

UN6GHZ PRE-APPROVAL GUIDANCE CHECKLIST

1. Antennas

1.1 Information for all the antennas, i.e., type, gain and relative positions within host, must be included in the filing.

Please refer to page 9 of “2210RSU047-U6-FCC 6ID Test Report_Rev01_Part1” for antenna information.

Please refer to document “EUT Internal Photo” for the antenna positions.

1.2 Show how the (aggregate, if applicable) antenna gain was computed/measured (as in TCB Workshop Presentation Aggregate Antenna Gain Review, April 2021). Provide equation(s) used to calculate Directional Gain and provide example calculation showing how the DG was calculated with the antenna gain of individual antennas. Provide details (references or attached documents) on how the individual antenna gains were derived, i.e., declared by the host manufacturer, based on data sheet, or measured. Since the CBP needs to detect a small signal, the worst case scenario to consider is when the receiver has the lowest antenna gain.

Please refer to page 9 of “2210RSU047-U6-FCC 6ID Test Report_Rev01_Part1” for antenna information.

According to FCC KDB 662911 D01v02r01:

CDD Mode

For power measurements: Array Gain = 0 dB for $N_{ANT} \leq 4$, the directional gain = max antenna gain + array gain

For power spectral density (PSD) measurements: the max directional gain (each angle) = $10 \log[(10^{G1/20} + 10^{G2/20} + \dots + 10^{GN/20})^2 / N_{ANT}]$

e.g.

The directional gain = $10 * \log[(10^{G1/20} + 10^{G2/20})^2 / N_{ANT}] = 10 * \log((10^{3.62/20} + 10^{3.56/20})^2 / 2) = 6.60 \text{dBi}$

Refer to the page 27 of WF-810E_Antenna Spec_Rev01

Frequency (MHz)	Degree		Gain		Correlated Gain (dBi) -Total
	Theta	Phi	6G0	6G1	
5925	240	0	4.24	1.69	6.07
6225	225	0	3.46	2.84	6.17
6325	225	0	3.62	3.56	6.60
6575	225	15	3.18	3.91	6.56
7125	300	30	3.94	1.11	5.65

STBC Mode

the max directional gain (each angle) = $10 \log[(10^{G1/10} + 10^{G2/10} + \dots + 10^{GN/10}) / N_{ANT}]$.

e.g.

The directional gain = $10 * \log[(10^{G1/10} + 10^{G2/10}) / N_{ANT}] = 10 * \log((10^{3.62/10} + 10^{3.56/10}) / 2) = 3.59 \text{dBi}$

Refer to the page 27 of WF-810E_Antenna Spec_Rev01

Frequency (MHz)	Degree (°)		Gain (dBi)		Uncorrelated (dBi) -Total
	Theta	Phi	6G0	6G1	
5925	240	0	4.24	1.69	3.15
6225	225	0	3.46	2.84	3.16
6325	225	0	3.62	3.56	3.59
6575	225	15	3.18	3.91	3.56
7125	300	30	3.94	1.11	2.75

The CBP was performed by conducted test. The uncorrelated has a minimum antenna gain of 4.2dBi, and the Ant 1 RF port was selected to perform CBP test. Please refer to page 153 of “2210RSU047-U6-FCC 6ID Test Report_Rev01_Part3” for CBP test result.

1.7. Antenna Details

Antenna Type	Frequency (MHz)	TX Path	Antenna Gain (dBi)				Directional Gain (dBi)	
			Ant 0	Ant 1	Ant 2	Ant 3	Correlated	Uncorrelated
Wi-Fi Antenna								
PIFA	2412 ~ 2462	2	3.80	4.10	--	--	4.46	1.56
	5180 ~ 5320	4	4.60	6.20	4.30	4.02	7.58	1.85
	5500 ~ 5720	4	4.30	5.50	4.80	4.35	8.01	2.29
	5745 ~ 5825	4	3.70	5.20	4.10	4.70	8.01	2.23
	5925 ~ 7125	2	4.70	4.20	--	--	6.60	3.59
Remark:								
<ol style="list-style-type: none"> The antenna gain and directional gain refer to manufacturer's antenna specification. The device supports CDD Mode and STBC mode, details refer to the table as below. CDD signals are correlated, the directional gain as follows, For power measurements: Array Gain = 0 dB for $N_{ANT} \leq 4$, the directional gain = max antenna gain + array gain For power spectral density (PSD) measurements: the max directional gain (each angle) = $10 \log[(10^{G1/20} + 10^{G2/20} + \dots + 10^{GN/20})^2 / N_{ANT}]$ STBC signals are uncorrelated, the directional gain as follows, the max directional gain (each angle) = $10 \log[(10^{G1/10} + 10^{G2/10} + \dots + 10^{GN/10}) / N_{ANT}]$ 								

1.3 For conducted test in MIMO cases, show that the testing was done for that path that has the lowest antenna gain.

The EUT supports MIMO mode (CDD and STBC mode, see the follow picture), and the CBP was performed by conducted test. The uncorrelated has a minimum antenna gain of 4.2dBi, and the Ant 1 RF port was selected to perform CBP test. Please refer to page 88 of “2210RSU047-U6-FCC 6ID Test Report_Rev01_Part3” for CBP test result.



Report No.: 2210RSU047-U6

Test Mode	T _x Paths	CDD Mode	STBC Mode
Wi-Fi 2.4G			
802.11b/g	2	√	X
802.11n/ax	2	X	√
Wi-Fi 5G			
802.11a	4	√	X
802.11n/ac/ax	4	X	√
Wi-Fi 6G			
802.11a	2	√	X
802.11ax	2	X	√
Remark: "√" means "Support", "X" means "Not support".			

2. Contention Based Protocol (CBP)

2.1 CBP testing shall be performed on one channel in each sub-band of operation for both narrowest and widest bandwidths.

Please refer to page 88 of “2210RSU047-U6-FCC 6ID Test Report_Rev01_Part3” for the test channel and bandwidth information as follows. The narrowest and widest bandwidths were test for each UNII band.

A.7 Contention Based Protocol Test Result

Test Site	WZ-SR5	Test Engineer	Jeff Yang
Test Date	2023-02-03 ~ 2023-04-07		

Test Channel	Bandwidth (MHz)	Freq. (MHz)	AWGN Freq. (MHz)	AWGN Power (dBm)	Ant. Gain (dBi)	Adjust Power (dBm)	Detection Limit (dBm)	Detected Number	Detection Probability (%)	Limit (%)	Test Result
Operation Band: U-NII 5											
33	20	6115	6115	-69	4.2	-73.2	≤ -62.0	10	100	90	Pass
47	160	6185	6110	-70	4.2	-74.2	≤ -62.0	10	100	90	Pass
47	160	6185	6185	-64	4.2	-68.2	≤ -62.0	10	100	90	Pass
47	160	6185	6260	-64	4.2	-68.2	≤ -62.0	10	100	90	Pass
Operation Band: U-NII 6											
97	20	6435	6435	-60	4.2	-64.2	≤ -62.0	10	100	90	Pass
103	80	6465	6430	-69	4.2	-73.2	≤ -62.0	10	100	90	Pass
103	80	6465	6465	-66	4.2	-70.2	≤ -62.0	10	100	90	Pass
103	80	6465	6500	-62	4.2	-66.2	≤ -62.0	10	100	90	Pass
Operation Band: U-NII 7											
153	20	6715	6715	-60.5	4.2	-64.7	≤ -62.0	10	100	90	Pass
143	160	6665	6590	-69	4.2	-73.2	≤ -62.0	10	100	90	Pass
143	160	6665	6665	-64	4.2	-68.2	≤ -62.0	10	100	90	Pass
143	160	6665	6740	-63	4.2	-67.2	≤ -62.0	10	100	90	Pass
Operation Band: U-NII 8											
213	20	7015	7015	-61	4.2	-65.2	≤ -62.0	10	100	90	Pass
207	160	6985	6910	-67	4.2	-71.2	≤ -62.0	10	100	90	Pass
207	160	6985	6985	-62	4.2	-66.2	≤ -62.0	10	100	90	Pass
207	160	6985	7060	-68	4.2	-72.2	≤ -62.0	10	100	90	Pass

Note 1: Adjust Power (dBm) = AWGN Power (dBm) – Antenna Gain (dBi).

Note 2: Conducted measurements are used.

2.2 Use three separate 10 MHz AWGN signals when testing a 160 MHz channel. The simulated incumbent signal must be a 10 MHz wide AWGN signal

Please refer to page 88 of “2210RSU047-U6-FCC 6ID Test Report_Rev01_Part3” for the test summary information.

A.7 Contention Based Protocol Test Result

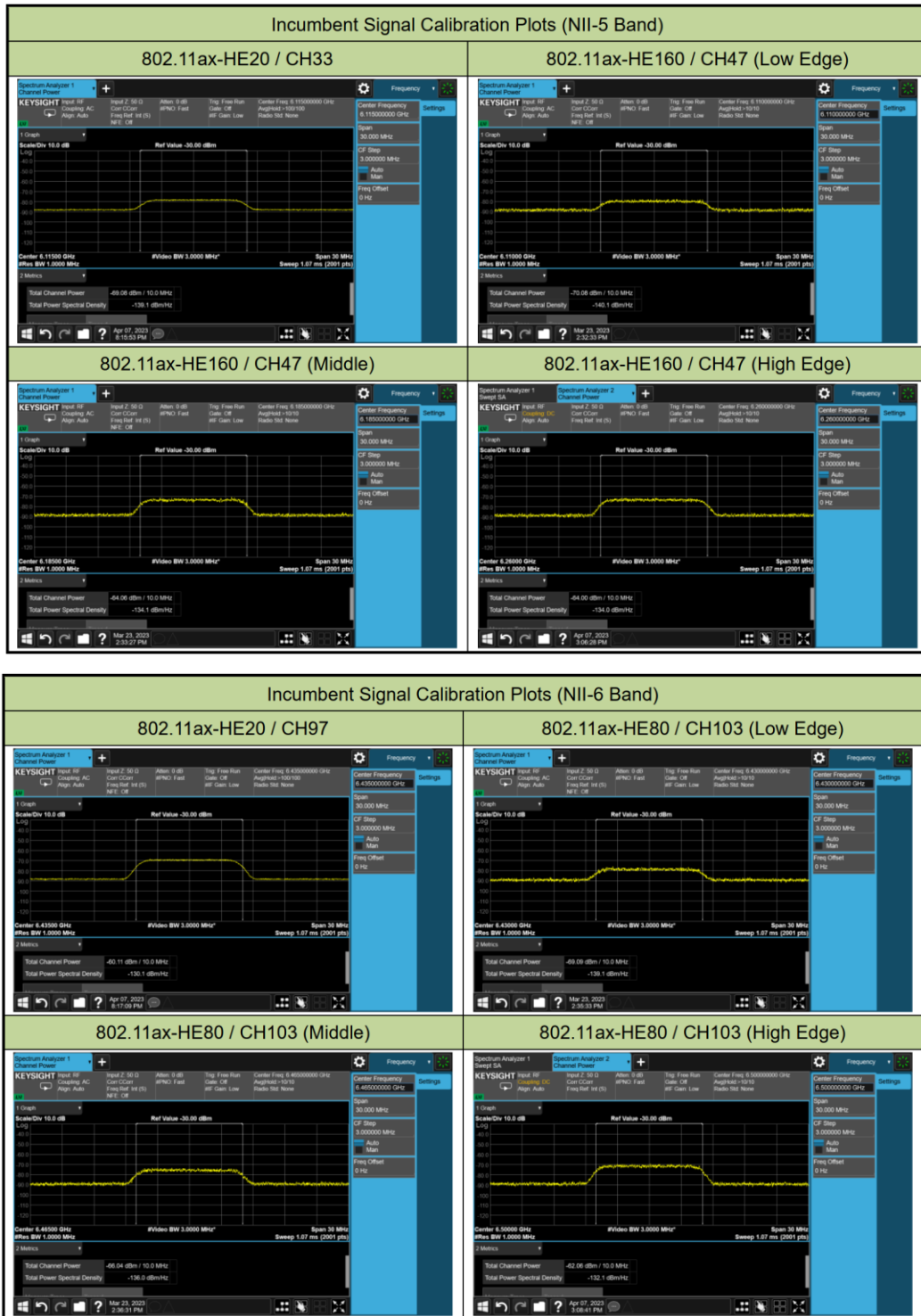
Test Site	WZ-SR5	Test Engineer	Jeff Yang
Test Date	2023-02-03 ~ 2023-04-07		

Test Channel	Bandwidth (MHz)	Freq. (MHz)	AWGN Freq. (MHz)	AWGN Power (dBm)	Ant. Gain (dBi)	Adjust Power (dBm)	Detection Limit (dBm)	Detected Number	Detection Probability (%)	Limit (%)	Test Result
Operation Band: U-NII 5											
33	20	6115	6115	-69	4.2	-73.2	≤ -62.0	10	100	90	Pass
47	160	6185	6110	-70	4.2	-74.2	≤ -62.0	10	100	90	Pass
47	160	6185	6185	-64	4.2	-68.2	≤ -62.0	10	100	90	Pass
47	160	6185	6260	-64	4.2	-68.2	≤ -62.0	10	100	90	Pass
Operation Band: U-NII 6											
97	20	6435	6435	-60	4.2	-64.2	≤ -62.0	10	100	90	Pass
103	80	6465	6430	-69	4.2	-73.2	≤ -62.0	10	100	90	Pass
103	80	6465	6465	-66	4.2	-70.2	≤ -62.0	10	100	90	Pass
103	80	6465	6500	-62	4.2	-66.2	≤ -62.0	10	100	90	Pass
Operation Band: U-NII 7											
153	20	6715	6715	-60.5	4.2	-64.7	≤ -62.0	10	100	90	Pass
143	160	6665	6590	-69	4.2	-73.2	≤ -62.0	10	100	90	Pass
143	160	6665	6665	-64	4.2	-68.2	≤ -62.0	10	100	90	Pass
143	160	6665	6740	-63	4.2	-67.2	≤ -62.0	10	100	90	Pass
Operation Band: U-NII 8											
213	20	7015	7015	-61	4.2	-65.2	≤ -62.0	10	100	90	Pass
207	160	6985	6910	-67	4.2	-71.2	≤ -62.0	10	100	90	Pass
207	160	6985	6985	-62	4.2	-66.2	≤ -62.0	10	100	90	Pass
207	160	6985	7060	-68	4.2	-72.2	≤ -62.0	10	100	90	Pass

Note 1: Adjust Power (dBm) = AWGN Power (dBm) – Antenna Gain (dBi).

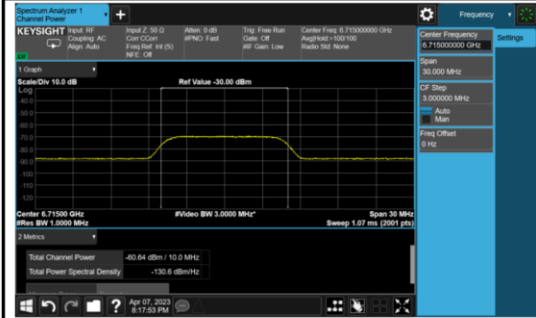
Note 2: Conducted measurements are used.

Please refer to page 92~95 of “2210RSU047-U6-FCC 6ID Test Report_Rev01_Part4” for the AWGN signal plots.

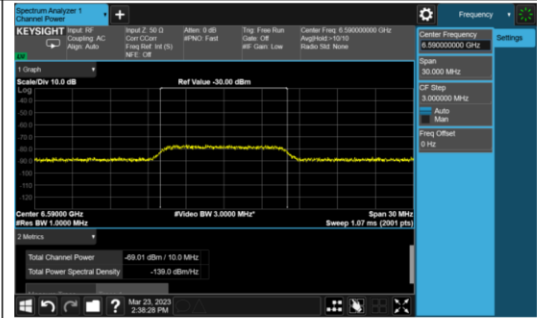


Incumbent Signal Calibration Plots (NII-7 Band)

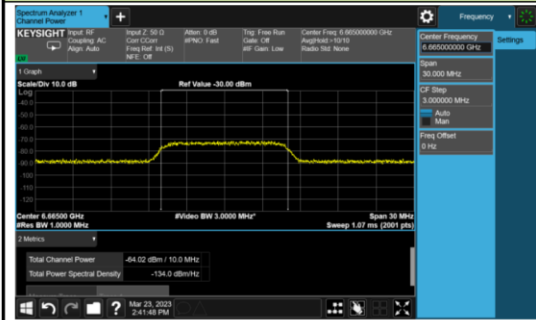
802.11ax-HE20 / CH153



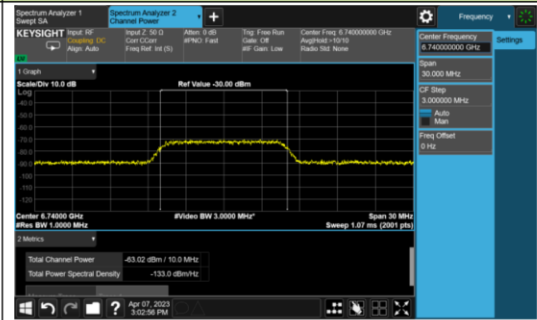
802.11ax-HE160 / CH143 (Low Edge)



802.11ax-HE160 / CH143 (Middle)

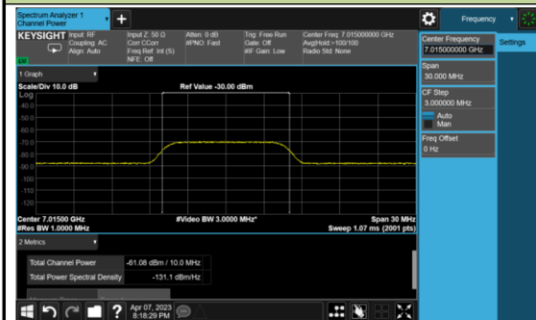


802.11ax-HE160 / CH143 (High Edge)



Incumbent Signal Calibration Plots (NII-8 Band)

802.11ax-HE20 / CH213



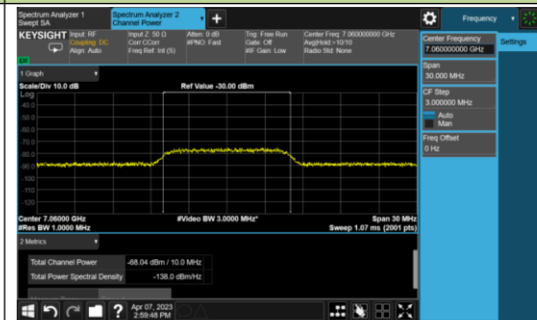
802.11ax-HE160 / CH207 (Low Edge)



802.11ax-HE160 / CH207 (Middle)



802.11ax-HE160 / CH207 (High Edge)



2.3 Report lowest AWGN signal detectable by EUT

Please refer to page 89~90 of “2210RSU047-U6-FCC 6ID Test Report_Rev01_Part3” for lowest AWGN signal detectable by EUT.

Bandwidth (MHz)	Freq. (MHz)	AWGN Freq. (MHz)	Adjust Power (dBm)	EUT Tx Status
Operation Band: U-NII 5				
20	6135	6135	-81.2	ON
			-80.2	Minimal
			-73.2	OFF
160	6185	6110	-78.2	ON
			-77.2	Minimal
			-74.2	OFF
160	6185	6185	-71.2	ON
			-70.2	Minimal
			-68.2	OFF
160	6185	6260	-76.2	ON
			-75.2	Minimal
			-68.2	OFF
Operation Band: U-NII 6				
20	6455	6455	-80.2	ON
			-79.2	Minimal
			-64.2	OFF
80	6465	6430	-75.2	ON
			-74.2	Minimal
			-73.2	OFF
80	6465	6465	-73.2	ON
			-72.2	Minimal
			-70.2	OFF
80	6465	6500	-78.2	ON
			-77.2	Minimal
			-66.2	OFF

Bandwidth (MHz)	Freq. (MHz)	AWGN Freq. (MHz)	Adjust Power (dBm)	EUT Status
Operation Band: U-NII 7				
20	6695	6695	-80.2	ON
			-79.2	Minimal
			-64.7	OFF
160	6665	6590	-78.2	ON
			-77.2	Minimal
			-73.2	OFF
160	6665	6665	-72.2	ON
			-71.2	Minimal
			-68.2	OFF
160	6665	6740	-76.2	ON
			-75.2	Minimal
			-67.2	OFF
Operation Band: U-NII 8				
20	7015	7015	-79.2	ON
			-78.2	Minimal
			-65.2	OFF
160	6985	6910	-77.2	ON
			-76.2	Minimal
			-71.2	OFF
160	6985	6985	-69.2	ON
			-68.2	Minimal
			-66.2	OFF
160	6985	7060	-76.2	ON
			-75.2	Minimal
			-72.2	OFF
<p>Note:</p> <p>OFF: AWGN level at which no transmission is detected, consistently for a minimum period of 10 seconds</p> <p>Minimal: AWGN level at which the system begins to trigger the transmission switch-off, albeit not being kept off consistently</p> <p>ON: AWGN level at which no impact on the transmission is detected, consistently for a minimum period of 10 seconds</p>				

2.4 Verify that the testing was performed with the AWGN signal set to lowest level (for example, -100 dBm) and increased until the EUT detects and stops transmitting.

The test was performed with a lowest AWGN signal level and increased until the EUT detects and stop transmission.

Please refer to page 89~90 of “2210RSU047-U6-FCC 6ID Test Report_Rev01_Part3” for the information.

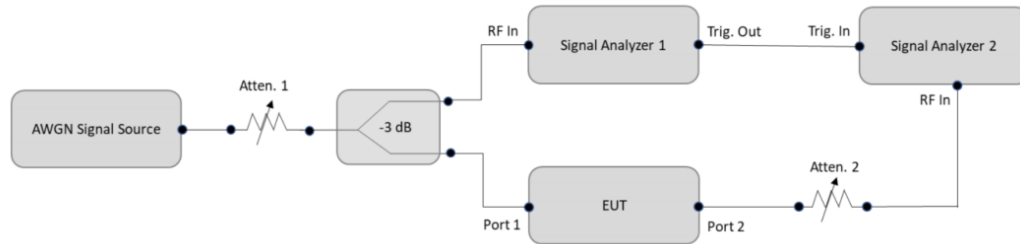
Bandwidth (MHz)	Freq. (MHz)	AWGN Freq. (MHz)	Adjust Power (dBm)	EUT Tx Status
Operation Band: U-NII 5				
20	6135	6135	-81.2	ON
			-80.2	Minimal
			-73.2	OFF
160	6185	6110	-78.2	ON
			-77.2	Minimal
			-74.2	OFF
160	6185	6185	-71.2	ON
			-70.2	Minimal
			-68.2	OFF
160	6185	6260	-76.2	ON
			-75.2	Minimal
			-68.2	OFF
Operation Band: U-NII 6				
20	6455	6455	-80.2	ON
			-79.2	Minimal
			-64.2	OFF
80	6465	6430	-75.2	ON
			-74.2	Minimal
			-73.2	OFF
80	6465	6465	-73.2	ON
			-72.2	Minimal
			-70.2	OFF
80	6465	6500	-78.2	ON
			-77.2	Minimal
			-66.2	OFF

Bandwidth (MHz)	Freq. (MHz)	AWGN Freq. (MHz)	Adjust Power (dBm)	EUT Status
Operation Band: U-NII 7				
20	6695	6695	-80.2	ON
			-79.2	Minimal
			-64.7	OFF
160	6665	6590	-78.2	ON
			-77.2	Minimal
			-73.2	OFF
160	6665	6665	-72.2	ON
			-71.2	Minimal
			-68.2	OFF
160	6665	6740	-76.2	ON
			-75.2	Minimal
			-67.2	OFF
Operation Band: U-NII 8				
20	7015	7015	-79.2	ON
			-78.2	Minimal
			-65.2	OFF
160	6985	6910	-77.2	ON
			-76.2	Minimal
			-71.2	OFF
160	6985	6985	-69.2	ON
			-68.2	Minimal
			-66.2	OFF
160	6985	7060	-76.2	ON
			-75.2	Minimal
			-72.2	OFF
<p>Note:</p> <p>OFF: AWGN level at which no transmission is detected, consistently for a minimum period of 10 seconds</p> <p>Minimal: AWGN level at which the system begins to trigger the transmission switch-off, albeit not being kept off consistently</p> <p>ON: AWGN level at which no impact on the transmission is detected, consistently for a minimum period of 10 seconds</p>				

2.5 If conducted measurements are used, the detection threshold needs to be corrected to refer to a 0 dBi gain antenna and include all the applicable losses (cables, etc.). For instance, the report should show (at least): Detection Level = Injected AWGN Power (dBm) – Antenna Gain (dBi) + Path Loss (dB)

Conducted test is performed for this device.

Please refer to page 28 of “2210RSU047-U6-FCC 6ID Test Report_Rev01_Part1” for the test setup diagram as below.



Please refer to page 88 of “2210RSU047-U6-FCC 6ID Test Report_Rev01_Part3” for the test result summary.

The uncorrelated has a minimum antenna gain of 4.2dBi, and the Ant 1 RF port was selected to perform CBP test

Adjust Power (dBm) = AWGN Power (dBm) – Antenna Gain (dBi).

Adjust Power (dBm) ≤ Detection Limit (-62dBm)

All Detection Power in the report comply with the -62dBm threshold.

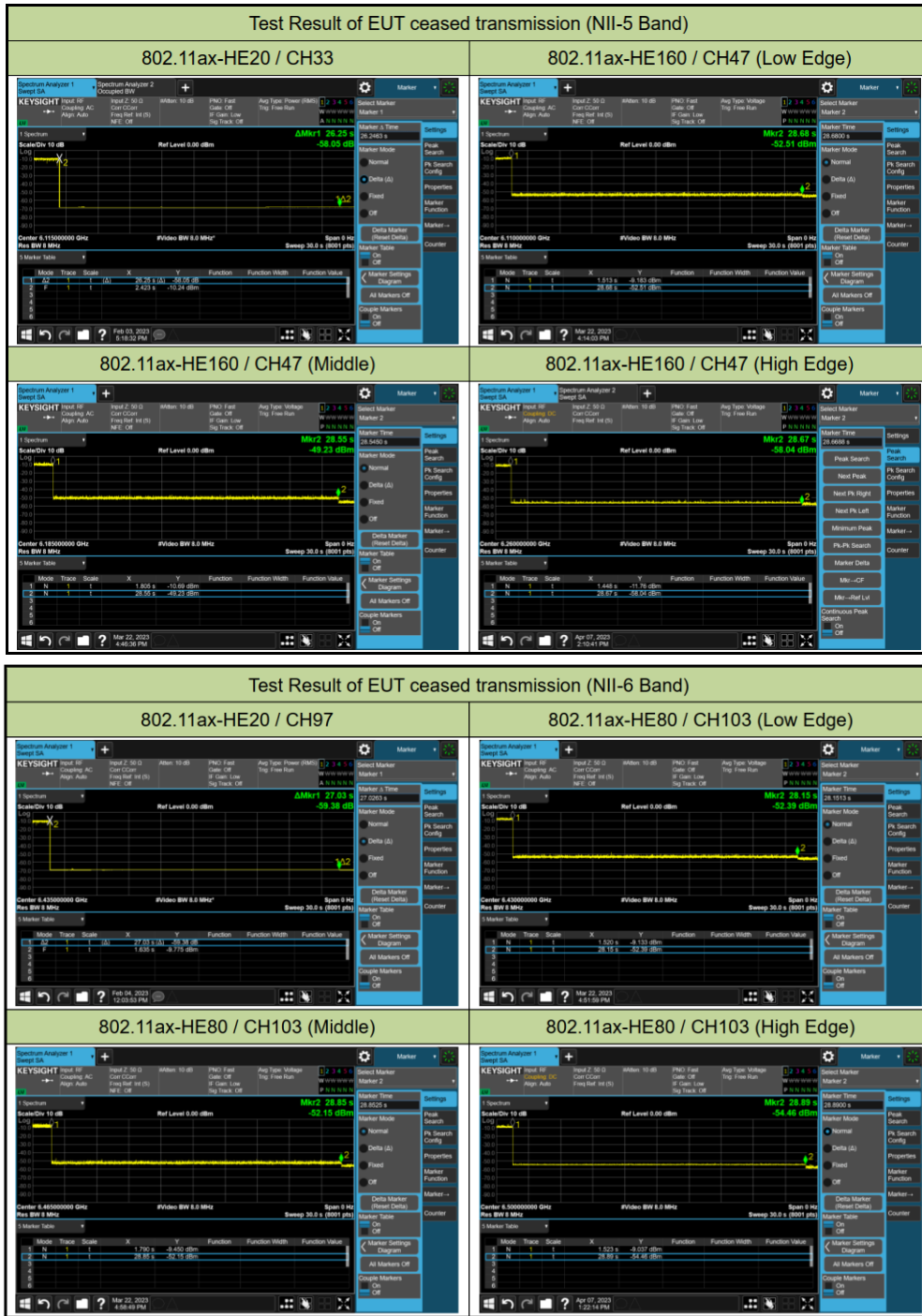
Test Channel	Bandwidth (MHz)	Freq. (MHz)	AWGN Freq. (MHz)	AWGN Power (dBm)	Ant. Gain (dBi)	Adjust Power (dBm)	Detection Limit (dBm)	Detected Number	Detection Probability (%)	Limit (%)	Test Result
Operation Band: U-NII 5											
33	20	6115	6115	-69	4.2	-73.2	≤ -62.0	10	100	90	Pass
47	160	6185	6110	-70	4.2	-74.2	≤ -62.0	10	100	90	Pass
47	160	6185	6185	-64	4.2	-68.2	≤ -62.0	10	100	90	Pass
47	160	6185	6260	-64	4.2	-68.2	≤ -62.0	10	100	90	Pass
Operation Band: U-NII 6											
97	20	6435	6435	-60	4.2	-64.2	≤ -62.0	10	100	90	Pass
103	80	6465	6430	-69	4.2	-73.2	≤ -62.0	10	100	90	Pass
103	80	6465	6465	-66	4.2	-70.2	≤ -62.0	10	100	90	Pass
103	80	6465	6500	-62	4.2	-66.2	≤ -62.0	10	100	90	Pass
Operation Band: U-NII 7											
153	20	6715	6715	-60.5	4.2	-64.7	≤ -62.0	10	100	90	Pass
143	160	6665	6590	-69	4.2	-73.2	≤ -62.0	10	100	90	Pass
143	160	6665	6665	-64	4.2	-68.2	≤ -62.0	10	100	90	Pass
143	160	6665	6740	-63	4.2	-67.2	≤ -62.0	10	100	90	Pass
Operation Band: U-NII 8											
213	20	7015	7015	-61	4.2	-65.2	≤ -62.0	10	100	90	Pass
207	160	6985	6910	-67	4.2	-71.2	≤ -62.0	10	100	90	Pass
207	160	6985	6985	-62	4.2	-66.2	≤ -62.0	10	100	90	Pass
207	160	6985	7060	-68	4.2	-72.2	≤ -62.0	10	100	90	Pass

Note 1: Adjust Power (dBm) = AWGN Power (dBm) – Antenna Gain (dBi).

Note 2: Conducted measurements are used.

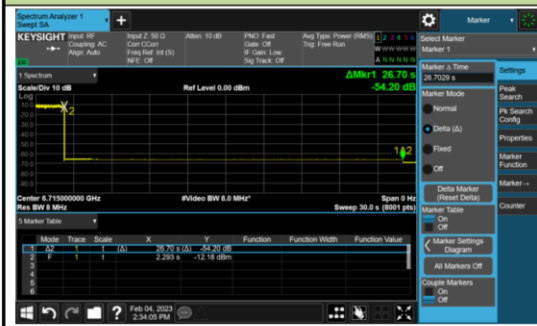
2.6 Include plots showing EUT has stopped transmitting after detection of AWGN signal.

The plots of UNII-5/-6/-7/-8 On page 96-99 of “210RSU047-U6-FCC 6ID Test Report_Rev01_Part4”



Test Result of EUT ceased transmission (NII-7 Band)

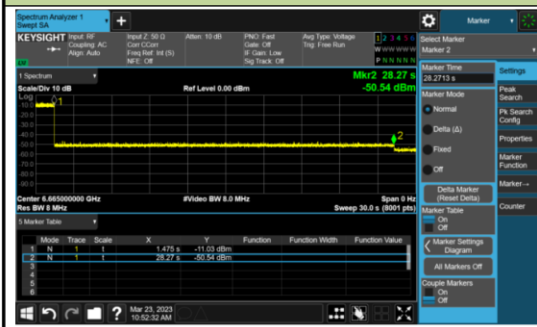
802.11ax-HE20 / CH153



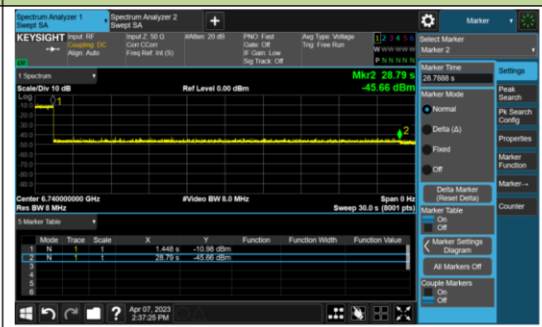
802.11ax-HE160 / CH143 (Low Edge)



802.11ax-HE160 / CH143 (Middle)



802.11ax-HE160 / CH143 (High Edge)



Test Result of EUT ceased transmission (NII-8 Band)

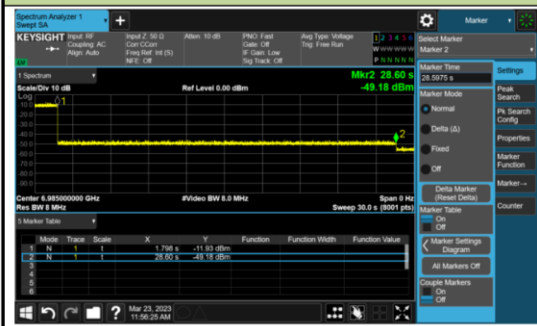
802.11ax-HE20 / CH213



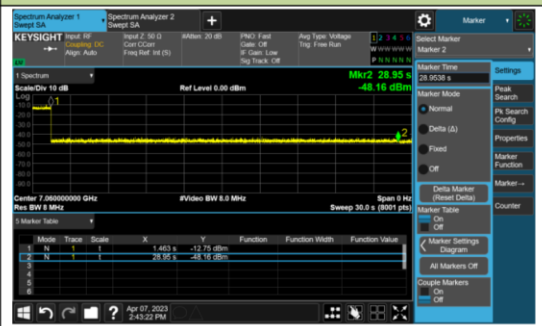
802.11ax-HE160 / CH207 (Low Edge)



802.11ax-HE160 / CH207 (Middle)



802.11ax-HE160 / CH207 (High Edge)



2.7 Describe whether channel puncturing and/or bandwidth reduction mechanisms supported. The report needs to include a plot as an example for at least one of the AWGN signals used.

Not Support.

2.8 If radiated testing is used, show that spot-checks were done to identify which side of the EUT has the lowest sensitivity to the incumbent signal detection, and that side was indeed chosen for the test.

Conducted test is performed for this device.

3. Client Device Limitations

This device is not a client device.

4. Emission Mask

4.1 Power spectral density suppression complies with 47 CFR § 15.407(b)(6).

Please refer to Annex A - A.8 (Page 100 ~ 157) and Annex A - A.9 (Page 158 ~ 197) of “2210RSU047-U6-FCC 6ID Test Report_Rev01_Part4” for the test result of power spectral density suppression.

4.2 If EUT supports OFDMA discuss testing of partial Resource Unit (RU) configurations. In any case the shape of the mask shall be based on full RU.

This device supports one configuration only in 802.11ax full RU mode.

Please refer to note 4 of Operation Description for this information (On Page 2)

This information is also noted on page 11 (section 2.1 note 3) of “2210RSU047-U6-FCC 6ID Test Report_Rev01_Part1”

4.3 OOB limits only apply outside of the 5.925-7.125 GHz band. All in-band emissions need to meet the channel mask. In case a higher RBW for the in-Band Emissions Mask is used (i.e., a more conservative case) that should be noted.

Please refer to Annex A - A.5 (Page 65 ~ 86) of “2210RSU047-U6-FCC 6ID Test Report_Rev01_Part2 & Part3” for the test result of channel mask.

5. Filing

99% of the occupied bandwidth must be contained within all the U-NII sub bands authorized for that equipment class.

Please refer to Annex A - A.2 (Page 41 ~ 51) of “2210RSU047-U6-FCC 6ID Test Report_Rev01_Part1” for the 99% OBW test result. The result satisfies this requirement.

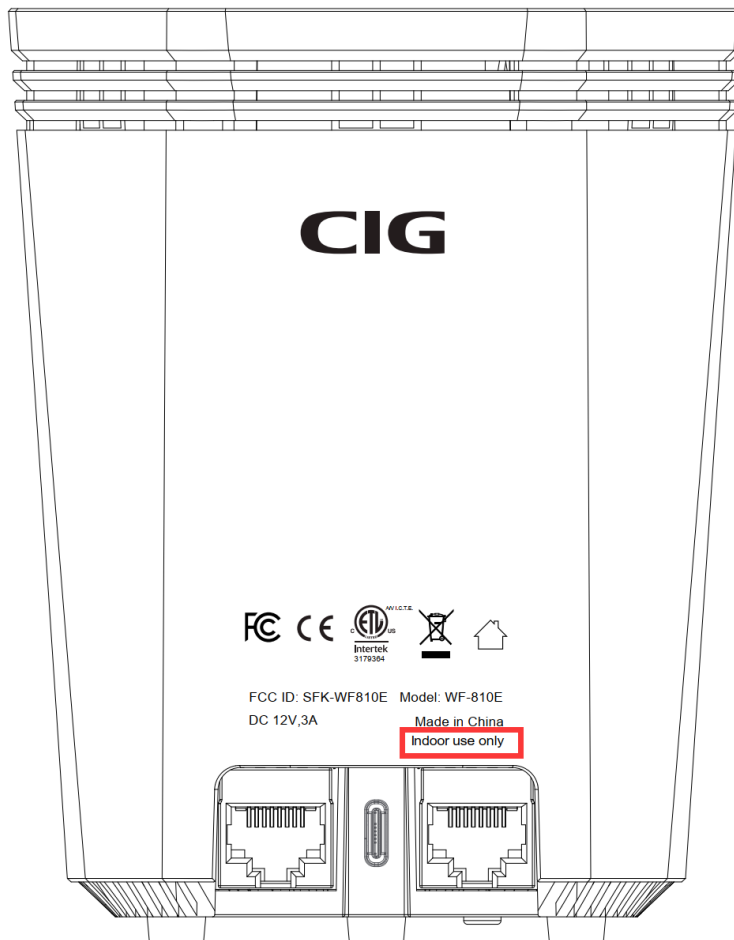
6. Hearing Aid Compatibility (HAC)

Not Applicable.

7. Labelling

7.1 Label showing indoor only for Subordinate and APs.

Please refer to the document “FCC ID Label”. The label showing “Indoor User only”.



7.2 E-labelling may be acceptable if proper justification is provided

Not Applicable.

8. Modular Certifications (when applicable)

Not Applicable.

9. RF Exposure

9.1 Demonstrate applicable classification (portable/mobile/fixed) in reference to worst-case scenario use cases

Please refer report “FCC RF Exposure Report” for RF Exposure information.

Section 1.6 of the report states that this device is a mobile device.

9.2 Address $f > 6$ GHz RF exposure via most recent applicable KDB or TCB Workshop procedures.

Section 1.6 of “FCC RF Exposure Report” showed that the most recent KDB (KDB 447498 D04 v01) was used.

9.3 Address all applicable simultaneous transmission conditions using the compliance condition $TER \leq 1$.

Please refer to section 2.3 of "FCC RF Exposure Report" for this information.

This device supports BLE, 2.4GHz WLAN, 5GHz WLAN and UN6GHz RLAN.

The BLE, 2.4GHz WLAN, 5GHz WLAN and 6GHz RLAN can transmit simultaneously.

The Max. Exposure Ratio = 0.9808 < 1.

10. Security

Provide specific exhibit with device security description is required (complying with 47 CFR § 15.407(i))

Please refer to the document "Software Security Requirements Cover Letter" for security information.

11. Spurious Emissions

Show that measurements are made at the prescribed antenna heights, per KDB Publication 987594 D01, including measurements along all three axes, as per ANSI C63.10.

Spurious Emissions test items refer to section 6.8 and 6.9 of "2210RSU047-U6-FCC 6ID Test Report_Rev01_Part1".

Spurious Emissions test results refer to Annex A - A.8 (Page 161 ~ 205) and Annex A - A.9 (Page 206 ~ 237) of "2210RSU047-U6-FCC 6ID Test Report_Rev01_Part4".

According to ANSI C63.10 - Section 6.3.1: "*Where EUTs are designed to be installed in one of two orientations (such as wireless access points that can be located horizontally on a table or mounted vertically to the wall), these devices shall be tested in both orientations*".

This device is designed to be located horizontally on a table, so only this orientation was tested.

Please refer to "EUT Test Setup Photos" for detailed information.