FCC Test Report

Airspan Communications Ltd
Radio Unit, Model: Air4G 2700 A4G27-F085-DC1-EXGG

In accordance with FCC 47 CFR Part 2 and FCC 47 CFR Part 22G
(eNB - OFDMA)

Prepared for: Airspan Communications Ltd
Bath Road
Slough, Berkshire
SL1 3UF
UNITED KINGDOM

FCC ID: O2J-2700ATG

COMMERCIAL-IN-CONFIDENCE

Document 75959925-01 Issue 02

SIGNATURE			
NAME	**JOB TITLE**	**RESPONSIBLE FOR**	**ISSUE DATE**
Matthew Russell	Chief Engineer	Authorised Signatory	

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

ENGINEERING STATEMENT
The measurements shown in this report were made in accordance with the procedures described on test pages. All reported testing was carried out on a sample equipment to demonstrate limited compliance with FCC 47 CFR Part 2 and FCC 47 CFR Part 22G. The sample tested was found to comply with the requirements defined in the applied rules.

RESPONSIBLE FOR	NAME	DATE	SIGNATURE
Testing	Neil Rousell	12 January 2024	
	Pier-Angelo Lorusso	13 December 2023	

FCC Accreditation
492497/UK2010 Octagon House, Fareham Test Laboratory

EXECUTIVE SUMMARY
A sample of this product was tested and found to be compliant with FCC 47 CFR Part 2: 2021 and FCC 47 CFR Part 22G: 2022 for the tests detailed in section 1.3.

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Contents

1 Report Summary

1.1 Report Modification Record

Alterations and additions to this report will be issued to the holders of each copy in the form of a complete document.

Issue	Description of Change	Date of Issue
1	First Issue	13-December-2023
2	Frequency stability re-measured to provide increased accuracy ppm value	

Table 1

1.2 Introduction

Applicant	Airspan Communications Ltd
Manufacturer	Airspan Communications Ltd
Model Number(s)	Air4G 2700 A4G27-F085-DC1-EXGG
Serial Number(s)	FD5879014AC
Hardware Version(s)	EVT2
Software Version(s)	ATGRU-94.4.3.0_GR_Dpd_AdiV5.1CFRV4.pak
Number of Samples Tested	1
Test Specification/Issue/Date	FCC 47 CFR Part 2: 2021 FCC 47 CFR Part 22G: 2022
Order Number	CG231817-00
Date	24-November-2023
Date of Receipt of EUT	27-November-2023
Start of Test	24-November-2023
Finish of Test	12-January-2024
Name of Engineer(s)	Neil Rousell and Pier-Angelo Lorusso
Related Document(s)	ANSI C63.26 (2015) FCC DA 22-657

1.3 Brief Summary of Results

A brief summary of the tests carried out in accordance with FCC 47 CFR Part 2 and FCC 47 CFR Part 22G is shown below.

Section	Specification Clause		Test Description	Result	Comments/Base Standard
	Part 2	Part 22G			
Configuration and Mode: Transmit					
2.1	2.1055	22.863	Frequency Stability	Pass	
2.2	2.1046	22.867	Effective Radiated Power	Pass	ANSI C63.26 (2015) FCC DA 22-657
2.3	2.1049	-	Occupied Bandwidth	Satisfactory	ANSI C63.26 (2015)
2.4	2.1051	22.861	Spurious Emission at Antenna Terminals	Pass	ANSI C63.26 (2015) FCC DA 22-657
2.5	2.1053	22.861	Radiated Spurious Emissions	Pass	ANSI C63.26 (2015)

Table 2

1.4 Application Form

Equipment Description

Technical Description: *(Please provide a brief description of the intended use of the equipment including the technologies the product supports)*	Dual Sector Basestation supporting Air to Ground communication to Aircraft operating in licensed spectrum with 47 CFR Subpart G rules.			
Manufacturer:	Airspan			
Model:	Air4G 2700 A4G27-F085-DC1-EXGG			
Part Number:	FD58790149AC			
Hardware Version:	EVT2			
Software Version:	ATGRU-94.4.3.0_GR_Dpd_AdiV5.1CFRV4.pak			
FCC ID of the product under test – see guidance here	O2J-2700ATG			
IC ID of the product under test – see guidance here				
Device Category	Mobile ☐	Portable ☐	Fixed ☒	
Equipment is fitted with an Audio Low Pass Filter		Yes ☐	No ☒	

Table 3

Intentional Radiators

Technology	OFDMA					
Frequency Range (MHz to MHz)	850 MHz	850 MHz				
Conducted Declared Output Power (dBm)	47dBm					
Antenna Gain (dBi)	Max 16.5 dBi	With power backup				
Supported Bandwidth(s) (MHz) (e.g. 1 MHz, 20 MHz, 40 MHz)	1.615 MHz					
Modulation Scheme(s) (e.g. GFSK, QPSK etc)	QPSK	16 QAM	64 QAM			
ITU Emission Designator (see guidance here) (not mandatory for Part 15 devices)	1M61W7D					
Bottom Frequency (MHz)	-					
Middle Frequency (MHz)	850 MHz					
Top Frequency (MHz)	-					

Table 4

Un-intentional Radiators

Highest frequency generated or used in the device or on which the device operates or tunes	895 MHz
Lowest frequency generated or used in the device or on which the device operates or tunes	25 MHz
Class A Digital Device (Use in commercial, industrial or business environment) ☒ Class B Digital Device (Use in residential environment only) ☐	

Table 5

AC Power Source

AC supply frequency:		Hz
Voltage		V
Max current:		A
Single Phase ☐ Three Phase ☒		

Table 6

DC Power Source

Nominal voltage:	48	V
Extreme upper voltage:	56	V
Extreme lower voltage:	40	V
Max current:	24.5A	A

Table 7

Battery Power Source

Voltage:		V
End-point voltage:		V *(Point at which the battery will terminate)*
Alkaline ☐ Leclanche ☐ Lithium ☐ Nickel Cadmium ☐ Lead Acid* ☐ **(Vehicle regulated)*		
Other ☐ Please detail:		

Table 8

Charging

Can the EUT transmit whilst being charged	Yes ☐ No ☐

Table 9

Temperature

Minimum temperature:	-5	°C
Maximum temperature:	40	°C

Table 10

Cable Loss

Adapter Cable Loss (Conducted sample)		dB

Table 11

Antenna Characteristics

Antenna connector ☒ 4.3/10			State impedance	50	Ohm
Temporary antenna connector ☐			State impedance		Ohm
Integral antenna ☐	Type:		Gain		dBi
External antenna ☒	Type:		Gain	up to 16.5	dBi
For external antenna only: Standard Antenna Jack ☐ If yes, describe how user is prohibited from changing antenna (if not professional installed): Equipment is only ever professionally installed ☒ Non-standard Antenna Jack ☐ All part 15 applications will need to show how the antenna gain was derived either from a manufacturer data sheet or a measurement. Where the gain of the antenna is inherently accounted for as a result of the measurement, such as field strength measurements on a part 15.249 or 15.231 device, so the gain does not necessarily need to be verified. However, enough information regarding the construction of the antenna shall be provided. Such information maybe photographs, length of wire antenna etc.					

Table 12

Ancillaries (if applicable)

Manufacturer:		Part Number:	
Model:		Country of Origin:	

Table 13

I hereby declare that the information supplied is correct and complete.

Name: Mike Livingstone
Position held: SVP Engineering
Date: 13 December 2023

1.5 Product Information

1.5.1 Technical Description

Dual Sector Basestation supporting Air to Ground communication to Aircraft operating in licensed spectrum with 47 CFR Subpart G rules.

1.5.2 System Architecture

The diagram below demonstrated the system architecture of the eNB radio interface:

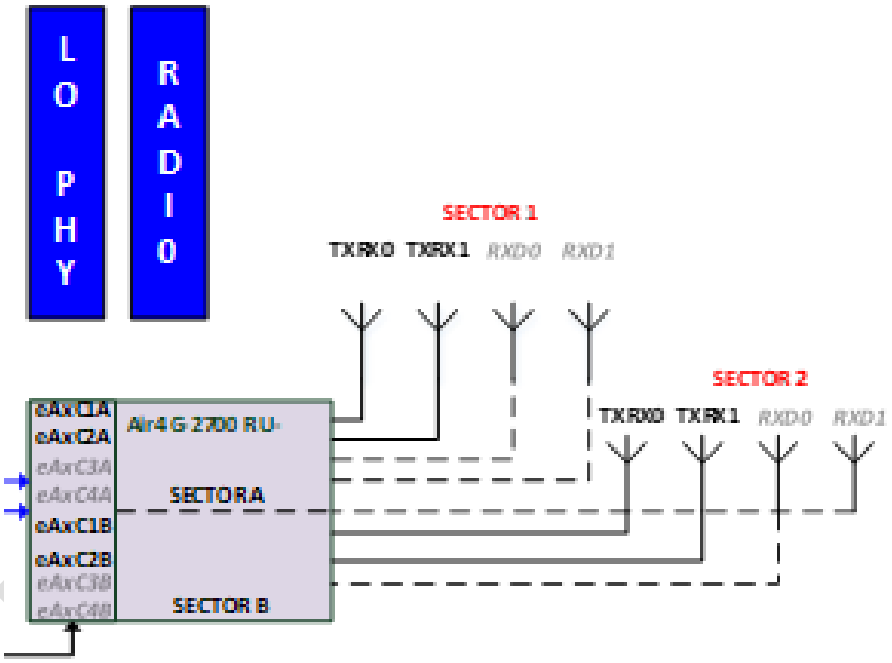

Figure 1

The applicant informed the test lab that Sectors 1 and 2 are connected to orthogonally polarised antennas, therefore a maximum of 2x2 MIMO has been considered for conducted measurements and that sectors A and B are electrically identical, therefore conducted tests were limited to Sector A only.

1.6 Deviations from the Standard

No deviations from the applicable test standard were made during testing.

1.7 EUT Modification Record

The table below details modifications made to the EUT during the test programme.

The modifications incorporated during each test are recorded on the appropriate test pages.

Modification State	Description of Modification still fitted to EUT	Modification Fitted By	Date Modification Fitted
Model: Air4G 2700 A4G27-F085-DC1-EXGG, Serial Number: FD5879014AC			
0	As supplied by the customer	Not Applicable	Not Applicable
1	Power amplifiers changed	Manufacturer	29-November 2023

Table 14

1.8 Test Location

TÜV SÜD conducted the following tests at our Octagon House Test Laboratory.

Test Name	Name of Engineer(s)	Accreditation
Configuration and Mode: Transmit		
Frequency Stability	Neil Rousell	UKAS
Effective Radiated Power	Neil Rousell	UKAS
Occupied Bandwidth	Neil Rousell	UKAS
Spurious Emission at Antenna Terminals	Neil Rousell	UKAS
Radiated Spurious Emissions	Pier-Angelo Lorusso	UKAS

Table 15

Office Address:

TÜV SÜD
Octagon House
Concorde Way
Fareham
Hampshire
PO15 5RL
United Kingdom

2 Test Details

2.1 Frequency Stability

2.1.1 Specification Reference

FCC 47 CFR Part 2, Clause 2.1055
FCC 47 CFR Part 22G, Clause 22.863

2.1.2 Equipment Under Test and Modification State

Air4G 2700 A4G27-F085-DC1-EXGG, S/N: FD5879014AC - Modification State 0, 1

2.1.3 Date of Test

27-November-2023 to 28-November-2023 and 11-January-2024 to 12-January-2024

2.1.4 Test Method

The equipment under test (EUT) was placed within a climatic chamber and the temperature was lowered to -30 °C and allowed to stabilise. The EUT was configured to transmit a modulated carrier and using the -26 dB bandwidth function the lower and upper points of the bandwidth were recorded to ensure the emission remained with the authorised frequency range. The temperature was then increased by 10 degrees and the measurement repeated until the upper temperature range of +50 °C.

At +20 °C, the voltage was also varied at 85 and 115% of the nominal value declared by the applicant.

In addition, The EUT was configured to transmit an EUTRA 1.4 MHz, 6 RB, 64 QAM carrier and the frequency error determined by using the spectrum analyser LTE FDD mode, EVM conformance measurement. This value was used to determine the ppm error stated.

2.1.5 Environmental Conditions

Ambient Temperature	18.7 - 21.1 °C
Relative Humidity	39.8 - 51.7 %

2.1.6 Test Results

Transmit

Temperature (˚C)	Voltage	F_L (MHz)	F_U (MHz)	Error (ppm)
50 °C	48.0	849.067042	850.933289	0.013
40 °C	48.0	849.101419	850.908983	0.017
30 °C	48.0	849.116483	850.901534	0.018
20 °C	48.0	849.149935	850.852684	0.018
10 °C	48.0	849.153805	850.855104	0.020
0 °C	48.0	849.155178	850.852847	0.021
-10 °C	48.0	849.153150	850.858381	0.023
-20 °C	48.0	849.147185	850.854749	0.021
-30 °C	48.0	849.123384	850.889275	0.022

Table 16 - Frequency Stability Under Temperature Variations

Temperature (˚C)	Voltage	F_L (MHz)	F_U (MHz)	Error (ppm)
20 °C	40.8	849.153601	850.863350	0.018
20 °C	55.2	849.119345	850..880535	0.019

Table 17 - Frequency Stability Under Voltage Variations

FCC 47 CFR Part 22, Limit Clause 22.863

The frequency stability of equipment used under this subpart shall be sufficient to ensure that, after accounting for Doppler frequency shifts, the occupied bandwidth of the fundamental emissions remains within the authorized frequency bands of operation.

2.1.7 Test Location and Test Equipment Used

This test was carried out in RF Laboratory 2.

Instrument	Manufacturer	Type No	TE No	Calibration Period (months)	Calibration Expires
Multimeter	Fluke	75 Mk3	455	12	15-Dec-2023
Multimeter	Fluke	179	4007	12	17-Nov-2024
Network Analyser	Rohde & Schwarz	ZVA 40	3548	12	06-Mar-2024
Calibration Unit	Rohde & Schwarz	ZV-Z54	4368	12	06-Mar-2024
Frequency Standard	Spectracom	SecureSync 1200-0408-0601	4393	6	08-Feb-2024
PXA Signal Analyser	Keysight Technologies	N9030A	4654	12	16-Jan-2024
Hygrometer	Rotronic	HP21	4989	12	21-Jul-2024
Climatic Chamber	Weiss Technik	TempEvent T/180/40/3	5894	12	07-Jul-2024

Figure 2

2.2 Effective Radiated Power

2.2.1 Specification Reference

FCC 47 CFR Part 22G, Clause 22.867
FCC 47 CFR Part 2, Clause 2.1046

2.2.2 Equipment Under Test and Modification State

Air4G 2700 A4G27-F085-DC1-EXGG, S/N: FD5879014AC - Modification State 0

2.2.3 Date of Test

24-November-2023

2.2.4 Test Method

This test was performed in accordance with ANSI C63.26, clause 5.2.4.4.1 (Average).

As per FCC Waiver document DA 22-657 power limits are permitted with the use of average measurements for OFDM modulation.

The conducted output power of the RU is configured at the installation site to maintain the emissions to the licensed limit of 500 W ERP. This is done using the network management tool provided by the applicant. A typical configuration has been tested within this report to demonstrate compliance.

The RU supports independent 60-degree non-overlapping sectors with a maximum of 2x MIMO layers on each sector.

2.2.5 Environmental Conditions

Ambient Temperature	20.7 °C
Relative Humidity	49.2 %

2.2.6 Test Results

Transmit

Frequency (MHz)	Sector A				
	Conducted Power (dBm)		Ant Gain (dBi)	System Loss (dB)	ERP (dBm)
	TxRx0	TxRx1			
850	47.1	47.1	16.5	7.5	56.9

Table 18 - ERP Results, QPSK

Frequency (MHz)	Sector A				
	Conducted Power (dBm)		Ant Gain (dBi)	System Loss (dB)	ERP (dBm)
	TxRx0	TxRx1			
850	47.0	47.1	16.5	7.5	56.9

Table 19 - ERP Results, 16QAM

Frequency (MHz)	Sector A				
	Conducted Power (dBm)		Ant Gain (dBi)	System Loss (dB)	ERP (dBm)
	TxRx0	TxRx1			
850	47.2	47.0	16.5	7.5	57.0

Table 20 - ERP Results, 64QAM

FCC 47 CFR Part 22, Limit Clause 22.867

The effective radiated power (ERP) of ground and airborne stations operating on the frequency ranges listed in 22.857 must not exceed the following limits:

a) The peak ERP of airborne mobile station transmitters must not exceed 12 Watts.
b) The peak ERP of ground station transmitters must not exceed 500 Watts.

Note: As per SA 22-657, the use of maximum average power measurement is permitted to demonstrate compliance with the above limit as an alternative to peak for OFDM based waveforms.

2.2.7 Test Location and Test Equipment Used

This test was carried out in RF Laboratory 2.

Instrument	Manufacturer	Type No	TE No	Calibration Period (months)	Calibration Expires
Multimeter	Fluke	75 Mk3	455	12	15-Dec-2023
Network Analyser	Rohde & Schwarz	ZVA 40	3548	12	06-Mar-2024
Calibration Unit	Rohde & Schwarz	ZV-Z54	4368	12	06-Mar-2024
Frequency Standard	Spectracom	SecureSync 1200-0408-0601	4393	6	08-Feb-2024
PXA Signal Analyser	Keysight Technologies	N9030A	4654	12	16-Jan-2024
Hygrometer	Rotronic	HP21	4989	12	21-Jul-2024

Figure 3

2.3 Occupied Bandwidth

2.3.1 Specification Reference

FCC 47 CFR Part 2, Clause 2.1049

2.3.2 Equipment Under Test and Modification State

Air4G 2700 A4G27-F085-DC1-EXGG, S/N: FD5879014AC - Modification State 0

2.3.3 Date of Test

24-November-2023

2.3.4 Test Method

This test was performed in accordance with ANSI C63.26, clause 5.4.

2.3.5 Environmental Conditions

Ambient Temperature	20.7 °C
Relative Humidity	49.2 %

2.3.6 Test Results

Transmit

Frequency (MHz)	Modulation	99% Occupied Bandwidth (MHz)	26 dB Bandwidth (MHz)
850	QPSK	1.61	1.69
850	16QAM	1.61	1.69
850	64QAM	1.61	1.69

Table 21 - Occupied Bandwidth Results

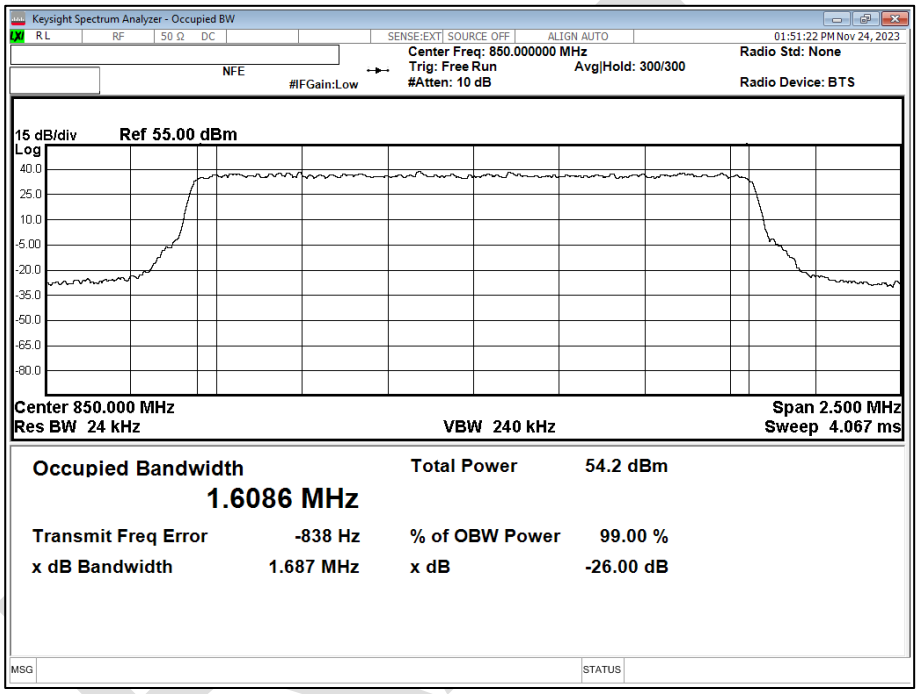

Figure 4 - 850 MHz, QPSK

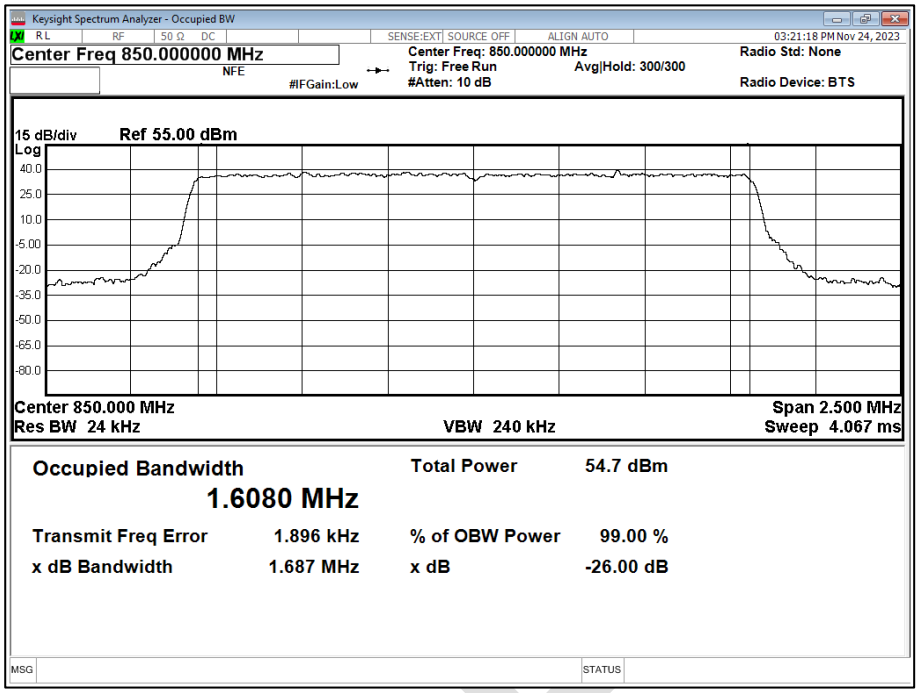

Figure 5 - 850 MHz, 16QAM

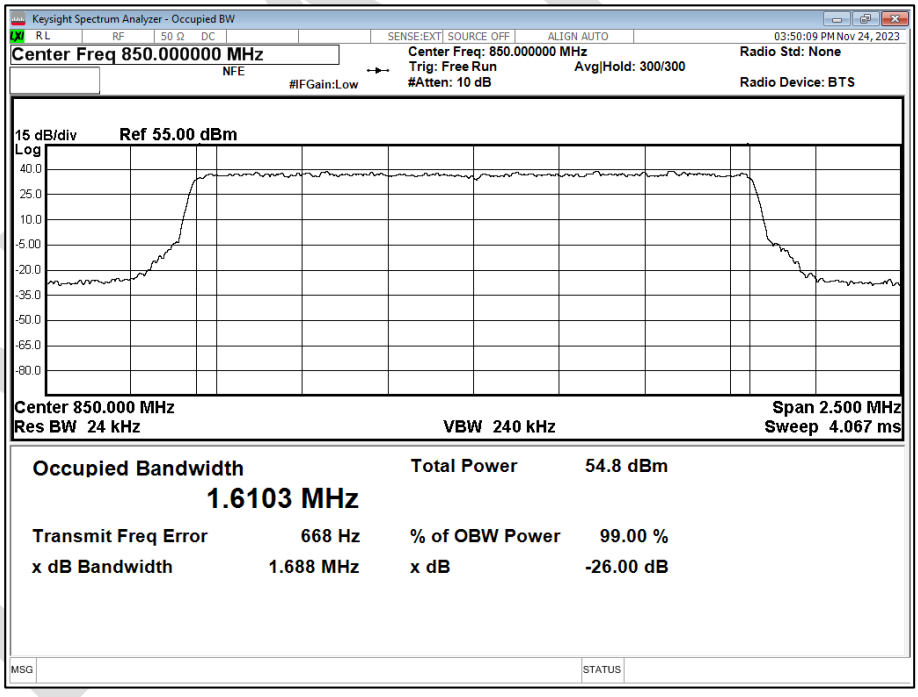

Figure 6 - 850 MHz, 64QAM

FCC 47 CFR Part 2, Limit Clause 2.1049

None stated.

2.3.7 Test Location and Test Equipment Used

This test was carried out in RF Laboratory 2.

Instrument	Manufacturer	Type No	TE No	Calibration Period (months)	Calibration Expires
Multimeter	Fluke	75 Mk3	455	12	15-Dec-2023
Network Analyser	Rohde & Schwarz	ZVA 40	3548	12	06-Mar-2024
Calibration Unit	Rohde & Schwarz	ZV-Z54	4368	12	06-Mar-2024
Frequency Standard	Spectracom	SecureSync 1200-0408-0601	4393	6	08-Feb-2024
PXA Signal Analyser	Keysight Technologies	N9030A	4654	12	16-Jan-2024
Hygrometer	Rotronic	HP21	4989	12	21-Jul-2024

Figure 7

2.4 Spurious Emission at Antenna Terminals

2.4.1 Specification Reference

FCC 47 CFR Part 2, Clause 2.1051
FCC 47 CFR Part 22G, Clause 22.861

2.4.2 Equipment Under Test and Modification State

Air4G 2700 A4G27-F085-DC1-EXGG, S/N: FD5879014AC - Modification State 0

2.4.3 Date of Test

24-November-2023

2.4.4 Test Method

This test was performed in accordance with ANSI C63.26, clause 5.7.

This test was performed on a single sector for both antenna ports as the applicant declared that both sectors are electrically identical. The limit was reduced by 10*Log(N), where N = Number of antenna ports.

10*Log(2) = 3 dB.

2.4.5 Environmental Conditions

Ambient Temperature	20.7 °C
Relative Humidity	49.2 %

2.4.6 Test Results

Transmit

Carrier Frequency (MHz)	Modulation	Band Edge Frequency (MHz)	Result at Band Edge (dBm)	Limit (dBm)	Margin (dB)
850	QPSK	849	-38.8	-16.0	22.8
850	QPSK	851	-39.4	-23.0	16.4
850	16QAM	849	-39.3	-16.0	23.3
850	16QAM	851	-39.4	-23.0	16.4
850	64QAM	849	-37.0	-16.0	21.0
850	64QAM	851	-36.6	-23.0	13.6

Table 22 - Band Edge Results, Sector A (TxRx0)

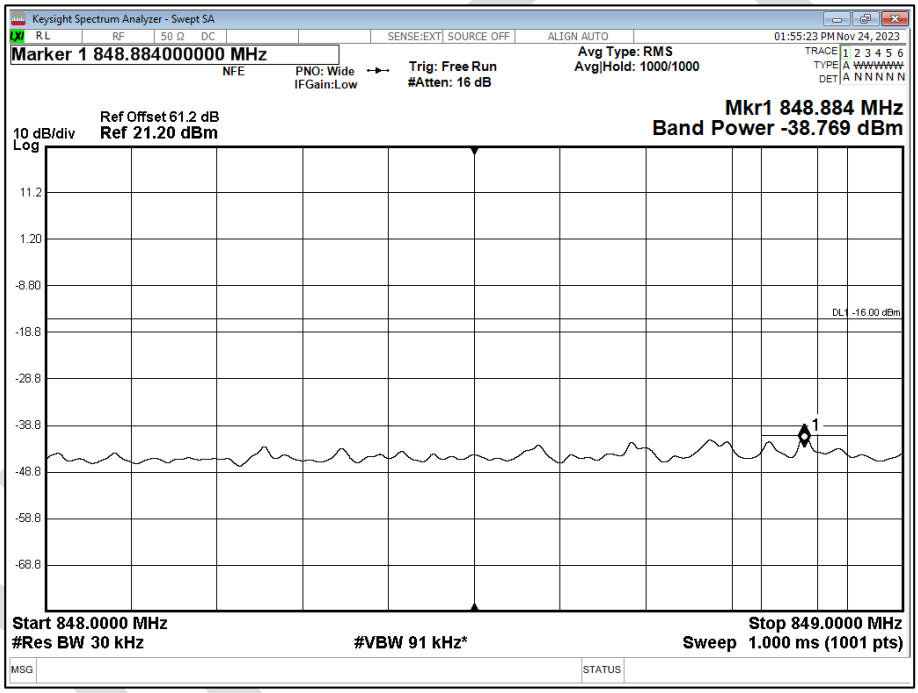

Figure 8 - 850 MHz, QPSK, Band Edge Frequency: 849 MHz. Sector A (TxRx0)

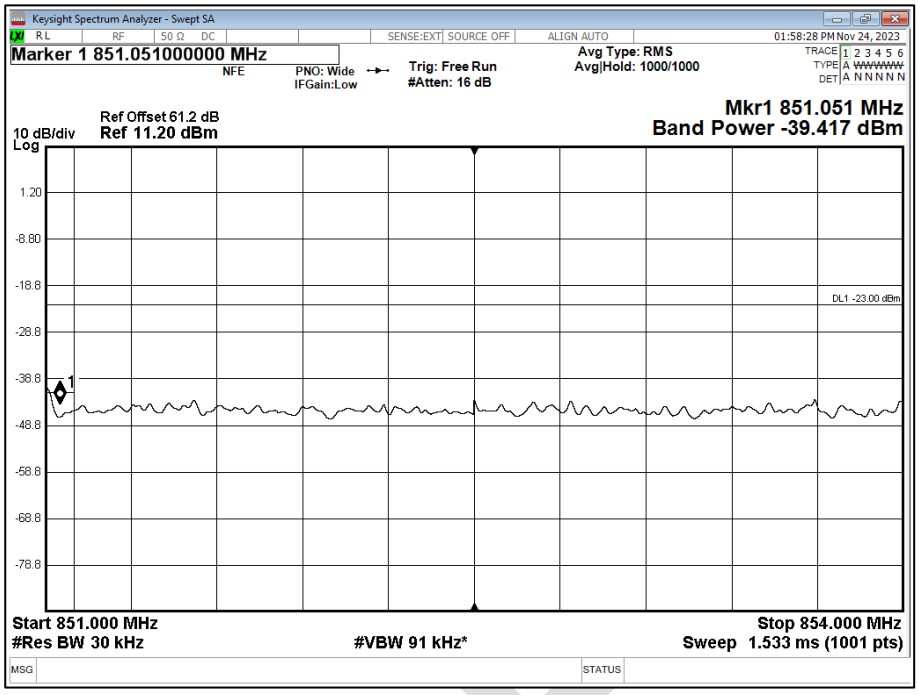

Figure 9 - 850 MHz, QPSK, Band Edge Frequency: 851 MHz. Sector A (TxRx0)

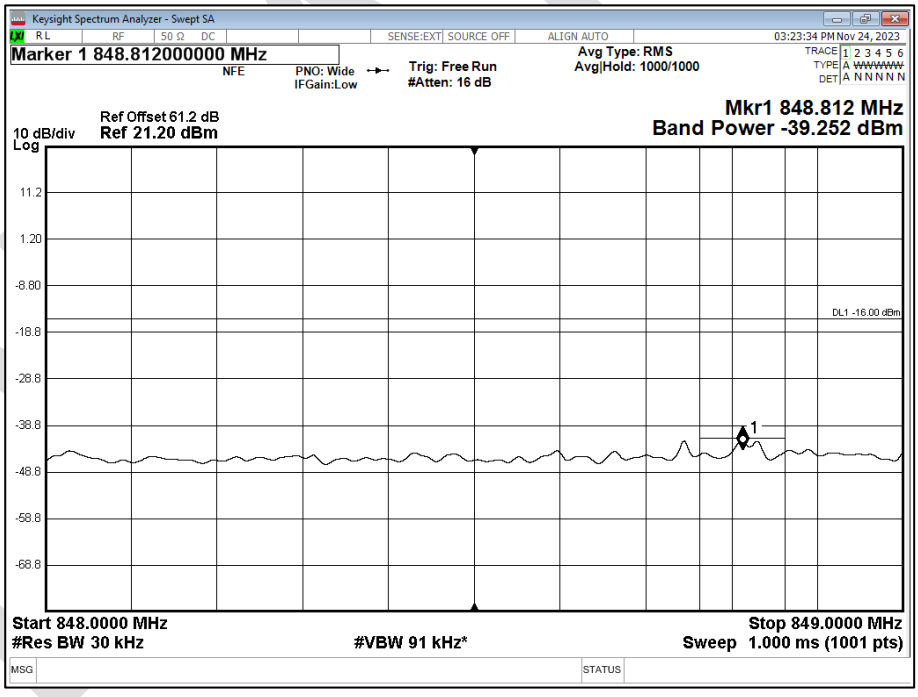

Figure 10 - 850 MHz, 16QAM, Band Edge Frequency: 849 MHz. Sector A (TxRx0)

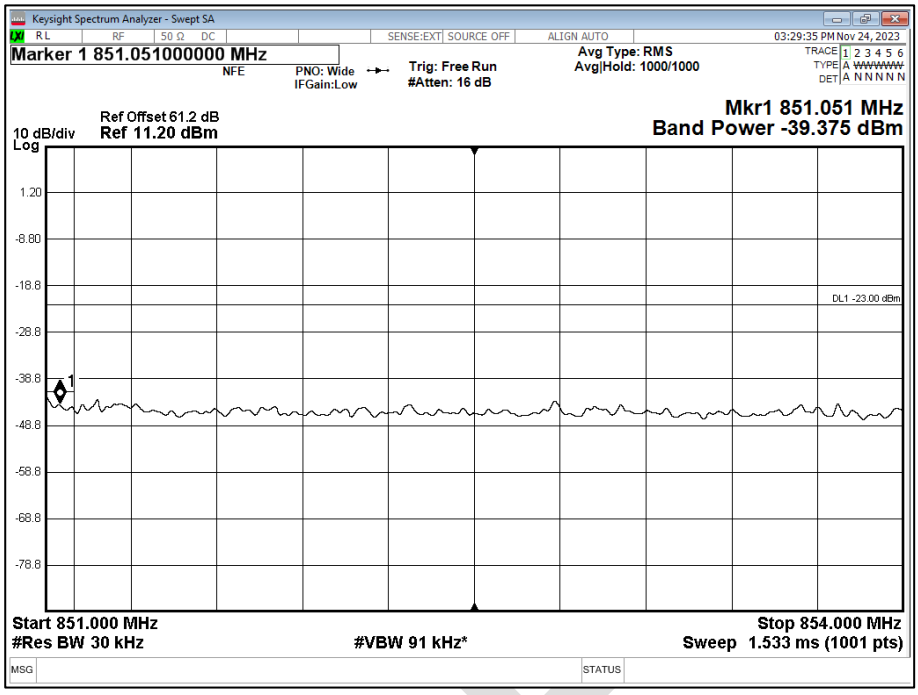

Figure 11 - 850 MHz, 16QAM, Band Edge Frequency: 851 MHz. Sector A (TxRx0)

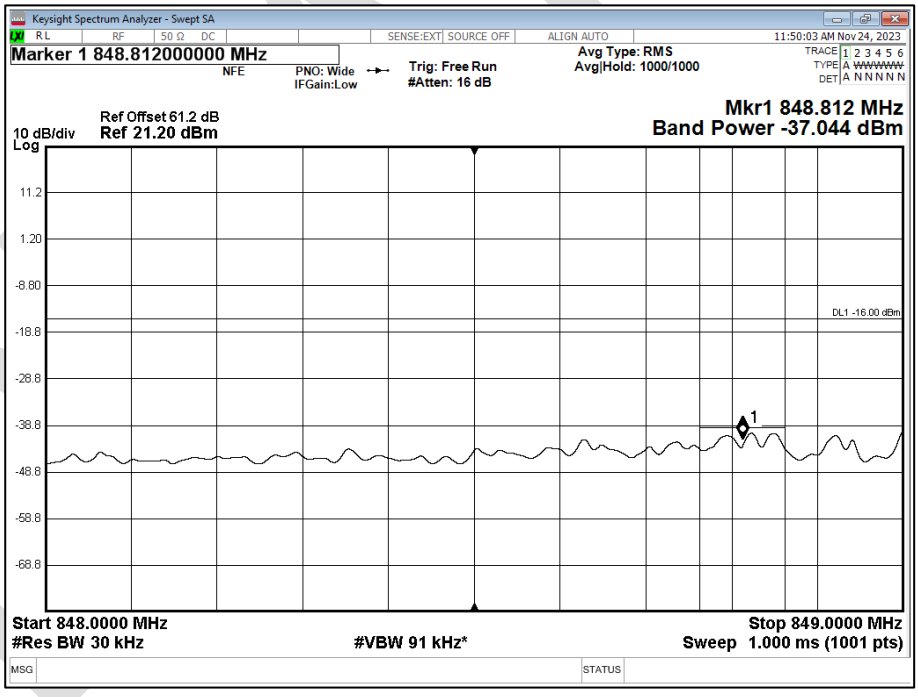

Figure 12 - 850 MHz, 64QAM, Band Edge Frequency: 849 MHz. Sector A (TxRx0)

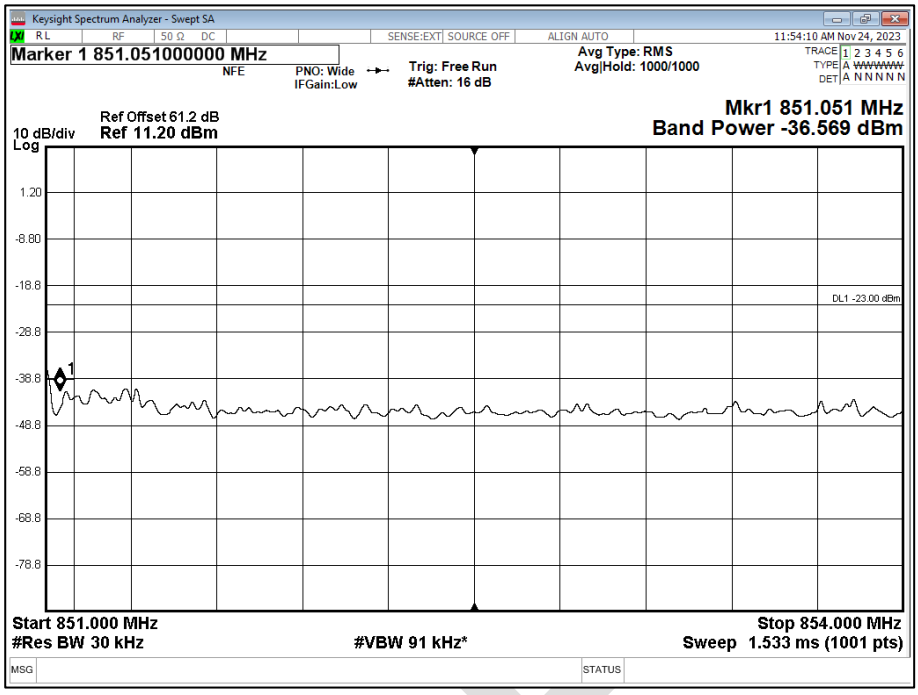

Figure 13 - 850 MHz, 64QAM, Band Edge Frequency: 851 MHz. Sector A (TxRx0)

Carrier Frequency (MHz)	Modulation	Band Edge Frequency (MHz)	Result at Band Edge (dBm)	Limit (dBm)	Margin (dB)
850	QPSK	849	-39.6	-16.0	23.6
850	QPSK	851	-39.7	-23.0	16.7
850	16QAM	849	-40.0	-16.0	24.0
850	16QAM	851	-39.6	-23.0	16.6
850	64QAM	849	-38.3	-16.0	22.3
850	64QAM	851	-36.1	-23.0	13.1

Table 23 - Band Edge Results, Sector A (TxRx1)

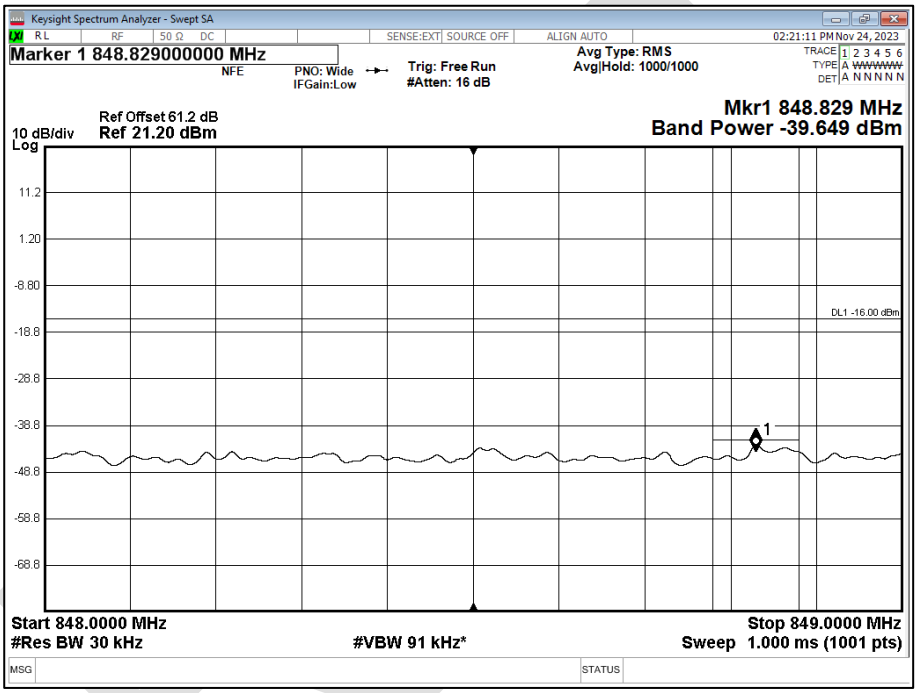

Figure 14 - 850 MHz, QPSK, Band Edge Frequency: 849 MHz. Sector A (TxRx1)

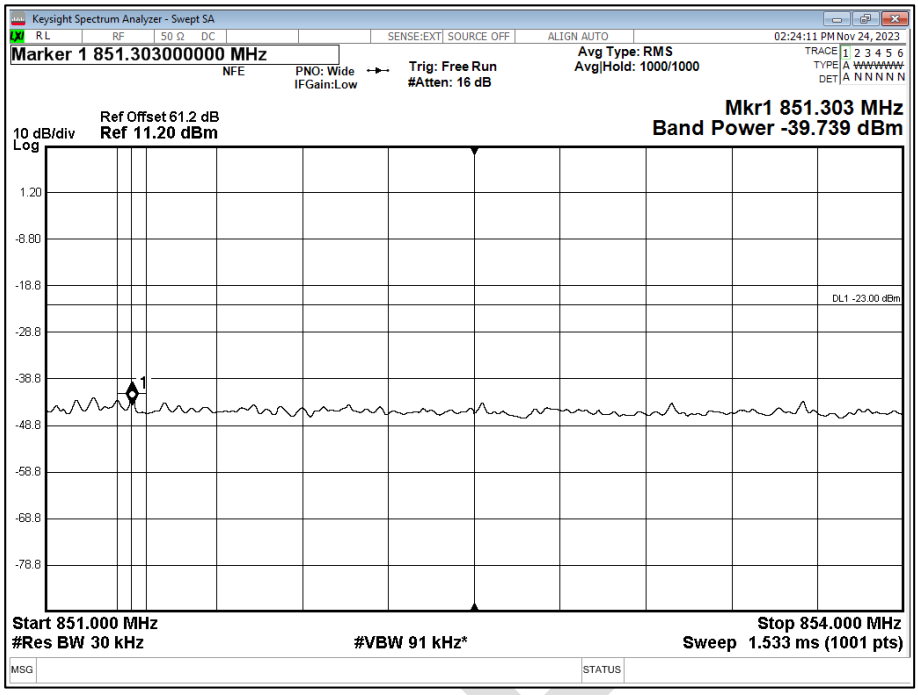

Figure 15 - 850 MHz, QPSK, Band Edge Frequency: 851 MHz. Sector A (TxRx1)

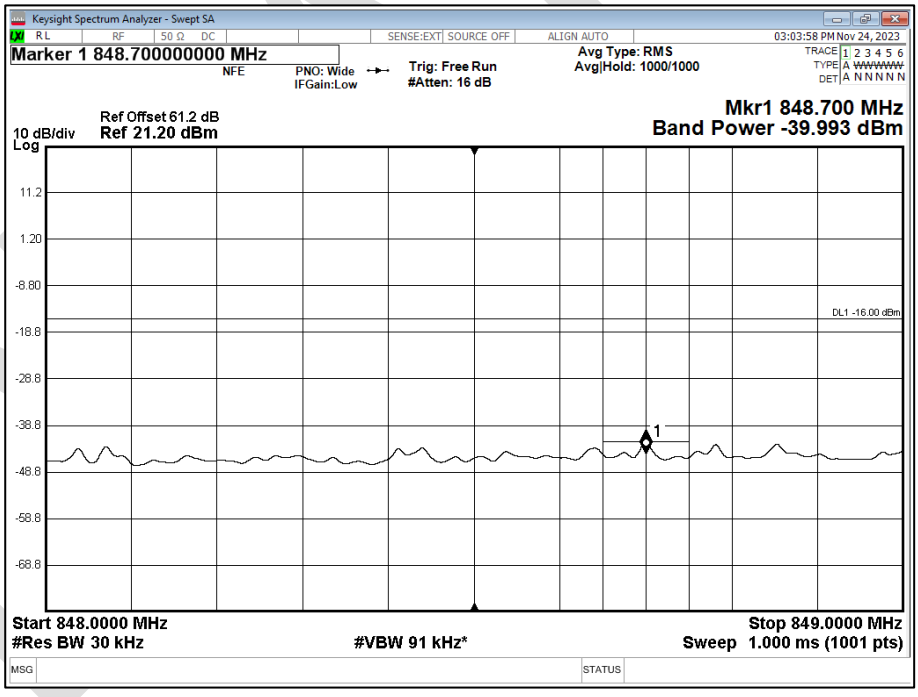

Figure 16 - 850 MHz, 16QAM, Band Edge Frequency: 849 MHz. Sector A (TxRx1)

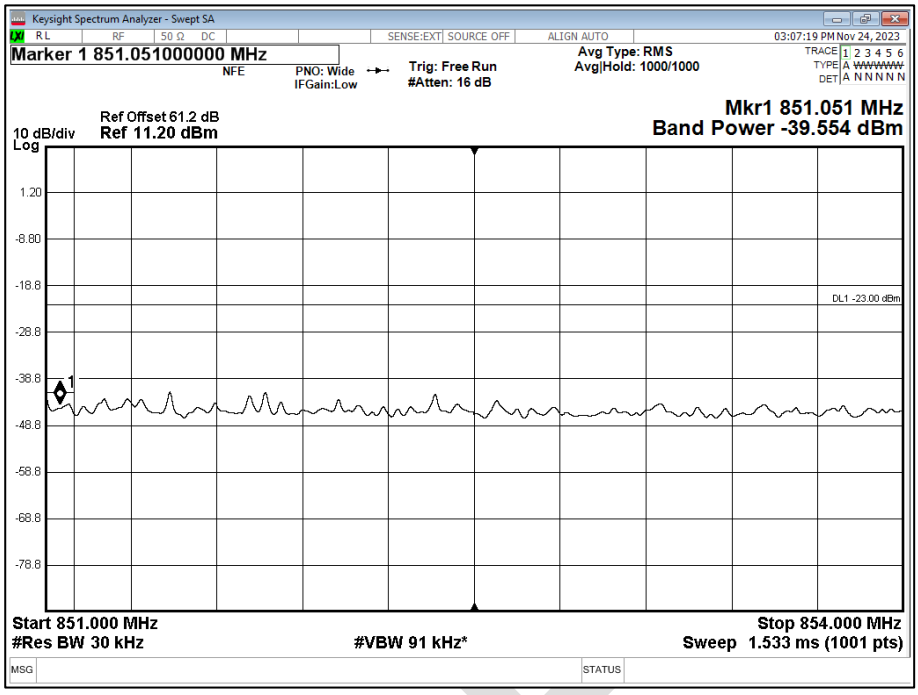

Figure 17 - 850 MHz, 16QAM, Band Edge Frequency: 851 MHz. Sector A (TxRx1)

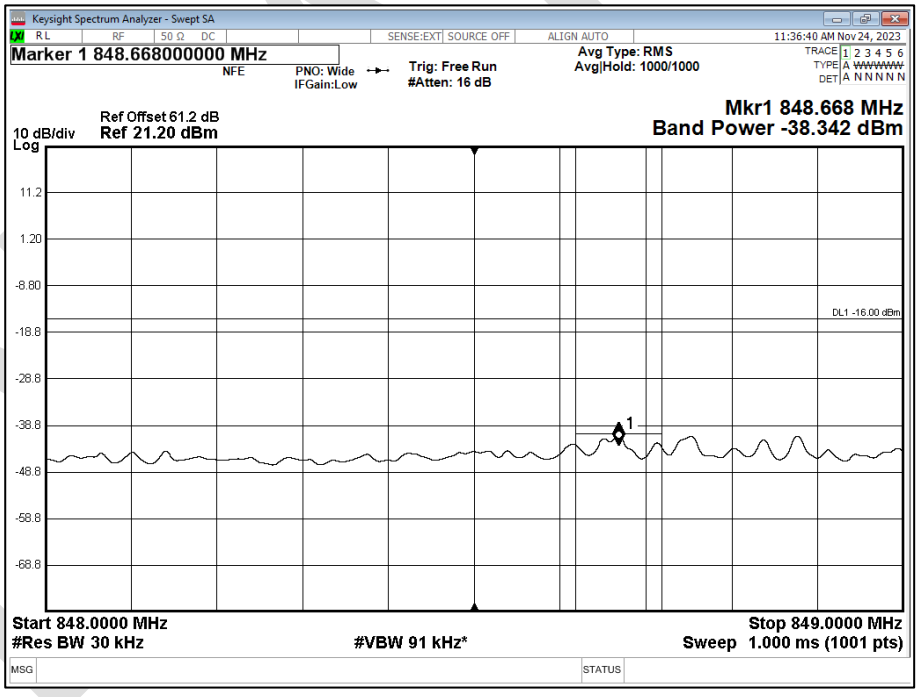

Figure 18 - 850 MHz, 64QAM, Band Edge Frequency: 849 MHz. Sector A (TxRx1)

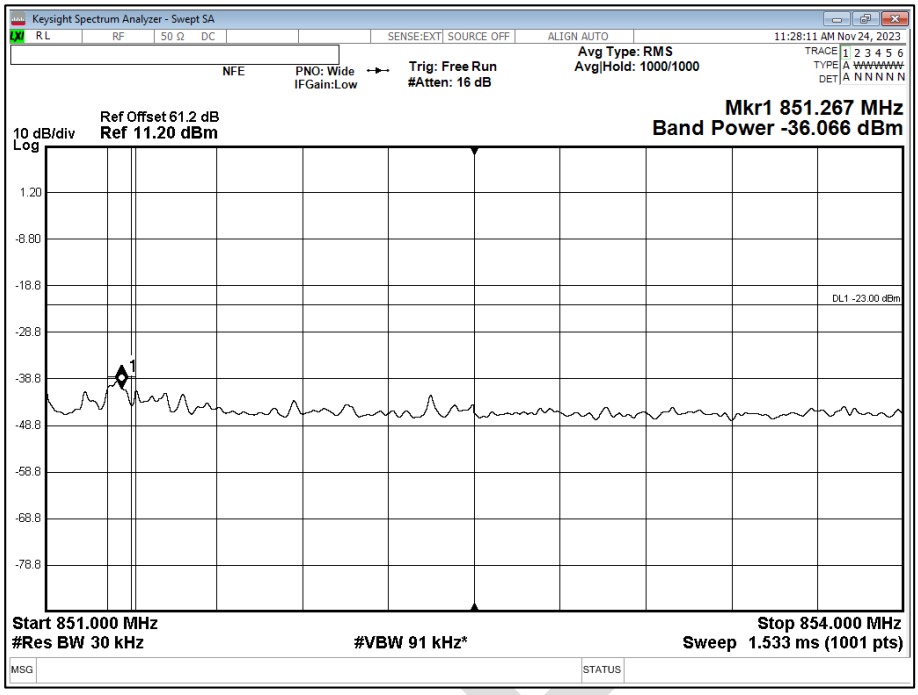

Figure 19 - 850 MHz, 64QAM, Band Edge Frequency: 851 MHz. Sector A (TxRx1)

Carrier Frequency (MHz)	Modulation	Emission Frequency (MHz)	Level (dBm)	Limit (dBm)	Margin (dB)
850	QPSK	3792	-25.4	-16.0	9.4
850	QPSK	8544	-24.7	-16.0	8.7
850	16QAM	4007	-25.9	-16.0	9.9
850	16QAM	8494	-25.0	-16.0	9.0
850	64QAM	5761	-25.6	-16.0	9.6
850	64QAM	8313	-23.9	-16.0	7.9

Table 24 - Conducted Spurious Emissions Results, Sector A (TxRx0)

No other emissions were found within 10 dB of the limit.

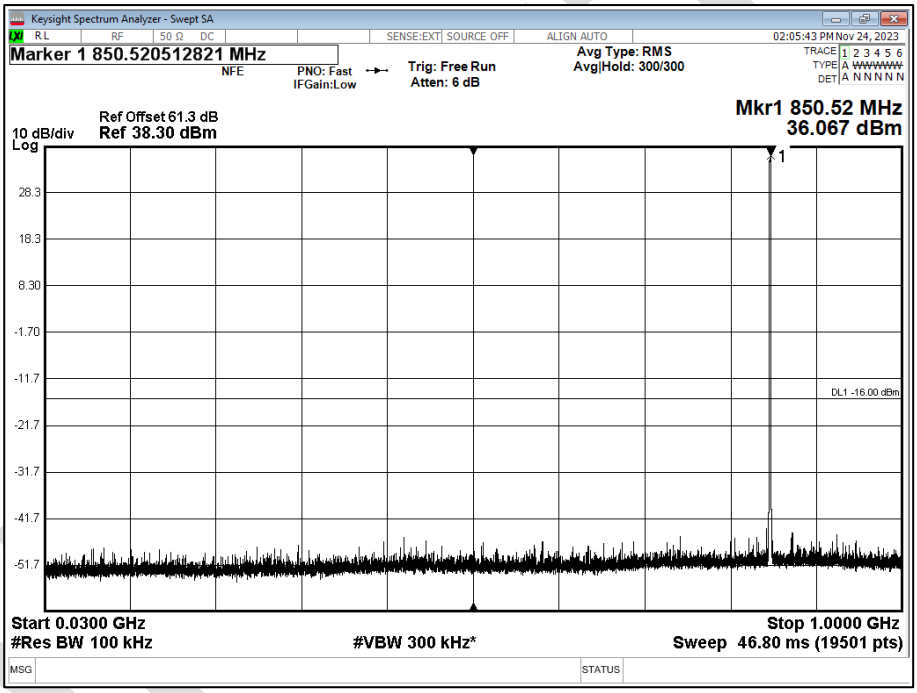

Figure 20 - 850 MHz, QPSK, 30 MHz to 1 GHz, Sector A (TxRx0)

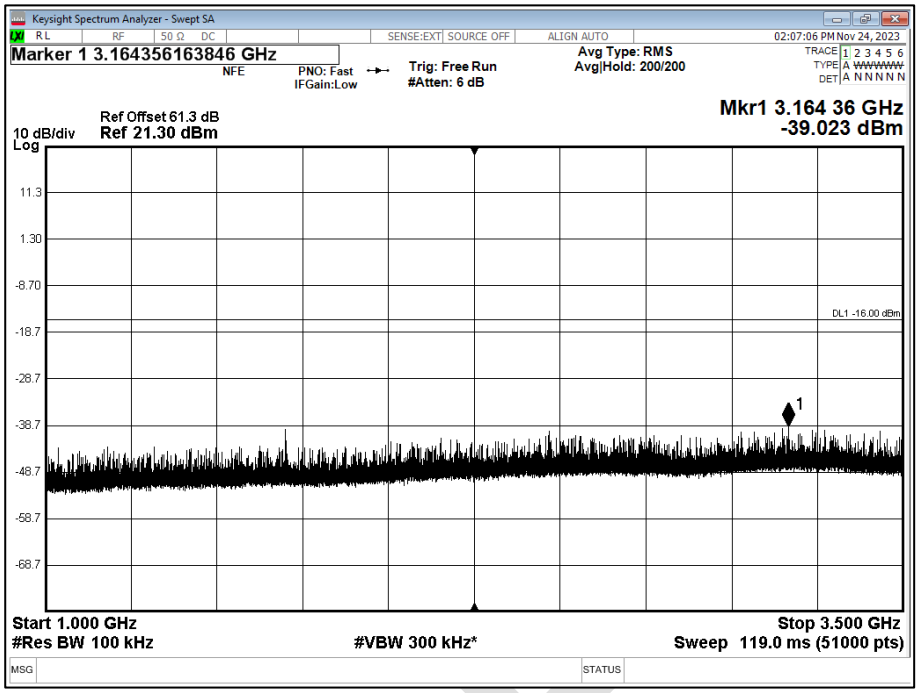

Figure 21 - 850 MHz, QPSK, 1 GHz to 3.5 GHz, Sector A (TxRx0)

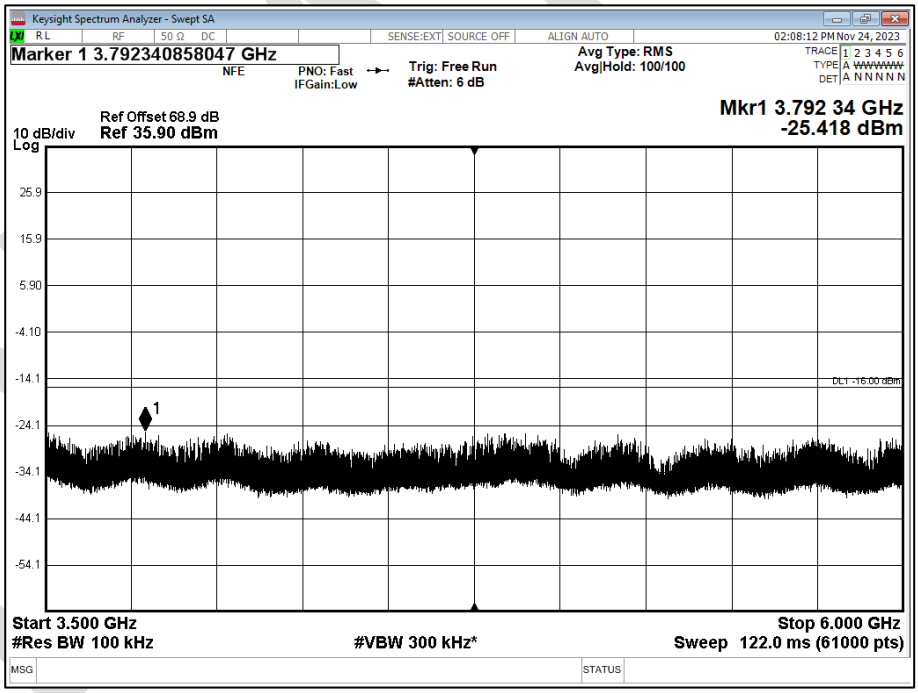

Figure 22 - 850 MHz, QPSK, 3.5 GHz to 6 GHz, Sector A (TxRx0)

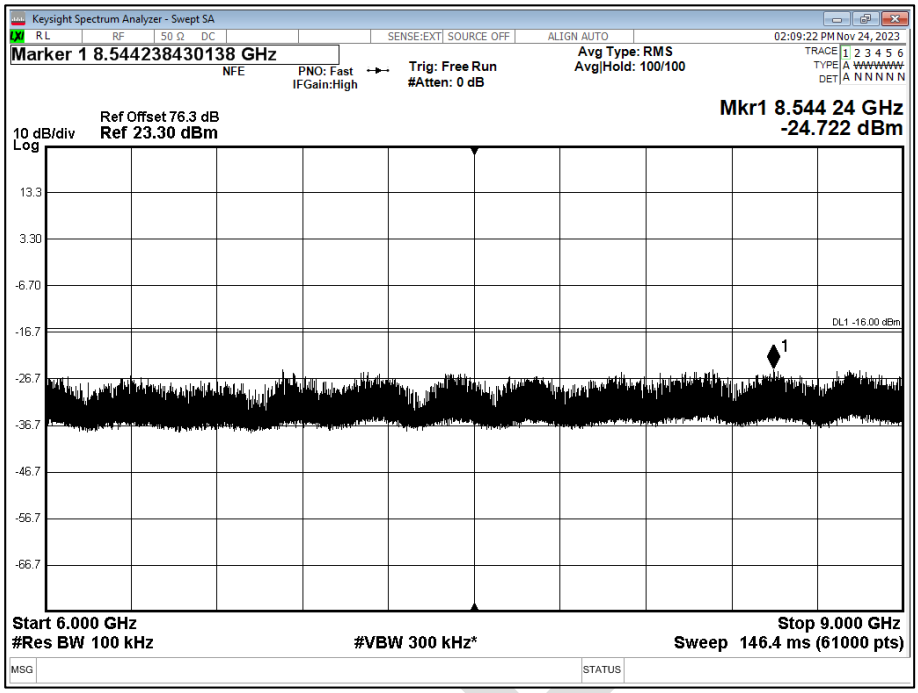

Figure 23 - 850 MHz, QPSK, 6 GHz to 9 GHz, Sector A (TxRx0)

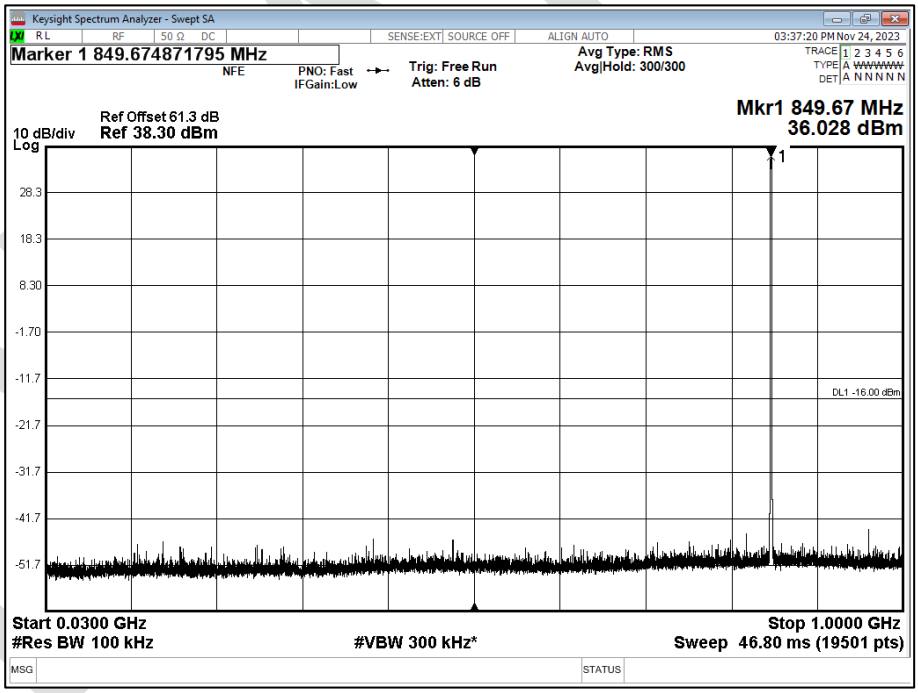

Figure 24 - 850 MHz, 16QAM, 30 MHz to 1 GHz, Sector A (TxRx0)

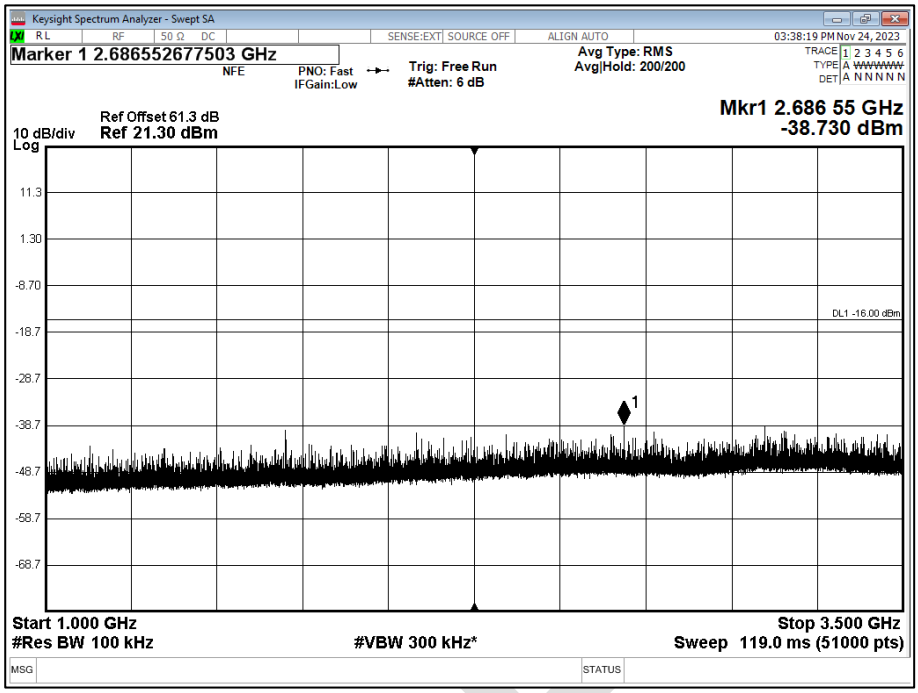

Figure 25 - 850 MHz, 16QAM, 1 GHz to 3.5 GHz, Sector A (TxRx0)

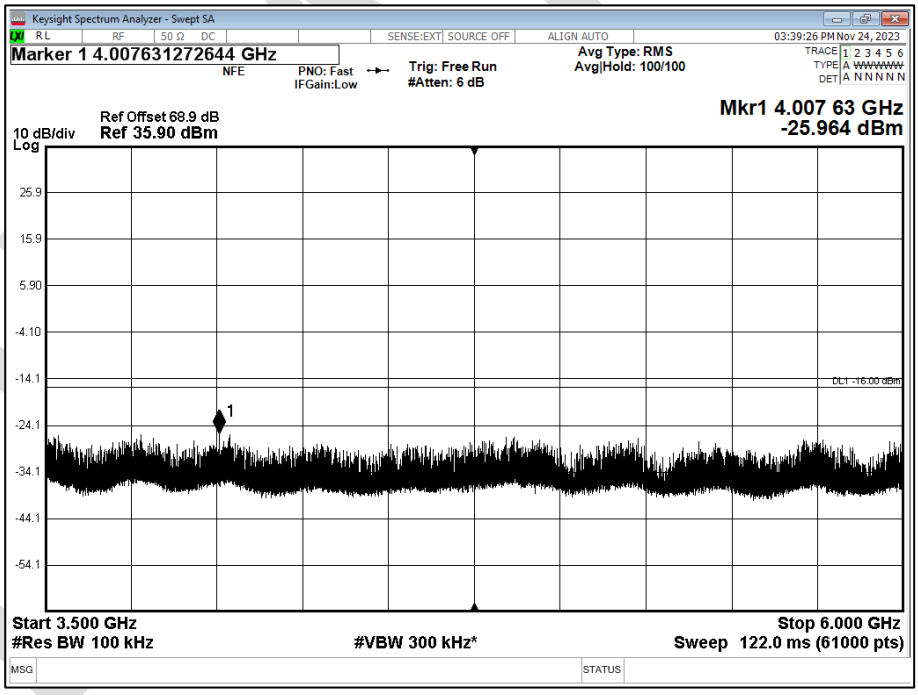

Figure 26 - 850 MHz, 16QAM, 3.5 GHz to 6 GHz, Sector A (TxRx0)

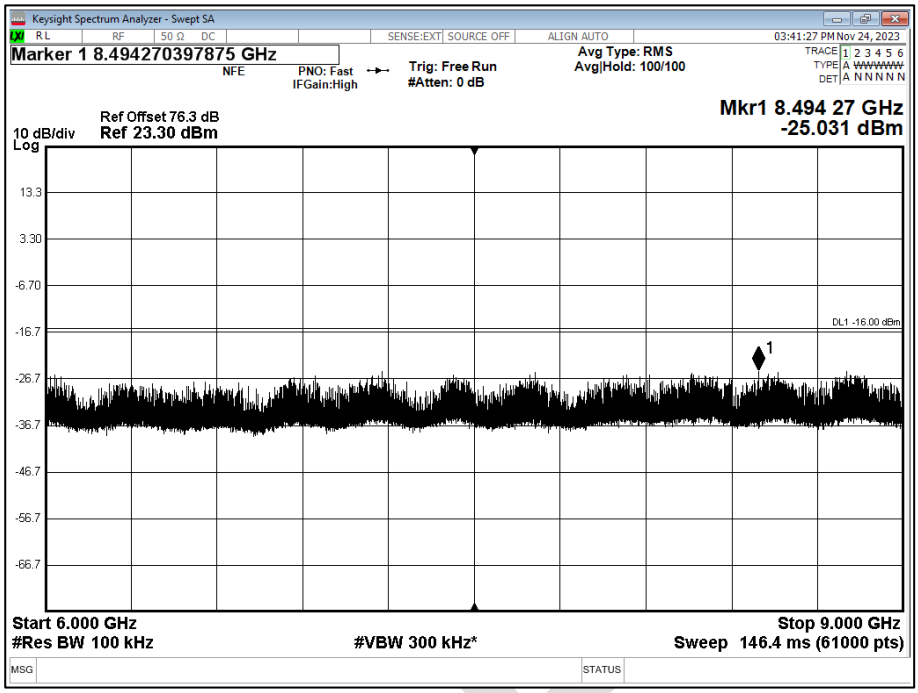

Figure 27 - 850 MHz, 16QAM, 6 GHz to 9 GHz, Sector A (TxRx0)

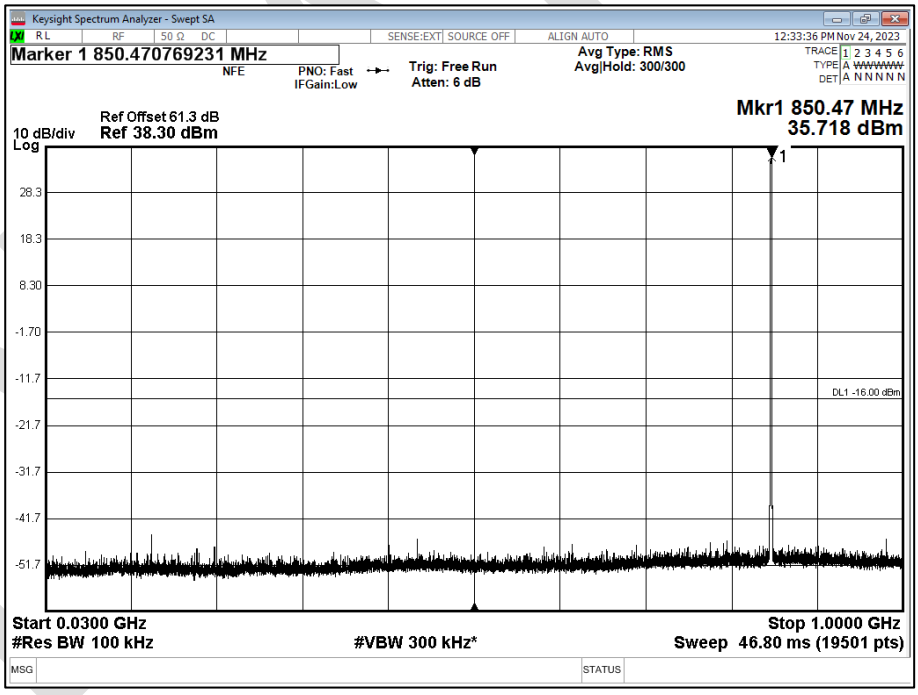

Figure 28 - 850 MHz, 64QAM, 30 MHz to 1 GHz, Sector A (TxRx0)

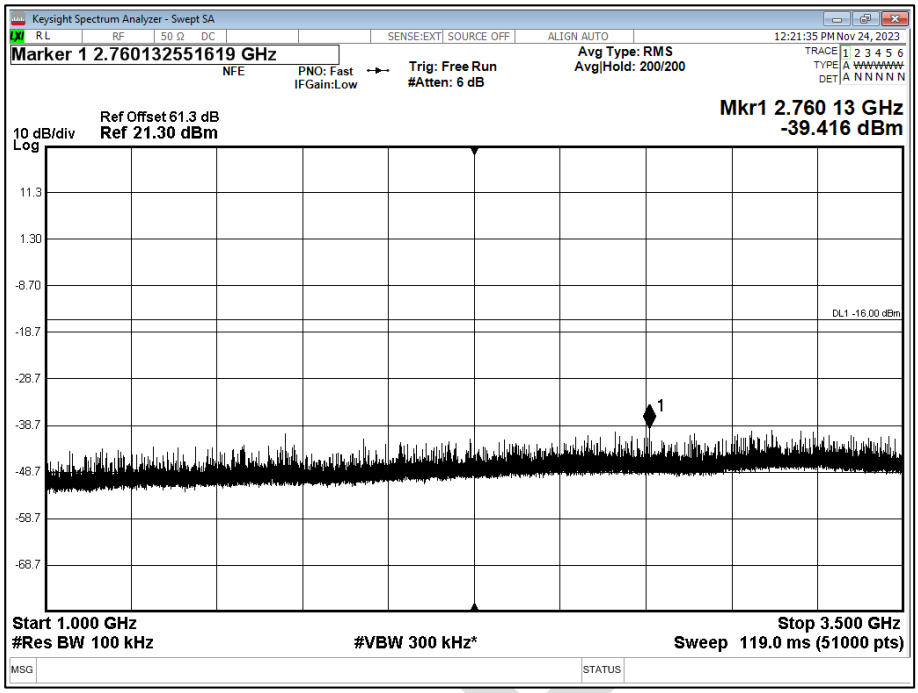

Figure 29 - 850 MHz, 64QAM, 1 GHz to 3.5 GHz, Sector A (TxRx0)

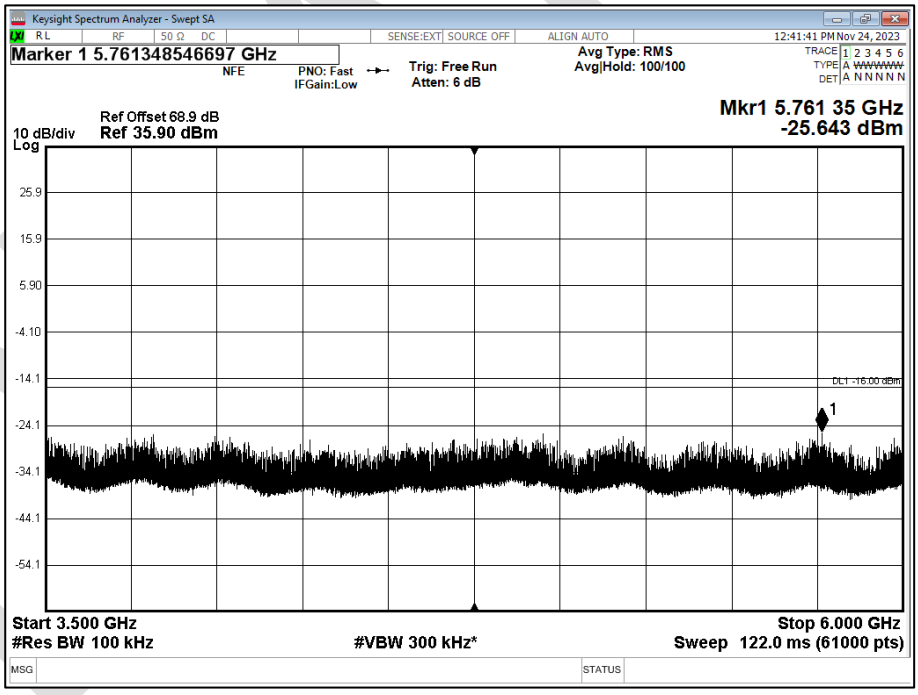

Figure 30 - 850 MHz, 64QAM, 3.5 GHz to 6 GHz, Sector A (TxRx0)

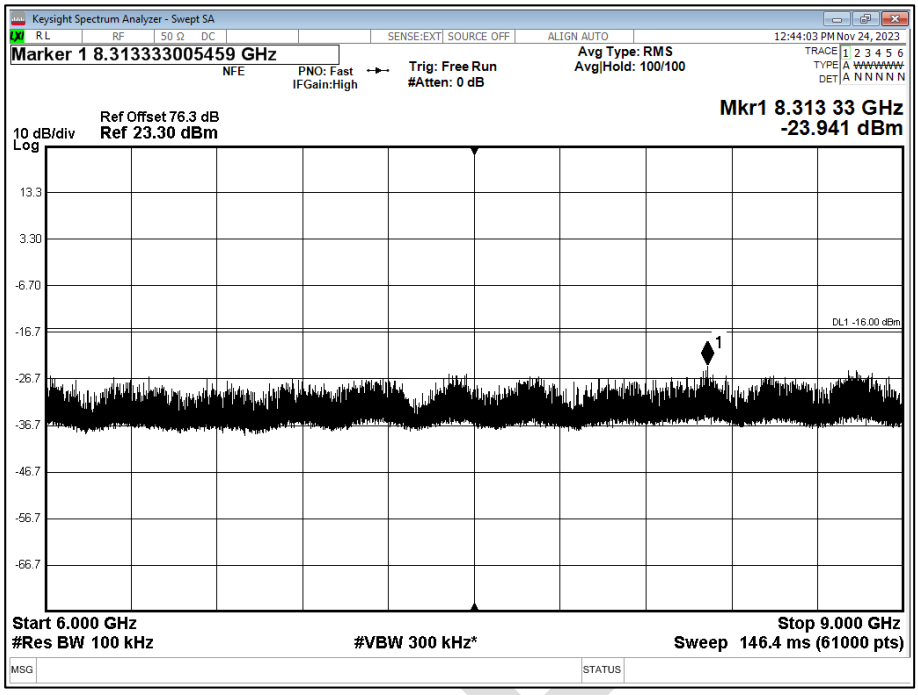

Figure 31 - 850 MHz, 64QAM, 6 GHz to 9 GHz, Sector A (TxRx0)

Carrier Frequency (MHz)	Modulation	Emission Frequency (MHz)	Level (dBm)	Limit (dBm)	Margin (dB)
850	QPSK	8804	-25.3	16.0	9.3
850	16QAM	4329	-25.8	16.0	9.8
850	16QAM	8821	-24.6	16.0	8.6
850	64QAM	3760	-25.6	16.0	9.6
850	64QAM	7394	-24.4	16.0	8.4

Table 25 - Conducted Spurious Emissions Results, Sector A (TxRx1)

No other emissions were found within 10 dB of the limit.

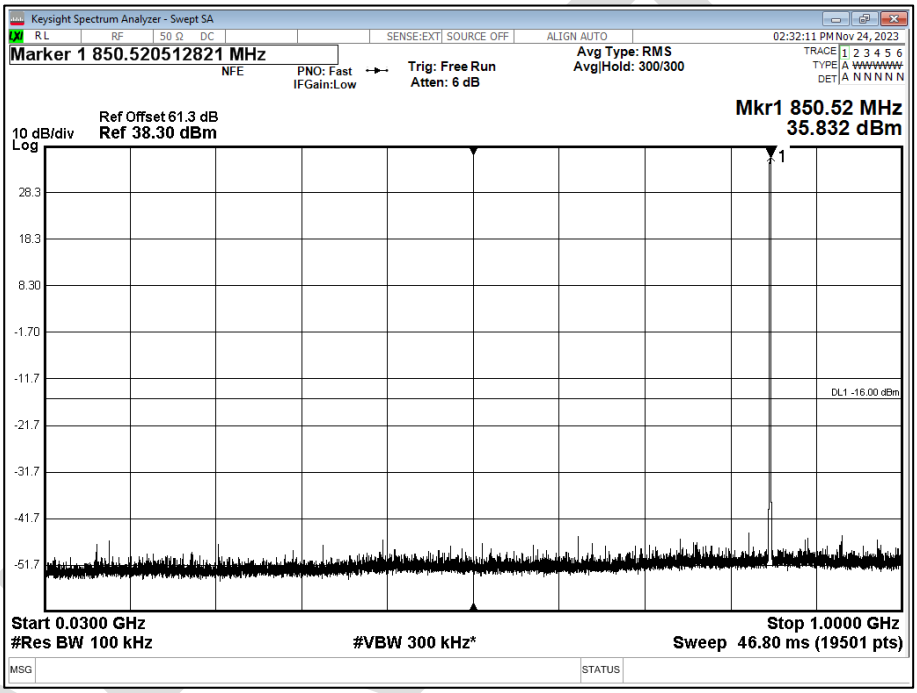

Figure 32 - 850 MHz, QPSK, 30 MHz to 1 GHz, Sector A (TxRx1)

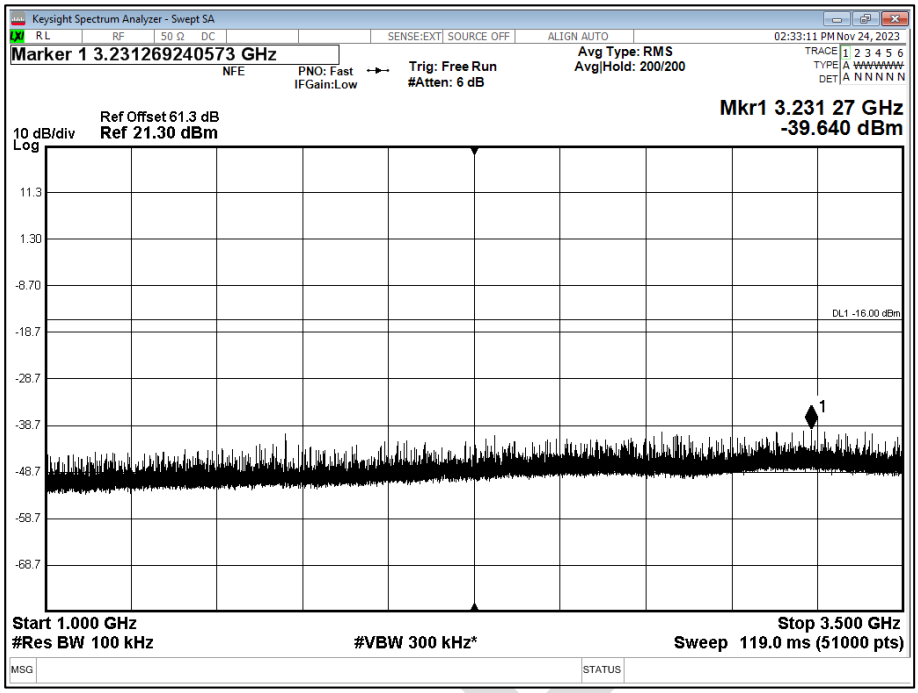

Figure 33 - 850 MHz, QPSK, 1 GHz to 3.5 GHz, Sector A (TxRx1)

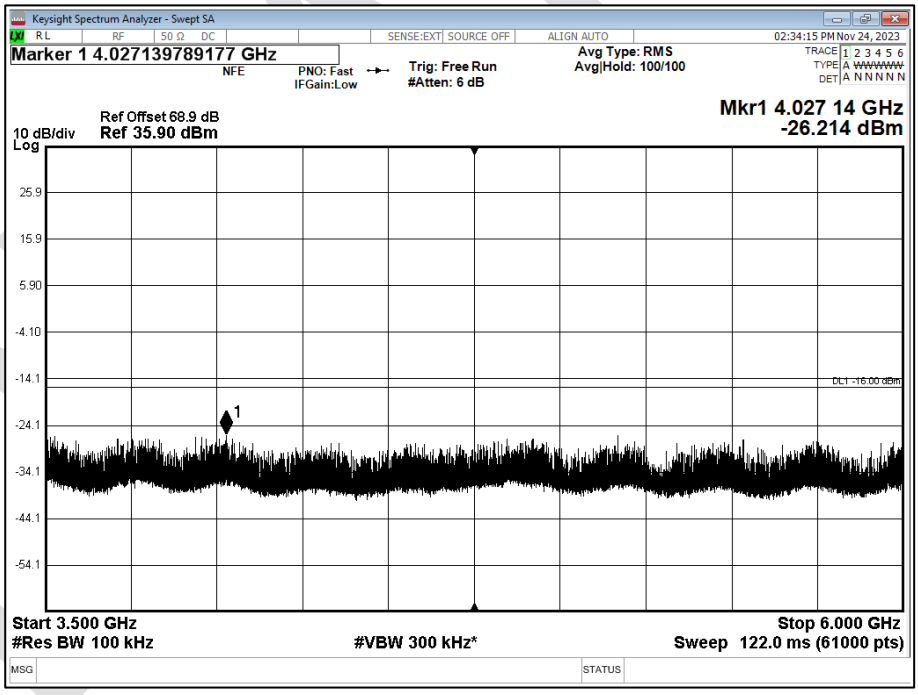

Figure 34 - 850 MHz, QPSK, 3.5 GHz to 6 GHz, Sector A (TxRx1)

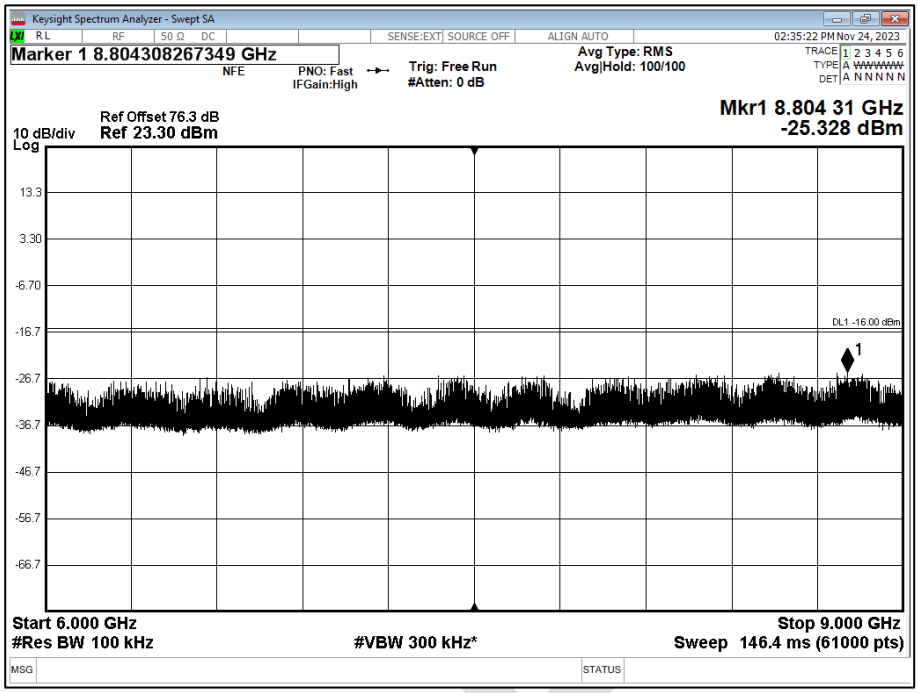

Figure 35 - 850 MHz, QPSK, 6 GHz to 9 GHz, Sector A (TxRx1)

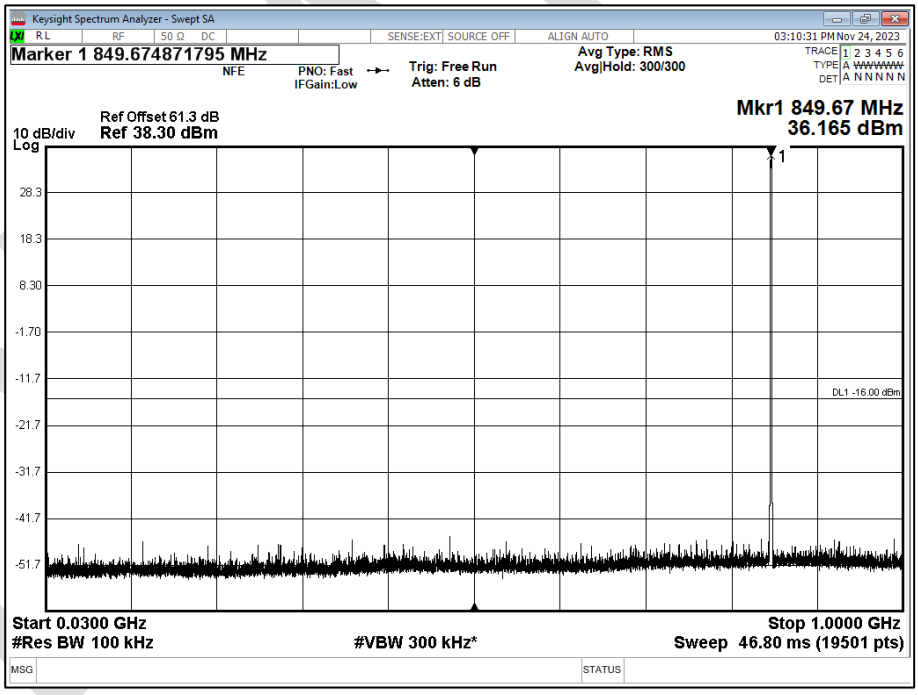

Figure 36 - 850 MHz, 16QAM, 30 MHz to 1 GHz, Sector A (TxRx1)

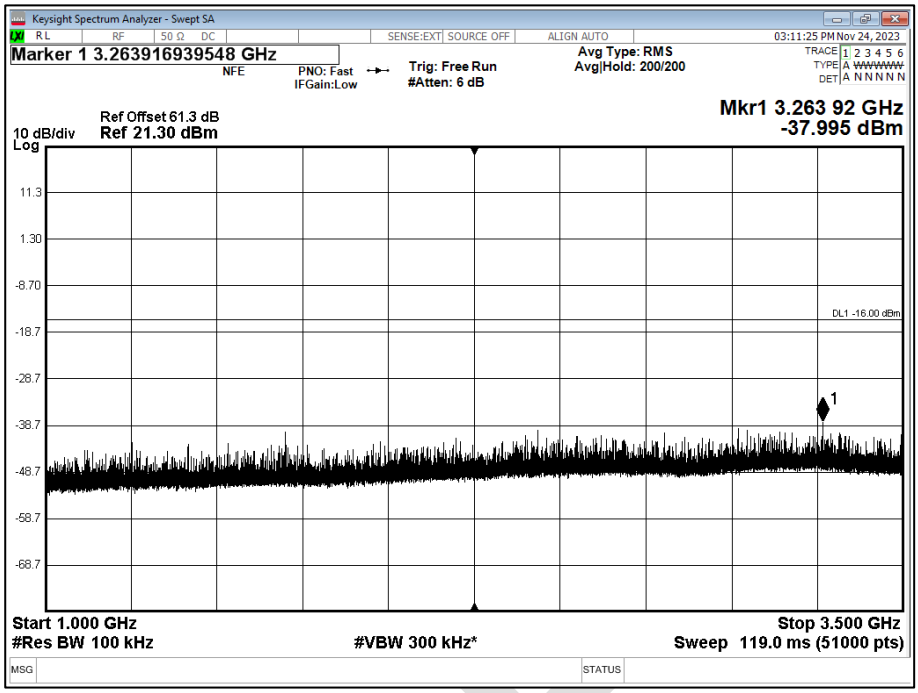

Figure 37 - 850 MHz, 16QAM, 1 GHz to 3.5 GHz, Sector A (TxRx1)

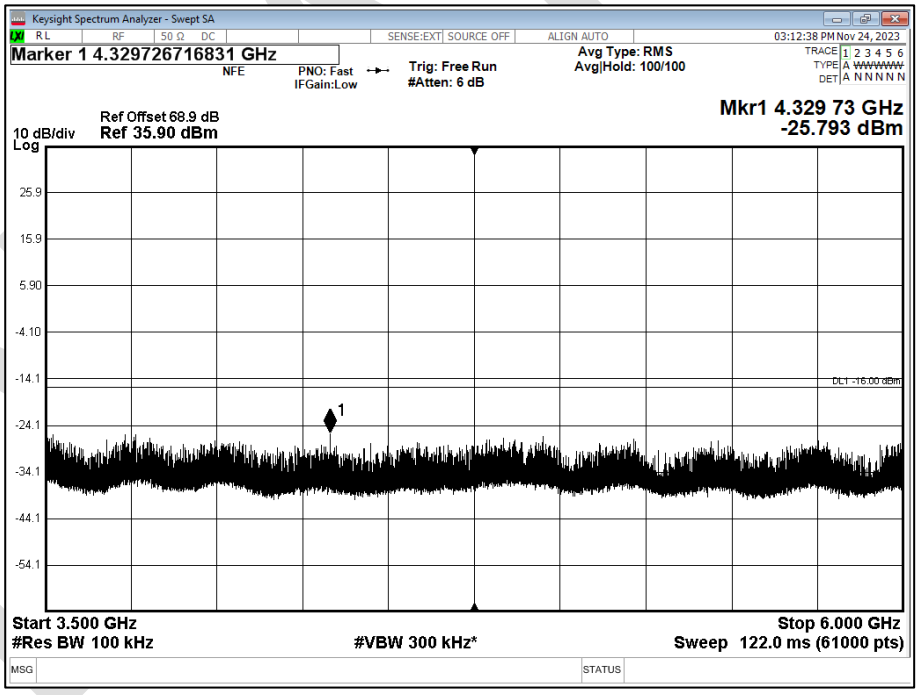

Figure 38 - 850 MHz, 16QAM, 3.5 GHz to 6 GHz, Sector A (TxRx1)

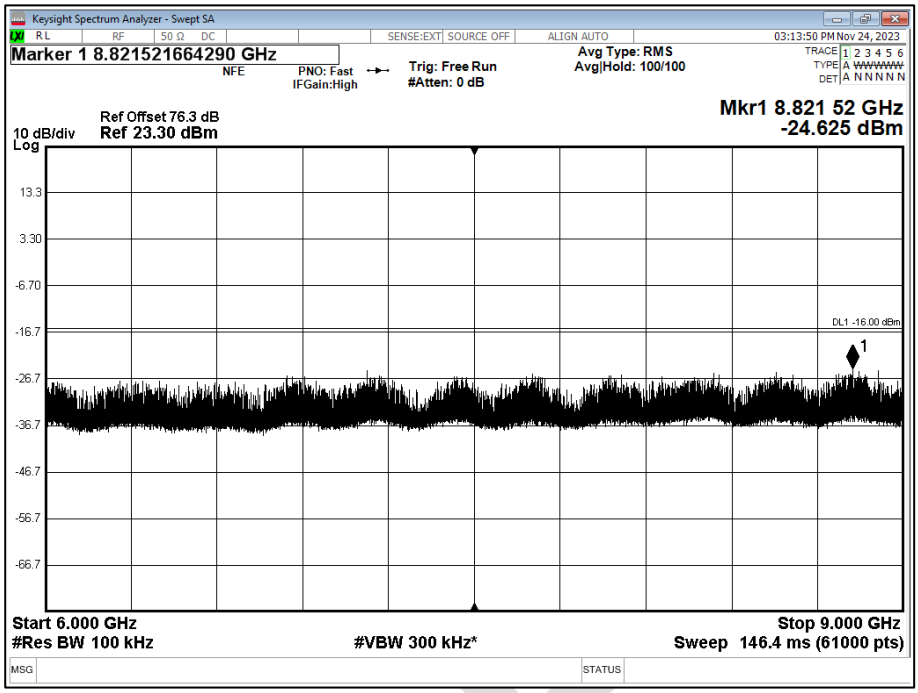

Figure 39 - 850 MHz, 16QAM, 6 GHz to 9 GHz, Sector A (TxRx1)

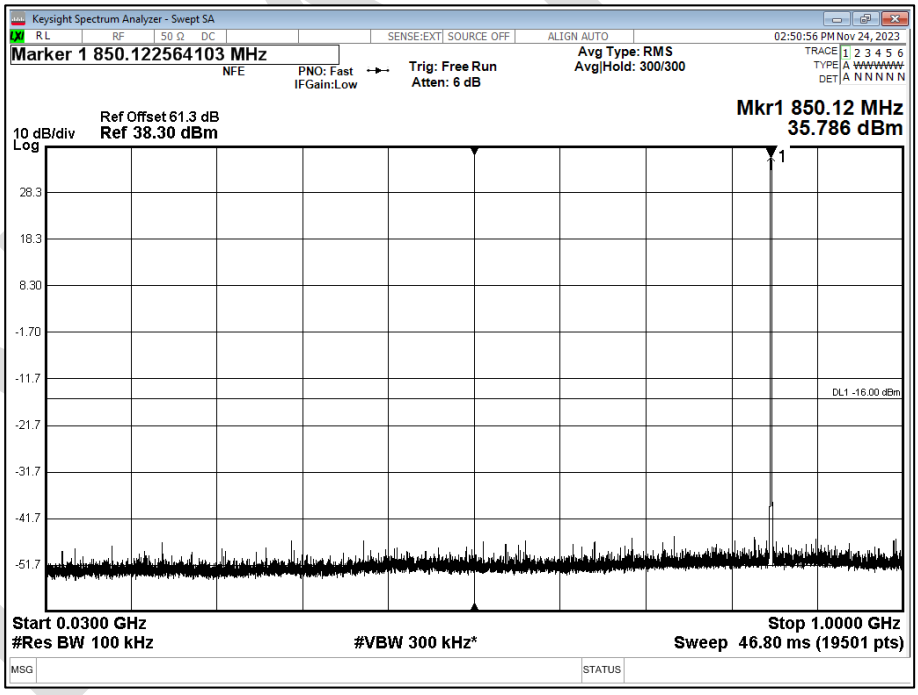

Figure 40 - 850 MHz, 64QAM, 30 MHz to 1 GHz, Sector A (TxRx1)

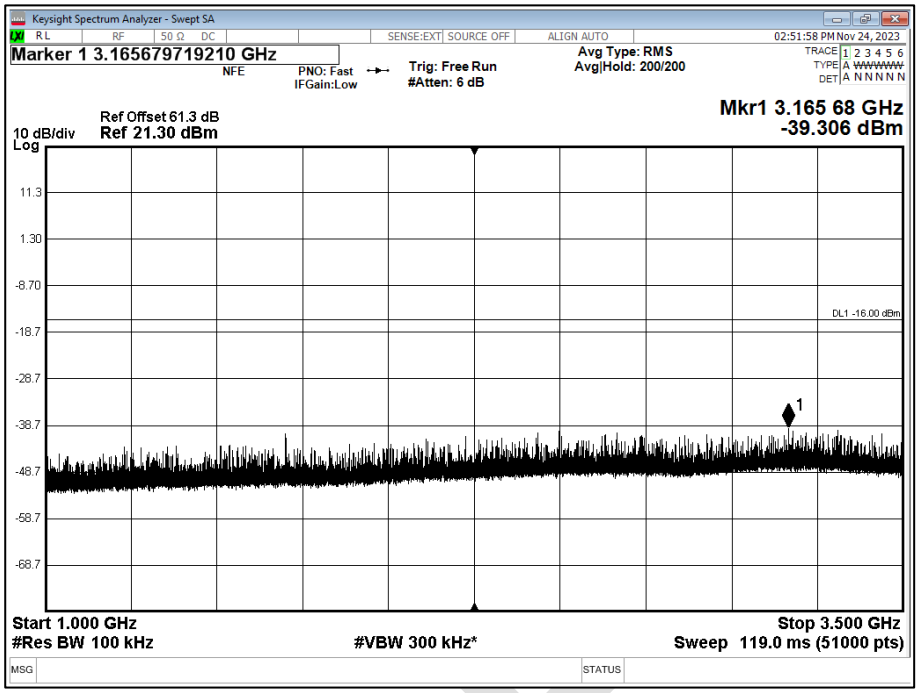

Figure 41 - 850 MHz, 64QAM, 1 GHz to 3.5 GHz, Sector A (TxRx1)

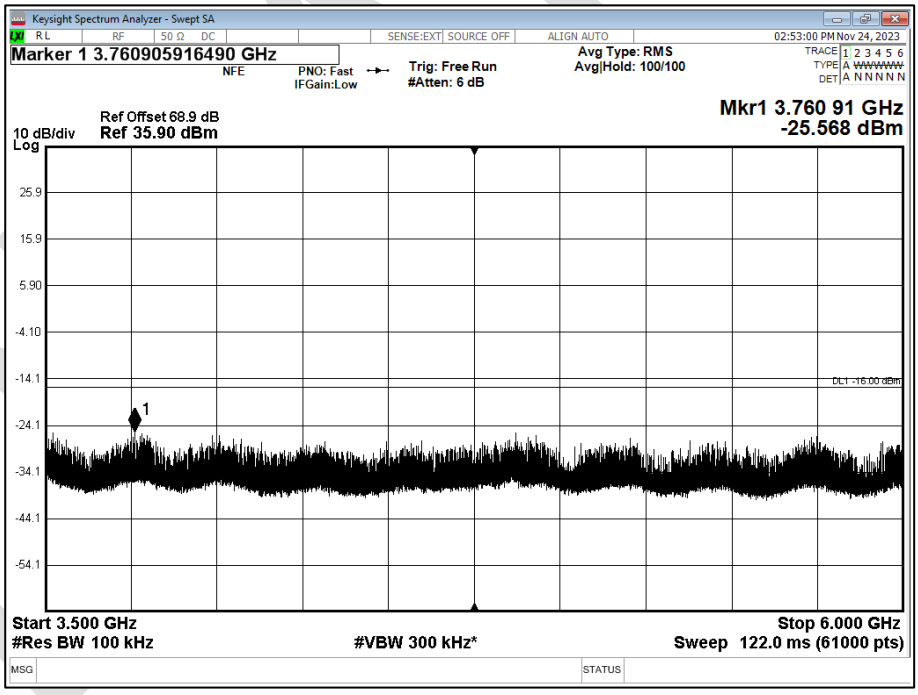

Figure 42 - 850 MHz, 64QAM, 3.5 GHz to 6 GHz, Sector A (TxRx1)

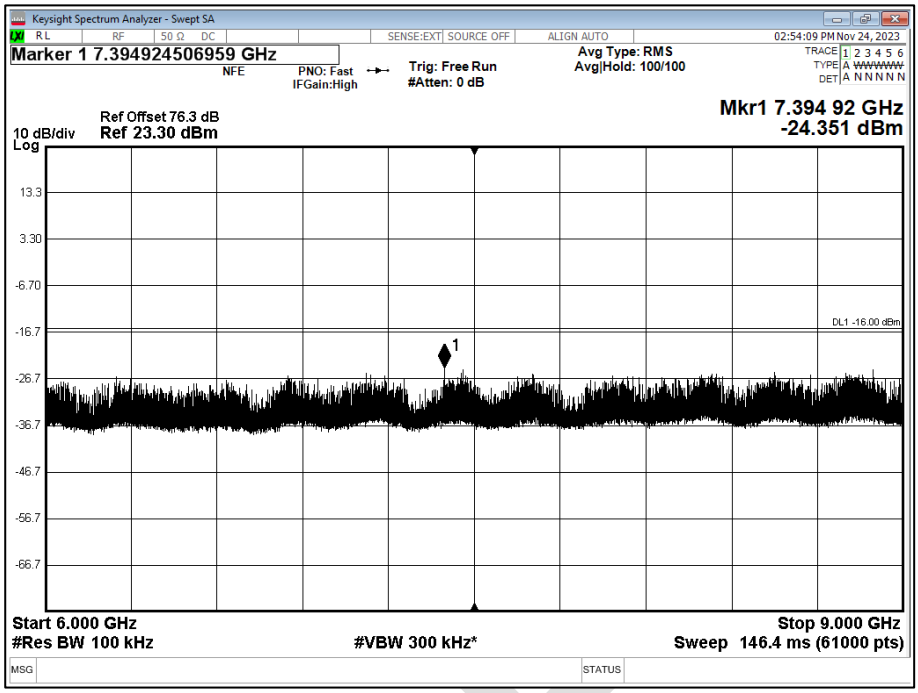

Figure 43 - 850 MHz, 64QAM, 6 GHz to 9 GHz, Sector A (TxRx1)

FCC 47 CFR Part 22, Limit Clause 22.861

The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log (P) dB.

Note: As per FCC DA 22-657, emissions shall be attenuated by 50 + 10 log (P) dB in the 851-854 MHz public safety band.

2.4.7 Test Location and Test Equipment Used

This test was carried out in RF Laboratory 2.

Instrument	Manufacturer	Type No	TE No	Calibration Period (months)	Calibration Expires
Multimeter	Fluke	75 Mk3	455	12	15-Dec-2023
Network Analyser	Rohde & Schwarz	ZVA 40	3548	12	06-Mar-2024
Calibration Unit	Rohde & Schwarz	ZV-Z54	4368	12	06-Mar-2024
Frequency Standard	Spectracom	SecureSync 1200-0408-0601	4393	6	08-Feb-2024
PXA Signal Analyser	Keysight Technologies	N9030A	4654	12	16-Jan-2024
Hygrometer	Rotronic	HP21	4989	12	21-Jul-2024

Figure 44

2.5 Radiated Spurious Emissions

2.5.1 Specification Reference

FCC 47 CFR Part 2, Clause 2.1053
FCC 47 CFR Part 22G, Clause 22.861

2.5.2 Equipment Under Test and Modification State

Air4G 2700 A4G27-F085-DC1-EXGG, S/N: FD5879014AC - Modification State 0, 1

2.5.3 Date of Test

29-November-2023 to 01-December-2023

2.5.4 Test Method

This test was performed in accordance with ANSI C63.26, clause 5.5.

A 50 ohm load was connected to each of the EUT's antenna ports. Each port was configured to transmit at maximum power.

2.5.5 Test Setup Diagram

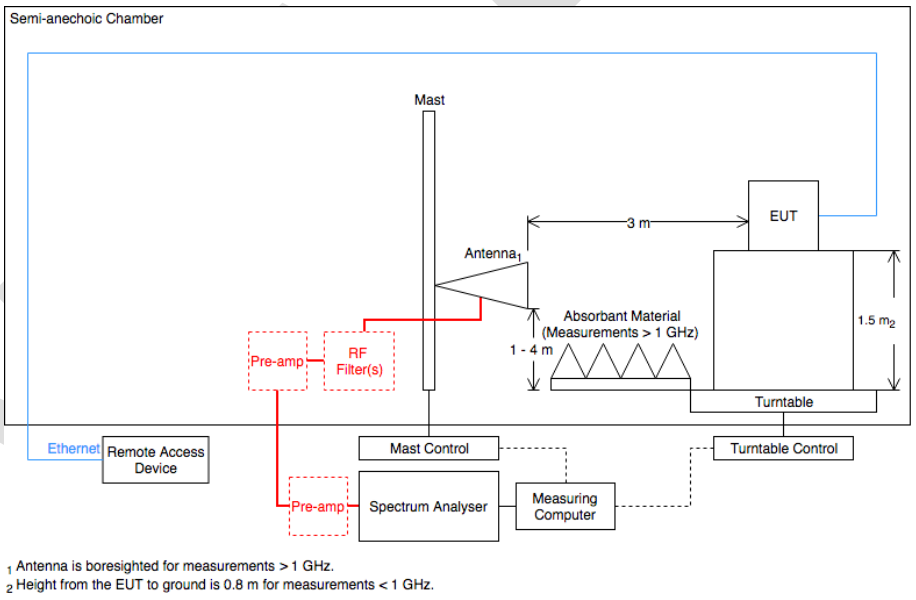

Figure 45

Note: Due to the physical dimensions of the EUT, the height of the EUT was adjusted so that the centre of the EUT was approximately 0.8m in height for measurements below 1 GHz and 1.5m for measurements above 1 GHz.

2.5.6 Environmental Conditions

Ambient Temperature	21.6 - 21.8 °C
Relative Humidity	27.1 - 31.7 %

2.5.7 Test Results

Transmit

Frequency (MHz)	Level (dBm)	Limit (dBm)	Margin (dB)	Detector	Angle (°)	Height (cm)	Polarisation
1699.933	-14.36	-13.00	-1.36	Peak	206	150	Vertical
1700.130	-14.42	-13.00	-1.42	Peak	181	196	Horizontal

Table 26 - QPSK, 850 MHz, 30 MHz to 9 GHz

No other emissions found within 10 dB of the limit.

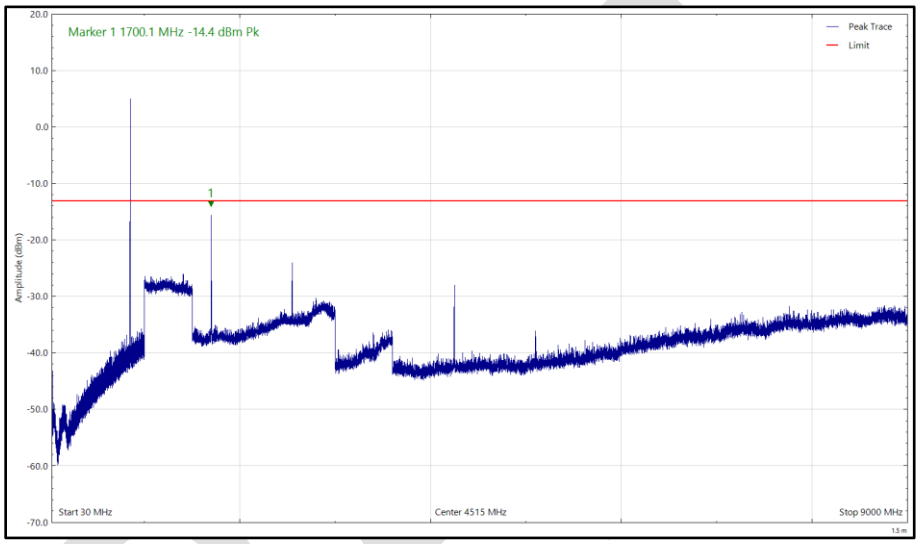

Figure 46 - QPSK, 850 MHz, 30 MHz to 9 GHz, Horizontal (Peak)

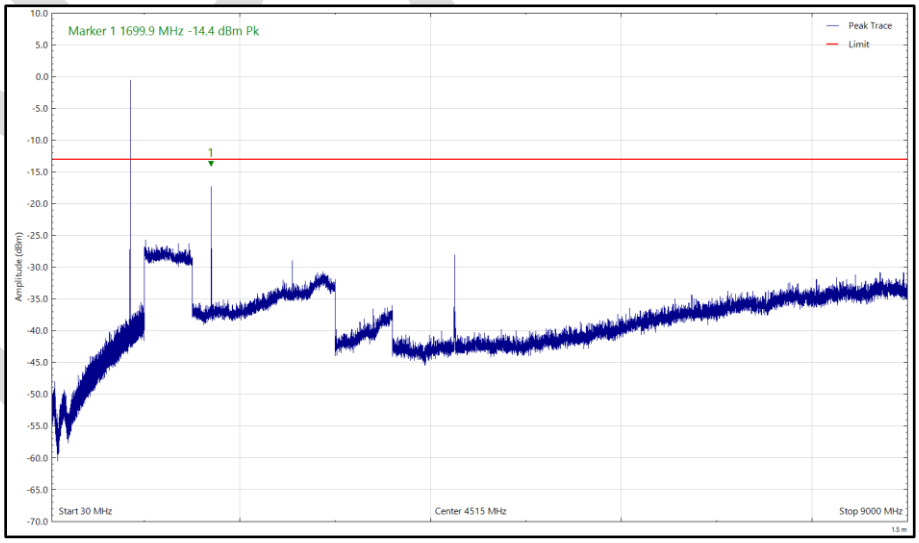

Figure 47 - QPSK, 850 MHz, 30 MHz to 9 GHz, Vertical (Peak)

Frequency (MHz)	Level (dBm)	Limit (dBm)	Margin (dB)	Detector	Angle (°)	Height (cm)	Polarisation
1699.979	-14.29	-13.00	-1.29	Peak	196	174	Vertical
1700.130	-17.85	-13.00	-4.85	Peak	155	150	Horizontal

Table 27 - 16QAM, 850 MHz, 30 MHz to 9 GHz

No other emissions found within 10 dB of the limit.

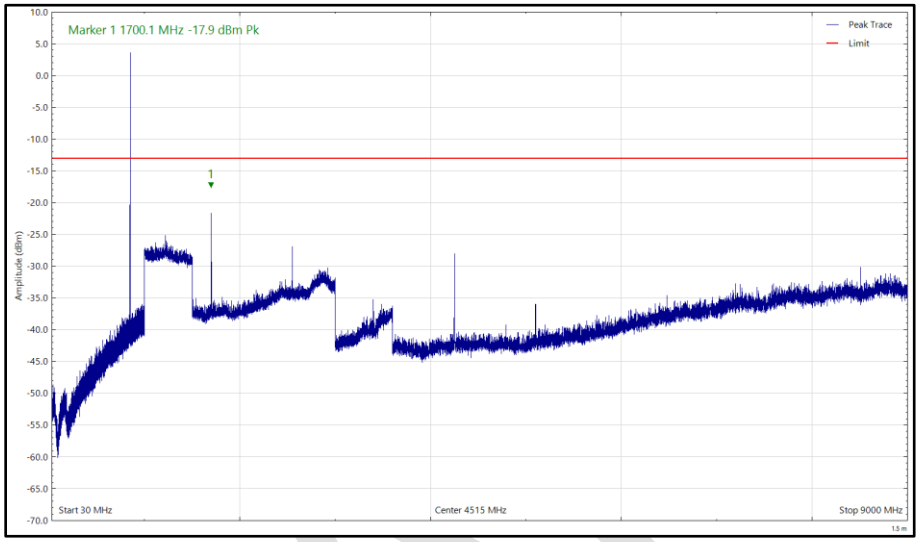

Figure 48 - 16QAM, 850 MHz, 30 MHz to 9 GHz, Horizontal (Peak)

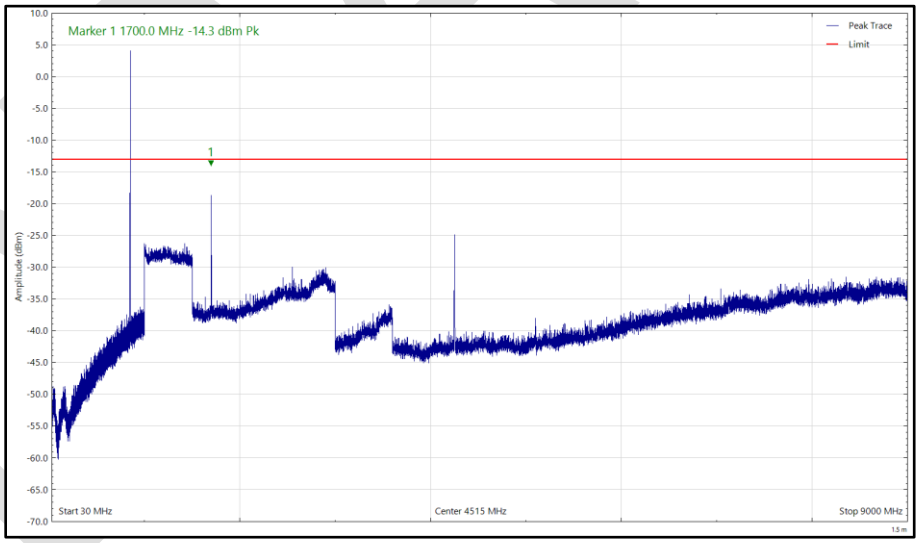

Figure 49 - 16QAM, 850 MHz, 30 MHz to 9 GHz, Vertical (Peak)

Frequency (MHz)	Level (dBm)	Limit (dBm)	Margin (dB)	Detector	Angle (°)	Height (cm)	Polarisation
1699.890	-15.22	-13.00	-2.22	Peak	188	185	Vertical
1700.085	-16.48	-13.00	-3.48	Peak	227	150	Horizontal

Table 28 - 64QAM, 850 MHz, 30 MHz to 9 GHz

No other emissions found within 10 dB of the limit.

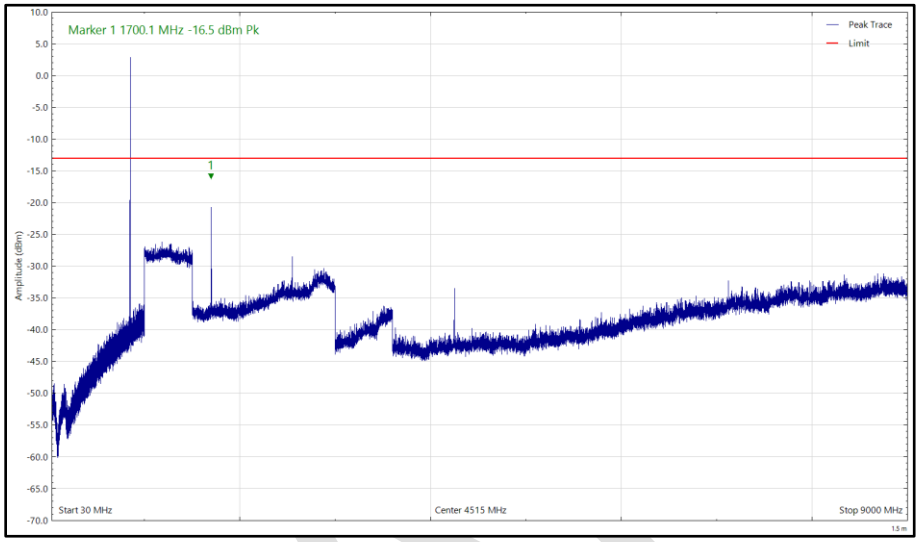

Figure 50 - 64QAM, 850 MHz, 30 MHz to 9 GHz, Horizontal (Peak)

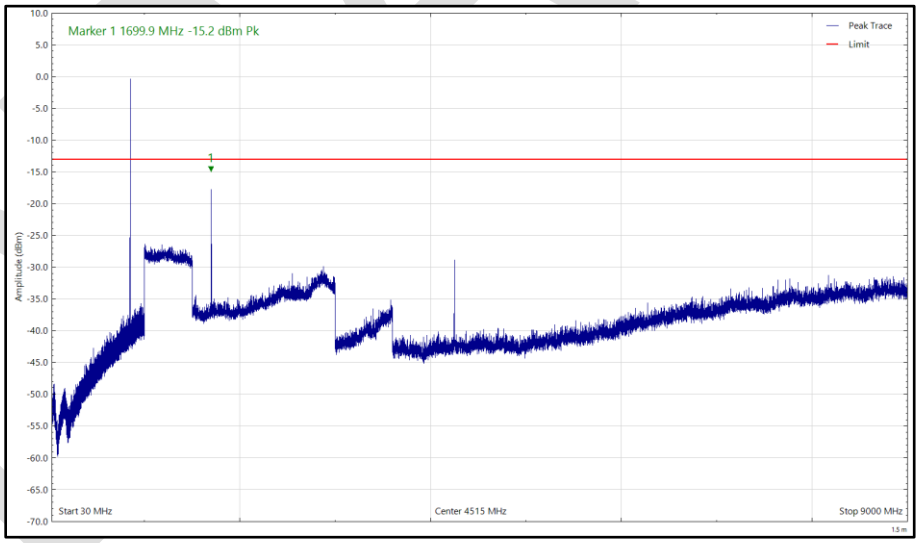

Figure 51 - 64QAM, 850 MHz, 30 MHz to 9 GHz, Vertical (Peak)

FCC 47 CFR Part 22, Limit Clause 22.861

The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log (P) dB.

2.5.8 Test Location and Test Equipment Used

This test was carried out in EMC Chamber 12.

Instrument	Manufacturer	Type No	TE No	Calibration Period (months)	Calibration Expires
Test Receiver	Rohde & Schwarz	ESU40	3506	12	30-Mar-2024
High Pass filter	Wainwright	WHKX12-1290-1500-18000-80SS	4962	12	14-Jun-2024
Pre-amplifier (30 dB, 1GHz to 18GHz)	Schwarzbeck	BBV 9718 C	5261	12	14-Apr-2024
Thermo-Hygro-Barometer	PCE Instruments	PCE-THB-40	5471	12	28-Apr-2024
Antenna (DRG, 1 GHz to 10.5 GHz)	Schwarzbeck	BBHA9120B	5611	12	15-Oct-2024
Turntable & Mast Controller	Maturo Gmbh	NCD/498/2799.01	5612	-	TU
Tilt Antenna Mast	Maturo Gmbh	TAM 4.0-P	5613	-	TU
3m Semi-Anechoic Chamber	MVG	EMC Chamber 12	5621	36	07-Aug-2026
Cable (N-Type to N-Type, 2 m)	Junkosha	MWX221-02000AMSAMS/B	5729	6	05-Dec-2023
1m K-Type Cable	Junkosha	MWX221/B	5908	12	21-May-2024
Antenna (Tri-log, 30 MHz to 1 GHz)	Schwarzbeck	VULB 9168	5942	24	03-Feb-2024
Attenuator (4 dB)	Pasternack	PE7074-4	6202	24	16-Jul-2024
Cable (N-Type to N-Type, 8 m)	Junkosha	MWX221-08000NMSNMS/B	6320	12	04-Feb-2024

Figure 52

TU - Traceability Unscheduled

3 Photographs

3.1 Test Setup Photographs

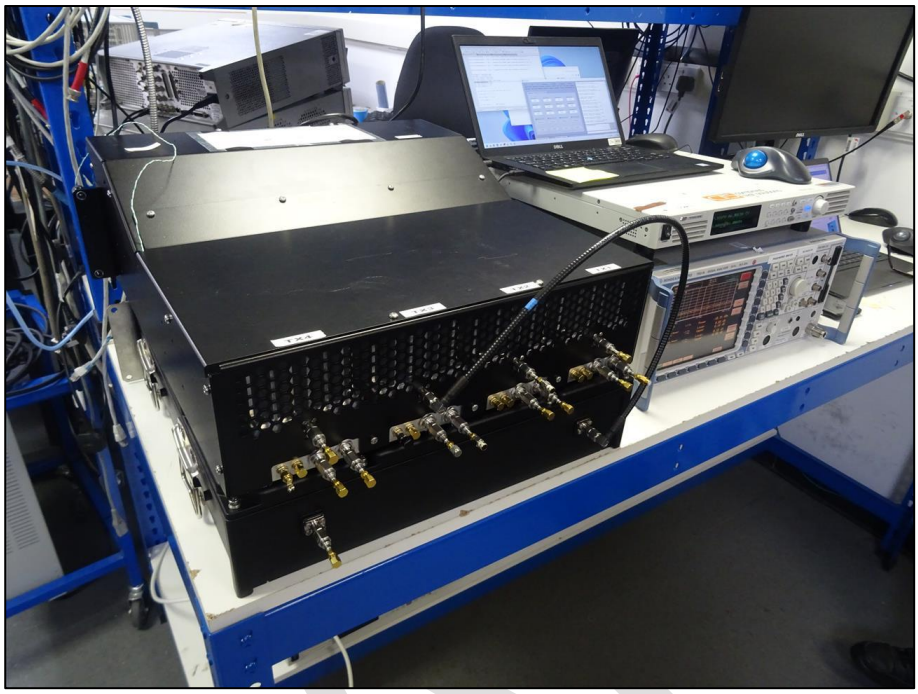

Figure 53 - Conducted Measurements Setup

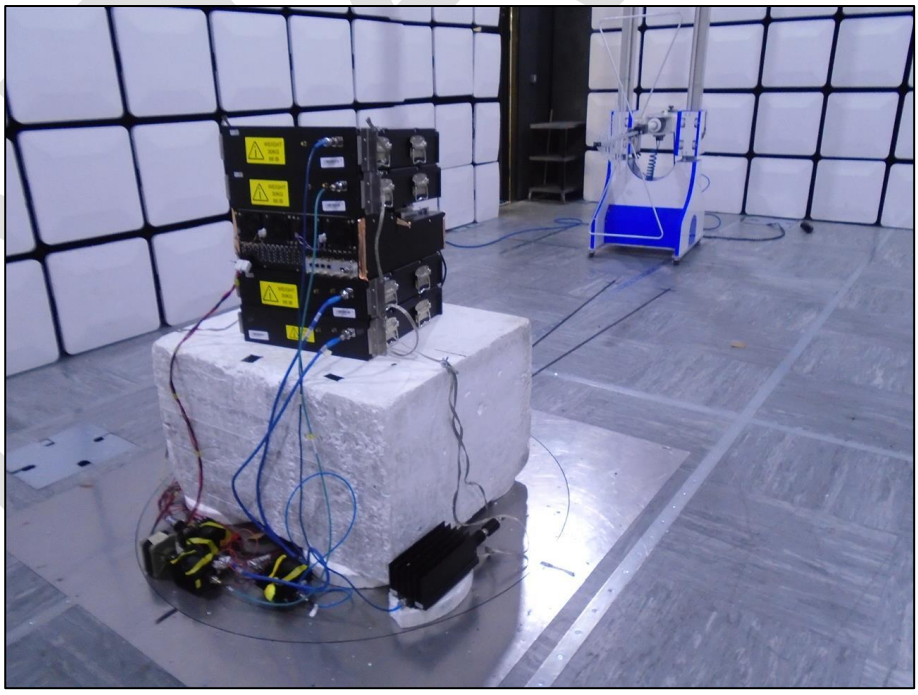

Figure 54 – 30 MHz to 1GHz Setup

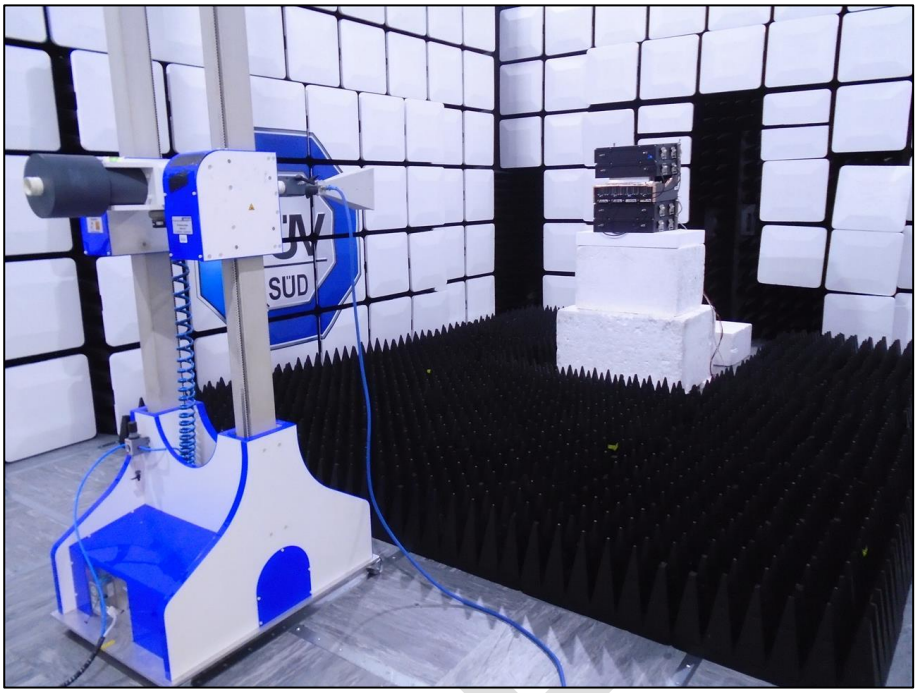

Figure 55 – 1 GHz to 9 GHz Setup

4 Test Equipment Information

4.1 Customer Support Equipment

Instrument	Manufacturer	Type No	Serial Number	Calibration Period (months)	Calibration Due
Power Suppy (DC)	aAP	SP75VDC1000W	0114017223200002	-	O/P Mon
Attenuator (20dB, 500W)	MCE/Weinschel	32-20-34	MU899	-	O/P Mon
Attenuator (30dB)	Narda	768-30	1096	-	O/P Mon
Attenuator	MCL	BW-N10W20+	-	-	O/P Mon
Power Suppy (DC)	aAP	SP75VDC1000W	0114017223200003	-	O/P Mon

Table 29

O/P Mon – Output monitored using calibrated test equipment.

5 Measurement Uncertainty

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

Test Name	Measurement Uncertainty
Frequency Stability	± 25.2 kHz
Effective Radiated Power	± 3.21 dB
Occupied Bandwidth	± 25.2 kHz
Spurious Emission at Antenna Terminals	± 0.6 dB (band edge), ±3.5 (conducted spurious emission)
Radiated Spurious Emissions	30 MHz to 1 GHz: ± 5.2 dB 1 GHz to 40 GHz: ± 6.3 dB

Table 30

Measurement Uncertainty Decision Rule – Accuracy Method

Determination of conformity with the specification limits is based on the decision rule according to IEC Guide 115:2021, Clause 4.4.3 (Procedure 2). The measurement results are directly compared with the test limit to determine conformance with the requirements of the standard.

Risk: The uncertainty of measurement about the measured result is negligible with regard to the final pass/fail decision. The measurement result can be directly compared with the test limit to determine conformance with the requirement (compare IEC Guide 115). The level of risk to falsely accept and falsely reject items is further described in ILAC-G8.