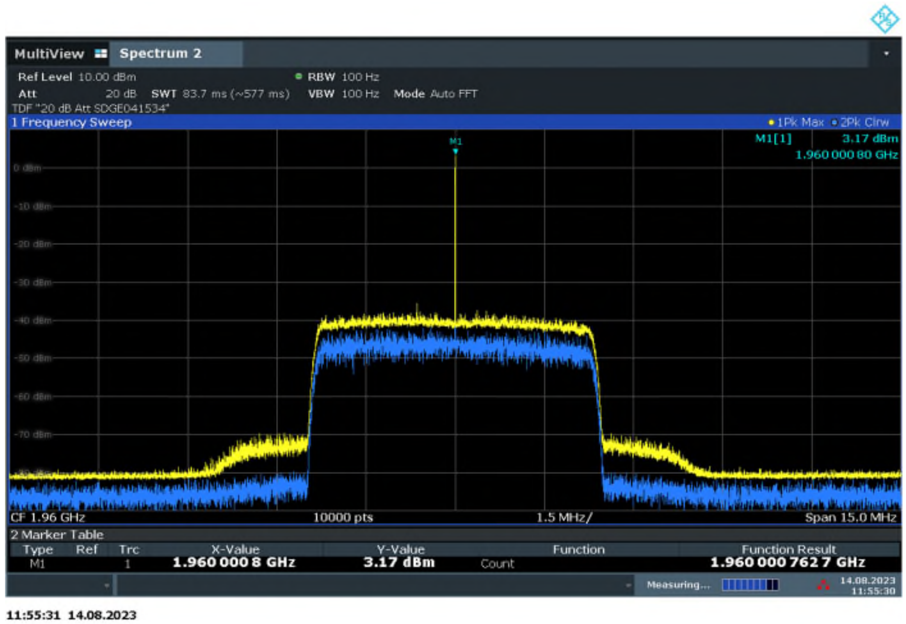
LTE B13 Uplink – 5 MHz BW Middle Channel 782 MHz				
Voltage (VAC)	***Temperature (°C)***	***Frequency Error (Hz)***	***Frequency Error (ppm)***	***Limit (ppm)***
120	-30	4.8	-0.01	-
	-20	4.8	-0.01	-
	-10	4.7	-0.01	-
	0	5.0	-0.01	-
	+10	5.0	-0.01	-
	+20	5.0	-0.01	-
	+30	5.0	-0.01	-
	+40	7.0	-0.01	-
	+50	4.0	-0.01	-
102	+20	5.0	-0.01	-
138		5.2	-0.01	-

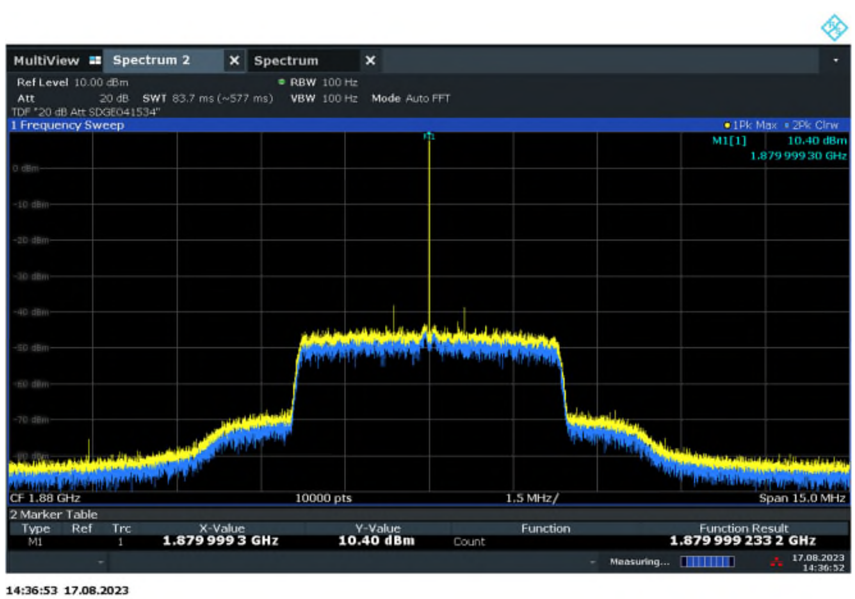
LTE B13 Uplink Frequency Range – 5 MHz BW					
Channel	***Temperature (°C)***	***Voltage (VAC)***	***F_L (MHz)***	***F_H (MHz)***	***Limit (MHz)***
Low Channel	-30	120	777.2753	-	>777
	+20	102	777.2719	-	
		120	777.2739	-	
		138	777.2723	-	
	+50	120	777.2735	-	
High Channel	-30	120	-	786.7158	<787
	+20	102	-	786.7242	
		120	-	786.7212	
		138	-	786.7242	
	+50	120	-	786.7218	

The frequency stability of the EUT is sufficient to keep it within the authorized frequency ranges at any temperature interval and voltage variations across the measured range.

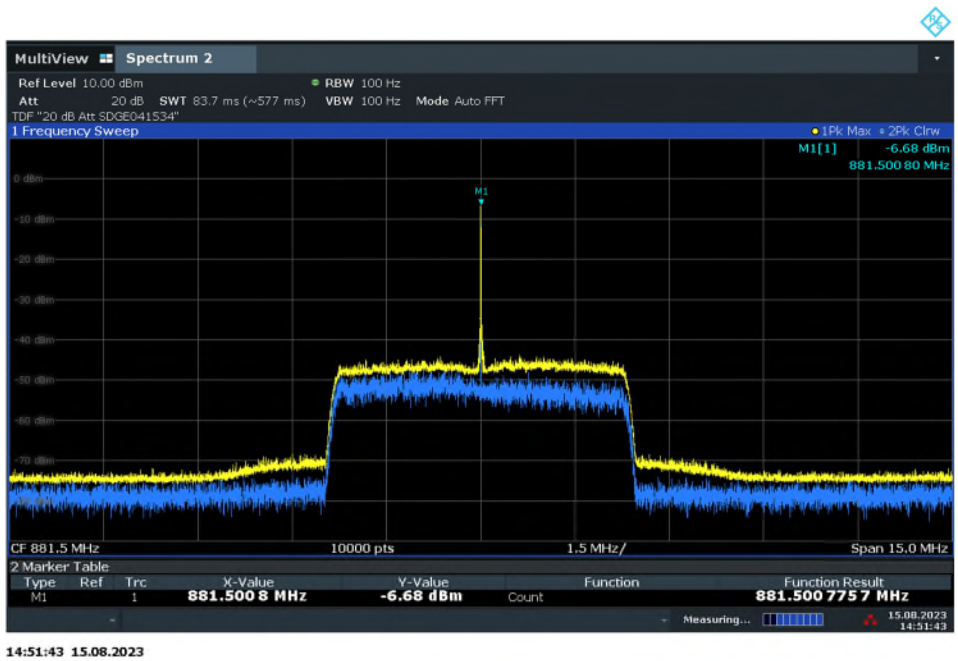
2.13.9 Sample Test Plots



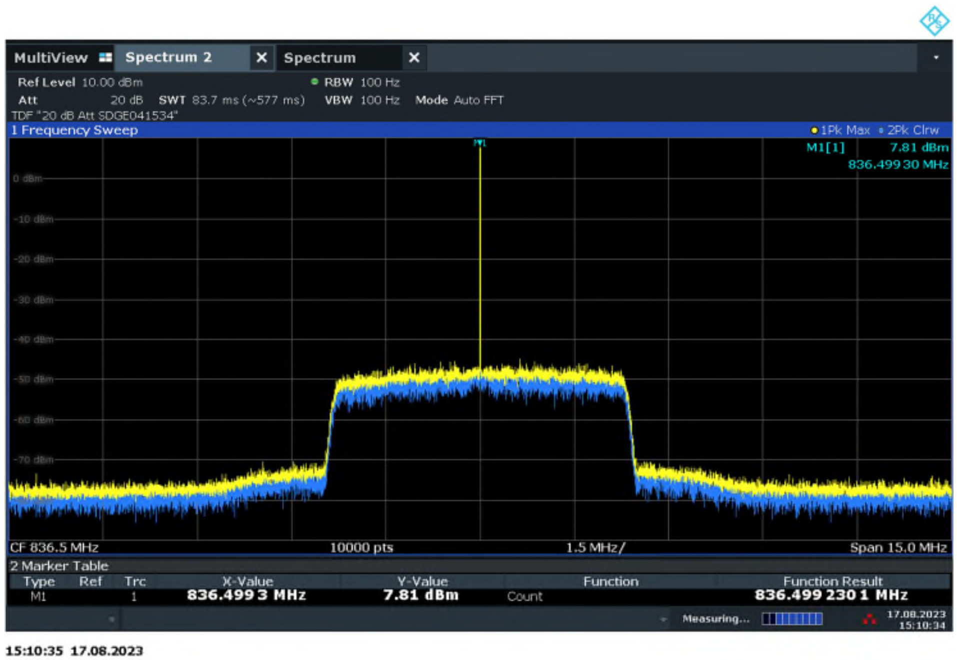
LTE B2 Downlink Middle Channel 120VAC @ 20°C



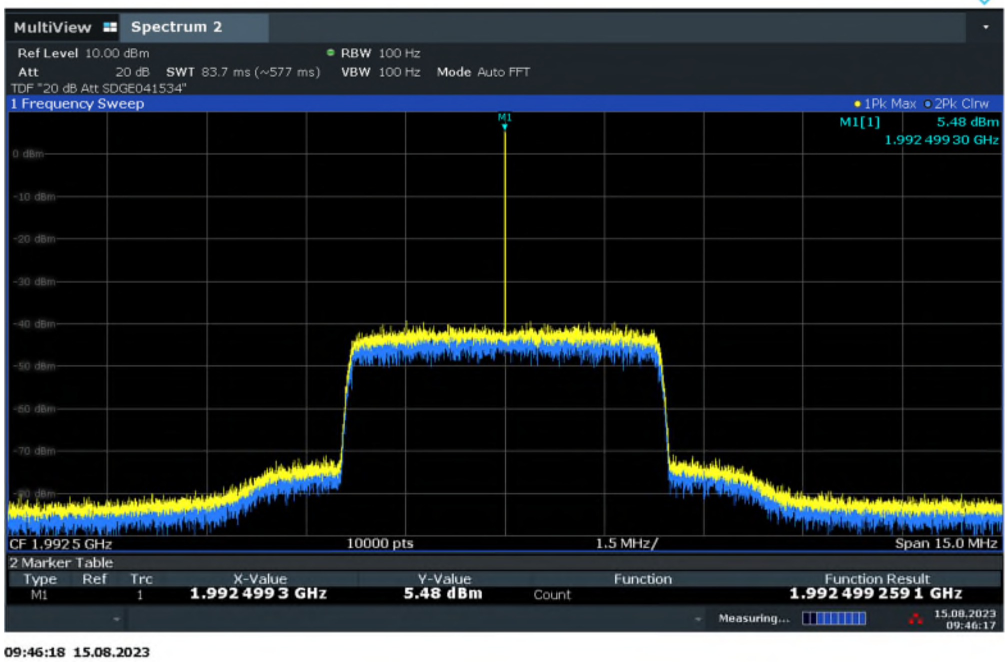
LTE B2 Uplink Middle Channel 120VAC @ -30°C



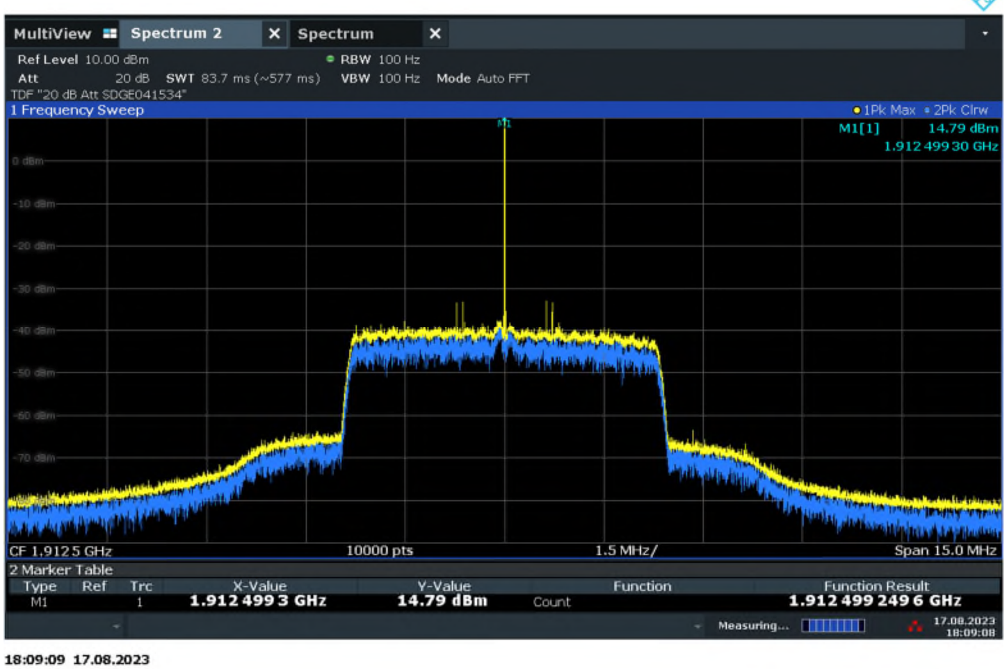
LTE B5 Downlink Middle Channel 120VAC @ 20°C



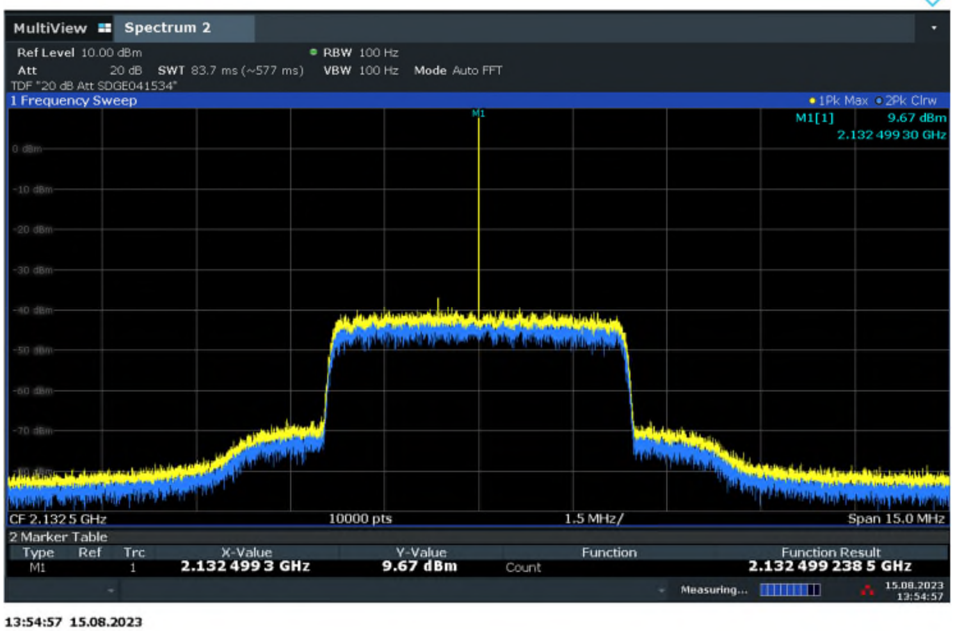
LTE B5 Uplink Middle Channel 120VAC @ -30°C



LTE B25 Downlink Middle Channel 120VAC @ 20°C



LTE B25 Uplink Middle Channel 120VAC @ -30°C

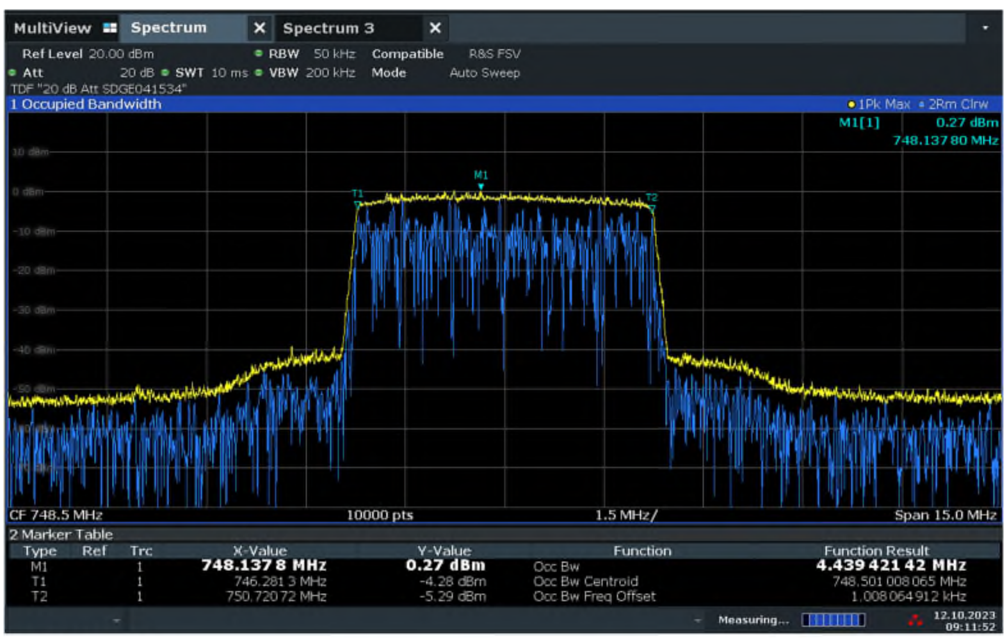


LTE Band 4 Downlink Middle Channel 120VAC @ 20°C

LTE Band 4 Uplink Low Channel OBW 120VAC @ 20°C

09:29:38 12.10.2023

LTE B12 Uplink High Channel OBW @ 20°C Nominal Voltage



09:11:53 12.10.2023

LTE B13 Downlink Low Channel OBW @ 20°C Nominal Voltage

2.14 Field Strength of Spurious Emissions

2.14.1 Specification Reference

§ 2.1053 Measurements required: Field strength of spurious radiation.

2.14.2 Standard Applicable

(a) Measurements shall be made to detect spurious emissions that may be radiated directly from the cabinet, control circuits, power leads, or intermediate circuit elements under normal conditions of installation and operation. Curves or equivalent data shall be supplied showing the magnitude of each harmonic and other spurious emission. For this test, single sideband, independent sideband, and controlled carrier transmitters shall be modulated under the conditions specified in paragraph (c) of § 2.1049, as appropriate. For equipment operating on frequencies below 890 MHz, an open field test is normally required, with the measuring instrument antenna located in the far-field at all test frequencies. In the event it is either impractical or impossible to make open field measurements (e.g. a broadcast transmitter installed in a building) measurements will be accepted of the equipment as installed. Such measurements must be accompanied by a description of the site where the measurements were made showing the location of any possible source of reflections which might distort the field strength measurements. Information submitted shall include the relative radiated power of each spurious emission with reference to the rated power output of the transmitter, assuming all emissions are radiated from halfwave dipole antennas.

RSS-130:
4.7.1 General unwanted emissions limits
The unwanted emissions in any 100 kHz bandwidth on any frequency outside the low frequency edge and the high frequency edge of each frequency block range(s), shall be attenuated below the transmitter power, P (dBW), by at least 43 + 10 log10 p (watts), dB. However, in the 100 kHz band immediately outside of the equipment's frequency block range, a resolution bandwidth of 30 kHz may be employed.

RSS-132
5.5 Transmitter unwanted emissions
Equipment shall meet the unwanted emission limits specified below:
In the first 1.0 MHz band immediately outside and adjacent to each of the sub-bands specified in Section 5.1, the power of emissions per any 1% of the occupied bandwidth shall be attenuated below the transmitter output power P (dBW) by at least 43 + 10 log(p) dB.
After the first 1.0 MHz immediately outside and adjacent to each of the sub-bands, the power of emissions in any 100 kHz bandwidth shall be attenuated below the transmitter output power P (dBW) by at least 43 + 10 log(p) dB. If the measurement is performed using 1% of the occupied bandwidth, power integration over 100 kHz is required.

RSS-139
5.6 Unwanted emission limits
Unwanted emissions shall be measured in terms of average values.
For all equipment, the TRP or total conducted power (sum of conducted power across all antenna connectors) of the unwanted emissions outside the frequency block or frequency block group shall not exceed the limits shown in table:

Unwanted emission limits	
Offset from the edge of the frequency block or frequency block group	**Unwanted emission limits**
1 MHz	-13 dBm/(1% of OB*)
>1MHz	-13 dBm/MHz

*OB is the occupied bandwidth.

RSS 140
4.4 Transmitter unwanted emission limits
The power of any unwanted emission outsidethe bands 758-768 MHz and 788-798 MHz shall be attenuated below the transmitteroutput power P in dBW as follows, where p is the transmitter output power in watts:
For any frequency between 769-775 MHz and 799-806 MHz:
76 + 10 log (p), dB in a 6.25 kHz band for fixed and base station equipment
65 + 10 log (p), dB in a 6.25 kHz band for mobile and portable/hand-held equipment
For any frequency between 775-788 MHz, above 806 MHz, and below 758 MHz: 43 + 10 log (p), dB in a bandwidth of 100 kHz or greater. However, in the 100 kHz bands immediately outside and adjacent to the frequency bands 758-768 MHz and 788-798 MHz, a resolution bandwidth of 30 kHz may be employed.
In addition, the equivalent isotropically radiated power (e.i.r.p.) of all emissions, including harmonics in the band 1559-1610 MHz, shall not exceed −70 dBW/MHz for wideband emissions, and −80 dBW/kHz for discrete emissions ofless than 700 Hz bandwidth.

2.14.3 Equipment Under Test and Modification State

Serial No: 864402002419 / Burn-in Mode, EUT is transmitting (Both Uplink and Downlink paths) at all supported bands simultaneously.

2.14.4 Date of Test/Initial of test personnel who performed the test

October 015, 16 and 22, 2024/ MARG

2.14.5 EUT Test Voltage

120V 60Hz

2.14.6 Environmental Conditions

Ambient Temperature	24.2 °C	23.5°C	24.1°C
Relative Humidity	98.6 %	28.5%	98.6%
Atmospheric Pressure	49.9 kPa	99.0kPa	51.7kPa

2.14.7 Additional Observations

- The spectrum was searched from 30MHz to 18GHz (Only noise floor observed above 18GHz).
- Verifications performed at 3 meters for both below 1GHz and above 1GHz.
- Fundamental for BLE and LTE frequencies were ignored for this test.
- Notch filter was used for BLE fundamental.
- Measurement was done using EMC32 automated software. Reported level is the actual level with all the correction factors factored in. Correction Factor column is for informational purposes only. See Section 2.14.9 and 2.14.10 for sample computation.
- Test limit lines for FCC Part 90 were presented since are identical to FCC Part 27 Limit Lines

2.14.8 Limit conversion example

-13dBm erp to Field strength at 3m

Using equation: E (dBμV/m) = ERP (dBm) - 20log(D) + 104.8 + 2.15; where D is the measurement distance (in the far field region) in m.

-13dBm ERP = 84.4 dBμV/m at 3m distance

2.14.9 Sample Computation (Radiated Emissions – 30MHz to 1GHz)

Measuring equipment raw measurement (dbµV) @ 30 MHz			24.4
Correction Factor (dB/m)	Asset# 1026 (cable)	0.8	-7.0
	Asset# 1057 (cable)	0.2	
	Asset# 1016 (preamplifier)	-30.8	
	Asset# 8850 (cable)	0.2	
	Asset# 1033 (antenna)	17.2	
	Asset# 8771 (6-dB attenuator)	5.4	
Reported QuasiPeak Final Measurement (dbµV/m) @ 30MHz			**17.4**

2.14.10 Sample Computation (Radiated Emissions –above 1GHz)

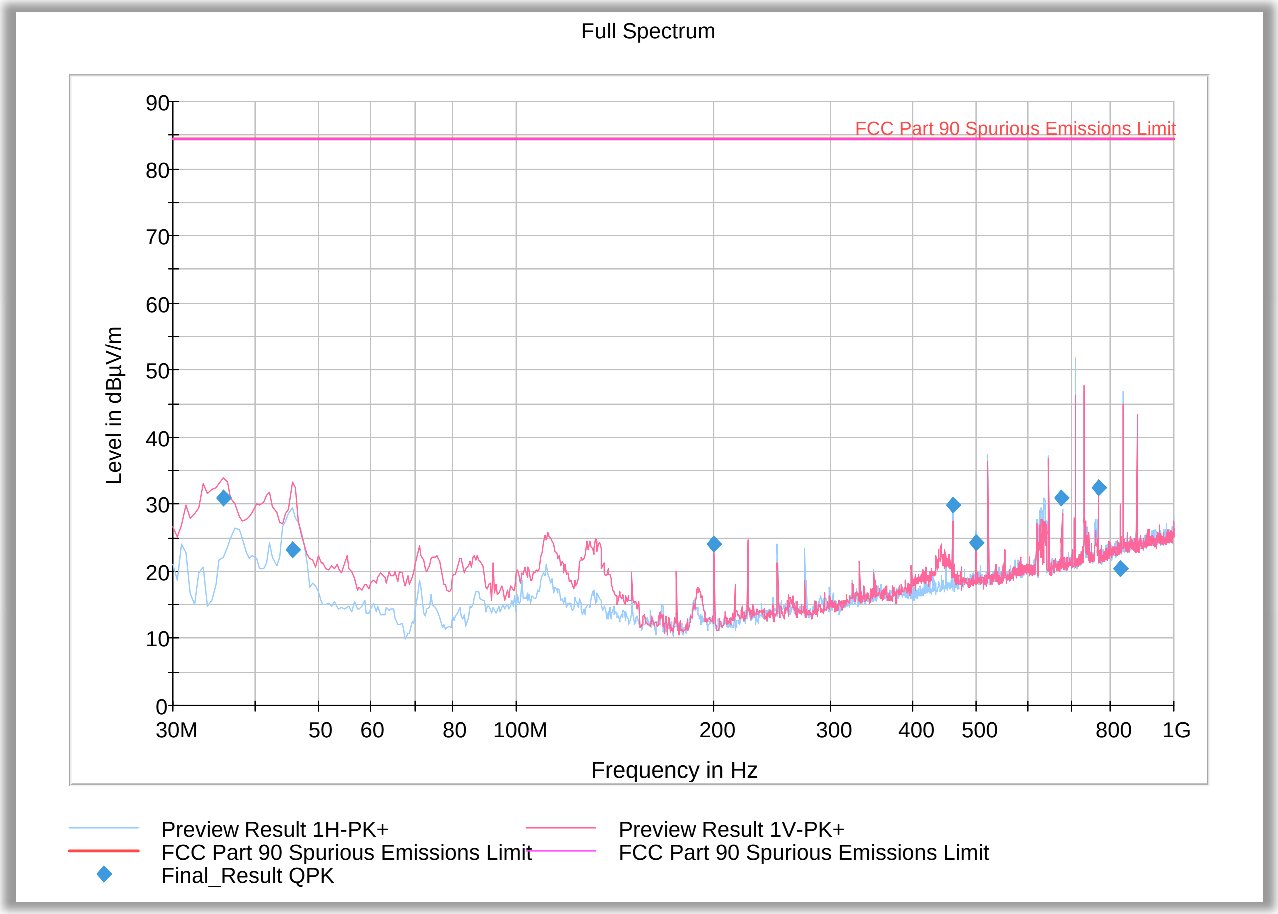
Measuring equipment raw measurement (dbµV) @ 2629 MHz			37.59
Correction Factor (dB/m)	Asset# 1016 (preamplifier)	-31.9	3
	Asset# 1175(cable)	2.5	
	Asset# 7631 (antenna)	32.4	
Reported Peak Final Measurement (dbµV/m) @ 30MHz			**40.59**

2.14.11 [1]Test Results

Performance assessment of the EUT made during this test: Pass

Detailed results are shown below.

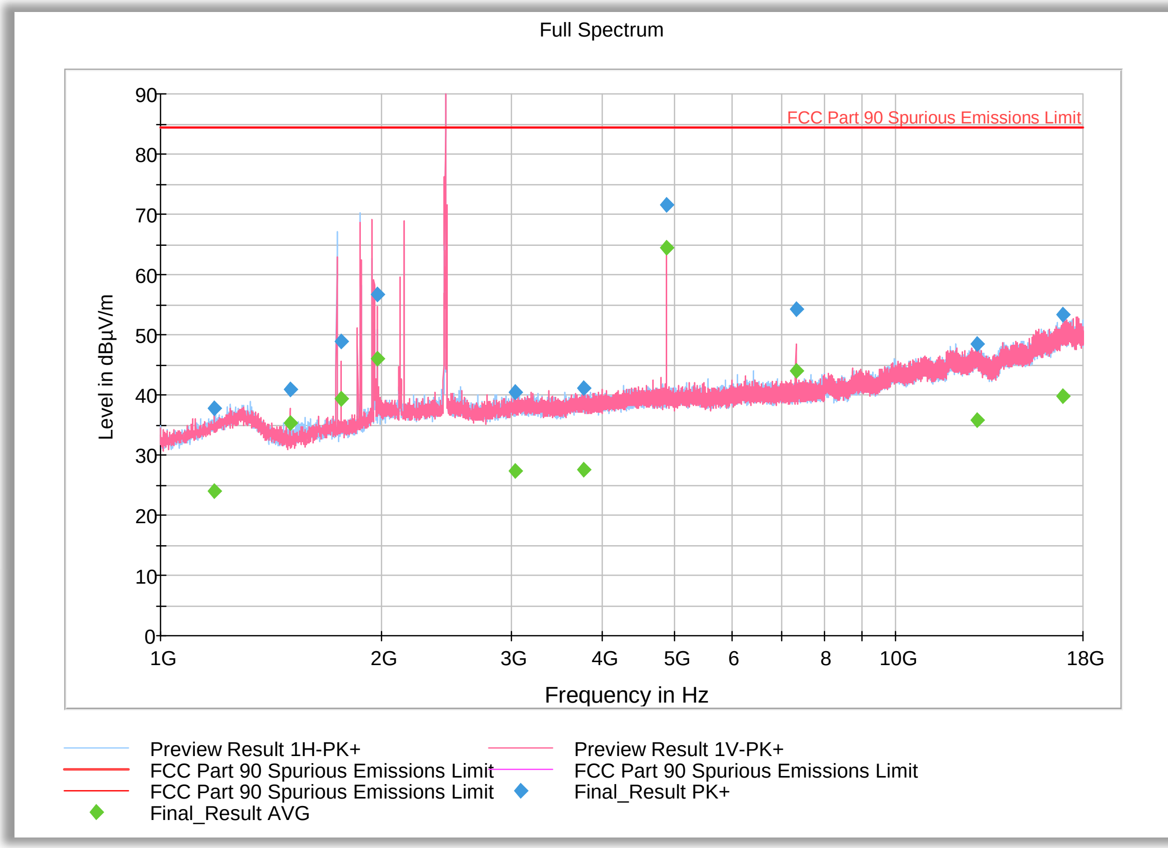
2.14.12 FCC Part 27 Below 1GHz Radiated Emissions



Quasi-Peak Result

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
35.820000	30.98	84.40	53.42	1000.0	120.000	116.0	V	278.0	-13.6
45.560000	23.12	84.40	61.28	1000.0	120.000	183.0	V	15.0	-10.5
199.990000	24.06	84.40	60.34	1000.0	120.000	103.0	V	36.0	-11.0
460.800000	29.76	84.40	54.64	1000.0	120.000	103.0	H	84.0	-4.3
499.965000	24.18	84.40	60.22	1000.0	120.000	208.0	H	70.0	-3.2
675.820000	30.93	84.40	53.47	1000.0	120.000	142.0	V	148.0	0.0
768.010000	32.34	84.40	52.06	1000.0	120.000	153.0	V	157.0	1.5
830.085000	20.49	84.40	63.91	1000.0	120.000	103.0	V	343.0	3.1

2.14.13 FCC Part 27 Above 1GHz Radiated Emissions



Peak Result

Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1182.066667	37.89	84.40	46.51	1000.0	1000.000	108.0	V	335.0	-6.7
1500.033333	40.91	84.40	43.49	1000.0	1000.000	196.0	V	223.0	-6.7
1761.033333	48.87	84.40	35.53	1000.0	1000.000	210.0	V	20.0	-4.1
1972.966667	56.56	84.40	27.84	1000.0	1000.000	201.0	V	113.0	-2.3
3041.233333	40.44	84.40	43.96	1000.0	1000.000	345.0	V	133.0	0.8
3759.600000	41.13	84.40	43.27	1000.0	1000.000	126.0	H	325.0	2.7
4879.966667	71.61	84.40	12.79	1000.0	1000.000	238.0	V	132.0	4.8
7320.033333	54.30	84.40	30.10	1000.0	1000.000	280.0	V	133.0	8.5
12897.966667	48.50	84.40	35.90	1000.0	1000.000	330.0	V	133.0	16.5
16893.233333	53.43	84.40	30.97	1000.0	1000.000	308.0	H	324.0	22.4

Average Result

Frequency (MHz)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1182.066667	24.09	84.40	60.31	1000.0	1000.000	108.0	V	335.0	-6.7
1500.033333	35.37	84.40	49.03	1000.0	1000.000	196.0	V	223.0	-6.7
1761.033333	39.33	84.40	45.07	1000.0	1000.000	210.0	V	20.0	-4.1
1972.966667	46.05	84.40	38.35	1000.0	1000.000	201.0	V	113.0	-2.3
3041.233333	27.23	84.40	57.17	1000.0	1000.000	345.0	V	133.0	0.8
3759.600000	27.66	84.40	56.74	1000.0	1000.000	126.0	H	325.0	2.7
4879.966667	64.46	84.40	19.94	1000.0	1000.000	238.0	V	132.0	4.8
7320.033333	43.90	84.40	40.50	1000.0	1000.000	280.0	V	133.0	8.5
12897.966667	35.74	84.40	48.66	1000.0	1000.000	330.0	V	133.0	16.5

3 Test Equipment Used

3.1 List of absolute measuring and other principal items of test equipment

Asset ID Number	Test Equipment	Type	Serial Number	Manufacturer	Cal Due Date
Antenna Conducted Port Setup					
7608	Vector Signal Generator	SMBV100A	259021	Rhode & Schwarz	10/03/2025
7582	Signal/Spectrum Analyzer	FSW26	101614	Rohde & Schwarz	12/21/2023
-	Power Splitter	ZN2PD2-50-S+	SUU27701207	Mini Circuits	Verified with (7608) and (7582)
7610	DFS Radar Simulator and Analyzer*	Aeroflex 3005	30050A/09L	Aeroflex	NCR (for signaling purposes only)
-	20dB Attenuator	5W DC-18GHz 20dB (ATX3518-20)	N/A	MCL	Verified by 7608 and 7582
7662	Power Meter	N1911A	MY451000951	Agilent	04/04/2024
7605	Wideband Power Meter	N1921A	MY51100054	Agilent	04/14/2024
8848	Step Attenuator	RSP	834500/009	Rhode & Schwarz	Verified by 7608 and 7582
-	Directional Coupler	4226-20	N/A	Narda	Verified by 7608 and 7582
Electromagnetic Radiation Disturbance					
1033	BiConiLog Antenna	3142C	00044556	ETS Lindgren	10/16/25
68302	EMI Test Receiver	ESW44	103418	Rohde & Schwarz	07/02/25
51235	RF Pre-Amp (9kHz to 1GHz)	310	412802	Sonoma	08/14/25
68301	EMI Test Receiver	ESW44	103417	Rohde & Schwarz	07/05/25
30181	1-18GHz DRG Horn	3117	155511	ETS-Lindgren	08/20/26
8628	Pre-Amplifier	QLJ-01182835-JO	8986002	Quinstar	02/19/25
9001	Horn antenna (18-26.5GHz)	HO42S	101	Custom Microwave	10/26/25
40815	18GHz to 40GHz Low Noise Amplifier	SLKKa-30-6	19D18	Spacek Labs	10/22/25
Miscellaneous					
43003	True RMS Multimeter	85 III	96880143	Fluke	01/09/2024
68516	Barometric Pressure/Humidity/Temperature Sensor	SD700	A.107085	Extech Instruments	08/24/25
-	Test Software	EMC32	V11.50.0	Rhode & Schwarz	NCR
7579	Temperature Chamber	115	151617	TestQuity	12/01/23

All Test Instruments were within calibration during testing.

4 Measurement Uncertainty

For a 95% confidence level, the measurement uncertainties for defined systems are:

4.1 Conducted Antenna Port Measurement

	Input Quantity (Contribution) Xi	Value		Prob. Dist.	Divisor	ui(x)	$ui(x)^2$
1	Receiver reading	0.10	dB	Normal, k=1	1.000	0.10	0.01
2	Cable attenuation	1.00	dB	Normal, k=2	2.000	0.50	0.25
3	Receiver sinewave accuracy	0.08	dB	Normal, k=2	2.000	0.04	0.00
4	Receiver pulse amplitude	0.00	dB	Rectangular	1.732	0.00	0.00
5	Receiver pulse repetition rate	0.00	dB	Rectangular	1.732	0.00	0.00
6	Noise floor proximity	0.00	dB	Rectangular	1.732	0.00	0.00
7	Frequency interpolation	0.10	dB	Rectangular	1.732	0.06	0.00
8	Mismatch	0.07	dB	U-shaped	1.414	0.05	0.00
	Combined standard uncertainty				Normal	0.52	dB
	Expanded uncertainty				**Normal, k=2**	**1.03**	**dB**

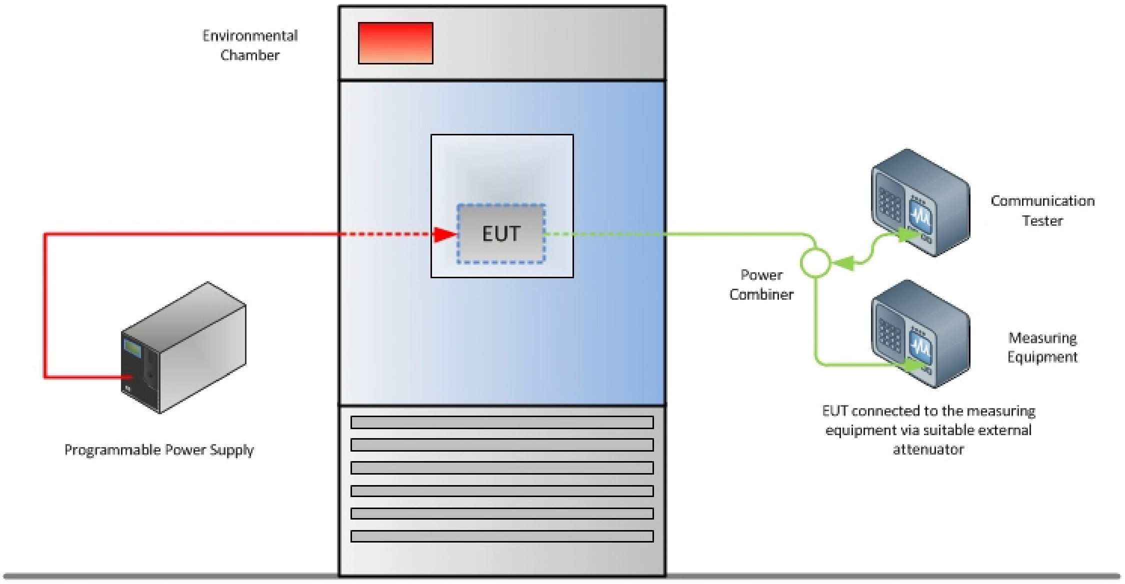
4.2 Radiated Measurement (30MHz to 1GHz)

Input Quantity (Contribution) Xi	Value		Prob. Dist.	Divisor	ui(x)	ui(x)2
Receiver reading	0.10	dB	Normal, k=1	1.000	0.10	0.01
Attenuation: antenna-receiver	0.20	dB	Normal, k=2	2.000	0.10	0.01
Antenna factor AF	0.75	dB	Normal, k=2	2.000	0.38	0.14
Receiver sinewave accuracy	1.10	dB	Normal, k=2	2.000	0.55	0.30
Receiver pulse amplitude	1.50	dB	Rectangular	1.732	0.87	0.75
Receiver pulse repetition rate	1.50	dB	Rectangular	1.732	0.87	0.75
Noise floor proximity	0.50	dB	Rectangular	1.732	0.29	0.08
Mismatch: antenna-receiver	0.95	dB	U-shaped	1.414	0.67	0.45
AF frequency interpolation	0.30	dB	Rectangular	1.732	0.17	0.03
AF height deviations	0.10	dB	Rectangular	1.732	0.06	0.00
Directivity difference at 3 m	3.12	dB	Rectangular	1.732	1.80	3.24
Phase center location at 3 m	1.00	dB	Rectangular	1.732	0.58	0.33
Cross-polarisation	0.90	dB	Rectangular	1.732	0.52	0.27
Balance	0.00	dB	Rectangular	1.732	0.00	0.00
Site imperfections	3.64	dB	Triangular	2.449	1.49	2.21
Separation distance at 3 m	0.30	dB	Rectangular	1.732	0.17	0.03
Effect of setup table material	0.40	dB	Rectangular	1.732	0.23	0.05
Table height at 3 m	0.10	dB	Normal, k=2	2.000	0.05	0.00
Near-field effects	0.00	dB	Triangular	2.449	0.00	0.00
Effect of ambient noise on OATS	0.00	dB				0.00
Combined standard uncertainty			Normal	2.95	dB	
Expanded uncertainty			Normal, k=2	5.89	dB	

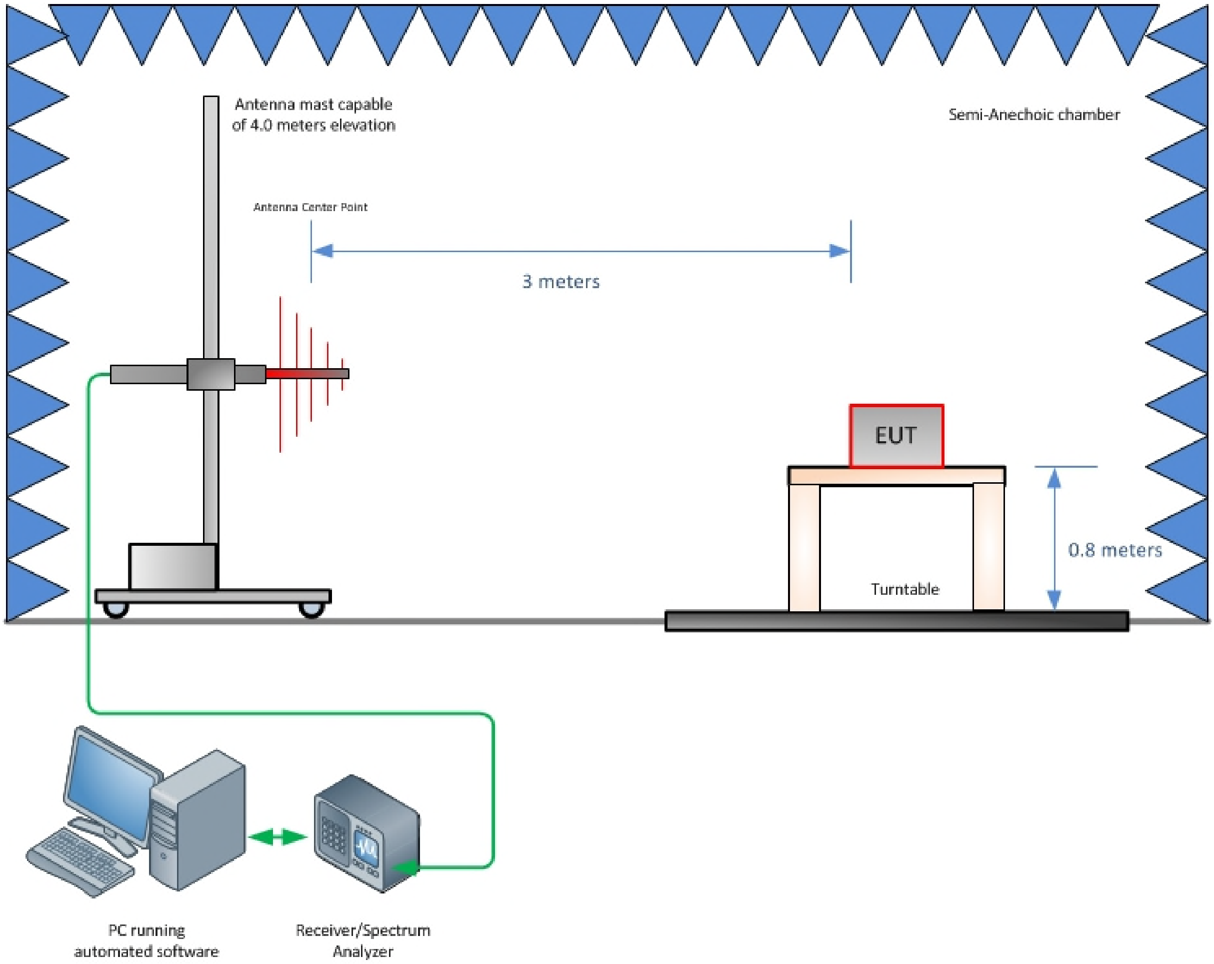
4.3 Radiated Measurement (Above 1GHz)

Input Quantity (Contribution) X_i	Value		Prob. Dist.	Divisor	$u_i(x)$	$u_i(x)^2$
Receiver reading	0.10	dB	Normal, k=1	1.000	0.10	0.01
Attenuation: antenna-receiver	0.30	dB	Normal, k=2	2.000	0.15	0.02
Preamplifier Gain	0.20	dB	Normal, k=2	2.000	0.10	0.01
Antenna factor AF	0.37	dB	Normal, k=2	2.000	0.19	0.03
Sinewave accuracy	0.57	dB	Normal, k=2	2.000	0.29	0.08
Instability of preamp gain	1.21	dB	Rectangular	1.732	0.70	0.49
Noise floor proximity	0.70	dB	Rectangular	1.732	0.40	0.16
Mismatch: antenna-preamplifier	1.41	dB	U-shaped	1.414	1.00	0.99
Mismatch: preamplifier-receiver	1.30	dB	U-shaped	1.414	0.92	0.85
AF frequency interpolation	0.30	dB	Rectangular	1.732	0.17	0.03
Directivity difference at 3 m	1.50	dB	Rectangular	1.732	0.87	0.75
Phase center location at 3 m	0.30	dB	Rectangular	1.732	0.17	0.03
Cross-polarisation	0.90	dB	Rectangular	1.732	0.52	0.27
Site imperfections VSWR (Method 2)	4.16	dB	Triangular	2.449	1.70	2.89
Effect of setup table material	1.15	dB	Rectangular	1.732	0.66	0.44
Separation distance at 3 m	0.30	dB	Rectangular	1.732	0.17	0.03
Table height at 3 m	0.00	dB	Normal, k=1	2.000	0.00	0.00
Combined standard uncertainty			Normal	2.66	dB	
Expanded uncertainty			Normal, k=2	5.32	dB	

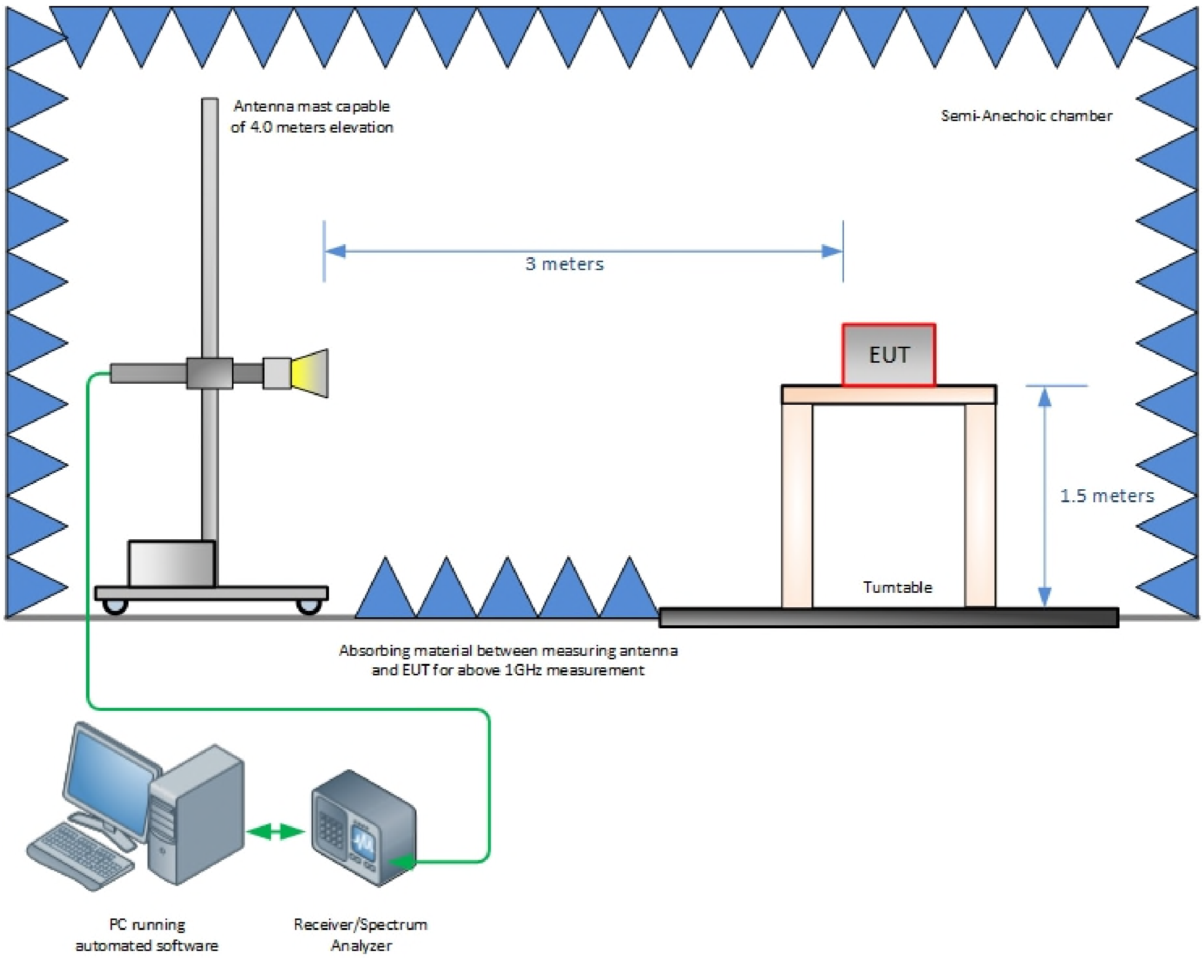
5 Test Setup Diagrams



Frequency Stability Test Configuration



Radiated Emission Test Setup (Below 1GHz)



Radiated Emission Test Setup (Above 1GHz)

6 Accreditation, Disclaimers and Copyright

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