Prüfbericht-Nr.: *Test report no.:*	**CN23CF7A 001**	**Auftrags-Nr.:** *Order no.*:	**244490783**	**Seite 1 von 49** *Page 1 of 49*
Kunden-Referenz-Nr.: *Client reference no.:*	**1288983**	**Auftragsdatum:** *Order date:*	**2023-01-08**	
Auftraggeber: *Client:*	**IKEA of Sweden AB** Box 702, Almhult, Sweden			
Prüfgegenstand: *Test item:*	**PARASOLL Open/Close Sensor**			
Bezeichnung / Typ-Nr.: *Identification / Type no.:*	E2013 FCC ID: FHO-E2013 IC: 10912A-E2013			
Auftrags-Inhalt: *Order content*:	Complete test			
Prüfgrundlage: *Test specification:*	FCC CFR47 Part 15, Subpart C Section 15.247 RSS-Gen Issue 5, Amendment 2, February 2021 RSS-247 Issue 2, February 2017 ANSI C63.10: 2013			
Wareneingangsdatum: *Date of sample receipt:*	2023-02-02	Refer to photo document		
Prüfmuster-Nr.: *Test sample no:*	A003408704-003			
Prüfzeitraum: *Testing period:*	Refer to test report			
Ort der Prüfung: *Place of testing:*	TÜV Rheinland (Shanghai) Co., Ltd.			
Prüflaboratorium: *Testing laboratory:*	TÜV Rheinland (Shanghai) Co., Ltd.			
Prüfergebnis*: *Test result*:*	Pass			

geprüft von: *tested by:*	X Hongfei Wu Signed by: Hongfei Wu	**genehmigt von:** *authorized by:*	X Elliot Zhang Signed by: Elliot Zhang
Datum: *Date:* 2023-05-10		**Ausstellungsdatum:** *Issue date:* 2023-05-10	
Stellung / *Position:*	PE	**Stellung** / *Position:*	Reviewer

Sonstiges / *Other:* HVIN: E2013

Zustand des Prüfgegenstandes bei Anlieferung: Prüfmuster vollständig und unbeschädigt
Condition of the test item at delivery: *Test item complete and undamaged*

* Legende:	P(ass) = entspricht o.g. Prüfgrundlage(n)	F(ail) = entspricht nicht o.g. Prüfgrundlage(n)	N/A = nicht anwendbar	N/T = nicht getestet
* *Legend:*	*P(ass) = passed a.m. test specification(s)*	*F(ail) = failed a.m. test specification(s)*	*N/A = not applicable*	*N/T = not tested*

V05

TEST SUMMARY

5.1.1 ANTENNA REQUIREMENT
RESULT: Pass

5.1.2 6DB & 99% BANDWIDTH
RESULT: Pass

5.1.3 PEAK OUTPUT POWER
RESULT: Pass

5.1.4 POWER SPECTRAL DENSITY
RESULT: Pass

5.1.5 CONDUCTED BAND EDGE AND OUT-OF BAND EMISSIONS
RESULT: Pass

5.2.1 CONDUCTED EMISSION
RESULT: N/A

5.3.1 RADIATED BAND-EDGE
RESULT: Pass

5.3.2 RADIATED SPURIOUS EMISSION
RESULT: Pass

Contents

1. General Remarks

1.1 Complementary Materials

Null.

2. Test Sites

2.1 Test Facilities

TÜV Rheinland (Shanghai) Co., Ltd.
Shanghai TUV Rheinland Building No. 177, 178 Lane 777, West Guangzhong Rd, Jing'an District, Shanghai, China
The used test equipment is in accordance with CISPR 16 for measurement of radio interference.

The Federal Communications Commission has reviewed the technical characteristics of the radiated and conducted emission facility, and has found these test facilities to be in compliance with the requirements of section 2.948 of the FCC rules. The description of the test facility is listed under FCC registration number 958801.

The Innovation, Science and Economic Development Canada has reviewed the technical characteristics of the radiated and conducted emission facility, and has found these test facilities to be in compliance. The description of the test facility is listed under chambers filing number 2932F.

2.2 List of Test and Measurement Instruments

Table 1: List of Test and Measurement Equipment

Equip.	Description	Model	Manufacturer	Last Date DD.MM.YYYY	Due Date DD.MM.YYYY
G1811378	3m modified semi-anechoic chamber	SAC3	Frankonia	10.06.2021	10.06.2024
9023229	EMI test receiver	ESR3	Rohde&Schwarz	11.08.2022	11.08.2023
G1811425	Bilog antenna	CBL 6112D	Teseq	10.03.2020	10.03.2023
G1811417	Log periodic antenna	HL050	Rohde&Schwarz	10.03.2020	10.03.2023
G1825371	Preamplifier	EMC051845SE	Taiwan EMCI	14.05.2021	14.05.2023
G1825372	Preamplifier	EMC184045SE	Taiwan EMCI	14.05.2021	14.05.2023
G1822702	Spectrum analyser	FSV40	Rohde&Schwarz	04.11.2021	04.11.2023
EMC-C-304	OSP	OSP-B157W8	Rohde & Schwarz	14.10.2022	14.10.2023
software					
G1824845	EMC measurement software	EMC32 (Ver 10.20.01)	Rohde&Schwarz	NA	NA
	EMC measurement software	EMC32 (Ver 11.40.00)	Rohde&Schwarz	NA	NA

2.3 Traceability

All measurement equipment calibrations are traceable to NIST or where calibration is performed outside the United States, to equivalent nationally recognized standards organizations.

2.4 Calibration

Equipment requiring calibration is calibrated periodically by the manufacturer or according to manufacturer's specifications. Additionally all equipment is verified for proper performance on a regular basics using in house standards or comparisons.

2.5 Measurement Uncertainty

Table 2: Measurement Uncertainty

Measurement Type	Frequency	Uncertainty
Antenna Port Conducted Emission	< 1GHz	±0.39dB
	> 1GHz	±0.68dB
Radiated Emission	9kHz – 30MHz	±2.93dB
	30MHz - 1GHz	±5.34dB
	> 1GHz	±5.40dB

3. General Product Information

3.1 Product Function and Intended Use

The EUT (Equipment Under Test) is an open/close sensor which supports Zigbee.

For details refer to the User Manual and Circuit Diagram.

3.2 Ratings and System Details

Table 3: Technical Specification of EUT

General Description of EUT	
Product Name:	PARASOLL Open/Close Sensor
Model No.:	E2013
Operating Voltage:	DC 1.5V (AAA battery*1)
Technical Specification of Zigbee	
Frequency Range:	2405 ~ 2480 MHz
Modulation Type:	OQPSK
Antenna Type:	PCB Antenna
Antenna Gain:	4.04 dBi

Note:
The EUT have two configurations, and only the power supply chip is different. In this report, full test EUT 1# and partial test EUT 2# (radiated test).

Configuration	Power supply chip
EUT 1#	OC6811
EUT 2#	MAX17224

3.3 Independent Operation Modes

Table 4: Independent Operation Modes

Test Mode	Channel Number	Channel Frequency [MHz]
TM1	11	2405
TM2	19	2445
TM3	26	2480

3.4 Noise Generating and Noise Suppressing Parts

Refer to the Circuit Diagram.

3.5 Submitted Documents

- Bill of Material
- PCB Layout
- Photo Document
- Circuit Diagram
- Instruction Manual
- Rating Label

4. Test Set-up and Operation Modes

4.1 Principle of Configuration Selection

The equipment under test (EUT) was configured to measure its maximum power level. The test modes were adapted accordingly in reference to the instructions for use.

4.2 Test Operation and Test Software

Test operation refers to test setup in chapter 5. All testing were performed according to the procedures in ANSI C63.10: 2013.
Test Software used: UartAssist.exe

Table 5: Power parameter value

Channel Frequency [MHz]	Power Parameter Value
2405	3
2445	3
2480	3

4.3 Special Accessories and Auxiliary Equipment

Null.

4.4 Countermeasures to achieve EMC Compliance

Null.

5. Test Results

5.1 Conducted Testing at Antenna Port

5.1.1 Antenna Requirement

RESULT: **Pass**

According to the manufacturer declared, the EUT has one PCB antenna, the directional gain of antenna is 4.04 dBi and the antenna is designed with permanent attachment and no consideration of replacement. Therefore the EUT is considered sufficient to comply with the provision.

Table 6: Antenna Requirement

FCC 15.203 – Antenna Requirement 1		
Requirement:	No antenna other than that furnished by the responsible party shall be used with the device	
Results:	Antenna type:	PCB antenna
Verdict:	Pass	

FCC 15.204 – Antenna Requirement 2	
Requirement:	An intentional radiator may be operated only with the antenna with which it is authorized. If an antenna is marketed with the intentional radiator, it shall be of a type which is authorized with the intentional radiator.
Results:	Only one PCB antenna can be used
Verdict:	Pass

RSS-Gen 6.4 – External Control	
Requirement:	The device shall not have any external controls accessible to the user that enable it to be adjusted, selected or programmed to operate in violation of the regulatory requirements, including RSS-Gen and the applicable RSSs
Results:	The device does not have any transmitter external controls accessible to the user that can be adjusted and operated in violation of the limits of this standard.
Verdict:	PASS

RSS-Gen 6.8 – Antenna Requirement		
Requirement:	When measurements at the antenna port are used to determine the RF output power, the effective gain of the device's antenna shall be stated, based on a measurement or on data from the antenna's manufacturer.	
Results:	a) Antenna Type:	PCB Antenna
	b) Manufacture:	N/A
	c) Model No.:	N/A
	d) Gain with reference to an isotropic radiator:	4.04 dBi
Verdict:	PASS	

5.1.2 6dB & 99% Bandwidth

RESULT: **Pass**

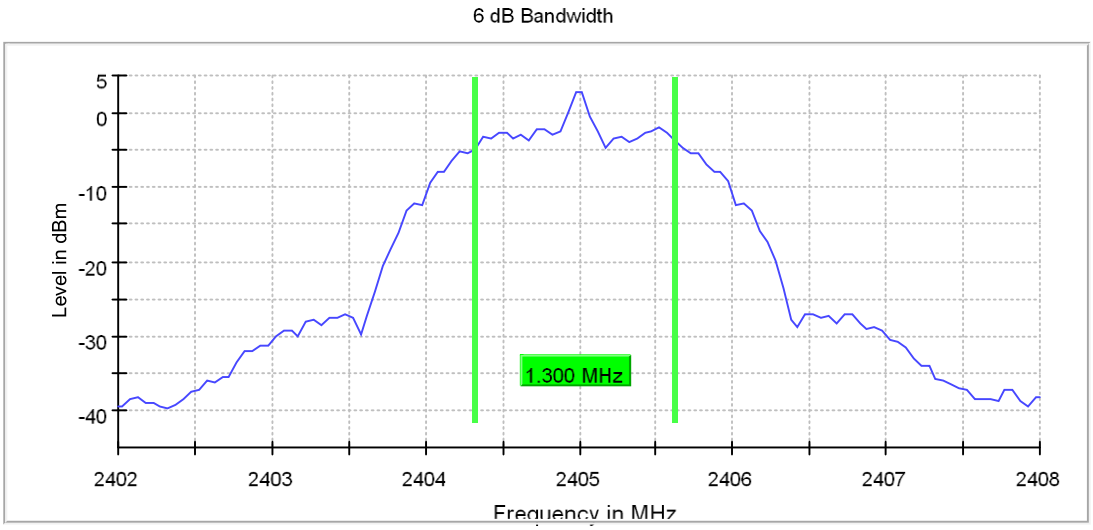
Date of testing	:	2023-02-09
Ambient temperature	:	22.1°C
Relative humidity	:	47.2%
Atmospheric pressure	:	101kPa
Test requirement	:	FCC Part 15.247(a)(2) RSS-247 Issue 2, February 2017, Clause 5.2(a)
Test procedure	:	ANSI C63.10: 2013
Test voltage	:	DC 1.5V
Test modes applied	:	TM1 to TM3

6dB Bandwidth, TM1, 2405MHz

DUT Frequency (MHz)	Bandwidth (MHz)	Limit Min (MHz)	Limit Max (MHz)	Band Edge Left (MHz)	Band Edge Right (MHz)
2405.000000	1.300000	0.500000	---	2404.325000	2405.625000

(continuation of the "6 dB Bandwidth" table from column 6 ...)

DUT Frequency (MHz)	Max Level (dBm)	Result
2405.000000	2.8	PASS



Measurement

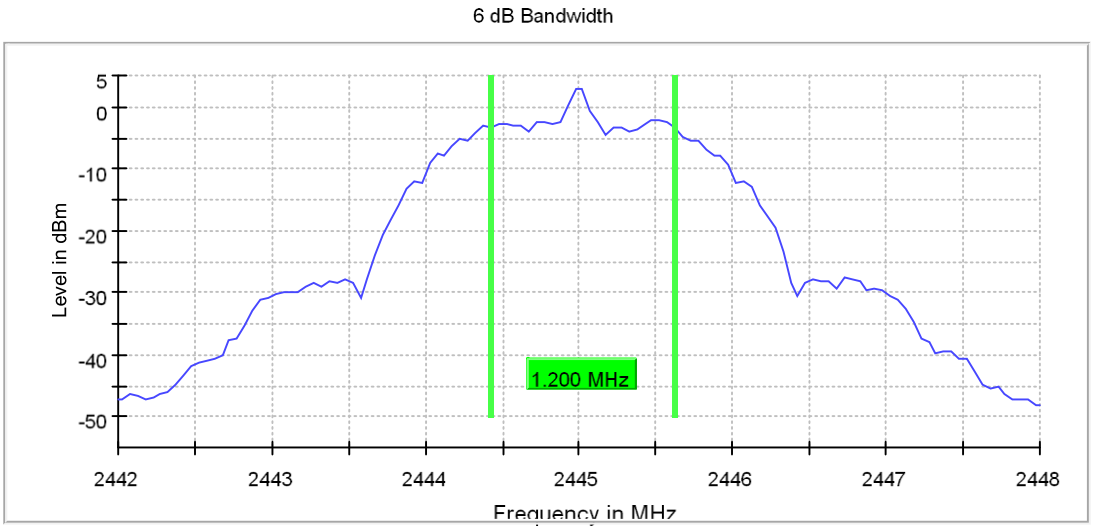
Setting	Instrument Value	Target Value
Start Frequency	2.40200 GHz	2.40200 GHz
Stop Frequency	2.40800 GHz	2.40800 GHz
Span	6.000 MHz	6.000 MHz
RBW	100.000 kHz	~ 100.000 kHz
VBW	300.000 kHz	~ 300.000 kHz
SweepPoints	120	~ 120
Sweeptime	18.984 µs	AUTO
Reference Level	20.000 dBm	20.000 dBm
Attenuation	35.000 dB	AUTO
Detector	MaxPeak	MaxPeak
SweepCount	100	100
Filter	3 dB	3 dB
Trace Mode	Max Hold	Max Hold
Sweeptype	FFT	AUTO
Preamp	off	off
Stablemode	Trace	Trace
Stablevalue	0.50 dB	0.50 dB
Run	12 / max. 150	max. 150
Stable	5 / 5	5
Max Stable Difference	0.15 dB	0.50 dB

6dB Bandwidth, TM2, 2445MHz

DUT Frequency (MHz)	Bandwidth (MHz)	Limit Min (MHz)	Limit Max (MHz)	Band Edge Left (MHz)	Band Edge Right (MHz)
2445.000000	1.200000	0.500000	---	2444.425000	2445.625000

(continuation of the "6 dB Bandwidth" table from column 6 ...)

DUT Frequency (MHz)	Max Level (dBm)	Result
2445.000000	3.0	PASS



Measurement

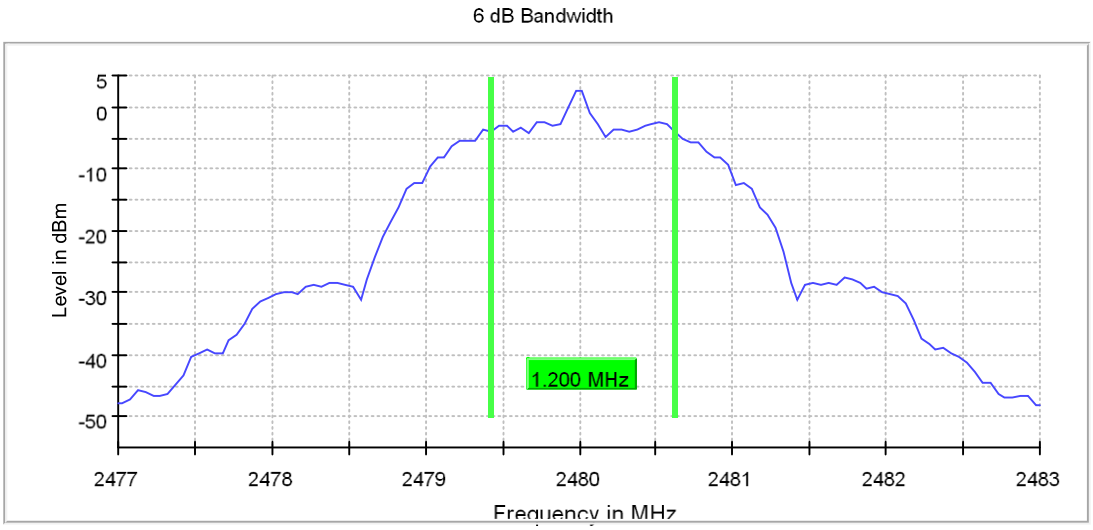
Setting	Instrument Value	Target Value
Start Frequency	2.44200 GHz	2.44200 GHz
Stop Frequency	2.44800 GHz	2.44800 GHz
Span	6.000 MHz	6.000 MHz
RBW	100.000 kHz	~ 100.000 kHz
VBW	300.000 kHz	~ 300.000 kHz
SweepPoints	120	~ 120
Sweeptime	18.984 µs	AUTO
Reference Level	0.000 dBm	0.000 dBm
Attenuation	20.000 dB	AUTO
Detector	MaxPeak	MaxPeak
SweepCount	100	100
Filter	3 dB	3 dB
Trace Mode	Max Hold	Max Hold
Sweeptype	FFT	AUTO
Preamp	off	off
Stablemode	Trace	Trace
Stablevalue	0.50 dB	0.50 dB
Run	10 / max. 150	max. 150
Stable	5 / 5	5
Max Stable Difference	0.19 dB	0.50 dB

6dB Bandwidth, TM3, 2480MHz

DUT Frequency (MHz)	Bandwidth (MHz)	Limit Min (MHz)	Limit Max (MHz)	Band Edge Left (MHz)	Band Edge Right (MHz)
2480.000000	1.200000	0.500000	---	2479.425000	2480.625000

(continuation of the "6 dB Bandwidth" table from column 6 ...)

DUT Frequency (MHz)	Max Level (dBm)	Result
2480.000000	2.6	PASS



Measurement

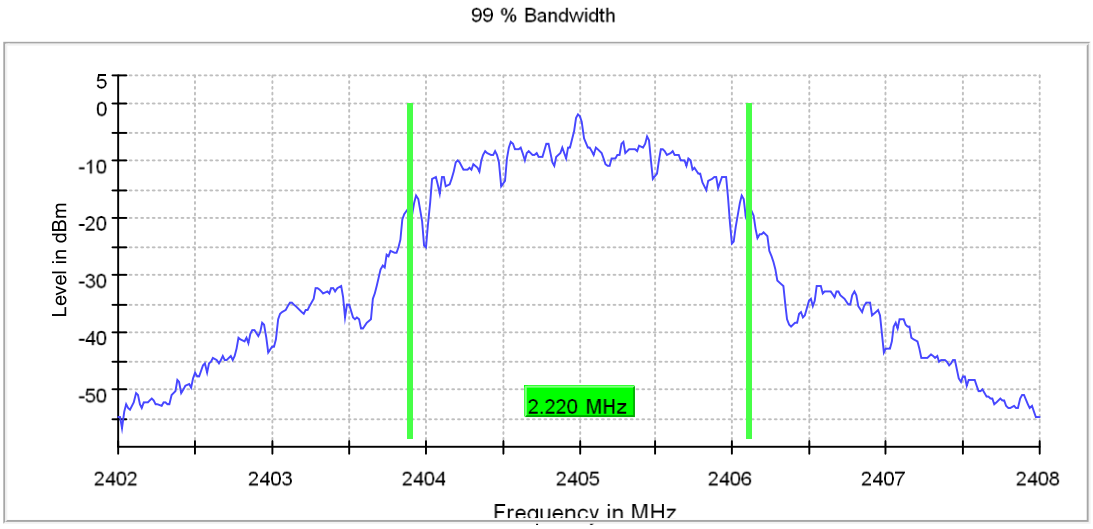
Setting	Instrument Value	Target Value
Start Frequency	2.47700 GHz	2.47700 GHz
Stop Frequency	2.48300 GHz	2.48300 GHz
Span	6.000 MHz	6.000 MHz
RBW	100.000 kHz	~ 100.000 kHz
VBW	300.000 kHz	~ 300.000 kHz
SweepPoints	120	~ 120
Sweeptime	18.984 µs	AUTO
Reference Level	0.000 dBm	0.000 dBm
Attenuation	20.000 dB	AUTO
Detector	MaxPeak	MaxPeak
SweepCount	100	100
Filter	3 dB	3 dB
Trace Mode	Max Hold	Max Hold
Sweeptype	FFT	AUTO
Preamp	off	off
Stablemode	Trace	Trace
Stablevalue	0.50 dB	0.50 dB
Run	10 / max. 150	max. 150
Stable	5 / 5	5
Max Stable Difference	0.11 dB	0.50 dB

99% Occupied Channel Bandwidth, TM1, 2405MHz

DUT Frequency (MHz)	Bandwidth (MHz)	Limit Min (MHz)	Limit Max (MHz)	Band Edge Left (MHz)	Band Edge Right (MHz)
2405.000000	2.220000	---	---	2403.897500	2406.117500

(continuation of the "99 % Bandwidth" table from column 6 ...)

DUT Frequency (MHz)	Result
2405.000000	PASS



Measurement

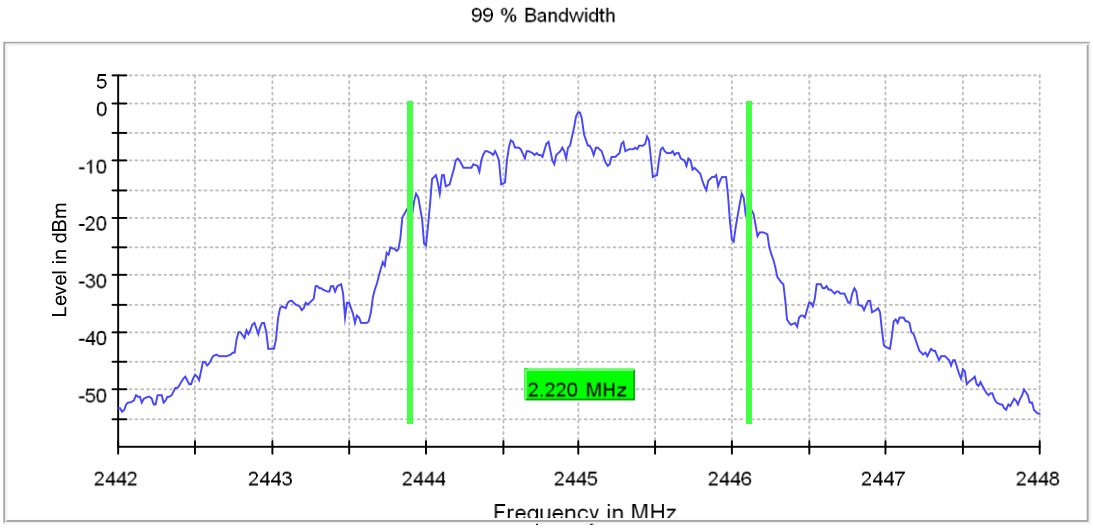
Setting	Instrument Value	Target Value
Start Frequency	2.40200 GHz	2.40200 GHz
Stop Frequency	2.40800 GHz	2.40800 GHz
Span	6.000 MHz	6.000 MHz
RBW	30.000 kHz	>= 30.000 kHz
VBW	100.000 kHz	>= 90.000 kHz
SweepPoints	400	~ 400
Sweeptime	63.216 µs	AUTO
Reference Level	0.000 dBm	0.000 dBm
Attenuation	20.000 dB	AUTO
Detector	MaxPeak	MaxPeak
SweepCount	100	100
Filter	3 dB	3 dB
Trace Mode	Max Hold	Max Hold
Sweeptype	FFT	AUTO
Preamp	off	off
Stablemode	Trace	Trace
Stablevalue	0.30 dB	0.30 dB
Run	8 / max. 150	max. 150
Stable	3 / 3	3
Max Stable Difference	0.18 dB	0.30 dB

99% Occupied Channel Bandwidth, TM2, 2445MHz

DUT Frequency (MHz)	Bandwidth (MHz)	Limit Min (MHz)	Limit Max (MHz)	Band Edge Left (MHz)	Band Edge Right (MHz)
2445.000000	2.220000	---	---	2443.897500	2446.117500

(continuation of the "99 % Bandwidth" table from column 6 ...)

DUT Frequency (MHz)	Result
2445.000000	PASS



Measurement

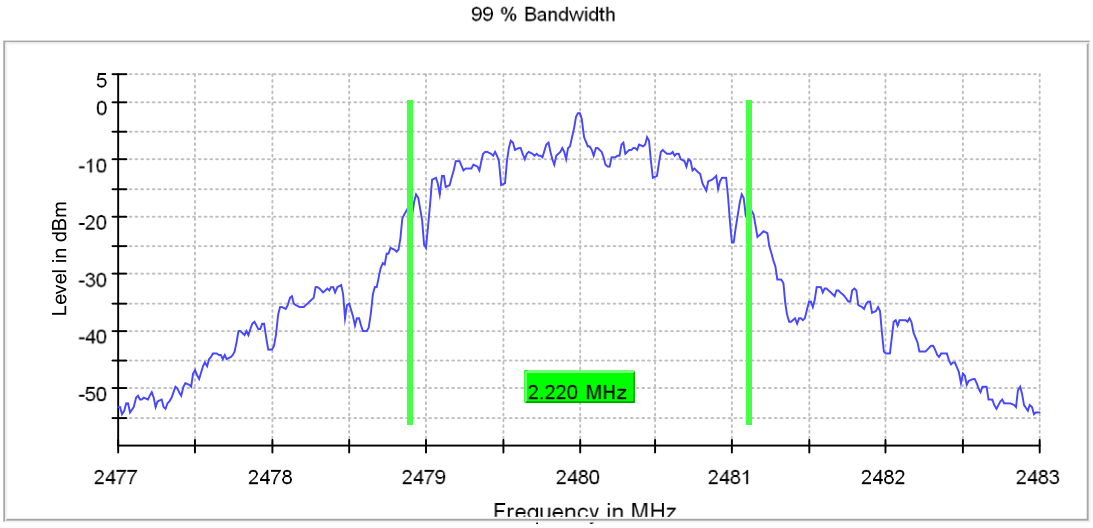
Setting	Instrument Value	Target Value
Start Frequency	2.44200 GHz	2.44200 GHz
Stop Frequency	2.44800 GHz	2.44800 GHz
Span	6.000 MHz	6.000 MHz
RBW	30.000 kHz	>= 30.000 kHz
VBW	100.000 kHz	>= 90.000 kHz
SweepPoints	400	~ 400
Sweeptime	63.216 µs	AUTO
Reference Level	0.000 dBm	0.000 dBm
Attenuation	20.000 dB	AUTO
Detector	MaxPeak	MaxPeak
SweepCount	100	100
Filter	3 dB	3 dB
Trace Mode	Max Hold	Max Hold
Sweeptype	FFT	AUTO
Preamp	off	off
Stablemode	Trace	Trace
Stablevalue	0.30 dB	0.30 dB
Run	10 / max. 150	max. 150
Stable	3 / 3	3
Max Stable Difference	0.07 dB	0.30 dB

99% Occupied Channel Bandwidth, TM3, 2480MHz

DUT Frequency (MHz)	Bandwidth (MHz)	Limit Min (MHz)	Limit Max (MHz)	Band Edge Left (MHz)	Band Edge Right (MHz)
2480.000000	2.220000	---	---	2478.897500	2481.117500

(continuation of the "99 % Bandwidth" table from column 6 ...)

DUT Frequency (MHz)	Result
2480.000000	PASS



Measurement

Setting	Instrument Value	Target Value
Start Frequency	2.47700 GHz	2.47700 GHz
Stop Frequency	2.48300 GHz	2.48300 GHz
Span	6.000 MHz	6.000 MHz
RBW	30.000 kHz	>= 30.000 kHz
VBW	100.000 kHz	>= 90.000 kHz
SweepPoints	400	~ 400
Sweeptime	63.216 µs	AUTO
Reference Level	0.000 dBm	0.000 dBm
Attenuation	20.000 dB	AUTO
Detector	MaxPeak	MaxPeak
SweepCount	100	100
Filter	3 dB	3 dB
Trace Mode	Max Hold	Max Hold
Sweeptype	FFT	AUTO
Preamp	off	off
Stablemode	Trace	Trace
Stablevalue	0.30 dB	0.30 dB
Run	7 / max. 150	max. 150
Stable	3 / 3	3
Max Stable Difference	0.20 dB	0.30 dB

5.1.3 Output Power

RESULT: **Pass**

Date of testing	:	2023-03-09
Ambient temperature	:	21.9°C
Relative humidity	:	48.5%
Atmospheric pressure	:	101kPa
Test requirement	:	FCC Part 15.247(b)(3) RSS-247 Issue 2, February 2017, Clause 5.4(d)
Test procedure	:	ANSI C63.10: 2013
Test voltage	:	DC 1.5V
Test modes applied	:	TM1 to TM3

Table 7: Peak Output Power

Mode	Antenna Gain [dBi]	CH.	Freq. [MHz]	Maximum Peak Conducted Output Power [dBm]	Peak Conducted Output Power Limit [dBm]	Maximum EIRP [dBm]	EIRP Limit [dBm]
TM1	4.04	11	2405	2.8	30	6.84	36
TM2		19	2445	3.1	30	7.14	36
TM3		26	2480	2.6	30	6.64	36

Table 8: Average Output Power

Mode	Antenna Gain [dBi]	CH.	Freq. [MHz]	Average Conducted Output Power [dBm]	Average EIRP [dBm]
TM1	4.04	11	2405	1.4	5.44
TM2		19	2445	1.7	5.74
TM3		26	2480	1.2	5.24

Note:
EIRP=Conducted Output Power + Antenna Gain
The cable loss=0.5dB was provided by the client, and was factored in the result Conducted Output Power

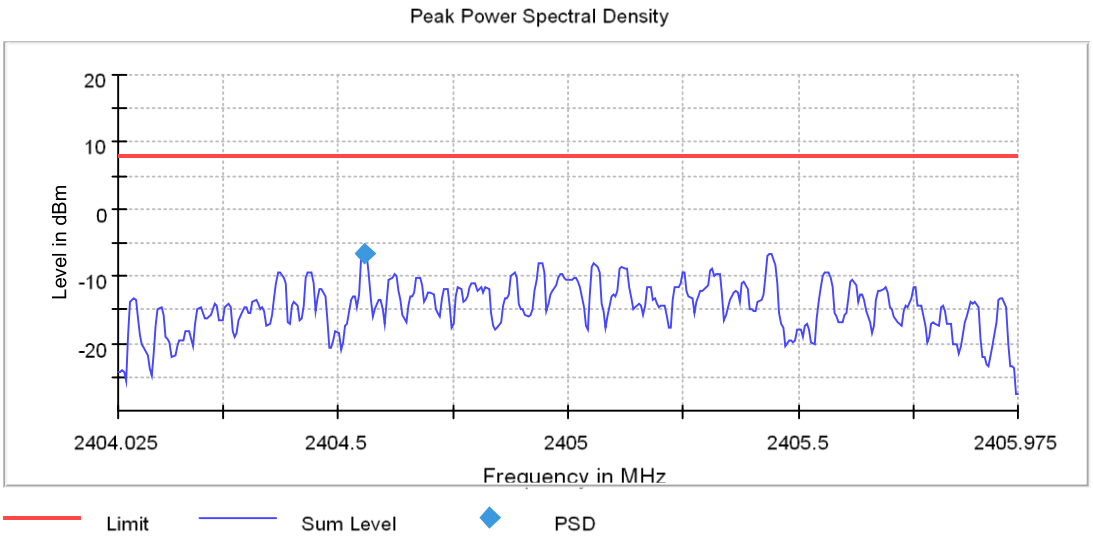
5.1.4 Power Spectral Density

RESULT: **Pass**

Date of testing	:	2023-02-09
Ambient temperature	:	22.1°C
Relative humidity	:	47.2%
Atmospheric pressure	:	101kPa
Test requirement	:	FCC Part 15.247(e) RSS-247 Issue 2, February 2017, Clause 5.2(b)
Test procedure	:	ANSI C63.10: 2013
Test voltage	:	DC 1.5V
Test modes applied	:	TM1 to TM3

Power Spectral Density, TM1, 2405MHz

DUT Frequency (MHz)	Frequency (MHz)	PSD (dBm)	Limit Max (dBm)	Result
2405.000000	2404.557500	-6.739	8.0	PASS

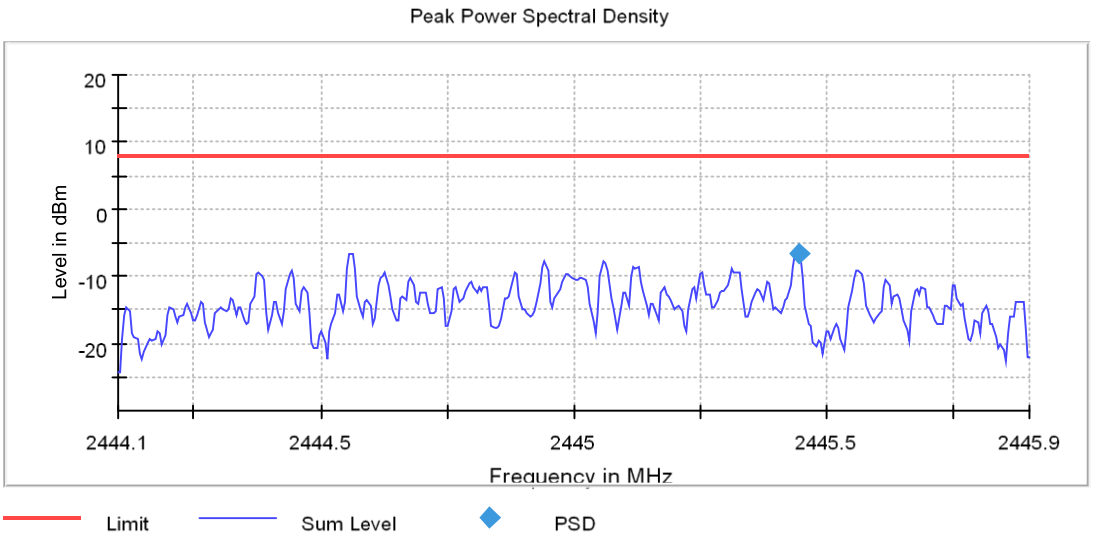


Measurement

Setting	Instrument Value	Target Value
Start Frequency	2.40403 GHz	2.40403 GHz
Stop Frequency	2.40598 GHz	2.40598 GHz
Span	1.950 MHz	1.950 MHz
RBW	10.000 kHz	<= 10.000 kHz
VBW	30.000 kHz	>= 30.000 kHz
SweepPoints	390	~ 390
Sweeptime	1.950 ms	AUTO
Reference Level	0.000 dBm	0.000 dBm
Attenuation	20.000 dB	AUTO
Detector	MaxPeak	MaxPeak
SweepCount	100	100
Filter	3 dB	3 dB
Trace Mode	Max Hold	Max Hold
Sweeptype	Sweep	Sweep
Preamp	off	off
Stablemode	Trace	Trace
Stablevalue	0.50 dB	0.50 dB
Run	5 / max. 150	max. 150
Stable	2 / 2	2
Max Stable Difference	0.13 dB	0.50 dB

Power Spectral Density, TM2, 2445MHz

DUT Frequency (MHz)	Frequency (MHz)	PSD (dBm)	Limit Max (dBm)	Result
2445.000000	2445.442500	-6.624	8.0	PASS

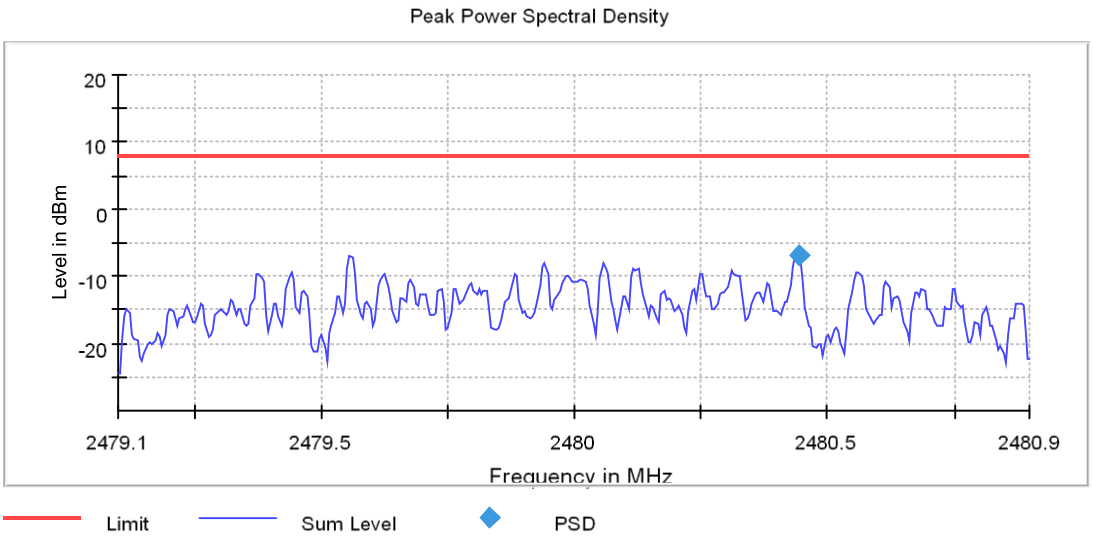


Measurement

Setting	Instrument Value	Target Value
Start Frequency	2.44410 GHz	2.44410 GHz
Stop Frequency	2.44590 GHz	2.44590 GHz
Span	1.800 MHz	1.800 MHz
RBW	10.000 kHz	<= 10.000 kHz
VBW	30.000 kHz	>= 30.000 kHz
SweepPoints	360	~ 360
Sweeptime	1.800 ms	AUTO
Reference Level	0.000 dBm	0.000 dBm
Attenuation	20.000 dB	AUTO
Detector	MaxPeak	MaxPeak
SweepCount	100	100
Filter	3 dB	3 dB
Trace Mode	Max Hold	Max Hold
Sweeptype	Sweep	Sweep
Preamp	off	off
Stablemode	Trace	Trace
Stablevalue	0.50 dB	0.50 dB
Run	4 / max. 150	max. 150
Stable	2 / 2	2
Max Stable Difference	0.09 dB	0.50 dB

Power Spectral Density, TM3, 2480MHz

DUT Frequency (MHz)	Frequency (MHz)	PSD (dBm)	Limit Max (dBm)	Result
2480.000000	2480.442500	-6.986	8.0	PASS



Measurement

Setting	Instrument Value	Target Value
Start Frequency	2.47910 GHz	2.47910 GHz
Stop Frequency	2.48090 GHz	2.48090 GHz
Span	1.800 MHz	1.800 MHz
RBW	10.000 kHz	<= 10.000 kHz
VBW	30.000 kHz	>= 30.000 kHz
SweepPoints	360	~ 360
Sweeptime	1.800 ms	AUTO
Reference Level	0.000 dBm	0.000 dBm
Attenuation	20.000 dB	AUTO
Detector	MaxPeak	MaxPeak
SweepCount	100	100
Filter	3 dB	3 dB
Trace Mode	Max Hold	Max Hold
Sweeptype	Sweep	Sweep
Preamp	off	off
Stablemode	Trace	Trace
Stablevalue	0.50 dB	0.50 dB
Run	4 / max. 150	max. 150
Stable	2 / 2	2
Max Stable Difference	0.21 dB	0.50 dB

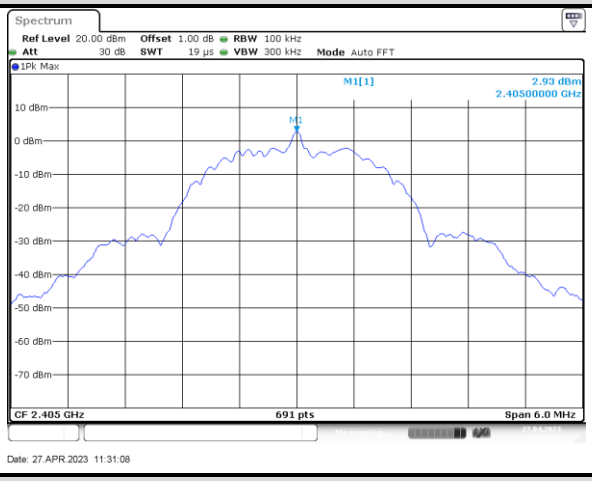
5.1.5 Conducted Band Edge and out-of Band Emissions

RESULT: **Pass**

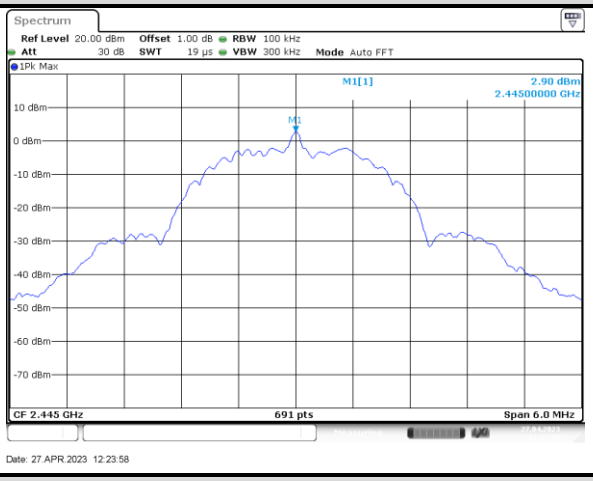
Date of testing	:	2023-04-27
Ambient temperature	:	21.8°C
Relative humidity	:	52.0%
Atmospheric pressure	:	101kPa
Test requirement	:	FCC Part 15.247(d) RSS-247 Issue 2, February 2017, Clause 5.5
Test procedure	:	ANSI C63.10: 2013
Test voltage	:	DC 1.5V
Test modes applied	:	TM1 to TM3

Figure 1: Reference level

TM1



TM2



TM3

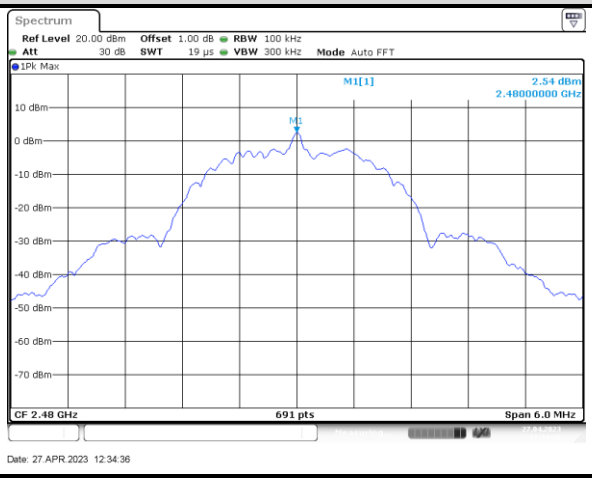


Figure 2: Conducted Spurious Emission

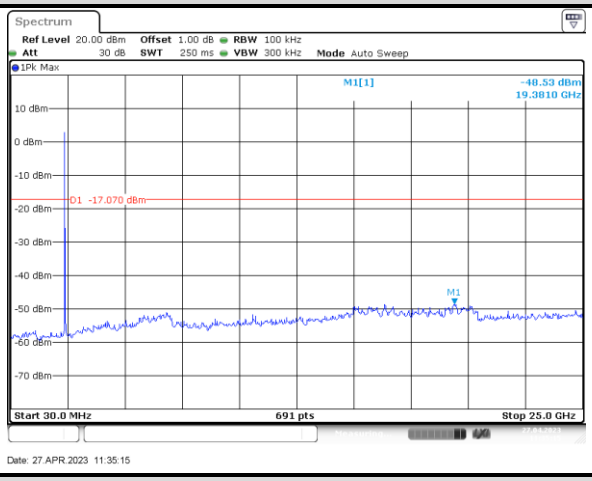
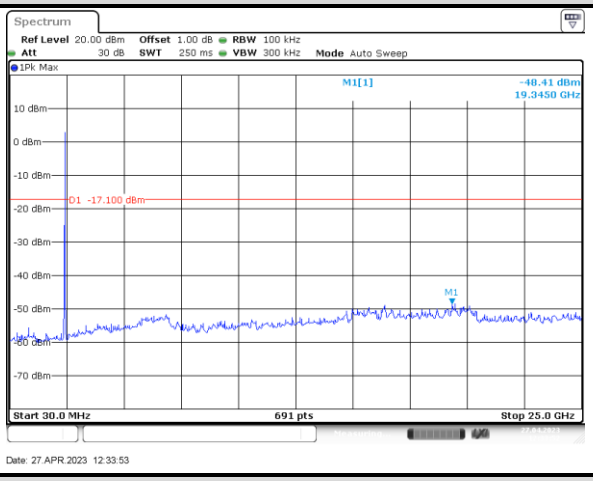
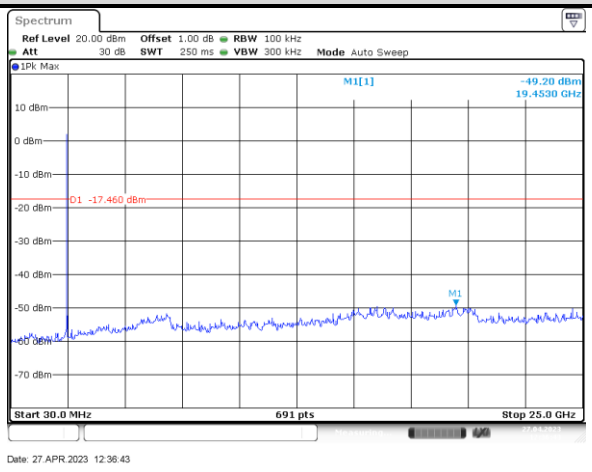
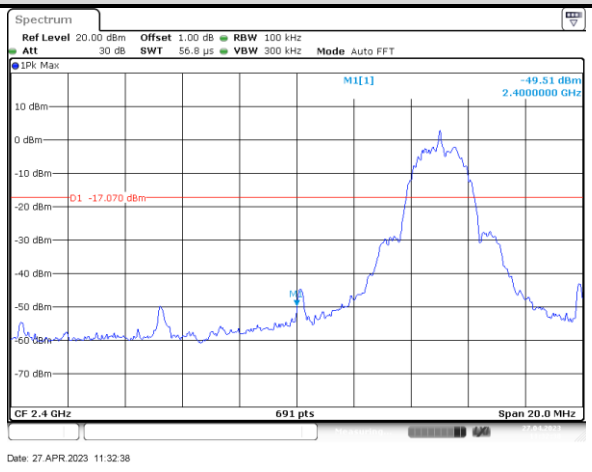
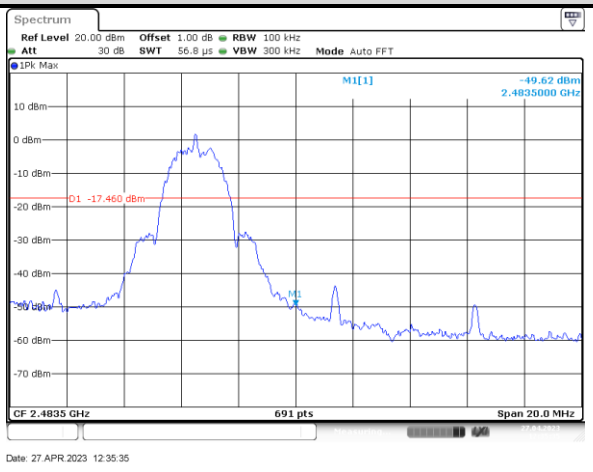
TM1	TM2
	
TM3	
	

Figure 3: Conducted Band Edge

TM1	TM3
	

5.2 Emission in the Frequency Range up to 30MHz

5.2.1 Conducted Emission

RESULT: **N/A**

Test requirement	:	FCC Part 15.207 (a) RSS-Gen Issue 5, Amendment 2, February 2021, Clause 8.8
Test procedure	:	ANSI C63.10: 2013

Note: This product is powered by battery, so this test is not applicable

5.3 Emission in the Frequency Range above 30MHz

5.3.1 Radiated Band-Edge

RESULT: **Pass**

Date of testing	:	2023-02-13
Ambient temperature	:	21.3°C
Relative humidity	:	42.9%
Atmospheric pressure	:	101kPa
Test requirement	:	FCC Part 15.247(d) FCC Part 15.205(a) FCC Part 15.209(a) RSS-Gen Issue 5, Amendment 2, February 2021, Clause 8.9 RSS-Gen Issue 5, Amendment 2, February 2021, Clause 8.10 RSS-247 Issue 2, February 2017, Clause 5.5
Test procedure	:	ANSI C63.10: 2013
Test voltage	:	DC 1.5V
Test modes applied	:	TM1, TM3

Figure 4: Radiated Band-Edge, TM1, H, MAX17224

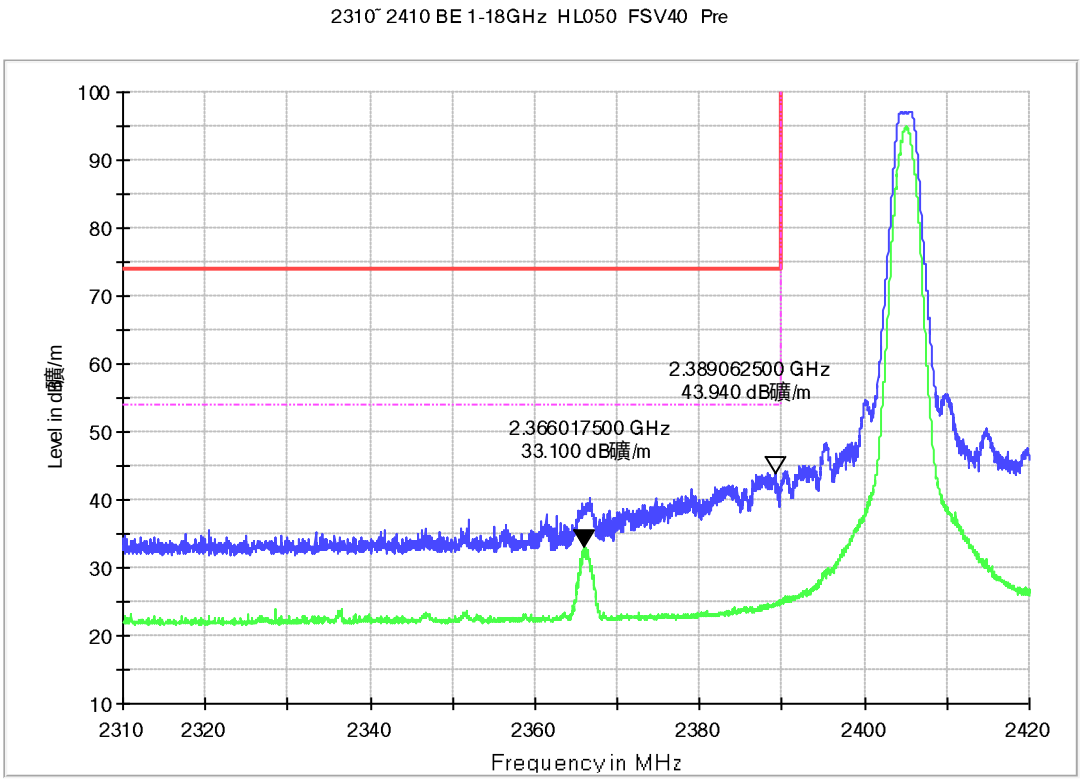


Figure 5: Radiated Band-Edge, TM1, V. MAX17224

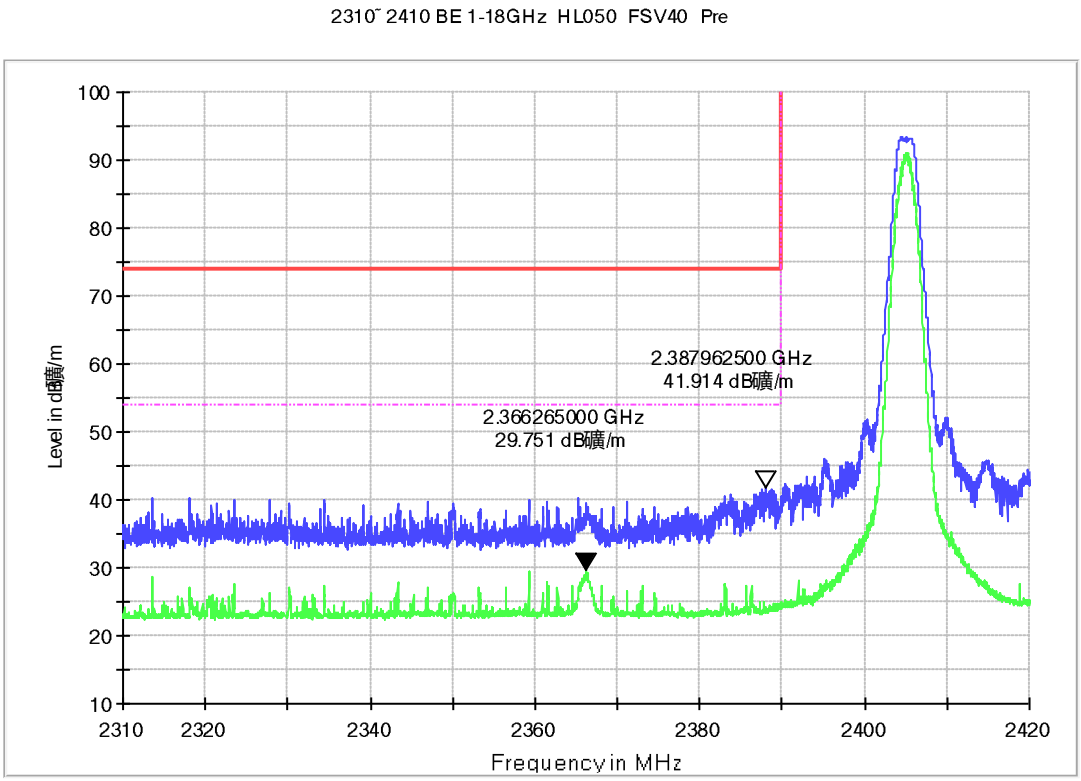


Figure 6: Radiated Band-Edge, TM3, H, MAX17224

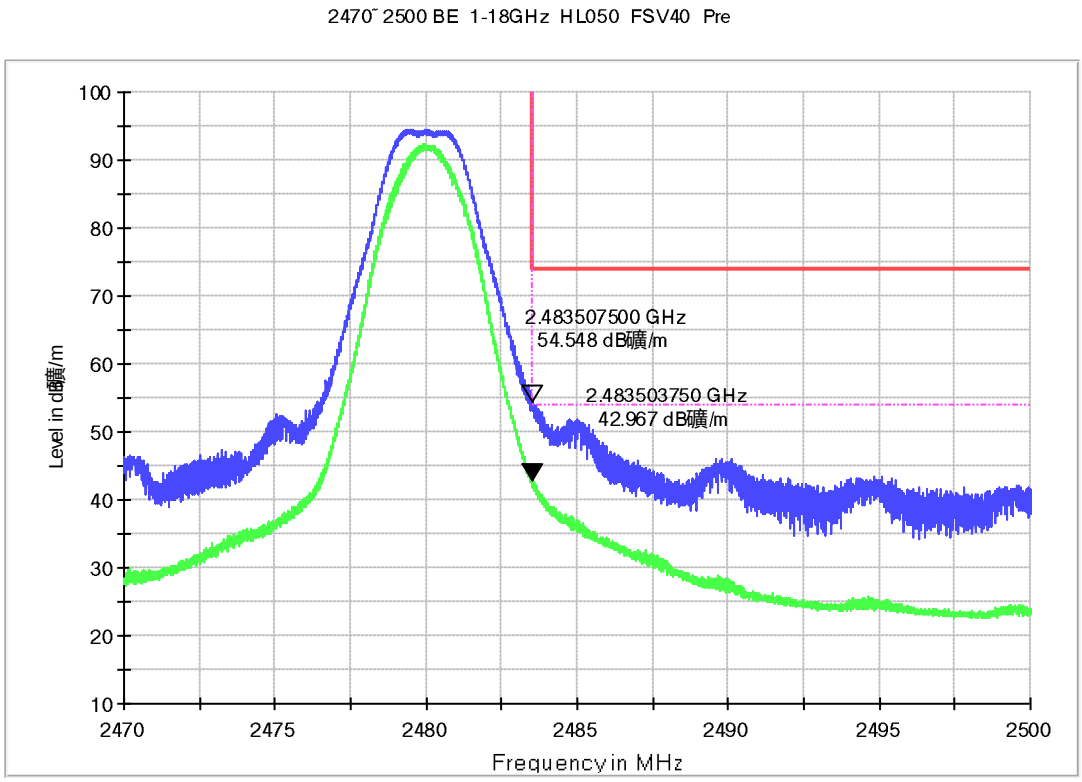


Figure 7: Radiated Band-Edge, TM3, V, MAX17224

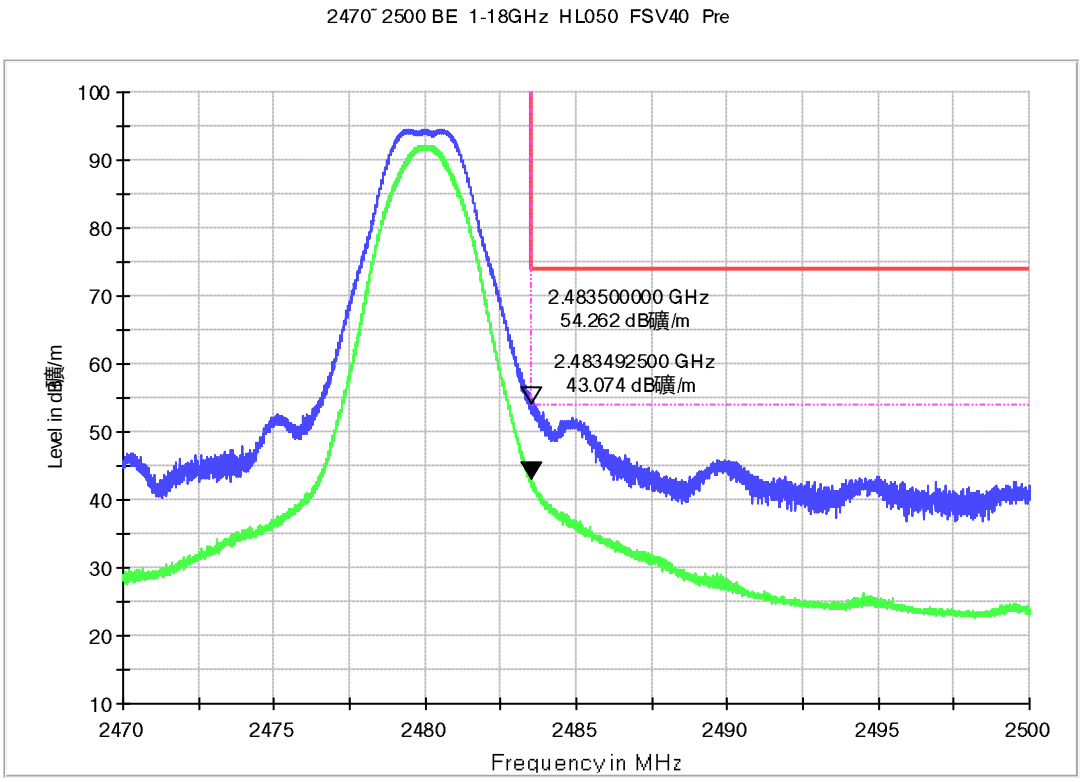


Figure 8: Radiated Band-Edge, TM1, H, OC6811

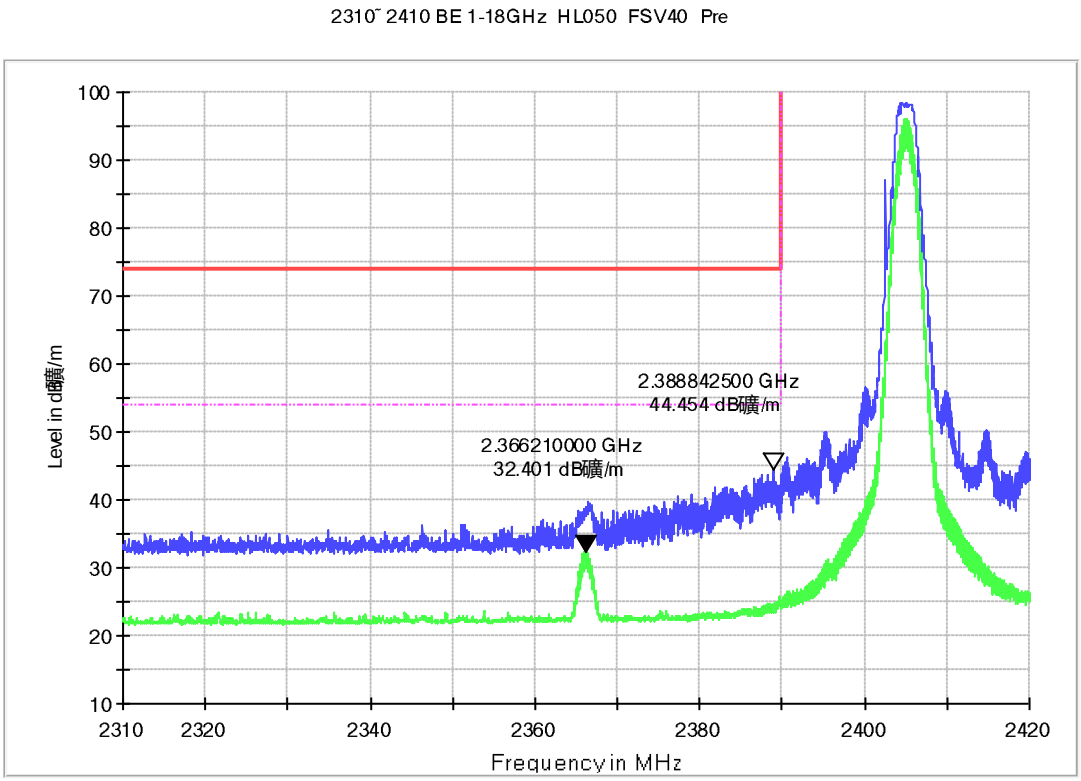


Figure 9: Radiated Band-Edge, TM1, V. OC6811

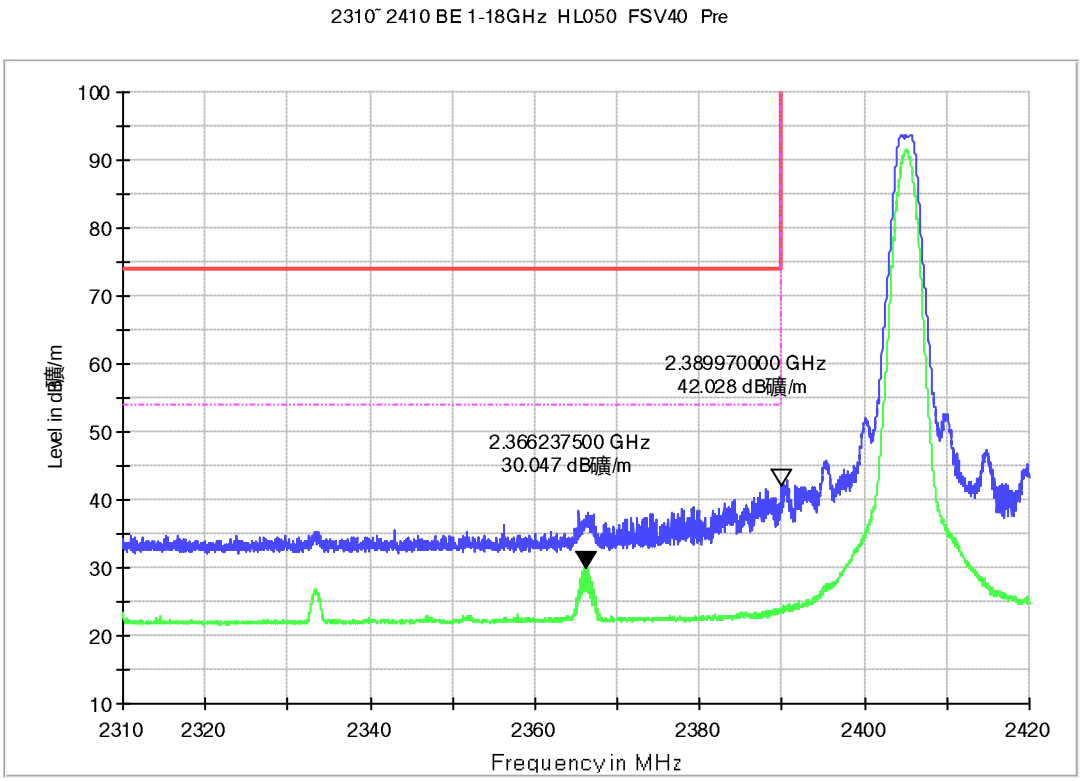


Figure 10: Radiated Band-Edge, TM3, H, OC6811

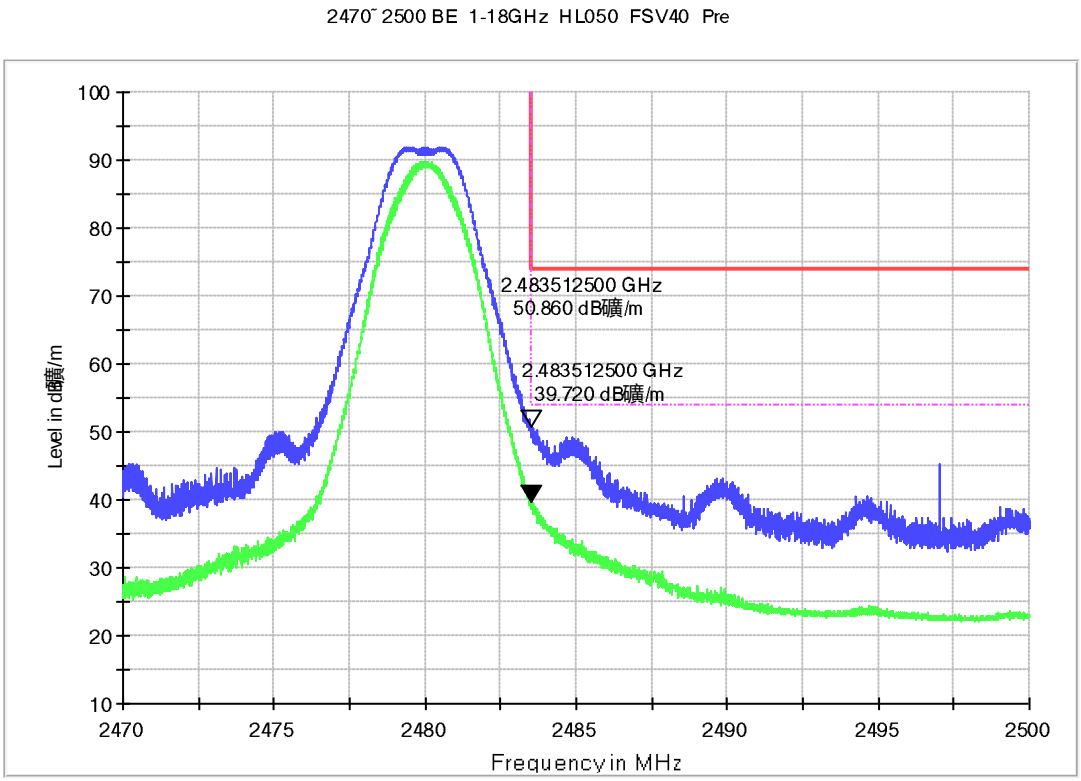
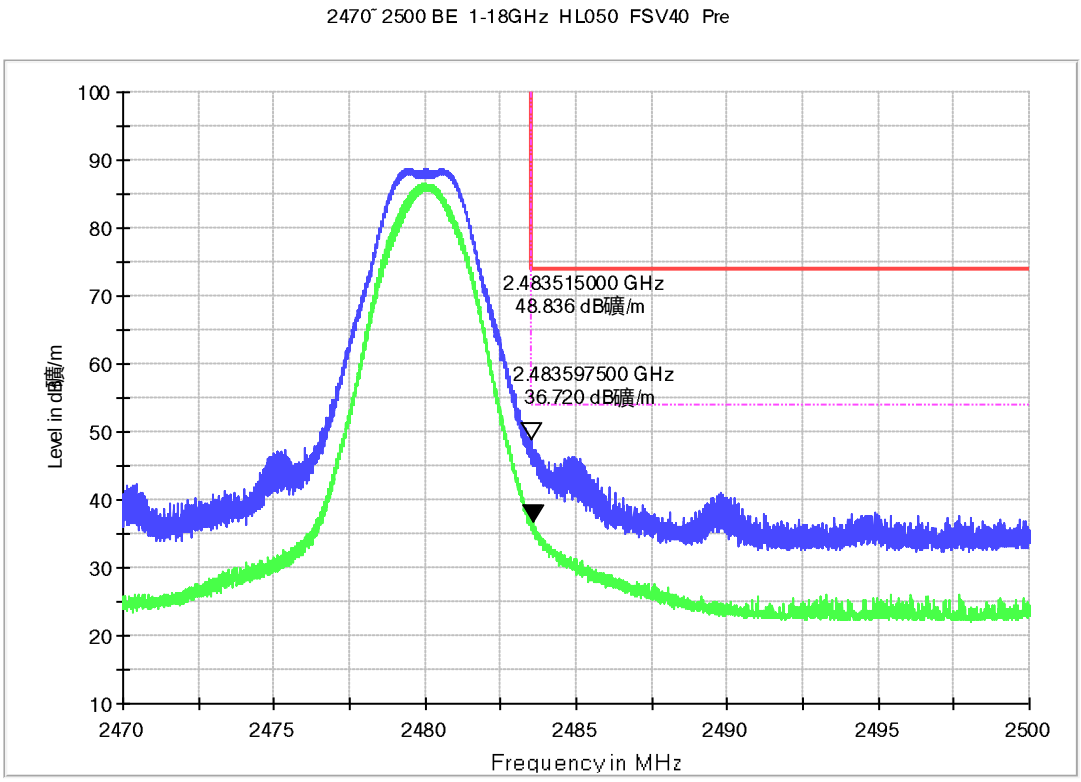


Figure 11: Radiated Band-Edge, TM3, V, OC6811



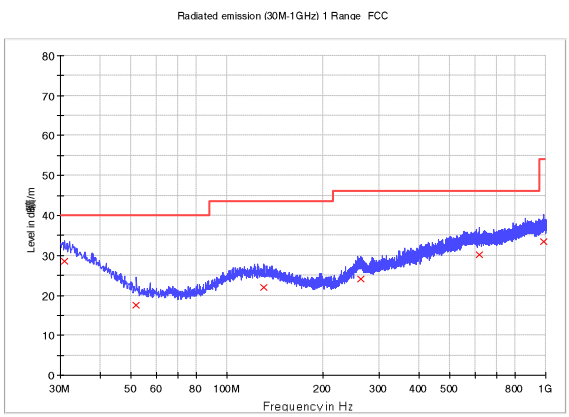
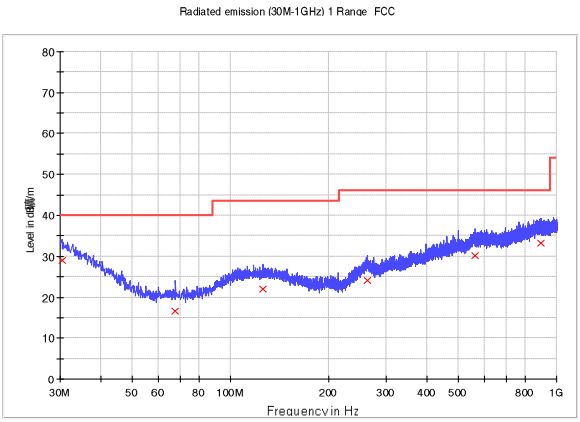
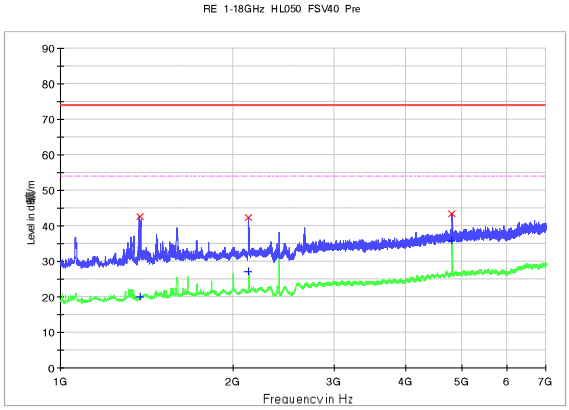
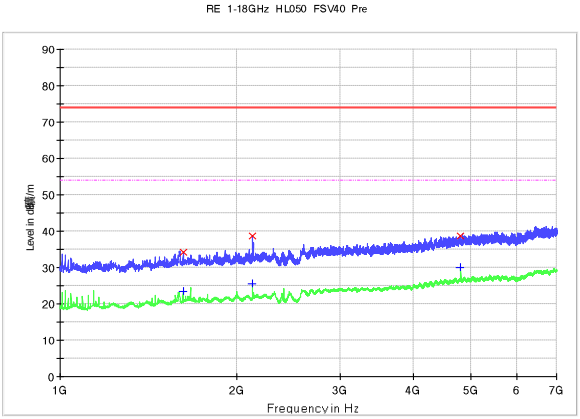
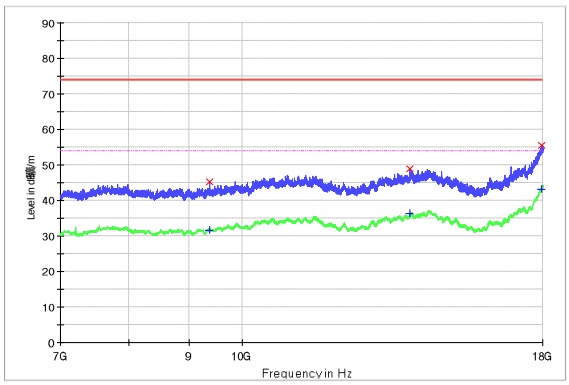
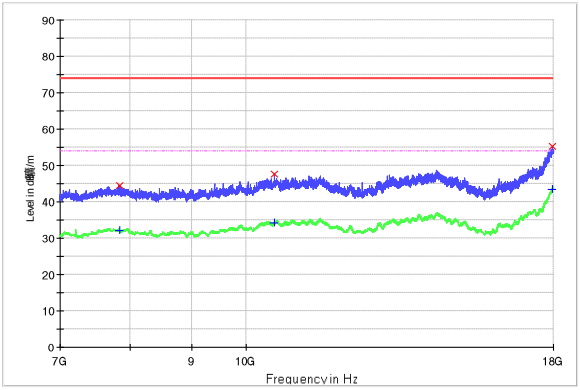
5.3.2 Radiated Spurious Emission

RESULT: **Pass**

Date of testing	:	2023-02-20~2022-03-06
Ambient temperature	:	20.2~20.5°C
Relative humidity	:	55.4~55.9%
Atmospheric pressure	:	101kPa
Test requirement	:	FCC Part 15.247(d) FCC Part 15.209(a) RSS-Gen Issue 5, Amendment 2, February 2021, Clause 8.9 RSS-247 Issue 2, February 2017, Clause 5.5
Test procedure	:	ANSI C63.10: 2013
Test voltage	:	DC 1.5V
Test modes applied	:	TM1 to TM3

Note:
For the frequency range from 18GHz to 25GHz, no emission was found.

Figure 12: Radiated Spurious Emission, TM1, MAX17224

30MHz to 1GHz H	30MHz to 1GHz V
	
1GHz to 7GHz H	**1GHz to 7GHz V**
	
7GHz to 18GHz H	**7GHz to 18GHz V**
	

Limit and Margin

QP

Frequency (MHz)	QuasiPeak (dBµV/m)	Pol	Corr. (dB/m)	Margin - QPK (dB)	Limit - QPK (dBµV/m)
30.970000	28.6	H	24.9	11.4	40.0
51.946250	17.6	H	13.9	22.4	40.0
130.273750	22.1	H	18.7	21.4	43.5
263.406250	24.1	H	20.7	21.9	46.0
616.728750	30.2	H	26.3	15.8	46.0
982.055000	33.5	H	28.8	20.5	54.0
30.363750	28.9	V	25.2	11.1	40.0
67.708750	16.7	V	13.0	23.3	40.0
126.030000	22.0	V	18.8	21.5	43.5
263.285000	24.1	V	20.7	21.9	46.0
562.045000	30.3	V	26.2	15.7	46.0
892.087500	33.3	V	28.2	12.7	46.0

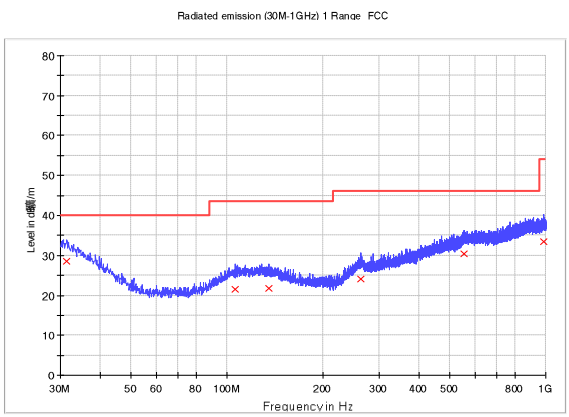
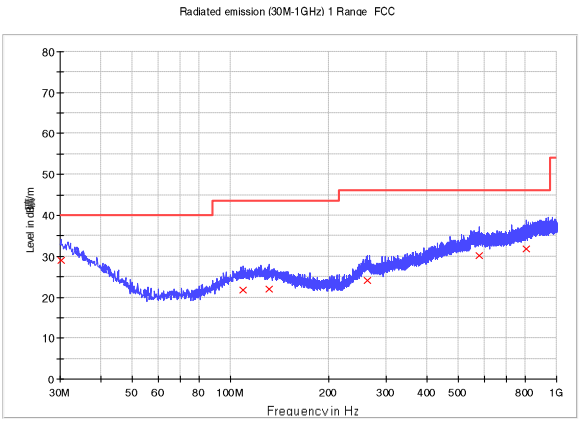
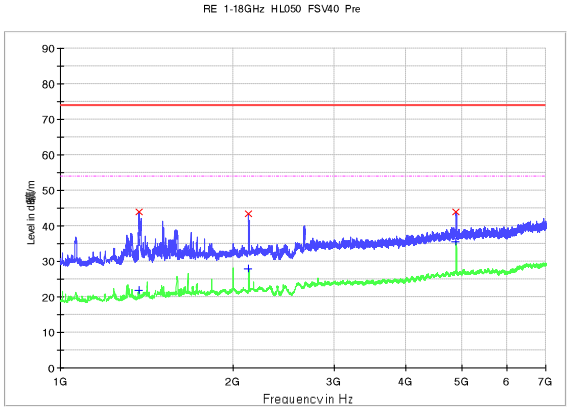
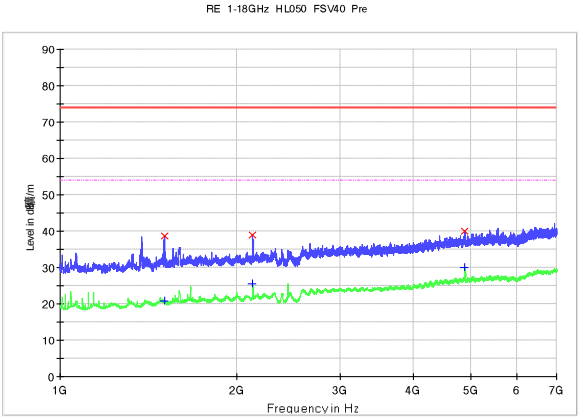
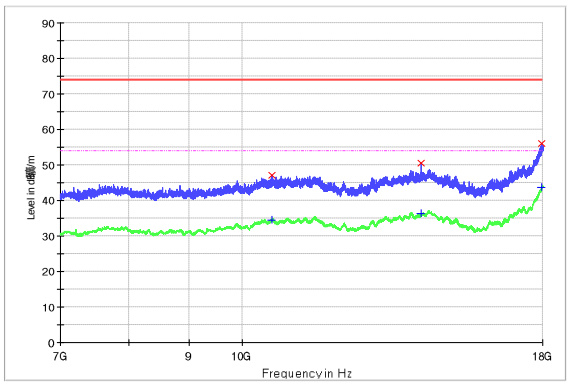
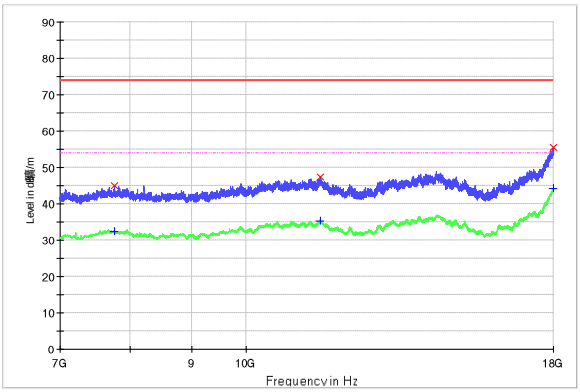
PK

Frequency (MHz)	MaxPeak (dBµV/m)	Pol	Corr. (dB/m)	Margin - PK+ (dB)	Limit - PK+ (dBµV/m)
1375.000000	42.6	H	-19.8	31.4	74.0
2125.000000	42.3	H	-17.2	31.7	74.0
4809.250000	43.4	H	-10.6	30.6	74.0
9380.125000	45.3	H	-4.4	28.7	74.0
13879.125000	49.0	H	1.5	25.0	74.0
17949.125000	55.5	H	11.7	18.5	74.0
1621.000000	34.3	V	-18.7	39.7	74.0
2125.750000	38.8	V	-17.2	35.2	74.0
4810.750000	38.8	V	-10.6	35.2	74.0
7848.375000	44.4	V	-5.3	29.6	74.0
10543.375000	47.5	V	-1.4	26.5	74.0
17964.250000	55.2	V	12.0	18.8	74.0

AV

Frequency (MHz)	Average (dBµV/m)	Pol	Corr. (dB/m)	Margin - AVG (dB)	Limit - AVG (dBµV/m)
1375.000000	20.0	H	-19.8	34.0	54.0
2125.000000	27.0	H	-17.2	27.0	54.0
4809.250000	35.7	H	-10.6	18.3	54.0
9380.125000	31.5	H	-4.4	22.5	54.0
13879.125000	36.2	H	1.5	17.8	54.0
17949.125000	43.1	H	11.7	10.9	54.0
1621.000000	23.4	V	-18.7	19.7	54.0
2125.750000	25.4	V	-17.2	15.2	54.0
4810.750000	29.9	V	-10.6	15.2	54.0
7848.375000	32.2	V	-5.3	21.8	54.0
10543.375000	34.3	V	-1.4	19.7	54.0
17964.250000	43.3	V	12.0	10.7	54.0

Figure 13: Radiated Spurious Emission, TM2, MAX17224

30MHz to 1GHz H	30MHz to 1GHz V
	
1GHz to 7GHz H	**1GHz to 7GHz V**
	
7GHz to 18GHz H	**7GHz to 18GHz V**
	

Limit and Margin

QP

Frequency (MHz)	QuasiPeak (dBµV/m)	Pol	Corr. (dB/m)	Margin - QPK (dB)	Limit - QPK (dBµV/m)
31.455000	28.4	H	24.7	11.6	40.0
105.781250	21.6	H	18.3	21.9	43.5
134.881250	21.8	H	18.4	21.7	43.5
263.406250	24.0	H	20.7	22.0	46.0
555.012500	30.5	H	26.5	15.5	46.0
985.813750	33.5	H	28.9	20.5	54.0
30.121250	29.0	V	25.3	11.0	40.0
109.418750	21.8	V	18.5	21.7	43.5
130.880000	22.0	V	18.7	21.5	43.5
263.163750	24.0	V	20.7	22.0	46.0
578.171250	30.2	V	26.1	15.8	46.0
809.031250	31.8	V	27.5	14.2	46.0

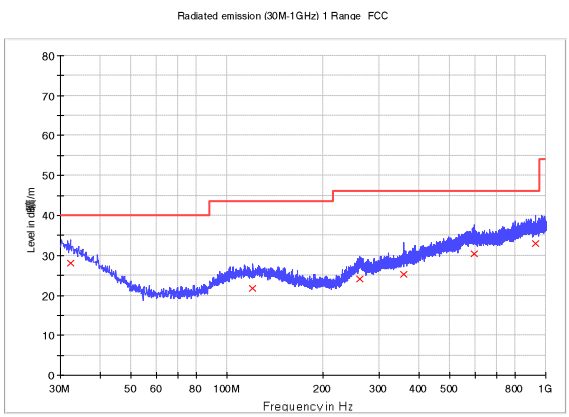
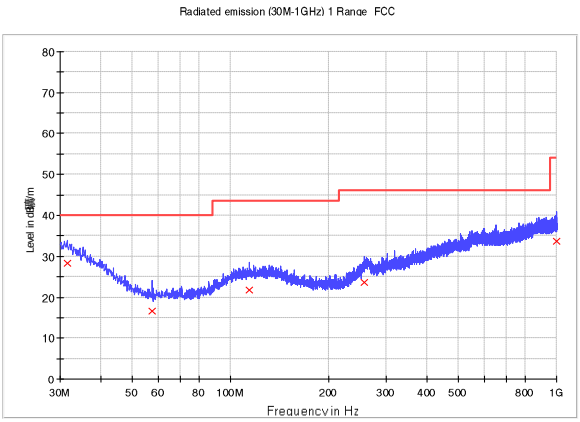
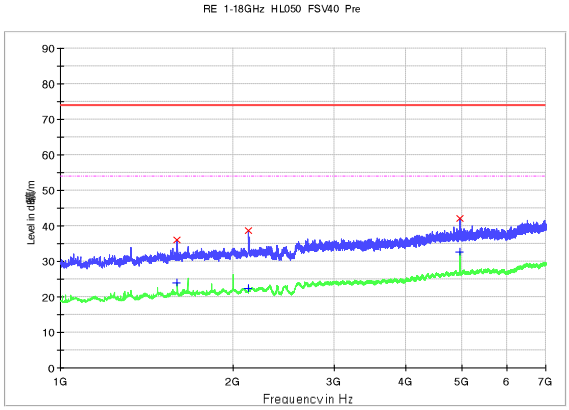
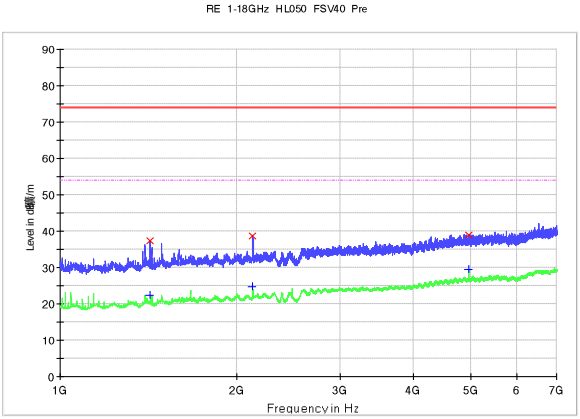
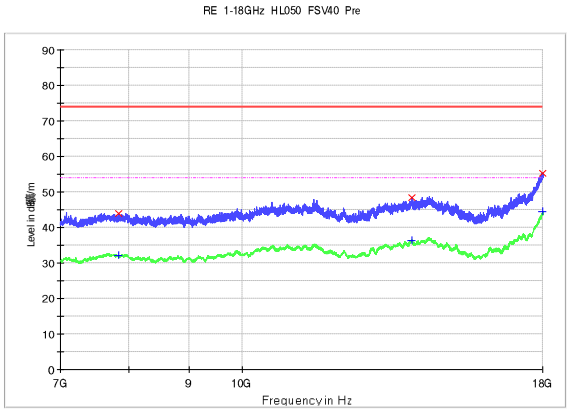
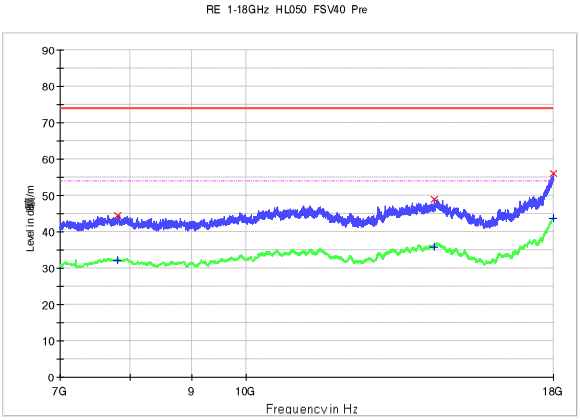
PK

Frequency (MHz)	MaxPeak (dBµV/m)	Pol	Corr. (dB/m)	Margin - PK+ (dB)	Limit - PK+ (dBµV/m)
1370.500000	43.9	H	-19.8	30.1	74.0
2122.750000	43.4	H	-17.2	30.6	74.0
4891.000000	43.9	H	-10.5	30.1	74.0
10588.750000	47.0	H	-0.9	27.0	74.0
14185.750000	50.4	H	2.0	23.6	74.0
17975.250000	56.1	H	12.3	17.9	74.0
1506.250000	38.6	V	-19.1	35.4	74.0
2128.000000	38.9	V	-17.2	35.1	74.0
4891.000000	40.1	V	-10.5	34.0	74.0
7763.125000	45.0	V	-5.4	29.0	74.0
11516.875000	47.4	V	-0.4	26.6	74.0
17990.375000	55.5	V	12.6	18.5	74.0

AV

Frequency (MHz)	Average (dBµV/m)	Pol	Corr. (dB/m)	Margin - AVG (dB)	Limit - AVG (dBµV/m)
1370.500000	21.9	H	-19.8	32.1	54.0
2122.750000	28.0	H	-17.2	16.0	54.0
4891.000000	35.5	H	-10.5	18.5	54.0
10588.750000	34.5	H	-0.9	19.5	54.0
14185.750000	36.2	H	2.0	17.8	54.0
17975.250000	43.6	H	12.3	10.4	54.0
1506.250000	20.7	V	-19.1	33.3	54.0
2128.000000	25.5	V	-17.2	28.5	54.0
4891.000000	30.0	V	-10.5	24.0	54.0
7763.125000	32.4	V	-5.4	21.6	54.0
11516.875000	35.1	V	-0.4	18.9	54.0
17990.375000	44.1	V	12.6	9.9	54.0

Figure 14: Radiated Spurious Emission, TM3, MAX17224

30MHz to 1GHz H	30MHz to 1GHz V
	
1GHz to 7GHz H	**1GHz to 7GHz V**
	
7GHz to 18GHz H	**7GHz to 18GHz V**
	

Limit and Margin

QP

Frequency (MHz)	QuasiPeak (dBµV/m)	Pol	Corr. (dB/m)	Margin - QPK (dB)	Limit - QPK (dBµV/m)
32.182500	28.1	H	24.4	11.9	40.0
120.573750	21.9	H	18.5	21.6	43.5
260.375000	24.0	H	20.7	22.0	46.0
359.436250	25.2	H	21.7	20.8	46.0
596.116250	30.4	H	26.2	15.6	46.0
930.402500	32.9	H	28.1	13.1	46.0
31.576250	28.4	V	24.7	11.6	40.0
57.402500	16.5	V	12.8	23.5	40.0
114.147500	21.8	V	18.5	21.7	43.5
257.828750	23.7	V	20.4	22.3	46.0
997.090000	33.6	V	28.9	20.4	54.0

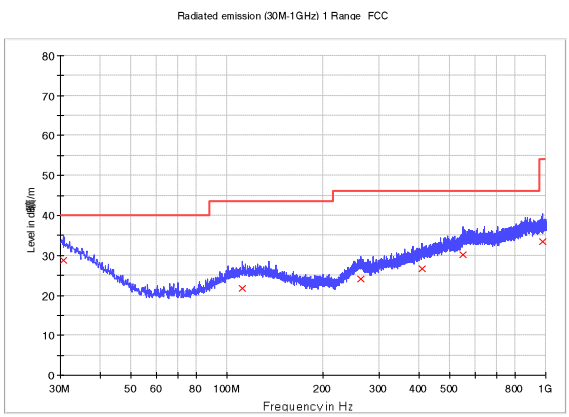
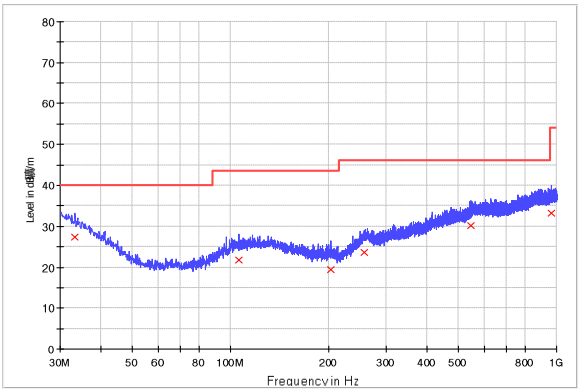
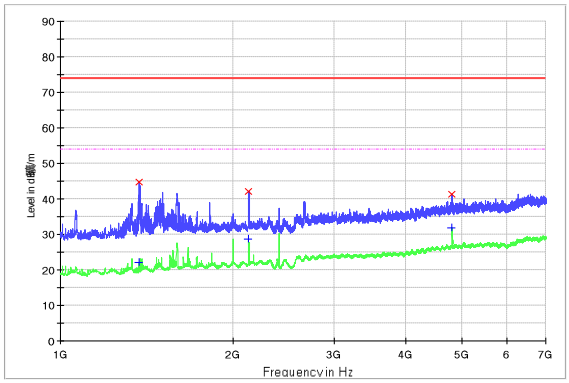
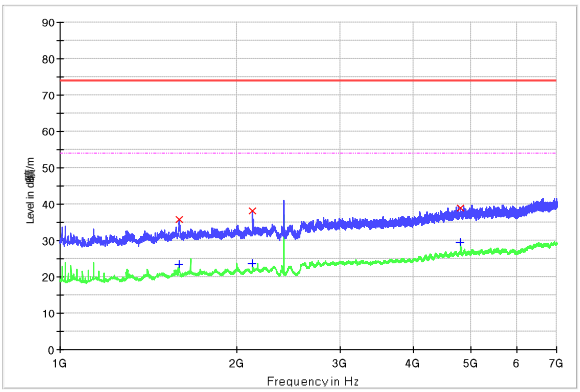
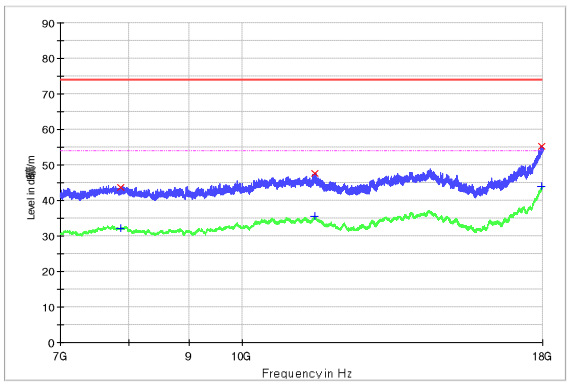
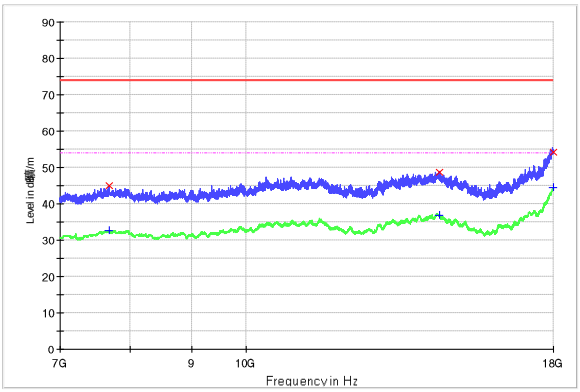
PK

Frequency (MHz)	MaxPeak (dBµV/m)	Pol	Corr. (dB/m)	Margin - PK+ (dB)	Limit - PK+ (dBµV/m)
1598.500000	35.9	H	-18.8	38.1	74.0
2123.500000	38.7	H	-17.2	35.3	74.0
4961.500000	42.0	H	-10.4	32.0	74.0
7838.750000	44.0	H	-5.4	30.0	74.0
13928.625000	48.5	H	1.8	25.5	74.0
17989.000000	55.2	H	12.5	18.8	74.0
1423.000000	37.3	V	-19.6	36.7	74.0
2128.000000	38.7	V	-17.2	35.3	74.0
4959.250000	38.9	V	-10.4	35.1	74.0
7820.875000	44.5	V	-5.4	29.5	74.0
14332.875000	48.8	V	2.4	25.2	74.0
17995.875000	56.1	V	12.7	17.9	74.0

AV

Frequency (MHz)	Average (dBµV/m)	Pol	Corr. (dB/m)	Margin - AVG (dB)	Limit - AVG (dBµV/m)
1598.500000	24.0	H	-18.8	30.0	54.0
2123.500000	22.5	H	-17.2	31.5	54.0
4961.500000	32.6	H	-10.4	21.5	54.0
7838.750000	32.0	V	-5.4	22.0	54.0
13928.625000	36.2	V	1.8	17.8	54.0
17989.000000	44.4	V	12.5	9.7	54.0
1423.000000	22.3	V	-19.6	31.7	54.0
2128.000000	24.7	V	-17.2	29.3	54.0
4959.250000	29.4	V	-10.4	24.6	54.0
7820.875000	32.1	V	-5.4	21.9	54.0
14332.875000	35.9	V	2.4	18.1	54.0
17995.875000	43.7	V	12.7	10.3	54.0

Figure 15: Radiated Spurious Emission, TM1, OC6811

30MHz to 1GHz H	30MHz to 1GHz V
	
1GHz to 7GHz H	**1GHz to 7GHz V**
	
7GHz to 18GHz H	**7GHz to 18GHz V**
	

Limit and Margin

QP

Frequency (MHz)	QuasiPeak (dBµV/m)	Pol	Corr. (dB/m)	Margin - QPK (dB)	Limit - QPK (dBµV/m)
30.606250	28.8	H	25.1	11.2	40.0
111.722500	21.8	H	18.5	21.7	43.5
262.072500	24.1	H	20.7	21.9	46.0
409.997500	26.6	H	23.1	19.4	46.0
549.677500	30.2	H	26.3	15.8	46.0
974.537500	33.5	H	28.8	20.5	54.0
33.273750	27.3	V	23.7	12.7	40.0
106.145000	21.6	V	18.3	21.9	43.5
202.538750	19.4	V	16.2	24.1	43.5
257.101250	23.6	V	20.3	22.4	46.0
547.495000	30.1	V	26.1	15.9	46.0
961.321250	33.3	V	28.5	20.7	54.0

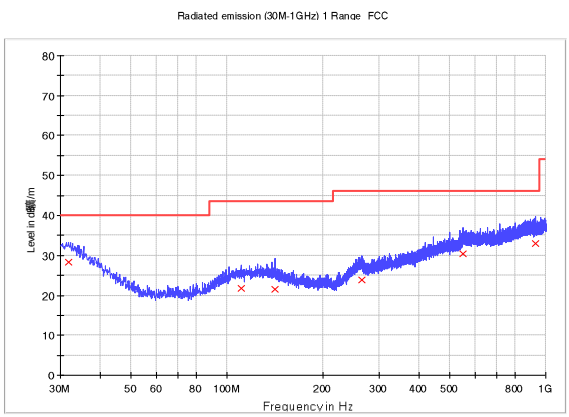
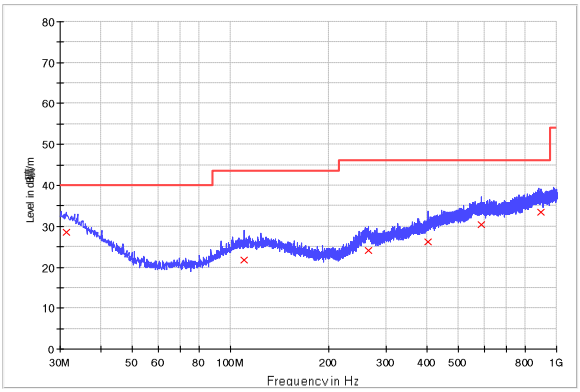
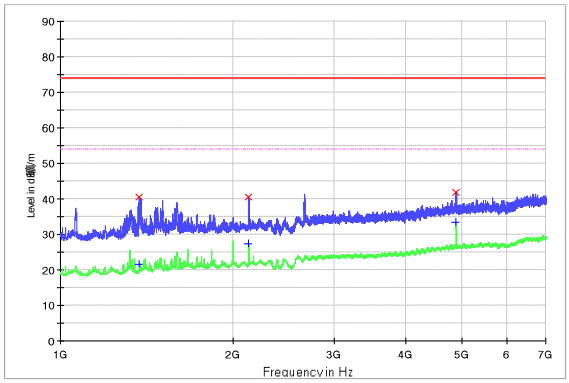
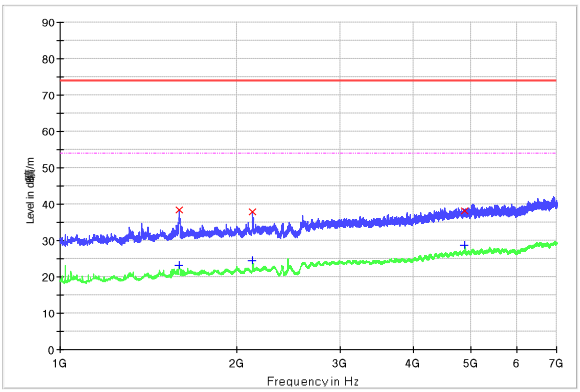
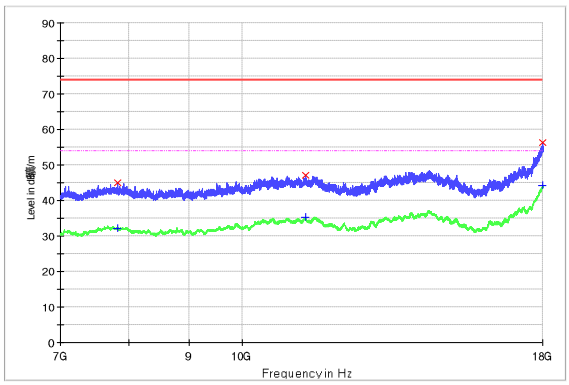
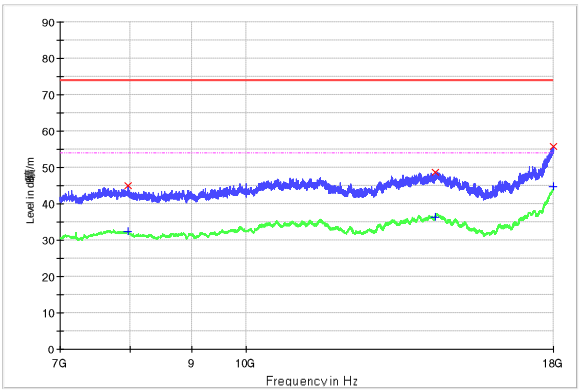
PK

Frequency (MHz)	MaxPeak (dBµV/m)	Pol	Corr. (dB/m)	Margin - PK+ (dB)	Limit - PK+ (dBµV/m)
1371.250000	44.8	H	-19.8	29.2	74.0
2122.750000	42.2	H	-17.2	31.8	74.0
4811.500000	41.4	H	-10.6	32.6	74.0
7875.875000	43.6	H	-5.2	30.4	74.0
11522.375000	47.6	H	-0.5	26.4	74.0
17976.625000	55.4	H	12.3	18.6	74.0
1593.250000	35.7	V	-18.8	38.3	74.0
2123.500000	38.1	V	-17.2	35.9	74.0
4810.750000	38.9	V	-10.6	35.1	74.0
7691.625000	44.9	V	-5.3	29.1	74.0
14471.750000	48.8	V	2.6	25.2	74.0
17998.625000	54.2	V	12.7	19.8	74.0

AV

Frequency (MHz)	Average (dBµV/m)	Pol	Corr. (dB/m)	Margin - AVG (dB)	Limit - AVG (dBµV/m)
1371.250000	22.0	H	-19.8	32.0	54.0
2122.750000	28.8	H	-17.2	25.2	54.0
4811.500000	31.9	H	-10.6	22.1	54.0
7875.875000	32.2	H	-5.2	21.8	54.0
11522.375000	35.4	H	-0.5	18.6	54.0
17976.625000	43.8	H	12.3	10.2	54.0
1593.250000	23.3	V	-18.8	30.7	54.0
2123.500000	23.8	V	-17.2	30.2	54.0
4810.750000	29.6	V	-10.6	24.4	54.0
7691.625000	32.6	V	-5.3	21.4	54.0
14471.750000	36.9	V	2.6	17.1	54.0
17998.625000	44.5	V	12.7	9.5	54.0

Figure 16: Radiated Spurious Emission, TM2, OC6811

30MHz to 1GHz H	30MHz to 1GHz V
	
1GHz to 7GHz H	**1GHz to 7GHz V**
	
7GHz to 18GHz H	**7GHz to 18GHz V**
	

Limit and Margin

QP

Frequency (MHz)	QuasiPeak (dBµV/m)	Pol	Corr. (dB/m)	Margin - QPK (dB)	Limit - QPK (dBµV/m)
31.818750	28.3	H	24.6	11.8	40.0
110.510000	21.8	H	18.5	21.7	43.5
141.550000	21.4	H	18.0	22.1	43.5
265.588750	24.0	H	20.6	22.0	46.0
551.738750	30.4	H	26.3	15.6	46.0
927.371250	33.0	H	28.1	13.1	46.0
31.333750	28.5	V	24.8	11.5	40.0
110.146250	21.8	V	18.5	21.7	43.5
264.376250	24.1	V	20.7	22.0	46.0
402.965000	26.3	V	22.7	19.7	46.0
585.810000	30.4	V	26.1	15.6	46.0
894.755000	33.5	V	28.4	12.5	46.0

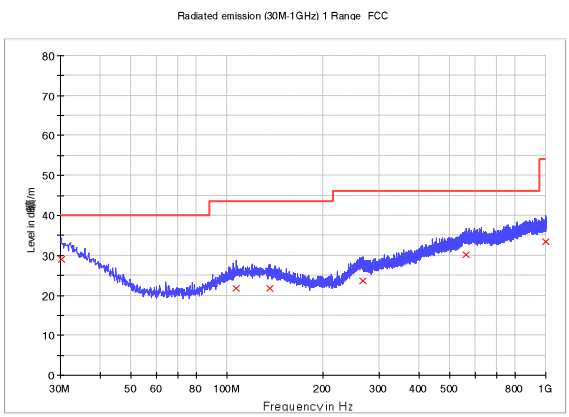
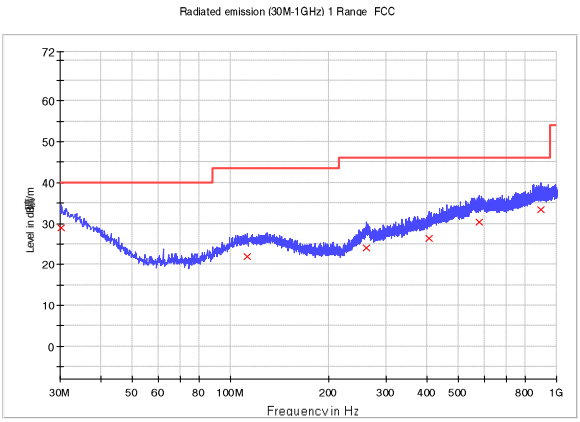
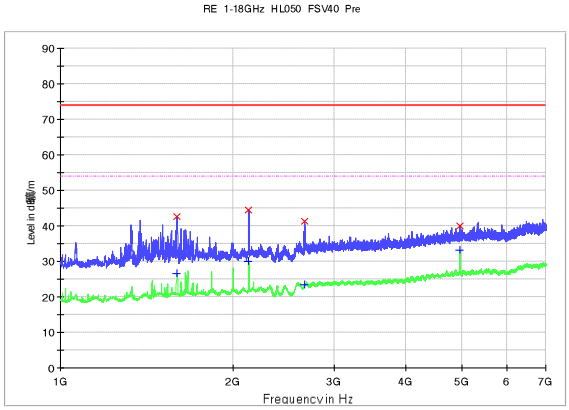
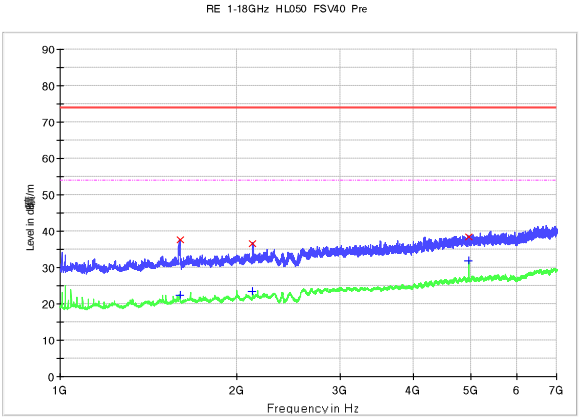
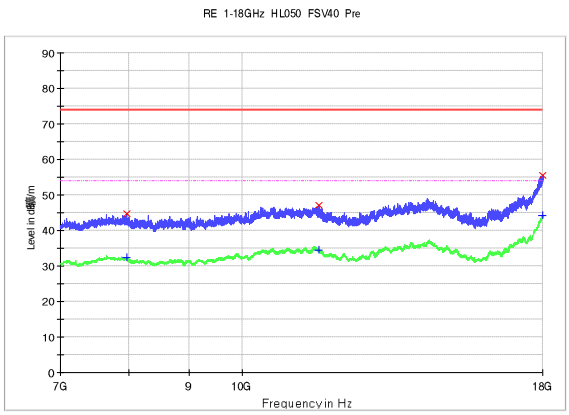
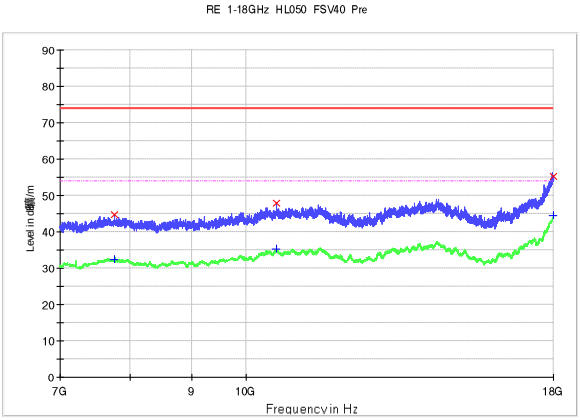
PK

Frequency (MHz)	MaxPeak (dBµV/m)	Pol	Corr. (dB/m)	Margin - PK+ (dB)	Limit - PK+ (dBµV/m)
1372.750000	40.4	H	-19.8	33.6	74.0
2123.500000	40.6	H	-17.2	33.4	74.0
4889.500000	41.8	H	-10.5	32.2	74.0
7833.250000	45.0	H	-5.4	29.0	74.0
11317.500000	47.1	H	-0.9	26.9	74.0
17998.625000	56.3	H	12.7	17.7	74.0
1597.750000	38.5	V	-18.8	35.5	74.0
2123.500000	37.8	V	-17.2	36.2	74.0
4891.000000	38.1	V	-10.5	35.9	74.0
7968.000000	45.0	V	-5.1	29.0	74.0
14365.875000	48.8	V	2.5	25.2	74.0
17995.875000	55.7	V	12.7	18.3	74.0

AV

Frequency (MHz)	Average (dBµV/m)	Pol	Corr. (dB/m)	Margin - AVG (dB)	Limit - AVG (dBµV/m)
1372.750000	21.7	H	-19.8	32.3	54.0
2123.500000	27.4	H	-17.2	26.6	54.0
4889.500000	33.3	H	-10.5	20.7	54.0
7833.250000	32.0	H	-5.4	22.0	54.0
11317.500000	35.2	H	-0.9	18.8	54.0
17998.625000	44.2	H	12.7	9.8	54.0
1597.750000	23.2	V	-18.8	30.8	54.0
2123.500000	24.6	V	-17.2	29.4	54.0
4891.000000	28.6	V	-10.5	25.4	54.0
7968.000000	32.4	V	-5.1	21.6	54.0
14365.875000	36.4	V	2.5	17.6	54.0
17995.875000	44.7	V	12.7	9.3	54.0

Figure 17: Radiated Spurious Emission, TM3, OC6811

30MHz to 1GHz H	30MHz to 1GHz V
	
1GHz to 7GHz H	**1GHz to 7GHz V**
	
7GHz to 18GHz H	**7GHz to 18GHz V**
	

Limit and Margin

QP

Frequency (MHz)	QuasiPeak (dBµV/m)	Pol	Corr. (dB/m)	Margin - QPK (dB)	Limit - QPK (dBµV/m)
30.121250	29.0	H	25.3	11.0	40.0
106.993750	21.8	H	18.4	21.8	43.5
136.700000	21.8	H	18.3	21.8	43.5
267.650000	23.5	H	20.2	22.5	46.0
563.136250	30.3	H	26.2	15.7	46.0
998.787500	33.5	H	28.9	20.5	54.0
30.242500	29.0	V	25.3	11.0	40.0
112.328750	21.9	V	18.5	21.6	43.5
260.738750	24.1	V	20.7	22.0	46.0
406.481250	26.5	V	22.9	19.5	46.0
577.080000	30.3	V	26.1	15.8	46.0
896.695000	33.4	V	28.4	12.6	46.0

PK

Frequency (MHz)	MaxPeak (dBµV/m)	Pol	Corr. (dB/m)	Margin - PK+ (dB)	Limit - PK+ (dBµV/m)
1597.750000	42.6	H	-18.8	31.4	74.0
2123.500000	44.4	H	-17.2	29.7	74.0
2662.750000	41.2	H	-15.4	32.8	74.0
4963.000000	40.0	H	-10.4	34.0	74.0
7965.250000	44.7	H	-5.2	30.4	74.0
11621.375000	47.0	H	-0.5	26.4	74.0
17995.875000	55.5	H	12.3	18.6	74.0
1599.250000	37.6	V	-18.8	36.4	74.0
2125.750000	36.7	V	-17.2	37.3	74.0
4963.000000	38.3	V	-10.4	35.7	74.0
7763.125000	44.7	V	-5.4	29.3	74.0
10590.125000	48.0	V	-0.9	26.0	74.0
18000.000000	55.3	V	12.8	18.7	74.0

AV

Frequency (MHz)	Average (dBµV/m)	Pol	Corr. (dB/m)	Margin - AVG (dB)	Limit - AVG (dBµV/m)
1597.750000	26.6	H	-18.8	27.4	54.0
2123.500000	30.1	H	-17.2	23.9	54.0
2662.750000	23.5	H	-15.4	30.5	54.0
4963.000000	33.3	H	-10.4	20.7	54.0
7965.250000	32.4	H	-5.1	21.6	54.0
11621.375000	34.5	H	-1.1	19.5	54.0
17995.875000	44.1	H	12.7	9.9	54.0
1599.250000	22.5	V	-18.8	31.5	54.0
2125.750000	23.5	V	-17.2	30.5	54.0
4963.000000	31.9	V	-10.4	22.1	54.0
7763.125000	32.4	V	-5.4	21.6	54.0
10590.125000	35.3	V	-0.9	18.7	54.0
18000.000000	44.4	V	12.8	9.6	54.0

6. List of Tables

7. List of Figures