Radio Testing of the

John Deere Intelligent Solution Group
Sensor, Eagle Radar
Model: PH85241196

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In accordance with

FCC Part 15 Subpart C §15.245 and
ISED RSS-210 Issue 11 June 2024

John Deere Intelligent Solution Group
9505 Northpark Dr.
Urbandale, Iowa 50131
USA

COMMERCIAL-IN-CONFIDENCE

Date: May 2026
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RESPONSIBLE FOR	NAME	DATE	SIGNATURE
Authorized Signatory	Ferdinand S. Custodio	05/01/26	

Signatures in this approval box have checked this document in line with the requirements of TÜV SÜD document control rules.

EXECUTIVE SUMMARY
A sample of this product was tested and found to be in compliance with FCC Part 15 Subpart C §15.245 and ISED RSS-210 Issue 11 June 2024.

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REPORT ON	Radio Testing of the John Deere Intelligent Solution Group Sensor, Eagle Radar Model PH85241196
TEST REPORT NUMBER	72171241B
TEST REPORT DATE	May 2026
PREPARED FOR	John Deere Intelligent Solution Group 9505 Northpark Dr. Urbandale, Iowa 50131 USA
CONTACT PERSON	Jessica Berberich Sr. Standards Engineer BerberichJessicaL@JohnDeere.com (515) 253-6337
PREPARED BY	Joe Salvador **Name** Authorized Signatory Title: Wireless/RF Test Engineer
APPROVED BY	Ferdinand S. Custodio **Name** Authorized Signatory Title: Senior EMC Test Engineer / Wireless Team Lead
DATED	05/01/26

Revision History

72171241B John Deere Intelligent Solution Group Sensor, Eagle Radar Model PH85241196					
DATE	OLD REVISION	NEW REVISION	REASON	PAGES AFFECTED	APPROVED BY
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SECTION 1

REPORT SUMMARY

Radio Testing of the
John Deere Intelligent Solution Group
Sensor, Eagle Radar PH85241196

1.1 INTRODUCTION

The information contained in this report is intended to show verification of the John Deere Intelligent Solution Group Sensor, Eagle Radar PH85241196 to the requirements of FCC Part 15 Subpart C §15.245 and ISED RSS-210 Issue 11 June 2024.

Objective	To perform Radio Testing to determine the Equipment Under Test's (EUT's) compliance with the test specification, for the series of tests carried out.
Manufacturer	John Deere Intelligent Solution Group
EUT	Sensor, C&F Redesign
Trade Name	John Deere
Model Name	PH85241196
FCC ID	OV5-PH85240000
IC ID	11137A-PH85240000
Serial Number(s)	PSFX00M100031
Number of Samples Tested	1
Test Specification/Issue/Date	• FCC Part 15 Subpart C §15.245 (October 1, 2025). • ISED RSS-210 Issue 11 June 2024: License-Exempt Radio Apparatus: Category I Equipment
Start of Test	August 13, 2022
Finish of Test	August 14, 2022
Name of Engineer(s)	Joe Salvador
Related Document(s)	• ANSI C63.10-2020. American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices • Eagle Radar PD 2_16_21.docx • Supporting documents for EUT certification are separate exhibits. • Eagle C&F Declaration of Similarity.docx

1.2 BRIEF SUMMARY OF RESULTS

A brief summary of the tests carried out in accordance with FCC Part 15 Subpart C §15.245 and ISED RSS-210 Issue 11 June 2024 with cross-reference to the corresponding ISED RSS standard are shown below.

Section	§15.245 Spec Clause	RSS	Test Description	Result	Comments /Base Standard
2.1	§15.245(b)	RSS-210 Annex F	Fundamental Emissions	Compliant	
2.2	§15.245(b)	RSS-210 Annex F	Spurious Emissions	Compliant	
2.3	-	RSS-Gen 6.7	99% Emission Bandwidth	For Reference Only	
-		RSS-Gen 8.8	AC Powerline conducted Emissions	N/A	

N/A Not performed as the EUT does not have provisions to connect to public AC mains.

1.3 PRODUCT INFORMATION

1.3.1 Technical Description

The Equipment Under Test (EUT) is a John Deere Intelligent Solution Group PH85241196 .The EUT is used to measure the true ground speed of a vehicle. Some of the uses for the radar speed signal are displaying ground speed on monitors, calculating distance and area for determining the rate of planting seeds and application of agricultural chemicals, tire slip calculations, and hitch slip control. The radar sensor uses dual beam K-band Doppler technology to sense the ground speed and processes this signal and provides a frequency output proportional to speed. The unit shall have CAN capabilities for providing speed information as well as diagnostics and programmability. The vehicle speed can range from 0.8 km/h to 100 km/h (0.5 mph to 62.1 mph).

1.3.2 EUT General Description

EUT Description	Sensor, C&F Redesign
Model Name	Sensor, Eagle Radar
Model Number	PH85241196
Serial Number	PSFX00M100031
Input Voltage	13.8VDC Nominal (9VDC to 24VDC)
Output RF Power	479.87 mW Peak EIRP
Frequency Range (TX)	24.134 GHz

1.4 EUT TEST CONFIGURATION

1.4.1 Test Configuration Description

Test Configuration	Description
Default	The EUT will start transmitting once power is applied (24 to 28VDC).

1.4.2 EUT Exercise Software

None. No special software was utilized to exercise the EUT during verifications.

1.4.3 Support Equipment and I/O cables

Manufacturer	Equipment/Cable	Description
John Deere	Wiring Harness	Custom cable assy with eight (8) 1.1 meters conductors and banana Jack connectors

1.4.4 Simplified Test Configuration Diagram

Not required. The EUT was verified on a stand-alone configuration.

1.5 DEVIATIONS FROM THE STANDARD

No deviations from the applicable test standards or test plan were made during testing.

1.6 MODIFICATION RECORD

Description of Modification	Modification Fitted By	Date Modification Fitted
Serial Number: PSFX00M100031		
None	—	—

The table above details modifications made to the EUT during the test programme. The modifications incorporated during each test (if relevant) are recorded on the appropriate test pages.

1.7 TEST METHODOLOGY

All measurements contained in this report were conducted with ANSI C63.10-2020, American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices

For conducted and radiated emissions, the equipment under test (EUT) was configured to measure its highest possible emission level. This level was based on the maximized cable configuration from exploratory testing per ANSI C63.10-2020. The test modes were adapted according to the Operating Instructions provided by the manufacturer/client.

1.8 TEST FACILITY LOCATION

1.8.1 TÜV SÜD America Inc. (Mira Mesa)

10040 Mesa Rim Road, San Diego, CA 92121-2912 (32.901268,-117.177681). Phone: 858 678 1400 Fax: 858 546 0364

1.8.2 TÜV SÜD America Inc. (Rancho Bernardo)

16936 Via Del Campo, San Diego, CA 92127-1708 (33.018644,-117.092409). Phone: 858 678 1400 Fax: 858 546 0364.

1.9 TEST FACILITY REGISTRATION

1.9.1 FCC – Designation No.: US1146

TÜV SÜD America Inc. (San Diego), is an accredited test facility with the site description report on file and has met all the requirements specified in §2.948 of the FCC rules. The acceptance letter from the FCC is maintained in our files and the Designation is US1146.

1.9.2 Innovation, Science and Economic Development Canada (IC) Registration No.: 3067A-1 & 22806-1

The 10m Semi-anechoic chamber of TÜV SÜD America Inc. (San Diego Rancho Bernardo) has been registered by Certification and Engineering Bureau of Innovation, Science and Economic Development Canada for radio equipment testing with Registration No. 3067A-1.

The 3m Semi-anechoic chamber of TÜV SÜD America Inc. (San Diego Mira Mesa) has been registered by Certification and Engineering Bureau of Innovation, Science and Economic Development Canada for radio equipment testing with Registration No. 22806-1.

1.9.3 BSMI – Laboratory Code: SL2-IN-E-028R (US0102)

TÜV Product Service Inc. (San Diego) is a recognized EMC testing laboratory by the BSMI under the MRA (Mutual Recognition Arrangement) with the United States. Accreditation includes CNS 13438 up to 6GHz.

1.9.4 NCC (National Communications Commission - US0102)

TÜV SÜD America Inc. (San Diego) is listed as a Foreign Recognized Telecommunication Equipment Testing Laboratory and is accredited to ISO/IEC 17025 (A2LA Certificate No.2955.13) which under APEC TEL MRA Phase 1 was designated as a Conformity Assessment Body competent to perform testing of equipment subject to the Technical Regulations covered under its scope of accreditation including RTTE01, PLMN01 and PLMN08 for TTE type of testing and LP002 for Low-Power RF Device type of testing.

1.9.5 VCCI – Registration No. A-0412 and A-0413

TÜV SÜD America Inc. (San Diego) is a VCCI registered measurement facility which includes radiated field strength measurement, radiated field strength measurement above 1GHz, mains port interference measurement and telecommunication port interference measurement.

1.9.6 RRA – Identification No. US0102

TÜV SÜD America Inc. (San Diego) is National Radio Research Agency (RRA) recognized laboratory under Phase I of the APEC Tel MRA.

1.9.7 OFCA – U.S. Identification No. US0102

TÜV SÜD America Inc. (San Diego) is recognized by Office of the Communications Authority (OFCA) under Appendix B, Phase I of the APEC Tel MRA.

SECTION 2

TEST DETAILS

Radio Testing of the
John Deere Intelligent Solution Group
Sensor, Eagle Radar PH85241196

2.1 RF POWER OUTPUT

2.1.1 Specification Reference

FCC 47 Chapter I Subchapter A Part 15 Subpart C §15.245
RSS-210, Annex F

2.1.2 Standard Applicable

(b) The field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following:

Fundamental frequency (MHz)	Field strength of fundamental (mv/m)	Field strength of harmonics (mv/m)
902-928	500	1.6
2435-2465	500	1.6
5785-5815	500	1.6
10500-10550	2500	25.0
24075-24175	2500	25.0

1) Regardless of the limits shown in the above table, harmonic emissions in the restricted bands below 17.7 GHz, as specified in §15.205, shall not exceed the field strength limits shown in §15.209. Harmonic emissions in the restricted bands at and above 17.7 GHz shall not exceed the following field strength limits:

(i) For the second and third harmonics of field disturbance sensors operating in the 24075-24175 MHz band and for other field disturbance sensors designed for use only within a building or to open building doors, 25.0 mV/m.

(ii) For all other field disturbance sensors, 7.5 mV/m.

(iii) Field disturbance sensors designed to be used in motor vehicles or aircraft must include features to prevent continuous operation unless their emissions in the restricted bands, other than the second and third harmonics from devices operating in the 24075-24175 MHz band, fully comply with the limits given in §15.209. Continuous operation of field disturbance sensors designed to be used in farm equipment, vehicles such as fork lifts that are intended primarily for use indoors or for very specialized operations, or railroad locomotives, railroad cars and other equipment which travels on fixed tracks is permitted. A field disturbance sensor will be considered not to be operating in a continuous mode if its operation is limited to specific activities of limited duration (e.g., putting a vehicle into reverse gear, activating a turn signal, etc.).

2.1.3 Equipment Under Test and Modification State

Serial No: PSFX00M100031 / Default Test Configuration

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

August , 2022 / JS

2.1.5 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.1.6 Environmental Conditions

Test performed at TÜV SÜD America Inc. Mira Mesa facility

Ambient Temperature	27.5 °C
Relative Humidity	43.5 %
ATM Pressure	100.1 kPa

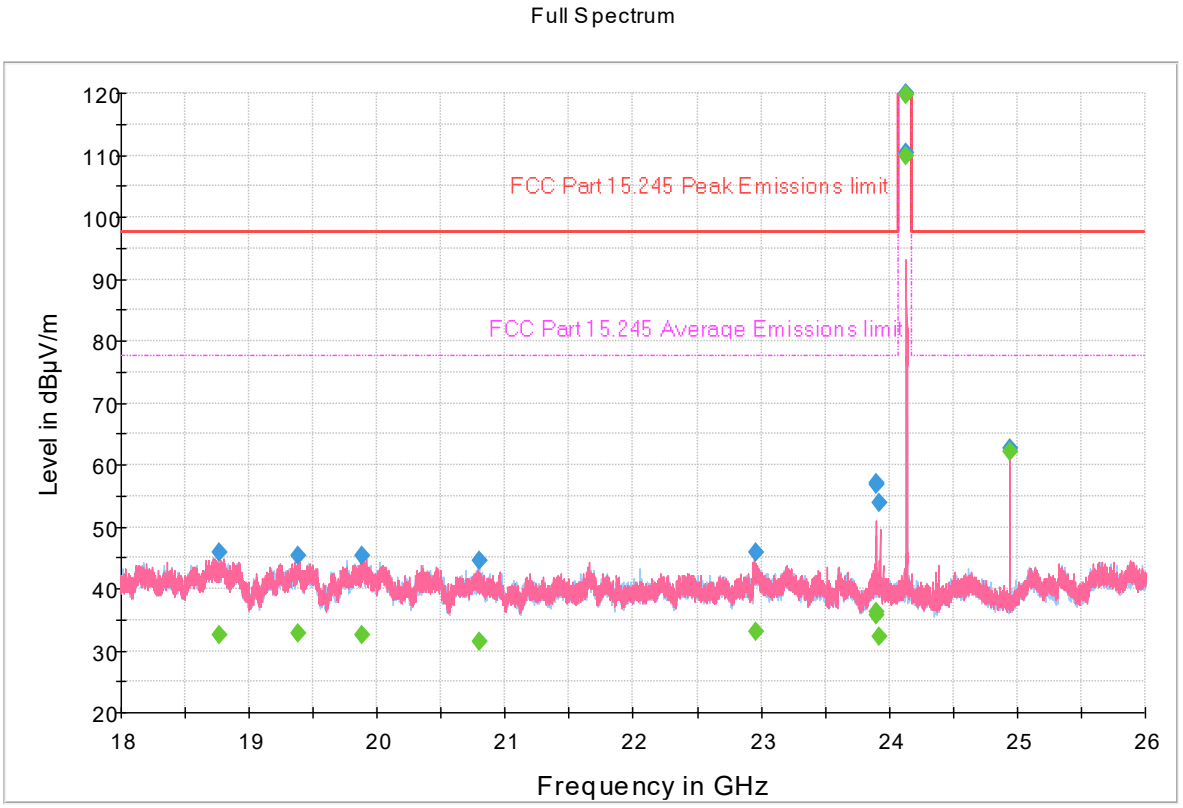
2.1.7 Additional Observations

Test results are from Section 2.2.13 of this test report.

2.1.8 Test Results

Compliant. See attached test plot.

2.1.9 From 18GHz to 26.5GHz Radiated Emission Test



Peak Data

Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
24134.442500	122.04	147.96	26.05	1000.0	1000.000	162.0	V	66.0	-2

Average Data

Frequency (MHz)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
24134.442500	121.94	127.96	5.95	1000.0	1000.000	162.0	V	66.0	-2

2.2 SPURIOUS EMISSIONS

2.2.1 Specification Reference

FCC 47 Chapter I Subchapter A Part 15 Subpart C §15.245
RSS-210, Annex F

2.2.2 Standard Applicable

(2) Field strength limits are specified at a distance of 3 meters.

(3) Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in §15.209, whichever is the lesser attenuation.

(4) The emission limits shown above are based on measurement instrumentation employing an average detector. The provisions in §15.35 for limiting peak emissions apply.

2.2.3 Equipment Under Test and Modification State

Serial No: PSFX00M100031 / Default Test Configuration

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

August 14, 2022 / JS

2.2.5 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.2.6 Environmental Conditions

Test performed at TÜV SÜD America Inc. Mira Mesa facility

Ambient Temperature	27.5 °C
Relative Humidity	43.5 %
ATM Pressure	100.1 kPa

2.2.7 Additional Observations

- This is a radiated test.
- The spectrum was searched from 9kHz to 100GHz.
- Limits used outside the frequency band 24075-24175MHz as required is per §15.209 which is identical to FCC Subpart B limit (§15.109 Class B). There are no significant emissions observed other than the Fundamental and Harmonics. Above 40GHz, only the Harmonics limits presented.
- Measurement was done using EMC32 automated software below 40GHz. Reported level is the actual level with all the correction factors factored in. Correction Factor column is for informational purposes only. See Section 2.2.8 for sample computation.

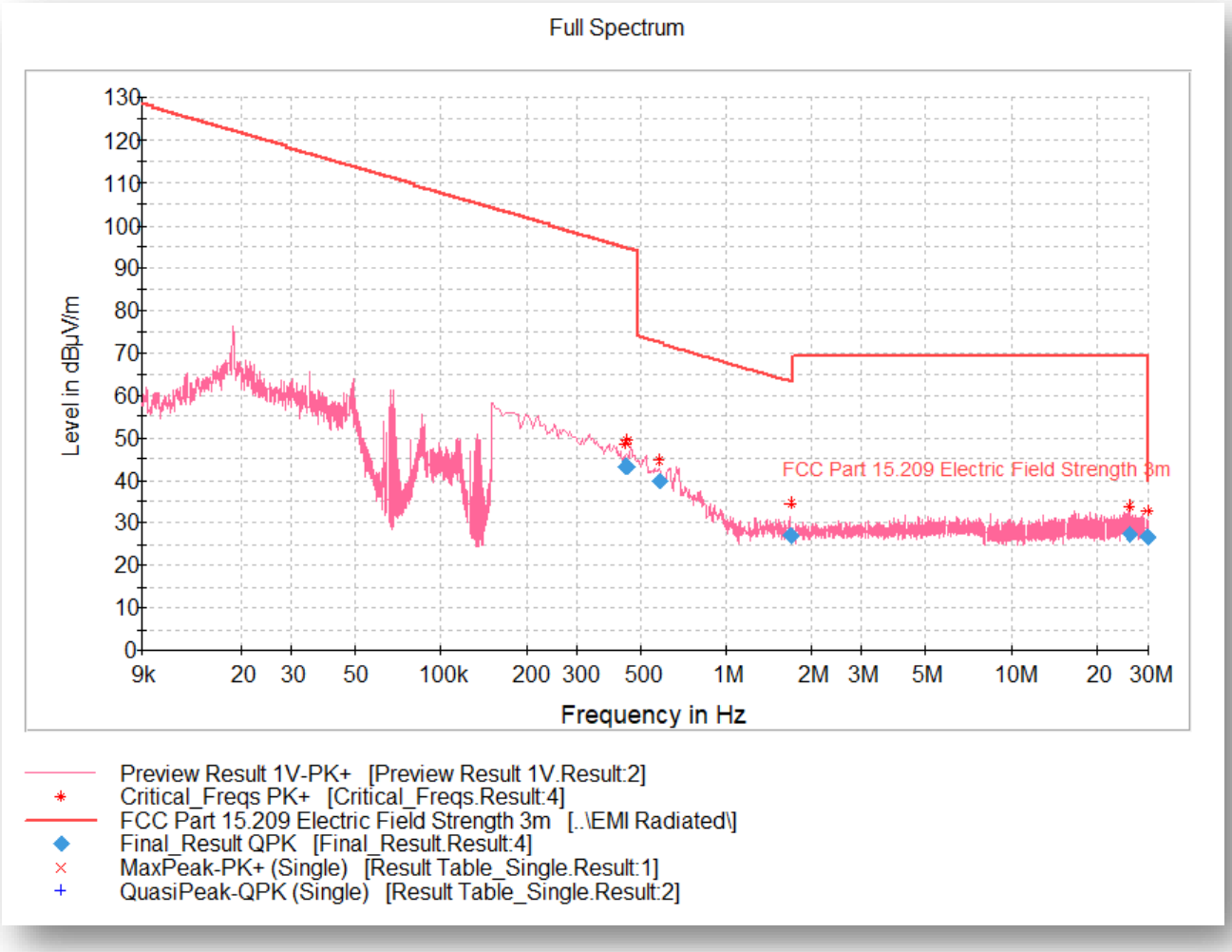
2.2.8 Sample Computation (Radiated Emission)

Measuring equipment raw measurement (dbµV) @ 30 MHz			24.4
Correction Factor (dB)	Asset# 1066 (cable)	0.3	-12.6
	Asset# 1172 (cable)	0.3	
	Asset# 1016 (preamplifier)	-30.7	
	Asset# 1175(cable)	0.3	
	Asset# 1002 (antenna)	17.2	
Reported QuasiPeak Final Measurement (dbµV/m) @ 30MHz			**11.8**

2.2.9 Test Results

Compliant. See attached plots.

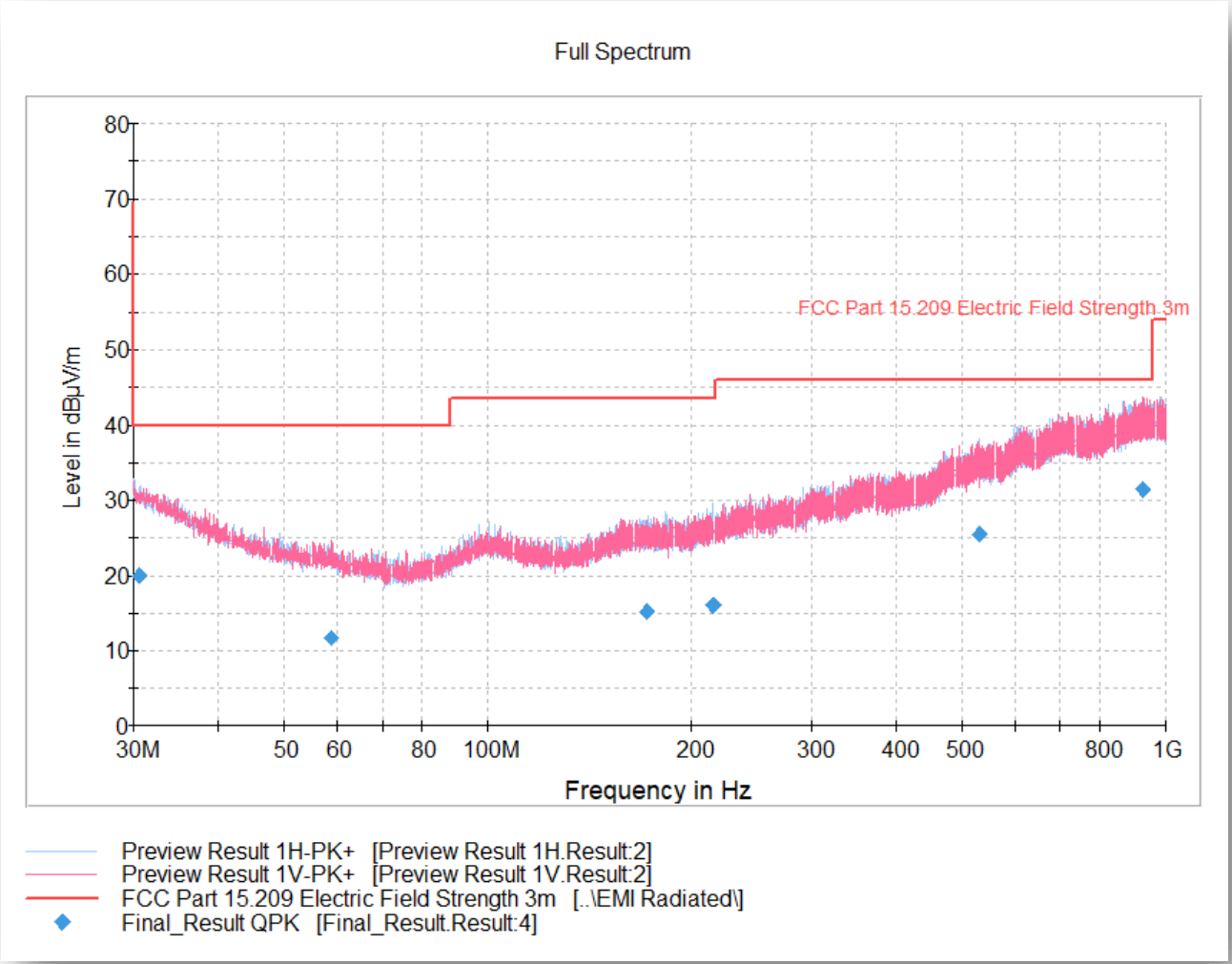
2.2.10 Below 30MHz Radiated Emission Test



Quasi-Peak Data

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Pol	Height (cm)	Azimuth (degrees)	Corr. (dB/m)
0.447625	43.26	94.59	51.32	1000.0	9.000	400.0	H	133.0	19
0.452655	43.44	94.49	51.05	1000.0	9.000	400.0	H	121.0	20
0.586905	39.92	72.23	32.31	1000.0	9.000	400.0	H	16.0	20
1.689953	26.97	63.04	36.07	1000.0	9.000	400.0	H	7.0	20
25.875080	27.29	69.50	42.21	1000.0	9.000	400.0	H	180.0	25
29.901265	26.77	69.50	42.73	1000.0	9.000	400.0	H	140.0	25

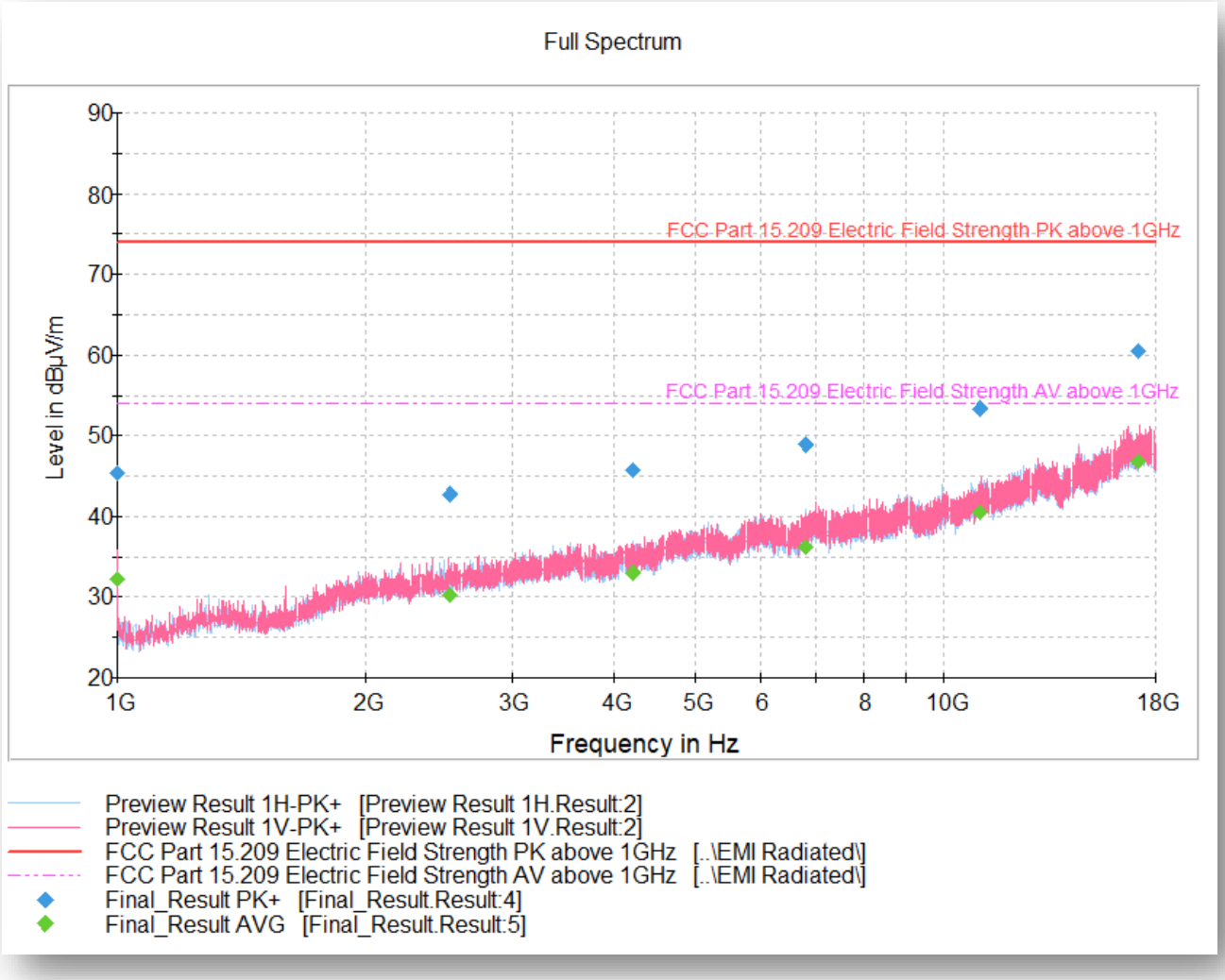
2.2.11 30MHz to 1GHz Radiated Emission Test



Quasi-Peak Data

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
30.640000	19.90	40.00	20.10	1000.0	120.000	390.0	H	333.0	22
58.847333	11.71	40.00	28.29	1000.0	120.000	117.0	V	351.0	14
171.575667	15.30	43.50	28.20	1000.0	120.000	302.0	H	138.0	17
215.722000	16.07	43.50	27.43	1000.0	120.000	400.0	H	121.0	18
531.088333	25.42	46.00	20.58	1000.0	120.000	395.0	H	15.0	26
927.741667	31.32	46.00	14.68	1000.0	120.000	225.0	V	169.0	31

2.2.12 From 1GHz to 18GHz Radiated Emission Test



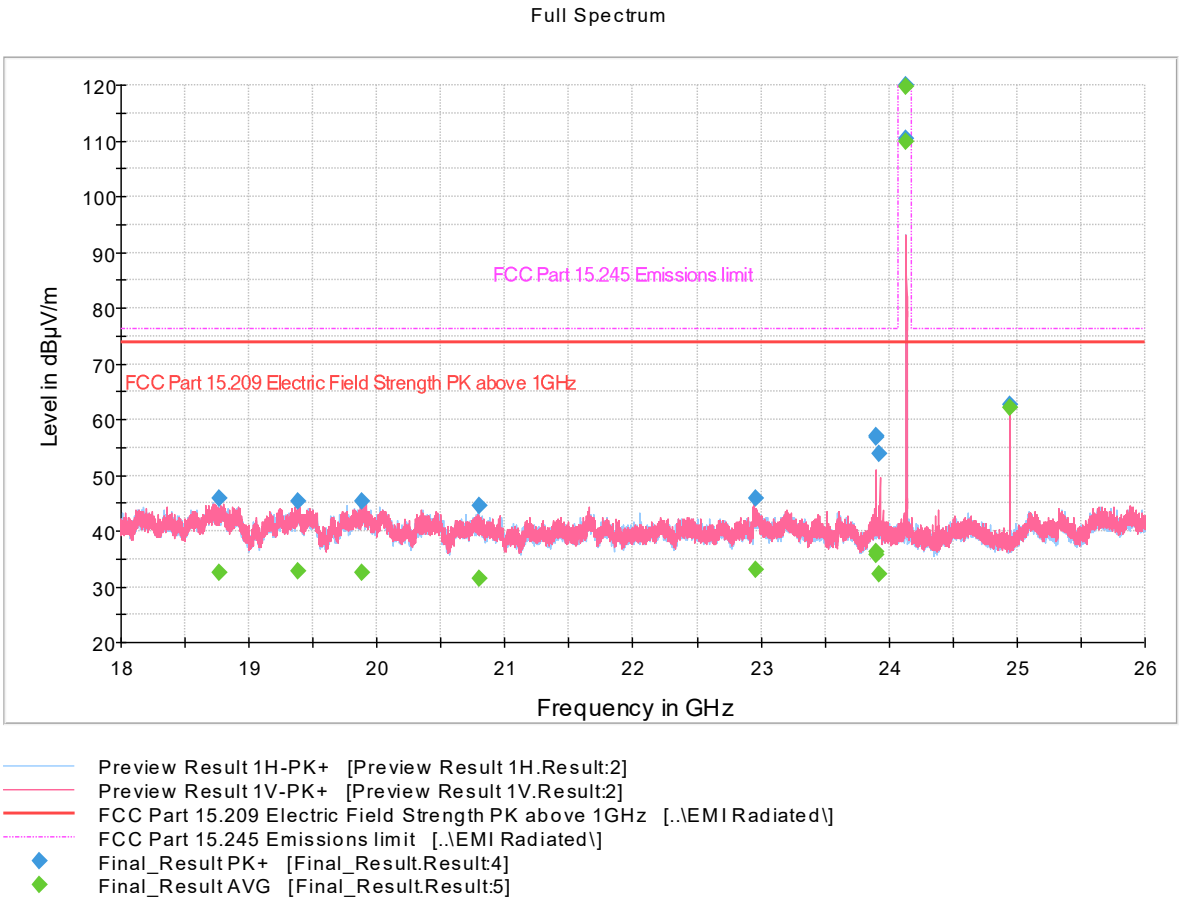
Peak Data

Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1000.000000	45.32	73.90	28.58	1000.0	1000.000	221.0	V	224.0	-6
2523.300000	42.83	73.90	31.07	1000.0	1000.000	223.0	V	274.0	1
4203.100000	45.75	73.90	28.15	1000.0	1000.000	365.0	H	35.0	4
6798.233333	48.89	73.90	25.01	1000.0	1000.000	336.0	H	220.0	6
11046.433333	53.36	73.90	20.54	1000.0	1000.000	255.0	H	41.0	14
17222.466667	60.57	73.90	13.33	1000.0	1000.000	175.0	V	200.0	18

Average Data

Frequency (MHz)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1000.000000	32.25	53.90	21.65	1000.0	1000.000	221.0	V	224.0	-6
2523.300000	30.33	53.90	23.57	1000.0	1000.000	223.0	V	274.0	1
4203.100000	33.16	53.90	20.74	1000.0	1000.000	365.0	H	35.0	4
6798.233333	36.28	53.90	17.62	1000.0	1000.000	336.0	H	220.0	6
11046.433333	40.50	53.90	13.40	1000.0	1000.000	255.0	H	41.0	14
17222.466667	46.88	53.90	7.02	1000.0	1000.000	175.0	V	200.0	18

2.2.13 18GHz to 26GHz Radiated Emission Test (including band edges verifications)



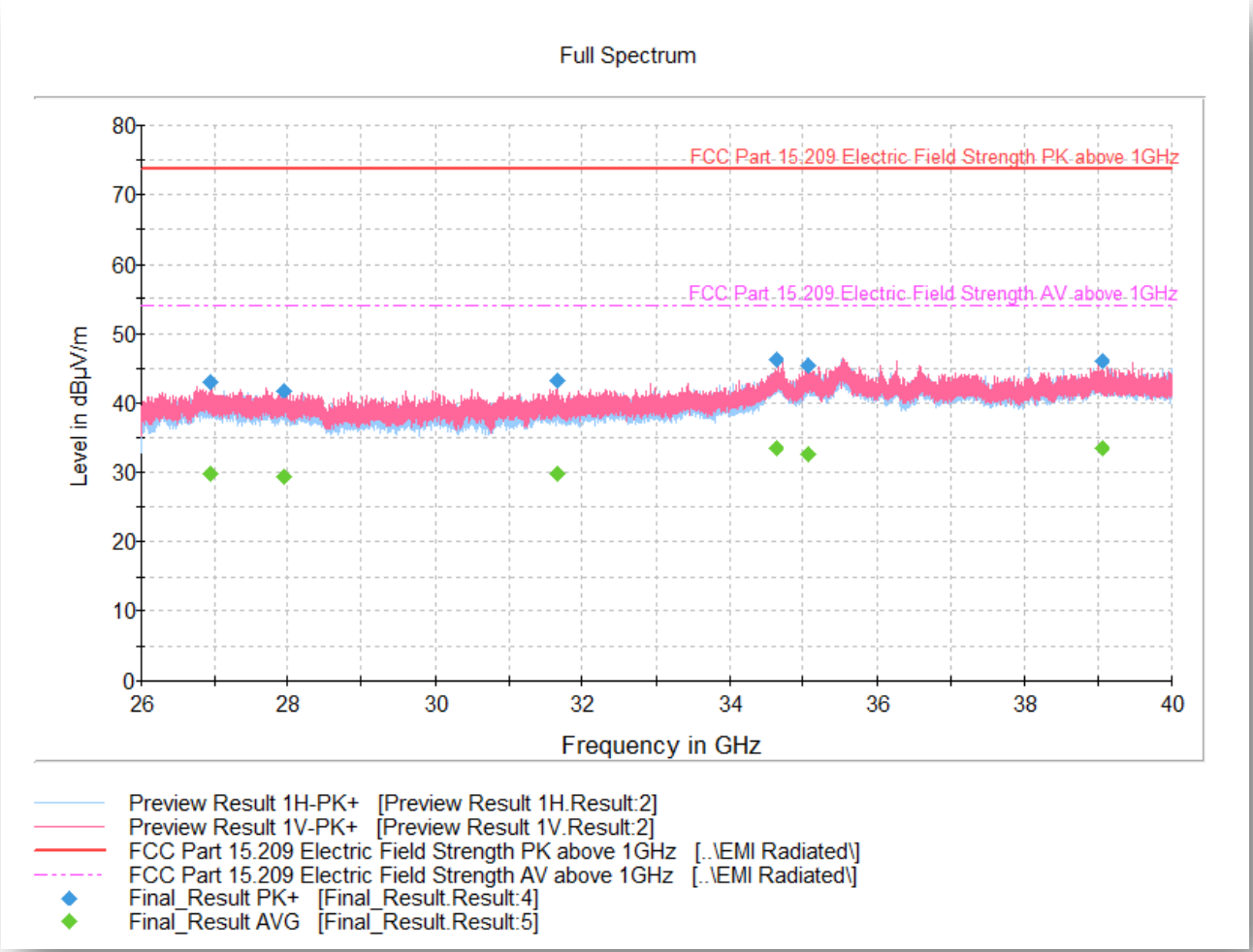
Peak Data

Frequency (MHz)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
18765.934500	32.57	76.20	43.63	1000.0	1000.000	163.0	H	96.0	-3
19377.125500	32.75	76.20	43.45	1000.0	1000.000	158.0	V	202.0	-2
19877.097500	32.54	76.20	43.66	1000.0	1000.000	190.0	V	312.0	-3
20797.026000	31.55	76.20	44.65	1000.0	1000.000	143.0	H	6.0	-3
22954.894500	33.11	76.20	43.09	1000.0	1000.000	152.0	V	278.0	-1
23893.954500	36.40	76.20	39.80	1000.0	1000.000	163.0	V	334.0	-1
23894.038000	35.74	76.20	40.46	1000.0	1000.000	154.0	V	336.0	-1
23926.522000	32.16	76.20	44.04	1000.0	1000.000	190.0	V	68.0	-2
24134.134500	109.94	129.20	19.26	1000.0	1000.000	163.0	V	320.0	-2
24134.442500	121.92	129.20	9.46	1000.0	1000.000	162.0	V	66.0	-2
24942.896000	62.08	76.20	14.12	1000.0	1000.000	163.0	V	334.0	-1

Average Data

Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
18765.934500	45.85	73.90	28.05	1000.0	1000.000	163.0	H	96.0	-3
19377.125500	45.34	73.90	28.56	1000.0	1000.000	158.0	V	202.0	-2
19877.097500	45.44	73.90	28.46	1000.0	1000.000	190.0	V	312.0	-3
20797.026000	44.51	73.90	29.39	1000.0	1000.000	143.0	H	6.0	-3
22954.894500	45.82	73.90	28.08	1000.0	1000.000	152.0	V	278.0	-1
23893.954500	57.13	73.90	16.77	1000.0	1000.000	163.0	V	334.0	-1
23894.038000	56.84	73.90	17.06	1000.0	1000.000	154.0	V	336.0	-1
23926.522000	53.76	73.90	20.14	1000.0	1000.000	190.0	V	68.0	-2
24134.134500	110.31	73.90	-36.41	1000.0	1000.000	163.0	V	320.0	-2
24134.442500	122.04	73.90	-46.00	1000.0	1000.000	162.0	V	66.0	-2
24942.896000	62.61	73.90	11.29	1000.0	1000.000	163.0	V	334.0	-1

2.2.14 26GHz to 40GHz Radiated Emission Test



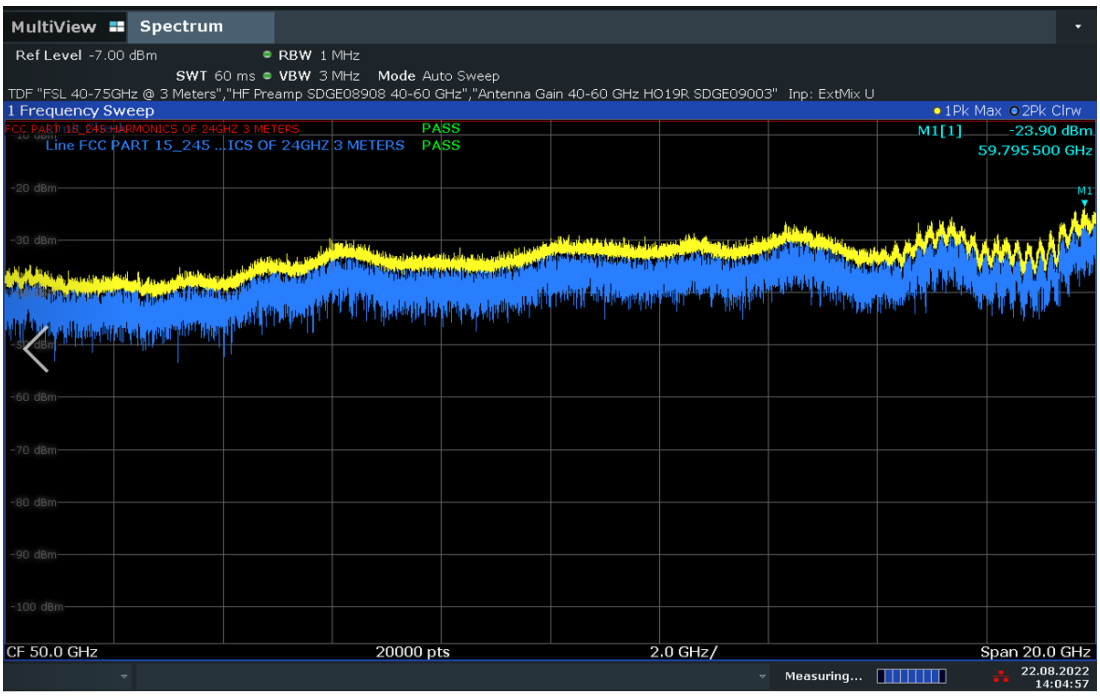
Peak Data

Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
26950.810385	42.99	73.90	30.91	1000.0	1000.000	133.0	V	136.0	3
27956.509231	41.89	73.90	32.01	1000.0	1000.000	146.0	V	41.0	3
31658.309231	43.30	73.90	30.60	1000.0	1000.000	225.0	V	215.0	5
34638.342308	46.37	73.90	27.53	1000.0	1000.000	196.0	V	12.0	7
35063.530384	45.52	73.90	28.38	1000.0	1000.000	225.0	H	259.0	7
39054.551538	46.16	73.90	27.74	1000.0	1000.000	183.0	V	278.0	8

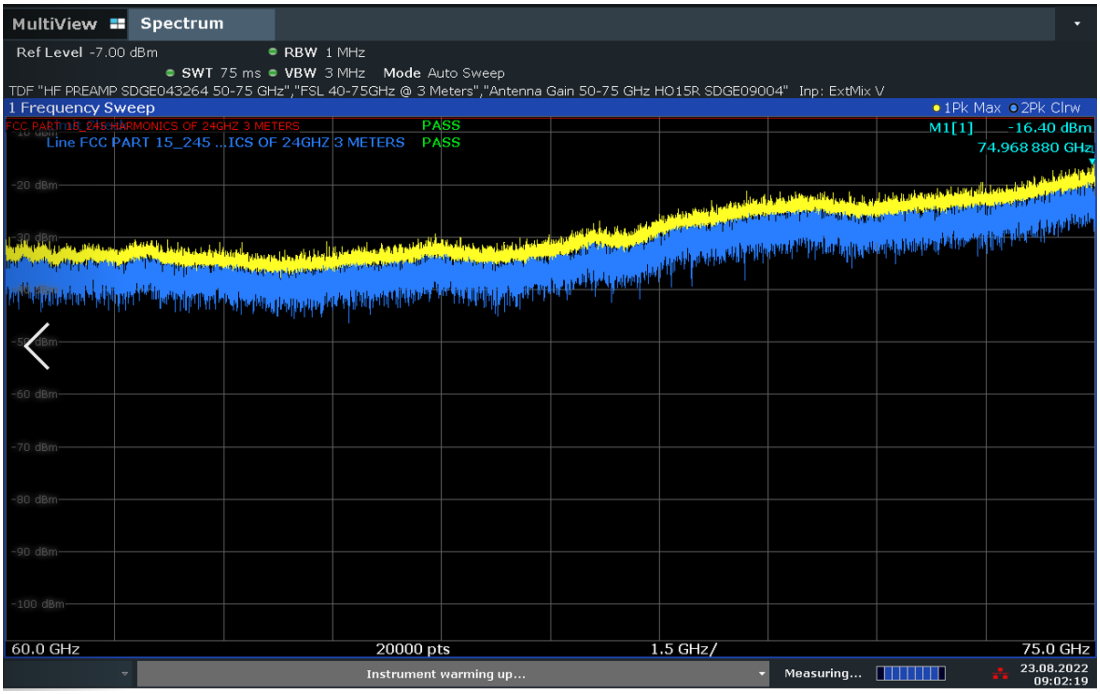
Average Data

Frequency (MHz)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
26950.810385	29.87	53.90	24.03	1000.0	1000.000	133.0	V	136.0	3
27956.509231	29.46	53.90	24.44	1000.0	1000.000	146.0	V	41.0	3
31658.309231	29.92	53.90	23.98	1000.0	1000.000	225.0	V	215.0	5
34638.342308	33.48	53.90	20.42	1000.0	1000.000	196.0	V	12.0	7
35063.530384	32.72	53.90	21.18	1000.0	1000.000	225.0	H	259.0	7
39054.551538	33.46	53.90	20.44	1000.0	1000.000	183.0	V	278.0	8

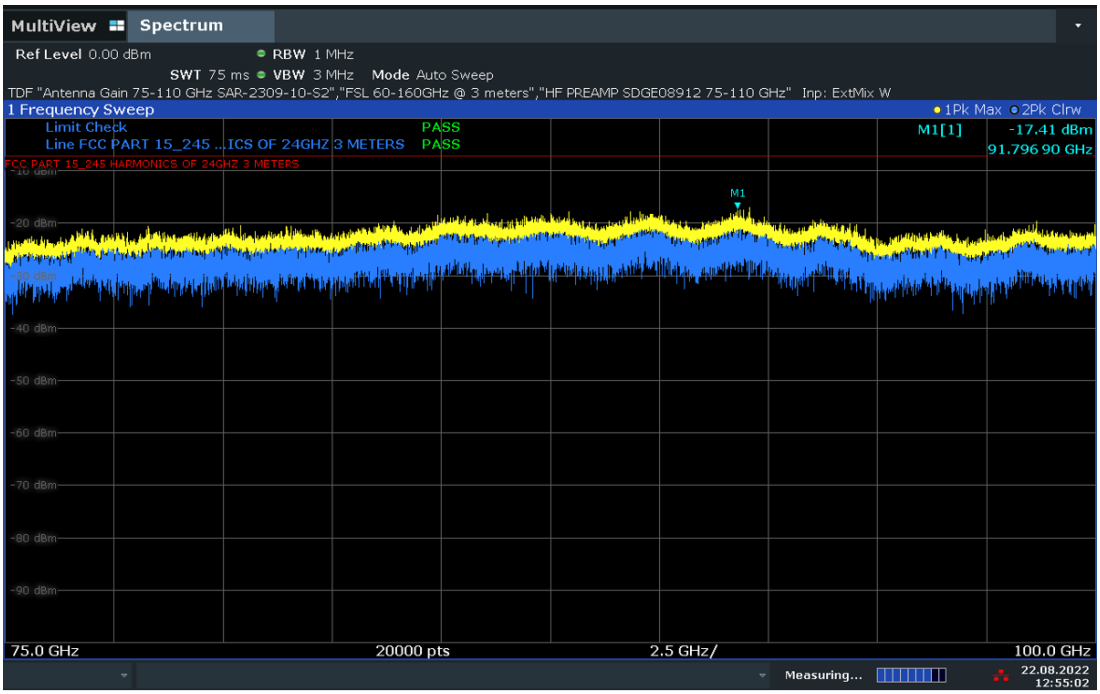
2.2.15 Maximized Plot from 40GHz to 100GHz



40GHz to 60GHz



60GHz to 75GHz



75GHz to 100GHz Verification

2.3 99% EMISSION BANDWIDTH

2.3.1 Specification Reference

RSS-Gen 6.7

2.3.2 Standard Applicable

The occupied bandwidth or the “99% emission bandwidth” is defined as the frequency range between two points, one above and the other below the carrier frequency, within which 99% of the total transmitted power of the fundamental transmitted emission is contained. The occupied bandwidth shall be reported for all equipment in addition to the specified bandwidth required in the applicable RSSs.
In some cases, the “x dB bandwidth” is required, which is defined as the frequency range between two points, one at the lowest frequency below and one at the highest frequency above the carrier frequency, at which the maximum power level of the transmitted emission is attenuated x dB below the maximum inband power level of the modulated signal, where the two points are on the outskirts of the in-band emission.

2.3.3 Equipment Under Test and Modification State

Serial No: PSFX00M100031 / Default Test Configuration

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

July 27, 2022 / JS

2.3.5 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.3.6 Environmental Conditions

Test performed at TÜV SÜD America Inc. Mira Mesa facility

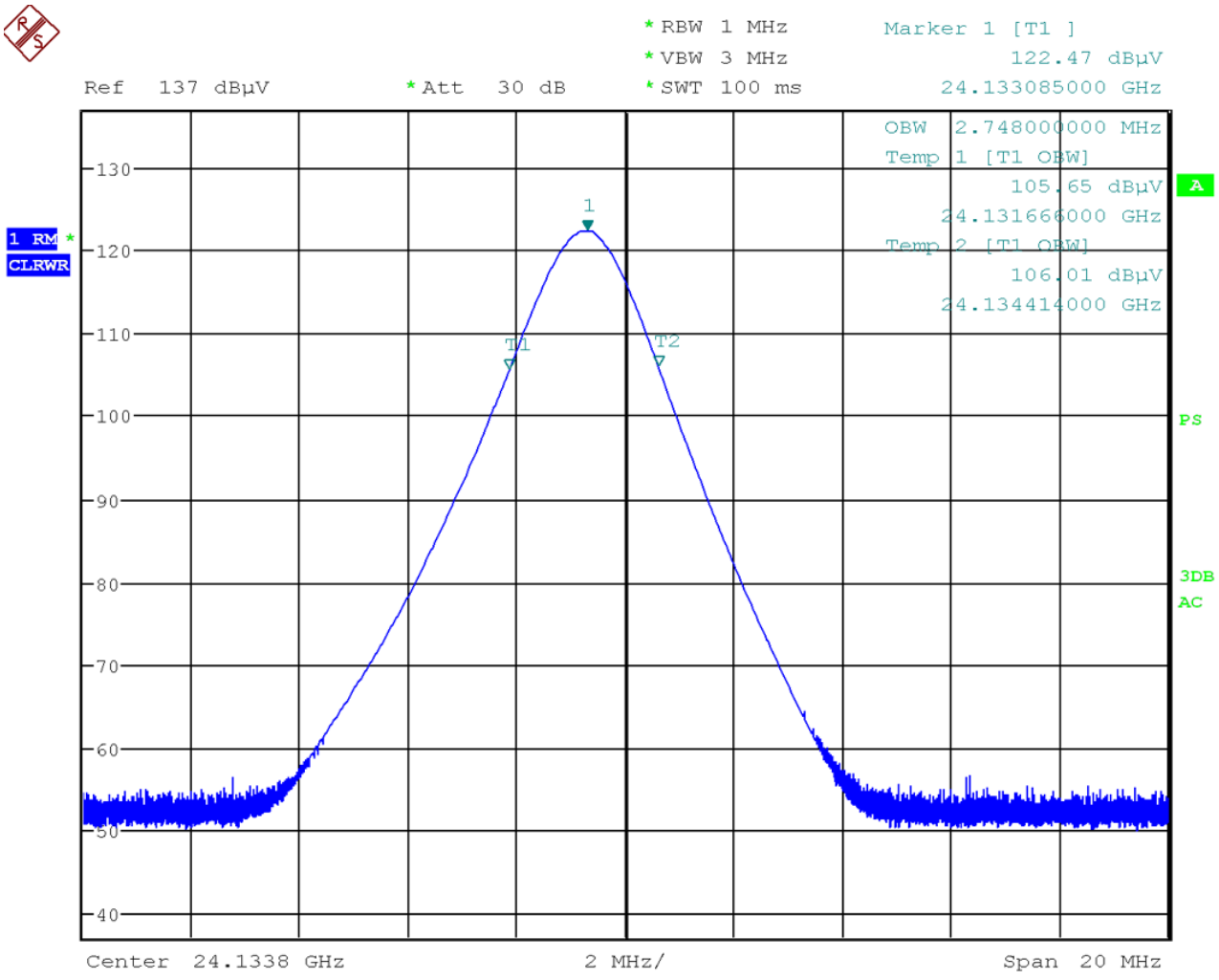
Ambient Temperature	28.6 °C
Relative Humidity	47.2 %
ATM Pressure	100.2 kPa

2.3.7 Additional Observations

The EUT behaves like a CW signal. The verification therefore is performed using worst case RBW of 1MHz.

2.3.8 Test Results

See attached test plot. For reference only.


* RBW 1 MHz
* VBW 3 MHz
* SWT 100 ms
Marker 1 [T1]
122.47 dBµV
24.133085000 GHz
Ref 137 dBµV
* Att 30 dB
OBW 2.748000000 MHz
Temp 1 [T1 OBW]
105.65 dBµV
24.131666000 GHz
Temp 2 [T1 OBW]
106.01 dBµV
24.134414000 GHz
1 RM *
CLRWR
A
PS
3DB
AC
130
120
110
100
90
80
70
60
50
40
T1
T2
Center 24.1338 GHz
2 MHz/
Span 20 MHz

99% OBW

SECTION 3

TEST EQUIPMENT USED

3.1 TEST EQUIPMENT USED

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

ID Number (SDGE/SDRB)	Test Equipment	Type	Serial Number	Manufacturer	Cal Date	Cal Due Date
Radiated Emission						
1049	EMI Test Receiver	ESU40	100133	Rohde & Schwarz	08/02/21	08/02/22
7611	Signal/Spectrum Analyzer	FSW26	102017	Rohde & Schwarz	02/09/22	02/09/23
1003	Signal Generator	SMR40	100443	Rohde & Schwarz	11/17/21	11/17/22
1002	Bilog Antenna	3142C	0058717	EMCO	10/21/21	10/21/23
7631	Double-ridged waveguide horn	3117	00205418	ETS-Lindgren	09/16/20	09/16/22
46797	Preamplifier	PA-122	181925	Com Power	10/11/21	10/11/22
6628	Loop Antenna	HFH2-Z2335.4711.52	FNr.800.458/25	Rohde & Schwarz	06/23/22	06/23/24
9001	Horn antenna (18-26.5GHz)	HO42S	101	Custom Microwave	09/23/23	09/23/23
9003	Horn antenna (26-40 GHz)	HO28S	102	Custom Microwaves	09/23/23	09/23/23
40815	Pre-amplifier (18-40 GHz)	19D18	15G27	Spacek Labs	10/11/21	10/11/22
7637	Harmonics mixer (40-60 GHz)	FS-Z60	100009	Rhode & Schwarz	07/29/20	07/29/23
7636	Harmonics mixer (60-90 GHz)	FS-Z90	100092	Rhode & Schwarz	07/29/20	07/29/23
51288	Harmonics mixer (50-75 GHz)	FS-Z75	102099	Rohde & Schwarz	03/11/21	07/29/23
7633	Harmonics mixer (75-110 GHz)	HM-110-7	101000	Radiometer Physics	02/22/21	07/29/23
8908	Pre-amplifier (40-60 GHz)	SBL-4036033080-1919-E1	12020-01	Sage Millimeter, Inc.	07/07/21	07/29/23
8892	Pre-amplifier (50-75 GHz)	SBL-5037533050-1515-E1	12020-01	Sage Millimeter, Inc.	07/07/21	07/29/23
8912	Pre-amplifier (75-110 GHz)	FLNA-10-0005	FTL17328	Farran Technology Ltd.	07/07/21	07/29/23
9003	Horn antenna (40-60 GHz)	HO19R	103	Custom Microwaves	Verified by 7611 and corresponding direct reading attenuator/active multiplier combination	
9004	Horn antenna (50-75 GHz)	HO15R	104	Custom Microwaves		
7628	Horn antenna (75-110 GHz)	SAR-2309-10-S2	13481-01	Sage Millimeter, Inc.		
8872	Direct Reading Attenuator (40-60	STA-60-19-D1	11875-01	Sage Millimeter, Inc.	Verified by 7611 and corresponding antenna/mixer combination	
8860	Direct Reading Attenuator (50-75	STA-60-15-D1	11466-01	Sage Millimeter, Inc.		
8861	Direct Reading Attenuator (75-110	STA-60-10-D1	11466-01	Sage Millimeter, Inc.		
8919	Direct Reading Attenuator (90-140	STA-60-08-D1	12605-01	Sage Millimeter, Inc.		
8873	Active Multiplier (40-60 GHz)	AMC-19-RFH00	124	Millitech, Inc.		

ID Number (SDGE/SDRB)	Test Equipment	Type	Serial Number	Manufacturer	Cal Date	Cal Due Date
8914	Active Multiplier (50-75 GHz)	AMC-15-RFH00	283	Millitech, Inc.	Verified by 7611 and corresponding antenna/mixer combination	
8915	Active Multiplier (75-110 GHz)	AMC-10-RFH00	606	Millitech, Inc.		
8920	Active Multiplier (90-140 GHz)	AMC-08-RFH00	58	Millitech, Inc.		
Miscellaneous						
43003	True RMS Multimeter	85 III	69880143	Fluke	11/19/21	11/19/22
7619	Temp/Humidity Sensor	iBTHX-W	15050268	Omega	03/09/21	03/09/22
-	Test Software	EMC32	V10.50.40	Rhode & Schwarz	N/A	

3.2 Measurement Uncertainty

Calculation of Measurement Uncertainty per CISPR 16-4-2:2011 with Corr. 1

3.2.1 Radiated Emission Measurements (Below 30MHz)

	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	Attenuation: antenna-receiver	0.20	dB	Normal, k=2	2.000	0.10	0.01
3	Antenna factor AF	0.44	dB	Normal, k=2	2.000	0.22	0.05
4	Receiver sinewave accuracy	0.15	dB	Normal, k=2	2.000	0.08	0.01
5	Receiver pulse amplitude	1.50	dB	Rectangular	1.732	0.87	0.75
6	Receiver pulse repetition rate	1.50	dB	Rectangular	1.732	0.87	0.75
7	Noise floor proximity	0.50	dB	Rectangular	1.732	0.29	0.08
8	Mismatch: antenna-receiver	0.95	dB	U-shaped	1.414	0.67	0.45
9	AF frequency interpolation	0.30	dB	Rectangular	1.732	0.17	0.03
10	AF height deviations	0.10	dB	Rectangular	1.732	0.06	0.00
11	Directivity difference at 10 m	3.12	dB	Rectangular	1.732	1.80	3.24
12	Phase center location at 10 m	1.00	dB	Rectangular	1.732	0.58	0.33
13	Cross-polarisation	0.90	dB	Rectangular	1.732	0.52	0.27
14	Balance	0.00	dB	Rectangular	1.732	0.00	0.00
15	Site imperfections	0.00	dB	Triangular	2.449	0.00	0.00
16	Separation distance at 10 m	0.30	dB	Rectangular	1.732	0.17	0.03
17	Effect of setup table material	0.00	dB	Rectangular	1.732	0.00	0.00
18	Table height at 10 m	0.10	dB	Normal, k=2	2.000	0.05	0.00
19	Near-field effects	0.00	dB	Triangular	2.449	0.00	0.00
20	Effect of ambient noise on OATS	0.00	dB				0.00
	Combined standard uncertainty			Normal	2.45	dB	
	Expanded uncertainty			**Normal, k=2**	**4.91**	**dB**	

3.2.2 Radiated Measurements (30MHz to 1GHz)

	Input Quantity (Contribution) X_i	Value		Prob. Dist.	Divisor	$u_i(x)$	$u_i(x)^2$
1	Receiver reading	0.10	dB	Normal, k=1	1.000	0.10	0.01
2	Attenuation: antenna-receiver	0.20	dB	Normal, k=2	2.000	0.10	0.01
3	Antenna factor AF	0.58	dB	Normal, k=2	2.000	0.29	0.08
4	Receiver sinewave accuracy	0.15	dB	Normal, k=2	2.000	0.08	0.01
5	Receiver pulse amplitude	1.50	dB	Rectangular	1.732	0.87	0.75
6	Receiver pulse repetition rate	1.50	dB	Rectangular	1.732	0.87	0.75
7	Noise floor proximity	0.50	dB	Rectangular	1.732	0.29	0.08
8	Mismatch: antenna-receiver	0.95	dB	U-shaped	1.414	0.67	0.45
9	AF frequency interpolation	0.30	dB	Rectangular	1.732	0.17	0.03
10	AF height deviations	0.10	dB	Rectangular	1.732	0.06	0.00
11	Directivity difference at 3 m	3.12	dB	Rectangular	1.732	1.80	3.24
12	Phase center location at 3 m	1.00	dB	Rectangular	1.732	0.58	0.33
13	Cross-polarisation	0.90	dB	Rectangular	1.732	0.52	0.27
14	Balance	0.00	dB	Rectangular	1.732	0.00	0.00
15	Site imperfections	3.99	dB	Triangular	2.449	1.63	2.65
16	Separation distance at 3 m	0.30	dB	Rectangular	1.732	0.17	0.03
17	Effect of setup table material	0.57	dB	Rectangular	1.732	0.33	0.11
18	Table height at 3 m	0.10	dB	Normal, k=2	2.000	0.05	0.00

19	Near-field effects	0.00	dB	Triangular	2.449	0.00	0.00
20	Effect of ambient noise on OATS	0.00	dB				0.00
	Combined standard uncertainty			Normal	2.97	dB	
	Expanded uncertainty			Normal, k=2	5.94	dB	

3.2.3 Radiated Measurements (Below 1GHz)

	Input Quantity (Contribution) X_i	Value		Prob. Dist.	Divisor	$u_i(x)$	$u_i(x)^2$
1	Receiver reading	0.10	dB	Normal, k=1	1.000	0.10	0.01
2	Attenuation: antenna-receiver	0.20	dB	Normal, k=2	2.000	0.10	0.01
3	Antenna factor AF	0.75	dB	Normal, k=2	2.000	0.38	0.14
4	Receiver sinewave accuracy	0.45	dB	Normal, k=2	2.000	0.23	0.05
5	Receiver pulse amplitude	1.50	dB	Rectangular	1.732	0.87	0.75
6	Receiver pulse repetition rate	1.50	dB	Rectangular	1.732	0.87	0.75
7	Noise floor proximity	0.50	dB	Rectangular	1.732	0.29	0.08
8	Mismatch: antenna-receiver	0.95	dB	U-shaped	1.414	0.67	0.45
9	AF frequency interpolation	0.30	dB	Rectangular	1.732	0.17	0.03
10	AF height deviations	0.10	dB	Rectangular	1.732	0.06	0.00
11	Directivity difference at 3 m	3.12	dB	Rectangular	1.732	1.80	3.24
12	Phase center location at 3 m	1.00	dB	Rectangular	1.732	0.58	0.33
13	Cross-polarisation	0.90	dB	Rectangular	1.732	0.52	0.27
14	Balance	0.00	dB	Rectangular	1.732	0.00	0.00
15	Site imperfections	3.76	dB	Triangular	2.449	1.54	2.36
16	Separation distance at 3 m	0.30	dB	Rectangular	1.732	0.17	0.03
17	Effect of setup table material	0.77	dB	Rectangular	1.732	0.44	0.20
18	Table height at 3 m	0.10	dB	Normal, k=2	2.000	0.05	0.00
19	Near-field effects	0.00	dB	Triangular	2.449	0.00	0.00
20	Effect of ambient noise on OATS	0.00	dB				0.00
	Combined standard uncertainty			Normal	2.95	dB	
	Expanded uncertainty			**Normal, k=2**	**5.90**	**dB**	

3.2.4 Radiated Emission Measurements (Above 1GHz)

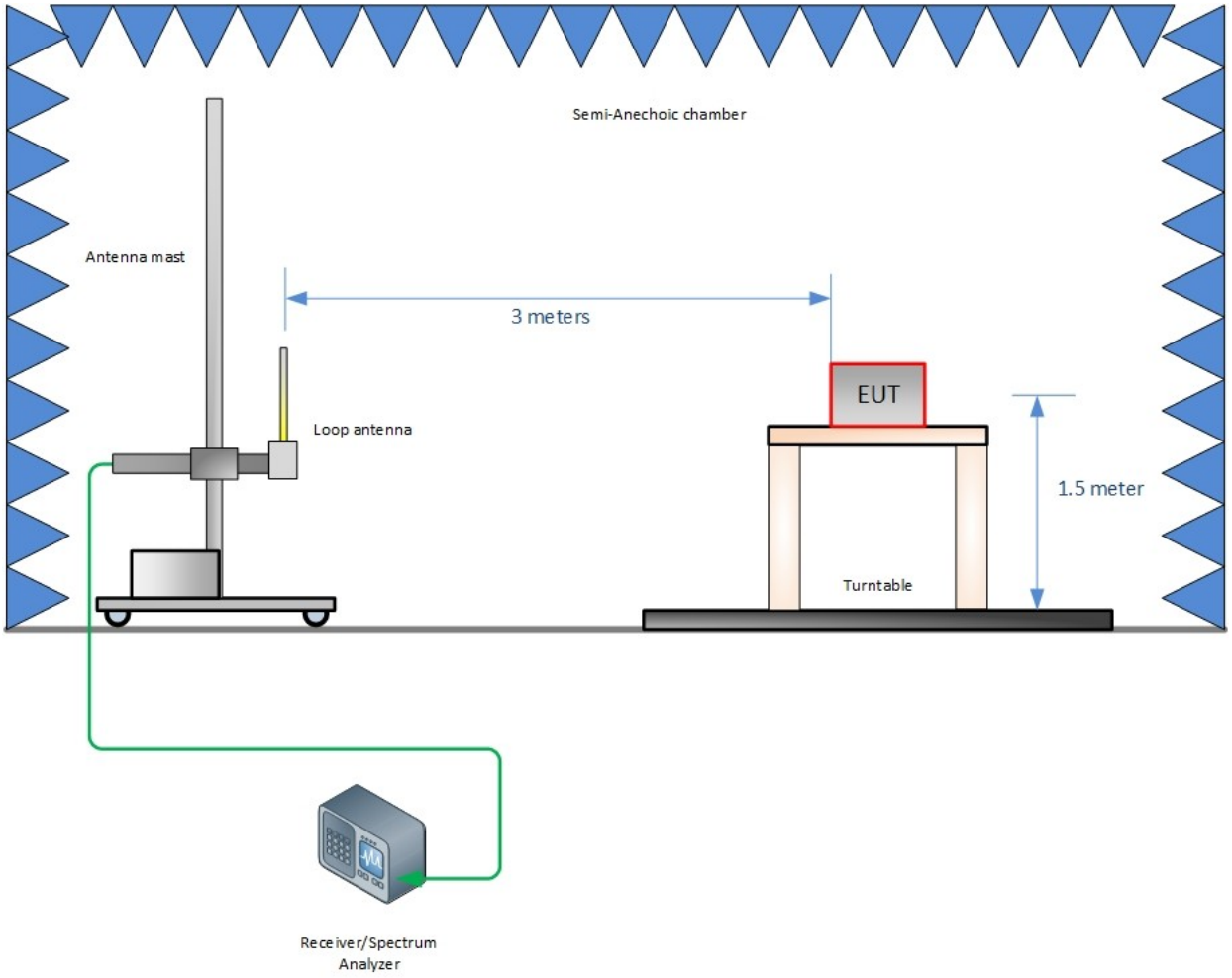
	Input Quantity (Contribution) X_i	Value	Prob. Dist.	Divisor	$u_i(x)$	$u_i(x)^2$
1	Receiver reading	0.10 dB	Normal, k=1	1.000	0.10	0.01
2	Attenuation: antenna-receiver	0.20 dB	Normal, k=2	2.000	0.10	0.01
3	Antenna factor AF	0.75 dB	Normal, k=2	2.000	0.38	0.14
4	Receiver sinewave accuracy	0.45 dB	Normal, k=2	2.000	0.23	0.05
5	Receiver pulse amplitude	1.50 dB	Rectangular	1.732	0.87	0.75
6	Receiver pulse repetition rate	1.50 dB	Rectangular	1.732	0.87	0.75
7	Noise floor proximity	0.50 dB	Rectangular	1.732	0.29	0.08
8	Mismatch: antenna-receiver	0.95 dB	U-shaped	1.414	0.67	0.45
9	AF frequency interpolation	0.30 dB	Rectangular	1.732	0.17	0.03
10	AF height deviations	0.10 dB	Rectangular	1.732	0.06	0.00
11	Directivity difference at 3 m	3.12 dB	Rectangular	1.732	1.80	3.24
12	Phase center location at 3 m	1.00 dB	Rectangular	1.732	0.58	0.33
13	Cross-polarisation	0.90 dB	Rectangular	1.732	0.52	0.27
14	Balance	0.00 dB	Rectangular	1.732	0.00	0.00
15	Site imperfections	3.25 dB	Triangular	2.449	1.33	1.76
16	Separation distance at 3 m	0.30 dB	Rectangular	1.732	0.17	0.03
17	Effect of setup table material	0.77 dB	Rectangular	1.732	0.44	0.20
18	Table height at 3 m	0.10 dB	Normal, k=2	2.000	0.05	0.00
19	Near-field effects	0.00 dB	Triangular	2.449	0.00	0.00
20	Effect of ambient noise on OATS	0.00 dB				0.00

Combined standard uncertainty	Normal	2.85 dB
Expanded uncertainty	**Normal, k=2**	**5.70 dB**

SECTION 4

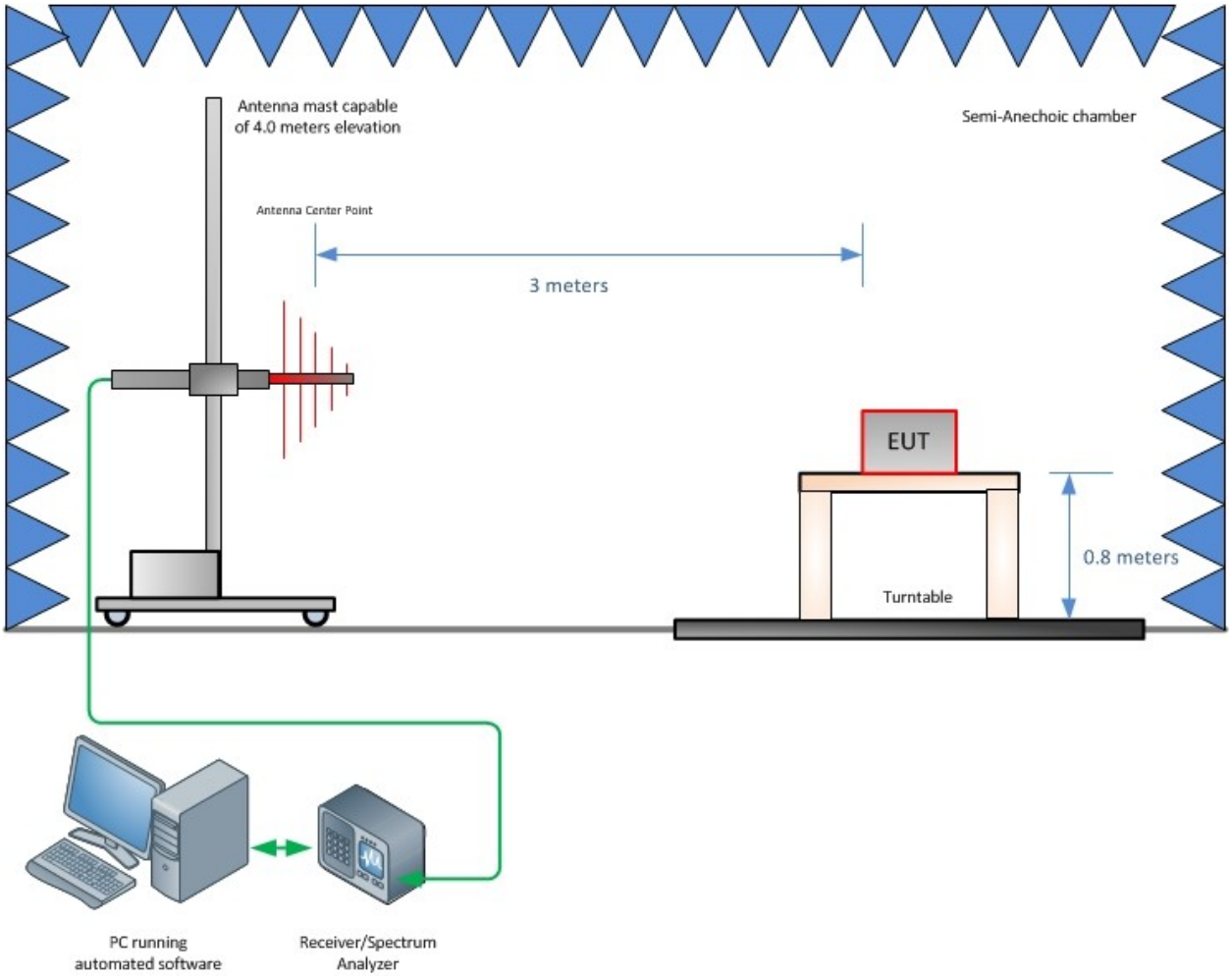
DIAGRAM OF TEST SETUP

4.1 Test Setup Diagram

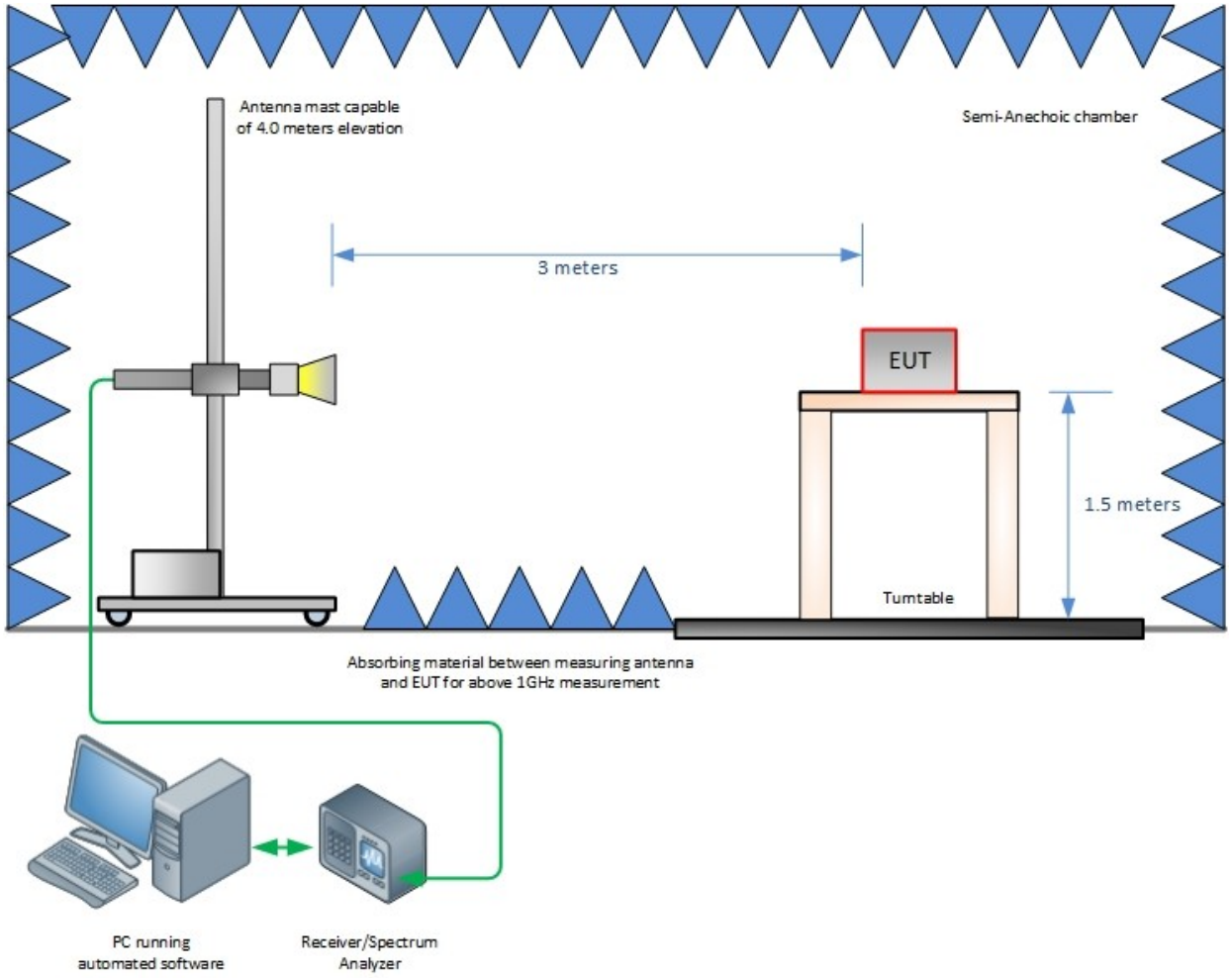


Radiated Emission Test Setup (Below 30MHz)

**Observed margin at this range is >20dB, the use of altenate test site (3 meter SAC) is justified.*



Radiated Emission Test Setup (Below 1GHz)



Radiated Emission Test Setup (Above 1GHz)

SECTION 5

ACCREDITATION, DISCLAIMERS AND COPYRIGHT

5.1 Accreditation, Disclaimers and Copyright

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