

Test data, continued

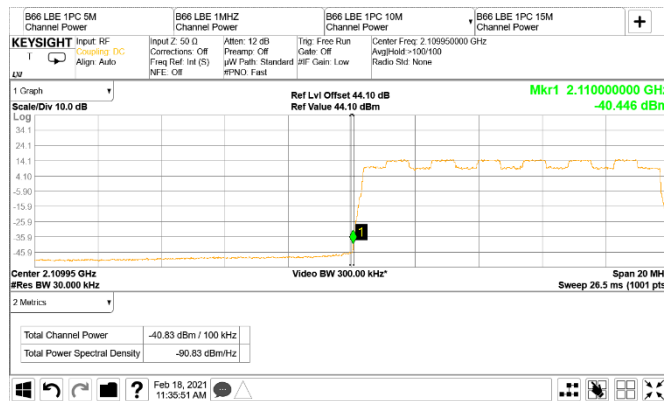


Figure 8.2-53: Conducted band edge emission at 2110 MHz, 10 MHz channel single-carrier operation (RBW = 1% of EBW)

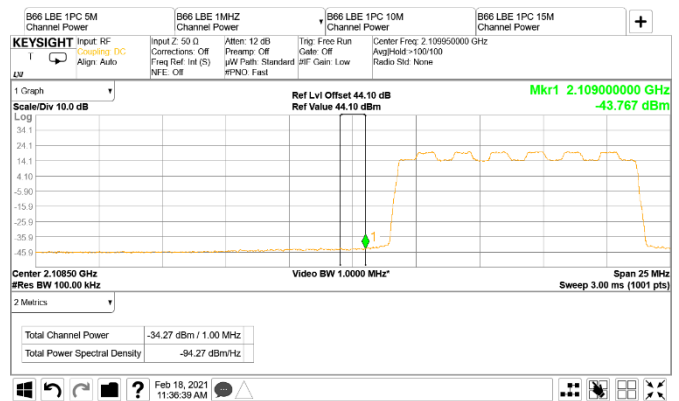


Figure 8.2-54: Conducted band edge emission at 2109 MHz, 10 MHz channel single-carrier operation (RBW = 1 MHz)

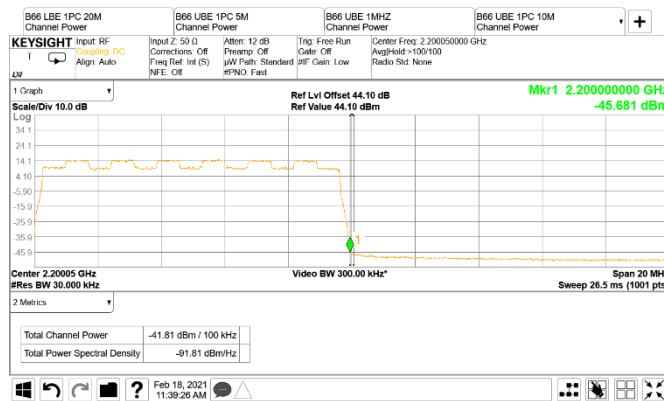


Figure 8.2-55: Conducted band edge emission at 2200 MHz, 10 MHz channel single-carrier operation (RBW = 1% of EBW)

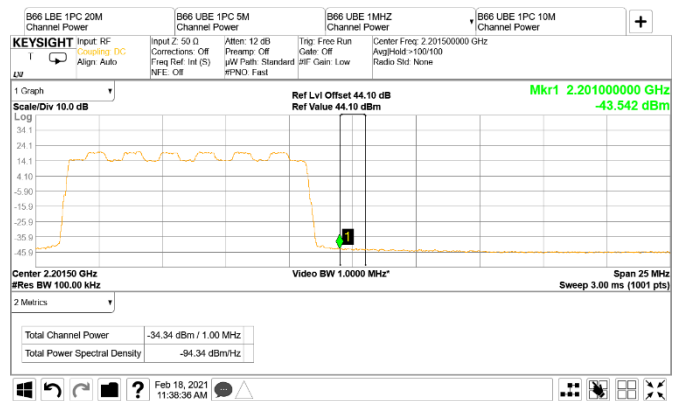


Figure 8.2-56: Conducted band edge emission at 2201 MHz, 10 MHz channel single-carrier operation (RBW = 1 MHz)

Test data, continued

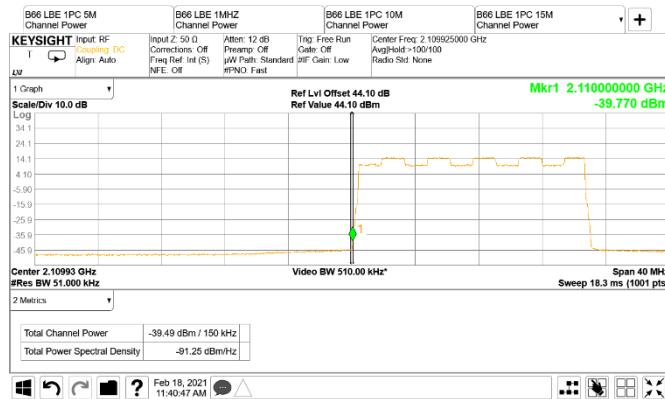


Figure 8.2-57: Conducted band edge emission at 2110 MHz, 15 MHz channel single-carrier operation (RBW = 1% of EBW)

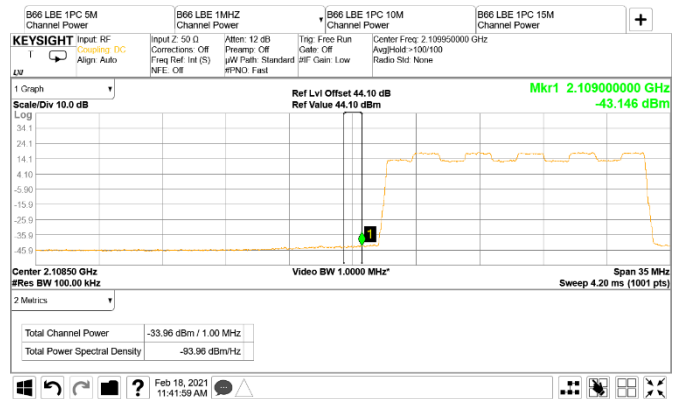


Figure 8.2-58: Conducted band edge emission at 2109 MHz, 15 MHz channel single-carrier operation (RBW = 1 MHz)

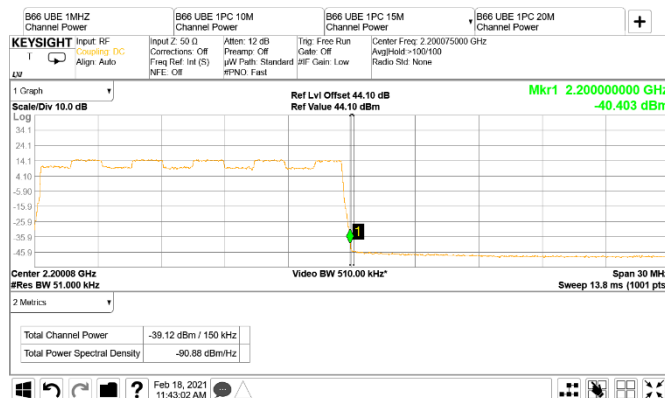


Figure 8.2-59: Conducted band edge emission at 2200 MHz, 15 MHz channel single-carrier operation (RBW = 1% of EBW)

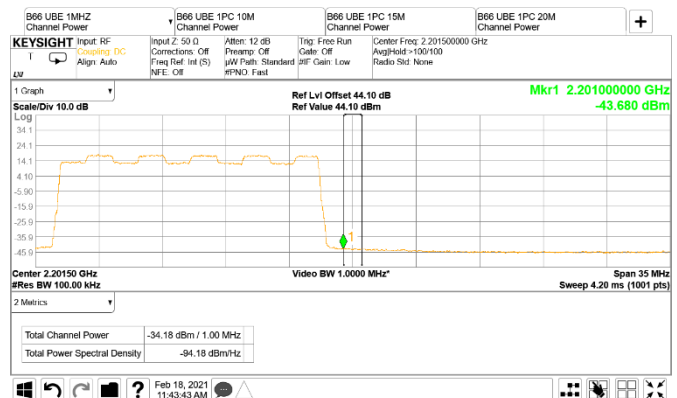


Figure 8.2-60: Conducted band edge emission at 2201 MHz, 15 MHz channel single-carrier operation (RBW = 1 MHz)

Test data, continued

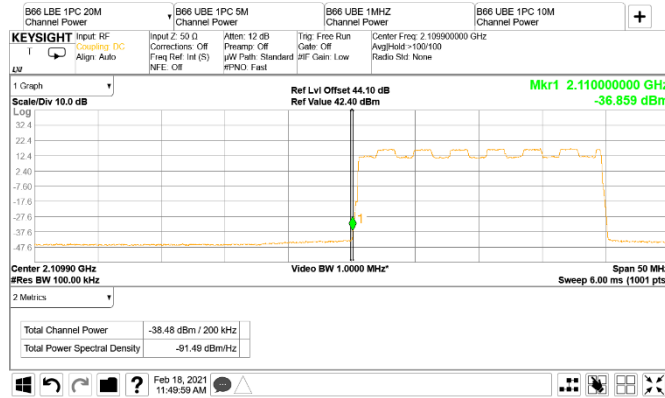


Figure 8.2-61: Conducted band edge emission at 2110 MHz, 20 MHz channel single-carrier operation (RBW = 1% of EBW)

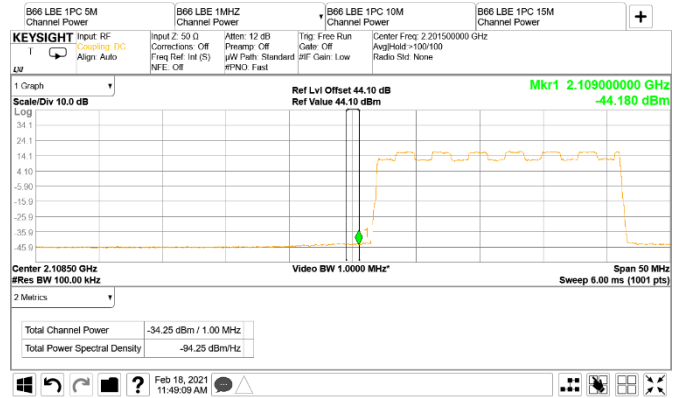


Figure 8.2-62: Conducted band edge emission at 2109 MHz, 20 MHz channel single-carrier operation (RBW = 1 MHz)

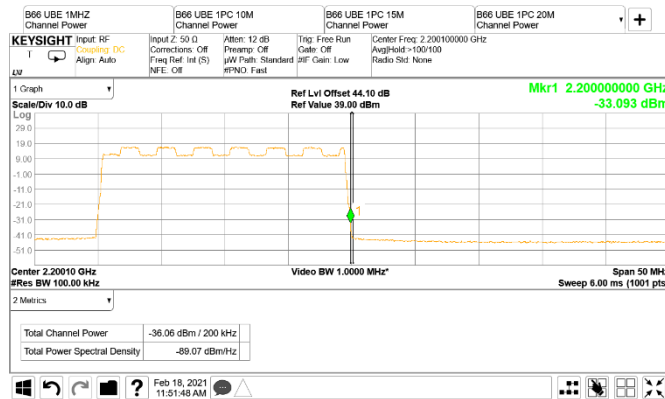


Figure 8.2-63: Conducted band edge emission at 2200 MHz, 20 MHz channel single-carrier operation (RBW = 1% of EBW)

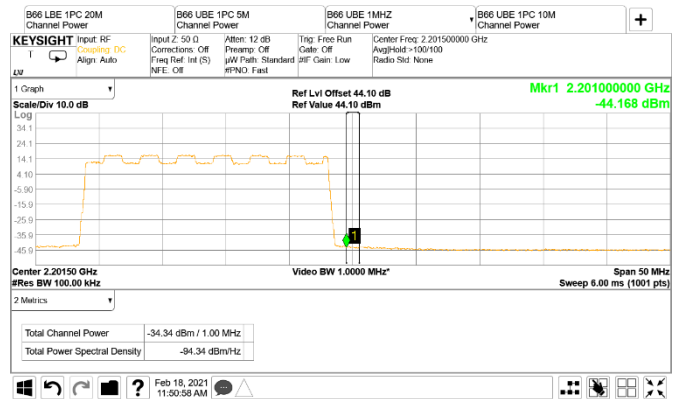


Figure 8.2-64: Conducted band edge emission at 2201 MHz, 20 MHz channel single-carrier operation (RBW = 1 MHz)

Test data, continued

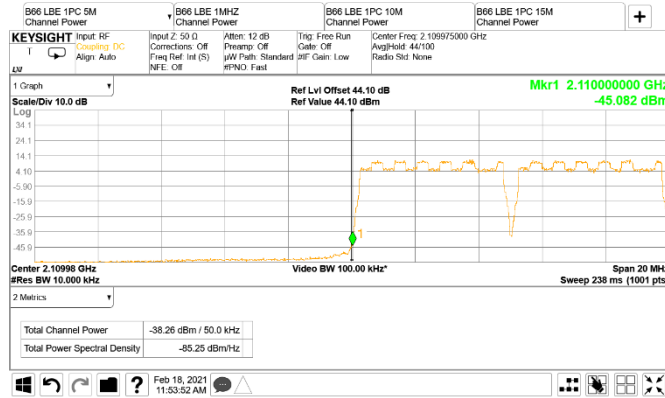


Figure 8.2-65: Conducted band edge emission at 2110 MHz, 5 MHz channel two-carrier operation (RBW = 1% of EBW)

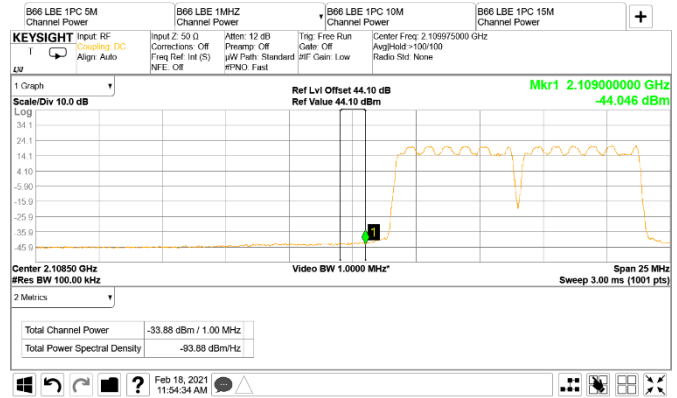


Figure 8.2-66: Conducted band edge emission at 2109 MHz, 5 MHz channel two-carrier operation (RBW = 1 MHz)

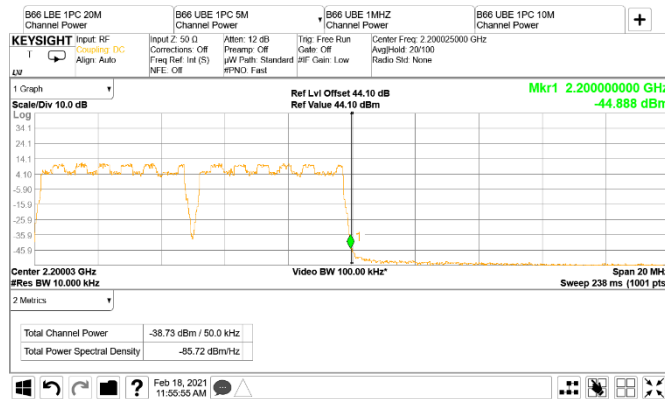


Figure 8.2-67: Conducted band edge emission at 2200 MHz, 5 MHz channel two-carrier operation (RBW = 1% of EBW)

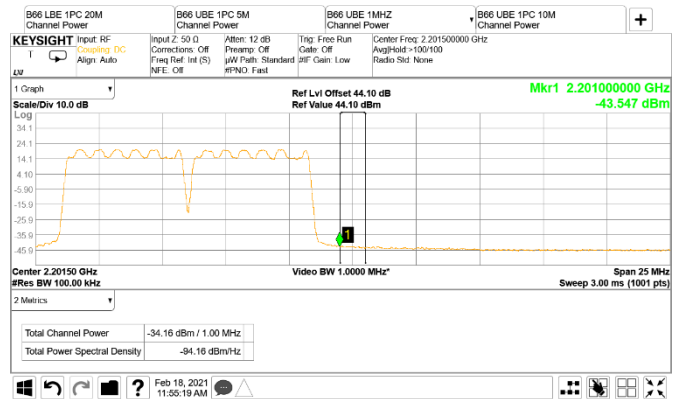
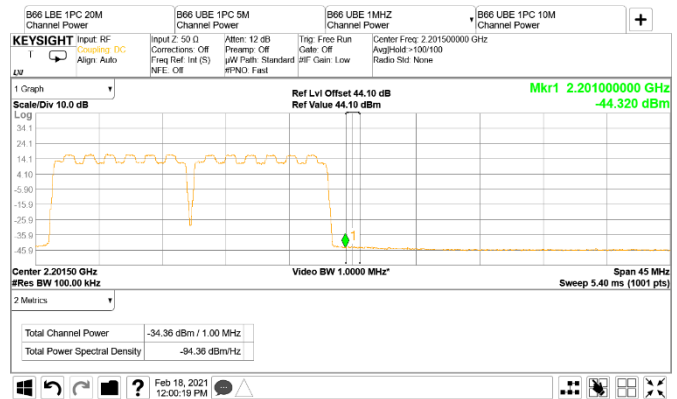
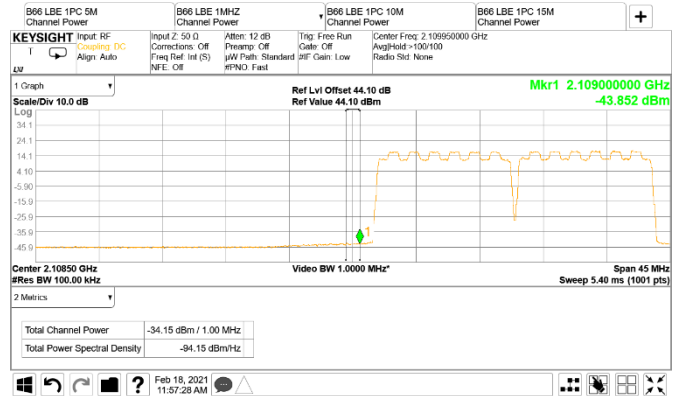
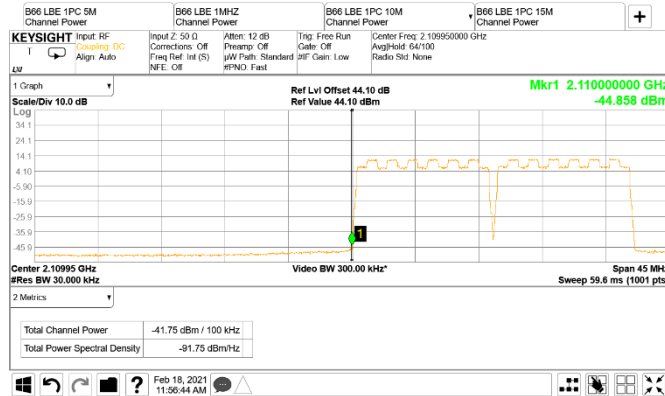


Figure 8.2-68: Conducted band edge emission at 2201 MHz, 5 MHz channel two-carrier operation (RBW = 1 MHz)

Test data, continued



Test data, continued

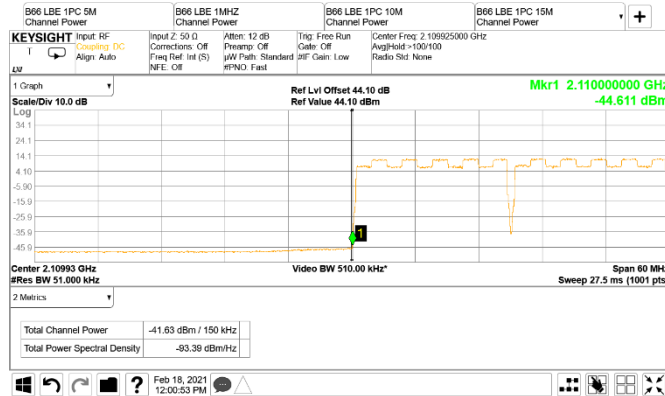


Figure 8.2-73: Conducted band edge emission at 2110 MHz, 15 MHz channel two-carrier operation (RBW = 1% of EBW)

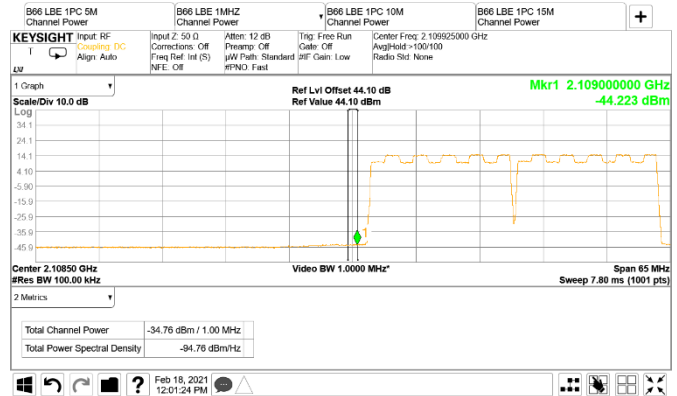


Figure 8.2-74: Conducted band edge emission at 2109 MHz, 15 MHz channel two-carrier operation (RBW = 1 MHz)



Figure 8.2-75: Conducted band edge emission at 2200 MHz, 15 MHz channel two-carrier operation (RBW = 1% of EBW)

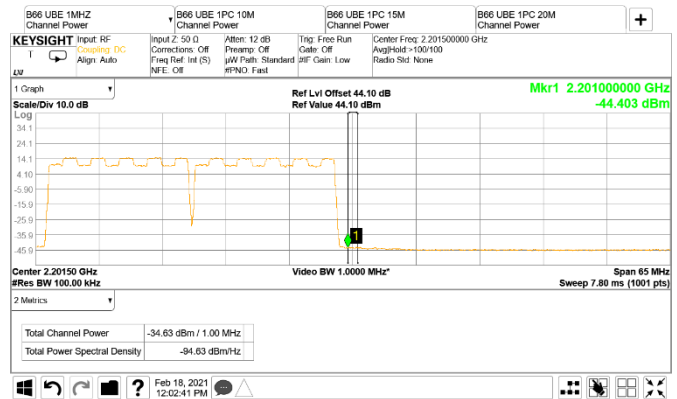
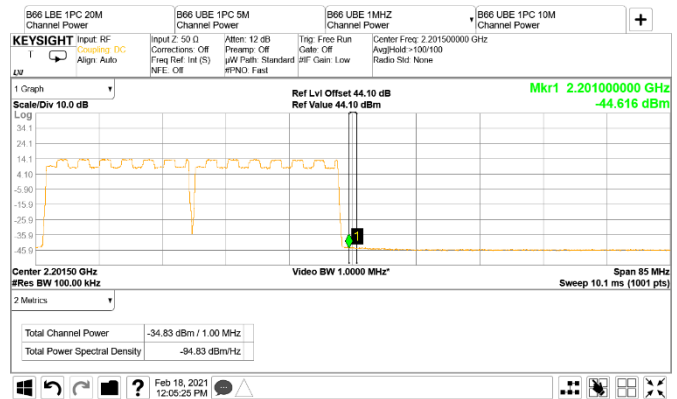
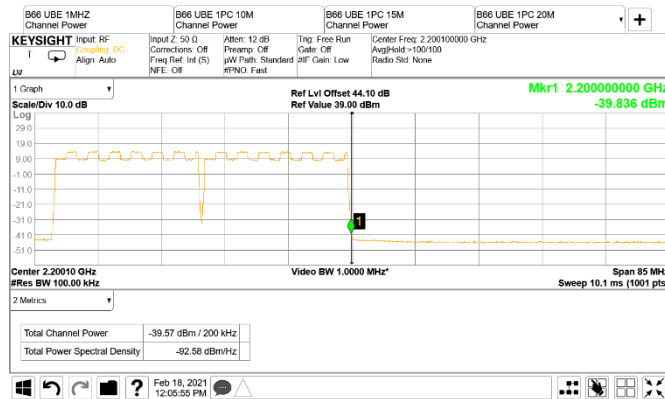
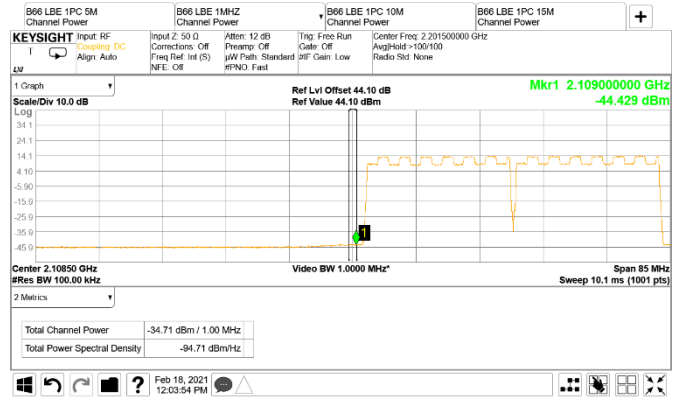
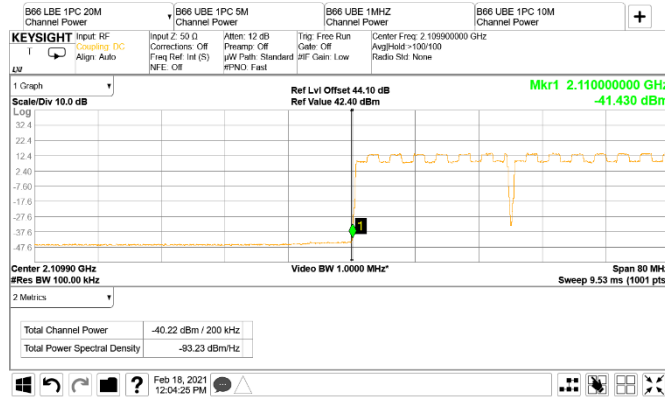


Figure 8.2-76: Conducted band edge emission at 2201 MHz, 15 MHz channel two-carrier operation (RBW = 1 MHz)

Test data, continued



Test data, continued

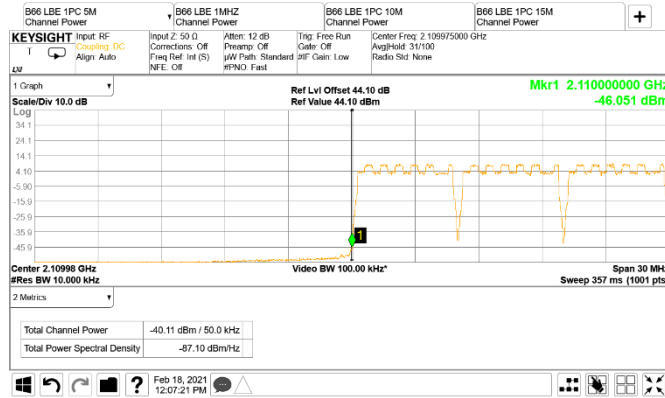


Figure 8.2-81: Conducted band edge emission at 2110 MHz, 5 MHz channel tree-carrier operation (RBW = 1% of EBW)

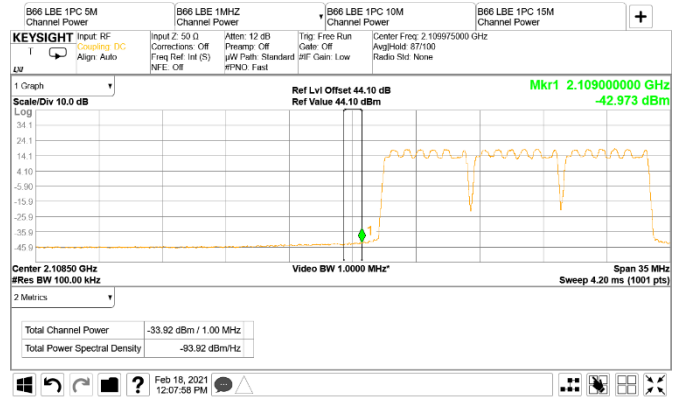


Figure 8.2-82: Conducted band edge emission at 2109 MHz, 5 MHz channel tree-carrier operation (RBW = 1 MHz)

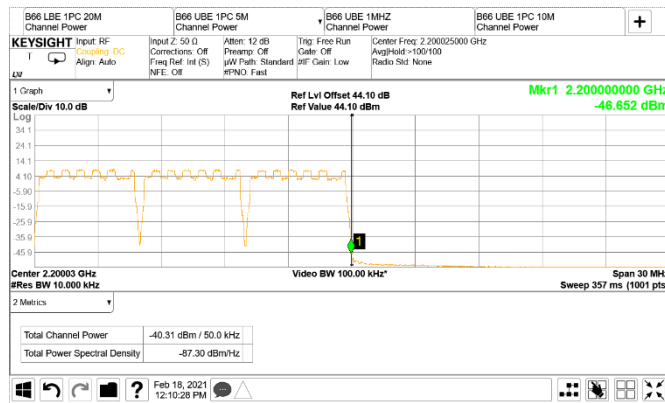


Figure 8.2-83: Conducted band edge emission at 2200 MHz, 5 MHz channel tree-carrier operation (RBW = 1% of EBW)

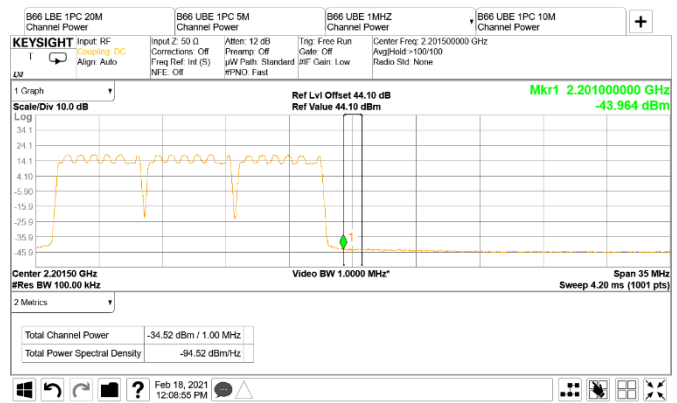


Figure 8.2-84: Conducted band edge emission at 2201 MHz, 5 MHz channel tree-carrier operation (RBW = 1 MHz)

Test data, continued

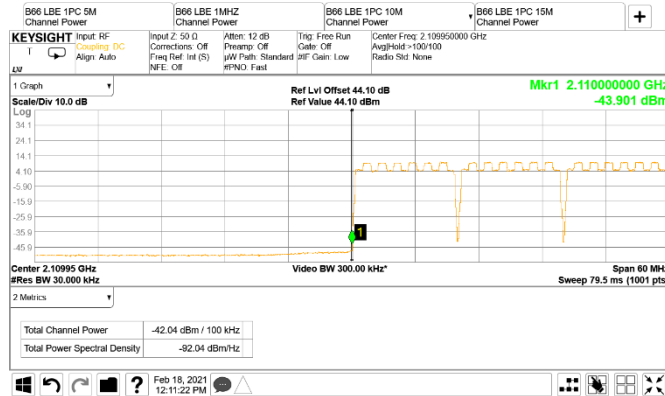


Figure 8.2-85: Conducted band edge emission at 2110 MHz, 10 MHz channel tree-carrier operation (RBW = 1% of EBW)

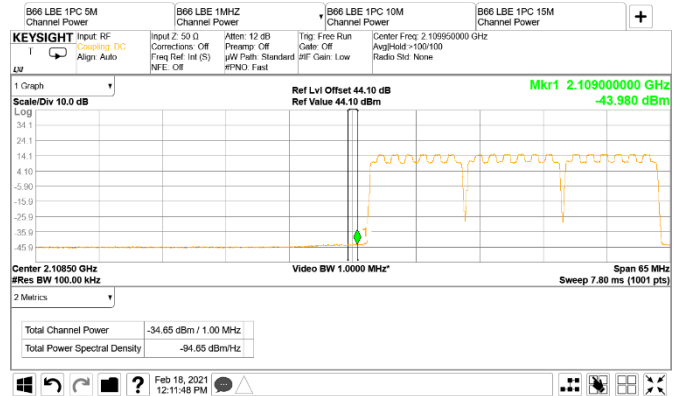


Figure 8.2-86: Conducted band edge emission at 2109 MHz, 10 MHz channel tree-carrier operation (RBW = 1 MHz)

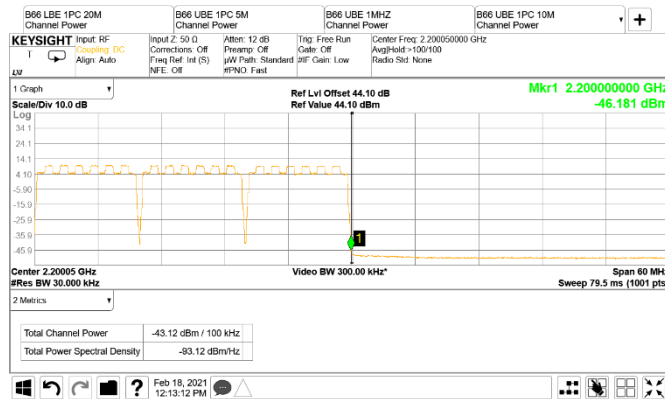


Figure 8.2-87: Conducted band edge emission at 2200 MHz, 10 MHz channel tree-carrier operation (RBW = 1% of EBW)

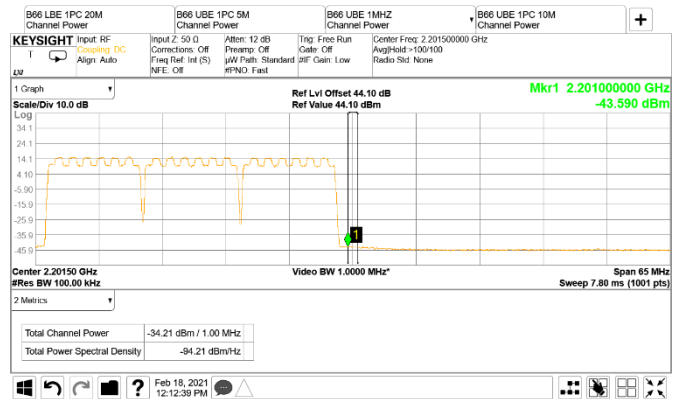


Figure 8.2-88: Conducted band edge emission at 2201 MHz, 10 MHz channel tree-carrier operation (RBW = 1 MHz)

Test data, continued

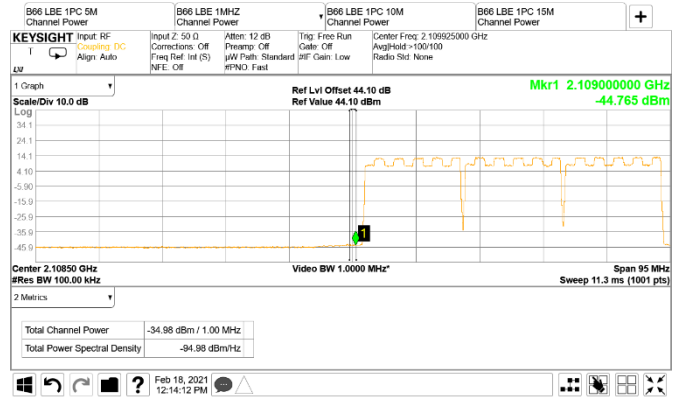
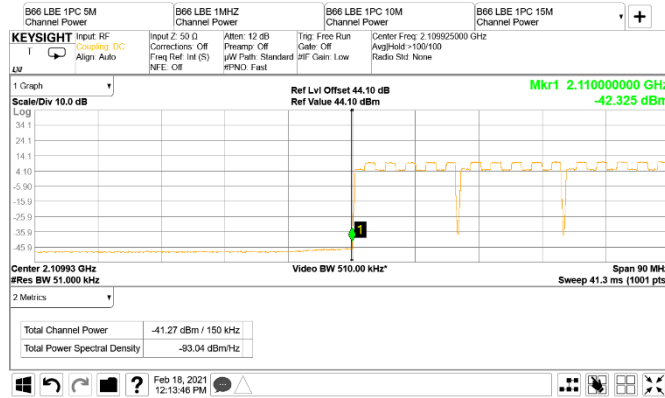


Figure 8.2-89: Conducted band edge emission at 2110 MHz, 15 MHz channel tree-carrier operation (RBW = 1% of EBW)

Figure 8.2-90: Conducted band edge emission at 2109 MHz, 15 MHz channel tree-carrier operation (RBW = 1 MHz)

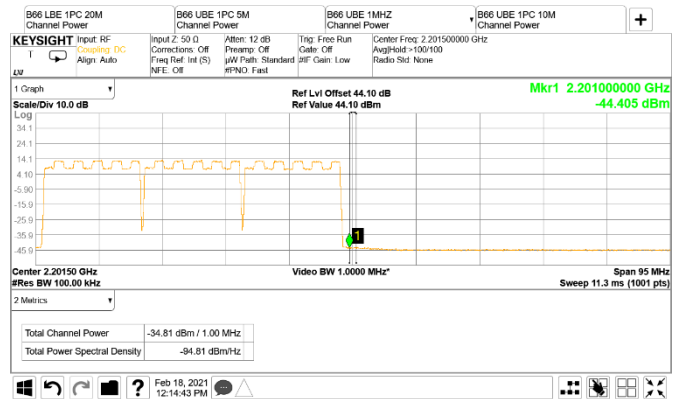
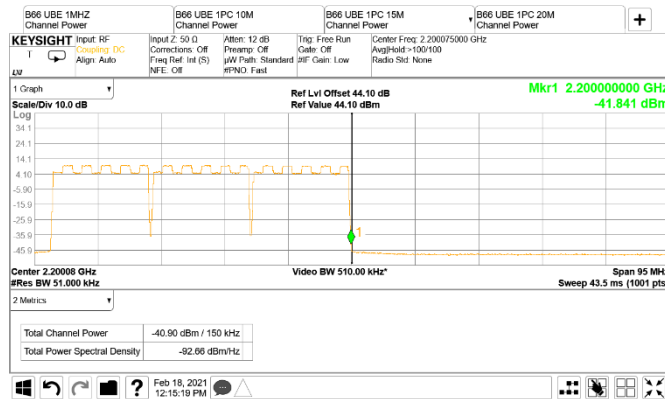
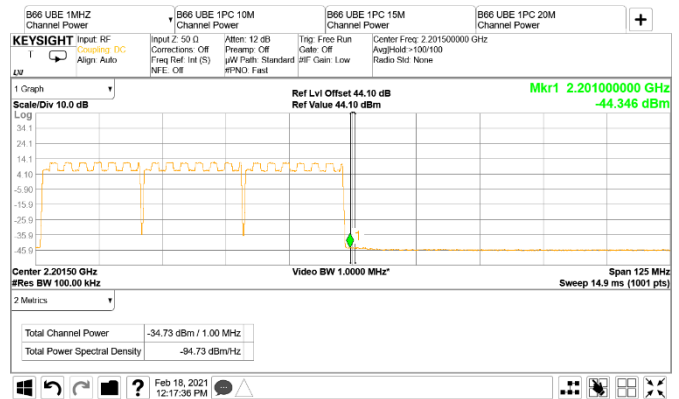
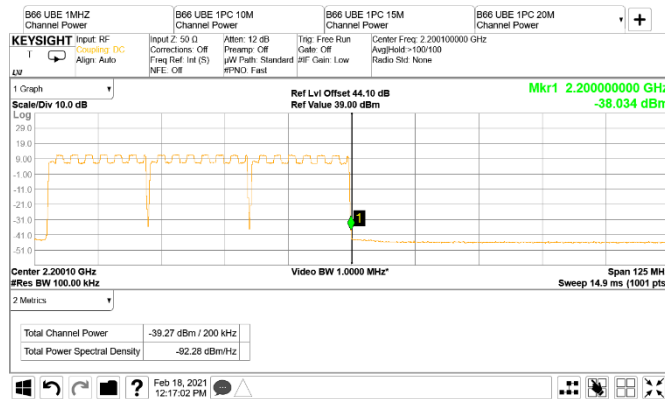
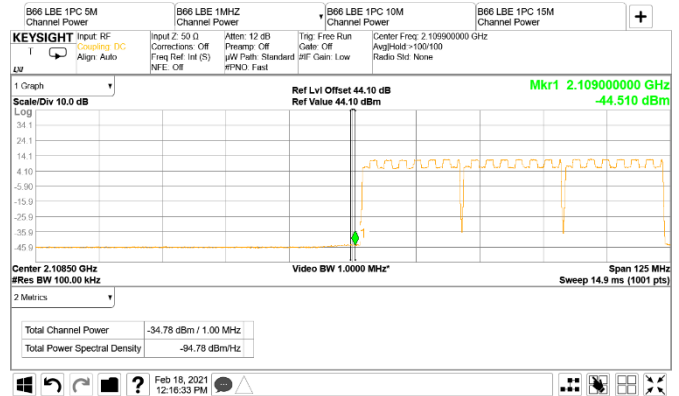


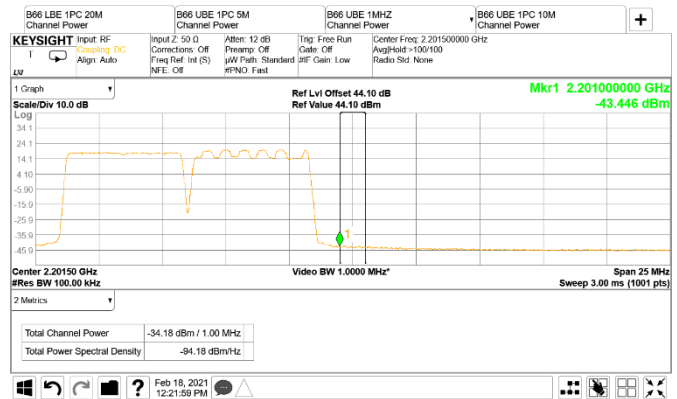
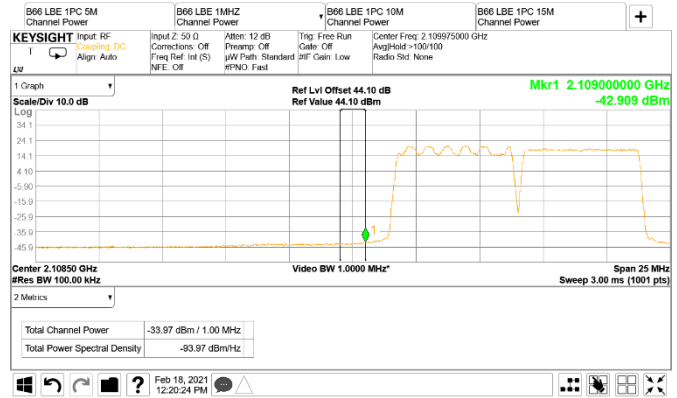
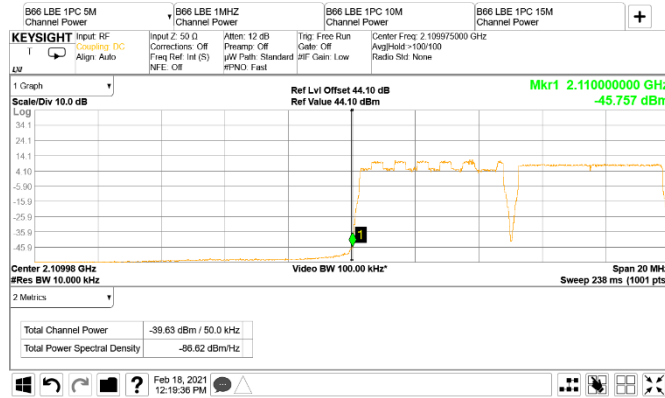
Figure 8.2-91: Conducted band edge emission at 2200 MHz, 15 MHz channel tree-carrier operation (RBW = 1% of EBW)

Figure 8.2-92: Conducted band edge emission at 2201 MHz, 15 MHz channel tree-carrier operation (RBW = 1 MHz)

Test data, continued



Test data, continued



Test data, continued

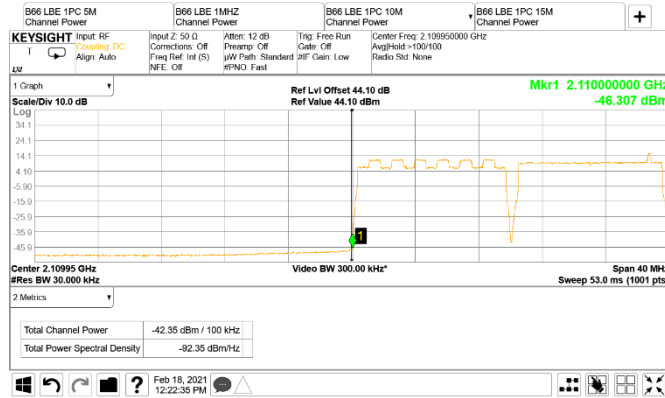


Figure 8.2-101: Conducted band edge emission at 2110 MHz, 10 MHz channel two-carrier LTE + NR operation (RBW = 1% of EBW)

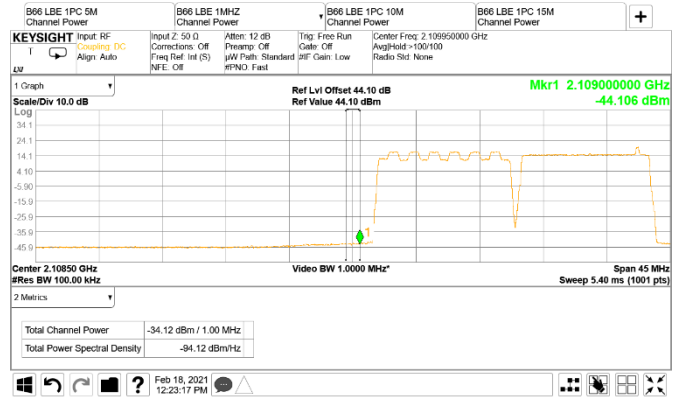


Figure 8.2-102: Conducted band edge emission at 2109 MHz, 10 MHz channel two-carrier LTE + NR operation (RBW = 1 MHz)

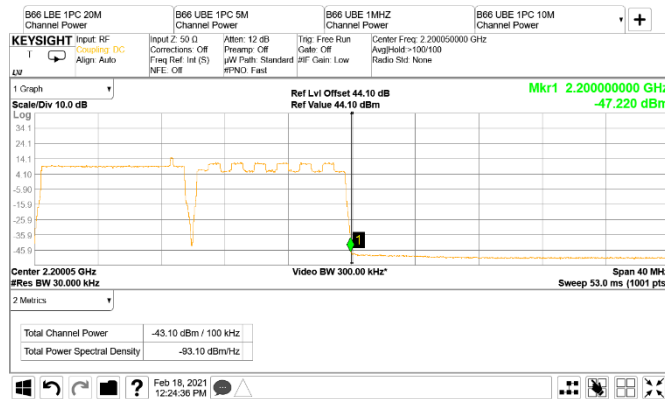


Figure 8.2-103: Conducted band edge emission at 2200 MHz, 10 MHz channel two-carrier LTE + NR operation (RBW = 1% of EBW)

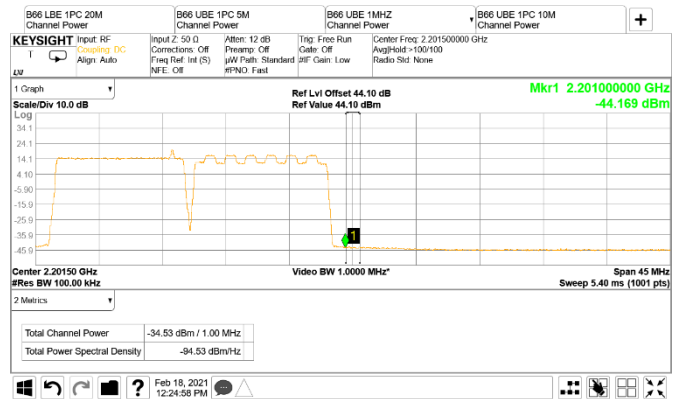


Figure 8.2-104: Conducted band edge emission at 2201 MHz, 10 MHz channel two-carrier LTE + NR operation (RBW = 1 MHz)

Test data, continued

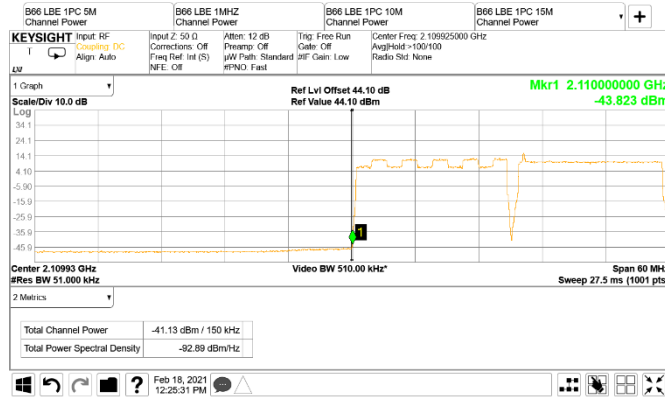


Figure 8.2-105: Conducted band edge emission at 2110 MHz, 15 MHz channel two-carrier LTE + NR operation (RBW = 1% of EBW)

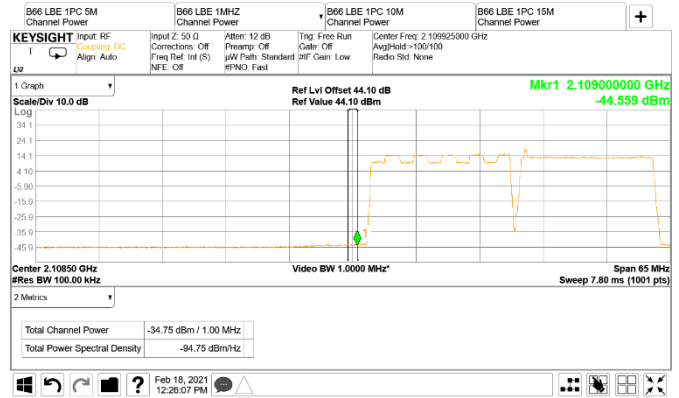


Figure 8.2-106: Conducted band edge emission at 2109 MHz, 15 MHz channel two-carrier LTE + NR operation (RBW = 1 MHz)

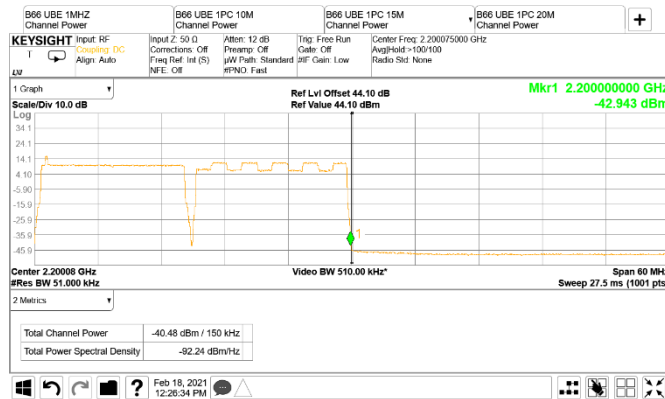


Figure 8.2-107: Conducted band edge emission at 2200 MHz, 15 MHz channel two-carrier LTE + NR operation (RBW = 1% of EBW)

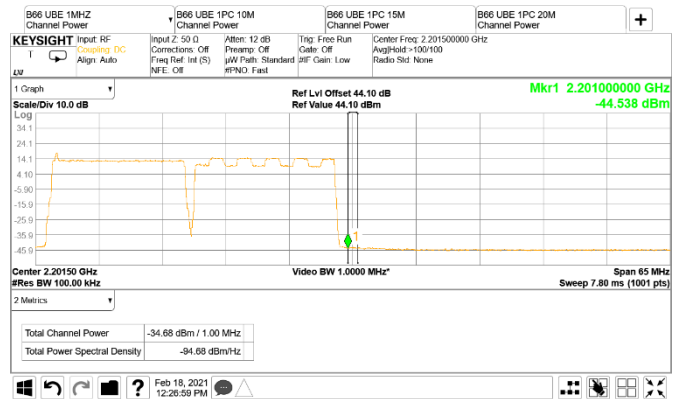


Figure 8.2-108: Conducted band edge emission at 2201 MHz, 15 MHz channel two-carrier LTE + NR operation (RBW = 1 MHz)

Test data, continued

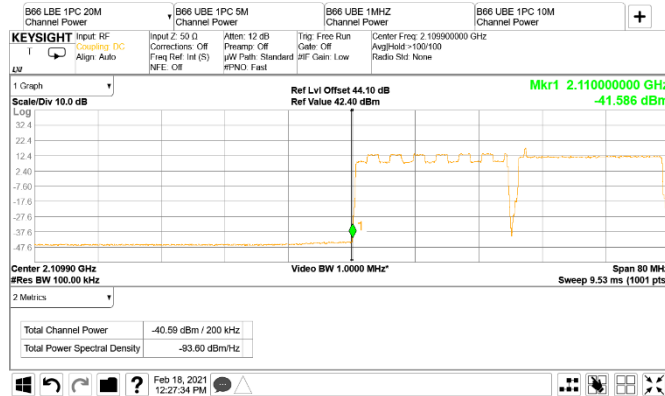


Figure 8.2-109: Conducted band edge emission at 2110 MHz, 20 MHz channel two-carrier LTE + NR operation (RBW = 1% of EBW)

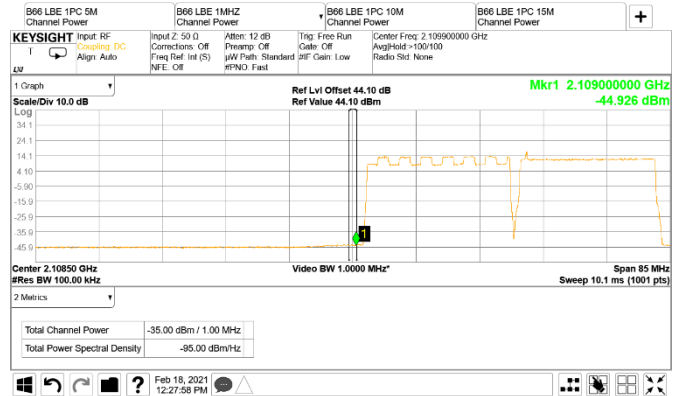


Figure 8.2-110: Conducted band edge emission at 2109 MHz, 20 MHz channel two-carrier LTE + NR operation (RBW = 1 MHz)

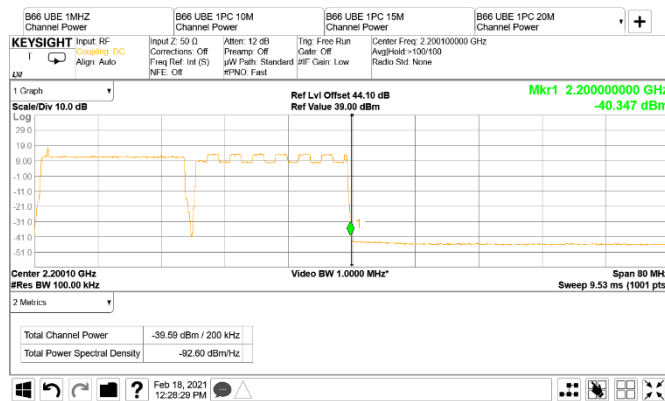


Figure 8.2-111: Conducted band edge emission at 2200 MHz, 20 MHz channel two-carrier LTE + NR operation (RBW = 1% of EBW)

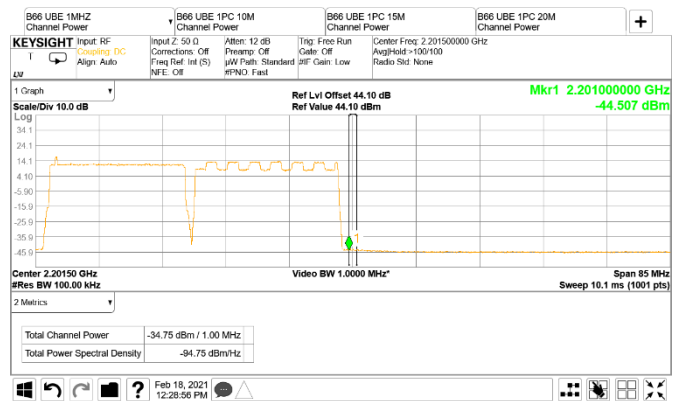


Figure 8.2-112: Conducted band edge emission at 2201 MHz, 20 MHz channel two-carrier LTE + NR operation (RBW = 1 MHz)

8.3 Radiated spurious emissions

8.3.1 Definitions and limits

FCC §27.53:

(h) AWS emission limits

(1) General protection levels. Except as otherwise specified below, for operations in the 1695–1710 MHz, 1710–1755 MHz, 1755–1780 MHz, 1915–1920 MHz, 1995–2000 MHz, 2000–2020 MHz, 2110–2155 MHz, 2155–2180 MHz, and 2180–2200 bands, the power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) in watts by at least $43 + 10 \log_{10}(P)$ dB.

(3) Measurement procedure.

(i) Compliance with this provision is based on the use of measurement instrumentation employing a resolution bandwidth of 1 megahertz or greater. However, in the 1-megahertz bands immediately outside and adjacent to the licensee's frequency block, a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.

(ii) When measuring the emission limits, the nominal carrier frequency shall be adjusted as close to the licensee's frequency block edges, both upper and lower, as the design permits.

(iii) The measurements of emission power can be expressed in peak or average values, provided they are expressed in the same parameters as the transmitter power.

RSS-139, Section 6.6:

i. In the first 1.0 MHz bands immediately outside and adjacent to the equipment's smallest operating frequency block, which can contain the equipment's occupied bandwidth, the emission power per any 1% of the emission bandwidth shall be attenuated below the transmitter output power P (in dBW) by at least $43 + 10 \log_{10} p$ (watts) dB.

ii. After the first 1.0 MHz outside the equipment's smallest operating frequency block, which can contain the equipment's occupied bandwidth, the emission power in any 1 MHz bandwidth shall be attenuated below the transmitter output power P (in dBW) by at least $43 + 10 \log_{10} p$ (watts) dB.

RSS-170, Section 5.4:

The transmitter unwanted emissions shall be measured for all channel bandwidths with the carrier frequency set at both the highest and lowest channels in which the equipment is designed to operate.

The e.i.r.p. density of unwanted and carrier-off state emissions outlined in this section (Section 5.4) shall be averaged over any 2-ms active transmission using an RMS detector with a resolution bandwidth of 1 MHz for broadband emissions and a resolution bandwidth of 1 kHz for discrete emissions, unless stated otherwise.

For ATC equipment operating in the bands 2000-2020 MHz and 2180-2200 MHz, the unwanted emission limits shall be determined using a measurement bandwidth of 1 MHz or greater. However, in the 1 MHz band immediately outside and adjacent to the equipment's operating frequency block, a resolution bandwidth of at least 1% of the occupied bandwidth may be employed.

5.4.1.2 ATC Base Station Equipment operating in bands 2000-2020 MHz and 2180-2200 MHz

he unwanted emissions of ATC base station equipment transmitting in the bands 2000–2020 MHz and 2180–2200 MHz shall comply with the following:

(1) The power of any unwanted emissions at frequencies outside the equipment's operating frequency block shall be attenuated below the transmitter power P (dBW), by $43 + 10 \log p$ (watts), dB.

(2) *For equipment operating in the band 2180–2200 MHz, in addition to (1), the power of any emissions on all frequencies between 2200 MHz and 2290 MHz shall not exceed an e.i.r.p. of -100.6 dBW/4 kHz (-70.6 dBm/4 kHz).

*** This requirement is for implementation and is enforced at the time of licensing. Therefore, results are not included in this report.**

8.3.2 Test summary

Test date	January 27, 2021
Test engineer	Andrey Adelberg

8.3.3 Observations, settings and special notes

- The spectrum was searched from 30 MHz to the 10th harmonic per ANSI C63.26 Paragraph 5.5.3.2 method.
- RBW within 30–1000 MHz was 100 kHz and 1 MHz above 1 GHz. VBW was wider than RBW.
- Testing was performed with RF ports terminated with 50 Ohm load.

8.3.4 Test data

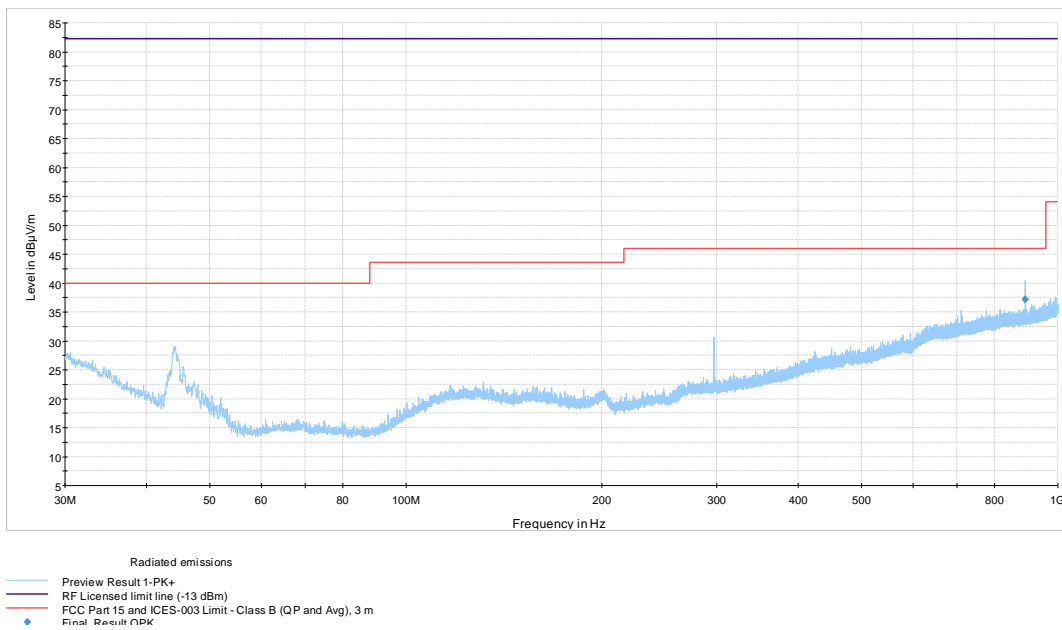
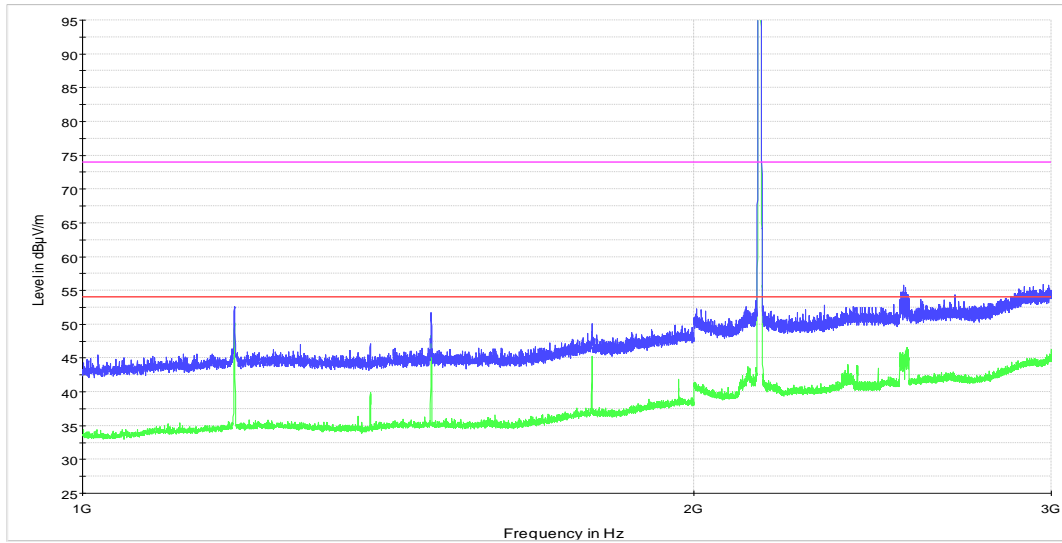


Figure 8.3-1: Radiated spurious emissions within 30–1000 MHz

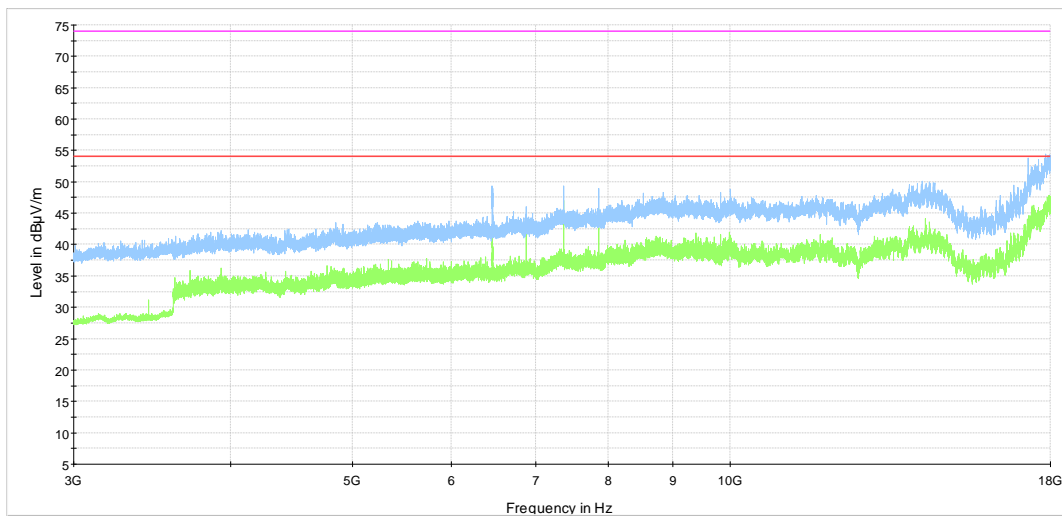
Test data, continued



Radiated Emissions

- AVG .MAXH
- PK+ .MAXH
- FCC Part 15 and ICES-003 Limit - Class B (QP and Avg), 3 m
- FCC Part 15 and ICES-003 Limit - Class B (PK) above 1GHz, 3 m

Figure 8.3-2: Radiated spurious emissions within 1–3 GHz



Radiated Emissions_1 to 18 GHz

- Preview Result2-AVG
- Preview Result1-PK+
- FCC Part 15 and ICES-003 Limit - Class B (QP and Avg), 3 m
- FCC Part 15 and ICES-003 Limit - Class B (PK) above 1GHz, 3 m

Figure 8.3-3: Radiated spurious emissions within 3–18 GHz

Test data, continued

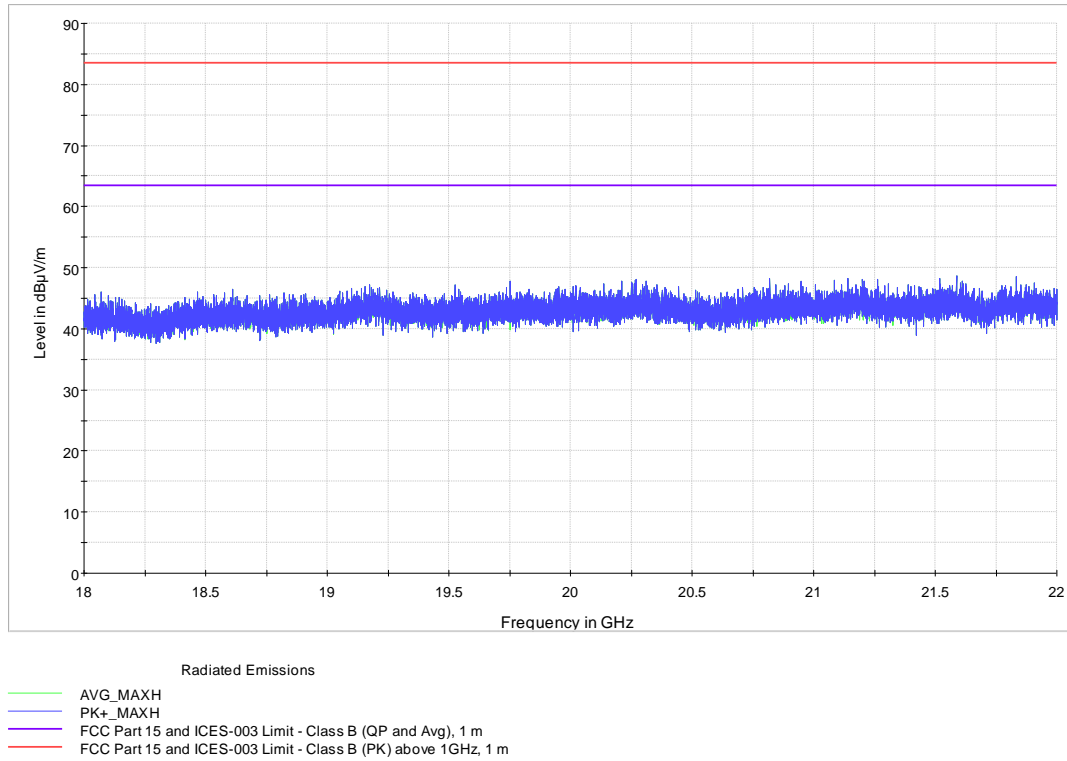


Figure 8.3-4: Radiated spurious emissions within 18–22 GHz

8.4 Occupied bandwidth

8.4.1 Definitions and limits

FCC §2.1049:

The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.

RSS-Gen, 6.7

The occupied bandwidth or the “99% emission bandwidth” is defined as the frequency range between two points, one above and the other below the carrier frequency, within which 99% of the total transmitted power of the fundamental transmitted emission is contained. The occupied bandwidth shall be reported for all equipment in addition to the specified bandwidth required in the applicable RSSs.

8.4.2 Test summary

Test date	February 17, 2021
Test engineer	Andrey Adelberg

8.4.3 Observations, settings and special notes

Testing was performed per ANSI C63.26 Paragraphs 5.4.3 and 5.4.4 methods.

Spectrum analyzer settings:

Detector mode	Peak
Resolution bandwidth	≥1 % of EBW
Video bandwidth	RBW × 3
Trace mode	Max Hold

8.4.4 Test data

Table 8.4-1: Occupied bandwidth results for 5 MHz channel

Remarks	Frequency, MHz	26 dB BW, MHz	99% OBW, MHz
QPSK, 5 MHz, Low channel	2112.5	4.805	4.4887
16QAM, 5 MHz, Low channel	2112.5	4.777	4.4771
64QAM, 5 MHz, Low channel	2112.5	4.787	4.4812
256QAM, 5 MHz, Low channel	2112.5	4.758	4.4869
QPSK, 5 MHz, Mid channel	2155.0	4.760	4.4771
QPSK, 5 MHz, High channel	2197.5	4.757	4.4825

Table 8.4-2: Occupied bandwidth results for 10 MHz channel

Remarks	Frequency, MHz	26 dB BW, MHz	99% OBW, MHz
QPSK, 10 MHz, Low channel	2115.0	9.741	9.2924
16QAM, 10 MHz, Low channel	2115.0	9.688	9.2010
64QAM, 10 MHz, Low channel	2115.0	9.730	9.3061
256QAM, 10 MHz, Low channel	2115.0	9.729	9.2819
QPSK, 10 MHz, Mid channel	2155.0	9.687	9.1813
QPSK, 10 MHz, High channel	2195.0	9.670	9.1845

Test data, continued

Table 8.4-3: Occupied bandwidth results for 15 MHz channel

Remarks	Frequency, MHz	26 dB BW, MHz	99% OBW, MHz
QPSK, 15 MHz, Low channel	2117.5	14.90	14.155
16QAM, 15 MHz, Low channel	2117.5	14.87	14.077
64QAM, 15 MHz, Low channel	2117.5	14.91	14.155
256QAM, 15 MHz, Low channel	2117.5	14.93	14.134
16QAM, 15 MHz, Mid channel	2155.0	14.87	14.108
16QAM, 15 MHz, High channel	2192.5	14.86	14.077

Table 8.4-4: Occupied bandwidth results for 20 MHz channel

Remarks	Frequency, MHz	26 dB BW, MHz	99% OBW, MHz
QPSK, 20 MHz, Low channel	2120.0	19.78	18.904
16QAM, 20 MHz, Low channel	2120.0	19.75	18.846
64QAM, 20 MHz, Low channel	2120.0	19.78	18.922
256QAM, 20 MHz, Low channel	2120.0	19.77	18.918
QPSK, 20 MHz, Mid channel	2155.0	19.73	18.871
QPSK, 20 MHz, High channel	2190.0	19.74	18.893

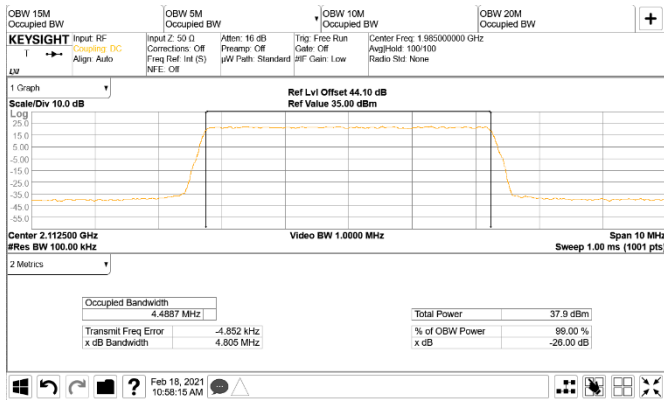


Figure 8.4-1: 99% Occupied bandwidth and 26 dB bandwidth sample plot for 5 MHz channel

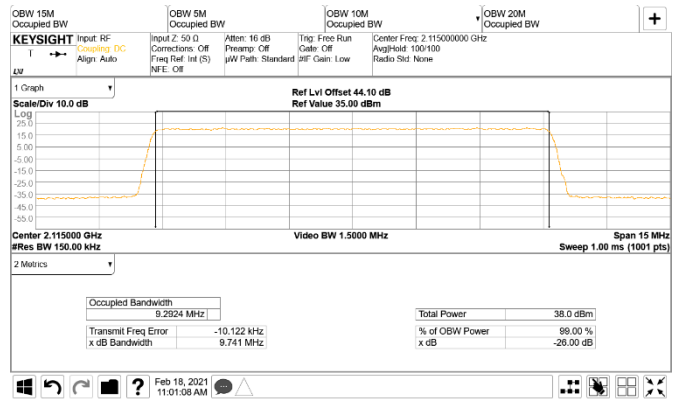


Figure 8.4-2: 99% Occupied bandwidth and 26 dB bandwidth sample plot for 10 MHz channel

Test data, continued

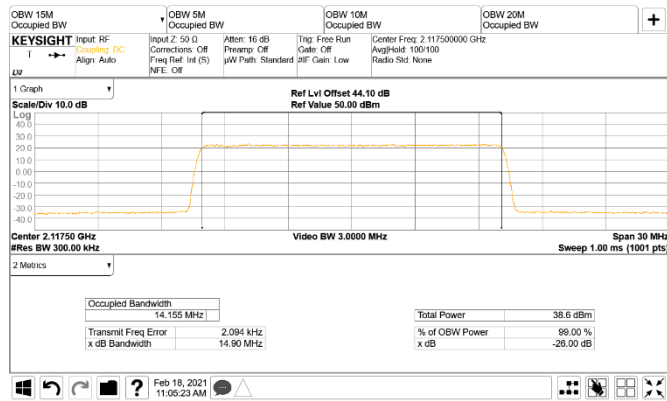


Figure 8.4-3: 99% Occupied bandwidth and 26 dB bandwidth sample plot for 15 MHz channel

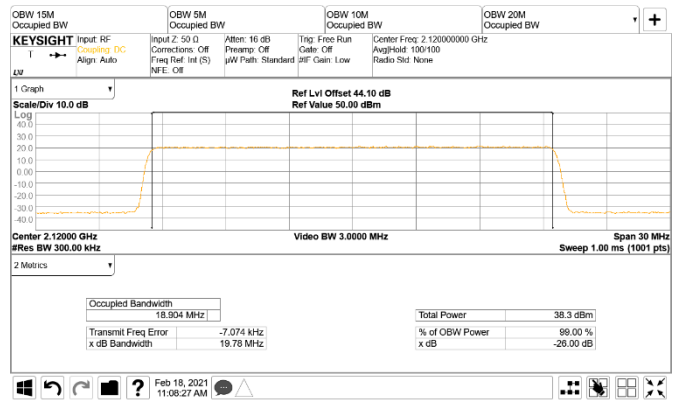
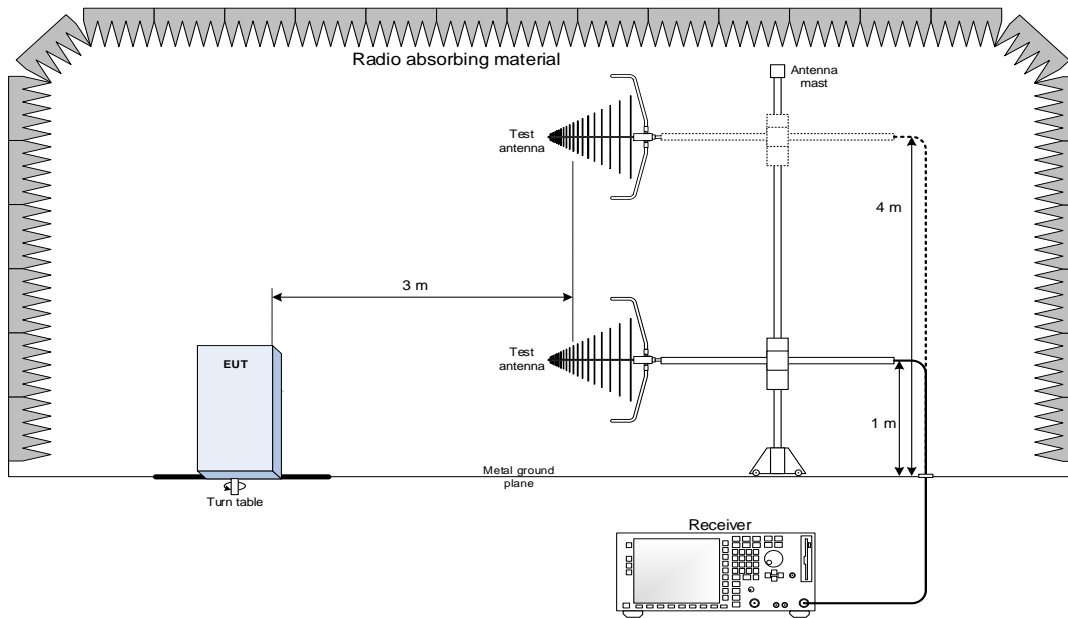


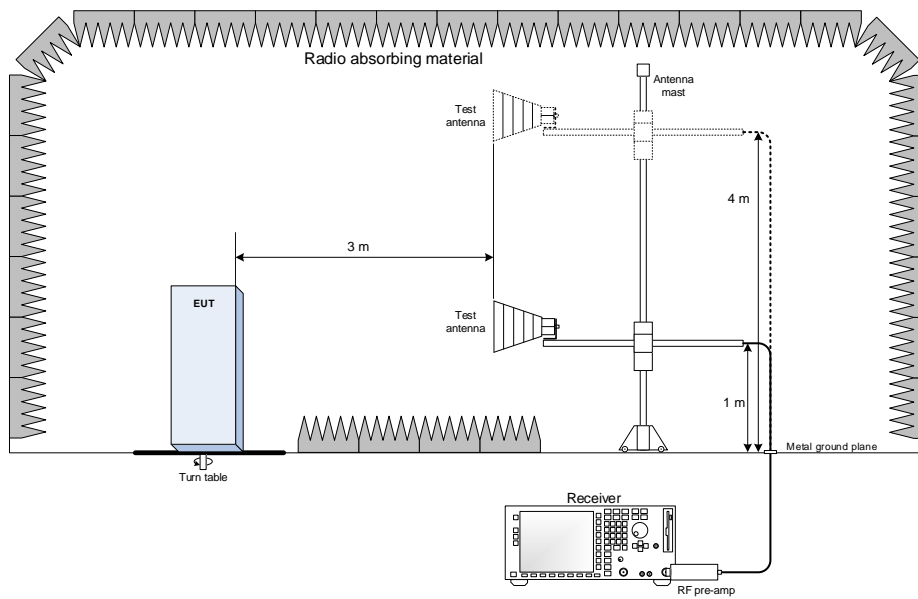
Figure 8.4-4: 99% Occupied bandwidth and 26 dB bandwidth sample plot for 20 MHz channel

Section 9. Block diagrams of test setups

9.1 Radiated emissions set-up for frequencies below 1 GHz



9.2 Radiated emissions set-up for frequencies above 1 GHz



9.3 Conducted emissions set-up

