RF Test Report

Applicant:	Quectel Wireless Solutions Company Limited
Address:	Building 5, Shanghai Business Park Phase III (Area B), No.1016 Tianlin Road, Minhang District, Shanghai, 200233 China
Product:	Smart LTE Module with Wi-Fi & Bluetooth
Model No.:	SC200E-NA,SC206E-NA
Brand Name:	QUECTEL
FCC ID:	XMR2024SC200ENA
Standards:	FCC CFR47 Part 15E
Report No.:	PD20240152-R3E
Issue Date:	2025/02/24
Test Result:	PASS *

* **Testing performed at Hefei Panwin Technology Co., Ltd. on the above equipment indicates the product meets the requirements of the relevant standards.**

Reviewed By: Jerry Zhang **Approved By:** Alec Yang

Hefei Panwin Technology Co., Ltd.

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Revision History

Report No.	Version	Description	Issue Date	Note
PD20240152-R3E	1	Initial Report	2025/02/24	Valid

Note: SC206E-NA shares the same hardware design with SC200E-NA. They support the same bands. The only difference between the two models is the operating system. The different OS is as below:

Module	SC200E-NA	SC206E-NA
System	Android	Linux

Above changes won't impact the protocol and RF performance for original frequency bands.

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Summary of Test Results

No.	Test Case	FCC Rules	Verdict
1	Occupied Bandwidth Measurement	15.407(e)	PASS
2	Maximum Conducted Output Power Measurement	15.407(a)	PASS
3	Power Spectral Density Measurement	15.407(a)	PASS
4	Unwanted Emissions Measurement	15.407(b)	PASS
5	AC Conducted Emission Measurement	15.207	NA
6	Antenna Requirements	15.203 & 15.407(a)	PASS
7	Frequency Stability[Note1]	15.407(g)	NA

Date of Testing: 2024/12/04 to 2025/02/24
Date of Sample Received: 2024/12/04

• We, Hefei Panwin Technology Co., Ltd., would like to declare that the tested sample has been evaluated in accordance with the procedures given in applied standard(s) in **Section 2.3** of this report and shown compliance with the applicable technical standards.

• All indications of PASS/FAIL in this report are based on interpretations and/or observations of test results. Measurement Uncertainties were not taken into account and are published for informational purposes only.

Note1: Manufacturers of U-NII devices are responsible for ensuring frequency stability such that an emission is maintained within the band of operation under all conditions of normal operation as specified in the users manual.

1 General Information

1.1 Notes of the Test Report

This report is invalid without signature of auditor and approver or with any alterations. The report shall not be partially reproduced without written approval of the testing company. Entrusted test results are only responsible for incoming samples. If there is any objection to the testing report, it shall be raised to the testing company within 15 days from the date of receiving the report. In the test results, "NA" means "not applicable", and the test items marked with "Δ" are subcontracted projects.

1.2 Test Facility

A2LA (Certificate Number: 6849.01)

Hefei Panwin Technology Co., Ltd. has been accredited by American Association for Laboratory Accreditation to perform measurement.

FCC (Designation Number: CN1361, Test Firm Registration Number: 473156)

Hefei Panwin Technology Co., Ltd. has been accredited on the US Federal Communications Commission list of test facilities recognized to perform measurements.

1.3 Testing Laboratory

Company Name	Hefei Panwin Technology Co., Ltd.
Address	Floor 1, Zone E, Plant 2#, Mingzhu Industrial Park, No.106 Chuangxin Avenue, High-tech Zone, Hefei City, Anhui Province,China
Telephone	+86-0551-63811775
Post Code	230031

2 General Description of Equipment under Test

2.1 Details of Application

Applicant	Quectel Wireless Solutions Company Limited
Applicant Address	Building 5, Shanghai Business Park Phase III (Area B), No.1016 Tianlin Road, Minhang District, Shanghai, 200233 China
Manufacturer	Quectel Wireless Solutions Company Limited
Manufacturer Address	Building 5, Shanghai Business Park Phase III (Area B), No.1016 Tianlin Road, Minhang District, Shanghai, 200233 China

2.2 General Information

Product	Smart LTE Module with Wi-Fi & Bluetooth
Model	SC200E-NA,SC206E-NA
SN	Conducted: E1C24IN1M000053; Radiated: E1C24IN1M000022 & E1C24IN1M000063
Hardware Version	R2.0
Software Version	SC200ENADAR13A02, SC206ENADAR60A01
Antenna Type	External Antenna
Max. Conducted Power	Wi-Fi 5G: 18.48dBm
WLAN Mode Supported:	802.11a 802.11n 20M/40M 802.11ac 20M/40M/80M
Antenna Gain	5150MHz to 5250MHz: -0.67dBi 5250MHz to 5350MHz: -0.19dBi 5470MHz to 5725MHz: 1.28dBi 5725MHz to 5850MHz: 1.10dBi
Directional Gain	NA
Test Band	U-NII-1(5150MHz-5250MHz) U-NII-2A(5250MHz-5350MHz) U-NII-2C(5470MHz-5725MHz) U-NII-3(5725MHz-5850MHz)
Operating voltage	Typical 3.8Vdc
Modulation Type	802.11a/n/ac: BPSK;QPSK;16QAM;64QAM;256QAM
Note: The declared of product specification for EUT and/or Antenna presented in the report are provided by the	

manufacturer, and the manufacturer takes all the responsibilities for the accuracy of product specification.

2.3 Application Standards

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

- 47 CFR Part 15 Subpart E
- FCC KDB 789033 D02 General UN ll Test Procedures New Rules v02r01
- ANSI C63.10-2013

Remark:

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

3 Test Condition

3.1 Test Configuration

Test mode

Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture). The worst cases were recorded in this report.

Radiated measurements are performed by rotating the EUT in three different orthogonal test planes (Z, X, Y axis), receiver antenna polarization (horizontal and vertical), the worst emission was found in Z position and the worst case was recorded.This report presents the data for the worst polarity.

Test Mode	Data Rate(Mbps)
802.11a	6
802.11n 20M	MCS0
802.11n 40M	MCS0
802.11ac 20M	MCS0
802.11ac 40M	MCS0
802.11ac 80M	MCS0

3.2 Wireless Technology and Frequency Range

Wireless Technology	Bandwidth		Channel	Frequency
Wi-Fi	U-NII-1	20MHz	36	5180 MHz
			40	5200 MHz
			44	5220 MHz
			48	5240 MHz
		40MHz	38	5190 MHz
			46	5230 MHz
		80MHz	42	5210 MHz
	U-NII-2A	20MHz	52	5260 MHz
			56	5280 MHz
			60	5300 MHz
			64	5320 MHz
		40MHz	54	5270 MHz
			62	5310 MHz
		80MHz	58	5290 MHz
	U-NII-2C	20MHz	100	5500 MHz
			104	5520 MHz
			108	5540 MHz
			112	5560 MHz
			116	5580 MHz
			120	5600 MHz
			124	5620 MHz
			128	5640 MHz
			132	5660 MHz
			136	5680 MHz
			140	5700 MHz
			144	5720 MHz
		40MHz	102	5510 MHz
			110	5550 MHz
			118	5590 MHz
			126	5630 MHz
			134	5670 MHz
			142	5710 MHz
		80MHz	106	5530 MHz
			122	5610 MHz
			138	5690 MHz
	U-NII-3	20MHz	149	5745 MHz

			153	5765 MHz
			157	5785 MHz
			161	5805 MHz
			165	5825 MHz
		40MHz	151	5755 MHz
			159	5795 MHz
		80MHz	155	5775 MHz
Does this device support TPC function?		☑ Yes		☐ No
Does this device support TDWR band?		☑ Yes		☐ No

3.3 Equipment List

Conducted

Instrument	Manufacturer	Model	Asset No.	Cal. Interval	Cal. Due Date
Spectrum Analyzer	KEYSIGHT	N9020B	PWC0048	1 Year	2025/09/11
RF Control Unit	Tonseced	JS0806-2	PWC0055	/	/
Shielded Chamber	Maorui	MR543	PWC0041	3 Years	2026/08/26
Test Software	Tonseced	JS1120-3 V3.2.22	/	/	/

Radiated

Instrument	Manufacturer	Model	Asset No.	Cal. Interval	Cal. Due Date
EMI Test Receiver	R&S	ESR7	PWB0023	1 Year	2025/09/11
Spectrum Analyzer	R&S	FSV3044	PWB0024	1 Year	2025/09/11
Loop Antenna	R&S	HFH2-Z2E	PWB0026	1 Year	2025/09/13
TRILOG Broadband	Schwarzbeck	VULB9162	PWB0029	1 Year	2025/09/09
Double-Ridged Guide Antenna	ETS-Lindgren	3117	PWB0031	1 Year	2025/09/26
k Type Horn Antenna	Steatite Antennas	QMS-00880	PWB0035	1 Year	2025/09/08
Pre-Amplifier	R&S	SCU40F1	PWB0036	1 Year	2025/09/11
Pre-Amplifier	COM-MW	DLNA8	PWB0094	1 Year	2025/09/11
Pre-Amplifier	R&S	SCU18F	PWB0034	1 Year	2025/09/11
Pre-Amplifier	R&S	OSP220 (OSP-B155G)	PWB0042	1 Year	2025/09/11

Anechoic Chamber	ETS.LINDGREN	Fact 3-2m	PWB0003	3 Years	2026/06/05
Test Software	Tonscend	JS36	/	/	/

3.4 Support Equipment List

Equipment	Manufacturer	Description	Model	Serial Number
External Antenna	Shanghai Saintenna Wireless Technology Co.,LTD	0dBi three Frequency WiFi antenna	SAA31578A	/
EVB	Quectel	/	Q1-A5324	P1Q22AS17000256
Adapter	STH	Output:5V/2A	P12F050200	/
RF cable	Quectel	2.4G:0.5dB; 5G:1dB	/	/

3.5 Test Uncertainty

No.	Parameter	Uncertainty
1	Emission Bandwidth	1.9%
2	Occupied channel bandwidth	1.9%
3	Min emission bandwidth	1.9%
4	Unwanted Emissions Measurement	9kHz-7GHz: 1.21dB 7GHz-40GHz: 3.31dB
5	Radiated Band Edges and Spurious Emission	Below 1GHz: 4.88 dB Above 1GHz: 5.06 dB
6	Temperature	3 °C
7	Humidity	1.3 %
8	Supply voltages	0.006 V

4 Test Items Description

Ambient condition

Shielded Chamber

Temperature [°C]	20.1 to 24.5
Humidity [%RH]	29 to 40
Pressure [kPa]	101.8 to 103.1

Anechoic Chamber

Temperature [°C]	20.5 to 22.3
Humidity [%RH]	31 to 57
Pressure [kPa]	100.3 to 103.0

4.1 6dB and 26dB and 99% Occupied Bandwidth Measurement

4.1.1 6dB and 26dB and 99% Occupied Bandwidth Measurement

The minimum 6 dB bandwidth shall be at least 500 kHz

26dB and 99% Occupied bandwidth are reporting only.

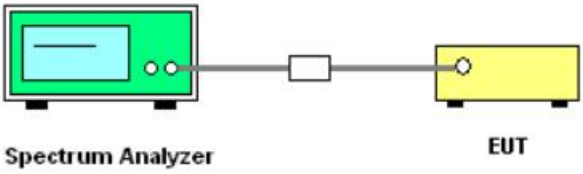
4.1.2 Measuring Instruments

The measuring equipment is listed in the section 3.3 of this test report.

4.1.3 Test Procedures

1. The testing follows FCC KDB 789033 D02 General UNII Test Procedures New Rules v02r01Section C) Emission bandwidth.
2. For 6dB BW, Set RBW = 100kHz.
   For 26dB BW, Set RBW = approximately 1% of the emission bandwidth.
   For 99% OBW, Set RBW = 1% to 5% of the OBW.
3. For 26dB BW. Set the VBW > RBW.
   For 6dB BW & 99% OBW. Set the VBW ≥ 3 × RBW
4. Detector = Peak.
5. Trace mode = max hold
6. Measure the maximum width of the emission that is 26 dB down from the peak of the emission.Compare this with the RBW setting of the analyzer, Readjust RBW and repeat measurements needed until the RBW/EBW ratio is approximately 1%.
7. For 99% Bandwidth Measurement, the spectrum analyzer's resolution bandwidth (RBW) is set1% to 5% of the OBW and set the Video bandwidth (VBW) ≥ 3* RBW.
8. Measure and record the results in the test report.

4.1.4 Test Setup



4.1.5 Test Results

See ANNEX A.1.

4.2 Maximum Conducted Output Power Measurement

4.2.1 Limit of Maximum Conducted Output Power

<FCC 14 -30 CFR 15.407>

For the band 5.15–5.25 GHz.

(i) For an outdoor access point operating in the band 5.15–5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W provided the maximum antenna gain does not exceed 6 dBi. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. The maximum e.i.r.p. at any elevation angle above 30 degrees as measured from the horizon must not exceed 125 mW (21 dBm).

(ii) For an indoor access point operating in the band 5.15–5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W provided the maximum antenna gain does not exceed 6 dBi. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

(iii) For fixed point-to-point access points operating in the band 5.15–5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W. Fixed point-to-point U–NII devices may employ antennas with directional gain up to 23 dBi without any corresponding reduction in the maximum conducted output power or maximum power spectral density. For fixed point-to-point transmitters that employ a directional antenna gain greater than 23 dBi, a 1 dB reduction in maximum conducted output power and maximum power spectral density is required for each 1 dB of antenna gain in excess of 23 dBi. Fixed, point-to-point operations exclude the use of point-to-multipoint systems, omnidirectional applications, and multiple collocated transmitters transmitting the same information. The operator of the U–NII device, or if the equipment is professionally installed, the installer, is responsible for ensuring that systems employing high gain directional antennas are used exclusively for fixed, point-to-point operations.

(iv) For client devices in the 5.15–5.25 GHz band, the maximum conducted output power over the frequency band of operation shall not exceed 250 mW provided the maximum antenna gain does not exceed 6 dBi. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

(2)For the 5.25 – 5.35 GHz and 5.47 – 5.725 GHz bands, the maximum conducted output power over the frequency bands of operation shall not exceed the lesser of 250 mW or 11 dBm + 10 log B, where B is the 26 dB emission bandwidth in megahertz. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

(3)For the band 5.725–5.850 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

4.2.2 Measuring Instruments

The measuring equipment is listed in the section 3.3 of this test report.

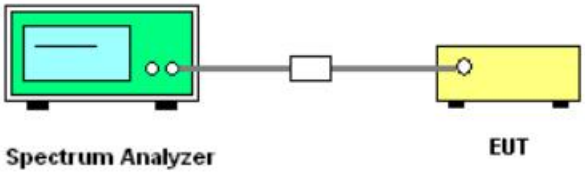
4.2.3 Test Procedures

The testing follows Method PM of FCC KDB 789033 D02 General UNII Test Procedures New Rules v02r01.

Method SA-1 (trace averaging with the EUT transmitting at full power throughout each sweep):

1. Set span to encompass the entire emission bandwidth (EBW) (or, alternatively, the entire 99% occupied bandwidth) of the signal.
2. Set RBW = 1 MHz.
3. Set VBW ≥ 3 MHz.
4. Number of points in sweep ≥ 2 × span / RBW. (This ensures that bin-to-bin spacing is ≤ RBW/2, so that narrowband signals are not lost between frequency bins.)
5. Sweep time = auto.
6. Detector = power averaging (rms), if available. Otherwise, use sample detector mode.
7. If transmit duty cycle < 98%, use a video trigger with the trigger level set to enable triggering only on full power pulses. Transmitter must operate at maximum power control level for the entire duration of every sweep. If the EUT transmits continuously (i.e., with no off intervals) or at duty cycle ≥ 98%, and if each transmission is entirely at the maximum power control level, then the trigger shall be set to "free run."
8. Trace average at least 100 traces in power averaging (rms) mode.
9. Compute power by integrating the spectrum across the EBW (or, alternatively, the entire 99% occupied bandwidth) of the signal using the instrument's band power measurement function with band limits set equal to the EBW (or occupied bandwidth) band edges. If the instrument does not have a band power function, sum the spectrum levels (in power units) at 1 MHz intervals extending across the EBW (or, alternatively, the entire 99% occupied bandwidth) of the spectrum.

4.2.4 Test Setup



4.2.5 Test Result of Maximum Conducted Output Power

Please refer to ANNEX A.2.

4.3 Power Spectral Density Measurement

4.3.1 Limit of Power Spectral Density

Rule FCC Part 15.407(a)(1)/ Part 15.407(a)(2)/Part 15.407(a)(3

For an indoor access point operating in the band 5.15–5.25 GHz, the maximum power spectral density shall not exceed 17 dBm in any 1 megahertz band.

For client devices in the 5.15–5.25 GHz band, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band.

For the 5.25-5.725 GHz bands, the maximum power spectral density shall not exceed 11 dBm in any1 megahertz band.

For the band 5.725-5.85 GHz, the maximum power spectral density shall not exceed 30 dBm in any 500-kHz band.

For Straddle Channel, According to KDB 789033 D02 General UNll Test Procedures New Rules v02r01, If the power and PSD of the devices are uniform and comply with the lower limits specified for the U-NII-2 bands, a single measurement over the entire emission bandwidth can be performed to show compliance.

If transmitting antennas of directional gain greater than 6 dBi are used, the peak output power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

4.3.2 Measuring Instruments

The measuring equipment is listed in the section 3.3 of this test report.

4.3.3 Test Procedures

The testing follows FCC KDB 789033 D02 General UNll Test Procedures New Rules v02r01 Section F) Maximum power spectral density.

1.Measure the duty cycle.

2.Set span to encompass the entire emission bandwidth (EBW) of the signal.

3.Set RBW ≥ 1/T, where T is defined in II.B.I.a).

4.Set VBW ≥ 3 RBW.

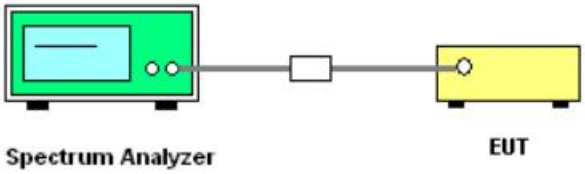
5.If measurement bandwidth of Maximum PSD is specified in 500 kHz, add 10 log (500 kHz/RBW) to the measured result, whereas RBW (<500 kHz) is the reduced resolution bandwidth of the spectrum analyzer set during measurement.

6.If measurement bandwidth of Maximum PSD is specified in 1 MHz, add 10 log (1MHz/RBW) to the measured result, whereas RBW (< 1 MHz) is the reduced resolution bandwidth of spectrum analyzer set during measurement.

7. Care must be taken to ensure that the measurements are performed during a period of continuous

transmission or are corrected upward for duty cycle.

4.3.4 Test Setup



4.3.5 Test Result of Power Spectral Density

Please refer to ANNEX A.3.

4.4 Unwanted Emissions Measurement

This section is to measure unwanted emissions through radiated measurement for band edge spurious emissions and out of band emissions measurement.

4.4.1 Limit of Unwanted Emissions

(1) For transmitters operating in the 5150-5250 MHz band: all emissions outside of the 5150-5350 MHz band shall not exceed an EIRP of -27dBm/MHz.

For transmitters operating in the 5250-5350 MHz band: all emissions outside of the 5150-5350 MHz band shall not exceed an EIRP of-27 dBm/MHz. Devices operating in the 5250-5350 MHz band that generate emissions in the 5150-5250 MHz band must meet all applicable technical requirements for operation in the 5150-5250 MHz band (including indoor use) or alternatively meet an out-of-band emission EIRP limit of -27 dBm/MHz in the 5150-5250 MHz band.

For transmitters operating in the 5470-5725 MHz band: all emissions outside of the 5470-5725MHz band shall not exceed an EIRP of -27 dBm/MHz.

For transmitters operating in the 5.725-5.85 GHz band:
15.407(b)(4)(i) All emissions shall be limited to a level of -27 dBm/MHz at 75 MHz or more above or below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above or below the band edge, and from 25 MHz above or below the band edge increasing linearly to a level of 15.6dBm/MHz at 5 MHz above or below the band edge, and from 5 MHz above or below the band edge increasing linearly to a level of 27 dBm/MHz at the band edge.

(2) Unwanted spurious emissions fallen in restricted bands shall comply with the general field strength limits as below table.

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

EIRP (dBm)	Field Strength at 3m (dB μ V/m)
- 27	68.2

Note: The following formula is used to convert the EIRP to field strength.

$$EIRP = E_{Meas} + 20\log(d_{Meas}) - 104.7$$

where

EIRP is the equivalent isotropically radiated power, in dBm

E_{Meas} is the field strength of the emission at the measurement distance, in dBμV/m

d_{Meas} is the measurement distance, in m

4.4.2 Measuring Instruments

The measuring equipment is listed in the section 3.3 of this test report.

4.4.3 Test Procedures

1. The testing follows FCC KDB 789033 D02 General UNll Test Procedures New Rules v02r01 Section G) Unwanted emissions measurement.

   (1)Procedure for Unwanted Emissions Measurements Below 1000MHz
   - RBW = 120 kHz
   - VBW = 300 kHz
   - Detector = Peak
   - Trace mode = max hold

   (2)Procedure for Peak Unwanted Emissions Measurements Above 1000 MHz
   - RBW= 1 MHz
   - VBW ≥ 3 MHz
   - Detector = Peak
   - Sweep time = auto
   - Trace mode = max hold

   (3)Procedures for Average Unwanted Emissions Measurements Above 1000MHz
   - RBW = 1 MHz
   - VBW = 10 Hz, when duty cycle is no less than 98 percent
   - VBW ⩾ 1/T, when duty cycle is less than 98 percent where T is the minimum transmission duration over which the transmitter is on and is transmitting at its maximum power control level for the tested mode of operation.
2. The EUT was placed on a turntable with 0.8 meter for frequency below 1GHz and 1.5 meter for frequency above 1GHz respectively above ground.
3. The EUT was set 3 meters from the interference receiving antenna which was mounted on the top of a variable height antenna tower.

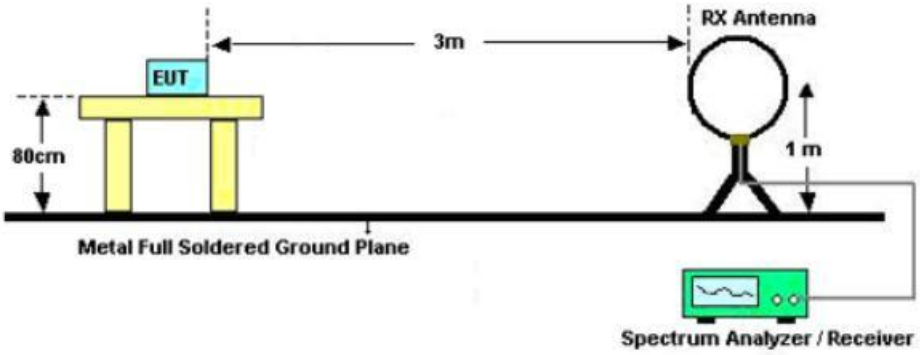
4.. The antenna is a broadband antenna and its height is adjusted between one meter and four.

meters above ground to find the maximum value of the field strength for both horizontal polarization and vertical polarization of the antenna.

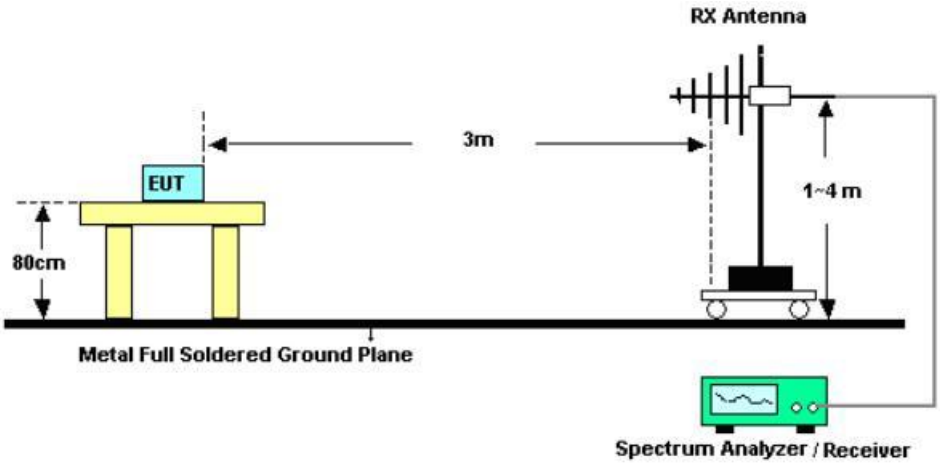
5. For each suspected emission, the EUT was arranged to its worst case and then adjust the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading.
6. For testing below 1GHz, if the emission level of the EUT in peak mode was 3 dB lower than the limit specified, then peak values of EUT will be reported, otherwise, the emissions will be repeated one by one using the CISPR quasi-peak method and reported.
7. For testing above 1GHz, the emission level of the EUT in peak mode was 20dB lower than peak limit (that means the emission level in average mode also complies with the limit in average mode), then peak values of EUT will be reported, otherwise, the emissions will be measured in average mode again and reported.

4.4.4 Test Setup

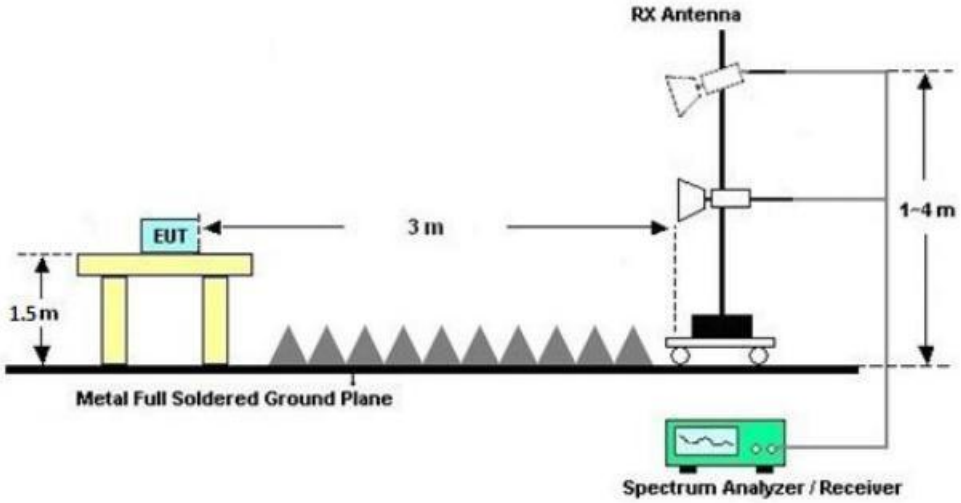
For radiated emissions below 30MHz



For radiated emissions from 30MHz to 1GHz



For radiated emissions above 1GHz



4.4.5Test Results of Radiated Spurious Emissions (9 kHz - 30 MHz)

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

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

4.4.6 Test Result of Radiated Spurious at Band Edges

Please refer to ANNEX B.1.

4.4.7 Test Result of Radiated Spurious Emissions (30MHz - 10th Harmonic or 40GHz whichever is lower)

Please refer to ANNEX B.1

4.4.8 Duty Cycle

Please refer to ANNEX A.4.

4.5 AC Conducted Emission Measurement

4.5.1 Limit of AC Conducted Emission

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

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

Decreases with the logarithm of the frequency.

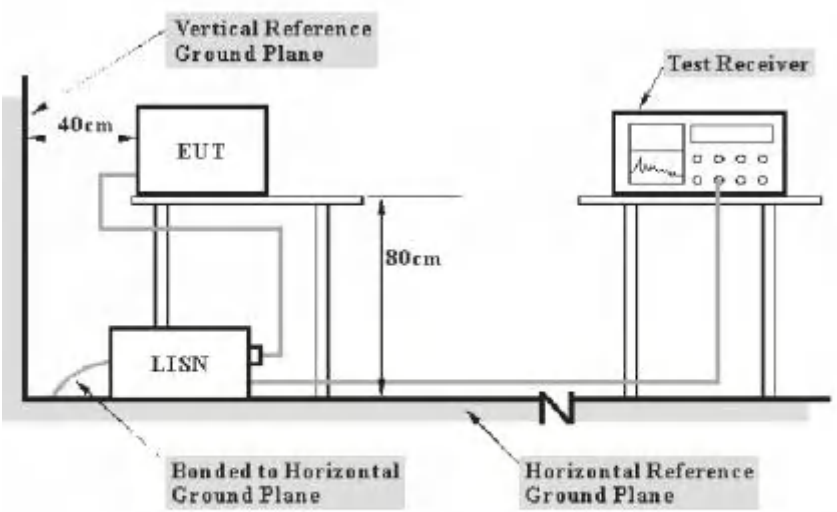
4.5.2 Measuring Instruments

The section 3.3 of List of Measuring Equipment of this test report is used for test.

4.5.3 Test Procedures

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

4.5.4 Test Setup



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

4.5.5 Uncertainty Measurement

Where relevant,the following measurement uncertainty levels have been estimated for tests performed on the EUT. The listed uncertainties are the worst case uncertainty for the entire range of measurement. Please note that the uncertainty values are provided for informational purposes only and are not used in determining the PASS/FAIL results.

This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

CASE	Uncertainty
Continuous Emission (AC port)	2.92 dB

4.5.6 Test Result

Remark: The product is DC powered, this test item is not applicable.

4.6 Antenna Requirements

4.6.1 Standard Applicable

15.203 requirement: 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. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

15.247(b) (4) requirement: The 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. Except as shown in paragraph (c) of this section, 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)(1), (b)(2), and(b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6dBi.

4.6.2 Antenna Anti-Replacement Construction

The antenna is External on the main PCB and no consideration of replacement. The best case gain of the antenna is 1.28dBi.

-------- THE END --------

ANNEX A: Test Results of Conducted Test

A.1 6dB and 26dB and 99% Occupied Bandwidth Measurement

Test Result_26dB Bandwidth

Test Mode	Antenna	Frequency[MHz]	26db EBW [MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
11A	Ant1	5180	22.560	5168.640	5191.200	---	---
11A	Ant1	5220	22.400	5209.240	5231.640	---	---
11A	Ant1	5240	22.200	5229.440	5251.640	---	---
11A	Ant1	5260	21.160	5249.680	5270.840	---	---
11A	Ant1	5300	23.280	5288.600	5311.880	---	---
11A	Ant1	5320	22.640	5309.640	5332.280	---	---
11A	Ant1	5500	21.120	5489.640	5510.760	---	---
11A	Ant1	5580	23.280	5569.080	5592.360	---	---
11A	Ant1	5700	21.840	5689.000	5710.840	---	---
11A	Ant1	5720	23.240	5708.920	5732.160	---	---
11A	Ant1	5720_UNII-2C	16.08	5708.920	5725	---	---
11A	Ant1	5720_UNII-3	7.16	5725	5732.160	---	---
11A	Ant1	5745	21.680	5733.800	5755.480	---	---
11A	Ant1	5785	21.480	5774.080	5795.560	---	---
11A	Ant1	5825	20.640	5814.960	5835.600	---	---
11N20SISO	Ant1	5180	22.000	5168.960	5190.960	---	---
11N20SISO	Ant1	5220	23.640	5207.880	5231.520	---	---
11N20SISO	Ant1	5240	22.400	5229.400	5251.800	---	---
11N20SISO	Ant1	5260	24.160	5248.640	5272.800	---	---
11N20SISO	Ant1	5300	22.400	5289.320	5311.720	---	---
11N20SISO	Ant1	5320	21.280	5309.520	5330.800	---	---
11N20SISO	Ant1	5500	22.760	5488.680	5511.440	---	---
11N20SISO	Ant1	5580	22.480	5568.880	5591.360	---	---
11N20SISO	Ant1	5700	22.680	5689.040	5711.720	---	---
11N20SISO	Ant1	5720	20.560	5710.000	5730.560	---	---
11N20SISO	Ant1	5720_UNII-2C	15	5710.000	5725	---	---
11N20SISO	Ant1	5720_UNII-3	5.56	5725	5730.560	---	---
11N20SISO	Ant1	5745	21.720	5734.000	5755.720	---	---
11N20SISO	Ant1	5785	21.720	5773.920	5795.640	---	---
11N20SISO	Ant1	5825	22.200	5813.680	5835.880	---	---
11N40SISO	Ant1	5190	40.640	5169.840	5210.480	---	---
11N40SISO	Ant1	5230	40.960	5209.600	5250.560	---	---
11N40SISO	Ant1	5270	40.320	5249.920	5290.240	---	---

11N40SISO	Ant1	5310	41.120	5289.520	5330.640	---	---
11N40SISO	Ant1	5510	40.000	5490.320	5530.320	---	---
11N40SISO	Ant1	5550	40.240	5530.000	5570.240	---	---
11N40SISO	Ant1	5670	40.000	5650.000	5690.000	---	---
11N40SISO	Ant1	5710	40.480	5690.080	5730.560	---	---
11N40SISO	Ant1	5710_UNII-2C	34.92	5690.080	5725	---	---
11N40SISO	Ant1	5710_UNII-3	5.56	5725	5730.560	---	---
11N40SISO	Ant1	5755	40.720	5734.520	5775.240	---	---
11N40SISO	Ant1	5795	40.320	5775.080	5815.400	---	---
11AC20SISO	Ant1	5180	21.880	5168.880	5190.760	---	---
11AC20SISO	Ant1	5220	21.280	5209.640	5230.920	---	---
11AC20SISO	Ant1	5240	21.120	5229.680	5250.800	---	---
11AC20SISO	Ant1	5260	22.920	5248.720	5271.640	---	---
11AC20SISO	Ant1	5300	24.360	5287.440	5311.800	---	---
11AC20SISO	Ant1	5320	21.080	5309.480	5330.560	---	---
11AC20SISO	Ant1	5500	22.920	5488.960	5511.880	---	---
11AC20SISO	Ant1	5580	22.320	5569.360	5591.680	---	---
11AC20SISO	Ant1	5700	21.120	5689.240	5710.360	---	---
11AC20SISO	Ant1	5720	22.520	5708.960	5731.480	---	---
11AC20SISO	Ant1	5720_UNII-2C	16.04	5708.960	5725	---	---
11AC20SISO	Ant1	5720_UNII-3	6.48	5725	5731.480	---	---
11AC20SISO	Ant1	5745	22.040	5734.040	5756.080	---	---
11AC20SISO	Ant1	5785	21.920	5773.720	5795.640	---	---
11AC20SISO	Ant1	5825	22.160	5813.920	5836.080	---	---
11AC40SISO	Ant1	5190	40.960	5169.760	5210.720	---	---
11AC40SISO	Ant1	5230	42.400	5209.840	5252.240	---	---
11AC40SISO	Ant1	5270	40.720	5249.760	5290.480	---	---
11AC40SISO	Ant1	5310	40.240	5290.080	5330.320	---	---
11AC40SISO	Ant1	5510	40.640	5489.520	5530.160	---	---
11AC40SISO	Ant1	5550	40.240	5530.160	5570.400	---	---
11AC40SISO	Ant1	5670	41.920	5649.920	5691.840	---	---
11AC40SISO	Ant1	5710	41.040	5689.680	5730.720	---	---
11AC40SISO	Ant1	5710_UNII-2C	35.32	5689.680	5725	---	---
11AC40SISO	Ant1	5710_UNII-3	5.72	5725	5730.720	---	---
11AC40SISO	Ant1	5755	40.160	5734.600	5774.760	---	---
11AC40SISO	Ant1	5795	41.040	5774.520	5815.560	---	---
11AC80SISO	Ant1	5210	86.080	5164.720	5250.800	---	---
11AC80SISO	Ant1	5290	86.400	5247.920	5334.320	---	---
11AC80SISO	Ant1	5530	87.360	5483.760	5571.120	---	---

11AC80SISO	Ant1	5610	89.600	5565.040	5654.640	---	---
11AC80SISO	Ant1	5690	81.760	5649.520	5731.280	---	---
11AC80SISO	Ant1	5690_UNII-2C	75.48	5649.520	5725	---	---
11AC80SISO	Ant1	5690_UNII-3	6.28	5725	5731.280	---	---
11AC80SISO	Ant1	5775	88.160	5727.800	5815.960	---	---

Test Result_6dB Bandwidth

U-NII-3

Test Mode	Antenna	Frequency[MHz]	6db EBW [MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
11A	Ant1	5745	15.680	5737.200	5752.880	0.5	PASS
11A	Ant1	5785	13.560	5778.080	5791.640	0.5	PASS
11A	Ant1	5825	15.560	5817.200	5832.760	0.5	PASS
11N20SISO	Ant1	5745	16.960	5736.440	5753.400	0.5	PASS
11N20SISO	Ant1	5785	17.560	5776.200	5793.760	0.5	PASS
11N20SISO	Ant1	5825	16.240	5817.120	5833.360	0.5	PASS
11N40SISO	Ant1	5755	36.320	5736.840	5773.160	0.5	PASS
11N40SISO	Ant1	5795	35.280	5777.480	5812.760	0.5	PASS
11AC20SISO	Ant1	5745	16.760	5736.640	5753.400	0.5	PASS
11AC20SISO	Ant1	5785	16.720	5776.640	5793.360	0.5	PASS
11AC20SISO	Ant1	5825	16.600	5816.520	5833.120	0.5	PASS
11AC40SISO	Ant1	5755	34.560	5738.040	5772.600	0.5	PASS
11AC40SISO	Ant1	5795	35.040	5777.480	5812.520	0.5	PASS
11AC80SISO	Ant1	5775	75.200	5737.400	5812.600	0.5	PASS

Test Result_99% Bandwidth

Test Mode	Antenna	Frequency[MHz]	OCB [MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
11A	Ant1	5180	16.687	5171.6991	5188.3861	---	---
11A	Ant1	5220	16.640	5211.7165	5228.3565	---	---
11A	Ant1	5240	16.703	5231.7065	5248.4095	---	---
11A	Ant1	5260	16.735	5251.6732	5268.4082	---	---
11A	Ant1	5300	16.679	5291.6849	5308.3639	---	---
11A	Ant1	5320	16.720	5311.6646	5328.3846	---	---
11A	Ant1	5500	16.680	5491.6958	5508.3758	---	---
11A	Ant1	5580	16.709	5571.6444	5588.3534	---	---
11A	Ant1	5700	16.618	5691.6623	5708.2803	---	---
11A	Ant1	5720	16.673	5711.6728	5728.3458	---	---
11A	Ant1	5720_UNII-2C	13.327	5711.6728	5725	---	---
11A	Ant1	5720_UNII-3	3.346	5725	5728.3458	---	---
11A	Ant1	5745	16.697	5736.6197	5753.3167	---	---

11A	Ant1	5785	16.664	5776.6504	5793.3144	---	---
11A	Ant1	5825	16.714	5816.6344	5833.3484	---	---
11N20SISO	Ant1	5180	17.884	5171.0469	5188.9309	---	---
11N20SISO	Ant1	5220	17.892	5211.0898	5228.9818	---	---
11N20SISO	Ant1	5240	17.904	5231.0678	5248.9718	---	---
11N20SISO	Ant1	5260	17.866	5251.0918	5268.9578	---	---
11N20SISO	Ant1	5300	17.884	5291.0674	5308.9514	---	---
11N20SISO	Ant1	5320	17.841	5311.0830	5328.9240	---	---
11N20SISO	Ant1	5500	17.854	5491.0754	5508.9294	---	---
11N20SISO	Ant1	5580	17.884	5571.0467	5588.9307	---	---
11N20SISO	Ant1	5700	17.843	5691.0495	5708.8925	---	---
11N20SISO	Ant1	5720	17.839	5711.0966	5728.9356	---	---
11N20SISO	Ant1	5720_UNII-2C	13.903	5711.0966	5725	---	---
11N20SISO	Ant1	5720_UNII-3	3.936	5725	5728.9356	---	---
11N20SISO	Ant1	5745	17.893	5736.0512	5753.9442	---	---
11N20SISO	Ant1	5785	17.835	5776.0666	5793.9016	---	---
11N20SISO	Ant1	5825	17.847	5816.0753	5833.9223	---	---
11N40SISO	Ant1	5190	36.313	5171.8737	5208.1867	---	---
11N40SISO	Ant1	5230	36.308	5211.9231	5248.2311	---	---
11N40SISO	Ant1	5270	36.334	5251.8846	5288.2186	---	---
11N40SISO	Ant1	5310	36.323	5291.8698	5328.1928	---	---
11N40SISO	Ant1	5510	36.305	5491.8434	5528.1484	---	---
11N40SISO	Ant1	5550	36.344	5531.9017	5568.2457	---	---
11N40SISO	Ant1	5670	36.313	5651.8752	5688.1882	---	---
11N40SISO	Ant1	5710	36.420	5691.7696	5728.1896	---	---
11N40SISO	Ant1	5710_UNII-2C	33.23	5691.7696	5725	---	---
11N40SISO	Ant1	5710_UNII-3	3.19	5725	5728.1896	---	---
11N40SISO	Ant1	5755	36.339	5736.8117	5773.1507	---	---
11N40SISO	Ant1	5795	36.354	5776.8249	5813.1789	---	---
11AC20SISO	Ant1	5180	17.882	5171.0773	5188.9593	---	---
11AC20SISO	Ant1	5220	17.904	5211.0745	5228.9785	---	---
11AC20SISO	Ant1	5240	17.904	5231.0669	5248.9709	---	---
11AC20SISO	Ant1	5260	17.847	5251.1190	5268.9660	---	---
11AC20SISO	Ant1	5300	17.879	5291.0805	5308.9595	---	---
11AC20SISO	Ant1	5320	17.823	5311.0867	5328.9097	---	---
11AC20SISO	Ant1	5500	17.830	5491.1103	5508.9403	---	---
11AC20SISO	Ant1	5580	17.819	5571.0822	5588.9012	---	---
11AC20SISO	Ant1	5700	17.827	5691.0813	5708.9083	---	---
11AC20SISO	Ant1	5720	17.806	5711.1036	5728.9096	---	---

11AC20SISO	Ant1	5720_UNII-2C	13.896	5711.1036	5725	---	---
11AC20SISO	Ant1	5720_UNII-3	3.91	5725	5728.9096	---	---
11AC20SISO	Ant1	5745	17.885	5736.0061	5753.8911	---	---
11AC20SISO	Ant1	5785	17.875	5776.0300	5793.9050	---	---
11AC20SISO	Ant1	5825	17.806	5816.0725	5833.8785	---	---
11AC40SISO	Ant1	5190	36.315	5171.8902	5208.2052	---	---
11AC40SISO	Ant1	5230	36.300	5211.8789	5248.1789	---	---
11AC40SISO	Ant1	5270	36.316	5251.9042	5288.2202	---	---
11AC40SISO	Ant1	5310	36.288	5291.8558	5328.1438	---	---
11AC40SISO	Ant1	5510	36.351	5491.8352	5528.1862	---	---
11AC40SISO	Ant1	5550	36.302	5531.8885	5568.1905	---	---
11AC40SISO	Ant1	5670	36.328	5651.8480	5688.1760	---	---
11AC40SISO	Ant1	5710	36.270	5691.8532	5728.1232	---	---
11AC40SISO	Ant1	5710_UNII-2C	33.147	5691.8532	5725	---	---
11AC40SISO	Ant1	5710_UNII-3	3.123	5725	5728.1232	---	---
11AC40SISO	Ant1	5755	36.244	5736.9016	5773.1456	---	---
11AC40SISO	Ant1	5795	36.319	5776.8176	5813.1366	---	---
11AC80SISO	Ant1	5210	75.758	5172.2641	5248.0221	---	---
11AC80SISO	Ant1	5290	75.788	5252.2716	5328.0596	---	---
11AC80SISO	Ant1	5530	75.872	5492.1150	5567.9870	---	---
11AC80SISO	Ant1	5610	75.730	5571.8735	5647.6035	---	---
11AC80SISO	Ant1	5690	75.958	5652.0288	5727.9868	---	---
11AC80SISO	Ant1	5690_UNII-2C	72.971	5652.0288	5725	---	---
11AC80SISO	Ant1	5690_UNII-3	2.987	5725	5727.9868	---	---
11AC80SISO	Ant1	5775	75.925	5737.0195	5812.9445	---	---

Test Graphs

26dB Occupied Bandwidth

11A-Ant1-5180	11A-Ant1-5220
	
11A-Ant1-5240	11A-Ant1-5260

11A-Ant1-5300

11A-Ant1-5320

11A-Ant1-5500

11A-Ant1-5580

11A-Ant1-5700

11A-Ant1-5720

11A-Ant1-5745

11A-Ant1-5785

11A-Ant1-5825

11N20SISO-Ant1-5180

11N20SISO-Ant1-5220

11N20SISO-Ant1-5240

11N20SISO-Ant1-5260

11N20SISO-Ant1-5300

11N20SISO-Ant1-5320

11N20SISO-Ant1-5500

11N20SISO-Ant1-5580

11N20SISO-Ant1-5700

11N20SISO-Ant1-5720

11N20SISO-Ant1-5745

11N20SISO-Ant1-5785

11N20SISO-Ant1-5825

11N40SISO-Ant1-5190

11N40SISO-Ant1-5230

11N40SISO-Ant1-5270

11N40SISO-Ant1-5310

11N40SISO-Ant1-5510

11N40SISO-Ant1-5550

11N40SISO-Ant1-5670

11N40SISO-Ant1-5710

11N40SISO-Ant1-5755

11N40SISO-Ant1-5795

11AC20SISO-Ant1-5180

11AC20SISO-Ant1-5220

11AC20SISO-Ant1-5240

11AC20SISO-Ant1-5260

11AC20SISO-Ant1-5300

11AC20SISO-Ant1-5320

11AC20SISO-Ant1-5500

11AC20SISO-Ant1-5580

11AC20SISO-Ant1-5700

11AC20SISO-Ant1-5720

11AC20SISO-Ant1-5745

11AC20SISO-Ant1-5785

11AC20SISO-Ant1-5825

11AC40SISO-Ant1-5190

11AC40SISO-Ant1-5230

11AC40SISO-Ant1-5270

11AC40SISO-Ant1-5310

11AC40SISO-Ant1-5510

11AC40SISO-Ant1-5550

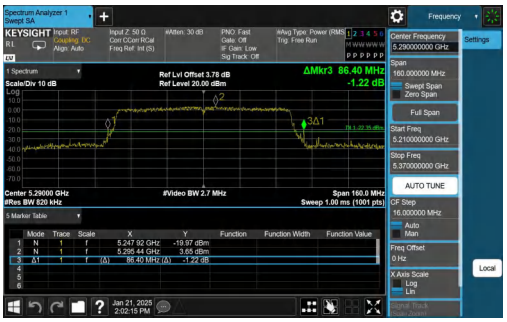
11AC40SISO-Ant1-5670

11AC40SISO-Ant1-5710

11AC40SISO-Ant1-5755

11AC40SISO-Ant1-5795

11AC80SISO-Ant1-5210

	
11AC80SISO-Ant1-5290	11AC80SISO-Ant1-5530
	
11AC80SISO-Ant1-5610	11AC80SISO-Ant1-5690
	
11AC80SISO-Ant1-5775	/
	/

6dB Bandwidth
U-NII-3

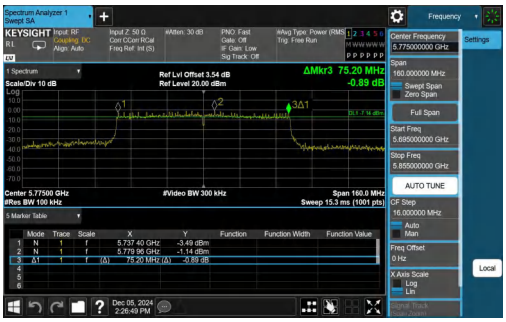
11A-Ant1-5745-PASS	11A-Ant1-5785-PASS
	
11A-Ant1-5825-PASS	11N20SISO-Ant1-5745-PASS
	
11N20SISO-Ant1-5785-PASS	11N20SISO-Ant1-5825-PASS
	
11N40SISO-Ant1-5755-PASS	11N40SISO-Ant1-5795-PASS
	
11AC20SISO-Ant1-5745-PASS	11AC20SISO-Ant1-5785-PASS

11AC20SISO-Ant1-5825-PASS

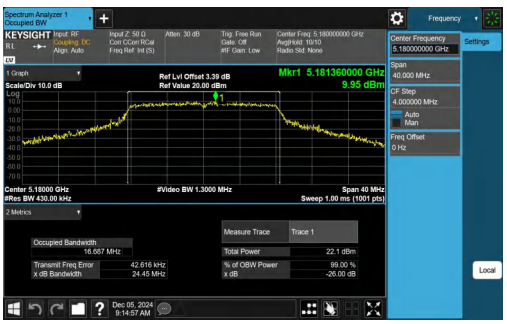
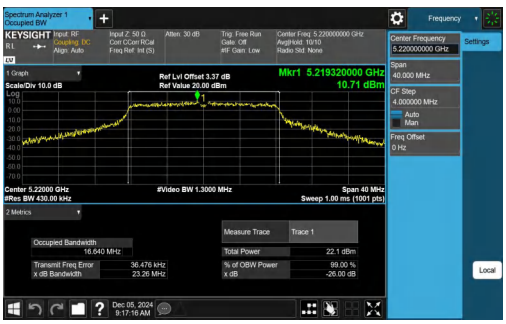
11AC40SISO-Ant1-5755-PASS

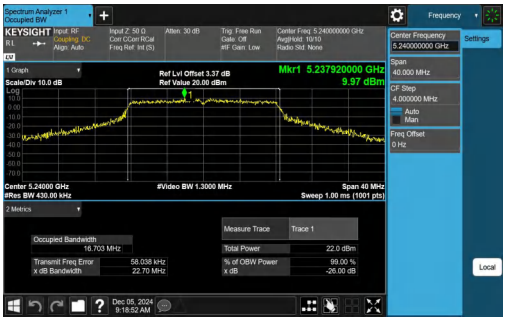
11AC40SISO-Ant1-5795-PASS

11AC80SISO-Ant1-5775-PASS



99% Bandwidth

11A-Ant1-5180	11A-Ant1-5220
	
11A-Ant1-5240	11A-Ant1-5260



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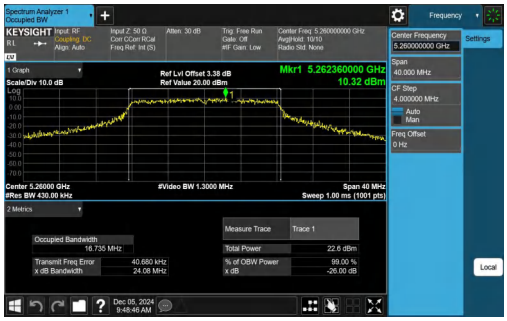

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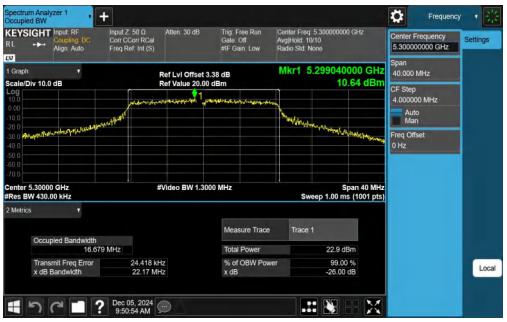

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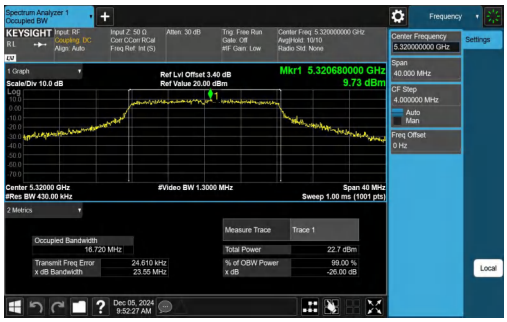

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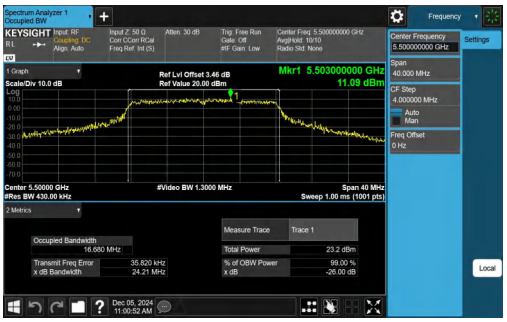

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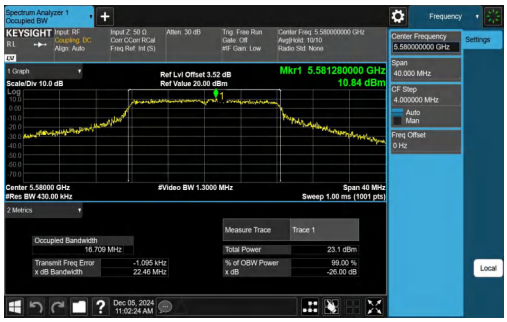

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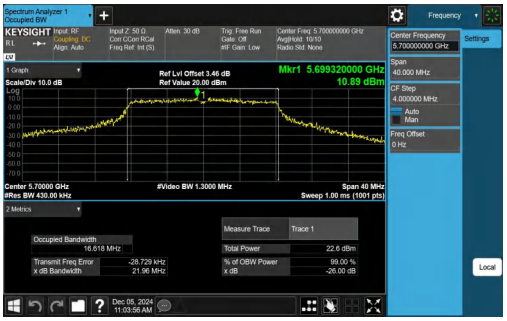

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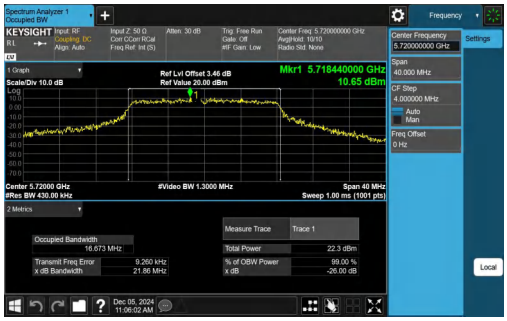

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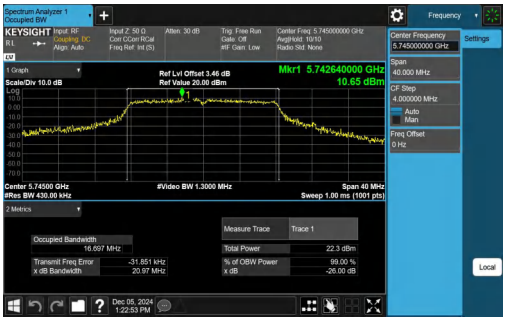

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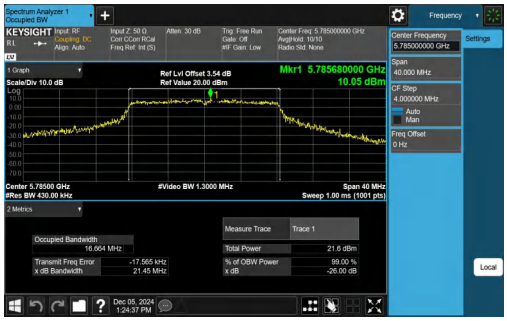

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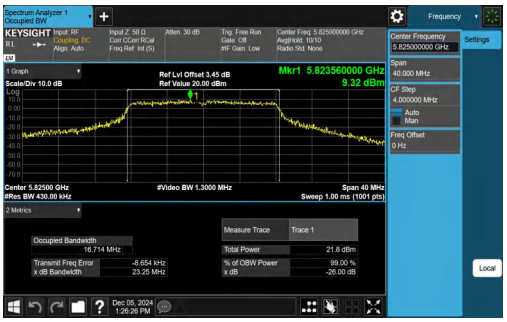

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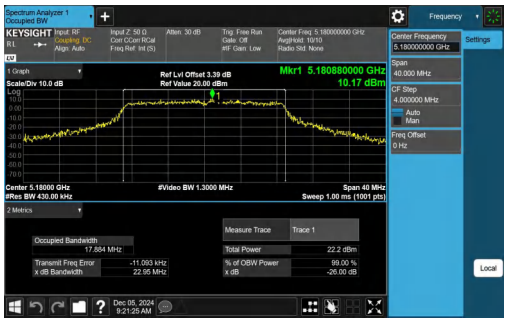

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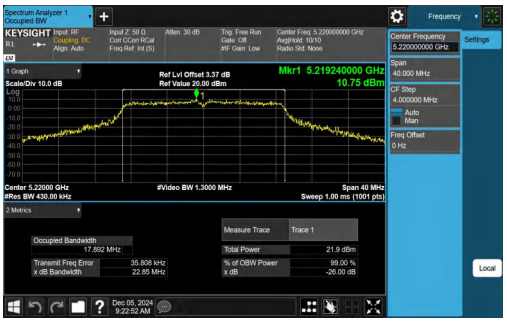

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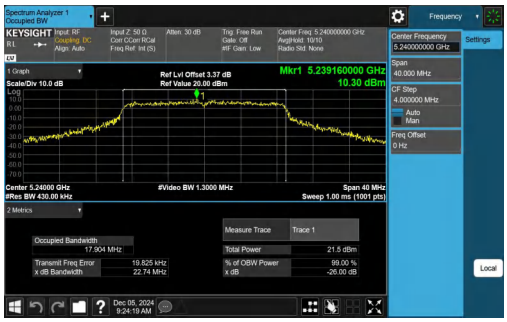

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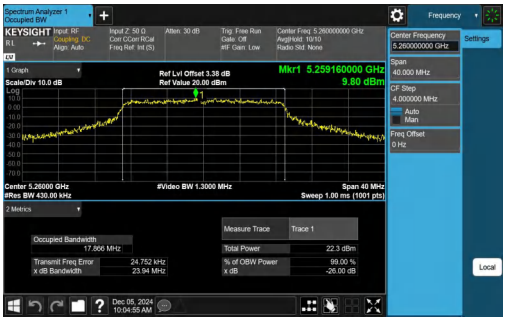

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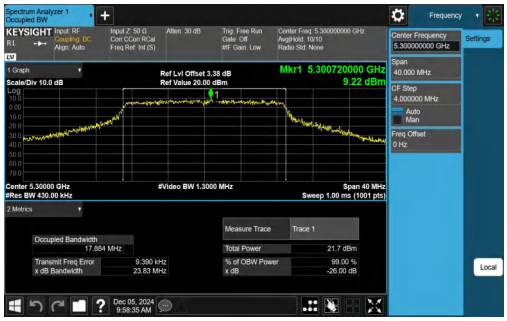

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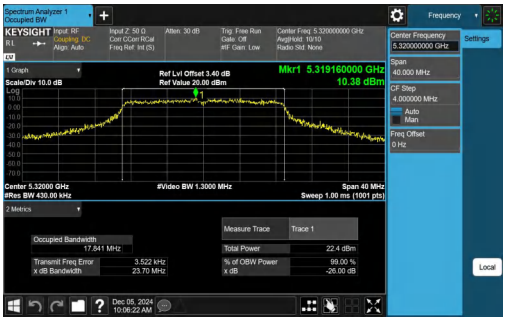

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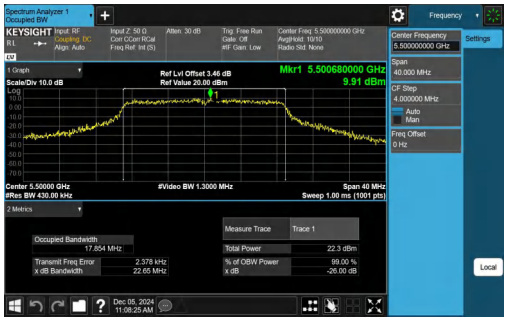

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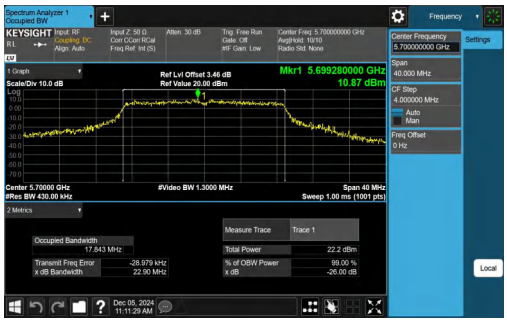

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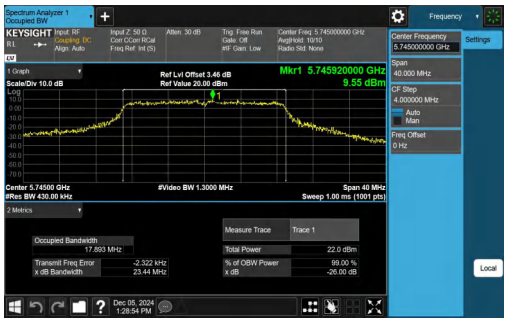

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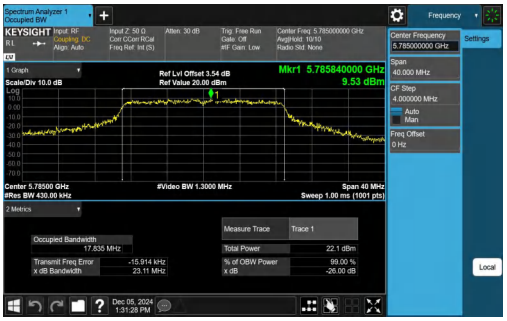

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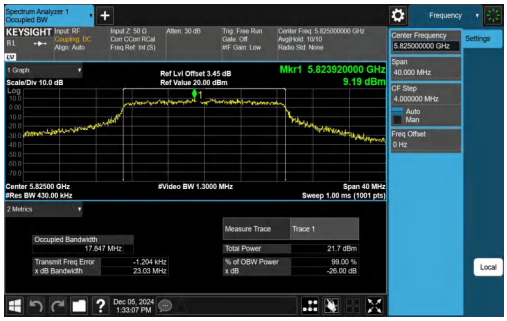

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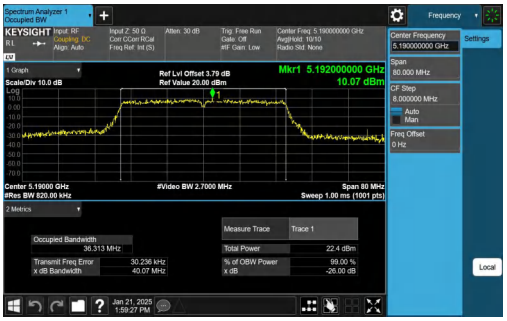

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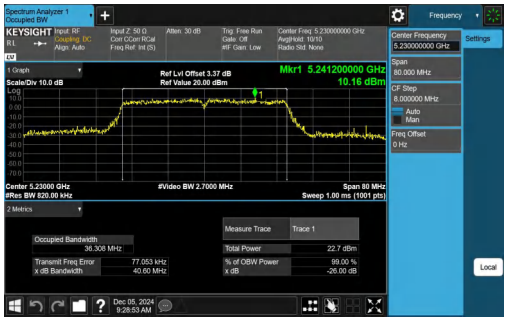

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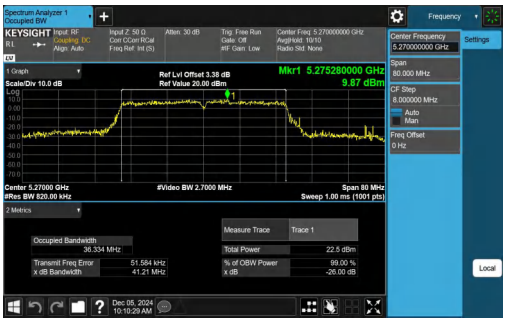

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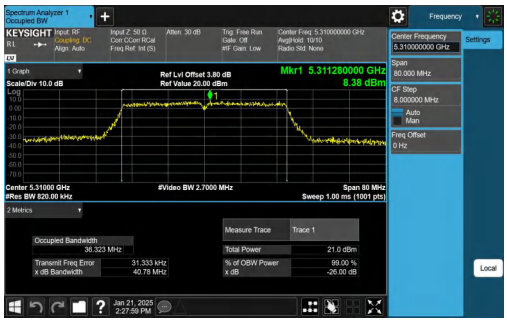

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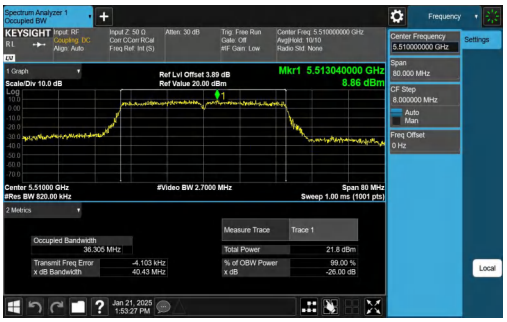

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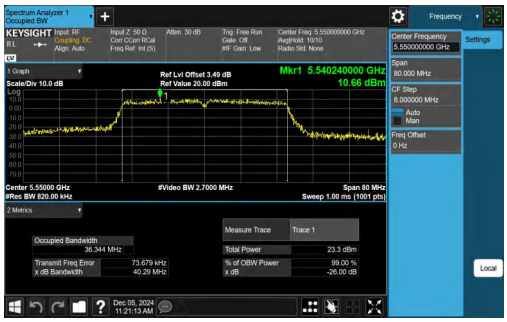

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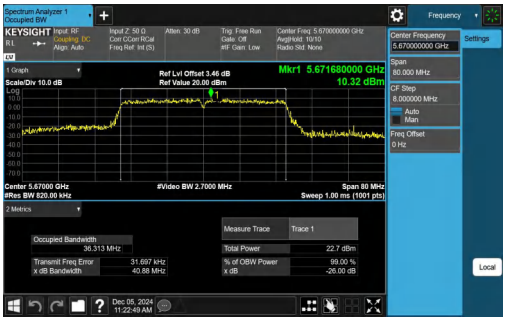

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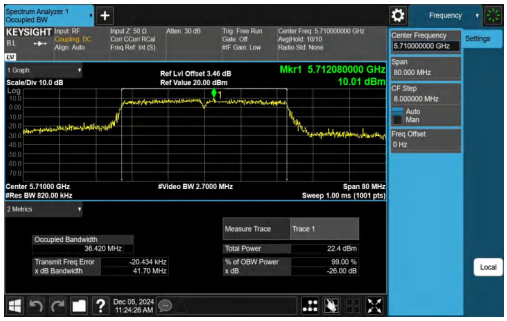

11N40SISO-Ant1-5795