



# TEST REPORT

No.I18Z60791-WMD01

for

**Radio 4415 B70 KRC 161 760/3**

**Remote Radio Unit**

**FCC ID: TA8FKRC161760-3**

**In accordance with FCC CFR 47 Part 27**

**Issued Date: 2018-06-13**



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**Test Laboratory:**

**ISED(IC) accredited test site number: 12389A-1 / 12389B-1**

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## **REPORT HISTORY**

<b>Report Number</b>	<b>Revision</b>	<b>Description</b>	<b>Issue Date</b>
I18Z60791-WMD01	Rev.0	1 <sup>st</sup> edition	2018-06-13



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## **1. Test Laboratory**

### **1.1. Testing Location**

Location 1:CTTL(Kangding Road) 12389B-1

Address: No. 18, Kangding Road, Yizhuang, Beijing,  
P. R. China 100176

Location 2:CTTL(Shouxiang) conducted testing

Address: No. 51 Shouxiang Science Building, Xueyuan Road,  
Haidian District, Beijing, P. R. China100191

### **1.2. Project data**

Testing Start Date: 2018-05-22

Testing End Date: 2018-06-13

### **1.3. Signature**



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**Dong Yuan**  
**(Prepared this test report)**



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**Zhou Yu**  
**(Reviewed this test report)**



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**Liu Baodian**  
**(Approved this test report)**



## **2. Client Information**

### **2.1. Applicant Information**

Company Name: Ericsson (China) Communications Company Ltd.  
Address /Post: Ericsson Tower, Lize East Street, Chaoyang District, Beijing 100102,  
P.R.China  
Contact: Weiqun Chen  
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### **2.2. Manufacturer Information**

Company Name: Ericsson AB  
Address /Post: Isafjordsgatan 10, 164 80 Stockholm  
Sweden  
Contact: /  
Email: /  
Telephone: /



### **3. Equipment Under Test (EUT)**

#### **3.1. About EUT**

Description	Remote Radio Unit
Product Name	Radio 4415 B70
Product Number	KRC 161 760/3
FCC ID	TA8FKRC161760-3
Antenna	N/A
Output power	Maximum 46.0dBm (40W) per port
Power source	-48V DC
Serial Number	D827382314
Hardware Version	R5A
Software Version	CXP9017316%7 R71EU
Frequency range	B70 : Rx: 1695-1710 MHz, Tx: 1995-2020 MHz
Supported TX/RX configuration	4 TX / 4 RX per unit
Maximum RF bandwidth (IBW)	25MHz (IBW for NB standalone is 20MHz)
Total number of supported carriers per port	5 DL/3 UL for LTE, 2 for NB-IoT standalone
Supported modulations	LTE: QPSK, 16QAM, 64QAM, 256QAM NB-IoT: QPSK
Date of receipt	2018-05-22

### **3.2. General Description**

The Equipment Under Test (EUT) is an Ericsson Remote Radio Unit working in 1995-2020MHz AWS band which provides communication connections in LTE / NB-IoT modes and MSR modes. The Radio 4415 B70 KRC 161 760/3 operates from a -48V DC supply.

The EUT includes 4 TX/RX ports and it can be configured to transmit in MIMO mode for LTE, and MIMO mode was used for measurements as the worst configuration. The complete testing was performed with the EUT transmitting at maximum RF power unless otherwise stated.

The EUT is shown in the photograph below. A full technical description can be found in the Manufacturer's documentation.



Equipment Under Test

### 3.3. Configuration Description

The following settings were used to representative for all traffic scenarios when settings with different modulations, channel bandwidths, number for carriers and RF configurations have been tested to find the worst case setting. The settings below were used for all measurements unless otherwise noted:

#### LTE

Configuration	Carrier	Carrier Bandwidth	Carrier Frequency Configuration (MHz)		
			Bottom	Middle	Top
LTE-MIMO-1C	1 Carrier	5MHz	1997.5	2007.5	2017.5
		10MHz	2000.0	2007.5	2015.0
		15MHz	2002.5	2007.5	2012.5
		20MHz	2005.0	2007.5	2010.0
LTE-MIMO-2C	2 Carriers	5MHz	-	1997.5 + 2017.5	-
		10MHz	-	2000 + 2015	-
LTE-MIMO-3C	3 Carriers	5MHz	-	1997.5 + 2002.5 + 2017.5	-
LTE-MIMO-5C	5 Carriers	5MHz	-	1997.5 + 2002.5 + 2007.5 + 2012.5 + 2017.5	-
LTE-MIMO-1C-BE	1 Carriers	5MHz	1997.5	N/A	2017.5
		10MHz	2000.0	N/A	2015.0
		15MHz	2002.5	N/A	2012.5
		20MHz	2005.0	N/A	2010.0
LTE-MIMO-2C-BE	2 Carriers	5MHz	1997.5 + 2002.5	N/A	2012.5 + 2017.5
		10MHz	2000 + 2010	N/A	2005 + 2015

#### NB-IoT

Configuration	Carrier	Carrier Bandwidth (MHz)	Carrier Frequency Configuration (MHz)		
			Bottom	Middle	Top
NB-IoT-InBand-1C	1 Carrier	5MHz	1997.5	2007.5	2017.5
		10MHz	2000.0	2007.5	2015.0
		15MHz	2002.5	2007.5	2012.5
		20MHz	2005.0	2007.5	2010.0
NB-IoT-InBand-1C-BE	1 Carrier	5MHz	1997.5	N/A	2017.5
		10MHz	2000.0	N/A	2015.0
		15MHz	2002.5	N/A	2012.5
		20MHz	2005.0	N/A	2010.0





Configuration	Carrier	Carrier Bandwidth (MHz)	Carrier Frequency Configuration (MHz)		
			Bottom	Middle	Top
NB-IoT-GuardBand-1C	1 Carrier	10MHz	2000.0	2007.5	2015.0
		15MHz	2002.5	2007.5	2012.5
		20MHz	2005.0	2007.5	2010.0
NB-IoT-GuardBand-1C-BE	1 Carrier	10MHz	2000.0	N/A	2015.0
		15MHz	2002.5	N/A	2012.5
		20MHz	2005.0	N/A	2010.0

Configuration	Carrier	Carrier Frequency Configuration (MHz)		
		Bottom	Middle	Top
NB-IoT-Standalone-1C	1 Carrier	1995.3	2007.5	2019.8
NB-IoT-Standalone-2C	2 Carrier	1995.3+2014.8	1997.7+2017.3	2000.2+2019.8
NB-IoT-Standalone-1C-BE	1 Carrier	1995.3	N/A	2019.8
NB-IoT-Standalone-2C-BE	2 Carrier	1995.3+1996.9	N/A	2018.2+2019.8

NB-IoT+LTE

Configuration	Carrier	LTE Carrier Bandwidth	Carrier Frequency Configuration (MHz)		
			Bottom	Middle	Top
NB-IoT+LTE-MIM O-MC-1	1NB+1L	5MHz	-	(NB)1995.3 + (L)2017.5	-
		10MHz	-	(NB)1995.3 + (L)2015	-
		15MHz	-	(NB)1995.3 + (L)2012.5	-
		20MHz	-	(NB)1995.3 + (L)2010	-
NB-IoT+LTE-MIM O-MC-2	2NB+1L	5MHz	(NB)1995.3 + (L)2005 + (NB)2014.8	(NB)1997.7 + (L)2007.5 + (NB)2017.3	(NB)2000.2 + (L)2010 + (NB)2019.8
		10MHz	(NB)1995.3 + (L)2005 + (NB)2014.8	(NB)1997.7 + (L)2007.5 + (NB)2017.3	(NB)2000.2 + (L)2010 + (NB)2019.8
		15MHz	(NB)1995.3 + (L)2005 + (NB)2014.8	(NB)1997.7 + (L)2007.5 + (NB)2017.3	(NB)2000.2 + (L)2010 + (NB)2019.8
		20MHz	-	(NB)1995.3 + 1995.9 + (L)2010	-
NB-IoT+LTE-MIM O-MC-3	2NB+3L	5MHz	(NB)1995.3 + (L)2000+2005+2010 + (NB)2014.8	(NB)1997.7 + (L)2002.5+2007.5+2012.5 + (NB)2017.3	(NB)2000.2 + (L)2005+2010+2015 + (NB)2019.8
	2NB+2L	10MHz	-	(NB)1995.3+1995.8 + (L)2005+2015	-
NB-IoT+LTE-MIM O-MC-1-BE	1NB+1L	5MHz	(NB)1995.3 + (L)1998	N/A	(L)2017.1 + (NB)2019.8
		10MHz	(NB)1995.3 + (L)2000.5	N/A	(L)2014.6 + (NB)2019.8
		15MHz	(NB)1995.3 + (L)2003	N/A	(L)2012.1 + (NB)2019.8
		20MHz	(NB)1995.3 + (L)2005.5	N/A	(L)2009.6 + (NB)2019.8
NB-IoT+LTE-MIM O-MC-2-BE	2NB+1L	5MHz	(NB)1995.3+1996.9+(L)19 99.6	N/A	(L)2015.5+(NB)2018.2+20 19.8
		10MHz	(NB)1995.3+1996.9+(L)20 02.1	N/A	(L)2013+(NB)2018.2+201 9.8
		15MHz	(NB)1995.3+1996.9+(L)20 04.6	N/A	(L)2010.5+(NB)2018.2+20 19.8
		20MHz	(NB)1995.3+1996.9+(L)20 07.1	N/A	(L)2008+(NB)2018.2+201 9.8

## 4. Reference Documents

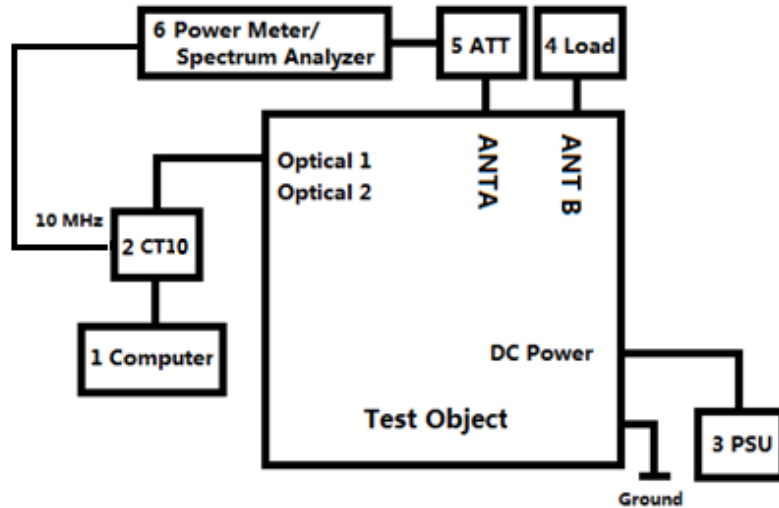
### 4.1. Reference Documents for testing

The following documents listed in this section are referred for testing.

Reference	Title	Version
FCC Part 27	MISCELLANEOUS WIRELESS COMMUNICATIONS SERVICES	10-1-17 Edition
FCC Part 2	FREQUENCY ALLOCATIONS AND RADIO TREATY MATTERS; GENERAL RULES AND REGULATIONS	10-1-17 Edition
ANSI/TIA-603-E	Land Mobile FM or PM Communications Equipment Measurement and Performance Standards	2016
ANSI C63.4	Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 KHz to 40 GHz	2014
ANSI 63.26	IEEE/ANSI Standard for Compliance Testing of Transmitters Used in Licensed Radio Services	2015
TIA 102.CAAA-E	Project 25 Digital C4FM/CQPSK Transceiver Measurement Methods	2016
KDB 971168 D01	MEASUREMENT GUIDANCE FOR CERTIFICATION OF LICENSED DIGITAL TRANSMITTERS	v03
KDB 662911 D01	Emissions Testing of Transmitters with Multiple Outputs in the Same Band	v02r01

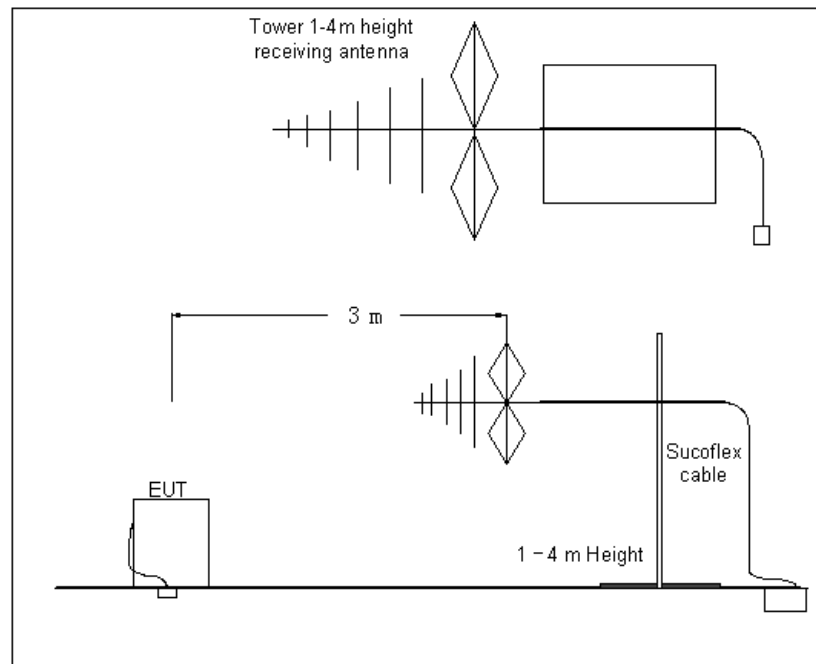
## 5. TEST SETUP

Test Setup, Conducted Measurement:



No.	Auxiliary Equipment	Model Type	Version
1	Computer	HP EliteBook 8540w	-
2	CT10	LPC 102 487/1	R1C
3	Power supply unit	PCR2000M	-
4	Load	TF150	-
5	40dB Attenuator	Aeroflex / Weinschel	-

Test Setup, Radiated Measurement:



## 6. LABORATORY ENVIRONMENT

**Control room / conducted chamber** did not exceed following limits along the EMC testing:

Temperature	Min. = 15 °C, Max. = 35 °C
Relative humidity	Min. = 20 %, Max. = 80 %
Shielding effectiveness	> 110 dB
Electrical insulation	> 2 MΩ
Ground system resistance	< 0.5 Ω

**Semi-anechoic chamber** (10 meters X 6.7 meters X 6.15 meters) did not exceed following limits along the EMC testing:

Temperature	Min. = 15 °C, Max. = 30 °C
Relative humidity	Min. = 35 %, Max. = 60 %
Shielding effectiveness	> 100 dB
Electrical insulation	> 2 MΩ
Ground system resistance	< 0.5 Ω
Normalised site attenuation (NSA)	< ± 3.5 dB, 3 m distance
Site voltage standing-wave ratio ( $S_{VSWR}$ )	Between 0 and 6 dB, from 1GHz to 18GHz
Uniformity of field strength	Between 0 and 6 dB, from 80 to 3000 MHz



## 7. SUMMARY OF TEST RESULTS

Items	Test Name	Clause in FCC rules	Verdict
1	Maximum Output Power and Peak-to-Average Power Ratio	27.50(d)	Pass
2	Equivalent Isotropically Radiated Power (EIRP)	-	N/A <sup>1</sup>
3	Occupied Bandwidth	27.53(h), 2.1049	Pass
4	Spurious Emissions at Band Edge	27.53(h)	Pass
5	Conducted Spurious Emission	27.53(h)	Pass
6	Radiated Spurious Emission	27.53 (h)	Pass
7	Frequency Stability	27.54	Pass
8	Receiver Spurious Emission	-	N/A

N/A<sup>1</sup> - Not Applicable, due to no integrated antenna

N/A – Not Applicable

## 8. Test Equipments Utilized

NO.	Description	TYPE	series number	MANUFACTURE	CAL DUE DATE
1	AC Power Supply	PCR2000M	PJ000583	Kikusui	2019-02-24
2	Load	TF150	11081907	Shanghai Huaxiang	-
3	40dB Attenuator	66-40-33	CD4019	Aeroflex / Weinschel	-
4	40dB Attenuator	TSG150R-4-40N11	1511040001	Nanjing Jiexi Technologies	-
5	Spectrum Analyzer	N9030	MY54490502	Keysight	2018-11-15
6	Power Sensor	NRP-Z91	103104	Rohde & Schwarz	2019-01-18
7	Power Sensor	NRP-Z21	102432	Rohde & Schwarz	2018-08-04
8	Power Meter	NRP2	105423-GL	Rohde & Schwarz	2018-08-15
9	EMI Antenna	3115	00167250	ETS-LINDGREN	2020-05-21
10	EMI Antenna	3116	2661	ETS-LINDGREN	2020-07-27
11	EMI Antenna	VULB 9163	9163-514	SCHWARZBECK	2021-01-03
12	Test Receiver	ESU26	100376	Rohde & Schwarz	2018-11-27
13	Climate Chamber	KTHG-415TBS	7353K	QINGSHENG	2018-12-16

## 9. MEASUREMENT UNCERTAINTY

For a 95% confidence level, the measurement uncertainties for defined systems are:

Test Discipline	Measurement Uncertainty
Conducted Maximum Peak Output Power	0.5dB
Occupied Bandwidth	1.1Hz
Conducted Spurious Emissions	2.3dB
Band Edge	2.3dB
Radiated Spurious Emissions	5.4dB
Frequency Stability	$<\pm 1 \times 10^{-7}$

## **ANNEX A: MEASUREMENT RESULTS**

### **A.1 Maximum Output Power and Peak-to-Average Power Ratio**

#### **A.1.1 Reference**

FCC CFR 47 Part 27, Clause 27.50 (d)

#### **A.1.2 Method of Measurements**

During the process of testing, the EUT was configured to transmit on maximum power and proper modulation. In case of the EUT was configured to MIMO mode, since the EUT transmits on all antennas simultaneously in the same frequency range, using the Measure-and-Sum approach, the output power at all antennas were tested, and the total output power were then summed mathematically in linear power units according to FCC KDB 662911 D01.

A peak to average ratio measurement is performed at the conducted ports of the EUT for single carrier for single RAT mode. The spectrum analyzers Complementary Cumulative Distribution Function (CCDF) was used and 0.1% probability value recorded.

#### **A.1.3 Limit**

Output Power:

(EIRP) 1640 W or 62.15 dBm for emission bandwidth  $\leq$  1MHz

1640 W/MHz or 62.15 dBm/MHz for emission bandwidth > 1MHz

Peak to Average Ratio: 13 dB



**A.1.4 Measurement result**

Configuration LTE-MIMO-1C

Maximum Output Power 46.02dBm per port

Antenna	Modulation/ Carrier Bandwidth (MHz)	Output Power / Peak to Average Ratio (PAR)								
		Channel position B			Channel position M			Channel position T		
		POWER (dBm)	POWER (dBm/MHz)	PAR (db)	POWER (dBm)	POWER (dBm/MHz)	PAR (db)	POWER (dBm)	POWER (dBm/MHz)	PAR (db)
A	QPSK/5.0	45.72	38.71	7.30	45.83	38.78	7.28	45.62	38.58	7.31
B		45.91	38.72	7.30	45.99	38.76	7.27	45.89	38.57	7.31
C		45.87	38.62	7.30	45.97	38.65	7.27	45.86	38.51	7.31
D		45.72	38.62	7.30	45.82	38.74	7.28	45.62	38.53	7.31
Total		51.83	44.69	-	51.92	44.75	-	51.77	44.57	-

Antenna	Modulation/ Carrier Bandwidth (MHz)	Output Power / Peak to Average Ratio (PAR)								
		Channel position B			Channel position M			Channel position T		
		POWER (dBm)	POWER (dBm/MHz)	PAR (db)	POWER (dBm)	POWER (dBm/MHz)	PAR (db)	POWER (dBm)	POWER (dBm/MHz)	PAR (db)
A	16QAM/5.0	45.79	38.70	7.30	45.85	38.71	7.28	45.66	38.65	7.32
B		45.95	38.71	7.30	46.03	38.72	7.28	45.90	38.57	7.32
C		45.91	38.62	7.31	46.00	38.70	7.27	45.90	38.54	7.32
D		45.79	38.67	7.30	45.86	38.71	7.27	45.64	38.54	7.31
Total		51.88	44.70	-	51.96	44.73	-	51.80	44.60	-

Antenna	Modulation/ Carrier Bandwidth (MHz)	Output Power / Peak to Average Ratio (PAR)								
		Channel position B			Channel position M			Channel position T		
		POWER (dBm)	POWER (dBm/MHz)	PAR (db)	POWER (dBm)	POWER (dBm/MHz)	PAR (db)	POWER (dBm)	POWER (dBm/MHz)	PAR (db)
A	64QAM/5.0	45.76	38.68	7.31	45.83	38.73	7.27	45.60	38.55	7.31
B		45.92	38.73	7.30	45.99	38.76	7.27	45.86	38.57	7.31
C		45.79	38.60	7.31	45.88	38.65	7.28	45.78	38.54	7.31
D		45.61	38.60	7.31	45.72	38.71	7.28	45.52	38.56	7.31
Total		51.79	44.67	-	51.88	44.73	-	51.71	44.58	-

Antenna	Modulation/ Carrier Bandwidth (MHz)	Output Power / Peak to Average Ratio (PAR)								
		Channel position B			Channel position M			Channel position T		
		POWER (dBm)	POWER (dBm/MHz)	PAR (db)	POWER (dBm)	POWER (dBm/MHz)	PAR (db)	POWER (dBm)	POWER (dBm/MHz)	PAR (db)
A	256QAM /5.0	45.73	38.70	7.32	45.80	38.72	7.30	45.60	38.54	7.34
B		45.92	38.71	7.32	45.98	38.77	7.30	45.85	38.57	7.34
C		45.81	38.61	7.32	45.91	38.68	7.30	45.81	38.51	7.33
D		45.67	38.61	7.33	45.78	38.72	7.30	45.55	38.53	7.33
Total		51.80	44.68	-	51.89	44.74	-	51.73	44.56	-



Maximum Output Power 46.02dBm per port

Antenna	Modulation/ Carrier Bandwidth (MHz)	Output Power / Peak to Average Ratio (PAR)								
		Channel position B			Channel position M			Channel position T		
		POWER (dBm)	POWER (dBm/MHz)	PAR (db)	POWER (dBm)	POWER (dBm/MHz)	PAR (db)	POWER (dBm)	POWER (dBm/MHz)	PAR (db)
A	QPSK/ 10.0	45.79	35.70	7.29	45.81	35.72	7.28	45.67	35.69	7.31
B		45.99	35.79	7.29	46.02	35.81	7.28	45.94	35.71	7.31
C		45.93	35.67	7.29	45.98	35.71	7.28	45.93	35.66	7.31
D		45.82	35.75	7.29	45.88	35.82	7.28	45.78	35.71	7.31
Total		51.90	41.75	-	51.94	41.79	-	51.85	41.71	-

Antenna	Modulation/ Carrier Bandwidth (MHz)	Output Power / Peak to Average Ratio (PAR)								
		Channel position B			Channel position M			Channel position T		
		POWER (dBm)	POWER (dBm/MHz)	PAR (db)	POWER (dBm)	POWER (dBm/MHz)	PAR (db)	POWER (dBm)	POWER (dBm/MHz)	PAR (db)
A	16QAM/ 10.0	45.79	35.67	7.29	45.83	35.68	7.28	45.65	35.67	7.31
B		45.99	35.71	7.30	46.01	35.78	7.28	45.92	35.70	7.31
C		45.91	35.67	7.30	45.96	35.78	7.28	45.91	35.70	7.31
D		45.80	35.71	7.29	45.85	35.79	7.28	45.72	35.72	7.31
Total		51.89	41.71	-	51.93	41.78	-	51.82	41.72	-

Antenna	Modulation/ Carrier Bandwidth (MHz)	Output Power / Peak to Average Ratio (PAR)								
		Channel position B			Channel position M			Channel position T		
		POWER (dBm)	POWER (dBm/MHz)	PAR (db)	POWER (dBm)	POWER (dBm/MHz)	PAR (db)	POWER (dBm)	POWER (dBm/MHz)	PAR (db)
A	64QAM/ 10.0	45.78	35.65	7.30	45.80	35.76	7.29	45.67	35.57	7.32
B		45.99	35.76	7.31	46.01	35.82	7.29	45.94	35.69	7.31
C		45.92	35.67	7.30	45.98	35.71	7.29	45.92	35.67	7.31
D		45.83	35.74	7.31	45.87	35.81	7.29	45.76	35.71	7.31
Total		51.90	41.73	-	51.94	41.80	-	51.84	41.68	-

Antenna	Modulation/ Carrier Bandwidth (MHz)	Output Power / Peak to Average Ratio (PAR)								
		Channel position B			Channel position M			Channel position T		
		POWER (dBm)	POWER (dBm/MHz)	PAR (db)	POWER (dBm)	POWER (dBm/MHz)	PAR (db)	POWER (dBm)	POWER (dBm/MHz)	PAR (db)
A	256QAM /10.0	45.78	35.68	7.31	45.82	35.75	7.29	45.67	35.58	7.32
B		46.00	35.77	7.31	46.02	35.82	7.29	45.95	35.72	7.32
C		45.95	35.71	7.30	45.98	35.73	7.29	45.94	35.70	7.31
D		45.84	35.75	7.31	45.88	35.81	7.29	45.76	35.74	7.31
Total		51.91	41.75	-	51.95	41.80	-	51.85	41.71	-



Maximum Output Power 46.02dBm per port

Antenna	Modulation/ Carrier Bandwidth (MHz)	Output Power / Peak to Average Ratio (PAR)								
		Channel position B			Channel position M			Channel position T		
		POWER (dBm)	POWER (dBm/MHz)	PAR (db)	POWER (dBm)	POWER (dBm/MHz)	PAR (db)	POWER (dBm)	POWER (dBm/MHz)	PAR (db)
A	QPSK/ 15.0	45.84	33.91	7.30	45.82	33.92	7.29	45.75	33.85	7.33
B		46.03	34.03	7.30	46.04	34.07	7.30	46.00	33.97	7.32
C		45.99	34.00	7.30	46.01	34.04	7.30	45.99	33.98	7.31
D		45.88	34.02	7.30	45.91	34.04	7.29	45.85	34.02	7.32
Total		51.96	40.01	-	51.97	40.04	-	51.92	39.98	-

Antenna	Modulation/ Carrier Bandwidth (MHz)	Output Power / Peak to Average Ratio (PAR)								
		Channel position B			Channel position M			Channel position T		
		POWER (dBm)	POWER (dBm/MHz)	PAR (db)	POWER (dBm)	POWER (dBm/MHz)	PAR (db)	POWER (dBm)	POWER (dBm/MHz)	PAR (db)
A	16QAM/ 15.0	45.84	33.94	7.29	45.82	33.93	7.29	45.77	33.95	7.31
B		46.03	34.04	7.30	46.03	34.01	7.29	46.00	33.97	7.30
C		45.94	34.01	7.30	45.95	34.03	7.29	45.93	33.96	7.30
D		45.81	34.03	7.29	45.82	34.03	7.29	45.76	34.02	7.30
Total		51.93	40.03	-	51.93	40.02	-	51.89	40.00	-

Antenna	Modulation/ Carrier Bandwidth (MHz)	Output Power / Peak to Average Ratio (PAR)								
		Channel position B			Channel position M			Channel position T		
		POWER (dBm)	POWER (dBm/MHz)	PAR (db)	POWER (dBm)	POWER (dBm/MHz)	PAR (db)	POWER (dBm)	POWER (dBm/MHz)	PAR (db)
A	64QAM/ 15.0	45.83	33.98	7.31	45.82	33.98	7.30	45.78	33.93	7.33
B		46.02	34.01	7.31	46.03	34.02	7.31	46.01	33.97	7.32
C		45.93	34.02	7.31	45.94	34.03	7.31	45.92	33.96	7.32
D		45.82	34.02	7.30	45.84	34.06	7.30	45.86	34.01	7.32
Total		51.92	40.03	-	51.93	40.04	-	51.91	39.99	-

Antenna	Modulation/ Carrier Bandwidth (MHz)	Output Power / Peak to Average Ratio (PAR)								
		Channel position B			Channel position M			Channel position T		
		POWER (dBm)	POWER (dBm/MHz)	PAR (db)	POWER (dBm)	POWER (dBm/MHz)	PAR (db)	POWER (dBm)	POWER (dBm/MHz)	PAR (db)
A	256QAM /15.0	45.86	33.94	7.31	45.77	33.94	7.30	45.71	33.82	7.33
B		46.03	34.02	7.31	46.00	34.05	7.31	45.97	33.99	7.32
C		45.93	34.02	7.31	45.94	34.03	7.31	45.92	33.98	7.32
D		45.81	34.03	7.31	45.83	34.04	7.30	45.76	34.02	7.32
Total		51.93	40.02	-	51.91	40.04	-	51.86	39.97	-



Maximum Output Power 46.02dBm per port

Antenna	Modulation/ Carrier Bandwidth (MHz)	Output Power / Peak to Average Ratio (PAR)								
		Channel position B			Channel position M			Channel position T		
		POWER (dBm)	POWER (dBm/MHz)	PAR (db)	POWER (dBm)	POWER (dBm/MHz)	PAR (db)	POWER (dBm)	POWER (dBm/MHz)	PAR (db)
A	QPSK/ 20.0	45.78	32.67	7.31	45.77	32.68	7.30	45.75	32.61	7.31
B		46.03	32.78	7.30	46.02	32.82	7.30	46.01	32.71	7.30
C		45.95	32.78	7.30	45.95	32.77	7.30	45.94	32.71	7.31
D		45.82	32.81	7.30	45.82	32.82	7.29	45.80	32.81	7.30
Total		51.92	38.78	-	51.91	38.79	-	51.90	38.73	-

Antenna	Modulation/ Carrier Bandwidth (MHz)	Output Power / Peak to Average Ratio (PAR)								
		Channel position B			Channel position M			Channel position T		
		POWER (dBm)	POWER (dBm/MHz)	PAR (db)	POWER (dBm)	POWER (dBm/MHz)	PAR (db)	POWER (dBm)	POWER (dBm/MHz)	PAR (db)
A	16QAM/ 20.0	45.80	32.72	7.29	45.78	32.70	7.29	45.76	32.65	7.30
B		46.02	32.77	7.29	46.03	32.70	7.29	46.01	32.73	7.29
C		45.96	32.78	7.29	45.97	32.73	7.29	45.96	32.75	7.30
D		45.85	32.82	7.30	45.83	32.81	7.29	45.82	32.72	7.30
Total		51.93	38.79	-	51.92	38.76	-	51.91	38.73	-

Antenna	Modulation/ Carrier Bandwidth (MHz)	Output Power / Peak to Average Ratio (PAR)								
		Channel position B			Channel position M			Channel position T		
		POWER (dBm)	POWER (dBm/MHz)	PAR (db)	POWER (dBm)	POWER (dBm/MHz)	PAR (db)	POWER (dBm)	POWER (dBm/MHz)	PAR (db)
A	64QAM/ 20.0	45.78	32.74	7.31	45.77	32.69	7.31	45.74	32.71	7.31
B		46.01	32.78	7.30	46.02	32.74	7.31	46.00	32.75	7.31
C		45.95	32.78	7.30	45.98	32.71	7.30	45.96	32.68	7.32
D		45.84	32.80	7.31	45.86	32.86	7.30	45.82	32.71	7.32
Total		51.92	38.80	-	51.93	38.77	-	51.90	38.73	-

Antenna	Modulation/ Carrier Bandwidth (MHz)	Output Power / Peak to Average Ratio (PAR)								
		Channel position B			Channel position M			Channel position T		
		POWER (dBm)	POWER (dBm/MHz)	PAR (db)	POWER (dBm)	POWER (dBm/MHz)	PAR (db)	POWER (dBm)	POWER (dBm/MHz)	PAR (db)
A	256QAM /20.0	45.79	32.73	7.31	45.77	32.70	7.31	45.74	32.68	7.31
B		46.02	32.78	7.31	46.02	32.78	7.31	46.01	32.75	7.32
C		45.88	32.77	7.30	45.89	32.78	7.30	45.88	32.67	7.31
D		45.75	32.82	7.31	45.76	32.82	7.30	45.74	32.71	7.31
Total		51.88	38.80	-	51.88	38.79	-	51.86	38.72	-



Configuration LTE-MIMO-2C  
Maximum Output Power 46.02dBm per port

Antenna	Modulation/ Carrier Bandwidth (MHz)	Output Power / Peak to Average Ratio (PAR)								
		Channel position B			Channel position M			Channel position T		
		POWER (dBm)	POWER (dBm/MHz)	PAR (db)	POWER (dBm)	POWER (dBm/MHz)	PAR (db)	POWER (dBm)	POWER (dBm/MHz)	PAR (db)
A	QPSK/5.0	-	-	-	45.42	-	-	-	-	-
B		-	-	-	45.64	-	-	-	-	-
C		-	-	-	45.53	-	-	-	-	-
D		-	-	-	45.31	-	-	-	-	-
Total		-	-	-	51.50	-	-	-	-	-

Antenna	Modulation/ Carrier Bandwidth (MHz)	Output Power / Peak to Average Ratio (PAR)								
		Channel position B			Channel position M			Channel position T		
		POWER (dBm)	POWER (dBm/MHz)	PAR (db)	POWER (dBm)	POWER (dBm/MHz)	PAR (db)	POWER (dBm)	POWER (dBm/MHz)	PAR (db)
A	16QAM/5.0	-	-	-	45.41	-	-	-	-	-
B		-	-	-	45.62	-	-	-	-	-
C		-	-	-	45.54	-	-	-	-	-
D		-	-	-	45.32	-	-	-	-	-
Total		-	-	-	51.49	-	-	-	-	-

Antenna	Modulation/ Carrier Bandwidth (MHz)	Output Power / Peak to Average Ratio (PAR)								
		Channel position B			Channel position M			Channel position T		
		POWER (dBm)	POWER (dBm/MHz)	PAR (db)	POWER (dBm)	POWER (dBm/MHz)	PAR (db)	POWER (dBm)	POWER (dBm/MHz)	PAR (db)
A	64QAM/5.0	-	-	-	45.41	-	-	-	-	-
B		-	-	-	45.63	-	-	-	-	-
C		-	-	-	45.54	-	-	-	-	-
D		-	-	-	45.35	-	-	-	-	-
Total		-	-	-	51.50	-	-	-	-	-

Antenna	Modulation/ Carrier Bandwidth (MHz)	Output Power / Peak to Average Ratio (PAR)								
		Channel position B			Channel position M			Channel position T		
		POWER (dBm)	POWER (dBm/MHz)	PAR (db)	POWER (dBm)	POWER (dBm/MHz)	PAR (db)	POWER (dBm)	POWER (dBm/MHz)	PAR (db)
A	256QAM /5.0	-	-	-	45.38	-	-	-	-	-
B		-	-	-	45.62	-	-	-	-	-
C		-	-	-	45.54	-	-	-	-	-
D		-	-	-	45.34	-	-	-	-	-
Total		-	-	-	51.49	-	-	-	-	-



Maximum Output Power 46.02dBm per port

Antenna	Modulation/ Carrier Bandwidth (MHz)	Output Power / Peak to Average Ratio (PAR)								
		Channel position B			Channel position M			Channel position T		
		POWER (dBm)	POWER (dBm/MHz)	PAR (db)	POWER (dBm)	POWER (dBm/MHz)	PAR (db)	POWER (dBm)	POWER (dBm/MHz)	PAR (db)
A	QPSK/ 10.0	-	-	-	45.61	-	-	-	-	-
B		-	-	-	45.87	-	-	-	-	-
C		-	-	-	45.80	-	-	-	-	-
D		-	-	-	45.66	-	-	-	-	-
Total		-	-	-	51.76	-	-	-	-	-

Antenna	Modulation/ Carrier Bandwidth (MHz)	Output Power / Peak to Average Ratio (PAR)								
		Channel position B			Channel position M			Channel position T		
		POWER (dBm)	POWER (dBm/MHz)	PAR (db)	POWER (dBm)	POWER (dBm/MHz)	PAR (db)	POWER (dBm)	POWER (dBm/MHz)	PAR (db)
A	16QAM/ 10.0	-	-	-	45.62	-	-	-	-	-
B		-	-	-	45.87	-	-	-	-	-
C		-	-	-	45.81	-	-	-	-	-
D		-	-	-	45.67	-	-	-	-	-
Total		-	-	-	51.76	-	-	-	-	-

Antenna	Modulation/ Carrier Bandwidth (MHz)	Output Power / Peak to Average Ratio (PAR)								
		Channel position B			Channel position M			Channel position T		
		POWER (dBm)	POWER (dBm/MHz)	PAR (db)	POWER (dBm)	POWER (dBm/MHz)	PAR (db)	POWER (dBm)	POWER (dBm/MHz)	PAR (db)
A	64QAM/ 10.0	-	-	-	45.61	-	-	-	-	-
B		-	-	-	45.86	-	-	-	-	-
C		-	-	-	45.81	-	-	-	-	-
D		-	-	-	45.67	-	-	-	-	-
Total		-	-	-	51.76	-	-	-	-	-

Antenna	Modulation/ Carrier Bandwidth (MHz)	Output Power / Peak to Average Ratio (PAR)								
		Channel position B			Channel position M			Channel position T		
		POWER (dBm)	POWER (dBm/MHz)	PAR (db)	POWER (dBm)	POWER (dBm/MHz)	PAR (db)	POWER (dBm)	POWER (dBm/MHz)	PAR (db)
A	256QAM /10.0	-	-	-	45.61	-	-	-	-	-
B		-	-	-	45.86	-	-	-	-	-
C		-	-	-	45.81	-	-	-	-	-
D		-	-	-	45.67	-	-	-	-	-
Total		-	-	-	51.76	-	-	-	-	-



Configuration LTE-MIMO-3C  
Maximum Output Power 46.02dBm per port

Antenna	Modulation/ Carrier Bandwidth (MHz)	Output Power / Peak to Average Ratio (PAR)								
		Channel position B			Channel position M			Channel position T		
		POWER (dBm)	POWER (dBm/MHz)	PAR (db)	POWER (dBm)	POWER (dBm/MHz)	PAR (db)	POWER (dBm)	POWER (dBm/MHz)	PAR (db)
A	QPSK/5.0	-	-	-	45.42	-	-	-	-	-
B		-	-	-	45.65	-	-	-	-	-
C		-	-	-	45.63	-	-	-	-	-
D		-	-	-	45.48	-	-	-	-	-
Total		-	-	-	51.57	-	-	-	-	-

Antenna	Modulation/ Carrier Bandwidth (MHz)	Output Power / Peak to Average Ratio (PAR)								
		Channel position B			Channel position M			Channel position T		
		POWER (dBm)	POWER (dBm/MHz)	PAR (db)	POWER (dBm)	POWER (dBm/MHz)	PAR (db)	POWER (dBm)	POWER (dBm/MHz)	PAR (db)
A	16QAM/5.0	-	-	-	45.41	-	-	-	-	-
B		-	-	-	45.64	-	-	-	-	-
C		-	-	-	45.64	-	-	-	-	-
D		-	-	-	45.47	-	-	-	-	-
Total		-	-	-	51.56	-	-	-	-	-

Antenna	Modulation/ Carrier Bandwidth (MHz)	Output Power / Peak to Average Ratio (PAR)								
		Channel position B			Channel position M			Channel position T		
		POWER (dBm)	POWER (dBm/MHz)	PAR (db)	POWER (dBm)	POWER (dBm/MHz)	PAR (db)	POWER (dBm)	POWER (dBm/MHz)	PAR (db)
A	64QAM/5.0	-	-	-	45.42	-	-	-	-	-
B		-	-	-	45.66	-	-	-	-	-
C		-	-	-	45.64	-	-	-	-	-
D		-	-	-	45.50	-	-	-	-	-
Total		-	-	-	51.58	-	-	-	-	-

Antenna	Modulation/ Carrier Bandwidth (MHz)	Output Power / Peak to Average Ratio (PAR)								
		Channel position B			Channel position M			Channel position T		
		POWER (dBm)	POWER (dBm/MHz)	PAR (db)	POWER (dBm)	POWER (dBm/MHz)	PAR (db)	POWER (dBm)	POWER (dBm/MHz)	PAR (db)
A	256QAM /5.0	-	-	-	45.40	-	-	-	-	-
B		-	-	-	45.64	-	-	-	-	-
C		-	-	-	45.67	-	-	-	-	-
D		-	-	-	45.41	-	-	-	-	-
Total		-	-	-	51.55	-	-	-	-	-



Configuration LTE-MIMO-5C  
Maximum Output Power 46.02dBm per port

Antenna	Modulation/ Carrier Bandwidth (MHz)	Output Power / Peak to Average Ratio (PAR)								
		Channel position B			Channel position M			Channel position T		
		POWER (dBm)	POWER (dBm/MHz)	PAR (db)	POWER (dBm)	POWER (dBm/MHz)	PAR (db)	POWER (dBm)	POWER (dBm/MHz)	PAR (db)
A	QPSK/ 5.0	-	-	-	45.62	-	-	-	-	-
B		-	-	-	45.85	-	-	-	-	-
C		-	-	-	45.81	-	-	-	-	-
D		-	-	-	45.66	-	-	-	-	-
Total		-	-	-	51.76	-	-	-	-	-

Antenna	Modulation/ Carrier Bandwidth (MHz)	Output Power / Peak to Average Ratio (PAR)								
		Channel position B			Channel position M			Channel position T		
		POWER (dBm)	POWER (dBm/MHz)	PAR (db)	POWER (dBm)	POWER (dBm/MHz)	PAR (db)	POWER (dBm)	POWER (dBm/MHz)	PAR (db)
A	16QAM/ 5.0	-	-	-	45.62	-	-	-	-	-
B		-	-	-	45.84	-	-	-	-	-
C		-	-	-	45.80	-	-	-	-	-
D		-	-	-	45.67	-	-	-	-	-
Total		-	-	-	51.75	-	-	-	-	-

Antenna	Modulation/ Carrier Bandwidth (MHz)	Output Power / Peak to Average Ratio (PAR)								
		Channel position B			Channel position M			Channel position T		
		POWER (dBm)	POWER (dBm/MHz)	PAR (db)	POWER (dBm)	POWER (dBm/MHz)	PAR (db)	POWER (dBm)	POWER (dBm/MHz)	PAR (db)
A	64QAM/ 5.0	-	-	-	45.65	-	-	-	-	-
B		-	-	-	45.84	-	-	-	-	-
C		-	-	-	45.82	-	-	-	-	-
D		-	-	-	45.67	-	-	-	-	-
Total		-	-	-	51.77	-	-	-	-	-

Antenna	Modulation/ Carrier Bandwidth (MHz)	Output Power / Peak to Average Ratio (PAR)								
		Channel position B			Channel position M			Channel position T		
		POWER (dBm)	POWER (dBm/MHz)	PAR (db)	POWER (dBm)	POWER (dBm/MHz)	PAR (db)	POWER (dBm)	POWER (dBm/MHz)	PAR (db)
A	256QAM /5.0	-	-	-	45.59	-	-	-	-	-
B		-	-	-	45.84	-	-	-	-	-
C		-	-	-	45.85	-	-	-	-	-
D		-	-	-	45.71	-	-	-	-	-
Total		-	-	-	51.77	-	-	-	-	-





Configuration NB-IoT-InBand-1C

Maximum Output Power 46.02dBm per port

Antenna	Modulation/ Carrier Bandwidth (MHz)	Output Power / Peak to Average Ratio (PAR)								
		Channel position B			Channel position M			Channel position T		
		POWER (dBm)	POWER (dBm/MHz)	PAR (db)	POWER (dBm)	POWER (dBm/MHz)	PAR (db)	POWER (dBm)	POWER (dBm/MHz)	PAR (db)
B	QPSK/5.0	45.90	38.77	7.30	45.98	38.82	7.28	45.83	38.62	7.31

Antenna	Modulation/ Carrier Bandwidth (MHz)	Output Power / Peak to Average Ratio (PAR)								
		Channel position B			Channel position M			Channel position T		
		POWER (dBm)	POWER (dBm/MHz)	PAR (db)	POWER (dBm)	POWER (dBm/MHz)	PAR (db)	POWER (dBm)	POWER (dBm/MHz)	PAR (db)
B	QPSK/10.0	45.92	35.73	7.30	46.01	35.81	7.29	45.93	35.66	7.33

Antenna	Modulation/ Carrier Bandwidth (MHz)	Output Power / Peak to Average Ratio (PAR)								
		Channel position B			Channel position M			Channel position T		
		POWER (dBm)	POWER (dBm/MHz)	PAR (db)	POWER (dBm)	POWER (dBm/MHz)	PAR (db)	POWER (dBm)	POWER (dBm/MHz)	PAR (db)
B	QPSK/15.0	46.00	33.97	7.30	46.00	33.02	7.30	45.95	33.95	7.32

Antenna	Modulation/ Carrier Bandwidth (MHz)	Output Power / Peak to Average Ratio (PAR)								
		Channel position B			Channel position M			Channel position T		
		POWER (dBm)	POWER (dBm/MHz)	PAR (db)	POWER (dBm)	POWER (dBm/MHz)	PAR (db)	POWER (dBm)	POWER (dBm/MHz)	PAR (db)
B	QPSK/20.0	45.97	32.82	7.30	45.99	32.80	7.30	45.97	32.76	7.31

Configuration NB-IoT-GuardBand-1C

Maximum Output Power 46.02dBm per port

Antenna	Modulation/ Carrier Bandwidth (MHz)	Output Power / Peak to Average Ratio (PAR)								
		Channel position B			Channel position M			Channel position T		
		POWER (dBm)	POWER (dBm/MHz)	PAR (db)	POWER (dBm)	POWER (dBm/MHz)	PAR (db)	POWER (dBm)	POWER (dBm/MHz)	PAR (db)
B	QPSK/10.0	45.76	35.61	7.46	45.80	35.67	7.46	45.72	35.56	7.47

Antenna	Modulation/ Carrier Bandwidth (MHz)	Output Power / Peak to Average Ratio (PAR)								
		Channel position B			Channel position M			Channel position T		
		POWER (dBm)	POWER (dBm/MHz)	PAR (db)	POWER (dBm)	POWER (dBm/MHz)	PAR (db)	POWER (dBm)	POWER (dBm/MHz)	PAR (db)
B	QPSK/15.0	45.83	33.87	7.41	45.83	33.96	7.41	45.79	33.91	7.42



Antenna	Modulation/ Carrier Bandwidth (MHz)	Output Power / Peak to Average Ratio (PAR)								
		Channel position B			Channel position M			Channel position T		
		POWER (dBm)	POWER (dBm/MHz)	PAR (db)	POWER (dBm)	POWER (dBm/MHz)	PAR (db)	POWER (dBm)	POWER (dBm/MHz)	PAR (db)
B	QPSK/20.0	45.94	32.78	7.32	45.94	32.77	7.31	45.93	32.76	7.32

Configuration NB-IoT-StandAlone-1C

Maximum Output Power 43.01dBm per port

Antenna	Modulation/ Carrier Bandwidth (KHz)	Output Power / Peak to Average Ratio (PAR)								
		Channel position B			Channel position M			Channel position T		
		POWER (dBm)	POWER (dBm/MHz)	PAR (db)	POWER (dBm)	POWER (dBm/MHz)	PAR (db)	POWER (dBm)	POWER (dBm/MHz)	PAR (db)
A	QPSK/ 250.0	42.19	-	4.59	42.18	-	4.61	42.12	-	4.60
B		42.37	-	4.61	42.37	-	4.60	42.37	-	4.62
C		42.35	-	4.58	42.47	-	4.57	42.48	-	4.61
D		42.28	-	4.62	42.32	-	4.58	42.17	-	4.60
Total		48.32	-	-	48.36	-	-	48.31	-	-

Configuration NB-IoT-StandAlone-2C

Maximum Output Power 46.02dBm per port

Antenna	Modulation/ Carrier Bandwidth (KHz)	Output Power / Peak to Average Ratio (PAR)								
		Channel position B			Channel position M			Channel position T		
		POWER (dBm)	POWER (dBm/MHz)	PAR (db)	POWER (dBm)	POWER (dBm/MHz)	PAR (db)	POWER (dBm)	POWER (dBm/MHz)	PAR (db)
A	QPSK/ 250.0	45.13	-	-	45.19	-	-	45.18	-	-
B		45.38	-	-	45.41	-	-	45.39	-	-
C		45.38	-	-	45.40	-	-	45.41	-	-
D		45.23	-	-	45.25	-	-	45.33	-	-
Total		51.30	-	-	51.33	-	-	51.35	-	-

Configuration NB-IoT+LTE-MIMO-MC-1 (1NB+1LTE)

Maximum Output Power 46.02dBm per port

Antenna	NB Mod./ LTE Mod. Bandwidth (MHz)	Output Power / Peak to Average Ratio (PAR)								
		Channel position B			Channel position M			Channel position T		
		POWER (dBm)	POWER (dBm/MHz)	PAR (db)	POWER (dBm)	POWER (dBm/MHz)	PAR (db)	POWER (dBm)	POWER (dBm/MHz)	PAR (db)
B	QPSK/ QPSK 5.0	-	-	-	45.27	-	-	-	-	-
	QPSK/ QPSK 10	-	-	-	45.24	-	-	-	-	-
	QPSK/ QPSK 15	-	-	-	45.65	-	-	-	-	-
	QPSK/ QPSK 20	-	-	-	45.67	-	-	-	-	-

Configuration NB-IoT+LTE-MIMO-MC-2 (2NB+1LTE)

Maximum Output Power 46.02dBm per port

Antenna	NB Mod./ LTE Mod. Bandwidth (MHz)	Output Power / Peak to Average Ratio (PAR)								
		Channel position B			Channel position M			Channel position T		
		POWER (dBm)	POWER (dBm/MHz)	PAR (db)	POWER (dBm)	POWER (dBm/MHz)	PAR (db)	POWER (dBm)	POWER (dBm/MHz)	PAR (db)
B	QPSK/ QPSK 5.0	45.31	-	-	45.32	-	-	45.29	-	-
	QPSK/ QPSK 10	45.71	-	-	45.70	-	-	45.67	-	-
	QPSK/ QPSK 15	45.41	-	-	45.39	-	-	45.37	-	-
	QPSK/ QPSK 20	-	-	-	45.57	-	-	-	-	-

Configuration NB-IoT+LTE-MIMO-MC-3 (2NB+3LTE)

Maximum Output Power 46.02dBm per port

Antenna	NB Mod./ LTE Mod. Bandwidth (MHz)	Output Power / Peak to Average Ratio (PAR)								
		Channel position B			Channel position M			Channel position T		
		POWER (dBm)	POWER (dBm/MHz)	PAR (db)	POWER (dBm)	POWER (dBm/MHz)	PAR (db)	POWER (dBm)	POWER (dBm/MHz)	PAR (db)
B	QPSK/ QPSK 5.0	45.77	-	-	45.78	-	-	45.74	-	-



Configuration NB-IoT+LTE-MIMO-MC-4 (2NB+2LTE)  
Maximum Output Power 46.02dBm per port

Antenna	NB Mod./ LTE Mod. Bandwidth (MHz)	Output Power / Peak to Average Ratio (PAR)								
		Channel position B			Channel position M			Channel position T		
		POWER (dBm)	POWER (dBm/MHz)	PAR (db)	POWER (dBm)	POWER (dBm/MHz)	PAR (db)	POWER (dBm)	POWER (dBm/MHz)	PAR (db)
B	QPSK/ QPSK 10.0	-	-	-	45.64	-	-	-	-	-

NOTE:

The DUT is tested without antenna. ERP/EIRP compliance is addressed at the time of licensing, as required by the responsible FCC Bureau(s). Licensee's are required to take into account maximum allowed antenna gain used in combination with above power settings to prevent the radiated output power to exceed the limits.



## **A.2 Occupied Bandwidth**

### **A.2.1 Reference**

FCC CFR 47 Part 2, Clause 2.1049

FCC CFR 47 Part 27, Clause 27.53 (h)

### **A.2.2 Method of Measurements**

The EUT was set to transmit at maximum power and testing was carried out on bottom, middle and top channels. Using the Occupied Bandwidth measurement function in the spectrum analyser, the 26dB bandwidth was measured in accordance with FCC KDB 971168 D01 Clause 4.2. In addition, measurements of 99% occupied bandwidths were made in accordance with RSS-GEN Clause 6.6.

The measurement method is from KDB 971168 4.2:

- a) The spectrum analyzer center frequency is set to the nominal EUT channel center frequency. The frequency span for the spectrum analyzer shall be set wide enough to capture all modulation products including the emission skirts (i.e., two to five times the OBW).
- b) The nominal IF filter bandwidth (3 dB RBW) shall be in the range of 1 to 5 % of the anticipated OBW, and the VBW shall be at least 3 times the RBW.
- c) Set the reference level of the instrument as required to keep the signal from exceeding the maximum input mixer level for linear operation. In general, the peak of the spectral envelope must be at least  $10\log(\text{OBW} / \text{RBW})$  below the reference level.
- d) Set the detection mode to peak, and the trace mode to max hold.
- e) Use the 99 % power bandwidth function of the spectrum analyzer and report the measured bandwidth.

**A.2.3 Measurement result**

Configuration LTE-MIMO-1C  
-26dBc Occupied Bandwidth

Antenna	Modulation / Bandwidth	Occupied Bandwidth (MHz)		
		Channel Position B	Channel Position M	Channel Position T
B	QPSK/ 5.0 MHz	4.81	4.80	4.81
	QPSK/ 10.0 MHz	9.65	9.64	9.63
	QPSK/ 15.0 MHz	14.46	14.44	14.43
	QPSK/ 20.0 MHz	19.26	19.17	19.21

-26dBc Occupied Bandwidth

Antenna	Bandwidth	Occupied Bandwidth (MHz)		
		Modulation 16QAM/ Channel Position M	Modulation 64QAM/ Channel Position M	Modulation 256QAM/ Channel Position M
B	5.0 MHz	4.81	4.83	4.82
	10.0 MHz	9.64	9.67	9.62
	15.0 MHz	14.40	14.39	14.42
	20.0 MHz	19.19	19.23	19.27



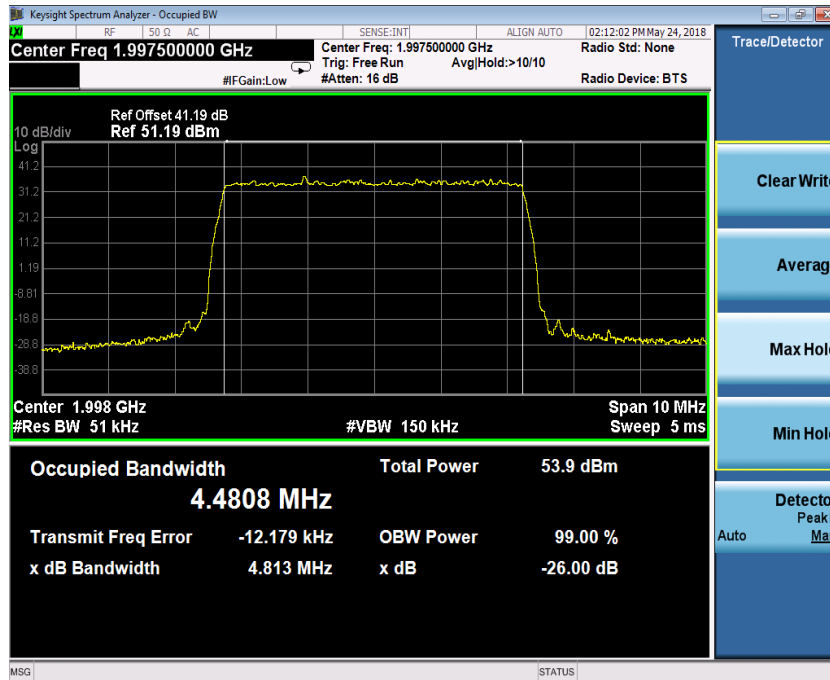
99% Occupied Bandwidth

Antenna	Modulation / Bandwidth	Occupied Bandwidth (MHz)		
		Channel Position B	Channel Position M	Channel Position T
B	QPSK/ 5.0 MHz	4.481	4.482	4.480
	QPSK/ 10.0 MHz	8.974	8.963	8.973
	QPSK/ 15.0 MHz	13.444	13.441	13.445
	QPSK/ 20.0 MHz	17.897	17.902	17.877

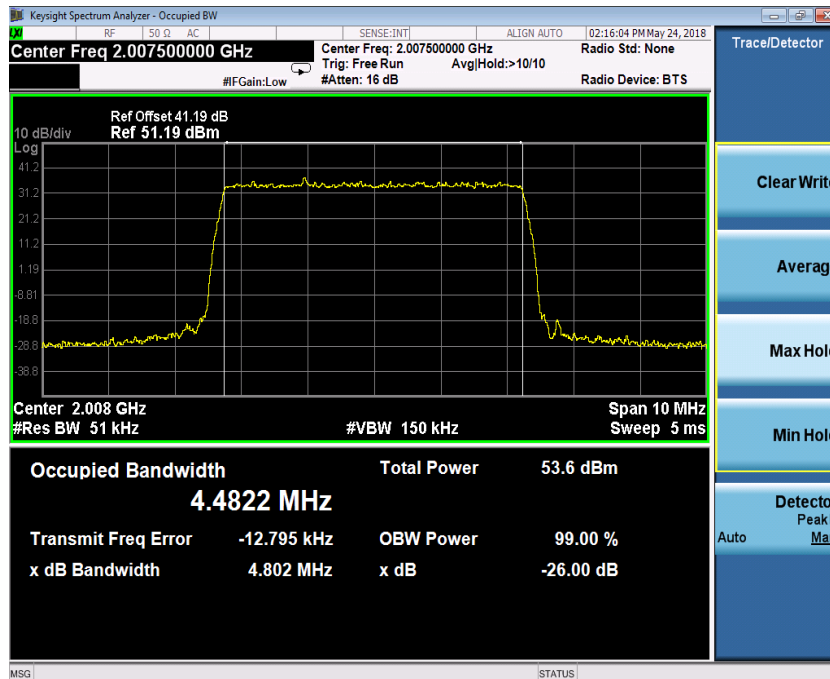
99% Occupied Bandwidth

Antenna	Bandwidth	Occupied Bandwidth (MHz)		
		Modulation 16QAM/ Channel Position M	Modulation 64QAM/ Channel Position M	Modulation 256QAM/ Channel Position M
B	5.0 MHz	4.478	4.495	4.489
	10.0 MHz	8.969	8.981	8.959
	15.0 MHz	13.450	13.442	13.435
	20.0 MHz	17.920	17.890	17.903

Port B, QPSK 5.0M Channel position B

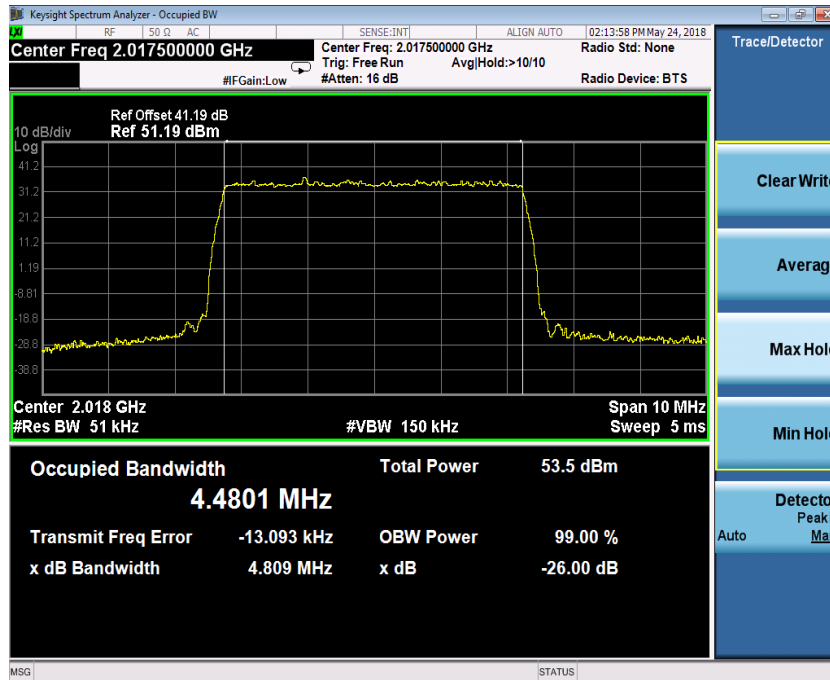


Port B, QPSK 5.0M Channel position M

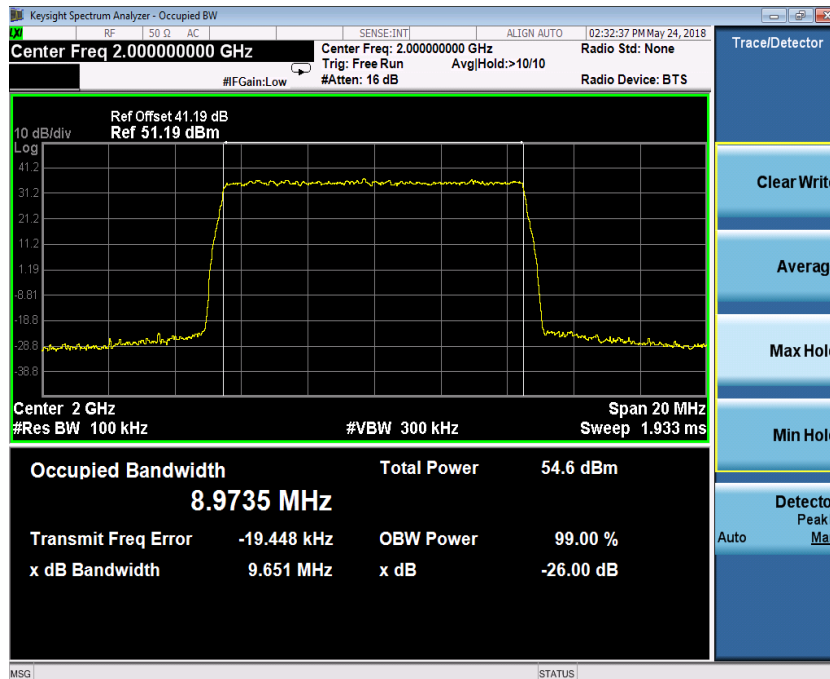




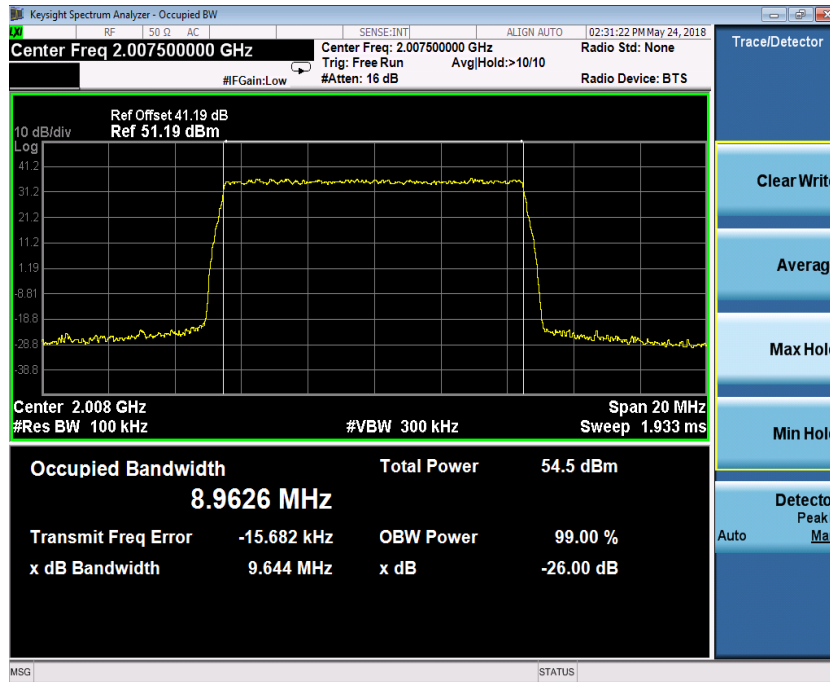
Port B, QPSK 5.0M Channel position T



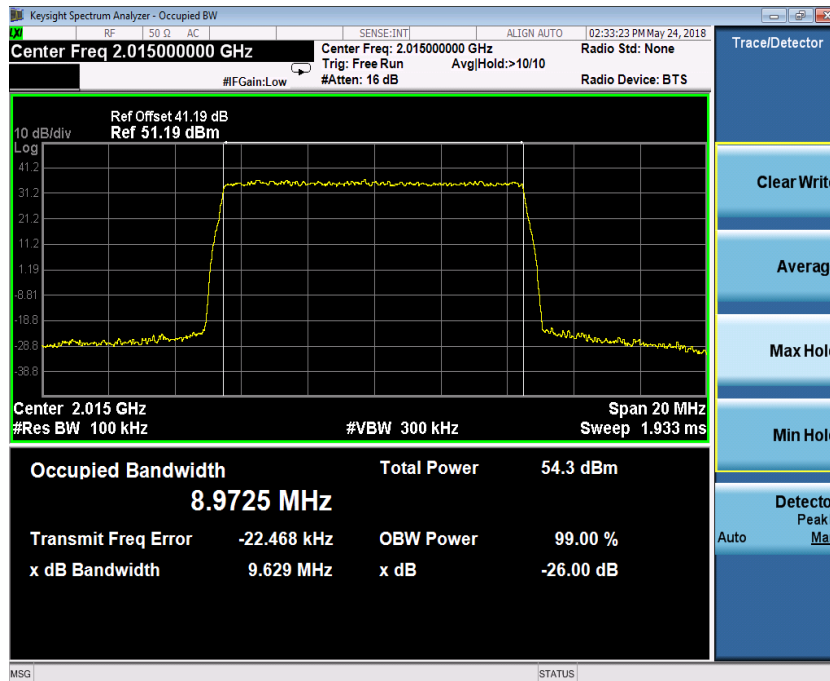
Port B, QPSK 10.0M Channel position B



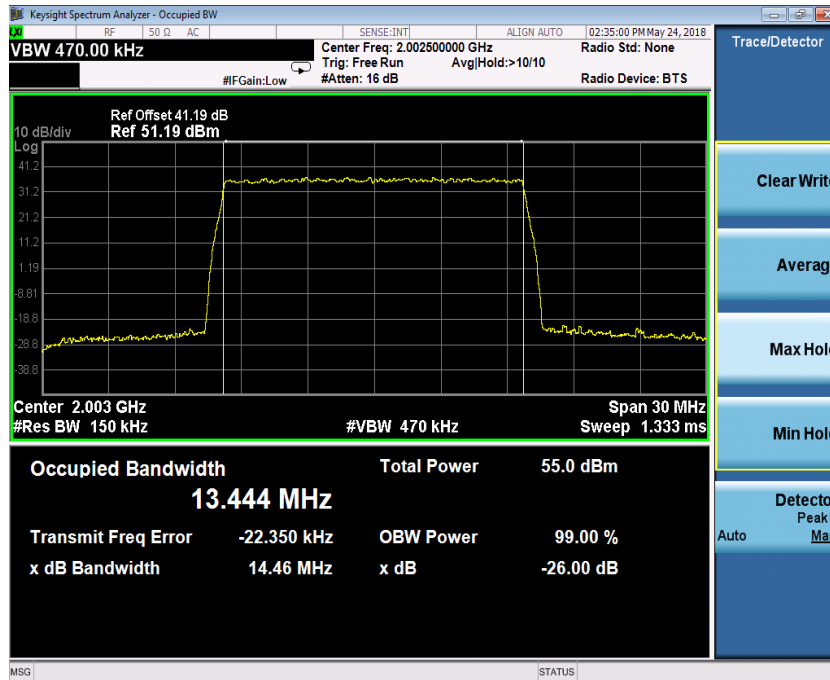
Port B, QPSK 10.0M Channel position M



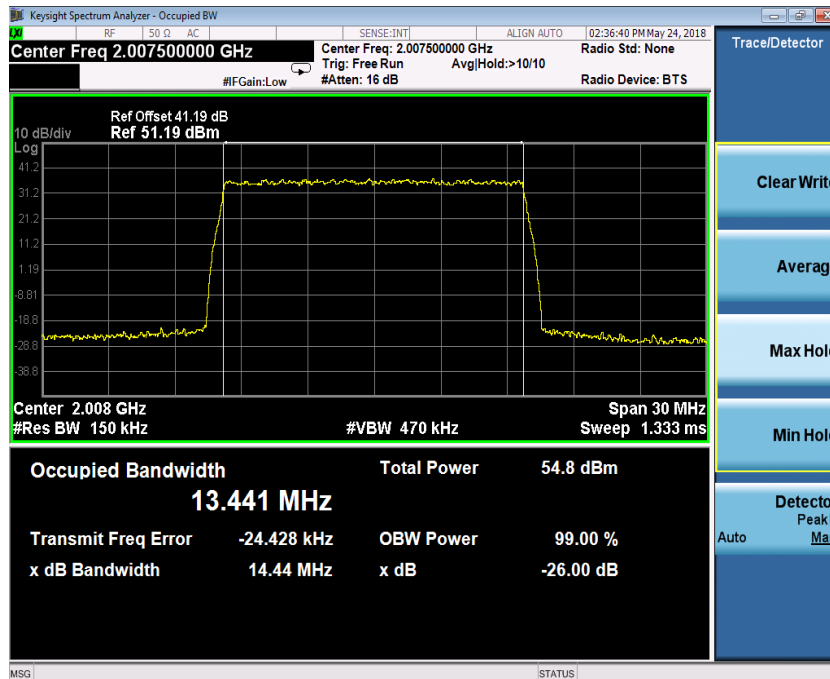
Port B, QPSK 10.0M Channel position T



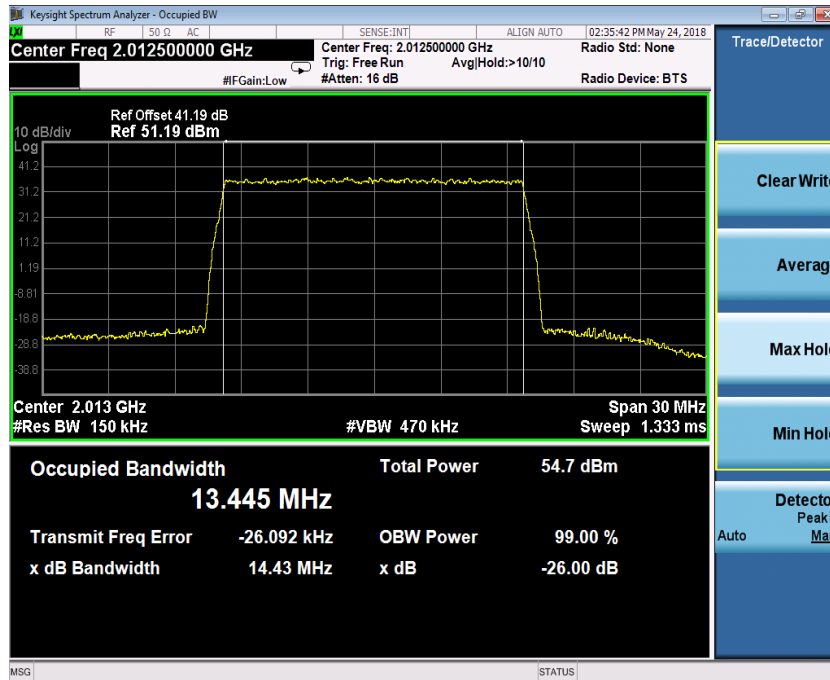
Port B, QPSK 15.0M Channel position B



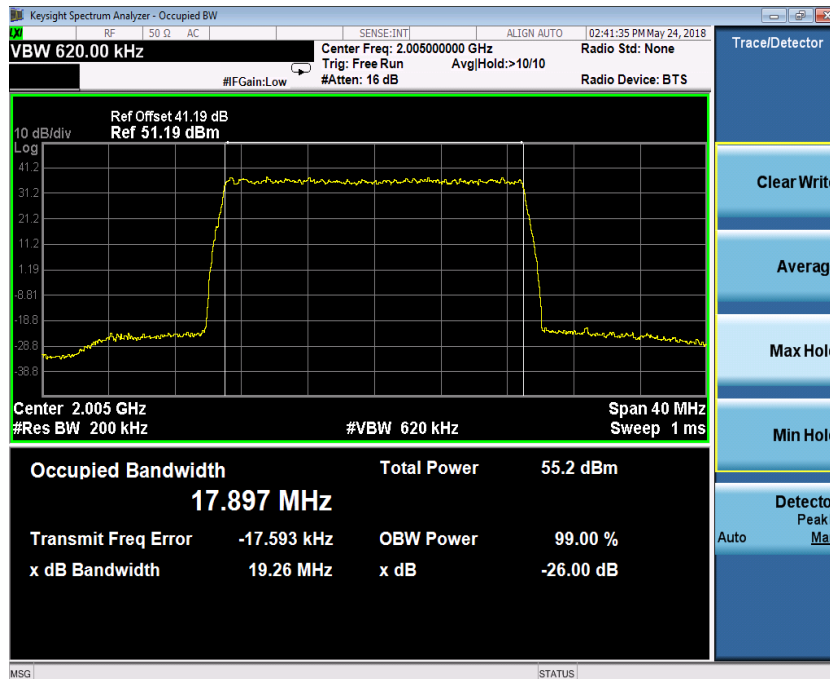
Port B, QPSK 15.0M Channel position M



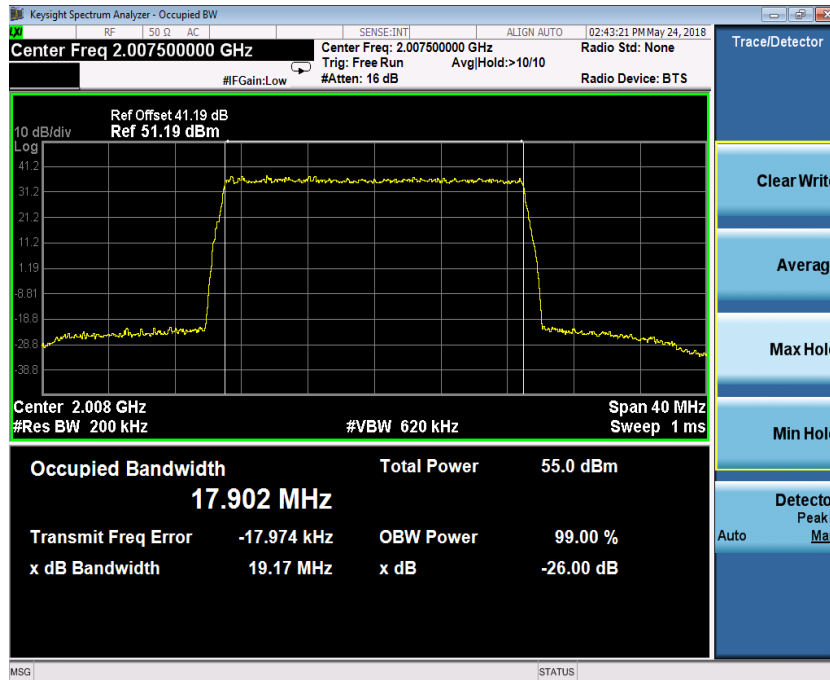
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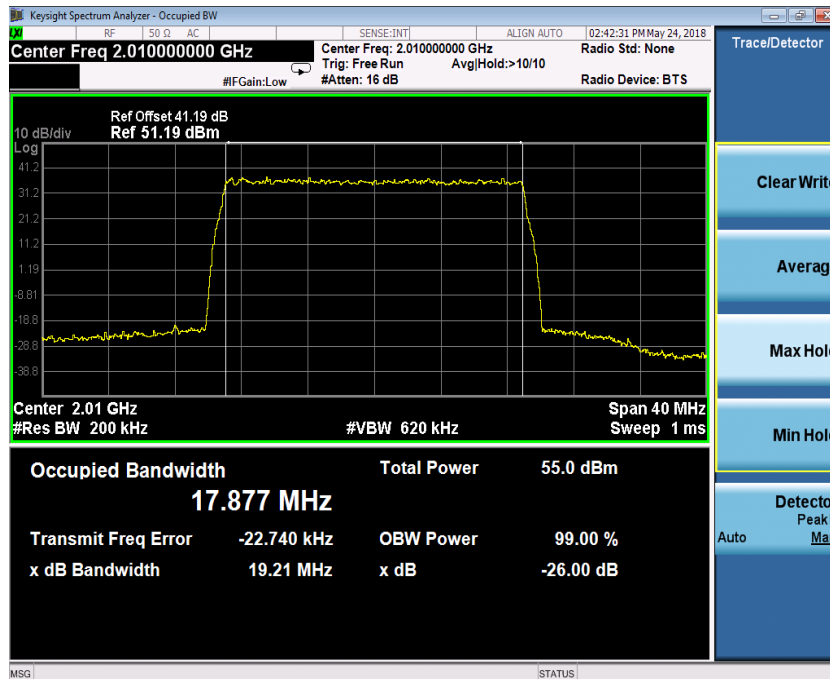
Port B, QPSK 20.0M Channel position B



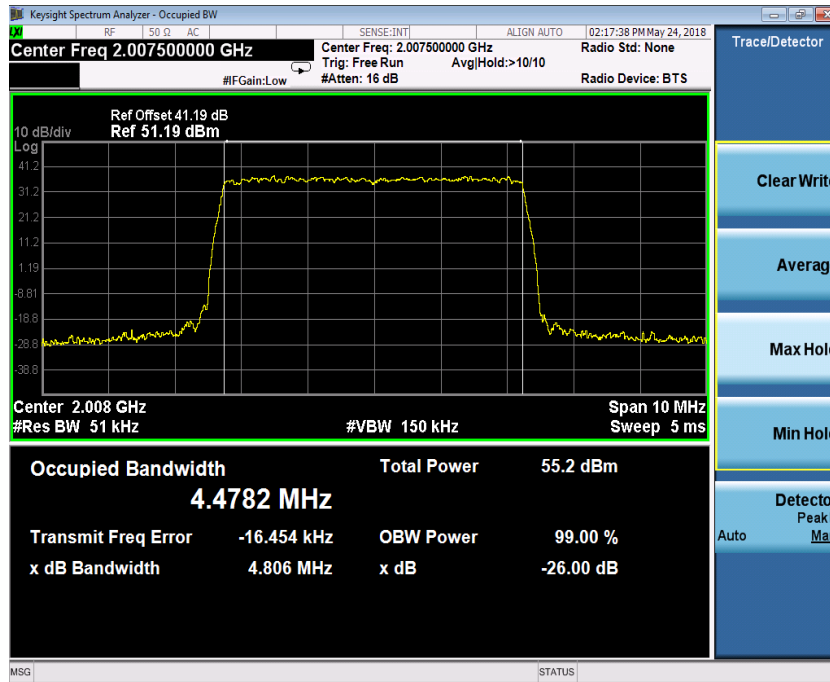
Port B, QPSK 20.0M Channel position M



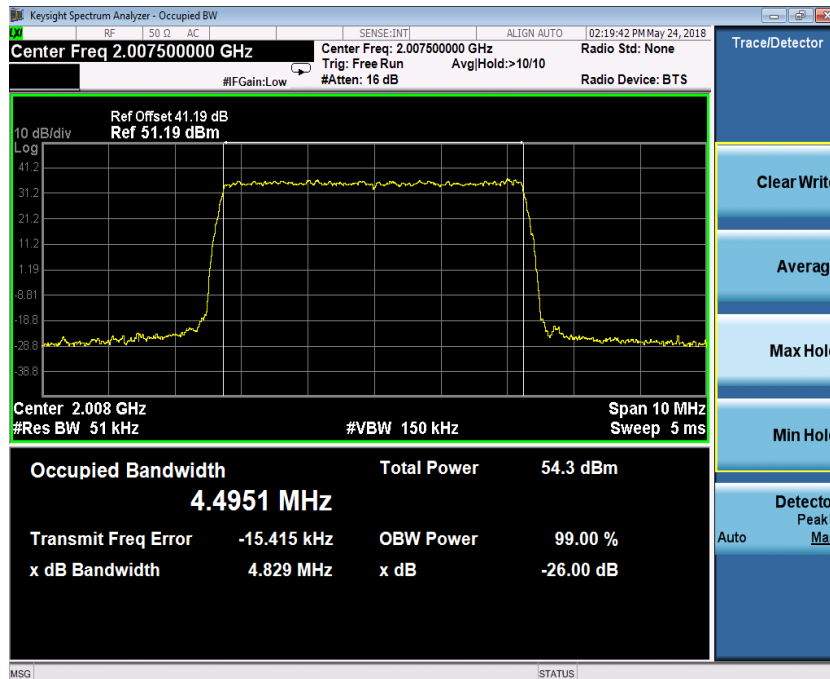
Port B, QPSK 20.0M Channel position T



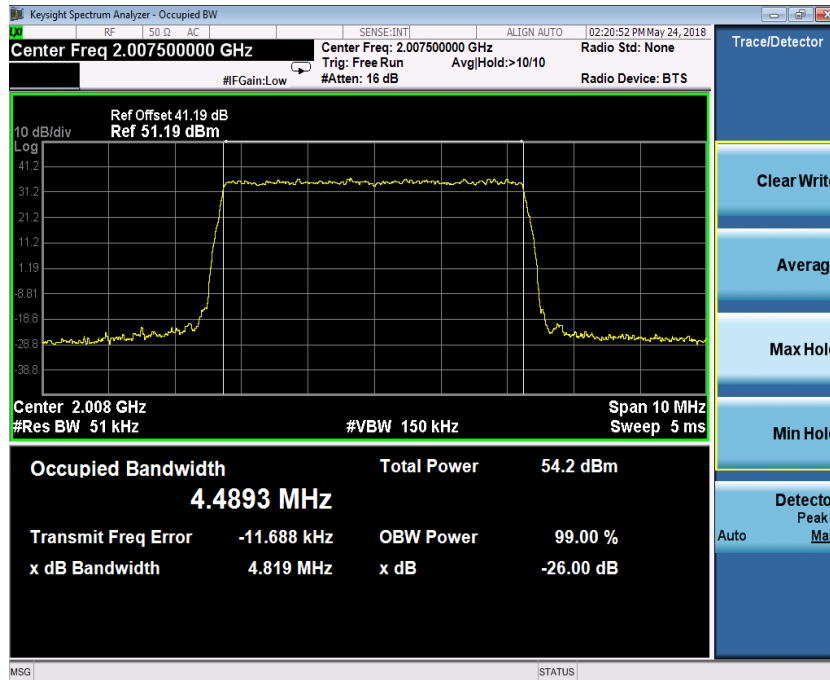
Port B, 16QAM 5.0M Channel Position M



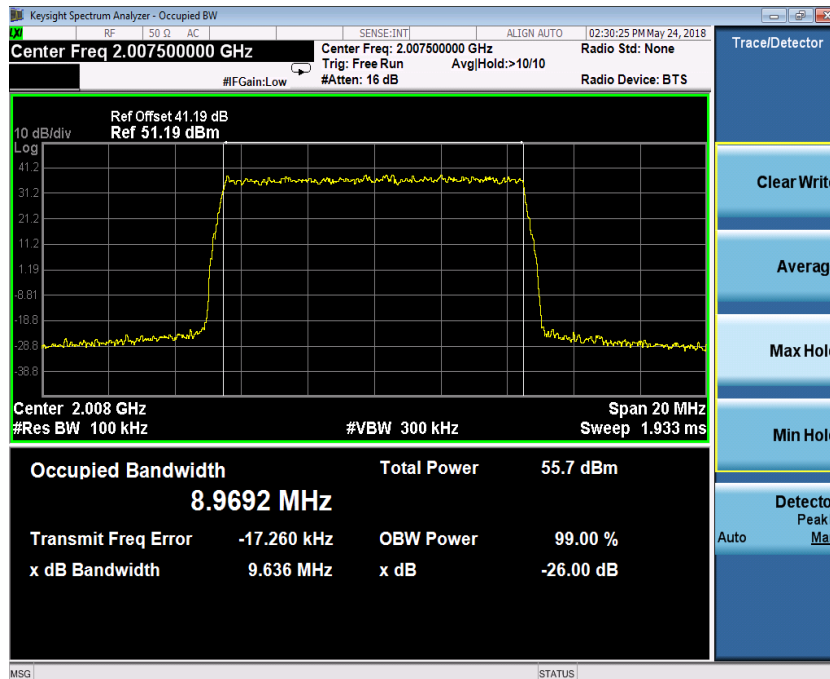
Port B, 64QAM 5.0M Channel Position M



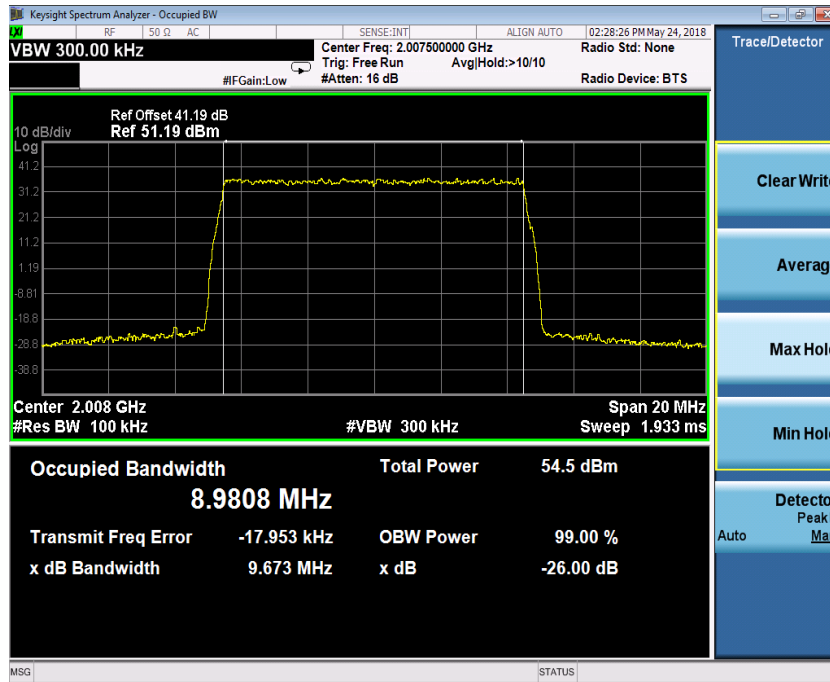
Port B, 256QAM 5.0M Channel Position M



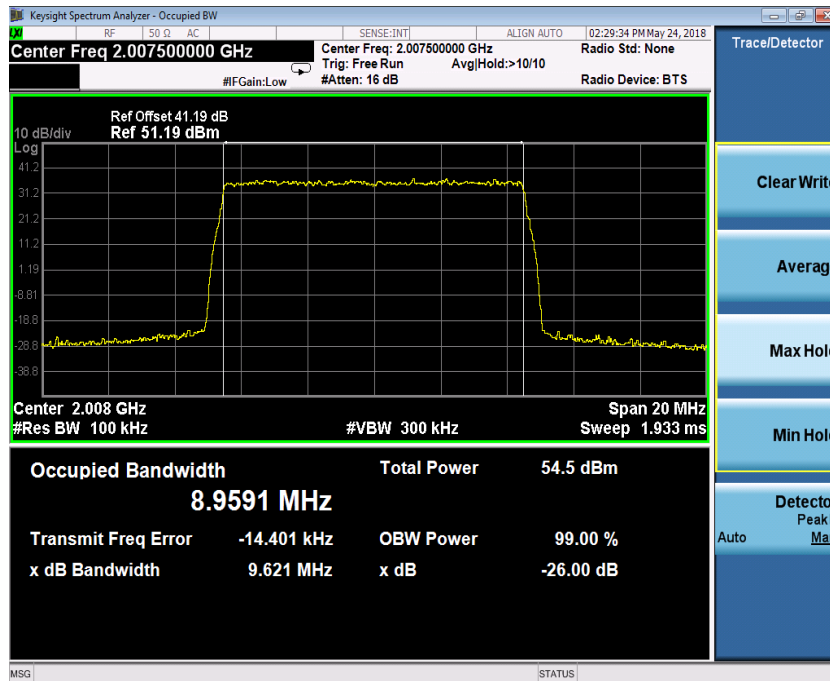
Port B, 16QAM 10.0M Channel Position M



Port B, 64QAM 10.0M Channel Position M

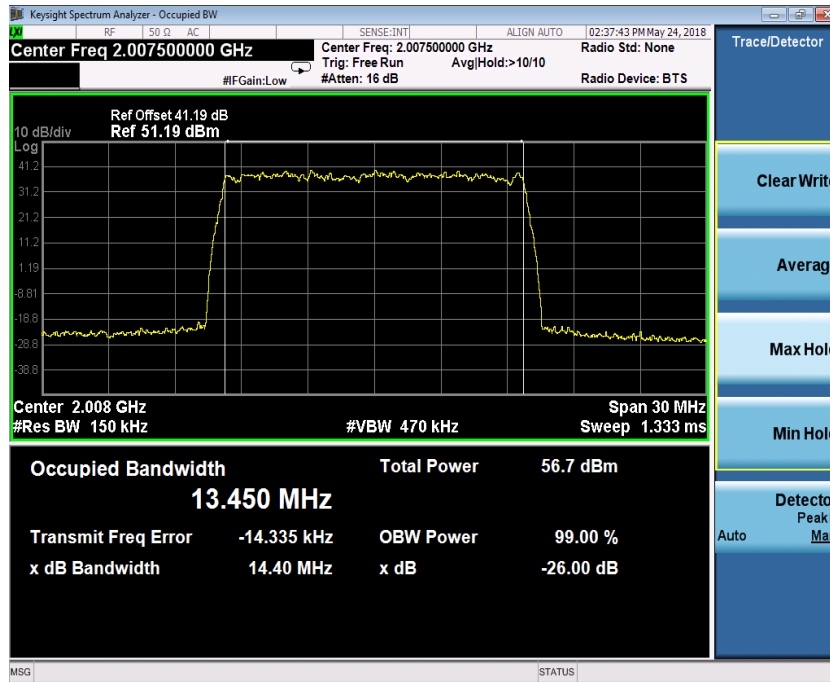


Port B, 256QAM 10.0M Channel Position M

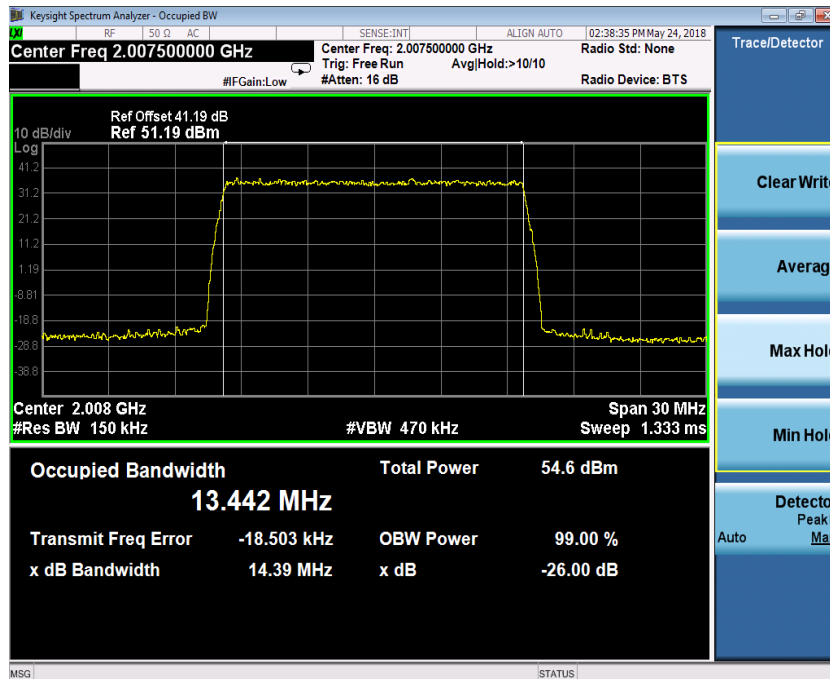




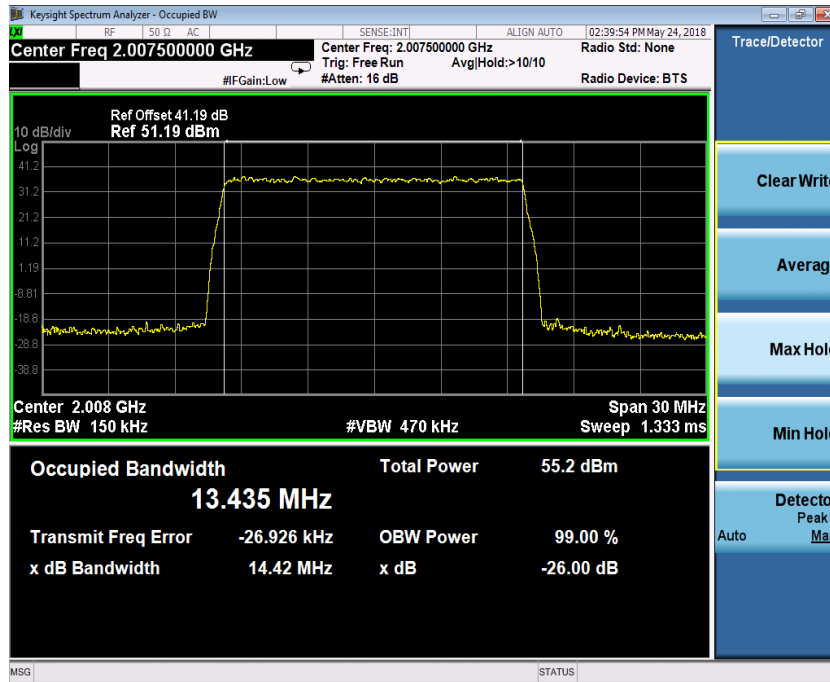
Port B, 16QAM 15.0M Channel Position M



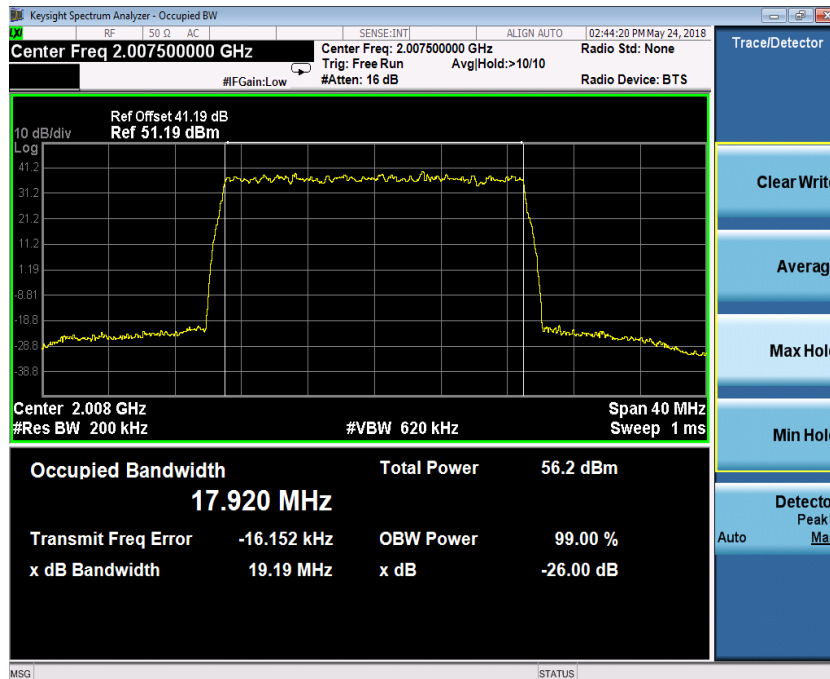
Port B, 64QAM 15.0M Channel Position M



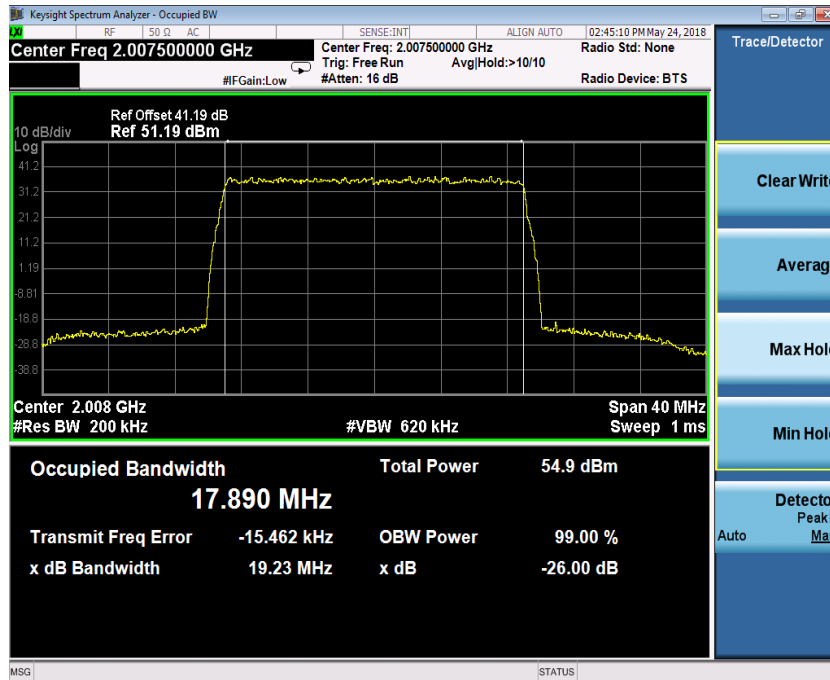
Port B, 256QAM 15.0M Channel Position M



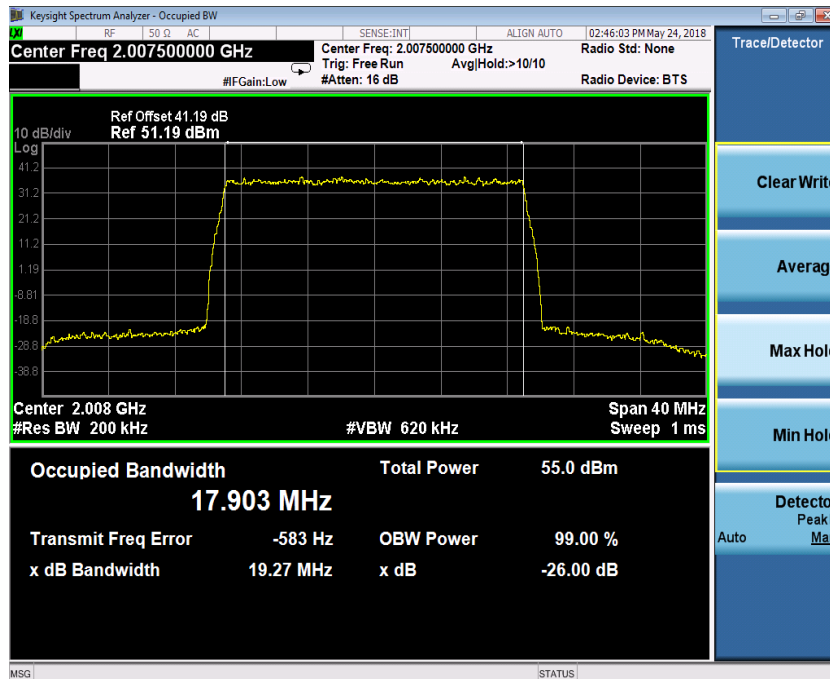
Port B, 16QAM 20.0M Channel Position M



Port B, 64QAM 20.0M Channel Position M



Port B, 256QAM 20.0M Channel Position M





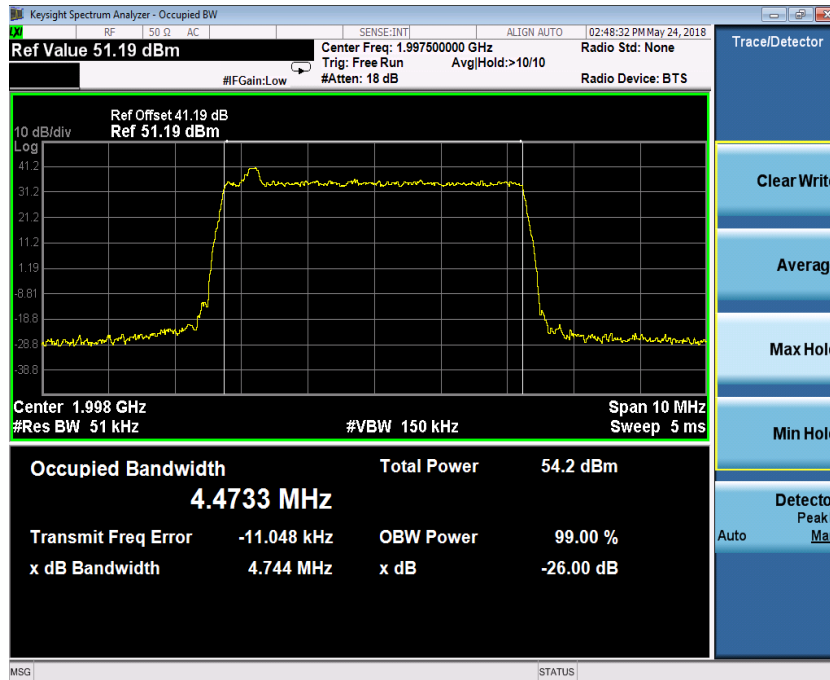
Configuration NB-IoT-InBand-1C  
-26dBc Occupied Bandwidth

Antenna	Modulation / Bandwidth	Occupied Bandwidth (MHz)		
		Channel Position B	Channel Position M	Channel Position T
B	QPSK/ 5.0 MHz	4.74	4.74	4.74
	QPSK/ 10.0 MHz	9.55	9.55	9.55
	QPSK/ 15.0 MHz	14.34	14.28	14.32
	QPSK/ 20.0 MHz	19.14	19.14	19.14

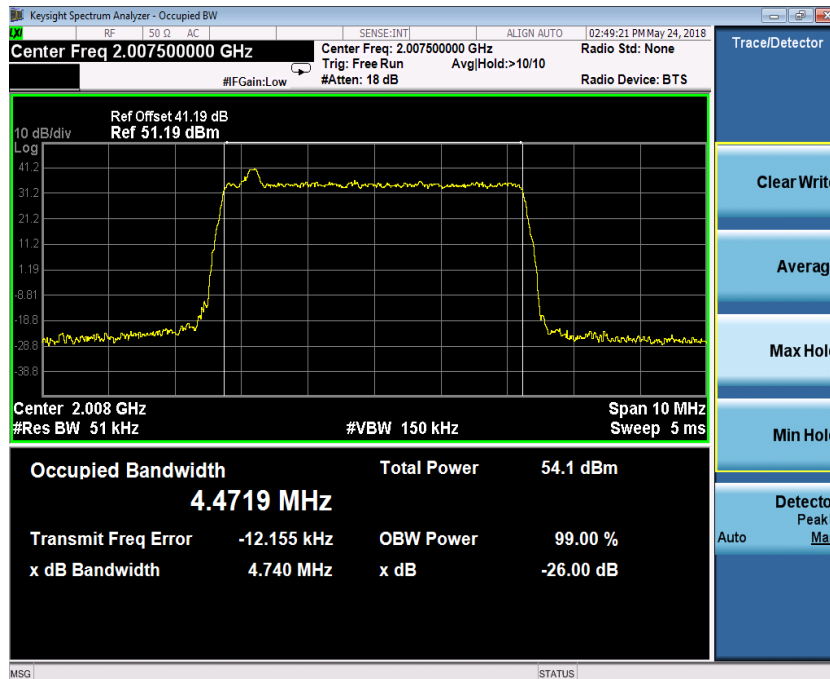
99% Occupied Bandwidth

Antenna	Modulation / Bandwidth	Occupied Bandwidth (MHz)		
		Channel Position B	Channel Position M	Channel Position T
B	QPSK/ 5.0 MHz	4.473	4.472	4.472
	QPSK/ 10.0 MHz	8.951	8.953	8.957
	QPSK/ 15.0 MHz	13.468	13.456	13.431
	QPSK/ 20.0 MHz	17.893	17.895	17.898

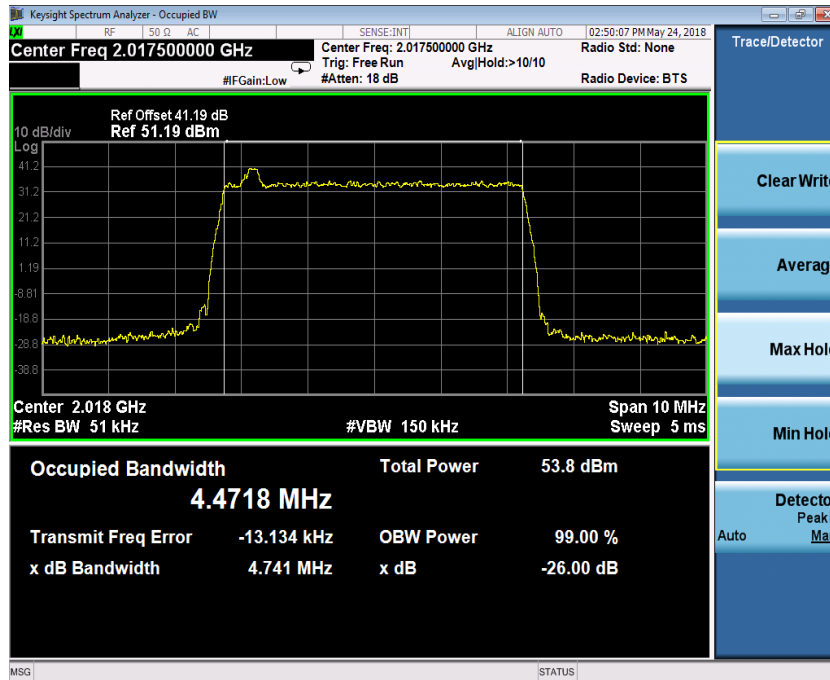
Port B, QPSK 5.0M Channel position B



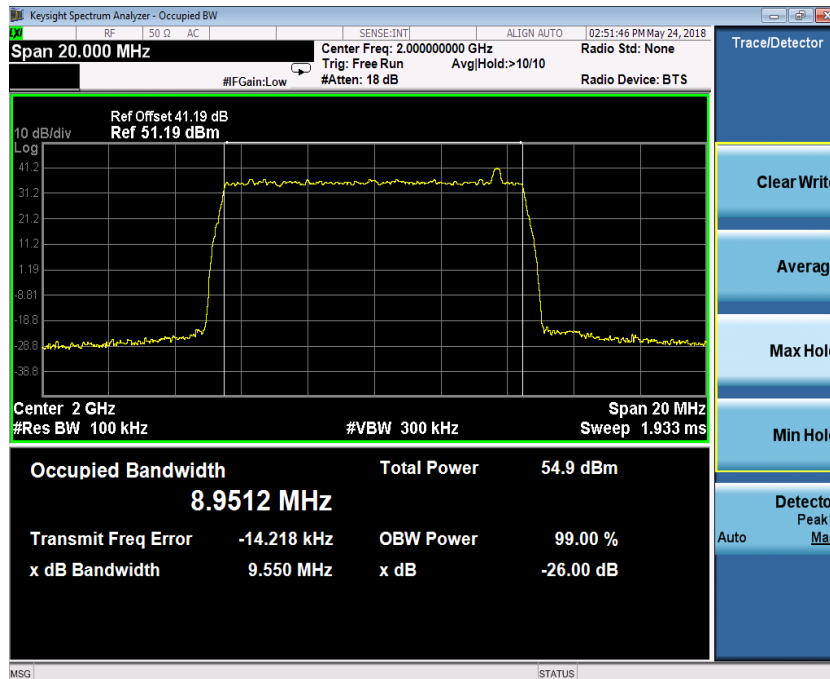
Port B, QPSK 5.0M Channel position M



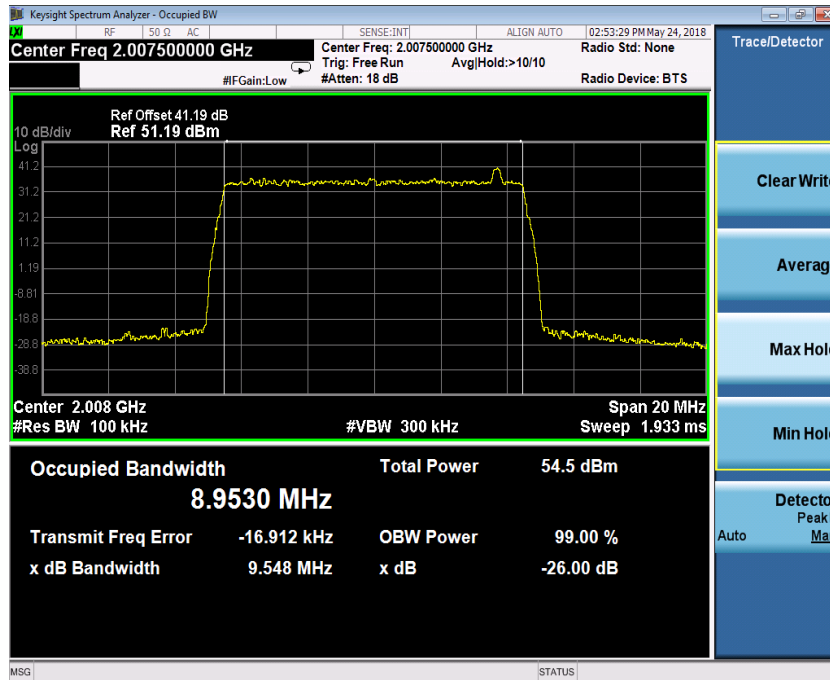
Port B, QPSK 5.0M Channel position T



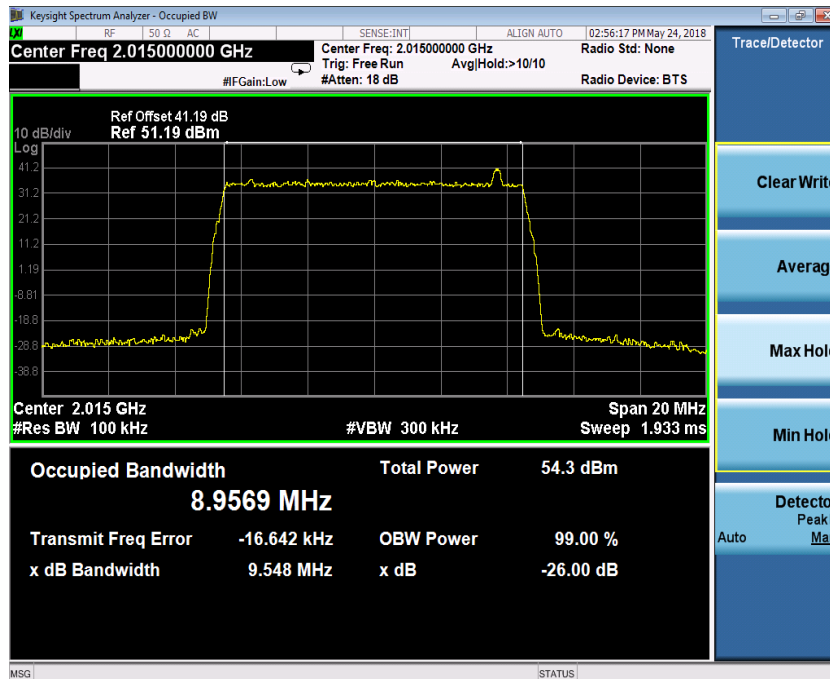
Port B, QPSK 10.0M Channel position B



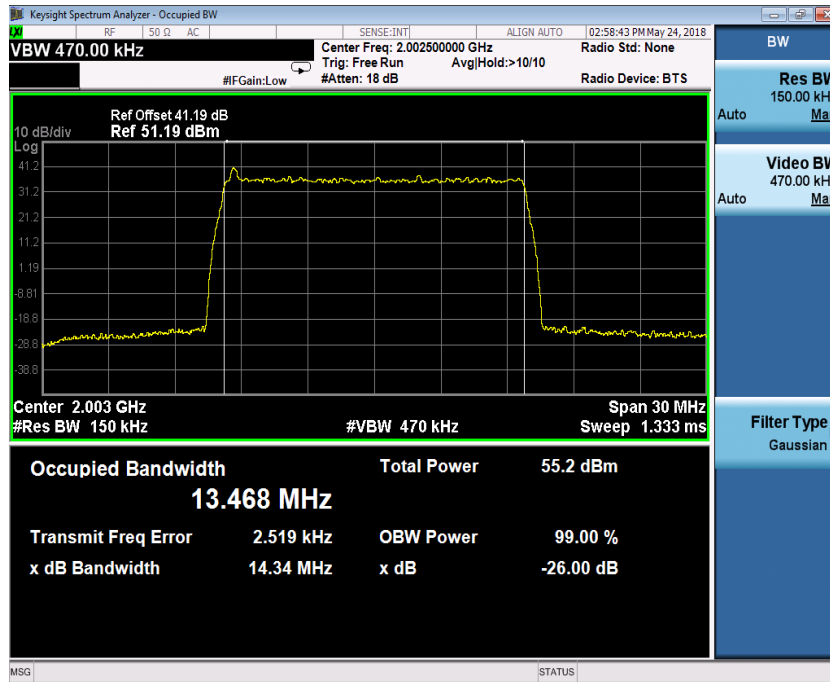
Port B, QPSK 10.0M Channel position M



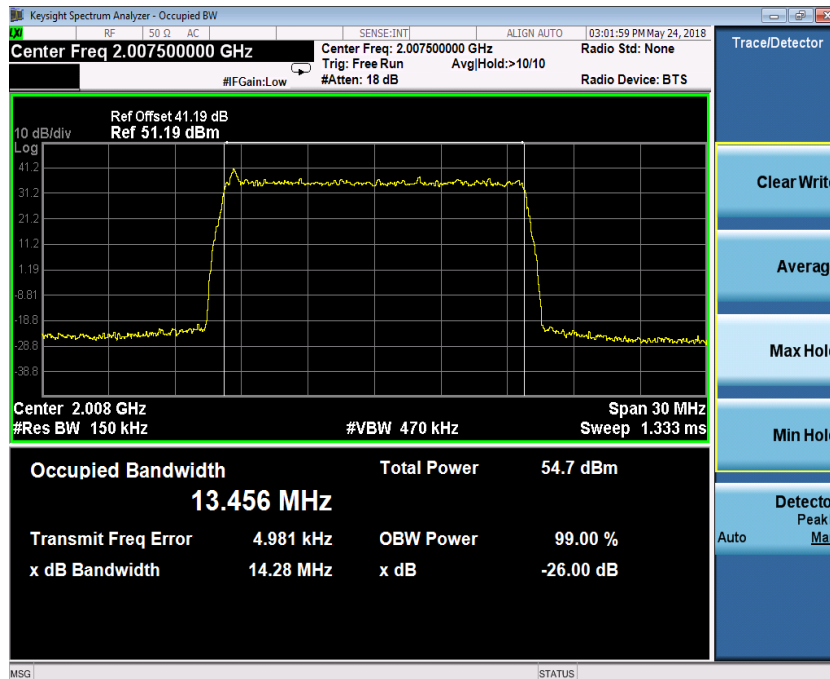
Port B, QPSK 10.0M Channel position T



Port B, QPSK 15.0M Channel position B

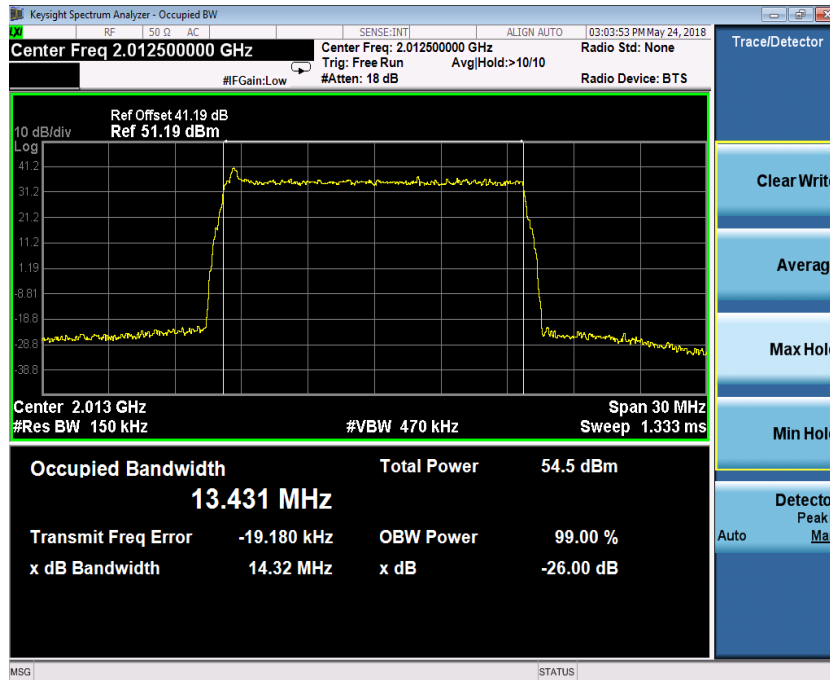


Port B, QPSK 15.0M Channel position M

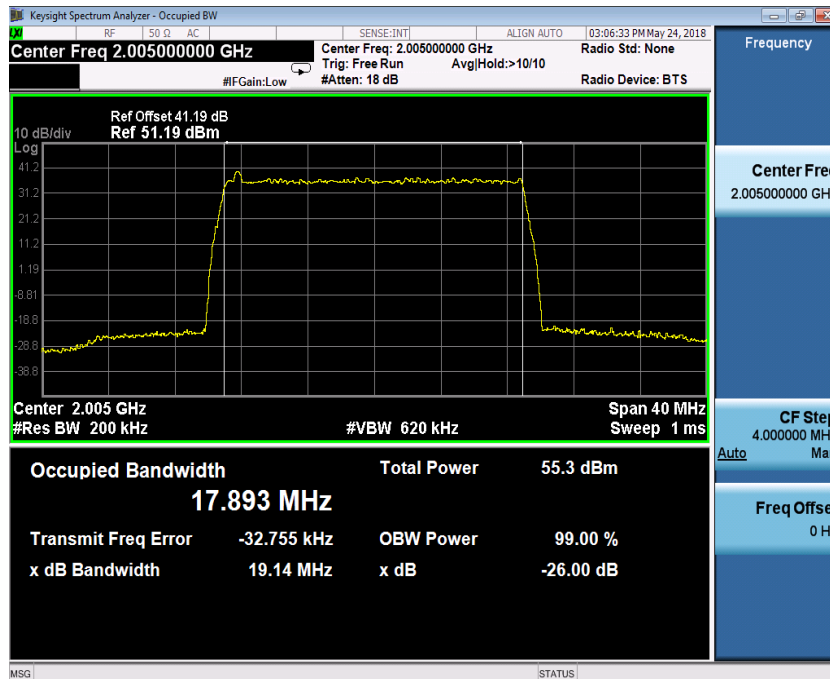




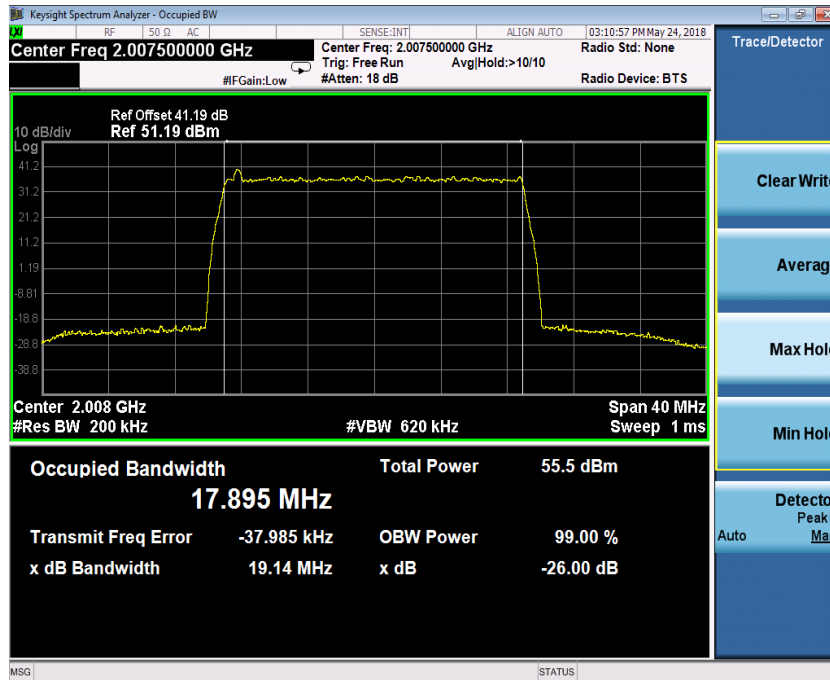
Port B, QPSK 15.0M Channel position T



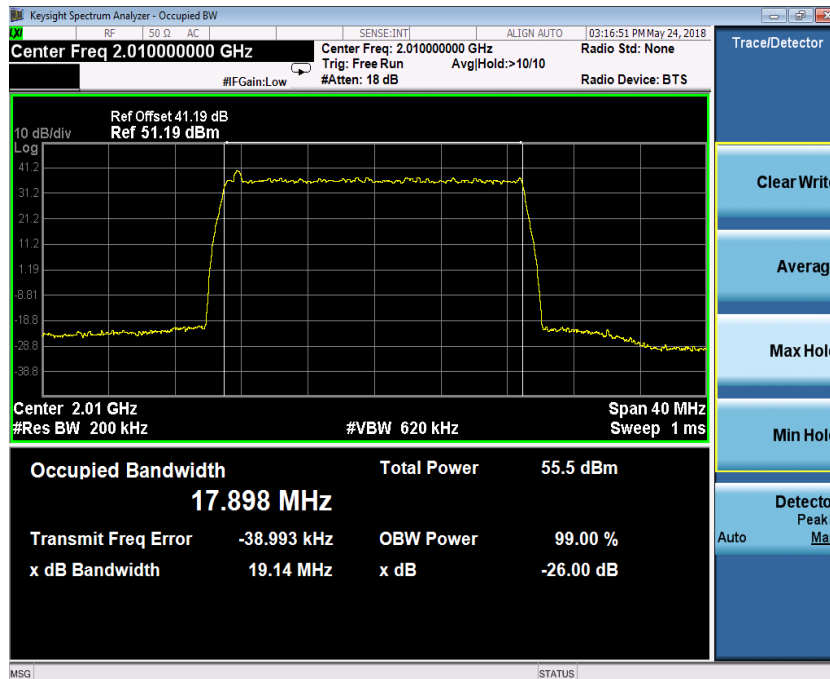
Port B, QPSK 20.0M Channel position B



Port B, QPSK 20.0M Channel position M



Port B, QPSK 20.0M Channel position T



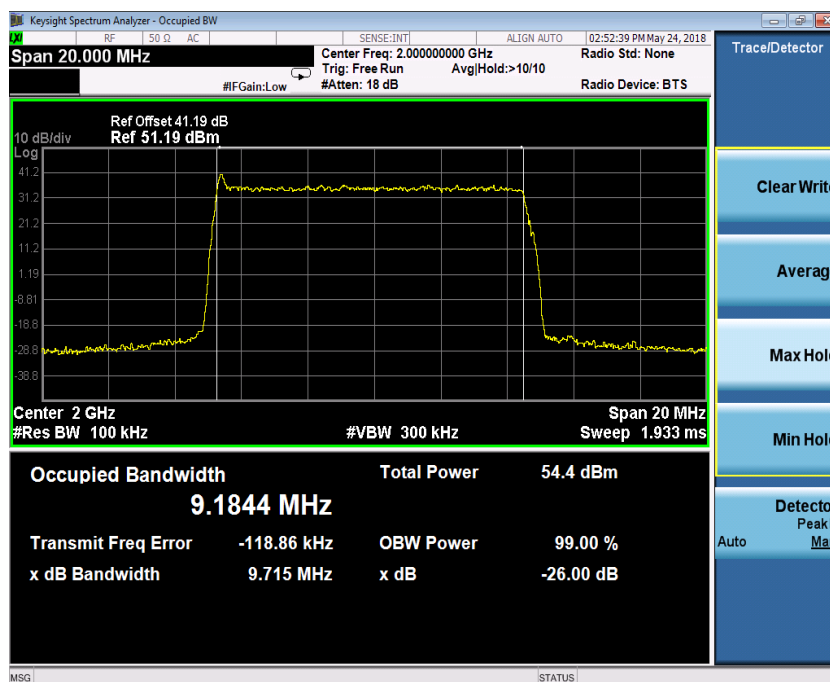
Configuration NB-IoT-GuardBand-1C  
-26dBc Occupied Bandwidth

Antenna	Modulation / Bandwidth	Occupied Bandwidth (MHz)		
		Channel Position B	Channel Position M	Channel Position T
B	QPSK/ 10.0 MHz	9.72	9.72	9.69
	QPSK/ 15.0 MHz	14.54	14.53	14.52
	QPSK/ 20.0 MHz	19.24	19.27	19.29

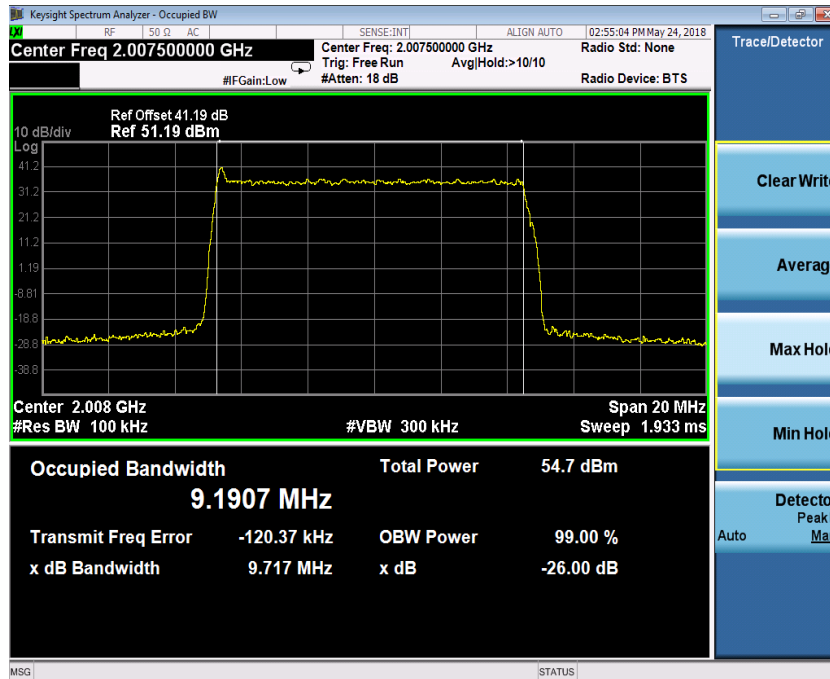
99% Occupied Bandwidth

Antenna	Modulation / Bandwidth	Occupied Bandwidth (MHz)		
		Channel Position B	Channel Position M	Channel Position T
B	QPSK/ 10.0 MHz	9.184	9.191	9.187
	QPSK/ 15.0 MHz	13.727	13.710	13.713
	QPSK/ 20.0 MHz	18.169	18.170	18.169

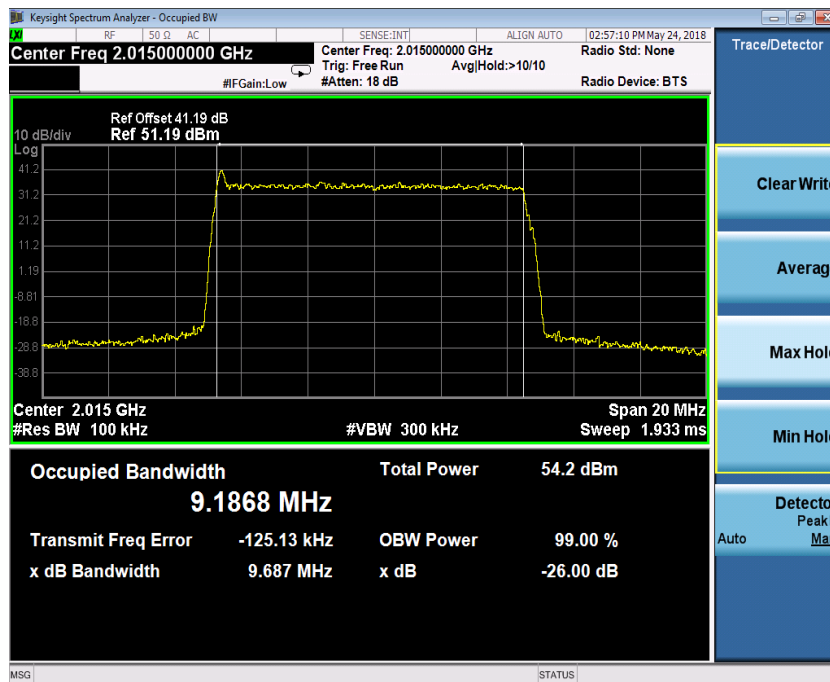
Port B, QPSK 10.0M Channel position B



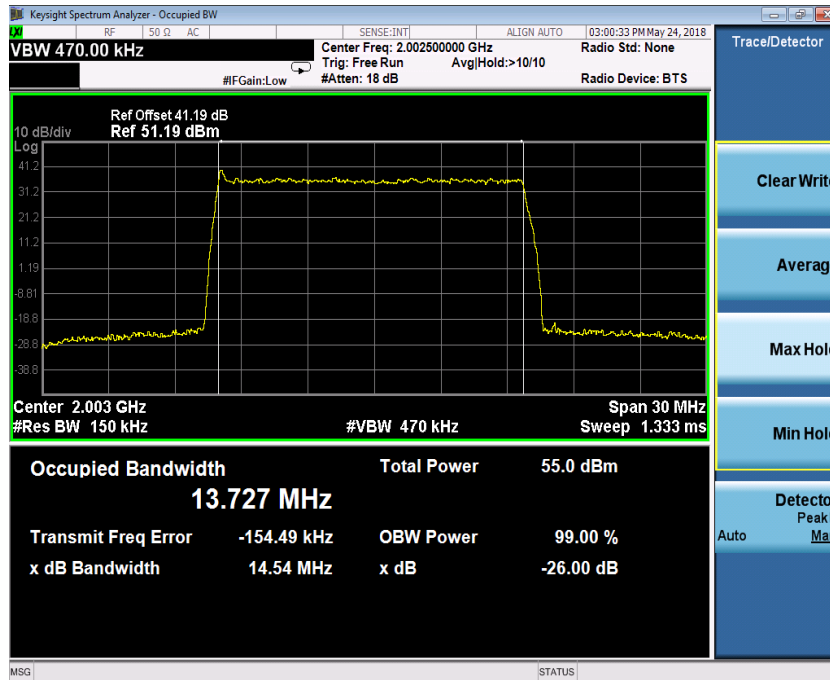
Port B, QPSK 10.0M Channel position M



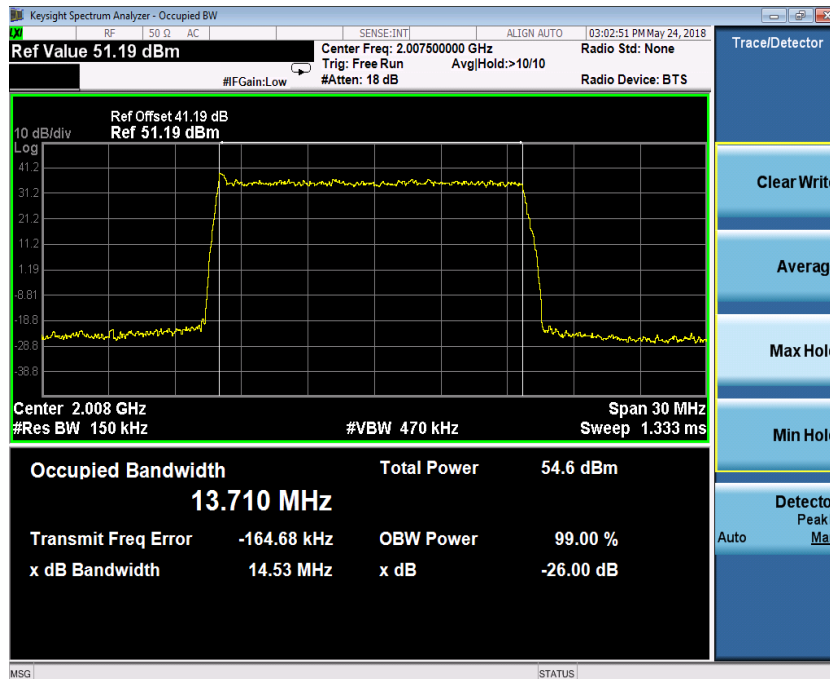
Port B, QPSK 10.0M Channel position T



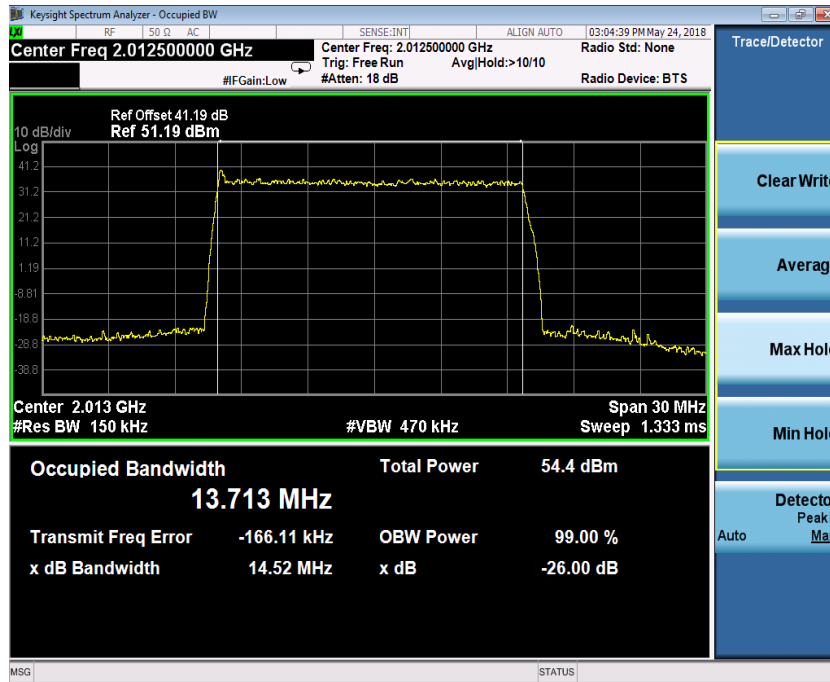
Port B, QPSK 15.0M Channel position B



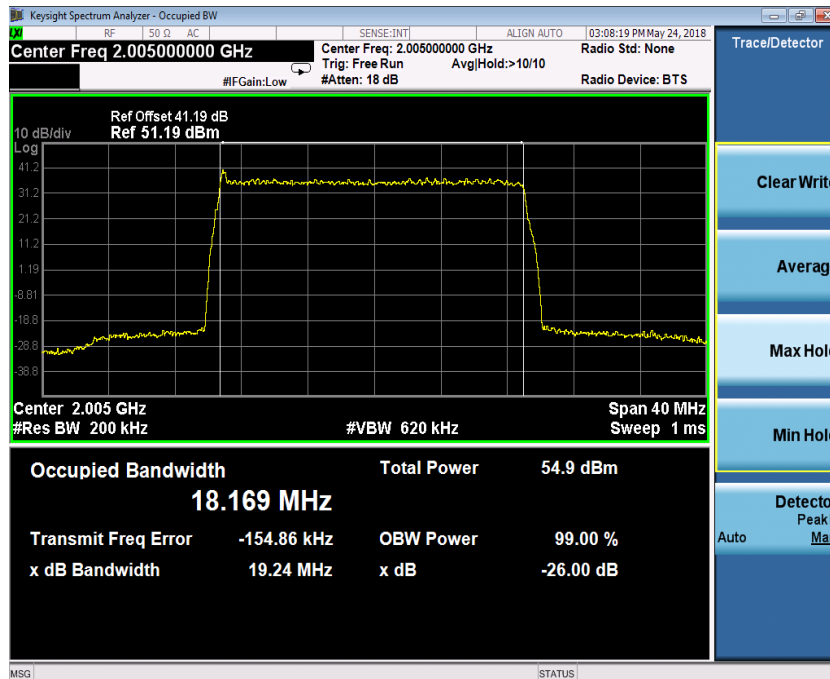
Port B, QPSK 15.0M Channel position M



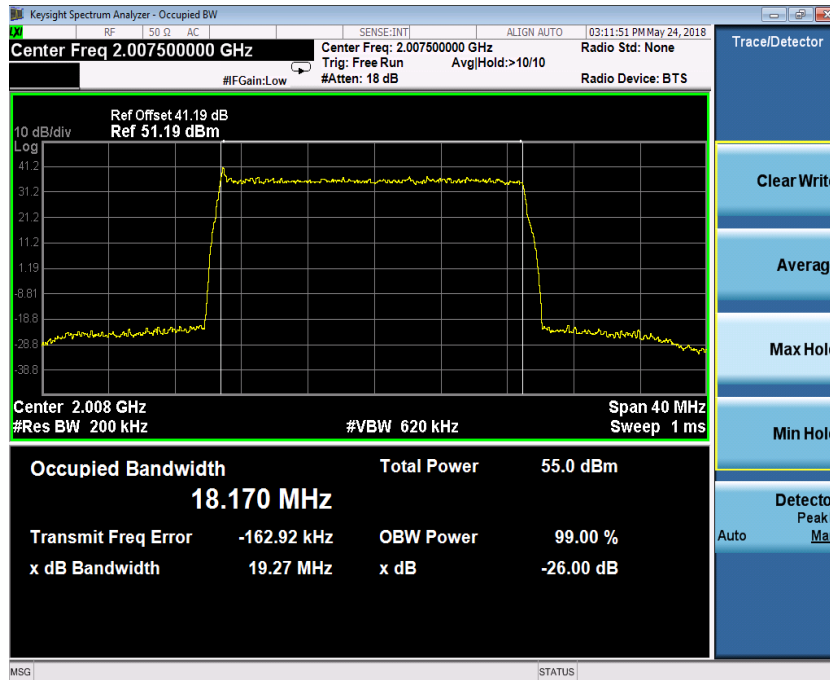
Port B, QPSK 15.0M Channel position T



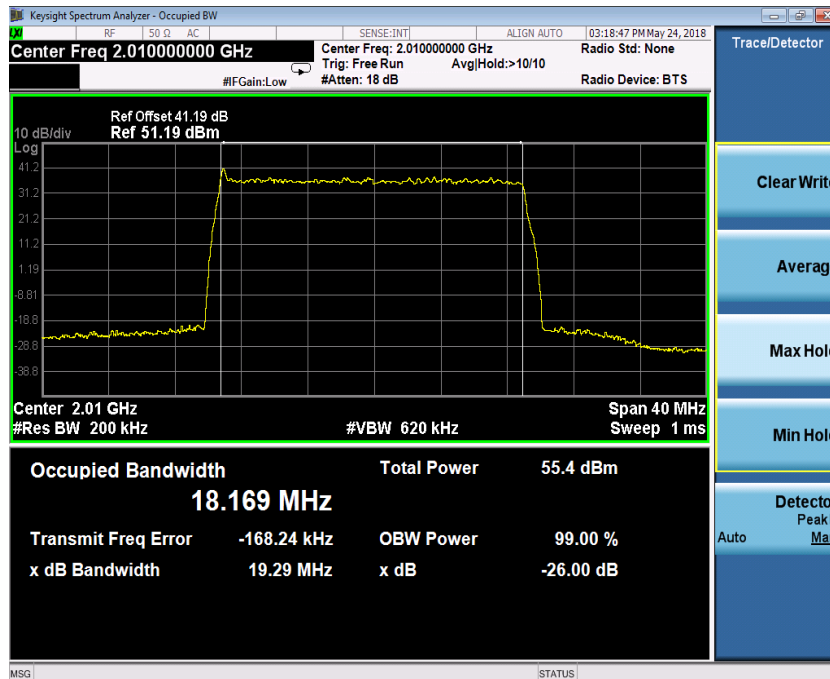
Port B, QPSK 20.0M Channel position B



Port B, QPSK 20.0M Channel position M



Port B, QPSK 20.0M Channel position T



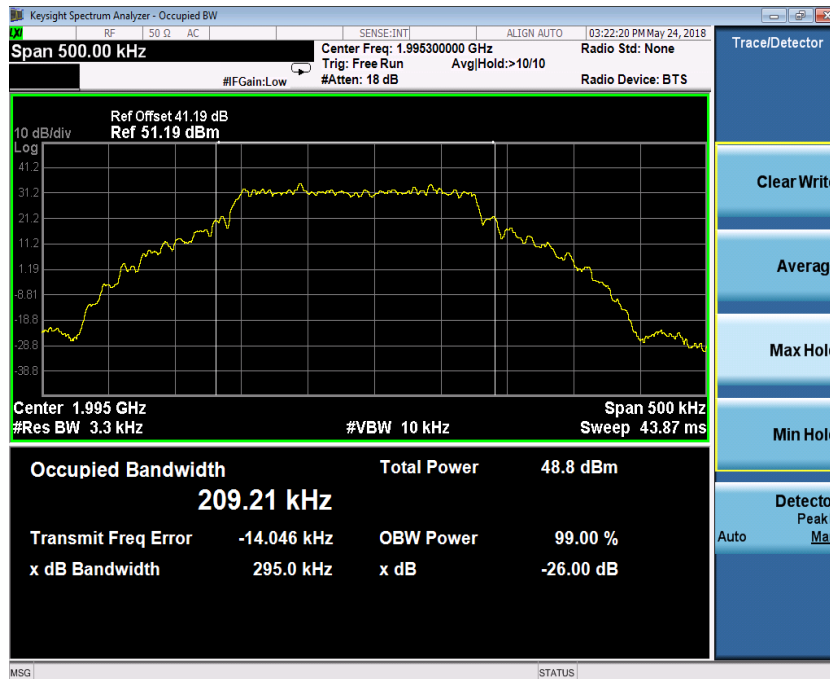
Configuration NB-IoT-StandAlone-1C  
-26dBc Occupied Bandwidth

Antenna	Modulation	Occupied Bandwidth (KHz)		
		Channel Position B	Channel Position M	Channel Position T
B	QPSK	295.0	295.0	294.5

99% Occupied Bandwidth

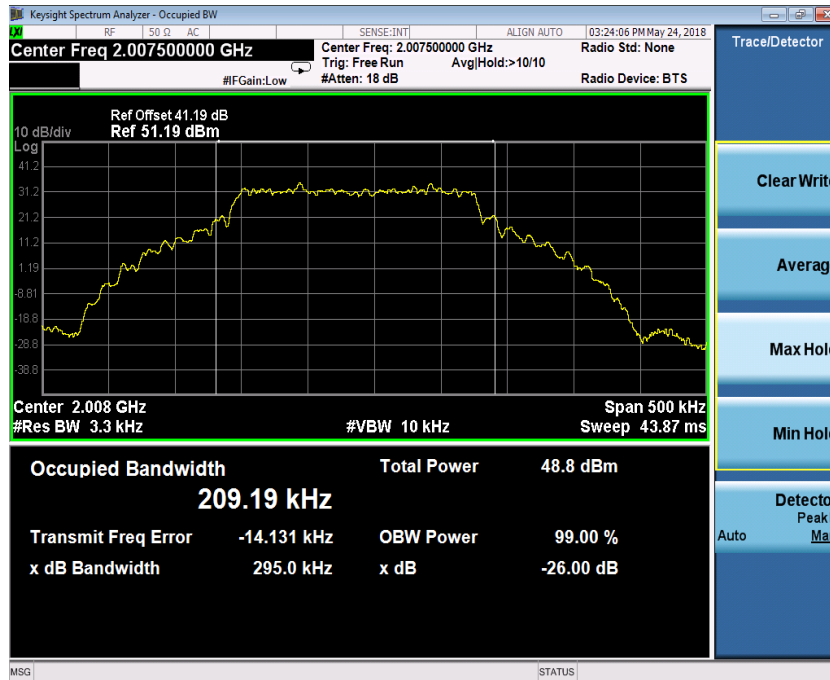
Antenna	Modulation	Occupied Bandwidth (KHz)		
		Channel Position B	Channel Position M	Channel Position T
B	QPSK	209.21	209.19	209.22

Port B, QPSK Channel Position B

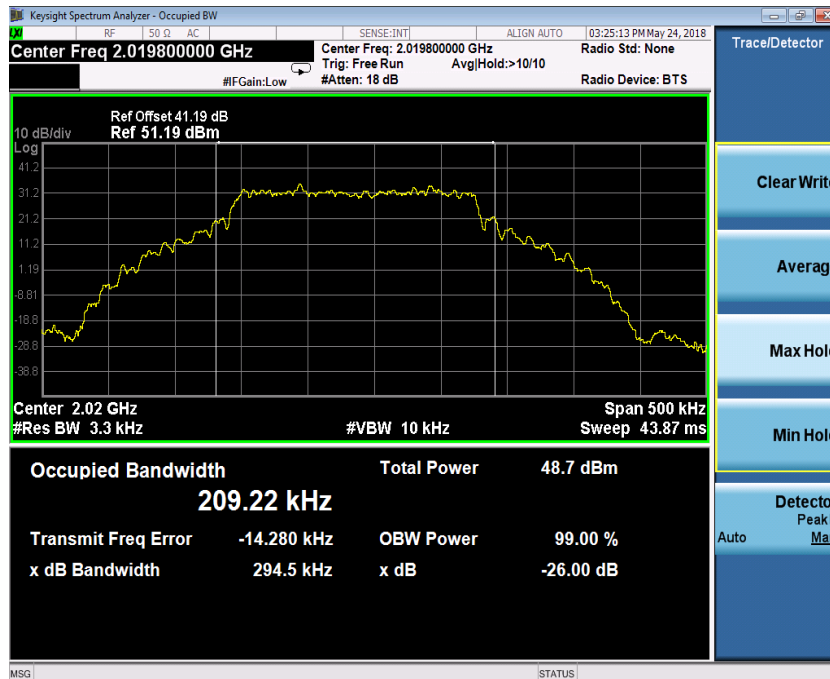




Port B, QPSK Channel Position M



Port B, QPSK Channel Position T



### **A.3 Spurious Emissions at Band Edge**

#### **A.3.1 Reference**

FCC CFR 47 Part 27, Clause 27.53 (h)

#### **A.3.2 Method of measurement**

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.

For MIMO mode configurations, the limit was adjusted with a correction of -6.02dB [10Log4] by using the Measure and Add 10Log(N) dB technique according to FCC KDB 662911 D01 Multiple Transmitter Output accounting for simultaneous transmission from antenna ports RF A,B,C and D.

According to FCC rules, 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 and a RBW of 1MHz for measurements of emissions > 1MHz away from the band edges.

The limit was adjusted with  $-13.01\text{dB}$  [10Log(50/1000)] to compensate for the reduce measurement bandwidth 50KHz for emission more than 1MHz away from the band edges. For MIMO mode, the limit of -32.03dBm was used for emission more than 1MHz away from the band edges. For Non-MIMO mode, the limit of -26.01dBm was used for emission more than 1MHz away from the band edges. Spectrum analyzer detector was set as RMS.

#### **A.3.3 Measurement limit**

(1) General protection levels. Except as otherwise specified below, for operations in the 1695–1710 MHz, 1710–1755 MHz, 1755–1780MHz, 1915–1920 MHz, 1995–2000 MHz, 2000–2020 MHz, 2110–2155 MHz, 2155–2180MHz, 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.

(2) Additional protection levels. Notwithstanding the foregoing paragraph (h) (1) of this section:

(ii) For operations in the 2000–2020MHz band, the power of any emissions below 2000 MHz shall be attenuated below the transmitter power (P) in watts by at least  $70 + 10 \log_{10}(P)$  dB.

(iv) For operations in the 1995–2000MHz band, the power of any emission between 2005–2020 MHz shall be attenuated below the transmitter power (P) in watts by at least  $70 + 10 \log_{10}(P)$  dB.

(4) Private agreements. (i) For AWS operations in the 2000–2020 MHz and 2180–2200 MHz bands, to the extent a licensee establishes unified operations across the AWS blocks, that licensee may choose not to observe the emission limit specified in paragraph (h)(1), above, strictly between its adjacent block licenses in a geographic area, so long as it complies with other Commission rules and is not adversely affecting the operations of other parties by virtue of exceeding the emission limit. (ii) For AWS operations in the 2000–2020 MHz band, a licensee may enter into private agreements with all licensees operating between 1995 and 2000 MHz to allow the  $70 + 10 \log_{10}(P)$  dB limit to be exceeded within the 1995–2000 MHz band.

Based on discussion in docket on DA 13-2409 (para. 25 and 47) for operations in 2000-2020 MHz in downlink, only 27.53(h)(1) and 27.53(h)(3) apply. 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.

### A.3.4 Measurement result

Configuration LTE-MIMO-1C, QPSK

Band Edge Frequency	Channel Bandwidth	RBW(KHz)	Limit(dBm)
Channel Position B 1995.0MHz	5.0 MHz	51	-19.02
Channel Position T 2020.0MHz	5.0 MHz	51	-19.02

Port B, Channel Position B, 5.0MHz





Port B, Channel Position T, 5.0MHz

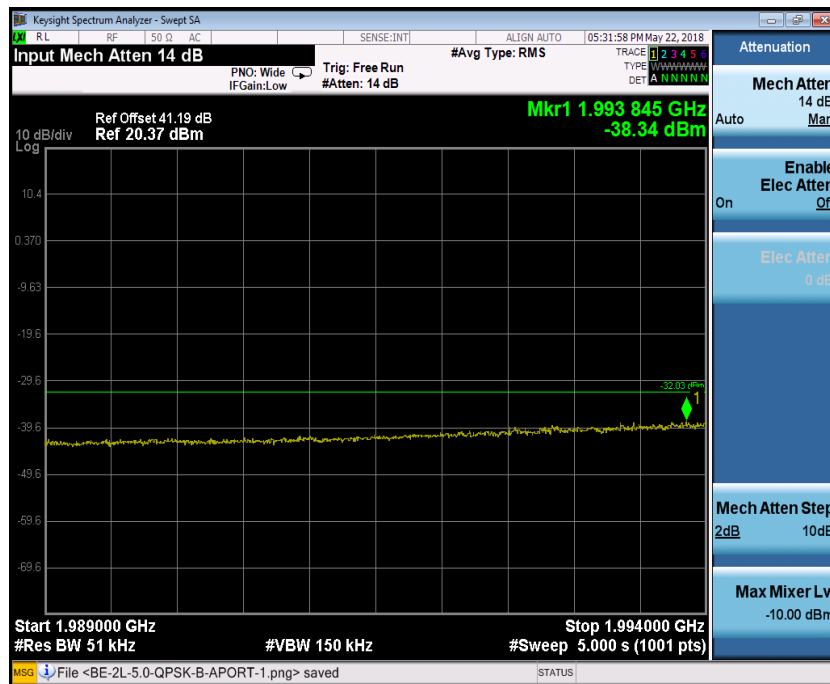
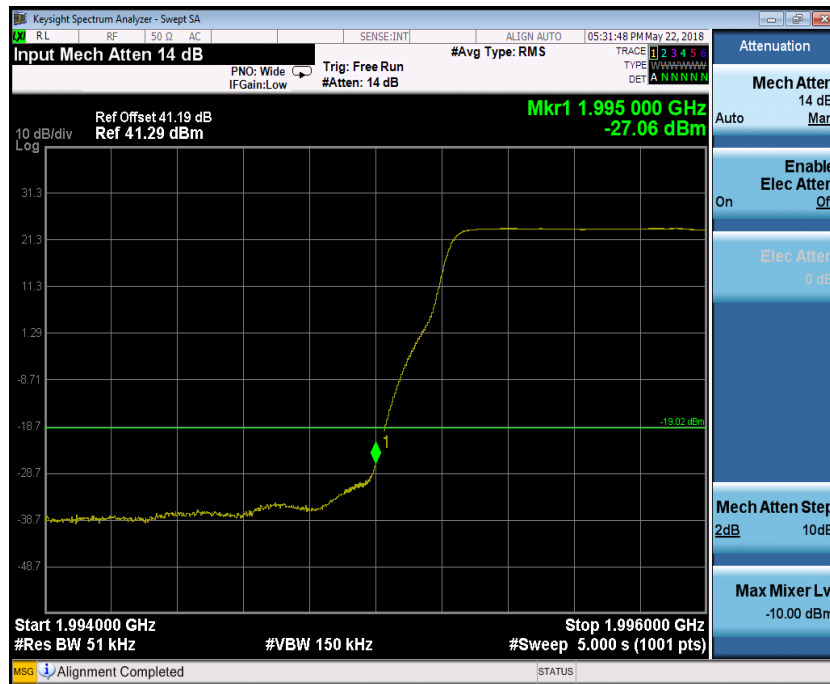




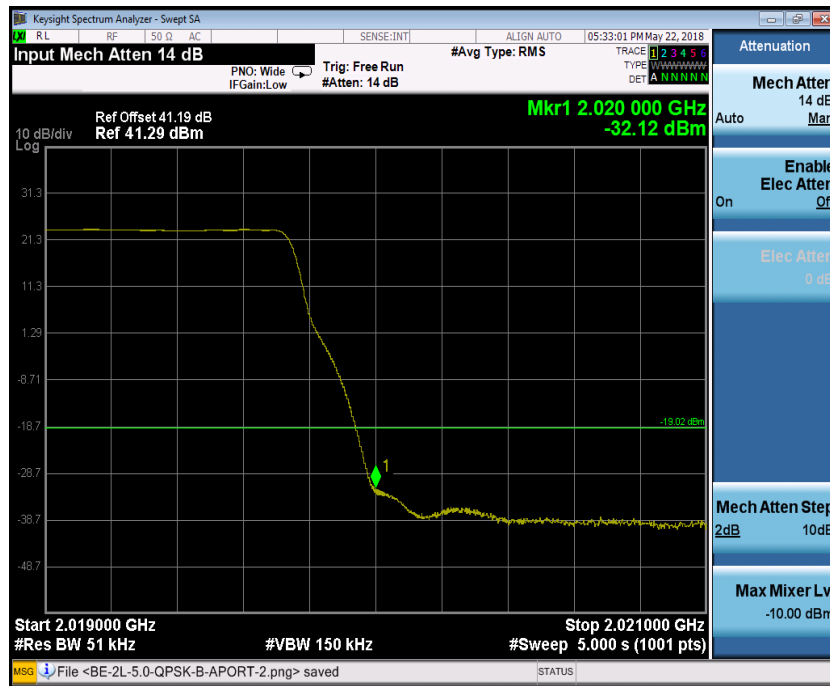
Configuration LTE-MIMO-2C-BE, QPSK

Band Edge Frequency	Channel Bandwidth	RBW(KHz)	Limit(dBm)
Channel Position B 1995.0MHz	5.0 MHz	51	-19.02
Channel Position T 2020.0MHz	5.0 MHz	51	-19.02

Port B, Channel Position B, 5.0MHz



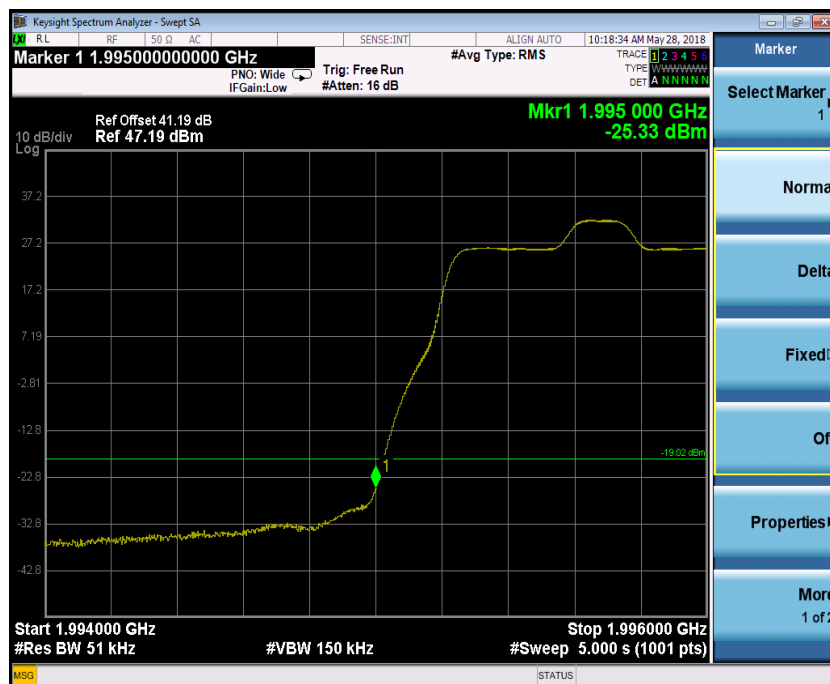
Port B, Channel Position T, 5.0MHz



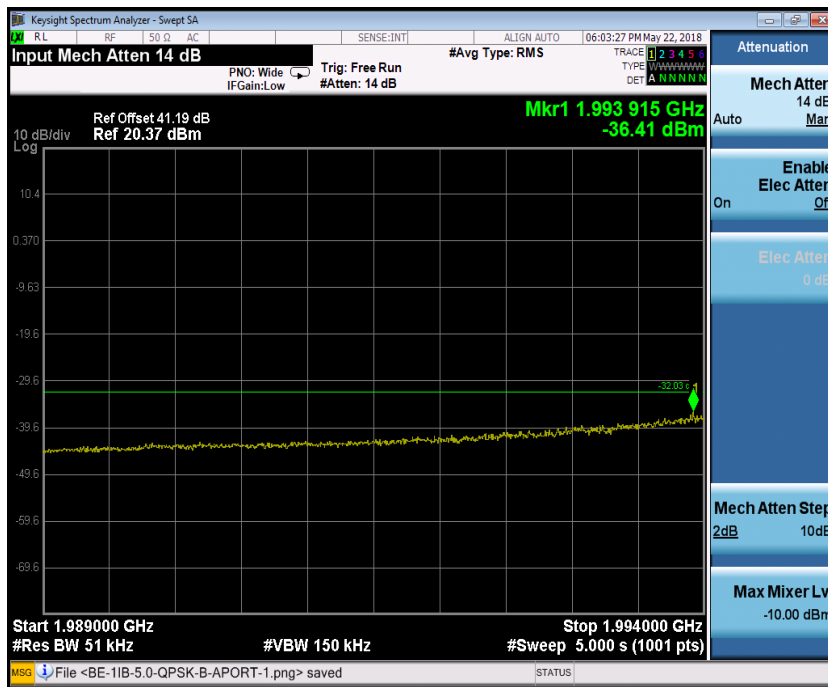
Configuration NB-IoT-InBand-1C, QPSK

Band Edge Frequency	Channel Bandwidth	RBW(KHz)	Limit(dBm)
Channel Position B 1995.0MHz	5.0 MHz	51	-19.02
	10.0 MHz	100	-19.02
	15.0 MHz	150	-19.02
	20.0 MHz	200	-19.02
Channel Position T 2020.0MHz	5.0 MHz	51	-19.02
	10.0 MHz	100	-19.02
	15.0 MHz	150	-19.02
	20.0 MHz	200	-19.02

Port B, Channel Position B, 5.0MHz







Port B, Channel Position T, 5.0MHz

