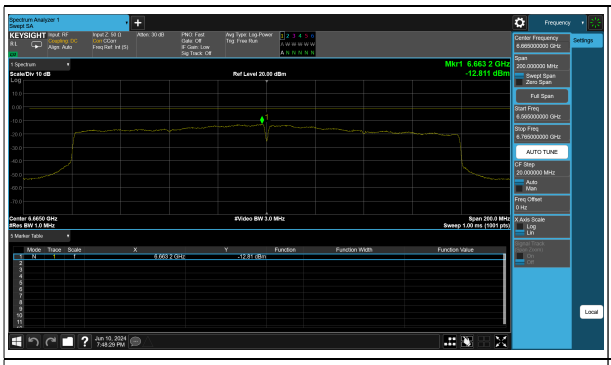
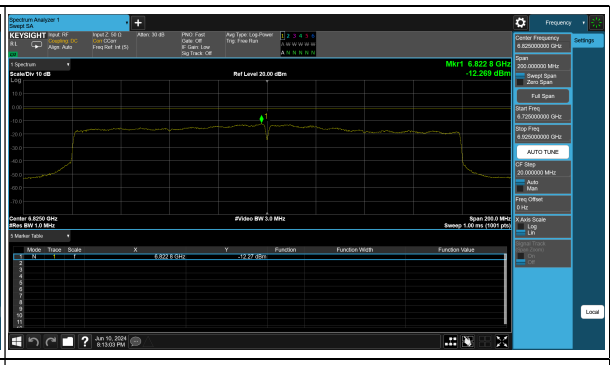
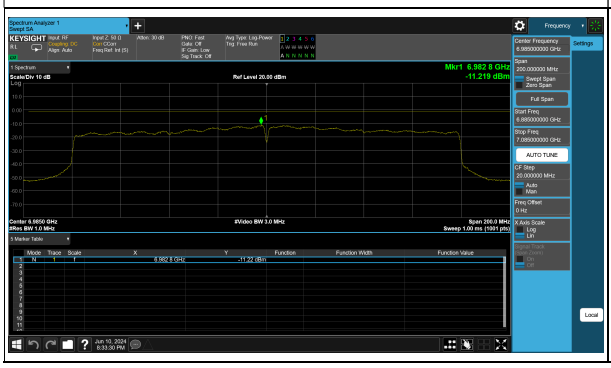

Mkr1 6.663 2 GHz
-12.811 dBm
Ref Level 20.00 dBm
Scale/Div 10 dB
Center 6.6650 GHz
#Res BW 1.0 MHz
#Video BW 3.0 MHz
Span 200.0 MHz
Sweep 1.00 ms (1001 pts)


Mkr1 6.822 8 GHz
-12.269 dBm
Ref Level 20.00 dBm
Scale/Div 10 dB
Center 6.8250 GHz
#Res BW 1.0 MHz
#Video BW 3.0 MHz
Span 200.0 MHz
Sweep 1.00 ms (1001 pts)

CH 207

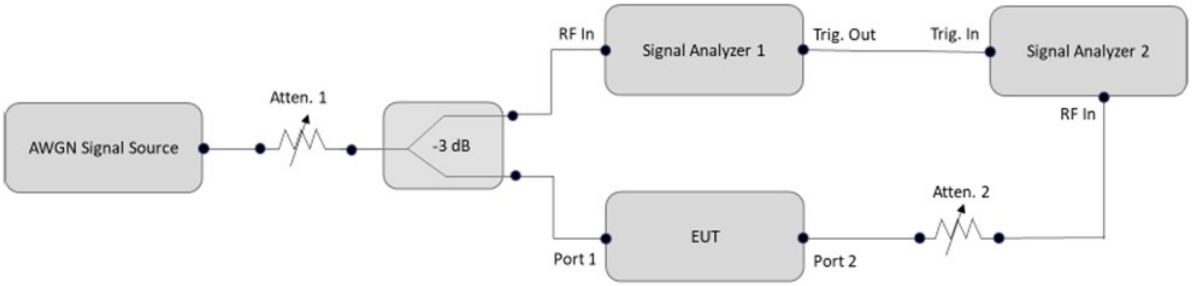

Mkr1 6.982 8 GHz
-11.219 dBm
Ref Level 20.00 dBm
Scale/Div 10 dB
Center 6.9850 GHz
#Res BW 1.0 MHz
#Video BW 3.0 MHz
Span 200.0 MHz
Sweep 1.00 ms (1001 pts)

## 1.6 Contention Based Protocol Measurement

### 1.6.1 Limits of Contention Based Protocol Measurement

Unlicensed indoor low-power devices must detect co-channel radio frequency power that is at least -62 dBm (The threshold is referenced to a 0 dBi antenna gain.) or lower. Additionally, indoor low-power devices must detect co-channel energy with 90% or greater certainty.

### 1.6.2 Test Setup



### 1.6.3 Test Procedure

a. Set the signal analyzer center frequency to the nominal EUT channel center frequency. The span range of the signal analyzer shall be between two times and five times the OBW of the EUT. Connect the output port of the EUT to the signal analyzer 2. Ensure that the attenuator 2 provides enough attenuation to not overload the signal analyzer 2 receiver.
b. Monitoring the signal analyzer 2, verify the EUT is operating and transmitting with the parameters (set as following section 4.7.5 EUT operating condition).
c. Determine number of times detection threshold test as following table,

| If | Number of Tests | Placement of Incumbent Transmission |
|---|---|---|
| $BW_{EUT} \leqq BW_{Inc}$ | Once | Same as EUT transmission |
| $BW_{Inc} < BW_{EUT} \leqq 2xBW_{Inc}$ | Once | Contained within $BW_{EUT}$ |
| $2xBW_{Inc} < BW_{EUT} \leqq 4xBW_{Inc}$ | Twice. (Incumbent transmission is contained within $BW_{EUT}$) | Closely to the lower edge and upper edge of the EUT Channel |
| $BW_{EUT} > 4xBW_{Inc}$ | Three times | Closely to the lower edge ,in the middle and upper edge of the EUT Channel |

d. Using an AWGN signal source, generate (but do not transmit, i.e., RF OFF) a 10 MHz-wide AWGN signal. Use step c table to determine the center frequency of the 10 MHz AWGN signal relative to the EUT's channel bandwidth and center frequency.
e. Set the AWGN signal power to an extremely low level (more than 20 dB below the -62 dBm threshold). Connect the AWGN signal source, via a 3-dB splitter, to the signal analyzer 1 and the EUT.
f. Transmit the AWGN signal (RF ON) and verify its characteristics on the signal analyzer 1.
g. Monitor the signal analyzer 2 to verify if the AWGN signal has been detected and the EUT has ceased transmission. If the EUT continues to transmit, then incrementally increase the AWGN signal power level until the EUT stops transmitting.
h. (Including all losses in the RF paths) Determine and record the AWGN signal power level (at the EUT's antenna port) at which the EUT ceased transmission. Repeat the procedure at least 10 times to verify the EUT can detect an AWGN signal with 90% (or better) level of certainty.
i. Refer to step c table to determine number of times the detection threshold testing needs to be repeated. If testing is required more than once, then go back to step d, choose a different center frequency for the AWGN signal and repeat the process.

### 1.6.4 EUT Operating Condition

Set the EUT to transmit with a constant duty cycle and relative operating parameters which including power level, operating frequency,modulation and bandwidth.

### 1.6.5 Test Results

UNII Band 5:

| Contention Based Protocol Measurement | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Operation Mode | Channel Bandwidth (MHz) | Channel Number | Channel Freq. (MHz) | Injected Signal (AWGN) | | Antenna Gain (dBi) | Path Loss (dB) | Adjusted Power (dBi) | Detection Limit | EUT TX Status |
| | | | | Freq. (MHz) | Power (dBm) | | | | | |
| 802.11ax | 20 | 45 | 6175 | 6175 | -83.00 | -0.82 | 2.5 | -79.68 | -62 | OFF |
| | | | | | -85.00 | -0.82 | 2.5 | -81.68 | -62 | Minimal |
| | | | | | -86.00 | -0.82 | 2.5 | -82.68 | -62 | ON |

Note: Adjusted Power = Injected Signal (AWGN) Power - Antenna Gain + Path Loss

| Contention Based Protocol Detection Probability | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Operation Mode | Channel Bandwidth (MHz) | AWGN Signal Freq. (MHz) | #01 | #02 | #03 | #04 | #05 | #06 | #07 | #08 | #09 | #10 | Detection Probability | Detection Limit | Test Result |
| 802.11ax | 20 | 6175 | v | v | v | v | v | v | v | v | v | v | 100% | 90% | Pass |

UNII Band 6:

| Contention Based Protocol Measurement | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Operation Mode | Channel Bandwidth (MHz) | Channel Number | Channel Freq. (MHz) | Injected Signal (AWGN) | | Antenna Gain (dBi) | Path Loss (dB) | Adjusted Power (dBi) | Detection Limit | EUT TX Status |
| | | | | Freq. (MHz) | Power (dBm) | | | | | |
| 802.11ax | 20 | 105 | 6475 | 6475 | -88.00 | -7.91 | 2.5 | -77.59 | -62 | OFF |
| | | | | | -90.00 | -7.91 | 2.5 | -79.59 | -62 | Minimal |
| | | | | | -91.00 | -7.91 | 2.5 | -80.59 | -62 | ON |

Note: Adjusted Power = Injected Signal (AWGN) Power - Antenna Gain + Path Loss

| Contention Based Protocol Detection Probability | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Operation Mode | Channel Bandwidth (MHz) | AWGN Signal Freq. (MHz) | #01 | #02 | #03 | #04 | #05 | #06 | #07 | #08 | #09 | #10 | Detection Probability | Detection Limit | Test Result |
| 802.11ax | 20 | 6475 | v | v | v | v | v | v | v | v | v | v | 100% | 90% | Pass |

UNII Band 7:

| Contention Based Protocol Measurement | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Operation Mode | Channel Bandwidth (MHz) | Channel Number | Channel Freq. (MHz) | Injected Signal (AWGN) | | Antenna Gain (dBi) | Path Loss (dB) | Adjusted Power (dBi) | Detection Limit | EUT TX Status |
| | | | | Freq. (MHz) | Power (dBm) | | | | | |
| 802.11ax | 20 | 153 | 6715 | 6715 | -79.00 | -5.07 | 2.5 | -71.43 | -62 | OFF |
| | | | | | -86.00 | -5.07 | 2.5 | -78.43 | -62 | Minimal |
| | | | | | -87.00 | -5.07 | 2.5 | -79.43 | -62 | ON |

Note: Adjusted Power = Injected Signal (AWGN) Power - Antenna Gain + Path Loss

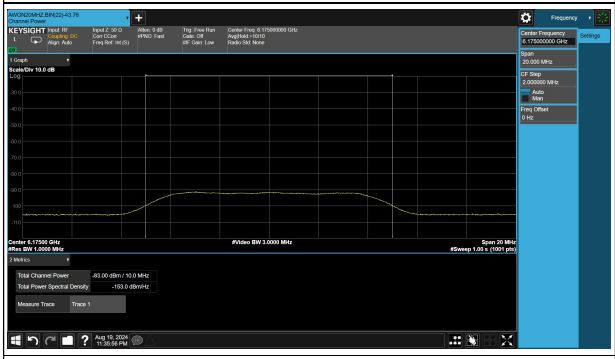
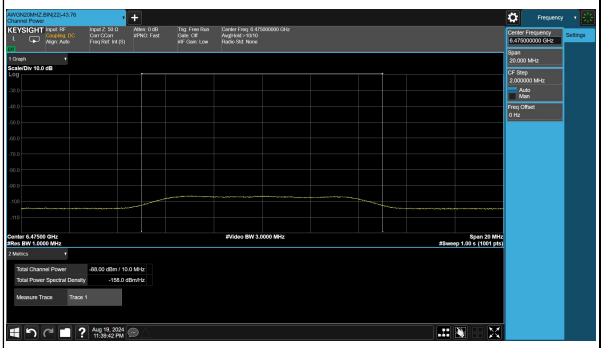
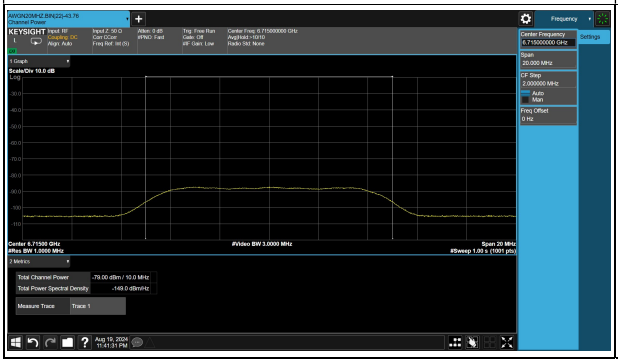
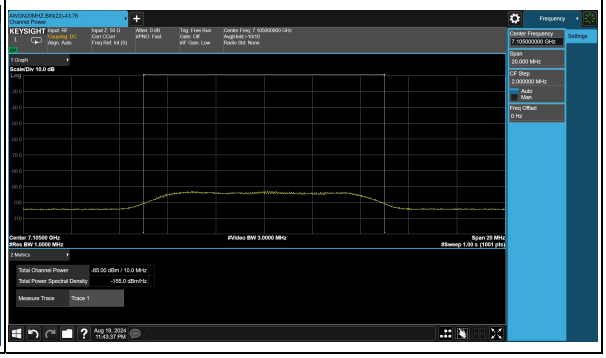
| Contention Based Protocol Detection Probability | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Operation Mode | Channel Bandwidth (MHz) | AWGN Signal Freq. (MHz) | #01 | #02 | #03 | #04 | #05 | #06 | #07 | #08 | #09 | #10 | Detection Probability | Detection Limit | Test Result |
| 802.11ax | 20 | 6695 | v | v | v | v | v | v | v | v | v | v | 100% | 90% | Pass |

UNII Band 8:

| Contention Based Protocol Measurement | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Operation Mode | Channel Bandwidth (MHz) | Channel Number | Channel Freq. (MHz) | Injected Signal (AWGN) | | Antenna Gain (dBi) | Path Loss (dB) | Adjusted Power (dBi) | Detection Limit | EUT TX Status |
| | | | | Freq. (MHz) | Power (dBm) | | | | | |
| 802.11ax | 20 | 213 | 7015 | 7015 | -85.00 | -2.55 | 2.5 | -79.95 | -62 | OFF |
| | | | | | -87.00 | -2.55 | 2.5 | -81.95 | -62 | Minimal |
| | | | | | -88.00 | -2.55 | 2.5 | -82.95 | -62 | ON |

Note: Adjusted Power = Injected Signal (AWGN) Power - Antenna Gain + Path Loss

| Contention Based Protocol Detection Probability | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Operation Mode | Channel Bandwidth (MHz) | AWGN Signal Freq. (MHz) | #01 | #02 | #03 | #04 | #05 | #06 | #07 | #08 | #09 | #10 | Detection Probability | Detection Limit | Test Result |
| 802.11ax | 20 | 6995 | v | v | v | v | v | v | v | v | v | v | 100% | 90% | Pass |

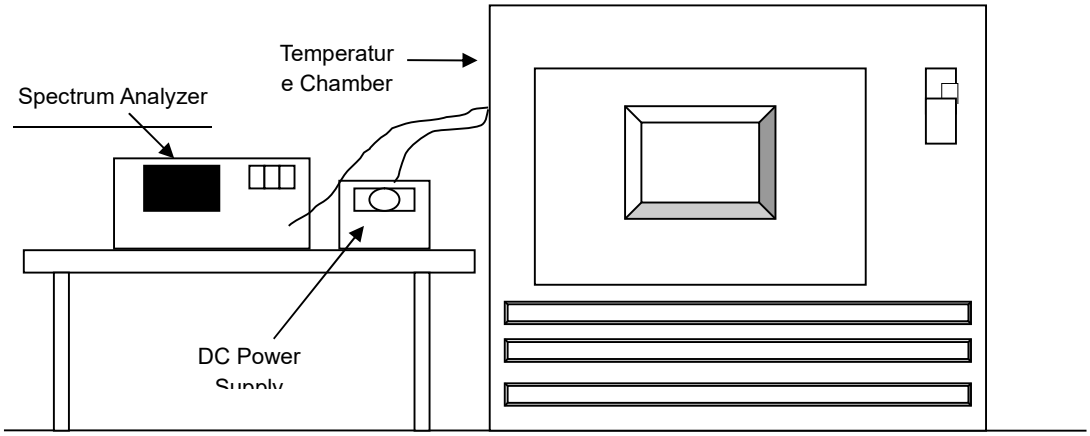
| Plots of Incumbent signal (AWGN) Level | |
|---|---|
| **UNII Band 5 / CH45** | **UNII Band 6 / CH105** |
|  |  |
| **UNII Band 7 / CH153** | **UNII Band 8 / CH213** |
|  |  |

## 1.7 Frequency Stability

### 1.7.1 Limits of Frequency Stability Measurement

The frequency of the carrier signal shall be maintained within band of operation

### 1.7.2 Test Setup




### 1.7.3 Test Procedure

a. The EUT was placed inside the environmental test chamber and powered by nominal DC voltage.

b. Turn the EUT on and couple its output to a spectrum analyzer.

c. Turn the EUT off and set the chamber to the highest temperature specified.

d. Allow sufficient time (approximately 30 min) for the temperature of the chamber to stabilize, turn the EUT on and measure the operating frequency after 2, 5, and 10 minutes.

e. Repeat step d with every 10 degrees reduction until the lowest temperature achieved.

f. The test chamber was allowed to stabilize at +20 degree C for a minimum of 30 minutes. The supply voltage was then adjusted on the EUT from 85% to 115% and the frequency record.