FCC 47 CFR PART 15 SUBPART C

Applicant	:	Roadeyes SAS
Applicant Address	:	168 avenue Charles de Gaulle, 92200 Neuilly, Seine, France
Product Type	:	recSNAP
Trade Name	:	RoadEyes
Model Number	:	recSNAP
Test Specification	:	FCC 47 CFR PART 15 SUBPART C ANSI C63.10:2013
Receive Date	:	May. 15, 2016
Test Period	:	May. 16, 2016 ~ Jun. 08, 2016
Issue Date	:	Jun. 09, 2016

Issue by

A Test Lab Techno Corp.
No. 140-1, Changan Street, Bade City,
Taoyuan County 334, Taiwan R.O.C.
Tel：+886-3-2710188 / Fax：+886-3-2710190

Taiwan Accreditation Foundation accreditation number: 1330

Revision History

Rev.	Issue Date	Revisions	Revised By
00	Jun. 09, 2016	Initial Issue	

Verification of Compliance

Issued Date: 2016/06/09

Applicant	:	Roadeyes SAS
Applicant Address	:	168 avenue Charles de Gaulle, 92200 Neuilly, Seine, France
Product Type	:	recSNAP
Trade Name	:	RoadEyes
Model Number	:	recSNAP
FCC ID	:	2ADYT-RESP1
EUT Rated Voltage	:	DC 3.0V
Test Voltage	:	DC 3.0V
Applicable Standard	:	FCC 47 CFR PART 15 SUBPART C ANSI C63.10:2013
Test Result	:	Complied
Application Purpose	:	Original
Performing Lab.	:	Stie1:A Test Lab Techno Corp. No. 140-1, Changan Street, Bade City, Taoyuan County 334, Taiwan R.O.C. Tel：+886-3-2710188 / Fax：+886-3-2710190 Taiwan Accreditation Foundation accreditation number: 1330

Site2:Shenzhen Academy of Metrology and Quality Inspection
No.4 TongFa Road, Xili Town Nanshan District, Shenzhen, China

A Test Lab Techno Corp. tested the above equipment in accordance with the requirements set forth in the above standards. All indications of Pass/Fail in this report are opinions expressed by A Test Lab Techno Corp. based on interpretations and/or observations of test results. Measurement Uncertainties were not taken into account and are published for informational purposes only. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

Approved By	: Fly Lu	Reviewed By	: Eric Ou Yang	
(Manager)	(Fly Lu)	(Testing Engineer)	(Eric Ou Yang)	

TABLE OF CONTENTS

1 General Information

1.1. Summary of Test Result

Standard	Item	Result	Remark	Test Site
15.249				
15.207	AC Power Conducted Emission	NA	Not Applicable	-----
Standard	Item	Result	Remark	
15.249				
15.249(a)	Transmitter Radiated Emissions	PASS	-----	Test Site 2
15.249(d)	Band Edge Measurement	PASS	-----	Test Site 2
15.203	Antenna Requirement	PASS	-----	-----
15.215	20 dB Bandwidth	PASS	-----	Test Site 1

The test results of this report relate only to the tested sample(s) identified in this report. Manufacturer or whom it may concern should recognize the pass or fail of the test result.

1.2. Measurement Uncertainty

Test Item	Frequency Range		Uncertainty (dB)
Conducted Emission	9kHz ~ 30MHz		± 2.02
Radiated Emission	30MHz ~ 1000MHz	Horizontal	± 3.98
		Vertical	± 3.62
	1000MHz ~ 18000MHz	Horizontal	± 3.11
		Vertical	± 3.07
	18000MHz ~ 40000MHz	Horizontal	± 3.66
		Vertical	± 3.54

2 EUT Description

Applicant	Roadeyes SAS
Applicant Address	168 avenue Charles de Gaulle, 92200 Neuilly, Seine, France
Manufacturer	Roadeyes SAS
Manufacturer Address	168 avenue Charles de Gaulle, 92200 Neuilly, Seine, France
Product Type	recSNAP
Trade Name	RoadEyes
Model Number	recSNAP
FCC ID	2ADYT-RECSP1
Frequency Range	2404 ~ 2480 MHz
Modulation Type	GFSK
Number of Channel	65 CH
Antenna Type	PCB Antenna
Antenna Gain	-3.0 dBi
Hardware Version	A
Software Version	16AC
Field Strength	82.1 dBuV/m

3 Test Methodology

3.1. Mode of Operation

Decision of Test ATL has verified the construction and function in typical operation. All the test modes were carried out with the EUT in normal operation, which was shown in this test report and defined as:

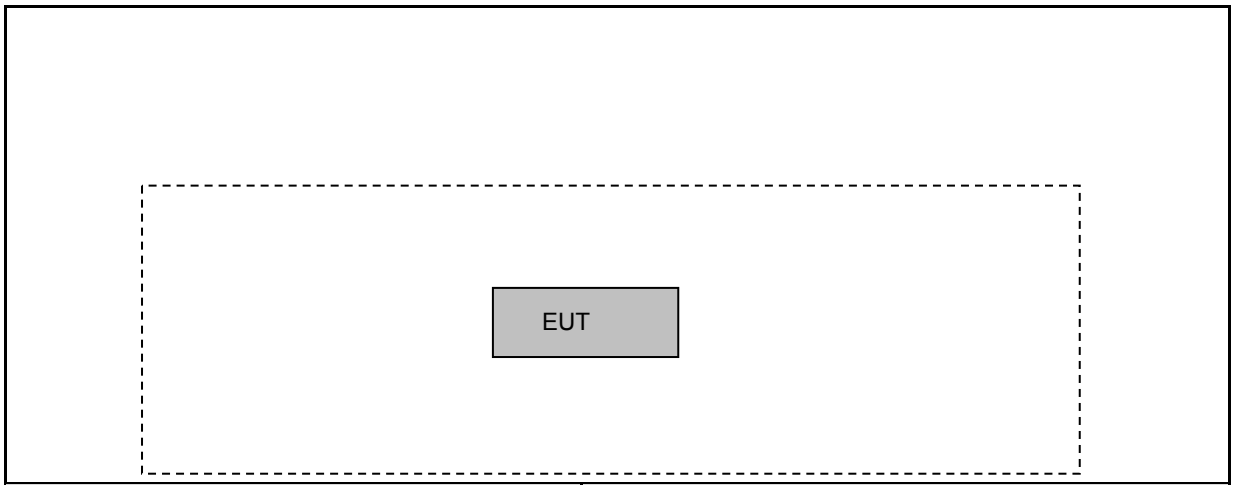
Test Mode
Mode 1: Normal Operation Mode
Mode 2: Transmission Mode

By preliminary testing and verifying three axis (X, Y and Z) position of EUT transmitted status, it was found that “X axis” position was the worst, then the final test was executed the worst condition and test data were recorded in this report.

3.2. EUT Exercise Software

1	Setup the EUT as shown on 3.3.
2	Turn on the power of EUT.

3.3. Configuration of Test System Details



Signal Cable Type		Signal Cable Description
--	--	--

3.4. Test Site Environment

Items	Required (IEC 60068-1)	Actual
Temperature (°C)	15-35	26
Humidity (%RH)	25-75	60
Barometric pressure (mbar)	860-1060	950

4 Conducted Emission Measurement

4.1. Limit

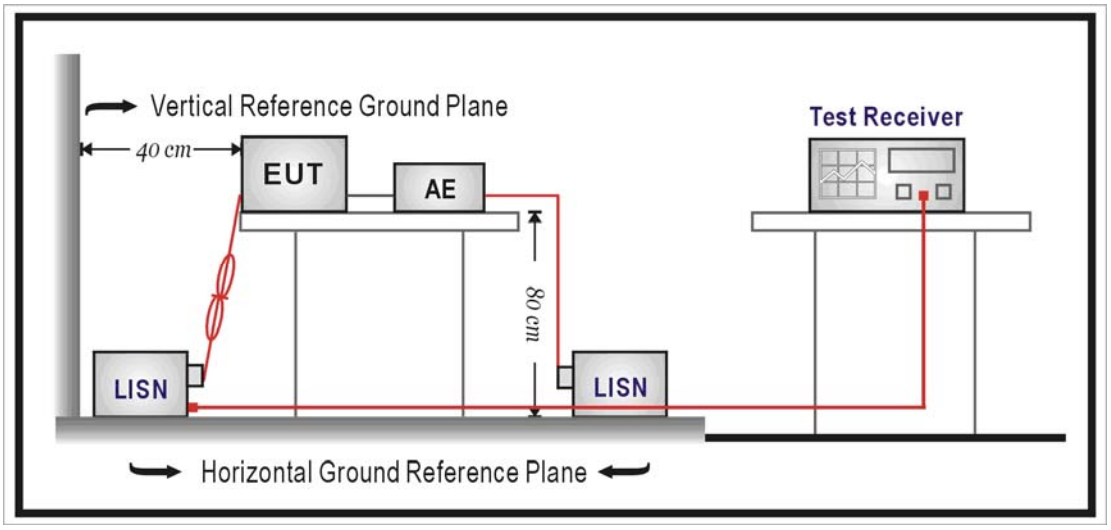
Frequency (MHz)	Quasi-peak	Average
0.15 - 0.5	66 to 56	56 to 46
0.50 - 5.0	56	46
5.0 - 30.0	60	50

4.2. Test Instruments

Describe	Manufacturer	Model Number	Serial Number	Cal. Date	Remark
Test Receiver	R&S	ESCI	100367	06/12/2015	(1)
LISN	R&S	ENV216	101040	03/10/2016	(1)
LISN	R&S	ENV216	101041	03/06/2016	(1)
Test Site	ATL	TE02	TE02	N.C.R.	-----

Remark: (1) Calibration period 1 year. (2) Calibration period 2 years. (3) Calibration period 3 years.
Note: N.C.R. = No Calibration Request.

4.3. Test Setup



4.4. Test Procedure

The power line conducted emission measurements were performed in a shielded enclosure. The EUT was assembled on a wooden table which is 80 centimeters high, was placed 40 centimeters from the back wall and at least 1 meter from the sidewall.

Power was fed to the EUT from the public utility power grid through a line filter and EMCO Model ENV216 SH Line Impedance Stabilization Networks (LISN). The LISN housing, measuring instrumentation case, ground plane, etc., were electrically bonded together at the same RF potential. The Spectrum analyzer was connected to the AC line through an isolation transformer. The 50-ohm output of the LISN was connected to the spectrum analyzer directly. Conducted emission levels were in the CISPR quasi-peak detection mode. The analyzer's 6 dB bandwidth was set to 9 KHz. No post-detector video filter was used.

The spectrum was scanned from 150 KHz to 30 MHz. The physical arrangement of the test system and associated cabling was varied (within the scope of arrangements likely to be encountered in actual use) to determine the effect on the unit's emanations in amplitude and frequency. All spurious emission frequencies were observed. The highest emission amplitudes relative to the appropriate limit were measured and have been recorded in paragraph 4.1.

4.5. Test Result

Not Applicable.

EUT is only powered by battery.

5 Radiated Interference Measurement

5.1. Limit

Frequency (MHz)	Field Strength (μV/m at meter)	Measurement Distance (meter)
0.009 – 0.490	2400 / F (kHz)	300
0.490 – 1.705	24000 / F (kHz)	30
1.705 – 30.0	30	30
30 - 88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

Harmonic emissions limits comply with below 54 dBuV/m at 3m. Other emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or comply with the radiated emissions limits specified in section 15.209(a) limit in the table below has to be followed.

Note: (1) The tighter limit applies at the band edges.

(2) Emission level (dBuV/m) =20log Emission level (uV/m).

Limits of Radiated Emission Measurement (FCC 15.209)

Frequency (MHz)	Class A (dBuV/m) (at 3m)		Class B (dBuV/m) (at 3m)	
	Peak	AVG	Peak	AVG
0.009 – 0.490	80	60	74	54

Notes: (1) The limit for radiated test was performed according to FCC PART 15C.

(2) The tighter limit applies at the band edges.

(3) Emission level (dBuV/m) =20log Emission level (uV/m).

Limits of Radiated Emission Measurement (FCC Part 15.249)

Frequency Range (MHz)	Limit
2400-2483.5	Field strength of fundamental 50000 μV/m (94 dBμV/m) @ 3 m
Above 2483.5	Field strength of harmonics 500 μV/m (54 dBμV/m) @ 3 m

5.2. Test Instruments

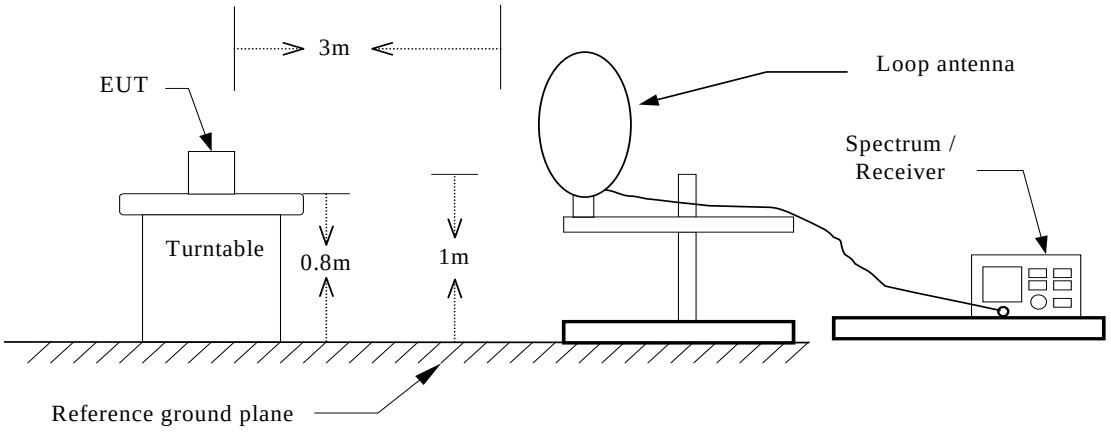
3 Meter Chamber					
Model No.	Equipment	Manufacturer	Serial Number	Cal. Date	Remark
ESCS30	EMI Test Receiver	Rohde & Schwarz	830245/009	Dec.29, 2016	(1)
VULB9163	Bilog Antenna	Schwarzbeck	264	Jan.19, 2016	(1)
9X6X6	3m Semi-anechoic chamber	Albatross Projects	SB3450/01	Oct.12, 2016	(1)
HF907	Horn Antenna	Rohde & Schwarz	100309	May.15,2016	(1)
FMZB1516	Loop Antenna	Schwarzbeck	113	Jan 21,2016	(1)
3160-09	Horn antenna	ETS	8501/10	May.15.2016	(1)
SCU26	Pre Amplifier	Rohde & Schwarz	10020	May.15.2016	(1)
SCU40	Pre Amplifier	Rohde & Schwarz	10015	May.15.2016	(1)
ESU40	Test Receiver	Rohde & Schwarz	100263	May.15.2016	(1)
---	RF cable	WOKEN	S02-1404-09-065	May.11.2016	(1)
---	RF cable	WOKEN	S02-1404-09-047	May.11.2016	(1)
---	RF cable	WOKEN	S02-1404-09-052	May.11.2016	(1)

Remark: (1) Calibration period 1 year. (2) Calibration period 2 years. (3) Calibration period 3 years.

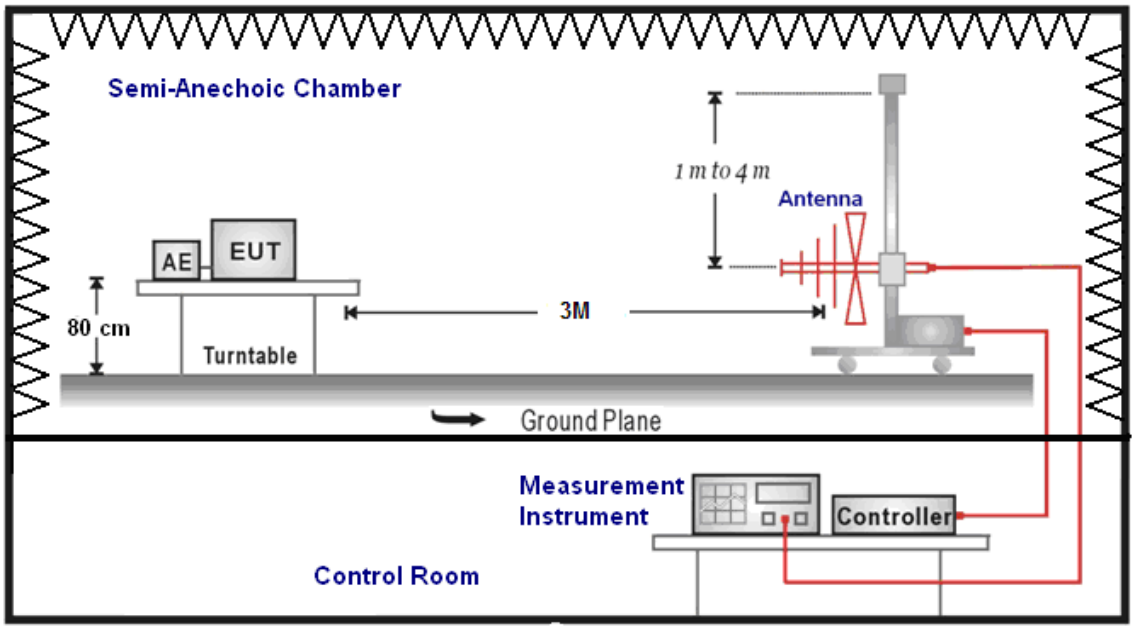
Note: N.C.R. = No Calibration Request. All the RF cables apply to 9 KHz to 40GHz.

5.3. Setup

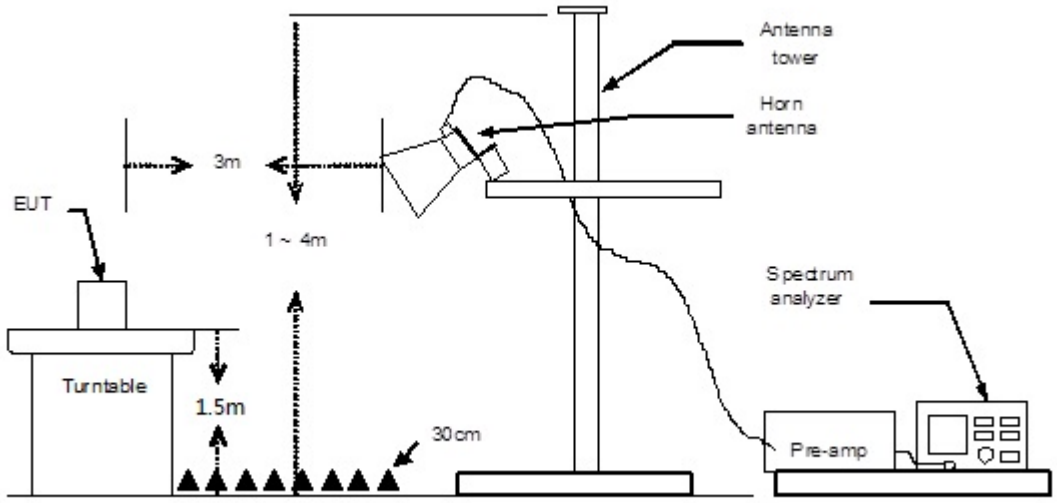
9kHz ~ 30MHz



Below 1GHz



Above 1GHz



5.4. Test Procedure

1) Sequence of testing 9 kHz to 30 MHz

Setup:

--- The equipment was set up to simulate a typical usage like described in the user manual or described by manufacturer.

--- If the EUT is a tabletop system, a rotatable table with 0.8 m height is used.

--- If the EUT is a floor standing device, it is placed on the ground.

--- Auxiliary equipment and cables were positioned to simulate normal operation conditions.

--- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.

--- The measurement distance is 3 meter.

--- The EUT was set into operation.

Premeasurement:

--- The turntable rotates from 0° to 315° using 45° steps.

--- The antenna height is 0.8 meter.

--- At each turntable position the analyzer sweeps with peak detection to find the maximum of all emissions

Final measurement:

--- Identified emissions during the premeasurement the software maximizes by rotating the turntable position (0° to 360°) and by rotating the elevation axes (0° to 360°).

--- The final measurement will be done in the position (turntable and elevation) causing the highest emissions with QPK detector.

--- The final levels, frequency, measuring time, bandwidth, turntable position, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the premeasurement and the limit will be stored.

2) Sequence of testing 30 MHz to 1 GHz

Setup:

--- The equipment was set up to simulate a typical usage like described in the user manual or described by manufacturer.

--- If the EUT is a tabletop system, a table with 0.8 m height is used, which is placed on the ground plane.

--- If the EUT is a floor standing device, it is placed on the ground plane with insulation between both.

--- Auxiliary equipment and cables were positioned to simulate normal operation conditions

--- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.

--- The measurement distance is 3 meter.

--- The EUT was set into operation.

Premeasurement:

--- The turntable rotates from 0° to 315° using 45° steps.

--- The antenna is polarized vertical and horizontal.

--- The antenna height changes from 1 to 3 meter.

--- At each turntable position, antenna polarization and height the analyzer sweeps three times in peak to find the maximum of all emissions.

Final measurement:

--- The final measurement will be performed with minimum the six highest peaks.

--- According to the maximum antenna and turntable positions of premeasurement the software maximize the peaks by changing turntable position (± 45°) and antenna movement between 1 and 4 meter.

--- The final measurement will be done with QP detector with an EMI receiver.

--- The final levels, frequency, measuring time, bandwidth, antenna height, antenna polarization, turntable angle, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the premeasurement with marked maximum final measurements and the limit will be stored.

3) Sequence of testing 1 GHz to 18 GHz

Setup:

--- The equipment was set up to simulate a typical usage like described in the user manual or described by manufacturer.

--- If the EUT is a tabletop system, a rotatable table with 1.5 m height is used.

--- If the EUT is a floor standing device, it is placed on the ground plane with insulation between both.

--- Auxiliary equipment and cables were positioned to simulate normal operation conditions

--- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.

--- The measurement distance is 3 meter.

--- The EUT was set into operation.

Premeasurement:

--- The turntable rotates from 0° to 315° using 45° steps.

--- The antenna is polarized vertical and horizontal.

--- The antenna height scan range is 1 meter to 2.5 meter.

--- At each turntable position and antenna polarization the analyzer sweeps with peak detection to find the maximum of all emissions.

Final measurement:

--- The final measurement will be performed with minimum the six highest peaks.

--- According to the maximum antenna and turntable positions of premeasurement the software maximize the peaks by changing turntable position (± 45°) and antenna movement between 1 and 4 meter. This procedure is repeated for both antenna polarizations.

--- The final measurement will be done in the position (turntable, EUT-table and antenna polarization) causing the highest emissions with Peak detector.

--- The final levels, frequency, measuring time, bandwidth, turntable position, EUT-table position, antenna polarization, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the premeasurement with marked maximum final measurements and the limit will be stored.

4) Sequence of testing above 18 GHz

Setup:

--- The equipment was set up to simulate a typical usage like described in the user manual or described by manufacturer.

--- If the EUT is a tabletop system, a rotatable table with 1.5 m height is used.

--- If the EUT is a floor standing device, it is placed on the ground plane with insulation between both.

--- Auxiliary equipment and cables were positioned to simulate normal operation conditions

--- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.

--- The measurement distance is 1 meter.

--- The EUT was set into operation.

Premeasurement:

--- The antenna is moved spherical over the EUT in different polarizations of the antenna.

Final measurement:

--- The final measurement will be performed at the position and antenna orientation for all detected emissions that were found during the premeasurements with Peak detector.

--- The final levels, frequency, measuring time, bandwidth, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the premeasurement and the limit will be stored.

The following procedures were used to convert the emission levels measured in decibels referenced to 1 microvolt (dBuV) into field intensity in micro volts pre meter (uV/m).
The actual field intensity in decibels referenced to 1 microvolt in to field intensity in micro colts per meter (dBuV/m).
The actual field is intensity in referenced to 1 microvolt per meter (dBuV/m) is determined by algebraically adding the measured reading in dBuV, the antenna factor (dB), and cable loss (dB) and Subtracting the gain of preamplifier (dB) is auto calculate in spectrum analyzer.

(1) Amplitude (dBuV/m) = FI (dBuV) +AF (dBuV) +CL (dBuV)-Gain (dB)
FI= Reading of the field intensity.
AF= Antenna factor.
CL= Cable loss.
P.S Amplitude is auto calculate in spectrum analyzer.

(2) Actual Amplitude (dBuV/m) = Amplitude (dBuV)-Dis(dB)
The FCC specified emission limits were calculated according the EUT operating frequency and by following linear interpolation equations:
(a) For fundamental frequency : Transmitter Output < +30dBm
(b) For spurious frequency : Spurious emission limits = fundamental emission limit /10
(c) Average values = Peak values + Duty cycle factor

Final radiation measurements were made on a three-meter, Semi Anechoic Chamber. The EUT system was placed on a nonconductive turntable which is 0.8 meters height for below 1GHz and 1.5 meters height for above 1GHz, top surface 1.0 x 1.5 meter. The spectrum was examined from 9 KHz to 26.5 GHz in order to cover the whole spectrum below 10th harmonic which could generate from the EUT. During the test, EUT was set to transmit continuously & Measurements spectrum range from 9 kHz to 26.5 GHz is investigated.
For measurements below 1 GHz the resolution bandwidth is set to 100 kHz for peak detection measurements or 120 kHz for quasi-peak detection measurements. Peak detection is used unless otherwise noted as quasi-peak.
For measurements above 1 GHz the resolution bandwidth is set to 1 MHz, and then the video bandwidth is set to 1 MHz for peak measurements and 10 Hz for average measurements.

A nonconductive material surrounded the EUT to supporting the EUT for standing on tree orthogonal planes. At each condition, the EUT was rotated 360 degrees, and the antenna was raised and lowered from one to four meters to find the maximum emission levels. Measurements were taken using both horizontal and vertical antenna polarization.
SCHWARZBECK MESS-ELEKTRONIK Biconilog Antenna (mode VULB9163) at 3 Meter and the SCHWARZBECK Double Ridged Guide Antenna (model FH907&3160) was used in frequencies 1 – 26.5 GHz at a distance of 1 meter. All test results were extrapolated to equivalent signal at 3 meters utilizing an inverse linear distance extrapolation Factor (20dB/decade).
For testing above 1GHz, the emission level of the EUT in peak mode was 20dB lower than average limit (that means the emission level in peak mode also complies with the limit in average mode), then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions will be measured in average mode again and reported.
Appropriate preamplifiers were used for improving sensitivity and precautions were taken to avoid overloading or desensitizing the spectrum analyzer. No post – detector video filters were used in the test.
For the radiated emission test above 1GHz:
Place the measurement antenna away from each area of the EUT determined to be a source of emissions at the specified measurement distance, while keeping the measurement antenna aimed at the source of emissions at each frequency of significant emissions, with polarization oriented for maximum response. The measurement antenna may have to be higher or lower than the EUT, depending on the radiation pattern of the emission and staying aimed at the emission source for receiving the maximum signal. The final measurement antenna elevation shall be that which maximizes the emissions. The measurement antenna elevation for maximum emissions shall be restricted to a range of heights of from 1 m to 4 m above the ground or reference ground plane.
The spectrum analyzer's 6 dB bandwidth was set to 1 MHz, and the analyzer was operated in the peak detection mode, for frequencies both below and up 1 GHz. The average levels were obtained by subtracting the duty cycle correction factor from the peak readings.
The following procedures were used to convert the emission levels measured in decibels referenced to 1 microvolt (dBuV) into field intensity in micro volts pre meter (uV/m).
The actual field intensity in decibels referenced to 1 microvolt in to field intensity in micro colts per meter (dBuV/m).
The actual field is intensity in referenced to 1 microvolt per meter (dBuV/m) is determined by algebraically adding the measured reading in dBuV, the antenna factor (dB), and cable loss (dB) and Subtracting the gain of preamplifier (dB) is auto calculate in spectrum analyzer.

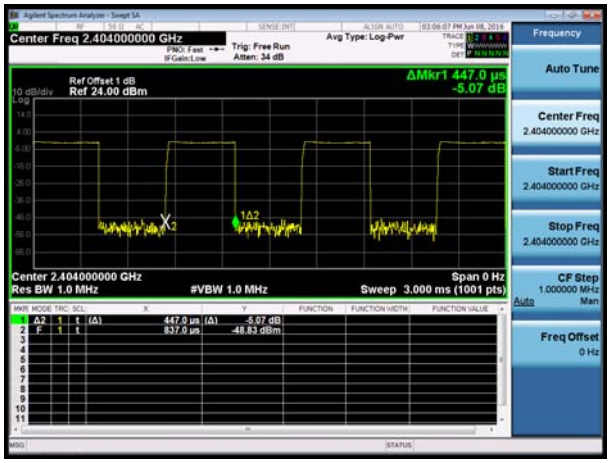
(1) Amplitude (dBuV/m) = FI (dBuV) +AF (dBuV) +CL (dBuV)-Gain (dB)
FI= Reading of the field intensity.
AF= Antenna factor.
CL= Cable loss.
P.S Amplitude is auto calculate in spectrum analyzer.

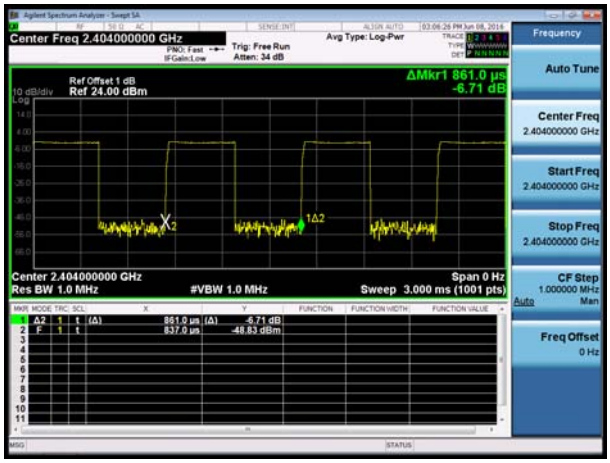
(2) Actual Amplitude (dBuV/m) = Amplitude (dBuV)-Dis(dB)
The IC specified emission limits were calculated according the EUT operating frequency and by following linear interpolation equations:
(d) For fundamental frequency : Transmitter Output < +30dBm
(e) For spurious frequency : Spurious emission limits = fundamental emission limit /10
(f) Average values = Peak values + duty cycle factor

Data of measurement within this frequency range without mark in the table above means the reading of emissions are

attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.

Duty cycle (ms)=Ton/T=0.447/0.861*100%=51.92%
Duty cycle factor=20log (duty cycle) =-5.69





5.5. Test Result

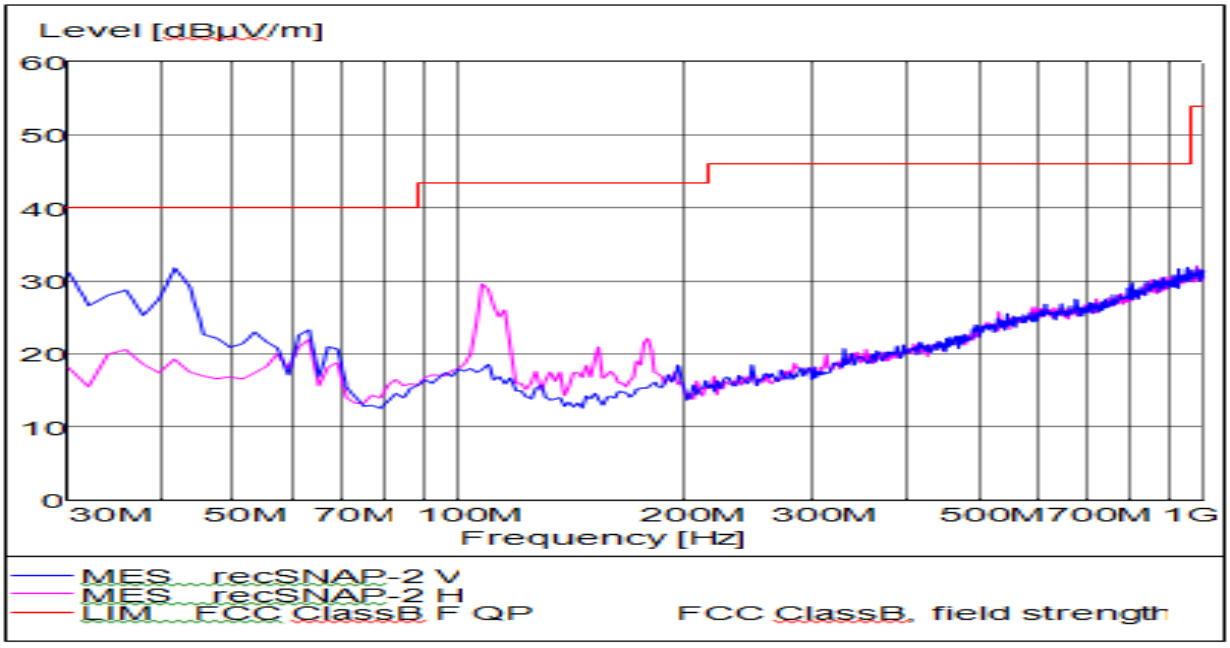
Below 1GHz

Standard:	FCC Part 15C	Test Distance:	3m
Test item:	Radiated Emission	Power:	DC 3.0V
Model Number:	recSNAP	Temp.(℃)/Hum.(%RH):	26(℃)/60%RH
Mode:	Mode 1	Date:	2016/06/07

Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Ant.Polar. H / V
--	--	--	--	--	--	QP	H
--	--	--	--	--	--	QP	H
--	--	--	--	--	--	QP	H
--	--	--	--	--	--	QP	H
--	--	--	--	--	--	QP	H
--	--	--	--	--	--	QP	H
--	--	--	--	--	--	QP	V
--	--	--	--	--	--	QP	V
--	--	--	--	--	--	QP	V
--	--	--	--	--	--	QP	V
--	--	--	--	--	--	QP	V
--	--	--	--	--	--	QP	V

Note: No emission found between lowest internal used/generated frequencies to 30MHz (9 kHz~30MHz). And only the worst case is recorded here for 30MHz to 1GHz.

Horizontal& Vertical

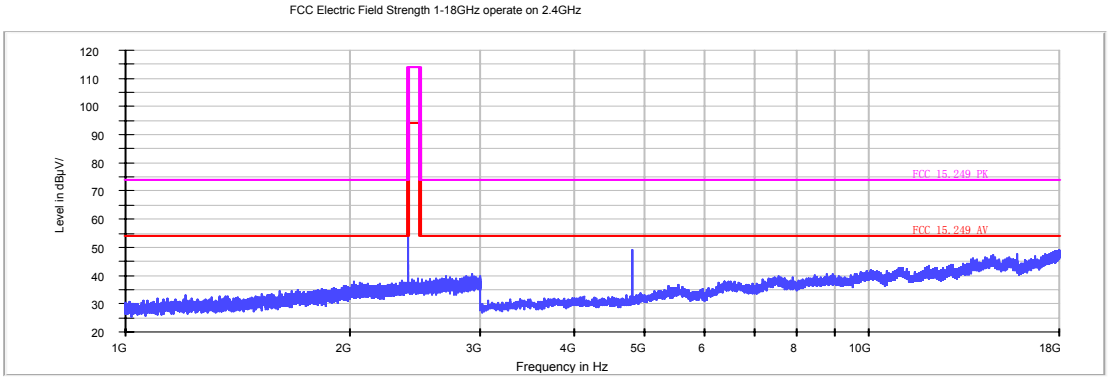


Above 1GHz

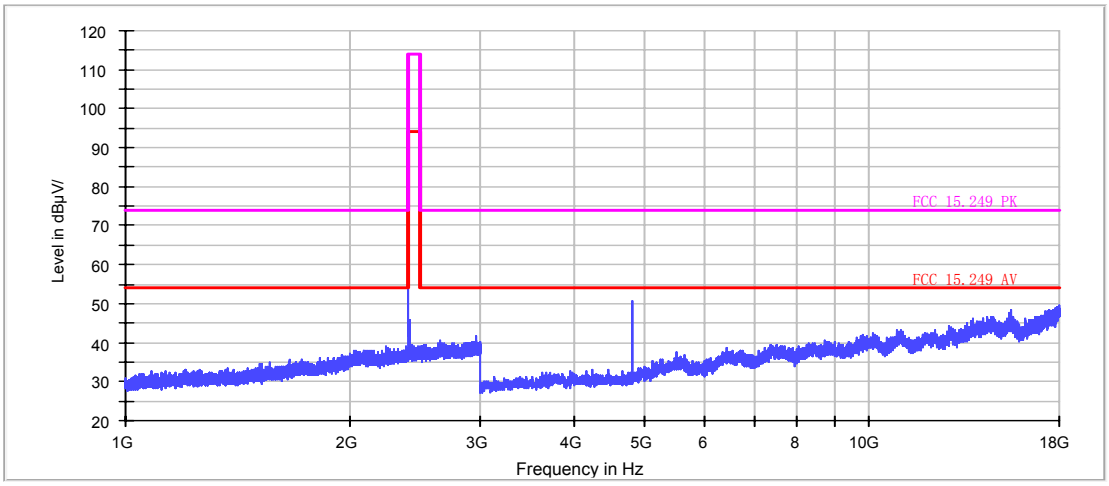
Standard:	FCC Part 15C	Test Distance:	3m
Test item:	Radiated Emission	Power:	DC 3.0V
Model Number:	recSNAP	Temp.(℃)/Hum.(%RH):	26(℃)/60%RH
Mode:	Mode 2	Date:	2016/06/07
Frequency:	2404 MHz		

Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Ant.Polar. H / V
2404	77.1	3.2	80.3	94.0	13.7	peak	H
4808	42.7	5.9	48.6	54.0	5.4	peak	H
2404	67.0	3.2	70.2	94.0	23.8	peak	V
4808	45.3	5.9	51.2	54.0	2.8	peak	V

Horizontal



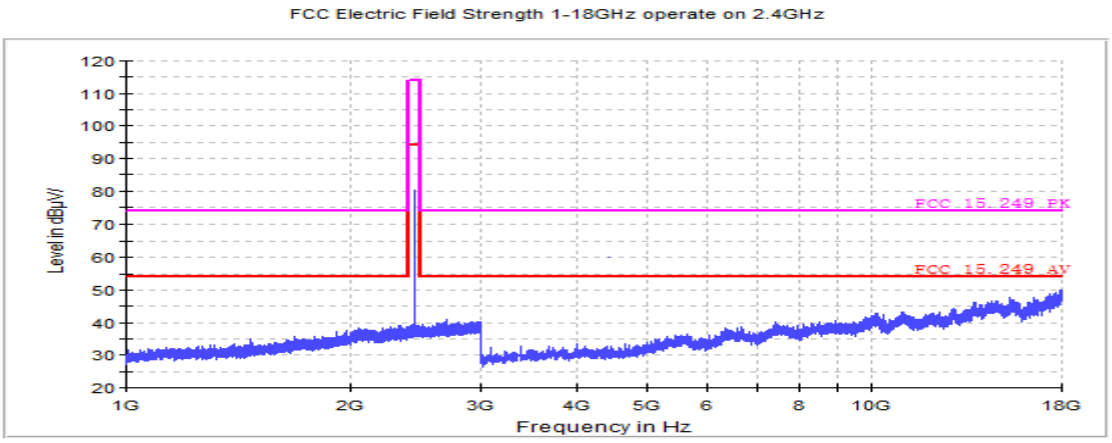
Vertical



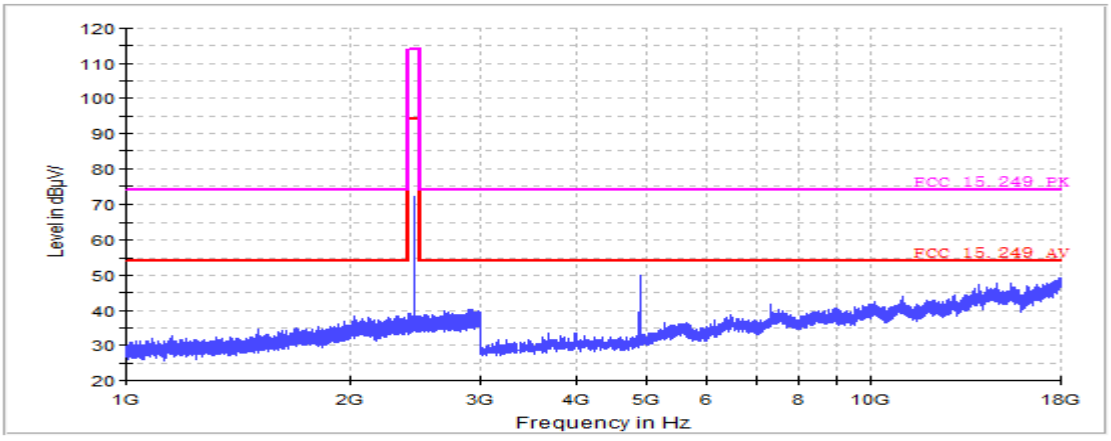
Standard:	FCC Part 15C	Test Distance:	3m
Test item:	Radiated Emission	Power:	DC 3.0V
Model Number:	recSNAP	Temp.(℃)/Hum.(%RH):	26(℃)/60%RH
Mode:	Mode 2	Date:	2016/06/07
Frequency:	2440 MHz		

Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Ant.Polar. H / V
2440	77.4	3.3	80.7	94.0	13.3	peak	H
4880	28.4	6.2	34.6	54.0	9.4	peak	H
2440	69.1	3.3	72.4	94.0	21.6	peak	V
4880	43.6	6.2	49.8	54.0	4.2	peak	V

Horizontal



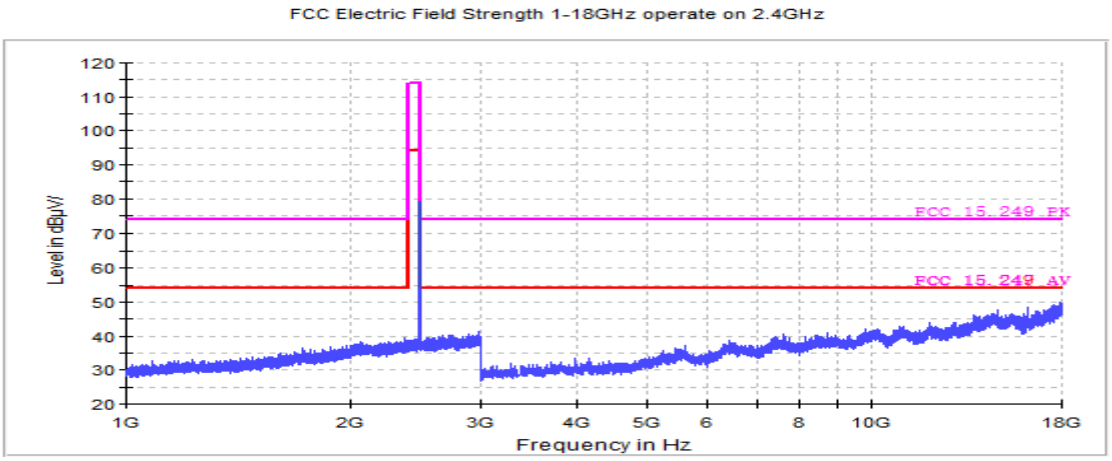
Vertical



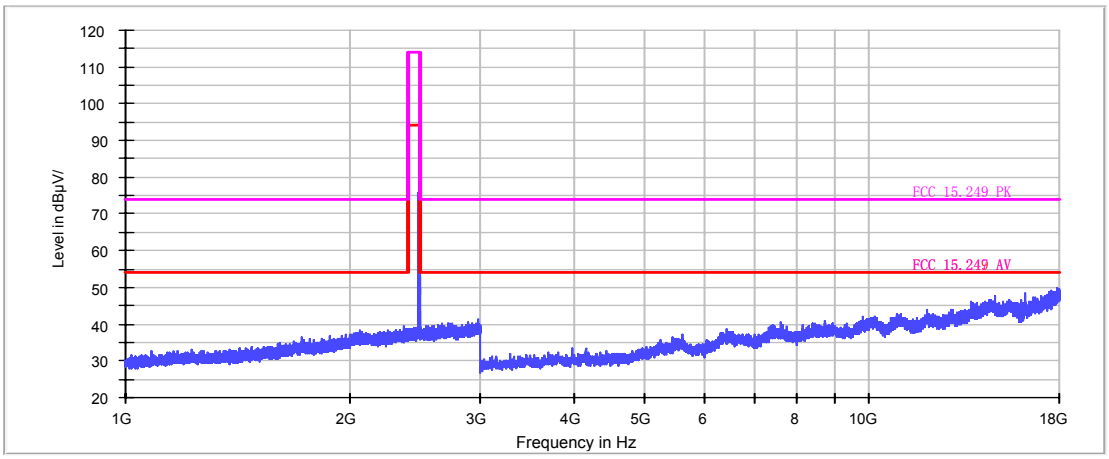
Standard:	FCC Part 15C	Test Distance:	3m
Test item:	Radiated Emission	Power:	DC 3.0V
Model Number:	recSNAP	Temp.(℃)/Hum.(%RH):	26(℃)/60%RH
Mode:	Mode 2	Date:	2016/06/07
Frequency:	2480 MHz		

Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Ant.Polar. H / V
2480	78.3	3.8	82.1	94.0	11.9	peak	H
4960	27.1	6.5	33.6	54.0	20.4	peak	H
2480	71.6	3.8	75.4	94.0	18.6	peak	V
4960	25.9	6.5	32.4	54.0	21.6	peak	V

Horizontal



Vertical

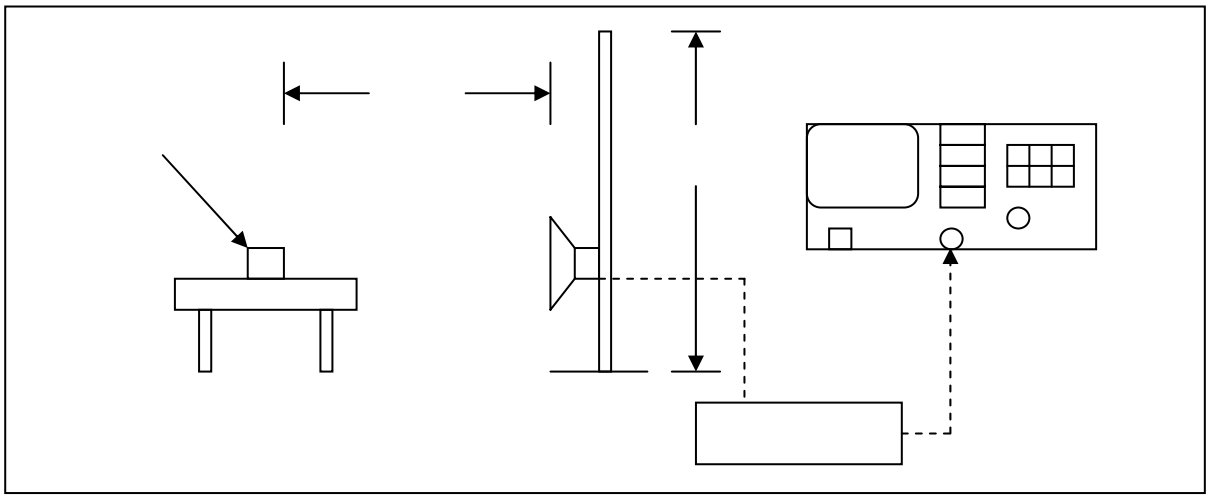


6 Band Edges Measurement

6.1. Limit

In any 100 kHz bandwidth outside the frequency band, the radio frequency power is at least 50dB below that in the 100 kHz bandwidth within the band that contains the highest lever of the desired power.

6.2. Test Setup



6.3. Test Instruments

3 Meter Chamber					
Model No.	Equipment	Manufacturer	Serial Number	Cal. Date	Remark
ESCS30	EMI Test Receiver	Rohde & Schwarz	830245/009	Dec.29, 2016	(1)
VULB9163	Bilog Antenna	Schwarzbeck	264	Jan.19, 2016	(1)
9X6X6	3m Semi-anechoic chamber	Albatross Projects	SB3450/01	Oct.12, 2016	(1)
HF907	Horn Antenna	Rohde & Schwarz	100309	May.15,2016	(1)
FMZB1516	Loop Antenna	Schwarzbeck	113	Jan 21,2016	(1)
3160-09	Horn antenna	ETS	8501/10	May.15.2016	(1)
SCU26	Pre Amplifier	Rohde & Schwarz	10020	May.15.2016	(1)
SCU40	Pre Amplifier	Rohde & Schwarz	10015	May.15.2016	(1)
ESU40	Test Receiver	Rohde & Schwarz	100263	May.15.2016	(1)
---	RF cable	WOKEN	S02-1404-09-065	May.11.2016	(1)
---	RF cable	WOKEN	S02-1404-09-047	May.11.2016	(1)
---	RF cable	WOKEN	S02-1404-09-052	May.11.2016	(1)

Remark: (1) Calibration period 1 year. (2) Calibration period 2 years. (3) Calibration period 3 years.

Note: N.C.R. = No Calibration Request. All the RF cables apply to 9 KHz to 40GHz.

6.4. Test Procedure

The emissions on the harmonics frequencies, the limits, and the margin of compliance are presented. These tests were made when the transmitter was in full radiated power. The additional test was performed to show compliance with the requirement at the band-edge frequency 2483.5 MHz and up to 2500 MHz and at 2390.0 MHz.

The transmitter was configured with the worst case antenna and setup to transmit at the highest channel. Then the field strength was measured at 2483.5 MHz.

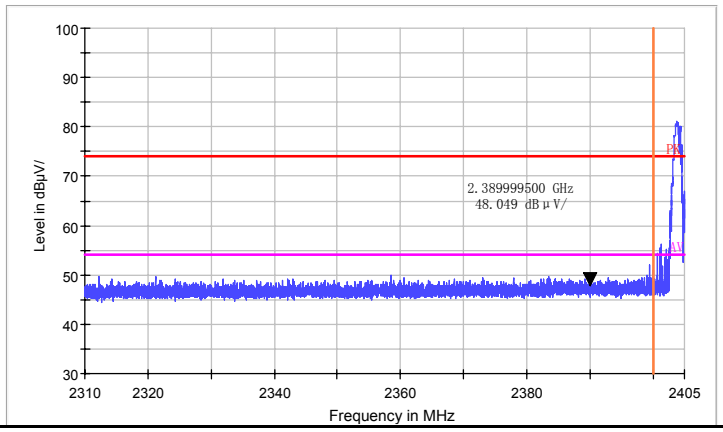
The transmitter was then configured with the worst case antenna and setup to transmit at the lowest channel. Then the field strength was measured at 2390.0 MHz. These tests were performed at 4 different bit rates.

For measurements the resolution bandwidth is set to 1 MHz, and then the video bandwidth is set to 1 MHz for peak measurements and 10 Hz for average measurements.

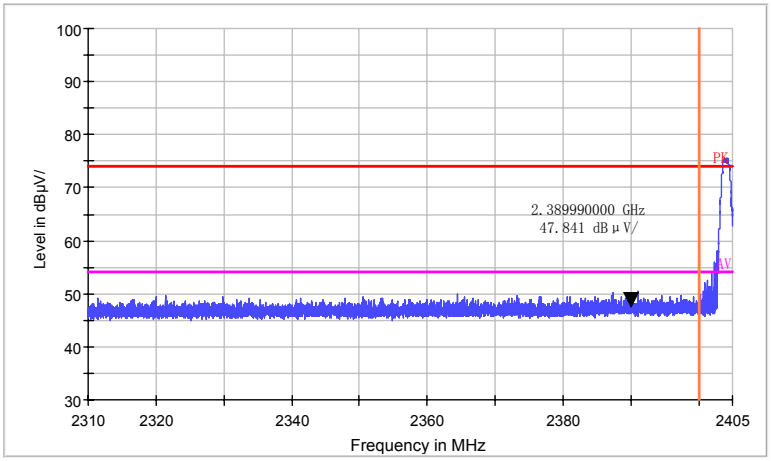
6.5. Test Result

Mode 2

2402/H



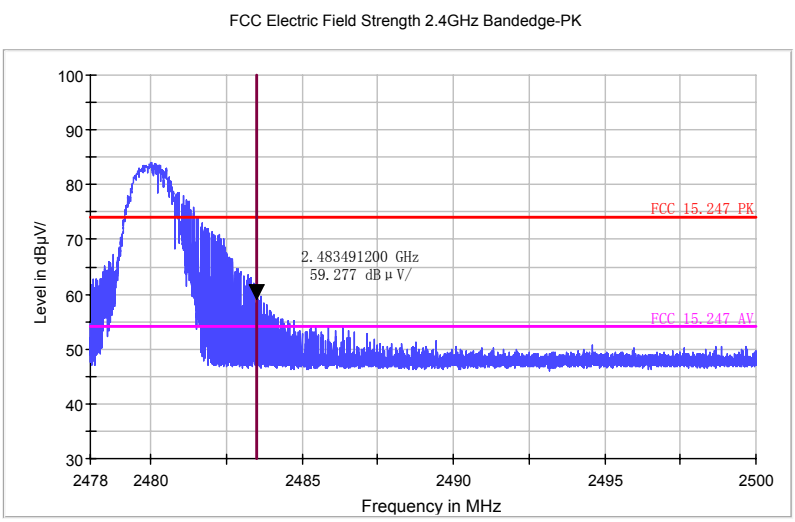
2402/V



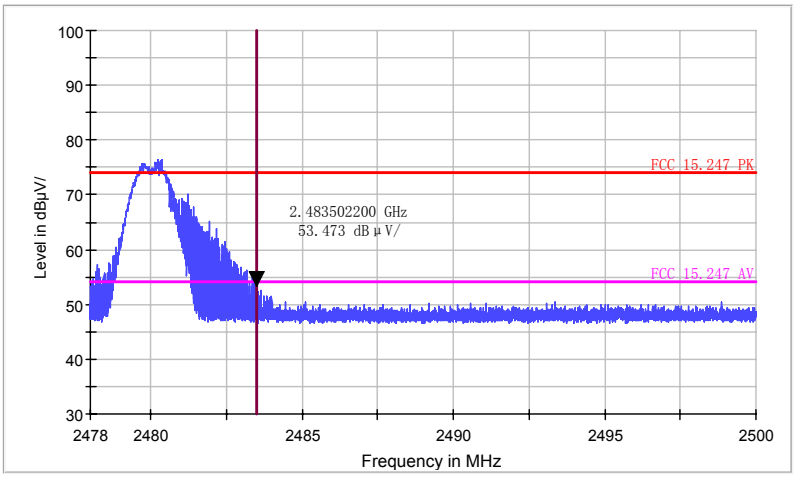
Frequency (MHz)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna	Remark
2390.0	48.05	54	5.95	H	Peak
--	--	--	--	--	Average
2390.0	47.84	54	6.16	V	Peak
--	--	--	--	--	Average

Mode 2

2480/H



2480/V



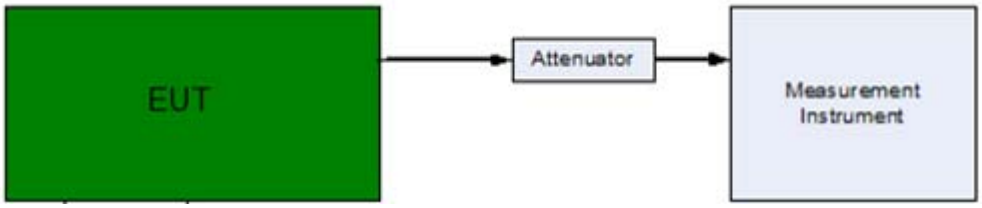
Frequency (MHz)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna	Remark
2483.5	59.28	74	14.72	H	Peak
2483.5	53.59	54	0.41	H	Average
2483.5	53.47	74	20.53	V	Peak
2483.5	47.78	54	6.22	V	Average

7 20dB RF Bandwidth and 99 % Occupied Bandwidth Measurement

7.1. Limit

N/A

7.2. Test Setup



7.3. Test Instruments

Equipment	Manufacturer	Model Number	Serial Number	Cal. Date	Remark
Spectrum Analyzer	Agilent	N9020A	MY53420615	05/12/2016	(1)
Test Site	ATL	TE02	TE02	N.C.R.	-----
RF cable	WOKEN	---	C.10-07-02	10/24/2015	(1)
RF cable	WOKEN	---	C.10-07-03	10/24/2015	(1)
Temporary antenna connector	---	---	A01-224	05/24/2016	(1)

Remark: (1) Calibration period 1 year. (2) Calibration period 2 years.
NOTE: N.C.R. = No Calibration Request. All the RF cables apply to 9 KHz to 40GHz.

7.4. Test Procedure

20dB RF Bandwidth
Testing must be done according to this procedure. This is the only method recognized by the FCC. The RF output port of the Equipment-Under-Test is directly coupled to the input of the EMC analyzer through a specialized RF connector and a 10dB passive attenuator. A fully charged battery was used for the supply voltage. The Bluetooth frequency hopping function of the EUT was enabled. The spectrum analyzer used the following settings:
1. Span = approx. 2 to 3 times the 20dB bandwidth, centered on a hopping frequency
2. RBW ≥ 1% of the 20dB span, VBW ≥ RBW
4. Sweep = auto
5. Detector function = peak
6. Trace = max hold
The trace was allowed to stabilize. The EUT was transmitting at its maximum data rate. The marker-to-peak function was used to set the marker to the peak of the emission. The marker-delta function was used to measure 20dB down one side of the emission. The marker-delta function and marker was moved to the other side of the

emission until it was even with the reference marker. The marker-delta reading at this point was the 20dB bandwidth of the emission.

99 % Occupied Bandwidth
The transmitter shall be operated at its maximum carrier power measured under normal test conditions.
The span of the analyzer shall be set to capture all products of the modulation process, including the emission skirts. The resolution bandwidth shall be set to as close to 1% of the selected span as is possible without being below 1%. The video bandwidth shall be set to 3 times the resolution bandwidth. Video averaging is not permitted. Where practical, a sampling detector shall be used since a peak or, peak hold, may produce a wider bandwidth than actual. The trace data points are recovered and are directly summed in linear terms. The recovered amplitude data points, beginning at the lowest frequency, are placed in a running sum until 0.5% of the total is reached and that frequency recorded. The process is repeated for the highest frequency data points. This frequency is recorded.

Note: We tests were performed in different modulation to find the worst case. And show the worst-case here.

7.5. Test Result

Model Number	recSNAP			
Test Item	20dB RF Bandwidth and 99 % Occupied Bandwidth			
Test Mode	Mode 2			
Date of Test	2016/06/08		Test Site	TE02
Frequency (MHz)	20dB RF Bandwidth (MHz)	99 % Occupied Bandwidth (MHz)	Limit (MHz)	
2404	1.701	1.526	-----	
2440	1.705	1.586	-----	
2480	1.847	1.724	-----	

7.6. Test Graphs

Mode 2: GFSK Link Mode	
2404	
2440	
2480	

8 Antenna Measurement

8.1. Limit

For intentional device, according to 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.

8.2. Antenna Connector Construction

The antenna used in this product is PCB Antenna. And the maximum Gain of this antenna is -3.0 dBi.