

Figure 8.4-45: Conducted spurious emissions within at Port A, QPSK, three-channel operation, configuration 2

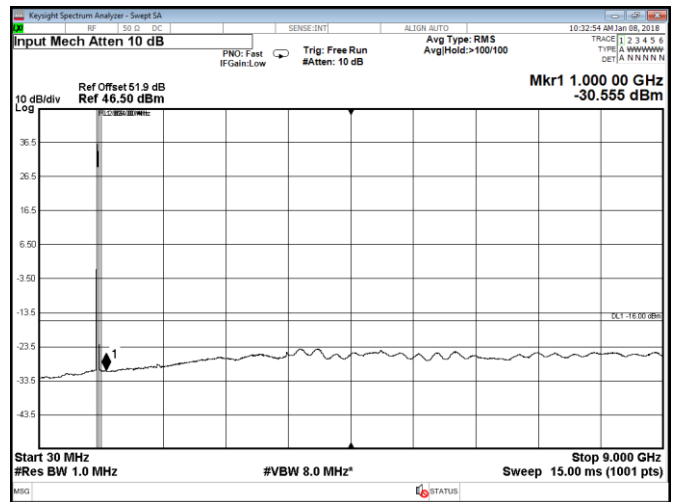


Figure 8.4-46: Conducted spurious emissions within at Port D, QPSK, three-channel operation, configuration 2

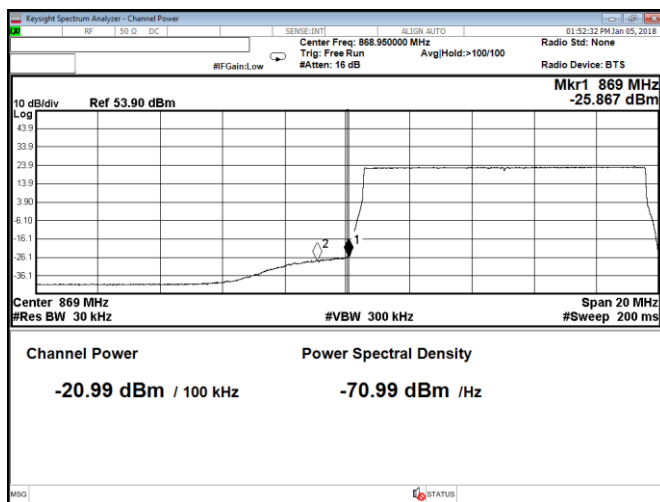


Figure 8.4-47: Conducted band edge emission at 869 MHz, Port A, QPSK, low channel, configuration 2

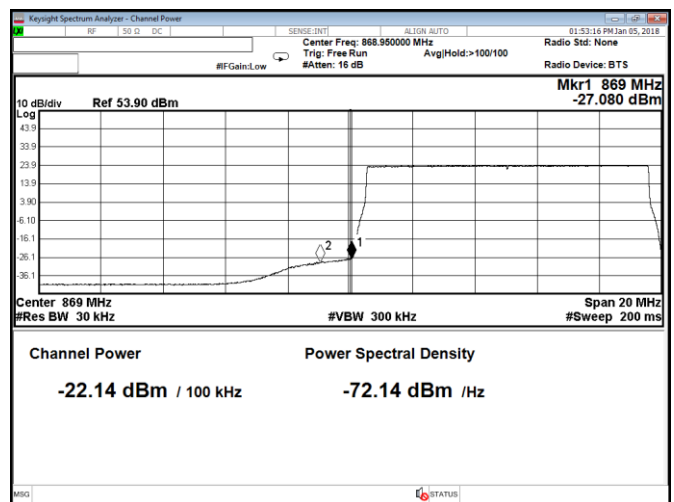


Figure 8.4-48: Conducted band edge emission at 869 MHz, Port D, QPSK, low channel, configuration 2

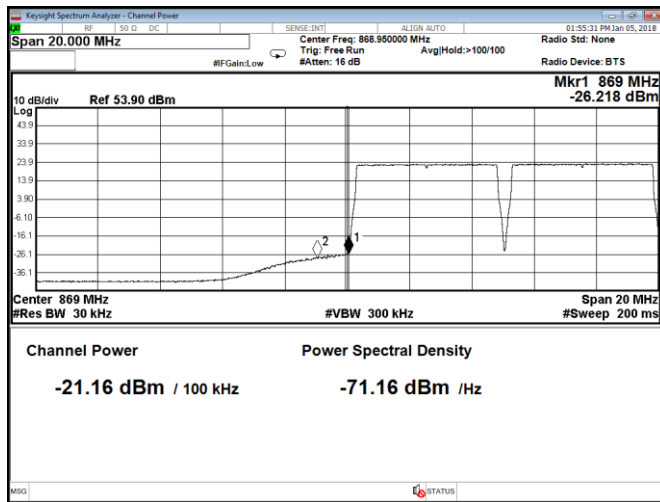


Figure 8.4-49: Conducted band edge emission at 869 MHz, Port A, QPSK, two-channel operation, configuration 2

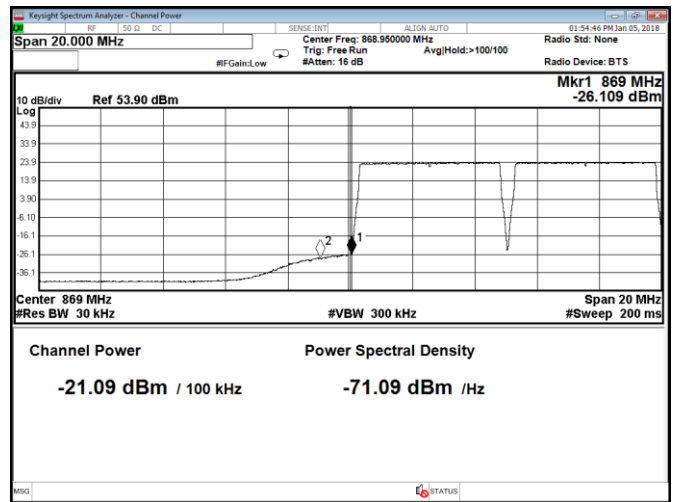


Figure 8.4-50: Conducted band edge emission at 869 MHz, Port D, QPSK, two-channel operation, configuration 2

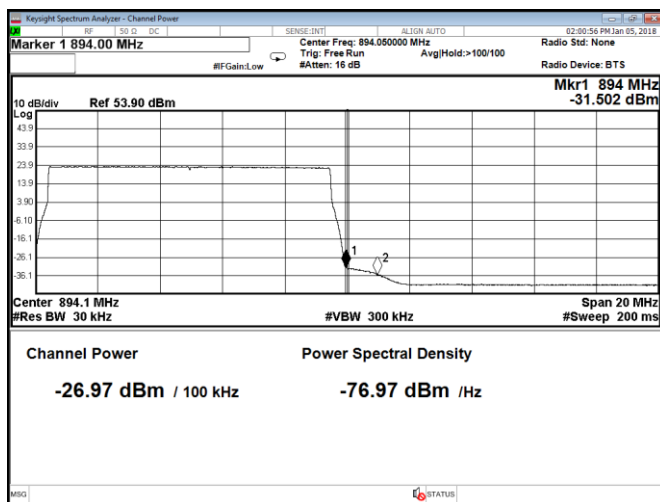


Figure 8.4-51: Conducted band edge emission at 894 MHz, Port A, QPSK, high channel, configuration 2

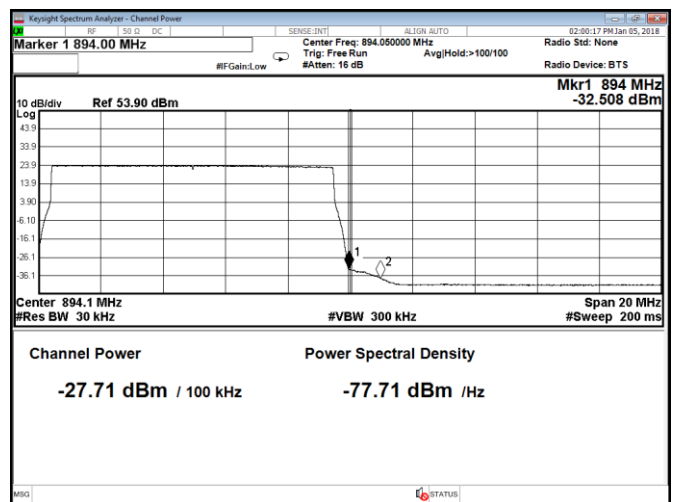


Figure 8.4-52: Conducted band edge emission at 894 MHz, Port D, QPSK, high channel, configuration 2

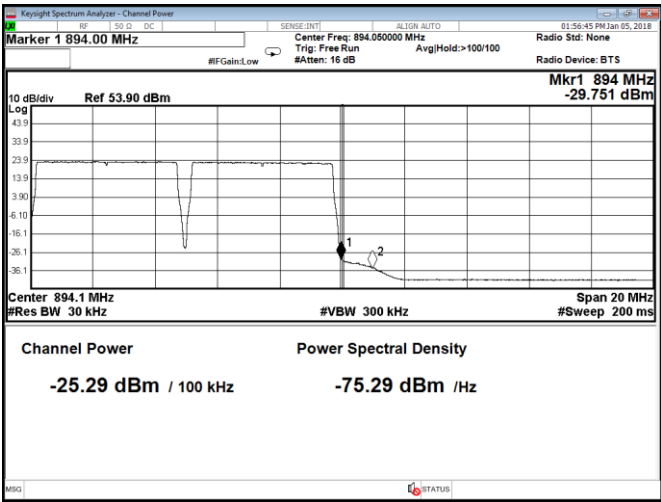


Figure 8.4-53: Conducted band edge emission at 894 MHz, Port A, QPSK, two-channel operation, configuration 2

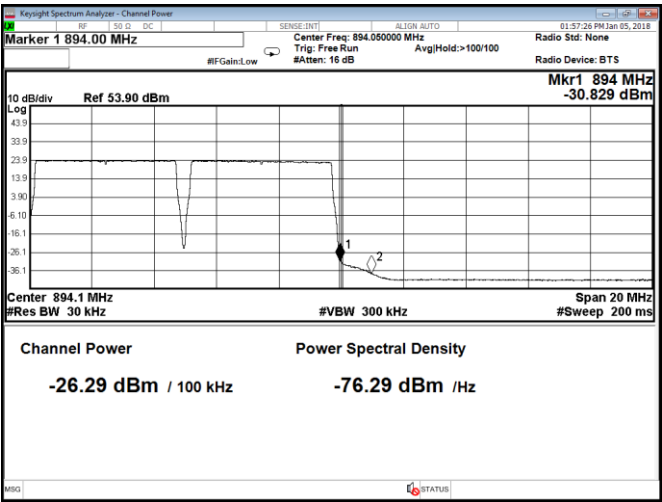


Figure 8.4-54: Conducted band edge emission at 894 MHz, Port D, QPSK, two-channel operation, configuration 2

## 8.5 FCC 27.53 and 22.917(a) Radiated spurious emissions

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### 8.5.1 Definitions and limits

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#### FCC 27.53

(c) For operations in the 746–758 MHz band and the 776–788 MHz band, the power of any emission outside the licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, in accordance with the following:

(1) On any frequency outside the 746–758 MHz band, the power of any emission shall be attenuated outside the band below the transmitter power (P) by at least  $43 + 10 \log(P)$  dB;

(2) On any frequency outside the 776–788 MHz band, the power of any emission shall be attenuated outside the band below the transmitter power (P) by at least  $43 + 10 \log(P)$  dB;

(f) For operations in the 746–758 MHz, 775–788 MHz, and 805–806 MHz bands, emissions in the band 1559–1610 MHz shall be limited to –70 dBW/MHz equivalent isotropically radiated power (EIRP) for wideband signals, and –80 dBW EIRP for discrete emissions of less than 700 Hz bandwidth. For the purpose of equipment authorization, a transmitter shall be tested with an antenna that is representative of the type that will be used with the equipment in normal operation.

#### FCC 22.917(a)

(a) Out of band emissions. The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least  $43 + 10 \log(P)$  dB.

(b) Measurement procedure. Compliance with these rules is based on the use of measurement instrumentation employing a reference bandwidth as follows:

(1) In the spectrum below 1 GHz, instrumentation should employ a reference bandwidth of 100 kHz or greater. In the 1 MHz bands immediately outside and adjacent to the frequency block, a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. A narrower resolution bandwidth is permitted in all cases to improve measurement accuracy, provided that the measured power is integrated over the full required reference bandwidth (i.e., 100 kHz or 1 percent of emission bandwidth, as specified). 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.

(2) In the spectrum above 1 GHz, instrumentation should employ a reference bandwidth of 1 MHz.

(c) Alternative out of band emission limit. Licensees in this service may establish an alternative out of band emission limit to be used at specified band edge(s) in specified geographical areas, in lieu of that set forth in this section, pursuant to a private contractual arrangement of all affected licensees and applicants. In this event, each party to such contract shall maintain a copy of the contract in their station files and disclose it to prospective assignees or transferees and, upon request, to the FCC.

### 8.5.2 Test summary

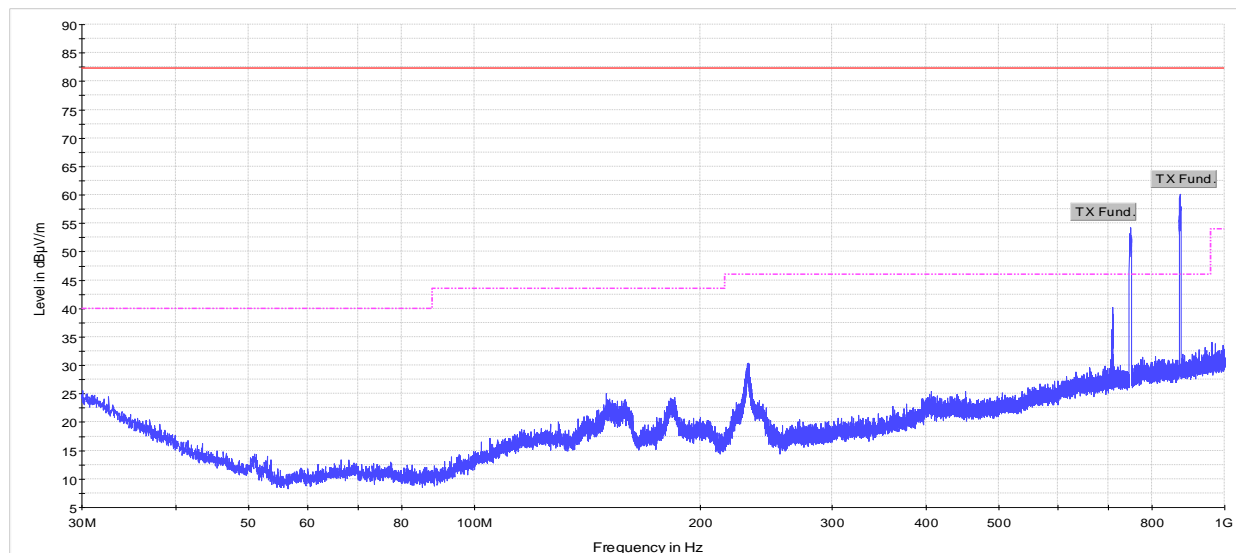
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Test date	January 7, 2018
Test engineer	David Duchesne
Verdict	Pass

### 8.5.3 Observations, settings and special notes

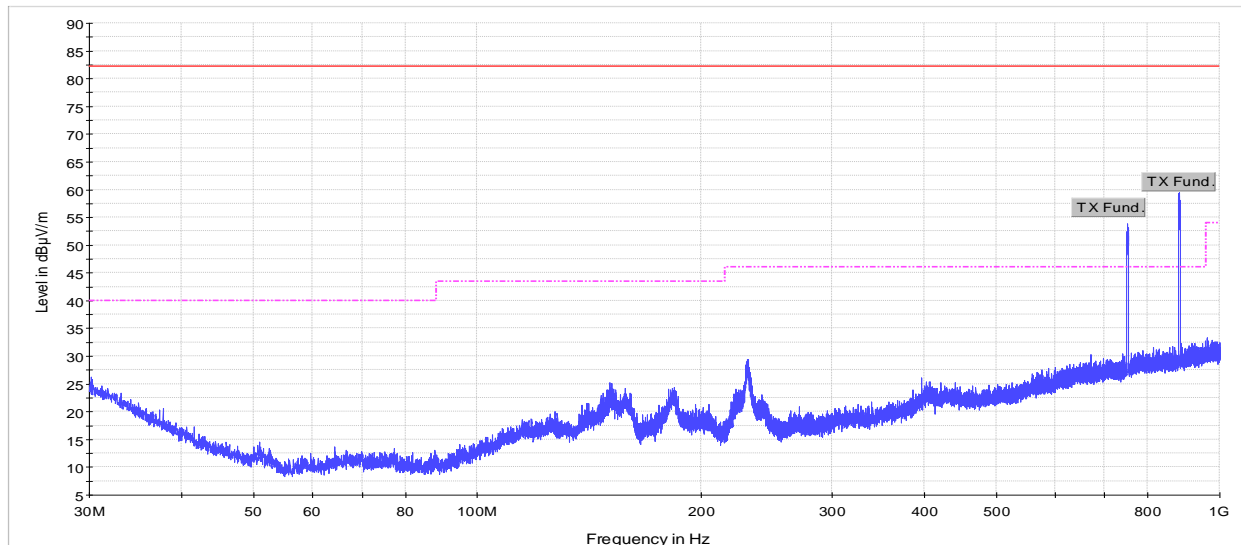
The spectrum was searched from 30 MHz to the 10<sup>th</sup> harmonic.  
All measurements were performed using a peak detector.  
RBW within 30–1000 MHz was 100 kHz and 1 MHz above 1 GHz. VBW was wider than RBW.  
Testing was performed with RF ports terminated with 50 Ohm load.  
Band 5 and Band 13 simultaneous transmission was tested as a worst-case emissions scenario.  
Configuration 1: Port A with 40 W power, Port B with 40 W power, Port C with 40 W power, Port D with 40 W power.  
Configuration 2: Port A with 60 W power, Port D with 60 W power.

### 8.5.4 Test data



1 Carrier 5 MHz B13 and B5 Bottom Channel Power Settings (4x (4x 40W))  
— PK+\_MAXH  
— -13 dBm (82.23 dBμV/m)  
— FCC Part 15 and ICES - Class B 3m Q-Peak Limit

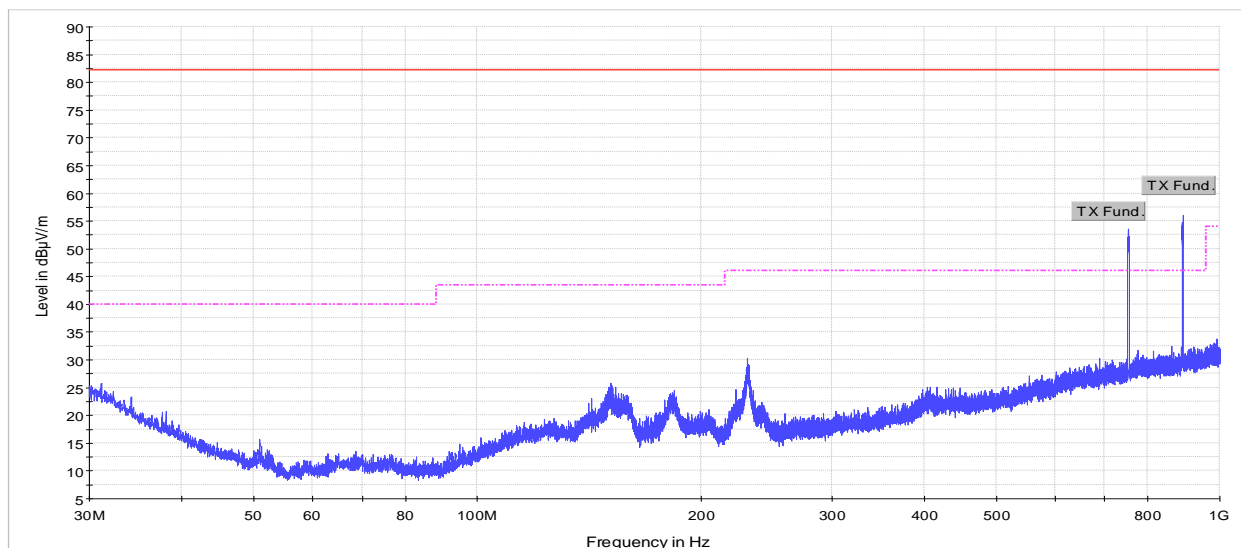
**Figure 8.5-1:** Radiated spurious emission below 1 GHz, B13 at low channel and B5 at low channel, configuration 1



1 Carrier 5 MHz B13 and B5 Middle Channel Power Settings (4x (4x 40W))

— PK+ MAXH  
— -13 dBm (82.23 dBμV/m)  
- - - - - FCC Part 15 and ICES - Class B 3m Q-Peak Limit

**Figure 8.5-2:** Radiated spurious emission below 1 GHz, B13 at low channel and B5 at mid channel, configuration 1



1 Carrier 5 MHz B13 and B5 High Channel Power Settings (4x (4x 40W))

— PK+ MAXH  
— -13 dBm (82.23 dBμV/m)  
- - - - - FCC Part 15 and ICES - Class B 3m Q-Peak Limit

**Figure 8.5-3:** Radiated spurious emission below 1 GHz, B13 at high channel and B5 at high channel, configuration 1

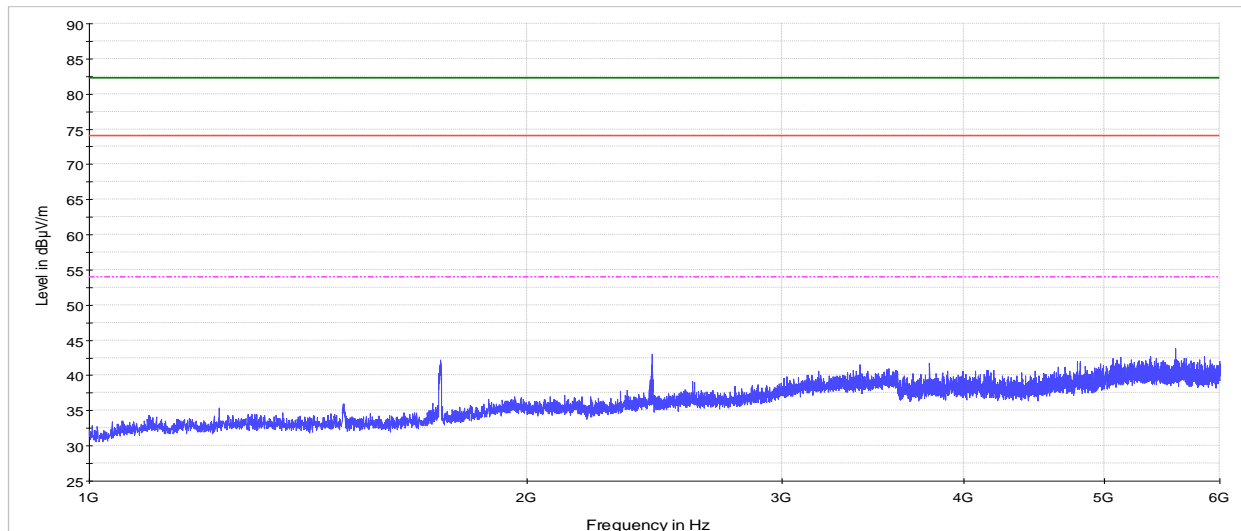


Figure 8.5-4: Radiated spurious emission within 1–6 GHz, B13 at low channel and B5 at low channel, configuration 1

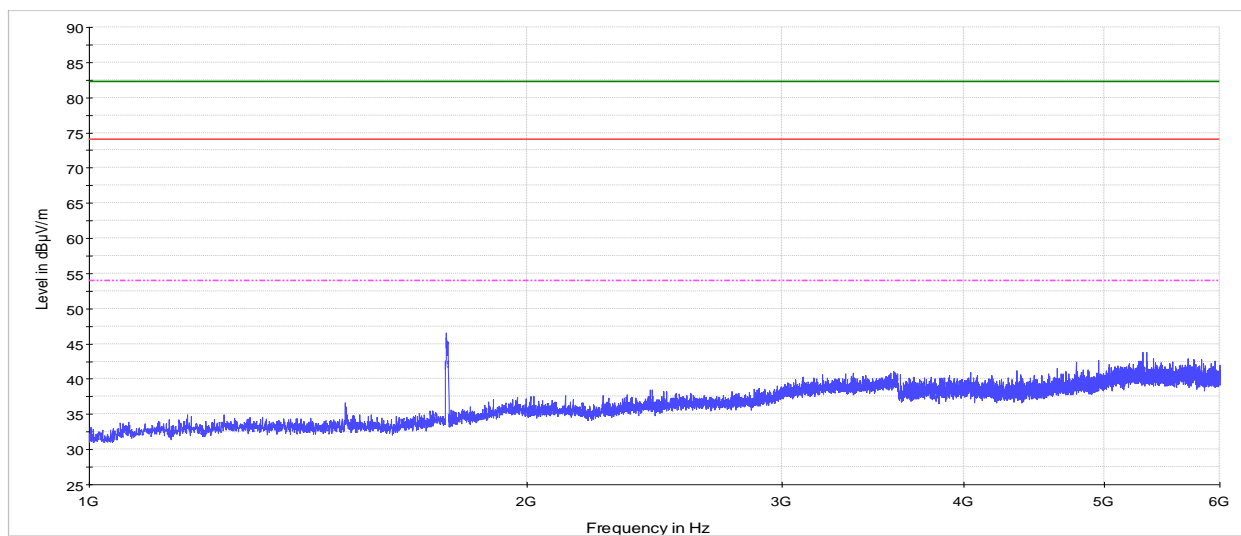
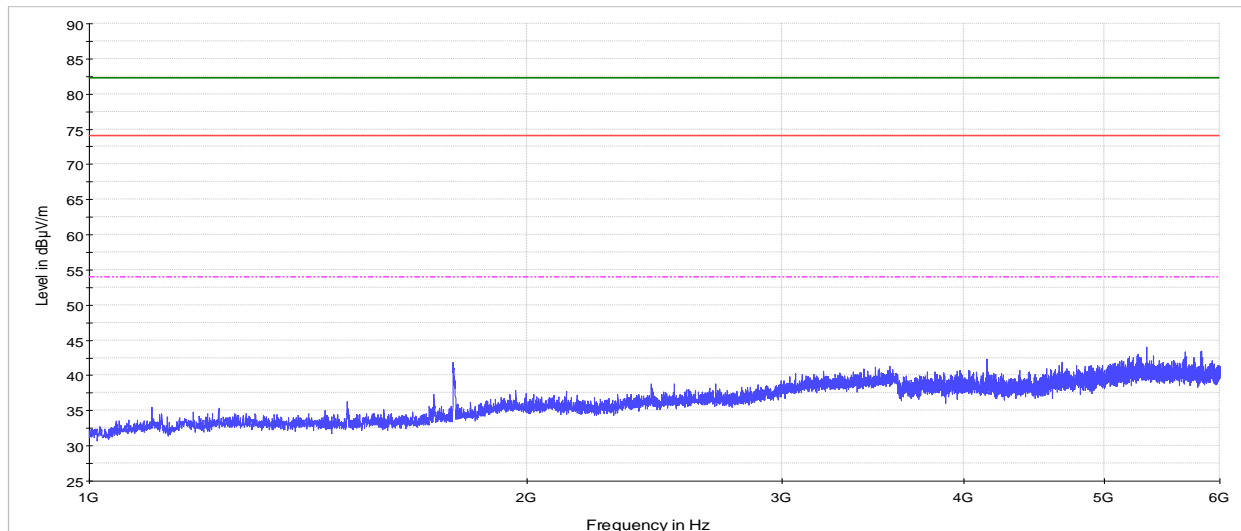
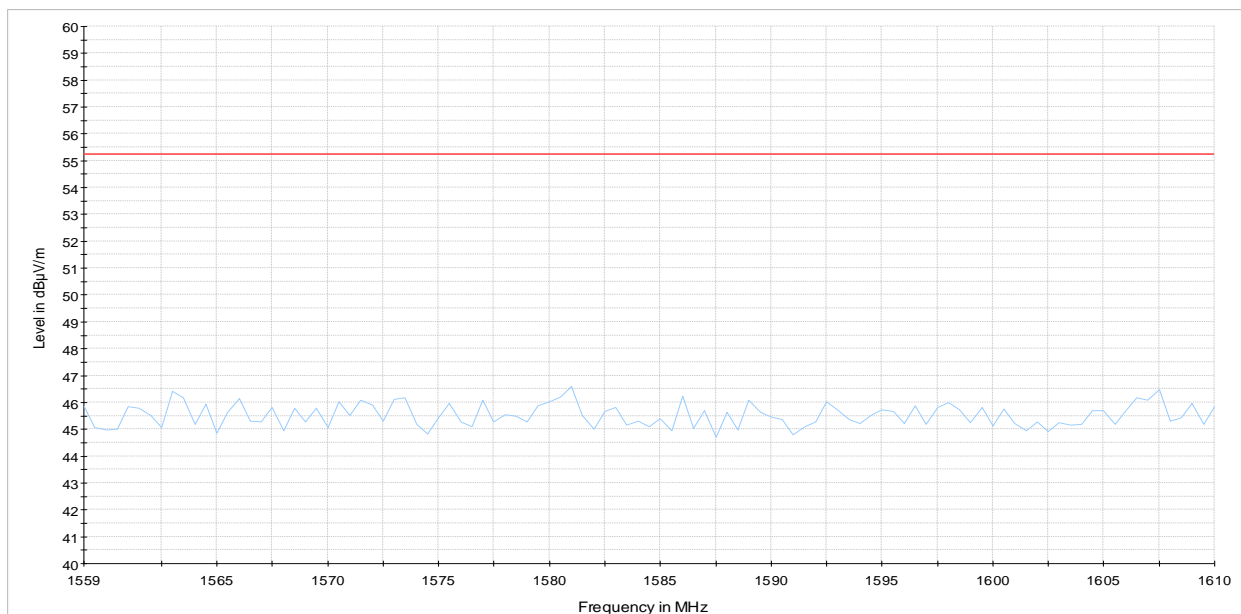


Figure 8.5-5: Radiated spurious emission within 1–6 GHz, B13 at low channel and B5 at mid channel, configuration 1



1 Carrier 5 MHz B13 and B5 High Channel Power Setting (4x (4x 40W))  
 -13 dBm (82.23 dBμV/m)  
 PK+ MAXH  
 FCC Part 15 and ICES- Class B 3m Peak Limit  
 FCC Part 15 and ICES - Class B 3m Average Limit

**Figure 8.5-6:** Radiated spurious emission within 1–6 GHz, B13 at high channel and B5 at high channel, configuration 1



B13 and B5 Top Channel  
 Preview Result 1-PK+  
 55.23 dBμV/m

**Figure 8.5-7:** Radiated spurious emission within 1559–1610 MHz, B13 and B5 at high channel (worst case), configuration 1

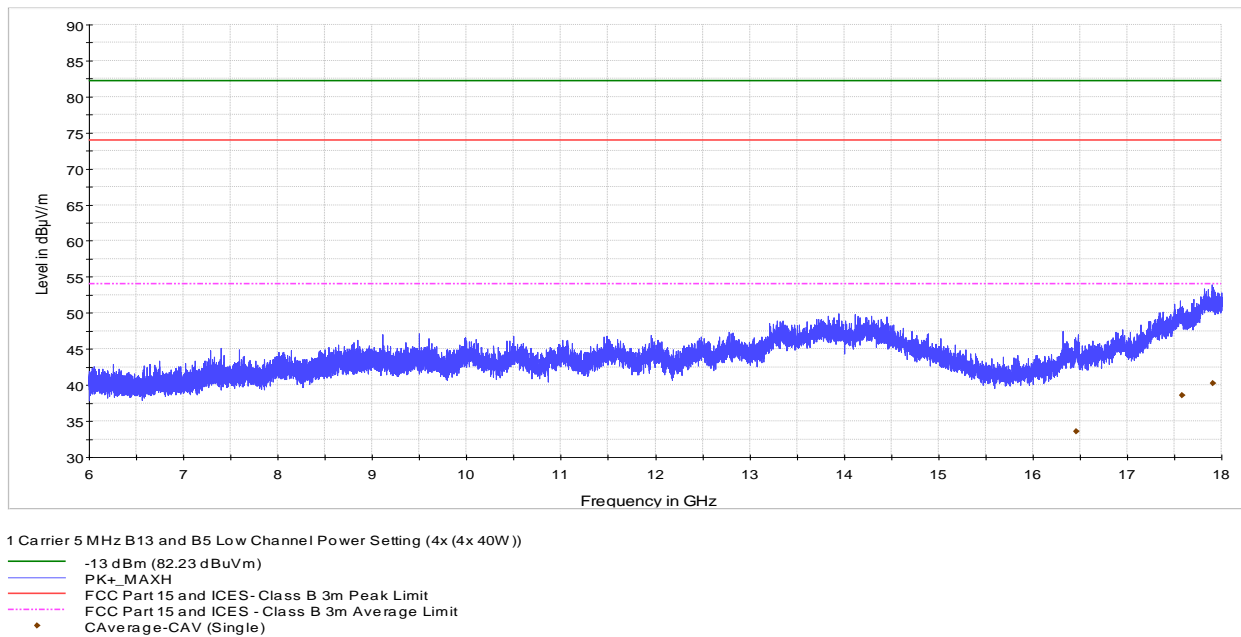


Figure 8.5-8: Radiated spurious emission above 6 GHz, B13 at low channel and B5 at low channel, configuration 1

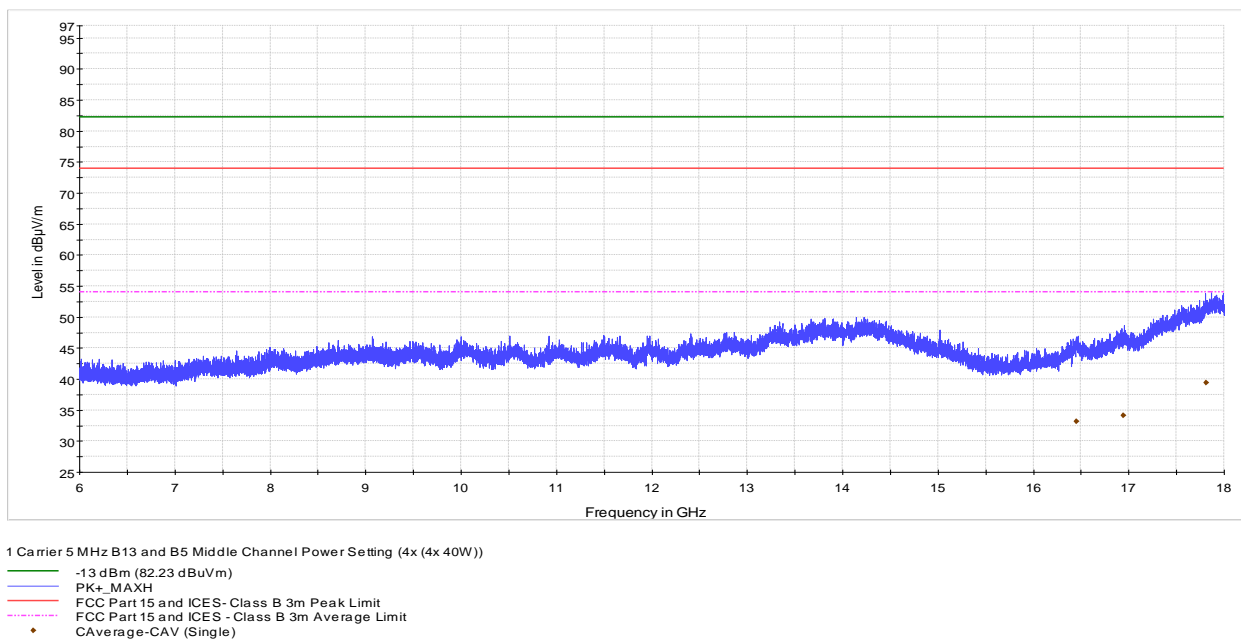
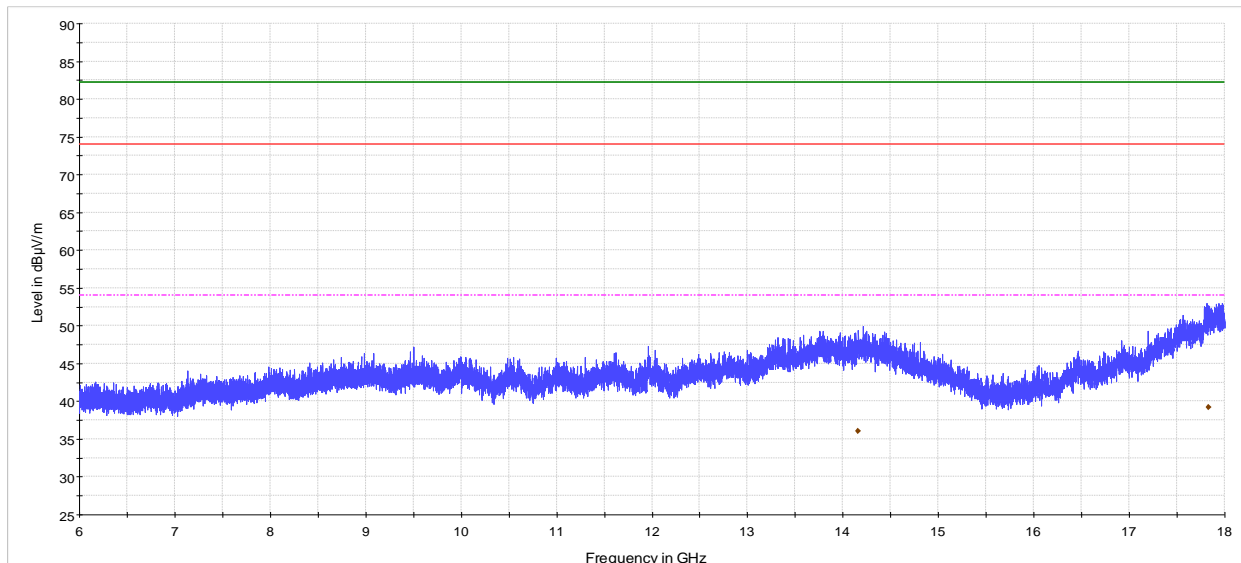
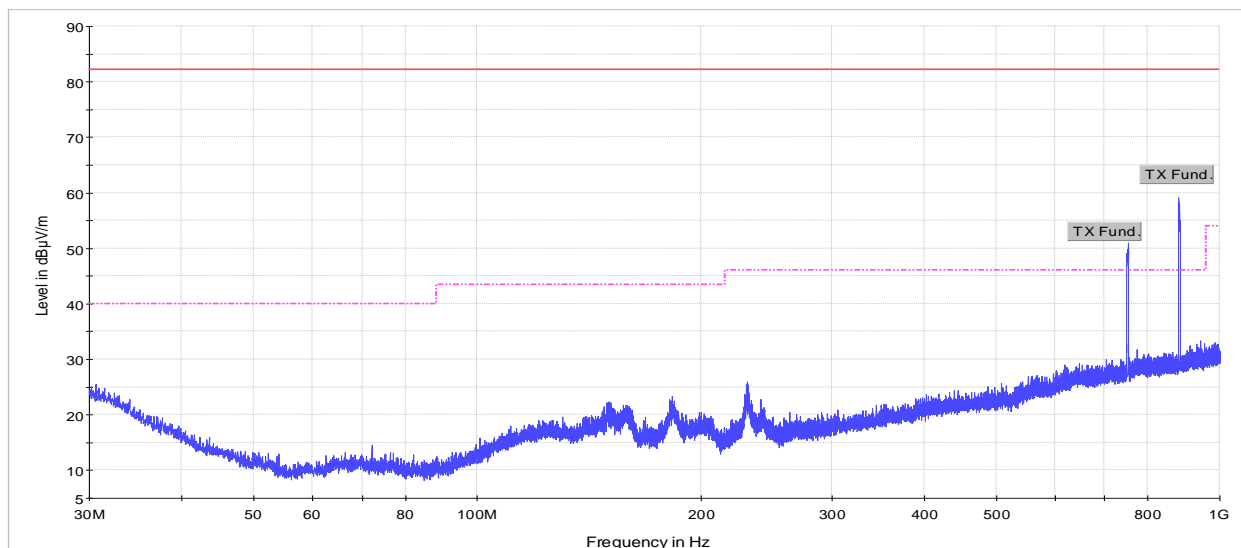


Figure 8.5-9: Radiated spurious emission above 6 GHz, B13 at low channel and B5 at mid channel, configuration 1



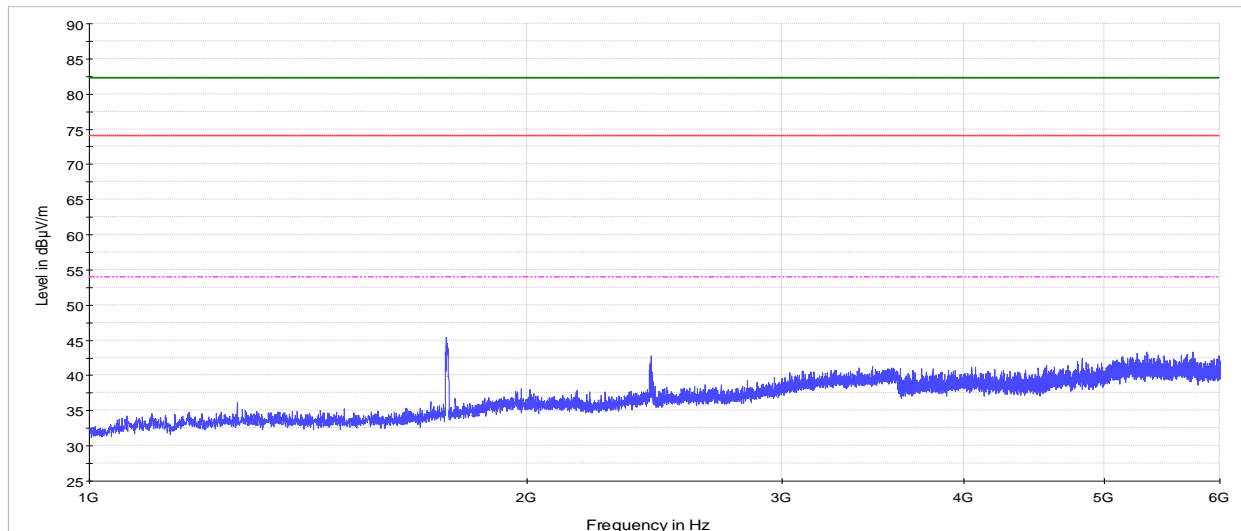
1 Carrier 5 MHz B13 and B5 High Channel Power Setting (4x (4x 40W))  
 -13 dBm (82.23 dBuV/m)  
 PK+\_MAXH  
 FCC Part 15 and ICES - Class B 3m Peak Limit  
 FCC Part 15 and ICES - Class B 3m Average Limit  
 CAVerage-CAV (Single)

Figure 8.5-10: Radiated spurious emission above 6 GHz, B13 at high channel and B5 at high channel, configuration 1



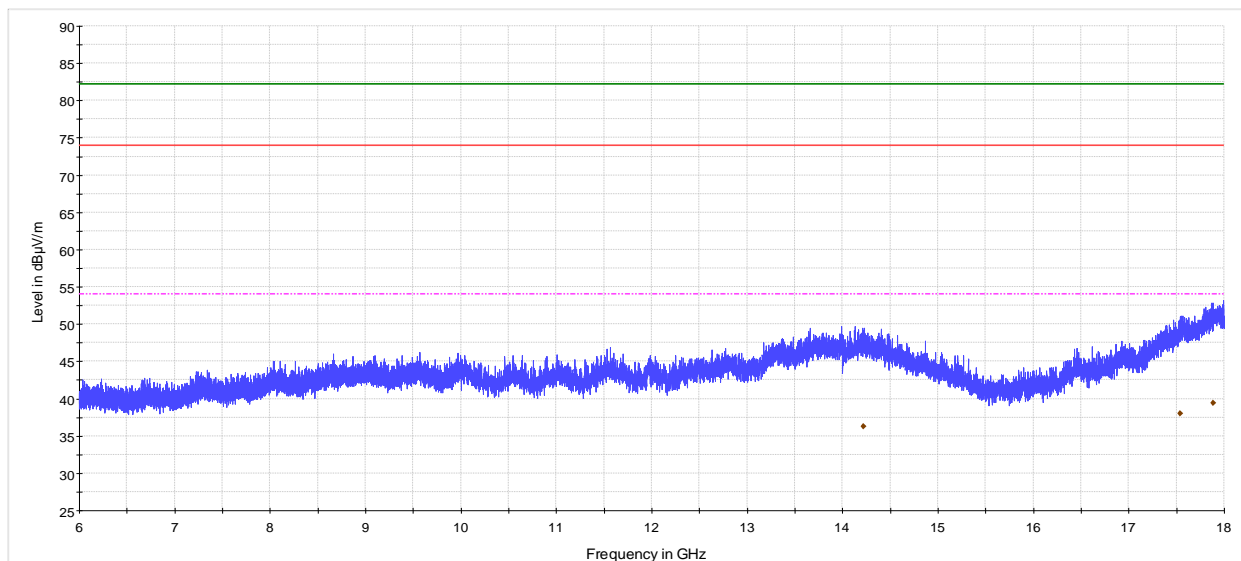
1 Carrier B13 10 MHz Power Settings (2x 60W) and 1 Carrier B5 5 MHz Middle Channel Power Settings (4x 40W)  
 PK+\_MAXH  
 -13 dBm (82.23 dBuV/m)  
 FCC Part 15 and ICES - Class B 3m Q-Peak Limit

Figure 8.5-11: Radiated spurious emission below 1 GHz, B13 and B5 (worst case), configuration 2



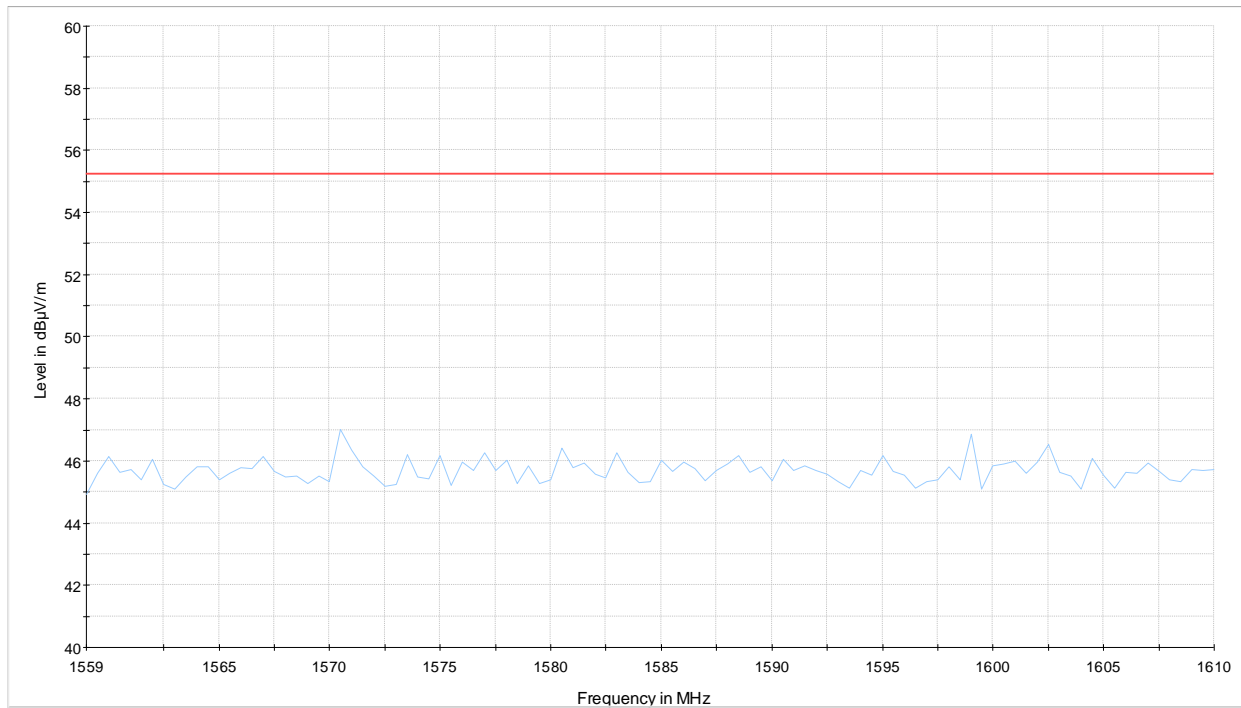
1 Carrier B13 10 MHz Power Settings (2x 60W) and 1 Carrier B5 5 MHz Middle Channel Power Settings (4x 40W)  
 -13 dBm (82.23 dBμV/m)  
 PK+ MAXH  
 FCC Part 15 and ICES- Class B 3m Peak Limit  
 FCC Part 15 and ICES - Class B 3m Average Limit

Figure 8.5-12: Radiated spurious emission within 1–6 GHz, B13 and B5 (worst case), configuration 2



1 Carrier B13 10 MHz Power Settings (2x 60W) and 1 Carrier B5 5 MHz Middle Channel Power Settings (4x 40W)  
 -13 dBm (82.23 dBμV/m)  
 PK+ MAXH  
 FCC Part 15 and ICES- Class B 3m Peak Limit  
 FCC Part 15 and ICES - Class B 3m Average Limit  
 CAverage-CAV (Single)

Figure 8.5-13: Radiated spurious emission above 6 GHz, B13 and B5 (worst case), configuration 2



**Figure 8.5-14:** Radiated spurious emission within 1559–1610 MHz, B13 and B5 (worst case), configuration 2

## 8.6 FCC Part 2.1049 Occupied bandwidth

### 8.6.1 Definitions and limits

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.

### 8.6.2 Test summary

Test date	January 4, 2018
Test engineer	Andrey Adelberg
Verdict	Pass

### 8.6.3 Observations, settings and special notes

Configuration 1: Port A with 40 W power, Port B with 40 W power, Port C with 40 W power, Port D with 40 W power.  
Configuration 2: Port A with 60 W power, Port D with 60 W power.

### 8.6.4 Test data

**Table 8.6-1:** Occupied bandwidth results for configuration 1 (B13, 5 MHz channel)

Remarks	99% OBW, MHz	26 dB BW, MHz
Antenna A, QPSK, low channel	4.482	4.705
Antenna B, QPSK, low channel	4.476	4.702
Antenna C, QPSK, low channel	4.476	4.733
Antenna D, QPSK, low channel	4.471	4.714
Antenna A, 16QAM, low channel	4.455	4.674
Antenna B, 16QAM, low channel	4.449	4.646
Antenna C, 16QAM, low channel	4.464	4.694
Antenna D, 16QAM, low channel	4.455	4.689
Antenna A, 64QAM, low channel	4.472	4.717
Antenna B, 64QAM, low channel	4.476	4.709
Antenna C, 64QAM, low channel	4.479	4.661
Antenna D, 64QAM, low channel	4.478	4.722
Antenna A, 256QAM, low channel	4.490	4.692
Antenna B, 256QAM, low channel	4.477	4.709
Antenna C, 256QAM, low channel	4.472	4.719
Antenna D, 256QAM, low channel	4.485	4.718
Antenna A, QPSK, high channel	4.480	4.695
Antenna B, QPSK, high channel	4.484	4.703
Antenna C, QPSK, high channel	4.474	4.697
Antenna D, QPSK, high channel	4.478	4.675

**Table 8.6-2: Occupied bandwidth results for configuration 2 (B13, 5 MHz channel)**

Remarks	99% OBW, MHz	26 dB BW, MHz
Antenna A, QPSK, low channel	4.479	4.706
Antenna D, QPSK, low channel	4.477	4.721
Antenna A, 16QAM, low channel	4.462	4.707
Antenna D, 16QAM, low channel	4.444	4.685
Antenna A, 64QAM, low channel	4.473	4.700
Antenna D, 64QAM, low channel	4.481	4.698
Antenna A, 256QAM, low channel	4.474	4.701
Antenna D, 256QAM, low channel	4.480	4.724
Antenna A, QPSK, high channel	4.471	4.726
Antenna D, QPSK, high channel	4.479	4.697

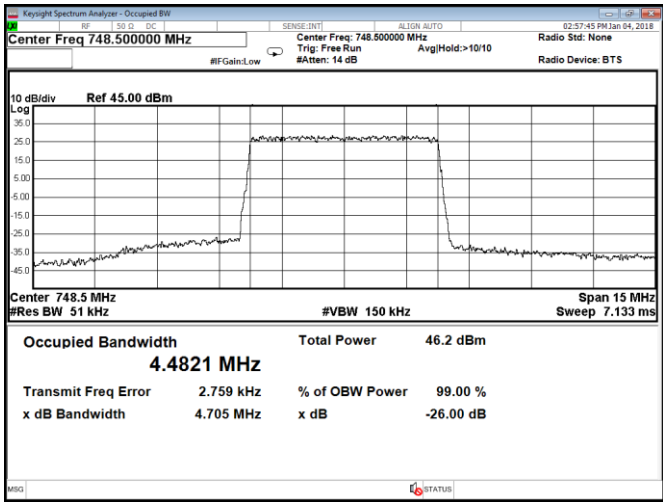


Figure 8.6-1: Occupied bandwidth, QPSK, Port A, low channel, configuration 1

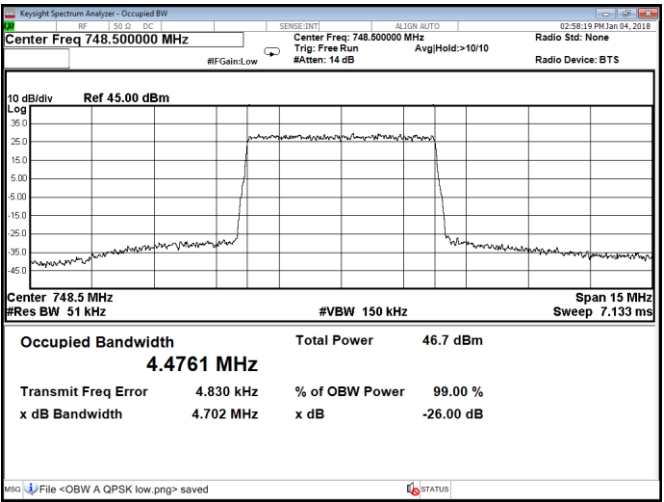


Figure 8.6-2: Occupied bandwidth, QPSK, Port B, low channel, configuration 1

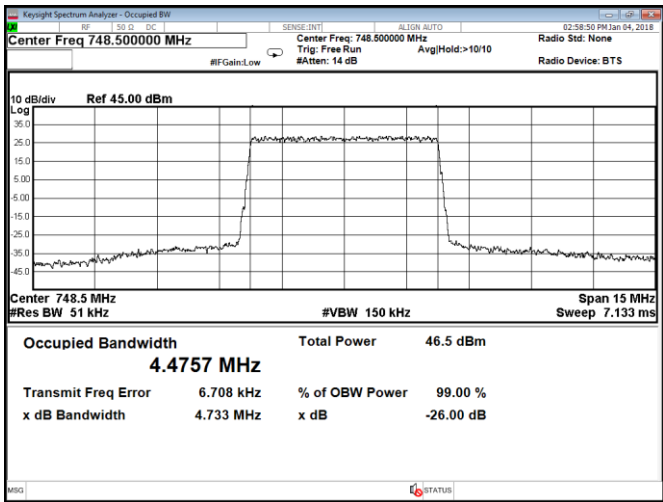


Figure 8.6-3: Occupied bandwidth, QPSK, Port C, low channel, configuration 1

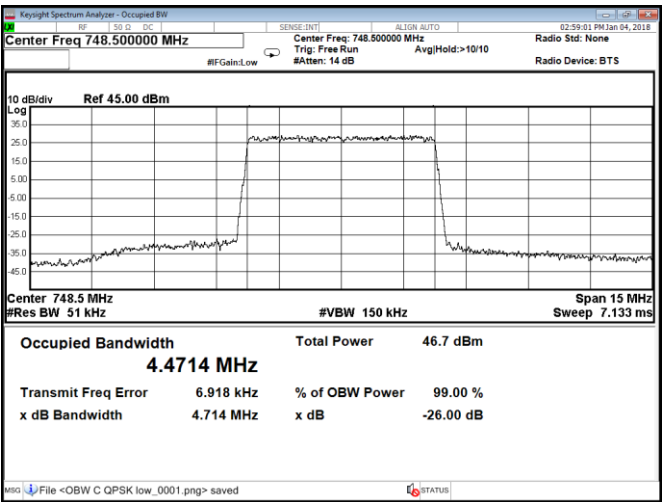


Figure 8.6-4: Occupied bandwidth, QPSK, Port D, low channel, configuration 1

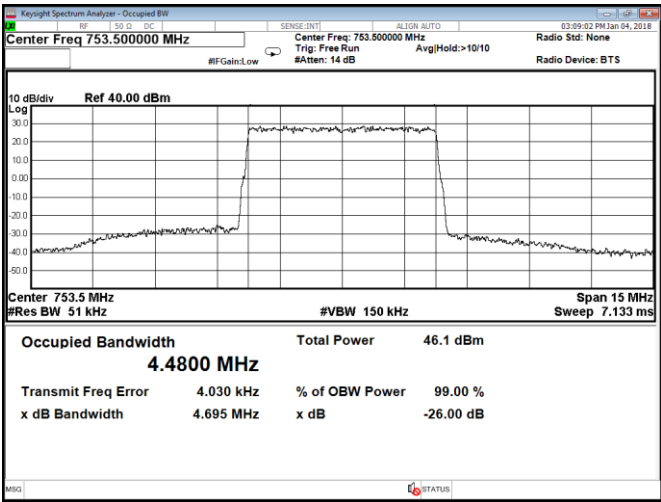


Figure 8.6-5: Occupied bandwidth, QPSK, Port A, high channel, configuration 1

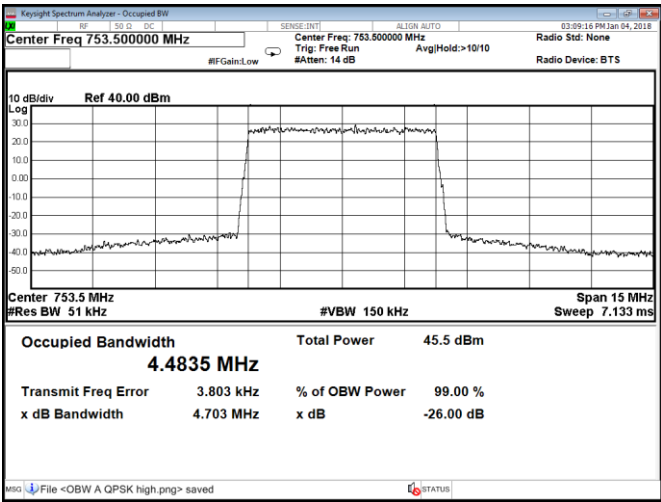


Figure 8.6-6: Occupied bandwidth, QPSK, Port B, high channel, configuration 1

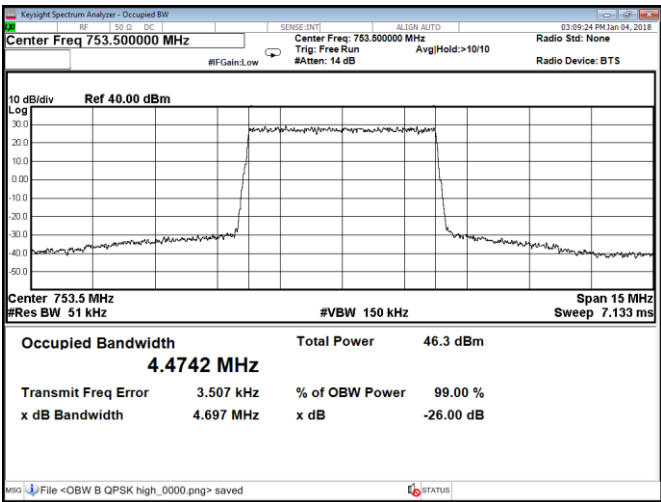


Figure 8.6-7: Occupied bandwidth, QPSK, Port C, high channel, configuration 1

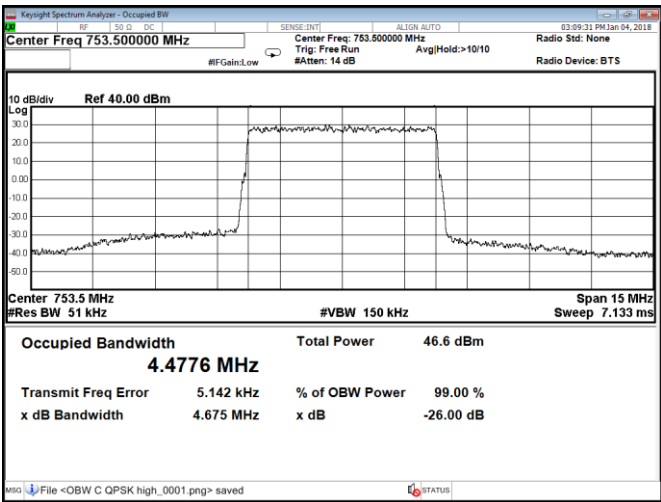


Figure 8.6-8: Occupied bandwidth, QPSK, Port D, high channel, configuration 1

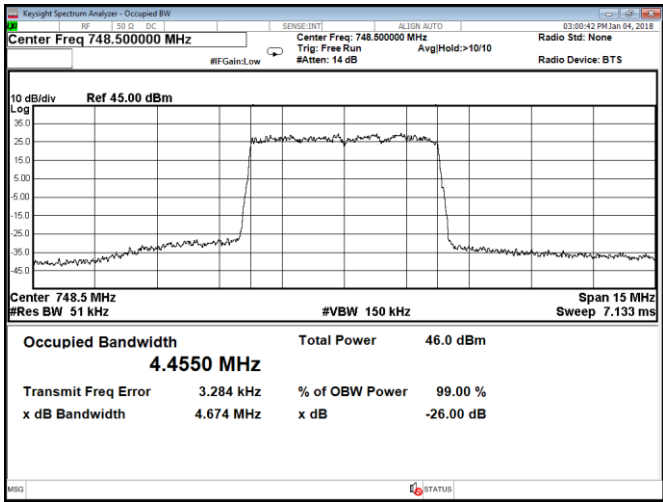


Figure 8.6-9: Occupied bandwidth, 16QAM, Port A, low channel, configuration 1

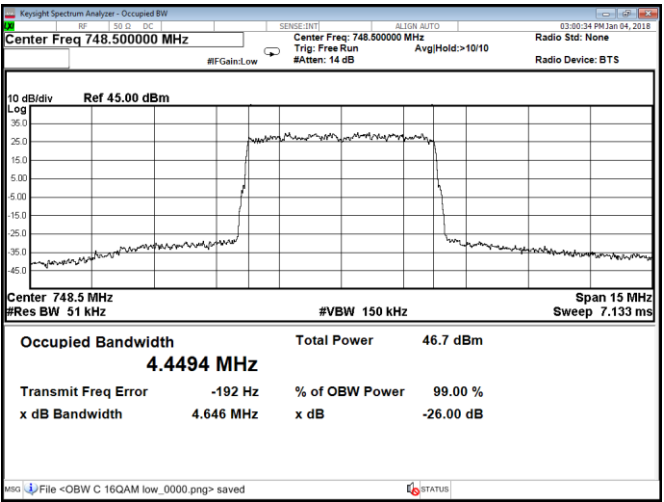


Figure 8.6-10: Occupied bandwidth, 16QAM, Port B, low channel, configuration 1

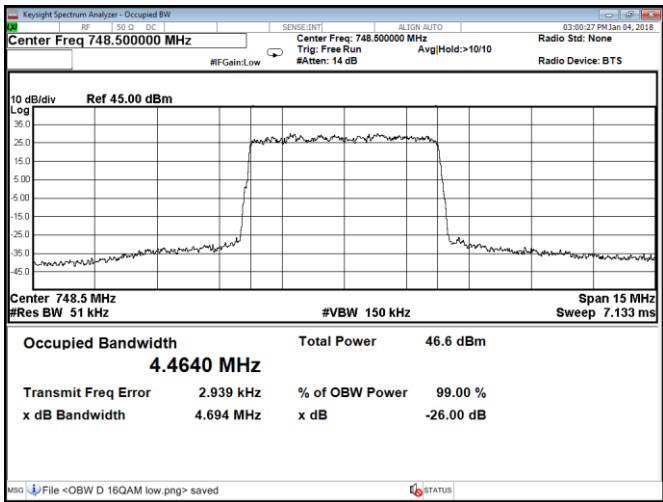


Figure 8.6-11: Occupied bandwidth, 16QAM, Port C, low channel, configuration 1

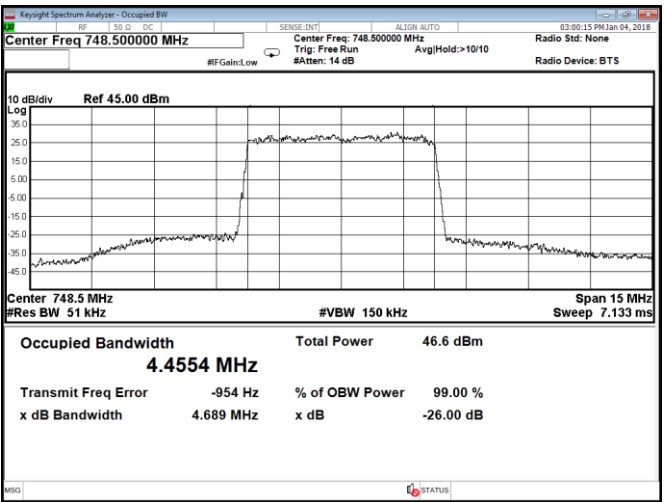


Figure 8.6-12: Occupied bandwidth, 16QAM, Port D, low channel, configuration 1

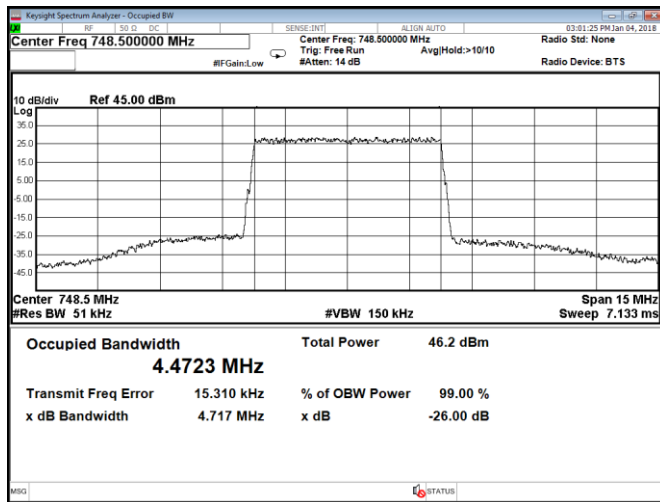


Figure 8.6-13: Occupied bandwidth, 64QAM, Port A, low channel, configuration 1

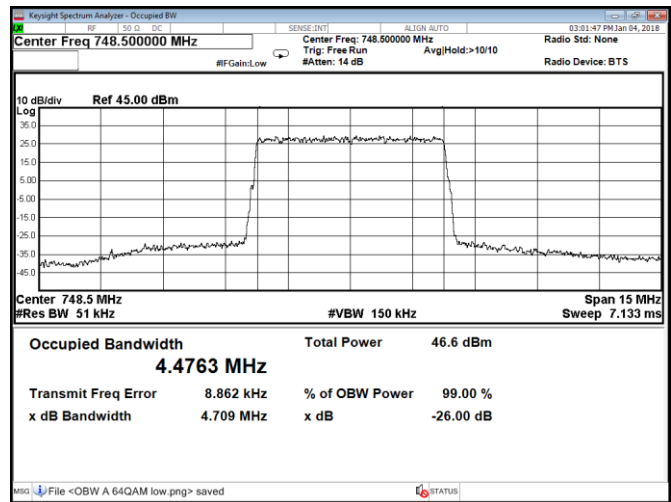


Figure 8.6-14: Occupied bandwidth, 64QAM, Port B, low channel, configuration 1

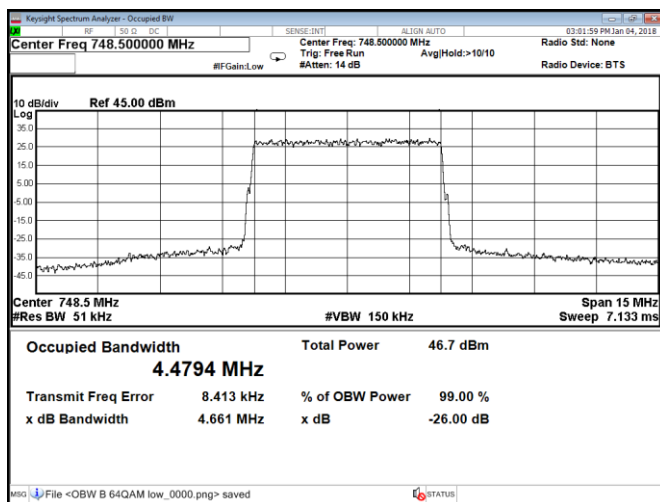


Figure 8.6-15: Occupied bandwidth, 64QAM, Port C, low channel, configuration 1

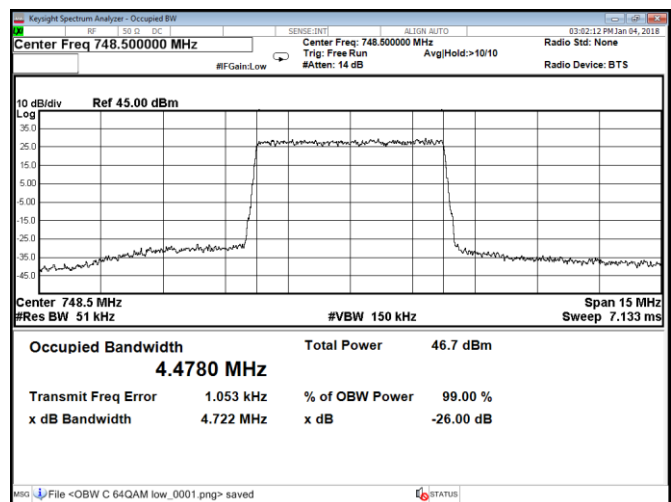


Figure 8.6-16: Occupied bandwidth, 64QAM, Port D, low channel, configuration 1

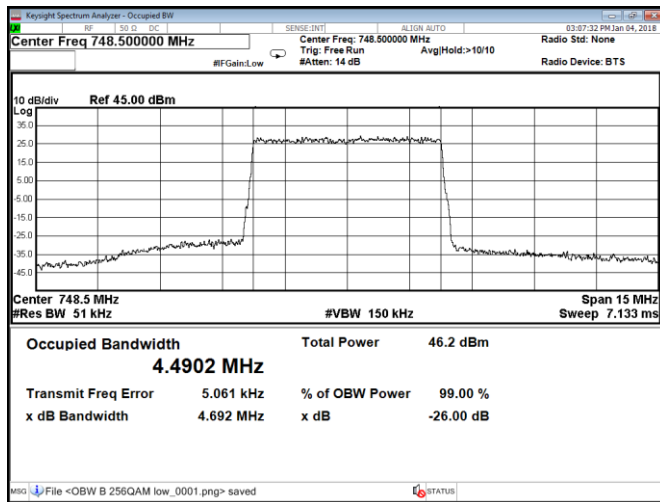


Figure 8.6-17: Occupied bandwidth, 256QAM, Port A, low channel, configuration 1

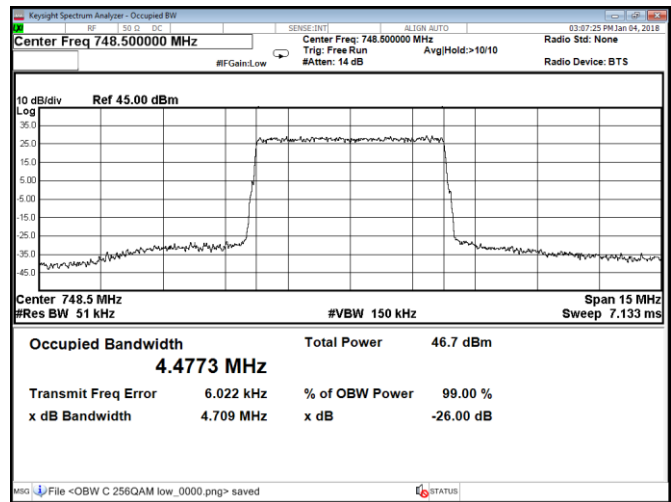


Figure 8.6-18: Occupied bandwidth, 256QAM, Port B, low channel, configuration 1

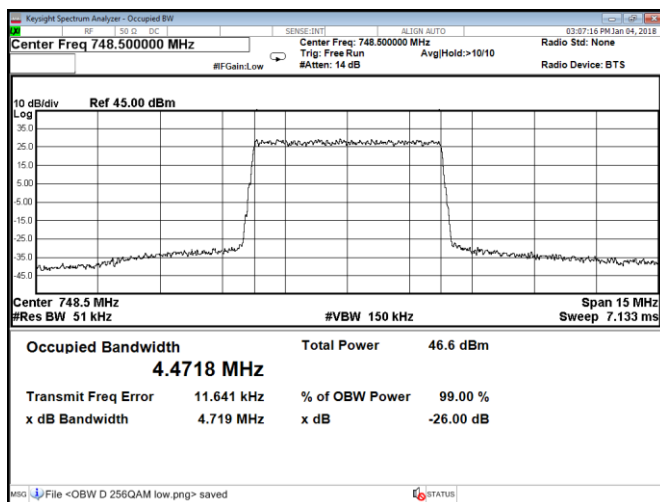


Figure 8.6-19: Occupied bandwidth, 256QAM, Port C, low channel, configuration 1

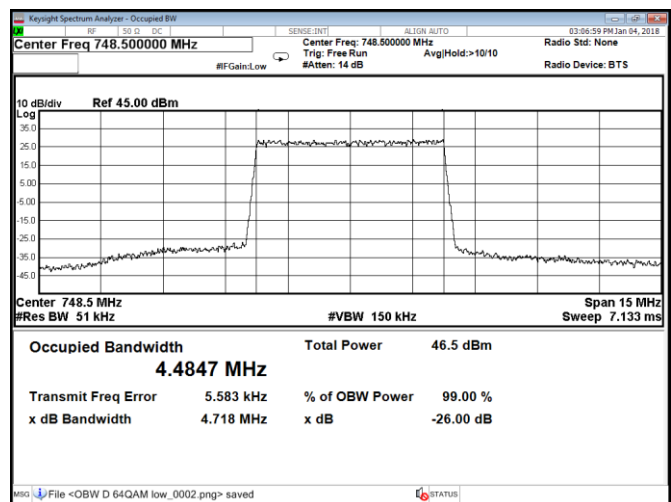


Figure 8.6-20: Occupied bandwidth, 256QAM, Port D, low channel, configuration 1

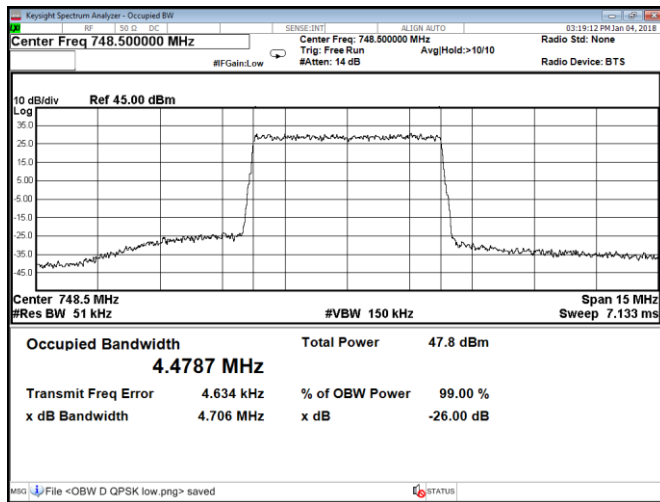


Figure 8.6-21: Occupied bandwidth, QPSK, Port A, low channel, configuration 2

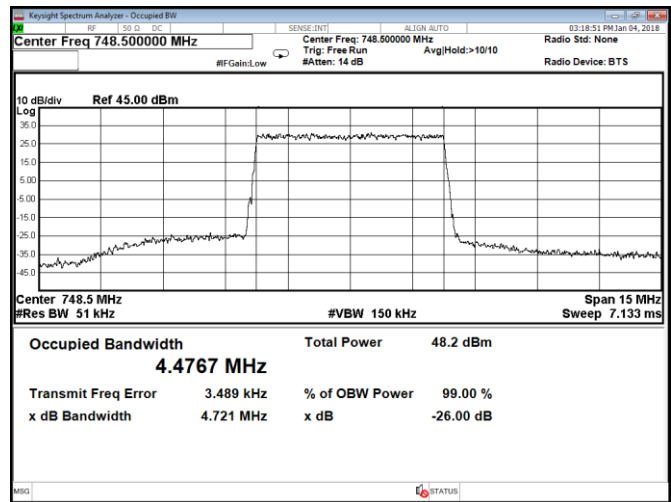


Figure 8.6-22: Occupied bandwidth, QPSK, Port D, low channel, configuration 2

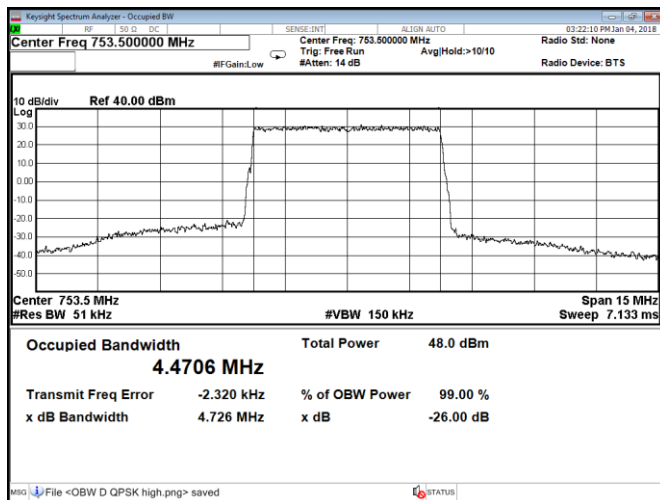


Figure 8.6-23: Occupied bandwidth, QPSK, Port A, high channel, configuration 2

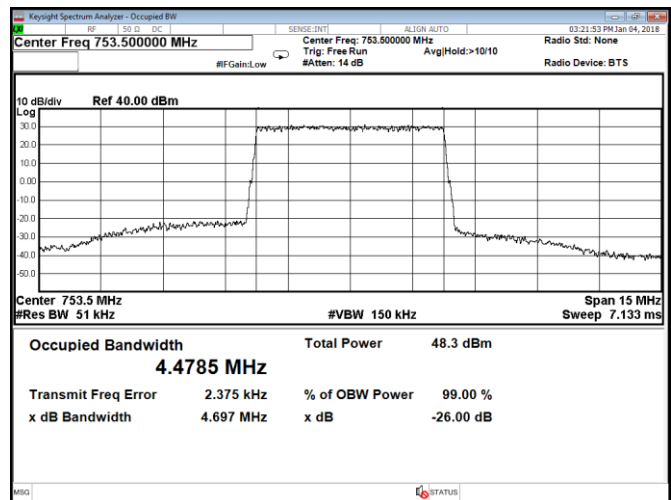


Figure 8.6-24: Occupied bandwidth, QPSK, Port D, high channel, configuration 2

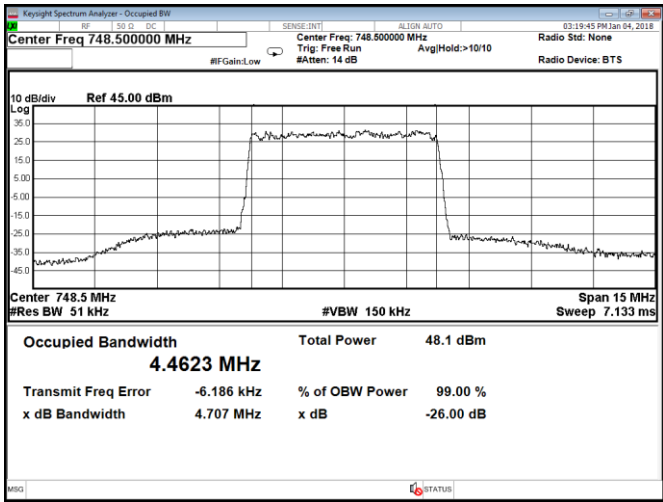


Figure 8.6-25: Occupied bandwidth, 16QAM, Port A, low channel, configuration 2

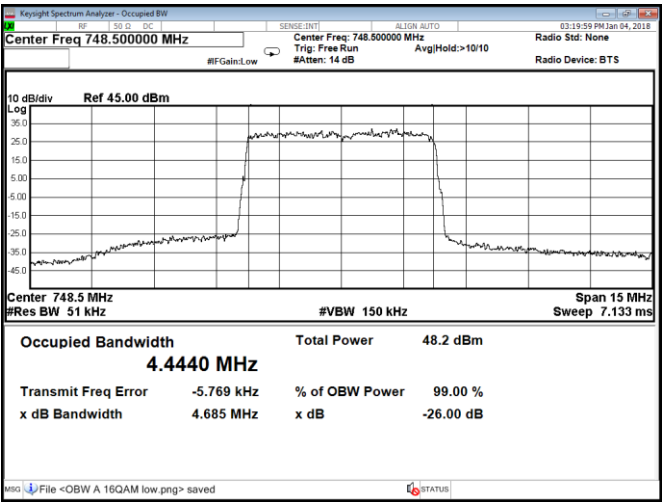


Figure 8.6-26: Occupied bandwidth, 16QAM, Port D, low channel, configuration 2

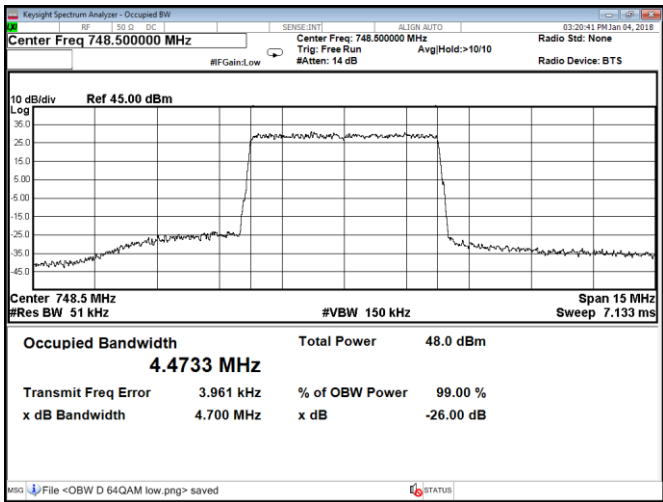


Figure 8.6-27: Occupied bandwidth, 64QAM, Port A, low channel, configuration 2

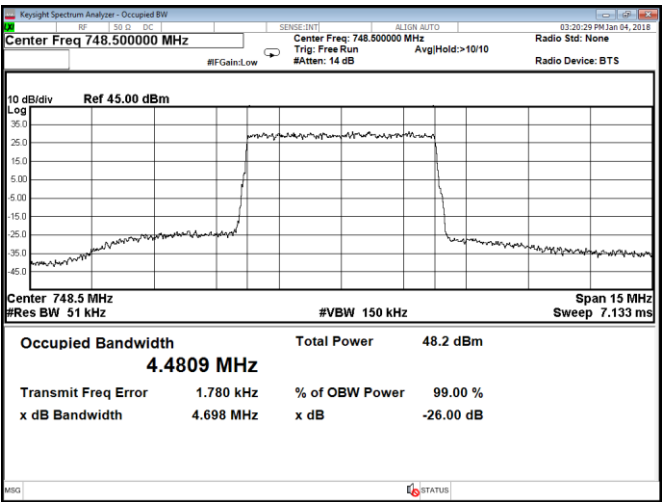


Figure 8.6-28: Occupied bandwidth, 64QAM, Port D, low channel, configuration 2

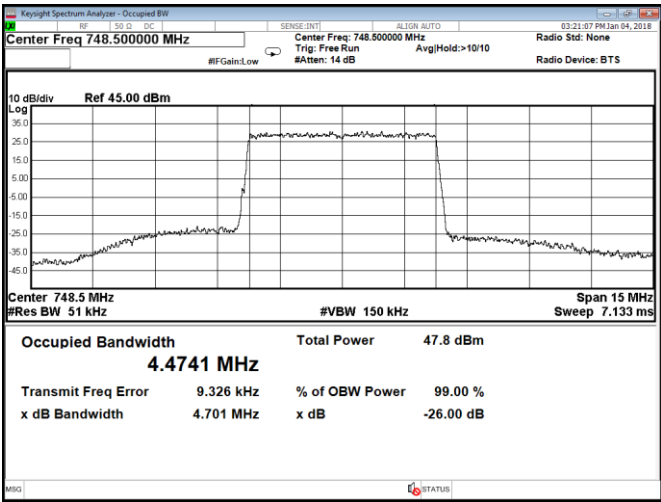


Figure 8.6-29: Occupied bandwidth, 256QAM, Port A, low channel, configuration 2

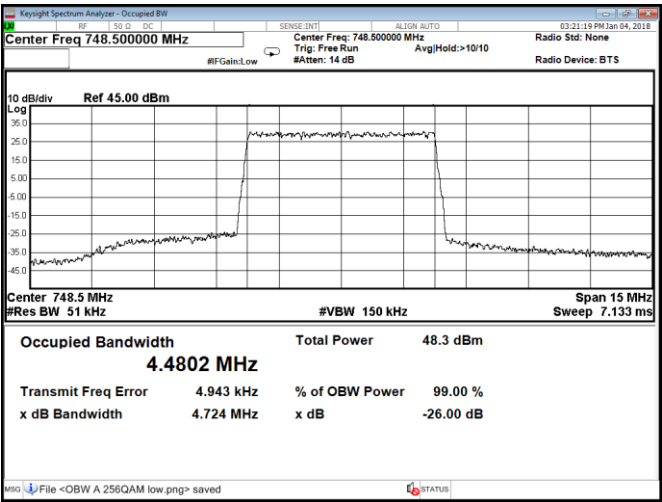


Figure 8.6-30: Occupied bandwidth, 256QAM, Port D, low channel, configuration 2

## 8.7 FCC Part 22.917(b) Occupied bandwidth

### 8.7.1 Definitions and limits

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.

### 8.7.2 Test summary

Test date	January 4, 2018
Test engineer	Andrey Adelberg
Verdict	Pass

### 8.7.3 Observations, settings and special notes

Configuration 1: Port A with 40 W power, Port B with 40 W power, Port C with 40 W power, Port D with 40 W power.  
Configuration 2: Port A with 60 W power, Port D with 60 W power.

### 8.7.4 Test data

**Table 8.7-1:** Occupied bandwidth results for configuration 1 (B5, 10 MHz channel)

Remarks	99% OBW, MHz	26 dB BW, MHz
Antenna A, QPSK, low channel	8.927	9.357
Antenna B, QPSK, low channel	8.942	9.329
Antenna C, QPSK, low channel	8.931	9.261
Antenna D, QPSK, low channel	8.932	9.329
Antenna A, 16QAM, low channel	8.922	9.354
Antenna B, 16QAM, low channel	8.922	9.249
Antenna C, 16QAM, low channel	8.911	9.232
Antenna D, 16QAM, low channel	8.914	9.319
Antenna A, 64QAM, low channel	8.926	9.384
Antenna B, 64QAM, low channel	8.933	9.348
Antenna C, 64QAM, low channel	8.920	9.244
Antenna D, 64QAM, low channel	8.936	9.346
Antenna A, 256QAM, low channel	8.926	9.341
Antenna B, 256QAM, low channel	8.925	9.358
Antenna C, 256QAM, low channel	8.906	9.276
Antenna D, 256QAM, low channel	8.931	9.315
Antenna A, QPSK, mid channel	8.931	9.323
Antenna B, QPSK, mid channel	8.928	9.375
Antenna C, QPSK, mid channel	8.933	9.269
Antenna D, QPSK, mid channel	8.922	9.323
Antenna A, QPSK, high channel	8.926	9.351
Antenna B, QPSK, high channel	8.936	9.285
Antenna C, QPSK, high channel	8.930	9.306
Antenna D, QPSK, high channel	8.916	9.314

**Table 8.7-2: Occupied bandwidth results for configuration 2 (B5, 10 MHz channel)**

Remarks	99% OBW, MHz	26 dB BW, MHz
Antenna A, QPSK, low channel	8.923	9.247
Antenna D, QPSK, low channel	8.932	9.271
Antenna A, 16QAM, low channel	8.934	9.331
Antenna D, 16QAM, low channel	8.934	9.280
Antenna A, 64QAM, low channel	8.915	9.325
Antenna D, 64QAM, low channel	8.921	9.331
Antenna A, 256QAM, low channel	8.929	9.355
Antenna D, 256QAM, low channel	8.935	9.301
Antenna A, QPSK, mid channel	8.937	9.309
Antenna D, QPSK, mid channel	8.924	9.248
Antenna A, QPSK, high channel	8.918	9.354
Antenna D, QPSK, high channel	8.919	9.312

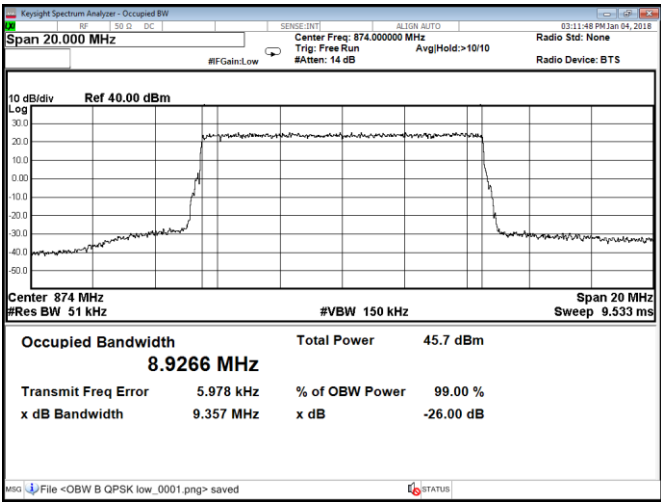


Figure 8.7-1: Occupied bandwidth, QPSK, Port A, low channel, configuration 1

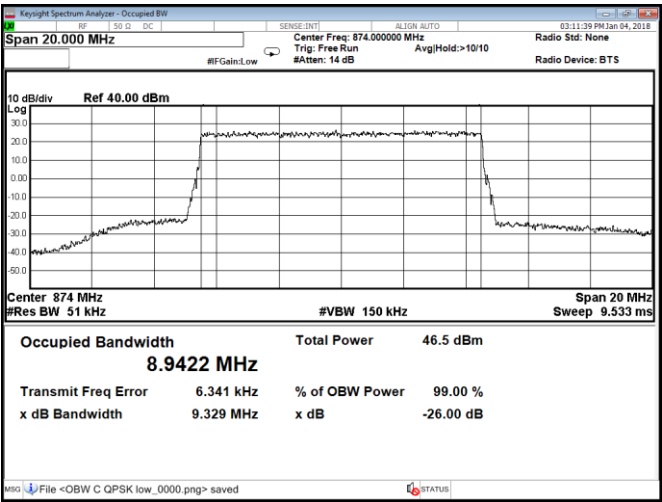


Figure 8.7-2: Occupied bandwidth, QPSK, Port B, low channel, configuration 1

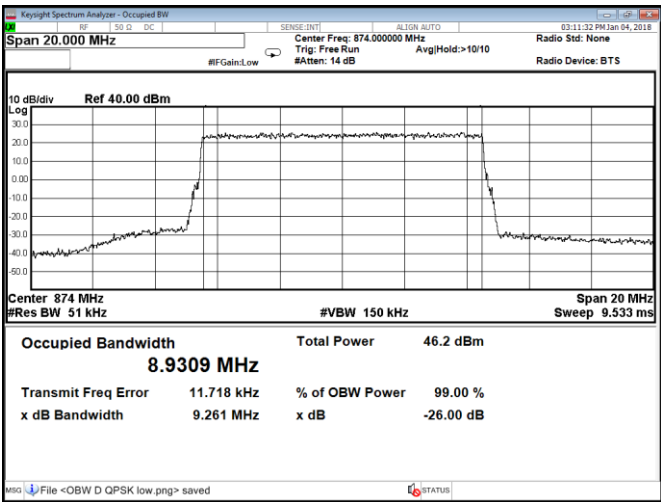


Figure 8.7-3: Occupied bandwidth, QPSK, Port C, low channel, configuration 1

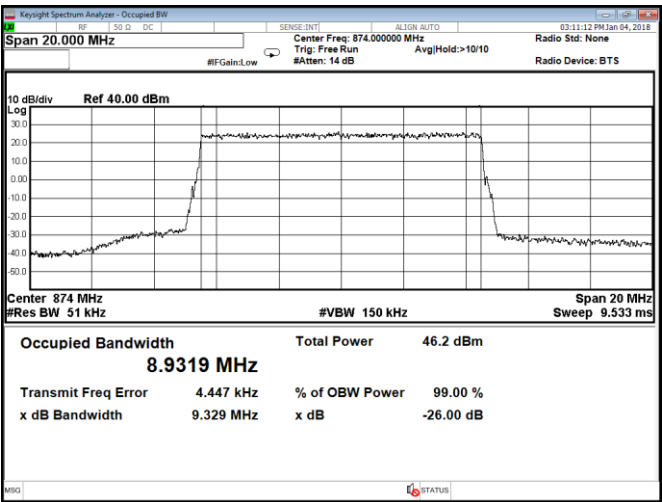


Figure 8.7-4: Occupied bandwidth, QPSK, Port D, low channel, configuration 1

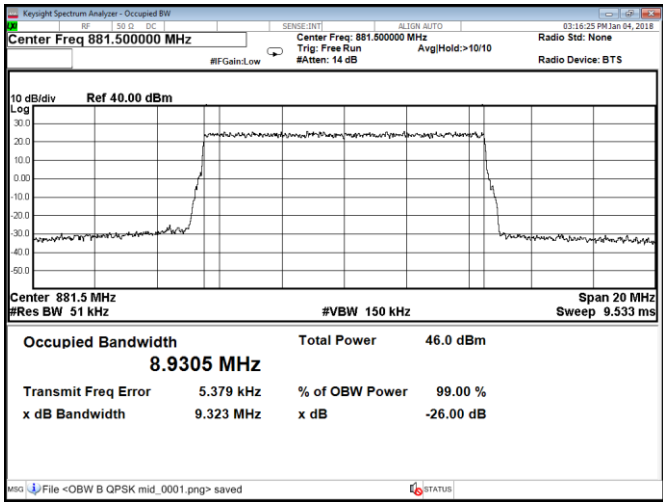


Figure 8.7-5: Occupied bandwidth, QPSK, Port A, mid channel, configuration 1

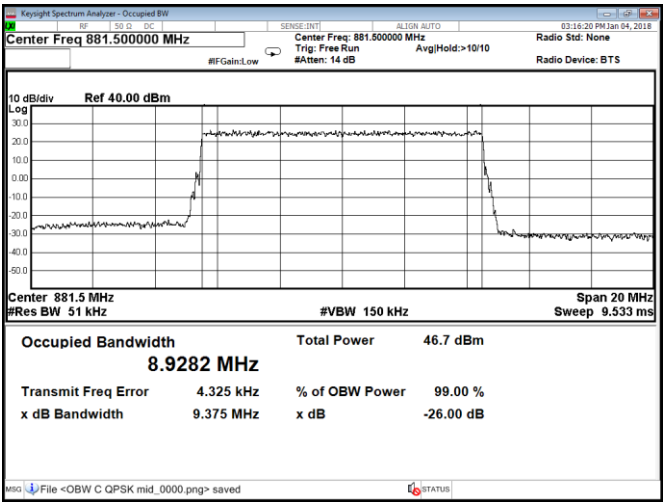


Figure 8.7-6: Occupied bandwidth, QPSK, Port B, mid channel, configuration 1

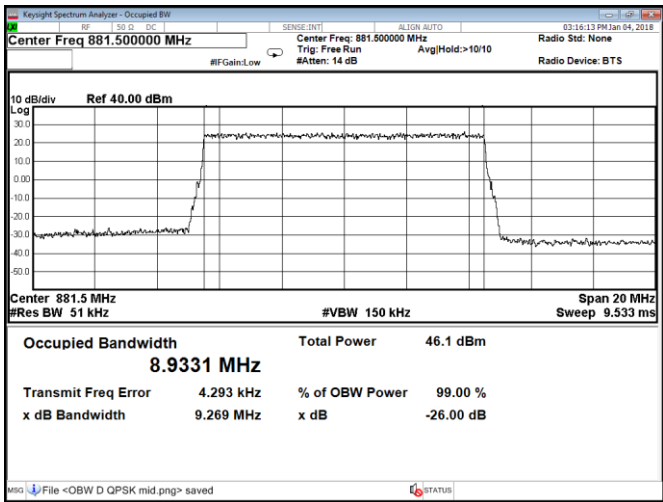


Figure 8.7-7: Occupied bandwidth, QPSK, Port C, mid channel, configuration 1

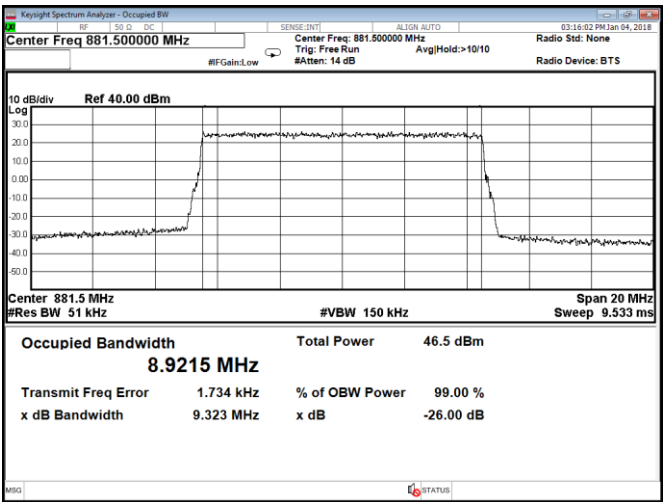


Figure 8.7-8: Occupied bandwidth, QPSK, Port D, mid channel, configuration 1

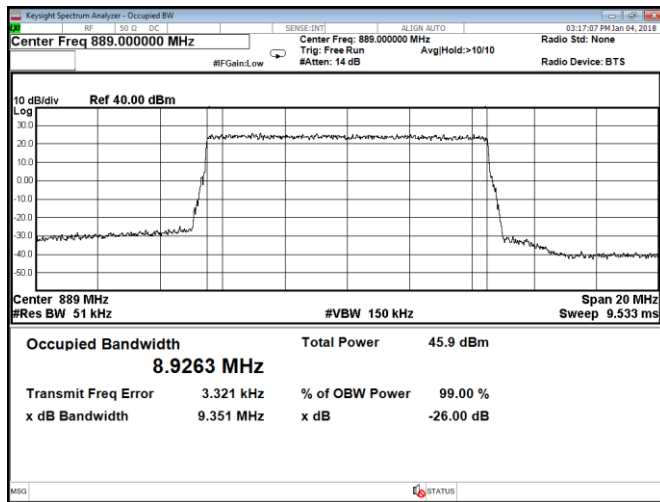


Figure 8.7-9: Occupied bandwidth, QPSK, Port A, high channel, configuration 1

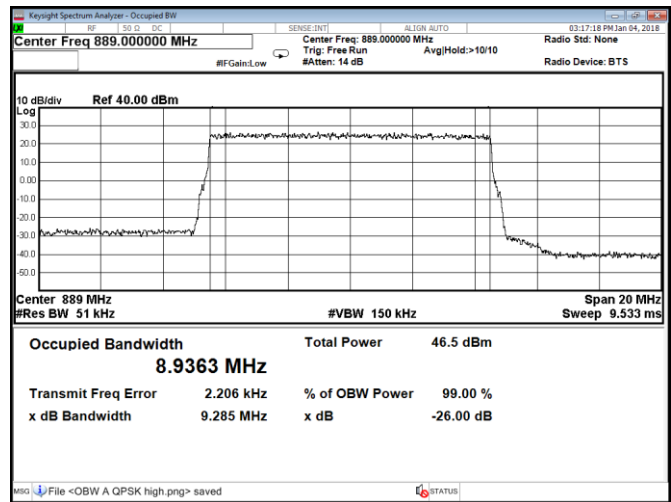


Figure 8.7-10: Occupied bandwidth, QPSK, Port B, high channel, configuration 1

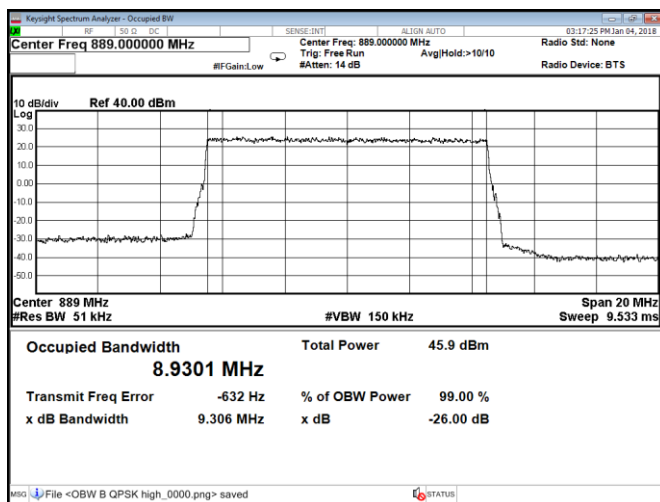


Figure 8.7-11: Occupied bandwidth, QPSK, Port C, high channel, configuration 1

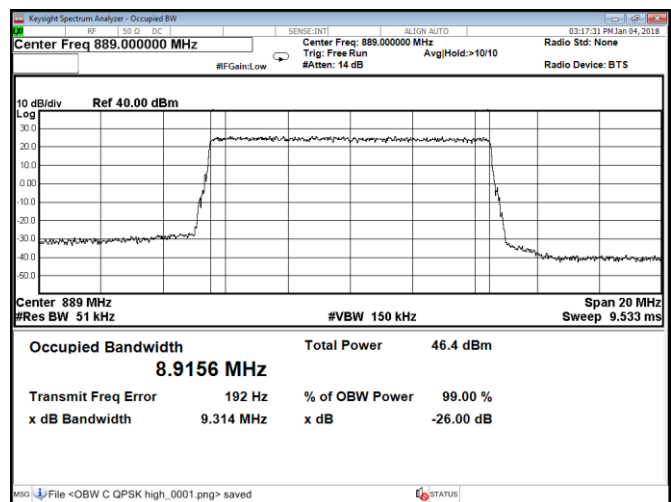


Figure 8.7-12: Occupied bandwidth, QPSK, Port D, high channel, configuration 1

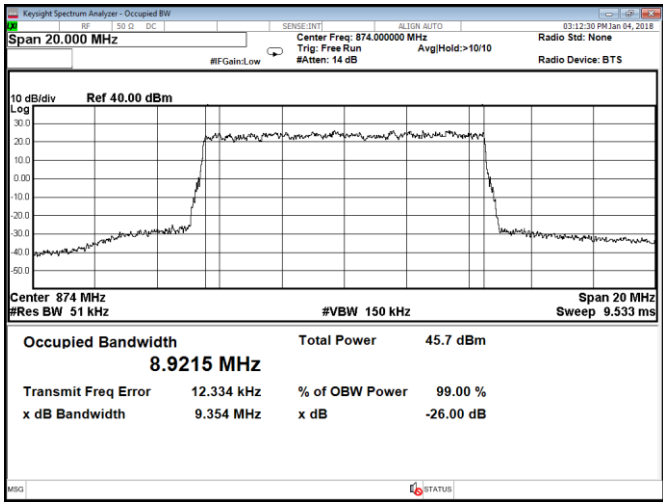


Figure 8.7-13: Occupied bandwidth, 16QAM, Port A, low channel, configuration 1

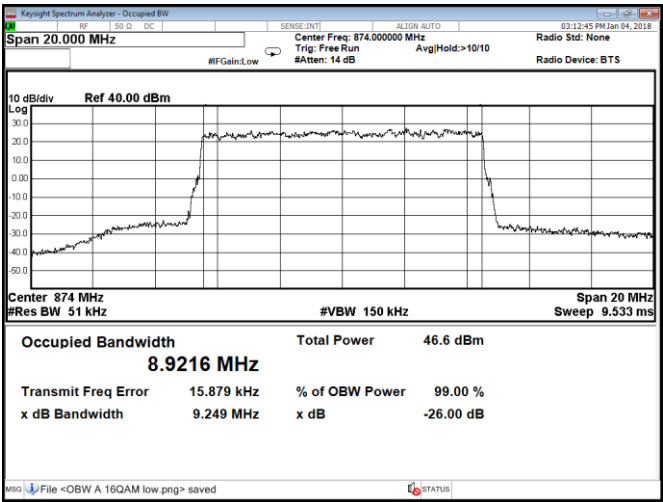


Figure 8.7-14: Occupied bandwidth, 16QAM, Port B, low channel, configuration 1

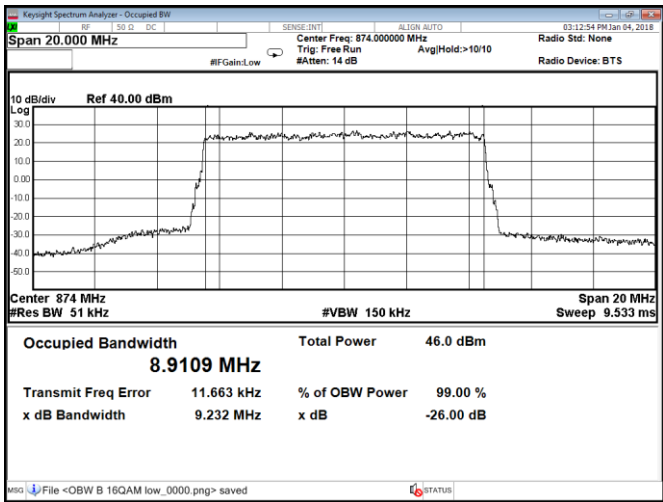


Figure 8.7-15: Occupied bandwidth, 16QAM, Port C, low channel, configuration 1

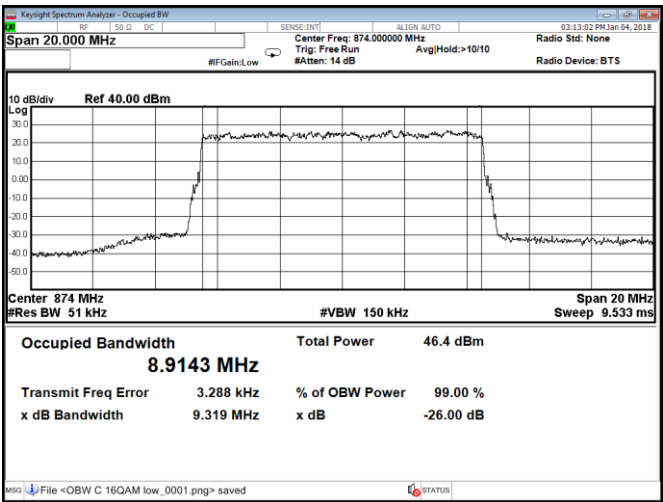


Figure 8.7-16: Occupied bandwidth, 16QAM, Port D, low channel, configuration 1

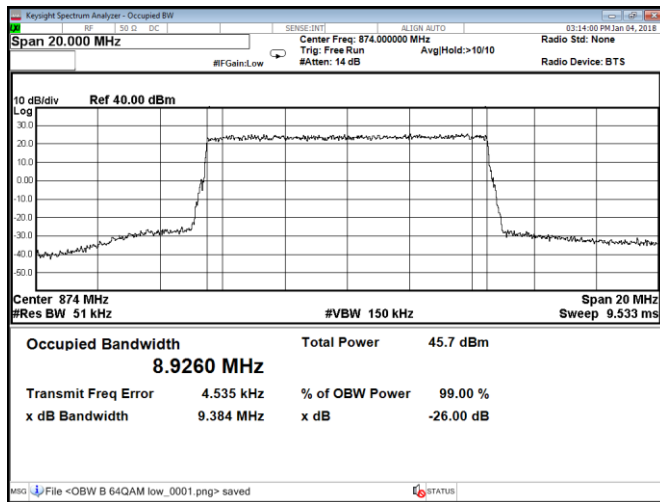


Figure 8.7-17: Occupied bandwidth, 64QAM, Port A, low channel, configuration 1

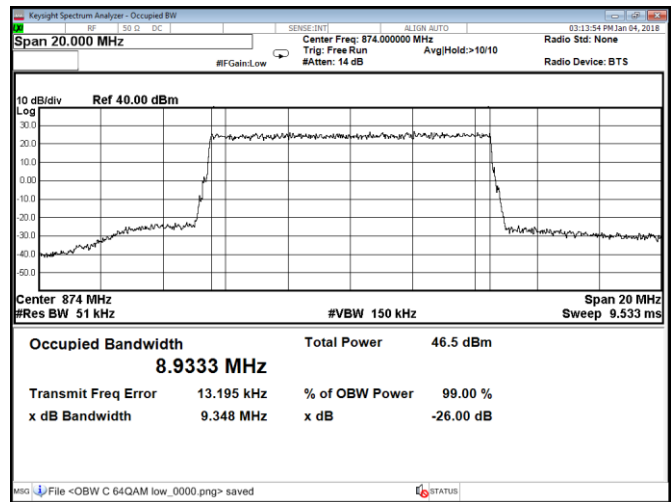


Figure 8.7-18: Occupied bandwidth, 64QAM, Port B, low channel, configuration 1

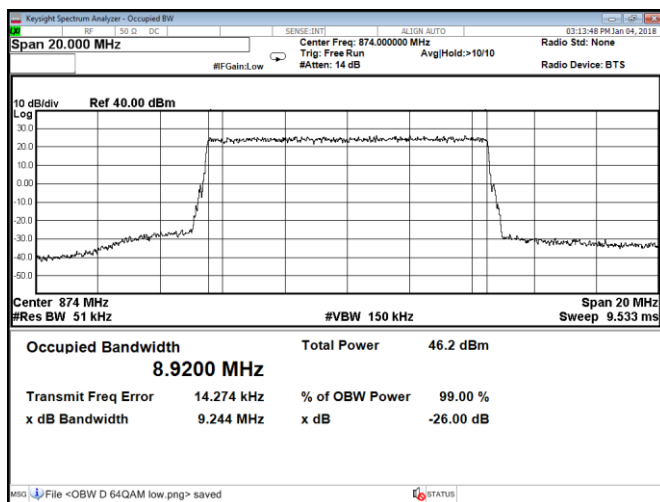


Figure 8.7-19: Occupied bandwidth, 64QAM, Port C, low channel, configuration 1

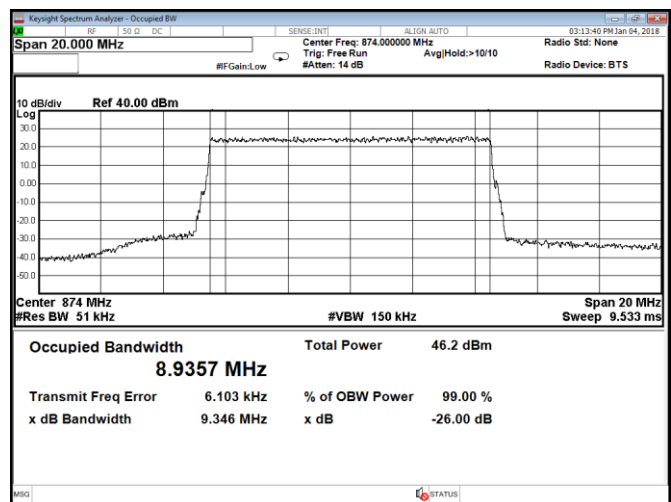


Figure 8.7-20: Occupied bandwidth, 64QAM, Port D, low channel, configuration 1

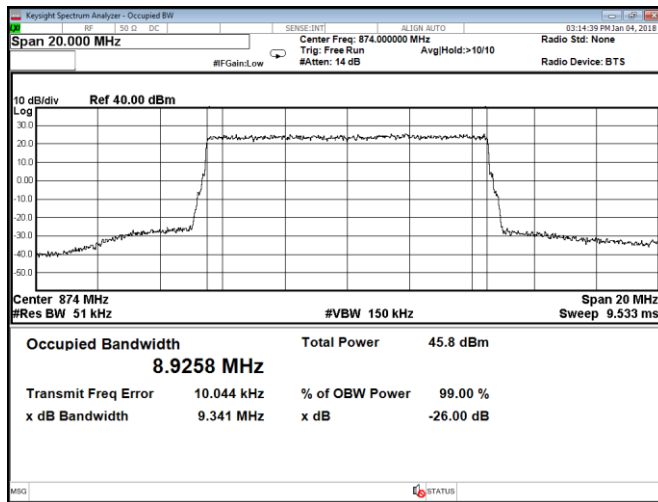


Figure 8.7-21: Occupied bandwidth, 256QAM, Port A, low channel, configuration 1

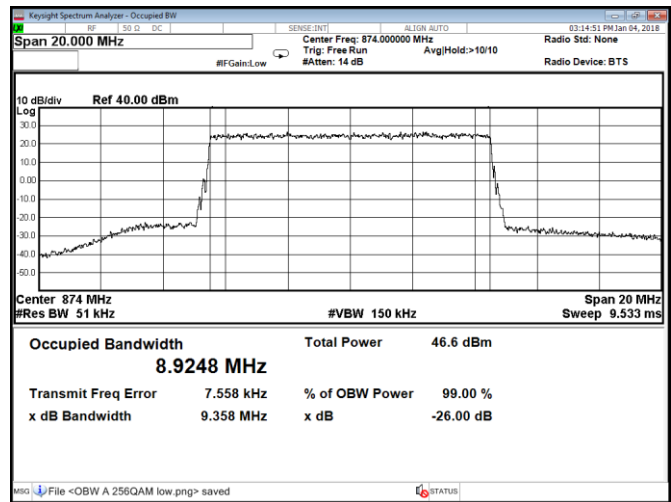


Figure 8.7-22: Occupied bandwidth, 256QAM, Port B, low channel, configuration 1

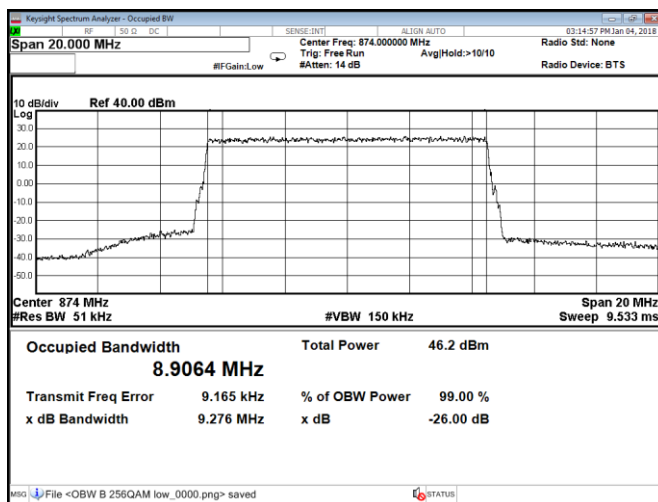


Figure 8.7-23: Occupied bandwidth, 256QAM, Port C, low channel, configuration 1

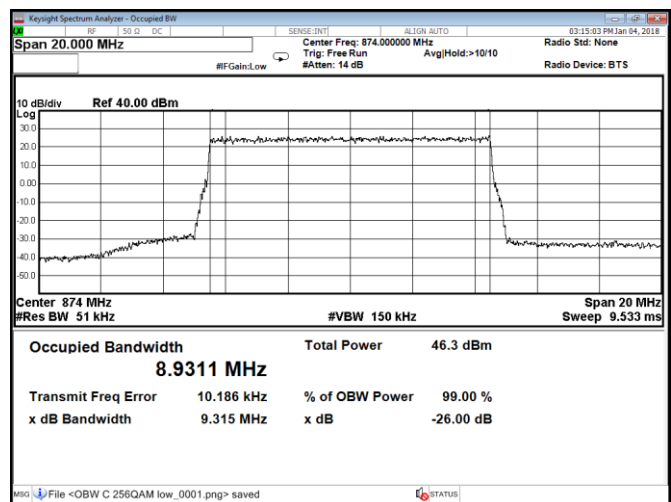


Figure 8.7-24: Occupied bandwidth, 256QAM, Port D, low channel, configuration 1

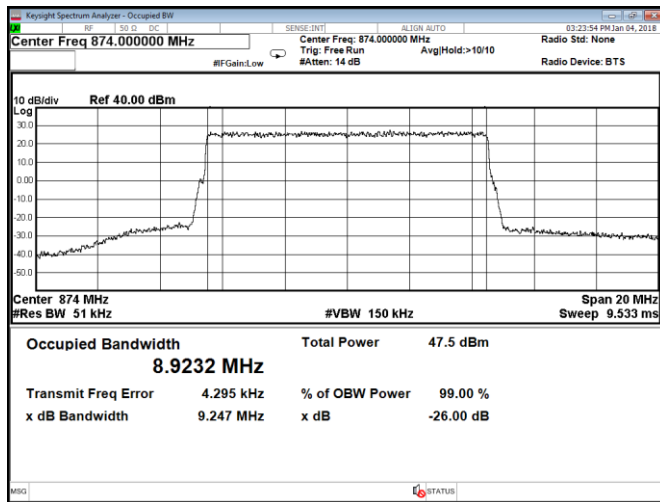


Figure 8.7-25: Occupied bandwidth, QPSK, Port A, low channel, configuration 2

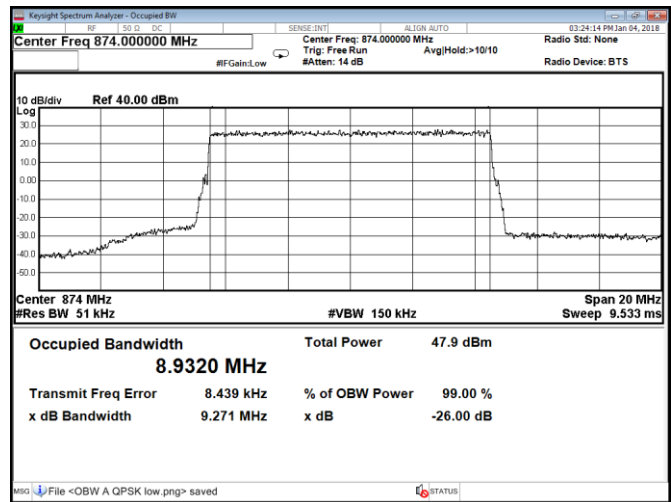


Figure 8.7-26: Occupied bandwidth, QPSK, Port D, low channel, configuration 2

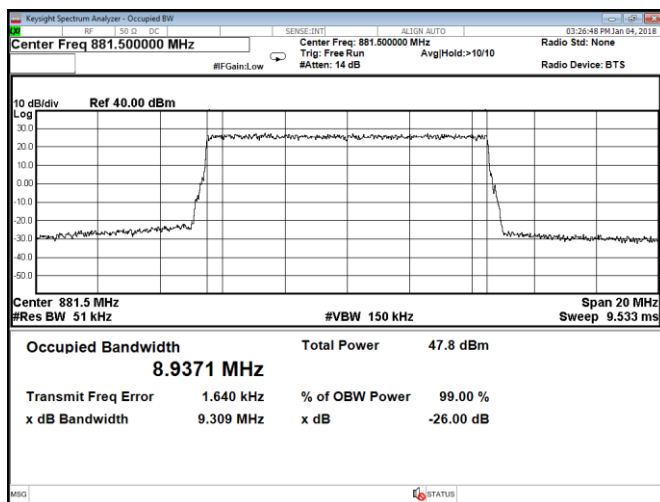


Figure 8.7-27: Occupied bandwidth, QPSK, Port A, mid channel, configuration 2

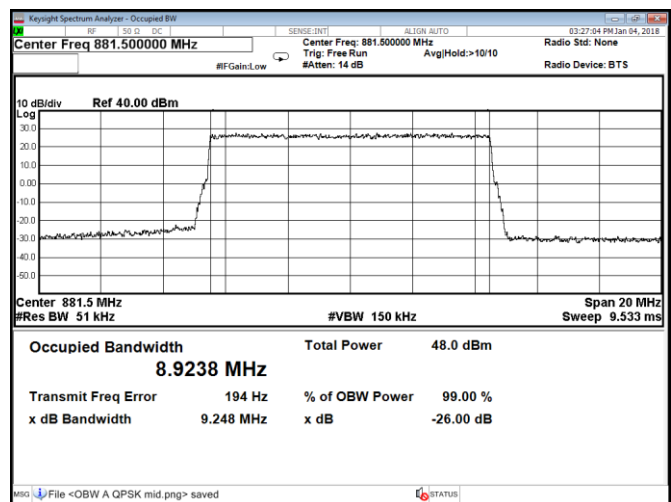


Figure 8.7-28: Occupied bandwidth, QPSK, Port D, mid channel, configuration 2