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Order No.: 11082230
Report No.: 16-11082230-FCC-1
Date: February 15, 2016
Model No.: AN-SP700
FCC ID : BEJSP700

FCC/IC Test Report

**in accordance with
FCC Part 15 Subpart C §15.247
IC RSS-247, RSS-GEN**

for

Slim Remote

**LG Electronics Inc.
222, LG-ro Jinwi-myeon, Pyeongtaek-si, Gyeonggi-do, 451-713, Korea**

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Summary of Test Results:

The following tests were performed on a sample submitted for evaluation of compliance with FCC Part 15 C Section 15.247 and IC RSS-247, RSS-GEN

No	FCC Reference Clause No.	IC Reference Clause No.	Conformance Requirements	Result	Remark
1	15.247(a)(2)	RSS-247 5.2(1)	6 dB Bandwidth Occupied Bandwidth	Complied	-
2	15.247(b)(3)	RSS-247 5.4(4)	Maximum peak output power	Complied	-
3	15.247(e)	RSS-247 5.2(2)	Power spectral density	Complied	-
4	15.247(d)	RSS-247 5.5	Band Edge Conducted spurious emission	Complied	-
5	15.205(a) 15.209(a)	RSS-247 5.5 RSS-GEN 8.9	Radiated spurious emissions	Complied	-
6	15.207(a)	RSS-GEN 8.8	Transmitter AC power line conducted emission	N/A	Note 1

Note 1. The EUT is DC operating only.

Conclusion:

The tests listed in the Summary of Testing section of this report have been performed and the results recorded by UL Korea Ltd. in accordance with the procedures stated in each test requirement and specification. The test list was determined by the Applicant as being applicable to the Equipment Under Test. As a result, the subject product has been verified to comply or not comply as noted in the Summary of Testing with each test specification. The test results relate only to the items tested.



Witness tested by
Jihoon Lee, WiSE Laboratory Engineer
Consumer Technology Division
UL Korea Ltd.
February 15, 2016



Reviewed by
Jeonghwan Kim, WiSE Laboratory Engineer
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UL Korea Ltd.
February 15, 2016

Test Report Details

Tests Performed By: UL Korea Ltd.
26th FL. GFC Center, 737 Yeoksam-dong, Gangnam-gu, Seoul, 135-984, Korea

Test Site: KCTL Inc.
65, Sinwon-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 443-390, Korea

Applicant: LG Electronics Inc.
222, LG-ro Jinwi-myeon, Pyeongtaek-si, Gyeonggi-do, 451-713, Korea

Applicant Contact: Byeong Kyu Jang

Title: Research Engineer

Phone: 82-31-8066-5537

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Product Type: Slim Remote

Model Number: AN-SP700

Trademark 

Sample Serial Number: N/A

Test standards: FCC Part 15 C Section 15.247
Operation within the bands 902–928 MHz, 2400–2483.5 MHz,
and 5725–5850 MHz
IC RSS-247
Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSs) and
Licence-Exempt Local Area Network (LE-LAN) Devices
IC RSS-GEN
General Requirements for Compliance of Radio Apparatus

Sample Receive Date: February 05, 2016

Testing Start Date: February 11, 2016

Testing Complete Date: February 12, 2016

Overall Results: **Pass**

UL Korea Ltd. reports apply only to the specific test samples and test results submitted for UL's review. All samples tested were in good operating condition throughout the entire test program. It is the manufacturer's responsibility to assure that additional production units of this model are manufactured with identical electrical and mechanical components. UL Korea Ltd. shall have no liability for any deductions, inferences or generalizations drawn by the client or others from UL Korea Ltd. issued reports. This report shall not be used to claim, constitute or imply product certification, approval, or any agency of the National Authorities. This report may contain test results that are not covered by the NVLAP or KOLAS accreditation.

Report Directory

1. GENERAL PRODUCT INFORMATION	5
1.1. EQUIPMENT DESCRIPTION	5
1.2. DETAILS OF TEST EQUIPMENT (EUT).....	5
1.3. EQUIPMENT CONFIGURATION	5
1.4. TECHNICAL DATA.....	5
1.5. ANTENNA INFORMATION	6
1.6. EQUIPMENT TYPE :	6
1.7. TECHNICAL DESCRIPTIONS AND DOCUMENTS	6
1.8. EQUIPMENT MARKING PLATE.....	6
1.9. DESCRIPTION OF ADDITIONAL MODEL NAME.....	6
2. TEST SPECIFICATION	7
3. TEST CONDITIONS	8
3.1. EQUIPMENT USED DURING TEST	8
3.2. INPUT/OUTPUT PORTS	8
3.3. POWER INTERFACE	8
3.4. OPERATING FREQUENCIES	9
3.5. OPERATION MODES	9
3.6. ENVIRONMENT CONDITIONS.....	9
3.7. TEST CONFIGURATIONS	10
3.8. LIST OF TEST EQUIPMENT.....	11
4. OVERVIEW OF TECHNICAL REQUIREMENTS	12
5. TEST RESULTS.....	13
5.1. 6 dB BANDWIDTH & OCCUPIED BANDWIDTH.....	13
5.2. MAXIMUM PEAK OUTPUT POWER	18
5.3. POWER SPECTRAL DENSITY	22
5.4. CONDUCTED SPURIOUS EMISSION MEASUREMENT.....	26
5.5. RADIATED SPURIOUS EMISSIONS MEASUREMENT	30
5.6. ANTENNA REQUIREMENT	39
APPENDIX A. ACCREDITATIONS AND AUTHORIZATIONS	40
APPENDIX B - MEASUREMENT UNCERTAINTIES	40

1. General Product Information

1.1. Equipment Description

AN-SP700 is a Slim Remote with Bluetooth LE.

1.2. Details of Test Equipment (EUT)

- Equipment Type : Slim Remote
- Model No. : AN-SP700
- Type of test Equipment : potable type
- Operating characteristic : Short range wireless device operating in the 2400 – 2483.5 ISM frequency band
- Manufacturer : LG Electronics Inc.
222, LG-ro Jinwi-myeon, Pyeongtaek-si, Gyeonggi-do, 451-713, Korea

1.3. Equipment Configuration

The EUT is consisted of the following component provided by the manufacturer.

Use*	Product Type	Manufacturer	Model	Comments
EUT	Slim Remote	LG Electronics Inc.	AN-SP700	-
Note: Use = EUT - Equipment Under Test, AE - Auxiliary/Associated Equipment. SIM - Simulator (Not Subjected to Test)				

1.4. Technical Data

Item	Description
Frequency Ranges	2 402 – 2 480 MHz
Output power	Max. -3 dBm ²⁾
Kind of modulation (s)	GFSK
Channel	40 channels (Bluetooth LE)
Antenna Gain	Max. 2.97 dBi
Working temperature	0 ~ 60 °C
Supply Voltage	DC 3.0 V

Note ;

1. All the technical data described above were provided by the manufacturer.
2. Transmit power tolerance is declared by the manufacturer. (Transmit power tolerance = +/- 1dBm)

1.5. Antenna Information

Antenna Model Name : SP16
Antenna Type : PCB Pattern antenna
Manufacturer : RADINA. Co.,Ltd
Transmit Gain dBi : Max. 2.97 dBi
Azimuth Beam Pattern : Omni-directional
Polarization : Linear

1.6. Equipment Type :

- ☐ Radio and ancillary equipment for fixed or semi-fixed use
☐ Radio and ancillary equipment for vehicular mounted use
☒ Radio and ancillary equipment for portable or handheld use
- ☒ Stand alone ☐ Host connected
- ☒ Self contained single unit ☐ Module with associated connection or interface

1.7. Technical descriptions and documents

The following documents was provided by the manufacturer.

No.	Document Title and Description
1	User Manual

1.8. Equipment Marking Plate



1.9. Description of additional model name

Model name	Model name Designation	Description of design
AN-SP700	Basic model	-

2. Test Specification

The following test specifications and standards have been applied and used for testing.

- 1) FCC Part 15 C Section 15.247 : Operation within the bands 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz
- 2) IC RSS-247 : Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSs) and Licence-Exempt Local Area Network (LE-LAN) Devices
- 3) IC RSS-GEN : General Requirements for Compliance of Radio Apparatus
- 4) ANSI C63.10:2013 : American National Standard for Testing Unlicensed Wireless Devices
- 5) KDB 558074 v03r04 : Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247

3. Test Conditions

3.1. Equipment Used During Test

Use*	Product Type	Manufacturer	Model	Comments
EUT	Slim Remote	LG Electronics Inc.	AN-SP700	-
AE	Desktop PC	A-tech	APTNBDH	-
Note: Use = EUT - Equipment Under Test, AE - Auxiliary/Associated Equipment. SIM - Simulator (Not Subjected to Test)				

3.2. Input/Output Ports

No	Port Name	Type*	Cable Max. >3m (Y/N)	Cable Shielded (Y/N)	Comments
1	Power Input	DC	N	N	Connected to DC Power supply
2	Radio Antenna	I/O	N	Y	-
3	Serial port	I/O	N	Y	Connected to Desktop PC
Note: *AC = AC Power Port DC = DC Power Port N/E = Non-Electrical I/O = Signal Input or Output Port (Not Involved in Process Control) TP = Telecommunication Ports					

3.3. Power Interface

Mode #	Voltage (V)	Current (A)	Power (W)	Frequency (DC/AC-Hz)	Phases (#)	Comments
Rated	3.0V	-	-	DC	-	Rating of EUT

3.4. Operating Frequencies

Mode #	Frequency tested
1	Operating frequency range : 2 402 MHz ~ 2 480 MHz (Bluetooth LE) - Low : 2 402 MHz - Mid : 2 440 MHz - High : 2 480 MHz

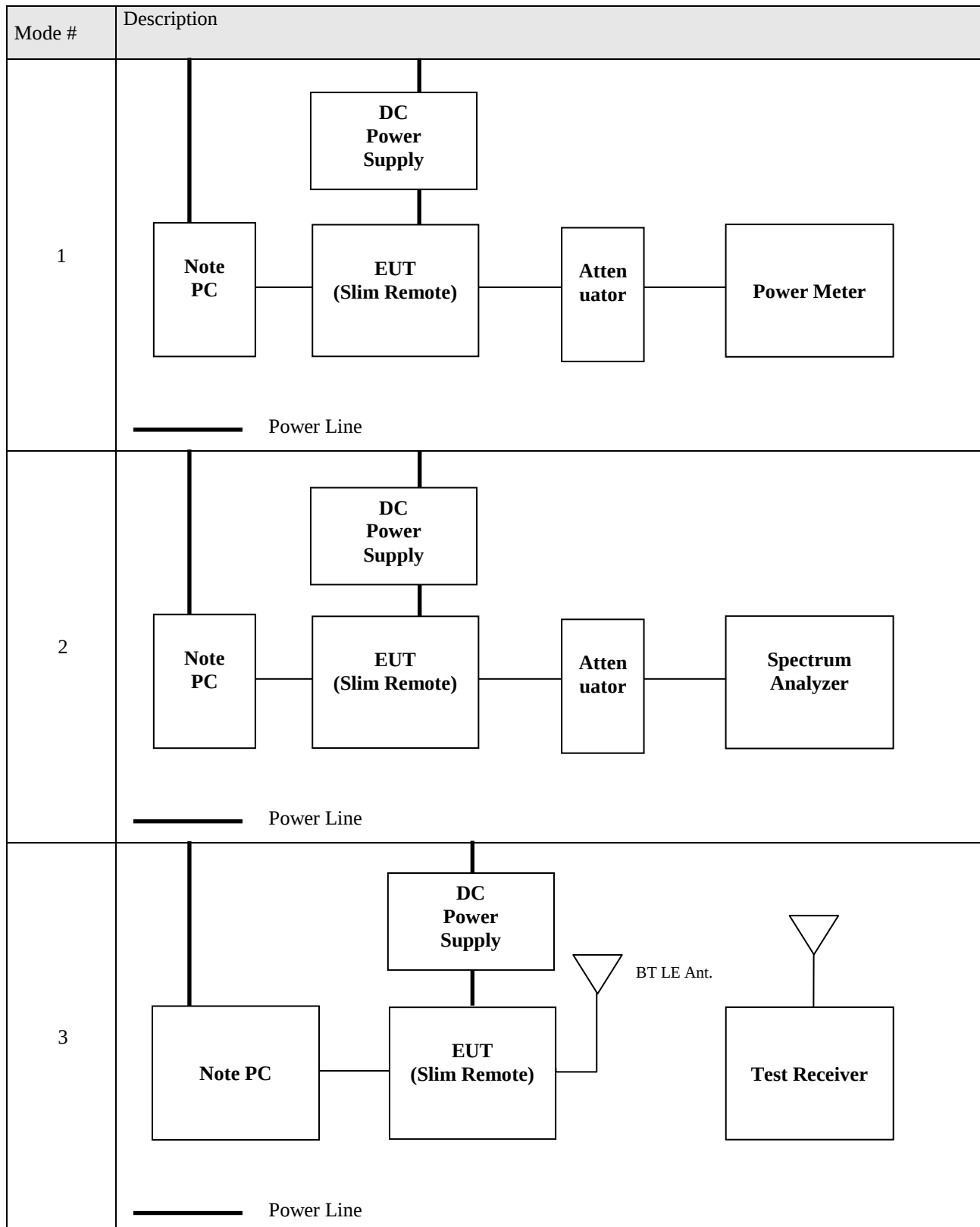
3.5. Operation Modes

Mode #	Description
1	Carrier on mode: Signal from the RF module was generated continuously for the representative channels (Low, Mid, High) by the test program incorporated
Note : - The worst-case condition is determined by the baseline measurement of RF output power out of various modulations and data rates.	

3.6. Environment Conditions

Parameters	Normal condition
Temperature	+15°C to +35°C;
Humidity	20 % to 75 %
Supply voltage	DC 3.0 V (Rated nominal voltage)
Note ; - The operating condition for humidity requirement has not been declared in the manufacturer's specification. - Test has been carried out for three frequencies specified above under the normal condition.	

3.7. Test Configurations



3.8. List of Test Equipment

No	Description	Manufacturer	Model	Identifier	Cal. Due
1	Spectrum Analyzer	R&S	FSV30	100808	2016.09.02
2	DC Power Supply	Agilent	E3632A	MY40017108	2016.07.15
3	Signal Generator	R & S	SMR40	100007	2016.06.15
4	Wideband Power Sensor	R & S	NRP-Z81	100677	2017.01.08
5	Test Receiver	ESCI7	100732	R&S	2016.09.02
6	Bi-Log Antenna	VULB 9168	440	SCHWARZBECK	2017.10.23
7	Amplifier	310N	344922	SONOMA INSTRUMENT	2016.09.02
8	3 dB Attenuator	8491B	22981	HP	2016.09.01
9	LOOP Antenna	HFH2-Z2	861971003	R&S	2017.03.03
10	Antenna Mast	MA4000-EP	303	Innco Systems	-
11	Turn Table	DT2000S-1t	79	Innco Systems	-
12	HORN ANTENNA	ETS-LINDGREN	3117-PA	00161083	2016.11.12
13	Horn antenna	ETS.lindgren	3116	00086635	2016.04.29
14	Broadband Preamplifier	SCHWARZBECK	BBV9721	2	2016.05.19
15	Antenna Mast	MATURO	AM4.0	079/3440509	-
16	Turn Table	MATURO	CO2000-SOFT	-	-
17	Highpass Filter	Wainwright Instruments GmbH	WHKX3.0/18G- 12SS	44	2017.02.01

4. Overview of Technical requirements

The following essential requirements and test specifications are relevant to the presumption of conformity FCC Part 15 C Section 15.247and RSS-247, RSS-GEN				Reported
FCC Reference Clause No.	IC Reference Clause No.	Essential technical requirements	Test method	
15.247(a)(2)	RSS-247 5.2(1)	6 dB Bandwidth Occupied Bandwidth	KDB 558074	[X]
15.247(b)(3)	RSS-247 5.4(4)	Maximum peak output power	KDB 558074	[X]
15.247(e)	RSS-247 5.2(2)	Power spectral density	KDB 558074	[X]
15.247(d)	RSS-247 5.5	Band Edge Conducted spurious emission	KDB 558074	[X]
15.205(a) 15.209(a)	RSS-247 5.5 RSS-GEN 8.9	Radiated spurious emissions	ANSI C63.10 KDB 558074	[X]

5. Test Results

5.1. 6 dB Bandwidth & Occupied Bandwidth

TEST: 6 dB Bandwidth & Occupied Bandwidth		
Method	a) Set RBW = 100 kHz. b) Set the video bandwidth (VBW) $\geq 3 \times$ RBW. c) Detector = Peak. d) Trace mode = max hold. e) Sweep = auto couple. f) Allow the trace to stabilize. g) Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.	
Reference Clause	Part15 C Section 15.247 (a)(2) RSS-247 5.2(1), RSS-GEN 6.6	
Parameters recorded during the test	Laboratory Ambient Temperature	25.4 °C
	Relative Humidity	47 %
	Frequency range	Measurement Point
Fully configured sample scanned over the following frequency range	2 402 MHz - 2 480 MHz	Antenna port

Configuration Settings

Power Interface Mode # (See Section 3.3)	EUT Operation Mode # (See Section 3.5)	Test Configurations Mode # (See Section 3.7)
1	1	2
Supplementary information: None		

Limits

According to §15.247(a)(2), systems using digital modulation techniques may operate in the 902 ~928 MHz, 2400 ~ 2483.5 MHz, and 5725 ~ 5825 MHz bands. The minimum of 6 dB Bandwidth shall be at least 500 kHz.

5.1.1. Measurement Results

Table 1. Data Table of 6 dB Bandwidth

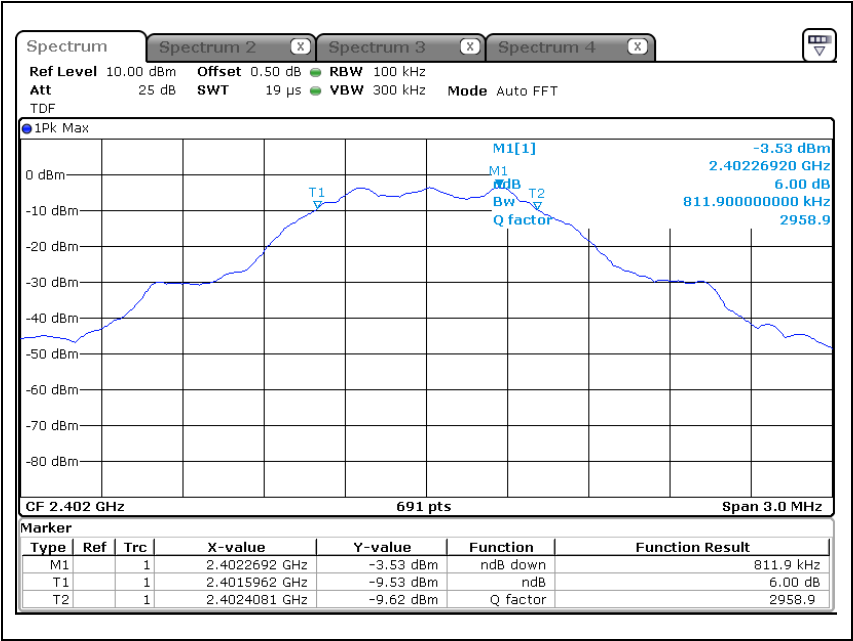
Operating Mode	Data Rate (Mbps)	Channel	Channel Frequency (MHz)	6 dB Bandwidth (MHz)	Limit (MHz)
GFSK	1	Low	2 402	0.81	0.5
		Middle	2 440	0.82	
		High	2 480	0.80	

Table 2. Data Table of Occupied Bandwidth (99% Bandwidth)

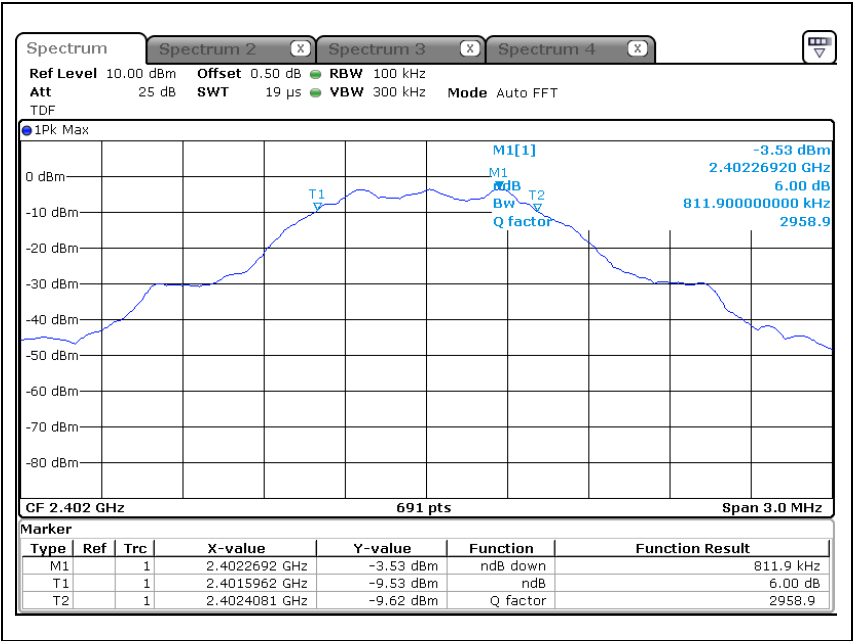
Operating Mode	Data Rate (Mbps)	Channel	Channel Frequency (MHz)	99% Bandwidth (MHz)	Limit (MHz)
GFSK	1	Low	2 402	1.12	-
		Middle	2 440	1.12	
		High	2 480	1.10	

Figure 1. Plots of 6 dB Bandwidth

GFSK : Low



GFSK : Middle



GFSK : High

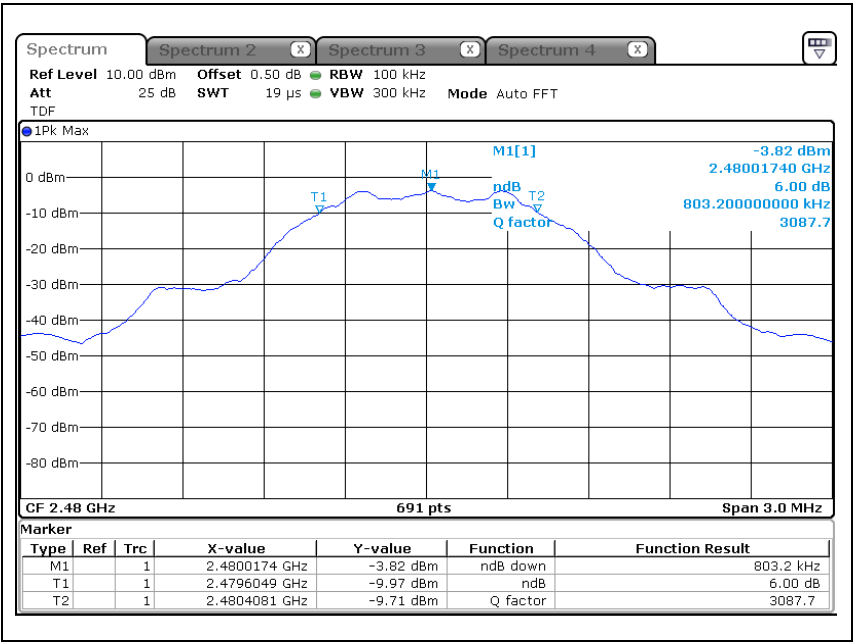
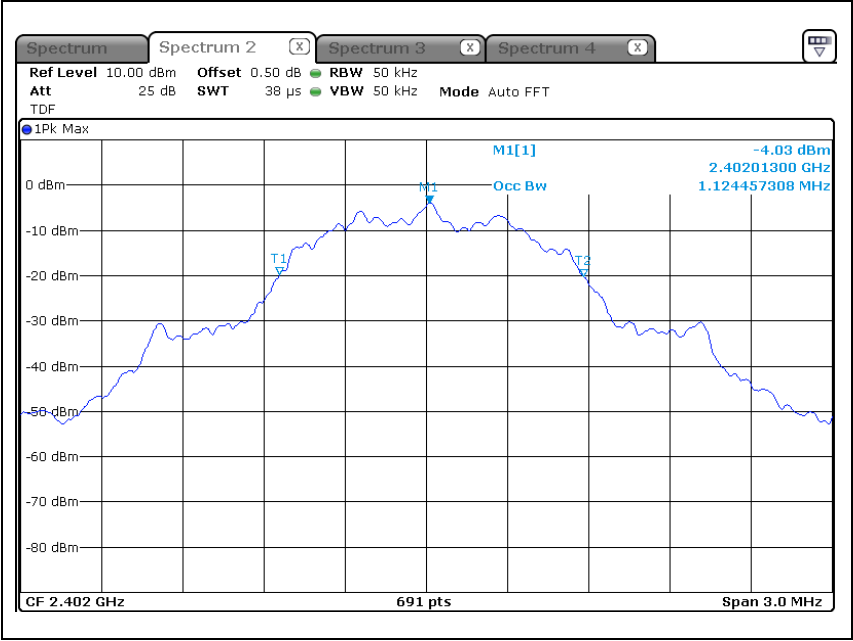


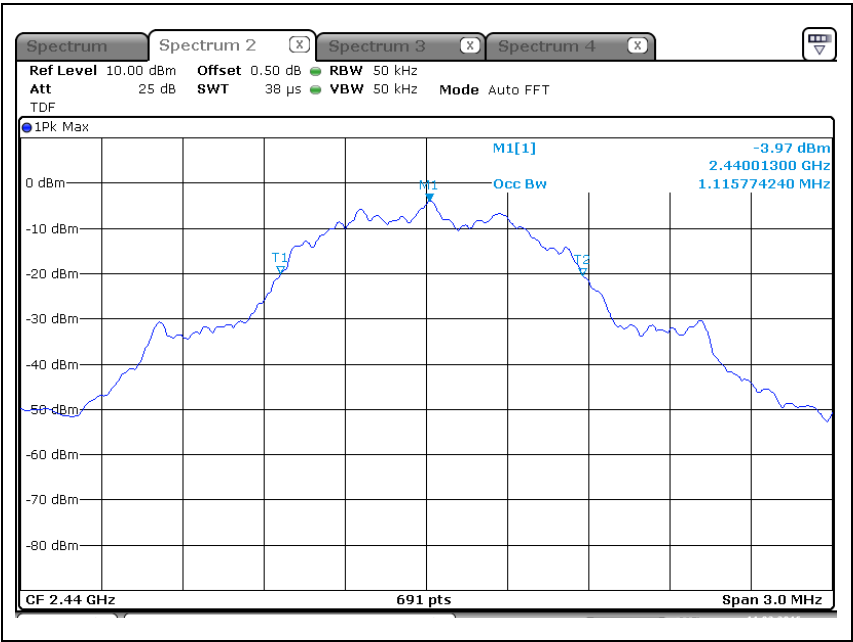
Figure 2. Plots of 99% Bandwidth

GFSK : Low



Order Number: 11082230
Model Number: AN-SP700

GFSK : Middle



GFSK : High



5.2. Maximum Peak Output Power

TEST: Maximum Peak Output Power		
Method	The maximum peak conducted output power may be measured using a broadband peak RF power meter. The power meter shall have a video bandwidth that is greater than or equal to the DTS bandwidth and shall utilize a fast-responding diode detector.	
Reference Clause	Part15 C Section 15.247 (b)(3) RSS-247 5.4(4)	
Parameters recorded during the test	Laboratory Ambient Temperature	25.4 °C
	Relative Humidity	47 %
	Frequency range	Measurement Point
Fully configured sample scanned over the following frequency range	2 402 MHz - 2 480 MHz	Antenna port

Configuration Settings

Power Interface Mode # (See Section 3.3)	EUT Operation Mode # (See Section 3.5)	Test Configurations Mode # (See Section 3.7)
1	1	1
Supplementary information: None		

Limits

According to §15.247(b)(3), for systems using digital modulation in the 902 ~ 928 MHz, 2400 ~2483.5 MHz, and 5725 ~ 5850 MHz band: 1 Watt. As an alternative to a peak power measurement, compliance with the one watt limit can be based on a measurement of the maximum conducted output power. Maximum Conducted output Power is defined as the total transmit power delivered to all antennas and antenna elements averaged across all symbols in the signaling alphabet when the transmitter is operating at its maximum power control level. Power must be summed across all antenna elements. The average must not include any intervals during which the transmitter is off or is transmitting at a reduced power level. If multiple modes of operation are possible (e.g., alternative modulation methods), the maximum conducted output power is the highest total transmit power occurring in any mode.

According to §15.247(b)(4), the conducted output power limit specified in paragraph(b) of this section is based on the use of antenna with directional gains that do not exceed 6 dBi. Except as shown in paragraph(c) of this section, if transmitting antenna of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraph (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

Measurement Results

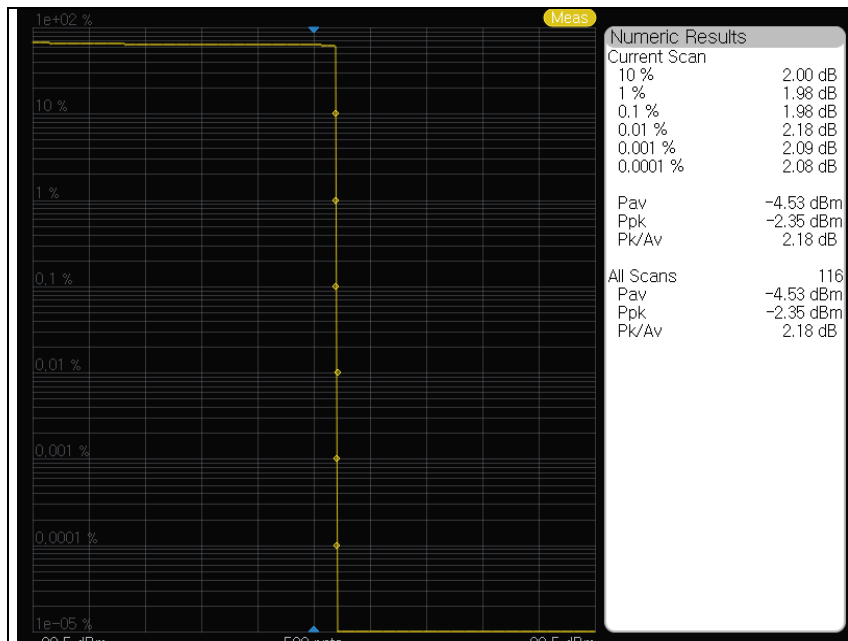
Table 3. Data Table of Maximum Peak Output Power

Operating Mode	Data Rate (Mbps)	Channel	Channel Frequency (MHz)	Peak Power Result (dBm)	Limit (dBm)
GFSK	1	Low	2 402	-2.35	30
		Middle	2 440	-2.35	
		High	2 480	-2.65	

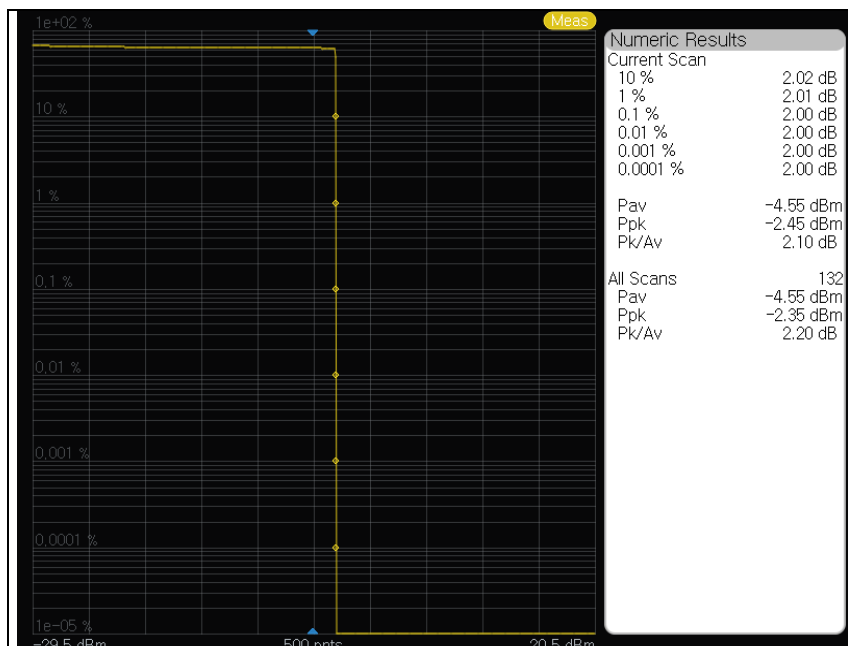
Note; The output power is same as original but due to the retest, the output power documented in this C2PC filing is within +/-0.5dBm from original grant which is considered as measurement uncertainty.

Figure 3. Plots of Maximum Peak Output Power

GFSK : Low

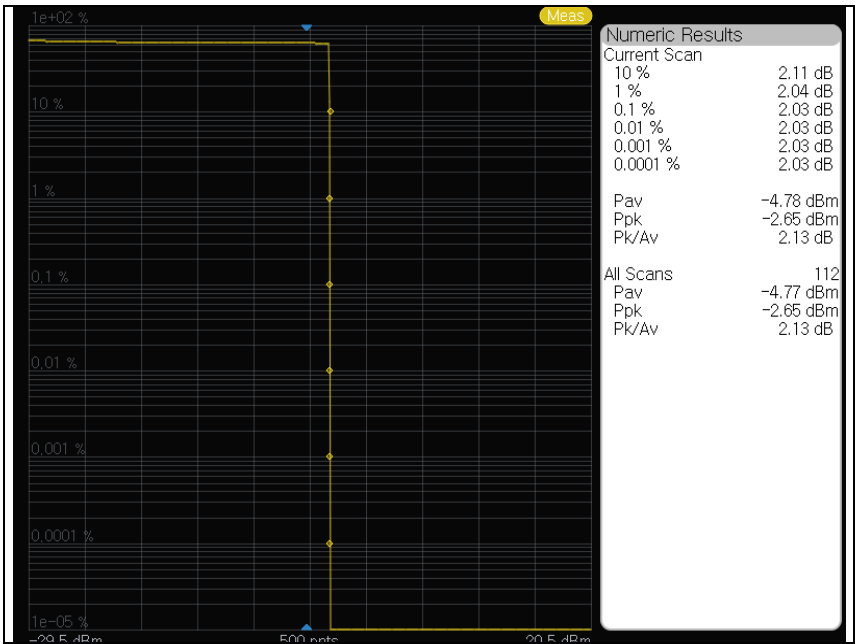


GFSK : Middle



Order Number: 11082230
Model Number: AN-SP700

GFSK : High



5.3. Power Spectral Density

TEST: Power Spectral Density		
Method	a) Set analyzer center frequency to DTS channel center frequency. b) Set the span to 1.5 times the <i>DTS bandwidth</i> . c) Set the RBW to: $3 \text{ kHz} \leq \text{RBW} \leq 100 \text{ kHz}$. d) Set the VBW $\geq 3 \times \text{RBW}$. e) Detector = peak. f) Sweep time = auto couple. g) Trace mode = max hold. h) Allow trace to fully stabilize. i) Use the peak marker function to determine the maximum amplitude level within the RBW. j) If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.	
Reference Clause	Part15 C Section 15.247 (e) RSS-247 5.2(2)	
Parameters recorded during the test	Laboratory Ambient Temperature	25.4 °C
	Relative Humidity	47 %
	Frequency range	Measurement Point
Fully configured sample scanned over the following frequency range	2 402 MHz - 2 480 MHz	Antenna port

Configuration Settings

Power Interface Mode # (See Section 3.3)	EUT Operation Mode # (See Section 3.5)	Test Configurations Mode # (See Section 3.7)
1	1	2
Supplementary information: None		

Limits

§15.247(e) For digitally modulated system, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dB m in any 3 kHz band any time interval of continuous transmission. This power spectral density shall be determined in accordance with the provisions of paragraph (b) of this section. The same method of determining the conducted output power shall be used to determine the power spectral density.

Order Number: 11082230
Model Number: AN-SP700

Page : 23 of 40

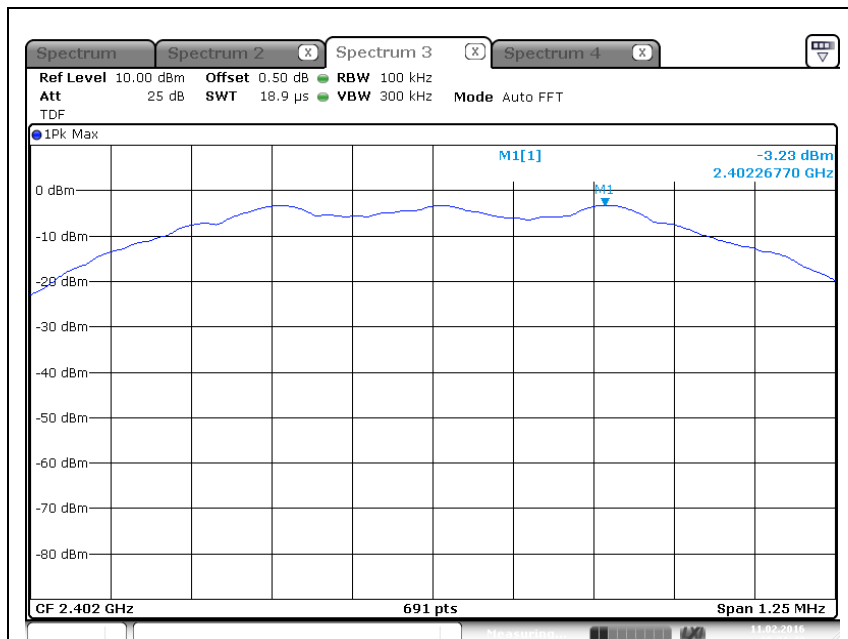
Measurement Result

Table 4. Data Table of Power Spectral Density

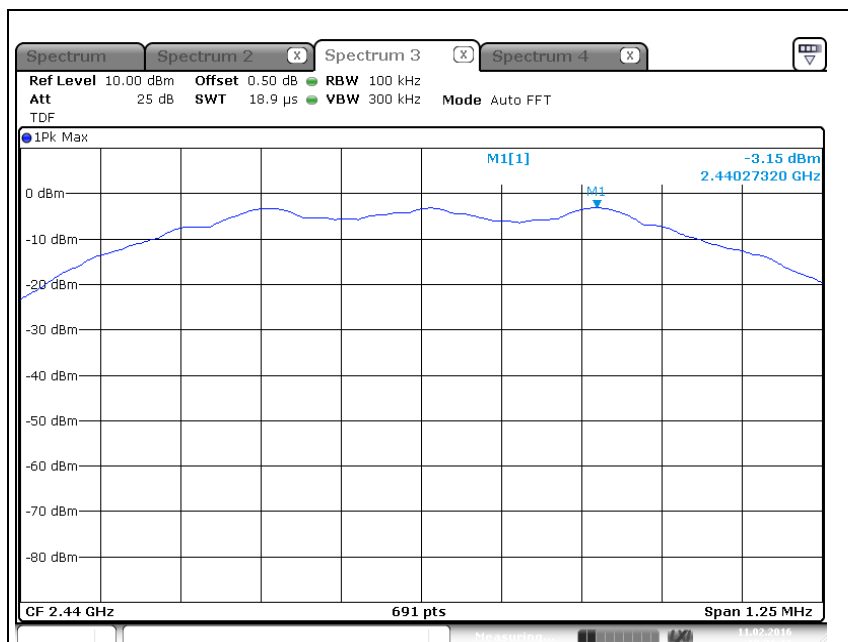
Operating Mode	Data Rate (Mbps)	Channel	Channel Frequency (MHz)	PSD Result (dBm)	Limit (dBm/3kHz)
GFSK	1	Low	2 402	-3.23	8
		Middle	2 440	-3.15	
		High	2 480	-3.48	

Figure 4. Plots of Power Spectral Density

GFSK : Low

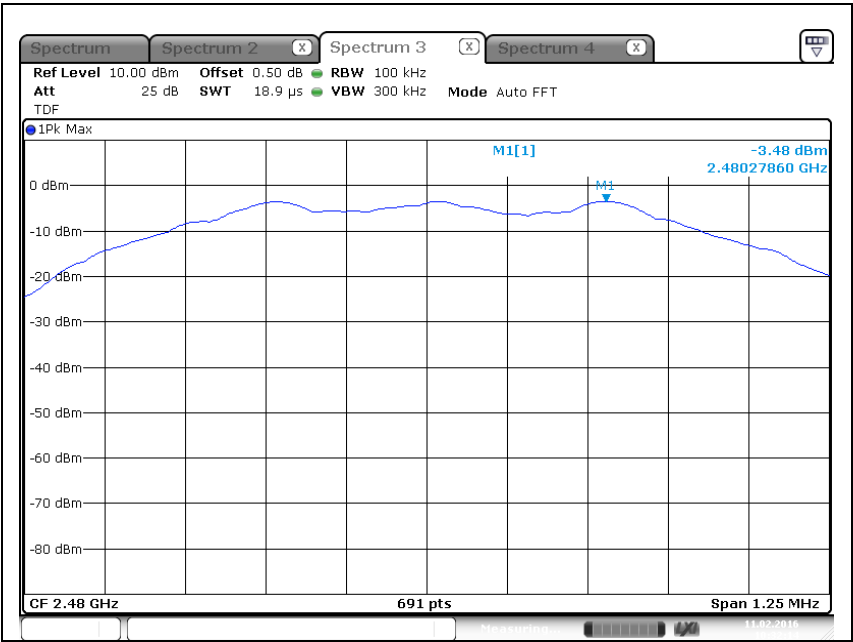


GFSK : Middle



Order Number: 11082230
Model Number: AN-SP700

GFSK : High



5.4. Conducted spurious emission Measurement

TEST: Conducted spurious emission measurement		
Method	a) Set the center frequency and span to encompass frequency range to be measured. b) Set the RBW = 100 kHz. c) Set the VBW $\geq 3 \times$ RBW. d) Detector = peak. e) Sweep time = auto couple. f) Trace mode = max hold. g) Allow trace to fully stabilize. h) Use the peak marker function to determine the maximum amplitude level.	
Reference Clause	Part15 C Section 15.247 (d) RSS-247 5.5 RSS-GEN 8.10	
Parameters recorded during the test	Laboratory Ambient Temperature	25.4 °C
	Relative Humidity	47 %
	Frequency range	Measurement Point
Fully configured sample scanned over the following frequency range	30 MHz – 25 GHz	Antenna port

Configuration Settings

Power Interface Mode # (See Section 3.3)	EUT Operation Mode # (See Section 3.5)	Test Configurations Mode # (See Section 3.7)
1	1	2
Supplementary information: None		

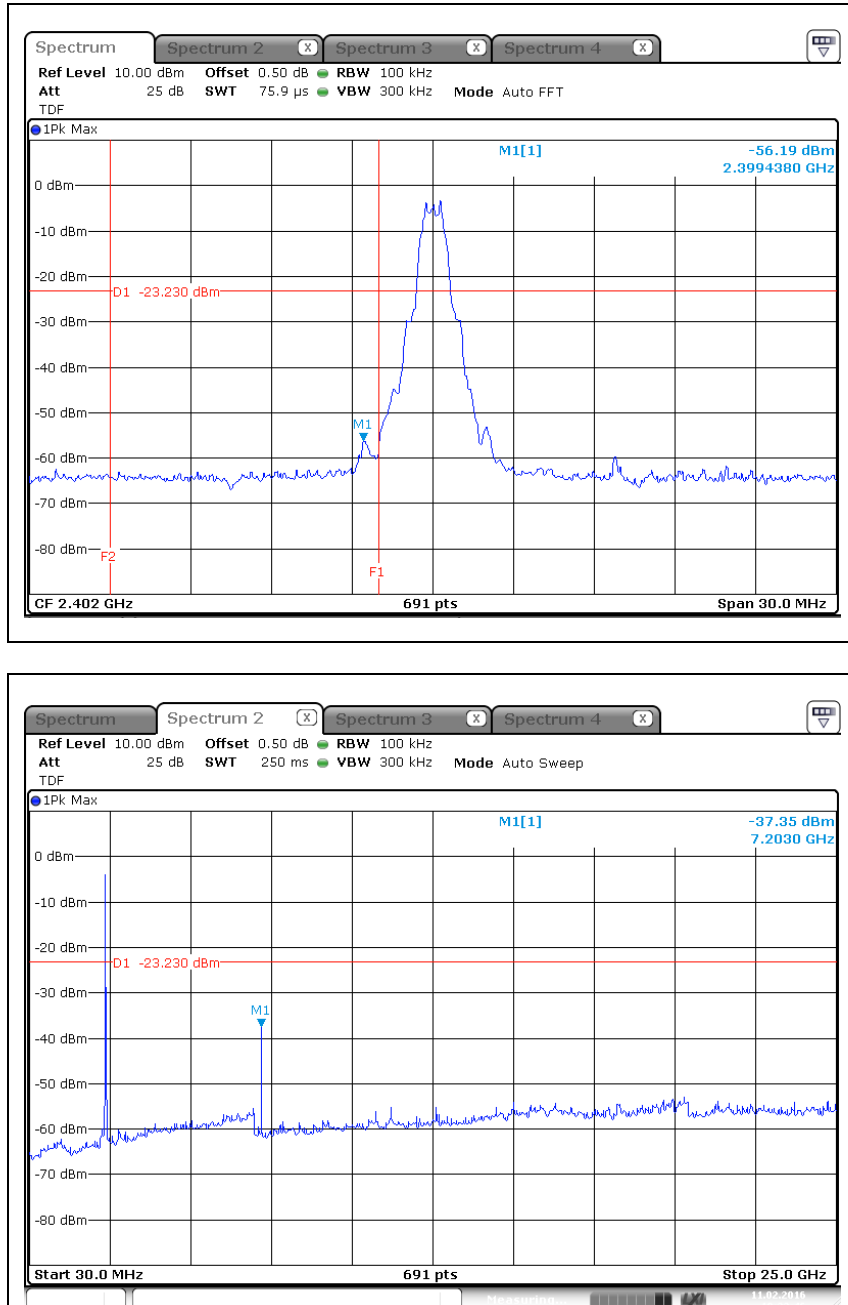
Limits

According to §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. Attenuation below the general limits specified in section §15.209(a) is not required. In addition, radiated emission which in the restricted band, as define in section §15.205(a), must also comply the radiated emission limits specified in section §15.209(a) (see section §15.205(c))

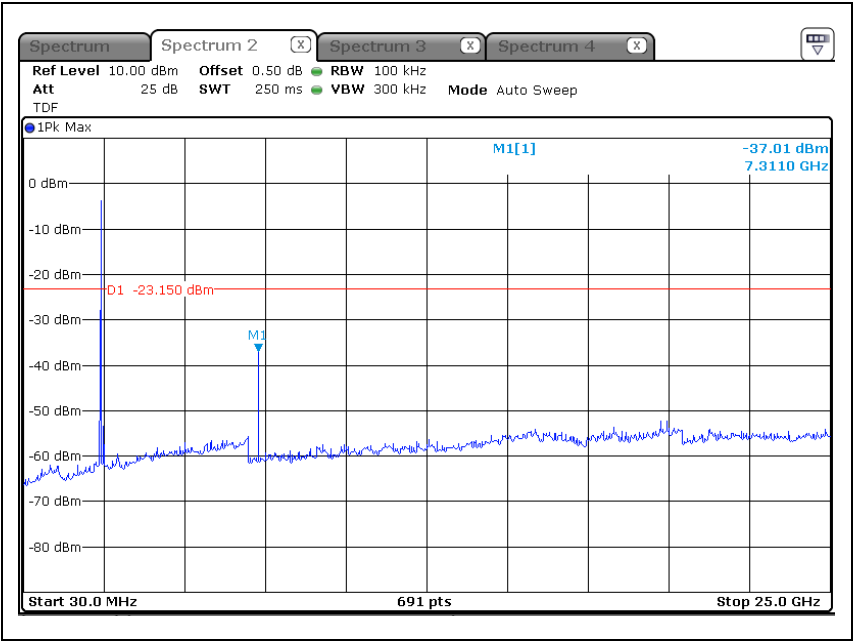
Measurement Results

Figure 5. Plots of Band-Edge and Restricted / Non-Restricted frequency bands

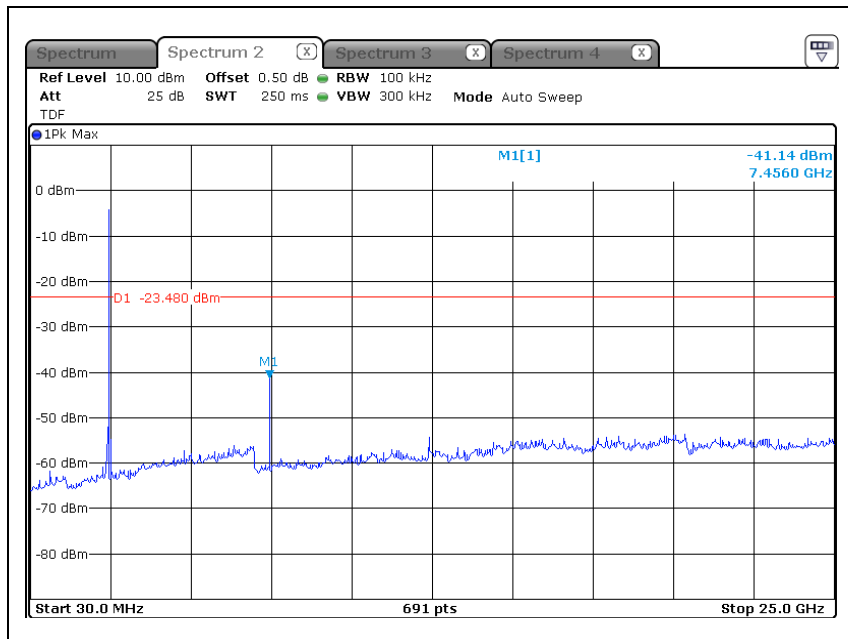
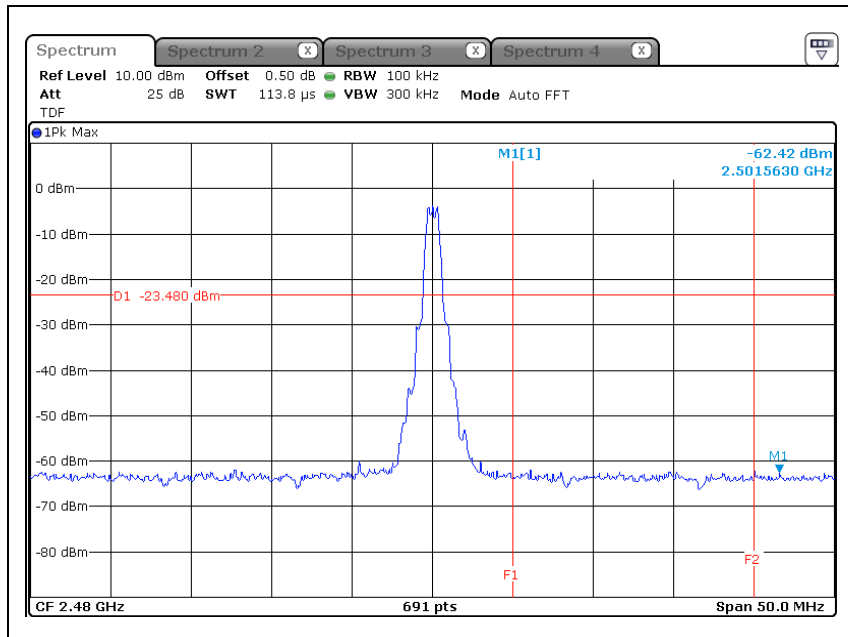
GFSK : Low



GFSK : Middle



GFSK : High



5.5. Radiated Spurious Emissions Measurement

TEST: Radiated spurious emissions measurement		
Method	The EUT is placed on a non-conducting table 80 cm and 150 cm above the ground plane. The antenna to EUT distance is 3 meters. The EUT is configured in accordance with ANSI C63.10 - 2013. The EUT is set to transmit in a continuous mode. For measurements below 1 GHz the resolution bandwidth is set to 100 kHz for peak detection measurements or 120 kHz for quasi-peak detection measurements. Peak detection is used unless otherwise noted as quasi-peak. For measurements above 1 GHz the resolution bandwidth is set to 1 MHz, then the video bandwidth is set to 1 MHz for peak measurements and reduced VBW averaging across on and off times of the EUT transmissions for average measurements. The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in the 2.4 GHz band. The frequency range of interest is monitored at a fixed antenna height and EUT azimuth. The EUT is rotated through 360 degrees to maximize emissions received. The antenna is scanned from 1 to 4 meters above the ground plane to further maximize the emission. Measurements are made with the antenna polarized in both the vertical and the horizontal positions.	
Reference Clause	Part15 C Section 15.205 (a), 15.209(a) RSS-247 5.5/ RSS-GEN 8.9, 8.10	
Parameters recorded during the test	Laboratory Ambient Temperature	25.4 °C
	Relative Humidity	47 %
	Frequency range	Measurement Point
Fully configured sample scanned over the following frequency range	30 MHz – 25 GHz	3 meter chamber

Configuration Settings

Power Interface Mode # (See Section 3.3)	EUT Operation Mode # (See Section 3.5)	Test Configurations Mode # (See Section 3.7)
1	1	3
Supplementary information: None		

Limits

According to §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. In addition, radiated emission which in the restricted band, as define in section §15.205(a), must also comply the radiated emission limits specified in section §15.209(a) (see section §15.205(c))

According to § 15.209(a), the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (MHz)	Distance (meters)	Field Strength (dBuV/m)	Field Strength (uV/m)
30-88	3	40.0	100
88-216	3	43.5	150
216-960	3	46.0	200
Above 960	3	54.0	500

5.5.1. Radiated Spurious Emissions Below 1 GHz

Measurement method : ☒ Radiated ☐ Conducted
Mode of operation : Continuous Wave
Power setting : Max. Power condition declared by the manufacturer
Worst case configuration : GFSK low channel

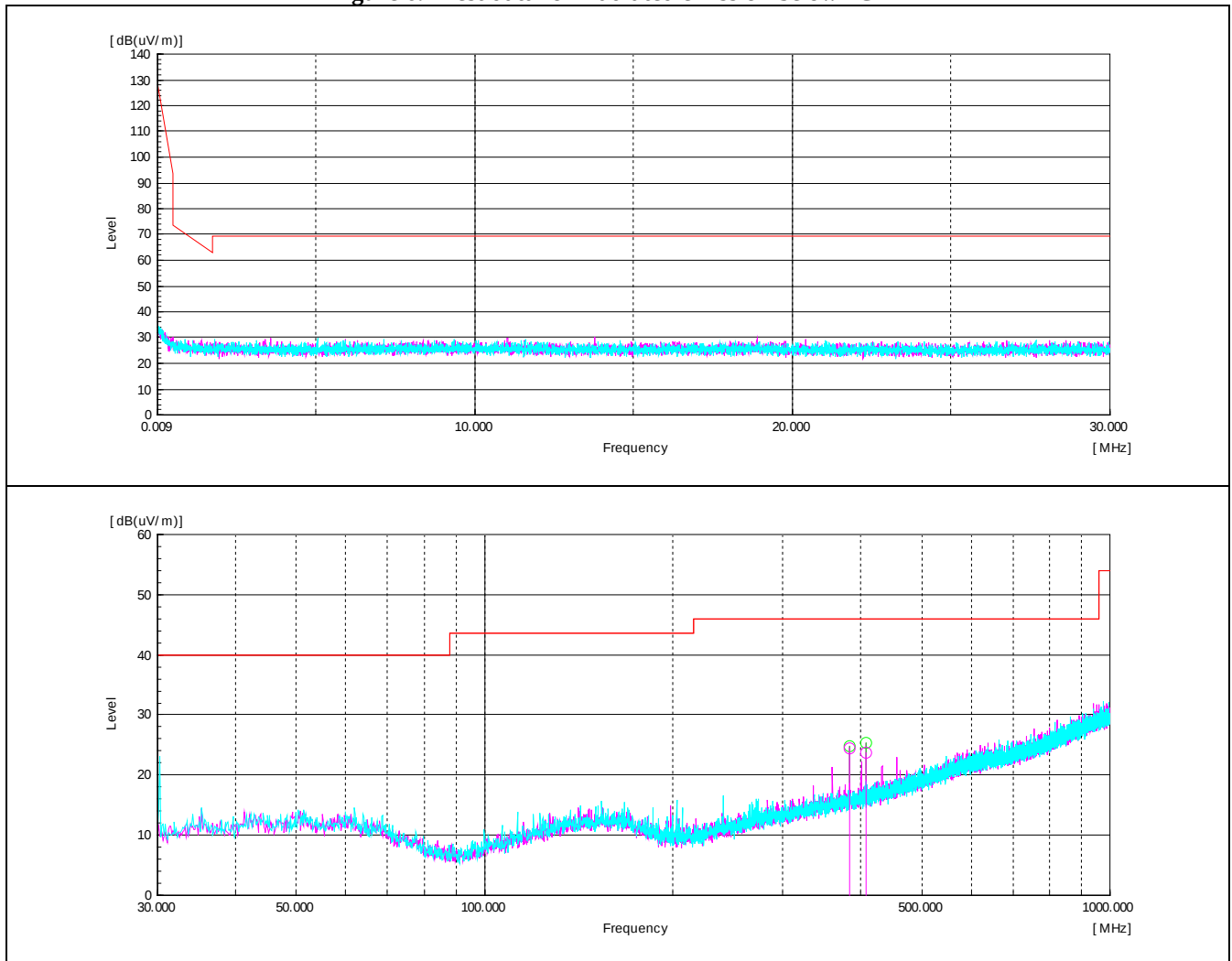
Table 5. Data Table of Radiated emission Below 1 GHz

Frequency [MHz]	Pol.	Detect Mode	Reading [dB(μV)]	Factor [dB]	Level [dB(μV/m)]	Limit [dB(μV/m)]	Margin [dB]
384.05	H	QP	33.2	-8.8	24.4	46.0	21.6
408.06	H	QP	31.9	-8.2	23.7	46.0	22.3

Supplementary information:

- The frequency spectrum from 30 MHz to 1 000 MHz was investigated. Emission levels of 30 dB below than the limit is not reported.
- The worst case is x-axis and reported.
- Factor = AF + CL + AG (AF : Antenna factor, CL : Cable loss, AG: Pre-Amp gain)
- Level = Reading + Factor (Factor = AF + CL + AG)
- Margin = Limit (dBuV/m) - Level (dBuV/m)

Figure 6. Test data for Radiated emission below 1GHz



5.5.2. Radiated Spurious Emissions Above 1 GHz

Measurement method : ☒ Radiated ☐ Conducted
Mode of operation : Continuous Wave
Power setting : Max. Power condition declared by the manufacturer

Table 6. Data Table of Radiated emission Above 1 GHz – Low Channel

Frequency [MHz]	Pol.	Detect Mode	Reading [dB(μV)]	Factor [dB]	Level [dB(μV/m)]	Limit [dB(μV/m)]	Margin [dB]
*2 353.80	H	PK	55.7	-10.5	45.2	74.0	28.8
*2 353.80	H	AV	53.5	-10.5	43.0	54.0	11.0
2 539.50	V	PK	62.2	-10.2	52.0	74.0	22.0
2 539.50	V	AV	52.9	-10.2	42.7	54.0	11.3
4 803.75	H	PK	54.7	-7.5	47.2	74.0	26.8
4 803.75	H	AV	47.3	-7.5	39.8	54.0	14.2
7 205.63	H	PK	58.5	-5.6	52.9	74.0	21.1
7 205.63	H	AV	51.5	-5.6	45.9	54.0	8.1
9 609.37	H	PK	54.2	-2.3	51.9	74.0	22.1
9 609.37	H	AV	46.2	-2.3	43.9	54.0	10.1
13 886.25	H	PK	47.9	1.9	49.8	74.0	24.2
13 886.25	H	AV	40.2	1.9	42.1	54.0	11.9
14 415.00	V	PK	50.1	1.3	51.4	74.0	22.6
14 415.00	V	AV	42.8	1.3	44.1	54.0	9.9

Table 7. Data Table of Radiated emission Above 1 GHz – Middle Channel

Frequency [MHz]	Pol.	Detect Mode	Reading [dB(μV)]	Factor [dB]	Level [dB(μV/m)]	Limit [dB(μV/m)]	Margin [dB]
4 878.75	H	PK	54.6	-7.6	47.0	74.0	27.0
4 878.75	H	AV	52.3	-7.6	44.7	54.0	9.3
5 973.75	H	PK	57.4	-7.4	50.0	74.0	24.0
5 973.75	H	AV	50.8	-7.4	43.4	54.0	10.6
7 318.13	H	PK	59.3	-5.6	53.7	74.0	20.3
7 318.13	H	AV	52.8	-5.6	47.2	54.0	6.8
9 761.25	V	PK	54.8	-1.6	53.2	74.0	20.8
9 761.25	V	AV	46.2	-1.6	44.6	54.0	9.4
12 202.50	V	PK	54.1	-2.7	51.4	74.0	22.6
12 202.50	V	AV	49.3	-2.7	46.6	54.0	7.4
14 637.12	V	PK	49.6	0.6	50.2	74.0	23.8
14 637.12	V	AV	41.7	0.6	42.3	54.0	11.7
4 878.75	H	PK	54.6	-7.6	47.0	74.0	27.0
4 878.75	H	AV	52.3	-7.6	44.7	54.0	9.3

Table 8. Data Table of Radiated emission Above 1 GHz – High Channel

Frequency [MHz]	Pol.	Detect Mode	Reading [dB(μV)]	Factor [dB]	Level [dB(μV/m)]	Limit [dB(μV/m)]	Margin [dB]
2 539.25	V	PK	61.1	-10.2	50.9	74.0	23.1
2 539.25	V	AV	49.7	-10.2	39.5	54.0	14.5
*2 492.43	V	PK	51.8	-10.3	41.5	74.0	32.5
*2 492.43	V	AV	41.3	-10.3	31.0	54.0	23.0
2 392.25	V	PK	61.1	-10.5	50.6	74.0	23.4
2 392.25	V	AV	52.7	-10.5	42.2	54.0	11.8
4 959.38	H	PK	55.7	-7.6	48.1	74.0	25.9
4 959.38	H	AV	45.6	-7.6	38.0	54.0	16.0
7 438.13	V	PK	62.9	-5.6	57.3	74.0	16.7
7 438.13	V	AV	56.3	-5.6	50.7	54.0	3.3
9 918.75	V	PK	54.0	-1.2	52.8	74.0	21.2
9 918.75	V	AV	46.2	-1.2	45.0	54.0	9.0

Supplementary information:

- The frequency spectrum from 1 000 MHz to 25 000 MHz was investigated. Emission levels of 30 dB below than the limit is not reported.
- No other spurious and harmonic emissions were found greater than listed emissions on above table.
- The worst case is x-axis and reported.
- * means restricted band
- Factor = AF + CL + AG (AF : Antenna factor, CL : Cable loss, AG: Pre-Amp gain)
- Level = Reading + Factor (Factor = AF + CL + AG)
- Margin = Limit (dBuV/m) - Level (dBuV/m)

5.5.3. Radiated Spurious Emissions Above 1 GHz

Measurement method : ☒ Radiated ☐ Conducted
Mode of operation : Continuous Wave
Power setting : Max. Power condition declared by the manufacturer

Figure 7. GFSK : Low – Restricted Bands

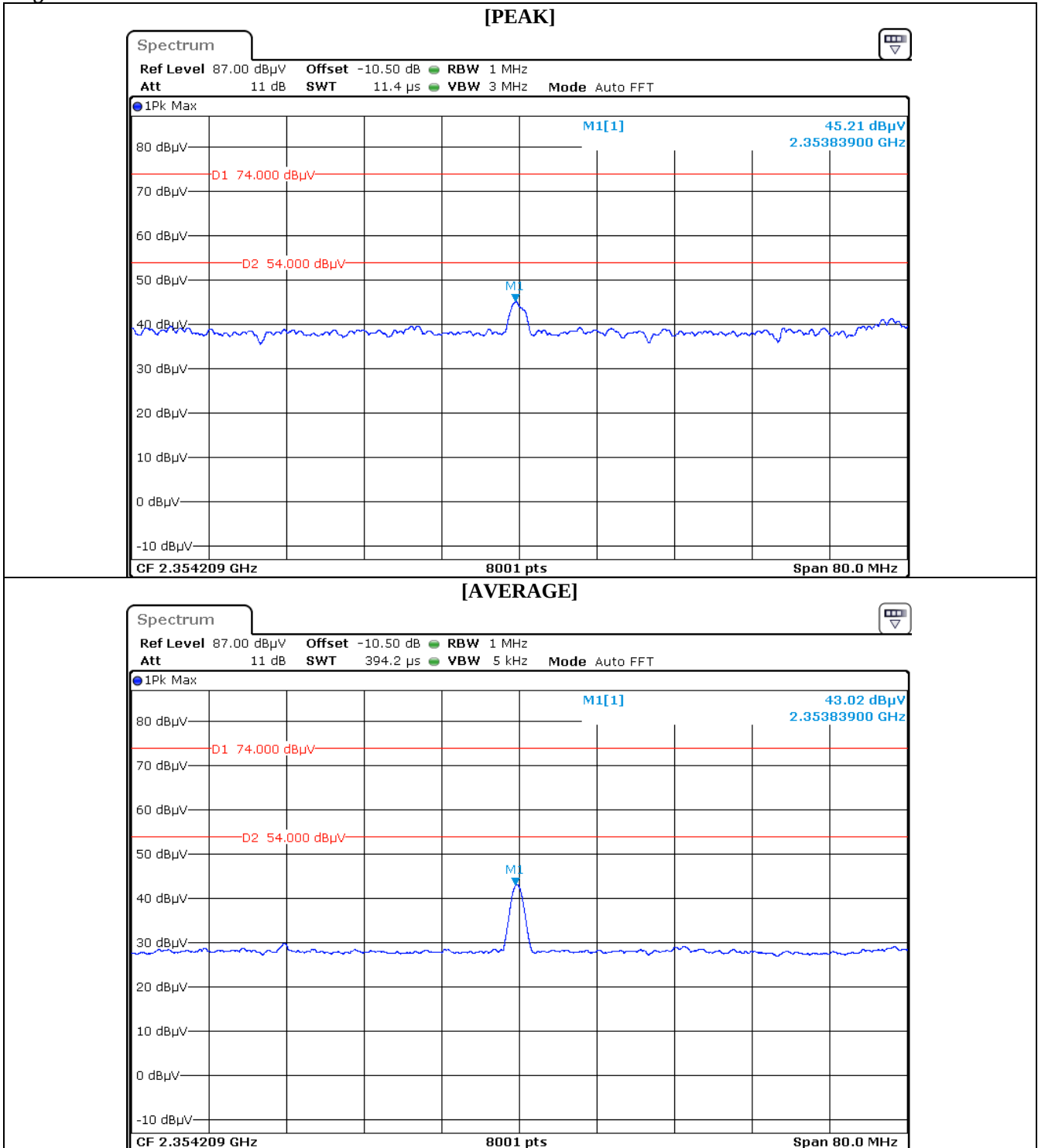


Figure 8. GFSK : High – Restricted Bands

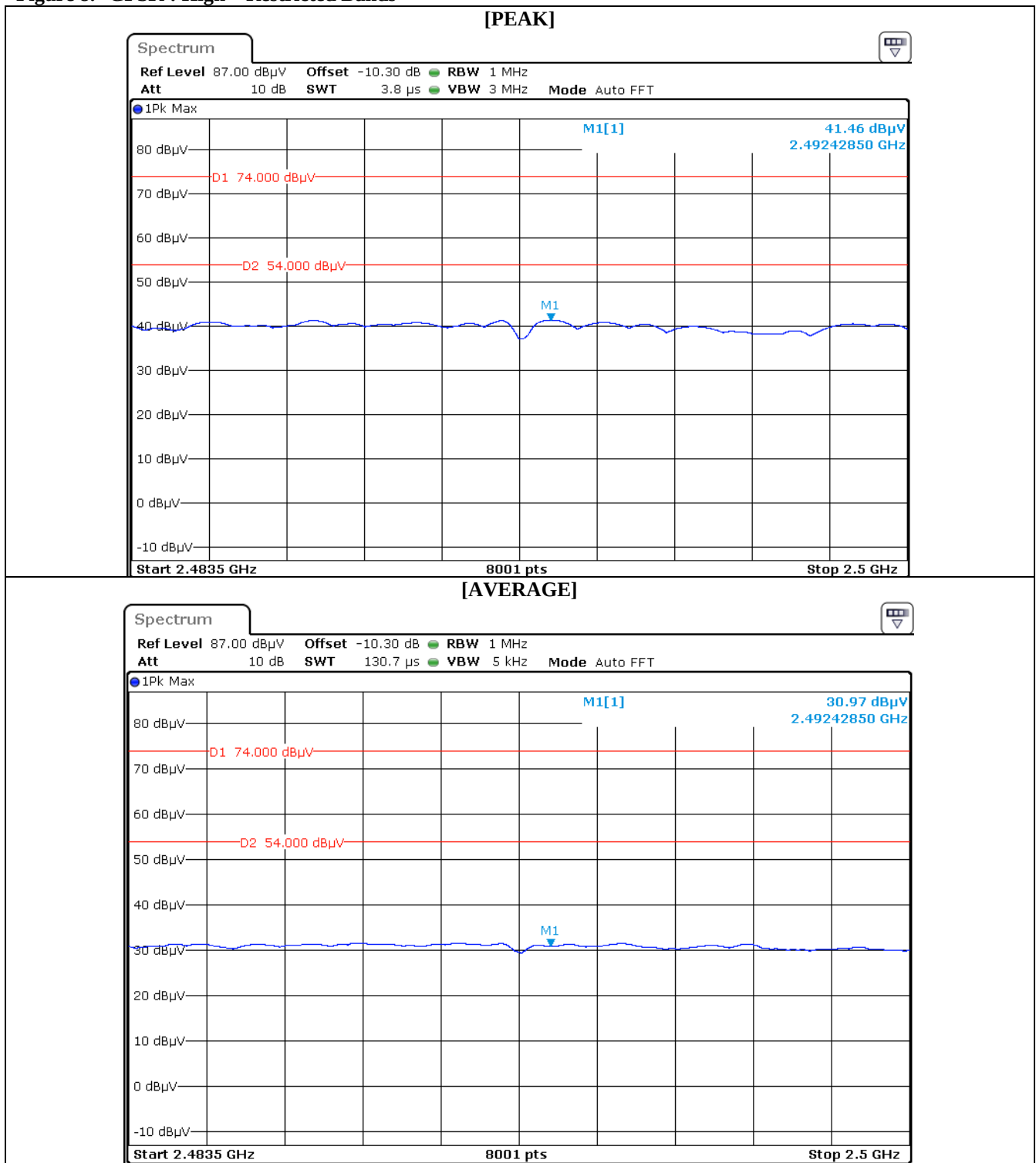


Figure 9. GFSK : Low

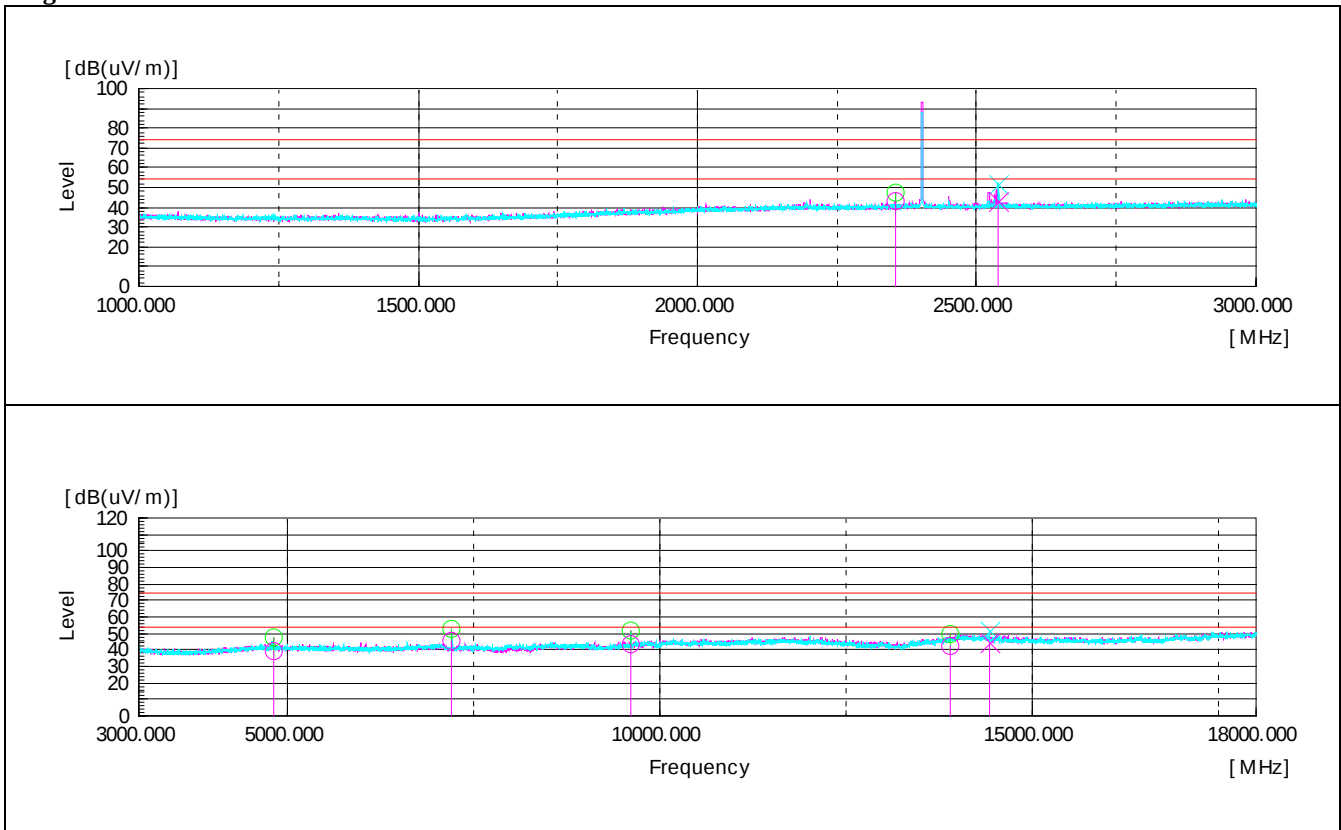


Figure 10. GFSK: Mid

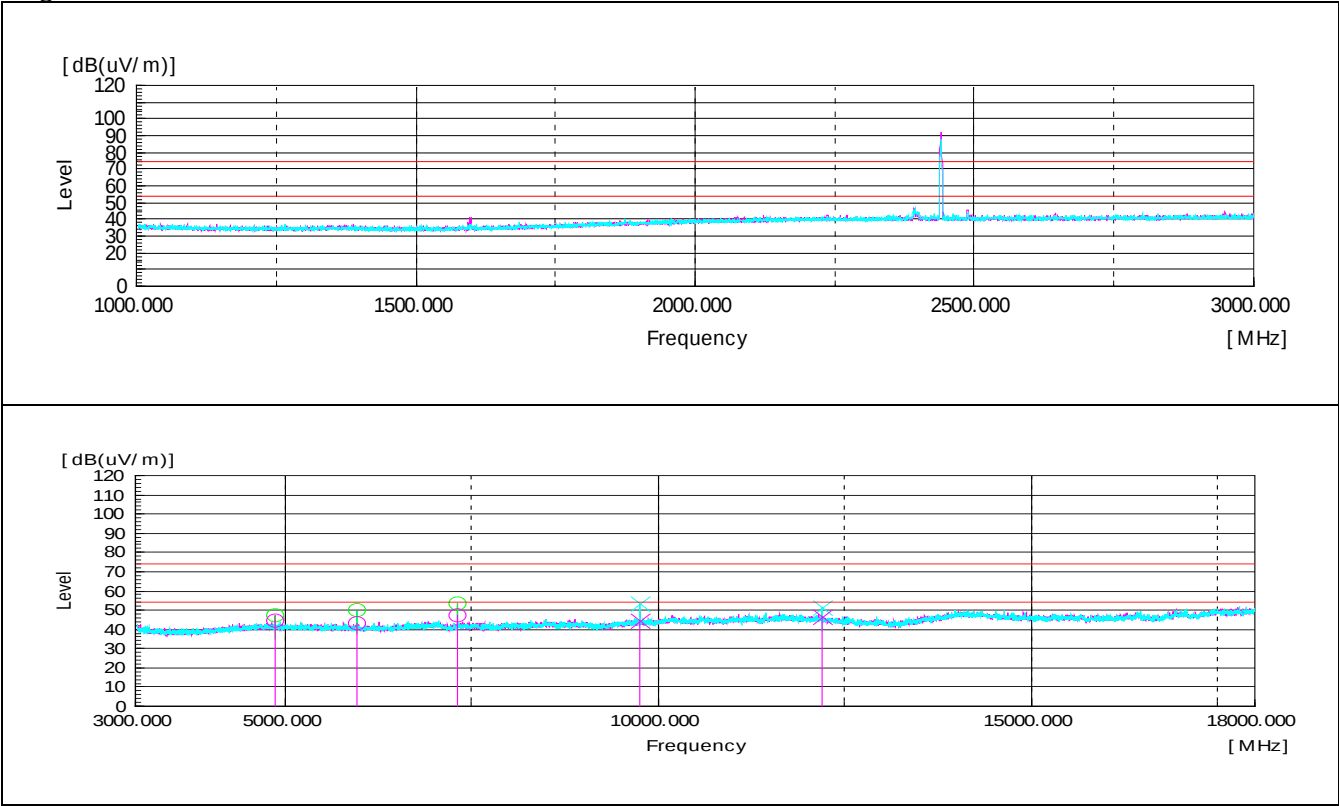
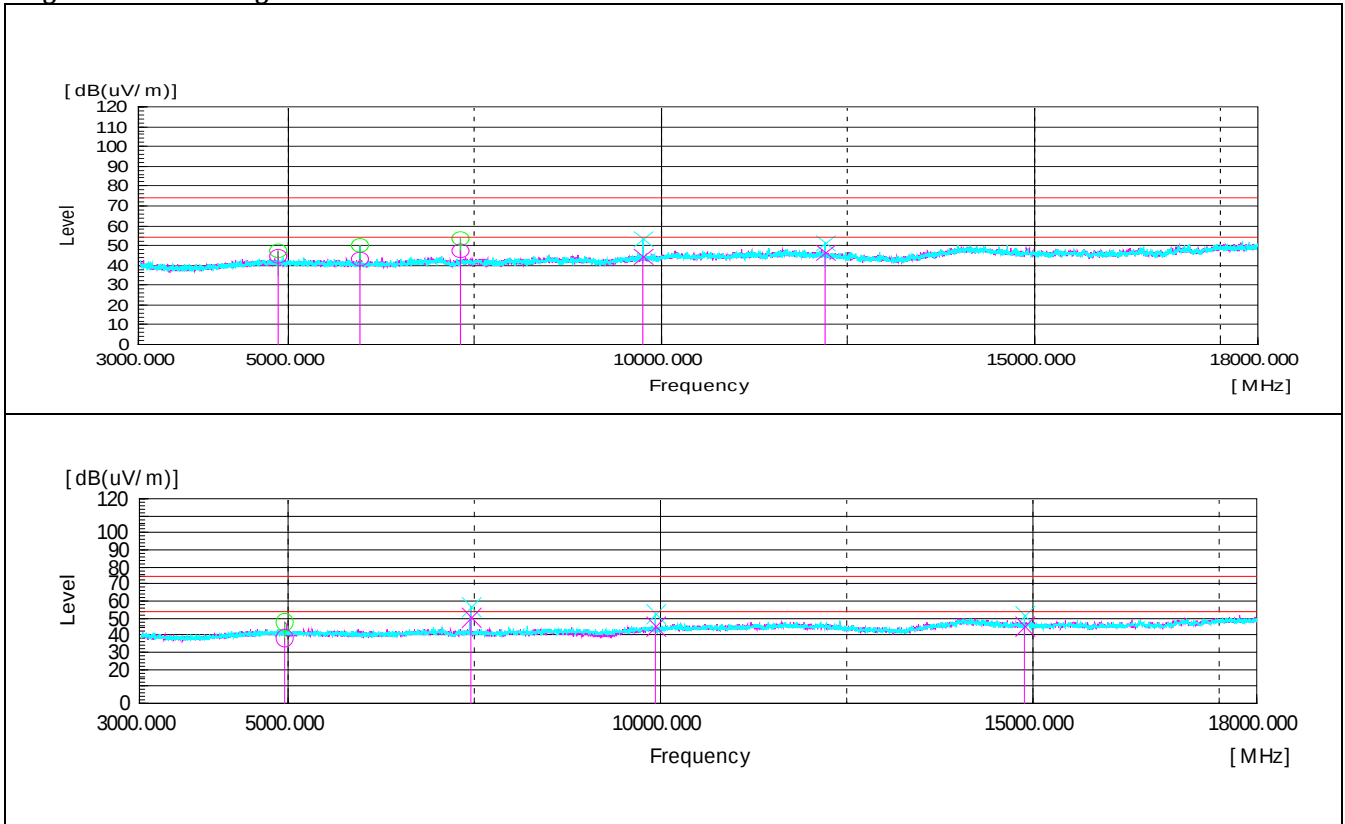


Figure 11. GFSK: High



5.6. Antenna Requirement

5.6.1. Standard Applicable

For intentional device, according to FCC 47 CFR Section §15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. And according to FCC 47 CFR Section § 15.247 (b), if transmitting antennas of directional gain greater than 6 dBi are used, the power shall be reduced by the amount in Db that the gain of the antenna exceeds 6 dBi.

5.6.2. Antenna Connected Construction

The antenna used of this product is Metal Stamping Antenna Assembly and peak max gain of each antennas as below . :

Band	2 402 – 2 480 MHz
Antenna Gain (dBi)	2.97

APPENDIX A. Accreditations and Authorizations

KCTL Inc. has been accredited / filed / authorized by the agencies listed in the following table;

Certificate	Nation	Agency	Code	Mark
Accreditation	Korea	KOLAS	No. 85	ISO/IEC 17025
Site Filing	USA	FCC	KR0013	Test Facility list & NSA Data
Certification	Korea	KC	KR0013	Test Facility list & NSA Data

Quality control in the testing laboratory is implemented as per ISO/IEC 17025 which is the “General requirements for the competent of calibration and testing laboratory”.

APPENDIX B - MEASUREMENT UNCERTAINTIES

Measurement Item	Expanded Uncertainty $U = kU_c (k = 2)$	
Conducted RF power	1.30 dB	
Conducted Spurious Emissions	1.52 dB	
Radiated Spurious Emissions	30 MHz ~ 300 MHz:	+ 4.94 dB, - 5.06 dB
		+ 4.93 dB, - 5.05 dB
	300 MHz ~ 1 000 MHz:	+ 4.97 dB, - 5.08 dB
		+ 4.84 dB, - 4.96 dB
	1 GHz ~ 25 GHz:	+ 6.03 dB, - 6.05 dB
Conducted Emissions	9 kHz ~ 150 kHz:	3.75 dB
	150 kHz ~ 30 MHz:	3.36 dB