LTA
Laboratory for Test & Approval Co.,Ltd.

243 Jubug-Ri,Yangji-Myeon, Yongin-Si, Gyeonggi-Do, Korea 17159
Tel: +82-31-323-6008 Fax: +82-31-323-6010
http://www.ltalab.com

Dates of Tests: April 24 ~ May 28, 2019
Test Report S/N: LR500111905O
Test Site : LTA CO., LTD.

CERTIFICATION OF COMPLIANCE

FCC ID **2AKDGDM-01**

APPLICANT **dot incorporation**

Equipment Class	**:**	**Part 15 Spread Spectrum Transmitter (DSS)**
Manufacturing Description	**:**	**Braille device**
Manufacturer	**:**	**dot incorporation**
Model name	**:**	**DM-01**
Test Device Serial No.:	**:**	**Identical prototype**
FCC Rule Part(s)	**:**	**FCC Part 15.247** **FCC Part 15.247 Subpart C ; ANSI C-63.4-2014** **ANSI C-63.10-2013**
Frequency Range	**:**	**2402 ~ 2480 MHz**
RF power	**:**	**Max 4.06 dBm – Conducted (Basic)**
Data of issue	**:**	**May 27, 2019**

This test report is issued under the authority of:

JaBeom.Koo

Ja-Beom, Koo / Director

The test was supervised by:

Hee-Cheon, Kwon / Test Engineer

This test result only responds to the tested sample. It is not allowed to copy this report even partly without the allowance of the test laboratory. The report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the Federal Government.

NVLAP LAB Code.: 200723-0

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1. General information

1-1 Test Performed

Company name : LTA Co., Ltd.
Address : 243, Jubug-ri,Yangji-Myeon,Youngin-Si, Kyunggi-Do, Korea. 449-822
Web site : http://www.ltalab.com
E-mail : chahn@ltalab.com
Telephone : +82-31-323-6008
Facsimile : +82-31-323-6010

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

1-2 Accredited agencies

LTA Co., Ltd. is approved to perform EMC testing by the following agencies:

Agency	Country	Accreditation No.	Validity	Reference
NVLAP	U.S.A	200723-0	UPDATING	ECT accredited Lab.
RRA	KOREA	KR0049	-	EMC accredited Lab.
FCC	U.S.A	649054	2019-04-13	FCC CAB
VCCI	JAPAN	C-4948, T-2416, R-4483(10 m), G-847	2020-09-10 2020-09-10 2020-10-15 2018-12-13	VCCI registration
IC	CANADA	5799A-1	2019-11-07	IC filing
KOLAS	KOREA	NO.551	2021-08-20	KOLAS accredited Lab.

2. Information about test item

2-1 Client & Manufacturer

Company name	:	Dot incorporation
Address	:	(Ace Highend Tower 7th 2002), 67, Gasan digital 2-ro, Geumcheon-gu, Seoul, South Korea
Tel / Fax	:	TEL No : +82-2-864-1113 / FAX No : +82-2-864-1989

2-2 Equipment Under Test (EUT)

Model name	:	DM-01
Serial number	:	Identical prototype
Date of receipt	:	April 24, 2019
EUT condition	:	Pre-production, not damaged
Antenna type	:	FPCB Antenna: -8.0 dBi
Frequency Range	:	2402 ~ 2480MHz
RF output power	:	Max 4.06 dBm – Conducted (Basic)
Number of channels	:	79
Channel spacing	:	1 MHz
Channel Access Protocol	:	Frequency Hopping Spread Spectrum (FHSS)
Type of Modulation	:	Basic Mode(GFSK)
Power Source	:	DC 3.7 V
Firmware Version	:	V1.0.0

2-3 Tested frequency

Bluetooth	LOW	MID	HIGH
Frequency (MHz) – Basic & EDR	2402	2441	2480

2-4 Ancillary Equipment

Equipment	Model No.	Serial No.	Manufacturer
Notebook	CR720	MS-1736	MSI

3. Test Report

3.1 Summary of tests

FCC Part Section(s)	Parameter	Limit	Test Condition	Status (note 1)
15.247(a)	Carrier Frequency Separation	≥ 2/3 of 20dB BW	Conducted	C
15.247(a)	Number of Hopping Frequencies	≥ 15 channels		C
15.247(a)	20 dB Bandwidth 99% Bandwidth	–		C
15.247(a)	Dwell Time	≤ 0.4 seconds		C
15.247(b)	Transmitter Output Power	≤ 1W for 1Mbps ≤ 125mW for 2,3Mbps		C
15.247(d)	Conducted Spurious emission	> 20 dBc		C
15.247(d)	Band Edge	> 20 dBc		C
15.249 / 15.209	Field Strength of Harmonics	< 54 dBuV (at 3m)	Radiated	C
15.109	Field Strength	–		C
15.207 /15.107	AC Conducted Emissions	EN 55022	Line Conducted	C
15.203	Antenna requirement	–	–	C

Note 1: C=Complies NC=Not Complies NT=Not Tested NA=Not Applicable

Note 2: The data in this test report are traceable to the national or international standards.

Note 1: Antenna Requirement

dot incorporation. **FCC ID: 2AKDGDM-01** unit complies with the requirement of §15.203.

The antenna type is FPCB Antenna

The sample was tested according to the following specification:

*FCC Parts 15.247; ANSI C-63.4-2014
*FCC KDB Publication No. 558074 D01 v05r02
*FCC TCB Workshop 2012, April

3.2 Frequency Hopping System Requirements

3.2.1 Standard Applicable

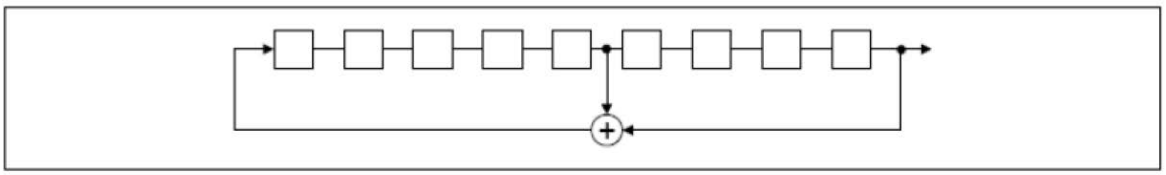
According to FCC Part 15.247(a)(1), The system shall hop to channel frequencies that are selected at the system hopping rate from a pseudo randomly ordered list of hopping frequencies. Each frequency must be used equally on the average by each transmitter. The system receivers shall have input bandwidths that match the hopping channel bandwidths of their corresponding transmitters and shall shift frequencies in synchronization with the transmitted signals.

(g) Frequency hopping spread spectrum systems are not required to employ all available hopping channels during each transmission. However, the system, consisting of both the transmitter and the receiver, must be designed to comply with all of the regulations in this section should the transmitter be presented with a continuous data (or information) stream. In addition, a system employing short transmission bursts must comply with the definition of a frequency hopping system and must distribute its transmissions over the minimum number of hopping channels specified in this section.

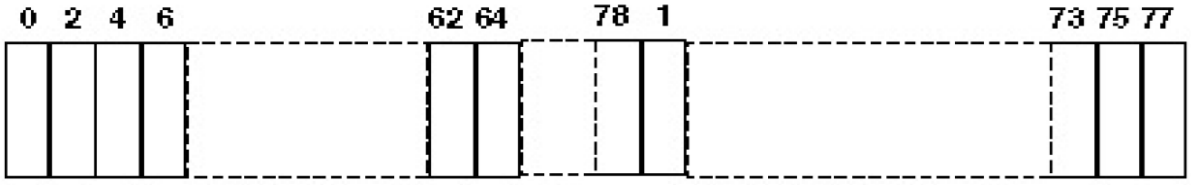
(h) The incorporation of intelligence within a frequency hopping spread spectrum system that permits the system to recognize other users within the spectrum band so that it individually and independently chooses and adapts its hopsets to avoid hopping on occupied channels is permitted. The coordination of frequency hopping systems in any other manner for the express purpose of avoiding the simultaneous occupancy of individual hopping frequencies by multiple transmitters is not permitted.

3.2.2 EUT Pseudorandom Frequency Hopping Sequence

The pseudorandom sequence may be generated in a nine-stage shift register whose 5th and 9th stage outputs are added in a modulo-two addition stage, and the result is fed back to the input of the first stage. The sequence begins with the first ONE of 9 consecutive ONEs; i.e. the shift register is initialized with nine ones. Number of shift register stages: 9
Length of pseudo-random sequence: 29-1 = 511 bits
Longest sequence of zeros: 8 (non-inverted signal)



Linear Feedback Shift Register for Generation of the PRBS sequence



Each frequency used equally on the average by each transmitter.
The system receiver have input bandwidths that match the hopping channel bandwidths of their corresponding transmitters and shift frequencies in synchronization with the transmitted signals.

3.2.3 Frequency Hopping System

This transmitter device is frequency hopping device, and complies with FCC part 15.247 rule.

This device uses Bluetooth radio which operates in 2400-2483.5 MHz band. Bluetooth uses a radio technology called frequency-hopping spread spectrum, which chops up the data being sent and transmits chunks of it on up to 79 bands (1 MHz each; centred from 2402 to 2480 MHz) in the range 2,400-2,483.5 MHz. The transmitter switches hop frequencies 1,600 times per second to assure a high degree of data security. All Bluetooth devices participating in a given piconet are synchronized to the frequency-hopping channel for the piconet. The frequency hopping sequence is determined by the master's device address and the phase of the hopping sequence (the frequency to hop at a specific time) is determined by the master's internal clock. Therefore, all slaves in a piconet must know the master's device address and must synchronize their clocks with the master's clock.

Adaptive Frequency Hopping (AFH) was introduced in the Bluetooth specification to provide an effective way for a Bluetooth radio to counteract normal interference. AFH identifies "bad" channels, where either other wireless devices are interfering with the Bluetooth signal or the Bluetooth signal is interfering with another device. The AFH-enabled Bluetooth device will then communicate with other devices within its piconet to share details of any identified bad channels. The devices will then switch to alternative available "good" channels, away from the areas of interference, thus having no impact on the bandwidth used.

*Example for a Bluetooth device using channel numbers would be : Chan 44, 35, 78, 03, 15, 21, 76, 40, 56, 13, 02, 19, 67, 39, 78, 20, 21, 64, 75 etc.

3.3 TECHNICAL CHARACTERISTIC TEST

3.3.1 Carrier Frequency Separation

Procedure:

The test follows DA00-705. The carrier frequency separation was measured with a spectrum analyzer connected to the antenna terminal, while EUT had its hopping function enabled.

After the trace being stable, the reading value between the peaks of the adjacent channels using the marker-delta function was recorded as the measurement results.

The spectrum analyzer is set to:

Span = 2~ 3 MHz (wide enough to capture the peaks of two adjacent channels)

RBW = 10 kHz (1% of the span or more) Sweep = auto

VBW = 10 kHz Detector function = peak

Trace = max hold

Measurement Data:

Test Results	
Carrier Frequency Separation (MHz)	**Result**
0.99 (Basic)	Complies

- See next pages for actual measured spectrum plots.

Minimum Standard:

The EUT shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or two-thirds of 20 dB bandwidth of the hopping channel, whichever is greater.

Measurement Setup

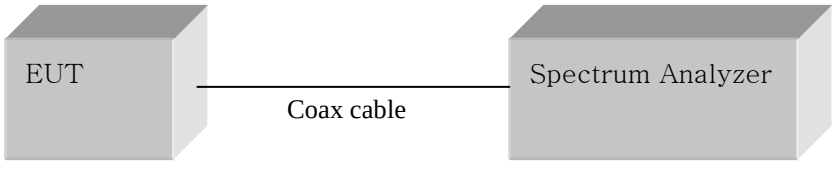
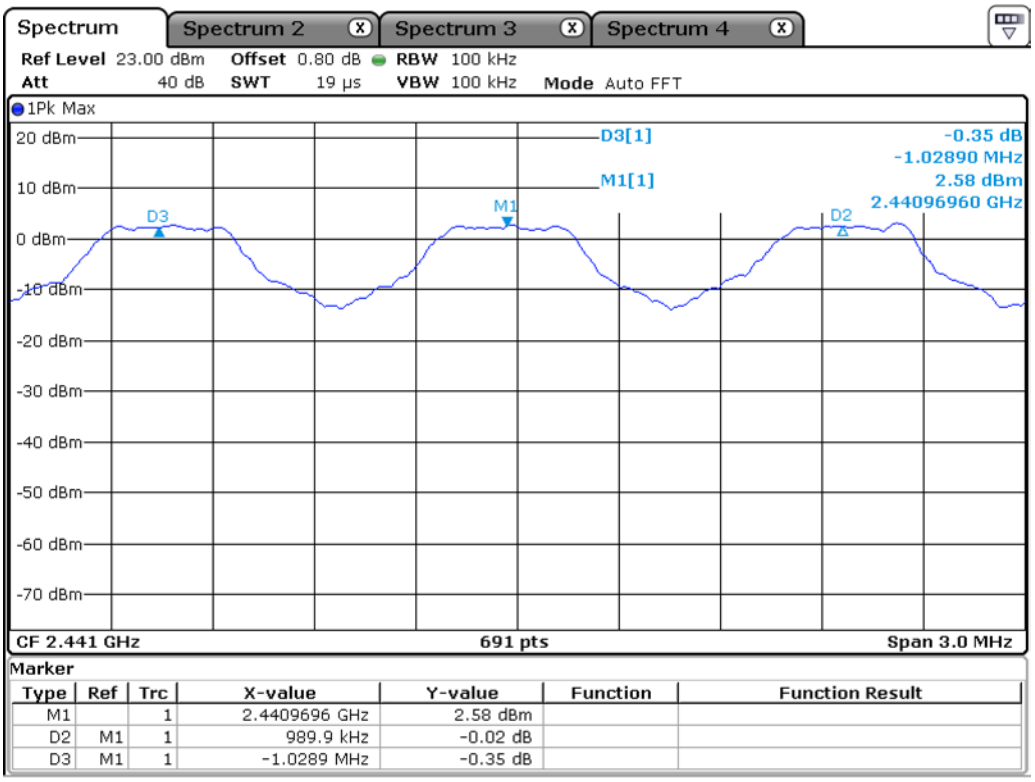


Figure 1: Measurement setup for the carrier frequency separation

Carrier Frequency Separation

Basic Mode



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3.3.2 Number of Hopping Frequencies

Procedure:

The test follows DA00-705. The number of hopping frequencies was measured with a spectrum analyzer connected to the antenna terminal, while EUT had its hopping function enabled.

To get higher resolution, four frequency ranges within the 2400 ~ 2483.5 MHz FH band were examined.

The spectrum analyzer is set to (Bluetooth):

Frequency range Start = 2400.0 MHz, Stop = 2483.5 MHz

RBW = 100 kHz (1% of the span or more) Sweep = auto

VBW = 100 kHz (VBW ≥ RBW) Detector function = peak

Trace = max hold Span > 40 MHz

Measurement Data : Complies

Total number of Hopping Channels	79

- See next pages for actual measured spectrum plots.

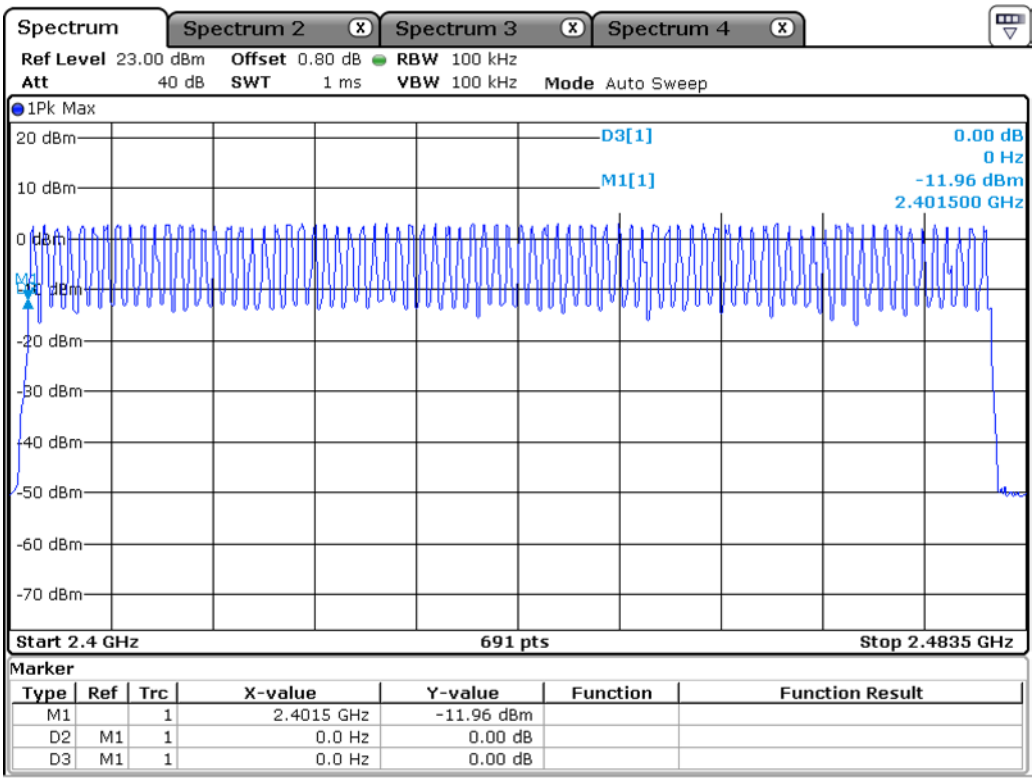
Minimum Standard:

At least 15 channels

Measurement Setup

Same as the Chapter 3.3.1 (Figure 1)

Number of Hopping Frequencies (Basic)



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3.3.3 20 dB Bandwidth

Procedure:

The bandwidth at 20 dB below the highest inband spectral density was measured with a spectrum analyzer connected to the antenna terminal, while EUT had its hopping function disabled at the highest, middle and the lowest available channels..

After the trace being stable, Use the marker-to-peak function to set the marker to the peak of the emission. Use the marker-delta function to measure 20 dB down one side of the emission. Reset the marker-delta function, and move the marker to the other side of the emission, until it is (as close as possible to) even with the reference marker level. The marker-delta reading at this point is the 20 dB bandwidth of the emission.

The spectrum analyzer is set to (Bluetooth):

Center frequency = the highest, middle and the lowest channels

Span = 3 MHz (approximately 2 or 3 times of the 20 dB bandwidth)

RBW = 30 kHz

Sweep = auto

VBW = 30 kHz (VBW ≥ RBW)

Detector function = peak

Trace = max hold

Measurement Data: Basic Mode

Frequency (MHz)	Channel No.	Test Results(MHz)	
		20dB Bandwidth	99% Bandwidth
2402	0	0.760	0.946
2441	39	0.734	0.946
2480	78	0.746	0.946

- See next pages for actual measured spectrum plots.

Minimum Standard:

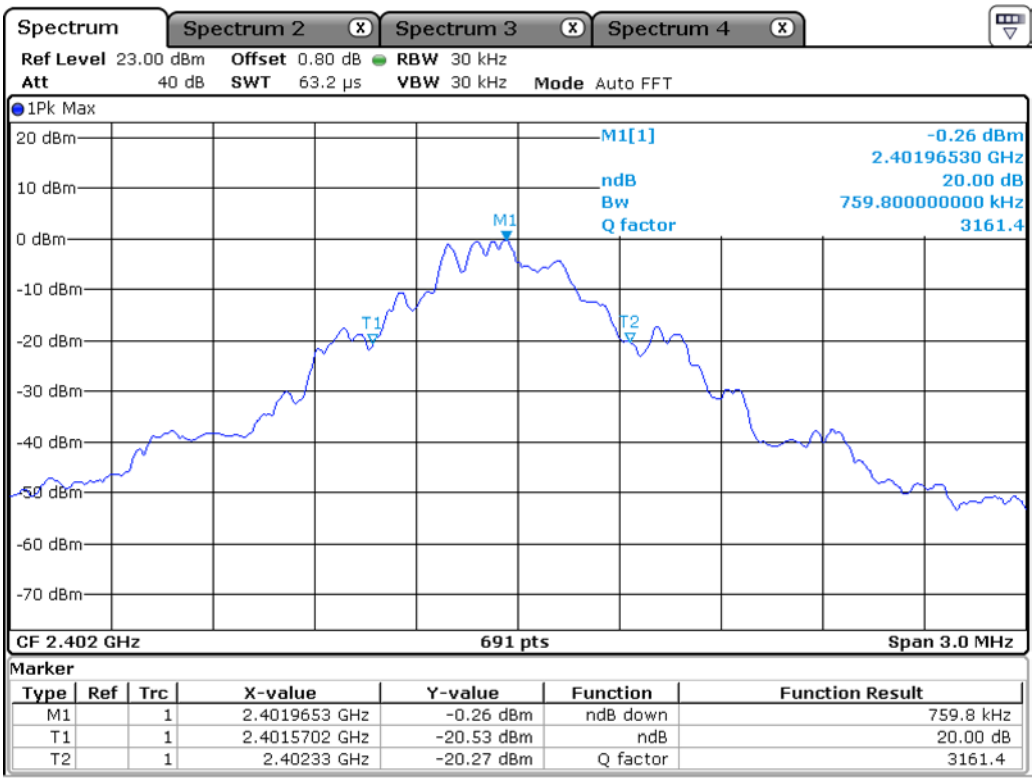
N/A

Measurement Setup

Same as the Chapter 3.3.1 (Figure 1)

Channel 0 of Basic mode

20 dB Bandwidth



Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.4019653 GHz	-0.26 dBm	ndB down	759.8 kHz
T1		1	2.4015702 GHz	-20.53 dBm	ndB	20.00 dB
T2		1	2.40233 GHz	-20.27 dBm	Q factor	3161.4

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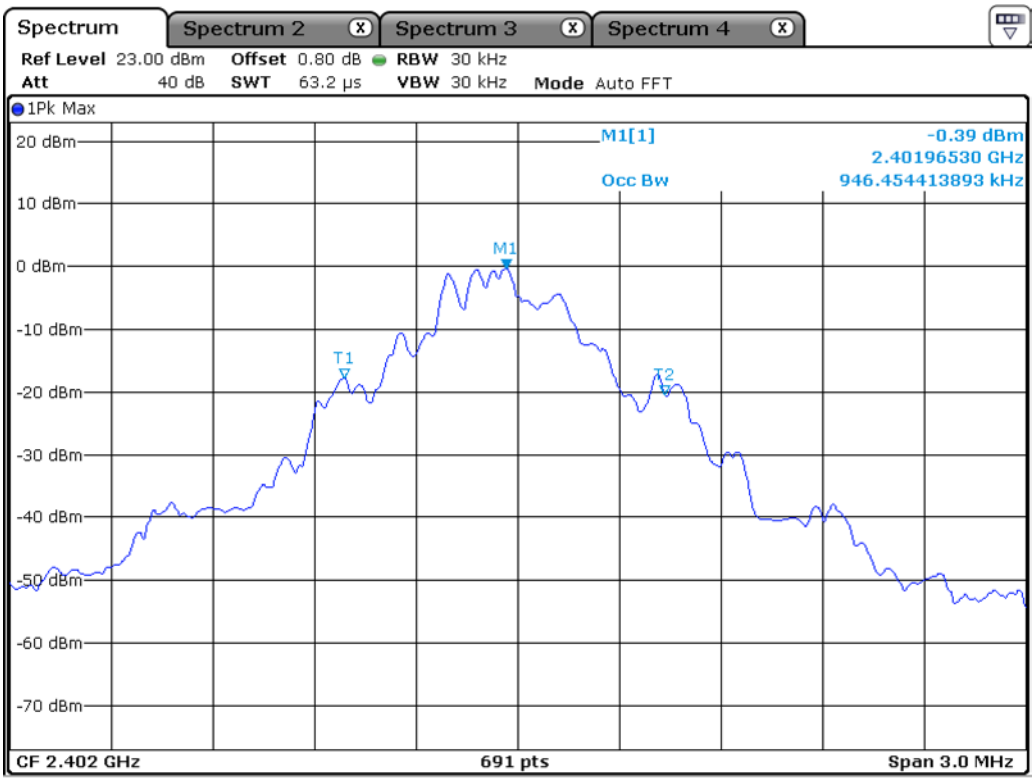
99% Bandwidth



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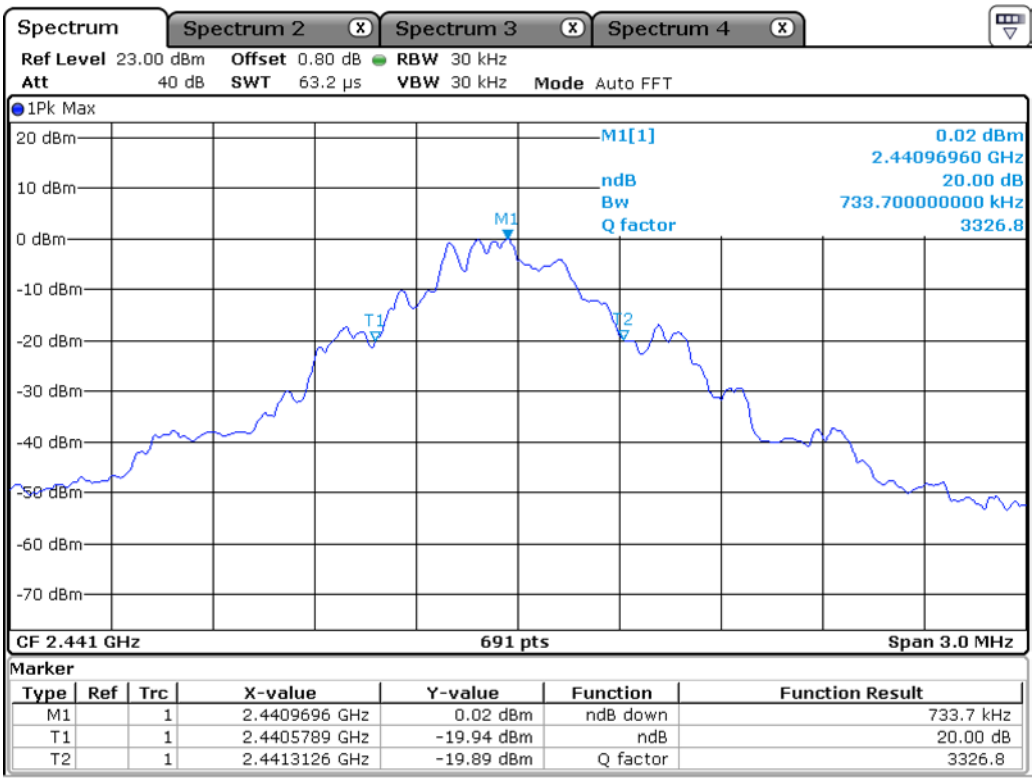
Channel 39 of Basic mode

20 dB Bandwidth



Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.4409696 GHz	0.02 dBm	ndB down	733.7 kHz
T1		1	2.4405789 GHz	-19.94 dBm	ndB	20.00 dB
T2		1	2.4413126 GHz	-19.89 dBm	Q factor	3326.8

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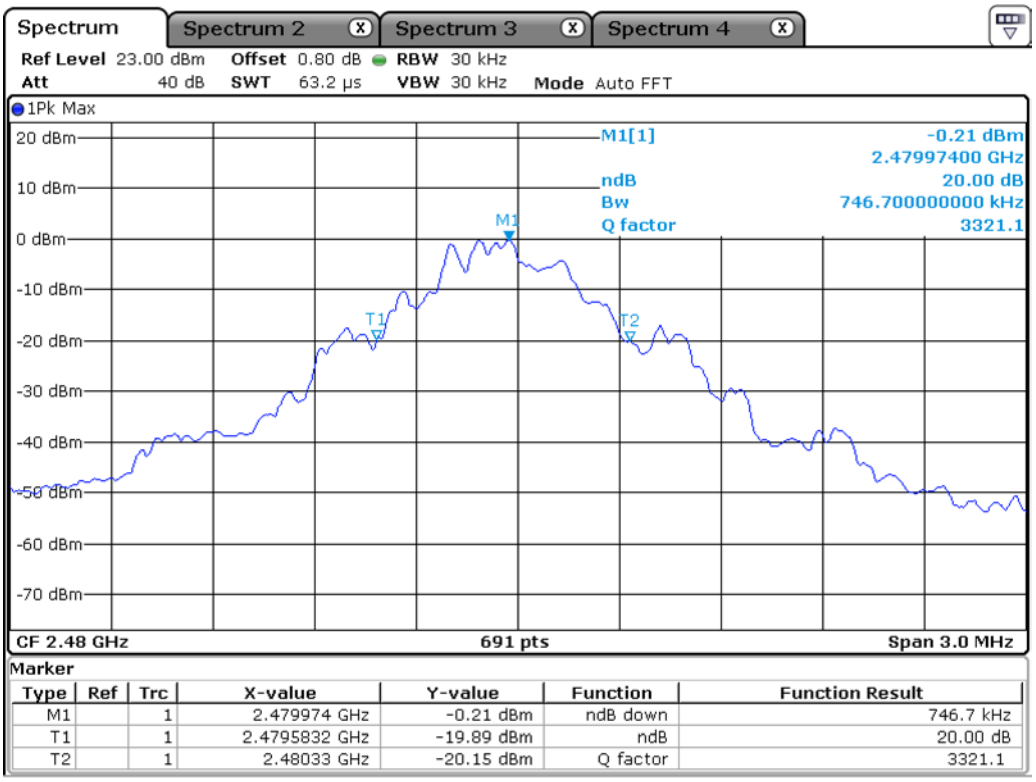
99% Bandwidth



Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.479974 GHz	-0.21 dBm	ndB down	746.7 kHz
T1		1	2.4795832 GHz	-19.89 dBm	ndB	20.00 dB
T2		1	2.48033 GHz	-20.15 dBm	Q factor	3321.1

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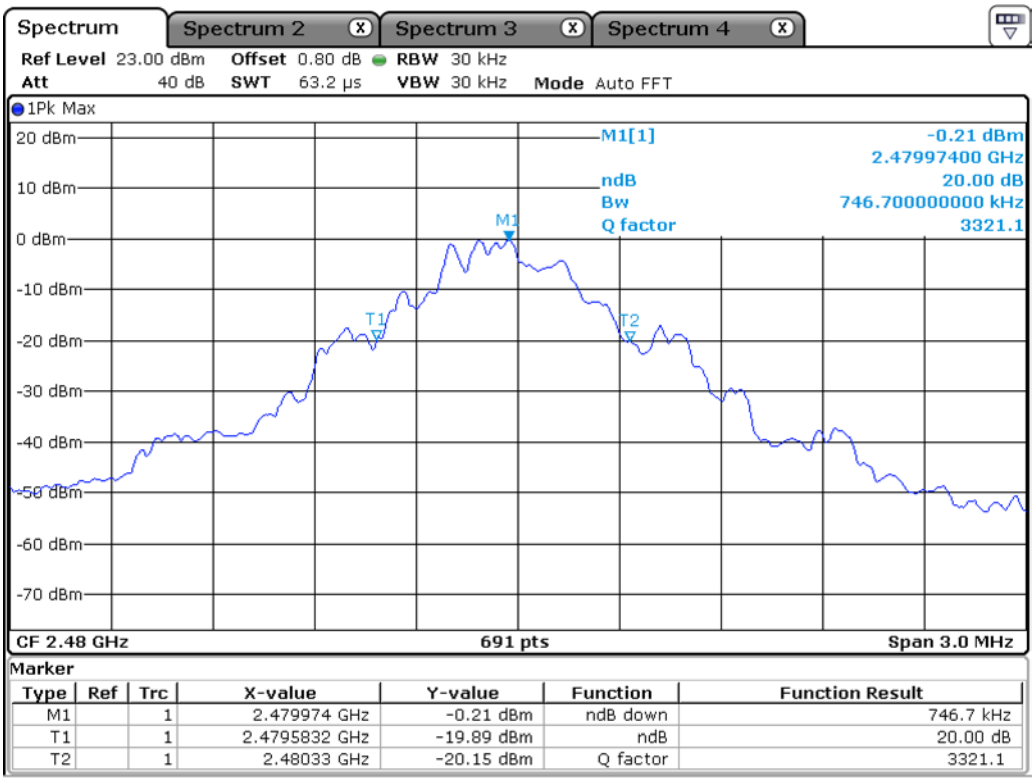
Channel 78 of Basic mode

20 dB Bandwidth



Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.479974 GHz	-0.21 dBm	ndB down	746.7 kHz
T1		1	2.4795832 GHz	-19.89 dBm	ndB	20.00 dB
T2		1	2.48033 GHz	-20.15 dBm	Q factor	3321.1

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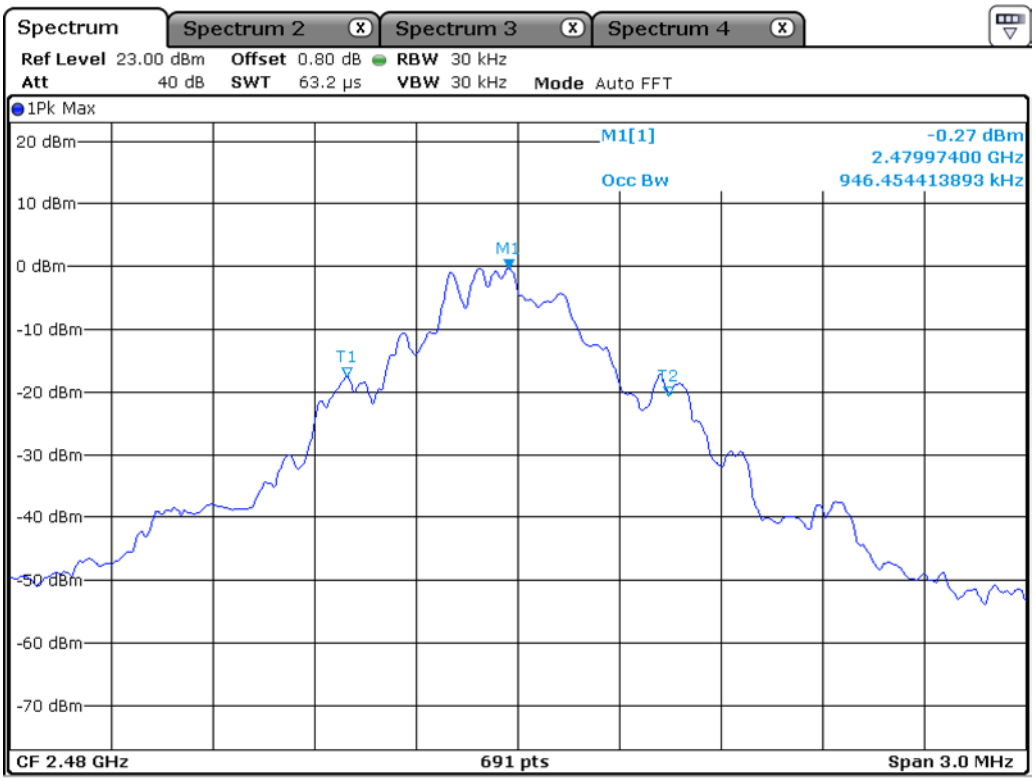
99% Bandwidth



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3.3.4 Time of Occupancy (Dwell Time)

Procedure:

The test follows DA00-705. The dwell time was measured with a spectrum analyzer connected to the antenna terminal, while EUT had its hopping function enabled.

The spectrum analyzer is set to :

Center frequency = 2441 MHz — Span = zero

RBW = 1 MHz — VBW = 1 MHz (VBW ≥ RBW)

Trace = max hold — Detector function = peak

Measurement Data (Basic,EDR):

Mode	Number of transmission in a 31.6s (79Hopping*0.4)	Length of Transmission Time (msec)	Result (msec)	Limit (msec)
DH1	**30(Times / 3sec) *10.533 = 315.99**	**0.464**	**146.61**	**400**
DH3	**15(Times / 3sec) *10.533 = 158.00**	**1.717**	**271.29**	**400**
DH5	**10(Times / 3sec) *10.533 = 105.33**	**2.986**	**311.46**	**400**

- See next pages for actual measured spectrum plots.
- dwell time = {(number of hopping per second / number of slot) x duration time per channel} x 0.4 ms

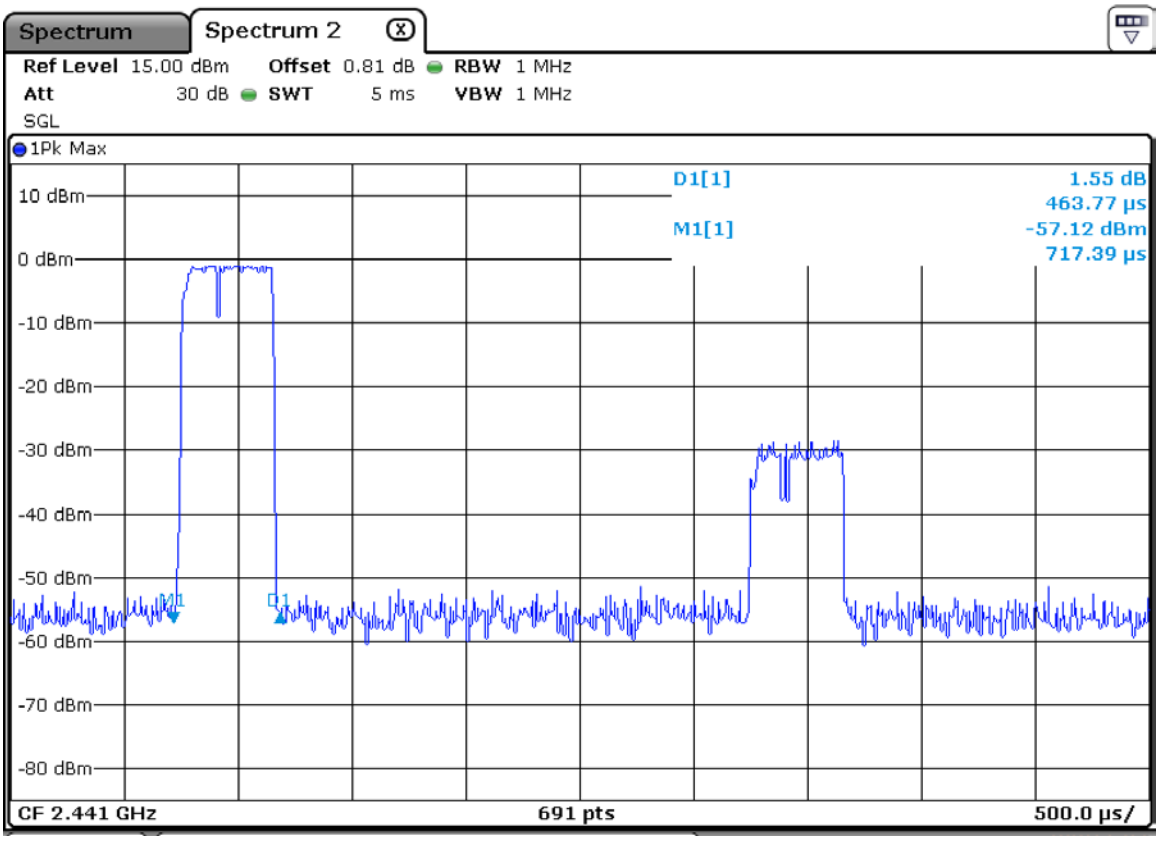
Minimum Standard:

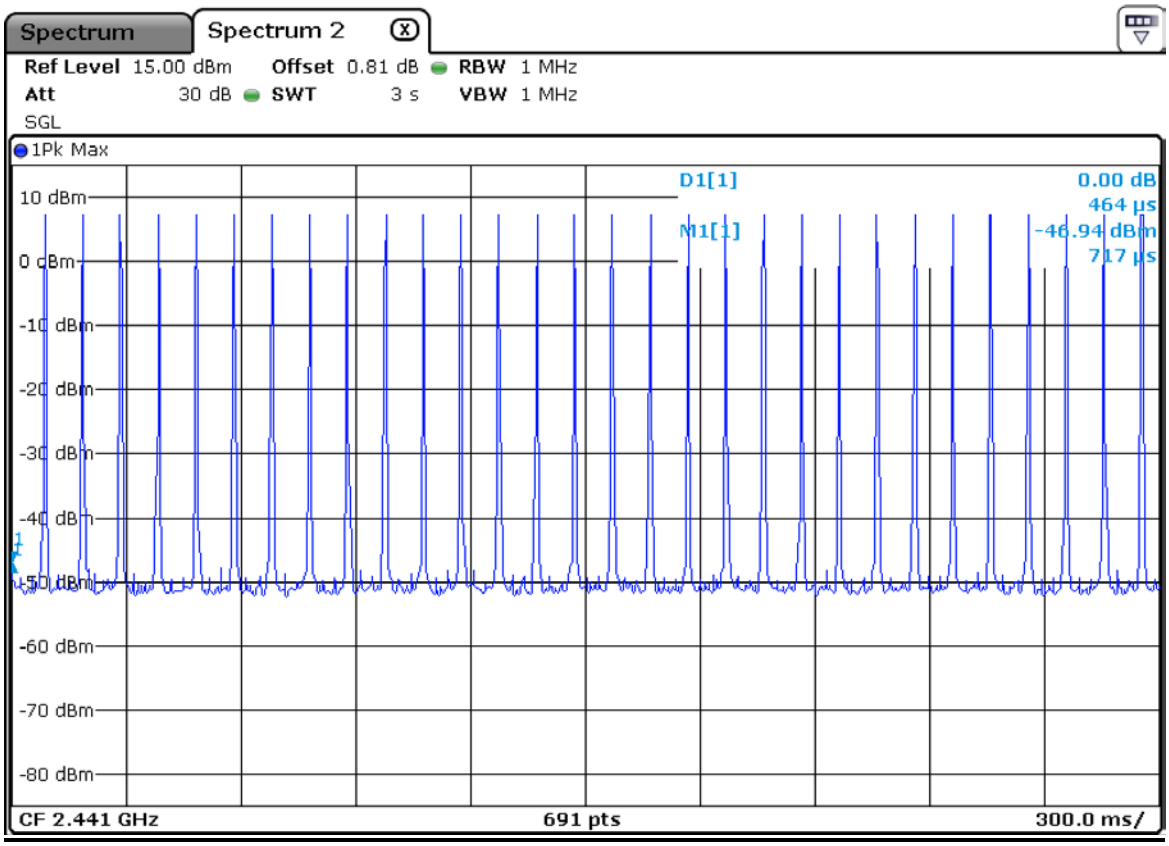
0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed

Measurement Setup

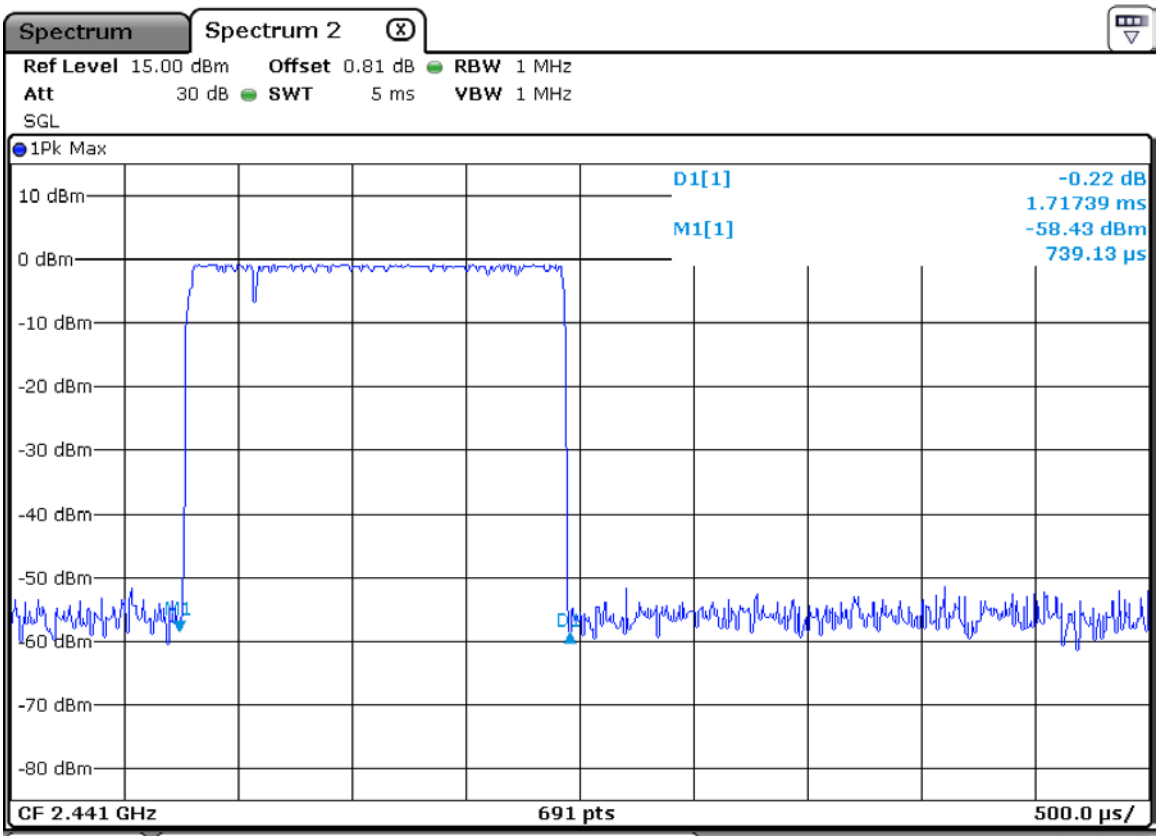
Same as the Chapter 3.3.1 (Figure 1)

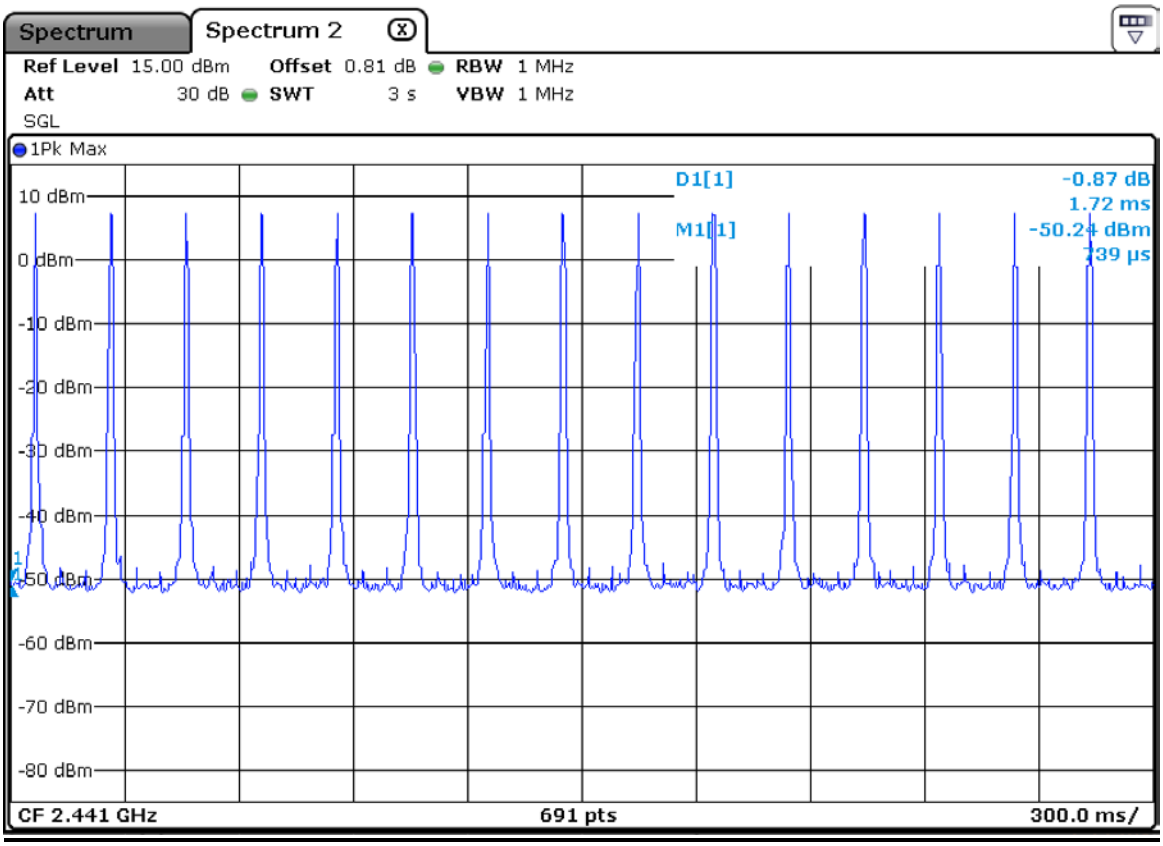
DH1 at Basic mode



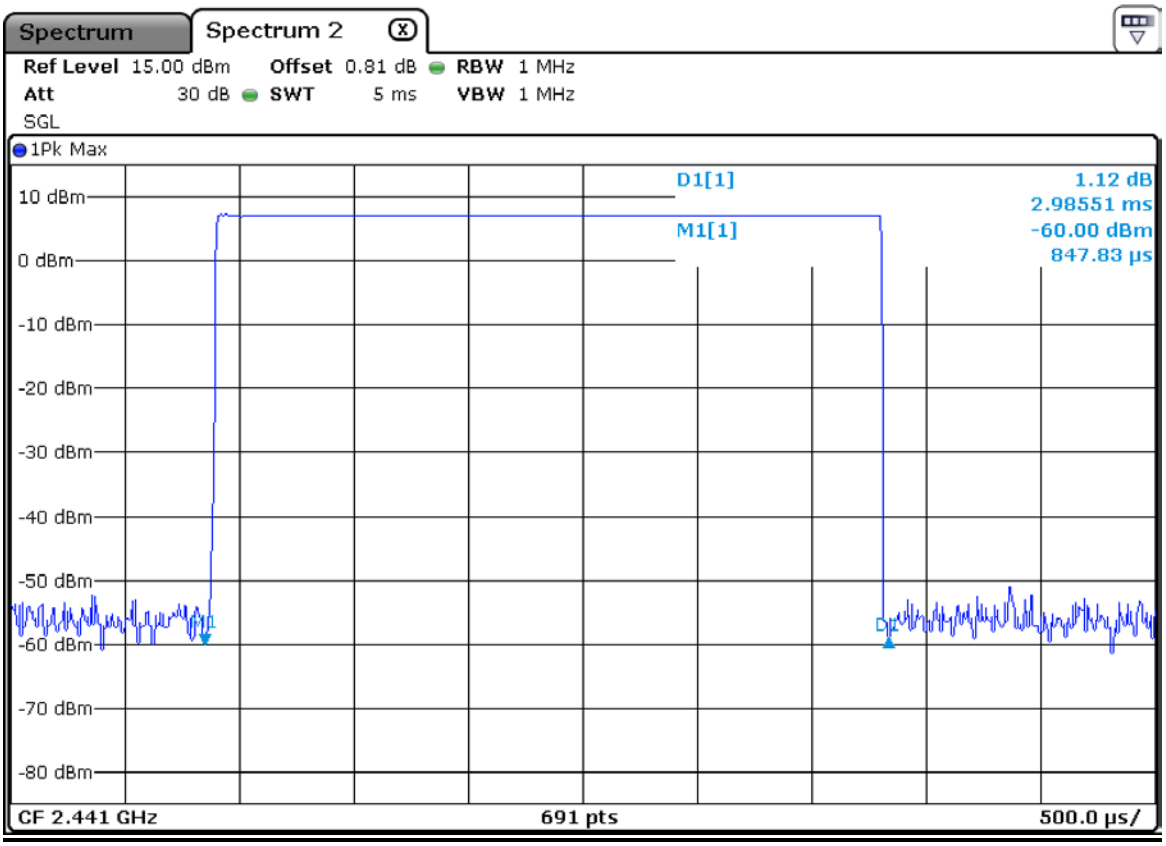


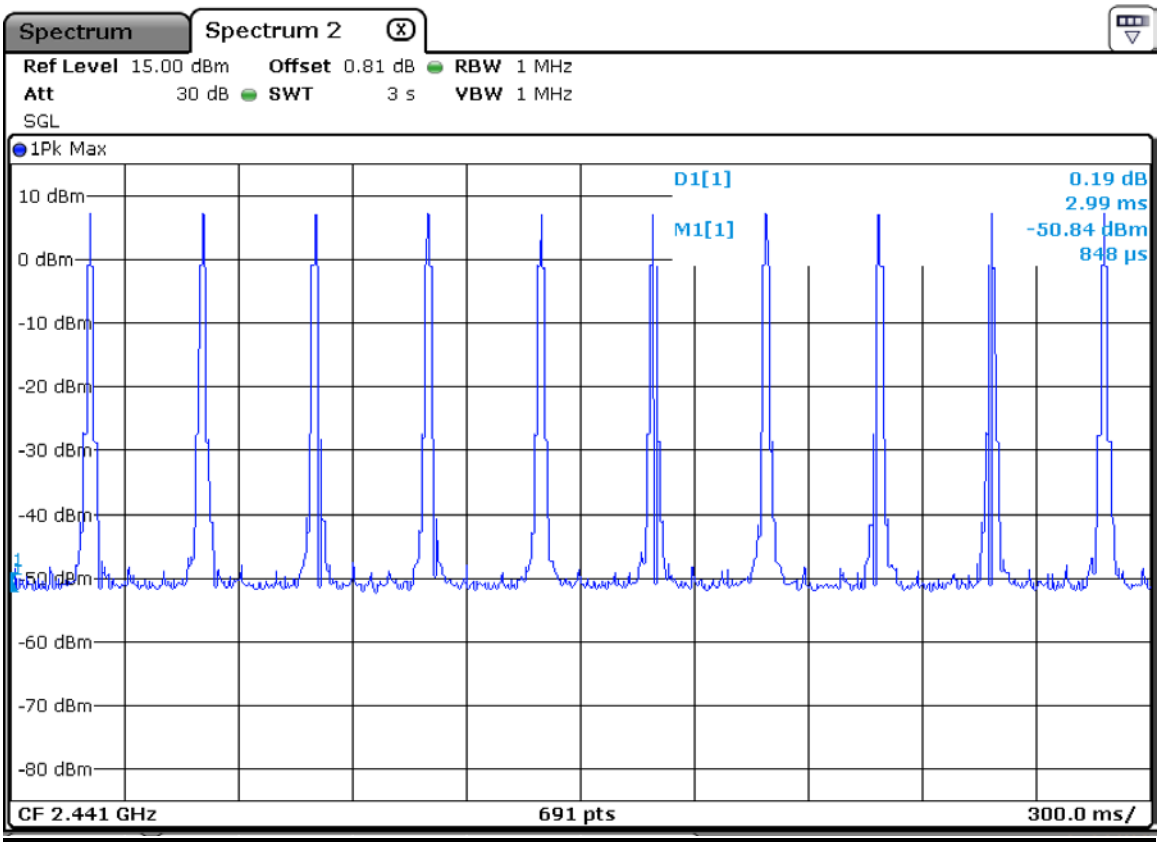
DH3 at Basic mode





DH5 at Basic mode





3.3.5 Transmitter Output Power

Procedure:

The test follows DA00-705. The peak output power was measured with a spectrum analyzer connected to the antenna terminal, while EUT had its hopping function disabled at the highest, middle and the lowest available channels..

After the trace being stable, Use the marker-to-peak function to set the marker to the peak of the emission. The indicated level is the peak output power.

The spectrum analyzer is set to :

Center frequency = the highest, middle and the lowest channels

Span = 10 MHz (approximately 5 times of the 20 dB bandwidth)

RBW = 3 MHz (greater than the 20 dB bandwidth of the emission being measured)

VBW = 3 MHz (VBW ≥ RBW) Detector function = peak

Trace = max hold Sweep = auto

Measurement Data : Basic Mode

Frequency (MHz)	Ch.	Test Results		
		dBm	mW	Result
2402	0	**3.72**	**2.36**	Complies
2441	39	**4.06**	**2.55**	Complies
2480	78	**3.90**	**2.54**	Complies

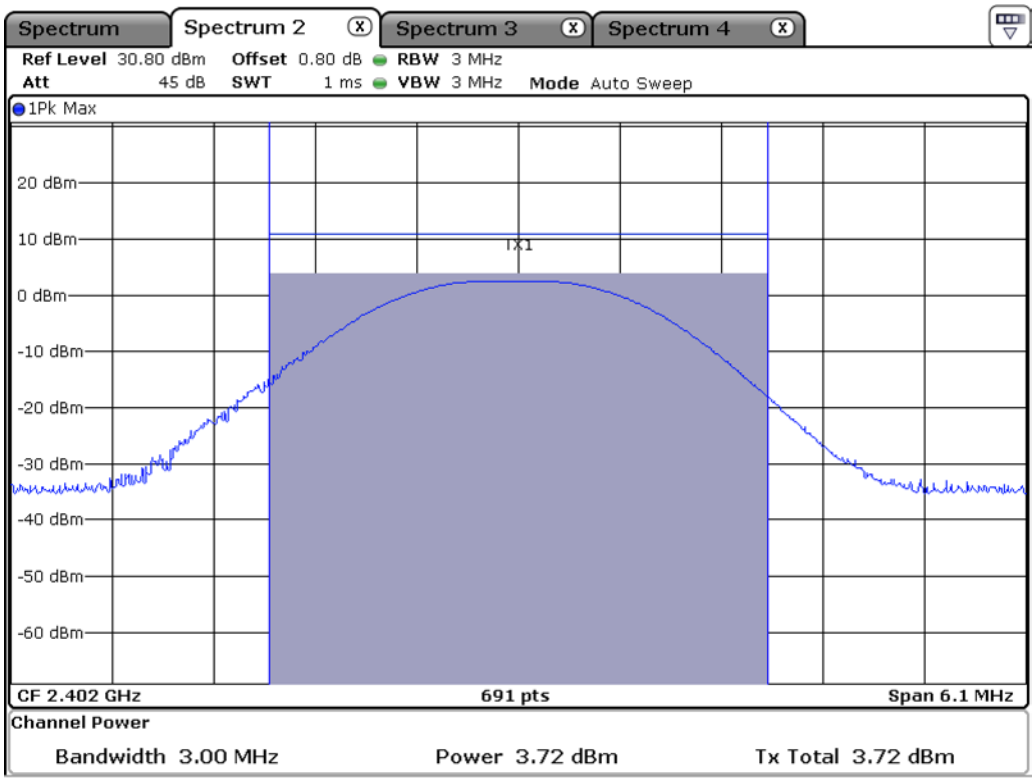
- See next pages for actual measured spectrum plots.

Minimum Standard:	For frequency hopping systems with at least 75 non-overlapping hopping channels: 1 watt. For all other frequency hopping systems: 0.125 W.

Measurement Setup

Same as the Chapter 3.3.1 (Figure 1)

Channel 1
Basic mode



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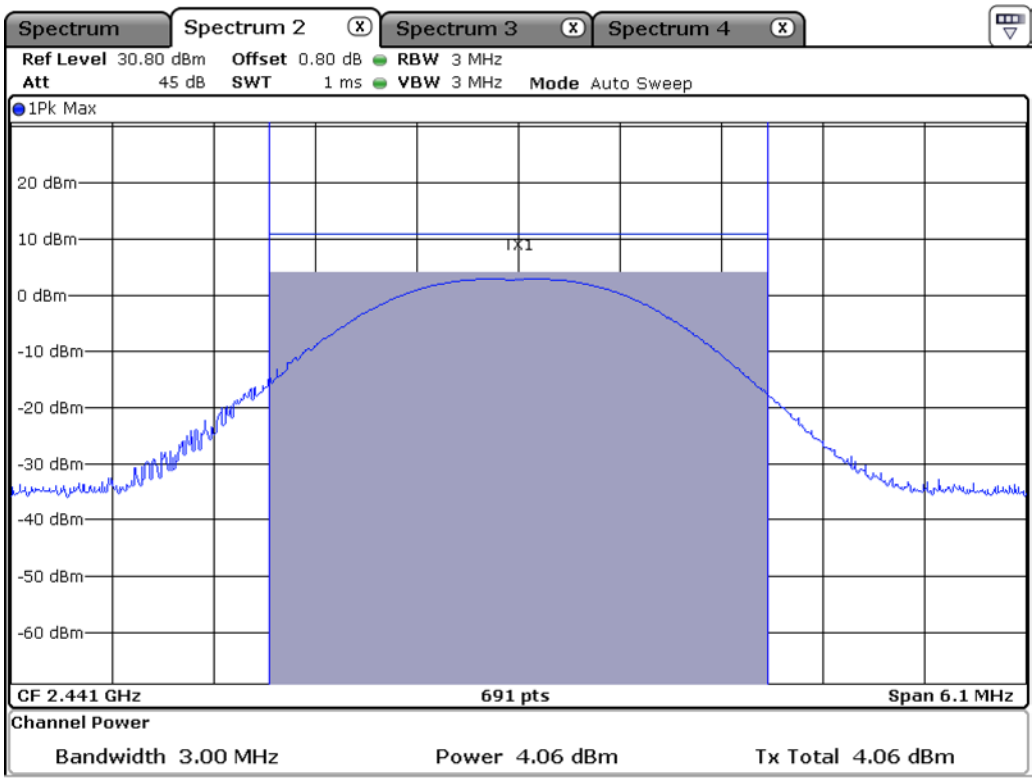
Channel 39
Basic mode



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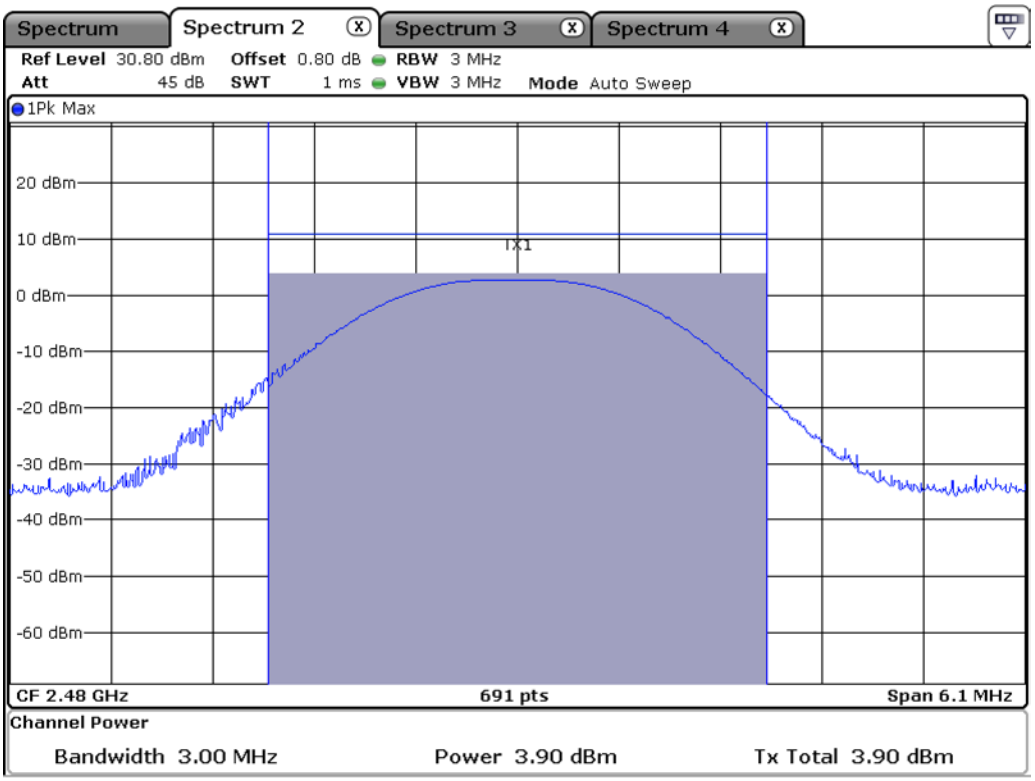
Channel 79
Basic mode



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3.3.6 Band Edge

Procedure:

The bandwidth at 20 dB down from the highest inband spectral density is measured with a spectrum analyzer connected to the antenna terminal, while EUT had its hopping function disabled at the highest, middle and the lowest available channels.

After the trace being stable, Use the marker-to-peak function to measure 20 dB down both sides of the intentional emission.

The spectrum analyzer is set to:

Center frequency = the highest, middle and the lowest channels

RBW = 100 kHz	VBW = 100 kHz
Span = 10~30 MHz	Detector function = peak
Trace = max hold	Sweep = auto

Measurement Data: **Complies**

- All conducted emission in any 100 kHz bandwidth outside of the spread spectrum band was at least 20 dB lower than the highest inband spectral density. Therefore the applying equipment meets the requirement.
- See next pages for actual measured spectrum plots.

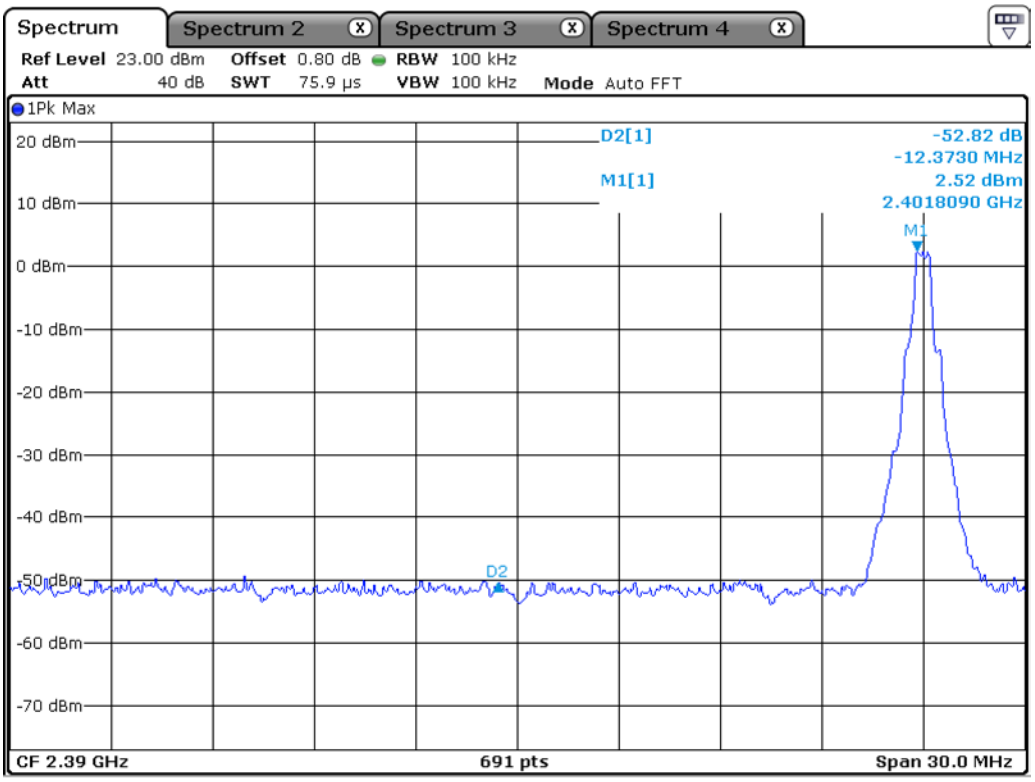
Minimum Standard:	> 20 dBc

Measurement Setup

Same as the Chapter 3.3.1 (Figure 1)

Band Edge (Basic)

Lower edge



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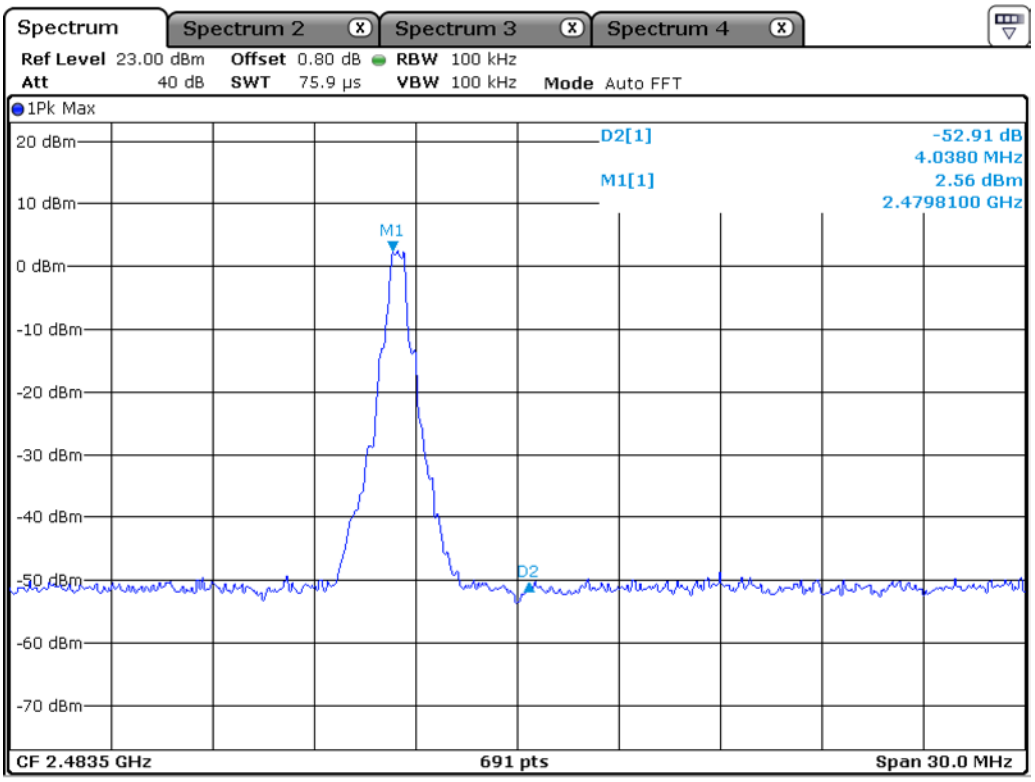
Upper edge



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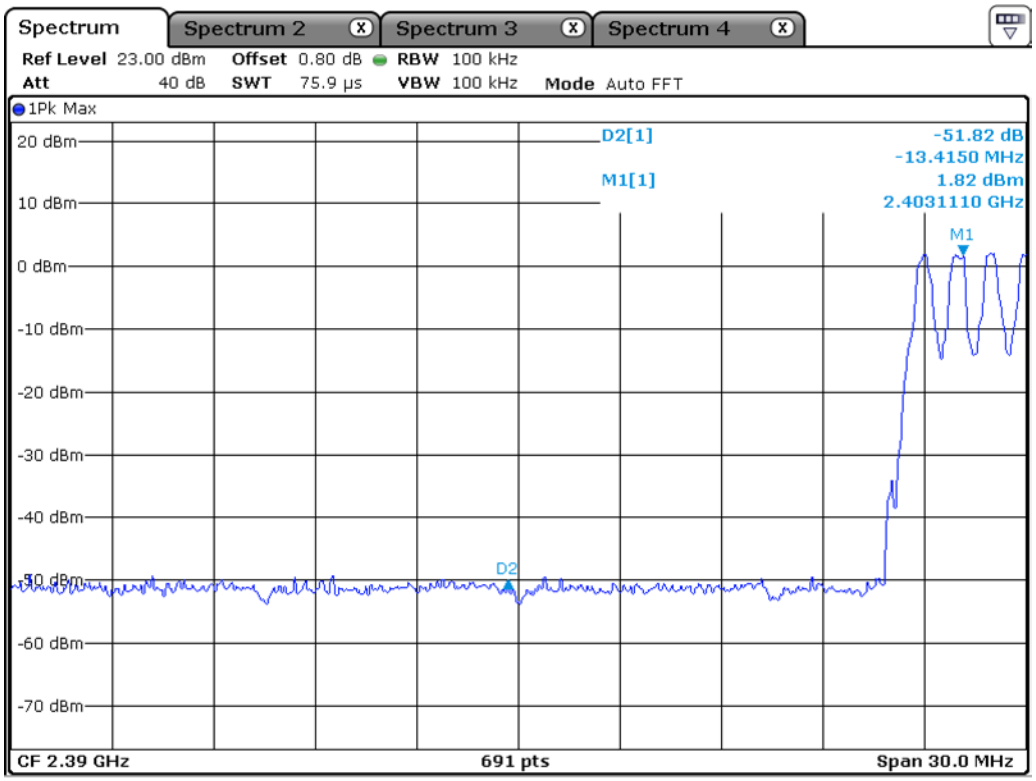
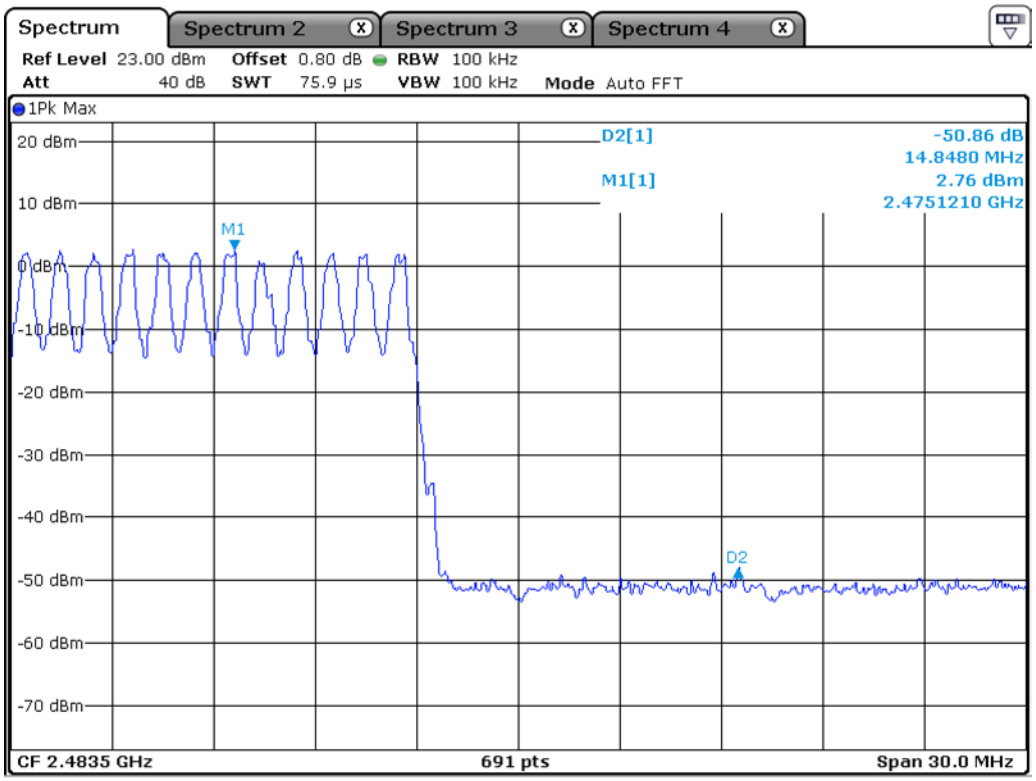
Band Edge- Hopping(Basic)

Lower edge



Date: 27.MAY.2019 17:28:58

Upper edge



Date: 27.MAY.2019 17:29:28

Radiated Band edges in the restricted band 2310-2390 MHz measurement (Basic)

Frequency [MHz]	Reading [dBuV/m] AV / Peak		Pol.	Correction Factor Antenna	Correction Factor Amp. Gain+CableLoss	Limits [dBuV/m] AV / Peak		Result [dBuV/m] AV / Peak		Margin [dB] AV / Peak	
2324.8	32.47	42.01	V	27.88	22.90	54	74	37.45	46.99	16.55	27.01
2319.3	32.55	42.06	V	28.09	23.11	54	74	37.54	47.04	16.46	26.96
2324.1	32.21	41.88	V	27.88	22.90	54	74	37.19	46.88	16.81	27.12

Radiated Band edges in the restricted band 2483.5-2500 MHz measurement

Frequency [MHz]	Reading [dBuV/m] AV / Peak		Pol.	Correction Factor Antenna	Correction Factor Amp. Gain+CableLoss	Limits [dBuV/m] AV / Peak		Result [dBuV/m] AV / Peak		Margin [dB] [MHz]	
2486.7	34.23	44.63	V	27.88	22.90	54	74	39.21	49.61	14.79	24.39
2487.1	33.97	43.47	V	27.88	22.90	54	74	38.95	48.45	15.05	25.55
2488.9	33.92	43.88	V	27.88	22.90	54	74	38.9	48.86	15.1	25.14

Note : This EUT was tested in 3 orthogonal positions and the worst-case data was presented.

3.3.7 Conducted Spurious Emissions

Procedure:

The test follows DA00-705. The conducted spurious emissions were measured with a spectrum analyzer connected to the antenna terminal, while EUT had its hopping function disabled at the highest, middle and the lowest available channels..

After the trace being stable, set the marker on the peak of any spurious emission recorded.

The spectrum analyzer is set to:

Span = wide enough to capture the peak level of the in-band emission and all spurious emissions

RBW = 100 kHz Sweep = auto

VBW = 100 kHz Detector function = peak

Trace = max hold

Measurement Data: **Complies**

- All conducted emission in any 100 kHz bandwidth outside of the spread spectrum band was at least 20 dB lower than the highest inband spectral density. Therefore the applying equipment meets the requirement.
- See next pages for actual measured spectrum plots.

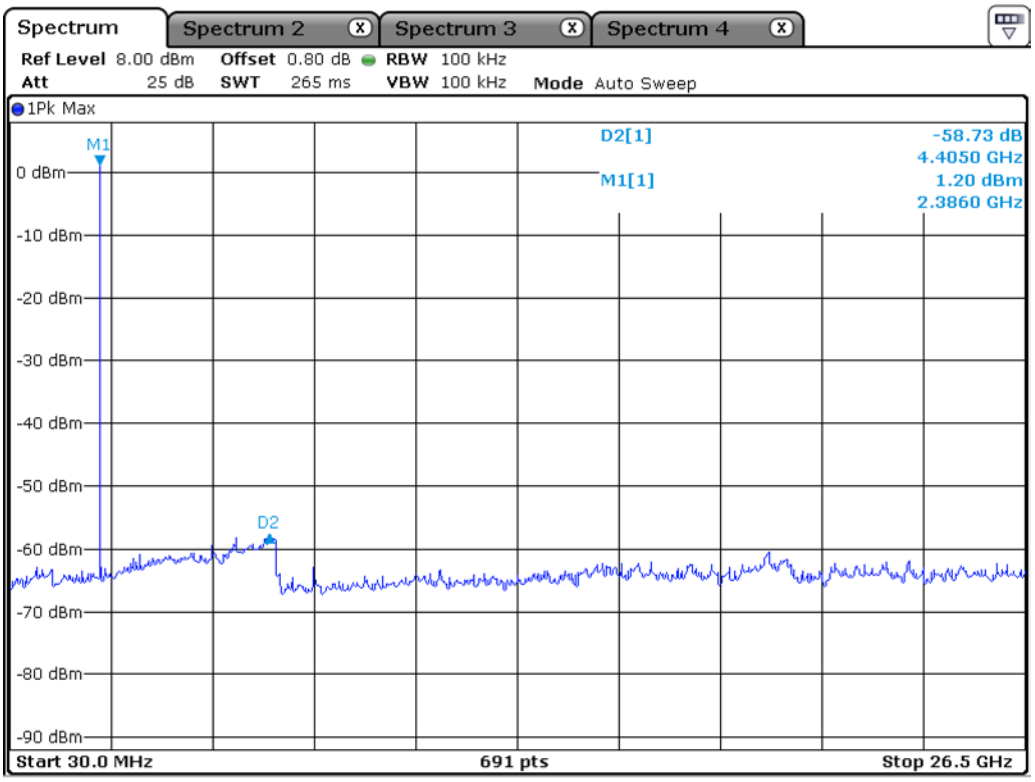
Minimum Standard:	> 20 dBc

Measurement Setup

Same as the Chapter 3.3.1 (Figure 1)

Unwanted Emission – Low channel (Basic)

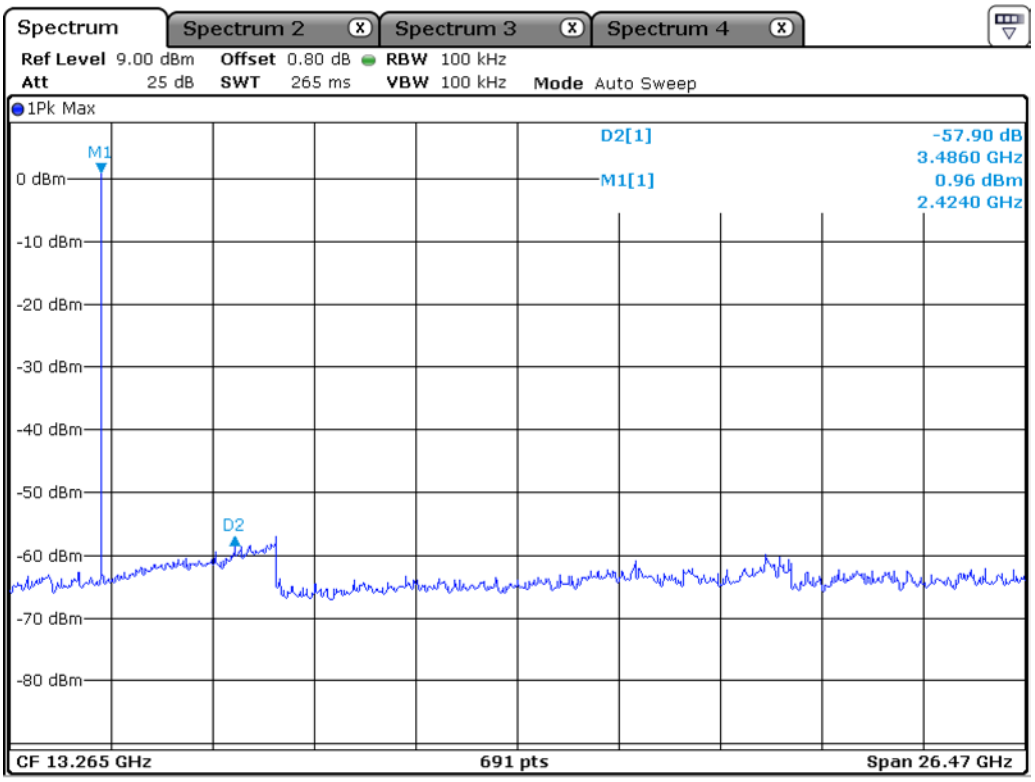
Frequency Range = 30 MHz ~ 26.5 GHz



Date: 27.MAY.2019 17:31:57

Unwanted Emission – Middle channel

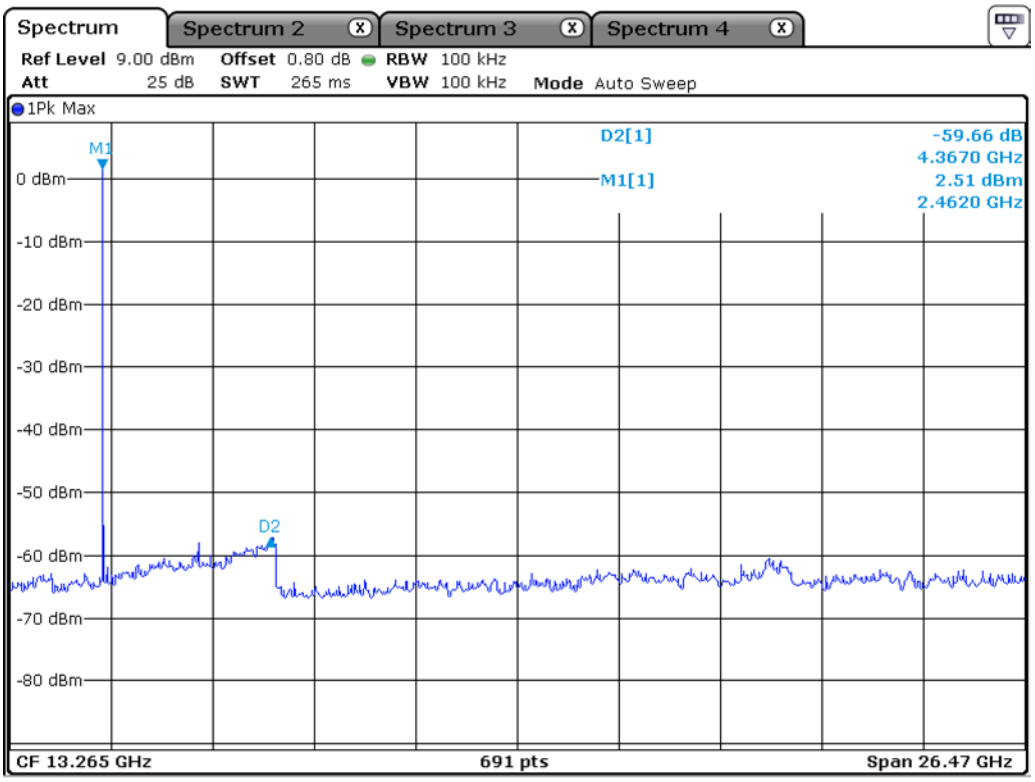
Frequency Range = 30 MHz ~ 26.5 GHz



Date: 27.MAY.2019 17:32:38

Unwanted Emission – High channel

Frequency Range = 30 MHz ~ 26.5 GHz



Date: 27.MAY.2019 17:33:12

3.3.8 Radiated Spurious Emissions

Procedure:

Radiated emissions from the EUT were measured according to the dictates of DA00-705. The EUT was placed on a 0.8 m high wooden table inside a shielded enclosure. An antenna was placed near the EUT and measurements of frequencies and amplitudes of field strengths were recorded for reference during final measurements. For final radiated testing, measurements were performed in OATS. Measurements were performed with the EUT oriented in 3 orthogonal axis and rotated 360 degrees to determine worst-case orientation for maximum emissions.

(a) In the frequency range of 9 kHz to 30 MHz, magnetic field is measured with Loop Test Antenna. The Test Antenna is positioned with its plane vertical at 3 m distance from the EUT. The center of the Loop Test Antenna is 1m above the ground. During the measurement the Loop Test Antenna rotates about its vertical axis for maximum response at each azimuth about the EUT.

(b) In the frequency range above 30 MHz, Bi-Log Test Antenna (30 MHz to 1 GHz) and Horn Test Antenna (above 1 GHz) are used. Test Antenna is 3 m away from the EUT. Test Antenna height is carried from 1 m to 4m above the ground to determine the maximum value of the field strength. The emission levels at both horizontal and vertical polarizations should be tested.

The spectrum analyzer is set to:

Center frequency = the worst channel

Frequency Range = 9 kHz ~ 10^{th} harmonic.

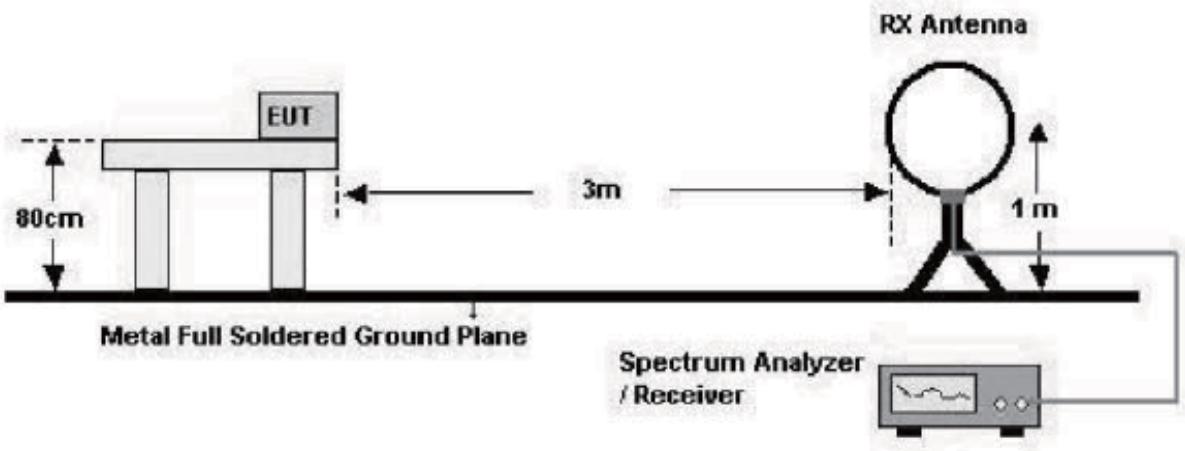
RBW = 120 kHz (30 MHz ~ 1 GHz) VBW ≥ RBW

= 1 MHz (1 GHz ~ 10^{th} harmonic)

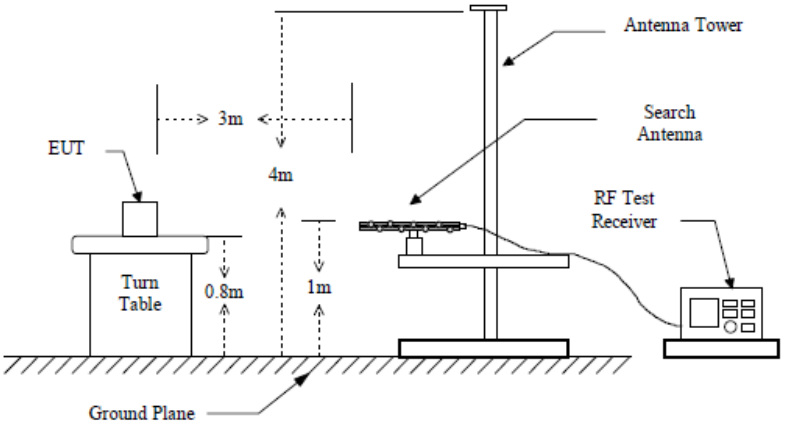
Span = 100 MHz Detector function = peak

Trace = max hold Sweep = auto

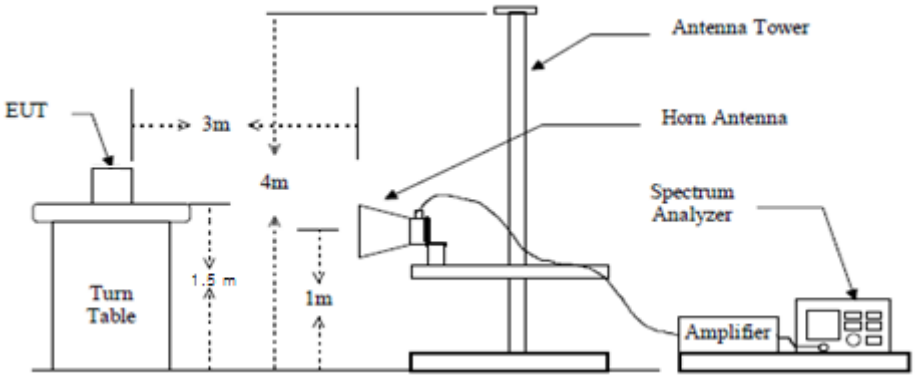
below 30 MHz



below 1 GHz (30 MHz to 1 GHz)



above 1 GHz



Measurement Data: **Complies**

- See next pages for actual measured data.
- No other emissions were detected at a level greater than 20 dB below limit include from 9 kHz to 30 MHz.

Minimum Standard: FCC Part 15.209(a)

Frequency (MHz)	Limit (uV/m) @ 3m
0.009 ~ 0.490	2400/F(kHz) **(@ 300m)**
0.490 ~ 1.705	24000/F(kHz) **(@ 30m)**
1.705 ~ 30	30**(@ 30m)**
30 ~ 88	100 **
88 ~ 216	150 **
216 ~ 960	200 **
Above 960	500

** Except as provided in 15.209(g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g. 15.231 and 15.241.

Measurement Data : Basic Mode (BDR)

Frequency [MHz]	Reading [dBuV/m] AV / Peak		Pol.	Correction Factor Antenna+(Cable-Amp.Gain)	D.C.F	Limits [dBuV/m] AV/Peak		Result [dBuV/m] AV/Peak		Margin [dB] AV / Peak	
10575.54	21.01	32.68	H	26.77	-30.16	54.0	74.0	17.62	29.29	36.38	44.71
7497.66	21.05	33.10	H	26.17	-30.16	54.0	74.0	17.06	29.11	36.96	44.89
10215.02	22.03	32.32	H	26.19	-30.16	54.0	74.0	18.06	28.35	35.94	45.65

- No other emissions were detected at a level greater than 20dB below limit.

- D.C.F (Duty Cycle Correction Factor) = 20log(The worst Case DWELL Time/100ms)

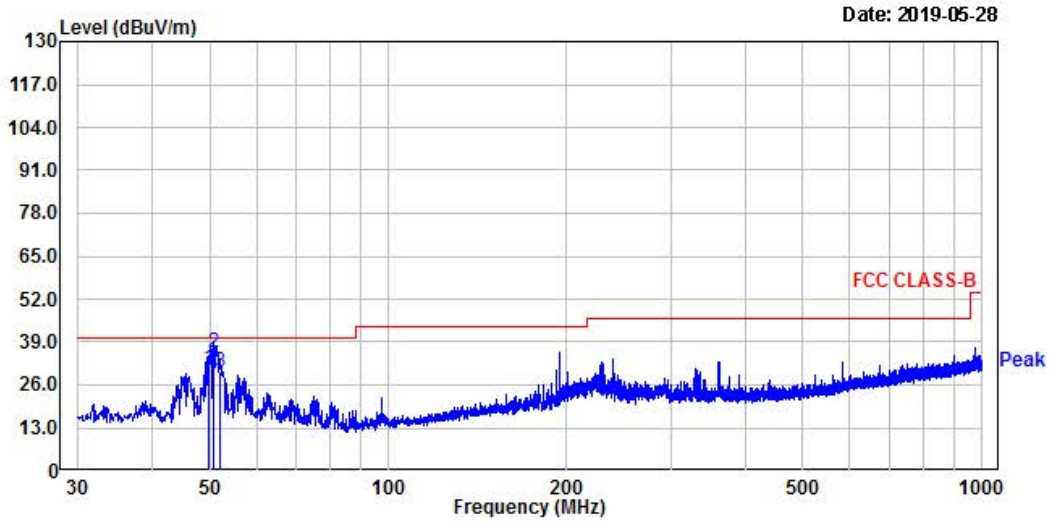
= 20log(3.101ms/100ms) = -30.16

Radiated Emissions – Basic mode (below 1GHz)

4, Songjuro 236Beon-gil, yanggi-myeon,
Yongin-si, Gyeonggi-do, Korea
Tel : +82-31-3236008,9
Fax : +82-31-3236010
www.ltalab.com

EUT/Model No.: DM-01 Temp/Humi: 23 / 36

Test Mode : bluetooth mode Tested by: KWON H C



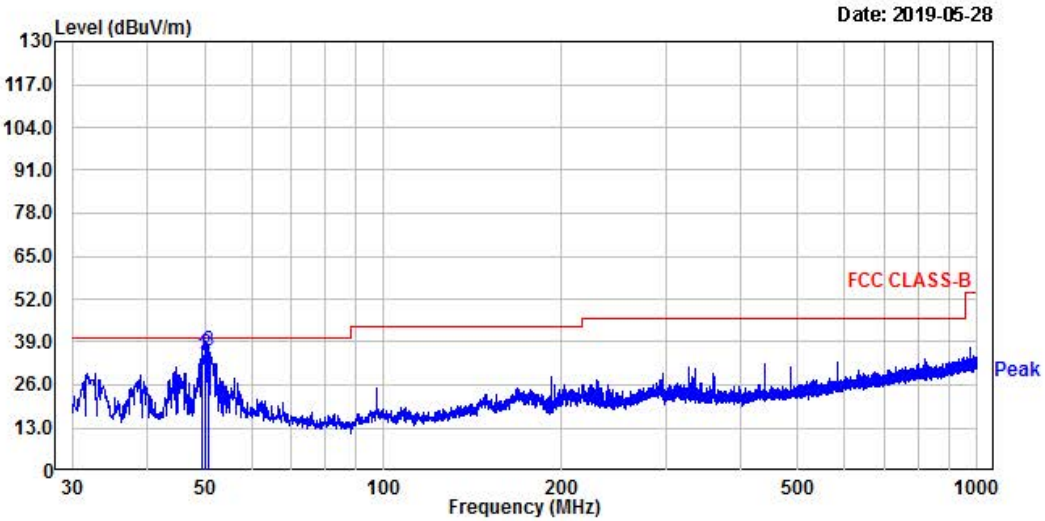
Freq	Reading	C.F	Result QP	Limit	Margin	Height	Angle	Polarity
MHz	dBuV	dB	dBuV/m	dBuV/m	dB	cm	deg	
49.76	44.02	-13.28	30.74	40.00	9.26	390	360	horizontal
50.73	49.31	-13.32	35.99	40.00	4.01	158	287	horizontal
51.95	43.15	-13.33	29.82	40.00	10.18	231	127	horizontal

Remarks: C.F (Correction Factor) = Antenna factor + Cable loss - Preamp gain

4, Songjuro 236Beon-gil, yanggi-myeon,
Yongin-si, Gyeonggi-do, Korea
Tel : +82-31-3236008,9
Fax : +82-31-3236010
www.ltalab.com

EUT/Model No.: DM-01 Temp/Humi: 23 / 36

Test Mode : bluetooth mode Tested by: KWON H C



Freq	Reading	C.F	Result QP	Limit	Margin	Height	Angle	Polarity
MHz	dBuV	dB	dBuV/m	dBuV/m	dB	cm	deg	
49.64	47.92	-13.31	34.61	40.00	5.39	100	65	vertical
50.25	48.74	-13.28	35.46	40.00	4.54	100	99	vertical
50.86	49.79	-13.34	36.45	40.00	3.55	100	87	vertical

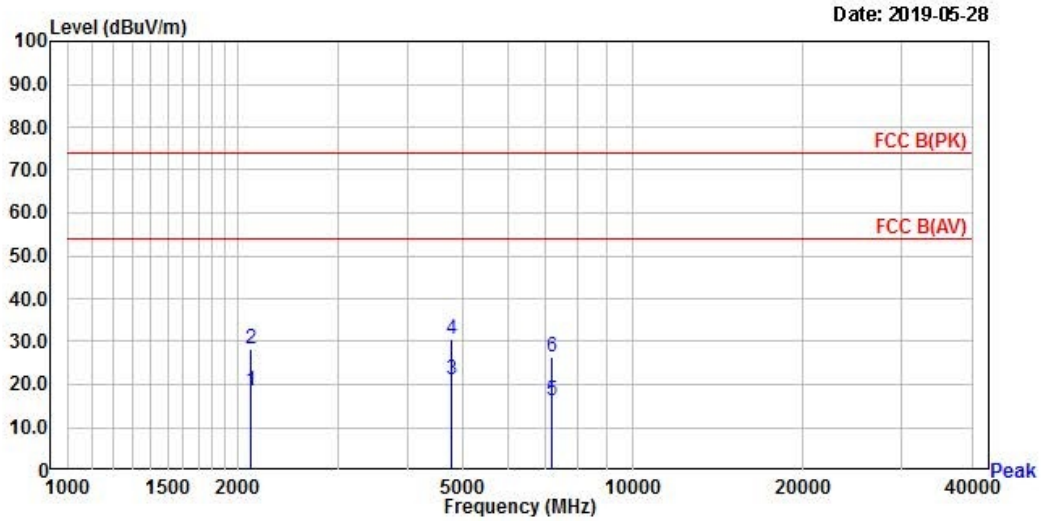
Remarks: C.F (Correction Factor) = Antenna factor + Cable loss - Preamp gain

Radiated Emissions – Basic mode (above 1GHz)

4, Songjuro 236Beon-gil, yanggi-myeon,
Yongin-si, Gyeonggi-do, Korea
Tel : +82-31-3236008,9
Fax : +82-31-3236010
www.ltalab.com

EUT/Model No.: DM-01 Temp/Humi: 23 / 40

Test Mode : Wireless_L Tested by: KWON H C



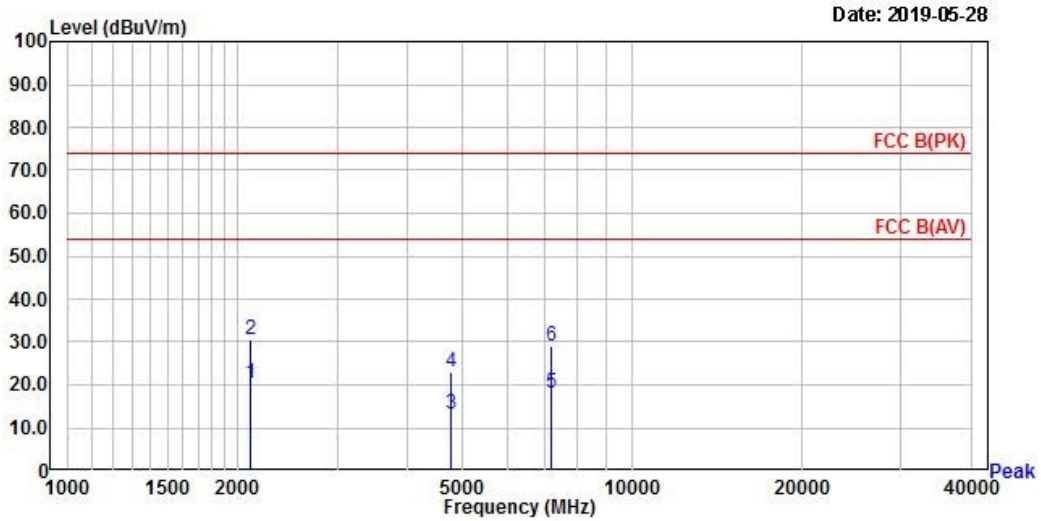
Freq	Reading	C.F	Result QP	Limit	Margin	Height	Angle	Polarity
MHz	dBuV	dB	dBuV/m	dBuV/m	dB	cm	deg	
2101.00	22.08	-3.78	18.30	54.00	35.70	100	16	Vertical
2101.00	32.11	-3.78	28.33	74.00	45.67	100	16	Vertical
4772.92	18.32	2.97	21.29	54.00	32.71	100	158	Vertical
4772.92	27.68	2.97	30.65	74.00	43.35	100	158	Vertical
7213.95	7.59	8.81	16.40	54.00	37.60	100	121	Vertical
7213.95	17.59	8.81	26.40	74.00	47.60	100	121	Vertical

Remarks: C.F (Correction Factor) = Antenna factor + Cable loss - Preamp gain

4, Songjuro 236Beon-gil, yanggi-myeon,
Yongin-si, Gyeonggi-do, Korea
Tel : +82-31-3236008,9
Fax : +82-31-3236010
www.ltalab.com

EUT/Model No.: DM-01 Temp/Humi: 23 / 40

Test Mode : Wireless_L Tested by: KWON H C



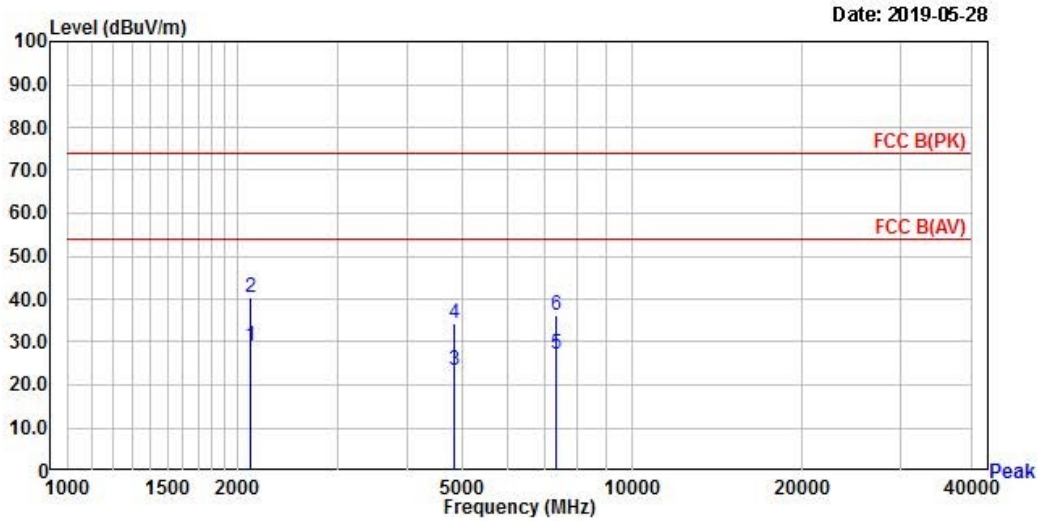
Freq	Reading	C.F	Result QP	Limit	Margin	Height	Angle	Polarity
MHz	dBuV	dB	dBuV/m	dBuV/m	dB	cm	deg	
2101.00	23.99	-3.78	20.21	54.00	33.79	100	184	Horizontal
2101.00	34.16	-3.78	30.38	74.00	43.62	100	184	Horizontal
4772.93	10.32	2.97	13.29	54.00	40.71	100	129	Horizontal
4772.93	20.16	2.97	23.13	74.00	50.87	100	129	Horizontal
7213.95	9.12	8.81	17.93	54.00	36.07	100	133	Horizontal
7213.95	20.12	8.81	28.93	74.00	45.07	100	133	Horizontal

Remarks: C.F (Correction Factor) = Antenna factor + Cable loss - Preamp gain

4, Songjuro 236Beon-gil, yanggi-myeon,
Yongin-si, Gyeonggi-do, Korea
Tel : +82-31-3236008,9
Fax : +82-31-3236010
www.ltalab.com

EUT/Model No.: DM-01 Temp/Humi: 23 / 40

Test Mode : Wireless _M Tested by: KWON H C



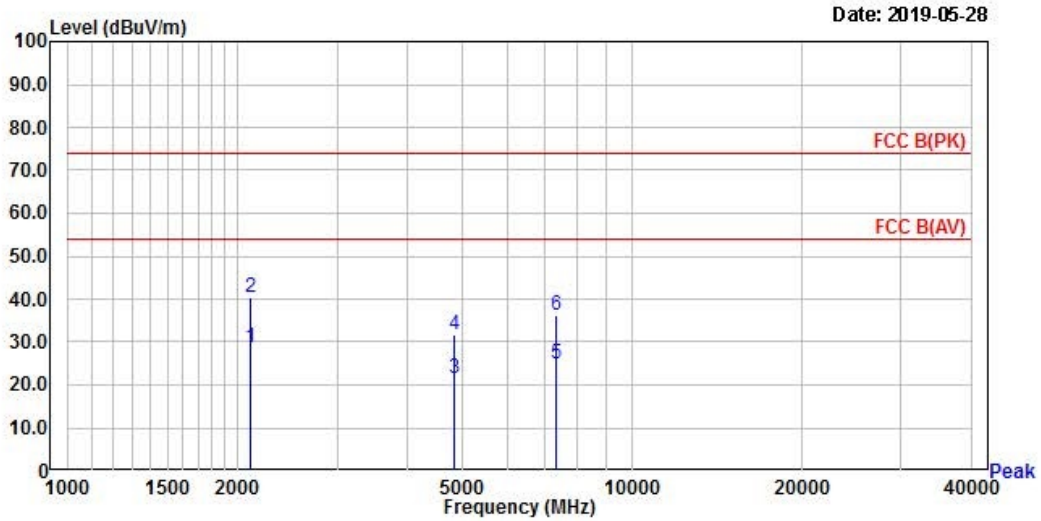
Freq	Reading	C.F	Result QP	Limit	Margin	Height	Angle	Polarity
MHz	dBuV	dB	dBuV/m	dBuV/m	dB	cm	deg	
2109.22	33.01	-3.79	29.22	54.00	24.78	100	185	Horizontal
2109.22	44.01	-3.79	40.22	74.00	33.78	100	185	Horizontal
4849.27	20.33	3.18	23.51	54.00	30.49	100	121	Horizontal
4849.27	31.22	3.18	34.40	74.00	39.60	100	121	Horizontal
7327.11	18.23	8.86	27.09	54.00	26.91	100	129	Horizontal
7327.11	27.23	8.86	36.09	74.00	37.91	100	129	Horizontal

Remarks: C.F (Correction Factor) = Antenna factor + Cable loss - Preamp gain

4, Songjuro 236Beon-gil, yanggi-myeon,
Yongin-si, Gyeonggi-do, Korea
Tel : +82-31-3236008,9
Fax : +82-31-3236010
www.ltalab.com

EUT/Model No.: DM-01 Temp/Humi: 23 / 40

Test Mode : Wireless_M Tested by: KWON H C



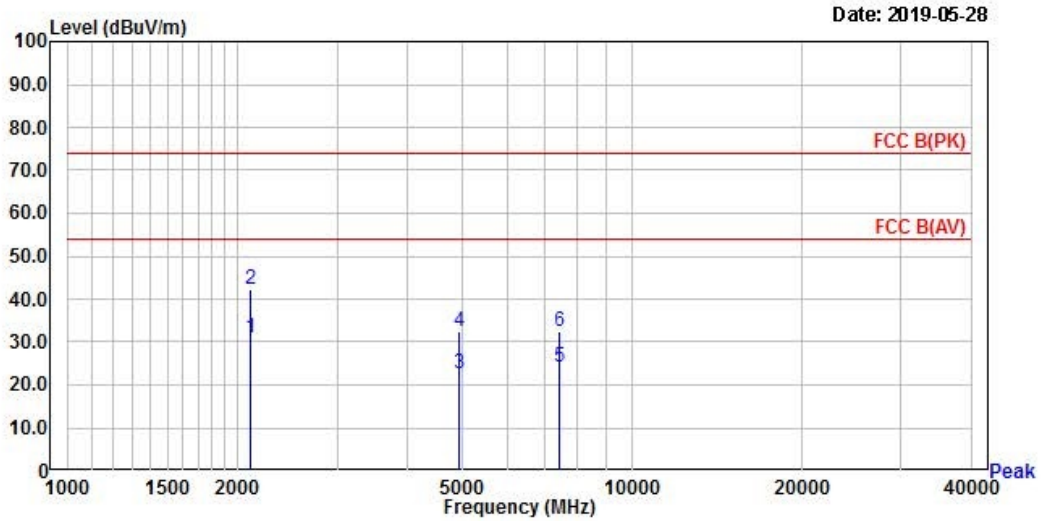
Freq	Reading	C.F	Result QP	Limit	Margin	Height	Angle	Polarity
MHz	dBuV	dB	dBuV/m	dBuV/m	dB	cm	deg	
2109.22	32.31	-3.79	28.52	54.00	25.48	100	124	Vertical
2109.22	44.32	-3.79	40.53	74.00	33.47	100	124	Vertical
4849.27	18.33	3.18	21.51	54.00	32.49	100	133	Vertical
4849.27	28.63	3.18	31.81	74.00	42.19	100	133	Vertical
7327.11	16.21	8.86	25.07	54.00	28.93	100	169	Vertical
7327.11	27.23	8.86	36.09	74.00	37.91	100	169	Vertical

Remarks: C.F (Correction Factor) = Antenna factor + Cable loss - Preamp gain

4, Songjuro 236Beon-gil, yanggi-myeon,
Yongin-si, Gyeonggi-do, Korea
Tel : +82-31-3236008,9
Fax : +82-31-3236010
www.ltalab.com

EUT/Model No.: DM-01 Temp/Humi: 23 / 40

Test Mode : Wireless_H Tested by: KWON H C



Freq	Reading	C.F	Result QP	Limit	Margin	Height	Angle	Polarity
MHz	dBuV	dB	dBuV/m	dBuV/m	dB	cm	deg	
2110.89	34.89	-3.80	31.09	54.00	22.91	100	169	Vertical
2110.89	45.89	-3.80	42.09	74.00	31.91	100	169	Vertical
4924.52	19.12	3.41	22.53	54.00	31.47	100	136	Vertical
4924.52	29.12	3.41	32.53	74.00	41.47	100	136	Vertical
7442.04	15.32	8.89	24.21	54.00	29.79	100	226	Vertical
7442.04	23.62	8.89	32.51	74.00	41.49	100	226	Vertical

Remarks: C.F (Correction Factor) = Antenna factor + Cable loss - Preamp gain

4, Songjuro 236Beon-gil, yanggi-myeon,
Yongin-si, Gyeonggi-do, Korea
Tel : +82-31-3236008,9
Fax : +82-31-3236010
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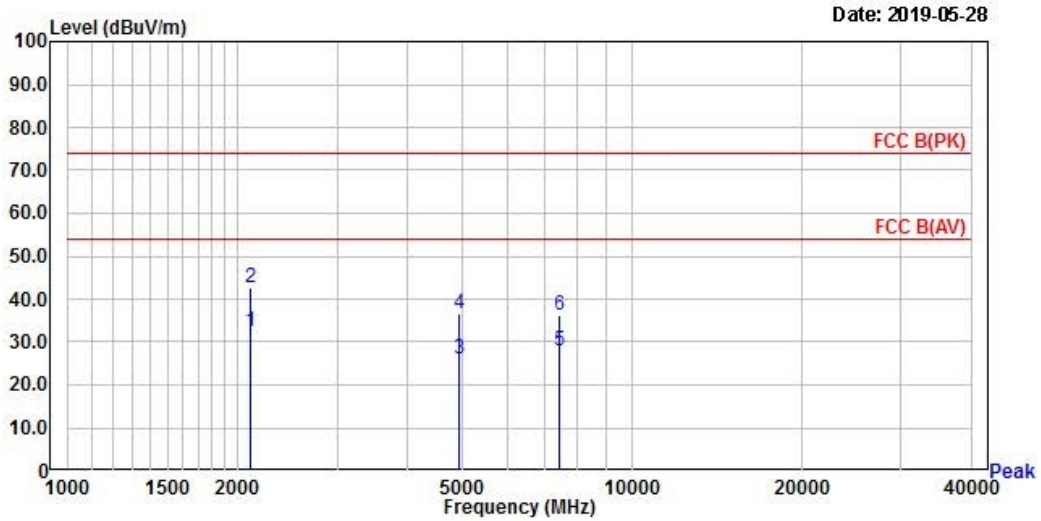
EUT/Model No.: DM-01 Temp/Humi: 23 / 40

Test Mode : Wireless_H Tested by: KWON H C



Freq	Reading	C.F	Result QP	Limit	Margin	Height	Angle	Polarity
MHz	dBuV	dB	dBuV/m	dBuV/m	dB	cm	deg	
2110.89	36.29	-3.80	32.49	54.00	21.51	100	166	Horizontal
2110.89	46.26	-3.80	42.46	74.00	31.54	100	166	Horizontal
4924.50	22.64	3.41	26.05	54.00	27.95	100	124	Horizontal
4924.50	33.11	3.41	36.52	74.00	37.48	100	124	Horizontal
7442.03	19.21	8.89	28.10	54.00	25.90	100	126	Horizontal
7442.03	27.32	8.89	36.21	74.00	37.79	100	126	Horizontal

Remarks: C.F (Correction Factor) = Antenna factor + Cable loss - Preamp gain

3.3.9 AC Conducted Emissions

Procedure:

AC power line conducted emissions from the EUT were measured according to the dictates of ANSI C63.4:2003. The conducted emissions are measured in the shielded room with a spectrum analyzer in peak hold. While the measurement, EUT had its hopping function disabled at the middle channels in line with Section 15.31(m). Emissions closest to the limit are measured in the quasi-peak mode (QP) with the tuned receiver using a bandwidth of 9 kHz. The emissions are maximized further by cable manipulation and Exerciser operation. The highest emissions relative to the limit are listed.

Measurement Data: N/A

- Refer to the next page.
- No other emissions were detected at a level greater than 20dB below limit
- It gave the worse case emissions

Minimum Standard: FCC Part 15.207(a)/EN 55022

Frequency Range (MHz)	Conducted Limit (d. 1t892 ㅂ BuV)	
	Quasi-Peak	Average
0.15 ~ 0.5	66 to 56 *	56 to 46 *
0.5 ~ 5	56	46
5 ~ 30	60	50

* Note: The limits will decrease with the frequency logarithmically within 0.15MHz to 0.5MHz

3.4 Measurement Uncertainty

Parameter	Uncertainty
Centre Frequency	±1 × 10^{-5} MHz
Occupied Channel Bandwidth	±5 %
RF output power, conducted	±1.5 dB
Power Spectral Density, conducted	±3 dB
Unwanted Emissions, conducted	±3 dB
All emissions, radiated	±6 dB
Temperature	±1 °C
Humidity	±5 %
DC and low frequency voltages	±3 %
Time	±5 %
Duty Cycle	±5 %

APPENDIX

TEST EQUIPMENT USED FOR TESTS

	Use	Description	Model No.	Serial No.	Manufacturer	Interval	Last Cal. Date
1	■	Signal Analyzer (9 kHz ~ 30 GHz)	FSV30	100757	R&S	1 year	2018-09-06
2		SYNTHESIZED CW GENERATOR	83711B	US34490456	HP	1 year	2019-03-16
3		Attenuator (3 dB)	8491A	37822	HP	1 year	2018-09-06
4		Attenuator (10 dB)	8491A	63196	HP	1 year	2018-09-06
5	■	EMI Test Receiver (~7 GHz)	ESCI7	100722	R&S	1 year	2018-09-06
6	■	RF Amplifier (~1.3 GHz)	8447D OPT 010	2944A07684	HP	1 year	2018-09-06
7	■	RF Amplifier (1~26.5 GHz)	8449B	3008A02126	HP	1 year	2019-03-16
8	■	Horn Antenna (1~18 GHz)	3115	00114105	ETS	2 year	2018-09-26
9		DRG Horn (Small)	3116B	81109	ETS-Lindgren	2 year	2018-05-03
10	■	DRG Horn (Small)	3116B	133350	ETS-Lindgren	2 year	2018-05-03
11	■	TRILOG Antenna	VULB 9160	9160-3237	SCHWARZBECK	2 year	2019-03-23
12		Temp.Humidity Data Logger	SK-L200TH II A	00801	SATO	1 year	2018-09-06
13	■	DC Power Supply	6674A	3637A01657	Agilent	-	-
14	■	Power Meter	EPM-441A	GB32481702	HP	1 year	2019-03-16
15	■	Power Sensor	8481A	3318A94972	HP	1 year	2018-09-06
16		Audio Analyzer	8903B	3729A18901	HP	1 year	2018-09-06
17		Modulation Analyzer	8901B	3749A05878	HP	1 year	2018-09-06
18		TEMP & HUMIDITY Chamber	YJ-500	LTAS06041	JinYoung Tech	1 year	2018-09-06
19		Stop Watch	HS-3	812Q08R	CASIO	2 year	2019-03-16
20		LISN	KNW-407	8-1430-1	Kyoritsu	1 year	2018-09-06
21		Two-Lime V-Network	ESH3-Z5	893045/017	R&S	1 year	2019-03-16
22		Highpass Filter	WHKX1.5/15G-10SS	74	Wainwright Instruments	1 year	2019-03-16
23		Highpass Filter	WHKX3.0/18G-10SS	118	Wainwright Instruments	1 year	2019-03-16
24		OSP120 BASE UNIT	OSP120	101230	R&S	1 year	2019-03-16
25	■	Signal Generator(100 kHz ~ 40 GHz)	SMB100A	177621	R&S	1 year	2019-03-16
26		Vector Signal Generator(9kHz ~ 6 GHz)	SMBV100A	255081	R&S	1 year	2019-03-16
27		Signal Analyzer (10 Hz ~ 40 GHz)	FSV40	101367	R&S	1 year	2019-03-16