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Report No.: 1608RSU00501
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MEASUREMENT REPORT

FCC PART 15.247 / RSS-247

FCC ID: DD4ULXD8X52

IC: 616A-ULXD8X52

APPLICANT: Shure Incorporated

Application Type: Certification

Product: Wireless Gooseneck Transmitter

Model No.: ULXD8 X52

Brand Name: SHURE

FCC Classification: Digital Transmission System (DTS)

FCC Rule Part(s): Part 15.247

IC Rule(s): RSS-247 Issue 1, RSS-GEN Issue 4

Test Procedure(s): ANSI C63.10-2013, KDB 558074 D01v03r05

Test Date: August 06 ~ 27, 2016

Reviewed By
Manager : Robin Wu
(Robin Wu)

Approved By
CEO : Marlin Chen
(Marlin Chen)



The test results relate only to the samples tested.

This equipment has been shown to be capable of compliance with the applicable technical standards as indicated in the measurement report and was tested in accordance with the measurement procedures specified in KDB 558074 D01v03r05. Test results reported herein relate only to the item(s) tested.

The test report shall not be reproduced except in full without the written approval of MRT Technology (Suzhou) Co., Ltd.

Revision History

Report No.	Version	Description	Issue Date	Note
1608RSU00501	Rev. 01	Initial report	10-23-2016	Valid

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§2.1033 General Information

Applicant:	Shure Incorporated
Applicant Address:	5800 West Touhy Avenue
Manufacturer:	Shure Incorporated
Manufacturer Address:	5800 West Touhy Avenue
Test Site:	MRT Technology (Suzhou) Co., Ltd
Test Site Address:	D8 Building, No.2 Tian'edang Rd., Wuzhong Economic Development Zone, Suzhou, China
FCC Registration No.:	809388
IC Registration No.:	11384A
FCC Rule Part(s):	Part 15.247
IC Rule:	RSS-247 Issue 1, RSS-GEN Issue 4
FCC ID:	DD4ULXD8X52
IC:	616A-ULXD8X52
Test Device Serial No.:	N/A <input type="checkbox"/> Production <input checked="" type="checkbox"/> Pre-Production <input type="checkbox"/> Engineering
FCC Classification:	Digital Transmission System (DTS)

Test Facility / Accreditations

Measurements were performed at MRT Laboratory located in Tian'edang Rd., Suzhou, China.

- MRT facility is a FCC registered (MRT Reg. No. 809388) test facility with the site description report on file and has met all the requirements specified in Section 2.948 of the FCC Rules.
- MRT facility is an IC registered (MRT Reg. No. 11384A-1) test laboratory with the site description on file at Industry Canada.
- MRT facility is a VCCI registered (R-4179, G-814, C-4664, T-2206) test laboratory with the site description on file at VCCI Council.
- MRT Lab is accredited to ISO 17025 by the American Association for Laboratory Accreditation (A2LA) under the American Association for Laboratory Accreditation Program (A2LA Cert. No. 3628.01) in EMC, Telecommunications and Radio testing for FCC, Industry Canada, EU and TELEC Rules.



1. INTRODUCTION

1.1. Scope

Measurement and determination of electromagnetic emissions (EMC) of radio frequency devices including intentional and/or unintentional radiators for compliance with the technical rules and regulations of the Federal Communications Commission and the Industry Canada Certification and Engineering Bureau.

1.2. MRT Test Location

The map below shows the location of the MRT LABORATORY, its proximity to the Taihu Lake. These measurement tests were conducted at the MRT Technology (Suzhou) Co., Ltd. Facility located at D8 Building, Youxin Industrial Park, No.2 Tian'edang Rd., Wuzhong Economic Development Zone, Suzhou, China. The detailed description of the measurement facility was found to be in compliance with the requirements of § 2.948 according to ANSI C63.4-2009 on September 30, 2013.



2. PRODUCT INFORMATION

2.1. Equipment Description

Product Name	Wireless Gooseneck Transmitter
Model No.	ULXD8 X52
Frequency Range	902 ~ 928 MHz
Working Mode	Normal Mode and HD Mode
Power Level	0.25mW & 10mW & 20mW
Antenna Type	PIFA
Antenna Gain	Max Peak Gain 1.45dBi
Components	
Rechargeable Li-ion Battery	Model: SB900A OUTPUT: 3.7Vdc, 1320mAh, 4.88Wh

Note 1: The EUT has two working modes (Normal Mode & HD Mode) and two modes can be switched from the digital wireless receiver.

Note 2: Normal mode has three power levels (0.25mW & 10mW & 20mW). Power levels are switchable among these power levels. HD mode means high density mode and it only has 0.25mW power level.

Note 3: The EUT is capable of operating with AA alkaline batteries or with the Shure SB900A rechargeable battery pack.

2.2. Product Specification Subjective to this Report

Working Mode	Normal Mode
Frequency Range	902 ~ 928 MHz
Power Level	0.25mW & 10mW & 20mW
Maximum Peak Output Power	18.18dBm
Type of Modulation	8PSK
Channel Spacing	25kHz
Date Rate	468.75kbps

Note: For other features of this EUT, test report will be issued separately.

2.3. Operation Frequency / Channel List

X52 Band

Channel	Frequency
LOW	902.4 MHz
...	...
MID	915.0 MHz
...	...
HIG	927.6 MHz

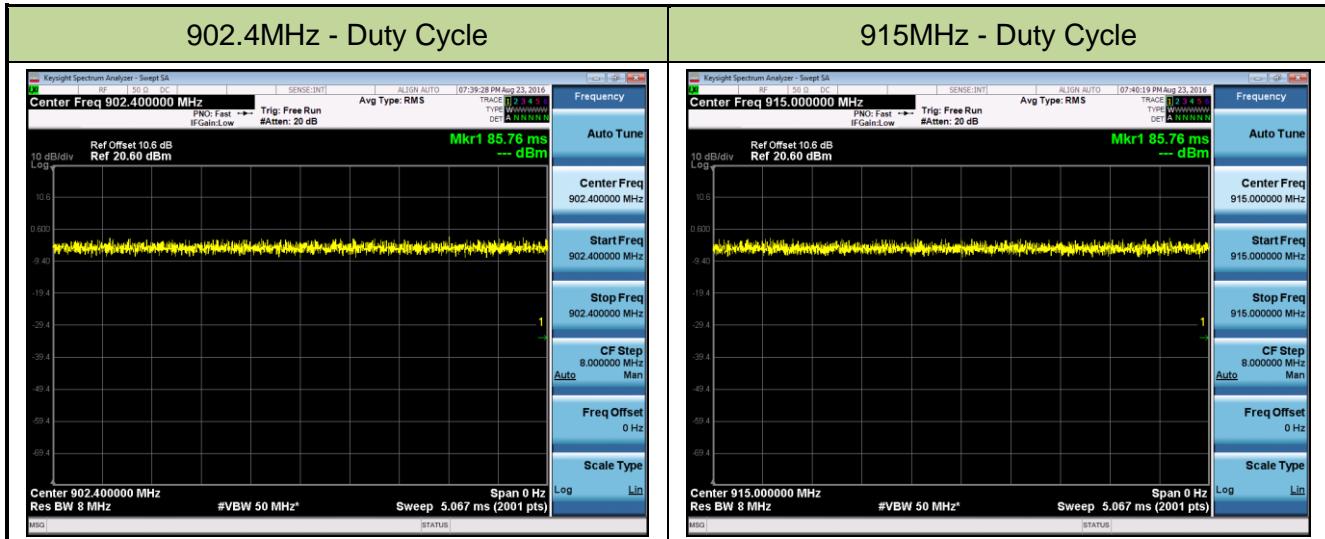
2.4. Device Capabilities

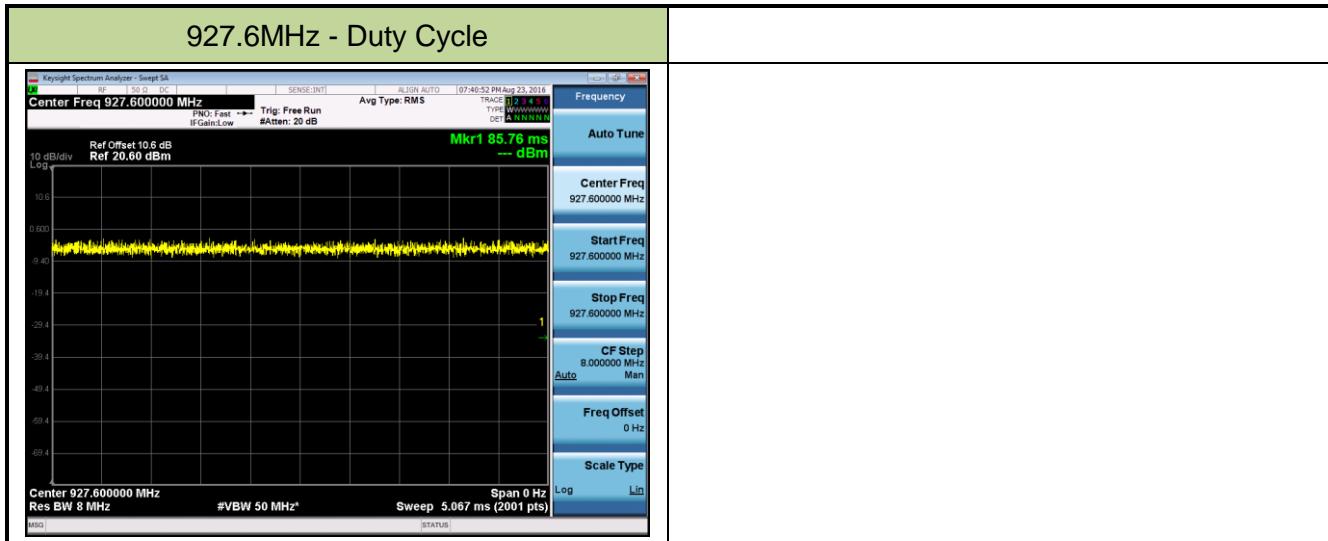
This device contains the following capabilities:

902 ~ 928 MHz (DTS), 902 ~ 928 MHz (DX)

Note: The maximum achievable duty cycle was determined based on measurements performed on a spectrum analyzer in zero-span mode with RBW = 8MHz, VBW = 50MHz. The RBW and VBW were both greater than 50/T, where T is the minimum transmission duration, and the number of sweep points across T was greater than 100. The duty cycles are as follows:

Test Mode	Duty Cycle
902.4MHz	100%
915MHz	100%
927.6MHz	100%





2.5. Test Software

The test utility software used during testing was “ttermpro.exe”.

2.6. Description of Support Units

The EUT has been tested with associated equipment below.

Description	Manufacturer	Model No.
Adapter	Supply by MRT	CYSK05-050100

2.7. Test Configuration

The **Wireless Gooseneck Transmitter** was tested per the guidance of KDB 558074 D01v03r05. ANSI C63.10-2013 was used to reference the appropriate EUT setup for radiated spurious emissions testing and AC line conducted testing.

2.8. Labeling Requirements

Per 2.1074 & 15.19; Docket 95-19

The label shall be permanently affixed at a conspicuous location on the device; instruction manual or pamphlet supplied to the user and be readily visible to the purchaser at the time of purchase. However, when the device is so small wherein placement of the label with specified statement is not practical, only the FCC ID must be displayed on the device per Section 15.19(a)(5). Please see attachment for FCC ID label and label location.

3. DESCRIPTION OF TEST

3.1. Evaluation Procedure

The measurement procedures described in the American National Standard for Testing Unlicensed Wireless Devices (ANSI C63.10-2013), and the guidance provided in KDB 558074 D01v03r05 were used in the measurement of the **Wireless Gooseneck Transmitter**.

Deviation from measurement procedure..........**None**

3.2. AC Line Conducted Emissions

The line-conducted facility is located inside an 8'x4'x4' shielded enclosure. A 1m x 2m wooden table 80cm high is placed 40cm away from the vertical wall and 80cm away from the sidewall of the shielded room. Two 10kHz-30MHz, 50Ω/50uH Line-Impedance Stabilization Networks (LISNs) are bonded to the shielded room floor. Power to the LISNs is filtered by external high-current high-insertion loss power line filters. These filters attenuate ambient signal noise from entering the measurement lines. These filters are also bonded to the shielded enclosure.

The EUT is powered from one LISN and the support equipment is powered from the second LISN. All interconnecting cables more than 1 meter were shortened to a 1 meter length by non-inductive bundling (serpentine fashion) and draped over the back edge of the test table. All cables were at least 40cm above the horizontal reference ground-plane. Power cables for support equipment were routed down to the second LISN while ensuring that that cables were not draped over the second LISN.

Sufficient time for the EUT, support equipment, and test equipment was allowed in order for them to warm up to their normal operating condition. The RF output of the LISN was connected to the receiver and exploratory measurements were made to determine the frequencies producing the maximum emission from the EUT. The receiver was scanned from 150kHz to 30MHz. The detector function was set to peak mode for exploratory measurements while the bandwidth of the analyzer was set to 9kHz. The EUT, support equipment, and interconnecting cables were arranged and manipulated to maximize each emission. Each emission was also maximized by varying: power lines, the mode of operation or data exchange speed, or support equipment whichever determined the worst-case emission. Once the worst case emissions have been identified, the one EUT cable configuration/arrangement and mode of operation that produced these emissions are used for final measurements on the same test site. The analyzer is set to CISPR quasi-peak and average detectors with a 9kHz resolution bandwidth for final measurements.

An extension cord was used to connect to a single LISN which powered by EUT. The extension cord was calibrated with LISN, the impedance and insertion loss are compliance with the requirements as stated in ANSI C63.10-2013.

Line conducted emissions test results are shown in Section 7.8.

3.3. Radiated Emissions

The radiated test facilities consisted of an indoor 3 meter semi-anechoic chamber used for final measurements and exploratory measurements, when necessary. The measurement area is contained within the semi-anechoic chamber which is shielded from any ambient interference. For measurements above 1GHz absorbers are arranged on the floor between the turn table and the antenna mast in such a way so as to maximize the reduction of reflections. For measurements below 1GHz, the absorbers are removed. A MF Model 210SS turntable is used for radiated measurement. It is a continuously rotatable, remote controlled, metallic turntable and 2 meters (6.56 ft.) in diameter. The turn table is flush with the raised floor of the chamber in order to maintain its function as a ground plane. An 80cm high PVC support structure is placed on top of the turntable.

For all measurements, the spectrum was scanned through all EUT azimuths and from 1 to 4 meter receive antenna height using a broadband antenna from 30MHz up to the upper frequency shown in 15.33(b)(1) depending on the highest frequency generated or used in the device or on which the device operates or tunes. For frequencies above 1GHz, linearly polarized double ridge horn antennas were used. For frequencies below 30MHz, a calibrated loop antenna was used. When exploratory measurements were necessary, they were performed at 1 meter test distance inside the semi-anechoic chamber using broadband antennas, broadband amplifiers, and spectrum analyzers to determine the frequencies and modes producing the maximum emissions. Sufficient time for the EUT, support equipment, and test equipment was allowed in order for them to warm up to their normal operating condition. The test set-up for frequencies below 1GHz was placed on top of the 0.8 meter high, 1 x 1.5 meter table; and test set-up for frequencies 1-25GHz was placed on top of the 1.5 meter high, 1 x 1.5 meter table. The EUT, support equipment, and interconnecting cables were arranged and manipulated to maximize each emission. Appropriate precaution was taken to ensure that all emissions from the EUT were maximized and investigated. The system configuration, clock speed, mode of operation or video resolution, if applicable, turntable azimuth, and receive antenna height was noted for each frequency found.

Final measurements were made in the semi-anechoic chamber using calibrated, linearly polarized broadband and horn antennas. The test setup was configured to the setup that produced the worst case emissions. The spectrum analyzer was set to investigate all frequencies required for testing to compare the highest radiated disturbances with respect to the specified limits. The turntable containing the EUT was rotated through 360 degrees and the height of the receive antenna was varied 1 to 4 meters and stopped at the azimuth and height producing the maximum emission. Each emission was maximized by changing the orientation of the EUT through three orthogonal planes and changing the polarity of the receive antenna, whichever produced the worst-case emissions. According to 3dB Beam-Width of horn antenna, the horn antenna should be always directed to the EUT when rising height.

4. ANTENNA REQUIREMENTS

Excerpt from §15.203 of the FCC Rules/Regulations:

“An intentional radiator antenna shall be designed to ensure that no antenna other than that furnished by the responsible party can be used with the device. 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 provisions of this section.”

- The antenna of the **Wireless Gooseneck Transmitter** is **permanently attached**.
- There are no provisions for connection to an external antenna.

Conclusion:

The **Wireless Gooseneck Transmitter** FCC ID: **DD4ULXD8X52** unit complies with the requirement of §15.203.

5. TEST EQUIPMENT CALIBRATION DATE

Conducted Emissions - SR2

Instrument	Manufacturer	Type No.	Serial No.	Cali. Interval	Cali. Due Date
EMI Test Receiver	R&S	ESR7	101209	1 year	2016/11/03
Two-Line V-Network	R&S	ENV216	101683	1 year	2016/11/03
Two-Line V-Network	R&S	ENV216	101684	1 year	2016/11/03
Temperature/Humidity Meter	Yuhuaze	N/A	N/A	1 year	2016/12/20
Shielding Anechoic Chamber	MIX-BEP	Chamber-SR2	N/A	1 year	2017/05/10

Radiated Emission - AC1

Instrument	Manufacturer	Type No.	Serial No.	Cali. Interval	Cali. Due Date
MXE EMI Receiver	Agilent	N9038A	MY51210182	1 year	2017/08/03
Preamplifier	Agilent	83017A	MY52090106	1 year	2017/03/28
Broadband Coaxial Preamplifier	Schwarzbeck	BBV 9721	1519-041	1 year	2017/04/11
Loop Antenna	Schwarzbeck	FMZB1519	9162-047	1 year	2016/12/14
TRILOG Antenna	Schwarzbeck	VULB9162	9120D-1167	1 year	2016/11/07
Broad-Band Horn Antenna	Schwarzbeck	BBHA9120D	BBHA9170549	1 year	2016/11/07
Digital Thermometer & Hygrometer	Yuhuaze	HTC-2	N/A	1 year	2016/12/20
Anechoic Chamber	TDK	Chamber-AC1	MY51210182	1 year	2017/05/10

Conducted Test Equipment - TR3

Instrument	Manufacturer	Type No.	Serial No.	Cali. Interval	Cali. Due Date
Spectrum Analyzer	Agilent	N9020A	MY52090106	1 year	2017/05/08
USB Wideband Power Sensor	Boonton	55006	8911	1 year	2017/05/08
Temperature/Humidity Meter	Yuhuaze	HTC-2	N/A	1 year	2016/12/20

Software	Version	Function
e3	V8.3.5	EMI Test Software

6. MEASUREMENT UNCERTAINTY

Where relevant, the following test uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of $k = 2$.

AC Conducted Emission Measurement - SR2
Measuring Uncertainty for a Level of Confidence of 95% ($U=2U_{c(y)}$): 150kHz~30MHz: 3.46dB
Radiated Emission Measurement – AC1
Measuring Uncertainty for a Level of Confidence of 95% ($U=2U_{c(y)}$): 9kHz ~ 1GHz: 4.18dB 1GHz ~ 25GHz: 4.76dB
Spurious Emissions, Conducted - TR3
Measuring Uncertainty for a Level of Confidence of 95% ($U=2U_{c(y)}$): 0.78dB
Output Power - TR3
Measuring Uncertainty for a Level of Confidence of 95% ($U=2U_{c(y)}$): 1.13dB
Power Spectrum Density - TR3
Measuring Uncertainty for a Level of Confidence of 95% ($U=2U_{c(y)}$): 1.15dB
Occupied Bandwidth - TR3
Measuring Uncertainty for a Level of Confidence of 95% ($U=2U_{c(y)}$): 0.28%

7. TEST RESULT

7.1. Summary

Company Name: Shure Incorporated

FCC ID: DD4ULXD8X52

IC: 616A-ULXD8X52

Data Rate(s) Tested: 468.75kbps

FCC Part Section(s)	RSS Section(s)	Test Description	Test Limit	Test Condition	Test Result	Reference
15.247(a)(2)	RSS-247 [5.2]	6dB Bandwidth	$\geq 500\text{kHz}$	Conducted	Pass	Section 7.2
15.247(b)(3)	RSS-247 [5.4(4)]	Output Power	$\leq 1\text{Watt} \text{ & EIRP } \leq 4\text{Watt}$		Pass	Section 7.3
15.247(e)	RSS-247 [5.2]	Power Spectral Density	$\leq 8\text{dBm} / 3\text{kHz Band}$		Pass	Section 7.4
15.247(d)	RSS-247 [5.5]	Band Edge / Out-of-Band Emissions	$\geq 20\text{dBc(Peak)}$		Pass	Section 7.5
15.205 15.209	RSS-247 [5.5]	General Field Strength Limits (Restricted Bands and Radiated Emission Limits)	Emissions in restricted bands must meet the radiated limits detailed in 15.209	Radiated	Pass	Section 7.6&7.7
15.207	RSS-Gen [8.8]	AC Conducted Emissions 150kHz - 30MHz	$< \text{FCC 15.207 limits}$	Line Conducted	Pass	Section 7.8

Notes:

- 1) All modes of operation and data rates were investigated. For radiated emission test, every axis (X, Y, Z) was also verified. The test results shown in the following sections represent the worst case emissions.
- 2) The analyzer plots shown in this section were all taken with a correction table loaded into the analyzer. The correction table was used to account for the losses of the cables and attenuators used as part of the system to connect the EUT to the analyzer at all frequencies of interest.
- 3) All antenna port conducted emissions testing was performed on a test bench with the antenna port of the EUT connected to the spectrum analyzer through calibrated cables and attenuators.
- 4) For the test items "6dB Bandwidth & Band Edge / Out-of-Band Emissions & Radiated Spurious Emission & Radiated Band-edge", we only evaluated the low/high power level mode.

7.2. 6dB Bandwidth Measurement

7.2.1. Test Limit

The minimum 6dB bandwidth shall be at least 500 kHz.

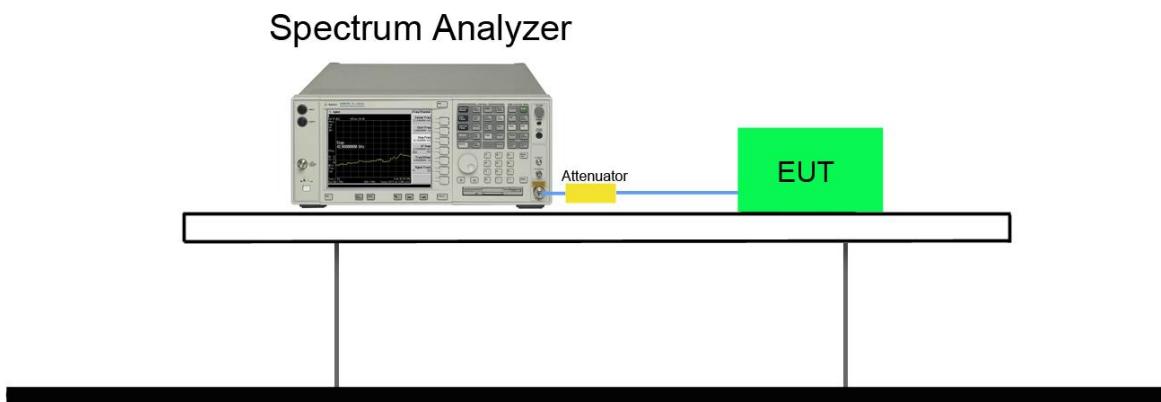
7.2.2. Test Procedure used

KDB 558074 D01v03r05 – Section 8.2 Option 2

7.2.3. Test Setting

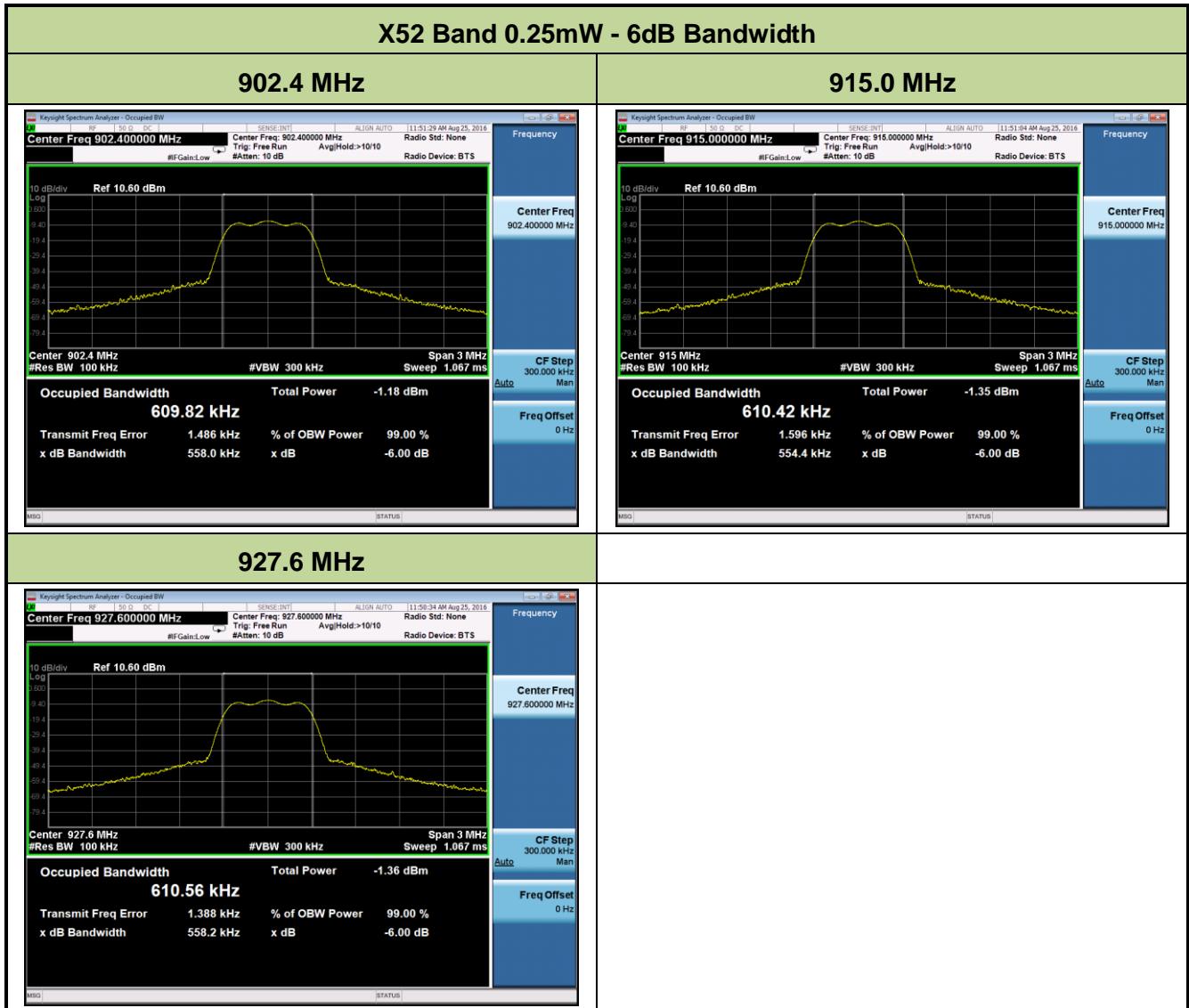
1. The Spectrum's automatic bandwidth measurement capability was used to perform the 6dB bandwidth measurement. The "X" dB bandwidth parameter was set to $X = 6$. The bandwidth measurement was not influenced by any intermediate power nulls in the fundamental emission.
2. Set RBW = 100 kHz
3. VBW $\geq 3 \times$ RBW
4. Detector = Peak
5. Trace mode = max hold
6. Sweep = auto couple
7. Allow the trace was allowed to stabilize

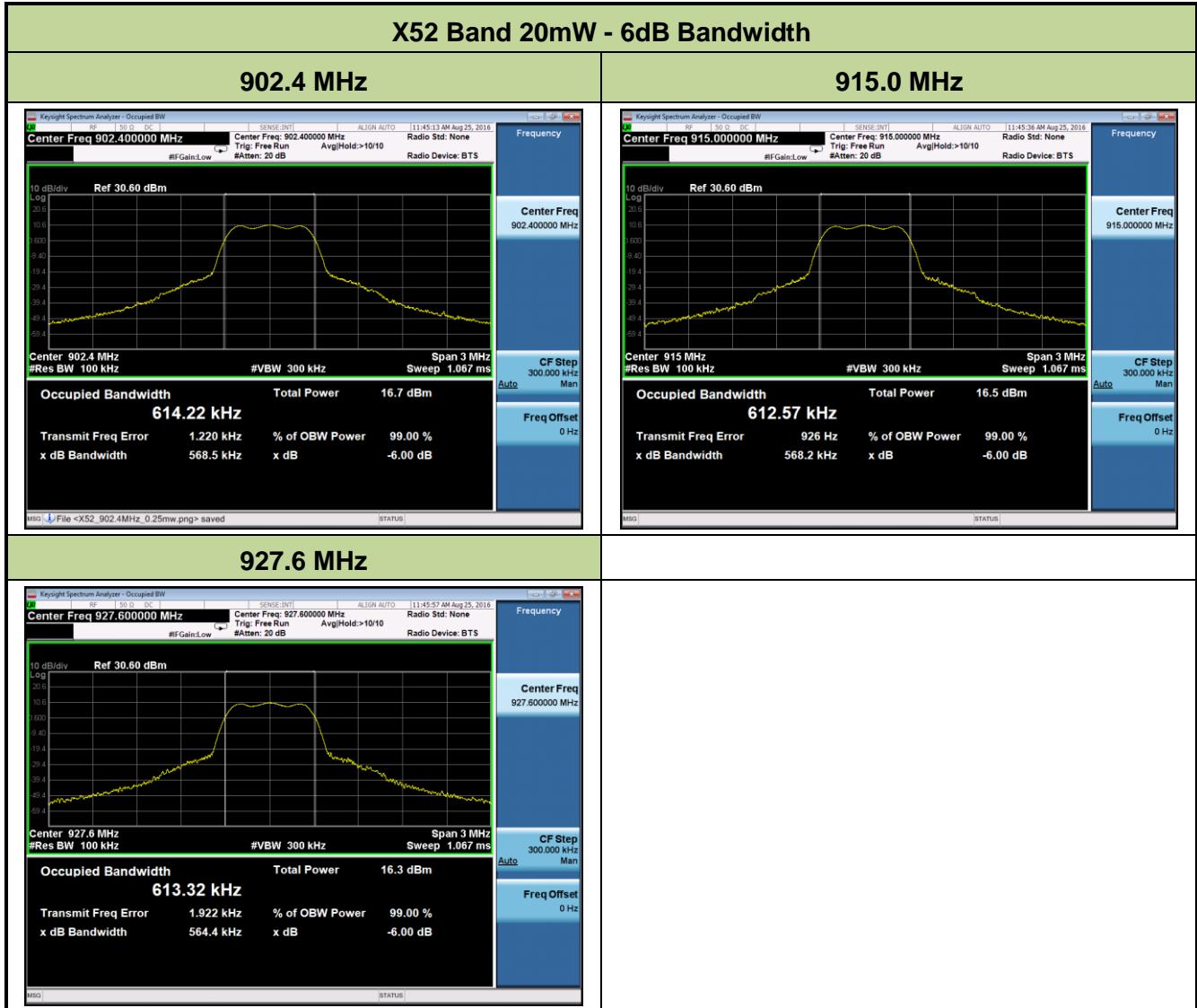
7.2.4. Test Setup



7.2.5. Test Result

Power Level (mW)	Frequency (MHz)	6dB Bandwidth (kHz)	Limit (kHz)	Result	99% Bandwidth (kHz)
0.25	902.4	558.0	≥ 500	Pass	609.82
	915.0	554.4	≥ 500	Pass	610.42
	927.6	558.2	≥ 500	Pass	610.56
20	902.4	568.5	≥ 500	Pass	614.22
	915.0	568.2	≥ 500	Pass	612.57
	927.6	564.4	≥ 500	Pass	613.32





7.3. Output Power Measurement

7.3.1. Test Limit

The maximum output power shall be less 1 Watt (30dBm).

7.3.2. Test Procedure Used

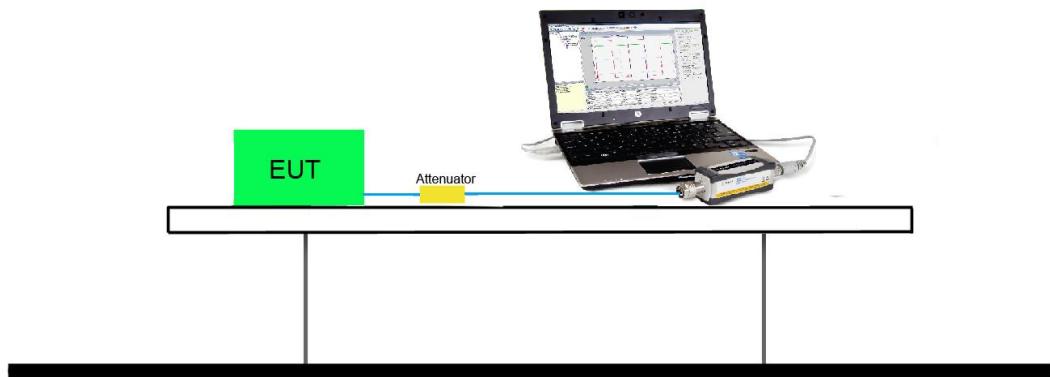
KDB 558074 D01v03r05 - Section 9.1.2 PKPM1 Peak Power Method (for signals with $BW \leq 50MHz$)

7.3.3. Test Setting

Method PKPM1 (Peak Power Measurement of Signals with DTS $BW \leq 50MHz$)

Peak power measurements were performed only when the EUT was transmitting at its maximum power control level using a broadband power meter with a pulse sensor. The pulse sensor employs a $VBW = 50MHz$ so this method was only used for signals whose DTS bandwidth was less than or equal to 50MHz.

7.3.4. Test Setup



7.3.5. Test Result of Output Power

Power Level (mW)	Frequency (MHz)	Peak Output Power (dBm)	Limit (dBm)	E.I.R.P (dBm)	E.I.R.P Limit (dBm)	Result
0.25	902.4	-0.11	≤ 30	1.34	≤ 36	Pass
0.25	915.0	-0.15	≤ 30	1.30	≤ 36	Pass
0.25	927.6	-0.21	≤ 30	1.24	≤ 36	Pass
10	902.4	15.48	≤ 30	16.93	≤ 36	Pass
10	915.0	15.38	≤ 30	16.83	≤ 36	Pass
10	927.6	15.15	≤ 30	16.60	≤ 36	Pass
20	902.4	18.18	≤ 30	19.63	≤ 36	Pass
20	915.0	18.07	≤ 30	19.52	≤ 36	Pass
20	927.6	17.97	≤ 30	19.42	≤ 36	Pass

Note: E.I.R.P (dBm) = Peak Output Power (dBm) + Antenna Gain (dBi).

7.3.6. Test Result of Average Output Power (Reporting Only)

Power Level (mW)	Frequency (MHz)	Average Output Power (dBm)	Limit (dBm)	E.I.R.P (dBm)	E.I.R.P Limit (dBm)	Result
0.25	902.4	-4.80	≤ 30	-3.35	≤ 36	Pass
0.25	915.0	-4.91	≤ 30	-3.46	≤ 36	Pass
0.25	927.6	-5.01	≤ 30	-3.56	≤ 36	Pass
10	902.4	11.26	≤ 30	12.71	≤ 36	Pass
10	915.0	11.15	≤ 30	12.60	≤ 36	Pass
10	927.6	11.05	≤ 30	12.50	≤ 36	Pass
20	902.4	14.16	≤ 30	15.61	≤ 36	Pass
20	915.0	14.07	≤ 30	15.52	≤ 36	Pass
20	927.6	13.92	≤ 30	15.37	≤ 36	Pass

Note: E.I.R.P (dBm) = Average Output Power (dBm) + Antenna Gain (dBi).

7.4. Power Spectral Density Measurement

7.4.1. Test Limit

The maximum permissible power spectral density is 8dBm in any 3 kHz band.

7.4.2. Test Procedure Used

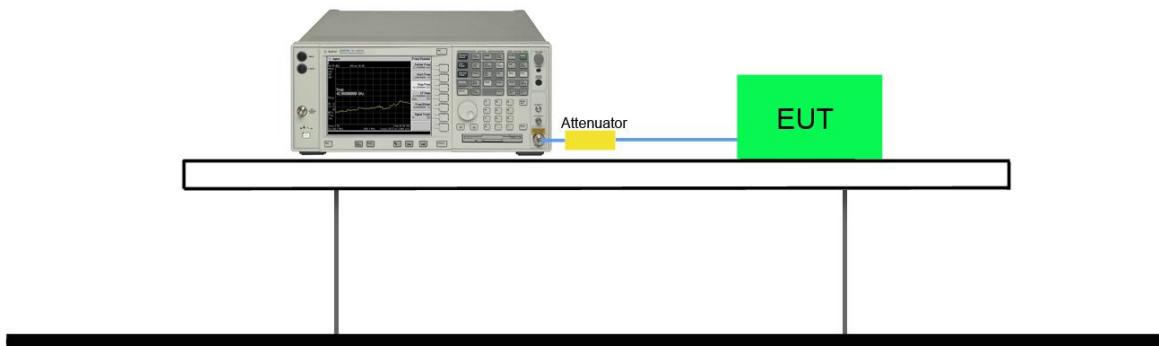
KDB 558074 D01v03r05 - Section 10.2 Method PKPSD

7.4.3. Test Setting

1. Analyzer was set to the center frequency of the DTS channel under investigation
2. Span = 1.5 times the DTS channel bandwidth
3. RBW = 3kHz
4. VBW = 10kHz
5. Detector = peak
6. Sweep time = auto couple
7. Trace mode = max hold
8. Trace was allowed to stabilize

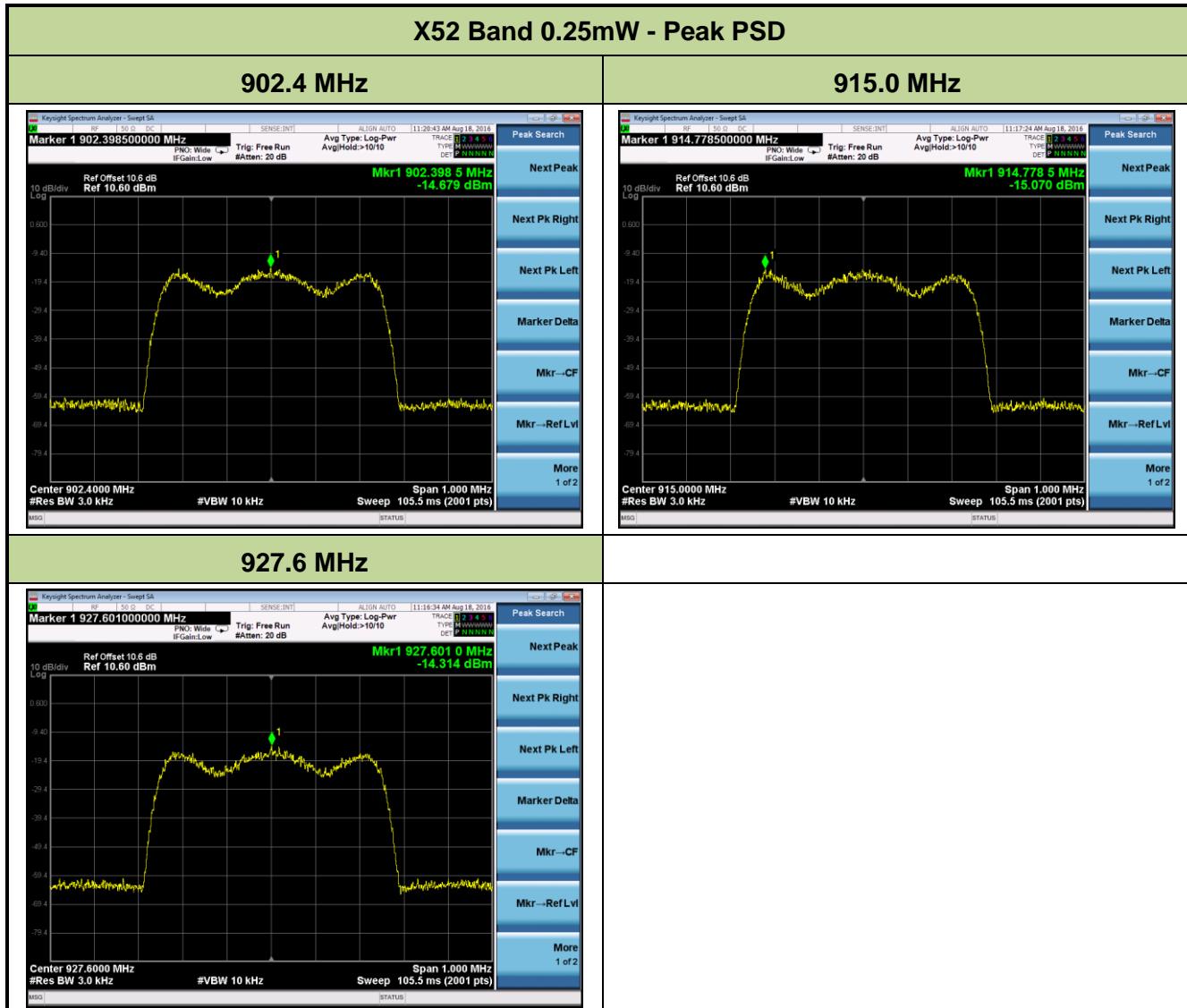
7.4.4. Test Setup

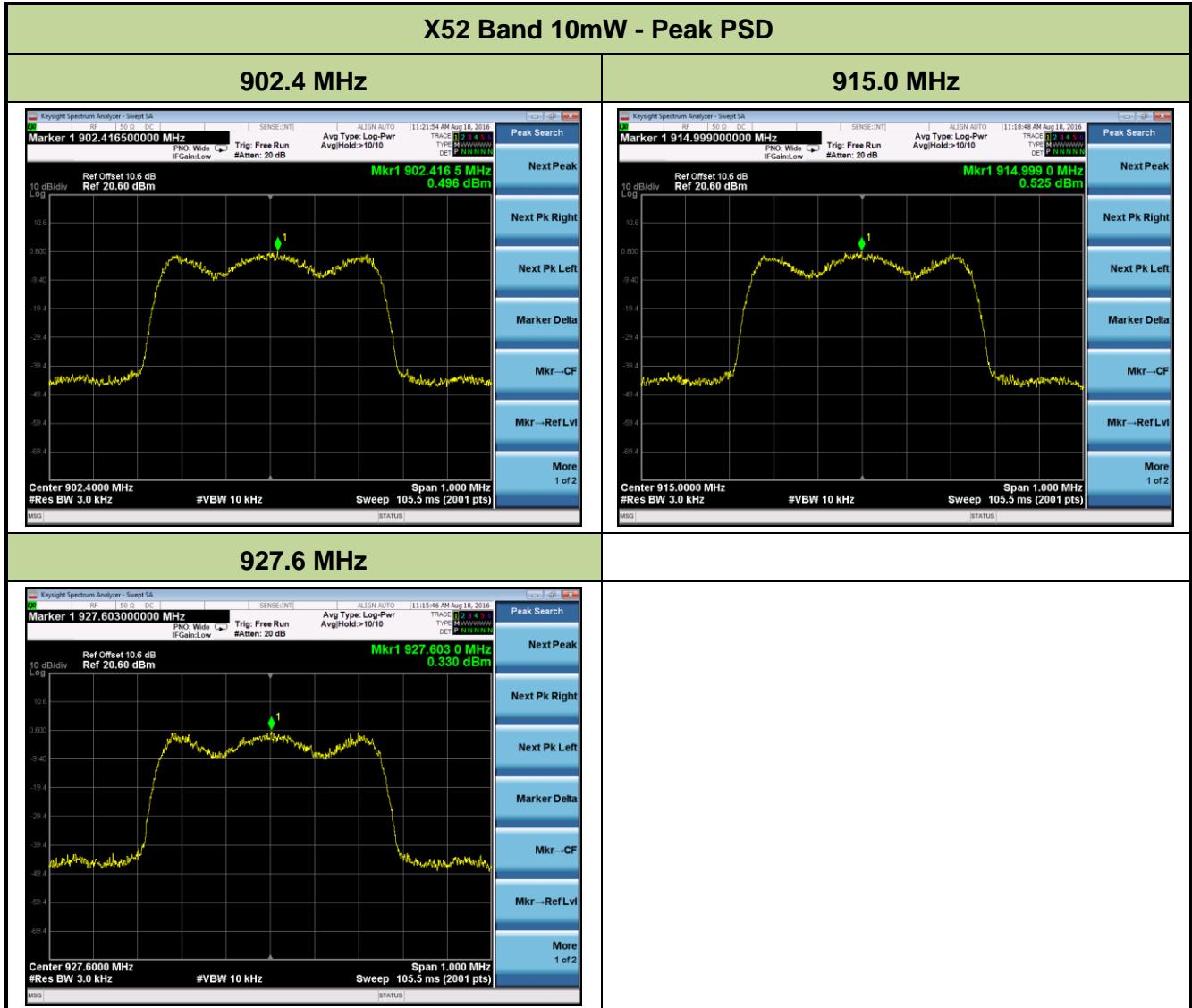
Spectrum Analyzer

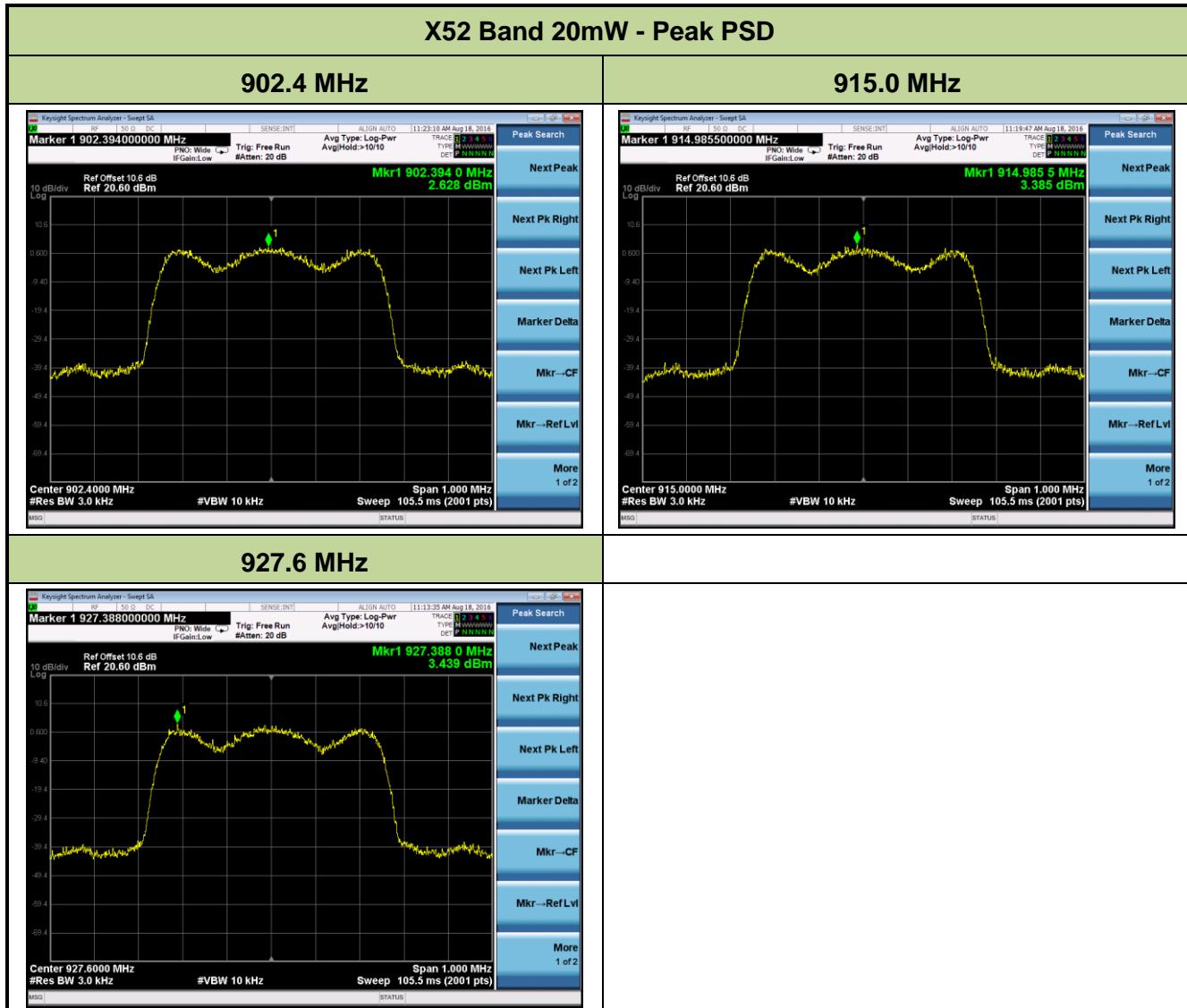


7.4.5. Test Result

Power Level (mW)	Frequency (MHz)	PSD Level (dBm / 3kHz)	Limit (dBm / 3kHz)	Result
0.25	902.4	-14.68	≤ 8.0	Pass
0.25	915.0	-15.07	≤ 8.0	Pass
0.25	927.6	-14.31	≤ 8.0	Pass
10	902.4	0.50	≤ 8.0	Pass
10	915.0	0.53	≤ 8.0	Pass
10	927.6	0.33	≤ 8.0	Pass
20	902.4	2.63	≤ 8.0	Pass
20	915.0	3.39	≤ 8.0	Pass
20	927.6	3.44	≤ 8.0	Pass







7.5. Conducted Band Edge and Out-of-Band Emissions

7.5.1. Test Limit

The limit for out-of-band spurious emissions at the band edge is 20dB below the fundamental emission level, as determined from the in-band power measurement of the DTS channel performed in a 100 kHz bandwidth per the PSD procedure.

7.5.2. Test Procedure Used

KDB 558074 D01v03r05 - Section 11.2 & Section 11.3

7.5.3. Test Setting

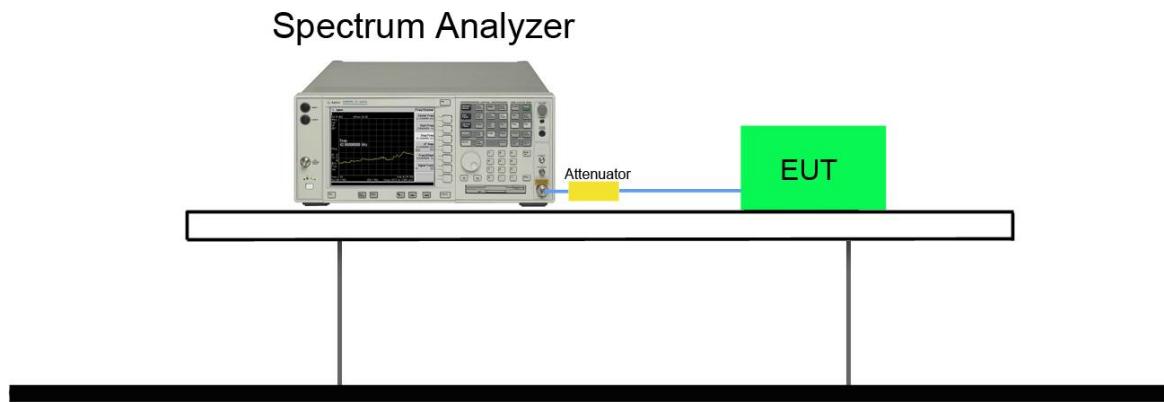
1. Reference level measurement

- (a) Set instrument center frequency to DTS channel center frequency
- (b) Set the span to \geq 1.5 times the DTS bandwidth
- (c) Set the RBW = 100 kHz
- (d) Set the VBW \geq 3 x RBW
- (e) Detector = peak
- (f) Sweep time = auto couple
- (g) Trace mode = max hold
- (h) Allow trace to fully stabilize

2. Emission level measurement

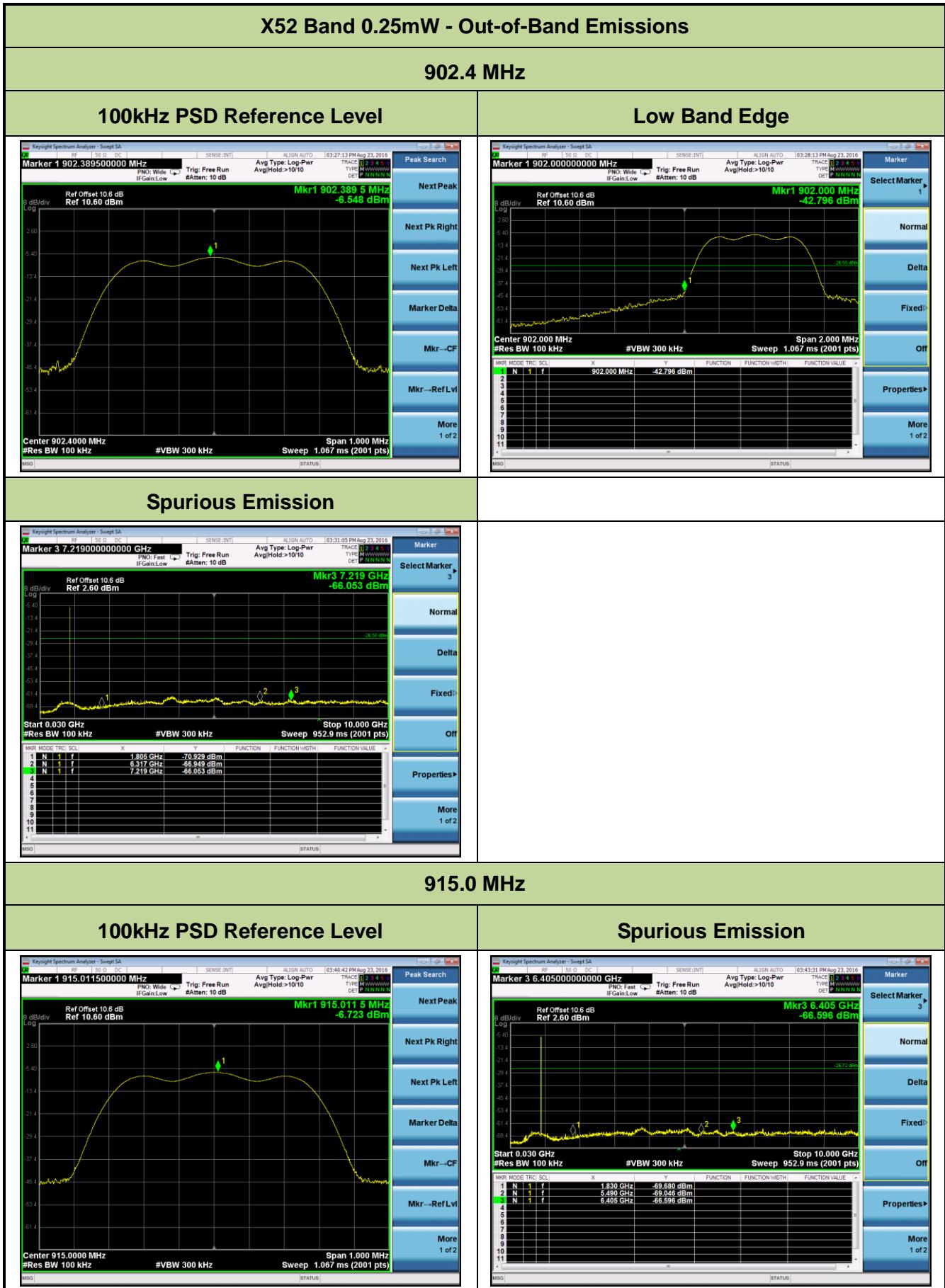
- (a) Set the center frequency and span to encompass frequency range to be measured
- (b) RBW = 100kHz
- (c) VBW = 300kHz
- (d) Detector = Peak
- (e) Trace mode = max hold
- (f) Sweep time = auto couple
- (g) The trace was allowed to stabilize

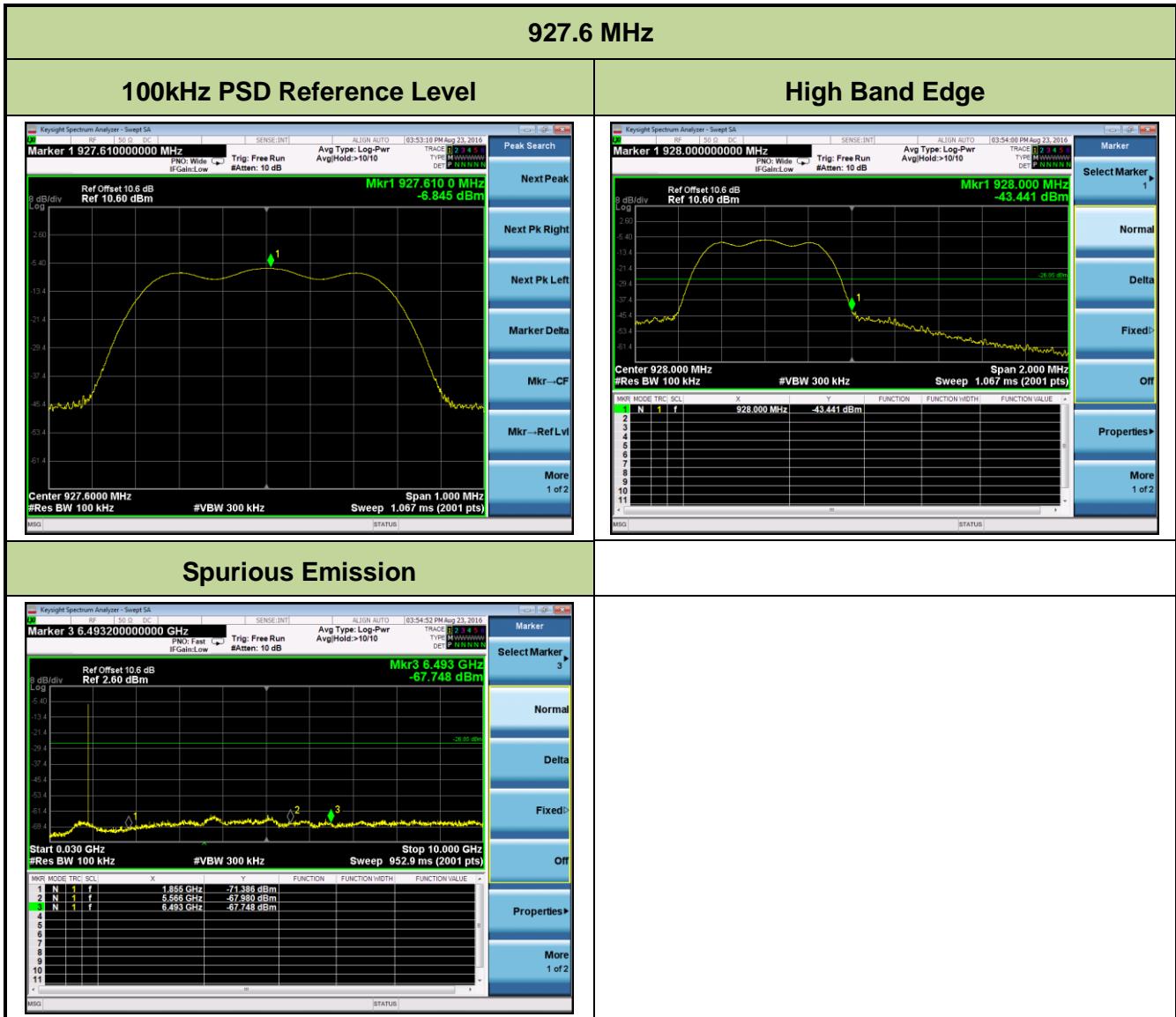
7.5.4. Test Setup



7.5.5. Test Result

Power Level (mW)	Frequency (MHz)	Limit	Result
0.25	902.4	20dBc	Pass
0.25	915.0	20dBc	Pass
0.25	927.6	20dBc	Pass
20	902.4	20dBc	Pass
20	915.0	20dBc	Pass
20	927.6	20dBc	Pass





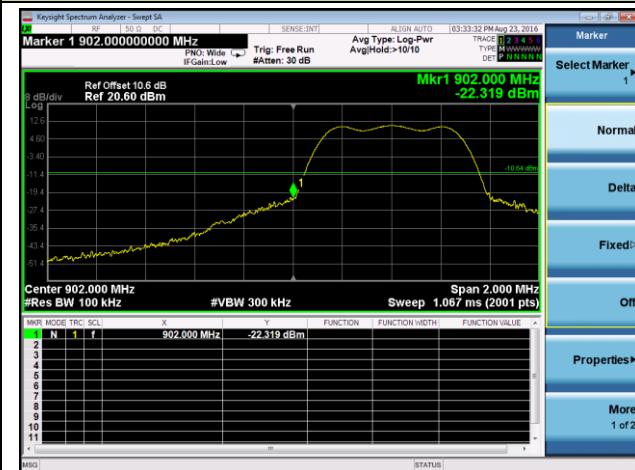
X52 Band 20mW - Out-of-Band Emissions

902.4 MHz

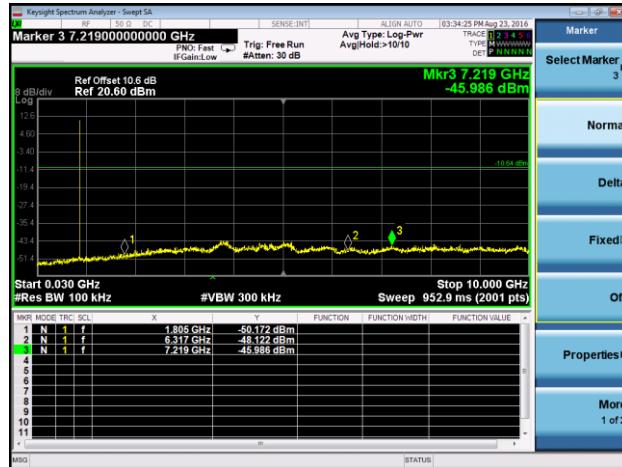
100kHz PSD Reference Level



Low Band Edge



Spurious Emission

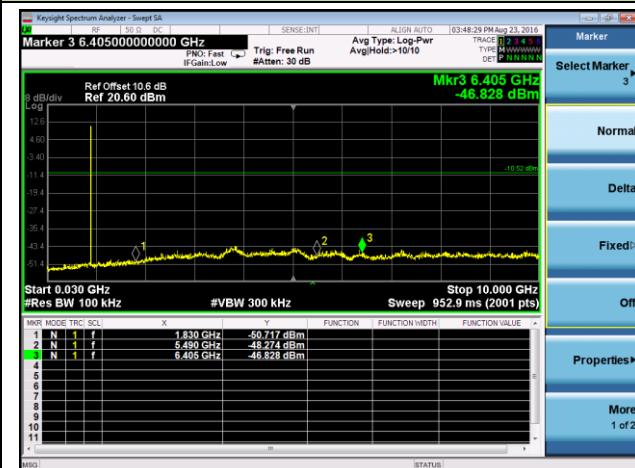


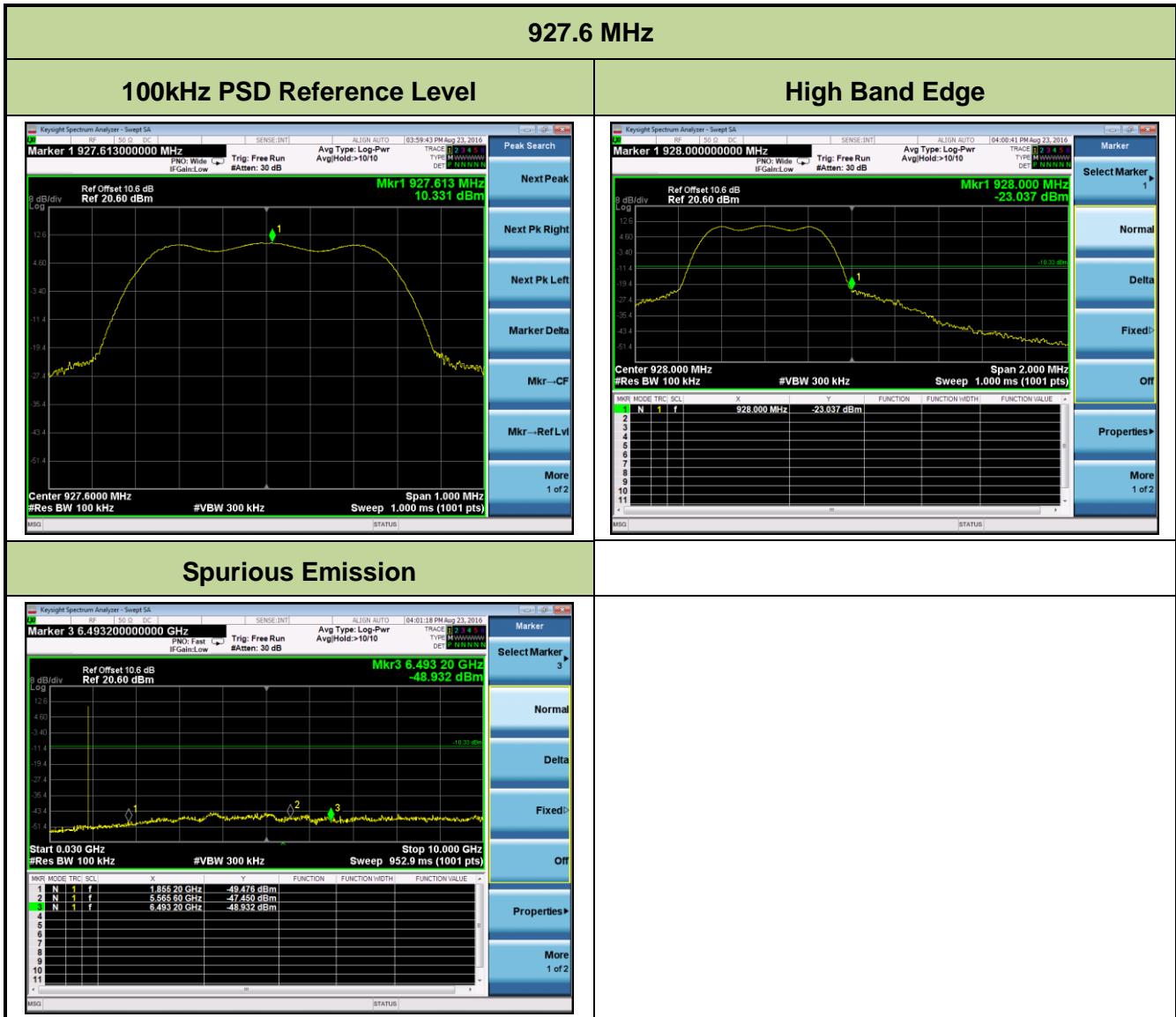
915.0 MHz

100kHz PSD Reference Level



Spurious Emission





7.6. Radiated Spurious Emission Measurement

7.6.1. Test Limit

All out of band emissions appearing in a restricted band as specified in Section 15.205 of the Title 47 CFR must not exceed the limits shown in Table per Section 15.209.

FCC Part 15 Subpart C Paragraph 15.209		
Frequency [MHz]	Field Strength [uV/m]	Measured Distance [Meters]
0.009 – 0.490	2400/F (kHz)	300
0.490 – 1.705	24000/F (kHz)	30
1.705 - 30	30	30
30 - 88	100	3
88 - 216	150	3
216 - 960	200	3
Above 960	500	3

7.6.2. Test Procedure Used

KDB 558074 D01v03r05 – Section 12.2.3 (quasi-peak measurements)

KDB 558074 D01v03r05 – Section 12.2.4 (peak power measurements)

KDB 558074 D01v03r05 – Section 12.2.5 (average power measurements)

7.6.3. Test Setting

Peak Field Strength Measurements per Section 12.2.4 of KDB 558074 D01v03r05

1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
2. RBW = as specified in Table 1
3. VBW = 3MHz
4. Detector = peak
5. Sweep time = auto couple

6. Trace mode = max hold
7. Trace was allowed to stabilize

Table 1 - RBW as a function of frequency

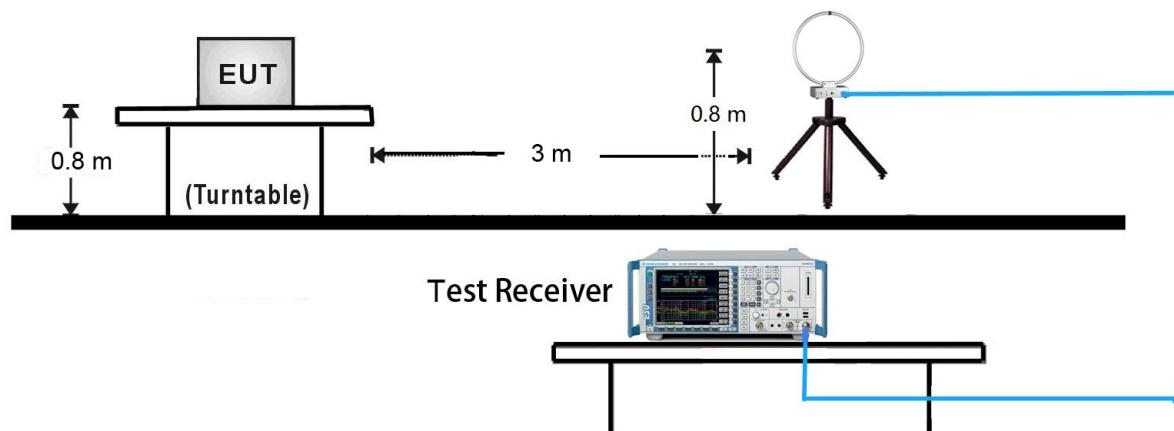
Frequency	RBW
9 ~ 150 kHz	200 ~ 300 Hz
0.15 ~ 30 MHz	9 ~ 10 kHz
30 ~ 1000 MHz	100 ~ 120 kHz
> 1000 MHz	1 MHz

Average Field Strength Measurements per Section 12.2.5.3 of KDB 558074 D01v03r05

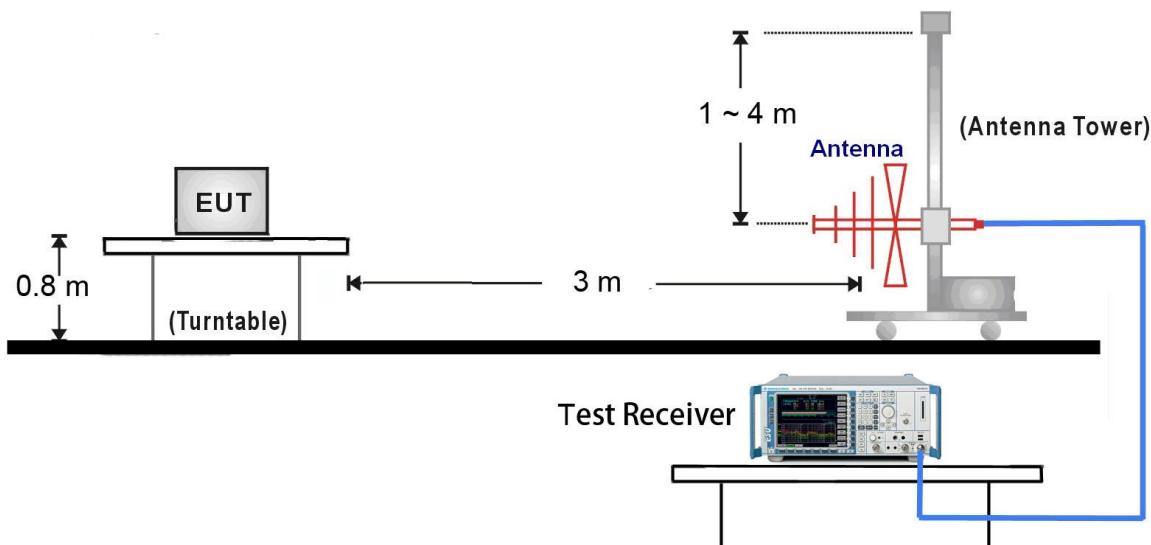
1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
2. RBW = 1MHz
3. VBW $\geq 1/T$
4. De As an alternative, the instrument may be set to linear detector mode. Ensure that video filtering is applied in linear voltage domain (rather than in a log or dB domain). Some instruments require linear display mode in order to accomplish this. Others have a setting for Average-VBW Type, which can be set to "Voltage" regardless of the display mode
5. Detector = Peak
6. Sweep time = auto
7. Trace mode = max hold
8. Allow max hold to run for at least 50 times (1/duty cycle) traces

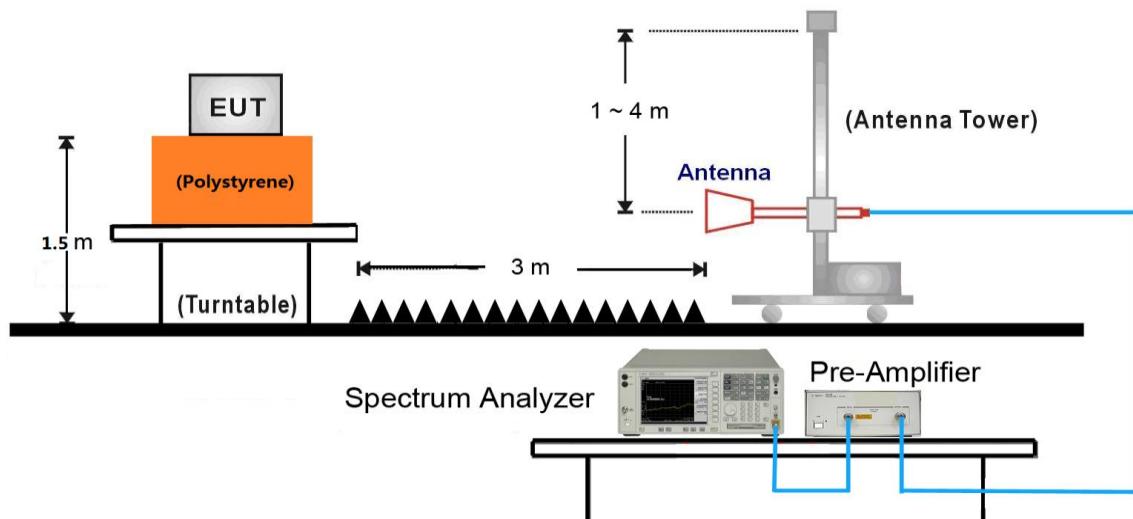
7.6.4. Test Setup

9kHz ~ 30MHz Test Setup:



30MHz ~ 1GHz Test Setup:



1GHz ~ 10GHz Test Setup:

7.6.5. Test Result

Test Mode:	X52 Band - 0.25mW	Test Site:	AC1
Frequency:	902.4MHz	Test Engineer:	Lewis Huang
Remark:	1. Average measurement was not performed if peak level lower than average limit. 2. Other frequency was 20dB below limit line within 1-10GHz, there is not show in the report.		

Mark	Frequency (MHz)	Reading Level (dB μ V)	Factor (dB)	Measure Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Detector	Polarization
*	1804.8	40.2	-6.9	33.3	74.0	-40.7	Peak	Horizontal
	2707.2	37.5	-2.7	34.8	74.0	-39.2	Peak	Horizontal
	3609.6	36.1	-0.7	35.4	74.0	-38.6	Peak	Horizontal
*	6316.8	35.5	5.0	40.5	74.0	-33.5	Peak	Horizontal
*	1804.8	39.0	-6.9	32.1	74.0	-41.9	Peak	Vertical
	2707.2	36.2	-2.7	33.5	74.0	-40.5	Peak	Vertical
	3609.6	35.4	-0.7	34.7	74.0	-39.3	Peak	Vertical
*	6316.8	33.7	5.0	38.7	74.0	-35.3	Peak	Vertical

Note 1: “**” is not in restricted band, its limit is 20dBc of the fundamental emission level (82.9dB μ V/m) or 15.209 which is higher.

Note 2: Measure Level (dB μ V/m) = Reading Level (dB μ V) + Factor (dB)

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m) - Pre_Amplifier Gain (dB)

Test Mode:	X52 Band - 0.25mW	Test Site:	AC1
Frequency:	915MHz	Test Engineer:	Lewis Huang
Remark:	1. Average measurement was not performed if peak level lower than average limit. 2. Other frequency was 20dB below limit line within 1-10GHz, there is not show in the report.		

Mark	Frequency (MHz)	Reading Level (dB μ V)	Factor (dB)	Measure Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Detector	Polarization
*	1830.0	37.9	-6.8	31.1	74.0	-42.9	Peak	Horizontal
	2745.0	37.5	-2.5	35.0	74.0	-39.0	Peak	Horizontal
	3660.0	35.1	-0.6	34.5	74.0	-39.5	Peak	Horizontal
*	6405.0	34.1	5.5	39.6	74.0	-34.4	Peak	Horizontal
*	1830.0	38.7	-6.8	31.9	74.0	-42.1	Peak	Vertical
	2745.0	37.0	-2.5	34.5	74.0	-39.5	Peak	Vertical
	3660.0	34.6	-0.6	34.0	74.0	-40.0	Peak	Vertical
*	6405.0	35.0	5.5	40.5	74.0	-33.5	Peak	Vertical

Note 1: “*” is not in restricted band, its limit is 20dBc of the fundamental emission level (82.7dB μ V/m) or 15.209 which is higher.

Note 2: Measure Level (dB μ V/m) = Reading Level (dB μ V) + Factor (dB)

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m) - Pre_Amplifier Gain (dB)

Test Mode:	X52 Band - 0.25mW	Test Site:	AC1
Frequency:	927.6MHz	Test Engineer:	Lewis Huang
Remark:	1. Average measurement was not performed if peak level lower than average limit. 2. Other frequency was 20dB below limit line within 1-10GHz, there is not show in the report.		

Mark	Frequency (MHz)	Reading Level (dB μ V)	Factor (dB)	Measure Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Detector	Polarization
*	1855.2	38.5	-6.6	31.9	74.0	-42.1	Peak	Horizontal
	2782.8	37.0	-2.4	34.6	74.0	-39.4	Peak	Horizontal
	3710.4	34.9	-0.5	34.4	74.0	-39.6	Peak	Horizontal
*	6493.2	33.3	5.9	39.2	74.0	-34.8	Peak	Horizontal
*	1855.2	38.6	-6.6	32.0	74.0	-42.0	Peak	Vertical
	2782.8	37.8	-2.4	35.4	74.0	-38.6	Peak	Vertical
	3710.4	35.6	-0.5	35.1	74.0	-38.9	Peak	Vertical
*	6493.2	33.8	5.9	39.7	74.0	-34.3	Peak	Vertical

Note 1: “*” is not in restricted band, its limit is 20dBc of the fundamental emission level (82.6dB μ V/m) or 15.209 which is higher.

Note 2: Measure Level (dB μ V/m) = Reading Level (dB μ V) + Factor (dB)

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m) - Pre_Amplifier Gain (dB)

Test Mode:	X52 Band - 20mW	Test Site:	AC1
Frequency:	902.4MHz	Test Engineer:	Lewis Huang
Remark:	1. Average measurement was not performed if peak level lower than average limit. 2. Other frequency was 20dB below limit line within 1-10GHz, there is not show in the report.		

Mark	Frequency (MHz)	Reading Level (dB μ V)	Factor (dB)	Measure Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Detector	Polarization
*	1804.8	41.5	-6.9	34.6	79.6	-45.0	Peak	Horizontal
	2707.2	38.3	-2.7	35.6	74.0	-38.4	Peak	Horizontal
	3609.6	35.6	-0.7	34.9	74.0	-39.1	Peak	Horizontal
*	6316.8	33.7	5.0	38.7	79.6	-40.9	Peak	Horizontal
*	1804.8	42.4	-6.9	35.5	79.6	-44.1	Peak	Vertical
	2707.2	37.7	-2.7	35.0	74.0	-39.0	Peak	Vertical
	3609.6	37.1	-0.7	36.4	74.0	-37.6	Peak	Vertical
*	6316.8	33.8	5.0	38.8	79.6	-40.8	Peak	Vertical

Note 1: “*” is not in restricted band, its limit is 20dBc of the fundamental emission level (99.6dB μ V/m) or 15.209 which is higher.

Note 2: Measure Level (dB μ V/m) = Reading Level (dB μ V) + Factor (dB)

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m) - Pre_Amplifier Gain (dB)

Test Mode:	X52 Band - 20mW	Test Site:	AC1
Frequency:	915MHz	Test Engineer:	Lewis Huang
Remark:	1. Average measurement was not performed if peak level lower than average limit. 2. Other frequency was 20dB below limit line within 1-10GHz, there is not show in the report.		

Mark	Frequency (MHz)	Reading Level (dB μ V)	Factor (dB)	Measure Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Detector	Polarization
*	1830.0	41.5	-6.8	34.7	79.5	-44.8	Peak	Horizontal
	2745.0	39.4	-2.5	36.9	74.0	-37.1	Peak	Horizontal
	3660.0	37.2	-0.6	36.6	74.0	-37.4	Peak	Horizontal
*	6405.0	33.9	5.5	39.4	79.5	-40.1	Peak	Horizontal
*	1830.0	42.5	-6.8	35.7	79.5	-43.8	Peak	Vertical
	2745.0	38.0	-2.5	35.5	74.0	-38.5	Peak	Vertical
	3660.0	35.5	-0.6	34.9	74.0	-39.1	Peak	Vertical
*	6405.0	34.5	5.5	40.0	79.5	-39.5	Peak	Vertical

Note 1: “*” is not in restricted band, its limit is 20dBc of the fundamental emission level (99.5dB μ V/m) or 15.209 which is higher.

Note 2: Measure Level (dB μ V/m) = Reading Level (dB μ V) + Factor (dB)

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m) - Pre_Amplifier Gain (dB)

Test Mode:	X52 Band - 20mW	Test Site:	AC1
Frequency:	927.6MHz	Test Engineer:	Lewis Huang
Remark:	1. Average measurement was not performed if peak level lower than average limit. 2. Other frequency was 20dB below limit line within 1-10GHz, there is not show in the report.		

Mark	Frequency (MHz)	Reading Level (dB μ V)	Factor (dB)	Measure Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Detector	Polarization
*	1855.2	39.8	-6.6	33.2	79.4	-46.2	Peak	Horizontal
	2782.8	36.9	-2.4	34.5	74.0	-39.5	Peak	Horizontal
	3710.4	35.8	-0.5	35.3	74.0	-38.7	Peak	Horizontal
*	6493.2	34.1	5.9	40.0	79.4	-39.4	Peak	Horizontal
*	1855.2	43.3	-6.6	36.7	79.4	-42.7	Peak	Vertical
	2782.8	38.1	-2.4	35.7	74.0	-38.3	Peak	Vertical
	3710.4	36.0	-0.5	35.5	74.0	-38.5	Peak	Vertical
*	6493.2	34.0	5.9	39.9	79.4	-39.5	Peak	Vertical

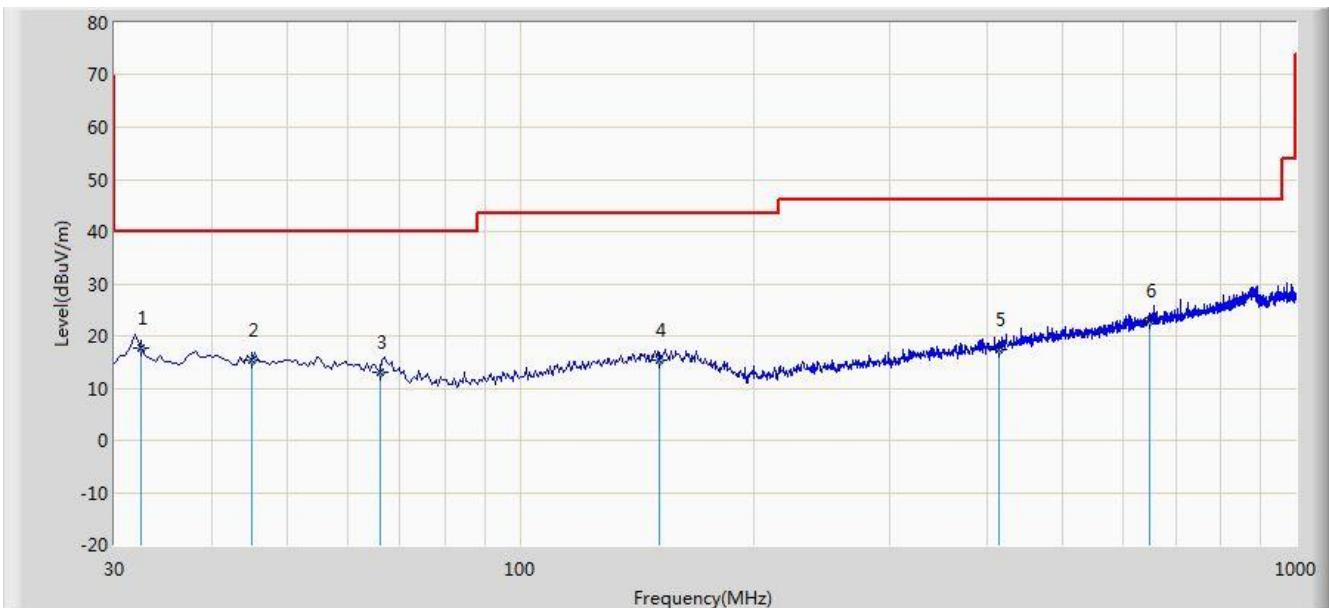
Note 1: “*” is not in restricted band, its limit is 20dBc of the fundamental emission level (99.4dB μ V/m) or 15.209 which is higher.

Note 2: Measure Level (dB μ V/m) = Reading Level (dB μ V) + Factor (dB)

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m) - Pre_Amplifier Gain (dB)

The worst case of Radiated Emission below 1GHz:

Site: AC1	Time: 2016/08/22 - 21:34
Limit: FCC_Part15.209_RE(3m)	Engineer: Lewis Huang
Probe: VULB 9168 _20-2000MHz	Polarity: Horizontal
EUT: Wireless Gooseneck Transmitter	Power: By Battery
Worse Case Mode: Transmit by X52 Band at Channel 927.6MHz (Power Level: 20mW)	

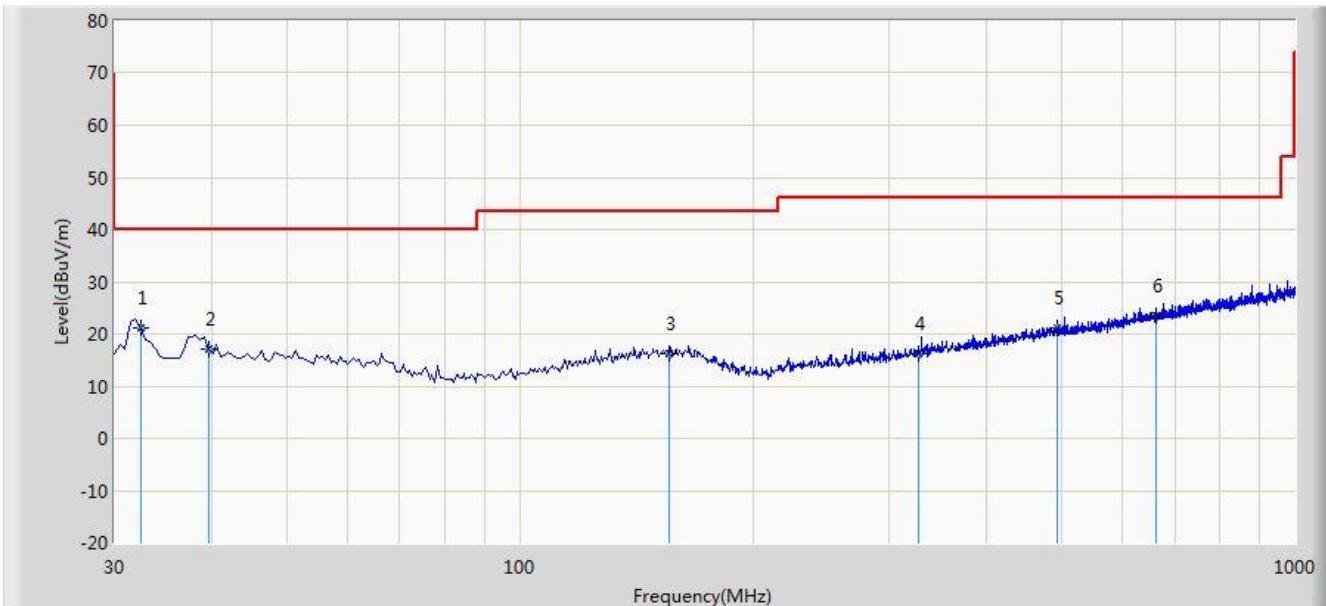


No	Flag	Mark	Frequency (MHz)	Measure Level (dB μ V/m)	Reading Level (dB μ V)	Over Limit (dB)	Limit (dB μ V/m)	Factor (dB)	Type
1	*		32.425	17.735	4.027	-22.265	40.000	13.708	QP
2			45.035	15.233	1.040	-24.767	40.000	14.193	QP
3			65.890	13.149	0.884	-26.851	40.000	12.265	QP
4			151.250	15.433	0.249	-28.067	43.500	15.184	QP
5			413.635	17.393	0.549	-28.607	46.000	16.844	QP
6			649.345	22.865	1.508	-23.135	46.000	21.357	QP

Note: Measure Level (dB μ V/m) = Reading Level (dB μ V) + Factor (dB)

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m)

Site: AC1	Time: 2016/08/22 - 21:36
Limit: FCC_Part15.209_RE(3m)	Engineer: Lewis Huang
Probe: VULB 9168 _20-2000MHz	Polarity: Vertical
EUT: Wireless Gooseneck Transmitter	Power: By Battery
Worse Case Mode: Transmit by X52 Band at Channel 927.6MHz (Power Level: 20mW)	

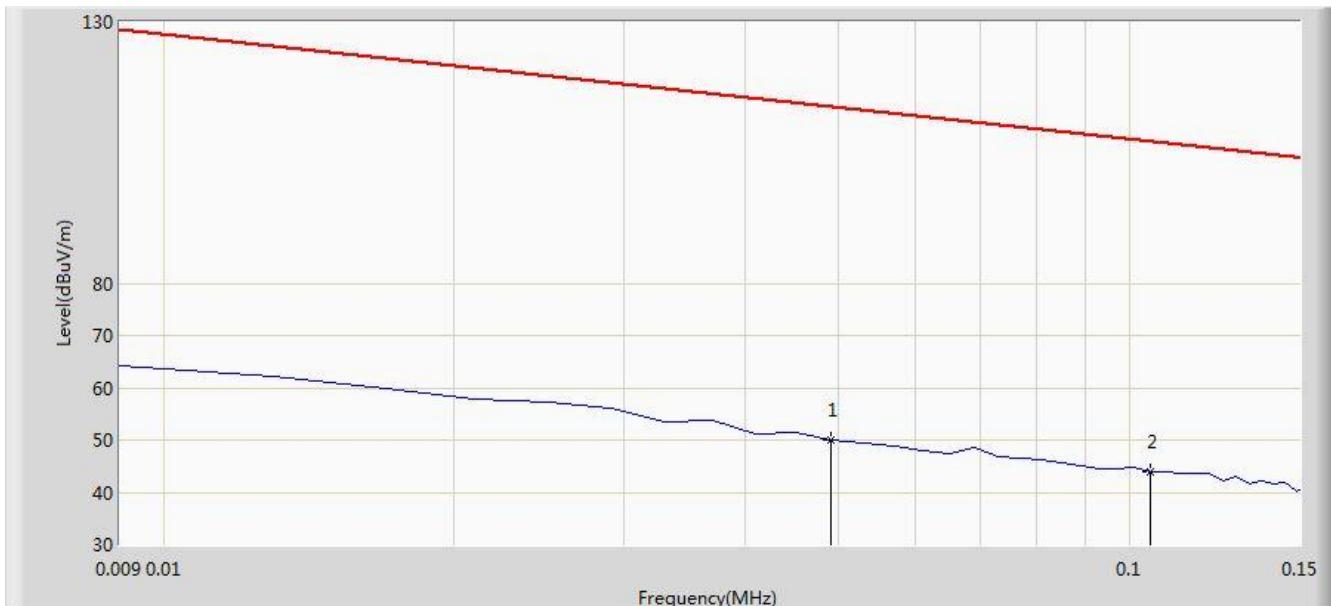


No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		*	32.425	21.121	7.413	-18.879	40.000	13.708	QP
2			39.700	17.100	2.592	-22.900	40.000	14.508	QP
3			156.100	16.127	0.944	-27.373	43.500	15.183	QP
4			327.305	16.326	1.276	-29.674	46.000	15.050	QP
5			493.660	21.015	2.618	-24.985	46.000	18.397	QP
6			661.470	23.446	1.935	-22.554	46.000	21.511	QP

Note: Measure Level (dB μ V/m) = Reading Level (dB μ V) + Factor (dB)

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m)

Site: AC1	Time: 2016/08/23 - 22:18
Limit: FCC_Part15.209_RE(3m)	Engineer: Roy Cheng
Probe: FMZB1519_0.009-30MHz	Polarity: Face on
EUT: Wireless Gooseneck Transmitter	Power: AC 120V/60Hz
Note: There is the ambient noise within frequency range 9kHz~30MHz.	

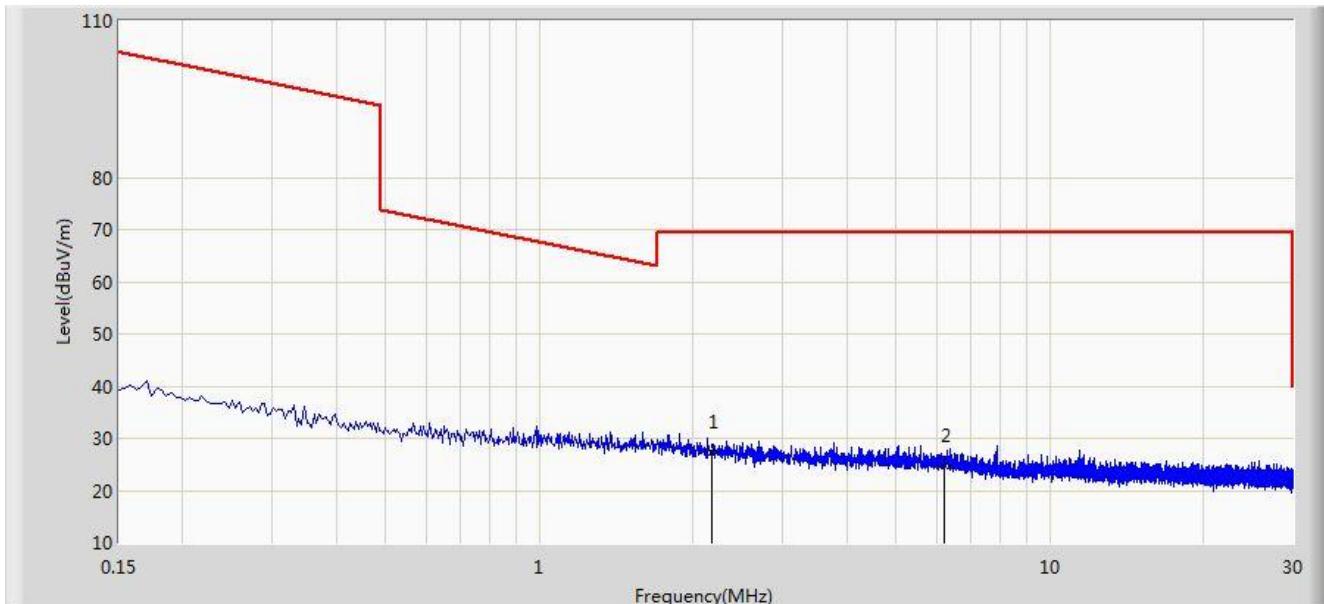


No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1			0.049	50.112	29.552	-63.688	113.800	20.560	AV
2		*	0.105	44.043	23.845	-63.137	107.180	20.198	QP

Note: Measure Level (dB μ V/m) = Reading Level (dB μ V) + Factor (dB)

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m)

Site: AC1	Time: 2016/08/23 - 22:20
Limit: FCC_Part15.209_RE(3m)	Engineer: Roy Cheng
Probe: FMZB1519_0.009-30MHz	Polarity: Face on
EUT: Wireless Gooseneck Transmitter	Power: AC 120V/60Hz
Note: There is the ambient noise within frequency range 9kHz~30MHz.	



No	Flag	Mark	Frequency (MHz)	Measure Level (dB μ V/m)	Reading Level (dB μ V)	Over Limit (dB)	Limit (dB μ V/m)	Factor (dB)	Type
1		*	2.175	27.371	6.960	-42.129	69.500	20.412	QP
2			6.216	24.786	4.701	-44.714	69.500	20.085	QP

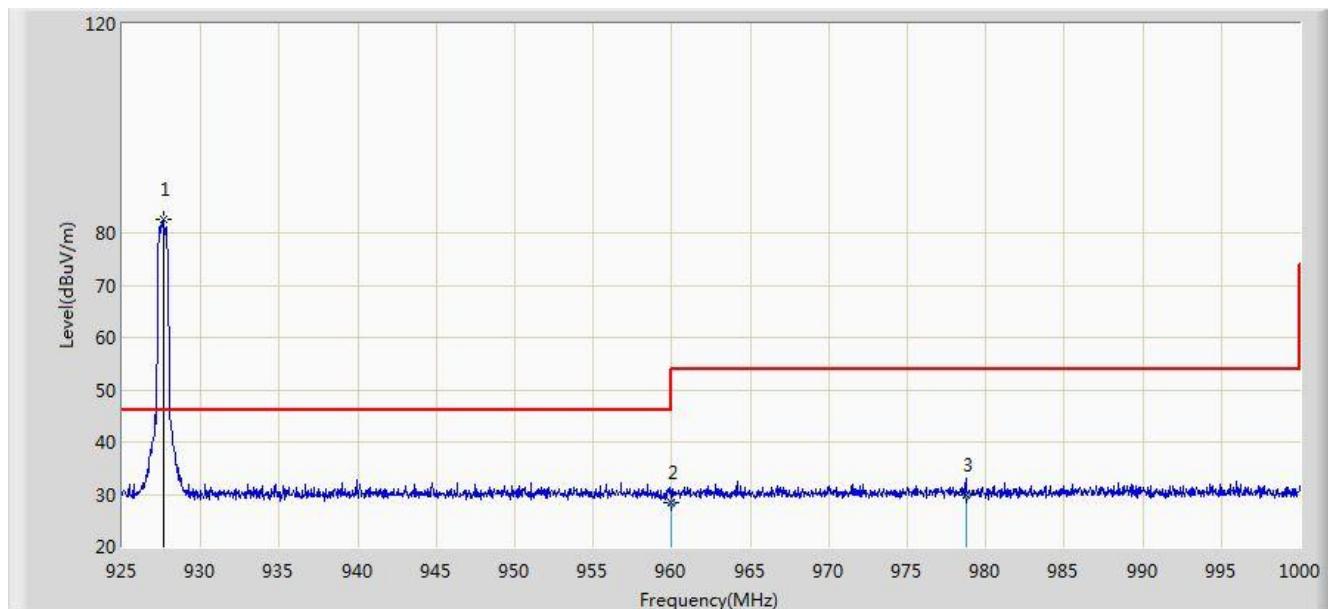
Note: Measure Level (dB μ V/m) = Reading Level (dB μ V) + Factor (dB)

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m)

7.7. Radiated Restricted Band Edge Measurement

7.7.1. Test Result

Site: AC1	Time: 2016/08/25 - 18:58
Limit: FCC_Part15.209_RE(3m)	Engineer: Lewis Huang
Probe: VULB 9168 _20-2000MHz	Polarity: Horizontal
EUT: Wireless Gooseneck Transmitter	Power: By Battery
Test Mode: Transmit by X52 Band at Channel 927.6MHz (Power Level: 0.25mW)	

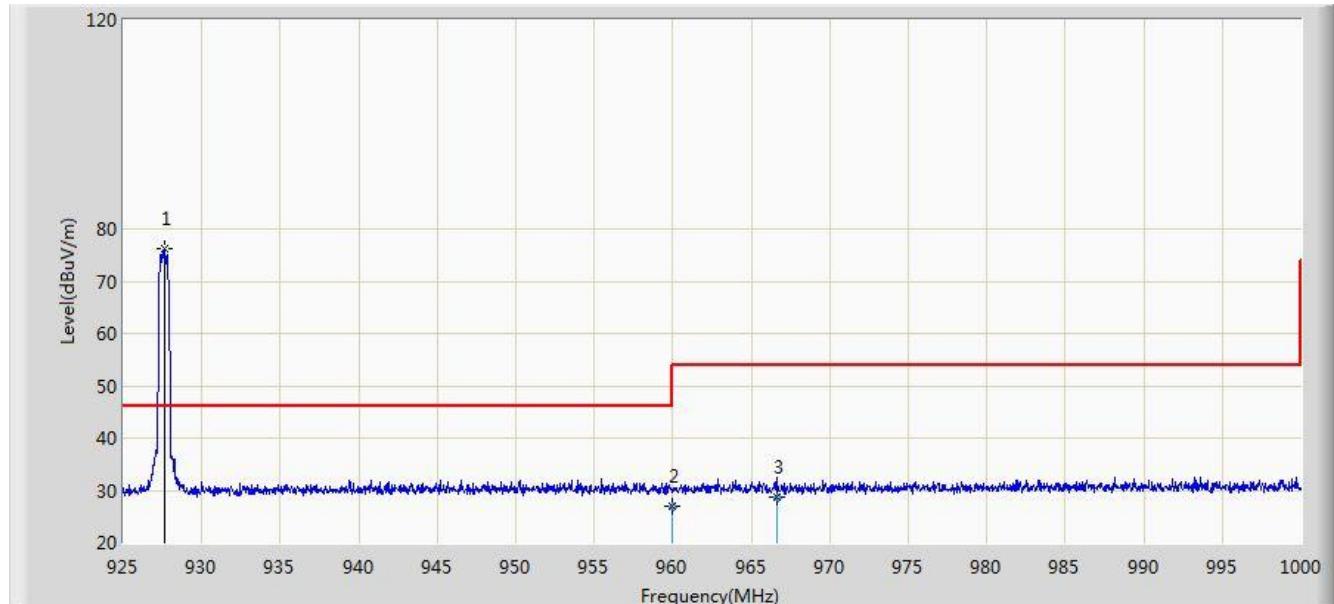


No	Flag	Mark	Frequency (MHz)	Measure Level (dB μ V/m)	Reading Level (dB μ V)	Over Limit (dB)	Limit (dB μ V/m)	Factor (dB)	Type
1	*		927.588	82.616	57.882	N/A	N/A	24.734	PK
2			960.000	28.367	3.421	-17.633	46.000	24.946	QP
3			978.737	29.886	4.852	-24.114	54.000	25.034	QP

Note: Measure Level (dB μ V/m) = Reading Level (dB μ V) + Factor (dB)

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m)

Site: AC1	Time: 2016/08/18 - 01:26
Limit: FCC_Part15.209_RE(3m)	Engineer: Lewis Huang
Probe: VULB 9168 _20-2000MHz	Polarity: Vertical
EUT: Wireless Gooseneck Transmitter	Power: By Battery
Test Mode: Transmit by X52 Band at Channel 927.6MHz (Power Level: 0.25mW)	

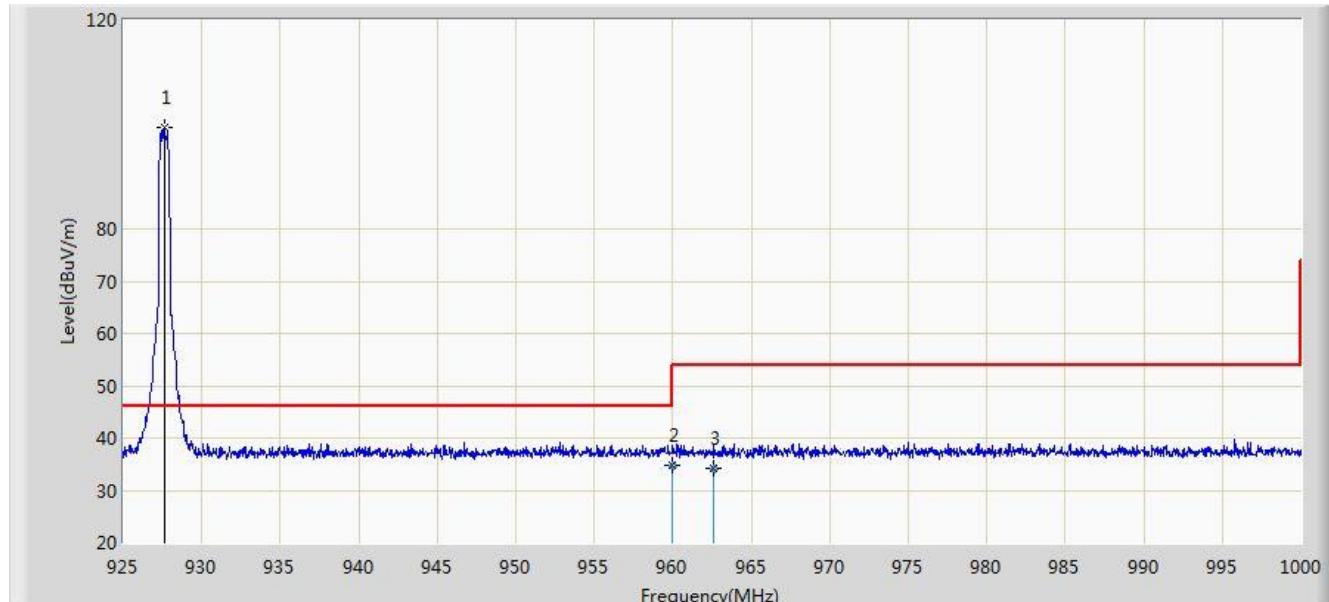


No	Flag	Mark	Frequency (MHz)	Measure Level (dB μ V/m)	Reading Level (dB μ V)	Over Limit (dB)	Limit (dB μ V/m)	Factor (dB)	Type
1		*	927.588	76.151	51.417	N/A	N/A	24.734	PK
2			960.000	27.091	2.145	-18.909	46.000	24.946	QP
3			966.625	28.732	3.741	-25.268	54.000	24.992	QP

Note: Measure Level (dB μ V/m) = Reading Level (dB μ V) + Factor (dB)

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m)

Site: AC1	Time: 2016/08/18 - 01:21
Limit: FCC_Part15.209_RE(3m)	Engineer: Lewis Huang
Probe: VULB 9168 _20-2000MHz	Polarity: Horizontal
EUT: Wireless Gooseneck Transmitter	Power: By Battery
Test Mode: Transmit by X52 Band at Channel 927.6MHz (Power Level: 20mW)	

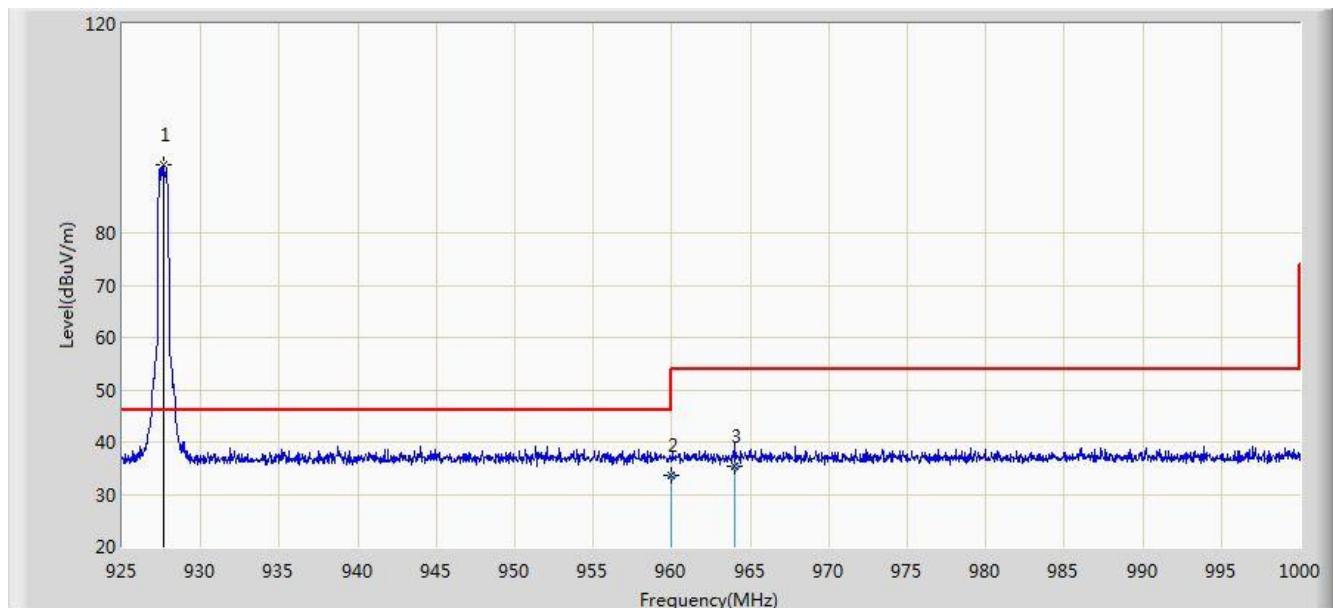


No	Flag	Mark	Frequency (MHz)	Measure Level (dB μ V/m)	Reading Level (dB μ V)	Over Limit (dB)	Limit (dB μ V/m)	Factor (dB)	Type
1		*	927.625	99.418	74.684	N/A	N/A	24.734	PK
2			960.000	34.726	9.780	-11.274	46.000	24.946	QP
3			962.612	34.247	9.280	-19.753	54.000	24.967	QP

Note: Measure Level (dB μ V/m) = Reading Level (dB μ V) + Factor (dB)

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m)

Site: AC1	Time: 2016/08/18 - 01:26
Limit: FCC_Part15.209_RE(3m)	Engineer: Lewis Huang
Probe: VULB 9168 _20-2000MHz	Polarity: Vertical
EUT: Wireless Gooseneck Transmitter	Power: By Battery
Test Mode: Transmit by X52 Band at Channel 927.6MHz (Power Level: 20mW)	



No	Flag	Mark	Frequency (MHz)	Measure Level (dB μ V/m)	Reading Level (dB μ V)	Over Limit (dB)	Limit (dB μ V/m)	Factor (dB)	Type
1		*	927.625	92.986	68.252	N/A	N/A	24.734	PK
2			960.000	33.506	8.560	-12.494	46.000	24.946	QP
3			964.037	35.263	10.290	-18.737	54.000	24.973	QP

Note: Measure Level (dB μ V/m) = Reading Level (dB μ V) + Factor (dB)

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m)

7.8. AC Conducted Emissions Measurement

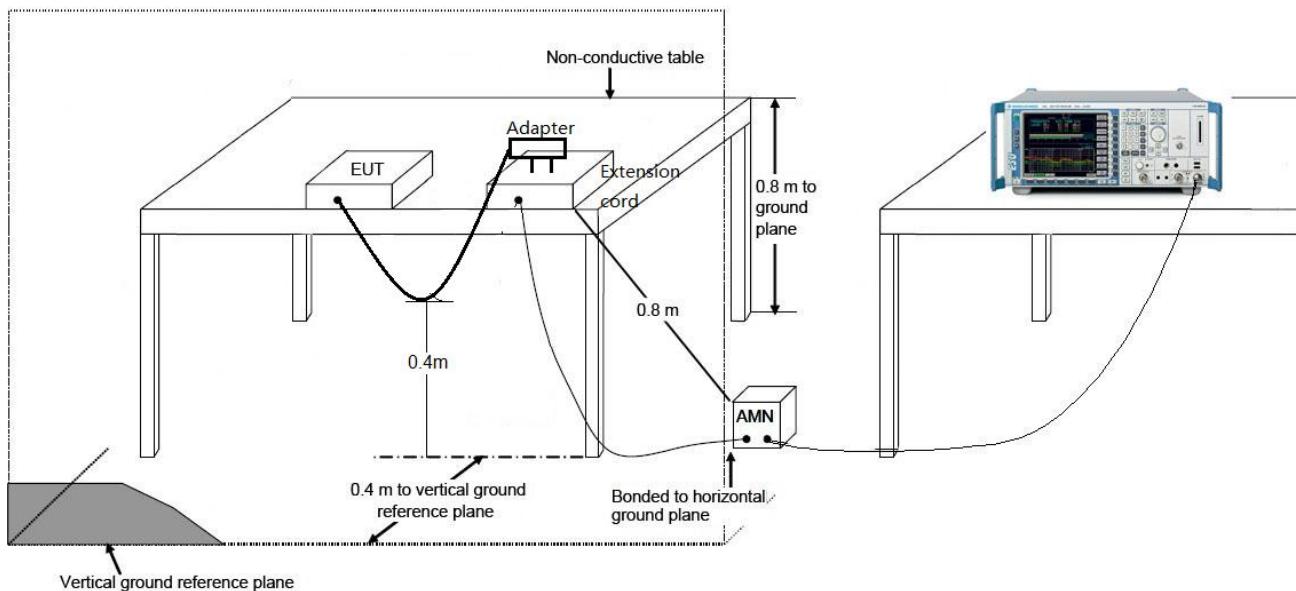
7.8.1. Test Limit

FCC Part 15 Subpart C Paragraph 15.207 Limits		
Frequency (MHz)	QP (dBuV)	AV (dBuV)
0.15 - 0.50	66 - 56	56 – 46
0.50 - 5.0	56	46
5.0 - 30	60	50

Note 1: The lower limit shall apply at the transition frequencies.

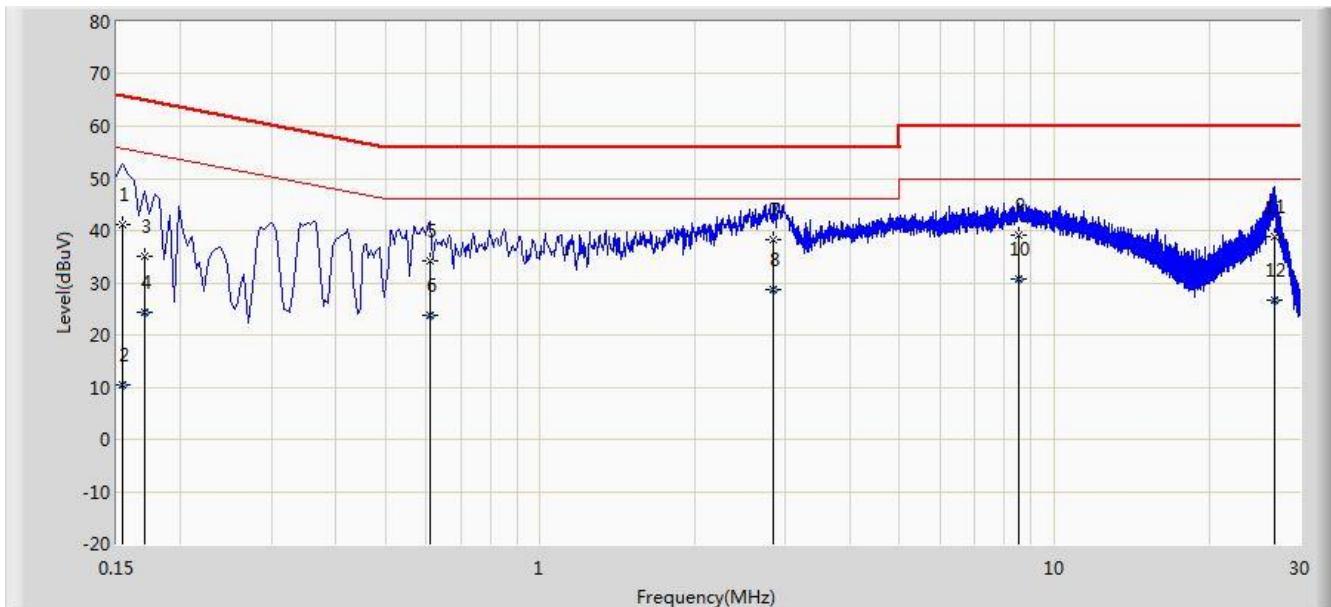
Note 2: The limit decreases linearly with the logarithm of the frequency in the range 0.15MHz to 0.5MHz.

7.8.2. Test Setup



7.8.3. Test Result

Site: SR2	Time: 2016/08/22 - 23:56
Limit: FCC_Part15.207_CE_Class B	Engineer: Lewis Huang
Probe: ENV216_101683_Filter On	Polarity: Line
EUT: Wireless Gooseneck Transmitter	Power: AC 120V/60Hz
Worse Case Mode: Transmit by X52 Band at Channel 927.6MHz	

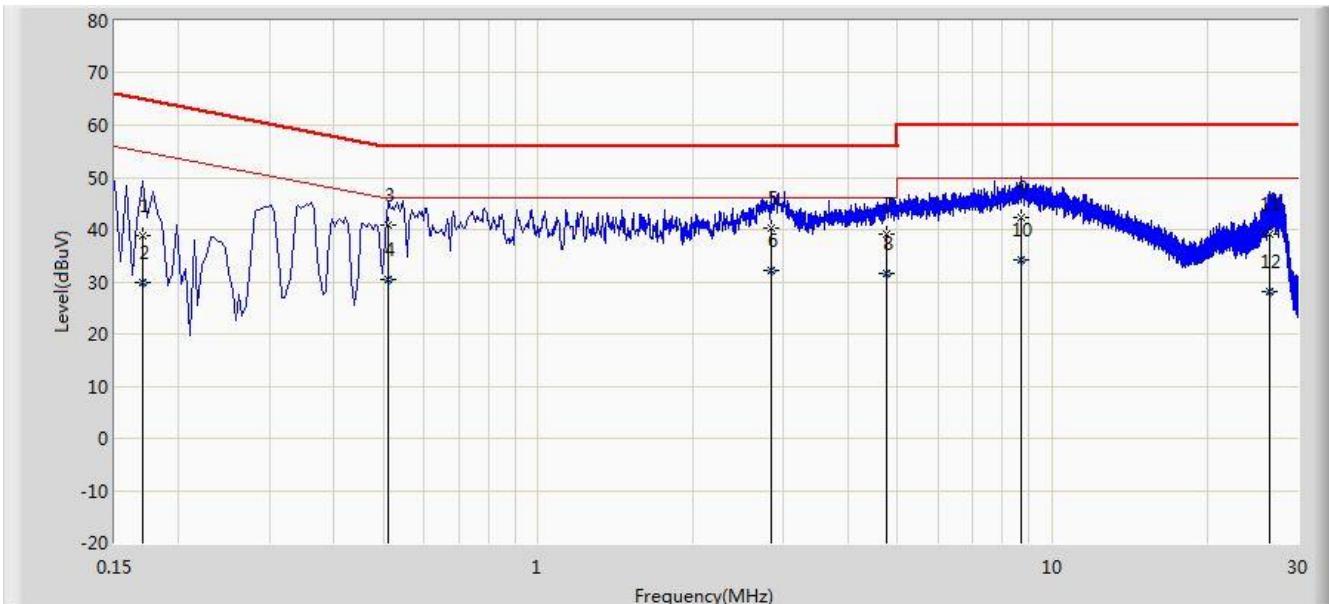


No	Flag	Mark	Frequency (MHz)	Measure Level (dB μ V)	Reading Level (dB μ V)	Over Limit (dB)	Limit (dB μ V)	Factor (dB)	Type
1			0.154	41.094	30.354	-24.688	65.781	10.740	QP
2			0.154	10.317	-0.423	-45.465	55.781	10.740	AV
3			0.170	35.216	25.139	-29.744	64.960	10.078	QP
4			0.170	24.330	14.252	-30.631	54.960	10.078	AV
5			0.610	34.191	24.081	-21.809	56.000	10.110	QP
6			0.610	23.682	13.573	-22.318	46.000	10.110	AV
7			2.842	38.204	28.359	-17.796	56.000	9.846	QP
8	*		2.842	28.818	18.972	-17.182	46.000	9.846	AV
9			8.498	39.076	28.896	-20.924	60.000	10.180	QP
10			8.498	30.741	20.561	-19.259	50.000	10.180	AV
11			26.874	38.708	28.467	-21.292	60.000	10.240	QP
12			26.874	26.537	16.297	-23.463	50.000	10.240	AV

Note: Measure Level (dB μ V) = Reading Level (dB μ V) + Factor (dB)

Factor (dB) = Cable Loss (dB) + LISN Factor (dB)

Site: SR2	Time: 2016/08/22 - 23:54
Limit: FCC_Part15.207_CE_Class B	Engineer: Lewis Huang
Probe: ENV216_101683_Filter On	Polarity: Neutral
EUT: Wireless Gooseneck Transmitter	Power: AC 120V/60Hz
Worse Case Mode: Transmit by X52 Band at Channel 927.6MHz	



No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV)	Factor (dB)	Type
1			0.170	38.708	28.644	-26.253	64.960	10.064	QP
2			0.170	29.754	19.691	-25.206	54.960	10.064	AV
3			0.510	40.884	30.707	-15.116	56.000	10.176	QP
4			0.510	30.337	20.160	-15.663	46.000	10.176	AV
5			2.838	40.210	30.359	-15.790	56.000	9.851	QP
6	*		2.838	32.044	22.193	-13.956	46.000	9.851	AV
7			4.770	39.268	29.238	-16.732	56.000	10.029	QP
8			4.770	31.540	21.511	-14.460	46.000	10.029	AV
9			8.694	42.264	32.070	-17.736	60.000	10.195	QP
10			8.694	34.160	23.965	-15.840	50.000	10.195	AV
11			26.414	39.145	28.790	-20.855	60.000	10.355	QP
12			26.414	28.145	17.790	-21.855	50.000	10.355	AV

Note: Measure Level (dB μ V) = Reading Level (dB μ V) + Factor (dB)

Factor (dB) = Cable Loss (dB) + LISN Factor (dB)

8. CONCLUSION

The data collected relate only the item(s) tested and show that the **Wireless Gooseneck**

Transmitter FCC ID: DD4ULXD8X52 is in compliance with Part 15C of the FCC Rules.

The End
