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Dates of Tests: November 14 ~ 23, 2016
 Test Report S/N: LR500111611G
 Test Site : LTA CO., LTD.

CERTIFICATION OF COMPLIANCE

FCC ID

PBNET30KH-BT

APPLICANT

ENTERMEDIA CO., LTD

Equipment Class	: Part 15 Spread Spectrum Transmitter (DSS)
Manufacturing Description	: Karaoke device
Manufacturer	: ENTERMEDIA CO., LTD.
Model name	: ET30KH-BT
Variant model	: ET30KH
Test Device Serial No.:	: Identical prototype
Rule Part(s)	: FCC Part 15.247 Subpart C ; ANSI C-63.4-2014
Frequency Range	: 2402 ~ 2480 MHz(Bluetooth BDR, EDR)
Max. Output Power	: Max -6.45 dBm – Conducted
Date of issue	: December 05, 2016

This test report is issued under the authority of:

Yong-Cheol Wang, Manager

The test was supervised by:

Jungwon Seo, 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

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
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 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	2016-09-30	ECT accredited Lab.
RRA	KOREA	KR0049	-	EMC accredited Lab.
FCC	U.S.A	610755	2017-04-21	FCC filing
FCC	U.S.A	649054	2017-04-13	FCC CAB
VCCI	JAPAN	R2133(10 m), C2307	2017-06-21	VCCI registration
VCCI	JAPAN	T-2009	2016-12-23	VCCI registration
VCCI	JAPAN	G-563	2018-12-13	VCCI registration
IC	CANADA	5799A-1	2019-11-07	IC filing
KOLAS	KOREA	NO.551	2017-01-08	KOLAS accredited Lab.

2. Information about test item

2. Information about test item

2-1 Client & Manufacturer

Company name : ENTERMEDIA CO., LTD.
 Address : Enter Bldg, 157-1, Seongo-ro, Ojeong-gu, Bucheon-si, Gyeonggi-do, Korea
 Tel / Fax : TEL No : +82-02-680-9139 / FAX No : +82-32-673-0868

2-2 Secondary Manufacturer

Company name : ASSA TECHNOLOGY JOINT STOCK COMPANY
 Address : Thanh Hoa Hamlet, Ho Nai 3 ward, Trang Bom District, Dong Nai province, Vietnam

2-3 Equipment Under Test (EUT)

Model name : ET30KH-BT
 Variant model name : ET30KH
 Serial number : Identical prototype
 Date of receipt : November 11, 2016
 EUT condition : Pre-production, not damaged
 Antenna type : IFA antenna - Max Gain 4.75 dBi
 Frequency Range : 2402 MHz ~ 2480 MHz
 RF output power : Max -6.45 dBm – Conducted(Bluetooth BDR, EDR)
 Number of channels : 79
 Type of Modulation : GFSK
 Power Source : AC 110 V
 Firmware Version : V1.0.0

2-4 Tested frequency

Bluetooth BLE	LOW	MID	HIGH
Frequency (MHz)	2402	2441	2480

2-5 Ancillary Equipment

Equipment	Model No.	Serial No.	Manufacturer
Monitor	VA703	8171340UV160R	ViewSonic

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	$\geq 2/3$ 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	$\leq 1W$ for 1Mbps $\leq 125mW$ 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

→ The **ENTERMEDIA CO., LTD.** FCC ID: **PBNET30KH-BT** unit complies with the requirement of §15.203.

The antenna type is IFA Antenna.

Note 2: The sample was tested according to the following specification:
FCC Parts 15.247; ANSI C-63.4-2014

Note3: TEST METHODOLOGY

The measurement procedure described in the American National Standard for Testing Unlicensed Wireless Devices(ANSI C63.10-2013) and FCC Public Notice DA 00-705 dated March 30, 2000 entitled “**Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems**” were used in the measurement of the **ENTERMEDIA CO., LTD.**, FCC ID: **PBNET30KH-BT**

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.

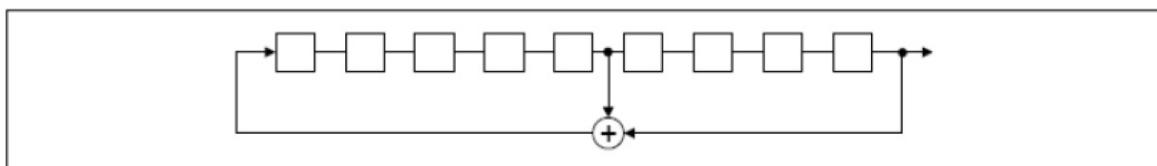
(h) The incorporation of intelligence within a frequency hopping spread spectrum system that permits the system to recognize other users within the spectrum band so that it individually and independently chooses and adapts its hopsets to avoid hopping on occupied channels is permitted. The coordination 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

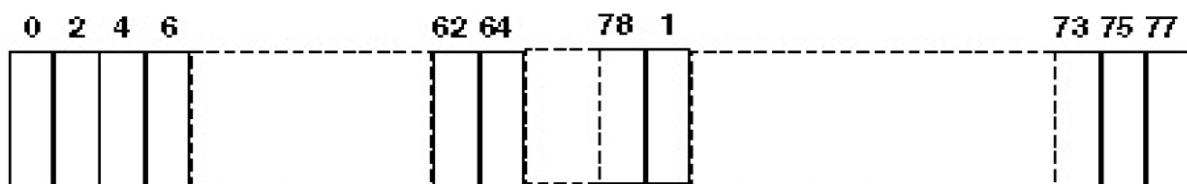
The pseudorandom sequence may be generated in a nine-stage shift register whose 5th and 9th stage outputs are added in a modulo-two addition stage, and the result is fed back to the input of the first stage. The sequence begins with the first ONE of 9 consecutive ONEs; i.e. the shift register is initialized with nine ones. Number of shift register stages: 9

Length of pseudo-random sequence: $2^9 - 1 = 511$ 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
0.9986	Complies

- See next pages for actual measured spectrum plots.

Minimum Standard:

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

Measurement Setup

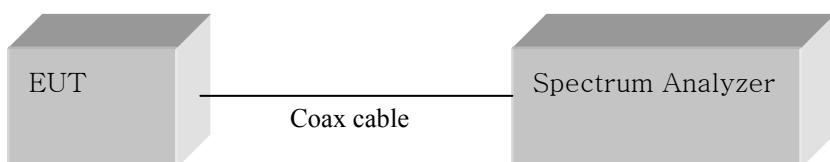
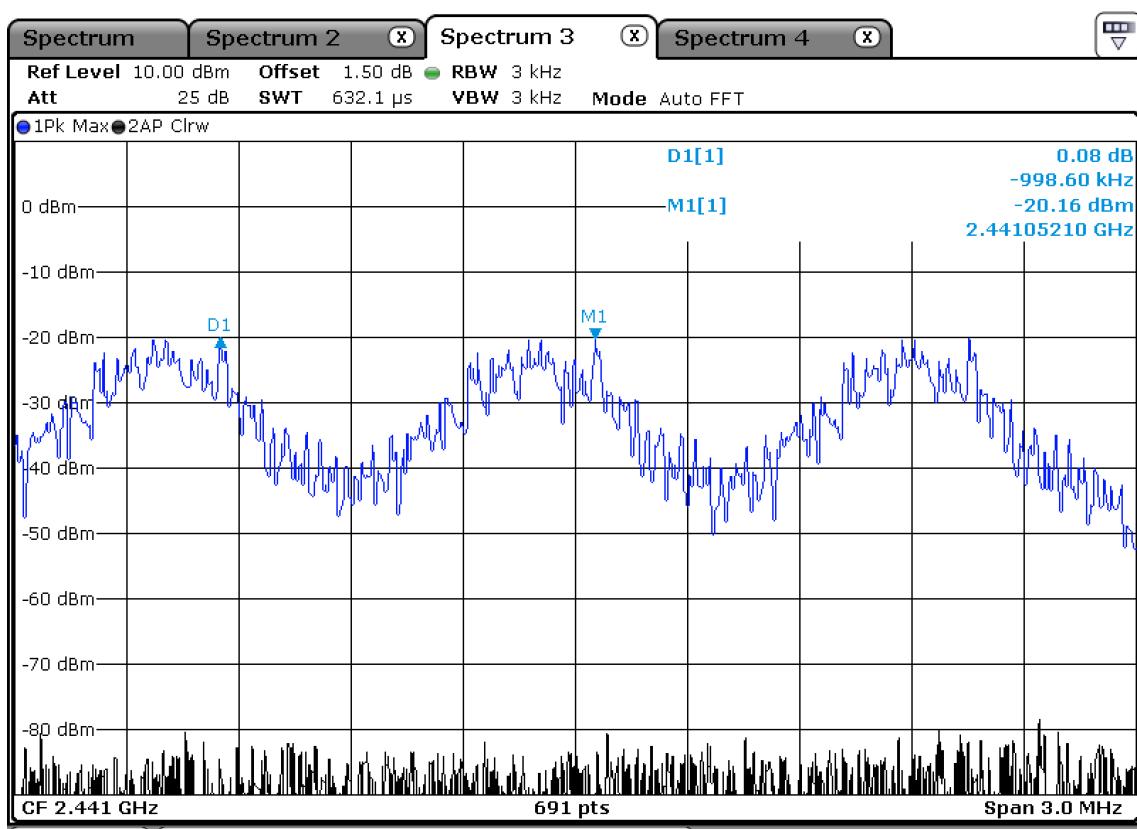
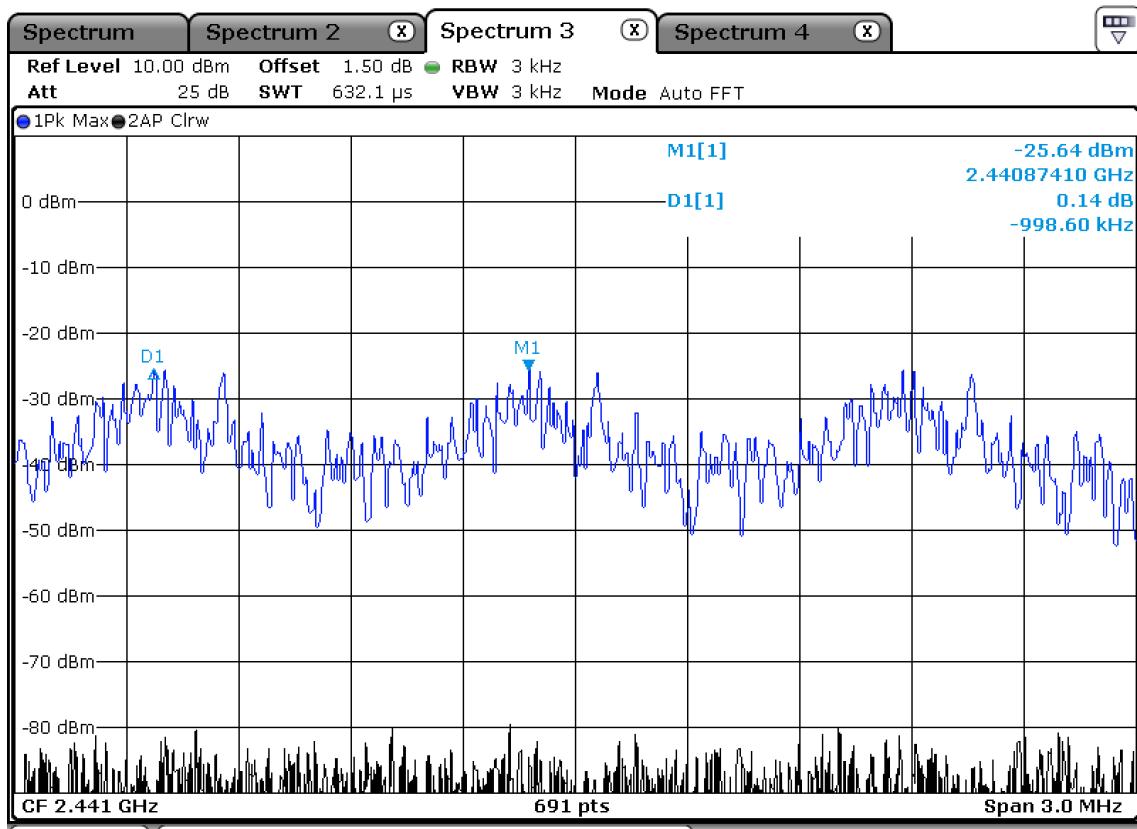


Figure 1: Measurement setup for the carrier frequency separation

Carrier Frequency SeparationBasic ModeEDR Mode

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 = 2400.0MHz, Stop = 2483.5 MHz

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

VBW = 100 kHz (VBW \geq RBW) Detector function = peak

Trace = max hold Span > 40MHz

Measurement Data : Complies

Total number of Hopping Channels	79
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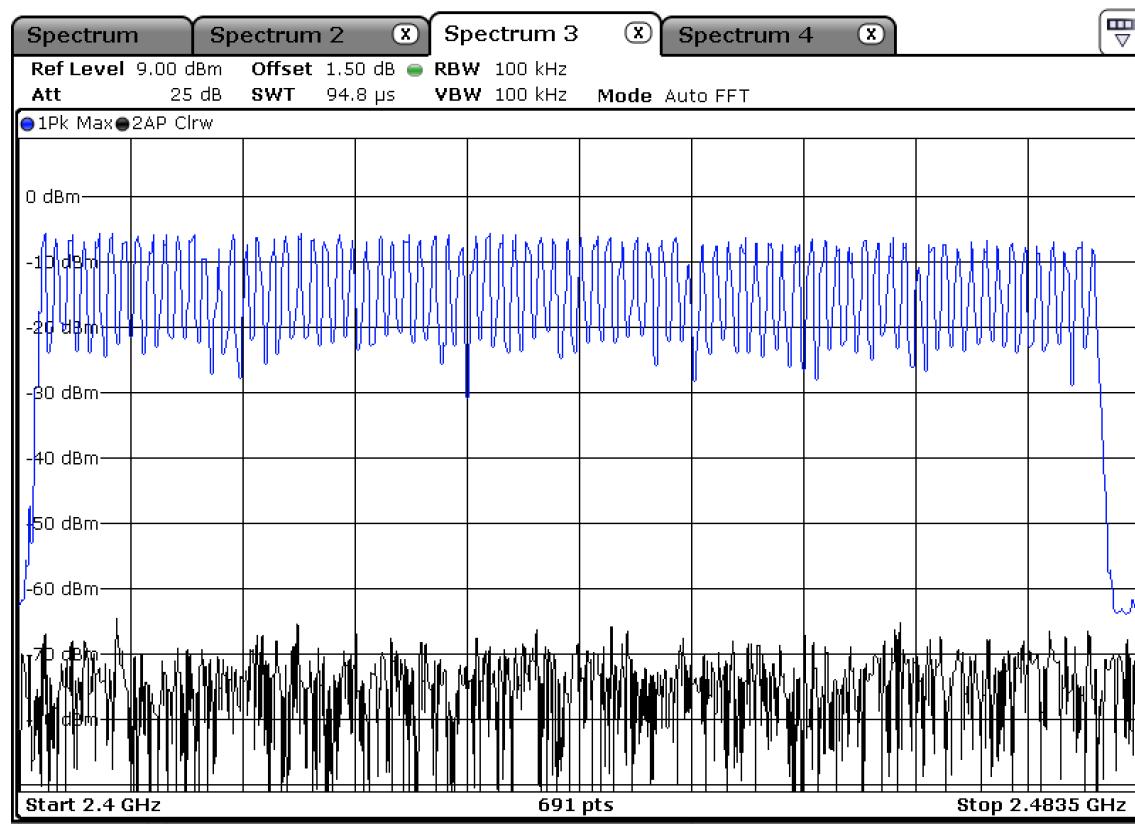
- See next pages for actual measured spectrum plots.

Minimum Standard:

At least 15 channels

Measurement Setup

Same as the Chapter 3.3.1 (Figure 1)

Number of Hopping Frequencies

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 20dB 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), 5 MHz(99% BW)

RBW = 30 kHz Sweep = auto

VBW = 30 kHz (VBW \geq RBW) Detector function = peak

Trace = max hold

Measurement Data: Basic Mode

Frequency (MHz)	Channel No.	Test Results(MHz)	
		20dB Bandwidth	99% Bandwidth
2402	0	0.8292	0.9190
2441	39	0.8249	0.9190
2480	78	0.8726	0.9190

Measurement Data: EDR Mode

Frequency (MHz)	Channel No.	Test Results(MHz)	
		20dB Bandwidth	99% Bandwidth
2402	0	1.216	1.143
2441	39	1.216	1.136
2480	78	1.216	1.136

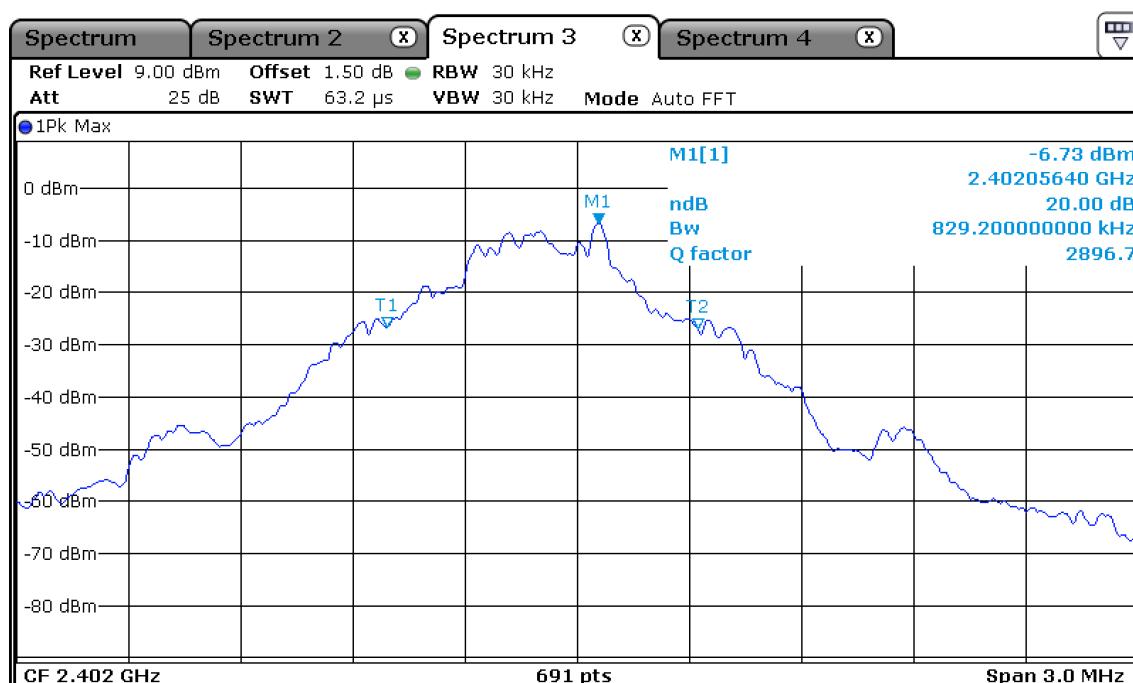
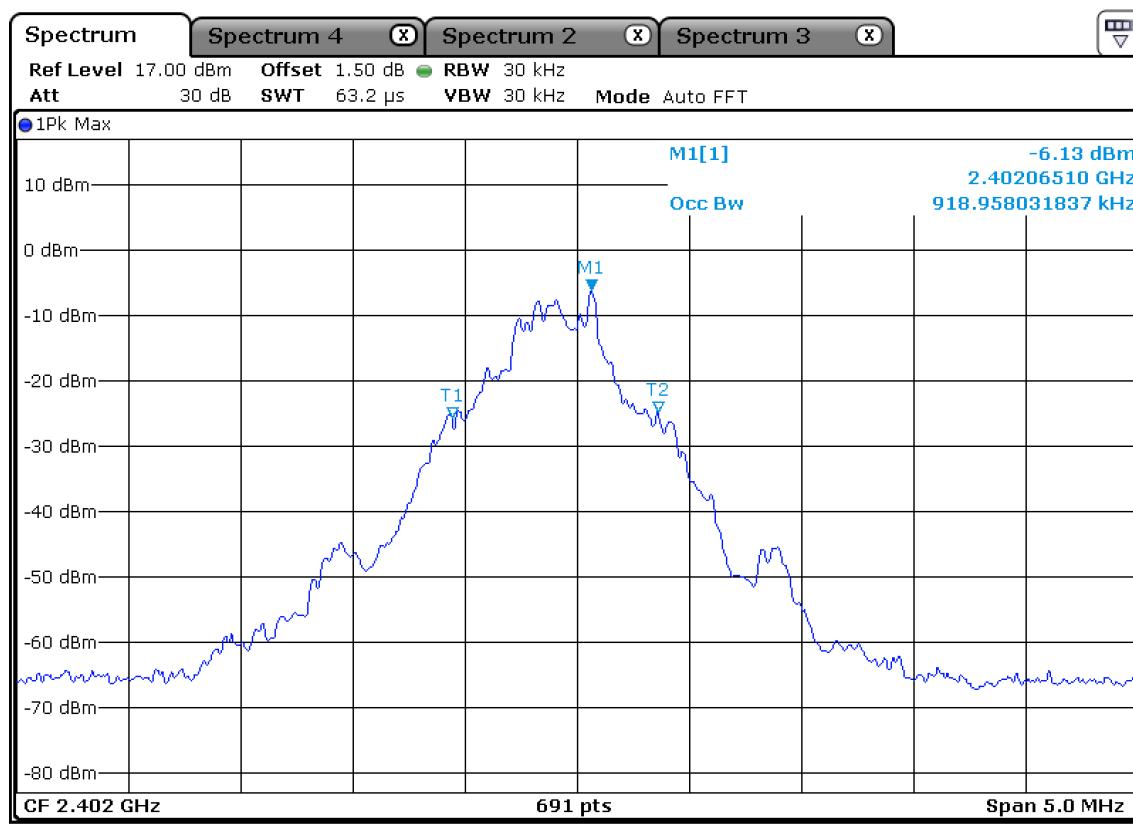
- See next pages for actual measured spectrum plots.

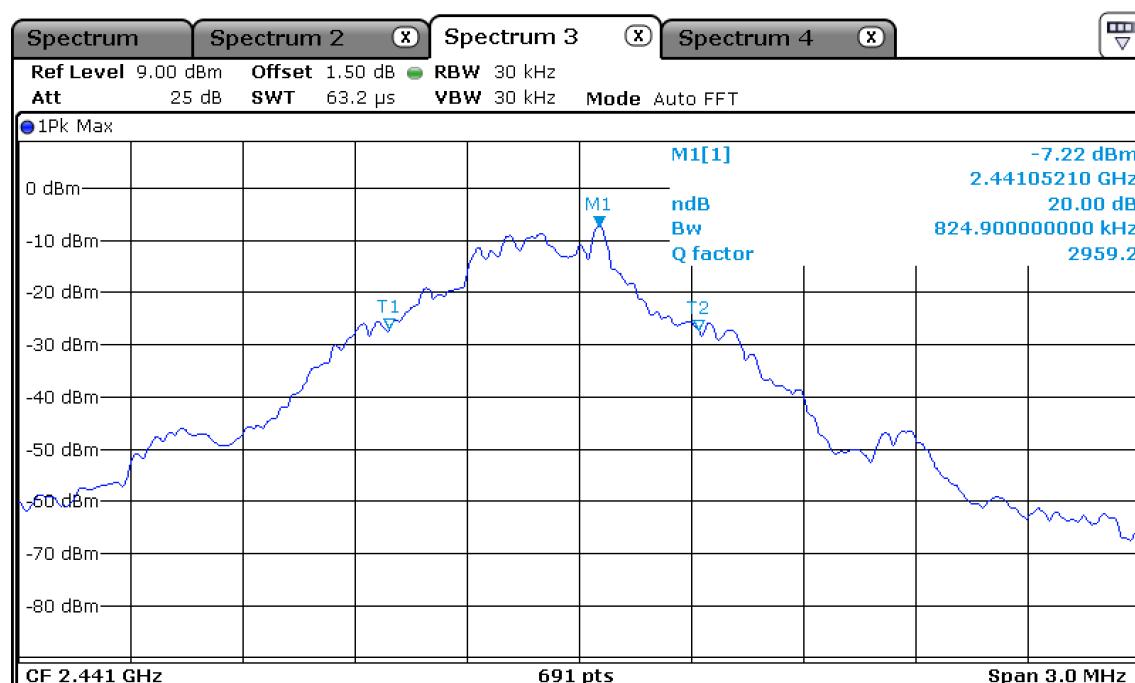
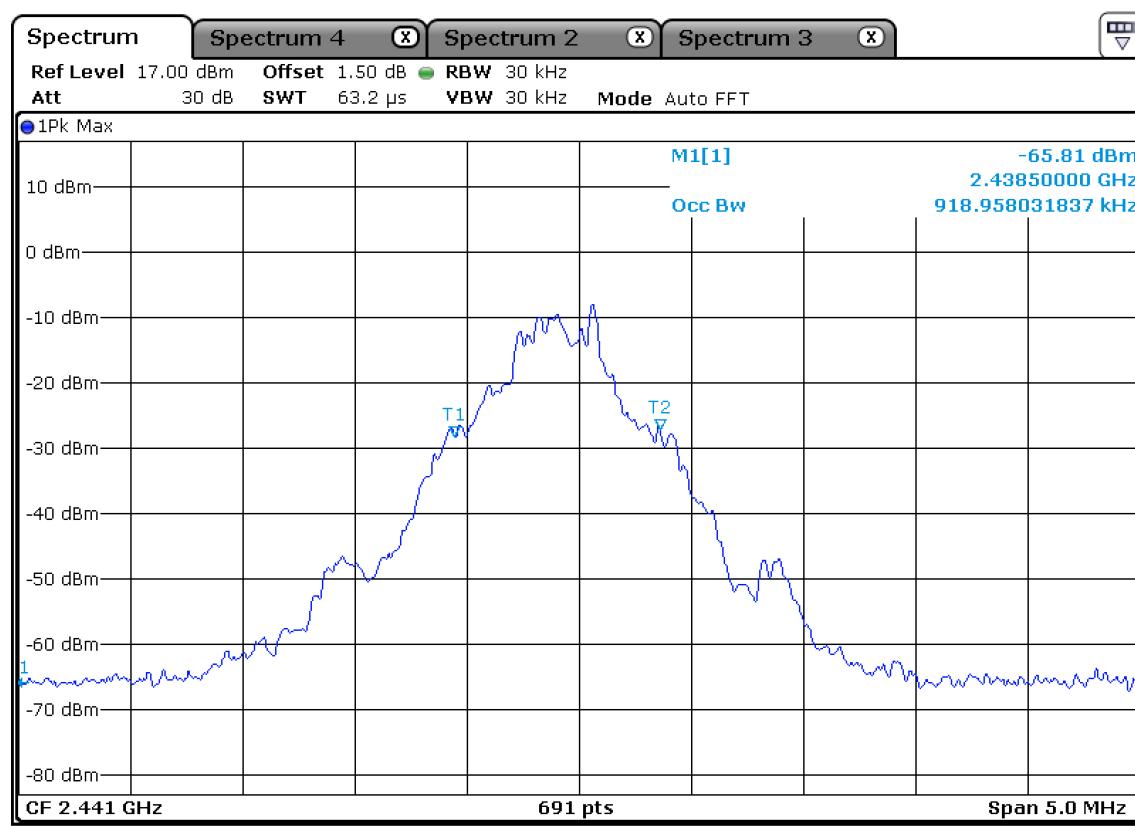
Minimum Standard:

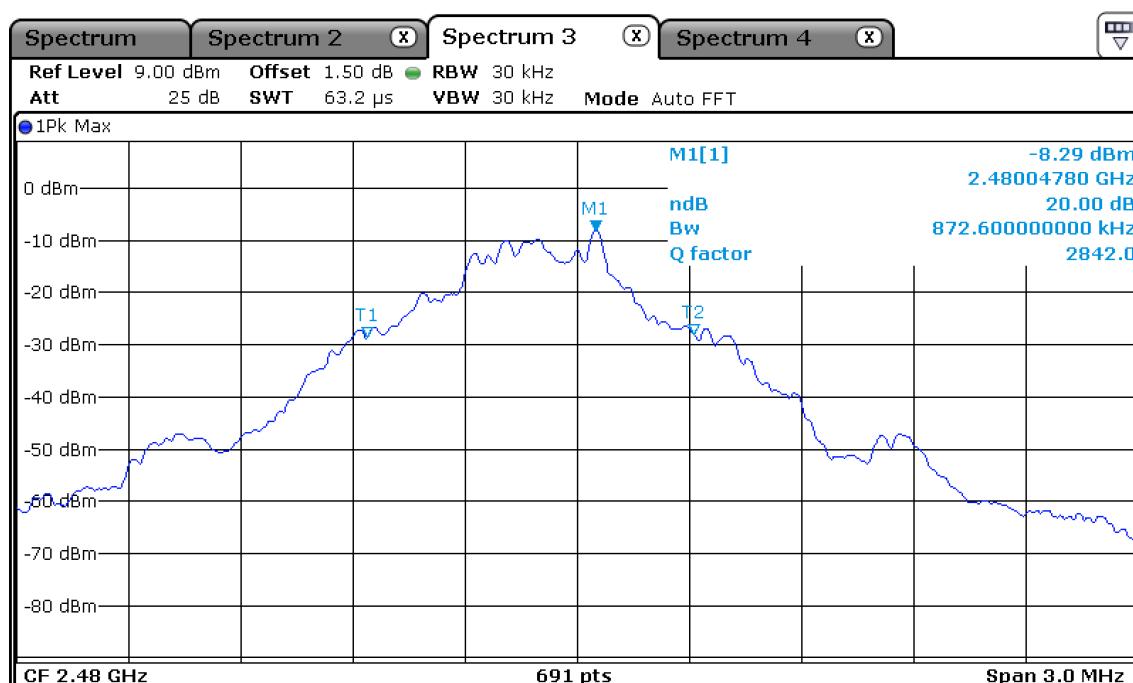
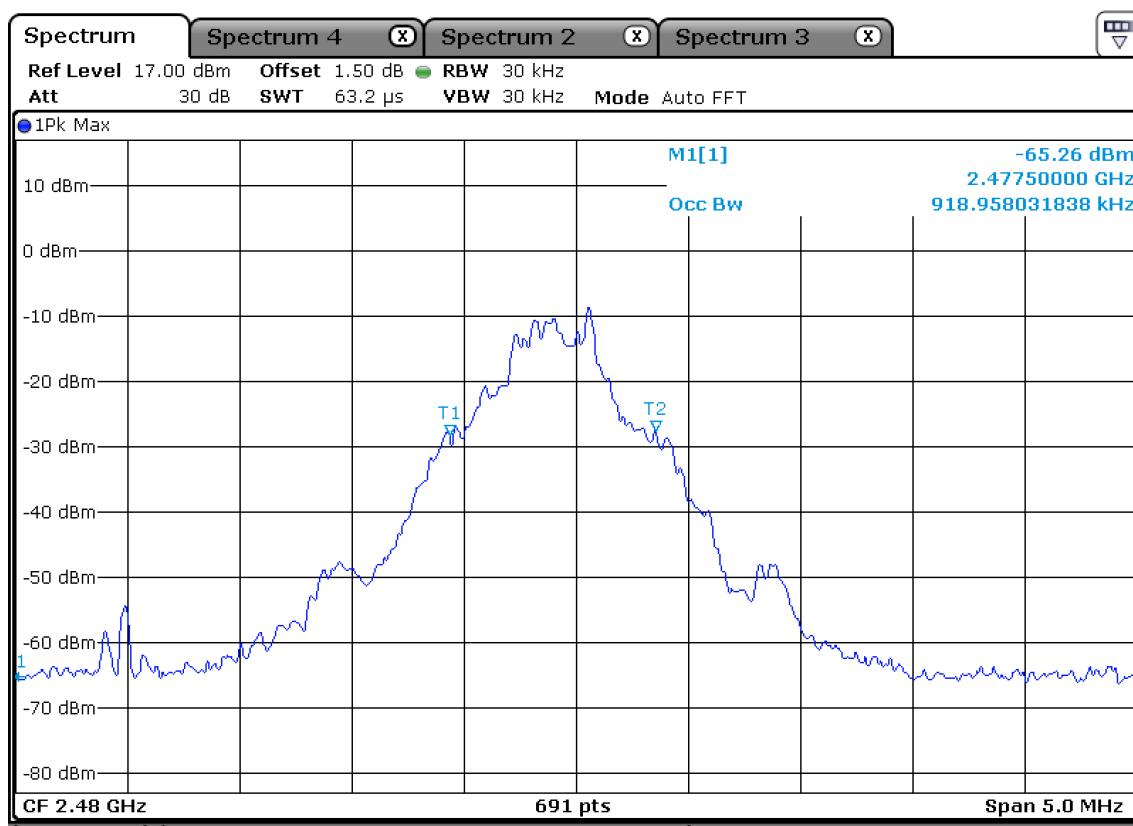
N/A

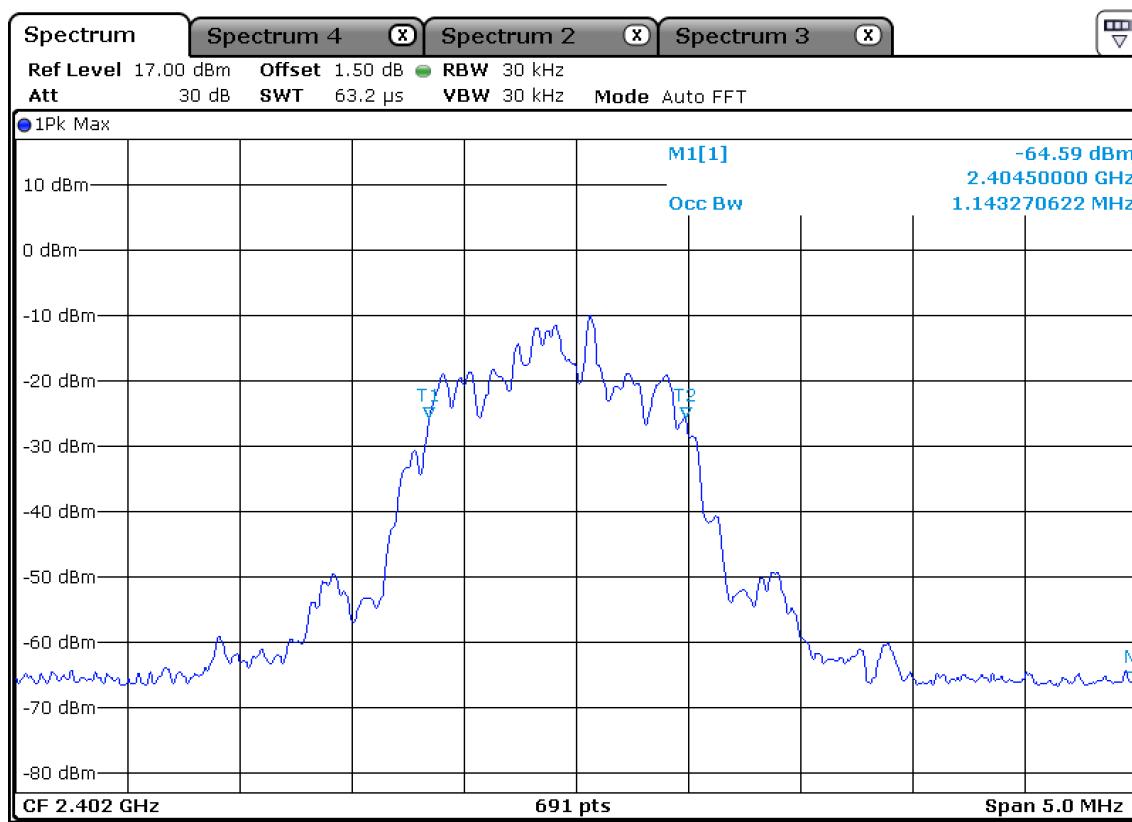
Measurement Setup

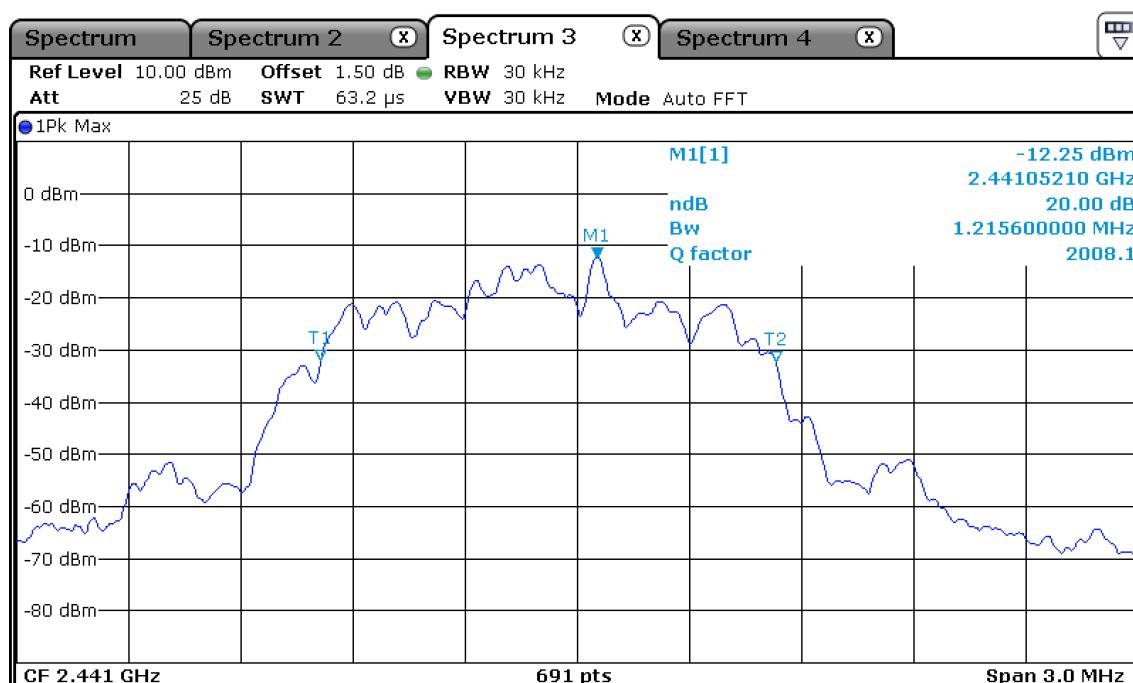
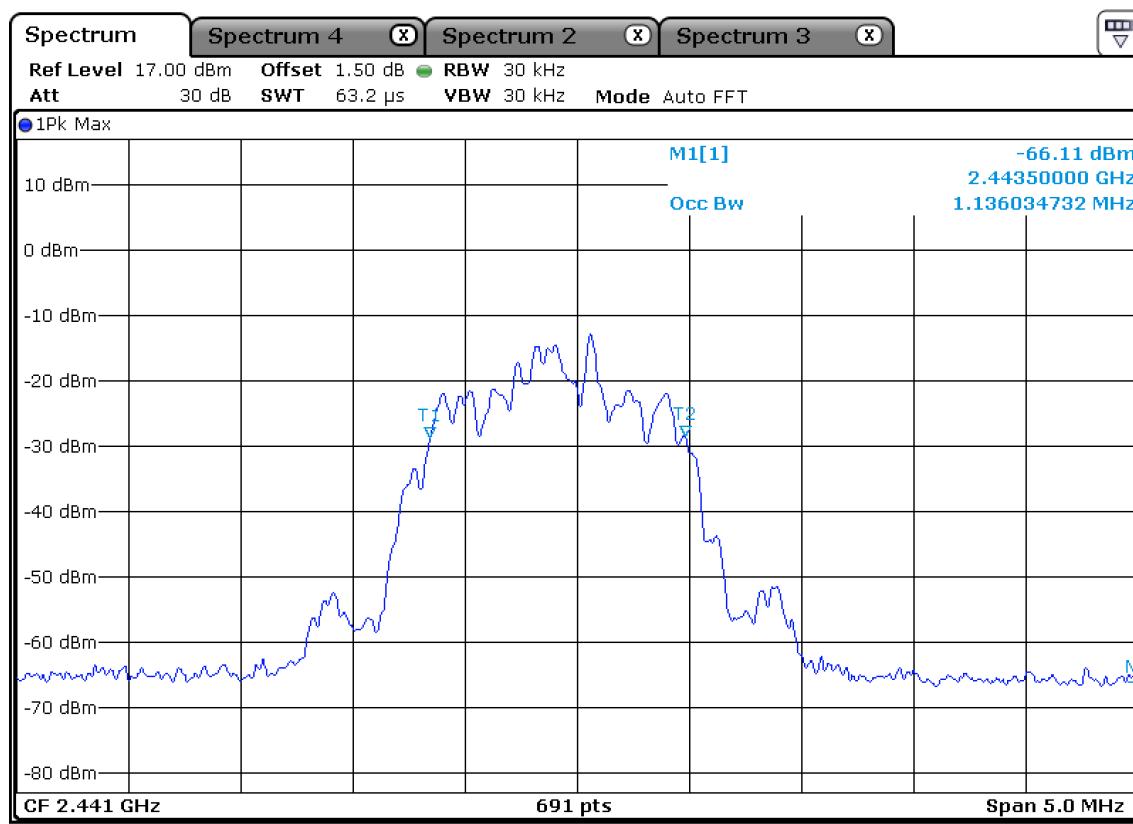
Same as the Chapter 3.3.1 (Figure 1)

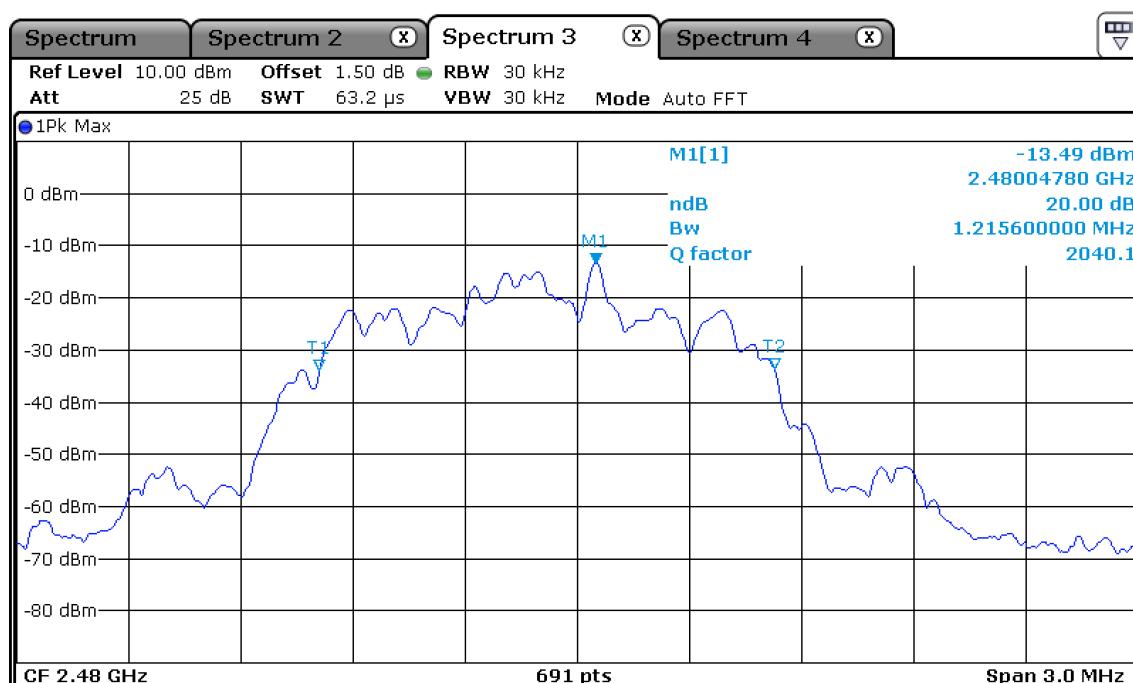
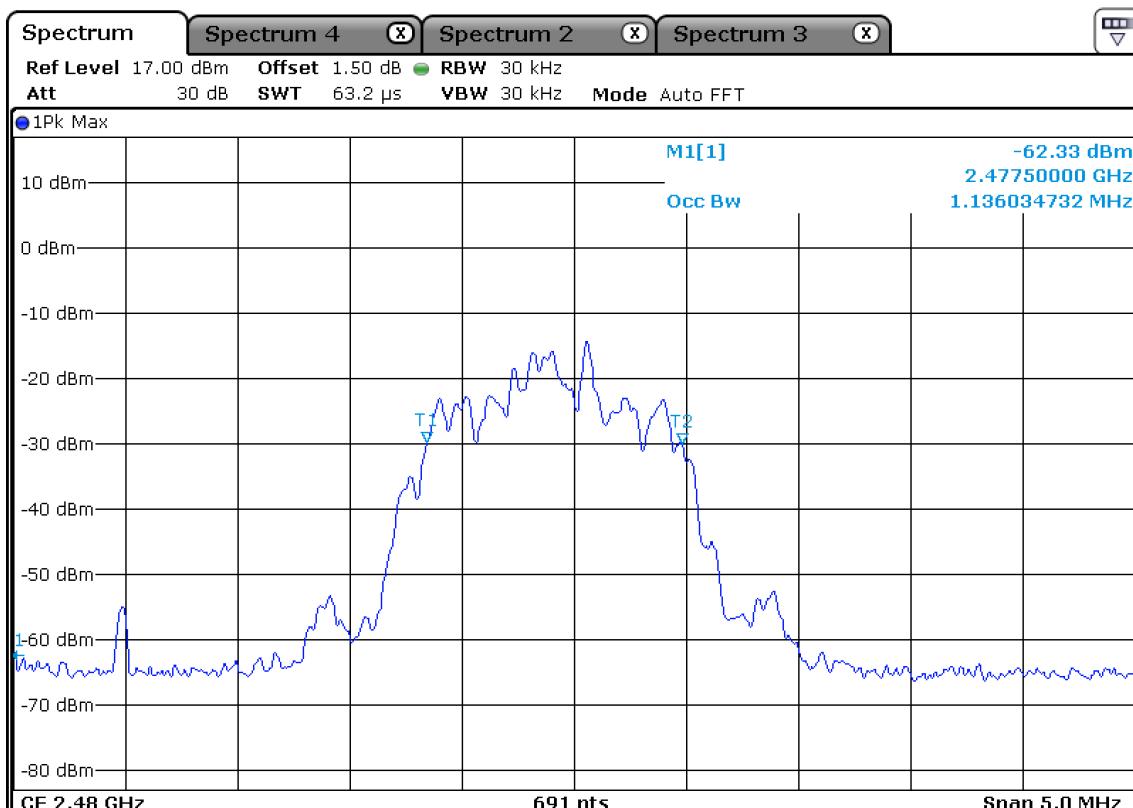
Channel 1 of basic mode20 dB Bandwidth99% Bandwidth

Channel 2 of basic mode20 dB Bandwidth99% Bandwidth

Channel 3 of basic mode20 dB Bandwidth99% Bandwidth

Channel 1 at EDR mode20 dB Bandwidth99% Bandwidth

Channel 2 at EDR mode20 dB Bandwidth99% Bandwidth

Channel 3 at EDR mode20 dB Bandwidth99% Bandwidth

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 \geq RBW)

Trace = max hold

Detector function = peak

Measurement Data (Bluetooth):

Mode	Number of transmission in a 31.6s (79Hopping*0.4)	Length of Transmission Time (msec)	Result (msec)	Limit (msec)
DH1	15(Times / 3sec) *10.533 = 158.00	0.275	43.45	400
DH3	11(Times / 3sec) *10.533 = 115.86	0.254	29.43	400
DH5	6(Times / 3sec) *10.533 = 63.20	0.268	16.94	400
EDR 3Mbps DH5	6(Times / 3sec) *10.533 = 63.20	0.268	16.94	400

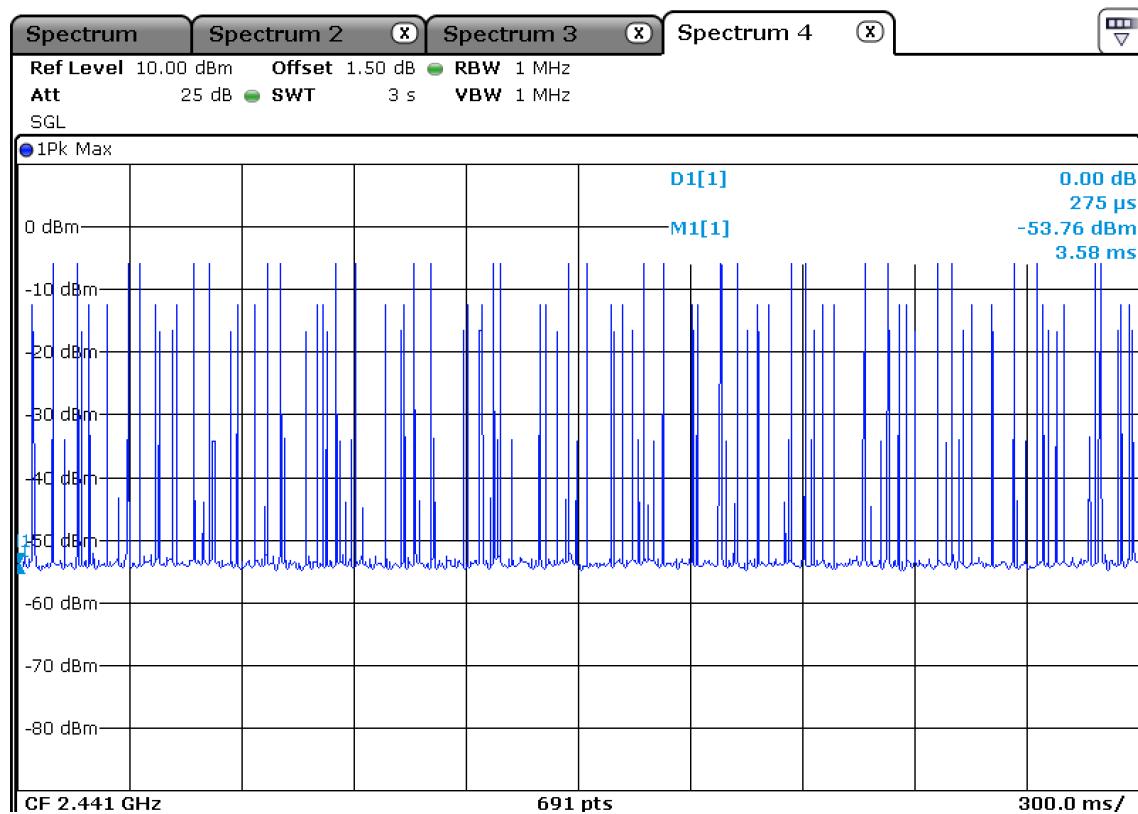
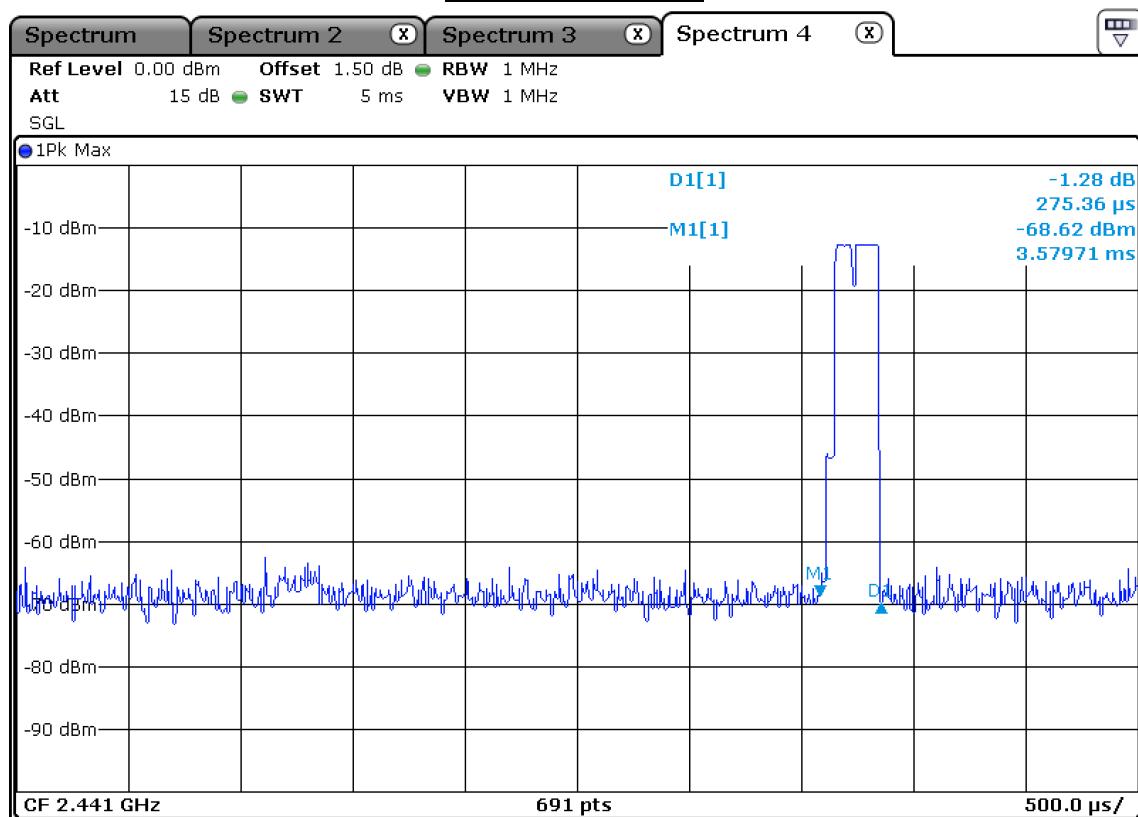
- See next pages for actual measured spectrum plots.
- dwell time = {(number of hopping per second / number of slot) x duration time per channel} x 0.4 ms

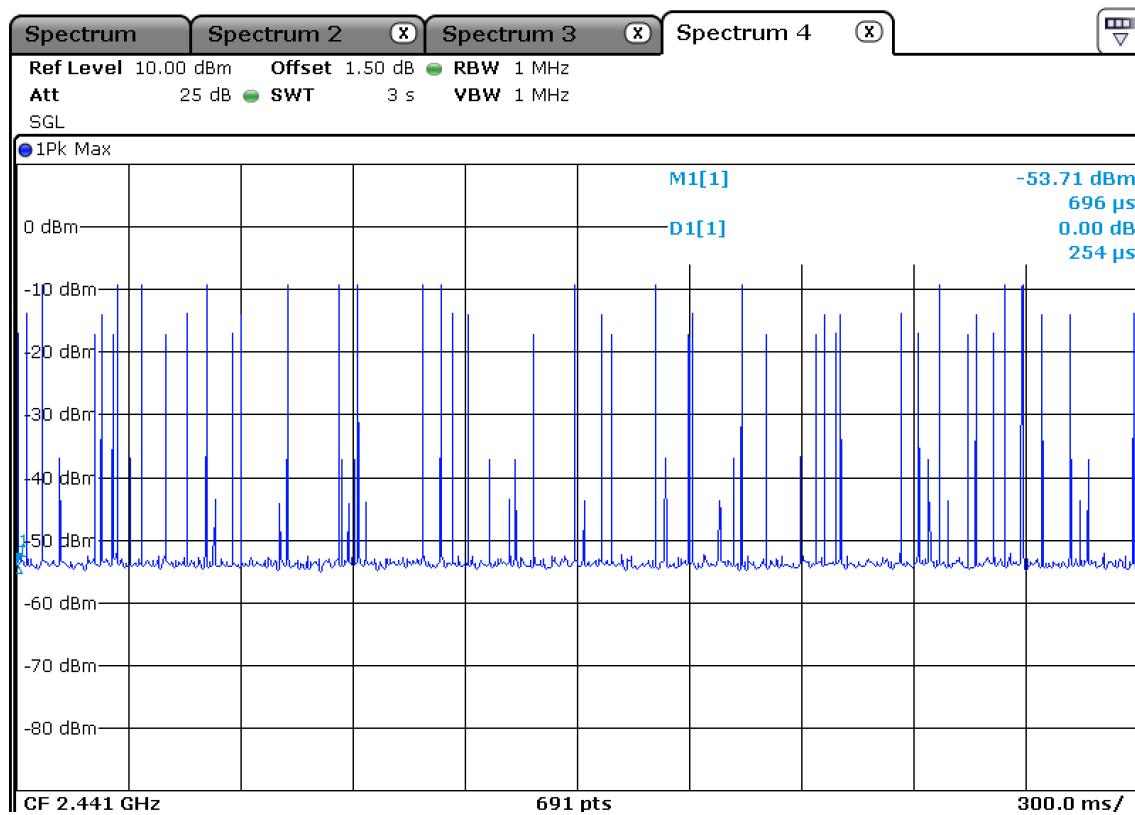
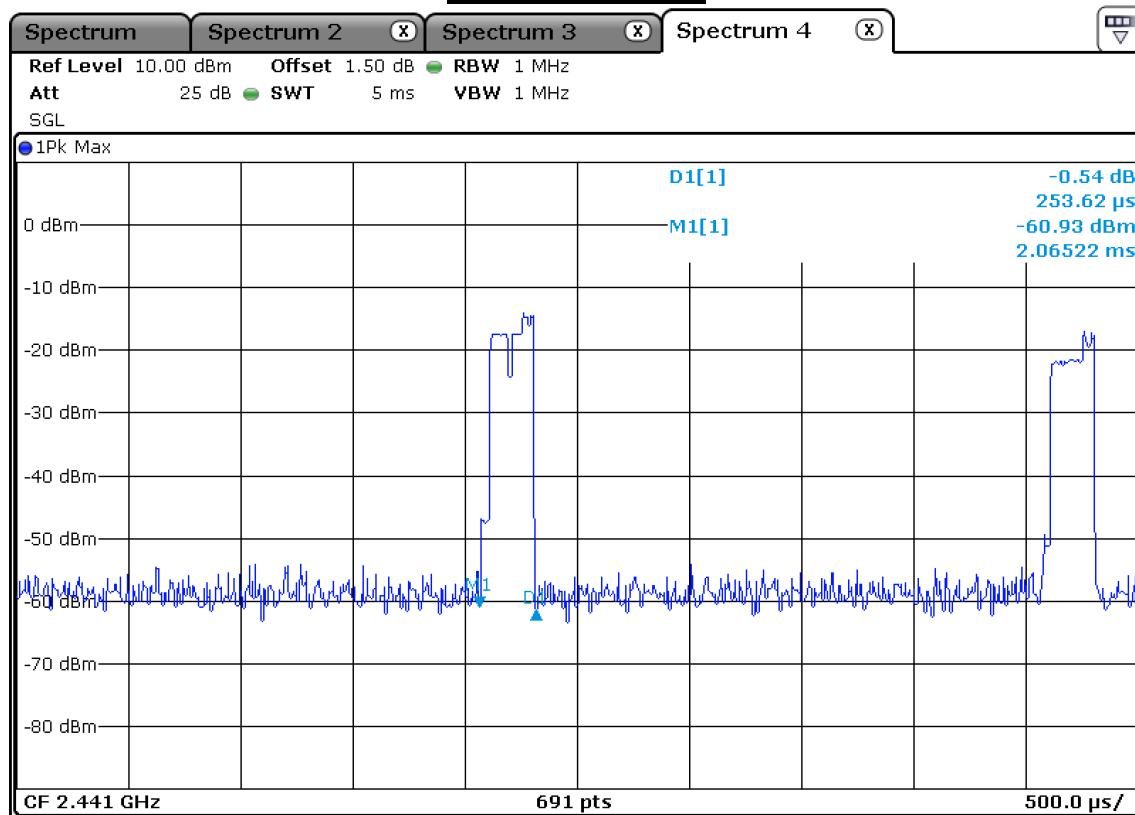
Minimum Standard:

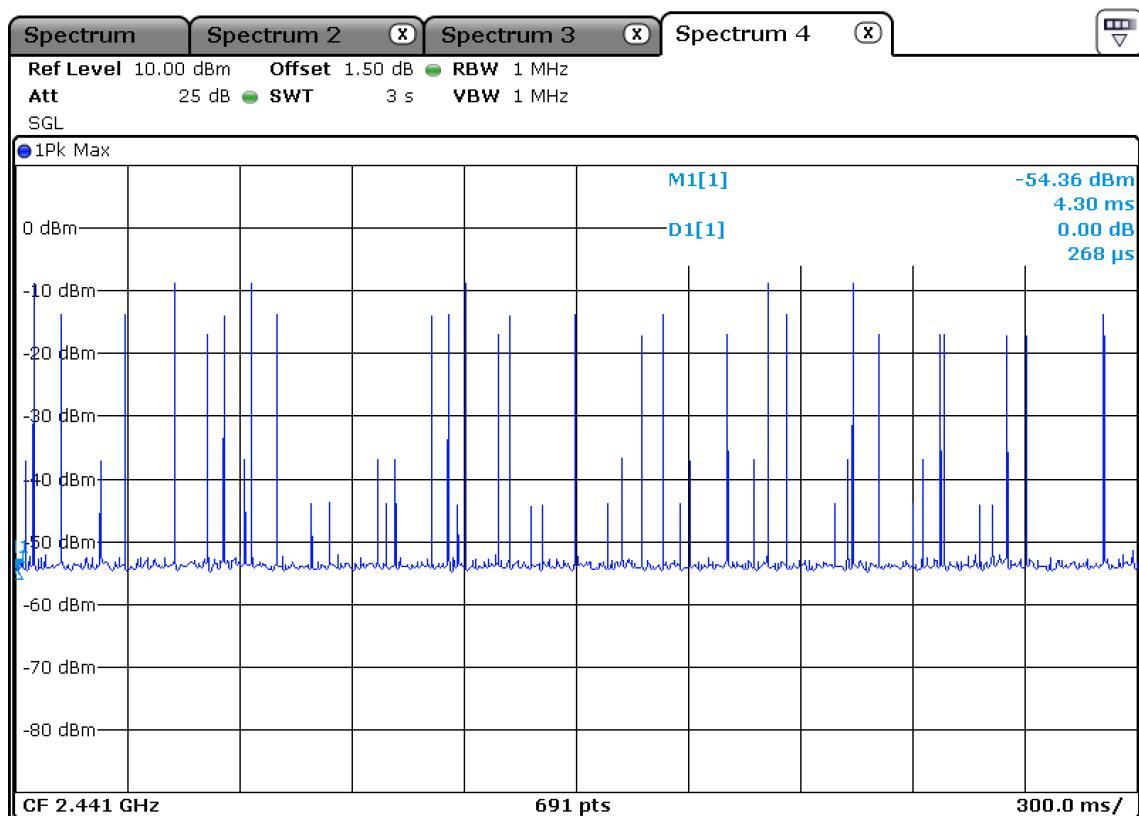
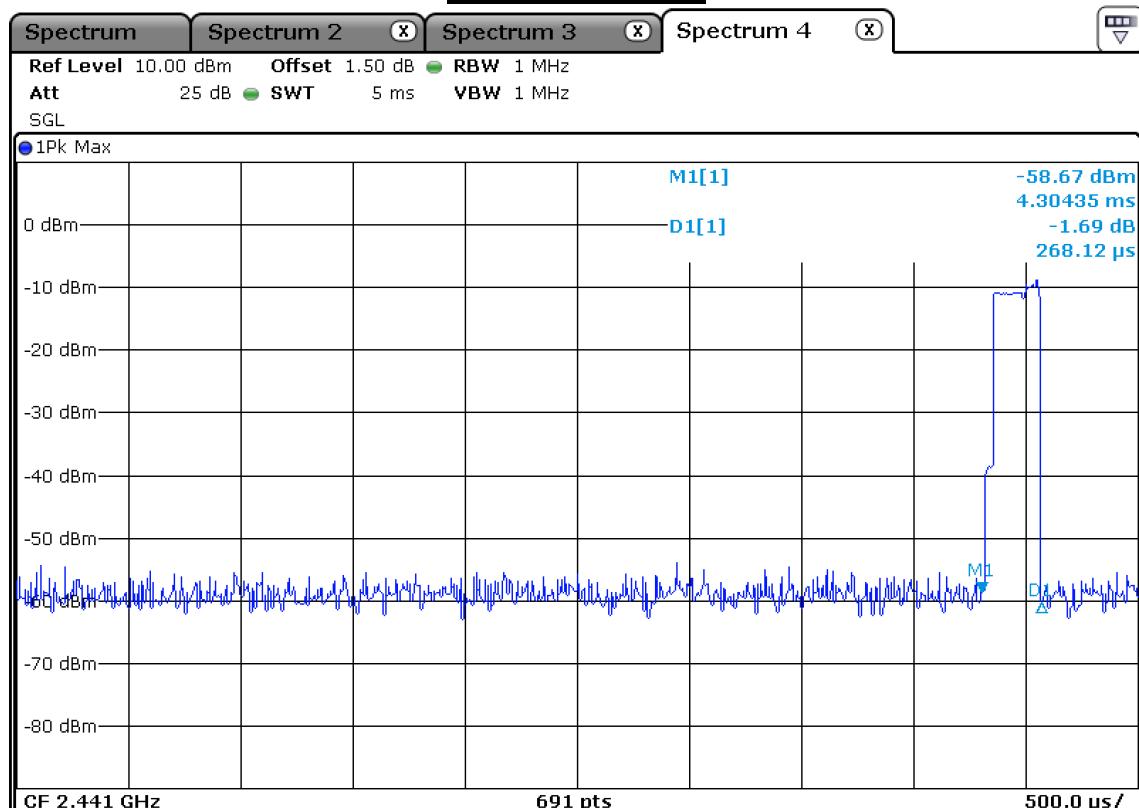
0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed

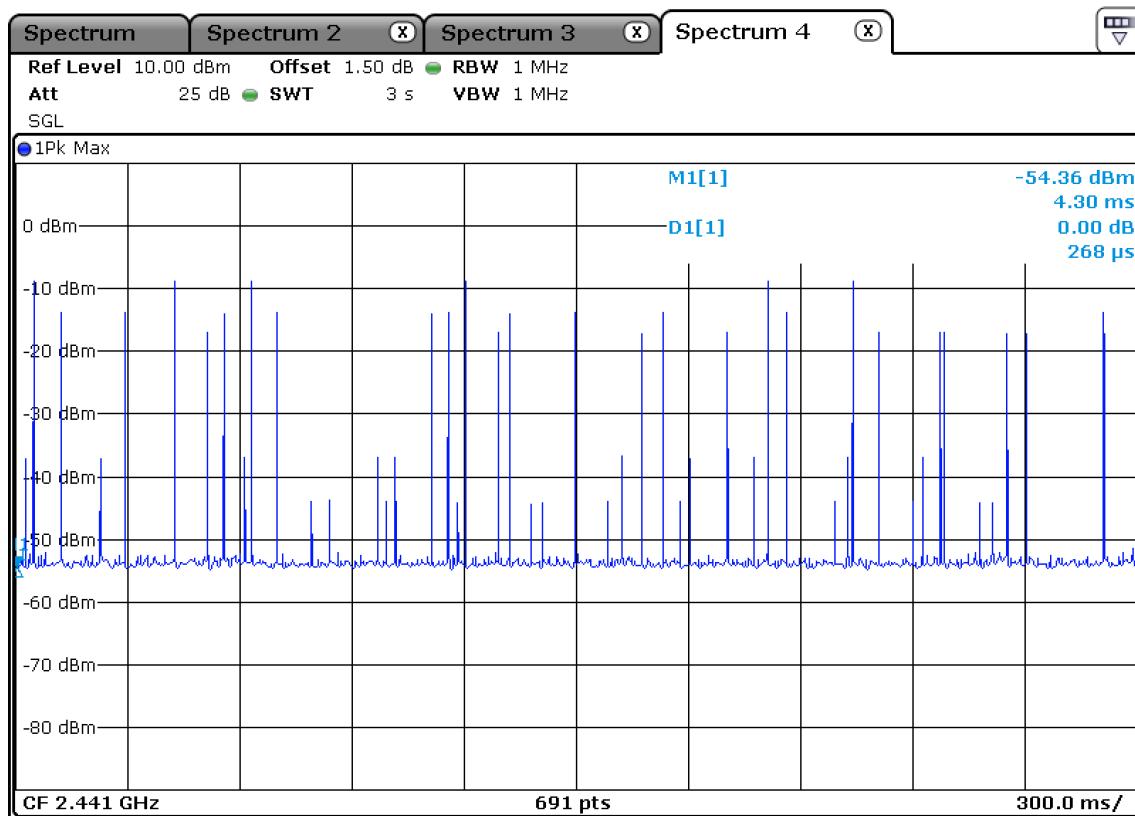
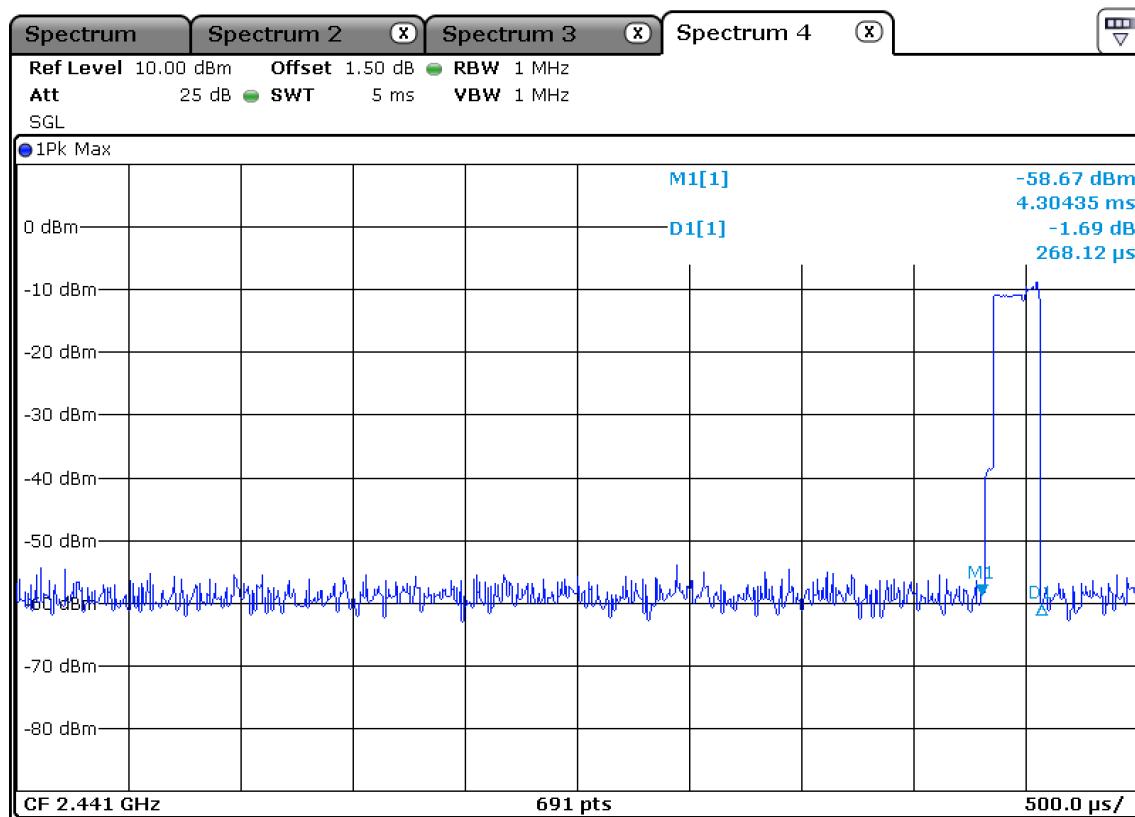
Measurement Setup

Same as the Chapter 3.3.1 (Figure 1)

DH1 at basic mode

DH3 at basic mode

DH5 at basic mode

DH5 at EDR mode with 3Mbps

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 20dB bandwidth of the emission being measured)

VBW = 3 MHz (VBW \geq RBW) Detector function = peak

Trace = max hold Sweep = auto

Measurement Data : Basic Mode

Frequency (MHz)	Ch.	Test Results		
		dBm	mW	Result
2402	0	-6.45	0.23	Complies
2441	39	-7.29	0.19	Complies
2480	78	-7.79	0.17	Complies

Measurement Data : EDR Mode

Frequency (MHz)	Ch.	Test Results		
		dBm	mW	Result
2402	0	-8.20	0.15	Complies
2441	39	-10.02	0.10	Complies
2480	78	-10.75	0.08	Complies

- See next pages for actual measured spectrum plots.

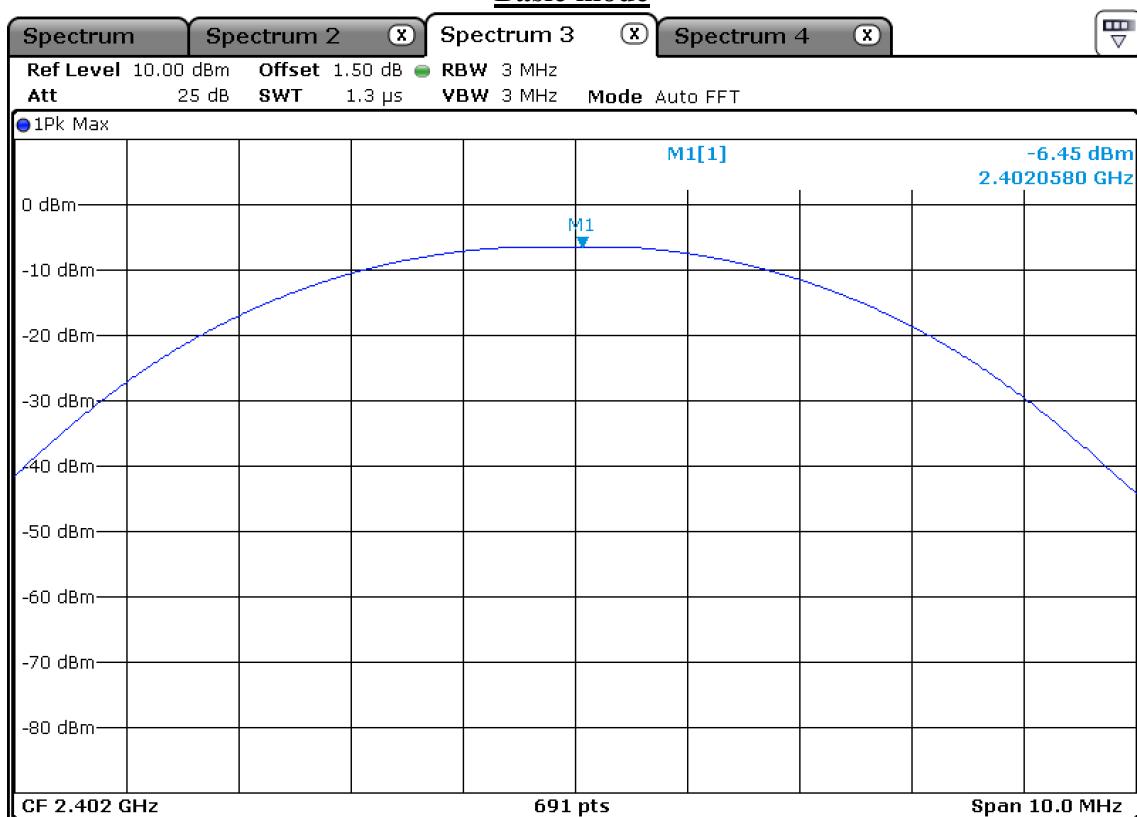
Minimum Standard:	For frequency hopping systems with at least 75 non-overlapping hopping channels: 1 watt. For all other frequency hopping systems: 0.125W.
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Measurement Setup

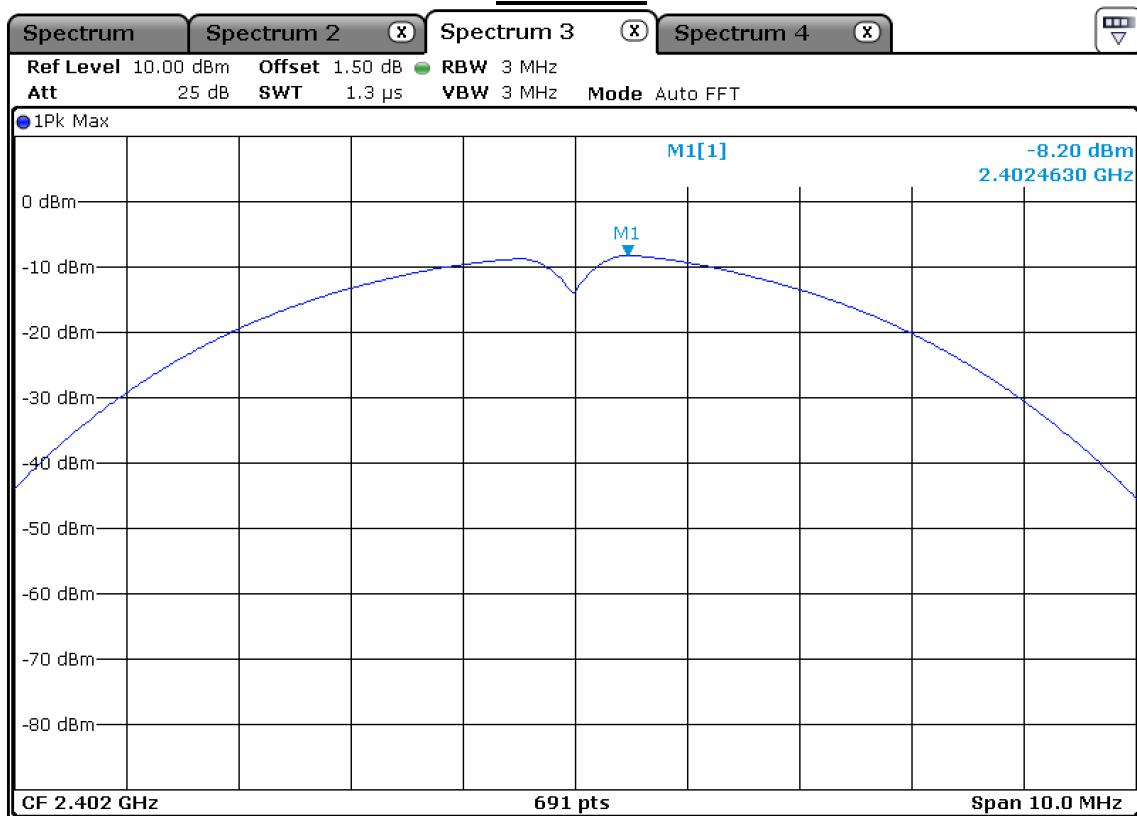
Same as the Chapter 3.3.1 (Figure 1)

Channel 1

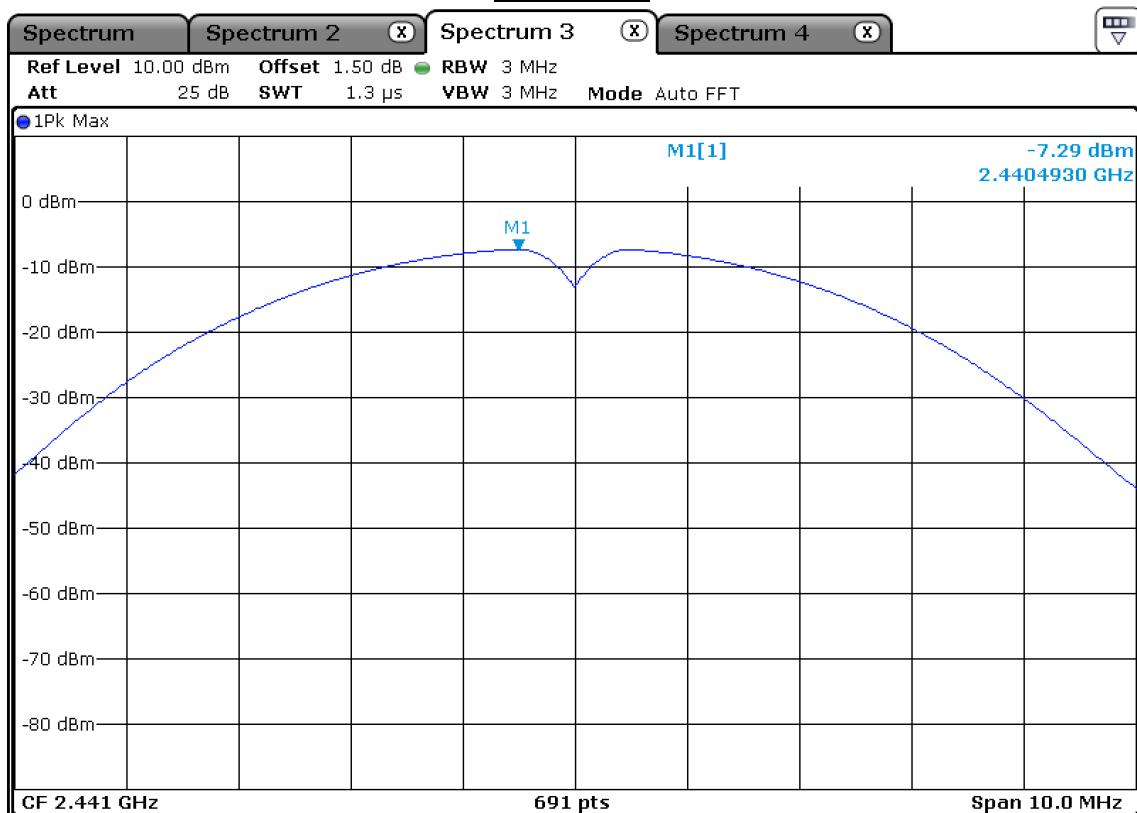
Basic mode



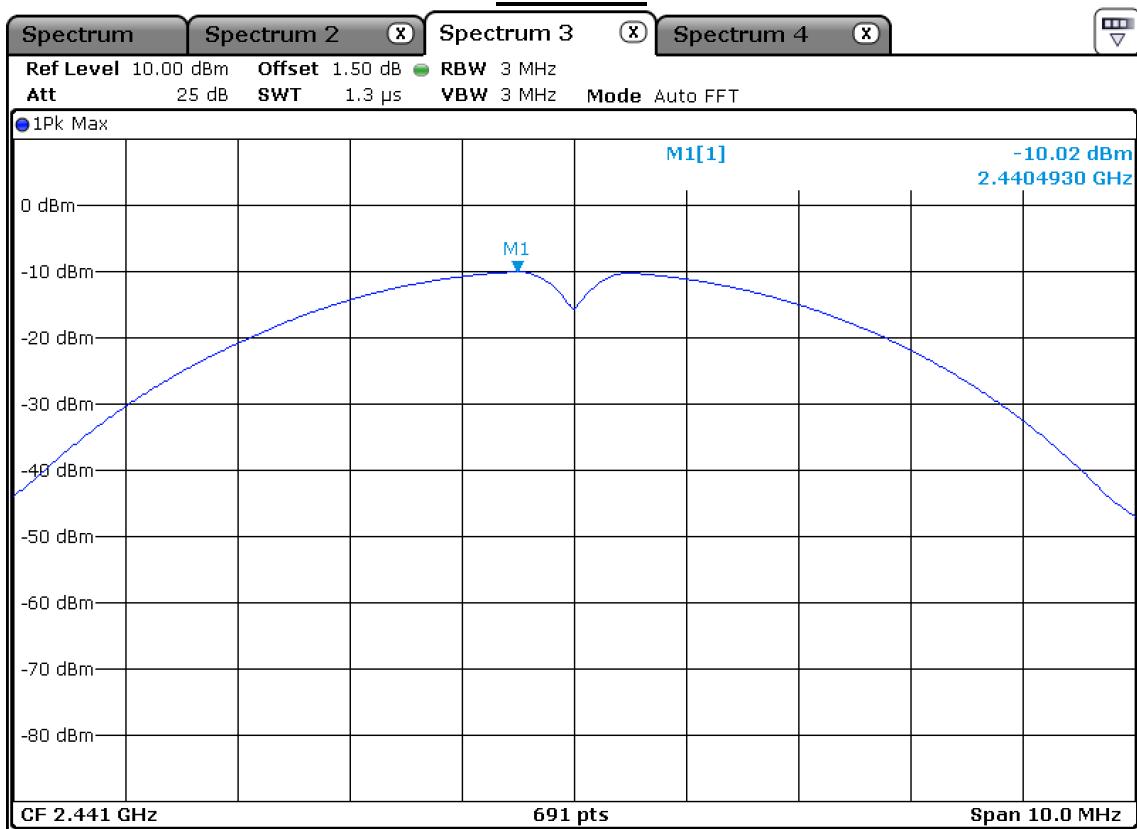
EDR mode



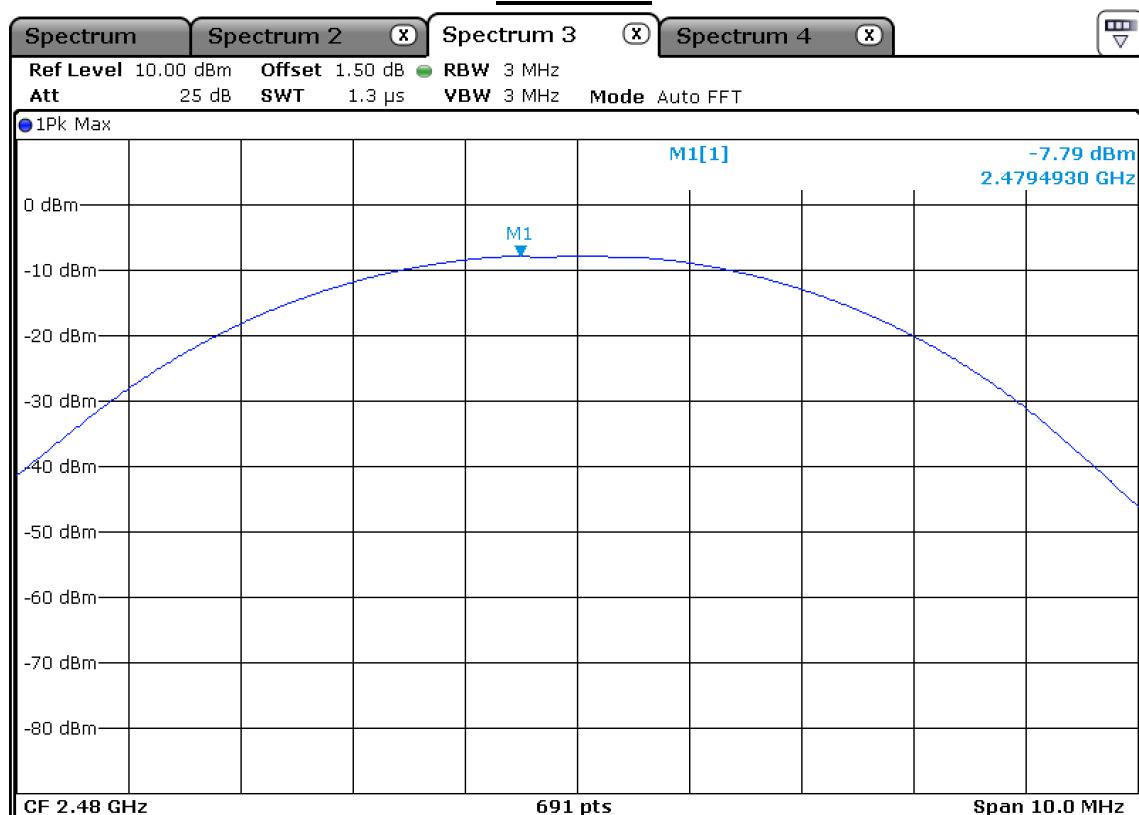
Channel 2
Basic mode



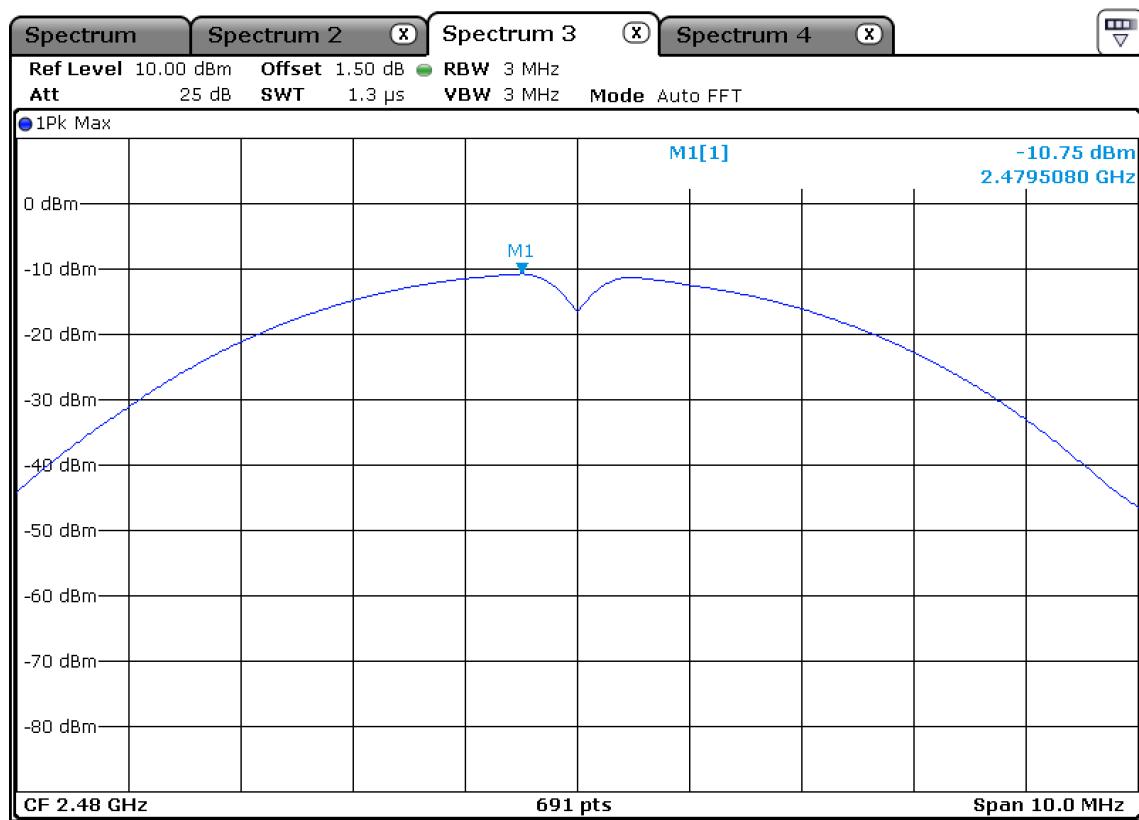
EDR mode



Channel 3
Basic mode



EDR mode



3.3.6 Band Edge

Procedure:

The bandwidth at 20dB 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

Span = 10~30 MHz Detector function = peak

Trace = max hold Sweep = auto

Measurement Data: Complies

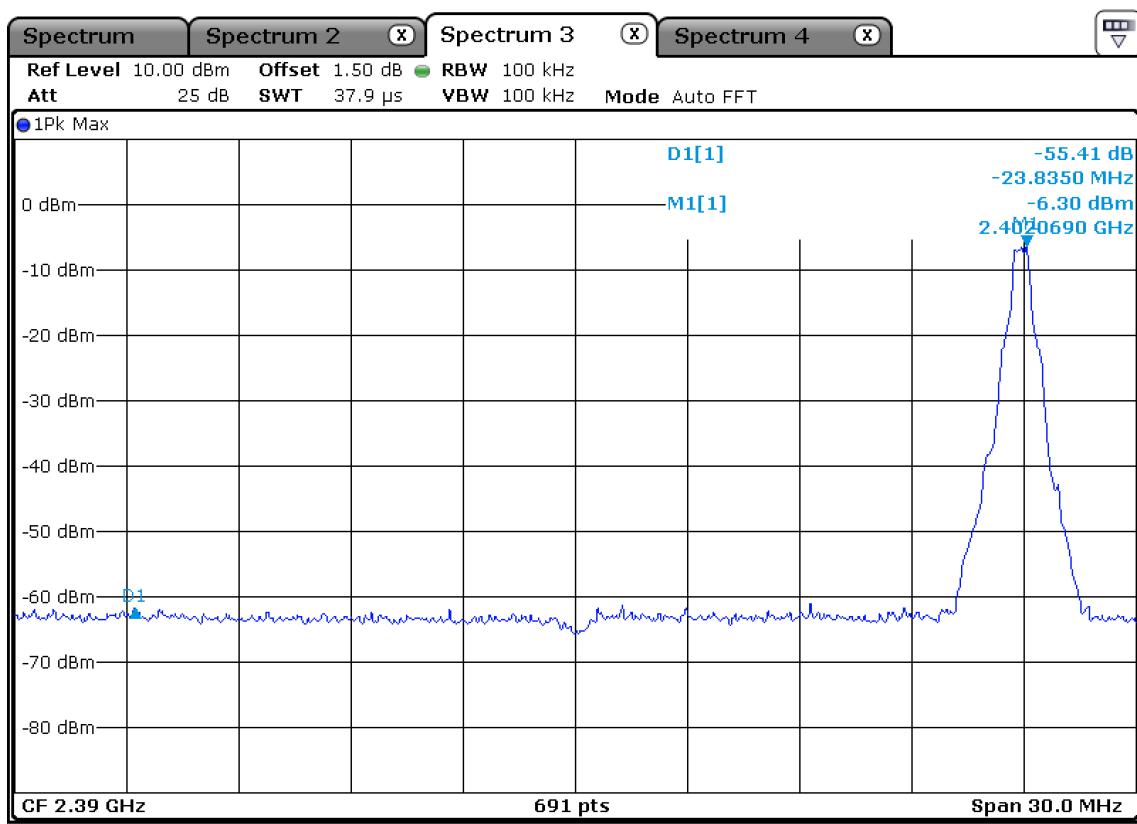
- All conducted emission in any 100kHz bandwidth outside of the spread spectrum band was at least 20dB lower than the highest inband spectral density. Therefore the applying equipment meets the requirement.
- See next pages for actual measured spectrum plots.

Minimum Standard:	> 20 dBc
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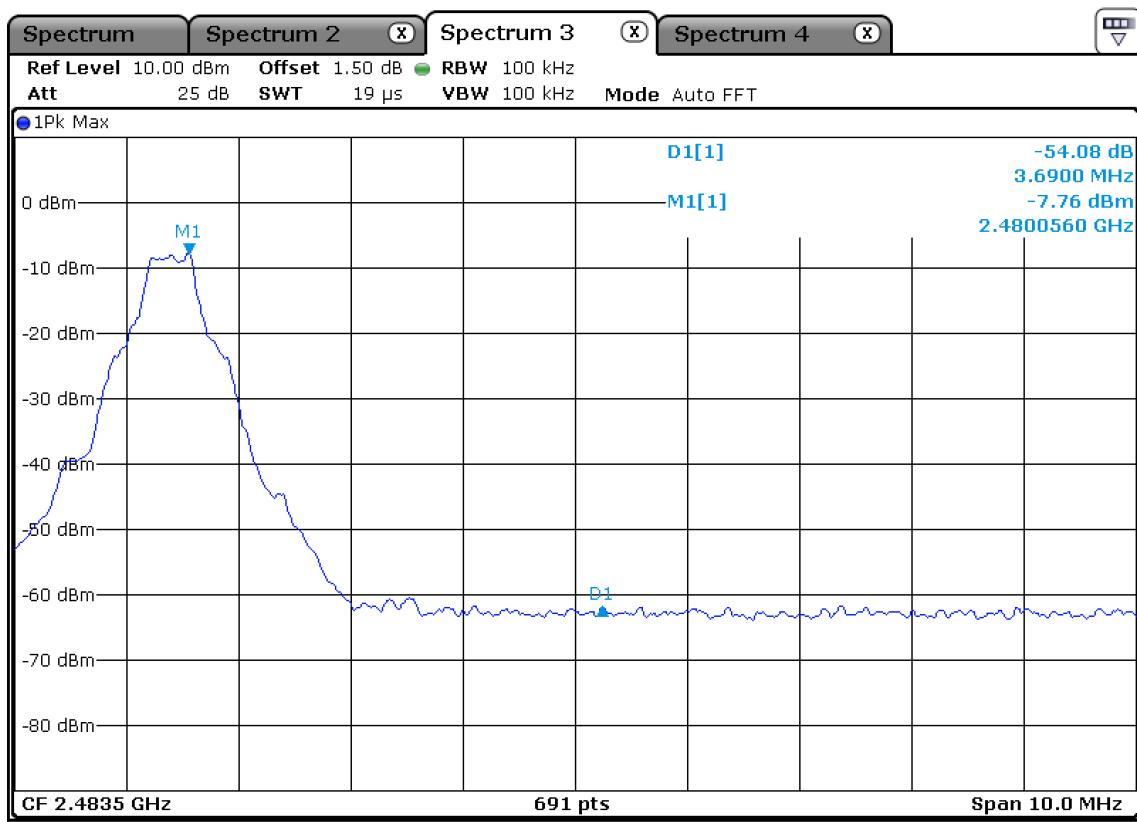
Measurement Setup

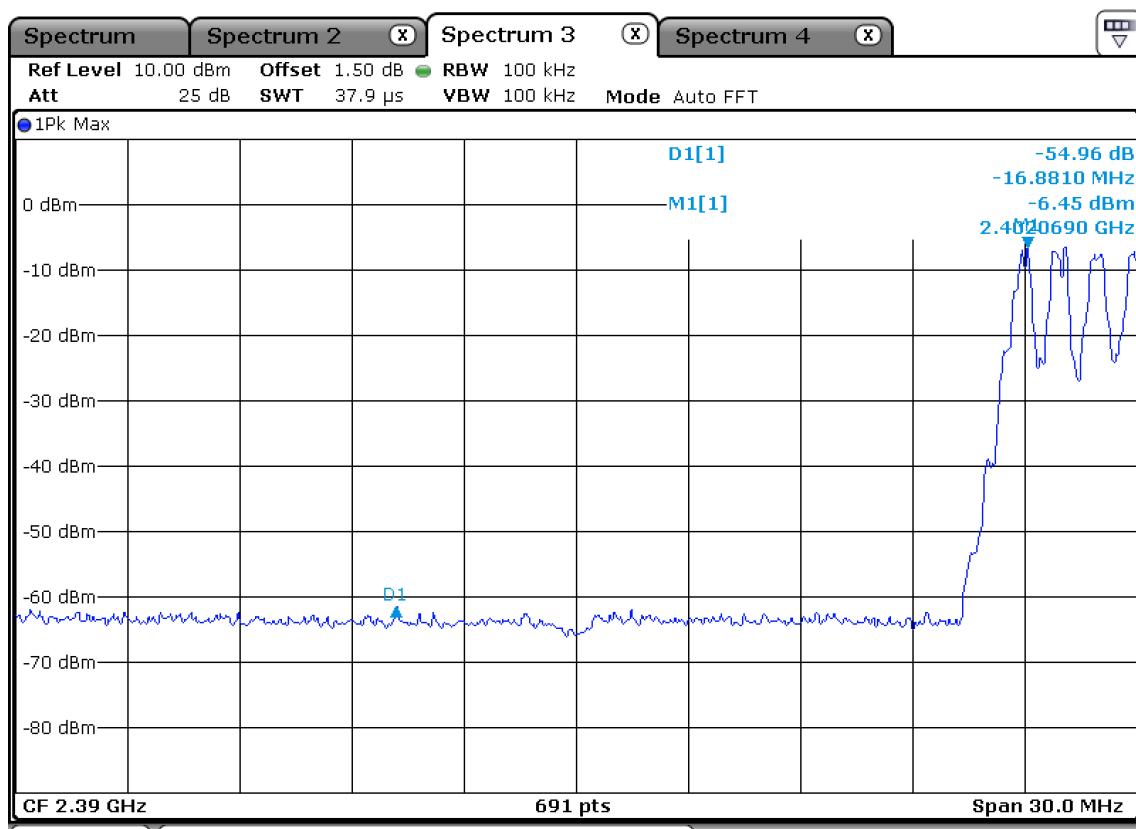
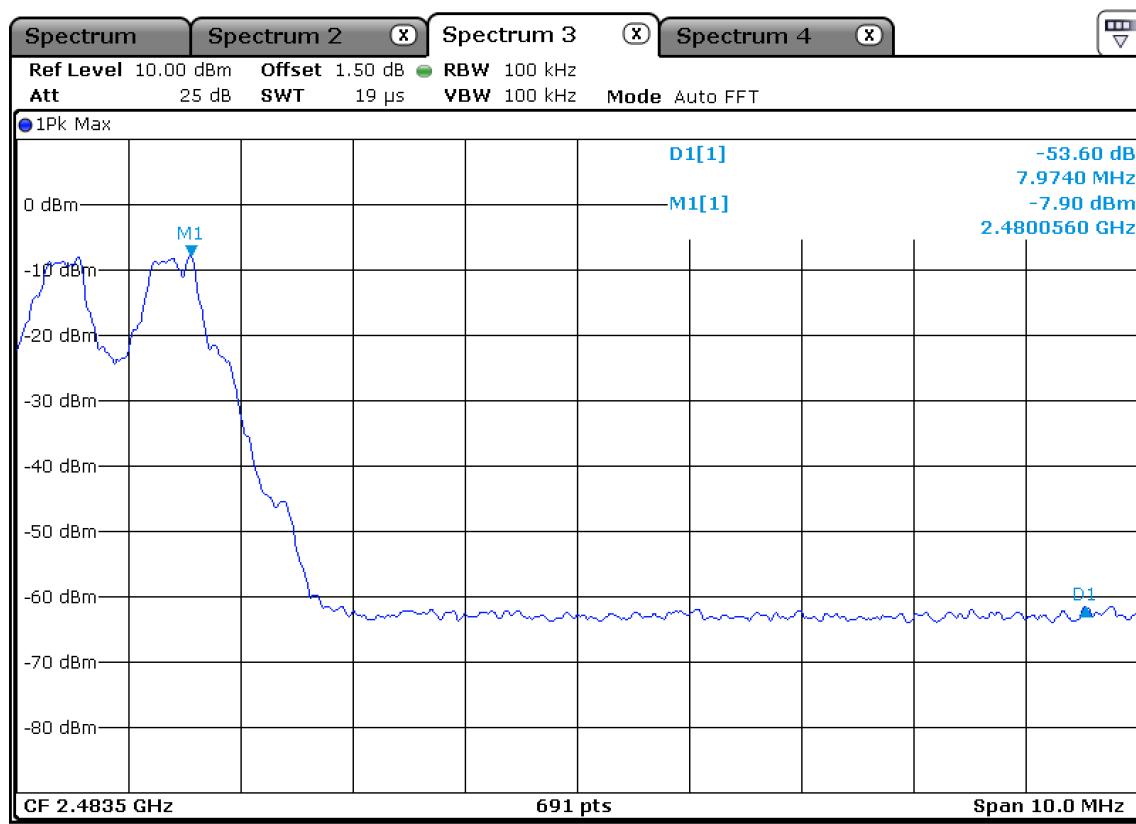
Same as the Chapter 3.3.1 (Figure 1)

Band Edge
Lower edge



Upper edge



Band Edge- HoppingLower edgeUpper edge

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

Frequency [MHz]	Reading [dBuV/m] AV / Peak	Pol.	Correction Factor		Limits [dBuV/m]		Result [dBuV/m] AV / Peak		Margin [dB] AV / Peak		
			Antenna	Amp. Gain+CableLoss	AV / Peak	AV / Peak	AV / Peak	AV / Peak	AV / Peak	AV / Peak	
2378.2	32.5	45.8	H	27.86	22.92	54.0	74.0	37.4	50.7	16.6	23.3

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

Frequency [MHz]	Reading [dBuV/m] AV / Peak	Pol.	Correction Factor		Limits [dBuV/m]		Result [dBuV/m] AV / Peak		Margin [dB] AV / Peak		
			Antenna	Amp. Gain+CableLoss	AV / Peak	AV / Peak	AV / Peak	AV / Peak	AV / Peak	AV / Peak	
2483.5	42.7	60.4	H	27.86	22.92	54.0	74.0	47.6	65.3	6.4	8.3

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

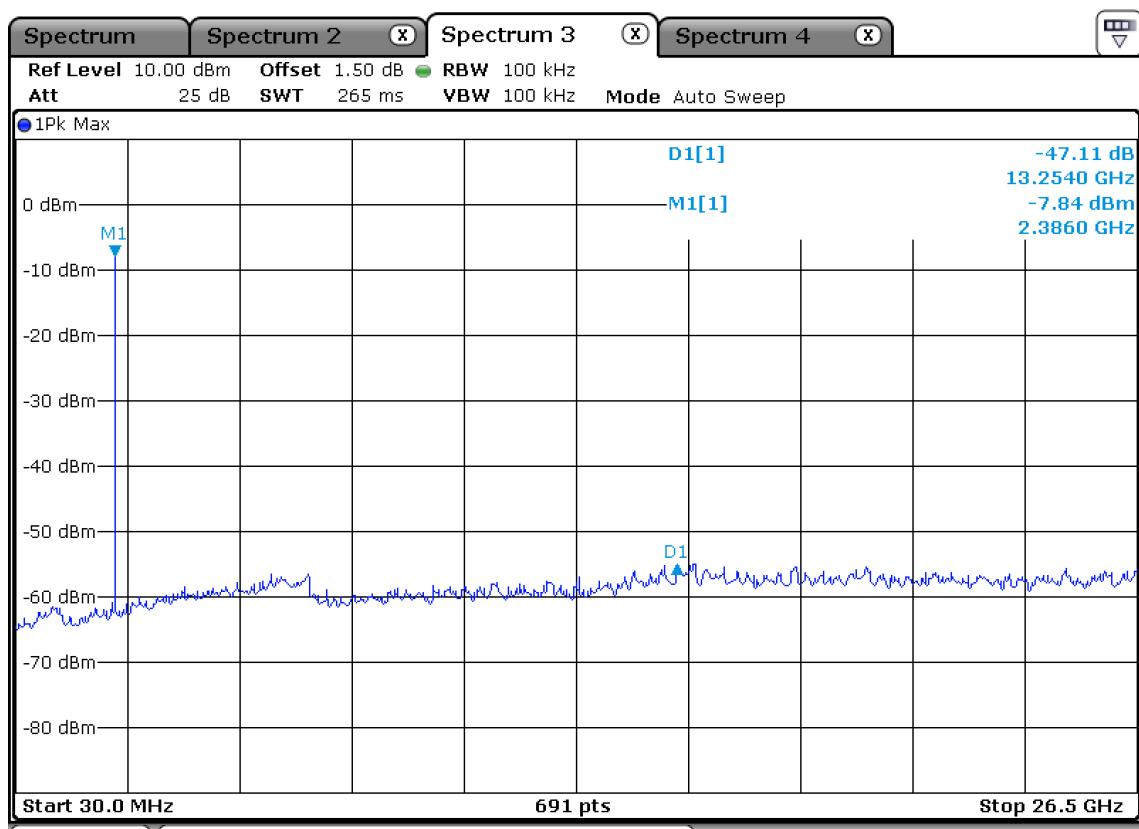
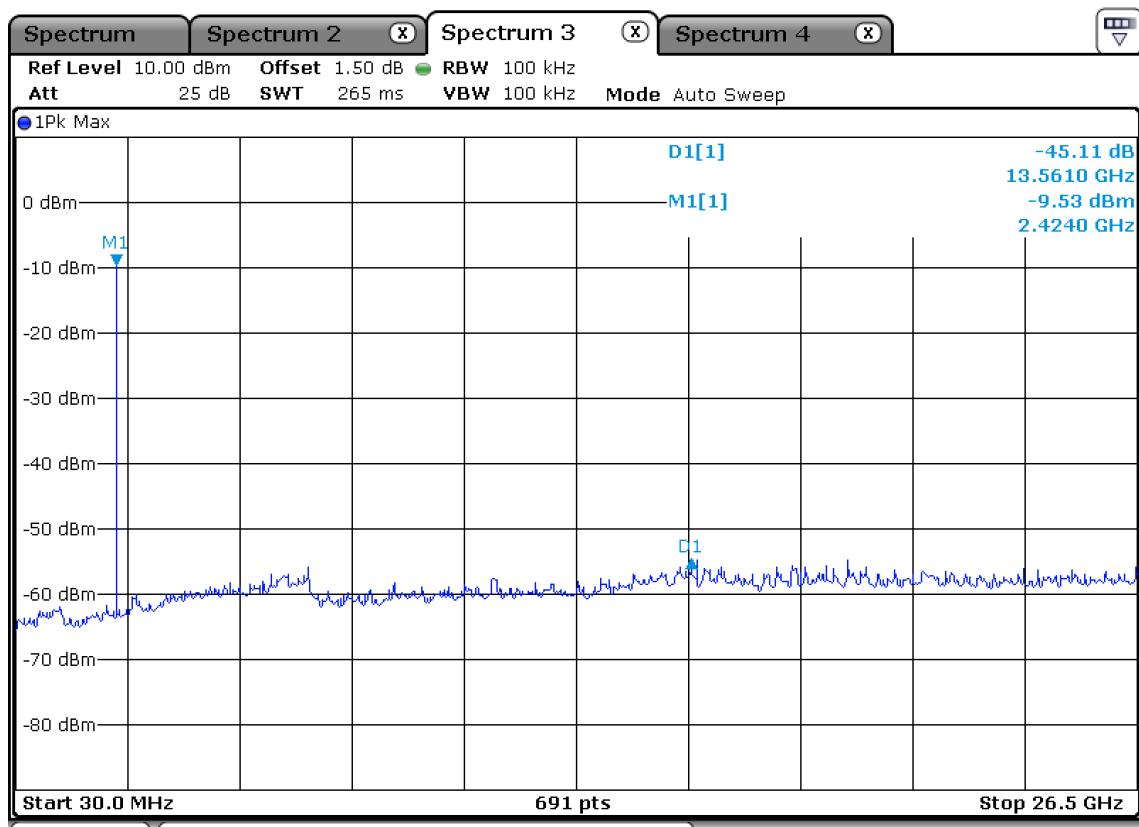
Measurement Data: **Complies**

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

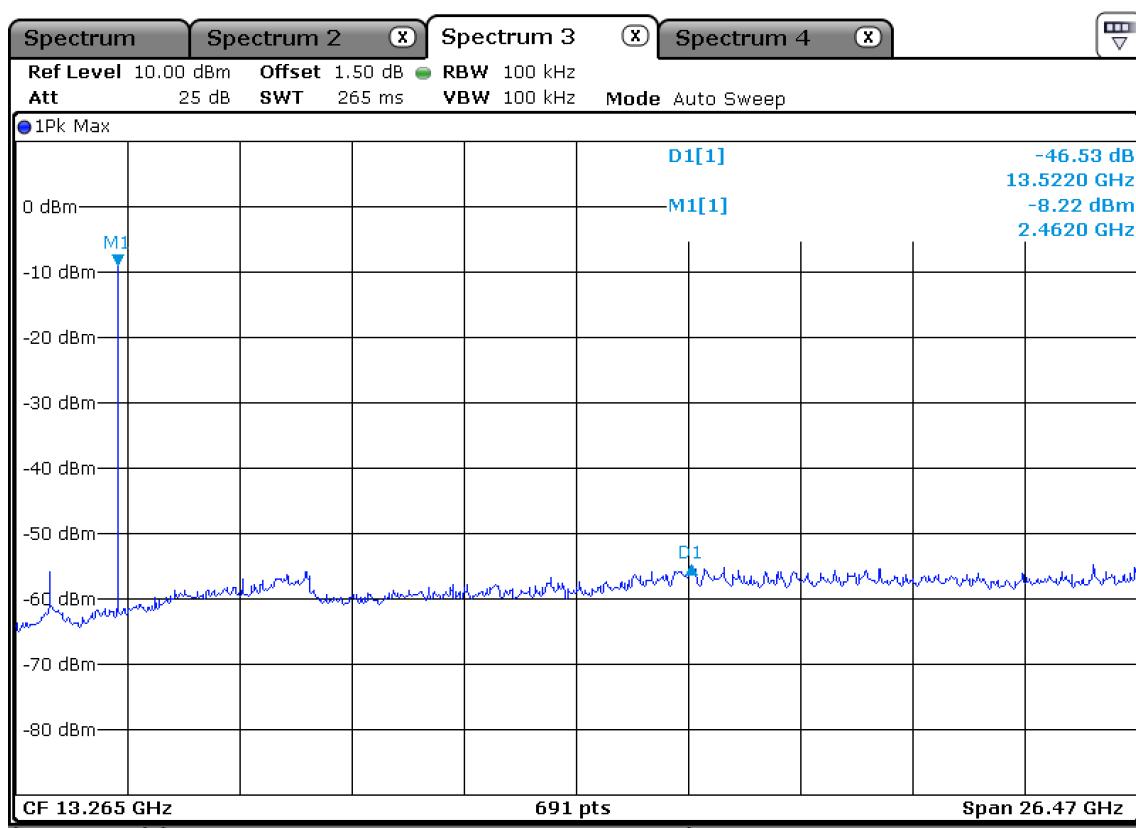
Minimum Standard:	> 20 dBc
--------------------------	----------

Measurement Setup

Same as the Chapter 3.3.1 (Figure 1)

Unwanted Emission – Low channelFrequency Range = 30 MHz ~ 26.5 GHzUnwanted Emission – Middle channelFrequency Range = 30 MHz ~ 26.5 GHz

Unwanted Emission – High channel
Frequency Range = 30 MHz ~ 26.5 GHz



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 0.8m 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 9kHz to 30 MHz, magnetic field is measured with Loop Test Antenna. The Test Antenna is positioned with its plane vertical at 3m 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 30MHz, Bi-Log Test Antenna (30MHz to 1GHz) and Horn Test Antenna (above 1GHz) are used. Test Antenna is 3m away from the EUT. Test Antenna height is carried from 1m 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 ~ 10th harmonic.

RBW = 120 kHz (30MHz ~ 1 GHz)

VBW \geq RBW

= 1 MHz (1 GHz ~ 10th harmonic)

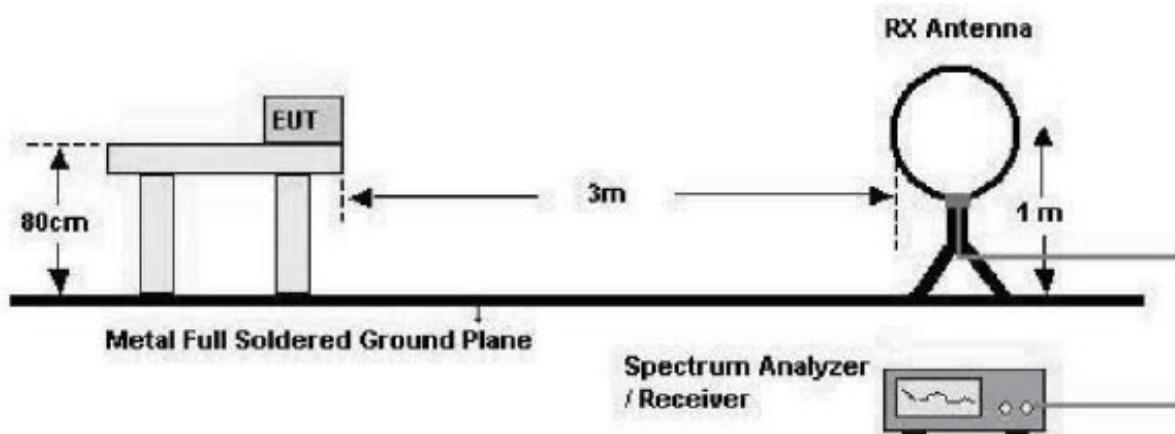
Span = 100 MHz

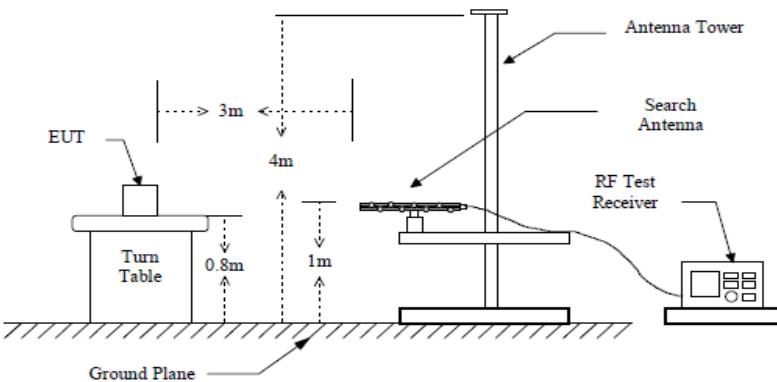
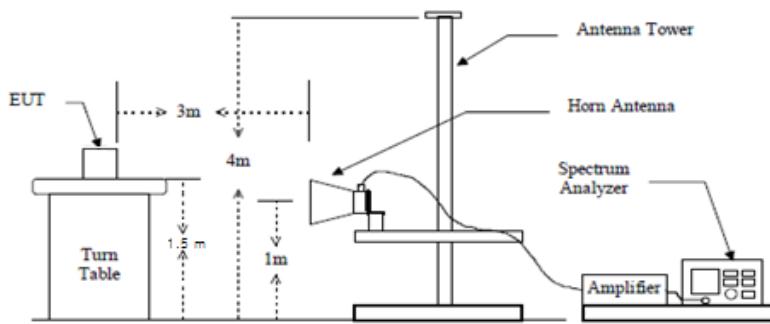
Detector function = peak

Trace = max hold

Sweep = auto

below 30MHz



below 1GHz (30MHz to 1GHz)**above 1GHz****Measurement Data: Complies**

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

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, 76-88MHz, 174-216MHz or 470-806MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g. 15.231 and 15.241.

Measurement Data :

Frequency [MHz]	Reading [dBuV/m]		Pol.	Correction Factor		D.C.F	Limits [dBuV/m]		Result [dBuV/m]		Margin [dB]	
				Antenna	Amp.Gain +Cable		AV/Peak	AV/Peak	AV/Peak	AV/Peak	AV/Peak	AV/Peak
4803.8	45.3	52.6	H	32.85	22.92	-51.21	54.0	74.0	3.99	10.29	50.01	62.71
-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-
No emissions were detected at a level greater than 20dB below limit.												
-	-	-	-	-	-	-	-	-	-	-	-	-
Frequency [MHz]	Reading [dBuV/m]		Pol.	Correction Factor		D.C.F	Limits [dBuV/m]		Result [dBuV/m]		Margin [dB]	
				Antenna	Amp.Gain +Cable		AV/Peak	AV/Peak	AV/Peak	AV/Peak	AV/Peak	AV/Peak
-	-	-	-	-	-	-	-	-	-	-	-	-
No emissions were detected at a level greater than 20dB below limit.												
-	-	-	-	-	-	-	-	-	-	-	-	-

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

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

$$= 20\log(0.275\text{ms}/100\text{ms}) = -51.21$$

Measurement Data: (9kHz - 30MHz)

Frequency [MHz]	Reading [dBuV/m]		Pol.	Correction Factor		D.C.F	Limits [dBuV/m]		Result [dBuV/m]		Margin [dB]	
				Antenna	Amp.Gain+Cable		AV/Peak	AV/Peak	AV/Peak	AV/Peak	AV/Peak	AV/Peak
-	-	-	-	-	-	-	-	-	-	-	-	-
No emissions were detected at a level greater than 20dB below limit.												
-	-	-	-	-	-	-	-	-	-	-	-	-

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

Radiated Emissions(Below 1 GHz) – Bluetooth(LOW) mode

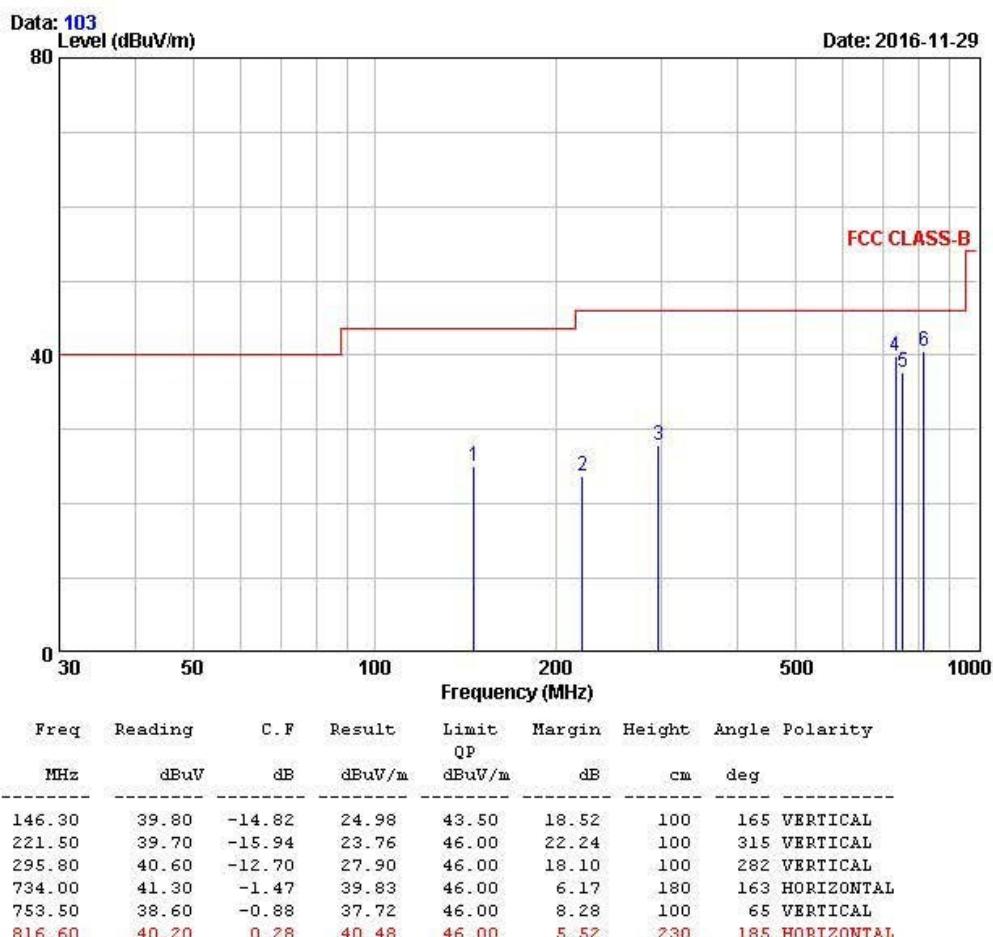
4, Songjuro236Beon-gil, Yangji-myeon,
Cheoin-gu, Youngin-si, Gyeonggi-do,
449-822 Korea
Tel :+82-31-3236008,9
Fax :+82-31-3236010

EUT/Model No.: ET30KH-BT

TEST MODE: Bluetooth(LOW) mode

Temp Humi : 13 / 36

Tested by: LEE S H



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

Bluetooth(MID) mode

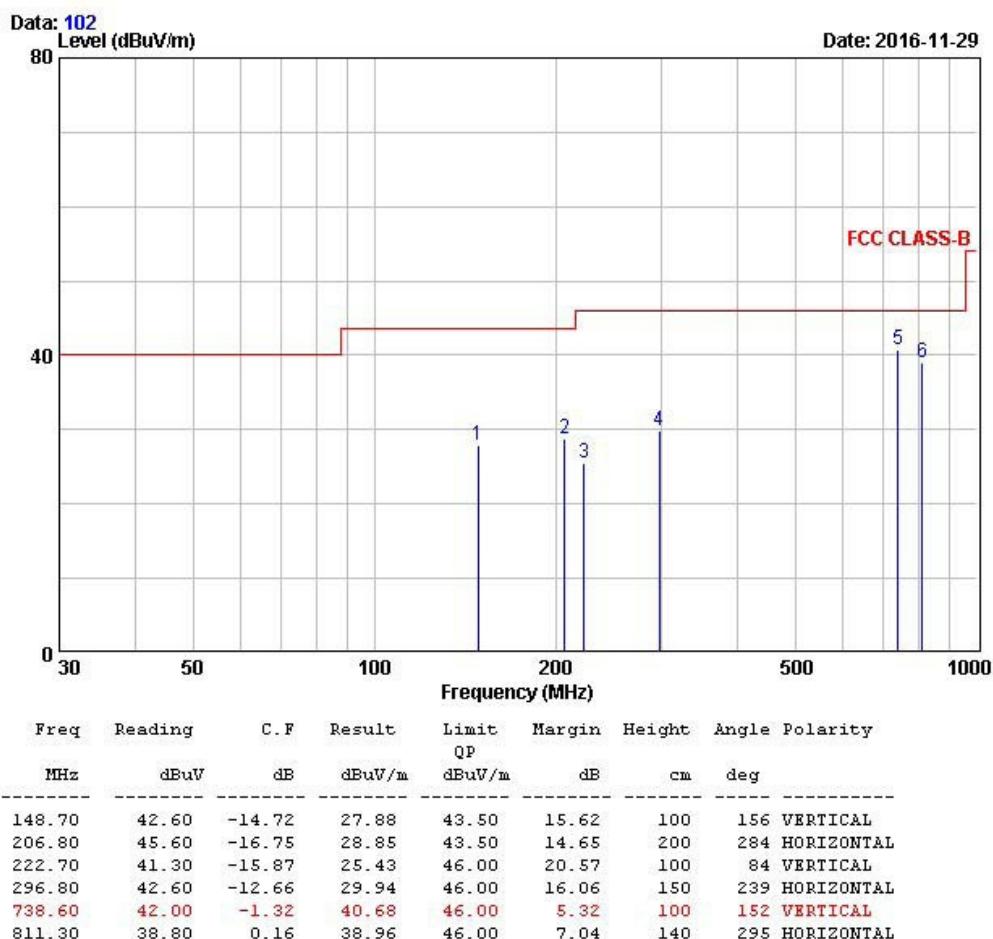
4, Songjuro236Beon-gil, Yangji-myeon,
Cheoin-gu, Youngin-si, Gyeonggi-do,
449-822 Korea
Tel :+82-31-3236008,9
Fax:+82-31-3236010

EUT/Model No.: ET30KH-BT

TEST MODE: Bluetooth(MID) mode

Temp Humi : 13 / 36

Tested by: LEE S H



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

Bluetooth(HIGH) mode

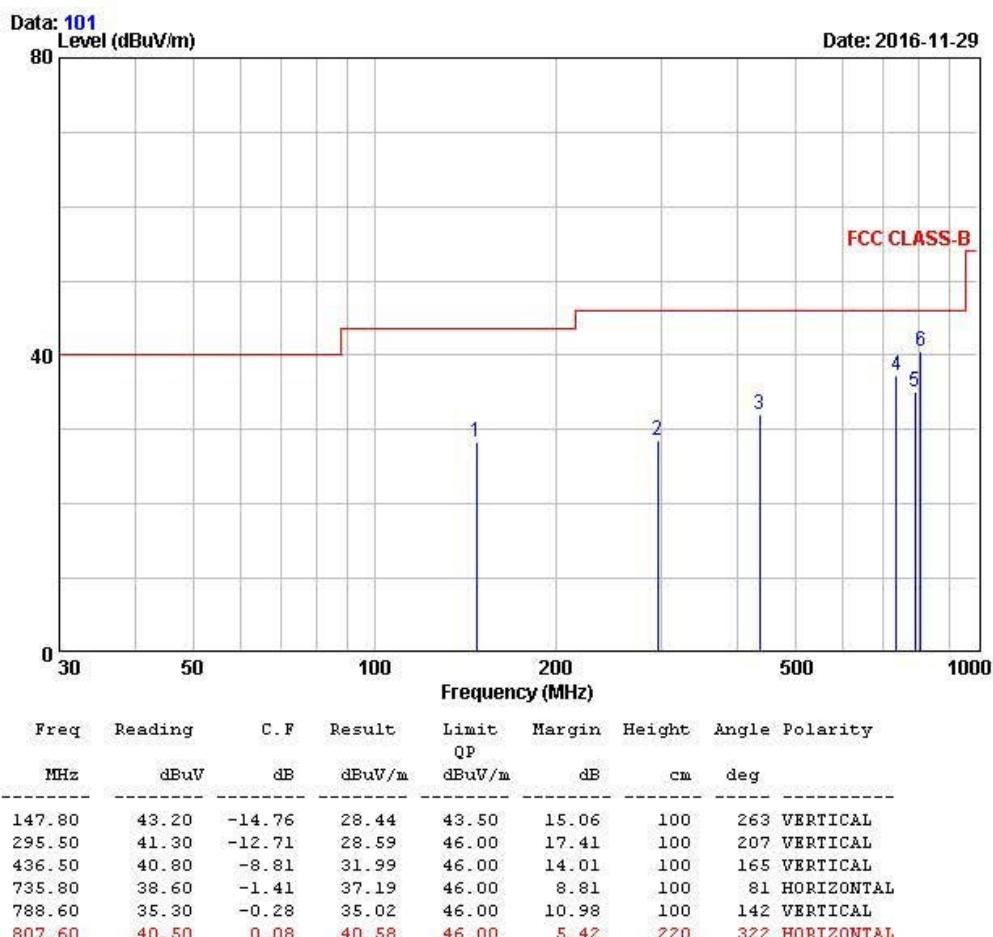
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Fax :+82-31-3236010

EUT/Model No.: ET30KH-BT

TEST MODE: Bluetooth(HIGH) mode

Temp Humi : 13 / 36

Tested by: LEE S H



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

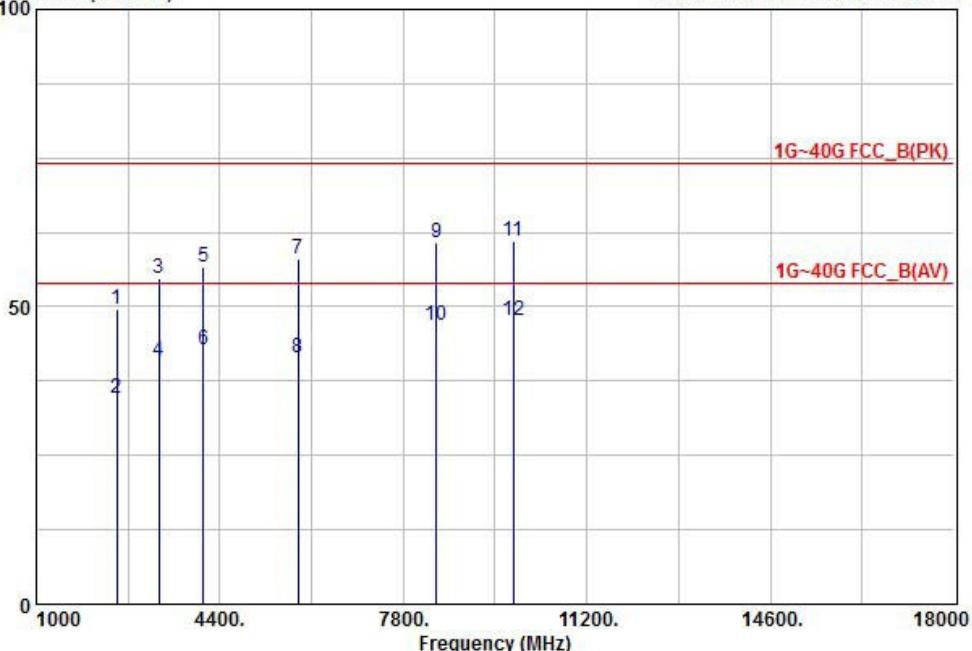
Radiated Emissions(Above 1 GHz) – Bluetooth(LOW) mode

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Fax:+82-31-3236010

EUT/Model No.: ET30KH-BT Test Mode: Bluetooth(Low) mode

Tested by : LEE S H Temp/Humi: 20 / 48

Data: 77 File: D:\LTA_e3\le3_backup\1GHz 이상\2016\CH1_ABOVE 1GHz_1611-1.EMI (99)
Level (dBuV/m) Date: 2016-11-28 Time: 18:56:20



Freq MHz	Reading dBuV	C.F dB	Result PK dBuV/m	Limit dBuV/m	Margin dB	Polarity
						HORIZONTAL
1 2486.60	46.10	3.50	49.60	74.00	24.40	HORIZONTAL
2 2486.60	31.20	3.50	34.70	54.00	19.30	HORIZONTAL
3 3267.20	44.90	9.79	54.69	74.00	19.31	HORIZONTAL
4 3267.20	31.20	9.79	40.99	54.00	13.01	HORIZONTAL
5 4088.60	42.10	14.58	56.68	74.00	17.32	HORIZONTAL
6 4088.60	28.30	14.58	42.88	54.00	11.12	HORIZONTAL
7 5843.50	35.80	22.28	58.08	74.00	15.92	VERTICAL
8 5843.50	19.20	22.28	41.48	54.00	12.52	VERTICAL
9 8415.60	32.30	28.33	60.63	74.00	13.37	HORIZONTAL
10 8415.60	18.60	28.33	46.93	54.00	7.07	HORIZONTAL
11 9844.20	31.60	29.55	61.15	74.00	12.85	HORIZONTAL
12 9844.20	18.20	29.55	47.75	54.00	6.25	HORIZONTAL

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



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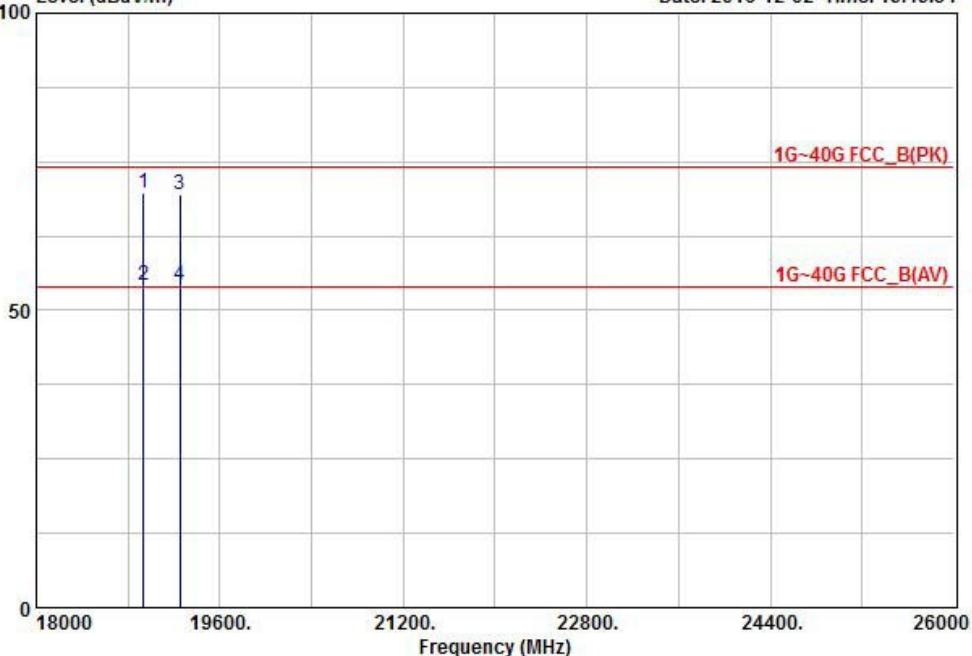
EUT/Model No.: ET30KH-BT

Test Mode: Bluetooth (LOW) mode

Tested by : LEE S H

Temp/Humi: 20 / 48

Data: 102 File: D:\LTA_e3\le3_backup\1GHz 이상\2016\CH1_ABOVE 1GHz_1611-1.EMI (102)
Level (dBuV/m) Date: 2016-12-02 Time: 19:49:34



Freq MHz	Reading dBuV	C.F dB	Result PK dBuV/m	Limit dBuV/m	Margin dB	Polarity
						Polarity
118935.50	21.10	48.70	69.80	74.00	4.20	VERTICAL
218935.50	5.60	48.70	54.30	74.00	19.70	VERTICAL
319255.60	20.30	49.15	69.45	74.00	4.55	VERTICAL
419255.60	5.10	49.15	54.25	74.00	19.75	VERTICAL

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

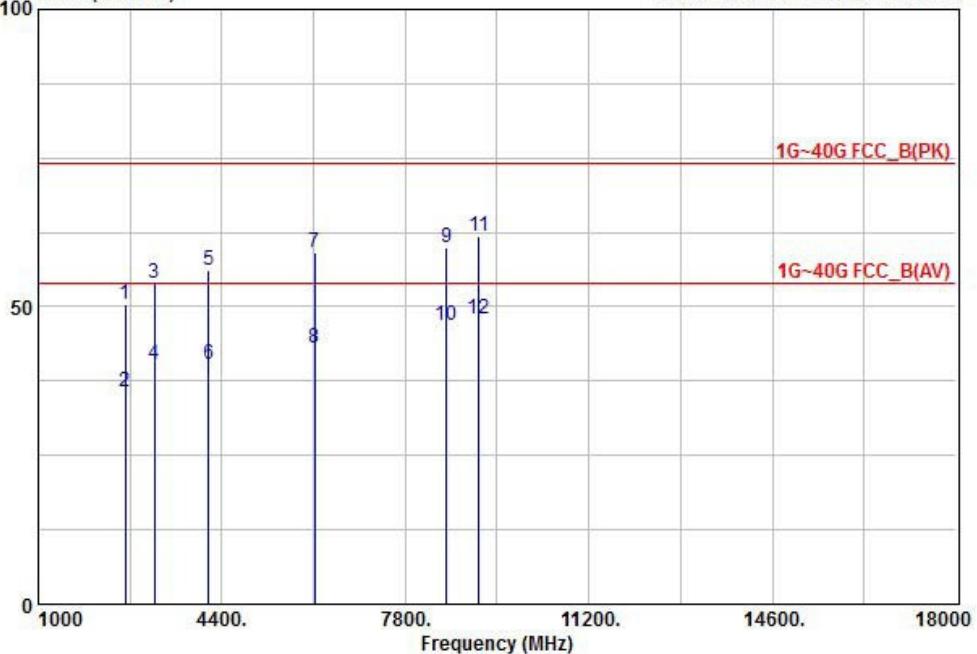
Bluetooth(MID) mode

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Fax:+82-31-3236010

EUT/Model No.: ET30KH-BT Test Mode: Bluetooth(MID) mode

Tested by : LEE S H Temp/Humi: 20 / 48

Data: 76 File: D:\LTA_e3\le3_backup\1GHz 이상\2016\CH1_ABOVE 1GHz_1611-1.EMI (99)
Level (dBuV/m) Date: 2016-11-28 Time: 18:56:20



Freq MHz	Reading dBuV	C.F dB	Result PK dBuV/m	Limit	Margin dB	Polarity
				dBuV/m		
1 2612.80	45.90	4.52	50.42	74.00	23.58	HORIZONTAL
2 2612.80	31.10	4.52	35.62	54.00	18.38	HORIZONTAL
3 3156.30	44.80	9.04	53.84	74.00	20.16	HORIZONTAL
4 3156.30	31.20	9.04	40.24	54.00	13.76	HORIZONTAL
5 4154.30	41.10	14.99	56.09	74.00	17.91	HORIZONTAL
6 4154.30	25.40	14.99	40.39	54.00	13.61	HORIZONTAL
7 6124.20	35.80	23.30	59.10	74.00	14.90	VERTICAL
8 6124.20	19.80	23.30	43.10	54.00	10.90	VERTICAL
9 8563.20	31.50	28.34	59.84	74.00	14.16	HORIZONTAL
10 8563.20	18.60	28.34	46.94	54.00	7.06	HORIZONTAL
11 9157.40	33.80	28.19	61.99	74.00	12.01	HORIZONTAL
12 9157.40	19.90	28.19	48.09	54.00	5.91	HORIZONTAL

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



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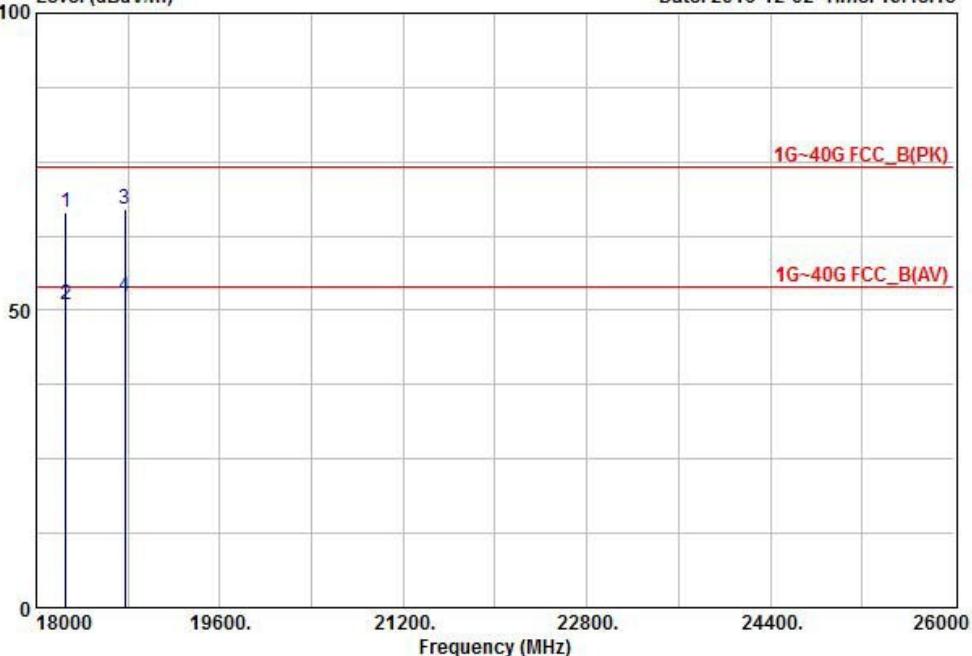
EUT/Model No.: ET30KH-BT

Test Mode: Bluetooth (MID) mode

Tested by : LEE S H

Temp/Humi: 20 / 48

Data: 101 File: D:\LTA_e3\le3_backup\1GHz 이상\2016\CH1_ABOVE 1GHz_1611-1.EMI (101)
Level (dBuV/m) Date: 2016-12-02 Time: 19:48:13



Freq MHz	Reading dBuV	C.F dB	Result PK	Limit dBuV/m	Margin dB	Polarity
			dBuV/m			
118260.00	21.30	45.10	66.40	74.00	7.60	VERTICAL
218260.00	5.80	45.10	50.90	74.00	23.10	VERTICAL
318773.50	19.80	47.23	67.03	74.00	6.97	HORIZONTAL
418773.50	5.10	47.23	52.33	74.00	21.67	HORIZONTAL

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

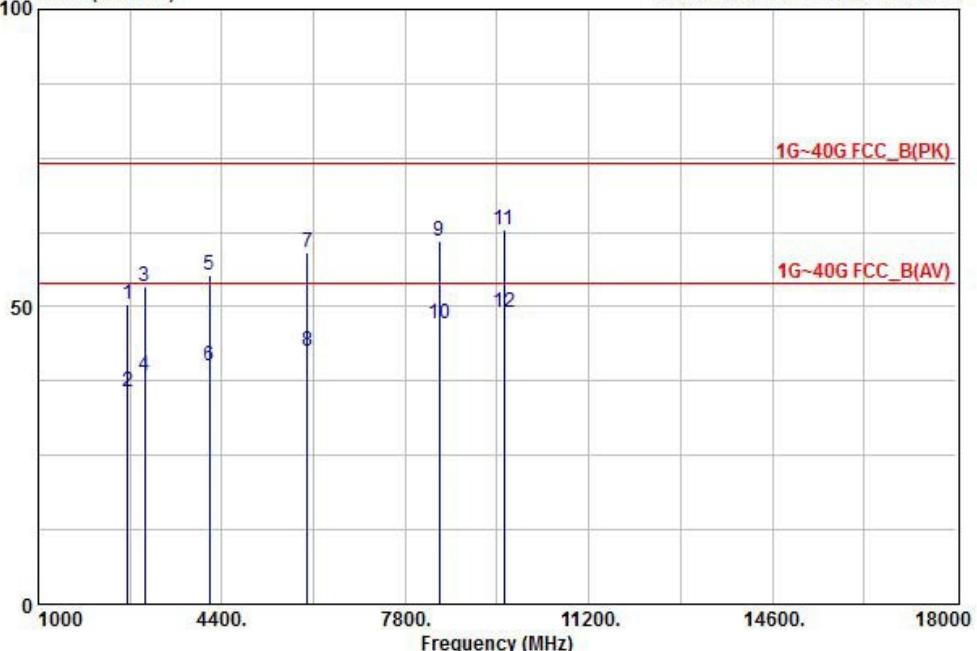
Bluetooth(HIGH) mode

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EUT/Model No.: ET30KH-BT Test Mode: Bluetooth(High) mode

Tested by : LEE S H Temp/Humi: 20 / 48

Data: 75 File: D:\LTA_e3\le3_backup\1GHz 이상\2016\CH1_ABOVE 1GHz_1611-1.EMI (99)
Level (dBuV/m) Date: 2016-11-28 Time: 18:56:20



Freq MHz	Reading dBuV	C.F dB	Result PK dBuV/m	Limit dBuV/m	Margin dB	Polarity
						HORIZONTAL
1 2654.30	45.60	4.89	50.49	74.00	23.51	HORIZONTAL
2 2654.30	30.80	4.89	35.69	54.00	18.31	HORIZONTAL
3 2965.60	45.60	7.68	53.28	74.00	20.72	HORIZONTAL
4 2965.60	30.80	7.68	38.48	54.00	15.52	HORIZONTAL
5 4165.30	40.30	15.06	55.36	74.00	18.64	HORIZONTAL
6 4165.30	25.10	15.06	40.16	54.00	13.84	HORIZONTAL
7 5984.60	36.10	23.01	59.11	74.00	14.89	VERTICAL
8 5984.60	19.60	23.01	42.61	54.00	11.39	VERTICAL
9 8433.50	32.60	28.35	60.95	74.00	13.05	HORIZONTAL
10 8433.50	18.90	28.35	47.25	54.00	6.75	HORIZONTAL
11 9633.50	33.50	29.33	62.83	74.00	11.17	HORIZONTAL
12 9633.50	19.60	29.33	48.93	54.00	5.07	HORIZONTAL

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



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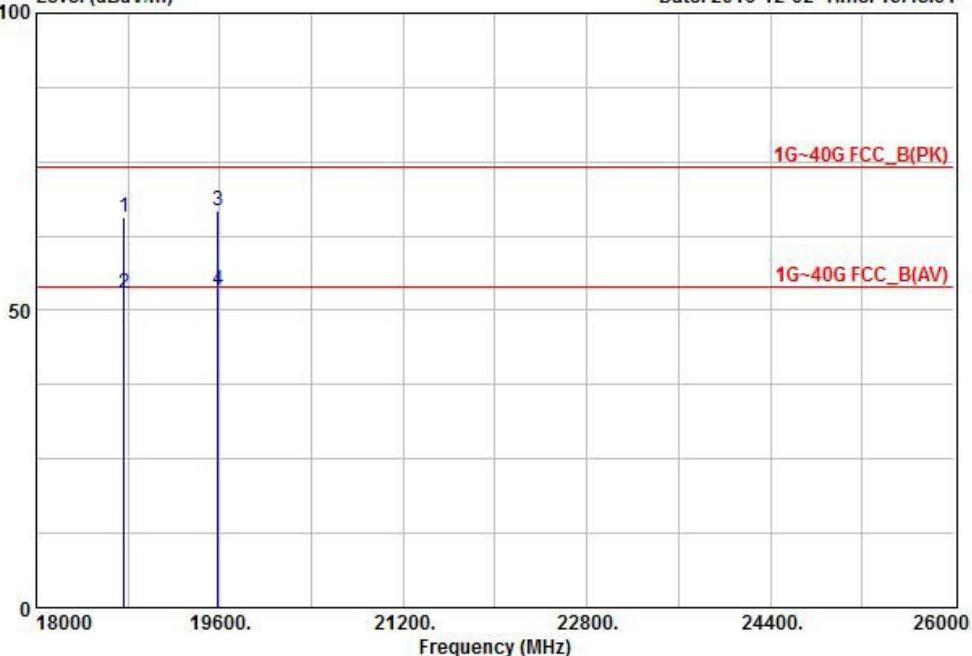
EUT/Model No.: ET30KH-BT

Test Mode: Bluetooth (HIGH) mode

Tested by : LEE S H

Temp/Humi: 20 / 48

Data: 100 File: D:\LTA_e3\le3_backup\1GHz 이상\2016\CH1_ABOVE 1GHz_1611-1.EMI (100)
Level (dBuV/m) Date: 2016-12-02 Time: 19:45:01



Freq MHz	Reading dBuV	C.F dB	Result PK	Limit dBuV/m	Margin dB	Polarity
			dBuV/m			
118763.50	18.60	47.14	65.74	74.00	8.26	VERTICAL
218763.50	5.60	47.14	52.74	74.00	21.26	VERTICAL
319583.30	17.90	48.86	66.76	74.00	7.24	VERTICAL
419583.30	4.50	48.86	53.36	74.00	20.64	VERTICAL

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

3.3.9 AC Conducted Emissions

Procedure:

AC power line conducted emissions from the EUT were measured according to the dictates of ANSI C63.4:2014. 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: **Complies**

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

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

Frequency Range (MHz)	Conducted Limit (dB μ V)	
	Quasi-Peak	Average
0.15 ~ 0.5	66 to 56 *	56 to 46 *
0.5 ~ 5	56	46
5 ~ 30	60	50

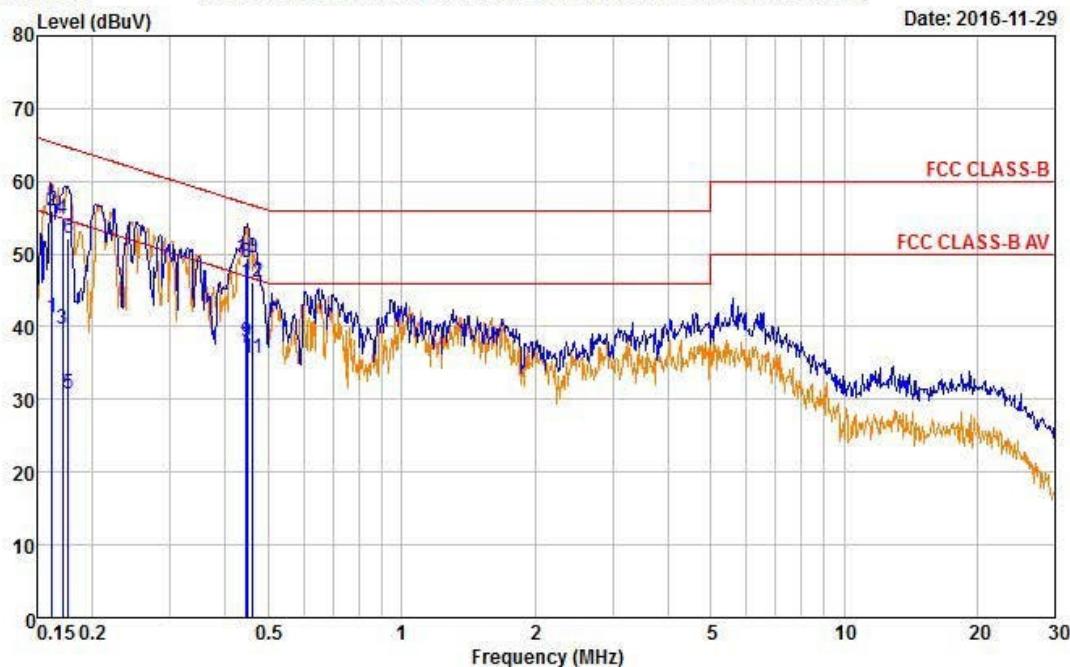
* Note: The limits will decrease with the frequency logarithmically within 0.15 MHz to 0.5 MHz

Conducted Emissions - Bluetooth(LOW) mode + LINE

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Tel:+82-31-3236008,9
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EUT / Model No. : ET30KH-BT Phase : LINE
 Test Mode : Bluetooth(LOW) mode Test Power : 120 / 60
 Temp. / Humi. : 20 / 37 Test Engineer : LEE S H

Data: 1996 File: D:\Conducted Data\2015\2016\LTA_Conduction_2016_11.EM6 (2004)



Freq MHz	RD QP		RD AV		C.F dB	Result QP dBuV	Result AV dBuV	Limit QP dBuV		Limit AV dBuV		Margin QP dB	Margin AV dB
	dBuV	dBuV	dBuV	dBuV				dBuV	dBuV	dBuV	dBuV		
0.162	36.48	21.72	19.47	55.95	41.19	65.35	55.35	9.40	14.16	46.94	46.94	7.41	9.00
0.171	35.31	20.26	19.48	54.79	39.74	64.90	54.90	10.11	15.16	46.94	46.94	7.41	9.00
0.177	32.68	11.20	19.48	52.16	30.68	64.64	54.64	12.48	23.96	46.94	46.94	7.41	9.00
0.446	29.27	17.67	19.56	48.83	37.23	56.94	46.94	8.11	9.71	46.94	46.94	7.41	9.00
0.447	29.97	18.38	19.56	49.53	37.94	56.94	46.94	7.41	9.00	46.94	46.94	7.41	9.00
0.462	26.64	16.00	19.58	46.22	35.58	56.66	46.66	10.44	11.08	46.66	46.66	7.41	9.00

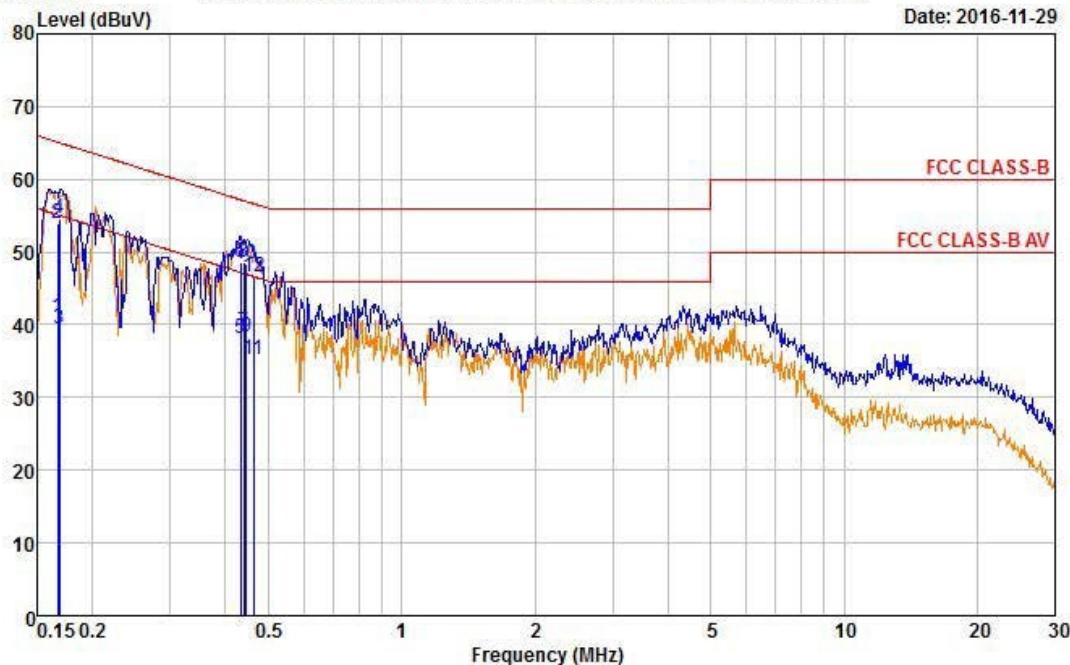
Remarks: C.F (Correction Factor) = Insertion loss + Cable loss + Pulse Limiter

Conducted Emissions - Bluetooth(LOW) mode + NEUTRAL

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Tel:+82-31-3236008,9
Fax:+82-31-3236010

EUT / Model No. : ET30KH-BT Phase : NEUTRAL
Test Mode : Bluetooth(LOW) mode Test Power : 120 / 60
Temp. / Humi. : 20 / 37 Test Engineer : LEE S H

Data: 2000 File: D:\Conducted Data\2015\2016\LTAConduction_2016_11.EM6 (2004)



Freq MHz	RD QP		RD AV		C.F dB	Result QP dBuV	Result AV dBuV	Limit QP dBuV	Limit AV dBuV	Margin QP dB	Margin AV dB
	dBuV	dBuV	dBuV	dBuV							
0.167	34.45	21.57	19.48	53.93	19.48	53.93	41.05	65.12	55.12	11.19	14.07
0.169	35.05	19.90	19.48	54.53	19.48	54.53	39.38	65.03	55.03	10.50	15.65
0.432	28.93	18.64	19.55	48.48	19.55	48.48	38.19	57.22	47.22	8.74	9.03
0.439	29.09	19.41	19.56	48.65	19.56	48.65	38.97	57.07	47.07	8.42	8.10
0.446	28.80	18.73	19.56	48.36	19.56	48.36	38.29	56.95	46.95	8.59	8.66
0.463	26.93	15.67	19.57	46.50	19.57	46.50	35.24	56.64	46.64	10.14	11.40

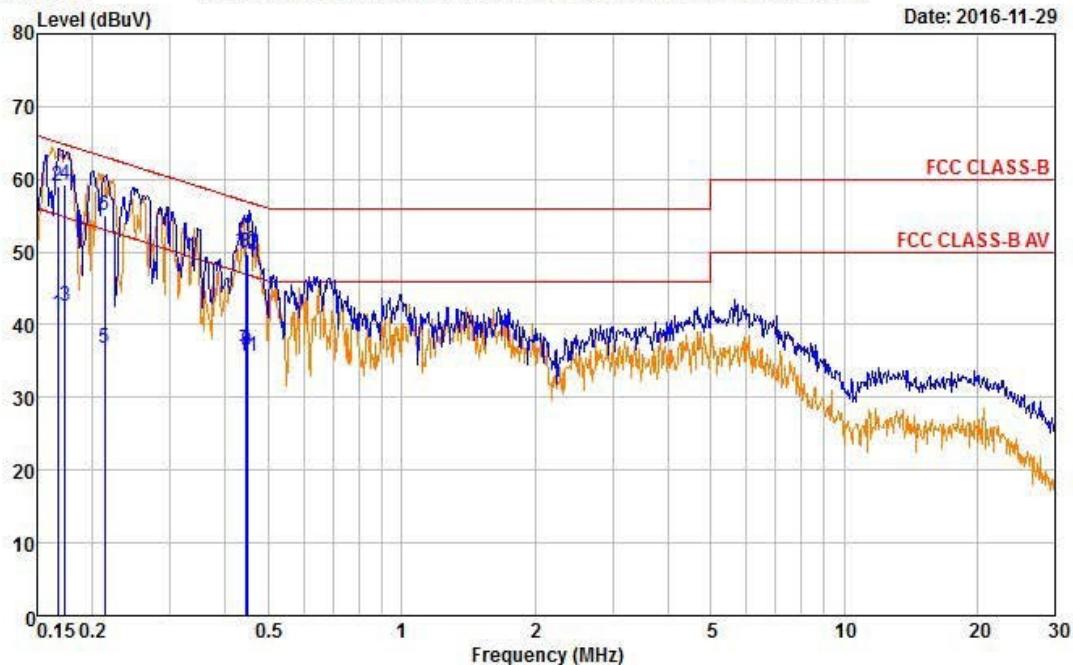
Remarks: C.F (Correction Factor) = Insertion loss + Cable loss + Pulse Limiter

Conducted Emissions - Bluetooth(MID) mode + LINE

4, Songjuro 236 Beon-gil, Yangji-myeon
Cheoin-gu, Youngin-si, Gyeonggi-do
449-822 Korea
Tel:+82-31-3236008,9
Fax:+82-31-3236010

EUT / Model No. : ET30KH-BT Phase : LINE
 Test Mode : Bluetooth(MID) mode Test Power : 120 / 60
 Temp. / Humi. : 20 / 37 Test Engineer : LEE S H

Data: 1988 File: D:\Conducted Data\2015\2016\LTA_Conduction_2016_11.EM6 (2004)



Freq MHz	RD QP		RD AV		C.F dB	Result QP dBuV	Result AV dBuV	Limit QP dBuV		Limit AV dBuV		Margin QP dB	Margin AV dB
	dBuV	dBuV	dBuV	dBuV				dBuV	dBuV	dBuV	dBuV		
0.167	39.58	21.96	19.48	59.06	41.44	65.12	55.12	6.06	13.68				
0.173	39.76	23.03	19.48	59.24	42.51	64.81	54.81	5.57	12.30				
0.213	35.44	17.33	19.50	54.94	36.83	63.09	53.09	8.15	16.26				
0.444	30.29	16.94	19.56	49.85	36.50	56.98	46.98	7.13	10.48				
0.446	30.60	16.70	19.56	50.16	36.26	56.95	46.95	6.79	10.69				
0.450	30.07	16.00	19.57	49.64	35.57	56.88	46.88	7.24	11.31				

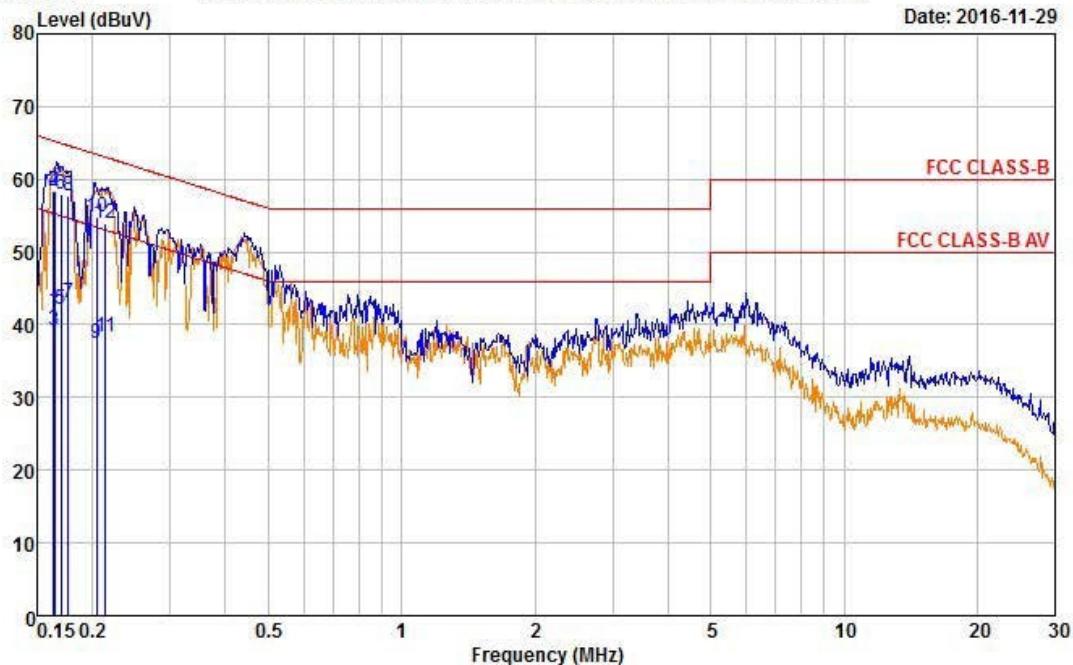
Remarks: C.F (Correction Factor) = Insertion loss + Cable loss + Pulse Limiter

Conducted Emissions - Bluetooth(MID) mode + NEUTRAL

4, Songjuro 236 Beon-gil, Yangji-myeon
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EUT / Model No. : ET30KH-BT Phase : NEUTRAL
 Test Mode : Bluetooth(MID) mode Test Power : 120 / 60
 Temp. / Humi. : 20 / 37 Test Engineer : LEE S H

Data: 1992 File: D:\Conducted Data\2015\2016\LTAConduction_2016_11.EM6 (2004)



Freq MHz	RD QP		RD AV		C.F dB	Result QP	Result dBuV	Limit QP		Limit AV		Margin QP dB	Margin AV dB
	dBuV	dBuV	dBuV	dBuV				dBuV	dBuV	dBuV	dBuV		
0.163	38.89	22.52	19.47	58.36	41.99	65.30	55.30	65.30	55.30	65.30	55.30	6.94	13.31
0.164	38.90	19.81	19.47	58.37	39.28	65.25	55.25	65.25	55.25	65.25	55.25	6.88	15.97
0.170	38.51	22.71	19.48	57.99	42.19	64.96	54.96	64.96	54.96	64.96	54.96	6.97	12.77
0.177	38.33	23.45	19.48	57.81	42.93	64.64	54.64	64.64	54.64	64.64	54.64	6.83	11.71
0.204	35.25	17.83	19.50	54.75	37.33	63.43	53.43	63.43	53.43	63.43	53.43	8.68	16.10
0.214	34.44	18.92	19.50	53.94	38.42	63.05	53.05	63.05	53.05	63.05	53.05	9.11	14.63

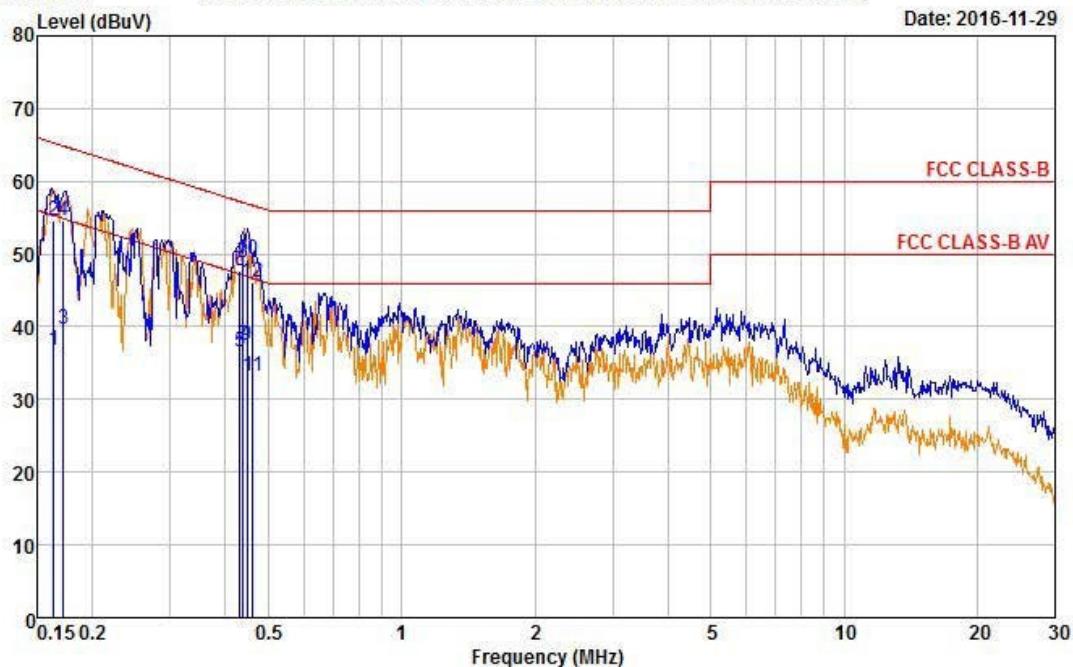
Remarks: C.F (Correction Factor) = Insertion loss + Cable loss + Pulse Limiter

Conducted Emissions - Bluetooth(HIGH) mode + LINE

4, Songjuro 236 Beon-gil, Yangji-myeon
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Fax: +82-31-3236010

EUT / Model No. : ET30KH-BT Phase : LINE
Test Mode : Bluetooth(HIGH) mode Test Power : 120 / 60
Temp. / Humi. : 20 / 37 Test Engineer : LEE S H

Data: 2004 File: D:\Conducted Data\2015\2016\LTAConduction_2016_11.EM6 (2004)



Freq MHz	RD QP		RD AV		C.F dB	Result QP	Result dBuV	Limit QP		Limit dBuV		Margin QP dB	Margin AV dB
	dBuV	dBuV	dBuV	dBuV				dBuV	dBuV	dBuV	dBuV		
0.163	35.17	17.20	19.47	54.64	36.67	65.30	55.30	10.66	18.63				
0.172	35.16	20.28	19.48	54.64	39.76	64.85	54.85	10.21	15.09				
0.430	28.04	16.99	19.55	47.59	36.54	57.25	47.25	9.66	10.71				
0.438	29.20	17.78	19.55	48.75	37.33	57.10	47.10	8.35	9.77				
0.448	29.57	17.78	19.57	49.14	37.35	56.91	46.91	7.77	9.56				
0.461	26.47	13.55	19.58	46.05	33.13	56.67	46.67	10.62	13.54				

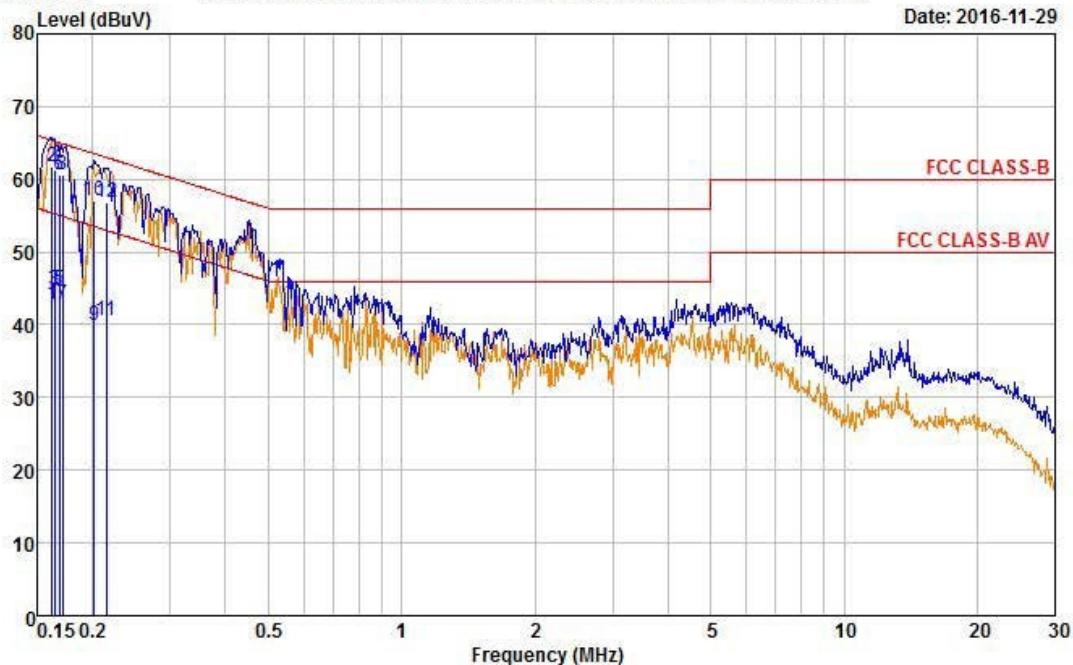
Remarks: C.F (Correction Factor) = Insertion loss + Cable loss + Pulse Limiter

Conducted Emissions - Bluetooth(HIGH) mode + NEUTRAL

4, Songjuro 236 Beon-gil, Yangji-myeon
Cheoin-gu, Youngin-si, Gyeonggi-do
449-822 Korea
Tel:+82-31-3236008,9
Fax:+82-31-3236010

EUT / Model No. : ET30KH-BT Phase : NEUTRAL
 Test Mode : Bluetooth(HIGH) mode Test Power : 120 / 60
 Temp. / Humi. : 20 / 37 Test Engineer : LEE S H

Data: 1984 File: D:\Conducted Data\2015\2016\LTAConduction_2016_11.EM6 (2004)



Freq MHz	RD QP		RD AV		C.F dB	Result QP dBuV	Result AV dBuV	Limit QP dBuV		Limit AV dBuV		Margin QP dB	Margin AV dB
	dBuV	dBuV	dBuV	dBuV				dBuV	dBuV	dBuV	dBuV		
0.162	42.18	23.38	19.47	19.47	61.65	42.85	65.35	55.35	55.35	3.70	12.50		
0.164	41.81	25.24	19.47	19.47	61.28	44.71	65.25	55.25	55.25	3.97	10.54		
0.169	41.10	25.24	19.48	19.48	60.58	44.72	65.03	55.03	55.03	4.45	10.31		
0.171	41.03	23.35	19.48	19.48	60.51	42.83	64.90	54.90	54.90	4.39	12.07		
0.202	37.45	20.28	19.50	19.50	56.95	39.78	63.54	53.54	53.54	6.59	13.76		
0.215	37.36	20.96	19.50	19.50	56.86	40.46	63.00	53.00	53.00	6.14	12.54		

Remarks: C.F (Correction Factor) = Insertion loss + Cable loss + Pulse Limiter

APPENDIX
TEST EQUIPMENT USED FOR TESTS

	Description	Model No.	Serial No.	Manufacturer	Interval	Last Cal. Date
1	Signal Analyzer (9 kHz ~ 30 GHz)	FSV30	100757	R&S	1 year	2016-03-22
2	Signal Generator (~ 3.2 GHz)	8648C	3623A02597	HP	1 year	2016-03-21
3	SYNTHESIZED CW GENERATOR	83711B	US34490456	HP	1 year	2016-03-21
4	Attenuator (3 dB)	8491A	37822	HP	1 year	2016-09-12
5	Attenuator (10 dB)	8491A	63196	HP	1 year	2016-09-12
6	Test Receiver (~ 30 MHz)	ESHS10	828404/009	R&S	1 year	2016-03-21
7	EMI Test Receiver (~ 7 GHz)	ESCI7	100722	R&S	1 year	2016-09-12
8	RF Amplifier (~ 1.3 GHz)	8447D OPT 010	2944A07684	HP	-	-
9	RF Amplifier (1 ~ 26.5 GHz)	8449B	3008A02126	HP	1 year	2016-03-22
10	Horn Antenna (1 ~ 18 GHz)	3115	00114105	ETS	1 year	2016-04-21
11	DRG Horn (Small)	3116B	81109	ETS-Lindgren	1 year	2016-02-26
12	DRG Horn (Small)	3116B	133350	ETS-Lindgren	1 year	2016-02-26
13	TRILOG Antenna	VULB 9160	9160-3237	SCHWARZBECK	2 year	2015-04-21
14	Temp.Humidity Data Logger	SK-L200TH II A	00801	SATO	1 year	2016-03-22
15	Splitter (SMA)	ZFSC-2-2500	SF617800326	Mini-Circuits	-	-
16	Power Divider	11636A	06243	HP	1 year	2016-09-12
17	DC Power Supply	6674A	3637A01657	Agilent	-	-
18	Frequency Counter	5342A	2826A12411	HP	1 year	2016-03-21
19	Power Meter	EPM-441A	GB32481702	HP	1 year	2016-03-22
20	Power Sensor	8481A	3318A94972	HP	1 year	2016-01-05
21	Audio Analyzer	8903B	3729A18901	HP	1 year	2016-09-12
22	Modulation Analyzer	8901B	3749A05878	HP	1 year	2016-09-12
23	TEMP & HUMIDITY Chamber	YJ-500	LTAS06041	JinYoung Tech	1 year	2016-09-12
24	Stop Watch	HS-3	812Q08R	CASIO	2 year	2016-03-22
25	LISN	KNW-407	8-1430-1	Kyoritsu	1 year	2016-09-12
26	Two-Lime V-Network	ESH3-Z5	893045/017	R&S	1 year	2016-03-21
27	UNIVERSAL RADIO COMMUNICATION TESTER	CMU200	106243	R&S	1 year	2016-03-21
28	Highpass Filter	WHKX1.5/15G-10SS	74	Wainwright Instruments	1 year	2016-03-21
29	Highpass Filter	WHKX3.0/18G-10SS	118	Wainwright Instruments	1 year	2016-03-21
30	Active Loop Antenna	FMZB1519	1519-031	SCHWARZBECK	2 year	2016-01-12
31	OSP120 BASE UNIT	OSP120	101230	R&S	1 year	2016-03-22
32	Signal Generator(100 kHz ~ 40 GHz)	SMB100A	177621	R&S	1 year	2016-03-22
33	Signal Analyzer (10 Hz ~ 40 GHz)	FSV40	101367	R&S	1 year	2016-03-22