LTA
Laboratory for Test & Approval Co.,Ltd.

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Dates of Tests: April 01, 2019 ~ April 24, 2019
Test Report S/N: LR500111904S
Test Site : LTA CO., LTD.

CERTIFICATION OF COMPLIANCE

FCC ID. **W6YPT400TWR**

APPLICANT **PASSTECH CO., LTD.**

Equipment Class	**:**	**Digital Transmission System (DTS)**
Manufacturing Description	**:**	**LOCKER LOCK**
Manufacturer	**:**	**PASSTECH CO., LTD.**
Model name	**:**	**PT400TWR**
Varient Model name	**:**	**PT200TWR, PT600TWR**
Test Device Serial No.:	**:**	**Identical prototype**
Rule Part(s)	**:**	**FCC Part 15.247 Subpart C ; ANSI C63.10 - 2013**
Frequency Range	**:**	**2402 ~ 2480 MHz - BLE**
		2405 ~ 2480 MHz - Zigbee
Max. Output Power	**:**	**Max 3.77 dBm (BLE) – Conducted**
		Max 1.96 dBm (Zigbee) - Conducted
Data of issue	**:**	**April 24, 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. 17159

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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	2019-09-30	ECT accredited Lab.
RRA	KOREA	KR0049	-	EMC accredited Lab.
FCC	U.S.A	649054	Updating	FCC CAB
VCCI	JAPAN	C-4948, T-2416, R-4483(10 m), G-847	2020-09-10 2020-09-10 2020-10-15 2022-06-13	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	:	PASSTECH CO., LTD.
Address	:	#1305 Kranz Techno, 5442-1, Sangdaewon-dong, Jungwon-gu, Seongnam-si, Gyeonggi-do, South Korea
Tel / Fax	:	+82-31-743-7277 / +82-31-743-7276

2-2 Equipment Under Test (EUT)

Model name	:	PT400TWR
Varient Model name	:	PT200TWR, PT600TWR
Serial number	:	Identical prototype
Date of receipt	:	April 01, 2019
EUT condition	:	Pre-production, not damaged
Antenna type	:	Chip Antenna (Max Gain : 3.5 dBi)
Frequency Range	:	2402 ~ 2480 MHz (BLE) 2405 ~ 2480 MHz (Zigbee)
RF output power	:	Max 3.77 dBm – Conducted (BLE) Max 1.96 dBm – Conducted (Zigbee)
Number of channels	:	40 (BLE), 16 (Zigbee)
Type of Modulation	:	GFSK, OQPSK
Power Source	:	6.0 Vdc

2-3 Tested frequency

	LOW	MID	HIGH
Frequency (MHz) - BLE	2402	2440	2480
Frequency (MHz) – Zigbee	2405	2440	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)	6 dB Bandwidth	> 500 kHz	Conducted	C
15.247(b)	Transmitter Peak Output Power	< 1 Watt		C
15.247(d)	Transmitter Power Spectral Density	< 8 dBm @ 3 kHz		C
15.247(d)	Band Edge	> 20 dBc		C
15.209	Field Strength of Harmonics	Emission	Radiated	C
15.207	AC Conducted Emissions	Emissions	Conducted	N/A
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.

The above equipment was tested by LTA Co., Ltd. The test data, data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in ANSI C63.10-2013 and the energy emitted by the sample EUT tested as described in this report is in compliance with the requirements of FCC Rules Part 2 and Part 15.247 The test results of this report relate only to the tested sample identified in this report.

→ Antenna Requirement
PASSTECH CO., LTD. FCC ID: W6YPT400TWR unit complies with the requirement of §15.203. The antenna type is Chip Antenna.

3.2 Technical Characteristics Test

3.2.1 6 dB Bandwidth

Procedure:

The bandwidth at 6 dB below the highest in-band spectral density was measured with a spectrum analyzer connected to the antenna terminal, while EUT is operating in transmission mode at the appropriate frequencies.

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 6 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 6 dB bandwidth of the emission.

The spectrum analyzer is set to:

Center frequency = the highest, middle and the lowest channels

RBW = 100 kHz	Span = 5 MHz
VBW = 300 kHz (VBW ≥ RBW)	Sweep = auto
Trace = max hold	Detector function = peak

Measurement Data : Complies

BLE Mode

Frequency (MHz)	Test Results	
	Measured Bandwidth (MHz)	Result
2402	**1.418**	Complies
2440	**1.425**	Complies
2480	**1.563**	Complies

Zigbee Mode

Frequency (MHz)	Test Results	
	Measured Bandwidth (MHz)	Result
2405	**1.584**	Complies
2440	**1.628**	Complies
2480	**1.613**	Complies

- See next pages for actual measured spectrum plots.

Minimum Standard:

6 dB Bandwidth > 500 kHz

Measurement Setup

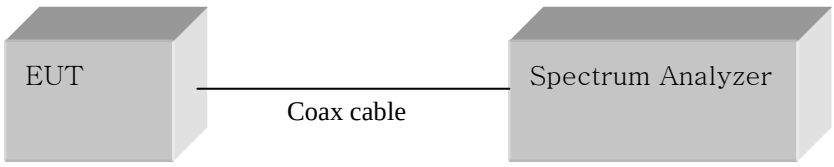
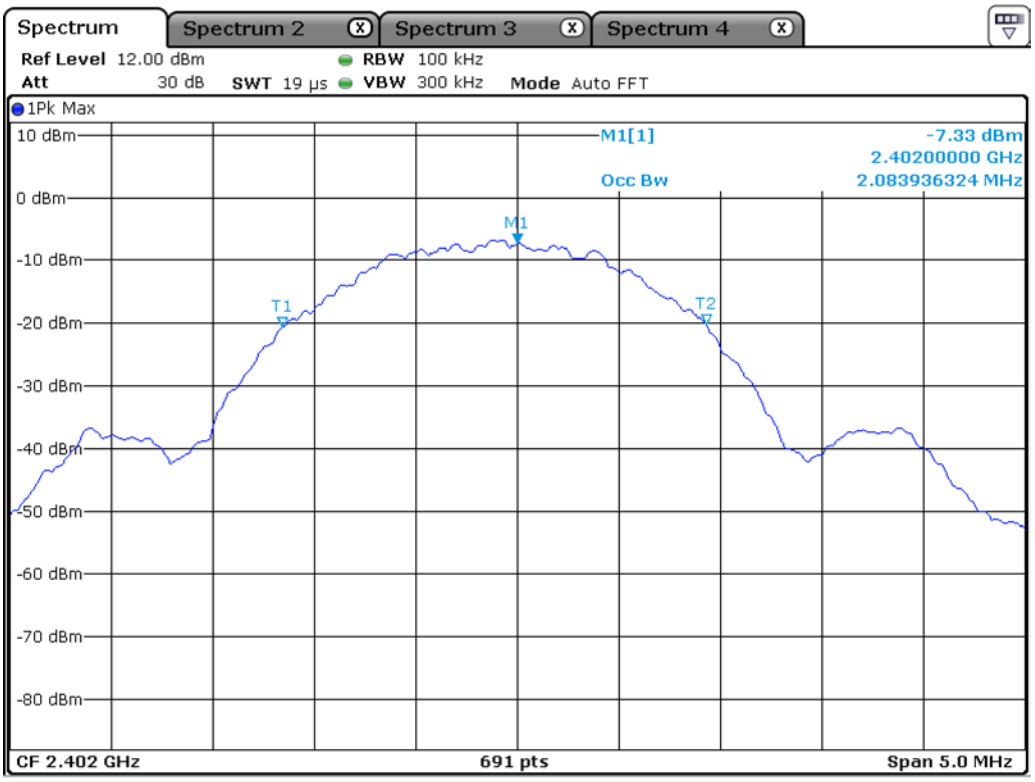


Figure 1: Measurement setup for the carrier frequency separation

Low Channel - BLE



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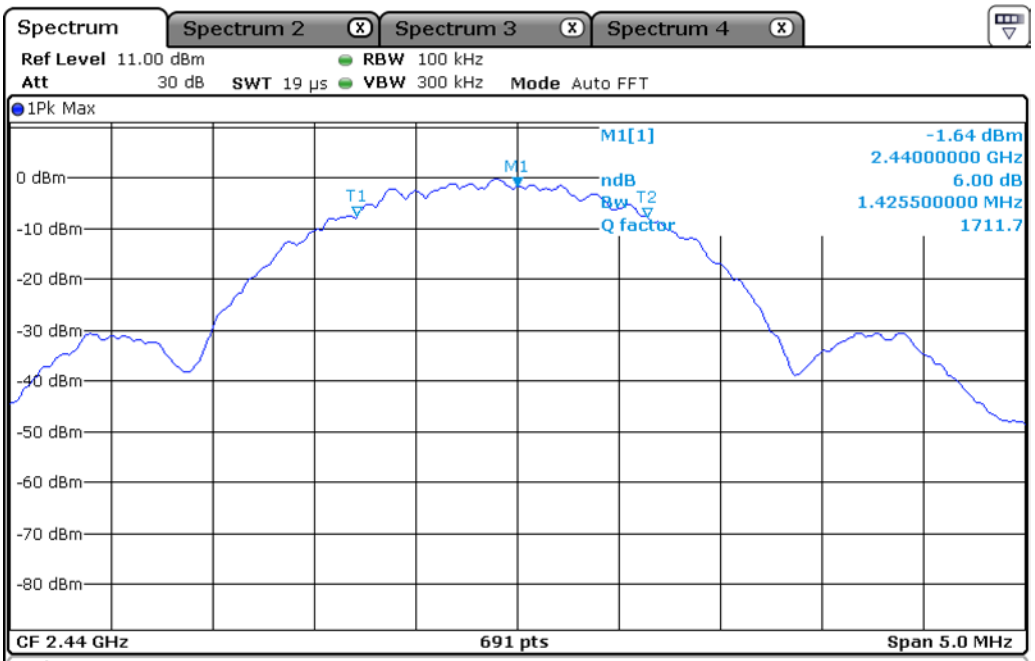
Middle Channel - BLE

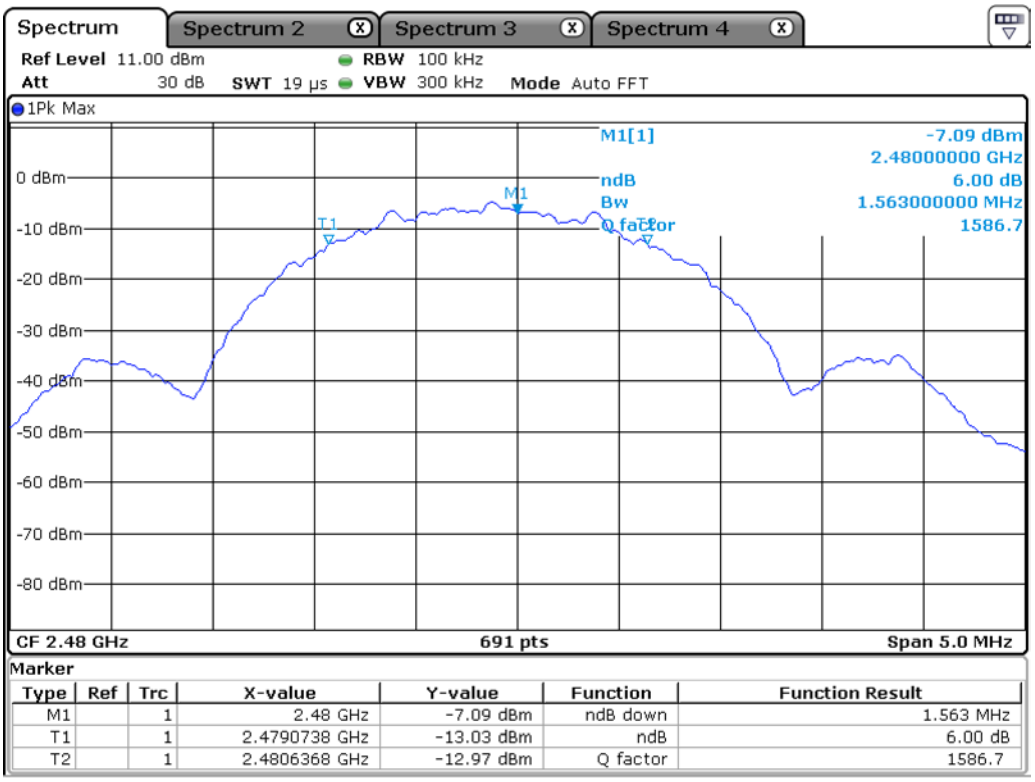


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.44 GHz	-1.64 dBm	ndB down	1.4255 MHz
T1		1	2.4392113 GHz	-7.58 dBm	ndB	6.00 dB
T2		1	2.4406368 GHz	-7.70 dBm	Q factor	1711.7

Date: 24.APR.2019 04:30:41

High Channel - BLE

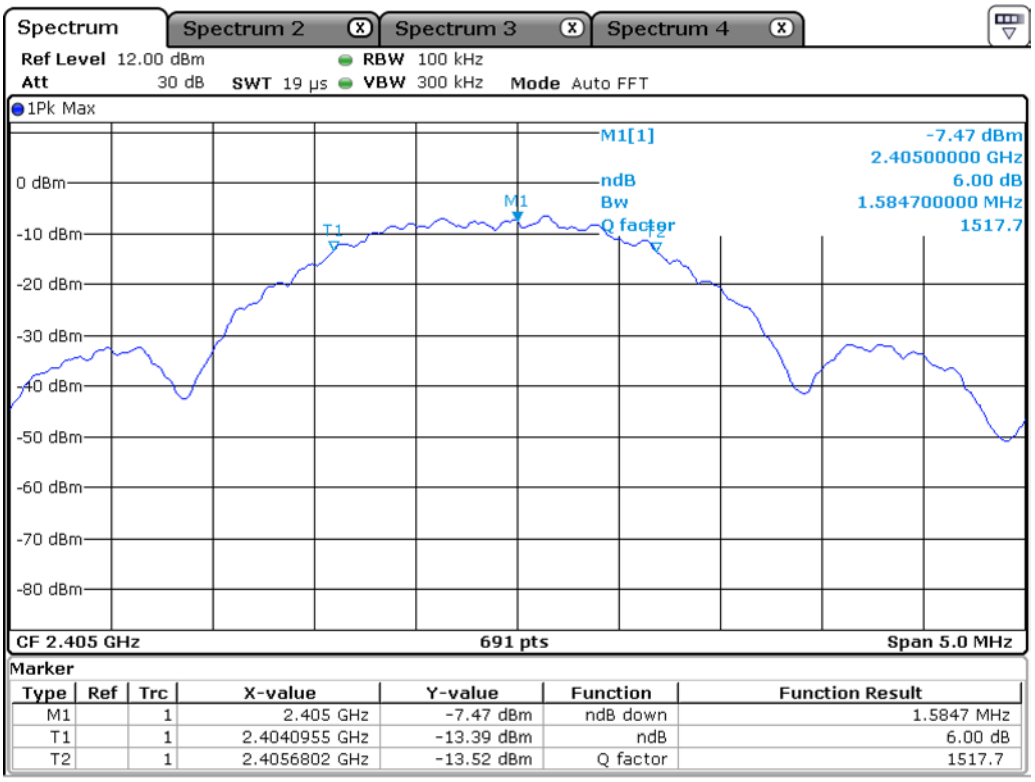


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.48 GHz	-7.09 dBm	ndB down	1.563 MHz
T1		1	2.4790738 GHz	-13.03 dBm	ndB	6.00 dB
T2		1	2.4806368 GHz	-12.97 dBm	Q factor	1586.7

Date: 24.APR.2019 04:35:45

Low Channel - Zigbee

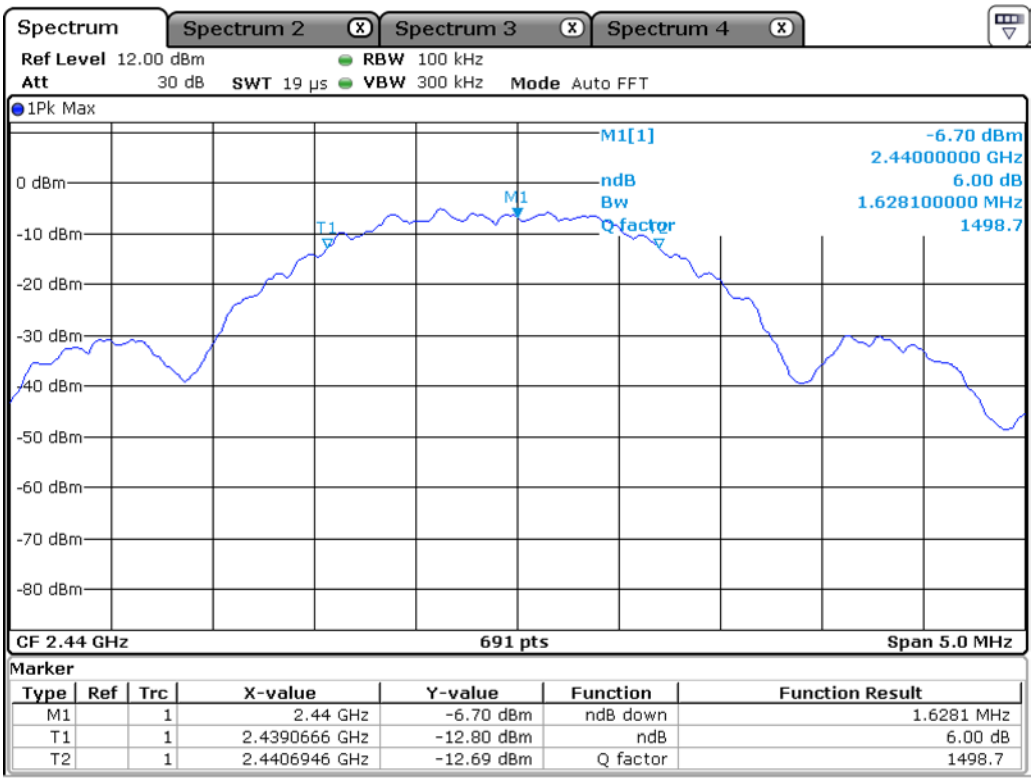


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.405 GHz	-7.47 dBm	ndB down	1.5847 MHz
T1		1	2.4040955 GHz	-13.39 dBm	ndB	6.00 dB
T2		1	2.4056802 GHz	-13.52 dBm	Q factor	1517.7

Date: 24.APR.2019 04:00:14

Middle Channel - Zigbee

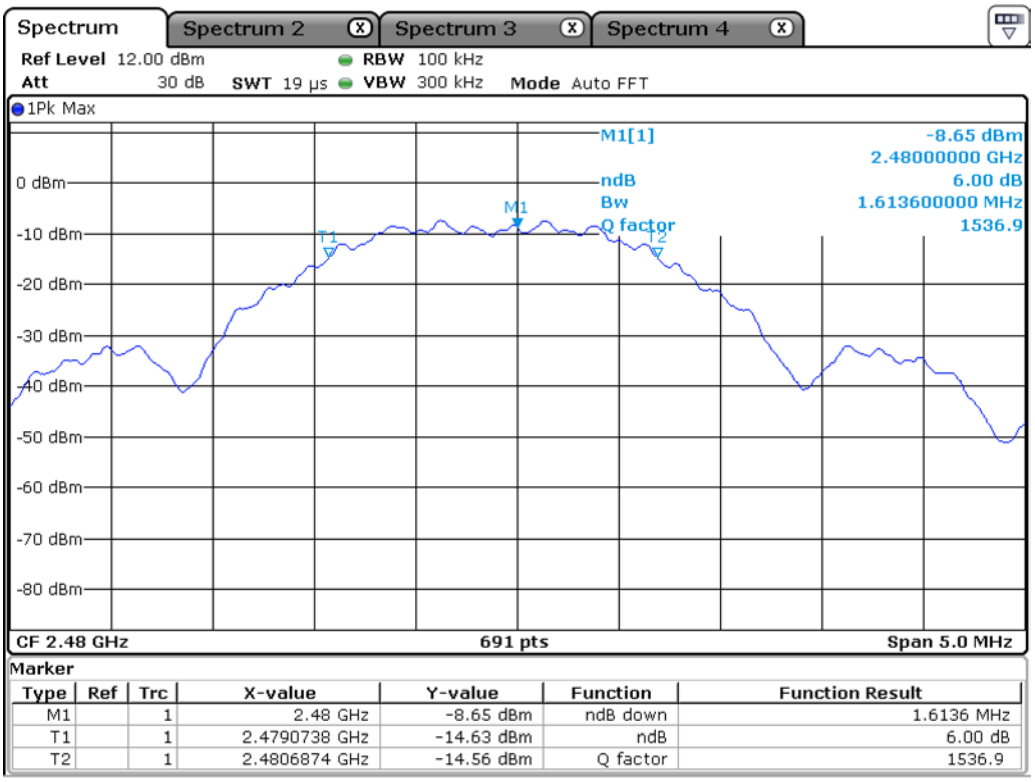


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.44 GHz	-6.70 dBm	ndB down	1.6281 MHz
T1		1	2.4390666 GHz	-12.80 dBm	ndB	6.00 dB
T2		1	2.4406946 GHz	-12.69 dBm	Q factor	1498.7

Date: 24.APR.2019 04:11:30

High Channel - Zigbee



Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.48 GHz	-8.65 dBm	ndB down	1.6136 MHz
T1		1	2.4790738 GHz	-14.63 dBm	ndB	6.00 dB
T2		1	2.4806874 GHz	-14.56 dBm	Q factor	1536.9

Date: 24.APR.2019 04:14:08

3.2.2 Peak Output Power Measurement

Procedure:

The maximum peak output power was measured with the spectrum analyzer connected to the antenna output of the EUT. The spectrum analyzer's internal channel power integration function is used to integrate the power over a bandwidth greater than or equal to the 99 % bandwidth. The EUT was operating in transmit mode at the appropriate center frequency.

The spectrum analyzer is set to:

Center frequency = the highest, middle and the lowest channels

RBW = 1 MHz Span = auto

VBW = 3 MHz (VBW ≥ RBW) Sweep = auto

Detector function = peak

Measurement Data : Complies

BLE Mode

Frequency (MHz)	Test Results		
	Measured Data (dBm)	mW	Result
2402	**-2.19**	0.60	Complies
2440	**3.77**	2.38	Complies
2480	**0.35**	1.08	Complies

Zigbee Mode

Frequency (MHz)	Test Results		
	Measured Data (dBm)	mW	Result
2402	**-0.35**	0.92	Complies
2440	**1.96**	1.57	Complies
2480	**-1.67**	0.68	Complies

- See next pages for actual measured spectrum plots.

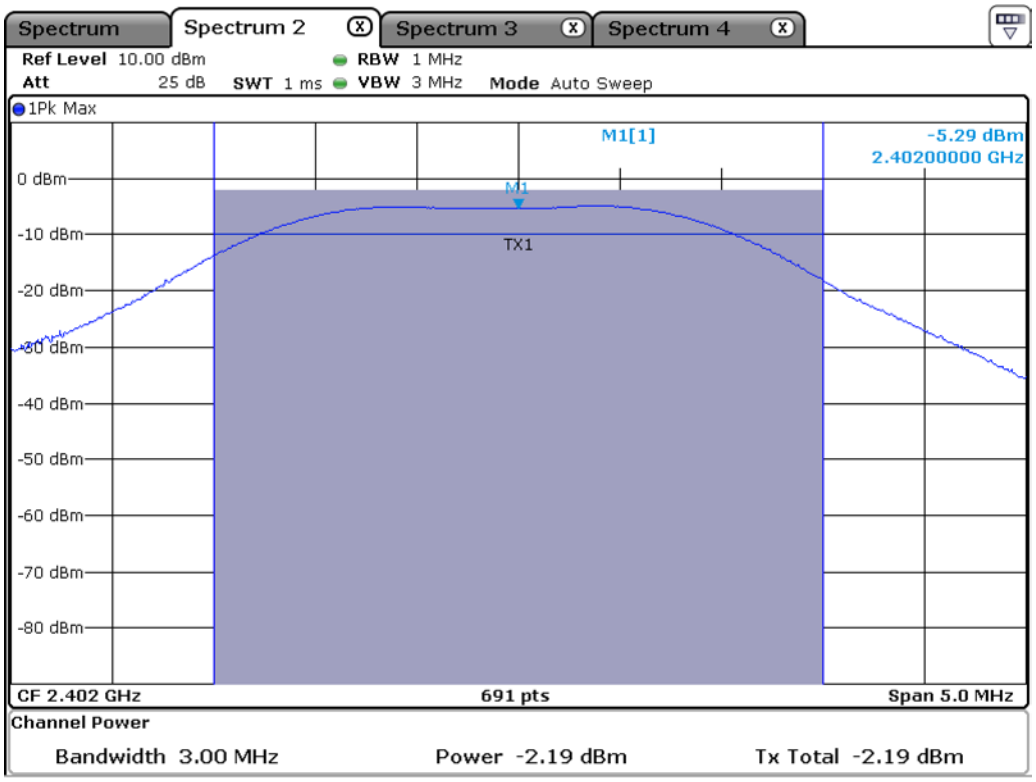
Minimum Standard:

Peak output power	< 1 W

Measurement Setup

Same as the Chapter 3.2.1 (Figure 1)

Low Channel - BLE



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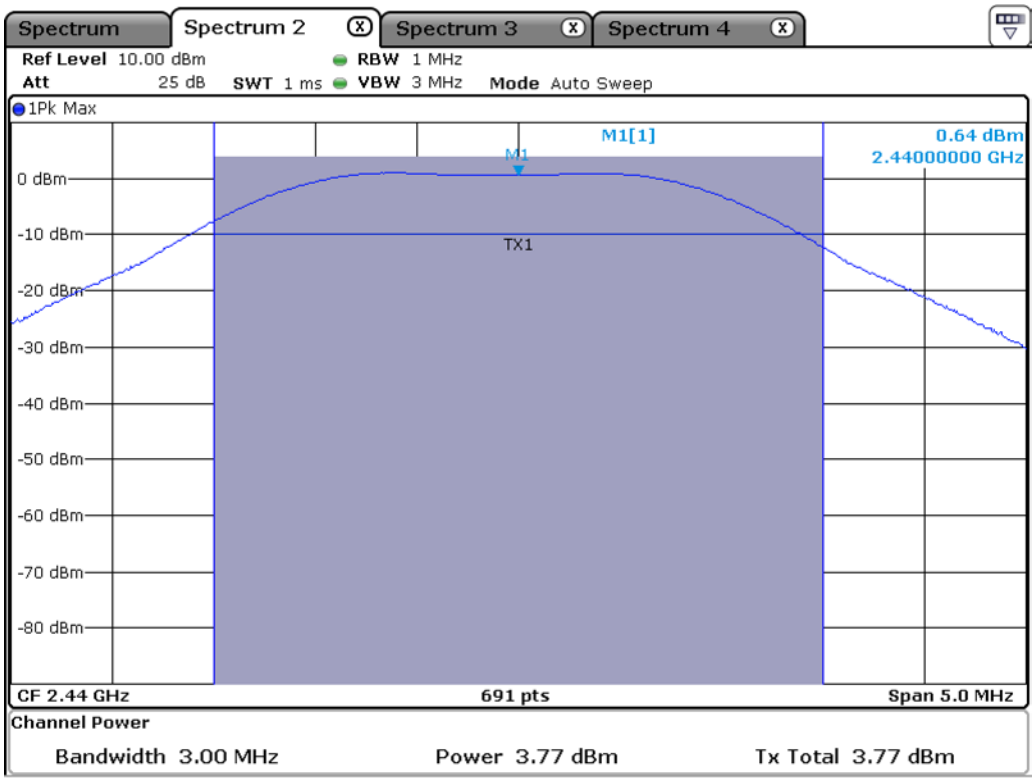
Middle Channel - BLE



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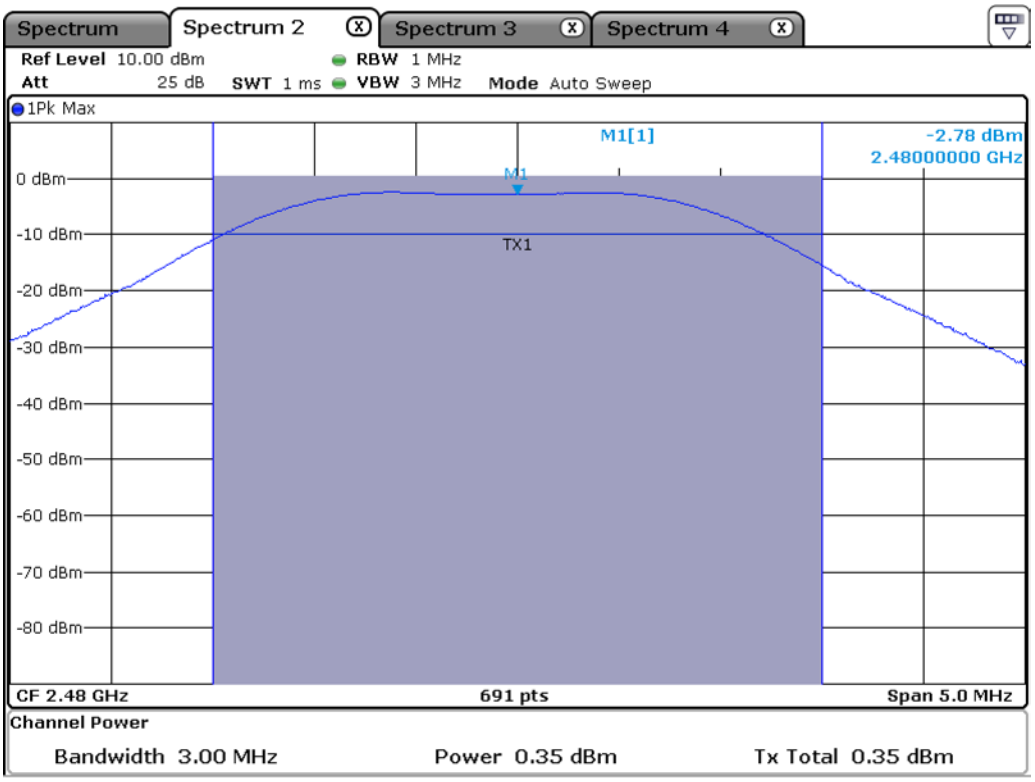
High Channel - BLE



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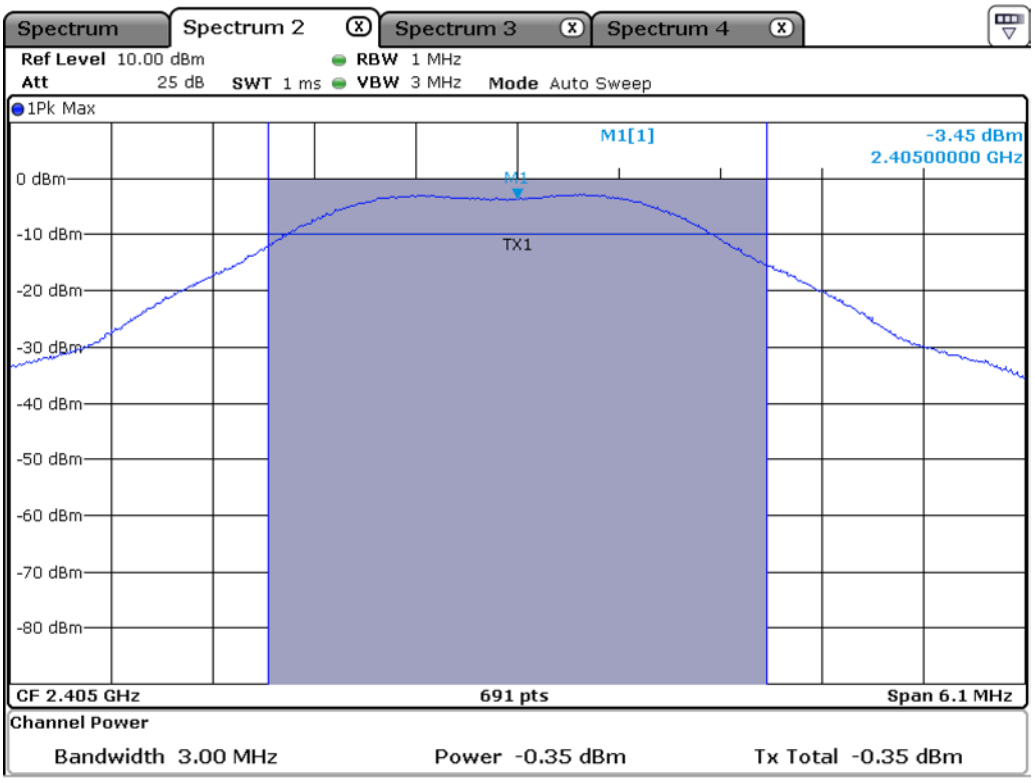
Low Channel - Zigbee



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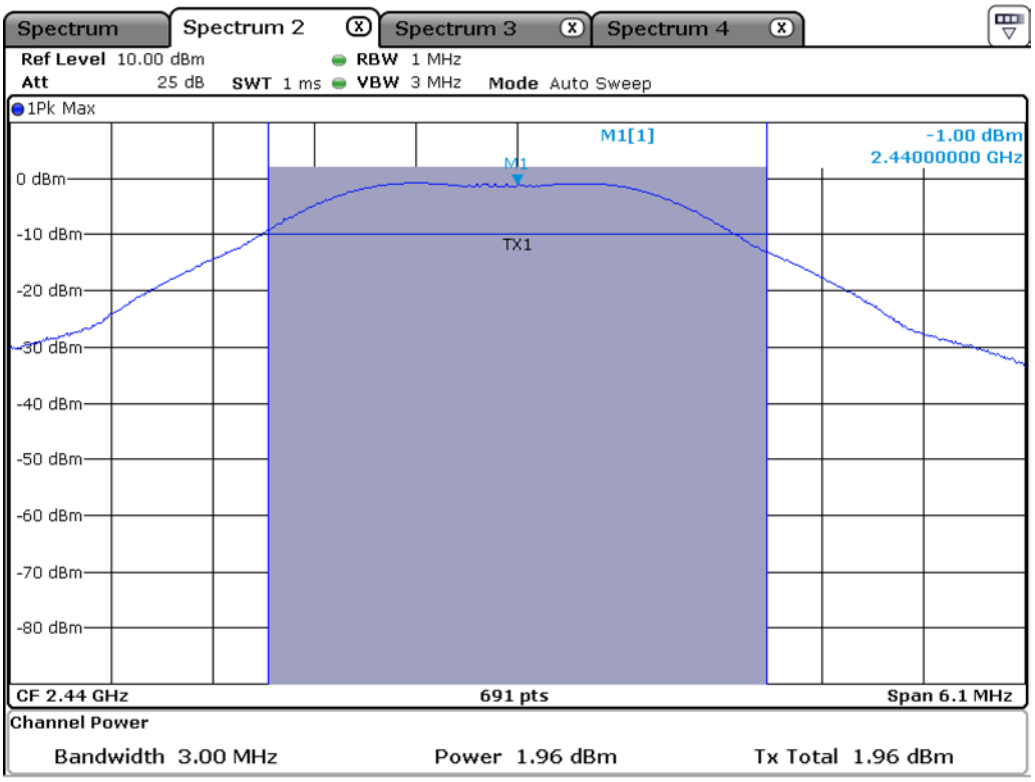
Middle Channel - Zigbee



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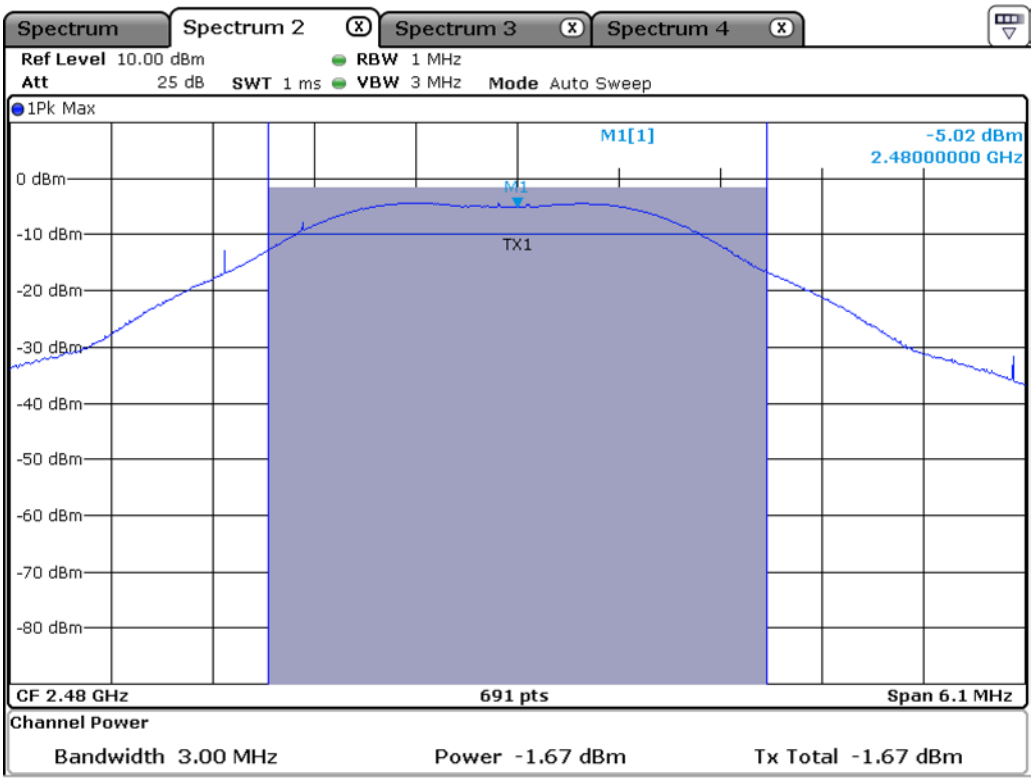
High Channel - Zigbee



Date: 24.APR.2019 04:14:48

3.2.3 Power Spectral Density

Procedure:

The peak power density is measured with a spectrum analyzer connected to the antenna terminal while the EUT is operating in transmission mode at the appropriate frequencies.

The spectrum analyzer is set to:

RBW = 3 kHz (3 kHz≤RBW≤100 kHz) Span = 1.5 times the DTS bandwidth

VBW = 10 kHz (3 X RBW) Sweep = auto

Detector function = peak Trace = max hold

Measurement Data : Complies

BLE Mode

Frequency (MHz)	Test Results	
	dBm/ 3 kHz BW	Result
2402	**-19.96**	Complies
2440	**-15.83**	Complies
2480	**-18.32**	Complies

Zigbee Mode

Frequency (MHz)	Test Results	
	dBm/ 3 kHz BW	Result
2405	**-17.81**	Complies
2440	**-17.03**	Complies
2480	**-18.57**	Complies

- See next pages for actual measured spectrum plots.

Minimum Standard:

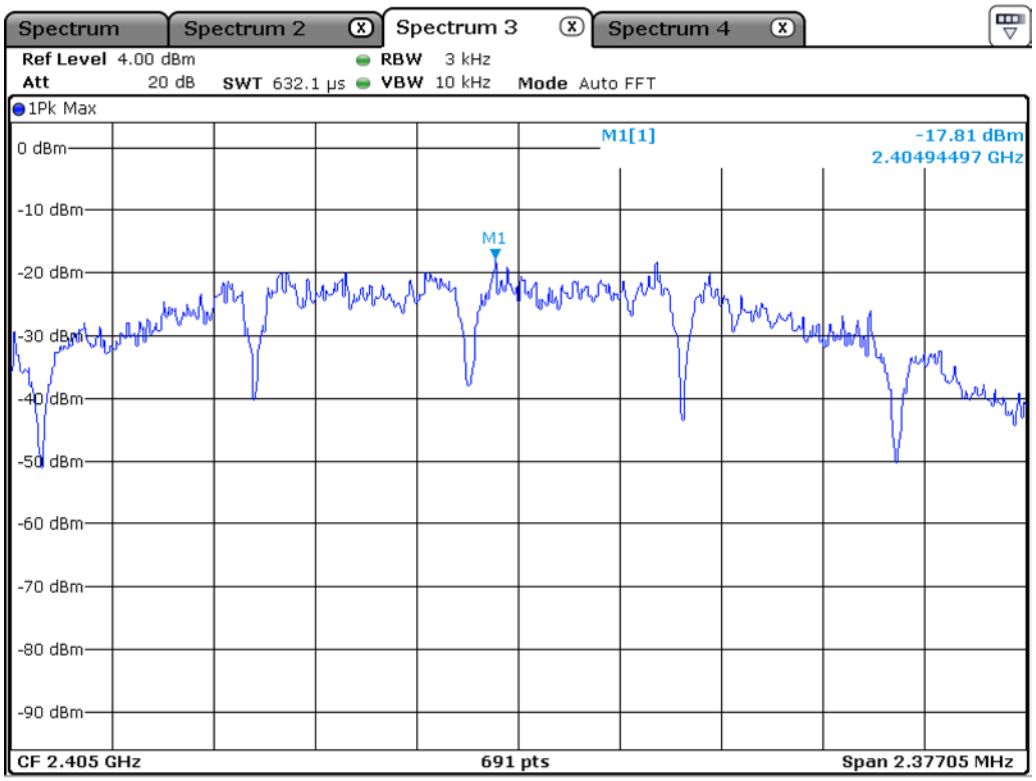
Power Spectral Density	< 8 dBm @ 3 kHz BW

Measurement Setup

Same as the Chapter 3.2.1 (Figure 1)

Power Density Measurement

Low Channel - BLE



Date: 24.APR.2019 04:07:01

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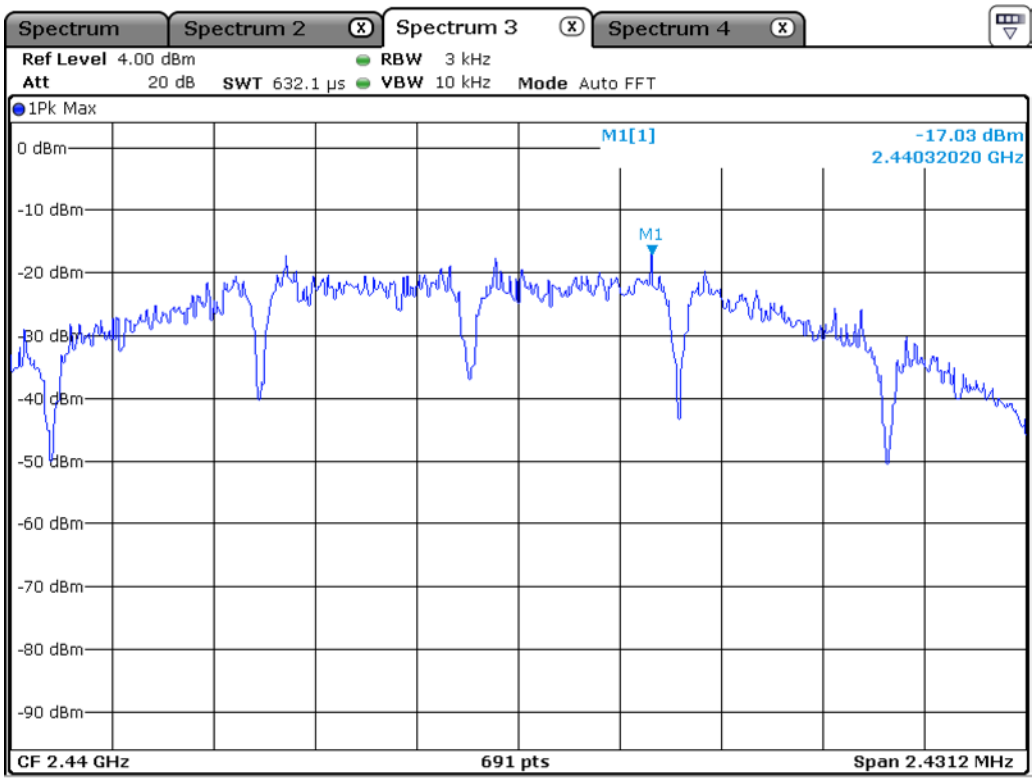

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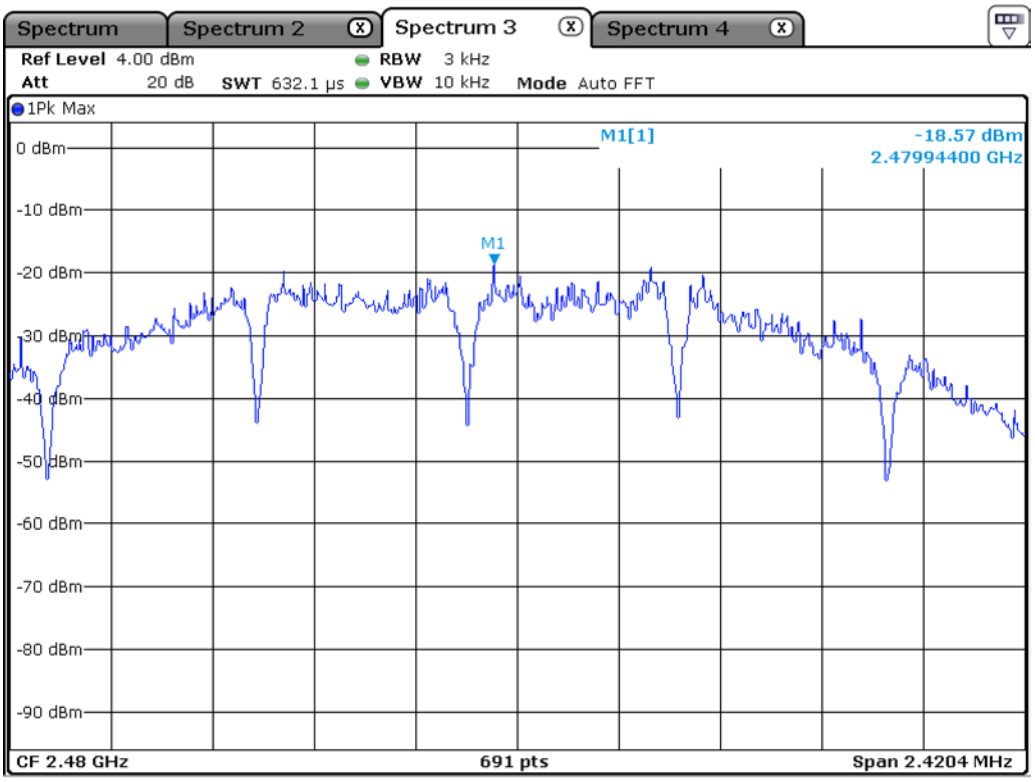

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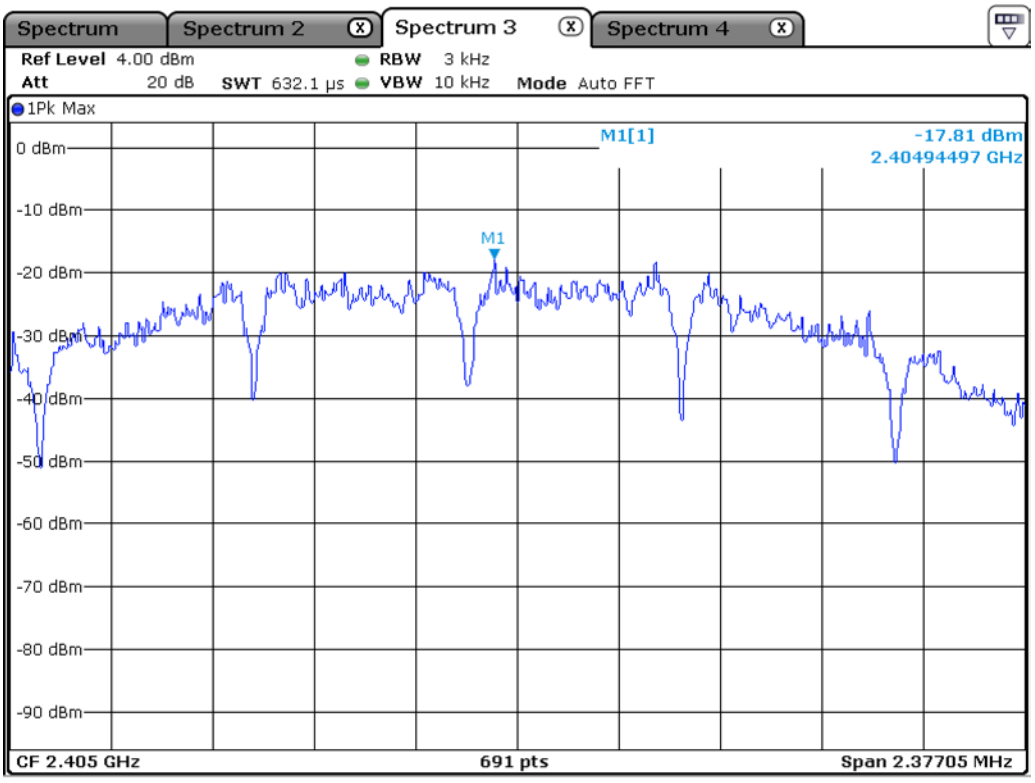
Low Channel - Zigbee



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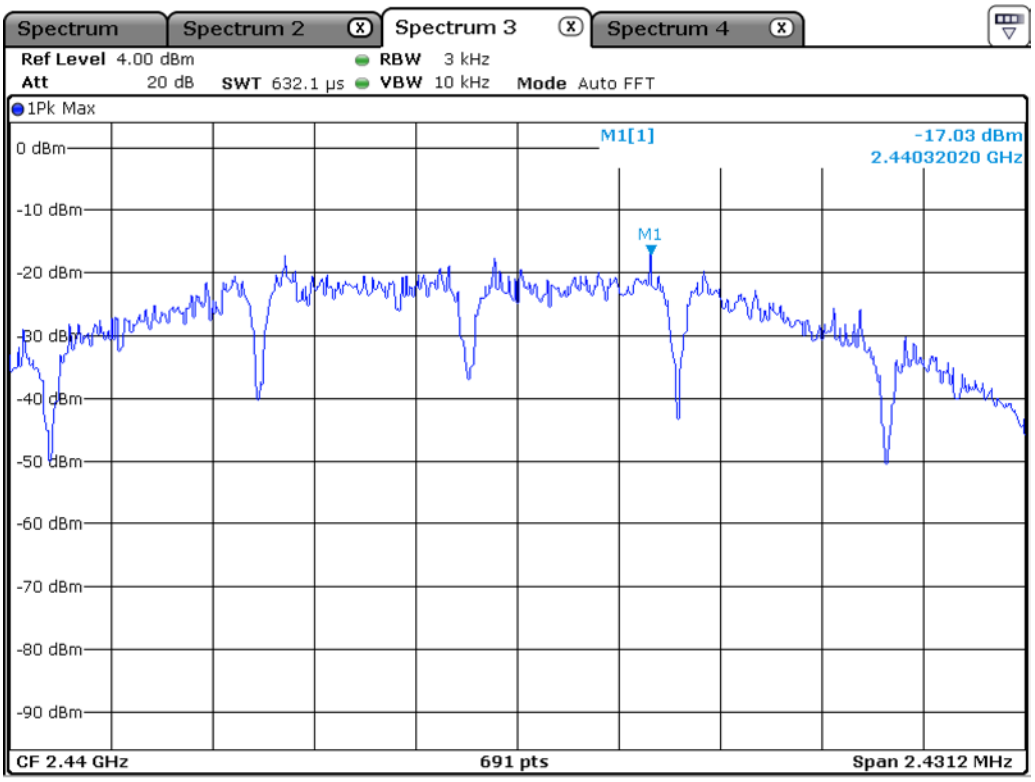

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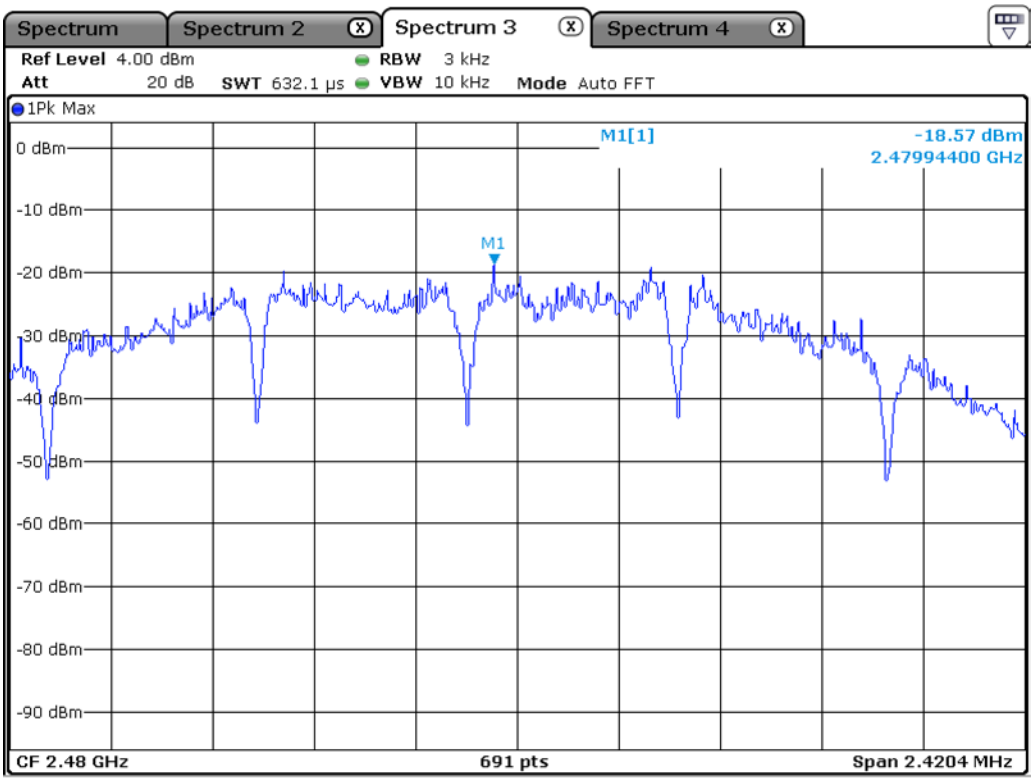
High Channel - Zigbee



Date: 24.APR.2019 04:15:08

3.2.4 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 is operating in transmission mode at the appropriate frequencies.

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 = 40 MHz, 100 MHz	Detector function = peak
Trace = max hold	Sweep = auto

Radiated emissions which fall in the restricted bands, as defined in 15.205(a), must also comply with the radiated emission limits specified in 15.209(a)

The spectrum analyzer is set to:

Center frequency = the highest, the lowest channels

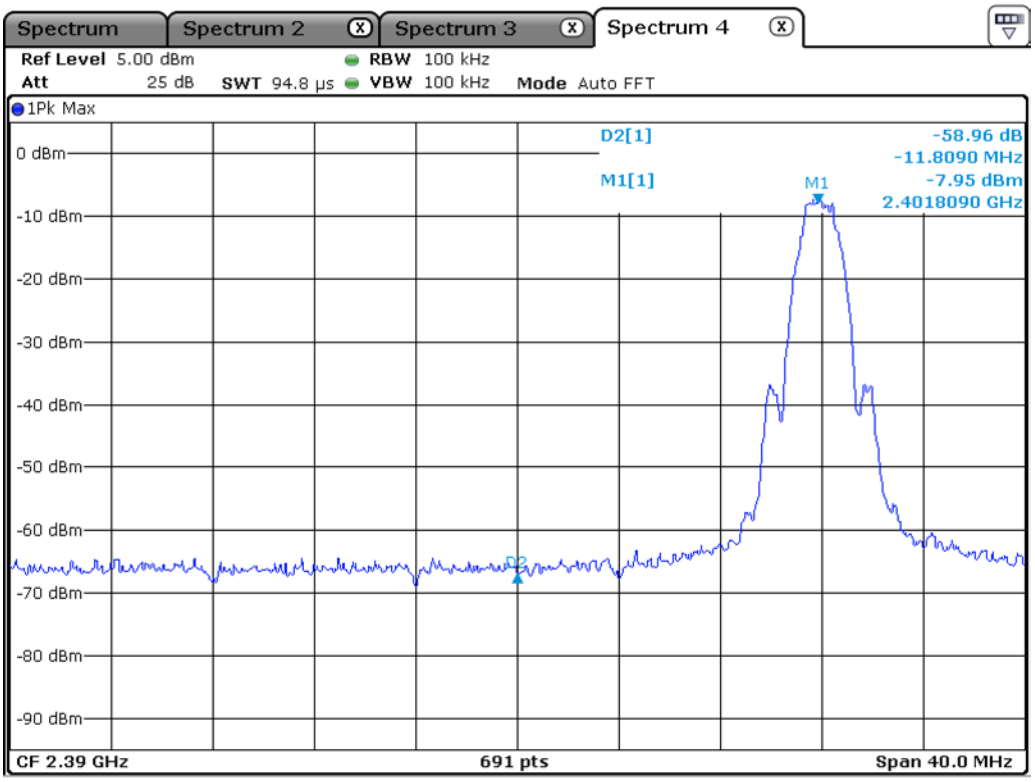
PEAK:	RBW = VBW = 1 MHz, Sweep=Auto
Average:	RBW = 1 MHz, VBW = 10 Hz, Sweep=Auto
Measurement Distance:	3 m
Polarization:	Horizontal / Vertical

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 require ment.
- See next pages for actual measured spectrum plots.

Minimum Standard:	> 20 dBc

Lower edge - BLE



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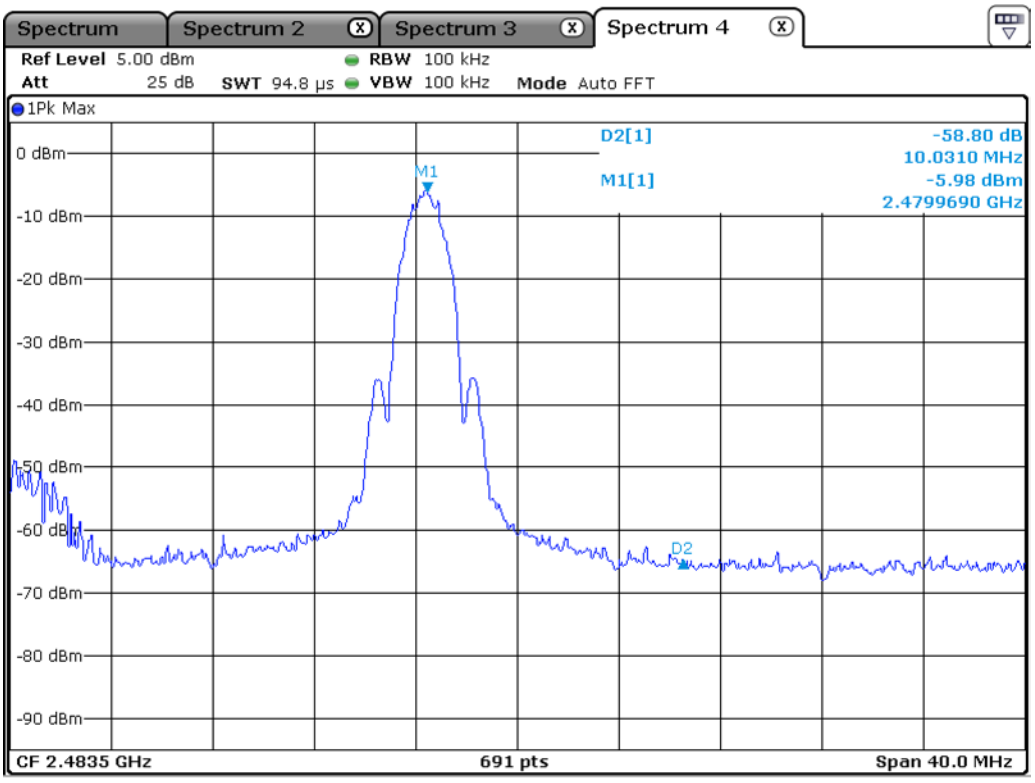
Upper edge- BLE



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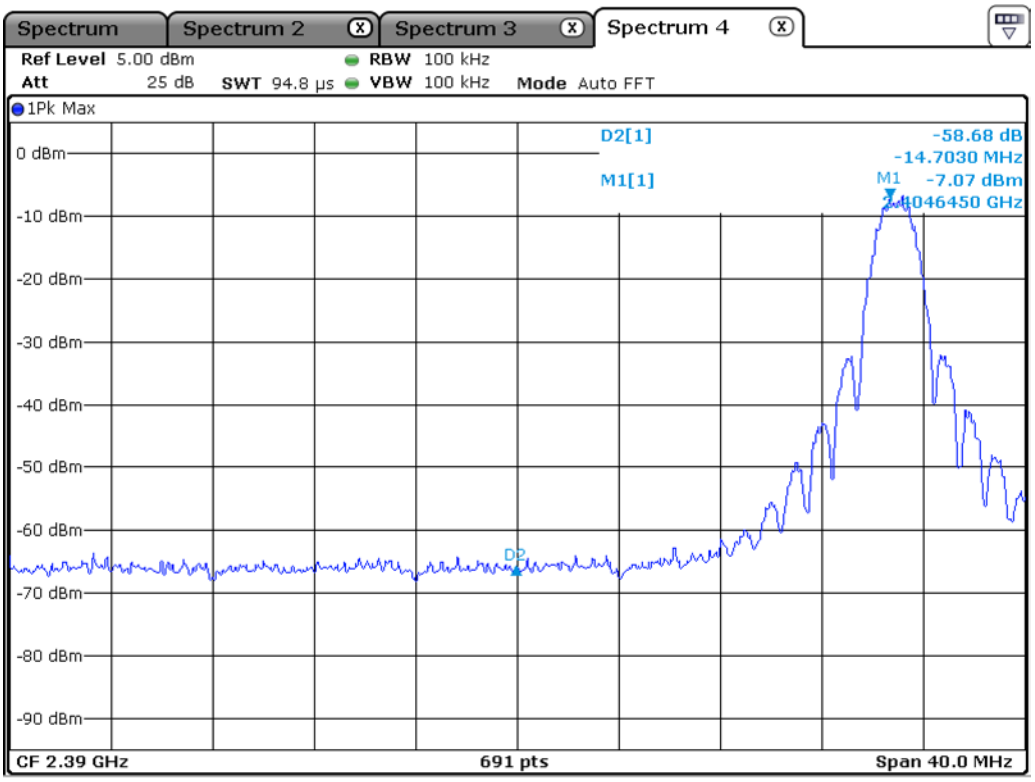
Lower edge - Zigbee



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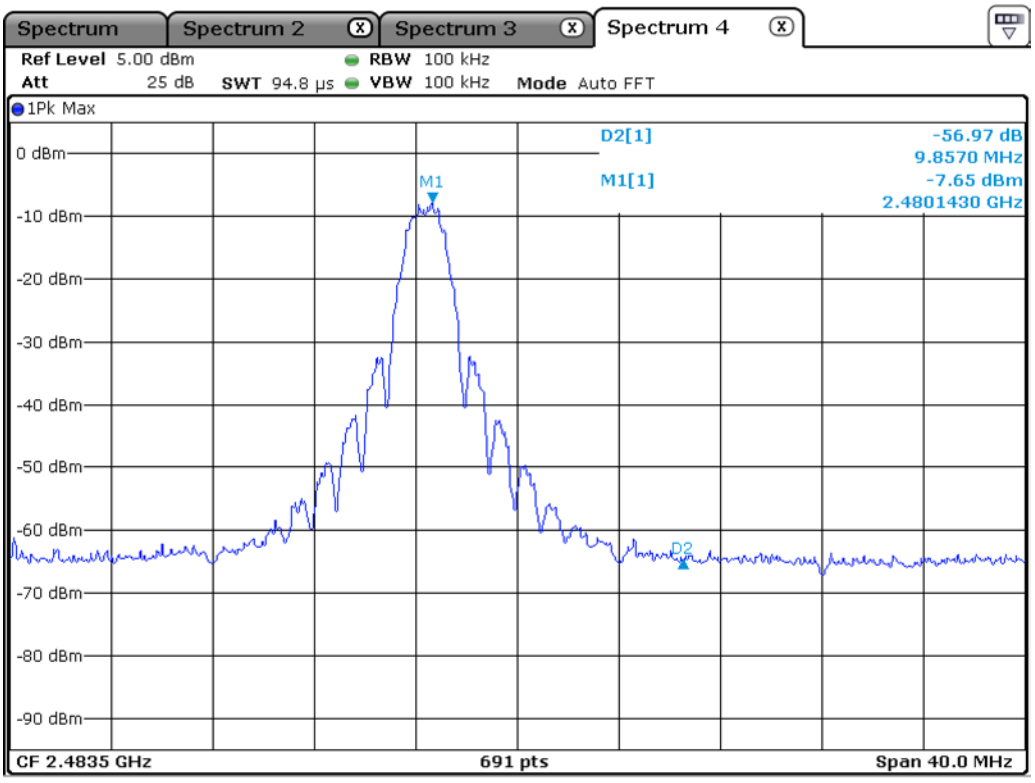
Upper edge- Zigbee



Date: 24.APR.2019 04:18:29

BLE Mode

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

Frequency [MHz]	Reading [dBuV/m] AV	Reading [dBuV/m] Peak	Pol.	Correction Factor	Limits [dBuV/m] AV	Limits [dBuV/m] Peak	Result [dBuV/m] AV	Result [dBuV/m] Peak	Margin [dB] AV	Margin [dB] Peak
2395.48	44.19	48.42	H	-9.37	54.0	74.0	34.82	39.05	19.18	34.95
2399.37	44.02	48.11	H	-9.37	54.0	74.0	34.65	38.74	19.35	35.26
2399.16	44.31	48.30	H	-9.37	54.0	74.0	34.94	38.93	19.06	35.07

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

Frequency [MHz]	Reading [dBuV/m] AV	Reading [dBuV/m] Peak	Pol.	Correction Factor	Limits [dBuV/m] AV	Limits [dBuV/m] Peak	Result [dBuV/m] AV	Result [dBuV/m] Peak	Margin [dB] AV	Margin [dB] Peak
2483.94	47.29	51.17	H	-9.24	54.0	74.0	38.05	41.93	15.95	32.07
2483.44	47.02	50.96	H	-9.24	54.0	74.0	37.78	41.72	16.22	32.28
2490.91	48.03	51.13	H	-9.24	54.0	74.0	38.79	41.89	15.21	32.11

Zigbee Mode

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

Frequency [MHz]	Reading [dBuV/m] AV	Reading [dBuV/m] Peak	Pol.	Correction Factor	Limits [dBuV/m] AV	Limits [dBuV/m] Peak	Result [dBuV/m] AV	Result [dBuV/m] Peak	Margin [dB] AV	Margin [dB] Peak
2396.23	42.93	46.23	H	-9.37	54.0	74.0	33.56	36.86	20.44	37.14
2399.48	43.62	47.03	H	-9.37	54.0	74.0	34.25	37.66	19.75	36.34
2399.95	42.15	46.48	H	-9.37	54.0	74.0	32.78	37.11	21.22	36.89

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

Frequency [MHz]	Reading [dBuV/m] AV	Reading [dBuV/m] Peak	Pol.	Correction Factor	Limits [dBuV/m] AV	Limits [dBuV/m] Peak	Result [dBuV/m] AV	Result [dBuV/m] Peak	Margin [dB] AV	Margin [dB] Peak
2483.89	48.19	52.28	H	-9.24	54.0	74.0	38.95	43.04	15.05	30.96
2483.12	48.95	52.32	H	-9.24	54.0	74.0	39.71	43.08	14.29	30.92
2490.25	48.41	52.46	H	-9.24	54.0	74.0	39.17	43.22	14.83	30.78

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

3.2.5 Conducted Spurious Emissions

Procedure:

The test follows KDB558074. 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

7Trace = 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 require ment.
- See next pages for actual measured spectrum plots.

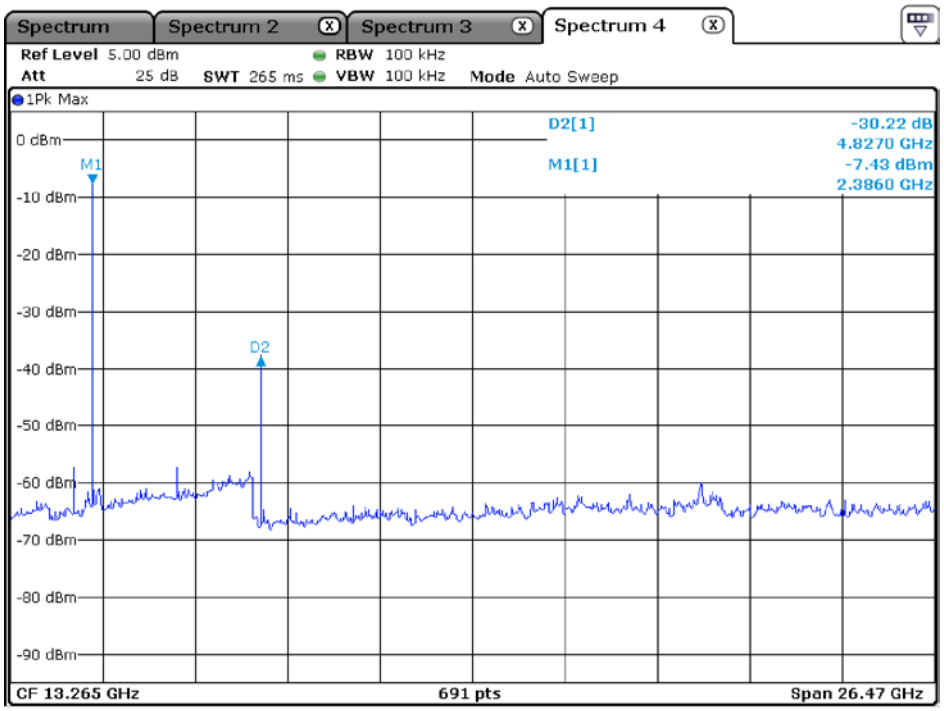
Minimum Standard:	> 20 dBc

Measurement Setup

Same as the Chapter 3.2.1 (Figure 1)

Unwanted Emission – Low Channel -BLE

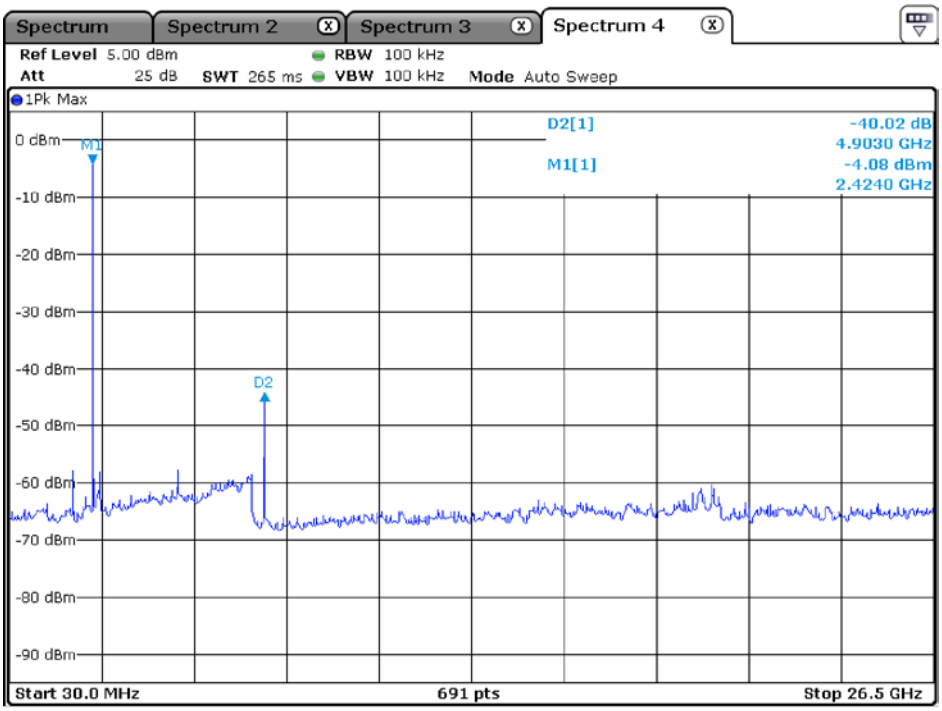
Frequency Range = 30 MHz ~ 26.5 GHz



Date: 24.APR.2019 04:26:32

Unwanted Emission – Middle Channel - BLE

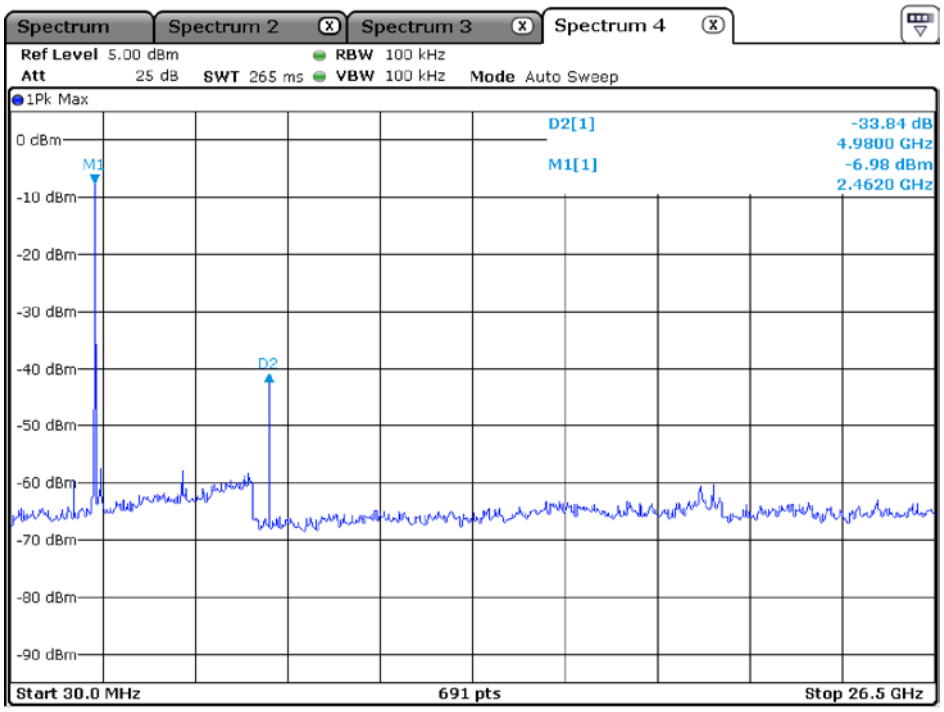
Frequency Range = 30 MHz ~ 26.5 GHz



Date: 24.APR.2019 04:33:16

Unwanted Emission – High Channel - BLE

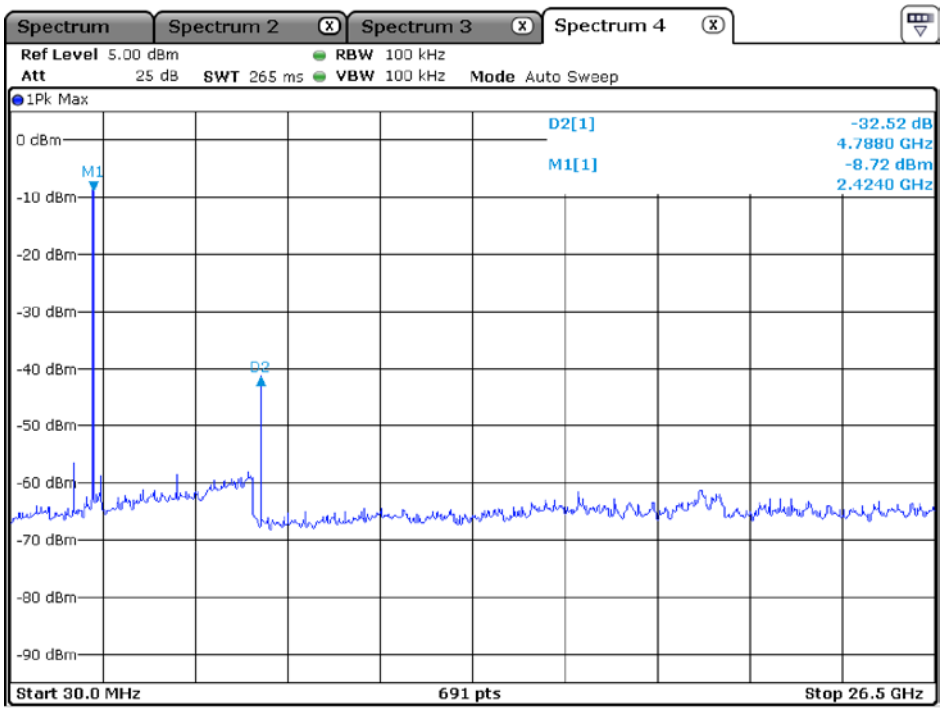
Frequency Range = 30 MHz ~ 26.5 GHz



Date: 24.APR.2019 04:36:42

Unwanted Emission – Low Channel -Zigbee

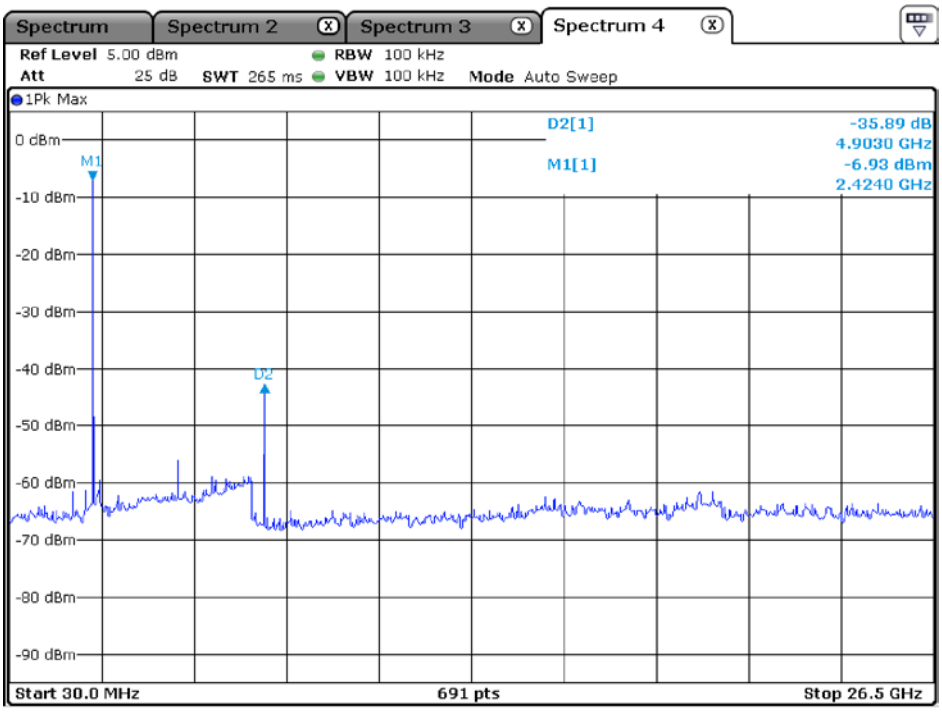
Frequency Range = 30 MHz ~ 26.5 GHz



Date: 24.APR.2019 04:09:46

Unwanted Emission – Middle Channel - Zigbee

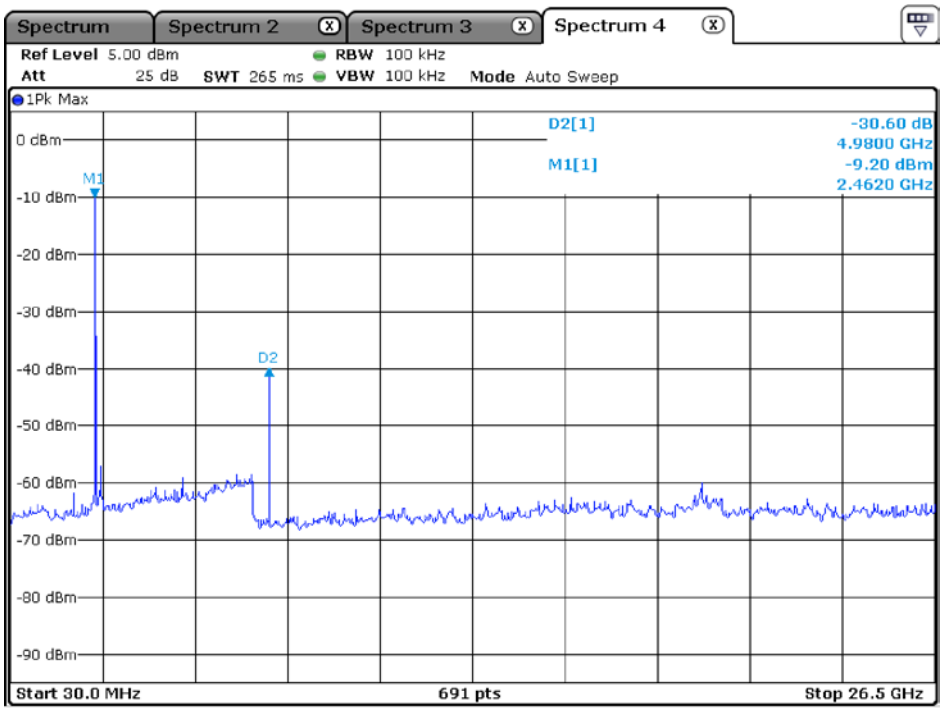
Frequency Range = 30 MHz ~ 26.5 GHz



Date: 24.APR.2019 04:13:04

Unwanted Emission – High Channel - Zigbee

Frequency Range = 30 MHz ~ 26.5 GHz



Date: 24.APR.2019 04:15:25

3.2.6 Radiated Spurious Emissions

Procedure:

Radiated emissions from 30 MHz to 25 GHz were measured according to the methods defines in ANSI C63.10-2013. The EUT is a placed on as turn table. For emissions testing at or below 1 GHz, the table height shall be 0.8 m above the reference ground plane. For emission measurements above 1 GHz, the table height shall be 1.5 m. The turn table shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3m away from the receiving antenna which varied from 1m to 4m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the max. emission, the relative positions of this hand-held transmitter (EUT) was rotated through three orthogonal axes and measurement procedures for electric field radiated emissions above 1 GHz the EUT measurement is to be made "while keeping the antenna in the 'cone of radiation' from that area and pointed at the area both in azimuth and elevation, with polarization oriented for maximum response." is still within the 3dB illumination BW of the measurement antenna.

The spectrum analyzer is set to:

Center frequency = the worst channel

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

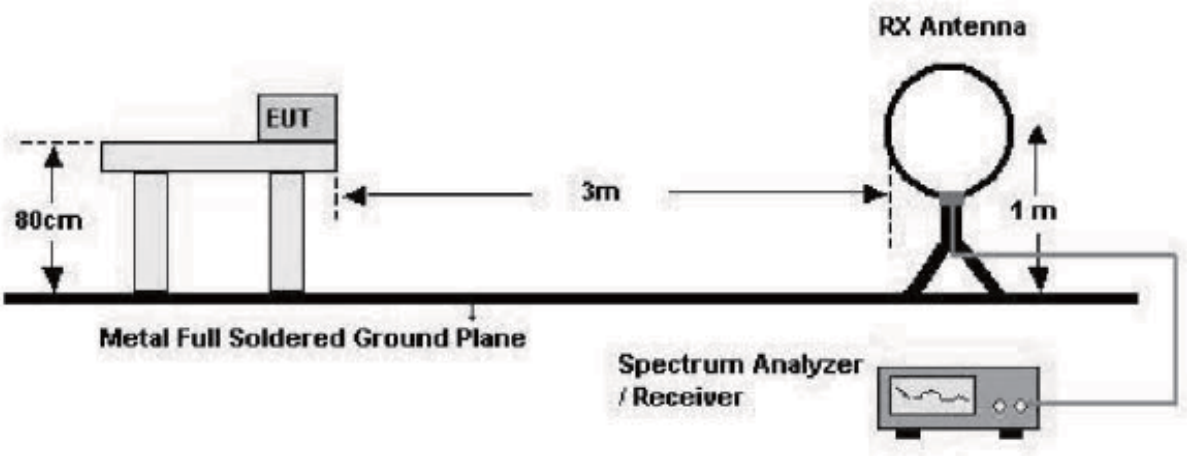
RBW = 100 kHz (30 MHz ~ 1 GHz) VBW ≥ RBW

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

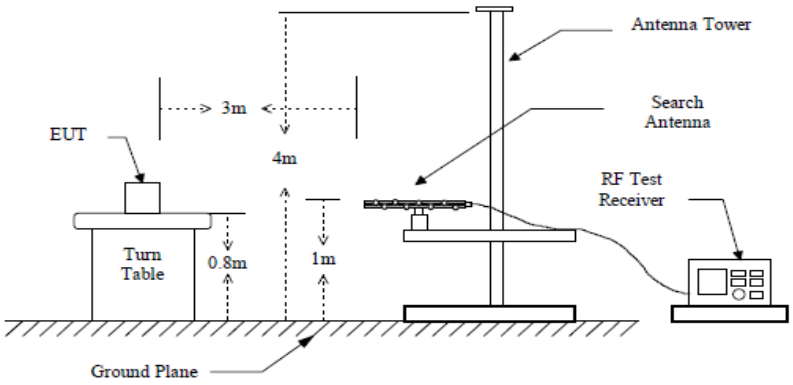
Span = 100 MHz Detector function = peak

Trace = max hold Sweep = auto

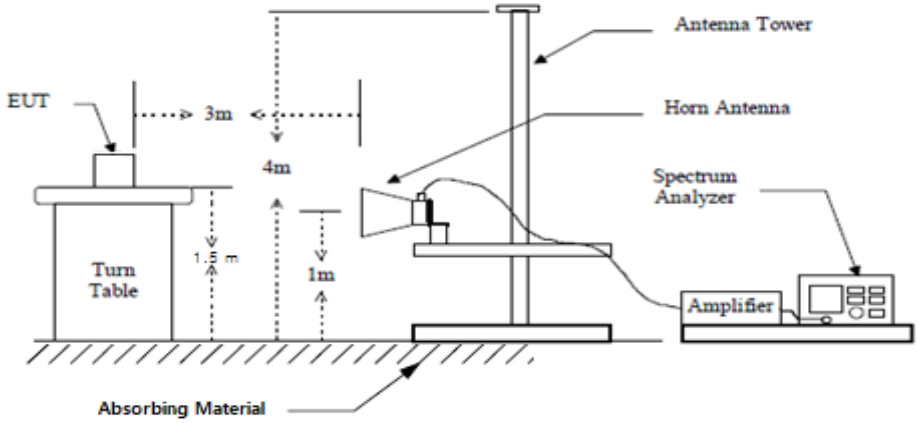
below 30 MHz



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 30MHz.

Minimum Standard: FCC Part 15.209(a)

Frequency (MHz)	Limit (uV/m) @ 3 m
0.009 ~ 0.490	2400/F(kHz) **(@ 300 m)**
0.490 ~ 1.705	24000/F(kHz) **(@ 30 m)**
1.705 ~ 30	30**(@ 30 m)**
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.

Radiated Emissions (Below 1 GHz) – Operating mode - BLE

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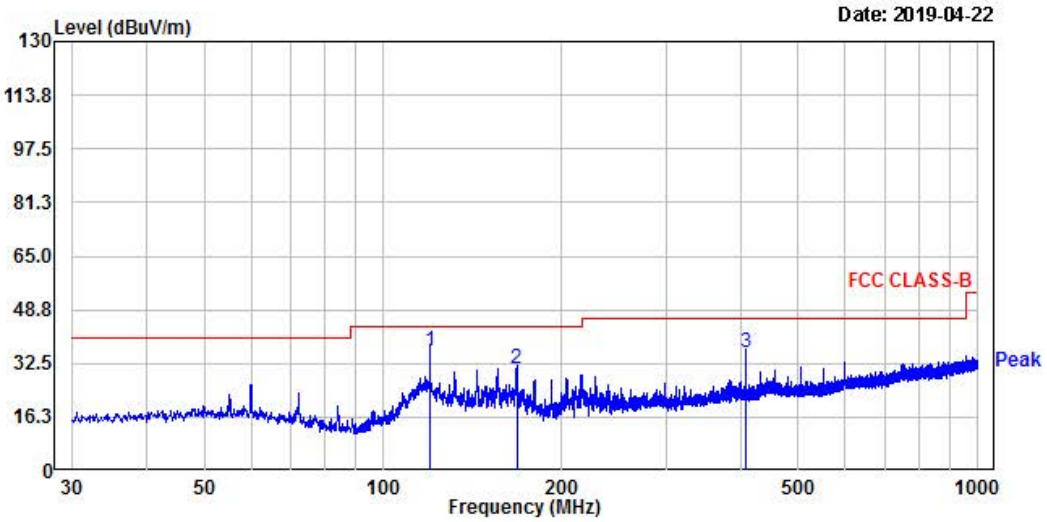
Fax : +82-31-3236010
www.ltalab.com

EUT/Model No.: PT400TWR 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	
120.09	51.32	-14.95	36.37	43.50	7.13	100	264	vertical
167.86	43.43	-12.68	30.75	43.50	12.75	100	289	vertical
408.06	44.57	-8.89	35.68	46.00	10.32	100	360	vertical

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

Radiated Emissions (Below 1 GHz) – Operating mode - BLE

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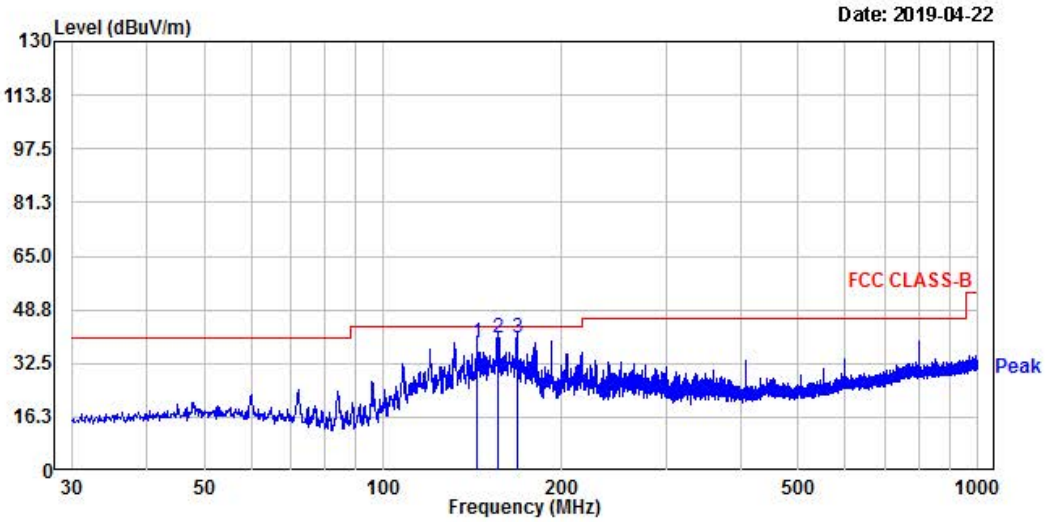
EUT/Model No.: PT400TWR Temp/Humi: 23 / 36

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	
143.98	51.68	-12.85	38.83	43.50	4.67	188	360	horizontal
156.10	52.69	-12.32	40.37	43.50	3.13	100	336	horizontal
167.98	52.76	-12.69	40.07	43.50	3.43	100	346	horizontal

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

Radiated Emissions (Below 1 GHz) – Operating mode - Zigbee

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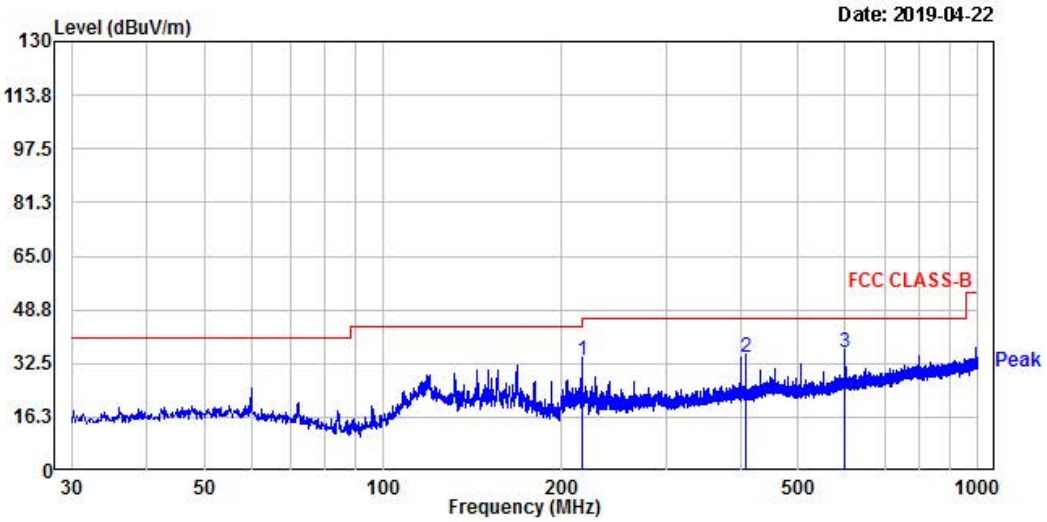
EUT/Model No.: PT400TWR Temp/Humi: 23 / 36

Test Mode : Zigbee 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	
216.12	48.51	-15.10	33.41	46.00	12.59	100	323	vertical
408.06	43.08	-8.89	34.19	46.00	11.81	100	334	vertical
600.00	40.67	-4.81	35.86	46.00	10.14	100	253	vertical

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

Radiated Emissions (Below 1 GHz) – Operating mode - Zigbee

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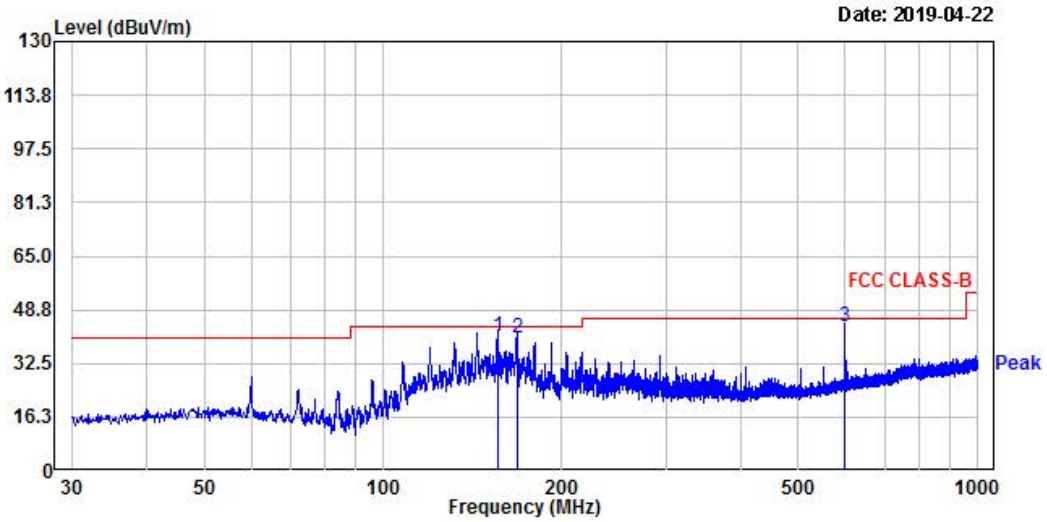
EUT/Model No.: PT400TWR Temp/Humi: 23 / 36

Test Mode : Zigbee 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	
155.98	52.86	-12.32	40.54	43.50	2.96	100	346	horizontal
167.98	52.81	-12.69	40.12	43.50	3.38	100	346	horizontal
600.00	48.24	-4.81	43.43	46.00	2.57	100	333	horizontal

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

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

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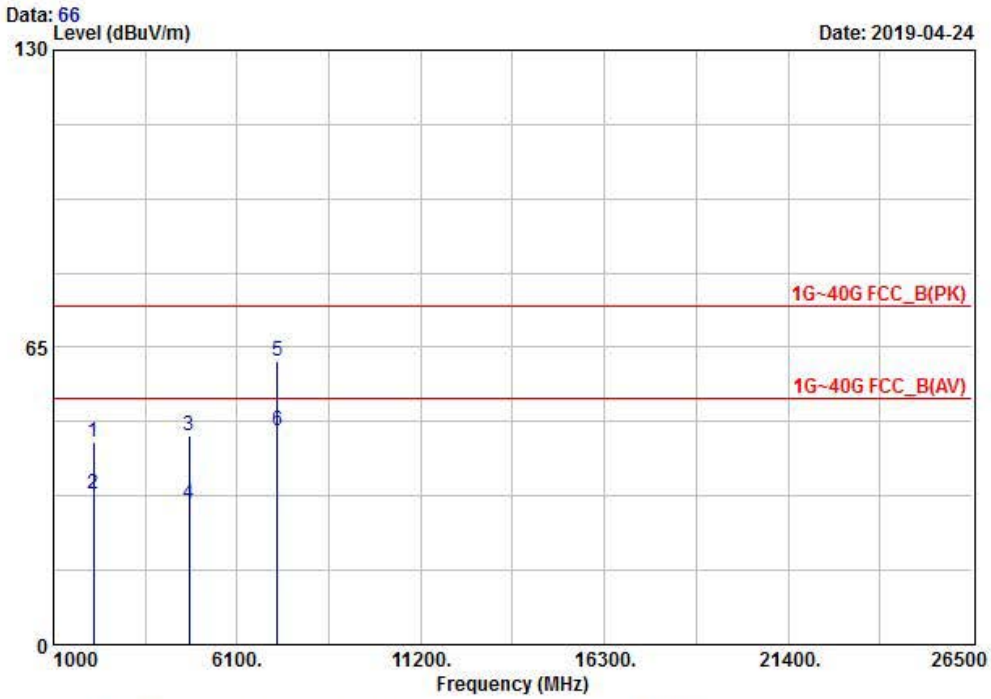
Fax:+82-31-3236010

EUT/Model No.: PT400TWR Test Mode: wireless (BLE)_L

Tested by : Kwon H C Temp/Humi:



	Freq	Reading	C.F	Result PK	Limit	Margin	Polarity
	MHz	dBuV	dB	dBuV/m	dBuV/m	dB	
1	2109.43	42.31	2.14	44.45	74.00	29.55	VERTICAL
2	2109.43	30.83	2.14	32.97	74.00	41.03	VERTICAL
3	4772.83	28.11	17.63	45.74	54.00	8.26	VERTICAL
4	4772.83	13.33	17.63	30.96	74.00	43.04	VERTICAL
5	7213.00	33.83	28.02	61.85	74.00	12.15	VERTICAL
6	7213.00	18.81	28.02	46.83	54.00	7.17	VERTICAL

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

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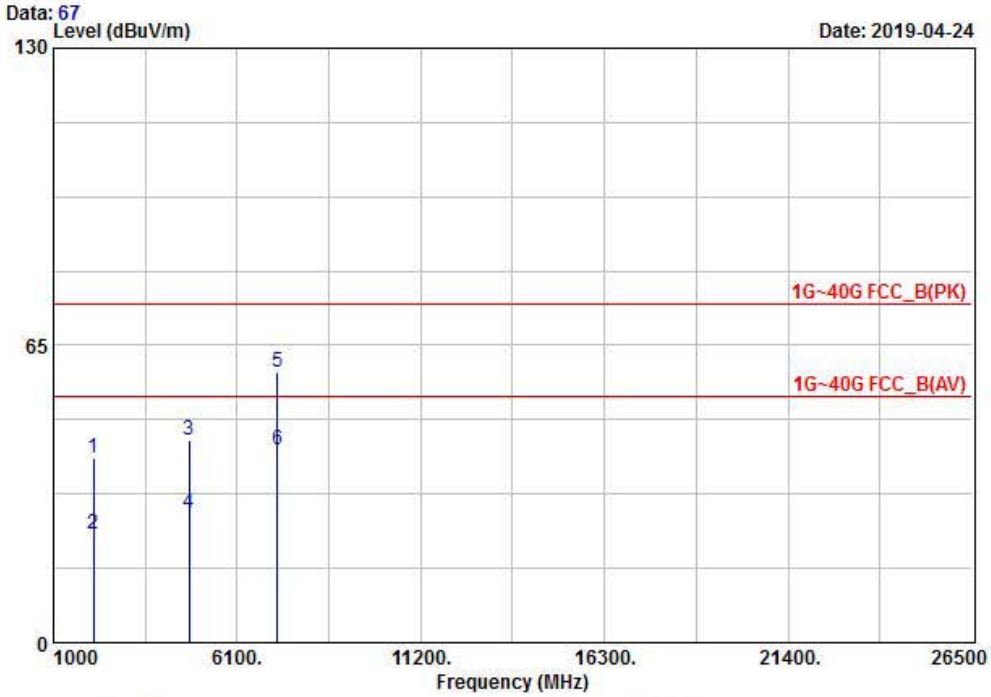
EUT/Model No.: PT400TWR Test Mode: wireless (BLE)_L
Tested by : Kwon H C Temp/Humi:



	Freq	Reading	C.F	Result PK	Limit	Margin	Polarity
	MHz	dBuV	dB	dBuV/m	dBuV/m	dB	
1	2109.41	39.27	1.24	40.51	74.00	33.49	HORIZONTAL
2	2109.41	21.48	2.14	23.62	54.00	30.38	HORIZONTAL
3	4772.84	26.64	17.63	44.27	74.00	29.73	HORIZONTAL
4	4772.84	10.64	17.63	28.27	54.00	25.73	HORIZONTAL
5	7213.01	31.07	28.02	59.09	74.00	14.91	HORIZONTAL
6	7213.01	14.17	28.02	42.19	54.00	11.81	HORIZONTAL

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

BLE (MID) mode

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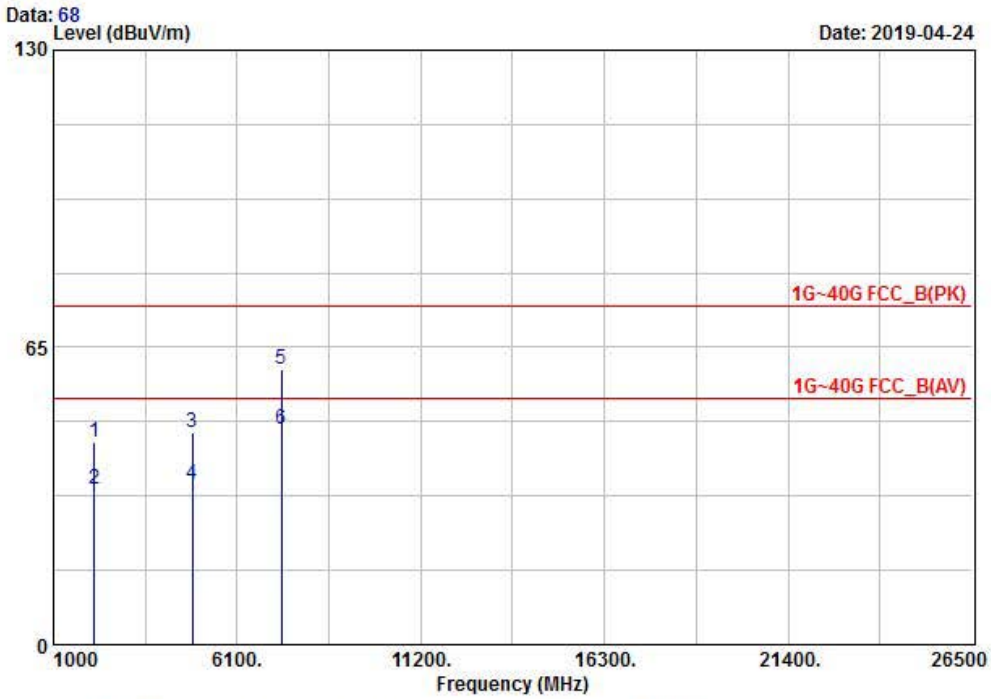
EUT/Model No.: PT400TWR Test Mode: wireless (BLE)_M

Tested by : Kwon H C Temp/Humi:



	Freq	Reading	C.F	Result PK	Limit	Margin	Polarity
	MHz	dBuV	dB	dBuV/m	dBuV/m	dB	
1	2134.89	42.03	2.21	44.24	74.00	29.76	HORIZONTAL
2	2134.89	31.72	2.21	33.93	54.00	20.07	HORIZONTAL
3	4848.43	28.31	17.96	46.27	74.00	27.73	HORIZONTAL
4	4848.43	17.22	17.96	35.18	54.00	18.82	HORIZONTAL
5	7327.02	30.27	29.85	60.12	74.00	13.88	HORIZONTAL
6	7327.02	17.32	29.85	47.17	54.00	6.83	HORIZONTAL

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

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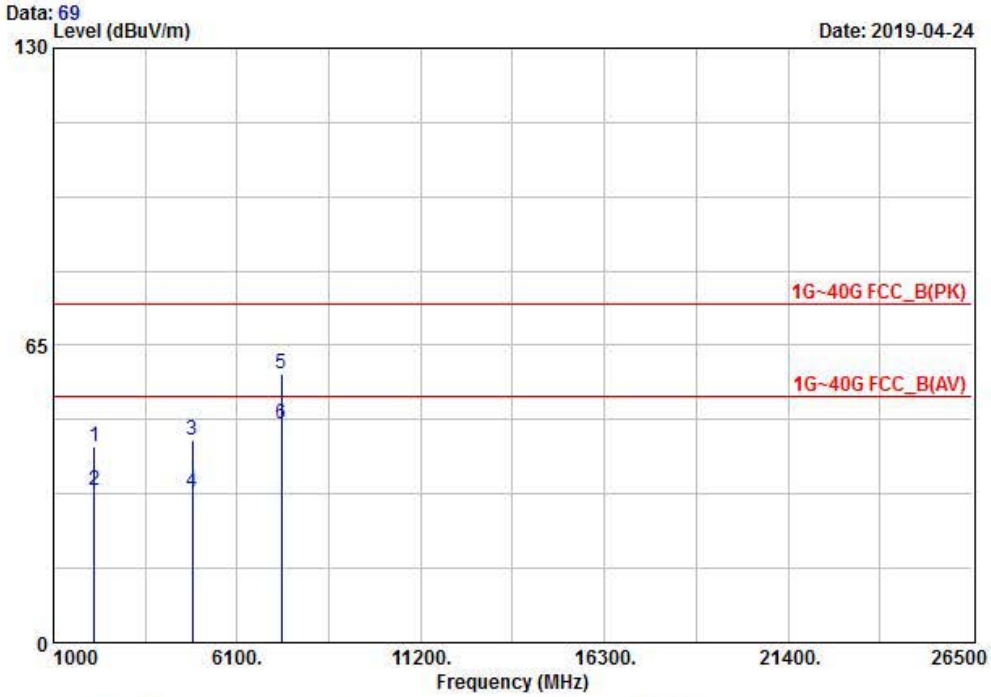
EUT/Model No.: PT400TWR Test Mode: wireless (BLE)_M
Tested by : Kwon H C Temp/Humi:



	Freq	Reading	C.F	Result PK	Limit	Margin	Polarity
	MHz	dBuV	dB	dBuV/m	dBuV/m	dB	
1	2134.88	40.68	2.21	42.89	74.00	31.11	VERTICAL
2	2134.88	31.02	2.21	33.23	54.00	20.77	VERTICAL
3	4848.43	26.38	17.96	44.34	74.00	29.66	VERTICAL
4	4848.43	14.95	17.96	32.91	54.00	21.09	VERTICAL
5	7327.03	28.95	29.85	58.80	74.00	15.20	VERTICAL
6	7327.03	17.83	29.85	47.68	54.00	6.32	VERTICAL

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

BLE (HIGH) mode

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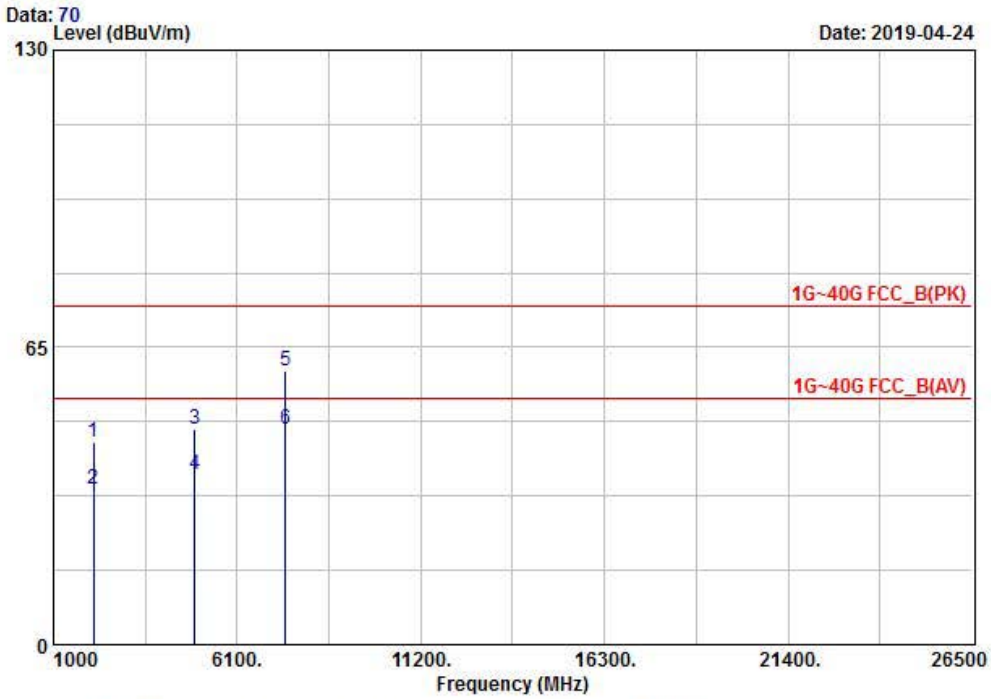
EUT/Model No.: PT400TWR Test Mode: wireless (BLE)_H
Tested by : Kwon H C Temp/Humi:



	Freq	Reading	C.F	Result PK	Limit	Margin	Polarity
	MHz	dBuV	dB	dBuV/m	dBuV/m	dB	
1	2104.89	42.17	2.13	44.30	74.00	29.70	HORIZONTAL
2	2104.89	31.93	2.13	34.06	54.00	19.94	HORIZONTAL
3	4924.31	29.03	18.04	47.07	74.00	26.93	HORIZONTAL
4	4924.31	19.01	18.04	37.05	54.00	16.95	HORIZONTAL
5	7442.23	28.71	31.18	59.89	74.00	14.11	HORIZONTAL
6	7442.23	15.89	31.18	47.07	54.00	6.93	HORIZONTAL

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

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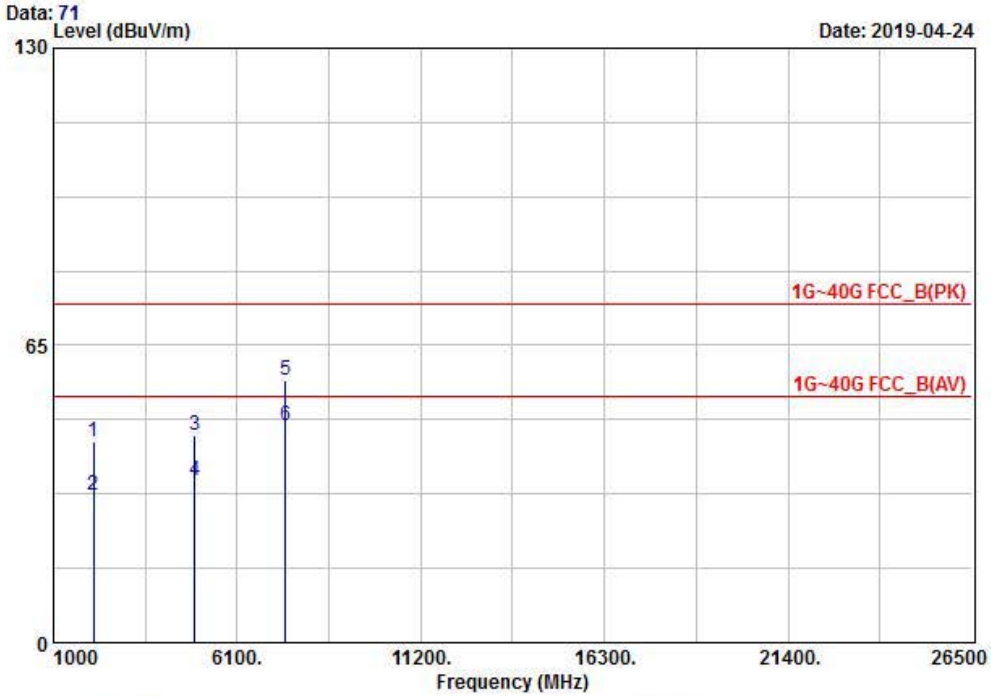
EUT/Model No.: PT400TWR Test Mode: wireless (BLE)_H

Tested by : Kwon H C Temp/Humi:



	Freq	Reading	C.F	Result PK	Limit	Margin	Polarity
	MHz	dBuV	dB	dBuV/m	dBuV/m	dB	
1	2104.88	41.89	2.13	44.02	74.00	29.98	VERTICAL
2	2104.88	30.12	2.13	32.25	54.00	21.75	VERTICAL
3	4924.31	27.35	18.04	45.39	74.00	28.61	VERTICAL
4	4924.31	17.42	18.04	35.46	54.00	18.54	VERTICAL
5	7442.23	26.35	31.18	57.53	74.00	16.47	VERTICAL
6	7442.23	16.42	31.18	47.60	54.00	6.40	VERTICAL

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

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

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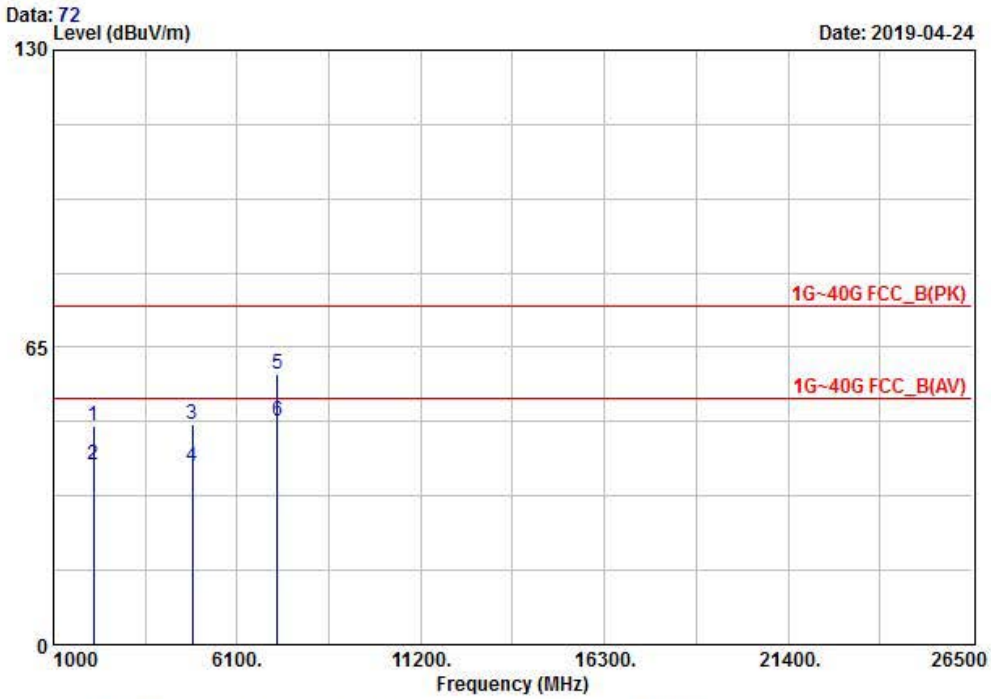
EUT/Model No.: PT400TWR Test Mode: wireless (Zigbee)_L
Tested by : Kwon H C Temp/Humi:



	Freq	Reading	C.F	Result PK	Limit	Margin	Polarity
	MHz	dBuV	dB	dBuV/m	dBuV/m	dB	
1	2105.73	45.73	2.13	47.86	74.00	26.14	HORIZONTAL
2	2105.73	37.12	2.13	39.25	54.00	14.75	HORIZONTAL
3	4848.07	30.22	17.95	48.17	74.00	25.83	HORIZONTAL
4	4848.07	21.00	17.95	38.95	54.00	15.05	HORIZONTAL
5	7212.04	31.04	28.00	59.04	74.00	14.96	HORIZONTAL
6	7212.04	20.95	28.00	48.95	54.00	5.05	HORIZONTAL

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

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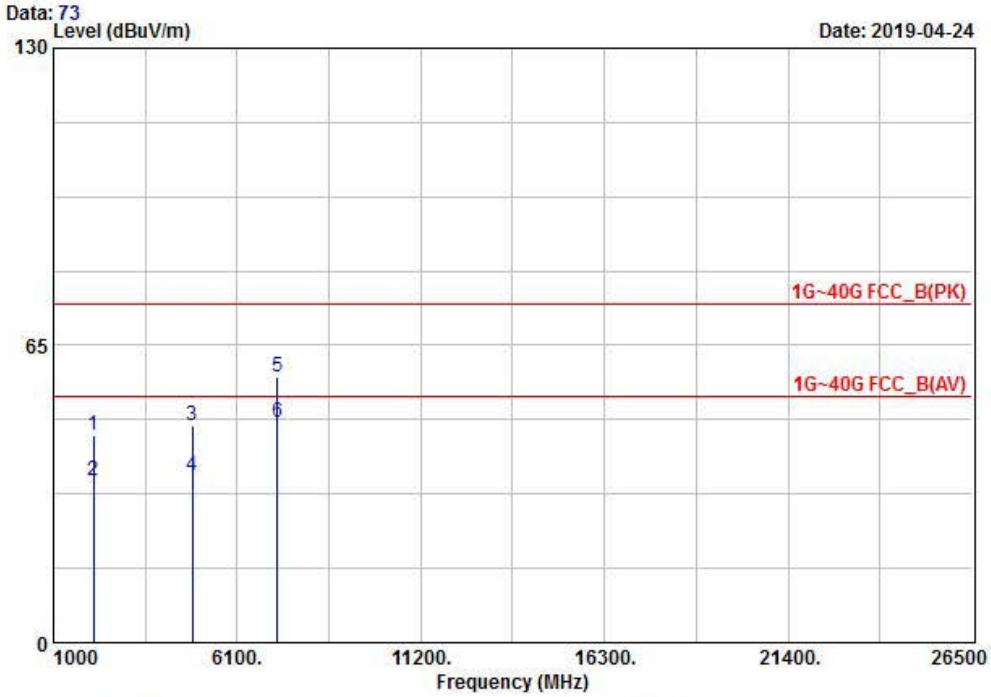
EUT/Model No.: PT400TWR Test Mode: wireless (Zigbee)_L

Tested by : Kwon H C Temp/Humi:



	Freq	Reading	C.F	Result PK	Limit	Margin	Polarity
	MHz	dBuV	dB	dBuV/m	dBuV/m	dB	
1	2105.73	43.12	2.13	45.25	74.00	28.75	VERTICAL
2	2105.73	33.20	2.13	35.33	54.00	18.67	VERTICAL
3	4848.06	29.34	17.95	47.29	74.00	26.71	VERTICAL
4	4848.06	18.67	17.95	36.62	54.00	17.38	VERTICAL
5	7212.04	29.95	28.00	57.95	74.00	16.05	VERTICAL
6	7212.04	20.02	28.00	48.02	54.00	5.98	VERTICAL

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

Zigbee (MID) mode

LTA
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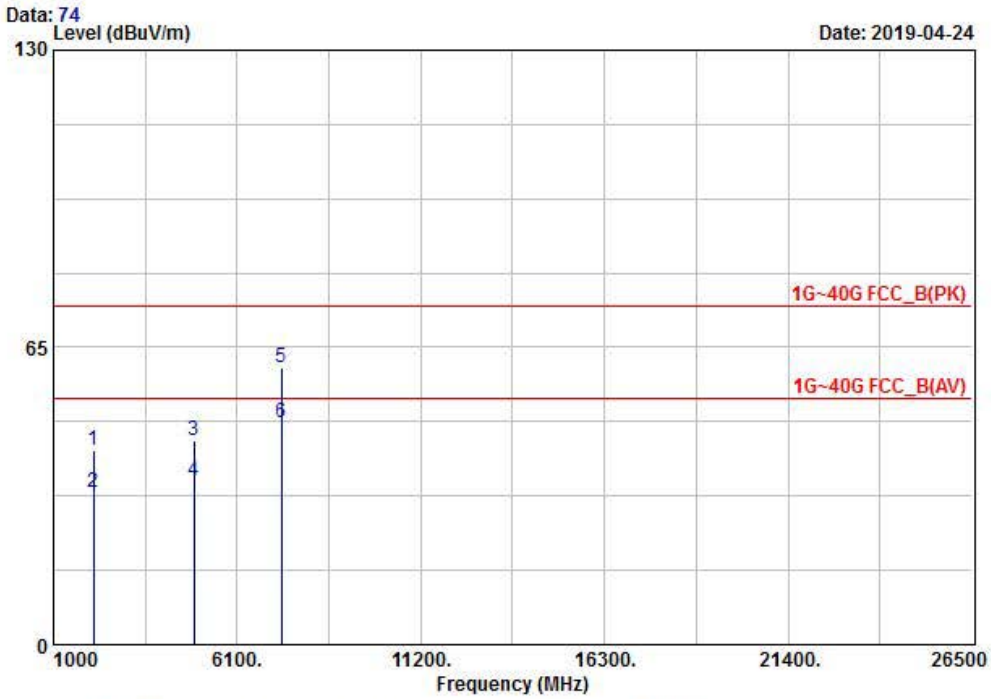
EUT/Model No.: PT400TWR Test Mode: wireless (Zigbee)_M
Tested by : Kwon H C Temp/Humi:



	Freq	Reading	C.F	Result PK	Limit	Margin	Polarity
	MHz	dBuV	dB	dBuV/m	dBuV/m	dB	
1	2107.77	40.30	2.14	42.44	74.00	31.56	HORIZONTAL
2	2107.77	31.00	2.14	33.14	54.00	20.86	HORIZONTAL
3	4902.24	26.52	18.07	44.59	74.00	29.41	HORIZONTAL
4	4902.24	17.63	18.07	35.70	54.00	18.30	HORIZONTAL
5	7327.11	30.89	29.85	60.74	74.00	13.26	HORIZONTAL
6	7327.11	18.63	29.85	48.48	54.00	5.52	HORIZONTAL

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

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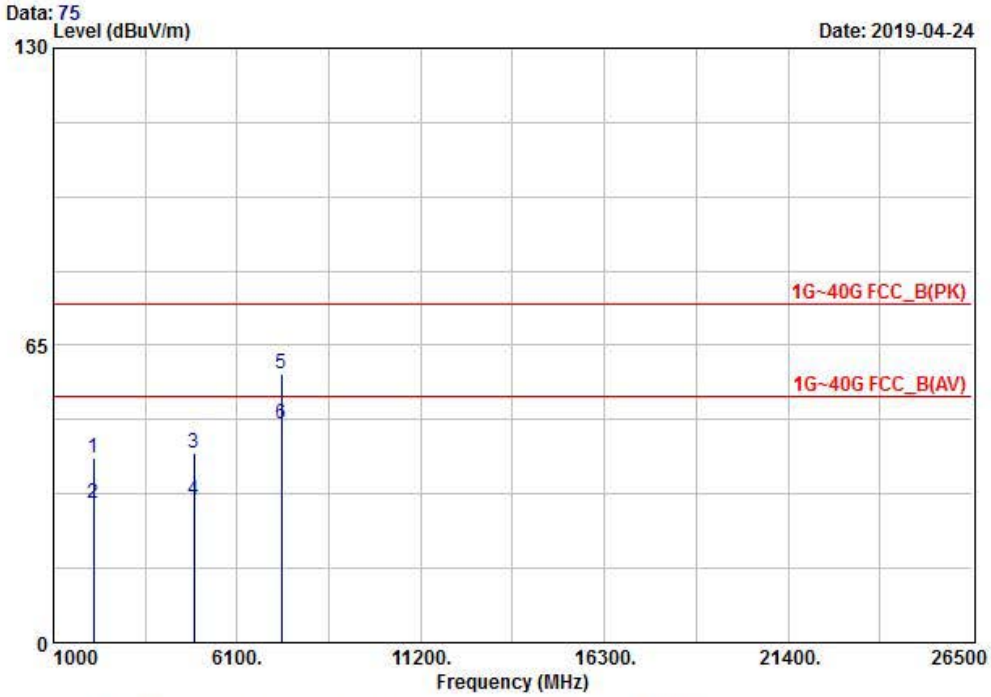
EUT/Model No.: PT400TWR Test Mode: wireless (Zigbee)_M
Tested by : Kwon H C Temp/Humi:



	Freq	Reading	C.F	Result PK	Limit	Margin	Polarity
	MHz	dBuV	dB	dBuV/m	dBuV/m	dB	
1	2107.78	38.25	2.14	40.39	74.00	33.61	VERTICAL
2	2107.78	28.28	2.14	30.42	54.00	23.58	VERTICAL
3	4902.06	23.41	18.07	41.48	74.00	32.52	VERTICAL
4	4902.06	12.99	18.07	31.06	54.00	22.94	VERTICAL
5	7327.13	28.82	29.85	58.67	74.00	15.33	VERTICAL
6	7327.13	18.12	29.85	47.97	54.00	6.03	VERTICAL

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

Zigbee (HIGH) mode

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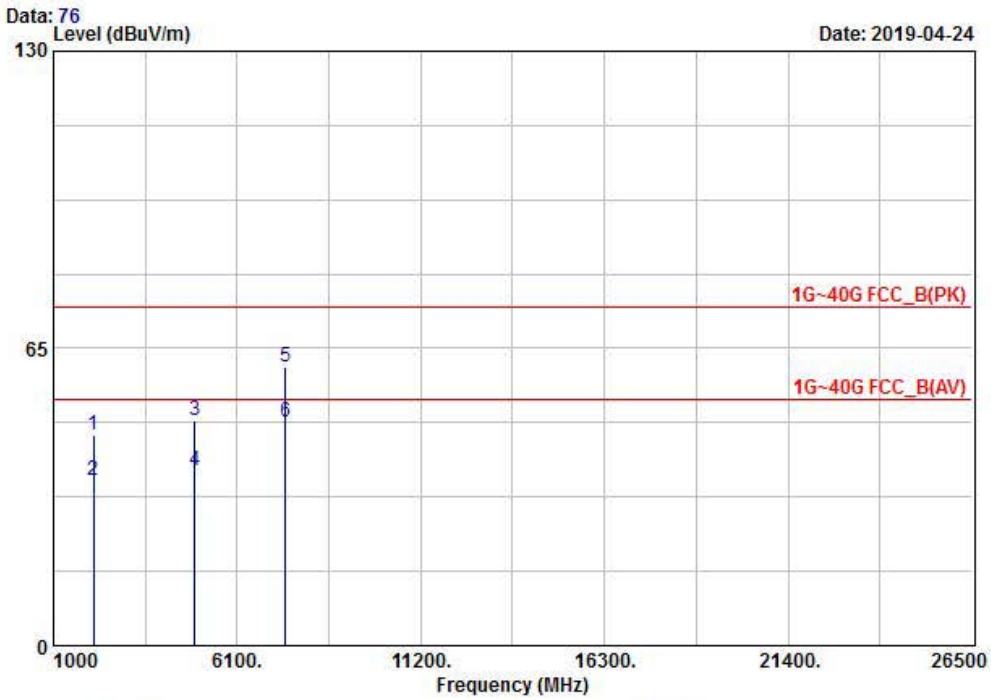
EUT/Model No.: PT400TWR Test Mode: wireless (Zigbee)_H

Tested by : Kwon H C Temp/Humi:



	Freq	Reading	C.F	Result PK	Limit	Margin	Polarity
	MHz	dBuV	dB	dBuV/m	dBuV/m	dB	
1	2110.12	44.02	2.14	46.16	74.00	27.84	HORIZONTAL
2	2110.12	33.89	2.14	36.03	54.00	17.97	HORIZONTAL
3	4924.07	31.04	18.04	49.08	74.00	24.92	HORIZONTAL
4	4924.07	20.12	18.04	38.16	54.00	15.84	HORIZONTAL
5	7442.30	29.83	31.18	61.01	74.00	12.99	HORIZONTAL
6	7442.30	17.53	31.18	48.71	54.00	5.29	HORIZONTAL

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

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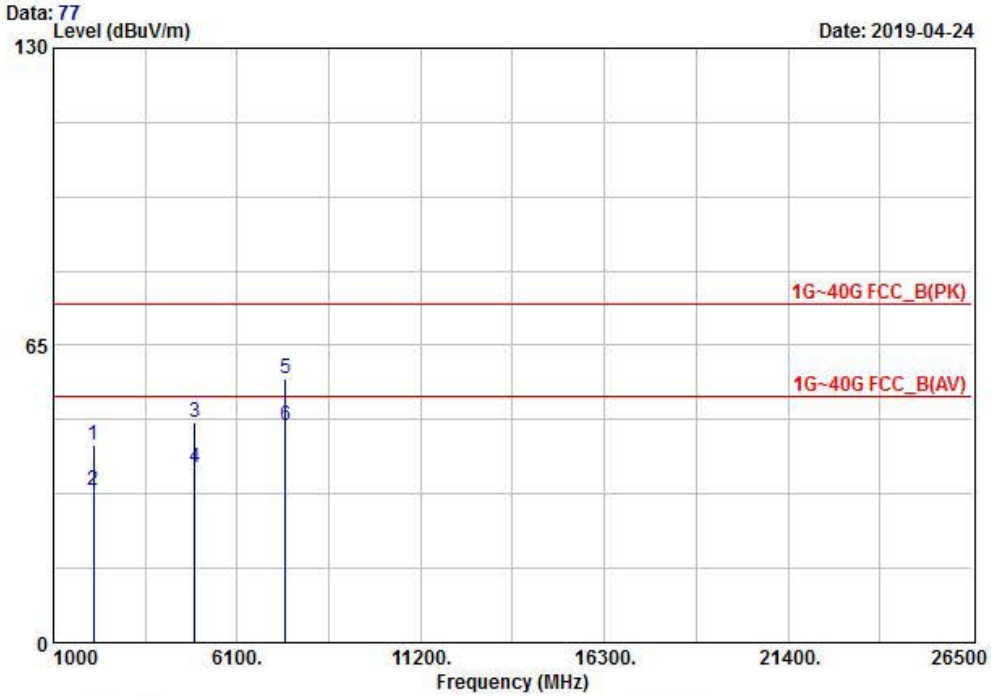
EUT/Model No.: PT400TWR Test Mode: wireless (Zigbee)_H

Tested by : Kwon H C Temp/Humi:



	Freq	Reading	C.F	Result PK	Limit	Margin	Polarity
	MHz	dBuV	dB	dBuV/m	dBuV/m	dB	
1	2110.14	41.00	2.14	43.14	74.00	30.86	VERTICAL
2	2110.14	30.98	2.14	33.12	54.00	20.88	VERTICAL
3	4924.06	30.23	18.04	48.27	74.00	25.73	VERTICAL
4	4924.06	20.17	18.04	38.21	54.00	15.79	VERTICAL
5	7442.33	26.43	31.18	57.61	74.00	16.39	VERTICAL
6	7442.33	16.31	31.18	47.49	54.00	6.51	VERTICAL

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

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	2018-08-04
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	2019-03-16
12		DC Power Supply	6674A	3637A01657	Agilent	-	-
13	■	Power Meter	EPM-441A	GB32481702	HP	1 year	2019-03-16
14	■	Power Sensor	8481A	3318A94972	HP	1 year	2018-09-06
15		Audio Analyzer	8903B	3729A18901	HP	1 year	2018-09-06
16		Modulation Analyzer	8901B	3749A05878	HP	1 year	2018-09-06
17		TEMP & HUMIDITY Chamber	YJ-500	LTAS06041	JinYoung Tech	1 year	2018-09-06
18		Stop Watch	HS-3	812Q08R	CASIO	2 year	2018-03-21
19	■	LISN	KNW-407	8-1430-1	Kyoritsu	1 year	2018-09-06
20		Two-Lime V-Network	ESH3-Z5	893045/017	R&S	1 year	2019-03-16
21		Highpass Filter	WHKX1.5/15G-10SS	74	Wainwright Instruments	1 year	2019-03-16
22		Highpass Filter	WHKX3.0/18G-10SS	118	Wainwright Instruments	1 year	2019-03-16
23		OSP120 BASE UNIT	OSP120	101230	R&S	1 year	2019-03-16
24	■	Signal Generator(100 kHz ~ 40 GHz)	SMB100A	177621	R&S	1 year	2019-03-16
25		Vector Signal Generator(9kHz ~ 6 GHz)	SMBV100A	255081	R&S	1 year	2019-03-16
26		Signal Analyzer (10 Hz ~ 40 GHz)	FSV40	101367	R&S	1 year	2019-03-16
27	■	RF Cable	SUCOFLEX	-	Huber+suhner	-	-