



TESTING LABORATORY
CERTIFICATE # 4297.01

ATC

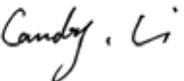
FCC PART 15.247 TEST REPORT

For

MPS MAYORISTA DE COLOMBIA S.A.

Autop Bog Medellin Km2.5 Parque Emp. Tecnologico, Cota, Colombia

FCC ID: 2AHVR1100AS

Report Type: Original Report	Product Type: Tablet PC
Report Number: <u>RSZ201216802-00B</u>	
Report Date: <u>2020-12-28</u>	
	
Reviewed By: <u>RF Engineer</u>	
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GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

Product	Tablet PC
Tested Model	1100AS
Multiple Model	1100AS+, AS1100, AS1000+
Model Differences	Only model name is different.
Frequency Range	Bluetooth: 2402~2480MHz
Maximum conducted Peak output power	Bluetooth: 5.17dBm
Modulation Technique	Bluetooth: GFSK, $\pi/4$ -DQPSK, 8DPSK
Antenna Specification*	Internal Antenna: -3.5dBi(provided by the applicant)
Voltage Range	DC3.7V from battery or DC 5.0V from adapter
Date of Test	2020-12-17 to 2020-12-28
Sample number	RSZ201216802-RF-S1(Assigned by ATC)
Received date	2020-12-17
Sample/EUT Status	Good condition
Adapter information	Model: JKX-777 INPUT: 100-240VAC, 50/60Hz, 0.5A max OUTPUT: 5V, 2000mA

Objective

This test report is in accordance with Part 2-Subpart J, Part 15-Subparts A and C of the Federal Communication Commission rules.

The tests were performed in order to determine compliance with FCC Part 15, Subpart C, section 15.203, 15.205, 15.207, 15.209 and 15.247 rules.

Test Methodology

All measurements contained in this report were conducted with ANSI C63.10-2013, American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices.

For Radiated Emissions testing, please refer to DA 00-705 Released March 30, 2000, Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems.

All emissions measurement was performed at Shenzhen Accurate Technology Co., Ltd. The radiated testing was performed at an antenna-to-EUT distance of 3 meters.

Measurement Uncertainty

Parameter	Uncertainty	
AC Power Lines Conducted Emissions	±2.72dB	
Emissions, Radiated	30MHz - 1GHz	±4.28dB
	1GHz- 18GHz	±4.98dB
	18GHz- 26.5GHz	±5.06dB

Note: The extended uncertainty given in this report is obtained by combining the standard uncertainty times the coverage factor K with the 95% confidence interval. Otherwise required by the applicant or Product Regulations, Decision Rule in this report did not consider the uncertainty.

Test Facility

The test site used by Shenzhen Accurate Technology Co., Ltd. to collect test data is located on the 1/F., Building A, Changyuan New Material Port, Science & Industry Park, Nanshan District, Shenzhen, Guangdong, P.R. China.

The test site has been approved by the FCC under the KDB 974614 D01 and is listed in the FCC Public Access Link (PAL) database, FCC Registration No.: 708358, the FCC Designation No.: CN1189. Accredited by American Association for Laboratory Accreditation (A2LA) The Certificate Number is 429 7.01.

Listed by Innovation, Science and Economic Development Canada (ISED), the Registration Number is 5077A-2

SYSTEM TEST CONFIGURATION

Description of Test Configuration

The system was configured for testing in an engineering mode.

EUT Exercise Software

Engineering mode and power level is default.

Special Accessories

No special accessory.

Equipment Modifications

No modification was made to the EUT tested.

Support Equipment List and Details

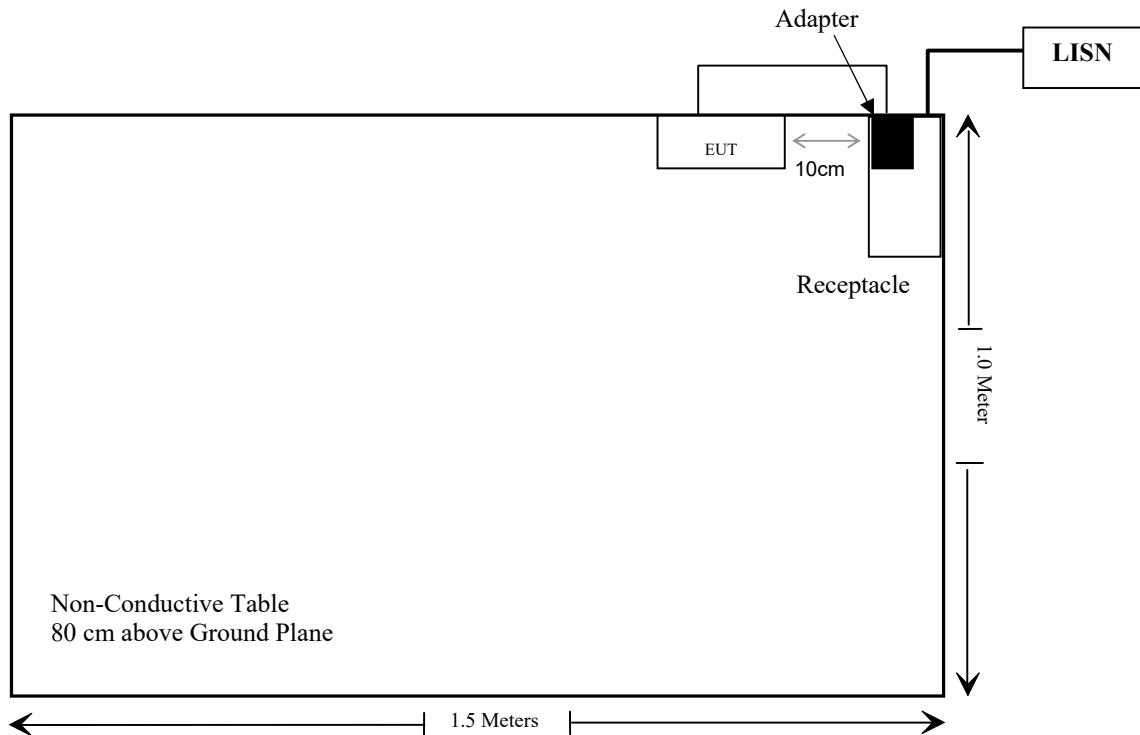
Manufacturer	Description	Model	Serial Number
/	/	/	/

External I/O Cable

Cable Description	Length (m)	From Port	To
Un-Shielding Detachable USB Cable	0.96	Adapter	EUT

Block Diagram of Test Setup

For conducted emission:



SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result
§15.247 (i), §1.1307 (b) (1)& §2.1093	RF Exposure	Compliance
§15.203	Antenna Requirement	Compliance
§15.207(a)	AC Line Conducted Emissions	Compliance
§15.205, §15.209 & §15.247(d)	Radiated Emissions	Compliance
§15.247(a)(1)	20 dB Emission Bandwidth & 99% Occupied Bandwidth	Compliance
§15.247(a)(1)	Channel Separation Test	Compliance
§15.247(a)(1)(iii)	Time of Occupancy (Dwell Time)	Compliance
§15.247(a)(1)(iii)	Quantity of hopping channel Test	Compliance
§15.247(b)(1)	Peak Output Power Measurement	Compliance
§15.247(d)	Band edges	Compliance

TEST EQUIPMENT LIST

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	Spectrum Analyzer	FSV-40	101495	2020/01/04	2021/01/03
Rohde & Schwarz	Open Switch and Control Unit	OSP120 +OSP-B157	101244 + 100866	2020/01/04	2021/01/03
Rohde & Schwarz	Test Receiver	ESPI	100396/003	2020/01/04	2021/01/03
Rohde & Schwarz	Test Receiver	ESCS30	100307	2020/01/04	2021/01/03
Schwarzbeck	L.I.S.N.	NLSK8126	8126431	2020/01/04	2021/01/03
Rohde & Schwarz	Pulse Limiter	ESH3-Z2	100815	2020/01/04	2021/01/03
Anritsu Corp	50Ω Coaxial Switch	MP59B	6200283936	2020/01/04	2021/01/03
Schwarzbeck	Horn Antenna	BBHA9120D	9120D-1067	2020/01/05	2021/01/04
Schwarzbeck	HORN ANTENNA	BBHA9170	9170-359	2020/01/05	2023/01/04
Rohde&Schwarz	Pre-Amplifier	CBLU1183540-01	3791	2020/01/04	2021/01/03
Quinstar	Amplifier	QLW-184055 36-J0	15964001002	2020/11/28	2021/11/27
Rohde&Schwarz	Spectrum Analyzer	FSV40	101495	2020/01/04	2021/01/03
Rohde& Schwarz	Test Receiver	ESR	101817	2020/01/04	2021/01/03
Agilent	Pre-Amplifier	8447D	2944A10619	2020/01/04	2021/01/03
Anritsu Corp	50 Coaxial Switch	MP59B	6100237248	2020/01/04	2021/01/03
Schwarzbeck	Bilog Antenna	VULB9163	9163-323	2020/01/05	2021/01/04

*** Statement of Traceability:** Shenzhen Accurate Technology Co., Ltd. attests that all calibrations have been performed in accordance to requirements that traceable to National Primary Standards and International System of Units (SI).

FCC§15.247 (i), §1.1307 (b) (1) &§2.1093 – RF EXPOSURE**Applicable Standard**

According to FCC §2.1093 and §1.1307(b) (1), systems operating under the provisions of this section shall be operated in a manner that ensure that the public is not exposed to radio frequency energy level in excess of the Commission's guideline.

According to KDB 447498 D01 General RF Exposure Guidance

The 1-g and 10-g SAR test exclusion thresholds for 100 MHz to 6 GHz at test separation distances ≤ 50 mm are determined by:

$[(\text{max. power of channel, including tune-up tolerance, mW}) / (\text{min. test separation distance, mm})] \cdot [\sqrt{f(\text{GHz})}] \leq 3.0 \text{ for 1-g SAR and } \leq 7.5 \text{ for 10-g extremity SAR, where}$

1. $f(\text{GHz})$ is the RF channel transmit frequency in GHz.

2. Power and distance are rounded to the nearest mW and mm before calculation.

3. The result is rounded to one decimal place for comparison.

4. When the minimum test separation distance is < 5 mm, a distance of 5 mm is applied to determine SAR test Exclusion.

For worst case:

Frequency (MHz)	Maximum Tune-up power		Calculated Distance (mm)	Calculated Value	Threshold (1-g SAR)	SAR Test Exclusion
	(dBm)	(mW)				
2480	5.5	3.55	5	1.1	3.0	Yes

Result: No Standalone SAR test is required

FCC §15.203 – ANTENNA REQUIREMENT

Applicable Standard

According to FCC § 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. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this Section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

Antenna Connector Construction

The EUT has one internal antenna arrangement, which was permanently attached and the antenna gain is -3.5 dBi, fulfill the requirement of this section. Please refer to the EUT photos.

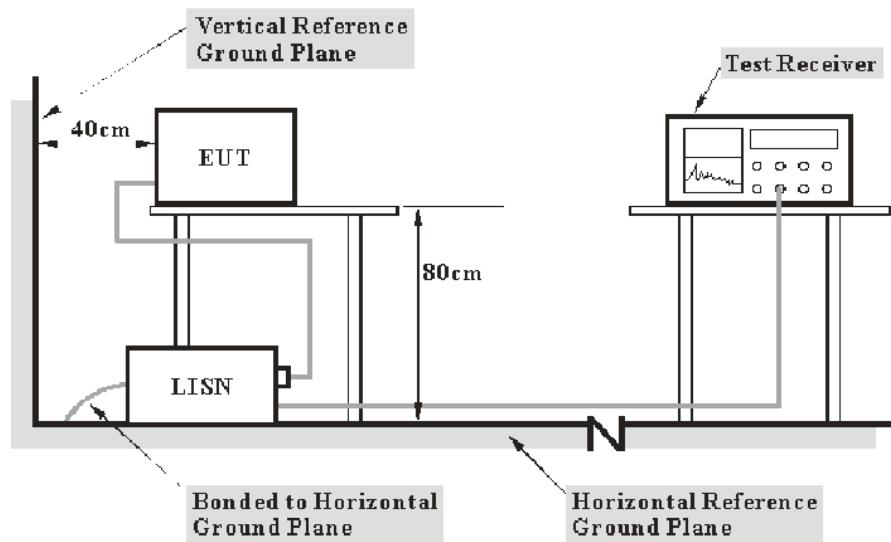
Result: Compliance.

FCC §15.207 (a) – AC LINE CONDUCTED EMISSIONS

Applicable Standard

FCC §15.207(a)

EUT Setup



Note: 1. Support units were connected to second LISN.
 2. Both of LISNs (AMN) 80 cm from EUT and at the least 80 cm from other units and other metal planes support units.

The measurement procedure of EUT setup is according with ANSI C63.10-2013. The related limit was specified in FCC Part 15.207.

The spacing between the peripherals was 10 cm.

EMI Test Receiver Setup

The EMI test receiver was set to investigate the spectrum from 150 kHz to 30 MHz.

During the conducted emission test, the EMI test receiver was set with the following configurations:

Frequency Range	IF B/W
150 kHz – 30 MHz	9 kHz

Test Procedure

During the conducted emission test, the device was connected to the outlet of the LISN.

Maximizing procedure was performed on the six (6) highest emissions of the EUT.

All final data was recorded in the Quasi-peak and average detection mode.

Transd Factor & Margin Calculation

The Transd factor is calculated by adding LISN VDF (Voltage Division Factor), Cable Loss and Transient Limiter Attenuation. The basic equation is as follows:

$$\text{Transd Factor} = \text{LISN VDF} + \text{Cable Loss}$$

The “Margin” column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of 7 dB means the emission is 7 dB below the limit. The equation for margin calculation is as follows:

$$\text{Margin} = \text{Limit} - \text{level}$$

$$\text{Level} = \text{reading level} + \text{Transd Factor}$$

Test Data

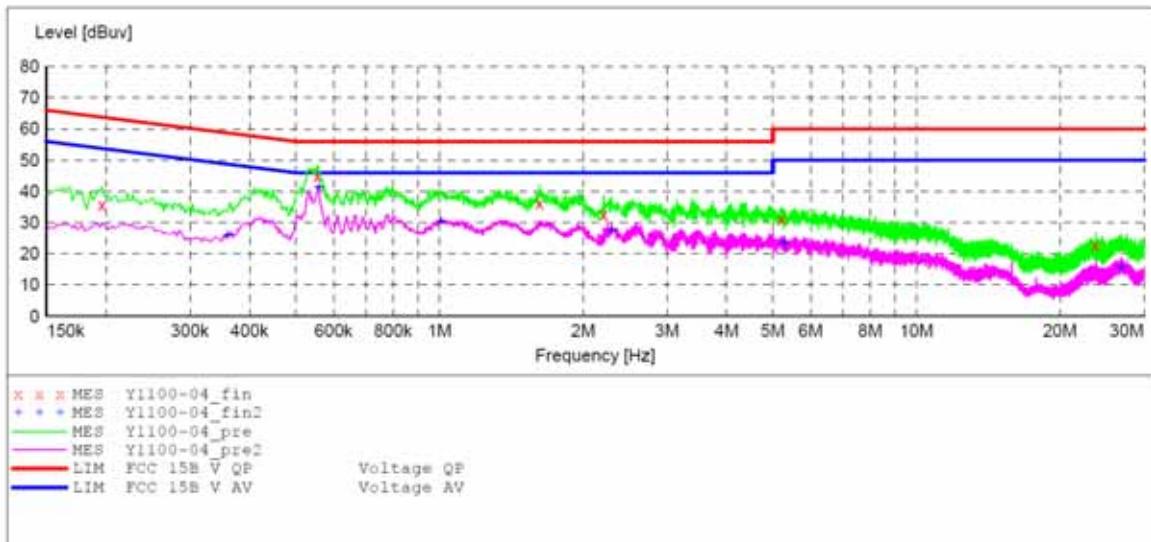
Environmental Conditions

Temperature:	24 °C
Relative Humidity:	48 %
ATM Pressure:	101.0 kPa

The testing was performed by Fan Yang on 2020-12-28.

EUT operation mode: Transmitting (the worst case is GFSK Mode, Middle channel)

AC 120V/60 Hz, Line

**MEASUREMENT RESULT: "Y1100-04_fin"**

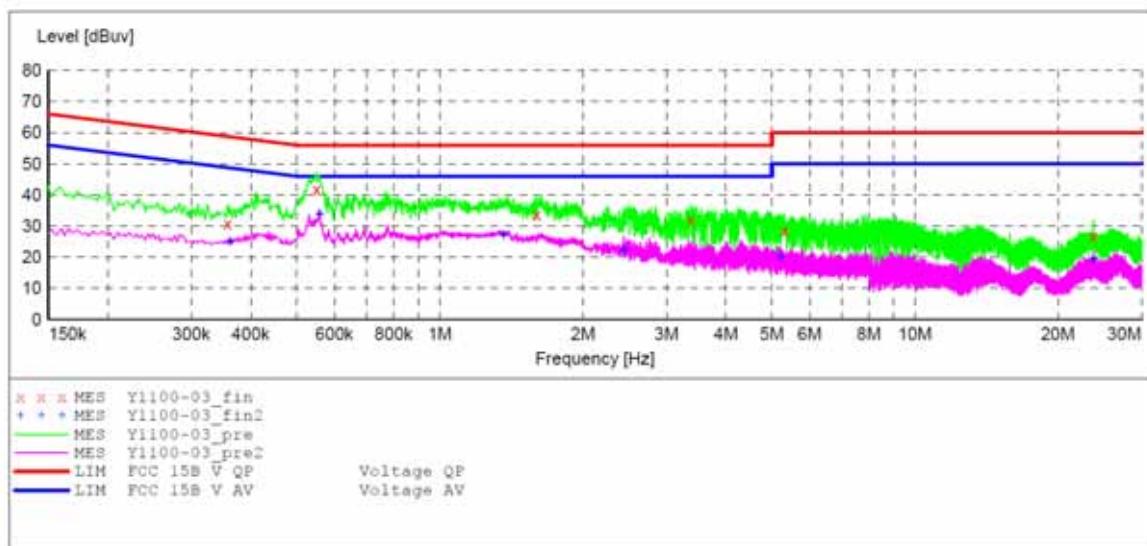
2020-12-28 11:11

Frequency MHz	Level dBuv	Transd dB	Limit dBuv	Margin dB	Detector	Line	PE
0.196000	35.60	10.8	64	28.4	QP	L1	GND
0.554000	44.90	11.0	56	11.1	QP	L1	GND
1.620000	36.00	11.2	56	20.0	QP	L1	GND
2.210000	32.70	11.3	56	23.3	QP	L1	GND
5.210000	30.90	11.4	60	29.1	QP	L1	GND
23.745000	22.50	11.7	60	37.5	QP	L1	GND

MEASUREMENT RESULT: "Y1100-04_fin2"

2020-12-28 11:11

Frequency MHz	Level dBuv	Transd dB	Limit dBuv	Margin dB	Detector	Line	PE
0.360000	25.80	10.9	49	23.2	AV	L1	GND
0.558000	41.30	11.0	46	4.7	AV	L1	GND
1.006000	30.50	11.1	46	15.5	AV	L1	GND
2.295000	27.50	11.3	46	18.5	AV	L1	GND
5.275000	23.40	11.4	50	26.6	AV	L1	GND
26.825000	15.70	11.8	50	34.3	AV	L1	GND

AC 120V/60 Hz, Neutral**MEASUREMENT RESULT: "Y1100-03_fin"**

2020-12-28 11:09

Frequency MHz	Level dBuv	Transd dB	Limit dBuv	Margin dB	Detector	Line	PE
0.358000	30.70	10.9	59	28.3	QP	N	GND
0.550000	41.70	11.0	56	14.3	QP	N	GND
1.596000	33.50	11.2	56	22.5	QP	N	GND
3.375000	31.90	11.4	56	24.1	QP	N	GND
5.315000	28.50	11.4	60	31.5	QP	N	GND
23.755000	26.60	11.7	60	33.4	QP	N	GND

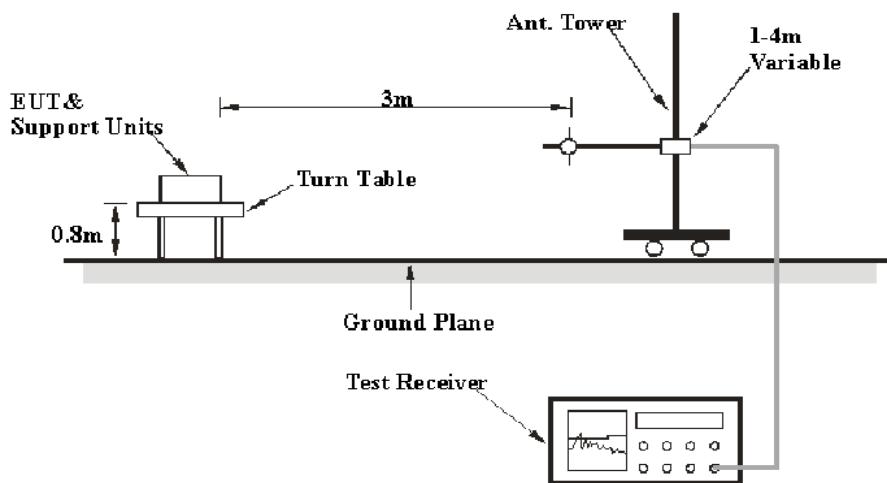
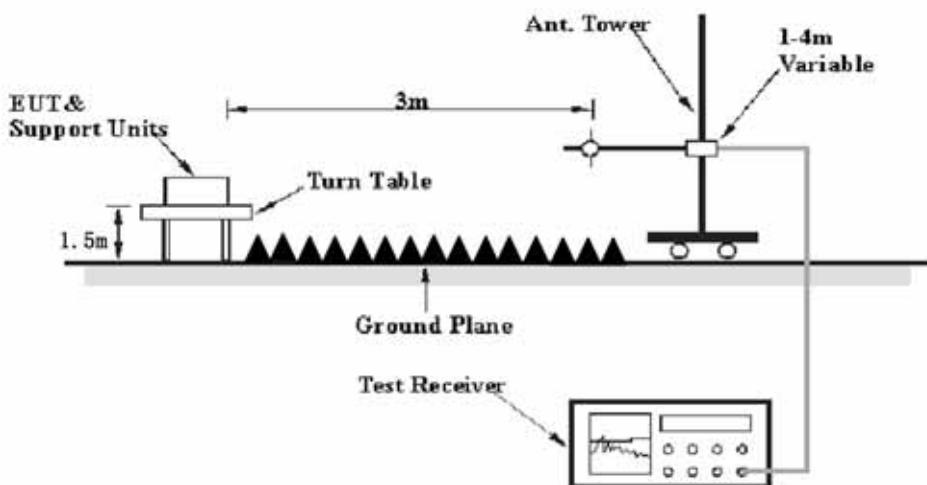
MEASUREMENT RESULT: "Y1100-03_fin2"

2020-12-28 11:09

Frequency MHz	Level dBuv	Transd dB	Limit dBuv	Margin dB	Detector	Line	PE
0.362000	25.20	10.9	49	23.8	AV	N	GND
0.558000	33.80	11.0	46	12.2	AV	N	GND
1.362000	26.90	11.2	46	19.1	AV	N	GND
2.440000	22.40	11.3	46	23.6	AV	N	GND
5.210000	20.00	11.4	50	30.0	AV	N	GND
23.755000	19.40	11.7	50	30.6	AV	N	GND

FCC §15.205, §15.209 & §15.247(d) – RADIATED EMISSIONS**Applicable Standard**

FCC §15.205; §15.209; §15.247(d)

EUT Setup**Below 1 GHz:****Above 1GHz:**

The radiated emission tests were performed in the 3 meters, using the setup accordance with the ANSI C63.10-2013. The specification used was the FCC 15.209 and FCC 15.247 limits.

EMI Test Receiver & Spectrum Analyzer Setup

During the radiated emission test, according to the DA 00-705 Released March 30, 2000, the EMI test receiver & Spectrum Analyzer Setup were set with the following configurations:

Frequency Range	RBW	Video B/W	IF B/W	Measurement
30 MHz – 1000 MHz	100 kHz	300 kHz	120 kHz	QP
Above 1 GHz	1 MHz	3 MHz	/	PK
	1 MHz	10 Hz	/	Average

Test Procedure

Maximizing procedure was performed on the highest emissions to ensure that the EUT complied with all installation combinations.

All final data was recorded in Quasi-peak detection mode for frequency range of 30 MHz -1 GHz and peak and Average detection modes for frequencies above 1 GHz.

Factor & Margin Calculation

The Factor is calculated by adding the Antenna Factor and Cable Loss, and subtracting the Amplifier Gain from the Meter Reading. The basic equation is as follows:

$$\text{Factor} = \text{Meter Reading} + \text{Antenna Factor} + \text{Cable Loss} - \text{Amplifier Gain}$$

The “Margin” column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of -7dB means the emission is 7dB below the limit. The equation for margin calculation is as follows:

$$\text{Margin} = \text{Result-Limit}$$

$$\text{Result} = \text{Reading} + \text{Factor}$$

Test Data

Environmental Conditions

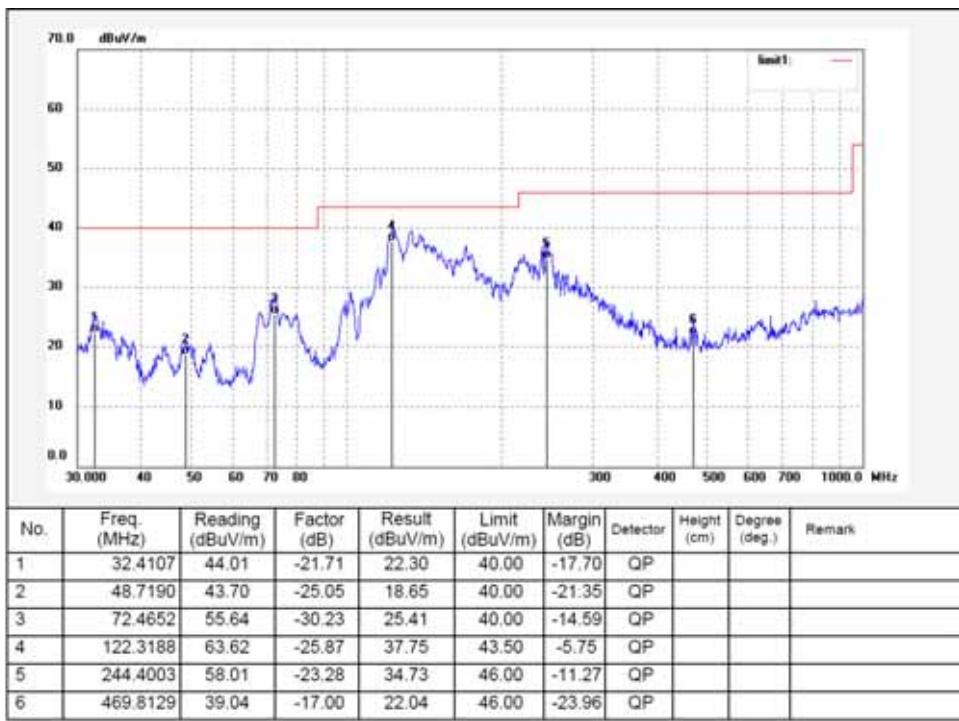
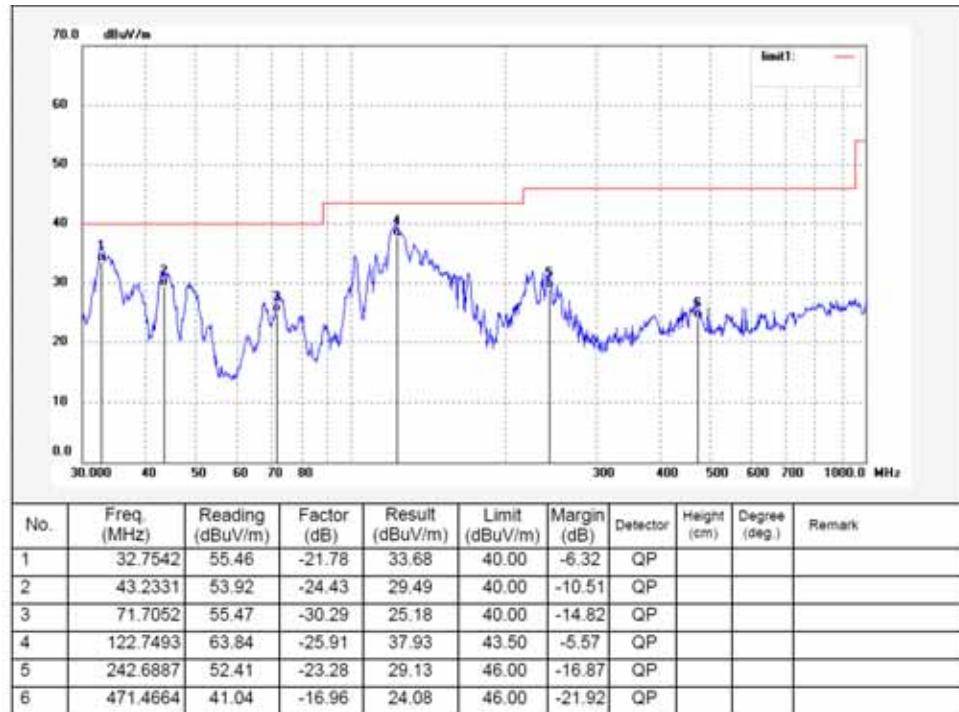
Temperature:	24
Relative Humidity:	48 %
ATM Pressure:	101.0 kPa

The testing was performed by Fan Yang on 2020-12-24 for below 1GHz and Fan Yang on 2020-12-22 for above 1GHz.

EUT operation mode: Transmitting

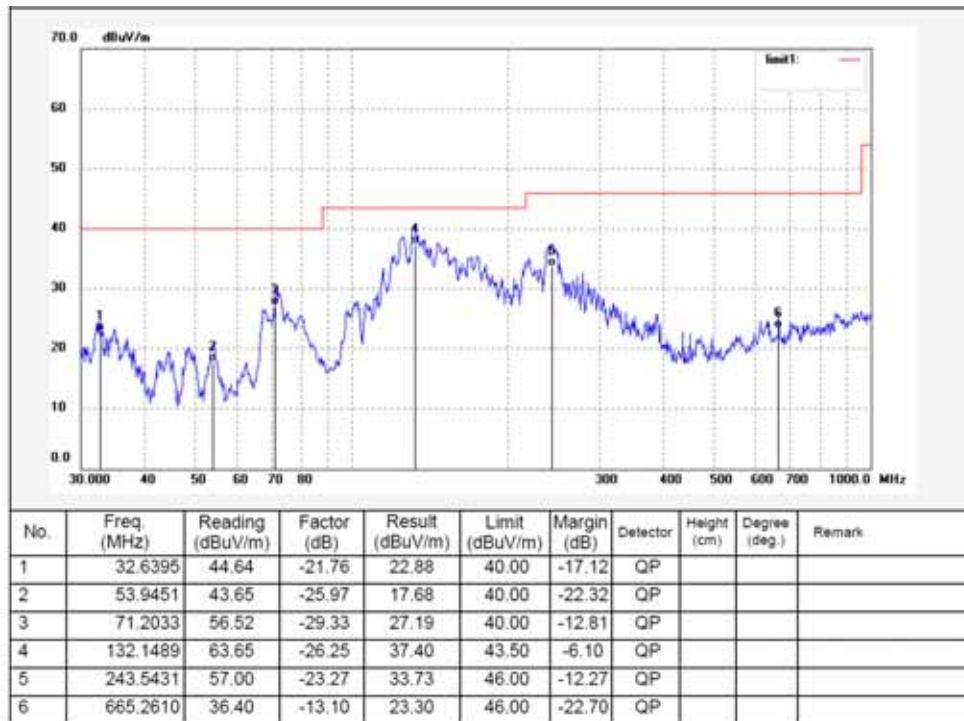
30 MHz~18 GHz: (Scan with GFSK, $\pi/4$ -DQPSK, 8DPSK mode, the worst case is GFSK Mode)

18~25GHz: The test values lower than the limits of 20dB or in the noise floor level, the test data were not recorded in the report.

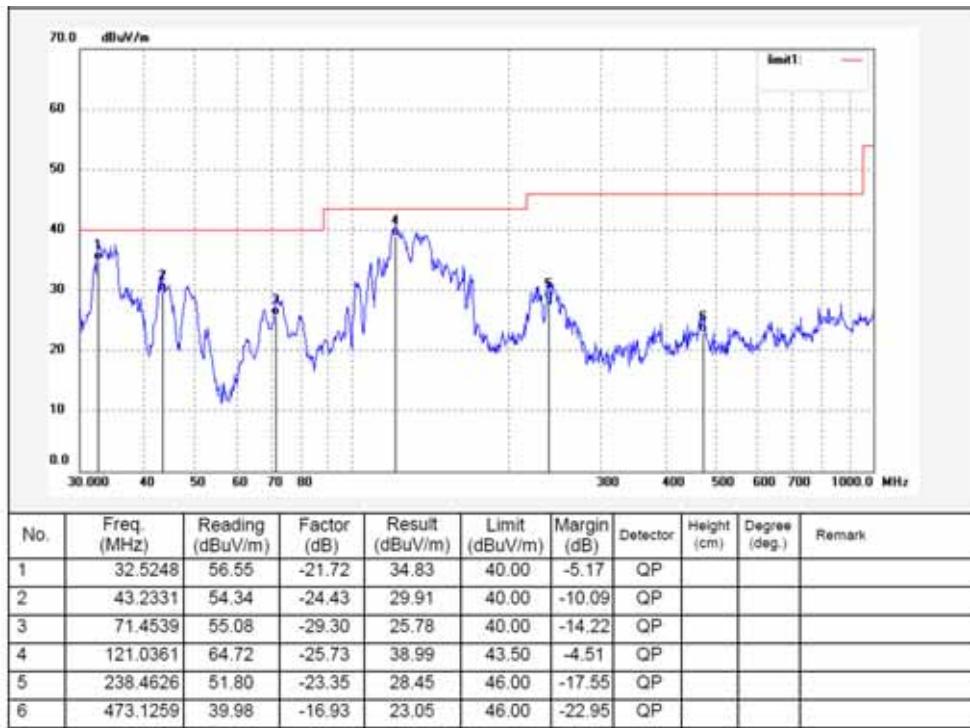
**Below 1GHz:
TX2402MHz (GFSK)****Horizontal****Vertical**

TX2441MHz (GFSK)

Horizontal

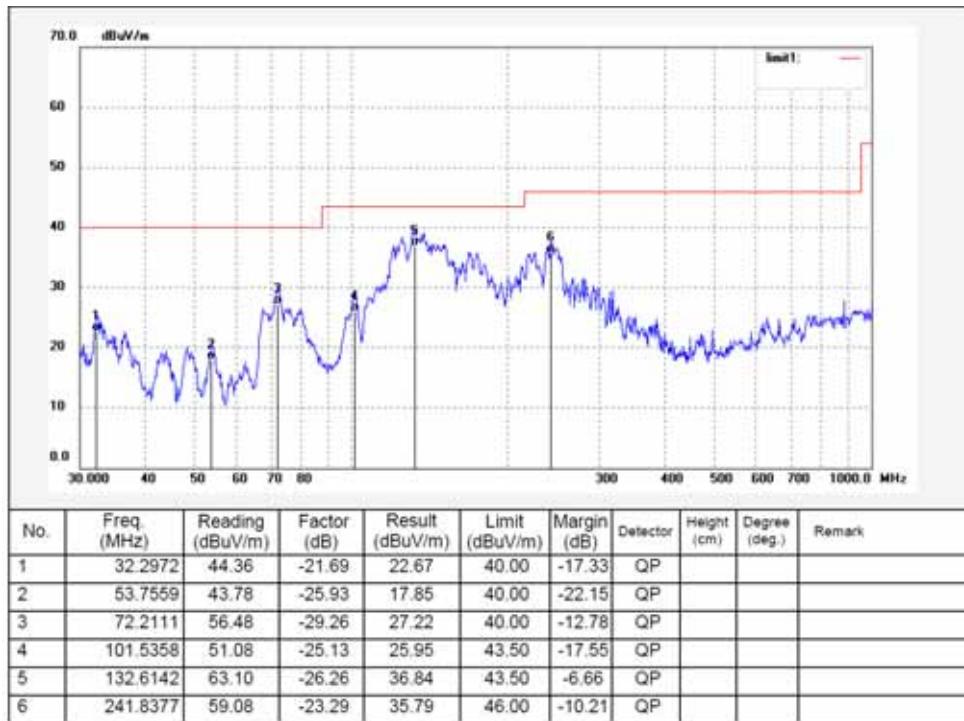


Vertical

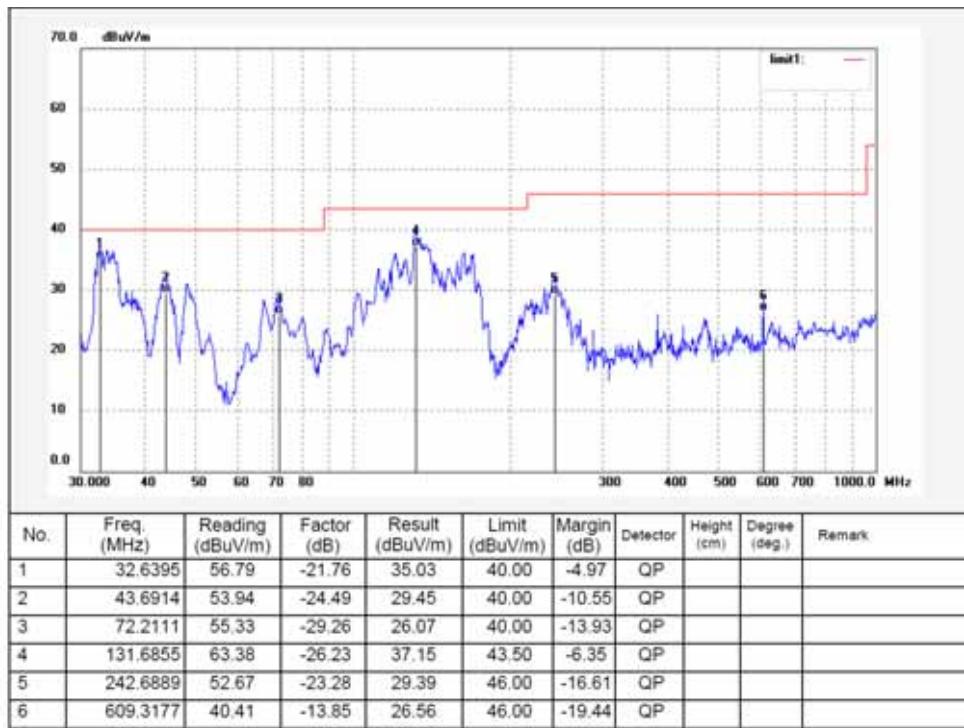


TX2480MHz (GFSK)

Horizontal

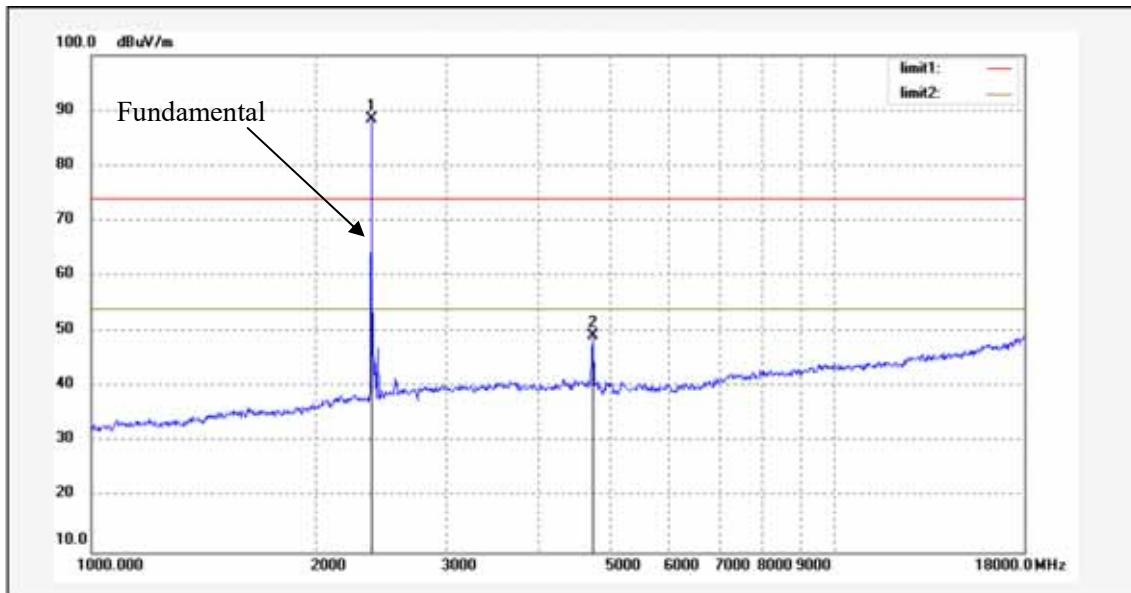
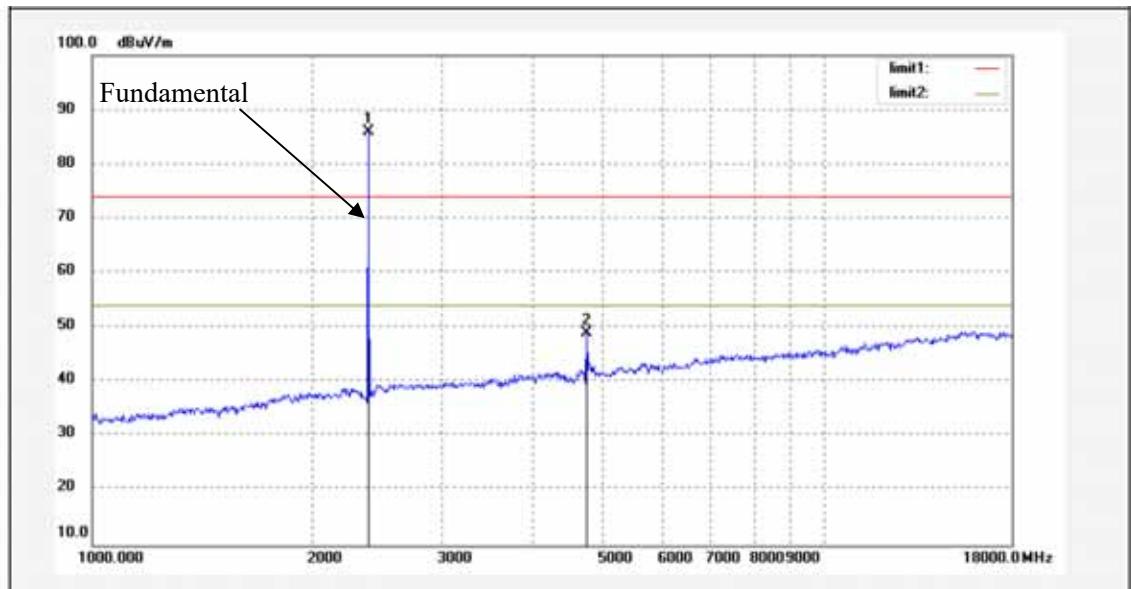


Vertical



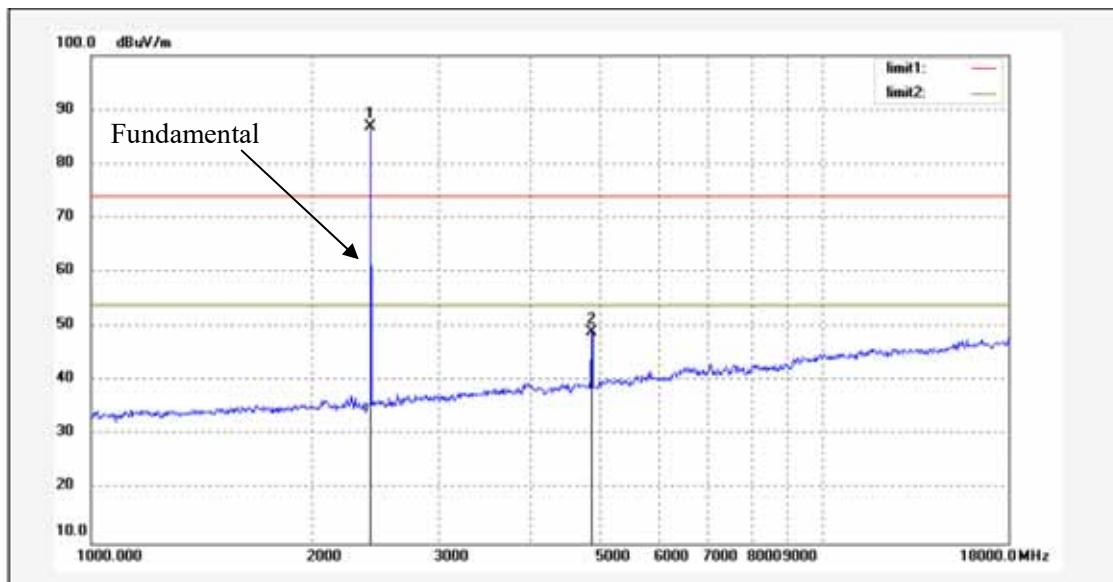
Above 1GHz:

Frequency (MHz)	Receiver		Turntable Degree	Rx Antenna		Corrected Factor (dB/m)	Corrected Amplitude (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)
	Reading (dB μ V)	PK/QP/Ave.		Height (m)	Polar (H/V)				
Low Channel (2402 MHz)									
4804	49.38	PK	107	1.8	H	3.15	52.53	74	21.47
4804	39.69	Ave.	107	1.8	H	3.15	42.84	54	11.16
4804	48.50	PK	226	1.7	V	3.15	51.65	74	22.35
4804	37.28	Ave.	226	1.7	V	3.15	40.43	54	13.57
Middle Channel (2441 MHz)									
4882	48.71	PK	93	1.3	H	4.06	52.77	74	21.23
4882	37.58	Ave.	93	1.3	H	4.06	41.64	54	12.36
4882	50.92	PK	333	1.2	V	4.06	54.98	74	19.02
4882	39.96	Ave.	333	1.2	V	4.06	44.02	54	9.98
High Channel (2480 MHz)									
4960	50.83	PK	13	1.1	H	4.69	55.52	74	18.48
4960	38.87	Ave.	13	1.1	H	4.69	43.56	54	10.44
4960	51.59	PK	246	2.1	V	4.69	56.28	74	17.72
4960	39.16	Ave.	246	2.1	V	4.69	43.85	54	10.15

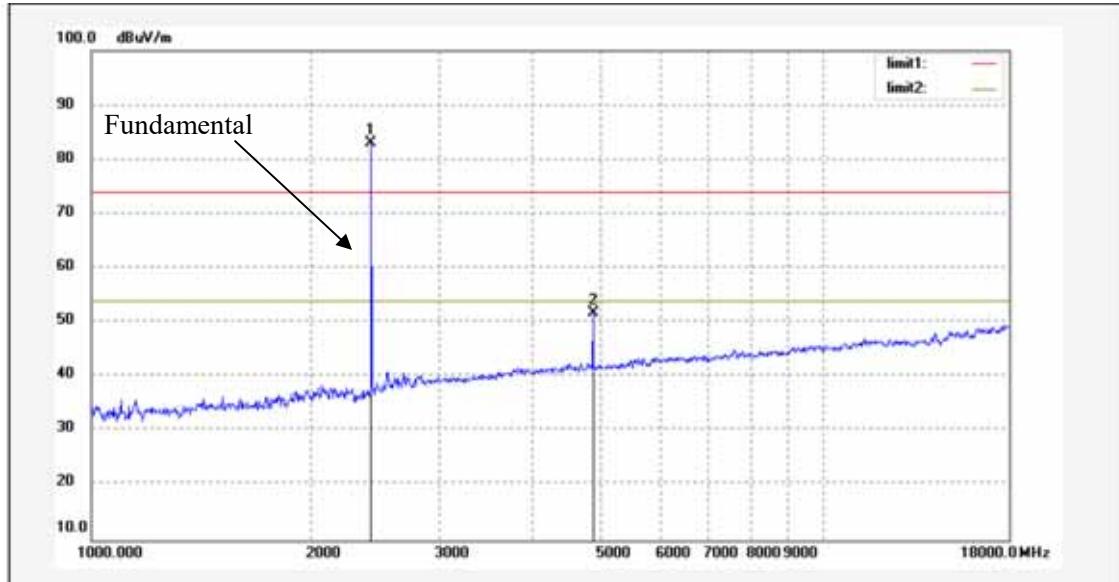
Pre-scan plots**TX2402MHz (GFSK)****Horizontal****Vertical**

TX2441MHz (GFSK)

Horizontal

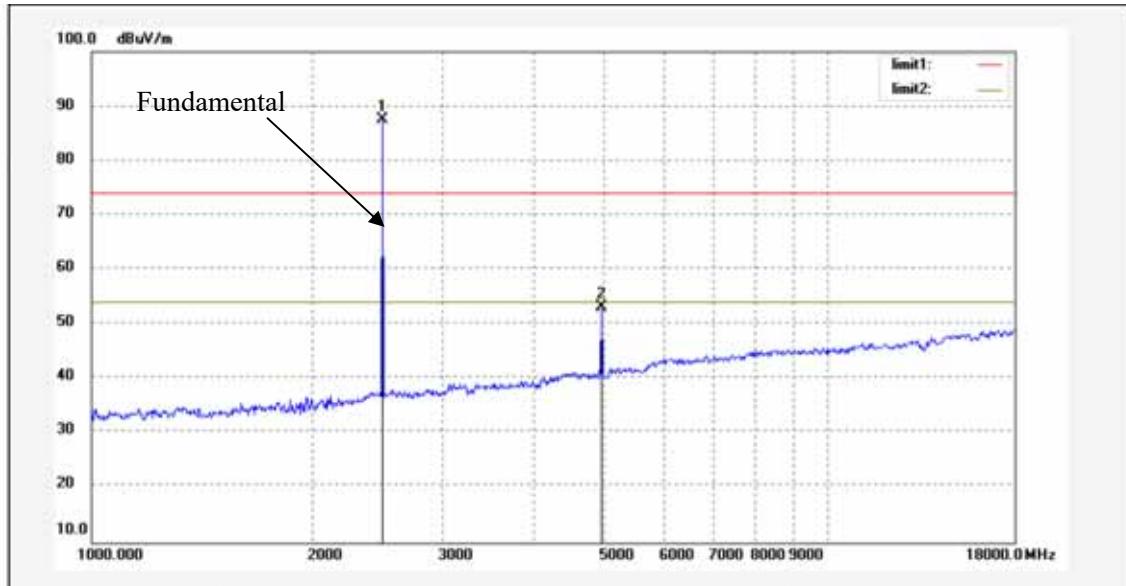


Vertical

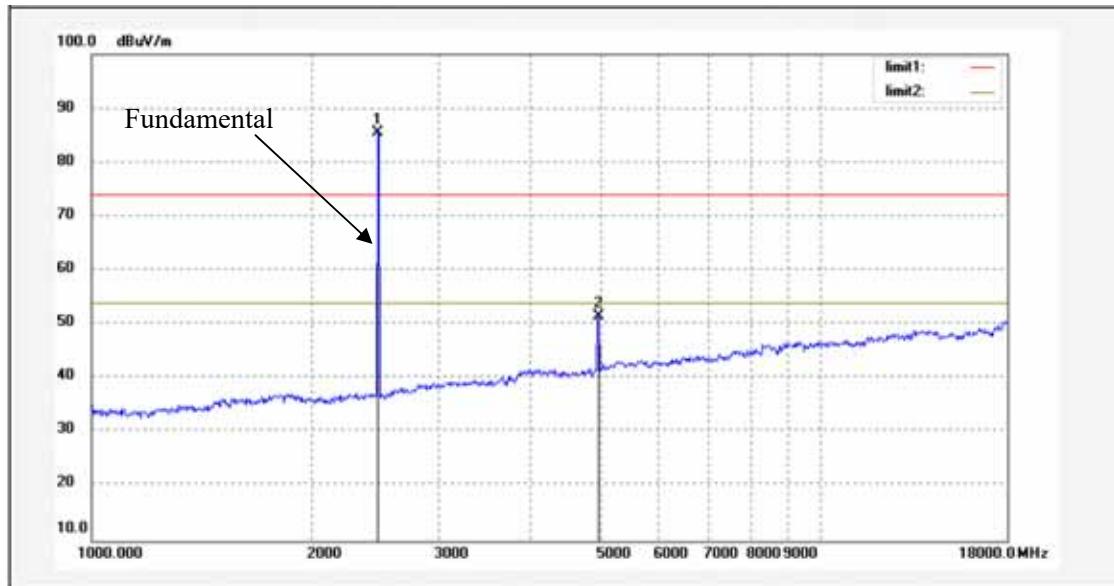


TX2480MHz (GFSK)

Horizontal



Vertical



FCC §15.247(a) (1)-CHANNEL SEPARATION TEST

Applicable Standard

Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater provided the systems operate with an output power no greater than 125 mW. The system shall hop to channel frequencies that are selected at the system hopping rate from a pseudo randomly ordered list of hopping frequencies. Each frequency must be used equally on the average by each transmitter. The system receivers shall have input bandwidths that match the hopping channel bandwidths of their corresponding transmitters and shall shift frequencies in synchronization with the transmitted signals.

Test Procedure

1. Set the EUT in transmitting mode, maxhold the channel.
2. Set the adjacent channel of the EUT and maxhold another trace.
3. Measure the channel separation.

Test Data

Environmental Conditions

Temperature:	24 °C
Relative Humidity:	48 %
ATM Pressure:	101.0 kPa

The testing was performed by Fan Yang on 2020-12-26

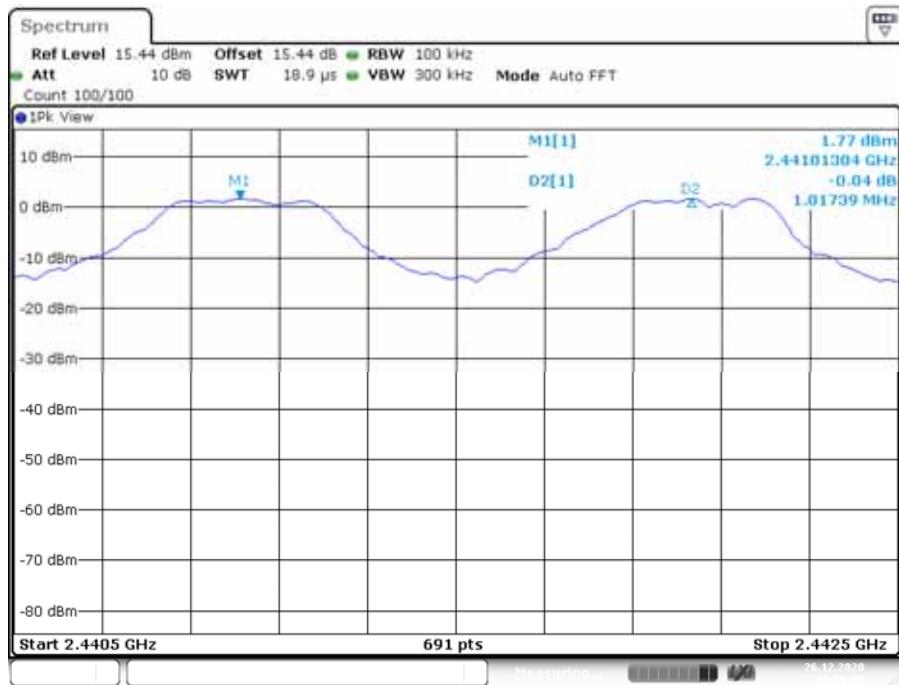
EUT operation mode: Transmitting

Test Result: Compliant.

Test Mode	Antenna	Channel	Result[MHz]	Limit[MHz]	Verdict
DH1	Ant1	Hop	1.017	>=0.700	PASS
2DH1	Ant1	Hop	0.991	>=0.906	PASS
3DH1	Ant1	Hop	1	>=0.880	PASS

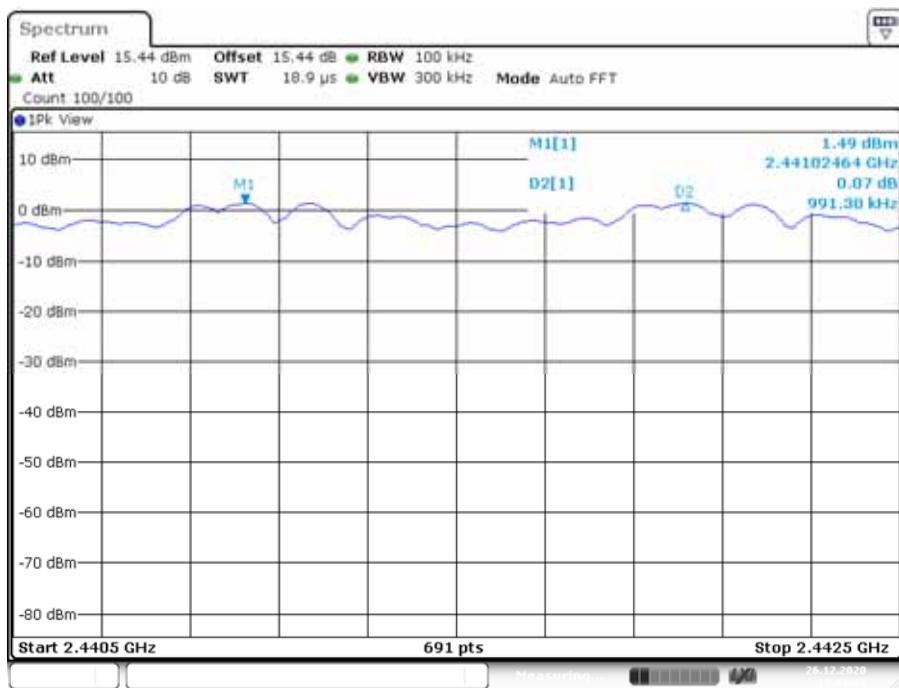
Please refer to the below plots:

DH1_Ant1_Hop

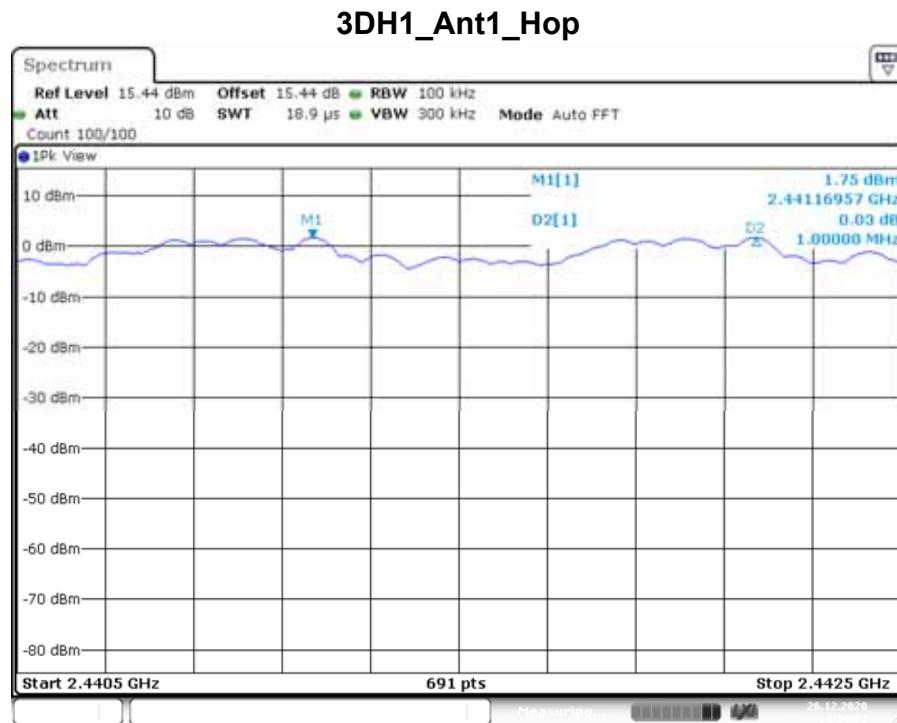


Date: 26.DEC.2020 13:39:48

2DH1_Ant1_Hop



Date: 26.DEC.2020 13:44:48



FCC §15.247(a) (1) – 20 dB EMISSION BANDWIDTH & 99% OCCUPIED BANDWIDTH

Applicable Standard

Alternatively, frequency hopping systems operating in the 2400–2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW.

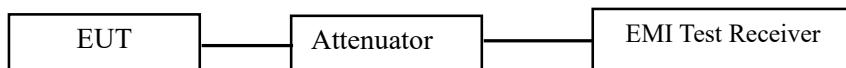
Test Procedure

The following conditions shall be observed for measuring the occupied bandwidth and 20 dB bandwidth:

- The transmitter shall be operated at its maximum carrier power measured under normal test conditions.
- The span of the spectrum analyzer shall be set large enough to capture all products of the modulation process, including the emission skirts, around the carrier frequency, but small enough to avoid having other emissions (e.g. on adjacent channels) within the span.
- The detector of the spectrum analyzer shall be set to “Sample”. However, a peak, or peak hold, may be used in place of the sampling detector since this usually produces a wider bandwidth than the actual bandwidth (worst-case measurement). Use of a peak hold (or “Max Hold”) may be necessary to determine the occupied / 20 dB bandwidth if the device is not transmitting continuously.
- The resolution bandwidth (RBW) shall be in the range of 1% to 5% of the actual occupied / 20 dB bandwidth and the video bandwidth (VBW) shall not be smaller than three times the RBW value. Video averaging is not permitted.

Note: It may be necessary to repeat the measurement a few times until the RBW and VBW are in compliance with the above requirement.

For the 99% emission bandwidth, the trace data points are recovered and directly summed in linear power level terms. The recovered amplitude data points, beginning at the lowest frequency, are placed in a running sum until 0.5% of the total is reached, and that frequency recorded. The process is repeated for the highest frequency data points (starting at the highest frequency, at the right side of the span, and going down in frequency). This frequency is then recorded. The difference between the two recorded frequencies is the occupied bandwidth (or the 99% emission bandwidth).



Test Data

Environmental Conditions

Temperature:	24 °C
Relative Humidity:	48 %
ATM Pressure:	101.0 kPa

The testing was performed by Fan Yang on 2020-12-26.

EUT operation mode: Transmitting

Test Result: Compliant.

Test Mode	Antenna	Channel	20db EBW[MHz]	Limit[MHz]	Verdict
DH1	Ant1	2402	1.047	---	PASS
		2441	1.050	---	PASS
		2480	1.047	---	PASS
2DH1	Ant1	2402	1.359	---	PASS
		2441	1.359	---	PASS
		2480	1.359	---	PASS
3DH1	Ant1	2402	1.317	---	PASS
		2441	1.317	---	PASS
		2480	1.320	---	PASS

Test Mode	Antenna	Channel	99% Occupied Bandwidth [MHz]	Limit[MHz]	Verdict
DH1	Ant1	2402	0.947	---	PASS
		2441	0.947	---	PASS
		2480	0.947	---	PASS
2DH1	Ant1	2402	1.202	---	PASS
		2441	1.199	---	PASS
		2480	1.199	---	PASS
3DH1	Ant1	2402	1.181	---	PASS
		2441	1.184	---	PASS
		2480	1.181	---	PASS

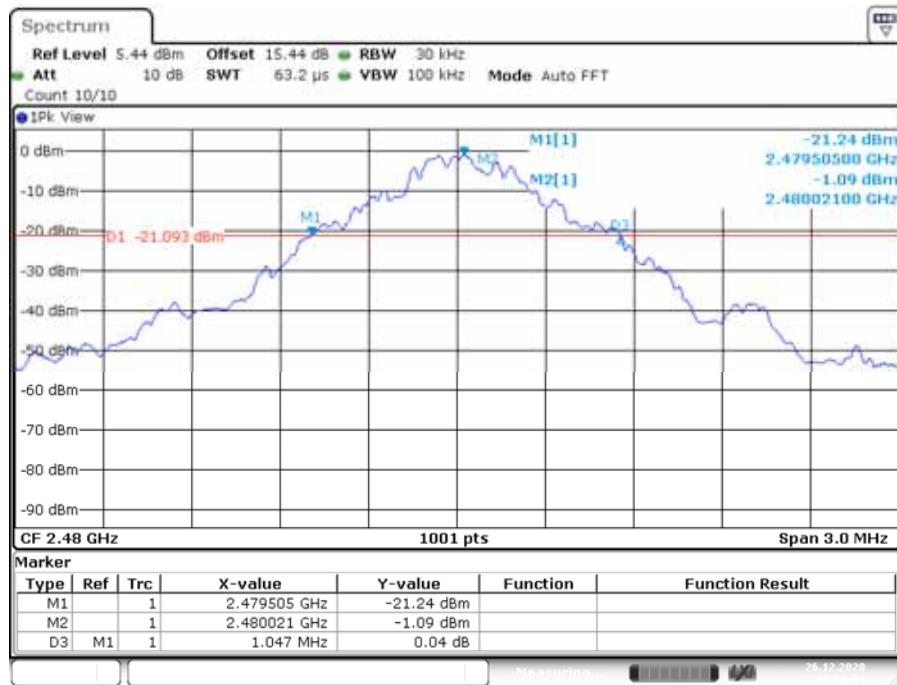
Please refer to the below plots:

20 dB EMISSION BANDWIDTH**DH1_Ant1_2402**

Date: 26.DEC.2020 12:53:29

DH1_Ant1_2441

Date: 26.DEC.2020 12:54:53

DH1_Ant1_2480

Date: 26.DEC.2020 12:56:31

2DH1_Ant1_2402

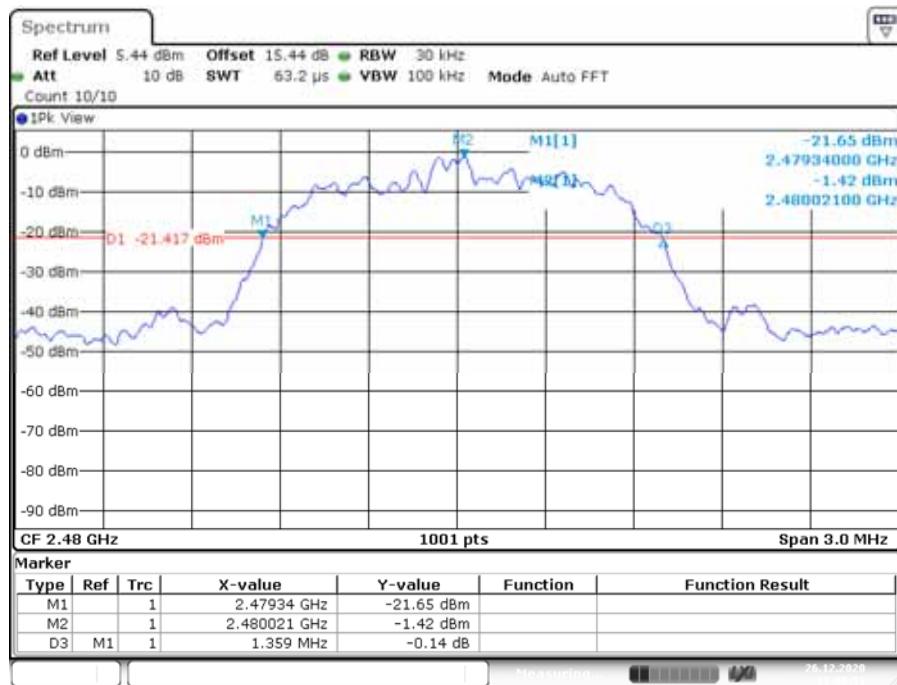
Date: 26.DEC.2020 12:58:24

2DH1_Ant1_2441



Date: 26.DEC.2020 12:59:53

2DH1_Ant1_2480



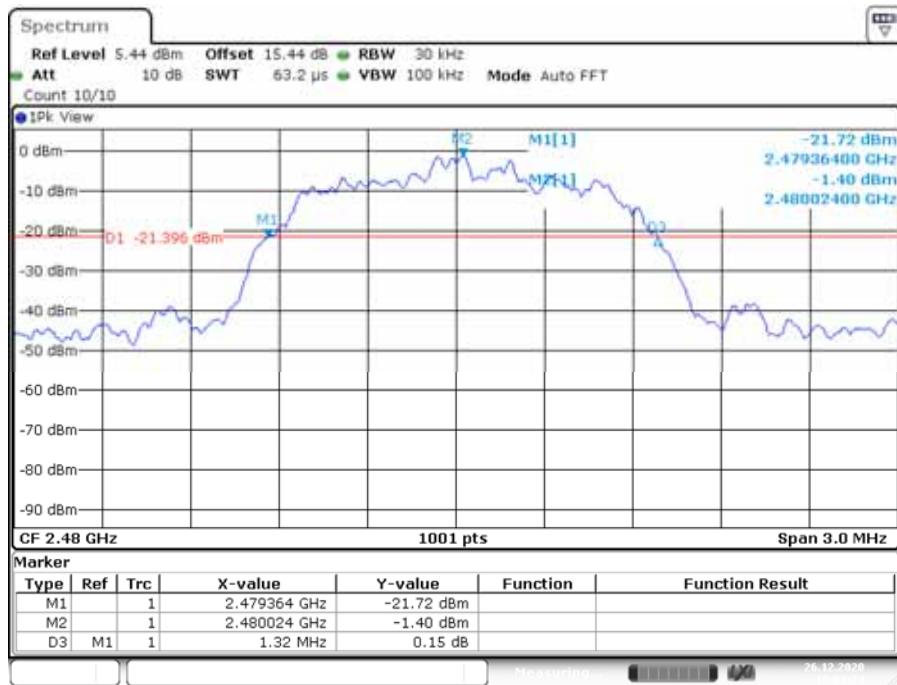
Date: 26.DEC.2020 13:00:51

3DH1_Ant1_2402

Date: 26.DEC.2020 13:02:12

3DH1_Ant1_2441

Date: 26.DEC.2020 13:03:27

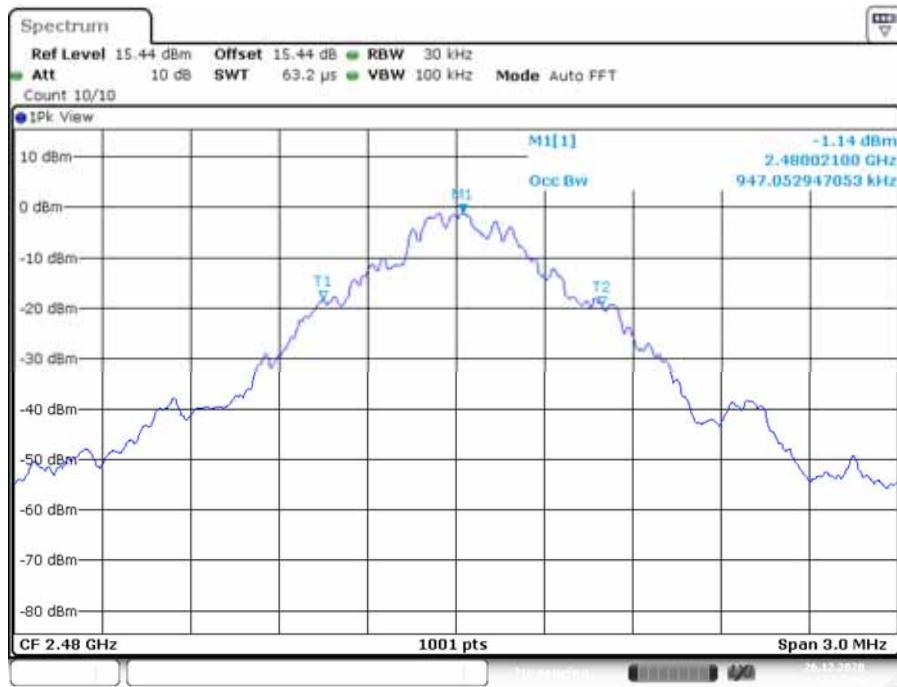
3DH1_Ant1_2480

99% OCCUPIED BANDWIDTH**DH1_Ant1_2402**

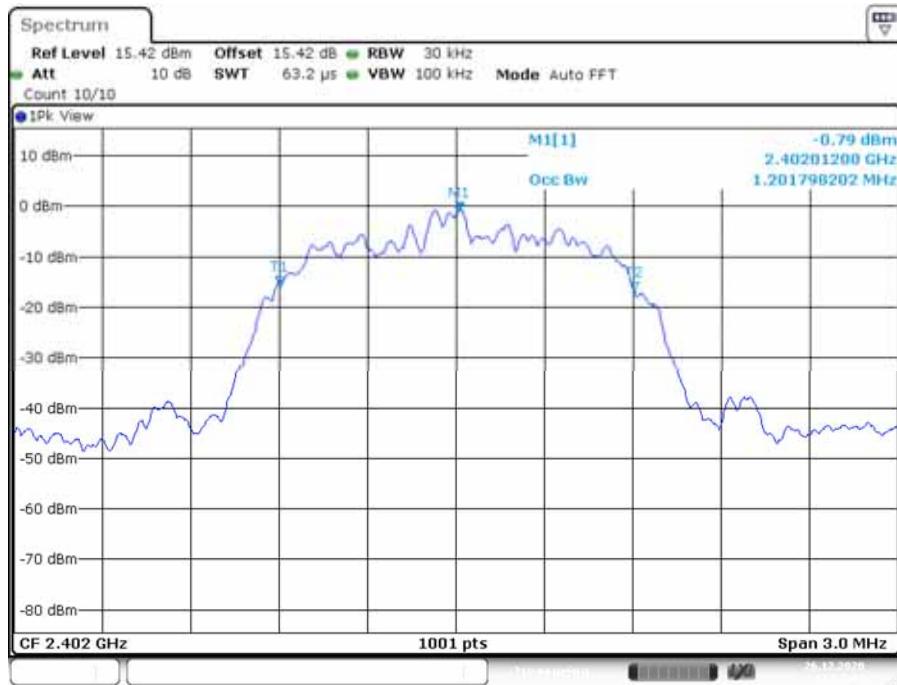
Date: 26.DEC.2020 12:53:46

DH1_Ant1_2441

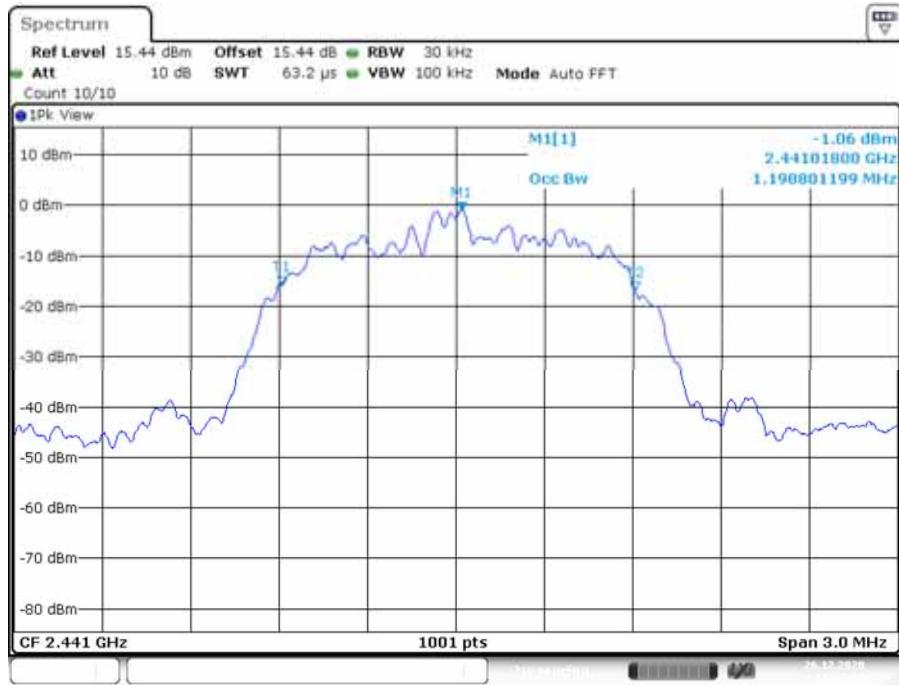
Date: 26.DEC.2020 12:55:10

DH1_Ant1_2480

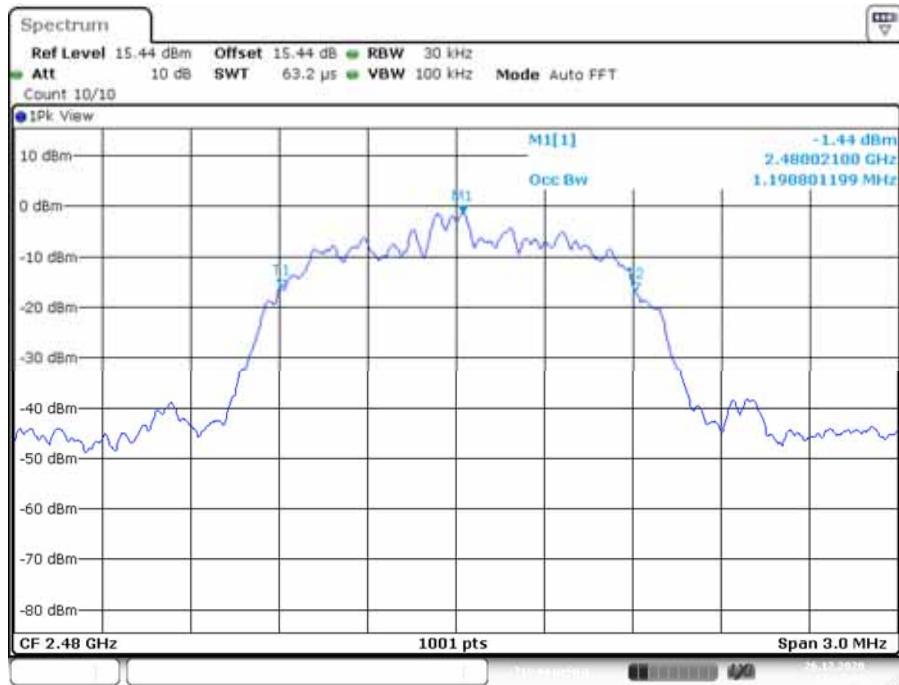
Date: 26.DEC.2020 12:56:48

2DH1_Ant1_2402

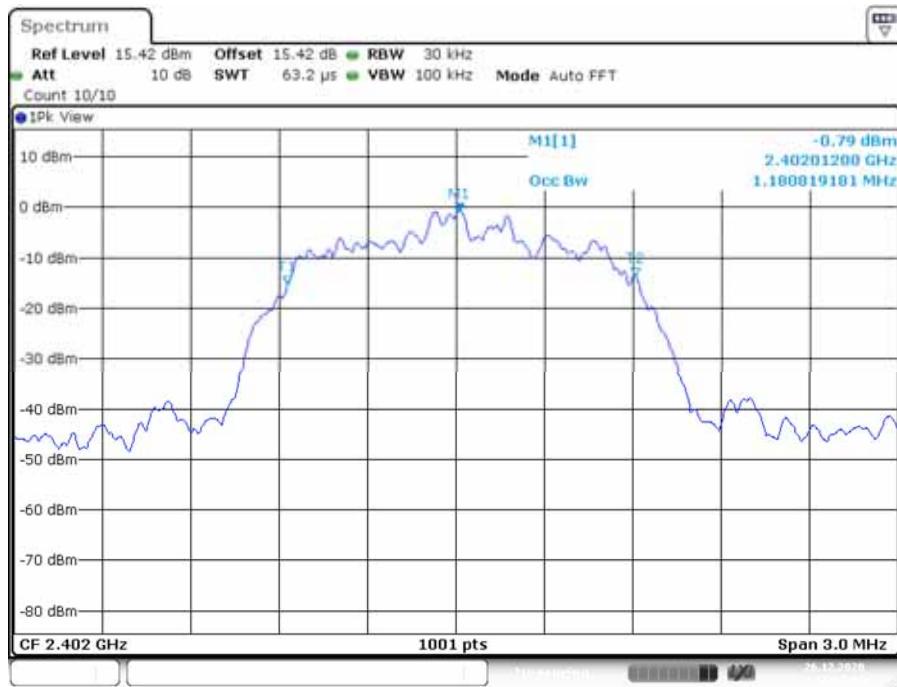
Date: 26.DEC.2020 12:58:41

2DH1_Ant1_2441

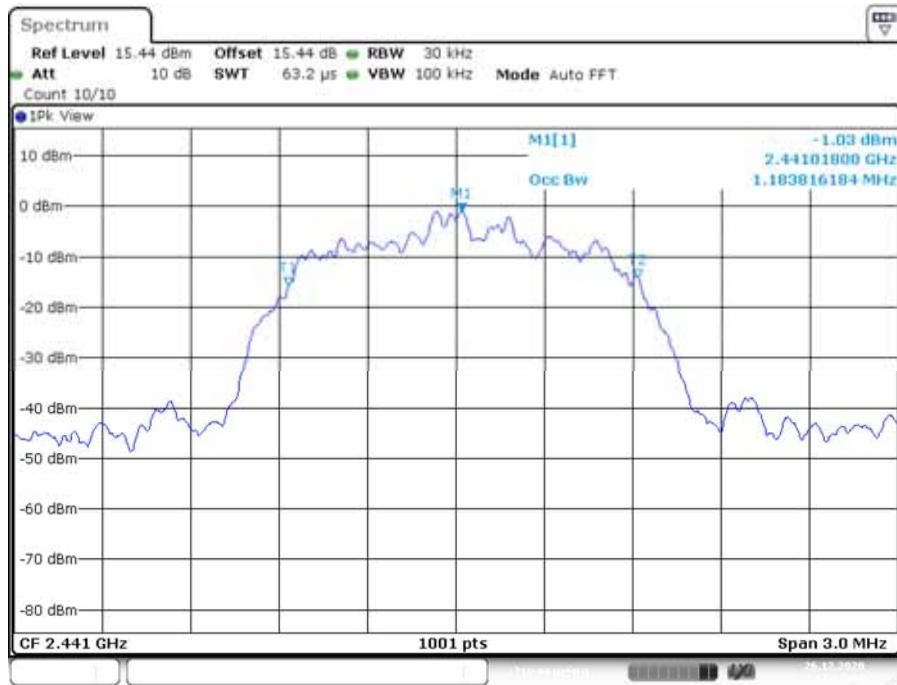
Date: 26.DEC.2020 13:00:10

2DH1_Ant1_2480

Date: 26.DEC.2020 13:01:08

3DH1_Ant1_2402

Date: 26.DEC.2020 13:02:29

3DH1_Ant1_2441

Date: 26.DEC.2020 13:03:44

3DH1_Ant1_2480

Date: 26.DEC.2020 13:04:41

FCC §15.247(a) (1) (iii)-QUANTITY OF HOPPING CHANNEL TEST

Applicable Standard

Frequency hopping systems in the 2400–2483.5 MHz band shall use at least 15 channels. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed. Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 channels are used.

Test Procedure

1. Check the calibration of the measuring instrument (SA) using either an internal calibrator or a known signal from an external generator.
2. Set the EUT in hopping mode from first channel to last.
3. By using the max-hold function record the quantity of the channel.

Test Data

Environmental Conditions

Temperature:	24 °C
Relative Humidity:	48 %
ATM Pressure:	101.0 kPa

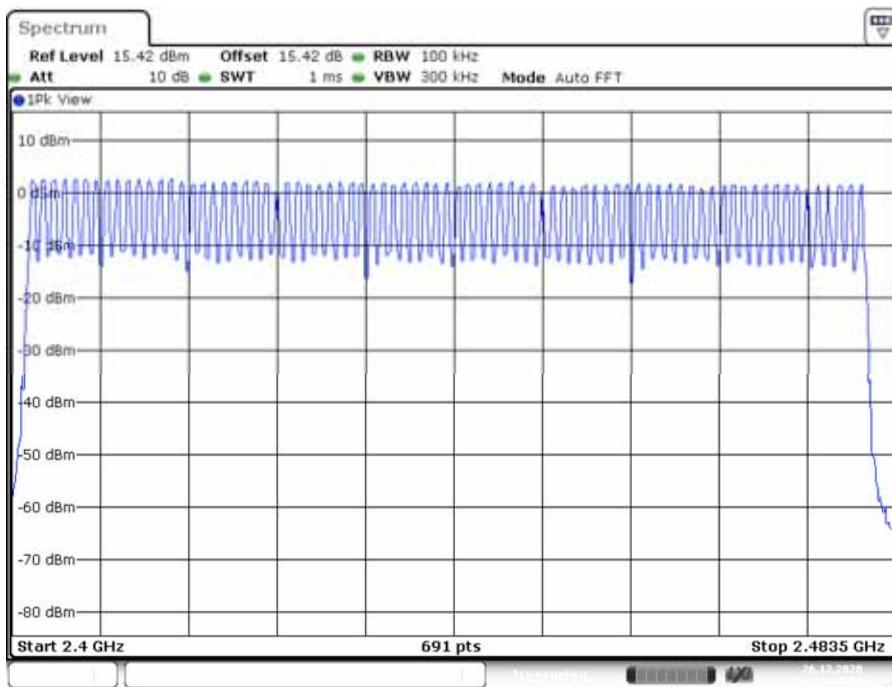
The testing was performed by Fan Yang on 2020-12-26.

EUT operation mode: Transmitting

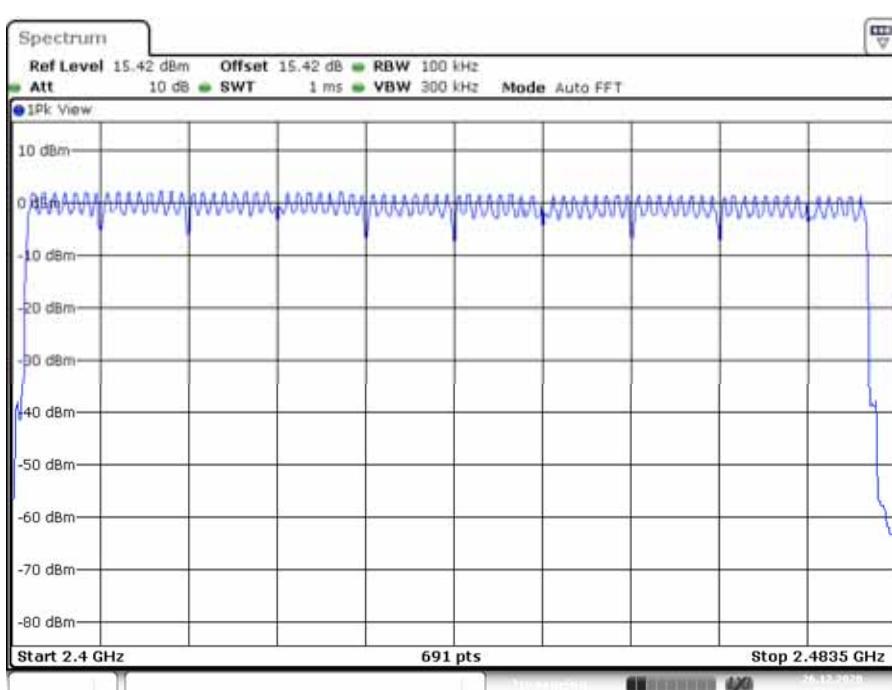
Test Result: Compliant.

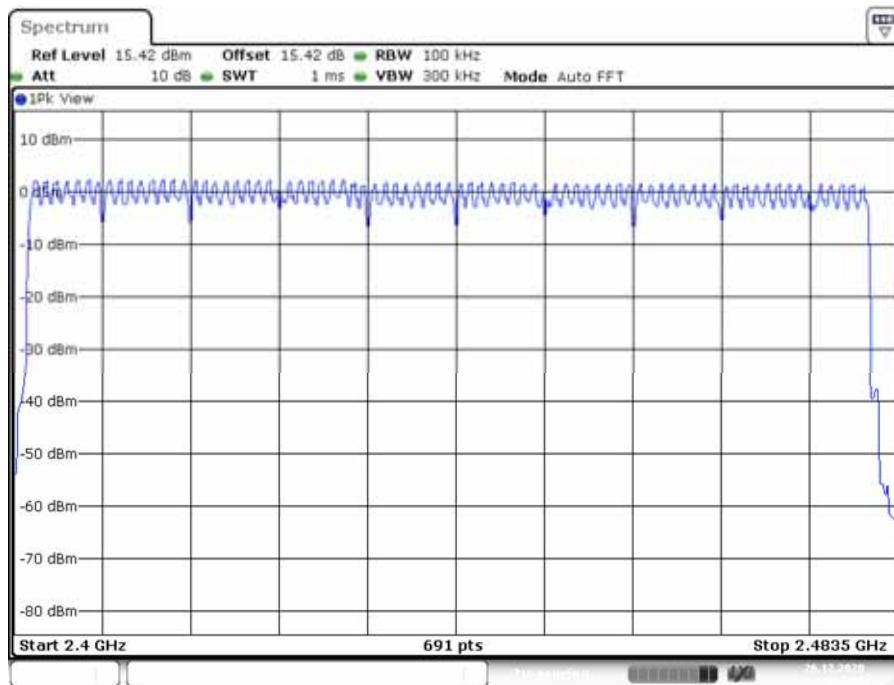
TestMode	Antenna	Channel	Result[Num]	Limit[Num]	Verdict
DH1	Ant1	Hop	79	>=15	PASS
2DH1	Ant1	Hop	79	>=15	PASS
3DH1	Ant1	Hop	79	>=15	PASS

DH1_Ant1_Hop



2DH1_Ant1_Hop



3DH1_Ant1_Hop

Date: 26.DEC.2020 14:15:36

FCC §15.247(a) (1) (iii) - TIME OF OCCUPANCY (DWELL TIME)

Applicable Standard

Frequency hopping systems in the 2400-2483.5 MHz shall use at least 15 channels. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed. Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 channels are used.

Test Procedure

1. The EUT was worked in channel hopping.
2. Set the RBW to: 1MHz.
3. Set the VBW $\geq 3 \times$ RBW.
4. Set the span to 0Hz.
5. Detector = peak.
6. Sweep time = auto couple.
7. Trace mode = max hold.
8. Allow trace to fully stabilize.
9. Recorded the time of single pulses

Test Data

Environmental Conditions

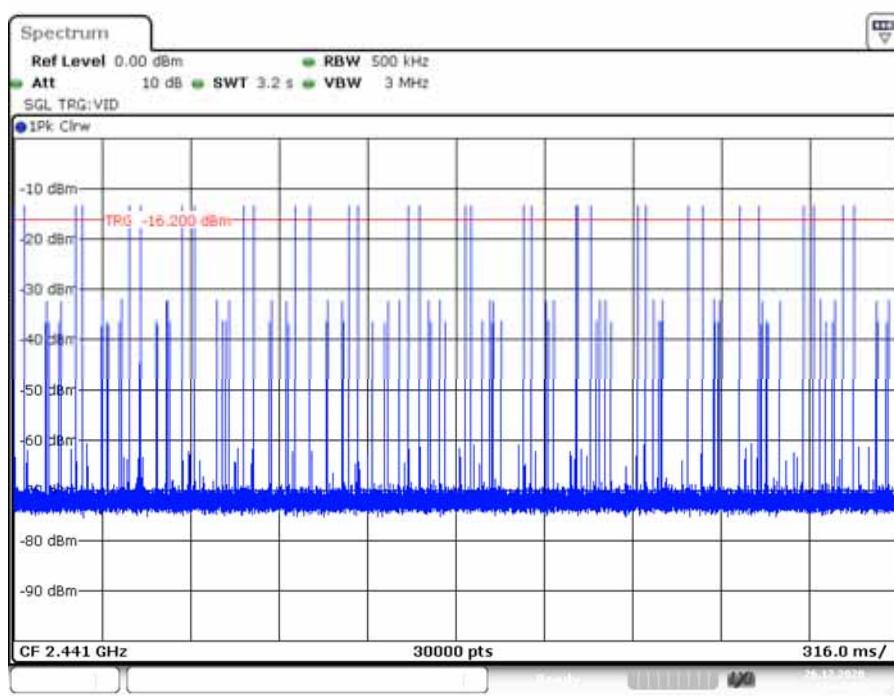
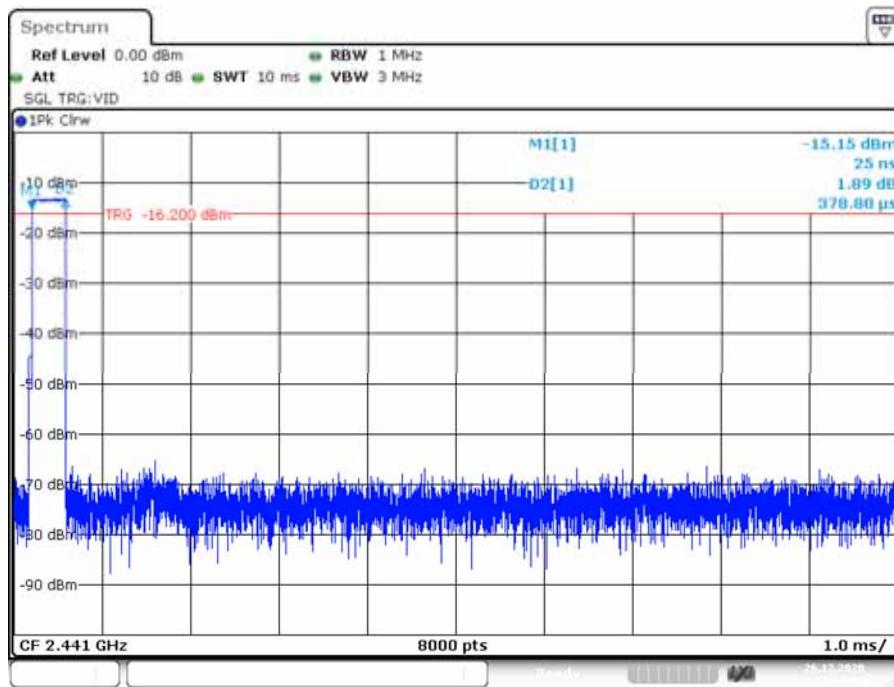
Temperature:	24 °C
Relative Humidity:	48 %
ATM Pressure:	101.0 kPa

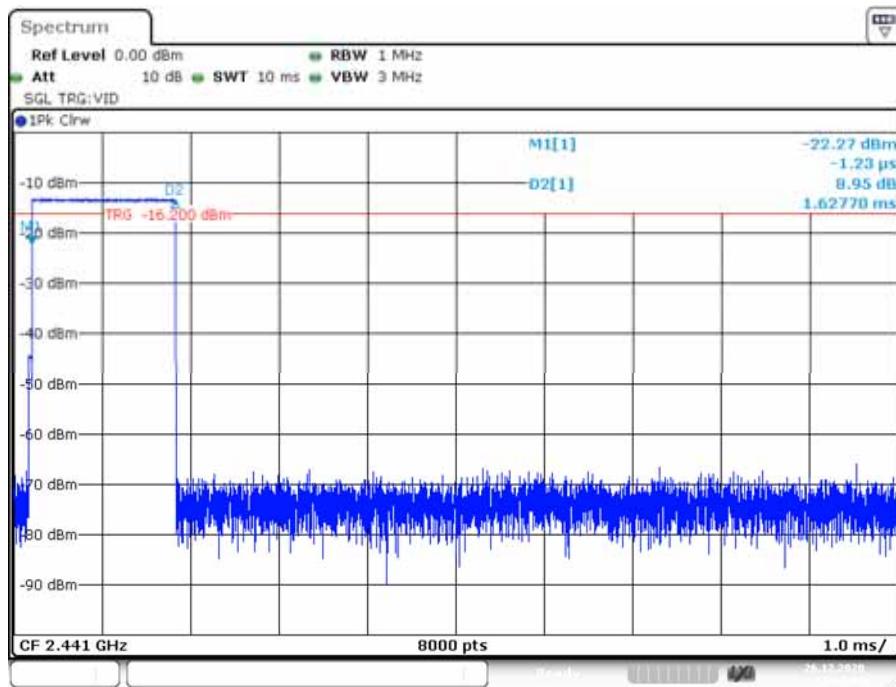
The testing was performed by Fan Yang on 2020-12-26.

EUT operation mode: Transmitting

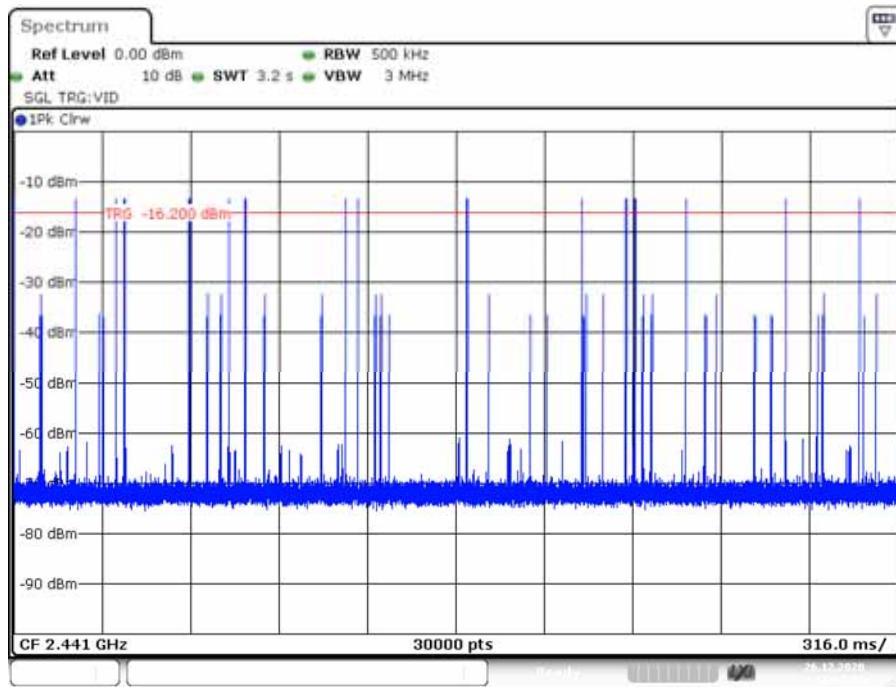
Test Result: Compliant.

Test Mode	Antenna	Channel	BurstWidth [ms]	TotalHops [Num]	Result[s]	Limit[s]	Verdict
DH1	Ant1	Hop	0.38	320	0.121	<=0.4	PASS
DH3	Ant1	Hop	1.63	160	0.26	<=0.4	PASS
DH5	Ant1	Hop	2.87	110	0.315	<=0.4	PASS
2DH1	Ant1	Hop	0.39	320	0.124	<=0.4	PASS
2DH3	Ant1	Hop	1.63	200	0.326	<=0.4	PASS
2DH5	Ant1	Hop	2.87	120	0.344	<=0.4	PASS
3DH1	Ant1	Hop	0.39	320	0.123	<=0.4	PASS
3DH3	Ant1	Hop	1.63	160	0.261	<=0.4	PASS
3DH5	Ant1	Hop	2.87	110	0.316	<=0.4	PASS

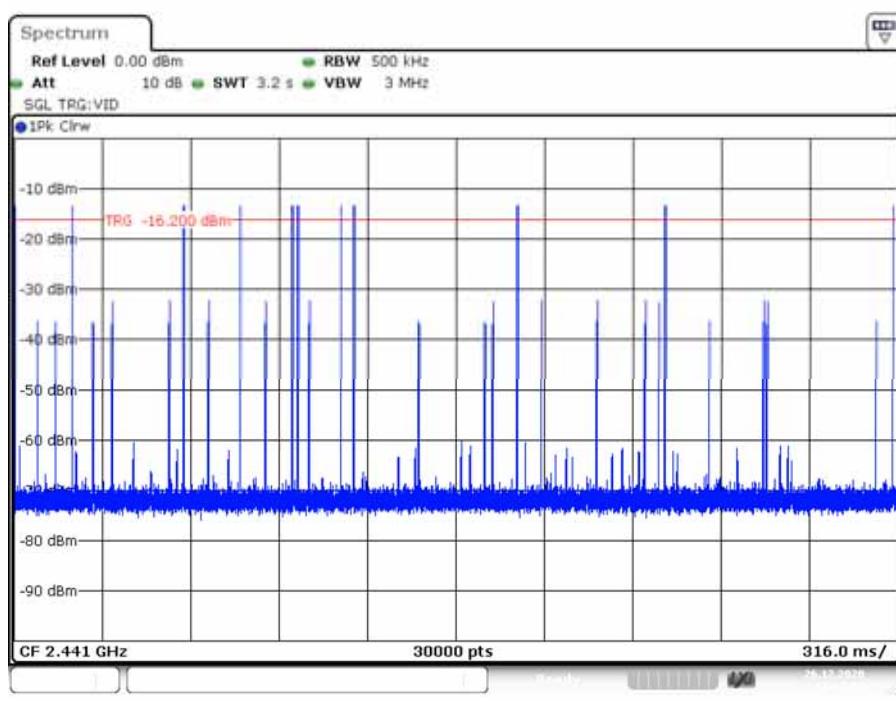
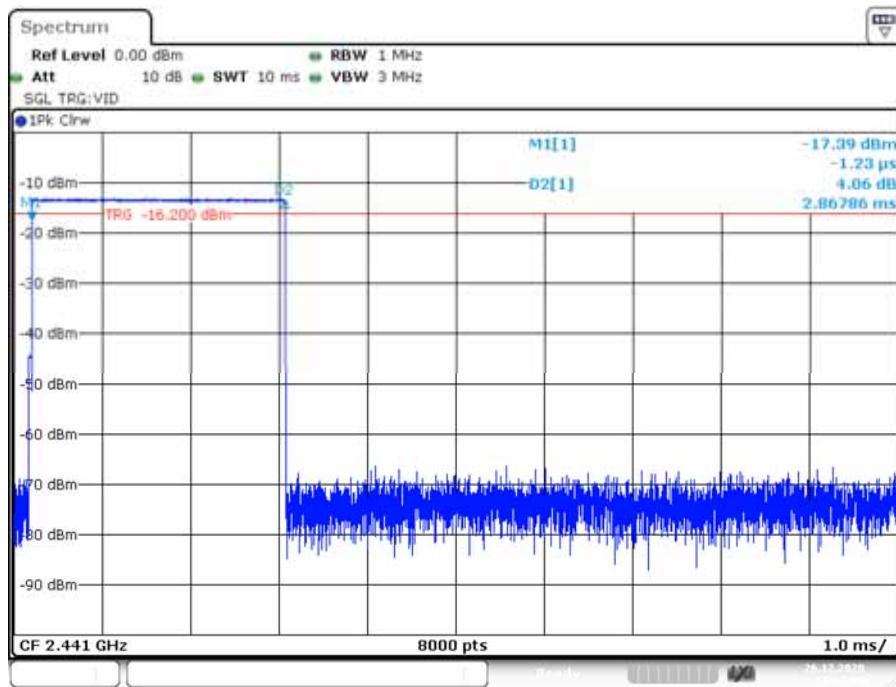
DH1_Ant1_Hop

DH3_Ant1_Hop

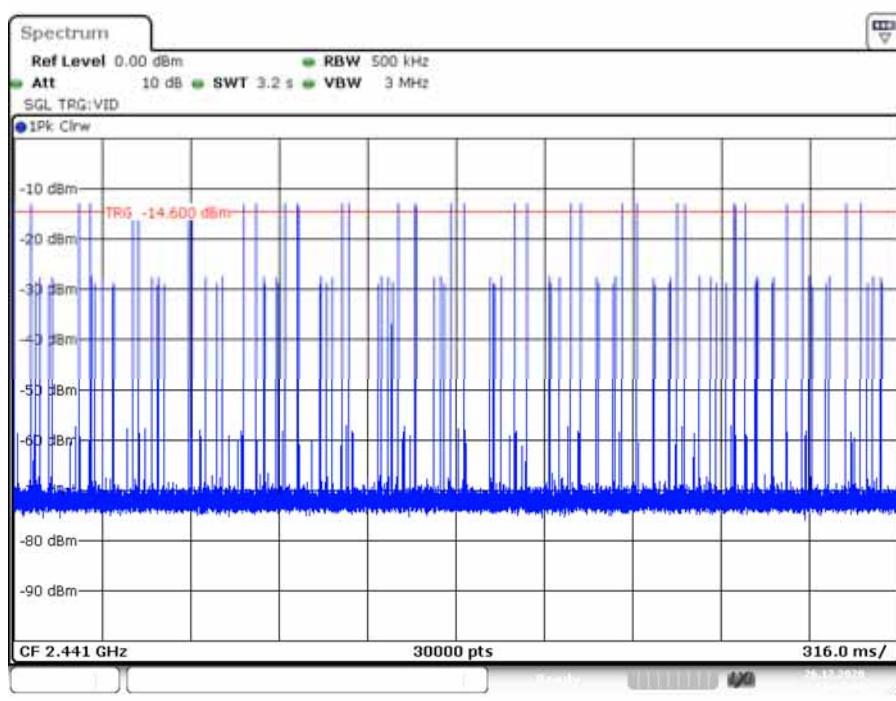
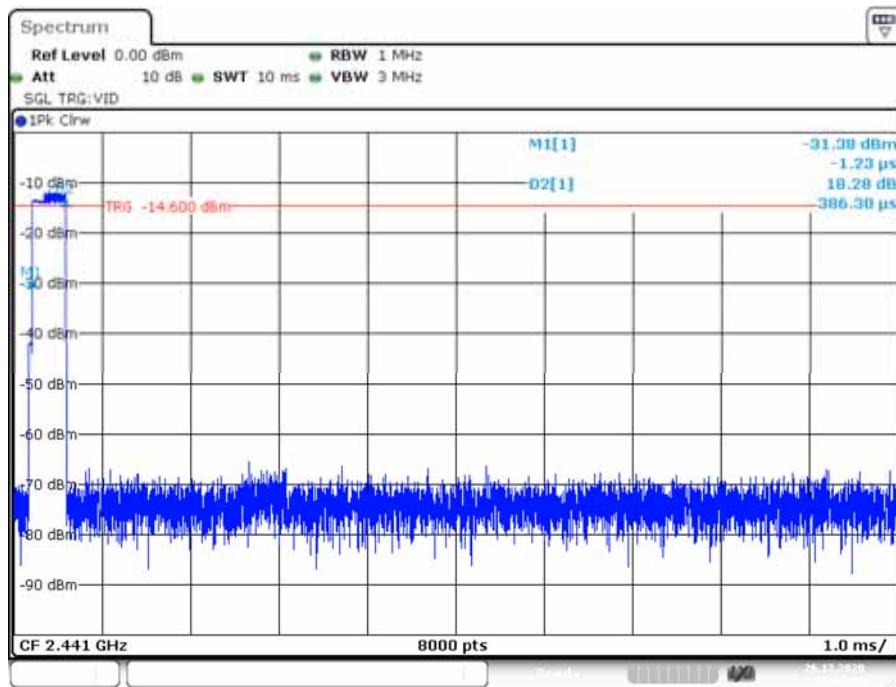
Date: 26.DEC.2020 13:41:45

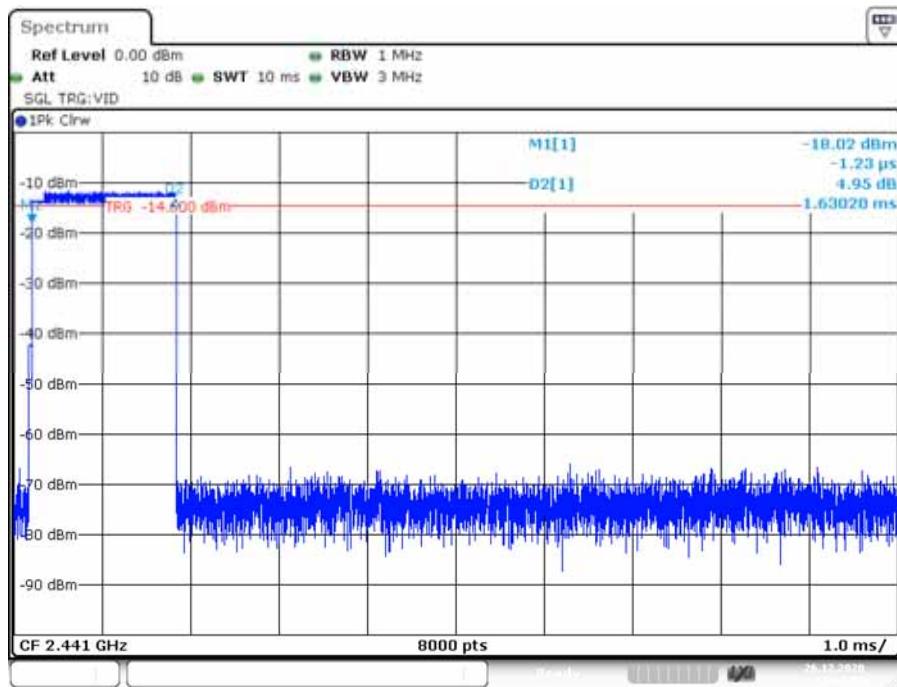


Date: 26.DEC.2020 13:41:50

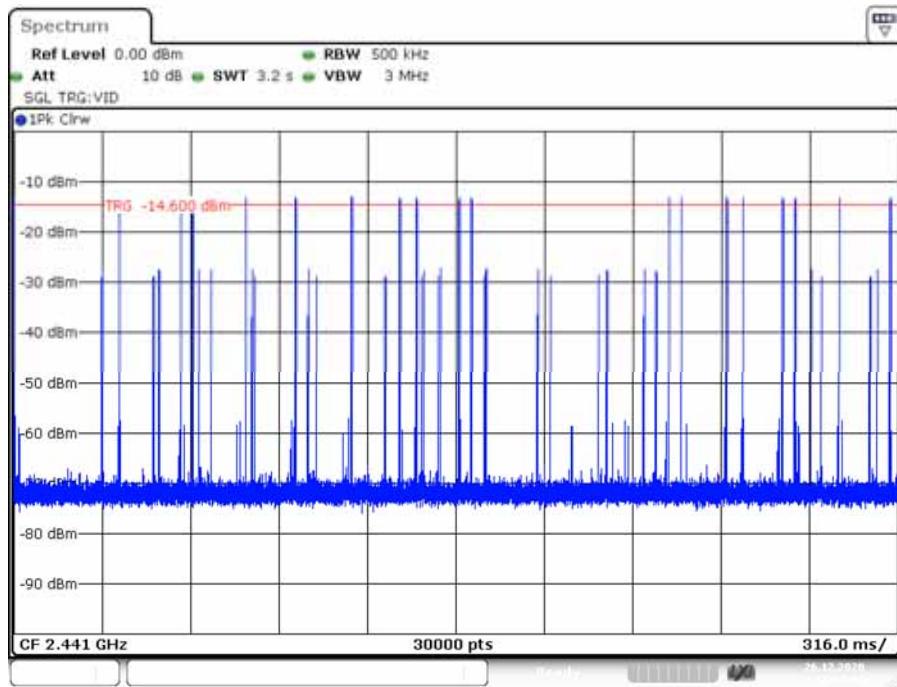
DH5_Ant1_Hop

2DH1_Ant1_Hop

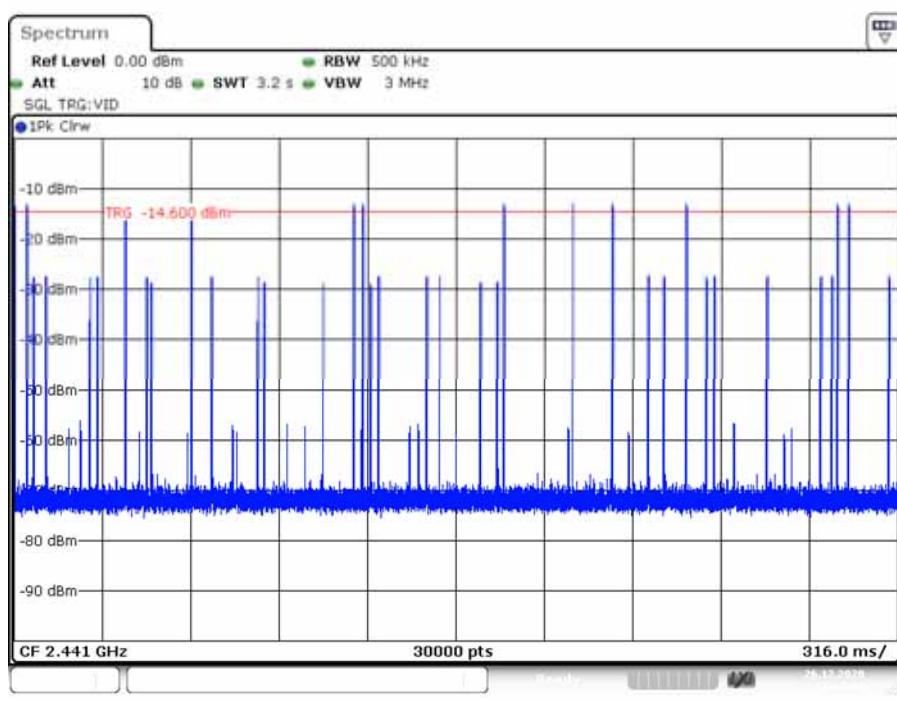
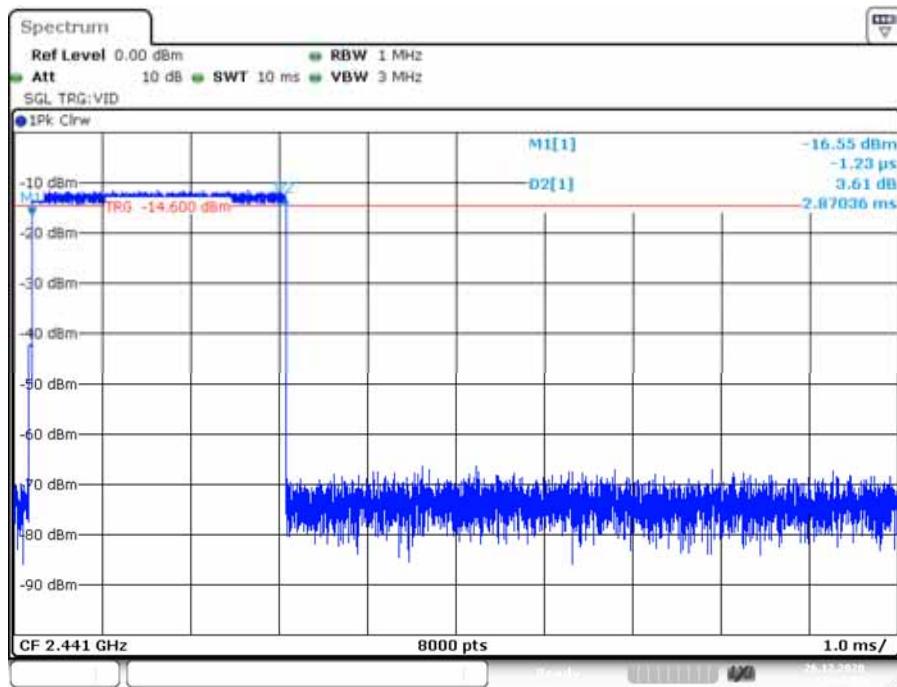


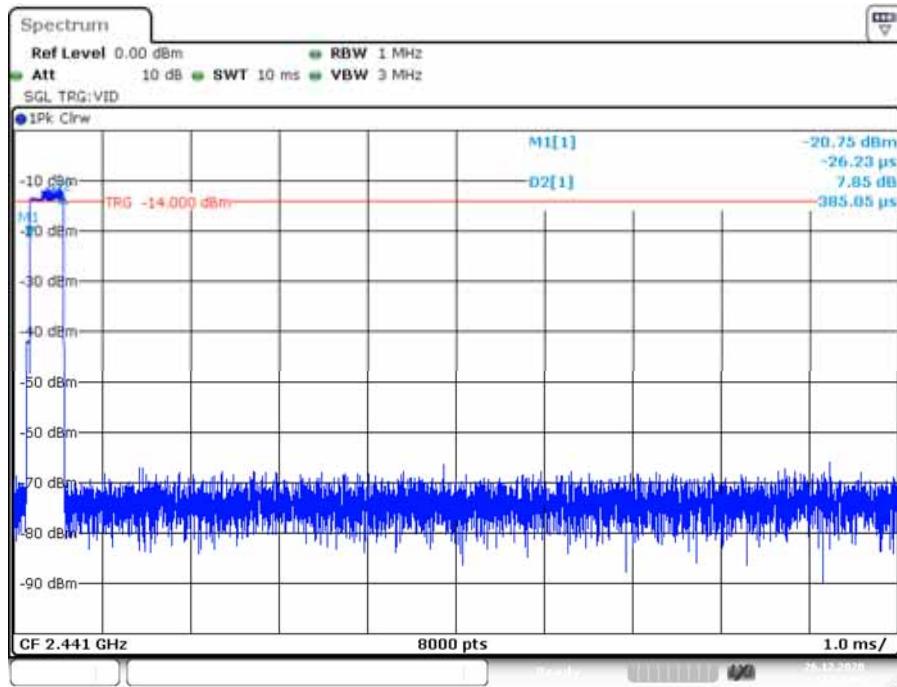
2DH3_Ant1_Hop

Date: 26.DEC.2020 13:47:59

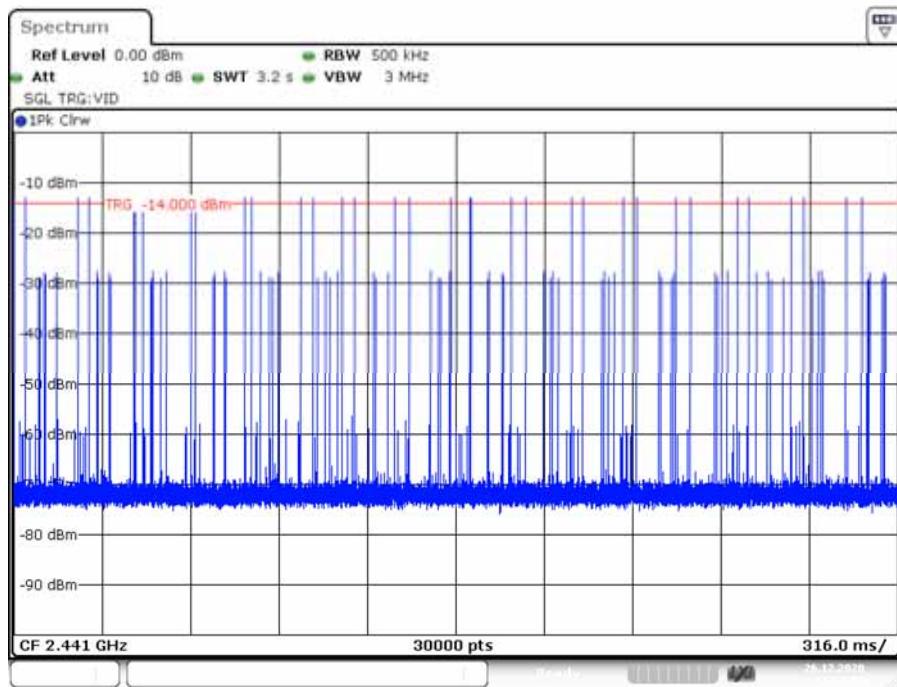


Date: 26.DEC.2020 13:48:04

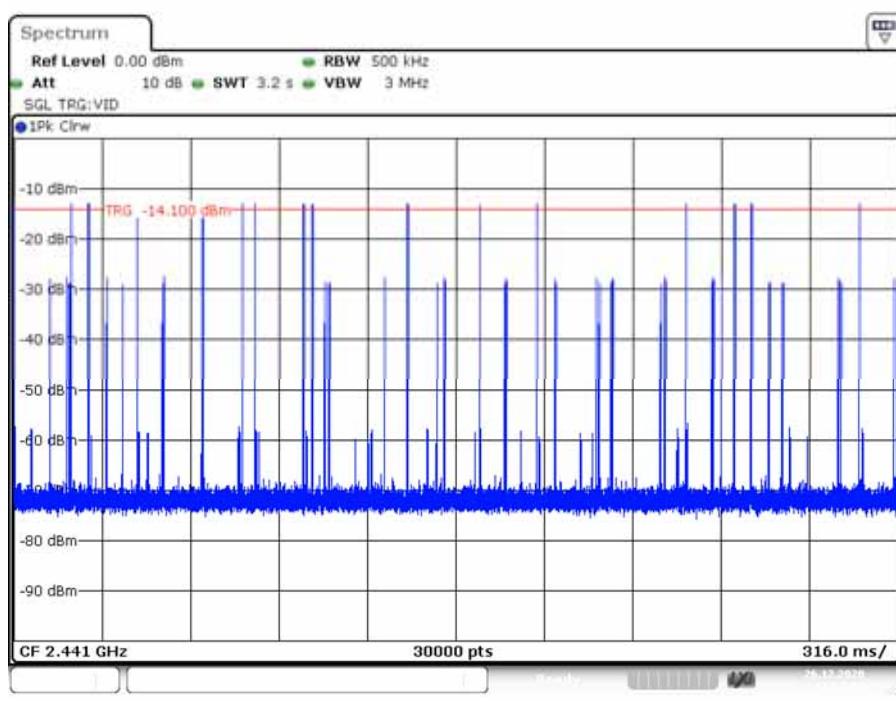
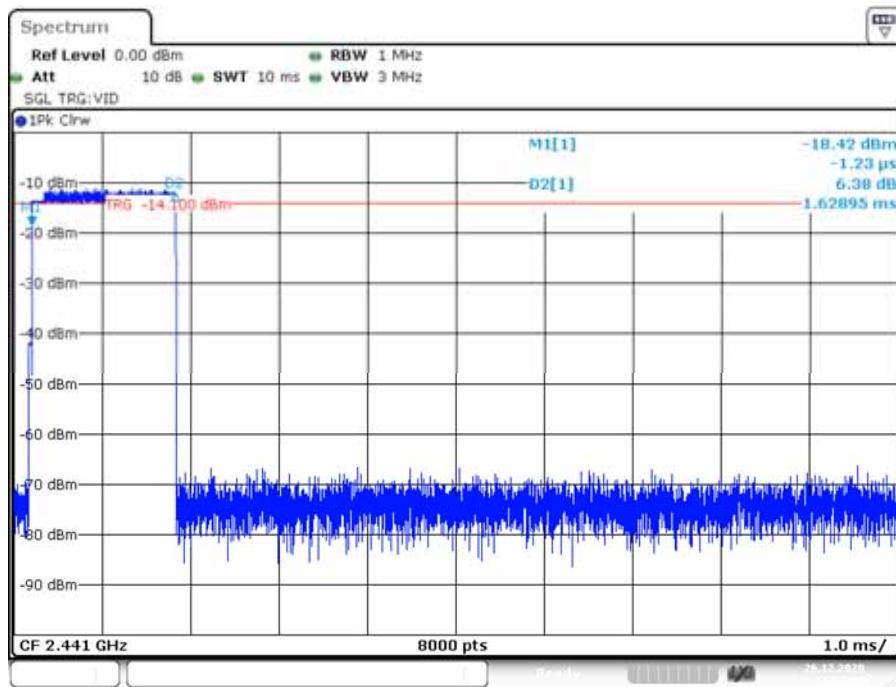
2DH5_Ant1_Hop

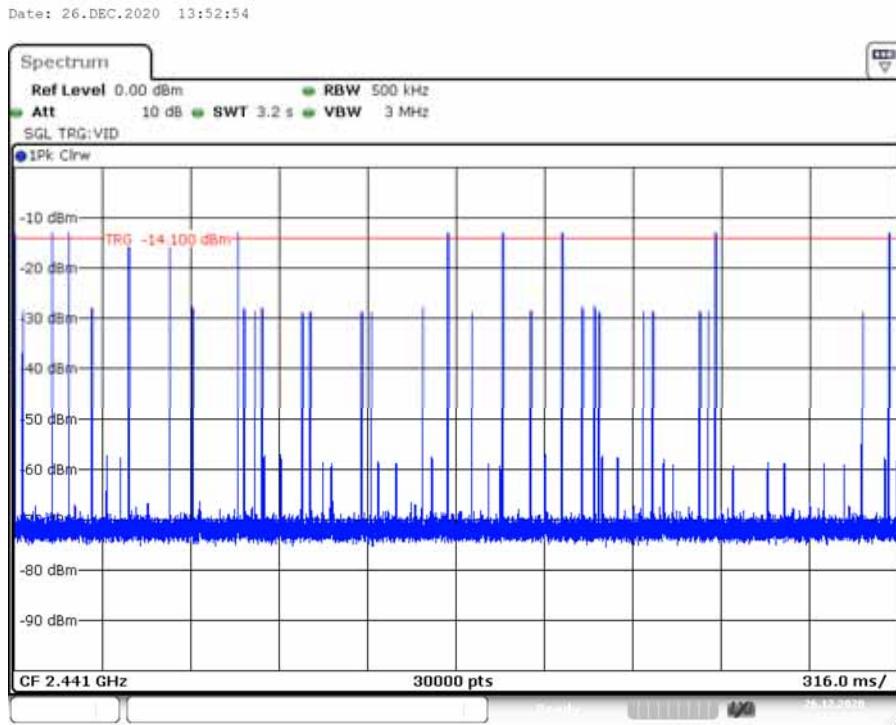
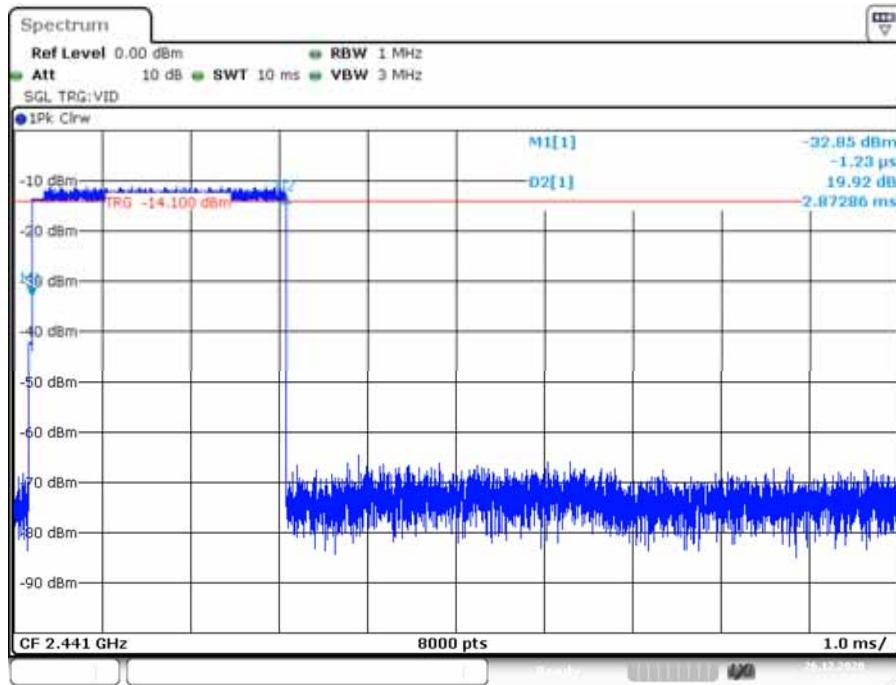
3DH1_Ant1_Hop

Date: 26.DEC.2020 13:51:48



Date: 26.DEC.2020 13:51:53

3DH3_Ant1_Hop

3DH5_Ant1_Hop

FCC §15.247(b) (1) - PEAK OUTPUT POWER MEASUREMENT

Applicable Standard

According to §15.247(b) (1), for frequency hopping systems operating in the 2400–2483.5 MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725–5850 MHz band: 1 watt. And for all other frequency hopping systems in the 2400–2483.5 MHz band: 0.125 watts.

Test Procedure

1. Place the EUT on a bench and set in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to one test equipment.
3. Add a correction factor to the display.

Test Data

Environmental Conditions

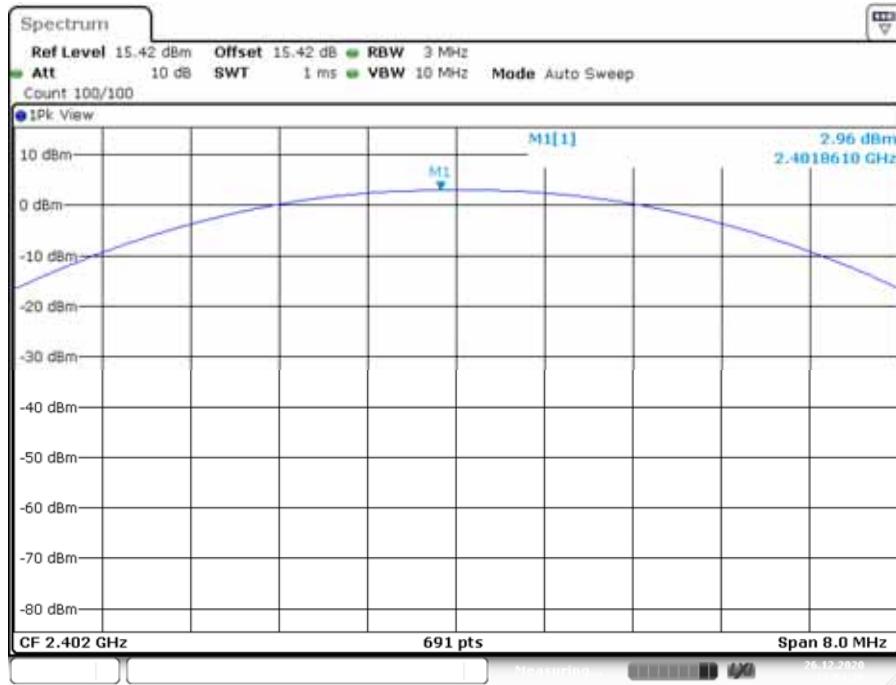
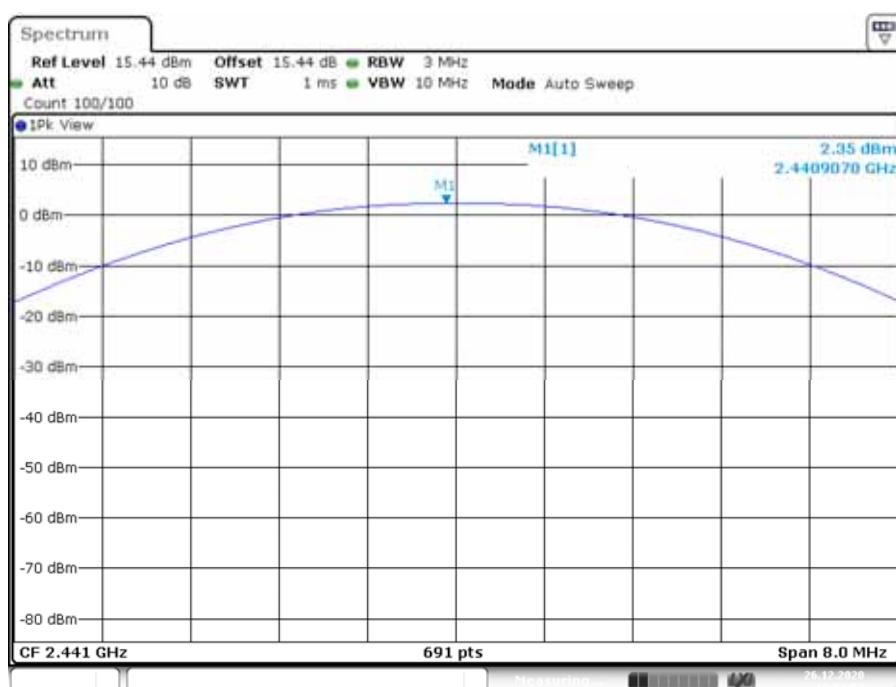
Temperature:	24°C
Relative Humidity:	48 %
ATM Pressure:	101.0 kPa

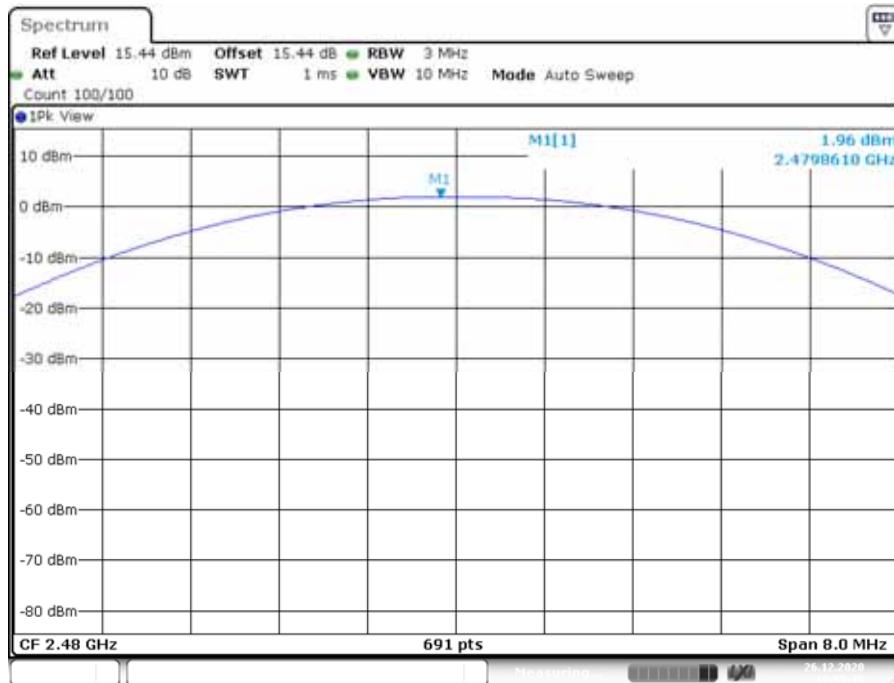
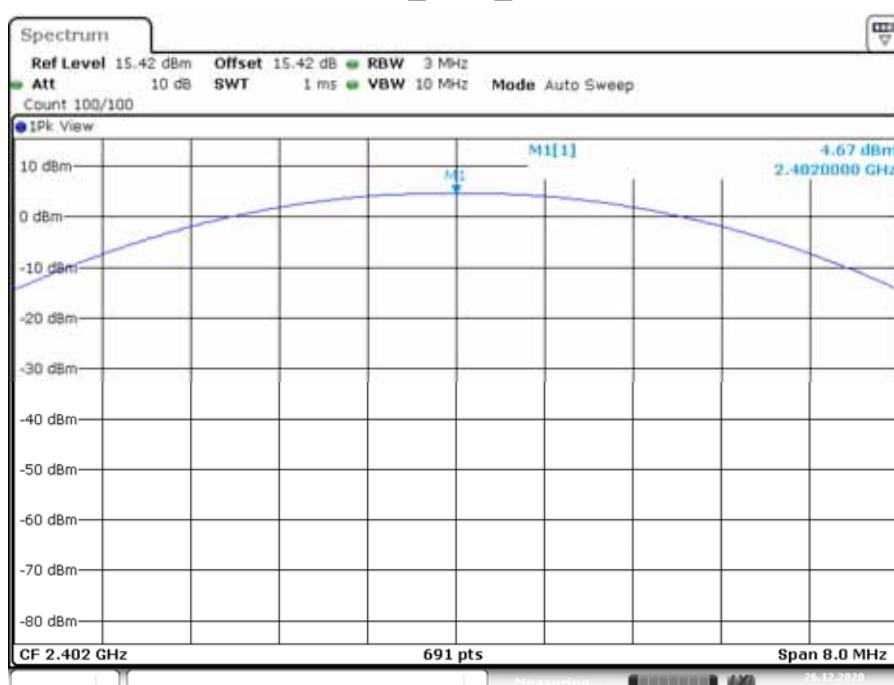
The testing was performed by Fan Yang on 2020-12-26.

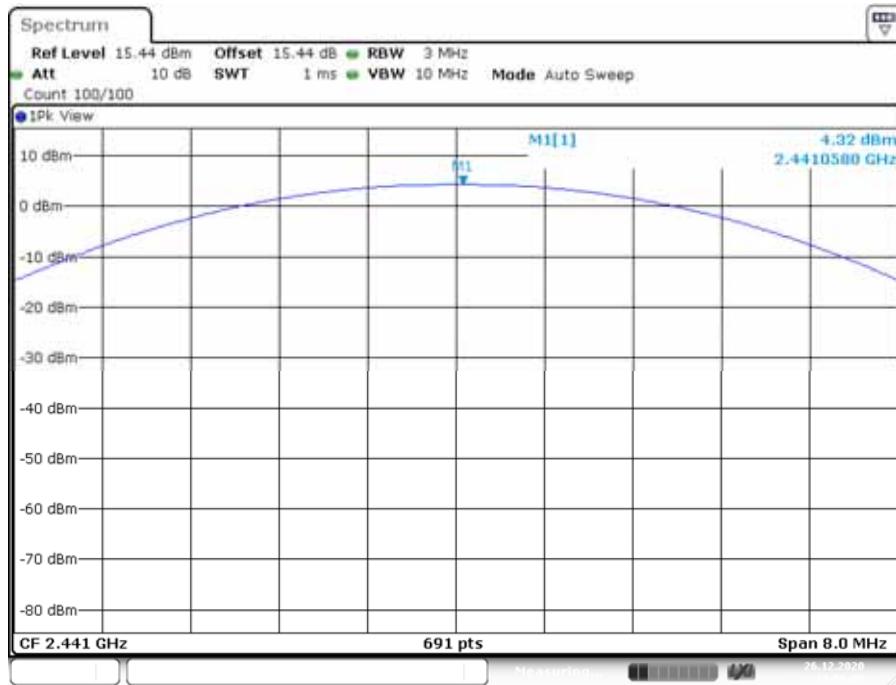
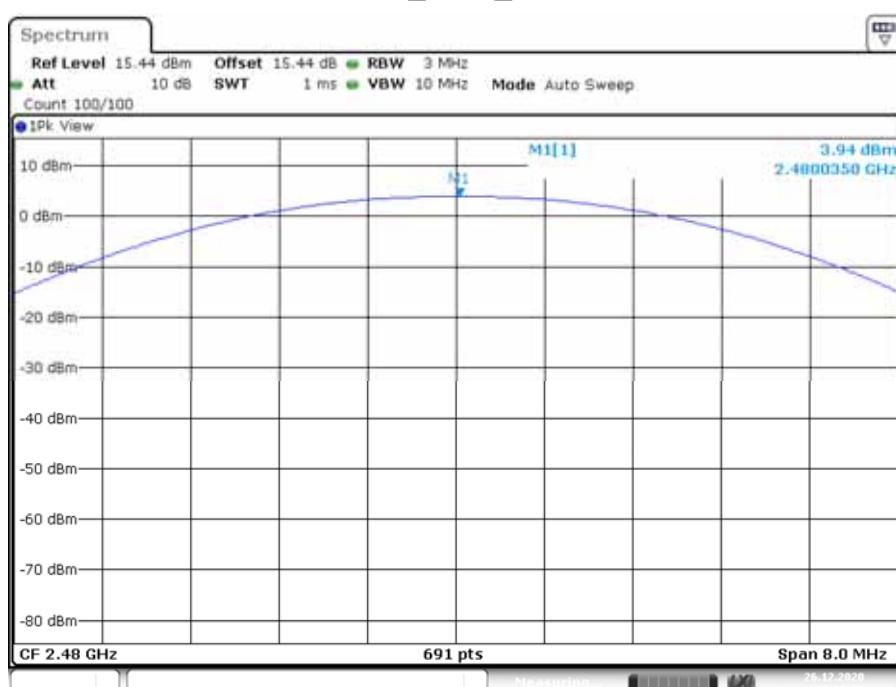
EUT operation mode: Transmitting

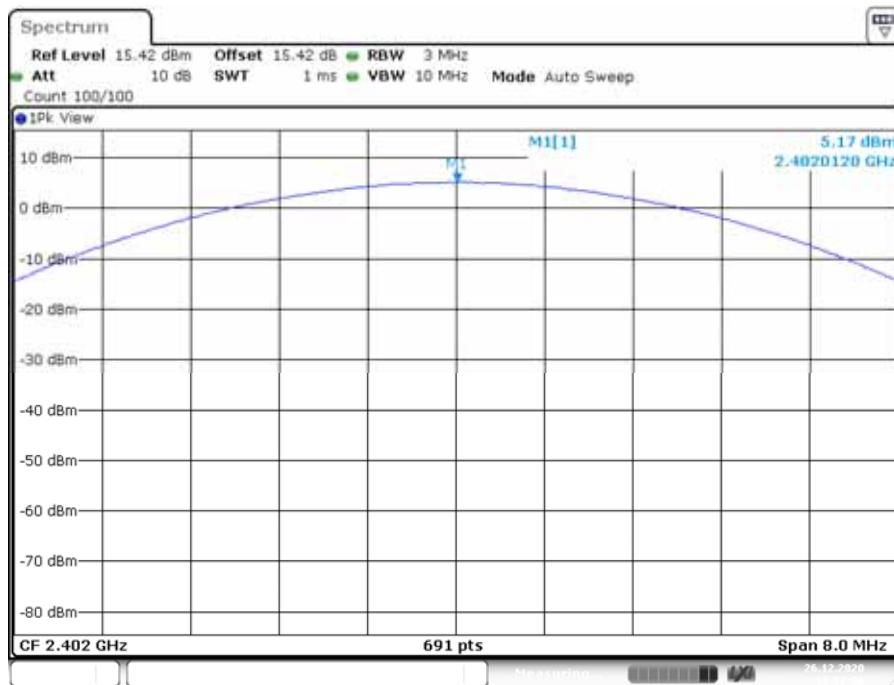
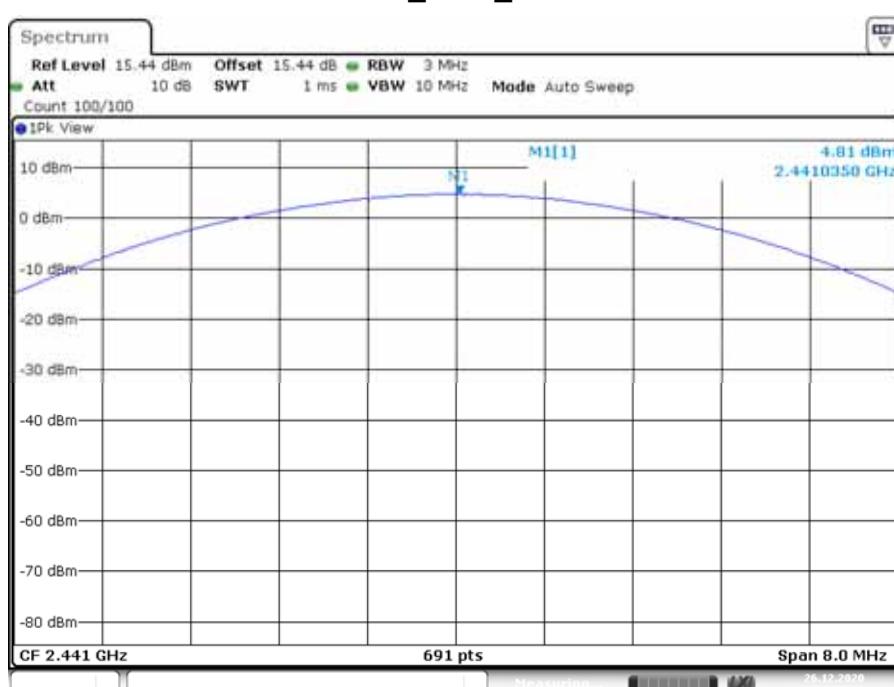
Test Result: Compliant.

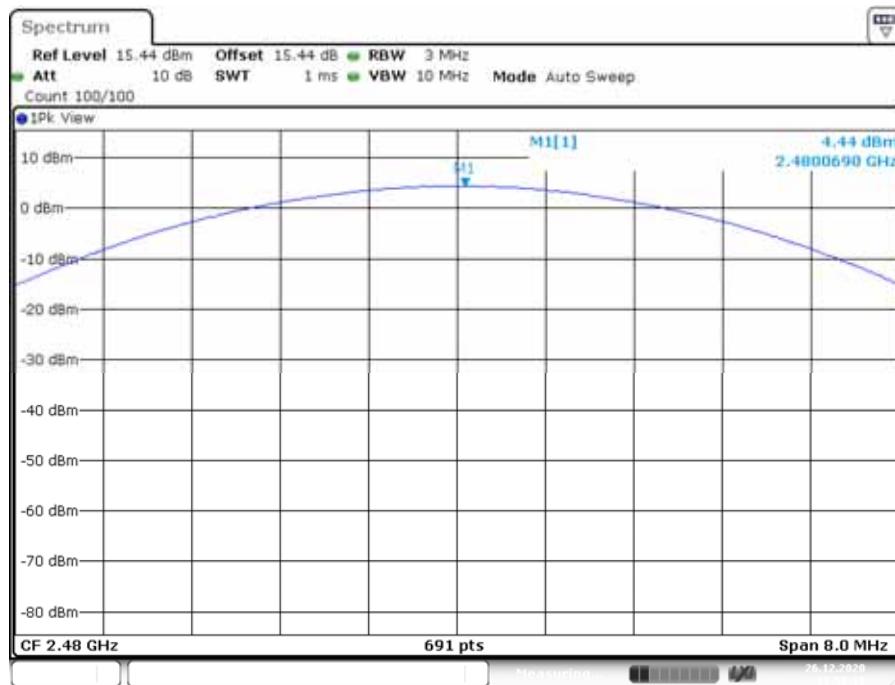
Test Mode	Antenna	Channel	Result[dBm]	Limit[dBm]	Verdict
DH1	Ant1	2402	2.96	<=20.97	PASS
		2441	2.35	<=20.97	PASS
		2480	1.96	<=20.97	PASS
2DH1	Ant1	2402	4.67	<=20.97	PASS
		2441	4.32	<=20.97	PASS
		2480	3.94	<=20.97	PASS
3DH1	Ant1	2402	5.17	<=20.97	PASS
		2441	4.81	<=20.97	PASS
		2480	4.44	<=20.97	PASS

DH1_Ant1_2402**DH1_Ant1_2441**

DH1_Ant1_2480**2DH1_Ant1_2402**

2DH1_Ant1_2441**2DH1_Ant1_2480**

3DH1_Ant1_2402**3DH1_Ant1_2441**

3DH1_Ant1_2480

FCC §15.247(d) - BAND EDGES TESTING

Applicable Standard

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

Test Procedure

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Remove the antenna from the EUT and then connect to a low loss RF cable from the antenna port to a EMI test receiver, then turn on the EUT and make it operate in transmitting mode. Then set it to Low Channel and High Channel within its operating range, and make sure the instrument is operated in its linear range.
3. Set RBW of spectrum analyzer to 100 kHz with a convenient frequency span including 100 kHz bandwidth from band edge.
4. Measure the highest amplitude appearing on spectral display and set it as a reference level. Plot the graph with marking the highest point and edge frequency.
5. Repeat above procedures until all measured frequencies were complete.

Test Data

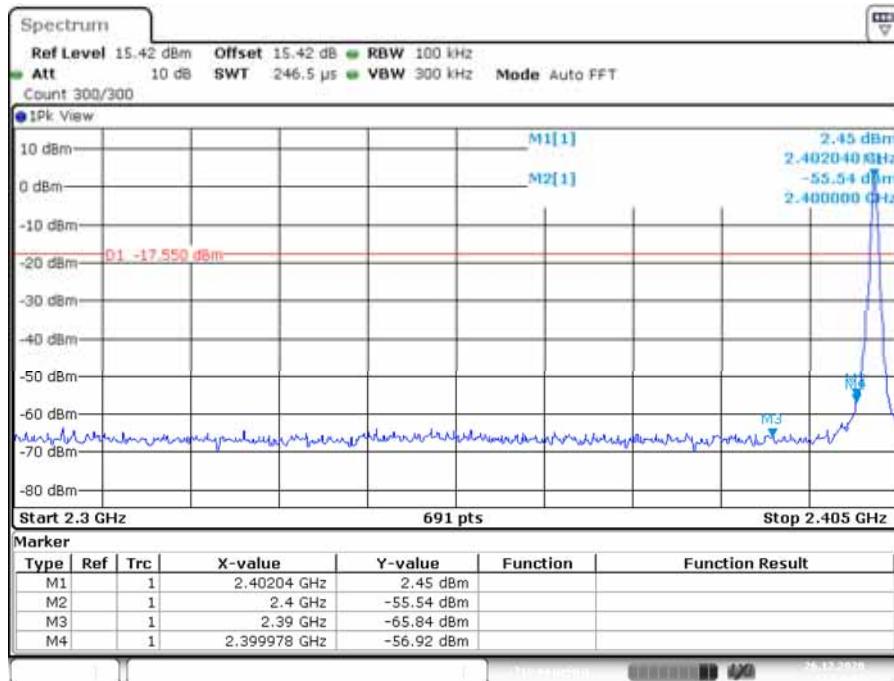
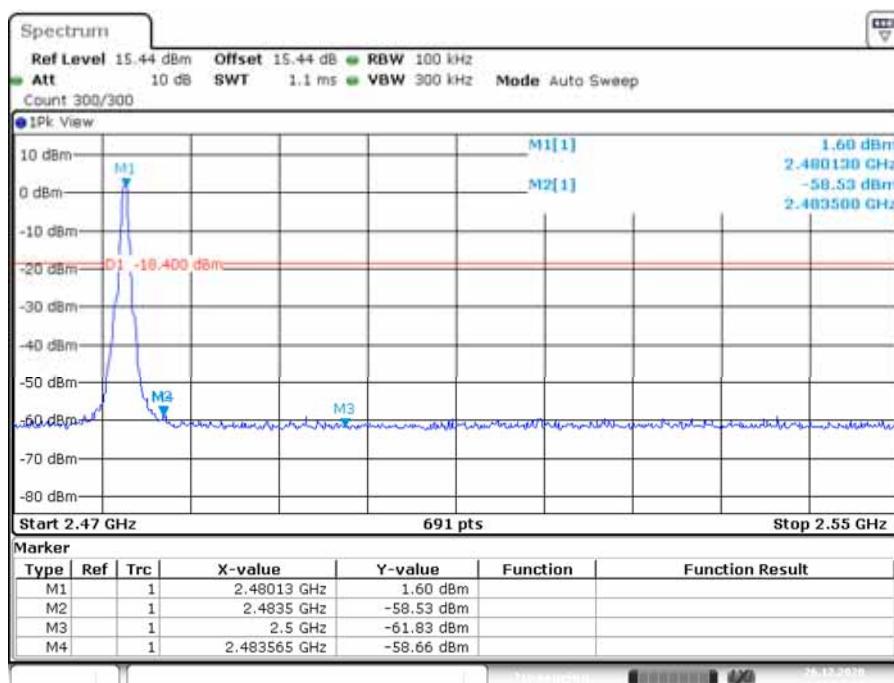
Environmental Conditions

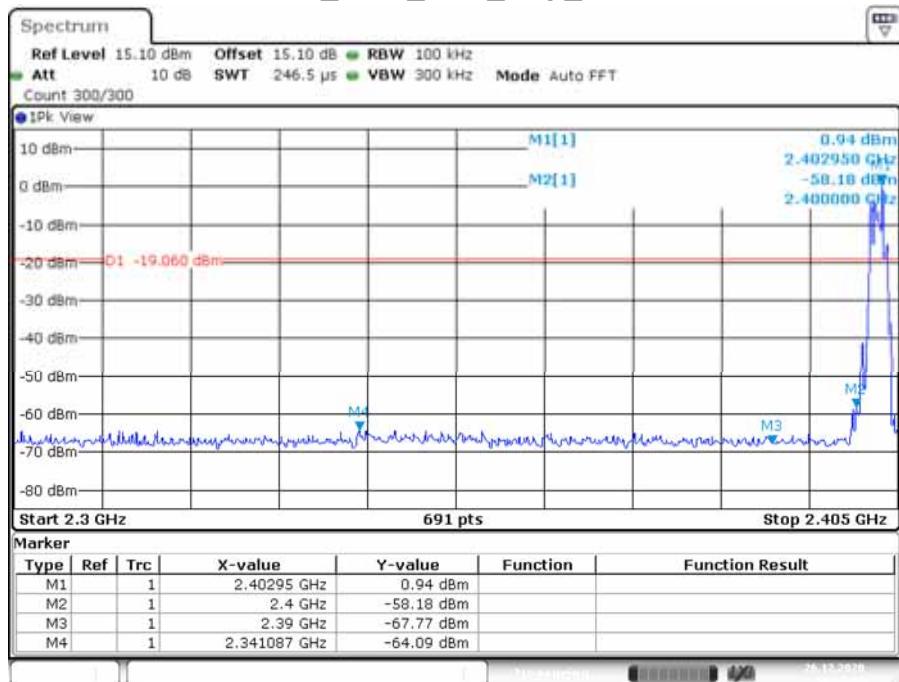
Temperature:	24°C
Relative Humidity:	48 %
ATM Pressure:	101.0 kPa

The testing was performed by Fan Yang on 2020-12-26.

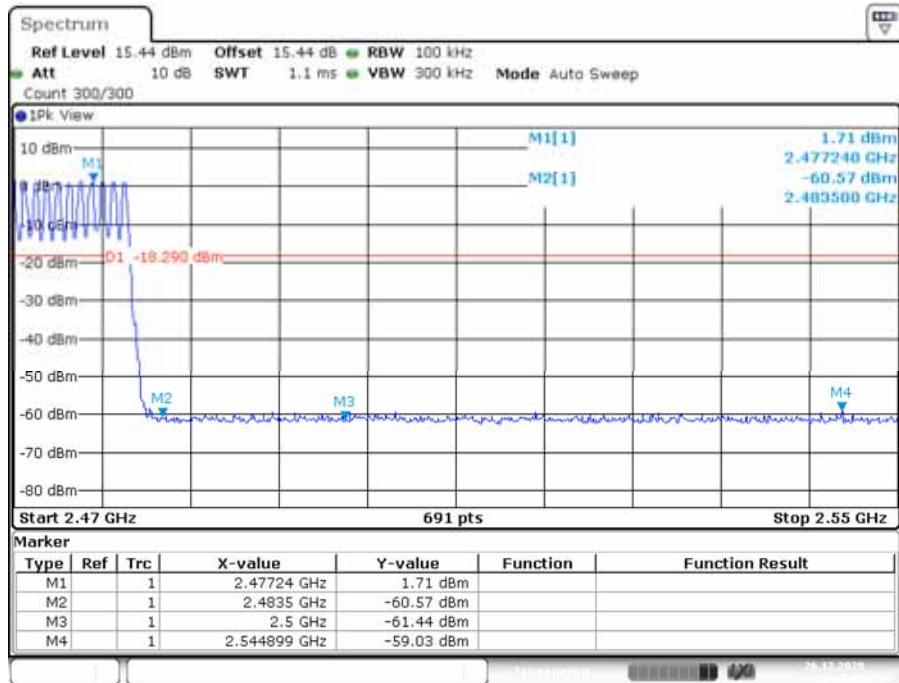
EUT operation mode: Transmitting

Test Result: Compliant.

Conducted Band Edge Result:**DH1_Ant1_Low_2402****DH1_Ant1_High_2480**

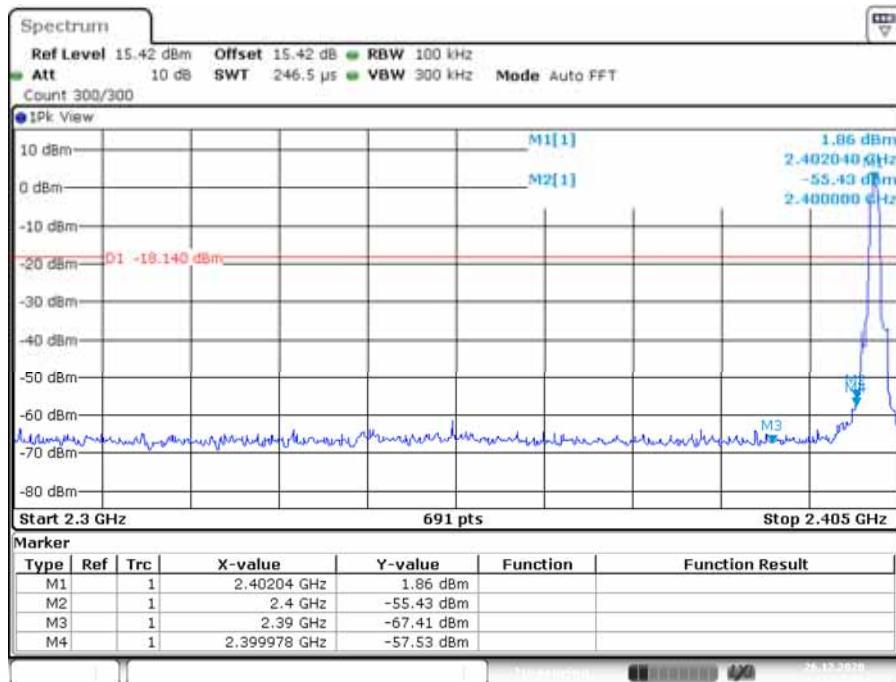
DH1_Ant1_Low_Hop_2402

Date: 26.DEC.2020 14:13:29

DH1_Ant1_High_Hop_2480

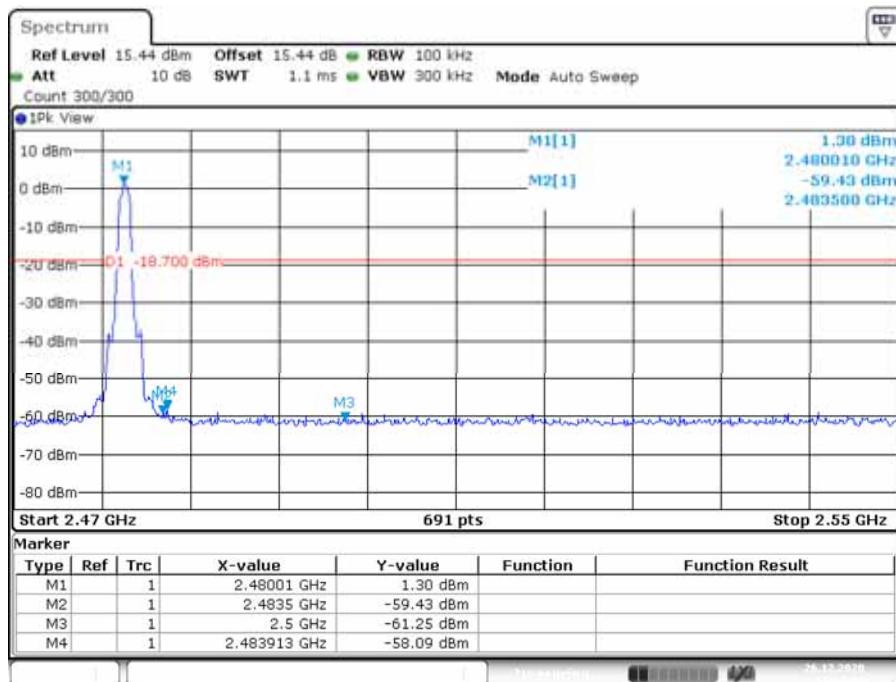
Date: 26.DEC.2020 13:43:28

2DH1_Ant1_Low_2402

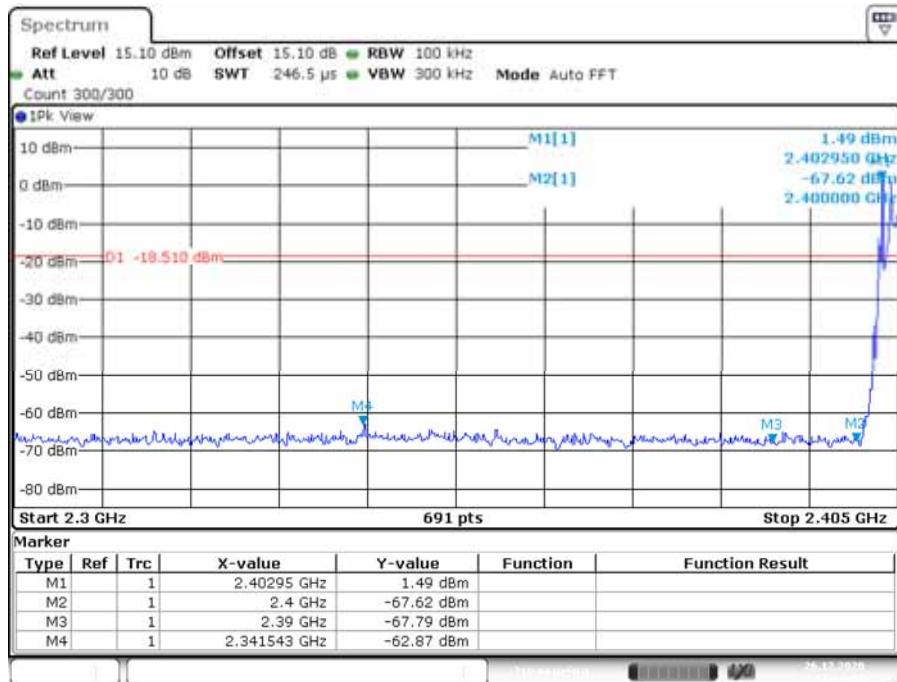


Date: 26.DEC.2020 12:58:56

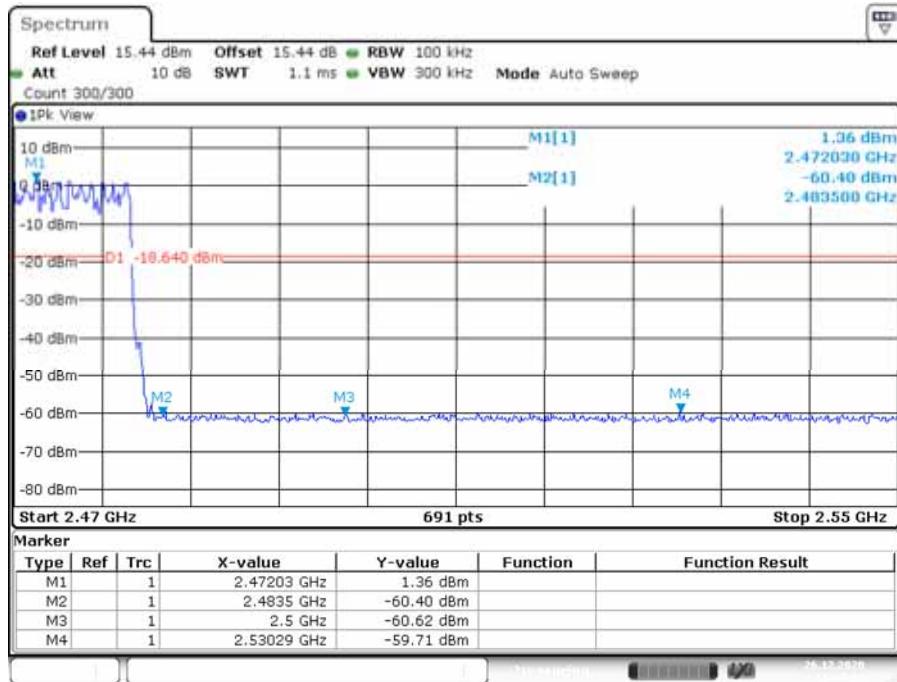
2DH1_Ant1_High_2480



Date: 26.DEC.2020 13:01:23

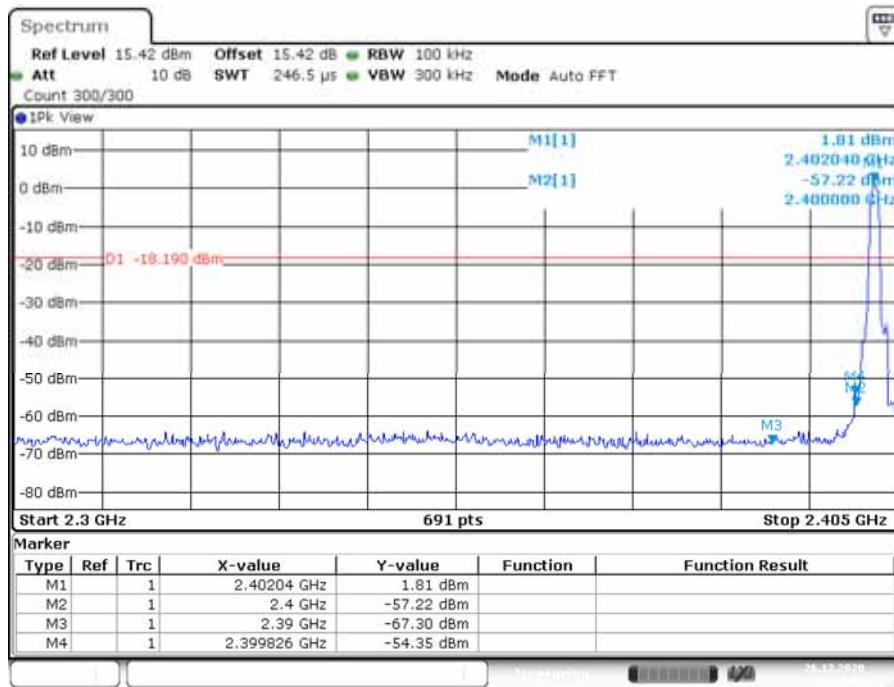
2DH1_Ant1_Low_Hop_2402

Date: 26.DEC.2020 13:44:05

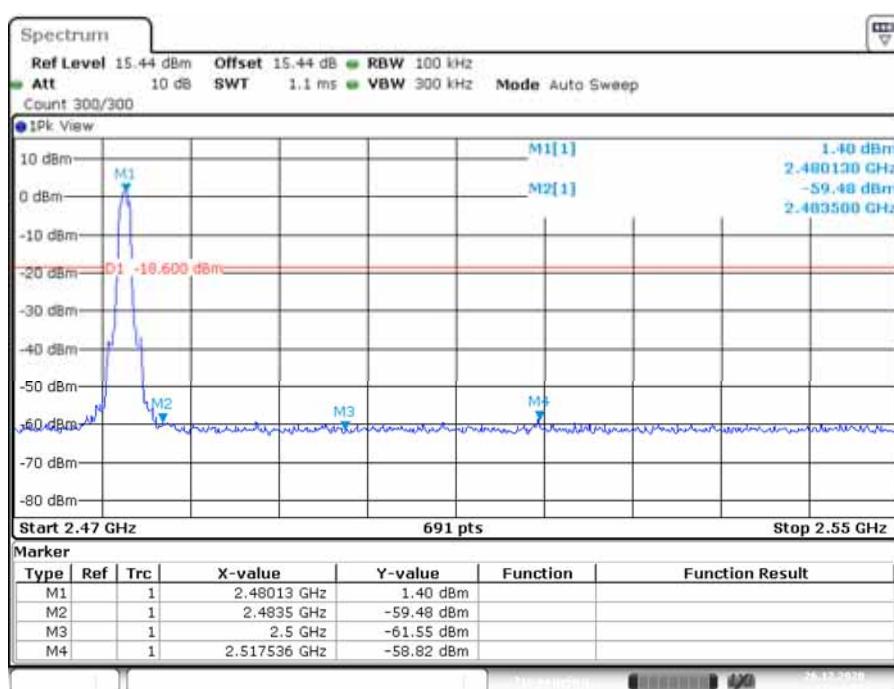
2DH1_Ant1_High_Hop_2480

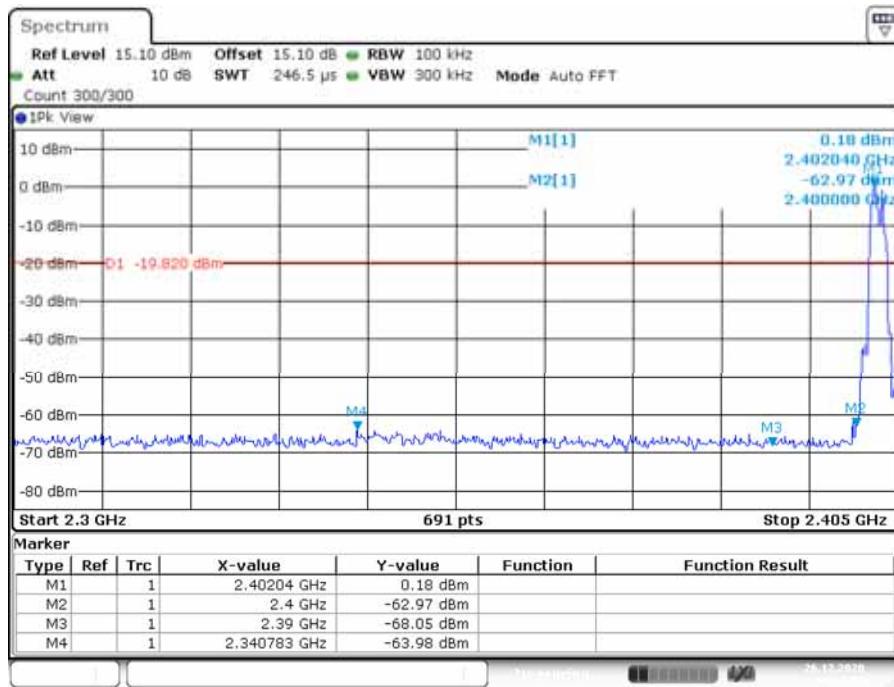
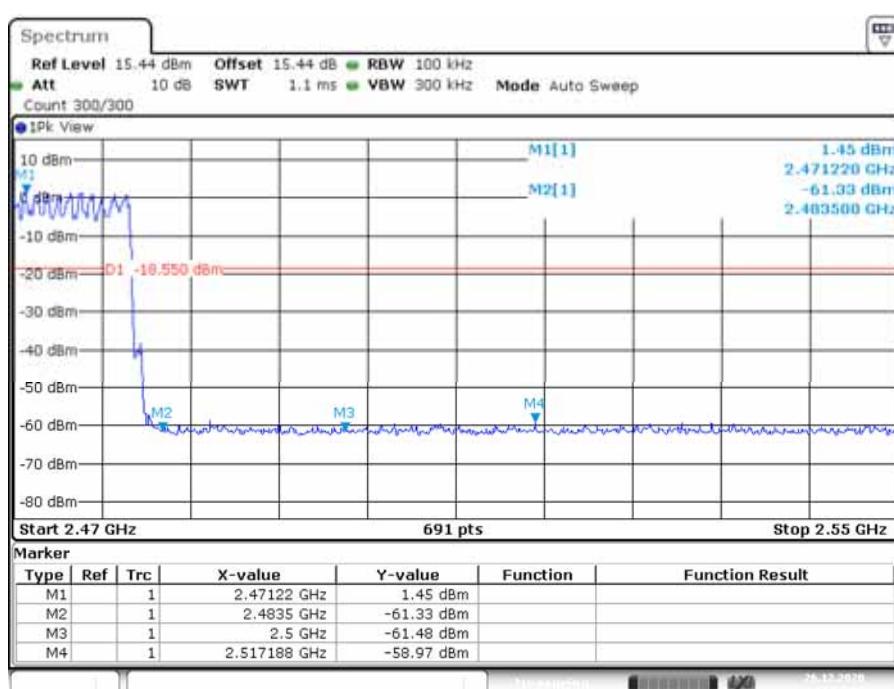
Date: 26.DEC.2020 13:49:23

3DH1_Ant1_Low_2402



3DH1_Ant1_High_2480



3DH1_Ant1_Low_Hop_2402**3DH1_Ant1_High_Hop_2480**

Radiated Band Edge Result:

Note:

1. Emissions attenuated more than 20 dB below the permissible value are not reported.
2. The field strength is calculated by adding the antenna factor, high pass filter loss(if used) and cable loss, and subtracting the amplifier gain(if any)from the measured reading. The basic equation calculation is as follows:
Result = Reading + Corrected Factor
3. Display the measurement of peak values.

Test Procedure:

The EUT and its simulators are placed on a turntable, which is 1.5 meter high above ground. The turntable can rotate 360 degrees to determine the position of the maximum emission level. EUT is set 3.0 meters away from the receiving antenna, which is mounted on an antenna tower. The antenna can be moved up and down between 1.0 meter and 4 meters to find out the maximum emission level. Broadband antenna (calibrated bi-log antenna) is used as receiving antenna. Both horizontal and vertical polarizations of the antenna are set on measurement. In order to find the maximum emission levels, all of the EUT location must be manipulated according to ANSI C63.10:2013 on radiated emission measurement. This EUT was tested in 3 orthogonal positions and the Worse case position data was reported.

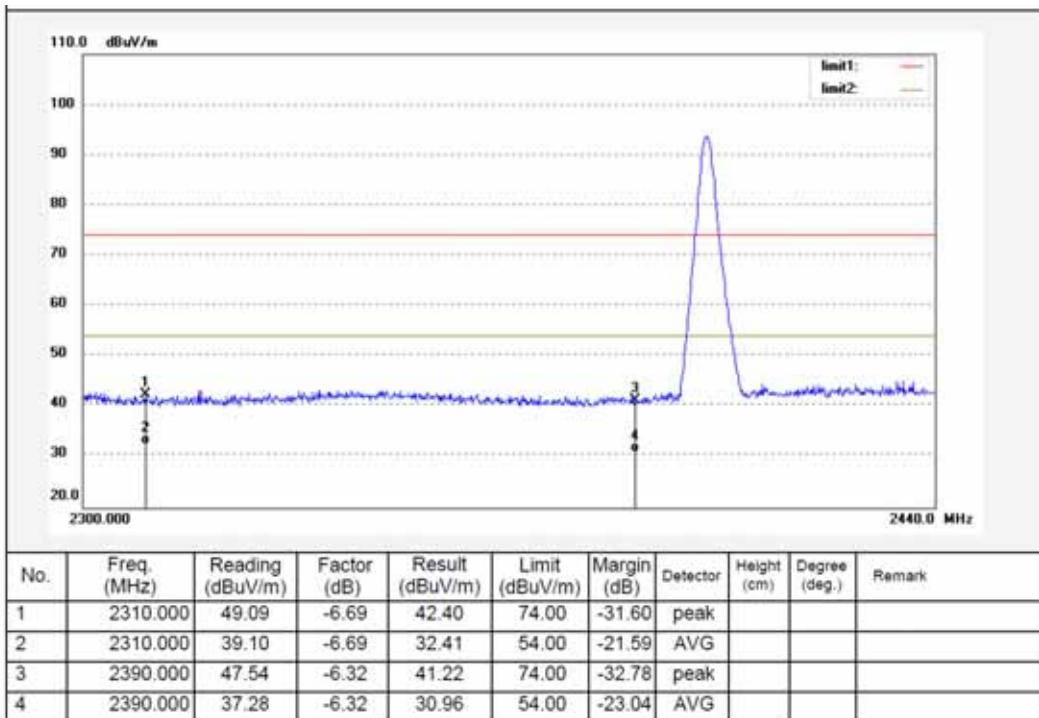
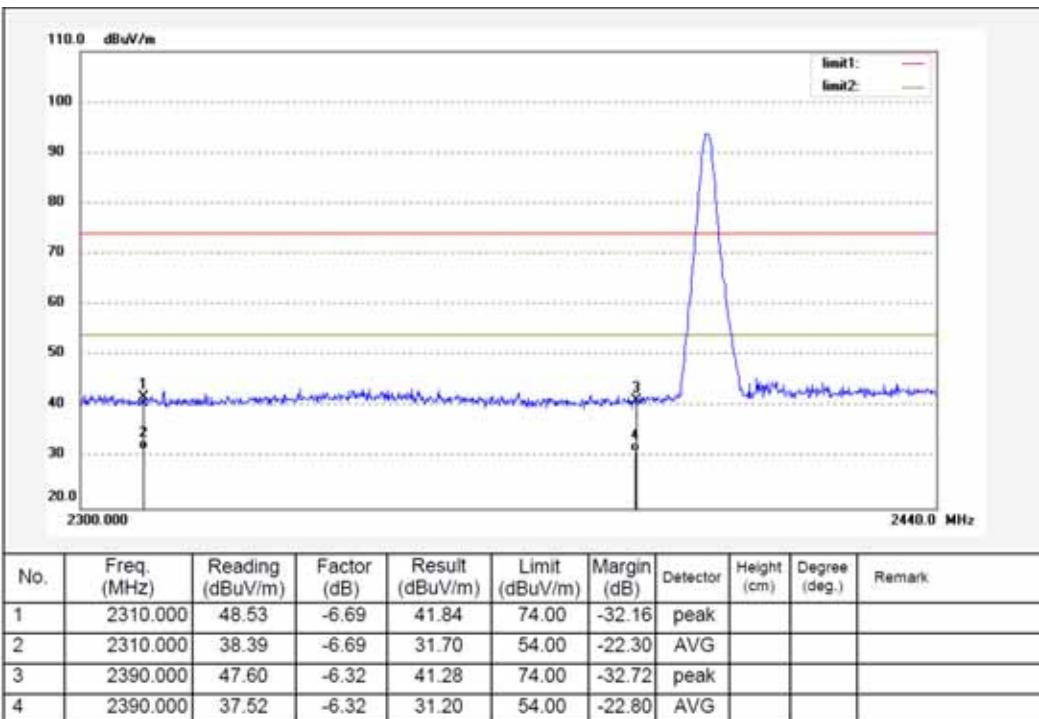
Let the EUT work in TX (Hopping off, Hopping on) modes measure it.

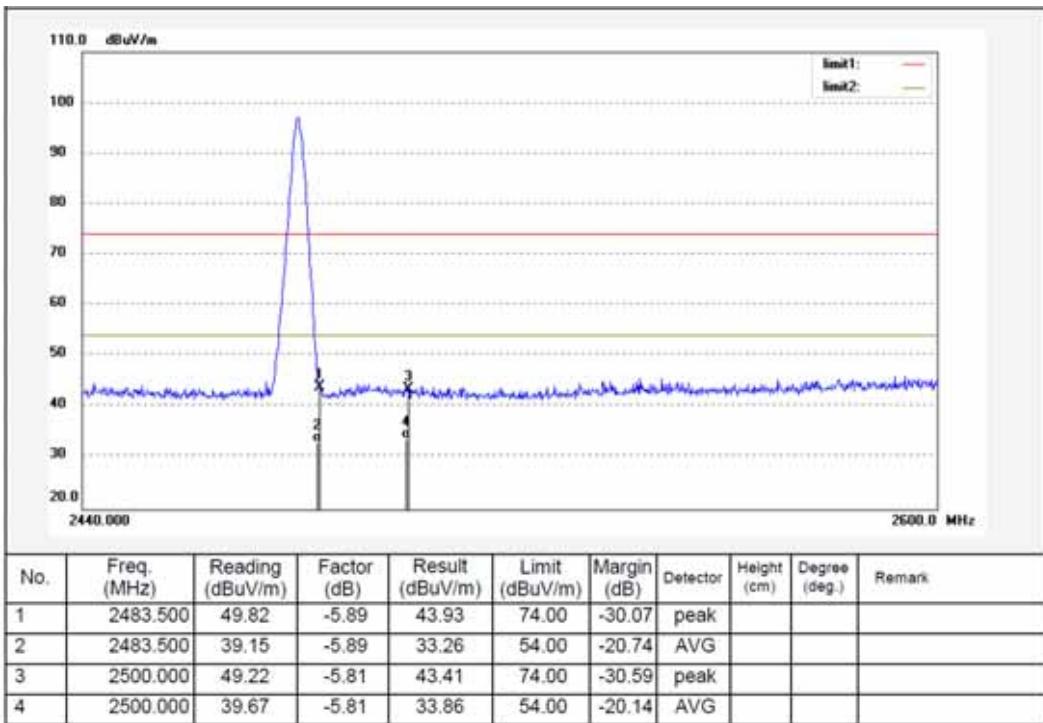
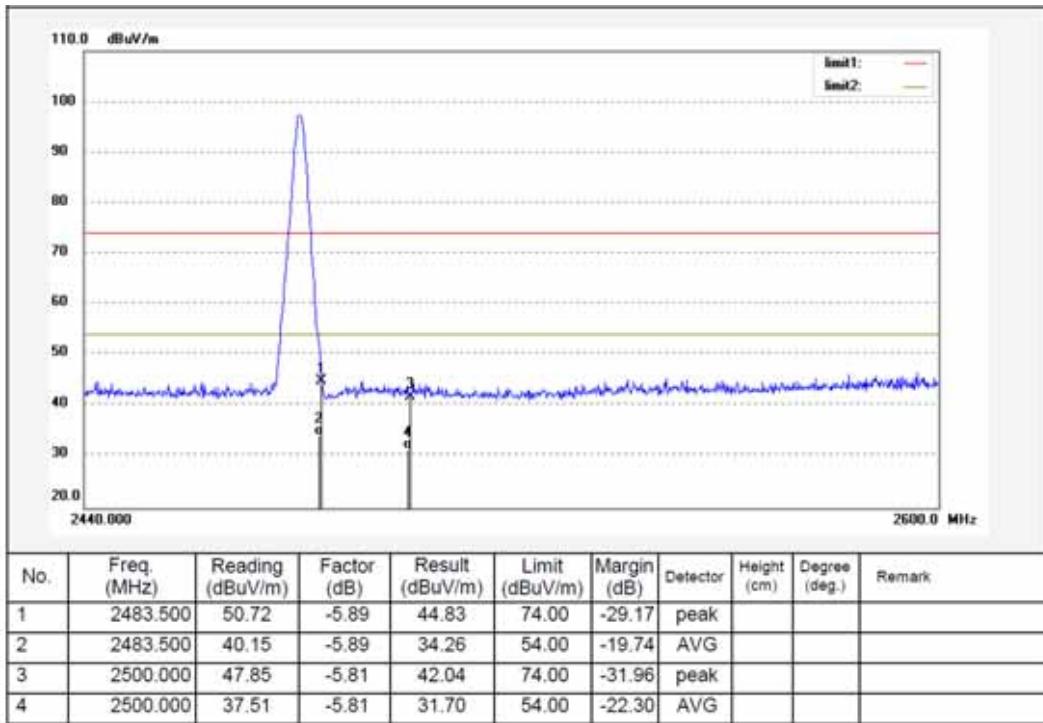
We select 2402MHz, 2480MHz TX frequency to transmit(Hopping off mode).

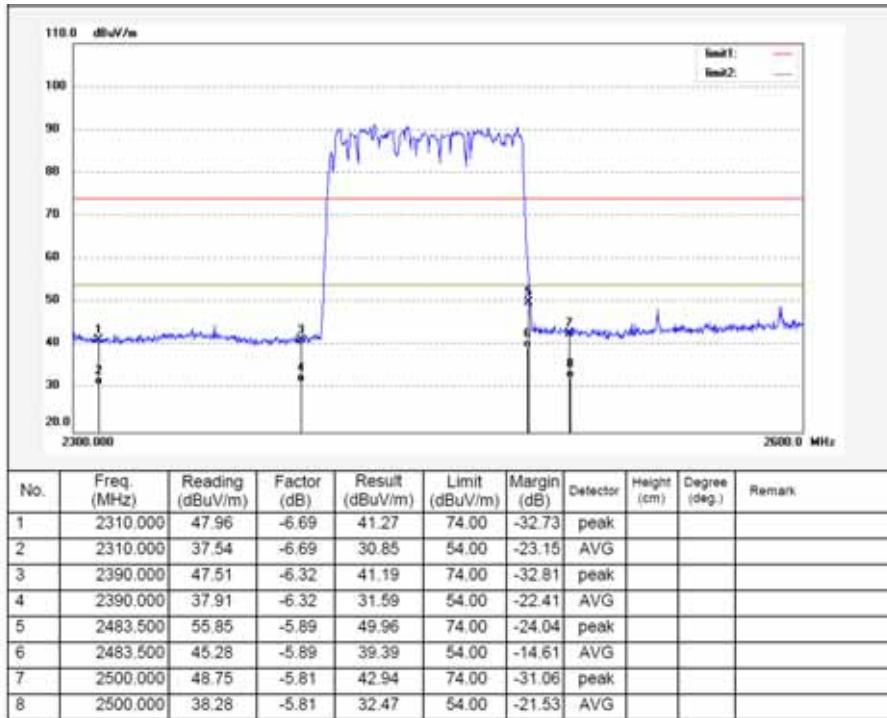
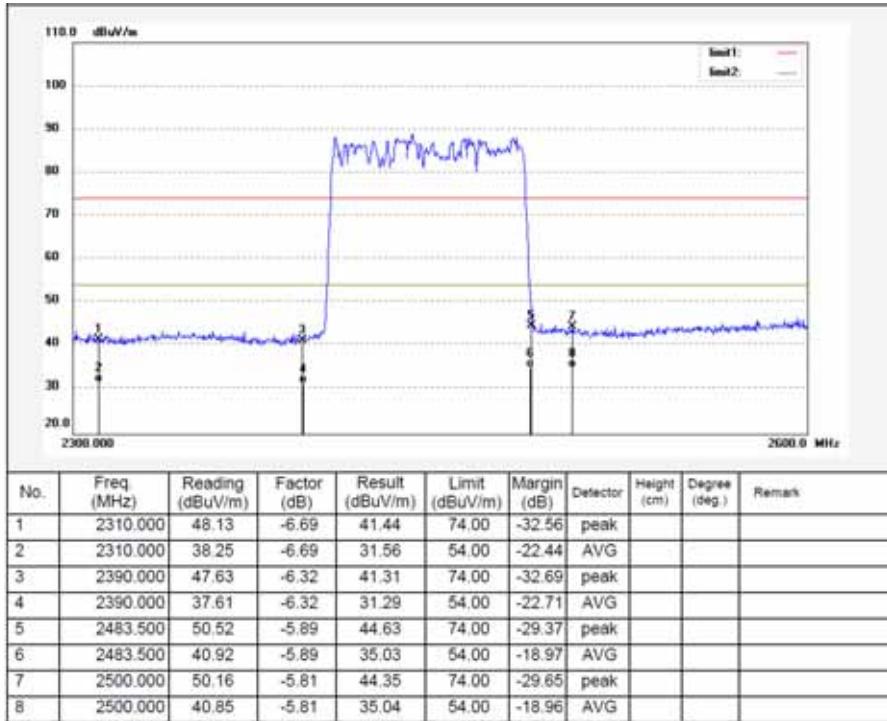
We select 2402-2480MHz TX frequency to transmit(Hopping on mode).

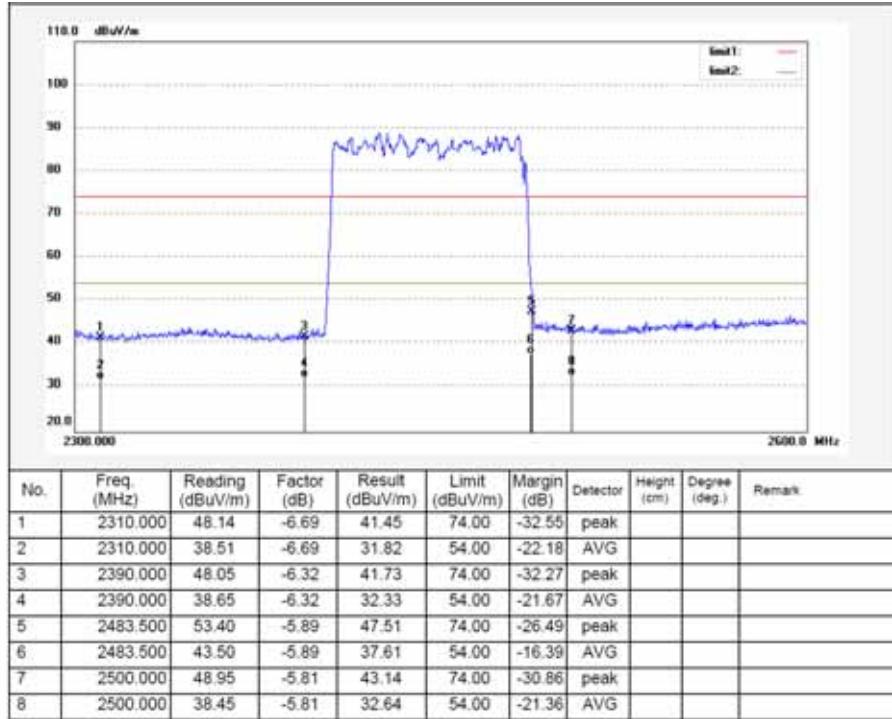
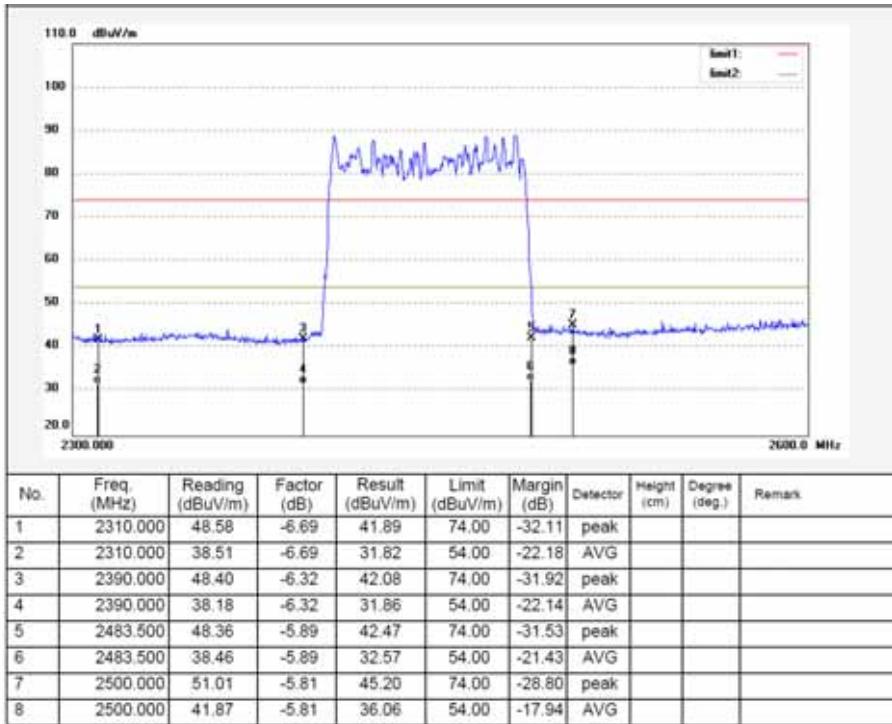
During the radiated emission test, the spectrum analyzer was set with the following configurations:

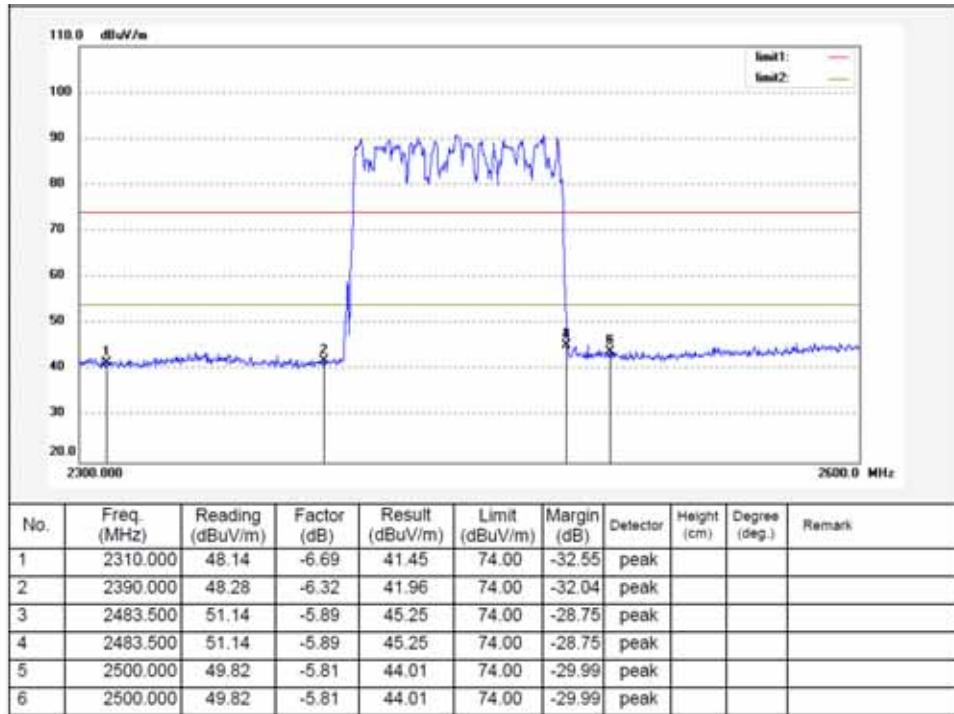
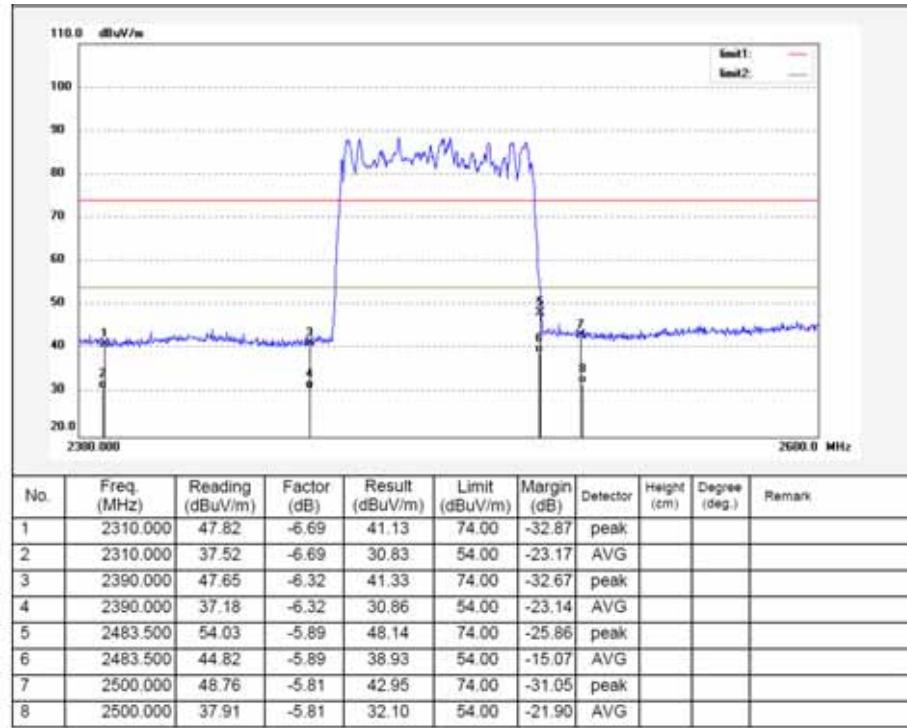
1. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and video bandwidth is 3MHz for peak measurement with peak detector at frequency above 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and video bandwidth is 10Hz for Average measurement with peak detection at frequency above 1GHz.
3. All modes of operation were investigated and the Non-hopping mode worse case (GFSK mode) and hopping mode (All modes) emissions are reported.

Non-hopping mode (Worse case (GFSK mode))**TX2402MHz:****Horizontal:****Vertical:**

TX2480MHz:**Horizontal:****Vertical:**

Hopping mode**GFSK:****Horizontal:****Vertical:**

/4DQPSK:**Horizontal:****Vertical:**

8DPSK:**Horizontal:****Vertical:********* END OF REPORT *******