

Produkte
Products

Prüfbericht - Nr.: 50074905 001		Seite 1 von 38 Page 1 of 38			
Test Report No.:					
Auftraggeber: CATEYE Co., Ltd. Client: 2-8-25, Kuwazu, Higashi-Sumiyoshi-Ku, Osaka, 546-0041 Japan					
Gegenstand der Prüfung: PADRONE DIGITAL Test Item:					
Bezeichnung: CC-PA400B Identification:		Serien-Nr.: Refer to section 4.3 Serial No.:			
Wareneingangs-Nr.: A000531445-001 to -005 Receipt No.:		Eingangsdatum: 2017-03-24 Date of Receipt:			
Zustand des Prüfgegenstandes bei Anlieferung: Good Condition of Test Item at Delivery:					
Prüfört: TÜV Rheinland Japan Ltd. – Global Technology Assessment Center Testing Location: 4-25-2 Kita-Yamata, Tsuzuki-ku, Yokohama 224-0021, Japan					
Prüfgrundlage: FCC 47 CFR Part 15, Subpart C, Section 15.249 (October 1, 2015) Test Specification: RSS-210 (Issue 9): 2016 RSS-Gen (Issue 4): 2014 ANSI C63.10-2013					
Prüfergebnis: Der Prüfgegenstand entspricht oben genannter Prüfgrundlage(n). Test Result: The test item passed the test specification(s).					
Prüflaboratorium: TÜV Rheinland Japan Ltd. – Global Technology Assessment Center Testing Laboratory: 4-25-2 Kita-Yamata, Tsuzuki-ku, Yokohama 224-0021, Japan					
geprüft/ tested by:  2017-04-24 A. Abe / Inspector		kontrolliert/ reviewed by:  2017-04-24 R. Meiranke / Reviewer			
Datum Date	Name/Stellung Name/Position	Unterschrift Signature	Datum Date	Name/Stellung Name/Position	Unterschrift Signature
Sonstiges / Other Aspects:					
Abkürzungen: P(ass) = entspricht Prüfgrundlage F(ail) = entspricht nicht Prüfgrundlage N/A = nicht anwendbar N/T = nicht getestet					
Abbreviations: P(ass) = passed F(ail) = failed N/A = not applicable N/T = not tested					
Dieser Prüfbericht bezieht sich nur auf das o.g. Prüfmuster und darf ohne Genehmigung der Prüfstelle nicht auszugsweise vervielfältigt werden. Dieser Bericht berechtigt nicht zur Verwendung eines Prüfzeichens. This test report relates to the a. m. test sample. Without permission of the test center this test report is not permitted to be duplicated in extracts. This test report does not entitle to carry any safety mark on this or similar products.					

TEST SUMMARY

5.1.1 SUPPLY VOLTAGE REQUIREMENTS

RESULT: PASS

5.1.2 ANTENNA REQUIREMENTS

RESULT: PASS

5.1.3 RESTRICTED BANDS OF OPERATION

RESULT: PASS

5.2.1 CONDUCTED OUTPUT POWER

5.3.1 20dB BANDWIDTH

RESULT: PASS

5.3.2 99% BANDWIDTH

5.3.3 FIELD STRENGTH OF FUNDAMENTAL

RESULT: Pass

5.3.4 RADIATED SPURIOUS EMISSIONS OF TRANSMITTER

RESULT: PASS

5.4.1 AC POWER LINE CONDUCTED EMISSION OF TRANSMITTER

RESULT: N/A

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1. General Remarks

1.1 Complementary Materials

There is no attachment to this test report.

2. Test Sites

2.1 Test Facilities

TÜV Rheinland Japan Ltd. – Global Technology Assessment Center
4-25-2 Kita-Yamata, Tsuzuki-ku, Yokohama 224-0021, Japan

The used test equipment is in accordance with CISPR 16 for measurement of radio interference.

The Federal Communications Commission has reviewed the technical characteristics of the radiated and conducted emission facilities and has found these test sites to be in compliance with the requirements of section 2.948 of the FCC rules. The description of the test facility is listed under FCC registration number 299054.

Innovation, Science and Economic Development Canada has reviewed the technical characteristics of the radiated and conducted emission facilities and has found these test sites to be in compliance with Canadian requirements. The description of the test facility is listed under OATS filing number 3466B-1.

The test facility is accredited by VLAC (member of ILAC) under number VLAC-017 according to ISO/IEC 17025:2005.



TÜV Rheinland Japan Ltd. is accredited by the Federal Communications Commission as a Conformity Assessment Body under Designation Number JP0017 and Test Firm Registration Number 386498.

2.2 List of Test and Measurement Instruments

Table 1: List of Test and Measurement Equipment

Kind of Equipment	Manufacturer	Model Name	Serial Number	Equip. ID	Cal. Interval	Cal. Date	Next Cal.
For Antenna Port Conducted Emission							
RF Power Meter	Agilent	N1911A	MY45101737	RF-0393	1 year	2016-10-14	2017-10-14
For Radiated Emission							
Radiated Emission Measurement Soft-ware (below 30MHz)	Toyo Corporation	EP5/ME	Ver. 5.0.10	RF-0172	1 year	2017-03-31	2018-03-31
Receiver	Rohde & Schwarz	ESU 8	100025	RF-0020	1 year	2016-07-30	2017-07-30
Receiver	Rohde & Schwarz	ESU 40	100029	RF-0021	1 year	2016-08-31	2017-08-31
RF Selector (10m Chamber)	Toyo Corporation	NS4900	0703-182	RF-0029	1 year	2017-03-31	2018-03-31
Loop Antenna with Amplifier, 9kHz-30MHz	Rohde & Schwarz	HFH2-Z2	100139	RF-0048	1 year	2016-06-03	2017-06-03
Trilog Antenna No. 2, 30-1000MHz	Schwarzbeck	VULB 9168	9168-475	RF-0462	1 year	2017-04-04	2018-04-04
5dB Attenuator	Pasternack	PE7047-5	-	RF-0731	1 year	2017-03-01	2018-03-01
Low Noise Preamplifier, 9kHz-1GHz	TSJ	MLA-10K01-B01-35	1370750	RF-0253	1 year	2017-01-18	2018-01-18
Low Pass Filter, DC-1GHz	R&K	LP1000CH 3	12104001	RF-0515	1 year	2017-01-18	2018-01-18
Horn Antenna, 1-8GHz	Schwarzbeck	BBHA 9120 D	1059	RF-0553	1 year	2016-06-03	2017-06-03
Microwave Preamplifier, 1-8GHz	Toyo Corporation	TPA0108-40	0634	RF-0052	1 year	2017-01-25	2018-01-25
Band Reject Filter, 1-8GHz	Nitsuki	NF-49BT	027	RF-0131	1 year	2017-01-26	2018-01-26
Horn Antenna with Preamplifier, 8-18GHz	Toyo Corporation	HAP06-18W	00000025	RF-0065	1 year	2016-06-03	2017-06-03
High Pass Filter, 8-18GHz	Micro-Tronics	HPM50107	006	RF-0334	1 year	2016-07-01	2017-07-01
Horn Antenna with Preamplifier, 18-26.5GHz	Toyo Corporation	HAP18-26N	00000010	RF-0070	1 year	2016-06-03	2017-06-03
Constant Voltage Constant Frequency Stabilizers and Power Accessories							
DC Power Supply	Agilent	E3646A	MY50350007	RF-0412	N/A	N/A	N/A
True RMS Multimeter	Fluke	87V	97680445	RF-0281	1 year	2017-02-02	2018-02-02

Conformance of the used measurement and test equipment with the requirements of ISO/IEC 17025:2005 has been confirmed before testing.

2.3 Measurement Uncertainty

Table 2: Emission Measurement Uncertainty

Measurement Type	Frequency	Uncertainty
AC Power Line Conducted Emission	150kHz - 30MHz	±2.0dB
Antenna Port Conducted Emission	20Hz - 40GHz	±1.5dB
Radiated Emission	150kHz - 30MHz	±4.7dB
	30MHz - 1GHz	±4.7dB
	> 1GHz	±4.7dB

3. General Product Information

3.1 Product Function and Intended Use

The EUT (Equipment Under Test) is a cyclocomputer with Bluetooth Low Energy wireless communication feature. It is called Padrone Digital and is installed on a handle bar of a bicycle. The EUT can communicate with an onboard speed cadence sensor and/or a heart rate sensor. In addition, the EUT transmits some information to an ITE device such as smart phone via BLE communication.

3.2 System Details

Radio standard:	Bluetooth 4.0 Low Energy
Measured output power:	-1.53dBm (Conducted, Peak)
Antenna gain:	-4.53dBi
Antenna type:	Lead antenna
Antenna mounting type:	Internal
Frequency range:	2402-2480MHz
Number of channels:	40 ($f = 2402\text{MHz} + k \cdot 2\text{MHz}$, where $k=0, 1, \dots, 39$)
Channel spacing:	2MHz
Modulation type:	GFSK
FCC classification:	DTS
IC classification:	Bluetooth Device
Emission designator:	1M06F1D

Rated voltage:	DC 3.0V (Li coin cell)
Rated current:	Max. 1.5mA
Protection class:	III

Test voltage:	DC 3.0V
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3.3 Clock Frequencies

The highest frequency generated or used by the EUT is 16MHz for the digital interface.

3.4 Noise Suppressing Parts

Refer to schematics.

4. Test Set-up and Operation Modes

4.1 Test Methodology

The test methodology used is based on the requirements of 47 CFR Part 15, Sections 15.31, 15.33, 15.35, 15.205, 15.207, 15.209 and 15.249.

The test methods, which have been used, are based on ANSI C63.10 and RSS-Gen.
For details, see under each test item.

4.2 Operation Modes

Testing was performed at the lowest operating frequency (2402MHz), at the operating frequency in the middle of the specified frequency band (2442MHz) and at the highest operating frequency (2480MHz).

The basic operation modes used for testing are:

- A. EUT transmits (TX mode), with full power, at lowest channel (2402MHz), a continuous modulated signal streaming with the maximum duty cycle.
- B. EUT transmits (TX mode), with full power, at middle channel (2442MHz), a continuous modulated signal streaming with the maximum duty cycle.
- C. EUT transmits (TX mode), with full power, at highest channel (2480MHz), a continuous modulated signal streaming with the maximum duty cycle.

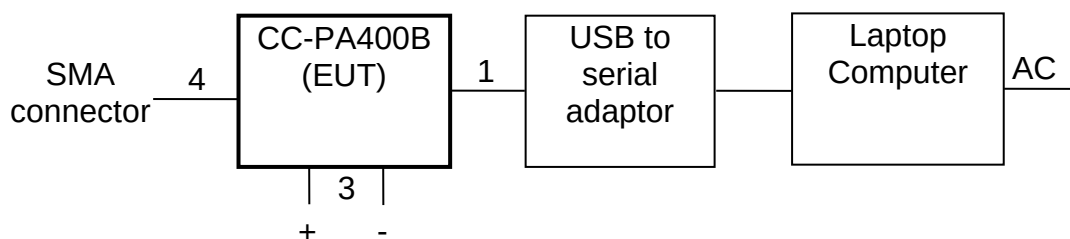
4.3 Physical Configuration for Testing

The test system was configured in a typical fashion (as a customer would normally use it).

The justification and manipulation of cables and equipment in order to simulate a worst-case behavior of the test setup has been carried out as prescribed in ANSI C63.10.

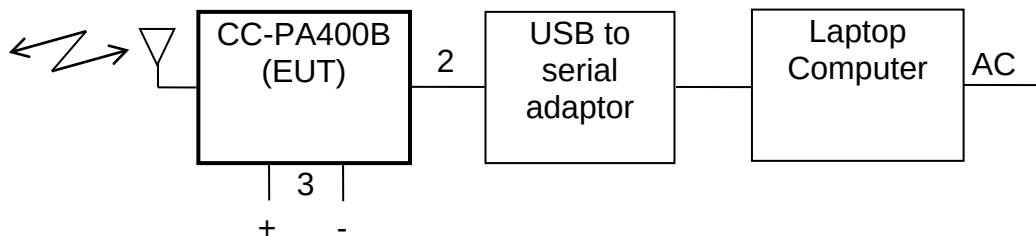
Figure 1: Block Diagram

1) Test Setup of Conducted Radio Testing



Note: A laptop computer and USB to serial adaptor were only used for an initial setup of radio operation. They were disconnected to the EUT during conducted and radiated radio testing.

2) Test Setup of Radiated Testing



Note: A laptop computer and USB to serial adaptor were only used for an initial setup of radio operation. They were disconnected to the EUT during conducted and radiated radio testing.

Table 3: Interfaces present on the EUT

No.	Interface	Cable Length for Testing, Shielding	Interface Classification
1.	Signal line	5cm, Un-Shielded	Signal Port
2.	(Between the EUT and Serial Adaptor)	1cm, Un-Shielded	Signal Port
3.	Battery Power Line (Conducted Radio test only)	5cm, Un-Shielded	DC Input Power Port
4.	RF Cable (Conducted Radio test only)	6cm, Shielded	RF Port

Note:

The EUT does not have any user accessible interface ports. However, above listed interface cables were used for an initial setting purpose.

Two test samples were available.

Sample No. 001 was used for antenna conducted measurements

Sample No. 002 was used for radiated measurements.

For antenna conducted measurements, the antenna was replaced by a 50Ω antenna connector.

For more details, refer to section: Photographs of the Test Set-Up.

4.4 Test Software

The EUT was provided by the manufacturer with suitable software to allow operation in all the required modes.

Software used for testing: BlueNRG GUI version 2.2.2 by STMicroelectronics

Before starting radio testing, special software mentioned above was running on a laptop computer connected to the EUT through a converter for an initial setting purpose. It was used to enable the test operation modes (mode A, B and C) listed in section 4.2 as appropriate.

4.5 Special Accessories and Auxiliary Equipment

The product has been tested together with the following additional accessories:

1. Product: Laptop Computer
Manufacturer: Panasonic
Model: CF-T9JWFCPS
Rated Voltage: DC 16V
Protection Class: III
Serial Number: 0DKSA02735
2. Product: AC Adapter for Laptop Computer
Manufacturer: Panasonic
Model: CF-AA6372A M3
Rated Voltage: 100V-240V
Input Current: 1.5A
Frequency: 50-60Hz
Protection Class: II
Serial Number: 6372AM310201996J
3. Product: USB to Serial Adapter
Manufacturer: IO DATA
Model: USB-RSAQ3
Rated Voltage: USB 5V
Protection Class: III
Serial Number: V1E0035358BT

4.6 Countermeasures to achieve Compliance

No additional measures were employed to achieve compliance.

5. Test Results RADIO

5.1 Technical Requirements

5.1.1 Supply Voltage Requirements

RESULT: **PASS**

Requirements:

FCC 15.31(e)

For intentional radiators, measurements of the variation of the input power or the radiated signal level of the fundamental frequency component of the emission, as appropriate, shall be performed with the supply voltage varied between 85% and 115% of the nominal rated supply voltage. For battery operated equipment, the equipment tests shall be performed using a new battery.

Verdict:

The EUT is battery operated and it was tested with a new battery. Hence it complies with the supply voltage requirements.

5.1.2 Antenna Requirements

RESULT: **PASS**

Requirements:

FCC 15.203

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.

Verdict:

The EUT has an internal antenna which is not user accessible. Hence it complies with the antenna requirements.

5.1.3 Restricted Bands of Operation

RESULT:

PASS

Requirements:

FCC 15.205 and RSS-Gen §8.10

Only spurious emissions are permitted in any of the restricted frequency bands, unless otherwise specified.

Verdict:

The EUT operation frequency range is 2402 - 2480MHz. Therefore only spurious emissions may be found in the restricted bands of operation and the EUT complies with the restricted frequency band requirement.

5.2 Conducted Measurements at Antenna Port

5.2.1 Conducted Output Power

Date of testing: 2017-04-14

Ambient temperature: 24°C

Relative humidity: 40%

Atmospheric pressure: 1010hPa

Requirements:

N/A

(This test item was performed for RF exposure evaluation.)

Test procedure:

RSS-Gen (Issue 4) §6.12

The maximum Peak Output Power (conducted) was measured at the antenna connector with a power meter.

Table 4: Conducted Output Power

Operating Frequency [MHz]	Peak Output Power	
	[dBm]	[mW]
2402	-1.53	0.7031
2442	-1.67	0.6808
2480	-1.75	0.6683

Note: Grey shading area shows the highest power in the test result.

5.3 Radiated Measurements

5.3.1 20dB Bandwidth

RESULT:

PASS

Date of testing: 2017-03-29

Ambient temperature: 26°C
Relative humidity: 57%
Atmospheric pressure: 1019hPa

Requirements:

FCC 15.215(c) and FCC 15.249

The 20dB bandwidth of the emission shall be contained within the frequency band designated in the rule section under which the equipment is operated.

Test procedure:

ANSI C63.10 §6.9.2

The EUT was placed on a nonconductive turntable 1.5m above the ground plane in a semi-anechoic chamber.

The 20dB bandwidth was measured with a horn antenna connected to a spectrum using a peak detector.

Final measurements were performed using a spectrum analyzer with the resolution bandwidth (RBW) set to in the range of 1% to 5% of the occupied bandwidth (OBW) and video bandwidth (VBW) shall be approximately $3 \times \text{RBW}$. Markers were placed at the lowest and highest intersections of the trace with a 20dBc line to obtain the value of the emission bandwidth.

Table 5: 20dB Bandwidth Edge Frequencies

20dB Bandwidth Edge Side	Operating Frequency [MHz]	Edge Frequency [MHz]	Limit [MHz]	Margin [MHz]
Lower freq.	2402MHz	2401.435	2400.0	1.435
Upper freq.	2480MHz	2480.624	2483.5	2.876

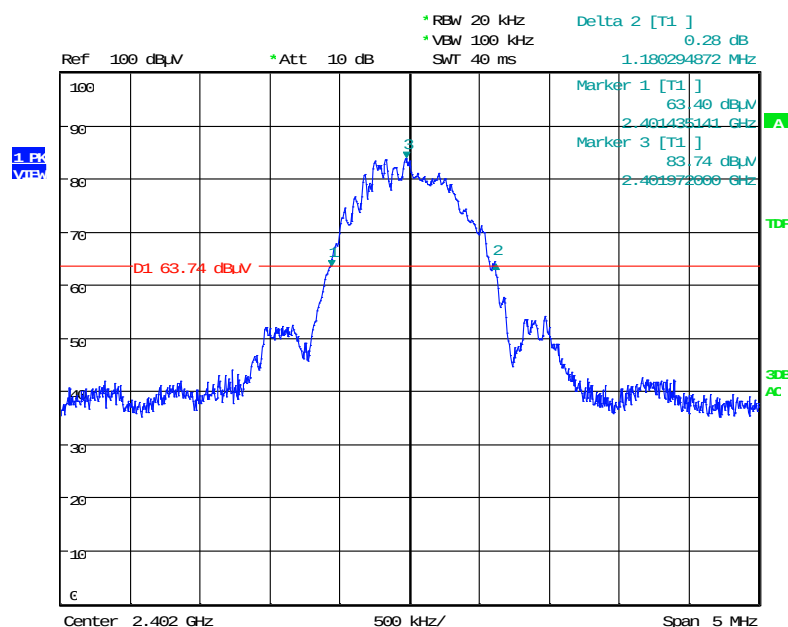
Note: EUT / Antenna Orientation was Z / H.

Table 6: 20dB Bandwidth

Operating Frequency [MHz]	EUT / Antenna Orient.	20dB Bandwidth [MHz]
2402	Z / H	1.180294872
2442	Z / H	1.200038462
2480	Z / H	1.187392308

Note: Grey shading area shows the widest bandwidth in this test result.

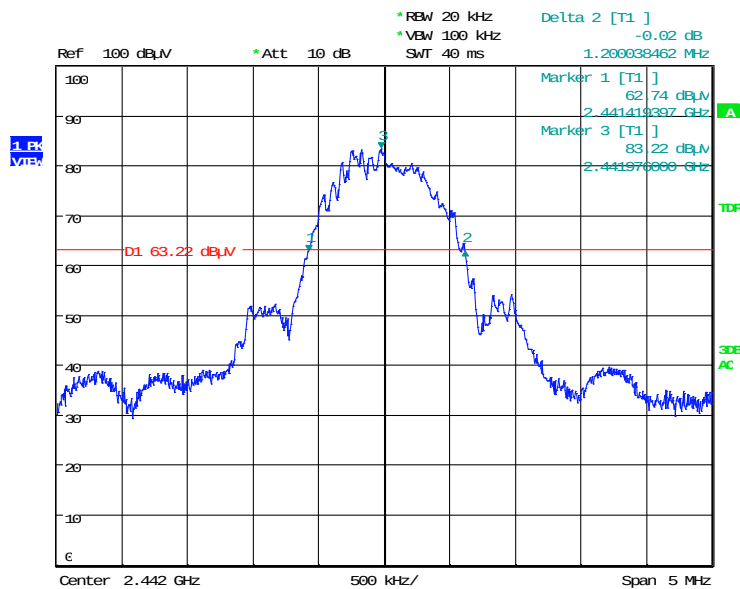
Figure 2: 20dB Bandwidth, Mode A (2402MHz)



Date: 29. MAR. 2017 15:24:49

Note: RBW was set to 1.69% of the observed OBW. $(20 \text{ kHz} / 1180 \text{ kHz}) \times 100 = 1.69 \%$

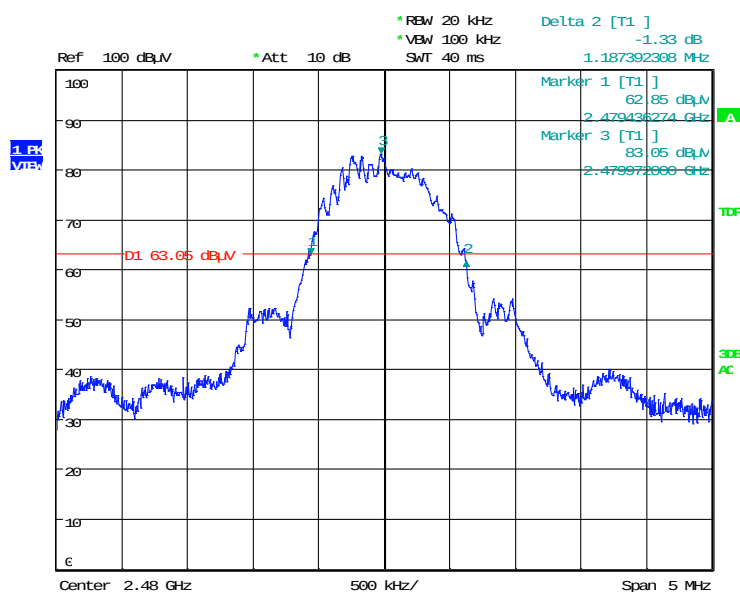
Figure 3: 20dB Bandwidth, Mode B (2442MHz)



Date: 29.MAR.2017 16:03:48

Note: RBW was set to 1.67% of the observed OBW. $(20 \text{ kHz} / 1200 \text{ kHz}) \times 100 = 1.67 \%$

Figure 4: 20dB Bandwidth, Mode C (2480MHz)



Date: 29.MAR.2017 16:26:42

Note: Frequency of the marker 2 is calculated. $2479.436274 + 1.187392 = 2480.623666 \text{ MHz}$
RBW was set to 1.68% of the observed OBW. $(20 \text{ kHz} / 1187 \text{ kHz}) \times 100 = 1.68 \%$

5.3.2 99% Bandwidth

Date of testing: 2017-03-29

Ambient temperature: 26°C

Relative humidity: 57%

Atmospheric pressure: 1019hPa

Requirements:

RSS-Gen §6.6 and 8.11

The 99% bandwidth shall be reported and shall lie entirely outside the restricted bands and the prohibited TV bands of 54-72MHz, 76-88MHz, 174-216MHz, 470-608MHz and 614-806MHz.

Test procedure:

ANSI C63.10 §6.9.3 and RSS-Gen §6.6

The EUT was placed on a nonconductive turntable 1.5m above the ground plane in a semi-anechoic chamber.

Final measurements were performed using a spectrum analyzer with the resolution bandwidth (RBW) set to in the range of 1% to 5% of the occupied bandwidth (OBW) and video bandwidth (VBW) shall be approximately $3 \times \text{RBW}$. The 99% bandwidth was measured by using the OBW function of the analyzer with a 99% coverage setting. Sample detector was used at this test item.

Table 7: 99% Bandwidth Edge Frequencies

99% Bandwidth Edge Side	Operating Frequency [MHz]	Edge Frequency [MHz]	Limit [MHz]	Margin [MHz]
Lower freq.	2402MHz	2401.492	2390	11.492
Upper freq.	2480MHz	2480.540	2655	174.460

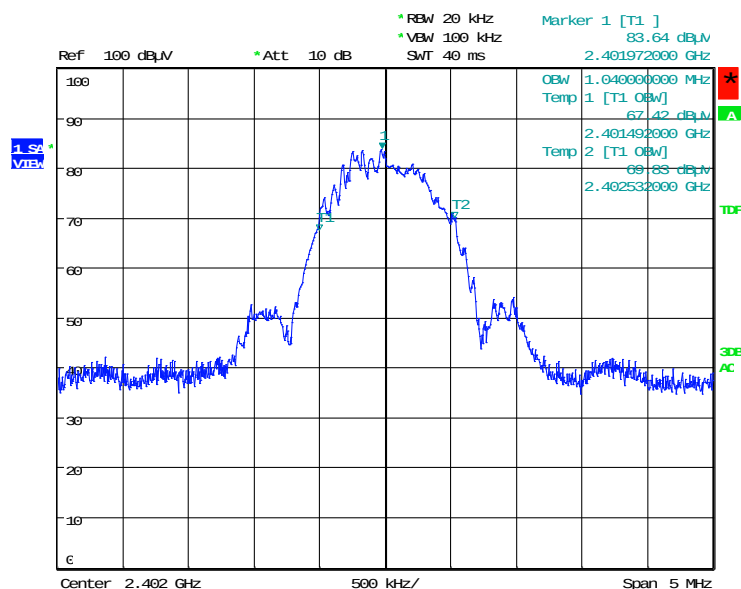
Note: EUT / Antenna Orient. Is Z/H

Table 8: 99% Bandwidth

Operating Frequency [MHz]	EUT / Antenna Orient.	99% Bandwidth [MHz]
2402	Z / H	1.040000000
2442	Z / H	1.048000000
2480	Z / H	1.056000000

Note: Grey shading area shows the widest bandwidth in this test result.

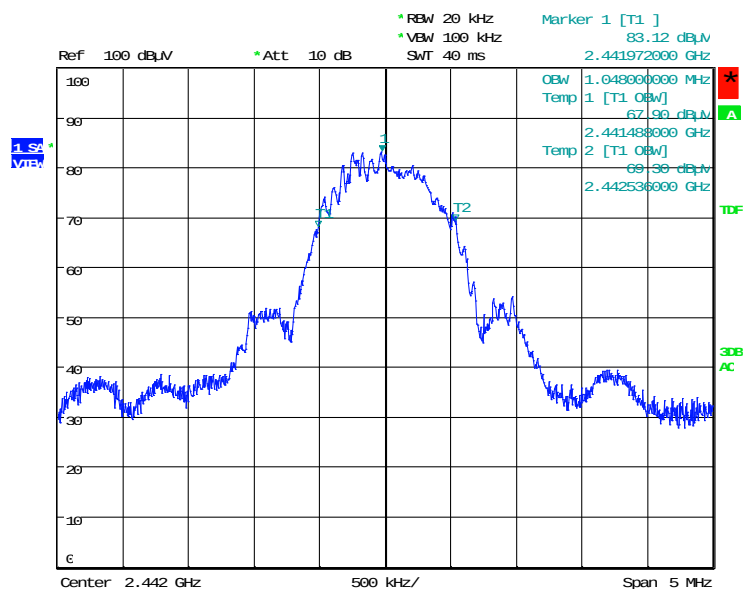
Figure 5: 99% Bandwidth, Mode A (2402MHz)



Date: 29.MAR.2017 15:26:56

Note: RBW was set to 1.92% of the observed OBW. $(20 \text{ kHz} / 1040 \text{ kHz}) \times 100 = 1.92 \%$

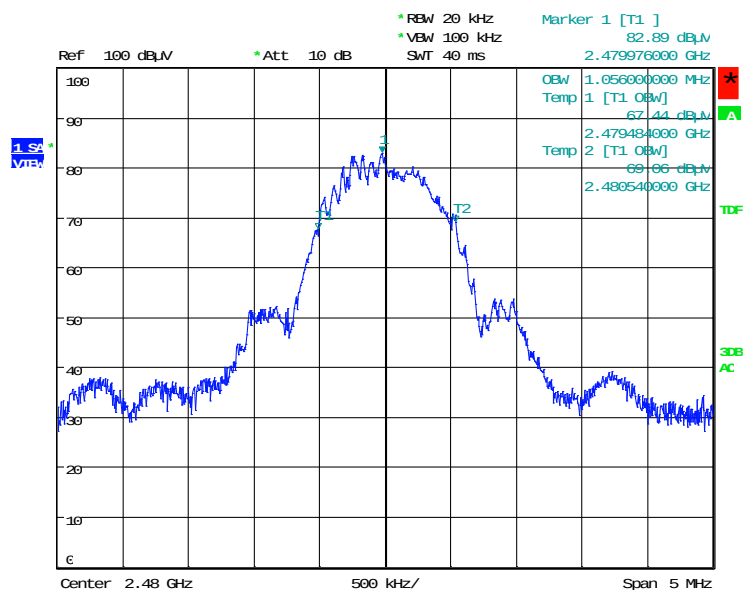
Figure 6: 99% Bandwidth, Mode B (2442MHz)



Date: 29.MAR.2017 16:05:12

Note: RBW was set to 1.91% of the observed OBW. $(20 \text{ kHz} / 1048 \text{ kHz}) \times 100 = 1.91 \%$

Figure 7: 99% Bandwidth, Mode C (2480MHz)



Date: 29.MAR.2017 16:28:25

Note: RBW was set to 1.89% of the observed OBW. $(20 \text{ kHz} / 1056 \text{ kHz}) \times 100 = 1.89 \%$

5.3.3 Field Strength of Fundamental

RESULT:

Pass

Date of testing: 2017-03-29, 2017-03-30

Ambient temperature: 26, 22°C

Relative humidity: 57, 41%

Atmospheric pressure: 1019, 1016hPa

Measurement distance: 3m

Kind of test site: Semi Anechoic Chamber

Requirements:

FCC 15.249 (a) (c) (e) and RSS-210 §B.10 (a)

The field strength of fundamental shall not exceed the level specified in FCC 15.249 (a) (e) and RSS-210 §B.10 (a).

Test procedure:

ANSI C63.10 §6.3 and 6.6 and RSS-Gen §8.1

The EUT was placed on a nonconductive turntable 0.8m above the ground plane. Measurements were made at 3m distance. The EUT was rotated 360° and the antenna was raised and lowered from 1 to 4m in order to determine the emission's maximum level.

Measurements were taken using both horizontal and vertical antenna polarizations for 3 EUT orientations (X, Y and Z).

Measurements were performed using a spectrum analyzer with a suitable span to encompass the peak of the fundamental and using the following settings: Peak: RBW = 1MHz, VBW = 3MHz. Average: RBW = 1MHz, VBW = 10Hz.

The highest emission amplitudes relative to the appropriate limit were measured and recorded in this report. In the spectra here below, the upper trace corresponds to the peak measurement and the lower trace corresponds to the average measurement.

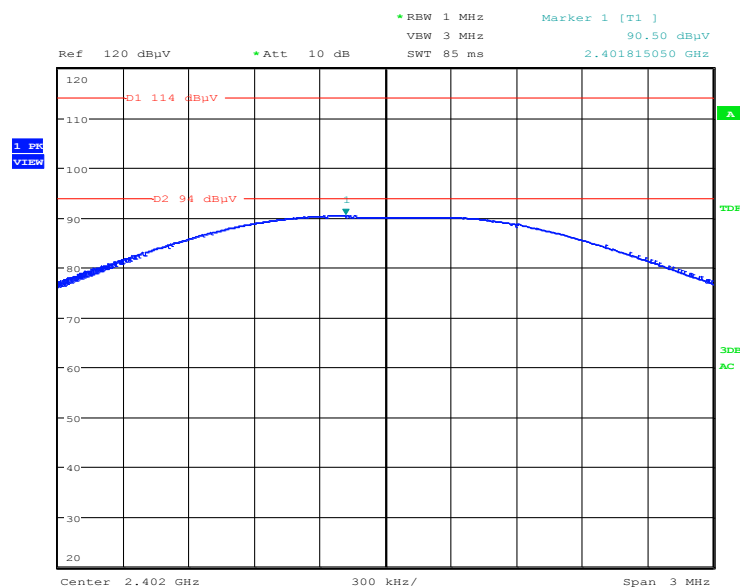
Table 9: Field Strength of Fundamental

Operating Frequency [MHz]	EUT / Antenna Orient.	Average Level [dBμV/m]	Peak Level [dBμV/m]	Average Limit [dBμV/m]	Peak Limit [dBμV/m]	Average Margin [dB]	Peak Margin [dB]
2402	Z / H	N/T (*)	90.50	94	114	N/T (*)	23.50
2442	Z / H	N/T (*)	90.08	94	114	N/T (*)	23.92
2480	Z / H	N/T (*)	89.64	94	114	N/T (*)	24.36

Notes: All correction factors (antenna, cable, pre-amplifier) are included in the measurement values.
Average limit in dBμV/m is calculated as follows: Average limit = $20 \times \log_{10}(50000 \mu\text{V/m})$.
Peak limit in dBμV/m is calculated as follows: Peak limit = Average limit + 20dB.

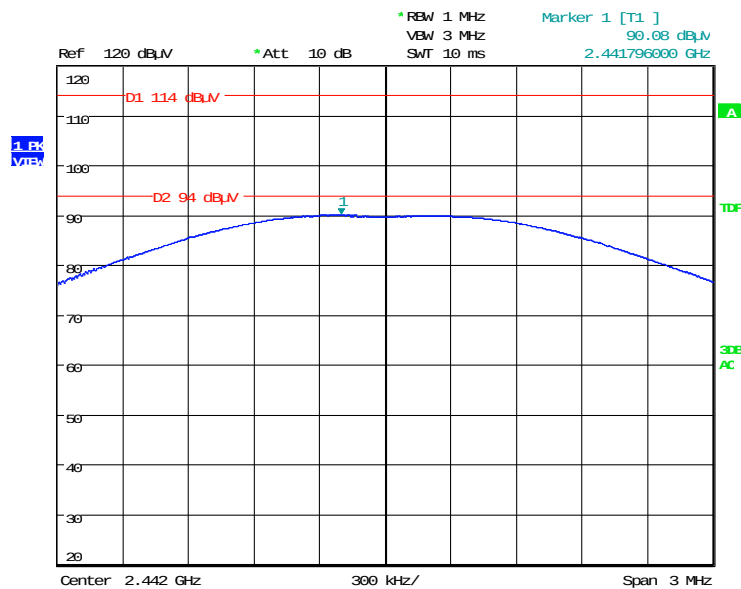
(*) Peak emissions level has met against the average limit 94dBμV/m. Therefore, average measurement was omitted.

Figure 8: Field Strength of Fundamental, Spectral Diagram, Mode A (2402MHz)



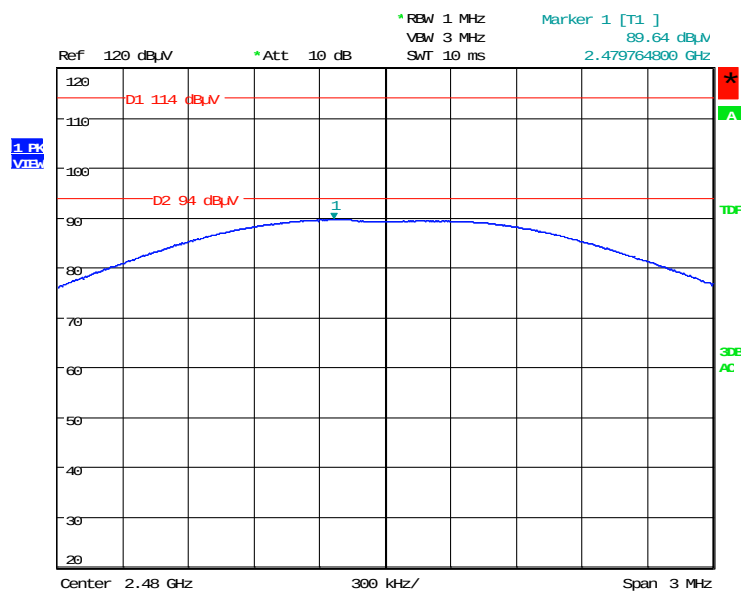
Date: 29.MAR.2017 15:21:03

Figure 9: Field Strength of Fundamental, Spectral Diagram, Mode B (2442MHz)



Date: 29.MAR.2017 16:01:04

Figure 10: Field Strength of Fundamental, Spectral Diagram, Mode C (2480MHz)



Date: 29.MAR.2017 16:24:12

5.3.4 Radiated Spurious Emissions of Transmitter

RESULT:

PASS

Date of testing: 2017-03-29, 2017-03-30

Ambient temperature: 26, 22°C

Relative humidity: 57, 41%

Atmospheric pressure: 1019, 1016hPa

Frequency range: 9kHz - 25GHz

Measurement distance: 3m

Kind of test site: Semi Anechoic Chamber

Requirements:

FCC 15.209, FCC 15.249(a)(c)(d)(e), RSS-Gen §8.9 and 8.10 and RSS-210 §B.10(a)(b)

Emission radiated outside the specified frequency bands must comply with the radiated emission limits specified in FCC 15.209, FCC 15.249(a)(d)(e), RSS-Gen §8.9 (tables 4 and 5) and RSS-210 §B.10(a)(b).

Test procedure:

ANSI C63.10 §6.3, 6.4, 6.5, 6.6, 6.10 and RSS-Gen §6.13 and 8.1

The EUT was placed on a nonconductive turntable. The table height was 0.8m for measurements below 1GHz and 1.5m for measurements above 1GHz. Before final measurements of radiated emissions were performed, the EUT was scanned to determine its emission spectrum profile. The physical arrangement of the test system, the associated cabling and the EUT orientation (X, Y and Z) were varied in order to ensure that maximum emission amplitudes were attained.

The spectrum was examined from 9kHz to the 10th harmonic of the highest fundamental transmitter frequency (25GHz). Final radiated emission measurements were made at 3m distance.

At each frequency where a spurious emission was found, the EUT was rotated 360° in order to determine the emission's maximum level. For frequencies above 30MHz, the antenna was raised and lowered from 1 to 4m and measurements were taken using both horizontal and vertical antenna polarizations.

For emissions between 30MHz and 1GHz, measurements were performed with a test receiver operating in the CISPR quasi-peak detection mode with a 6dB bandwidth set to 120kHz. For emissions above 1GHz, measurements were performed with a spectrum analyzer using the following settings: for peak field strength: RBW = 1MHz & VBW ≥ 1MHz; for average field strength: RBW = 1MHz & VBW = 10Hz.

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Absorbers have been placed on the floor between the EUT and the measuring antenna for testing above 1GHz.

The highest emission amplitudes relative to the appropriate limit were recorded in this report. Emissions other than those mentioned are small or not detectable.

No spurious emission was found in the following ranges. 9kHz - 30MHz, 8 – 18GHz and 18 – 25GHz.

Table 10: Radiated Emissions, Quasi Peak Data, 30MHz - 1GHz, Horizontal and Vertical Antenna Orientations, Mode A (2402MHz)

Frequency [MHz]	EUT / Antenna Orientation	Reading QP [dBμV]	Factor [dB(1/m)]	Level QP [dBμV/m]	Limit [dBμV/m]	Margin QP [dB]	Height [cm]	Angle [°]
30.204	X/V	35.1	-22.8	12.3	40.0	27.7	163	147
123.208	X/H	30.5	-22.5	8.0	43.5	35.5	213	134
165.606	X/V	30.3	-20.5	9.8	43.5	33.7	164	352
586.294	X/H	29.8	-11.1	18.7	46.0	27.3	113	200
955.840	X/V	30.6	-6.4	24.2	46.0	21.8	140	324

Note: Level QP = Reading QP + Factor

Table 11: Radiated Emissions, Quasi Peak Data, 30MHz - 1GHz, Horizontal and Vertical Antenna Orientations, Mode B (2442MHz)

Freq. [MHz]	EUT / Antenna Orientation	Reading QP [dBμV]	Factor [dB(1/m)]	Level QP [dBμV/m]	Limit [dBμV/m]	Margin QP [dB]	Height [cm]	Angle [°]
30.760	X/V	35.8	-22.6	13.2	40.0	26.8	163	267
53.458	X/H	30.5	-20.8	9.7	40.0	30.3	113	237
150.986	X/V	30.4	-20.6	9.8	43.5	33.7	100	285
598.797	X/H	29.9	-10.9	19.0	46.0	27.0	191	72
935.092	X/V	30.7	-7.0	23.7	46.0	22.3	115	225

Note: Level QP = Reading QP + Factor

Table 12: Radiated Emissions, Quasi Peak Data, 30MHz - 1GHz, Horizontal and Vertical Antenna Orientations, Mode C (2480MHz)

Freq. [MHz]	EUT / Antenna Orientation	Reading QP [dBμV]	Factor [dB(1/m)]	Level QP [dBμV/m]	Limit [dBμV/m]	Margin QP [dB]	Height [cm]	Angle [°]
30.153	X/V	35.3	-22.8	12.5	40.0	27.5	163	213
49.170	X/H	31.2	-20.7	10.5	40.0	29.5	201	282
164.952	X/H	30.4	-20.4	10.0	43.5	33.5	108	219
408.563	X/V	29.8	-15.6	14.2	46.0	31.8	141	31
913.917	X/V	31.1	-7.6	23.5	46.0	22.5	140	29

Note: Level QP = Reading QP + Factor

Table 13: Radiated Emissions, Average Data, 1 - 25GHz, Horizontal and Vertical Antenna Orientations, Mode A (2402MHz)

Freq. [MHz]	EUT / Antenna Orientation	Reading AV [dBμV]	Factor [dB(1/m)]	Level AV [dBμV/m]	Limit [dBμV/m]	Margin AV [dB]	Height [cm]	Angle [°]
1524.408	Z/V	39.2	-16.1	23.1	54.0	30.9	111	288
4822.610	Z/V	38.9	-6.6	32.3	54.0	21.7	143	188
8004.348	Z/H	38.4	0.0	38.4	54.0	15.6	153	170

Note: Level AV = Reading AV + Factor

Table 14: Radiated Emissions, Peak Data, 1 - 25GHz, Horizontal and Vertical Antenna Orientations, Mode A (2402MHz)

Freq. [MHz]	EUT / Antenna Orientation	Reading PK [dBμV]	Factor [dB(1/m)]	Level PK [dBμV/m]	Limit [dBμV/m]	Margin PK [dB]	Height [cm]	Angle [°]
1524.408	Z/V	52.6	-16.1	36.5	74.0	37.5	111	288
4822.610	Z/V	55.9	-6.6	49.2	74.0	24.8	143	188
8004.348	Z/H	52.8	0.0	52.8	74.0	21.2	153	170

Note: Level PK = Reading PK + Factor

Table 15: Radiated Emissions, Average Data, 1 - 25GHz, Horizontal and Vertical Antenna Orientations, Mode B (2442MHz)

Freq. [MHz]	EUT / Antenna Orientation	Reading AV [dBμV]	Factor [dB(1/m)]	Level AV [dBμV/m]	Limit [dBμV/m]	Margin AV [dB]	Height [cm]	Angle [°]
1508.165	Z/V	39.0	-16.0	23.0	54.0	31.0	174	255
4883.886	Z/V	46.3	-6.9	39.4	54.0	14.6	174	167
7997.678	Z/H	38.5	2.6	41.1	54.0	12.9	176	28

Note: Level AV = Reading AV + Factor

Table 16: Radiated Emissions, Peak Data, 1 - 25GHz, Horizontal and Vertical Antenna Orientations, Mode B (2442MHz)

Freq. [MHz]	EUT / Antenna Orientation	Reading PK [dBμV]	Factor [dB(1/m)]	Level PK [dBμV/m]	Limit [dBμV/m]	Margin PK [dB]	Height [cm]	Angle [°]
1508.165	Z/V	53.2	-16.0	37.2	74.0	36.8	174	255
4883.886	Z/V	57.8	-6.9	50.9	74.0	23.1	174	167
7997.678	Z/H	52.8	2.6	52.8	74.0	21.2	176	28

Note: Level PK = Reading PK + Factor

Table 17: Radiated Emissions, Average Data, 1 - 25GHz, Horizontal and Vertical Antenna Orientations, Mode C (2480MHz)

Freq. [MHz]	EUT / Antenna Orientation	Reading AV [dBμV]	Factor [dB(1/m)]	Level AV [dBμV/m]	Limit [dBμV/m]	Margin AV [dB]	Height [cm]	Angle [°]
1524.359	Z/V	39.2	-16.1	23.1	54.0	30.9	147	139
4959.892	Z/V	45.5	-6.5	39.0	54.0	15.0	162	201
7814.565	Z/V	38.6	1.6	40.2	54.0	13.8	172	336

Note: Level AV = Reading AV + Factor

Table 18: Radiated Emissions, Peak Data, 1 - 25GHz, Horizontal and Vertical Antenna Orientations, Mode C (2480MHz)

Freq. [MHz]	EUT / Antenna Orientation	Reading PK [dBμV]	Factor [dB(1/m)]	Level PK [dBμV/m]	Limit [dBμV/m]	Margin PK [dB]	Height [cm]	Angle [°]
1524.359	Z/V	53.1	-16.1	37.0	74.0	37.0	147	139
4959.892	Z/V	56.5	-6.5	50.0	74.0	24.0	162	201
7814.565	Z/V	52.9	1.6	54.5	74.0	19.5	172	336

Note: Level PK = Reading PK + Factor

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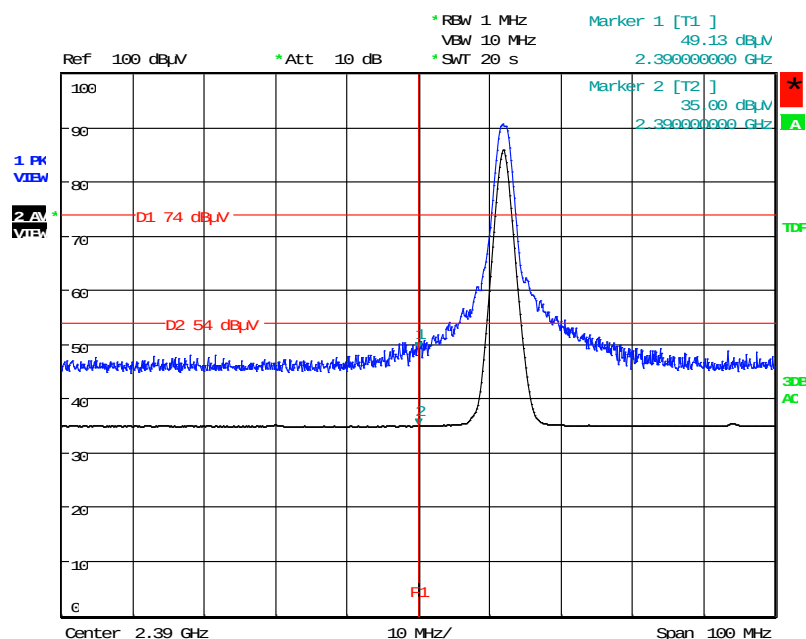
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Table 19: Radiated Emissions at Band Edge, Average and Peak Data, Horizontal and Vertical Antenna Orientations, Modes A (2402MHz) and C (2480MHz)

Operating Frequency [MHz]	EUT / Antenna Orientation	Level AV [dBµV/m]	Level PK [dBµV/m]	Limit AV [dBµV/m]	Limit PK [dBµV/m]	Margin AV [dB]	Margin PK [dB]
2402	Z / H	35.00	49.13	54.0	74.0	19.00	24.87
2480	Z / H	41.81	59.91	54.0	74.0	12.19	14.09

Notes: All correction factors (antenna, cable, pre-amplifier) are included in the measurement values.
Average limit in dBµV/m is calculated as follows: Average limit = $20 \times \log_{10}(500\mu\text{V/m})$.
Peak limit in dBµV/m is calculated as follows: Peak limit = Average limit + 20dB.

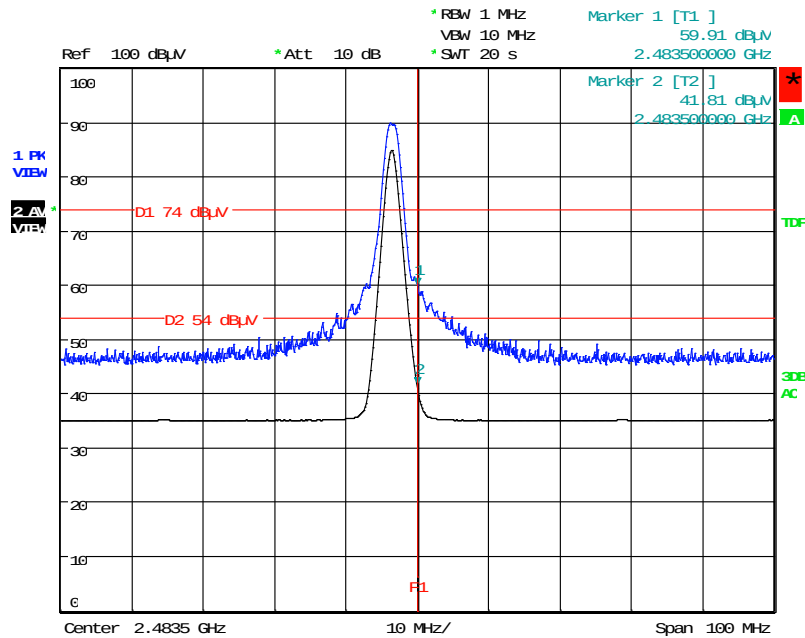
Figure 11: Radiated Emissions at Band Edge, Spectral Diagram, Mode A (2402MHz)



Date: 29.MAR.2017 15:34:53

Note: The upper trace shows the peak value and the lower trace shows the average value.

Figure 12: Radiated Emissions at Band Edge, Spectral Diagram, Mode C (2480MHz)



Date: 29.MAR.2017 16:32:09

Note: The upper trace shows the peak value and the lower trace shows the average value.

5.4 AC Power Line Conducted Measurements

5.4.1 AC Power Line Conducted Emission of Transmitter

RESULT: N/A

Frequency range: 0.15 - 30MHz

Requirements:

FCC 15.207 and RSS-Gen 8.8

The AC power line conducted emission on any frequency within the band 150kHz to 30MHz shall not exceed the limits specified in FCC 15.207 and RSS-Gen 8.8 (Table 3).

Test procedure:

ANSI C63.10-2013

Note:

It is not applicable since the EUT is battery operated.

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