RADIO TEST REPORT

Report No: STS1710201W01

Issued for

Star Systems International Limited

Unit 04, 12/F Vanta Industrial Centre, 21-33 Tai Lin Pai Road, Kwai Chung, HK

Product Name:	RFID READER
Brand Name:	TITAN
Model Name:	HRD22000
Series Model:	N/A
FCC ID:	2AA7KTITAN-22000
Test Standard:	FCC Part 15.247

Shenzhen STS Test Services Co., Ltd.
1/F., Building B, Zhuoke Science Park, No.190, Chongqing Road,
Fuyong Street, Bao'an District, Shenzhen, Guangdong, China
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TEST RESULT CERTIFICATION

Applicant'sname……:	Star Systems International Limited
Address.....:	Unit 04, 12/F Vanta Industrial Centre, 21-33 Tai Lin Pai Road, Kwai Chung, HK
Manufacture's Name .....:	Star Systems International Limited
Address.....:	Unit 04, 12/F Vanta Industrial Centre, 21-33 Tai Lin Pai Road, Kwai Chung, HK

Product description

Product Name .....:	RFID READER
Brand Name .....:	TITAN
Model Name.....:	HRD22000
Series Model .....:	N/A
Test Standards.....:	FCC Part15.247
Test procedure .....:	ANSI C63.10-2013

This device described above has been tested by STS, the test results show that the equipment under test (EUT) is in compliance with the FCC requirements. And it is applicable only to the tested sample identified in the report.
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Date of Test.....:	
Date (s) of performance of tests :	10 Oct. 2017~13 Nov. 2017
Date of Issue .....:	13 Nov. 2017
Test Result .....:	Pass

Testing Engineer : Sean She

(Sean she)

Technical Manager : Hakim. hou

(Hakim.hou)

Authorized Signatory : Vita Li

(Vita Li)

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Revision History

Rev.	Issue Date	Report NO.	Effect Page	Contents
00	13 Nov. 2017	STS1710201W01	ALL	Initial Issue

1. SUMMARY OF TEST RESULTS

Test procedures according to the technical standards: DA 00-705

FCC Part 15.247,Subpart C			
Standard Section	Test Item	Judgment	Remark
15.207	Conducted Emission	PASS	--
15.247(a)(1)	Hopping Channel Separation	PASS	--
15.247(a)(1)&(b)(1)	Output Power	PASS	--
15.247(c)	Radiated Spurious Emission	PASS	--
15.247(d)	Conducted Spurious & Band Edge Emission	PASS	--
15.247(a)(iii)	Number of Hopping Frequency	PASS	--
15.247(a)(iii)	Dwell Time	PASS	--
15.247(a)(1)	Bandwidth	PASS	--
15.205	Restricted Band Edge Emission	PASS	--
Part 15.247(d)/part 15.209(a)	Band Edge Emission	PASS	--
15.203	Antenna Requirement	PASS	KDB 594280

NOTE:

(1)" N/A" denotes test is not applicable in this Test Report

(2) All tests are according to ANSI C63.10-2013

1.1 TEST FACTORY

Shenzhen STS Test Services Co., Ltd.
Add. : 1/F., Building B, Zhuoke Science Park, No.190, Chongqing Road,
Fuyong Street, Bao'an District, Shenzhen, Guangdong, China
CNAS Registration No.: L7649; FCC Registration No.: 625569
IC Registration No.: 12108A; A2LA Certificate No.: 4338.01;

1.2 MEASUREMENT UNCERTAINTY

The reported uncertainty of measurement **y ±U**，where expended uncertainty **U** is based on a standard uncertainty multiplied by a coverage factor of **k=2**，providing a level of confidence of approximately **95** %。

No.	Item	Uncertainty
1	Conducted Emission (9KHz-150KHz)	±2.88dB
2	Conducted Emission (150KHz-30MHz)	±2.67dB
3	RF power,conducted	±0.71dB
4	Spurious emissions,conducted	±0.63dB
5	All emissions,radiated (9KHz-30MHz)	±3.02dB
6	All emissions,radiated (30MHz-200MHz)	±3.80dB
7	All emissions,radiated (200MHz-1000MHz)	±3.97dB
8	All emissions,radiated(>1G)	±3.03dB

2. GENERAL INFORMATION

2.1 GENERAL DESCRIPTION OF EUT

Product Name	RFID READER
Trade Name	TITAN
Model Name	HRD22000
Series Model	N/A
Model Difference	N/A
Channel List	Please refer to the Note 2.
RF Information	Frequency: 902~928MHz Modulation: FHSS
Adapter	Input: AC 100-240V, 800mA, 50/60 Hz Output: DC 24V, 1.25A
Operation mode	Dense reader mode
	Single reader mode
Hardware version number	R5
Software version number	0.7.2.9319_rr
Connecting I/O Port(s)	Please refer to the User's Manual

Note:

1. For a more detailed features description, please refer to the manufacturer's specifications or the User's Manual.
2. This device only supports SISO mode, just one of the four RF ports will be actived during normal operating. Meanwhile, the four RF ports are identical in RF characterics

2.

Operation Frequency of channel					
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
01	902.75	18	911.25	35	919.75
02	903.25	19	911.75	36	920.25
03	903.75	20	912.25	37	920.75
04	904.25	21	912.75	38	921.25
05	904.75	22	913.25	39	921.75
06	905.25	23	913.75	40	922.25
07	905.75	24	914.25	41	922.75
08	906.25	25	914.75	42	923.25
09	906.75	26	915.25	43	923.75
10	907.25	27	915.75	44	924.25
11	907.75	28	916.25	45	924.75
12	908.25	29	916.75	46	925.25
13	908.75	30	917.25	47	925.75
14	909.25	31	917.75	48	926.25
15	909.75	32	918.25	49	926.75
16	910.25	33	918.75	50	927.25
17	910.75	34	919.25		

3. Table for Filed Antenna

Ant	Brand	Model Name	Antenna Type	Connector	Gain (dBi)	NOTE
1	TITAN	HRD22000	Avior	N/A	15	Antenna
2	TITAN	HRD22000	Cheetah	N/A	12	Antenna
3	TITAN	HRD22000	Hydra	N/A	12	Antenna
4	TITAN	HRD22000	Bobcat	N/A	9	Antenna

4. The EUT has been programmed to continuously transmit during test by the PC via an Ethernet cable. The EUT is transmitting through a long enough antenna cable with a stated loss of 12dB into the antenna with typy N connector 15dBi gain.
Power setting by the firewave is:
lowest channel=33dBm,middle channel=33dBm ,highest channel =33dBm

2.2 DESCRIPTION OF TEST MODES

To investigate the maximum EMI emission characteristics generates from EUT, the test system was pre-scanning tested base on the consideration of following EUT operation mode or test configuration mode which possible have effect on EMI emission level. Each of these EUT operation mode(s) or test configuration mode(s) mentioned above was evaluated respectively.

Worst Mode	Description	Operation mode
Mode 1	CH01	Dense reader mode
Mode 2	CH26	Dense reader mode
Mode 3	CH50	Dense reader mode
Mode 4	CH01	Single reader mode
Mode 5	CH26	Single reader mode
Mode 6	CH50	Single reader mode

Note:

(1) The measurements are performed at all Bit Rate of Transmitter, the worst data was reported

(2) We have be tested for all avaiable U.S. voltage and frequencies(For 120V,50/60Hz and 240V, 50/60Hz) for which the device is capable of operation, and the worst case of 120V,50/60Hz is shown in the report

For AC Conducted Emission

Test Case	
AC Conducted Emission	Mode 7 : Keeping TX

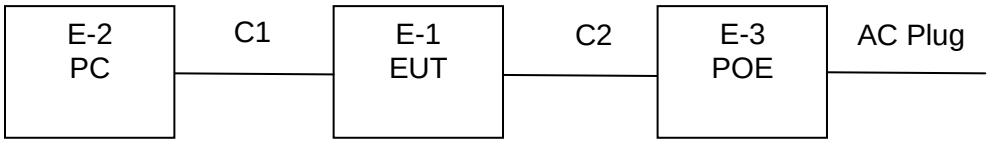
2.3 TABLE OF PARAMETERS OF TEXT SOFTWARE SETTING

During testing channel & power controlling software provided by the customer was used to control the operating channel as well as the output power level. The RF output power selection is for the setting of RF output power expected by the customer and is going to be fixed on the firmware of the final end product power parameters of FHSS.

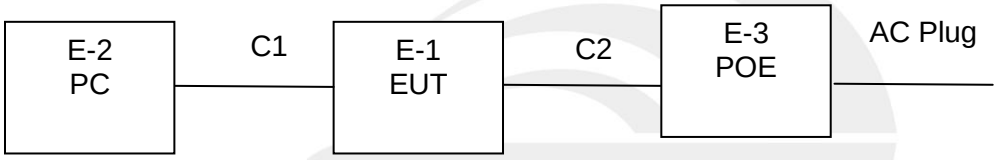
2.4 BLOCK DIGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED

During testing channel & power controlling software provided by the customer was used to control the operating channel as well as the output power level. The RF output power selection is for the setting of RF output power expected by the customer and is going to be fixed on the firmware of the final end product power parameters of FHSS

Radiated Spurious EmissionTest



Conducted Emission Test



2.5 DESCRIPTION OF SUPPORT UNITS

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

Item	Equipment	Mfr/Brand	Model/Type No.	Serial No.	Note
E-2	PC	4CV428DQXR	500-320cx	N/A	N/A
E-3	POE	Phihong	PSAC30U-240L6	N/A	N/A

Item	Shielded Type	Ferrite Core	Length	Note
C1	Ethernet cable	NO	7m	N/A
C2	Power cord	NO	3m	N/A

Note:

(1) The support equipment was authorized by Declaration of Confirmation.
(2) For detachable type I/O cable should be specified the length in cm in『Length』column.
(3) “YES” is means “shielded” “with core”; “NO” is means “unshielded” “without core”.

2.6 EQUIPMENTS LIST FOR ALL TEST ITEMS

Radiation Test equipment

Kind of Equipment	Manufacturer	Type No.	Serial No.	Last calibration	Calibrated until
EMI Test Receiver	R&S	ESW	101535	2017.06.01	2018.05.31
Bilog Antenna	TESEQ	CBL6111D	34678	2017.03.24	2018.03.23
Horn Antenna	Schwarzbeck	BBHA 9120D	9120D-1343	2017.03.06	2018.03.05
SHF-EHF Horn Antenna (15G-40GHz)	BBHA 9170	SCHWARZBECK	BBHA9170367	2017.05.02	2018.05.01
Temperature & Humitidy	HH660	Mieo	N/A	2017.10.15	2018.10.14
Temperature & Humitidy	HH660	Mieo	N/A	2017.10.15	2018.10.14
Pre-mplifier (0.1M-3GHz)	EM	EM330	60538	2017.03.12	2018.03.11
PreAmplifier (1G-26.5GHz)	Agilent	8449B	60538	2017.10.15	2018.10.14
Pre-mplifier (18G-40G)	MINI-CIRCUITS	AP-040G	1382501	2017.05.15	2018.05.14
Operational Manual Passive Loop (9K--30MHz)	ETS	6512	00165355	2017.03.06	2018.03.05
Low frequency cable	EM	R01	N/A	2017.03.12	2018.03.11
Low frequency cable	EM	R06	N/A	2017.03.12	2018.03.11
High frequency cable	SCHWARZBECK	R04	N/A	2017.03.12	2018.03.11
High frequency cable	SCHWARZBECK	R02	N/A	2017.03/12	2018.03.11
Semi-anechoic chamber	Changling	966	N/A	2017.10.15	2018.10.14
trun table	EM	SC100_1	60531	N/A	N/A
Antnna mast	EM	SC100	N/A	N/A	N/A
Max-full Antenna Corp	MF	MFA-440H	N/A	N/A	N/A

Conduction Test equipment

Kind of Equipment	Manufacturer	Type No.	Serial No.	Last calibration	Calibrated until
Test Receiver	R&S	ESCI	101427	2017.10.15	2018.10.14
LISN	R&S	ENV216	101242	2017.10.15	2018.10.14
conduction Cable	EM	C01	N/A	2017.03.12	2018.03.11
Temperature & Humitidy	Mieo	HH660	N/A	2017.10.15	2018.10.14

RF Connected Test

Kind of Equipment	Manufacturer	Type No.	Serial No.	Last calibration	Calibrated until
USB RF power sensor	DARE	RPR3006W	15I00041SNO03	2017.10.15	2018.10.14
Power Meter	R&S	NRP	100510	2017.10.15	2018.10.14
Spectrum Analyzer	Agilent	E4407B	MY50140340	2017.03.11	2018.03.10
Signal Analyzer	Agilent	N9020A	MY49100060	2017.03.11	2018.03.10

3. EMC EMISSION TEST

3.1 CONDUCTED EMISSION MEASUREMENT

3.1.1 POWER LINE CONDUCTED EMISSION LIMITS

Operating frequency band. In case the emission fall within the restricted band specified on Part 207(a) limit in the table below has to be followed.

FREQUENCY (MHz)	Conducted Emissionlimit (dBuV)	
	Quasi-peak	Average
0.15 -0.5	66 - 56 *	56 - 46 *
0.50 -5.0	56.00	46.00
5.0 -30.0	60.00	50.00

Note:

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

(2) The limit of " * " marked band means the limitation decreases linearly with the logarithm of the frequency in the range.

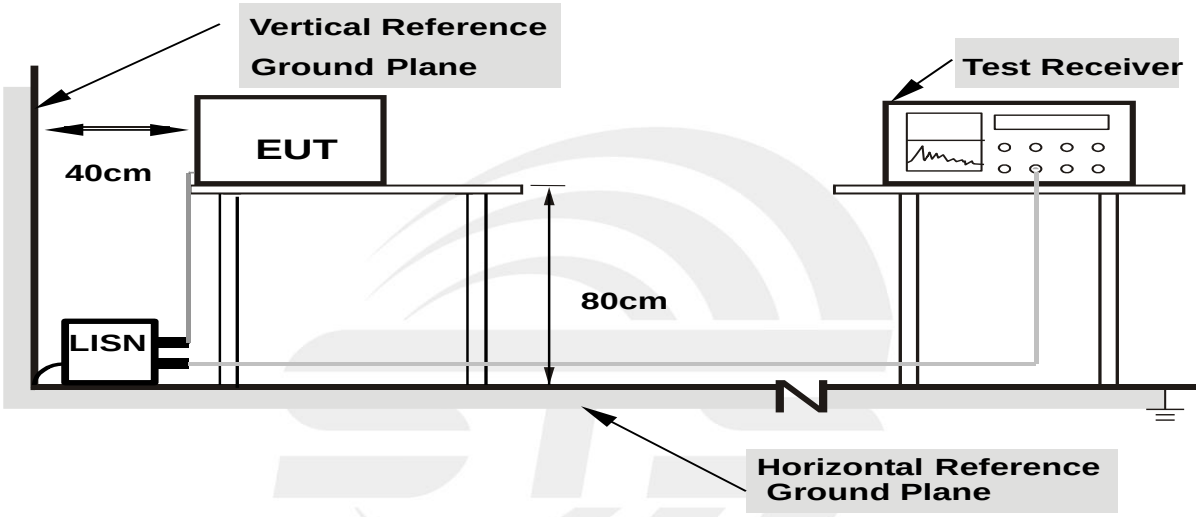
The following table is the setting of the receiver

Receiver Parameters	Setting
Attenuation	10 dB
Start Frequency	0.15 MHz
Stop Frequency	30 MHz
IF Bandwidth	9 kHz

3.1.2 TEST PROCEDURE

a. The EUT was 0.8 meters from the horizontal ground plane and 0.4 meters from the vertical ground plane with EUT being connected to the power mains through a line impedance stabilization network (LISN). All other support equipments powered from additional LISN(s). The LISN provide 50 Ohm/ 50uH of coupling impedance for the measuring instrument.
b. Interconnecting cables that hang closer than 40 cm to the ground plane shall be folded back and forth in the center forming a bundle 30 to 40 cm long.
c. I/O cables that are not connected to a peripheral shall be bundled in the center. The end of the cable may be terminated, if required, using the correct terminating impedance. The overall length shall not exceed 1 m.
d. LISN at least 80 cm from nearest part of EUT chassis.
e. For the actual test configuration, please refer to the related Item –EUT Test Photos.

3.1.3 TEST SETUP



Note: 1.Support units were connected to second LISN.
2.Both of LISNs (AMN) are 80 cm from EUT and at least 80 from other units and other metal planes

3.1.4 EUT OPERATING CONDITIONS

The EUT was configured for testing in a typical fashion (as a customer would normally use it). The EUT has been programmed to continuously transmit during test. This operating condition was tested and used to collect the included data.

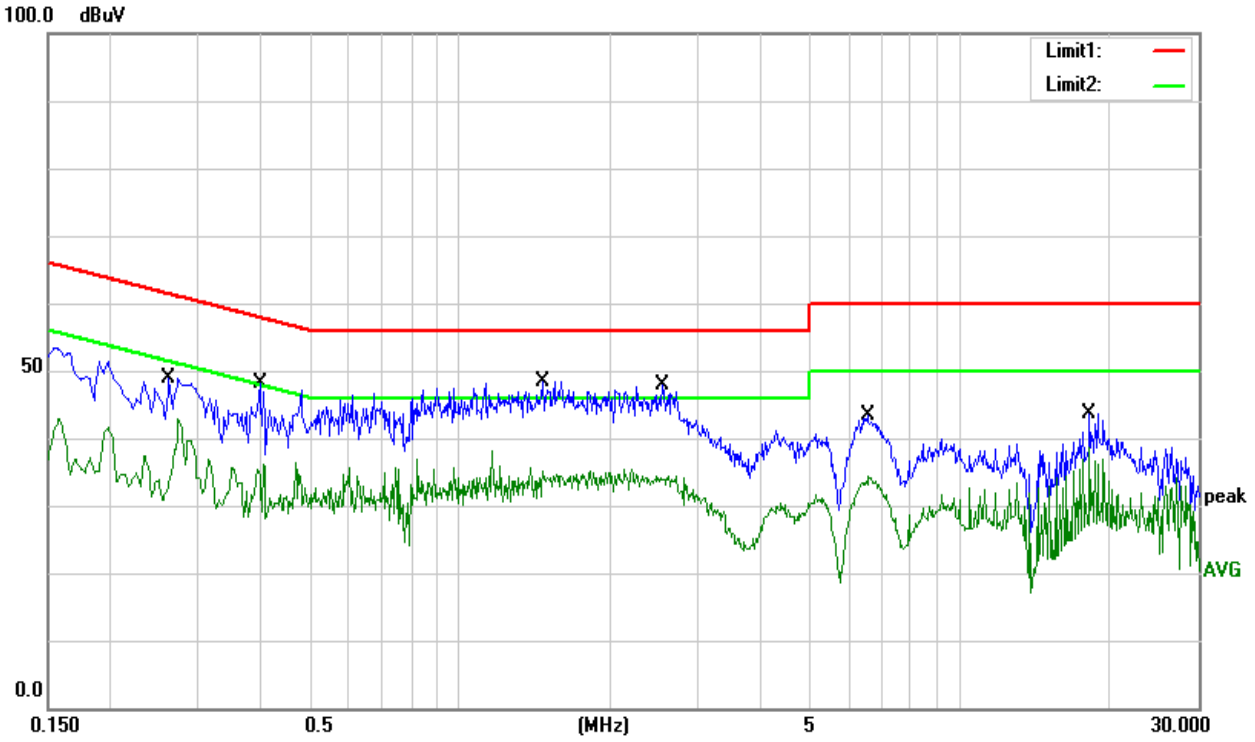
Dense reader mode and Dense reader mode have been tested,only show the worst case in the report

3.1.5 TEST RESULT

Temperature:	26 ℃	Relative Humidity:	54%
Pressure:	1010hPa	Phase:	L
Test Voltage:	AC 120V/60Hz	Test Mode:	Mode 7

Frequency (MHz)	Reading (dBuV)	Correct Factor(dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Remark
0.2620	38.83	10.06	48.89	61.37	-12.48	QP
0.2620	23.41	10.06	33.47	51.37	-17.90	AVG
0.3980	38.15	10.03	48.18	57.90	-9.72	QP
0.3980	22.32	10.03	32.35	47.90	-15.55	AVG
1.4660	38.63	9.79	48.42	56.00	-7.58	QP
1.4660	23.85	9.79	33.64	46.00	-12.36	AVG
2.5500	38.19	9.80	47.99	56.00	-8.01	QP
2.5500	24.58	9.80	34.38	46.00	-11.62	AVG
6.5540	33.54	9.88	43.42	60.00	-16.58	QP
6.5540	24.44	9.88	34.32	50.00	-15.68	AVG
18.1500	33.20	10.38	43.58	60.00	-16.42	QP
18.1500	28.29	10.38	38.67	50.00	-11.33	AVG

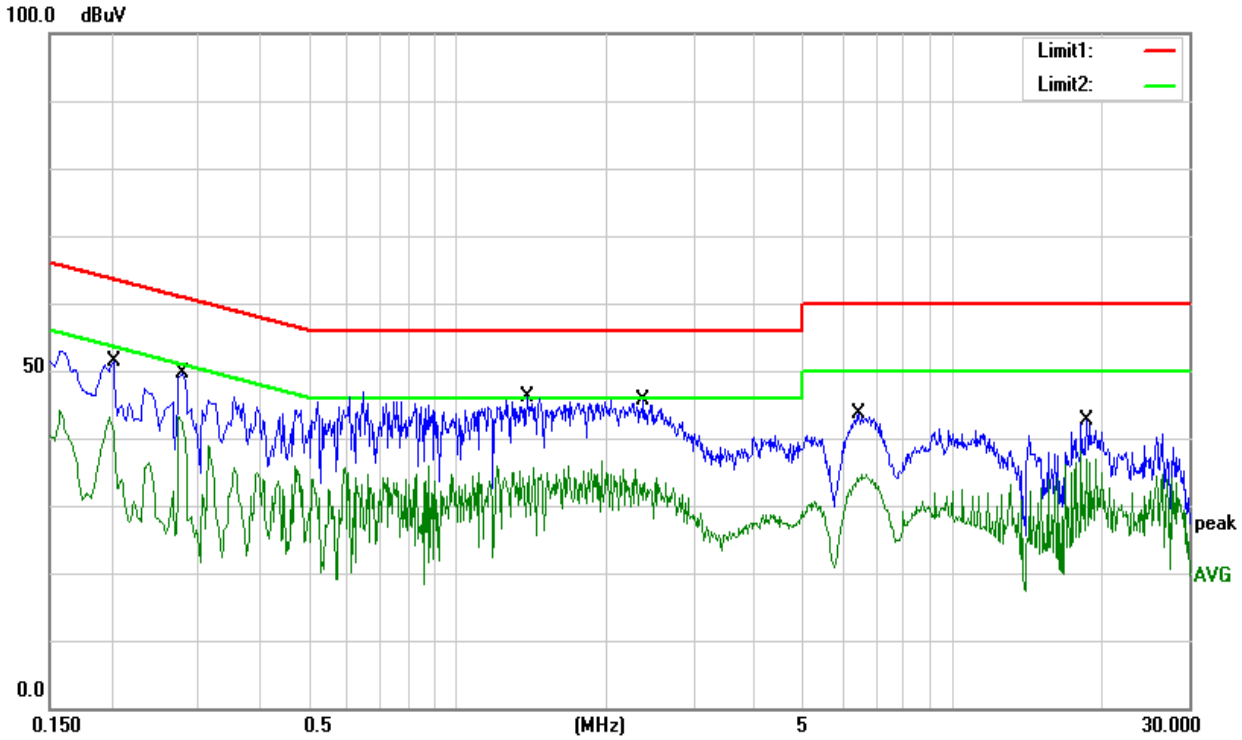
Remark:
1. All readings are Quasi-Peak and Average values.
2. Margin = Result (Result =Reading + Factor)–Limit



Temperature:	26 ℃	Relative Humidity:	54%
Pressure:	1010hPa	Phase:	N
Test Voltage:	AC 120V/60Hz	Test Mode:	Mode 7

Frequency (MHz)	Reading (dBuV)	Correct Factor(dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Remark
0.2020	41.50	9.88	51.38	63.53	-12.15	QP
0.2020	29.21	9.88	39.09	53.53	-14.44	AVG
0.2780	39.55	10.18	49.73	60.88	-11.15	QP
0.2780	30.66	10.18	40.84	50.88	-10.04	AVG
1.3860	36.22	9.83	46.05	56.00	-9.95	QP
1.3860	22.77	9.83	32.60	46.00	-13.40	AVG
2.3780	35.81	9.89	45.70	56.00	-10.30	QP
2.3780	23.02	9.89	32.91	46.00	-13.09	AVG
6.4820	33.74	9.89	43.63	60.00	-16.37	QP
6.4820	24.71	9.89	34.60	50.00	-15.40	AVG
18.6820	32.28	10.37	42.65	60.00	-17.35	QP
18.6820	26.48	10.37	36.85	50.00	-13.15	AVG

Remark:
1. All readings are Quasi-Peak and Average values.
2. Margin = Result (Result =Reading + Factor)–Limit



3.2 RADIATED EMISSION MEASUREMENT

3.2.1 RADIATED EMISSION LIMITS

in any 100 kHz bandwidth outside the operating frequency band. In case the emission fall within the Restricted band specified on Part15.205(a)&209(a) limit in the table and according to ANSI C63.10-2013 below has to be followed

LIMITS OF RADIATED EMISSION MEASUREMENT (0.009MHz - 1000MHz)

Frequencies (MHz)	Field Strength (micorvolts/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

LIMITS OF RADIATED EMISSION MEASUREMENT (1GHz-25 GHz)

FREQUENCY (MHz)	(dBuV/m) (at 3M)	
	PEAK	AVERAGE
Above 1000	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).

For Radiated Emission

Spectrum Parameter	Setting
Attenuation	Auto
Detector	Peak
Start Frequency	1000 MHz(Peak/AV)
Stop Frequency	10th carrier hamonic(Peak/AV)
RB / VB (emission in restricted band)	PK=1MHz / 1MHz, AV=1 MHz /10 Hz

For Band edge

Spectrum Parameter	Setting
Detector	Peak
Start/Stop Frequency	Lower Band Edge: 800 to 904 MHz Upper Band Edge: 924 to 1000 MHz
RB / VB (emission in restricted band)	PK=1MHz / 1MHz, AV=1 MHz / 10 Hz

Receiver Parameter	Setting
Attenuation	Auto
Start ~ Stop Frequency	9kHz~90kHz / RB 200Hz for PK & AV
Start ~ Stop Frequency	90kHz~110kHz / RB 200Hz for QP
Start ~ Stop Frequency	110kHz~490kHz / RB 200Hz for PK & AV
Start ~ Stop Frequency	490kHz~30MHz / RB 9kHz for QP
Start ~ Stop Frequency	30MHz~1000MHz / RB 120kHz for QP

3.2.2 TEST PROCEDURE

a. The measuring distance of at 3 m shall be used for measurements at frequency 0.009MHz up to 1GHz,and above 1GHz.
b. The EUT was placed on the top of a rotating table 0.8 meters(above 1GHz is 1.5 m) above the ground at a 3 meter anechoic chamber test site. The table was rotated 360 degrees to determine the position of the highest radiation.
c. The height of the equipment shall be 0.8 m(above 1GHz is 1.5 m); the height of the test antenna shall vary between 1 m to 4 m. horizontal and vertical polarizations of the antenna are set to make the measurement.
d. The initial step in collecting conducted emission data is a spectrum analyzer peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then QuasiPeak detector mode re-measured.
e. If the Peak Mode measured value compliance with and lower than Quasi Peak Mode Limit, the EUT shall be deemed to meet QP Limits and then no additional QP Mode measurement performed.
f. For the actual test configuration, please refer to the related Item –EUT Test Photos.

Note:

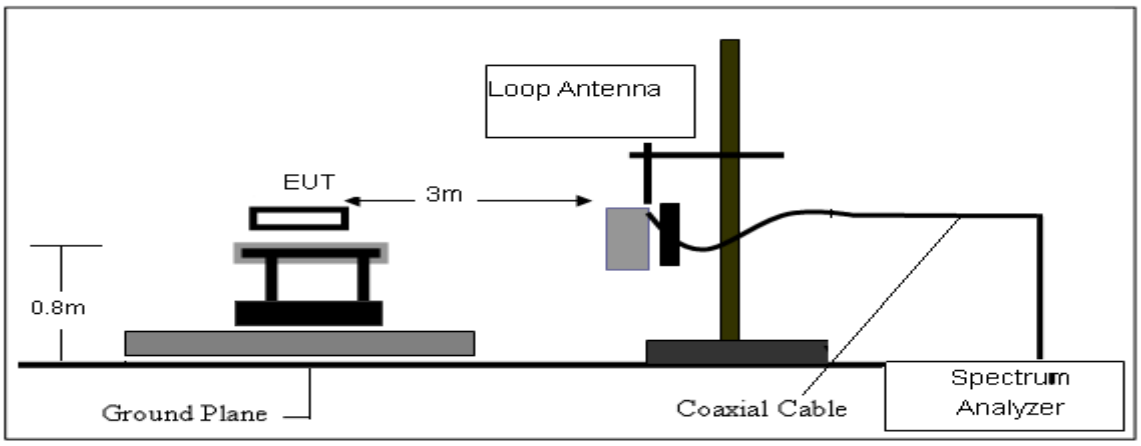
Both horizontal and vertical antenna polarities were tested
and performed pretest to three orthogonal axis. The worst case emissions were reported

3.2.3 DEVIATION FROM TEST STANDARD

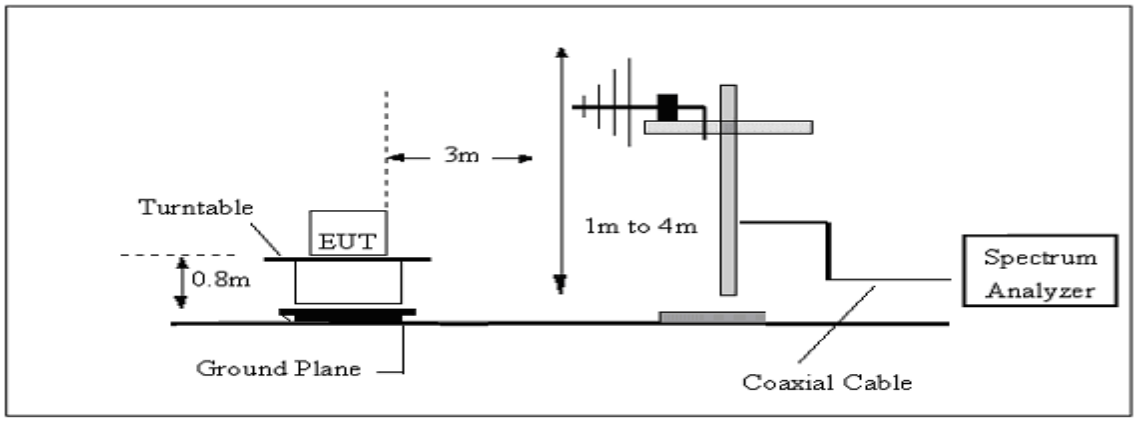
No deviation

3.2.4 TESTSETUP

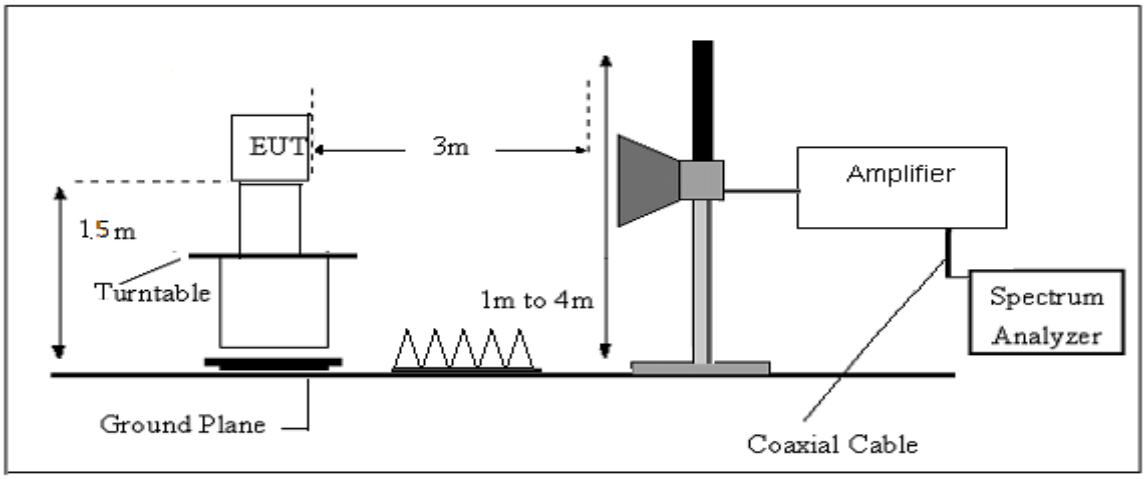
（A）Radiated Emission Test-Up Frequency Below 30MHz



（B）Radiated Emission Test-Up Frequency 30MHz~1GHz



（C）Radiated Emission Test-Up Frequency Above 1GHz



3.2.5 EUT OPERATING CONDITIONS

The EUT was configured for testing in a typical fashion (as a customer would normally use it). The EUT has been programmed to continuously transmit during test. This operating condition was tested and used to collect the included data.
Dense reader mode and Dense reader mode have been tested,only show the worst case in the report

3.2.6 FIELD STRENGTH CALCULATION

The field strength is calculated by adding the Antenna Factor and Cable Factor and subtracting the Amplifier Gain and Duty Cycle Correction Factor (if any) from the measured reading. The basic equation with a sample calculation is as follows:
FS = RA + AF + CL - AG
Where
FS = Field Strength
CL = Cable Attenuation Factor (Cable Loss)
RA = Reading Amplitude
AG = Amplifier Gain
AF = Antenna Factor
For example

Frequency	FS	RA	AF	CL	AG	Factor
(MHz)	(dBμV/m)	(dBμV/m)	(dB)	(dB)	(dB)	(dB)
300	40	58.1	12.2	1.6	31.9	-18.1

Factor=AF+CL-AG

3.2.7 TEST RESULTS

(9KHz-30MHz)

Temperature:	26 ℃	Relative Humidity:	54%
Pressure:	1010hPa	Test Mode:	TX Mode
Test Voltage:	DC 24V from adapter		

Freq.	Reading	Limit	Margin	State	Test Result
(MHz)	(dBuV/m)	(dBuV/m)	(dB)	P/F	
--	--	--	--	--	PASS
--	--	--	--	--	PASS

Note:

The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.

Distance extrapolation factor =40 log (specific distance/test distance)(dB);

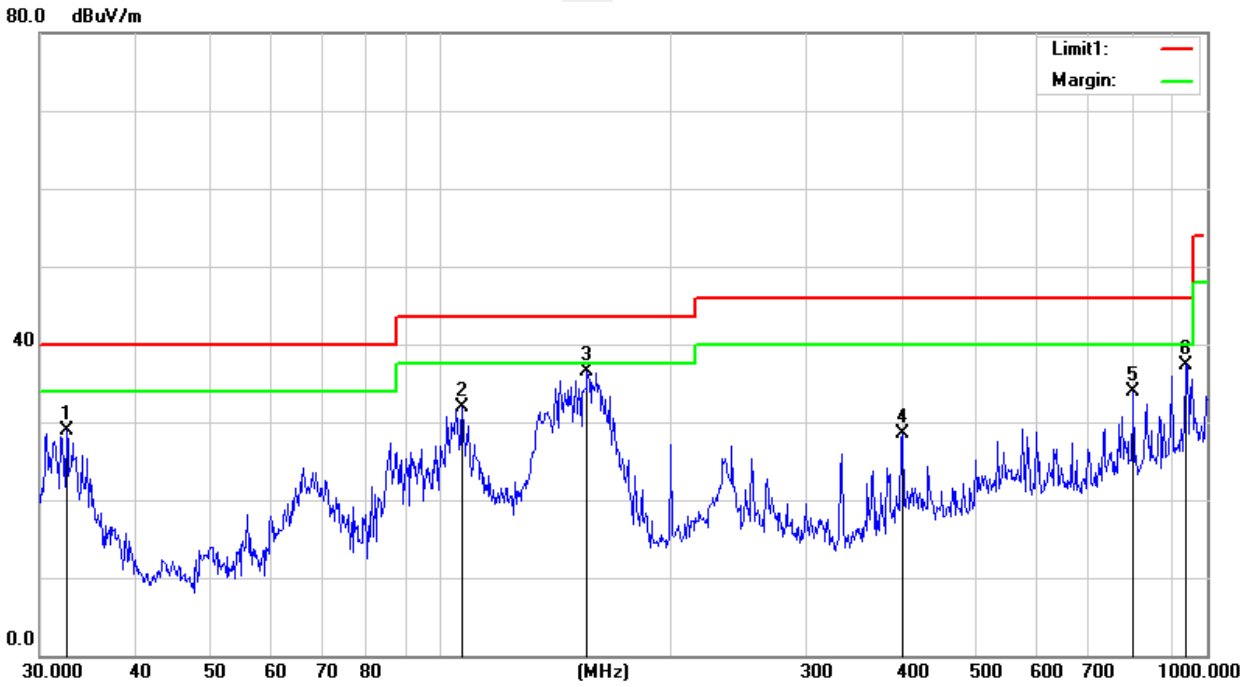
Limit line = specific limits(dBuv) + distance extrapolation factor.

(30MHz-1000MHz)

Temperature:	26 ℃	Relative Humidity:	54%
Pressure:	1010hPa	Phase:	Horizontal
Test Voltage:	DC 24V from adapter	Test Mode:	Mode 1/2/3/4/5/6 (Mode 1 worst mode)

Frequency	Reading	Correct	Result	Limit	Margin	Remark
(MHz)	(dBuV)	Factor(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
32.5198	41.41	-12.48	28.93	40.00	-11.07	QP
106.7587	50.45	-18.61	31.84	43.50	-11.66	QP
155.3644	54.78	-18.25	36.53	43.50	-6.97	QP
400.4320	39.68	-11.22	28.46	46.00	-17.54	QP
801.7863	37.34	-3.49	33.85	46.00	-12.15	QP
938.8326	38.07	-0.75	37.32	46.00	-8.68	QP

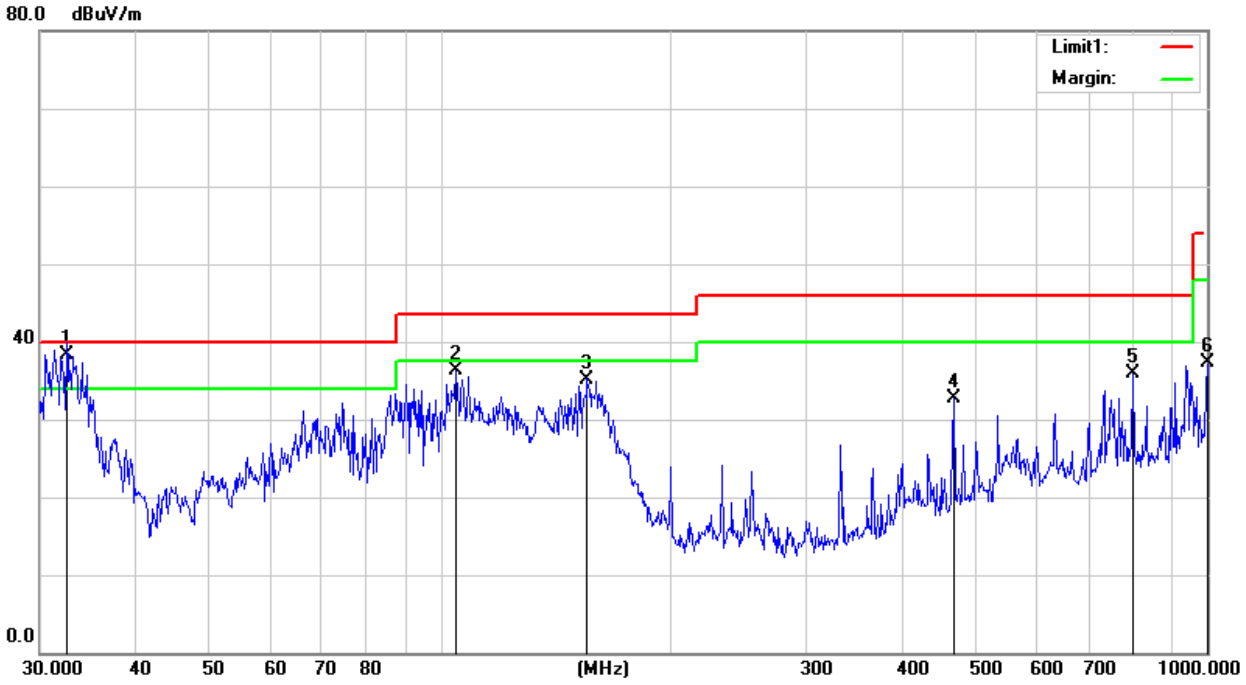
Remark:
1. Margin = Result (Result =Reading + Factor)–Limit



Temperature:	26 ℃	Relative Humidity:	54%
Pressure:	1010hPa	Phase:	Vertical
Test Voltage:	DC 24V from adapter	Test Mode:	Mode 1/2/3/4/5/6 (Mode 1 worst mode)

Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
32.5790	50.85	-12.51	38.34	40.00	-1.66	QP
104.5361	55.12	-18.81	36.31	43.50	-7.19	QP
155.3644	53.45	-18.25	35.20	43.50	-8.30	QP
467.2350	42.49	-9.87	32.62	46.00	-13.38	QP
801.7863	39.44	-3.49	35.95	46.00	-10.05	QP
1000.0000	37.33	-0.07	37.26	54.00	-16.74	QP

Remark:
1. Margin = Result (Result =Reading + Factor)–Limit



(1GHz~10GHz) Restricted band and Spurious emission Requirements

Low Channel

Frequency (MHz)	Reading (dBμV)	Amplifier （dB）	Loss （dB）	Antenna Factor （dB/m）	Corrected Factor （dB）	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type	Comment
Low Channel (902.75 MHz)										
1805.50	62.32	45.23	5.70	26.74	-12.79	49.53	74.00	-24.47	PK	Vertical
1805.50	54.21	45.23	5.70	26.74	-12.79	41.42	54.00	-12.58	AV	Vertical
1805.25	62.38	45.23	5.70	26.74	-12.79	49.59	74.00	-24.41	PK	Horizontal
1805.25	40.18	45.23	5.70	26.74	-12.79	27.39	54.00	-26.61	AV	Horizontal
2708.25	64.96	44.82	8.41	29.65	-6.76	58.20	74.00	-15.80	PK	Vertical
2708.25	54.47	44.82	8.41	29.65	-6.76	47.71	54.00	-6.29	AV	Vertical
2708.36	60.49	44.82	8.41	29.65	-6.76	53.73	74.00	-20.27	PK	Horizontal
2708.36	50.48	44.82	8.41	29.65	-6.76	43.72	54.00	-10.28	AV	Horizontal
5360.20	47.40	43.20	10.05	32.15	-1.00	46.40	74.00	-27.60	PK	Vertical
5360.20	39.40	43.20	10.05	32.15	-1.00	38.40	54.00	-15.60	AV	Vertical
5385.00	47.39	43.20	10.05	32.15	-1.00	46.39	74.00	-27.61	PK	Horizontal
5385.00	39.38	43.20	10.05	32.15	-1.00	38.38	54.00	-15.62	AV	Horizontal
7523.29	52.87	43.01	11.58	35.96	4.53	57.40	74.00	-16.60	PK	Vertical
7523.29	44.83	43.01	11.58	35.96	4.53	49.36	54.00	-4.64	AV	Vertical
7525.42	52.87	43.01	11.58	35.96	4.53	57.40	74.00	-16.60	PK	Horizontal
7525.42	44.87	43.01	11.58	35.96	4.53	49.40	54.00	-4.60	AV	Horizontal

Mid Channel

Frequency (MHz)	Reading (dBμV)	Amplifier （dB）	Loss （dB）	Antenna Factor （dB/m）	Corrected Factor （dB）	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type	Comment
Mid Channel (915.25 MHz)										
1830.50	62.90	45.23	5.70	26.74	-12.79	50.11	74.00	-23.89	PK	Vertical
1830.50	54.11	45.23	5.70	26.74	-12.79	41.32	54.00	-12.68	AV	Vertical
1832.25	61.93	45.23	5.70	26.74	-12.79	49.14	74.00	-24.86	PK	Horizontal
1832.25	40.78	45.23	5.70	26.74	-12.79	27.99	54.00	-26.01	AV	Horizontal
2745.75	65.52	44.82	8.41	29.65	-6.76	58.76	74.00	-15.24	PK	Vertical
2745.75	55.07	44.82	8.41	29.65	-6.76	48.31	54.00	-5.69	AV	Vertical
2743.10	60.04	44.82	8.41	29.65	-6.76	53.28	74.00	-20.72	PK	Horizontal
2743.10	49.95	44.82	8.41	29.65	-6.76	43.19	54.00	-10.81	AV	Horizontal
5363.14	46.52	43.20	10.05	32.15	-1.00	45.52	74.00	-28.48	PK	Vertical
5363.14	39.61	43.20	10.05	32.15	-1.00	38.61	54.00	-15.39	AV	Vertical
5384.25	47.54	43.20	10.05	32.15	-1.00	46.54	74.00	-27.46	PK	Horizontal
5384.25	39.41	43.20	10.05	32.15	-1.00	38.41	54.00	-15.59	AV	Horizontal
7522.52	53.65	43.01	11.58	35.96	4.53	58.18	74.00	-15.82	PK	Vertical
7522.52	44.97	43.01	11.58	35.96	4.53	49.50	54.00	-4.50	AV	Vertical
7523.31	53.25	43.01	11.58	35.96	4.53	57.78	74.00	-16.22	PK	Horizontal
7523.31	45.28	43.01	11.58	35.96	4.53	49.81	54.00	-4.19	AV	Horizontal

High Channel

Frequency (MHz)	Reading (dBμV)	Amplifier （dB）	Loss （dB）	Antenna Factor （dB/m）	Corrected Factor （dB）	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type	Comment
High Channel (927.25 MHz)										
1854.50	61.95	45.23	5.70	26.74	-12.79	49.16	74.00	-24.84	PK	Vertical
1854.50	54.27	45.23	5.70	26.74	-12.79	41.48	54.00	-12.52	AV	Vertical
1856.14	61.68	45.23	5.70	26.74	-12.79	48.89	74.00	-25.11	PK	Horizontal
1856.14	40.35	45.23	5.70	26.74	-12.79	27.56	54.00	-26.44	AV	Horizontal
2781.75	65.39	44.82	8.41	29.65	-6.76	58.63	74.00	-15.37	PK	Vertical
2781.75	55.29	44.82	8.41	29.65	-6.76	48.53	54.00	-5.47	AV	Vertical
2780.11	59.85	44.82	8.41	29.65	-6.76	53.09	74.00	-20.91	PK	Horizontal
2780.11	50.47	44.82	8.41	29.65	-6.76	43.71	54.00	-10.29	AV	Horizontal
5362.24	46.75	43.20	10.05	32.15	-1.00	45.75	74.00	-28.25	PK	Vertical
5362.24	39.81	43.20	10.05	32.15	-1.00	38.81	54.00	-15.19	AV	Vertical
5363.32	48.23	43.20	10.05	32.15	-1.00	47.23	74.00	-26.77	PK	Horizontal
5363.32	39.12	43.20	10.05	32.15	-1.00	38.12	54.00	-15.88	AV	Horizontal
7521.32	54.35	43.01	11.58	35.96	4.53	58.88	74.00	-15.12	PK	Vertical
7521.32	44.57	43.01	11.58	35.96	4.53	49.10	54.00	-4.90	AV	Vertical
7521.38	53.94	43.01	11.58	35.96	4.53	58.47	74.00	-15.53	PK	Horizontal
7521.38	44.87	43.01	11.58	35.96	4.53	49.40	54.00	-4.60	AV	Horizontal

Note:

1) Scan with **Dense reader mode** and **Single reader mode** ,the worst case is **Dense reader mode**

2) Factor = Antenna Factor + Cable Loss – Pre-amplifier.

Emission Level = Reading + Factor

3) The frequency emission of peak points that did not show above the forms are at least 10dB below the limit, the frequency emission is mainly from the environment noise.

4) This device only supports SISO mode, four RF ports are identical in RF characterics. only show the data of port 1 in the report.

Band edge Requirements

Frequency (MHz)	Reading (dBμV)	Amplifier （dB）	Loss （dB）	Antenna Factor （dB/m）	Corrected Factor （dB）	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type	Comment
902.00	69.25	43.80	4.91	25.90	-12.99	56.26	74	-17.74	PK	Vertical
902.00	55.06	43.80	4.91	25.90	-12.99	42.07	54	-11.93	AV	Vertical
902.00	70.26	43.80	4.91	25.90	-12.99	57.27	74	-16.73	PK	Horizontal
902.00	54.15	43.80	4.91	25.90	-12.99	41.16	54	-12.84	AV	Horizontal
928.00	71.06	43.80	5.12	25.90	-12.78	58.28	74	-15.72	PK	Vertical
928.00	54.04	43.80	5.12	25.90	-12.78	41.26	54	-12.74	AV	Vertical
928.00	71.14	43.80	5.12	25.90	-12.78	58.36	74	-15.64	PK	Horizontal
928.00	54.06	43.80	5.12	25.90	-12.78	41.28	54	-12.72	AV	Horizontal

Hopping Band edge

Frequency (MHz)	Reading (dBμV)	Amplifier （dB）	Loss （dB）	Antenna Factor （dB/m）	Corrected Factor （dB）	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type	Comment
902.00	69.25	43.80	4.91	25.90	-12.99	56.26	74	-17.74	PK	Vertical
902.00	55.06	43.80	4.91	25.90	-12.99	42.07	54	-11.93	AV	Vertical
902.00	70.26	43.80	4.91	25.90	-12.99	57.27	74	-16.73	PK	Horizontal
902.00	54.15	43.80	4.91	25.90	-12.99	41.16	54	-12.84	AV	Horizontal
928.00	71.06	43.80	5.12	25.90	-12.78	58.28	74	-15.72	PK	Vertical
928.00	54.04	43.80	5.12	25.90	-12.78	41.26	54	-12.74	AV	Vertical
928.00	71.14	43.80	5.12	25.90	-12.78	58.36	74	-15.64	PK	Horizontal
928.00	54.06	43.80	5.12	25.90	-12.78	41.28	54	-12.72	AV	Horizontal

Note:

1) Scan with **Dense reader mode** and **Single reader mode** ,the worst case is **Dense reader mode**

2) Factor = Antenna Factor + Cable Loss – Pre-amplifier.

   Emission Level = Reading + Factor

3) The frequency emission of peak points that did not show above the forms are at least 10dB below the limit, the frequency emission is mainly from the environment noise.

4) This device only supports SISO mode, four RF ports are identical in RF characterics. only show the data of port 1 in the report.

4. CONDUCTED SPURIOUS & BAND EDGE EMISSION

4.1 REQUIREMENT

According to FCC section 15.247(d), in any 100kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement.

4.2 TEST PROCEDURE

Spectrum Parameter	Setting
Detector	Peak
Start/Stop Frequency	30 MHz to 10th carrier harmonic
RB / VB (emission in restricted band)	100 KHz/300 KHz
Trace-Mode:	Max hold

.

For Band edge

Spectrum Parameter	Setting
Detector	Peak
Start/Stop Frequency	Lower Band Edge: 800 to 904 MHz Upper Band Edge: 924 to 1000 MHz
RB / VB (emission in restricted band)	100 KHz/300 KHz
Trace-Mode:	Max hold

Remark : Hopping on and Hopping off mode all have been tested,only worst case hopping off is reported.

4.3 TEST SETUP

The EUT is coupled to the Spectrum Analyzer; the RF load attached to the EUT antenna terminal is 50Ohm; the path loss as the factor is calibrated to correct the reading. Make the measurement with the spectrum analyzer's resolution bandwidth(RBW) = 100 kHz. In order to make an accurate measurement, set the span greater than RBW.

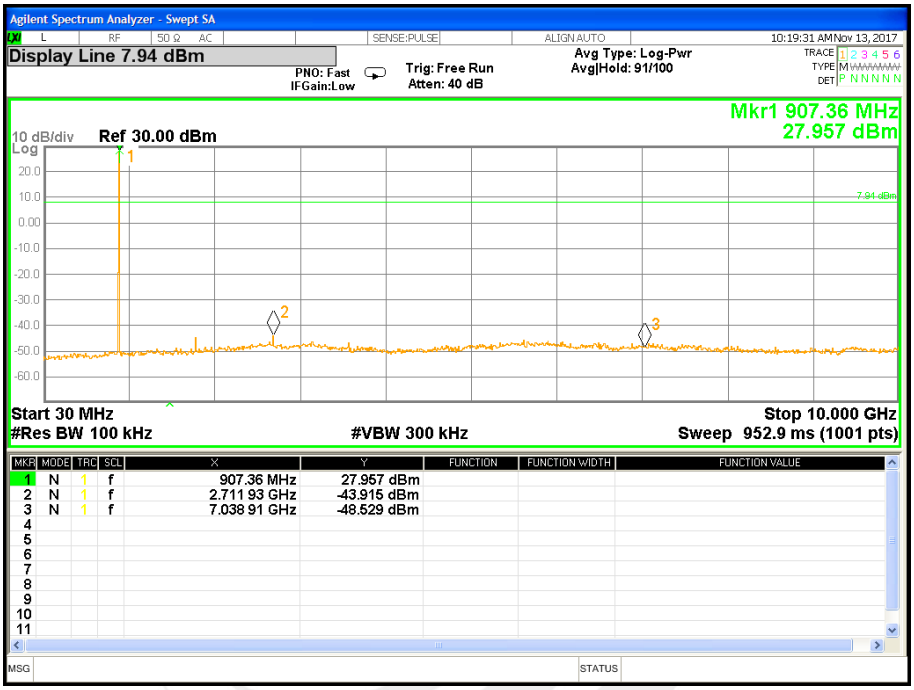
4.4 EUT OPERATION CONDITIONS

The EUT tested system was configured as the statements of 2.3 Unless otherwise a special operating condition is specified in the follows during the testing.

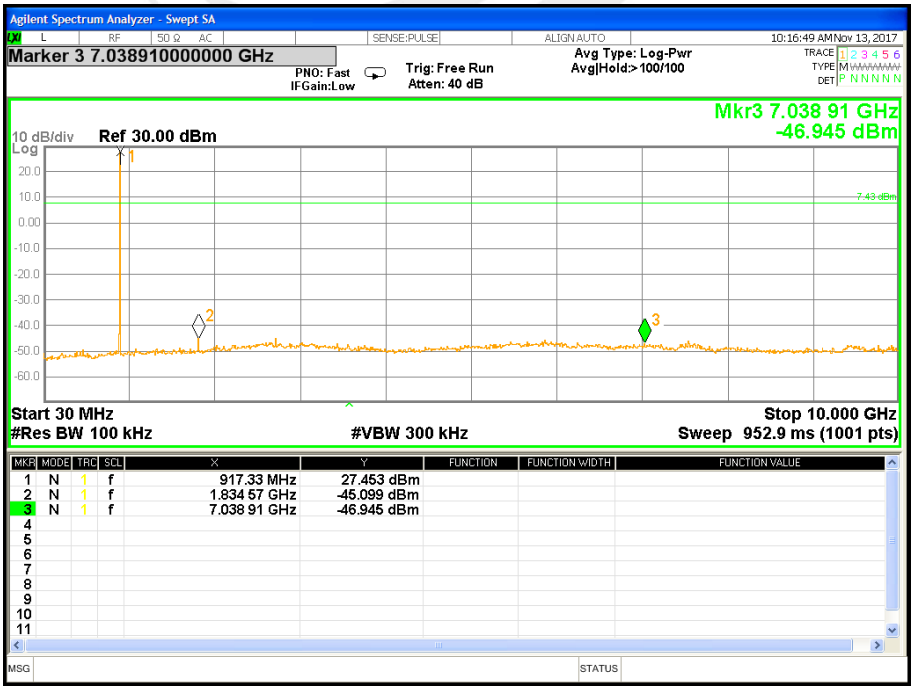
4.5 TEST RESULTS

Temperature:	25℃	Relative Humidity:	50%
Pressure:	1012 hPa	Test Voltage:	DC 24V from adapter
Test Mode:	Dense reader mode /CH01, CH26, CH50		

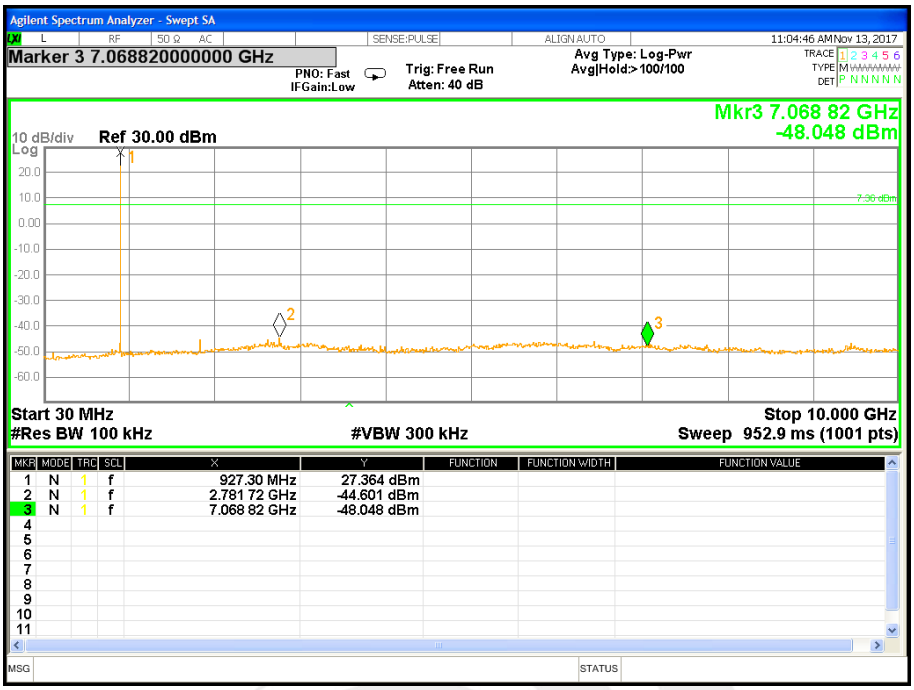
CH 01



CH 26

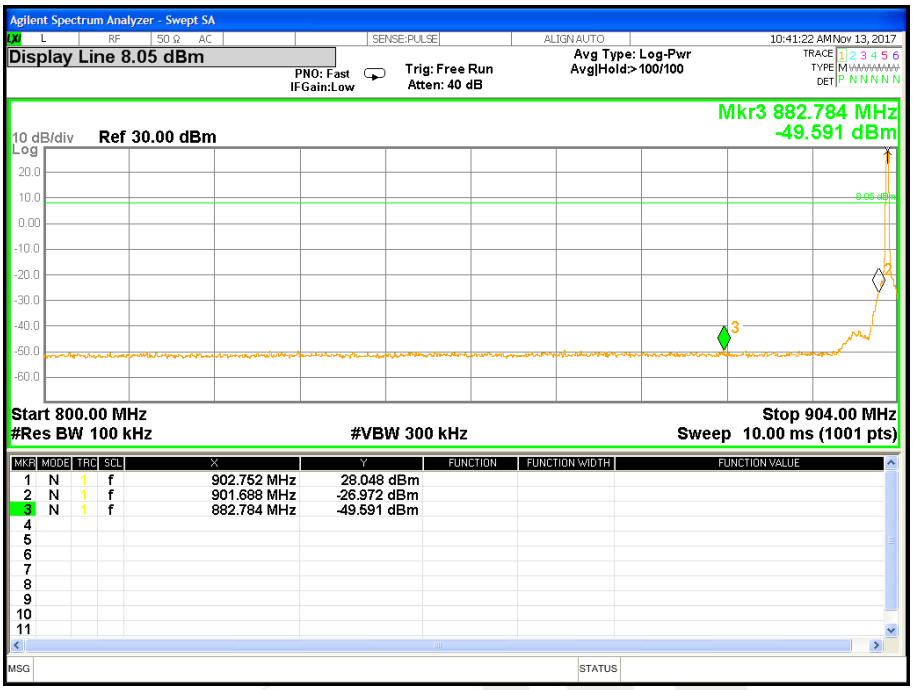


CH 50

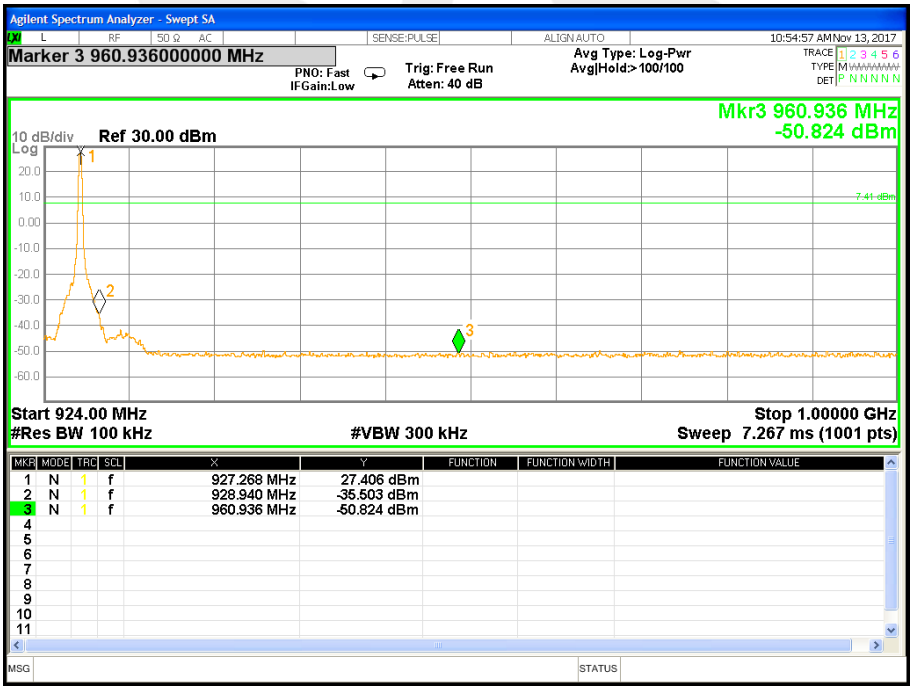

Agilent Spectrum Analyzer - Swept SA
Marker 3 7.068820000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 40 dB
Avg Type: Log-Pwr
Avg|Hold:>100/100
11:04:46 AM Nov 13, 2017
Mkr3 7.068 82 GHz
-48.048 dBm
10 dB/div
Log
Ref 30.00 dBm
7.36 dBm
Start 30 MHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 10.000 GHz
Sweep 952.9 ms (1001 pts)
1 N 1 f 927.30 MHz 27.364 dBm
2 N 1 f 2.781 72 GHz -44.601 dBm
3 N 1 f 7.068 82 GHz -48.048 dBm

For Band edge

CH 01



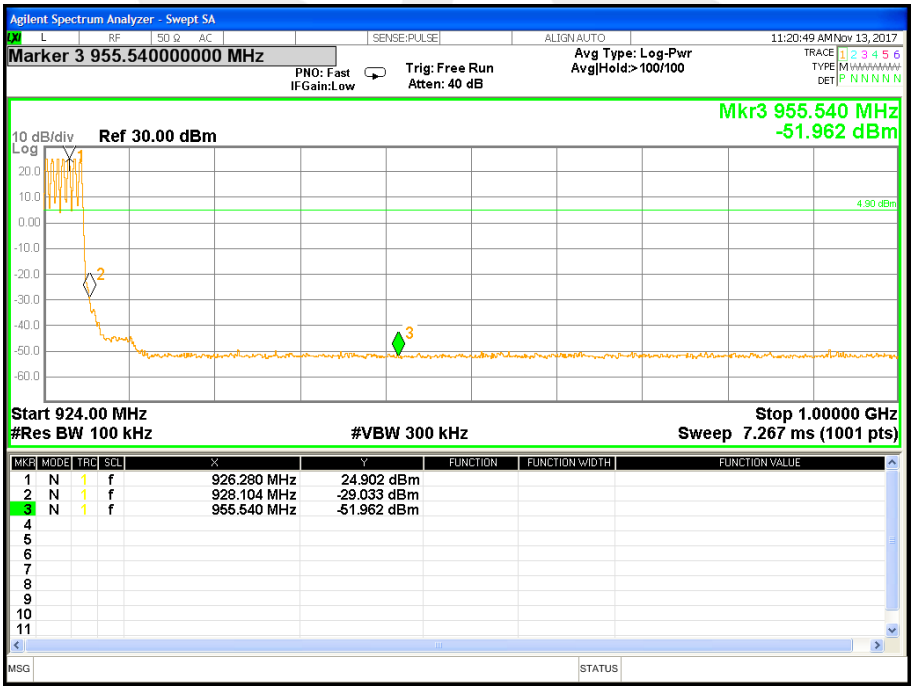
CH 50



For Hopping Band edge

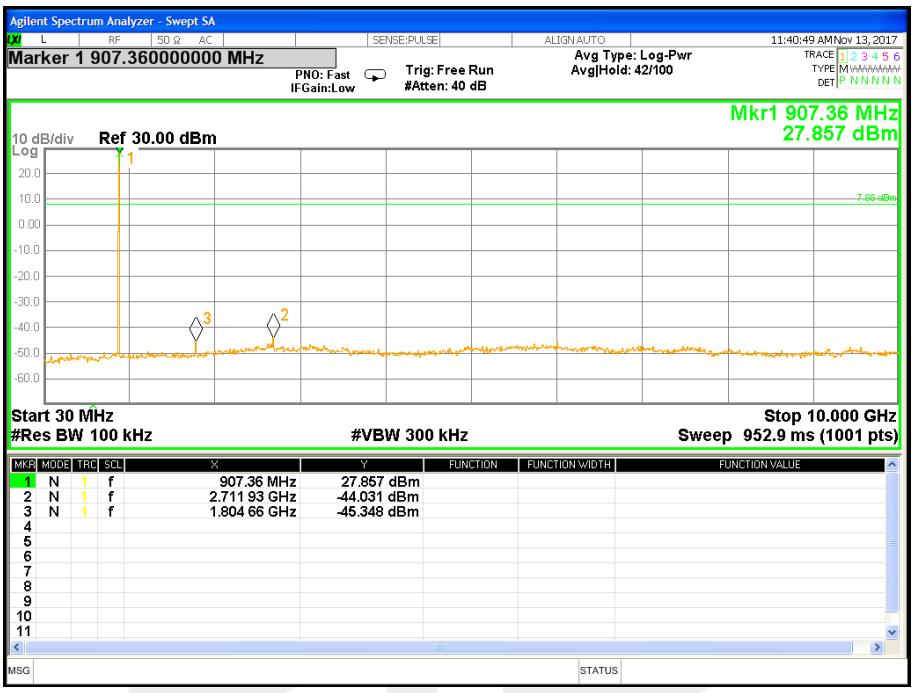
CH 01

CH 50

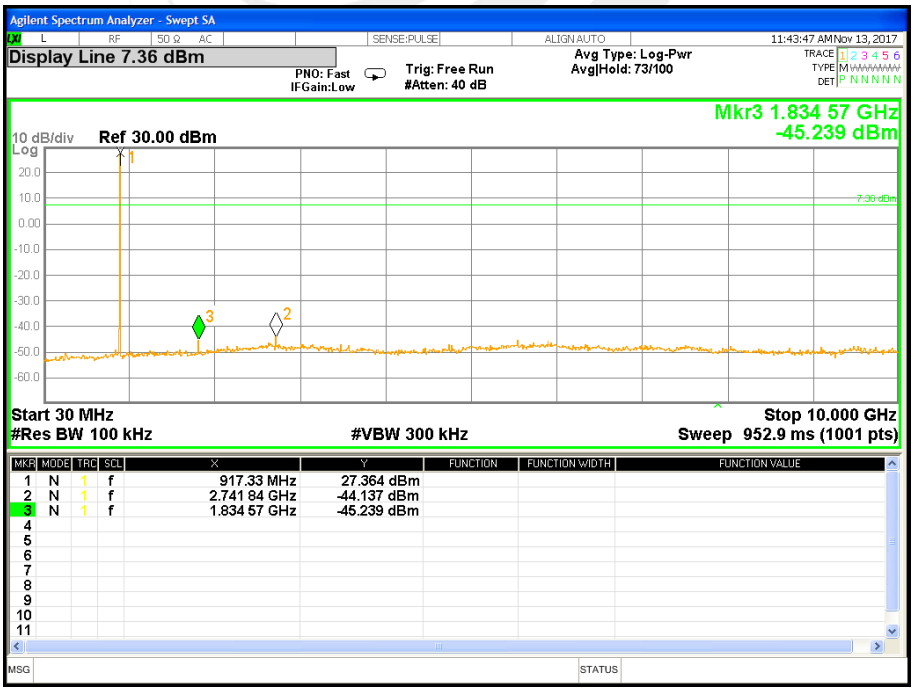


Temperature:	25℃	Relative Humidity:	50%
Pressure:	1012 hPa	Test Voltage:	DC 24V from adapter
Test Mode:	Single reader mode /CH01, CH26, CH50		

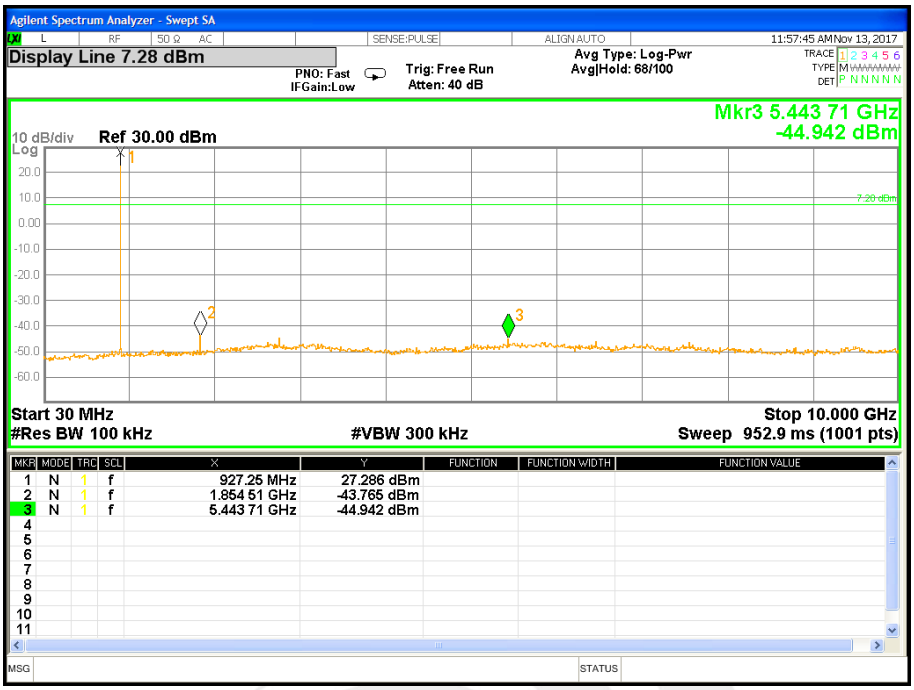
CH 01



CH 26



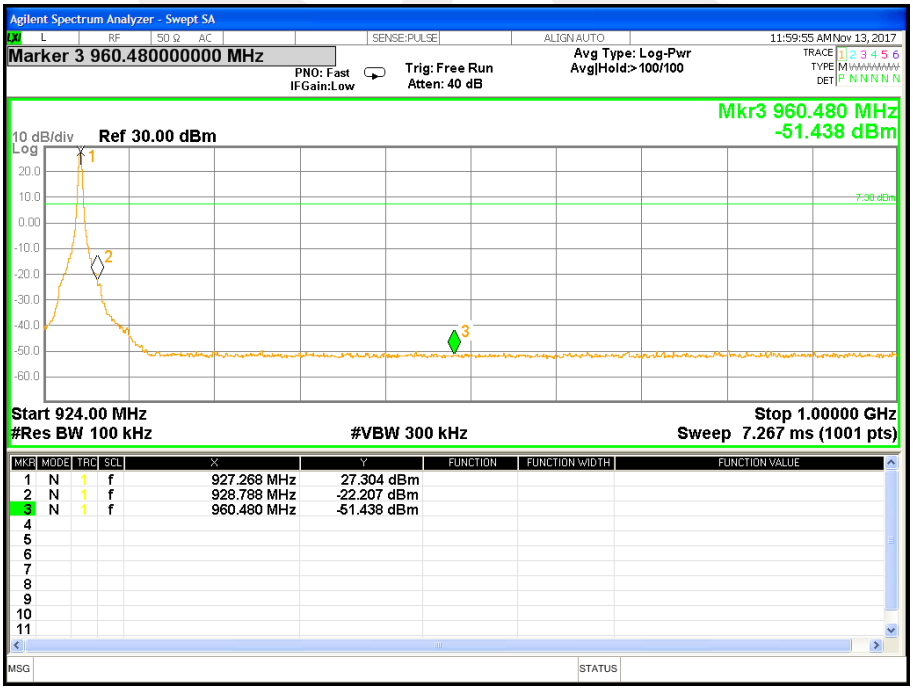
CH 50


Agilent Spectrum Analyzer - Swept SA
Display Line 7.28 dBm
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 40 dB
Avg Type: Log-Pwr
Avg|Hold: 68/100
11:57:45 AM Nov 13, 2017
Mkr3 5.443 71 GHz
-44.942 dBm
10 dB/div
Log
Ref 30.00 dBm
7.28 dBm
Start 30 MHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 10.000 GHz
Sweep 952.9 ms (1001 pts)
1 N 1 f 927.25 MHz 27.286 dBm
2 N 1 f 1.854 51 GHz -43.765 dBm
3 N 1 f 5.443 71 GHz -44.942 dBm

For Band edge

CH 01

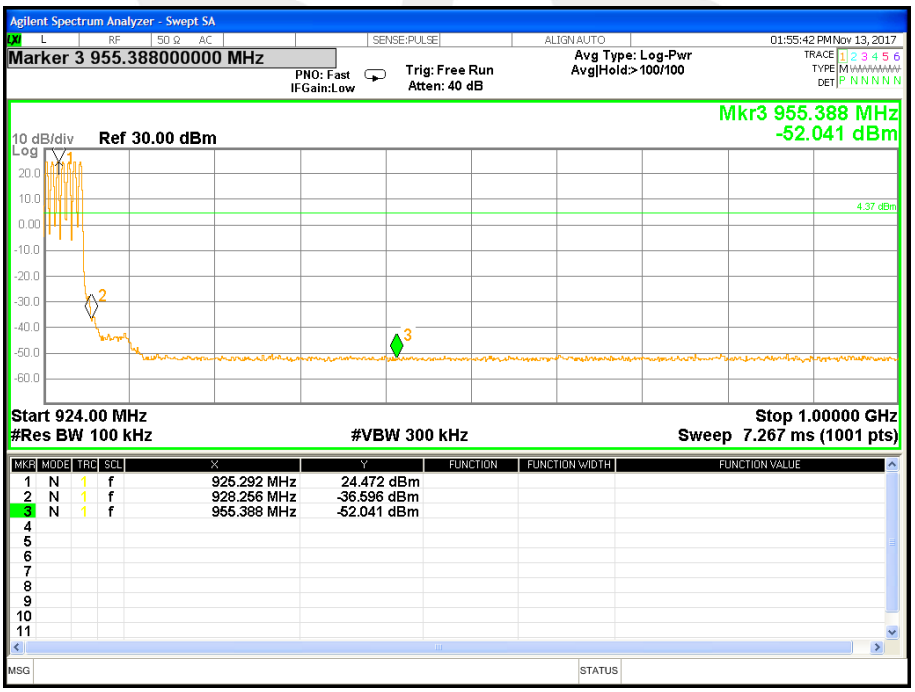
CH 50



For Hopping Band edge

CH 01

CH 50



5. NUMBER OF HOPPING CHANNEL

5.1 APPLIED PROCEDURES / LIMIT

FCC Part 15.247,Subpart C				
Section	Test Item	Limit	FrequencyRange (MHz)	Result
15.247 (a)(1)(i)	Number of Hopping Channel	≥25	902-928	PASS

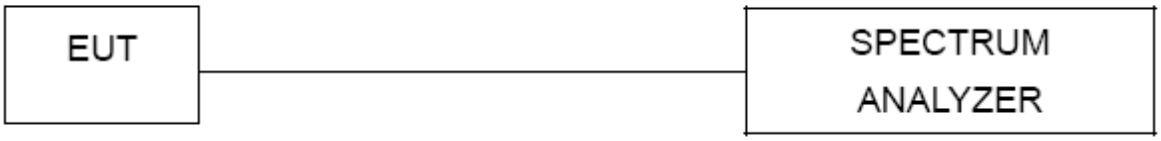
Spectrum Parameters	Setting
Attenuation	Auto
Span Frequency	> Operating FrequencyRange
RB	100KHz
VB	300KHz
Detector	Peak
Trace	Max Hold
Sweep Time	Auto

5.2 TEST PROCEDURE

a. The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below,

b. Spectrum Setting : RBW= 100KHz, VBW=300KHz, Sweep time = Auto.

5.3 TEST SETUP



5.4 EUT OPERATION CONDITIONS

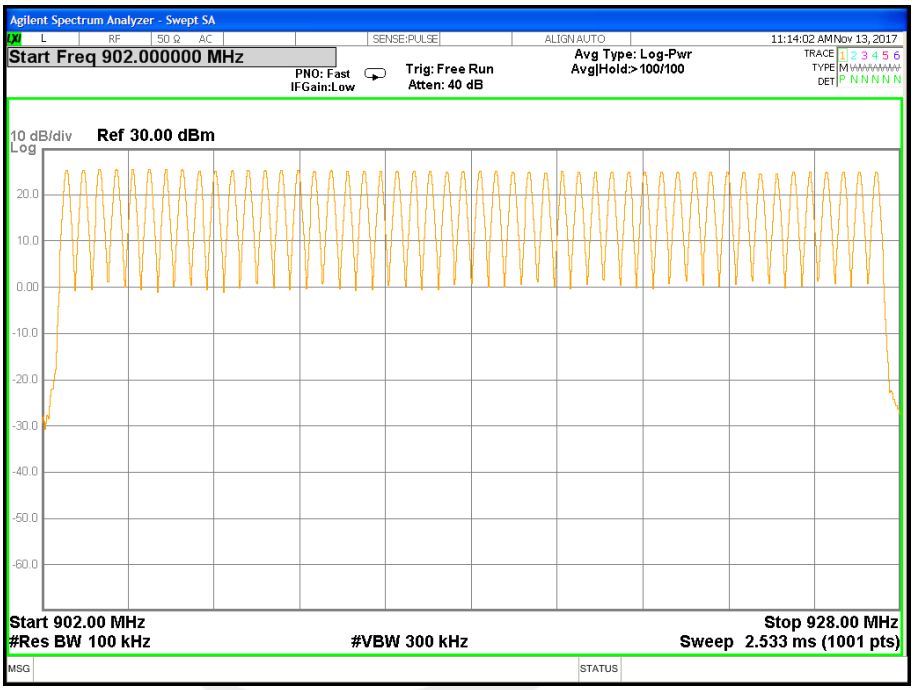
The EUT tested system was configured as the statements of 2.4 Unless otherwise a special operating condition is specified in the follows during the testing.

5.5 TEST RESULTS

Temperature:	25℃	Relative Humidity:	60%
Pressure:	1015 hPa	Test Voltage:	DC 24V from adapter
Test Mode:	Hopping Mode (Dense reader mode)		

Number of Hopping Channel 50

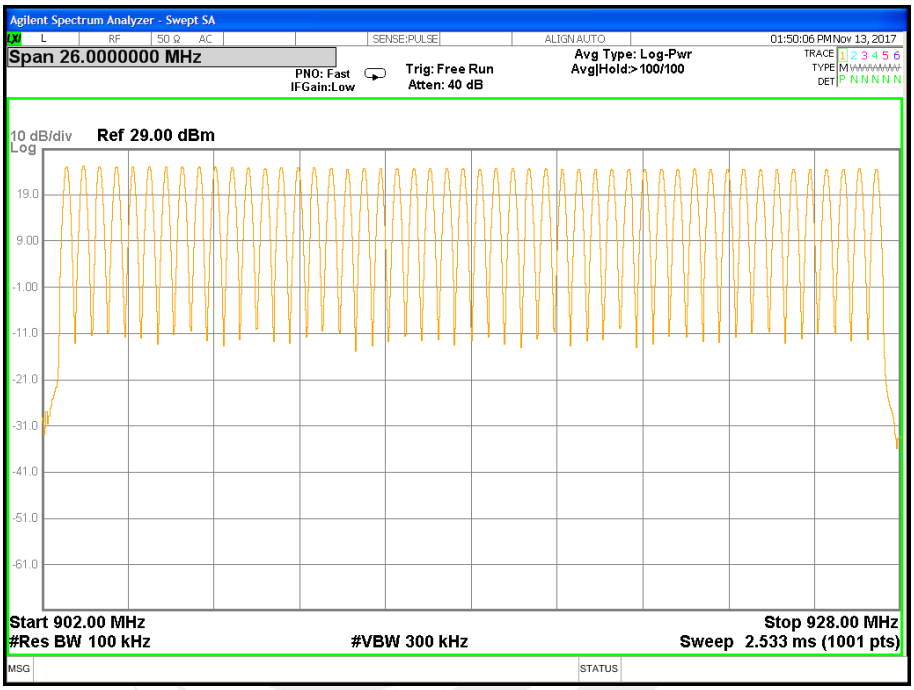
Hopping channel



Temperature:	25℃	Relative Humidity:	60%
Pressure:	1015 hPa	Test Voltage:	DC 24V from adapter
Test Mode:	Hopping Mode (Single reader mode)		

Number of Hopping Channel 50

Hopping channel



6. AVERAGE TIME OF OCCUPANCY

6.1 APPLIED PROCEDURES / LIMIT

FCC Part 15.247,Subpart C				
Section	Test Item	Limit	FrequencyRange (MHz)	Result
15.247 (a)(1)(i)	Average Time of Occupancy	0.4sec	902-928	PASS

6.2 TEST PROCEDURE

a. The transmitter output (antenna port) was connected to the spectrum analyzer
b. Set RBW =1MHz/VBW =3MHz.
c. Use a video trigger with the trigger level set to enable triggering only on full pulses.
d. Sweep Time is 20 second.
e. Set the center frequency on any frequency would be measure and set the frequency span to zero span.
f. Measure the maximum time duration of one single pulse.

6.3 TEST SETUP

6.4 EUT OPERATION CONDITIONS

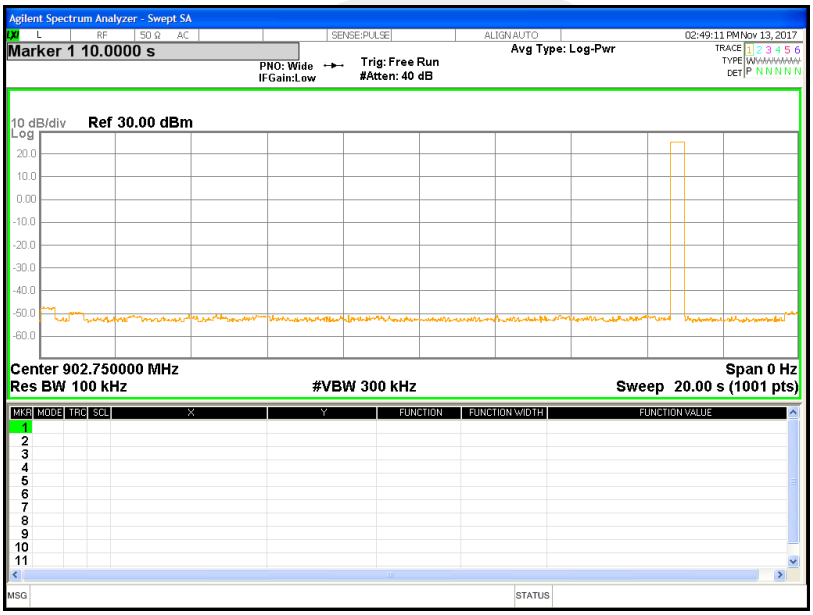
The EUT tested system was configured as the statements of 2.4 Unless otherwise a special operating condition is specified in the follows during the testing.

6.5 TEST RESULTS

Temperature:	25℃	Relative Humidity:	50%
Pressure:	1012 hPa	Test Voltage:	DC 24V from adapter
Test Mode:	Dense reader mode /CH01, CH26, CH50		

Frequency	Dwell Time(s)	Limits(s)	result
902.75 MHz	0.378	0.4	Pass
915.25 MHz	0.377	0.4	Pass
927.25 MHz	0.377	0.4	Pass

CH01



CH26


Agilent Spectrum Analyzer - Swept SA
02:53:26 PM Nov 13, 2017
Avg Type: Log-Pwr
PNO: Wide
IFGain:Low
Trig: Free Run
#Atten: 40 dB
10 dB/div
Log
Ref 30.00 dBm
Center 915.250000 MHz
Res BW 100 kHz
#VBW 300 kHz
Span 0 Hz
Sweep 20.00 s (1001 pts)
MKR MODE TRC SCL X Y FUNCTION FUNCTION WIDTH FUNCTION VALUE
MSG
STATUS


Agilent Spectrum Analyzer - Swept SA
02:51:49 PM Nov 13, 2017
Marker 1 Δ 377.000 ms
Avg Type: Log-Pwr
PNO: Wide
IFGain:Low
Trig: Free Run
#Atten: 40 dB
ΔMkr1 377.0 ms
3.81 dB
10 dB/div
Log
Ref 30.00 dBm
1Δ2
Center 915.250000 MHz
Res BW 100 kHz
#VBW 300 kHz
Span 0 Hz
Sweep 1.000 s (1001 pts)
1 Δ2 1 t (Δ) 377.0 ms (Δ) 3.81 dB
2 F 1 t 400.0 ms -56.48 dBm
MSG
STATUS

CH50

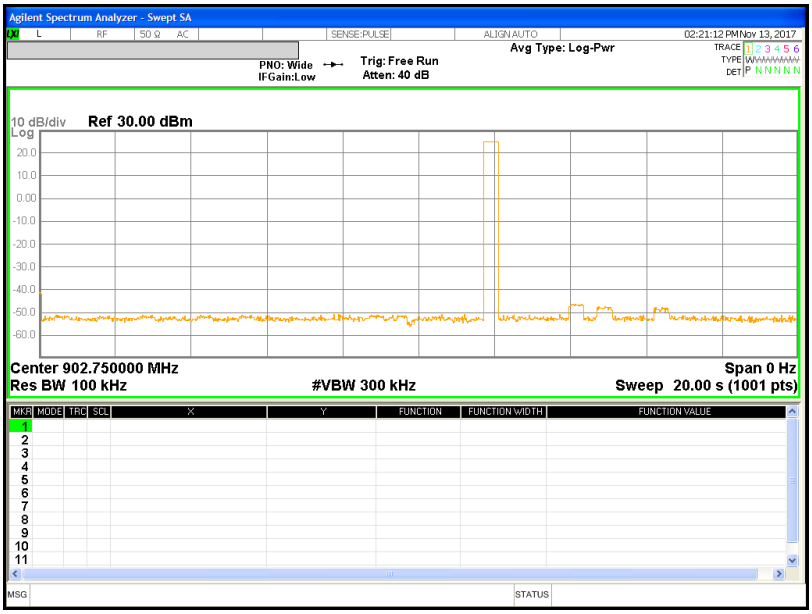

Agilent Spectrum Analyzer - Swept SA
Center Freq 927.250000 MHz
PNO: Wide
IFGain:Low
Trig: Free Run
#Atten: 40 dB
Avg Type: Log-Pwr
02:54:24 PM Nov 13, 2017
10 dB/div
Ref 30.00 dBm
Center 927.250000 MHz
Res BW 100 kHz
#VBW 300 kHz
Span 0 Hz
Sweep 20.00 s (1001 pts)
MKR MODE TRC SCL X Y FUNCTION FUNCTION WIDTH FUNCTION VALUE
MSG
STATUS


Agilent Spectrum Analyzer - Swept SA
Marker 1 Δ 377.000 ms
PNO: Wide
IFGain:Low
Trig: Free Run
#Atten: 40 dB
Avg Type: Log-Pwr
02:55:35 PM Nov 13, 2017
ΔMkr1 377.0 ms
0.10 dB
10 dB/div
Ref 30.00 dBm
1Δ2
Center 927.250000 MHz
Res BW 100 kHz
#VBW 300 kHz
Span 0 Hz
Sweep 1.000 s (1001 pts)
1 Δ2 1 t (Δ) 377.0 ms (Δ) 0.10 dB
2 F 1 t 425.0 ms -55.79 dBm
MSG
STATUS

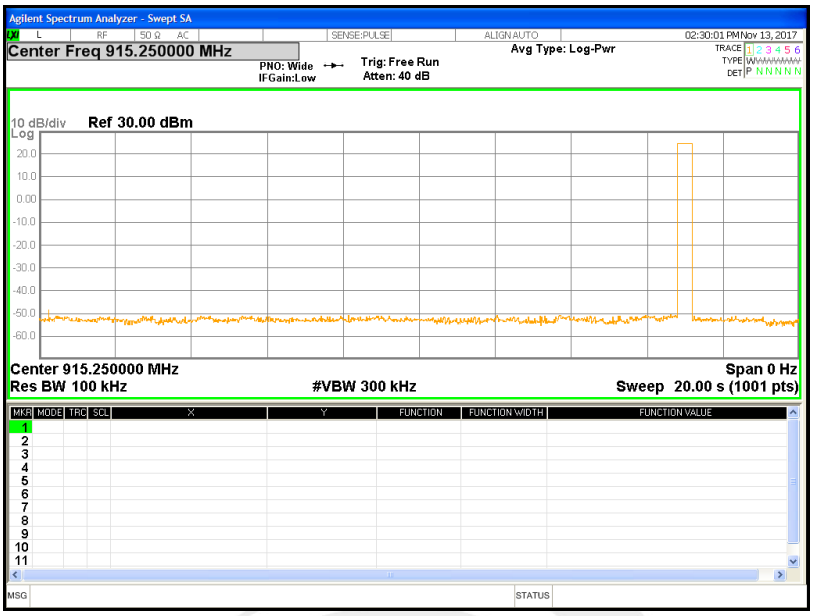
Temperature:	25℃	Relative Humidity:	50%
Pressure:	1012 hPa	Test Voltage:	DC 24V from adapter
Test Mode:	Single reader mode /CH01, CH26, CH50		

Frequency	Dwell Time(s)	Limits(s)	Result
902.75 MHz	0.377	0.4	Pass
915.25 MHz	0.377	0.4	Pass
927.25 MHz	0.377	0.4	Pass

CH01

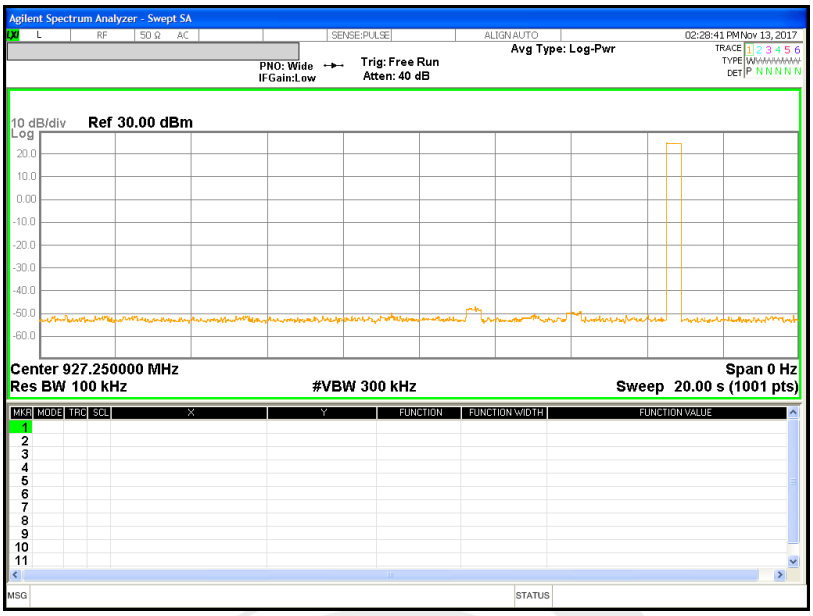


CH26


Agilent Spectrum Analyzer - Swept SA
Center Freq 915.250000 MHz
PNO: Wide
IFGain:Low
Trig: Free Run
Atten: 40 dB
Avg Type: Log-Pwr
02:30:01 PM Nov 13, 2017
10 dB/div
Ref 30.00 dBm
Center 915.250000 MHz
Res BW 100 kHz
#VBW 300 kHz
Span 0 Hz
Sweep 20.00 s (1001 pts)
MKR MODE TRC SCL X Y FUNCTION FUNCTION WIDTH FUNCTION VALUE
MSG
STATUS


Agilent Spectrum Analyzer - Swept SA
Marker 1 Δ 377.000 ms
PNO: Wide
IFGain:Low
Trig: Free Run
Atten: 40 dB
Avg Type: Log-Pwr
02:25:59 PM Nov 13, 2017
ΔMkr1 377.0 ms
-0.02 dB
10 dB/div
Ref 30.00 dBm
1Δ2
Center 915.250000 MHz
Res BW 100 kHz
#VBW 300 kHz
Span 0 Hz
Sweep 1.000 s (1001 pts)
1 Δ2 1 t (Δ) 377.0 ms (Δ) -0.02 dB
2 F 1 t 89.00 ms -53.70 dBm
MSG
STATUS

CH50


Agilent Spectrum Analyzer - Swept SA
02:28:41 PM Nov 13, 2017
Avg Type: Log-Pwr
PNO: Wide
IFGain:Low
Trig: Free Run
Atten: 40 dB
10 dB/div
Ref 30.00 dBm
Log
Center 927.250000 MHz
Res BW 100 kHz
#VBW 300 kHz
Span 0 Hz
Sweep 20.00 s (1001 pts)
MSG
STATUS


Agilent Spectrum Analyzer - Swept SA
02:27:14 PM Nov 13, 2017
Marker 1 Δ 377.000 ms
Avg Type: Log-Pwr
PNO: Wide
IFGain:Low
Trig: Free Run
Atten: 40 dB
ΔMkr1 377.0 ms
0.06 dB
10 dB/div
Ref 30.00 dBm
Log
1Δ2
Center 927.250000 MHz
Res BW 100 kHz
#VBW 300 kHz
Span 0 Hz
Sweep 1.000 s (1001 pts)
1 Δ2 1 t (Δ) 377.0 ms (Δ) 0.06 dB
2 F 1 t 379.0 ms -55.58 dBm
MSG
STATUS

7. HOPPING CHANNEL SEPARATION MEASUREMEN

7.1 APPLIED PROCEDURES / LIMIT

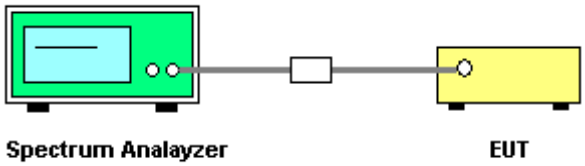
Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.

Spectrum Parameter	Setting
Attenuation	Auto
Span Frequency	> 20 dB Bandwidth or Channel Separation
RB	30 kHz (20dB Bandwidth) / 30 kHz (Channel Separation)
VB	100 kHz (20dB Bandwidth) / 100 kHz (Channel Separation)
Detector	Peak
Trace	Max Hold
Sweep Time	Auto

7.2 TEST PROCEDURE

a. The transmitter output (antenna port) was connected to the spectrum analyser in peak hold mode.
b. The resolution bandwidth of 30 kHz and the video bandwidth of 100 kHz were utilised for 20 dB bandwidth measurement.
c. The resolution bandwidth of 30 kHz and the video bandwidth of 100 kHz were utilised for channel separation measurement.

7.3 TEST SETUP



7.4 EUT OPERATION CONDITIONS

The EUT was programmed to be in continuously transmitting mode.

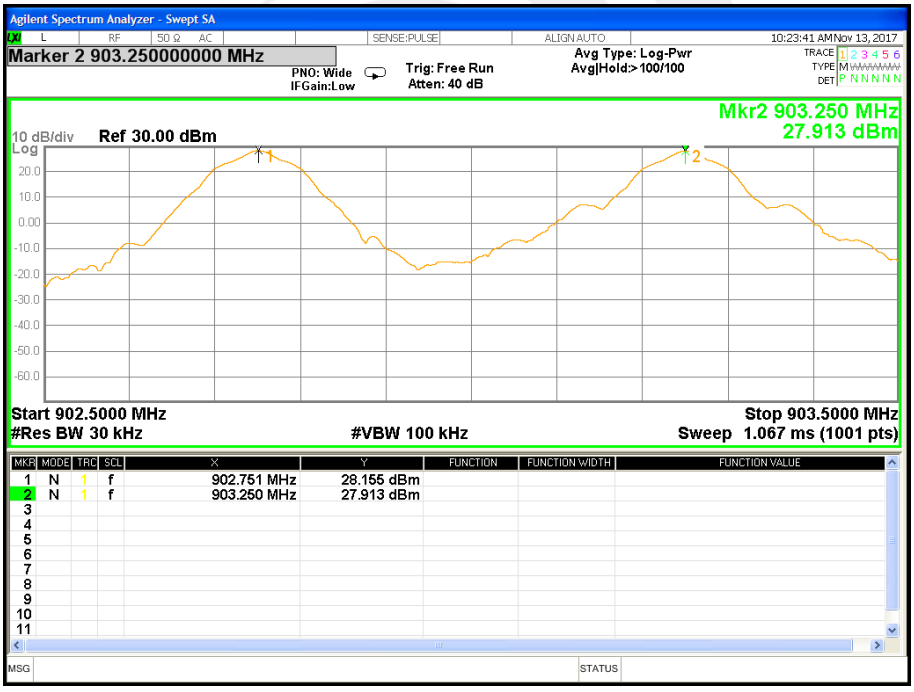
7.5 TEST RESULTS

Temperature:	25℃	Relative Humidity:	50%
Pressure:	1012 hPa	Test Voltage:	DC 24V from adapter
Test Mode:	Dense reader mode /CH01, CH26, CH50		

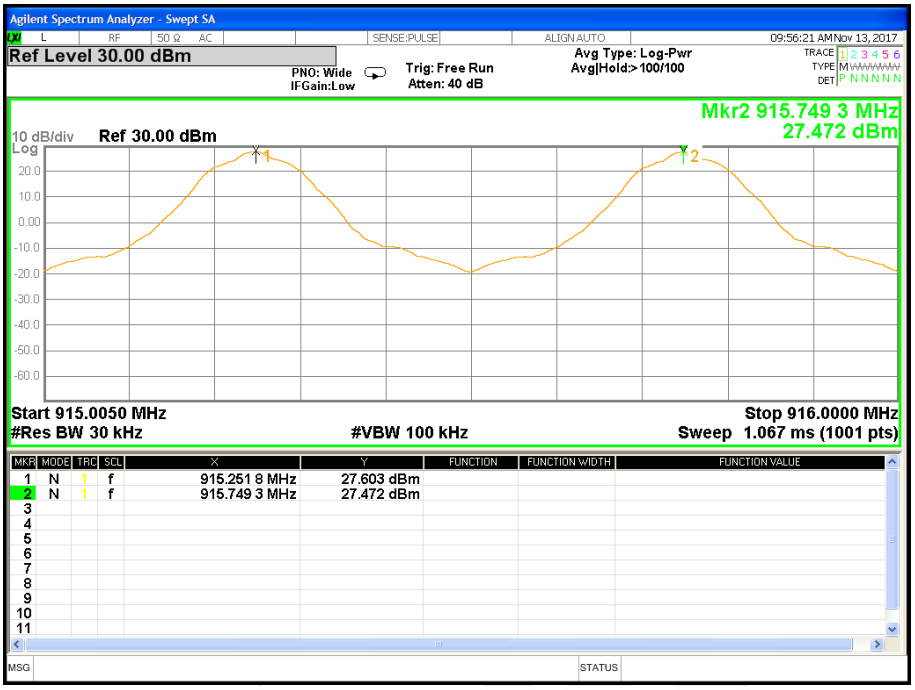
Frequency	Ch. Separation (KHz)	Limit(KHz)	Result
902.75MHz	499.0	108.4	Complies
915.25 MHz	497.5	105.4	Complies
927.25 MHz	500.0	105.2	Complies

Ch. Separation Limits: > 20dB bandwidth

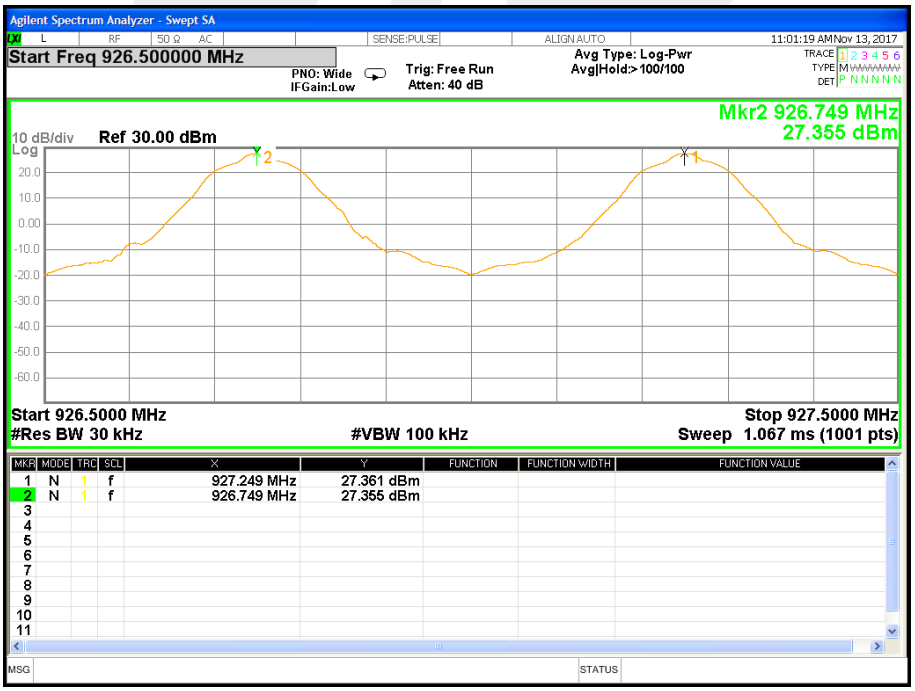
CH01



CH26


Agilent Spectrum Analyzer - Swept SA
Ref Level 30.00 dBm
PNO: Wide
IFGain:Low
Trig: Free Run
Atten: 40 dB
Avg Type: Log-Pwr
Avg|Hold:>100/100
09:56:21 AM Nov 13, 2017
Mkr2 915.749 3 MHz
27.472 dBm
10 dB/div
Ref 30.00 dBm
Log
Start 915.0050 MHz
#Res BW 30 kHz
#VBW 100 kHz
Stop 916.0000 MHz
Sweep 1.067 ms (1001 pts)
1 N 1 f 915.251 8 MHz 27.603 dBm
2 N 1 f 915.749 3 MHz 27.472 dBm

CH50

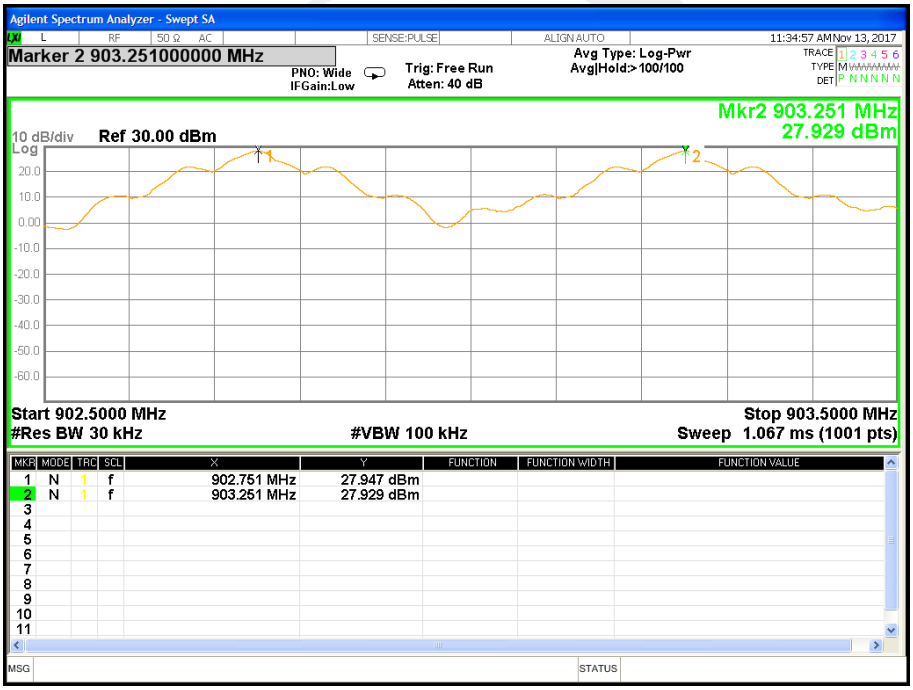

Agilent Spectrum Analyzer - Swept SA
Start Freq 926.500000 MHz
PNO: Wide
IFGain:Low
Trig: Free Run
Atten: 40 dB
Avg Type: Log-Pwr
Avg|Hold:>100/100
11:01:19 AM Nov 13, 2017
Mkr2 926.749 MHz
27.355 dBm
10 dB/div
Ref 30.00 dBm
Log
Start 926.5000 MHz
#Res BW 30 kHz
#VBW 100 kHz
Stop 927.5000 MHz
Sweep 1.067 ms (1001 pts)
1 N 1 f 927.249 MHz 27.361 dBm
2 N 1 f 926.749 MHz 27.355 dBm

Temperature:	25℃	Relative Humidity:	50%
Pressure:	1012 hPa	Test Voltage:	DC 24V from adapter
Test Mode:	Single reader mode /CH01, CH26, CH50		

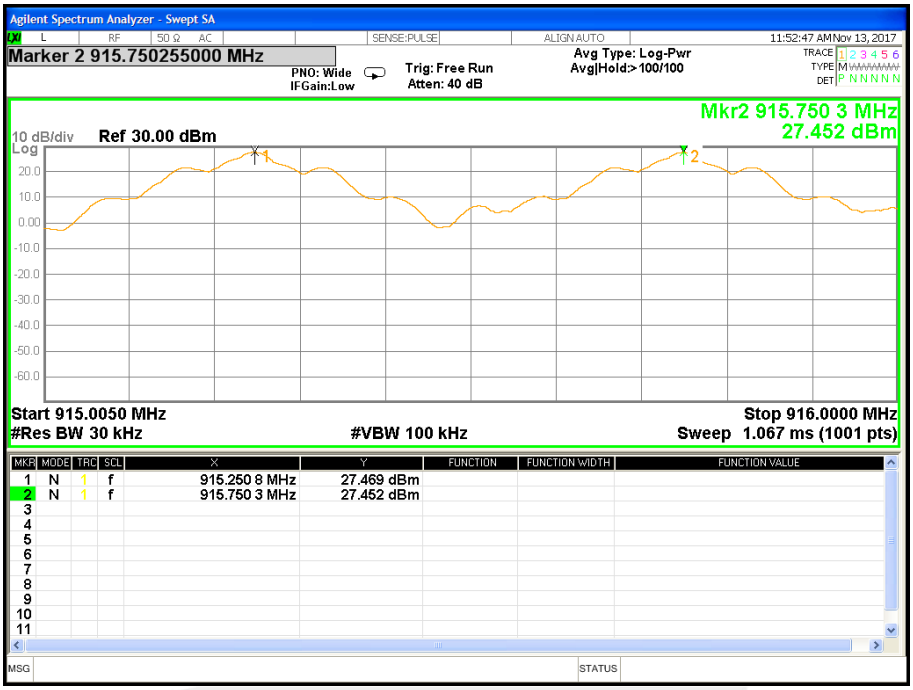
Frequency	Ch. Separation (MHz)	Limit	Result
902.75MHz	500.0	192.6	Complies
915.25 MHz	499.5	190.5	Complies
927.25 MHz	500.0	190.8	Complies

Ch. Separation Limits: > 20dB bandwidth

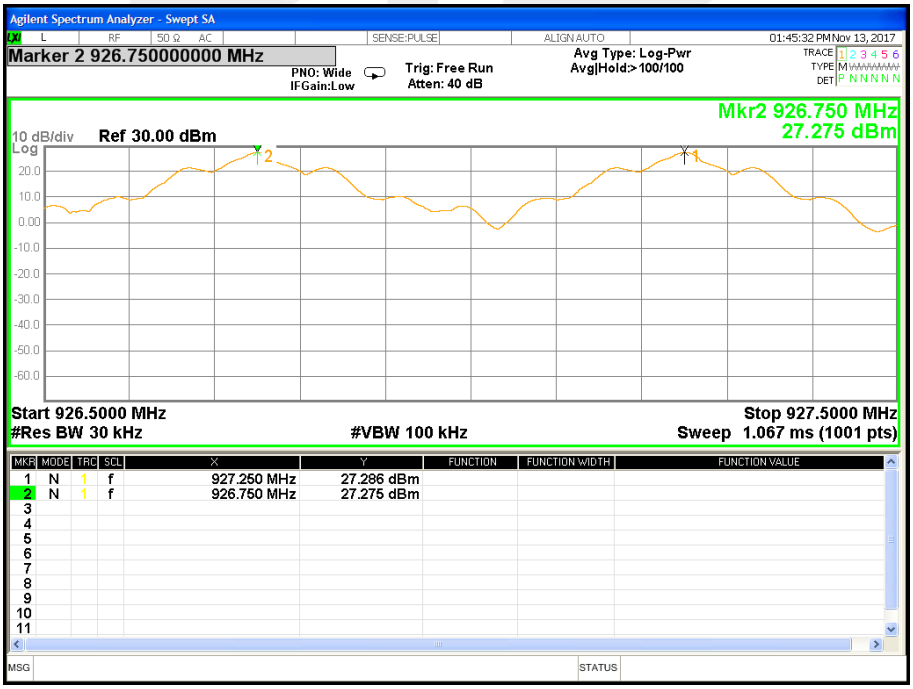
CH01



CH26


Agilent Spectrum Analyzer - Swept SA
Marker 2 915.750255000 MHz
PNO: Wide
IFGain:Low
Trig: Free Run
Atten: 40 dB
Avg Type: Log-Pwr
Avg|Hold:>100/100
11:52:47 AM Nov 13, 2017
Mkr2 915.750 3 MHz
27.452 dBm
10 dB/div
Ref 30.00 dBm
Log
Start 915.0050 MHz
#Res BW 30 kHz
#VBW 100 kHz
Stop 916.0000 MHz
Sweep 1.067 ms (1001 pts)
1 N 1 f 915.250 8 MHz 27.469 dBm
2 N 1 f 915.750 3 MHz 27.452 dBm

CH50


Agilent Spectrum Analyzer - Swept SA
Marker 2 926.750000000 MHz
PNO: Wide
IFGain:Low
Trig: Free Run
Atten: 40 dB
Avg Type: Log-Pwr
Avg|Hold:>100/100
01:45:32 PM Nov 13, 2017
Mkr2 926.750 MHz
27.275 dBm
10 dB/div
Ref 30.00 dBm
Log
Start 926.5000 MHz
#Res BW 30 kHz
#VBW 100 kHz
Stop 927.5000 MHz
Sweep 1.067 ms (1001 pts)
1 N 1 f 927.250 MHz 27.286 dBm
2 N 1 f 926.750 MHz 27.275 dBm

8. BANDWIDTH TEST

8.1 APPLIED PROCEDURES / LIMIT

FCC Part15 15.247,Subpart C				
Section	Test Item	Limit	FrequencyRange (MHz)	Result
15.247 (a)(1)(i)	20dB Bandwidth	500KHz	902-928	PASS

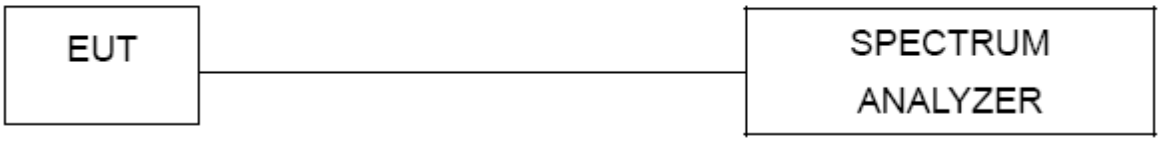
Spectrum Parameter	Setting
Attenuation	Auto
Span Frequency	> Measurement Bandwidth or Channel Separation
RB	1 kHz (20dB Bandwidth) /1 kHz (Channel Separation)
VB	3 kHz (20dB Bandwidth) 3 kHz (Channel Separation)
Detector	Peak
Trace	Max Hold
Sweep Time	Auto

8.2 TEST PROCEDURE

a. The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below,

b. Spectrum Setting : RBW= 1KHz, VBW=3KHz, Sweep time = Auto.

8.3 TEST SETUP



8.4 EUT OPERATION CONDITIONS

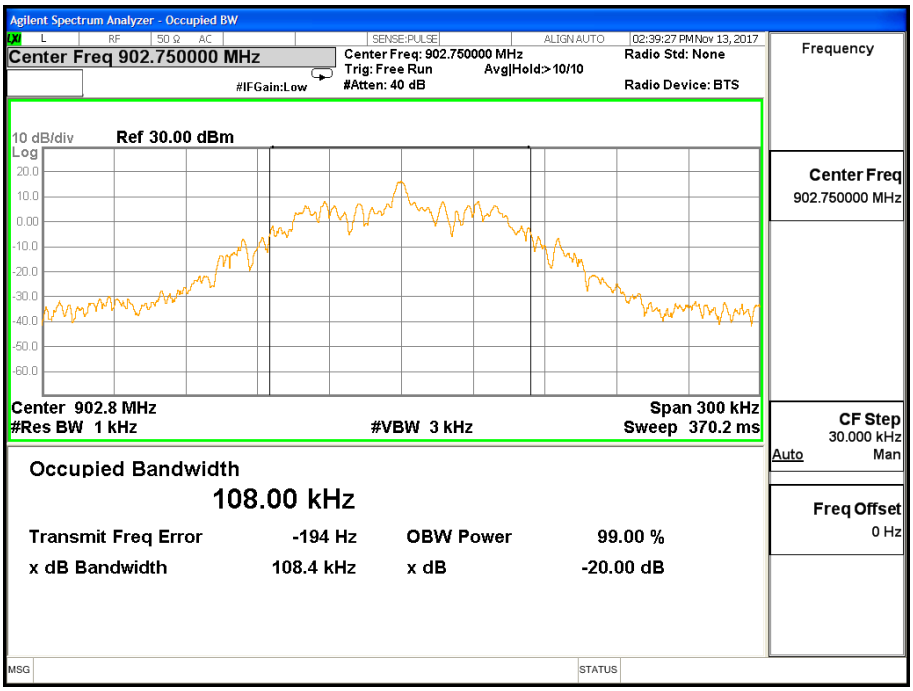
The EUT tested system was configured as the statements of 2.4 Unless otherwise a special operating condition is specified in the follows during the testing.

8.5 TEST RESULTS

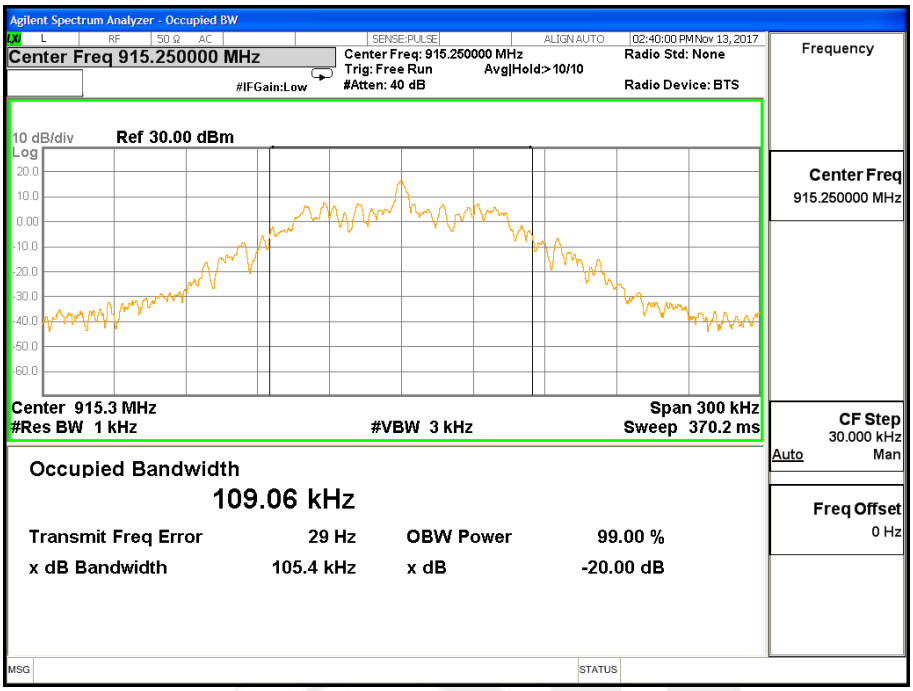
Temperature:	25℃	Relative Humidity:	50%
Pressure:	1012 hPa	Test Voltage:	DC 24V from adapter
Test Mode:	Dense reader mode /CH01, CH26, CH50		

Frequency	20dB Bandwidth(kHz)	Limit (KHz)	Result
902.75 MHz	108.4	500	PASS
915.25 MHz	105.4	500	PASS
927.25 MHz	105.2	500	PASS

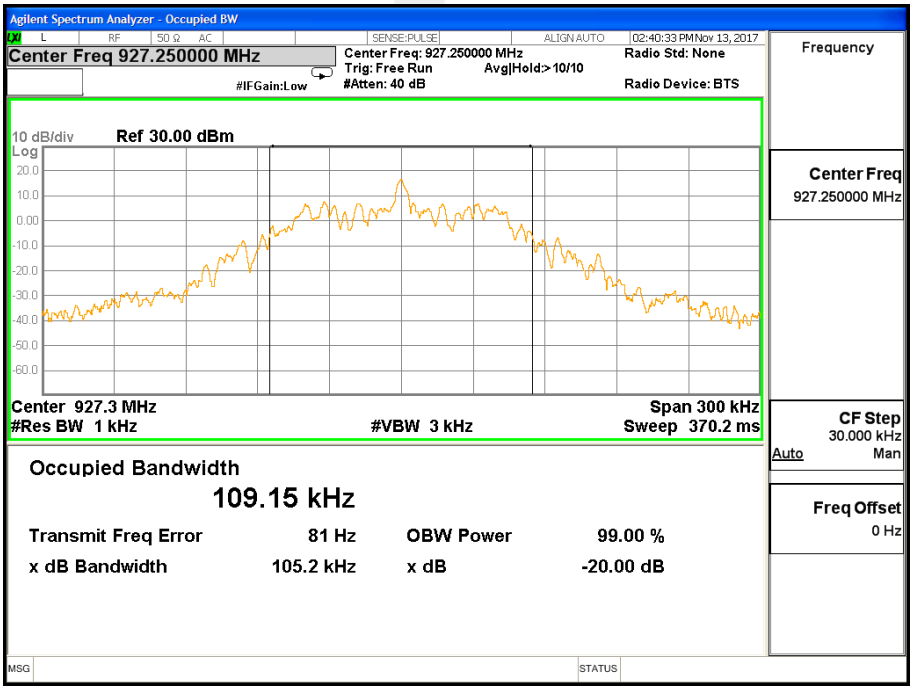
CH01



CH26


Agilent Spectrum Analyzer - Occupied BW
Center Freq 915.250000 MHz
Center Freq: 915.250000 MHz
Trig: Free Run
Avg|Hold:>10/10
#Atten: 40 dB
#IFGain:Low
Radio Std: None
Radio Device: BTS
02:40:00 PM Nov 13, 2017
Frequency
10 dB/div
Ref 30.00 dBm
Log
Center Freq
915.250000 MHz
Center 915.3 MHz
#Res BW 1 kHz
#VBW 3 kHz
Span 300 kHz
Sweep 370.2 ms
CF Step
30.000 kHz
Auto
Man
Occupied Bandwidth
109.06 kHz
Transmit Freq Error 29 Hz
OBW Power 99.00 %
x dB Bandwidth 105.4 kHz
x dB -20.00 dB
Freq Offset
0 Hz
MSG
STATUS

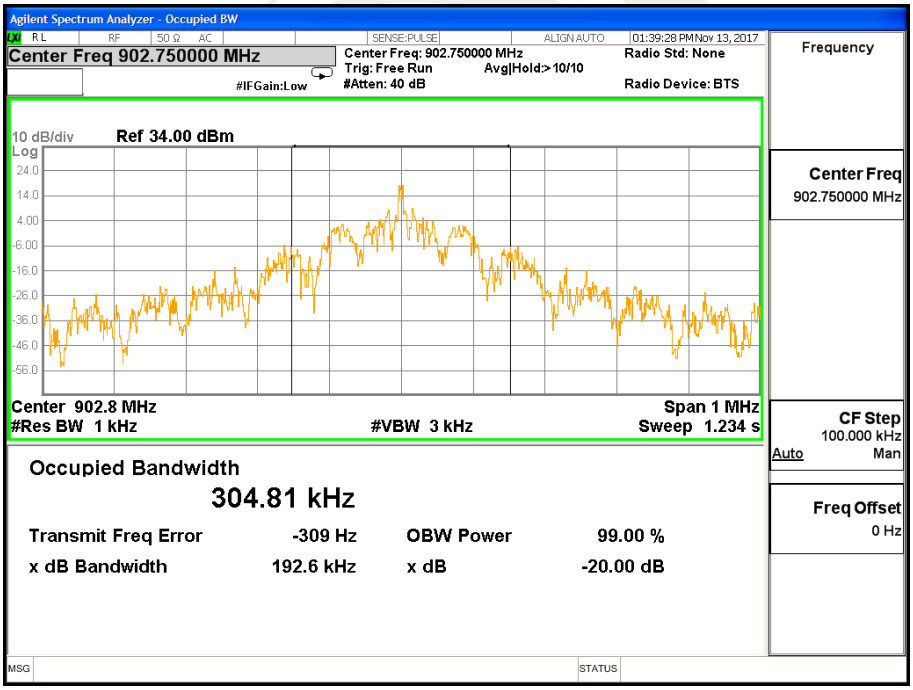
CH50


Agilent Spectrum Analyzer - Occupied BW
Center Freq 927.250000 MHz
Center Freq: 927.250000 MHz
Trig: Free Run
Avg|Hold:>10/10
#Atten: 40 dB
#IFGain:Low
Radio Std: None
Radio Device: BTS
02:40:33 PM Nov 13, 2017
Frequency
10 dB/div
Ref 30.00 dBm
Log
Center Freq
927.250000 MHz
Center 927.3 MHz
#Res BW 1 kHz
#VBW 3 kHz
Span 300 kHz
Sweep 370.2 ms
CF Step
30.000 kHz
Auto
Man
Occupied Bandwidth
109.15 kHz
Transmit Freq Error 81 Hz
OBW Power 99.00 %
x dB Bandwidth 105.2 kHz
x dB -20.00 dB
Freq Offset
0 Hz
MSG
STATUS

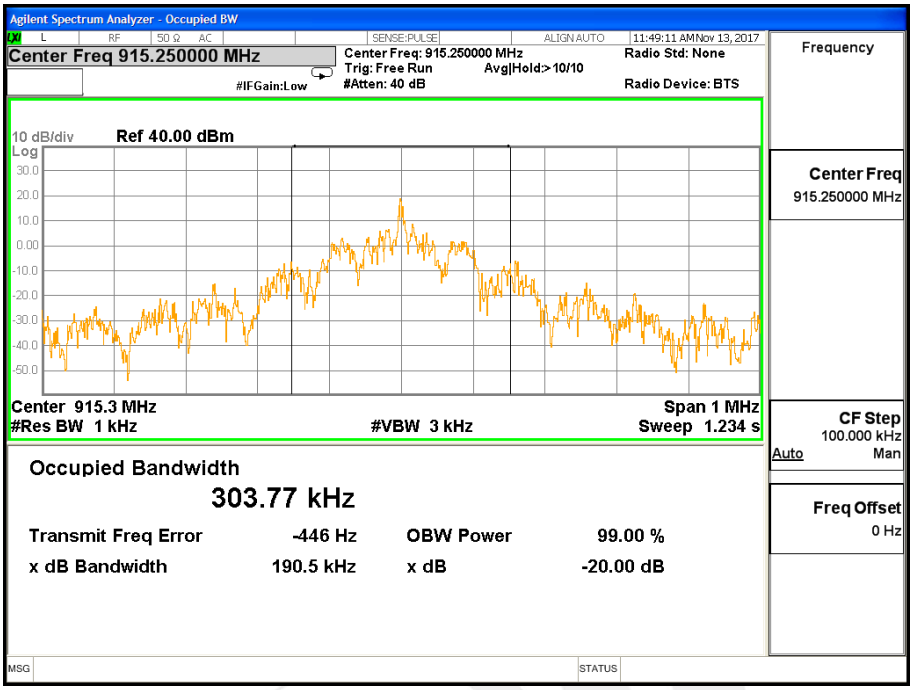
Temperature:	25℃	Relative Humidity:	50%
Pressure:	1012 hPa	Test Voltage:	DC 24V from adapter
Test Mode:	Single reader mode /CH01, CH26, CH50		

Frequency	20dB Bandwidth(kHz)	Limit (KHz)	Result
902.75 MHz	192.6	500	PASS
915.25 MHz	190.5	500	PASS
927.25 MHz	190.8	500	PASS

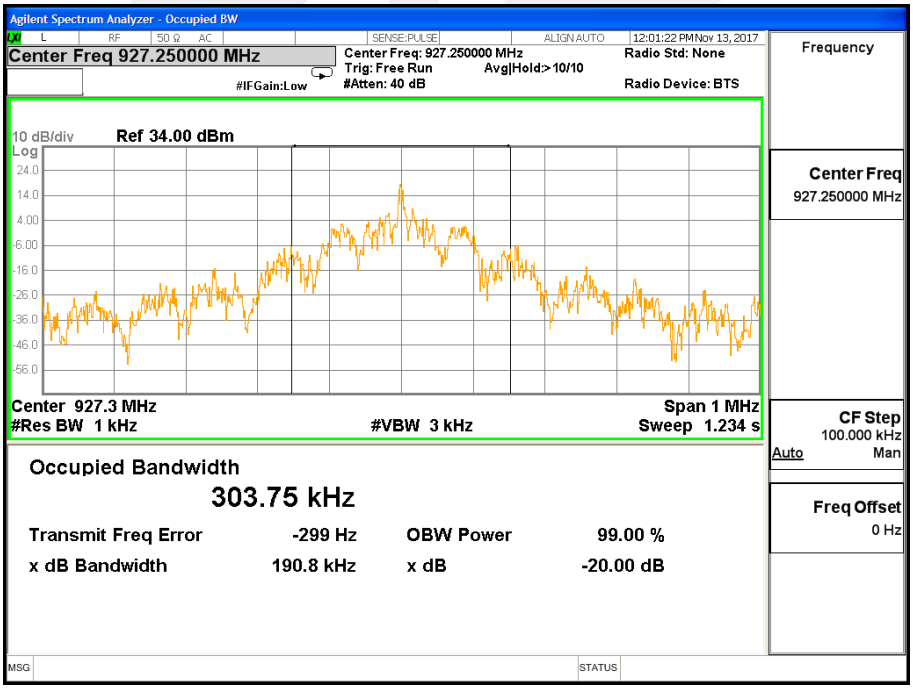
CH01



CH26


Agilent Spectrum Analyzer - Occupied BW
Center Freq 915.250000 MHz
Center Freq: 915.250000 MHz
Trig: Free Run
Avg|Hold:>10/10
#Atten: 40 dB
#IFGain:Low
Radio Std: None
Radio Device: BTS
11:49:11 AM Nov 13, 2017
Frequency
10 dB/div
Ref 40.00 dBm
Log
30.0
20.0
10.0
0.00
-10.0
-20.0
-30.0
-40.0
-50.0
Center 915.3 MHz
#Res BW 1 kHz
#VBW 3 kHz
Span 1 MHz
Sweep 1.234 s
Center Freq
915.250000 MHz
CF Step
100.000 kHz
Auto
Man
Freq Offset
0 Hz
Occupied Bandwidth
303.77 kHz
Transmit Freq Error -446 Hz
OBW Power 99.00 %
x dB Bandwidth 190.5 kHz
x dB -20.00 dB
MSG
STATUS

CH50


Agilent Spectrum Analyzer - Occupied BW
Center Freq 927.250000 MHz
Center Freq: 927.250000 MHz
Trig: Free Run
Avg|Hold:>10/10
#Atten: 40 dB
#IFGain:Low
Radio Std: None
Radio Device: BTS
12:01:22 PM Nov 13, 2017
Frequency
10 dB/div
Ref 34.00 dBm
Log
24.0
14.0
4.00
-6.00
-16.0
-26.0
-36.0
-46.0
-56.0
Center 927.3 MHz
#Res BW 1 kHz
#VBW 3 kHz
Span 1 MHz
Sweep 1.234 s
Center Freq
927.250000 MHz
CF Step
100.000 kHz
Auto
Man
Freq Offset
0 Hz
Occupied Bandwidth
303.75 kHz
Transmit Freq Error -299 Hz
OBW Power 99.00 %
x dB Bandwidth 190.8 kHz
x dB -20.00 dB
MSG
STATUS

9. OUTPUT POWER TEST

9.1 APPLIED PROCEDURES / LIMIT

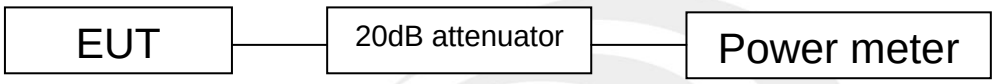
FCC Part 15.247,Subpart C				
Section	Test Item	Limit	FrequencyRange (MHz)	Result
15.247 (b)(2)	Output Power	1 W	902-928	PASS

9.2 TEST PROCEDURE

a. The EUT was directly connected to the Power Meter

b. Power setting by the firewave is:
lowest channel=33dBm,middle channel=33dBm ,highest channel =33dBm

9.3 TEST SETUP



9.4 EUT OPERATION CONDITIONS

The EUT tested system was configured as the statements of 2.4 Unless otherwise a special operating condition is specified in the follows during the testing.

9.5 TEST RESULTS

Temperature:	25℃	Relative Humidity:	60%
Pressure:	1012 hPa	Test Voltage:	DC 24V from adapter

Dense reader mode			
Test Channel	Frequency	Conducted Output Power	LIMIT
	(MHz)	Peak (dBm)	dBm
CH01	902.75	29.564	30
CH26	915.25	29.032	30
CH50	927.25	29.123	30

Single reader mode			
Test Channel	Frequency	Conducted Output Power	LIMIT
	(MHz)	Peak (dBm)	dBm
CH01	902.75	29.634	30
CH26	915.25	29.427	30
CH50	927.25	29.110	30

Note: The EUT is transmitting through a long enough antenna cable with a stated loss of 12dB into the antenna with typy N connector 15dBi gain.

Worst case modulation used by the device.

KDB 594280. Professional installation or authorized service personnel is required to configure radio parameters of the transmitter using the software for adjusting total EIRP (36dBm) power at local installation to ensure compliance with FCC Rules.

10. ANTENNA REQUIREMENT

10.1 STANDARD REQUIREMENT

15.203 requirement: 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.

Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with §15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this part are not exceeded.

10.2 EUT ANTENNA

The EUT antenna is installed professionally by the installer, so that the limits in this part are not exceeded.

11. RF EXPOSURE COMPLIANCE

11.1 LIMIT

The limit for Maximum Permissible Exposure (MPE) specified in FCC 1.1310 is followed.
According to FCC 1.1310: The criteria listed in the following table shall be used to evaluate the environmental impact of the human exposure to radio-frequency (RF) radiation as specified in 1.1307 (b)

Limits for Maximum Permissible Exposure (MPE)

Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm^2)
Limits for Occupational / controlled Exposures			
300 - 1500	--	--	F/300
1500 – 100000	--	--	5.0
Limits for General population / Uncontrolled Exposure			
300 - 1500	--	--	F/1500
1500 – 100000	--	--	1.0

11.2 RESULT

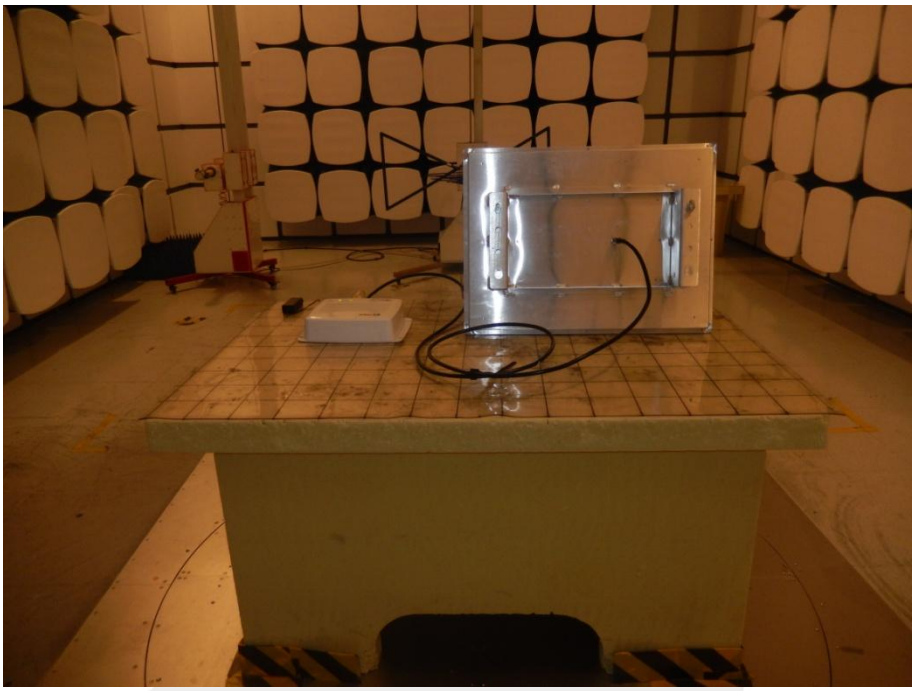
Protocol	MAX EIRP (dBm)	MAX EIRP (mW)	Power Density (mW/cm^2)	Limit (mW/cm^2)	Result
FHSS	36	3981	0.032	0.6013	Pass

Friss Transmission Formula: Pd = (Pout) / ($4*pi*R^2$)

Where
Pd = power density in mW/cm^2
Pout = antenna power in mW
Pi = 3.1416
R = Distance between observation point and the center of radiator in cm, R=100cm

APPENDIX-PHOTOS OF TEST SETUP

Radiated Measurement Photos



Conducted Measurement Photos

※※※※※END OF THE REPORT※※※※※