

Forcite Helmet Systems PTY LTD

TEST REPORT

Model:
MK1

REPORT NUMBER
220600067THC-001

ISSUE DATE
Oct. 17, 2022

PAGES
51

DOCUMENT CONTROL NUMBER
GFT-OP-10h (28-Nov-2018)
© 2020 Intertek



Radio Spectrum TEST REPORT

Applicant:	Forcite Helmet Systems PTY LTD Unit A1, 35-39 Bourke Rd, Alexandria NSW 2015, Australia
Product:	FORCITE HELMET
Model No.:	MK1
Brand Name:	MK1S, MK1R, MK1X, MK1SE, MK1D
FCC ID:	2A8MD-MK1
Test Method/ Standard:	47 CFR FCC Part 15.247 & ANSI C63.10 2013 KDB 558074 D01 v05r02
Test By:	Intertek Testing Services Taiwan Ltd., Hsinchu Laboratory No. 11, Lane 275, Ko-Nan 1 Street, Chia-Tung Li, Shiang-Shan District, Hsinchu City, Taiwan



Zero Chen

Zero Chen
Engineer

Rico Deng

Rico Deng
Reviewer

This report is for the exclusive use of Intertek's Client and is provided pursuant to the agreement between Intertek and its Client. Intertek's responsibility and liability are limited to the terms and conditions of the agreement. Intertek assumes no liability to any party, other than to the Client in accordance with the agreement, for any loss, expense or damage occasioned by the use of this report. Only the Client is authorized to permit copying or distribution of this report and then only in its entirety. Any use of the Intertek name or one of its marks for the sale or advertisement of the tested material, product or service must first be approved in writing by Intertek. The observations and test results in this report are relevant only to the sample tested. This report by itself does not imply that the material, product, or service is or has ever been under an Intertek certification program.

TEST REPORT

Revision History

Report No.	Issue Date	Revision Summary
220600067THC-001	Oct. 17, 2022	Original report

Table of Contents

Summary of Test Data	5
1. General Information	6
1.1 Identification of the EUT	6
1.2 Additional information about the EUT	6
1.3 Antenna description	6
1.4 Operation mode	7
1.5 Peripherals equipment	7
2. 20dB Bandwidth Test.....	8
2.1 Test Setup & Procedure	8
2.2 Operating Environment Condition	8
2.3 Test Results	8
3. Carrier Frequency Separation Test	12
3.1 Test Setup & Procedure	12
3.2 Operating Environment Condition	12
3.3 Test Results	12
4. Number of Hopping Frequencies Test.....	16
4.1 Test Setup & Procedure	16
4.2 Operating Environment Condition	16
4.3 Test Results	16
5. Time of Occupancy (Dwell Time).....	18
5.1 Test Setup & Procedure	18
5.2 Operating Environment Condition	18
5.3 Test Results	18
6. Maximum Output Power Test	22
6.1 Test Setup & Procedure	22
6.2 Operating Environment Condition	22
6.3 Test Results	22
7. RF Antenna Conducted Spurious Test	23
7.1 Test Setup & Procedure	23
7.2 Operating Environment Condition	23
7.3 Test Results	24
8. Emissions in Restricted Frequency Bands (Radiated emission measurements)	33
8.1 Instrument Setting.....	33
8.2 Test setup & procedure	33
8.3 Limit.....	35
8.4 Test Result.....	36
8.4.1 Measurement results: frequencies 9kHz to 30MHz.....	36

TEST REPORT

8.4.2 Measurement results: frequencies below 1 GHz	37
8.4.3 Measurement results: frequency above 1GHz to 25GHz.....	38
9. Emission on Band Edge.....	39
9.1 Instrument Setting.....	39
9.2 Test Procedure	39
9.3 Operating Environment Condition	39
9.4 Test Results	40
10. AC Power Line Conducted Emission	45
10.1 Measuring instrument setting.....	45
10.2 Test Procedure	45
10.3 Test Diagram	45
10.4 Limit	46
10.5 Test Results	47
Appendix A: Test equipment list.....	49
Appendix B: Measurement Uncertainty.....	51

Summary of Test Data

Test Requirement	Applicable Rule (Section 15.247)	Result
20dB Bandwidth Test	15.247(a)(1)	Pass
Carrier Frequency Separation Test	15.247(a)(1)	Pass
Number of Hopping Frequencies Test	15.247(a)(1)	Pass
Time of Occupancy (Dwell Time) Test	15.247(a)(1)(iii)	Pass
Maximum Output Power Test	15.247(b)	Pass
RF Antenna Conducted Spurious Test	15.247(d)	Pass
Radiated Spurious Emission Test	15.205, 15.209	Pass
Emission on the Band Edge Test	15.247(d)	Pass
AC Power Line Conducted Emission Test	15.207	Pass
Antenna Requirement	15.203	Pass

Note: Please note that the test results with statement of conformity, the decision rules which are based on: Safety Testing: the specification, standard or IEC Guide 115.

Other Testing: the specification, standard and not taking into account the measurement uncertainty.

1. General Information

1.1 Identification of the EUT

Product:	FORCITE HELMET
Model No.:	MK1
Operating Frequency:	2402 MHz ~ 2480 MHz
Channel Number:	79 channels
Frequency of Each Channel:	2402+k, k = 0~78
Rated Power:	DC 5V
Power Cord:	N/A
Sample receiving date:	2022/07/21
Sample condition:	Workable
Test Date(s):	2022/08/22 ~ 2022/09/07

1.2 Additional information about the EUT

The customer confirmed there are several trade names, the different brands served as marketing strategy.

Brand Name	Model Number	Different
MK1S	MK1	painting different; helmet padding different
MK1R	MK1	painting different; helmet padding different
MK1X	MK1	painting different; helmet padding different
MK1SE	MK1	painting different; helmet padding different
MK1D	MK1	painting different; helmet padding different

1.3 Antenna description

Antenna Gain	: 3.77 dBi
Antenna Type	: PCB antenna
Connector Type	: I-Pex

1.4 Operation mode

Connected to Notebook via USB Cable, executing “BLU Test3” and select different frequency and modulation.

System Receiver Input Bandwidth

It is determined in the Bluetooth core specification. The value matches to the bandwidth of transmitter signal.

1.5 Peripherals equipment

Peripherals	Brand	Model No.	Serial No.	Data cable
Notebook PC	ASUS	N81V	N/A	Micro USB shielded cable 0.2m
Fixture	N/A	N/A	N/A	Micro USB shielded cable 0.2m
Adapter	Samsung	EP-TA10JWS	N/A	N/A

2. 20dB Bandwidth Test

2.1 Test Setup & Procedure

The test procedure was according to FCC measurement guidelines DA 00-705.

The 20dB bandwidth per FCC §15.247(a)(1) was measured using a 50 ohm spectrum analyzer with the resolutions bandwidth set $\geq 1\%$ of 20dB Bandwidth, the video bandwidth $\geq$ RBW, and the SPAN may equal to approximately 2 to 3 times the 20dB bandwidth. The test was performed at 3 channels (lowest, middle and highest channel). The maximum 20dB modulation bandwidth is in the following Table.

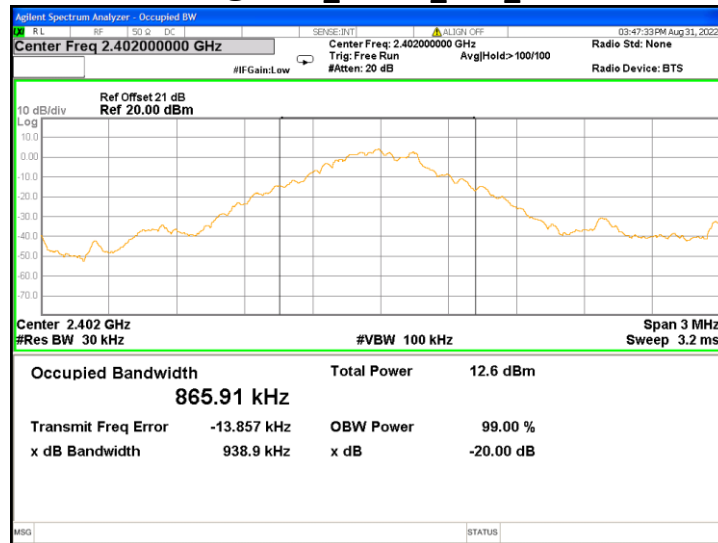
2.2 Operating Environment Condition

Temperature (°C) :	27
Relative Humidity (%) :	61
Test date :	2022/08/31

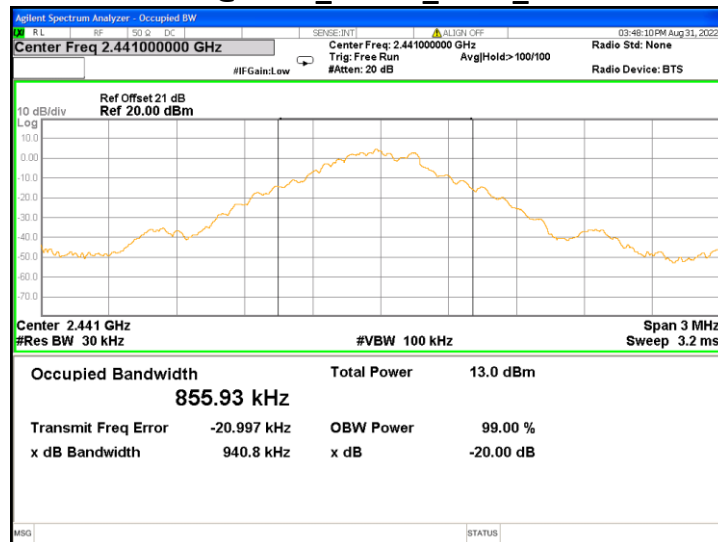
2.3 Test Results

Mode	Channel	Frequency (MHz)	20dB Bandwidth (MHz)
DH5	0	2402	0.939
	39	2441	0.941
	78	2480	0.937
2DH5	0	2402	1.228
	39	2441	1.269
	78	2480	1.276
3DH5	0	2402	1.231
	39	2441	1.229
	78	2480	1.230

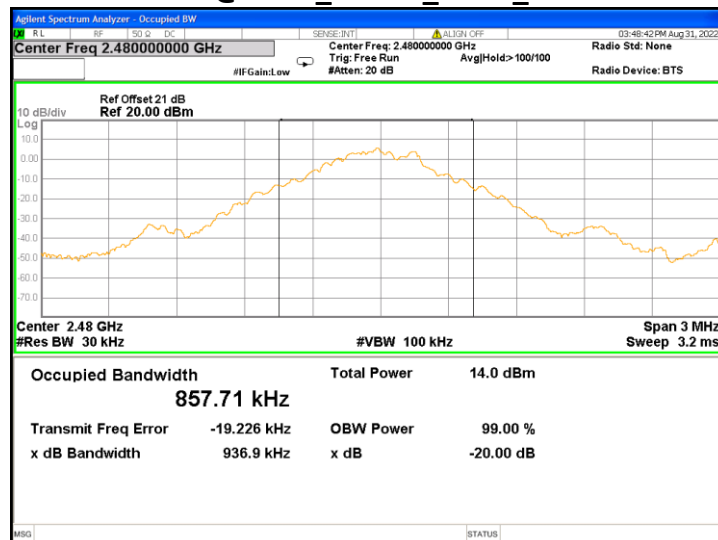
20dB@1DH5_Chain0_Ch 0_2402



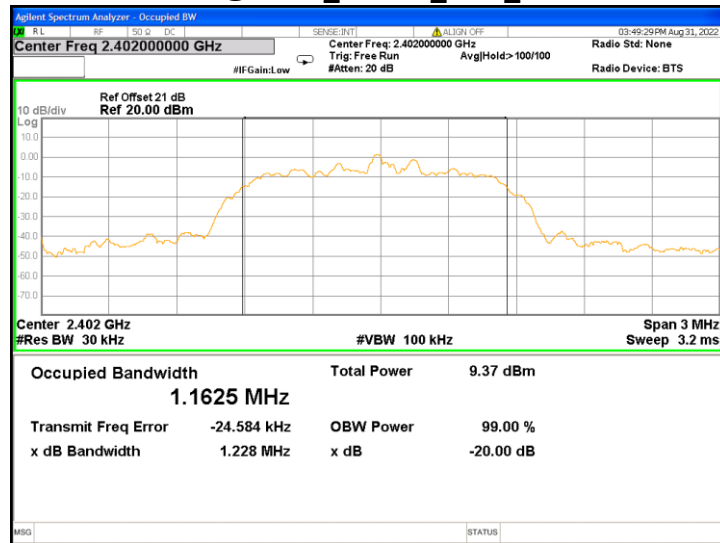
20dB@1DH5_Chain0_Ch 39_2441



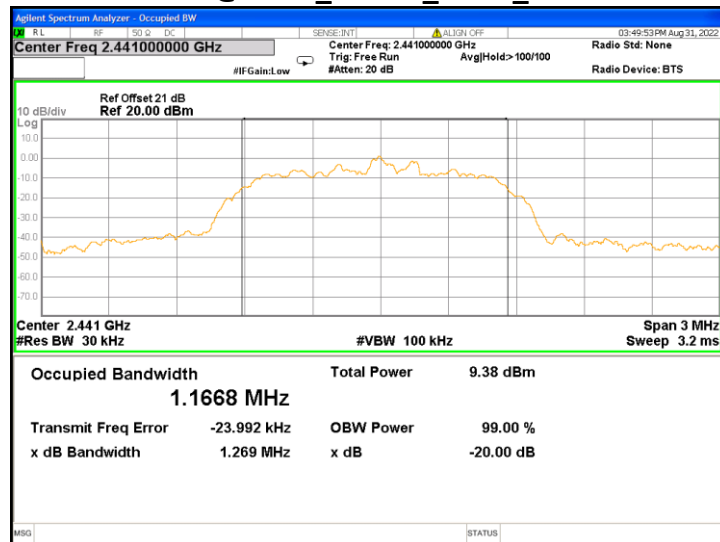
20dB@1DH5_Chain0_Ch 78_2480



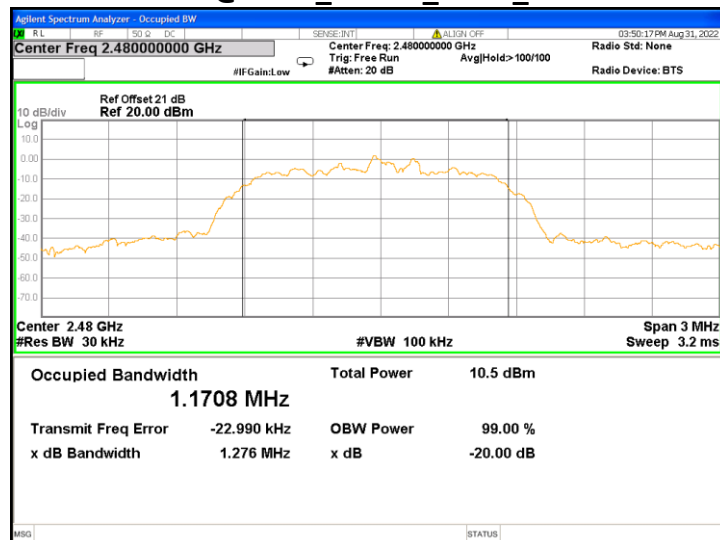
20dB@2DH5_Chain0_Ch 0_2402



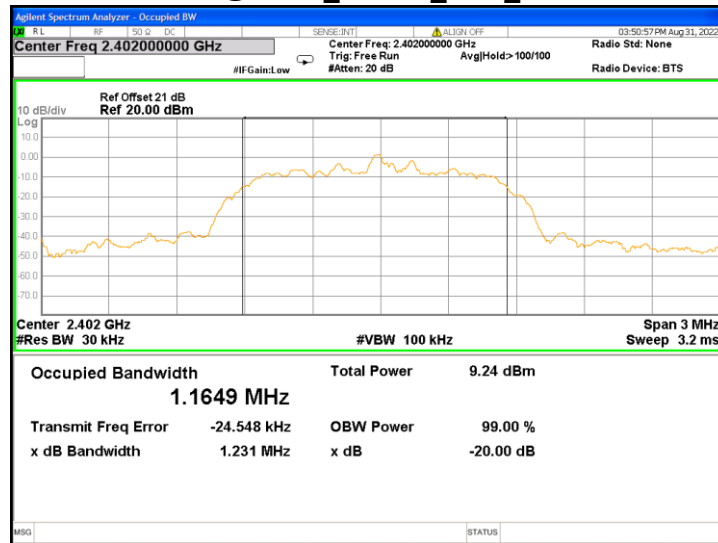
20dB@2DH5_Chain0_Ch 39_2441



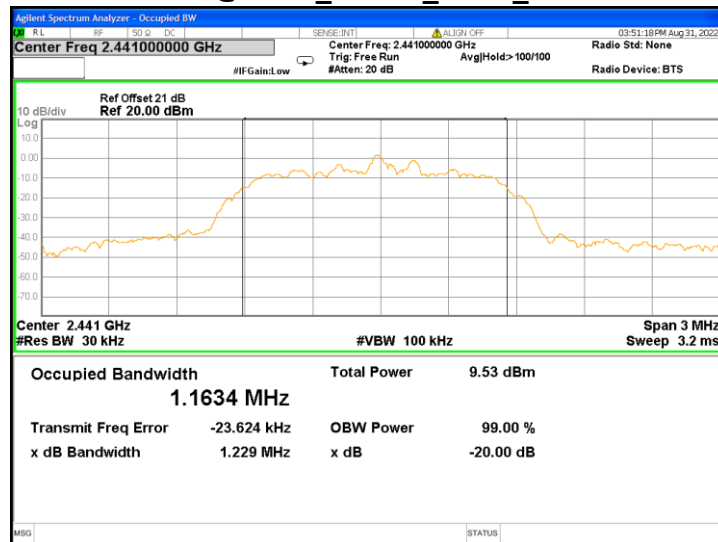
20dB@2DH5_Chain0_Ch 78_2480



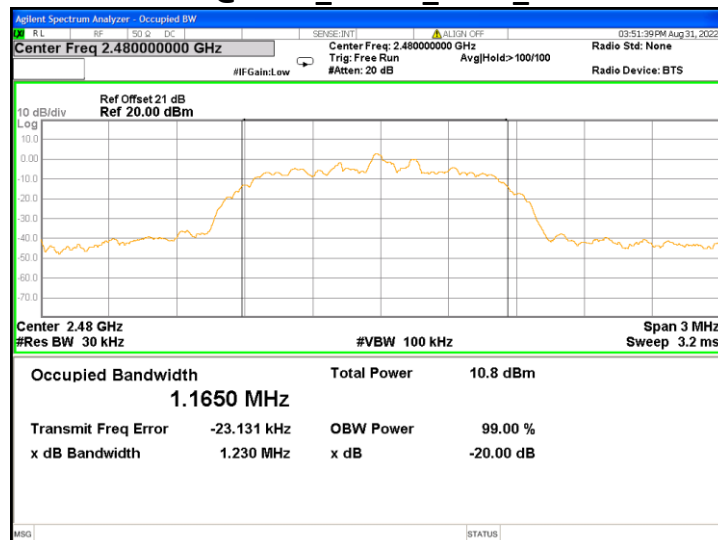
20dB@3DH5_Chain0_Ch 0_2402



20dB@3DH5_Chain0_Ch 39_2441



20dB@3DH5_Chain0_Ch 78_2480



3. Carrier Frequency Separation Test

3.1 Test Setup & Procedure

The test procedure was according to FCC measurement guidelines DA 00-705.

The carrier frequency separation per FCC §15.247(a)(1) was measured using a 50 ohm spectrum analyzer with the resolutions bandwidth set at $\geq 1\%$ of the span, the video bandwidth $\geq$ RBW, and the SPAN was wide enough to capture the peaks of two adjacent channels. The carrier frequency separation result is in the following Table.

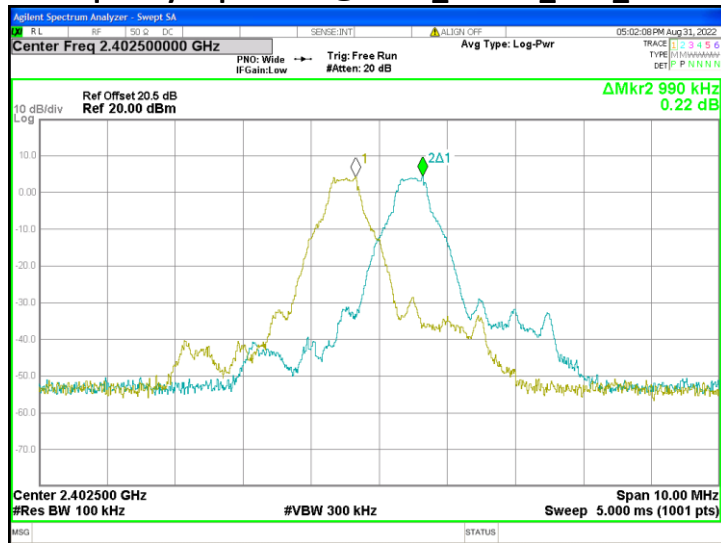
3.2 Operating Environment Condition

Temperature (°C) :	27
Relative Humidity (%) :	61
Test date :	2022/08/31

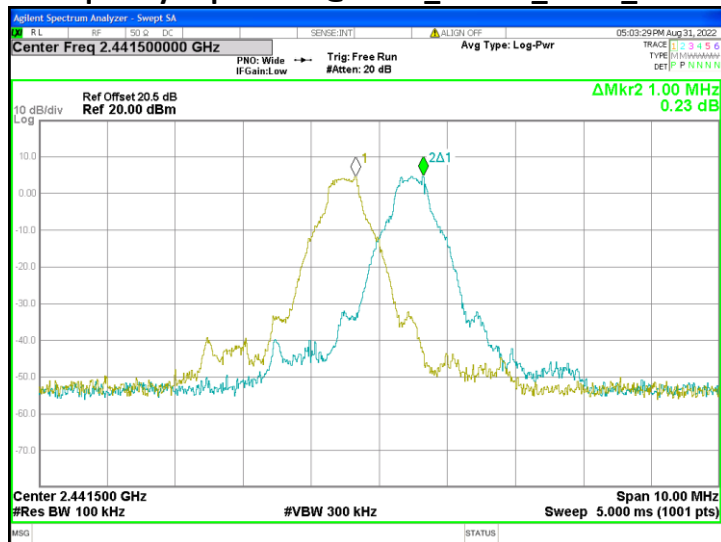
3.3 Test Results

Mode	Channel	Frequency (MHz)	Adjacent channel separation (MHz)	>Limit (MHz)	Results
DH5	0	2402	0.990	0.626	Pass
	39	2441	1.000	0.627	Pass
	78	2480	1.200	0.625	Pass
2DH5	0	2402	1.110	0.819	Pass
	39	2441	0.990	0.846	Pass
	78	2480	1.000	0.851	Pass
3DH5	0	2402	1.160	0.821	Pass
	39	2441	1.060	0.819	Pass
	78	2480	1.130	0.820	Pass

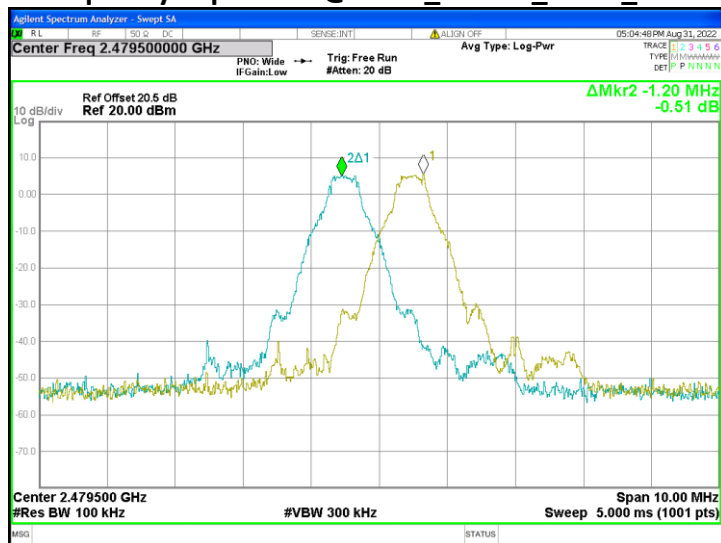
Frequency Separation@1DH5_Chain0_Ch 0_2402



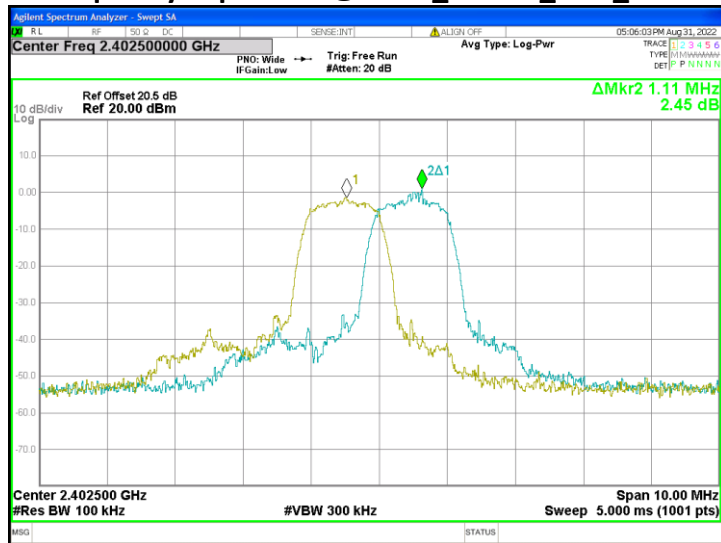
Frequency Separation@1DH5_Chain0_Ch 39_2441



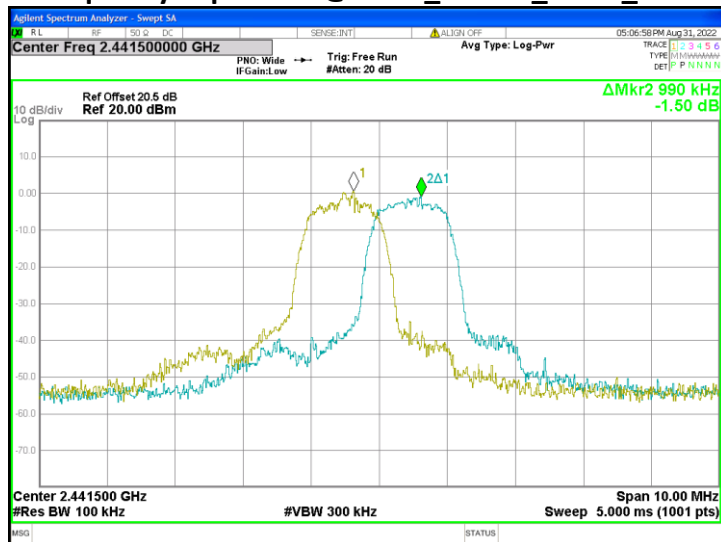
Frequency Separation@1DH5_Chain0_Ch 78_2480



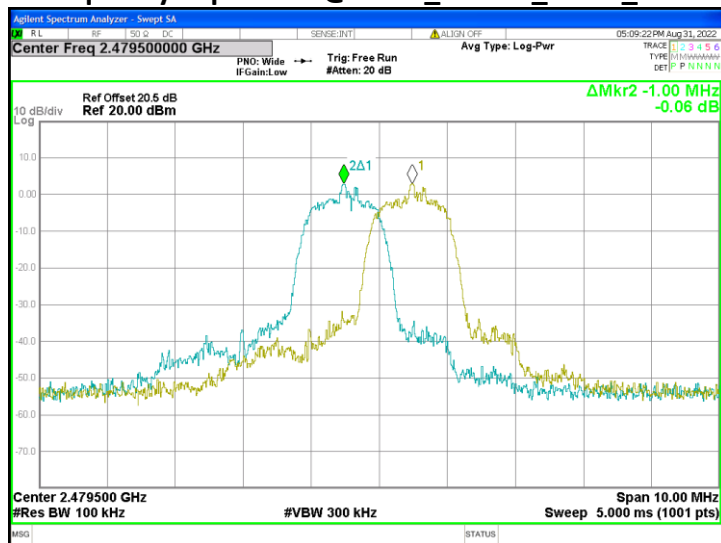
Frequency Separation@2DH5_Chain0_Ch 0_2402



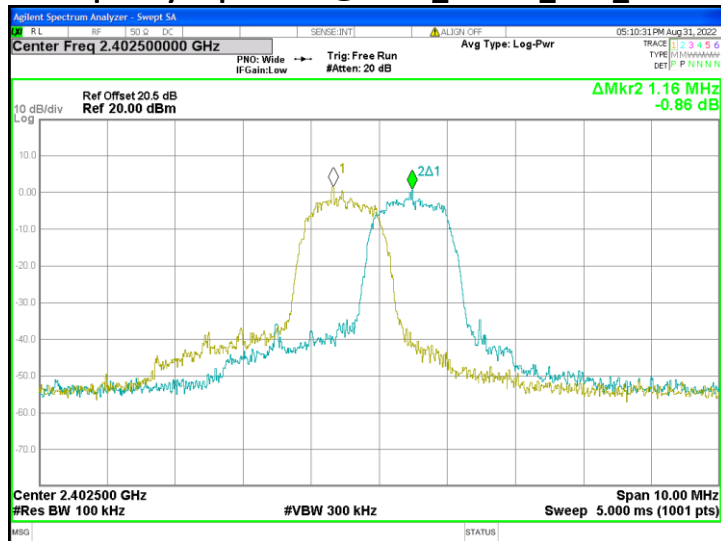
Frequency Separation@2DH5_Chain0_Ch 39_2441



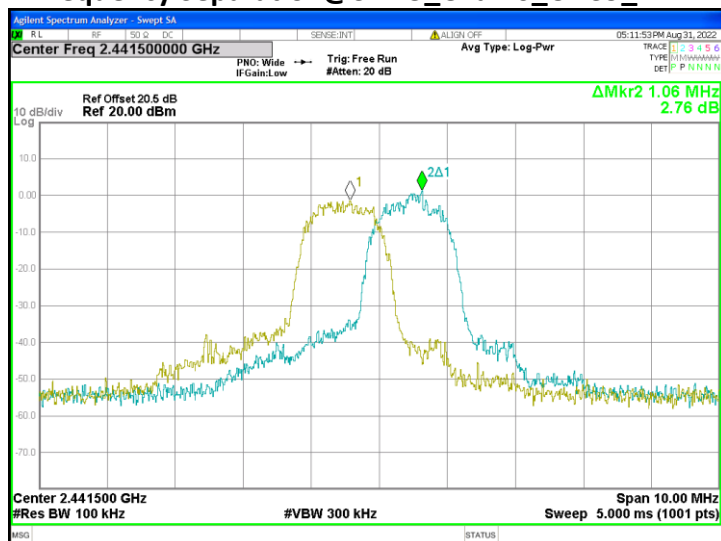
Frequency Separation@2DH5_Chain0_Ch 78_2480



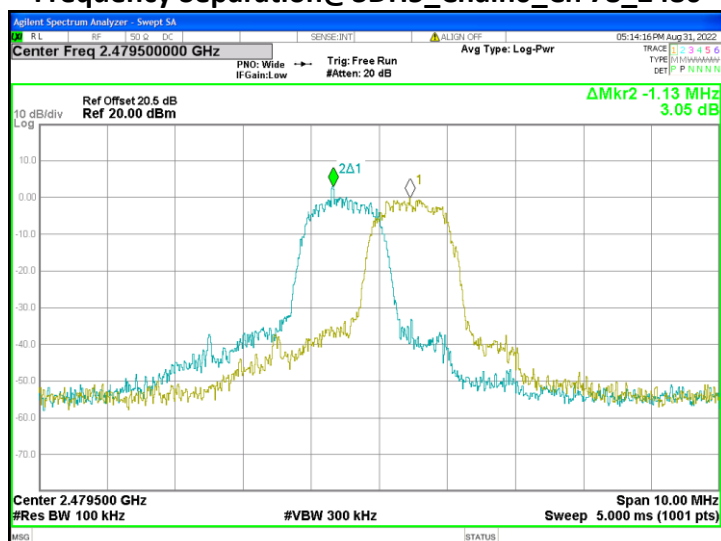
Frequency Separation@3DH5_Chain0_Ch 0_2402



Frequency Separation@3DH5_Chain0_Ch 39_2441



Frequency Separation@3DH5_Chain0_Ch 78_2480



4. Number of Hopping Frequencies Test

4.1 Test Setup & Procedure

The test procedure was according to FCC measurement guidelines DA 00-705.

The number of hopping frequencies per FCC §15.247(a)(1) was measured using a 50 ohm spectrum analyzer with the resolutions bandwidth set at $\geq 1\%$ of the span, the video bandwidth $\geq$ RBW, and the SPAN was the frequency band of operation. The carrier frequency separation result is in the following Table.

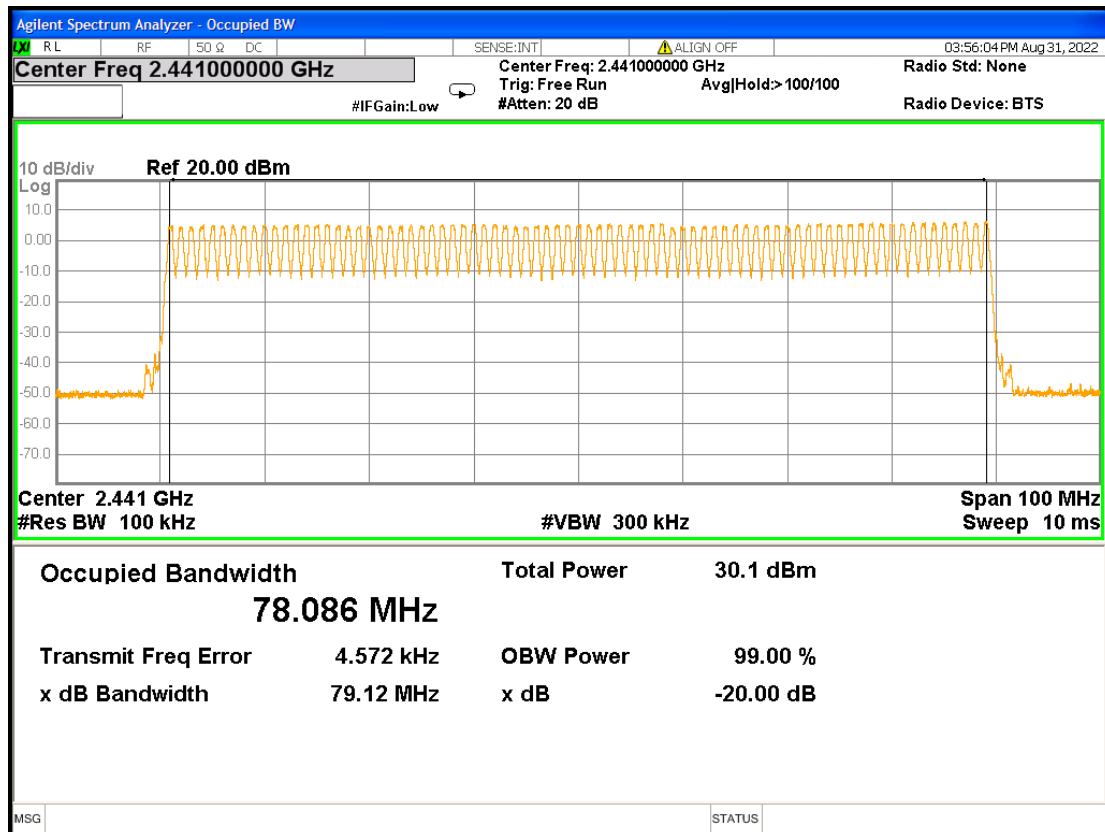
4.2 Operating Environment Condition

Temperature (°C) :	27
Relative Humidity (%) :	61
Test date :	2022/08/31

4.3 Test Results

Frequency Range (MHz)	Hopping Channels
2402~2480	79

Number of Hopping Frequencies @ DH5 Hopping Mode



5. Time of Occupancy (Dwell Time)

5.1 Test Setup & Procedure

The test procedure was according to FCC measurement guidelines DA 00-705.

The time of occupancy (dwell time) per FCC §15.247(a)(1) was measured using a 50 ohm spectrum analyzer with the resolutions bandwidth set at 1MHz, the video bandwidth $\geq$ RBW, and the zero span function of spectrum analyzer was enable. The EUT has its hopping function enable.

5.2 Operating Environment Condition

Temperature (°C) :	27
Relative Humidity (%) :	61
Test date :	2022/08/31

5.3 Test Results

Mode	Pulse duration (ms)	Measure time (s)	Dwell time (s)	<Limit (s)	Results
DH1	0.386	31.6	0.123	0.4	Pass
DH3	1.641	31.6	0.263	0.4	Pass
DH5	2.890	31.6	0.308	0.4	Pass
2DH1	0.418	31.6	0.134	0.4	Pass
2DH3	1.669	31.6	0.267	0.4	Pass
2DH5	2.918	31.6	0.311	0.4	Pass
3DH1	0.417	31.6	0.133	0.4	Pass
3DH3	1.667	31.6	0.267	0.4	Pass
3DH5	2.919	31.6	0.311	0.4	Pass

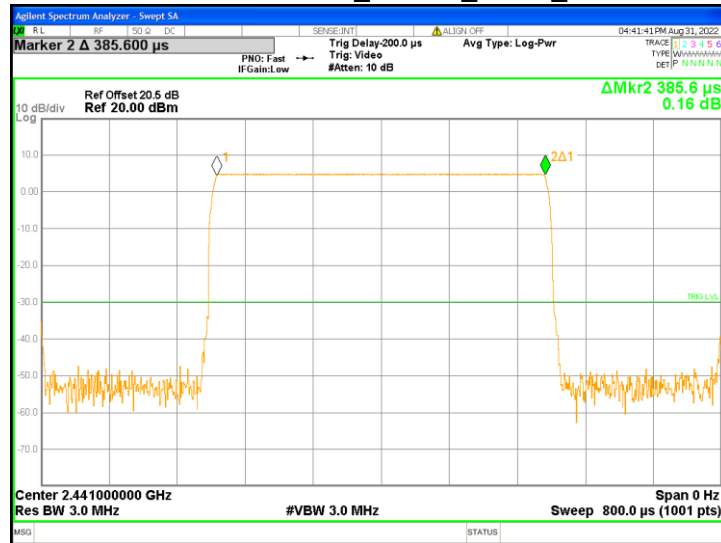
Note: (1) Dwell time = $1600 \div (79 \times N) \times \text{Pulse duration} \times \text{Measure time}$

(2) DH1, N=2

DH3, N=4

DH5, N=6

Dwell time@1DH1_Chain0_Ch 39_2441



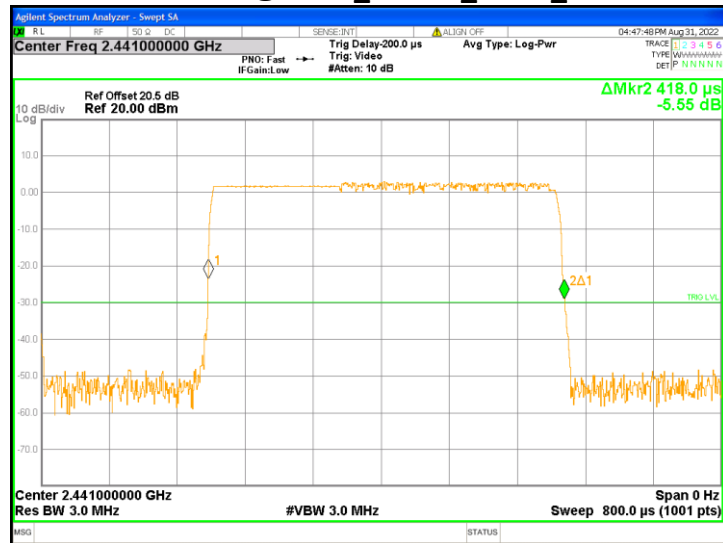
Dwell time@1DH3_Chain0_Ch 39_2441



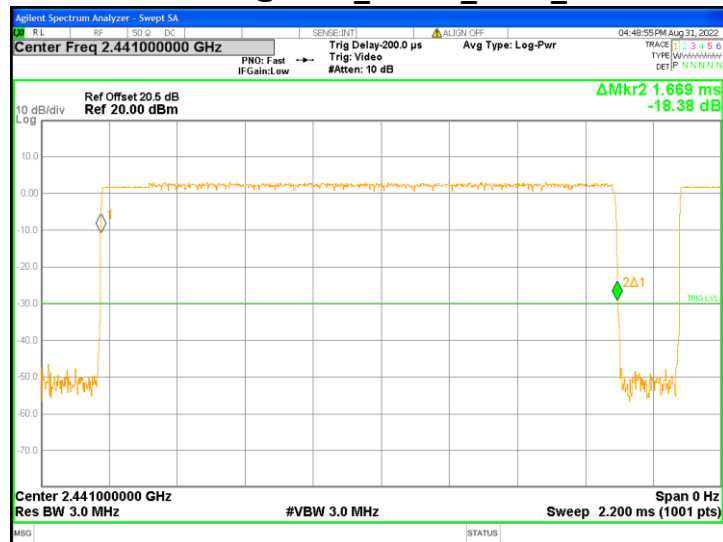
Dwell time@1DH5_Chain0_Ch 39_2441



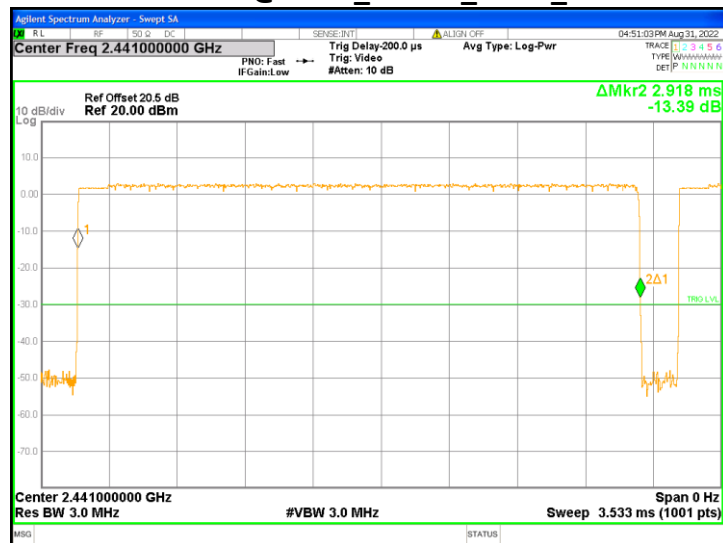
Dwell time@2DH1_Chain0_Ch 39_2441



Dwell time@2DH3_Chain0_Ch 39_2441



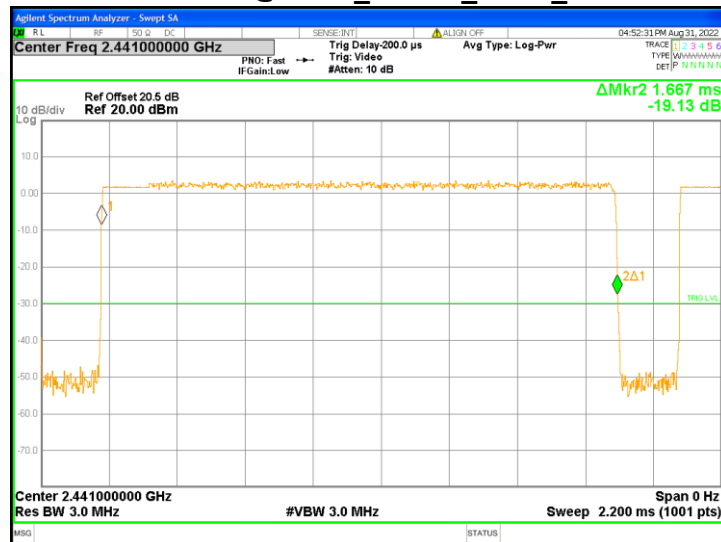
Dwell time@2DH5_Chain0_Ch 39_2441



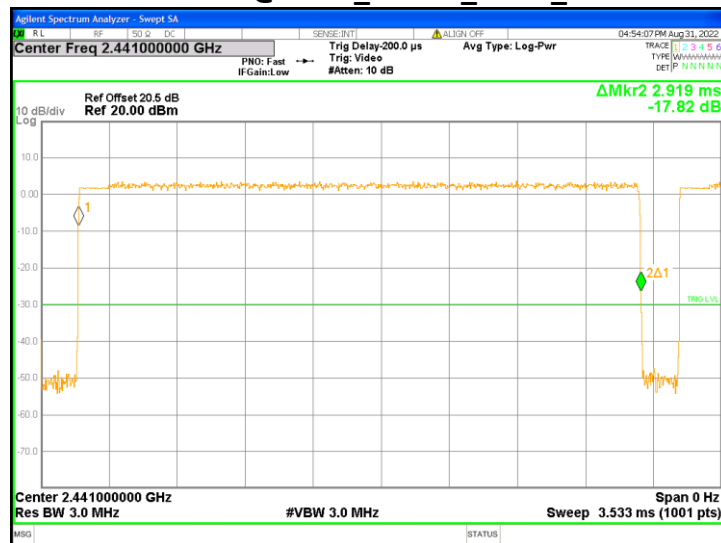
Dwell time@3DH1_Chain0_Ch 39_2441



Dwell time@3DH3_Chain0_Ch 39_2441



Dwell time@3DH5_Chain0_Ch 39_2441



6. Maximum Output Power Test

6.1 Test Setup & Procedure

The test procedure was according to FCC measurement guidelines DA 00-705.

The power output per FCC §15.247(b) was measured on the EUT using a 50 ohm SMA cable connected to peak power meter via power sensor. Power was read directly and cable loss correction (2 dB) was added to the reading to obtain power at the EUT antenna terminals. The test was performed at 3 channels (lowest, middle and highest channel).

Note: Using the gate function of power meter.

6.2 Operating Environment Condition

Temperature (°C) :	27
Relative Humidity (%) :	61
Test date :	2022/08/31

6.3 Test Results

Mode	Channel	Frequency (MHz)	Output Power [AV] (dBm)	Total Power [AV] (mW)	Limit (dBm)	Margin (dB)
DH5	0	2402	-1.24	0.75	30	-31.24
	39	2441	-3.73	0.42	30	-33.73
	78	2480	-2.83	0.52	30	-32.83
2DH5	0	2402	-1.51	0.71	21	-22.51
	39	2441	-2.19	0.60	21	-23.19
	78	2480	-0.91	0.81	21	-21.91
3DH5	0	2402	-1.39	0.73	21	-22.39
	39	2441	-1.99	0.63	21	-22.99
	78	2480	-0.75	0.84	21	-21.75

7. RF Antenna Conducted Spurious Test

7.1 Test Setup & Procedure

The test procedure was according to FCC measurement guidelines DA 00-705.

The measurements were performed from 30MHz to 25GHz RF antenna conducted per FCC 15.247 (c) was measured from the EUT antenna port using a 50ohm spectrum analyzer with the resolution bandwidth set at 100 kHz, and the video bandwidth set at 100 kHz.

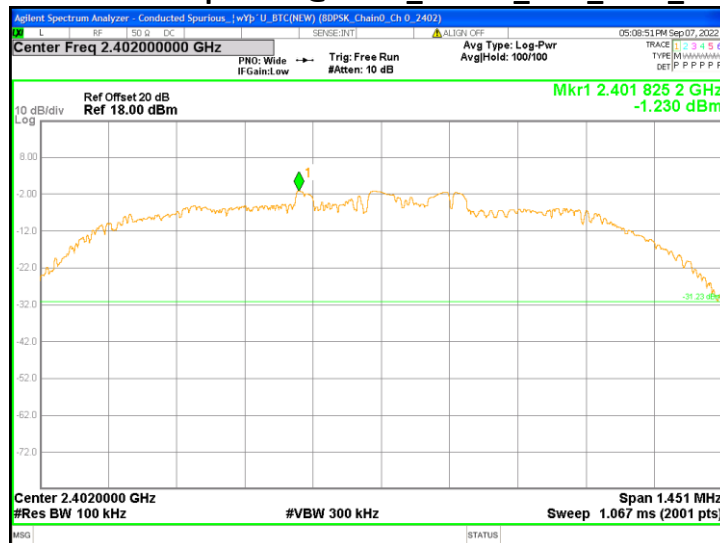
Harmonics and spurious noise must be at least 30dB down from the highest emission level within the authorized band as measured with a 100 kHz RBW.

7.2 Operating Environment Condition

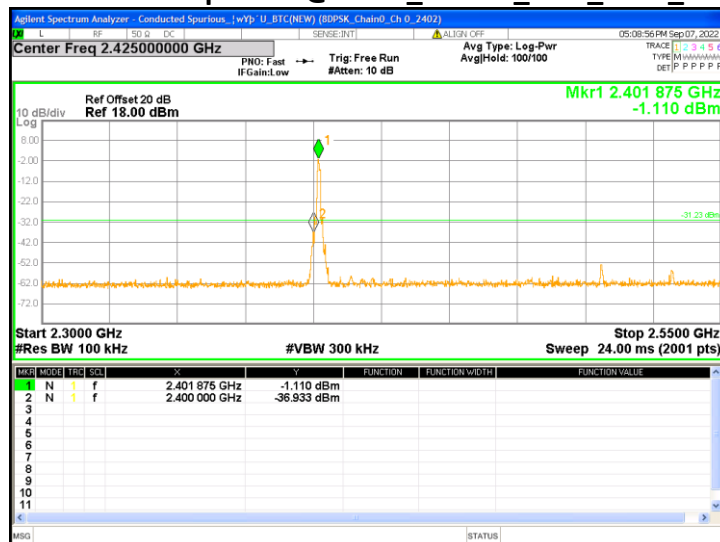
Temperature (°C) :	27
Relative Humidity (%) :	61
Test date :	2022/08/31

7.3 Test Results

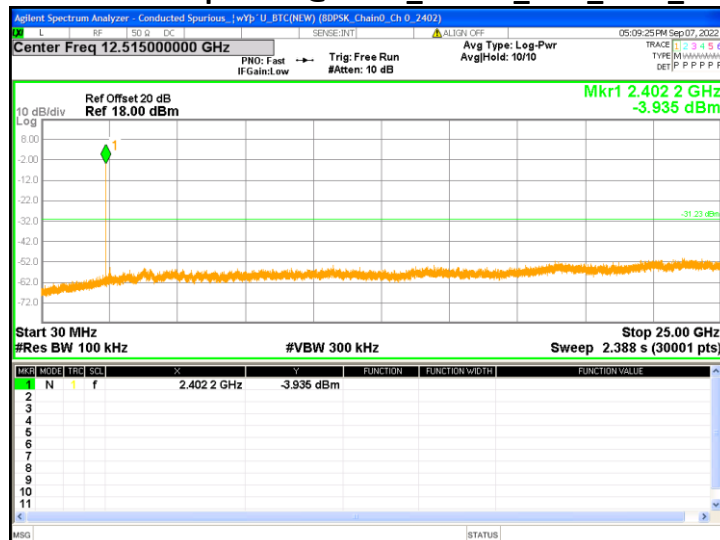
Conducted Spurious@1DH5_Chain0_Ch 0_2402_1



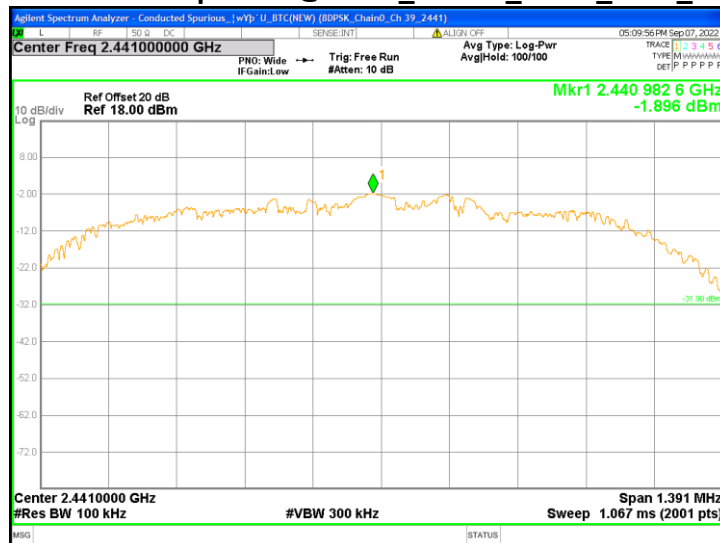
Conducted Spurious@1DH5_Chain0_Ch 0_2402_2



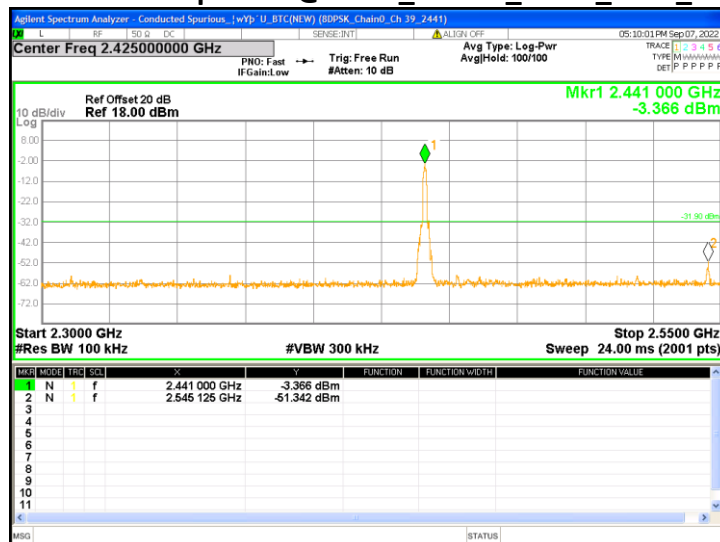
Conducted Spurious@1DH5_Chain0_Ch 0_2402_3



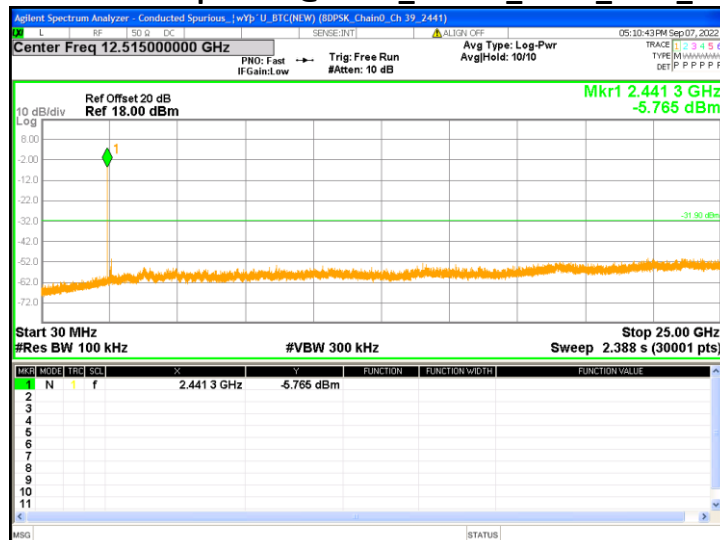
Conducted Spurious@1DH5_Chain0_Ch 39_2441_1



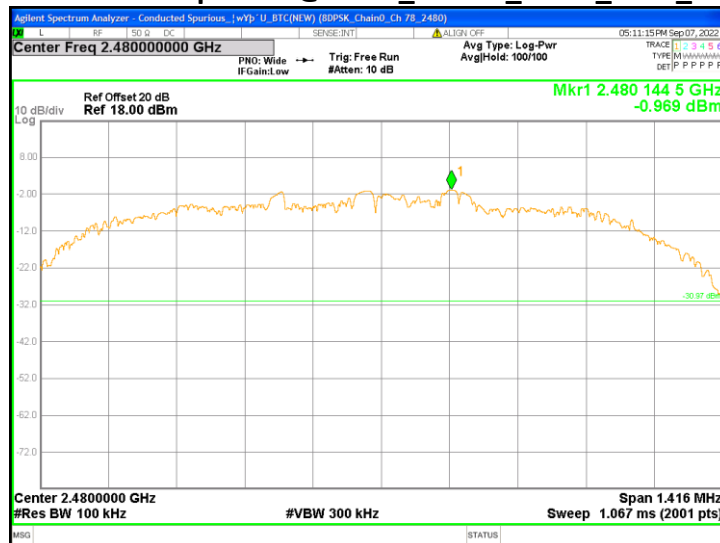
Conducted Spurious@1DH5_Chain0_Ch 39_2441_2



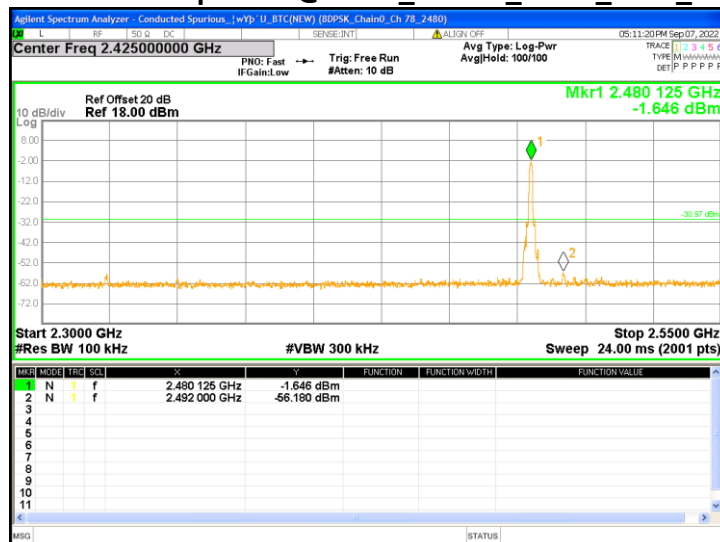
Conducted Spurious@1DH5_Chain0_Ch 39_2441_3



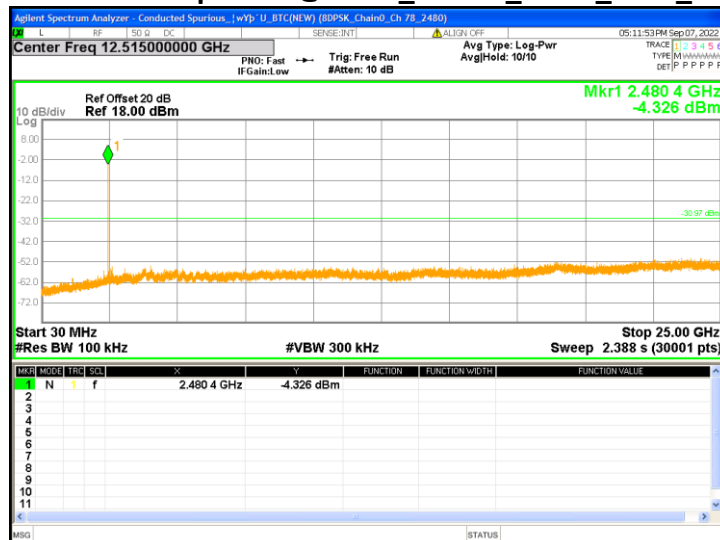
Conducted Spurious@1DH5_Chain0_Ch 78_2480_1



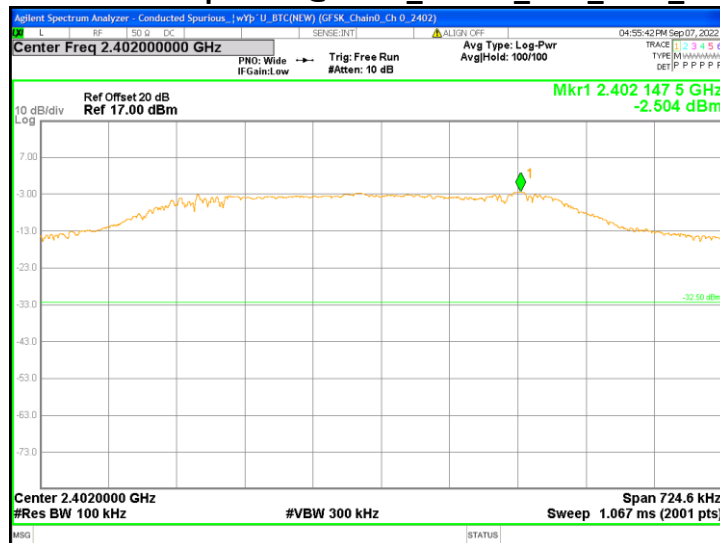
Conducted Spurious@1DH5_Chain0_Ch 78_2480_2



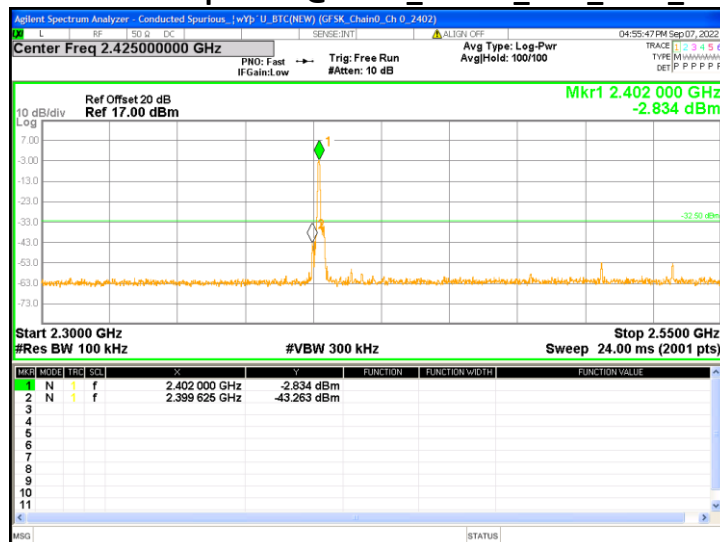
Conducted Spurious@1DH5_Chain0_Ch 78_2480_3



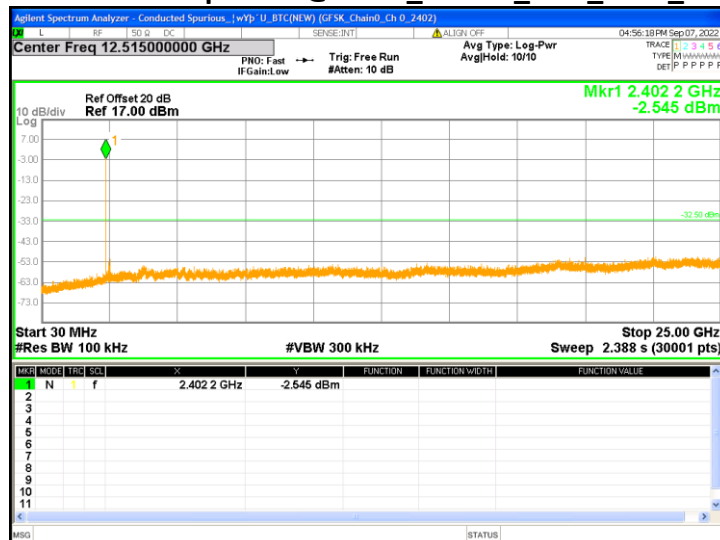
Conducted Spurious@2DH5_Chain0_Ch 0_2402_1



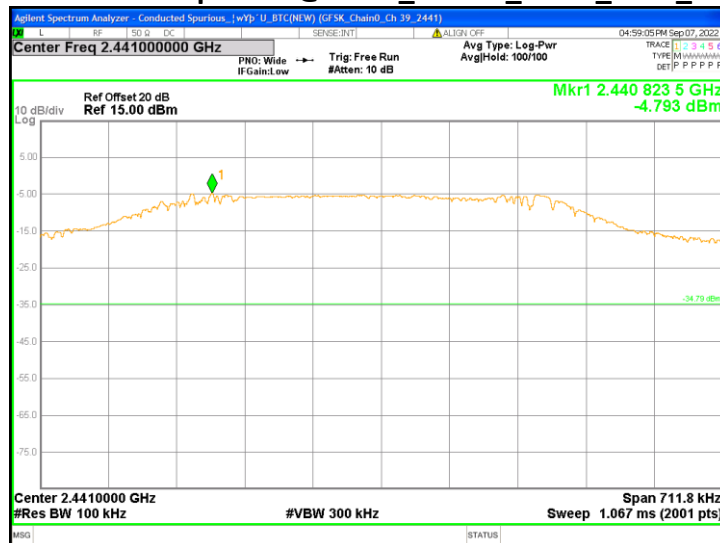
Conducted Spurious@2DH5_Chain0_Ch 0_2402_2



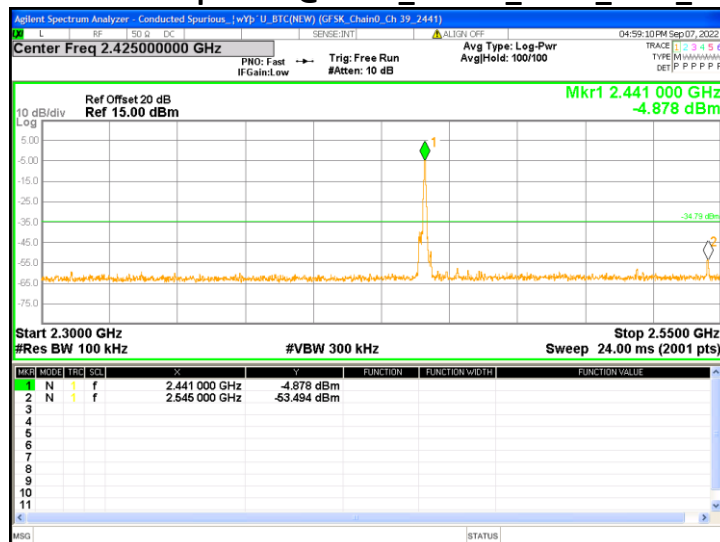
Conducted Spurious@2DH5_Chain0_Ch 0_2402_3



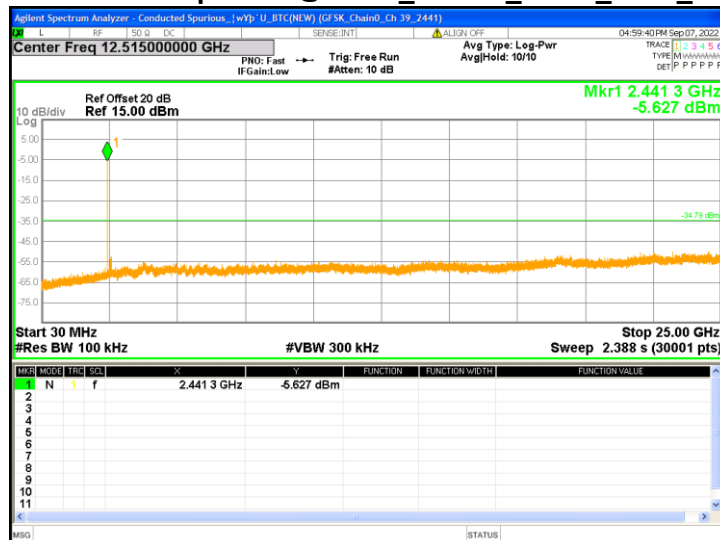
Conducted Spurious@2DH5_Chain0_Ch 39_2441_1



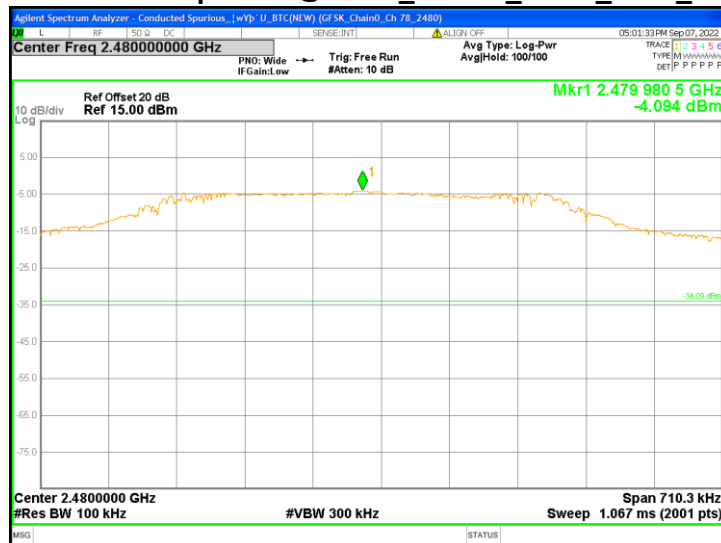
Conducted Spurious@2DH5_Chain0_Ch 39_2441_2



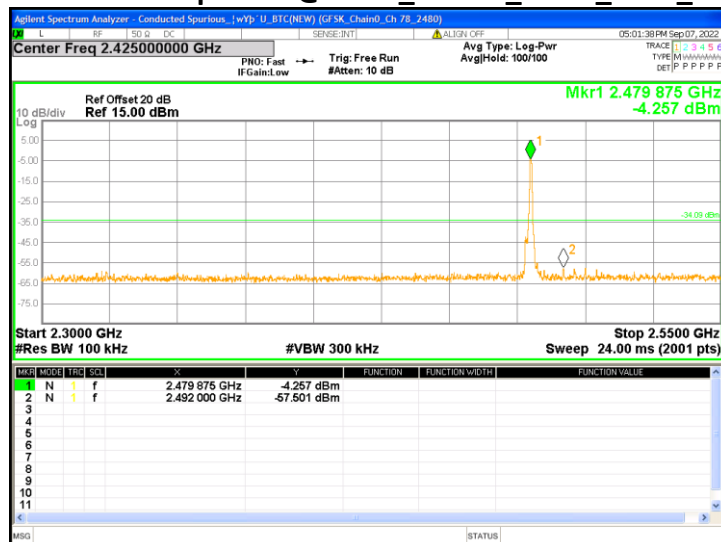
Conducted Spurious@2DH5_Chain0_Ch 39_2441_3



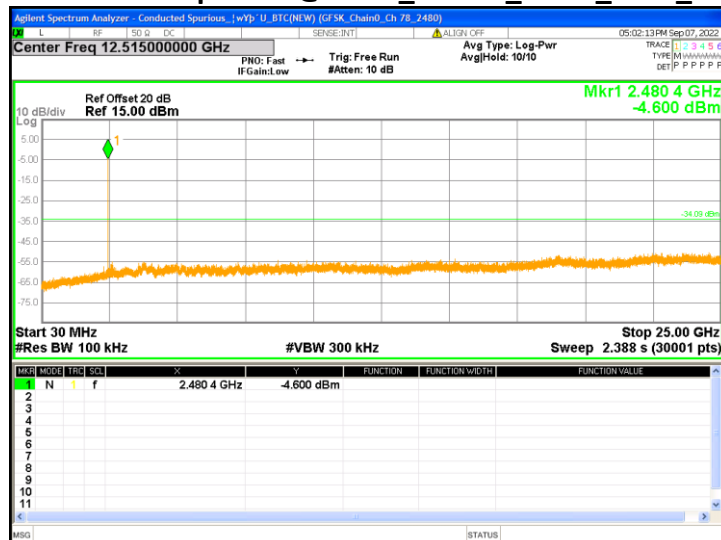
Conducted Spurious@2DH5_Chain0_Ch 78_2480_1



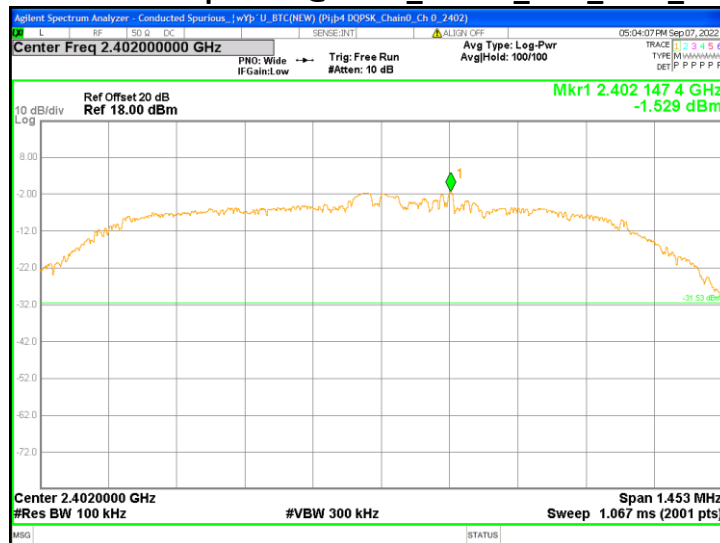
Conducted Spurious@2DH5_Chain0_Ch 78_2480_2



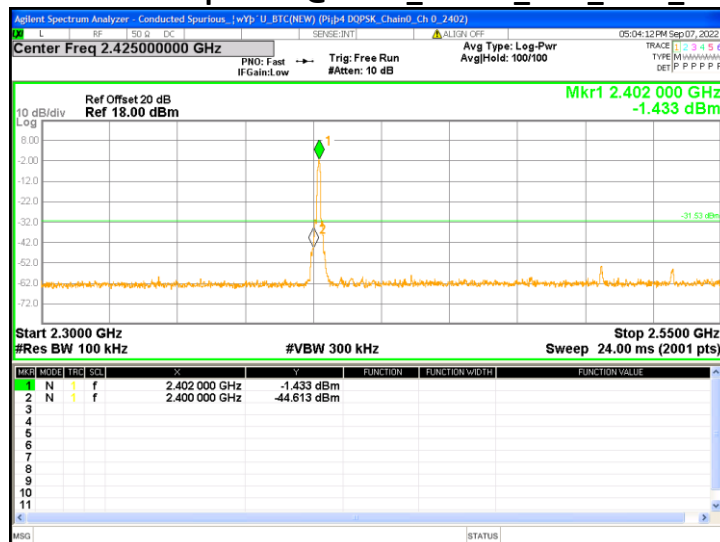
Conducted Spurious@2DH5_Chain0_Ch 78_2480_3



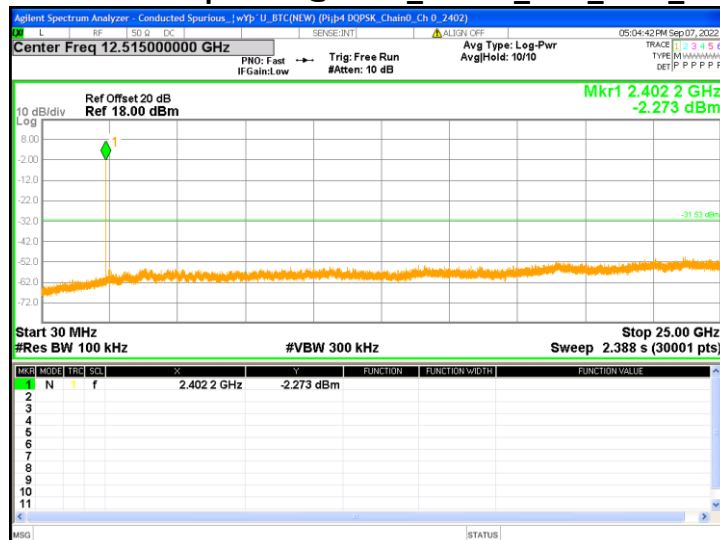
Conducted Spurious@3DH5_Chain0_Ch 0_2402_1



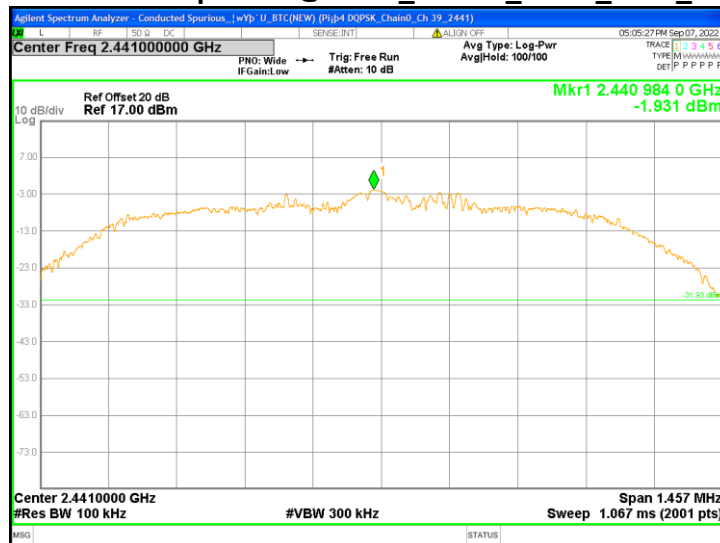
Conducted Spurious@3DH5_Chain0_Ch 0_2402_2



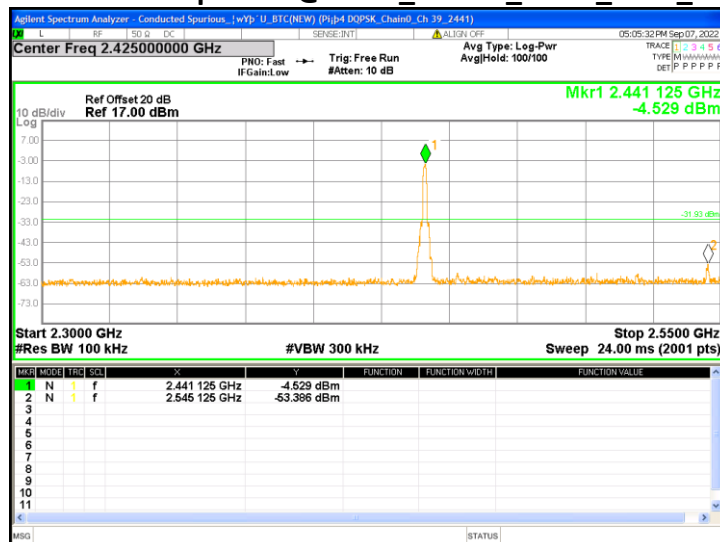
Conducted Spurious@3DH5_Chain0_Ch 0_2402_3



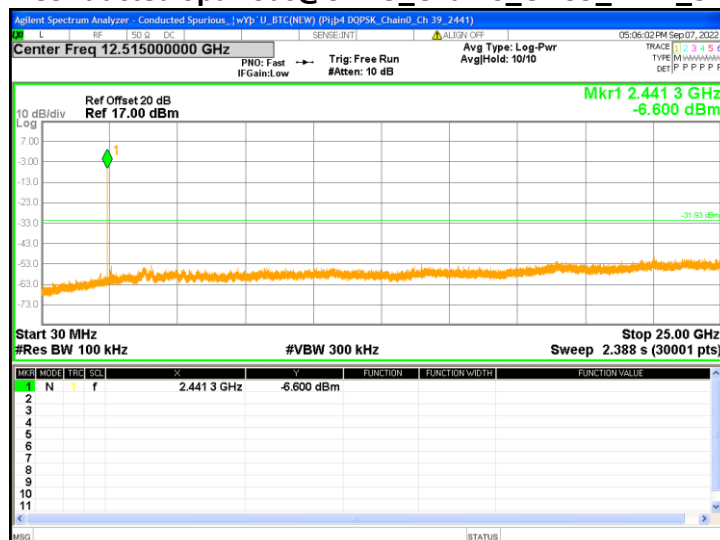
Conducted Spurious@3DH5_Chain0_Ch 39_2441_1



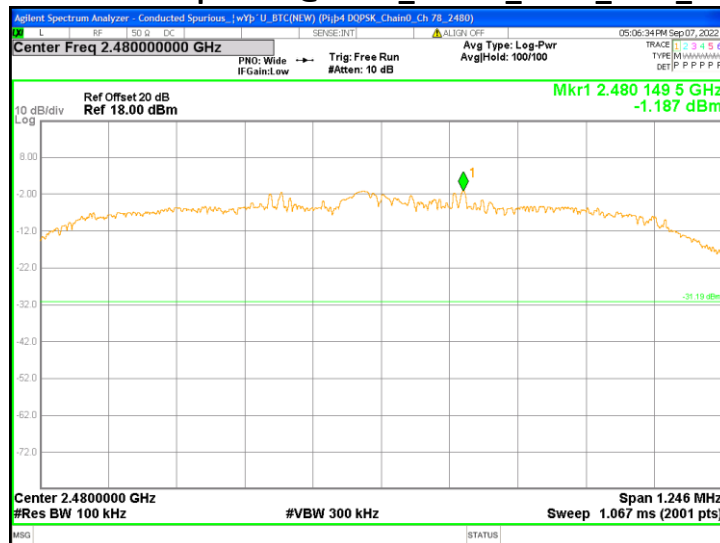
Conducted Spurious@3DH5_Chain0_Ch 39_2441_2



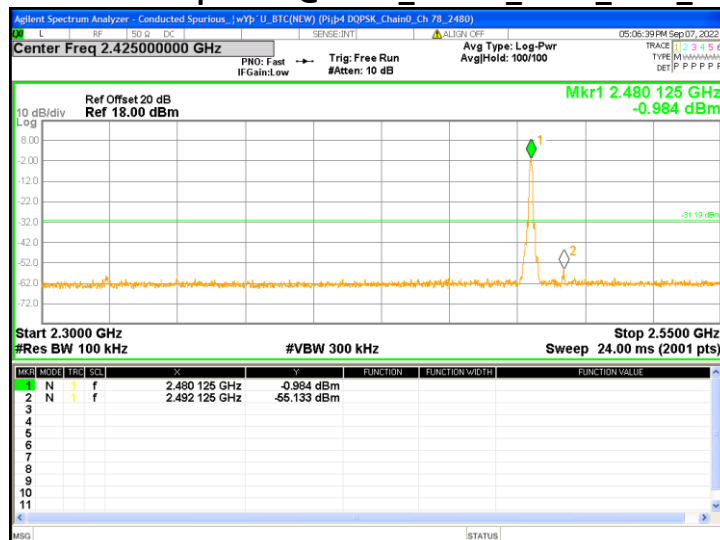
Conducted Spurious@3DH5_Chain0_Ch 39_2441_3



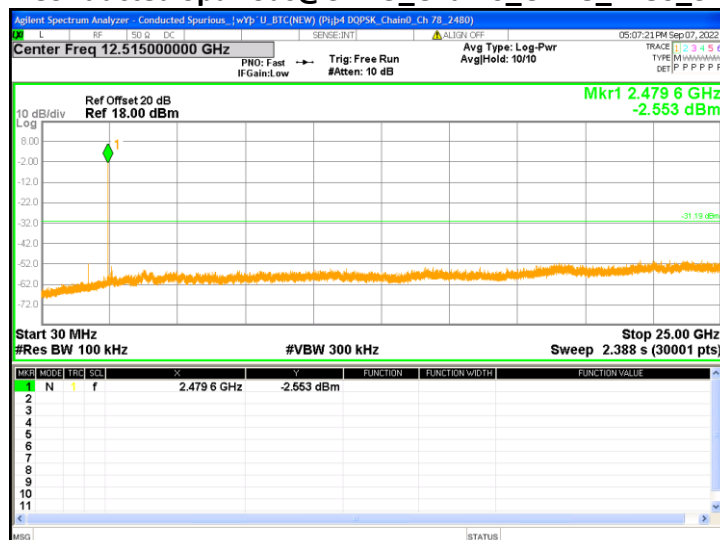
Conducted Spurious@3DH5_Chain0_Ch 78_2480_1



Conducted Spurious@3DH5_Chain0_Ch 78_2480_2



Conducted Spurious@3DH5_Chain0_Ch 78_2480_3



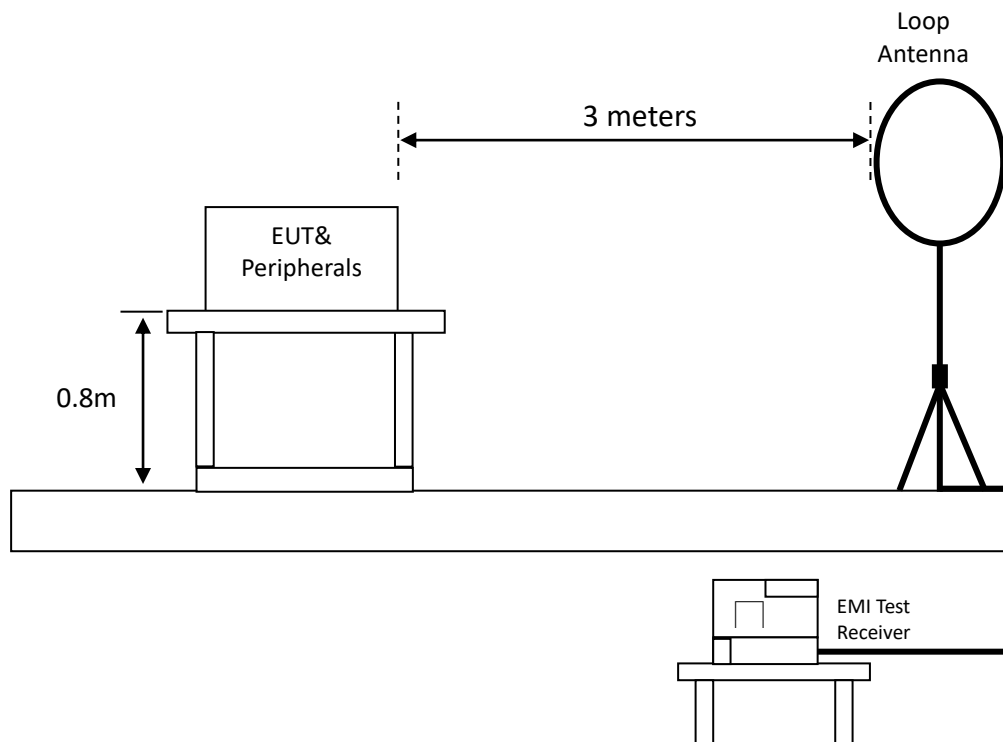
8. Emissions in Restricted Frequency Bands (Radiated emission measurements)

8.1 Instrument Setting

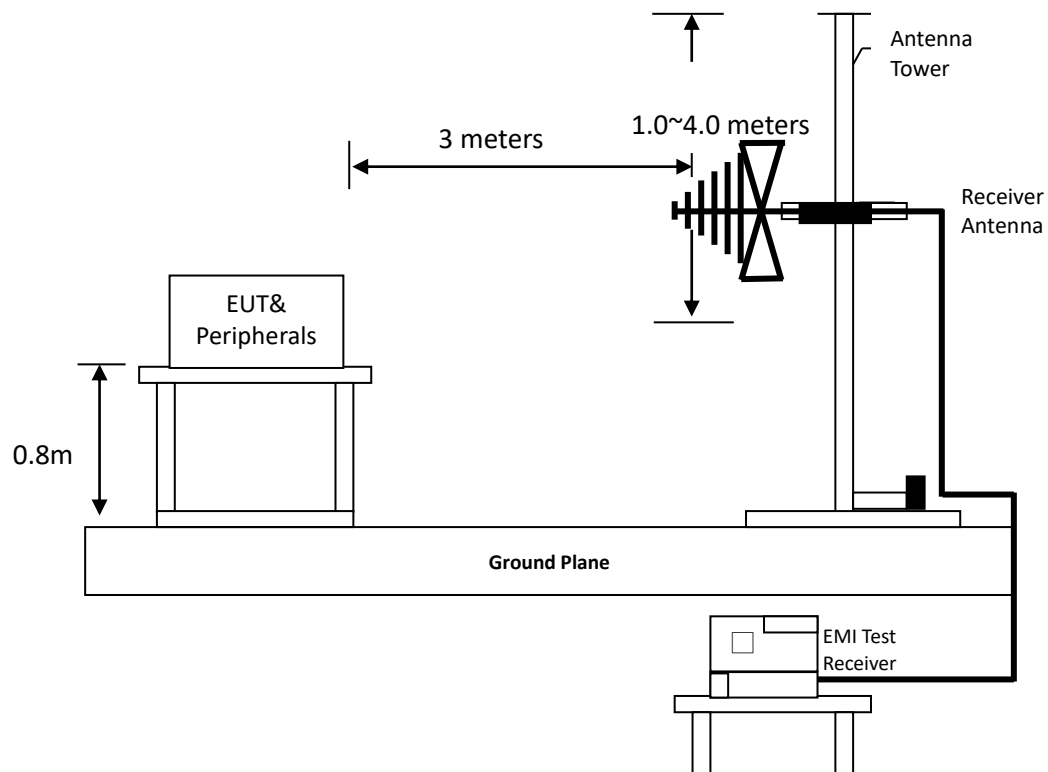
Receiver Function	Setting (Below 1GHz)	Setting (Above 1GHz)
Detector	QP	Peak and Average
RBW	9-150 kHz ; 200-300 Hz 0.15-30 MHz; 9-10 kHz 30-1000 MHz; 100-120 kHz	1MHz
VBW	$\geq 3 \times \text{RBW}$	3MHz & 1/T Minimum VBW
Sweep	Auto couple	Auto couple
Start Frequency	9 kHz	1GHz
Stop Frequency	1 GHz	Tenth harmonic
Attenuation	Auto	Auto

8.2 Test setup & procedure

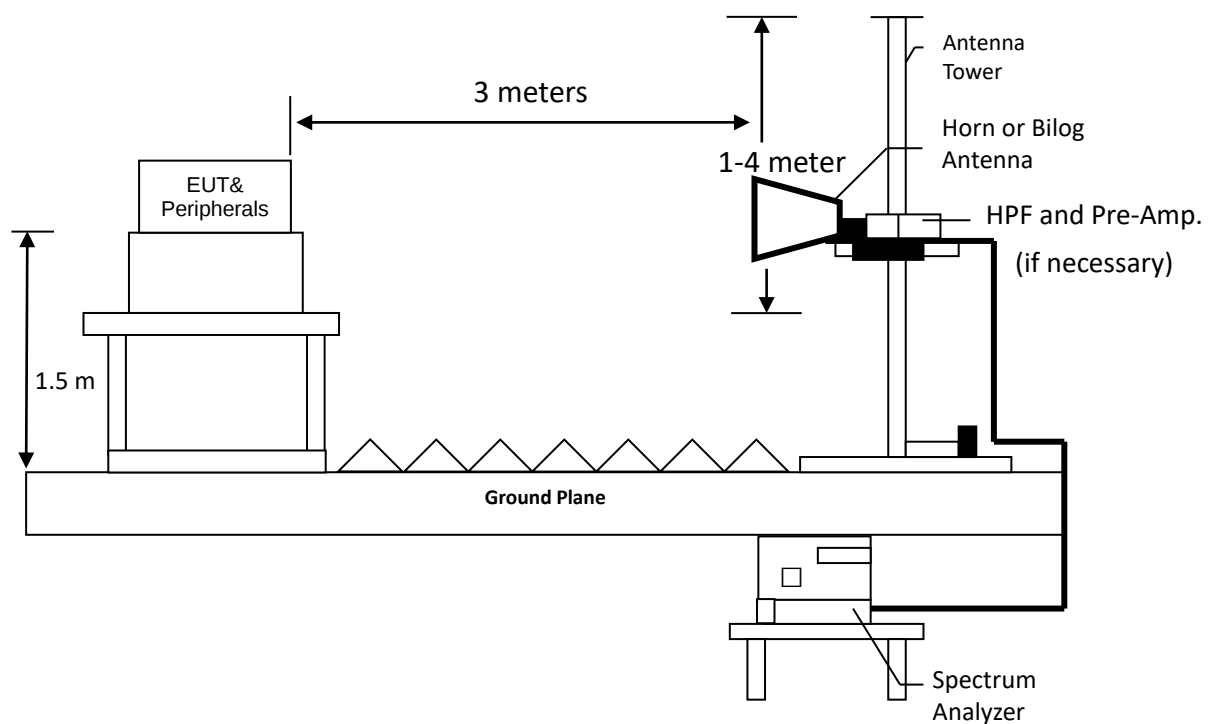
Radiated emission from 9kHz to 30MHz uses Loop Antenna:



Radiated emission below 1GHz using Bilog Antenna



Radiated emission above 1GHz using Horn Antenna



TEST REPORT

Radiated emissions were investigated cover the frequency range from 30MHz to 1000MHz using a receiver RBW of 120kHz record QP reading, and the frequency over 1GHz using a spectrum analyzer RBW of 1MHz and 10Hz VBW record Average reading. (15.209 paragraph), the Peak reading (1 MHz RBW/ 3 MHz VBW) recorded also on the report.

The EUT for testing is arranged on a turntable. If some peripherals apply to the EUT, the peripherals will be connected to EUT and the whole system. During the test, all cables were arranged to produce worst-case emissions. The signal is maximized through rotation. The height of antenna and polarization is changing constantly for exploring for maximum signal level. The height of antenna can be up to 4 meters and down to 1 meter.

The measurement for radiated emission will be done at the distance of three meters unless the signal level is too low to measure at that distance. In the case of the reading under noise floor, a pre-amplifier is used and/or the test is conducted at a closer distance. And then all readings are extrapolated back to the equivalent three meter reading using inverse scaling with distance.

8.3 Limit

Frequency(MHz)	Field Strength(uV/m)	Measurement distance(m)
0.009~0.490	2400/F(kHz)	300
0.490~1.705	24000/F(kHz)	30
1.705~30	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

Remark:

1. In the above table, the tighter limit applies at the band edges.
2. Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the device or system

8.4 Test Result

8.4.1 Measurement results: frequencies 9kHz to 30MHz

Temperature (°C) :	26
Relative Humidity (%) :	61
Test date :	2022/08/23

The test was performed on EUT under continuously transmitting mode. The worst case occurred at 1DH5 Ch 78.

Antenna Polarity	Frequency (MHz)	Detector	Correction Factor (dB/m)	Reading (dBμV)	Corrected Reading (dBμV/m)	Limit @ 3 m (dBμV/m)	Margin (dB)
Perpendicular	0.009	AV	18.11	60.07	78.18	128.52	-50.34
Perpendicular	0.609	QP	18.86	37.01	55.87	71.93	-16.06
Perpendicular	1.029	QP	19.10	29.06	48.16	67.37	-19.21
Perpendicular	1.209	QP	19.10	31.23	50.33	65.96	-15.63
Perpendicular	1.778	QP	19.10	26.71	45.81	69.54	-23.73
Perpendicular	2.378	QP	19.10	23.57	42.67	69.54	-26.87

Antenna Polarity	Frequency (MHz)	Detector	Correction Factor (dB/m)	Reading (dBμV)	Corrected Reading (dBμV/m)	Limit @ 3 m (dBμV/m)	Margin (dB)
Parallel	0.009	AV	18.11	56.74	74.85	128.52	-53.67
Parallel	0.579	QP	18.85	40.61	59.46	72.38	-12.92
Parallel	1.179	QP	19.10	30.65	49.75	66.19	-16.44
Parallel	1.539	QP	19.10	24.76	43.86	63.88	-20.02
Parallel	1.778	QP	19.10	26.19	45.29	69.54	-24.25
Parallel	2.438	QP	19.10	22.86	41.96	69.54	-27.58

Antenna Polarity	Frequency (MHz)	Detector	Correction Factor (dB/m)	Reading (dBμV)	Corrected Reading (dBμV/m)	Limit @ 3 m (dBμV/m)	Margin (dB)
Ground-parallel	0.009	AV	18.11	60.35	78.46	128.52	-50.06
Ground-parallel	0.609	QP	18.86	36.96	55.82	71.93	-16.11
Ground-parallel	1.119	QP	19.10	29.76	48.86	66.66	-17.80
Ground-parallel	1.179	QP	19.10	31.02	50.12	66.19	-16.07
Ground-parallel	1.359	QP	19.10	27.51	46.61	64.96	-18.35
Ground-parallel	1.778	QP	19.10	26.76	45.86	69.54	-23.68

Remark: Corr. Factor = Antenna Factor + Cable Loss

TEST REPORT

8.4.2 Measurement results: frequencies below 1 GHz

Temperature (°C) :	26
Relative Humidity (%) :	61
Test date :	2022/08/23

The test was performed on EUT under continuously transmitting mode. The worst case occurred at 1DH5 Ch 78.

Antenna Polarity	Frequency (MHz)	Spectrum Analyzer Detector	Correction Factor (dB/m)	Reading (dBμV)	Corrected Reading (dBμV/m)	Limit @ 3 m (dBμV/m)	Margin (dB)
Horizontal	148.34	QP	20.34	15.07	35.41	43.50	-8.09
Horizontal	222.06	QP	17.93	11.71	29.64	46.00	-16.36
Horizontal	296.75	QP	21.52	16.80	38.32	46.00	-7.68
Horizontal	370.47	QP	23.52	14.89	38.41	46.00	-7.59
Horizontal	445.16	QP	25.77	13.30	39.07	46.00	-6.93
Horizontal	556.71	QP	27.62	8.48	36.10	46.00	-9.90

Antenna Polarity	Frequency (MHz)	Spectrum Analyzer Detector	Correction Factor (dB/m)	Reading (dBμV)	Corrected Reading (dBμV/m)	Limit @ 3 m (dBμV/m)	Margin (dB)
Vertical	43.58	QP	20.22	14.90	35.12	40.00	-4.88
Vertical	91.11	QP	14.84	17.81	32.65	43.50	-10.85
Vertical	142.52	QP	20.05	16.86	36.91	43.50	-6.59
Vertical	222.06	QP	17.93	15.30	33.23	46.00	-12.77
Vertical	296.75	QP	21.52	15.41	36.93	46.00	-9.07
Vertical	370.47	QP	23.52	19.46	42.98	46.00	-3.02

Remark: Corr. Factor = Antenna Factor + Cable Loss

TEST REPORT

8.4.3 Measurement results: frequency above 1GHz to 25GHz

Temperature (°C) :	28
Relative Humidity (%) :	59
Test date :	2022/08/22

Mode	Frequency (MHz)	Spectrum Analyzer Detector	Ant. Pol. (H/V)	Correction Factor (dB/m)	Reading (dBμV)	Corrected Reading (dBμV/m)	Limit @ 3 m (dBμV/m)	Margin (dB)
DH5_Ch0	4804	PK	H	-6.59	53.94	47.35	74	-26.65
	4804	PK	V	-6.59	53.70	47.11	74	-26.89
DH5_Ch39	4882	PK	H	-6.09	53.43	47.34	74	-26.66
	4882	PK	V	-6.09	54.96	48.87	74	-25.13
DH5_Ch78	4960	PK	H	-6.04	49.55	43.51	74	-30.49
	4960	PK	V	-6.04	52.19	46.15	74	-27.85
2DH5_Ch0	4804	PK	H	-6.59	56.04	49.45	74	-24.55
	4804	PK	V	-6.59	53.01	46.42	74	-27.58
2DH5_Ch39	4882	PK	H	-6.09	52.75	46.66	74	-27.34
	4882	PK	V	-6.09	53.72	47.63	74	-26.37
2DH5_Ch78	4960	PK	H	-6.04	49.96	43.92	74	-30.08
	4960	PK	V	-6.04	50.15	44.11	74	-29.89
3DH5_Ch0	4804	PK	H	-6.59	53.70	47.11	74	-26.89
	4804	PK	V	-6.59	52.00	45.41	74	-28.59
3DH5_Ch39	4882	PK	H	-6.09	52.75	46.66	74	-27.34
	4882	PK	V	-6.09	53.64	47.55	74	-26.45
3DH5_Ch78	4960	PK	H	-6.04	50.72	44.68	74	-29.32
	4960	PK	V	-6.04	50.18	44.14	74	-29.86

Remark: Correction Factor = Antenna Factor + Cable Loss + High Pass Filter Loss - Pre_Amplifier Gain

9. Emission on Band Edge

9.1 Instrument Setting

Spectrum Function	Setting
Detector	Peak and Average
RBW	1MHz
VBW	3MHz & 1/T Minimum VBW
Sweep	Auto couple
Restrict bands	2310 MHz ~ 2390 MHz 2483.5 MHz ~ 2500 MHz
Attenuation	Auto

9.2 Test Procedure

The test procedure is the same as Emissions in Restricted Frequency Bands (Radiated emission measurements).

9.3 Operating Environment Condition

Temperature (°C) :	28
Relative Humidity (%) :	59
Test date :	2022/08/22

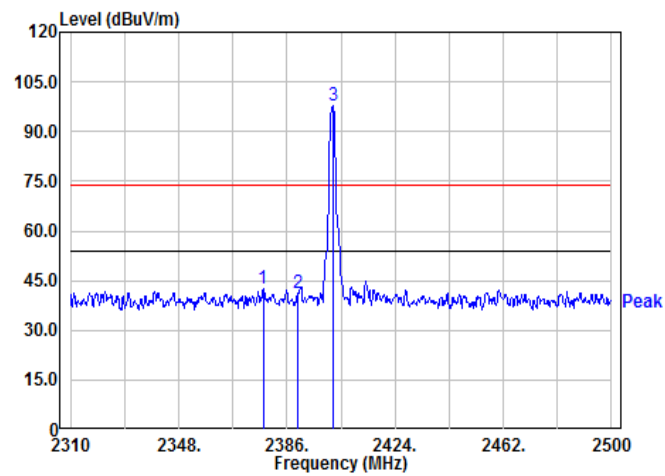
TEST REPORT

9.4 Test Results

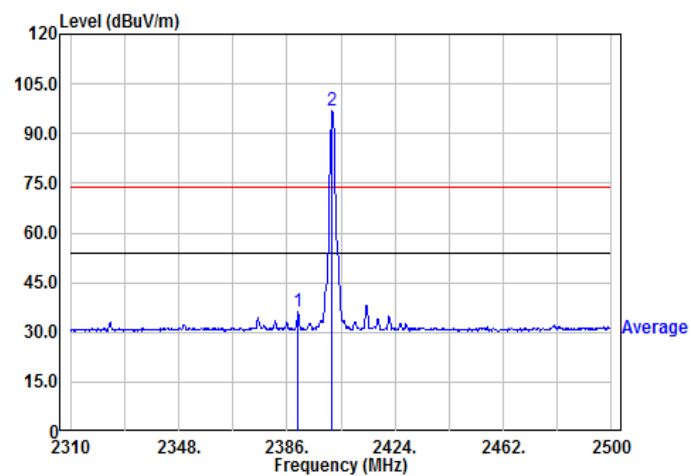
Mode	Frequency (MHz)	Spectrum Analyzer Detector	Ant. Pol. (H/V)	Correction Factor (dB/m)	Reading (dBμV)	Corrected Reading (dBμV/m)	Limit @ 3 m (dBμV/m)	Margin (dB)	Restricted band (MHz)
DH5	2377.64	PK	H	34.31	8.40	42.71	74	-31.29	2310~2390
	2390.00	AV	H	34.25	1.82	36.07	54	-17.93	
	2491.83	PK	H	34.65	9.14	43.79	74	-30.21	2483.5~2500
	2492.02	AV	H	34.65	-1.79	32.86	54	-21.14	
2DH5	2390.00	PK	H	34.25	6.34	40.59	74	-33.41	2310~2390
	2376.12	AV	H	34.32	-1.39	32.93	54	-21.07	
	2497.34	PK	H	34.70	7.81	42.51	74	-31.49	2483.5~2500
	2492.21	AV	H	34.65	-1.79	32.86	54	-21.14	
3DH5	2373.27	PK	H	34.33	9.25	43.58	74	-30.42	2310~2390
	2376.12	AV	H	34.32	-2.20	32.12	54	-21.88	
	2495.25	PK	H	34.68	6.73	41.41	74	-32.59	2483.5~2500
	2492.02	AV	H	34.65	-1.52	33.13	54	-20.87	

Remark: Correction Factor = Antenna Factor + Cable Loss

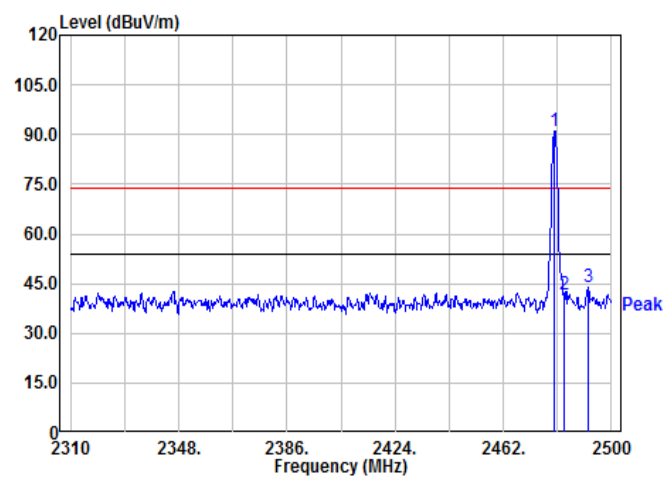
Chain0 : Restricted Band Bandedge @ DH5 Mode Ch0 PK



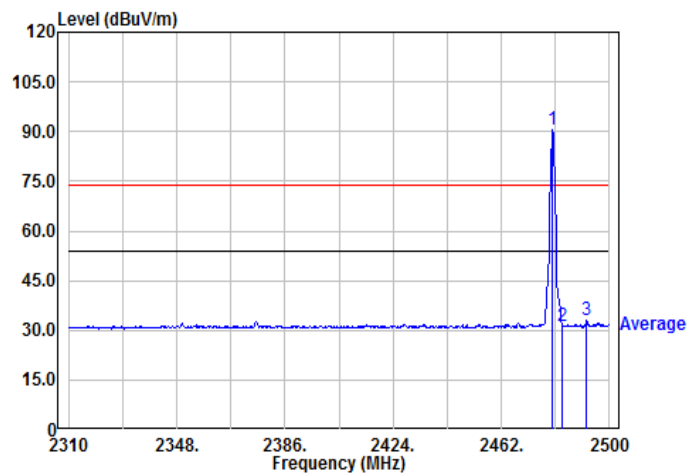
Chain0 : Restricted Band Bandedge @ DH5 Mode Ch0 AV



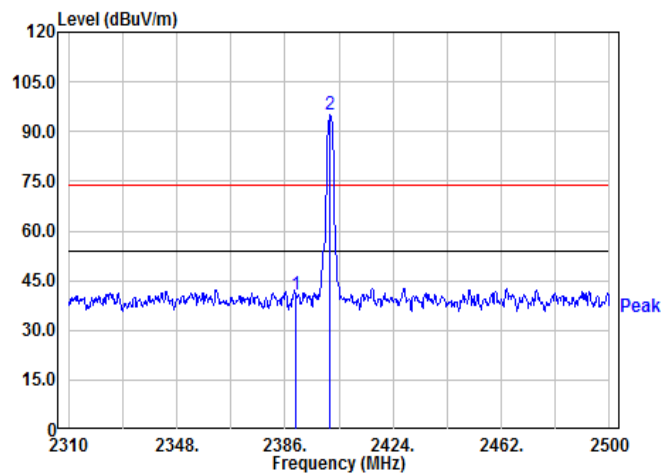
Chain0 : Restricted Band Bandedge @ DH5 Mode Ch78 PK



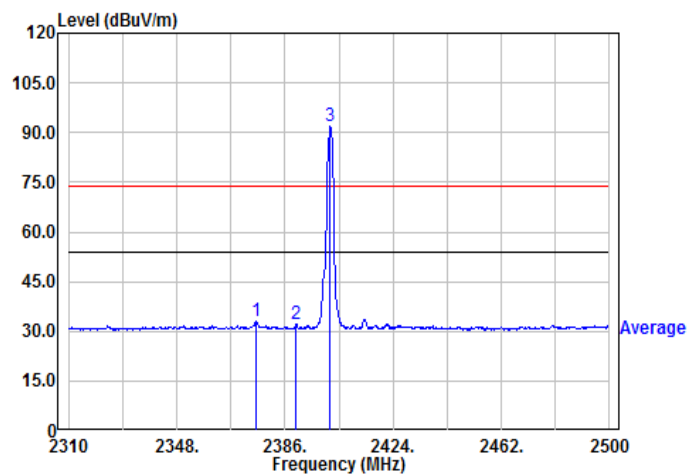
Chain0 : Restricted Band Bandedge @ DH5 Mode Ch78 AV



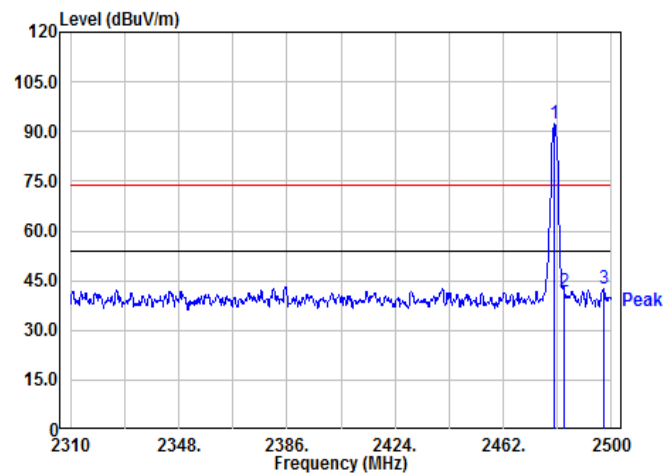
Chain0 : Restricted Band Bandedge @ 2DH5 Mode Ch0 PK



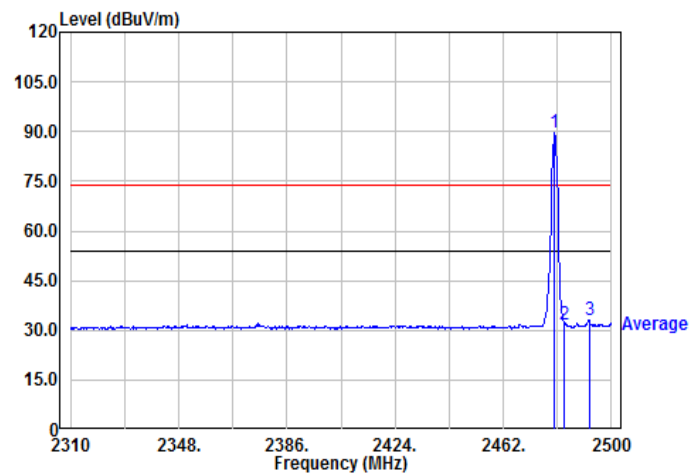
Chain0 : Restricted Band Bandedge @ 2DH5 Mode Ch0 AV



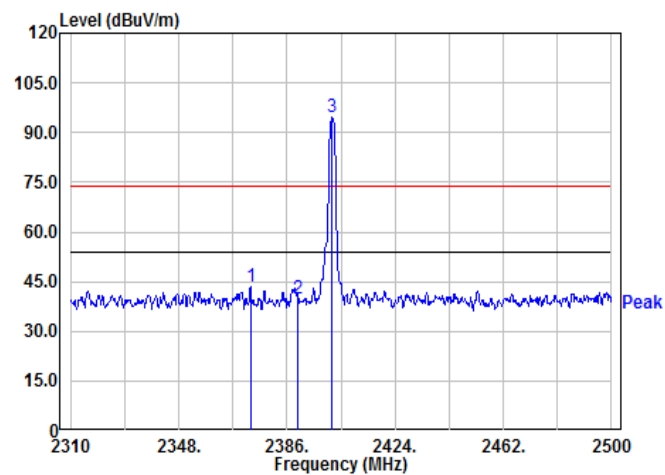
Chain0 : Restricted Band Bandedge @ 2DH5 Mode Ch78 PK



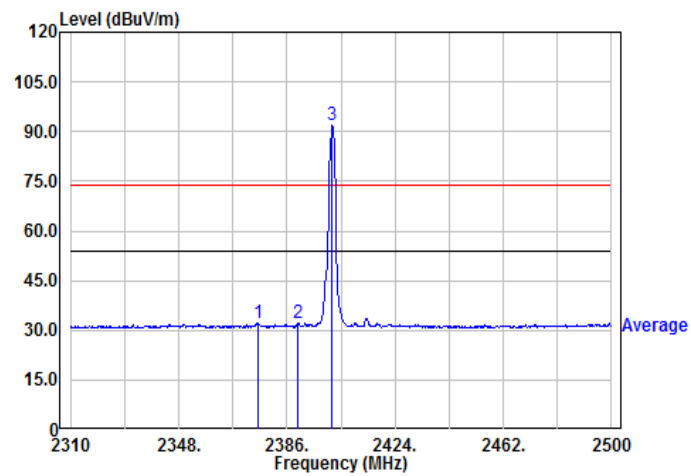
Chain0 : Restricted Band Bandedge @ 2DH5 Mode Ch78 AV



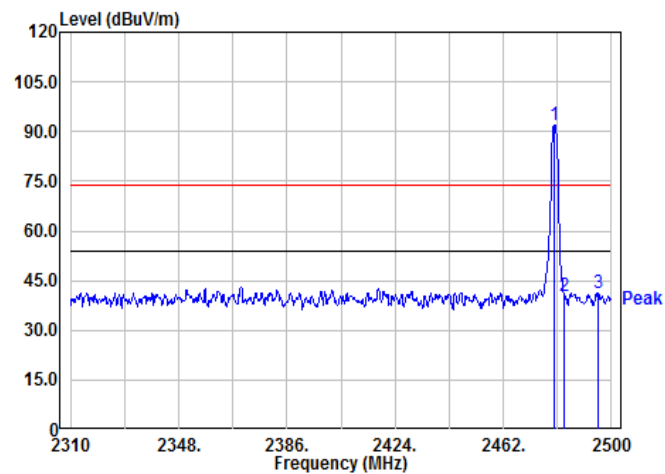
Chain0 : Restricted Band Bandedge @ 3DH5 Mode Ch0 PK



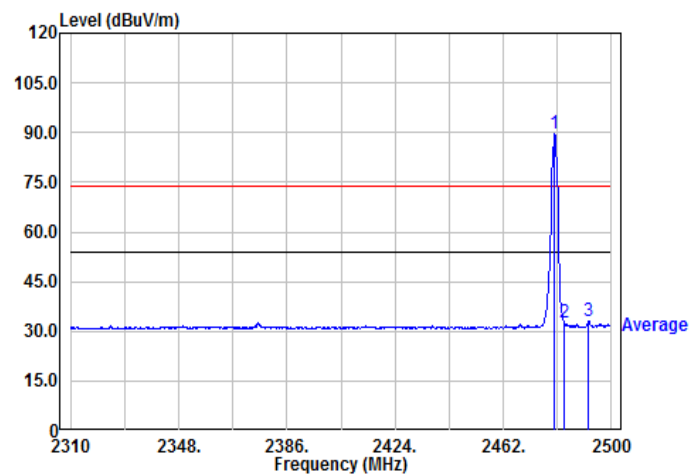
Chain0 : Restricted Band Bandedge @ 3DH5 Mode Ch0 AV



Chain0 : Restricted Band Bandedge @ 3DH5 Mode Ch78 PK



Chain0 : Restricted Band Bandedge @ 3DH5 Mode Ch78 AV



10. AC Power Line Conducted Emission

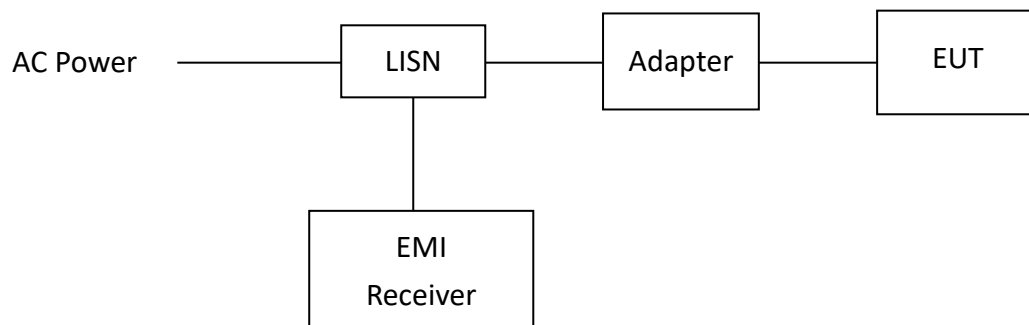
10.1 Measuring instrument setting

Receiver Function	Setting
Detector	QP
Start frequency	0.15MHz
Stop frequency	30MHz
IF bandwidth	9 kHz
Attenuation	10dB

10.2 Test Procedure

Step 1	Configure the EUT according to ANSI C63.10:2013. The EUT or host of EHT has to be placed 0.4 meter far from the conducting wall of the shielding room and at least 80 centimeters from any other grounded conducting surface.
Step 2	Connect EUT or host of EUT to the power mains through a line impedance stabilization network.
Step 3	All the companion devices are connected to the other LISN. The LISN should provide 50Uh/50ohms coupling impedance.
Step 4	The frequency range from 150 kHz to 30MHz was searched.
Step 5	Set the test-receiver system to peak detector and specified bandwidth with maximum hold mode.
Step 6	The measurement has to be done between each power line and ground at the power terminal.

10.3 Test Diagram

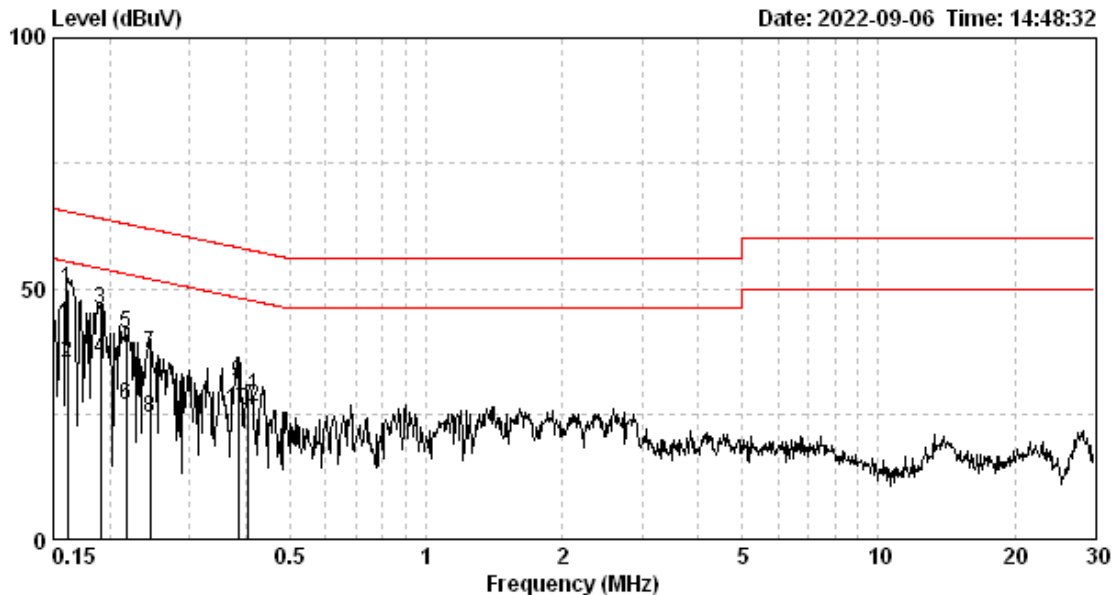


10.4 Limit

Frequency (MHz)	Conducted Limit (dBuV)	
	Q.P.	Ave.
0.15~0.50	66 – 56	56 – 46
0.50~5.00	56	46
5.00~30.0	60	50

10.5 Test Results

Test Condition: Tx mode

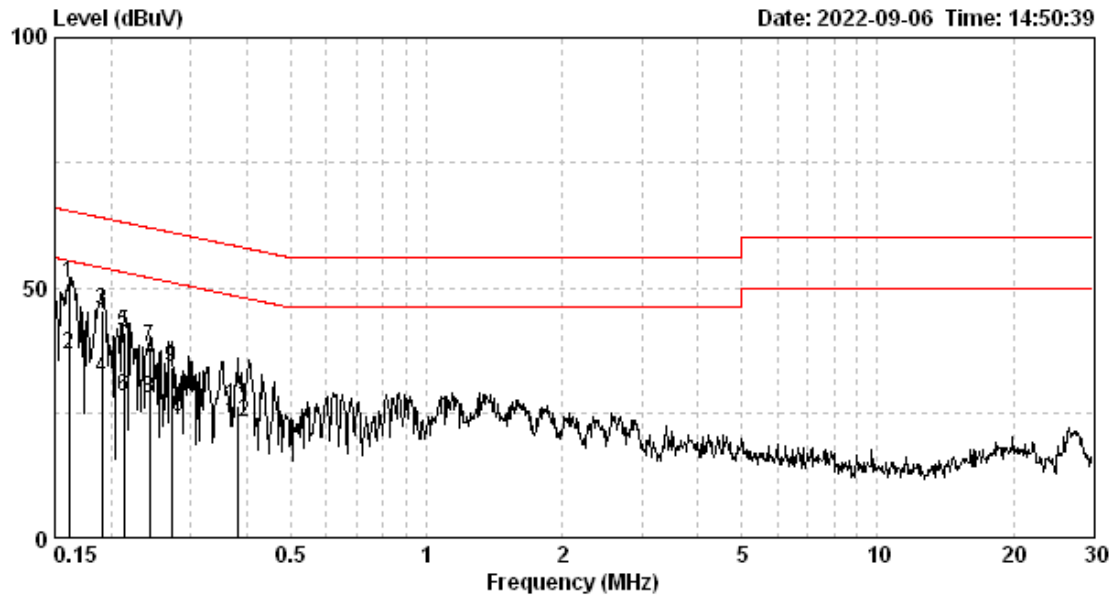


Test voltage :AC 120V / 60Hz
Temp. / R.H. :28 °C / 60 %
Atmospheric pressure :1008 hPa

Phase	Frequency (MHz)	Corr. Factor (dB)	Reading QP (dBuV)	Level QP (dBuV)	Limit QP (dBuV)	Reading AV (dBuV)	Level AV (dBuV)	Limit AV (dBuV)	Margin (dB)	
									QP	AV
LINE	0.162	9.65	40.19	49.84	65.38	25.52	35.17	55.38	-15.54	-20.21
LINE	0.190	9.65	36.04	45.69	64.02	26.42	36.07	54.02	-18.33	-17.95
LINE	0.217	9.65	31.31	40.96	62.92	17.27	26.92	52.92	-21.96	-26.00
LINE	0.246	9.65	27.42	37.07	61.91	14.49	24.14	51.91	-24.83	-27.77
LINE	0.385	9.66	21.48	31.14	58.17	16.12	25.78	48.17	-27.02	-22.39
LINE	0.404	9.66	18.86	28.52	57.77	16.85	26.51	47.77	-29.25	-21.26

Remark:

1. Corr. Factor (dB) = LISN Factor (dB) + Cable Loss (dB)
2. Level (dBuV) = Corr. Factor (dB) + Reading (dBuV)
3. Margin (dB) = Level (dBuV) – Limit (dBuV)



Test voltage :AC 120V / 60Hz
 Temp. / R.H. :28 °C / 60 %
 Atmospheric pressure :1008 hPa

Phase	Frequency (MHz)	Corr. Factor (dB)	Reading	Level	Limit	Reading	Level	Limit	Margin (dB)	
			QP (dBuV)	QP (dBuV)	QP (dBuV)	AV (dBuV)	AV (dBuV)	AV (dBuV)	QP	AV
NEUTRAL	0.162	9.66	41.13	50.79	65.38	26.91	36.57	55.38	-14.59	-18.81
NEUTRAL	0.190	9.66	35.91	45.57	64.02	22.06	31.72	54.02	-18.45	-22.30
NEUTRAL	0.214	9.66	31.45	41.11	63.05	18.73	28.39	53.05	-21.94	-24.67
NEUTRAL	0.243	9.66	28.57	38.24	62.00	18.29	27.95	52.00	-23.76	-24.04
NEUTRAL	0.272	9.66	24.51	34.18	61.07	14.40	24.07	51.07	-26.89	-27.01
NEUTRAL	0.381	9.67	16.81	26.47	58.25	13.51	23.18	48.25	-31.78	-25.08

Remark:

1. Corr. Factor (dB) = LISN Factor (dB) + Cable Loss (dB)
2. Level (dBuV) = Corr. Factor (dB) + Reading (dBuV)
3. Margin (dB) = Level (dBuV) – Limit (dBuV)

Appendix A: Test equipment list

Test Equipment/ Test site	Brand	Model No.	Serial No.	Calibration Date	Next Calibration Date
EMI Test Receiver	Rohde & Schwarz	ESR7	101822	2022/08/09	2023/08/08
Signal Analyzer	Agilent	N9030A	MY51380492	2022/08/09	2023/08/08
Active Loop Antenna	SCHWARZBECK MESS-ELEKTRONIC	FMZB1519	1519-067	2022/04/13	2023/04/12
Broadband Antenna	SHWARZBECK	VULB 9168	9168-172	2022/01/20	2023/01/19
Horn Antenna	SHWARZBECK	BBHA 9120 D	9120D-456	2022/01/21	2023/01/20
Horn Antenna	SCHWARZBECK	BBHA 9170	BBHA9170159	2020/08/20	2023/08/19
Pre-amplifier	SGH	SGH184	20201124-1	2021/12/06	2022/12/05
Power Meter	Anritsu	ML2495A	0844001	2022/07/04	2023/07/03
966-2(A) Cable	SUHNER	SUCOFLEX 104	295105/4	2022/03/04	2023/03/03
966-2(B) Cable	SUHNER	SUCOFLEX 104P	CB0005	2022/03/04	2023/03/03
966-2 Cable	SUHNER	SUCOFLEX 104P	9403/4P	2021/11/30	2022/11/29
966-2_3m Semi-Anechoic Chamber	966_2	CEM-966_2	N/A	2022/01/14	2023/01/13
Hight Pass Filter	Reactel	7HS-3G/18G-S11	N/A	2022/05/25	2023/05/24
20dB Attenuator	Mini-Circuits	BW-S20W5+	N/A	2022/05/25	2023/05/24
Test software	Audix	e3	V9	NCR	NCR

Note: No Calibration Required (NCR).

Test Equipment	Brand	Model No.	Serial No.	Calibration Date	Next Calibration Date
EMI Test Receiver	R&S	ESCI	100018	2021/11/16	2022/11/15
LISN	R&S	ENV216	101160	2022/07/13	2023/07/12
CON-2 Cable	SUHNER	EMCCFD300-BM -NM-6000	170502	2022/04/29	2023/04/28
Test software	Audix	e3	V4.20040112L	NCR	NCR

Note: No Calibration Required (NCR).

Appendix B: Measurement Uncertainty

This uncertainty represents an expanded uncertainty expressed at approximately the 95 % confidence level using a coverage factor of $k=2$.

Item	Uncertainty
Vertically polarized radiated disturbances from 30MHz~1GHz in a semi-anechoic chamber at a distance of 3m	5.16 dB
Horizontally polarized radiated disturbances from 30MHz~1GHz in a semi-anechoic chamber at a distance of 3m	5.02 dB
Radiated disturbances from 1GHz~18GHz in a semi-anechoic chamber at a distance of 3m	5.17 dB
Vertically polarized Radiated disturbances from 18GHz~26.5GHz in a semi-anechoic chamber at a distance of 1m	2.39 dB
Horizontally polarized Radiated disturbances from 18GHz~26.5GHz in a semi-anechoic chamber at a distance of 1m	2.39 dB
Radiated disturbances from 9kHz~30MHz in a semi-anechoic chamber at a distance of 3m	3.70 dB
Emission on the Band Edge Test	4.32 dB
RF Antenna Conducted Spurious Test	1.27 dB
Maximum Output Power Test	0.44 dB
Occupied Bandwidth Test	7.78 %
Carrier Frequency Separation Test	1.27 dB
Number of Hopping Frequencies Test	1.27 dB
Time of Occupancy (Dwell Time) Test	1.27 dB
AC Power Line Conducted Emission	3.08 dB