TÜVRheinland®

Produkte
Products

Prüfbericht - Nr.: *Test Report No.:*	**50004840 001**	**Seite 1 von 39** *Page 1 of 39*

Auftraggeber: *Client:*	**CATEYE Co., Ltd.** 2-8-25, Kuwazu, Higashi-Sumiyoshi-Ku, Osaka, 546-0041 Japan
Gegenstand der Prüfung: *Test Item:*	**SPEED CADENCE SENSOR**
Bezeichnung: *Identification:*	**ISC-12**
Serien-Nr.: *Serial No.:*	**Prototype**
Wareneingangs-Nr.: *Receipt No.:*	**A000039586**
Eingangsdatum: *Date of Receipt:*	**2014-02-20**
Zustand des Prüfgegenstandes bei Anlieferung: *Condition of Test Item at Delivery:*	**Good**
Prüfort: *Testing Location:*	**TÜV Rheinland Japan Ltd. – Global Technology Assessment Center** 4-25-2 Kita-Yamata, Tsuzuki-ku, Yokohama 224-0021, Japan
Prüfgrundlage: *Test Specification:*	**FCC 47 CFR Part 15, Subpart C, Section 15.249 (October 1, 2013)** ANSI C63.10-2009 **RSS-210 (Issue 8): 2010** **RSS-Gen (Issue 3): 2010** ANSI C63.10-2009
Prüfergebnis: *Test Result:*	**Der Prüfgegenstand entspricht oben genannter Prüfgrundlage(n).** *The test item passed the test specification(s).*
Prüflaboratorium: *Testing Laboratory:*	**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:*		
2014-10-14	P. Zhang / Inspector		2014-10-14	R. Meiranke / Reviewer	
Datum *Date*	**Name/Stellung** *Name/Position*	**Unterschrift** *Signature*	**Datum** *Date*	**Name/Stellung** *Name/Position*	**Unterschrift** *Signature*

Sonstiges / *Other Aspects:*

Abkürzungen:				*Abbreviations:*			
P(ass)	=	*entspricht Prüfgrundlage*		*P(ass)*	=	*passed*	
F(ail)	=	*entspricht nicht Prüfgrundlage*		*F(ail)*	=	*failed*	
N/A	=	*nicht anwendbar*		*N/A*	=	*not applicable*	
N/T	=	*nicht getestet*		*N/T*	=	*not tested*	

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

5.2.2 20DB BANDWIDTH
RESULT: PASS

5.2.3 99% BANDWIDTH

5.3.1 DUTY CYCLE

5.3.2 FIELD STRENGTH OF FUNDAMENTAL
RESULT: Pass

5.3.3 RADIATED SPURIOUS EMISSIONS OF TRANSMITTER
RESULT: PASS

5.4.1 AC POWER LINE CONDUCTED EMISSION OF TRANSMITTER
RESULT: N/A

Contents

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.

ilac-MRA VLAC Lab Accreditation VLAC-017

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					
Receiver	Rohde & Schwarz	ESU 8	100025	RF-0020	2014-09
Spectrum Analyzer	Agilent	E4447A	MY48250005	BT-8267	2014-05
RF Power Meter	Agilent	N1911A	MY45101737	RF-0393	2014-11
RF Peak Power Sensor	Agilent	N1921A	MY45242228	RF-0394	2014-11
For Radiated Emission					
Receiver	Rohde & Schwarz	ESU 8	100025	RF-0020	2014-09
Spectrum Analyzer	Rohde & Schwarz	FSP30	100006/030	BT-8017	2014-10
RF Selector (10m Chamber)	Toyo Corporation	NS4900	0703-182	RF-0029	2014-11
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	2015-01
10dB Attenuator	Hewlett Packard	8491A 10dB	58354	RF-0314	2014-11
Low Noise Preamplifier, 9kHz-1GHz	TSJ	MLA-10K01-B01-35	1370750	RF-0253	2014-11
Low Pass Filter, DC-1GHz	R&K	LP1000CH3	12104001	RF-0515	2014-11
Horn Antenna, 1-8GHz	Schwarzbeck	BBHA9120D	1059	RF-0553	2014-03
Microwave Preamplifier, 1-8GHz	Toyo Corporation	TPA0108-40	0634	RF-0052	2014-11
Band Reject Filter, 1-8GHz	Nitsuki	NF-49BT	027	RF-0131	2014-11
Horn Antenna with Preamplifier, 8-18GHz	Toyo Corporation	HAP06-18W	00000025	RF-0065	2014-05
High Pass Filter, 8-18GHz	Micro-Tronics	HPM50107	006	RF-0334	2014-05
Horn Antenna with Preamplifier, 18-26.5GHz	Toyo Corporation	HAP18-26N	00000010	RF-0070	2014-05

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 Bluetooth Smart Speed/Cadence Sensor to be installed on a bicycle. It can transmit speed information to a remote device via Bluetooth.

3.2 System Details

Radio standard:	Bluetooth 4.0 Low Energy
Specified output power:	-6.59dBm (Conducted, Peak)
Antenna gain:	-2.59dBi
Antenna type:	Pattern antenna
Antenna mounting type:	On board
Frequency range:	2402 - 2480MHz f= 2402MHz +k*2MHz, where k=0, 1,….., 39
Number of channels:	40
Channel spacing:	2MHz
Modulation type:	GFSK
FCC classification:	DTS
IC classification:	Bluetooth Device (2400-2483.5 MHz)
Emission designator:	F1D
Rated voltage:	DC 3V (Li coin cell)
Rated current:	Max. 1.0mA
Protection class:	III
Test voltage:	DC 3V

3.3 Clock Frequencies

The highest frequency generated or used by the EUT is 16MHz for the Radio portion. For the details, refer to schematics.

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 FCC KDB, ANSI C63.10-2009 and RSS-Gen (Issue 3).

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 21.9% duty cycle.

B. EUT transmits (TX mode), with full power, at middle channel (2442MHz), a continuous modulated signal streaming with 21.9% duty cycle.

C. EUT transmits (TX mode), with full power, at highest channel (2480MHz), a continuous modulated signal streaming with 21.9% duty cycle.

4.3 Physical Configuration for Testing

The test system was configured in a typical fashion. USB to serial port adaptor and Laptop were connected for testing 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.

Figure 1*:* Test Setup for Conducted Radio Testing

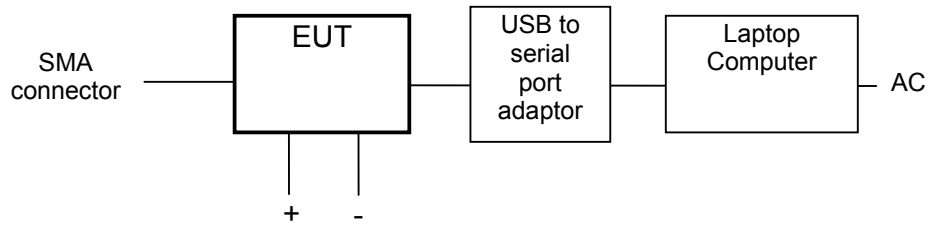
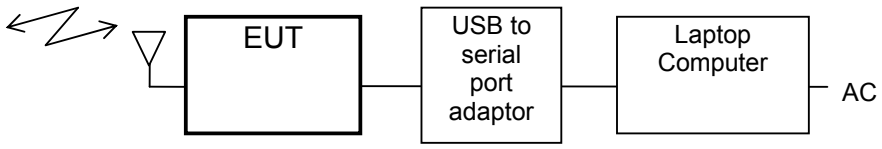


Figure 2*:* Test Setup for Radiated Radio Testing



Notes:

USB to serial port adaptor and Laptop computer were disconnected after the test mode setting. These were out of chamber during test.

Table 3: Interfaces present on the EUT

No.	Interface	Cable Length for Testing, Shielding	Interface Classification
1.	Battery Power Line (Conducted Radio test only)	0.2m, un-shielded	DC input power port
2.	Signal line (Between EUT and USB to serial port adaptor)	0.2m, un-shielded	Signal port

Notes:

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

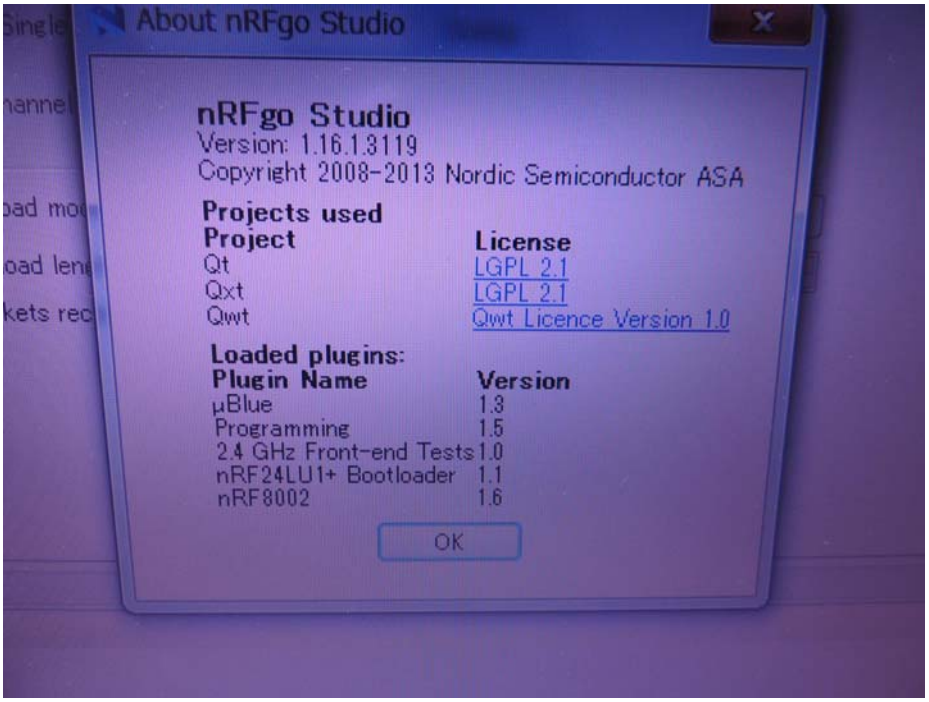
4.4 Test Software

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

Software used for testing: nRFgo Studio version 1.16.1.3119 by Nordic Semiconductor ASA.

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 Adaptor 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: Serial Adaptor
   Manufacturer: IO DATA
   Model: USB-RSAQ3
   Rated Voltage: USB 5V
   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 7.2.2

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: 2014-03-11

Ambient temperature: 24°C
Relative humidity: 32%
Atmospheric pressure: 1020hPa

Requirements:

RSS-Gen (Issue 3) §4.8

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

Test procedure:

RSS-Gen (Issue 3) §4.8

The maximum peak output power (conducted) was measured at the antenna connector with a power meter.

Table 4: Conducted Output Power

Frequency [MHz]	Peak Power [dBm]	Average Power [dBm]
2402	-6.59	-11.14
2442	-7.08	-11.63
2480	-8.09	-12.67

5.2.2 20dB Bandwidth

RESULT: **PASS**

Date of testing:	2014-03-06
Ambient temperature:	22°C
Relative humidity:	30%
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 = 100kHz.

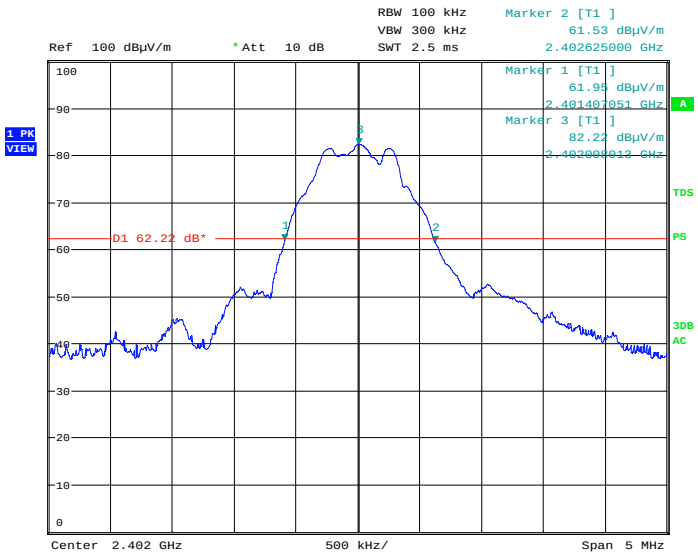
Table 5: 20dB Bandwidth Edge Frequencies

20dB Bandwidth Edge Side	Operating Frequency [MHz]	EUT / Antenna Orient.	Edge Frequency [MHz]	Limit [MHz]	Margin [MHz]
Left	2402	Y / V	2401.407	2400	1.407
Right	2480	Y / V	2480.625	2483.5	2.875

Table 6: 20dB Bandwidth

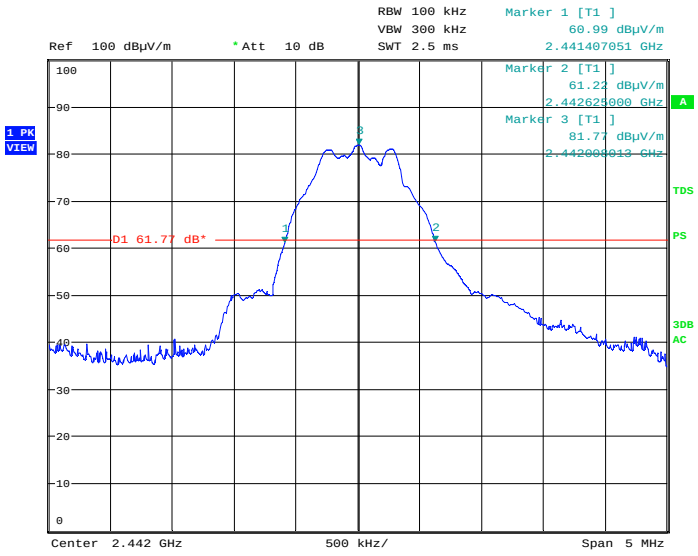
Operating Frequency [MHz]	EUT / Antenna Orient.	20dB Bandwidth [MHz]
2402	Y / V	1.218
2442	Y / V	1.218
2480	Y / V	1.242

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



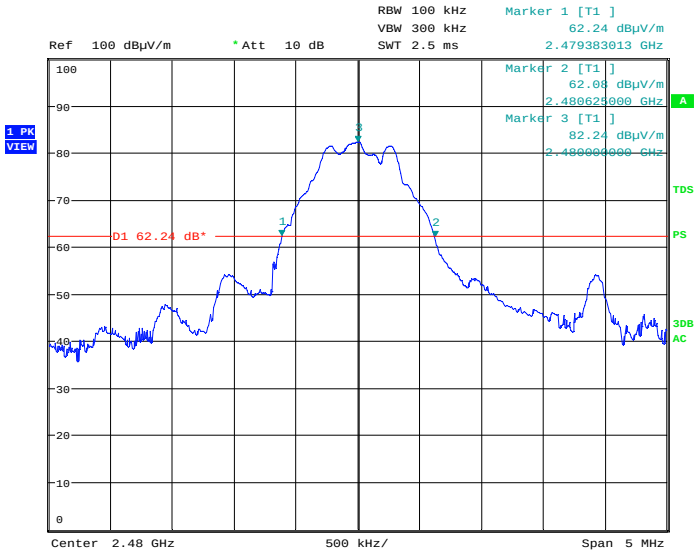
ISC-12, 20dB BW, 2.402GHz, Y
Date: 6.MAR.2014 10:54:17

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



ISC-12, 20dB BW, 2.442GHz, Y
Date: 6.MAR.2014 10:00:19

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



ISC-12, 20dB BW, 2.480GHz, Y
Date: 5.MAR.2014 18:25:11

5.2.3 99% Bandwidth

Date of testing: 2014-03-31

Ambient temperature: 22°C
Relative humidity: 20%
Atmospheric pressure: 1003hPa

Requirements:

RSS-Gen 4.6.1

The 99% bandwidth shall be reported according to RSS-Gen 4.6.1.

Test procedure:

RSS-Gen 4.6.1.

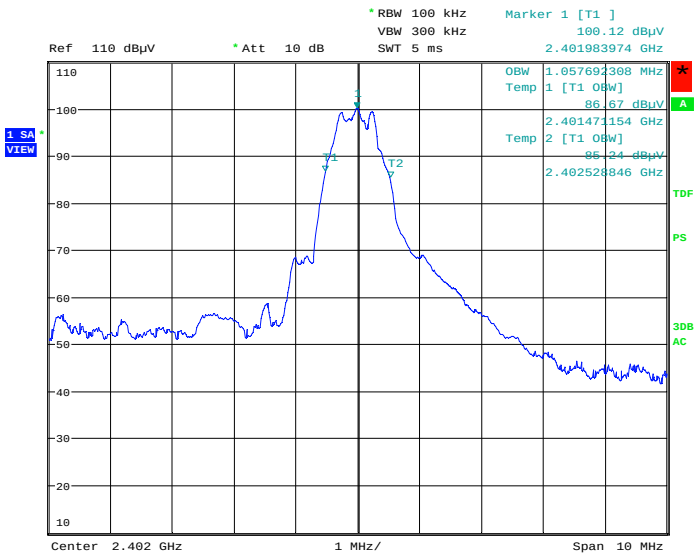
The 99% Bandwidth (conducted) was measured at the antenna connector with Spectrum Analyzer.

Final measurements were performed using a spectrum analyzer with the resolution bandwidth set to 100kHz (1% of the span) and the video bandwidth to 300kHz. The 99% bandwidth was measured by using the OBW function of the analyzer with a 99% coverage setting.

Table 7: 99% Bandwidth

Operating Frequency [MHz]	99% Bandwidth [MHz]
2402	1.058
2442	1.074
2480	1.058

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

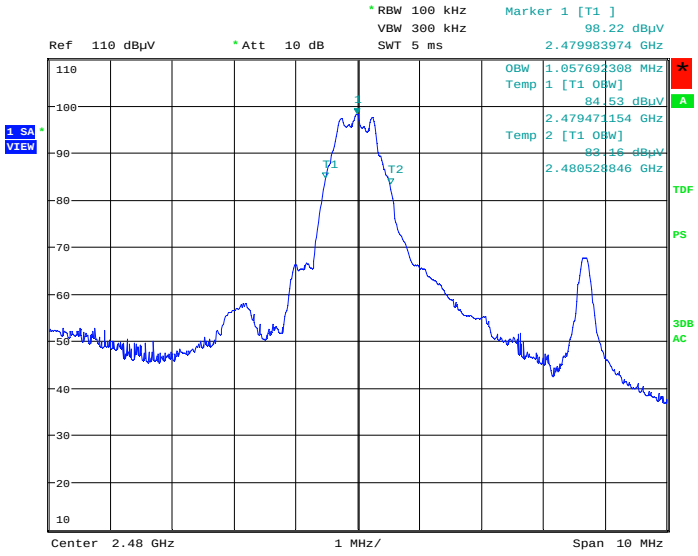


ISC-12, 99per BW, 2.402GHz, Conducted
Date: 31.MAR.2014 10:17:01

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

ISC-12, 99per BW, 2.442GHz, Conducted
Date: 31.MAR.2014 10:20:27

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



ISC-12, 99per BW, 2.480GHz, Conducted
Date: 31.MAR.2014 10:25:52

5.3 Radiated Measurements

5.3.1 Duty Cycle

Date of testing: 2014-03-06

Ambient temperature: 22°C
Relative humidity: 30%
Atmospheric pressure: 1010hPa

Requirements:

FCC 15.35(c) and RSS-Gen 4.5

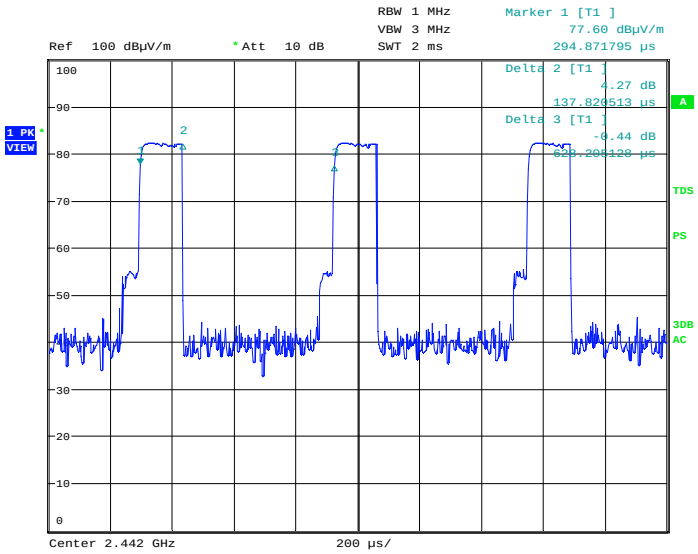
Test procedure:

ANSI C63.10-2009

Table 8: Duty Cycle

On Time Duration [us]	Period of the Pulse Train [us]	Total On Time [%]
137.8	628.2	21.9

Figure 10: Duty Cycle, Mode B (2442MHz)



ISC-12, Duty Cycle, 2.442GHz, Y
Date: 6.MAR.2014 11:11:59

5.3.2 Field Strength of Fundamental

RESULT: **Pass**

Date of testing:	2014-03-06
Ambient temperature:	22°C
Relative humidity:	30%
Atmospheric pressure:	1010hPa
Measurement distance:	3m
Kind of test site:	Semi Anechoic Chamber

Requirements:

FCC 15.249(a) and RSS 210 A2.9(a)

The field strength of fundamental shall not exceed the level specified in FCC 15.249(a) and RSS-210 A2.9(a).

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).

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.

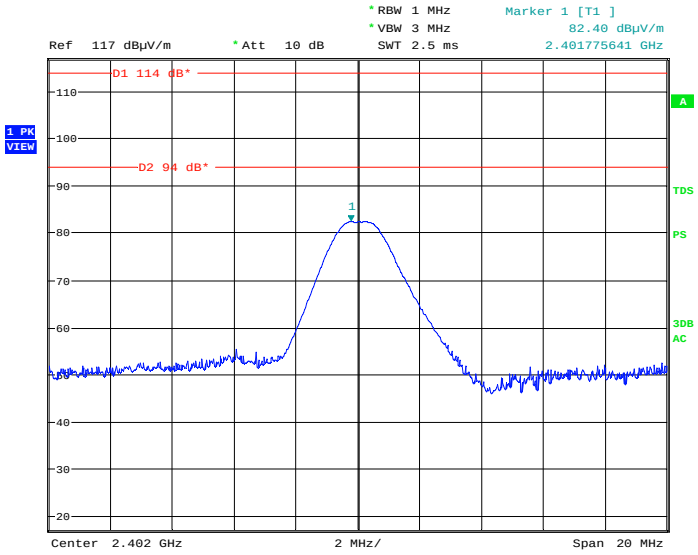
The highest emission amplitudes relative to the appropriate limit were measured and recorded in this report. In the spectra here below, the upper trace corresponds to the peak measurement and the lower trace corresponds to the average measurement.

Table 9: Field Strength of Fundamental

Operating Frequency [MHz]	EUT / Antenna Orient.	Average Value [dBµV/m]	Peak Value [dBµV/m]	Average Limit [dBµV/m]	Peak Limit [dBµV/m]	Average Margin [dB]	Peak Margin [dB]
2401.7756	Y / V	-	82.4	94.0	114.0	-	31.6
2442.2885	Y / V	-	82.1	94.0	114.0	-	31.9
2480.0	Y / V	-	82.6	94.0	114.0	-	31.4

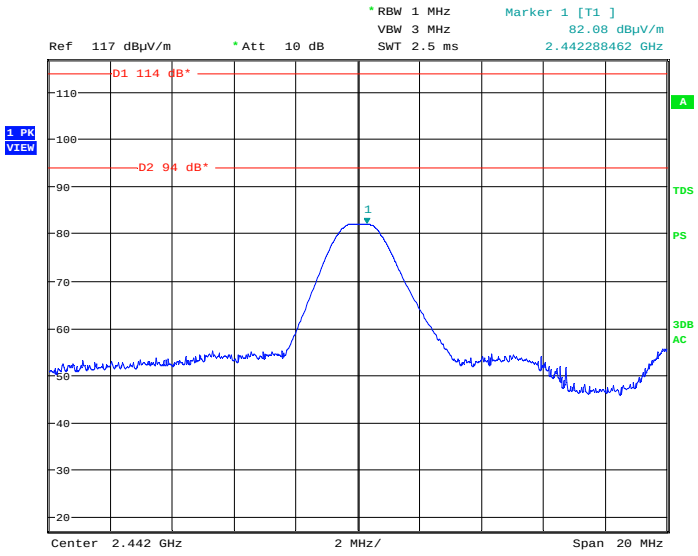
Notes: Average value is not required as the peak value is significantly below the average limit.
All correction factors (antenna, cable, pre-amplifier) are included in the measurement values.
Average limit in dBµV/m is calculated as follows: Average limit = 20 x log(50000µV/m).
Peak limit in dBµV/m is calculated as follows: Peak limit = Average limit + 20dB.

Figure 11: Field Strength of Fundamental, Spectral Diagram, Mode A (2402MHz)



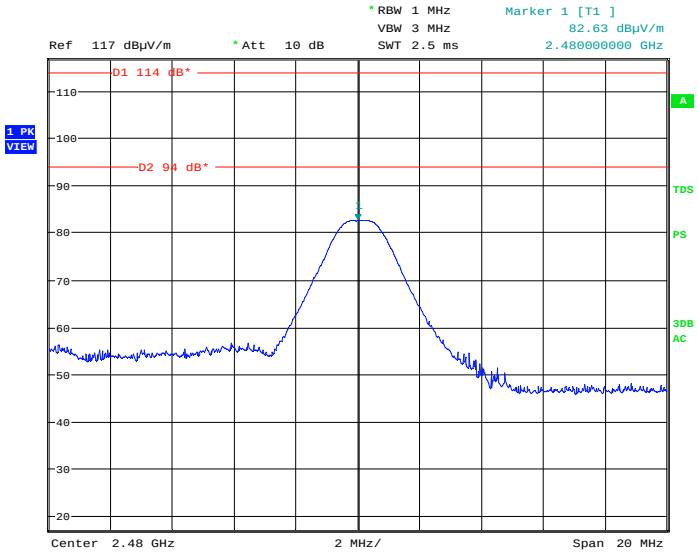
ISC-12, FSoF, 2.402GHz, Y
Date: 6.MAR.2014 10:39:53

Figure 12: Field Strength of Fundamental, Spectral Diagram, Mode B (2442MHz)



ISC-12, FSoF, 2.442GHz, Y
Date: 6.MAR.2014 09:45:25

Figure 13: Field Strength of Fundamental, Spectral Diagram, Mode C (2480MHz)



ISC-12, FSoF, 2.480GHz, Y
Date: 5.MAR.2014 18:06:04

5.3.3 Radiated Spurious Emissions of Transmitter

RESULT: **PASS**

Date of testing:	2014-02-23 till 2014-03-11
Ambient temperature:	19-25°C
Relative humidity:	30-43%
Atmospheric pressure:	1010-1025hPa
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 7.2.2 and 7.2.5 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 and RSS-Gen 4.9 and 7.2

The EUT was placed on a nonconductive turntable 0.8m 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.

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

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 [°]
32.052	Z / H	38.4	-16.6	21.8	40.0	18.2	101	359
80.003	Z / H	33.8	-19.0	14.8	40.0	25.2	346	340
889.965	Z / V	31.1	-2.7	28.4	46.0	17.6	395	227

Note: Level QP = Reading QP + Factor

Table 11: 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 [°]
2334.163	Y / V	39.4	-14.1	25.3	54.0	28.7	112	344
4804.044	Y / V	56.3	-7.1	49.2	54.0	4.8	195	135
17620.660	Z / H	42.3	-4.4	37.9	54.0	16.1	192	146

Note: Level AV = Reading AV + Factor

Table 12: 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 [°]
2334.163	Y / V	63.5	-14.1	49.4	74.0	24.6	112	344
4804.044	Y / V	70.2	-7.1	63.1	74.0	10.9	195	135
17620.660	Z / H	56.9	-4.4	52.5	74.0	21.5	192	146

Note: Level PK = Reading PK + Factor

Table 13: 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 [°]
32.062	X / H	39.9	-16.6	23.3	40.0	16.7	100	359
79.998	X / H	33.3	-18.9	14.4	40.0	25.6	357	62
969.231	X / H	30.1	-0.6	29.5	54.0	24.5	246	284

Note: Level QP = Reading QP + Factor

Table 14: 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 [°]
2333.890	Y / V	39.5	-14.1	25.4	54.0	28.6	108	359
2390.442	Y / V	39.7	-14.1	25.6	54.0	28.4	107	6
4883.988	Y / V	56.5	-7.3	49.2	54.0	4.8	168	144
4884.011	Y / V	55.4	-7.3	48.1	54.0	5.9	171	174
17882.080	Z / V	42.8	-3.5	39.3	54.0	14.7	169	340

Note: Level AV = Reading AV + Factor

Table 15: 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 [°]
2333.890	Y / V	63.9	-14.1	49.8	74.0	24.2	108	359
2390.442	Y / V	67.7	-14.1	53.6	74.0	20.4	107	6
4883.988	Y / V	70.3	-7.3	63.0	74.0	11.0	168	144
4884.011	Y / V	69.1	-7.3	61.8	74.0	12.2	171	174
17882.080	Z / V	56.6	-3.5	53.1	74.0	20.9	169	340

Note: Level PK = Reading PK + Factor

Table 16: 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 [°]
32.066	Z / H	39.5	-16.6	22.9	40.0	17.1	101	1
80.008	Z / V	33.3	-19.3	14.0	40.0	26.0	233	317
940.031	Z / V	30.6	-1.5	29.1	46.0	16.9	129	249

Note: Level QP = Reading QP + 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 [°]
2510.984	Z / H	39.7	-14.6	25.1	54.0	28.9	143	350
2586.614	Z / H	39.9	-14.6	25.3	54.0	28.7	168	178
4959.981	Z / H	56.8	-6.9	49.9	54.0	4.1*	140	143
7913.648	Z / H	37.0	1.3	38.3	54.0	15.7	196	130
17861.020	Z / V	42.9	-3.7	39.2	54.0	14.8	171	193

Note: Level AV = Reading AV + Factor

(*) The measured result is below the specification limit by a margin less than the measurement uncertainty; it is therefore not possible to determine compliance at a level of confidence of 95%. However, the measured result indicates a high probability that the tested product complies with the specification limit.

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 [°]
2510.984	Z / H	68.0	-14.6	53.4	74.0	20.6	143	350
2586.614	Z / H	67.7	-14.6	53.1	74.0	20.9	168	178
4959.981	Z / H	70.6	-6.9	63.7	74.0	10.3	140	143
7913.648	Z / H	51.1	1.3	52.4	74.0	21.6	196	130
17861.020	Z / V	58.0	-3.7	54.3	74.0	19.7	171	193

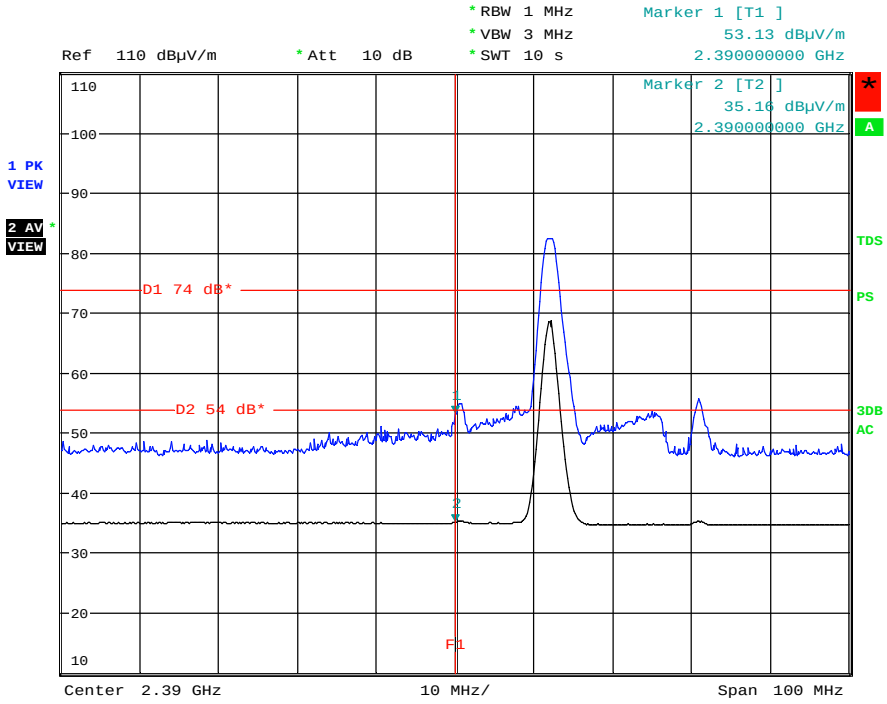
Note: Level PK = Reading PK + Factor

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

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]
2390.0	Y / V	35.16	53.13	54.0	74.0	18.84	20.87
2483.5	Y / V	36.17	55.54	54.0	74.0	17.83	18.46

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.

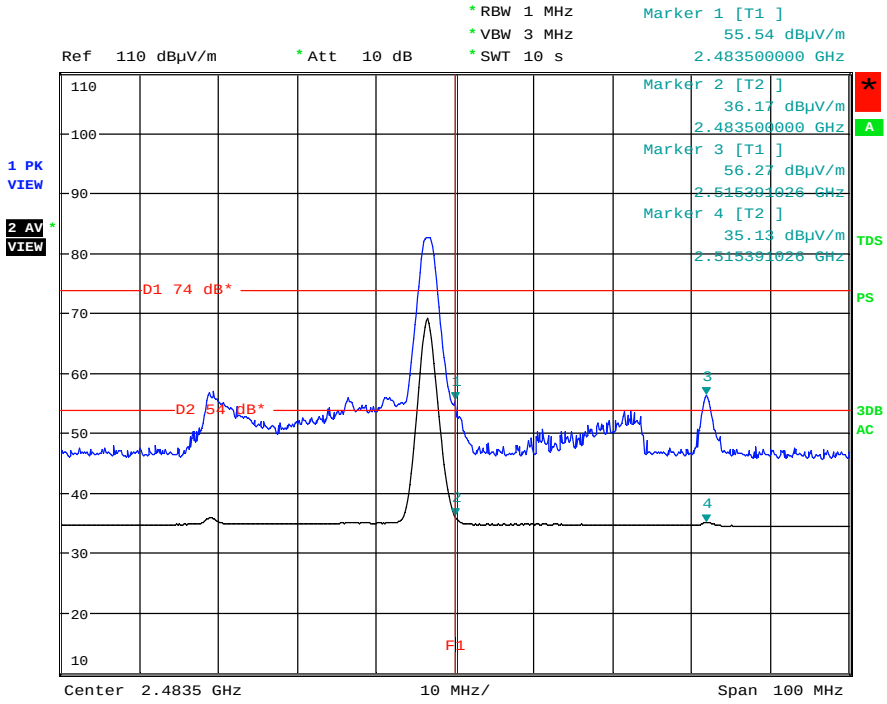
Figure 14: Radiated Emissions at Band Edge, Spectral Diagram, Mode A (2402MHz)



ISC-12, BE, 2.39GHz, Y
Date: 6.MAR.2014 10:49:42

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

Figure 15: Radiated Emissions at Band Edge, Spectral Diagram, Mode C (2480MHz)



ISC-12, BE, 2.4835GHz, Y
Date: 5.MAR.2014 17:51:56

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 7.2.4

Note:
It is not applicable as the product is battery operated.

7. List of Tables

8. List of Figures

9. List of Photographs