

1.1 Field Strength of Spurious Radiations

FCC 15 Para. No.: 2.1053, 2.1057, 90.210

RSS-119: 5.8

Measurement Data:

Detector Mode	Peak
Resolution Bandwidth	100kHz below 1GHz and 1MHz above 1GHz
Video Bandwidth	300kHz/3MHz
Trace mode	Max Hold

Modulation type	Channel frequency MHz	Output power W	Radiated emission frequency range	Polarization	Measured Value dBuV/m	Limit dBuV/m
7K60FXW	851.1	50	30MHz – 10GHz	VP/HP	< 84.38	84.38
16K0F3E	851.1	50	30MHz – 10GHz	VP/HP	< 84.38	84.38
0.35TETRA	851.1	25	30MHz – 10GHz	VP/HP	< 84.38	84.38
25kHzTEDS	851.1	10	30MHz – 10GHz	VP/HP	< 84.38	84.38
7K60FXW	860.0	50	30MHz – 10GHz	VP/HP	< 84.38	84.38
16K0F3E	860.0	50	30MHz – 10GHz	VP/HP	< 84.38	84.38
0.35TETRA	860.0	25	30MHz – 10GHz	VP/HP	< 84.38	84.38
25kHzTEDS	860.0	10	30MHz – 10GHz	VP/HP	< 84.38	84.38
150kHzTEDS	860.0	10	30MHz – 10GHz	VP/HP	< 84.38	84.38
7K60FXW	868.8	50	30MHz – 10GHz	VP/HP	< 84.38	84.38
16K0F3E	868.8	50	30MHz – 10GHz	VP/HP	< 84.38	84.38
0.35TETRA	868.8	25	30MHz – 10GHz	VP/HP	< 84.38	84.38
25kHzTEDS	868.8	10	30MHz – 10GHz	VP/HP	< 84.38	84.38
150kHzTEDS	868.8	10	30MHz – 10GHz	VP/HP	< 84.38	84.38

-13dBm (ERP) =84.38 dBuV/m

Measurement distance 3m

The Cabinet Radiated Spurious emissions in TX mode were performed from 30MHz – 10th harmonic (10GHz).

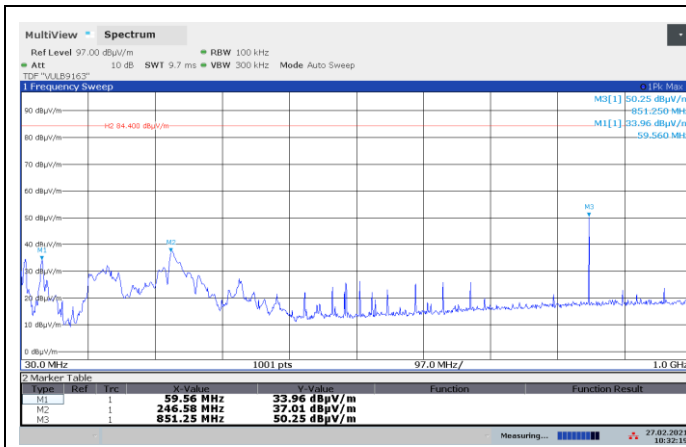
EUT was transmitting continuously with modulation activated.

Requirements:

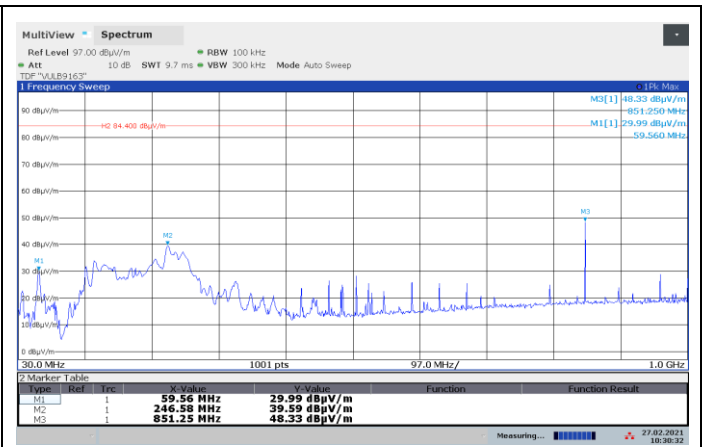
The Cabinet Radiated Spurious emissions shall be below -13 dBm or 84.38dBuV/m.

Nemko Group

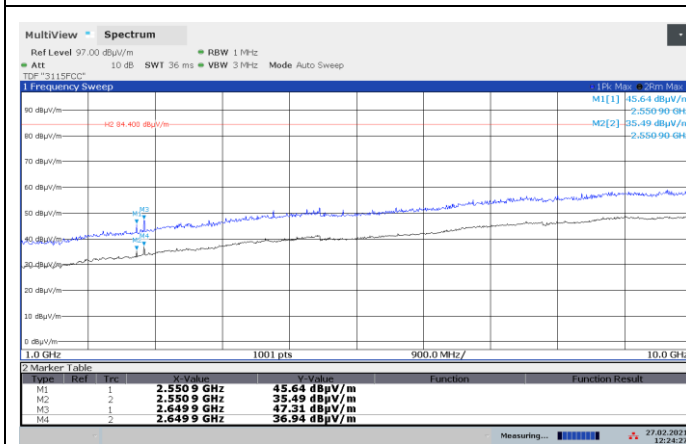
Nemko Scandinavia AS, Instituttveien 6, P.O. Box 96 Kjeller, 2027 Kjeller, Norway
 TEL +47 22 96 03 30 EMAIL info@nemko.com



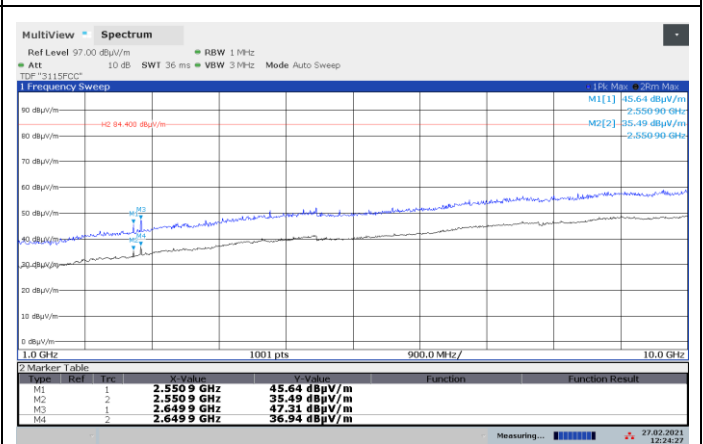
VP: 30 - 1000MHz, 7K60FXW , 50W, 851,1MHz



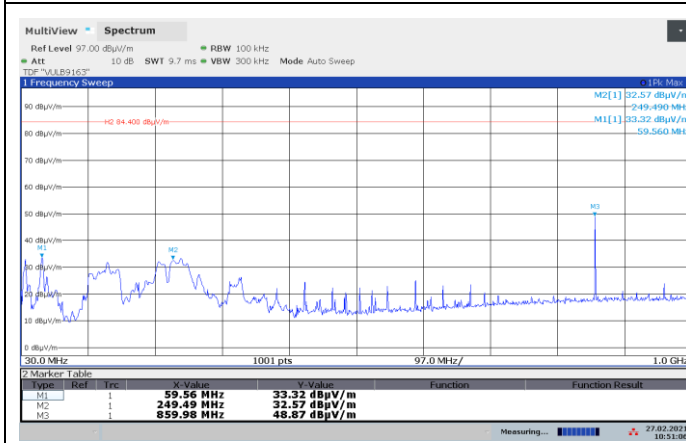
HP: 30 - 1000MHz, 7K60FXW , 50W, 851,1MHz



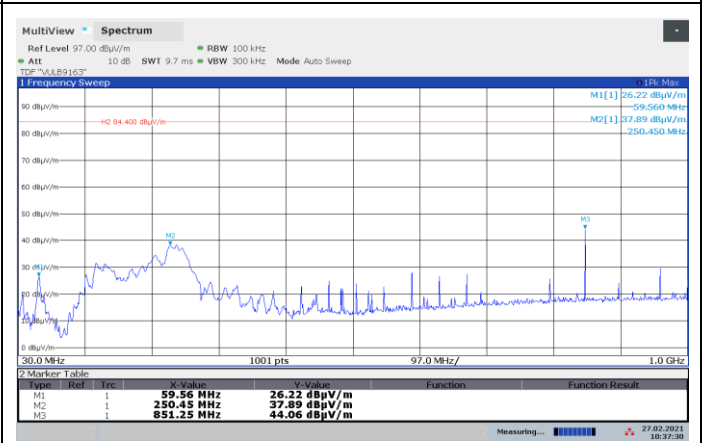
VP: 1 - 10GHz, 7K60FXW, 50W, 851,1MHz



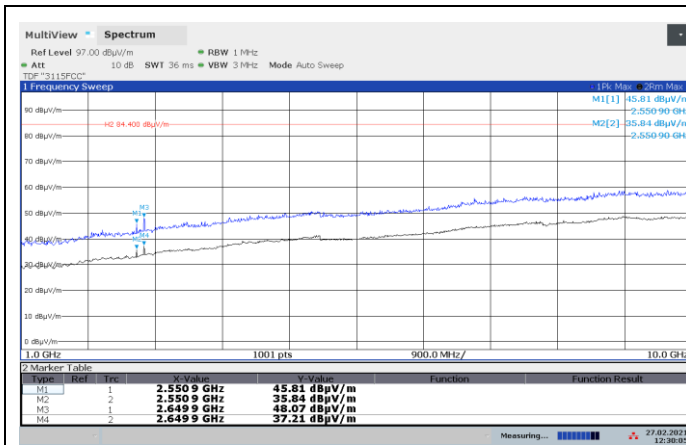
HP: 1 - 10GHz, 7K60FXW, 50W, 851,1MHz



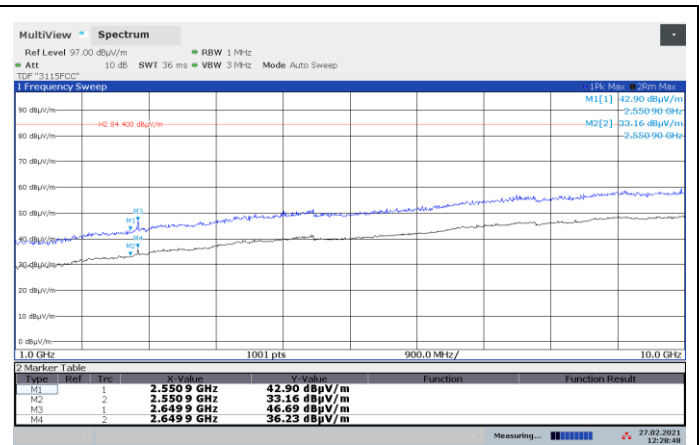
VP: 30 - 1000MHz, 16K0F3E , 50W, 851,1MHz



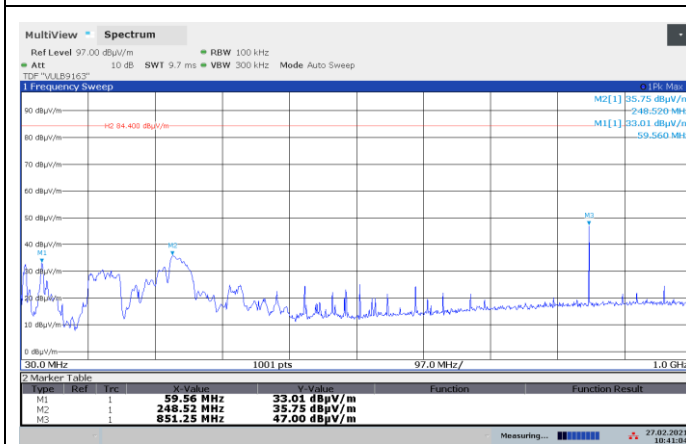
HP: 30 - 1000MHz, 16K0F3E , 50W, 851,1MHz



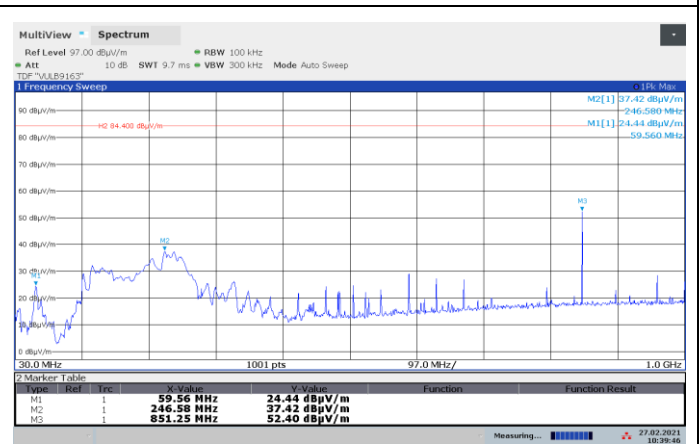
VP: 1 - 10GHz, 16K0F3E, 50W, 851,1MHz



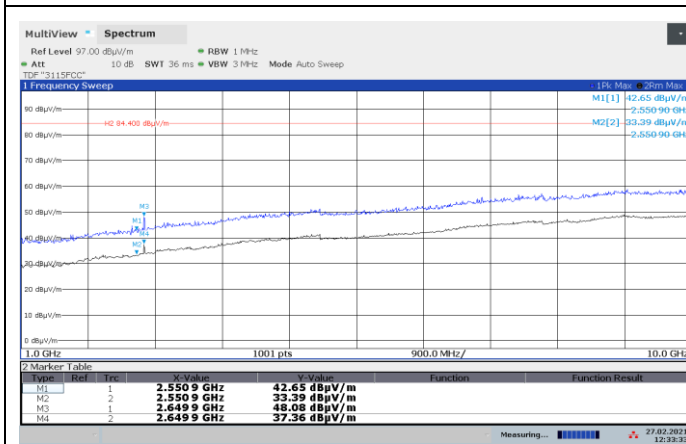
HP: 1 - 10GHz, 16K0F3E, 50W, 851,1MHz



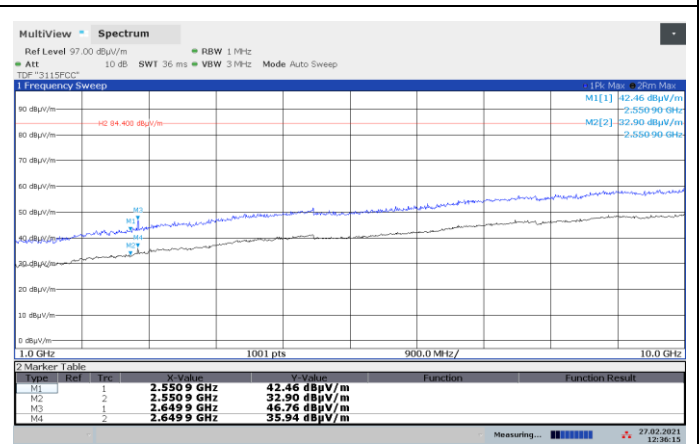
VP: 30 - 1000MHz, 0.35TETRA, 25W, 851,1MHz



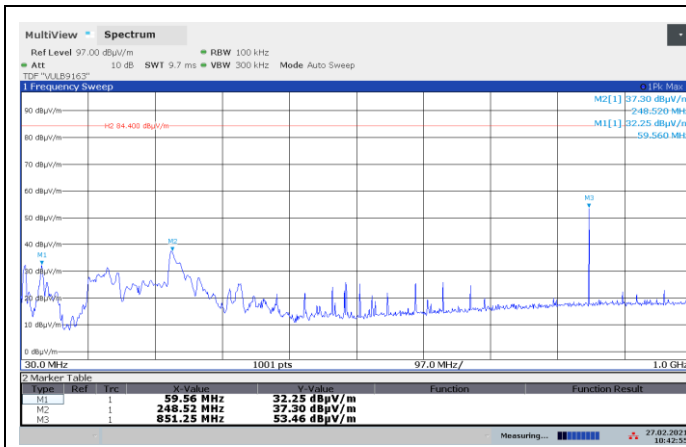
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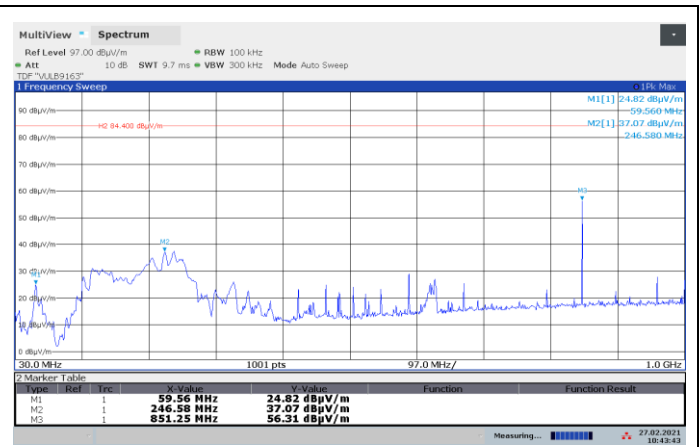
VP: 1 - 10GHz, 0.35TETRA, 25W, 851,1MHz



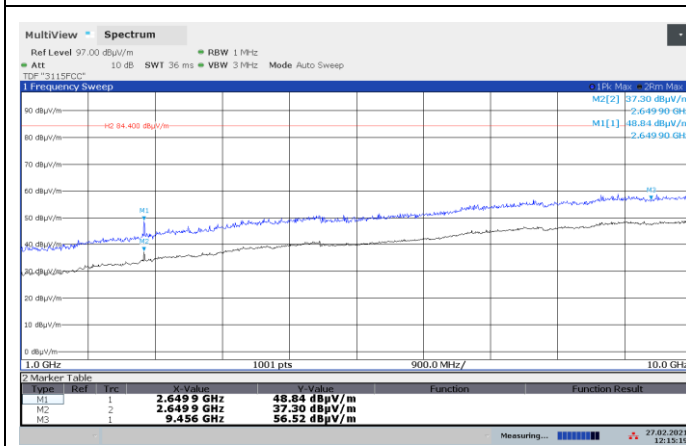
HP: 1 - 10GHz, 0.35TETRA, 25W, 851,1MHz



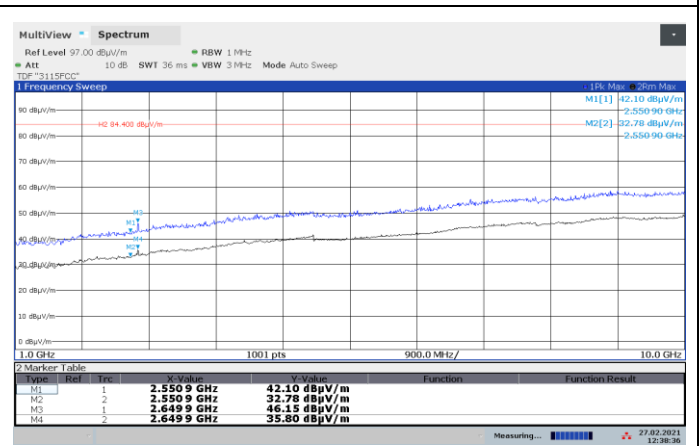
VP: 30 - 1000MHz, 25kHzTEDS , 10W, 851,1MHz



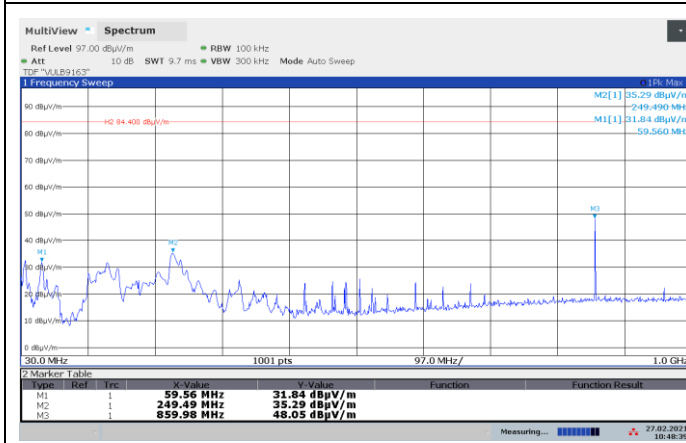
HP: 30 - 1000MHz, 25kHzTEDS , 10W, 851,1MHz



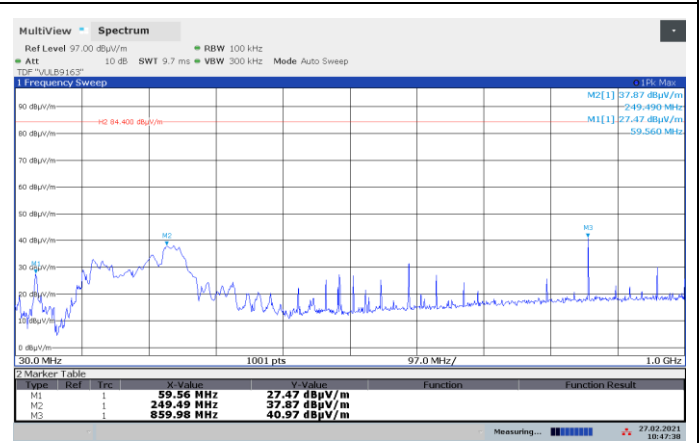
VP: 1 - 10GHz, 25kHzTEDS , 10W, 851,1MHz



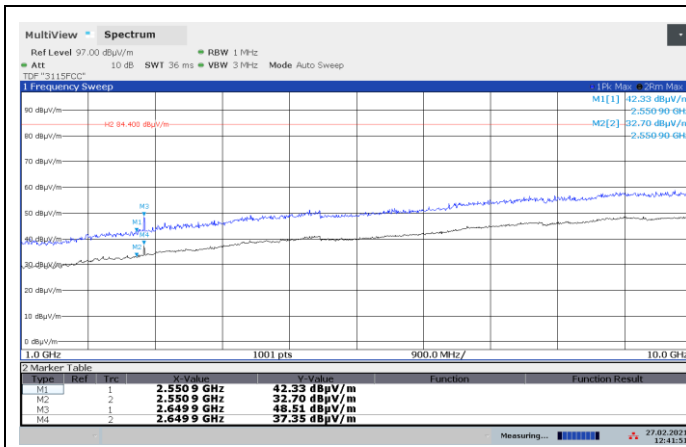
HP: 1 - 10GHz, 25kHzTEDS , 10W, 851,1MHz



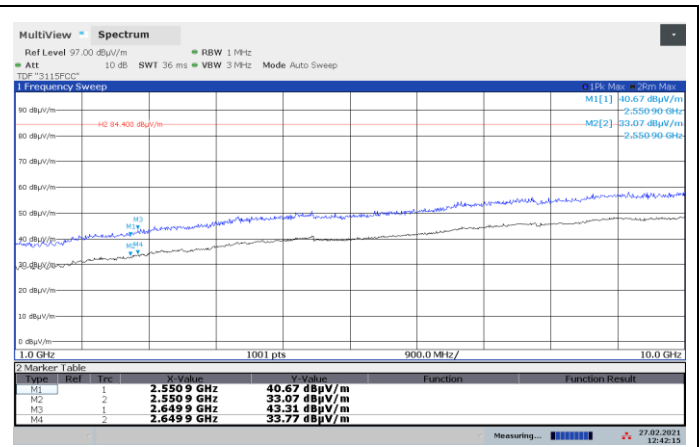
VP: 30 - 1000MHz, 7K60FXW , 50W, 860.0MHz



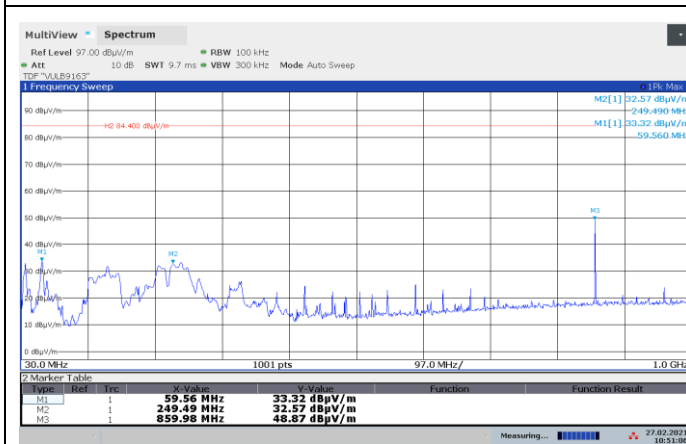
HP: 30 - 1000MHz, 7K60FXW , 50W, 860.0MHz



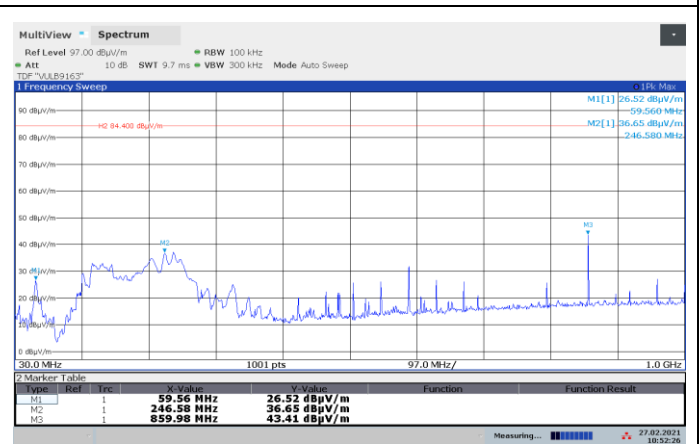
VP: 1 - 10GHz, 7K60FXW , 50W, 860.0MHz



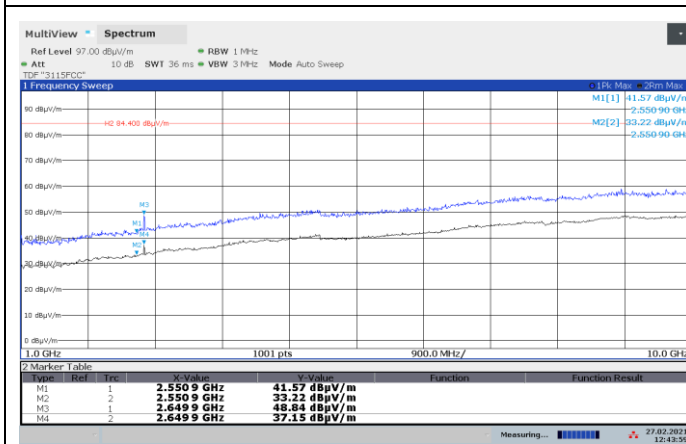
HP: 1 - 10GHz, 7K60FXW , 50W, 860.0MHz



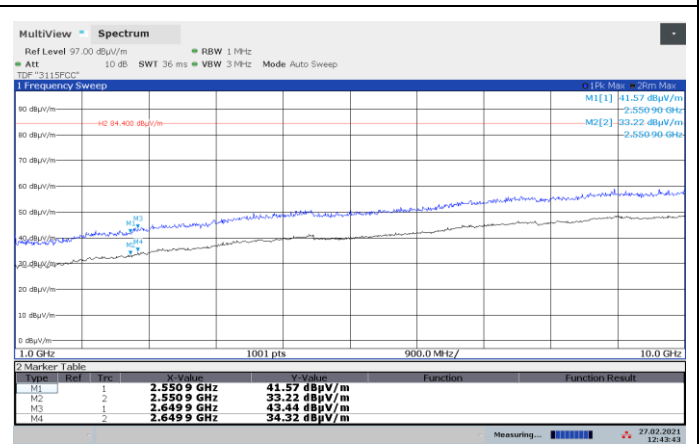
VP: 30 - 1000MHz, 16K0F3E , 50W, 860.0MHz



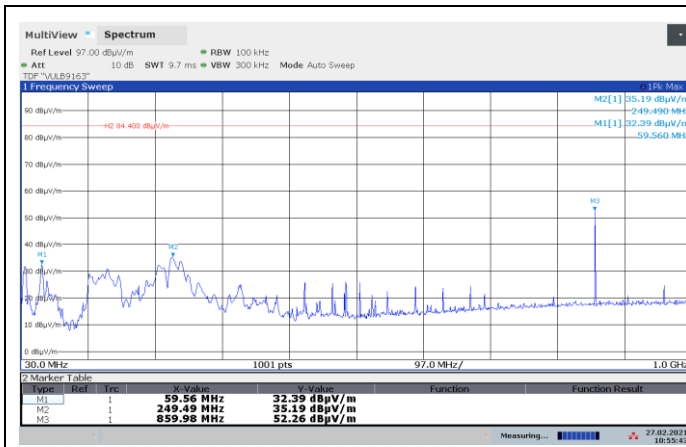
HP: 30 - 1000MHz, 16K0F3E , 50W, 860.0MHz



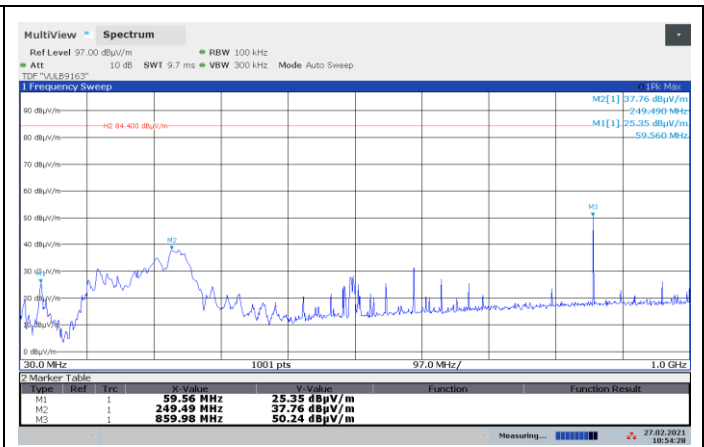
VP: 1 - 10GHz, 16K0F3E , 50W, 860.0MHz



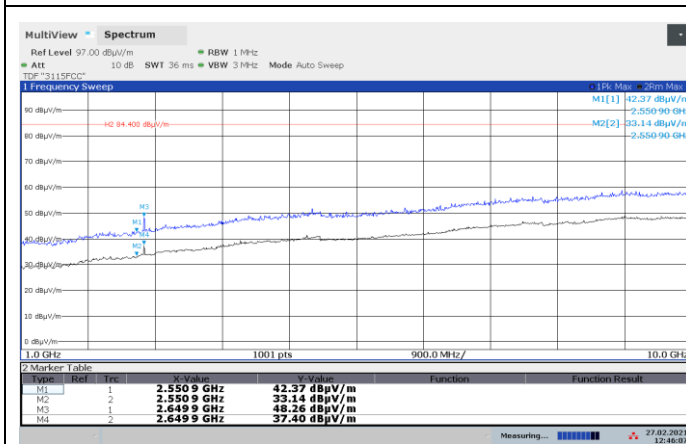
HP: 1 - 10GHz, 16K0F3E , 50W, 860.0MHz



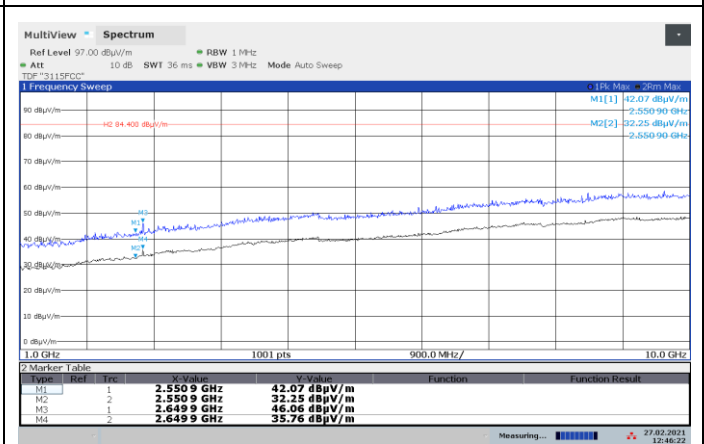
VP: 30 - 1000MHz, 0.35TETRA , 25W, 860.0MHz



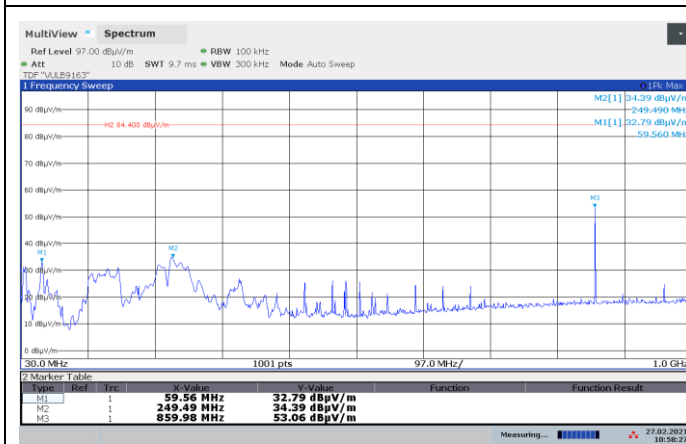
HP: 30 - 1000MHz, 0.35TETRA , 25W, 860.0MHz



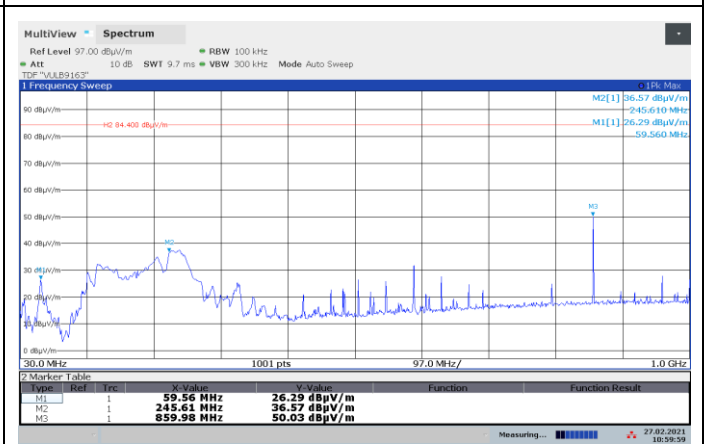
VP: 1 - 10GHz, 0.35TETRA , 25W, 860.0MHz



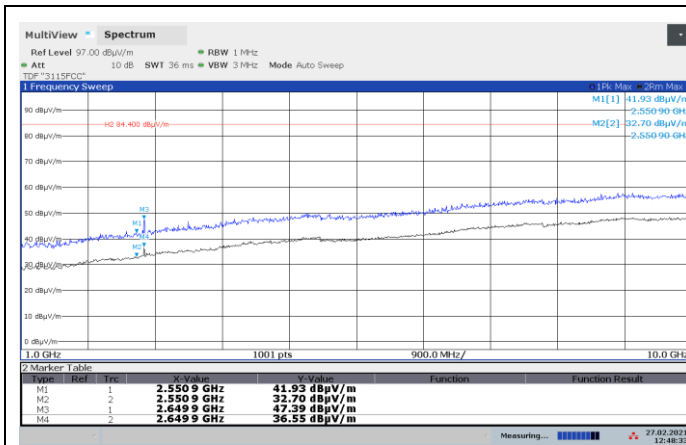
HP: 1 - 10GHz, 0.35TETRA , 25W, 860.0MHz



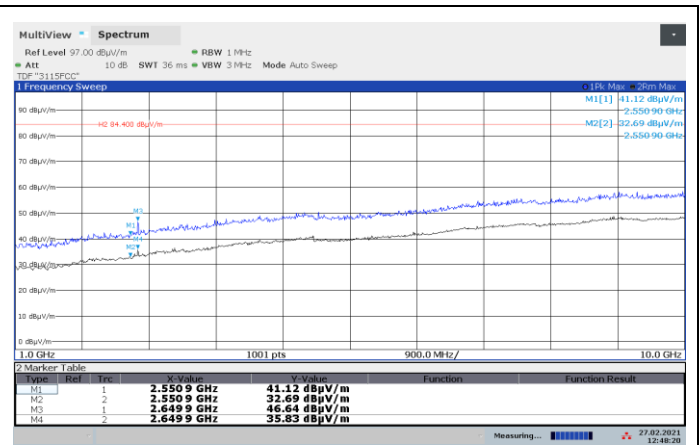
VP: 30 - 1000MHz, 25kHzTEDS , 10W, 860.0MHz



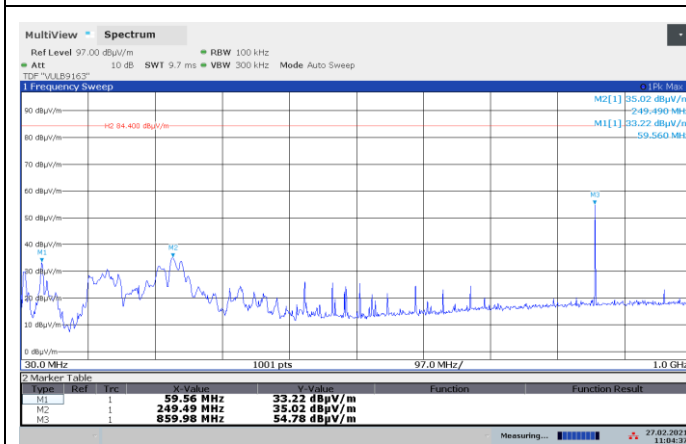
HP: 30 - 1000MHz, 25kHzTEDS , 10W, 860.0MHz



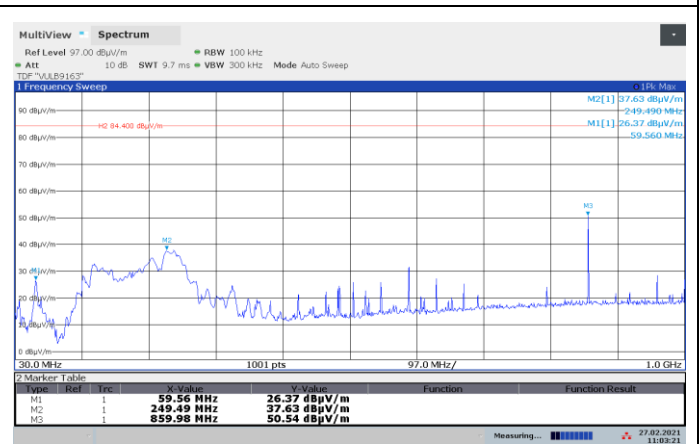
VP: 1 - 10GHz, 25kHzTEDS, 10W, 860.0MHz



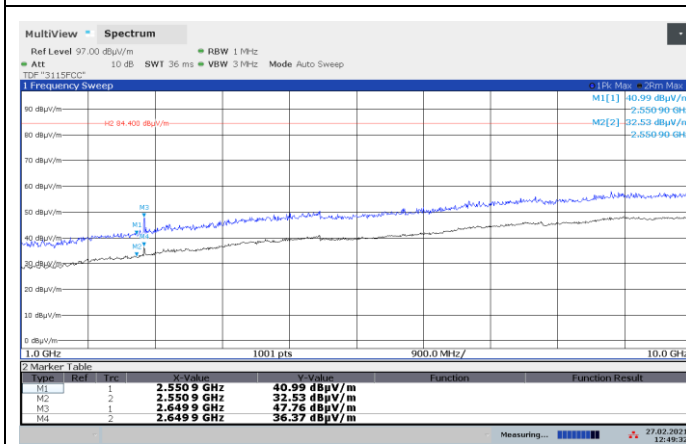
HP: 1 - 10GHz, 25kHzTEDS, 10W, 860.0MHz



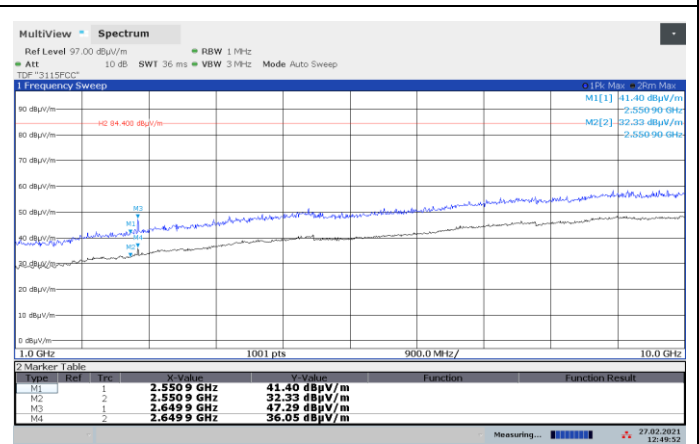
VP: 30 - 1000MHz, 150kHzTEDS, 10W, 860.0MHz



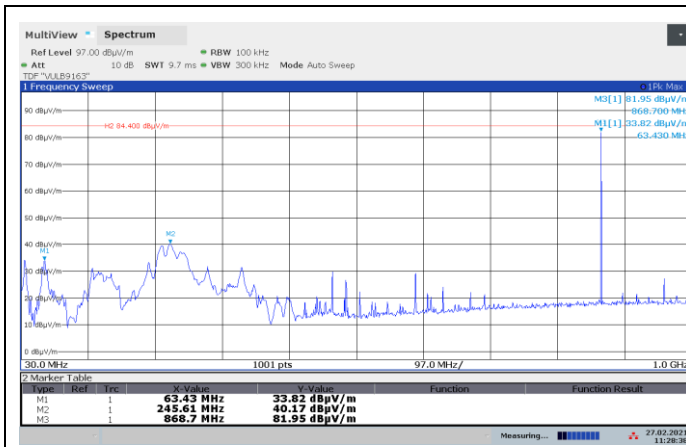
HP: 30 - 1000MHz, 150kHzTEDS, 10W, 860.0MHz



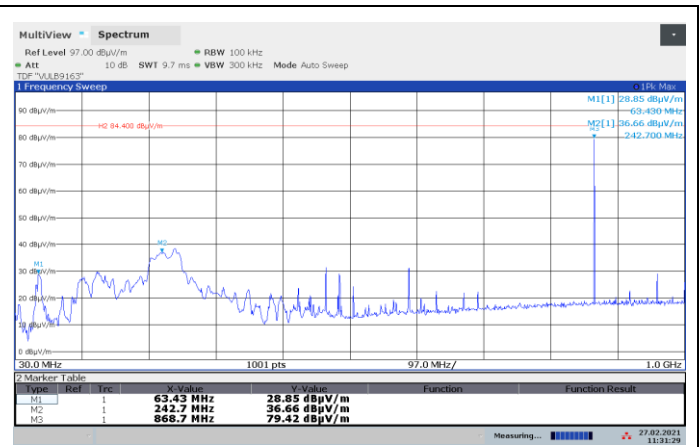
VP: 1 - 10GHz, 150kHzTEDS, 10W, 860.0MHz



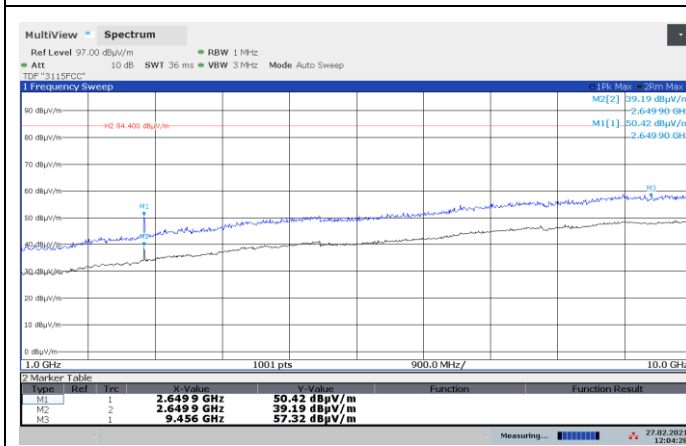
HP: 1 - 10GHz, 150kHzTEDS, 10W, 860.0MHz



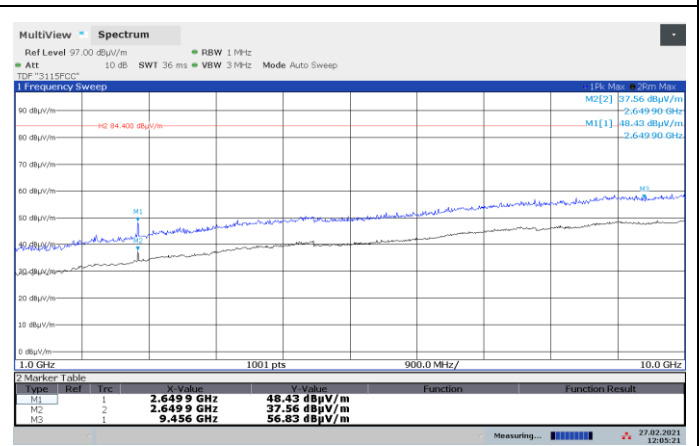
VP: 30 - 1000MHz, 7K60FXW , 50W, 868.8MHz



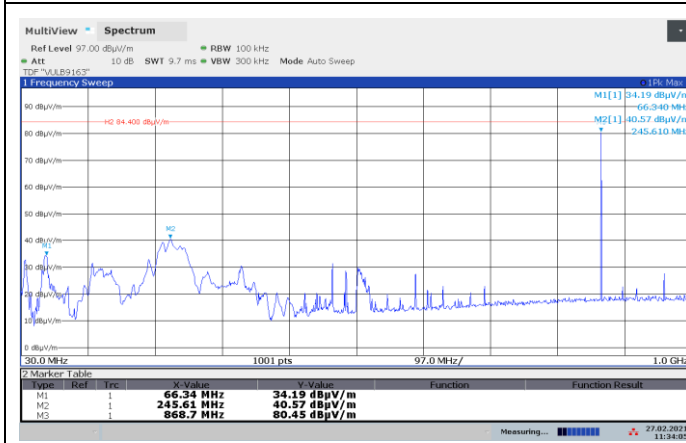
HP: 30 - 1000MHz, 7K60FXW , 50W, 868.8MHz



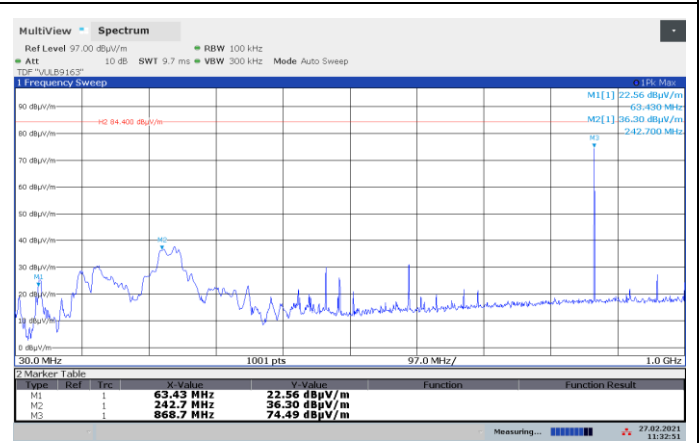
VP: 1 - 10GHz, 7K60FXW , 50W, 868.8MHz



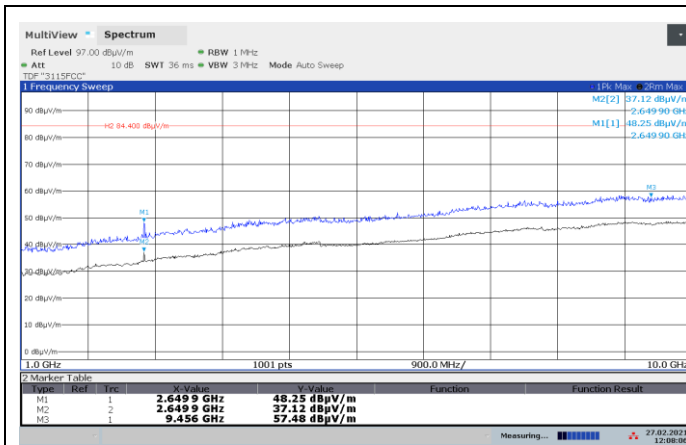
HP: 1 - 10GHz, 7K60FXW , 50W, 868.8MHz



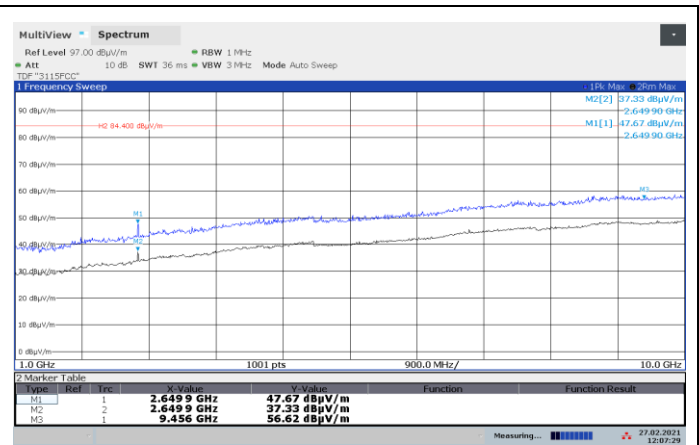
VP: 30 - 1000MHz, 16K0F3E , 50W, 868.8MHz



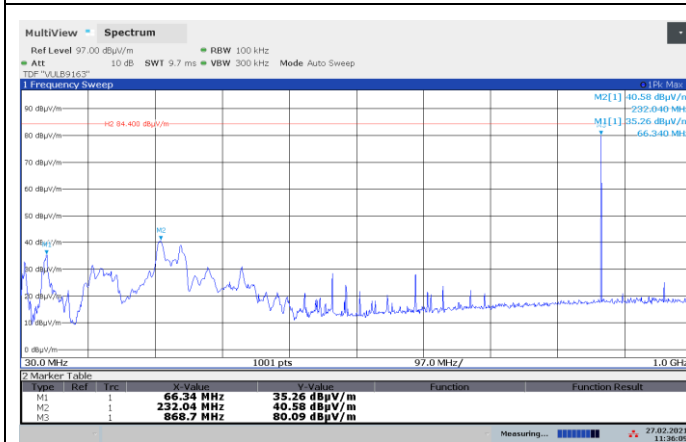
HP: 30 - 1000MHz, 16K0F3E , 50W, 868.8MHz



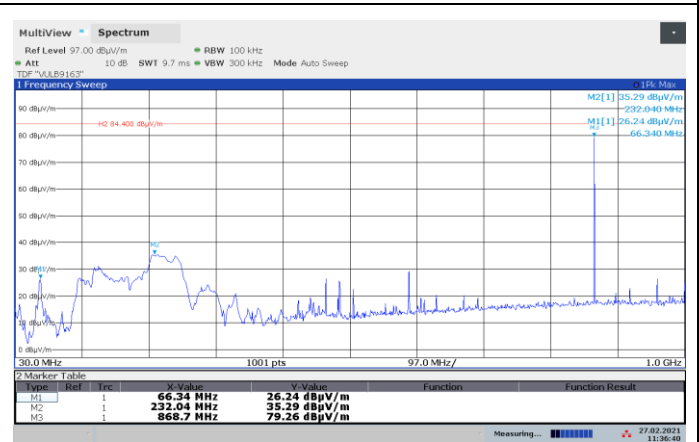
VP: 1 - 10GHz, 16K0F3E , 50W, 868.8MHz



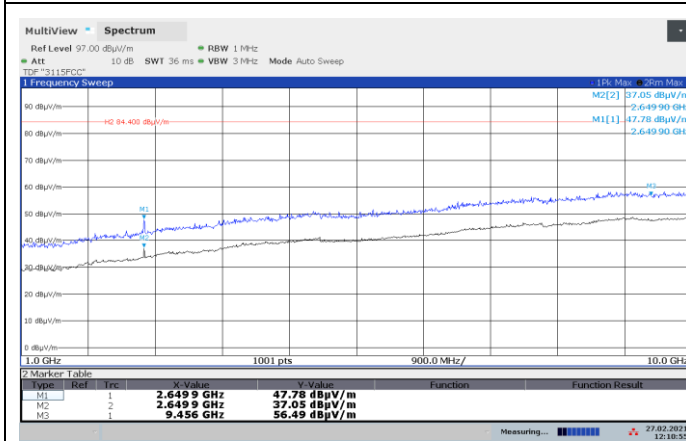
HP: 1 - 10GHz, 16K0F3E , 50W, 868.8MHz



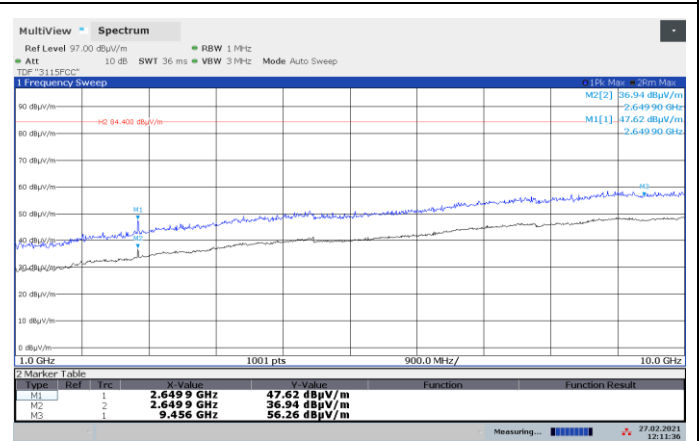
VP: 30 - 1000MHz, 0.35TETRA , 25W, 868.8MHz



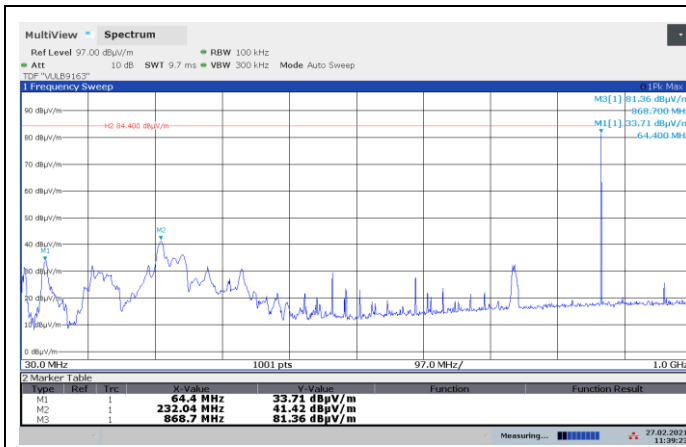
HP: 30 - 1000MHz, 0.35TETRA , 25W, 868.8MHz



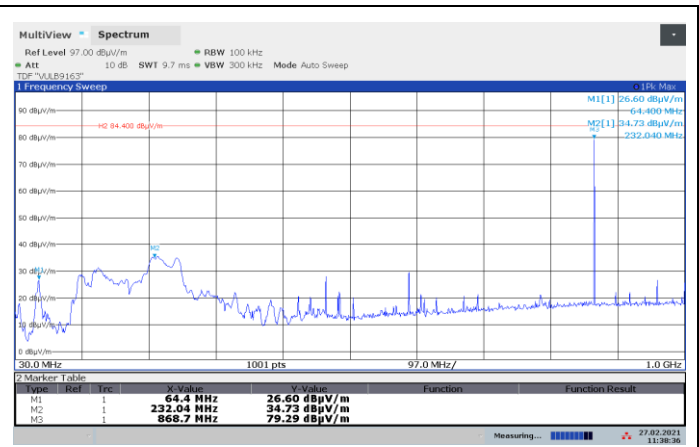
VP: 1 - 10GHz, 0.35TETRA , 25W, 868.8MHz



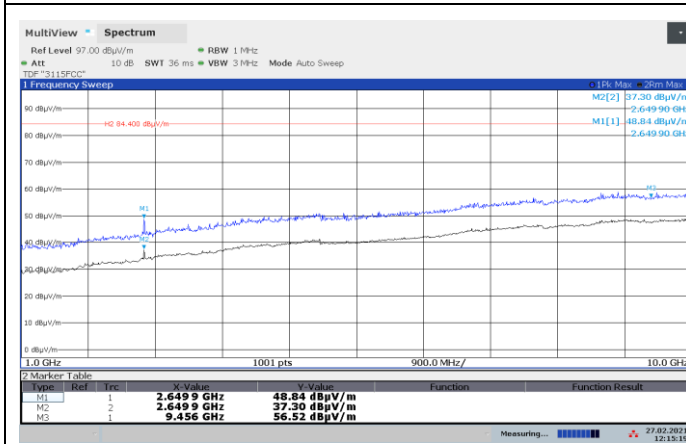
HP: 1 - 10GHz, 0.35TETRA , 25W, 868.8MHz



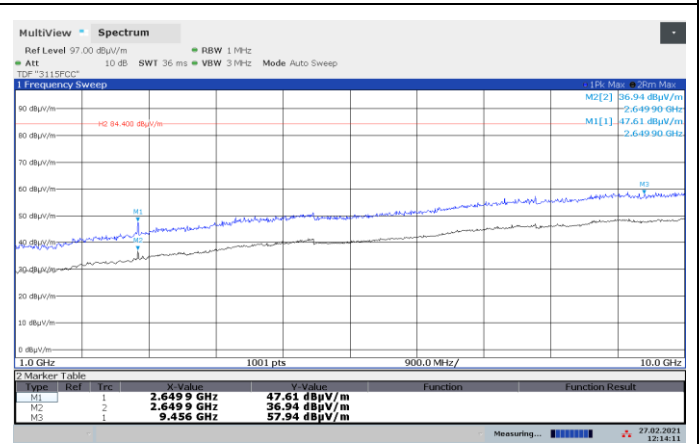
VP: 30 - 1000MHz, 25kHzTEDS, 10W, 868.8MHz



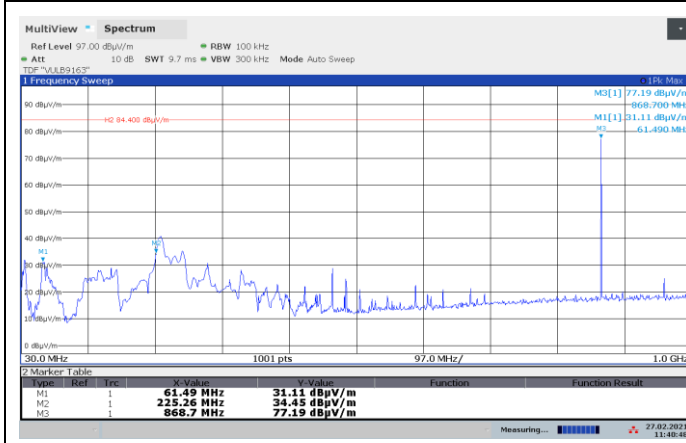
HP: 30 - 1000MHz, 25kHzTEDS, 10W, 868.8MHz



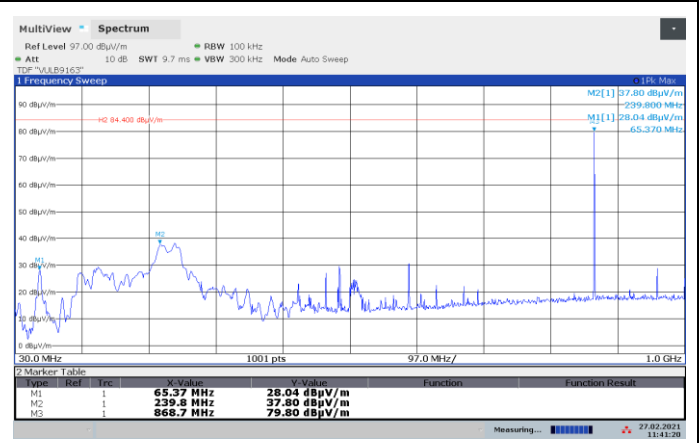
VP: 1 - 10GHz, 25kHzTEDS, 10W, 868.8MHz



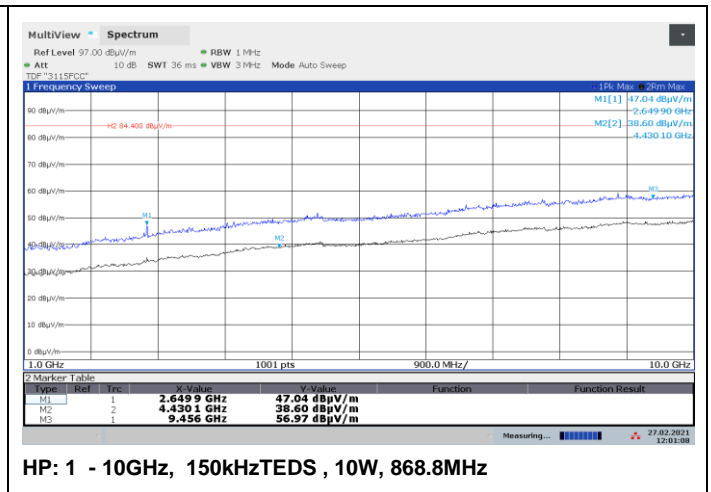
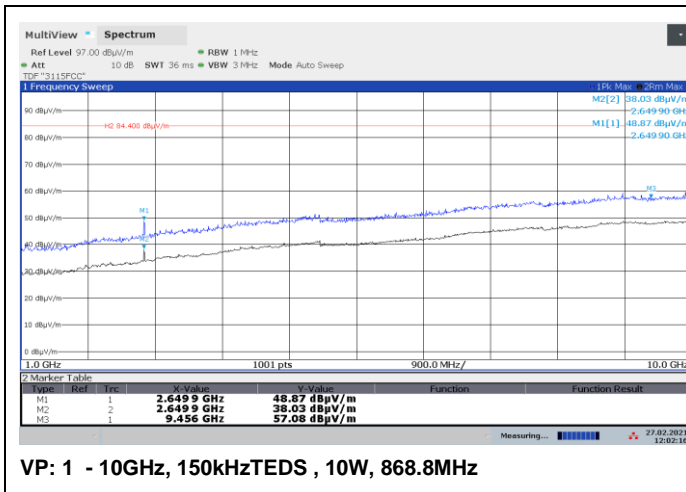
HP: 1 - 10GHz, 25kHzTEDS, 10W, 868.8MHz



VP: 30 - 1000MHz, 150kHzTEDS, 10W, 868.8MHz



HP: 30 - 1000MHz, 150kHzTEDS, 10W, 868.8MHz



1.2 Frequency Stability

FCC Para. No.: 2.1055, 90.213, 90.217(b)

RSS-119 Para. No.:5.6

Test Results: Complies

Measurement Data:

Test conditions	Measured Frequency (MHz)	Deviation (Hz)	Deviation (\pm ppm)	Limit (\pm ppm)	Margin (\pm ppm)
+50 °C, 48Vdc	859.999852164	23.242	0.025	0.1	0.08
+40 °C, 48Vdc	859.999855387	20.019	0.023	0.1	0.08
+30 °C, 48Vdc	859.999868145	7.261	0.008	0.1	0.09
+20 °C, 48Vdc	859.999875406	0.0	0	0.1	0
+20 °C, 42Vdc	859.999873288	2.118	0.002	0.1	0.09
+20 °C, 55.2Vdc	859.999872467	2.939	0.003	0.1	0.09
+10 °C, 48Vdc	859.999833883	41.523	0.048	0.1	0.05
0 °C, 48Vdc	859.999892026	-16.620	-0.019	0.1	0.08
-10 °C, 48Vdc	859.999934631	-59.225	-0.069	0.1	0.03
-20 °C, 48Vdc	859.999938654	-63.248	-0.074	0.1	0.03
-30 °C, 48Vdc	859.999943658	-68.252	-0.079	0.1	0.02

Requirements:

Frequency stability should comply as given in FCC 90.213(a), Table 1 for 800MHz and for RSS-119, cl5.3, Table 1 for 800MHz.

1.3 Adjacent channel power limits

FCC Para. No.: 90.221 (c) (1) (2) (d)

RSS-119 Para. No.:/

Test Results: Complies

Frequency range: 854 - 869 MHz

Frequency (MHz)	Modulation type	Lower Adjacent channel power (dBc)	Upper Adjacent channel power (dBc)	Limit (dBc)
860.0	25kHzTEDS	-79.43	-79.27	< -70
868.8	25kHzTEDS	-79.07	-78.84	< -70
860.0	0.35TETRA	-80.07	-80.06	< -70
868.8	0.35TETRA	-80.28	-80.34	< -70

See attached plots below. It shows also 50 kHz and 75 kHz offset upto 140 kHz

Requirements:

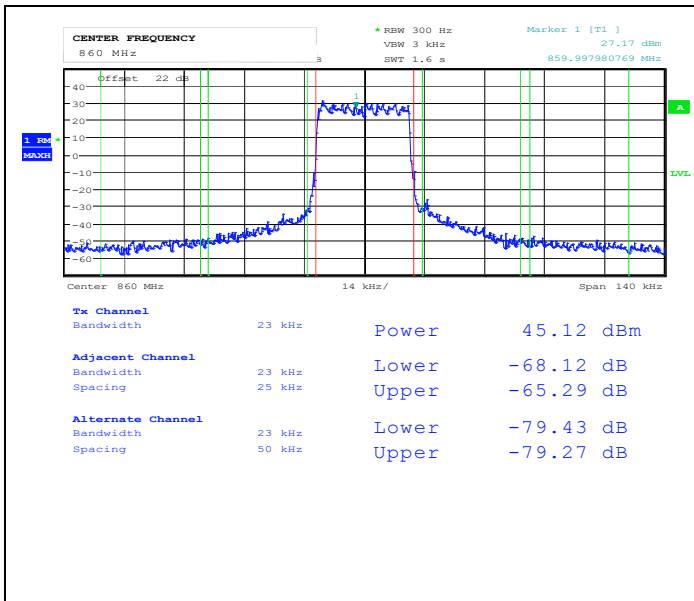
For the frequency bands indicated below, operations using equipment designed to operate with a 25 kHz channel bandwidth may be authorized up to a 22 kHz bandwidth if the equipment meets the adjacent channel power (ACP) limits below. The table specifies a value for the ACP as a function of the displacement from the channel center frequency and a measurement bandwidth of 18 kHz.

(c) (1) Maximum adjacent power levels for frequencies in the 809-824/854-869 MHz band:

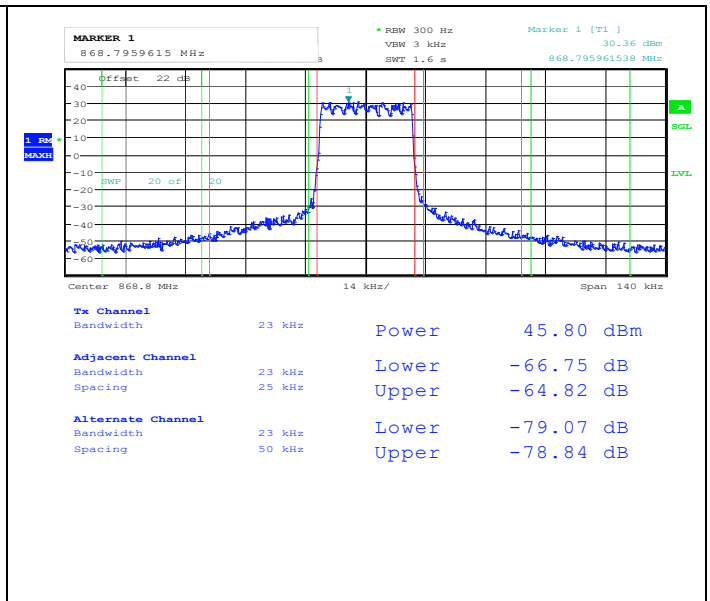
Frequency offset	Maximum ACP (dBc) for devices less than 15 watts	Maximum ACP (dBc) for devices 15 watts and above
25 kHz	-55 dBc	-55 dBc
50 kHz	-65 dBc	-65 dBc
75 kHz	-65 dBc	-70 dBc

(2) In any case, no requirement in excess of -36 dBm shall apply.

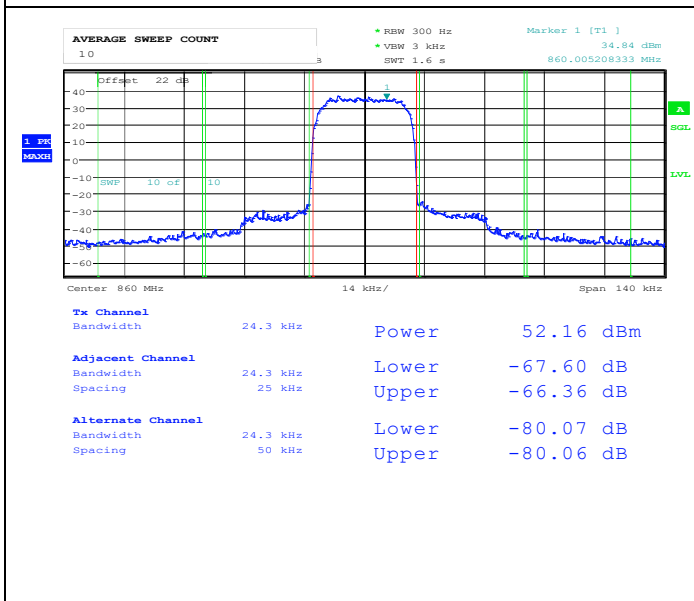
(d) On any frequency removed from the assigned frequency by more than 75 kHz, the attenuation of any emission must be at least $43 + 10 \log (P_{\text{watts}})$ dB.



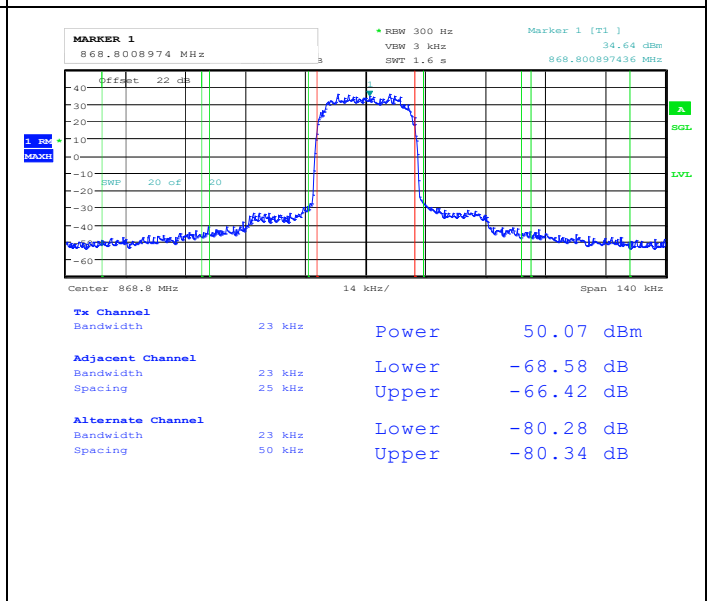
25kHzTEDS,860.0MHz



25kHzTEDS, 868.8MHz



0.35TETRA, 860.0MHz



0.35TETRA,868.8MHz

1.4 Measurement Uncertainty

Measurement Uncertainty Values		
Test Item		Uncertainty
Output Power		±0.5 dB
Power Spectral Density		±0.5 dB
Out of Band Emissions, Conducted	< 3.6 GHz	±0.6 dB
	> 3.6 GHz	±0.9 dB
Spurious Emissions, Radiated	< 1 GHz	±2.5 dB
	> 1 GHz	±2.2 dB
Emission Bandwidth		±4 %
Power Line Conducted Emissions		+2.9 / -4.1 dB
Spectrum Mask Measurements	Frequency	±5 %
	Amplitude	±1.0 dB
Frequency Error		±0.6 ppm
Temperature Uncertainty		±1 °C

All uncertainty values are expanded standard uncertainty to give a confidence level of 95%, based on coverage factor k=2

2 LIST OF TEST EQUIPMENT

To facilitate inclusion on each page of the test equipment used for related tests, each item of test equipment and ancillaries are identified (numbered) by the Test Laboratory.

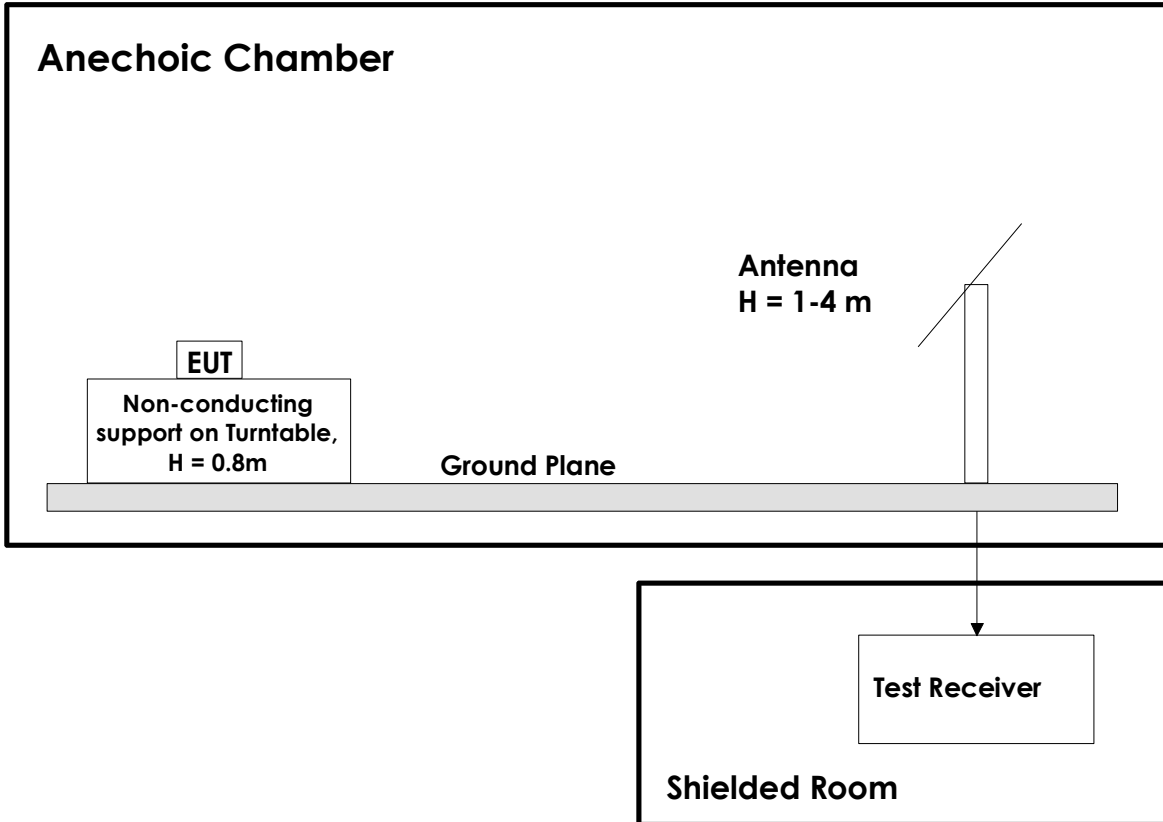
No.	Model number	Description	Manufacturer	Ref. no.	Cal. date	Cal. Due
1	FSW43	Spectrum Analyzer	Rohde & Schwarz	LR 1690	2020.10	2022.10
2	FSU26	Measuring Receiver	Rohde & Schwarz	LR 1504	2020.07	2022.07
3	770-20	Attenuator	Narda	LR 1777	Cal b4 use	
4	768-20	Attenuator	Narda	LR 1196	Cal b4 use	
5	6HC1000/4000	Highpass Filter	Trilithic	LR 1770	Cal b4 use	
6	5VF2000/400	Bandpass filter	Trilithic	LR 1176	Cal b4 use	
7	NRP-Z81	Power Sensor	Rohde & Schwarz	LR 1644	2020.09	2022.09
8	3115	Antenna Horn	EMCO	LR 1330	N/A	
9	8449B	Pre-amplifier	Hewlett Packard	LR 1322	2020.08	2021.08
10	VULB9163	Bi-log Hybrid antenna	Schwarzbeck	LR 1616	2020.01	2022.01
11	45 DMM	Multimeter	Fluke	LT5218	2021-01	2022-01
12	CPX400S	Power supply	AIM TTI	LR 1745	N/A	
12	TY 80	Climatic chamber	ACS	LR 1083	2020-06	2022-06
13	768-10	Attenuator	Narda	LR 1005	Cal b4 use	

The software listed below has been used for one or more tests in this report.

No.	Manufacturer	Name	Version	Comment
1	Nemko AS	RSPlot	1.0.8.0	Screenshots from R&S Spectrum Analyzers

3 BLOCK DIAGRAM

3.1 Test Site Radiated Emission



This test setup is used for all radiated emissions tests. For frequencies below 30 MHz the measuring distance is 10m, for all other frequencies it is 3m or 1m. Emissions above 1 GHz are measured with a Spectrum Analyzer and Horn Antenna. For measurements above 18 GHz the test receiver is moved inside the anechoic chamber and located next to the antenna to minimize the cable loss. All measurements at 1GHz and above were performed with turntable height 1.5m and with the ground plane covered by absorbers. A pre-amplifier is used for all measurements above 30 MHz, and High-Pass or Band-Pass filter is used for all harmonics.

Revision history

Revision	Date	Comment	Sign
00	2021-12-14	First Version	gns
01	2022-01-24	Antenna gain and rated output is corrected	gns
02	2022-01-31	Antenna gain in page 8 is updated	gns
03	2022-03-04	Antenna height is updated	gns