3.8 Out-of-Band Emissions

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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 con-ducted or a radiated measurement, pro-vided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter com-plies 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 any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the RF power that is produced 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 that the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of root-mean-square averaging over a time interval, as permitted under Section 5.4(4), the attenuation required shall be 30 dB instead of 20 dB. Attenuation below the general field strength limits specified in RSS-Gen is not required.

Test Procedure

Connect the transmitter output to spectrum analyzer using a low loss RF cable, and set the spectrum analyzer to RBW=100 kHz, VBW= 300 kHz, peak detector, and max hold. Measurements utilizing these setting are made of the in-band reference level, band edge and out-of-band emissions.

Test Configuration



<u>Test Results</u>

Remark: The measurement frequency range is from 30MHz to the 10th harmonic of the fundamental frequency. The lowest, middle and highest channels are tested to verify the spurious emissions and bandage measurement data.

We measured all conditions (DH1, DH3, DH5) and recorded worst case at DH5 and 3DH5

Test plot as follows:

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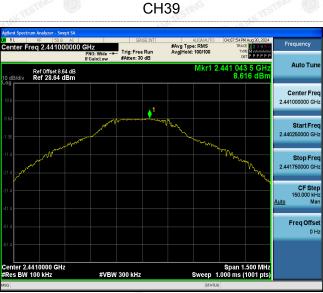


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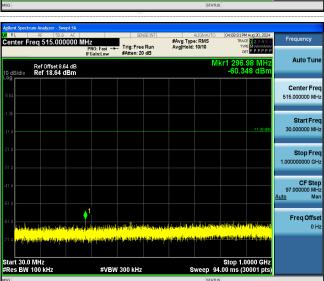
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lent Spect	rum Analyzer - Sv									
	req 515.00	2 AC 0000 N	AHZ PNO: Fast ↔	T		#Avg T Avg Ho	ALIGNAUTO /pe: RMS Id: 10/10	TRAC	Aug 30, 2024 1 2 3 4 5 6 E MINNIM	Frequency
dB/div	Ref Offset 8 Ref 18.64	64 dB dBm	FGame	Pricen. 24			М	kr1 930. -60.73	77 MHz 35 dBm	Auto Tui
9 54										Center Fr 515.000000 Mi
5 4									-11.25 dBm	Start Fro 30.000000 Mi
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art 30.0 es BW	MHz 100 kHz		#VBW	300 kHz			Sweep 94	Stop 1.0	000 GHz	



		Q AC		SENSE:INT		ALIGNAUTO	04:07:03 PM Aug 30, 2024	Frequency
nter F	req 13.750		East T	rig: Free Run Atten: 20 dB		Type: RMS Hold: 10/10	TRACE 123456 TYPE MONOTONIC DET PPPPP	
dB/div	Ref Offset					Mkr	2 4.804 60 GHz -44.175 dBm	Auto Tun
9 54 36 .4	⟩1 						-11.25 dBn	Center Fre 13.750000000 GH
.4	¢²							Start Fre 1.000000000 GH
4 4 4			,					Stop Fre 26.50000000 GF
art 1.00 es BW	GHz 100 kHz		#VBW 30	0 kHz		Sweep 2	Stop 26.50 GHz 2.438 s (30001 pts)	CF Ste 2.550000000 GH Auto Ma
N MODE TH	f	× 2.401 65 4.804 60		γ 3.703 dBm	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE	
N 1		4.804 60	JHZ -44	l.175 dBm				Freq Offs 0 F

enter Fi		2 AC 000000 GH:	7	SENSE: INT		ALIGNAUTO	04:08:34 PM TRACE	123456	Frequency
		PNO: IFGai	Fast Trig:	Free Run n:20 dB	Avg Ho	id: 10/10	TVP	MWWWWWW PPPPPP	
0 dB/div	Ref Offset 8. Ref 18.64					Mkr	2 4.881 9 -43.40	95 GHz 1 dBm	Auto Tur
. og 8.64	∑1								Center Fre
1.36									13.750000000 Gł
11.4								-11,38 dBm	
21.4									Start Fr
41.4									1.00000000 GI
51.4								al de la cital	
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'1.4									
tart 1.00 Res BW) GHz 100 kHz		#VBW 300 k	Hz		Sweep 2	Stop 26 2.438 s (30	i.50 GHz 1001 pts)	CF Sto 2.55000000 G
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4 N 4		4.881 95 0	Hz -43.40	1 dBm					Freq Offs
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2 N 1 3 4									
2 N 1 3 4 5 6									
2 N 1 3 4 5 5 6 7 8									
2 N 1 3 4 5 6 7 7									

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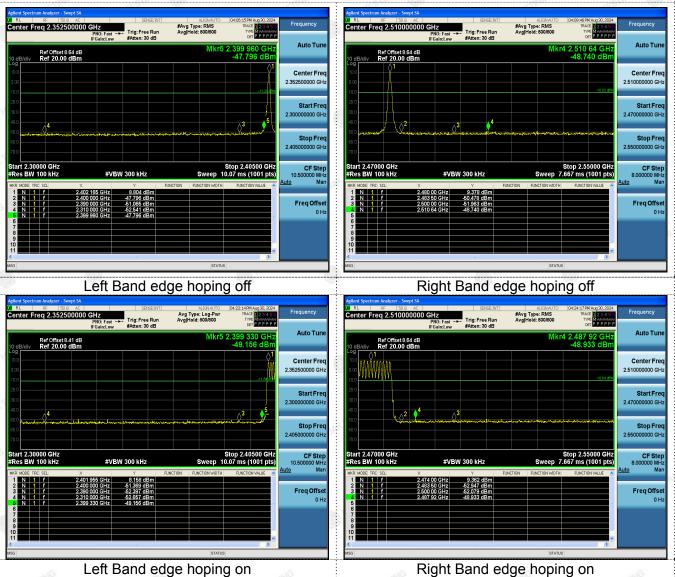


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Left Band edge hoping on

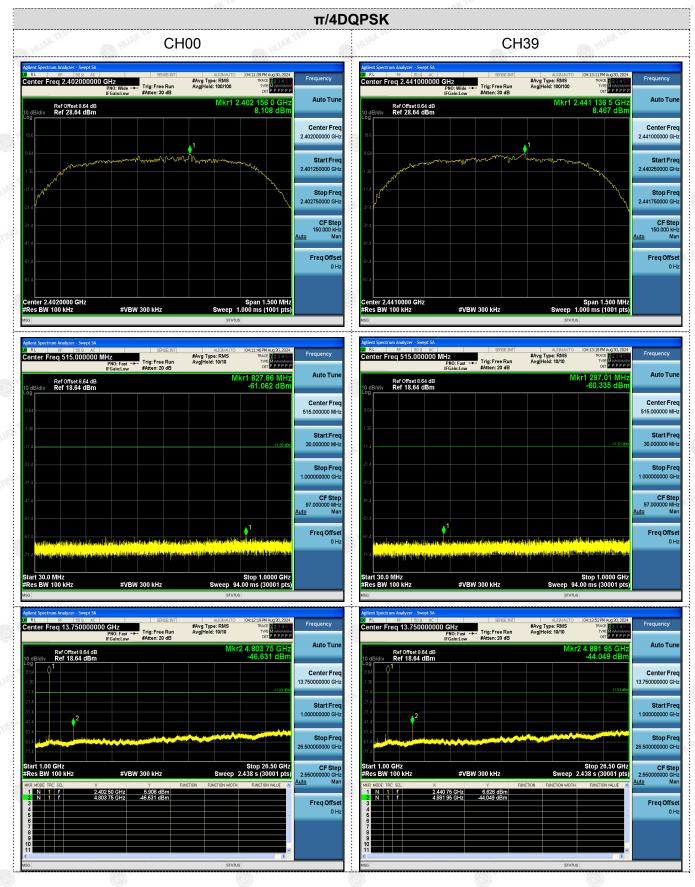
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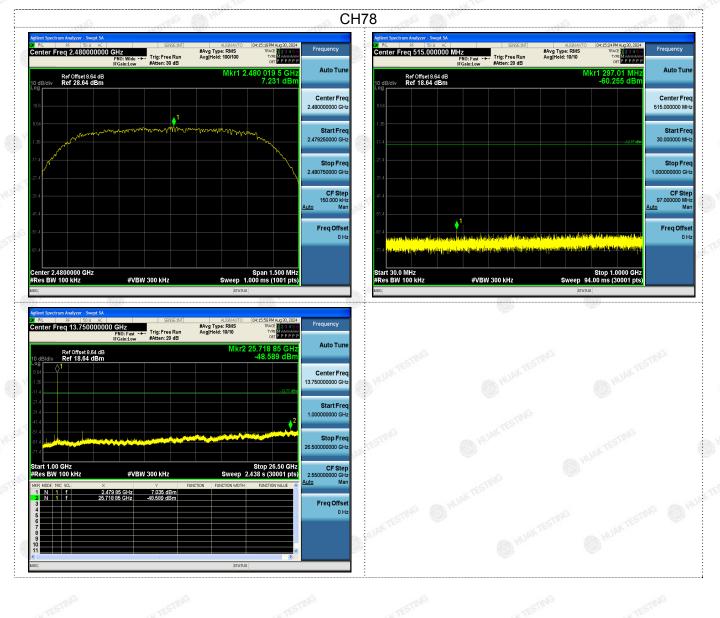
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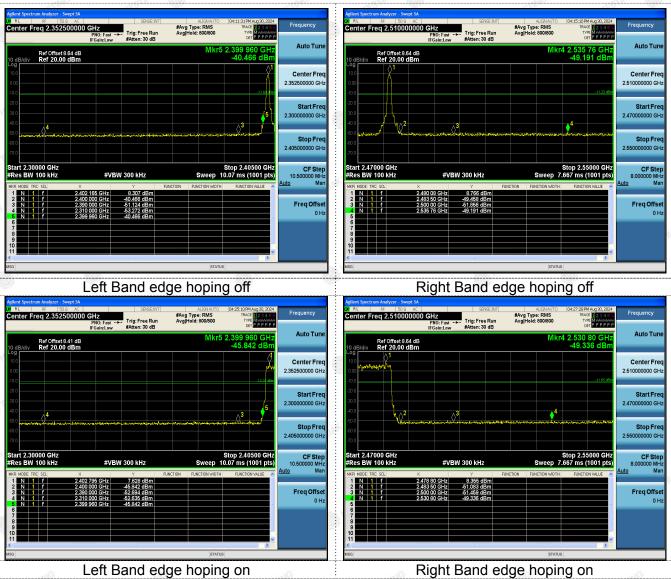
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Left Band edge hoping on

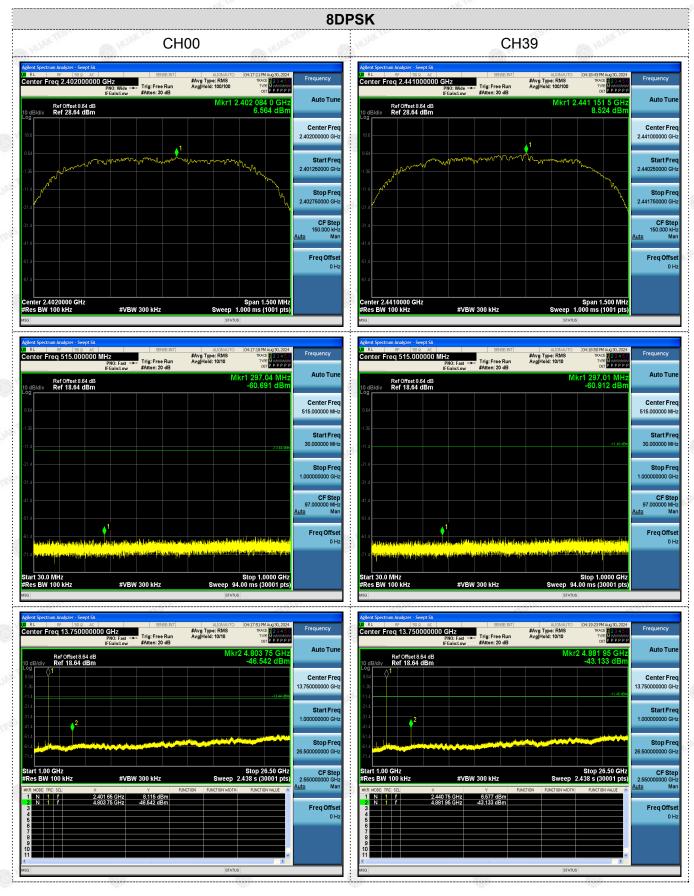
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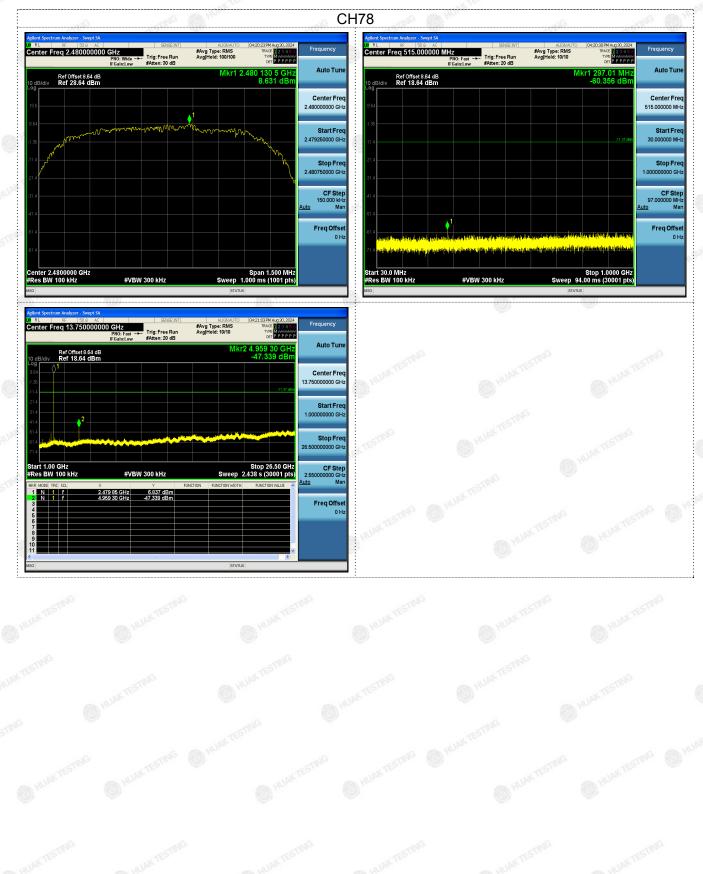


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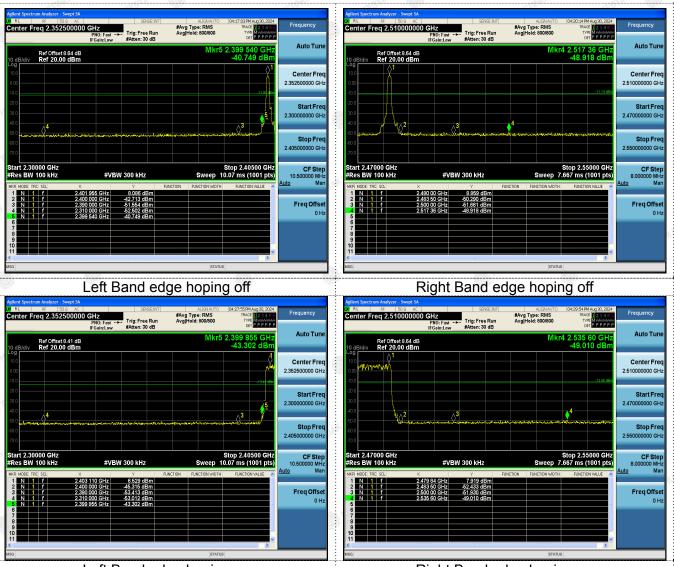
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Left Band edge hoping on

Right Band edge hoping on

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3.9 Pseudorandom Frequency Hopping Sequence

Test Applicable

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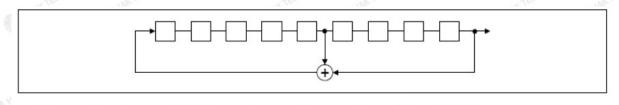
For 47 CFR Part 15C section 15.247 (a) (1):

Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hop-ping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400–2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW. The system shall hop to channel frequencies that are selected at the system hopping rate from a pseudo randomly ordered list of hopping frequencies. Each frequency must be used equally on the average by each transmitter. The system receivers shall have input bandwidths that match the hop-ping channel bandwidths of their corresponding transmitters and shall shift frequencies in synchronization with the transmitted signals.

EUT Pseudorandom Frequency Hopping Sequence Requirement

The pseudorandom frequency hopping sequence may be generated in a nice-stage shift register whose 5th and 9th stage outputs are added in a modulo-two addition stage. And the result is fed back to the input of the first stage. The sequence begins with the first one of 9 consecutive ones, for example: the shift register is initialized with nine ones.

- Number of shift register stages:9
- Length of pseudo-random sequence:29-1=511 bits
- Longest sequence of zeros:8(non-inverted signal)



Linear Feedback Shift Register for Generation of the PRBS sequence

0	2	4	6	62 6	4 78	3 1	73 75 7
				11			

Each frequency used equally one the average by each transmitter.

The system receiver have input bandwidths that match the hopping channel bandwidths of their corresponding transmitter and shift frequencies in synchronization with the transmitted signals.

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3.10 Antenna Requirement

Standard Applicable

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, 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.

Refer to Statement Below for Compliance.

The manufacturer may design the unit so that the user can replace a broken antenna, but the use of a standard antenna jack or electrical connector is prohibited. Further, this requirement does not apply to intentional radiators that must be professionally installed.

Antenna Connected Construction

10 20 30

90 200

8

2

8

50

The antenna used in this product is a FPC antenna, need professional installation, not easy to remove. It conforms to the standard requirements. The directional gains of antenna used for transmitting is 2.02dBi.

Antenna



30 50 10 300 30 80 10 60 20 40 30 50 10 500 30 80 10 60 20 40 30 50 10 100 30 80 10 60 20 40 30 50 20

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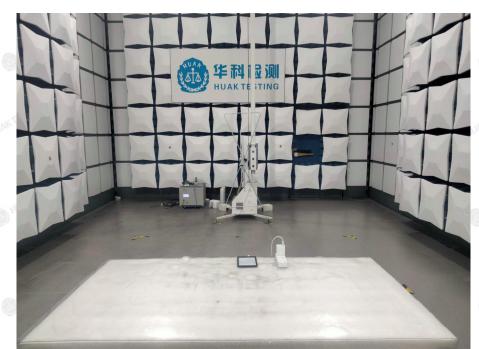
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4. Test Setup Photos of the EUT

Radiated Emission





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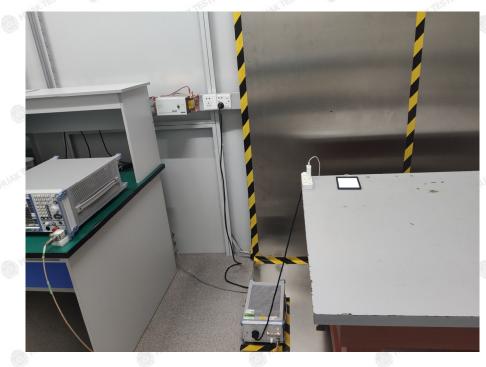
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Conducted Emission



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5. Photos of the EUT

Reference to the report: ANNEX A of External photos and ANNEX B of Internal photos

-----End of test report-----

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