RF TEST REPORT

Applicant	Quectel Wireless Solutions Co., Ltd
FCC ID	XMR201907BC66NA
Product	NB-IoT Module
Brand	Quectel
Model	BC66-NA
Marketing	Quectel BC66-NA
Report No.	R1906A0274-R3V1
Issue Date	July 22, 2019

TA Technology (Shanghai) Co., Ltd. tested the above equipment in accordance with the requirements in **FCC CFR47 Part 2 (2018)/ FCC CFR47 Part 27C (2018)**. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

Peng Tao

Performed by: Peng Tao

Kai Xu

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Summary of Measurement Results

Number	Test Case	Clause in FCC rules	Verdict
1	RF power output	2.1046	PASS
2	Effective Isotropic Radiated power	27.50(d)(4)/27.50(b)(10) /27.50(c)(10)/27.50(h)(2)	PASS
3	Occupied Bandwidth	2.1049	PASS
4	Band Edge Compliance	27.53(h)/27.53(g) /27.53(f) /27.53(c)	PASS
5	Peak-to-Average Power Ratio	27.50(d)/KDB971168 D01(5.7)	PASS
6	Frequency Stability	2.1055 / 27.54	PASS
7	Spurious Emissions at Antenna Terminals	2.1051 /27.53(h) /27.53(g) /27.53(f) /27.53(c)	PASS
8	Radiates Spurious Emission	2.1053 /27.53(h) /27.53(f) /27.53(c)	PASS
Note: PASS: The EUT complies with the essential requirements in the standard. FAIL: The EUT does not comply with the essential requirements in the standard.			
Date of Testing: June 13, 2019~ July 3, 2019			

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1 Test Laboratory

1.1 Notes of the Test Report

This report shall not be reproduced in full or partial, without the written approval of **TA technology (shanghai) co., Ltd.** The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein .Measurement Uncertainties were not taken into account and are published for informational purposes only. This report is written to support regulatory compliance of the applicable standards stated above.

1.2 Test facility

FCC (Designation number: CN1179, Test Firm Registration Number: 446626)

TA Technology (Shanghai) Co., Ltd. has been listed on the US Federal Communications Commission list of test facilities recognized to perform electromagnetic emissions measurements.

IC (recognition number is 8510A)

TA Technology (Shanghai) Co., Ltd. has been listed by industry Canada to perform electromagnetic emission measurement.

VCCI (recognition number is C-4595, T-2154, R-4113, G-10766)

TA Technology (Shanghai) Co., Ltd. has been listed by industry Japan to perform electromagnetic emission measurement.

A2LA (Certificate Number: 3857.01)

TA Technology (Shanghai) Co., Ltd. has been listed by American Association for Laboratory Accreditation to perform electromagnetic emission measurement.

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1.3 Testing Location

Company:	TA Technology (Shanghai) Co., Ltd.
Address:	No.145, Jintang Rd, Tangzhen Industry Park, Pudong Shanghai, China
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2 General Description of Equipment under Test

Client Information

Applicant	Quectel Wireless Solutions Co., Ltd
Applicant address	7th Floor, Hongye Building, No.1801 Hongmei Road, Xuhui District, Shanghai 200233, China
Manufacturer	Quectel Wireless Solutions Co., Ltd
Manufacturer address	7th Floor, Hongye Building, No.1801 Hongmei Road, Xuhui District, Shanghai 200233, China

General information

EUT Description			
Model	BC66-NA		
IMEI	863405040003730		
Hardware Version	R1.0		
Software Version	BC66NADAR01A01		
Power Supply	External Power Supply		
Antenna Type	External Antenna		
Antenna Gain	4.0 dBi		
Test Mode(s)	NB-IOT Band 4/12/13/17/66/71/85		
Test Modulation	BPSK, QPSK		
Category	NB1		
Deployment	stand-alone		
Sub-carrier spacing	3.75KHz, 15KHz		
Ntones	single, multi-tone		
Maximum E.I.R.P./ E.R.P.	NB-IOT Band 4:	22.01dBm	
	NB-IOT Band 12:	20.73dBm	
	NB-IOT Band 13:	21.42dBm	
	NB-IOT Band 17:	22.56dBm	
	NB-IOT Band 66:	22.74dBm	
	NB-IOT Band 71:	23.12dBm	
	NB-IOT Band 85:	22.92dBm	
Rated Power Supply Voltage:	3.3V		
Extreme Voltage	Minimum: 2.1V Maximum: 3.6V		
Extreme Temperature	Lowest: -40°C Highest: +85°C		
Operating Frequency Range(s)	Mode	Tx (MHz)	Rx (MHz)
	NB-IOT Band 4	1710 ~ 1755	2110 ~ 2155
	NB-IOT Band 12	699 ~ 716	729 ~ 746
	NB-IOT Band 13	777 ~ 787	746 ~ 756

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	NB-IOT Band 17	704 ~ 716	734 ~ 746
	NB-IOT Band 66	1710 ~ 1780	2110 ~ 2200
	NB-IOT Band 71	663 ~ 698	617 ~ 652
	NB-IOT Band 85	698 ~ 716	728 ~ 746
Note: 1. The information of the EUT is declared by the manufacturer.			

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3 Applied Standards

According to the specifications of the manufacturer, it must comply with the requirements of the following standards:

Test standards

FCC CFR47 Part 2 (2018)

FCC CFR47 Part 27C (2018)

ANSI C63.26 (2015)

KDB 971168 D01 Power Meas License Digital Systems v03r01

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4 Test Configuration

Radiated measurements are performed by rotating the EUT in three different orthogonal test planes. EUT stand-up position (Z axis), lie-down position (X, Y axis). Receiver antenna polarization (horizontal and vertical), the worst emission was found in position (Z axis, horizontal polarization) and the worst case was recorded.

All modes as Subcarrier Spacing, modulations, Channel were investigated.
Subsequently, only the worst case emissions are reported.
The following testing in NB-IOT is set based on the maximum RF Output Power.
The following testing in different mode is set to detail in the following table:
Test modes are chosen to be reported as the worst case configuration below for NB-IOT Band 4/12/13/17/66/71/85:

Test items	Deployment mode	Subcarrier Spacing (kHz)		Modulation		Test Channel		
	Stand-alone	3.75	15	BPSK	QPSK	L	M	H
RF power output	O	O	O	O	O	O	O	O
Effective Isotropic Radiated power	O	O	O	O	O	O	O	O
Occupied Bandwidth	O	O	O	O	O	O	O	O
Band Edge Compliance	O	O	O	O	O	O	-	O
Peak-to-Average Power Ratio	O	O	O	O	O	-	O	-
Frequency Stability	O	O	O	O	O	O	O	O
Conducted Spurious Emissions	O	-	O	-	O	O	O	O
Radiates Spurious Emission	O	-	O	-	O	O	O	O

Note
1. The mark “O” means that this configuration is chosen for testing.
2. The mark “-” means that this configuration is not testing.

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5 Test Case Results

5.1 RF Power Output

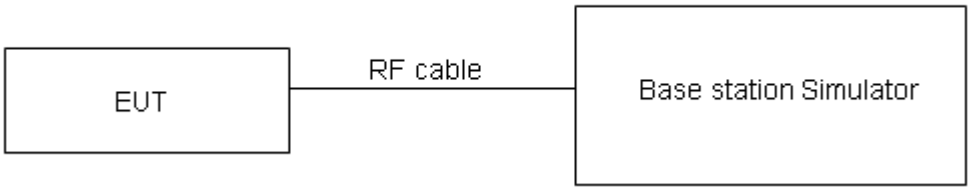
Ambient condition

Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.5kPa

Methods of Measurement

During the process of the testing, The EUT is controlled by the Base Station Simulator to ensure max power transmission and proper modulation.

Test Setup



The loss between RF output port of the EUT and the input port of the tester has been taken into consideration.

Limits

No specific RF power output requirements in part 2.1046.

Measurement Uncertainty

The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor k = 2, U=0.4 dB.

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Test Results

Mode	Modulation	Sub-carrier spacing (KHz)	Ntones	Conducted Power (dBm) for low/mid/high channel		
				19951/1710.1	20175/1732.5	20399/1754.9
Band 4 Standalone	BPSK	3.75	1@0	22.80	22.79	22.71
			1@47	22.78	22.77	22.69
		15	1@0	22.76	22.70	22.68
			1@11	22.73	22.71	22.66
	QPSK	3.75	1@0	22.82	22.83	22.74
			1@47	22.83	22.73	22.72
		15	1@0	22.68	22.74	22.67
			1@11	22.80	22.77	22.60
		15	12@0	21.03	21.10	21.06

Mode	Modulation	Sub-carrier spacing (KHz)	Ntones	Conducted Power (dBm) for low/mid/high channel		
				23011/699.1	23095/707.5	23179/715.9
Band 12 Standalone	BPSK	3.75	1@0	22.70	22.69	22.68
			1@47	22.67	22.66	22.67
		15	1@0	22.64	22.63	22.65
			1@11	22.62	22.64	22.66
	QPSK	3.75	1@0	22.71	22.68	22.69
			1@47	22.70	22.78	22.79
		15	1@0	22.67	22.69	22.73
			1@11	22.59	22.57	22.76
		15	12@0	20.57	20.64	20.95

Mode	Modulation	Sub-carrier spacing (KHz)	Ntones	Conducted Power (dBm) for low/mid/high channel		
				23181/777.1	23230/782	23279/786.9
Band 13 Standalone	BPSK	3.75	1@0	22.53	22.58	22.69
			1@47	22.51	22.56	22.67
		15	1@0	22.46	22.54	22.62
			1@11	22.45	22.52	22.60
	QPSK	3.75	1@0	22.55	22.59	22.71
			1@47	22.54	22.57	22.62
		15	1@0	22.52	22.50	22.66
			1@11	22.45	22.48	22.57
		15	12@0	20.39	20.48	20.52

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Mode	Modulation	Sub-carrier spacing (KHz)	Ntones	Conducted Power (dBm) for low/mid/high channel		
				23731/704.1	23790/710	23849/715.9
Band 17 Standalone	BPSK	3.75	1@0	22.85	22.77	22.81
			1@47	22.84	22.76	22.87
		15	1@0	22.70	22.67	22.73
			1@11	22.68	22.69	22.72
	QPSK	3.75	1@0	22.88	22.79	22.91
			1@47	22.79	22.71	22.90
		15	1@0	22.72	22.66	22.77
			1@11	22.67	22.75	22.65
		15	12@0	20.90	20.69	20.81

Mode	Modulation	Sub-carrier spacing (KHz)	Ntones	Conducted Power (dBm) for low/mid/high channel		
				131973/1710.1	132322/1745	132671/1779.9
Band 66 Standalone	BPSK	3.75	1@0	22.73	22.74	22.67
			1@47	22.75	22.71	22.64
		15	1@0	22.71	22.70	22.69
			1@11	22.72	22.69	22.72
	QPSK	3.75	1@0	22.79	22.76	22.63
			1@47	22.70	22.75	22.58
		15	1@0	22.77	22.73	22.57
			1@11	22.64	22.76	22.65
		15	12@0	21.03	21.09	20.93

Mode	Modulation	Sub-carrier spacing (KHz)	Ntones	Conducted Power (dBm) for low/mid/high channel		
				133123/663.1	133297/680.5	133471/697.9
Band 71 Standalone	BPSK	3.75	1@0	22.79	22.67	22.81
			1@47	22.78	22.65	22.79
		15	1@0	22.76	22.62	22.75
			1@11	22.75	22.61	22.77
	QPSK	3.75	1@0	22.81	22.69	22.73
			1@47	22.82	22.60	22.83
		15	1@0	22.63	22.59	22.76
			1@11	22.68	22.69	22.73
		15	12@0	20.90	20.64	20.77

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Mode	Modulation	Sub-carrier spacing (KHz)	Ntones	Conducted Power (dBm) for low/mid/high channel		
				134003/698.1	134081/705.9	134181/715.9
Band 85 Standalone	BPSK	3.75	1@0	22.90	22.97	23.05
			1@47	22.99	22.95	23.02
		15	1@0	22.82	22.92	22.98
			1@11	22.90	22.94	22.99
	QPSK	3.75	1@0	23.03	22.98	23.07
			1@47	22.94	22.90	23.06
		15	1@0	22.87	22.91	22.90
			1@11	22.83	22.98	22.96
		15	12@0	21.06	21.94	21.24

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5.2 Effective Isotropic Radiated Power

Ambient condition

Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.5kPa

Methods of Measurement

1. The testing follows FCC KDB 971168 D01 v03r01 Section 5.8 and ANSI C63.26 (2015).

a) Connect the equipment as illustrated. Mount the equipment with the manufacturer specified antenna in a vertical orientation on a manufacturer specified mounting surface located on a non-conducting rotating platform of a RF anechoic chamber (preferred) or a standard radiation site.

b) Key the transmitter, then rotate the EUT 360° azimuthally and record spectrum analyzer power level (LVL) measurements at angular increments that are sufficiently small to permit resolution of all peaks. If a standard radiation test site is used, raise and lower the test antenna to obtain a maximum reading at each angular increment. (Note: several batteries may be needed to offset the effect of battery voltage droop, which should not exceed 5% of the manufactured specified battery voltage during transmission).

c) Replace the transmitter under test with a vertically polarized half-wave dipole (or an antenna whose gain is known relative to an ideal half-wave dipole). The center of the antenna should be at the same location as the center of the antenna under test.

d) Connect the antenna to a signal generator with a known output power and record the path loss (in dB) as LOSS. If a standard radiation test site is used, raise and lower the test antenna to obtain a maximum reading.LOSS = Generator Output Power (dBm) – Analyzer reading (dBm)

e) Determine the effective radiated output power at each angular position from the readings in steps b) and d) using the following equation:ERP (dBm) = LVL (dBm) + LOSS (dB)

f) The maximum ERP is the maximum value determined in the preceding step.

g) When calculating ERP, in addition to knowing the antenna radiation and matching characteristics, it is necessary to know the loss values of all elements (e.g.transmission line attenuation, mismatches, filters, combiners) interposed between the point where transmitter output power is measured, and the point where power is applied to the antenna. ERP can then be calculated as follows:

EIRP (dBm) = Output Power (dBm) - Losses (dB) + Antenna Gain (dBi)

where:dBd refers to gain relative to an ideal dipole.

EIRP (dBm) = ERP (dBm) + 2.15 (dB.)

The RB allocation refers to section 5.1, using the maximum output power configuration.

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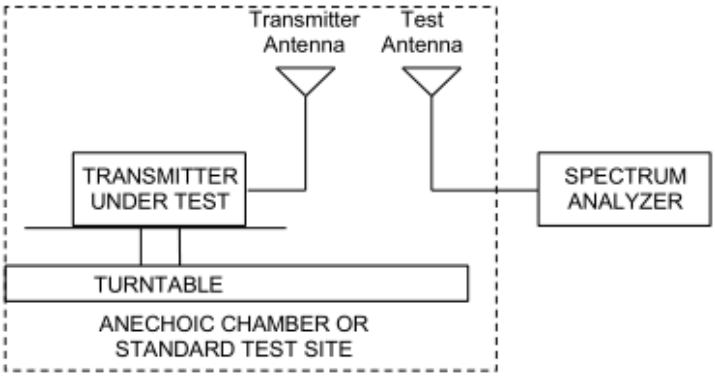
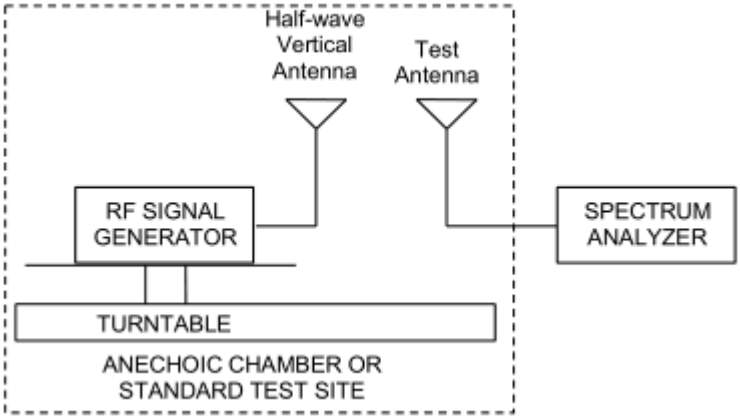
Test setup





Note: Area side:2.4mX3.6m

The radiated emission was measured in the following position: EUT stand-up position (Z axis), lie-down position (X, Y axis). The worst emission was found in stand-up position (Z axis) and the worst case was recorded.

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Limits

Rule Part 27.50(b) (10) specifies that “Portable stations (hand-held devices) transmitting in the 746-757 MHz, 776-788 MHz, and 805-806 MHz bands are limited to 3 watts ERP”

Rule Part 27.50(c) (10) specifies that “Portable stations (hand-held devices) in the 600 MHz uplink band and the 698-746 MHz band, and fixed and mobile stations in the 600 MHz uplink band are limited to 3 watts ERP”

Rule Part 27.50(d) (4) specifies that “Fixed, mobile and portable (hand-held) stations operating in the 1710–1755 MHz band are limited to 1 watt EIRP”

Part 27.50(b)(10)Limit	⩽ 3 W (34.77 dBm)
Part 27.50(c)(10)Limit	⩽ 3 W (34.77 dBm)
Part 27.50(d)(4)Limit	⩽ 1 W (30 dBm)

Measurement Uncertainty

The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor k = 2, U= 1.19 dB

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Test Results

The measurement is performed for both of horizontal and vertical antenna Polarization, and only the data of worst mode is recorded in this report.

Mode	Channel	Frequency (MHz)	Modulation	Polarization	Sub-carrier spacing (KHz)	Ntones	EIRP (dBm)	Limit (dBm)	Conclusion
Band4 Standalone	19951	1710.1	BPSK	V	3.75	1@0	21.91	30	Pass
			QPSK	V	3.75	1@0	22.01	30	Pass
			BPSK	V	15	1@0	21.79	30	Pass
			QPSK	V	15	1@0	21.82	30	Pass
	20175	1732.5	BPSK	V	3.75	1@0	21.97	30	Pass
			QPSK	V	3.75	1@0	21.95	30	Pass
			BPSK	V	15	1@0	21.62	30	Pass
			QPSK	V	15	1@0	21.73	30	Pass
	20399	1754.9	BPSK	V	3.75	1@0	21.76	30	Pass
			QPSK	V	3.75	1@0	21.88	30	Pass
			BPSK	V	15	1@0	21.68	30	Pass
			QPSK	V	15	1@0	21.62	30	Pass

Mode	Channel	Frequency (MHz)	Modulation	Polarization	Sub-carrier spacing (KHz)	Ntones	ERP (dBm)	Limit (dBm)	Conclusion
Band12 Standalone	23011	699.1	BPSK	H	3.75	1@0	20.67	34.77	Pass
			QPSK	H	3.75	1@0	20.73	34.77	Pass
			BPSK	H	15	1@0	20.46	34.77	Pass
			QPSK	H	15	1@0	20.34	34.77	Pass
	23095	707.5	BPSK	H	3.75	1@0	20.61	34.77	Pass
			QPSK	H	3.75	1@0	20.51	34.77	Pass
			BPSK	H	15	1@0	20.37	34.77	Pass
			QPSK	H	15	1@0	20.29	34.77	Pass
	23179	715.9	BPSK	H	3.75	1@0	20.59	34.77	Pass
			QPSK	H	3.75	1@0	20.63	34.77	Pass
			BPSK	H	15	1@0	20.43	34.77	Pass
			QPSK	H	15	1@0	20.28	34.77	Pass

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Mode	Channel	Frequency (MHz)	Modulation	Polarization	Sub-carrier spacing (KHz)	Ntones	ERP (dBm)	Limit (dBm)	Conclusion
Band13 Standalone	23181	777.1	BPSK	H	3.75	1@0	21.32	34.77	Pass
			QPSK	H	3.75	1@0	21.36	34.77	Pass
			BPSK	H	15	1@0	21.27	34.77	Pass
			QPSK	H	15	1@0	21.19	34.77	Pass
	23230	782	BPSK	H	3.75	1@0	21.28	34.77	Pass
			QPSK	H	3.75	1@0	21.19	34.77	Pass
			BPSK	H	15	1@0	21.15	34.77	Pass
			QPSK	H	15	1@0	21.08	34.77	Pass
	23279	786.9	BPSK	H	3.75	1@0	21.34	34.77	Pass
			QPSK	H	3.75	1@0	21.42	34.77	Pass
			BPSK	H	15	1@0	21.08	34.77	Pass
			QPSK	H	15	1@0	21.14	34.77	Pass

Mode	Channel	Frequency (MHz)	Modulation	Polarization	Sub-carrier spacing (KHz)	Ntones	ERP (dBm)	Limit (dBm)	Conclusion
Band17 Standalone	23731	704.1	BPSK	H	3.75	1@0	22.56	34.77	Pass
			QPSK	H	3.75	1@0	22.43	34.77	Pass
			BPSK	H	15	1@0	22.27	34.77	Pass
			QPSK	H	15	1@0	22.34	34.77	Pass
	23790	710	BPSK	H	3.75	1@0	22.49	34.77	Pass
			QPSK	H	3.75	1@0	22.40	34.77	Pass
			BPSK	H	15	1@0	22.28	34.77	Pass
			QPSK	H	15	1@0	22.21	34.77	Pass
	23849	715.9	BPSK	H	3.75	1@0	22.39	34.77	Pass
			QPSK	H	3.75	1@0	22.42	34.77	Pass
			BPSK	H	15	1@0	22.15	34.77	Pass
			QPSK	H	15	1@0	22.18	34.77	Pass

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Mode	Channel	Frequency (MHz)	Modulation	Polarization	Sub-carrier spacing (KHz)	Ntones	EIRP (dBm)	Limit (dBm)	Conclusion
Band66 Standalone	131973	1710.1	BPSK	V	3.75	1@0	22.27	30	Pass
			QPSK	V	3.75	1@0	22.14	30	Pass
			BPSK	V	15	1@0	22.03	30	Pass
			QPSK	V	15	1@0	22.15	30	Pass
	132322	1745	BPSK	V	3.75	1@0	22.74	30	Pass
			QPSK	V	3.75	1@0	22.66	30	Pass
			BPSK	V	15	1@0	22.15	30	Pass
			QPSK	V	15	1@0	22.09	30	Pass
	132671	1779.9	BPSK	V	3.75	1@0	22.37	30	Pass
			QPSK	V	3.75	1@0	22.43	30	Pass
			BPSK	V	15	1@0	22.04	30	Pass
			QPSK	V	15	1@0	22.16	30	Pass

Mode	Channel	Frequency (MHz)	Modulation	Polarization	Sub-carrier spacing (KHz)	Ntones	ERP (dBm)	Limit (dBm)	Conclusion
Band71 Standalone	133123	663.1	BPSK	H	3.75	1@0	23.12	34.77	Pass
			QPSK	H	3.75	1@0	23.08	34.77	Pass
			BPSK	H	15	1@0	22.89	34.77	Pass
			QPSK	H	15	1@0	22.91	34.77	Pass
	133297	680.5	BPSK	H	3.75	1@0	23.11	34.77	Pass
			QPSK	H	3.75	1@0	23.01	34.77	Pass
			BPSK	H	15	1@0	22.96	34.77	Pass
			QPSK	H	15	1@0	23.03	34.77	Pass
	133471	697.9	BPSK	H	3.75	1@0	22.86	34.77	Pass
			QPSK	H	3.75	1@0	22.70	34.77	Pass
			BPSK	H	15	1@0	22.76	34.77	Pass
			QPSK	H	15	1@0	22.81	34.77	Pass

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Mode	Channel	Frequency (MHz)	Modulation	Polarization	Sub-carrier spacing (KHz)	Ntones	ERP (dBm)	Limit (dBm)	Conclusion
Band85 Standalone	134003	698.1	BPSK	H	3.75	1@0	22.87	34.77	Pass
			QPSK	H	3.75	1@0	22.92	34.77	Pass
			BPSK	H	15	1@0	22.64	34.77	Pass
			QPSK	H	15	1@0	22.56	34.77	Pass
	134081	705.9	BPSK	H	3.75	1@0	22.74	34.77	Pass
			QPSK	H	3.75	1@0	22.86	34.77	Pass
			BPSK	H	15	1@0	22.43	34.77	Pass
			QPSK	H	15	1@0	22.51	34.77	Pass
	134181	715.9	BPSK	H	3.75	1@0	22.67	34.77	Pass
			QPSK	H	3.75	1@0	22.57	34.77	Pass
			BPSK	H	15	1@0	22.46	34.77	Pass
			QPSK	H	15	1@0	22.43	34.77	Pass

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5.3 Occupied Bandwidth

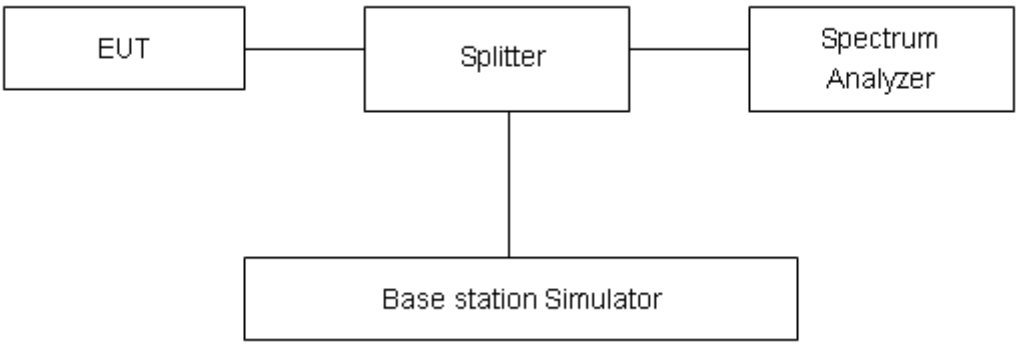
Ambient condition

Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.5kPa

Method of Measurement

The EUT was connected to Spectrum Analyzer and Base Station Simulator via power Splitter. The occupied bandwidth is measured using spectrum analyzer.
RBW is set to 2kHz, VBW is set to 6.2kHz for NB-IOT Band 4/12/13/17/66/71/85.
99% power and -26dBc occupied bandwidths are recorded. Spectrum analyzer plots are included on the following pages.

Test Setup



Limits

No specific occupied bandwidth requirements in part 2.1049.

Measurement Uncertainty

The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor k = 2, U=624Hz.

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Test Result

Mode	Modulation	Sub-carrier spacing (KHz)	Ntones	Bandwidth(KHz) for low/mid/high channel					
				19951/1710.1		20175/1732.5		20399/1754.9	
				99% Power	-26dBc	99% Power	-26dBc	99% Power	-26dBc
Band 4 Standalone	BPSK	3.75	1@0	51.78	39.06	50.49	39.03	50.33	39.18
	QPSK	3.75	1@0	57.50	42.40	57.32	42.97	57.53	44.83
	BPSK	15	1@0	104.12	114.80	111.05	126.20	109.43	114.60
	QPSK	15	1@0	111.80	117.80	106.80	127.70	104.88	117.30
	QPSK	15	12@0	182.61	249.30	180.59	235.20	181.26	233.30

Mode	Modulation	Sub-carrier spacing (KHz)	Ntones	Bandwidth(KHz) for low/mid/high channel					
				23011/699.1		23095/707.5		23179/715.9	
				99% Power	-26dBc	99% Power	-26dBc	99% Power	-26dBc
Band 12 Standalone	BPSK	3.75	1@0	48.12	38.79	48.17	38.69	48.47	38.80
	QPSK	3.75	1@0	53.88	42.62	52.98	41.91	53.28	42.05
	BPSK	15	1@0	104.89	115.00	101.08	114.00	105.75	113.50
	QPSK	15	1@0	103.38	116.60	103.57	114.60	102.22	129.50
	QPSK	15	12@0	179.90	234.20	182.02	238.00	182.21	238.40

Mode	Modulation	Sub-carrier spacing (KHz)	Ntones	Bandwidth(KHz) for low/mid/high channel					
				23181/777.1		23230/782		23279/786.9	
				99% Power	-26dBc	99% Power	-26dBc	99% Power	-26dBc
Band 13 Standalone	BPSK	3.75	1@0	47.49	38.73	48.02	38.78	48.38	38.46
	QPSK	3.75	1@0	54.48	42.89	54.57	42.80	53.48	42.36
	BPSK	15	1@0	105.20	115.00	111.59	119.20	104.15	112.90
	QPSK	15	1@0	101.78	130.00	105.17	1229.90	100.07	129.50
	QPSK	15	12@0	181.93	238.90	180.40	232.40	182.25	234.90

Mode	Modulation	Sub-carrier spacing (KHz)	Ntones	Bandwidth(KHz) for low/mid/high channel					
				23731/704.1		23790/710		23849/715.9	
				99% Power	-26dBc	99% Power	-26dBc	99% Power	-26dBc
Band 17 Standalone	BPSK	3.75	1@0	47.81	38.64	48.92	38.82	48.14	38.52
	QPSK	3.75	1@0	54.05	42.37	54.19	40.32	53.51	42.28
	BPSK	15	1@0	104.34	127.20	106.39	111.90	111.82	118.80
	QPSK	15	1@0	103.60	116.70	105.32	130.70	106.92	129.90
	QPSK	15	12@0	179.27	235.90	181.67	237.30	180.84	235.30

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Mode	Modulation	Sub-carrier spacing (KHz)	Ntones	Bandwidth(KHz) for low/mid/high channel					
				131973/1710.1		132322/1745		132671/1779.9	
				99% Power	-26dBc	99% Power	-26dBc	99% Power	-26dBc
Band 66 Standalone	BPSK	3.75	1@0	51.06	39.17	50.76	38.89	50.84	38.47
	QPSK	3.75	1@0	56.91	42.10	57.66	42.91	57.03	44.15
	BPSK	15	1@0	112.09	134.47	107.42	115.40	108.51	114.20
	QPSK	15	1@0	118.19	140.60	106.23	129.90	104.88	117.00
	QPSK	15	12@0	182.99	249.50	183.11	249.70	181.60	247.80

Mode	Modulation	Sub-carrier spacing (KHz)	Ntones	Bandwidth(KHz) for low/mid/high channel					
				133123/663.1		133297/680.5		133471/679.9	
				99% Power	-26dBc	99% Power	-26dBc	99% Power	-26dBc
Band 71 Standalone	BPSK	3.75	1@0	47.73	38.63	47.81	38.48	48.37	38.46
	QPSK	3.75	1@0	53.31	42.45	53.61	41.97	53.90	42.10
	BPSK	15	1@0	105.21	117.10	103.69	116.90	102.34	114.40
	QPSK	15	1@0	102.26	117.30	103.08	117.10	101.99	128.10
	QPSK	15	12@0	179.00	231.40	182.56	238.50	180.95	235.80

Mode	Modulation	Sub-carrier spacing (KHz)	Ntones	Bandwidth(KHz) for low/mid/high channel					
				134003/698.1		134081/705.9		134181/715.9	
				99% Power	-26dBc	99% Power	-26dBc	99% Power	-26dBc
Band 85 Standalone	BPSK	3.75	1@0	48.12	38.62	50.24	38.66	47.75	38.49
	QPSK	3.75	1@0	53.67	41.01	54.83	42.27	53.36	41.72
	BPSK	15	1@0	106.00	117.20	106.17	116.50	105.71	113.20
	QPSK	15	1@0	103.79	115.20	101.56	117.90	102.59	127.90
	QPSK	15	12@0	180.64	234.90	181.53	245.40	181.50	237.90

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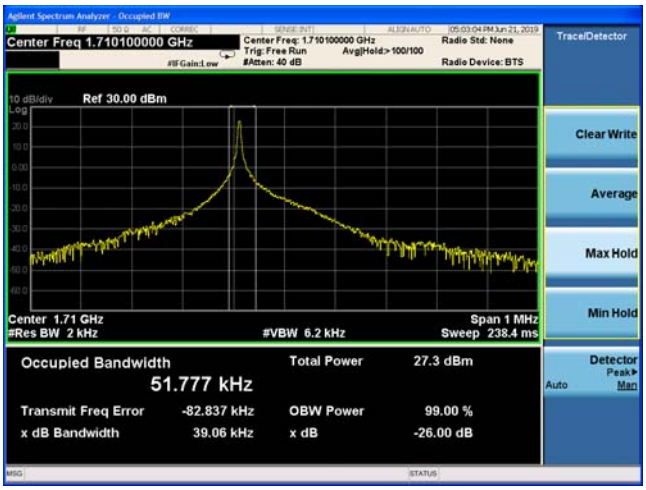
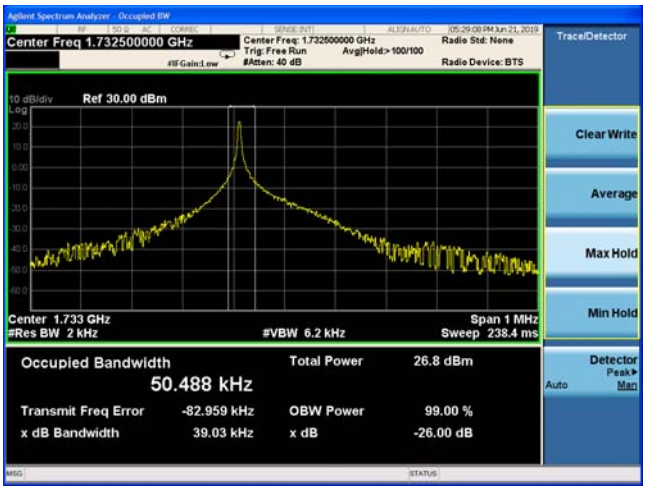
NB-IOT Band 4 BPSK 3.75KHz 1@0 CH-Low

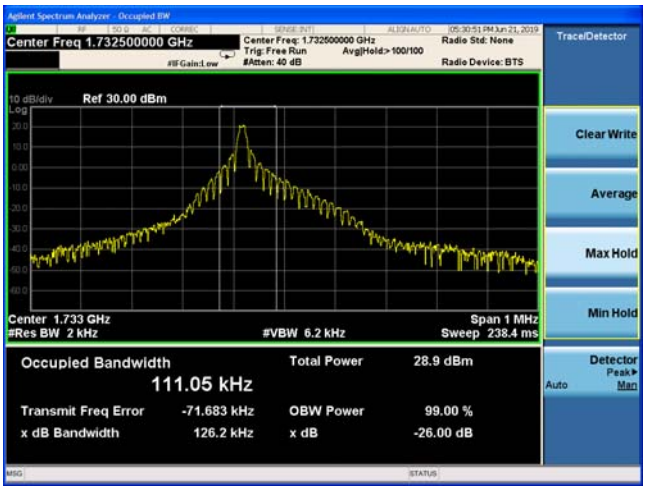


NB-IOT Band 4 BPSK 15KHz 1@0 CH-Low

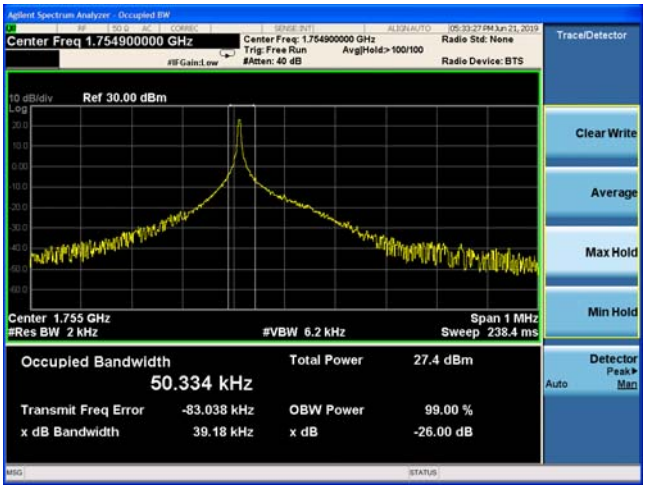
NB-IOT Band 4 BPSK 3.75KHz 1@0 CH-Middle



NB-IOT Band 4 BPSK 15KHz 1@0 CH-Middle



NB-IOT Band 4 BPSK 3.75KHz 1@0 CH-High



NB-IOT Band 4 BPSK 15KHz 1@0 CH-High

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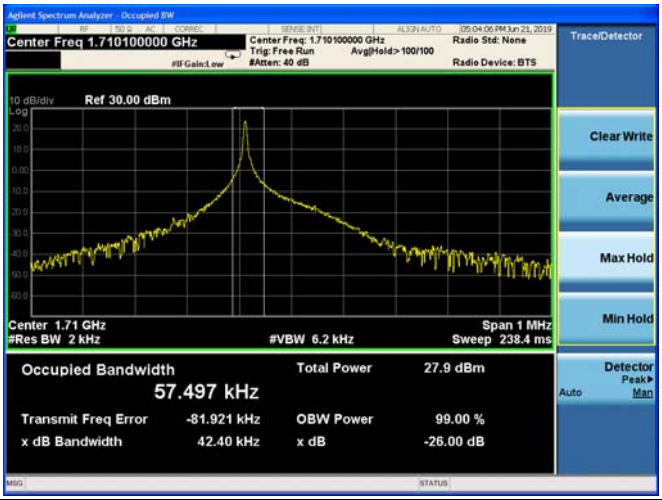
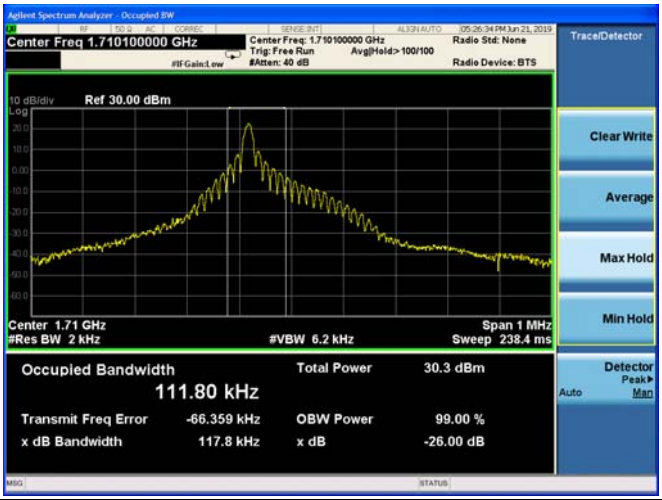
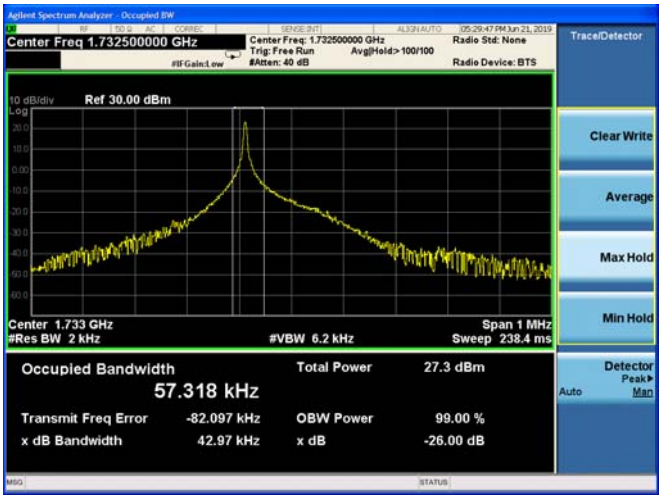
NB-IOT Band 4 QPSK 3.75KHz 1@0 CH-Low



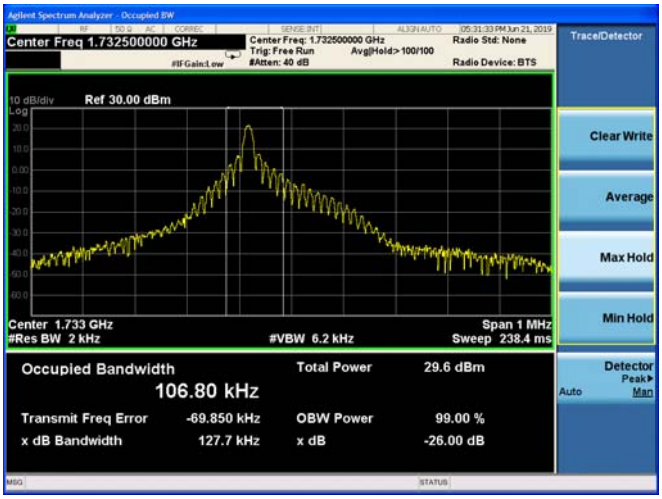
NB-IOT Band 4 QPSK 15KHz 1@0 CH-Low



NB-IOT Band 4 QPSK 3.75KHz 1@0 CH-Middle



NB-IOT Band 4 QPSK 15KHz 1@0 CH-Middle



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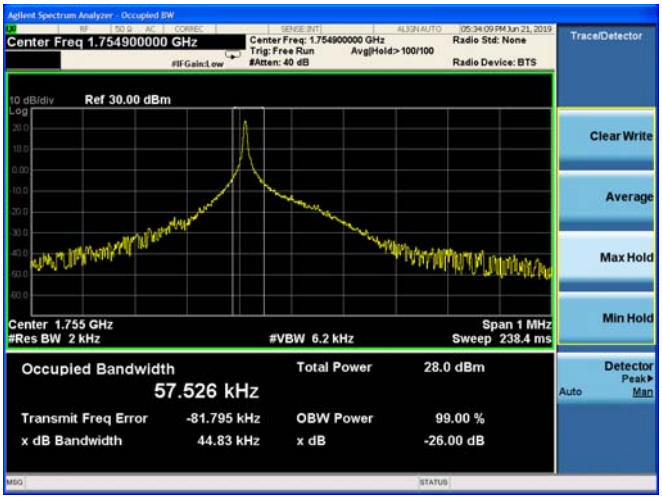
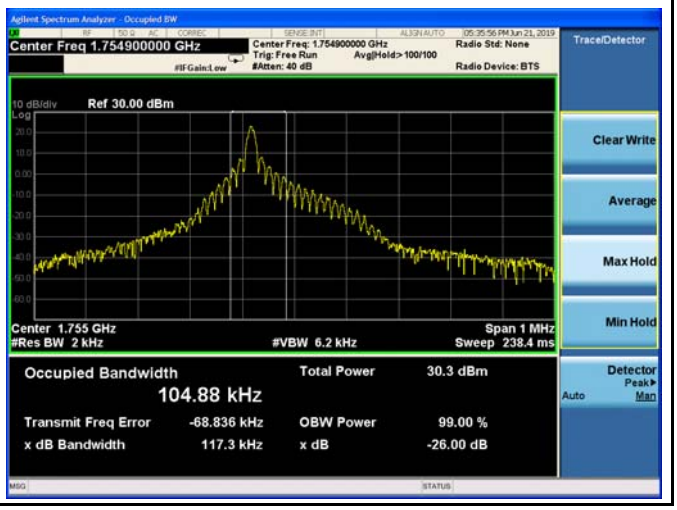


NB-IOT Band 4 QPSK 15KHz 1@0 CH-High



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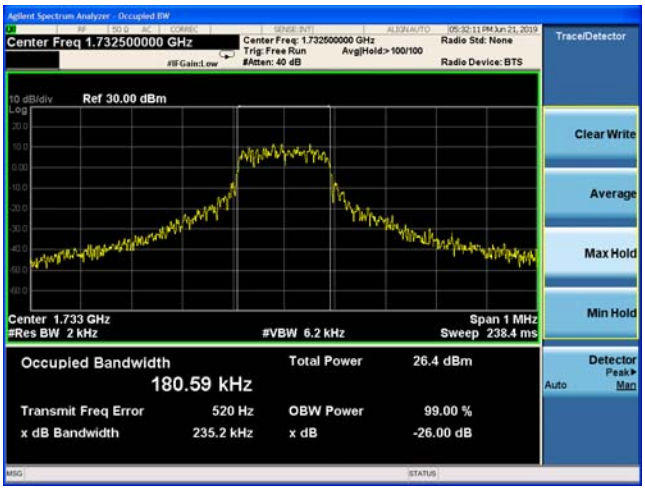
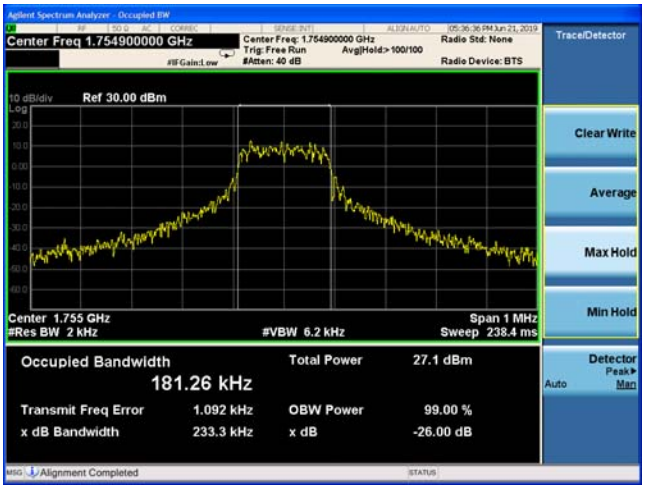
NB-IOT Band 4 QPSK 15KHz 12@0 CH-Low

NB-IOT Band 4 QPSK 15KHz 12@0 CH-Middle



NB-IOT Band 4 QPSK 15KHz 12@0 CH-High



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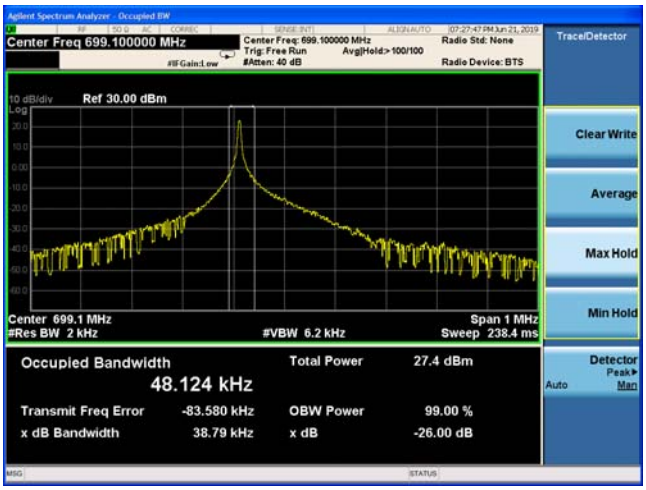
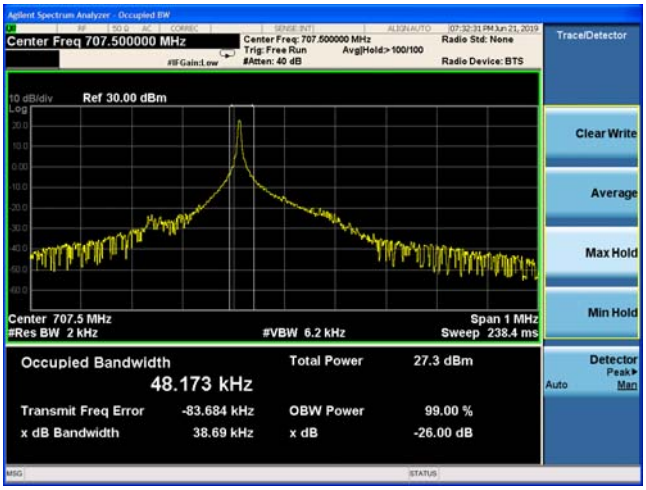
NB-IOT Band 12 BPSK 3.75KHz 1@0 CH-Low

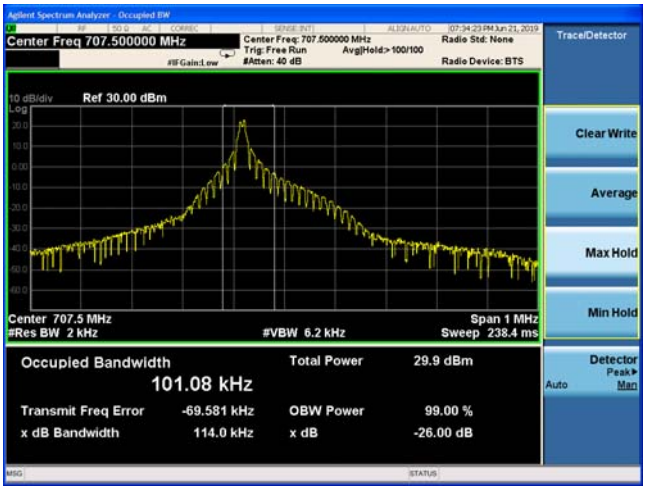


NB-IOT Band 12 BPSK 15KHz 1@0 CH-Low

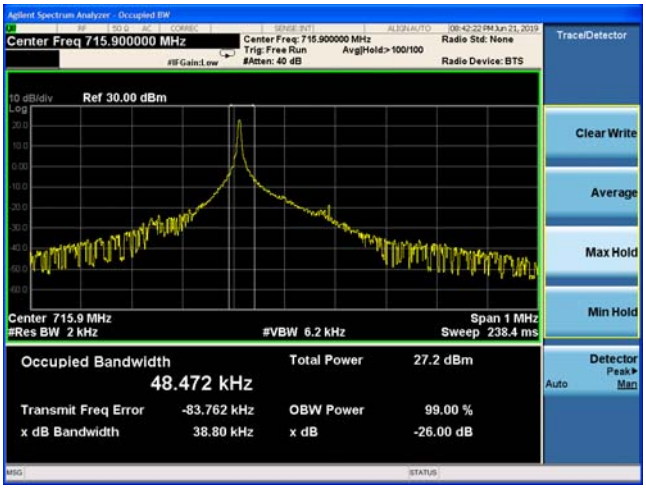
NB-IOT Band 12 BPSK 3.75KHz 1@0 CH-Middle



NB-IOT Band 12 BPSK 15KHz 1@0 CH-Middle



NB-IOT Band 12 BPSK 3.75KHz 1@0 CH-High



NB-IOT Band 12 BPSK 15KHz 1@0 CH-High

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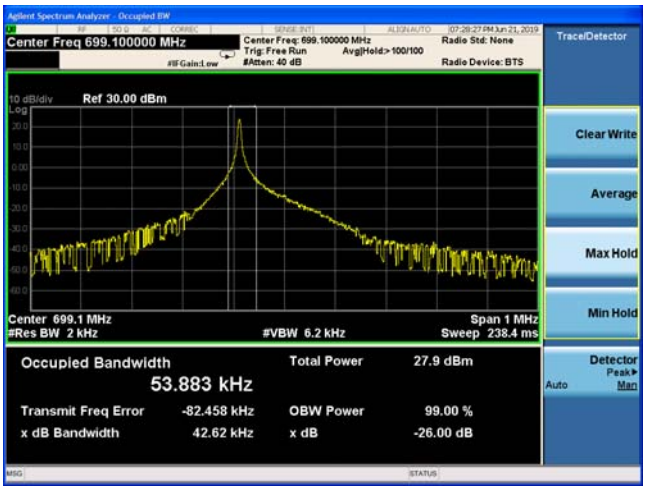
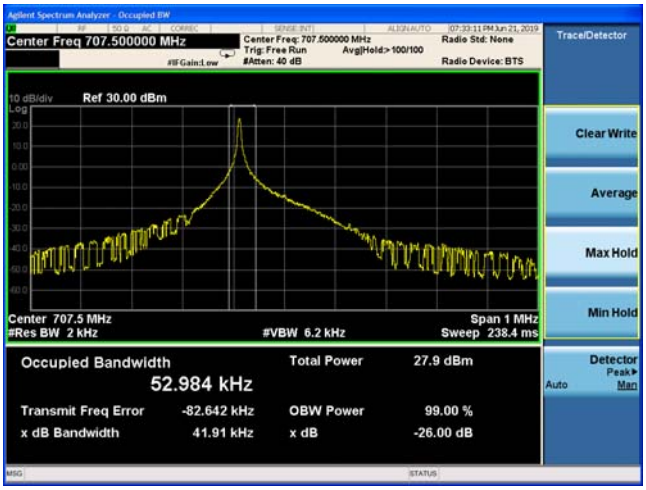
NB-IOT Band 12 QPSK 3.75KHz 1@0 CH-Low

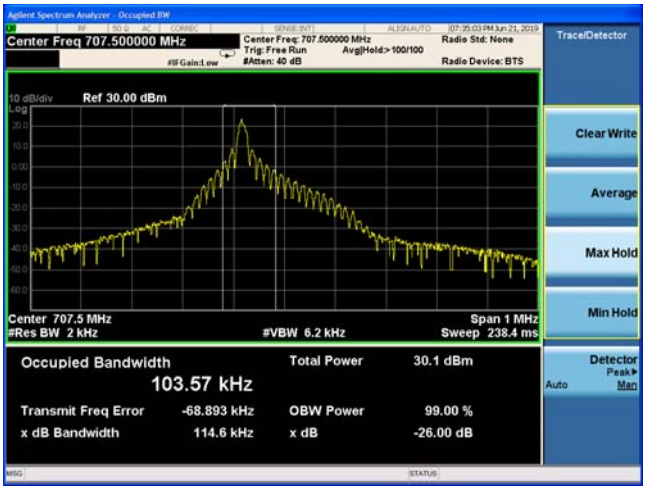


NB-IOT Band 12 QPSK 15KHz 1@0 CH-Low

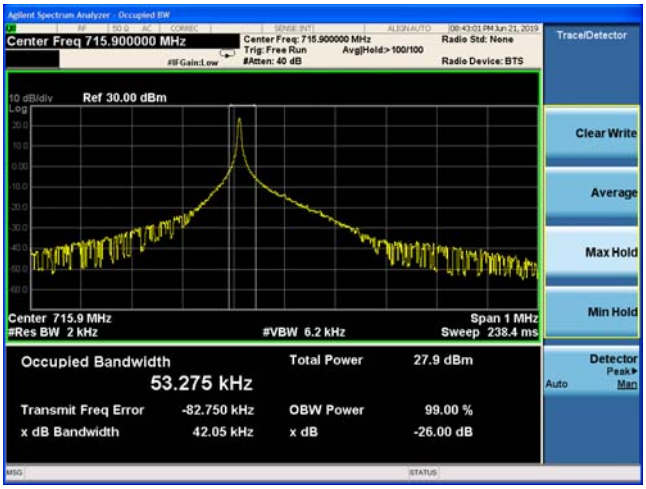
NB-IOT Band 12 QPSK 3.75KHz 1@0 CH-Middle



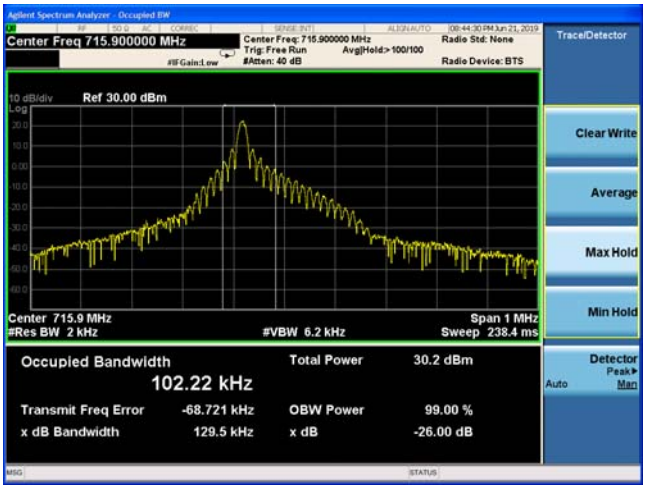
NB-IOT Band 12QPSK 15KHz 1@0 CH-Middle



NB-IOT Band 12 QPSK 3.75KHz 1@0 CH-High



NB-IOT Band 12 QPSK 15KHz 1@0 CH-High



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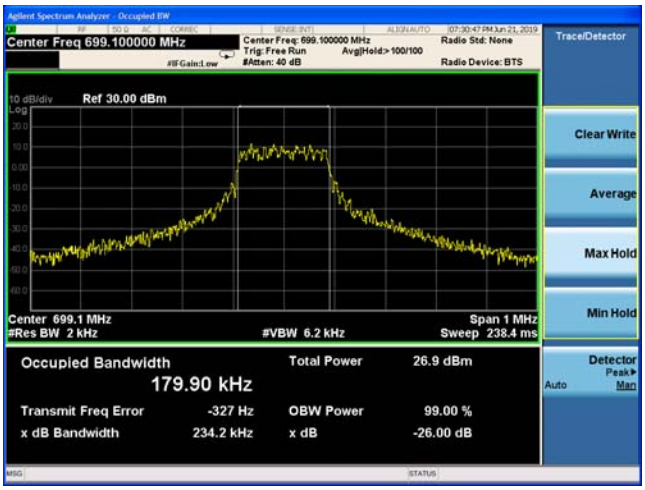
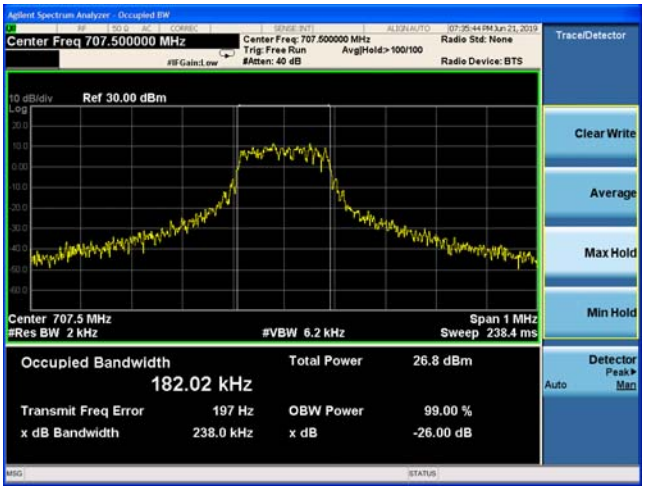
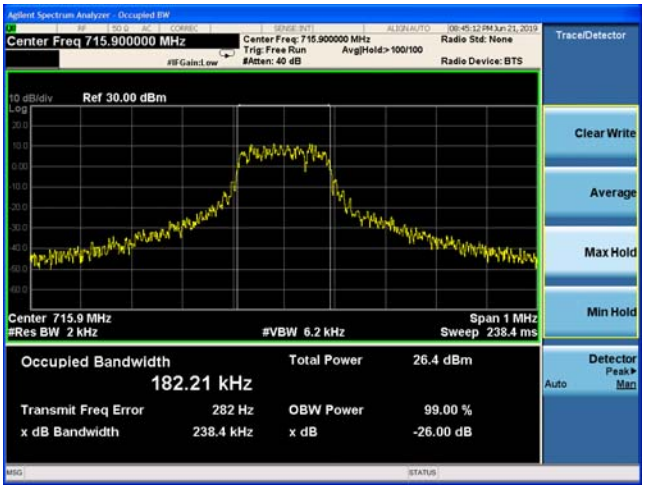
NB-IOT Band 12 QPSK 15KHz 12@0 CH-Low



NB-IOT Band 12 QPSK 15KHz 12@0 CH-Middle



NB-IOT Band 12 QPSK 15KHz 12@0 CH-High



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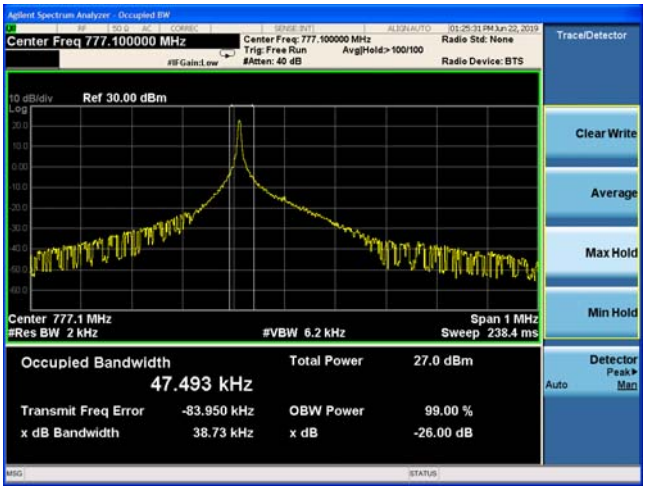
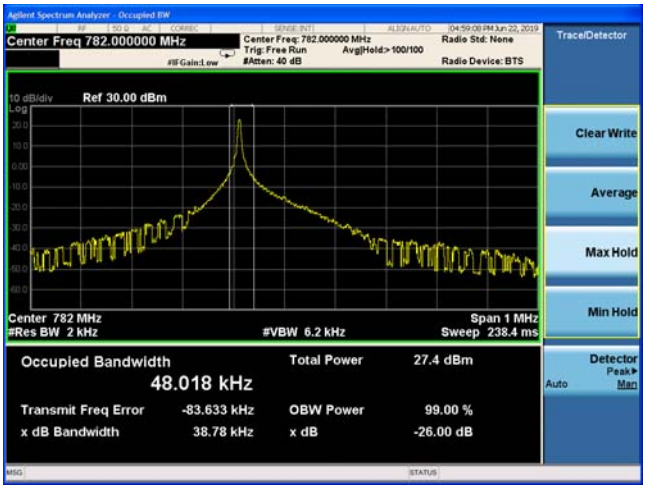
NB-IOT Band 13 BPSK 3.75KHz 1@0 CH-Low



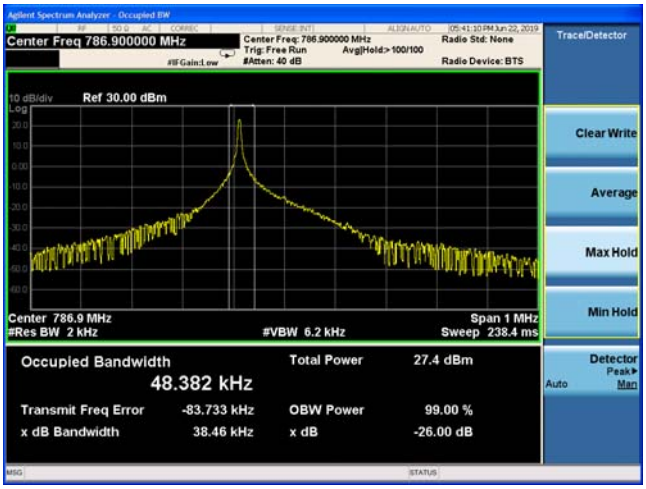
NB-IOT Band 13 BPSK15KHz 1@0 CH-Low

NB-IOT Band 13 BPSK 3.75KHz 1@0 CH-Middle



NB-IOT Band 13 BPSK 15KHz 1@0 CH-Middle

NB-IOT Band 13 BPSK 3.75KHz 1@0 CH-High



NB-IOT Band 13 BPSK 15KHz 1@0 CH-High

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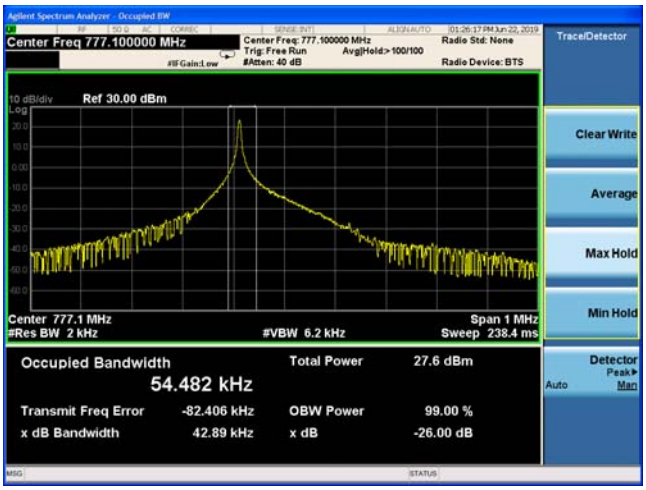
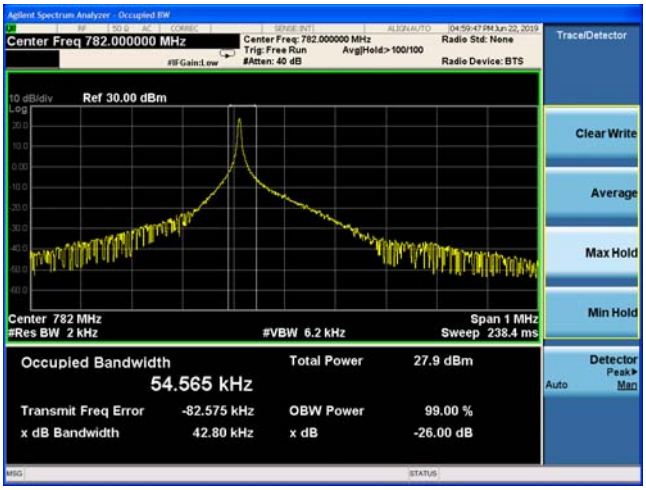
NB-IOT Band 13 QPSK 3.75KHz 1@0 CH-Low



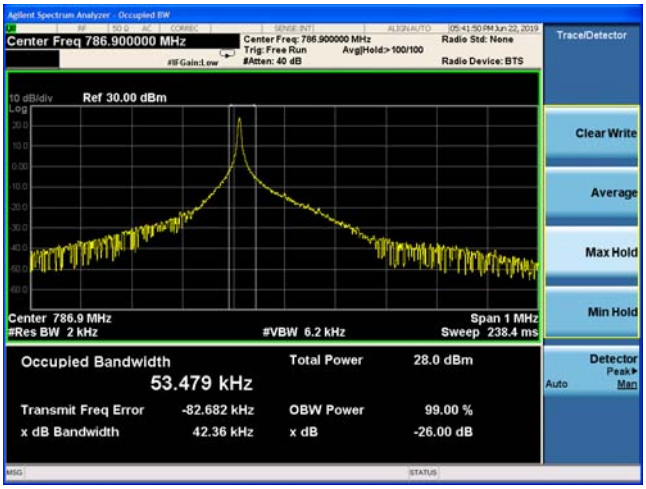
NB-IOT Band 13 QPSK 15KHz 1@0 CH-Low

NB-IOT Band 13 QPSK 3.75KHz 1@0 CH-Middle

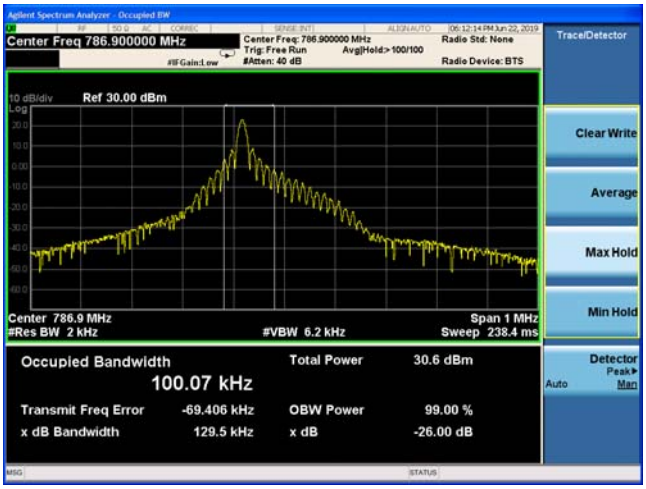


NB-IOT Band 13QPSK 15KHz 1@0 CH-Middle

NB-IOT Band 13 QPSK 3.75KHz 1@0 CH-High



NB-IOT Band 13 QPSK 15KHz 1@0 CH-High



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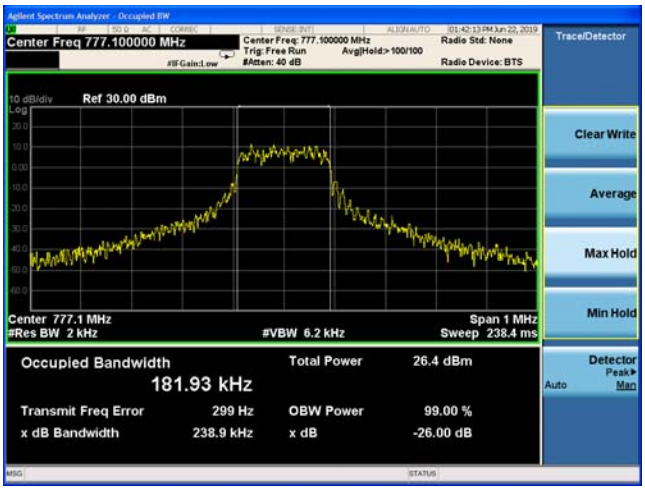
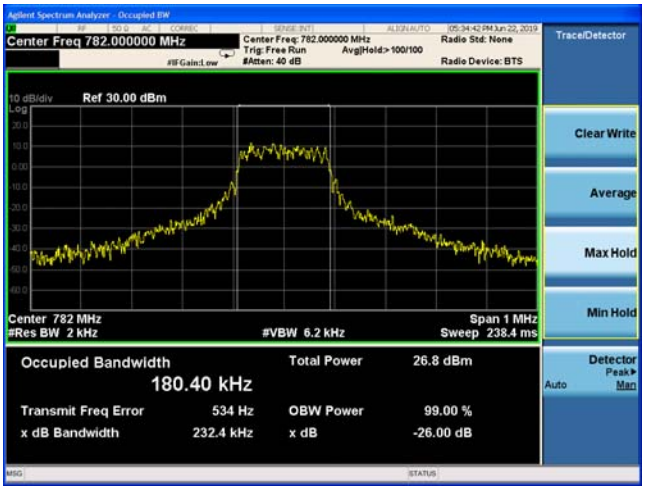
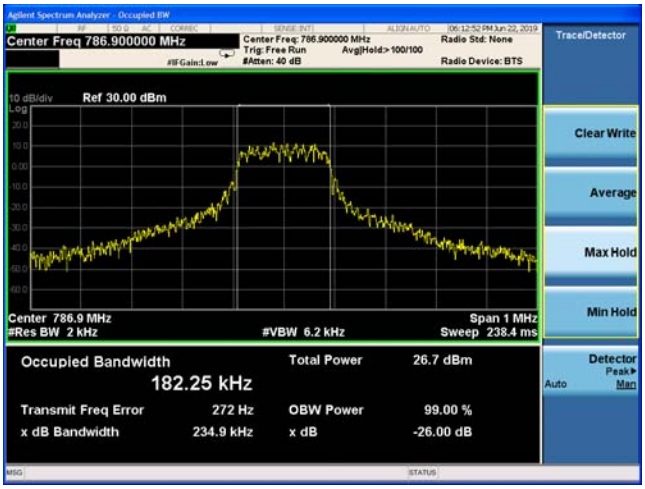
NB-IOT Band 13 QPSK 15KHz 12@0 CH-Low



NB-IOT Band 13 QPSK 15KHz 12@0 CH-Middle



NB-IOT Band 13 QPSK 15KHz 12@0 CH-High



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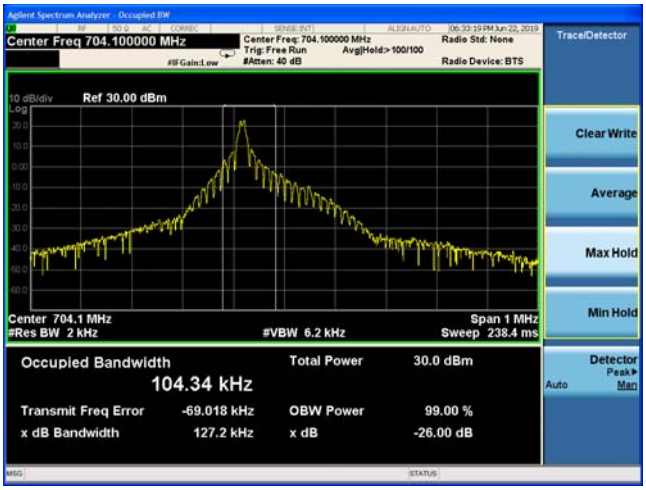
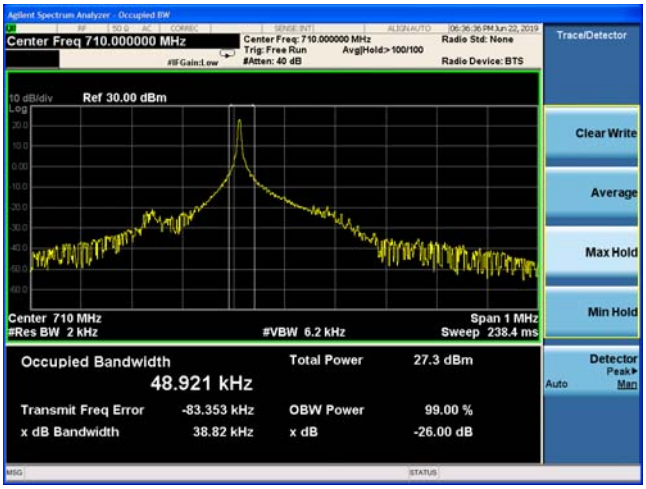
NB-IOT Band 17 BPSK 3.75KHz 1@0 CH-Low

NB-IOT Band 17 BPSK15KHz 1@0 CH-Low

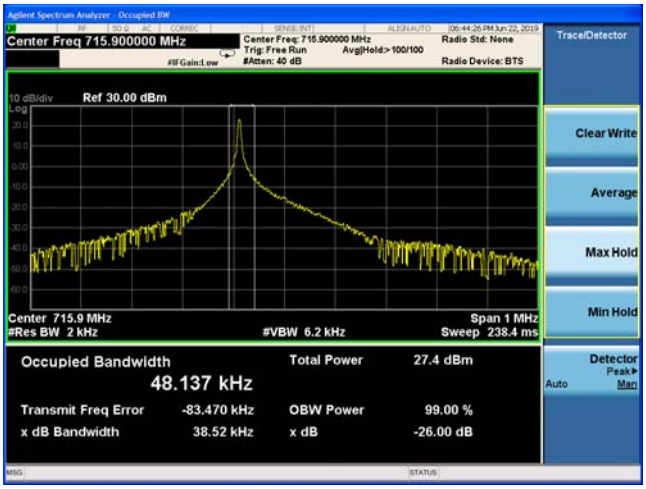


NB-IOT Band 17 BPSK 3.75KHz 1@0 CH-Middle



NB-IOT Band 17 BPSK 15KHz 1@0 CH-Middle

NB-IOT Band 17 BPSK 3.75KHz 1@0 CH-High



NB-IOT Band 17 BPSK 15KHz 1@0 CH-High

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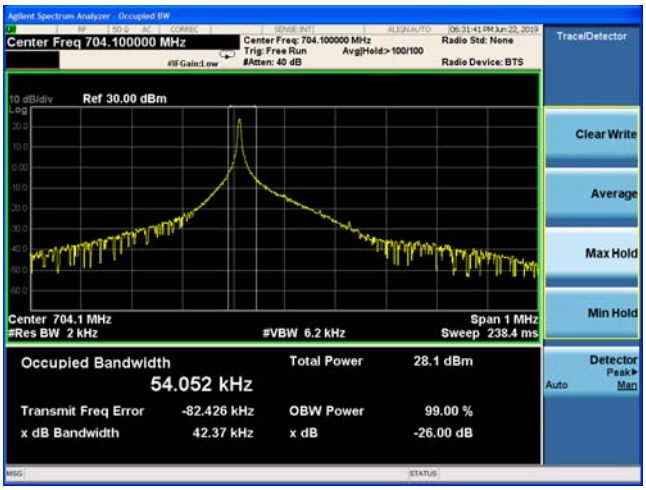
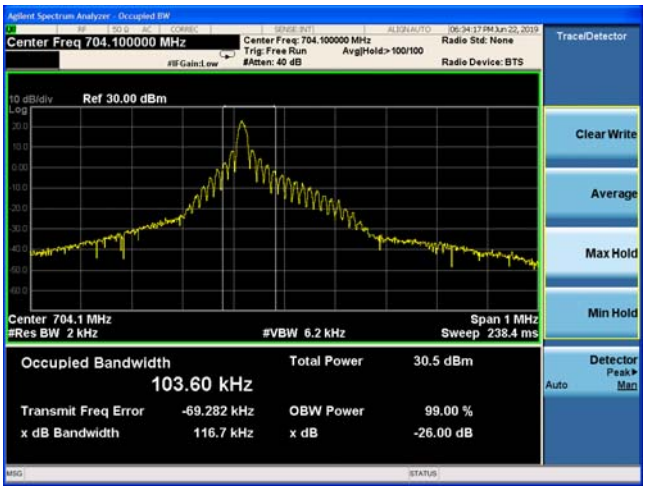
NB-IOT Band 17 QPSK 3.75KHz 1@0 CH-Low



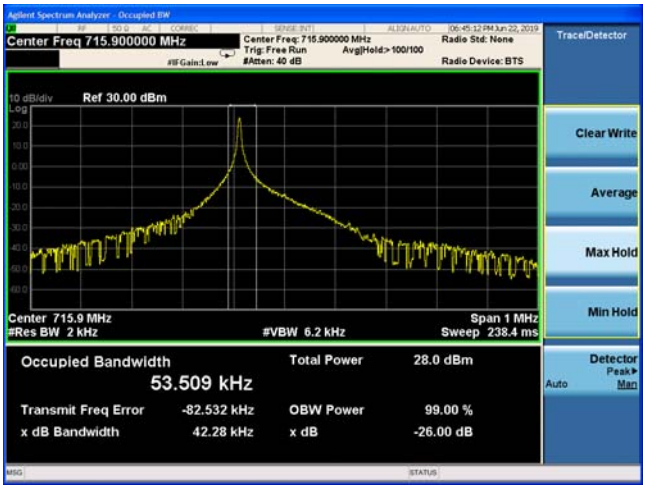
NB-IOT Band 17 QPSK 15KHz 1@0 CH-Low



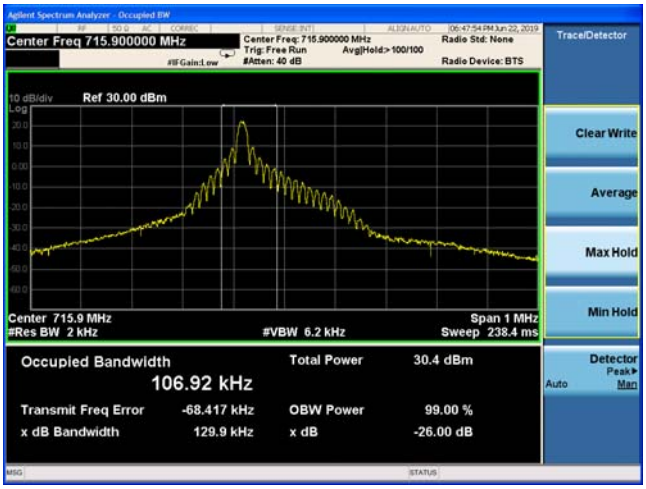
NB-IOT Band 17 QPSK 3.75KHz 1@0 CH-Middle

NB-IOT Band 17QPSK 15KHz 1@0 CH-Middle

NB-IOT Band 17 QPSK 3.75KHz 1@0 CH-High



NB-IOT Band 17 QPSK 15KHz 1@0 CH-High



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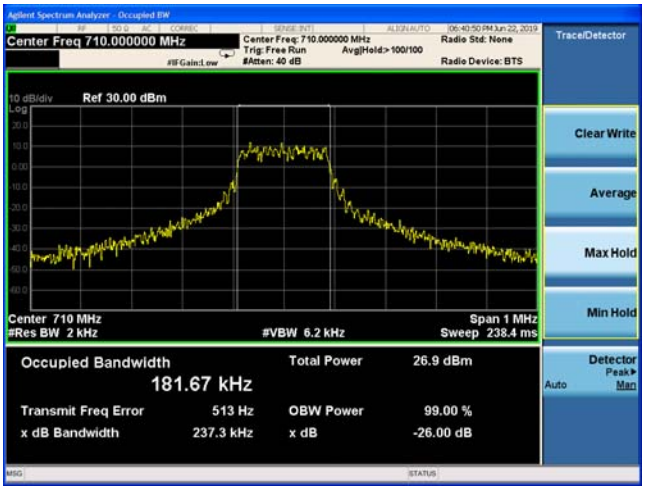
NB-IOT Band 17 QPSK 15KHz 12@0 CH-Low

NB-IOT Band 17 QPSK 15KHz 12@0 CH-Middle



NB-IOT Band 17 QPSK 15KHz 12@0 CH-High

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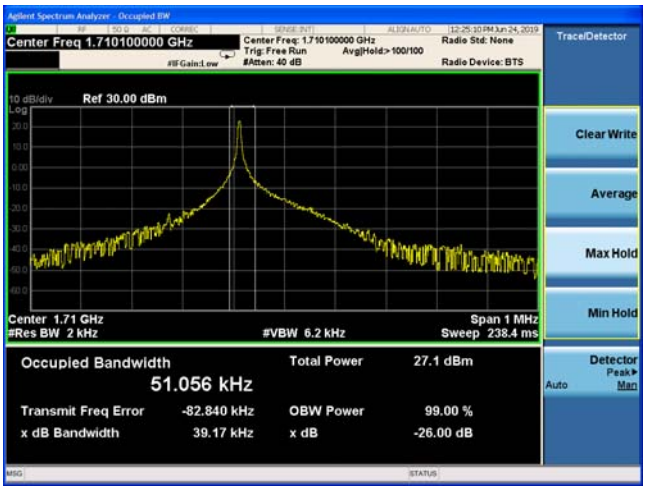
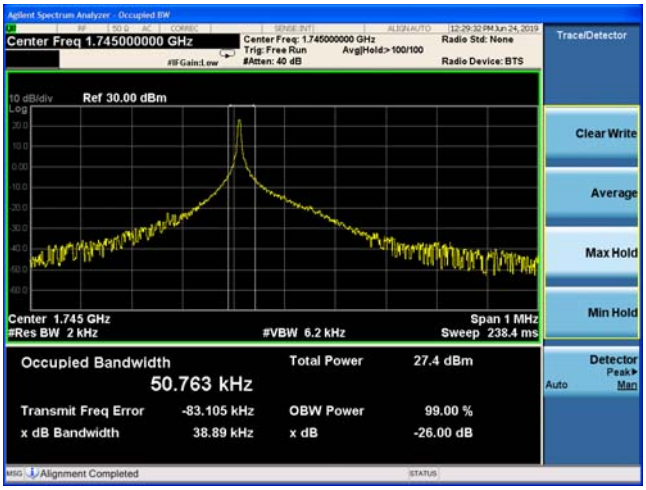
NB-IOT Band 66 BPSK 3.75KHz 1@0 CH-Low

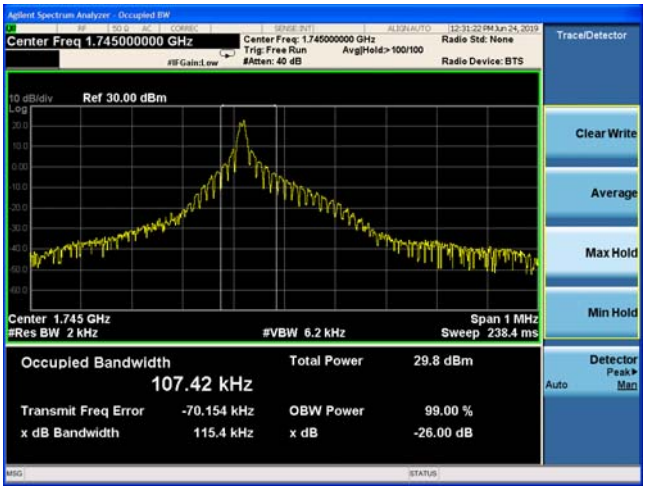


NB-IOT Band 66 BPSK 15KHz 1@0 CH-Low

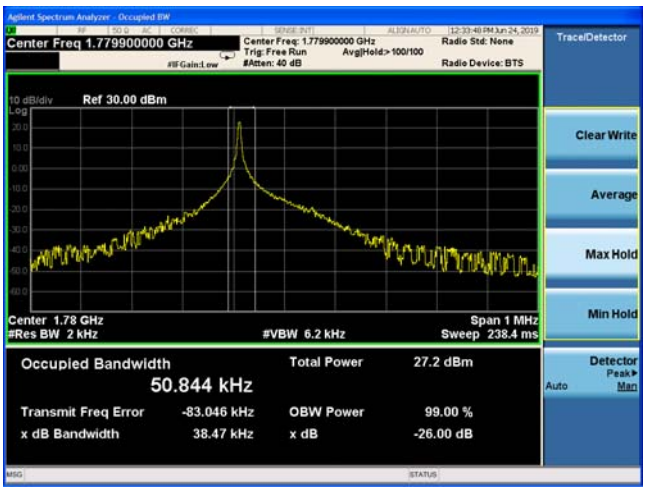
NB-IOT Band 66 BPSK 3.75KHz 1@0 CH-Middle



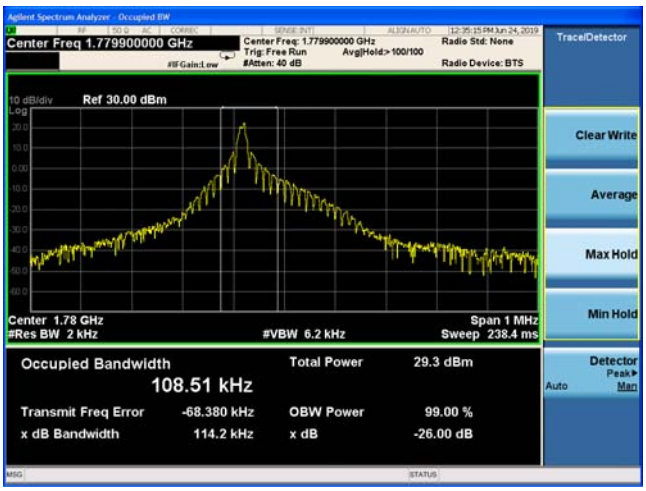
NB-IOT Band 66 BPSK 15KHz 1@0 CH-Middle



NB-IOT Band 66 BPSK 3.75KHz 1@0 CH-High



NB-IOT Band 66 BPSK 15KHz 1@0 CH-High



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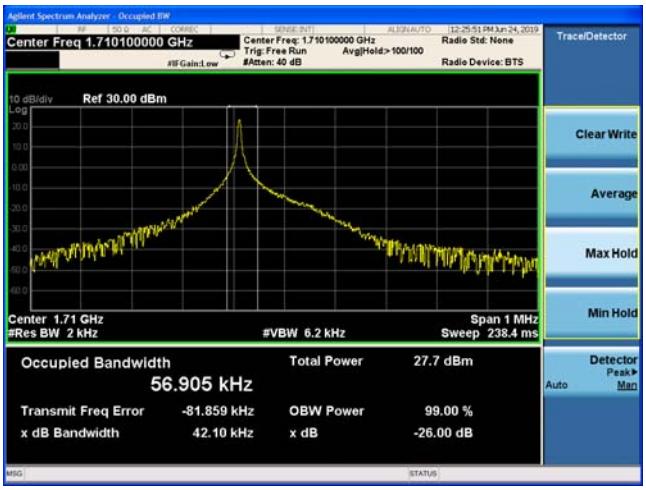
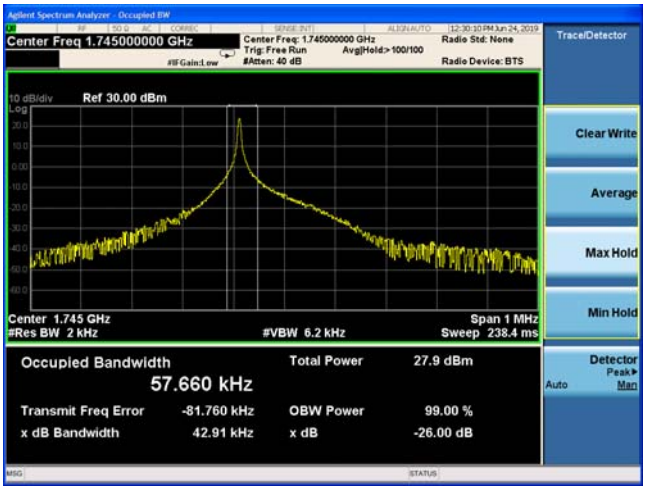
NB-IOT Band 66 QPSK 3.75KHz 1@0 CH-Low



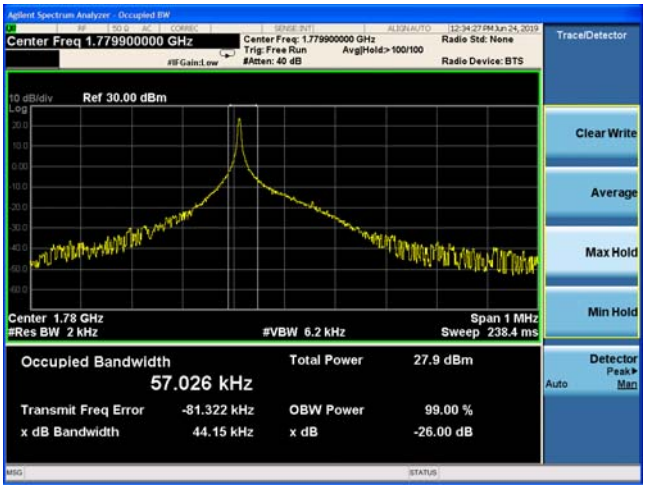
NB-IOT Band 66 QPSK 15KHz 1@0 CH-Low

NB-IOT Band 66 QPSK 3.75KHz 1@0 CH-Middle



NB-IOT Band 66 QPSK 15KHz 1@0 CH-Middle

NB-IOT Band 66 QPSK 3.75KHz 1@0 CH-High



NB-IOT Band 66 QPSK 15KHz 1@0 CH-High

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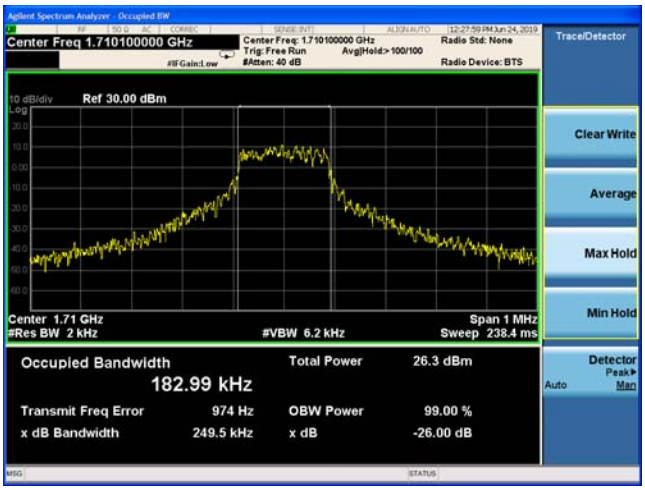
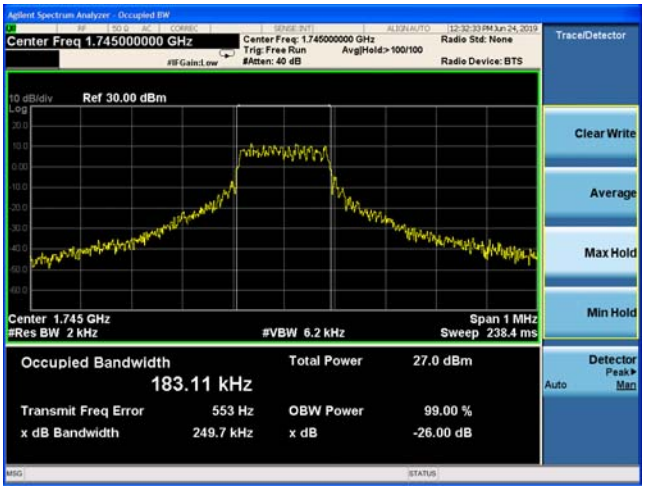
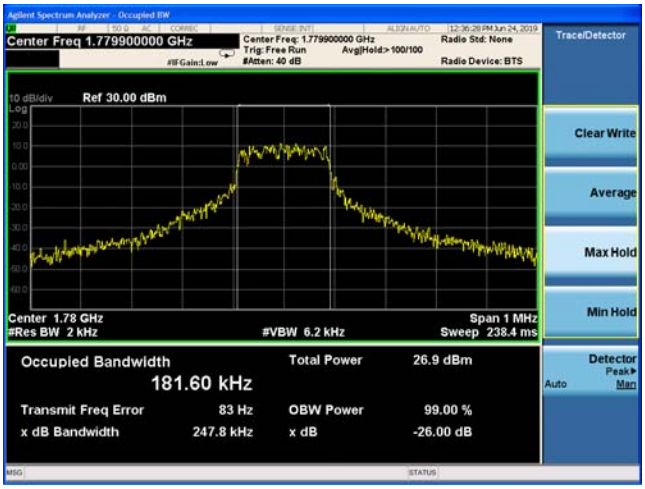
NB-IOT Band 66 QPSK 15KHz 12@0 CH-Low



NB-IOT Band 66 QPSK 15KHz 12@0 CH-Middle



NB-IOT Band 66 QPSK 15KHz 12@0 CH-High



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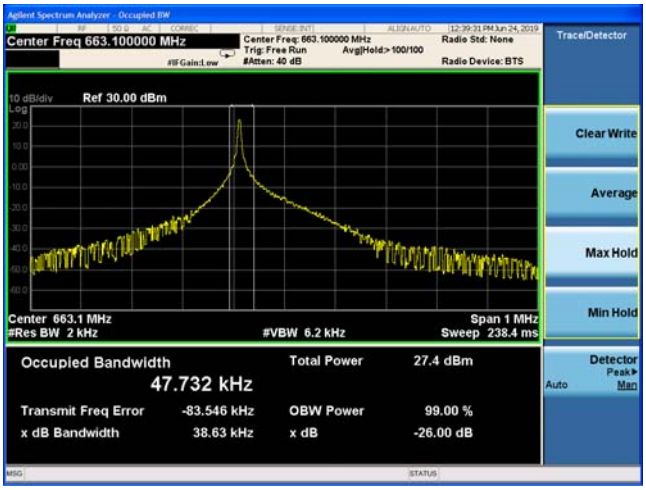
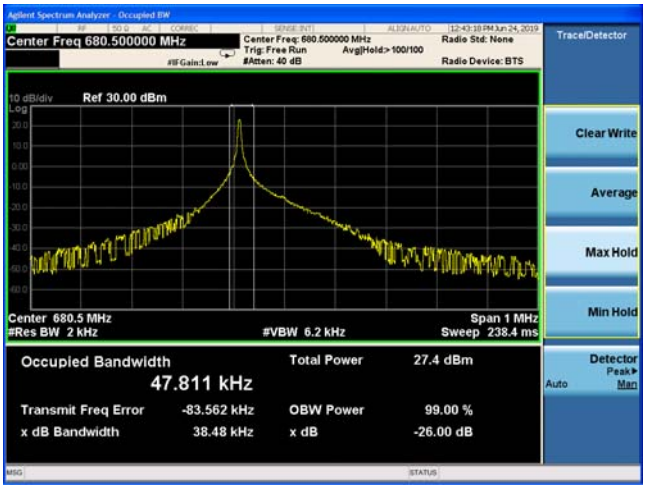
NB-IOT Band 71 BPSK 3.75KHz 1@0 CH-Low



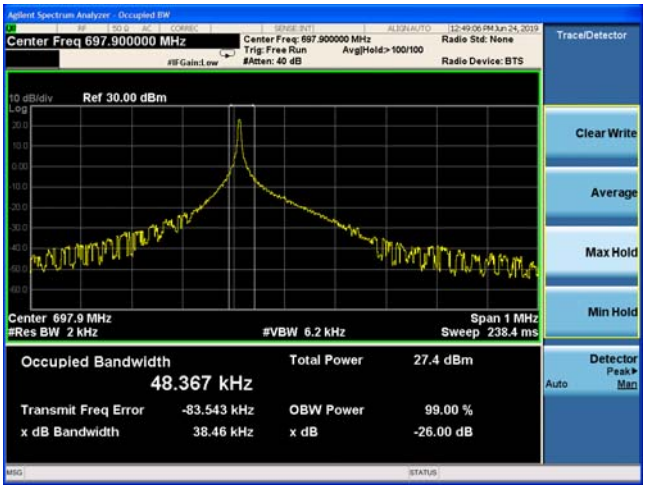
LTE Band 71 BPSK 15KHz 1@0 CH-Low

NB-IOT Band 71 BPSK 3.75KHz 1@0 CH-Middle

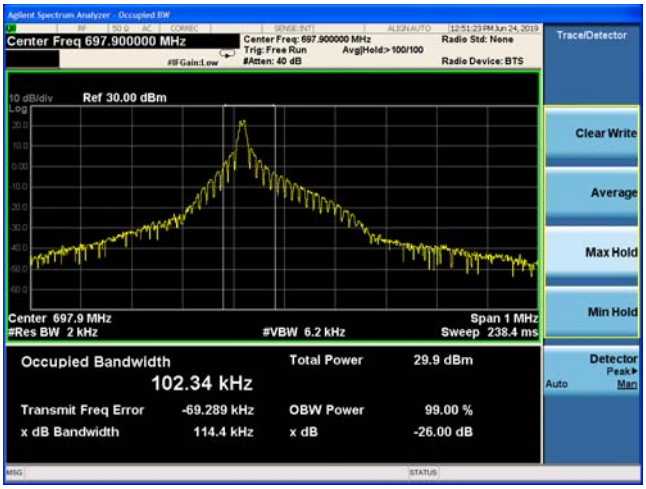


LTE Band 71 BPSK 15KHz 1@0 CH-Middle

NB-IOT Band 71 BPSK 3.75KHz 1@0 CH-High



LTE Band 71 BPSK 15KHz 1@0 CH-High



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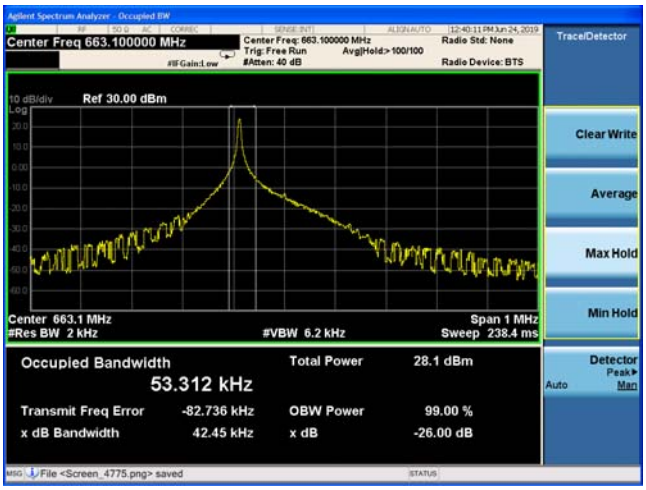
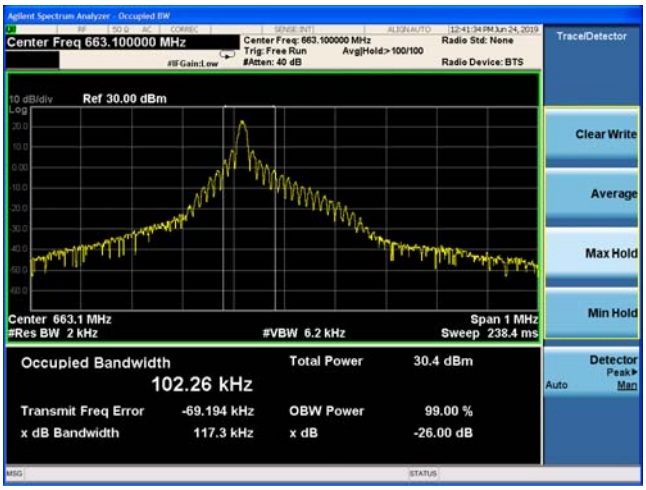
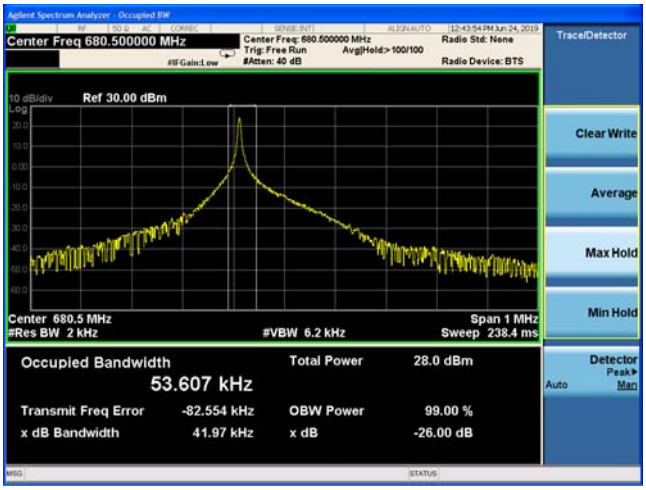
NB-IOT Band 71 QPSK 3.75KHz 1@0 CH-Low



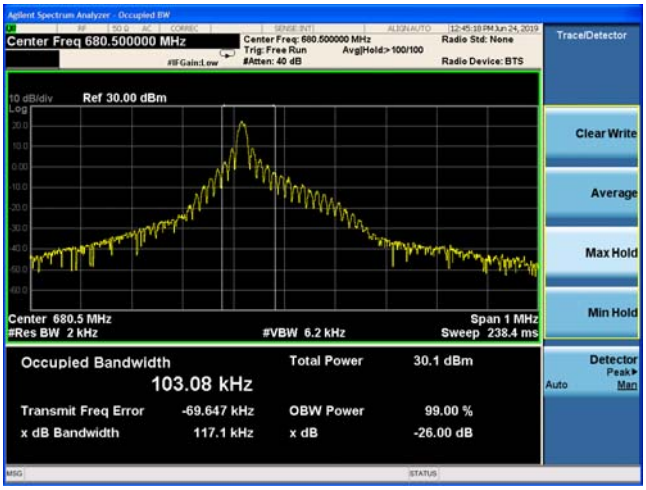
NB-IOT Band 71 QPSK 15KHz 1@0 CH-Low



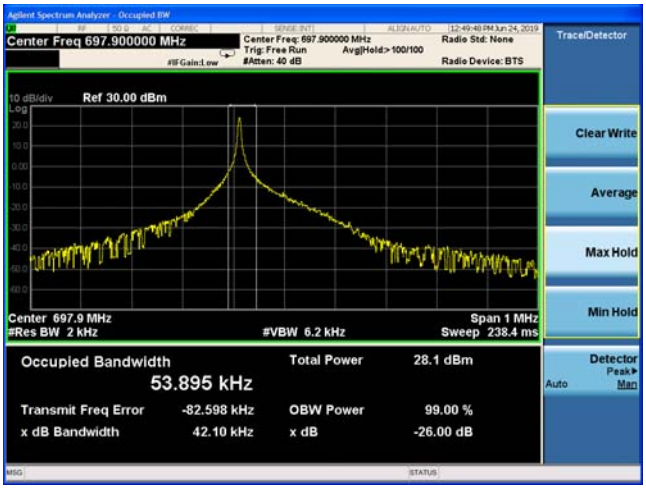
NB-IOT Band 71 QPSK 3.75KHz 1@0 CH-Middle



NB-IOT Band 71 QPSK 15KHz 1@0 CH-Middle



NB-IOT Band 71 QPSK 3.75KHz 1@0 CH-High



NB-IOT Band 71 QPSK 15KHz 1@0 CH-High

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