3.3 Spurious Emission at Antenna Port

3.3.1 Limit

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak Output Power limits. If the transmitter complies with the Output Power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).

3.3.2 Test Procedure

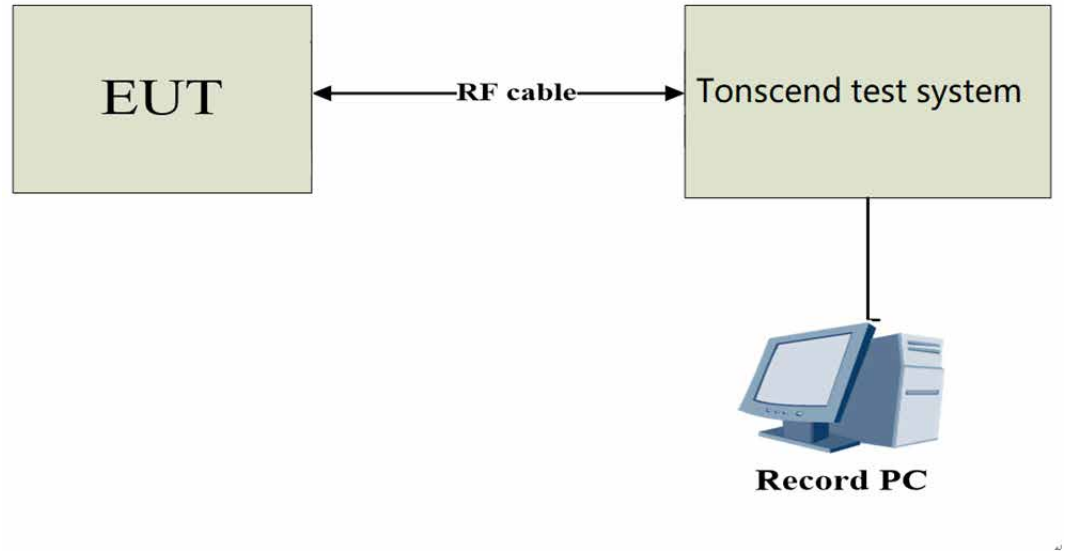
Test Method	
●Conducted Measurement	○Radiated Measurement
Test Channels	
● Lowest, Middle and Highest Channel	○ Lowest and Highest Channel
Environmental conditions	
●Normal	○Normal and Extreme
Note:●:Test ○:No Test	

a) The EUT was directly connected to the tonscend test system and antenna output port as show in the block diagram below.

b) Spectrum Setting as below:

Centre Frequency	The centre frequency of the channel under test
Spectrum Parameters	Setting
Start Frequency	30 MHz
Stop Frequency	26.5 GHz
RBW	100 kHz
VBW	300 kHz
Detector	Peak
Trace	Max Hold
Sweep Time	Auto

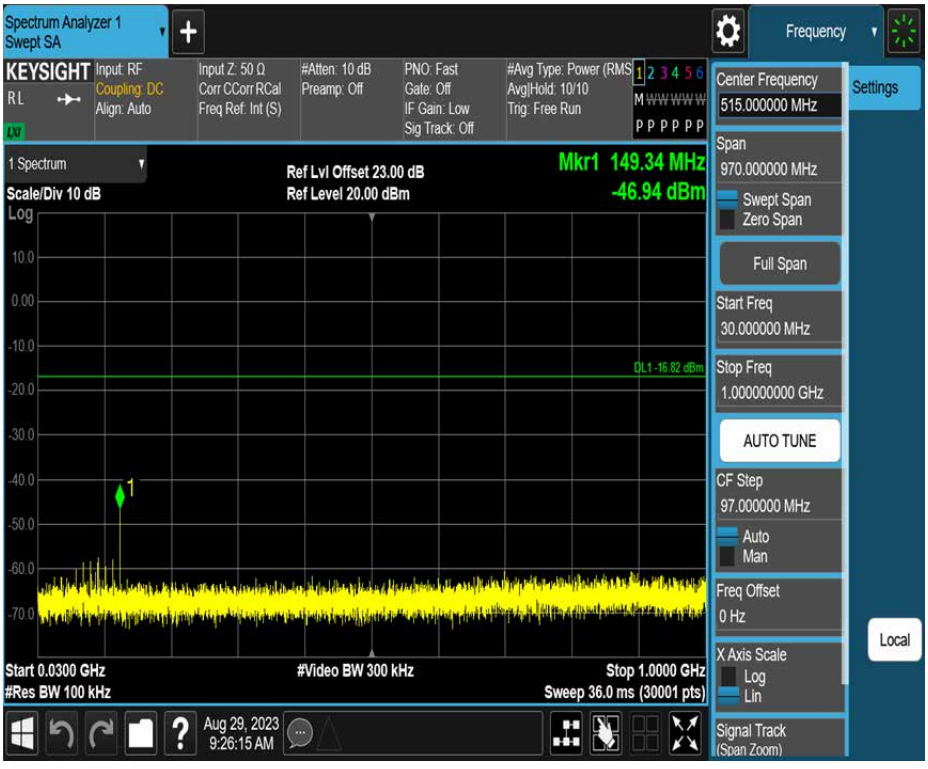
3.3.3 Test Setup



3.3.4 The Result

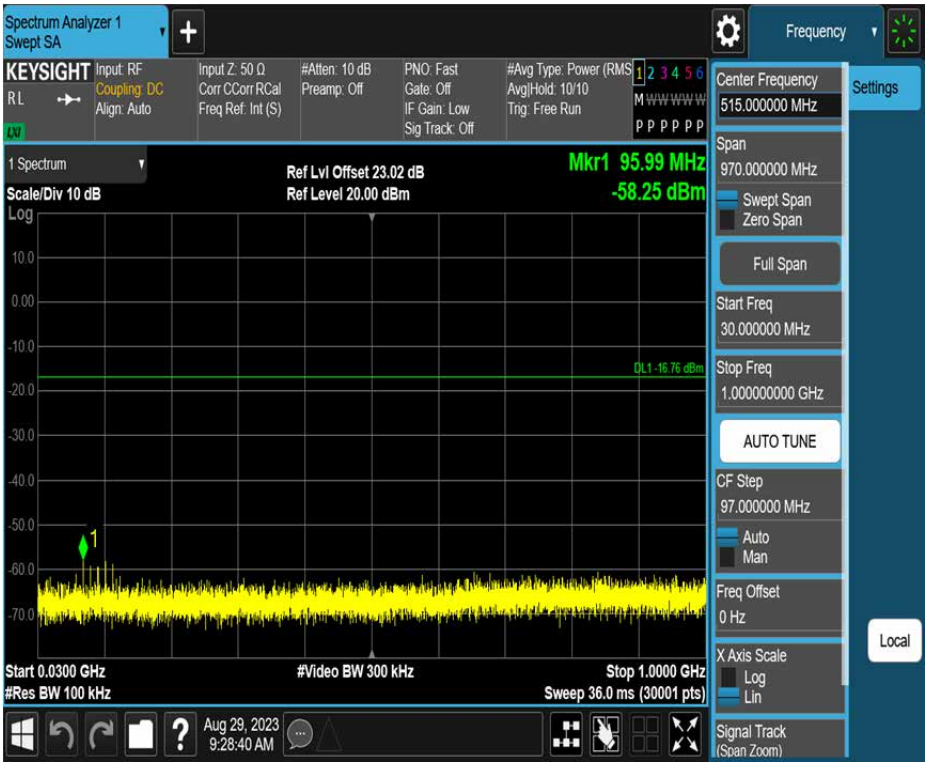
Conducted Spurious Emission

11B_Ant1_2412_0~Reference

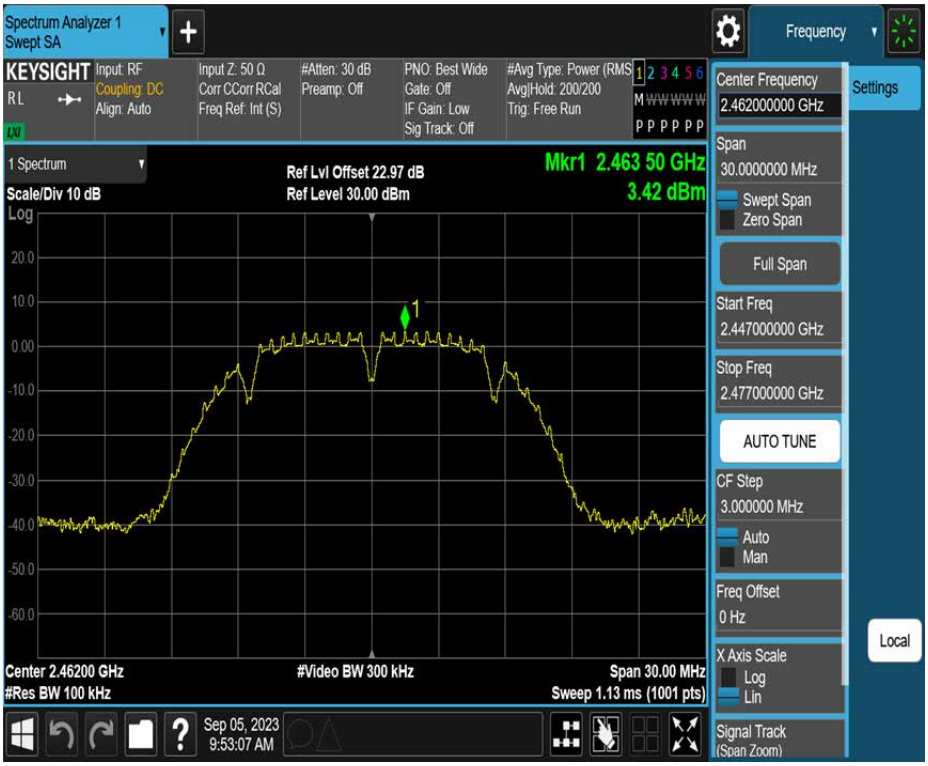
11B_Ant1_2412_30~1000


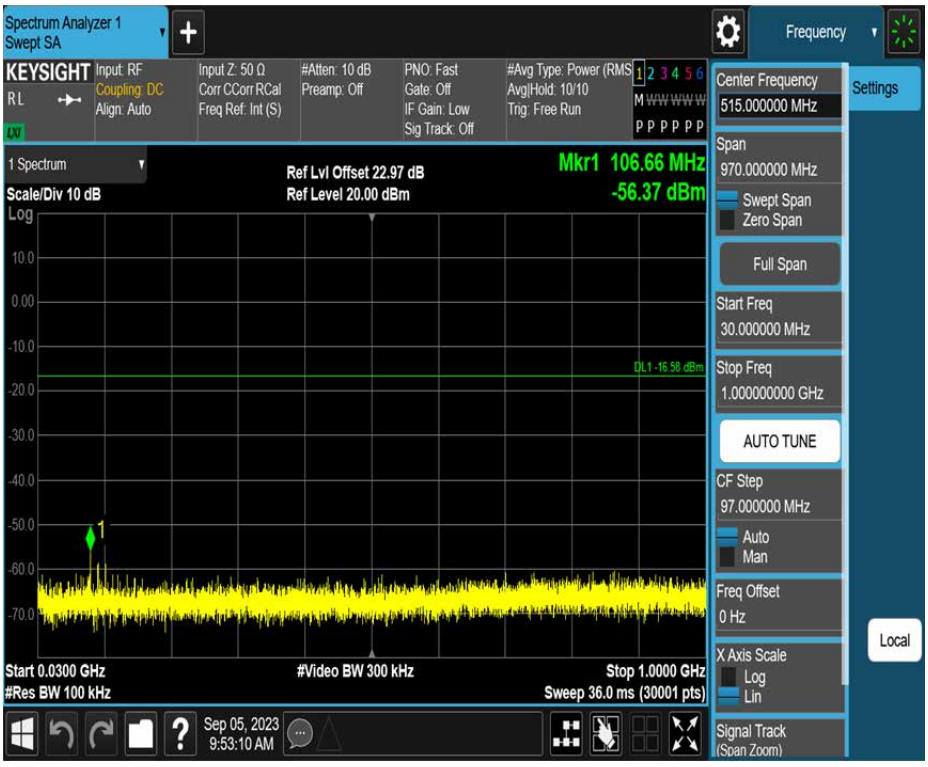
11B_Ant1_2412_1000~26500


11B_Ant1_2437_0~Reference


11B_Ant1_2437_30~1000


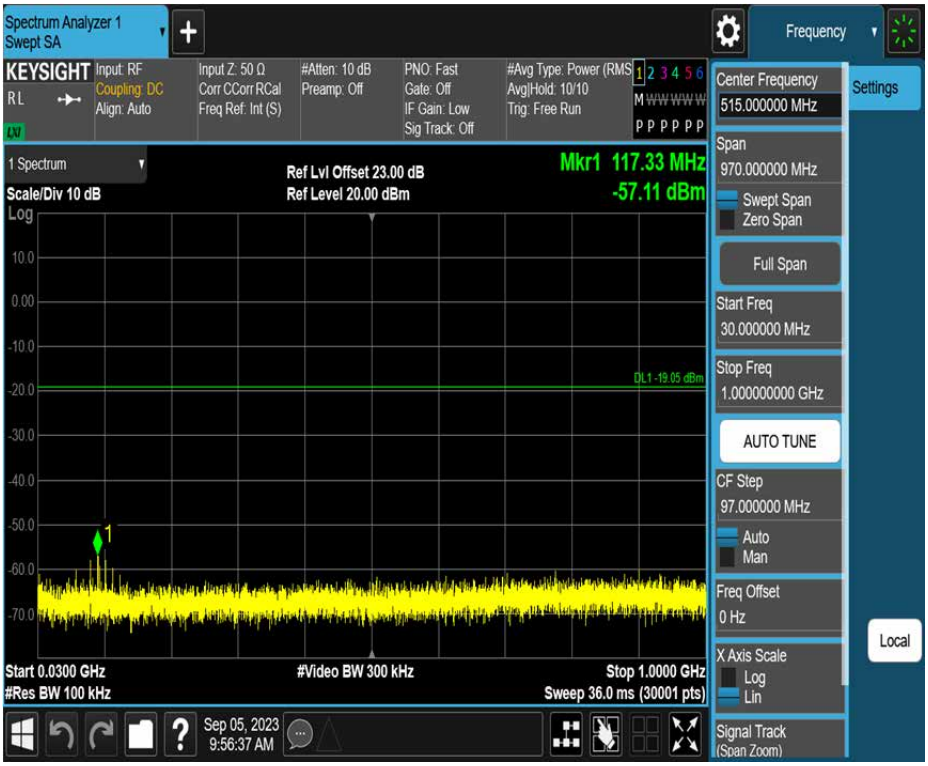
11B_Ant1_2437_1000~26500


11B_Ant1_2462_0~Reference


11B_Ant1_2462_30~1000


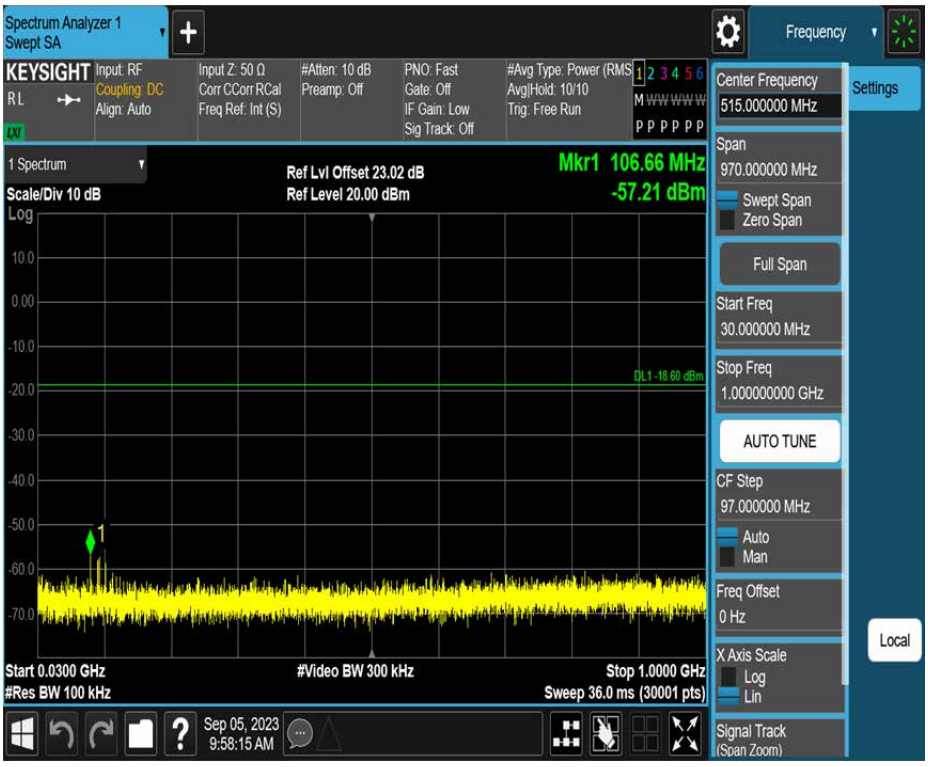
11B_Ant1_2462_1000~26500


11G_Ant1_2412_0~Reference

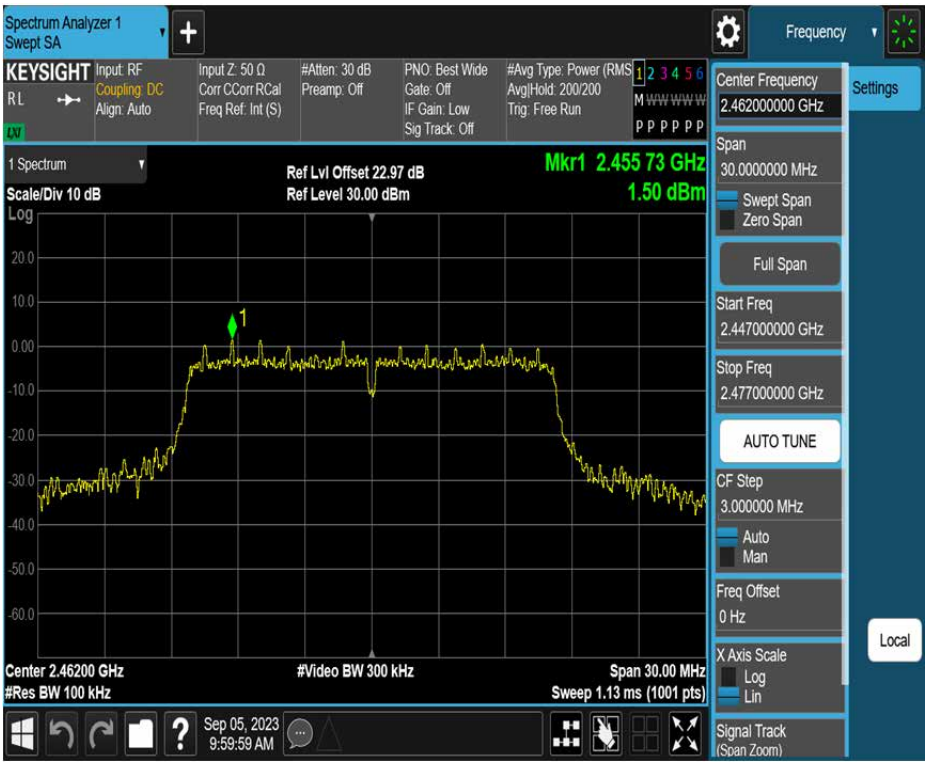

11G_Ant1_2412_30~1000


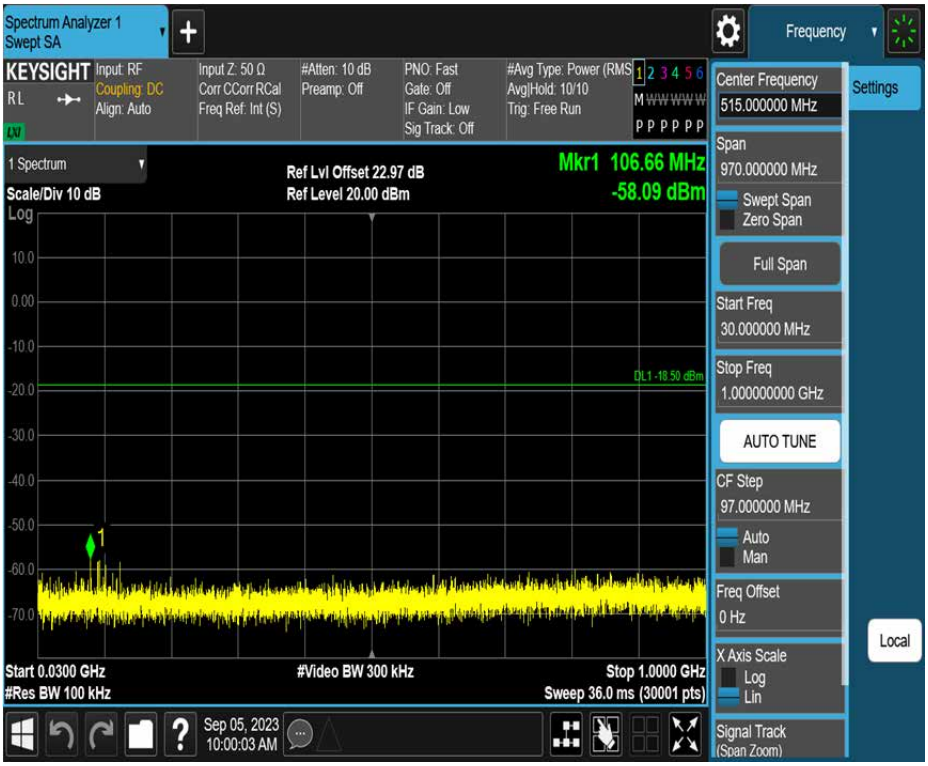
11G_Ant1_2412_1000~26500


11G_Ant1_2437_0~Reference

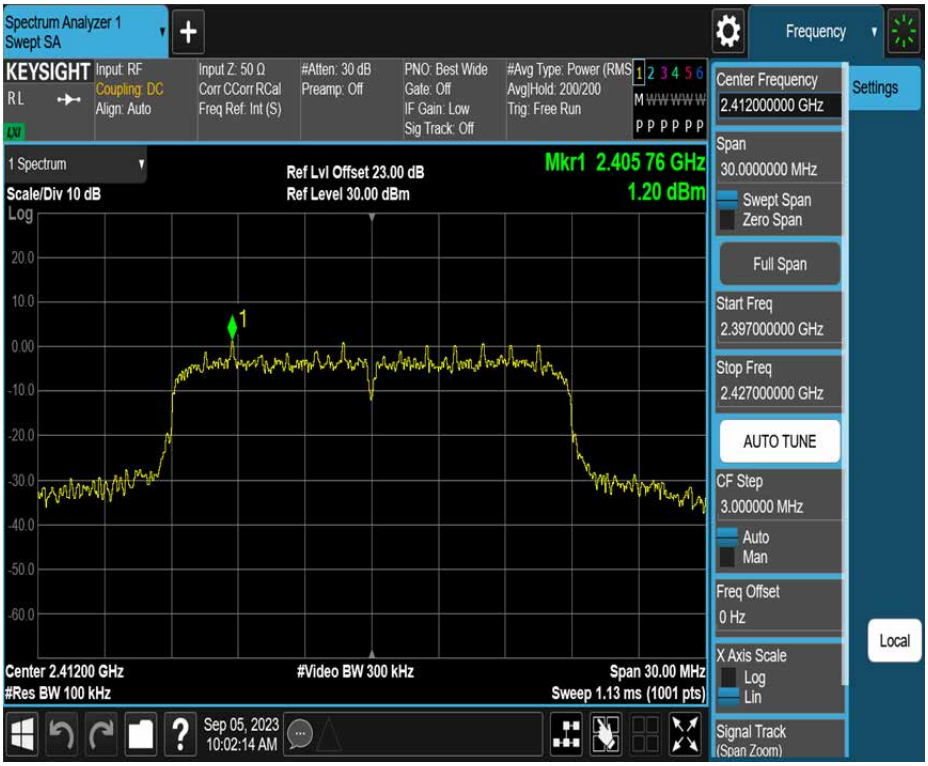

11G_Ant1_2437_30~1000


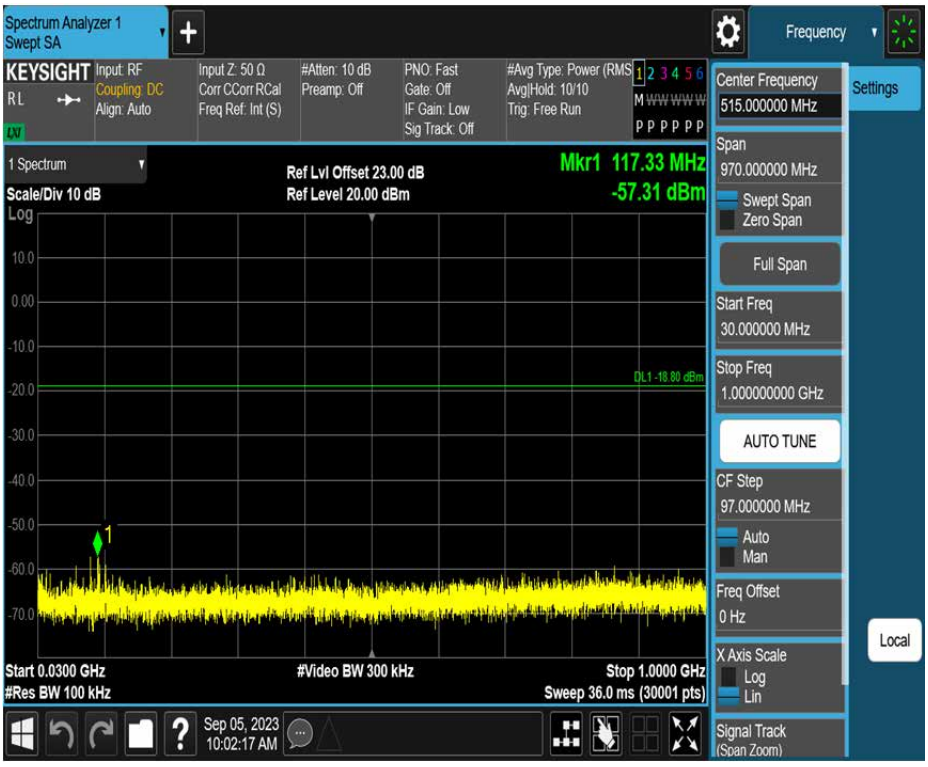
11G_Ant1_2437_1000~26500


11G_Ant1_2462_0~Reference


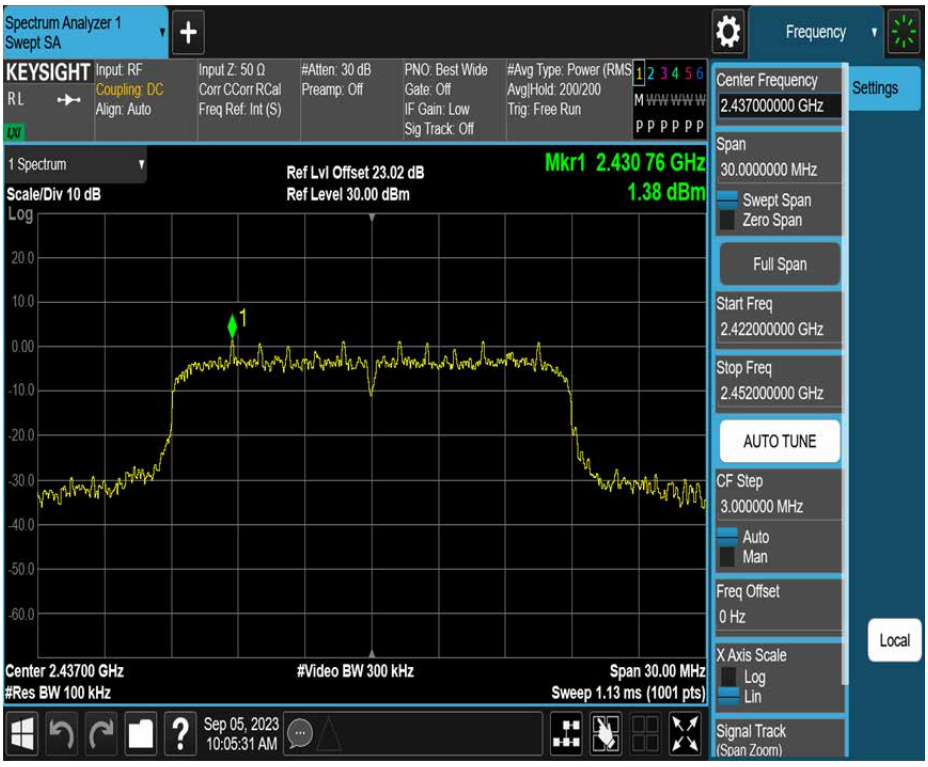
11G_Ant1_2462_30~1000


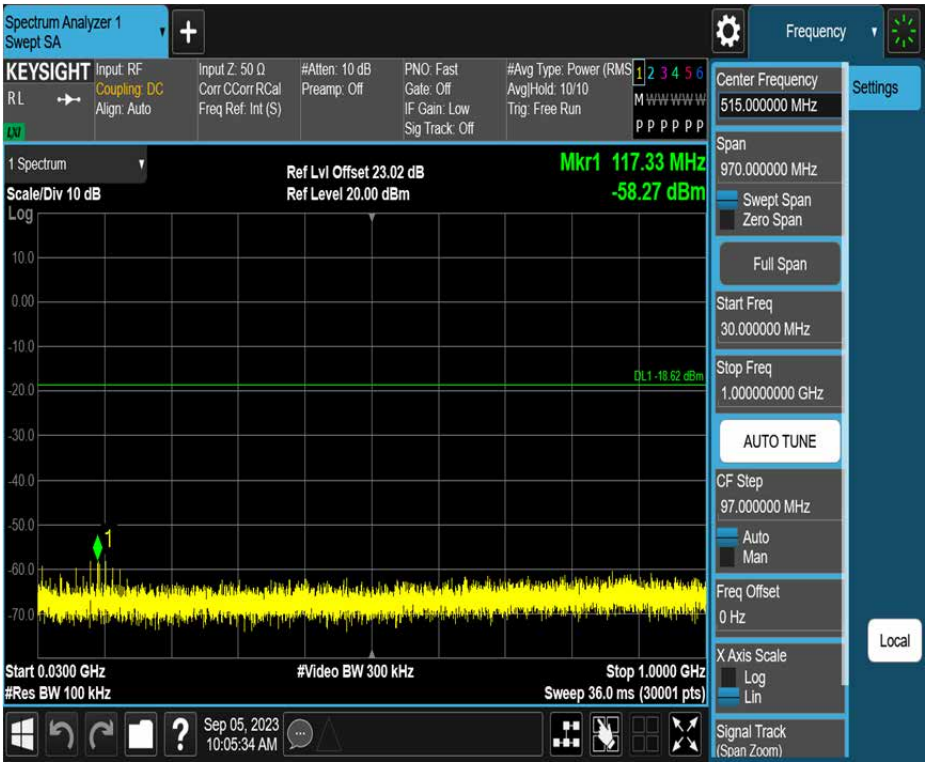
11G_Ant1_2462_1000~26500


11N20SISO_Ant1_2412_0~Reference


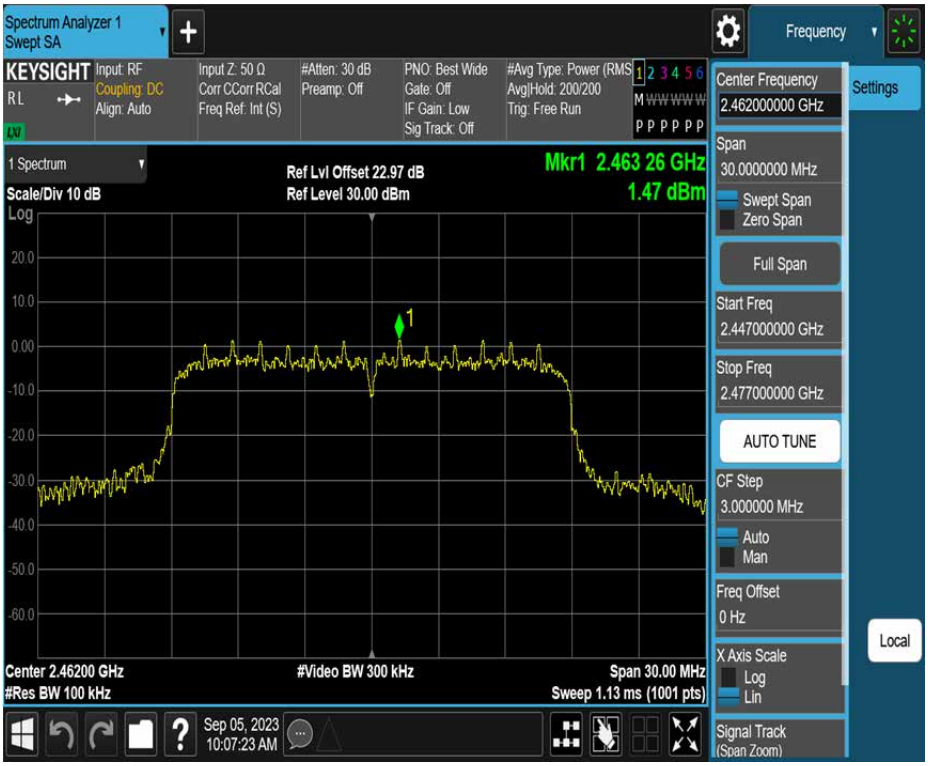
11N20SISO_Ant1_2412_30~1000


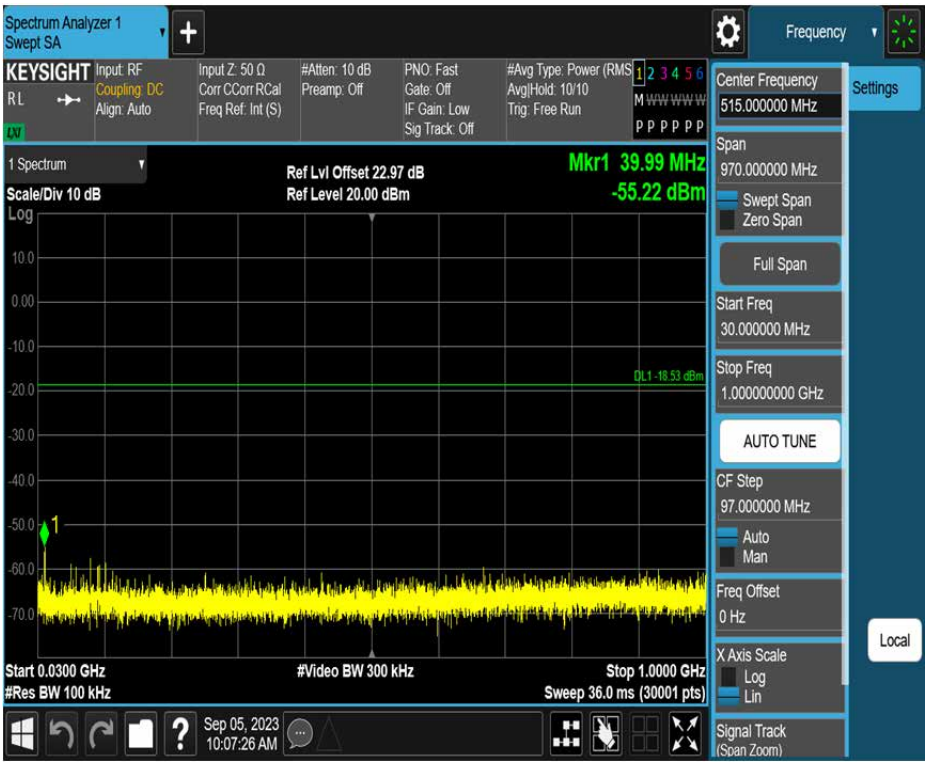
11N20SISO_Ant1_2412_1000~26500


11N20SISO_Ant1_2437_0~Reference


11N20SISO_Ant1_2437_30~1000


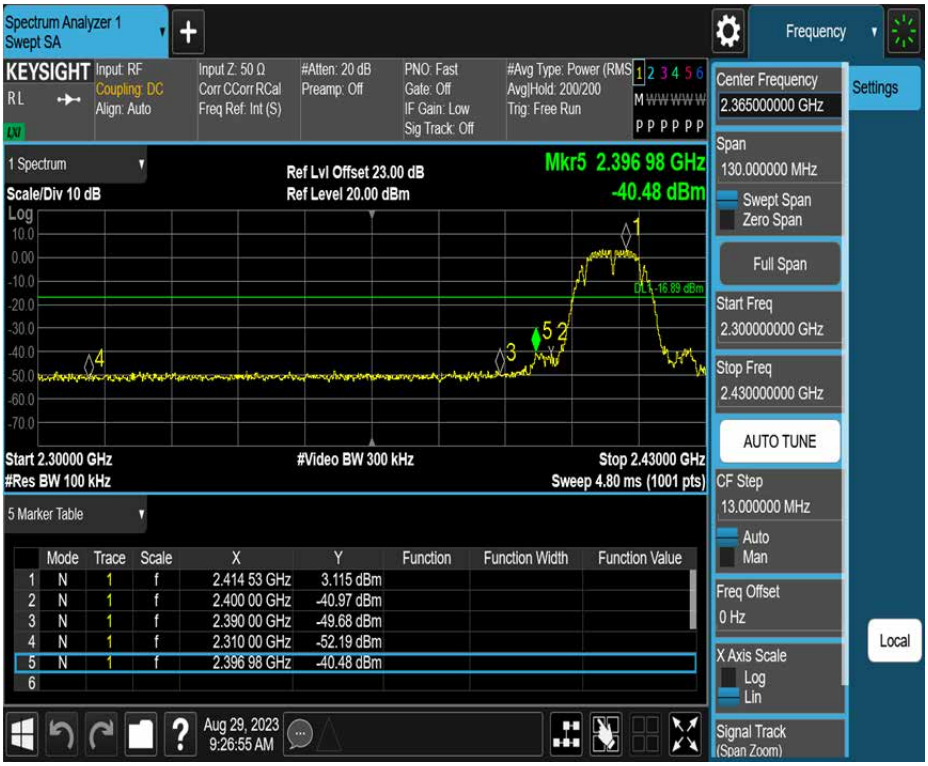
11N20SISO_Ant1_2437_1000~26500


11N20SISO_Ant1_2462_0~Reference


11N20SISO_Ant1_2462_30~1000


11N20SISO_Ant1_2462_1000~26500


Band edge

11B_Ant1_Low_2412


11B_Ant1_High_2462


11G_Ant1_Low_2412


11G_Ant1_High_2462


11N20SISO_Ant1_Low_2412


11N20SISO_Ant1_High_2462


3.4 6dB Bandwidth

3.4.1 Limit

For direct sequence systems, the minimum 6dB bandwidth shall be at least 500kHz

3.4.2 Test Procedure

Test Method	
●Conducted Measurement	○Radiated Measurement
Test Channels	
●Lowest, Middle and Highest Channel	○ Lowest and Highest Channel
Environmental conditions	
●Normal	○Normal and Extreme
Note:●:Test ○:No Test	

a) The EUT was connected to the tonscend test system, and the spectrum analyser is set as follow:

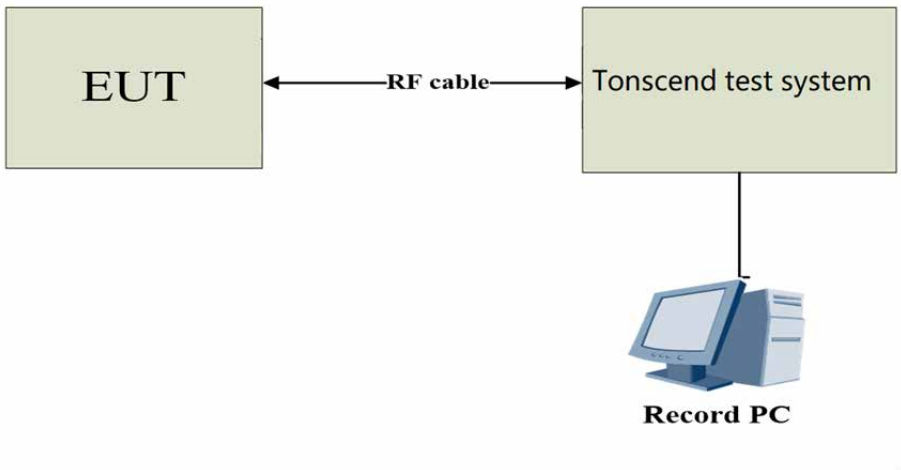
Centre Frequency	The centre frequency of the channel under test
RBW	100kHz
VBW	300kHz
Frequency span	2x Nominal Channel Bandwidth
Detector Mode	Peak
Trace Mode	Max Hold
Sweep Time	Auto Couple

b) Wait for the trace to stabilize then find the peak value of the trace and place the analyser marker on this peak.

c) Use the -6dB bandwidth function of the spectrum analyser to measure the 6dB Bandwidth of the EUT. This value shall be recorded.

d) Make sure that the power envelope is sufficiently above the noise floor of the analyser to avoid the noise signals left and right from the power envelope being taken into account by this measurement.

3.4.3 Test Setup



3.4.4 Test Result

DTS Bandwidth

Test Mode	Antenna	Frequency[MHz]	DTS BW [MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
11B	Ant1	2412	10.120	2406.960	2417.080	0.5	PASS
		2437	10.120	2431.920	2442.040	0.5	PASS
		2462	10.080	2456.960	2467.040	0.5	PASS
11G	Ant1	2412	15.680	2404.200	2419.880	0.5	PASS
		2437	16.320	2428.840	2445.160	0.5	PASS
		2462	15.800	2454.200	2470.000	0.5	PASS
11N20SISO	Ant1	2412	16.160	2403.920	2420.080	0.5	PASS
		2437	16.400	2428.760	2445.160	0.5	PASS
		2462	16.240	2453.760	2470.000	0.5	PASS

11B_Ant1_2412

11B_Ant1_2437


11B_Ant1_2462


11G_Ant1_2412


11G_Ant1_2437


11G_Ant1_2462


11N20SISO_Ant1_2412


11N20SISO_Ant1_2437


11N20SISO_Ant1_2462


Occupied Channel Bandwidth

Test Mode	Antenna	Frequency[MHz]	OCB [MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
11B	Ant1	2412	13.523	2405.2112	2418.7342	---	---
		2437	13.527	2430.2019	2443.7289	---	---
		2462	13.506	2455.2223	2468.7283	---	---
11G	Ant1	2412	16.771	2403.6016	2420.3726	---	---
		2437	16.808	2428.5460	2445.3540	---	---
		2462	16.837	2453.5152	2470.3522	---	---
11N20SISO	Ant1	2412	17.543	2403.2235	2420.7665	---	---
		2437	17.520	2428.2237	2445.7437	---	---
		2462	17.516	2453.2401	2470.7561	---	---

11B_Ant1_2412

11B_Ant1_2437


11B_Ant1_2462


11G_Ant1_2412


11G_Ant1_2437


11G_Ant1_2462


11N20SISO_Ant1_2412


11N20SISO_Ant1_2437


11N20SISO_Ant1_2462


3.5 Maximum conducted output power

3.5.1 Limit

For systems using digital modulation in the 2400~2483.5MHz, The Maximum output Power shall not exceed 1W(30dBm)

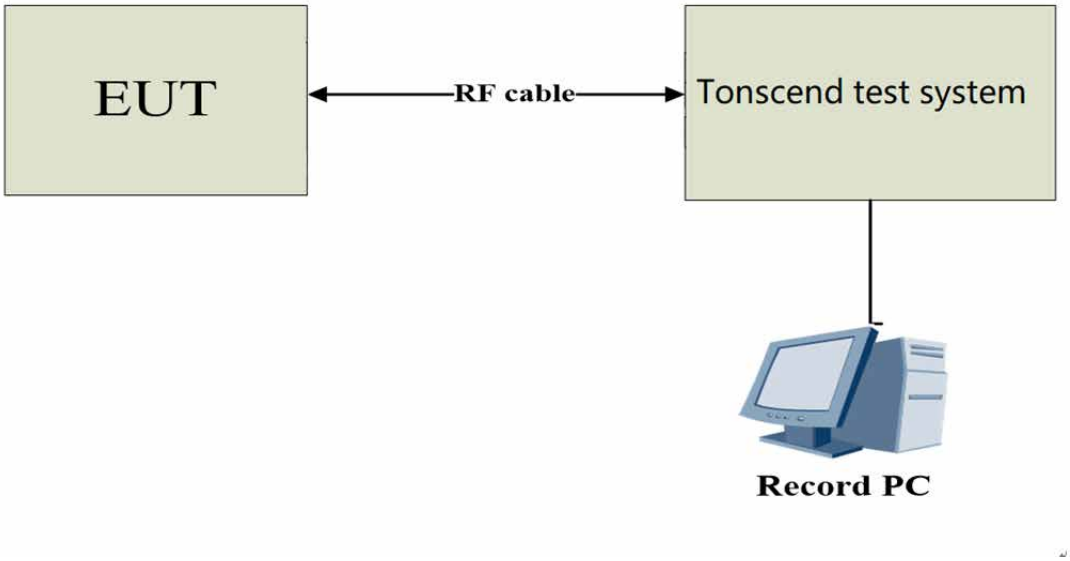
3.5.2 Test Procedure

Test Method	
●Conducted Measurement	○Radiated Measurement
Test Channels	
●Lowest, Middle and Highest Channel	○ Lowest and Highest Channel
Environmental conditions	
●Normal	○Normal and Extreme
Note:●:Test ○:No Test	

a) The EUT was directly connected to the tonscend test system and antenna output port as show in the block diagram below.

b) The maximum conducted output power was performed in accordance with method 11.9.1.3 (for peak power) of ANSI C63.10-2013 and FCC KDB 662911 D01 v02r01 Multiple Transmitter Output.

3.5.3 Test Setup



3.5.4 Table of Parameters of Text Software Setting

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

Test Software Version	cmd.exe		
Frequency (MHz)	2412	2437	2462
IEEE 802.11b	Default	Default	Default
IEEE 802.11g	Default	Default	Default
IEEE 802.11n(20)	Default	Default	Default

3.5.5 The Result

Test Mode	Antenna	Frequency[MHz]	Maximum conducted output Power [dBm]	Limit [dBm]	Verdict
11B	Ant1	2412	17.03	≤30.00	PASS
		2437	16.89	≤30.00	PASS
		2462	17.37	≤30.00	PASS
11G	Ant1	2412	19.02	≤30.00	PASS
		2437	19.28	≤30.00	PASS
		2462	19.28	≤30.00	PASS
11N20SISO	Ant1	2412	19.44	≤30.00	PASS
		2437	19.61	≤30.00	PASS
		2462	19.74	≤30.00	PASS

3.6 Power Spectral Density

3.6.1 Limit

For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8dBm in any 3kHz band during any time interval of continuous transmitting.

3.6.2 Test Procedure

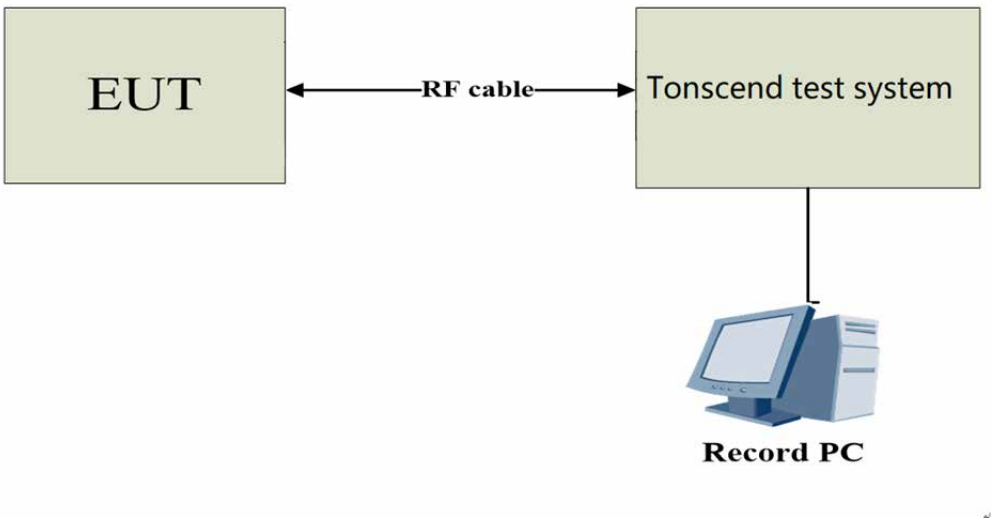
Test Method	
●Conducted Measurement	○Radiated Measurement
Test Channels	
●Lowest, Middle and Highest Channel	○ Lowest and Highest Channel
Environmental conditions	
●Normal	○Normal and Extreme
Note:●:Test ○:No Test	

a) The EUT was directly connected to the tonscend test system and antenna output port as show in the block diagram below.

b) Spectrum analyser settings as following:

Spectrum Parameters	Setting
Span Frequency	1.5 times the DTS bandwidth
RBW	3 kHz
VBW	10 kHz
Detector	Peak
Trace	Max Hold
Sweep Time	Auto

3.6.3 Test Setup



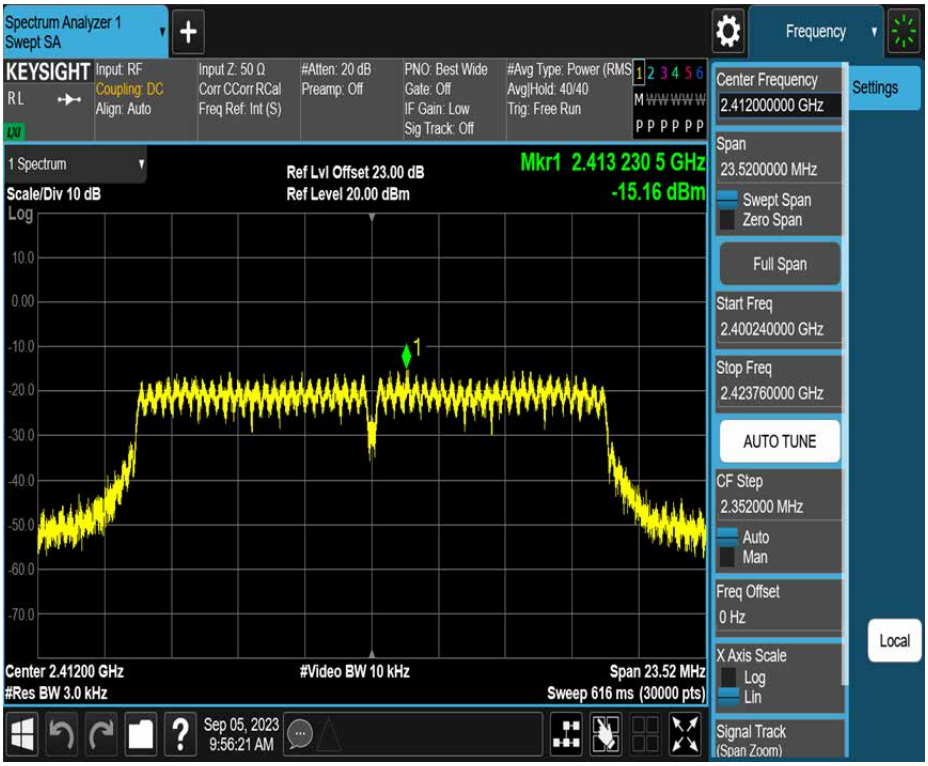
3.6.4 The Result

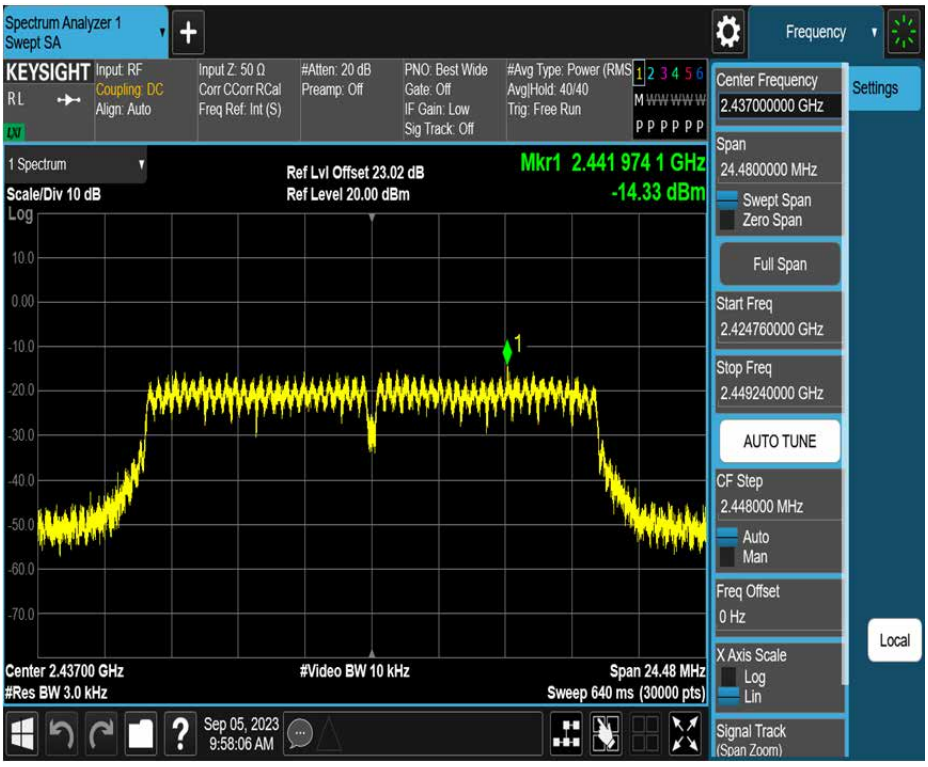
Test Mode	Antenna	Frequency[MHz]	Result[dBm/3kHz]	Limit[dBm/3kHz]	Verdict
11B	Ant1	2412	-13.09	≤8.00	PASS
		2437	-13.19	≤8.00	PASS
		2462	-12.83	≤8.00	PASS
11G	Ant1	2412	-15.16	≤8.00	PASS
		2437	-14.33	≤8.00	PASS
		2462	-14.61	≤8.00	PASS
11N20SISO	Ant1	2412	-14.75	≤8.00	PASS
		2437	-14.04	≤8.00	PASS
		2462	-14.69	≤8.00	PASS

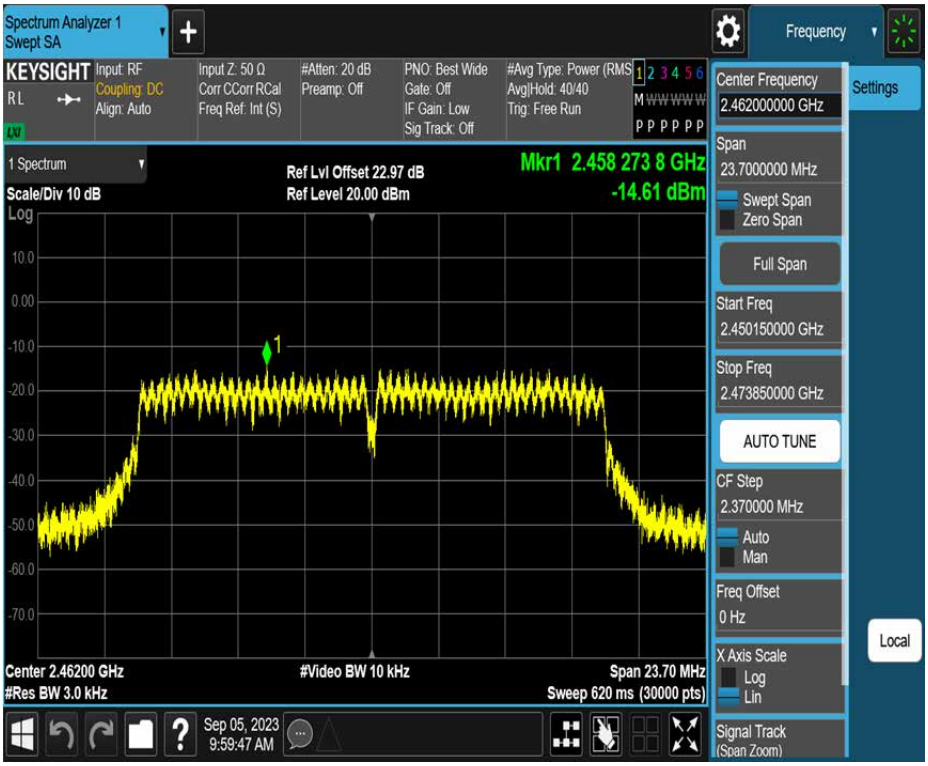
11B_Ant1_2412

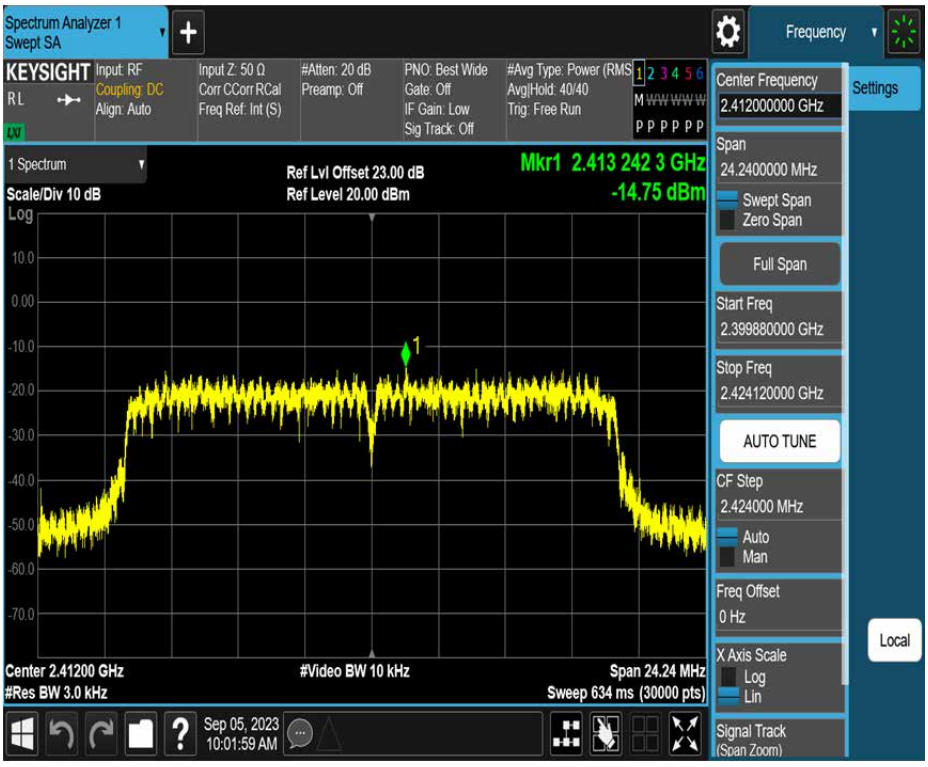
11B_Ant1_2437

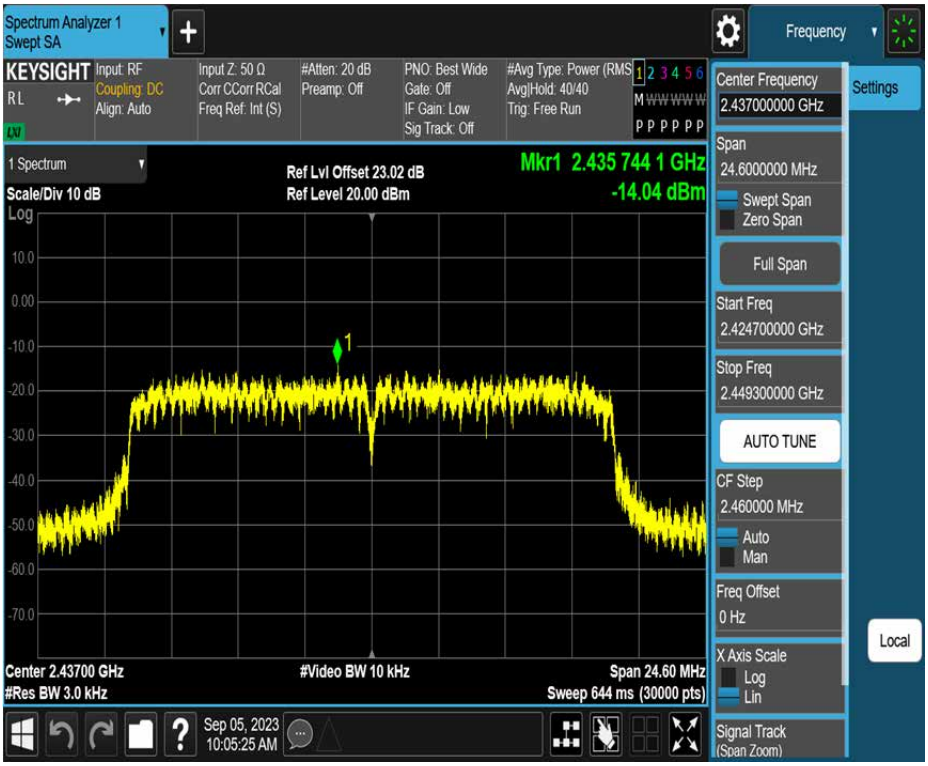
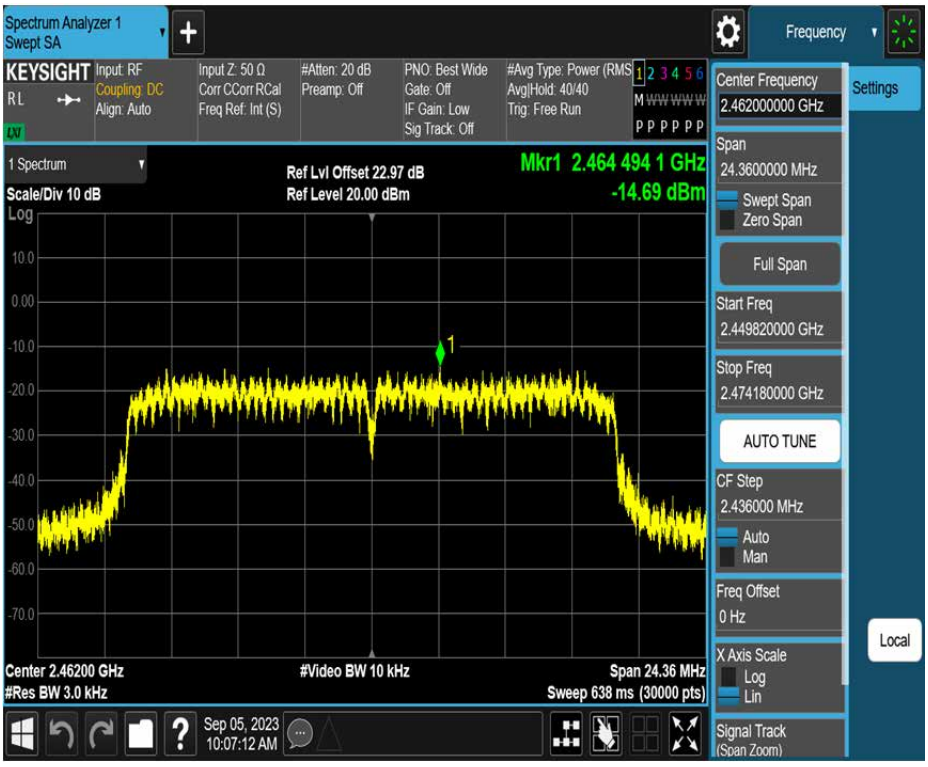

11B_Ant1_2462


11G_Ant1_2412


11G_Ant1_2437


11G_Ant1_2462


11N20SISO_Ant1_2412


11N20SISO_Ant1_2437

11N20SISO_Ant1_2462


End of Test Report