction is already included in the corresponding measurement plots.

# **10 MEASUREMENT UNCERTAINTIES**

Radio frequency	≤ ± 10 ppm
Radiated emission	≤ ± 6 dB
Temperature	≤ ± 1 °C
Humidity	≤ ± 5 %
DC and low frequency voltages	≤ ± 3 %

The indicated expanded measurement uncertainty corresponds to the standard measurement uncertainty for the measurement results multiplied by the coverage factor k = 2. It was determined in accordance with EA-4/01 m:2013. The true value is located in the corresponding interval with a probability of 95 %.



# Annex 1 EUT Photographs, external

Photo No. 1:



2023-09-25

#### Photo No. 2:



2023-09-25



#### Photo No. 3:



### Photo No. 4:



2023-09-25



# Annex 2 EUT Photographs, internal

Internal pictures provided by pplicant. Photo No. 5:

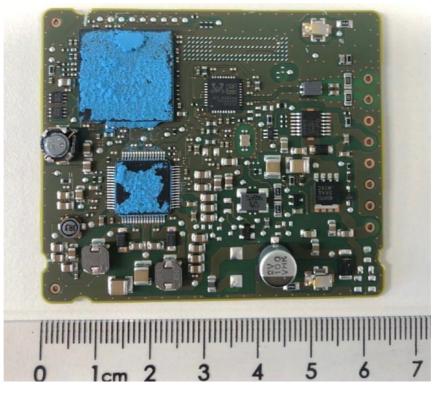
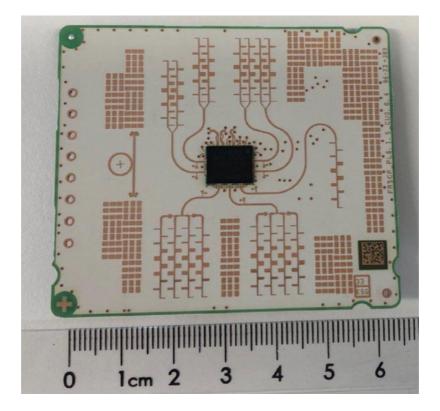
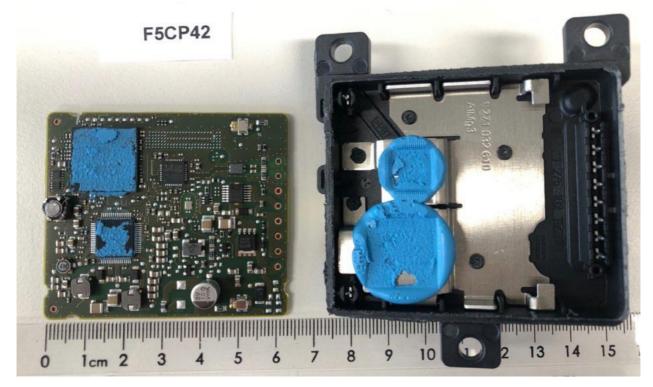


Photo No. 6:



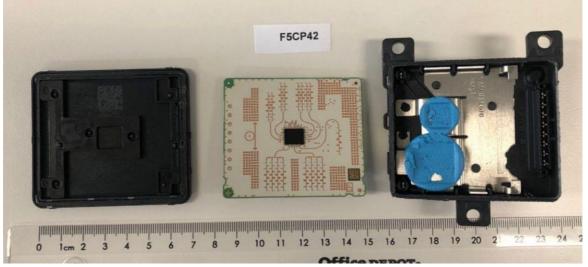


## Photo No. 7:



2023-09-25

Photo No. 8:





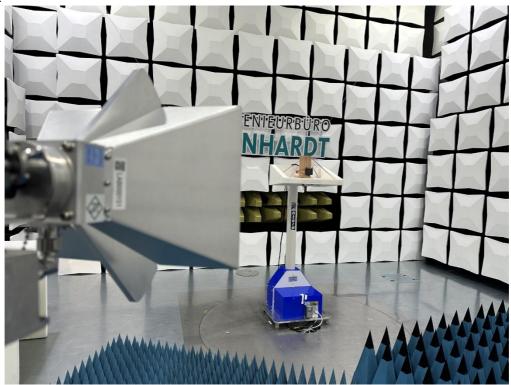
2023-09-25

# Annex 3 Test Setup Photographs

Photo No. 9:



Photo No. 10:



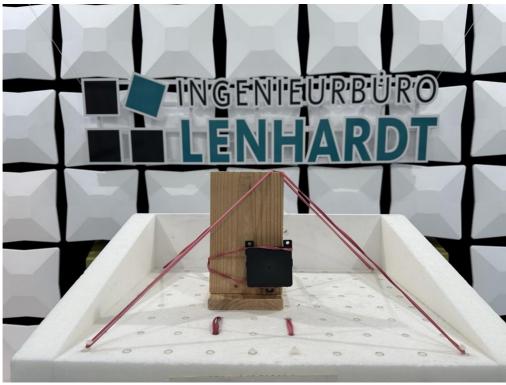


2023-09-25

Photo No. 11:



Photo No. 12:



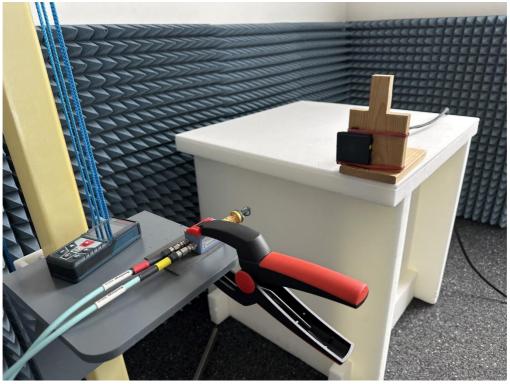
2023-09-25



# Photo No. 13:



Photo No. 14:





2023-09-25

### Photo No. 15:

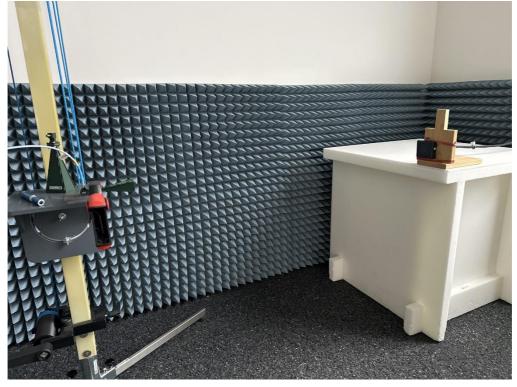


Photo No. 16:





2023-09-25

# **End of Test Report**