RF TEST REPORT

Applicant	Quectel Wireless Solutions Co., Ltd
FCC ID	XMR201808BC66
Product	NB-LoT Module
Brand	Quectel
Model	BC66
Report No.	R2105A0419-R3V4
Issue Date	August 10, 2021

TA Technology (Shanghai) Co., Ltd. tested the above equipment in accordance with the requirements in **FCC CFR47 Part 2 (2020)/ FCC CFR47 Part 27C (2020)**. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

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Version	Revision description	Issue Date
Rev.0	Initial issue of report.	July 15, 2021
Rev.1	Update description in Page 4. Update data in Page 68 ~ 69.	July 30, 2021
Rev.2	Update description in Page 4. Update data in Page.	August 5, 2021
Rev.3	Add data in Page 16~19.	August 6, 2021
Rev.4	Update description in Page 14. Add data in Page 22~23.	August 10, 2021
Note: This revised report (Report No. R2105A0419-R3V4) supersedes and replaces the previously issued report (Report No. R2105A0419-R3V3). Please discard or destroy the previously issued report and dispose of it accordingly.		

Summary of Measurement Results

Number	Test Case	Clause in FCC rules	Verdict
1	RF Power Output and Effective Isotropic Radiated Power	2.1046 27.50(d)(4) 27.50(b)(10) 27.50(c)(10)	PASS
2	Occupied Bandwidth	2.1049	PASS
3	Band Edge Compliance	27.53(h) /27.53(g) /27.53(f) /27.53(c)	PASS
4	Peak-to-Average Power Ratio	27.50(d)/KDB971168 D01(5.7)	PASS
5	Frequency Stability	2.1055 / 27.54	PASS
6	Spurious Emissions at Antenna Terminals	2.1051 /27.53(h) /27.53(g) /27.53(f)	PASS
7	Radiates Spurious Emission	2.1053 /27.53(h) /27.53(g) /27.53(f)	PASS
Date of Testing: (Original) October 29, 2018 ~ November 12, 2018 (Variant) May 18, 2021~ June 11, 2021 and August 5, 2021			
Date of Sample Received: (Variant) May 14, 2021			
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.			

BC66 (Report No.: R2105A0419-R3V4) is a variant model of BC66 (Report No.: R1809A0442-R3V3).Test values partial duplicated from Original for variant. There is only tested RF power output and Effective Radiated Power, Frequency Stability, Occupied Bandwidth, Band Edge Compliance, Receiver Spurious Emissions with worst Channel for variant in this report. The detailed product change description please refers to Statement letter.

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.

A2LA (Certificate Number: 3857.01)

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

1.3 Testing Location

Company:	TA Technology (Shanghai) Co., Ltd.
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2 General Description of Equipment under Test

Client Information

Applicant	Quectel Wireless Solutions Co., Ltd.
Applicant address	Building 5, Shanghai Business Park Phase III (Area B), No.1016 Tianlin Road, Minhang District, Shanghai 200233, China
Manufacturer	Quectel Wireless Solutions Co., Ltd.
Manufacturer address	Building 5, Shanghai Business Park Phase III (Area B), No.1016 Tianlin Road, Minhang District, Shanghai 200233, China

General information

EUT Description			
Model	BC66		
IMEI	Original: 867997030054273 Variant: 867997030002819		
Hardware Version	R2.5		
Software Version	BC66NBR01A11		
Power Supply	External Power Supply		
Antenna Type	External Antenna		
Antenna Gain	Band	Frequency (MHz)	Gain (dBi)
	NB-IoT Band 4	1700	1.67
		1720	1.94
		1740	2.00
		1760	1.57
	NB-IoT Band 12	700	1.66
		710	3.26
		720	3.95
	NB-IoT Band 13	770	3.98
		780	4.45
		790	3.63
	NB-IoT Band 17	700	1.66
		710	3.26
		720	3.95
	NB-IoT Band 66	1700	1.67
		1720	1.94
		1740	2.00
		1760	1.57
		1780	0.97
Test Mode(s)	NB-IoT Band 4/ NB-IoT Band 12/ NB-IoT Band 13 / NB-IoT Band 17/ NB-IoT Band 66;		
Test Modulation	BPSK, QPSK		

Category	NB1		
Deployment	stand-alone		
Sub-carrier spacing	3.75KHz, 15KHz		
Ntones	single-tone, multi-tone		
Maximum E.I.R.P./ E.R.P.	NB-IoT Band 4:	26.09dBm	
	NB-IoT Band 12:	26.06dBm	
	NB-IoT Band 13:	26.56dBm	
	NB-IoT Band 17:	25.78dBm	
	NB-IoT Band 66:	25.78dBm	
Rated Power Supply Voltage:	3.3V		
Extreme Voltage	Minimum: 2.1V Maximum: 3.63V		
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
	NB-IoT Band 17	704 ~ 716	734 ~ 746
	NB-IoT Band 66	1710 ~ 1780	2110 ~ 2180
Note：1. The information of the EUT is declared by the manufacturer.			

Accessory equipment	
Evaluation Board	RF Cable
RS232-to-USB Cable	Antenna: Dipole Antenna
DC 5V Adaptor	/

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 27C (2020)

ANSI C63.26 (2015)

Reference standard:

FCC CFR47 Part 2 (2020)

KDB 971168 D01 Power Meas License Digital Systems v03r01

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 mode and data rates and positions and RB size and modulations 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.
Test modes are chosen to be reported as the worst case configuration below for NB-IoT Band 4/12/13/17/66:

Test items	Mode	Deployment mode	Subcarrier Spacing (kHz)		Modulation		Test Channel		
		Stand-alone	3.75	15	BPSK	QPSK	L	M	H
RF Power Output and Effective Isotropic Radiated Power	NB-IoT B4	O	O	O	O	O	O	O	O
	NB-IoT B12	O	O	O	O	O	O	O	O
	NB-IoT B13	O	O	O	O	O	O	O	O
	NB-IoT B17	O	O	O	O	O	O	O	O
	NB-IoT B66	O	O	O	O	O	O	O	O
Occupied Bandwidth	NB-IoT B4	O	O	O	O	O	O	O	O
	NB-IoT B12	O	O	O	O	O	O	O	O
	NB-IoT B13	O	O	O	O	O	O	O	O
	NB-IoT B17	O	O	O	O	O	O	O	O
	NB-IoT B66	O	O	O	O	O	O	O	O
Band Edge Compliance	NB-IoT B4	O	O	O	O	O	O	-	O
	NB-IoT B12	O	O	O	O	O	O	-	O
	NB-IoT B13	O	O	O	O	O	O	-	O
	NB-IoT B17	O	O	O	O	O	O	-	O
	NB-IoT B66	O	O	O	O	O	O	-	O
Peak-to-Average Power Ratio	NB-IoT B4	O	O	O	O	O	-	O	-
	NB-IoT B12	O	O	O	O	O	-	O	-
	NB-IoT B13	O	O	O	O	O	-	O	-
	NB-IoT B17	O	O	O	O	O	-	O	-
	NB-IoT B66	O	O	O	O	O	-	O	-
Frequency Stability	NB-IoT B4	O	O	O	O	O	-	O	-
	NB-IoT B12	O	O	O	O	O	-	O	-
	NB-IoT B13	O	O	O	O	O	-	O	-
	NB-IoT B17	O	O	O	O	O	-	O	-
	NB-IoT B66	O	O	O	O	O	-	O	-

Conducted Spurious Emissions	NB-IoT B4	O	-	O	-	O	O	O	O
	NB-IoT B12	O	-	O	-	O	O	O	O
	NB-IoT B13	O	-	O	-	O	O	O	O
	NB-IoT B17	O	-	O	-	O	O	O	O
	NB-IoT B66	O	-	O	-	O	O	O	O
Radiates Spurious Emission	NB-IoT B4	O	-	O	-	O	O	O	O
	NB-IoT B12	O	-	O	-	O	O	O	O
	NB-IoT B13	O	-	O	-	O	O	O	O
	NB-IoT B17	O	-	O	-	O	O	O	O
	NB-IoT B66	O	-	O	-	O	O	O	O
Note1. The mark “O” means that this configuration is chosen for testing. 2. The mark “-” means that this configuration is not testing.									

5 Test Case Results

5.1 RF Power Output and Effective Isotropic Radiated Power

Ambient condition

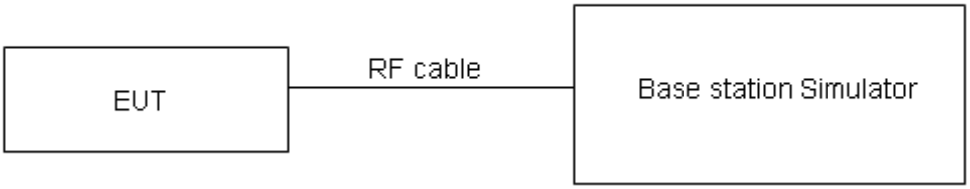
Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.5kPa

Methods of Measurement

During the process of the testing, The EUT was connected to the Base Station Simulator with a known loss. The EUT is controlled by the Base Station Simulator test set to ensure max power transmission with proper modulation.

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.)

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.

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=0.4 dB for RF power output, k = 2, U= 1.19 dB for ERP/EIRP.

Test Results

Power of new variant are varied due to measurement uncertainty, and sample tolerance of the acceptance range.

Variant

Mode	Modulation	Sub-carrier spacing (KHz)	Ntones	Conducted Power (dBm) for low/mid/high channel			EIRP (dBm)		
				19952/ 1710.2	20175/ 1732.5	20398/ 1754.8	19952/ 1710.2	20175/ 1732.5	20398/ 1754.8
NB-IoT Band 4 Standalone	BPSK	3.75	1@0	23.95	24.09	24.25	25.89	26.09	25.50
			1@47	23.96	24.01	24.22	25.90	26.01	25.47
		15	1@0	23.84	23.88	23.79	25.78	25.88	25.04
			1@11	23.71	23.97	23.86	25.65	25.97	25.11
	QPSK	3.75	1@0	24.04	24.03	24.29	25.98	26.03	25.54
			1@47	23.97	24.06	24.28	25.91	26.06	25.53
		15	1@0	23.79	23.80	23.78	25.73	25.80	25.03
			1@11	23.89	23.86	23.91	25.83	25.86	25.16
		15	12@0	21.63	21.63	21.71	23.57	23.63	22.96
Mode	Modulation	Sub-carrier spacing (KHz)	Ntones	Conducted Power (dBm) for low/mid/high channel			ERP (dBm)		
				23012/ 699.2	23095/ 707.5	23178/ 715.8	23012/ 699.2	23095/ 707.5	23178/ 715.8
NB-IoT Band 12 Standalone	BPSK	3.75	1@0	23.65	23.06	24.26	23.16	24.17	26.06
			1@47	23.51	24.05	24.23	23.02	25.16	26.03
		15	1@0	23.58	23.88	24.05	23.09	24.99	25.85
			1@11	23.49	23.92	24.02	23.00	25.03	25.82
	QPSK	3.75	1@0	23.62	24.02	24.23	23.13	25.13	26.03
			1@47	23.58	24.06	24.22	23.09	25.17	26.02
		15	1@0	23.52	23.82	23.93	23.03	24.93	25.73
			1@11	23.72	24.00	24.03	23.23	25.11	25.83
		15	12@0	23.00	21.81	21.88	22.51	22.92	23.68
Mode	Modulation	Sub-carrier spacing (KHz)	Ntones	Conducted Power (dBm) for low/mid/high channel			ERP (dBm)		
				23182/ 777.2	23230/ 782	23278/ 786.8	23182/ 777.2	23230/ 782	23278/ 786.8
NB-IoT Band 13 Standalone	BPSK	3.75	1@0	23.88	24.26	24.31	26.18	26.56	25.79
			1@47	23.78	24.25	24.29	26.08	26.55	25.77
		15	1@0	23.79	23.95	24.17	26.09	26.25	25.65
			1@11	23.75	23.87	24.13	26.05	26.17	25.61
	QPSK	3.75	1@0	23.79	24.24	24.29	26.09	26.54	25.77
			1@47	23.79	24.23	24.30	26.09	26.53	25.78
		15	1@0	23.67	23.87	24.08	25.97	26.17	25.56
			1@11	23.90	24.06	24.25	26.20	26.36	25.73
		15	12@0	21.67	21.91	22.01	23.97	24.21	23.49

Mode	Modulation	Sub-carrier spacing (KHz)	Ntones	Conducted Power (dBm) for low/mid/high channel			ERP (dBm)		
				23732/ 704.2	23790/ 710	23848/ 715.8	23732/ 704.2	23790/ 710	23848/ 715.8
NB-IoT Band 17 Standalone	BPSK	3.75	1@0	23.59	24.01	23.94	23.10	25.12	25.74
			1@47	23.46	23.96	23.98	22.97	25.07	25.78
		15	1@0	23.49	23.79	23.92	23.00	24.90	25.72
			1@11	23.59	23.89	23.94	23.10	25.00	25.74
	QPSK	3.75	1@0	23.56	23.93	23.98	23.07	25.04	25.78
			1@47	23.54	23.97	23.91	23.05	25.08	25.71
		15	1@0	23.39	23.67	23.89	22.90	24.78	25.69
			1@11	23.47	23.80	23.95	22.98	24.91	25.75
		15	12@0	21.27	21.69	21.72	20.78	22.80	23.52
Mode	Modulation	Sub-carrier spacing (KHz)	Ntones	Conducted Power (dBm) for low/mid/high channel			EIRP (dBm)		
				131974/ 1710.2	132322/ 1745	132670/ 1779.8	131974/ 1710.2	132322/ 1745	132670/ 1779.8
NB-IoT Band 66 Standalone	BPSK	3.75	1@0	23.71	23.78	23.84	25.65	25.78	24.81
			1@47	23.62	23.71	23.78	25.56	25.71	24.75
		15	1@0	23.58	23.52	23.55	25.52	25.52	24.52
			1@11	23.66	23.60	23.64	25.60	25.60	24.61
	QPSK	3.75	1@0	23.62	23.72	23.77	25.56	25.72	24.74
			1@47	23.63	23.69	23.78	25.57	25.69	24.75
		15	1@0	23.52	23.48	23.49	25.46	25.48	24.46
			1@11	23.56	23.64	23.65	25.50	25.64	24.62
		15	12@0	21.32	21.47	21.61	23.26	23.47	22.58

Original

Mode	Modulation	Sub-carrier spacing (KHz)	Ntones	Output Power (dBm) for low/mid/high channel		
				19951/1710.1	20175/1732.5	20399/1754.9
Band 4 Standalone	BPSK	3.75	1@0	23.28	23.32	23.64
			1@47	23.19	23.31	23.57
		15	1@0	23.21	23.23	23.40
			1@11	23.11	23.18	23.31
	QPSK	3.75	1@0	23.25	23.29	23.50
			1@47	23.26	23.30	23.51
		15	1@0	23.14	23.15	23.33
			1@11	23.08	23.09	23.27
		15	12@0	20.82	20.91	21.25

Mode	Modulation	Sub-carrier spacing (KHz)	Ntones	Output Power (dBm) for low/mid/high channel		
				23011/699.1	23095/707.5	23179/715.9
Band 12 Standalone	BPSK	3.75	1@0	23.04	23.36	23.51
			1@47	22.99	23.29	23.44
		15	1@0	22.96	23.23	23.36
			1@11	22.88	23.31	23.27
	QPSK	3.75	1@0	22.97	23.32	23.49
			1@47	23.06	23.30	23.45
		15	1@0	22.86	23.21	23.31
			1@11	22.80	23.08	23.23
		15	12@0	20.63	20.78	20.87

Mode	Modulation	Sub-carrier spacing (KHz)	Ntones	Output Power (dBm) for low/mid/high channel		
				23181/777.1	23230/782	23279/786.9
Band 13 Standalone	BPSK	3.75	1@0	22.81	23.15	23.10
			1@47	22.75	23.05	23.01
		15	1@0	22.50	22.96	22.95
			1@11	22.41	22.83	22.85
	QPSK	3.75	1@0	22.78	23.11	23.03
			1@47	22.76	23.07	23.02
		15	1@0	22.55	22.95	22.88
			1@11	22.37	22.86	22.80
		15	12@0	20.37	20.71	20.78

Mode	Modulation	Sub-carrier spacing (KHz)	Ntones	Output Power (dBm) for low/mid/high channel		
				23731/704.1	23790/710	23849/715.9
Band 17 Standalone	BPSK	3.75	1@0	22.98	23.38	23.38
			1@47	22.91	23.31	23.34
		15	1@0	22.82	23.19	23.12
			1@11	22.77	23.21	23.10
	QPSK	3.75	1@0	22.88	23.32	23.31
			1@47	22.84	23.34	23.26
		15	1@0	22.75	23.16	23.19
			1@11	22.68	23.07	23.15
		15	12@0	20.66	20.89	20.90

Mode	Modulation	Sub-carrier spacing (KHz)	Ntones	Output Power (dBm) for low/mid/high channel		
				131973/1710.1	132322/1745	132671/1779.9
Band 66 Standalone	BPSK	3.75	1@0	23.22	23.21	23.35
			1@47	23.03	23.17	23.33
		15	1@0	23.05	23.08	23.25
			1@11	22.91	23.00	23.16
	QPSK	3.75	1@0	23.16	23.15	23.39
			1@47	23.10	23.18	23.32
		15	1@0	23.09	23.02	23.20
			1@11	22.98	23.04	23.11
		15	12@0	20.87	20.76	20.92

Mode	Channel	Frequency (MHz)	Modulation	Polarization	Sub-carrier spacing (KHz)	Ntones	EIRP (dBm)	Limit (dBm)	Conclusion
Band4 Standalone	19951	1710.1	BPSK	H	3.75	1@0	24.67	30	Pass
			QPSK	H	3.75	1@0	24.58	30	Pass
			BPSK	H	15	1@0	24.16	30	Pass
			QPSK	H	15	1@0	24.05	30	Pass
	20175	1732.5	BPSK	H	3.75	1@0	24.59	30	Pass
			QPSK	H	3.75	1@0	24.63	30	Pass
			BPSK	H	15	1@0	24.21	30	Pass
			QPSK	H	15	1@0	24.13	30	Pass
	20399	1754.9	BPSK	H	3.75	1@0	25.11	30	Pass
			QPSK	H	3.75	1@0	25.08	30	Pass
			BPSK	H	15	1@0	25.08	30	Pass
			QPSK	H	15	1@0	25.01	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	24.29	34.77	Pass
			QPSK	H	3.75	1@0	24.21	34.77	Pass
			BPSK	H	15	1@0	24.31	34.77	Pass
			QPSK	H	15	1@0	24.18	34.77	Pass
	23095	707.5	BPSK	H	3.75	1@0	24.57	34.77	Pass
			QPSK	H	3.75	1@0	24.32	34.77	Pass
			BPSK	H	15	1@0	24.46	34.77	Pass
			QPSK	H	15	1@0	24.13	34.77	Pass
	23179	715.9	BPSK	H	3.75	1@0	25.11	34.77	Pass
			QPSK	H	3.75	1@0	24.98	34.77	Pass
			BPSK	H	15	1@0	24.67	34.77	Pass
			QPSK	H	15	1@0	24.32	34.77	Pass

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	27.07	34.77	Pass
			QPSK	H	3.75	1@0	26..98	34.77	Pass
			BPSK	H	15	1@0	27.03	34.77	Pass
			QPSK	H	15	1@0	26.87	34.77	Pass
	23230	782	BPSK	H	3.75	1@0	27.05	34.77	Pass
			QPSK	H	3.75	1@0	27.01	34.77	Pass
			BPSK	H	15	1@0	26.77	34.77	Pass
			QPSK	H	15	1@0	26.89	34.77	Pass
	23279	786.9	BPSK	H	3.75	1@0	27.12	34.77	Pass
			QPSK	H	3.75	1@0	27.13	34.77	Pass
			BPSK	H	15	1@0	26.98	34.77	Pass
			QPSK	H	15	1@0	27.01	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	24.01	34.77	Pass
			QPSK	H	3.75	1@0	23.87	34.77	Pass
			BPSK	H	15	1@0	23.97	34.77	Pass
			QPSK	H	15	1@0	23.65	34.77	Pass
	23790	710	BPSK	H	3.75	1@0	24.87	34.77	Pass
			QPSK	H	3.75	1@0	24.63	34.77	Pass
			BPSK	H	15	1@0	24.58	34.77	Pass
			QPSK	H	15	1@0	24.39	34.77	Pass
	23849	715.9	BPSK	H	3.75	1@0	24.76	34.77	Pass
			QPSK	H	3.75	1@0	24.51	34.77	Pass
			BPSK	H	15	1@0	24.32	34.77	Pass
			QPSK	H	15	1@0	24.16	34.77	Pass

Mode	Channel	Frequency (MHz)	Modulation	Polarization	Sub-carrier spacing (KHz)	Ntones	EIRP (dBm)	Limit (dBm)	Conclusion
Band66 Standalone	131973	1710.1	BPSK	H	3.75	1@0	25.76	30	Pass
			QPSK	H	3.75	1@0	25.61	30	Pass
			BPSK	H	15	1@0	25.37	30	Pass
			QPSK	H	15	1@0	25.24	30	Pass
	132322	1745	BPSK	H	3.75	1@0	26.01	30	Pass
			QPSK	H	3.75	1@0	25.84	30	Pass
			BPSK	H	15	1@0	25.87	30	Pass
			QPSK	H	15	1@0	25.61	30	Pass
	132671	1779.9	BPSK	H	3.75	1@0	25.43	30	Pass
			QPSK	H	3.75	1@0	25.47	30	Pass
			BPSK	H	15	1@0	25.47	30	Pass
			QPSK	H	15	1@0	25.29	30	Pass

5.2 Occupied Bandwidth

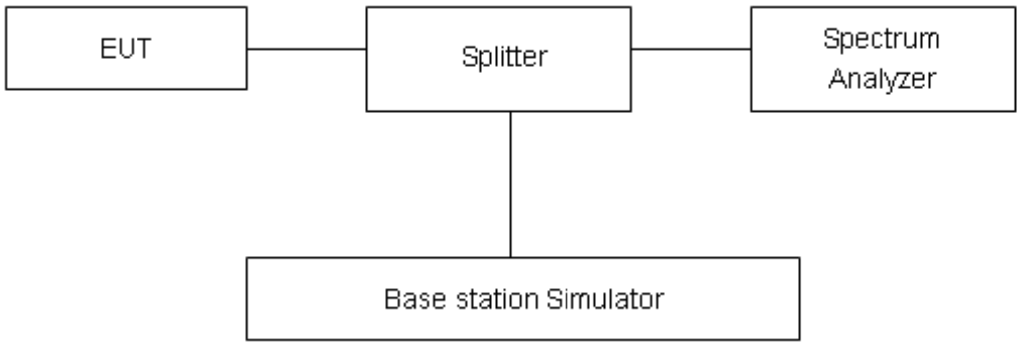
Ambient condition

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.
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.

Test Result

Variant

Mode	Modulation	Sub-carrier spacing (KHz)	Ntones	Bandwidth(KHz) for low/mid/high channel					
				19952/1710.2		20175/1732.5		20398/1754.8	
				99% Power	-26dBc	99% Power	-26dBc	99% Power	-26dBc
NB-IoT Band 4 Standalone	BPSK	3.75	1@0	59.32	42.96	57.69	43.28	55.99	42.95
	QPSK	3.75	1@0	63.47	42.24	64.26	44.82	63.63	45.93
	BPSK	15	1@0	103.73	116.00	106.80	120.00	105.80	105.80
	QPSK	15	1@0	105.20	129.60	105.18	130.60	104.49	117.00
	QPSK	15	12@0	181.44	233.90	180.80	226.50	181.29	239.30

Mode	Modulation	Sub-carrier spacing (KHz)	Ntones	Bandwidth(KHz) for low/mid/high channel					
				23012/699.2		23095/707.5		23178/715.8	
				99% Power	-26dBc	99% Power	-26dBc	99% Power	-26dBc
NB-IoT Band 12 Standalone	BPSK	3.75	1@0	55.57	41.96	55.38	42.48	55.20	42.39
	QPSK	3.75	1@0	62.39	42.90	62.97	44.98	62.64	43.34
	BPSK	15	1@0	105.90	115.00	104.84	114.60	105.40	112.40
	QPSK	15	1@0	110.83	131.80	104.28	129.20	105.80	129.00
	QPSK	15	12@0	180.05	227.00	180.44	236.10	180.56	222.80

Mode	Modulation	Sub-carrier spacing (KHz)	Ntones	Bandwidth(KHz) for low/mid/high channel					
				23182/777.2		23230/782		23278/786.8	
				99% Power	-26dBc	99% Power	-26dBc	99% Power	-26dBc
NB-IoT Band 13 Standalone	BPSK	3.75	1@0	56.50	42.87	55.62	42.45	55.07	42.92
	QPSK	3.75	1@0	61.30	42.59	61.52	42.12	63.39	45.11
	BPSK	15	1@0	104.43	118.30	105.39	118.50	103.73	115.20
	QPSK	15	1@0	108.69	145.70	103.17	129.70	105.94	117.90
	QPSK	15	12@0	179.81	236.00	180.52	241.30	178.91	221.60

Mode	Modulation	Sub-carrier spacing (KHz)	Ntones	Bandwidth(KHz) for low/mid/high channel					
				23732/704.2		23790/710		23848/715.8	
				99% Power	-26dBc	99% Power	-26dBc	99% Power	-26dBc
NB-IoT Band 17 Standalone	BPSK	3.75	1@0	55.34	41.54	54.98	41.57	55.24	42.98
	QPSK	3.75	1@0	62.73	44.75	62.31	43.07	61.11	42.96
	BPSK	15	1@0	111.40	126.60	105.51	113.90	104.62	115.30
	QPSK	15	1@0	102.94	128.10	113.25	131.20	112.40	143.00
	QPSK	15	12@0	179.81	234.30	179.46	239.30	180.31	224.60

Mode	Modulation	Sub-carrier spacing (KHz)	Ntones	Bandwidth(KHz) for low/mid/high channel					
				131974/1710.2		132322/1745		132670/1779.8	
				99% Power	-26dBc	99% Power	-26dBc	99% Power	-26dBc
NB-IoT Band 66 Standalone	BPSK	3.75	1@0	58.28	42.82	56.92	42.44	58.02	42.23
	QPSK	3.75	1@0	63.90	45.39	62.55	42.90	62.28	44.81
	BPSK	15	1@0	101.50	115.10	104.01	116.50	106.18	111.60
	QPSK	15	1@0	102.68	130.60	104.49	130.40	108.78	131.10
	QPSK	15	12@0	179.69	234.10	181.56	227.90	182.41	237.40

Original

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	60.07	43.14	58.35	42.24	57.86	42.80
	QPSK	3.75	1@0	63.77	42.50	65.28	42.76	65.81	45.01
	BPSK	15	1@0	96.11	106.20	104.88	117.50	105.79	127.20
	QPSK	15	1@0	104.06	131.00	104.62	129.10	104.45	128.30
	QPSK	15	12@0	181.43	239.10	181.15	238.30	181.05	238.00

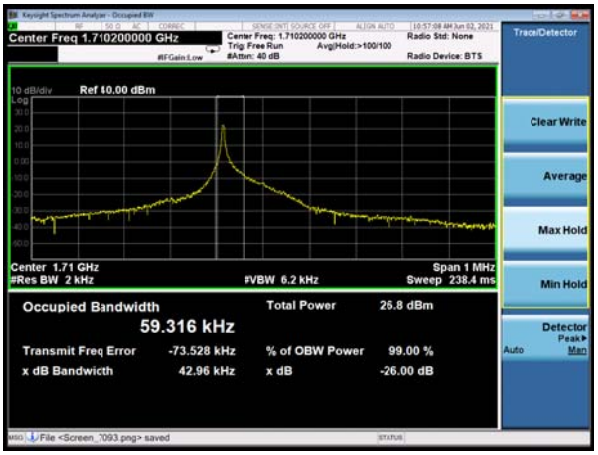
Mode	Modulation	Sub-carrier spacing (KHz)	Ntones	Bandwidth(KHz) for low/mid/high channel					
				23011/699.1		23095/707.5		23179/715.9	
				99% Power	-26dBc	99% Power	-26dBc	99% Power	-26dBc
Band 12 Standalone	BPSK	3.75	1@0	56.31	42.58	56.32	42.42	56.29	42.74
	QPSK	3.75	1@0	64.21	45.48	62.99	42.07	63.53	44.69
	BPSK	15	1@0	106.62	114.90	107.55	124.70	106.10	116.40
	QPSK	15	1@0	107.92	130.20	105.64	130.60	102.88	130.20
	QPSK	15	12@0	179.99	238.80	180.20	237.50	180.58	237.80

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	57.34	42.99	56.92	41.78	56.97	42.49
	QPSK	3.75	1@0	62.19	42.29	63.23	45.30	62.03	42.25
	BPSK	15	1@0	108.70	124.70	104.22	115.40	104.03	114.50
	QPSK	15	1@0	108.64	131.30	104.95	129.80	104.19	130.10
	QPSK	15	12@0	180.34	236.20	180.28	235.60	181.13	222.70

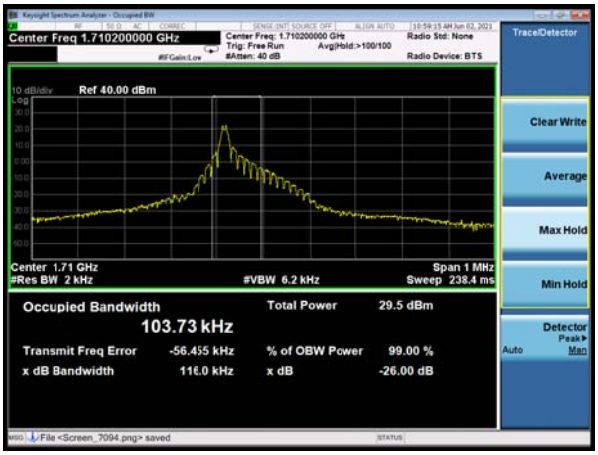
Mode	Modulation	Sub-carrier spacing (KHz)	Ntones	Bandwidth(KHz) for low/mid/high channel					
				23731/704.1		23790/710		23849/715.9	
				99% Power	-26dBc	99% Power	-26dBc	99% Power	-26dBc
Band 17 Standalone	BPSK	3.75	1@0	56.65	40.22	56.77	44.82	56.55	42.61
	QPSK	3.75	1@0	63.15	46.19	63.78	42.39	61.82	42.47
	BPSK	15	1@0	102.63	115.10	104.32	113.60	105.42	119.70
	QPSK	15	1@0	103.44	131.00	107.36	130.60	103.64	131.80
	QPSK	15	12@0	179.11	226.90	179.66	238.50	179.06	236.00

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	58.34	42.39	58.14	42.70	58.17	42.05
	QPSK	3.75	1@0	63.75	44.58	64.16	45.09	64.22	45.08
	BPSK	15	1@0	104.94	117.90	102.67	113.40	103.83	114.00
	QPSK	15	1@0	102.70	129.80	104.55	129.80	105.87	130.40
	QPSK	15	12@0	180.41	238.20	179.33	237.30	179.97	238.10

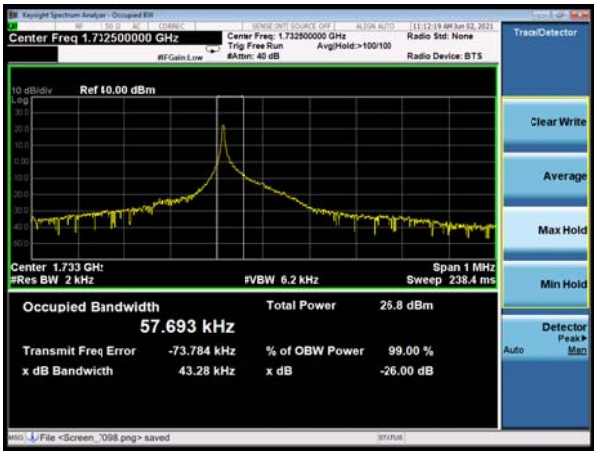
NB-IoT Band 4 BPSK 3.75kHz 1@0 CH-Low



NB-IoT Band 4 BPSK 15kHz 1@0 CH-Low

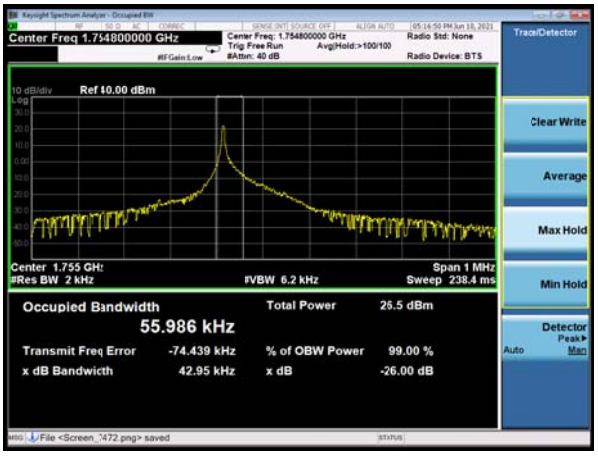


NB-IoT Band 4 BPSK 3.75kHz 1@0 CH-Middle

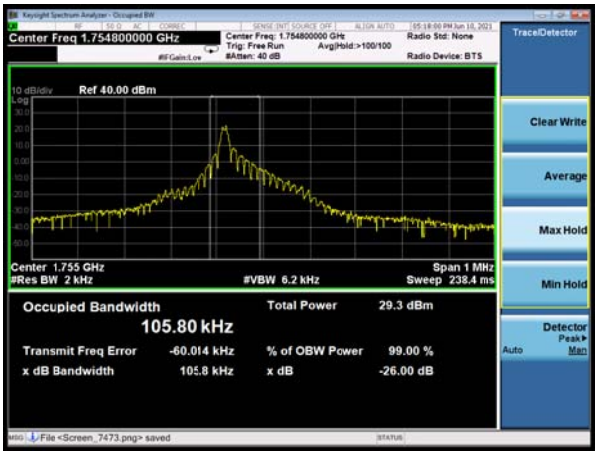


NB-IoT Band 4 BPSK 15kHz 1@0 CH-Middle

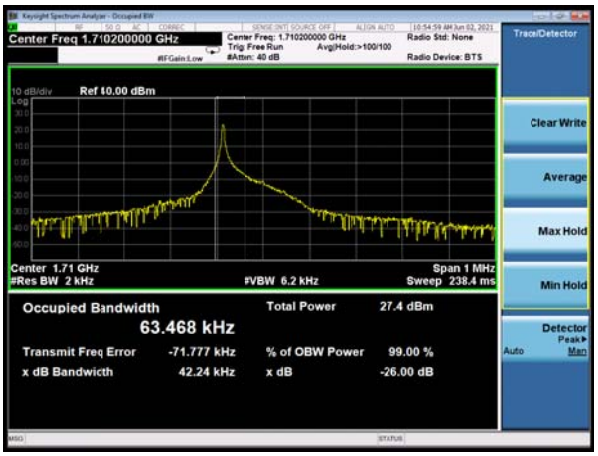
NB-IoT Band 4 BPSK 3.75kHz 1@0 CH-High



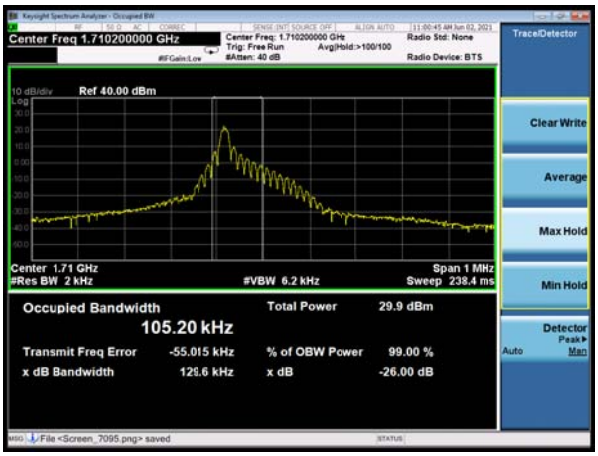
NB-IoT Band 4 BPSK 15kHz 1@0 CH-High



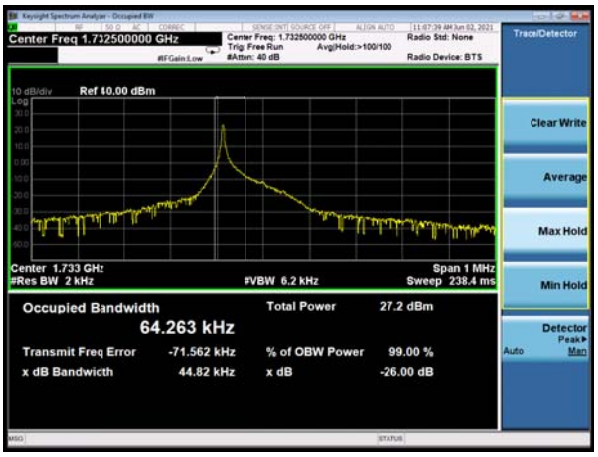
NB-IoT Band 4 QPSK 3.75kHz 1@0 CH-Low



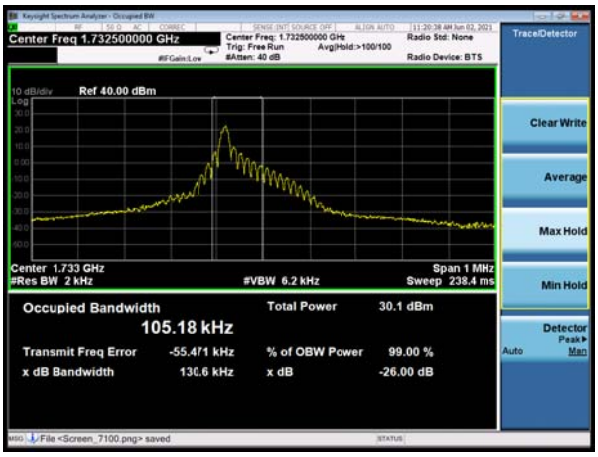
NB-IoT Band 4 QPSK 15kHz 1@0 CH-Low



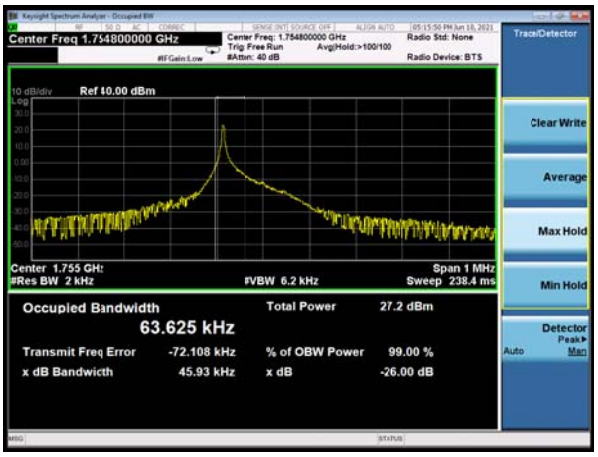
NB-IoT Band 4 QPSK 3.75kHz 1@0 CH-Middle



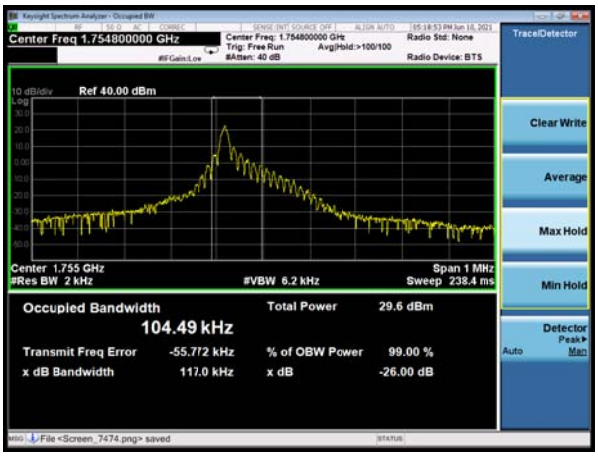
NB-IoT Band 4 QPSK 15kHz 1@0 CH-Middle



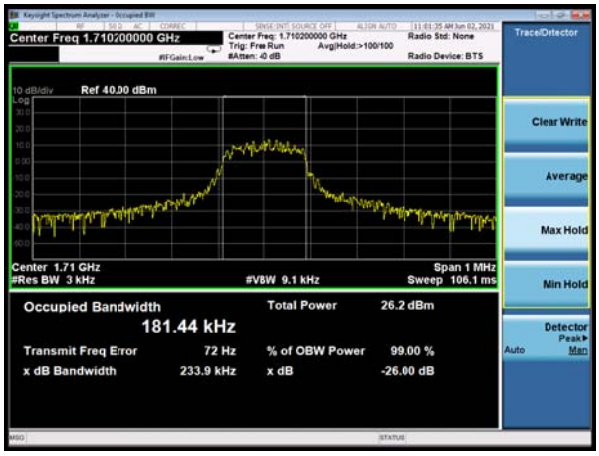
NB-IoT Band 4 QPSK 3.75kHz 1@0 CH-High



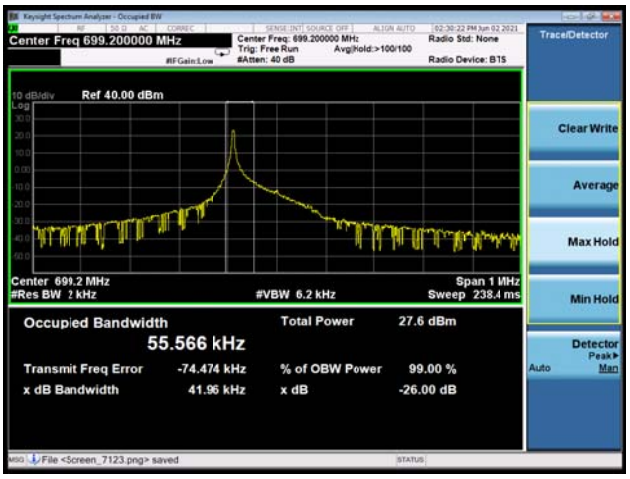
NB-IoT Band 4 QPSK 15kHz 1@0 CH-High



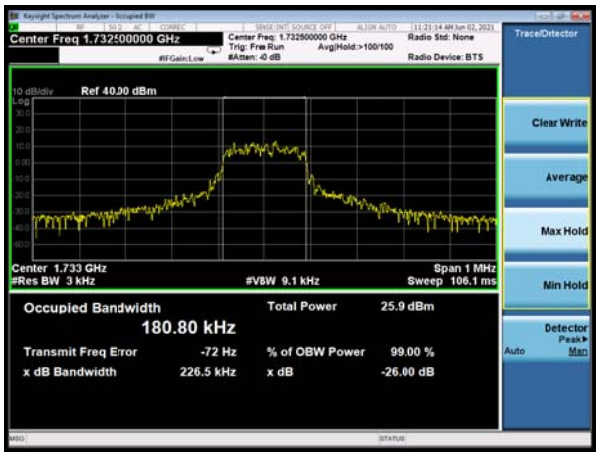
NB-IoT Band 4 QPSK 15kHz 12@0 CH-Low



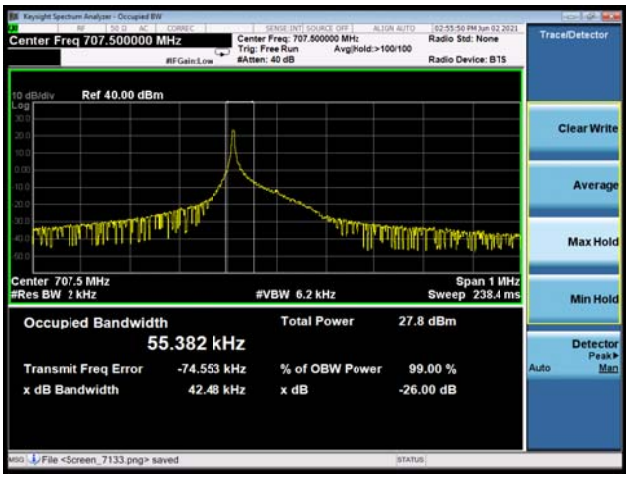
NB-IoT Band 12 BPSK 3.75kHz 1@0 CH-Low



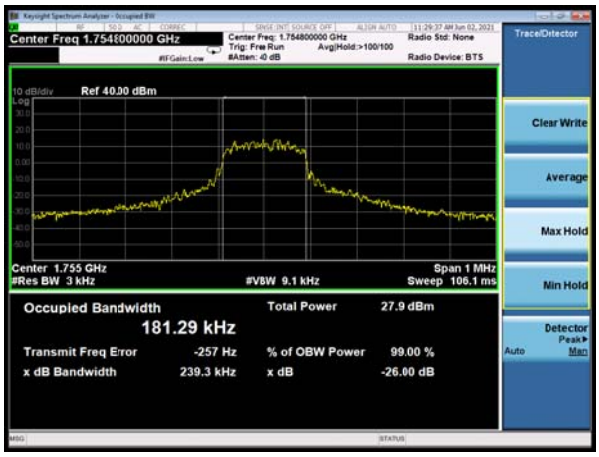
NB-IoT Band 4 QPSK 15kHz 12@0 CH-Middle



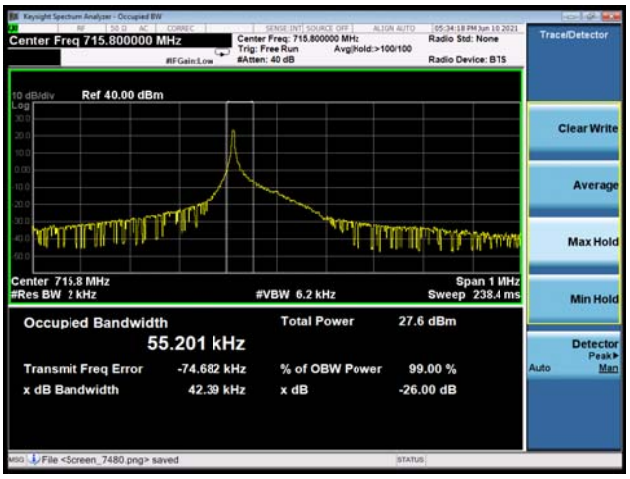
NB-IoT Band 12 BPSK 3.75kHz 1@0 CH-Middle



NB-IoT Band 4 QPSK 15kHz 12@0 CH-High



NB-IoT Band 12 BPSK 3.75kHz 1@0 CH-High

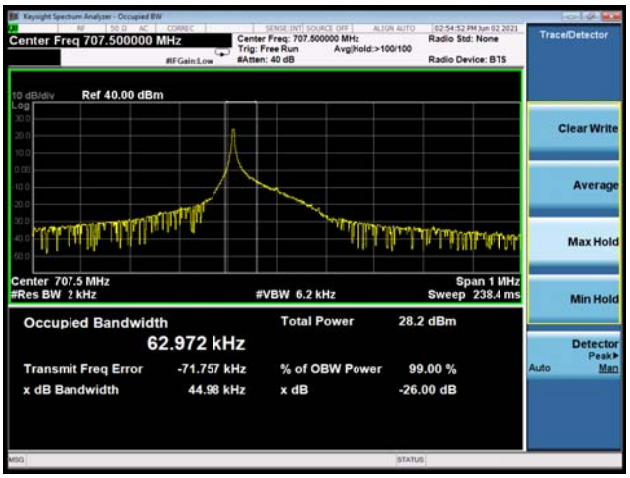


NB-IoT Band 12 BPSK 15kHz 1@0 CH-Low

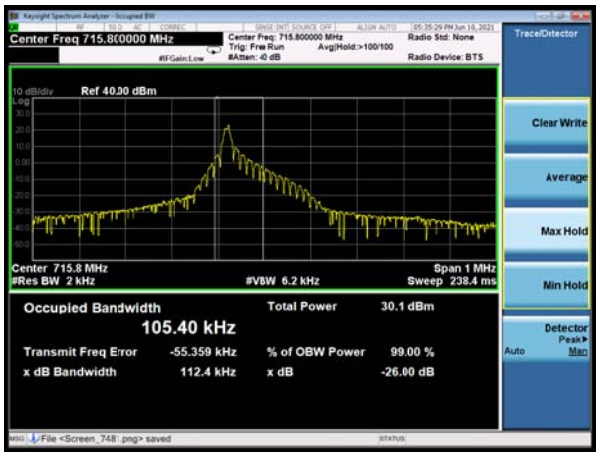
NB-IoT Band 12 QPSK 3.75kHz 1@0 CH-Low

NB-IoT Band 12 BPSK 15kHz 1@0 CH-Middle

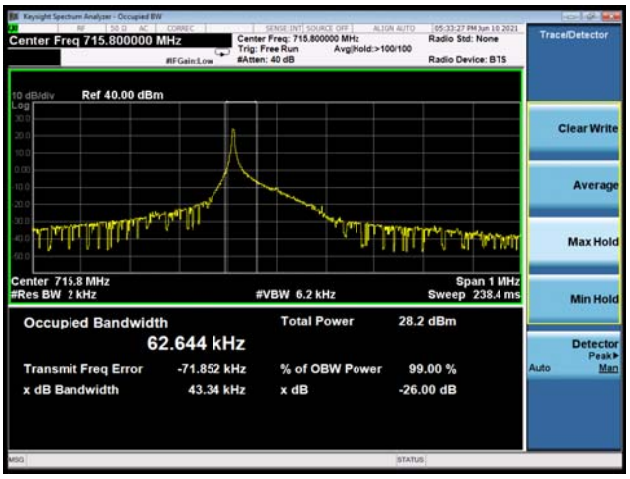
NB-IoT Band 12 QPSK 3.75kHz 1@0 CH-Middle



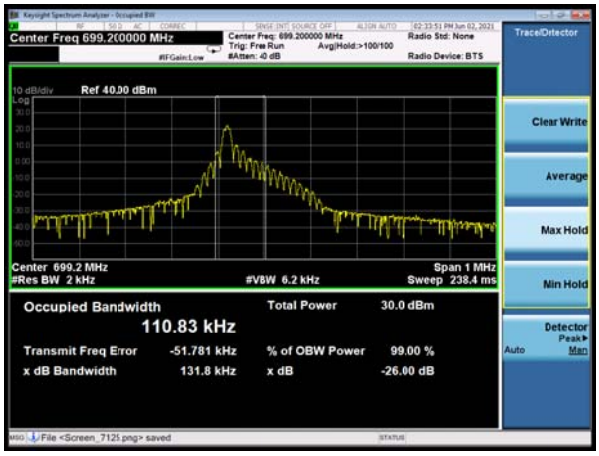
NB-IoT Band 12 BPSK 15kHz 1@0 CH-High



NB-IoT Band 12 QPSK 3.75kHz 1@0 CH-High



NB-IoT Band 12 QPSK 15kHz 1@0 CH-Low

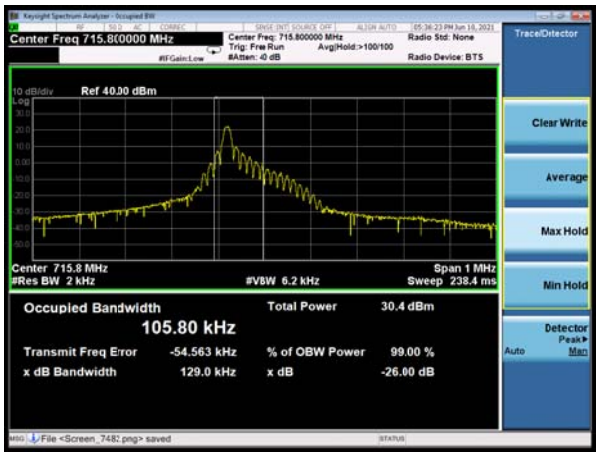


NB-IoT Band 12 QPSK 15kHz 12@0 CH-Low

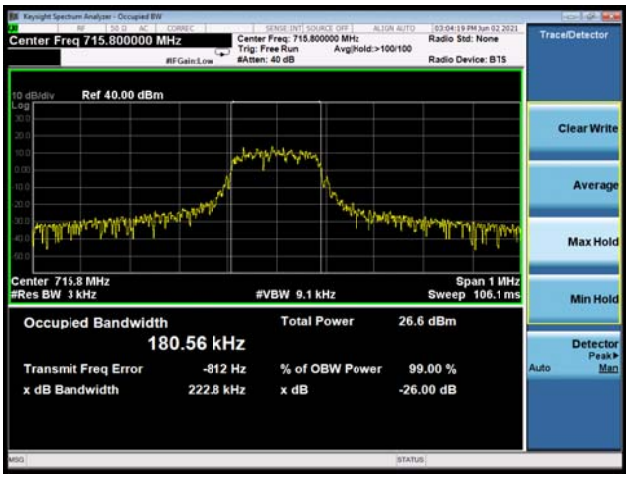
NB-IoT Band 12 QPSK 15kHz 1@0 CH-Middle

NB-IoT Band 12 QPSK 15kHz 12@0 CH-Middle

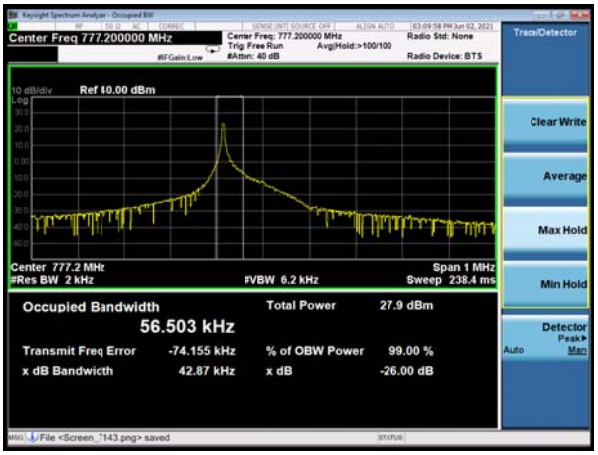
NB-IoT Band 12 QPSK 15kHz 1@0 CH-High



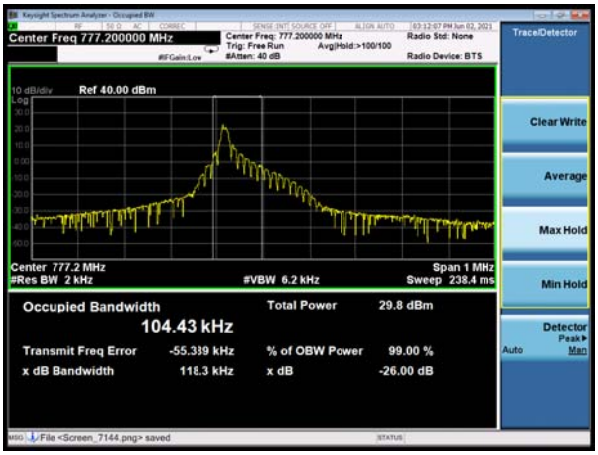
NB-IoT Band 12 QPSK 15kHz 12@0 CH-High



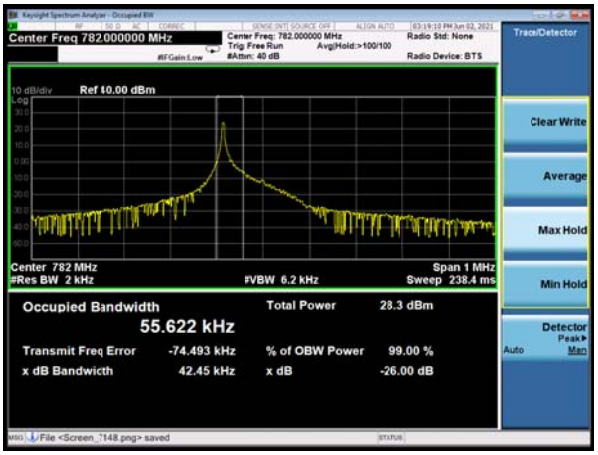
NB-IoT Band 13 BPSK 3.75kHz 1@0 CH-Low



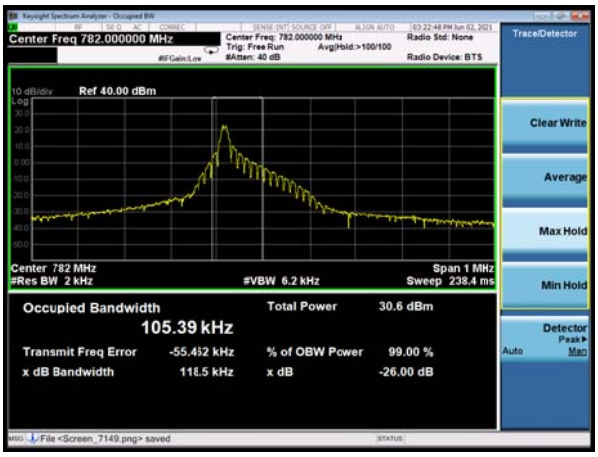
NB-IoT Band 13 BPSK 15kHz 1@0 CH-Low



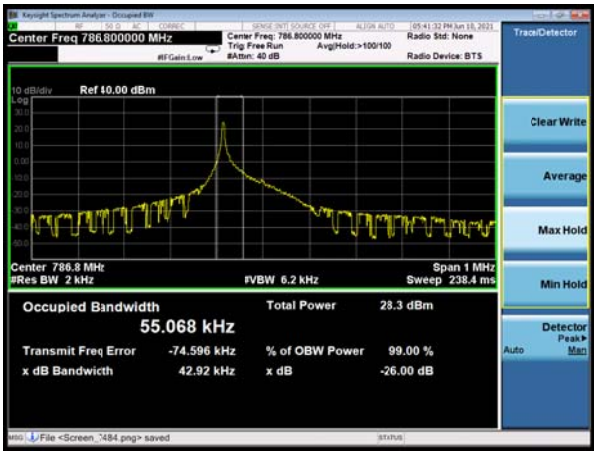
NB-IoT Band 13 BPSK 3.75kHz 1@0 CH-Middle



NB-IoT Band 13 BPSK 15kHz 1@0 CH-Middle

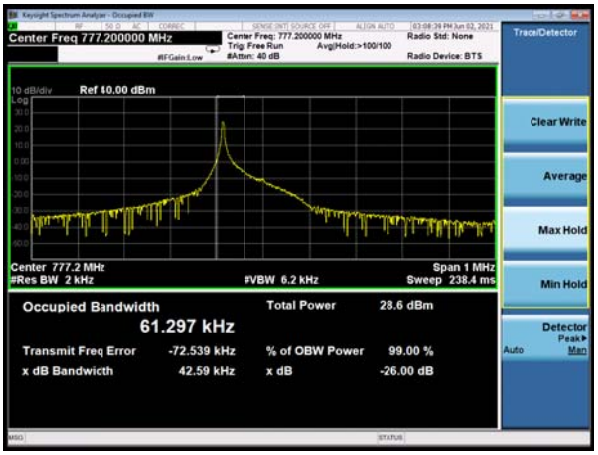


NB-IoT Band 13 BPSK 3.75kHz 1@0 CH-High



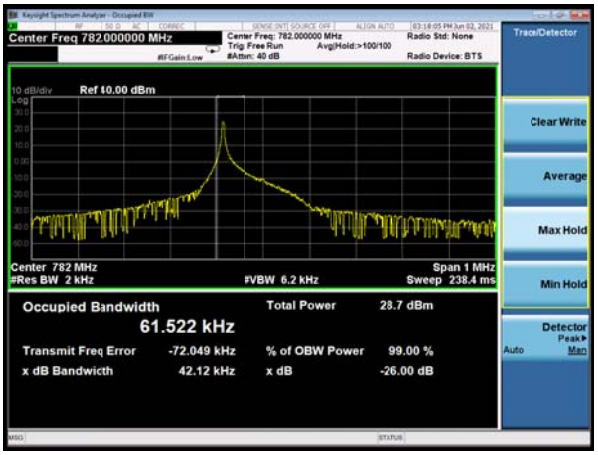
NB-IoT Band 13 BPSK 15kHz 1@0 CH-High

NB-IoT Band 13 QPSK 3.75kHz 1@0 CH-Low

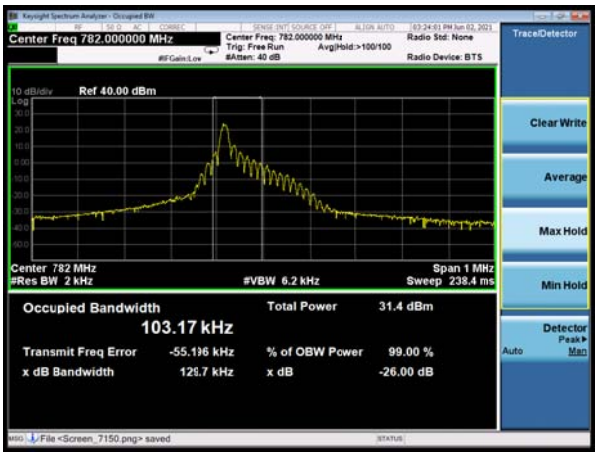


NB-IoT Band 13 QPSK 15kHz 1@0 CH-Low

NB-IoT Band 13 QPSK 3.75kHz 1@0 CH-Middle



NB-IoT Band 13 QPSK 15kHz 1@0 CH-Middle

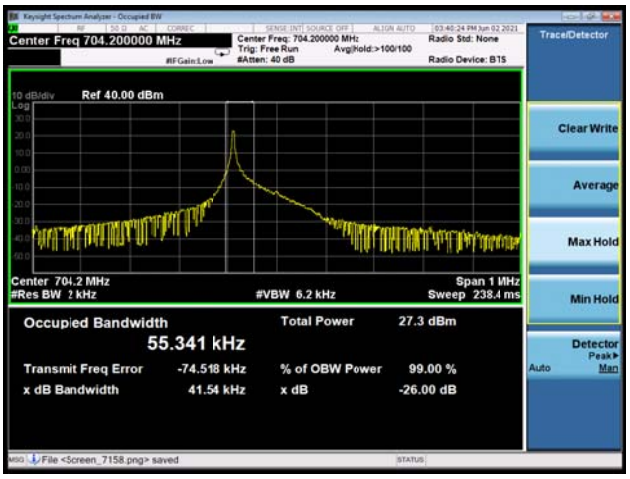


NB-IoT Band 13 QPSK 3.75kHz 1@0 CH-High

NB-IoT Band 13 QPSK 15kHz 1@0 CH-High

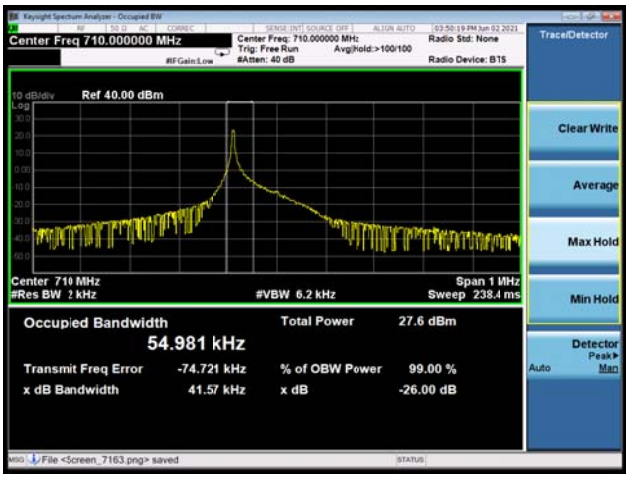
NB-IoT Band 13 QPSK 15kHz 12@0 CH-Low

NB-IoT Band 17 BPSK 3.75kHz 1@0 CH-Low



NB-IoT Band 13 QPSK 15kHz 12@0 CH-Middle

NB-IoT Band 17 BPSK 3.75kHz 1@0 CH-Middle

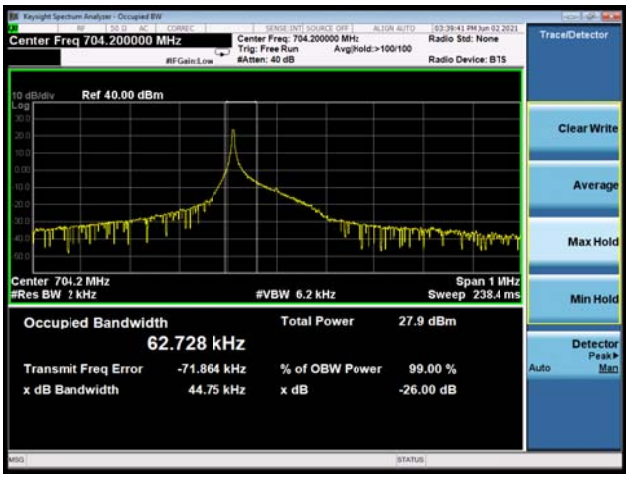


NB-IoT Band 13 QPSK 15kHz 12@0 CH-High

NB-IoT Band 17 BPSK 3.75kHz 1@0 CH-High

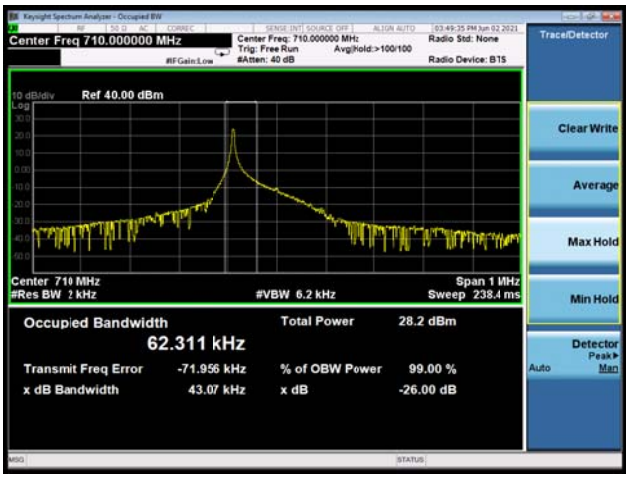
NB-IoT Band 17 BPSK 15kHz 1@0 CH-Low

NB-IoT Band 17 QPSK 3.75kHz 1@0 CH-Low

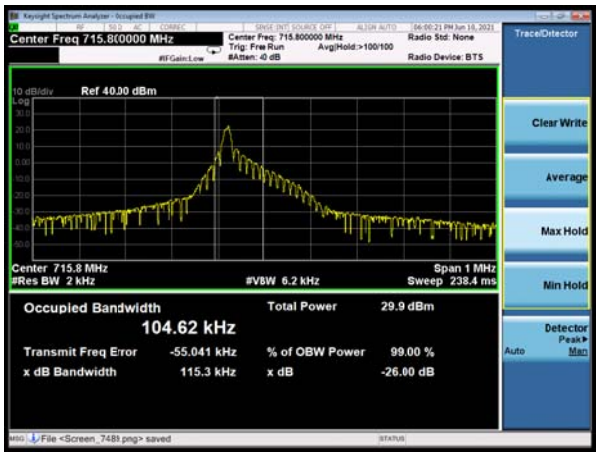


NB-IoT Band 17 BPSK 15kHz 1@0 CH-Middle

NB-IoT Band 17 QPSK 3.75kHz 1@0 CH-Middle

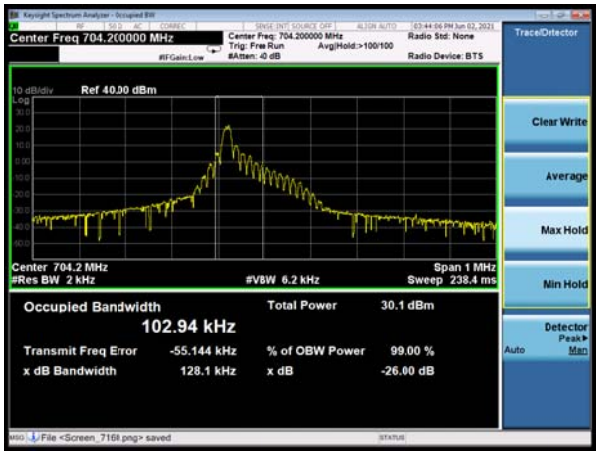


NB-IoT Band 17 BPSK 15kHz 1@0 CH-High

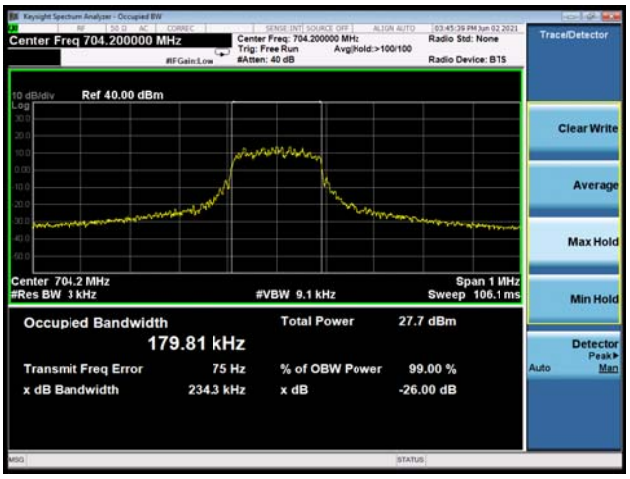


NB-IoT Band 17 QPSK 3.75kHz 1@0 CH-High

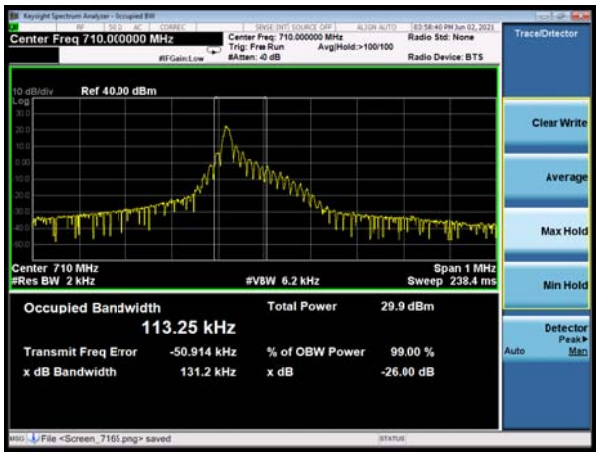
NB-IoT Band 17 QPSK 15kHz 1@0 CH-Low



NB-IoT Band 17 QPSK 15kHz 12@0 CH-Low



NB-IoT Band 17 QPSK 15kHz 1@0 CH-Middle

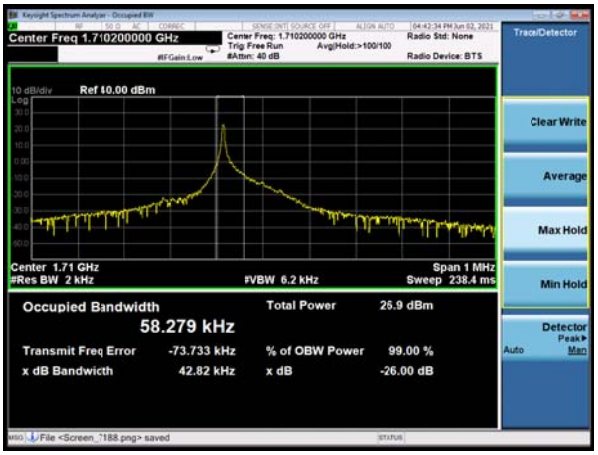


NB-IoT Band 17 QPSK 15kHz 12@0 CH-Middle

NB-IoT Band 17 QPSK 15kHz 1@0 CH-High

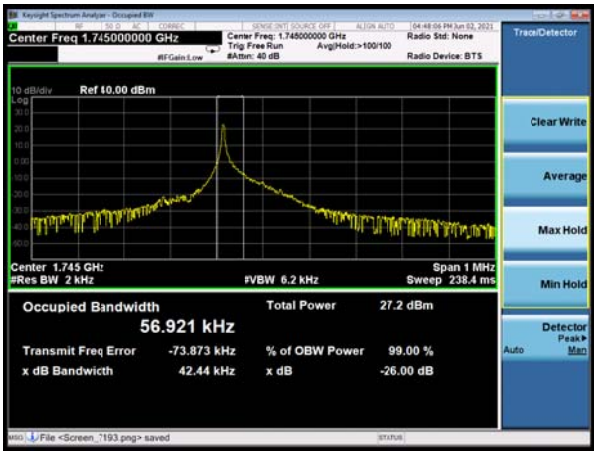
NB-IoT Band 17 QPSK 15kHz 12@0 CH-High

NB-IoT Band 66 BPSK 3.75kHz 1@0 CH-Low

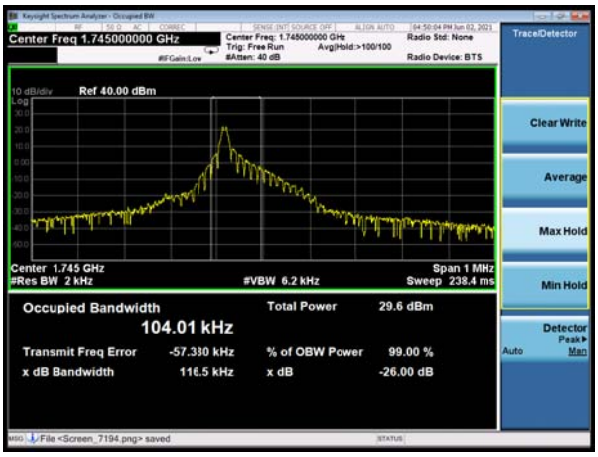


NB-IoT Band 66 BPSK 15kHz 1@0 CH-Low

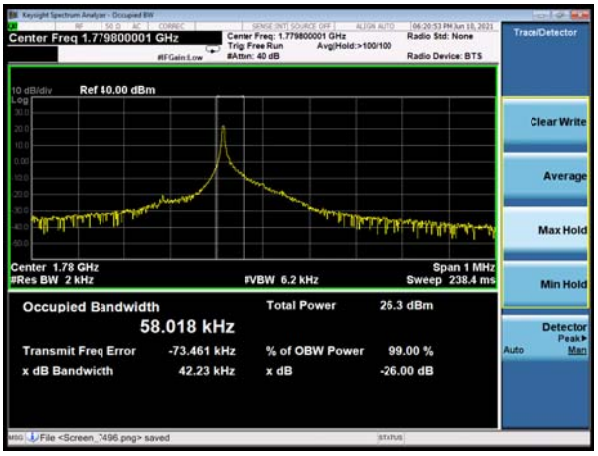
NB-IoT Band 66 BPSK 3.75kHz 1@0 CH-Middle



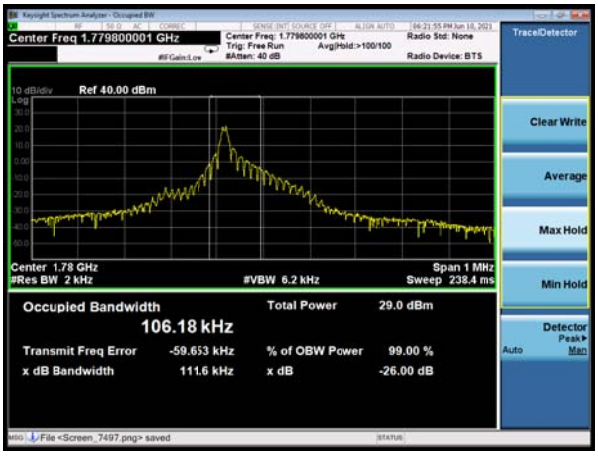
NB-IoT Band 66 BSK 15kHz 1@0 CH-Middle



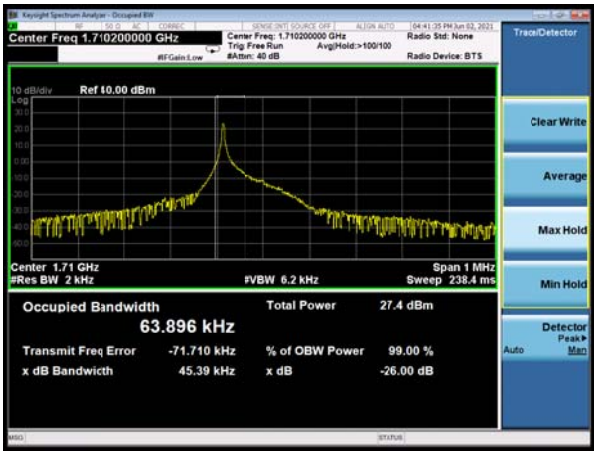
NB-IoT Band 66 BPSK 3.75kHz 1@0 CH-High



NB-IoT Band 66 BPSK 15kHz 1@0 CH-High

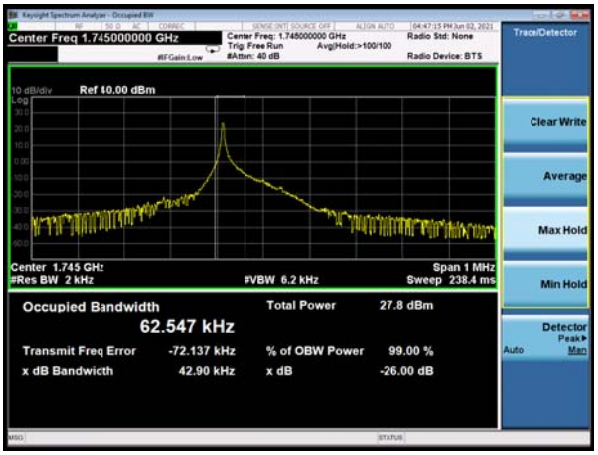


NB-IoT Band 66 QPSK 3.75kHz 1@0 CH-Low

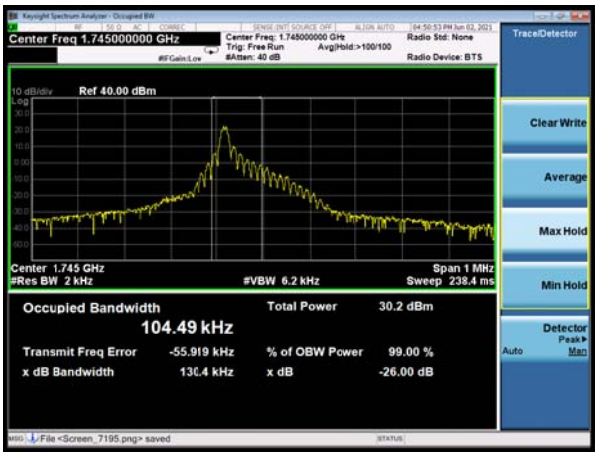


NB-IoT Band 66 QPSK 15kHz 1@0 CH-Low

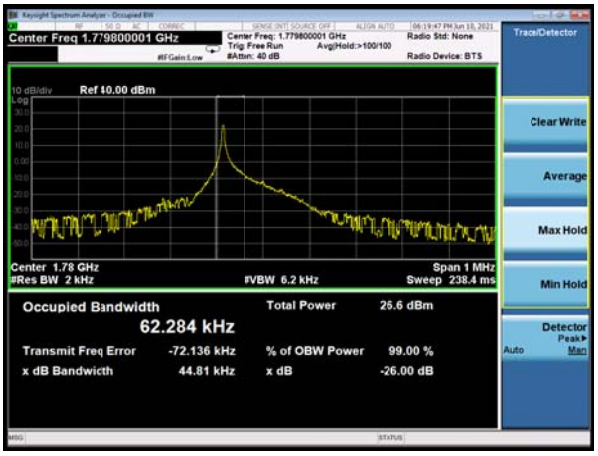
NB-IoT Band 66 QPSK 3.75kHz 1@0 CH-Middle



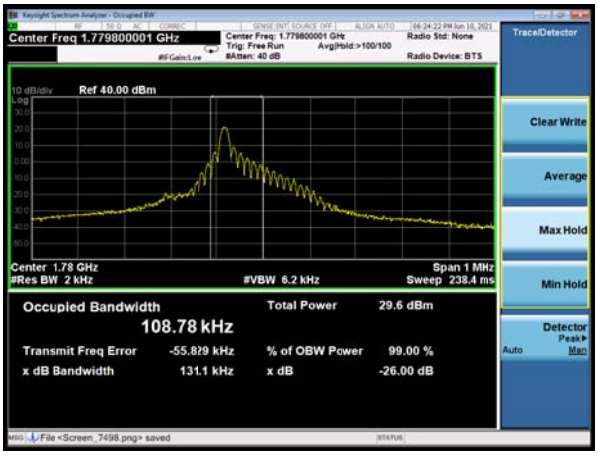
NB-IoT Band 66 QPSK 15kHz 1@0 CH-Middle



NB-IoT Band 66 QPSK 3.75kHz 1@0 CH-High



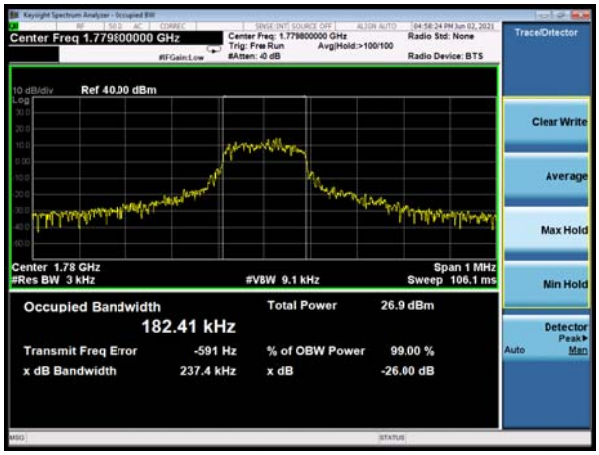
NB-IoT Band 66 QPSK 15kHz 1@0 CH-High



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



5.3 Band Edge Compliance

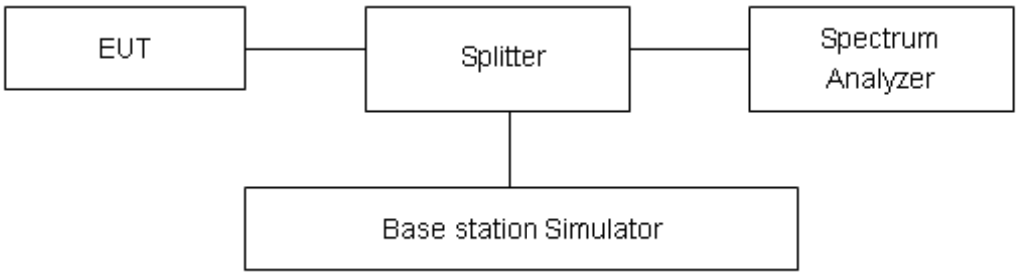
Ambient condition

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 band edge of the lowest and highest channels were measured.
The testing follows KDB 971168 D01 v03r01 Section 6.0
1.The EUT was connected to spectrum analyzer and system simulator via a power divider.
2. The band edges of low and high channels for the highest RF powers were measured.
3. RBW is set to ≥1%EBW, VBW is set to 3x RBW.
4. Set spectrum analyzer with RMS detector.
5. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.
6. Checked that all the results comply with the emission limit line.

Test Setup



Limits

Rule Part 27.53(h)/ specifies that " for operations in the 1695-1710 MHz, 1710-1755 MHz, 1755-1780 MHz, 1915-1920 MHz, 1995-2000 MHz, 2000-2020 MHz, 2110-2155 MHz, 2155-2180 MHz, and 2180-2200 bands, the power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) in watts by at least 43 + 10 $\log_{10}$ (P) dB"
Part 27.53(g) For operations in the 600 MHz band and the 698-746 MHz band, the power of any emission outside a licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, by at least 43 + 10 log (P) dB. Compliance with this provision is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kilohertz or greater. However, in the 100 kilohertz bands immediately outside and adjacent to a licensee's frequency block, a resolution bandwidth of at least

30 kHz may be employed.

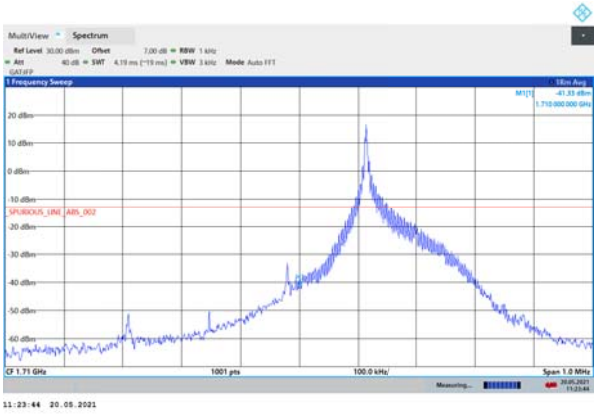
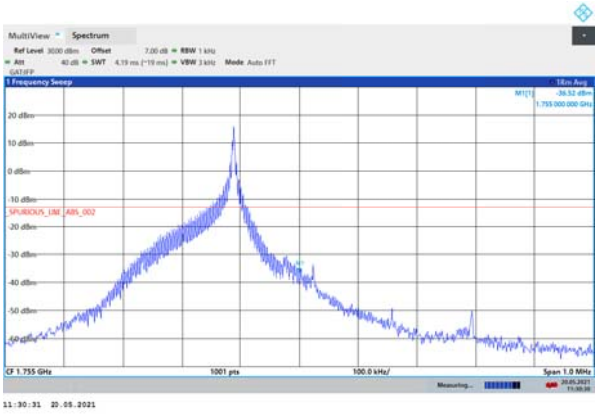
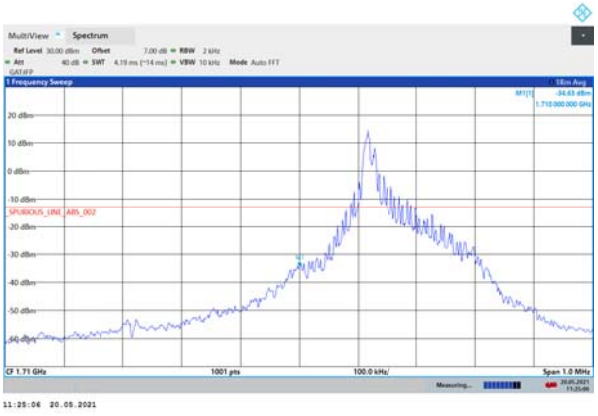
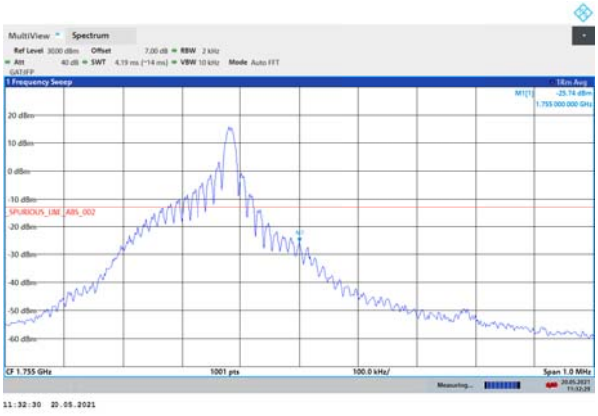
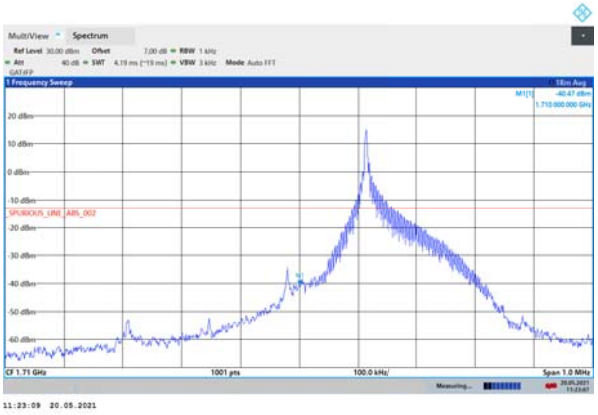
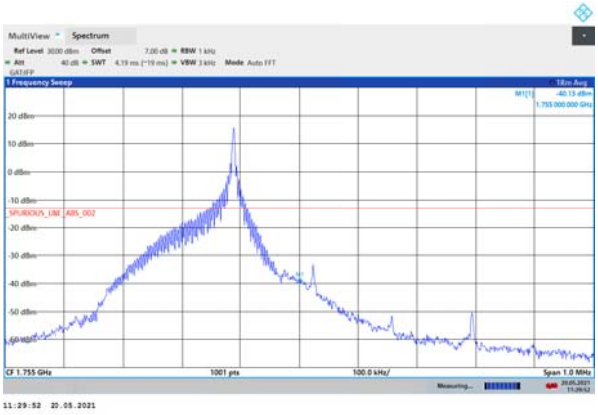
Rule Part 27.53(f) For operations in the 746-758 MHz, 775-788 MHz, and 805-806 MHz bands, emissions in the band 1559-1610 MHz shall be limited to −70 dBW/MHz equivalent isotropically radiated power (EIRP) for wideband signals, and −80 dBW EIRP for discrete emissions of less than 700 Hz bandwidth. For the purpose of equipment authorization, a transmitter shall be tested with an antenna that is representative of the type that will be used with the equipment in normal operation.

Measurement Uncertainty

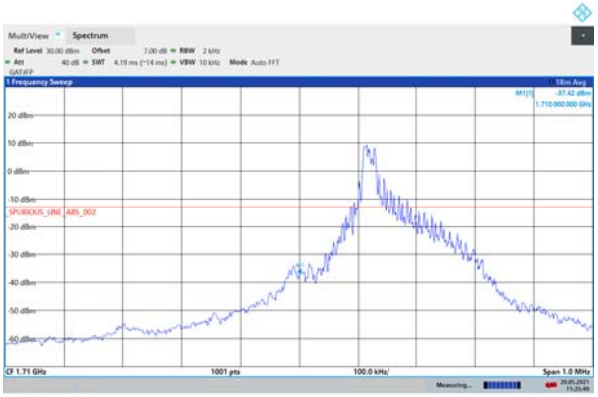
The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor k = 1.96, U=0.684dB.

Test Result

All the test traces in the pLoTs shows the test results clearly.

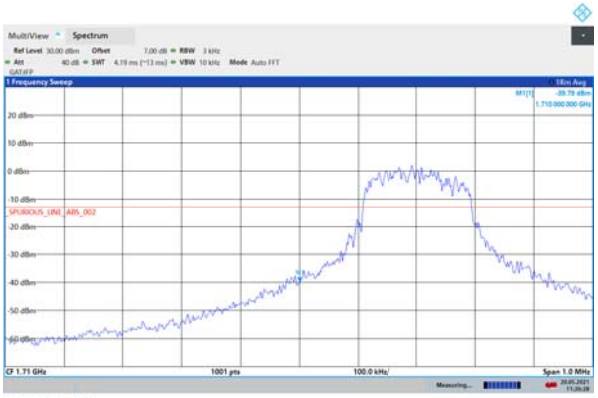
NB-IoT Band 4 BPSK 3.75kHz 1@0 CH-Low	NB-IoT Band 4 BPSK 3.75kHz 1@47 CH-High
	
NB-IoT Band 4 BPSK 15kHz 1@0 CH-Low	NB-IoT Band 4 BPSK 15kHz 1@11 CH-High
	
NB-IoT Band 4 QPSK 3.75kHz 1@0 CH-Low	NB-IoT Band 4 QPSK 3.75kHz 1@47 CH-High
	

NB-IoT Band 4 QPSK 15kHz 1@0 CH-Low

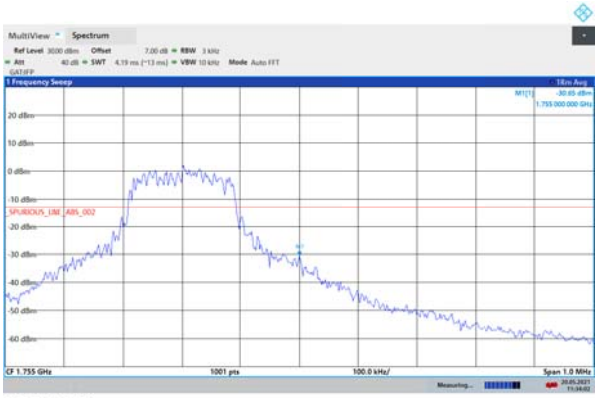


NB-IoT Band 4 QPSK 15kHz 1@11 CH-High

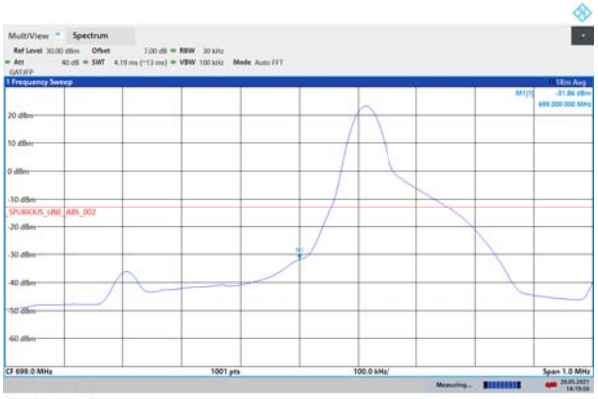
NB-IoT Band 4 QPSK 15kHz 12@0 CH-Low



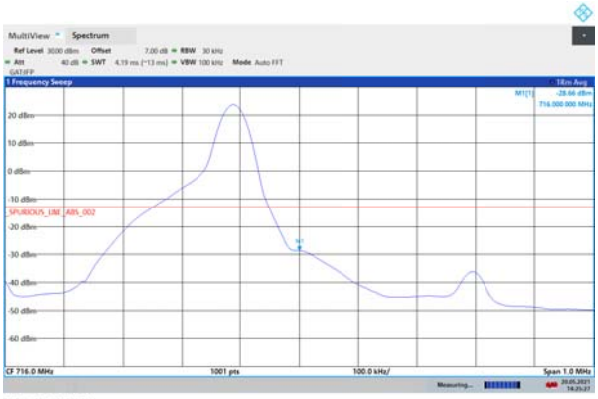
NB-IoT Band 4 QPSK 15kHz 12@0 CH-High



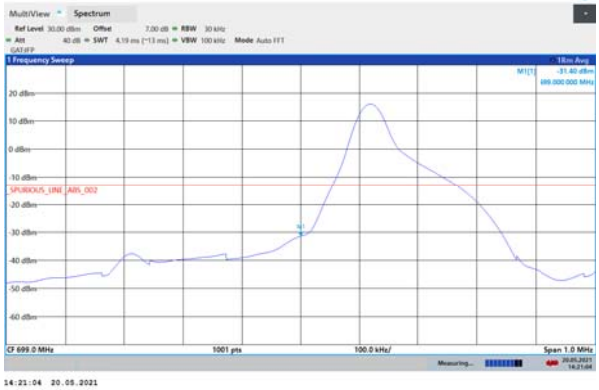
NB-IoT Band 12 BPSK 3.75kHz 1@0 CH-Low



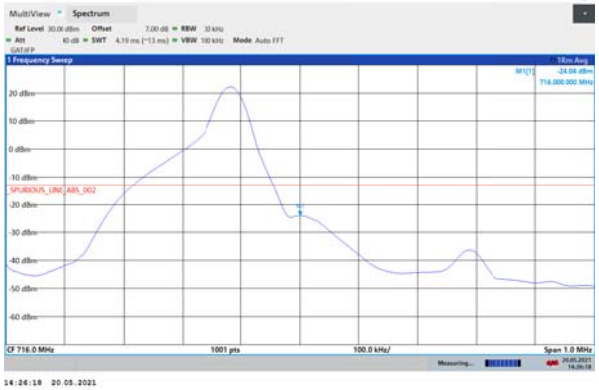
NB-IoT Band 12 BPSK 3.75kHz 1@47 CH-High



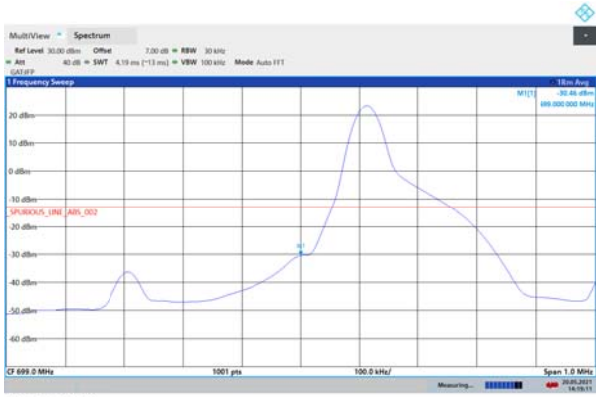
NB-IoT Band 12 BPSK 15kHz 1@0 CH-Low



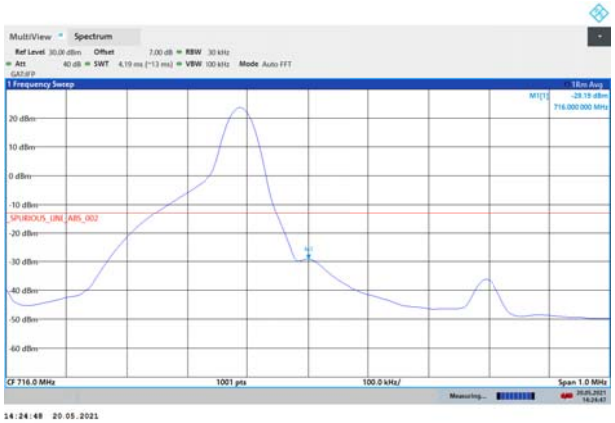
NB-IoT Band 12 BPSK 15kHz 1@11 CH-High



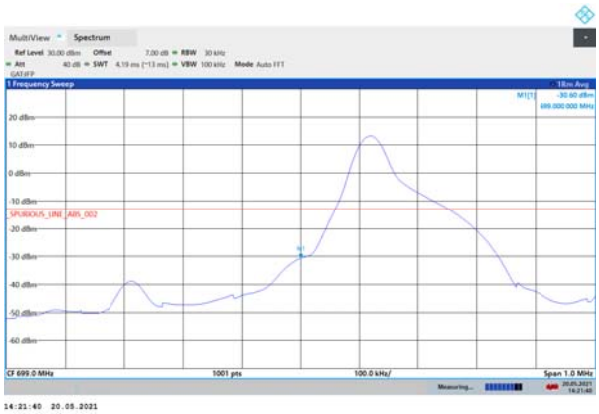
NB-IoT Band 12 QPSK 3.75kHz 1@0 CH-Low



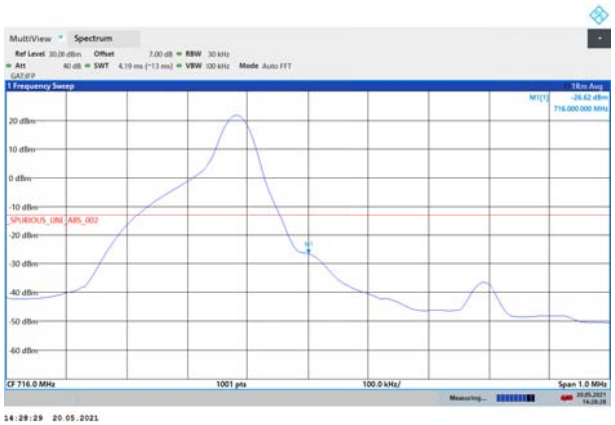
NB-IoT Band 12 QPSK 3.75kHz 1@47 CH-High



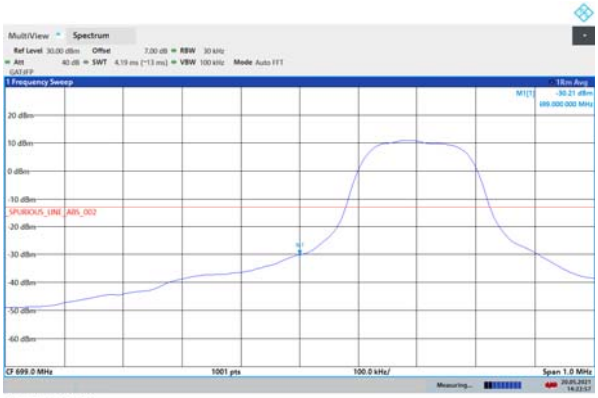
NB-IoT Band 12 QPSK 15kHz 1@0 CH-Low



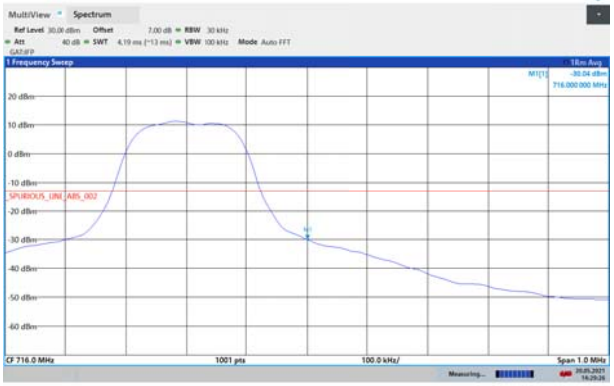
NB-IoT Band 12 QPSK 15kHz 1@11 CH-High



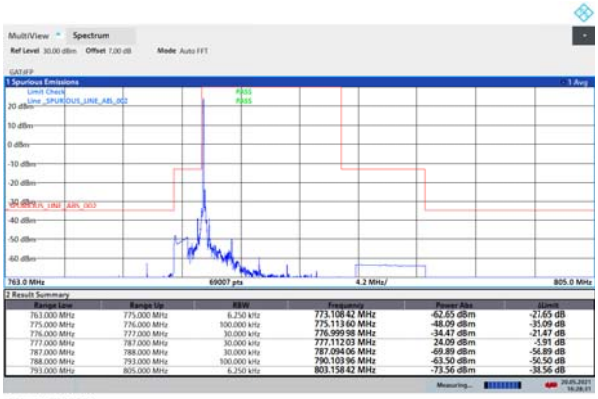
NB-IoT Band 12 QPSK 15kHz 12@0 CH-Low



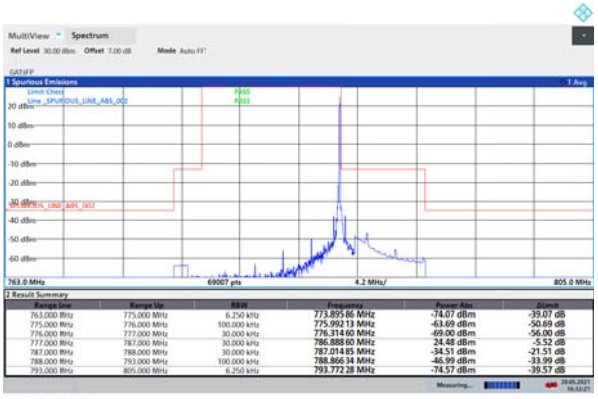
NB-IoT Band 12 QPSK 15kHz 12@0 CH-High



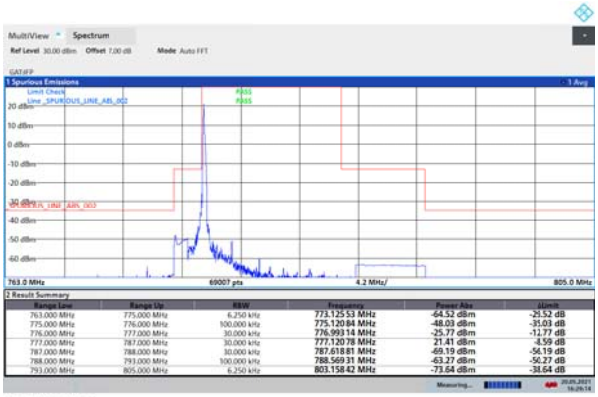
NB-IoT Band 13 BPSK 3.75kHz 1@0 CH-Low



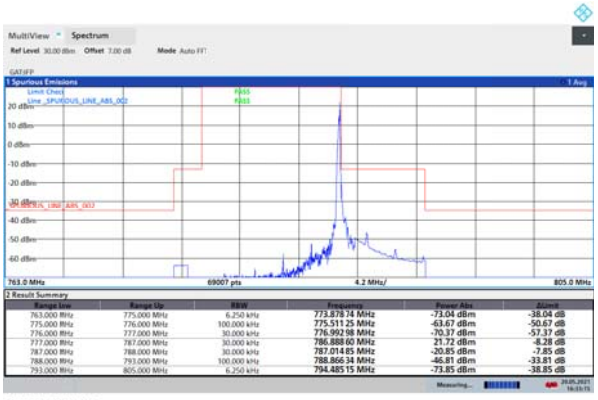
NB-IoT Band 13 BPSK 3.75kHz 1@47 CH-High



NB-IoT Band 13 BPSK 15kHz 1@0 CH-Low



NB-IoT Band 13 BPSK 15kHz 1@11 CH-High



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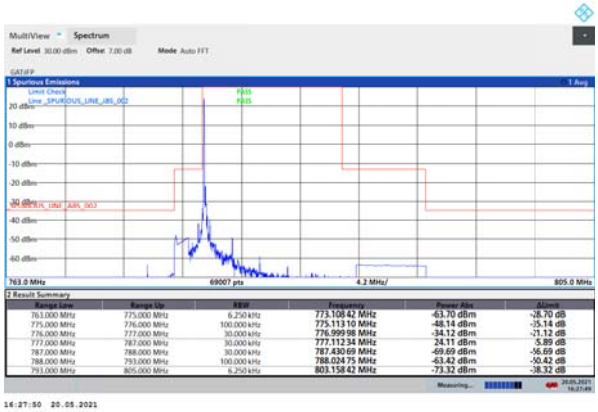

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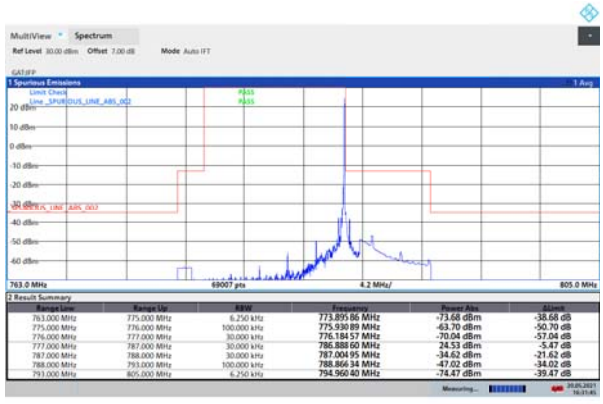

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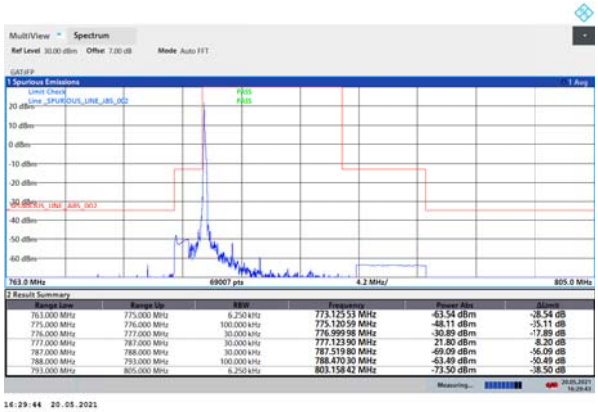
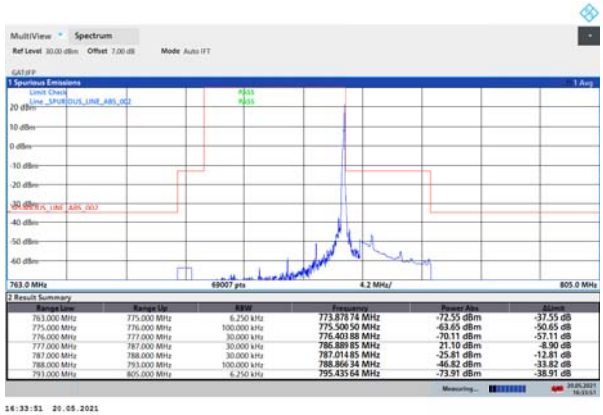
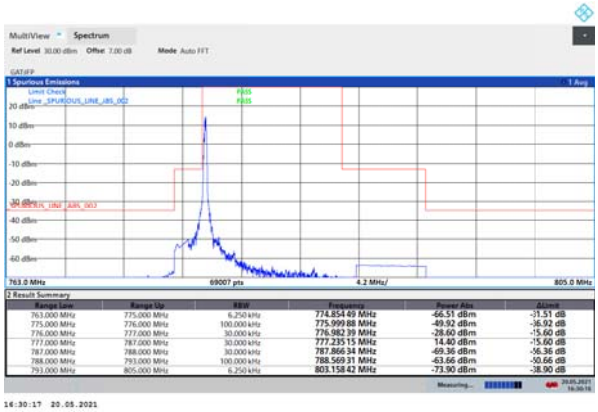


NB-IoT Band 13 QPSK 15kHz 1@11 CH-High



NB-IoT Band 13 QPSK 15kHz 12@0 CH-Low



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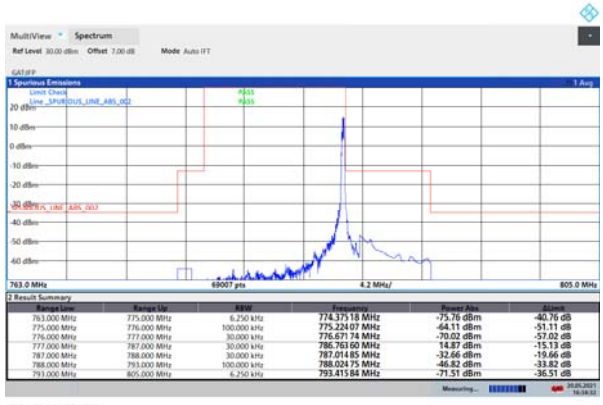
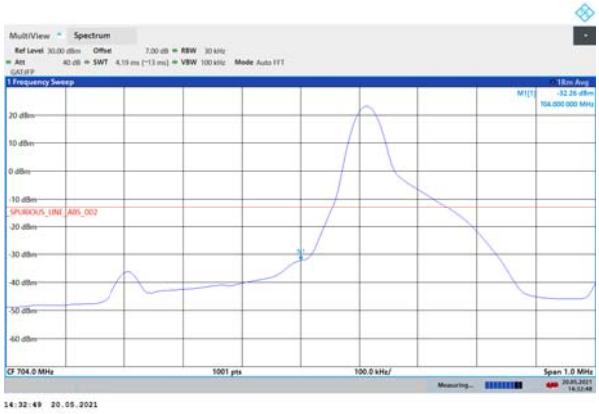


NB-IoT Band 17 BPSK 3.75kHz 1@0 CH-Low



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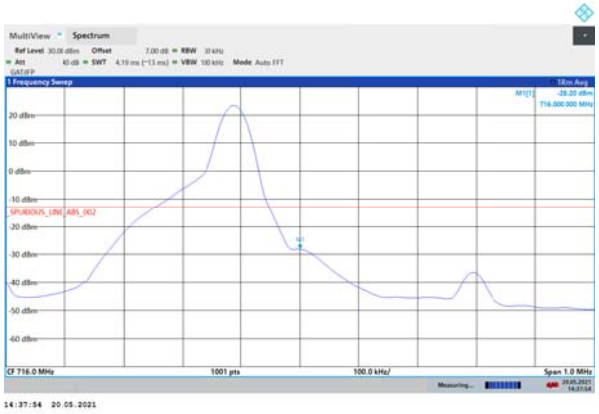
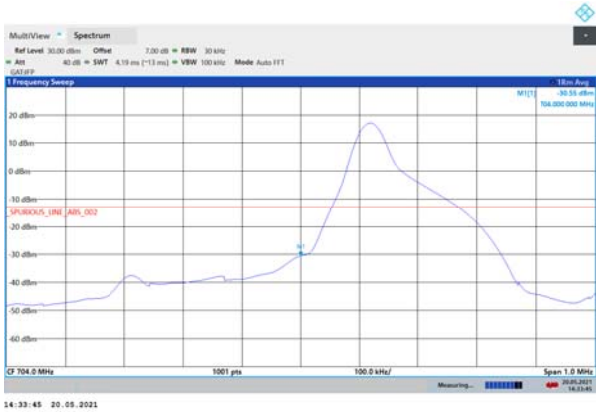
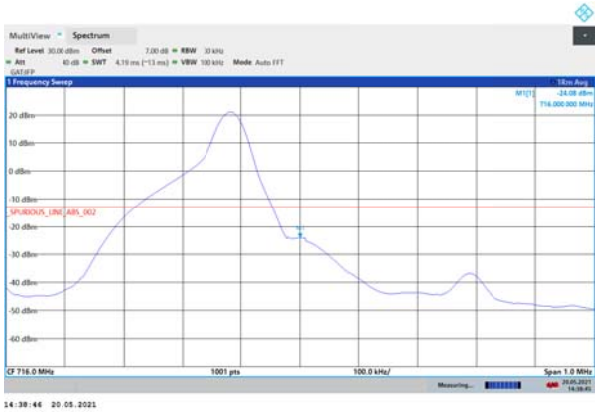


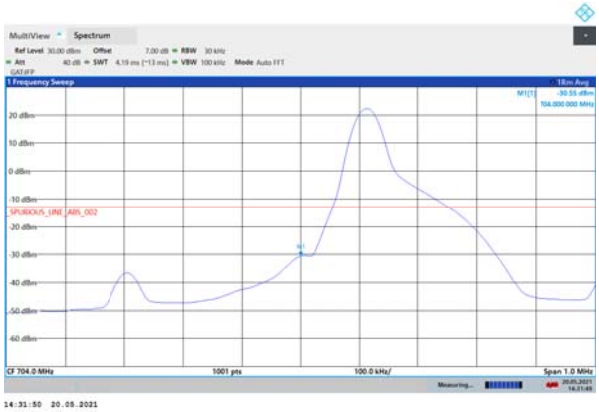
NB-IoT Band 17 BPSK 15kHz 1@0 CH-Low



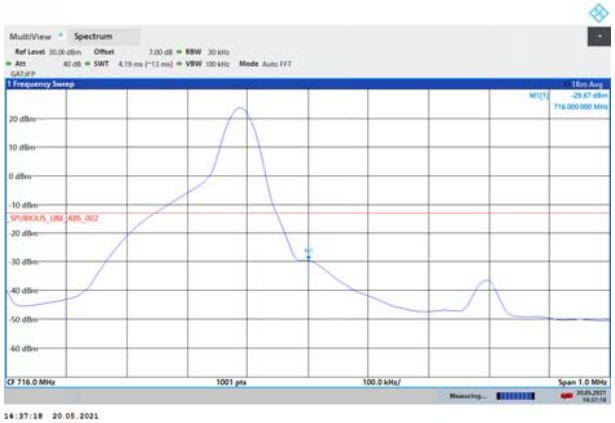
NB-IoT Band 17 BPSK 15kHz 1@11 CH-High



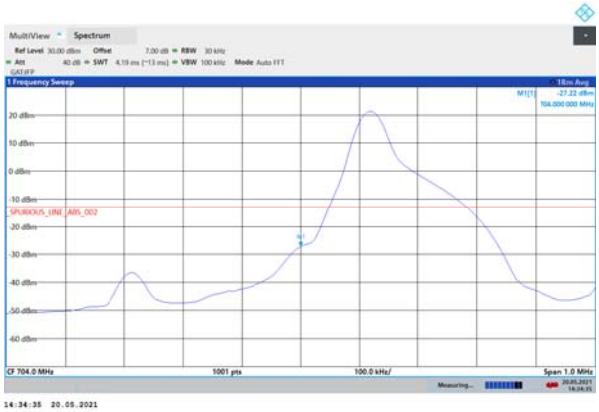
NB-IoT Band 17 QPSK 3.75kHz 1@0 CH-Low



NB-IoT Band 17 QPSK 3.75kHz 1@47 CH-High



NB-IoT Band 17 QPSK 15kHz 1@0 CH-Low



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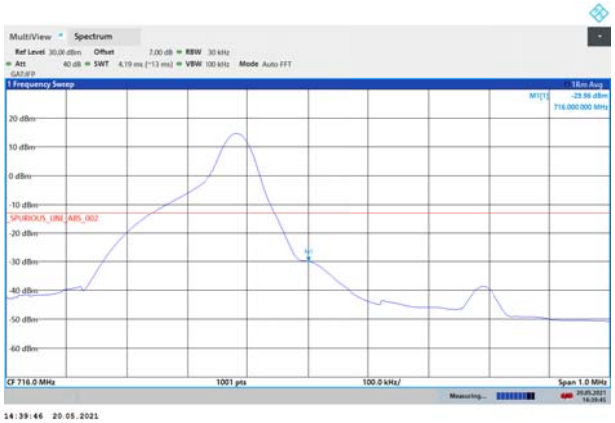
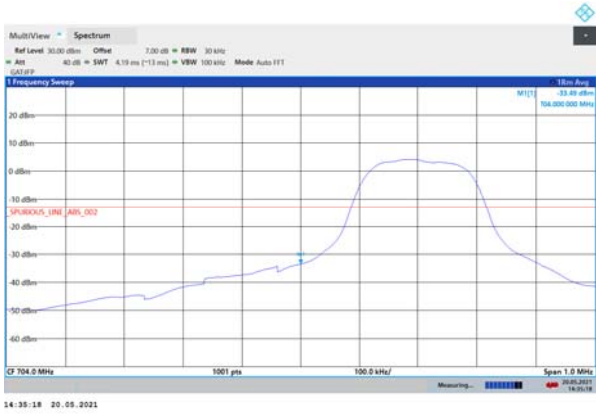
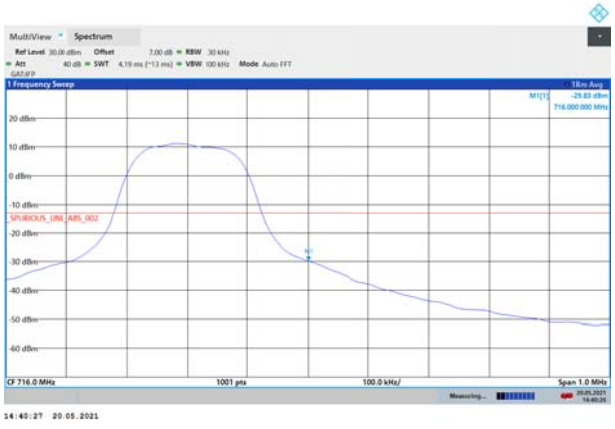


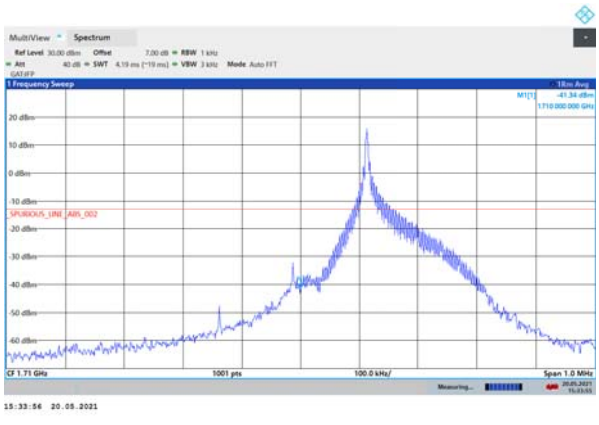
NB-IoT Band 17 QPSK 15kHz 12@0 CH-Low



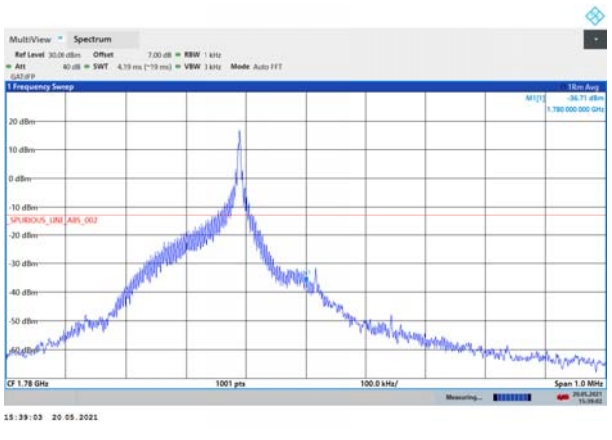
NB-IoT Band 17 QPSK 15kHz 12@0 CH-High



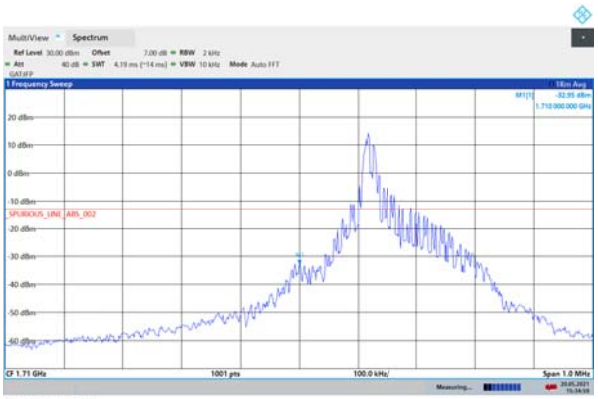
NB-IoT Band 66 BPSK 3.75kHz 1@0 CH-Low



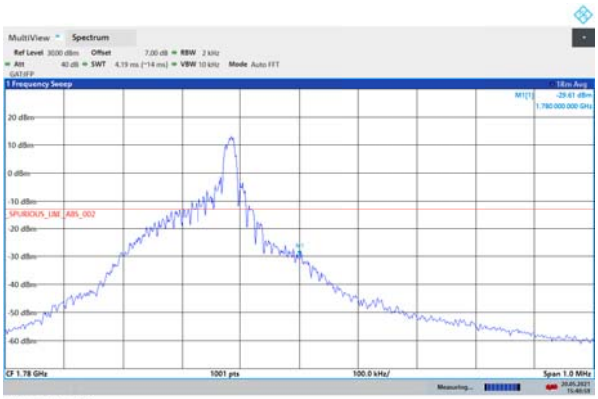
NB-IoT Band 66 BPSK 3.75kHz 1@47CH-High



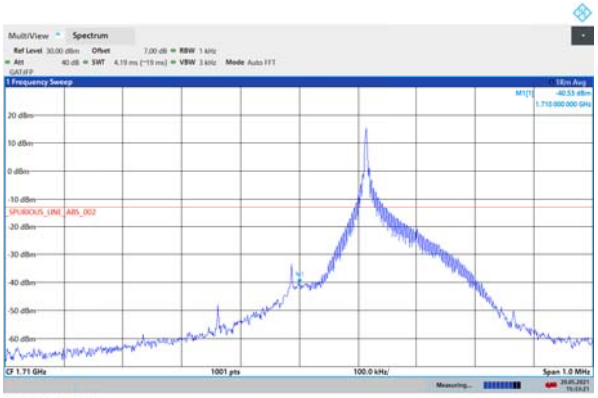
NB-IoT Band 66 BPSK 15kHz 1@0 CH-Low



NB-IoT Band 66 BPSK 15kHz 1@11 CH-High



NB-IoT Band 66 QPSK 3.75kHz 1@0 CH-Low



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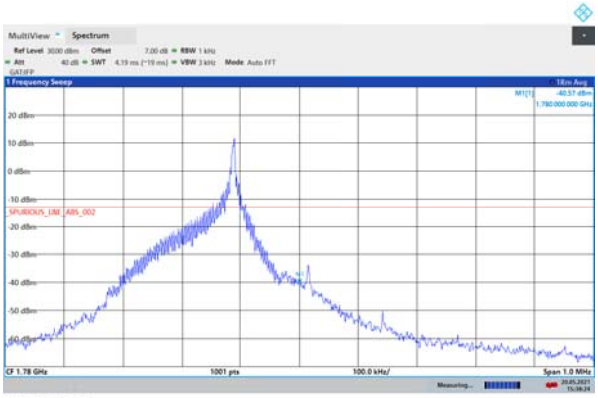
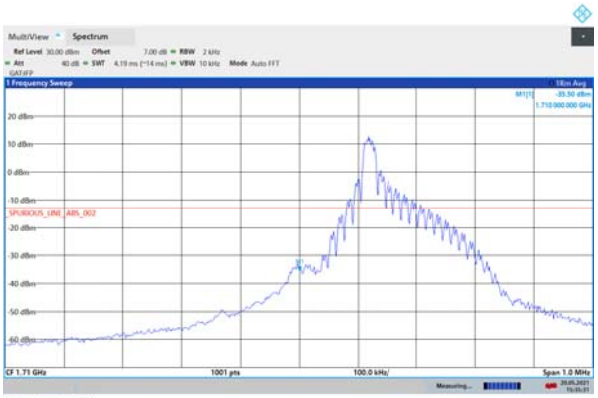
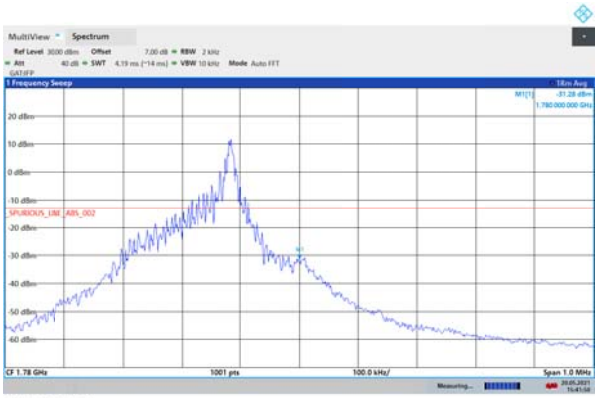
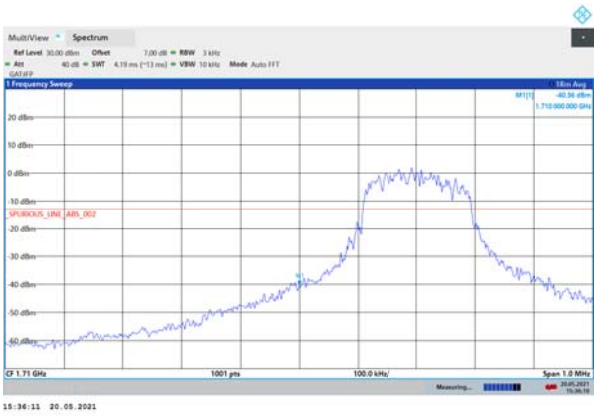
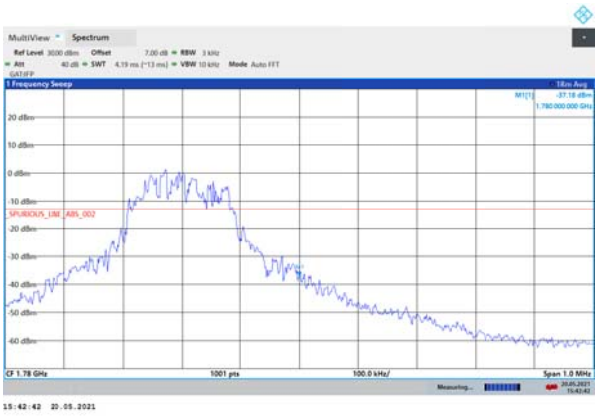


NB-IoT Band 66 QPSK 15kHz 1@0 CH-Low



NB-IoT Band 66 QPSK 15kHz 1@11 CH-High



NB-IoT Band 66 QPSK 15kHz 12@0 CH-Low	NB-IoT Band 66 QPSK 15kHz 12@0 CH-High
	

5.4 Peak-to-Average Power Ratio (PAPR)

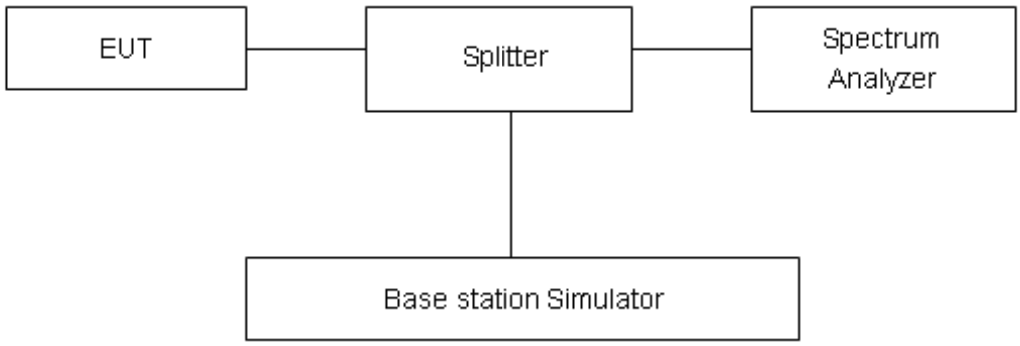
Ambient condition

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

Methods of Measurement

Measure the total peak power and record as PPk. And measure the total average power and record as PAvg. Both the peak and average power levels must be expressed in the same logarithmic units (*e.g.*, dBm). Determine the PAPR from:
PAPR (dB) = PPk (dBm) - PAvg (dBm).

Test Setup



Limits

Rule Part 27.50(d)(5) Equipment employed must be authorized in accordance with the provisions of 24.51. Power measurements for transmissions by stations authorized under this section may be made either in accordance with a Commission-approved average power technique or in compliance with paragraph (d)(6) of this section. In measuring transmissions in this band using an average power technique, the peak-to-average ratio (PAR) of the transmission may not exceed 13 dB.

Measurement Uncertainty

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

Test Results

Mode	Modulation	Sub-carrier spacing (KHz)	Channel/ Frequency(MHz)	Peak-to-Average Power Ratio (PAPR)		
				Peak(dBm)	Avg(dBm)	PAPR(dB)
NB-IoT Band 4 Standalone	BPSK	3.75	20175/1732.5	26.39	22.21	4.18
	QPSK	3.75	20175/1732.5	25.87	22.19	3.68
	BPSK	15	20175/1732.5	26.07	19.22	6.85
	QPSK	15	20175/1732.5	25.83	19.17	6.66

Mode	Modulation	Sub-carrier spacing (KHz)	Channel/ Frequency(MHz)	Peak-to-Average Power Ratio (PAPR)		
				Peak(dBm)	Avg(dBm)	PAPR(dB)
NB-IoT Band 12 Standalone	BPSK	3.75	23095/707.5	26.44	22.14	4.30
	QPSK	3.75	23095/707.5	25.92	22.16	3.76
	BPSK	15	23095/707.5	26.18	19.21	6.97
	QPSK	15	23095/707.5	25.91	19.12	6.79

Mode	Modulation	Sub-carrier spacing (KHz)	Channel/ Frequency(MHz)	Peak-to-Average Power Ratio (PAPR)		
				Peak(dBm)	Avg(dBm)	PAPR(dB)
NB-IoT Band 13 Standalone	BPSK	3.75	23230/782	26.30	21.99	4.31
	QPSK	3.75	23230/782	25.75	22.02	3.73
	BPSK	15	23230/782	25.90	18.64	7.26
	QPSK	15	23230/782	25.65	18.92	6.73

Mode	Modulation	Sub-carrier spacing (KHz)	Channel/ Frequency(MHz)	Peak-to-Average Power Ratio (PAPR)		
				Peak(dBm)	Avg(dBm)	PAPR(dB)
NB-IoT Band 17 Standalone	BPSK	3.75	23790/710	26.41	22.11	4.30
	QPSK	3.75	23790/710	25.80	22.04	3.76
	BPSK	15	23790/710	26.05	19.04	7.01
	QPSK	15	23790/710	25.77	19.00	6.77

Mode	Modulation	Sub-carrier spacing (KHz)	Channel/ Frequency(MHz)	Peak-to-Average Power Ratio (PAPR)		
				Peak(dBm)	Avg(dBm)	PAPR(dB)
NB-IoT Band 66 Standalone	BPSK	3.75	132322/1745	26.19	21.92	4.27
	QPSK	3.75	132322/1745	25.64	21.91	3.73
	BPSK	15	132322/1745	25.89	19.01	6.88
	QPSK	15	132322/1745	25.63	18.96	6.67

5.5 Frequency Stability

Ambient condition

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

Method of Measurement

Frequency Stability (Temperature Variation)

The temperature inside the climate chamber is varied from -40°C to +85°C in 10°C step size.

(1)With all power removed, the temperature was decreased to -10°C and permitted to stabilize for three hours.

(2)Measure the carrier frequency with the test equipment in a “call mode”. These measurements should be made within 1 minute of powering up the mobile station, to prevent significant self warming.

(3) Repeat the above measurements at 10°C increments from -40°C to +85°C. Allow at least 1.5 hours at each temperature, un-powered, before making measurements.

Frequency Stability (Voltage Variation)

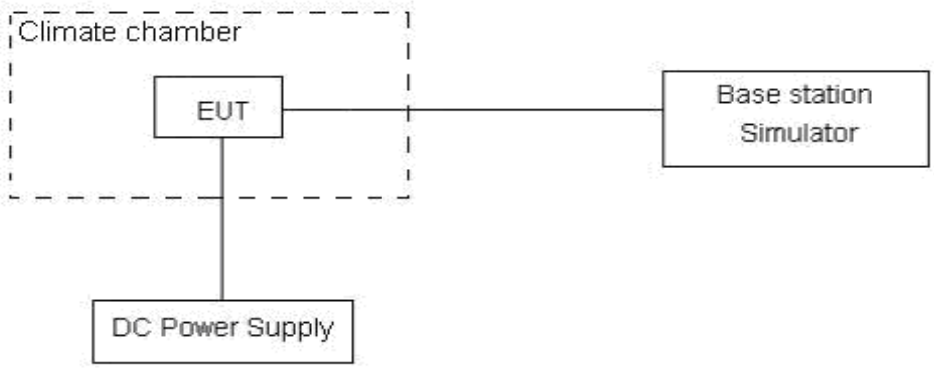
The frequency stability shall be measured with variation of primary supply voltage as follows:

(1) Vary primary supply voltage from 85 to 115 percent of the nominal value for other than hand carried battery equipment.

(2) For hand carried, battery powered equipment, reduce primary supply voltage to the battery-operating end point which shall be specified by the manufacturer.

This transceiver is specified to operate with an input voltage of between 2.1 V and 3.63 V, with a nominal voltage of 3.3V.

Test setup



Limits

The frequency stability shall be sufficient to ensure that the fundamental emissions stay within the authorized bands of operation.

Measurement Uncertainty

The assessed measurement uncertainty to ensure 99.75％ confidence level for the normal distribution is with the coverage factor k = 3,U=0.01ppm.

Test Result

NB-IoT Band 4(1732.5MHz)						
Condition		Freq.Error (Hz)	Freq.Error (Hz)	Frequency Stability （ppm）	Frequency Stability （ppm）	Verdict
Subcarrier Spacing	3.75					
Temperature	Voltage	BPSK	QPSK	BPSK	QPSK	
Normal（25℃）	Normal	3.92	7.32	0.00208	0.00390	PASS
Extreme（85℃）		1.03	2.70	0.00055	0.00144	PASS
Extreme（80℃）		11.87	10.92	0.00631	0.00581	PASS
Extreme（70℃）		2.79	10.24	0.00148	0.00544	PASS
Extreme（60℃）		17.25	5.74	0.00918	0.00305	PASS
Extreme（50℃）		16.23	14.22	0.00863	0.00756	PASS
Extreme（40℃）		6.10	12.60	0.00324	0.00670	PASS
Extreme（30℃）		6.91	8.37	0.00367	0.00445	PASS
Extreme（20℃）		3.12	1.64	0.00166	0.00087	PASS
Extreme（10℃）		5.54	6.84	0.00295	0.00364	PASS
Extreme（0℃）		7.61	15.82	0.00405	0.00841	PASS
Extreme（-10℃）		11.60	10.45	0.00617	0.00556	PASS
Extreme（-20℃）		3.56	11.59	0.00190	0.00617	PASS
Extreme（-30℃）		5.82	13.73	0.00310	0.00730	PASS
Extreme（-40℃）		11.74	15.80	0.00624	0.00840	PASS
25℃	LV	9.08	13.64	0.00483	0.00726	PASS
	HV	5.32	10.15	0.00283	0.00540	PASS

NB-IoT Band 4(1732.5MHz)						
Condition		Freq.Error (Hz)	Freq.Error (Hz)	Frequency Stability （ppm）	Frequency Stability （ppm）	Verdict
Subcarrier Spacing	15					
Temperature	Voltage	BPSK	QPSK	BPSK	QPSK	
Normal（25℃）	Normal	6.69	15.48	0.00356	0.00823	PASS
Extreme（85℃）		15.78	17.64	0.00840	0.00938	PASS
Extreme（80℃）		4.81	17.08	0.00256	0.00909	PASS
Extreme（70℃）		13.90	11.64	0.00739	0.00619	PASS
Extreme（60℃）		7.26	7.48	0.00386	0.00398	PASS
Extreme（50℃）		3.27	1.72	0.00174	0.00092	PASS
Extreme（40℃）		2.80	8.12	0.00149	0.00432	PASS
Extreme（30℃）		5.35	4.61	0.00284	0.00245	PASS
Extreme（20℃）		9.24	6.29	0.00491	0.00335	PASS
Extreme（10℃）		9.36	10.09	0.00498	0.00537	PASS
Extreme（0℃）		15.88	9.17	0.00845	0.00488	PASS
Extreme（-10℃）		8.83	5.08	0.00469	0.00270	PASS
Extreme（-20℃）		10.07	2.58	0.00536	0.00137	PASS
Extreme（-30℃）		2.94	15.64	0.00157	0.00832	PASS
Extreme（-40℃）		10.26	8.19	0.00546	0.00435	PASS
25℃	LV	7.10	2.88	0.00377	0.00153	PASS
	HV	8.90	11.30	0.00473	0.00601	PASS

NB-IoT Band 12(707.5MHz)						
Condition		Freq.Error (Hz)	Freq.Error (Hz)	Frequency Stability （ppm）	Frequency Stability （ppm）	Verdict
Subcarrier Spacing	3.75					
Temperature	Voltage	BPSK	QPSK	BPSK	QPSK	
Normal（25℃）	Normal	6.28	12.19	0.00334	0.00649	PASS
Extreme（85℃）		8.22	2.44	0.00437	0.00130	PASS
Extreme（80℃）		7.86	11.77	0.00418	0.00626	PASS
Extreme（70℃）		9.27	10.41	0.00493	0.00554	PASS
Extreme（60℃）		8.43	15.26	0.00448	0.00812	PASS
Extreme（50℃）		12.57	12.57	0.00668	0.00668	PASS
Extreme（40℃）		10.87	7.99	0.00578	0.00425	PASS
Extreme（30℃）		5.51	14.74	0.00293	0.00784	PASS
Extreme（20℃）		3.20	2.23	0.00170	0.00118	PASS
Extreme（10℃）		15.10	14.27	0.00803	0.00759	PASS
Extreme（0℃）		16.70	8.78	0.00888	0.00467	PASS
Extreme（-10℃）		17.13	10.22	0.00911	0.00544	PASS
Extreme（-20℃）		11.56	4.74	0.00615	0.00252	PASS
Extreme（-30℃）		3.54	2.25	0.00188	0.00120	PASS
Extreme（-40℃）		10.97	10.22	0.00583	0.00544	PASS
25℃	LV	7.64	10.49	0.00406	0.00558	PASS
	HV	4.04	1.15	0.00215	0.00061	PASS

NB-IoT Band 12(707.5MHz）						
Condition		Freq.Error (Hz)	Freq.Error (Hz)	Frequency Stability （ppm）	Frequency Stability （ppm）	Verdict
Subcarrier Spacing	15					
Temperature	Voltage	BPSK	QPSK	BPSK	QPSK	
Normal（25℃）	Normal	9.36	7.64	0.00498	0.00406	PASS
Extreme（85℃）		16.19	12.54	0.00861	0.00667	PASS
Extreme（80℃）		16.22	1.12	0.00863	0.00060	PASS
Extreme（70℃）		14.28	10.10	0.00760	0.00537	PASS
Extreme（60℃）		1.42	17.80	0.00076	0.00947	PASS
Extreme（50℃）		14.57	7.01	0.00775	0.00373	PASS
Extreme（40℃）		14.99	2.51	0.00797	0.00133	PASS
Extreme（30℃）		2.29	14.01	0.00122	0.00745	PASS
Extreme（20℃）		17.30	16.35	0.00920	0.00870	PASS
Extreme（10℃）		3.13	15.60	0.00166	0.00830	PASS
Extreme（0℃）		5.49	16.74	0.00292	0.00891	PASS
Extreme（-10℃）		5.71	3.99	0.00304	0.00212	PASS
Extreme（-20℃）		13.29	1.26	0.00707	0.00067	PASS
Extreme（-30℃）		15.39	1.69	0.00818	0.00090	PASS
Extreme（-40℃）		16.56	9.01	0.00881	0.00479	PASS
25℃	LV	2.92	2.22	0.00155	0.00118	PASS
	HV	17.38	7.22	0.00924	0.00384	PASS

NB-IoT Band 13（782MHz）						
Condition		Freq.Error (Hz)	Freq.Error (Hz)	Frequency Stability （ppm）	Frequency Stability （ppm）	Verdict
Subcarrier Spacing	3.75					
Temperature	Voltage	BPSK	QPSK	BPSK	QPSK	
Normal（25℃）	Normal	15.79	2.63	0.00840	0.00140	PASS
Extreme（85℃）		5.47	3.30	0.00291	0.00176	PASS
Extreme（80℃）		9.08	1.90	0.00483	0.00101	PASS
Extreme（70℃）		12.67	1.41	0.00674	0.00075	PASS
Extreme（60℃）		12.30	9.61	0.00654	0.00511	PASS
Extreme（50℃）		6.86	14.25	0.00365	0.00758	PASS
Extreme（40℃）		4.52	1.02	0.00240	0.00054	PASS
Extreme（30℃）		4.03	10.88	0.00215	0.00578	PASS
Extreme（20℃）		15.46	14.24	0.00822	0.00758	PASS
Extreme（10℃）		3.62	16.68	0.00192	0.00887	PASS
Extreme（0℃）		12.35	16.11	0.00657	0.00857	PASS
Extreme（-10℃）		5.14	5.87	0.00273	0.00312	PASS
Extreme（-20℃）		9.02	11.30	0.00480	0.00601	PASS
Extreme（-30℃）		1.79	1.61	0.00095	0.00086	PASS
Extreme（-40℃）		1.88	12.81	0.00100	0.00682	PASS
25℃	LV	4.41	7.58	0.00234	0.00403	PASS
	HV	3.92	4.78	0.00208	0.00254	PASS

NB-IoT Band 13（782MHz）						
Condition		Freq.Error (Hz)	Freq.Error (Hz)	Frequency Stability （ppm）	Frequency Stability （ppm）	Verdict
Subcarrier Spacing	15					
Temperature	Voltage	BPSK	QPSK	BPSK	QPSK	
Normal（25℃）	Normal	17.05	17.27	0.00907	0.00919	PASS
Extreme（85℃）		4.76	12.44	0.00253	0.00662	PASS
Extreme（80℃）		1.85	13.33	0.00098	0.00709	PASS
Extreme（70℃）		17.27	8.23	0.00918	0.00438	PASS
Extreme（60℃）		11.42	13.72	0.00607	0.00730	PASS
Extreme（50℃）		11.40	9.06	0.00607	0.00482	PASS
Extreme（40℃）		17.87	5.33	0.00951	0.00283	PASS
Extreme（30℃）		1.26	9.28	0.00067	0.00494	PASS
Extreme（20℃）		5.95	8.83	0.00316	0.00470	PASS
Extreme（10℃）		13.32	5.89	0.00708	0.00313	PASS
Extreme（0℃）		14.90	2.55	0.00792	0.00136	PASS
Extreme（-10℃）		17.77	7.75	0.00945	0.00412	PASS
Extreme（-20℃）		10.50	15.94	0.00558	0.00848	PASS
Extreme（-30℃）		12.41	2.49	0.00660	0.00133	PASS
Extreme（-40℃）		4.81	13.87	0.00256	0.00738	PASS
25℃	LV	6.08	1.13	0.00324	0.00060	PASS
	HV	9.97	9.69	0.00530	0.00515	PASS

NB-IoT Band 17（710MHz）						
Condition		Freq.Error (Hz)	Freq.Error (Hz)	Frequency Stability （ppm）	Frequency Stability （ppm）	Verdict
Subcarrier Spacing	3.75					
Temperature	Voltage	BPSK	QPSK	BPSK	QPSK	
Normal（25℃）	Normal	5.32	6.61	0.00283	0.00351	PASS
Extreme（85℃）		1.17	8.87	0.00062	0.00472	PASS
Extreme（80℃）		6.42	1.40	0.00342	0.00074	PASS
Extreme（70℃）		5.36	3.24	0.00285	0.00172	PASS
Extreme（60℃）		17.08	7.60	0.00909	0.00404	PASS
Extreme（50℃）		2.61	7.63	0.00139	0.00406	PASS
Extreme（40℃）		5.82	13.03	0.00310	0.00693	PASS
Extreme（30℃）		10.89	2.11	0.00579	0.00112	PASS
Extreme（20℃）		1.42	13.16	0.00075	0.00700	PASS
Extreme（10℃）		17.62	14.61	0.00937	0.00777	PASS
Extreme（0℃）		8.31	15.78	0.00442	0.00839	PASS
Extreme（-10℃）		3.11	2.56	0.00166	0.00136	PASS
Extreme（-20℃）		2.46	9.89	0.00131	0.00526	PASS
Extreme（-30℃）		8.76	17.65	0.00466	0.00939	PASS
Extreme（-40℃）		12.46	8.47	0.00663	0.00451	PASS
25℃	LV	5.07	13.38	0.00270	0.00712	PASS
	HV	3.53	7.48	0.00188	0.00398	PASS

NB-IoT Band 17（710MHz）						
Condition		Freq.Error (Hz)	Freq.Error (Hz)	Frequency Stability （ppm）	Frequency Stability （ppm）	Verdict
Subcarrier Spacing	15					
Temperature	Voltage	BPSK	QPSK	BPSK	QPSK	
Normal（25℃）	Normal	16.86	13.84	0.00897	0.00736	PASS
Extreme（85℃）		7.68	4.35	0.00408	0.00231	PASS
Extreme（80℃）		13.14	6.57	0.00699	0.00349	PASS
Extreme（70℃）		2.45	13.36	0.00131	0.00711	PASS
Extreme（60℃）		10.28	1.26	0.00547	0.00067	PASS
Extreme（50℃）		2.35	11.80	0.00125	0.00628	PASS
Extreme（40℃）		8.48	9.69	0.00451	0.00516	PASS
Extreme（30℃）		13.26	17.74	0.00705	0.00943	PASS
Extreme（20℃）		11.86	14.19	0.00631	0.00755	PASS
Extreme（10℃）		6.21	17.35	0.00330	0.00923	PASS
Extreme（0℃）		14.29	5.86	0.00760	0.00312	PASS
Extreme（-10℃）		17.86	1.73	0.00950	0.00092	PASS
Extreme（-20℃）		5.61	16.84	0.00299	0.00896	PASS
Extreme（-30℃）		1.40	1.15	0.00074	0.00061	PASS
Extreme（-40℃）		4.90	13.12	0.00261	0.00698	PASS
25℃	LV	1.14	2.24	0.00061	0.00119	PASS
	HV	9.72	17.14	0.00517	0.00912	PASS

NB-IoT Band 66（1745MHz）						
Condition		Freq.Error (Hz)	Freq.Error (Hz)	Frequency Stability （ppm）	Frequency Stability （ppm）	Verdict
Subcarrier Spacing	3.75					
Temperature	Voltage	BPSK	QPSK	BPSK	QPSK	
Normal（25℃）	Normal	16.65	17.38	0.00886	0.00925	PASS
Extreme（85℃）		13.48	6.64	0.00717	0.00353	PASS
Extreme（80℃）		16.74	2.23	0.00890	0.00119	PASS
Extreme（70℃）		6.66	9.21	0.00355	0.00490	PASS
Extreme（60℃）		2.51	1.64	0.00134	0.00087	PASS
Extreme（50℃）		11.37	14.17	0.00605	0.00754	PASS
Extreme（40℃）		8.71	12.69	0.00463	0.00675	PASS
Extreme（30℃）		11.77	5.58	0.00626	0.00297	PASS
Extreme（20℃）		8.84	11.00	0.00470	0.00585	PASS
Extreme（10℃）		16.06	7.46	0.00854	0.00397	PASS
Extreme（0℃）		4.66	5.33	0.00248	0.00283	PASS
Extreme（-10℃）		11.70	9.66	0.00622	0.00514	PASS
Extreme（-20℃）		8.21	16.79	0.00437	0.00893	PASS
Extreme（-30℃）		2.70	9.93	0.00143	0.00528	PASS
Extreme（-40℃）		10.16	4.01	0.00541	0.00213	PASS
25℃	LV	5.78	14.52	0.00307	0.00772	PASS
	HV	5.93	15.40	0.00316	0.00819	PASS

NB-IoT Band 66（1745MHz）						
Condition		Freq.Error (Hz)	Freq.Error (Hz)	Frequency Stability （ppm）	Frequency Stability （ppm）	Verdict
Subcarrier Spacing	15					
Temperature	Voltage	BPSK	QPSK	BPSK	QPSK	
Normal（25℃）	Normal	13.61	6.90	0.00724	0.00367	PASS
Extreme（85℃）		6.27	9.99	0.00334	0.00531	PASS
Extreme（80℃）		8.70	11.04	0.00463	0.00587	PASS
Extreme（70℃）		1.39	4.62	0.00074	0.00246	PASS
Extreme（60℃）		2.55	7.40	0.00136	0.00394	PASS
Extreme（50℃）		3.92	3.88	0.00209	0.00206	PASS
Extreme（40℃）		10.74	10.93	0.00571	0.00581	PASS
Extreme（30℃）		6.05	10.80	0.00322	0.00574	PASS
Extreme（20℃）		3.46	10.61	0.00184	0.00564	PASS
Extreme（10℃）		4.07	8.74	0.00216	0.00465	PASS
Extreme（0℃）		8.85	11.59	0.00471	0.00617	PASS
Extreme（-10℃）		7.08	6.63	0.00377	0.00353	PASS
Extreme（-20℃）		17.68	10.99	0.00941	0.00584	PASS
Extreme（-30℃）		4.05	7.10	0.00216	0.00378	PASS
Extreme（-40℃）		15.91	16.88	0.00846	0.00898	PASS
25℃	LV	1.88	4.87	0.00100	0.00259	PASS
	HV	17.07	5.32	0.00908	0.00283	PASS

5.6 Spurious Emissions at Antenna Terminals

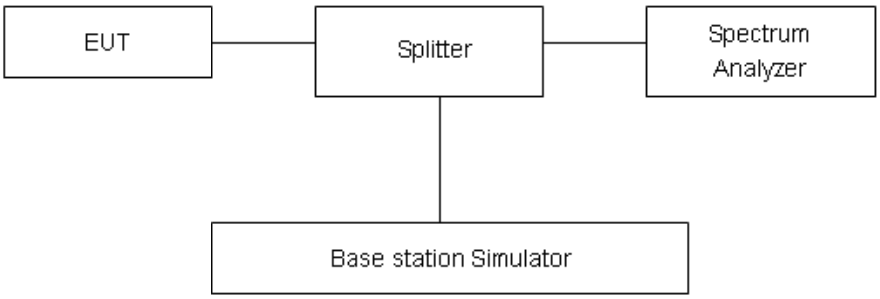
Ambient condition

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 measurement is carried out using a spectrum analyzer. The spectrum analyzer scans from 9kHz to the 10th harmonic of the carrier. The peak detector is used.
RBW is set to 100kHz, VBW is set to 300kHz for 30MHz~1GHz
RBW is set to 1MHz, VBW is set to 3MHz for above 1GHz, Sweep is set to ATUO.
Of those disturbances below (limit – 20 dB), the mark is not required for the EUT.
The modulation mode and RB allocation refer to section 5.1, using the maximum output power configuration.

Test setup



Limits

NB-IoT -4 Rule Part 27.53(h) specifies that “for operations in the 1695-1710 MHz, 1710-1755 MHz, 1755-1780 MHz, 1915-1920 MHz, 1995-2000 MHz, 2000-2020 MHz, 2110-2155 MHz, 2155-2180 MHz, and 2180-2200 bands, the power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) in watts by at least 43 + 10 log10 (P) dB..”

NB-IoT -12 Rule Part 27.53 (g) For operations in the 600 MHz band and the 698-746 MHz band, the power of any emission outside a licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, by at least 43 + 10 log (P) dB. Compliance with this provision is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kilohertz or greater. However, in the 100 kilohertz bands immediately outside and adjacent to a licensee's frequency block, a resolution bandwidth of at least 30 kHz may be employed.

NB-IoT -13 Rule Part 27.53(f) For operations in the 746-758 MHz, 775-788 MHz, and 805-806 MHz bands, emissions in the band 1559-1610 MHz shall be limited to −70 dBW/MHz equivalent

isotropically radiated power (EIRP) for wideband signals, and −80 dBW EIRP for discrete emissions of less than 700 Hz bandwidth. For the purpose of equipment authorization, a transmitter shall be tested with an antenna that is representative of the type that will be used with the equipment in normal operation.

NB-IoT 13- Part 27.53 (c) For operations in the 746-758 MHz band and the 776-788 MHz band, the power of any emission outside the licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, in accordance with the following:
(1) On any frequency outside the 746-758 MHz band, the power of any emission shall be attenuated outside the band below the transmitter power (P) by at least 43 + 10 log (P) dB;
(2) On any frequency outside the 776-788 MHz band, the power of any emission shall be attenuated outside the band below the transmitter power (P) by at least 43 + 10 log (P) dB;
(3) On all frequencies between 763-775 MHz and 793-805 MHz, by a factor not less than 76 + 10 log (P) dB in a 6.25 kHz band segment, for base and fixed stations;
(4) On all frequencies between 763-775 MHz and 793-805 MHz, by a factor not less than 65 + 10 log (P) dB in a 6.25 kHz band segment, for mobile and portable stations;
(5) Compliance with the provisions of paragraphs (c)(1) and (c)(2) of this section is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kHz or greater. However, in the 100 kHz bands immediately outside and adjacent to the frequency block, a resolution bandwidth of at least 30 kHz may be employed;

Part 27.53 (h)/(g) Limit		-13 dBm
Part 27.53(f) Limit	Limit out of the band 1559-1610 MHz	-13 dBm
	Limit in the band 1559-1610 MHz	-40 dBm

Measurement Uncertainty

The assessed measurement uncertainty to ensure 99.75％ confidence level for the normal distribution is with the coverage factor *k* = 1.96.

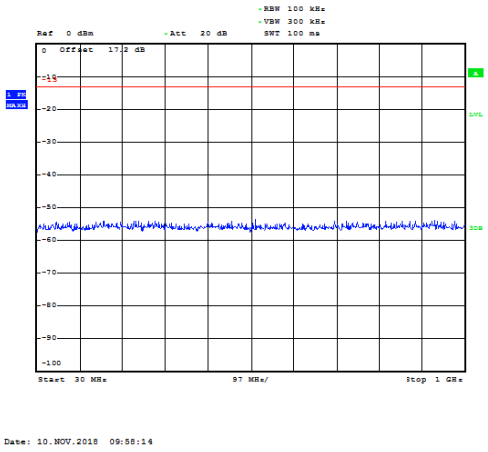
Frequency	Uncertainty
9kHz-1GHz	0.684 dB
1GHz-27GHz	1.407 dB

Test Result

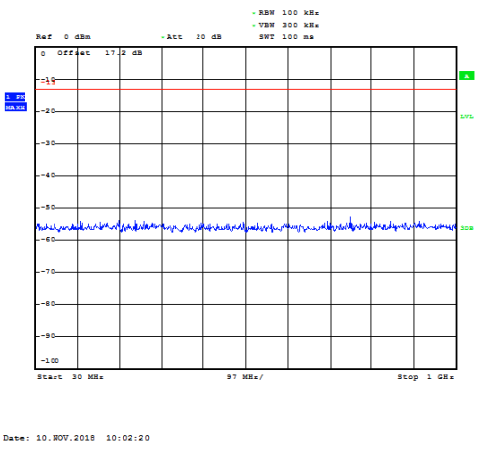
Sweep the whole frequency band through the range from 9kHz to the 10th harmonic of the carrier, the emissions more than 20 dB below the limit are not reported.

The signal beyond the limit is carrier.

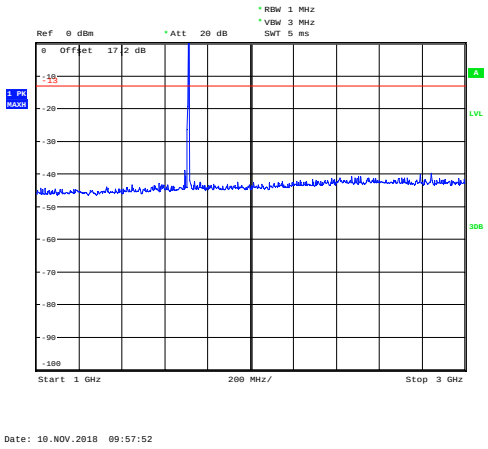
NB-IoT Band 4 CH-Low 30MHz~1GHz



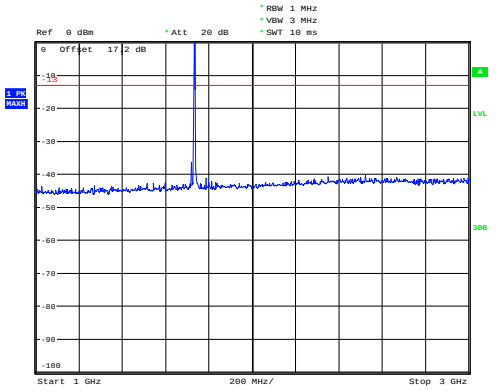
NB-IoT Band 4 CH-Middle 30MHz~1GHz



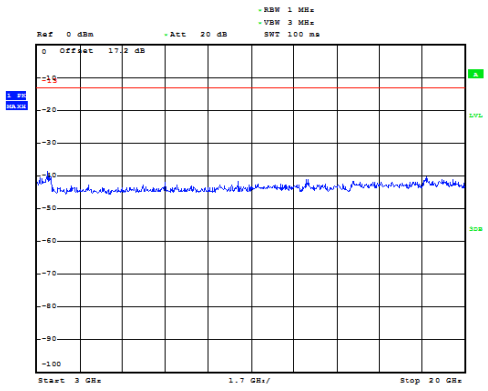
NB-IoT Band 4 CH-Low 1GHz~3GHz



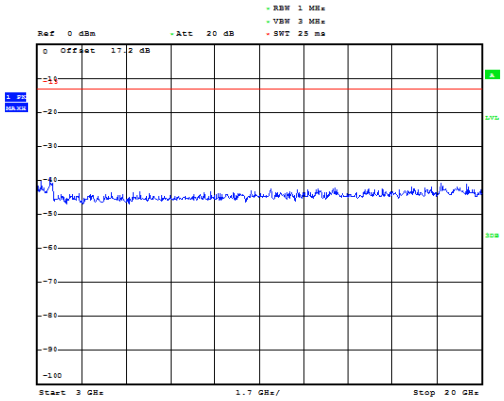
NB-IoT Band 4 CH-Middle 1GHz~3GHz



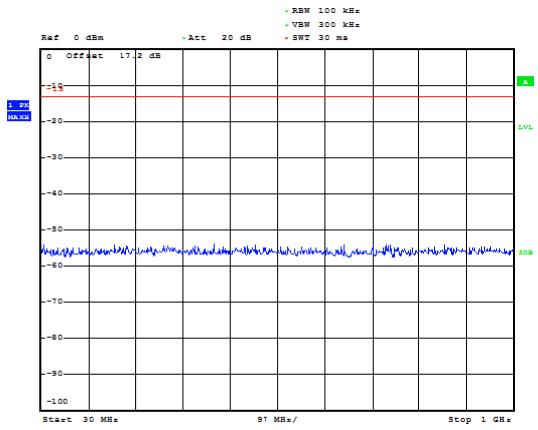
NB-IoT Band 4 CH-Low 3GHz~20GHz



NB-IoT Band 4 CH-Middle 3GHz~20GHz



NB-IoT Band 4 CH-High 30MHz~1GHz



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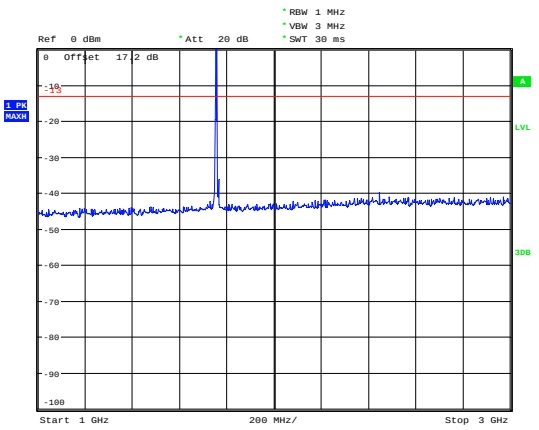
NB-IoT Band 4 CH-High 1GHz~3GHz



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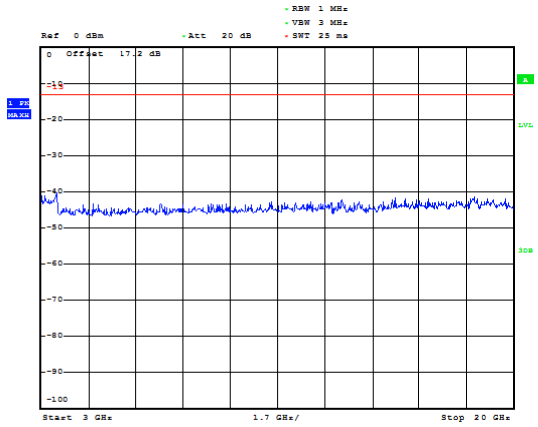
NB-IoT Band 4 CH-High 3GHz~20GHz



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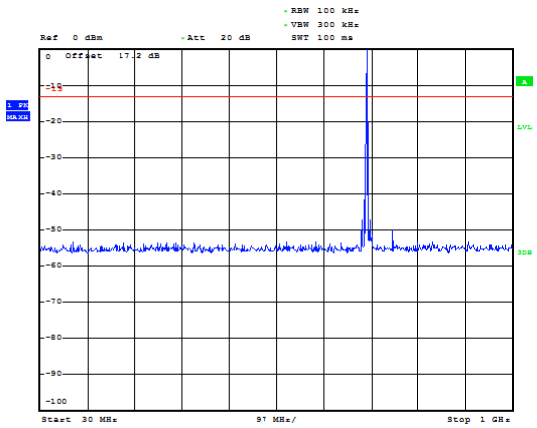
NB-IoT Band 12 CH-Low 30MHz~1GHz



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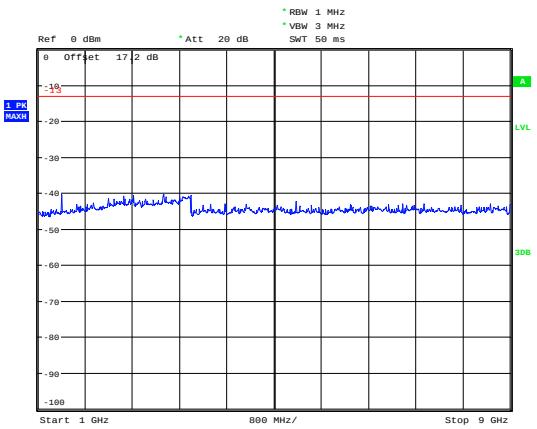
NB-IoT Band 12 CH-Low 1GHz~9GHz



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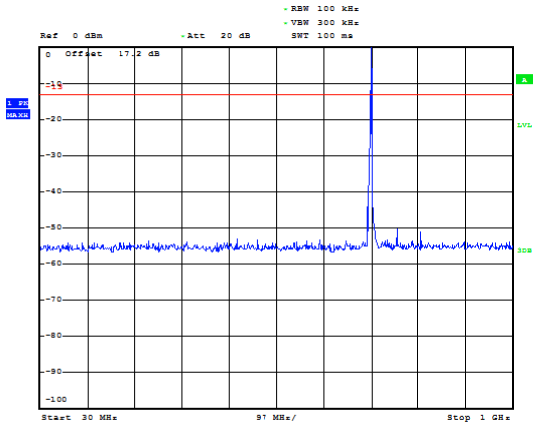
NB-IoT Band 12 CH- Middle 30MHz~1GHz



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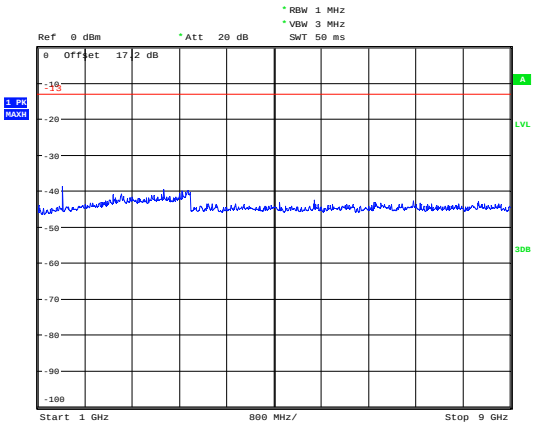
NB-IoT Band 12 CH- Middle 1GHz~9GHz



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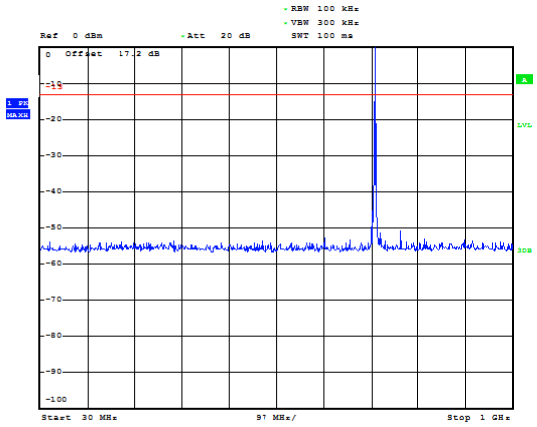
NB-IoT Band 12 CH-High 30MHz~1GHz



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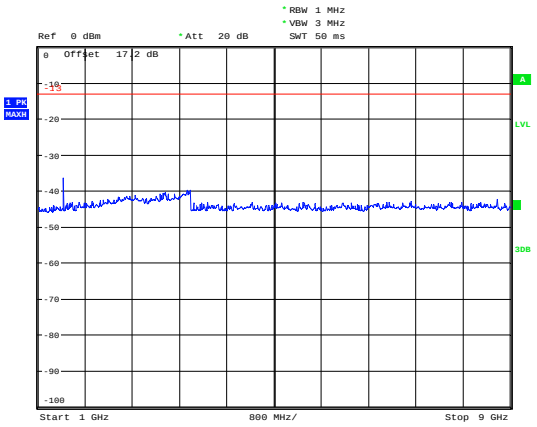
NB-IoT Band 12 CH-High 1GHz~9GHz



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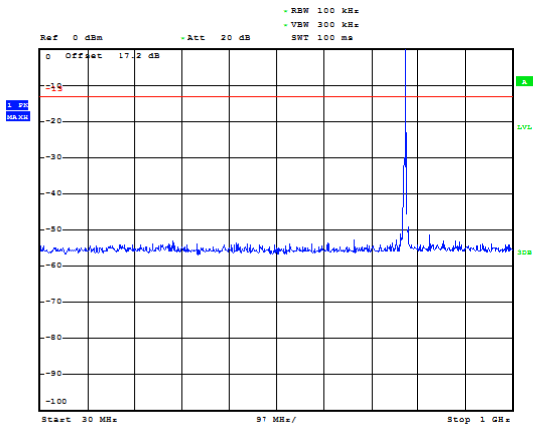
NB-IoT Band 13 CH-Low 30MHz~1GHz



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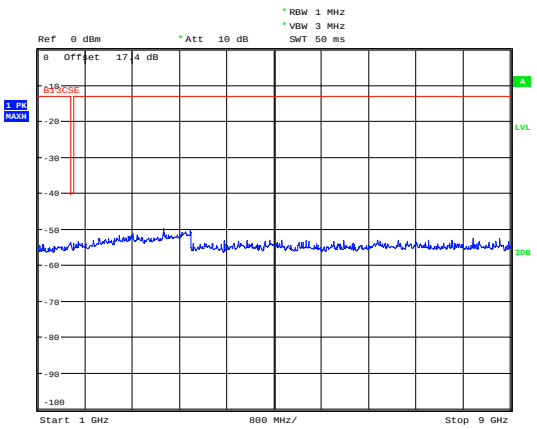
NB-IoT Band 13 CH-Low 1GHz~9GHz



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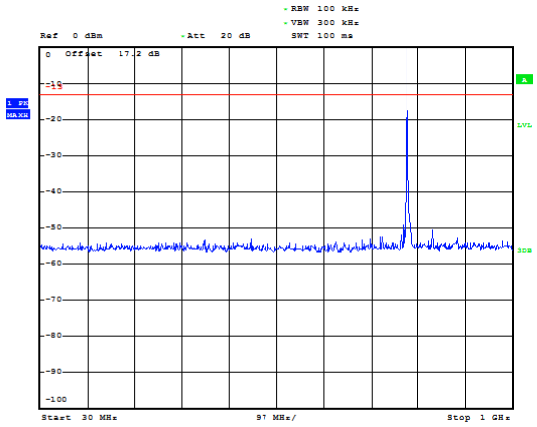
NB-IoT Band 13 CH- Middle 30MHz~1GHz



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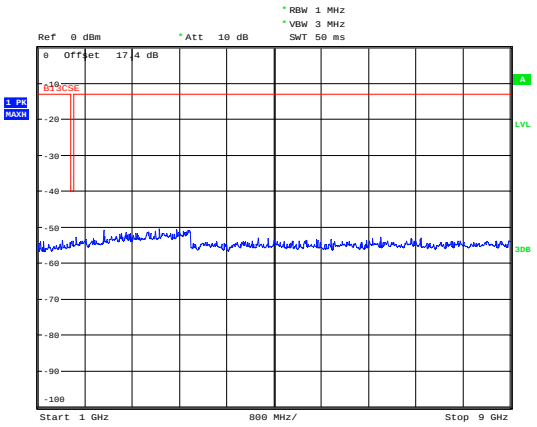
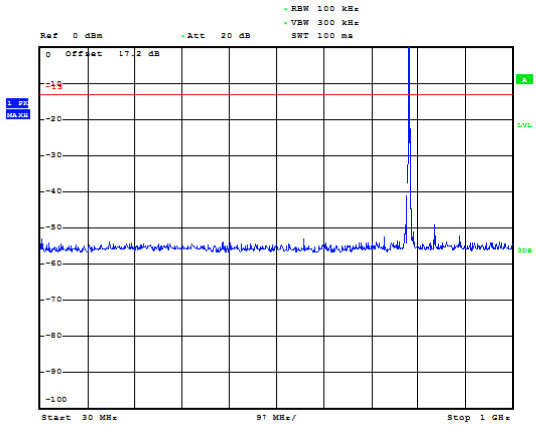
NB-IoT Band 13 CH- Middle 1GHz~9GHz



Date: 14.NOV.2018 16:31:45

NB-IoT Band 13 CH-High 30MHz~1GHz



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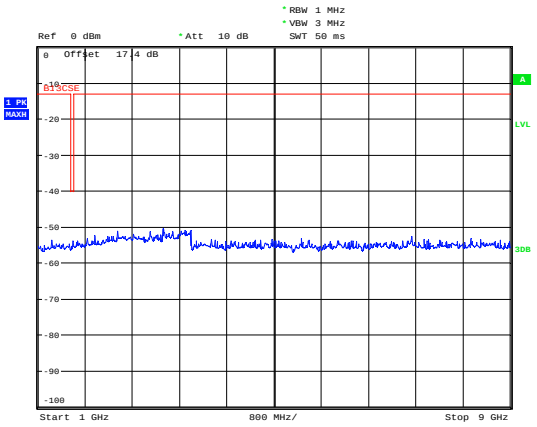
NB-IoT Band 13 CH-High 1GHz~9GHz



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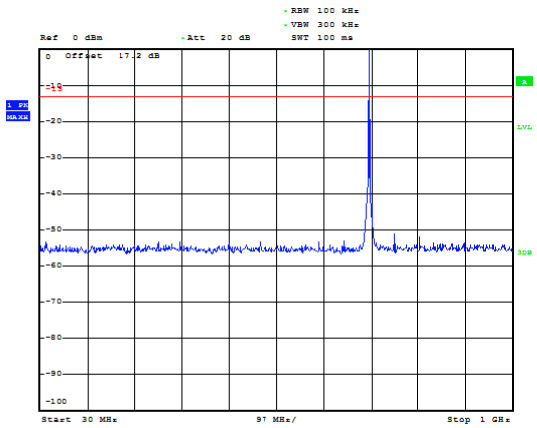
NB-IoT Band 17 CH-Low 30MHz~1GHz



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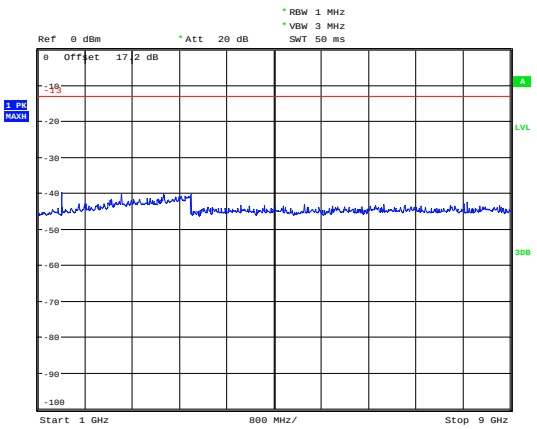
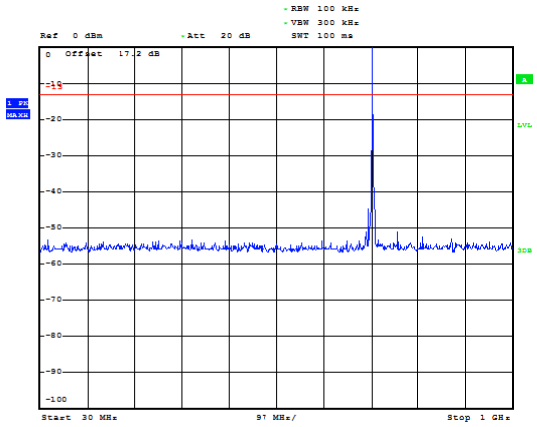
NB-IoT Band 17 CH-Low 1GHz~9GHz



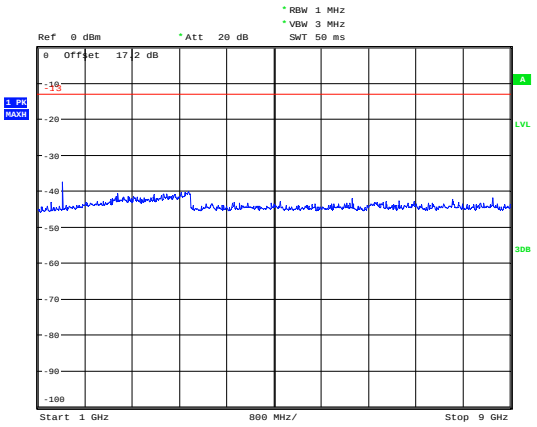
Date: 29.OCT.2018 11:59:02

NB-IoT Band 17 CH- Middle 30MHz~1GHz



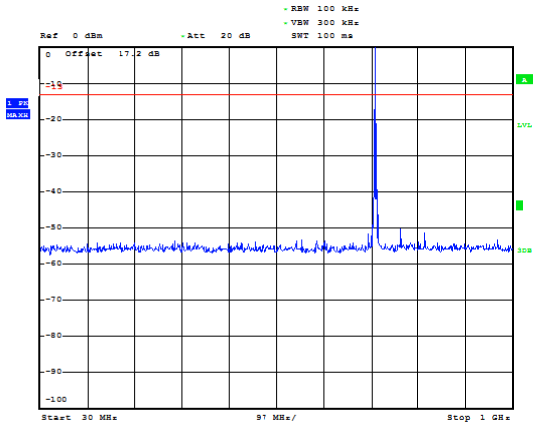
Date: 29.OCT.2018 12:01:38

NB-IoT Band 17 CH- Middle 1GHz~9GHz



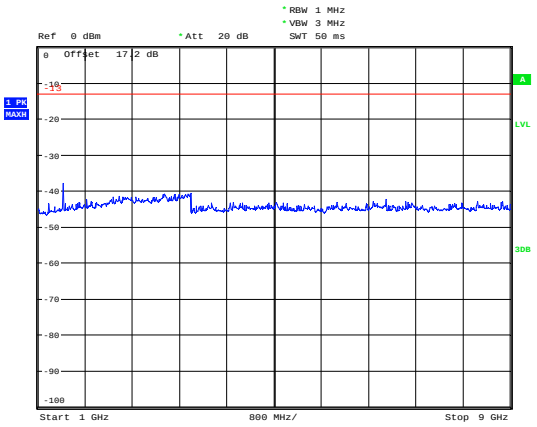
Date: 29.OCT.2018 12:00:07

NB-IoT Band 17 CH-High 30MHz~1GHz



Date: 29.OCT.2018 12:05:23

NB-IoT Band 17 CH-High 1GHz~9GHz



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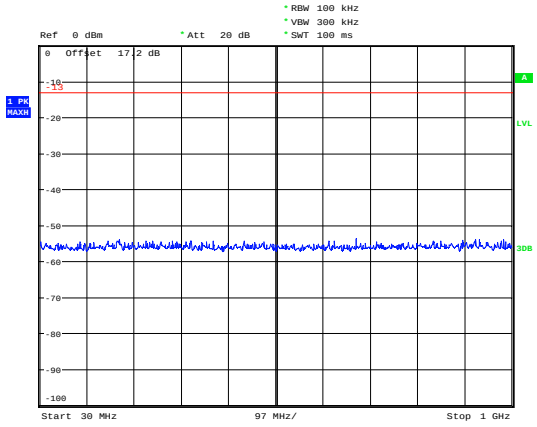
NB-IoT Band 66 CH-Low 30MHz~1GHz



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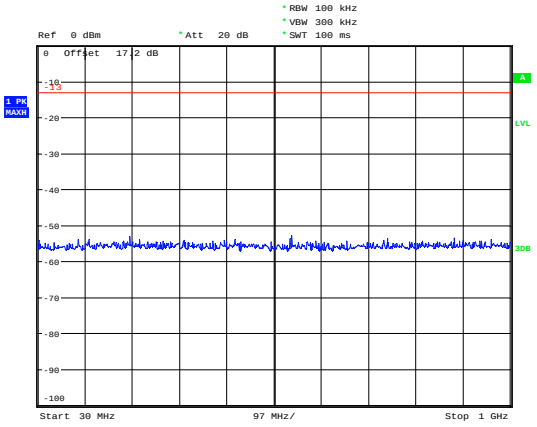
NB-IoT Band 66 CH-Middle 30MHz~1GHz



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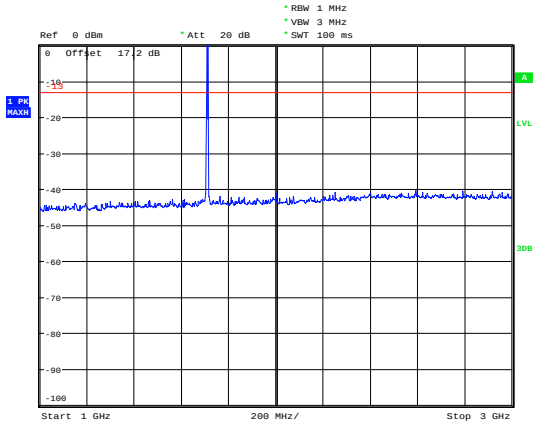
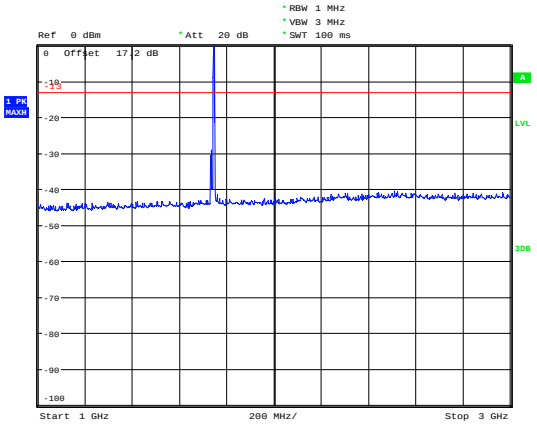
NB-IoT Band 66 CH-Low 1GHz~3GHz



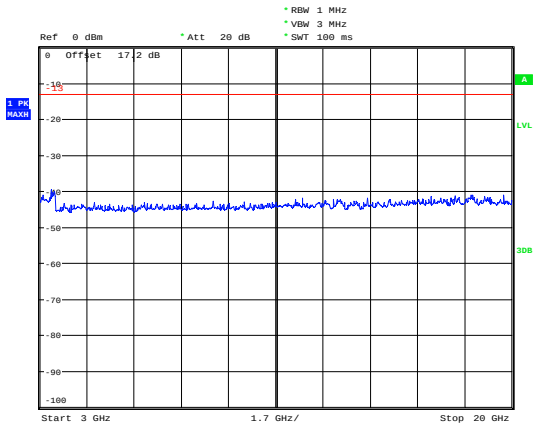
Date: 29.OCT.2018 13:54:33

NB-IoT Band 66 CH-Middle 1GHz~3GHz



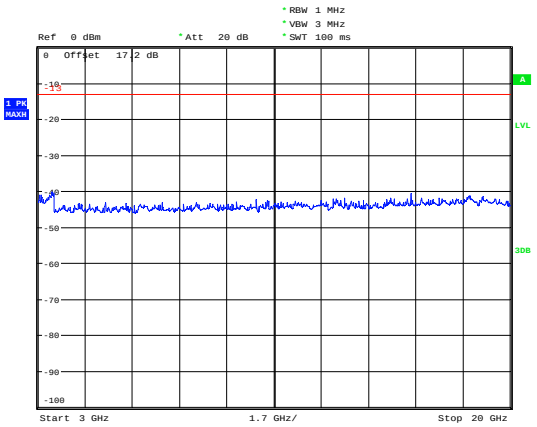
Date: 29.OCT.2018 13:58:01

NB-IoT Band 66 CH-Low 3GHz~20GHz



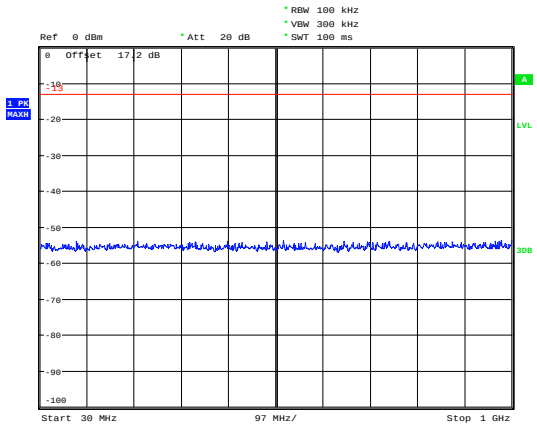
Date: 29.OCT.2018 13:54:51

NB-IoT Band 66 CH-Middle 3GHz~20GHz



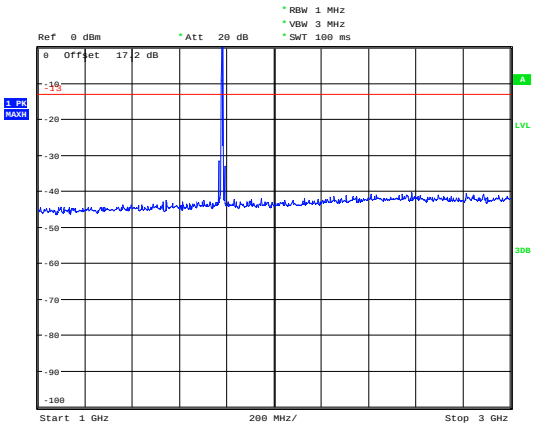
Date: 29.OCT.2018 13:58:16

NB-IoT Band 66 CH-High 30MHz~1GHz



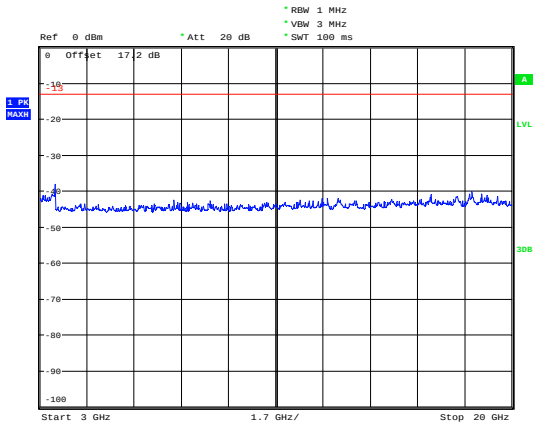
Date: 29.OCT.2018 14:01:56

NB-IoT Band 66 CH-High 1GHz~3GHz



Date: 29.OCT.2018 14:01:26

NB-IoT Band 66 CH-High 3GHz~20GHz



Date: 29.OCT.2018 14:01:09

5.7 Radiates Spurious Emission

Ambient condition

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

Method of Measurement

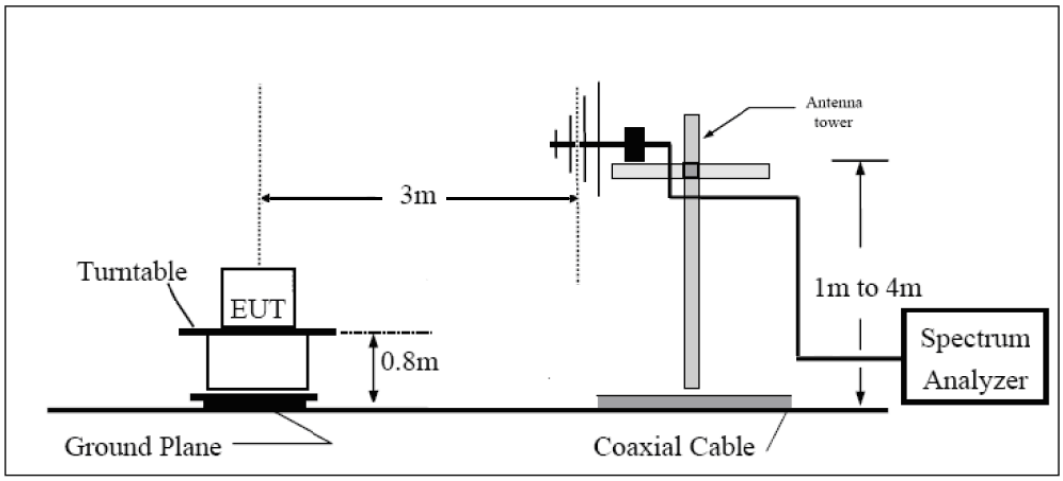
1. The testing follows FCC KDB 971168 D01 v03r01 Section 5.8 and ANSI C63.26 (2015).
2. Above 30MHz: The EUT is placed on a turntable 0.8 meters above the ground in the chamber, 3 meter away from the antenna. The maximal emission value is acquired by adjusting the antenna height, polarisation and turntable azimuth. Normally, the height range of antenna is 1 m to 4 m, the azimuth range of turntable is 0° to 360°, and the receive antenna has two polarizations Vertical (V) and Horizontal (H). Above 1GHz: (Note: the FCC's permission to use 1.5m as an alternative per TCBC Conf call of Dec. 2, 2014.) The EUT is placed on a turntable 1.5 meters above the ground in the chamber, 3 meter away from the antenna. The maximal emission value is acquired by adjusting the antenna height, polarisation and turntable azimuth. Normally, the height range of antenna is 1 m to 4 m, the azimuth range of turntable is 0° to 360°, and the receive antenna has two polarizations Vertical (V) and Horizontal (H).
3. A log-periodic antenna or horn antenna shall be substituted in place of the EUT. The log-periodic antenna will be driven by a signal generator and the level will be adjusted till the same power value on the spectrum analyzer or receiver. The level of the spurious emissions can be calculated through the level of the signal generator, cable loss, the gain of the substitution antenna and the reading of the spectrum analyzer or receiver.
4. The EUT is then put into continuously transmitting mode at its maximum power level during the test.Set Test Receiver or Spectrum RBW=1MHz,VBW=3MHz for above 1GHz and RBW=100kHz,VBW=300kHz for 30MHz to 1GHz,, And the maximum value of the receiver should be recorded as (Pr).
5. The EUT shall be replaced by a substitution antenna. In the chamber, an substitution antenna for the frequency band of interest is placed at the reference point of the chamber. An RF Signal source for the frequency band of interest is connected to the substitution antenna with a cable that has been constructed to not interfere with the radiation pattern of the antenna. A power (PMea) is applied to the input of the substitution antenna, and adjust the level of the signal generator output until the value of the receiver reach the previously recorded (Pr). The power of signal source (PMea) is recorded. The test should be performed by rotating the test item and adjusting the receiving antenna polarization.
6. A amplifier should be connected to the Signal Source output port. And the cable should be connect between the Amplifier and the Substitution Antenna. The cable loss (Pcl) ,the Substitution Antenna Gain (Ga) and the Amplifier Gain (PAg) should be recorded after test.
7. The measurement results are obtained as described below:
Power(EIRP)=PMea- PAg - Pcl + Ga
The measurement results are amend as described below:
Power(EIRP)=PMea- Pcl + Ga
8. This value is EIRP since the measurement is calibrated using an antenna of known gain (2.15 dBi) and known input power. ERP can be calculated from EIRP by subtracting the gain of the dipole, ERP

= EIRP-2.15dBi.

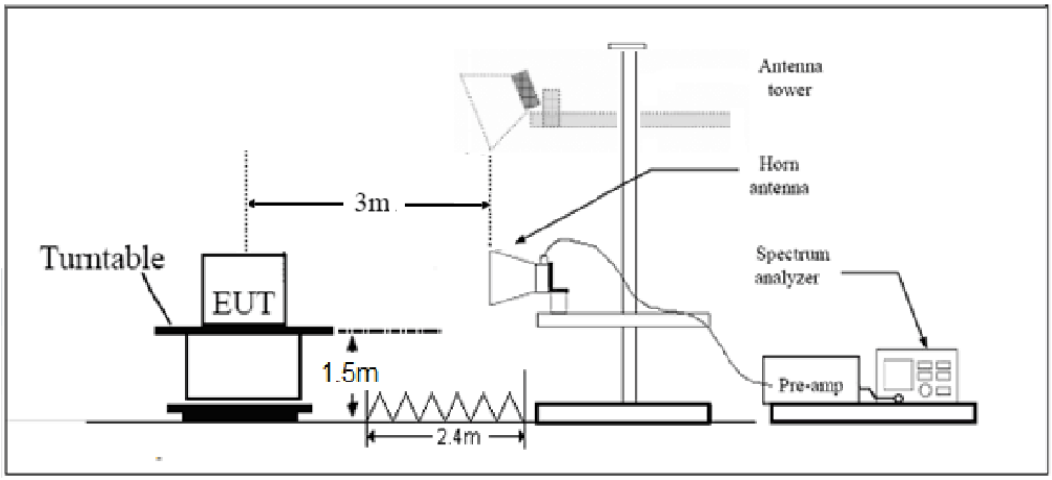
The modulation mode and RB allocation refer to section 5.1, using the maximum output power configuration.

Test setup

30MHz~~~ 1GHz



Above 1GHz



Note: Area side:2.4mX3.6m

Limits

Rule Part 27.53(h) specifies that “for operations in the 1695-1710 MHz, 1710-1755 MHz, 1755-1780 MHz, 1915-1920 MHz, 1995-2000 MHz, 2000-2020 MHz, 2110-2155 MHz, 2155-2180 MHz, and 2180-2200 bands, the power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) in watts by at least 43 + 10 log10 (P) dB..”

Rule Part 27.53 (g) For operations in the 600 MHz band and the 698-746 MHz band, the power of any emission outside a licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, by at least 43 + 10 log (P) dB. Compliance with this provision is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kilohertz or greater. However, in the 100 kilohertz bands immediately outside and adjacent to a licensee's frequency block, a resolution bandwidth of at least 30 kHz may be employed.

Rule Part 27.53(f)For operations in the 746-758 MHz, 775-788 MHz, and 805-806 MHz bands, emissions in the band 1559-1610 MHz shall be limited to −70 dBW/MHz equivalent isotropically radiated power (EIRP) for wideband signals, and −80 dBW EIRP for discrete emissions of less than 700 Hz bandwidth. For the purpose of equipment authorization, a transmitter shall be tested with an antenna that is representative of the type that will be used with the equipment in normal operation.

Part 27.53 (c) For operations in the 746-758 MHz band and the 776-788 MHz band, the power of any emission outside the licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, in accordance with the following:
(1) On any frequency outside the 746-758 MHz band, the power of any emission shall be attenuated outside the band below the transmitter power (P) by at least 43 + 10 log (P) dB;
(2) On any frequency outside the 776-788 MHz band, the power of any emission shall be attenuated outside the band below the transmitter power (P) by at least 43 + 10 log (P) dB;
(3) On all frequencies between 763-775 MHz and 793-805 MHz, by a factor not less than 76 + 10 log (P) dB in a 6.25 kHz band segment, for base and fixed stations;
(4) On all frequencies between 763-775 MHz and 793-805 MHz, by a factor not less than 65 + 10 log (P) dB in a 6.25 kHz band segment, for mobile and portable stations;
(5) Compliance with the provisions of paragraphs (c)(1) and (c)(2) of this section is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kHz or greater. However, in the 100 kHz bands immediately outside and adjacent to the frequency block, a resolution bandwidth of at least 30 kHz may be employed;

Part 27.53/(h)/(g) Limit		-13 dBm
Part 27.53(f) Limit	Limit out of the band 1559-1610 MHz	-13 dBm
	Limit in the band 1559-1610 MHz	-40 dBm

Measurement Uncertainty

The assessed measurement uncertainty to ensure 95％ confidence level for the normal distribution is with the coverage factor k = ±1.96, U= ±3.55 dB.

Test Result

Sweep the whole frequency band through the range from 30MHz to the 10th harmonic of the carrier, the emissions below the noise floor will not be recorded in the report.

NB-IoT Band 4 CH-Low

Harmonic	Frequency (MHz)	SG (dBm)	Cable Loss (dB)	Gain (dBi)	Antenna Polarization	EIRP Level (dBm)	Limit (dBm)	Margin (dB)	Azimuth (deg)
2	3509.8	-63.17	2.70	12.70	Horizontal	-53.17	-13.00	40.17	135
3	5264.7	-64.02	3.20	12.50	Horizontal	-54.72	-13.00	41.72	180
4	7019.6	-57.53	4.20	11.80	Horizontal	-49.93	-13.00	36.93	315
5	8774.5	-56.53	4.40	12.50	Horizontal	-48.43	-13.00	35.43	135
6	10529.4	-52.22	4.70	11.30	Horizontal	-45.62	-13.00	32.62	225
7	12284.3	-54.22	5.20	13.80	Horizontal	-45.62	-13.00	32.62	90
8	14039.2	-48.87	5.70	11.30	Horizontal	-43.27	-13.00	30.27	135
9	15794.1	-57.82	6.10	16.80	Horizontal	-47.12	-13.00	34.12	45
10	17549	-51.56	6.10	14.20	Horizontal	-43.46	-13.00	30.46	180
Note: 1.The other Spurious RF Radiated emissions level is no more than noise floor. 2. The worst emission was found in the antenna is Horizontal position.									

NB-IoT Band 4 CH-Middle

Harmonic	Frequency (MHz)	SG (dBm)	Cable Loss (dB)	Gain (dBi)	Antenna Polarization	EIRP Level (dBm)	Limit (dBm)	Margin (dB)	Azimuth (deg)
2	3461	-67.20	2.70	12.70	Horizontal	-57.20	-13.0	44.20	180
3	5191.5	-63.45	3.20	12.50	Horizontal	-54.15	-13.0	41.15	45
4	6922	-54.50	4.20	11.80	Horizontal	-46.90	-13.0	33.90	0
5	8652.5	-58.27	4.40	12.50	Horizontal	-50.17	-13.0	37.17	0
6	10383	-53.23	4.70	11.30	Horizontal	-46.63	-13.0	33.63	315
7	12113.5	-55.76	5.20	13.80	Horizontal	-47.16	-13.0	34.16	45
8	13844	-50.85	5.70	11.30	Horizontal	-45.25	-13.0	32.25	45
9	15574.5	-54.45	6.10	16.80	Horizontal	-43.75	-13.0	30.75	45
10	17305	-52.95	6.10	14.20	Horizontal	-44.85	-13.0	31.85	180
Note: 1.The other Spurious RF Radiated emissions level is no more than noise floor. 2. The worst emission was found in the antenna is Horizontal position.									

NB-IoT Band 4 CH-High

Harmonic	Frequency (MHz)	SG (dBm)	Cable Loss (dB)	Gain (dBi)	Antenna Polarization	EIRP Level (dBm)	Limit (dBm)	Margin (dB)	Azimuth (deg)
2	3420	-67.66	2.70	12.70	Horizontal	-57.66	-13.00	44.66	135
3	5130	-62.20	3.20	12.50	Horizontal	-52.90	-13.00	39.90	180
4	6840	-58.31	4.20	11.80	Horizontal	-50.71	-13.00	37.71	315
5	8550	-57.15	4.40	12.50	Horizontal	-49.05	-13.00	36.05	135
6	10260	-53.03	4.70	11.30	Horizontal	-46.43	-13.00	33.43	225
7	11970	-52.92	5.20	13.80	Horizontal	-44.32	-13.00	31.32	90
8	13680	-48.45	5.70	11.30	Horizontal	-42.85	-13.00	29.85	135
9	15390	-57.32	6.10	16.80	Horizontal	-46.62	-13.00	33.62	45
10	17100	-51.64	6.10	14.20	Horizontal	-43.54	-13.00	30.54	180
Note: 1.The other Spurious RF Radiated emissions level is no more than noise floor. 2. The worst emission was found in the antenna is Horizontal position.									

NB-IoT Band 12 CH-Low

Harmonic	Frequency (MHz)	SG (dBm)	Cable Loss (dB)	Gain (dBi)	Antenna Polarization	ERP Level (dBm)	Limit (dBm)	Margin (dB)	Azimuth (deg)
2	1398.0	-47.41	1.70	8.70	Horizontal	-42.56	-13.00	29.56	315
3	2097.0	-61.73	2.10	11.10	Horizontal	-54.88	-13.00	41.88	90
4	2796.0	-63.17	2.30	13.10	Horizontal	-54.52	-13.00	41.52	45
5	3520.0	-65.75	2.60	12.70	Horizontal	-57.80	-13.00	44.80	135
6	4224.0	-62.75	3.30	12.50	Horizontal	-55.70	-13.00	42.70	180
7	4928.0	-59.85	3.40	12.50	Horizontal	-52.90	-13.00	39.90	45
8	5632.0	-61.65	3.30	12.50	Horizontal	-54.60	-13.00	41.60	225
9	6336.0	-58.25	3.80	11.50	Horizontal	-52.70	-13.00	39.70	180
10	7040.0	-54.25	4.20	11.80	Horizontal	-48.80	-13.00	35.80	180
Note: 1.The other Spurious RF Radiated emissions level is no more than noise floor. 2. The worst emission was found in the antenna is Horizontal position.									

NB-IoT Band 12 CH-Middle

Harmonic	Frequency (MHz)	SG (dBm)	Cable Loss (dB)	Gain (dBi)	Antenna Polarization	ERP Level (dBm)	Limit (dBm)	Margin (dB)	Azimuth (deg)
2	1415.0	-67.16	1.70	8.70	Horizontal	-62.31	-13.0	49.31	180
3	2122.5	-65.75	2.10	11.10	Horizontal	-58.90	-13.0	45.90	45
4	2830.0	-67.34	2.30	13.10	Horizontal	-58.69	-13.0	45.69	315
5	3537.5	-68.11	2.60	12.70	Horizontal	-60.16	-13.0	47.16	180
6	4245.0	-64.53	3.30	12.50	Horizontal	-57.48	-13.0	44.48	270
7	4952.5	-62.43	3.40	12.50	Horizontal	-55.48	-13.0	42.48	0
8	5660.0	-62.76	3.30	12.50	Horizontal	-55.71	-13.0	42.71	180
9	6367.5	-57.61	3.80	11.50	Horizontal	-52.06	-13.0	39.06	45
10	7075.0	-54.49	4.20	11.80	Horizontal	-49.04	-13.0	36.04	0
Note: 1.The other Spurious RF Radiated emissions level is no more than noise floor. 2. The worst emission was found in the antenna is Horizontal position.									

NB-IoT Band 12 CH-High

Harmonic	Frequency (MHz)	SG (dBm)	Cable Loss (dB)	Gain (dBi)	Antenna Polarization	ERP Level (dBm)	Limit (dBm)	Margin (dB)	Azimuth (deg)
2	1431.5	-46.71	1.70	8.70	Horizontal	-41.86	-13.00	28.86	90
3	2133.0	-61.82	2.10	11.10	Horizontal	-54.97	-13.00	41.97	45
4	2844.0	-62.76	2.30	13.10	Horizontal	-54.11	-13.00	41.11	90
5	3555.0	-65.40	2.60	12.70	Horizontal	-57.45	-13.00	44.45	135
6	4266.0	-63.60	3.30	12.50	Horizontal	-56.55	-13.00	43.55	225
7	4977.0	-61.82	3.40	12.50	Horizontal	-54.87	-13.00	41.87	90
8	5688.0	-61.24	3.30	12.50	Horizontal	-54.19	-13.00	41.19	135
9	6399.0	-57.93	3.80	11.50	Horizontal	-52.38	-13.00	39.38	45
10	7110.0	-54.62	4.20	11.80	Horizontal	-49.17	-13.00	36.17	225
Note: 1.The other Spurious RF Radiated emissions level is no more than noise floor. 2. The worst emission was found in the antenna is Horizontal position.									

NB-IoT Band 13 CH-Low

Harmonic	Frequency (MHz)	SG (dBm)	Cable Loss (dB)	Gain (dBi)	Antenna Polarization	ERP Level (dBm)	Limit (dBm)	Margin (dB)	Azimuth (deg)
2	1554.0	-53.58	1.70	8.70	Horizontal	-48.73	-13.00	35.73	45
3	2330.9	-62.73	2.10	12.00	Horizontal	-54.98	-13.00	41.98	315
4	3084.4	-65.74	2.30	13.10	Horizontal	-57.09	-13.00	44.09	180
5	3855.5	-64.15	2.90	12.50	Horizontal	-56.70	-13.00	43.70	90
6	4626.6	-62.99	3.10	12.50	Horizontal	-55.74	-13.00	42.74	45
7	5397.7	-60.69	3.30	12.50	Horizontal	-53.64	-13.00	40.64	90
8	6168.8	-60.99	3.50	12.80	Horizontal	-53.84	-13.00	40.84	135
9	6939.9	-56.11	4.20	11.80	Horizontal	-50.66	-13.00	37.66	180
10	7711.0	-55.64	4.40	12.30	Horizontal	-49.89	-13.00	36.89	45
Note: 1.The other Spurious RF Radiated emissions level is no more than noise floor. 2. The worst emission was found in the antenna is Horizontal position.									

NB-IoT Band 13 CH-Middle

Harmonic	Frequency (MHz)	SG (dBm)	Cable Loss (dB)	Gain (dBi)	Antenna Polarization	ERP Level (dBm)	Limit (dBm)	Margin (dB)	Azimuth (deg)
2	1564.0	-65.01	1.70	8.70	Horizontal	-60.16	-40.0	20.16	90
3	2346.0	-68.36	2.10	12.00	Horizontal	-60.61	-13.0	47.61	0
4	3128.0	-64.75	2.30	13.10	Horizontal	-56.10	-13.0	43.10	315
5	3910.0	-66.39	2.90	12.50	Horizontal	-58.94	-13.0	45.94	45
6	4692.0	-63.77	3.10	12.50	Horizontal	-56.52	-13.0	43.52	45
7	5474.0	-62.56	3.30	12.50	Horizontal	-55.51	-13.0	42.51	225
8	6256.0	-61.20	3.50	12.80	Horizontal	-54.05	-13.0	41.05	135
9	7038.0	-55.46	4.20	11.80	Horizontal	-50.01	-13.0	37.01	225
10	7820.0	-55.07	4.40	12.30	Horizontal	-49.32	-13.0	36.32	0
Note: 1.The other Spurious RF Radiated emissions level is no more than noise floor. 2. The worst emission was found in the antenna is Horizontal position.									

NB-IoT Band 13 CH-High

Harmonic	Frequency (MHz)	SG (dBm)	Cable Loss (dB)	Gain (dBi)	Antenna Polarization	ERP Level (dBm)	Limit (dBm)	Margin (dB)	Azimuth (deg)
2	1573.8	-58.35	1.70	8.70	Horizontal	-53.5	-40.0	13.45	135
3	2360.7	-63.65	2.10	12.00	Horizontal	-55.9	-13.0	42.93	90
4	3147.6	-67.65	2.30	13.10	Horizontal	-59.0	-13.0	45.99	45
5	3934.5	-63.35	2.90	12.50	Horizontal	-55.9	-13.0	42.95	135
6	4721.4	-62.95	3.10	12.50	Horizontal	-55.7	-13.0	42.69	90
7	5508.3	-61.55	3.30	12.50	Horizontal	-54.5	-13.0	41.45	135
8	6295.2	-60.35	3.50	12.80	Horizontal	-53.2	-13.0	40.21	90
9	7082.1	-58.45	4.20	11.80	Horizontal	-53.0	-13.0	40.04	315
10	7869.0	-55.55	4.40	12.30	Horizontal	-49.8	-13.0	36.79	90
Note: 1.The other Spurious RF Radiated emissions level is no more than noise floor. 2. The worst emission was found in the antenna is Horizontal position.									

NB-IoT Band 17 CH-Low

Harmonic	Frequency (MHz)	SG (dBm)	Cable Loss (dB)	Gain (dBi)	Antenna Polarization	ERP Level (dBm)	Limit (dBm)	Margin (dB)	Azimuth (deg)
2	1408.0	-45.79	1.70	8.70	Horizontal	-40.94	-13.00	27.94	45
3	2112.0	-62.94	2.10	11.10	Horizontal	-56.09	-13.00	43.09	315
4	2816.0	-63.80	2.50	13.10	Horizontal	-55.35	-13.00	42.35	90
5	3520.0	-65.90	2.60	12.70	Horizontal	-57.95	-13.00	44.95	90
6	4224.0	-61.76	3.30	12.50	Horizontal	-54.71	-13.00	41.71	135
7	4928.7	-62.34	3.40	12.50	Horizontal	-55.39	-13.00	42.39	180
8	5632.8	-61.20	3.40	12.80	Horizontal	-53.95	-13.00	40.95	45
9	6336.9	-56.95	4.10	11.50	Horizontal	-51.70	-13.00	38.70	225
10	7041.0	-55.38	4.20	12.20	Horizontal	-49.53	-13.00	36.53	180
Note: 1.The other Spurious RF Radiated emissions level is no more than noise floor. 2. The worst emission was found in the antenna is Horizontal position.									

NB-IoT Band 17 CH-Middle

Harmonic	Frequency (MHz)	SG (dBm)	Cable Loss (dB)	Gain (dBi)	Antenna Polarization	ERP Level (dBm)	Limit (dBm)	Margin (dB)	Azimuth (deg)
2	1420.0	-67.25	1.70	8.70	Horizontal	-62.40	-13.0	49.40	45
3	2130.0	-65.98	2.10	11.10	Horizontal	-59.13	-13.0	46.13	225
4	2840.0	-69.74	2.50	13.10	Horizontal	-61.29	-13.0	48.29	45
5	3550.0	-67.26	2.60	12.70	Horizontal	-59.31	-13.0	46.31	45
6	4260.0	-64.65	3.30	12.50	Horizontal	-57.60	-13.0	44.60	90
7	4970.0	-65.10	3.40	12.50	Horizontal	-58.15	-13.0	45.15	135
8	5680.0	-63.31	3.40	12.80	Horizontal	-56.06	-13.0	43.06	45
9	6390.0	-59.70	4.10	11.50	Horizontal	-54.45	-13.0	41.45	135
10	7100.0	-54.85	4.20	12.20	Horizontal	-49.00	-13.0	36.00	225
Note: 1.The other Spurious RF Radiated emissions level is no more than noise floor. 2. The worst emission was found in the antenna is Horizontal position.									

NB-IoT Band 17 CH-High

Harmonic	Frequency (MHz)	SG (dBm)	Cable Loss (dB)	Gain (dBi)	Antenna Polarization	ERP Level (dBm)	Limit (dBm)	Margin (dB)	Azimuth (deg)
2	1431.5	-46.94	1.70	8.70	Horizontal	-42.09	-13.00	29.09	180
3	2154.0	-60.61	2.10	11.10	Horizontal	-53.76	-13.00	40.76	90
4	2860.0	-63.29	2.50	13.10	Horizontal	-54.84	-13.00	41.84	45
5	3555.0	-65.57	2.60	12.70	Horizontal	-57.62	-13.00	44.62	315
6	4266.0	-64.19	3.30	12.50	Horizontal	-57.14	-13.00	44.14	135
7	4977.0	-61.58	3.40	12.50	Horizontal	-54.63	-13.00	41.63	225
8	5688.0	-60.96	3.40	12.80	Horizontal	-53.71	-13.00	40.71	90
9	6399.0	-58.57	4.10	11.50	Horizontal	-53.32	-13.00	40.32	135
10	7110.0	-54.27	4.20	12.20	Horizontal	-48.42	-13.00	35.42	45
Note: 1.The other Spurious RF Radiated emissions level is no more than noise floor. 2. The worst emission was found in the antenna is Horizontal position.									

NB-IoT Band 66 CH-Low

Harmonic	Frequency (MHz)	SG (dBm)	Cable Loss (dB)	Gain (dBi)	Antenna Polarization	EIRP Level (dBm)	Limit (dBm)	Margin (dB)	Azimuth (deg)
2	3421.4	-67.76	2.70	12.70	Horizontal	-57.76	-13.0	44.76	180
3	5131.1	-59.41	3.20	12.50	Horizontal	-50.11	-13.0	37.11	0
4	6842.8	-58.35	4.20	11.80	Horizontal	-50.75	-13.0	37.75	0
5	8553.5	-55.20	4.40	12.50	Horizontal	-47.10	-13.0	34.10	180
6	10264.2	-53.53	4.70	11.80	Horizontal	-46.43	-13.0	33.43	0
7	11974.9	-53.73	5.20	13.80	Horizontal	-45.13	-13.0	32.13	45
8	13685.6	-51.49	5.70	13.20	Horizontal	-43.99	-13.0	30.99	45
9	15396.3	-56.85	6.10	16.80	Horizontal	-46.15	-13.0	33.15	90
10	17107	-53.08	6.10	14.20	Horizontal	-44.98	-13.0	31.98	90
Note: 1.The other Spurious RF Radiated emissions level is no more than noise floor. 2. The worst emission was found in the antenna is Horizontal position.									

NB-IoT Band 66 CH-Middle

Harmonic	Frequency (MHz)	SG (dBm)	Cable Loss (dB)	Gain (dBi)	Antenna Polarization	EIRP Level (dBm)	Limit (dBm)	Margin (dB)	Azimuth (deg)
2	3464.3	-65.76	2.70	12.70	Horizontal	-55.76	-13.00	42.76	135
3	5197.5	-63.55	3.20	12.50	Horizontal	-54.25	-13.00	41.25	180
4	6930	-58.11	4.20	11.80	Horizontal	-50.51	-13.00	37.51	45
5	8662.5	-57.16	4.40	12.50	Horizontal	-49.06	-13.00	36.06	225
6	10395	-53.59	4.70	11.80	Horizontal	-46.49	-13.00	33.49	180
7	12127.5	-54.68	5.20	13.80	Horizontal	-46.08	-13.00	33.08	180
8	13860	-51.93	5.70	13.20	Horizontal	-44.43	-13.00	31.43	90
9	15592.5	-57.89	6.10	16.80	Horizontal	-47.19	-13.00	34.19	45
10	17325	-51.89	6.10	14.20	Horizontal	-43.79	-13.00	30.79	90
Note: 1.The other Spurious RF Radiated emissions level is no more than noise floor. 2. The worst emission was found in the antenna is Horizontal position.									

NB-IoT Band 66 CH-High

Harmonic	Frequency (MHz)	SG (dBm)	Cable Loss (dB)	Gain (dBi)	Antenna Polarization	EIRP Level (dBm)	Limit (dBm)	Margin (dB)	Azimuth (deg)
2	3507.8	-64.24	2.70	12.70	Horizontal	-54.24	-13.00	41.24	135
3	5261.6	-62.55	3.20	12.50	Horizontal	-53.25	-13.00	40.25	180
4	7017.2	-56.03	4.20	11.80	Horizontal	-48.43	-13.00	35.43	315
5	8771.5	-56.33	4.40	12.50	Horizontal	-48.23	-13.00	35.23	135
6	10525.8	-53.19	4.70	11.80	Horizontal	-46.09	-13.00	33.09	225
7	12280.1	-53.20	5.20	13.80	Horizontal	-44.60	-13.00	31.60	90
8	14034.4	-50.99	5.70	13.20	Horizontal	-43.49	-13.00	30.49	135
9	15788.7	-56.77	6.10	16.80	Horizontal	-46.07	-13.00	33.07	45
10	17543	-52.89	6.10	14.20	Horizontal	-44.79	-13.00	31.79	180

Note: 1.The other Spurious RF Radiated emissions level is no more than noise floor.
2. The worst emission was found in the antenna is Horizontal position.

6 Main Test Instruments

Date of Testing: October 29, 2018 ~ November 12, 2018

Name	Manufacturer	Type	Serial Number	Calibration Date	Expiration Date
Base Station Simulator	R&S	CMW500	113824	2018-05-20	2019-05-19
Power Splitter	Hua Xiang	SHX-GF2-2-13	10120101	/	/
Spectrum Analyzer	Key sight	N9010A	MY50210259	2018-05-20	2019-05-19
Signal Analyzer	R&S	FSV30	100815	2017-12-17	2018-12-16
EMI Test Receiver	R&S	ESCI	100948	2018-05-20	2019-05-19
Loop Antenna	SCHWARZBECK	FMZB1519	1519-047	2017-09-26	2019-09-25
Trilog Antenna	SCHWARZBECK	VUBL 9163	9163-201	2017-11-18	2019-11-17
Horn Antenna	R&S	HF907	100126	2018-07-07	2020-07-06
Horn Antenna	ETS-Lindgren	3160-09	00102643	2018-06-20	2020-06-19
Horn Antenna	STEATITE	QSH-SL-26-40-K-15	16779	2017-07-20	2019-07-19
Signal generator	R&S	SMB 100A	102594	2018-05-20	2019-05-19
Climatic Chamber	ESPEC	SU-242	93000506	2017-12-17	2020-12-16
Preampflier	R&S	SCU18	102327	2018-05-20	2019-05-19
MOB COMMS DC SUPPLY	Keysight	66319D	MY43004105	2018-05-21	2019-05-20
RF Cable	Agilent	SMA 15cm	0001	/	/
Software	R&S	EMC32	9.26.0	/	/

Date of Testing: May 18, 2021~ June 11, 2021 and August 5, 2021

Name	Manufacturer	Type	Serial Number	Calibration Date	Expiration Date
Base Station Simulator	R&S	CMW500	113645	2021-05-15	2022-05-14
Power Splitter	Hua Xiang	SHX-GF2-2-13	10120101	/	/
Spectrum Analyzer	Key sight	N9010A	MY47191109	2021-05-15	2022-05-14
Spectrum Analyzer	R&S	FSV3030	101411	2020-12-13	2021-12-12
Loop Antenna	SCHWARZBECK	FMZB1519	1519-047	2020-04-02	2023-04-01
TRILOG Broadband Antenna	SCHWARZBECK	VULB 9163	391	2019-12-16	2022-12-15
Horn Antenna	R&S	HF907	102723	2018-08-11	2021-08-10
Horn Antenna	ETS-Lindgren	3160-09	00102643	2018-06-20	2021-06-19
Horn Antenna	STEATITE	QSH-SL-26-40-K-15	16779	2019-12-24	2022-12-23
Signal generator	R&S	SMB 100A	102594	2021-05-15	2022-05-14
Climatic Chamber	ESPEC	SU-242	93000506	2020-12-13	2021-12-12
Preampflier	R&S	SCU18	102327	2021-05-15	2022-05-14
MOB COMMS DC SUPPLY	Keysight	66319D	MY43004105	2021-06-09	2021-12-08
RF Cable	Agilent	SMA 15cm	0001	2020-12-09	2021-06-08
				2021-06-09	2021-12-08
Software	R&S	EMC32	9.26.0	/	/

*******END OF REPORT *******

ANNEX A: The EUT Appearance

The EUT Appearance are submitted separately.

ANNEX B: Test Setup Photos

The Test Setup Photos are submitted separately.