

7 Conduct Band Edge And Spurious Emissions Measurement

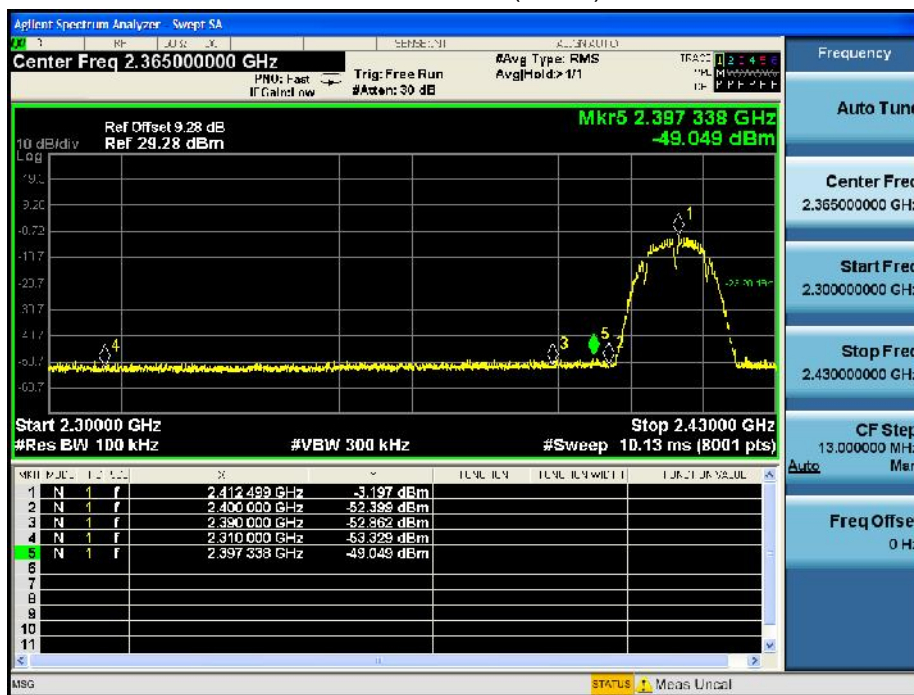
Test Requirement	:	RSS-247 §5.5 & Section 15.247(d) In addition, radiated emissions which fall in the restricted bands. as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).
Test Method	:	ANSI C63.10:2013
Test Limit	:	Regulation 15.247 (d), 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 conducted power limits. If the transmitter complies with the conducted 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 §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

7.1 Test Procedure

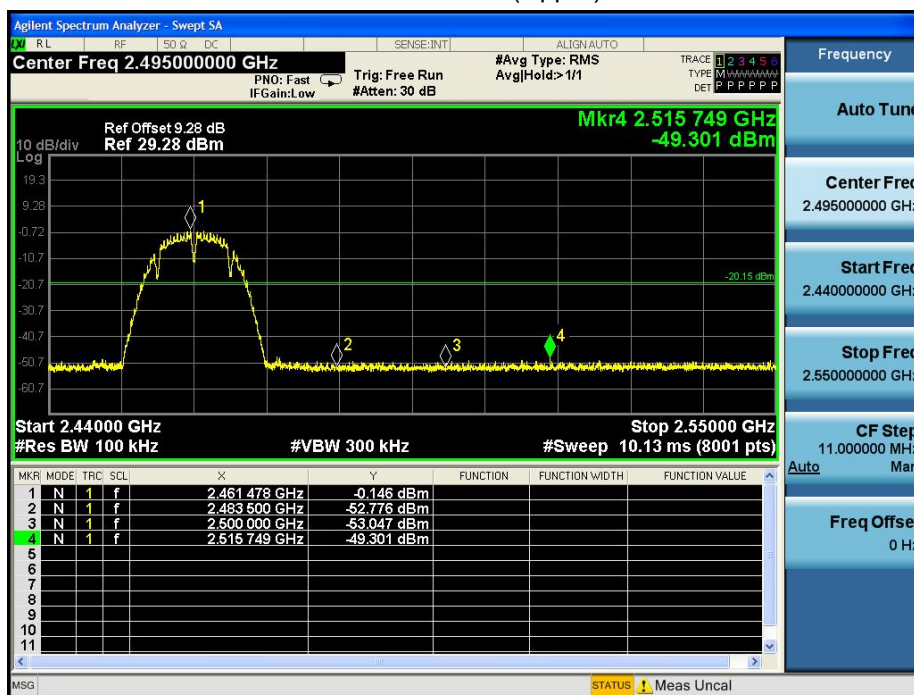
1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum;
2. Set the spectrum analyzer: RBW = 100kHz, VBW = 300kHz, Sweep = auto
Detector function = peak, Trace = max hold

7.2 Test Result

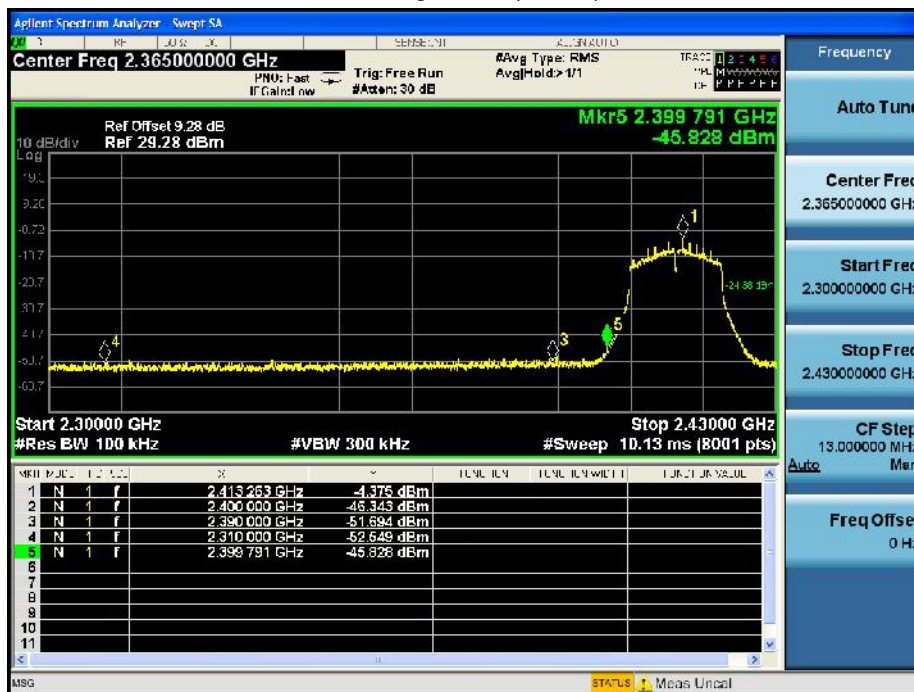
Conduct Band Edge (WIFI 2.4G) 802.11b CH01 (Lower)



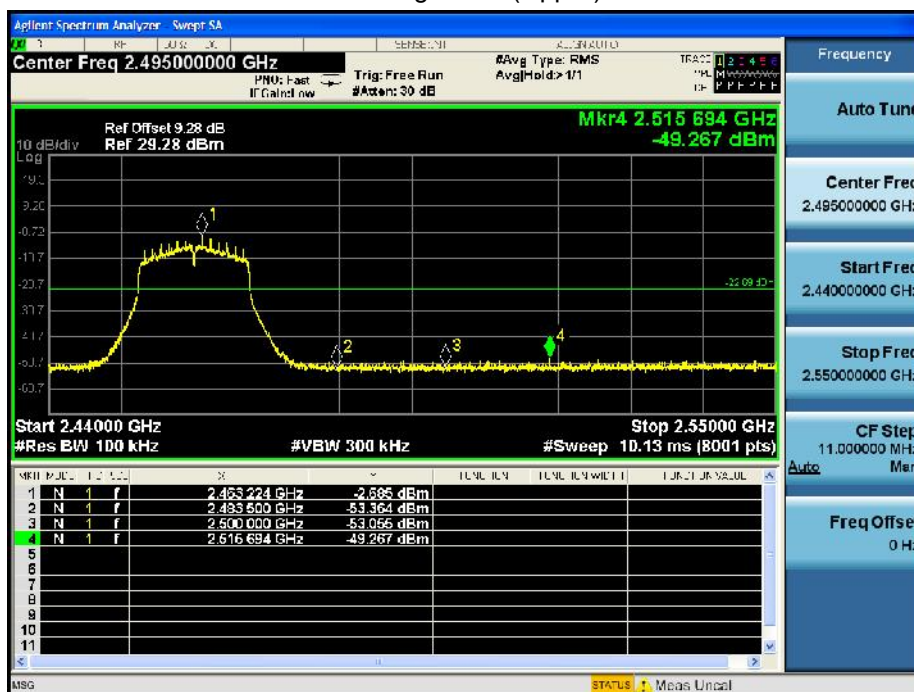
802.11b CH 11(Upper)



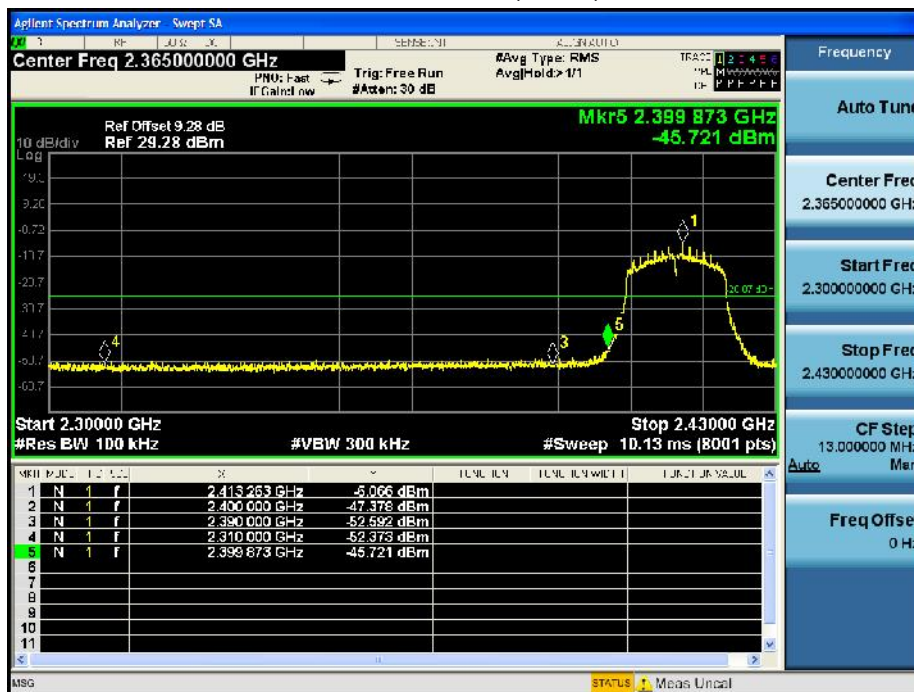
802.11g CH01 (Lower)



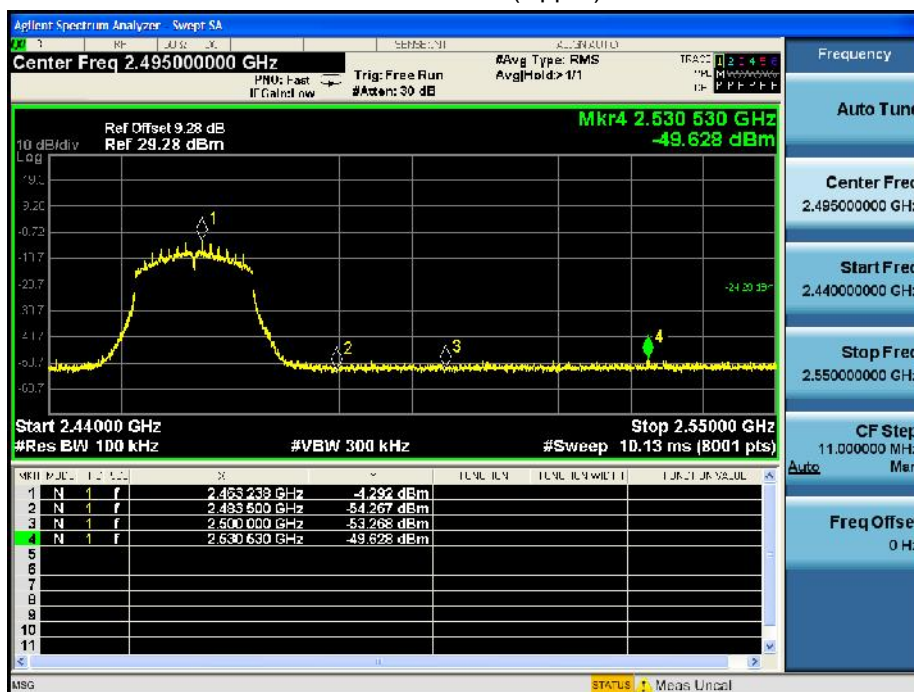
802.11g CH 11(Upper)



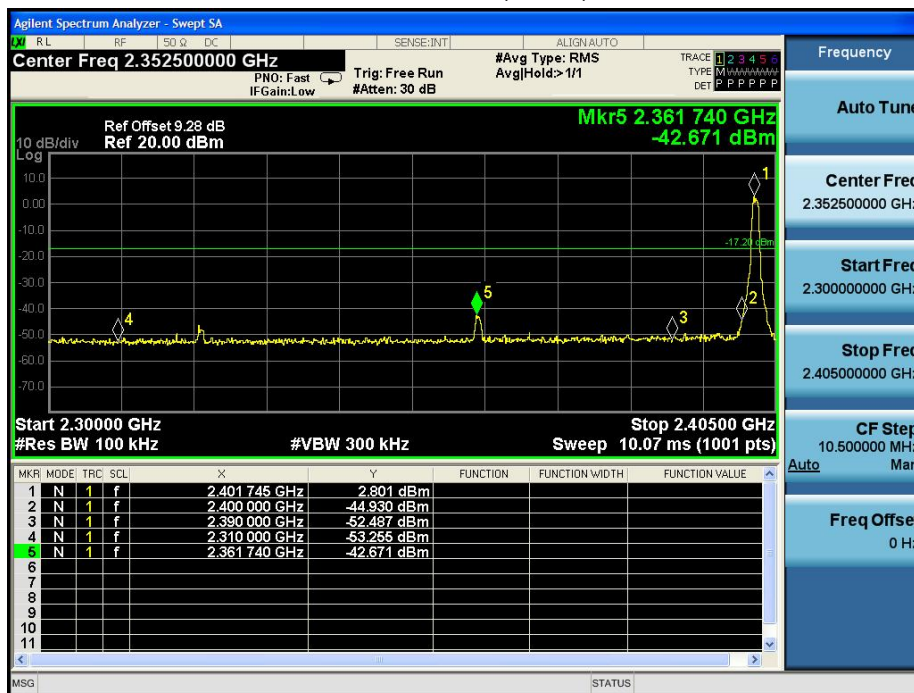
802.11n CH01 (Lower)



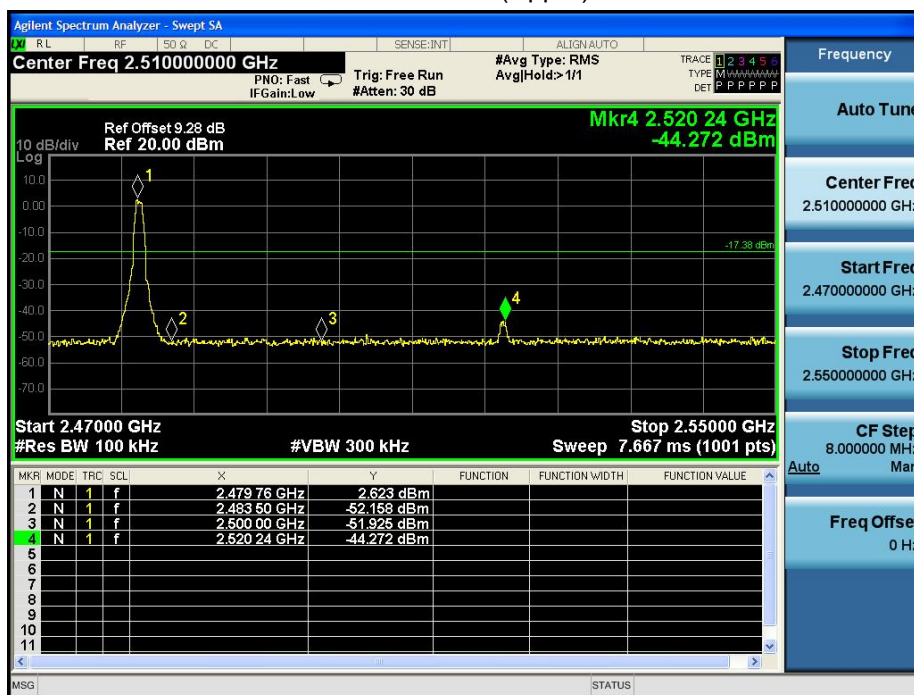
802.11n CH 11(Upper)



Conduct Band Edge (BLE) GFSK CH00 (Lower)



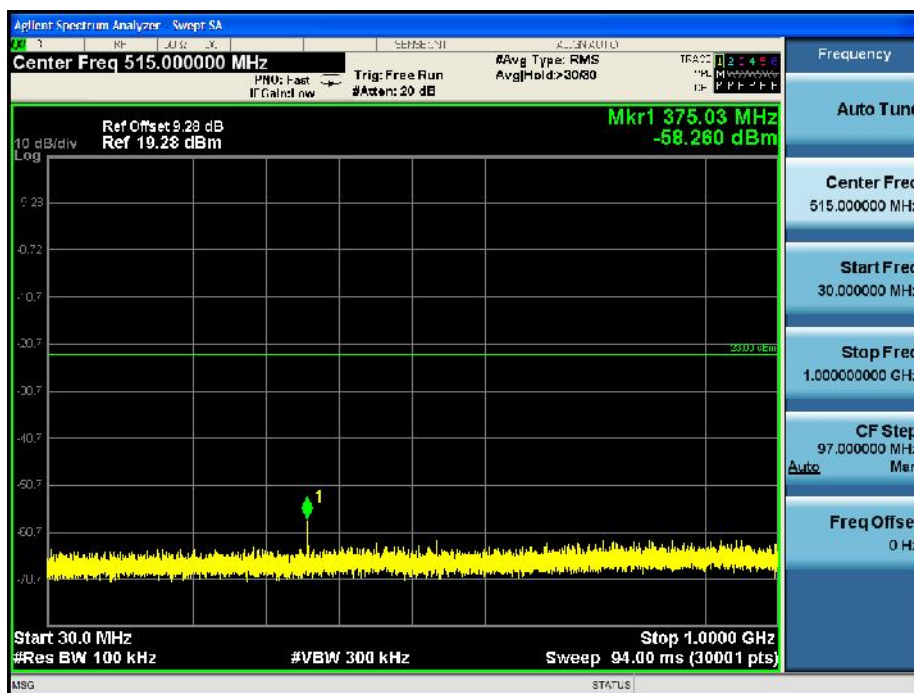
GFSK CH 39(Upper)

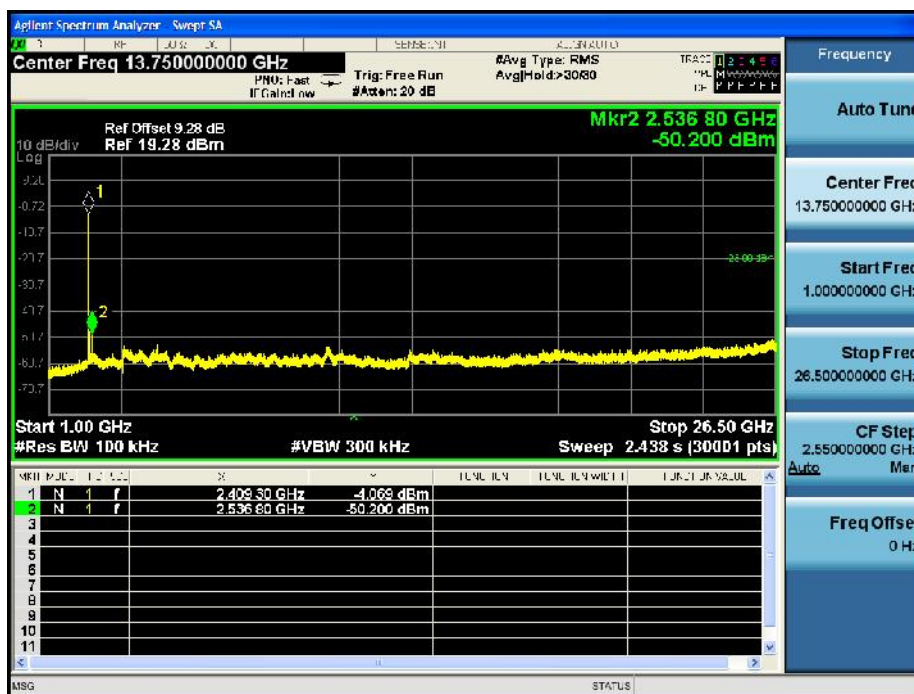


SPURIOUS RF CONDUCTED EMISSION (WIFI 2.4G)

802.11b Worst Case

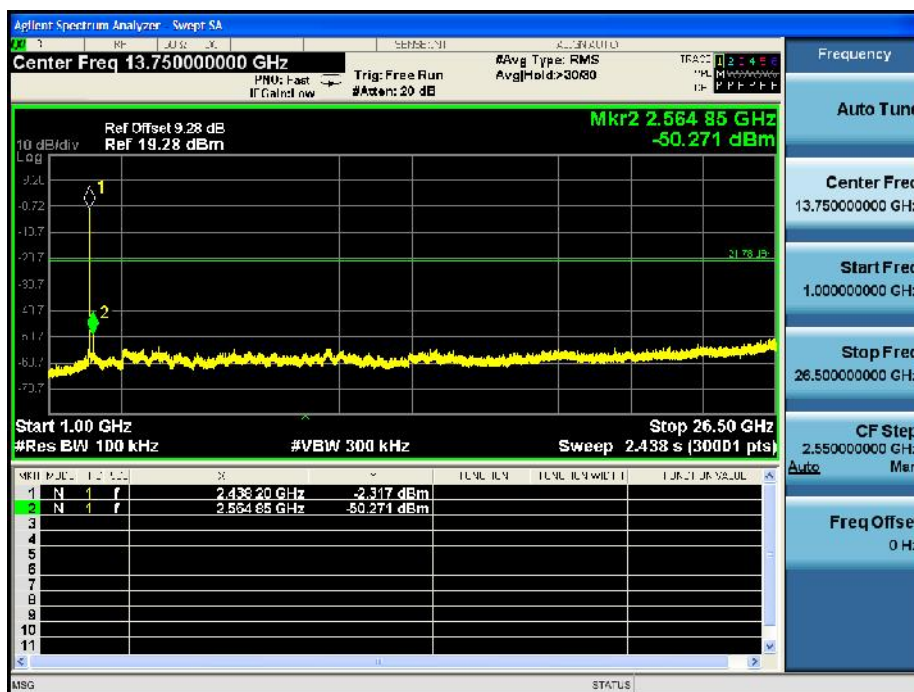
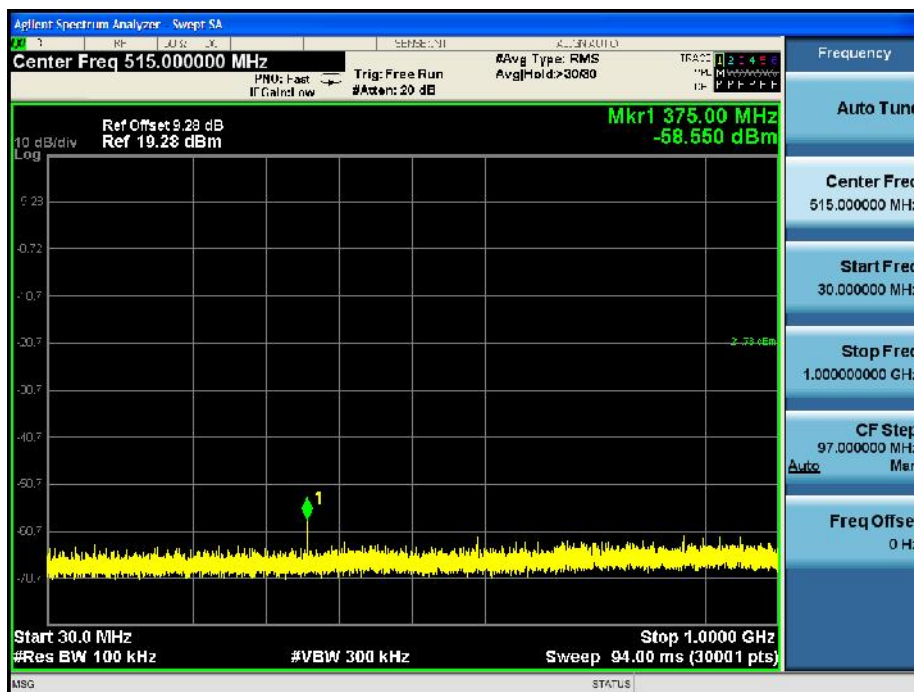
802.11b CH01



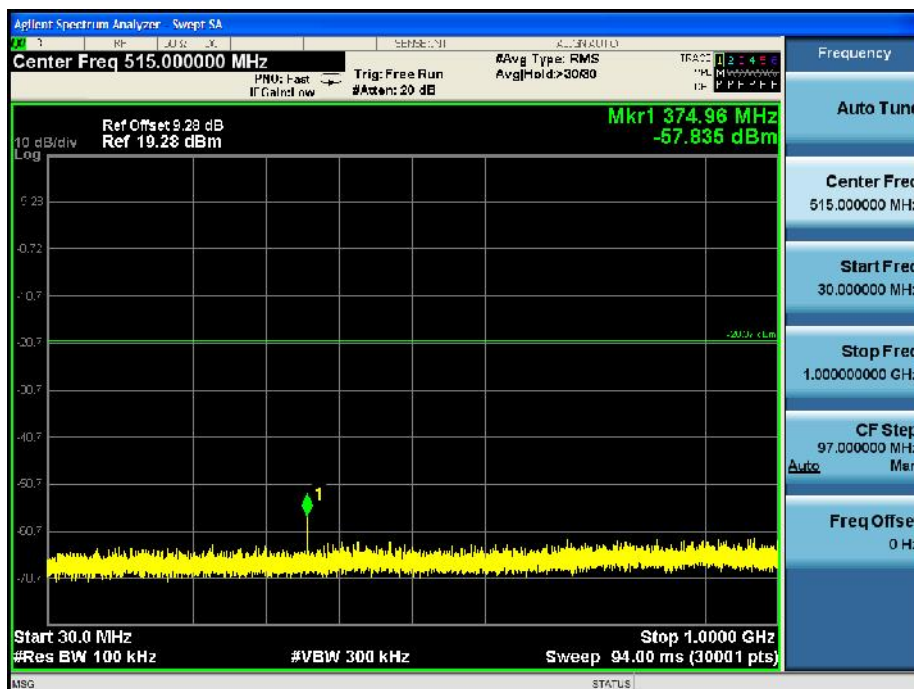


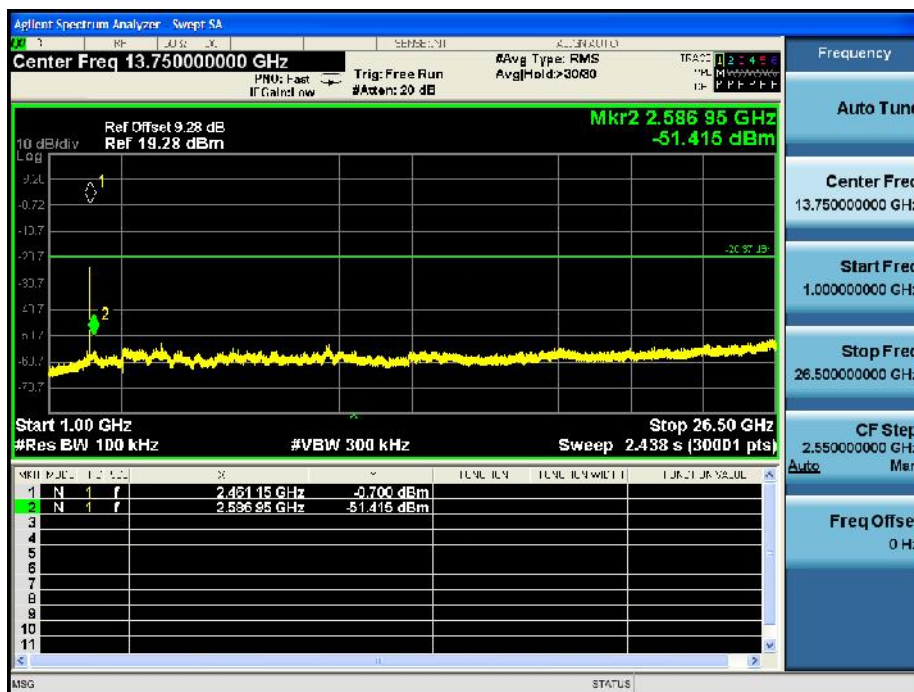
802.11b CH06





802.11b CH11

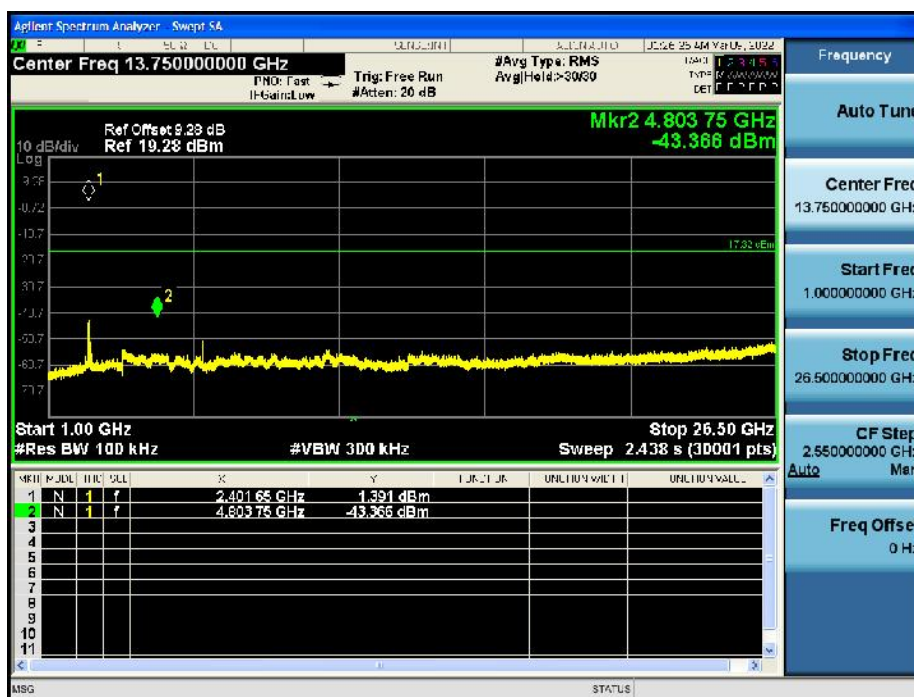
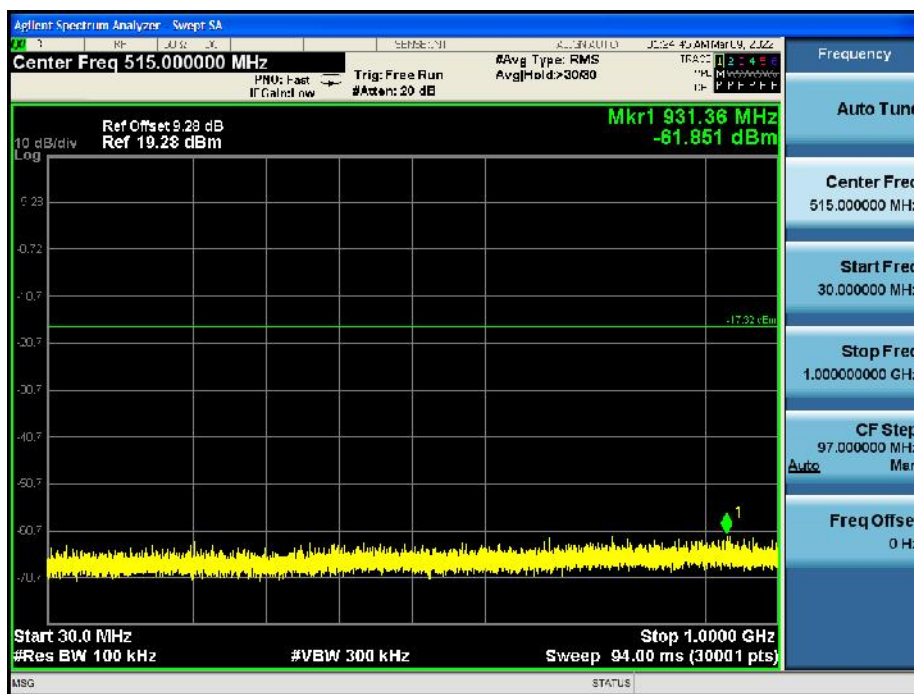




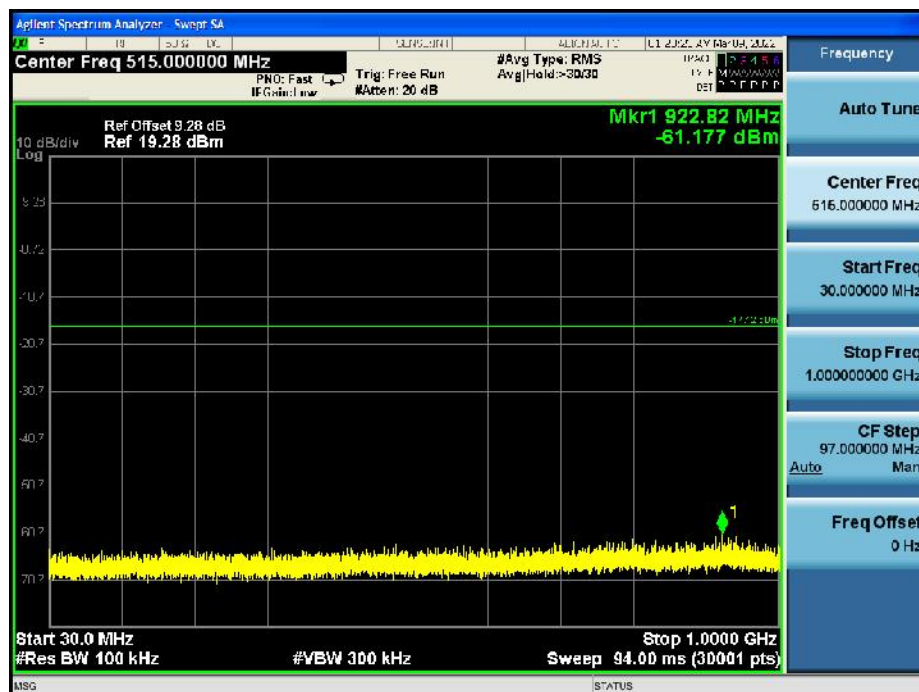
SPURIOUS RF CONDUCTED EMISSION (BLE)

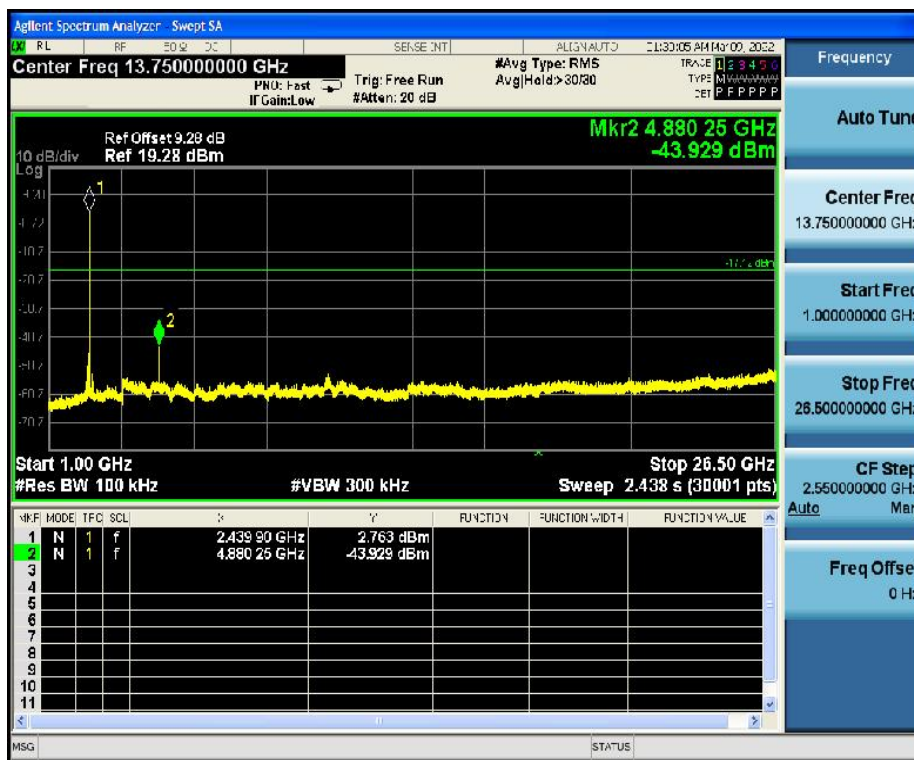
GFSK CH00





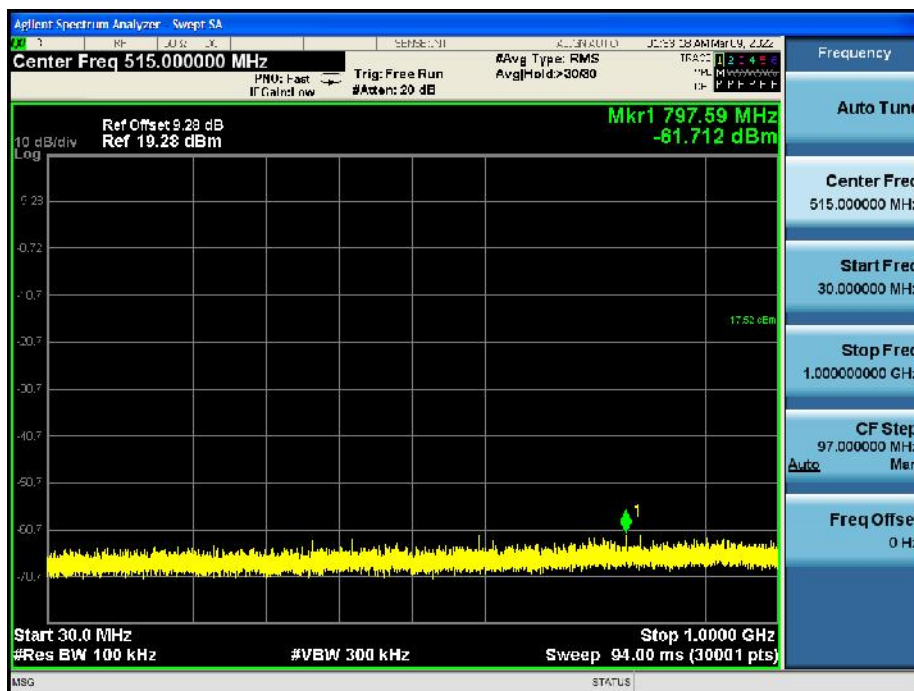
GFSK CH19



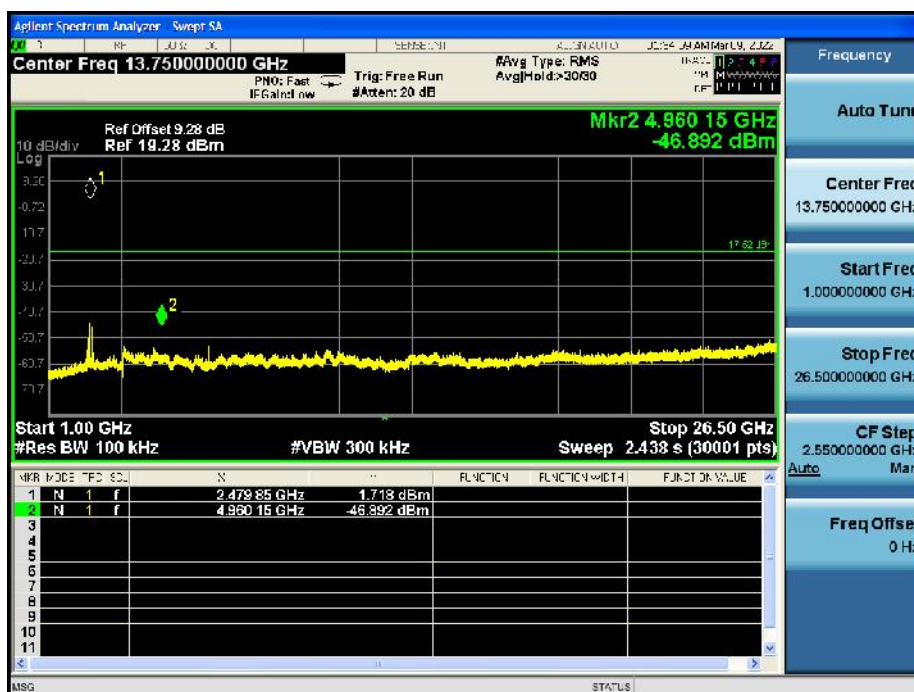


GFSK CH39





GFSK CH39



8 6dB Bandwidth Measurement

Test Requirement : FCC CFR47 Part 15 Section 15.247&RSS-247 § 5.2

Test Method : ANSI C63.10:2013

Test Limit : Systems using digital modulation techniques may operate in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.

8.1 Test Procedure

1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum;
2. Set the spectrum analyzer: RBW = 100kHz, VBW = 300kHz

8.2 Test Result

WIFI 2.4G			
Test Mode	Channel frequency (MHz)	Measurement level (MHz)	Required Limit (KHz)
802.11b	2412	10.040	>500
	2437	10.040	>500
	2462	10.040	>500
802.11g	2412	15.040	>500
	2437	15.000	>500
	2462	12.560	>500
802.11n(20)	2412	15.000	>500
	2437	15.000	>500
	2462	15.040	>500

BLE			
Test Mode	Channel frequency (MHz)	Measurement level (MHz)	Required Limit (KHz)
GFSK	2402	0.700	>500
	2440	0.704	>500
	2480	0.704	>500

WIFI 2.4G DTS BW 802.11b Channel 2412



802.11b Channel 2437



802.11b Channel 2462



802.11g Channel 2412



802.11g Channel 2437



802.11g Channel 2462



802.11n(20) Channel 2412



802.11n(20) Channel 2437



802.11n(20) Channel 2462



BLE DTS BW

GFSK Channel 2402



GFSK Channel 2440



GFSK Channel 2480



9 Maximum Peak Output Power

Test Requirement : FCC CFR47 Part 15 Section 15.247&RSS-247 § 5.4

Test Method : ANSI C63.10:2013

Test Limit : Regulation 15.247 (b)(3), For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 Watt. 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.

9.1 Test Procedure

1. The RF output of EUT was connected to the power meter by RF cable and attenuator. The path loss was compensated to the results for each measurement.
2. Set to the maximum power setting and enable the EUT transmit continuously.
3. Measure the conducted output power and record the results in the test report.

9.2 Test Result

WIFI 2.4G			
Test Mode	Channel frequency (MHz)	Peak Output Power(dBm)	Required Limit (dBm)
802.11b	2412	8.16	30
	2437	8.44	30
	2462	8.12	30
802.11g	2412	7.54	30
	2437	8.11	30
	2462	7.65	30
802.11n(20)	2412	8.13	30
	2437	8.13	30
	2462	7.88	30

BLE			
Test Mode	Channel frequency (MHz)	Peak Output Power(dBm)	Required Limit (dBm)
GFSK	2402	3.14	30
	2440	3.02	30
	2480	2.98	30

10 Power Spectral density

Test Requirement	:	FCC CFR47 Part 15 Section 15.247&RSS-247 § 5.2
Test Method	:	ANSI C63.10:2013 Regulation 15.247(f) The power spectral density conducted from the intentional radiator to the antenna due to the digital modulation
Test Limit	:	operation of the hybrid system, with the frequency hopping operation turned off, shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

10.1 Test Procedure

1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum.
2. Set the spectrum analyzer: RBW = 3kHz. VBW = 10kHz , Span = 1.5 times the DTS channel bandwidth(6 dB bandwidth). Sweep = auto; Detector Function = Peak. Trace = Max hold.
3. Allow the trace to stabilize. Use the marker-delta function to determine the separation between the peaks of the adjacent channels. The limit is specified in one of the subparagraphs of this Section Submit this plot.

10.2 Test Result

WIFI 2.4G			
Test Mode	Channel frequency (MHz)	Power Spectral density (dBm)	Required Limit (dBm/3KHz)
802.11b	2412	-15.92	8
	2437	-14.23	8
	2462	-12.65	8
802.11g	2412	-18.47	8
	2437	-17.45	8
	2462	-15.60	8
802.11n(20)	2412	-19.47	8
	2437	-17.90	8
	2462	-18.03	8

BLE			
Test Mode	Channel frequency (MHz)	Power Spectral density (dBm)	Required Limit (dBm/3KHz)
GFSK	2402	-11.95	8
	2440	-11.13	8
	2480	-12.18	8

WIFI 2.4G PSD

802.11b Channel 2412



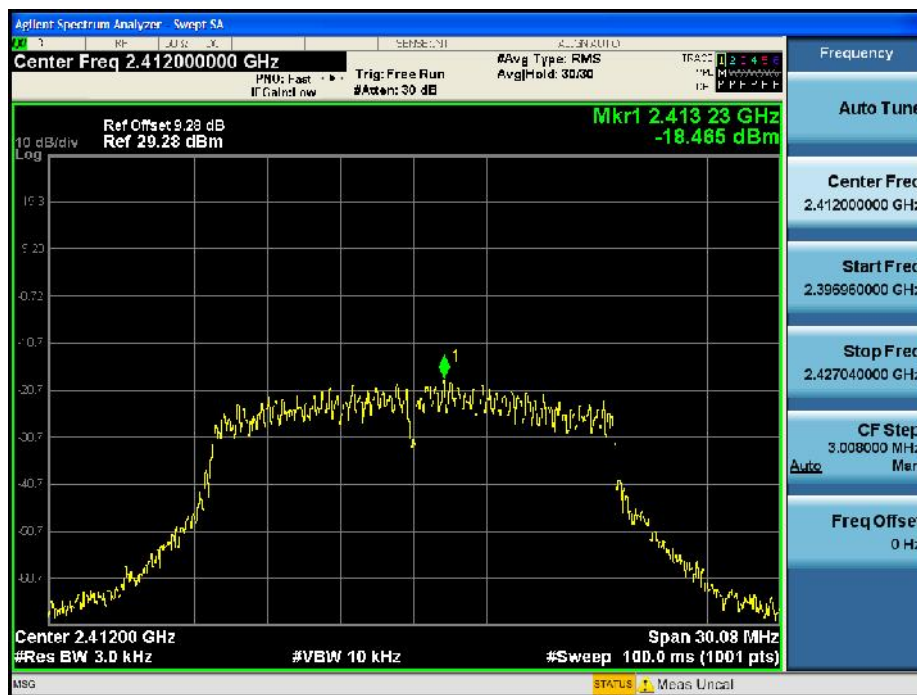
802.11b Channel 2437



802.11b Channel 2462



802.11g Channel 2412



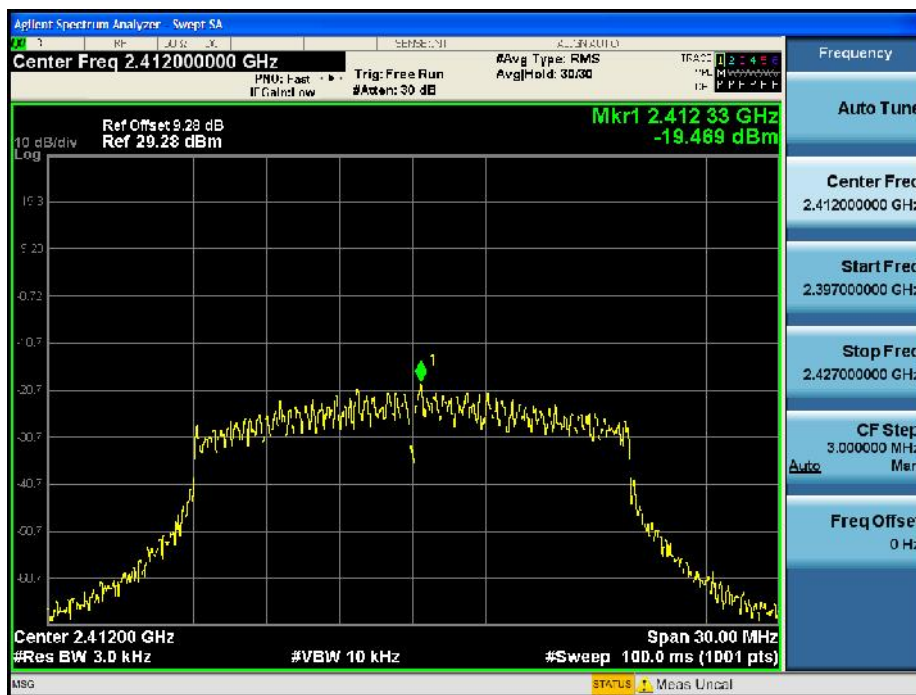
802.11g Channel 2437



802.11g Channel 2462



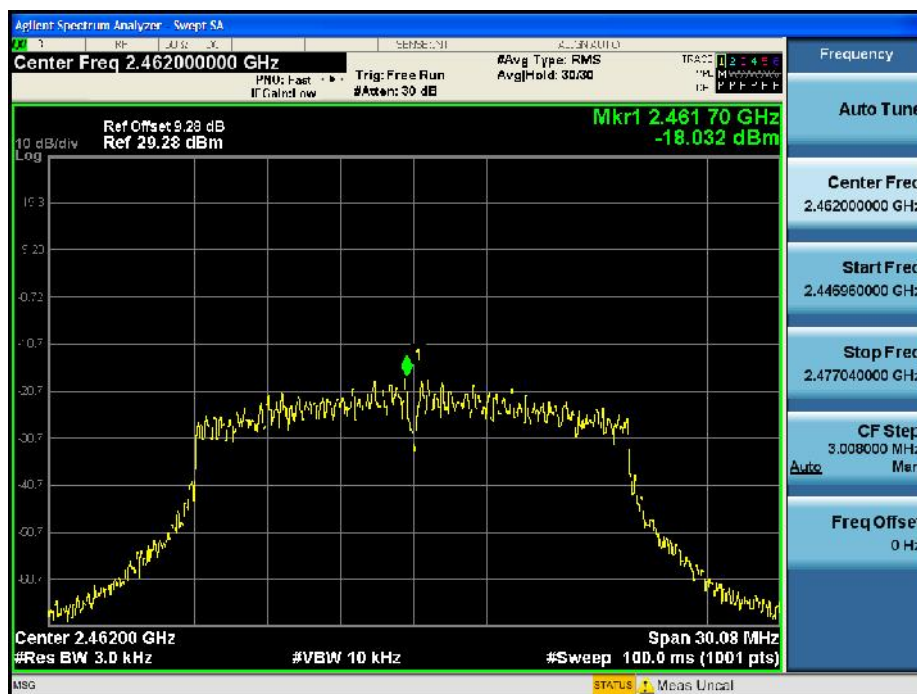
802.11n(20) Channel 2412



802.11n(20) Channel 2437



802.11n(20) Channel 2462

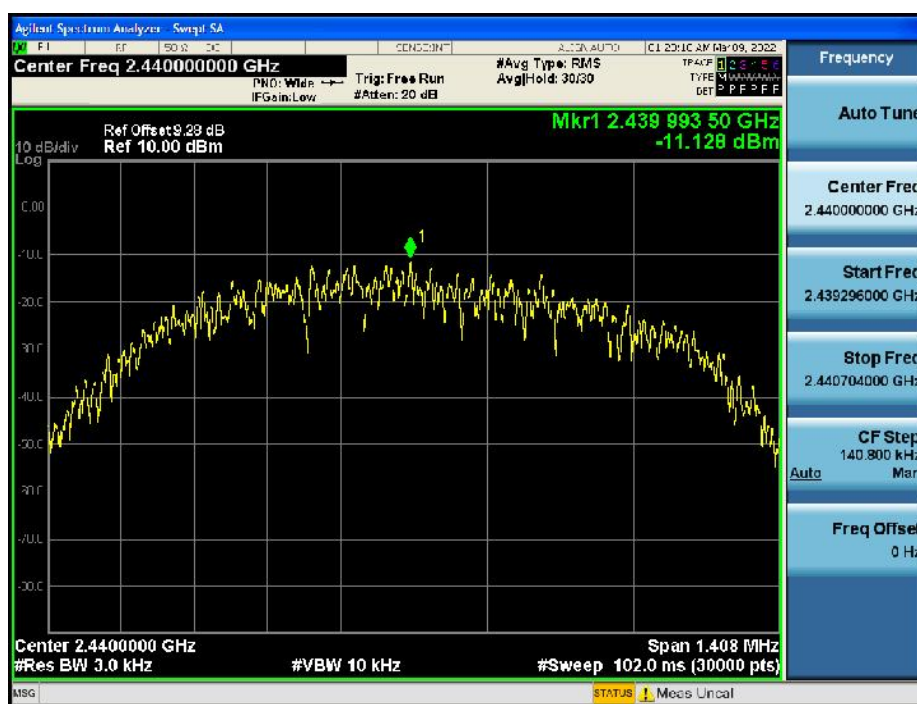


BLE PSD

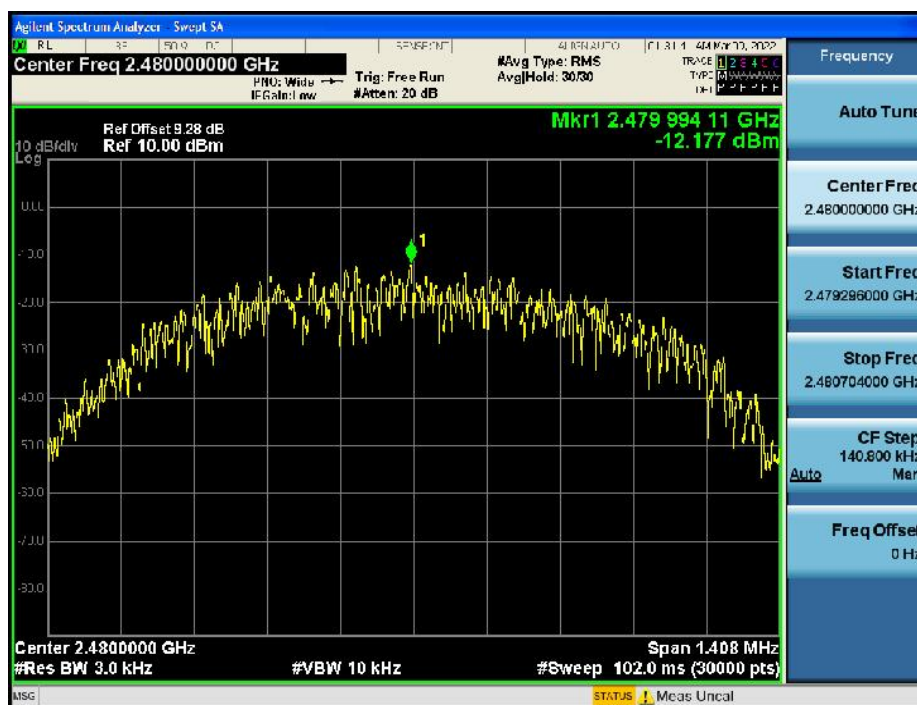
GFSK Channel 2402



GFSK Channel 2440



GFSK Channel 2480



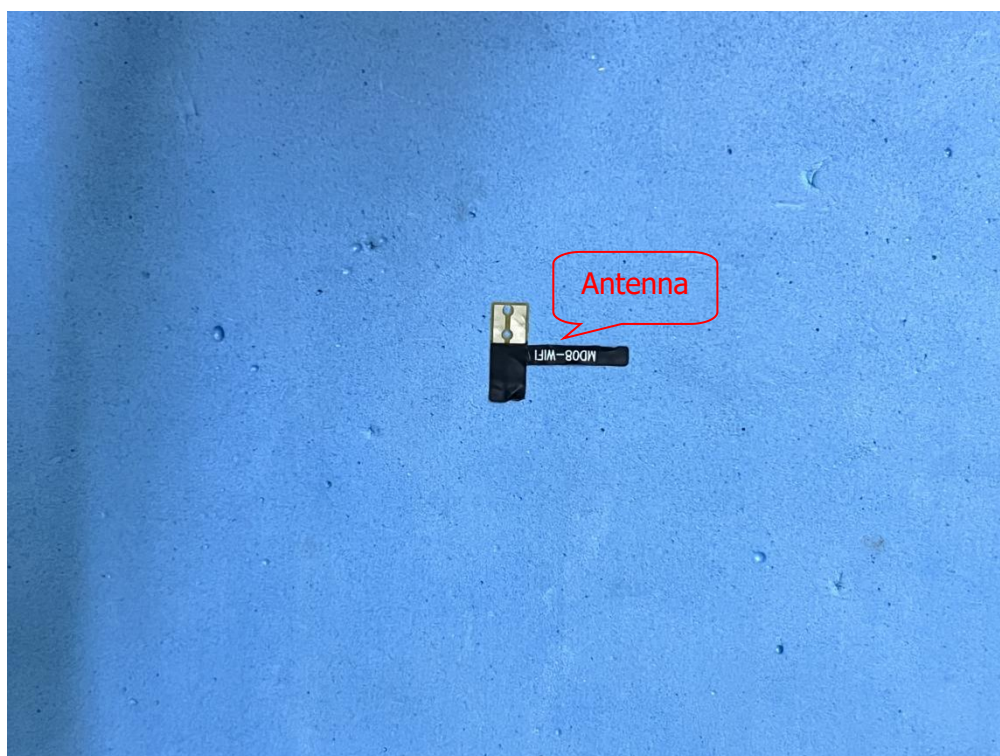
11 Antenna Application

11.1 Antenna Requirement

For intentional device, according to FCC 47 CFR Section 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. And according to FCC 47 CFR Section 15.247 (b), if transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

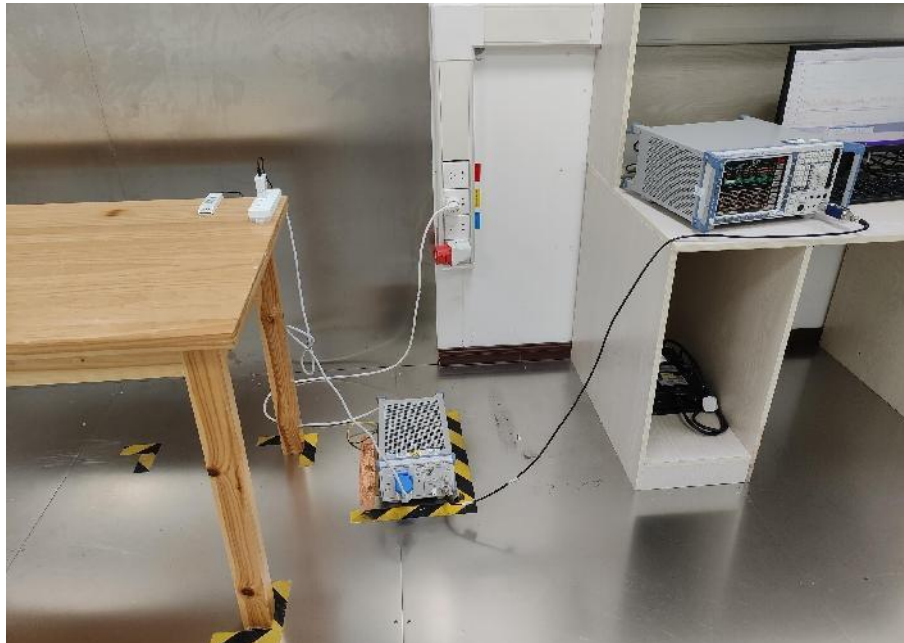
11.2 Result

The EUT'S antenna, permanent attached antenna, is internal antenna. The antenna's gain is 3.09 dBi and meets the requirement.



12 Test Setup

Conducted Emissions



Radiated Spurious Emissions





*****THE END REPORT*****