



2.6 Maximum Conducted Output Power

2.6.1 Specification Reference

FCC 47 CFR Part 15C, Clause 15.247 (b)
ISED RSS-247, Clause 5.4
ISED RSS-GEN, Clause 6.12

2.6.2 Equipment Under Test and Modification State

A2941, S/N: GF6K93M959 - Modification State 0

2.6.3 Date of Test

09-March-2023

2.6.4 Test Method

The test was performed in accordance with ANSI C63.10 clause 7.8.5.

2.6.5 Environmental Conditions

Ambient Temperature	21.8 °C
Relative Humidity	32.6 %



2.6.6 Test Results

2.4 GHz Bluetooth FHSS

Test Configuration			
Frequency Range:	2400-2483.5 MHz	Band:	2.4 GHz
Limit Clause(s):	15.247 (b)(1) RSS-247 5.4 b)	Test Method(s):	C63.10 7.8.5
Additional Reference(s):	-		

DUT Configuration			
Mode:	ePA $\pi/4$ DQPSK (2-DH5)	Duty Cycle (%):	76.8
Antenna Configuration:	SISO	DCCF (dB):	-
Active Port(s):	B (Core 0)	Peak Antenna Gain (dBi):	4.85

Test Frequency (MHz)	Maximum Conducted Output Power (dBm)					Limit (dBm)	Margin (dB)
	A	B	C	D	Σ		
2402	-	18.85	-	-	-	30.00	-11.15
2441	-	19.17	-	-	-	30.00	-10.83
2480	-	18.91	-	-	-	30.00	-11.09

Table 45 - FCC Maximum Conducted (peak) Output Power Results

Test Frequency (MHz)	Maximum Conducted Output Power (dBm)					Limit (dBm)	Margin (dB)	EIRP (dBm)	EIRP Limit (dBm)	EIRP Margin (dB)
	A	B	C	D	Σ					
2402	-	18.85	-	-	-	30.00	-11.15	23.70	36.00	-12.30
2441	-	19.17	-	-	-	30.00	-10.83	24.02	36.00	-11.98
2480	-	18.91	-	-	-	30.00	-11.09	23.76	36.00	-12.24

Table 46 - ISED Maximum Conducted (peak) Output Power Results



Test Configuration			
Frequency Range:	2400-2483.5 MHz	Band:	2.4 GHz
Limit Clause(s):	15.247 (b)(1) RSS-247 5.4 b)	Test Method(s):	C63.10 7.8.5
Additional Reference(s):	-		

DUT Configuration			
Mode:	ePA 8-DPSK (3-DH5)	Duty Cycle (%):	77.2
Antenna Configuration:	SISO	DCCF (dB):	-
Active Port(s):	B (Core 0)	Peak Antenna Gain (dBi):	4.85

Test Frequency (MHz)	Maximum Conducted Output Power (dBm)					Limit (dBm)	Margin (dB)
	A	B	C	D	Σ		
2402	-	19.35	-	-	-	30.00	-10.65
2441	-	19.41	-	-	-	30.00	-10.59
2480	-	19.35	-	-	-	30.00	-10.65

Table 47 - FCC Maximum Conducted (peak) Output Power Results

Test Frequency (MHz)	Maximum Conducted Output Power (dBm)					Limit (dBm)	Margin (dB)	EIRP (dBm)	EIRP Limit (dBm)	EIRP Margin (dB)
	A	B	C	D	Σ					
2402	-	19.35	-	-	-	30.00	-10.65	24.20	36.00	-11.80
2441	-	19.41	-	-	-	30.00	-10.59	24.26	36.00	-11.74
2480	-	19.35	-	-	-	30.00	-10.65	24.20	36.00	-11.80

Table 48 - ISED Maximum Conducted (peak) Output Power Results



Test Configuration			
Frequency Range:	2400-2483.5 MHz	Band:	2.4 GHz
Limit Clause(s):	15.247 (b)(1) RSS-247 5.4 b)	Test Method(s):	C63.10 7.8.5
Additional Reference(s):	662911 D01 v02r01 F)2)d)(i), 662911 D01 v02r01 E)1)		

DUT Configuration			
Mode:	ePA $\pi/4$ DQPSK (2-DH5)	Duty Cycle (%):	77.1
Antenna Configuration:	Beamforming	DCCF (dB):	-
Active Port(s):	B+C (Core 0 + Core 1)	Peak Antenna Gain (dBi):	7.69

Test Frequency (MHz)	Maximum Conducted Output Power (dBm)					Limit (dBm)	Margin (dB)
	A	B	C	D	Σ		
2402	-	15.95	16.11	-	19.04	28.31	-9.27
2441	-	15.92	16.11	-	19.02	28.31	-9.29
2480	-	15.83	15.99	-	18.92	28.31	-9.39

Table 49 - FCC Maximum Conducted (peak) Output Power Results

Test Frequency (MHz)	Maximum Conducted Output Power (dBm)					Limit (dBm)	Margin (dB)	EIRP (dBm)	EIRP Limit (dBm)	EIRP Margin (dB)
	A	B	C	D	Σ					
2402	-	15.95	16.11	-	19.04	30.00	-10.96	26.73	36.00	-9.27
2441	-	15.92	16.11	-	19.02	30.00	-10.98	26.71	36.00	-9.29
2480	-	15.83	15.99	-	18.92	30.00	-11.08	26.61	36.00	-9.39

Table 50 - ISED Maximum Conducted (peak) Output Power Results



Test Configuration			
Frequency Range:	2400-2483.5 MHz	Band:	2.4 GHz
Limit Clause(s):	15.247 (b)(1) RSS-247 5.4 b)	Test Method(s):	C63.10 7.8.5
Additional Reference(s):	662911 D01 v02r01 F)2)d)(i), 662911 D01 v02r01 E)1)		

DUT Configuration			
Mode:	ePA 8-DPSK (3-DH5)	Duty Cycle (%):	77.2
Antenna Configuration:	Beamforming	DCCF (dB):	-
Active Port(s):	B+C (Core 0 + Core 1)	Peak Antenna Gain (dBi):	7.69

Test Frequency (MHz)	Maximum Conducted Output Power (dBm)					Limit (dBm)	Margin (dB)
	A	B	C	D	Σ		
2402	-	16.42	16.60	-	19.52	28.31	-8.79
2441	-	16.44	16.36	-	19.41	28.31	-8.90
2480	-	16.48	16.52	-	19.51	28.31	-8.81

Table 51 - FCC Maximum Conducted (peak) Output Power Results

Test Frequency (MHz)	Maximum Conducted Output Power (dBm)					Limit (dBm)	Margin (dB)	EIRP (dBm)	EIRP Limit (dBm)	EIRP Margin (dB)
	A	B	C	D	Σ					
2402	-	16.42	16.60	-	19.52	30.00	-10.48	27.21	36.00	-8.79
2441	-	16.44	16.36	-	19.41	30.00	-10.59	27.10	36.00	-8.90
2480	-	16.48	16.52	-	19.51	30.00	-10.49	27.19	36.00	-8.81

Table 52 - ISED Maximum Conducted (peak) Output Power Results



Test Configuration			
Frequency Range:	2400-2483.5 MHz	Band:	2.4 GHz
Limit Clause(s):	15.247 (b)(1) RSS-247 5.4 b)	Test Method(s):	C63.10 7.8.5
Additional Reference(s):	-		

DUT Configuration			
Mode:	iPA GFSK (DH5)	Duty Cycle (%):	76.7
Antenna Configuration:	SISO	DCCF (dB):	-
Active Port(s):	B (Core 0)	Peak Antenna Gain (dBi):	4.85

Test Frequency (MHz)	Maximum Conducted Output Power (dBm)					Limit (dBm)	Margin (dB)
	A	B	C	D	Σ		
2402	-	12.95	-	-	-	30.00	-17.05
2441	-	13.02	-	-	-	30.00	-16.98
2480	-	13.15	-	-	-	30.00	-16.85

Table 53 - FCC Maximum Conducted (peak) Output Power Results

Test Frequency (MHz)	Maximum Conducted Output Power (dBm)					Limit (dBm)	Margin (dB)	EIRP (dBm)	EIRP Limit (dBm)	EIRP Margin (dB)
	A	B	C	D	Σ					
2402	-	12.95	-	-	-	30.00	-17.05	17.80	36.00	-18.20
2441	-	13.02	-	-	-	30.00	-16.98	17.87	36.00	-18.13
2480	-	13.15	-	-	-	30.00	-16.85	18.00	36.00	-18.00

Table 54 - ISCED Maximum Conducted (peak) Output Power Results



Test Configuration			
Frequency Range:	2400-2483.5 MHz	Band:	2.4 GHz
Limit Clause(s):	15.247 (b)(1) RSS-247 5.4 b)	Test Method(s):	C63.10 7.8.5
Additional Reference(s):	662911 D01 v02r01 F)2)d)(i), 662911 D01 v02r01 E)1)		

DUT Configuration			
Mode:	iPA GFSK (DH5)	Duty Cycle (%):	76.7
Antenna Configuration:	Beamforming	DCCF (dB):	-
Active Port(s):	B+C (Core 0 + Core 1)	Peak Antenna Gain (dBi):	7.69

Test Frequency (MHz)	Maximum Conducted Output Power (dBm)					Limit (dBm)	Margin (dB)
	A	B	C	D	Σ		
2402	-	12.73	13.14	-	15.95	28.31	-12.36
2441	-	12.95	13.19	-	16.09	28.31	-12.23
2480	-	13.02	13.20	-	16.12	28.31	-12.19

Table 55 - FCC Maximum Conducted (peak) Output Power Results

Test Frequency (MHz)	Maximum Conducted Output Power (dBm)					Limit (dBm)	Margin (dB)	EIRP (dBm)	EIRP Limit (dBm)	EIRP Margin (dB)
	A	B	C	D	Σ					
2402	-	12.73	13.14	-	15.95	30.00	-14.05	23.64	36.00	-12.36
2441	-	12.95	13.19	-	16.09	30.00	-13.91	23.77	36.00	-12.23
2480	-	13.02	13.20	-	16.12	30.00	-13.88	23.81	36.00	-12.19

Table 56 - ISED Maximum Conducted (peak) Output Power Results



Test Configuration			
Frequency Range:	2400-2483.5 MHz	Band:	2.4 GHz
Limit Clause(s):	15.247 (b)(1) RSS-247 5.4 b)	Test Method(s):	C63.10 7.8.5
Additional Reference(s):	-		

DUT Configuration			
Mode:	iPA $\pi/4$ DQPSK (2-DH5)	Duty Cycle (%):	77.1
Antenna Configuration:	SISO	DCCF (dB):	-
Active Port(s):	B (Core 0)	Peak Antenna Gain (dBi):	4.85

Test Frequency (MHz)	Maximum Conducted Output Power (dBm)					Limit (dBm)	Margin (dB)
	A	B	C	D	Σ		
2402	-	11.68	-	-	-	30.00	-18.32
2441	-	11.66	-	-	-	30.00	-18.34
2480	-	11.84	-	-	-	30.00	-18.16

Table 57 - FCC Maximum Conducted (peak) Output Power Results

Test Frequency (MHz)	Maximum Conducted Output Power (dBm)					Limit (dBm)	Margin (dB)	EIRP (dBm)	EIRP Limit (dBm)	EIRP Margin (dB)
	A	B	C	D	Σ					
2402	-	11.68	-	-	-	30.00	-18.32	16.53	36.00	-19.47
2441	-	11.66	-	-	-	30.00	-18.34	16.51	36.00	-19.49
2480	-	11.84	-	-	-	30.00	-18.16	16.69	36.00	-19.31

Table 58 - ISCED Maximum Conducted (peak) Output Power Results



Test Configuration			
Frequency Range:	2400-2483.5 MHz	Band:	2.4 GHz
Limit Clause(s):	15.247 (b)(1) RSS-247 5.4 b)	Test Method(s):	C63.10 7.8.5
Additional Reference(s):	-		

DUT Configuration			
Mode:	iPA 8-DPSK (3-DH5)	Duty Cycle (%):	77.0
Antenna Configuration:	SISO	DCCF (dB):	-
Active Port(s):	B (Core 0)	Peak Antenna Gain (dBi):	4.85

Test Frequency (MHz)	Maximum Conducted Output Power (dBm)					Limit (dBm)	Margin (dB)
	A	B	C	D	Σ		
2402	-	12.17	-	-	-	30.00	-17.83
2441	-	12.05	-	-	-	30.00	-17.95
2480	-	12.32	-	-	-	30.00	-17.68

Table 59 - FCC Maximum Conducted (peak) Output Power Results

Test Frequency (MHz)	Maximum Conducted Output Power (dBm)					Limit (dBm)	Margin (dB)	EIRP (dBm)	EIRP Limit (dBm)	EIRP Margin (dB)
	A	B	C	D	Σ					
2402	-	12.17	-	-	-	30.00	-17.83	17.02	36.00	-18.98
2441	-	12.05	-	-	-	30.00	-17.95	16.90	36.00	-19.10
2480	-	12.32	-	-	-	30.00	-17.68	17.17	36.00	-18.83

Table 60 - ISED Maximum Conducted (peak) Output Power Results



Test Configuration			
Frequency Range:	2400-2483.5 MHz	Band:	2.4 GHz
Limit Clause(s):	15.247 (b)(1) RSS-247 5.4 b)	Test Method(s):	C63.10 7.8.5
Additional Reference(s):	662911 D01 v02r01 F)2)d)(i), 662911 D01 v02r01 E)1)		

DUT Configuration			
Mode:	iPA $\pi/4$ DQPSK (2-DH5)	Duty Cycle (%):	76.8
Antenna Configuration:	Beamforming	DCCF (dB):	-
Active Port(s):	B+C (Core 0 + Core 1)	Peak Antenna Gain (dBi):	7.69

Test Frequency (MHz)	Maximum Conducted Output Power (dBm)					Limit (dBm)	Margin (dB)
	A	B	C	D	Σ		
2402	-	11.62	11.84	-	14.74	28.31	-13.57
2441	-	11.67	11.86	-	14.78	28.31	-13.54
2480	-	11.15	11.55	-	14.37	28.31	-13.95

Table 61 - FCC Maximum Conducted (peak) Output Power Results

Test Frequency (MHz)	Maximum Conducted Output Power (dBm)					Limit (dBm)	Margin (dB)	EIRP (dBm)	EIRP Limit (dBm)	EIRP Margin (dB)
	A	B	C	D	Σ					
2402	-	11.62	11.84	-	14.74	30.00	-15.26	22.43	36.00	-13.57
2441	-	11.67	11.86	-	14.78	30.00	-15.22	22.46	36.00	-13.54
2480	-	11.15	11.55	-	14.37	30.00	-15.63	22.05	36.00	-13.95

Table 62 - ISED Maximum Conducted (peak) Output Power Results



Test Configuration			
Frequency Range:	2400-2483.5 MHz	Band:	2.4 GHz
Limit Clause(s):	15.247 (b)(1) RSS-247 5.4 b)	Test Method(s):	C63.10 7.8.5
Additional Reference(s):	662911 D01 v02r01 F)2)d)(i), 662911 D01 v02r01 E)1)		

DUT Configuration			
Mode:	iPA 8-DPSK (3-DH5)	Duty Cycle (%):	77.2
Antenna Configuration:	Beamforming	DCCF (dB):	-
Active Port(s):	B+C (Core 0 + Core 1)	Peak Antenna Gain (dBi):	7.69

Test Frequency (MHz)	Maximum Conducted Output Power (dBm)					Limit (dBm)	Margin (dB)
	A	B	C	D	Σ		
2402	-	12.12	12.39	-	15.27	28.31	-13.04
2441	-	12.06	12.38	-	15.23	28.31	-13.08
2480	-	12.17	12.43	-	15.31	28.31	-13.00

Table 63 - FCC Maximum Conducted (peak) Output Power Results

Test Frequency (MHz)	Maximum Conducted Output Power (dBm)					Limit (dBm)	Margin (dB)	EIRP (dBm)	EIRP Limit (dBm)	EIRP Margin (dB)
	A	B	C	D	Σ					
2402	-	12.12	12.39	-	15.27	30.00	-14.73	22.96	36.00	-13.04
2441	-	12.06	12.38	-	15.23	30.00	-14.77	22.92	36.00	-13.08
2480	-	12.17	12.43	-	15.31	30.00	-14.69	23.00	36.00	-13.00

Table 64 - ISED Maximum Conducted (peak) Output Power Results

FCC 47 CFR Part 15, Limit Clause 15.247 (b)(3)

For systems using digital modulation in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands: 1 Watt.

ISED RSS-247, Limit Clause 5.4 (d)

For DTSs employing digital modulation techniques operating in the bands 902-928 MHz and 2400-2483.5 MHz, the maximum peak conducted output power shall not exceed 1 W. The e.i.r.p. shall not exceed 4 W, except as provided in section 5.4(e) of the specification.



2.6.7 Test Location and Test Equipment Used

This test was carried out in RF Laboratory 14.

Instrument	Manufacturer	Type No	TE No	Calibration Period (months)	Calibration Expires
Hygrometer	Rotronic	I-1000	3068	12	21-Sep-2023
Multi-GNSS Simulator (GPS)	Spirent	GSS6700	4596	12	22-Aug-2023
AC Programmable Power Supply	iTech	IT7324	5225	-	O/P Mon
Signal Conditioning Unit	TUV SUD	SPECTRUM SCU001	5546	12	06-Apr-2023
MXA Signal Analyser	Keysight Technologies	N9020B	5529	24	13-Dec-2024
Digital Multimeter	Fluke	115	6147	12	16-Jun-2023

Table 65

O/P Mon – Output Monitored using calibrated equipment



2.7 Authorised Band Edges

2.7.1 Specification Reference

FCC 47 CFR Part 15C, Clause 15.247 (d)
ISED RSS-247, Clause 5.5

2.7.2 Equipment Under Test and Modification State

A2941, S/N: F91VYD72Q5 - Modification State 0

2.7.3 Date of Test

16-January-2023 to 17-January-2023

2.7.4 Test Method

The test was performed in accordance with ANSI C63.10, clause 6.10.4.

2.7.5 Environmental Conditions

Ambient Temperature	21.0 - 23.8 °C
Relative Humidity	41.4 - 43.0 %



2.7.6 Test Results

2.4 GHz Bluetooth FHSS

iPA - Core 0 (SISO)

Mode	Packet Type	TX Frequency (MHz)	Band Edge Frequency (MHz)	Level (dBc)
Static	DH5	2402	2400	-64.40
Static	2-DH5	2402	2400	-52.29
Static	3-DH5	2402	2400	-51.79
Hopping	DH5	hopping	2400	-66.96
Hopping	2-DH5	hopping	2400	-61.13
Hopping	3-DH5	hopping	2400	-58.55

Table 66 - SISO Authorised Band Edge Results

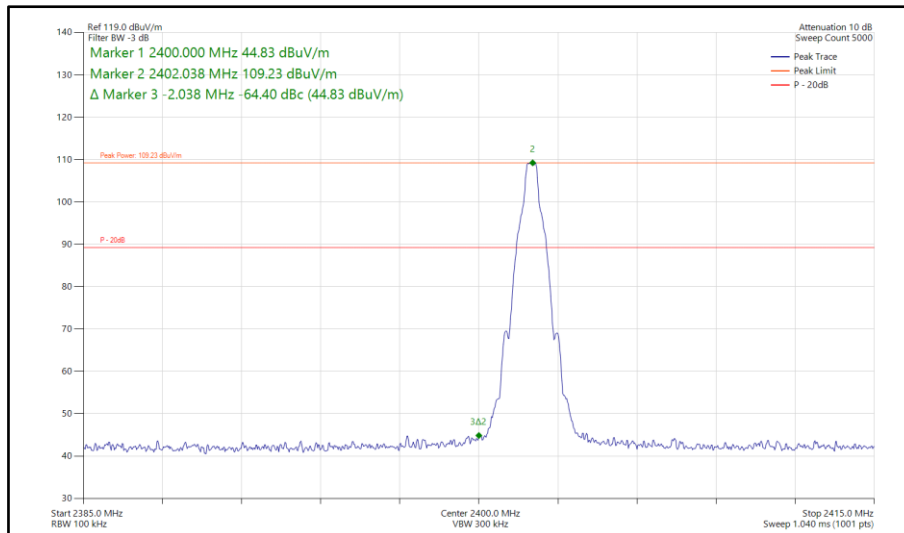
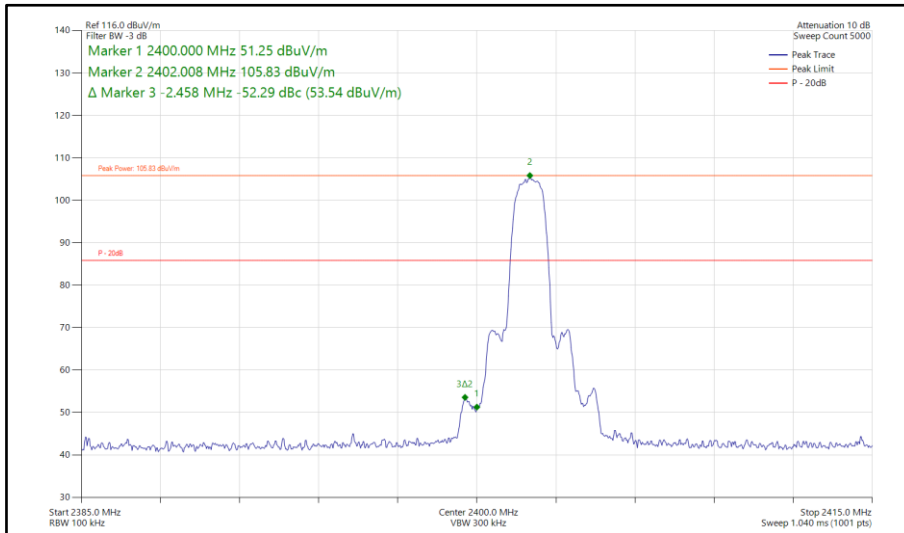
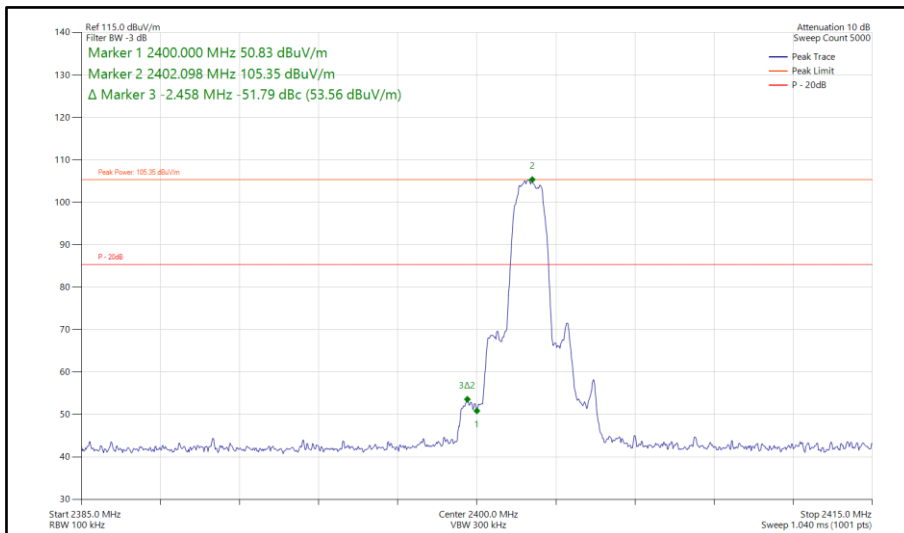


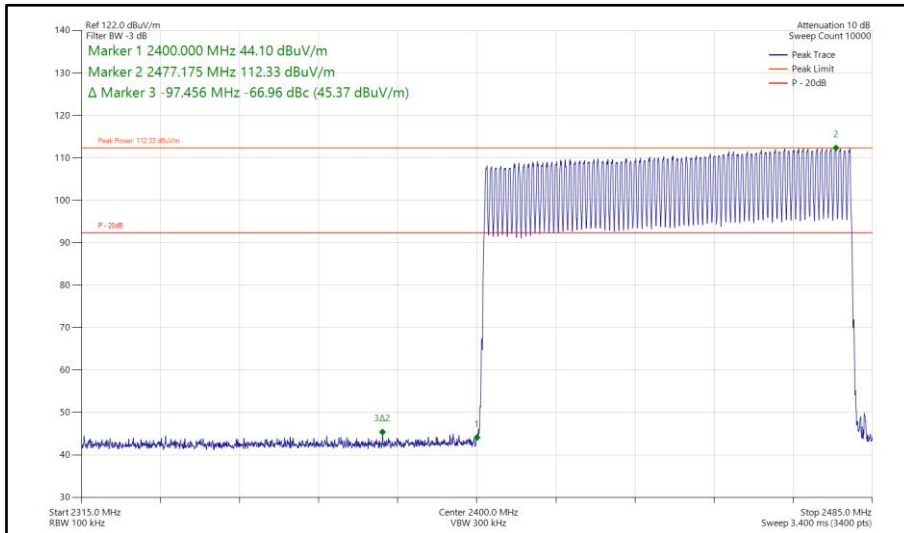
Figure 84 - Bluetooth DH5, SISO, Core 0 - 2402 MHz, Band Edge Frequency 2400 MHz



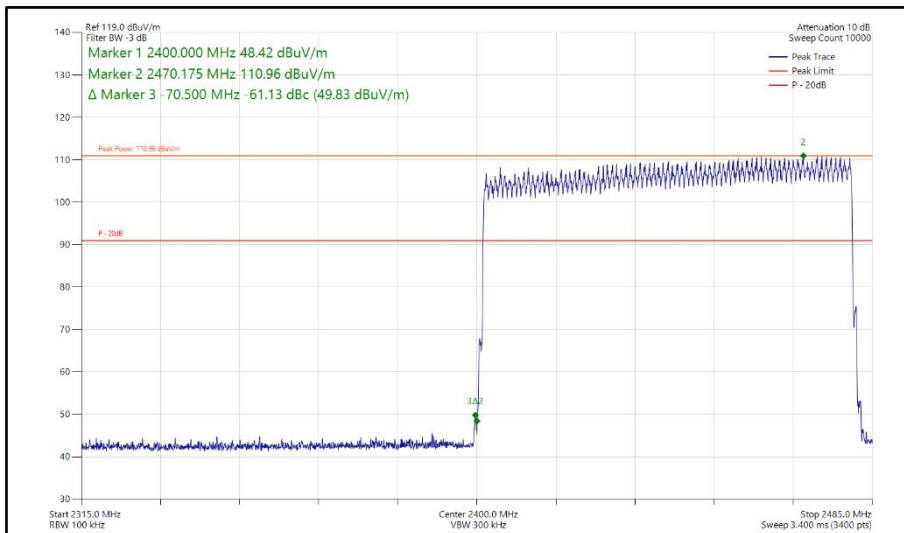
**Figure 85 - Bluetooth 2-DH5, SISO, Core 0 - 2402 MHz,
Band Edge Frequency 2400 MHz**



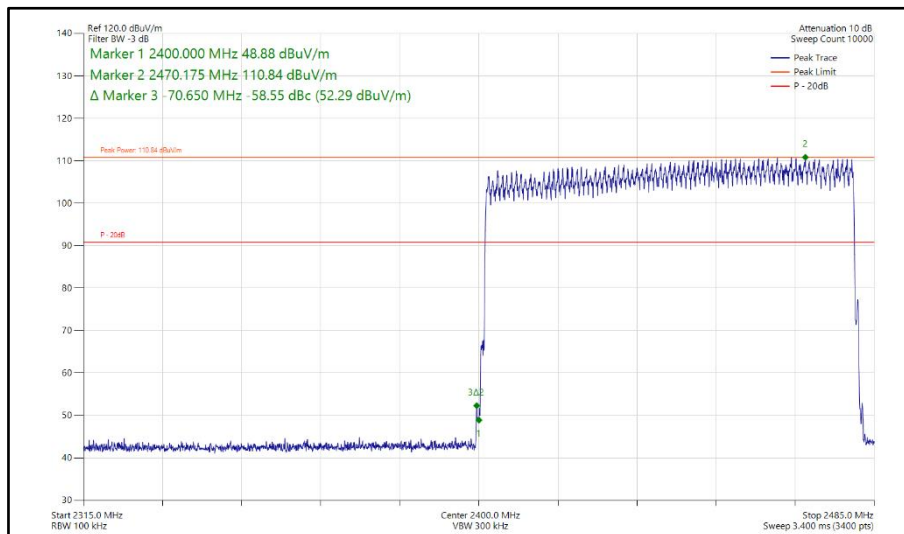
**Figure 86 - Bluetooth 3-DH5, SISO, Core 0 - 2402 MHz,
Band Edge Frequency 2400 MHz**



**Figure 87 - Bluetooth DH5, SISO, Core 0 – Hopping
Band Edge Frequency 2400 MHz**



**Figure 88 - Bluetooth 2-DH5, SISO, Core 0 – Hopping,
Band Edge Frequency 2400 MHz**



**Figure 89 - Bluetooth 3-DH5, SISO, Core 0 – Hopping,
Band Edge Frequency 2400 MHz**



iPA - Core 0-1 (MIMO)

Mode	Packet Type	TX Frequency (MHz)	Band Edge Frequency (MHz)	Level (dBc)
Static	DH5	2402	2400	-67.48
Static	2-DH5	2402	2400	-58.59
Static	3-DH5	2402	2400	-56.84
Hopping	DH5	hopping	2400	-66.50
Hopping	2-DH5	hopping	2400	-59.87
Hopping	3-DH5	hopping	2400	-58.52

Table 67 - MIMO Authorised Band Edge Results

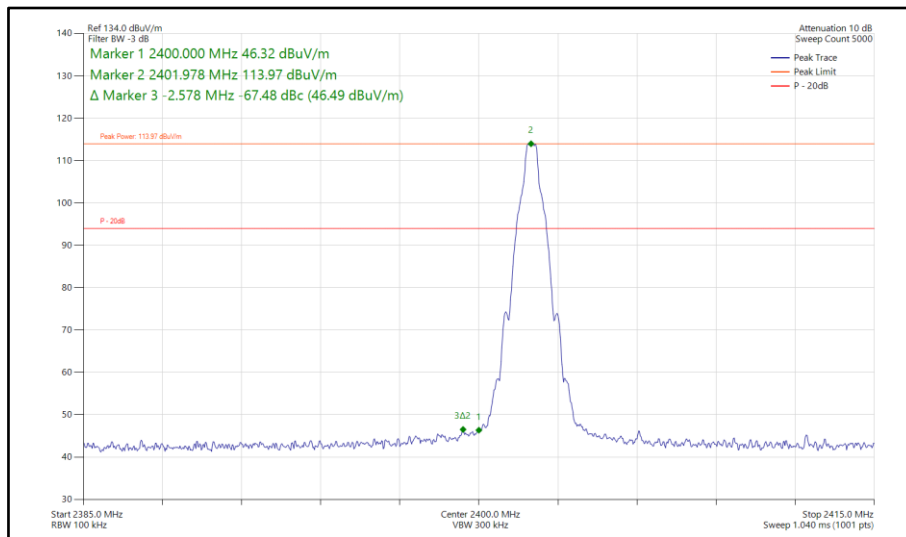


Figure 90 - Bluetooth DH5, MIMO, Core 0-1 - 2402 MHz, Band Edge Frequency 2400 MHz

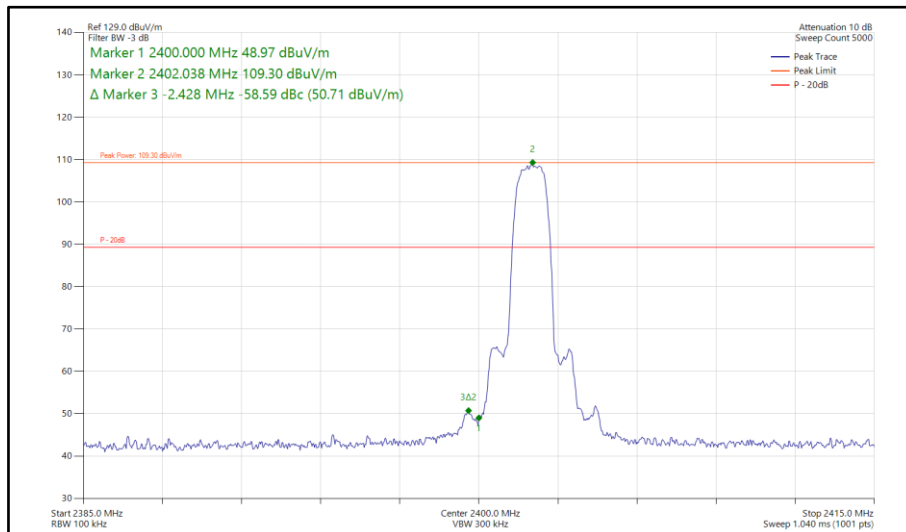
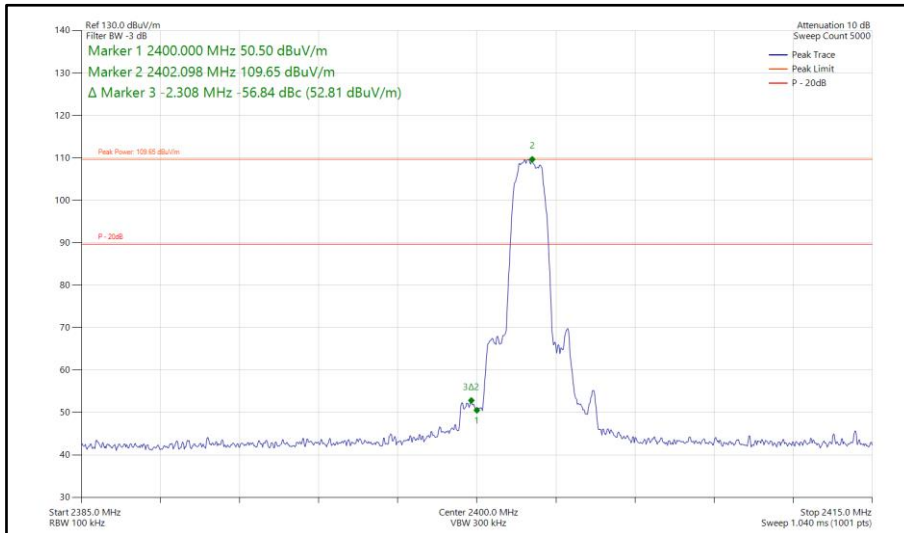
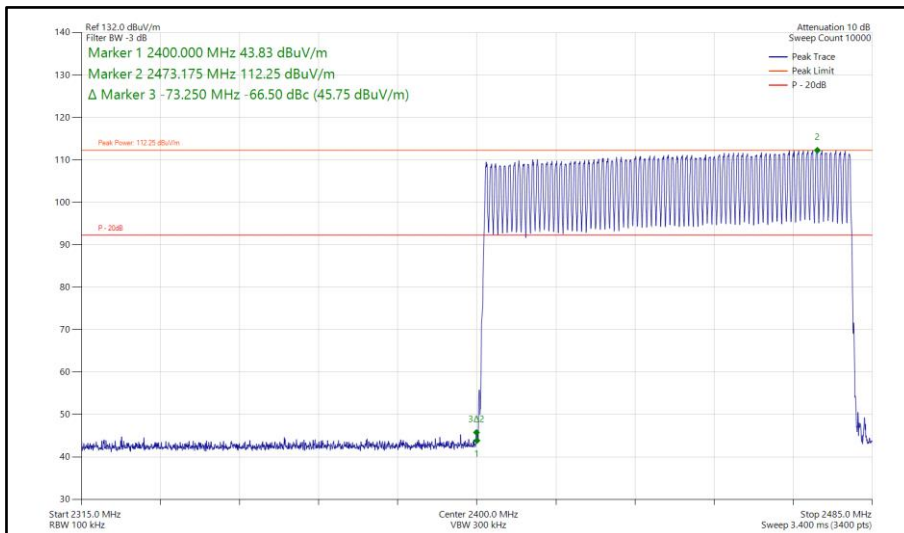


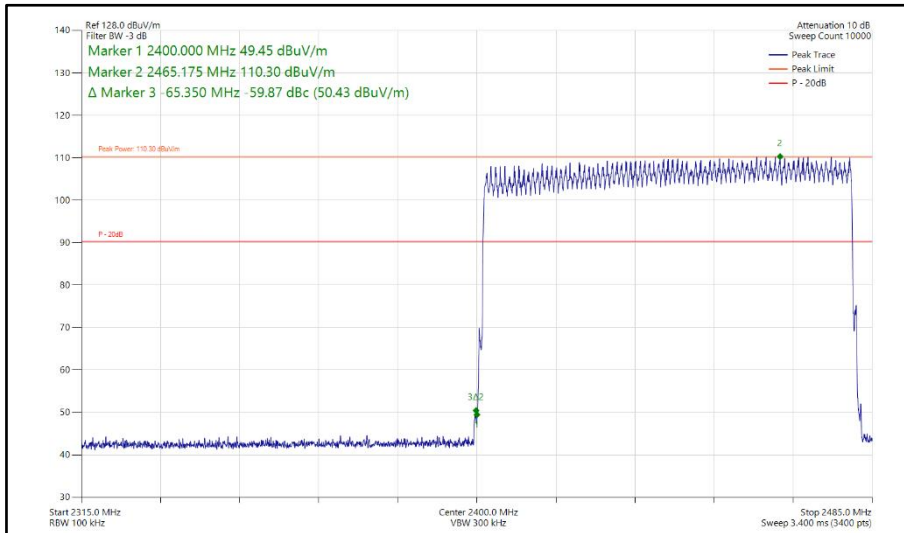
Figure 91 - Bluetooth 2-DH5, MIMO, Core 0-1 - 2402 MHz, Band Edge Frequency 2400 MHz



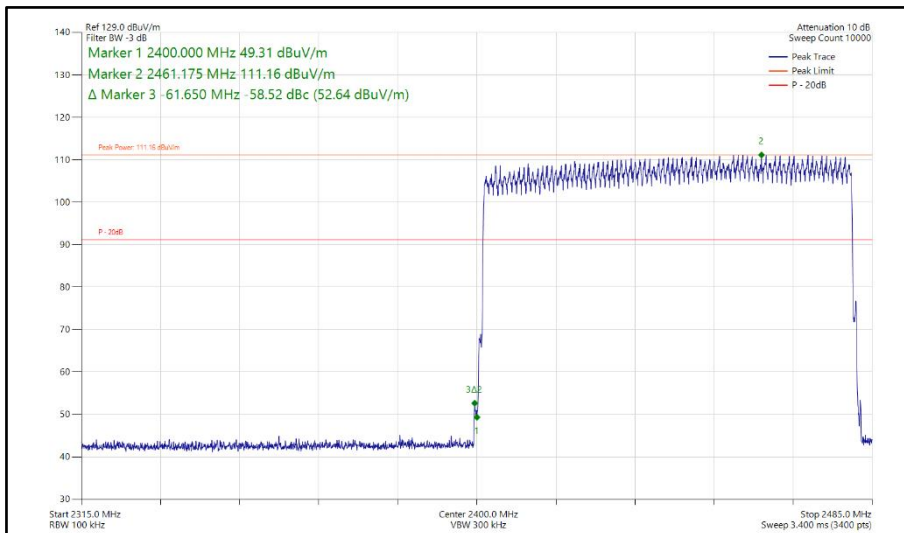
**Figure 92 - Bluetooth 3-DH5, MIMO, Core 0-1 - 2402 MHz,
Band Edge Frequency 2400 MHz**



**Figure 93 - Bluetooth DH5, MIMO, Core 0-1 – Hopping,
Band Edge Frequency 2400 MHz**



**Figure 94 - Bluetooth 2-DH5, MIMO, Core 0-1 – Hopping,
Band Edge Frequency 2400 MHz**



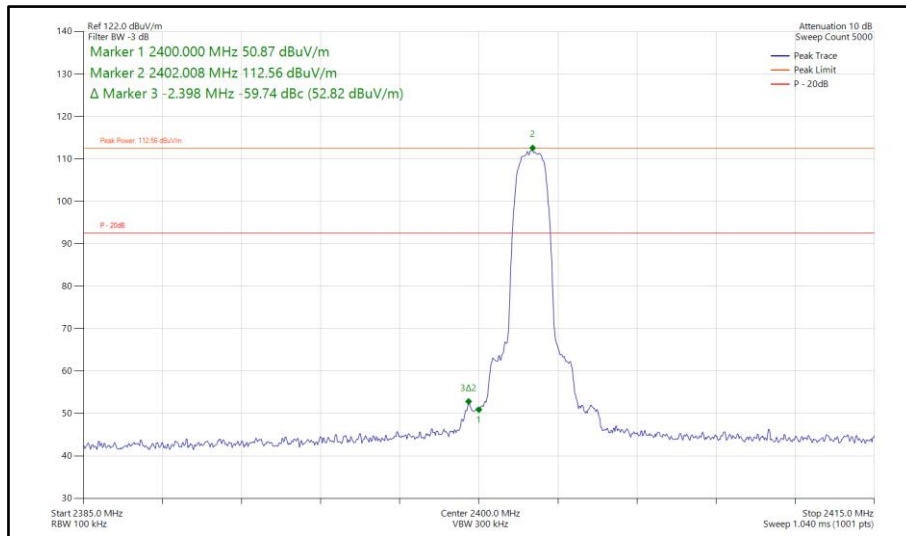
**Figure 95 - Bluetooth 3-DH5, MIMO, Core 0-1 – Hopping,
Band Edge Frequency 2400 MHz**



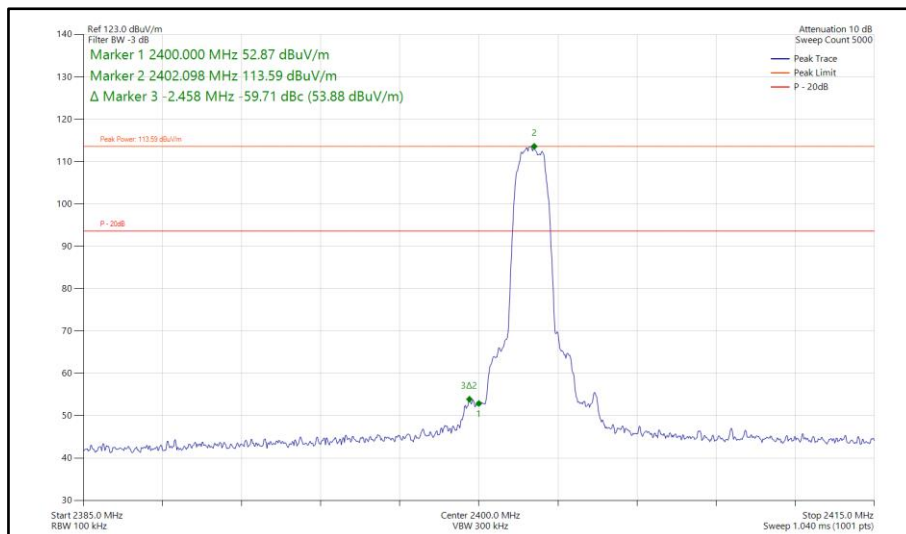
ePA - Core 0 (SISO)

Mode	Packet Type	TX Frequency (MHz)	Band Edge Frequency (MHz)	Level (dBc)
Static	2-DH5	2402	2400	-59.74
Static	3-DH5	2402	2400	-59.71
Hopping	2-DH5	hopping	2400	-65.03
Hopping	3-DH5	hopping	2400	-65.22

Table 68 - SISO Authorised Band Edge Results



**Figure 96 - Bluetooth 2-DH5, SISO, Core 0 - 2402 MHz,
 Band Edge Frequency 2400 MHz**



**Figure 97 - Bluetooth 3-DH5, SISO, Core 0 - 2402 MHz,
 Band Edge Frequency 2400 MHz**

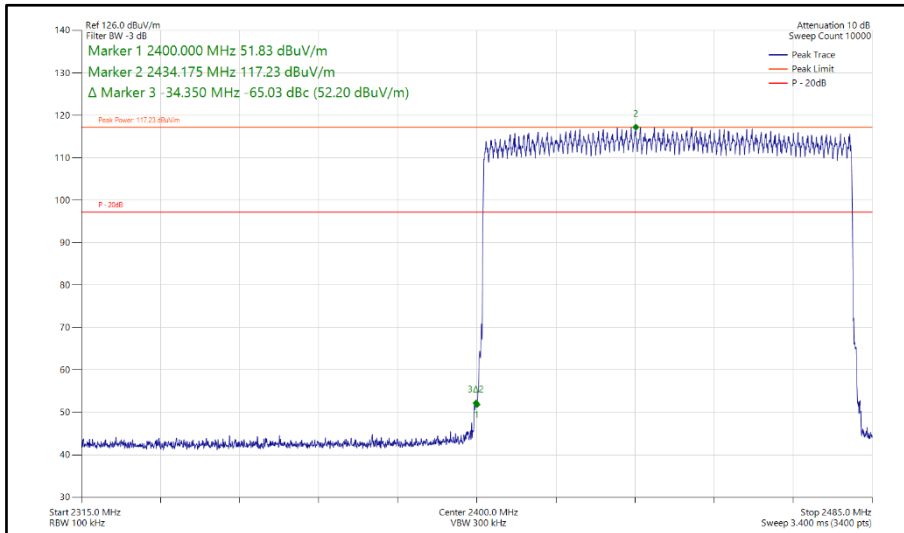


Figure 98 - Bluetooth 2-DH5, SISO, Core 0 – Hopping
Band Edge Frequency 2400 MHz

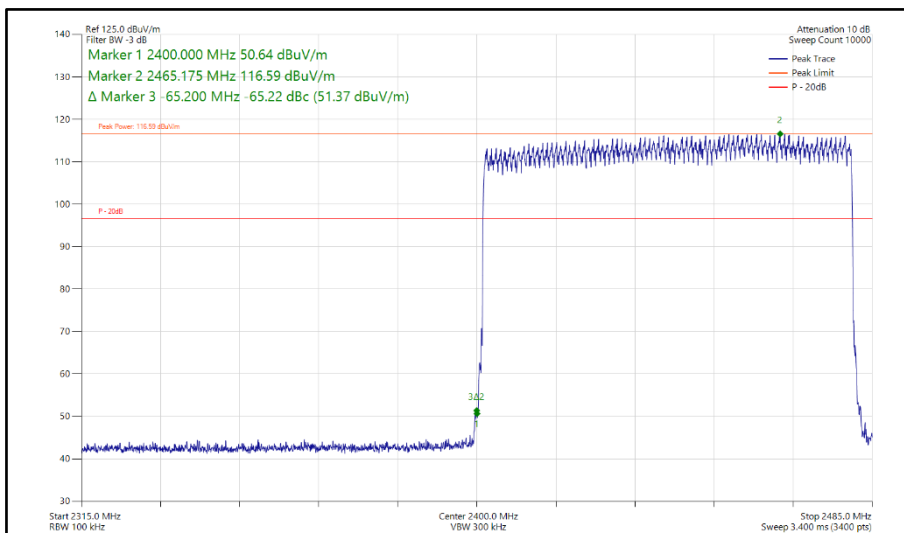


Figure 99 - Bluetooth 3-DH5, SISO, Core 0 – Hopping
Band Edge Frequency 2400 MHz



ePA - Core 0-1 (MIMO)

Mode	Packet Type	TX Frequency (MHz)	Band Edge Frequency (MHz)	Level (dBc)
Static	2-DH5	2402	2400	-61.01
Static	3-DH5	2402	2400	-60.62
Hopping	2-DH5	hopping	2400	-66.51
Hopping	3-DH5	hopping	2400	-66.09

Table 69 - MIMO Authorised Band Edge Results

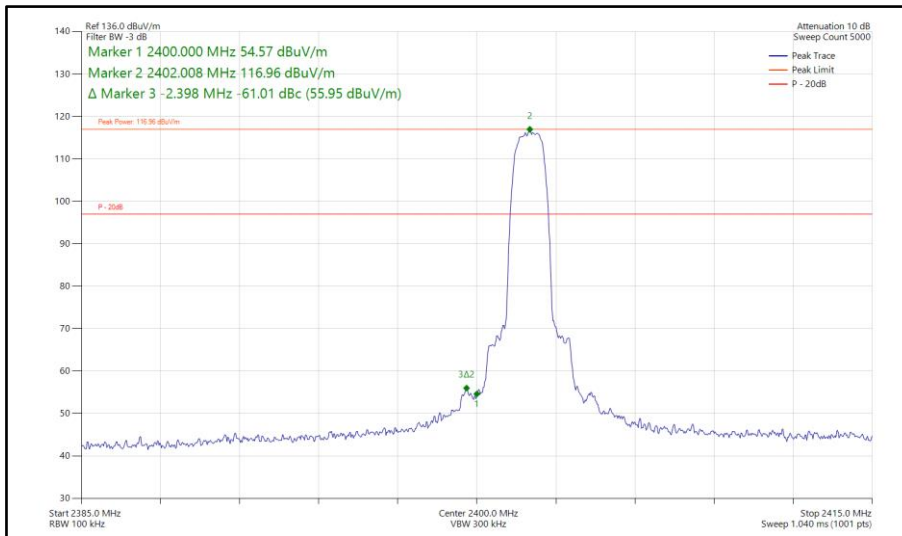


Figure 100 - Bluetooth 2-DH5, MIMO, Core 0-1 - 2402 MHz, Band Edge Frequency 2400 MHz

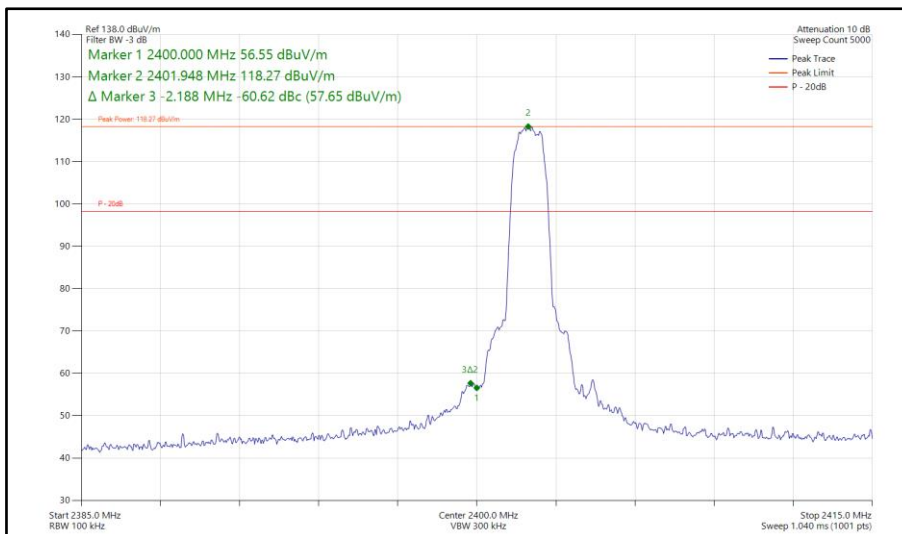
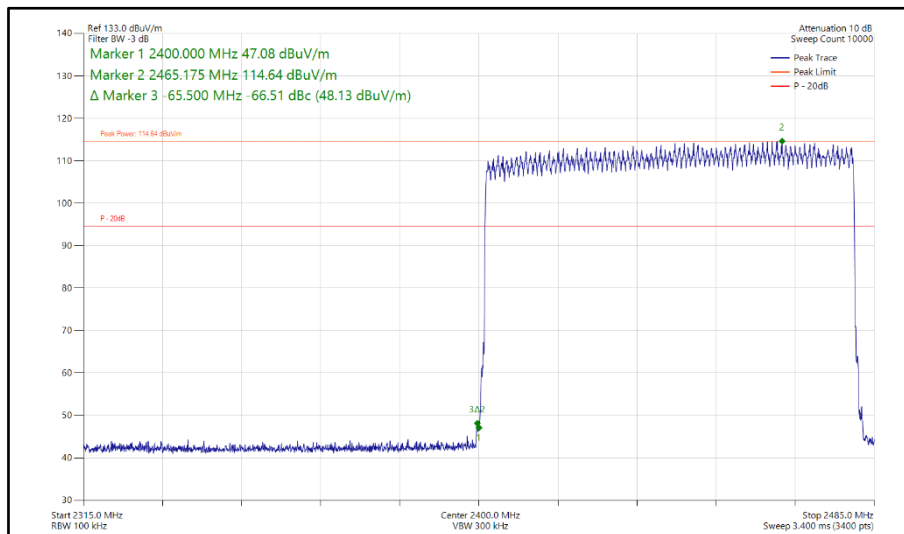
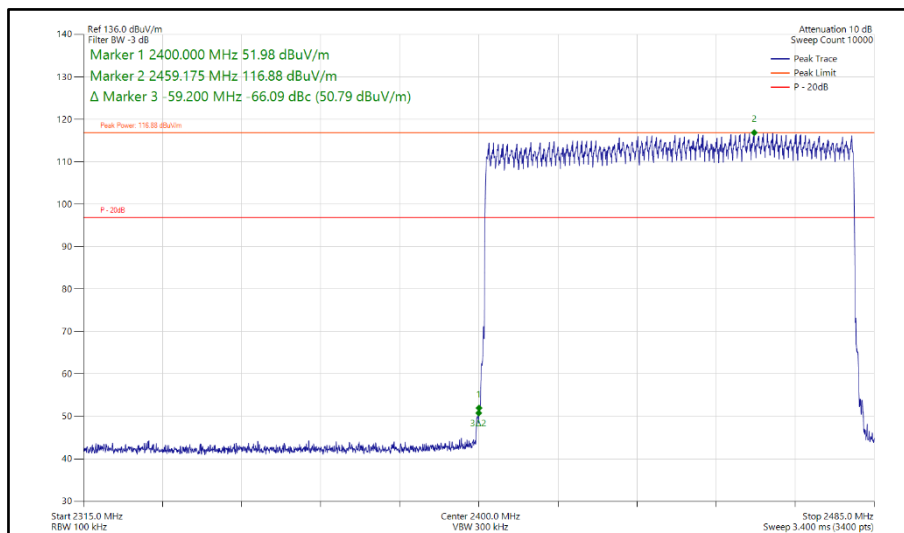


Figure 101 - Bluetooth 3-DH5, MIMO, Core 0-1 - 2402 MHz, Band Edge Frequency 2400 MHz



**Figure 102 - Bluetooth 2-DH5, MIMO, Core 0-1 – Hopping,
Band Edge Frequency 2400 MHz**



**Figure 103 - Bluetooth 3-DH5, MIMO, Core 0-1 – Hopping,
Band Edge Frequency 2400 MHz**

FCC 47 CFR Part 15, Limit Clause 15.247 (d)

20 dB below the fundamental measured in a 100 kHz bandwidth using a peak detector. If the transmitter complies with the conducted power limits, based on the use of RMS averaging over a time interval, the attenuation required shall be 30 dB below the fundamental instead of 20 dB.

ISED RSS-247, Limit Clause 5.5

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the RF power that is produced shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided that the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of root-mean-square averaging over a time interval, as permitted



under Section 5.4(4), the attenuation required shall be 30 dB instead of 20 dB. Attenuation below the general field strength limits specified in RSS-Gen is not required.



2.7.7 Test Location and Test Equipment Used

This test was carried out in RF Chamber 15.

Instrument	Manufacturer	Type No	TE No	Calibration Period (months)	Calibration Expires
Emissions Software	TUV SUD	EmX V3.1.10	5125	-	Software
EMI Test Receiver	Rohde & Schwarz	ESW44	5911	12	24-Mar-2023
1500W (300V 12A) AC Power Supply	iTech	IT7324	5956	-	O/P Mon
5m Semi-Anechoic Chamber (Dual-Axis)	Albatross Projects	RF Chamber 15	5963	36	28-Apr-2025
Mast & Turntable Controller	Maturo Gmbh	FCU3.0	5966	-	TU
Tilt Antenna Mast	Maturo Gmbh	BAM4.5-P	5967	-	TU
Turntable	Maturo Gmbh	TT1.5SI	5968	-	TU
Cable (SMA to SMA 1m)	Junkosha	MWX221-01000AMSAMS/A	5996	12	06-Jun-2023
Cable (SMA to SMA 1m)	Junkosha	MWX221-01000AMSAMS/A	6007	12	06-Jun-2023
Cable (SMA to SMA 6.5m)	Junkosha	MWX221-06500AMSAMS/B	6014	12	07-Jun-2023
Horn Antenna (1-10 GHz)	Schwarzbeck	BBHA9120B	6140	12	21-Jun-2023
Digital Multimeter	Fluke	115	6147	12	16-Jun-2023
Humidity & Temperature meter	R.S Components	1364	6150	12	17-Jun-2023
SAC Switch Unit	TUV SUD	TUV_SSU_001	6191	12	12-Dec-2023

Table 70

TU – Traceability Unscheduled
 O/P Mon – Output Monitored using calibrated equipment



2.8 Spurious Radiated Emissions

2.8.1 Specification Reference

FCC 47 CFR Part 15C, Clause and 15.209 and 15.247 (d)
ISED RSS-247, Clause 3.3 and 5.5
ISED RSS-GEN, Clause 6.13 and 8.9

2.8.2 Equipment Under Test and Modification State

A2941, S/N: HGQQL724XY - Modification State 0

2.8.3 Date of Test

27-February-2023 to 01-March-2023

2.8.4 Test Method

This test was performed in accordance with ANSI C63.10, clause 6.3, 6.5 and 6.6.

For frequencies > 1 GHz, plots for average measurements were taken in accordance with ANSI C63.10, clause 4.1.5.2.6 to characterize the EUT. Where emissions were detected, final average measurements were taken in accordance with ANSI C63.10, clause 4.1.5.2.2.

Ports on the EUT were terminated with loads as described in ANSI C63.4 clause 6.2.4. For EUT's with multiple connectors of the same type, additional interconnecting cables were connected, and pre-scans performed to determine whether the level of the emissions were increased by >2 dB.

In the 30 MHz to 1 GHz range pre-scans were only performed on the mid channel (2441 MHz) only.

The plots shown are the characterisation of the EUT. The limits on the plots represent the most stringent case for restricted bands, (74/54 dBuV/m) when compared to 20 dBc outside restricted bands. The limits shown have been used as a threshold to determine where further measurements are necessary. Where results are within 10 dB of the limits shown on the plots, further investigation was carried out and reported in results tables.

The following conversion can be applied to convert from dB μ V/m to μ V/m:
 $10^{(\text{Field Strength in dB}\mu\text{V/m}/20)}$.

Above 18 GHz, the measurement distance was reduced to 1 m. The limit line was increased by $20 \cdot \text{LOG}(3/1) = 9.54$ dB.

At a measurement distance of 1 meter the limit line was increased by $20 \cdot \text{LOG}(3/1) = 9.54$ dB.

Where formal measurements have been necessary, the results have been presented in the emissions table.

2.8.5 Example Test Setup Diagram

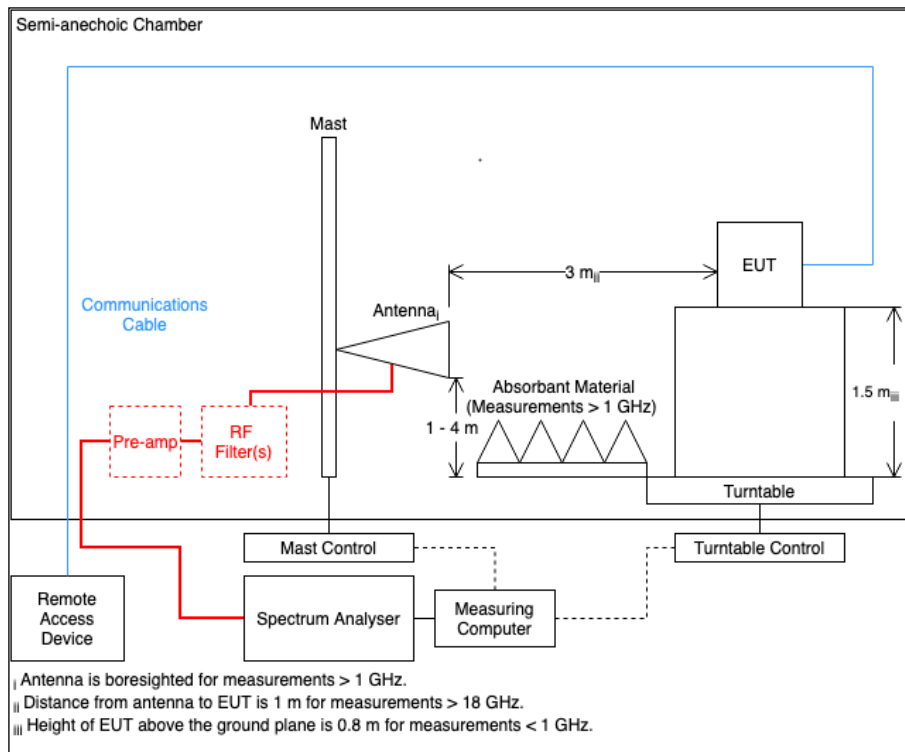


Figure 104

2.8.6 Environmental Conditions

Ambient Temperature	21.0 - 21.8 °C
Relative Humidity	35.8 - 38.6 %



2.8.7 Test Results

2.4 GHz Bluetooth FHSS

Frequency (MHz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Angle (°)	Height (cm)	Polarisation
31.695	22.45	40.00	-17.55	Q-Peak	350	139	Vertical
40.123	20.23	40.00	-19.77	Q-Peak	201	152	Vertical

Table 71 - 2441 MHz (CH39), DH5, iPA, Core 0 + Core 1, 30 MHz to 26 GHz

No other emissions found within 10 dB of the limit.

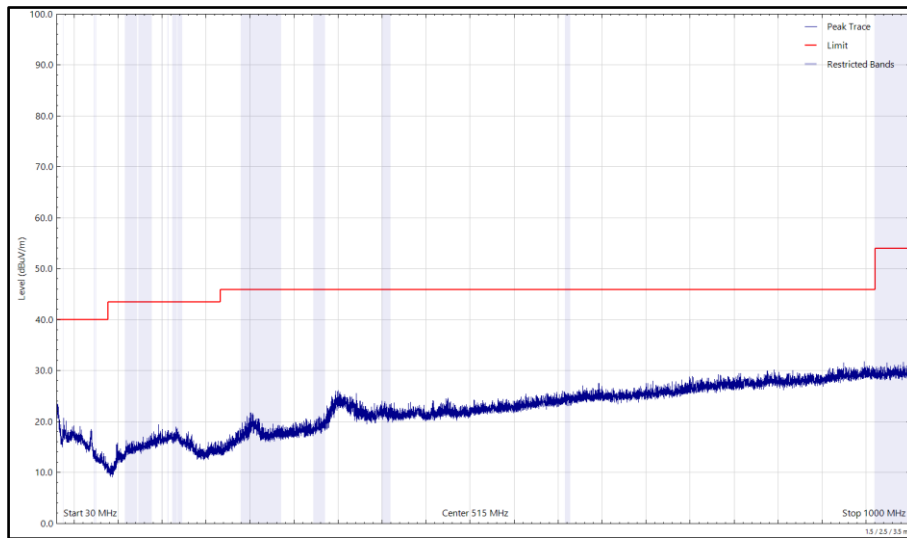


Figure 105 - 2441 MHz (CH39), DH5, iPA, Core 0 + Core 1, 30 MHz to 1 GHz, Horizontal (Peak)

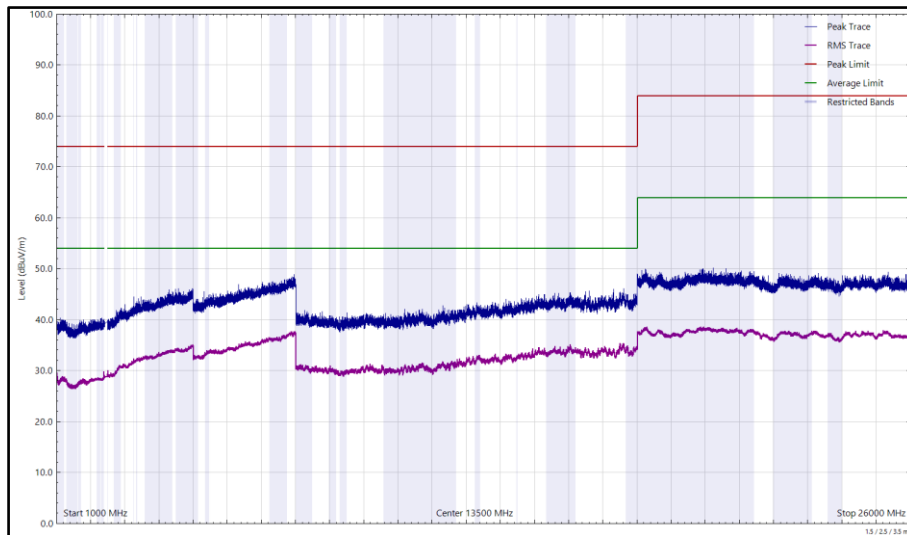


Figure 106 - 2441 MHz (CH39), DH5, iPA, Core 0 + Core 1, 1 GHz to 26 GHz, Horizontal

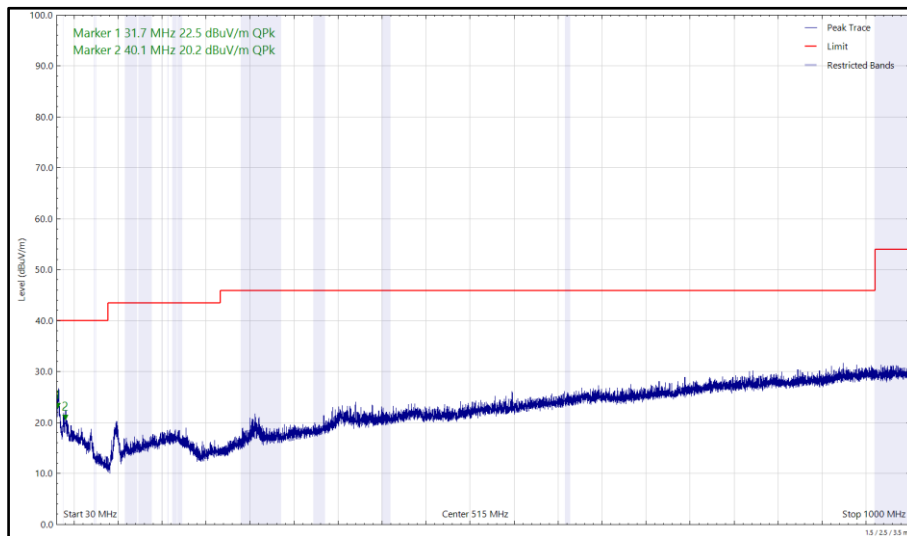


Figure 107 - 2441 MHz (CH39), DH5, iPA, Core 0 + Core 1, 30 MHz to 1 GHz, Vertical (Peak)

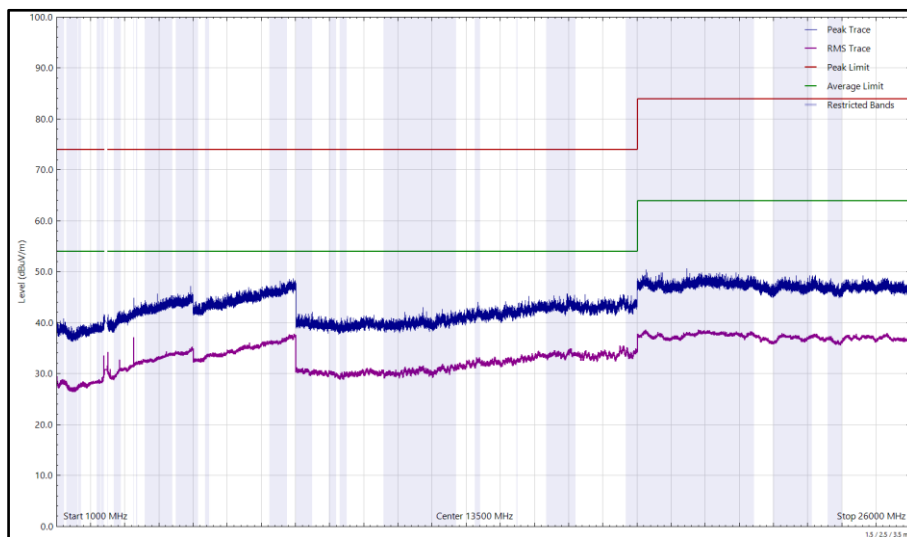


Figure 108 - 2441 MHz (CH39), DH5, iPA, Core 0 + Core 1, 1 GHz to 26 GHz, Vertical



Frequency (MHz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Angle (°)	Height (cm)	Polarisation
32.454	21.81	40.00	-18.19	Q-Peak	311	100	Vertical

Table 72 - 2441 MHz (CH39), 2DH5, ePA, Core 0 + Core 1, 30 MHz to 26 GHz

No other emissions found within 10 dB of the limit.

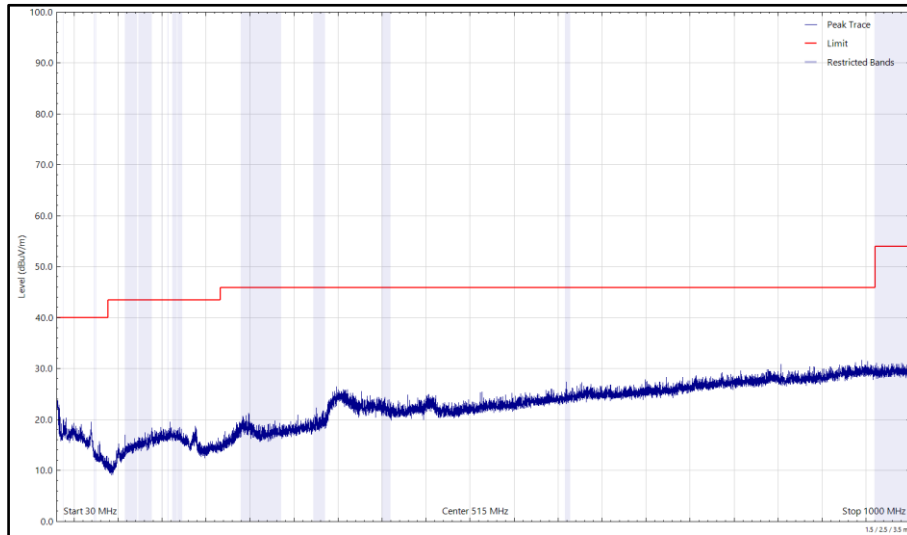


Figure 109 - 2441 MHz (CH39), 2DH5, ePA, Core 0 + Core 1, 30 MHz to 1 GHz, Horizontal (Peak)

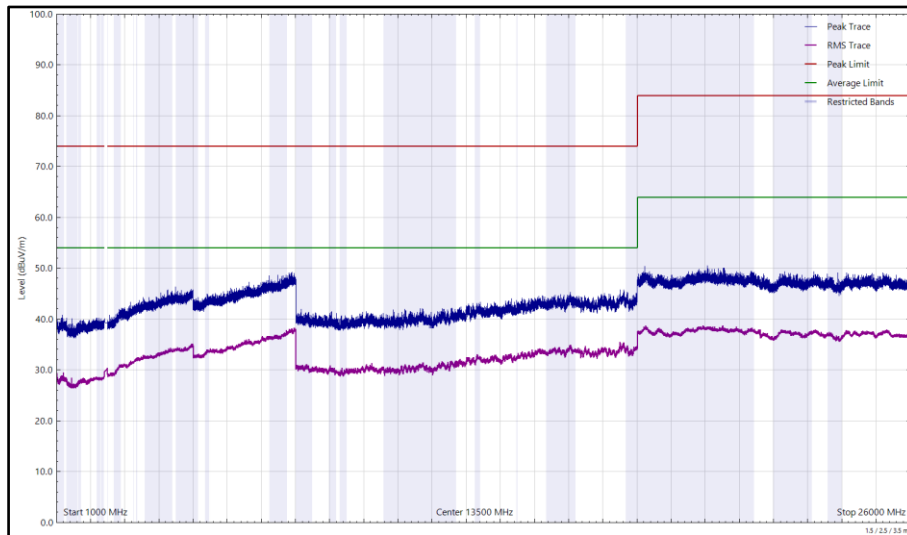


Figure 110 - 2441 MHz (CH39), 2DH5, ePA, Core 0 + Core 1, 1 GHz to 26 GHz, Horizontal

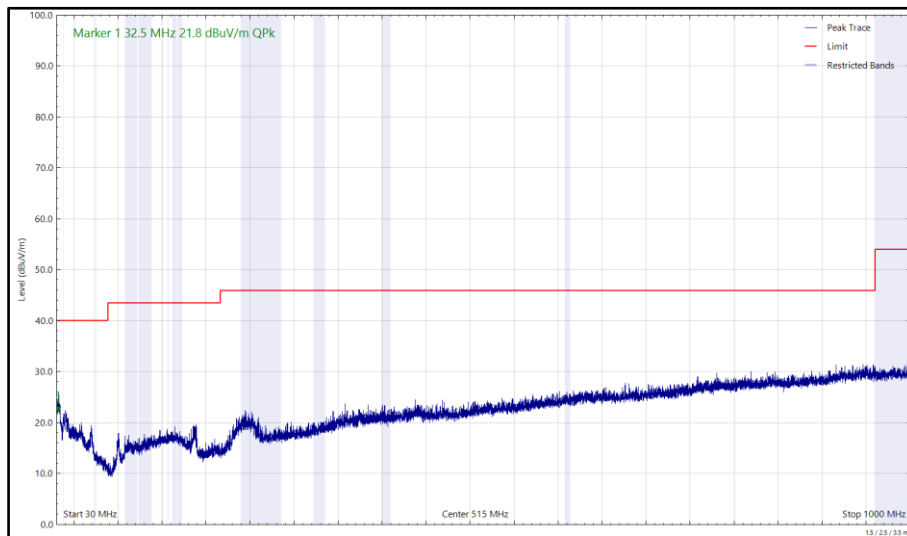


Figure 111 - 2441 MHz (CH39), 2DH5, ePA, Core 0 + Core 1, 30 MHz to 1 GHz, Vertical (Peak)

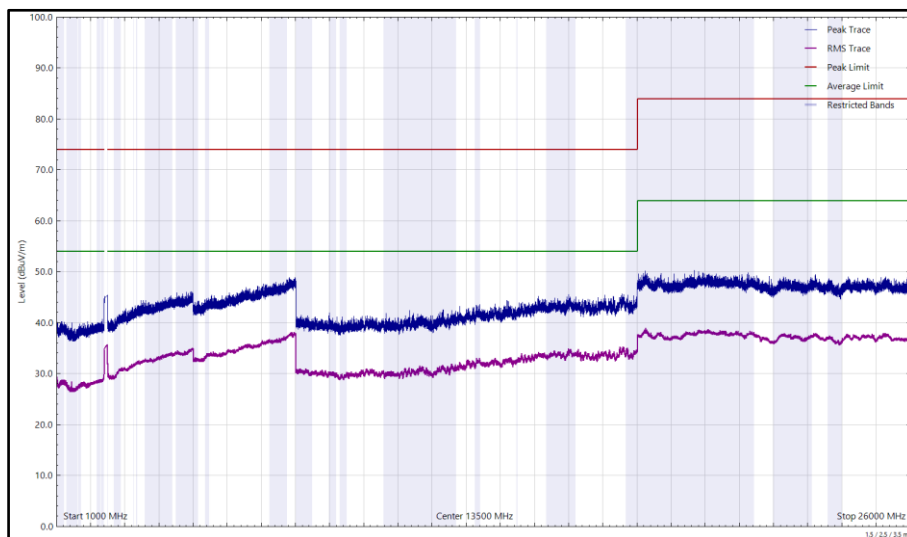


Figure 112 - 2441 MHz (CH39), 2DH5, ePA, Core 0 + Core 1, 1 GHz to 26 GHz, Vertical



Frequency (MHz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Angle (°)	Height (cm)	Polarisation
*							

Table 73 - 2402 MHz (CH0), DH5, iPA, Core 0 + Core 1, 1 GHz to 26 GHz

*No emissions found within 10 dB of the limit.

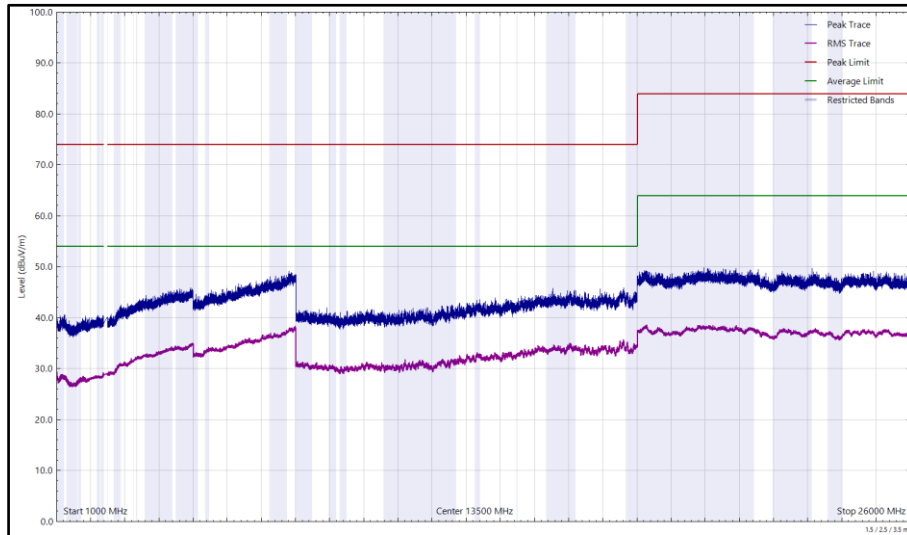


Figure 113 - 2402 MHz (CH0), DH5, iPA, Core 0 + Core 1, 1 GHz to 26 GHz, Horizontal

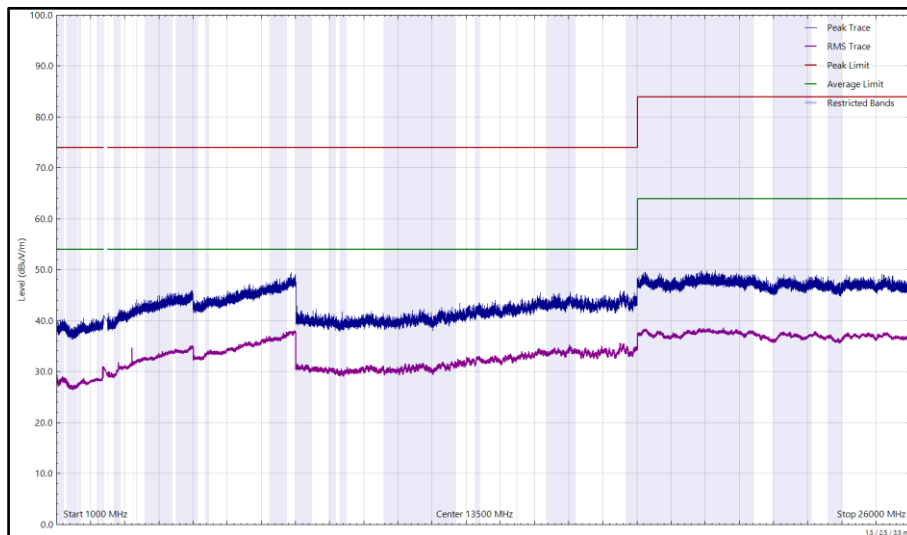


Figure 114 - 2402 MHz (CH0), DH5, iPA, Core 0 + Core 1, 1 GHz to 26 GHz, Vertical



Frequency (MHz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Angle (°)	Height (cm)	Polarisation
*							

Table 74 - 2480 MHz (CH78), DH5, iPA, Core 0 + Core 1, 1 GHz to 26 GHz

*No emissions found within 10 dB of the limit.

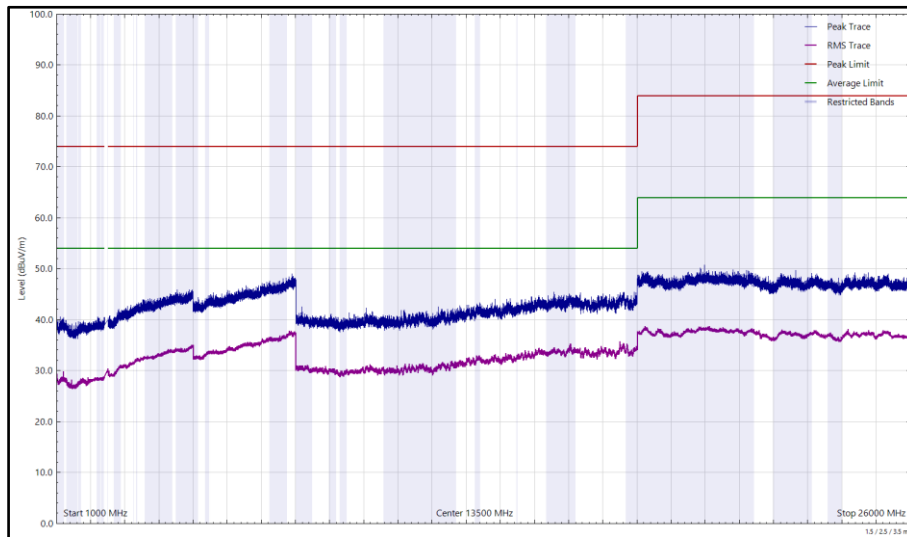


Figure 115 - 2480 MHz (CH78), DH5, iPA, Core 0 + Core 1, 1 GHz to 26 GHz, Horizontal

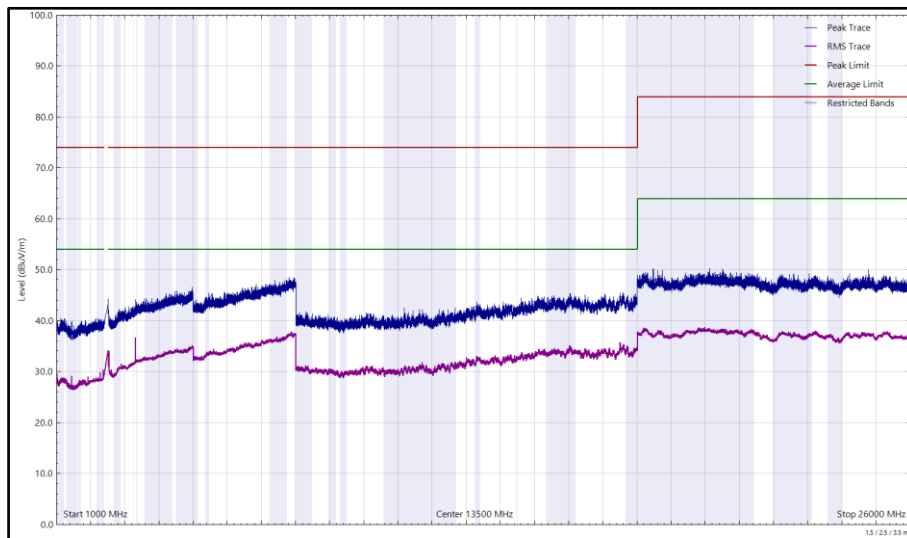


Figure 116 - 2480 MHz (CH78), DH5, iPA, Core 0 + Core 1, 1 GHz to 26 GHz, Vertical



Frequency (MHz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Angle (°)	Height (cm)	Polarisation
*							

Table 75 - 2402 MHz (CH0), 2DH5, ePA, Core 0 + Core 1, 1 GHz to 26 GHz

*No emissions found within 10 dB of the limit.

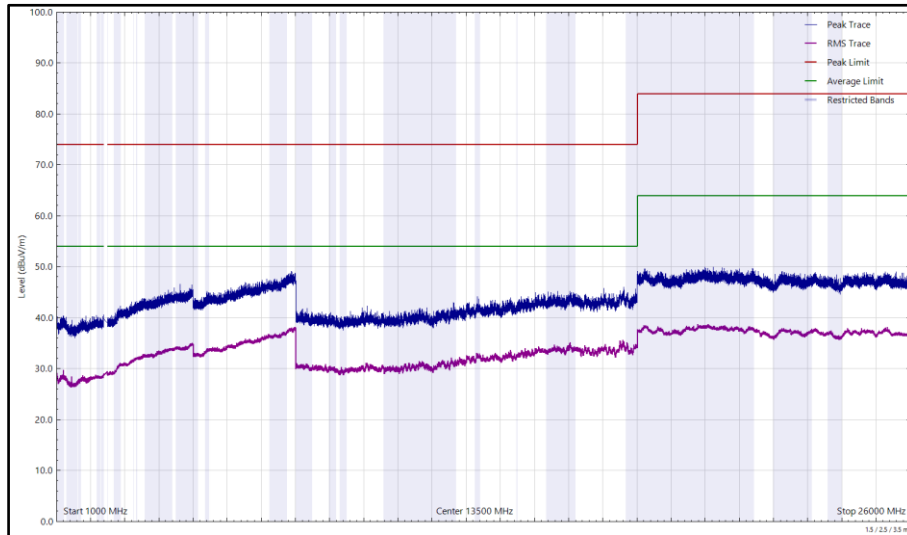


Figure 117 - 2402 MHz (CH0), 2DH5, ePA, Core 0 + Core 1, 1 GHz to 26 GHz, Horizontal

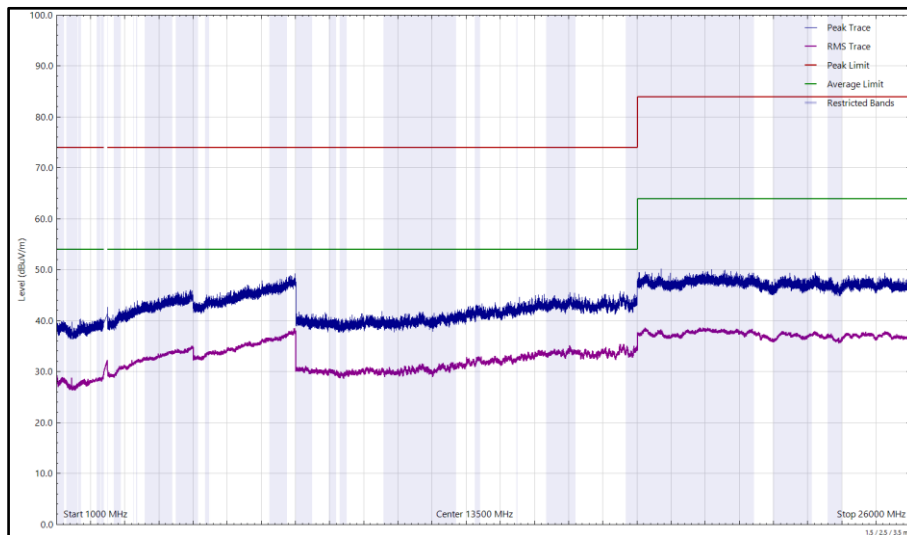


Figure 118 - 2402 MHz (CH0), 2DH5, ePA, Core 0 + Core 1, 1 GHz to 26 GHz, Vertical



Frequency (MHz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Angle (°)	Height (cm)	Polarisation
*							

Table 76 - 2480 MHz (CH78), 2DH5, ePA, Core 0 + Core 1, 1 GHz to 26 GHz

*No emissions found within 10 dB of the limit.

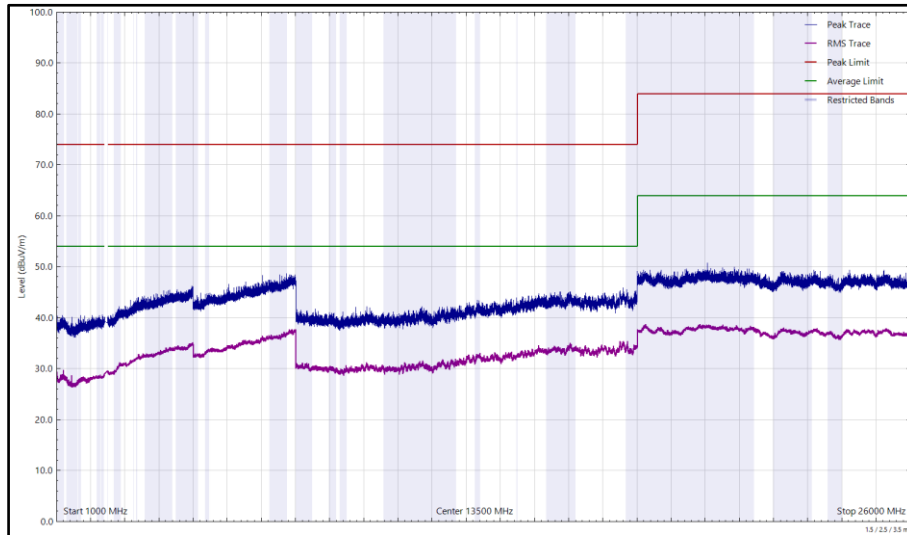


Figure 119 - 2480 MHz (CH78), 2DH5, ePA, Core 0 + Core 1, 1 GHz to 26 GHz, Horizontal

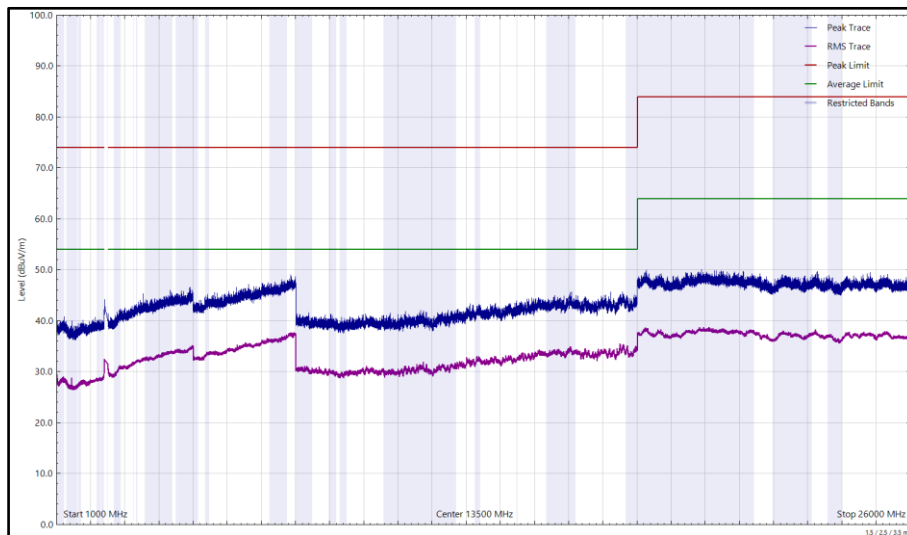


Figure 120 - 2480 MHz (CH78), 2DH5, ePA, Core 0 + Core 1, 1 GHz to 26 GHz, Vertical



FCC 47 CFR Part 15, Limit Clause 15.247 (d)

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB.

Attenuation below the general limits specified in § 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in § 15.205(a), must also comply with the radiated emission limits specified in 15.209(a)

ISED RSS-247, Limit Clause 5.5

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the RF power that is produced shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided that the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of root-mean-square averaging over a time interval, as permitted under Section 5.4(4), the attenuation required shall be 30 dB instead of 20 dB. Attenuation below the general field strength limits specified in RSS-Gen is not required.

In addition, radiated emissions which fall in the restricted bands, as defined in RSS-GEN, clause 8.10, must also comply with the radiated emission limits specified in RSS-GEN clause 8.9.



2.8.8 Test Location and Test Equipment Used

This test was carried out in RF Chamber 15.

Instrument	Manufacturer	Type No	TE No	Calibration Period (months)	Calibration Expires
Emissions Software	TUV SUD	EmX V3.1.10 V.	5125	-	Software
EMI Test Receiver	Rohde & Schwarz	ESW44	5911	12	24-Mar-2023
Cable (K Type 2m)	Junkosha	MWX241-02000KMSKMS/B	5935	12	14-May-2023
DRG Horn Antenna (7.5-18GHz)	Schwarzbeck	HWRD750	5939	12	29-May-2023
TRILOG Super Broadband Test Antenna	Schwarzbeck	VULB 9168	5944	24	03-Feb-2024
1500W (300V 12A) AC Power Supply	iTech	IT7324	5956	-	O/P Mon
5m Semi-Anechoic Chamber (Dual-Axis)	Albatross Projects	RF Chamber 15	5963	36	28-Apr-2025
Compact Antenna Mast	Maturo Gmbh	CAM4.0-P	5964	-	TU
Mast & Turntable Controller	Maturo Gmbh	FCU3.0	5966	-	TU
Tilt Antenna Mast	Maturo Gmbh	BAM4.5-P	5967	-	TU
Turntable	Maturo Gmbh	TT1.5SI	5968	-	TU
Cable (SMA to SMA 1m)	Junkosha	MWX221-01000AMSAMS/A	5996	12	06-Jun-2023
Cable (N to N 1m)	Junkosha	MWX221-01000NMSNMS/B	5999	12	05-Jun-2023
Cable (N to N 7m)	Junkosha	MWX221-07000NMSNMS/B	6005	12	05-Jun-2023
Cable (N to N 8m)	Junkosha	MWX221-08000NMSNMS/A	6006	12	05-Jun-2023
Cable (SMA to SMA 1m)	Junkosha	MWX221-01000AMSAMS/A	6007	12	06-Jun-2023
Cable (SMA to SMA 6.5m)	Junkosha	MWX221-06500AMSAMS/B	6014	12	07-Jun-2023
Cable (SMA to SMA 1m)	Junkosha	MWX221-01000AMSAMS/B	6019	12	07-Jun-2023
Horn Antenna (1-10 GHz)	Schwarzbeck	BBHA9120B	6140	12	21-Jun-2023
Digital Multimeter	Fluke	115	6147	12	16-Jun-2023
Humidity & Temperature meter	R.S Components	1364	6150	12	17-Jun-2023
Double Ridge Active Horn Antenna (18-40 GHz)	Com-Power	AHA-840	6187	24	02-Jun-2024
SAC Switch Unit	TUV SUD	TUV_SSU_001	6191	12	12-Dec-2023
8GHz Highpass Filter	Wainwright	WHKX 7150 8000 18000 50SS	6195	12	15-Jul-2023



Instrument	Manufacturer	Type No	TE No	Calibration Period (months)	Calibration Expires
Pre Amp 8 - 18 GHz	Wright Technologies	APS06 0061	6198	12	19-Jul-2023
Attenuator 4dB	Pasternack	PE7074-4	6203	24	16-Jul-2024
Cable (SMA to SMA 20cm)	TUV SUD	MH-FH 8-18	6214	12	25-Jul-2023

Table 77

TU – Traceability Unscheduled
O/P Mon – Output Monitored using calibrated equipment



3 Measurement Uncertainty

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

Test Name	Measurement Uncertainty
Restricted Band Edges	30 MHz to 1 GHz: ± 5.2 dB 1 GHz to 40 GHz: ± 6.3 dB
Frequency Hopping Systems - Average Time of Occupancy	-
Frequency Hopping Systems - Channel Separation	± 20.51 kHz
Frequency Hopping Systems - Number of Hopping Channels	-
Frequency Hopping Systems - 20 dB Bandwidth	± 23.51 kHz
Maximum Conducted Output Power	± 1.38 dB
Authorised Band Edges	30 MHz to 1 GHz: ± 5.2 dB 1 GHz to 40 GHz: ± 6.3 dB
Spurious Radiated Emissions	30 MHz to 1 GHz: ± 5.2 dB 1 GHz to 40 GHz: ± 6.3 dB

Table 78

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.