

# TEST REPORT

**REPORT NUMBER: B19W50105-WWAN\_Rev5**

**ON**

**Type of Equipment:** NB-IoT Wireless Module  
**Model Name:** SIM7020G  
**Manufacturer:** SIMCom Wireless Solutions Co.,Ltd

## ACCORDING TO

**FCC CFR Part 2, FREQUENCY ALLOCATIONS AND RADIO TREATY MATTERS; GENERAL RULES AND REGULATIONS;**

**PART 22, PUBLIC MOBILE SERVICES;**

**PART 24, PERSONAL COMMUNICATIONS SERVICES;**

**PART 27, MISCELLANEOUS WIRELESS COMMUNICATIONS SERVICES;**

**Chongqing Academy of Information and Communications Technology**

*Month date, year*

*Sep, 06, 2019*

Signature



**Zhang Yan**

**Director**

**Note:**

The test results in this test report relate only to the devices specified in this report. This report shall not be reproduced except in full without the written approval of Chongqing Academy of Information and Communications Technology.

# Chongqing Academy of Information and Communications Technology

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## Revision Version

Report Number	Revision	Date	Memo
B19W50105-WWAN	V0.0	2019-07-02	--
B19W50105-WWAN	V1.0	2019-08-02	--
B19W50105-WWAN	V2.0	2019-08-12	--
B19W50105-WWAN	V3.0	2019-08-16	--
B19W50105-WWAN	V4.0	2019-08-21	--
B19W50105-WWAN	V5.0	2019-09-06	--

# Chongqing Academy of Information and Communications Technology

**Report No.:B19W50105-WWAN\_Rev5**

**FCC ID:** 2AJYU-8FCA101

**Report Date:** 2019-09-06

**Test Firm Name:** Chongqing Academy of Information and  
Communications Technology

**FCC Registration Number:** CN1239

## Statement

The measurements shown in this report were made in accordance with the procedures described on test pages. All reported tests were carried out on a sample equipment to demonstrate limited compliance with FCC CFR 47 Parts 2, 22,24, 27, The sample tested was found to comply with the requirements defined in the applied rules.

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## 1 General Information

### 1.1 Notes

All reported tests were carried out on a sample equipment to demonstrate limited compliance with FCC CFR 47 Parts 2, 22,24, 27.

The test results of this test report relate exclusively to the item(s) tested as specified in section 2.

The following deviation from, additions to, or exclusions from the test specifications have been made. See Annex B.

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## 1.2 Testers

Name: Li Xu  
Position: Engineer  
Department: Department of RF test  
Date: 2019-06-05 to 2019-09-06

Signature: 

Editor of this test report:

Name: Chen Wen  
Position: Engineer  
Department: Department of RF test  
Date: 2019-09-06

Signature: 

Technical responsibility for area of testing:

Name: Zhang Yan  
Position: Manager  
Department: Director of the laboratory  
Date: 2019-09-06

Signature: 

# Chongqing Academy of Information and Communications Technology

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## 1.3 Testing Laboratory information

### 1.3.1 Location

Name: Chongqing Academy of Information and Communications Technology

Address: Building B, Technology Innovation Center, No.8, Yuma Road, Chayuan New Area, Nan'an District, Chongqing, People's Republic of China, 401336

Tel: +86-23-88069965

Fax: +86-23-88608777

Email: liqiao@caict.ac.cn

### 1.3.2 Test location, where different from section 1.3.1

Name: -----

Street: -----

City: -----

Country: -----

Telephone: -----

Fax: -----

Postcode: -----

# Chongqing Academy of Information and Communications Technology

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## 1.4 Details of applicant or manufacturer

### 1.4.1 Applicant

Name: SIMCom Wireless Solutions Co.,Ltd  
Address: Building B,SIM Technology Building, No.633 Jinzhong Road, Changning District, Shanghai P.R.China  
Country: China  
Telephone: --  
Fax: --  
Contact: Chunlin.zhu  
Telephone: 13918237170  
Email: --

### 1.4.2 Manufacturer (if different from applicant in section 1.4.1)

Name: --  
Address: --  
Country: --  
Telephone: --  
Fax: --  
Contact: --  
Telephone: --  
Email: --



**2 Test Item**

**2.1 General Information**

Manufacturer: SIMCom Wireless Solutions Co.,Ltd  
Type of Equipment: NB-IoT Wireless Module  
Model Name: SIM7020G  
Production Status: Product  
Hardware Version: V4.01  
Software Version: 1910B01SIM7020G  
Normal Voltages 3.30 V  
High Voltages 3.60 V  
Low Voltages 3.00 V  
Receipt date of test item: 2019-03-21

**2.2 Outline of Equipment under Test**

The SIM7020G, referred to as “EUT” hereafter, is a multi-Band wireless module operating on the NB-IoT networks. The table below shows the supported Bands for the EUT.

Technology	Band	UL Freq.(MHz)	DL Freq.(MHz)	Note
NB-IoT	B2	1850 – 1910	1930 – 1990	--
	B4	1710 – 1755	2110 – 2155	--
	B12	699 – 716	729 – 746	--
	B13	777 - 787	746 - 756	--
	B26	814-849	859-894	--
	B66	1710-1780	2110-2200	--
	B71	663-698	617-652	--

**2.3 Modifications Incorporated in EUT**

The EUT has not been modified from what is described by the brand name and unique type identification stated above.

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## 2.4 Equipment Configuration

Equipment configuration list:

Item	Generic Description	Manufacturer	Type	Serial No.	Remarks
A	Modules	SIMCom Wireless Solutions Co.,Ltd	SIM7020G	868334032569216	None
B	Modules	SIMCom Wireless Solutions Co.,Ltd	SIM7020G	868334032569323	None

## 2.5 Other Information

--

**3 Summary of Test Results**

A brief summary of the tests carried out is shown as following.

<b>FCC Rules</b>	<b>Name of Test</b>	<b>Result</b>
2.1046 22.913(a) 24.232(c) 27.50	Conducted RF Power Output	Pass
2.1049 22.917(b) 24.238(b)	Occupied Bandwidth	--
2.1051 2.1053 22.917 24.238 27.53	Conducted spurious emissions	Pass
2.1051 2.1053 22.917 24.238 27.53	Radiated Spurious Emission	Pass
2.1051 2.1053 22.917 24.238 27.53	Band Edge	Pass
2.1055 22.355 24.235 27.54	Frequency Stability over Temperature Variation	Pass
2.1055 22.355 24.235 27.54	Frequency Stability over Voltage Variation	Pass
24.232 27.50	Peak to Average Ratio	Pass
22.913(a), 24.232(b)	ERP and EIRP	Pass
Note:--		

### 4 Test Equipments and Ancillaries Used For Tests

The test equipments and ancillaries used are as follows.

No.	Equipment	Model	SN	Manufacture	Cal. Due Date
1	EMI Test Receiver	ESU26	100367	R&S	2020-03-01
2	Trilog super broad band test antenna	VULB 9163	9163-544	R&S	2019-11-24
3	Double-Ridged Horn Antenna	HF907	100357	R&S	2021-06-22
4	Fully-Anechoic Chamber	11.8m×6.5m×6.3m	--	ETS	2019-10-23
5	Universal Radio Communication Tester	SP8315	SP8315-1249	StarPoint	2020-03-01
6	Signal Generator	SMU200A	104517	R&S	2020-03-01
7	Spectrum analyzer	FSQ 26	201137/026	R&S	2020-03-01
8	DC Power Supply	N6705B	MY50000919	Agilent	2019-12-05
9	Climate chamber	SH-241	92010759	ESPEC	2020-03-01

**5 Test Results**

**5.1 Conducted RF Power Output**

<b>Specifications:</b>	FCC Part 2.1046, 22.913(a),24.232(c), 27.50
<b>DUT Serial Number:</b>	868334032569216
<b>Test conditions:</b>	Ambient Temperature:15°C-35°C Relative Humidity:30%-60% Air pressure: 86-106kPa
<b>Test Results:</b>	Pass

**Limit Level Construction:**

According to Part 22.913(a) and 24.232(c), the ERP of mobile transmitters and auxiliary test transmitters must not exceed 7 Watts;

According to Part24.232(c), mobile and portable stations are limited to 2 watts EIRP and the equipment must employ a means for limiting power to the minimum necessary for successful communications.

According to Part 27.50(c), 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.

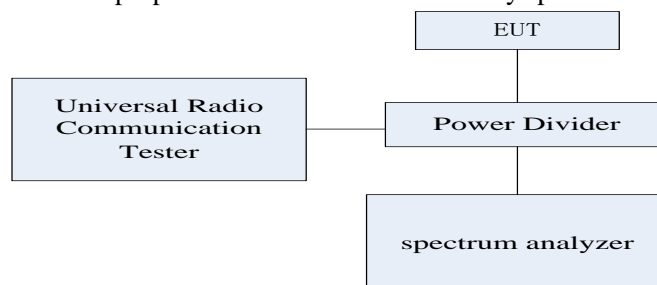
According to Part 27.50(d), fixed, mobile, and portable (hand-held) stations operating in the 1710-1755 MHz Band and mobile and portable stations operating in the 1695-1710 MHz and 1755-1780 MHz Bands are limited to 1 watt EIRP.

**Measurement Uncertainty:**

Item	Uncertainty
Expanded Uncertainty	0.52 dB (k=2)

**Test Setup:**

During the test, the EUT was controlled via the Wireless Telecommunications Test Set to ensure max power transmission and proper modulation and measured by spectrum analyzer.



**Test Method:**

- 1) The EUT was coupled to the spectrum analyzer and the Wireless Telecommunications Test Set

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through a power divider. The loss of the RF cables of the test system is calibrated to correct the readings.

2) For RMS power test, the spectrum analyzer was set to RMS Detector function and Maximum hold mode.

3) For Peak power test, the spectrum analyzer was set to Maxpeak Detector function and Maximum hold mode.

4) The resolution Bandwidth of the spectrum analyzer was comparable to the emission Bandwidth.

**Note:** Only worst case mode of in-band result is given below.

**5.1.1 NB-IoT Band 2**

Maximum Average Conducted Power (dBm)						
Sub-carrier Spacing [kHz]	Modulation	N <sub>tones</sub>		Channel		
				Low	Mid	High
3.75	BPSK	1@0	Average	22.07	21.80	21.65
			Peak	24.21	23.97	23.82
		1@47	Average	21.99	21.88	21.66
			Peak	24.13	24.02	23.82
	QPSK	1@0	Average	21.99	21.83	21.69
			Peak	23.68	23.54	23.44
		1@47	Average	22.03	21.86	21.64
			Peak	23.81	23.65	23.36
15	BPSK	1@0	Average	21.88	21.71	21.60
			Peak	23.70	23.53	23.41
		1@11	Average	21.88	21.69	21.57
			Peak	23.72	23.55	23.42
	QPSK	1@0	Average	21.90	21.70	21.60
			Peak	23.52	23.53	23.22
		1@11	Average	21.90	21.70	21.61
			Peak	23.53	23.56	23.24
		12@0	Average	21.15	21.09	21.54
			Peak	24.75	24.39	24.29

5.1.2 NB-IoT Band 4

Maximum Average Conducted Power (dBm)						
Sub-carrier Spacing [kHz]	Modulation	N <sub>tones</sub>		Channel		
				Low	Mid	High
3.75	BPSK	1@0	Average	22.59	22.40	22.47
			Peak	24.62	24.48	24.55
		1@47	Average	22.60	22.39	22.40
			Peak	24.63	24.47	24.54
	QPSK	1@0	Average	22.51	22.40	22.47
			Peak	24.19	24.06	24.18
		1@47	Average	22.48	22.38	22.46
			Peak	24.21	24.14	24.13
15	BPSK	1@0	Average	22.36	22.26	22.36
			Peak	24.17	24.06	24.15
		1@11	Average	22.39	22.31	22.27
			Peak	24.21	24.13	24.12
	QPSK	1@0	Average	22.41	22.29	22.38
			Peak	24.11	23.90	24.06
		1@11	Average	22.38	22.28	22.36
			Peak	23.91	23.91	23.89
		12@0	Average	21.42	21.08	21.39
			Peak	25.29	25.33	25.40

5.1.3 NB-IoT Band 12

Maximum Average Conducted Power (dBm)						
Sub-carrier Spacing [kHz]	Modulation	N <sub>tones</sub>		Channel		
				Low	Mid	High
3.75	BPSK	1@0	Average	23.27	23.58	23.54
			Peak	25.51	25.72	25.25
		1@47	Average	23.17	23.60	23.52
			Peak	25.44	25.74	25.63
	QPSK	1@0	Average	23.22	23.59	23.55
			Peak	25.02	25.31	25.27
		1@47	Average	23.22	23.60	23.54
			Peak	25.11	25.42	25.32
15	BPSK	1@0	Average	23.03	23.40	23.39
			Peak	24.98	25.28	25.24
		1@11	Average	23.06	23.40	23.39
			Peak	25.04	25.30	25.28
	QPSK	1@0	Average	23.04	23.44	23.31
			Peak	24.99	25.21	25.02
		1@11	Average	23.07	23.40	23.33
			Peak	25.05	25.00	25.03
		12@0	Average	20.71	20.96	20.84
			Peak	26.10	26.26	26.21



5.1.4 NB-IoT Band 13

Maximum Average Conducted Power (dBm)						
Sub-carrier Spacing [kHz]	Modulation	N <sub>tones</sub>		Channel		
				Low	Mid	High
3.75	BPSK	1@0	Average	22.87	23.13	22.96
			Peak	24.95	25.14	25.01
		1@47	Average	22.86	23.12	23.00
			Peak	24.94	25.14	25.03
	QPSK	1@0	Average	22.88	23.20	23.01
			Peak	24.57	24.84	24.62
		1@47	Average	22.88	23.18	22.97
			Peak	24.61	24.80	24.69
15	BPSK	1@0	Average	22.71	22.99	22.81
			Peak	24.52	24.74	24.57
		1@11	Average	22.72	23.02	22.83
			Peak	24.55	24.80	24.61
	QPSK	1@0	Average	22.74	22.98	22.79
			Peak	24.73	24.55	24.45
		1@11	Average	22.73	23.04	22.76
			Peak	24.27	24.61	24.27
		12@0	Average	20.45	20.66	20.52
			Peak	25.60	25.77	25.55

5.1.5 NB-IoT Band 26

Maximum Average Conducted Power (dBm)						
Sub-carrier Spacing [kHz]	Modulation	N <sub>tones</sub>		Frequency (MHz)		
				Low	Mid	High
3.75	BPSK	1@0	Average	22.72	23.02	22.56
			Peak	24.79	25.03	24.61
		1@47	Average	22.75	23.03	22.54
			Peak	24.81	25.03	24.60
	QPSK	1@0	Average	22.72	23.02	22.57
			Peak	24.36	24.61	24.22
		1@47	Average	22.75	23.04	22.58
			Peak	24.47	24.71	24.26
15	BPSK	1@0	Average	22.62	22.89	22.43
			Peak	24.37	24.62	24.40
		1@11	Average	22.62	22.91	22.43
			Peak	24.41	24.66	24.22
	QPSK	1@0	Average	22.58	22.88	22.57
			Peak	24.34	24.61	24.20
		1@11	Average	22.64	22.90	22.43
			Peak	24.43	24.64	23.93
		12@0	Average	21.73	21.65	21.49
			Peak	25.71	25.63	25.51

5.1.6 NB-IoT Band 66

Maximum Average Conducted Power (dBm)						
Sub-carrier Spacing [kHz]	Modulation	N <sub>tones</sub>		Channel		
				Low	Mid	High
3.75	BPSK	1@0	Average	23.38	22.68	22.42
			Peak	25.13	24.71	24.56
		1@47	Average	23.33	22.69	22.49
			Peak	25.09	24.72	24.61
	QPSK	1@0	Average	23.37	22.77	22.49
			Peak	24.84	24.36	24.17
		1@47	Average	23.39	22.70	22.51
			Peak	24.81	24.41	24.28
15	BPSK	1@0	Average	23.00	22.44	22.38
			Peak	24.65	24.22	24.18
		1@11	Average	23.04	22.53	22.43
			Peak	24.69	24.33	24.25
	QPSK	1@0	Average	23.09	22.54	22.39
			Peak	24.61	24.14	24.07
		1@11	Average	23.04	22.55	22.37
			Peak	24.43	24.16	23.88
		12@0	Average	20.94	20.79	21.05
			Peak	25.55	25.61	25.40

5.1.7 NB-IoT Band 71

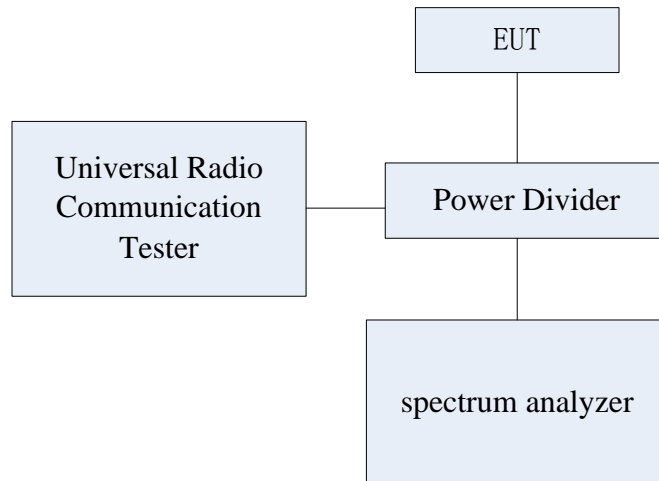
Maximum Average Conducted Power (dBm)						
Sub-carrier Spacing [kHz]	Modulation	N <sub>tones</sub>		Channel		
				Low	Mid	High
3.75	BPSK	1@0	Average	22.93	23.46	23.79
			Peak	25.43	25.82	26.01
		1@47	Average	22.97	23.47	23.86
			Peak	25.46	25.82	26.03
	QPSK	1@0	Average	23.02	23.53	23.83
			Peak	24.99	25.39	25.64
		1@47	Average	23.01	23.52	23.87
			Peak	25.09	25.49	25.67
15	BPSK	1@0	Average	22.79	23.35	23.52
			Peak	24.90	25.37	25.50
		1@11	Average	22.82	23.36	23.55
			Peak	24.96	25.41	25.54
	QPSK	1@0	Average	22.87	23.39	23.58
			Peak	24.85	25.28	25.43
		1@11	Average	22.81	23.38	23.53
			Peak	24.59	25.07	25.22
		12@0	Average	20.52	20.81	20.97
			Peak	26.27	26.45	26.46

5.2 Occupied Bandwidth

<b>Specifications:</b>	FCC Part 2.1049, 22.917(b), 24.238(b)
<b>DUT Serial Number:</b>	868334032569216
<b>Test conditions:</b>	Ambient Temperature:15°C-35°C Relative Humidity:30%-60% Air pressure: 86-106kPa
<b>Test Results:</b>	--

Test Setup

During the test, the EUT was controlled via the Wireless Communications Test Set to ensure max power transmission and proper modulation and measured by spectrum analyzer.



Measurement Uncertainty:

Item	Uncertainty
Expanded Uncertainty	69 kHz (k=2)

Test Method

The 99% occupied Bandwidth was calculated from the spectrum analyzer. Markers in the spectrum analyzer were then placed between the calculated frequencies to show the calculated 99% power Band. The 26dB Bandwidth was also measured and recorded.

**Note:** For Occupied Bandwidth test, the EUT working in Sub-carrier Spacing 15 kHz, full tones mode is the worst case mode.

5.2.1 NB-IoT Band 2

NB-IoT standalone Test frequencies for operating band 2

Frequency ID	N <sub>UL</sub>	Sub-carrier Spacing [kHz]	Occupied Bandwidth (99%) (kHz)		Occupied Bandwidth (26dB) (kHz)	
			QPSK	BPSK	QPSK	BPSK
			12@0	1@0	12@0	1@0
Low Range	18601	15	182.98	112.18	234.6	107.37
Mid Range	18900		182.88	115.38	241.6	110.58
High Range	19199		181.15	112.18	227.0	105.78

NB-IoT in-band Test frequencies for operating band 2

Frequency ID	N <sub>UL</sub>	Sub-carrier Spacing [kHz]	Occupied Bandwidth (99%) (kHz)		Occupied Bandwidth (26dB) (kHz)	
			QPSK	BPSK	QPSK	BPSK
			12@0	1@0	12@0	1@0
Low Range	18601	15	182.34	115.38	221.40	105.77
Mid Range	18900		180.89	108.97	220.00	107.30
High Range	19199		182.34	107.37	228.70	105.76

NB-IoT guard-band Test frequencies for operating band 2

Frequency ID	N <sub>UL</sub>	Sub-carrier Spacing [kHz]	Occupied Bandwidth (99%) (kHz)		Occupied Bandwidth (26dB) (kHz)	
			QPSK	BPSK	QPSK	BPSK
			12@0	1@0	12@0	1@0
Low Range	18601	15	191.44	115.38	265.2	105.76
Mid Range	18900		180.35	112.18	230.6	107.37
High Range	19199		181.98	110.57	224.6	107.37

5.2.2 NB-IoT Band 4

NB-IoT standalone Test frequencies for operating band 4

Frequency ID	N <sub>UL</sub>	Sub-carrier Spacing [kHz]	Occupied Bandwidth (99%) (kHz)		Occupied Bandwidth (26dB) (kHz)	
			QPSK	BPSK	QPSK	BPSK
			12@0	1@0	12@0	1@0
Low Range	19951	15	183.43	107.37	235.20	105.77
Mid Range	20175		181.92	107.37	238.70	107.37
High Range	20399		180.16	112.18	234.80	108.97

NB-IoT in-band Test frequencies for operating band 4

Frequency ID	N <sub>UL</sub>	Sub-carrier Spacing [kHz]	Occupied Bandwidth (99%) (kHz)		Occupied Bandwidth (26dB) (kHz)	
			QPSK	BPSK	QPSK	BPSK
			12@0	1@0	12@0	1@0
Low Range	19951	15	180.89	105.77	217.10	107.37
Mid Range	20175		180.89	108.97	217.10	107.37
High Range	20399		182.34	112.18	217.10	108.97

NB-IoT guard-band Test frequencies for operating band 4

Frequency ID	N <sub>UL</sub>	Sub-carrier Spacing [kHz]	Occupied Bandwidth (99%) (kHz)		Occupied Bandwidth (26dB) (kHz)	
			QPSK	BPSK	QPSK	BPSK
			12@0	1@0	12@0	1@0
Low Range	19951	15	186.56	112.18	252.10	105.77
Mid Range	20175		181.69	105.77	237.60	107.37
High Range	20399		182.28	112.18	236.80	105.77

5.2.3 NB-IoT Band 12

NB-IoT standalone Test frequencies for operating band 12

Frequency ID	N <sub>UL</sub>	Sub-carrier Spacing [kHz]	Occupied Bandwidth (99%) (kHz)		Occupied Bandwidth (26dB) (kHz)	
			QPSK	BPSK	QPSK	BPSK
			12@0	1@0	12@0	1@0
Low Range	23011	15	181.84	110.57	238.90	107.37
Mid Range	23095		182.69	108.97	243.30	105.77
High Range	23179		180.80	107.37	238.70	107.37

NB-IoT in-band Test frequencies for operating band 12

Frequency ID	N <sub>UL</sub>	Sub-carrier Spacing [kHz]	Occupied Bandwidth (99%) (kHz)		Occupied Bandwidth (26dB) (kHz)	
			QPSK	BPSK	QPSK	BPSK
			12@0	1@0	12@0	1@0
Low Range	23011	15	182.34	110.58	217.10	105.77
Mid Range	23095		182.34	107.37	243.58	105.77
High Range	23179		180.89	110.57	217.10	107.37

NB-IoT guard-band Test frequencies for operating band 12

Frequency ID	N <sub>UL</sub>	Sub-carrier Spacing [kHz]	Occupied Bandwidth (99%) (kHz)		Occupied Bandwidth (26dB) (kHz)	
			QPSK	BPSK	QPSK	BPSK
			12@0	1@0	12@0	1@0
Low Range	23011	15	210.03	108.97	299.70	107.37
Mid Range	23095		181.99	108.97	237.90	97.75
High Range	23179		182.53	107.37	224.10	105.77



5.2.4 NB-IoT Band 13

NB-IoT standalone Test frequencies for operating band 13

Frequency ID	N <sub>UL</sub>	Sub-carrier Spacing [kHz]	Occupied Bandwidth (99%) (kHz)		Occupied Bandwidth (26dB) (kHz)	
			QPSK	BPSK	QPSK	BPSK
			12@0	1@0	12@0	1@0
Low Range	23181	15	180.76	112.18	237.90	107.37
Mid Range	23230		182.10	108.97	237.50	105.77
High Range	23279		182.79	107.37	239.50	107.37

NB-IoT in-band Test frequencies for operating band 13

Frequency ID	N <sub>UL</sub>	Sub-carrier Spacing [kHz]	Occupied Bandwidth (99%) (kHz)		Occupied Bandwidth (26dB) (kHz)	
			QPSK	BPSK	QPSK	BPSK
			12@0	1@0	12@0	1@0
Low Range	23181	15	182.34	107.37	217.10	105.76
Mid Range	23230		182.23	113.78	235.20	108.97
High Range	23279		182.34	108.97	217.10	105.77

NB-IoT guard-band Test frequencies for operating band 13

Frequency ID	N <sub>UL</sub>	Sub-carrier Spacing [kHz]	Occupied Bandwidth (99%) (kHz)		Occupied Bandwidth (26dB) (kHz)	
			QPSK	BPSK	QPSK	BPSK
			12@0	1@0	12@0	1@0
Low Range	23181	15	212.62	112.18	313.60	107.37
Mid Range	23230		182.94	107.37	243.10	107.37
High Range	23279		181.28	110.57	239.40	108.97

5.2.5 NB-IoT Band 26

NB-IoT standalone Test Data(824 MHz ~849MHz)

Frequency ID	N <sub>UL</sub>	Sub-carrier Spacing [kHz]	Occupied Bandwidth (99%) (kHz)		Occupied Bandwidth (26dB) (kHz)	
			QPSK	BPSK	QPSK	BPSK
			12@0	1@0	12@0	1@0
Low Range	26791	15	182.69	107.37	232.37	107.37
Mid Range	26915		181.08	116.98	233.97	110.57
High Range	27039		182.69	110.57	219.55	107.37

NB-IoT in-band Test Data(824 MHz ~849MHz)

Frequency ID	N <sub>UL</sub>	Sub-carrier Spacing [kHz]	Occupied Bandwidth (99%) (kHz)		Occupied Bandwidth (26dB) (kHz)	
			QPSK	BPSK	QPSK	BPSK
			12@0	1@0	12@0	1@0
Low Range	26791	15	182.69	108.98	229.16	108.98
Mid Range	26915		182.69	107.37	230.76	107.37
High Range	27039		182.69	110.58	241.98	107.35

NB-IoT guard-band Test Data(824 MHz ~849MHz)

Frequency ID	N <sub>UL</sub>	Sub-carrier Spacing [kHz]	Occupied Bandwidth (99%) (kHz)		Occupied Bandwidth (26dB) (kHz)	
			QPSK	BPSK	QPSK	BPSK
			12@0	1@0	12@0	1@0
Low Range	26791	15	182.69	107.38	219.55	107.37
Mid Range	26915		184.29	112.18	229.16	110.58
High Range	27039		182.69	108.97	229.16	107.37

5.2.6 NB-IoT Band 66

NB-IoT standalone Test frequencies for operating band 66

Frequency ID	N <sub>UL</sub>	Sub-carrier Spacing [kHz]	Occupied Bandwidth (99%) (kHz)		Occupied Bandwidth (26dB) (kHz)	
			QPSK	BPSK	QPSK	BPSK
			12@0	1@0	12@0	1@0
Low Range	131972	15	181.77	107.37	240.80	107.37
Mid Range	132322		181.82	108.97	245.40	107.37
High Range	132671		179.97	110.57	229.80	107.37

NB-IoT in-band Test frequencies for operating band 66

Frequency ID	N <sub>UL</sub>	Sub-carrier Spacing [kHz]	Occupied Bandwidth (99%) (kHz)		Occupied Bandwidth (26dB) (kHz)	
			QPSK	BPSK	QPSK	BPSK
			12@0	1@0	12@0	1@0
Low Range	131972	15	182.34	108.97	231.50	107.37
Mid Range	132322		180.89	112.18	231.50	108.97
High Range	132671		182.34	112.18	231.50	108.97

NB-IoT guard-band Test frequencies for operating band 66

Frequency ID	N <sub>UL</sub>	Sub-carrier Spacing [kHz]	Occupied Bandwidth (99%) (kHz)		Occupied Bandwidth (26dB) (kHz)	
			QPSK	BPSK	QPSK	BPSK
			12@0	1@0	12@0	1@0
Low Range	131972	15	204.88	113.78	286.20	108.97
Mid Range	132322		180.62	118.91	226.90	107.37
High Range	132671		181.70	110.57	236.10	107.37

5.2.7 NB-IoT Band 71

NB-IoT standalone Test frequencies for operating band 71

Frequency ID	N <sub>UL</sub>	Sub-carrier Spacing [kHz]	Occupied Bandwidth (99%) (kHz)		Occupied Bandwidth (26dB) (kHz)	
			QPSK	BPSK	QPSK	BPSK
			12@0	1@0	12@0	1@0
Low Range	133122	15	181.57	105.76	245.60	113.78
Mid Range	133297		182.25	107.37	242.00	104.17
High Range	133471		180.97	104.16	237.40	108.97

NB-IoT in-band Test frequencies for operating band 71

Frequency ID	N <sub>UL</sub>	Sub-carrier Spacing [kHz]	Occupied Bandwidth (99%) (kHz)		Occupied Bandwidth (26dB) (kHz)	
			QPSK	BPSK	QPSK	BPSK
			12@0	1@0	12@0	1@0
Low Range	133122	15	183.79	110.57	244.60	105.77
Mid Range	133297		183.79	110.57	234.40	110.57
High Range	133471		183.79	110.57	231.50	105.76

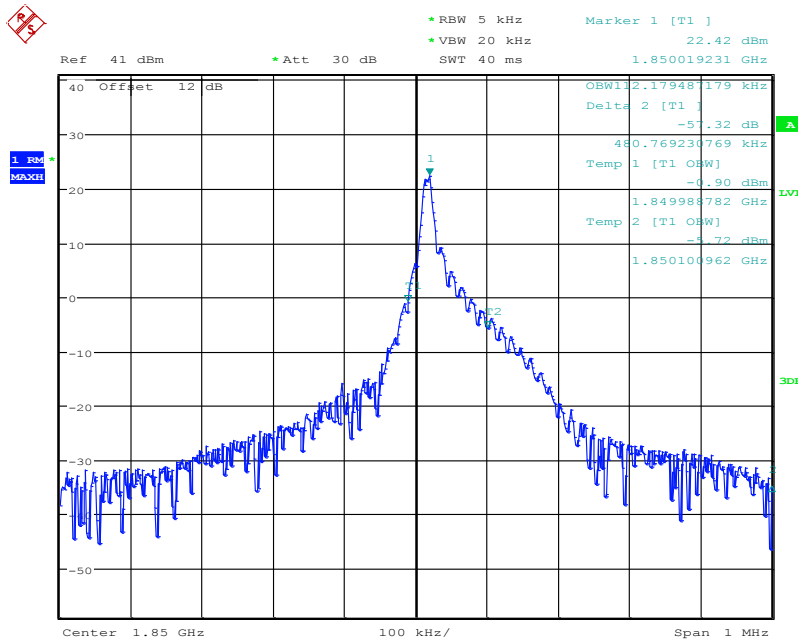
NB-IoT guard-band Test frequencies for operating band 71

Frequency ID	N <sub>UL</sub>	Sub-carrier Spacing [kHz]	Occupied Bandwidth (99%) (kHz)		Occupied Bandwidth (26dB) (kHz)	
			QPSK	BPSK	QPSK	BPSK
			12@0	1@0	12@0	1@0
Low Range	133122	15	213.34	112.18	336.00	105.77
Mid Range	133297		182.25	107.37	242.00	84.94
High Range	133471		180.97	110.57	237.40	105.77

Graphical results for Band2:

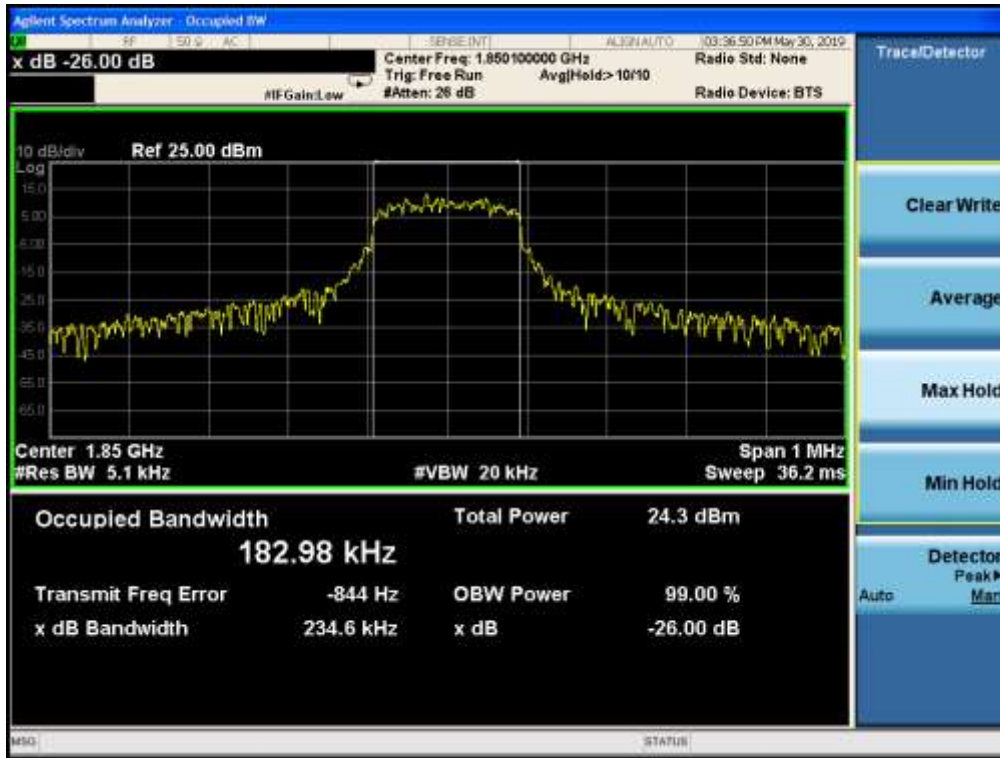


NB-IoT standalone band 2 18601 QPSK(99%)

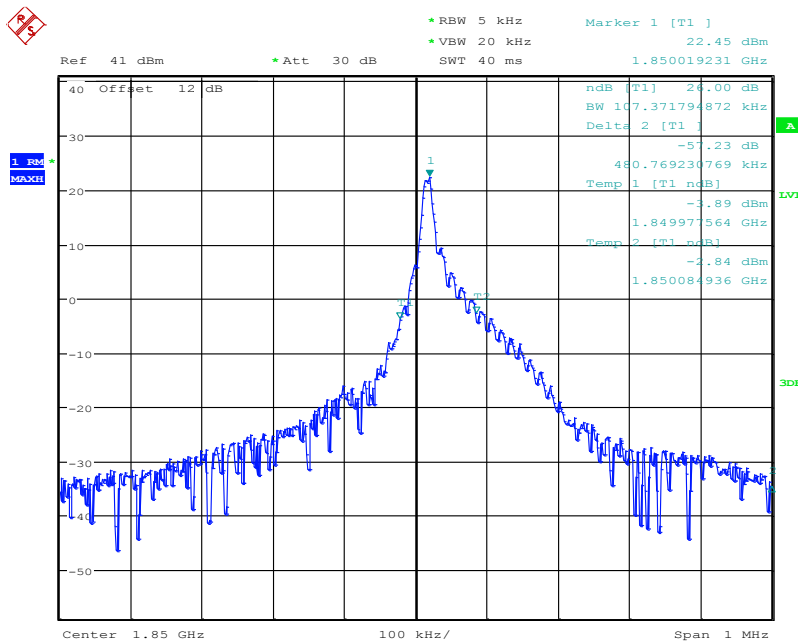


Date: 5.SEP.2019 14:13:52

NB-IoT standalone band 2 18601 BPSK(99%)



NB-IoT standalone band 2 18601 QPSK(26dB)

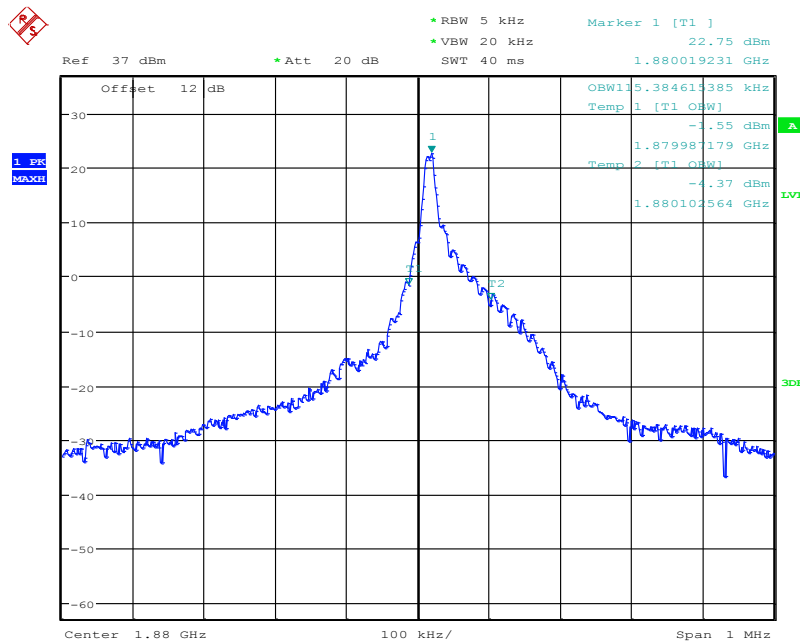


Date: 5.SEP.2019 14:13:23

NB-IoT standalone band 2 18601 BPSK(26dB)



NB-IoT standalone band 2 18900 QPSK(99%)

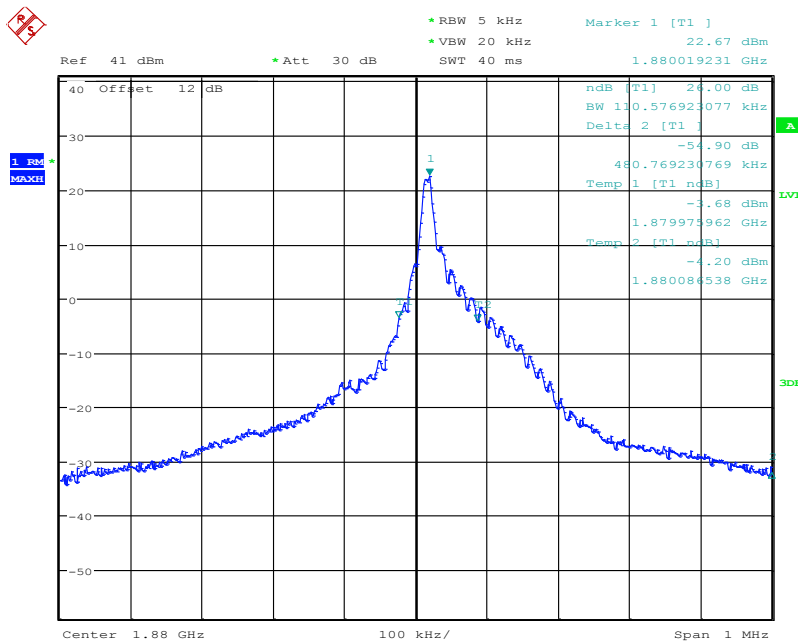


Date: 5.SEP.2019 13:36:07

NB-IoT standalone band 2 18900 BPSK(99%)



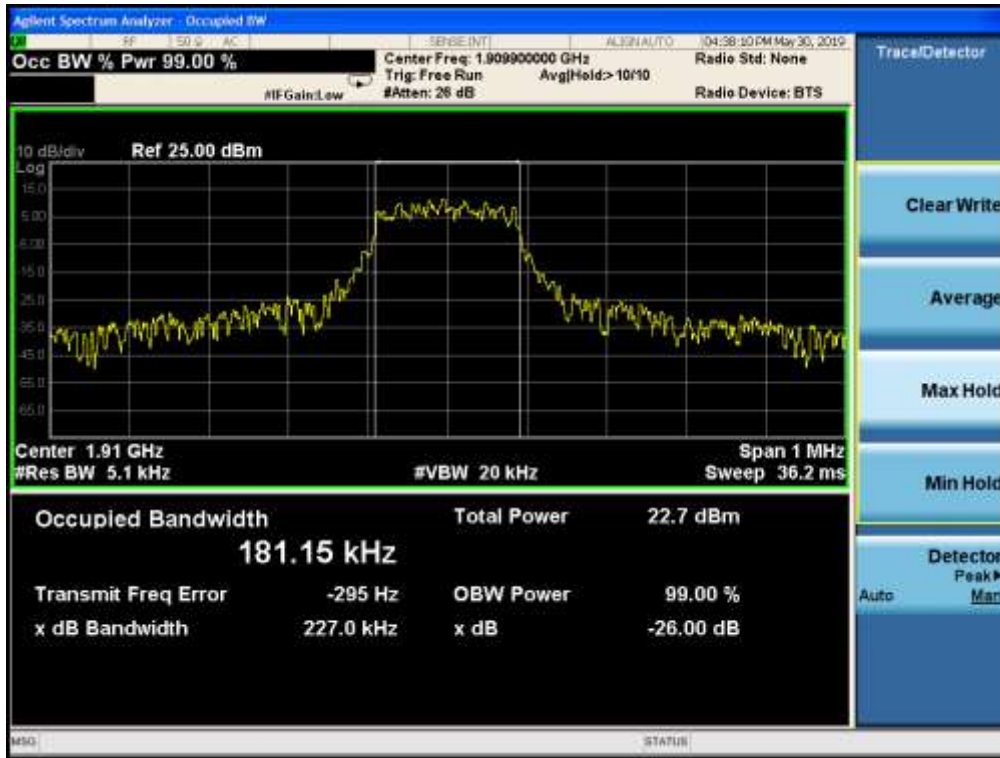
NB-IoT standalone band 2 18900 QPSK(26dB)



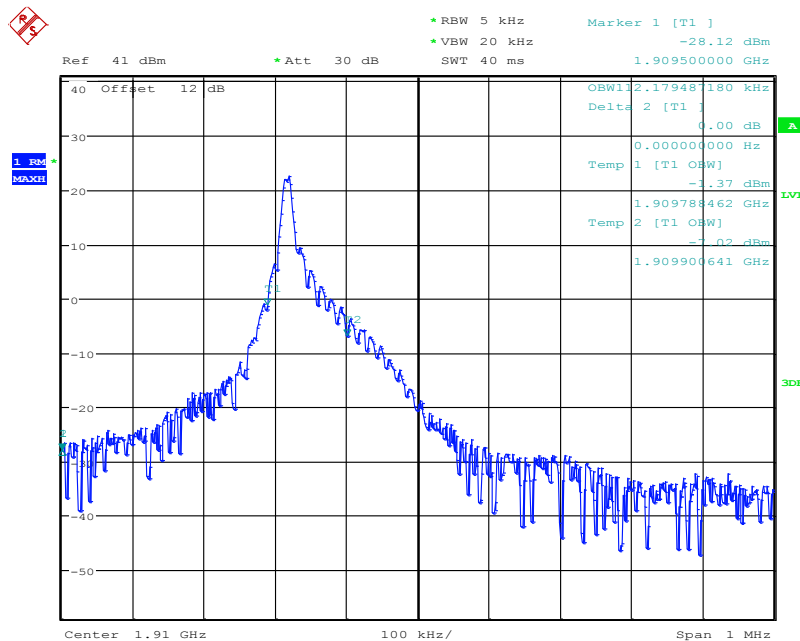
Date: 5.SEP.2019 14:05:47

NB-IoT standalone band 2 18900 BPSK(26dB)



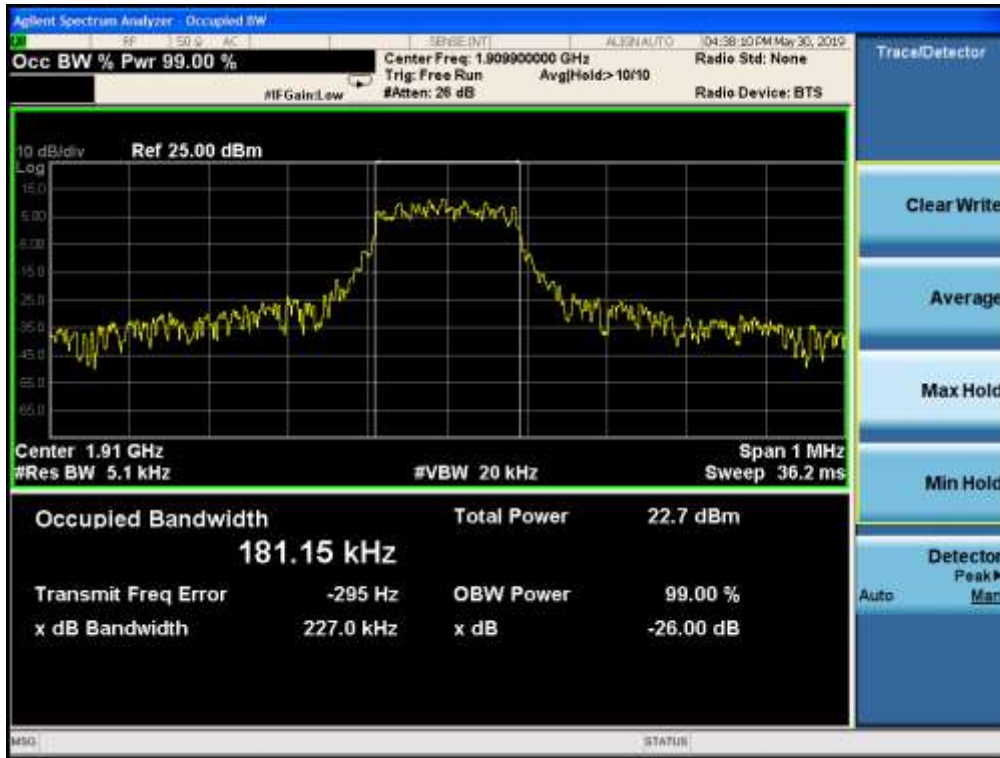


NB-IoT standalone band 2 19199 QPSK(99%)

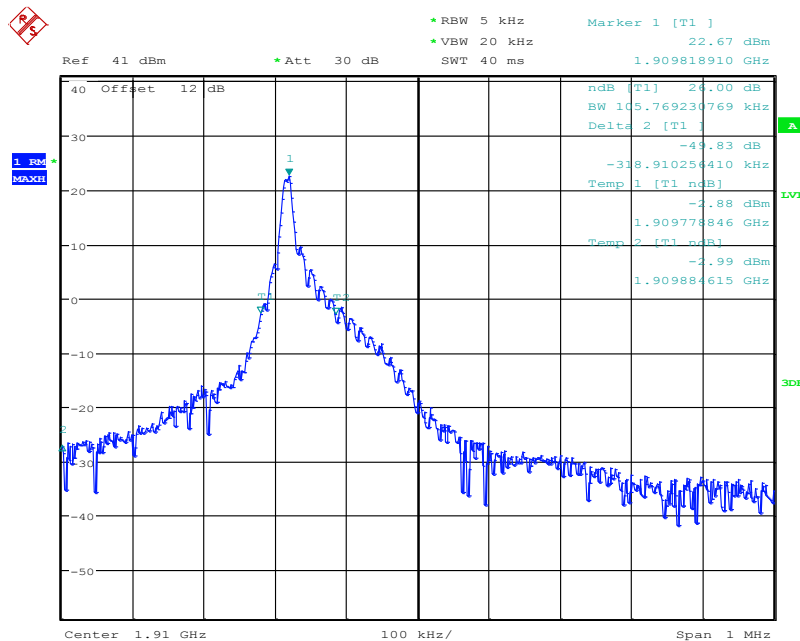


Date: 5.SEP.2019 14:11:24

NB-IoT standalone band 2 19199 BPSK(99%)

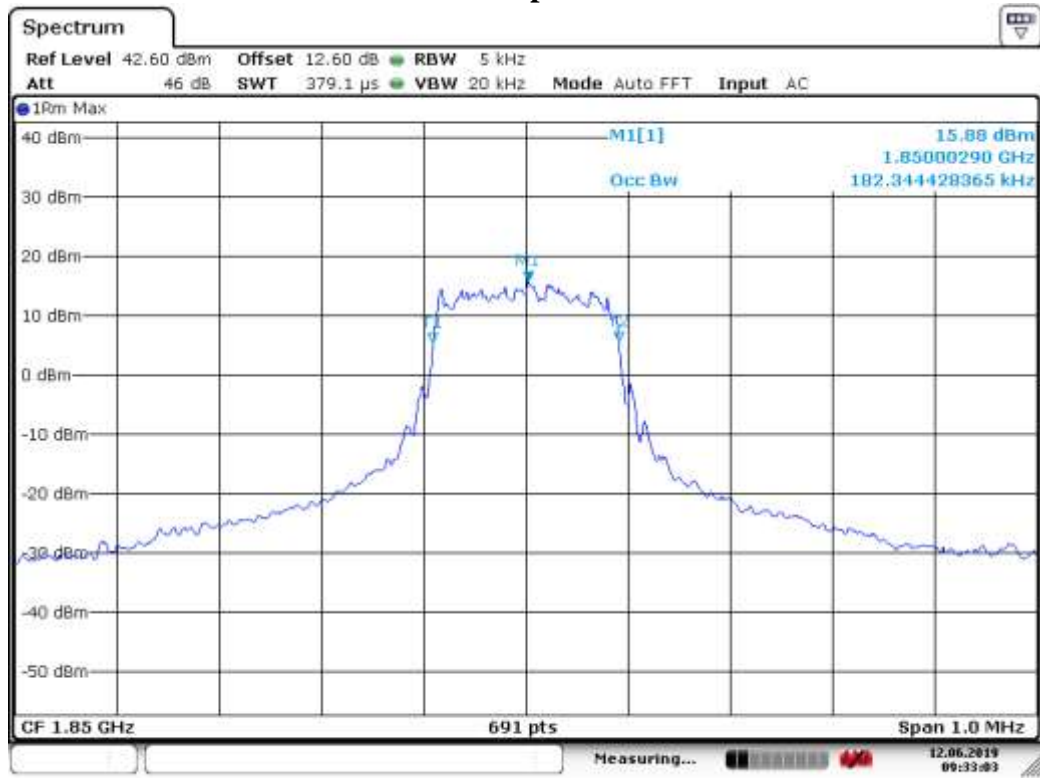


NB-IoT standalone band 2 19199 QPSK(26dB)



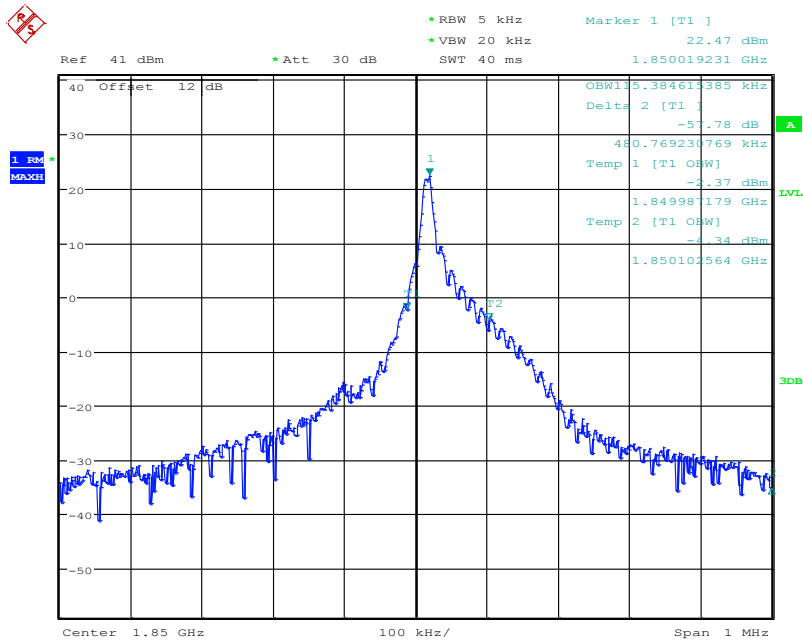
Date: 5.SEP.2019 14:11:54

NB-IoT standalone band 2 19199 BPSK(26dB)



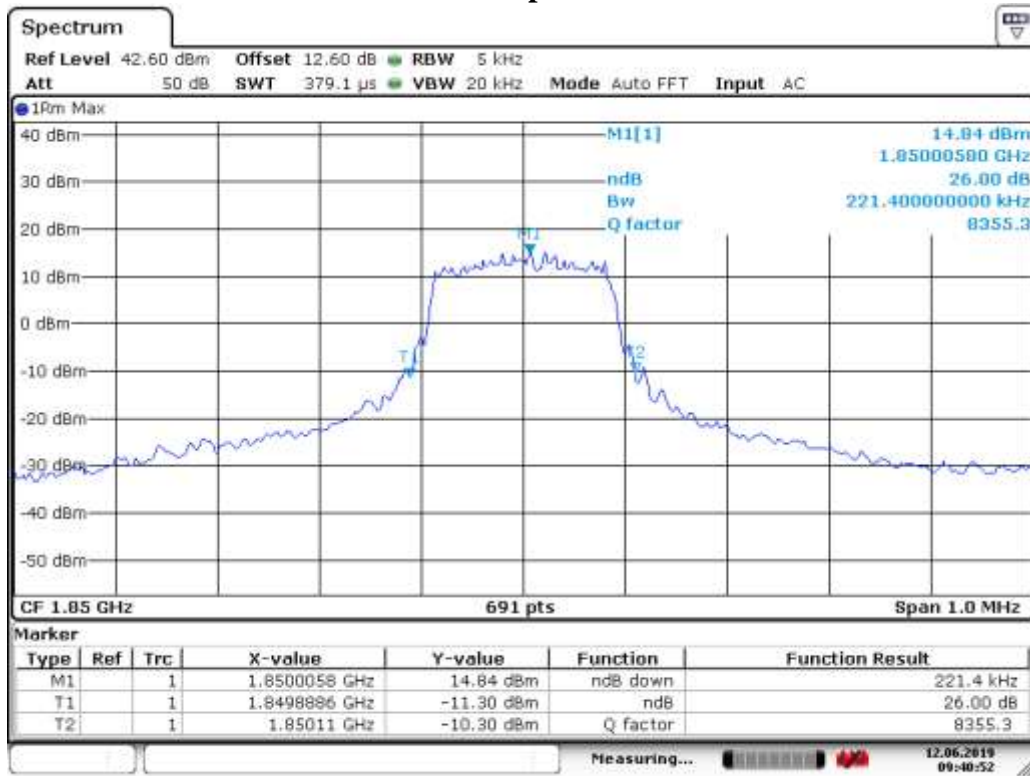
Date: 12 JUN. 2019 09:33:04

NB-IoT In-band band 2 18601 QPSK(99%)



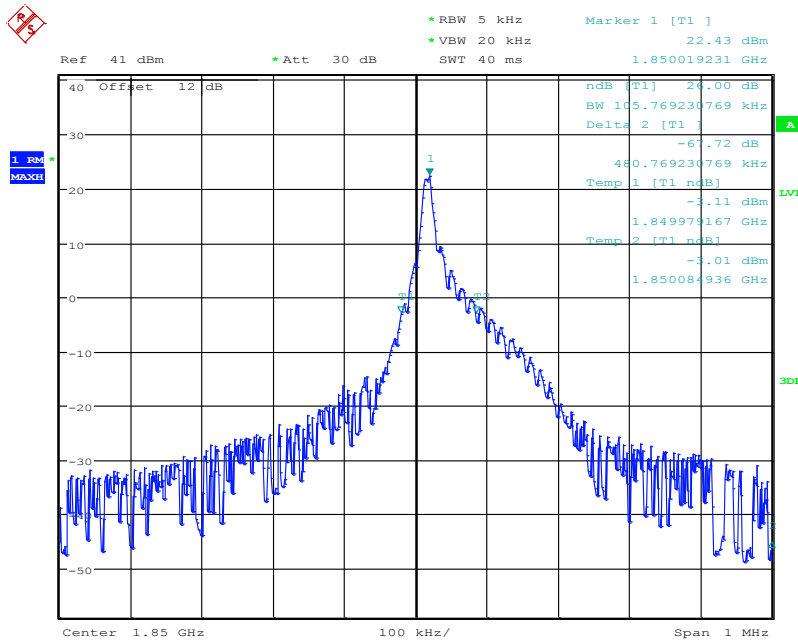
Date: 5.SEP.2019 14:15:12

NB-IoT In-band band 2 18601 BPSK(99%)



Date: 12 JUN.2019 09:40:52

NB-IoT In-band band 2 18601 QPSK(26dB)



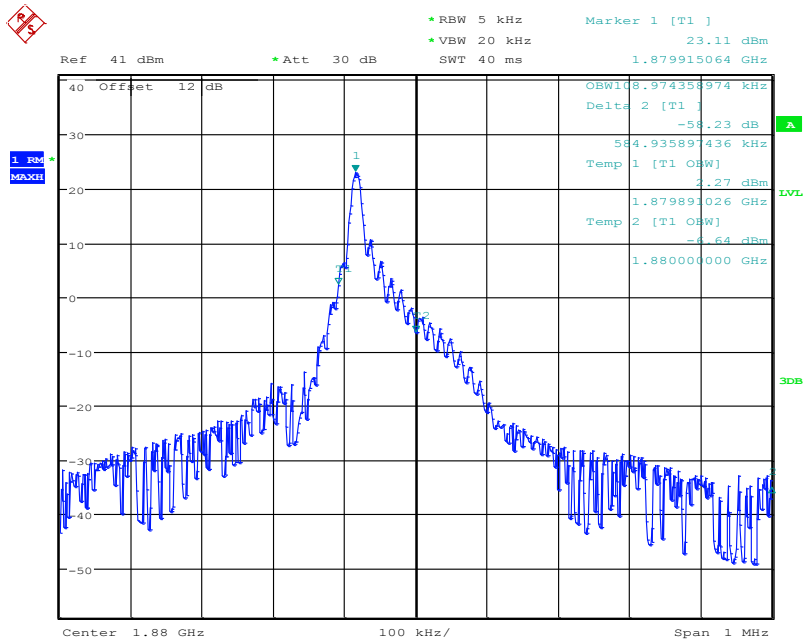
Date: 5.SEP.2019 14:15:29

NB-IoT In-band band 2 18601 BPSK(26dB)



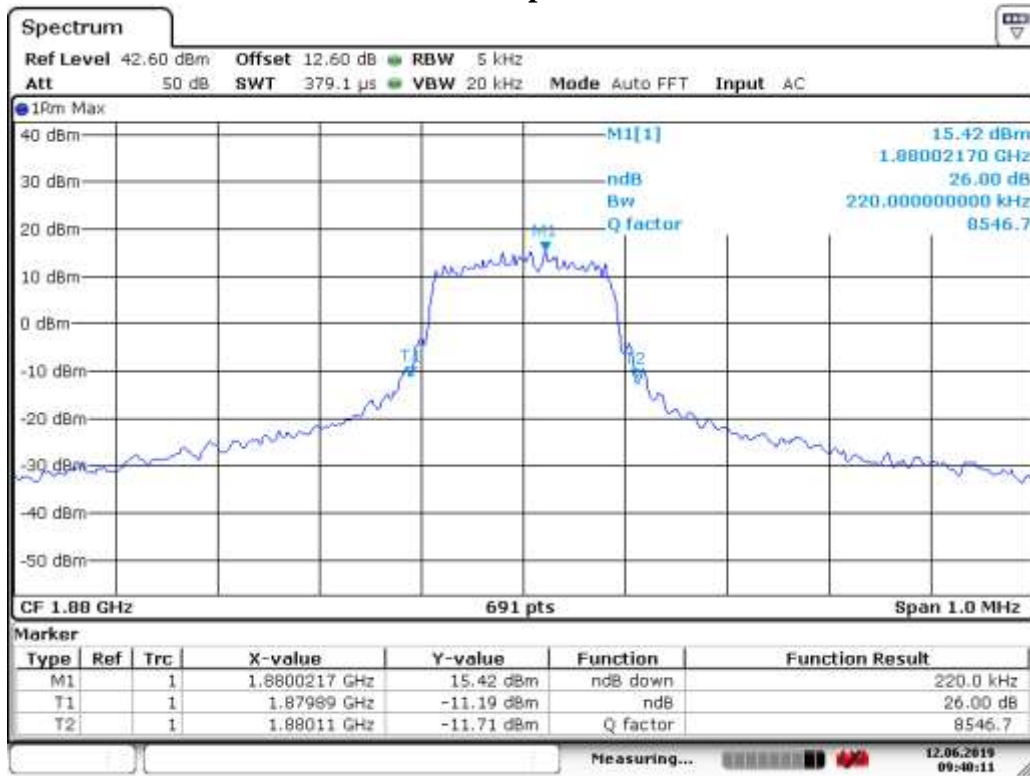
Date: 12 JUN.2019 09:38:41

NB-IoT In-band band 2 18900 QPSK(99%)



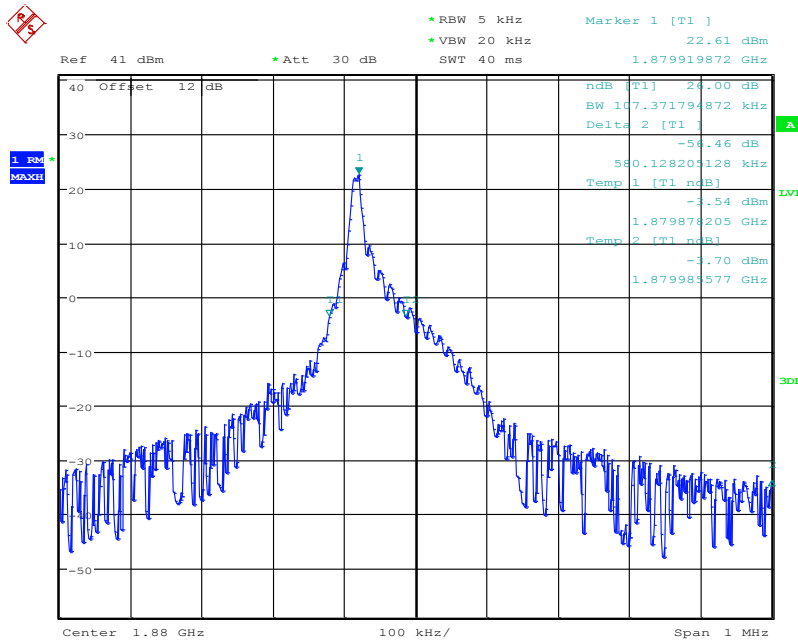
Date: 5.SEP.2019 14:17:20

NB-IoT In-band band 2 18900 BPSK(99%)



Date: 12 JUN.2019 09:40:11

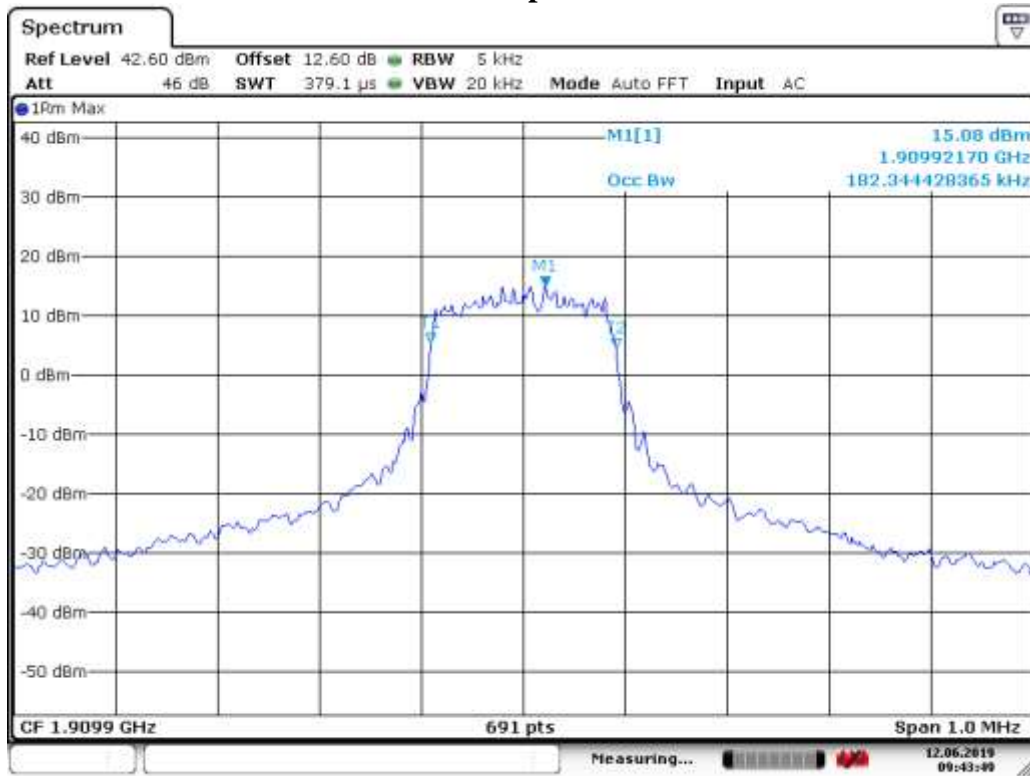
NB-IoT In-band band 2 18900 QPSK(26dB)



Date: 5.SEP.2019 14:17:32

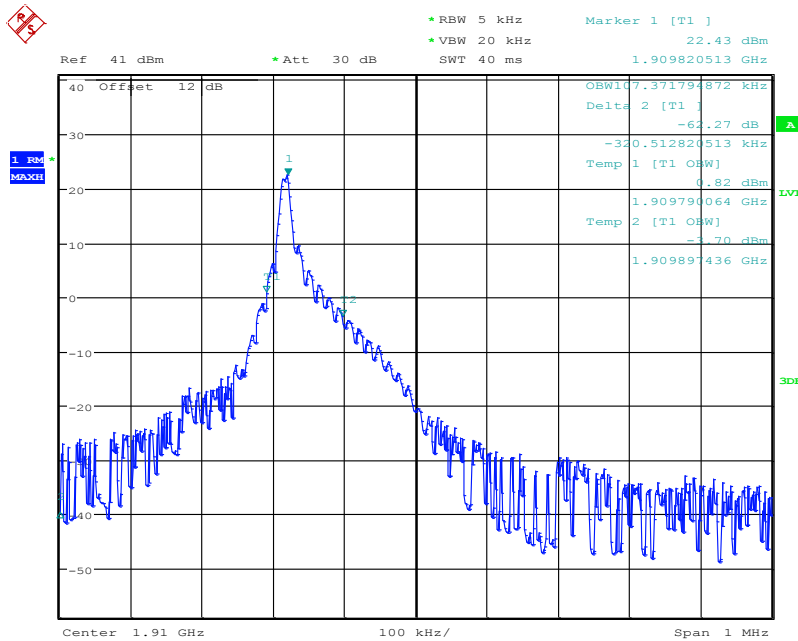
NB-IoT In-band band 2 18900 BPSK(26dB)

Report No.:B19W50105-WWAN\_Rev5



Date: 12 JUN.2019 09:43:49

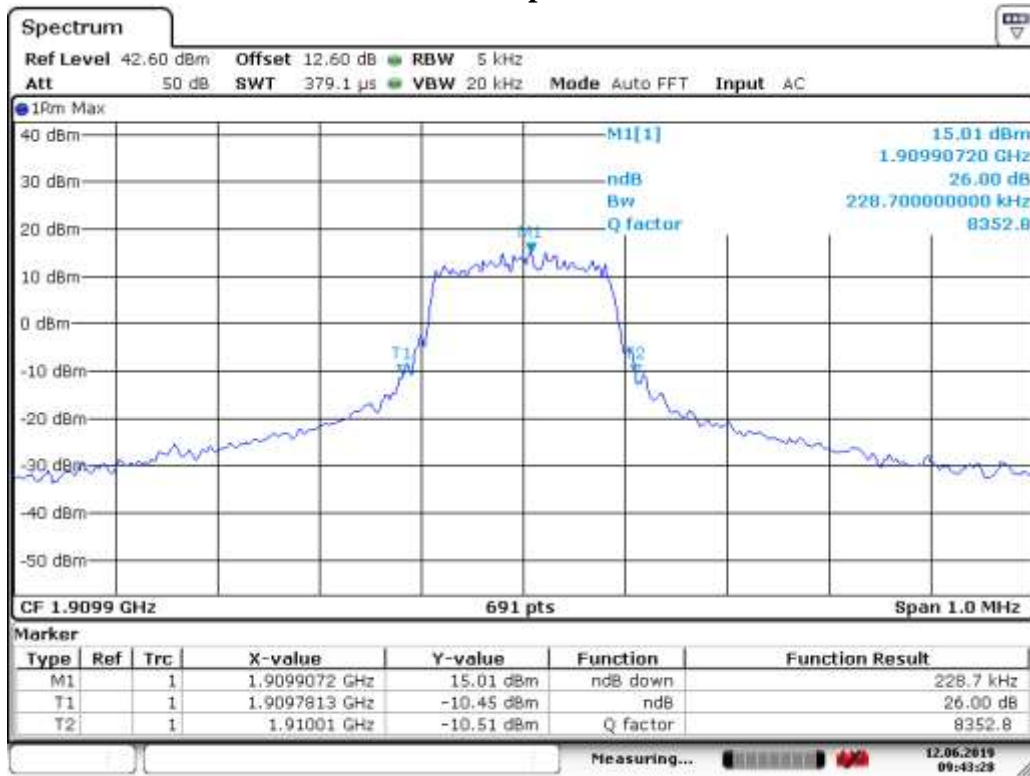
NB-IoT In-band band 2 19199 QPSK(99%)



Date: 5.SEP.2019 14:16:39

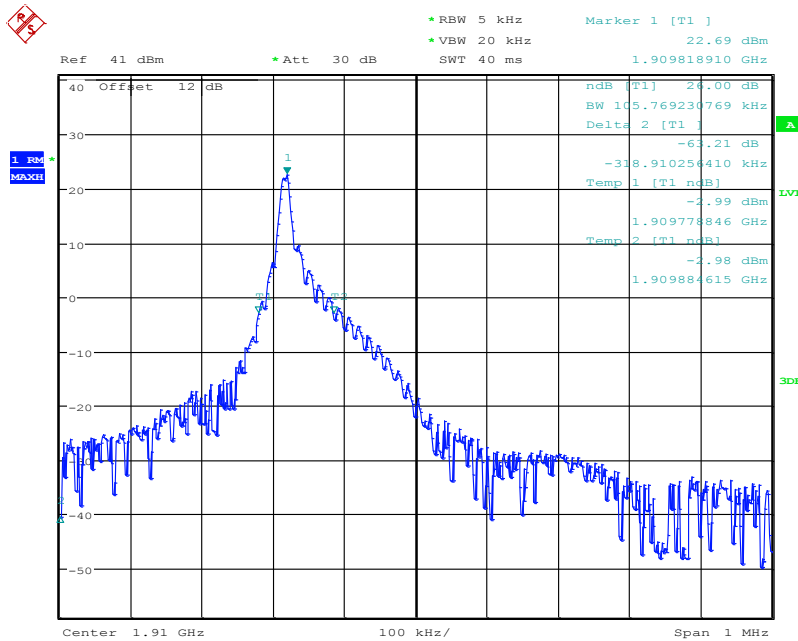
NB-IoT In-band band 2 19199 BPSK(99%)





Date: 12 JUN.2019 09:43:28

NB-IoT In-band band 2 19199 QPSK(26dB)



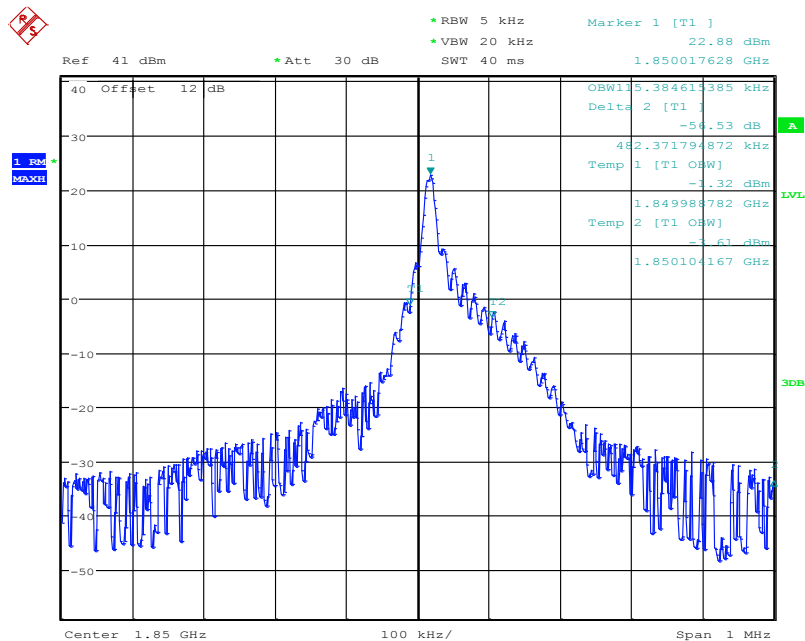
Date: 5.SEP.2019 14:16:27

NB-IoT In-band band 2 19199 BPSK(26dB)



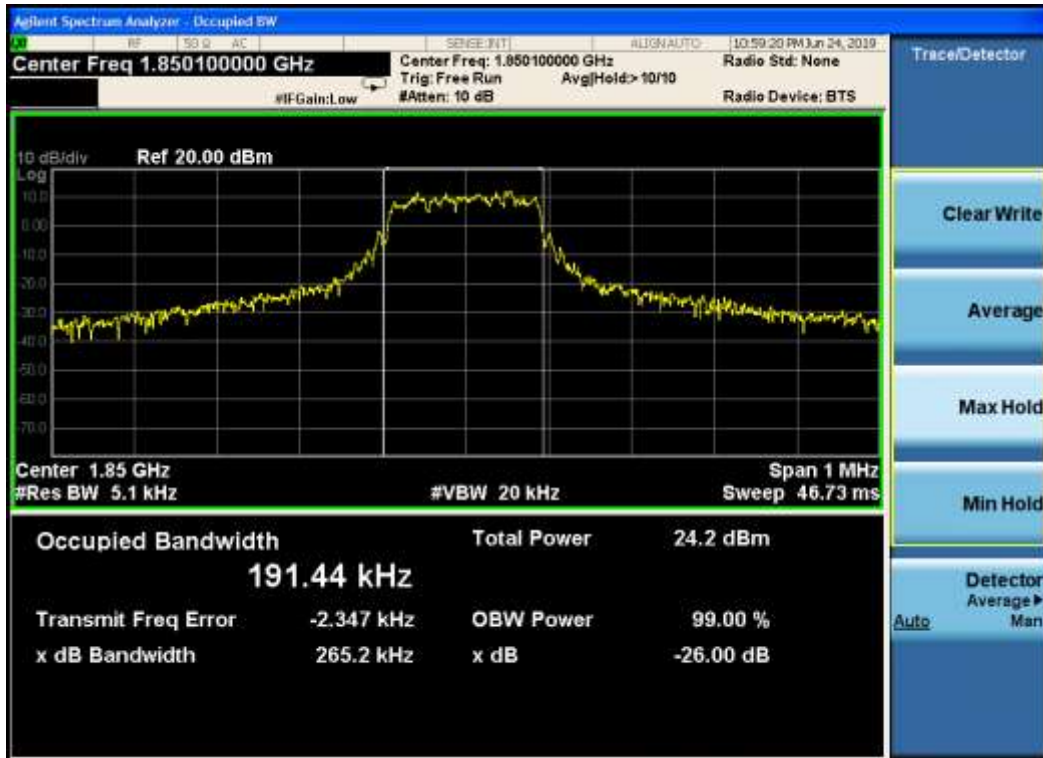


NB-IoT Guard-band band 2 18601 QPSK(99%)

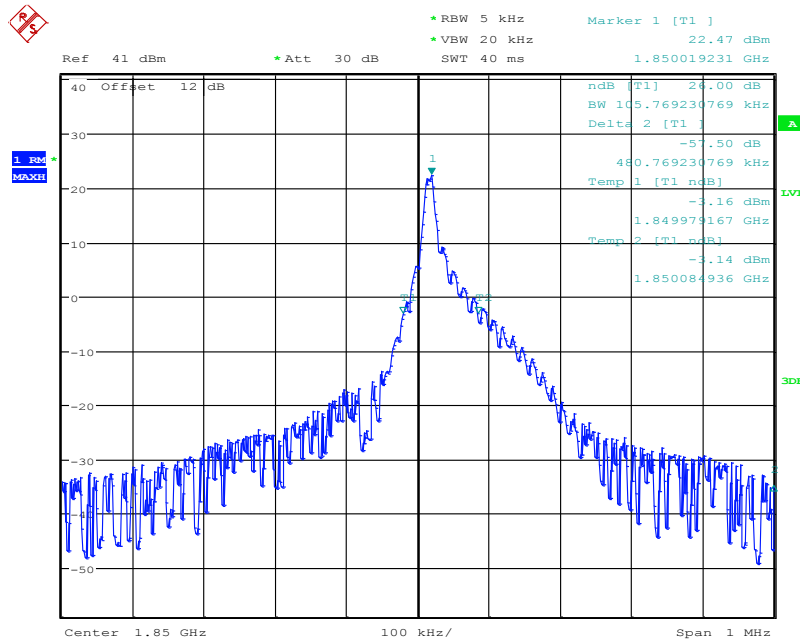


Date: 5.SEP.2019 14:19:39

NB-IoT Guard-band band 2 18601 BPSK(99%)

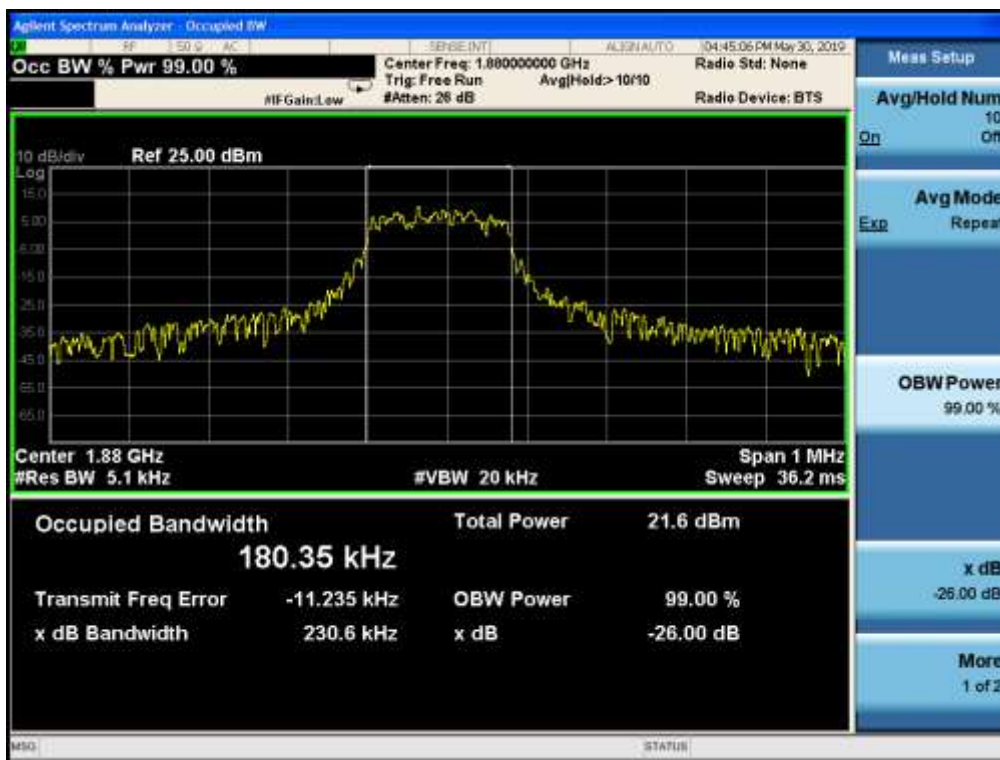


NB-IoT Guard-band band 2 18601 QPSK(26dB)

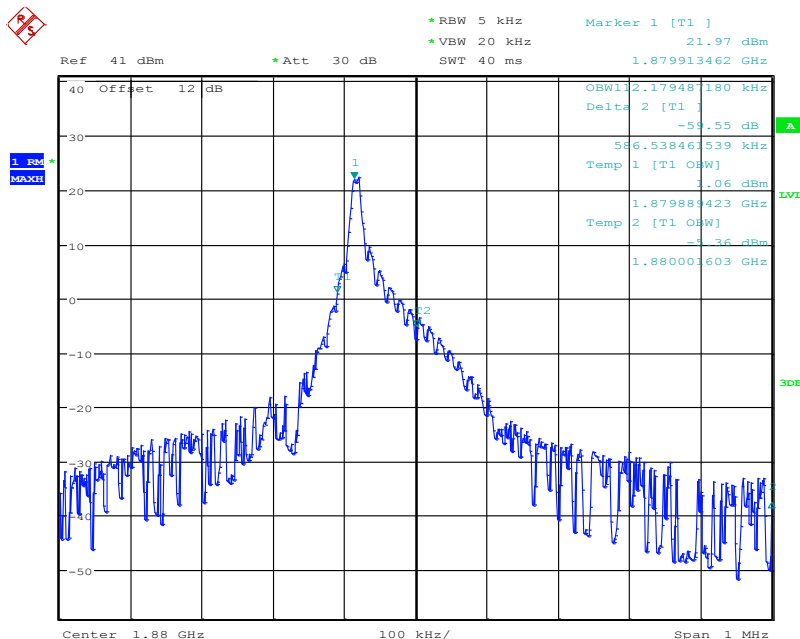


Date: 5.SEP.2019 14:19:52

NB-IoT Guard-band band 2 18601 BPSK(26dB)



NB-IoT Guard-band band 2 18900 QPSK(99%)

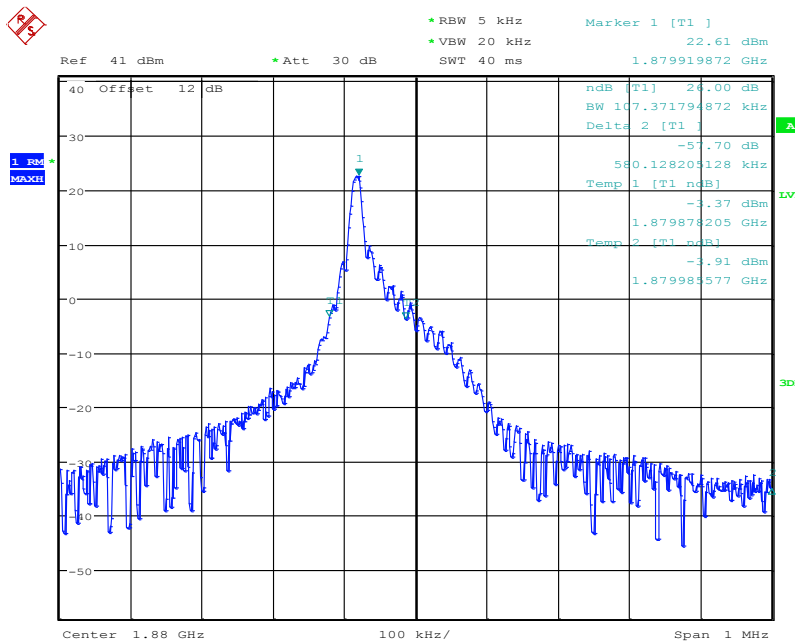


Date: 5.SEP.2019 14:18:59

NB-IoT Guard-band band 2 18900 BPSK(99%)

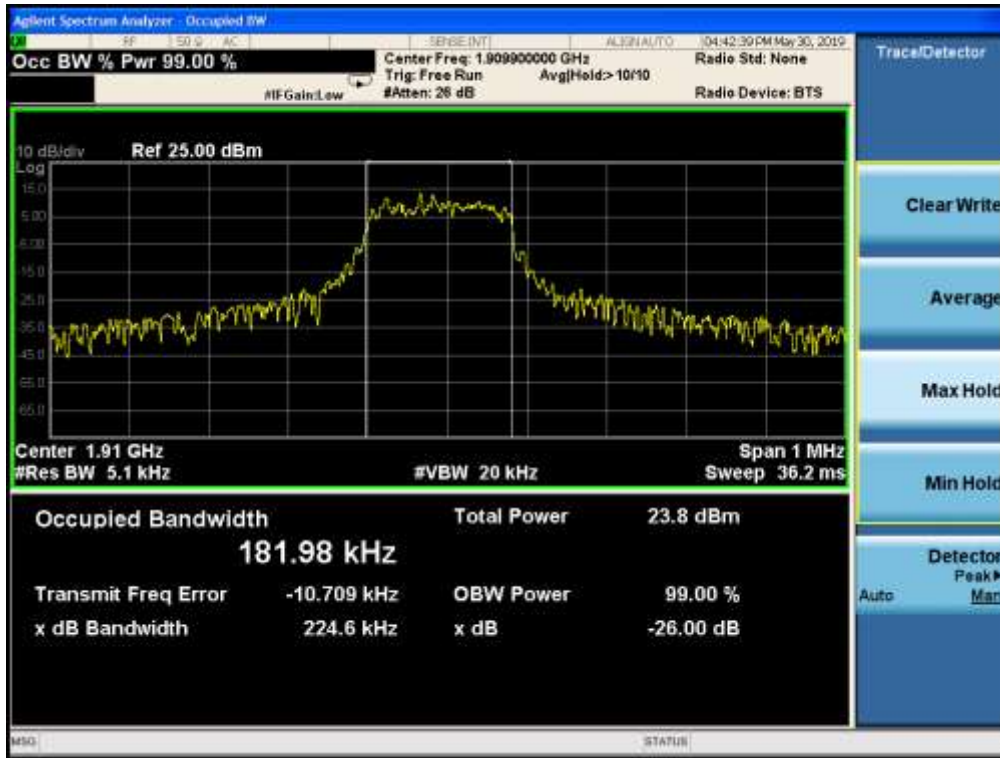


NB-IoT Guard-band band 2 18900 QPSK(26dB)

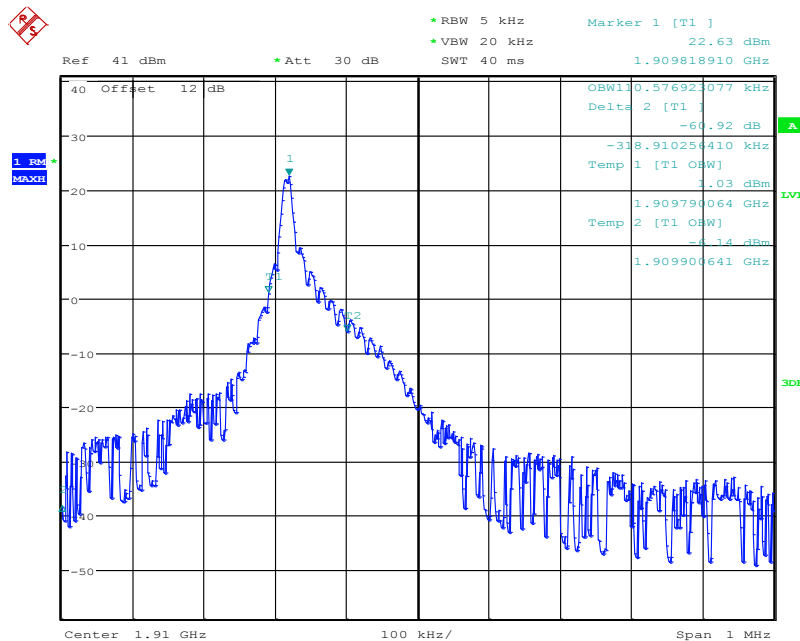


Date: 5.SEP.2019 14:18:46

NB-IoT Guard-band band 2 18900 BPSK(26dB)

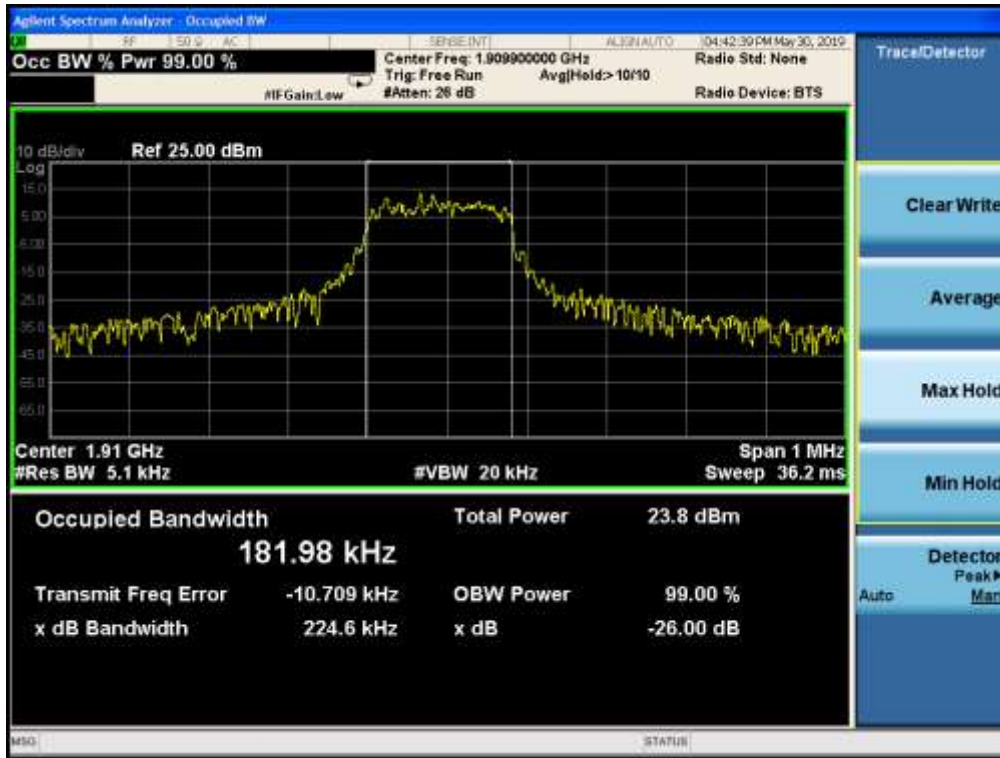


NB-IoT Guard-band band 2 19199 QPSK(99%)

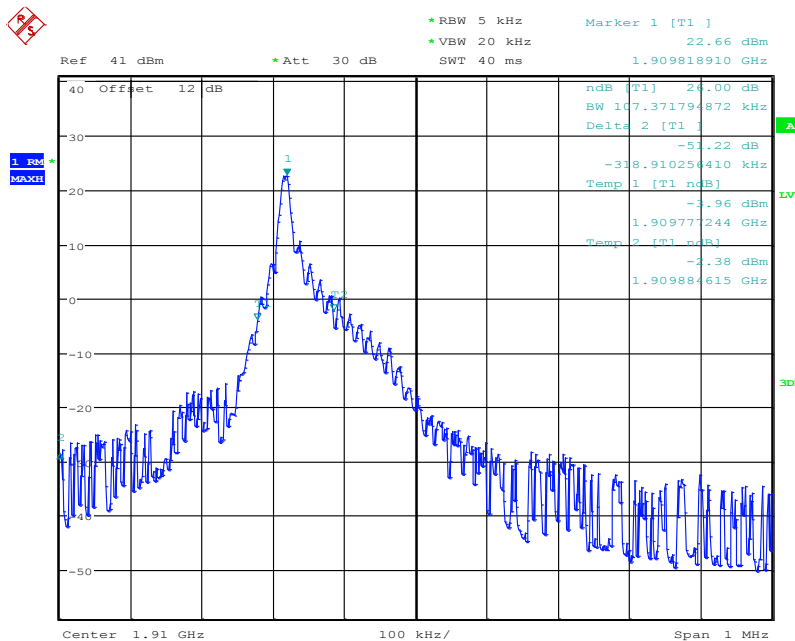


Date: 5.SEP.2019 14:20:42

NB-IoT Guard-band band 2 19199 BPSK(99%)



NB-IoT Guard-band band 2 19199 QPSK(26dB)

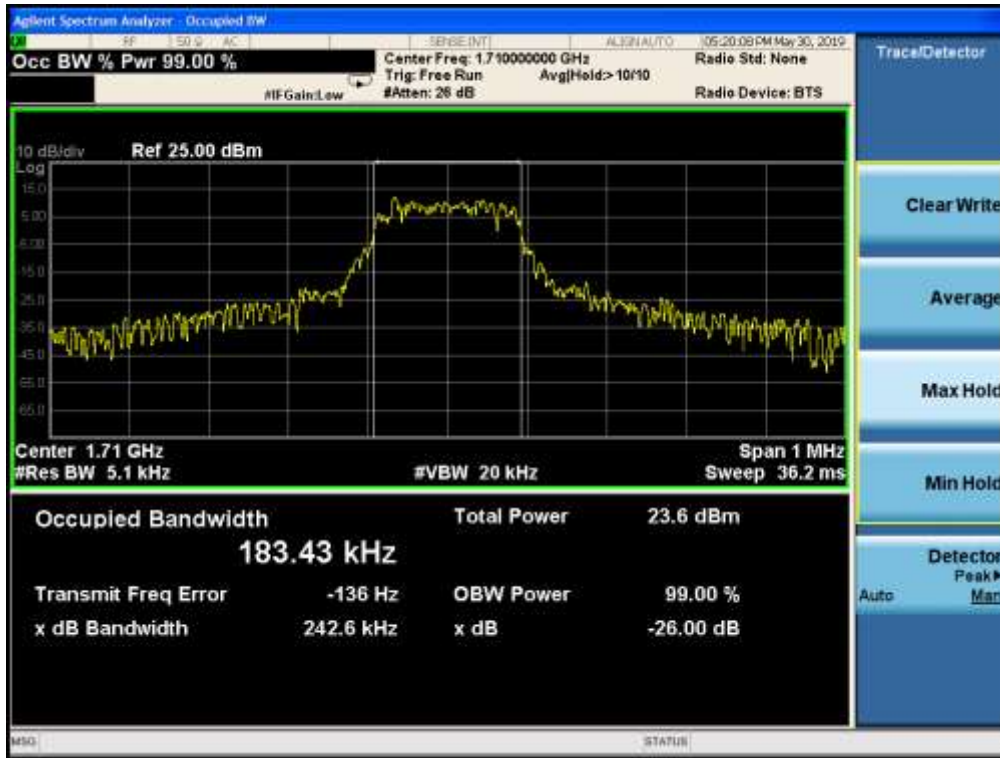


Date: 5.SEP.2019 14:20:28

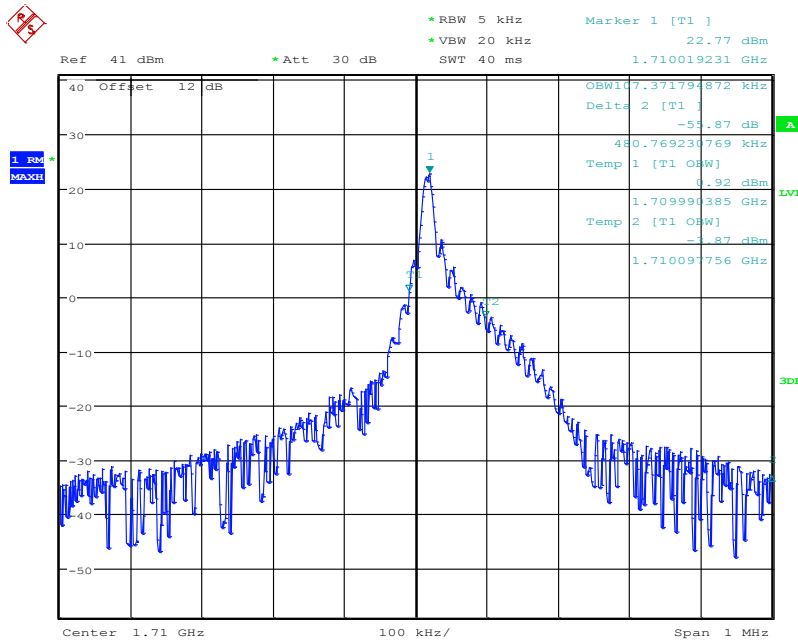
NB-IoT Guard-band band 2 19199 BPSK(26dB)



Graphical results for Band4:

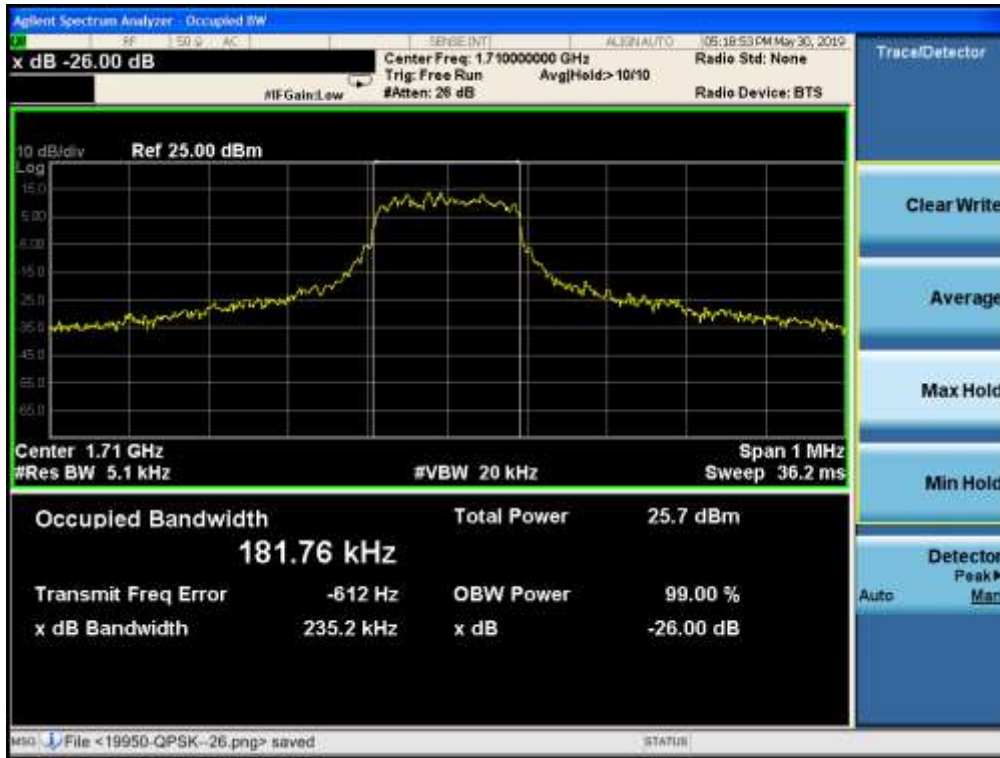


NB-IoT standalone band 4 19951 QPSK(99%)

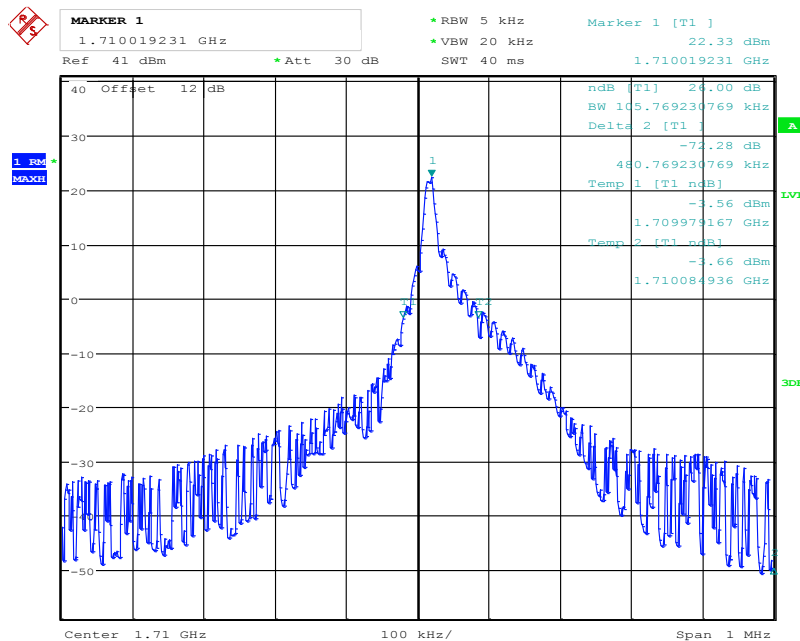


Date: 5.SEP.2019 14:28:52

NB-IoT standalone band 4 19951 BPSK(99%)



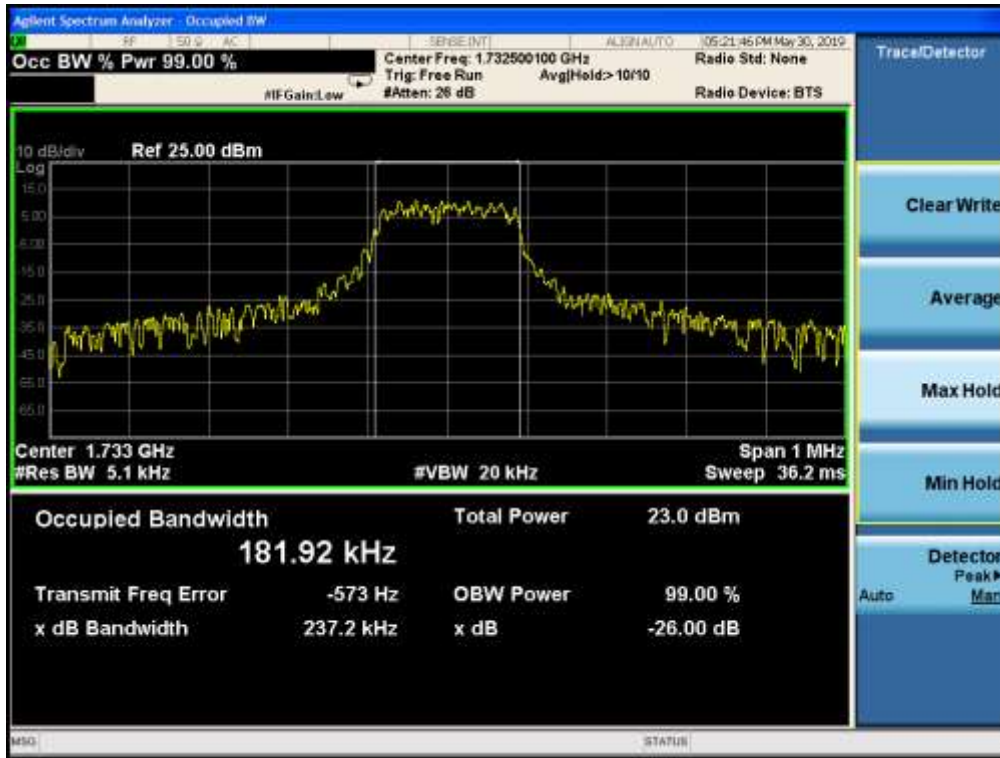
NB-IoT standalone band 4 19951 QPSK(26dB)



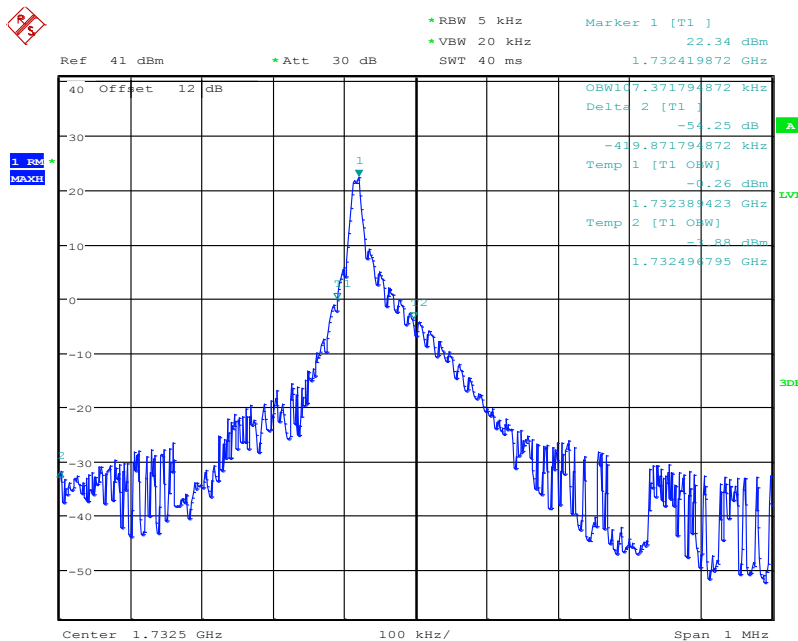
Date: 5.SEP.2019 14:29:03

NB-IoT standalone band 4 19951 BPSK(26dB)



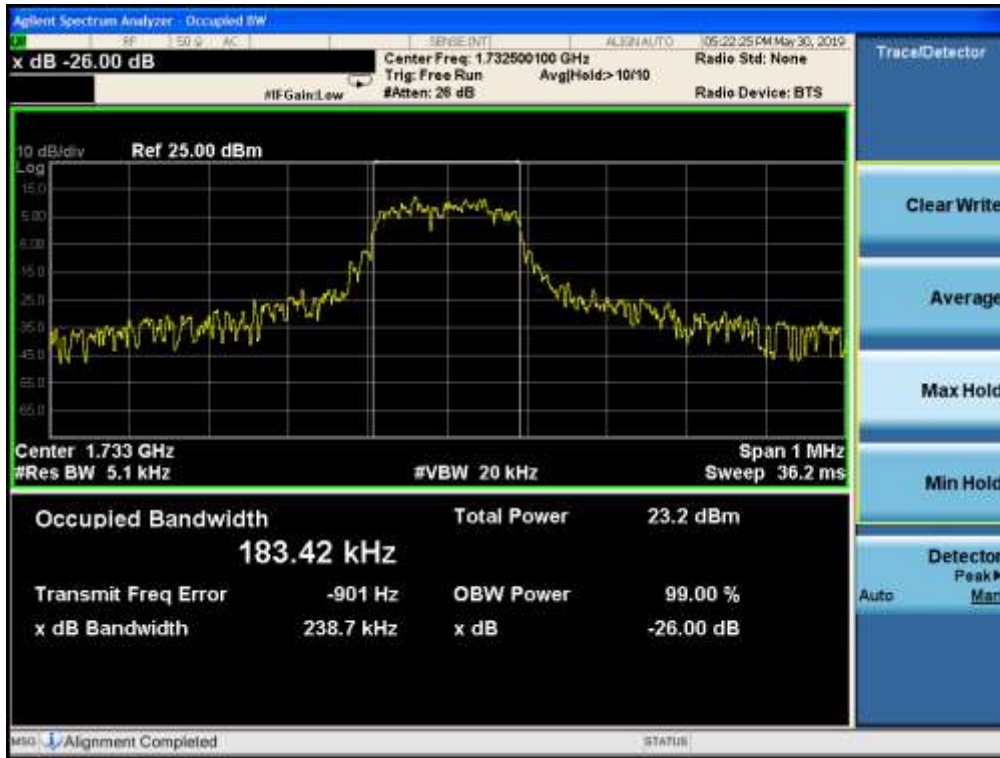


NB-IoT standalone band 4 20175 QPSK(99%)

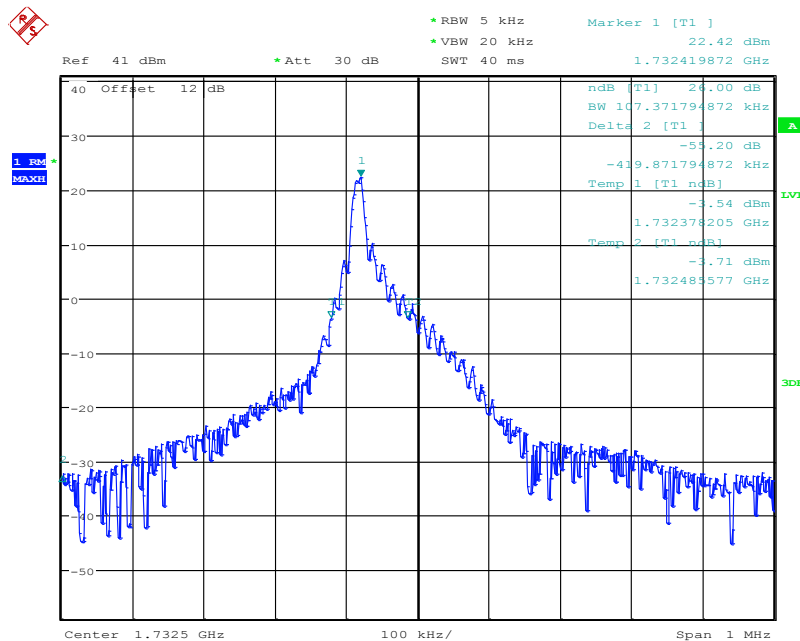


Date: 5.SEP.2019 14:30:01

NB-IoT standalone band 4 20175 BPSK(99%)



NB-IoT standalone band 4 20175 QPSK(26dB)

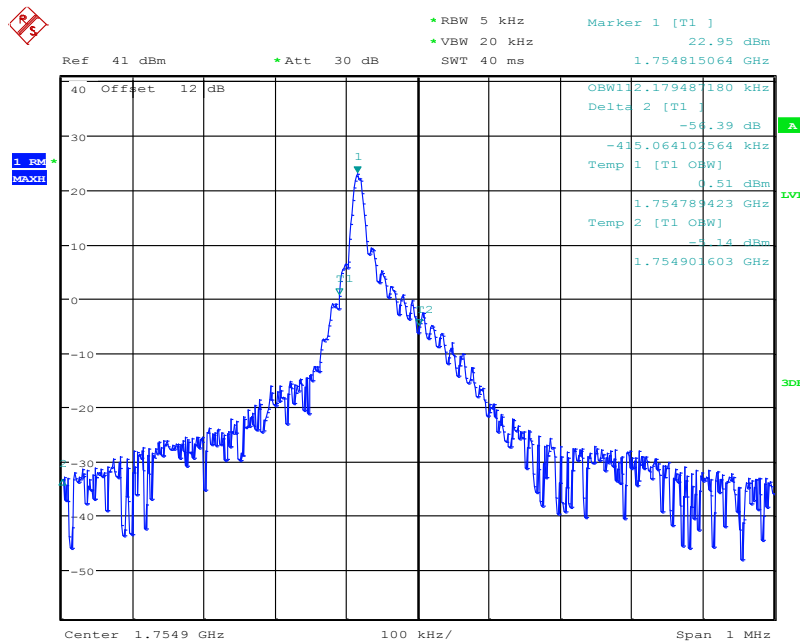


Date: 5.SEP.2019 14:29:48

NB-IoT standalone band 4 20175 BPSK(26dB)

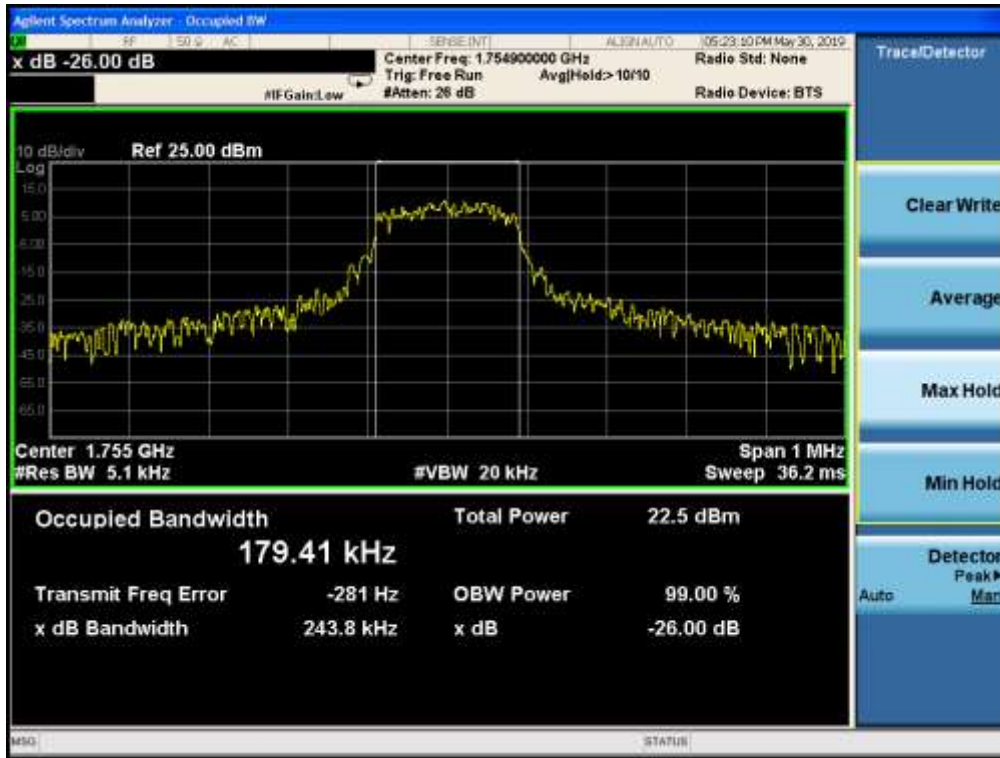


NB-IoT standalone band 4 20399 QPSK(99%)

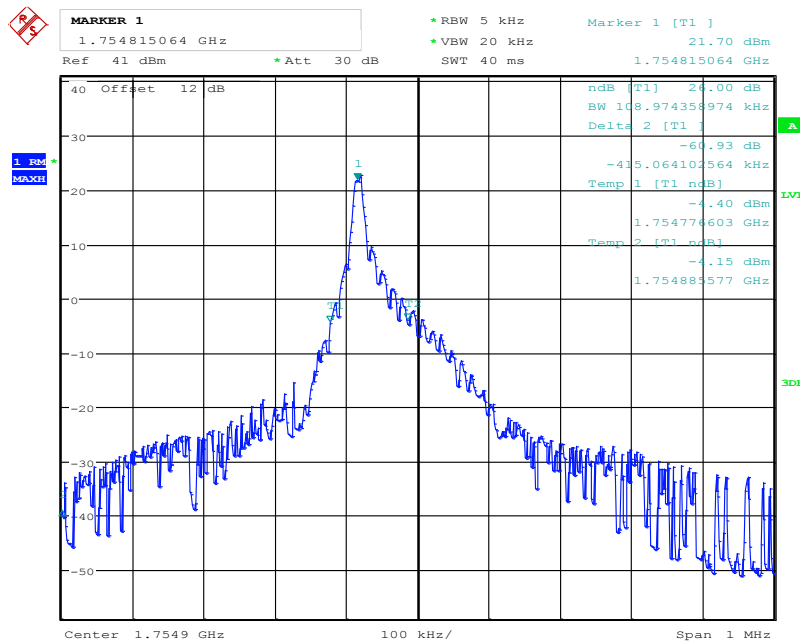


Date: 5.SEP.2019 14:30:33

NB-IoT standalone band 4 20399 BPSK(99%)

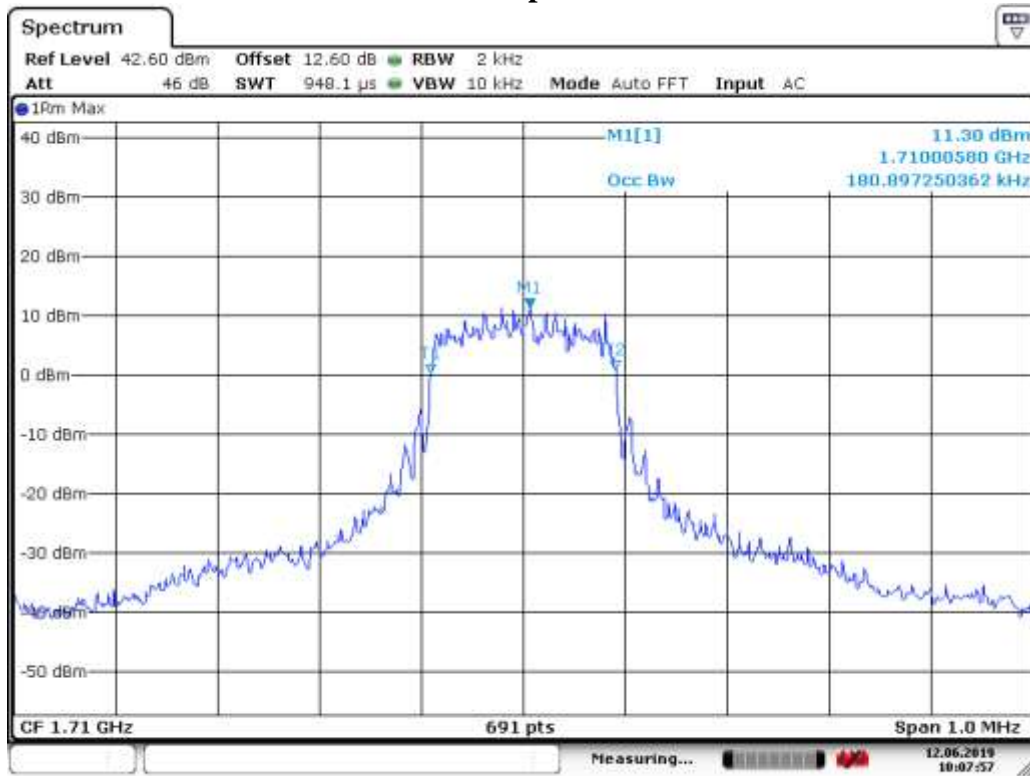


NB-IoT standalone band 4 20399 QPSK(26dB)



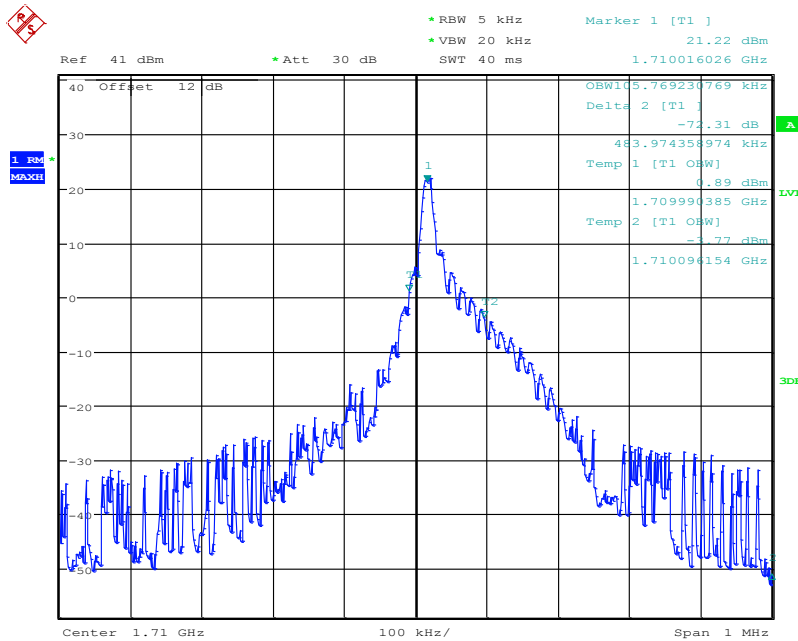
Date: 5.SEP.2019 14:30:43

NB-IoT standalone band 4 20399 BPSK(26dB)



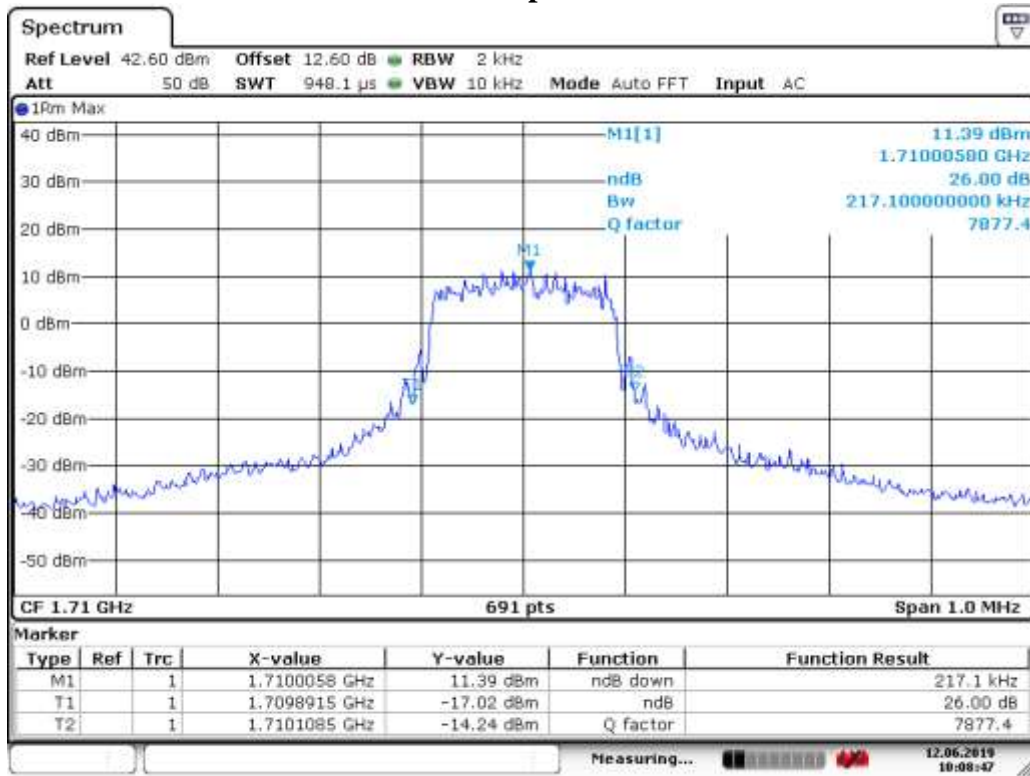
Date: 12 JUN.2019 10:07:57

NB-IoT In-band band 4 19951 QPSK(99%)



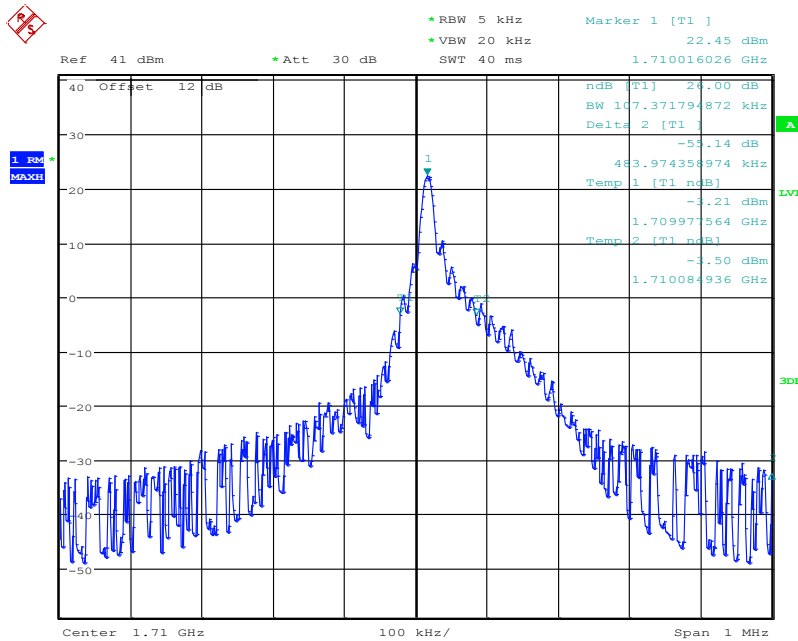
Date: 5.SEP.2019 14:28:19

NB-IoT In-band band 4 19951 BPSK(99%)



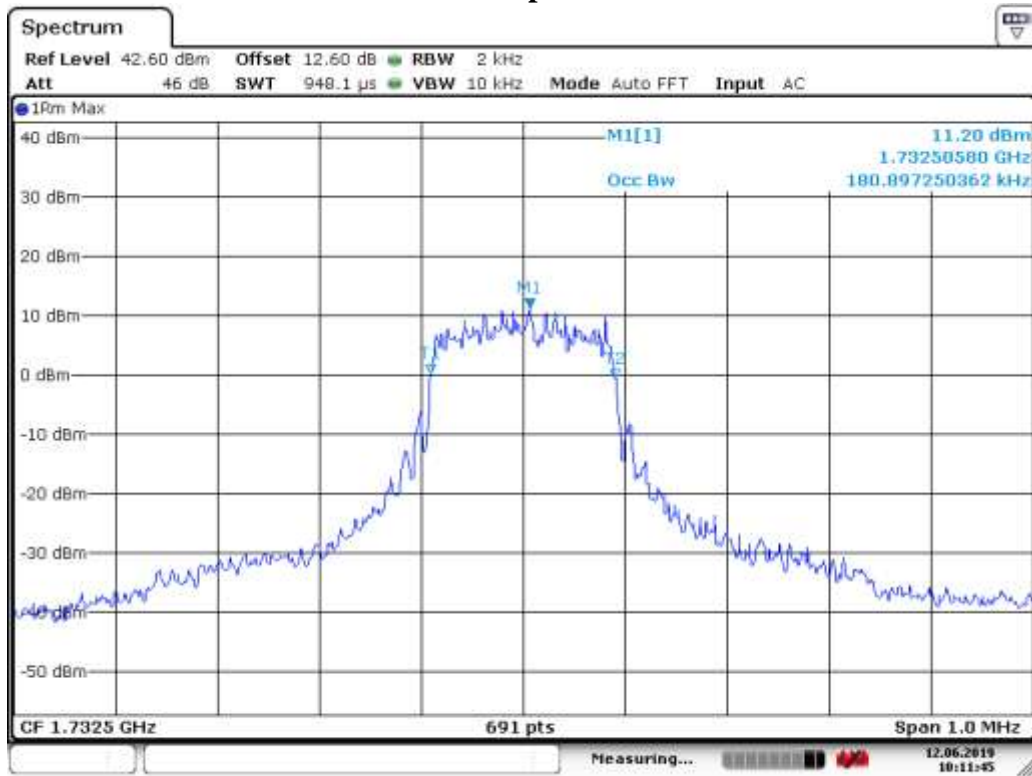
Date: 12 JUN.2019 10:08:47

NB-IoT In-band band 4 19951 QPSK(26dB)



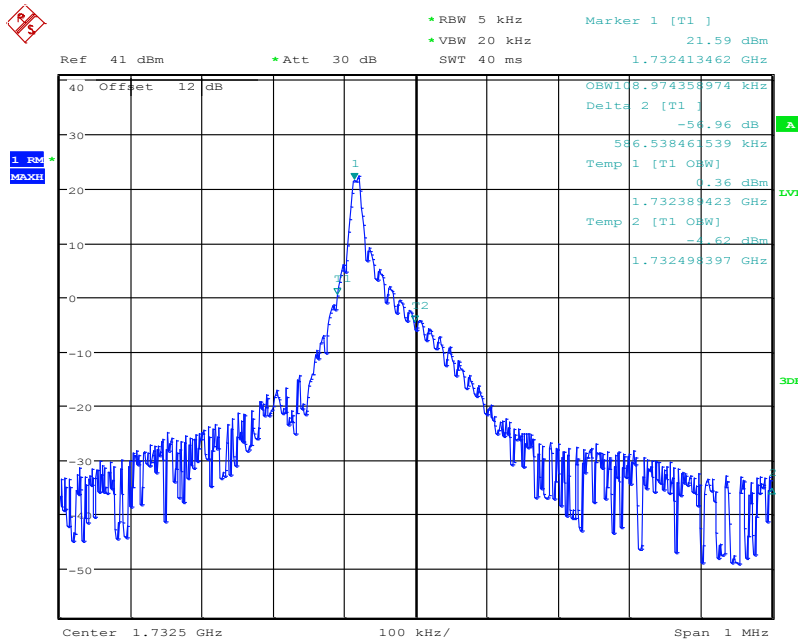
Date: 5.SEP.2019 14:28:08

NB-IoT In-band band 4 19951 BPSK(26dB)



Date: 12 JUN.2019 10:11:46

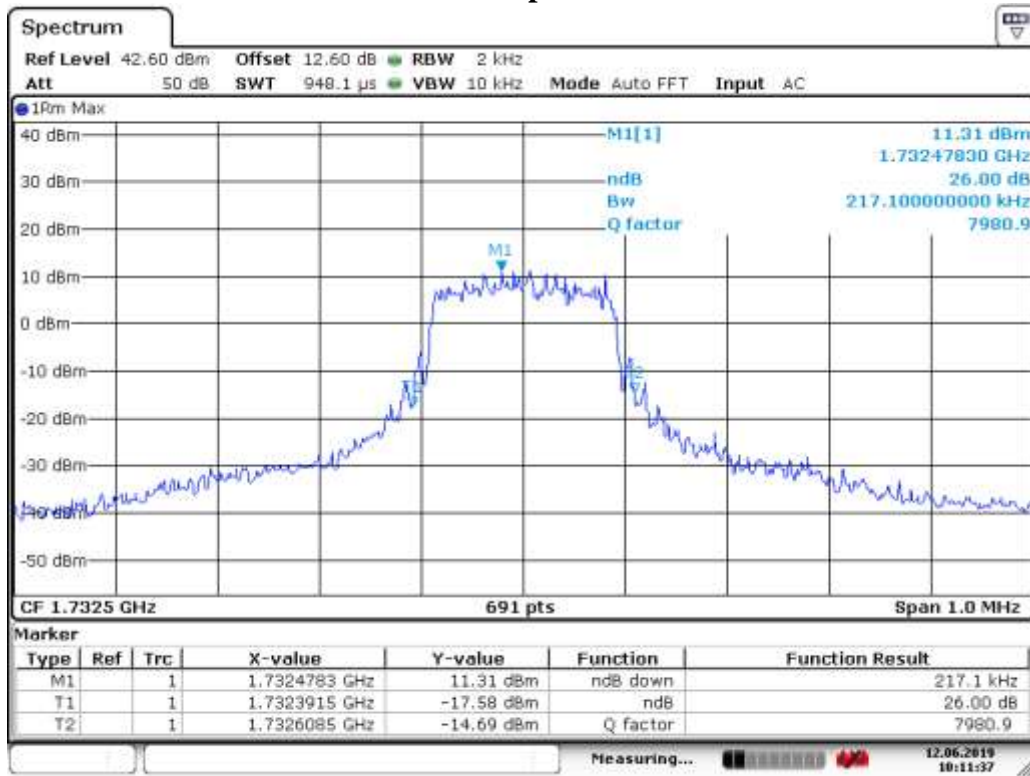
NB-IoT In-band band 4 20175 QPSK(99%)



Date: 5.SEP.2019 14:27:31

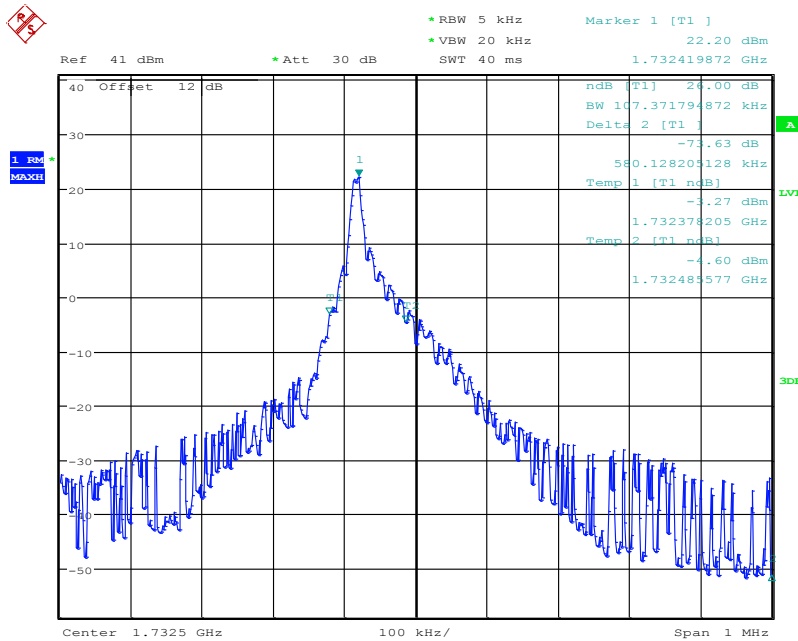
NB-IoT In-band band 4 20175 BPSK(99%)





Date: 12 JUN.2019 10:11:37

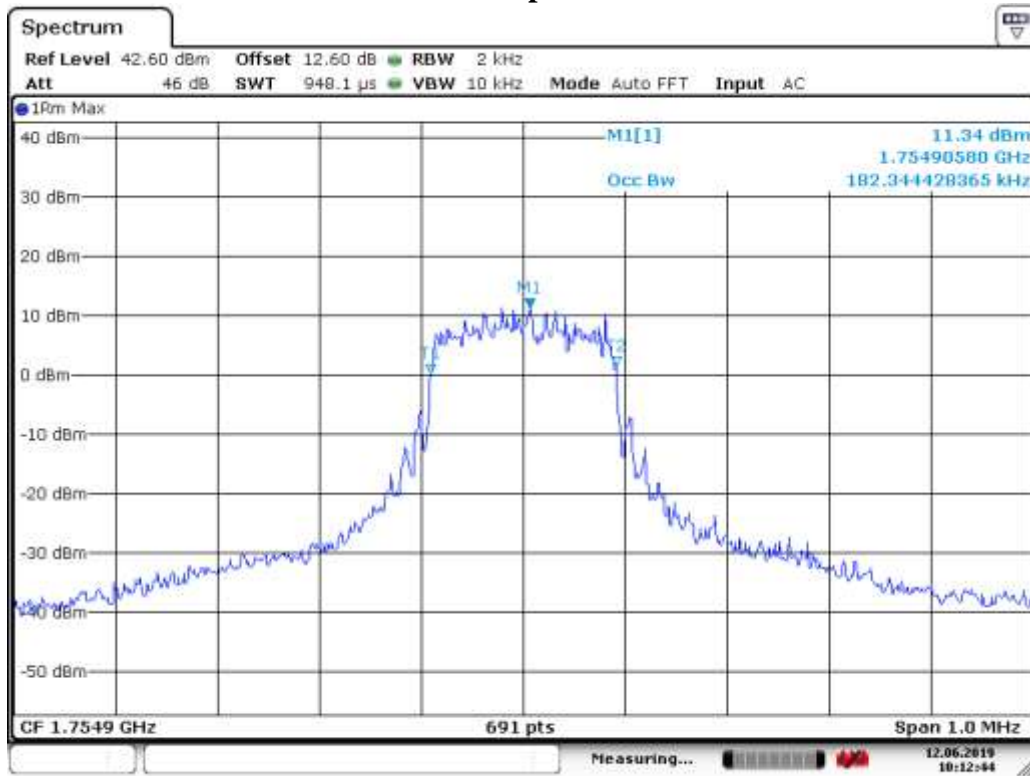
NB-IoT In-band band 4 20175 QPSK(26dB)



Date: 5.SEP.2019 14:27:42

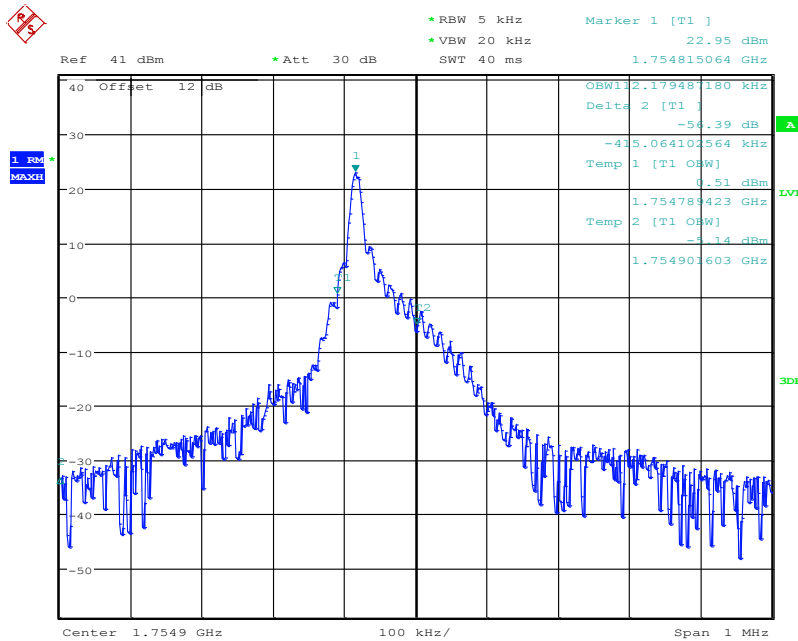
NB-IoT In-band band 4 20175 BPSK(26dB)





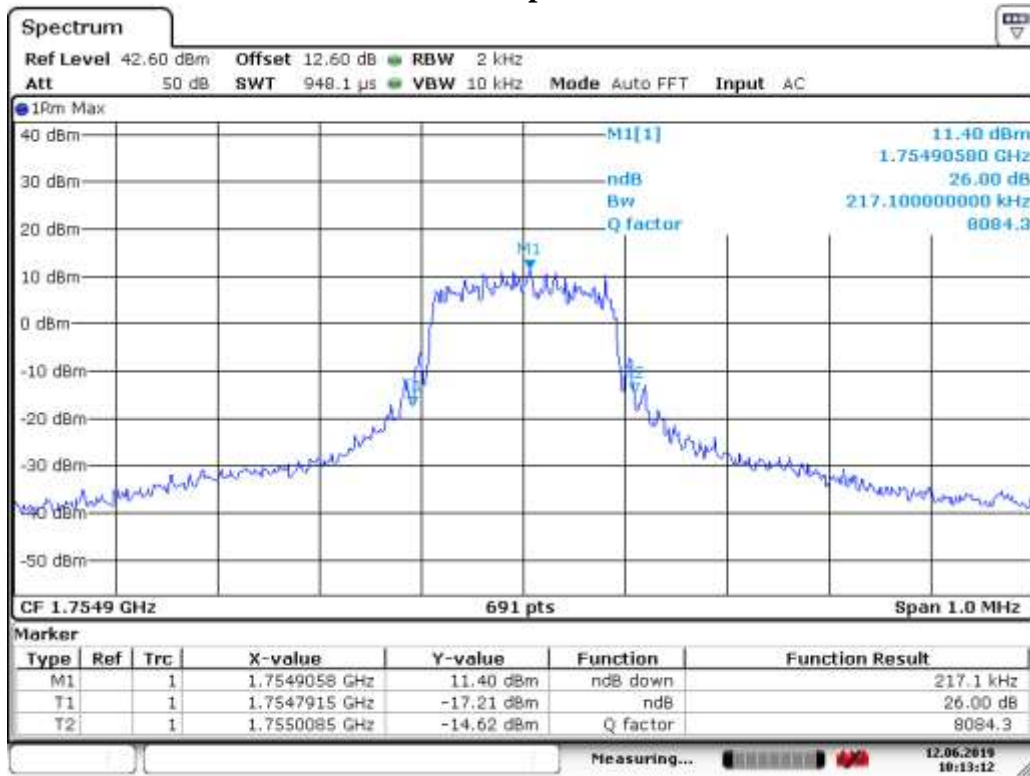
Date: 12 JUN.2019 10:12:44

NB-IoT In-band band 4 20399 QPSK(99%)



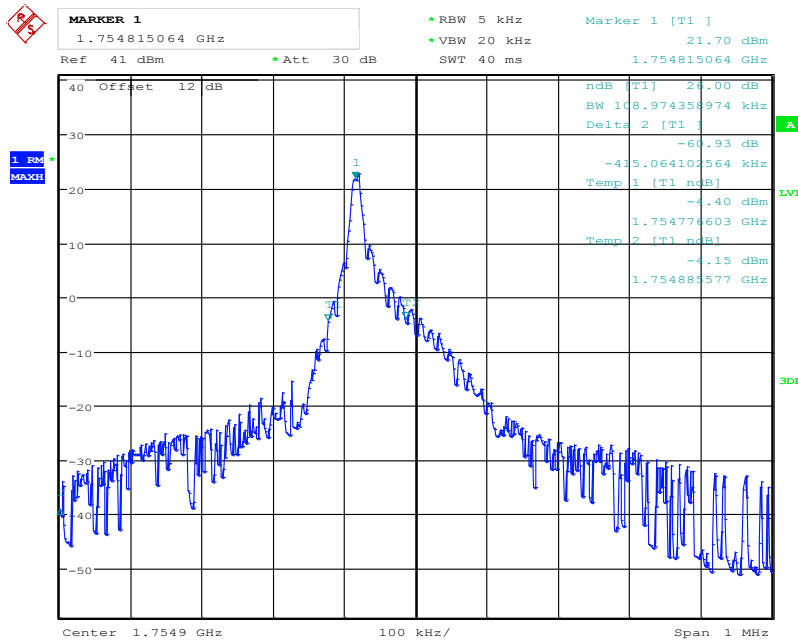
Date: 5.SEP.2019 14:30:33

NB-IoT In-band band 4 20399 BPSK(99%)



Date: 12 JUN.2019 10:13:11

NB-IoT In-band band 4 20399 QPSK(26dB)

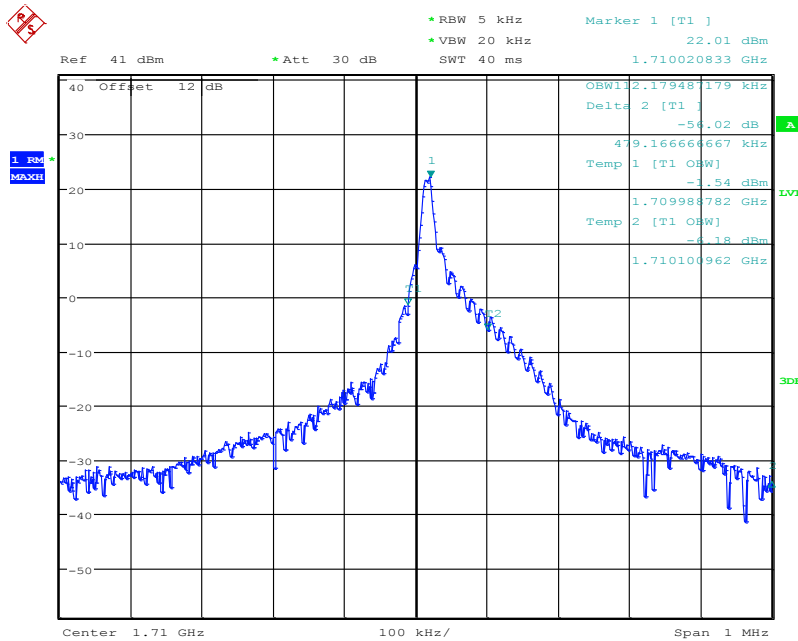


Date: 5.SEP.2019 14:30:43

NB-IoT In-band band 4 20399 BPSK(26dB)



NB-IoT Guard-band band 4 19951 QPSK(99%)

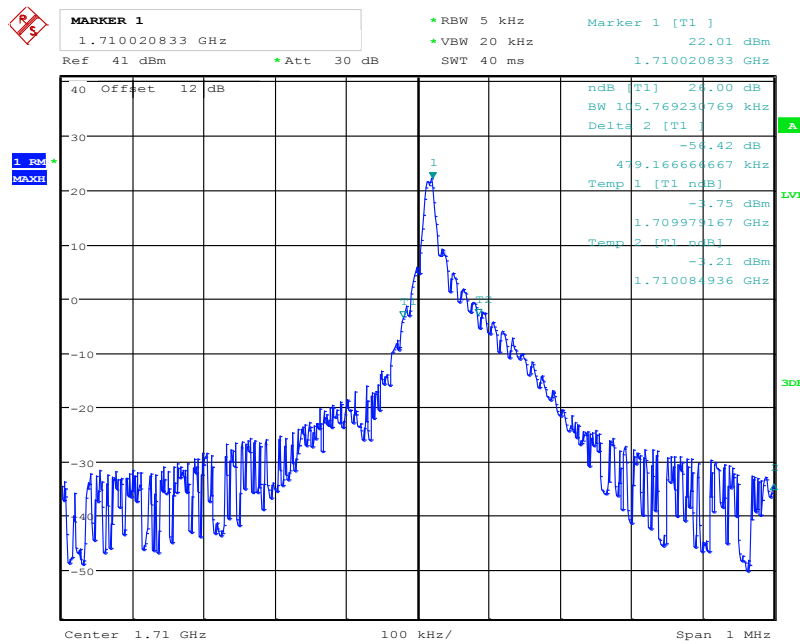


Date: 5.SEP.2019 14:24:14

NB-IoT Guard-band band 4 19951 BPSK(99%)

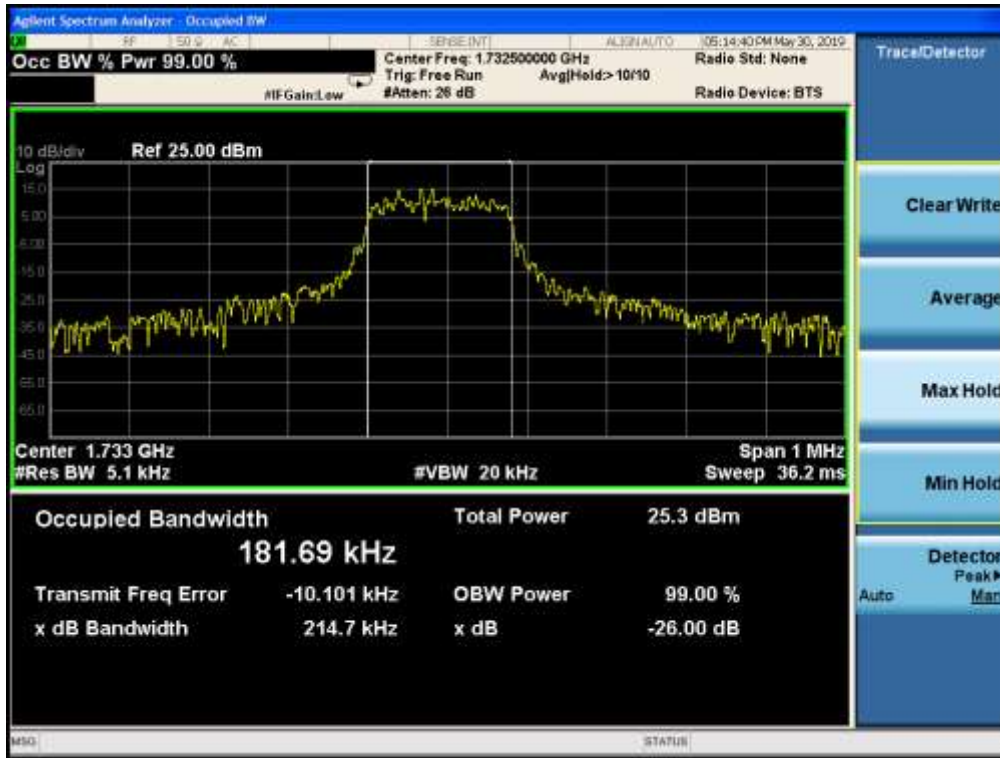


NB-IoT Guard-band band 4 19951 QPSK(26dB)

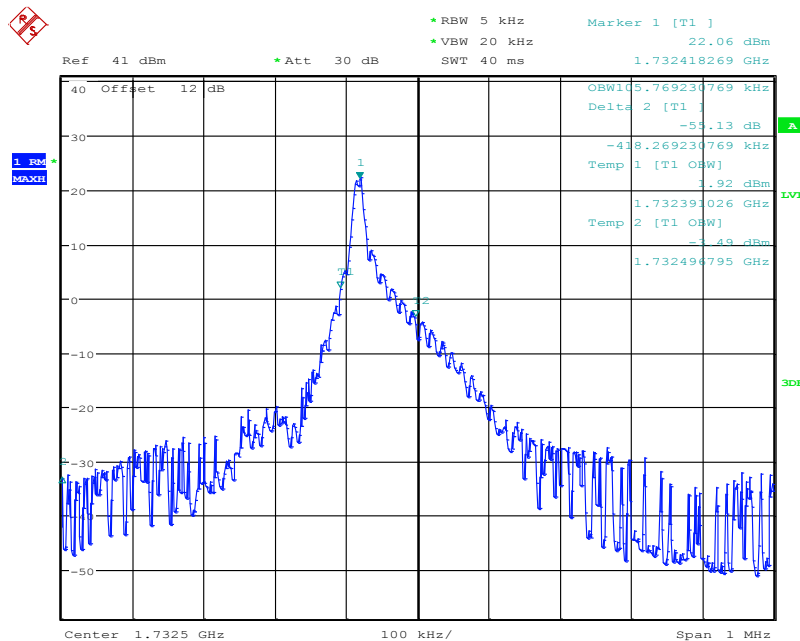


Date: 5.SEP.2019 14:24:29

NB-IoT Guard-band band 4 19951 BPSK(26dB)

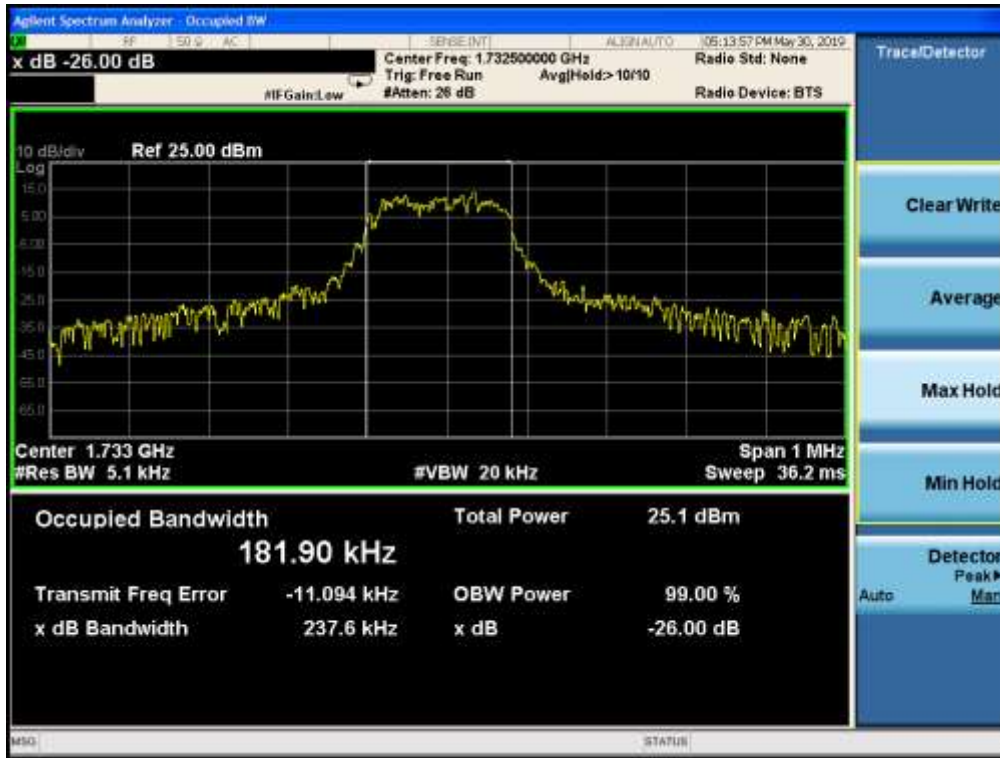


NB-IoT Guard-band band 4 20175 QPSK(99%)

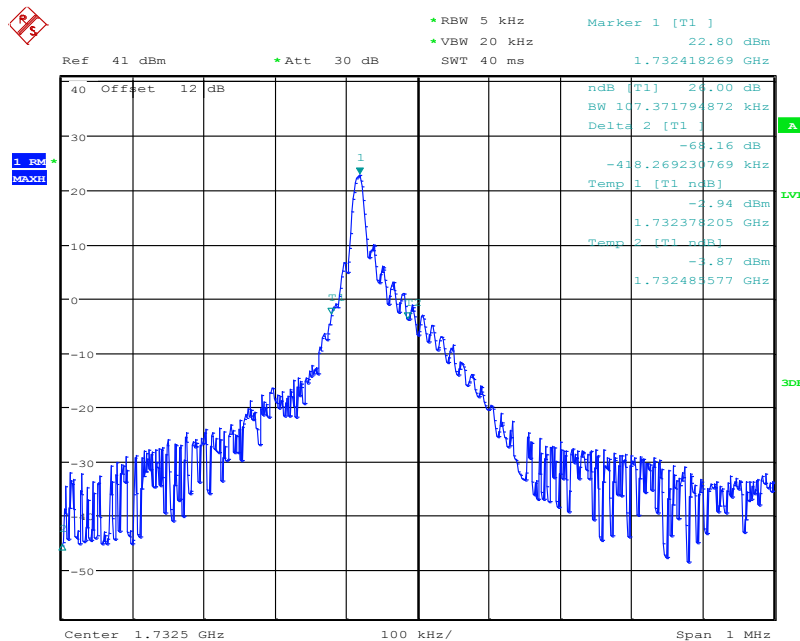


Date: 5.SEP.2019 14:25:17

NB-IoT Guard-band band 4 20175 BPSK(99%)



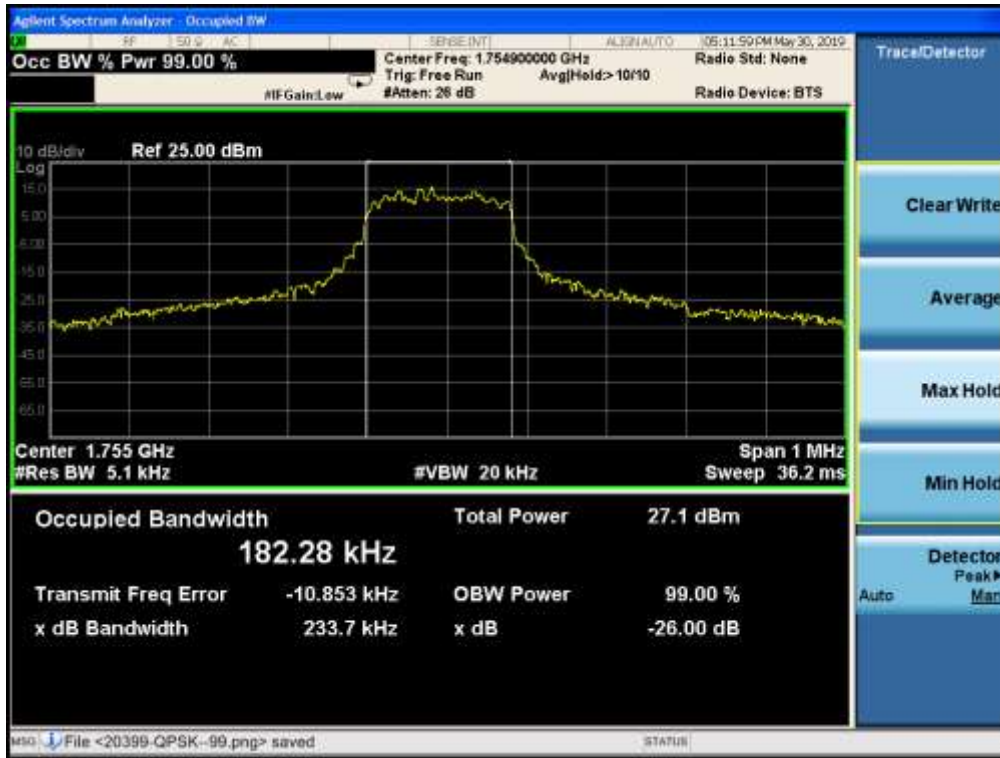
NB-IoT Guard-band band 4 20175 QPSK(26dB)



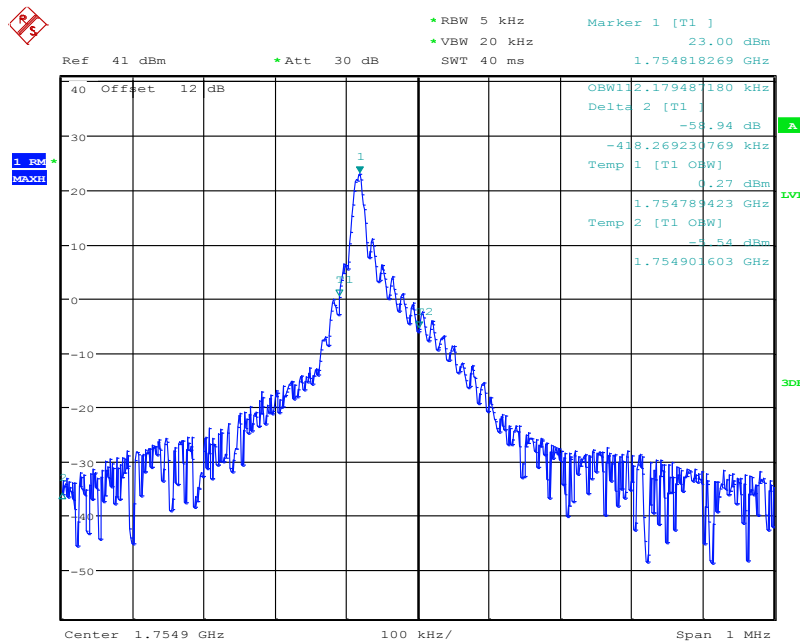
Date: 5.SEP.2019 14:25:05

NB-IoT Guard-band band 4 20175 BPSK(26dB)



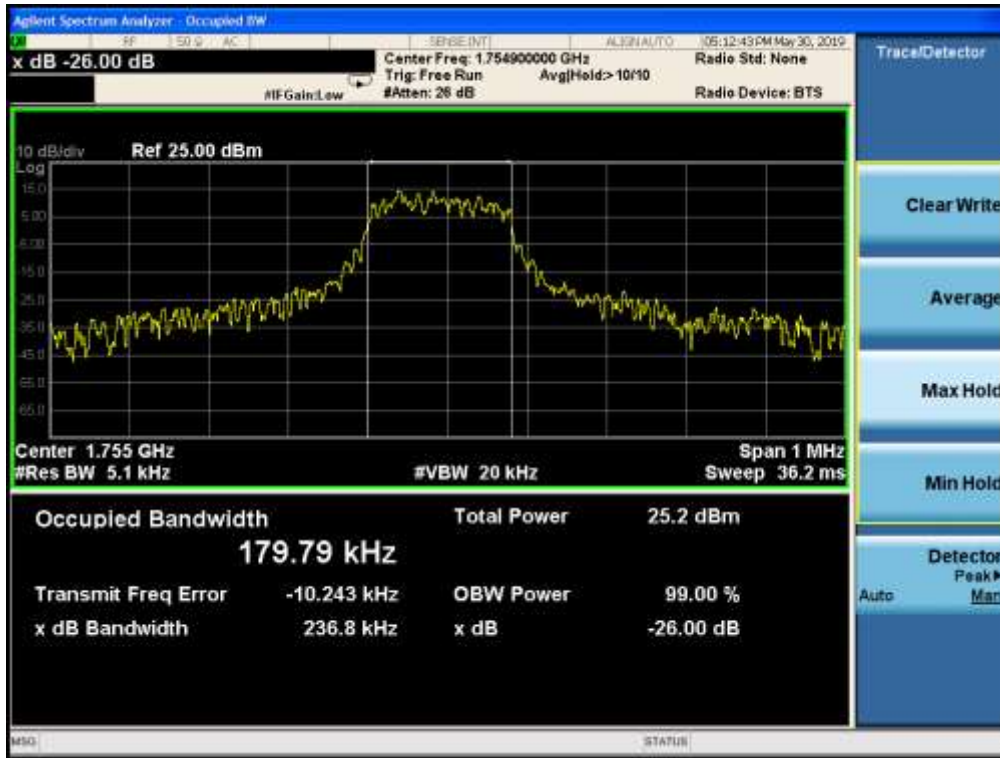


NB-IoT Guard-band band 4 20399 QPSK(99%)

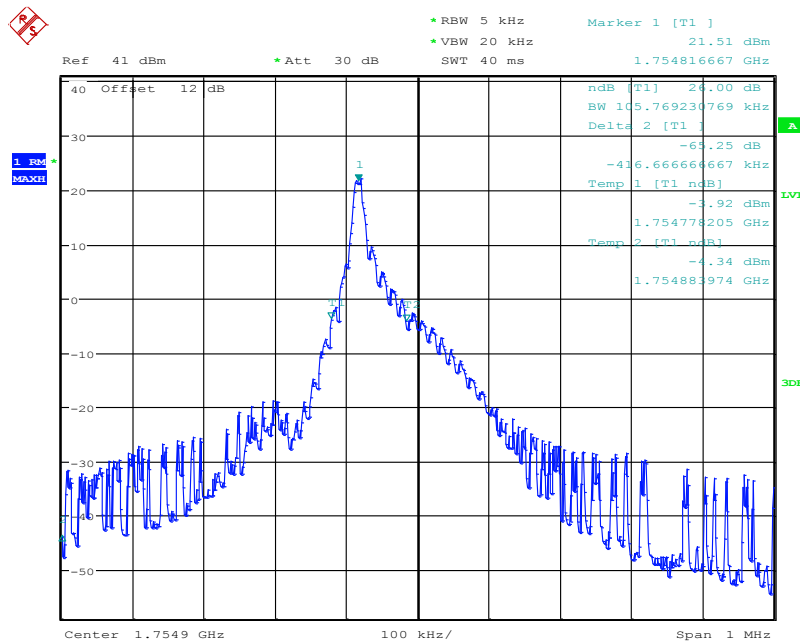


Date: 5.SEP.2019 14:25:50

NB-IoT Guard-band band 4 20399 BPSK(99%)



NB-IoT Guard-band band 4 20399 QPSK(26dB)

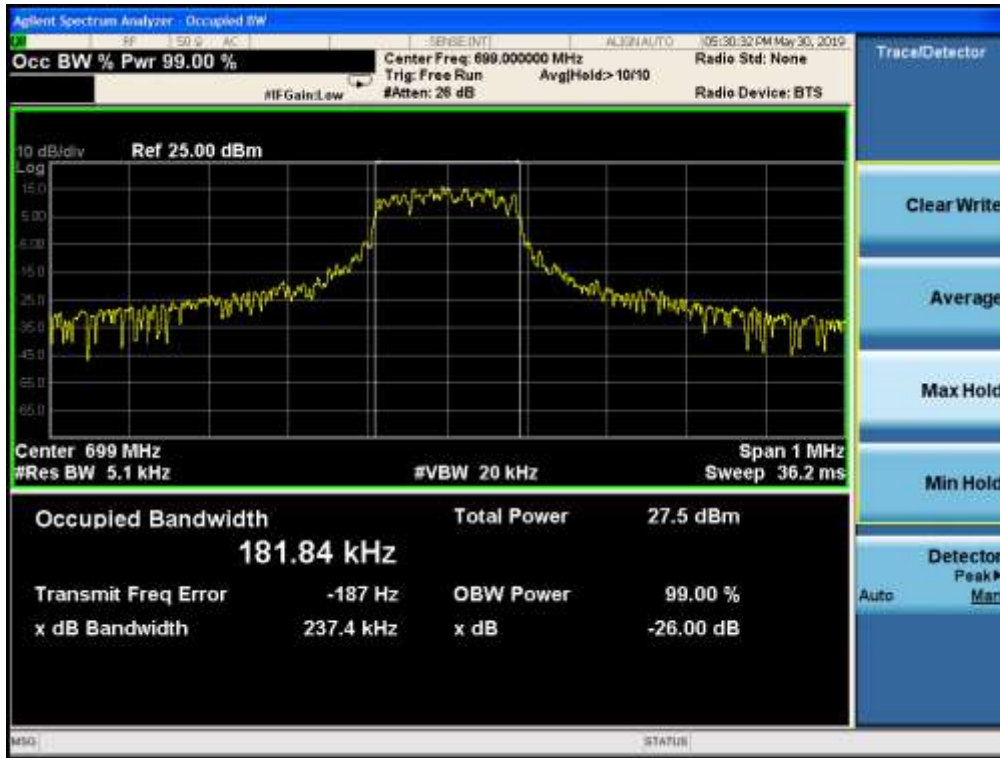


Date: 5.SEP.2019 14:26:01

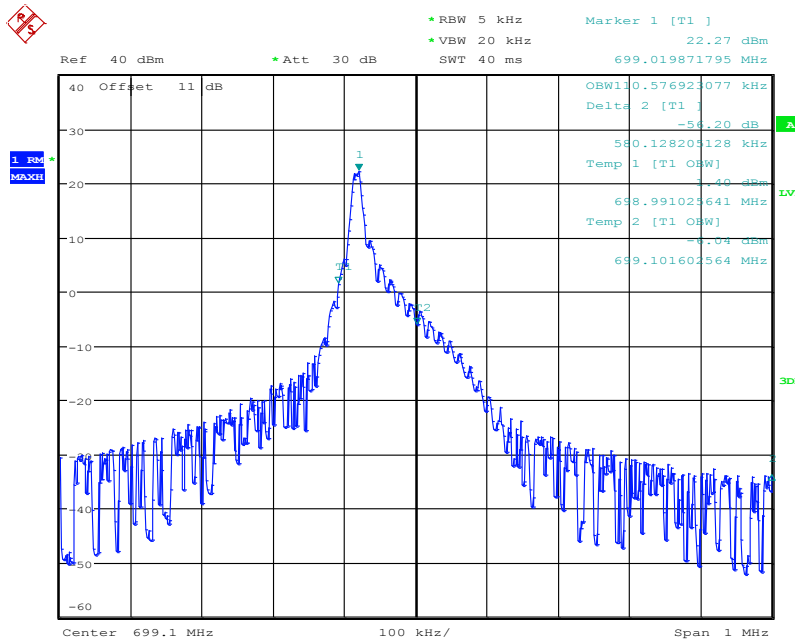
NB-IoT Guard-band band 4 20399 BPSK(26dB)



Graphical results for Band12:

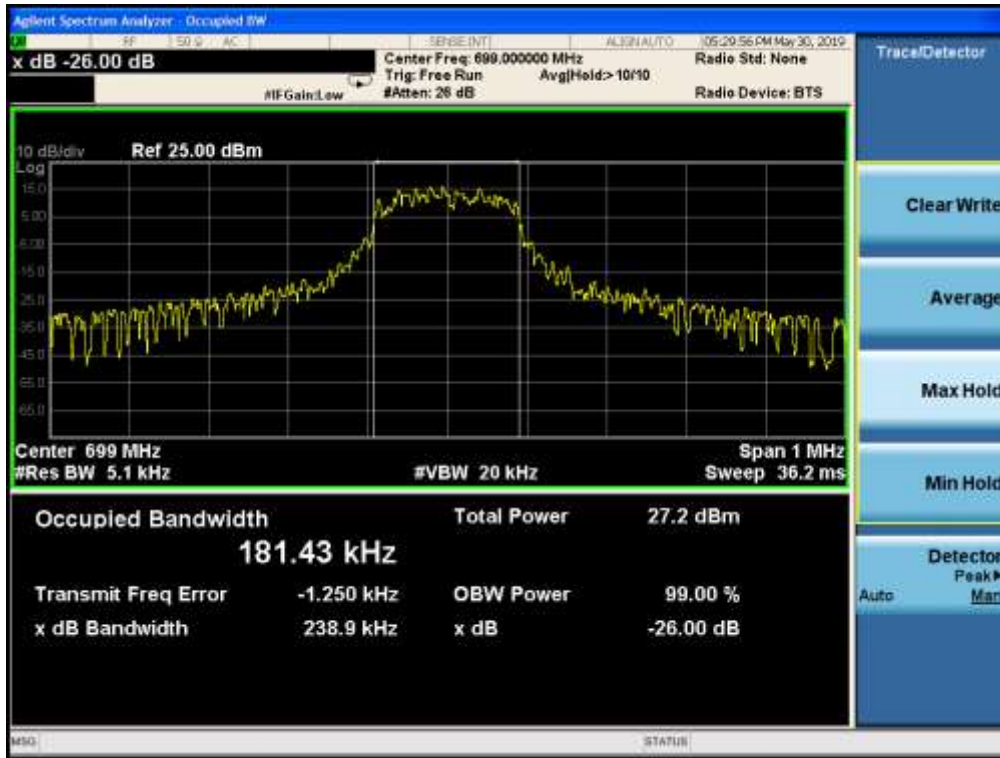


NB-IoT standalone band 12 23011 QPSK(99%)

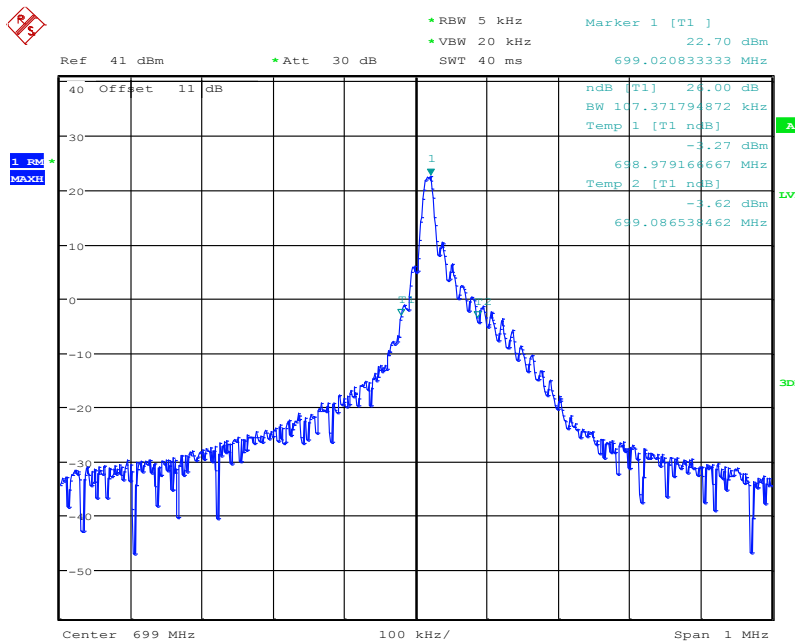


Date: 5.SEP.2019 14:32:46

NB-IoT standalone band 12 23011 BPSK(99%)

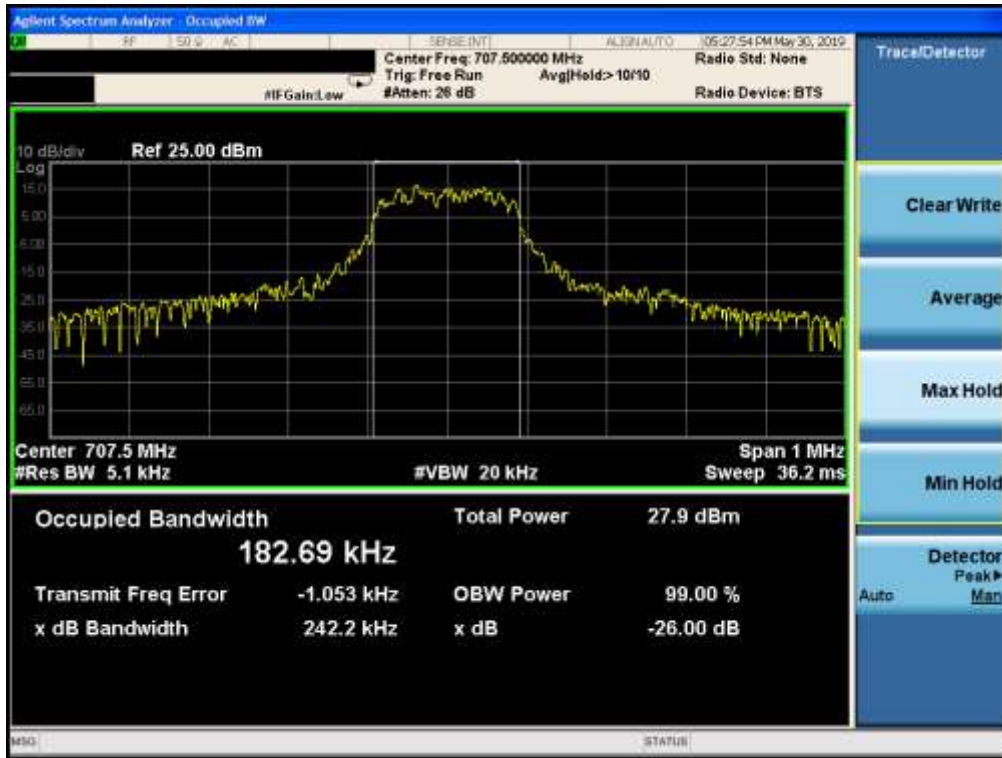


NB-IoT standalone band 12 23011 QPSK(26dB)

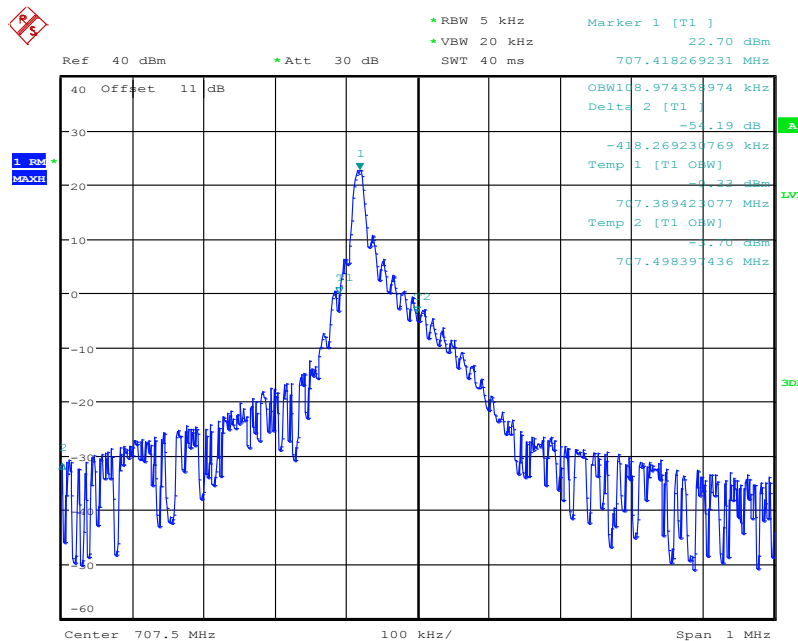


Date: 6.SEP.2019 13:15:44

NB-IoT standalone band 12 23011 BPSK(26dB)

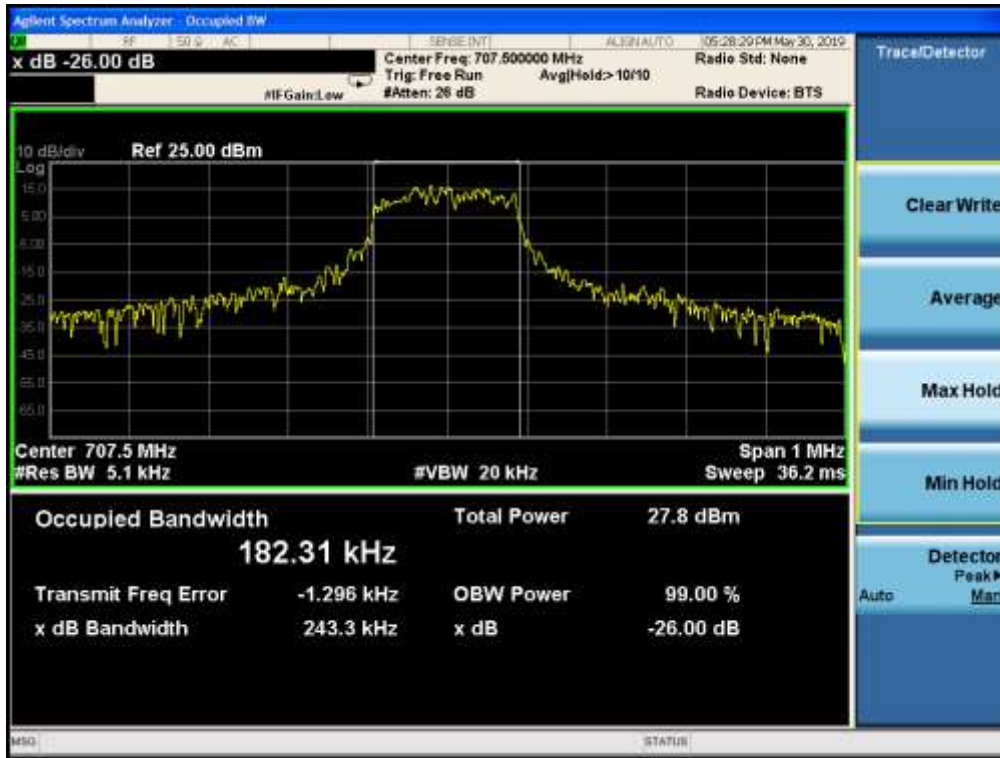


NB-IoT standalone band 12 23095 QPSK(99%)

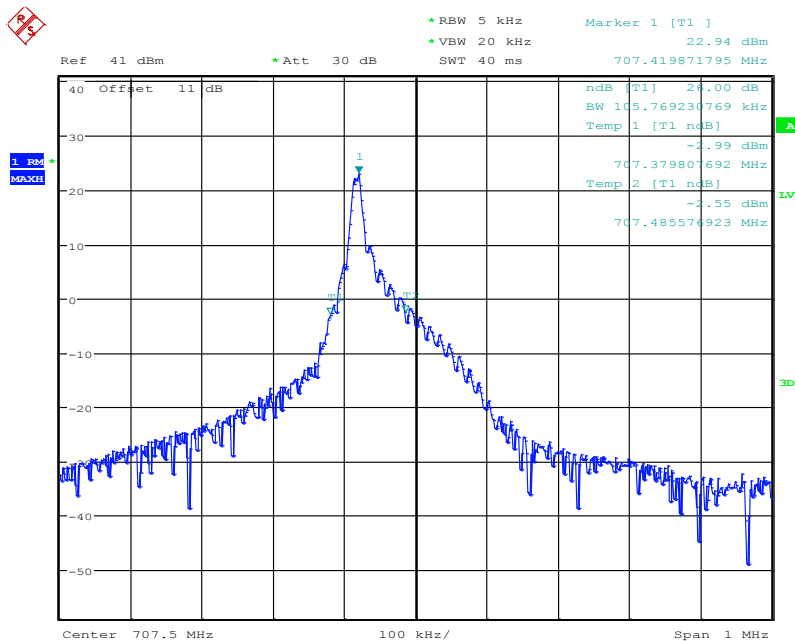


Date: 5.SEP.2019 14:33:18

NB-IoT standalone band 12 23095 BPSK(99%)

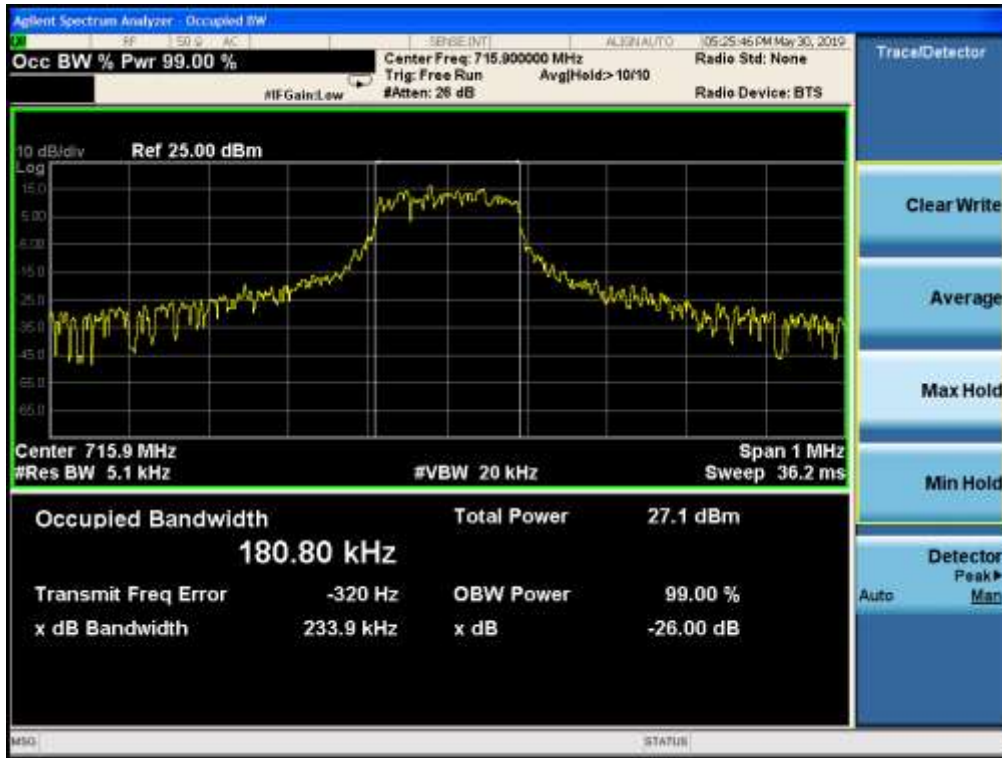


NB-IoT standalone band 12 23095 QPSK(26dB)

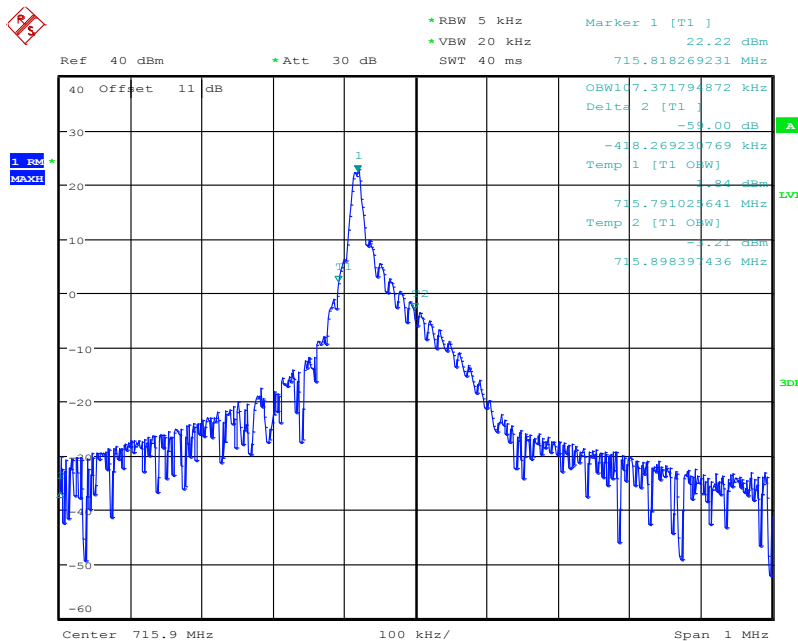


Date: 6.SEP.2019 13:16:46

NB-IoT standalone band 12 23095 BPSK(26dB)



NB-IoT standalone band 12 23179 QPSK(99%)

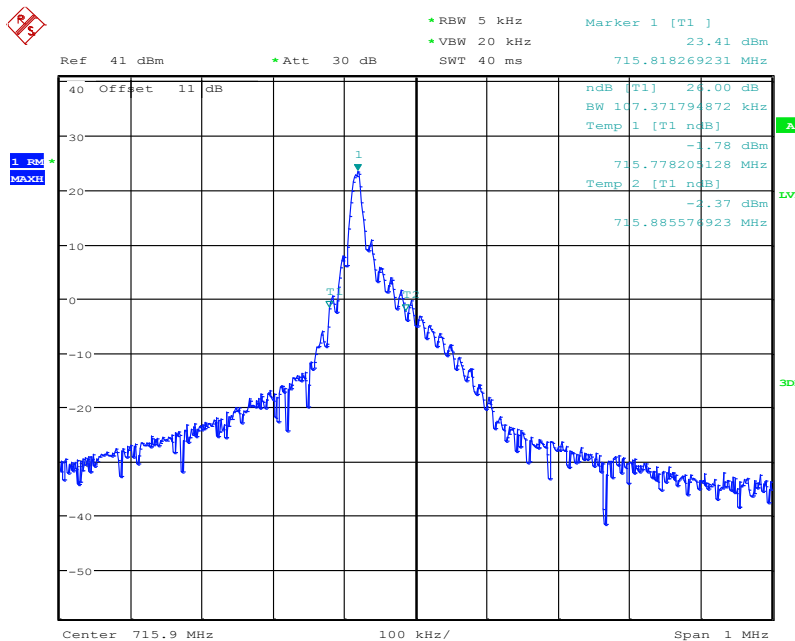


Date: 5.SEP.2019 14:34:13

NB-IoT standalone band 12 23179 BPSK(99%)

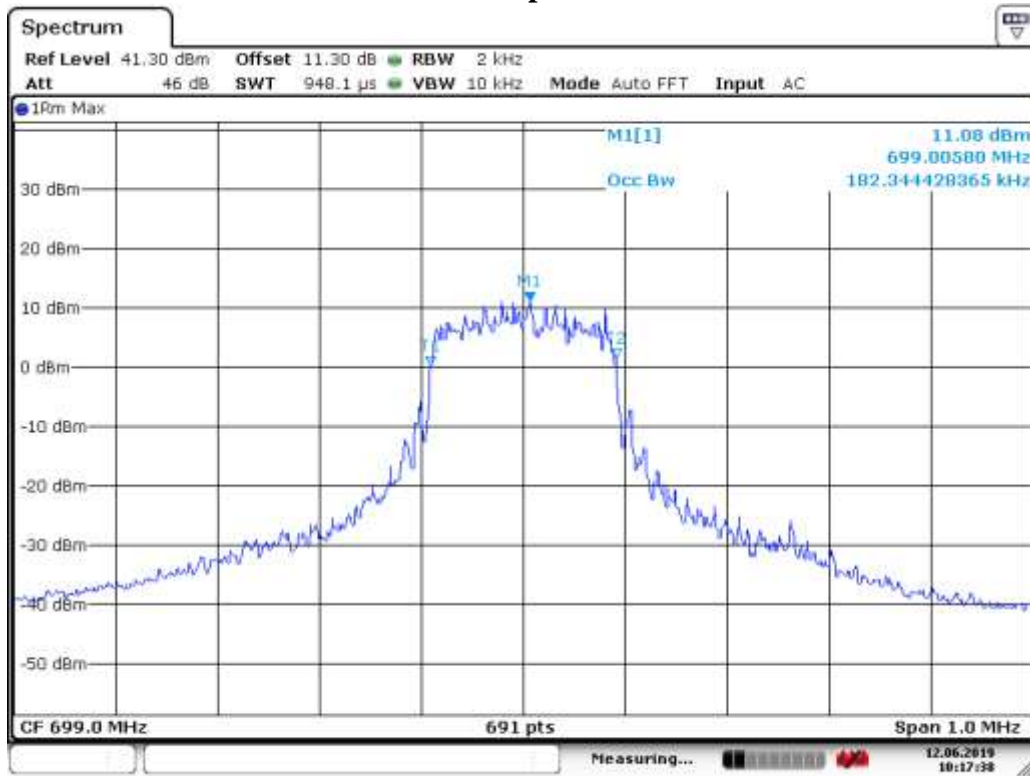


NB-IoT standalone band 12 23179 QPSK(26dB)



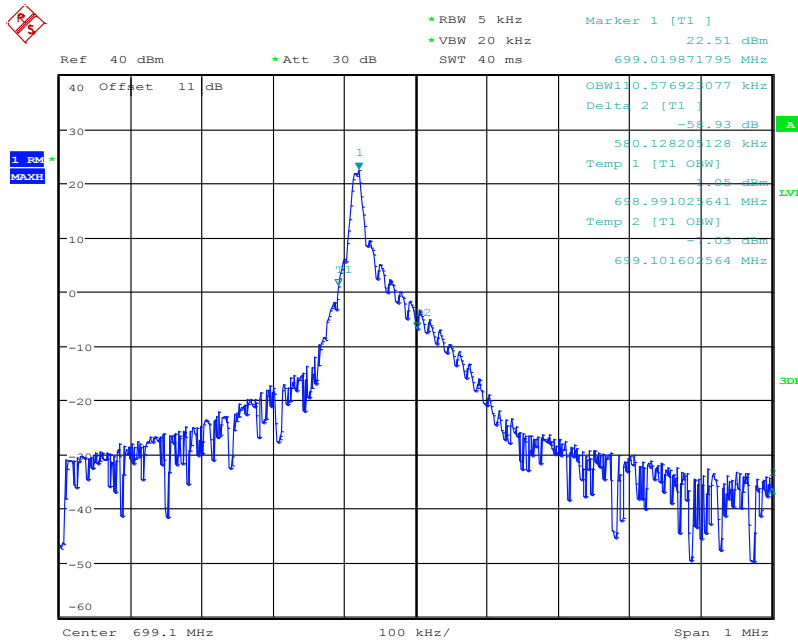
Date: 6.SEP.2019 13:17:54

NB-IoT standalone band 12 23179 BPSK(26dB)



Date: 12 JUN.2019 10:17:39

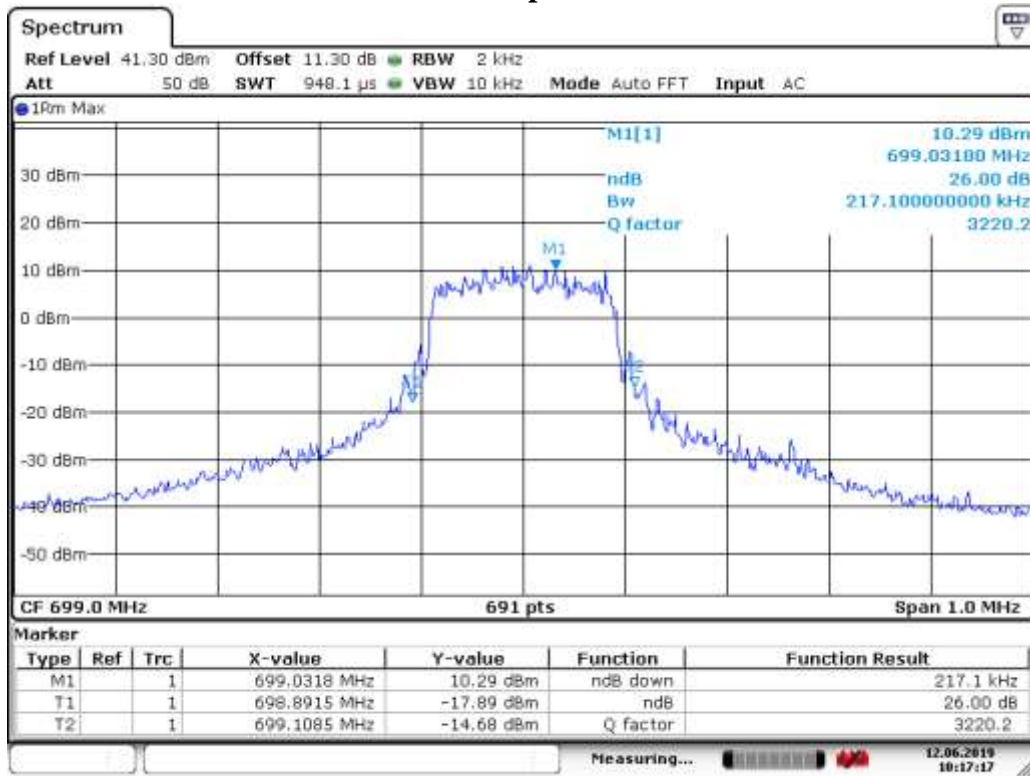
NB-IoT In-band band 12 23011 QPSK(99%)



Date: 5.SEP.2019 14:36:16

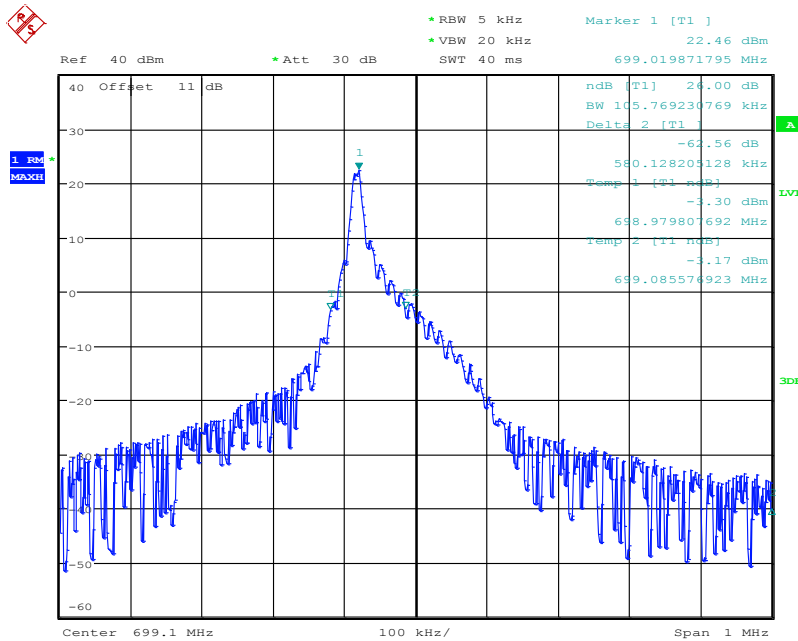
NB-IoT In-band band 12 23011 BPSK(99%)





Date: 12 JUN.2019 10:17:17

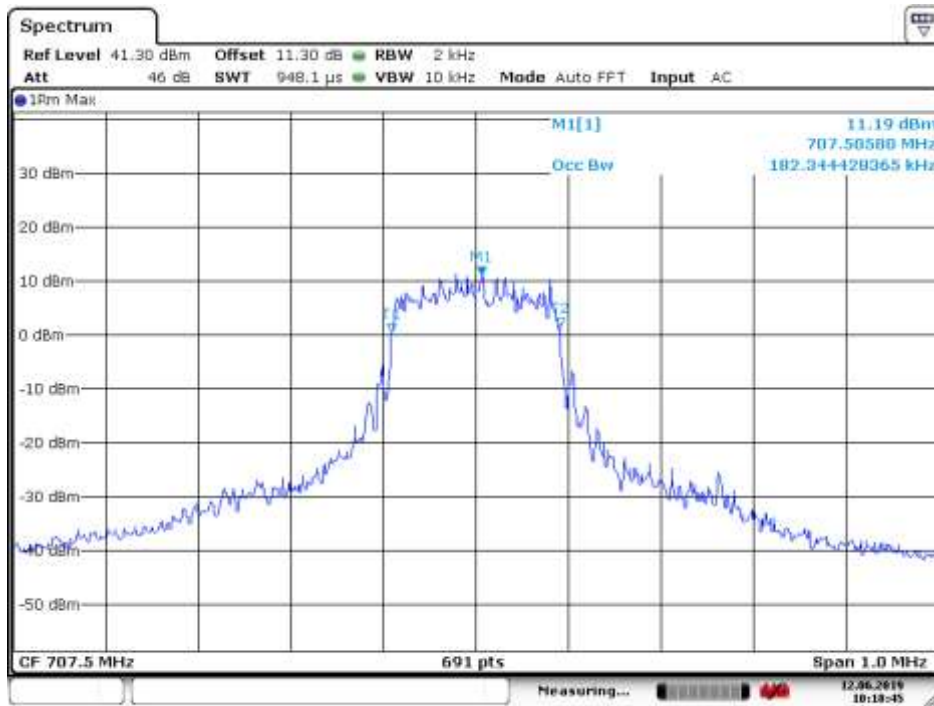
NB-IoT In-band band 12 23011 QPSK(26dB)



Date: 5.SEP.2019 14:36:28

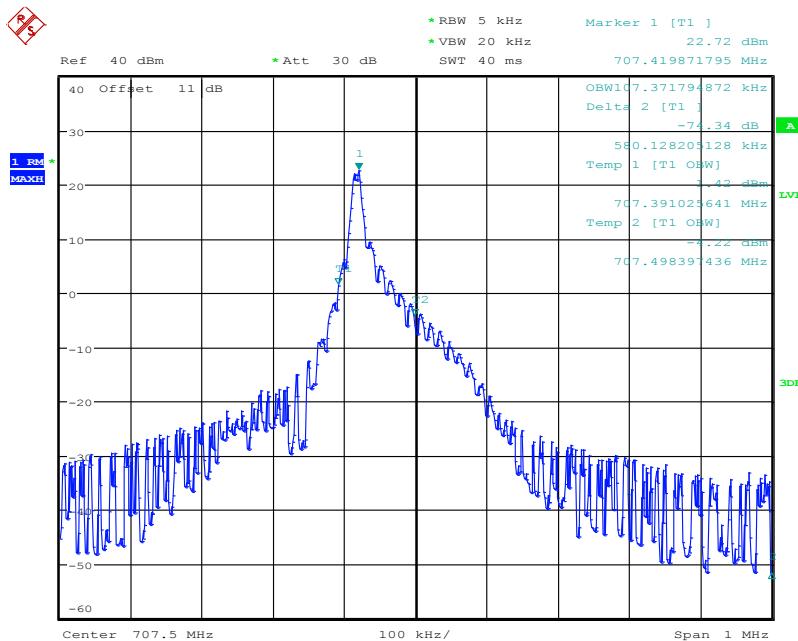
NB-IoT In-band band 12 23011 BPSK(26dB)





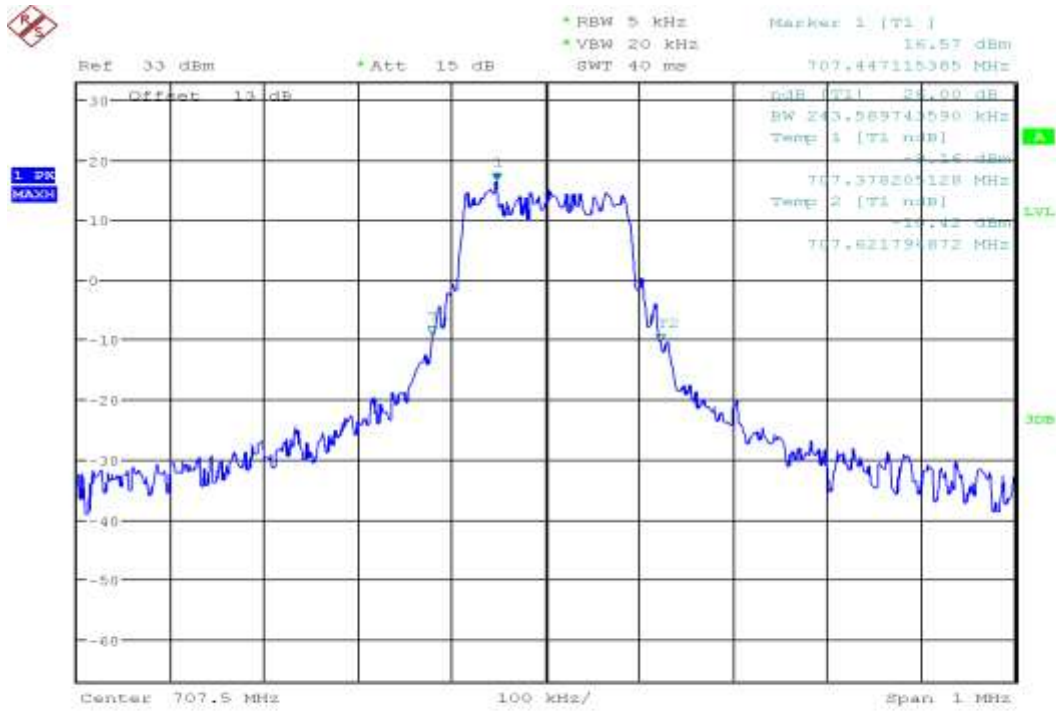
Date: 12 JUN 2019 10:18:45

NB-IoT In-band band 12 23095 QPSK(99%)



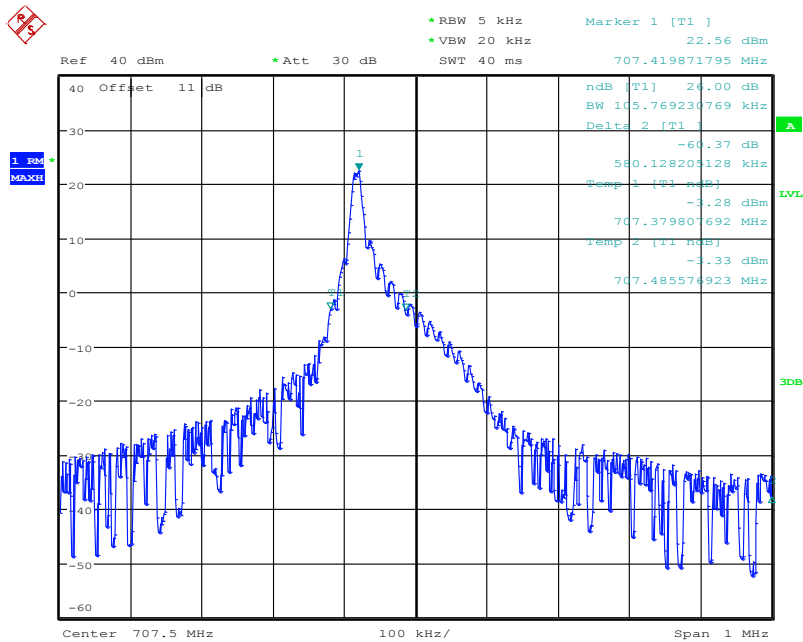
Date: 5.SEP.2019 14:35:41

NB-IoT In-band band 12 23095 BPSK(99%)



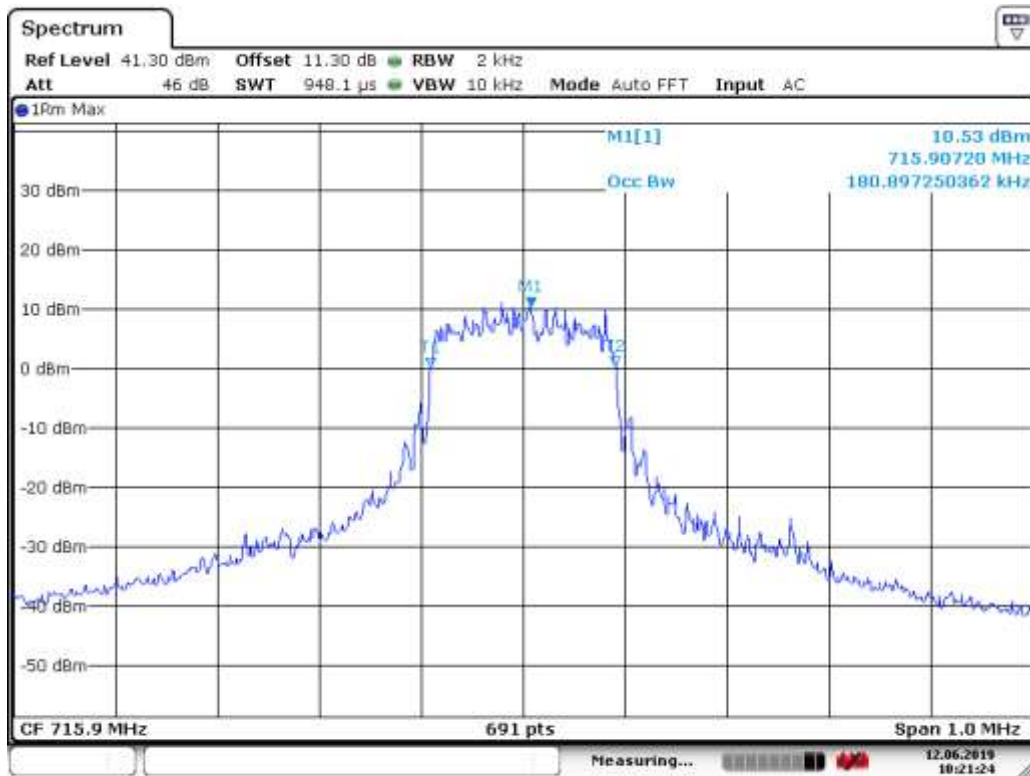
Date: 26.DEC.2018 21:57:43

NB-IoT In-band band 12 23095 QPSK(26dB)



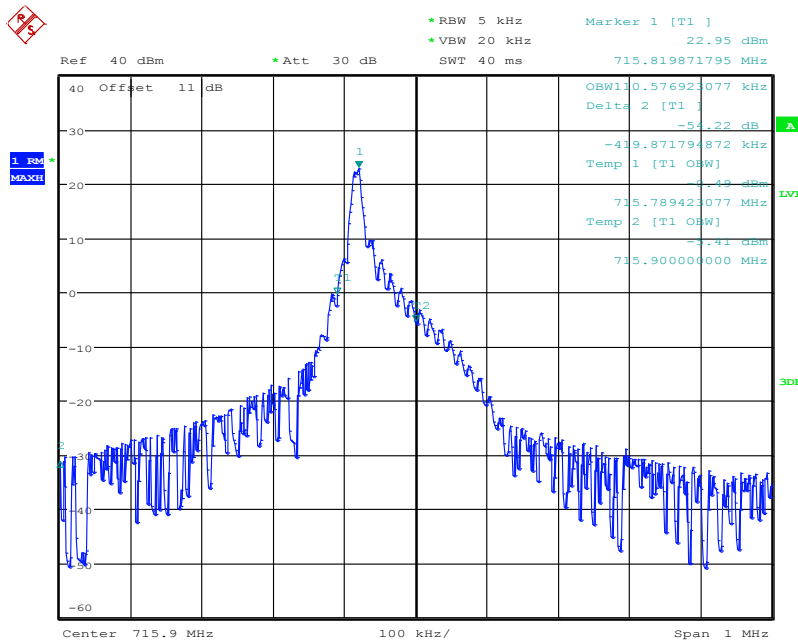
Date: 5.SEP.2019 14:35:23

NB-IoT In-band band 12 23095 BPSK(26dB)



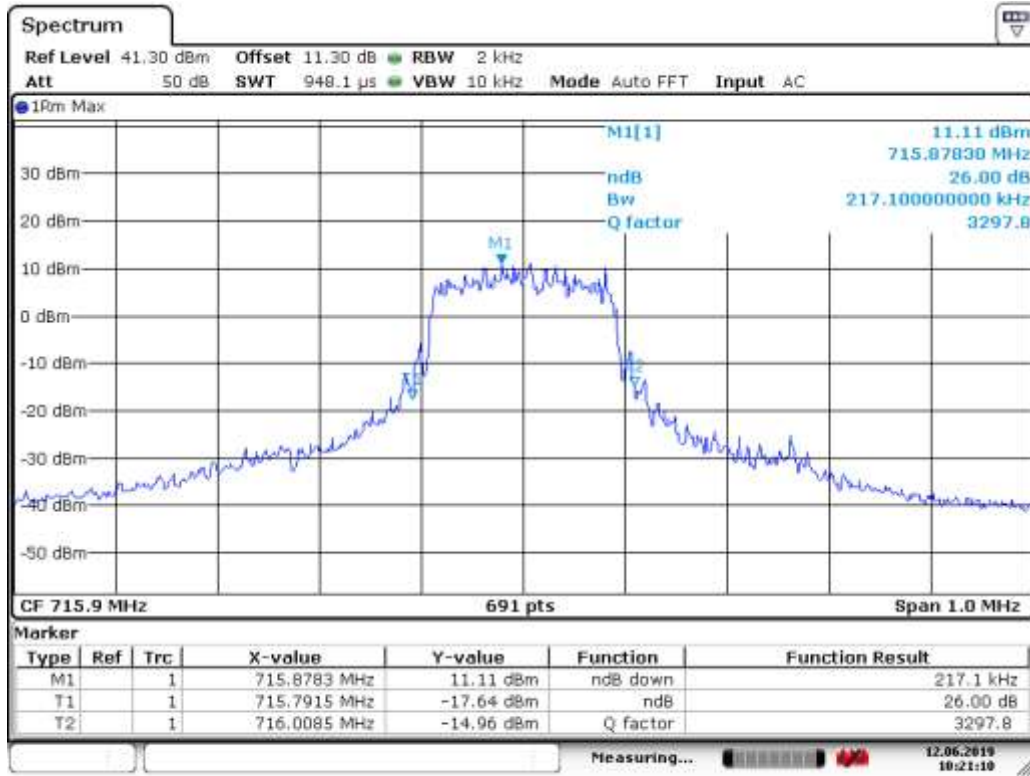
Date: 12 JUN 2019 10:21:24

NB-IoT In-band band 12 23179 QPSK(99%)



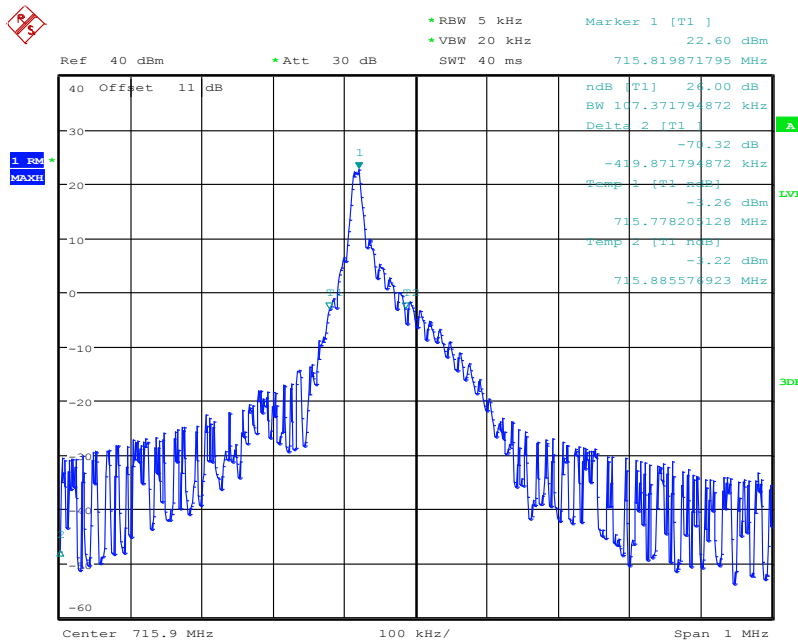
Date: 5.SEP.2019 14:34:35

NB-IoT In-band band 12 23179 BPSK(99%)



Date: 12 JUN 2019 10:21:10

NB-IoT In-band band 12 23179 QPSK(26dB)

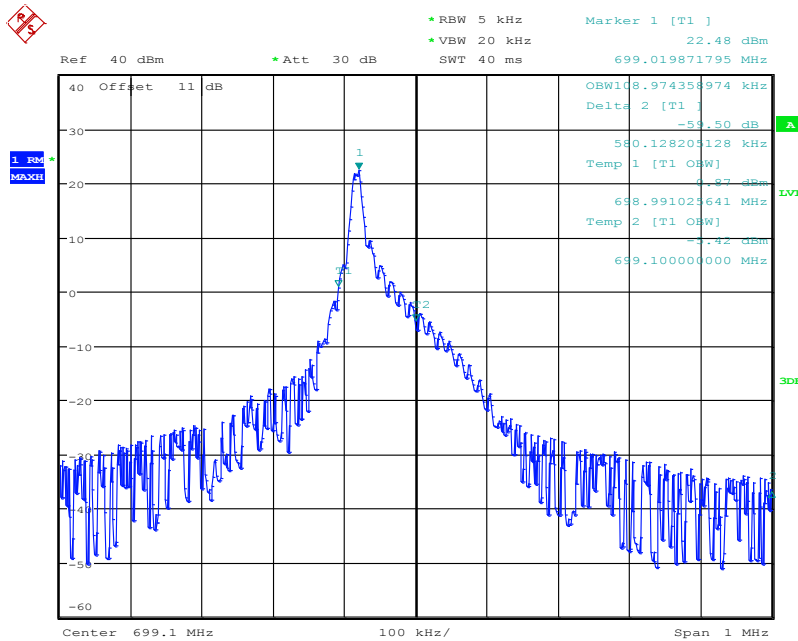


Date: 5 SEP 2019 14:34:45

NB-IoT In-band band 12 23179 BPSK(26dB)



NB-IoT Guard-band band 12 23011 QPSK(99%)

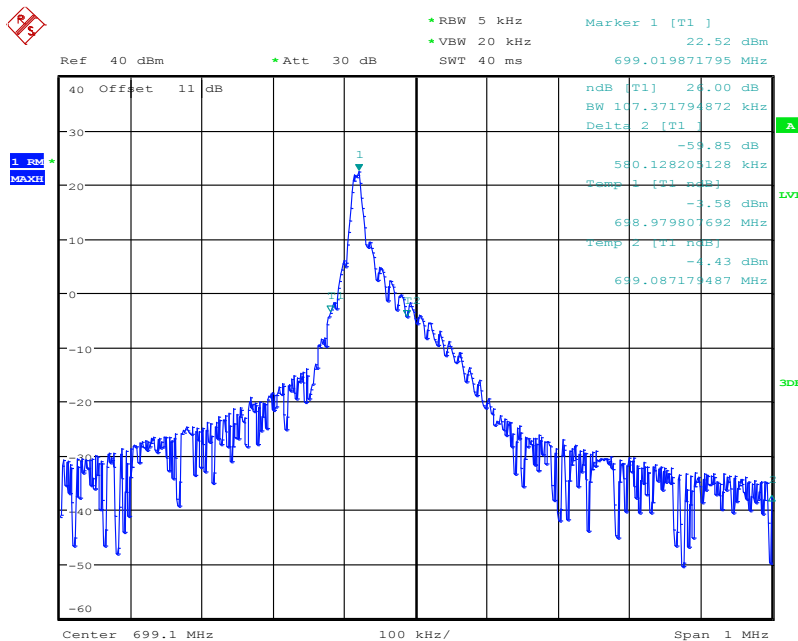


Date: 5.SEP.2019 14:37:12

NB-IoT Guard-band band 12 23011 BPSK(99%)

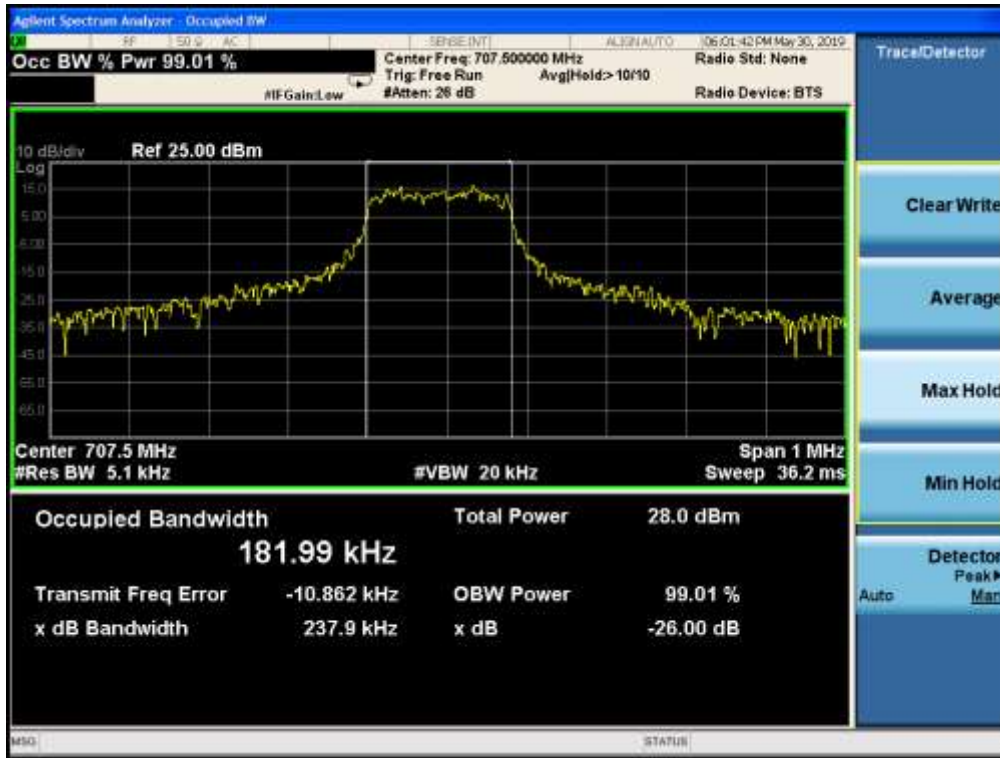


NB-IoT Guard-band band 12 23011 QPSK(26dB)

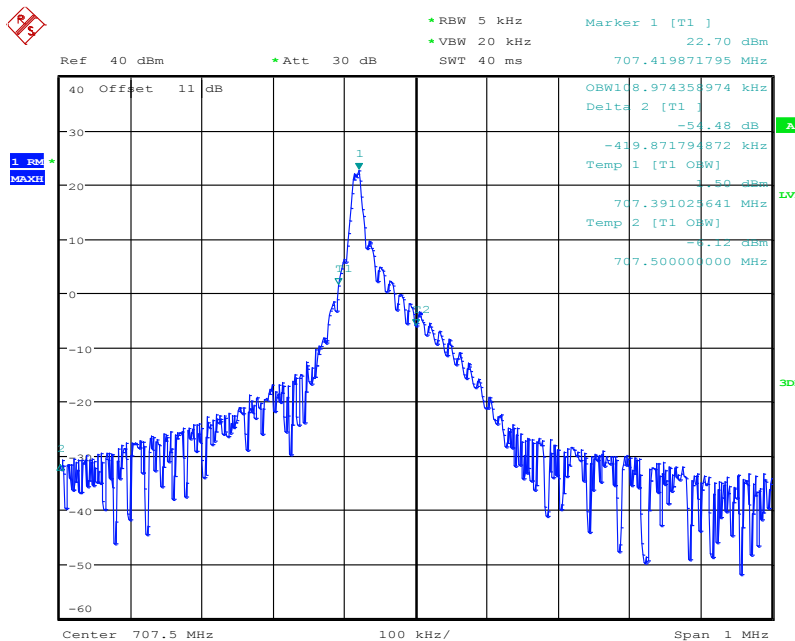


Date: 5.SEP.2019 14:36:59

NB-IoT Guard-band band 12 23011 BPSK(26dB)



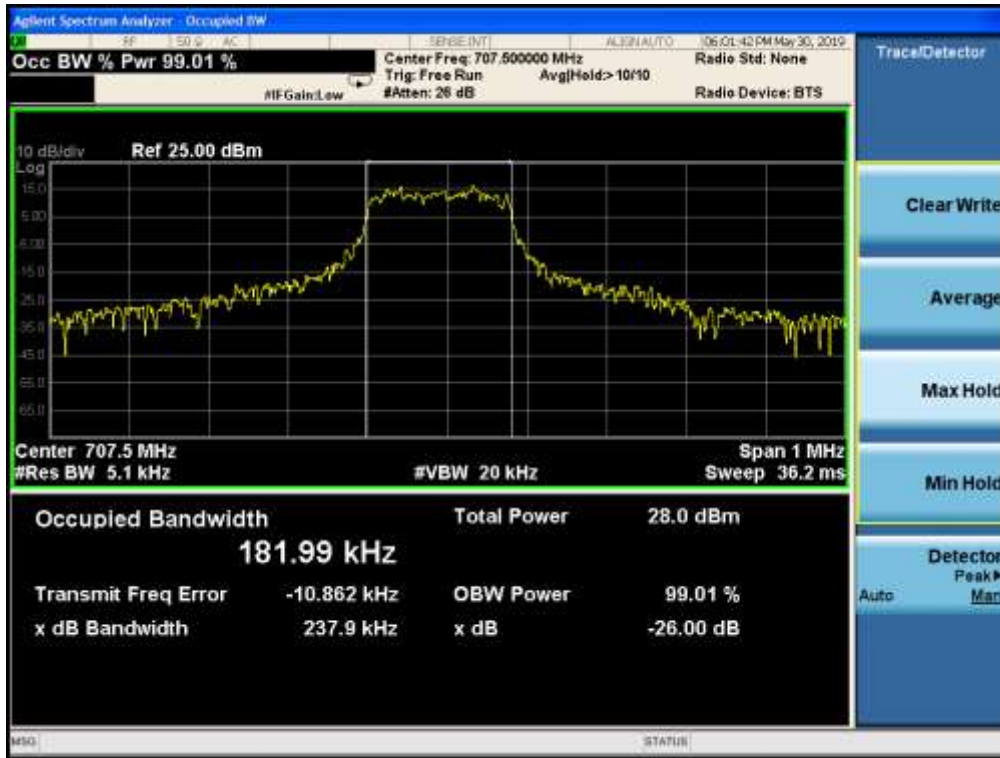
NB-IoT Guard-band band 12 23095 QPSK(99%)



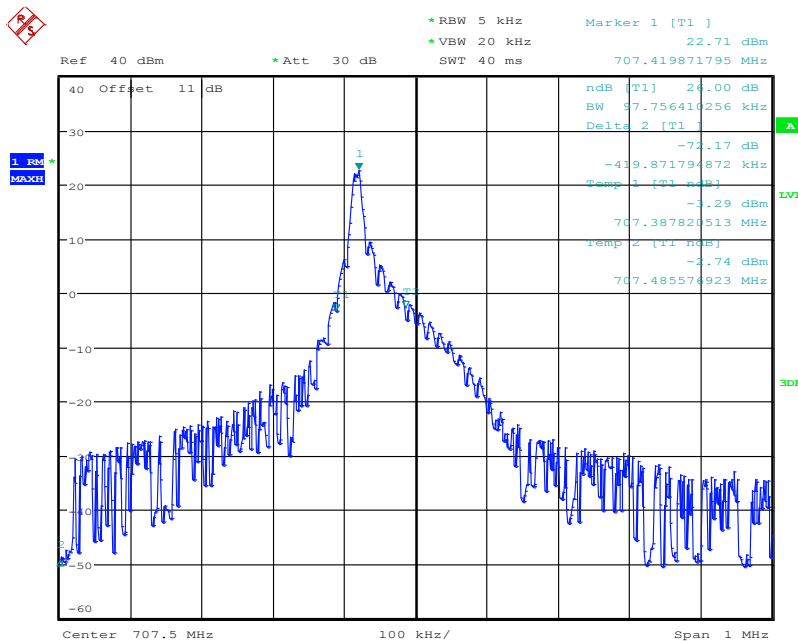
Date: 5.SEP.2019 14:37:54

NB-IoT Guard-band band 12 23095 BPSK(99%)





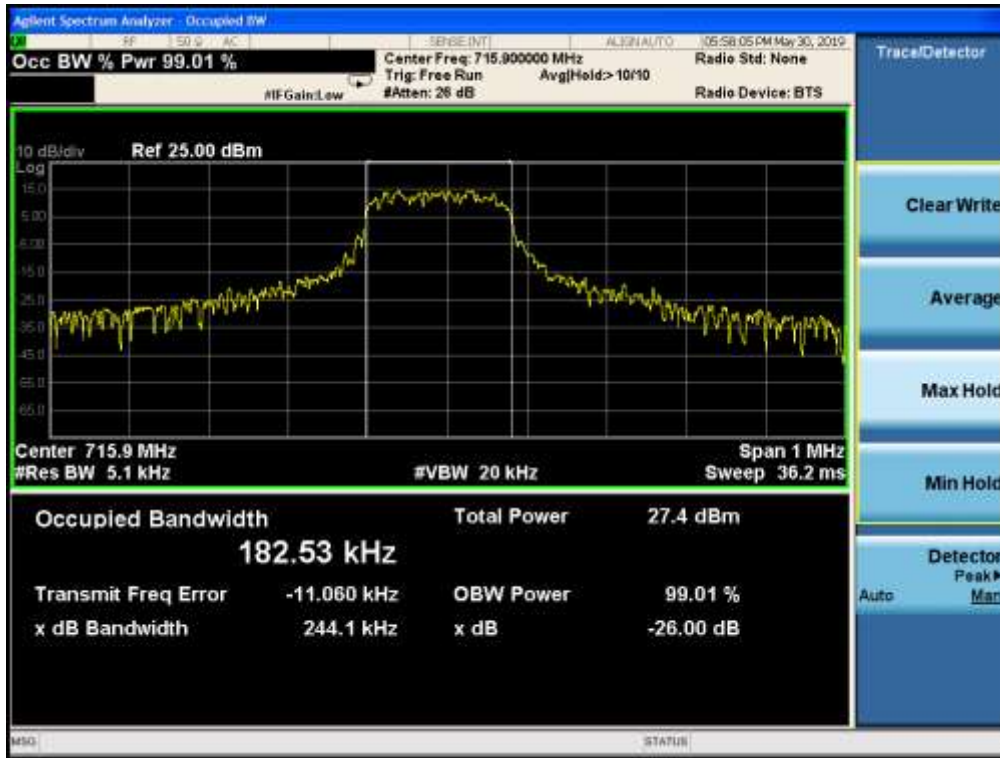
NB-IoT Guard-band band 12 23095 QPSK(26dB)



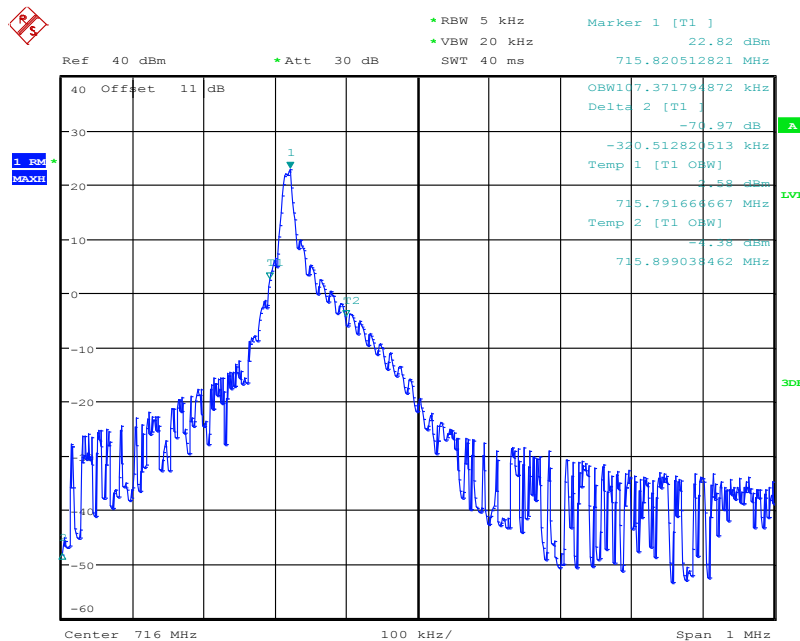
Date: 5.SEP.2019 14:38:08

NB-IoT Guard-band band 12 23095 BPSK(26dB)





NB-IoT Guard-band band 12 23179 QPSK(99%)

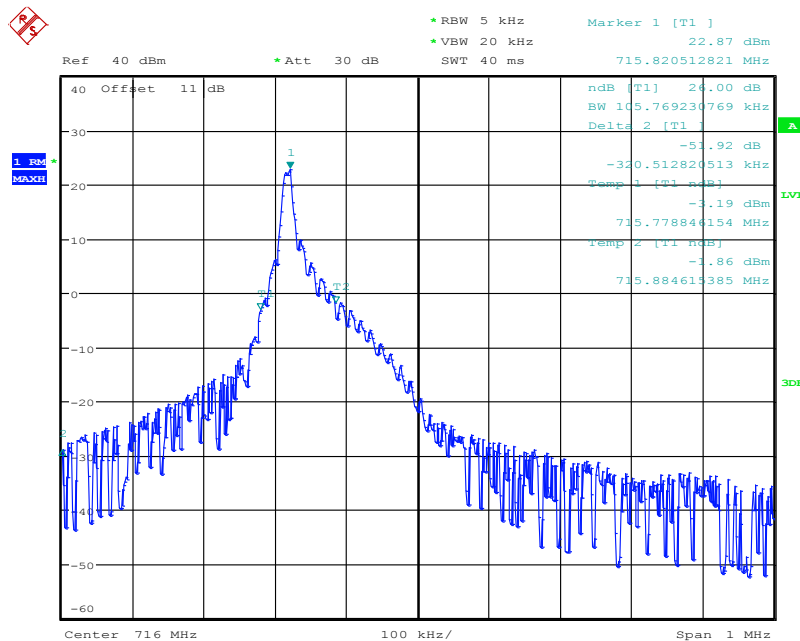


Date: 5.SEP.2019 14:39:03

NB-IoT Guard-band band 12 23179 BPSK(99%)



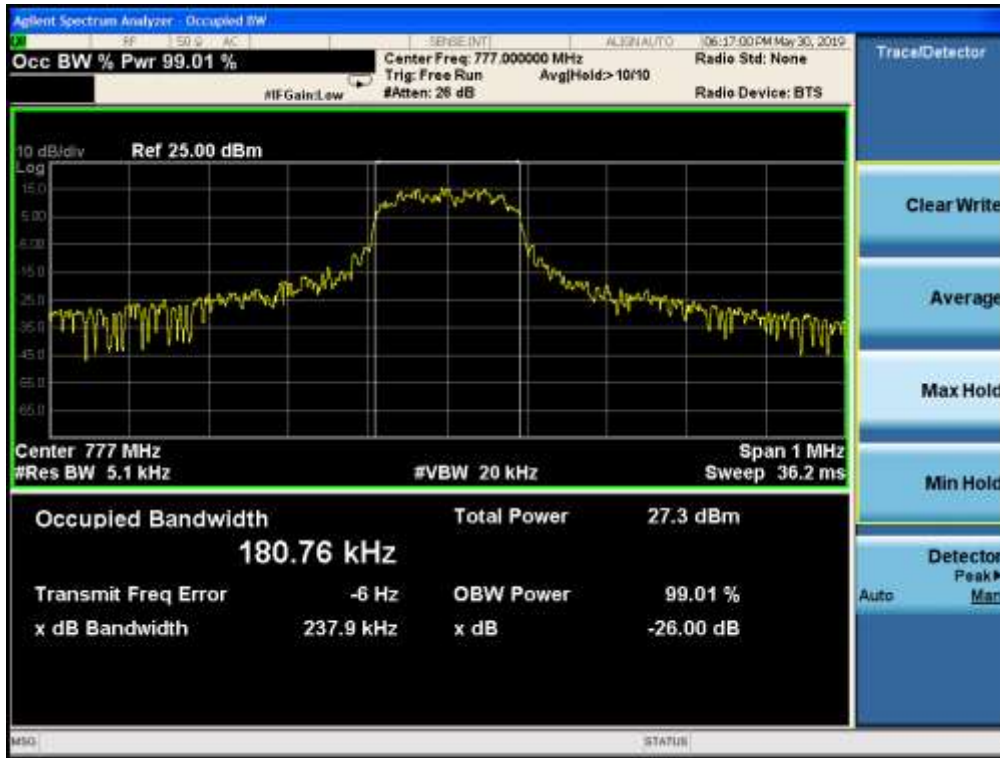
NB-IoT Guard-band band 12 23179 QPSK(26dB)



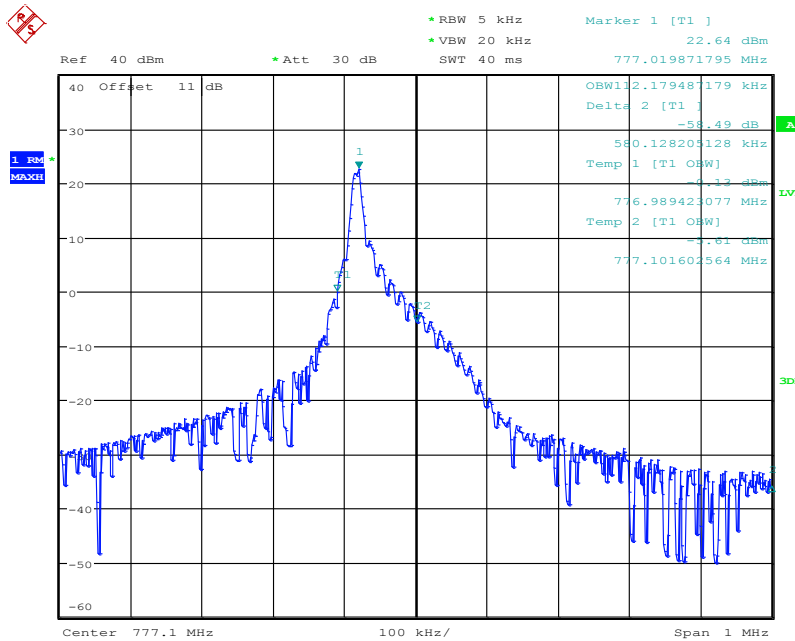
Date: 5.SEP.2019 14:38:49

NB-IoT Guard-band band 12 23179 BPSK(26dB)

Graphical results for Band13:



NB-IoT standalone band 13 23181 QPSK(99%)

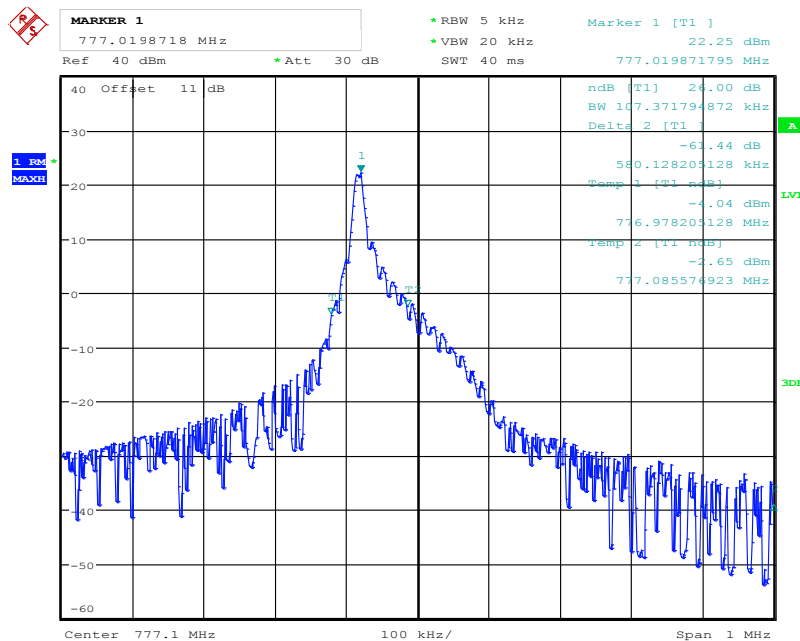


Date: 5.SEP.2019 14:45:31

NB-IoT standalone band 13 23181 BPSK(99%)



NB-IoT standalone band 13 23181 QPSK(26dB)

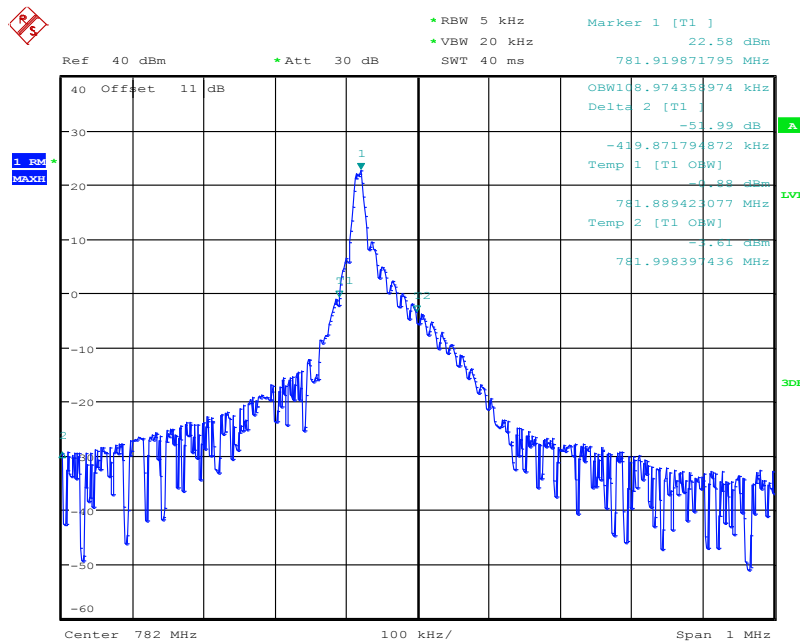


Date: 5.SEP.2019 14:45:47

NB-IoT standalone band 13 23181 BPSK(26dB)

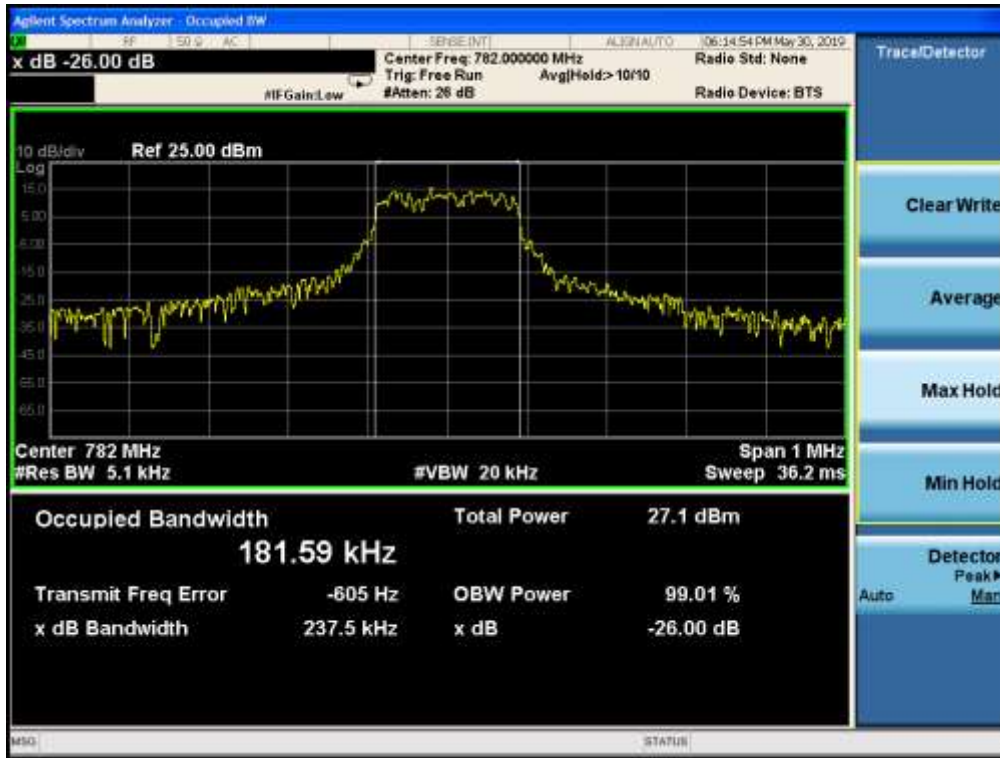


NB-IoT standalone band 13 23230 QPSK(99%)

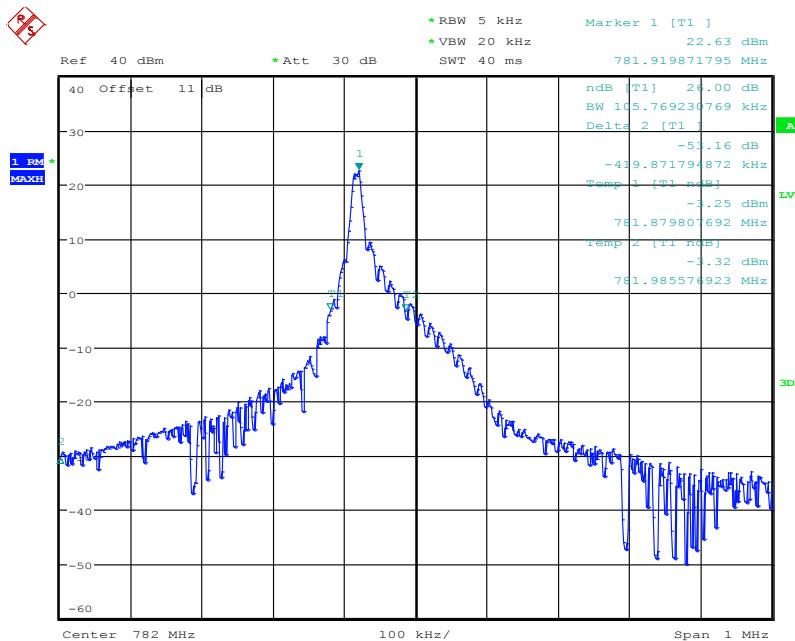


Date: 5.SEP.2019 14:46:51

NB-IoT standalone band 13 23230 BPSK(99%)



NB-IoT standalone band 13 23230 QPSK(26dB)



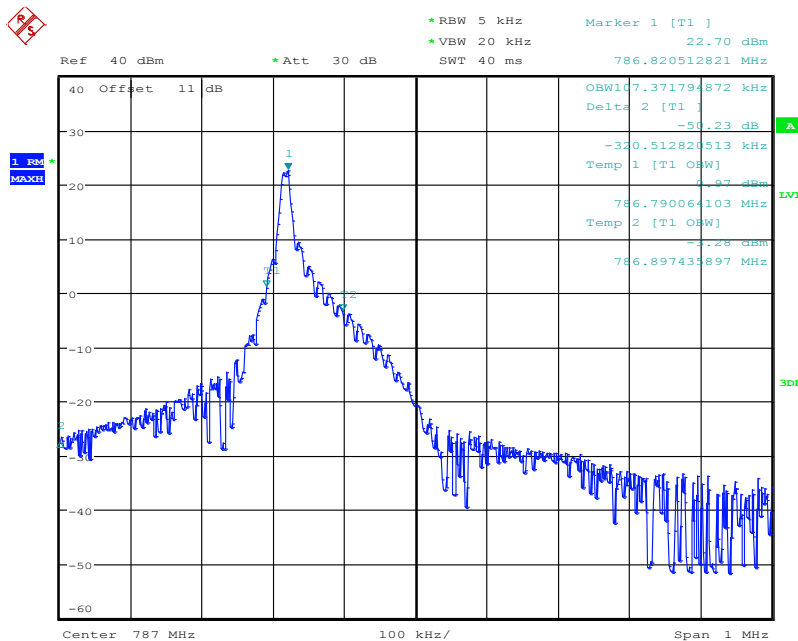
Date: 5.SEP.2019 14:46:35

NB-IoT standalone band 13 23230 BPSK(26dB)



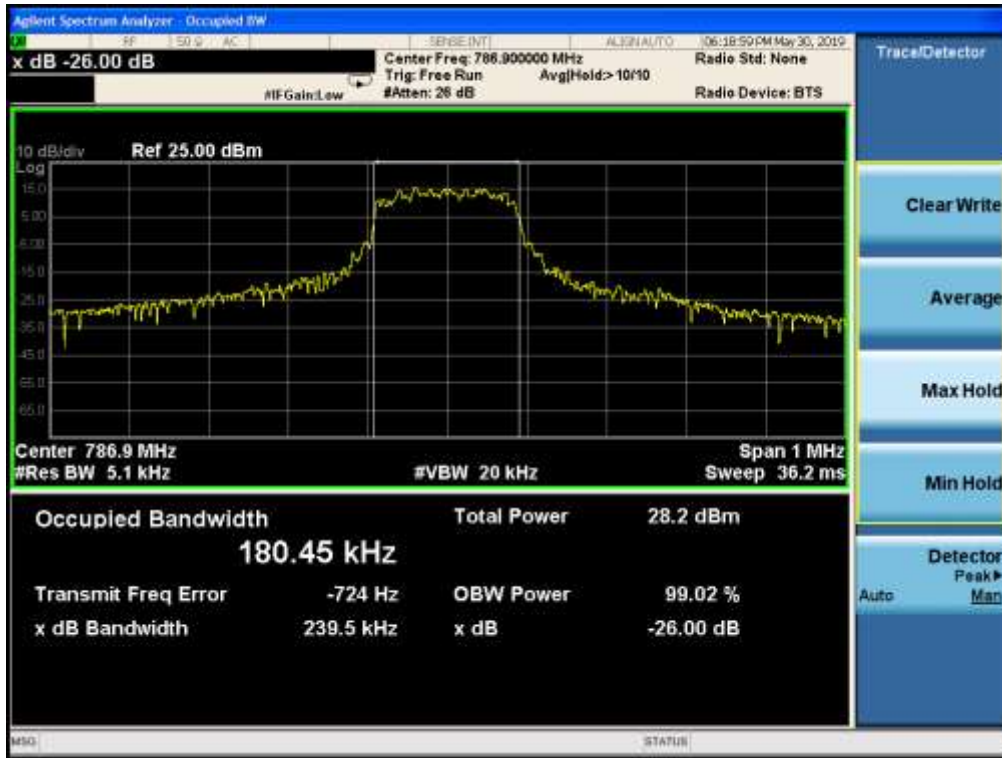


NB-IoT standalone band 13 23279 QPSK(99%)

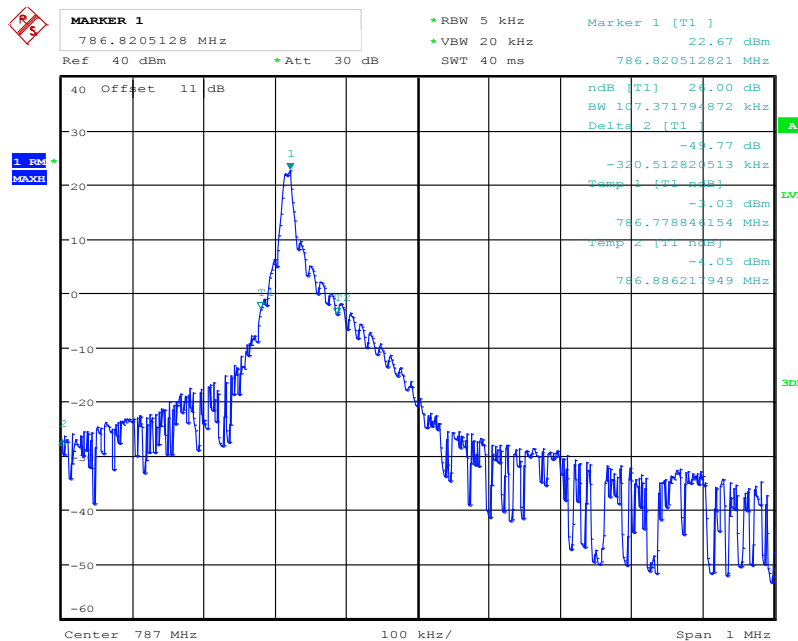


Date: 5.SEP.2019 14:47:42

NB-IoT standalone band 13 23279 BPSK(99%)



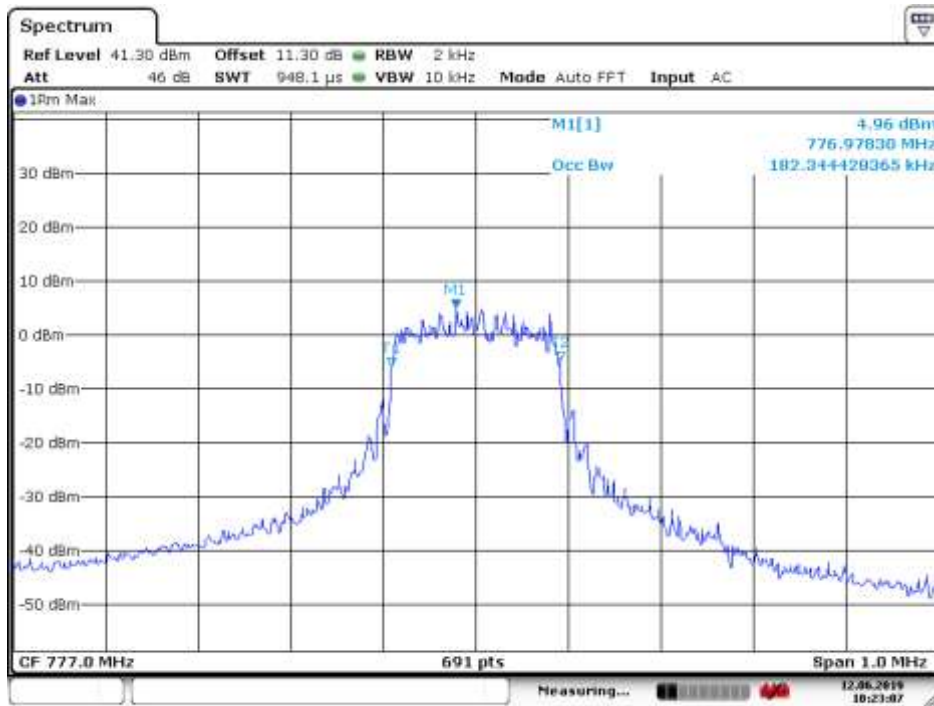
NB-IoT standalone band 13 23279 QPSK(26dB)



Date: 5.SEP.2019 14:48:04

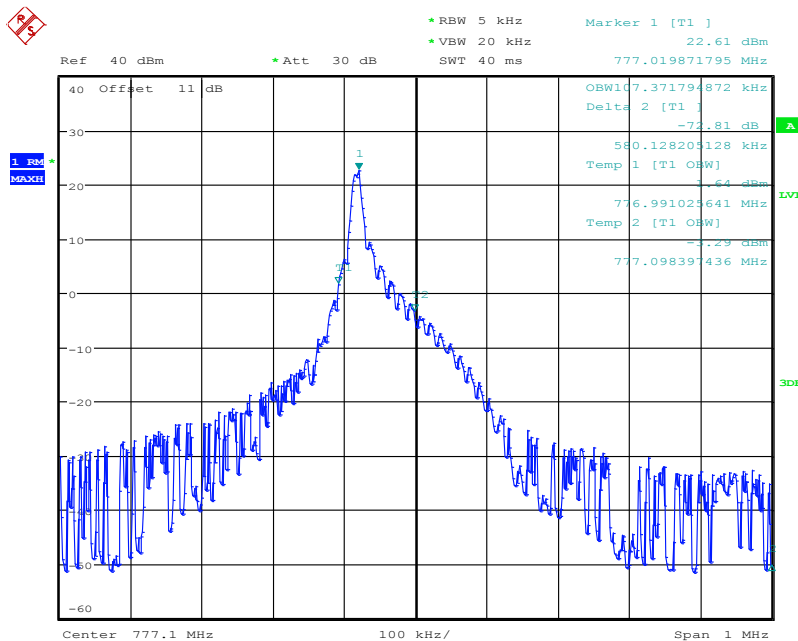
NB-IoT standalone band 13 23279 BPSK(26dB)





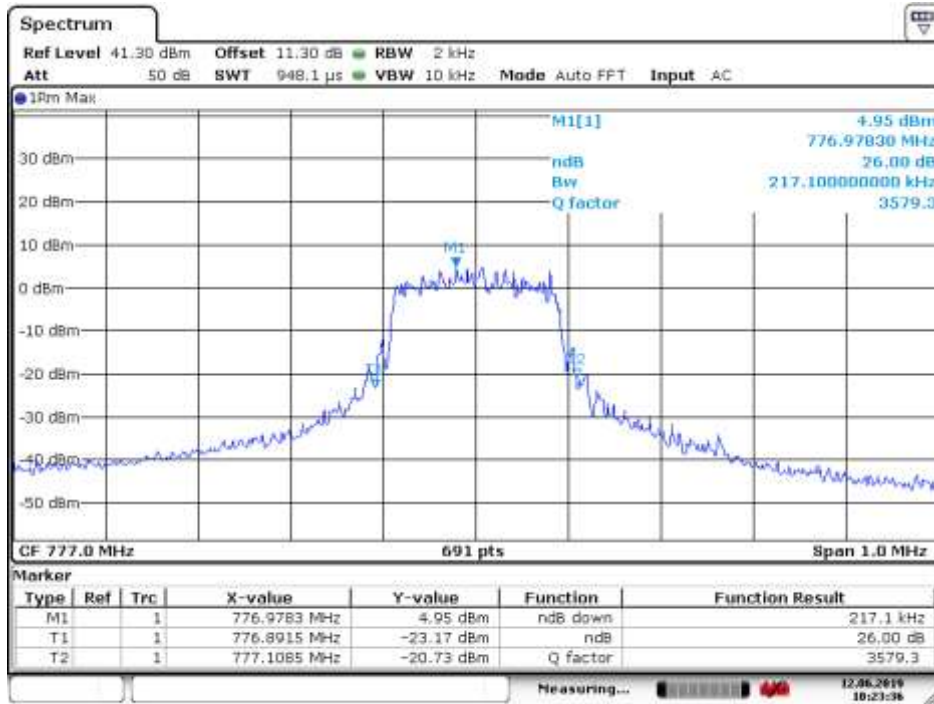
Date: 12 JUN 2019 10:23:07

NB-IoT In-band band 13 23181 QPSK(99%)



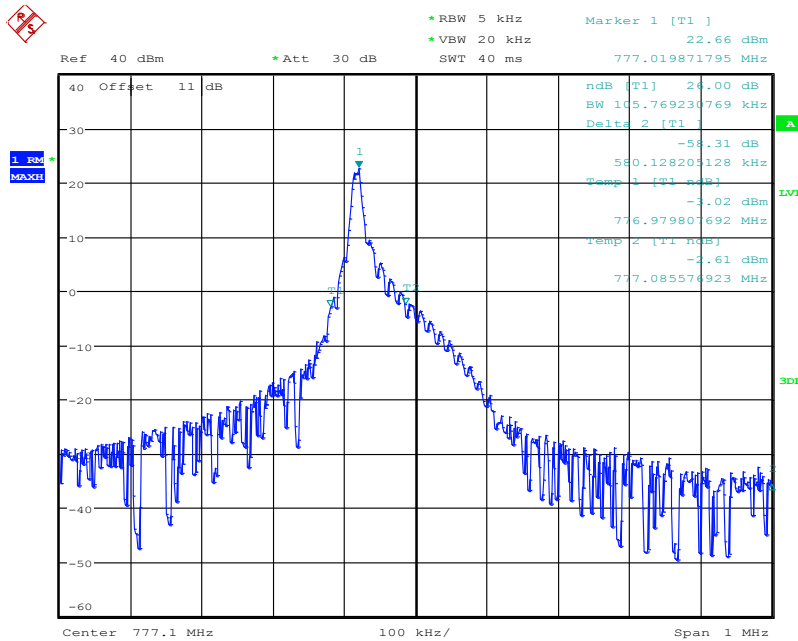
Date: 5.SEP.2019 14:44:55

NB-IoT In-band band 13 23181 BPSK(99%)



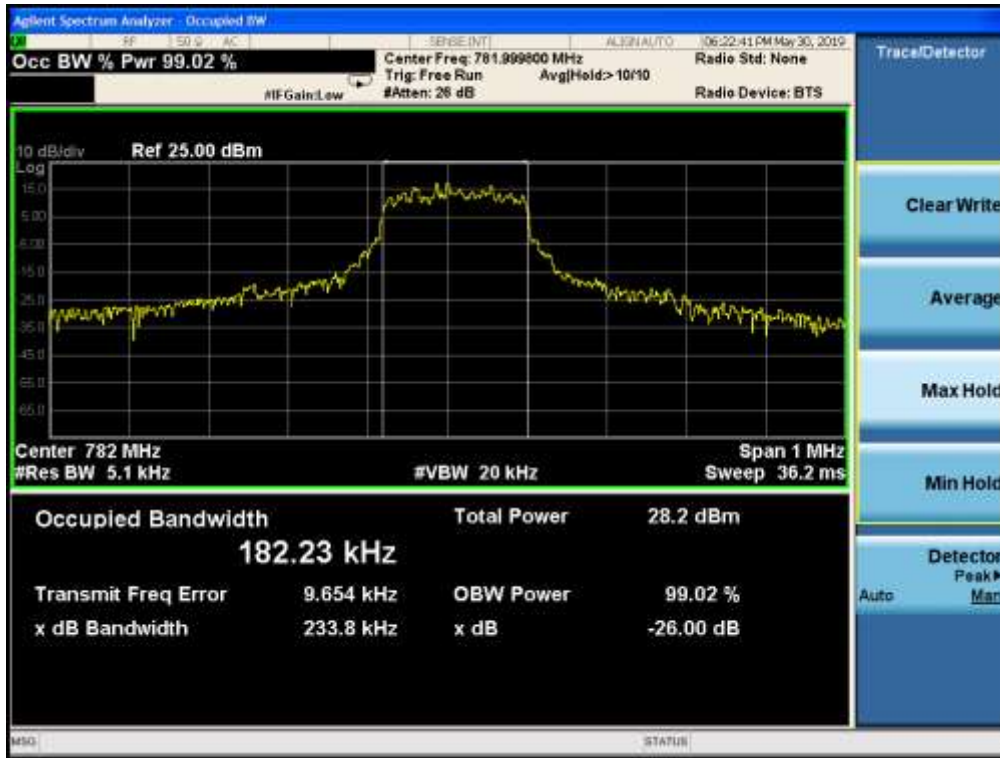
Date: 12 JUN 2019 10:23:36

NB-IoT In-band band 13 23181 QPSK(26dB)

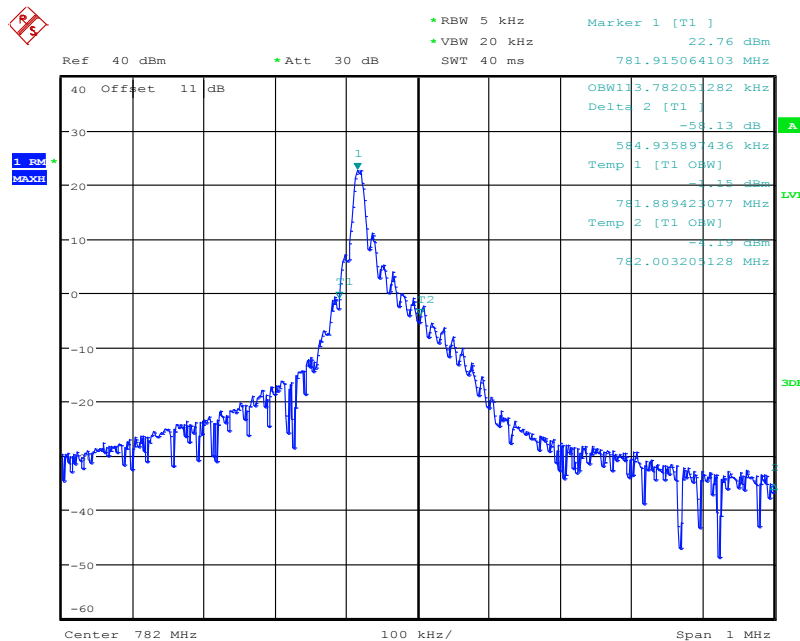


Date: 5.SEP.2019 14:44:39

NB-IoT In-band band 13 23181 BPSK(26dB)

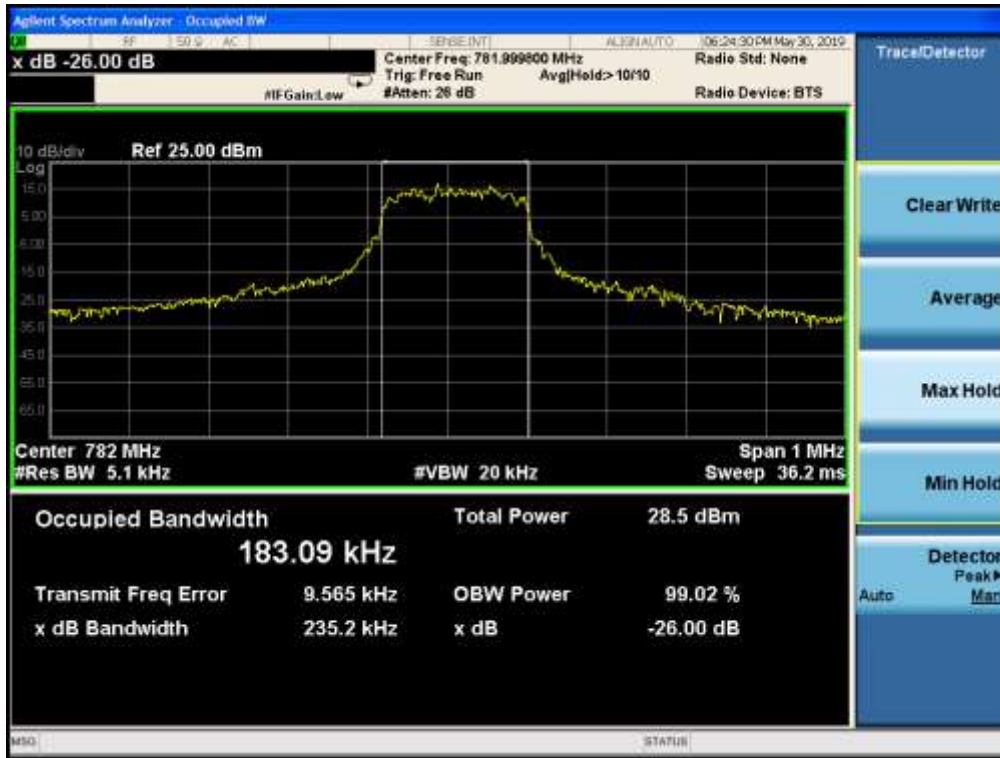


NB-IoT In-band band 13 23230 QPSK(99%)

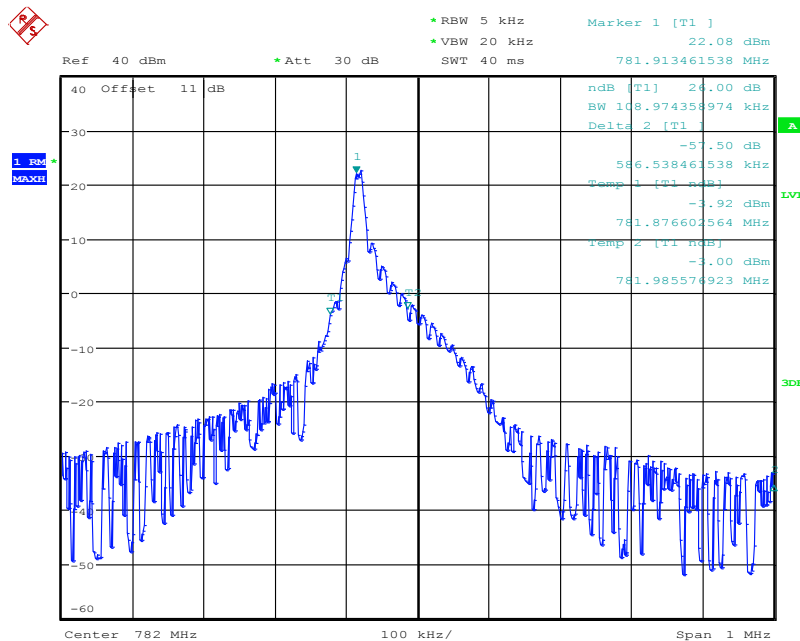


Date: 5.SEP.2019 14:43:51

NB-IoT In-band band 13 23230 BPSK(99%)



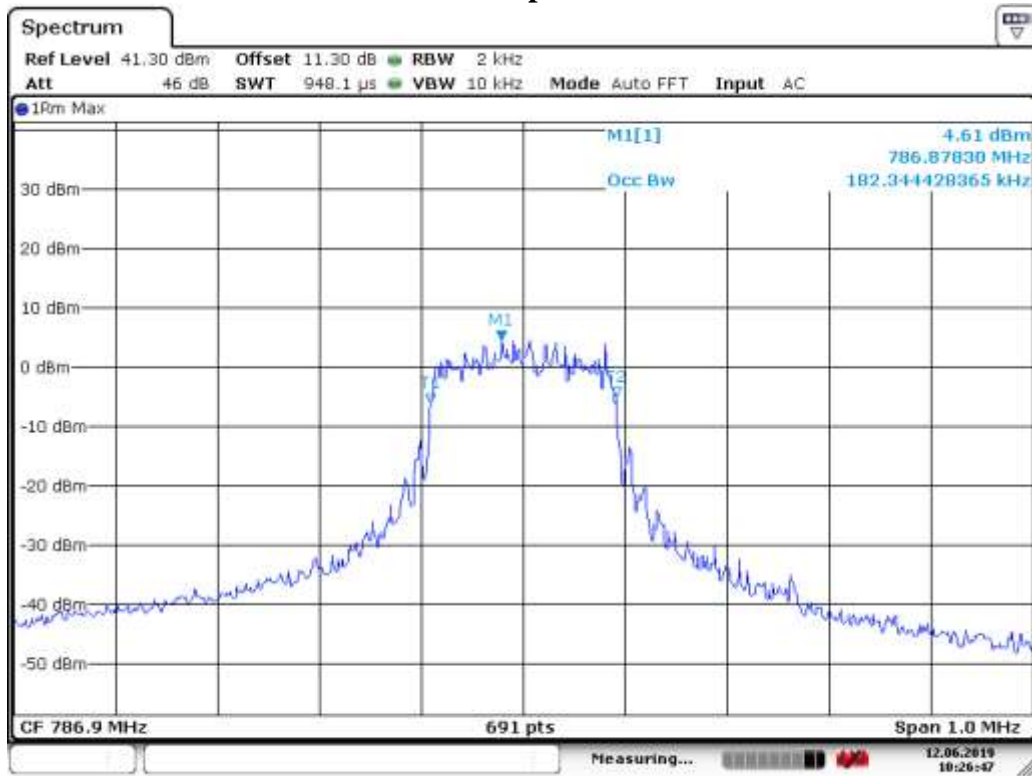
NB-IoT In-band band 13 23230 QPSK(26dB)



Date: 5.SEP.2019 14:44:03

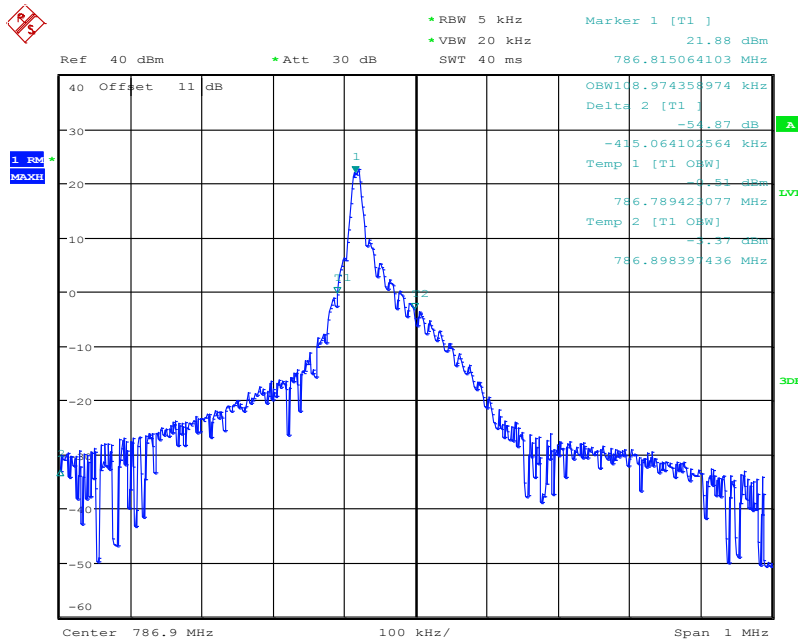
NB-IoT In-band band 13 23230 BPSK(26dB)

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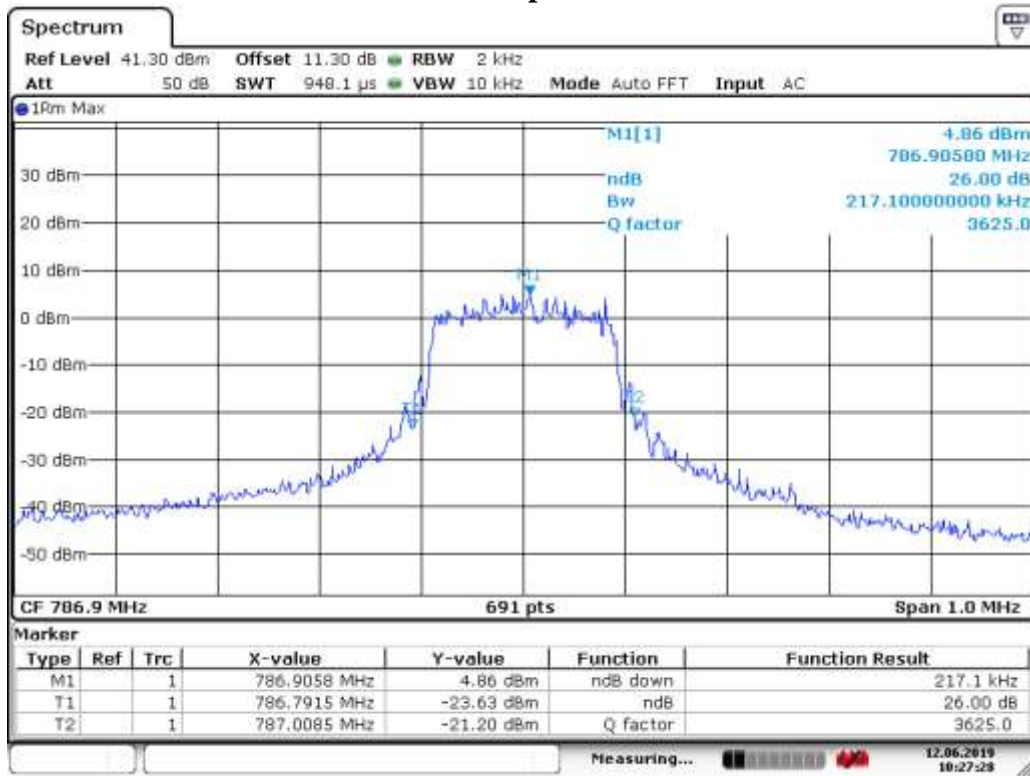
Date: 12 JUN.2019 10:26:47

NB-IoT In-band band 13 23279 QPSK(99%)



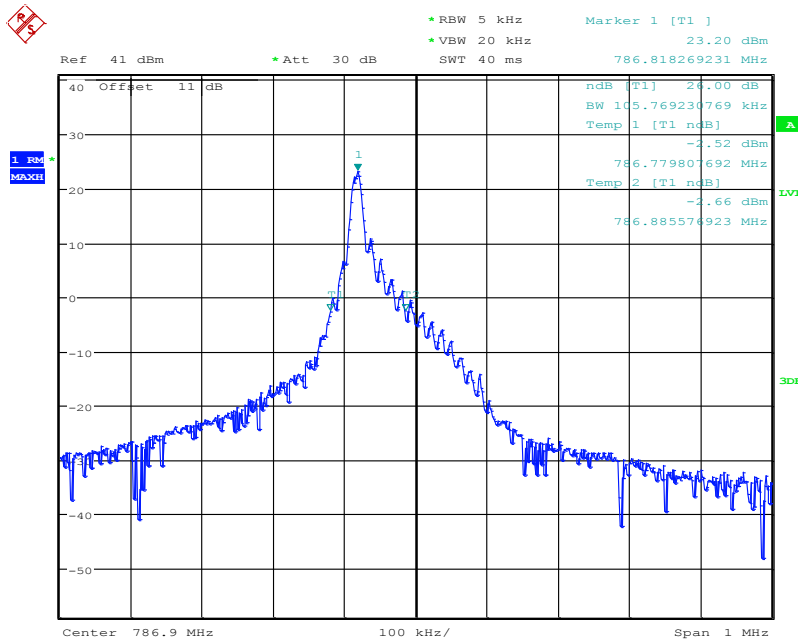
Date: 5.SEP.2019 14:43:06

NB-IoT In-band band 13 23279 BPSK(99%)



Date: 12 JUN.2019 10:27:29

NB-IoT In-band band 13 23279 QPSK(26dB)

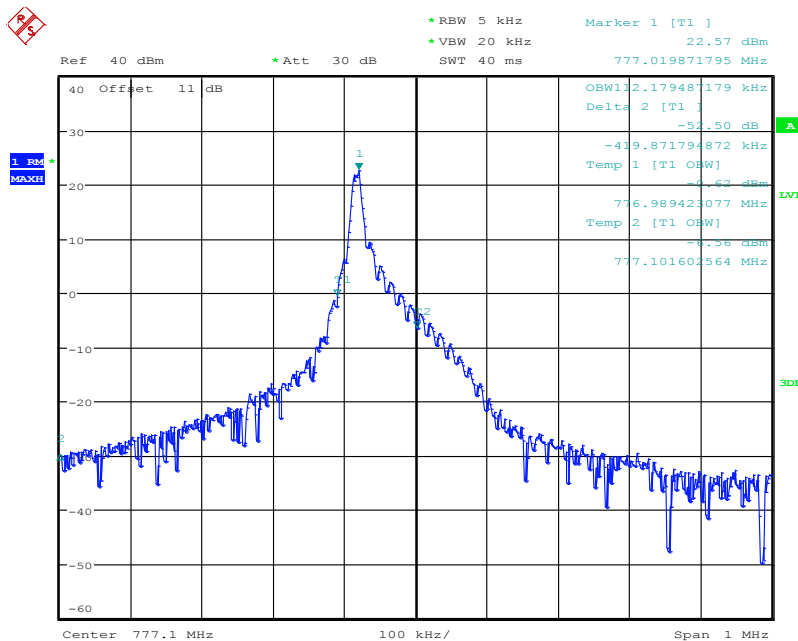


Date: 6.SEP.2019 13:20:01

NB-IoT In-band band 13 23279 BPSK(26dB)



NB-IoT Guard-band band 13 23181 QPSK(99%)



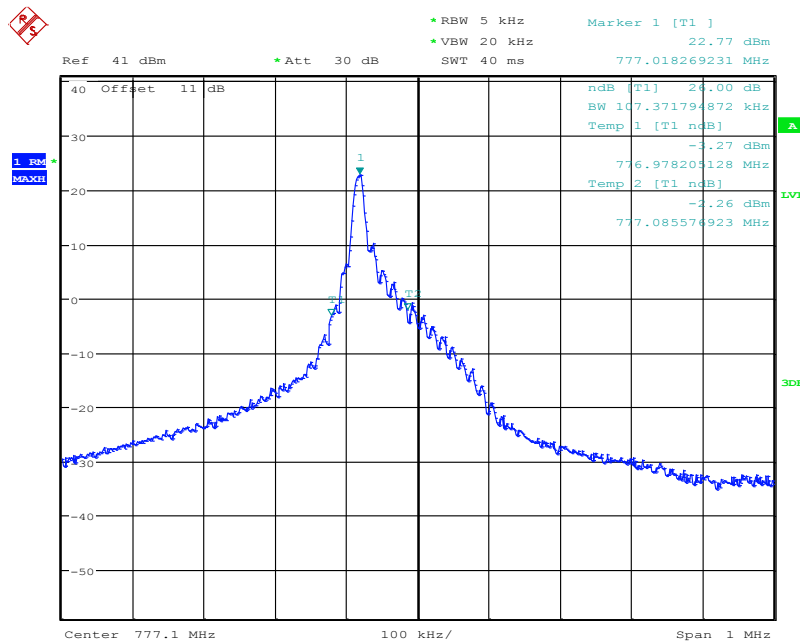
Date: 5.SEP.2019 14:40:38

NB-IoT Guard-band band 13 23181 BPSK(99%)





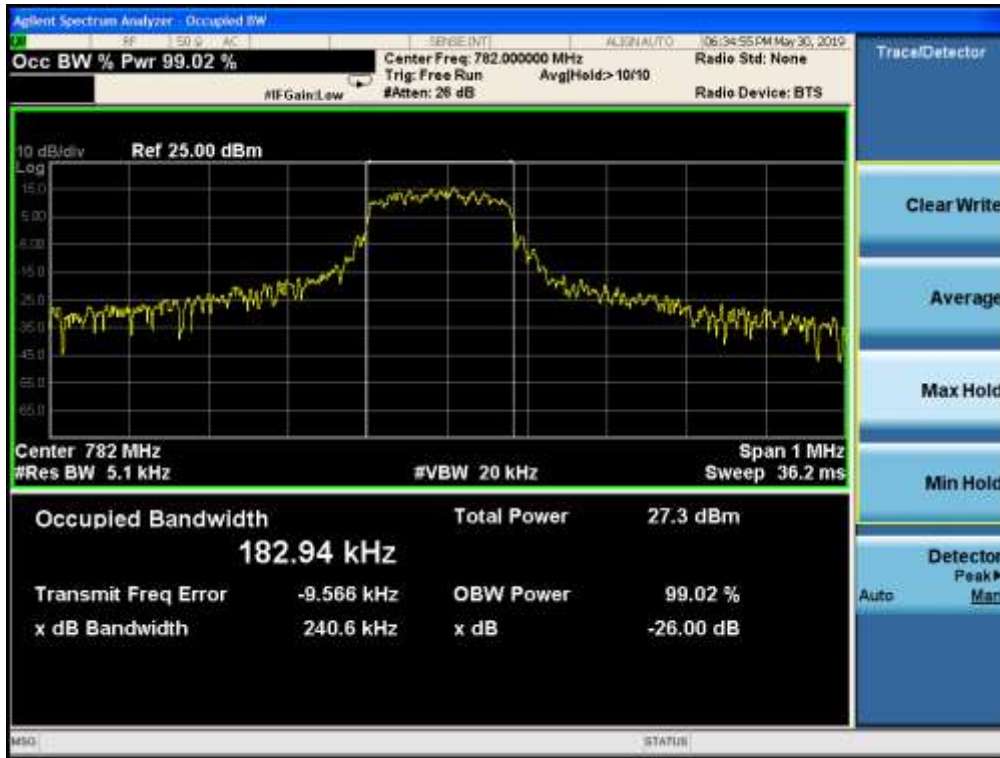
NB-IoT Guard-band band 13 23181 QPSK(26dB)



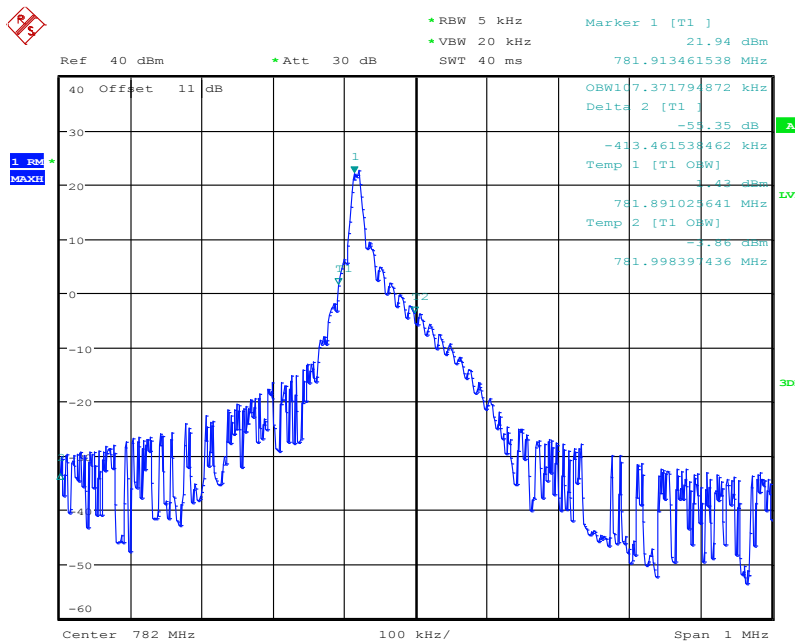
Date: 6.SEP.2019 13:22:17

NB-IoT Guard-band band 13 23181 BPSK(26dB)





NB-IoT Guard-band band 13 23230 QPSK(99%)

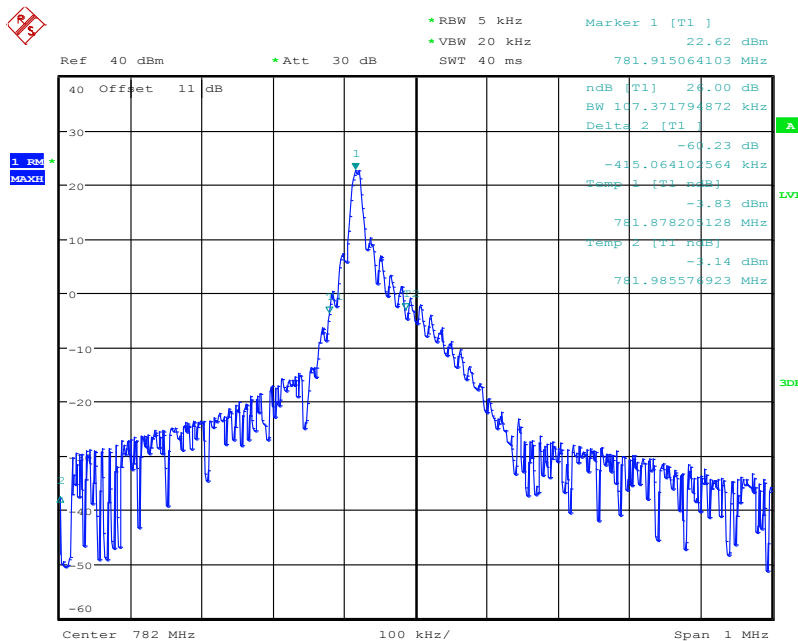


Date: 5.SEP.2019 14:41:37

NB-IoT Guard-band band 13 23230 BPSK(99%)



NB-IoT Guard-band band 13 23230 QPSK(26dB)

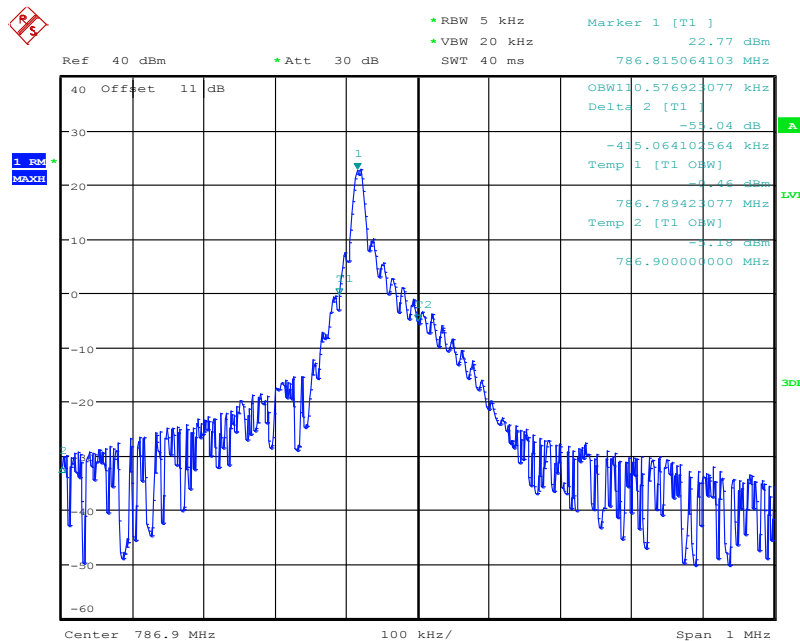


Date: 5.SEP.2019 14:41:25

NB-IoT Guard-band band 13 23230 BPSK(26dB)

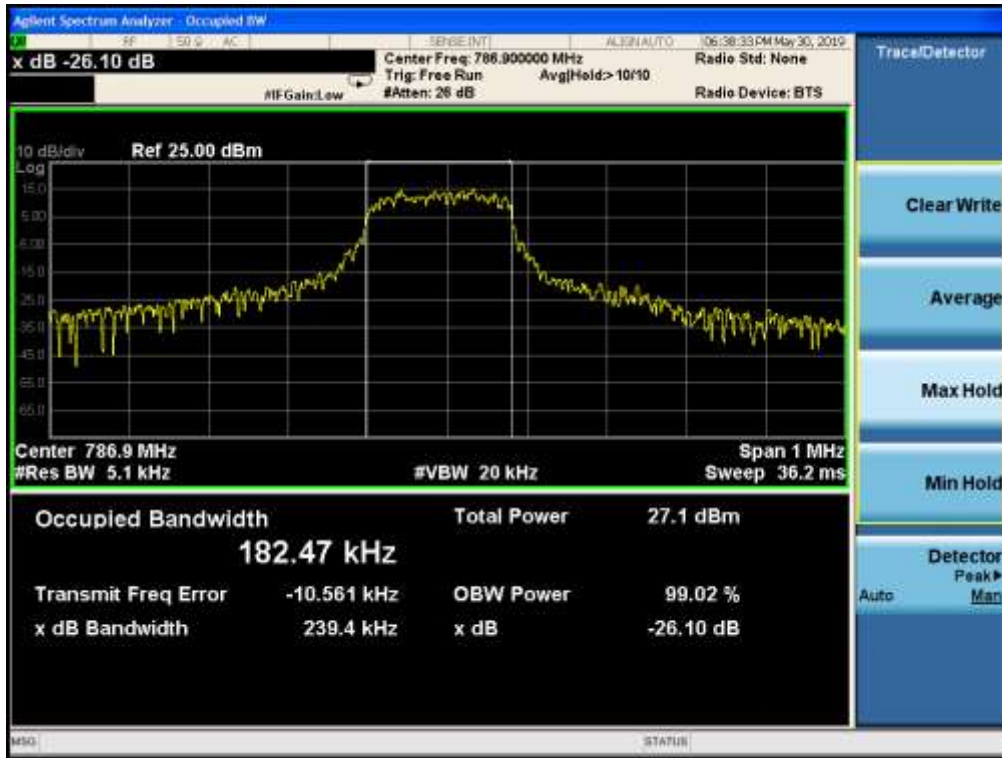


NB-IoT Guard-band band 13 23279 QPSK(99%)

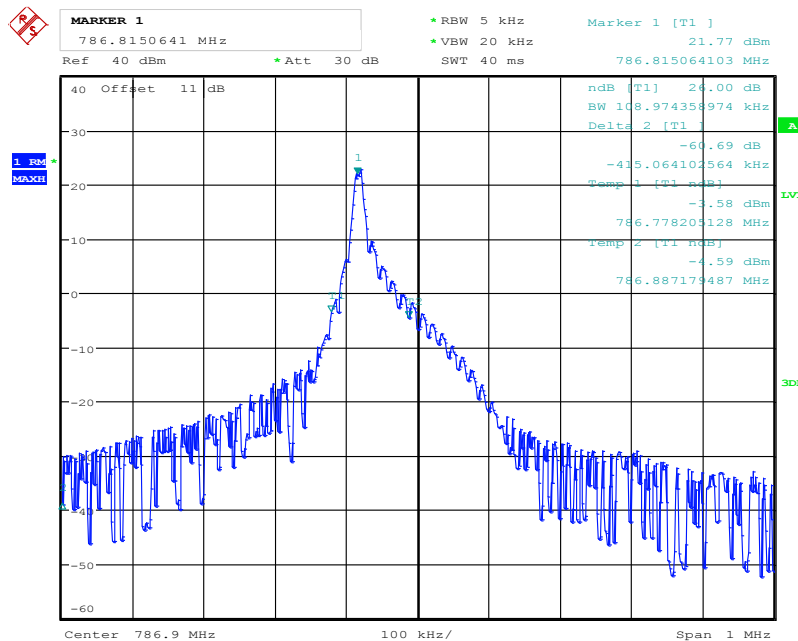


Date: 5.SEP.2019 14:42:10

NB-IoT Guard-band band 13 23279 BPSK(99%)



NB-IoT Guard-band band 13 23279 QPSK(26dB)



Date: 5.SEP.2019 14:42:23

NB-IoT Guard-band band 13 23279 BPSK(26dB)