

TEST REPORT

Product Name : X2 Dongle
Model Number : SVP-D2L1B
FCC ID : 2A4GC-D2L1B

Prepared for : Shiftall Inc.
Address : 4F TokyoDaiwa Bldg., 2-6-10 Nihonbashibakurocho, Chuo,
Tokyo 103-0002, Japan

Prepared by : EMTEK (DONGGUAN) CO., LTD.
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Date(s) of Tests : Nov 18, 2024 to Dec 12, 2024
Date of issue : Dec 12, 2024

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1 TEST RESULT CERTIFICATION

Applicant : Shiftall Inc.
Address : 4F TokyoDaiwa Bldg., 2-6-10 Nihonbashibakurocho, Chuo, Tokyo 103-0002, Japan
Manufacturer : Shiftall Inc.
Address : 4F TokyoDaiwa Bldg., 2-6-10 Nihonbashibakurocho, Chuo, Tokyo 103-0002, Japan
Factory : SHENZHEN PCBA-TECH CO.,LTD.
Address : 2211-B315,Xincheng Plaza Bldg.,Xixiang,Baoan,Shenzhen,Guangdong,China
EUT : X2 Dongle
Model Name : SVP-D2L1B
Trademark : X2 Dongle

Measurement Procedure Used:

APPLICABLE STANDARDS	
STANDARD	TEST RESULT
FCC 47 CFR Part 2 , Subpart J FCC 47 CFR Part 15, Subpart C	PASS
IC RSS-GEN, Issue 5(04-2018)+A1(03-2019)+A2(02-2021) IC RSS-247 Issue 3(08-2023)	PASS

The above equipment was tested by EMTEK(DONGGUAN) CO., LTD. The test data, data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in ANSI C63.10 (2013) and the energy emitted by the sample EUT tested as described in this report is in compliance with the requirements of FCC Rules Part 2, Part 15.247, IC RSS-247 Issue 2 and IC RSS-GEN, Issue 5.

The test results of this report relate only to the tested sample identified in this report.

Date of Test : Nov 18, 2024 to Dec 12, 2024

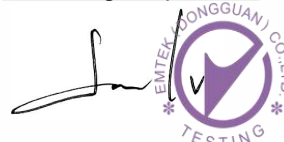
Prepared by : Warren Deng

Warren Deng /Editor

Reviewer : Tim Dong

Tim Dong/ Supervisor

Approve & Authorized Signer : Sam Lv / Manager



Modified History

Version	Report No.	Revision Date	Summary
	EDG2410310054E00401R	/	Original Report

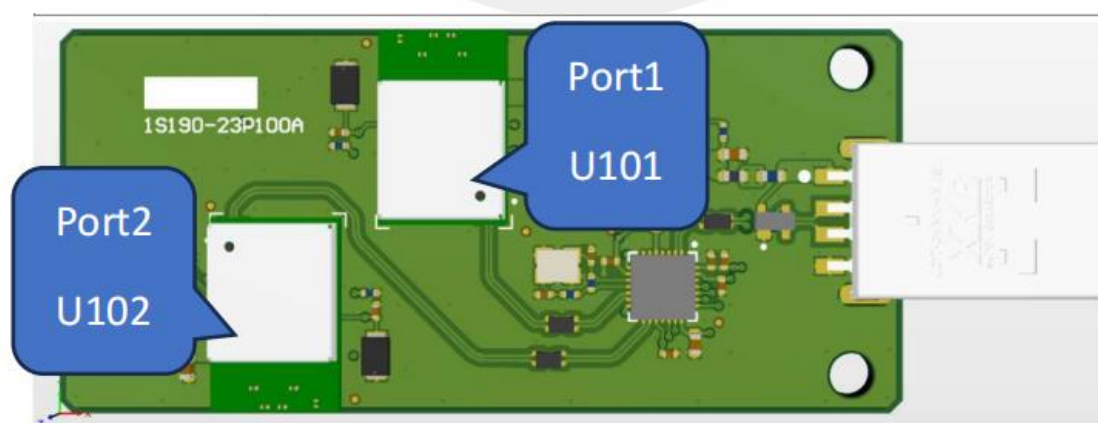


2 EUT TECHNICAL DESCRIPTION

Characteristics	Description
Product:	X2 Dongle
Model Number:	SVP-D2L1B
Sample number:	1#
Data Rate :	1Mbps
Modulation:	GFSK
Operating Frequency Range:	2402-2480MHz
Number of Channels:	79 Channels
Transmit Power Max:	1.69 dBm(0.001476 W)
Antenna Type:	u-blox PCB trace antenna
Antenna Gain:	3.0 dBi
Power Supply:	DC 5V from USB
Temperature Range:	10° C ~ +30° C

Note: for more details, please refer to the User's manual of the EUT.

Note: The product has two identical wireless modules. Antenna 1 represents the antenna of U101 module, while antenna represents the antenna of U102.



3 SUMMARY OF TEST RESULT

FCC Part Clause	IC Part Clause	Test Parameter	Verdict	Remark
15.247(a)(2)	RSS-247 5.2(a) RSS-Gen 6.7	Emission Bandwidth	PASS	
15.247(b)(3)	RSS-247 5.4(d) RSS-Gen 6.12	Maximum Peak Conducted Output Power	PASS	
15.247(e)	RSS-247 5.2(b) RSS-Gen 6.12	Maximum Power Spectral Density Level	PASS	
15.247(d)	RSS-247 5.5	Unwanted Emission Into Non-Restricted Frequency Bands	PASS	
15.247(d)	RSS-247 5.5	Unwanted Emission Into Restricted Frequency Bands (conducted)	PASS	
15.247(d) 15.209 15.205	RSS-Gen 8.9 RSS-Gen 8.10 RSS-Gen 6.13 RSS-247 3.3 RSS-247 5.5	Radiated Spurious Emission	PASS	
15.207	RSS-Gen 8.8	Conducted Emission Test	PASS	
15.203 15.247(b)	RSS-Gen 6.8 RSS-247 5.4	Antenna Application	PASS	
NOTE1: N/A (Not Applicable)				
NOTE2: According to FCC OET KDB 558074, the report use radiated measurements in the restricted frequency bands. In addition, the radiated test is also performed to ensure the emissions emanating from the device cabinet also comply with the applicable limits.				

RELATED SUBMITTAL(S)/GRANT(S):

This submittal(s) (test report) is intended for **FCC ID: 2A4GC-D2L1B** filing to comply with Section 15.247 of the FCC Part 15, Subpart C Rules.

4 TEST METHODOLOGY

4.1 GENERAL DESCRIPTION OF APPLIED STANDARDS

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

FCC 47 CFR Part 2, Subpart J

FCC 47 CFR Part 15, Subpart C

IC RSS-GEN, Issue 5(04-2018)+A1(03-2019)+A2(02-2021)

IC RSS-247 Issue 3(08-2023)

FCC KDB 558074 D01 15.247 Meas Guidance v05r02

4.2 MEASUREMENT EQUIPMENT USED

Conducted Emission Test Equipment

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
EMI Test Receiver	Rohde&Schwarz	ESCI	100137	2024/4/29	1Year
Signal Analyzer	R&S	FSV30	103039	2024/4/28	1 Year
AMN	Rohde&Schwarz	ENV216	101209	2024/4/28	1Year
AMN	Rohde&Schwarz	ENV216	100017	2024/4/28	1Year
RF Switching Unit	CDS	RSU-M2	38401	2024/4/28	1Year
AMN	Schwarzbeck	NNLK8121	8121-641	2024/4/28	1Year
AMN	Rohde&Schwarz	ESH3-Z6	101101	2024/4/28	1Year
AMN	Rohde&Schwarz	ESH3-Z6	101102	2024/4/28	1Year
Power Splitters & Dividers	Weinschel Associates	WA1506A	A1066	2024/4/28	1Year
Current Probe	FCC	F-52	8377	2024/4/28	1Year
Passive voltage probe	Rohde&Schwarz	ESH2-Z3	100122	2024/4/28	1Year

For Spurious Emissions Test

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
EMI Test Receiver	Rohde&Schwarz	ESCI	101415	2024/4/28	1Year
Signal Analyzer	R&S	FSV30	103039	2024/4/28	1 Year
Bi-log Hybrid Antenna	Schwarzbeck	VULB9163	141	2024/5/5	1Year
Pre-Amplifier	HP	8447F	OPTH64	2024/4/28	1 Year
Signal Analyzer	R&S	FSV30	103039	2024/4/28	1 Year
Horn Antenna	Schwarzbeck	BBHA9120D	1272	2024/5/5	1Year
Horn Antenna	Schwarzbeck	BBHA9170	9170-567	2024/5/5	1Year
Pre-Amplifier	LUNAR EM	PM1-18-40	J10100000081	2024/4/28	1Year
Loop antenna	Schwarzbeck	FMZB1519	1519-012	2024/5/5	1Year

For other test items:

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
Wireless Connectivity Tester	R&S	CMW270	102543	2024/4/29	1Year
Automatic Control Unit	Tonscend	JS0806-2	2118060480	2024/4/29	1Year
Signal Analyzer	KEYSIGHT	N9010B	MY60242456	2024/4/29	1Year
Analog Signal Generator	KEYSIGHT	N5173B	MY61252625	2024/4/29	1Year
UP/DOWN-Converter	R&S	CMW-Z800A	100274	2024/4/29	1Year
Vector Signal Generator	KEYSIGHT	N5182B	MY61252674	2024/4/29	1Year
Frequency Extender	KEYSIGHT	N5182BX07	MY59362541	2024/4/29	1Year
Temperature&Humidity test chamber	ESPEC	EL-02KA	12107166	2024/4/29	1 Year

4.3 DESCRIPTION OF TEST MODES

The EUT has been tested under its typical operating condition.

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner which intends to maximize its emission characteristics in a continuous normal application.

The Transmitter was operated in the normal operating mode. The TX frequency was fixed which was for the purpose of the measurements.

Test of channel included the lowest and middle and highest frequency to perform the test, then record on this report.

Those data rates (2.4G DTS :1Mbps) were used for all test.

Pre-defined engineering program for regulatory testing used to control the EUT for staying in continuous transmitting and receiving mode is programmed.

Frequency and Channel list for 2.4G DTS:

Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
0	2402	19	2440	...	...
1	2404	20	2442	37	2476
2	2406	21	2444	38	2478
...	...	...	...	39	2480

Note: $f_c = 2402\text{MHz} + k \times 2\text{MHz}$ $k=1$ to 40

Test Frequency and channel for 2.4G DTS:

Lowest Frequency		Middle Frequency		Highest Frequency	
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
0	2402	19	2440	39	2480

Multi-antenna correlation:

☐	Transmit Signals are Correlated
	Directional gain = $10 \log[(10^{G1/20} + 10^{G2/20} + \dots + 10^{GN/20})^2 / N_{ANT}]$ dBi
☒	All Transmit Signals are Completely Uncorrelated
	Directional gain = $10 \log[(10^{G1/10} + 10^{G2/10} + \dots + 10^{GN/10}) / N_{ANT}]$ dBi

Directional gain = $10 \log [(10^{0.5/20} + 10^{0.5/20})^2 / 2]$ dBi=6.01 dBi

5 FACILITIES AND ACCREDITATIONS

5.1 FACILITIES

All measurement facilities used to collect the measurement data are located at:

EMTEK (DONGGUAN) CO., LTD.

-1&2/F., Building 2, Zone A, Zhongda Marine Biotechnology Research and Development Base, No.9, Xincheng Avenue, Songshanhu High-technology Industrial Development Zone, Dongguan, Guangdong, China

The sites are constructed in conformance with the requirements of ANSI C63.7, ANSI C63.4 and CISPR Publication 22.

5.2 EQUIPMENT

Radiated emissions are measured with one or more of the following types of linearly polarized antennas: tuned dipole, biconical, log periodic, bi-log, and/or ridged waveguide, horn. Spectrum analyzers with preselectors and quasi-peak detectors are used to perform radiated measurements.

Conducted emissions are measured with Line Impedance Stabilization Networks and EMI Test Receivers.

Calibrated wideband preamplifiers, coaxial cables, and coaxial attenuators are also used for making measurements.

All receiving equipment conforms to CISPR Publication 16-1, "Radio Interference Measuring Apparatus and Measurement Methods."

5.3 LABORATORY ACCREDITATIONS AND LISTINGS

Site Description

EMC Lab.

: **Accredited by CNAS**

The Laboratory has been assessed and proved to be in compliance with CNAS-CL01:2018

The Certificate Registration Number is L3150

Accredited by FCC

Designation Number: CN1300

Test Firm Registration Number: 945551

Accredited by A2LA

The Certificate Registration Number is 4321.02

Accredited by Industry Canada

The Certificate Registration Number is CN0113

Name of Firm

: EMTEK (DONGGUAN) CO., LTD.

Site Location

: -1&2/F., Building 2, Zone A, Zhongda Marine Biotechnology Research and Development Base, No.9, Xincheng Avenue, Songshanhu High-technology Industrial Development Zone, Dongguan, Guangdong, China

6 TEST SYSTEM UNCERTAINTY

The following measurement uncertainty levels have been estimated for tests performed on the apparatus:

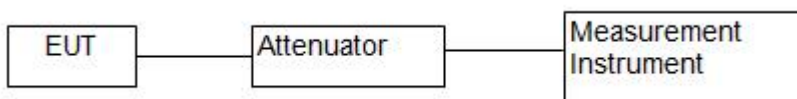
Test Parameter	Measurement Uncertainty
Radio Frequency	$\pm 1 \times 10^{-5}$
Maximum Peak Output Power Test	$\pm 1.0\text{dB}$
Conducted Emissions Test	$\pm 2.0\text{dB}$
Radiated Emission Test	$\pm 2.0\text{dB}$
Power Density	$\pm 2.0\text{dB}$
Occupied Bandwidth Test	$\pm 1.0\text{dB}$
Band Edge Test	$\pm 3\text{dB}$
All emission, radiated	$\pm 3\text{dB}$
Antenna Port Emission	$\pm 3\text{dB}$
Temperature	$\pm 0.5^\circ\text{C}$
Humidity	$\pm 3\%$

Measurement Uncertainty for a level of Confidence of 95%

7 SETUP OF EQUIPMENT UNDER TEST

7.1 RADIO FREQUENCY TEST SETUP 1

The Wireless connecting component's antenna ports(s) of the EUT are connected to the measurement instrument per an appropriate attenuator. The EUT is controlled by PC/software to emit the specified signals for the purpose of measurements.



7.2 RADIO FREQUENCY TEST SETUP 2

The test site semi-anechoic chamber has met the requirement of NSA tolerance 4 dB according to the standards: ANSI C63.10. The test distance is 3m. The setup is according to the requirements in Section 13.1.4.1 of ANSI C63.10-2013 and CAN/CSA-CEI/IEC CISPR 22.

The maximal emission value is acquired by adjusting the antenna height, polarisation and turntable azimuth. Normally, the height range of antenna is 1 m to 4 m, the azimuth range of turntable is 0° to 360°, and the receive antenna has two polarizations Vertical (V) and Horizontal (H).

Below 30MHz:

The EUT is placed on a turntable 0.8 meters above the ground in the chamber, 3 meter away from the antenna (loop antenna). The Antenna should be positioned with its plane vertical at the specified distance from the EUT and rotated about its vertical axis for maximum response at each azimuth about the EUT. The center of the loop shall be 1 m above the ground. For certain applications, the loop antenna plane may also need to be positioned horizontally at the specified distance from the EUT.

Above 30MHz:

The EUT is placed on a turntable 0.8 meters above the ground in the chamber, 3 meter away from the antenna. The maximal emission value is acquired by adjusting the antenna height, polarisation and turntable azimuth. Normally, the height range of antenna is 1 m to 4 m, the azimuth range of turntable is 0° to 360°, and the receive antenna has two polarizations Vertical (V) and Horizontal (H).

Above 1GHz:

The EUT is placed on a turntable 1.5 meters above the ground in the chamber, 3 meter away from the antenna. The maximal emission value is acquired by adjusting the antenna height, polarisation and turntable azimuth. Normally, the height range of antenna is 1 m to 4 m, the azimuth range of turntable is 0° to 360°, and the receive antenna has two polarizations Vertical (V) and Horizontal (H).

Measurements shall be taken, using the following steps, at a test site that has been validated using the procedures of ANSI C63.4 or the latest CISPR 16-1-4 for measurements above 1 GHz, so as to simulate a near free-space environment (see RSS-Gen for applicable versions of ANSI and CISPR standards).

(1) Line the ground plane with absorbers between the transmitter and the receive antenna to minimize reflections. The absorbers used should have a minimum-rated attenuation of 20 dB through the measurement frequency range of interest. The absorbers shall be positioned to replicate the layout used when compliance with the applicable acceptability criterion was achieved, as set forth in the aforementioned standards on site validation.

(2) Set the height of the receive antenna to 1.5 m. The receive antenna must be one that was designed and fabricated to operate over the entire frequency range of interest, for example, an appropriate standard gain horn.

(3) The distance between the receive antenna and the radiating source shall be sufficient in order to ensure far-field conditions.

(4) Mount the transmitter at a height of 1.5 m.

(5) Configure the device under test (DUT) to produce the maximum power spectral density as measured while assessing compliance with Section 6.2.2 (i.e. channel frequency, modulation type and data rate). If the DUT is equipped with a detachable antenna and the antenna is intended for remote installation (i.e.

tower-mounted), the DUT may be substituted with a suitable signal generator. The level and frequency settings on the generator shall be set so as to reproduce the maximum power spectral density, measured within a 1 MHz bandwidth, obtained while assessing compliance to Section 6.2.2.

(6) Position the transmitter or the radiating antenna so that elevation pattern measurements can be taken.

(7) Find the 0° reference point in the horizontal plane.

(8) Care should be taken when positioning the receive antenna to avoid cross-polarization. Antennas of known mounting polarization should be assessed with the receive antenna oriented in the same polarity. If the polarization of the transmit antenna is unknown or the transmit antenna can be mounted in either polarization, e.i.r.p. measurements should be performed to find which mounting polarity provides the highest e.i.r.p. value. Testing shall be carried out with the receive antenna and the DUT mounted in each polarity.

(9) The emission shall be centred on the display of the spectrum analyzer with the following settings:

i. If the power spectral density of the DUT was assessed with a peak detector and the antenna cannot be detached from the DUT, the spectrum analyzer shall be set to a peak detector with a resolution bandwidth and video bandwidth of 1 MHz.

ii. If the power spectral density of the DUT was assessed using a sample detector with power averaging and the antenna cannot be detached from the DUT, the spectrum analyzer shall be set to a sample detector, configured to produce 100 power averages and set with a resolution bandwidth, as well as a video bandwidth of 1 MHz.

iii. If the antenna can be detached from the DUT, a continuous wave (CW) signal equal to that of the power spectral density measurement may be used, the spectrum analyzer shall be set to peak detector with a resolution bandwidth and video bandwidth of 1 MHz.

(10) Rotate the turntable 360° recording the field strength at each step. Throughout the main beam of the antenna, the step size shall be kept to a maximum of 1°.

Once outside the main beam of the antenna, the maximum step size shall be as follows, when compared to the requirements of Section 6.2.2:

i. Between 0° and 8°, maximum step size of 2°;

ii. Between 8° and 40°, maximum step size of 4°;

iii. Between 40° and 45°, maximum step size of 1°;

iv. Between 45° and 90°, maximum step size of 5°.

Once the mask reaches 90°, the mask will be inverted and the step size will follow in the same manner as above.

For the purpose of this procedure, the main beam of the antenna is defined as the 3 dB beamwidth.

(11) Convert the measured field strength values in terms of e.i.r.p. density (dBW/1 MHz) using the following equation:

$$\text{e.i.r.p. density (dBW/MHz)} = 10 \log((E \cdot r)^2 / 30)$$

E = field strength in V/m

r = measurement distance in metres

(12) Plot the results against the emission mask with reference to the horizontal plane.

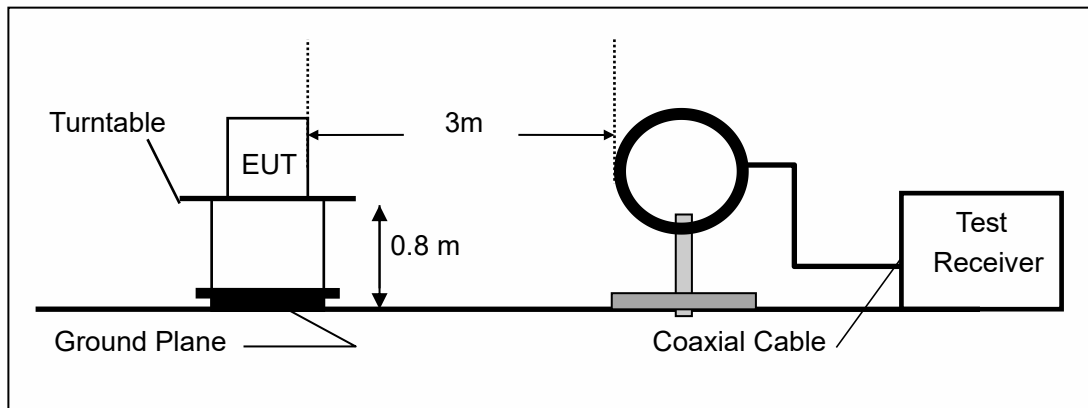
(13) Using the plot, the 0° can be rotated to determine the worst-case installation tilt angle.

(14) Testing shall be performed using the highest gain antenna for every antenna type, if applicable.

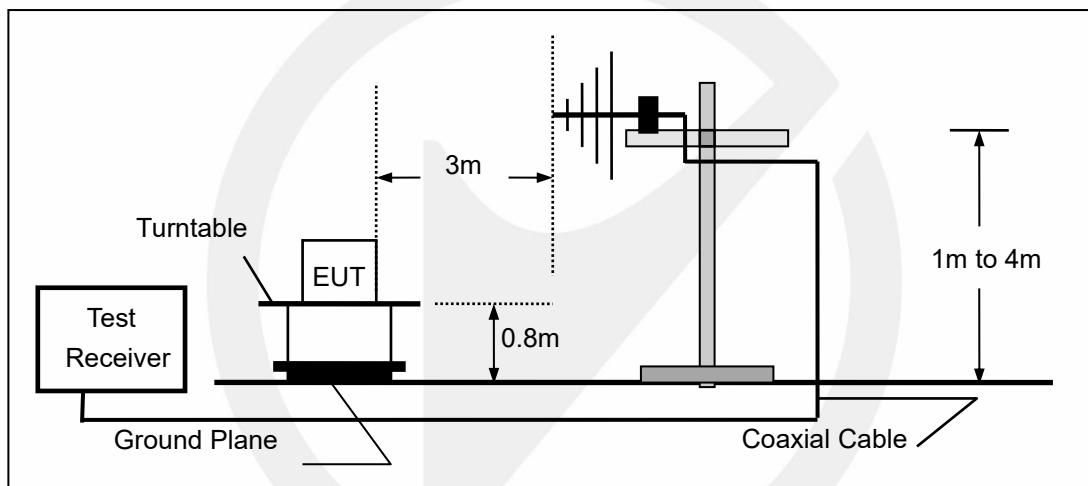
(15) Antenna type(s), antenna model number(s), and worst-case tilt angle(s) necessary to remain compliant with the elevation mask requirement set forth in Section 6.2.2(3) of RSS-247 shall be clearly indicated in the user manual.

The following figure is an example of a polar elevation mask measured using the Method 1 reference to dBμV/m at 3 m.

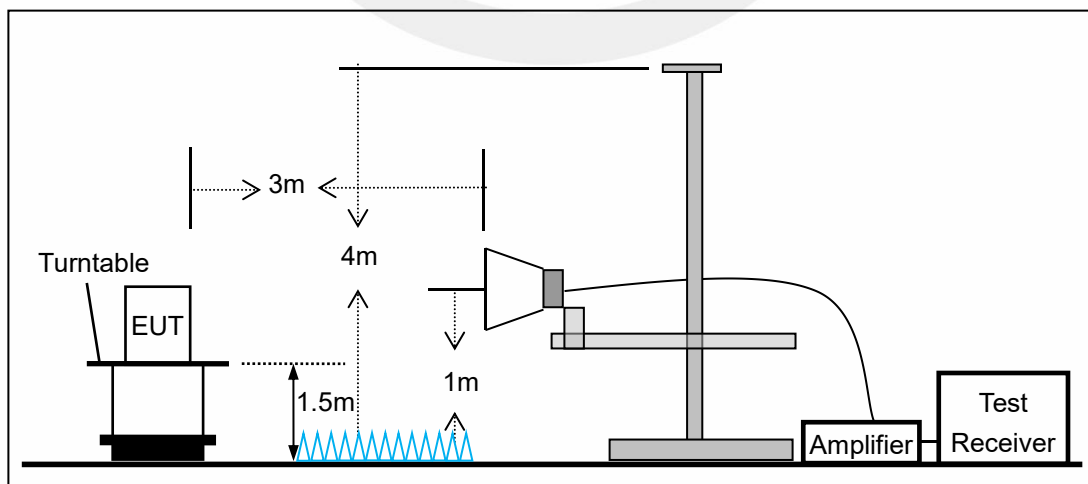
(a) Radiated Emission Test Set-Up, Frequency Below 30MHz



(b) Radiated Emission Test Set-Up, Frequency Below 1000MHz



(c) Radiated Emission Test Set-Up, Frequency above 1000MHz

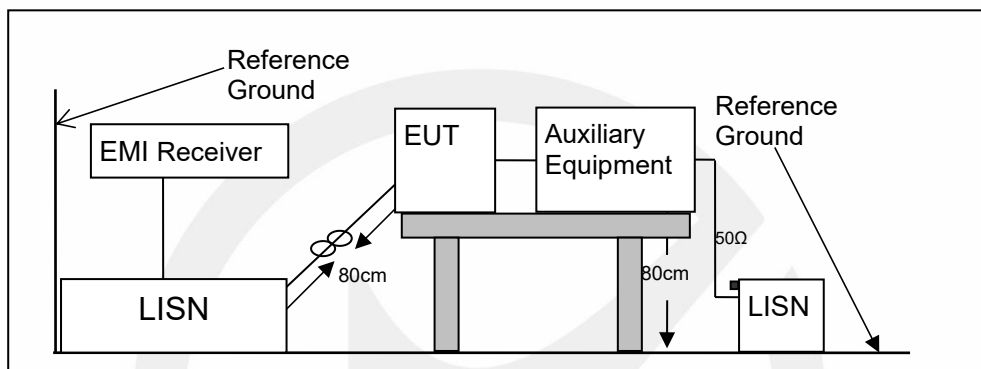


7.3 CONDUCTED EMISSION TEST SETUP

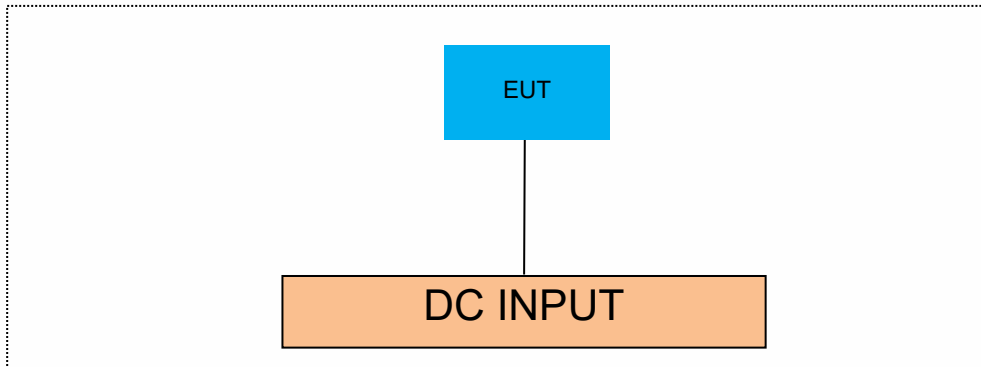
The mains cable of the EUT (maybe per AC/DC Adapter) must be connected to LISN. The LISN shall be placed 0.8 m from the boundary of EUT and bonded to a ground reference plane for LISN mounted on top of the ground reference plane. This distance is between the closest points of the LISN and the EUT. All other units of the EUT and associated equipment shall be at least 0.8m from the LISN.

Ground connections, where required for safety purposes, shall be connected to the reference ground point of the LISN and, where not otherwise provided or specified by the manufacturer, shall be of same length as the mains cable and run parallel to the mains connection at a separation distance of not more than 0.8 m.

According to the requirements in Section 13.1.4.1 of ANSI C63.10-2013 Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30 MHz using CISPR Quasi-Peak and average detector mode.



7.4 BLOCK DIAGRAM CONFIGURATION OF TEST SYSTEM



7.5 SUPPORT EQUIPMENT

Equipment List and Details			
Description	Manufacturer	Model	Serial Number
USB Cable (for X2 Dongle)	Shiftall Inc.	HG-2	/
FlipVR	Shiftall Inc.	SVP-VC1B-R , SVP-VC1B-L	/
USB Cable (for FlipVR)	Shiftall Inc.	PowerLine II USB-C & USB-A 3.1(Gen2)	/
USB charger (for FlipVR)	Shiftall Inc.	IACU-90KN	/

EUT Cable List and Details			
Cable Description	Length (m)	Shielded/Unshielded	With / Without Ferrite
/	/	/	/

Auxiliary Cable List and Details			
Cable Description	Length (m)	Shielded/Unshielded	With / Without Ferrite
/	/	/	/
/	/	/	/

Auxiliary Equipment List and Details			
Description	Manufacturer	Model	Serial Number
Notebook	Lenovo	E46L	11S168003748Z0LR06E0HG
/	/	/	/

Notes:

1. All the equipment/cables were placed in the worst-case configuration to maximize the emission during the test.
2. Grounding was established in accordance with the manufacturer's requirements and conditions for the intended use.

8 TEST REQUIREMENTS

8.1 DTS 6DB BANDWIDTH

8.1.1 Applicable Standard

According to FCC Part 15.247(a)(2) and KDB 558074 D01 15.247 Meas Guidance v05r02
According to RSS-247 5.2(a)

8.1.2 Conformance Limit

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

8.1.3 Test Configuration

Test according to clause 7.1 radio frequency test setup 1

8.1.4 Test Procedure

The EUT was operating in Wireless connecting mode and controlled its channel. Printed out the test result from the spectrum by hard copy function.

The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.

Set to the maximum power setting and enable the EUT transmit continuously

Set RBW = 100 kHz.

Set the video bandwidth (VBW) = 300 kHz.

Set Span = 2 times OBW

Set Detector = Peak.

Set Trace mode = max hold.

Set Sweep = auto couple.

Allow the trace to stabilize.

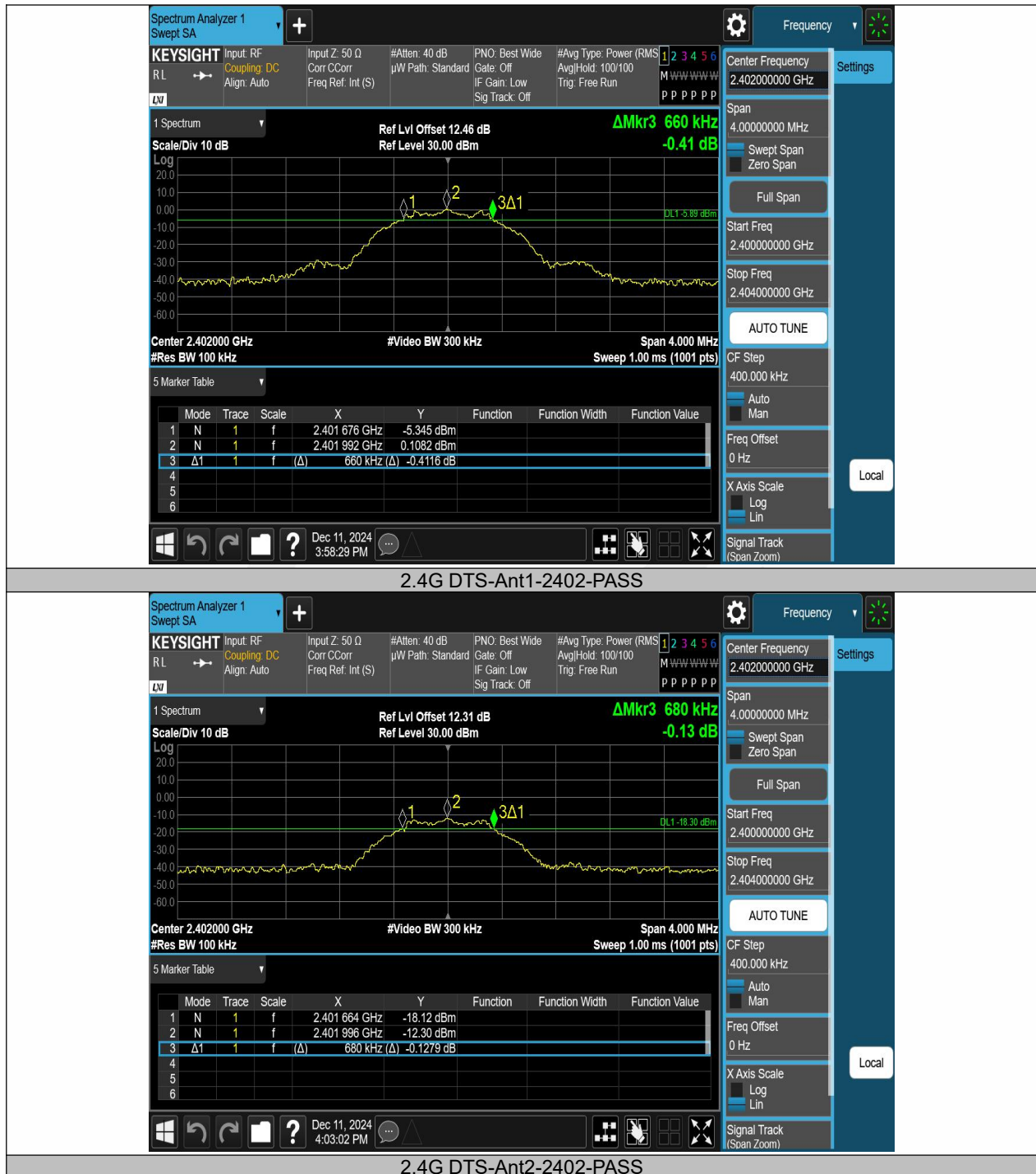
Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

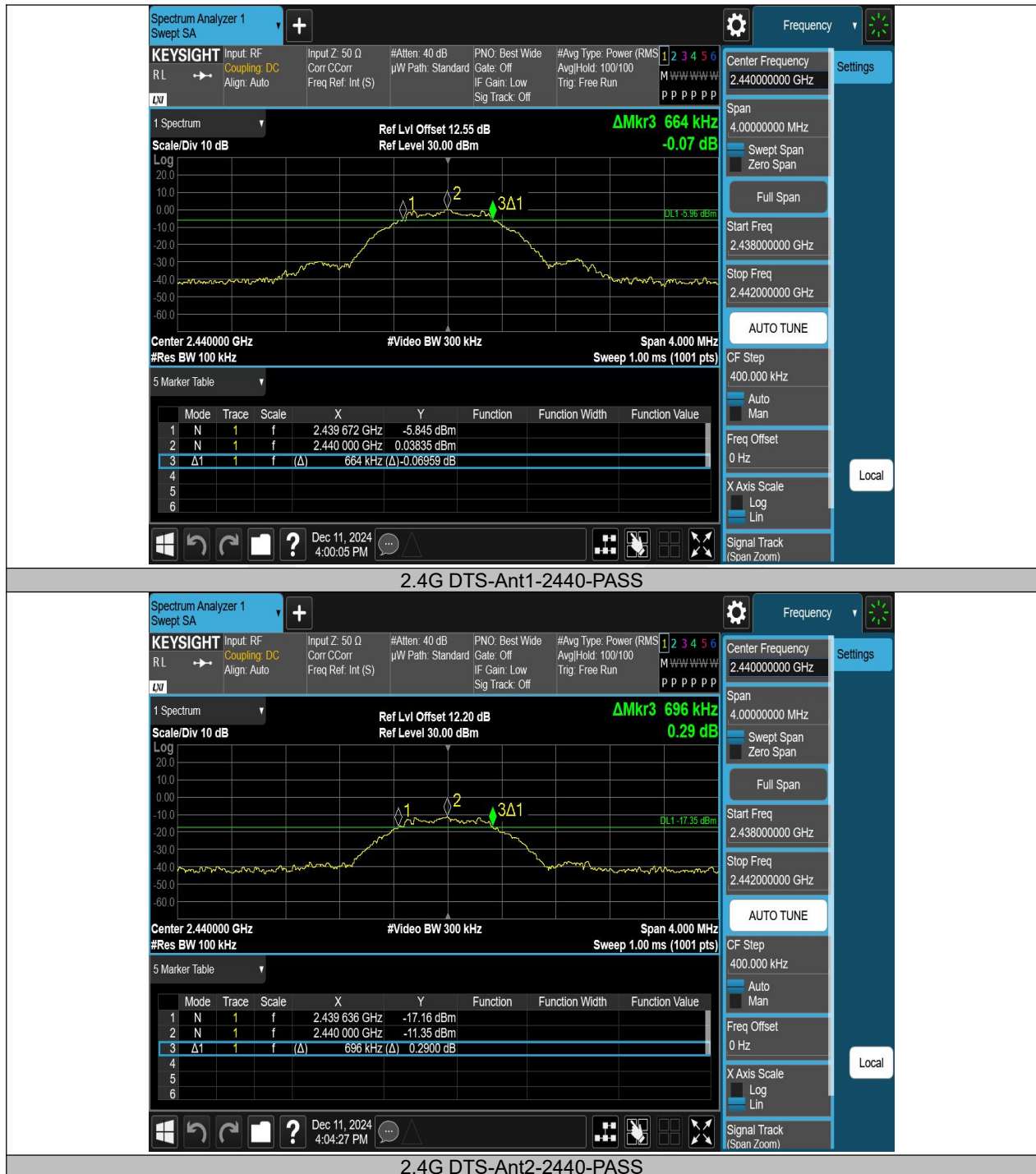
Measure and record the results in the test report.

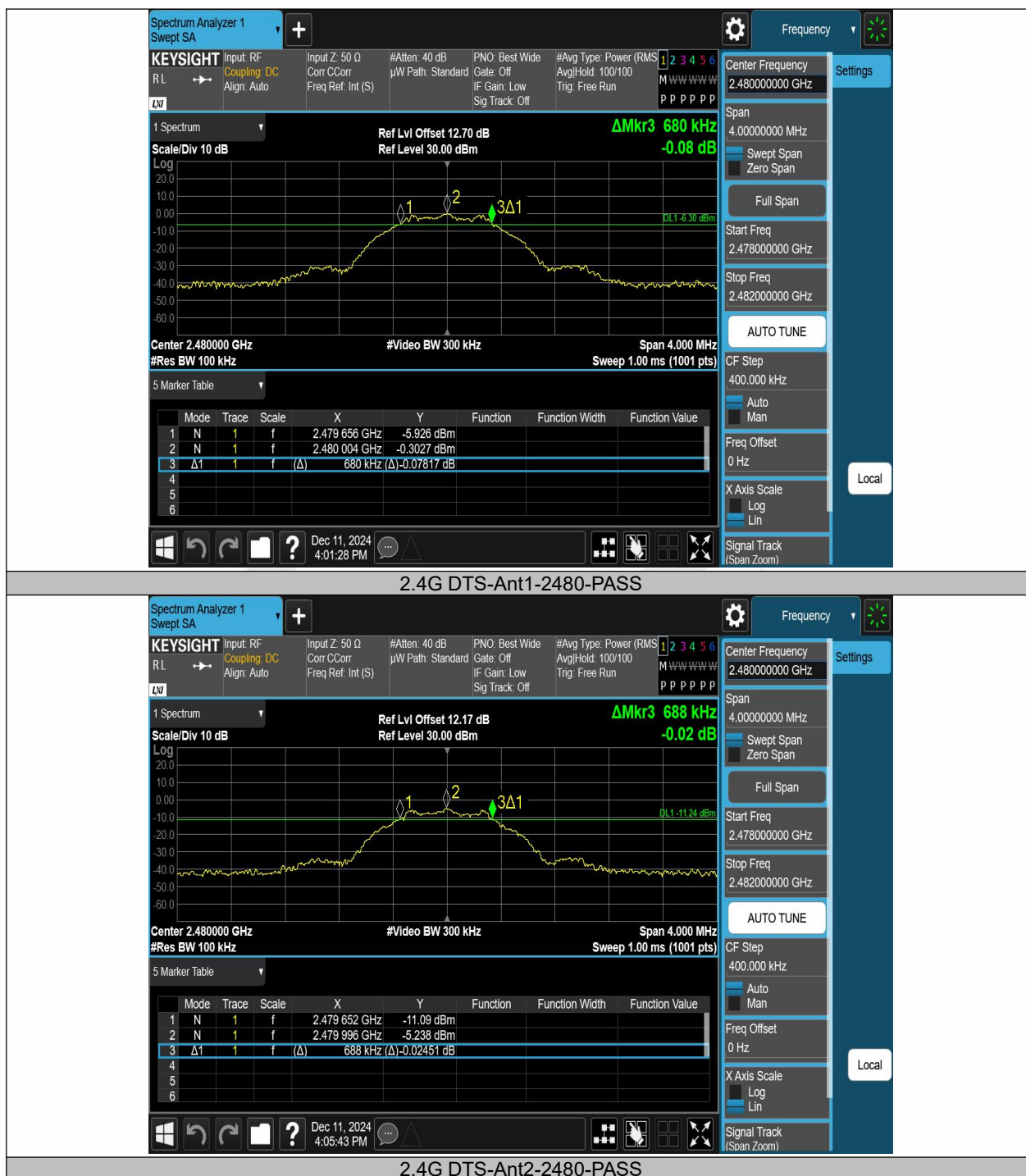
Test Results

Temperature:	25°C
Relative Humidity:	45%
ATM Pressure:	1011 mbar

TestMode	Antenna	Frequency[MHz]	DTS BW [MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
2.4G DTS	Ant1	2402	0.660	2401.676	2402.336	0.5	PASS
2.4G DTS	Ant2	2402	0.680	2401.664	2402.344	0.5	PASS
2.4G DTS	Ant1	2440	0.664	2439.672	2440.336	0.5	PASS
2.4G DTS	Ant2	2440	0.696	2439.636	2440.332	0.5	PASS
2.4G DTS	Ant1	2480	0.680	2479.656	2480.336	0.5	PASS
2.4G DTS	Ant2	2480	0.688	2479.652	2480.340	0.5	PASS
2.4G DTS_MIMO	Ant1	2402	0.680	2401.656	2402.336	0.5	PASS
2.4G DTS_MIMO	Ant2	2402	0.672	2401.660	2402.332	0.5	PASS
2.4G DTS_MIMO	Ant1	2440	0.668	2439.664	2440.332	0.5	PASS
2.4G DTS_MIMO	Ant2	2440	0.668	2439.652	2440.320	0.5	PASS
2.4G DTS_MIMO	Ant1	2480	0.692	2479.648	2480.340	0.5	PASS
2.4G DTS_MIMO	Ant2	2480	0.688	2479.652	2480.340	0.5	PASS









2.4G DTS MIMO-Ant1-2402-PASS



2.4G DTS MIMO-Ant2-2402-PASS



2.4G DTS MIMO-Ant1-2440-PASS



2.4G DTS MIMO-Ant2-2440-PASS



2.4G DTS MIMO-Ant1-2480-PASS



2.4G DTS MIMO-Ant2-2480-PASS

8.2 DTS 99% BANDWIDTH

8.2.1 Applicable Standard

According to RSS-Gen 6.7 and KDB 558074 D01 DTS Meas Guidance v05r02

8.2.2 Test Configuration

Test according to clause 7.1 radio frequency test setup 1

8.2.3 Test Procedure

The EUT was operating in Wireless connecting mode and controlled its channel. Printed out the test result from the spectrum by hard copy function.

The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.

Set to the maximum power setting and enable the EUT transmit continuously

Set RBW = 1%-5% OBW(43 KHz).

Set the video bandwidth (VBW) =130 kHz.

Set Span=4 MHz

Set Detector = Peak.

Set Trace mode = max hold.

Set Sweep = auto couple.

Allow the trace to stabilize.

Use the 99 % power bandwidth function of the instrument

Measure the maximum width of the emission.

Measure and record the results in the test report.

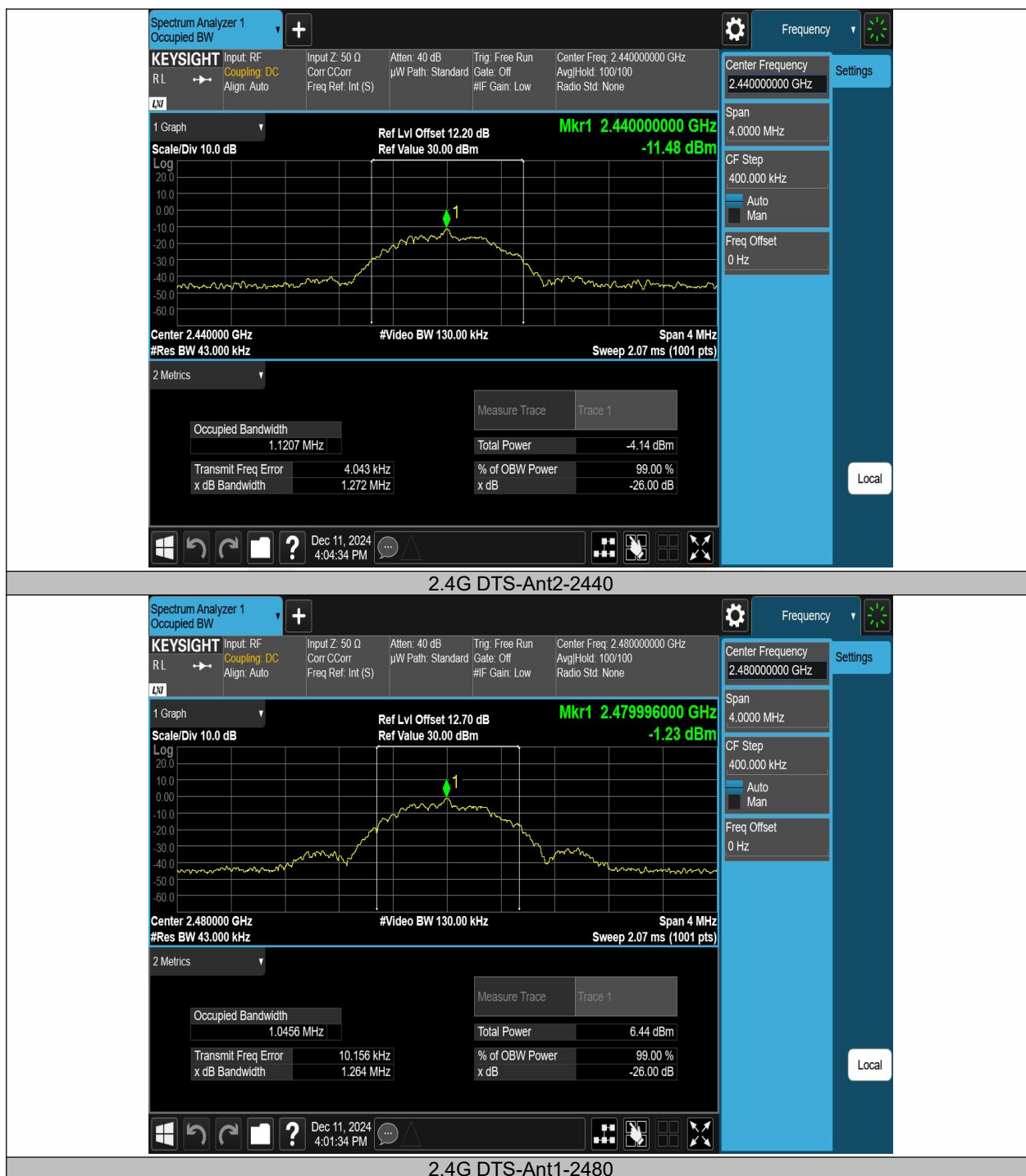
8.2.4 Test Results

Temperature:	25°C
Relative Humidity:	45%
ATM Pressure:	1011 mbar

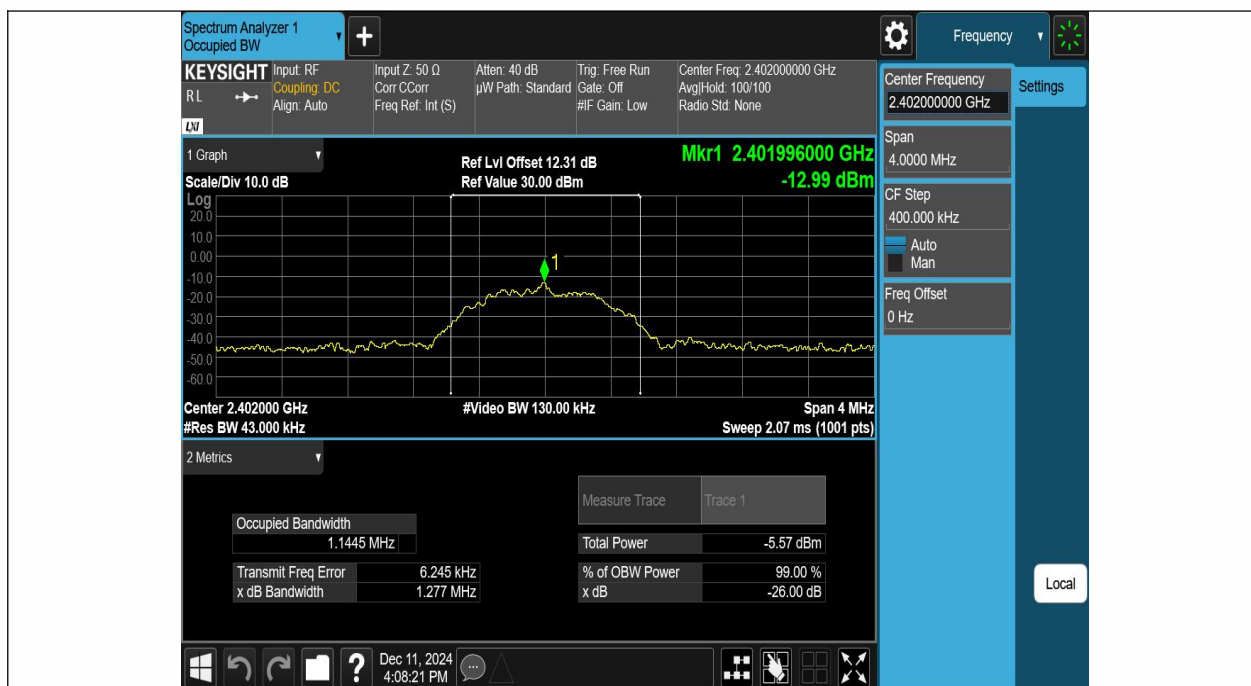
TestMode	Antenna	Frequency[MHz]	OCB [MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
2.4G DTS	Ant1	2402	1.0525	2401.4818	2402.5343	---	---
2.4G DTS	Ant2	2402	1.1533	2401.4235	2402.5768	---	---
2.4G DTS	Ant1	2440	1.0421	2439.4817	2440.5238	---	---
2.4G DTS	Ant2	2440	1.1207	2439.4437	2440.5644	---	---
2.4G DTS	Ant1	2480	1.0456	2479.4874	2480.5330	---	---
2.4G DTS	Ant2	2480	1.0706	2479.4670	2480.5376	---	---
2.4G DTS_MIMO	Ant1	2402	1.0479	2401.4827	2402.5306	---	---
2.4G DTS_MIMO	Ant2	2402	1.1445	2401.4340	2402.5785	---	---
2.4G DTS_MIMO	Ant1	2440	1.0492	2439.4811	2440.5303	---	---
2.4G DTS_MIMO	Ant2	2440	1.1201	2439.4462	2440.5663	---	---
2.4G DTS_MIMO	Ant1	2480	1.0470	2479.4875	2480.5345	---	---
2.4G DTS_MIMO	Ant2	2480	1.0633	2479.4750	2480.5383	---	---



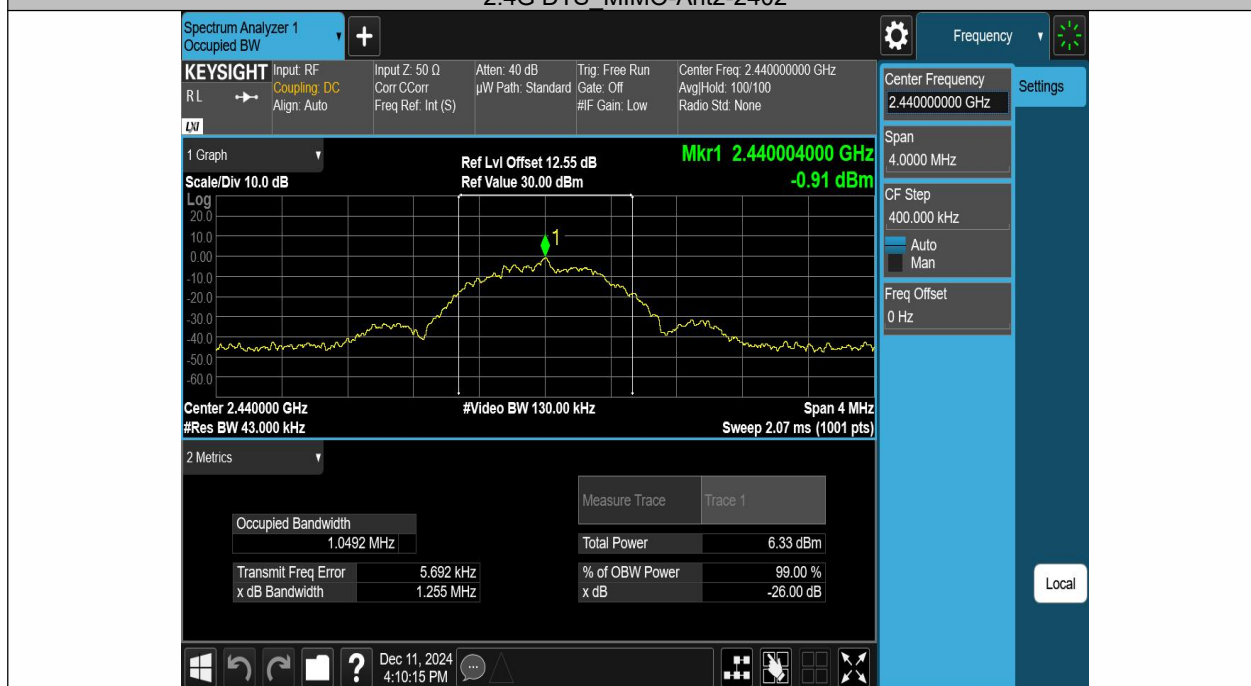








2.4G DTS MIMO-Ant2-2402



2.4G DTS MIMO-Ant1-2440





8.3 MAXIMUM PEAK CONDUCTED OUTPUT POWER

8.3.1 Applicable Standard

According to FCC Part 15.247(b)(3) and KDB 558074 D01 15.247 Meas Guidance v05r02
According to RSS-247 5.4(d) and RSS-Gen 6.12

8.3.2 Conformance Limit

The maximum peak conducted output power of the intentional radiator for systems using digital modulation in the 2400 - 2483.5 MHz bands shall not exceed: 1 Watt (30 dBm).

8.3.3 Test Configuration

Test according to clause 7.1 radio frequency test setup 1

8.3.4 Test Procedure

As an alternative to a peak power measurement, compliance with the one Watt limit can be based on a measurement of the maximum conducted output power. For smart system, Maximum Conducted Output Power is defined as the total transmit power delivered to all antennas and antenna elements averaged across all symbols in the signaling alphabet when the transmitter is operating at its maximum power control level. Power must be summed across all antennas and antenna elements. If multiple modes of operation are possible (e.g., alternative modulation methods), the maximum conducted output power is the highest total transmit power occurring in any mode.

Set the RBW $\geq$ DTS bandwidth (about 2MHz).

Set VBW $\approx 3 \times$ RBW (about 6MHz)

Set the span $\geq 3 \times$ RBW

Set Sweep time = auto couple.

Set Detector = peak.

Set Trace mode = max hold.

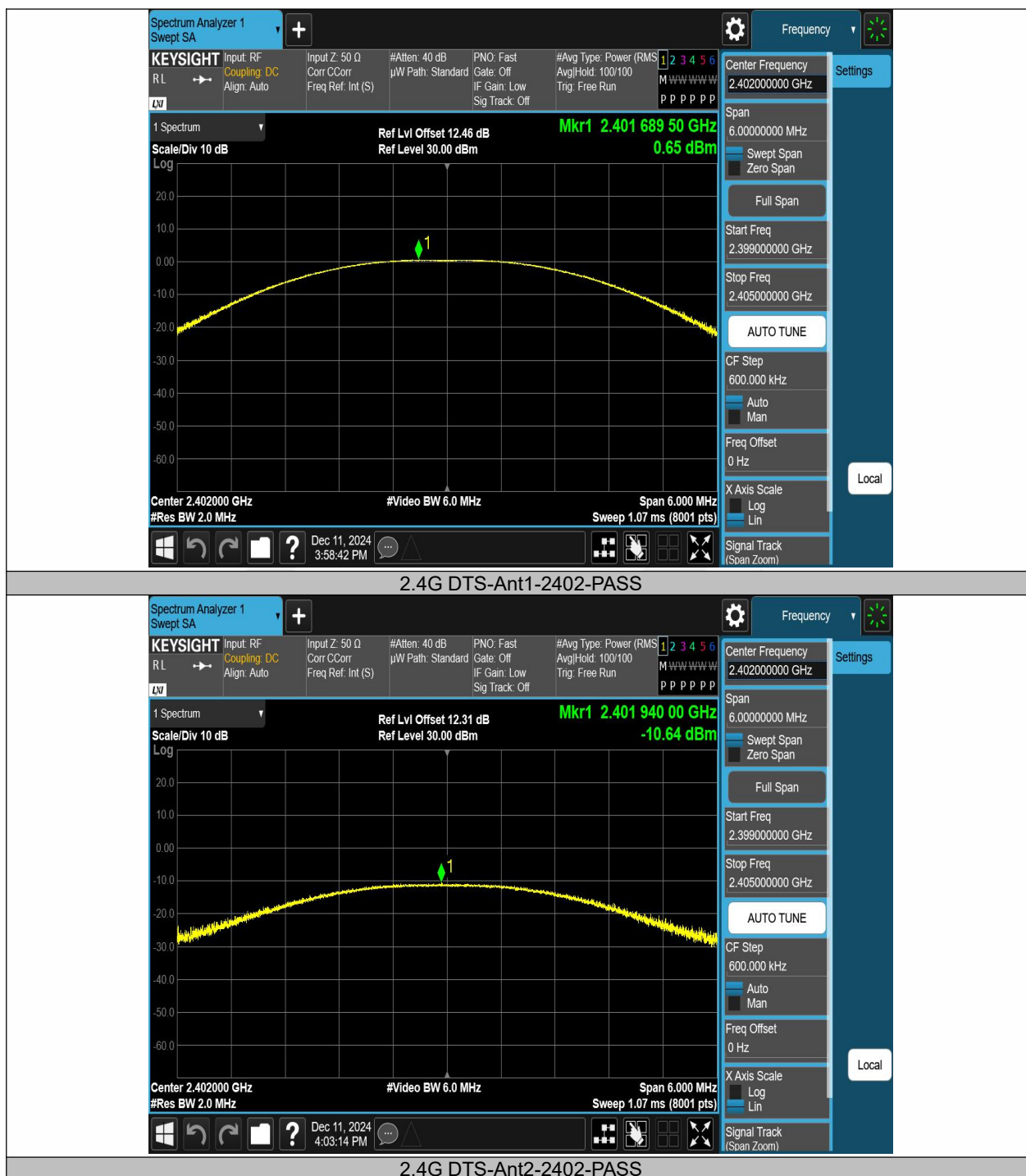
Allow trace to fully stabilize. Use peak marker function to determine the peak amplitude level.

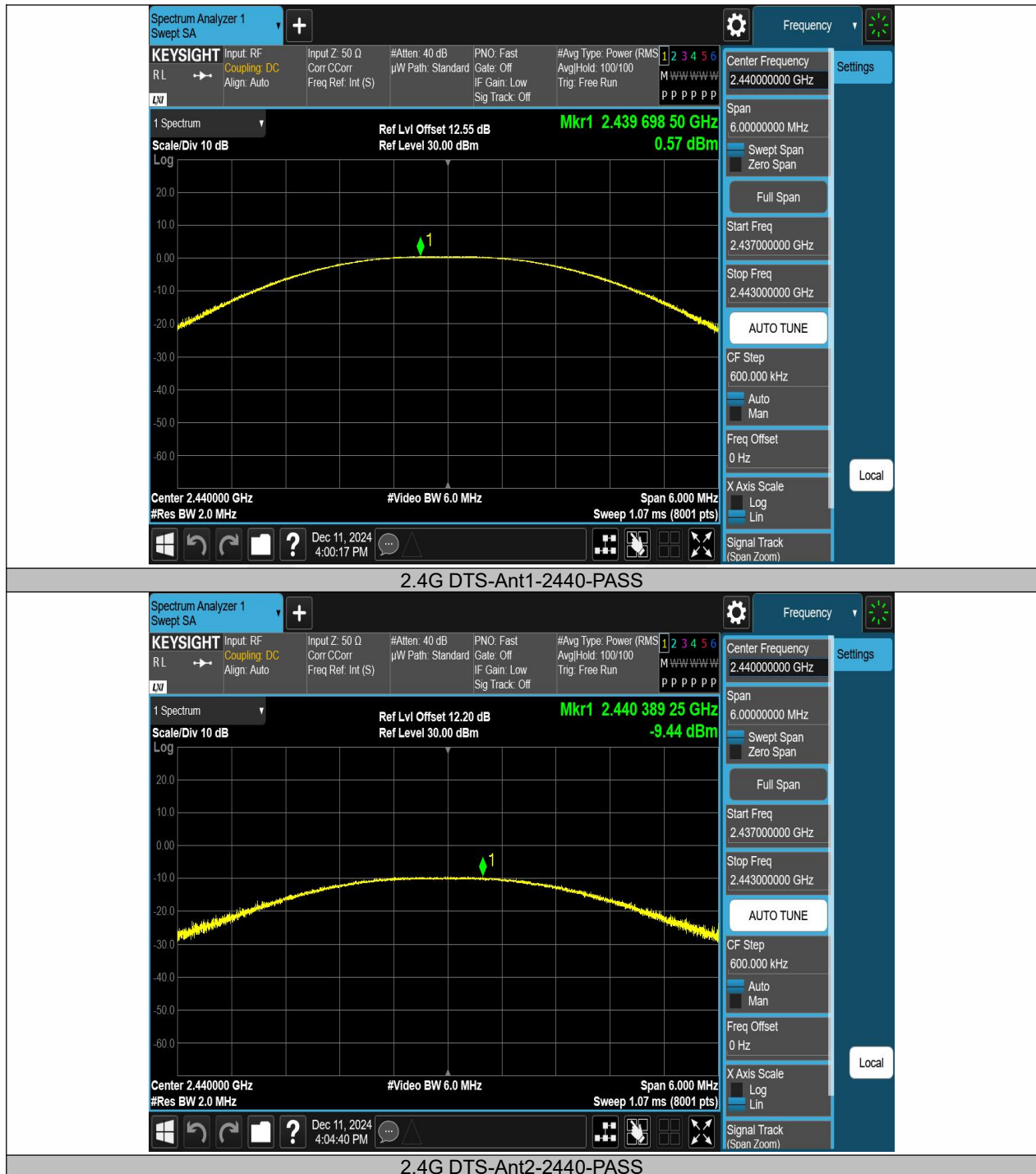
Conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. If transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

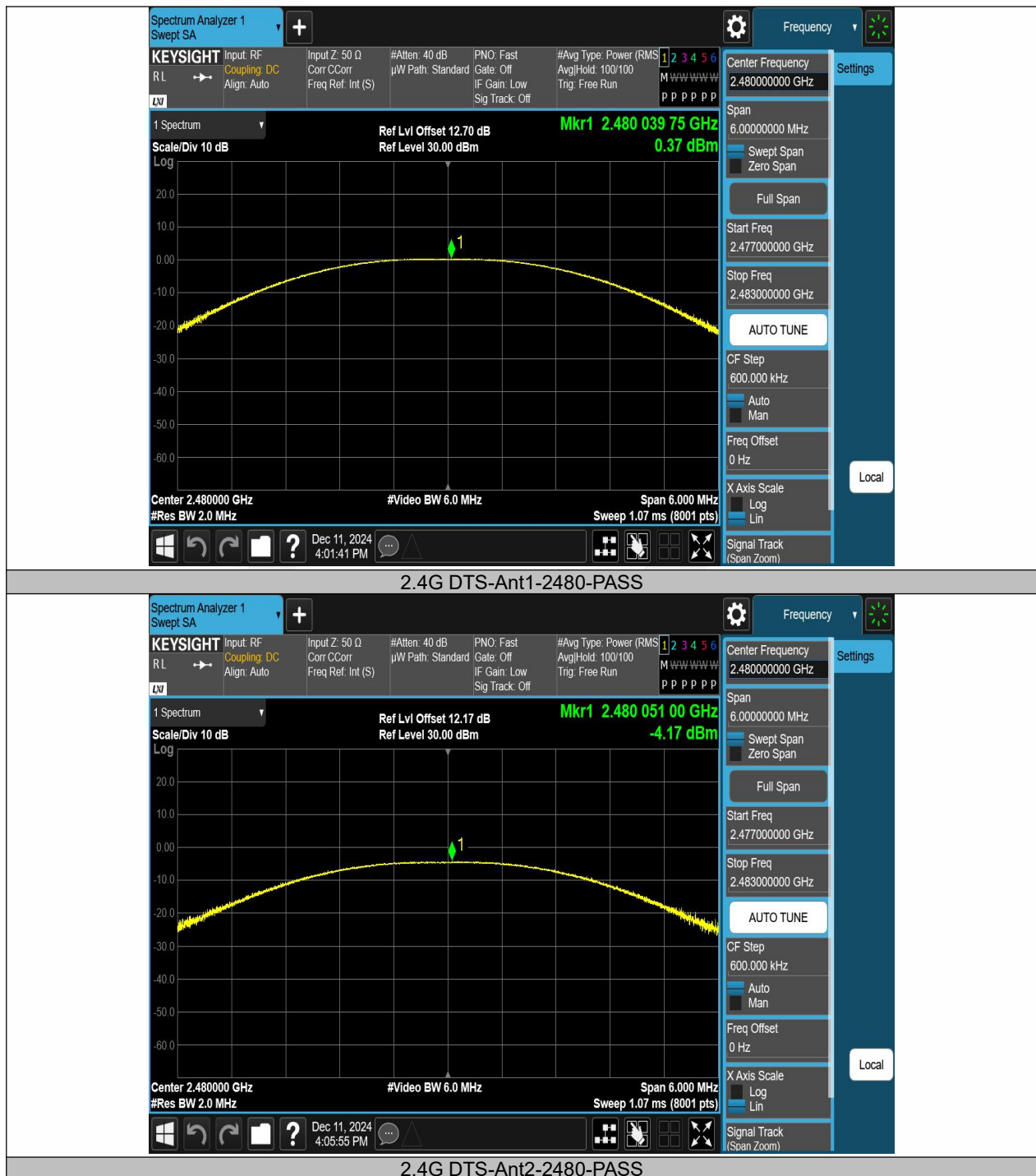
8.3.5 Test Results

Temperature:	25 °C
Relative Humidity:	45%
ATM Pressure:	1011 mbar

TestMode	Antenna	Frequency[MHz]	Conducted Peak Power[dBm]	Conducted Limit[dBm]	EIRP[dBm]	EIRP Limit[dBm]	Verdict
2.4G DTS	Ant1	2402	0.65	≤30	1.15	≤36	PASS
2.4G DTS	Ant2	2402	-10.64	≤30	-10.14	≤36	PASS
2.4G DTS	Ant1	2440	0.57	≤30	1.07	≤36	PASS
2.4G DTS	Ant2	2440	-9.44	≤30	-8.94	≤36	PASS
2.4G DTS	Ant1	2480	0.37	≤30	0.87	≤36	PASS
2.4G DTS	Ant2	2480	-4.17	≤30	-3.67	≤36	PASS
2.4G DTS_MIMO	Ant1	2402	0.54	≤30	1.04	≤36	PASS
2.4G DTS_MIMO	Ant2	2402	-10.51	≤30	-10.01	≤36	PASS
2.4G DTS_MIMO	total	2402	0.87	≤30	1.37	≤36	PASS
2.4G DTS_MIMO	Ant1	2440	0.49	≤30	0.99	≤36	PASS
2.4G DTS_MIMO	Ant2	2440	-9.52	≤30	-9.02	≤36	PASS
2.4G DTS_MIMO	total	2440	0.90	≤30	1.40	≤36	PASS
2.4G DTS_MIMO	Ant1	2480	0.32	≤30	0.82	≤36	PASS
2.4G DTS_MIMO	Ant2	2480	-4.00	≤30	-3.50	≤36	PASS
2.4G DTS_MIMO	total	2480	1.69	≤30	2.19	≤36	PASS









2.4G DTS MIMO-Ant1-2402-PASS



2.4G DTS MIMO-Ant2-2402-PASS



2.4G DTS MIMO-Ant1-2440-PASS



2.4G DTS MIMO-Ant2-2440-PASS