

Wireless test report – REP011020

Type of assessment:

Transmitter co-location

Applicant:

Andrew Wireless Systems
Industriering 10, Buchdorf 86675
Germany

Product:

Carrier Access Point Radio Module

Model:

UAP 2 7E/17E/19/37T

Model variant(s):

--

FCC ID:

XS5-UAP27171937

IC Registration number:

--

Date of issue: May 12, 2023

Specifications:

- FCC 47 CFR Part 15 Subpart C, §15.209
Radiated emission limits; general requirements.

Tested by

(name, function and signature) D Guarnone

Signature:



Reviewed by

(name, function and signature) P. Barbieri

Signature:



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Test location(s)

Company name	Nemko Spa
Address	Via del Carroccio, 4
City	Biassono
Province	MB
Postal code	20853
Country	Italy
Telephone	+39 039 220 12 01
Facsimile	+39 039 220 12 21
Website	www.nemko.com
Site number	FCC: 682159 (10 m semi anechoic chamber)

Limits of responsibility

Note that the results contained in this report relate only to the items tested and were obtained in the period between the date of initial receipt of samples and the date of issue of the report. This test report has been completed in accordance with the requirements of ISO/IEC 17025. All results contained in this report are within Nemko Spa ISO/IEC 17025 accreditation.

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Section 1. Report summary

1.1 Applicant and manufacturer

Company name	Andrew Wireless Systems
Address	Industriering 10, Buchdorf 86675 Germany

1.2 Test specifications

FCC 47 CFR Part 2	Frequency Allocations and Radio Treaty Matters; General Rules and Regulations
FCC 47 CFR Part 27	Miscellaneous wireless communications services
FCC 47 CFR Part 24	tests personal communications services (PCS)
FCC 47 CFR Part 90	PRIVATE LAND MOBILE RADIO SERVICES

1.3 Test method

ANSI C63.26-2015	American National Standard for Compliance Testing of Transmitters Used in Licensed Radio Services
KDB 935210 D05	Indus Booster Basic Meas v01r04
KDB 662911 D01	Multiple Transmitter Output v02r01
KDB 662911 D02	MIMO with Cross-Polarized Antennas v01

1.4 Statement of compliance

In the configuration tested, the EUT was found compliant.

Testing was performed against all relevant requirements of the test standard except as noted in section 1.5 below. Results obtained indicate that the product under test complies in full with the requirements tested. The test results relate only to the items tested.

See "Summary of test results" for full details.

1.5 Exclusions

As per quote, the purpose of this report is verification of transmitters colocation. Only inter-modulation products within restricted bands were assessed, other requirements were excluded from the scope of this report.

1.6 Test report revision history

Revision #	Date of issue	Details of changes made to test report
REP011020	May 12, 2023	Original report issued



Section 2. Summary of test results

2.1 FCC Part 15 Subpart C, general requirements test results

Part	Test description	Verdict
§15.209	Radiated emission limits; general requirements.	Pass

Section 3. Equipment under test (EUT) details

3.1 Sample information

Receipt date	2023-04-28
Nemko sample ID number	

3.2 EUT information

Product name	Carrier Access Point Radio Module
Model	UAP 2 7E/17E/19/37T
Model variant	--
Serial number	--

3.3 Technical information

Frequency band	BAND	LBE	UBE
		MHz	MHz
	7E-B12	729	746
	7E-B13	746	756
	7E-B14	758	768
	17E-B66	2110	2180
	19-B25	1930	1995
	37T C-Band	3700	3980
Type of modulation	--		
Emission classification (F1D, G1D, D1D)	-		
Transmitter spurious, dB μ V/m @3 m	--		
EUT power requirements	24 V _{DC} , via 120 V _{AC} adapter or battery		
Antenna information	The EUT uses a unique antenna coupling.		

3.4 EUT setup diagram

Figure 3.4-1: Setup diagram

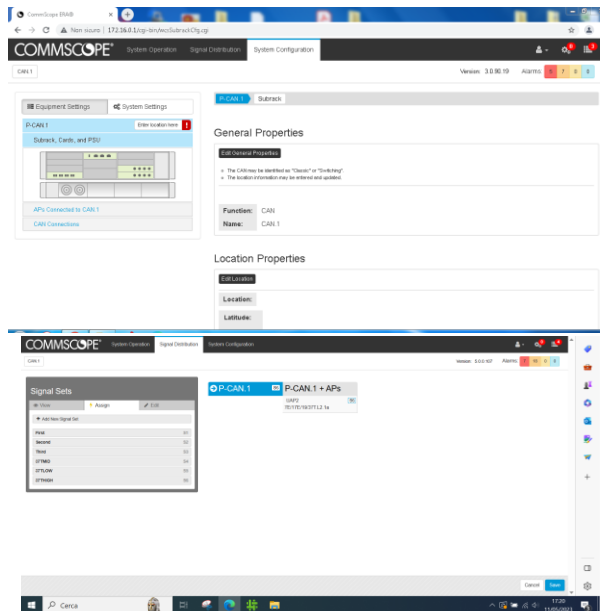
3.5 Product description and theory of operation

3.6 EUT sub assemblies

Table 3.6-1: EUT sub assemblies

Description	Brand name	Model/Part number	Serial number

3.7 EUT exercise details



A signal generator with an AWGN5 signal with 4.1 MHz 99% OBW representative of a 5 MHz LTE channel has been connected to the RF input of the server. The RF output of the EUT was connected to a spectrum analyzer or a dummy load.

Section 4. Engineering considerations

4.1 Modifications incorporated in the EUT

There were no modifications performed to the EUT during this assessment.

4.2 Technical judgment

The EUT has WIFI and Bluetooth in 2.4 GHz band, WIFI is chosen to be the representative worst-case due to higher output power.

4.3 Deviations from laboratory tests procedures

No deviations were made from laboratory procedures.

Section 5. Test conditions

5.1 Atmospheric conditions

In the laboratory, the following ambient conditions are respected for each test reported below:

Temperature	18 – 33 °C
Relative humidity	25 – 70 %
Air pressure	860 – 1060 mbar

The following instruments are used to monitor the environmental conditions:

Equipment	Manufacturer	Model no.	Asset no.	Cal date	Next cal.
Thermo-hygrometer data loggers	Testo	175-H2	20012380/305	2022-12	2024-12
Thermo-hygrometer data loggers	Testo	175-H2	38203337/703	2022-12	2024-12
Barometer	Castle	GPB 3300	072015	2022-09	2024-09

5.2 Power supply range

The normal test voltage for equipment to be connected to the mains shall be the nominal mains voltage. For the purpose of the present document, the nominal voltage shall be the declared voltage, or any of the declared voltages $\pm 5\%$, for which the equipment was designed.

Section 6. Measurement uncertainty

6.1 Uncertainty of measurement

The measurement uncertainty was calculated for each test and quantity listed in this test report, according to CISPR 16-4-2 and other specific test standard and is documented in Nemko Spa working manual WML1002.

The assessment of conformity for each test performed on the equipment is performed not taking into account the measurement uncertainty. The two following possible verdicts are stated in the report:

P (Pass) - The measured values of the equipment respect the specification limit at the points tested. The specific risk of false accept is up to 50% when the measured result is close to the limit.

F (Fail) - One or more measured values of the equipment do not respect the specification limit at the points tested. The specific risk of false reject is up to 50% when the measured result is close to the limit.

Hereafter Nemko's measurement uncertainties are reported:

EUT	Type	Test	Range	Measurement Uncertainty	Notes
Transmitter	Conducted	Frequency error	0.001 MHz ÷ 40 GHz	0.08 ppm	(1)
		Carrier power RF Output Power	0.009 MHz ÷ 30 MHz	1.1 dB	(1)
			30 MHz ÷ 18 GHz	1.5 dB	(1)
			18 MHz ÷ 40 GHz	3.0 dB	(1)
			40 MHz ÷ 140 GHz	5.0 dB	(1)
		Adjacent channel power	1 MHz ÷ 18 GHz	1.4 dB	(1)
		Conducted spurious emissions	0.009 MHz ÷ 18 GHz	3.0 dB	(1)
			18 GHz ÷ 40 GHz	4.2 dB	(1)
			40 GHz ÷ 220 GHz	6.0 dB	(1)
		Intermodulation attenuation	1 MHz ÷ 18 GHz	2.2 dB	(1)
		Attack time – frequency behaviour	1 MHz ÷ 18 GHz	2.0 ms	(1)
		Attack time – power behaviour	1 MHz ÷ 18 GHz	2.5 ms	(1)
		Release time – frequency behaviour	1 MHz ÷ 18 GHz	2.0 ms	(1)
		Release time – power behaviour	1 MHz ÷ 18 GHz	2.5 ms	(1)
		Transient behaviour of the transmitter– Transient frequency behaviour	1 MHz ÷ 18 GHz	0.2 kHz	(1)
		Transient behaviour of the transmitter – Power level slope	1 MHz ÷ 18 GHz	9%	(1)
		Frequency deviation - Maximum permissible frequency deviation	0.001 MHz ÷ 18 GHz	1.3%	(1)
		Frequency deviation - Response of the transmitter to modulation frequencies above 3 kHz	0.001 MHz ÷ 18 GHz	0.5 dB	(1)
	Dwell time	-	3%	(1)	
	Hopping Frequency Separation	0.01 MHz ÷ 18 GHz	1%	(1)	
Occupied Channel Bandwidth	0.01 MHz ÷ 18 GHz	2%	(1)		
Modulation Bandwidth	0.01 MHz ÷ 18 GHz	2%	(1)		
Radiated	Radiated spurious emissions	0.009 MHz ÷ 26.5 GHz	6.0 dB	(1)	
		26.5 GHz ÷ 66 GHz	8.0 dB	(1)	
		66 GHz ÷ 220 GHz	10 dB	(1)	
	Effective radiated power transmitter	10 kHz ÷ 26.5 GHz	6.0 dB	(1)	
		26.5 GHz ÷ 66 GHz	8.0 dB	(1)	
		66 GHz ÷ 220 GHz	10 dB	(1)	

EUT	Type	Test	Range	Measurement Uncertainty	Notes
Receiver	Radiated	Radiated spurious emissions	0.009 MHz ÷ 26.5 GHz	6.0 dB	(1)
			26.5 GHz ÷ 66 GHz	8.0 dB	(1)
			66 GHz ÷ 220 GHz	10 dB	(1)
		Sensitivity measurement	1 MHz ÷ 18 GHz	6.0 dB	(1)
	Conducted	Conducted spurious emissions	0.009 MHz ÷ 18 GHz	3.0 dB	(1)
			18 GHz ÷ 40 GHz	4.2 dB	(1)
40 GHz ÷ 220 GHz			6.0 dB	(1)	

NOTES:

(1) The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor $k = 2$, which for a normal distribution corresponds to a coverage probability of approximately 95 %

Section 7. Test equipment

7.1 Test equipment list

Table 7.1-1: Equipment list

Equipment	Manufacturer	Model no.	Asset no.	Cal cycle	Next cal.
EMI receiver (20 Hz ÷ 8 GHz)	Rohde & Schwarz	ESU8	100202	2022-09	2023-09
EMI receiver (20 Hz ÷ 8 GHz)	Rohde & Schwarz	ESW44	101620	2022-08	2023-08
Trilog Antenna (30 MHz ÷ 7 GHz)	Schwarzbeck	VULB 9162	9162-025	2021-07	2024-07
Bilog antenna (1 ÷ 18 GHz)	Schwarzbeck	STLP 9148	9148-123	2021-09	2024-09
Preamplifier (1 ÷ 18 GHz)	Schwarzbeck	BBV 9718C	00121	2023-03	2024-03
Double Ridge Horn Antenna	RFSpin	DRH40	061106A40	2023-04	2026-04
Preamplifier (18 ÷ 40 GHz)	Sage	STB-1834034030-KFKF-L1	18490-01	2022-05	2023-05
Controller	Maturo	FCU3.0	10041	NCR	NCR
Tilt antenna mast	Maturo	TAM4.0-E	10042	NCR	NCR
Turntable	Maturo	TT4.0-5T	2.527	NCR	NCR
3m Semi anechoic chamber	Comtest	SAC-3	1711-150	2022-09	2024-09
Shielded room	Siemens	10m control room	1947	NCR	NCR
LISN	Rohde & Schwarz	ESH2-Z5	872 460/041	2022-10	2023-10
Shielded room	Siemens	Conducted emission test room	1862	NCR	NCR
Semi-anechoic chamber	Nemko S.p.a.	10m semi-anechoic chamber	530	2021-09	2023-09

Note: NCR - no calibration required, VOU - verify on use



Section 8. Testing data

8.1 FCC 15.209 Radiated emission limits; general requirements

8.1.1 Definitions and limits

FCC:

(f) In accordance with §15.33(a), in some cases the emissions from an intentional radiator must be measured to beyond the tenth harmonic of the highest fundamental frequency designed to be emitted by the intentional radiator because of the incorporation of a digital device. If measurements above the tenth harmonic are so required, the radiated emissions above the tenth harmonic shall comply with the general radiated emission limits applicable to the incorporated digital device, as shown in §15.109 and as based on the frequency of the emission being measured, or, except for emissions contained in the restricted frequency bands shown in §15.205, the limit on spurious emissions specified for the intentional radiator, whichever is the higher limit. Emissions which must be measured above the tenth harmonic of the highest fundamental frequency designed to be emitted by the intentional radiator and which fall within the restricted bands shall comply with the general radiated emission limits in §15.109 that are applicable to the incorporated digital device.

Table 8.1-1: FCC §15.209 and RSS-Gen – Radiated emission limits

Frequency, MHz	Field strength of emissions		Measurement distance, m
	µV/m	dBµV/m	
0.009–0.490	2400/F	67.6 – 20 × log ₁₀ (F)	300
0.490–1.705	24000/F	87.6 – 20 × log ₁₀ (F)	30
1.705–30.0	30	29.5	30
30–88	100	40.0	3
88–216	150	43.5	3
216–960	200	46.0	3
above 960	500	54.0	3

Notes: In the emission table above, the tighter limit applies at the band edges.

For frequencies above 1 GHz the limit on peak RF emissions is 20 dB above the maximum permitted average emission limit applicable to the equipment under test

Table 8.1-2: FCC restricted frequency bands

MHz	MHz	MHz	GHz
0.090–0.110	16.42–16.423	399.9–410	4.5–5.15
0.495–0.505	16.69475–16.69525	608–614	5.35–5.46
2.1735–2.1905	16.80425–16.80475	960–1240	7.25–7.75
4.125–4.128	25.5–25.67	1300–1427	8.025–8.5
4.17725–4.17775	37.5–38.25	1435–1626.5	9.0–9.2
4.20725–4.20775	73–74.6	1645.5–1646.5	9.3–9.5
6.215–6.218	74.8–75.2	1660–1710	10.6–12.7
6.26775–6.26825	108–121.94	1718.8–1722.2	13.25–13.4
6.31175–6.31225	123–138	2200–2300	14.47–14.5
8.291–8.294	149.9–150.05	2310–2390	15.35–16.2
8.362–8.366	156.52475–156.52525	2483.5–2500	17.7–21.4
8.37625–8.38675	156.7–156.9	2690–2900	22.01–23.12
8.41425–8.41475	162.0125–167.17	3260–3267	23.6–24.0
12.29–12.293	167.72–173.2	3332–3339	31.2–31.8
12.51975–12.52025	240–285	3345.8–3358	36.43–36.5
12.57675–12.57725	322–335.4	3600–4400	Above 38.6
13.36–13.41			

8.1.2 Test summary

Test start date	May 9, 2023
Test engineer	D. Guarnone

8.1.3 Observations, settings and special notes

The spectrum was searched from 30 MHz to 40 GHz.

EUT's LTE and WIFI transmitters were set to transmit continuously, different channel setting has been investigated as per provided by client's setup, only the worst-case is presented.

Radiated measurements were performed at a distance of 3 m for frequency range below 18 GHz, and 1 m for frequency range above 18 GHz. No inter-modulation products emissions were detected above 18 GHz within 6 dB below the limit.

Spectrum analyzer settings for frequencies below 30 MHz:

Detector mode	Quasi-Peak
Resolution bandwidth	9 kHz
Video bandwidth	30 kHz
Trace mode	Max Hold
Measurement time	100 ms

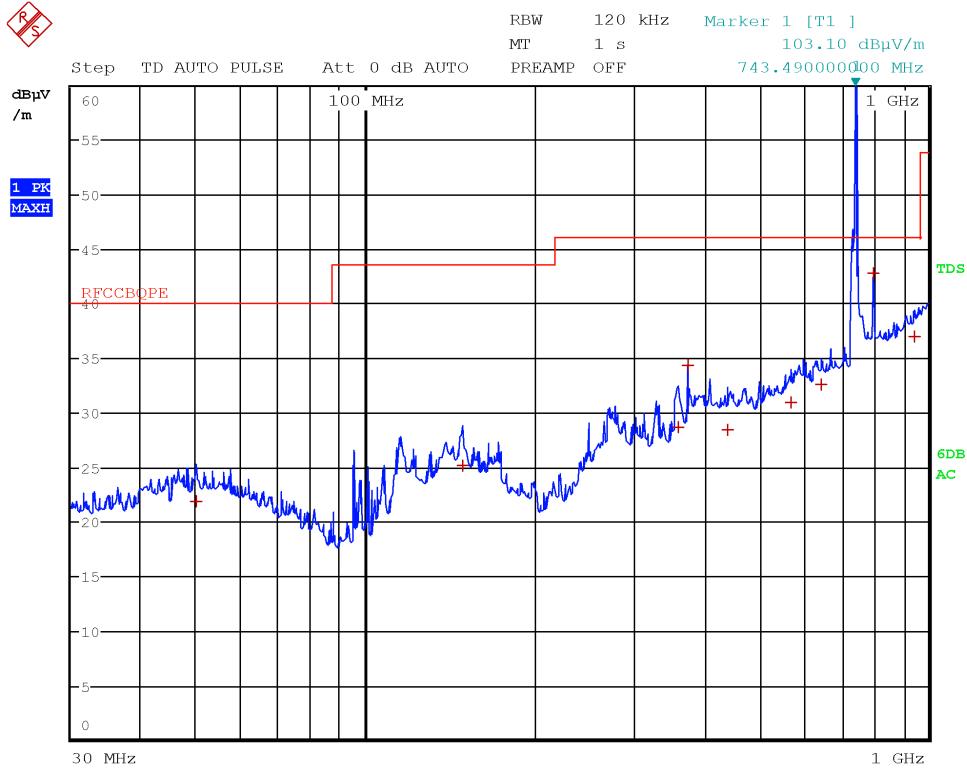
Spectrum analyser settings for radiated measurements within restricted bands 30 MHz to 1 GHz:

Resolution bandwidth:	1 MHz
Video bandwidth:	3 MHz
Detector mode:	Peak
Trace mode:	Max Hold

Spectrum analyser settings for average radiated measurements within restricted bands above 1 GHz:

Resolution bandwidth:	1 MHz
Video bandwidth:	10 Hz
Detector mode:	Peak
Trace mode:	Max Hold

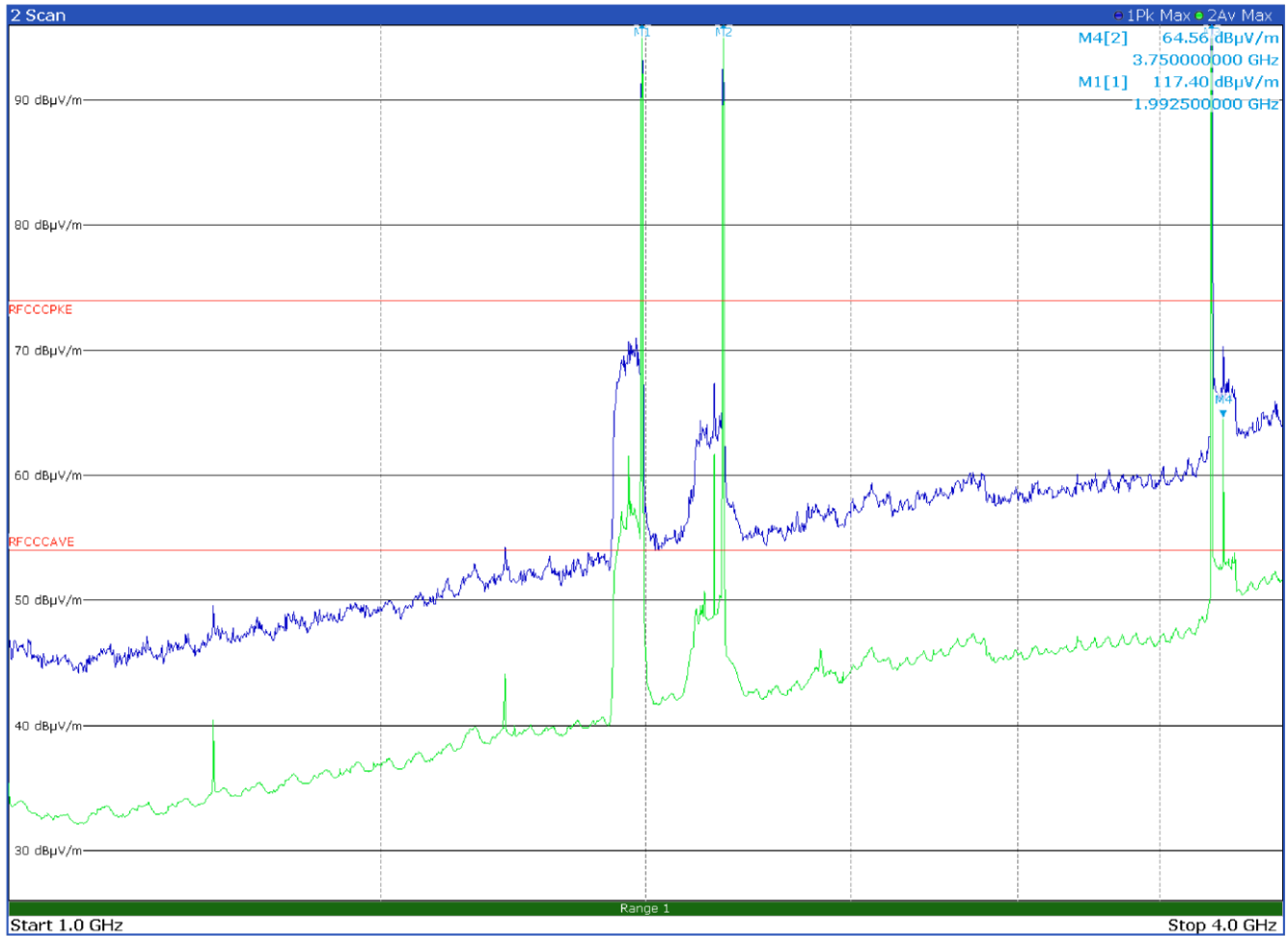
8.1.4 Test data



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Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector
50.1000	21.9	40.0	-18.1	QP
148.7700	25.2	43.5	-18.3	QP
358.7700	28.7	46.0	-17.3	QP
375.0000	34.4	46.0	-11.6	QP
439.5000	28.5	46.0	-17.5	QP
569.7000	31.0	46.0	-15.0	QP
644.7600	32.6	46.0	-13.4	QP
743.4900	103.2	46.0	57.2	QP
800.0100	42.9	46.0	-3.1	QP
946.9500	37.0	46.0	-9.0	QP

7E-B12, 17E-B66, 19-B25, 37T C-Band, horizontal polarization

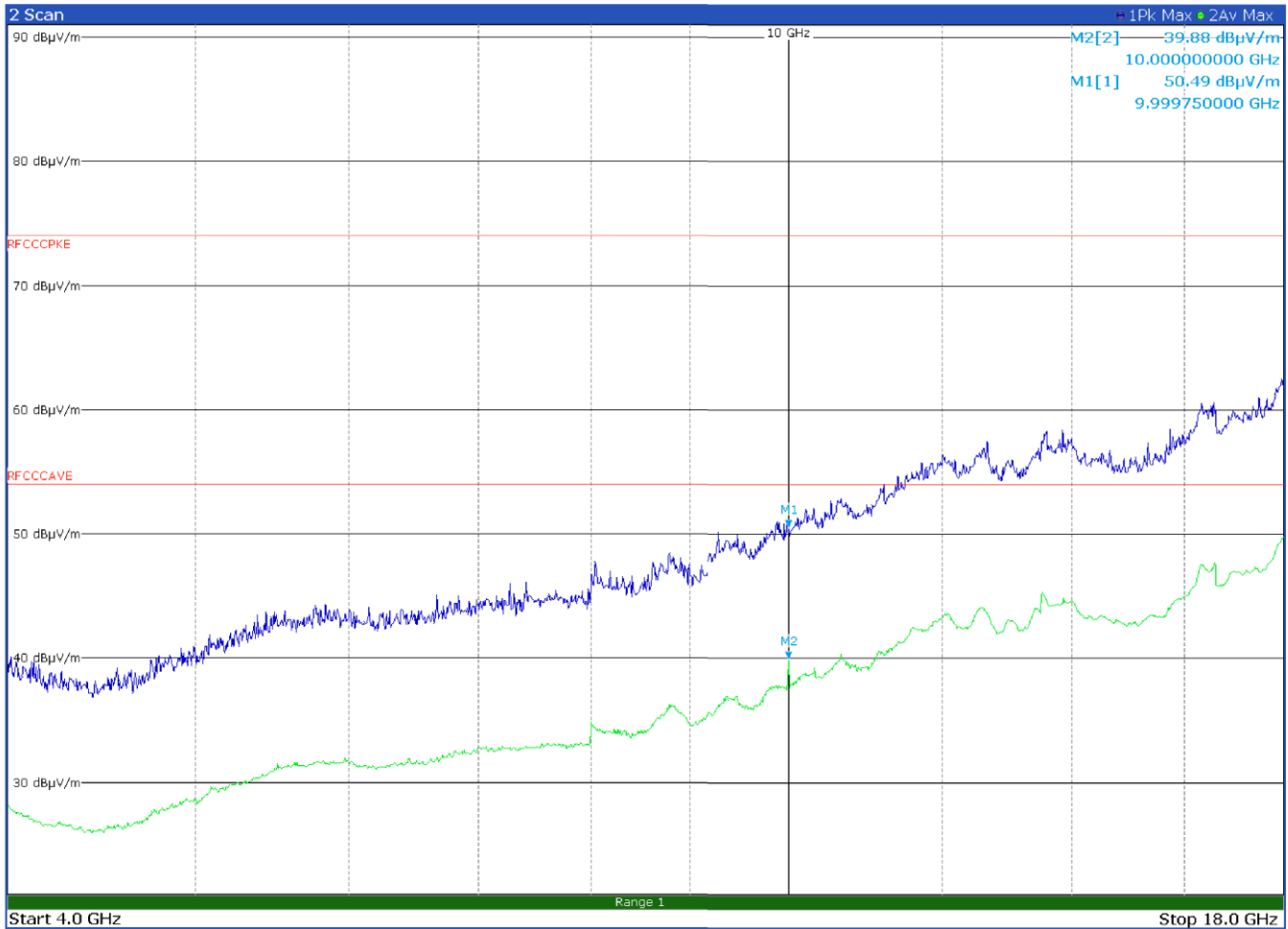


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3 Marker Table					
Wnd	Type	Ref	Trc	X-value	Y-value
Scan	M1		1	1.9925 GHz	117.4 dBµV/m
Scan	M2		1	2.17725 GHz	115.79 dBµV/m
Scan	M3		1	3.7025 GHz	118.34 dBµV/m
Scan	M4		2	3.75 GHz	64.56 dBµV/m

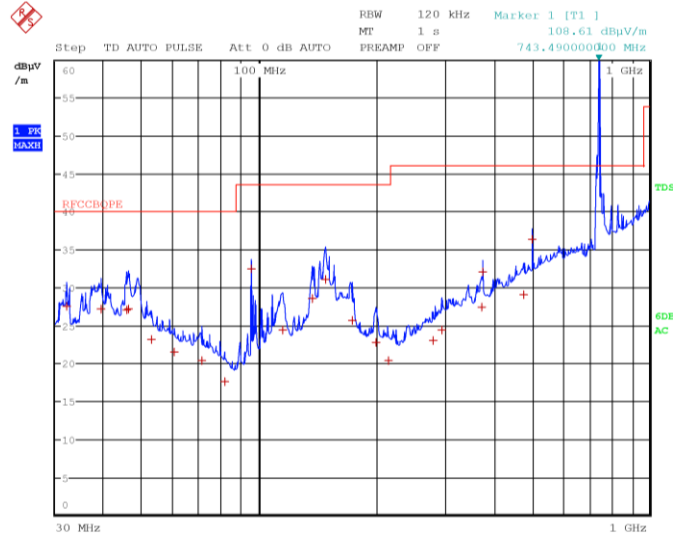
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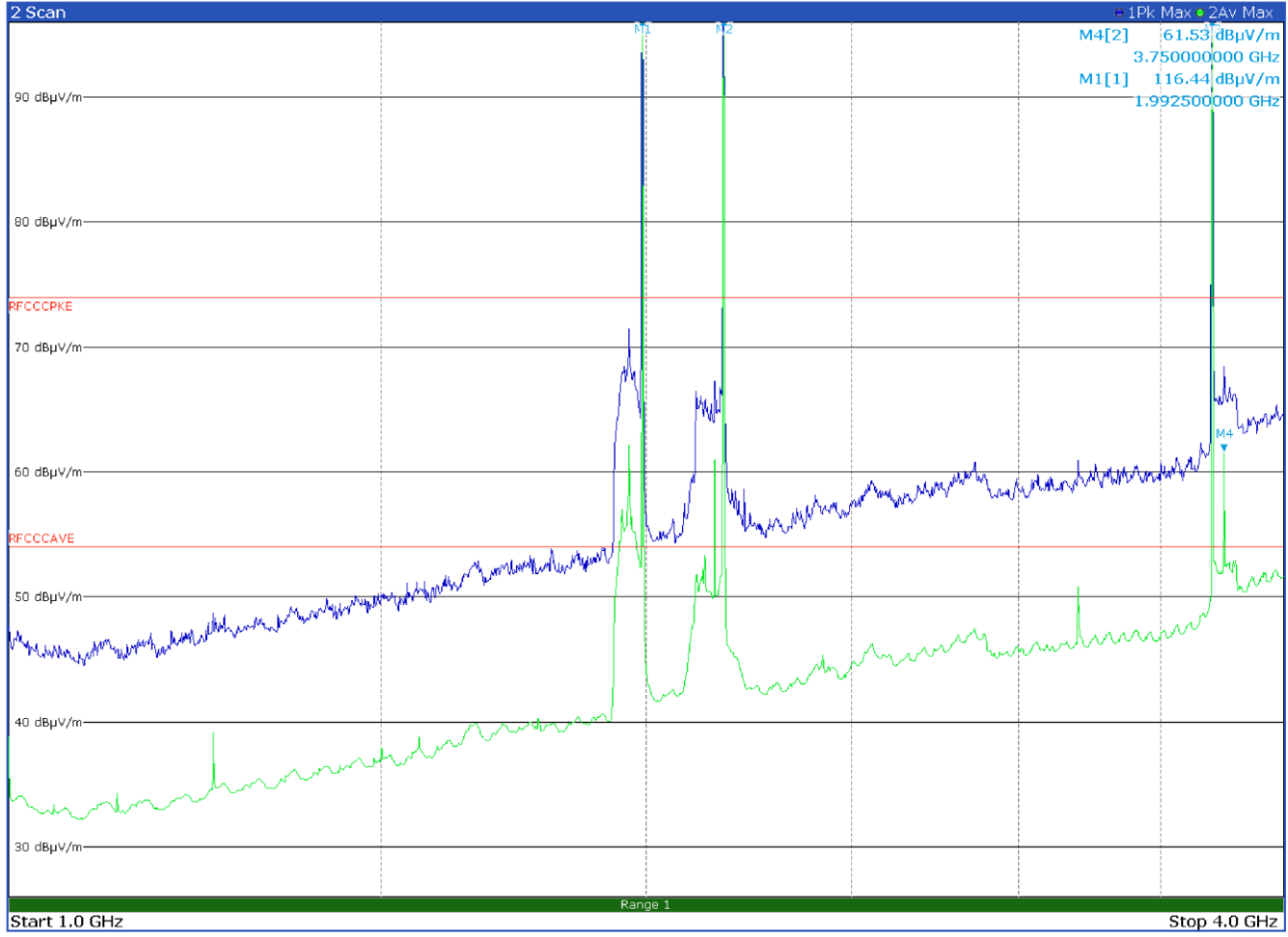
7E-B12, 17E-B66, 19-B25, 37T C-Band, horizontal polarization



Date: 8.MAY.2023 13:14:05

Frequency (MHz)	Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector
32.1000	27.6	40.0	-12.4	QP
39.3000	27.3	40.0	-12.7	QP
45.6900	27.0	40.0	-13.0	QP
46.1100	27.3	40.0	-12.7	QP
52.8000	23.1	40.0	-16.9	QP
60.6900	21.5	40.0	-18.5	QP
71.1300	20.4	40.0	-19.6	QP
81.3600	17.6	40.0	-22.4	QP
95.5200	32.5	43.5	-11.0	QP
115.0200	24.4	43.5	-19.1	QP
137.1300	28.6	43.5	-14.9	QP
148.2600	31.1	43.5	-12.4	QP
172.8000	25.7	43.5	-17.8	QP
199.1400	22.8	43.5	-20.7	QP
213.9300	20.5	43.5	-23.0	QP
279.8400	23.1	46.0	-22.9	QP
294.3900	24.4	46.0	-21.6	QP
372.9600	27.4	46.0	-18.6	QP
375.0000	32.1	46.0	-13.9	QP
477.4800	29.1	46.0	-16.9	QP
500.0100	36.4	46.0	-9.6	QP

7E-B12, 17E-B66, 19-B25, 37T C-Band, vertical polarization

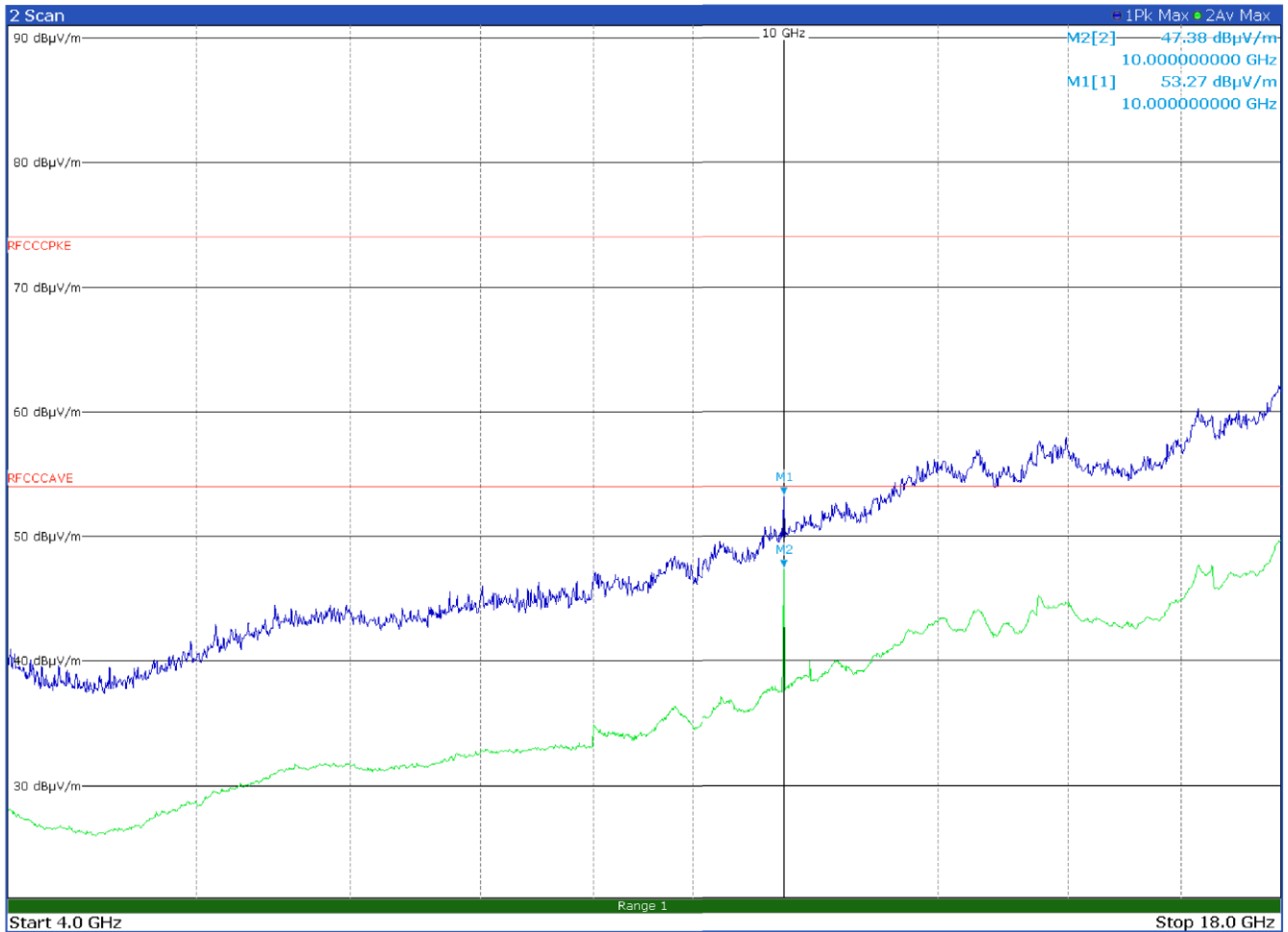


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3 Marker Table					
Wnd	Type	Ref	Trc	X-value	Y-value
Scan	M1		1	1.9925 GHz	116.44 dBµV/m
Scan	M2		1	2.17725 GHz	117.35 dBµV/m
Scan	M3		1	3.7025 GHz	118.36 dBµV/m
Scan	M4		2	3.75 GHz	61.53 dBµV/m

7E-B12, 17E-B66, 19-B25, 37T C-Band, vertical polarization



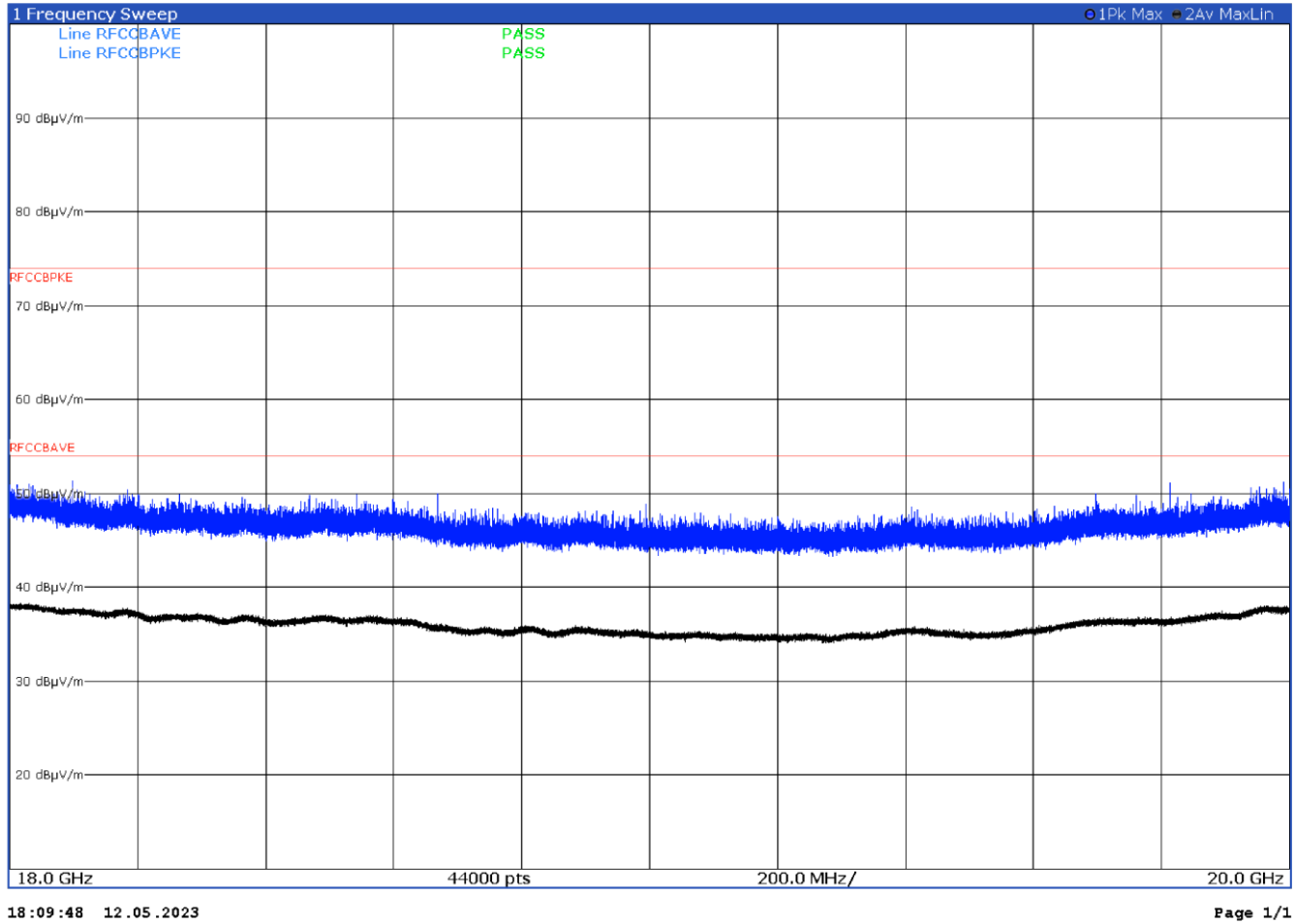
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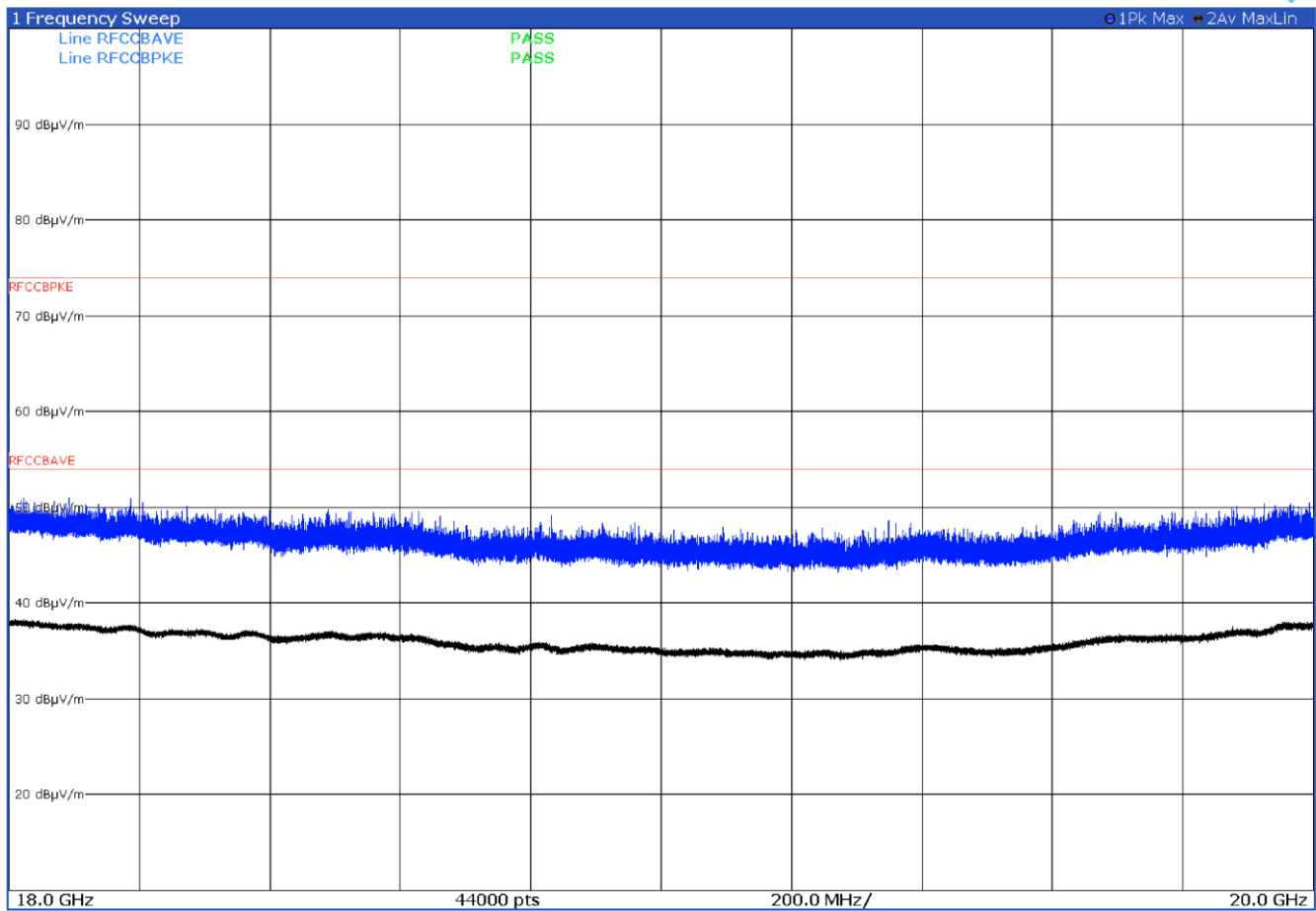
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Section 8
Test name
Specification

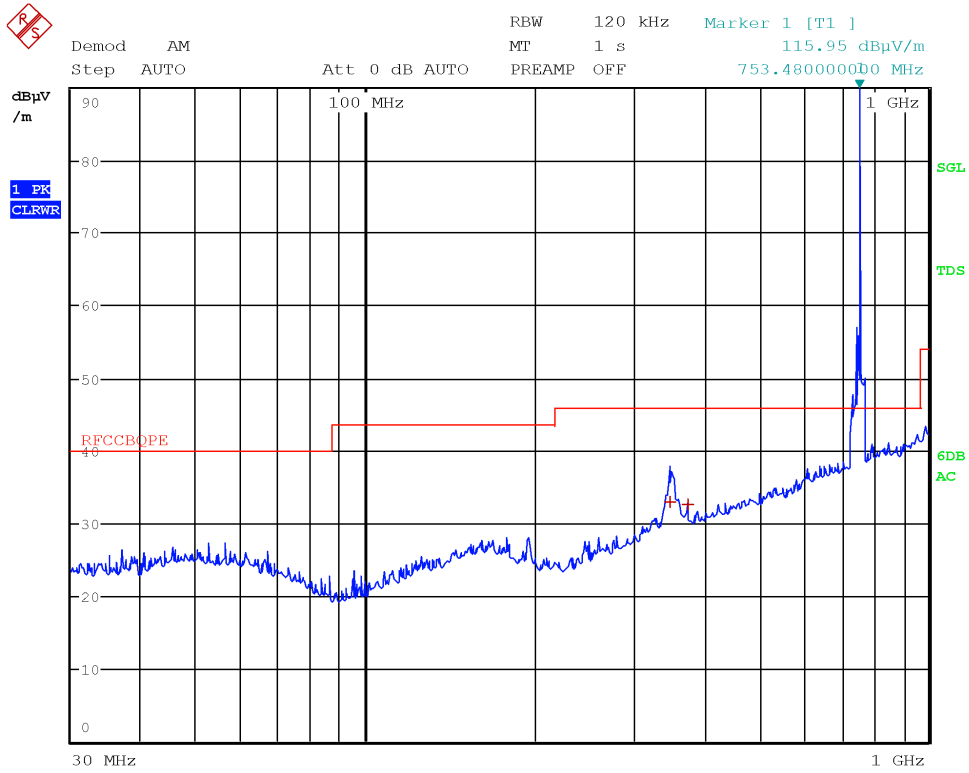
Testing data
FCC 15.209 and RSS-GEN section 8.9 Radiated emission limits; general requirements
FCC Part 15 Subpart C and RSS-GEN, Issue 5



7E-B12, 17E-B66, 19-B25, 37T C-Band, vertical polarization



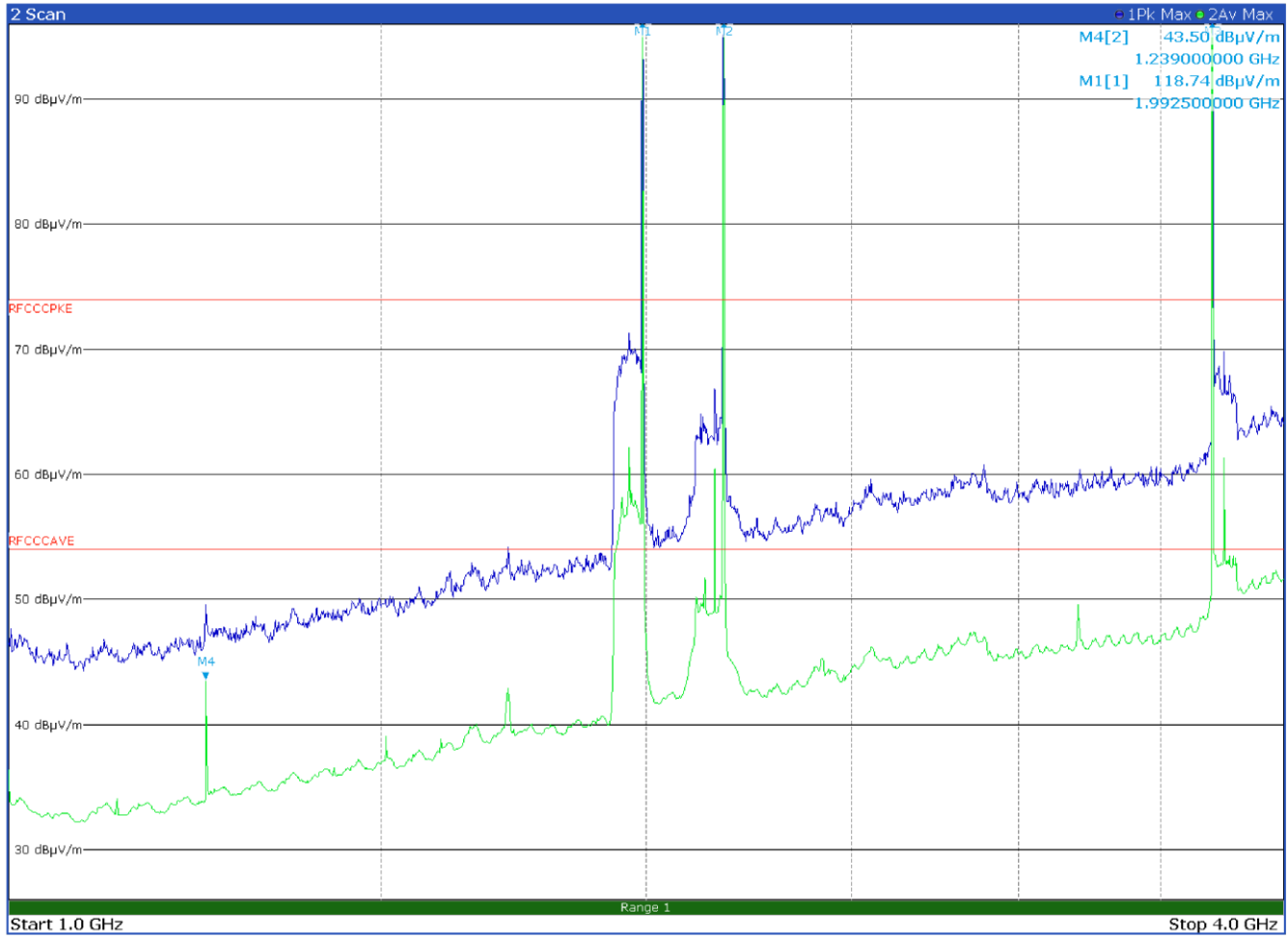
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Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector
348.5600	33.0	46.0	-13.0	QP
375.0000	32.7	46.0	-13.3	QP

7E-B13, 17E-B66, 19-B25, 37T C-Band, horizontal polarization

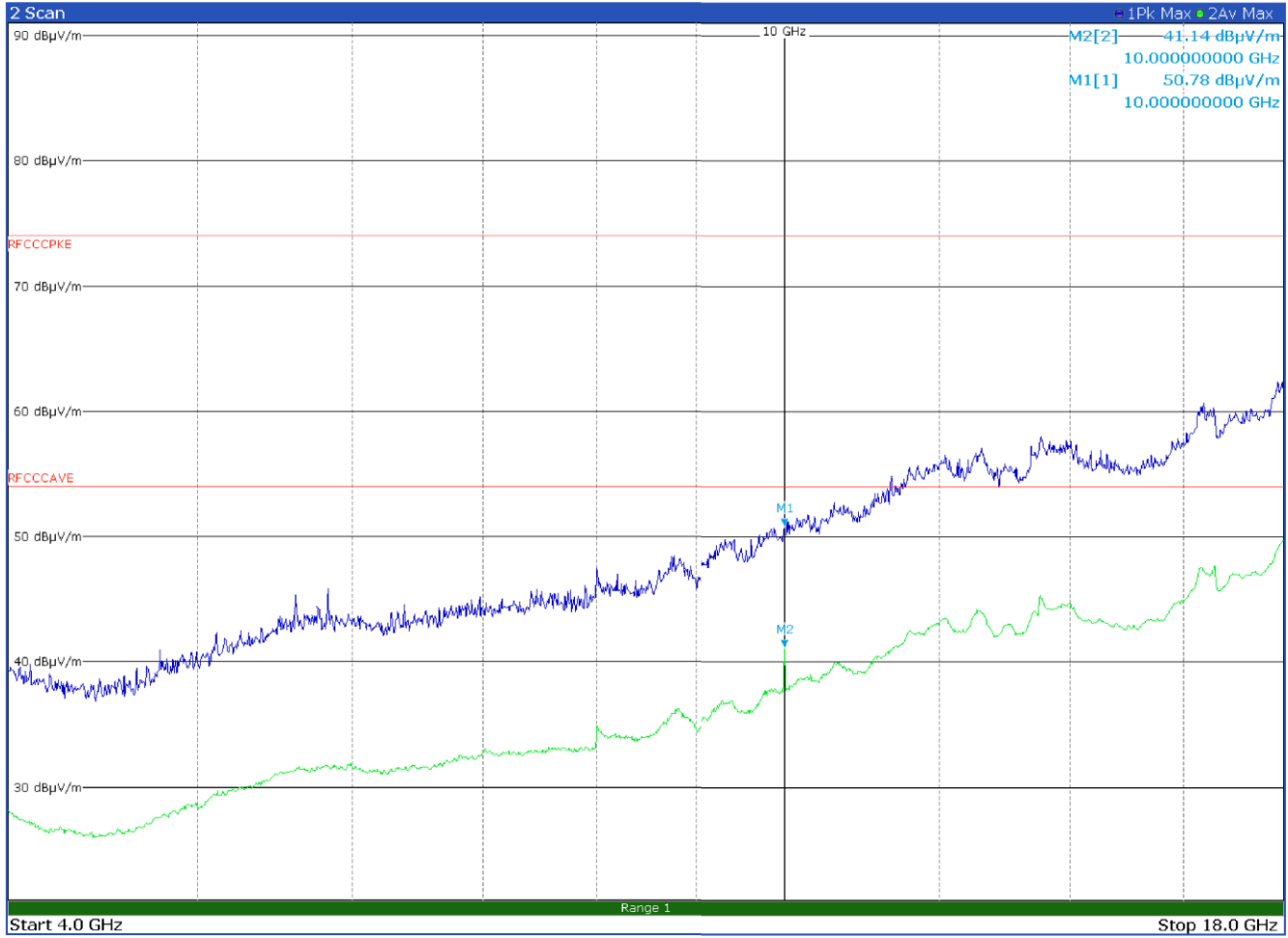


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3 Marker Table						
Wnd	Type	Ref	Trc	X-value	Y-value	
Scan	M1		1	1.9925 GHz	118.74 dBµV/m	
Scan	M2		1	2.17725 GHz	116.05 dBµV/m	
Scan	M3		1	3.7025 GHz	118.73 dBµV/m	
Scan	M4		2	1.239 GHz	43.5 dBµV/m	

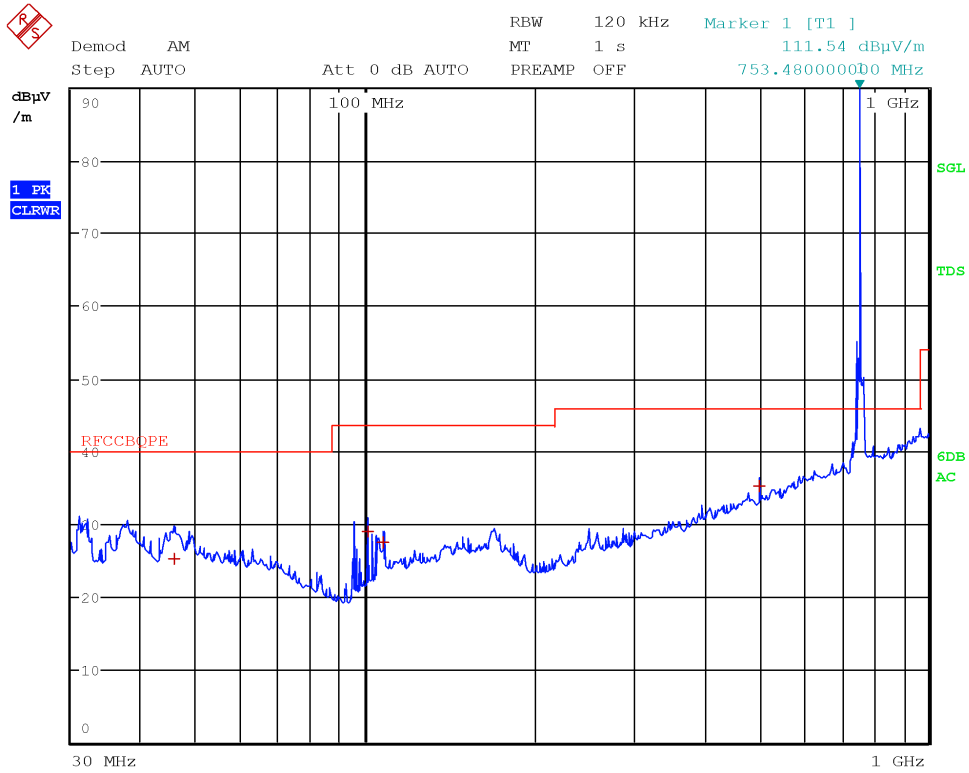
7E-B13, 17E-B66, 19-B25, 37T C-Band, horizontal polarization



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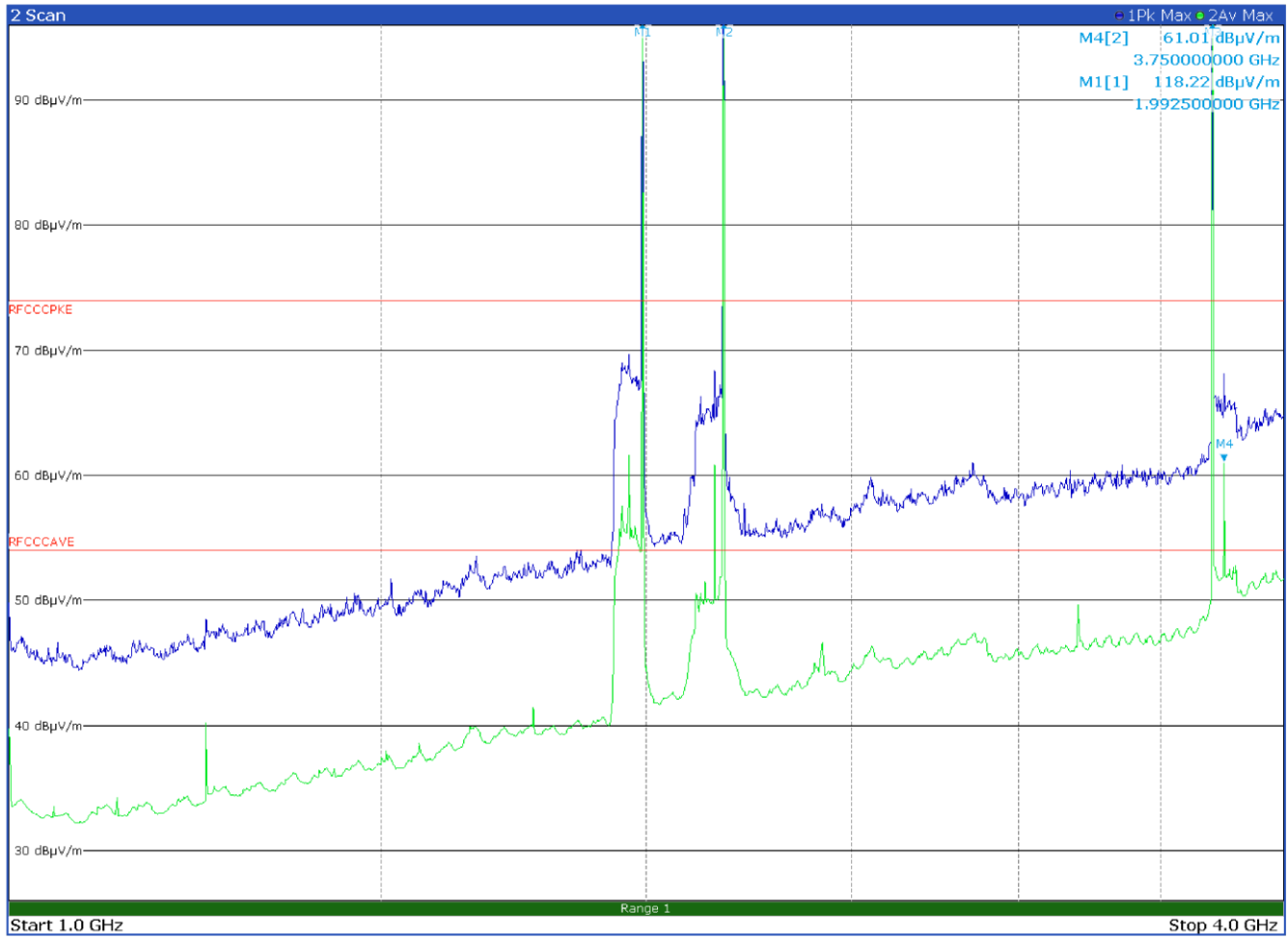
7E-B13, 17E-B66, 19-B25, 37T C-Band, horizontal polarization



Date: 8.MAY.2023 16:12:59

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector
45.6800	25.2	40.0	-14.8	QP
101.1600	29.0	43.5	-14.5	QP
107.6000	27.6	43.5	-15.9	QP
500.0000	35.3	46.0	-10.7	QP

7E-B13, 17E-B66, 19-B25, 37T C-Band, vertical polarization

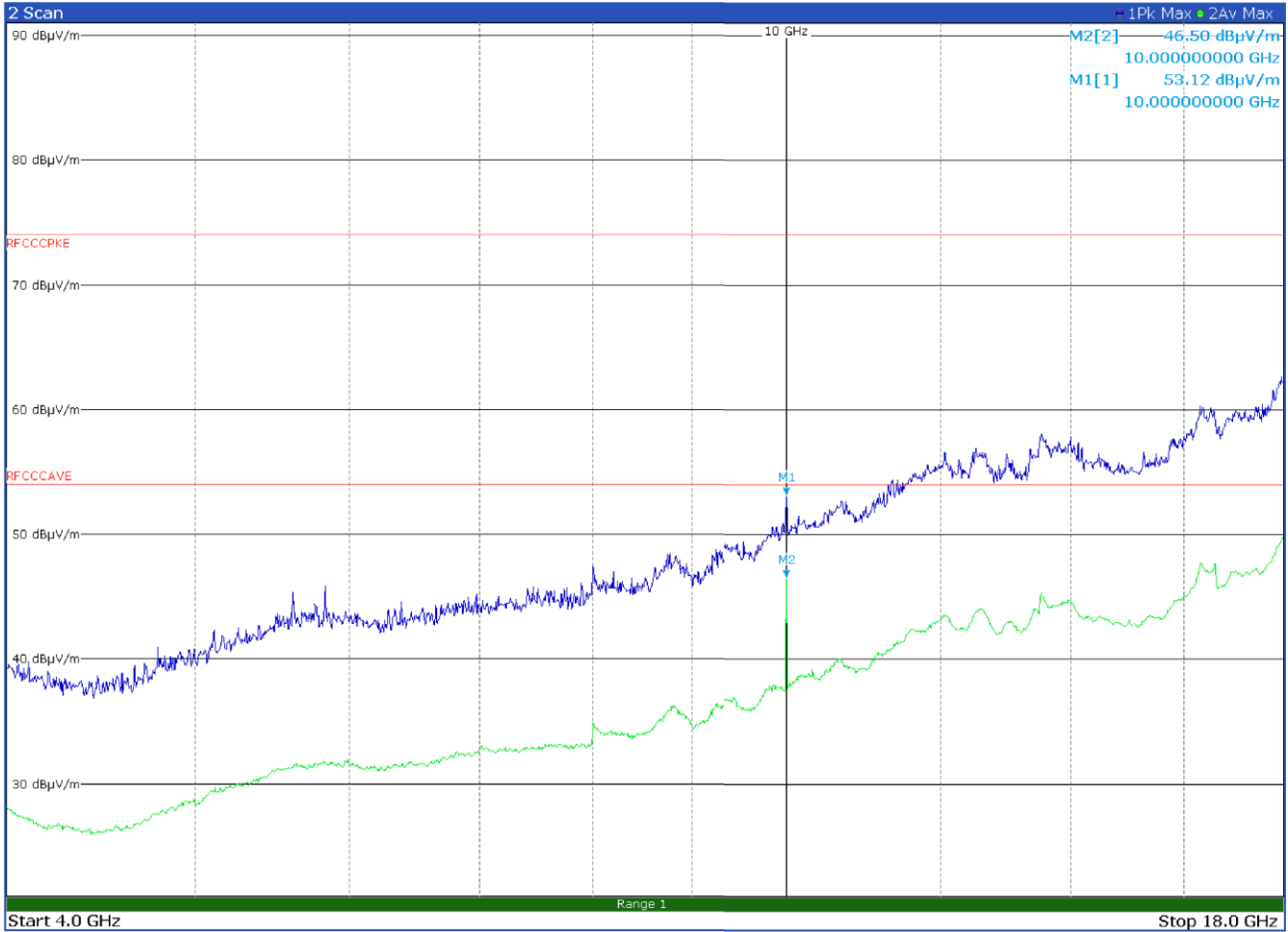


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3 Marker Table						
Wnd	Type	Ref	Trc	X-value	Y-value	
Scan	M1		1	1.9925 GHz	118.22 dBµV/m	
Scan	M2		1	2.17725 GHz	116.56 dBµV/m	
Scan	M3		1	3.7025 GHz	118.52 dBµV/m	
Scan	M4		2	3.75 GHz	61.01 dBµV/m	

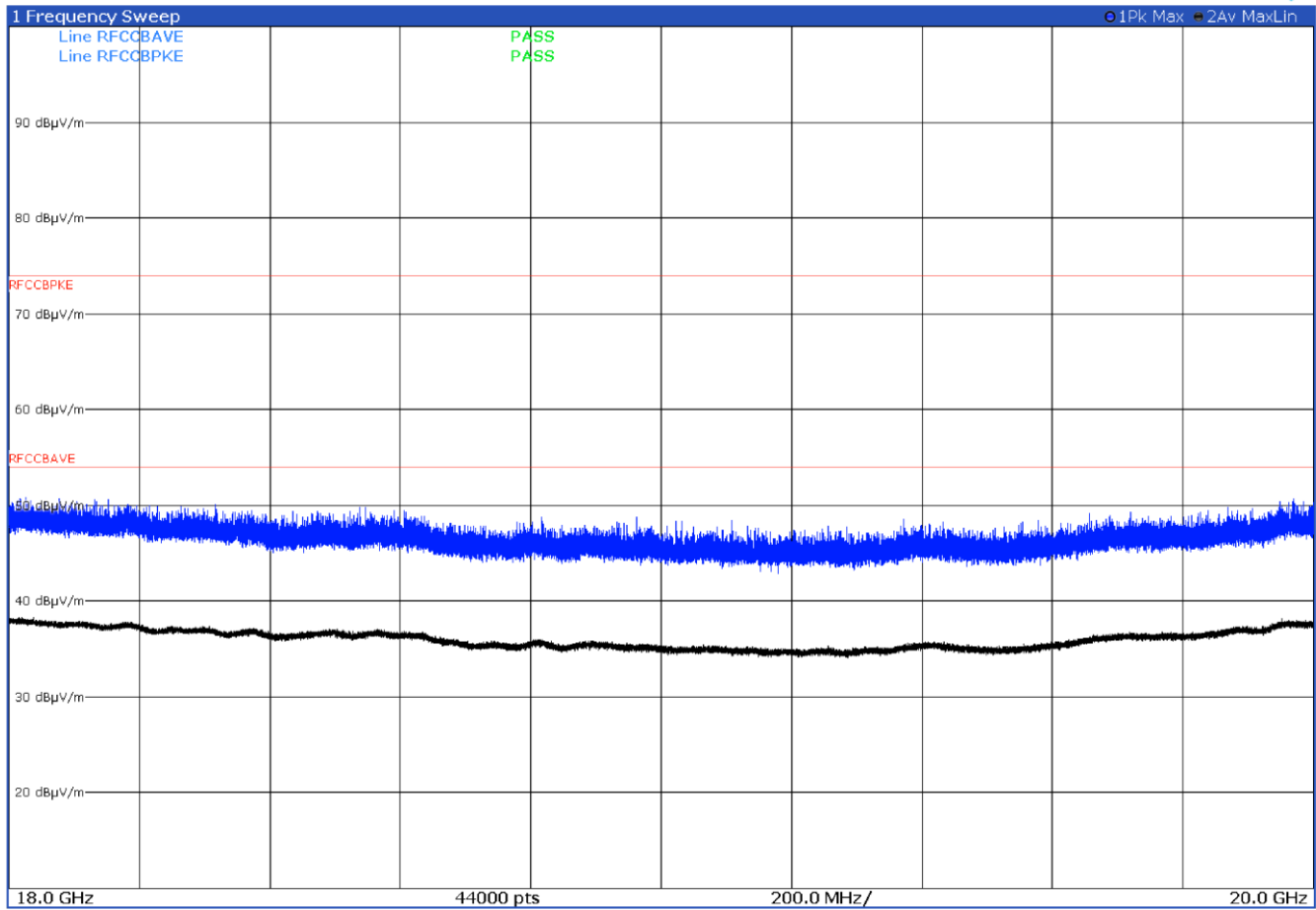
7E-B13, 17E-B66, 19-B25, 37T C-Band, vertical polarization



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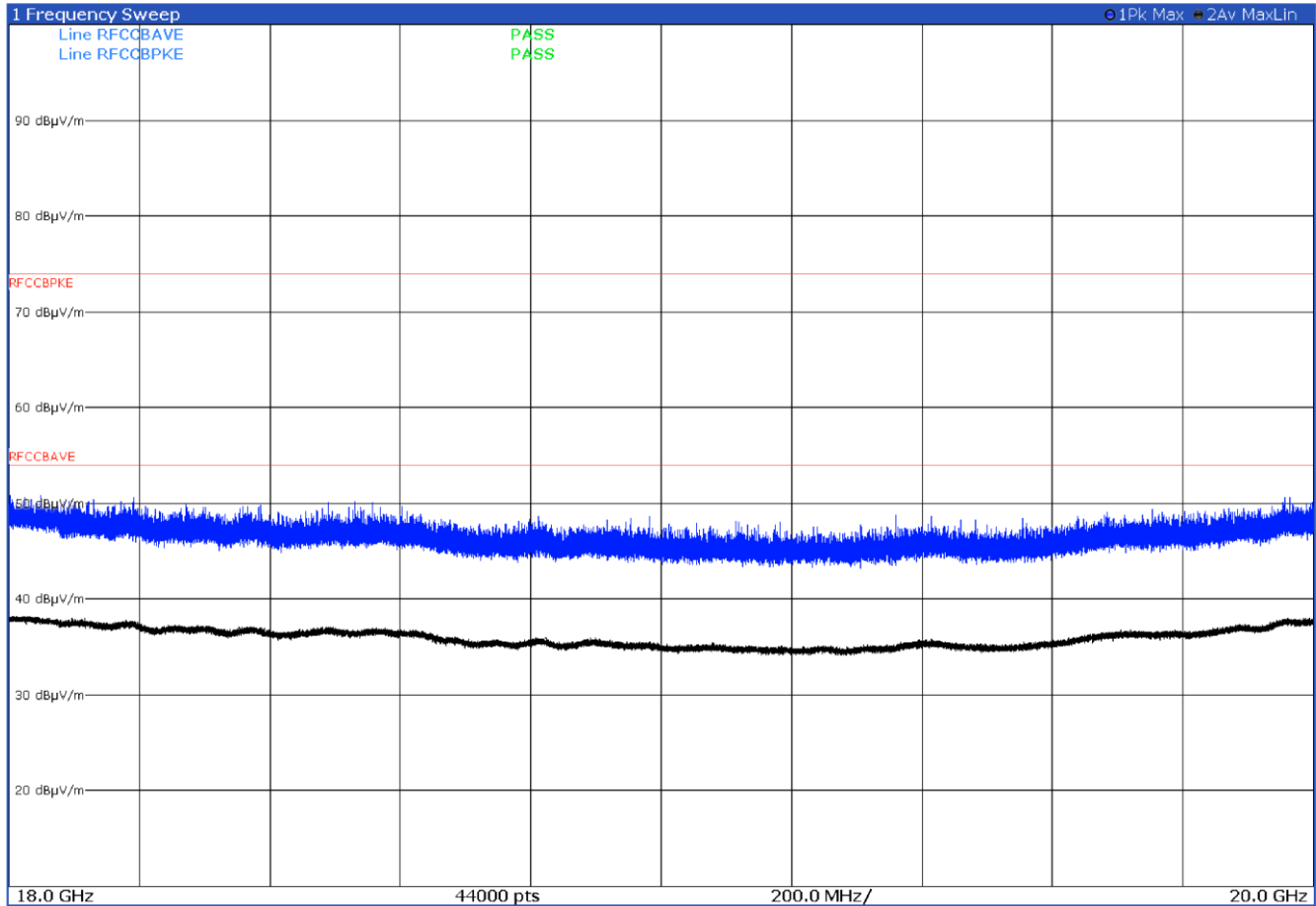
7E-B13, 17E-B66, 19-B25, 37T C-Band, vertical polarization



18:06:28 12.05.2023

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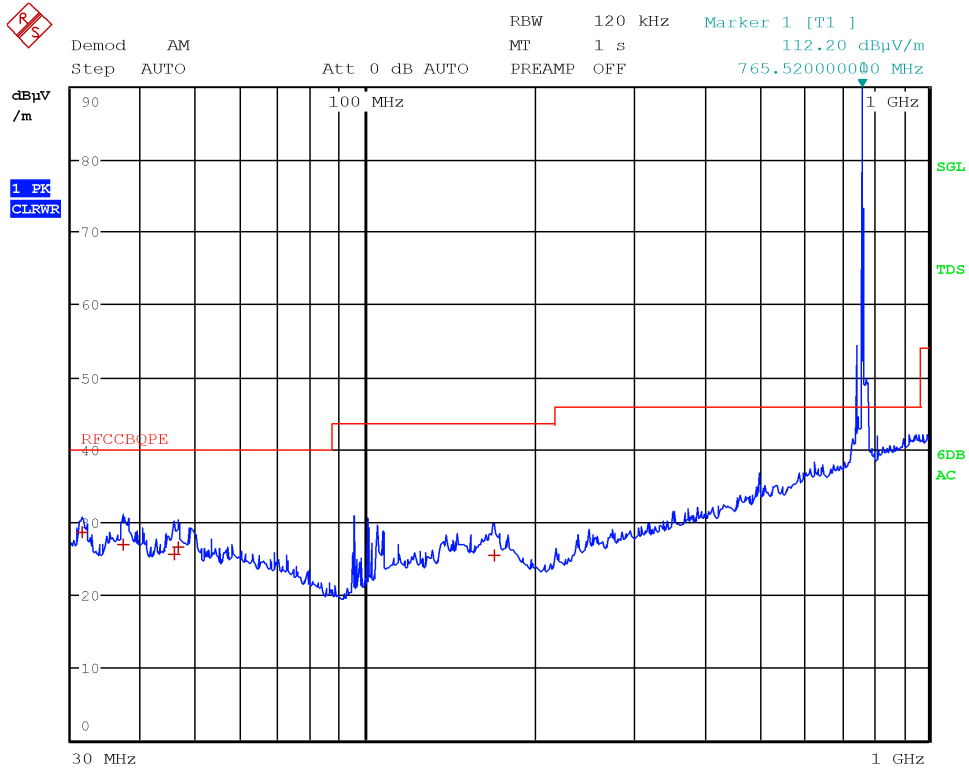
7E-B13, 17E-B66, 19-B25, 37T C-Band, vertical polarization



18:07:33 12.05.2023

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7E-B13, 17E-B66, 19-B25, 37T C-Band, horizontal polarization



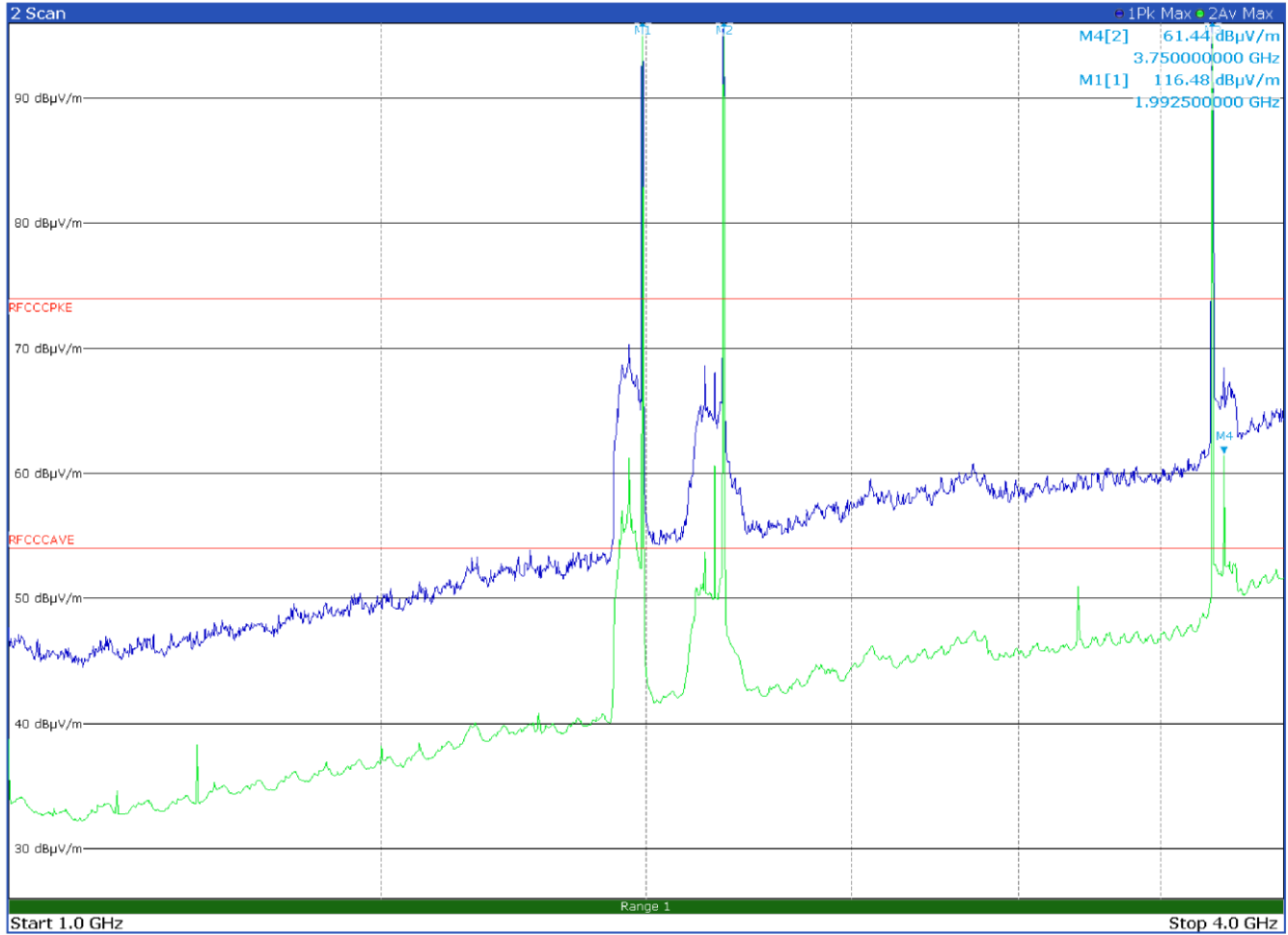
Date: 8.MAY.2023 16:40:34

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector
31.3600	28.8	40.0	-11.2	QP
37.1600	27.1	40.0	-12.9	QP
45.5600	25.7	40.0	-14.3	QP
46.4000	26.6	40.0	-13.4	QP
168.9200	25.5	43.5	-18.0	QP

7E-B14, 17E-B66, 19-B25, 37T C-Band, vertical polarization

Section 8
Test name
Specification

Testing data
 FCC 15.209 and RSS-GEN section 8.9 Radiated emission limits; general requirements
 FCC Part 15 Subpart C and RSS-GEN, Issue 5

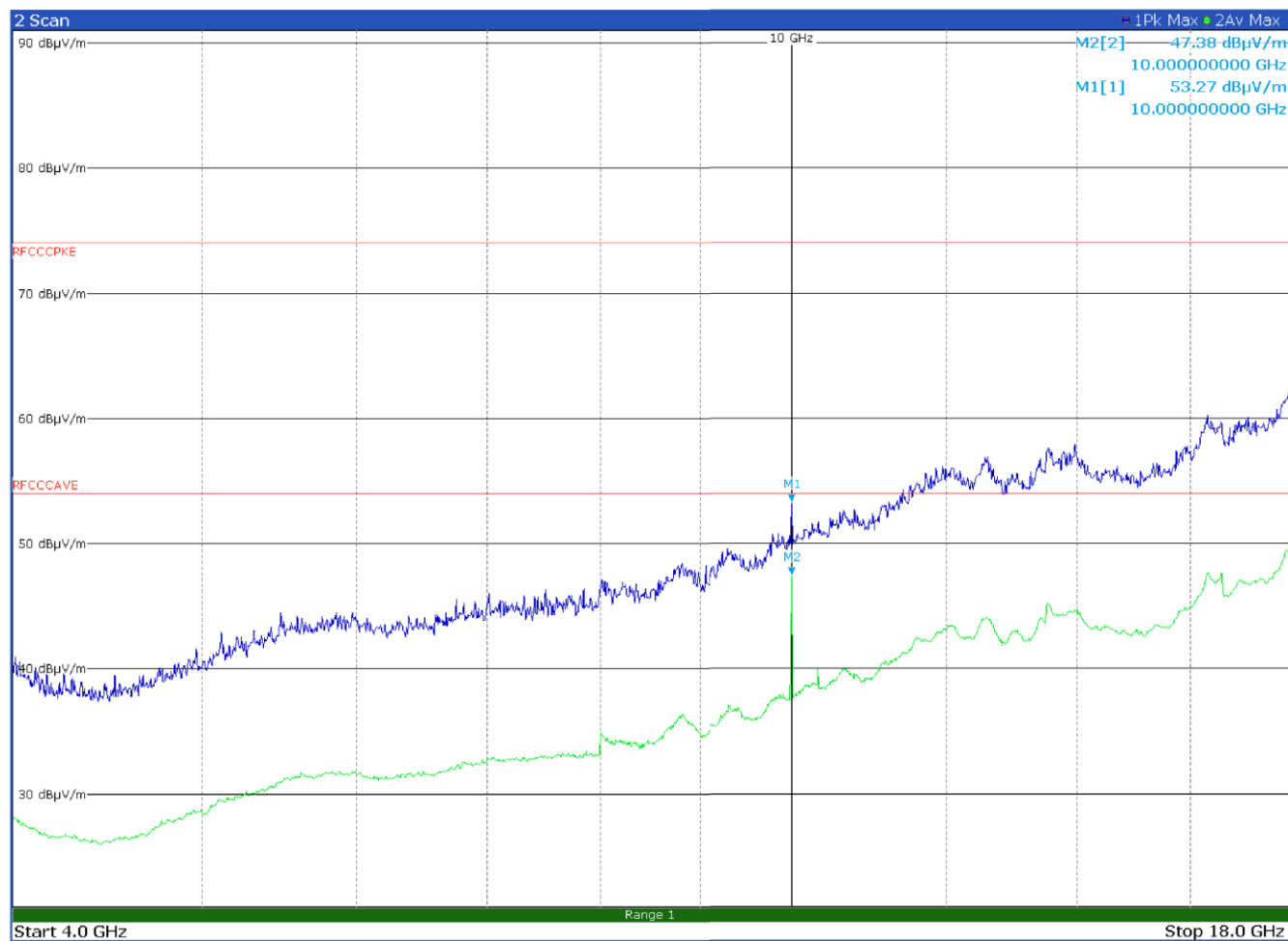


03:41:41 PM 05/05/2023

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3 Marker Table			Trc	X-value	Y-value
Scan	M1	Ref	1	1.9925 GHz	116.48 dBµV/m
Scan	M2		1	2.17725 GHz	117.3 dBµV/m
Scan	M3		1	3.7025 GHz	118.5 dBµV/m
Scan	M4		2	3.75 GHz	61.44 dBµV/m

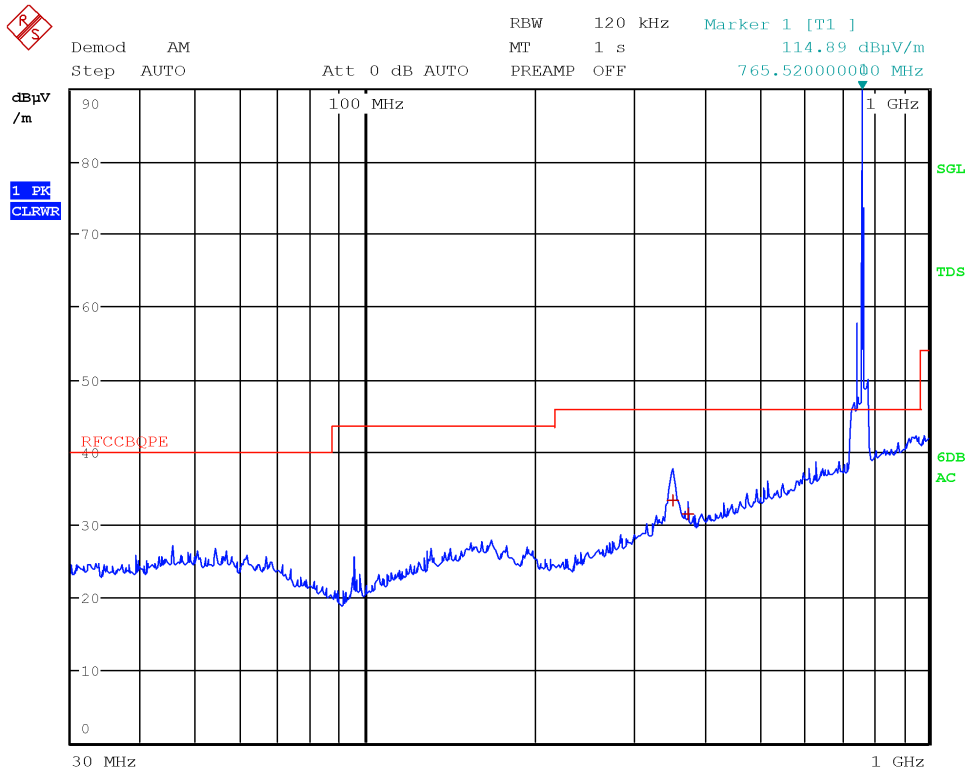
7E-B14, 17E-B66, 19-B25, 37T C-Band, vertical polarization



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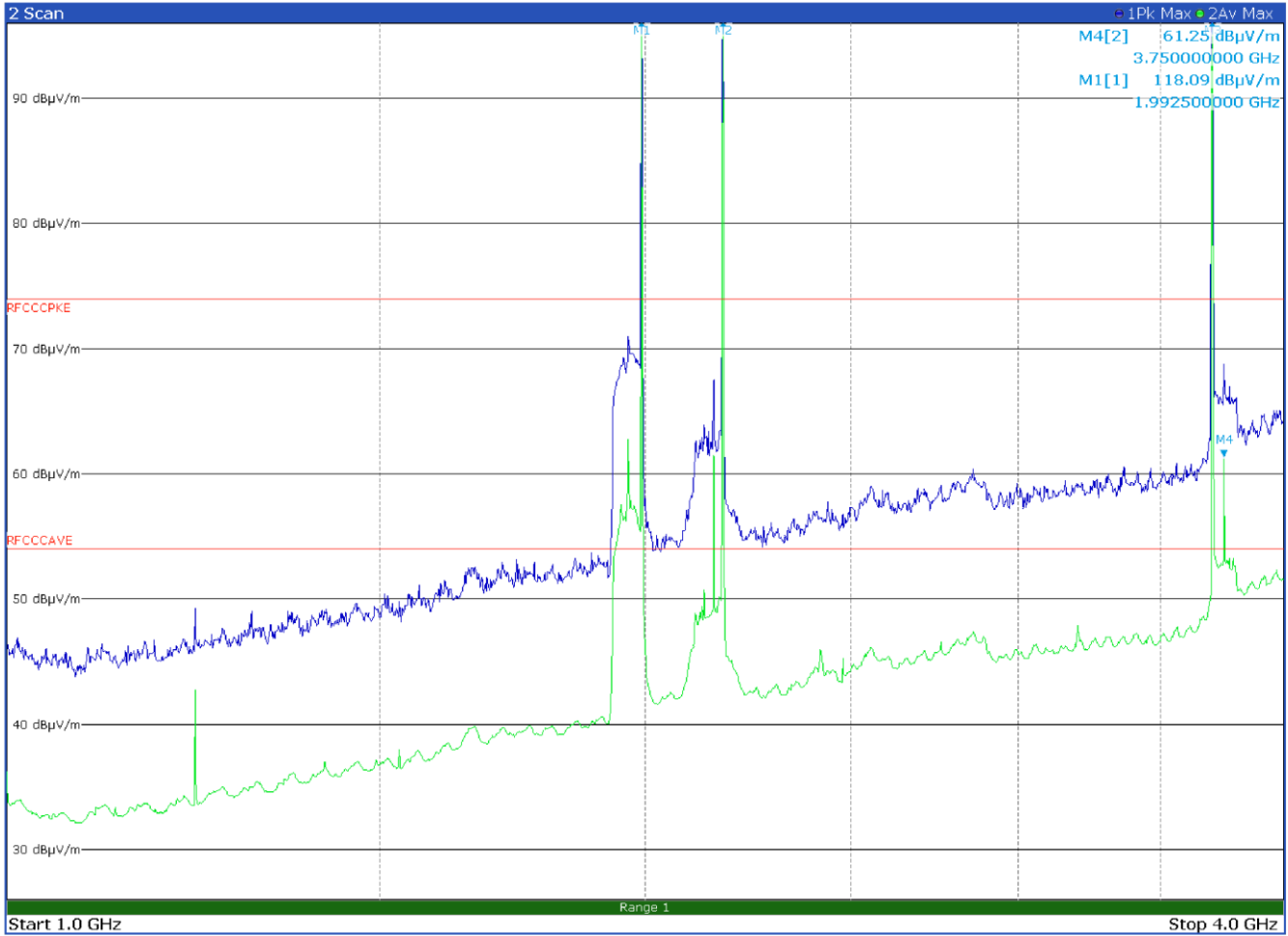
7E-B14, 17E-B66, 19-B25, 37T C-Band, vertical polarization



Date: 8.MAY.2023 16:44:59

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector
351.8400	33.5	46.0	-12.5	QP
375.0000	31.6	46.0	-14.4	QP

7E-B14, 17E-B66, 19-B25, 37T C-Band, horizontal polarization

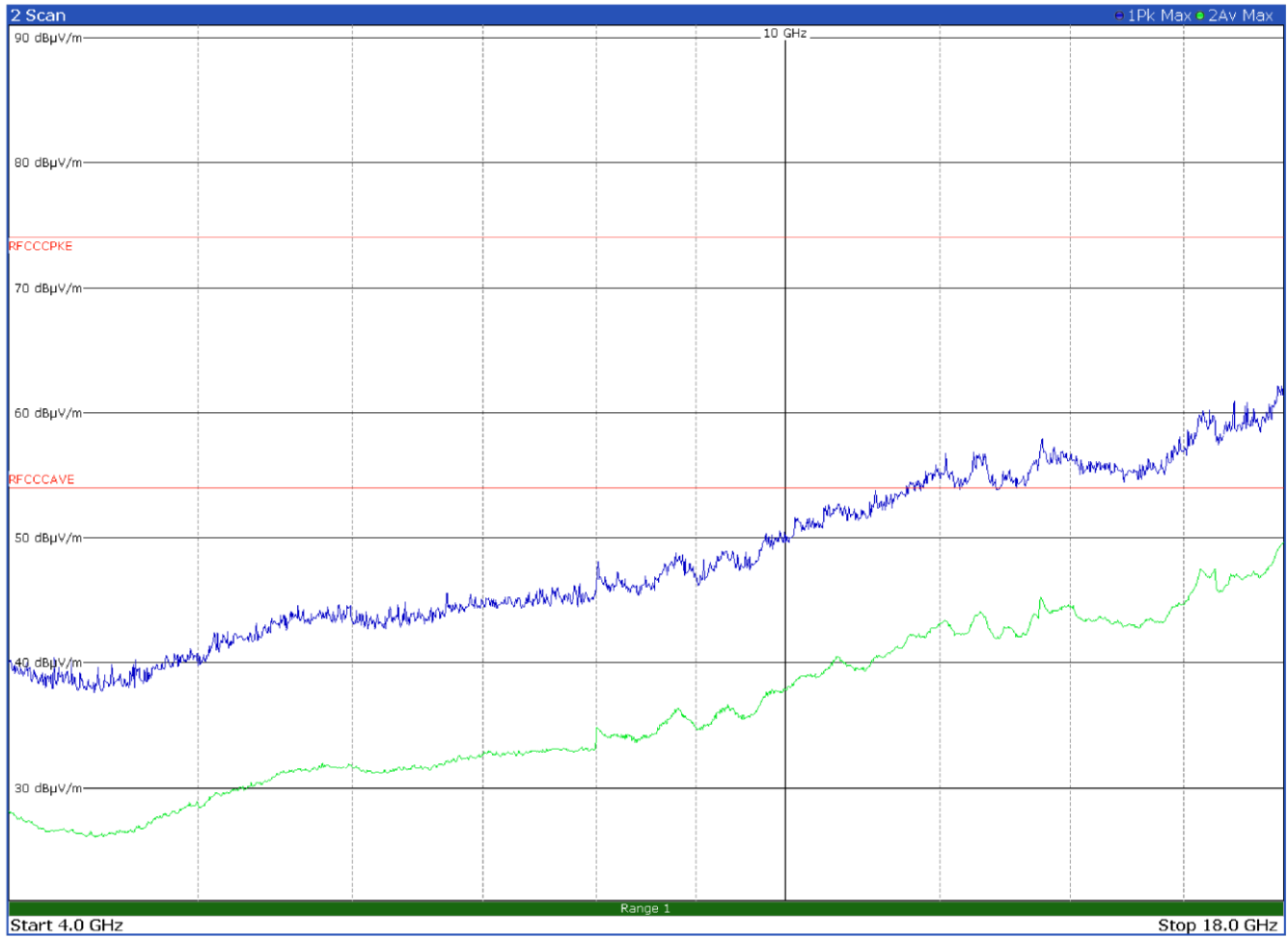


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3 Marker Table				X-value	Y-value
Scan	M1	Ref	Trc	1.9925 GHz	118.09 dBµV/m
Scan	M2		1	2.17725 GHz	115.98 dBµV/m
Scan	M3		1	3.7025 GHz	119.39 dBµV/m
Scan	M4		2	3.75 GHz	61.25 dBµV/m

7E-B14, 17E-B66, 19-B25, 37T C-Band, horizontal polarization



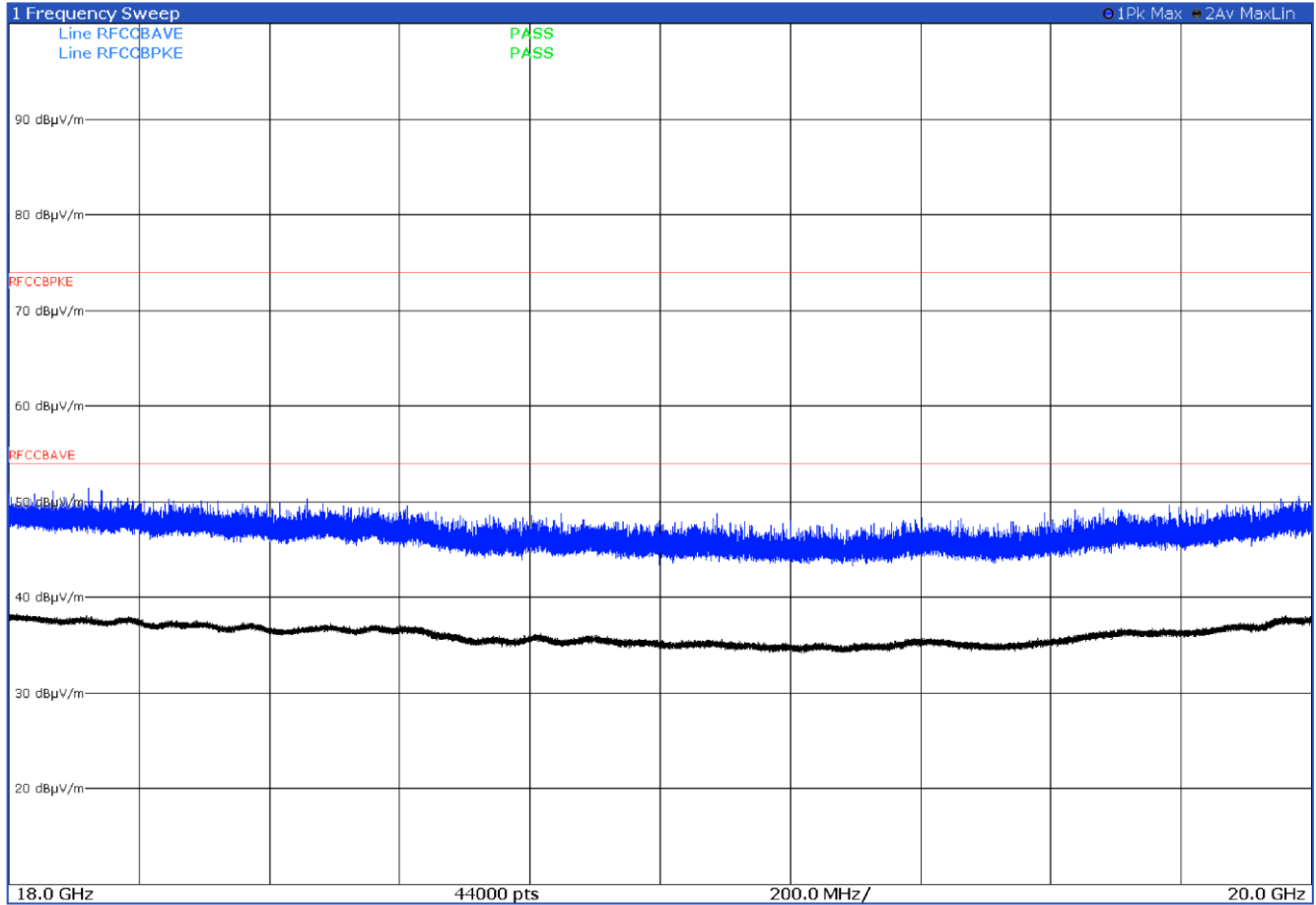
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7E-B14, 17E-B66, 19-B25, 37T C-Band, horizontal polarization

Section 8
Test name
Specification

Testing data
FCC 15.209 and RSS-GEN section 8.9 Radiated emission limits; general requirements
FCC Part 15 Subpart C and RSS-GEN, Issue 5



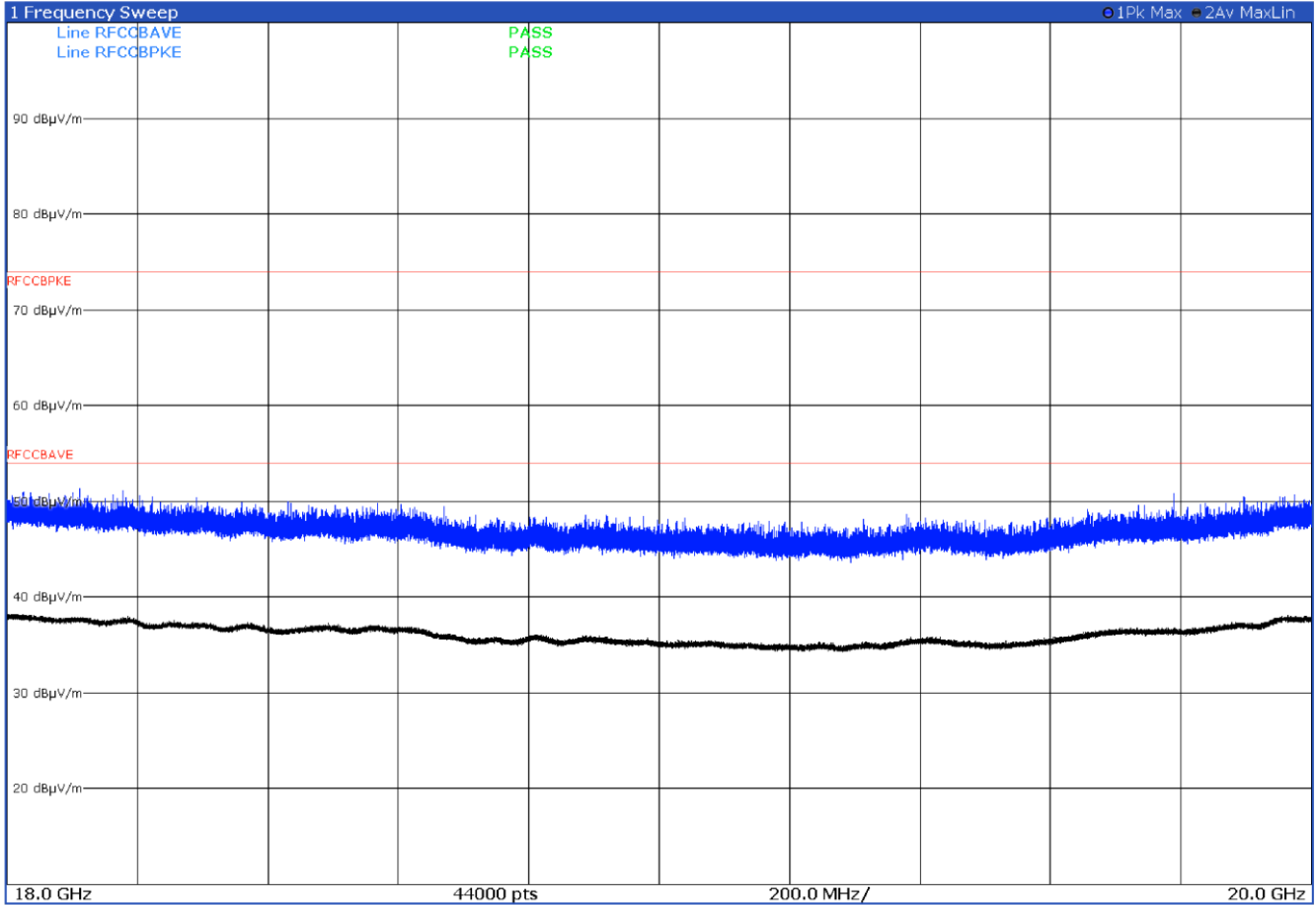
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7E-B14, 17E-B66, 19-B25, 37T C-Band, horizontal polarization

Section 8
Test name
Specification

Testing data
FCC 15.209 and RSS-GEN section 8.9 Radiated emission limits; general requirements
FCC Part 15 Subpart C and RSS-GEN, Issue 5



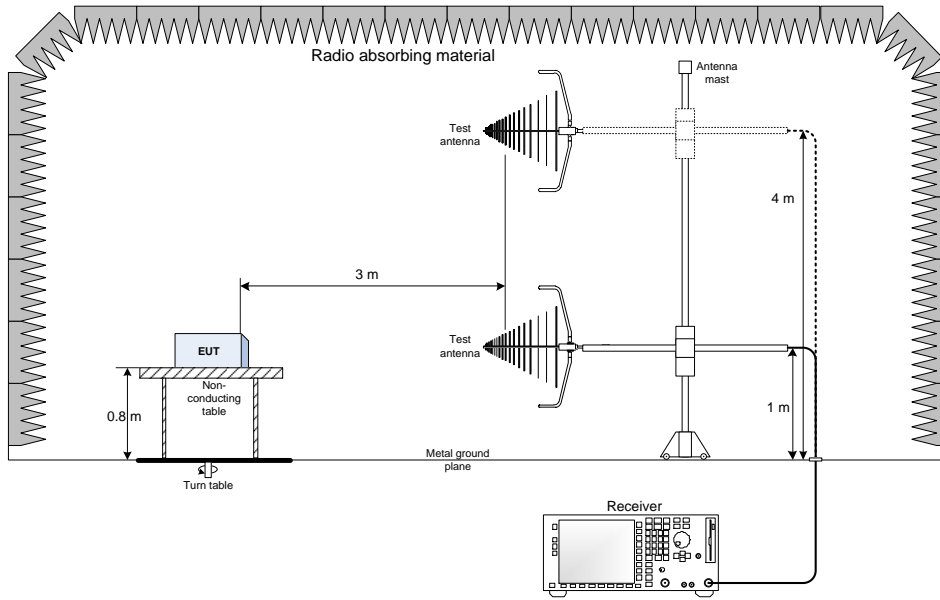
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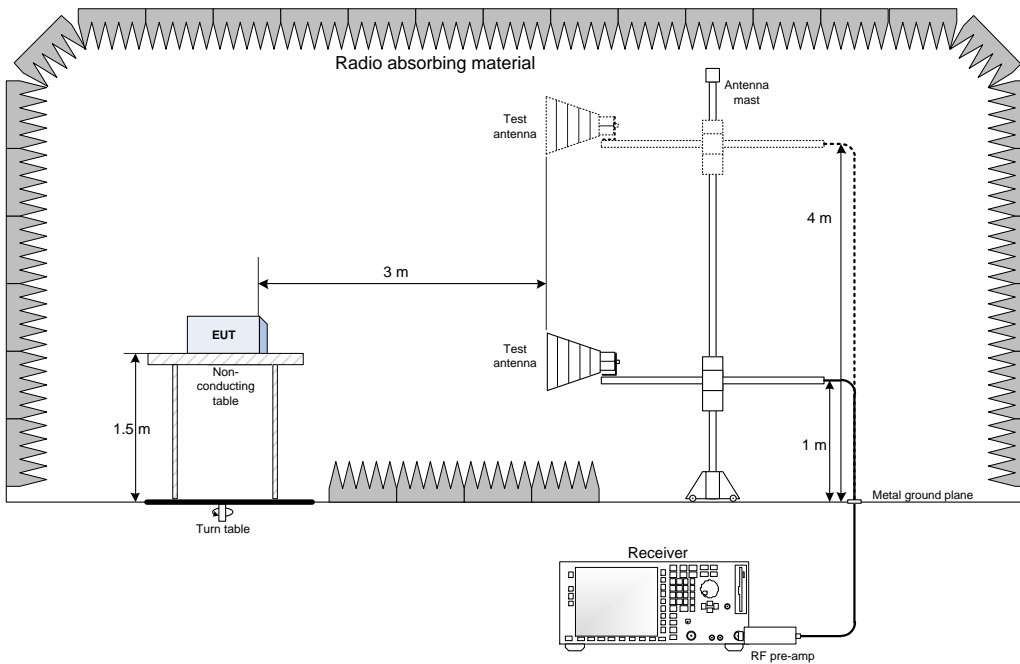
7E-B14, 17E-B66, 19-B25, 37T C-Band, vertical polarization

Section 9. Block diagrams of test set-ups

9.1 Radiated emissions set-up for frequencies below 1 GHz

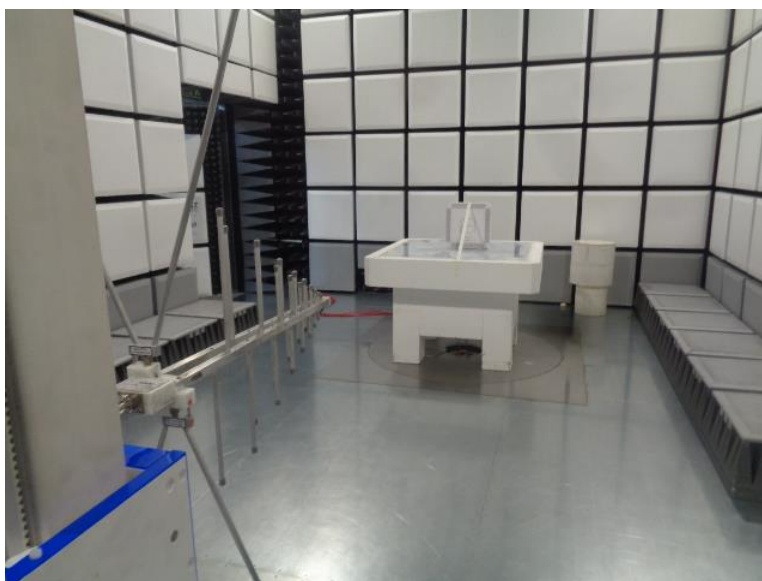


9.2 Radiated emissions set-up for frequencies above 1 GHz



Section 10. Photos

10.1 Photos of the test set-up



Radiated emission below 1 GHz



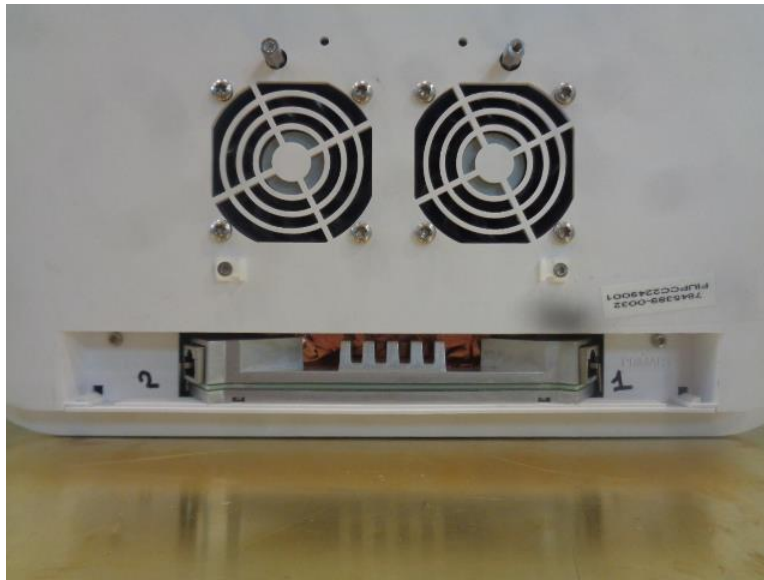
Radiated emission above 1 GHz

Photos of the EUT









(End of report)