FCC RF Test Report

APPLICANT	:	**Ness Corporation Pty Ltd.**
EQUIPMENT	:	**Medi-Minder Guardian**
BRAND NAME	:	**Smartlink (A division of Ness Corporation Pty Ltd.)**
MODEL NAME	:	**SMIND-GUARD-LTE**
FCC ID	:	**O2K-SMINDLTE**
STANDARD	:	**FCC Part 15 Subpart C §15.247**
CLASSIFICATION	:	**(DSS) Spread Spectrum Transmitter**

The product was received on Aug. 28, 2020 and testing was completed on Sep. 23, 2020. We, Sporton International (Shenzhen) Inc., would like to declare that the tested sample has been evaluated in accordance with the test procedures and has been in compliance with the applicable technical standards.

The test results in this report apply exclusively to the tested model / sample. Without written approval of Sporton International (Shenzhen) Inc., the test report shall not be reproduced except in full.

Reviewed by: Derreck Chen / Supervisor

Approved by: Eric Shih / Manager

ACCREDITED Cert #5145.01

Sporton International (ShenZhen) Inc.

1/F, 2/F, Bldg 5, Shiling Industrial Zone, Xinwei Village, Xili, Nanshan, Shenzhen, 518055

People's Republic of China

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REVISION HISTORY

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FR082803	Rev. 01	Initial issue of report	Oct. 13, 2020

SUMMARY OF TEST RESULT

Report Section	FCC Rule	Description	Limit	Result	Remark
3.1	15.247(a)(1)	Number of Channels	≥ 25Chs	Pass	-
3.2	15.247(a)(1)	Hopping Channel Separation	≥ 25 kHz or the 20 dB bandwidth	Pass	-
3.3	15.247(a)(1)	Dwell Time of Each Channel	≤ 0.4sec in 10sec period	Pass	-
3.4	15.247(a)(1)	20dB Bandwidth	≤ 500KHz	Pass	-
3.4	-	99% Bandwidth	-	Pass	-
3.5	15.247(b)(1)	Peak Output Power	≤ 24dBm	Pass	-
3.6	15.247(d)	Conducted Band Edges	≤ 20dBc	Pass	-
3.7	15.247(d)	Conducted Spurious Emission	≤ 20dBc	Pass	-
3.8	15.247(d)	Radiated Band Edges and Radiated Spurious Emission	15.209(a) & 15.247(d)	Pass	Under limit 5.50 dB at 3660.00 MHz
3.9	15.207	AC Conducted Emission	15.207(a)	Pass	Under limit 21.02 dB at 0.15 MHz
3.10	15.203 & 15.247(b)	Antenna Requirement	N/A	Pass	-

Declaration of Conformity:
The test results with all measurement uncertainty excluded are presented in accordance with the regulation limits or requirements declared by manufacturers.
Comments and Explanations:
The declared of product specification for EUT presented in the report are provided by the manufacturer, and the manufacturer takes all the responsibilities for the accuracy of product specification.

1 General Description

1.1 Applicant

Ness Corporation Pty Ltd.
4/167 Prospect Highway, Seven Hills, NSW, 2147, Australia

1.2 Manufacturer

Ness Corporation Pty Ltd.
4/167 Prospect Highway, Seven Hills, NSW, 2147, Australia

1.3 Product Feature of Equipment Under Test

Product Feature	
Equipment	Medi-Minder Guardian
Brand Name	Smartlink (A division of Ness Corporation Pty Ltd.)
Model Name	SMIND-GUARD-LTE
FCC ID	O2K-SMINDLTE
EUT supports Radios application	WCDMA/LTE/SRD
IMEI Code	Conducted: SN5005 Conduction: SN5002 Radiation: 355285089993750
HW Version	5
SW Version	1.5
EUT Stage	Identical Prototype

Remark: The above EUT's information was declared by manufacturer. Please refer to the specifications or user's manual for more detailed description.

1.4 Product Specification of Equipment Under Test

Standards-related Product Specification	
Tx/Rx Frequency Range	903 MHz ~ 927 MHz
Number of Channels	25
Carrier Frequency of Each Channel	903+n*1 MHz; n=0~24
Maximum Output Power to Antenna	20.78 dBm (0.1197 W)
Antenna Type / Gain	Fixed Internal Antenna with gain 2.15 dBi
Type of Modulation	GFSK

1.5 Modification of EUT

No modifications are made to the EUT during all test items.

1.6 Testing Location

Sporton International (Shenzhen) Inc. is accredited to ISO/IEC 17025:2017 by American Association for Laboratory Accreditation with Certificate Number 5145.01.

Test Firm	Sporton International (Shenzhen) Inc.		
Test Site Location	1/F, 2/F, Bldg 5, Shiling Industrial Zone, Xinwei Village, Xili, Nanshan, Shenzhen, 518055 People's Republic of China TEL: +86-755-86379589 FAX: +86-755-86379595		
Test Site No.	**Sporton Site No.**	**FCC Designation No.**	**FCC Test Firm Registration No.**
	CO01-SZ TH01-SZ	CN1256	421272

Test Firm	Sporton International (Shenzhen) Inc.		
Test Site Location	No. 3 Bldg the third floor of south, Shahe River west, Fengzeyuan Warehouse, Nanshan Shenzhen, 518055 People's Republic of China TEL: +86-755-33202398		
Test Site No.	**Sporton Site No.**	**FCC Designation No.**	**FCC Test Firm Registration No.**
	03CH04-SZ	CN1256	421272

1.7 Test Software

Item	Site	Manufacture	Name	Version
1.	03CH04-SZ	AUDIX	E3	6.2009-8-24
2.	CO01-SZ	AUDIX	E3	6.120613b

1.8 Applicable Standards

According to the specifications of the manufacturer, the EUT must comply with the requirements of the following standards:

- FCC Part 15 Subpart C §15.247
- ANSI C63.10-2013

Remark:

1. All test items were verified and recorded according to the standards and without any deviation during the test.
2. This EUT has also been tested and complied with the requirements of FCC Part 15, Subpart B, recorded in a separate test report.

2 Test Configuration of Equipment Under Test

2.1 Descriptions of Test Mode

Preliminary tests were performed in different data rates and recorded the RF output power in the following table:

Channel	Frequency	SRD RF Output Power
CH00	903MHz	**20.78 dBm**
CH12	915MHz	20.35 dBm
CH24	927MHz	19.88 dBm

Remark:

a. The EUT has been associated with peripherals and configuration operated in a manner tended to maximize its emission characteristics in a typical application. Frequency range investigated: conduction (150 kHz to 30 MHz), radiation (9 kHz to the 10th harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower).

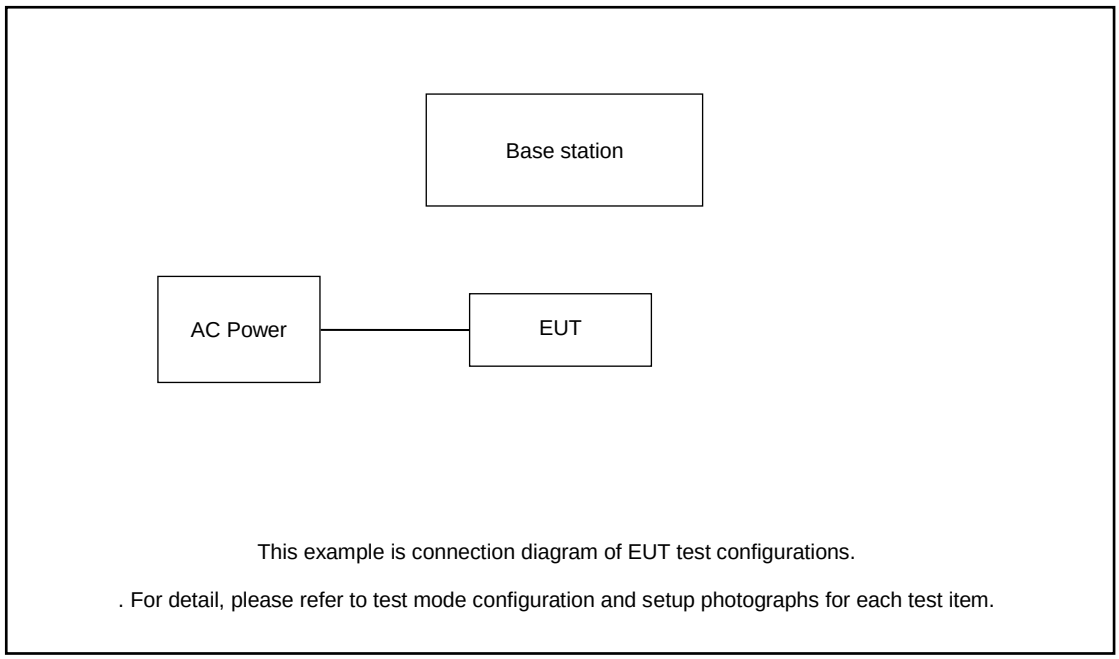
b. AC power line Conducted Emission was tested under maximum output power.

2.2 Test Mode

The following summary table is showing all test modes to demonstrate in compliance with the standard.

Summary table of Test Cases	
Test Item	**Data Rate**
Conducted Test Cases	Mode 1: CH00_903 MHz Mode 2: CH12_915 MHz Mode 3: CH24_927 MHz
Radiated TCs	Mode 1: CH00_903 MHz Mode 2: CH12_915 MHz Mode 3: CH24_927 MHz
AC Conducted Emission	Mode 1 :WCDMA Band II Idle + Charging from Adapter + SRD Tx
Remark: For Radiated Test Cases, The tests were performance with Adapter.	

2.3 Connection Diagram of Test System



This example is connection diagram of EUT test configurations.

. For detail, please refer to test mode configuration and setup photographs for each test item.

2.4 Support Unit used in test configuration and system

Item	Equipment	Trade Name	Model Name	FCC ID	Data Cable	Power Cord
1.	Base station	Anritsu	MT8820C	N/A	N/A	Unshielded, 1.8 m

2.5 EUT Operation Test Setup

For SRD function, The programmed RF utility, “Test Tool” installed in the notebook to make the EUT get into the engineering modes to continuously transmit.

For AC power line conducted emissions, the EUT was set to connect with the Base station under large package sizes transmission.

2.6 Measurement Results Explanation Example

For all conducted test items:

The offset level is set in the spectrum analyzer to compensate the RF cable loss and attenuator factor between EUT conducted output port and spectrum analyzer. With the offset compensation, the spectrum analyzer reading level is exactly the EUT RF output level.

Example :

The spectrum analyzer offset is derived from RF cable loss and attenuator factor.

Offset = RF cable loss + attenuator factor.

Following shows an offset computation example with cable loss 4.0 dB and 10dB attenuator.

Offset(dB) = RF cable loss(dB) + attenuator factor(dB).

= 4.0 + 10 = 14.0 (dB)

3 Test Result

3.1 Number of Channel Measurement

3.1.1 Limits of Number of Hopping Frequency

For frequency hopping systems operating in the 902-928 MHz band: if the 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall use at least 50 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 20 second period; if the 20 dB bandwidth of the hopping channel is 250 kHz or greater, the system shall use at least 25 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 10 second period.

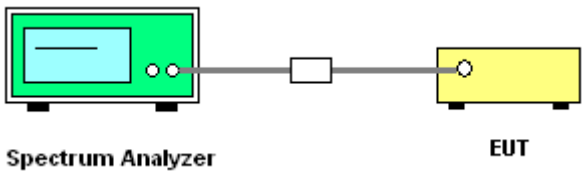
3.1.2 Measuring Instruments

The measuring equipment is listed in the section 4 of this test report.

3.1.3 Test Procedure

1. The testing follows ANSI C63.10-2013 clause 7.8.3.
2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. Set to the maximum power setting and enable the EUT transmit continuously.
4. Enable the EUT hopping function.
5. Use the following spectrum analyzer settings: Span = the frequency band of operation; RBW = 300kHz; VBW ≥ RBW; Sweep = auto; Detector function = peak; Trace = max hold.
6. The number of hopping frequency used is defined as the number of total channel.
7. Record the measurement data derived from spectrum analyzer.

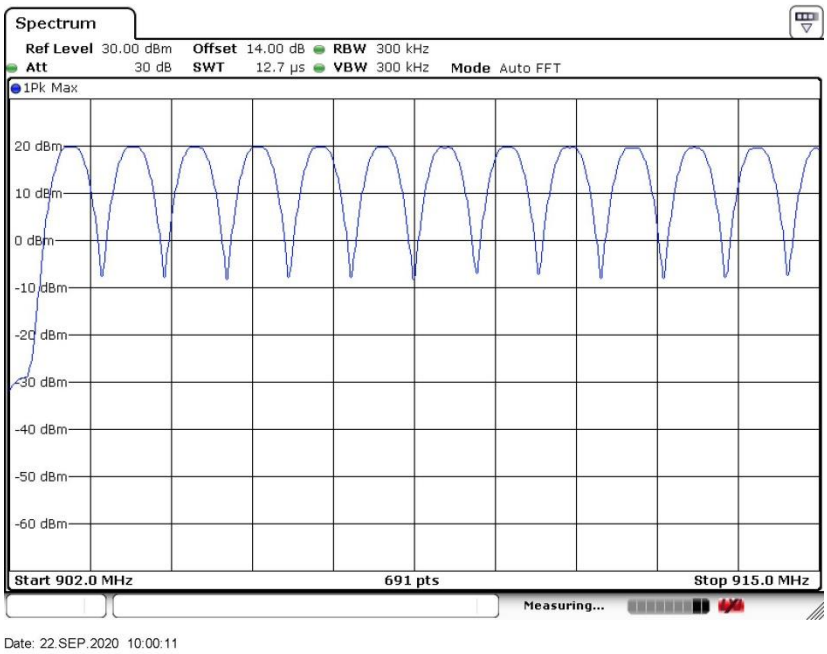
3.1.4 Test Setup



3.1.5 Test Result of Number of Hopping Frequency

Please refer to Appendix A.

Number of Hopping Channel Plot on Channel 00 - 24



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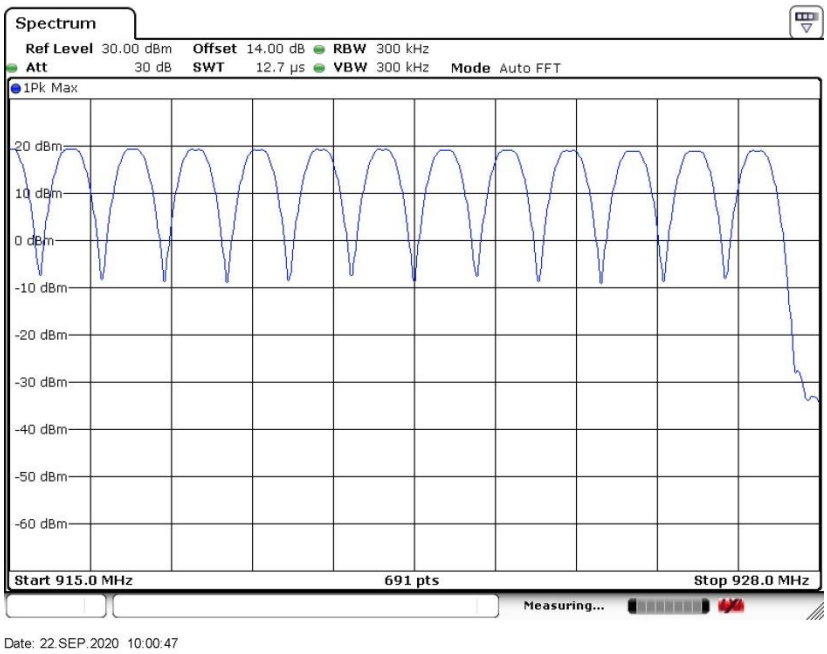


Date: 22.SEP.2020 10:00:47

3.2 Hopping Channel Separation Measurement

3.2.1 Limit of Hopping Channel Separation

Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.

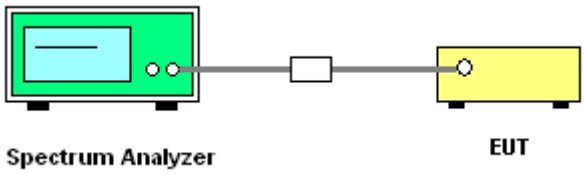
3.2.2 Measuring Instruments

The measuring equipment is listed in the section 4 of this test report.

3.2.3 Test Procedures

1. The testing follows ANSI C63.10-2013 clause 7.8.2.
2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. Set to the maximum power setting and enable the EUT transmit continuously.
4. Enable the EUT hopping function.
5. Use the following spectrum analyzer settings:
   Span = wide enough to capture the peaks of two adjacent channels;
   RBW = 300kHz; VBW ≥ RBW; Sweep = auto; Detector function = peak; Trace = max hold.
6. Measure and record the results in the test report.

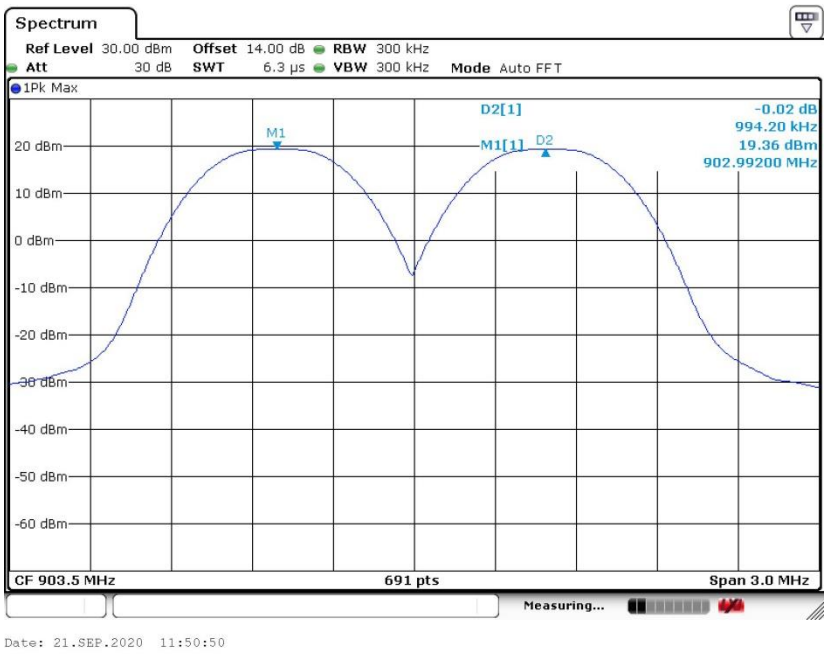
3.2.4 Test Setup



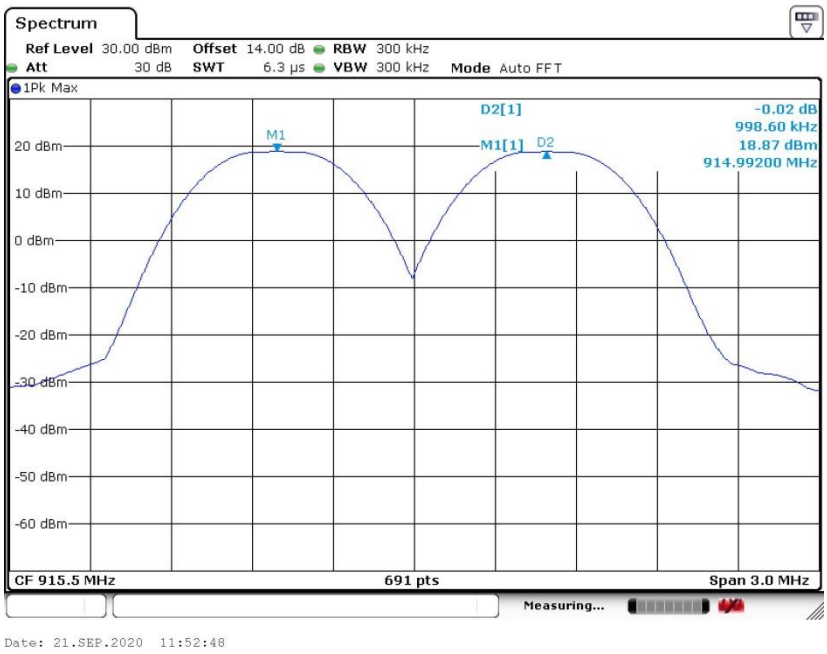
3.2.5 Test Result of Hopping Channel Separation

Please refer to Appendix A.

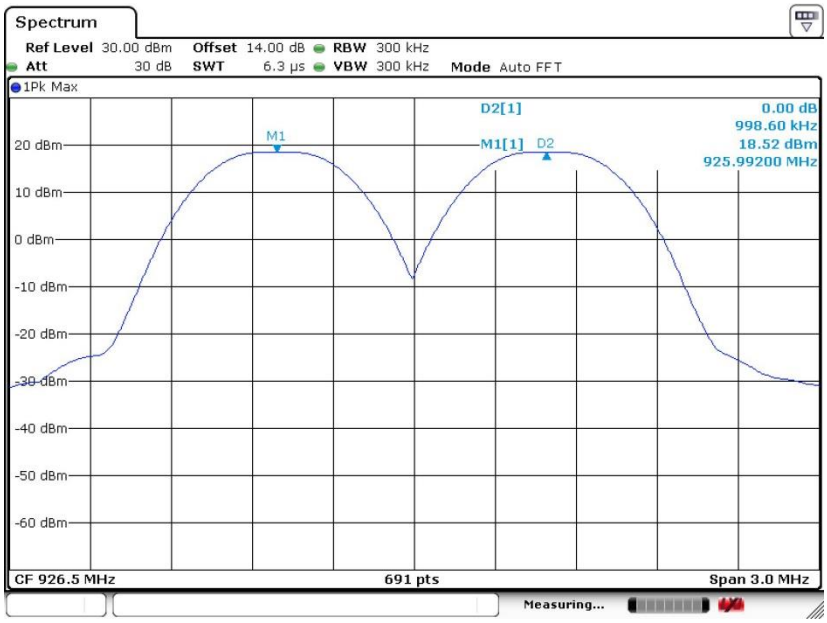
Channel Separation Plot on Channel 00 - 01



Channel Separation Plot on Channel 12 - 13



Channel Separation Plot on Channel 23 - 24



3.3 Dwell Time Measurement

3.3.1 Limit of Dwell Time

The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed.

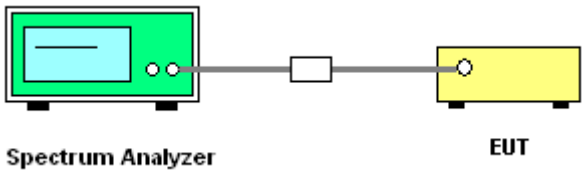
3.3.2 Measuring Instruments

The measuring equipment is listed in the section 4 of this test report.

3.3.3 Test Procedures

1. The testing follows ANSI C63.10-2013 clause 7.8.4.
2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. Set to the maximum power setting and enable the EUT transmit continuously.
4. Enable the EUT hopping function.
5. Use the following spectrum analyzer settings: Span = zero span, centered on a hopping channel; RBW = 1 MHz; VBW ≥ RBW; Sweep = as necessary to capture the entire dwell time per hopping channel; Detector function = peak; Trace = max hold.
6. Measure and record the results in the test report.

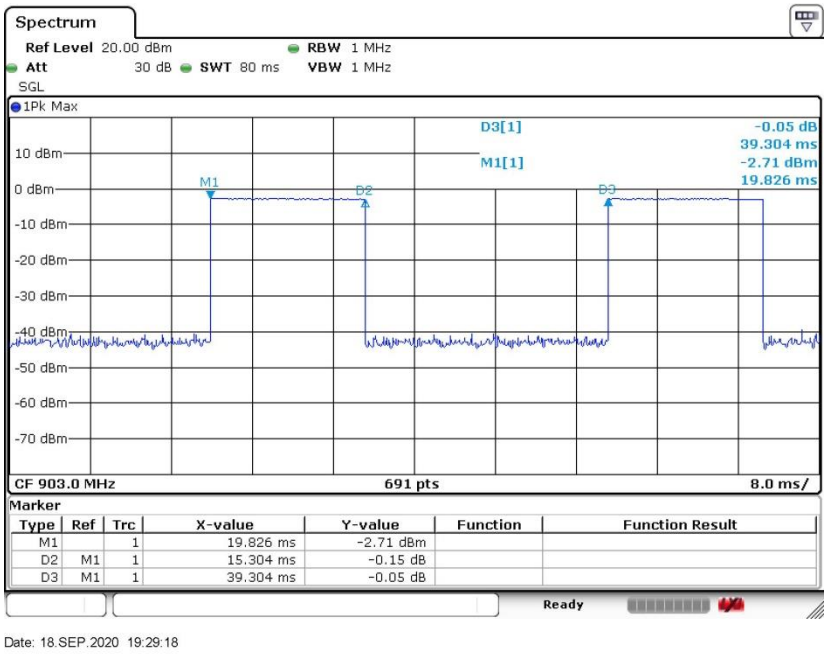
3.3.4 Test Setup



3.3.5 Test Result of Dwell Time

Please refer to Appendix A.

Package Transfer Time Plot



3.4 20dB and 99% Bandwidth Measurement

3.4.1 Limit of 20dB and 99% Bandwidth

The maximum allowed 20 dB bandwidth of the hopping channel is 500kHz.

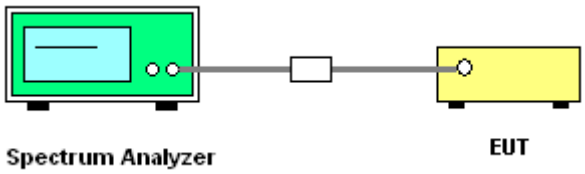
3.4.2 Measuring Instruments

The measuring equipment is listed in the section 4 of this test report.

3.4.3 Test Procedures

1. The testing follows ANSI C63.10-2013 clause 6.9.2 and 6.9.3.
2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. Set to the maximum power setting and enable the EUT transmit continuously.
4. Use the following spectrum analyzer settings for 20dB Bandwidth measurement.
   Span = approximately 2 to 5 times the 20 dB bandwidth, centered on a hopping channel;
   RBW ≥ 1% of the 20 dB bandwidth; VBW ≥ RBW; Sweep = auto; Detector function = peak;
   Trace = max hold.
5. Use the following spectrum analyzer settings for 99 % Bandwidth measurement.
   Span = approximately 1.5 to 5 times the 99% bandwidth, centered on a hopping channel;
   RBW ≥ 1% of the 99% bandwidth; VBW ≥ RBW; Sweep = auto; Detector function = peak;
   Trace = max hold.
6. Measure and record the results in the test report.

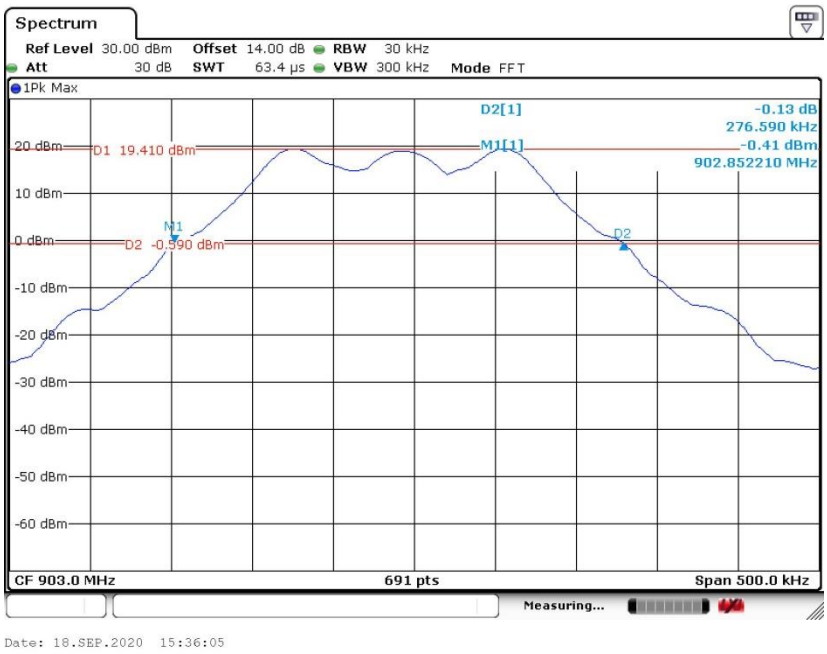
3.4.4 Test Setup



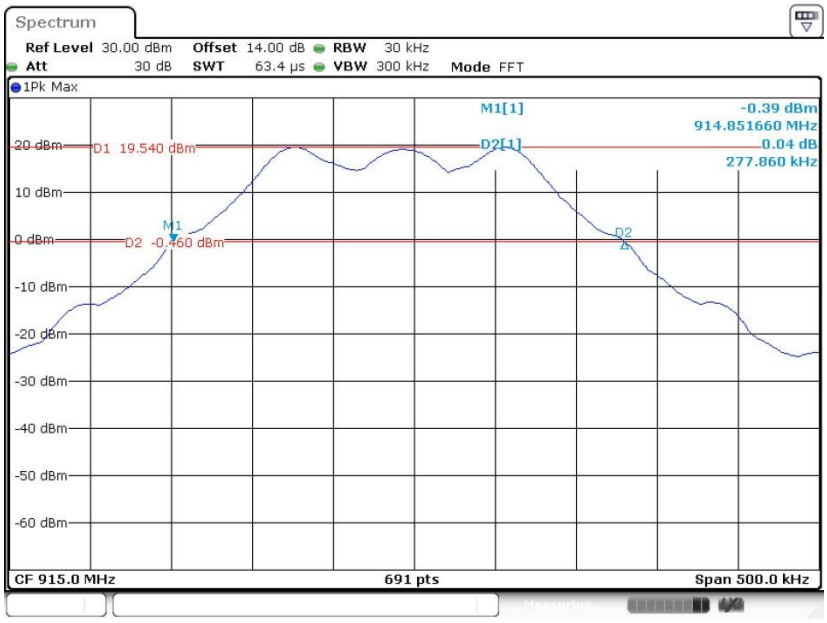
3.4.5 Test Result of 20dB Bandwidth

Please refer to Appendix A.

20 dB Bandwidth Plot on Channel 00



20 dB Bandwidth Plot on Channel 12



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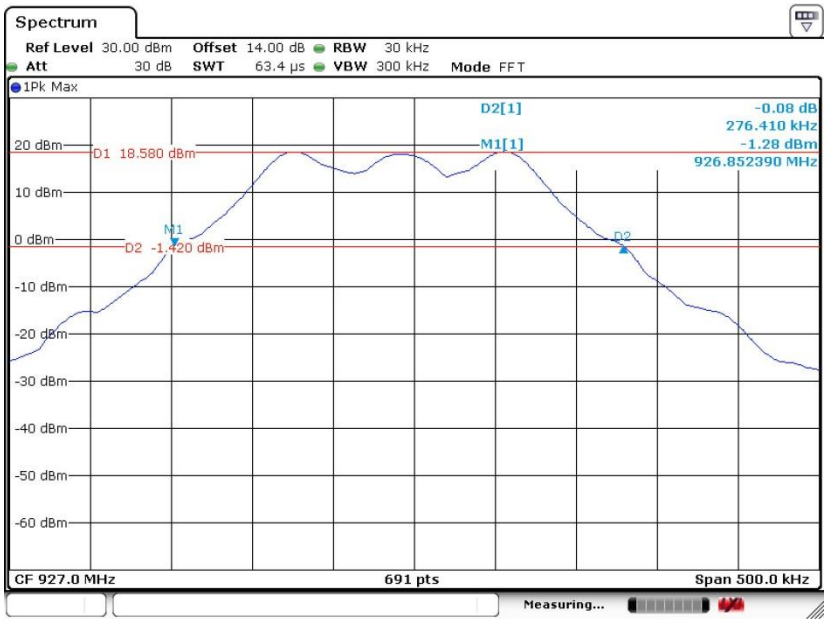
20 dB Bandwidth Plot on Channel 24

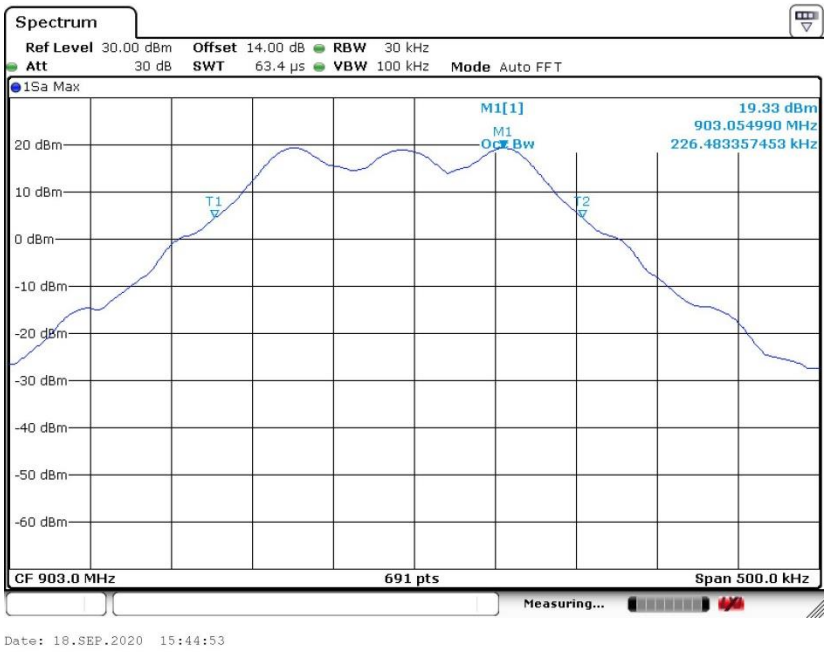


Date: 18.SEP.2020 15:30:26

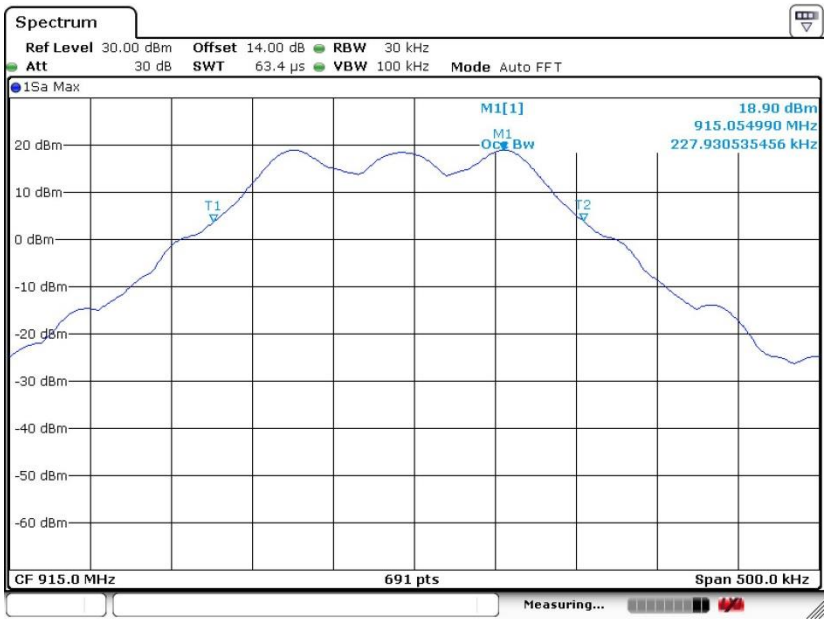
3.4.6 Test Result of 99% Occupied Bandwidth

Please refer to Appendix A.

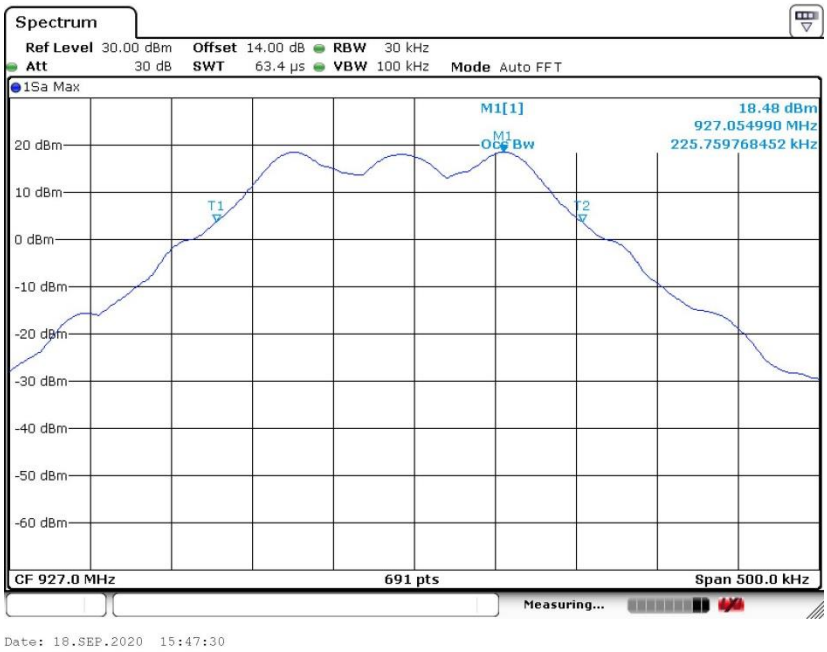
99% Occupied Bandwidth Plot on Channel 00



99% Occupied Bandwidth Plot on Channel 12



99% Occupied Bandwidth Plot on Channel 24



3.5 Peak Output Power Measurement

3.5.1 Limit of Peak Output Power

For systems using digital modulation in the 903-927MHz, the limit for peak output power is 24dBm. If transmitting antenna of directional gain greater than 6dBi is used, the peak output power from the intentional radiator shall be reduced below the above stated value by the amount in dB that the directional gain of the antenna exceeds 6 dBi. In case of point-to-point operation, the limit has to be reduced by 1dB for every 3dB that the directional gain of the antenna exceeds 6dBi.

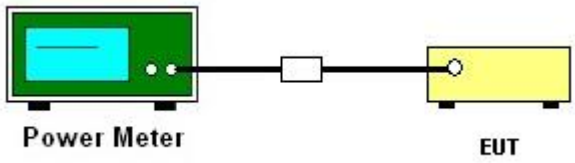
3.5.2 Measuring Instruments

The measuring equipment is listed in the section 4 of this test report.

3.5.3 Test Procedures

1. The testing follows ANSI C63.10-2013 clause 7.8.5.
2. The RF output of EUT was connected to the power meter by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. Set to the maximum power setting and enable the EUT transmit continuously.
4. Measure the conducted output power with cable loss and record the results in the test report.
5. Measure and record the results in the test report.

3.5.4 Test Setup



3.5.5 Test Result of Peak Output Power

Please refer to Appendix A.

3.5.6 Test Result of Average Output Power (Reporting Only)

Please refer to Appendix A.

3.6 Conducted Band Edges Measurement

3.6.1 Limit of Band Edges

In any 100 kHz bandwidth outside the intentional radiation frequency band, the radio frequency power shall be at least 20 dB below the highest level of the radiated power. In addition, radiated emissions which fall in the restricted bands must also comply with the radiated emission limits.

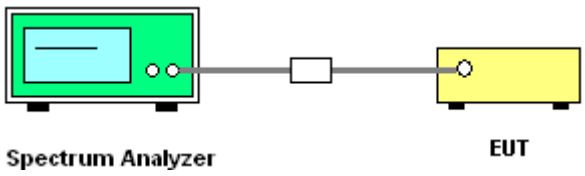
3.6.2 Measuring Instruments

The measuring equipment is listed in the section 4 of this test report.

3.6.3 Test Procedures

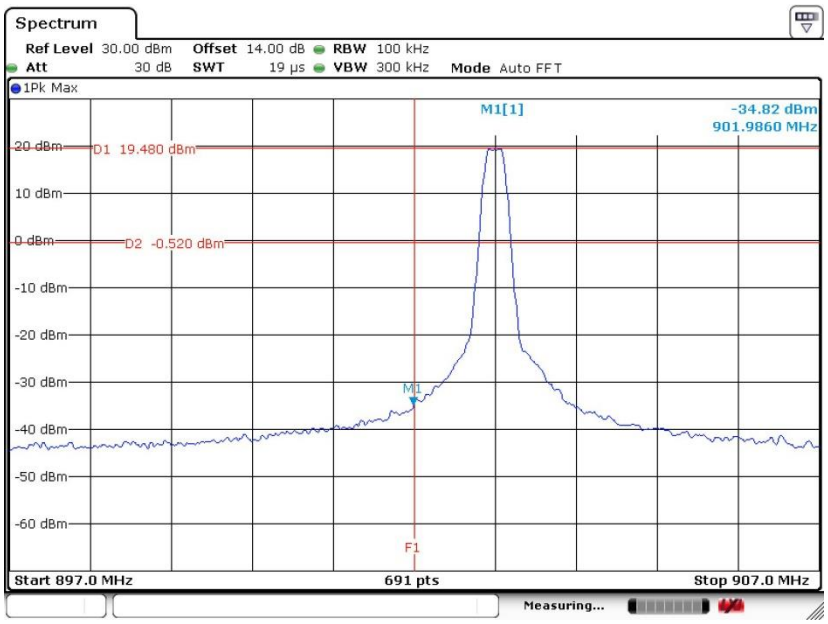
1. The testing follows ANSI C63.10-2013 clause 7.8.6.
2. Set to the maximum power setting and enable the EUT transmit continuously.
3. Set RBW = 100kHz, VBW = 300kHz. Band edge emissions must be at least 20 dB down from the highest emission level within the authorized band as measured with a 100kHz RBW. The attenuation shall be 30 dB instead of 20 dB when RMS conducted output power procedure is used.
4. Enable hopping function of the EUT and then repeat step 2. and 3.
5. Measure and record the results in the test report.

3.6.4 Test Setup

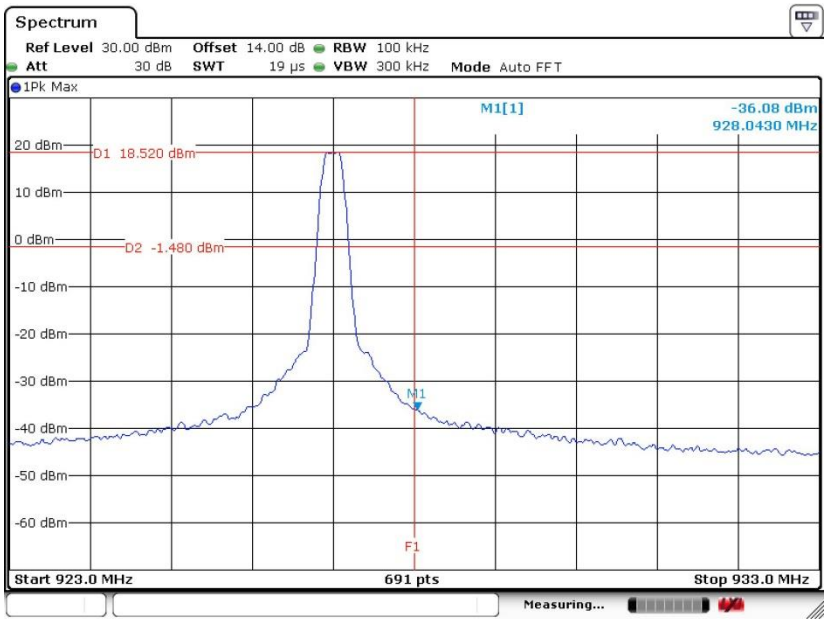


3.6.5 Test Result of Conducted Band Edges

Low Band Edge Plot on Channel 00

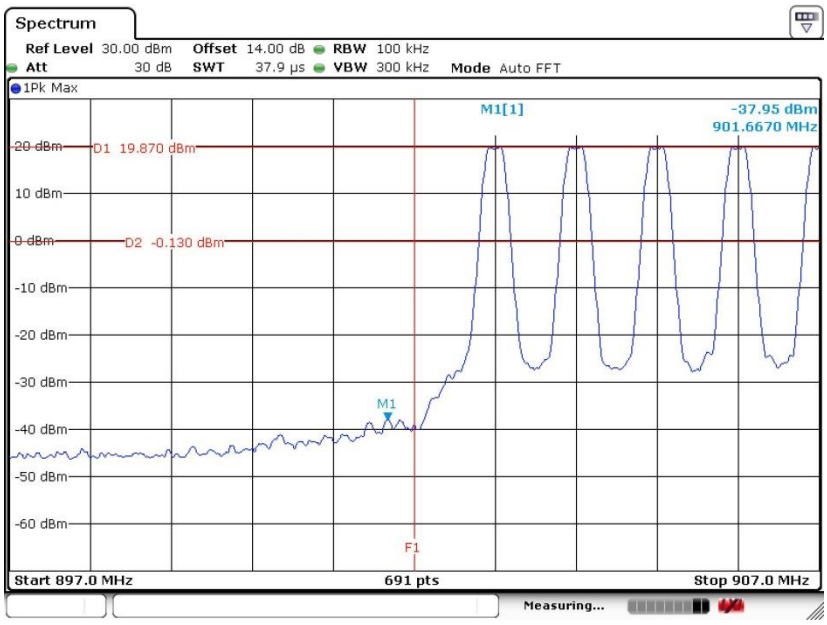


High Band Edge Plot on Channel 24



3.6.6 Test Result of Conducted Hopping Mode Band Edges

Hopping Mode Low Band Edge Plot



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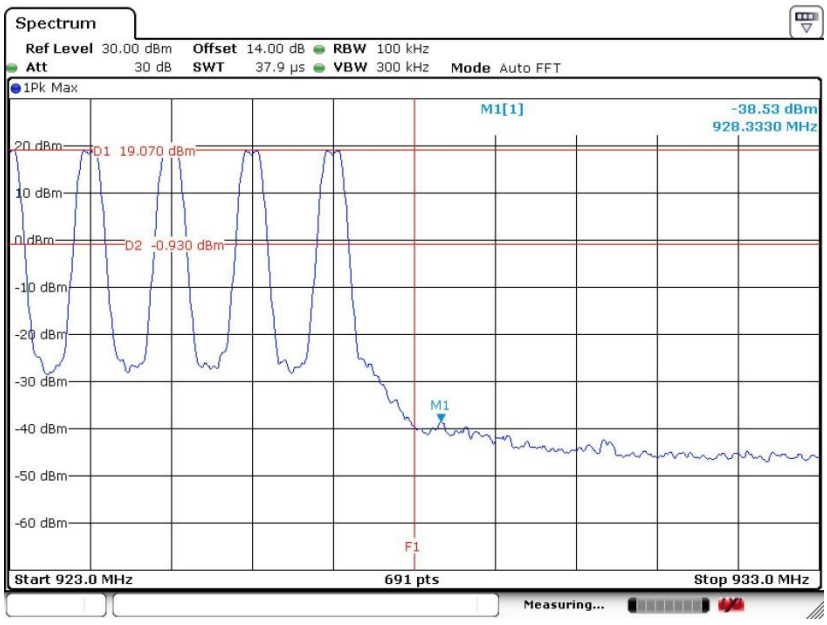
Hopping Mode High Band Edge Plot



Date: 22.SEP.2020 09:54:07

3.7 Conducted Spurious Emission Measurement

3.7.1 Limit of Spurious Emission Measurement

In any 100 kHz bandwidth outside the intentional radiation frequency band, the radio frequency power shall be at least 20 dB below the highest level of the radiated power. In addition, radiated emissions which fall in the restricted bands must also comply with the radiated emission limits.

3.7.2 Measuring Instruments

The measuring equipment is listed in the section 4 of this test report.

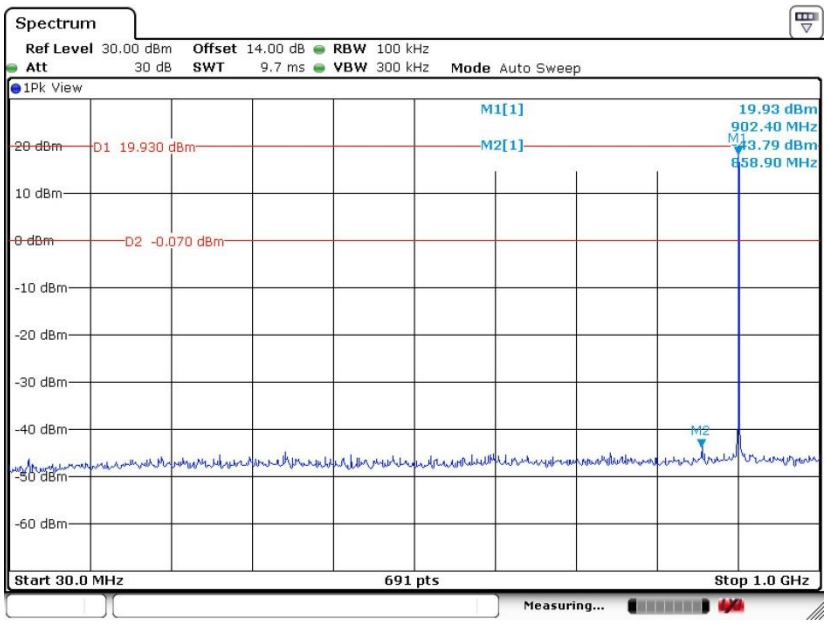
3.7.3 Test Procedure

1. The testing follows ANSI C63.10-2013 clause 7.8.8.
2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. Set to the maximum power setting and enable the EUT transmit continuously.
4. Set RBW = 100 kHz, VBW = 300kHz, scan up through 10th harmonic. All harmonics / spurs must be at least 20 dB down from the highest emission level within the authorized band as measured with a 100 kHz RBW.
5. Measure and record the results in the test report.
6. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.

3.7.4 Test Setup

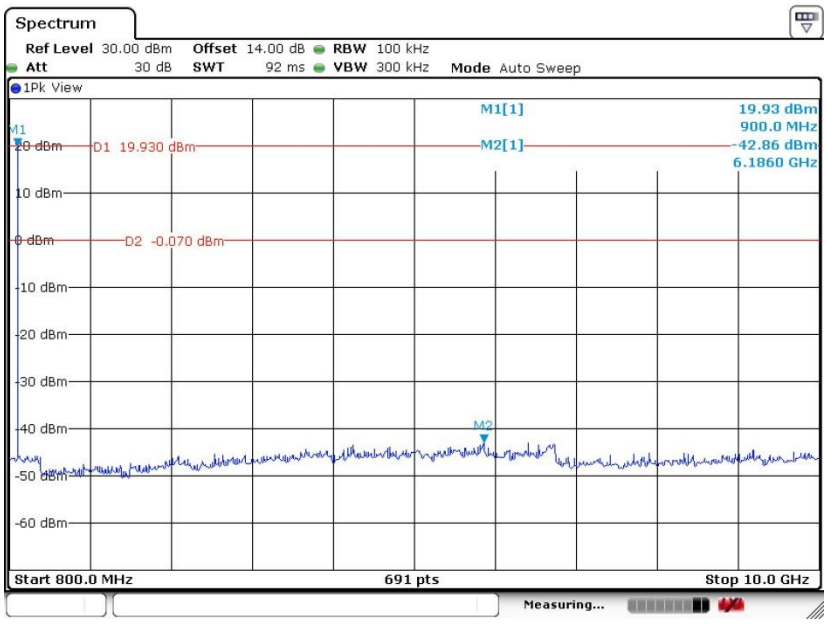
3.7.5 Test Result of Conducted Spurious Emission

CSE Plot on Ch 00 between 30MHz ~ 1 GHz



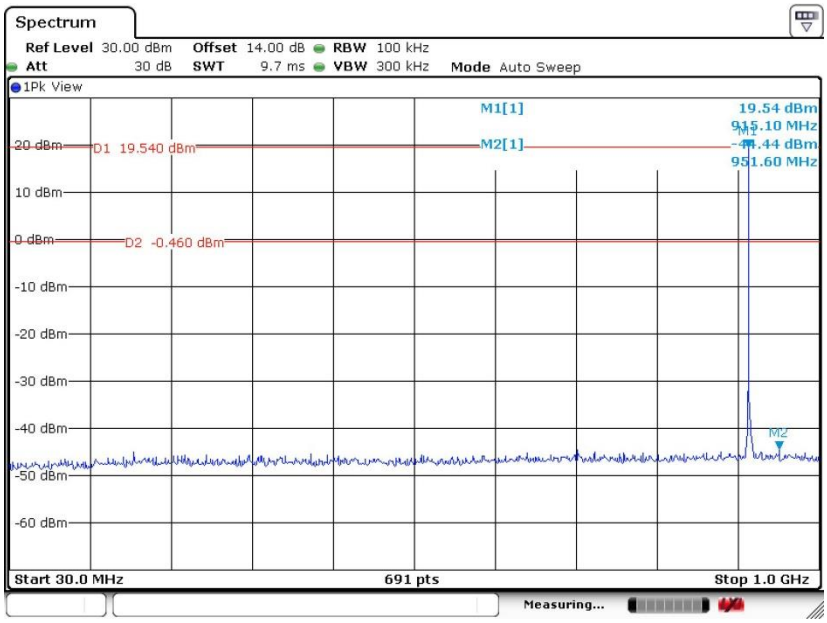
Date: 22.SEP.2020 10:13:19

CSE Plot on Ch 00 between 800MHz ~ 10 GHz



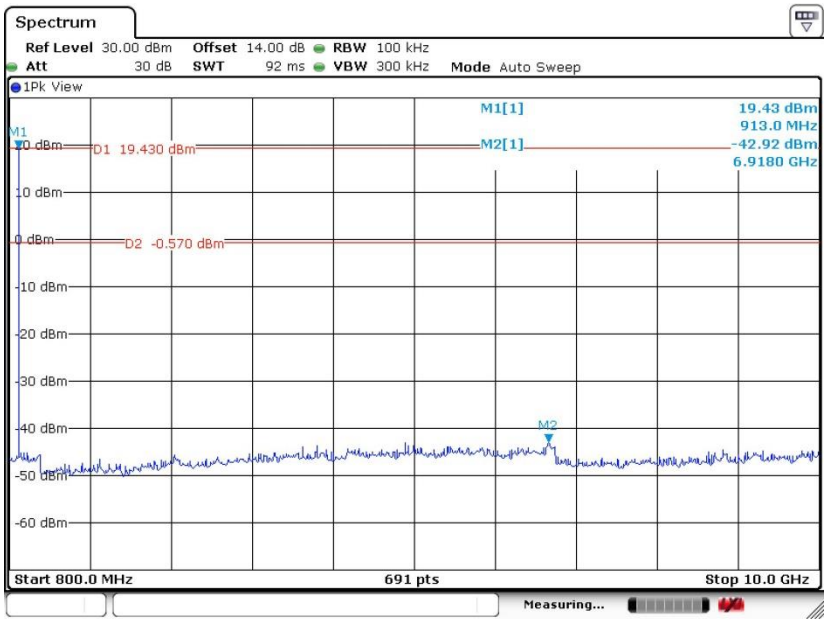
Date: 22.SEP.2020 10:15:16

CSE Plot on Ch 12 between 30MHz ~ 1 GHz



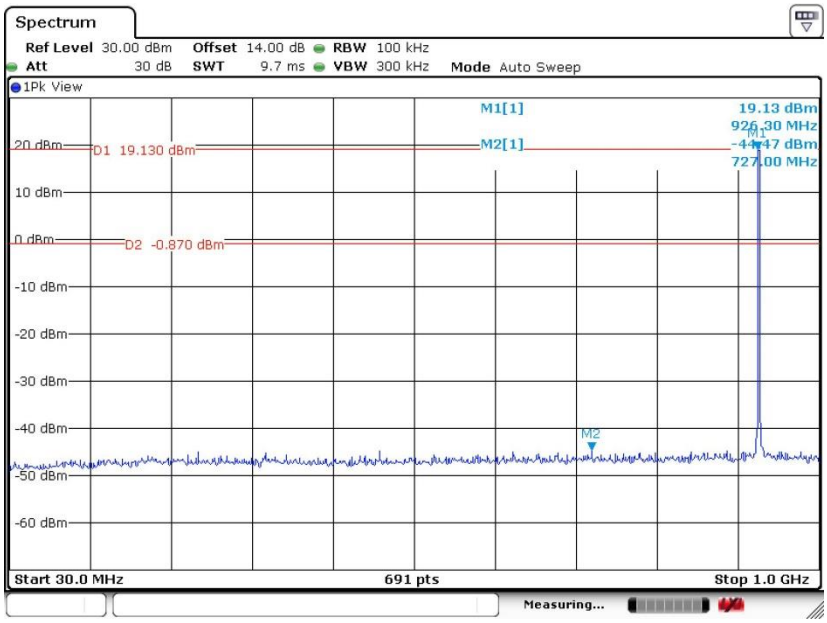
Date: 22.SEP.2020 10:28:23

CSE Plot on Ch 12 between 800MHz ~ 10 GHz



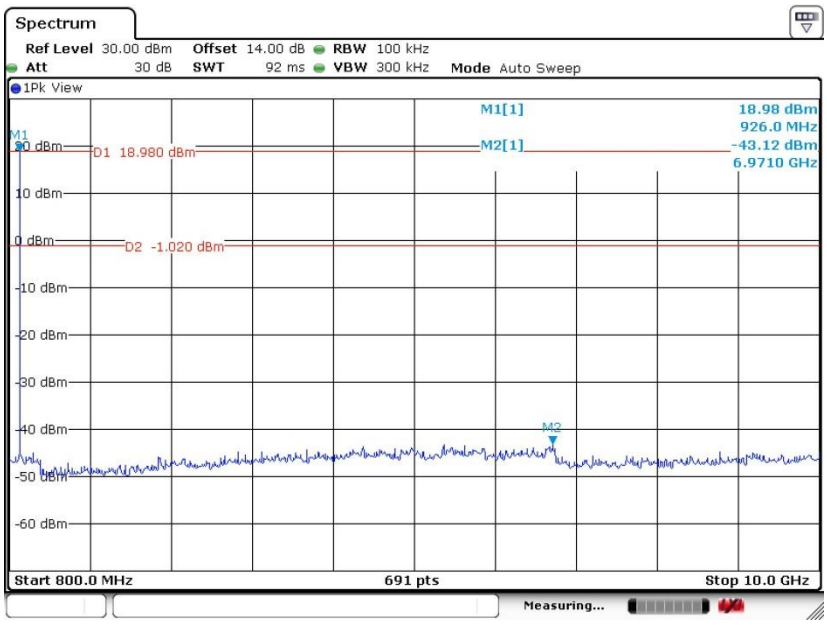
Date: 22.SEP.2020 10:29:36

CSE Plot on Ch 24 between 30MHz ~ 1 GHz



Date: 22.SEP.2020 10:30:50

CSE Plot on Ch 24 between 800MHz ~ 10 GHz



Date: 22.SEP.2020 10:31:50

3.8 Radiated Band Edges and Spurious Emission Measurement

3.8.1 Limit of Radiated Band Edges and Spurious Emission

In any 100 kHz bandwidth outside the intentional radiator frequency band, all harmonics/spurious must be at least 20 dB below the highest emission level within the authorized band. In addition, radiated emissions which fall in the restricted bands must also comply with the limits as below.

Frequency (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
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

3.8.2 Measuring Instruments

The measuring equipment is listed in the section 4 of this test report.

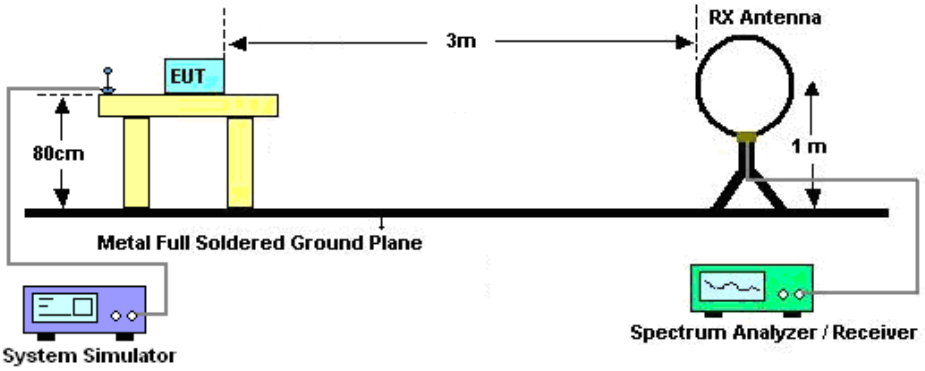
3.8.3 Test Procedures

1. The EUT was placed on a turntable with 0.8 meter for frequency below 1GHz and 1.5 meter for frequency above 1GHz respectively above ground.
2. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.
3. For each suspected emission, the EUT was arranged to its worst case and then tune the Antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level to comply with the guidelines.
4. Set to the maximum power setting and enable the EUT transmit continuously.
5. Use the following spectrum analyzer settings:
   (1) Span shall wide enough to fully capture the emission being measured;
   (2) Set RBW=100 kHz for f < 1 GHz, RBW=1MHz for f>1GHz ; VBW ≥ RBW; Sweep = auto; Detector function = peak; Trace = max hold for peak
   (3) For average measurement: use duty cycle correction factor method per 15.35(c).
   Duty cycle = On time/100 milliseconds
   On time = $N_1*L_1+N_2*L_2+...+N_{n-1}*LN_{n-1}+N_n*L_n$
   Where N_1 is number of type 1 pulses, L_1 is length of type 1 pulses, etc.
   Average Emission Level = Peak Emission Level + 20*log(Duty cycle)
6. Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level

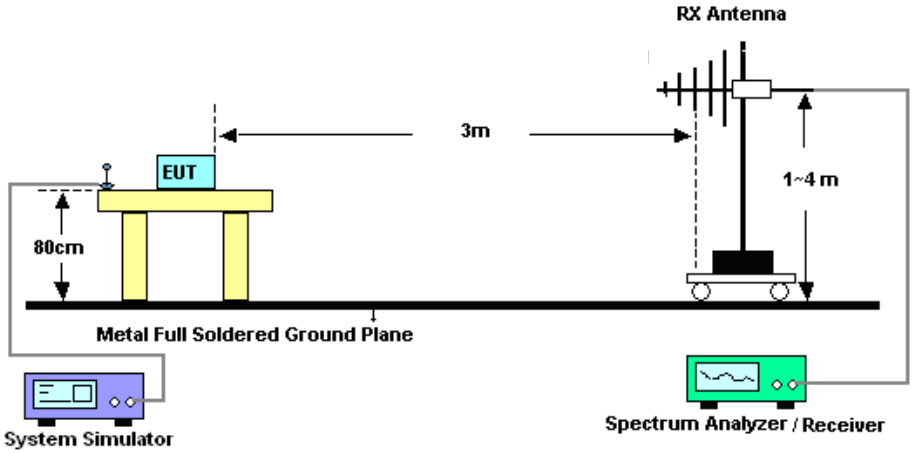
Note: The average levels were calculated from the peak level corrected with duty cycle correction factor derived from 20log (dwell time/100ms). This correction is only for signals that hop with the fundamental signal, such as band-edge and harmonic. Other spurious signals that are independent of the hopping signal would not use this correction.

3.8.4 Test Setup

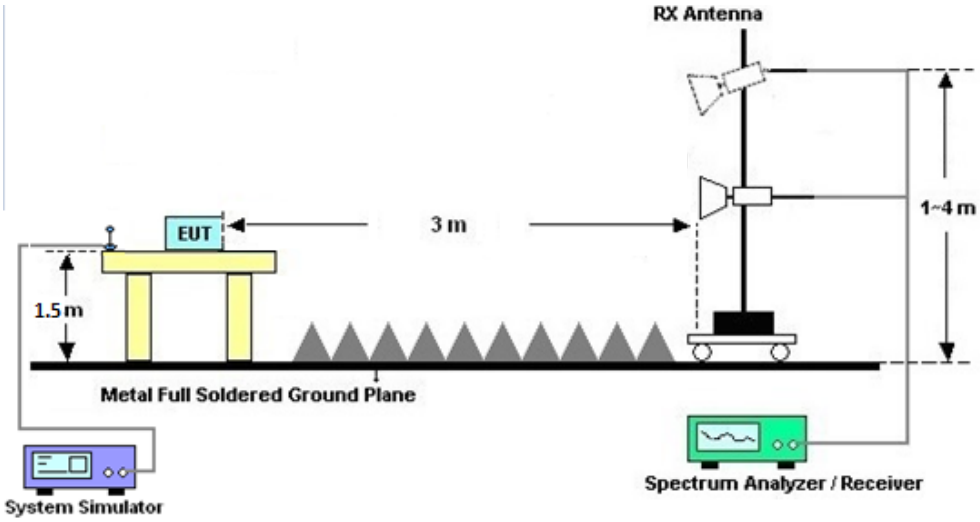
For radiated emissions below 30MHz



For radiated emissions from 30MHz to 1GHz



For radiated emissions above 1GHz



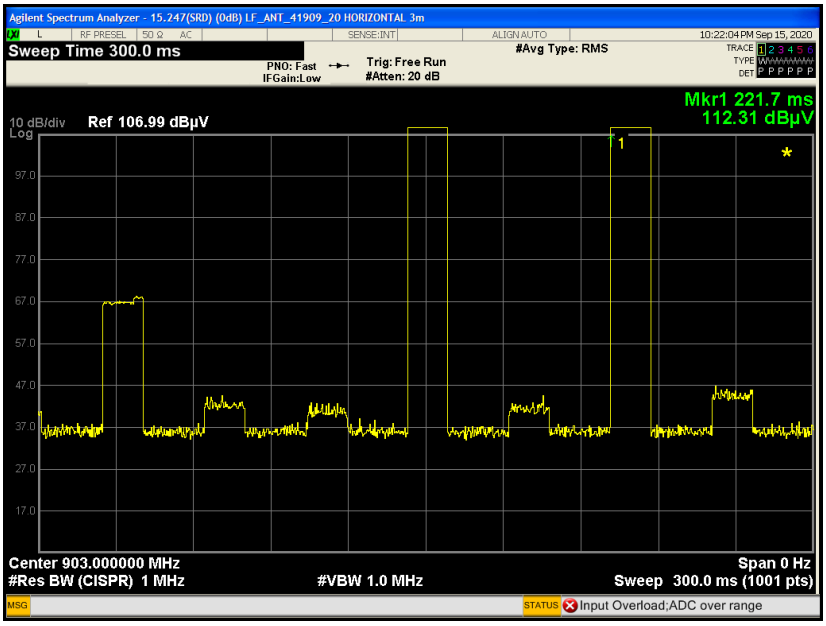
3.8.5 Test Results of Radiated Spurious Emissions (9 kHz ~ 30 MHz)

The low frequency, which started from 9 kHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit line was not reported.

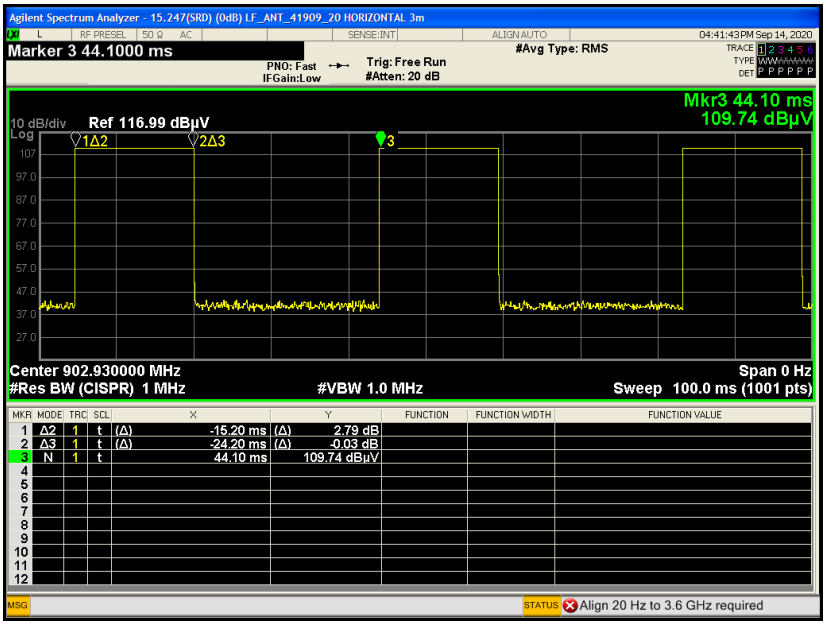
There is a comparison data of both open-field test site and semi-Anechoic chamber, and the result came out very similar.

3.8.6 Duty cycle correction factor for average measurement

903MHz: on time (One Pulse) Plot on Channel 00



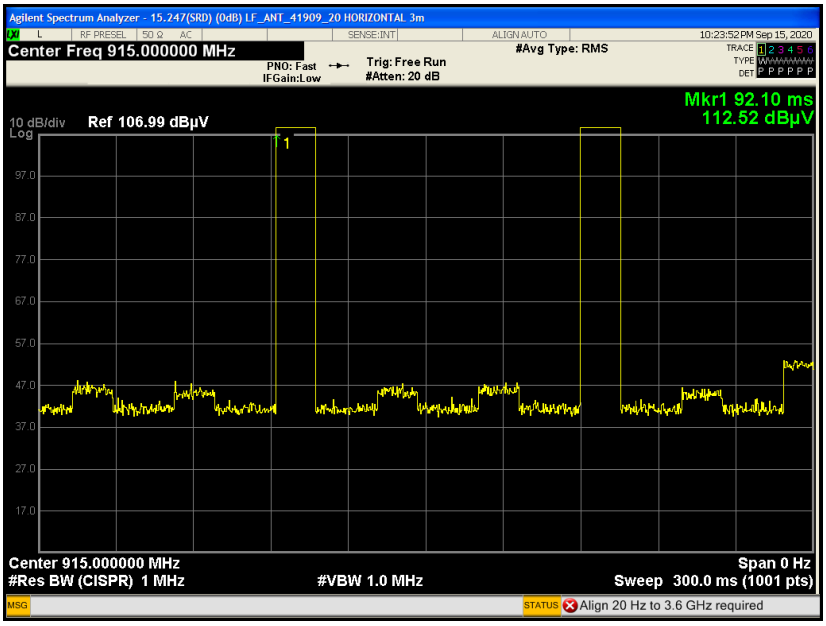
903MHz: on time (Count Pulses) Plot on Channel 00



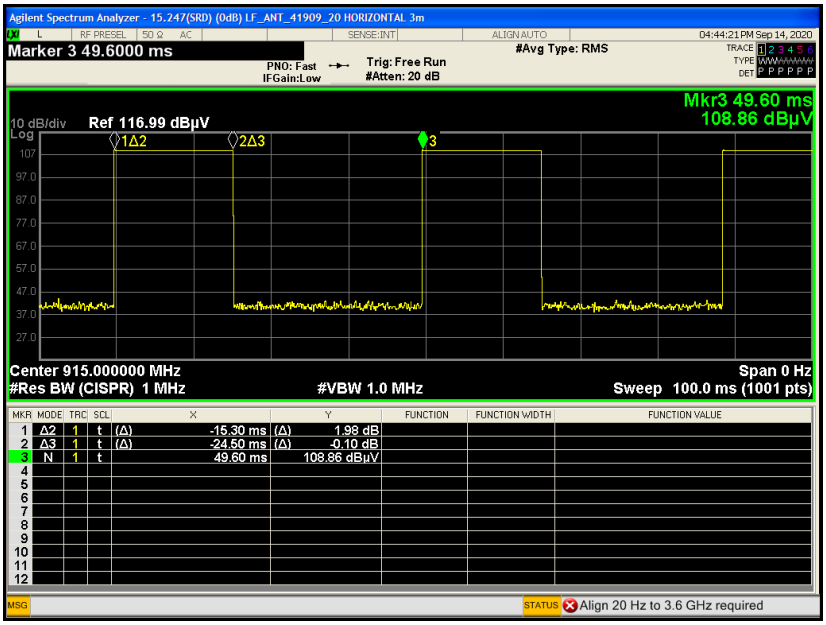
Note:

1. Duty cycle = on time/100 milliseconds = 2 * 15.2 / 100 = 30.40 %
2. Duty cycle correction factor = 20*log(Duty cycle) = -10.34 dB

915MHz: on time (One Pulse) Plot on Channel 12



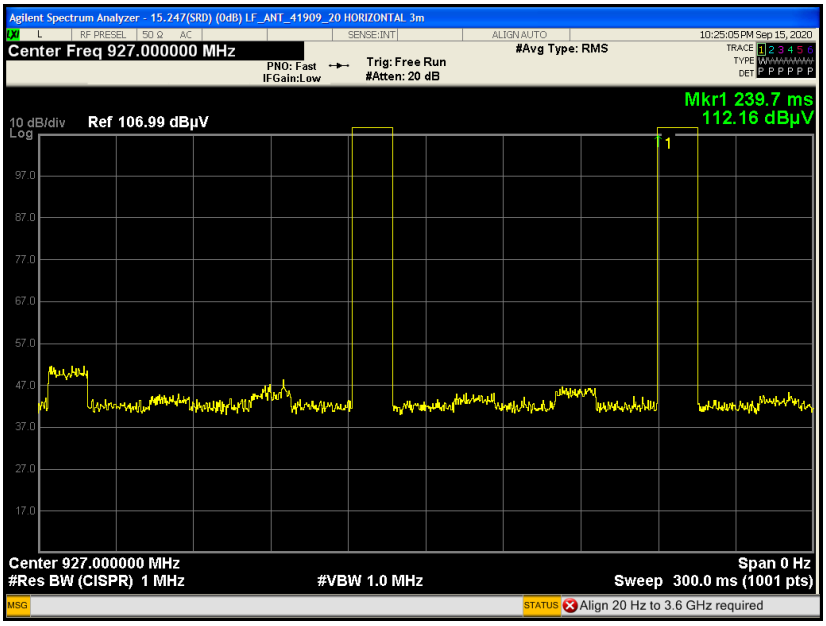
915MHz: on time (Count Pulses) Plot on Channel 12



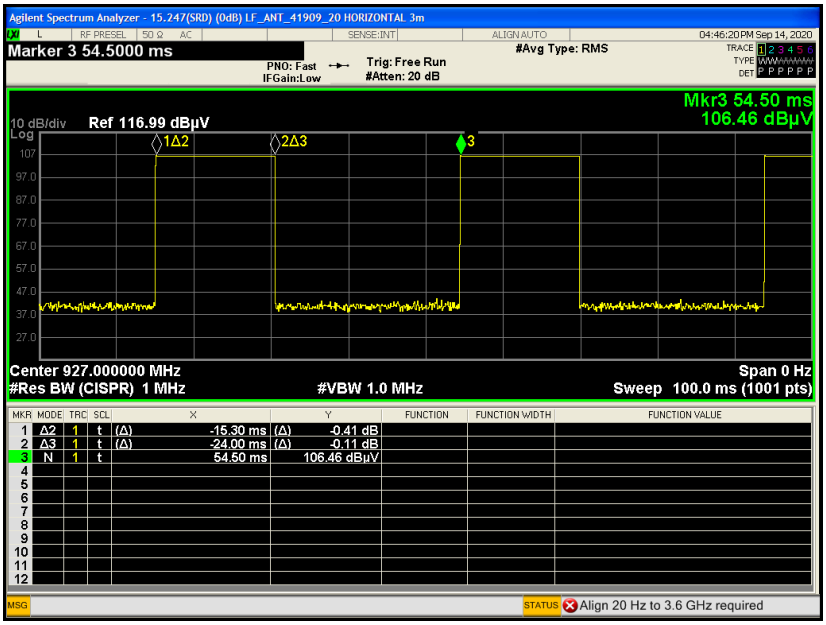
Note:

1. Duty cycle = on time/100 milliseconds = 2 * 15.3 / 100 = 30.60 %
2. Duty cycle correction factor = 20*log(Duty cycle) = -10.29 dB

927MHz: on time (One Pulse) Plot on Channel 24



927MHz: on time (Count Pulses) Plot on Channel 24



Note:

1. Duty cycle = on time/100 milliseconds = 2 * 15.3 / 100 = 30.60 %
2. Duty cycle correction factor = 20*log(Duty cycle) = -10.29 dB

3.8.7 Test Result of Radiated Spurious at Band Edges

Please refer to Appendix B.

3.8.8 Test Result of Radiated Spurious Emission (30MHz ~ 10th Harmonic)

Please refer to Appendix B.

3.9 AC Conducted Emission Measurement

3.9.1 Limit of AC Conducted Emission

For equipment that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table.

Frequency of emission (MHz)	Conducted limit (dBμV)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

*Decreases with the logarithm of the frequency.

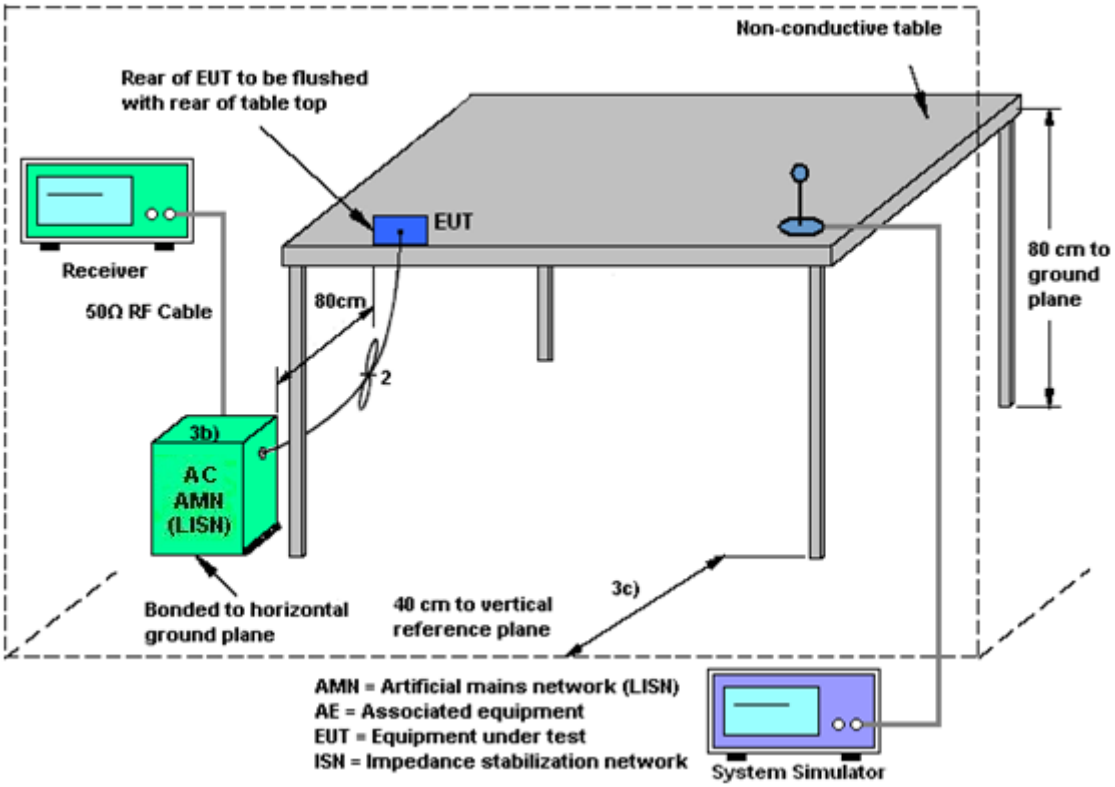
3.9.2 Measuring Instruments

The measuring equipment is listed in the section 4 of this test report.

3.9.3 Test Procedures

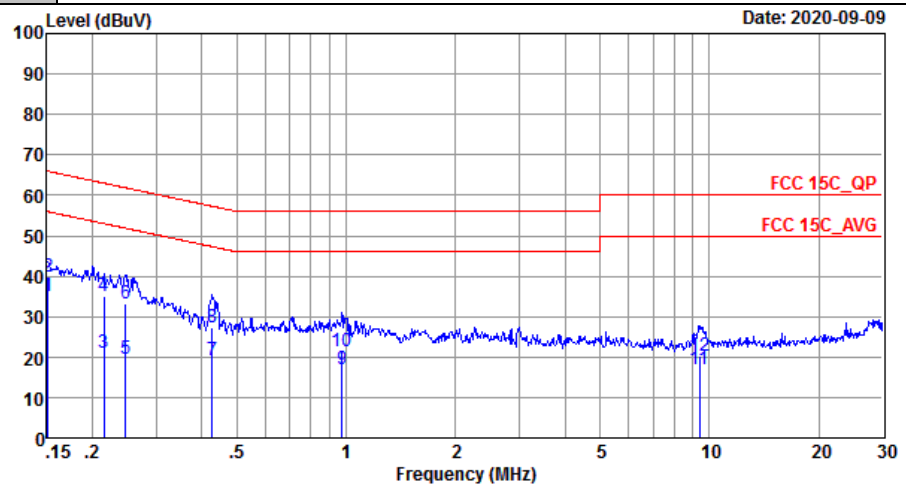
1. The EUT was placed 0.4 meter from the conducting wall of the shielding room was kept at least 80 centimeters from any other grounded conducting surface.
2. Connect EUT to the power mains through a line impedance stabilization network (LISN).
3. All the support units are connecting to the other LISN.
4. The LISN provides 50 ohm coupling impedance for the measuring instrument.
5. The FCC states that a 50 ohm, 50 microhenry LISN should be used.
6. Both sides of AC line were checked for maximum conducted interference.
7. The frequency range from 150 kHz to 30 MHz was searched.
8. Set the test-receiver system to Peak Detect Function and specified bandwidth (IF Bandwidth = 9kHz) with Maximum Hold Mode. Then measurement is also conducted by Average Detector and Quasi-Peak Detector Function respectively.

3.9.4 Test Setup



3.9.5 Test Result of AC Conducted Emission

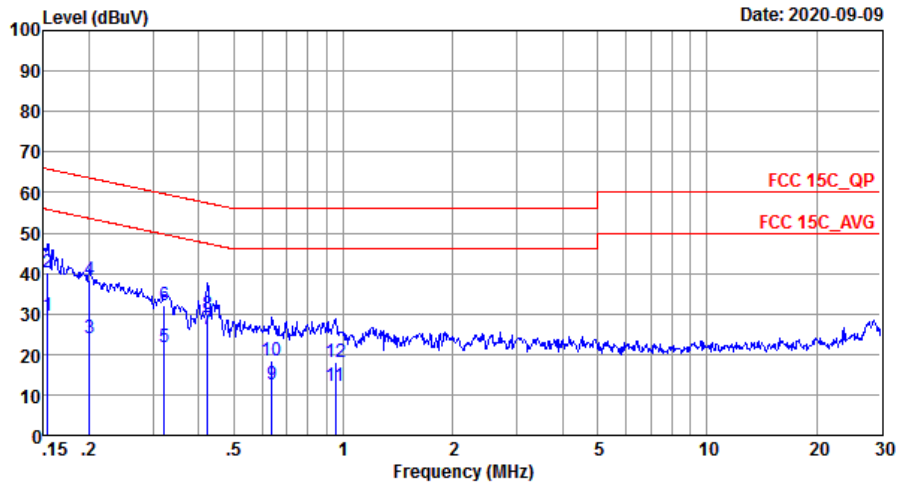
Test Mode :	Mode 1	Temperature :	22~25℃
Test Engineer :	Yuqiang Xie	Relative Humidity :	50~55%
Test Voltage :	120Vac / 60Hz	Phase :	Line
Function Type :	WCDMA Band II Idle + Charging from Adapter + SRD Tx		



Site : CO01-SZ
Condition: FCC 15C_QP LISN_20200719_L LINE

	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1 *	0.15	34.94	-21.02	55.96	24.90	0.03	10.01	Average
2	0.15	39.84	-26.12	65.96	29.80	0.03	10.01	QP
3	0.22	21.04	-31.97	53.01	11.00	0.03	10.01	Average
4	0.22	35.14	-27.87	63.01	25.10	0.03	10.01	QP
5	0.25	19.74	-32.12	51.86	9.70	0.03	10.01	Average
6	0.25	33.14	-28.72	61.86	23.10	0.03	10.01	QP
7	0.43	19.35	-27.94	47.29	9.29	0.03	10.03	Average
8	0.43	27.35	-29.94	57.29	17.29	0.03	10.03	QP
9	0.97	17.02	-28.98	46.00	6.90	0.07	10.05	Average
10	0.97	21.42	-34.58	56.00	11.30	0.07	10.05	QP
11	9.40	16.98	-33.02	50.00	6.40	0.34	10.24	Average
12	9.40	20.38	-39.62	60.00	9.80	0.34	10.24	QP

Test Mode :	Mode 1	Temperature :	22~25℃
Test Engineer :	Yuqiang Xie	Relative Humidity :	50~55%
Test Voltage :	120Vac / 60Hz	Phase :	Neutral
Function Type :	WCDMA Band II Idle + Charging from Adapter + SRD Tx		



Site : CO01-SZ
Condition: FCC 15C_QP LISN_20200719_N NEUTRAL

		Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
		MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1		0.15	29.64	-26.14	55.78	19.60	0.03	10.01	Average
2		0.15	40.24	-25.54	65.78	30.20	0.03	10.01	QP
3		0.20	23.94	-29.64	53.58	13.90	0.03	10.01	Average
4		0.20	38.44	-25.14	63.58	28.40	0.03	10.01	QP
5		0.32	21.84	-27.82	49.66	11.80	0.03	10.01	Average
6		0.32	32.14	-27.52	59.66	22.10	0.03	10.01	QP
7	*	0.42	26.04	-21.33	47.37	16.00	0.02	10.02	Average
8		0.42	29.84	-27.53	57.37	19.80	0.02	10.02	QP
9		0.64	12.59	-33.41	46.00	2.50	0.02	10.07	Average
10		0.64	18.49	-37.51	56.00	8.40	0.02	10.07	QP
11		0.95	12.20	-33.80	46.00	2.10	0.05	10.05	Average
12		0.95	18.20	-37.80	56.00	8.10	0.05	10.05	QP

3.10 Antenna Requirements

3.10.1 Standard Applicable

If directional gain of transmitting antennas is greater than 6dBi, the power shall be reduced by the same level in dB comparing to gain minus 6dBi. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the rule.

3.10.2 Antenna Anti-Replacement Construction

An embedded-in antenna design is used.

3.10.3 Antenna Gain

The antenna peak gain of EUT is less than 6 dBi. Therefore, it is not necessary to reduce maximum peak output power limit.

4 List of Measuring Equipment

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
Spectrum Analyzer	R&S	FSV40	101078	10Hz~40GHz	Apr. 17, 2020	Sep. 18, 2020~ Sep. 22, 2020	Apr. 16, 2021	Conducted (TH01-SZ)
Pulse Power Senor	Anritsu	MA2411B	1207253	30MHz~40GHz	Dec. 26, 2019	Sep. 18, 2020~ Sep. 22, 2020	Dec. 25, 2020	Conducted (TH01-SZ)
Power Meter	Anritsu	ML2495A	1218010	50MHz Bandwidth	Dec. 26, 2019	Sep. 18, 2020~ Sep. 22, 2020	Dec. 25, 2020	Conducted (TH01-SZ)
EMI Test Receiver	R&S	ESR7	101404	9kHz~7GHz	Oct. 16, 2019	Sep. 14, 2020~ Sep. 15, 2020	Oct. 15, 2020	Radiation (03CH04-SZ)
EXA Spectrum Analyzer	KEYSIGHT	N9010A	MY55150213	10Hz~44GHz	Jul. 21, 2020	Sep. 14, 2020~ Sep. 15, 2020	Jul. 20, 2021	Radiation (03CH04-SZ)
Loop Antenna	R&S	HFH2-Z2	100354	9kHz~30MHz	Jun. 22, 2020	Sep. 14, 2020~ Sep. 15, 2020	Jun. 21, 2022	Radiation (03CH04-SZ)
Bilog Antenna	TeseQ	CBL6111D	41909	30MHz~1GHz	Nov. 07, 2019	Sep. 14, 2020~ Sep. 15, 2020	Nov. 06, 2020	Radiation (03CH04-SZ)
Double Ridge Horn Antenna	SCHWARZBECK	BBHA9120 D	9120D-1474	1GHz~18GHz	May. 23, 2020	Sep. 14, 2020~ Sep. 15, 2020	Mar. 22, 2021	Radiation (03CH04-SZ)
Amplifier	Burgeon	BPA-530	102211	0.01Hz ~3000MHz	Oct. 17,2019	Sep. 14, 2020~ Sep. 15, 2020	Oct. 16,2020	Radiation (03CH04-SZ)
HF Amplifier	MITEQ	AMF-7D-00 101800-30-10P-R	1943528	1GHz~18GHz	Oct. 17,2019	Sep. 14, 2020~ Sep. 15, 2020	Oct. 16,2020	Radiation (03CH04-SZ)
Amplifier	Agilent Technologies	83017A	MY53270156	500MHz~26.5GHz	Oct.17 2019	Sep. 14, 2020~ Sep. 15, 2020	Oct.16 2020	Radiation (03CH04-SZ)
AC Power Source	Chroma	61601	N/A	N/A	NCR	Sep. 14, 2020~ Sep. 15, 2020	NCR	Radiation (03CH04-SZ)
Turn Table	EM	EM1000	N/A	0~360 degree	NCR	Sep. 14, 2020~ Sep. 15, 2020	NCR	Radiation (03CH04-SZ)
Antenna Mast	EM	EM1000	N/A	1 m~4 m	NCR	Sep. 14, 2020~ Sep. 15, 2020	NCR	Radiation (03CH04-SZ)
EMI Receiver	R&S	ESR7	101630	9kHz~7GHz;	Dec. 26, 2018	Sep. 09, 2020	Dec. 25, 2020	Conduction (CO01-SZ)
AC LISN	EMCO	3816/2SH	00103912	9kHz~30MHz	Oct. 17, 2019	Sep. 09, 2020	Oct. 16, 2020	Conduction (CO01-SZ)
AC LISN (for auxiliary equipment)	EMCO	3816/2SH	00103892	9kHz~30MHz	Oct. 17, 2019	Sep. 09, 2020	Oct. 16, 2020	Conduction (CO01-SZ)
AC Power Source	Chroma	61602	616020000891	100Vac~250Vac	Jul. 21, 2020	Sep. 09, 2020	Jul. 20, 2021	Conduction (CO01-SZ)

NCR: No Calibration Required

5 Uncertainty of Evaluation

Uncertainty of Conducted Emission Measurement (150 kHz ~ 30 MHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**2.7dB**

Uncertainty of Radiated Emission Measurement (30 MHz ~ 1000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**5.0dB**

Uncertainty of Radiated Emission Measurement (1000 MHz ~ 18000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**4.8dB**

Appendix A. conducted test results

Report Number : FR082803

Test Engineer:	Zhang Jiang	Temperature:	21~25	°C
Test Date:	2020/9/18~2020/9/22	Relative Humidity:	51~54	%

TEST RESULTS DATA
20dB and 99% Occupied Bandwidth and Hopping Channel Separation

Mod.	Data Rate	NTX	CH.	Freq. (MHz)	20db BW (MHz)	99% Bandwidth (MHz)	Hopping Channel Separation Measurement (MHz)	Maximum 20 dB bandwidth Limit (MHz)	Hopping Channel Separation Measurement Limit (MHz)	Pass/Fail
SRD	128kbps	1	0	903	0.277	0.226	0.994	0.500	0.1846	Pass
SRD	128kbps	1	12	915	0.278	0.228	0.999	0.500	0.1852	Pass
SRD	128kbps	1	24	927	0.276	0.226	0.999	0.500	0.1843	Pass

TEST RESULTS DATA
Dwell Time

Mod.	Hopping Channel Number Rate	Hops Over Occupancy Time(hops)	Package Transfer Time (msec)	Dwell Time (sec)	Limits (sec)	Pass/Fail
SRD	25	10	15.30	0.15	0.4	Pass

TEST RESULTS DATA
Peak Power Table

DH	CH.	NTX	Peak Power (dBm)	Power Limit (dBm)	Test Result
SRD	0	1	**20.78**	24.00	Pass
	12	1	20.35	24.00	Pass
	24	1	19.88	24.00	Pass

TEST RESULTS DATA
Average Power Table
(Reporting Only)

DH	CH.	NTX	Average Power (dBm)	Duty Factor (dB)
SRD	0	1	**20.10**	4.10
	12	1	19.70	4.10
	24	1	19.40	4.10

TEST RESULTS DATA
Number of Hopping Frequency

Number of Hopping (Channel)	Adaptive Frequency Hopping (Channel)	Limits (Channel)	Pass/Fail
25	25	≥25	Pass

Appendix B. Radiated Spurious Emission

SRD TX 902~928MHz

15C.247 (Band Edge @ 3m)

SRD	Note	Frequency	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Ant Pos	Table Pos	Peak Avg.	Pol.
		(MHz)	(dBµV/m)	(dB)	(dBµV/m)	(dBµV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
SRD CH00 903MHz		901.925	57.58	-36.9	94.48	59.52	29.2	3.16	34.3	132	189	P	H
	*	903	114.48	-	-	116.41	29.2	3.16	34.29	132	189	P	H
		901.99	51.89	-36.92	88.81	53.83	29.2	3.16	34.3	175	236	P	V
	*	903	108.81	-	-	110.74	29.2	3.16	34.29	175	236	P	V
SRD CH12 915MHz	*	915	107.47	-	-	109.16	29.4	3.18	34.27	189	145	P	H
	*	915	104.79	-	-	106.48	29.4	3.18	34.27	123	166	P	V
SRD CH24 927MHz	*	927	106.93	-	-	108.3	29.68	3.2	34.25	162	86	P	H
		928.025	50.71	-36.22	86.93	52.03	29.72	3.2	34.24	162	86	P	H
	*	927	104.01	-	-	105.38	29.68	3.2	34.25	170	229	P	V
		928.01	48.27	-35.74	84.01	49.59	29.72	3.2	34.24	170	229	P	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

15C.247 (Band Edge @ 3m) Hopping

SRD	Note	Frequency (MHz)	Level (dBµV/m)	Over Limit (dB)	Limit Line (dBµV/m)	Read Level (dBµV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
SRD Hopping		901.96	50.09	-38.09	88.18	52.03	29.2	3.16	34.3	107	71	P	H
	*	910.02	108.18	-	-	109.99	29.3	3.17	34.28	107	71	P	H
		901.98	46.72	-38.07	84.79	48.66	29.2	3.16	34.3	123	142	P	V
	*	910.02	104.79	-	-	106.6	29.3	3.17	34.28	123	142	P	V
SRD Hopping	*	919.96	105.48	-	-	107.07	29.48	3.19	34.26	109	68	P	H
		928.01	46.7	-38.78	85.48	48.02	29.72	3.2	34.24	109	68	P	H
	*	919.96	106.68	-	-	108.27	29.48	3.19	34.26	120	138	P	V
		928.24	48.68	-38	86.68	50	29.72	3.2	34.24	120	138	P	V

SRD TX 902~928MHz

15C.247 (Harmonic @ 3m)

SRD	Note	Frequency (MHz)	Level (dBµV/m)	Over Limit (dB)	Limit Line (dBµV/m)	Read Level (dBµV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
SRD CH00 903MHz		1806	48.15	-25.85	74	70.63	25.53	4.67	52.68	123	158	P	H
		1806	37.81	-16.19	54					123	158	A	H
		2709	55.49	-18.51	74	74.5	27.92	5.68	52.61	108	22	P	H
		2709	45.15	-8.85	54					108	22	A	H
		3612	58.4	-15.6	74	74.5	29.22	6.68	52	159	57	P	H
		3612	48.06	-5.94	54					159	57	A	H
		4515	43.85	-30.15	74	56.05	30.77	7.84	50.81	134	84	P	H
		4515	33.51	-20.49	54					134	84	A	H
		5418	49.75	-24.25	74	57.59	31.65	9.66	49.15	122	25	P	H
		5418	39.41	-14.59	54					122	25	A	H
		6321	50.18	-23.82	74	57.48	33.32	10.51	51.13	159	14	P	H
		6321	39.84	-14.16	54					159	14	A	H
		1806	46.19	-27.81	74	68.67	25.53	4.67	52.68	100	41	P	V
		1806	35.85	-18.15	54					100	41	A	V
		2708	54.97	-19.03	74	73.99	27.92	5.68	52.62	105	24	P	V
		2708	44.63	-9.37	54					105	24	A	V
		3612	57.81	-16.19	74	73.91	29.22	6.68	52	102	36	P	V
		3612	47.47	-6.53	54					102	36	A	V
		4515	42.49	-31.51	74	54.69	30.77	7.84	50.81	100	66	P	V
		4515	32.15	-21.85	54					100	66	A	V
		5418	49.95	-24.05	74	57.79	31.65	9.66	49.15	122	58	P	V
		5418	39.61	-14.39	54					122	58	A	V
		6321	52.3	-21.7	74	59.6	33.32	10.51	51.13	105	246	P	V
		6321	41.96	-12.04	54					105	246	A	V

SRD	Note	Frequency (MHz)	Level (dBµV/m)	Over Limit (dB)	Limit Line (dBµV/m)	Read Level (dBµV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
SRD CH12 915MHz		1830	44.46	-29.54	74	66.85	25.64	4.67	52.7	162	177	P	H
		1830	34.17	-19.83	54					162	177	A	H
		2745	57.56	-16.44	74	76.46	27.99	5.71	52.6	124	62	P	H
		2745	47.27	-6.73	54					124	62	A	H
		3660	58.79	-15.21	74	74.74	29.29	6.74	51.98	147	142	P	H
		3660	48.5	-5.5	54					147	142	A	H
		4575	42.27	-31.73	74	54.03	30.86	7.94	50.56	132	57	P	H
		4575	31.98	-22.02	54					132	57	A	H
		5490	50.82	-23.18	74	58.52	31.87	9.7	49.27	133	331	P	H
		5490	40.53	-13.47	54					133	331	A	H
		6405	50.67	-23.33	74	57.82	33.62	10.53	51.3	199	57	P	H
		6405	40.38	-13.62	54					199	57	A	H
		1830	43.46	-30.54	74	65.85	25.64	4.67	52.7	100	24	P	V
		1830	33.17	-20.83	54					100	24	A	V
		2745	54.33	-19.67	74	73.23	27.99	5.71	52.6	100	45	P	V
		2745	44.04	-9.96	54					100	45	A	V
		3660	56.84	-17.16	74	72.79	29.29	6.74	51.98	100	79	P	V
		3660	46.55	-7.45	54					100	79	A	V
		4575	43.07	-30.93	74	54.83	30.86	7.94	50.56	100	155	P	V
		4575	32.78	-21.22	54					100	155	A	V
		5490	50.52	-23.48	74	58.22	31.87	9.7	49.27	100	17	P	V
		5490	40.23	-13.77	54					100	17	A	V
		6405	52.3	-21.7	74	59.45	33.62	10.53	51.3	100	88	P	V
		6405	42.01	-11.99	54					100	88	A	V

SRD	Note	Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
SRD CH24 927MHz		1854	44.06	-29.94	74	66.32	25.74	4.71	52.71	100	154	P	H
		1854	33.77	-20.23	54					100	154	A	H
		2781	56.47	-17.53	74	75.26	28.06	5.74	52.59	100	95	P	H
		2781	46.18	-7.82	54					100	95	A	H
		3708	57.64	-16.36	74	73.41	29.36	6.8	51.93	100	21	P	H
		3708	47.35	-6.65	54					100	21	A	H
		4635	44.08	-29.92	74	55.17	30.97	8.15	50.21	122	142	P	H
		4635	33.79	-20.21	54					122	142	A	H
		5562	48.25	-25.75	74	55.84	32.09	9.74	49.42	100	47	P	H
		5562	37.96	-16.04	54					100	47	A	H
		6490	53.07	-20.93	74	59.81	33.96	10.77	51.47	134	34	P	H
		6490	42.78	-11.22	54					134	34	A	H
		1854	43.25	-30.75	74	65.51	25.74	4.71	52.71	164	46	P	V
		1854	32.96	-21.04	54					164	46	A	V
		2781	54.9	-19.1	74	73.69	28.06	5.74	52.59	102	29	P	V
		2781	44.61	-9.39	54					102	29	A	V
		3708	56.79	-17.21	74	72.56	29.36	6.8	51.93	107	55	P	V
		3708	46.5	-7.5	54					107	55	A	V
		4635	43.19	-30.81	74	54.28	30.97	8.15	50.21	110	127	P	V
		4635	32.9	-21.1	54					110	127	A	V
		5562	47.91	-26.09	74	55.5	32.09	9.74	49.42	124	65	P	V
		5562	37.62	-16.38	54					124	65	A	V
		6489	54.4	-19.6	74	61.14	33.96	10.77	51.47	100	88	P	V
		6489	44.11	-9.89	54					100	88	A	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

Emission below 1GHz

15C.247 SRD (LF)

SRD	Note	Frequency	Level	Over	Limit	Read	Antenna	Cable	Preamp	Ant	Table	Peak	Pol.
				Limit	Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
15C.247 SRD LF		30	24.4	-15.6	40	33.67	25.2	0.53	35			P	H
		122.15	19.35	-24.15	43.5	35.68	17.7	1.13	35.16			P	H
		216.24	37.79	-8.21	46	56.38	14.98	1.5	35.07	100	241	P	H
		289.96	29.6	-16.4	46	43.65	19.1	1.77	34.92			P	H
		423.82	27.92	-18.08	46	37.72	22.8	2.15	34.75			P	H
		574.17	27.91	-18.09	46	33.83	26.12	2.51	34.55			P	H
		30.97	24.06	-15.94	40	33.82	24.7	0.54	35			P	V
		129.91	17.79	-25.71	43.5	33.97	17.8	1.16	35.14			P	V
		180.35	20.98	-22.52	43.5	39.71	15	1.37	35.1			P	V
		216.24	33.73	-12.27	46	52.32	14.98	1.5	35.07	100	74	P	V
		286.08	20.85	-25.15	46	35.08	18.94	1.76	34.93			P	V
		559.62	26.72	-19.28	46	32.32	26.5	2.48	34.58			P	V
		915	70.57	24.57	46	72.26	29.4	3.18	34.27				V
Remark	1. No other spurious found. 2. All results are PASS against limit line.												

Note symbol

*	**Fundamental Frequency** which can be ignored. However, the level of any unwanted emissions shall not exceed the level of the fundamental frequency.
!	Test result is **over limit** line.
P/A	**P**eak or **A**verage
H/V	**H**orizontal or **V**ertical

A calculation example for radiated spurious emission is shown as below:

WIFI	Note	Frequency	Level	Over	Limit	Read	Antenna	Cable	Preamp	Ant	Table	Peak	Pol.
Ant.				Limit	Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
1+2		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
802.11b CH 01 2412MHz		2390	55.45	-18.55	74	54.51	32.22	4.58	35.86	103	308	P	H
		2390	43.54	-10.46	54	42.6	32.22	4.58	35.86	103	308	A	H

1. Level(dBμV/m) =

Antenna Factor(dB/m) + Cable Loss(dB) + Read Level(dBμV) - Preamp Factor(dB)

2. Over Limit(dB) = Level(dBμV/m) – Limit Line(dBμV/m)

For Peak Limit @ 2390MHz:

1. Level(dBμV/m)

= Antenna Factor(dB/m) + Cable Loss(dB) + Read Level(dBμV) - Preamp Factor(dB)

= 32.22(dB/m) + 4.58(dB) + 54.51(dBμV) – 35.86 (dB)

= 55.45 (dBμV/m)

2. Over Limit(dB)

= Level(dBμV/m) – Limit Line(dBμV/m)

= 55.45(dBμV/m) – 74(dBμV/m)

= -18.55(dB)

For Average Limit @ 2390MHz:

1. Level(dBμV/m)

= Antenna Factor(dB/m) + Cable Loss(dB) + Read Level(dBμV) - Preamp Factor(dB)

= 32.22(dB/m) + 4.58(dB) + 42.6(dBμV) – 35.86 (dB)

= 43.54 (dBμV/m)

2. Over Limit(dB)

= Level(dBμV/m) – Limit Line(dBμV/m)

= 43.54(dBμV/m) – 54(dBμV/m)

= -10.46(dB)

Both peak and average measured complies with the limit line, so test result is "PASS".