

Produkte
Products

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<i>Test Report No.:</i>			
Auftraggeber: <i>Client:</i>	CATEYE Co., Ltd. 2-8-25, Kuwazu, Higashi-Sumiyoshi-Ku, Osaka, 546-0041 Japan		
Gegenstand der Prüfung: <i>Test Item:</i>	PADRONE SMART		
Bezeichnung: <i>Identification:</i>	CC-PA500B	Serien-Nr.: <i>Serial No.:</i>	No.1, No.2
Wareneingangs-Nr.: <i>Receipt No.:</i>	A000157806, A000164372	Eingangsdatum: <i>Date of Receipt:</i>	2015-01-20, 2015-02-06
Zustand des Prüfgegenstandes bei Anlieferung: <i>Condition of Test Item at Delivery:</i>	Good		
Prüfört: <i>Testing Location:</i>	TÜV Rheinland Japan Ltd. – Global Technology Assessment Center 4-25-2 Kita-Yamata, Tsuzuki-ku, Yokohama 224-0021, Japan		
Prüfgrundlage: <i>Test Specification:</i>	FCC 47 CFR Part 15, Subpart C, Section 15.249 (October 1, 2014) ANSI C63.10-2009 RSS-210 (Issue 8): 2010 RSS-Gen (Issue 4): 2014 ANSI C63.10-2013		
Prüfergebnis: <i>Test Result:</i>	Der Prüfgegenstand entspricht oben genannter Prüfgrundlage(n). <i>The test item passed the test specification(s).</i>		
Prüflaboratorium: <i>Testing Laboratory:</i>	TÜV Rheinland Japan Ltd. – Global Technology Assessment Center 4-25-2 Kita-Yamata, Tsuzuki-ku, Yokohama 224-0021, Japan		
geprüft/ tested by:	kontrolliert/ reviewed by:		
2015-03-24	A. Abe / Inspector	2015-03-24	R. Meiranke / Reviewer
<i>(Signature)</i>	<i>(Signature)</i>	<i>(Signature)</i>	<i>(Signature)</i>
Datum <i>Date</i>	Name/Stellung <i>Name/Position</i>	Unterschrift <i>Signature</i>	Datum <i>Date</i>
			Name/Stellung <i>Name/Position</i>
			Unterschrift <i>Signature</i>
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. <i>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.</i>			

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 DUTY CYCLE

5.3.2 20dB BANDWIDTH

RESULT: PASS

5.3.3 99% BANDWIDTH

5.3.4 FIELD STRENGTH OF FUNDAMENTAL

RESULT: Pass

5.3.5 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.

The Industry 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	Equipment ID	Calibrated until
For Antenna Port Conducted Emission					
RF Power Meter	Agilent	N1911A	MY45101737	RF-0393	2015-12
RF Peak Power Sensor	Agilent	N1921A	MY45242228	RF-0394	2015-12
For Radiated Emission					
Radiated Emission Measurement Software (below 30MHz)	Toyo Corporation	EP5/ME	Ver. 5.0.10	RF-0172	2016-01
Radiated Emission Measurement Software (above 30MHz)	Toyo Corporation	EP7/RE	Ver. 5.0.2	RF-0026	2016-01
Receiver	Rohde & Schwarz	ESU 8	100025	RF-0020	2015-09
Receiver	Rohde & Schwarz	ESU 40	100029	RF-0021	2015-03
RF Selector (10m Chamber)	Toyo Corporation	NS4900	0703-182	RF-0029	2016-01
Loop Antenna with Amplifier, 9kHz-30MHz	Rohde & Schwarz	HFH2-Z2	100139	RF-0048	2015-02
Trilog Antenna No. 2, 30-1000MHz	Schwarzbeck	VULB9168	9168-475	RF-0462	2015-12
10dB Attenuator	Hewlett Packard	8491A 10dB	58354	RF-0314	2016-01
Low Noise Preampfier, 9kHz-1GHz	TSJ	MLA-10K01-B01-35	1370750	RF-0253	2016-01
Low Pass Filter, DC-1GHz	R&K	LP1000CH3	12104001	RF-0515	2016-01
Horn Antenna, 1-8GHz	Schwarzbeck	BBHA9120D	1059	RF-0553	2015-05
Microwave Preampfier, 1-8GHz	Toyo Corporation	TPA0108-40	0634	RF-0052	2016-01
Band Reject Filter, 1-8GHz	Nitsuki	NF-49BT	027	RF-0131	2016-01
Horn Antenna with Preampfier, 8-18GHz	Toyo Corporation	HAP06-18W	00000025	RF-0065	2015-05
High Pass Filter, 8-18GHz	Micro-Tronics	HPM50107	006	RF-0334	2015-05
Horn Antenna with Preampfier, 18-26.5GHz	Toyo Corporation	HAP18-26N	00000010	RF-0070	2015-05
Constant Voltage Constant Frequency Stabilizers and Power Accessories					
True RMS Multimeter	Fluke	87V	97680445	RF-0281	2016-01

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
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 wireless Bluetooth Device and is called PADRONE SMART to be installed on a bicycle. The EUT can transmit speed information to a remote device via Bluetooth.

3.2 System Details

Radio standard:	Bluetooth 4.0 LE
Specified output power:	-2.88dBm (Conducted, Peak)
Antenna gain:	-4.49dBi
Antenna type:	Lead antenna
Antenna mounting type:	On board
Frequency range:	2402 - 2480MHz
Number of channels:	40 f= 2402MHz +k*2MHz, where k=0, 1,....., 39
Modulation type:	GFSK
FCC classification:	DTS
IC classification:	Bluetooth Device
Emission designator:	F1D
Rated voltage:	DC 3.0V
Rated current:	Max. 1.5mA
Protection class:	III
Test voltage:	DC 3.0V

3.3 Clock Frequencies

The highest frequency generated or used by the EUT is 16MHz for the radio portion, and is 4MHz for the digital interface portion.

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, 15.209 and 15.249.

The test methods, which have been used, are based on ANSI C63.10-2009, RSS-Gen (Issue 4) and ANSI C63.10-2013.

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 100% duty cycle.
- B. EUT transmits (TX mode), with full power, at middle channel (2442MHz), a continuous modulated signal streaming with 100% duty cycle.
- C. EUT transmits (TX mode), with full power, at highest channel (2480MHz), a continuous modulated signal streaming with 100% duty cycle.

4.3 Physical Configuration for Testing

The test system was configured in a typical fashion. USB to Serial port adaptor and laptop PC were connected for testing purpose only.

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 C63.10-2009 and ANSI C63.10-2013.

Serial number No.1 was for Conducted Radio Testing.
Serial number No.2 was for Radiated Radio Testing.

Figure 1: Test Setup of Conducted Radio Testing

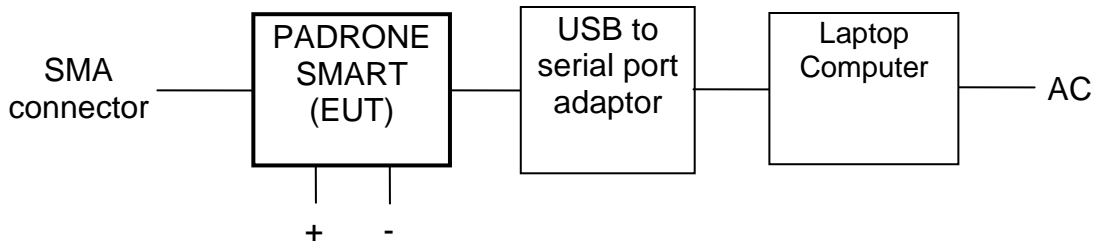
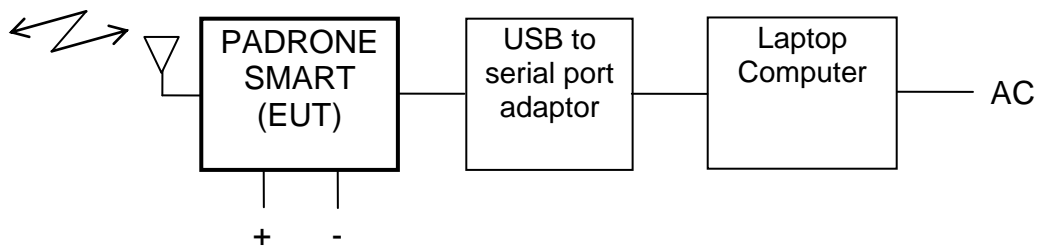


Figure 2: Test Setup of Radiated Radio Testing



Note:

USB to Serial port Adaptor and Laptop computer were disconnected after the initial test mode setting.

Table 3: Interfaces present on the EUT

No.	Interface	Cable Length for Testing, Shielding	Interface Classification
1.	Signal line (Between the EUT and Serial Adaptor)	0.2m, Un-Shielded	Signal Port
2.	Battery Power Line (Conducted Radio test only)	0.1m, Un-Shielded	DC Input Power Port
3.	RF Cable (Conducted Radio test only)	9cm, Shielded	RF Port

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

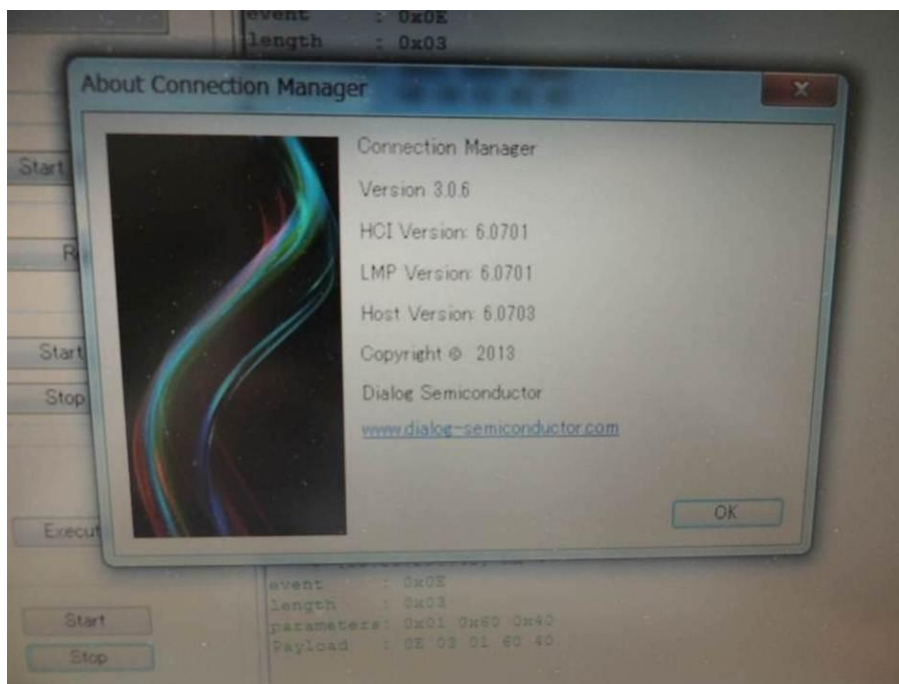
4.4 Test Software

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

Software used for testing: Connection Manager Version 3.0.6 by Dialog Semiconductor.

This software was running on the laptop computer connected to the EUT. It was used to enable the test operation modes listed in section 4.2 as appropriate.

Figure 3: Software Version



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: AC 100V-240V
Input Current: 1.5A
Frequency: 50-60Hz
Protection Class: II
Serial Number: 6372AM310201996J

3. Product: Serial Adapter
Manufacturer: IO DATA
Model: USB-RSAQ3
Rated Voltage: DC 5V (via USB)
Protection Class: III
Serial Number: V1E0035358BT

4.6 Countermeasures to achieve EMC 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

5.2.1 Conducted Output Power

Date of testing: 2015-02-27

Ambient temperature: 24°C

Relative humidity: 34%

Atmospheric pressure: 1003hPa

Requirements:

RSS-210 (Issue 8) §A.8.4 (4)

Transmitter output power measurements shall be carried out before the unwanted emissions test.

Test procedure:

RSS-Gen (Issue 4) §6.12

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

Table 4: Conducted Output Power

Frequency [MHz]	Peak Output Power [dBm]	Average Output Power [dBm]
2402	-2.88	-2.99
2440	-3.02	-3.12
2480	-3.20	-3.31

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

5.3 Radiated Measurements

5.3.1 Duty Cycle

Date of testing: 2015-02-13

Ambient temperature: 25°C

Relative humidity: 25%

Atmospheric pressure: 999hPa

Requirements:

FCC 15.35(c) and RSS-Gen 6.10

Test procedure:

ANSI C63.10-2009 and ANSI C63.10-2013

Note: The duty cycle of the EUT is 100%.

5.3.2 20dB Bandwidth

RESULT:

PASS

Date of testing:	2015-02-16
Ambient temperature:	24°C
Relative humidity:	35%
Atmospheric pressure:	1010hPa

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 C63.10-2009

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). The results corresponding to the worst case antenna polarization and EUT orientation are recorded in this report.

Measurements were performed using a spectrum analyzer with a suitable span to encompass the peak of the fundamental and using the following settings: RBW = 100kHz, VBW = 300kHz.

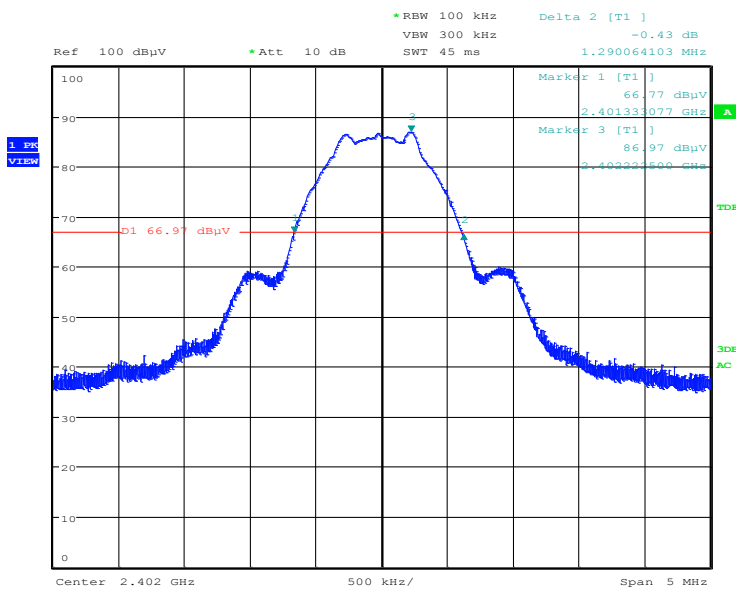
Table 5: 20dB Bandwidth Edge Frequencies

Operating Frequency [MHz]	EUT / Antenna Orient.	Edge Frequency [MHz]	Limit [MHz]	Margin [MHz]
2402	X / H	2401.333	2400.0	1.333
2480	Z / V	2480.622	2483.5	2.878

Table 6: 20dB Bandwidth

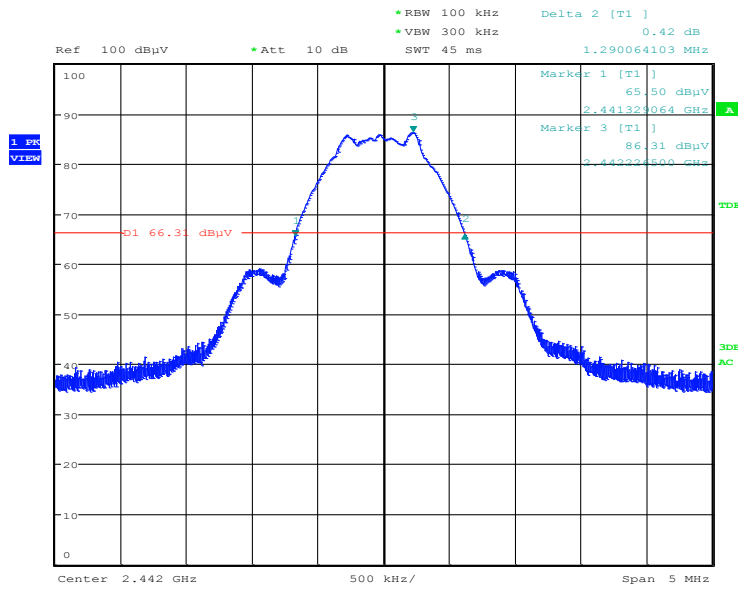
Operating Frequency [MHz]	EUT / Antenna Orient.	20dB Bandwidth [MHz]
2402	X / H	1.290064103
2442	Z / H	1.290064103
2480	Z / V	1.303230769

Figure 4: 20dB Bandwidth, Mode A (2402MHz)



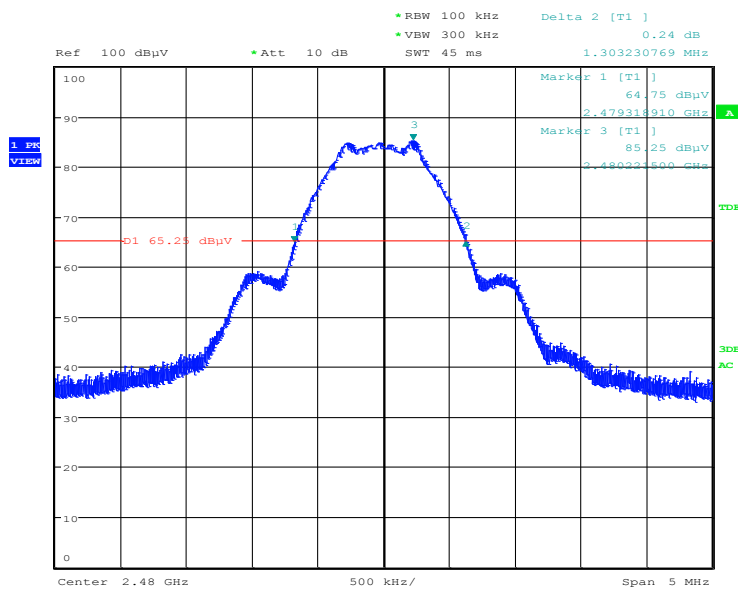
20dB BW, 2.402GHz, X, H
 Date: 16.FEB.2015 15:05:37

Figure 5: 20dB Bandwidth, Mode B (2442MHz)



20dB BW, 2.442GHz, Z, H
Date: 16.FEB.2015 15:43:14

Figure 6: 20dB Bandwidth, Mode C (2480MHz)



20dB BW, 2.480GHz, Z, V
Date: 16.FEB.2015 16:24:53

5.3.3 99% Bandwidth

Date of testing:	2015-02-26
Ambient temperature:	21°C
Relative humidity:	38%
Atmospheric pressure:	1018hPa

Requirements:

RSS-Gen 6.6

The 99% bandwidth shall be reported according to RSS-Gen 6.6.

Test procedure:

RSS-Gen 6.6

The EUT was placed on a nonconductive turntable 1.5m 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.

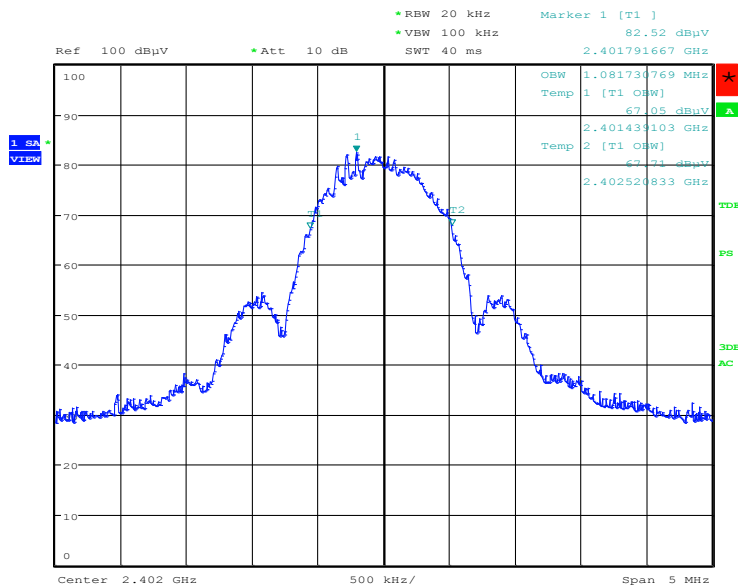
Measurements were taken using both horizontal and vertical antenna polarizations for 3 EUT orientations (X, Y and Z). The results corresponding to the worst case antenna polarization and EUT orientation are recorded in this report.

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 × 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

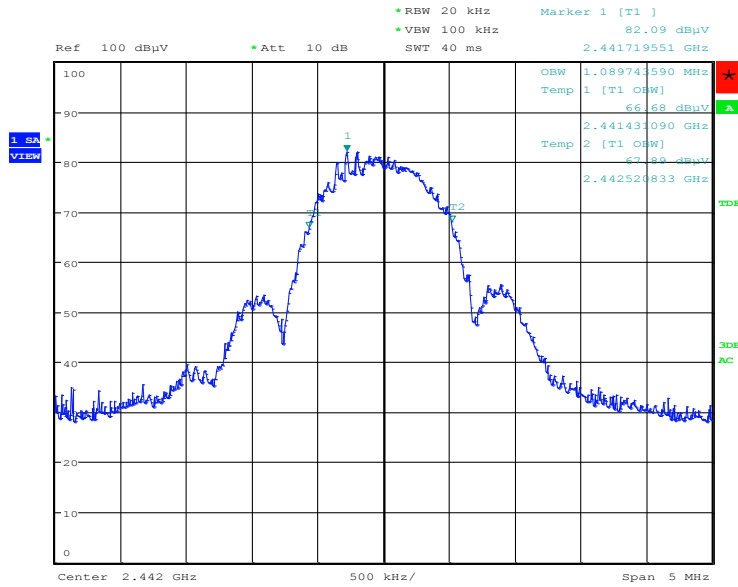
Operating Frequency [MHz]	EUT / Antenna Orient.	99% Bandwidth [MHz]
2402	X / H	1.081730769
2442	X / H	1.089743590
2480	X / H	1.105769231

Figure 7: 99% Bandwidth, Mode A (2402MHz)



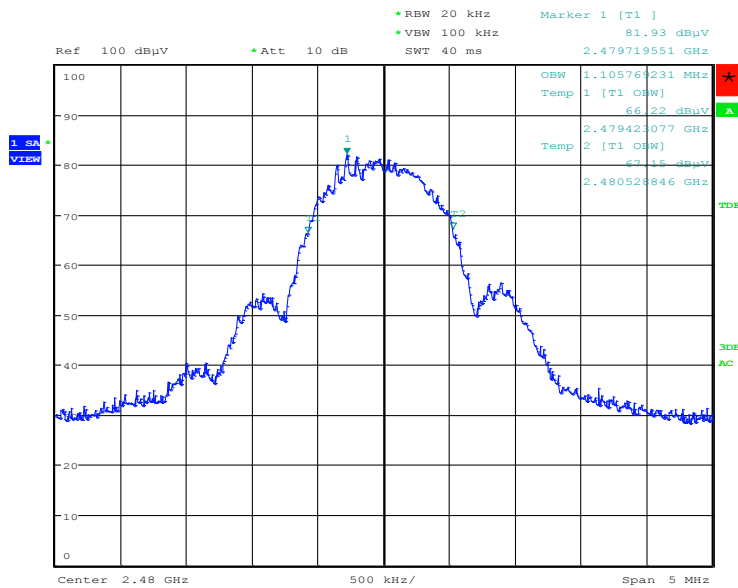
99per BW, 2.402GHz, X, H, 150cm
 Date: 26.FEB.2015 10:12:46

Figure 8: 99% Bandwidth, Mode B (2442MHz)



99per BW, 2.442GHz, X, H, 150cm
 Date: 26.FEB.2015 11:04:21

Figure 9: 99% Bandwidth, Mode C (2480MHz)



99per BW, 2.480GHz, X, H, 150cm
 Date: 26.FEB.2015 13:27:00

5.3.4 Field Strength of Fundamental

RESULT:

Pass

Date of testing: 2015-02-16, 2015-02-17, 2015-02-26
Ambient temperature: 24, 23, 21°C
Relative humidity: 35, 40, 38%
Atmospheric pressure: 1010, 1010, 1018hPa

Measurement distance: 3m
Kind of test site: Semi Anechoic Chamber

Requirements:

FCC 15.249(a) and RSS 210 A 2.9(a)

The field strength of fundamental shall not exceed the level specified in FCC 15.249(a) and RSS-210 A 2.9(a).

Test procedure:

ANSI C63.10-2009 and ANSI C63.10-2013

The EUT was placed on a nonconductive turntable 0.8m and 1.5m 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.

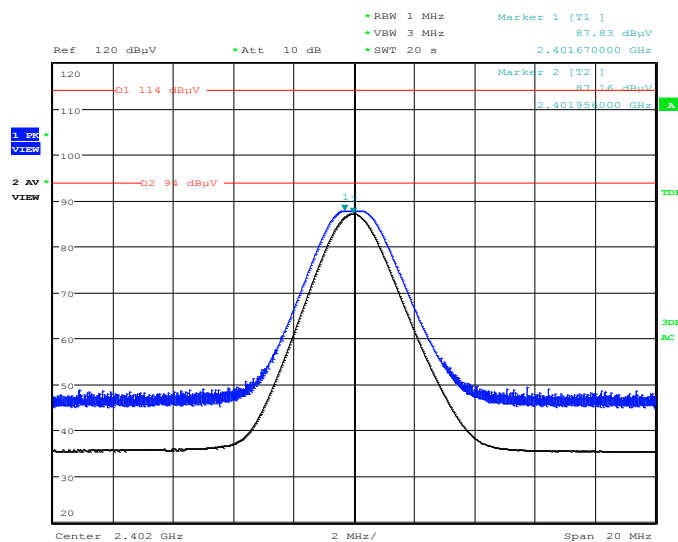
The highest emission amplitudes relative to the appropriate limit were measured and recorded in this report. In the spectra here below, the upper trace corresponds to the peak measurement and the lower trace corresponds to the average measurement.

Table 8: Field Strength of Fundamental at 0.8m height

Operating Frequency [MHz]	EUT / Antenna Orient.	Average Value [dBµV/m]	Peak Value [dBµV/m]	Average Limit [dBµV/m]	Peak Limit [dBµV/m]	Average Margin [dB]	Peak Margin [dB]
2402	X / H	87.16	87.83	94	114	6.84	26.17
2442	Z / H	86.52	87.20	94	114	7.48	26.80
2480	Z / V	85.56	86.29	94	114	8.44	27.71

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 x log(50000µV/m).
 Peak limit in dBµV/m is calculated as follows: Peak limit = Average limit + 20dB.

Figure 10: Field Strength of Fundamental, Spectral Diagram, Mode A (2402MHz) at 0.8m height



FSoF, 2.402GHz, X, H
 Date: 16.FEB.2015 14:49:56

Figure 11: Field Strength of Fundamental, Spectral Diagram, Mode B (2442MHz) at 0.8m height

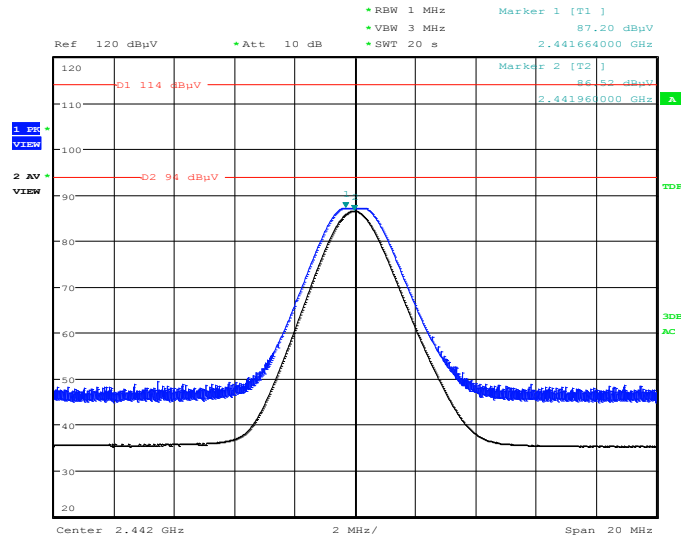


Figure 12: Field Strength of Fundamental, Spectral Diagram, Mode C (2480MHz) at 0.8m height

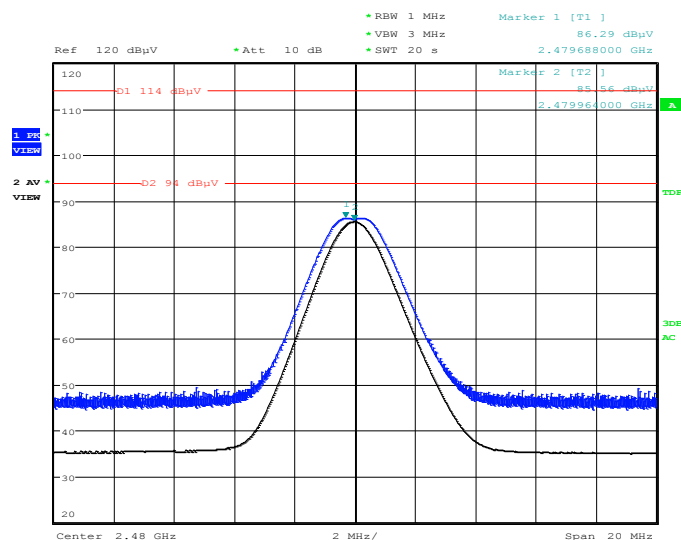
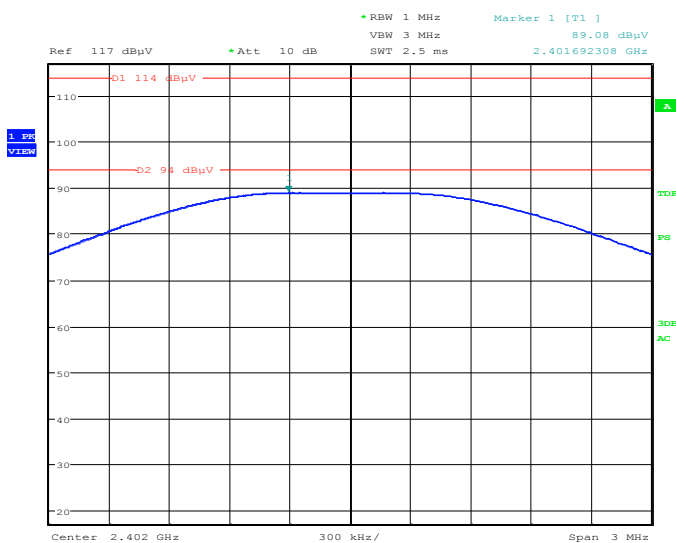


Table 9: Field Strength of Fundamental at 1.5m height

Operating Frequency [MHz]	EUT / Antenna Orient.	Average Value [dBµV/m]	Peak Value [dBµV/m]	Average Limit [dBµV/m]	Peak Limit [dBµV/m]	Average Margin [dB]	Peak Margin [dB]
2401.956	X / H	N/T (*)	89.08	94	114	N/T (*)	24.92
2441.960	X / H	N/T (*)	88.81	94	114	N/T (*)	25.19
2479.964	X / H	N/T (*)	88.74	94	114	N/T (*)	25.26

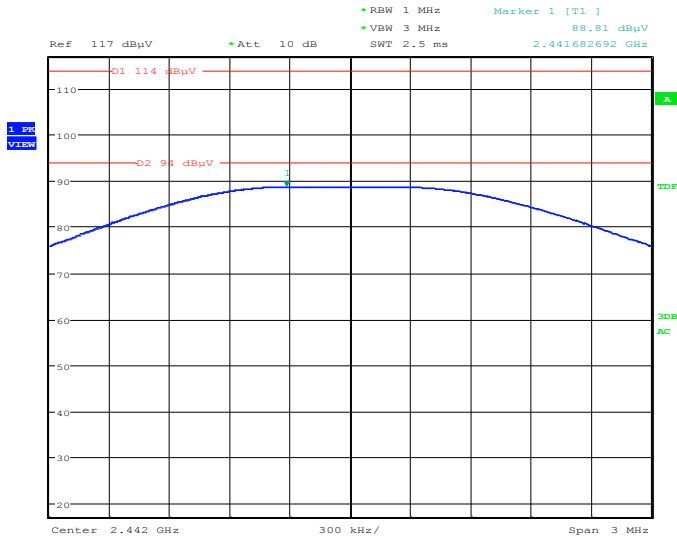
Notes: All correction factors (antenna, cable, pre-amplifier) are included in the measurement values.
 Average limit in dBµV/m is calculated as follows: Average limit = 20 x log(50000µV/m).
 Peak limit in dBµV/m is calculated as follows: Peak limit = Average limit + 20dB.
 (*) Peak emissions level has met against the average limit 54dBµV/m. Therefore, average measurement was omitted.

Figure 13: Field Strength of Fundamental, Spectral Diagram, Mode A (2402MHz) at 1.5m height



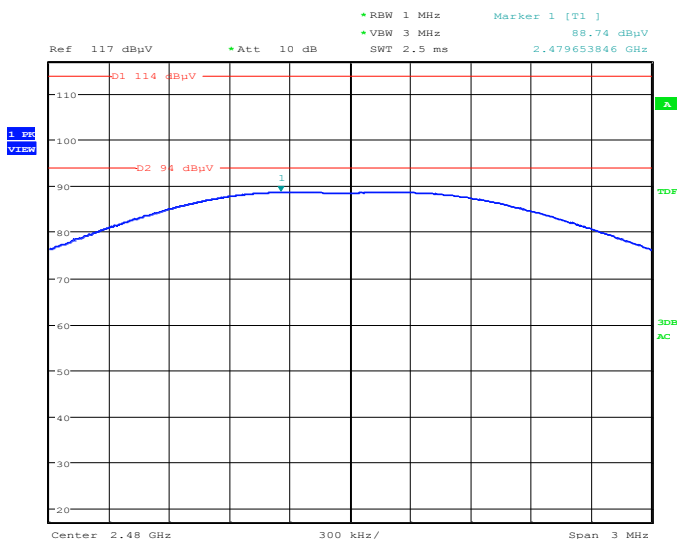
FSoF, 2.402GHz, X, H, 150cm
 Date: 26.FEB.2015 10:19:42

Figure 14: Field Strength of Fundamental, Spectral Diagram, Mode B (2442MHz) at 1.5m height



FSoF, 2.442GHz, X, H, 150cm
Date: 26.FEB.2015 11:02:23

Figure 15: Field Strength of Fundamental, Spectral Diagram, Mode C (2480MHz) at 1.5m height



FSoF, 2.480GHz, X, H, 150cm
Date: 26.FEB.2015 13:24:04

5.3.5 Radiated Spurious Emissions of Transmitter

RESULT: **PASS**

Date of testing: 2015-02-16, 2015-02-17, 2015-02-26

Ambient temperature: 24, 23, 21°C

Relative humidity: 35, 40, 38%

Atmospheric pressure: 1010, 1010, 1018hPa

Frequency range: 9kHz - 25GHz

Measurement distance: 3m

Kind of test site: Semi Anechoic Chamber

Requirements:

FCC 15.209, FCC 15.249(a), FCC 15.249(d), RSS-Gen 6.1.3 and RSS-210 2.1, 2.2, 2.5, A2.9(a) and A2.9(b)

Emission radiated outside the specified frequency bands must comply with the radiated emission limits specified in FCC 15.209(a), FCC 15.249(a), RSS-Gen 7.2.5 (tables 5 and 6) and RSS-210 A2.9(a).

Test procedure:

ANSI C63.10-2009, ANSI C63.10-2013

The EUT was placed on a nonconductive turntable 0.8m and 1.5m above the ground plane. 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, 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° 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 emissions between 30MHz and 1GHz, measurements were performed with a test receiver operating in the CISPR quasi-peak detection mode. The receiver's 6dB bandwidth was 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.

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 range 9kHz - 30MHz.

Since enough margin (i.e. more than 20dB) at the range 30MHz – 1GHz were seen at 80cm table height condition, additional measurement were only performed above 1GHz range at 1.5m table height.

Table 10: Radiated Emissions, Quasi Peak Data, 30MHz - 1GHz, Horizontal and Vertical Antenna Orientations, Mode A (2402MHz) at 0.8m height

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 [°]
32.070	Z / H	35.0	-16.9	18.1	40.0	21.9	100	359
32.072	Z / V	33.8	-16.9	16.9	40.0	23.1	101	315
44.238	Z / V	32.6	-15.5	17.1	40.0	22.9	202	83
48.322	Z / H	30.6	-15.6	15.0	40.0	25.0	333	124
143.997	Z / V	31.7	-14.9	16.8	43.5	26.7	246	208
159.903	Z / H	30.4	-14.5	15.9	43.5	27.6	237	359

Note: Level QP = Reading QP + Factor

Table 11: Radiated Emissions, Average Data, 1 - 25GHz, Horizontal and Vertical Antenna Orientations, Mode A (2402MHz) at 0.8m height

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 [°]
1299.956	Z / V	43.5	-15.8	27.7	54.0	26.3	182	141
2433.962	Z / V	39.6	-14.2	25.4	54.0	28.6	113	39
3651.011	Z / V	38.4	-10.3	28.1	54.0	25.9	197	214
7205.452	Z / V	39.5	-0.1	39.4	54.0	14.6	125	1
7987.105	Z / V	38.1	1.5	39.6	54.0	14.4	143	79

Note: Level AV = Reading AV + Factor

Table 12: Radiated Emissions, Peak Data, 1 - 25GHz, Horizontal and Vertical Antenna Orientations, Mode A (2402MHz) at 0.8m height

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 [°]
1299.956	Z / V	57.1	-15.8	41.3	74.0	32.7	182	141
2433.962	Z / V	53.7	-14.2	39.6	74.0	34.4	113	39
3651.011	Z / V	51.9	-10.3	41.6	74.0	32.4	197	214
7205.452	Z / V	52.8	-0.1	52.7	74.0	21.3	125	1
7987.105	Z / V	51.8	1.5	53.3	74.0	20.7	143	79

Note: Level PK = Reading PK + Factor

Table 13: Radiated Emissions, Quasi Peak Data, 30MHz - 1GHz, Horizontal and Vertical Antenna Orientations, Mode B (2442MHz) at 0.8m height

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 [°]
32.074	Z / H	35.1	-16.9	18.2	40.0	21.8	100	119
32.074	Z / V	34.2	-16.9	17.3	40.0	22.7	101	8
44.242	Z / H	32.5	-15.7	16.8	40.0	23.2	320	33
44.535	Z / V	30.7	-15.5	15.2	40.0	24.8	186	81
64.144	Z / H	32.7	-16.1	16.6	40.0	23.4	373	79
73.610	Z / H	30.9	-17.8	13.1	40.0	26.9	106	173
142.186	Z / H	30.4	-14.9	15.5	43.5	28.0	141	12
160.014	Z / V	31.7	-14.3	17.4	43.5	26.1	100	285

Note: Level QP = Reading QP + Factor

Table 14: Radiated Emissions, Average Data, 1 - 25GHz, Horizontal and Vertical Antenna Orientations, Mode B (2442MHz) at 0.8m height

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 [°]
1299.891	X / V	43.4	-15.8	27.6	54.0	26.4	189	146
1961.170	X / V	44.1	-15.7	28.4	54.0	25.6	104	214
2422.464	X / H	39.6	-14.1	25.5	54.0	28.5	188	337
7190.480	X / H	38.1	-0.3	37.8	54.0	16.2	130	137
7792.637	X / V	37.9	0.7	38.6	54.0	15.4	167	236

Note: Level AV = Reading AV + Factor

Table 15: Radiated Emissions, Peak Data, 1 - 25GHz, Horizontal and Vertical Antenna Orientations, Mode B (2442MHz) at 0.8m height

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 [°]
1299.891	X / V	57.7	-15.8	41.9	74.0	32.1	189	146
1961.170	X / V	64.2	-15.7	48.5	74.0	25.5	104	214
2422.464	X / H	54.2	-14.1	40.1	74.0	33.9	188	337
7190.480	X / H	52.2	-0.3	51.9	74.0	22.1	130	137
7792.637	X / V	52.4	0.7	53.1	74.0	20.9	167	236

Note: Level PK = Reading PK + Factor

Table 16: Radiated Emissions, Quasi Peak Data, 30MHz - 1GHz, Horizontal and Vertical Antenna Orientations, Mode C (2480MHz) at 0.8m height

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 [°]
32.055	Y / H	34.9	-16.9	18.0	40.0	22.0	200	205
32.071	Y / V	34.0	-16.9	17.1	40.0	22.9	101	67
44.239	Y / V	32.5	-15.5	17.0	40.0	23.0	348	52
44.242	Y / H	32.5	-15.7	16.8	40.0	23.2	179	21
55.682	Y / H	30.8	-15.3	15.5	40.0	24.5	220	136
143.994	Y / V	31.7	-14.9	16.8	43.5	26.7	128	15
159.739	Y / H	30.4	-14.5	15.9	43.5	27.6	178	41

Note: Level QP = Reading QP + Factor

Table 17: Radiated Emissions, Average Data, 1 - 25GHz, Horizontal and Vertical Antenna Orientations, Mode C (2480MHz) at 0.8m height

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 [°]
1299.912	Y / V	43.4	-15.8	27.6	54.0	26.4	189	35
2232.996	Y / V	39.2	-13.6	25.6	54.0	28.4	104	146
4852.520	Y / V	38.1	-7.1	31.0	54.0	23.0	110	318
7412.876	Y / H	38.4	0.3	38.7	54.0	15.3	158	200
7785.303	Y / H	38.0	0.7	38.7	54.0	15.3	101	226

Note: Level AV = Reading AV + Factor

Table 18: Radiated Emissions, Peak Data, 1 - 25GHz, Horizontal and Vertical Antenna Orientations, Mode C (2480MHz) at 0.8m height

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 [°]
1299.912	Y / V	56.9	-15.8	41.1	74.0	32.9	189	35
2232.996	Y / V	52.7	-13.6	39.1	74.0	34.9	104	146
4852.520	Y / V	52.5	-7.1	45.4	74.0	28.6	110	318
7412.876	Y / H	52.5	0.3	52.8	74.0	21.2	158	200
7785.303	Y / H	51.8	0.7	52.5	74.0	21.5	101	226

Note: Level PK = Reading PK + Factor

Table 19: Radiated Emissions, Average Data, 1 - 25GHz, Horizontal and Vertical Antenna Orientations, Mode A (2402MHz) at 1.5m height

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 [°]
1499.974	X / V	39.8	-16.1	23.7	54.0	30.3	196	265
3381.245	X / H	39.3	-12.4	26.9	54.0	27.1	222	311
4803.949	X / H	46.1	-7.1	39.0	54.0	15.0	101	217
7398.040	X / V	38.3	0.3	38.6	54.0	15.4	245	353
7795.744	X / H	37.8	0.7	38.5	54.0	15.5	249	90

Note: Level AV = Reading AV + Factor

Table 20: Radiated Emissions, Peak Data, 1 - 25GHz, Horizontal and Vertical Antenna Orientations, Mode A (2402MHz) at 1.5m height

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 [°]
1499.974	X / V	55.9	-16.1	39.8	74.0	34.2	196	265
3381.245	X / H	53.0	-12.4	40.6	74.0	33.4	222	311
4803.949	X / H	54.7	-7.1	47.6	74.0	26.4	101	217
7398.040	X / V	52.4	0.3	52.7	74.0	21.3	245	353
7795.744	X / H	52.2	0.7	52.9	74.0	21.1	249	90

Note: Level PK = Reading PK + Factor

Table 21: Radiated Emissions, Average Data, 1 - 25GHz, Horizontal and Vertical Antenna Orientations, Mode B (2442MHz) at 1.5m height

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 [°]
1499.957	Y / V	40.2	-16.1	24.1	54.0	29.9	249	208
2464.336	Y / H	39.8	-14.3	25.5	54.0	28.5	249	101
3869.071	Y / V	38.3	-9.7	28.6	54.0	25.4	103	313
7325.983	Y / V	43.8	0.3	44.1	54.0	9.9	178	136
7942.870	Y / H	37.5	1.3	38.8	54.0	15.2	113	58

Note: Level AV = Reading AV + Factor

Table 22: Radiated Emissions, Peak Data, 1 - 25GHz, Horizontal and Vertical Antenna Orientations, Mode B (2442MHz) at 1.5m height

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 [°]
1499.957	Y / V	56.3	-16.1	40.2	74.0	33.8	249	208
2464.336	Y / H	53.4	-14.3	39.1	74.0	34.9	249	101
3869.071	Y / V	52.9	-9.7	43.2	74.0	30.8	103	313
7325.983	Y / V	55.0	0.3	55.3	74.0	18.7	178	136
7942.870	Y / H	52.2	1.3	53.4	74.0	20.6	113	58

Note: Level PK = Reading PK + Factor

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Table 23: Radiated Emissions, Average Data, 1 - 25GHz, Horizontal and Vertical Antenna Orientations, Mode C (2480MHz) at 1.5m height

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 [°]
1500.045	X / V	40.1	-16.1	24.0	54.0	30.0	192	338
4959.939	X / V	47.7	-6.9	40.8	54.0	13.2	156	183
7440.703	X / V	38.2	0.3	38.5	54.0	15.5	154	119
7694.259	X / H	38.2	0.2	38.4	54.0	15.6	145	238
7950.714	X / V	37.6	1.3	38.9	54.0	15.1	165	30

Note: Level AV = Reading AV + Factor

Table 24: Radiated Emissions, Peak Data, 1 - 25GHz, Horizontal and Vertical Antenna Orientations, Mode C (2480MHz) at 1.5m height

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 [°]
1500.045	X / V	56.9	-16.1	40.8	74.0	33.2	192	338
4959.939	X / V	56.3	-6.9	49.4	74.0	24.6	156	183
7440.703	X / V	52.2	0.3	52.5	74.0	21.5	154	119
7694.259	X / H	52.5	0.2	52.6	74.0	21.4	145	238
7950.714	X / V	52.2	1.3	53.5	74.0	20.5	165	30

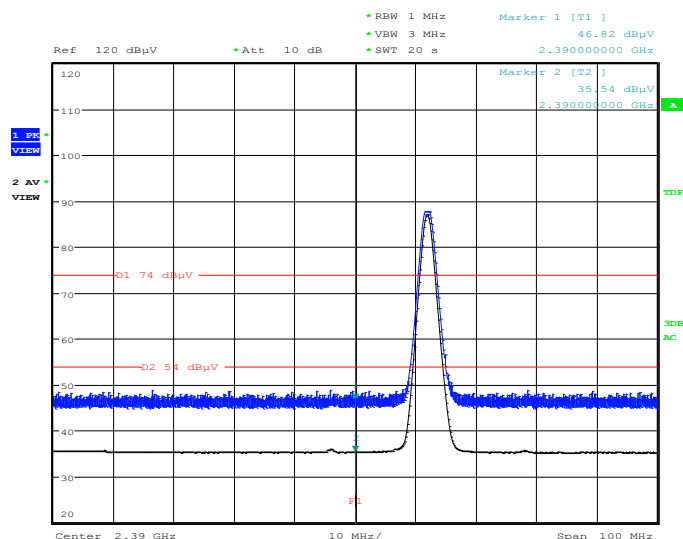
Note: Level PK = Reading PK + Factor

Table 25: 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]	Table Height [m]
2402	X / H	35.5	46.8	54.0	74.0	18.5	27.2	0.8
2480	Z / V	40.8	49.9	54.0	74.0	13.2	24.1	0.8
2402	X / H	34.9	46.5	54.0	74.0	19.1	27.5	1.5
2480	X / H	43.1	51.3	54.0	74.0	10.9	22.7	1.5

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 x log(500µV/m).
 Peak limit in dBµV/m is calculated as follows: Peak limit = Average limit + 20dB.

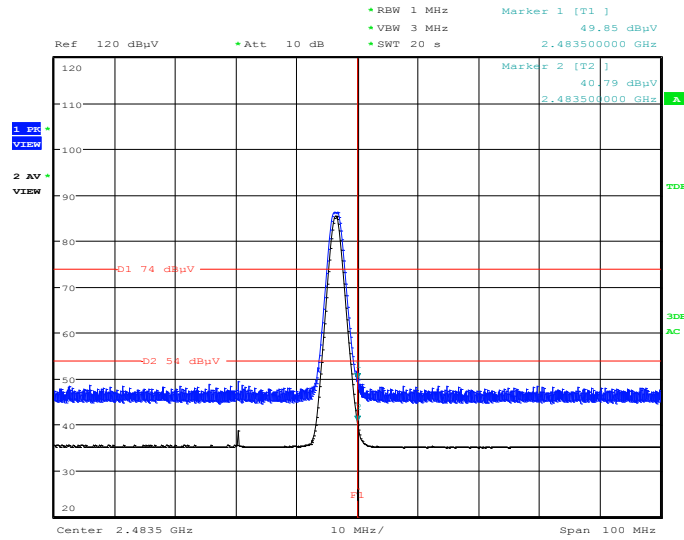
Figure 16: Radiated Emissions at Band Edge, Spectral Diagram, Mode A (2402MHz) at 0.8m height



BE, 2.402GHz, X, H
 Date: 16.FEB.2015 14:54:49

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

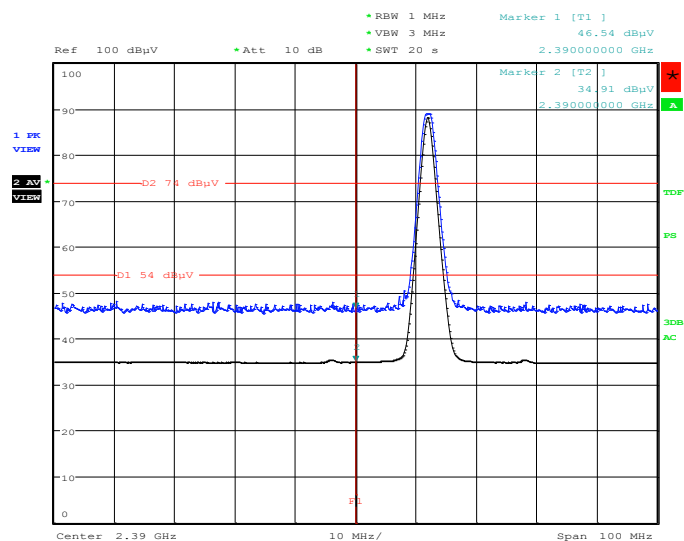
Figure 17: Radiated Emissions at Band Edge, Spectral Diagram, Mode C (2480MHz) at 0.8m height



BE, 2.4835GHz, Z, V
Date: 16.FEB.2015 16:20:49

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

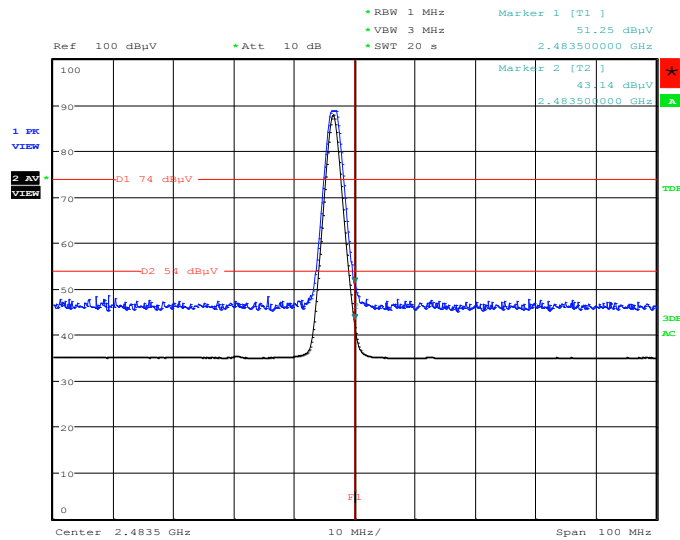
Figure 18: Radiated Emissions at Band Edge, Spectral Diagram, Mode A (2402MHz) at 1.5m height



BE, 2.402GHz, X, H, 150cm
Date: 26.FEB.2015 10:36:08

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

Figure 19: Radiated Emissions at Band Edge, Spectral Diagram, Mode C (2480MHz) at 1.5m height



BE, 2.4835GHz, X, H, 150cm
Date: 26.FEB.2015 13:21:03

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 C63.10-2009, ANSI C63.10-2013

Note:

It is not applicable since the EUT is battery operated.

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