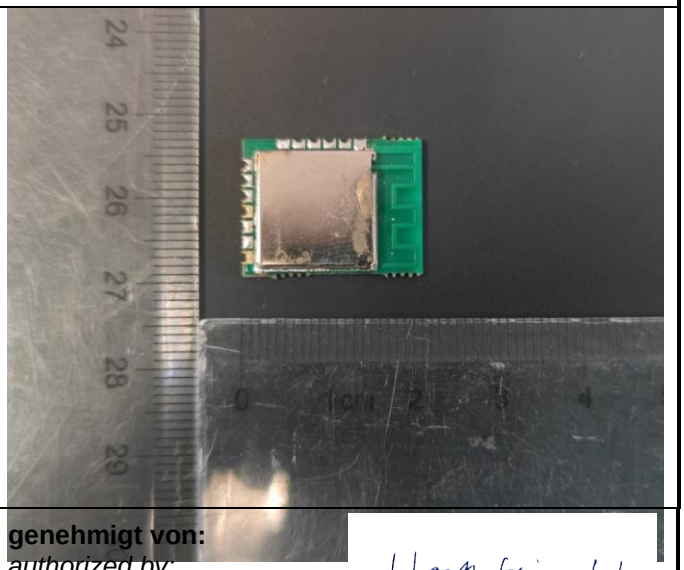
Prüfbericht-Nr.: *Test report no.:*	**CN21D4R6 002**	**Auftrags-Nr.:** *Order no.*:	**244361353**	Seite 1 von 34 *Page 1 of 34*
Kunden-Referenz-Nr.: *Client reference no.:*	**2018581**	**Auftragsdatum:** *Order date:*	**2021-09-16**	
Auftraggeber: *Client:*	**JOYTECH Healthcare Co., Ltd** No. 365, Wuzhou Road, Yuhang Economic Development Zone, Hangzhou City, 311100 Zhejiang , P.R. China			
Prüfgegenstand: *Test item:*	Bluetooh LE & Wi-Fi Module			
Bezeichnung / Typ-Nr.: *Identification / Type no.:*	JMD1200 FCC ID: 2AQVU0025 IC: 28012-JMD1200A			
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:*	2021-10-21			
Prüfmuster-Nr.: *Test sample no:*	A003149462-001~002			
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 Weidong Wang Signed by: Weidong Wang	**genehmigt von:** *authorized by:*	X Hongfei Wu Signed by: Hongfei Wu
Datum: *Date:* 2022-01-18		**Ausstellungsdatum:** *Issue date:* 2022-01-18	
Stellung / *Position:* PE		**Stellung** / *Position:* Reviewer	

Sonstiges / *Other:* *HVIN: JMD1200*

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

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

Instrument	Manufacturer	Type No.	Asset No.	Cali. Due Date
3m modified semi-anechoic chamber	Frankonia	SAC3	G1811378	2022-06-27
Bilog antenna	Teseq	CBL 6112D	G1811425	2023-03-10
EMI test receiver	Rohde & Schwarz	ESCI	G1811402	2022-09-01
Spectrum analyser	Rohde & Schwarz	FSV40	G1822702	2023-11-04
Preamplifier	Taiwan EMCI	EMC184045SE	G1825372	2023-05-14
Log periodic antenna	Rohde & Schwarz	HL050	G1811417	2023-03-10
Broadband Horn Antenna	Schwarzbeck	BBHA 9170	9170-305	2023-07-08
Preamplifier	Taiwan EMCI	EMC051845SE	G1825371	2023-05-14
Spectrum Analyzer	Keysight	N9020A	MY54500180	2022-09-08

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 a Module which supports Wi-Fi and Bluetooth LE. The aim of this report is to evalute the RF characteristic of the Bluetooth LE Part of this EUT.
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:	Bluetooh LE & Wi-Fi Module
Model No.:	JMD1200
Rated Voltage:	DC 3.3V
Technical Specification of BLE	
Frequency Range:	2402 to 2480MHz
Modulation Type:	GFSK
Data Rate:	1Mbps(GFSK)
Antenna Type:	PCB Antenna
Antenna Gain:	1.5dBi (Provided by the Client)
Technical Specification of Wi-Fi	
Frequency Range:	2412 to 2462MHz
Modulation Type:	802.11b: DSSS (CCK, DQPSK, DBPSK)
Data Rate:	802.11b: 1/2/5.5/11Mbps
Antenna Type:	PCB Antenna
Antenna Gain:	1.5dBi (Provided by the Client)

3.3 Independent Operation Modes

Table 4: Independent Operation Modes

Test Mode	Channel	Frequency	Data Rate
TM1	00	2402	1 MB/s
TM2	19	2440	1 MB/s
TM3	39	2480	1 MB/s
TM4	Normal Operating Mode		

3.4 Noise Generating and Noise Suppressing Parts

Refer to the Circuit Diagram.

3.5 Submitted Documents

- Bill of Material
- Circuit Diagram
- PCB Layout
- Instruction Manual
- Photo Document
- 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: SecureCRT

Table 5: Power parameter value

Operating Mode	Power Parameter Value
BLE	Default

4.3 Special Accessories and Auxiliary Equipment

Table 6: Auxiliary Equipment

Product Name	Model Name	Manufactory
Laptop	T450	Thinkpad

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 1.5 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 7: 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:	1.5dBi
Verdict:	PASS	

5.1.2 6dB & 99% Bandwidth

RESULT: **Pass**

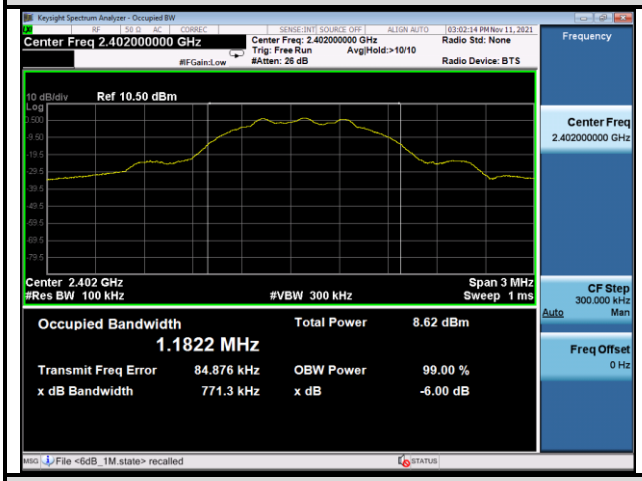
Date of testing	:	2021-11-11
Ambient temperature	:	20.2°C
Relative humidity	:	54.1%
Atmospheric pressure	:	101kPa
Test requirement	:	FCC Part 15.247(a)(2) RSS-247 Issue 2, February 2017, Clause 5.2(a)
Test procedure	:	ANSI C63.10: 2013
Test voltage	:	DC 3.3V
Test modes applied	:	TM1 to TM3

Table 8: 6dB & 99% Bandwidth

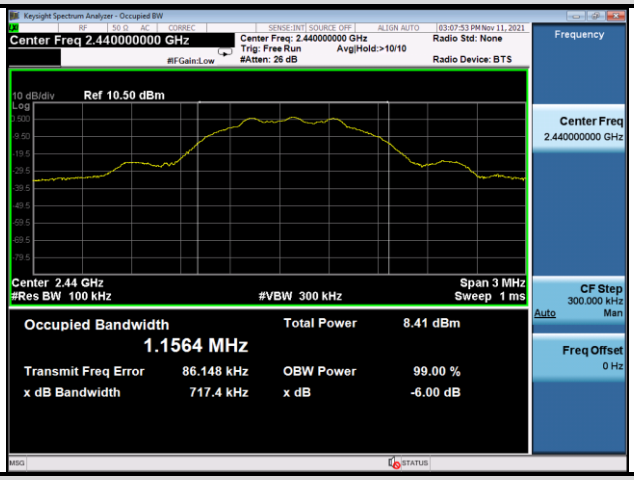
Test Mode	CH.	Freq. [MHz]	6dB Bandwidth [MHz]	6dB Bandwidth limit [kHz]	99% Bandwidth [MHz]
TM1	00	2402	771.3	≥500	1.1517
TM2	19	2440	717.4	≥500	1.1285
TM3	39	2480	767.7	≥500	1.1631

Figure 1: 6dB Bandwidth

TM1



TM2



TM3

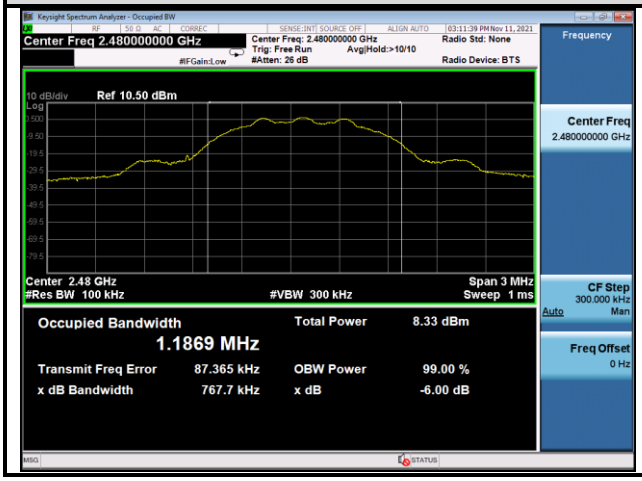
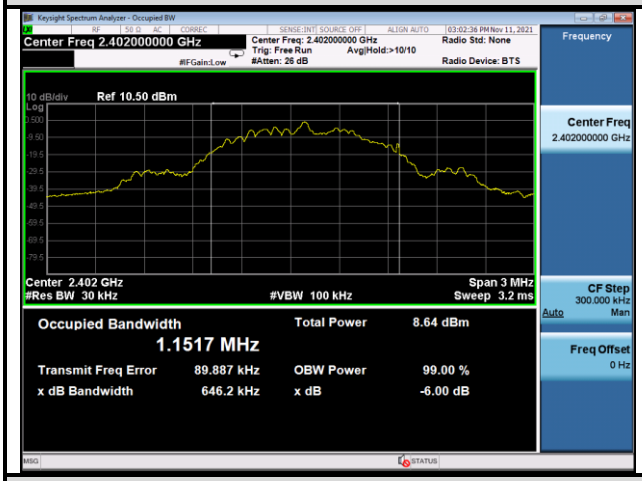
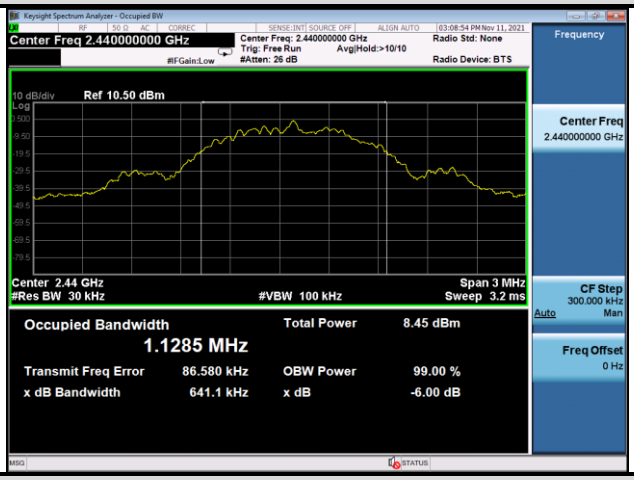


Figure 2: 99% Bandwidth

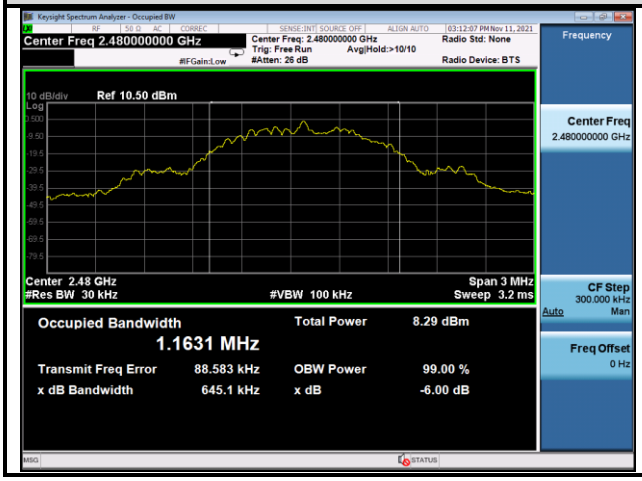
TM1



TM2



TM3



5.1.3 Peak Output Power

RESULT: **Pass**

Date of testing	:	2021-11-11
Ambient temperature	:	20.2°C
Relative humidity	:	54.1%
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 3.3V
Test modes applied	:	TM1 to TM3

Table 9: 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	1.5	00	2402	1.901	30	3.401	36
TM2		19	2440	1.786	30	3.286	36
TM3		39	2480	1.649	30	3.149	36

Note:
EIRP=Peak Conducted Output Power + Antenna Gain
The cable loss=1dB was provided by the client, and was factored in the result Peak Conducted Output Power

Figure 3: Peak Output Power, TM1 to TM3

TM1

TM2

TM3

5.1.4 Power Spectral Density

RESULT: **Pass**

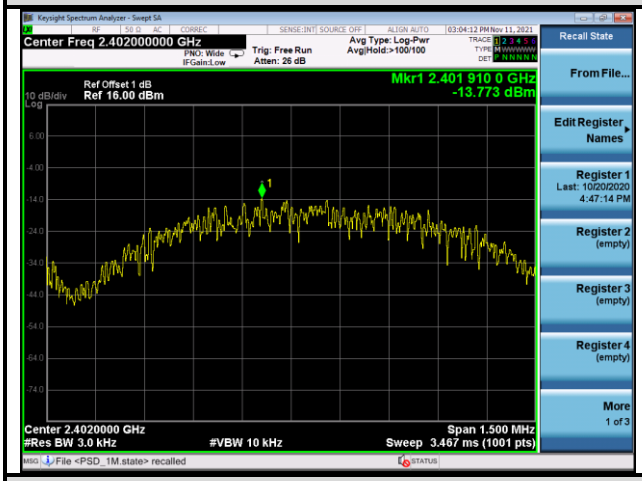
Date of testing	:	2021-11-11
Ambient temperature	:	20.2°C
Relative humidity	:	54.1%
Atmospheric pressure	:	101kPa
Test requirement	:	FCC Part 15.247(e) RSS-247 Issue 2, February 2017, Clause 5.2(b)
Test procedure	:	ANSI C63.10: 2013
Test voltage	:	DC 3.3V
Test modes applied	:	TM1 to TM3

Table 10: Power Spectral Density

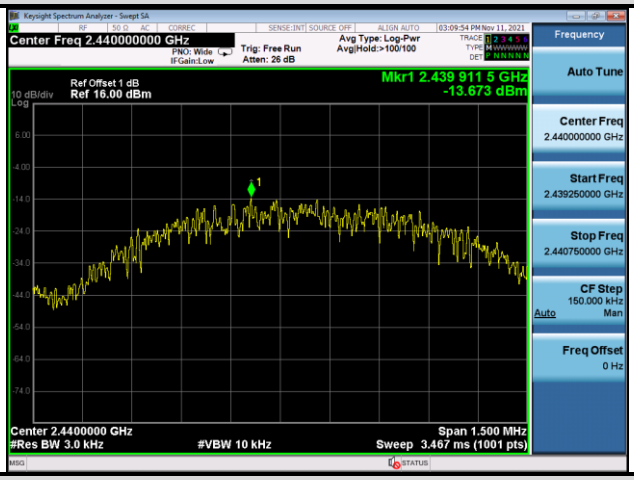
Mode	CH.	Frequency [MHz]	Result [dBm/3kHz]	Limit [dBm/3kHz]
TM1	00	2402	-13.773	8
TM2	19	2440	-13.673	8
TM3	39	2480	-13.974	8

Figure 4: Power Spectral Density

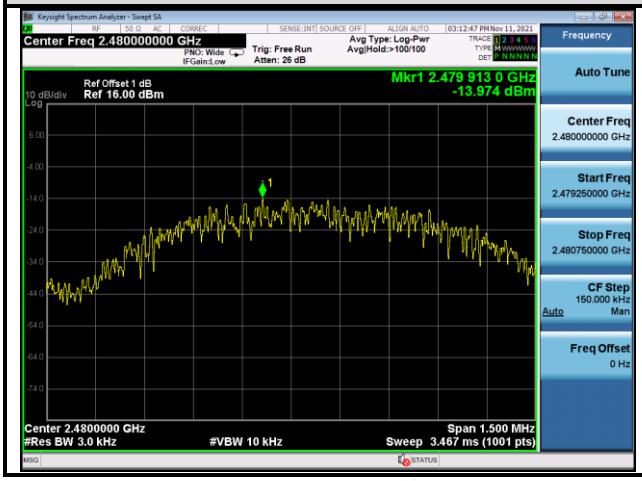
TM1



TM2



TM3



5.1.5 Conducted Band Edge and out-of Band Emissions

RESULT: **Pass**

Date of testing	:	2021-11-11 to 2021-12-09
Ambient temperature	:	20.2°C~21.3°C
Relative humidity	:	54.1%~48.6%
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 3.3V
Test modes applied	:	TM1 to TM3

Figure 5: Reference level

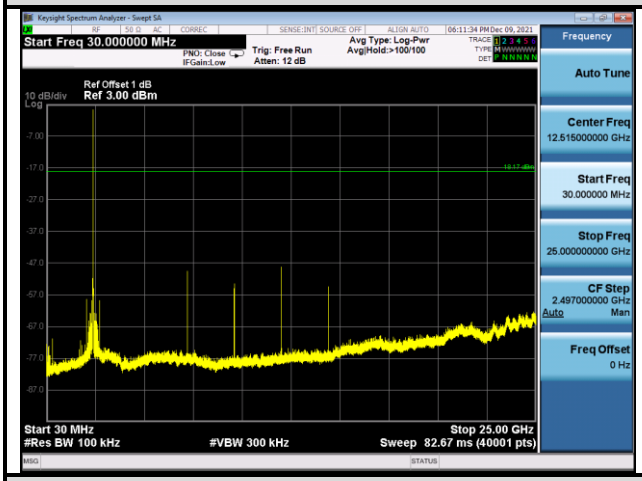
TM1

TM2

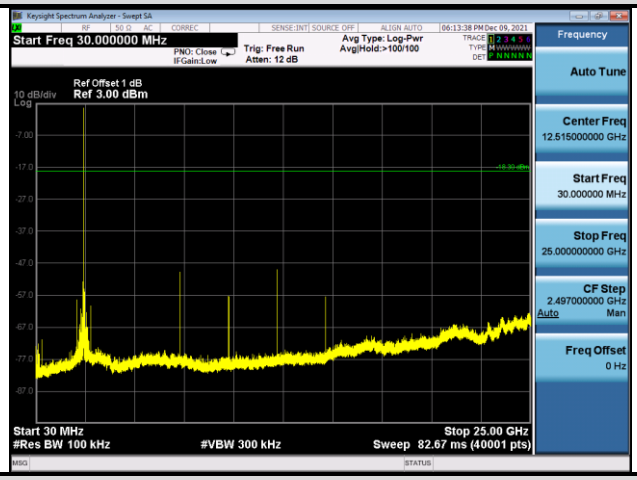
TM3

Figure 6: Conducted Spurious Emission

TM1



TM2



TM3

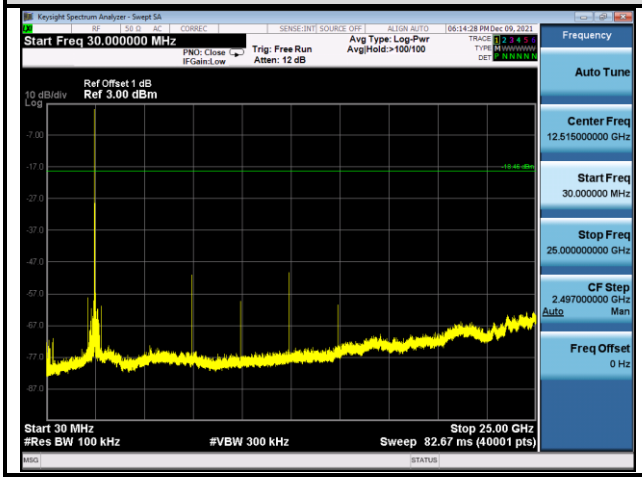


Figure 7: Conducted Band Edge

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 power by DC3.3V.
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	:	2021-10-26
Ambient temperature	:	25.3°C
Relative humidity	:	38.4%
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 3.3V
Test modes applied	:	TM1, TM3

Figure 8: Radiated Band-Edge, TM1

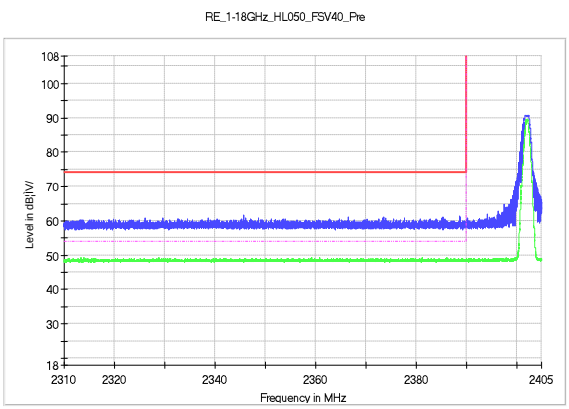
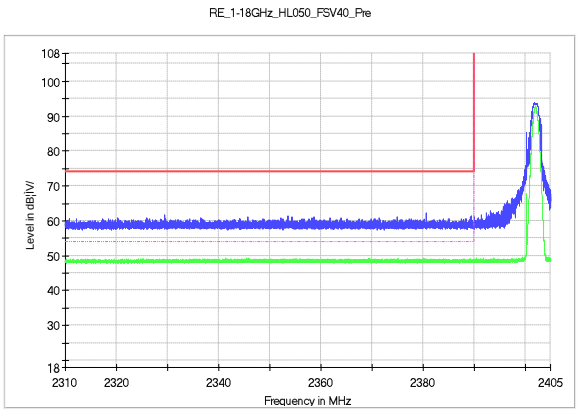
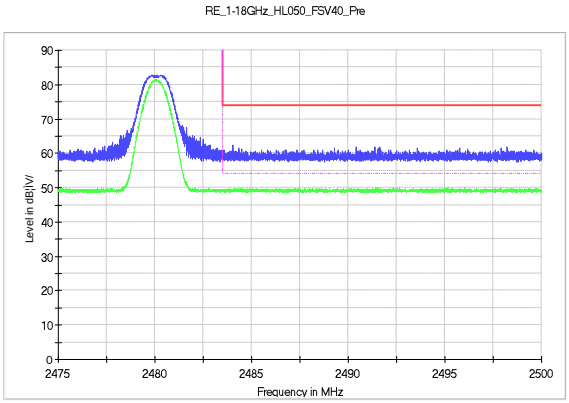
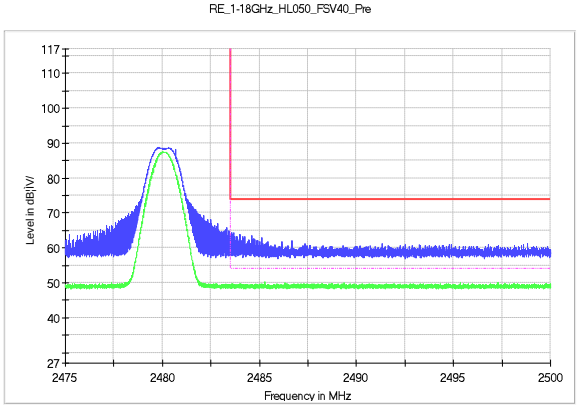
H	V
	

Figure 9: Radiated Band-Edge, TM3

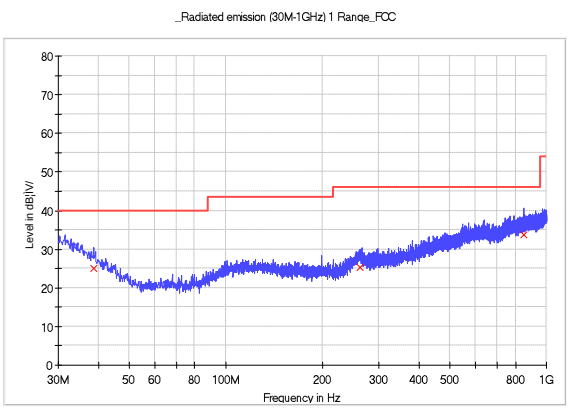
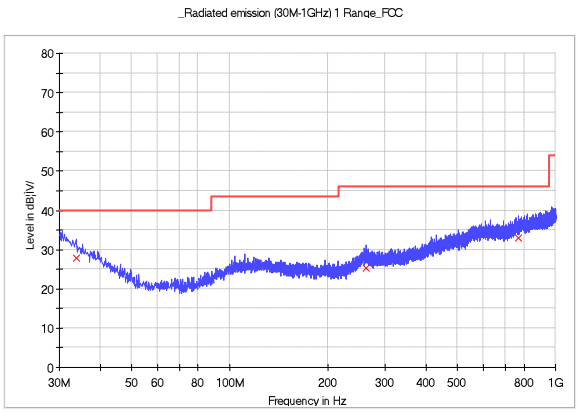
H	V
	

5.3.2 Radiated Spurious Emission

RESULT: **Pass**

Date of testing	:	2021-10-26 ~ 2021-11-09
Ambient temperature	:	26.1°C
Relative humidity	:	32.7 %
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 3.3V
Test modes applied	:	TM1 to TM3

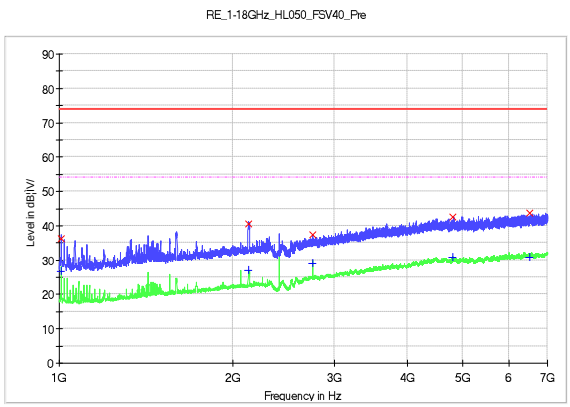
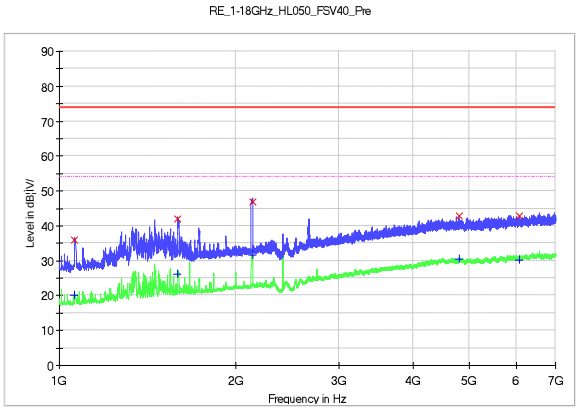
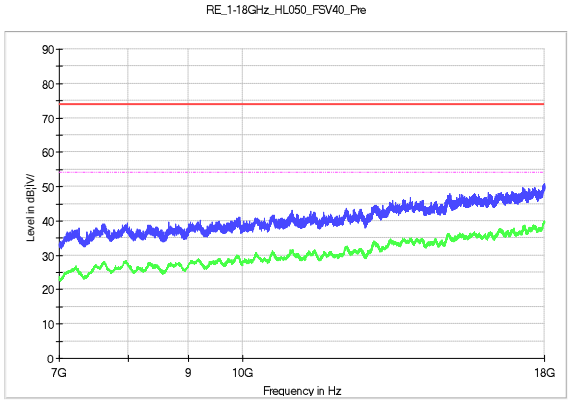
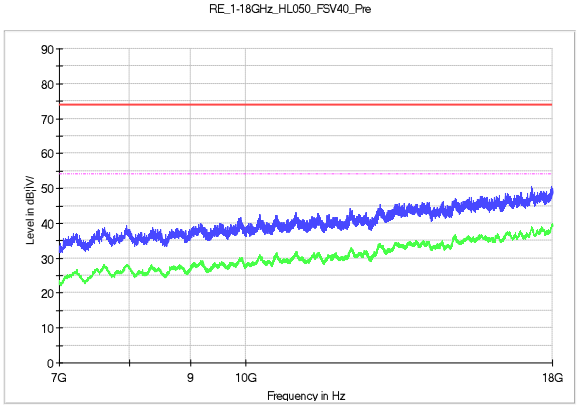
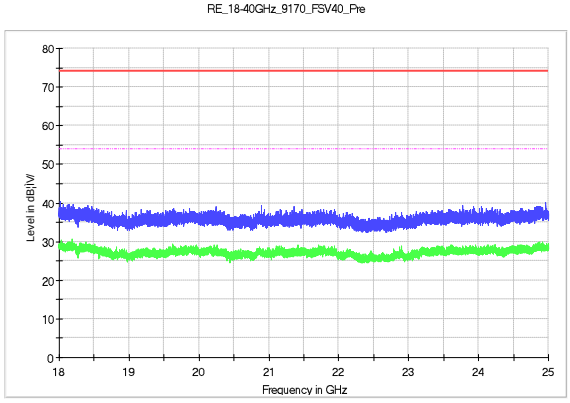
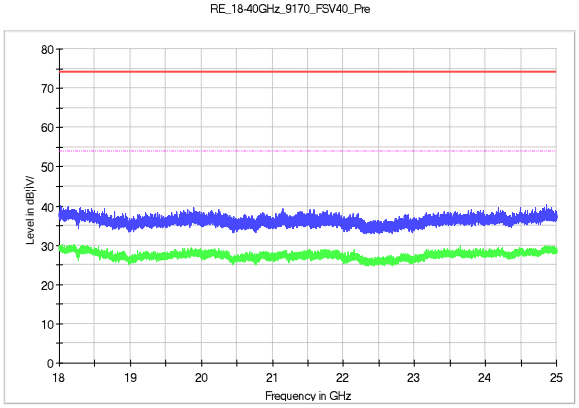
Figure 10: Radiated Spurious Emission, TM1, 30MHz to 1GHz

30MHz to 1GHz H	30MHz to 1GHz V
	

Limit and Margin

Frequency (MHz)	MaxPeak (dBµV/m)	Pol	Corr. (dB/m)	Margin - PK+ (dB)	Limit - PK+ (dBµV/m)
38.700000	25.0	H	20.7	15.0	40.0
262.200000	25.4	H	20.7	20.6	46.0
847.860000	33.7	H	27.8	12.3	46.0
33.780000	27.8	V	23.4	12.3	40.0
262.920000	25.4	V	20.7	20.6	46.0
770.820000	33.1	V	27.5	12.9	46.0

Figure 11: Radiated Spurious Emission, TM1, 1GHz to 25GHz

1GHz to 7GHz H	1GHz to 7GHz V
	
7GHz to 18GHz H	**7GHz to 18GHz V**
	
18GHz to 25GHz H	**18GHz to 25GHz V**
	

Limit and Margin

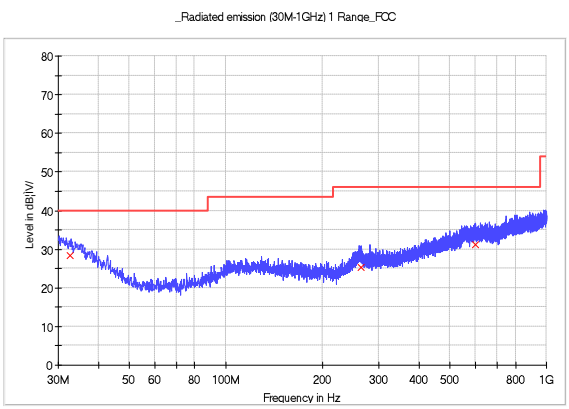
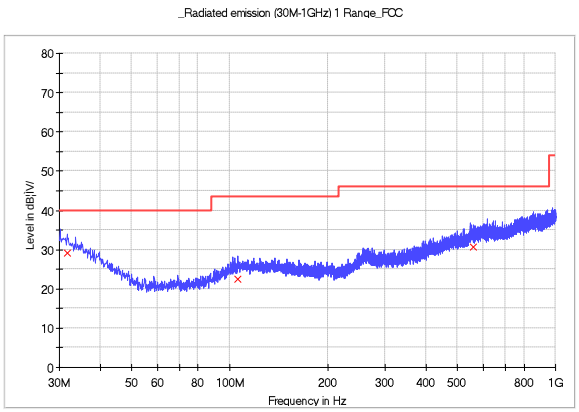
PK

Frequency (MHz)	MaxPeak (dBµV/m)	Pol	Corr. (dB/m)	Margin - PK+ (dB)	Limit - PK+ (dBµV/m)
1007.800000	36.2	H	-22.4	37.8	74.0
2128.000000	40.5	H	-15.7	33.5	74.0
2745.400000	37.5	H	-12.9	36.5	74.0
4804.600000	42.6	H	-6.5	31.4	74.0
6517.600000	43.7	H	-4.6	30.3	74.0
1062.400000	35.8	V	-22.1	38.2	74.0
1592.200000	42.1	V	-18.4	31.9	74.0
2131.600000	46.8	V	-15.7	27.2	74.0
4804.000000	42.9	V	-6.5	31.1	74.0
6066.400000	42.9	V	-5.8	31.1	74.0

AV

Frequency (MHz)	MaxPeak (dBµV/m)	Pol	Corr. (dB/m)	Margin - PK+ (dB)	Limit - PK+ (dBµV/m)
1007.800000	26.8	H	-22.4	27.2	54.0
2128.000000	27.1	H	-15.7	26.9	54.0
2745.400000	28.9	H	-12.9	25.1	54.0
4804.600000	30.8	H	-6.5	23.2	54.0
6517.600000	30.9	H	-4.6	23.1	54.0
1062.400000	20.2	V	-22.1	33.8	54.0
1592.200000	26.3	V	-18.4	27.7	54.0
2131.600000	31.5	V	-15.7	22.5	54.0
4804.000000	30.6	V	-6.5	23.4	54.0
6066.400000	30.1	V	-5.8	23.9	54.0

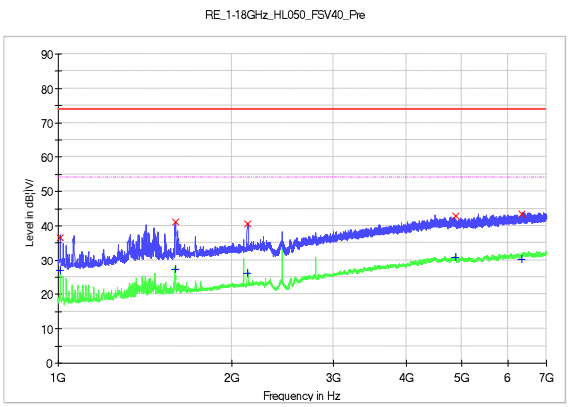
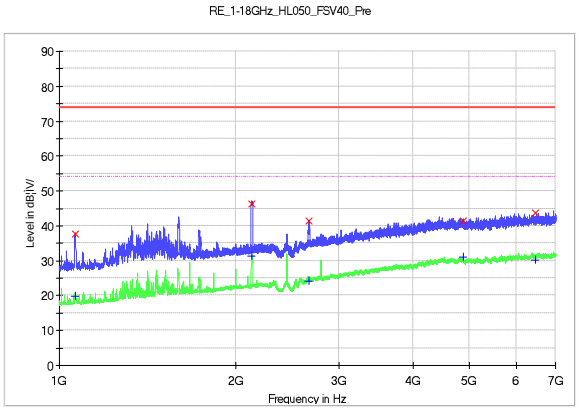
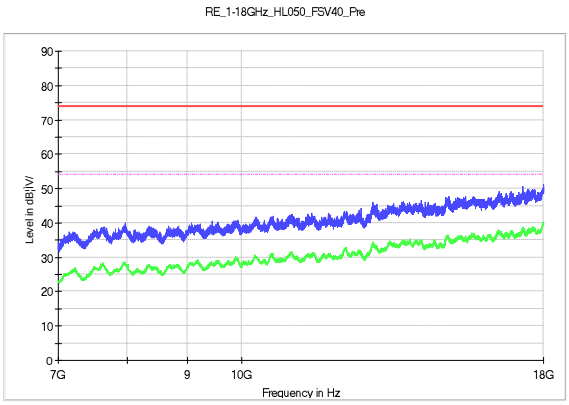
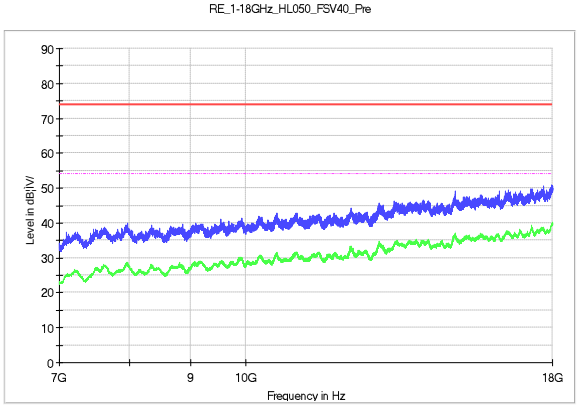
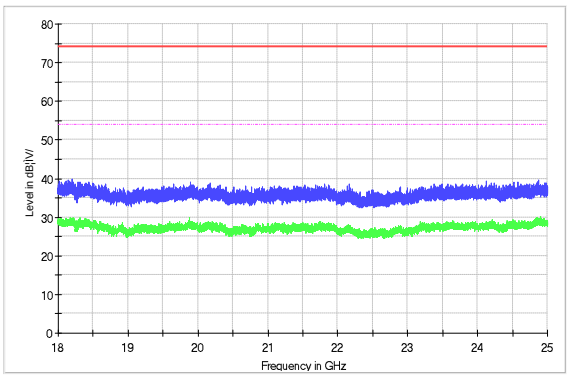
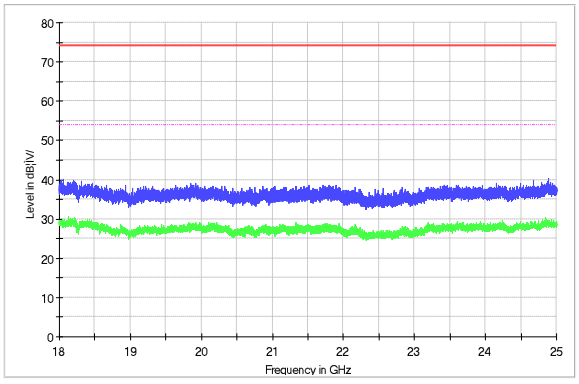
Figure 12: Radiated Spurious Emission, TM2, 30MHz to 1GHz

30MHz to 1GHz H	30MHz to 1GHz V
	

Limit and Margin

Frequency (MHz)	MaxPeak (dBµV/m)	Pol	Corr. (dB/m)	Margin - PK+ (dB)	Limit - PK+ (dBµV/m)
32.760000	28.4	H	24.0	11.6	40.0
264.480000	25.4	H	20.7	20.7	46.0
602.520000	31.2	H	26.2	14.8	46.0
31.680000	29.1	V	24.6	11.0	40.0
105.780000	22.4	V	18.3	21.1	43.5
561.060000	30.7	V	26.3	15.3	46.0

Figure 13: Radiated Spurious Emission, TM2, 1GHz to 25GHz

1GHz to 7GHz H	1GHz to 7GHz V
	
7GHz to 18GHz H	**7GHz to 18GHz V**
	
18GHz to 25GHz H	**18GHz to 25GHz V**
	

Limit and Margin

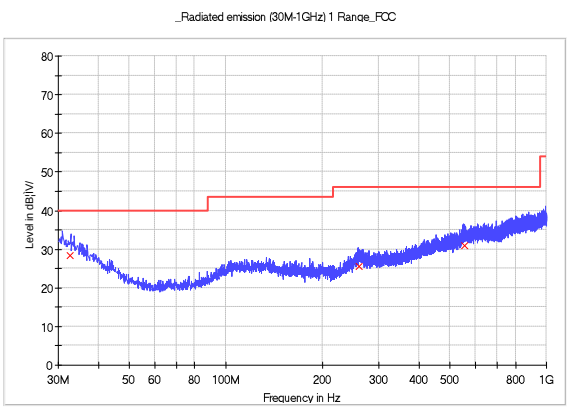
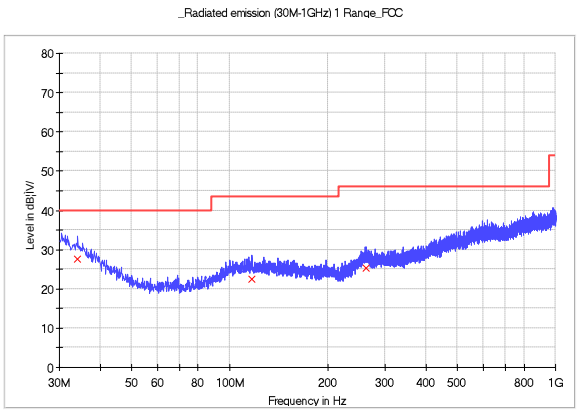
PK

Frequency (MHz)	MaxPeak (dBµV/m)	Pol	Corr. (dB/m)	Margin - PK+ (dB)	Limit - PK+ (dBµV/m)
1007.800000	36.4	H	-22.4	37.6	74.0
1594.000000	41.0	H	-18.4	33.0	74.0
2130.400000	40.5	H	-15.7	33.5	74.0
4880.200000	43.0	H	-6.5	31.0	74.0
6334.000000	43.5	H	-5.0	30.5	74.0
1063.000000	37.7	V	-22.1	36.3	74.0
2123.200000	46.4	V	-15.8	27.6	74.0
2666.200000	41.3	V	-13.3	32.7	74.0
4880.200000	41.5	V	-6.5	32.5	74.0
6468.400000	43.6	V	-4.6	30.4	74.0

AV

Frequency (MHz)	MaxPeak (dBµV/m)	Pol	Corr. (dB/m)	Margin - PK+ (dB)	Limit - PK+ (dBµV/m)
1007.800000	27.1	H	-22.4	26.9	54.0
1594.000000	27.4	H	-18.4	26.6	54.0
2130.400000	26.1	H	-15.7	27.9	54.0
4880.200000	30.7	H	-6.5	23.3	54.0
6334.000000	30.3	H	-5.0	23.7	54.0
1063.000000	19.8	V	-22.1	34.2	54.0
2123.200000	31.2	V	-15.8	22.8	54.0
2666.200000	24.2	V	-13.3	29.8	54.0
4880.200000	31.1	V	-6.5	22.9	54.0
6468.400000	30.2	V	-4.6	23.8	54.0

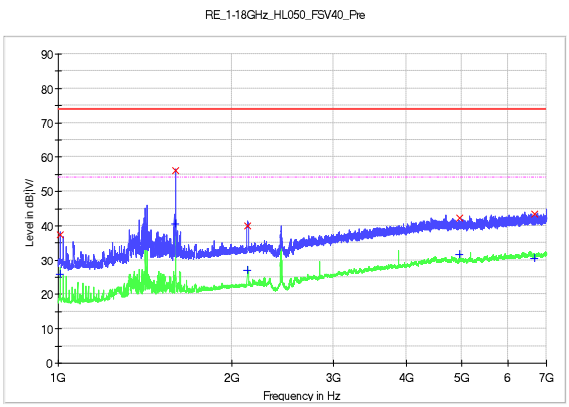
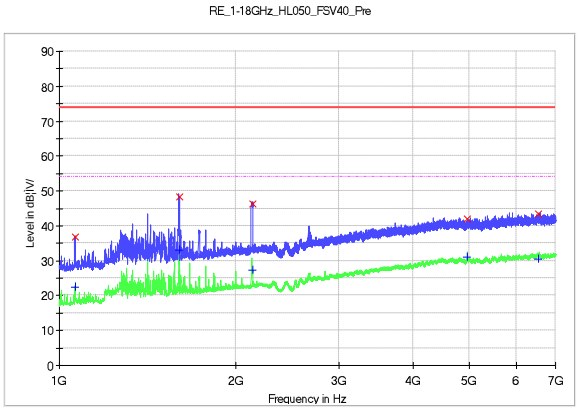
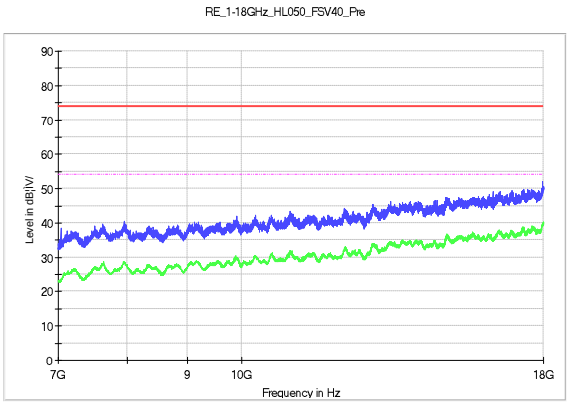
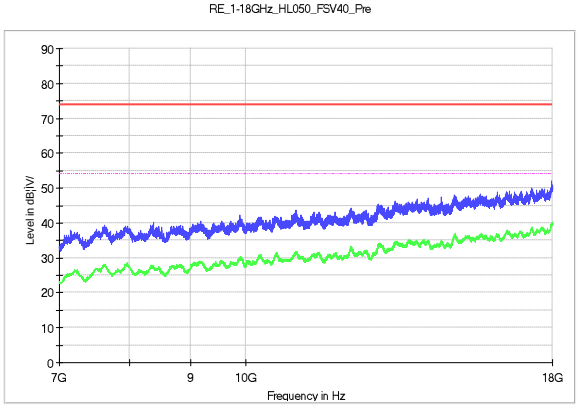
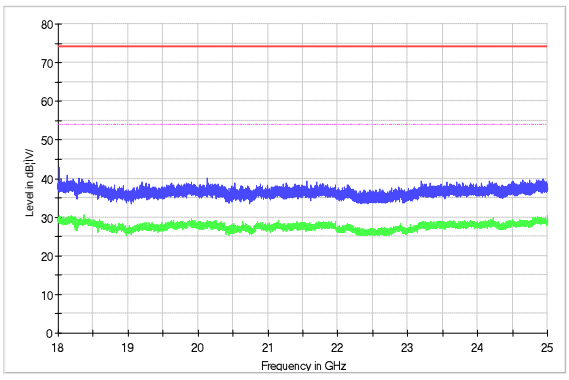
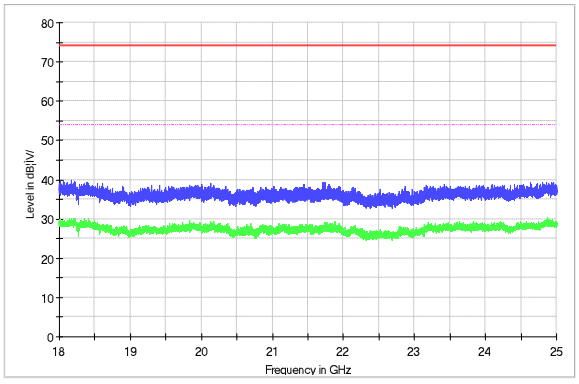
Figure 14: Radiated Spurious Emission, TM3, 30MHz to 1GHz

30MHz to 1GHz H	30MHz to 1GHz V
	

Limit and Margin

Frequency (MHz)	MaxPeak (dBµV/m)	Pol	Corr. (dB/m)	Margin - PK+ (dB)	Limit - PK+ (dBµV/m)
32.760000	28.4	H	24.0	11.6	40.0
260.520000	25.5	H	20.7	20.5	46.0
555.600000	31.0	H	26.5	15.0	46.0
34.140000	27.5	V	23.2	12.5	40.0
117.180000	22.5	V	18.5	21.0	43.5
261.480000	25.4	V	20.7	20.6	46.0

Figure 15: Radiated Spurious Emission, TM3, 1GHz to 25GHz

1GHz to 7GHz H	1GHz to 7GHz V
	
7GHz to 18GHz H	**7GHz to 18GHz V**
	
18GHz to 25GHz H	**18GHz to 25GHz V**
	

Limit and Margin

PK

Frequency (MHz)	MaxPeak (dBµV/m)	Pol	Corr. (dB/m)	Margin - PK+ (dB)	Limit - PK+ (dBµV/m)
1007.800000	37.5	H	-22.4	36.5	74.0
1596.400000	56.1	H	-18.3	17.9	74.0
2130.400000	40.1	H	-15.7	33.9	74.0
4960.600000	42.3	H	-6.6	31.7	74.0
6669.400000	43.3	H	-4.8	30.7	74.0
1064.800000	36.7	V	-22.1	37.3	74.0
1600.000000	48.2	V	-18.3	25.8	74.0
2132.800000	46.3	V	-15.7	27.7	74.0
4960.000000	42.1	V	-6.6	31.9	74.0
6560.200000	43.3	V	-4.6	30.7	74.0

AV

Frequency (MHz)	MaxPeak (dBµV/m)	Pol	Corr. (dB/m)	Margin - PK+ (dB)	Limit - PK+ (dBµV/m)
1007.800000	25.9	H	-22.4	28.1	54.0
1596.400000	40.5	H	-18.3	13.5	54.0
2130.400000	27.1	H	-15.7	26.9	54.0
4960.600000	31.7	H	-6.6	22.3	54.0
6669.400000	30.4	H	-4.8	23.6	54.0
1064.800000	22.4	V	-22.1	31.6	54.0
1600.000000	33.2	V	-18.3	20.8	54.0
2132.800000	27.4	V	-15.7	26.6	54.0
4960.000000	31.1	V	-6.6	22.9	54.0
6560.200000	30.6	V	-4.6	23.4	54.0

6. List of Tables

7. List of Figures