

FCC - TEST REPORT

Report Number : **68.930.18.0040.01** Date of Issue: February 02, 2019

Model : **MD4300**

Product Type : Digital Automatic Wrist Blood Pressure Monitor

Applicant : Grandway Technology (Shenzhen) Limited

Address : No. 5, the Second Industrial Zone, Zhukeng Community, Longtian
Street, Pingshan District, 518118 Shenzhen, China

Production Facility : Grandway Technology (Shenzhen) Limited

Address : No. 5, the Second Industrial Zone, Zhukeng Community, Longtian
Street, Pingshan District, 518118 Shenzhen, China

Test Result : **Positive** **Negative**

Total pages including Appendices : 27

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2 Details about the Test Laboratory

Details about the Test Laboratory

Test Site 1

Company name: TÜV SÜD Certification and Testing (China) Co., Ltd. Shenzhen Branch
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Nantou Checkpoint Road 2, Nanshan District,
Shenzhen City, 518052,
P. R. China

FCC Registration Number: 514049

Telephone: 86 755 8828 6998
Fax: 86 755 8828 5299

3 Description of the Equipment under Test

Product:	Digital Automatic Wrist Blood Pressure Monitor
Model no.:	MD4300
FCC ID:	2ABAFMD4300A
Rating:	3VDC (supplied by 2x1.5V AAA batteries)
RF Transmission Frequency:	2402MHz-2480MHz
No. of Operated Channel:	40
Modulation:	GFSK
Antenna Type:	Integrated Antenna
Antenna Gain:	0dBi max for 2.4GHz
Description of the EUT:	The Equipment Under Test (EUT) is a Digital Automatic Wrist Blood Pressure Monitor supports 2.4GHz Bluetooth functions.

4 Summary of Test Standards

Test Standards	
FCC Part 15 Subpart C 10-1-2017 Edition	PART 15 - RADIO FREQUENCY DEVICES Subpart C - Intentional Radiators

All the test methods were according to KDB558074 D01 15.247 Meas Guidance v05 and ANSI C63.10 (2013).

5 Summary of Test Results

Technical Requirements				
FCC Part 15 Subpart C				
Test Condition		Pages	Test Result	Test Site
§15.207	Conducted emission AC power port *	--	N/A	--
§15.247(b)(1)	Conducted PEAK output power for FHSS	--	N/A	--
§15.247(b)(3)	Conducted PEAK output power for DTS	13	Pass	Site 1
§15.247(e)	Power spectral density	20	Pass	Site 1
§15.247(a)(2)	6dB bandwidth	16	Pass	Site 1
§15.247(a)(1)	20dB Occupied bandwidth	--	N/A	--
§15.247(a)(1)	Carrier frequency separation	--	N/A	--
§15.247(a)(1)(iii)	Number of hopping frequencies	--	N/A	--
§15.247(a)(1)(iii)	Dwell Time	--	N/A	--
§15.247(d)	Spurious RF conducted emissions	22	Pass	Site 1
§15.247(d)	Band edge	25	Pass	Site 1
§15.247(d) & §15.209 & §15.205	Spurious radiated emissions for transmitter	27	Pass	Site 1
§15.203	Antenna requirement	See note 1	Pass	--

Remark “**”: EUT isn’t designed to be connected to the public utility (AC) power line, therefore this test is not applicable.

Remark 1: N/A – Not Applicable.

Note 1: The EUT uses an Integrated Antenna 0dBi max. According to §15.203, it is considered sufficiently to comply with the provisions of this section.



6 General Remarks

Remarks

This submittal(s) (test report) is intended for FCC ID: 2ABAFMD4300A complies with Section 15.207, 15.209, 15.205, 15.247 of the FCC Part 15, Subpart C.

SUMMARY:

All tests according to the regulations cited on page 5 were

■ - Performed

□ - **Not** Performed

The Equipment under Test

■ - **Fulfills** the general approval requirements.

□ - **Does not** fulfill the general approval requirements.

Sample Received Date: October 29, 2018

Testing Start Date: October 29, 2018

Testing End Date: November 26, 2018

- TÜV SÜD Certification and Testing (China) Co., Ltd. Shenzhen Branch -

Reviewed by:

Prepared by:

Tested by:

Trevor You



Nick Huang

Louise Liu

Trevor You
EMC Project Manager

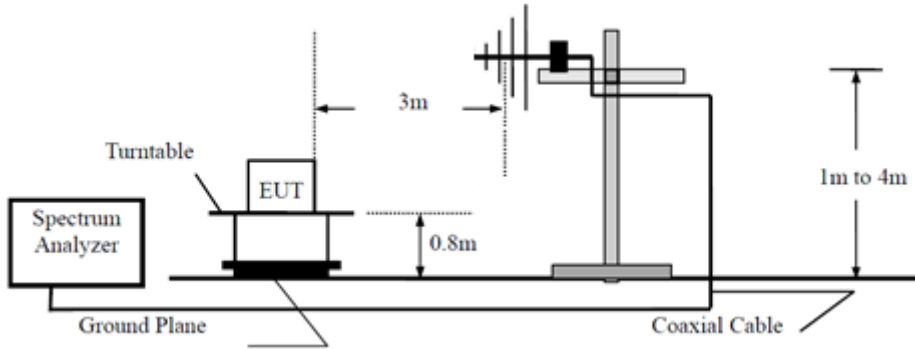
Nick Huang
EMC Project Engineer

Louise Liu
EMC Test Engineer

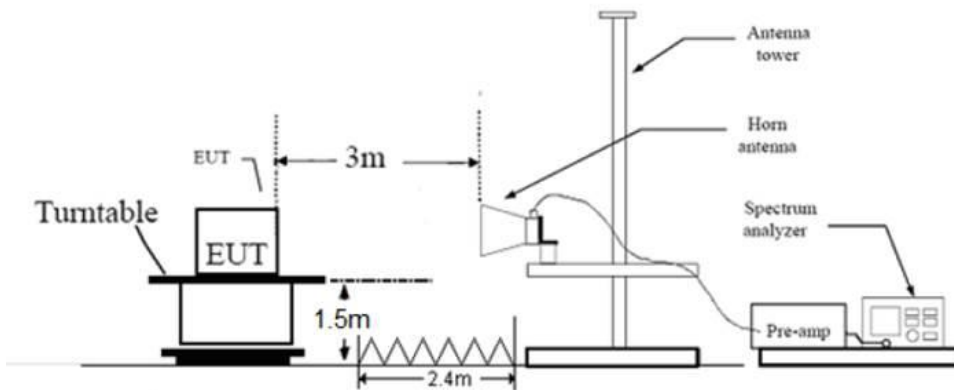
7 Test Setups

7.1 Radiated test setups

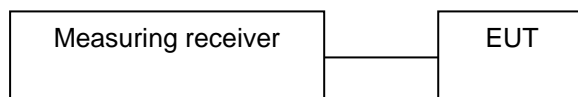
Below 1GHz



Above 1GHz



7.2 Conducted RF test setups



8 Systems test configuration

Auxiliary Equipment Used during Test:

DESCRIPTION	MANUFACTURER	MODEL NO.	S/N
Blood Pressure Simulator	Fluke	BP P UMP 2	3157014
---	---	---	---
---	---	---	---

Test software information:

Test Software Version	SmartRF Studio 7	
Modulation	Setting TX Power	Packet Type
GFSK	/	/

The system was configured to channel 0, 19, and 39 for the test.

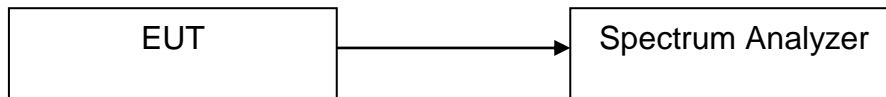
9 Technical Requirement

9.1 Conducted PEAK output power

Test Method

1. Use the following spectrum analyzer settings:
 RBW > the 6dB bandwidth of the emission being measured, VBW ≥ 3RBW, Span ≥ 3RBW
 Sweep = auto, Detector function = peak, Trace = max hold.
2. Add a correction factor to the display.
3. Allow the trace to stabilize. Use the marker-to-peak function to set the marker to the peak of the emission. The indicated level is the peak output power.

Test Setup



Limits

According to §15.247 (b) (3), conducted PEAK output power limit as below:

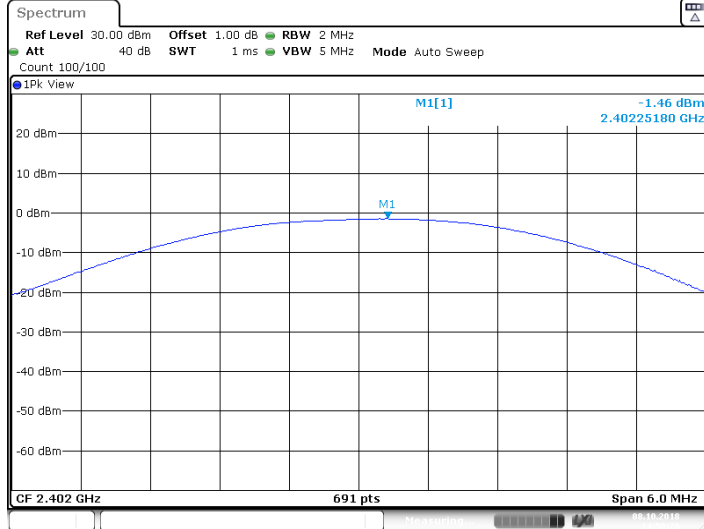
Frequency Range MHz	Limit (Output Power) W	Limit (Output Power) dBm
2400-2483.5	≤1	≤30

Test result as below table

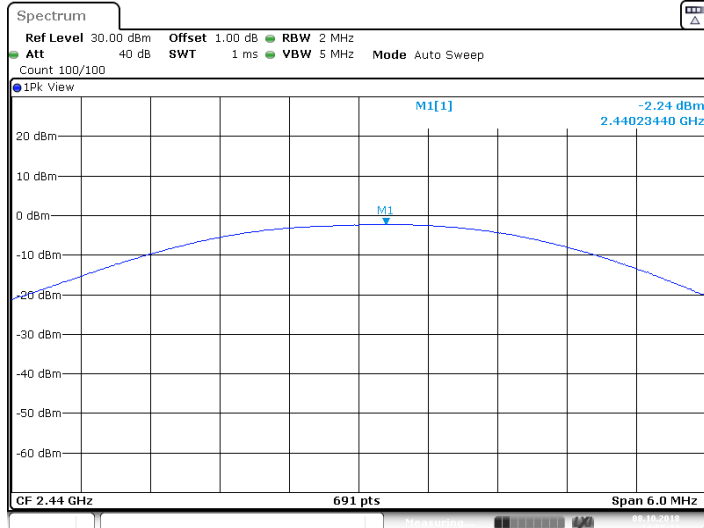
Frequency MHz	Conducted PEAK Output Power dBm	Result
Top channel 2402MHz	-1.46	Pass
Middle channel 2440MHz	-2.24	Pass
Bottom channel 2480MHz	-2.61	Pass

Test Graphs

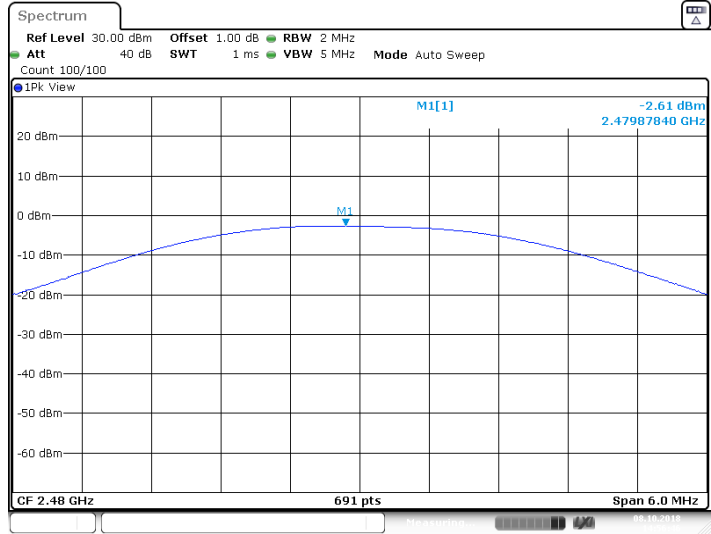
BLE_Ant1_2402



BLE_Ant1_2440



BLE_Ant1_2480



9.2 6dB bandwidth

Test Method

1. Use the following spectrum analyzer settings:
RBW=100K, VBW≥3RBW, Sweep = auto, Detector function = peak, Trace = max hold
2. Use the automatic bandwidth measurement capability of an instrument, may be employed using the X dB bandwidth mode with X set to 6 dB, care shall be taken so that the bandwidth measurement is not influenced by any intermediate power nulls in the fundamental emission that might be ≥ 6 dB.
3. Allow the trace to stabilize, record the X dB Bandwidth value.

Limit

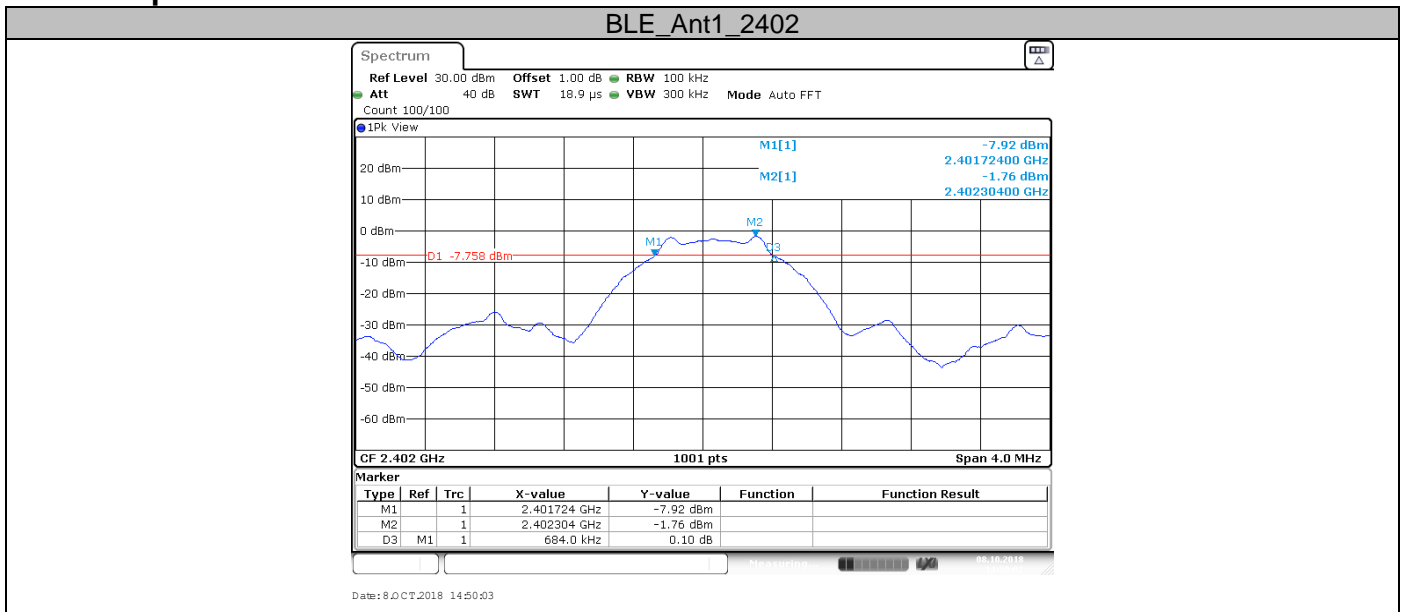
Limit [kHz]

≥500

Test result

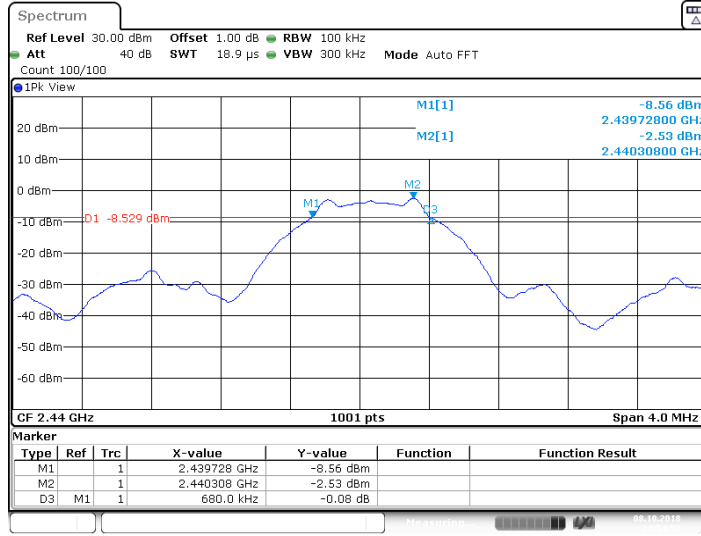
Test Mode	Channel (MHz)	Result (MHz)	Limit (KHz)	Verdict
BLE	2402	0.684	≥500	PASS
BLE	2440	0.680	≥500	PASS
BLE	2480	0.688	≥500	PASS

Test Graphs



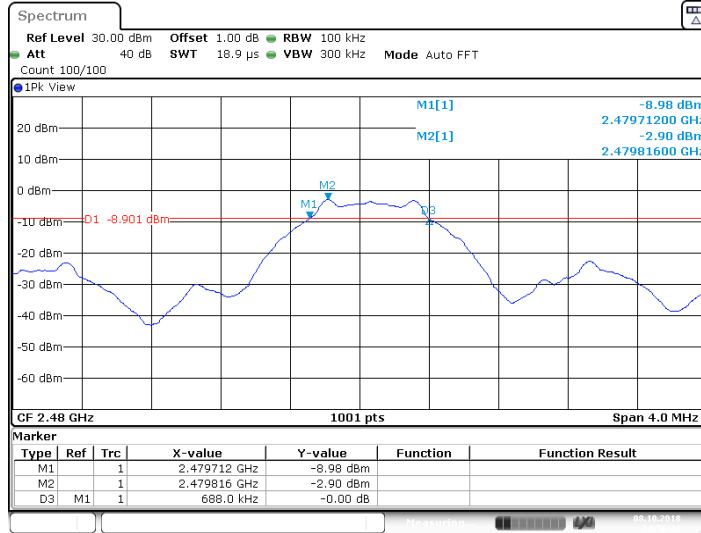


BLE_Ant1_2440



Date: 8.OCT.2018 14:54:54

BLE_Ant1_2480



Date: 8.OCT.2018 14:56:28

9.3 Power spectral density

Test Method

This procedure shall be used if maximum peak conducted output power was used to demonstrate compliance:

1. Set analyzer center frequency to DTS channel center frequency.
 RBW=100kHz,VBW≥3RBW,Span=1.5 times DTS bandwidth, Detector=Peak, Sweep=auto, Trace= max hold.
2. Allow trace to fully stabilize, use the peak marker function to determine the maximum amplitude level within the RBW.
3. Repeat above procedures until other frequencies measured were completed.

Limit

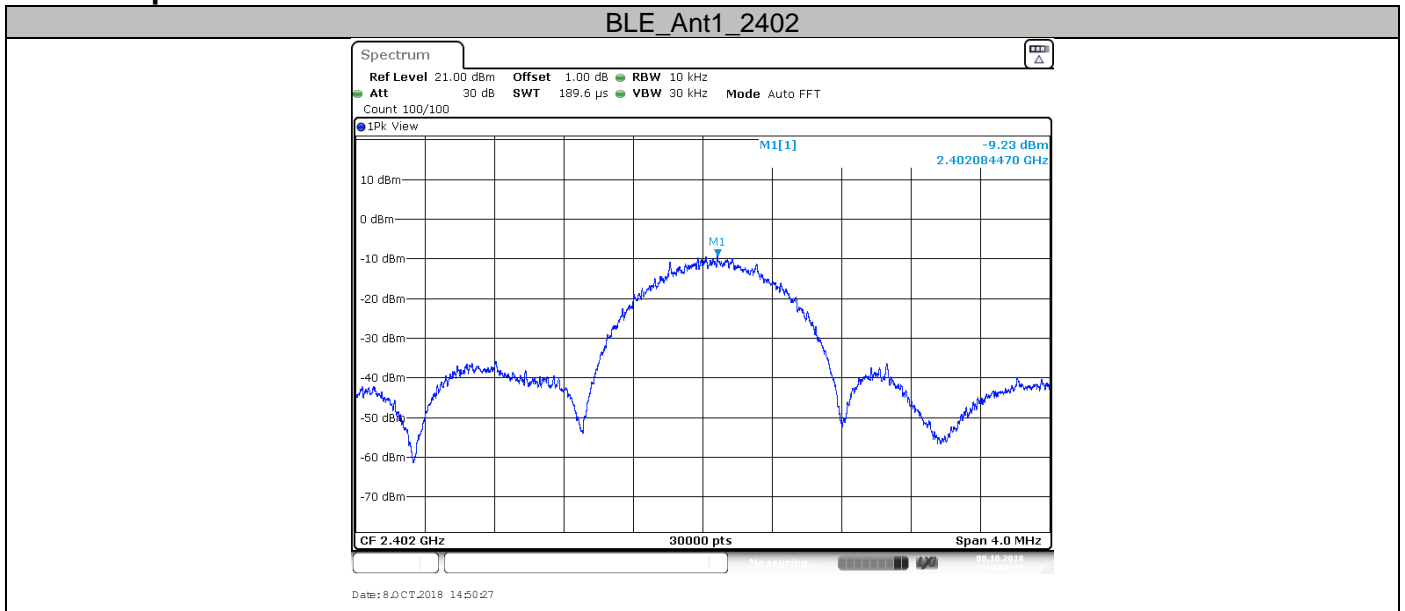
Limit [dBm]

≤8

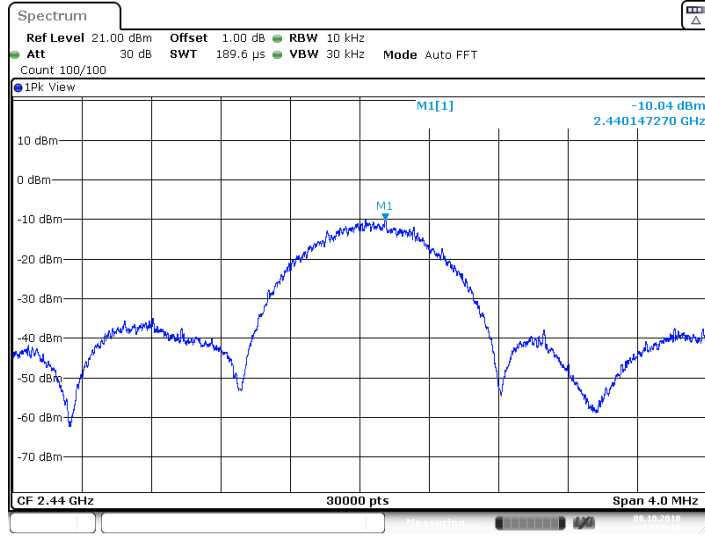
Test result

Test Mode	Channel (MHz)	Result (dBm)	Limit	Verdict
BLE	2402	-9.23	8	PASS
BLE	2440	-10.04	8	PASS
BLE	2480	-10.48	8	PASS

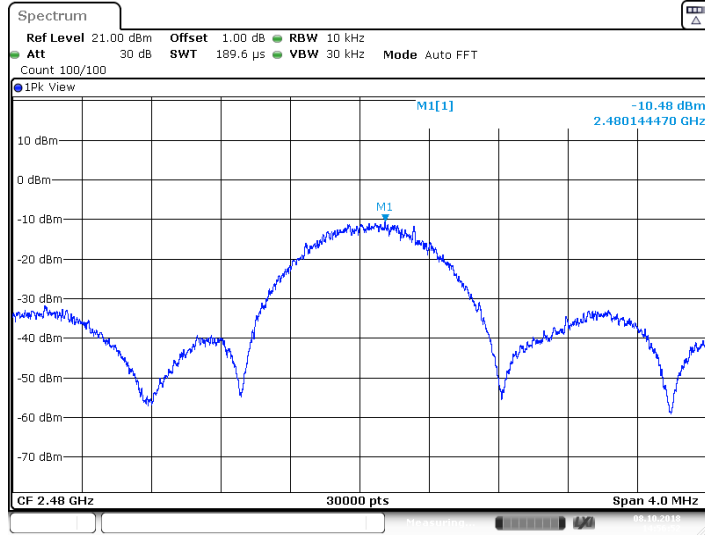
Test Graphs



BLE_Ant1_2440



BLE_Ant1_2480



9.4 Spurious RF conducted emissions

Test Method

1. Establish a reference level by using the following procedure:
 - a. Set RBW=100 kHz. VBW \geq 3RBW. Detector =peak, Sweep time = auto couple, Trace mode = max hold.
 - b. Allow trace to fully stabilize, use the peak marker function to determine the maximum PSD level.
2. Use the maximum PSD level to establish the reference level.
 - a. Set the center frequency and span to encompass frequency range to be measured.
 - b. Use the peak marker function to determine the maximum amplitude level. Ensure that the amplitude of all unwanted emissions outside of the authorized frequency band (excluding restricted frequency bands) are attenuated by at least the minimum requirements, report the three highest emissions relative to the limit.
3. Repeat above procedures until other frequencies measured were completed.

Limit

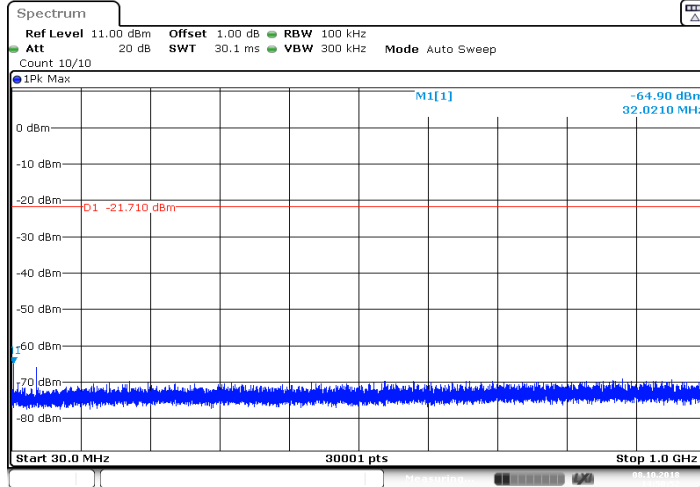
Frequency Range MHz	Limit (dBc)
30-25000	-20

Test Result

Test Mode	Channel (MHz)	Freq Range (MHz)	Result (dBm)	Limit (dBm)	Verdict
BLE	2402	30~1000	-64.90	-21.71	PASS
BLE	2402	1000~26500	-33.15	-21.71	PASS
BLE	2440	30~1000	-65.47	-22.71	PASS
BLE	2440	1000~26500	-36.07	-22.71	PASS
BLE	2480	30~1000	-64.92	-23.06	PASS
BLE	2480	1000~26500	-36.53	-23.06	PASS

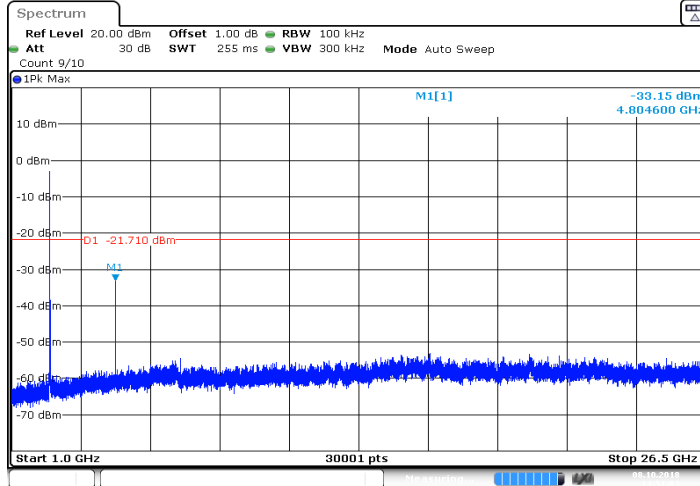
Test Graphs

BLE_Ant1_2402_30~1000_-1.71



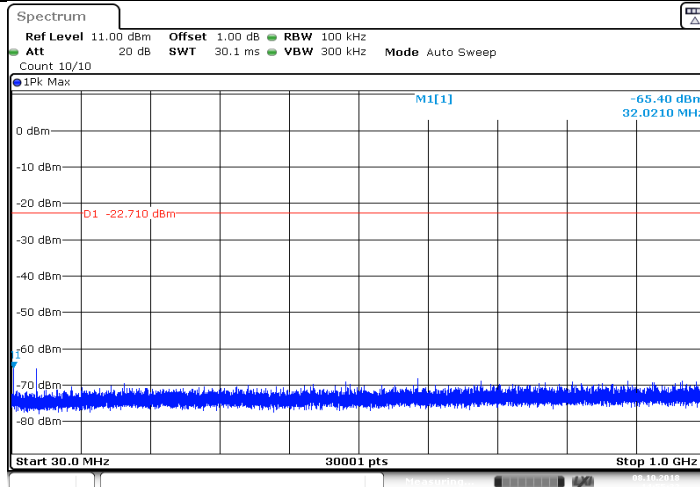
Date: 8.OCT.2018 14:50:52

BLE_Ant1_2402_1000~26500_-1.71



Date: 8.OCT.2018 14:51:04

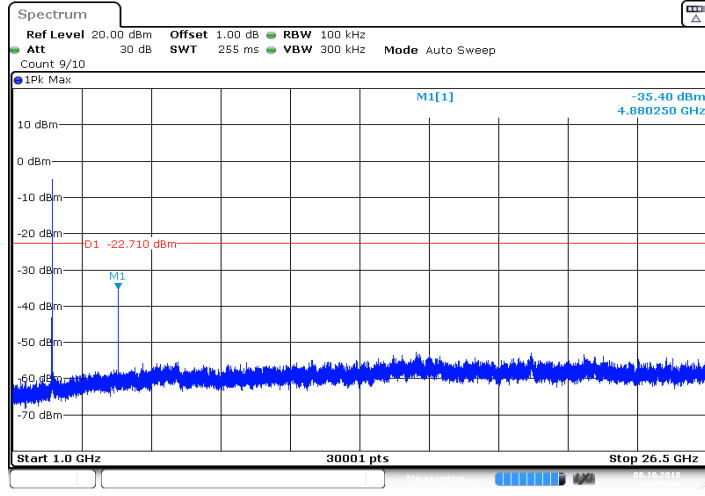
BLE_Ant1_2440_30~1000_-2.71



Date: 8.OCT.2018 14:55:32

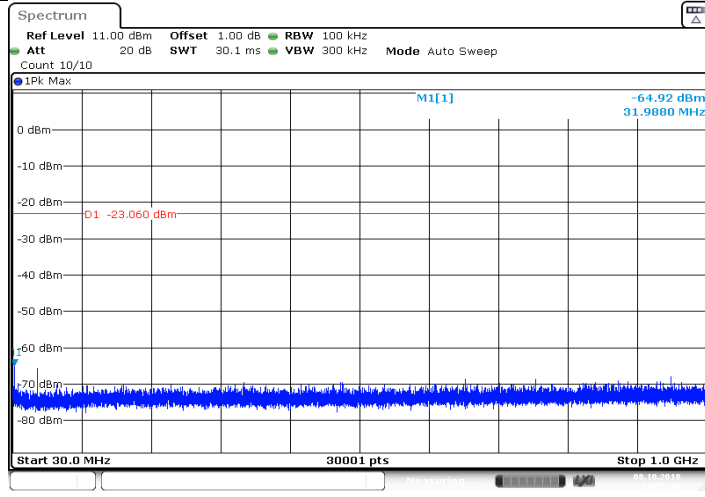


BLE_Ant1_2440_1000~26500_-2.71



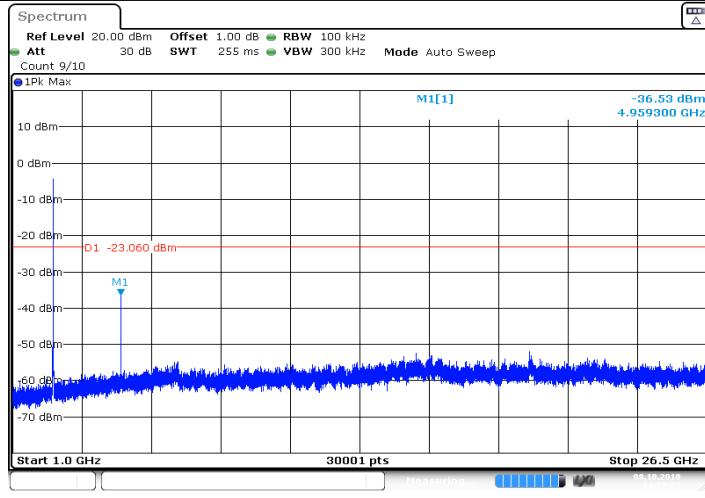
Date: 8.OCT.2018 14:55:44

BLE_Ant1_2480_30~1000_-3.06



Date: 8.OCT.2018 14:57:16

BLE_Ant1_2480_1000~26500_-3.06



Date: 8.OCT.2018 14:57:28

9.5 Band edge

Test Method

- 1 Use the following spectrum analyzer settings:
Span = wide enough to capture the peak level of the in-band emission and all spurious
RBW = 100 kHz, VBW \geq RBW, Sweep = auto, Detector function = peak, Trace = max hold.
- 2 Allow the trace to stabilize, use the peak and delta measurement to record the result.
- 3 The level displayed must comply with the limit specified in this Section.

Limit

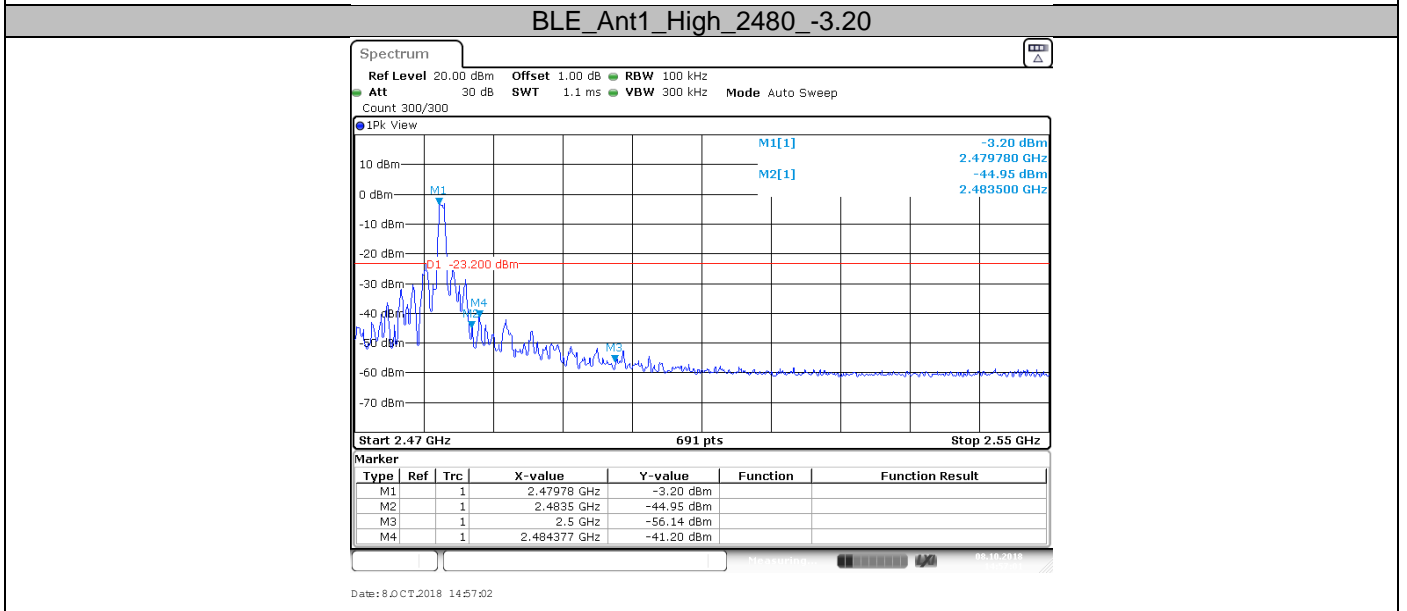
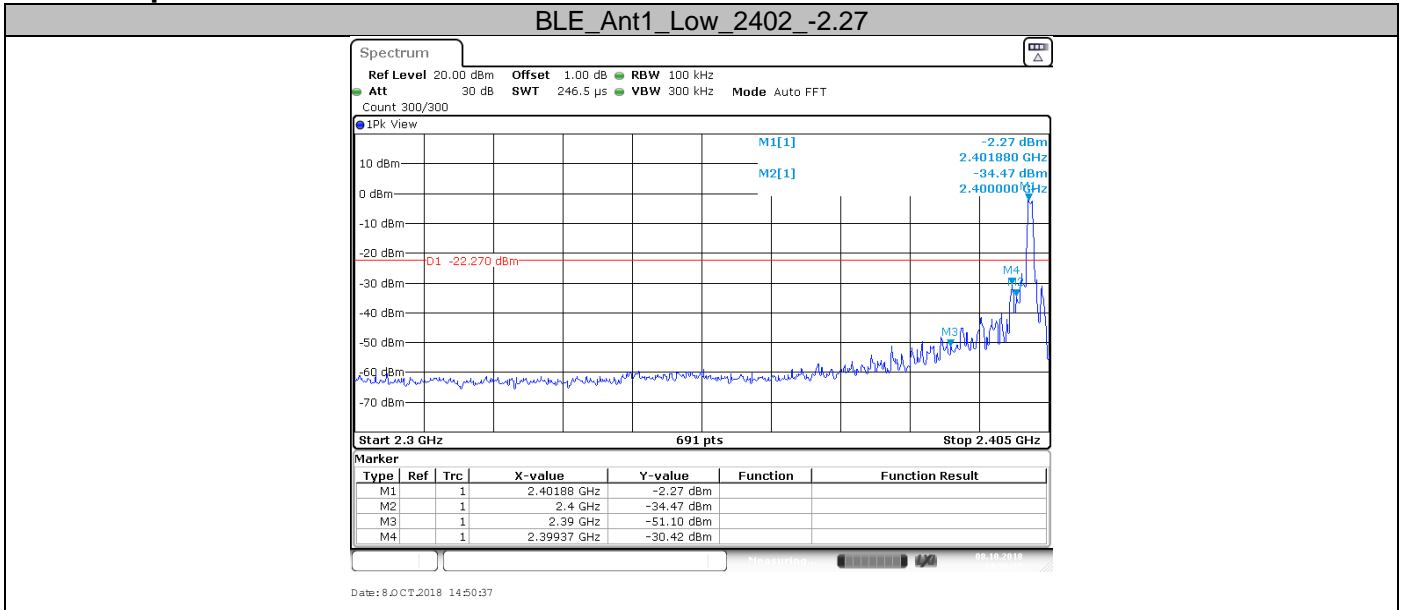
Frequency Range MHz	Limit (dBc)
30-25000	-20

Test result

Test Mode	Ch Name	Channel (MHz)	Result (dBm)	Limit	Verdict
BLE	Low	2402	-30.42	-22.27	PASS
BLE	High	2480	-41.20	-23.20	PASS



Test Graphs



9.6 Spurious radiated emissions for transmitter

Test Method

- 1: The EUT was placed on a turn table which is 1.5m above ground plane for above 1GHz and 0.8m above ground for below 1GHz at 3 meter chamber room for test. The table was rotated 360 degrees to determine the position of the highest radiation.
- 2: The EUT was set 3 meters away from the interference – receiving antenna, which was mounted on the top of a variable – height antenna tower.
- 3: The height of antenna is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- 4: For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- 5: Use the following spectrum analyzer settings According to C63.10:
For Above 1GHz
Span = wide enough to capture the peak level of the in-band emission and all spurious
RBW = 1MHz, VBW \geq RBW for peak measurement and VBW = 10Hz for average measurement, Sweep = auto, Detector function = peak, Trace = max hold.
For Below 1GHz
Use the following spectrum analyzer settings:
Span = wide enough to capture the peak level of the in-band emission and all spurious
RBW = 100 KHz, VBW \geq RBW for peak measurement, Sweep = auto, Detector function = peak, Trace = max hold.

Note:

- 1: The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 KHz for Quasi-peak detection (QP) at frequency below 1GHz.
- 2: The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is 3MHz for peak detection (PK) at frequency above 1GHz.
- 3: The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is 3MHz for RMS Average ((duty cycle < 98%) for Average detection (AV) at frequency above 1GHz, then the measurement results was added to a correction factor ($20\log(1/\text{duty cycle})$).
- 4: The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is 10Hz (duty cycle > 98%) for Average detection (AV) at frequency above 1GHz.

Limit

The radio emission outside the operating frequency band shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power. Radiated emissions which fall in the restricted bands, as defined in section 15.205, must comply with the radiated emission limits specified in section 15.209.

Frequency MHz	Field Strength uV/m	Field Strength dB μ V/m	Detector
30-88	100	40	QP
88-216	150	43.5	QP
216-960	200	46	QP
960-1000	500	54	QP
Above 1000	500	54	AV
Above 1000	5000	74	PK

Spurious radiated emissions for transmitter

According to C63.10, if the peak (or quasi-peak) measured value complies with the average limit, it is unnecessary to perform an average measurement, so AV emission value did not show in below table if the peak value complies with average limit.

Transmitting spurious emission test result as below:

2402MHz (30MHz – 1GHz)

Frequency MHz	Emission Level dBuV/m	Polarization	Limit dB μ V/m	Margin dB	Detector	Corr. dB	Result
856.329876	31.29	Horizontal	46.00	14.71	QP	-16.0	Pass
886.570897	31.43	Vertical	46.00	14.57	QP	-15.6	Pass

2402MHz (Above 1GHz)

Frequency MHz	Emission Level dBuV/m	Polarization	Limit dB μ V/m	Margin dB	Detector	Corr. dB/m	Result
4803.281250*	43.77	Horizontal	74.00	30.23	PK	3.7	Pass
4804.687500*	41.60	Vertical	74.00	32.40	PK	3.7	Pass

2440MHz (30MHz – 1GHz)

Frequency MHz	Emission Level dBuV/m	Polarization	Limit dB μ V/m	Margin dB	Detector	Corr. dB	Result
--	--	Horizontal	--	--	QP	--	Pass
--	--	Vertical	--	--	QP	--	Pass

2440MHz (Above 1GHz)

Frequency MHz	Emission Level dBuV/m	Polarization	Limit dB μ V/m	Margin dB	Detector	Corr. dB/m	Result
4879.687500*	44.95	Horizontal	74.00	29.05	PK	3.8	Pass
7652.343750*	41.33	Vertical	74.00	32.67	PK	9.4	Pass



2480MHz (30MHz – 1GHz)

Frequency MHz	Emission Level dBuV/m	Polarization	Limit dBµV/m	Margin dB	Detector	Corr. dB	Result
--	--	Horizontal	--	--	QP	--	Pass
--	--	Vertical	--	--	QP	--	Pass

2480MHz (Above 1GHz)

Frequency MHz	Emission Level dBuV/m	Polarization	Limit dBµV/m	Margin dB	Detector	Corr. dB/m	Result
12402.18750*	43.60	Horizontal	74.00	30.40	PK	14.2	Pass
11921.71875*	44.08	Vertical	74.00	29.92	PK	12.0	Pass

Remark:

- (1) "*" means the emission(s) appear within the restrict bands shall follow the requirement of section 15.205.
- (2) Data of measurement within this frequency range shown "--" in the table above means the reading of emissions are the noise floor or attenuated more than 10dB below the permissible limits or the field strength is too small to be measured.
- (3) Above 1GHz: Corrector factor = Antenna Factor + Cable Loss- Amplifier Gain.
- (4) Below 1GHz: Corrector factor = Antenna Factor + Cable Loss.

10 Test Equipment List

Radiated Emission Test

DESCRIPTION	MANUFACTURER	MODEL NO.	SERIAL NO.	CAL. DUE DATE
EMI Test Receiver	Rohde & Schwarz	ESR 26	101269	2019-7-6
Trilog Super Broadband Test Antenna	Schwarzbeck	VULB 9163	707	2019-6-28
Horn Antenna	Rohde & Schwarz	HF907	102294	2019-6-28
Pre-amplifier	Rohde & Schwarz	SCU 18	102230	2019-7-6
Signal Generator	Rohde & Schwarz	SMY01	839369/005	2019-7-6
Attenuator	Agilent	8491A	MY39264334	2019-7-6
3m Semi-anechoic chamber	TDK	9X6X6	----	2020-7-7
Test software	Rohde & Schwarz	EMC32	Version 9.15.00	N/A

Conducted RF Test

DESCRIPTION	MANUFACTURER	MODEL NO.	SERIAL NO.	CAL. DUE DATE
Signal Analyzer	Rohde & Schwarz	FSV40	101030	2019-7-6
Test software	Tonscend	System for BT/WIFI	Version 2.6	N/A



11 System Measurement Uncertainty

For a 95% confidence level, the measurement expanded uncertainties for defined systems, in accordance with the recommendations of ISO 17025 were:

System Measurement Uncertainty	
Items	Extended Uncertainty
Uncertainty for Radiated Spurious Emission 25MHz-3000MHz	Horizontal: 4.80dB; Vertical: 4.87dB;
Uncertainty for Radiated Spurious Emission 3000MHz-18000MHz	Horizontal: 4.59dB; Vertical: 4.58dB;
Uncertainty for Radiated Spurious Emission 18000MHz-40000MHz	Horizontal: 5.05dB; Vertical: 5.04dB;
Uncertainty for Conducted RF test with TS 8997	Power level test involved: 1.16dB Frequency test involved: 0.6×10^{-7}