

TEST REPORT

REPORT NUMBER: B19W50105-WWAN_Rev7

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;

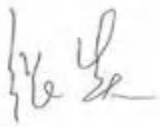
PART 27, MISCELLANEOUS WIRELESS COMMUNICATIONS SERVICES;

Chongqing Academy of Information and Communications Technology

Month date, year

Jan, 09, 2020

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.

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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	--
B19W50105-WWAN	V6.0	2019-10-21	--
B19W50105-WWAN	V7.0	2020-01-09	--

Chongqing Academy of Information and Communications Technology

Report No.:B19W50105-WWAN_Rev7

FCC ID: 2AJYU-8FCA101

Report Date: 2020-01-09

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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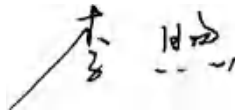
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1.2 Testers

Name: Li Xu
Position: Engineer
Department: Department of RF test
Date: 2019-06-05 to 2020-01-09

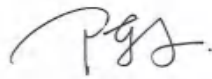
Signature:



Editor of this test report:

Name: Chen Wen
Position: Engineer
Department: Department of RF test
Date: 2020-01-09

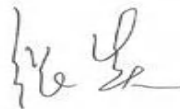
Signature:



Technical responsibility for area of testing:

Name: Zhang Yan
Position: Manager
Department: Director of the laboratory
Date: 2020-01-09

Signature:



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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: -----

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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

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3 Summary of Test Results

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

FCC Rules	Name of Test	Result
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:--		

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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	2020-11-23
3	Double-Ridged Horn Antenna	HF907	100357	R&S	2021-06-22
4	Fully-Anechoic Chamber	11.8m×6.5m×6.3m	--	ETS	2020-10-22
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	2020-12-04
9	Climate chamber	SH-241	92010759	ESPEC	2020-03-01

5 Test Results

5.1 Conducted RF Power Output

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

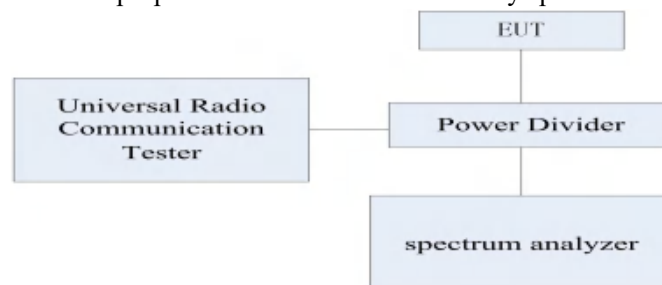
According to Part 27.50(d), fixed, mobile, and portable (hand-held) stations operating in the 1710-1755 MHz Band and mobile and portable stations operating in the 1695-1710 MHz and 1755-1780 MHz Bands are limited to 1 watt EIRP.

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

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 _{tones}		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 _{tones}		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 _{tones}		Channel			
				Low	Mid	715.8 MHz	High
3.75	BPSK	1@0	Average	23.27	23.58	22.99	-12.71
			Peak	25.51	25.72	25.42	-10.15
		1@47	Average	23.17	23.60	22.89	-12.79
			Peak	25.44	25.74	25.50	-10.37
	QPSK	1@0	Average	23.22	23.59	23.04	-12.76
			Peak	25.02	25.31	25.12	-10.22
		1@47	Average	23.22	23.60	22.94	-12.75
			Peak	25.11	25.42	25.27	-9.87
15	BPSK	1@0	Average	23.03	23.40	22.71	-12.89
			Peak	24.98	25.28	25.75	-10.35
		1@11	Average	23.06	23.40	22.65	-12.98
			Peak	25.04	25.30	25.33	-10.44
	QPSK	1@0	Average	23.04	23.44	22.90	-12.95
			Peak	24.99	25.21	25.51	-10.37
		1@11	Average	23.07	23.40	22.63	-13.04
			Peak	25.05	25.00	25.15	-10.75
		12@0	Average	20.71	20.96	20.60	-13.02
			Peak	26.10	26.26	25.91	-10.67

5.1.4 NB-IoT Band 13

Maximum Average Conducted Power (dBm)						
Sub-carrier Spacing [kHz]	Modulation	N _{tones}		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 _{tones}		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 _{tones}		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

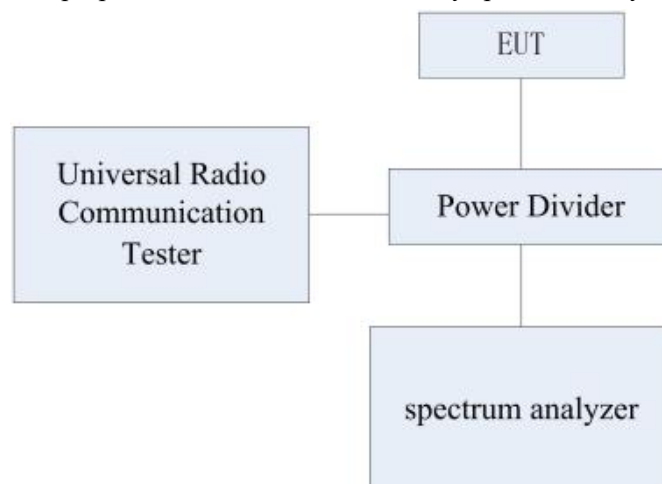
Maximum Average Conducted Power (dBm)						
Sub-carrier Spacing [kHz]	Modulation	N _{tones}		Channel		
				Low	Mid	High
3.75	BPSK	1@0	Average	22.93	23.46	23.79
			Peak	25.43	25.82	26.01
		1@47	Average	22.97	23.47	23.86
			Peak	25.46	25.82	26.03
	QPSK	1@0	Average	23.02	23.53	23.83
			Peak	24.99	25.39	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

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

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 _{UL}	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 _{UL}	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 _{UL}	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 _{UL}	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 _{UL}	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 _{UL}	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 _{UL}	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		184.29	115.38	227.56	107.37

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

Frequency ID	N _{UL}	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		184.29	107.37	225.96	84.93

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

Frequency ID	N _{UL}	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		184.29	107.37	219.55	84.93

5.2.4 NB-IoT Band 13

NB-IoT standalone Test frequencies for operating band 13

Frequency ID	N _{UL}	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 _{UL}	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 _{UL}	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

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5.2.5 NB-IoT Band 26

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

Frequency ID	N _{UL}	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 _{UL}	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 _{UL}	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 _{UL}	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 _{UL}	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 _{UL}	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 _{UL}	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 _{UL}	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

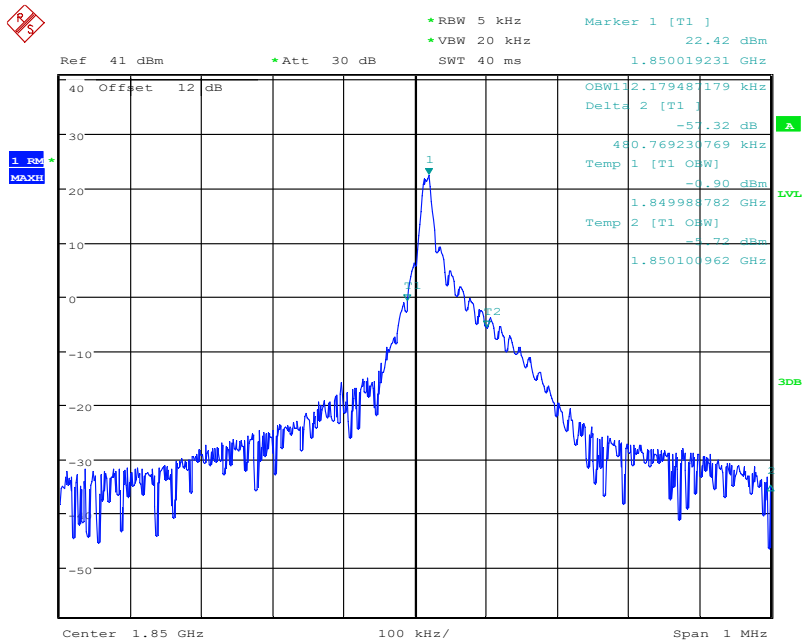
NB-IoT guard-band Test frequencies for operating band 71

Frequency ID	N _{UL}	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%)

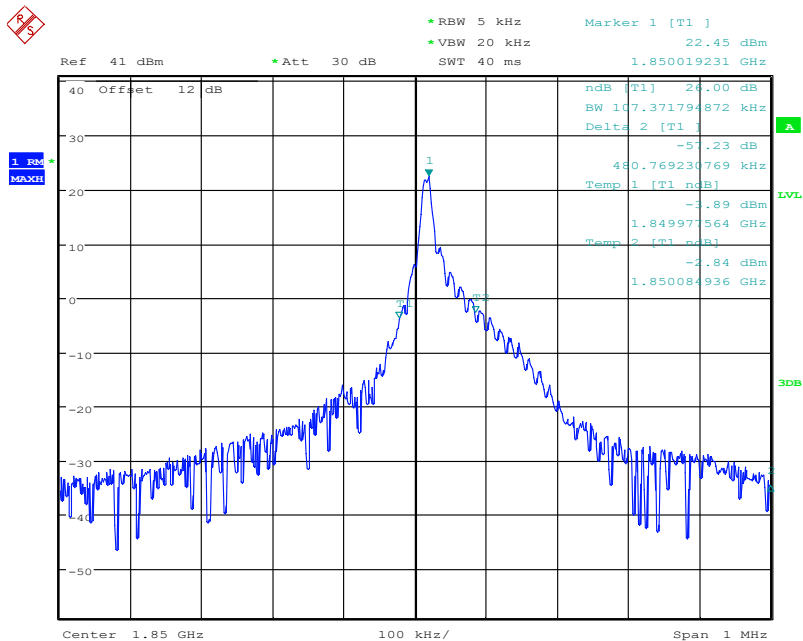


Date: 5.SEP.2019 14:13:52

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



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

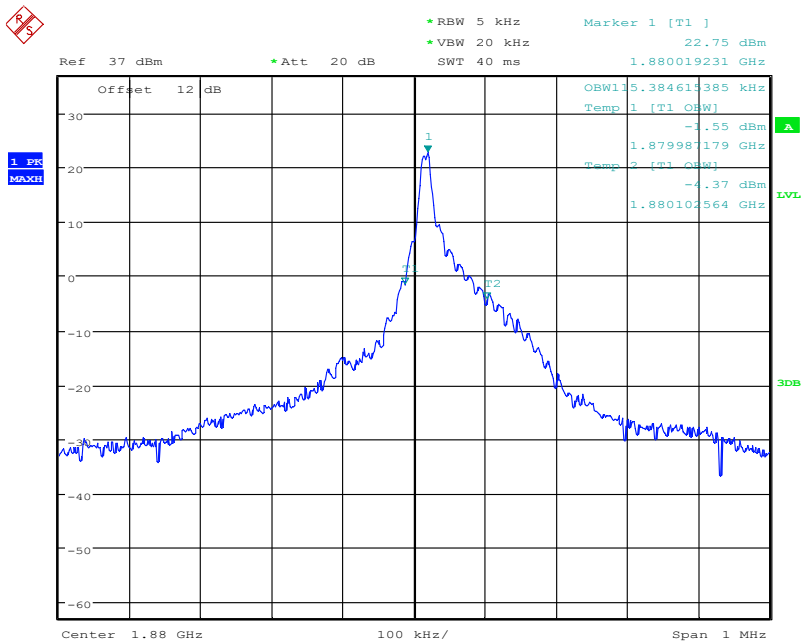


Date: 5.SEP.2019 14:13:23

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



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

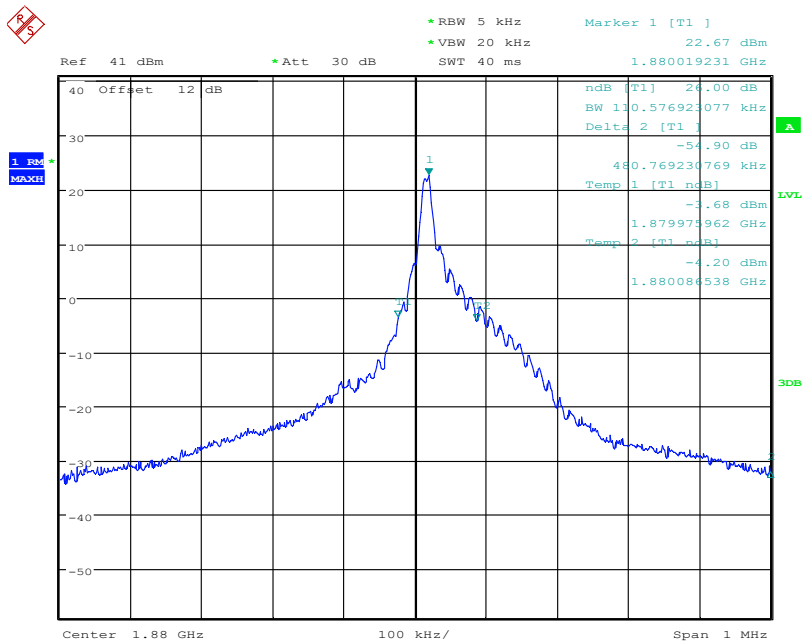


Date: 5.SEP.2019 13:36:07

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

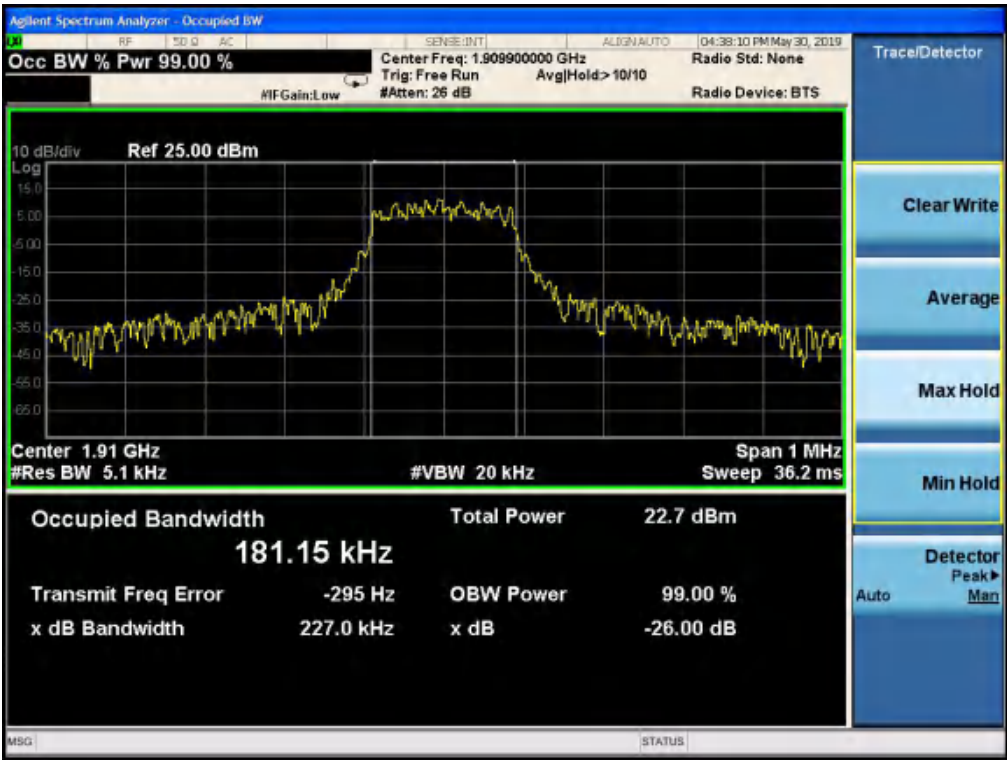


NB-IoT standalone band 2 18900 QPSK(26dB)

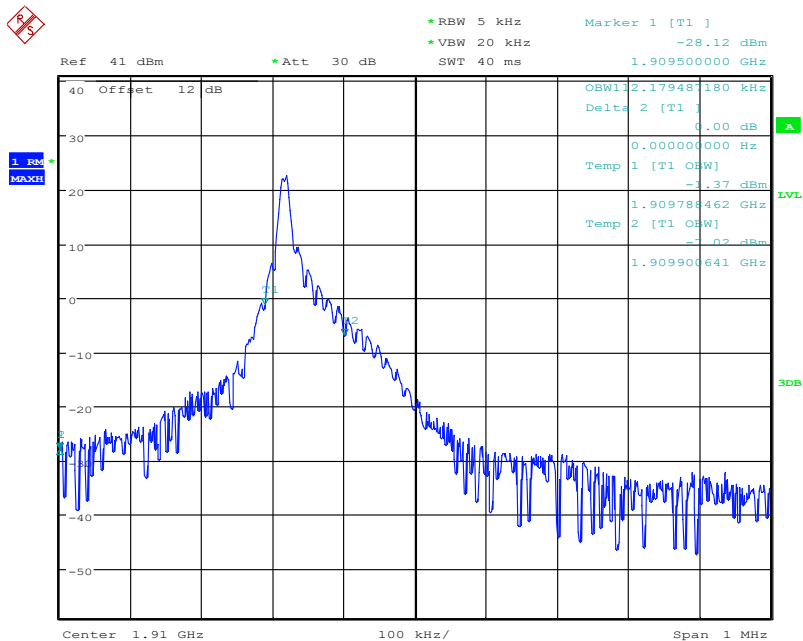


Date: 5.SEP.2019 14:05:47

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

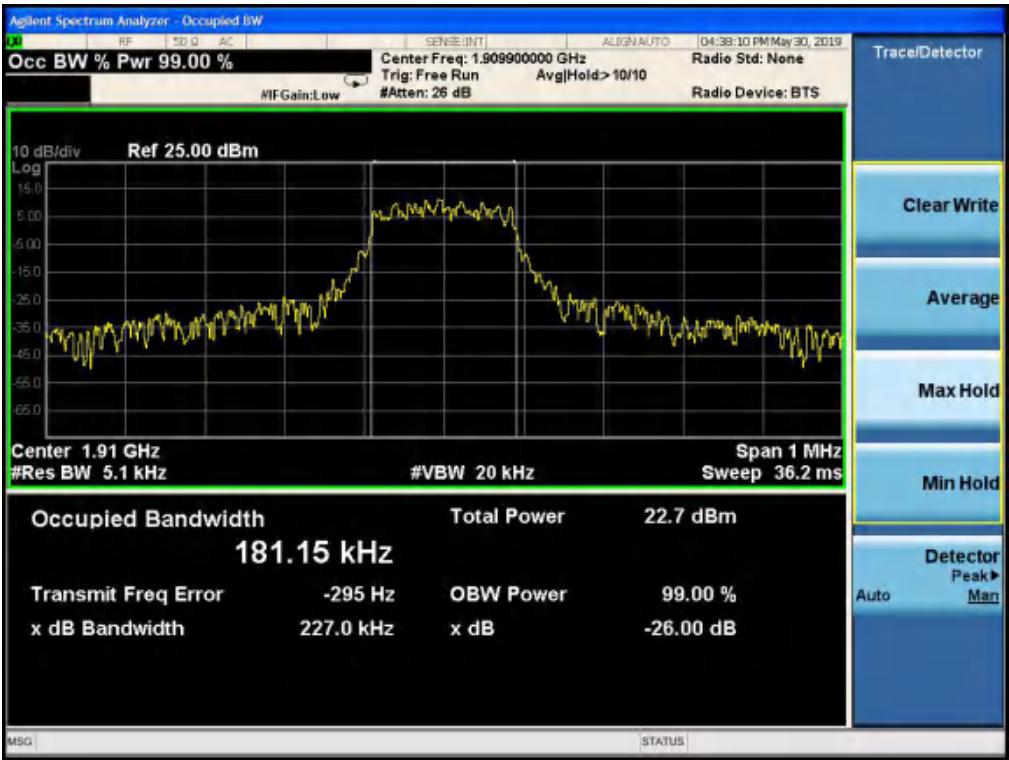


NB-IoT standalone band 2 19199 QPSK(99%)

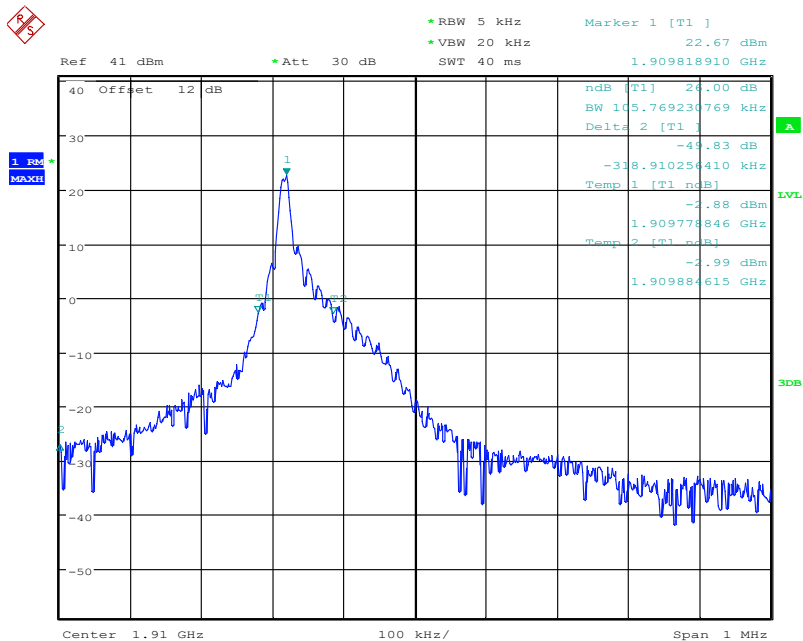


Date: 5.SEP.2019 14:11:24

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

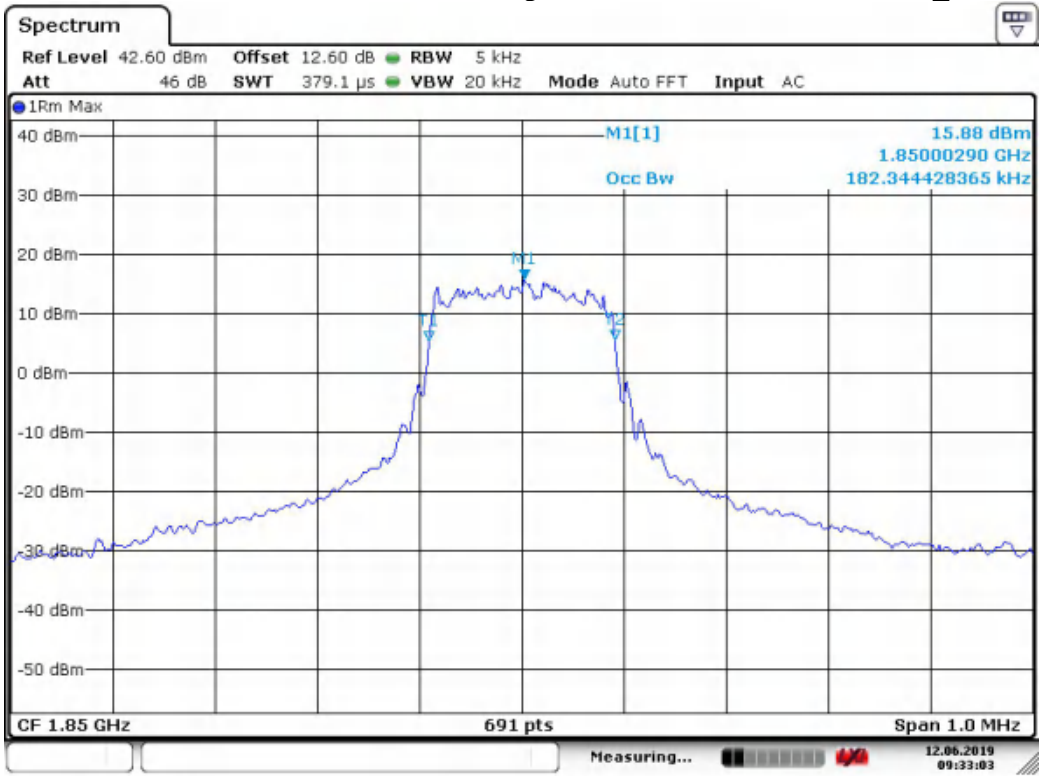


NB-IoT standalone band 2 19199 QPSK(26dB)



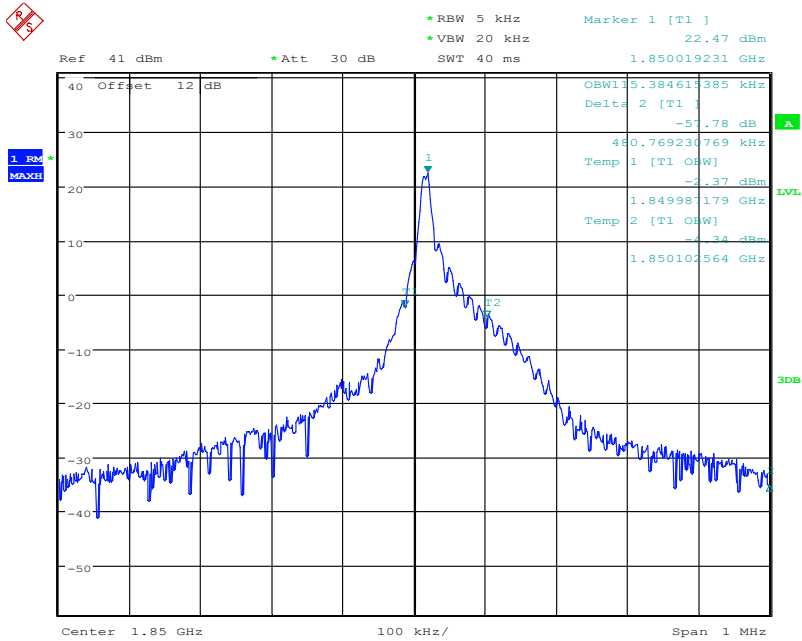
Date: 5.SEP.2019 14:11:54

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



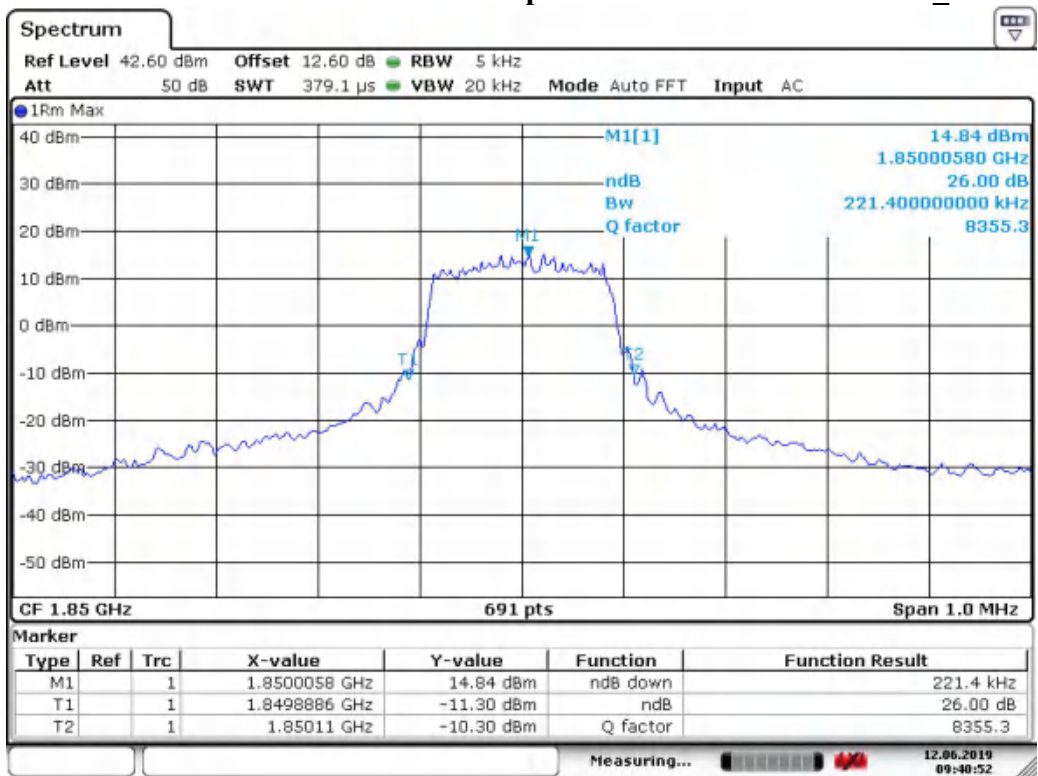
Date: 12.JUN.2019 09:33:04

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



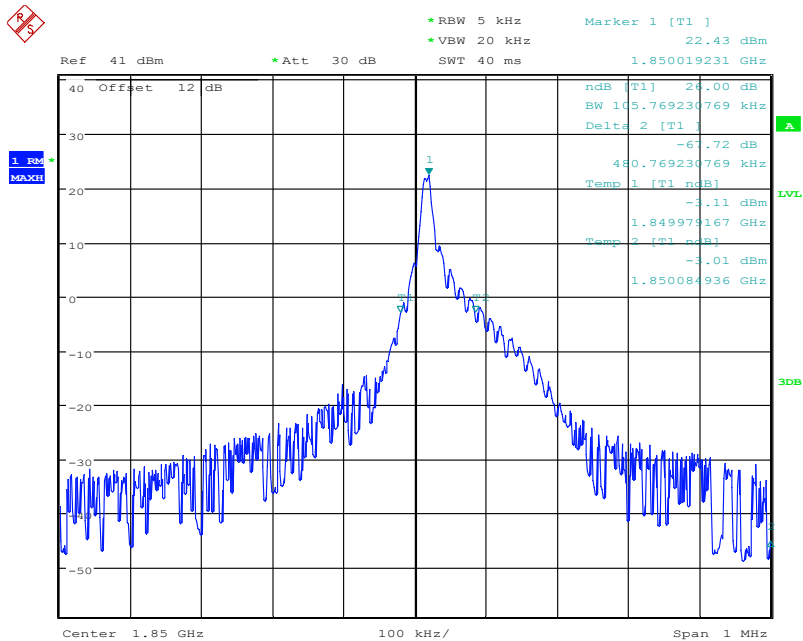
Date: 5.SEP.2019 14:15:12

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



Date: 12 JUN 2019 09:40:52

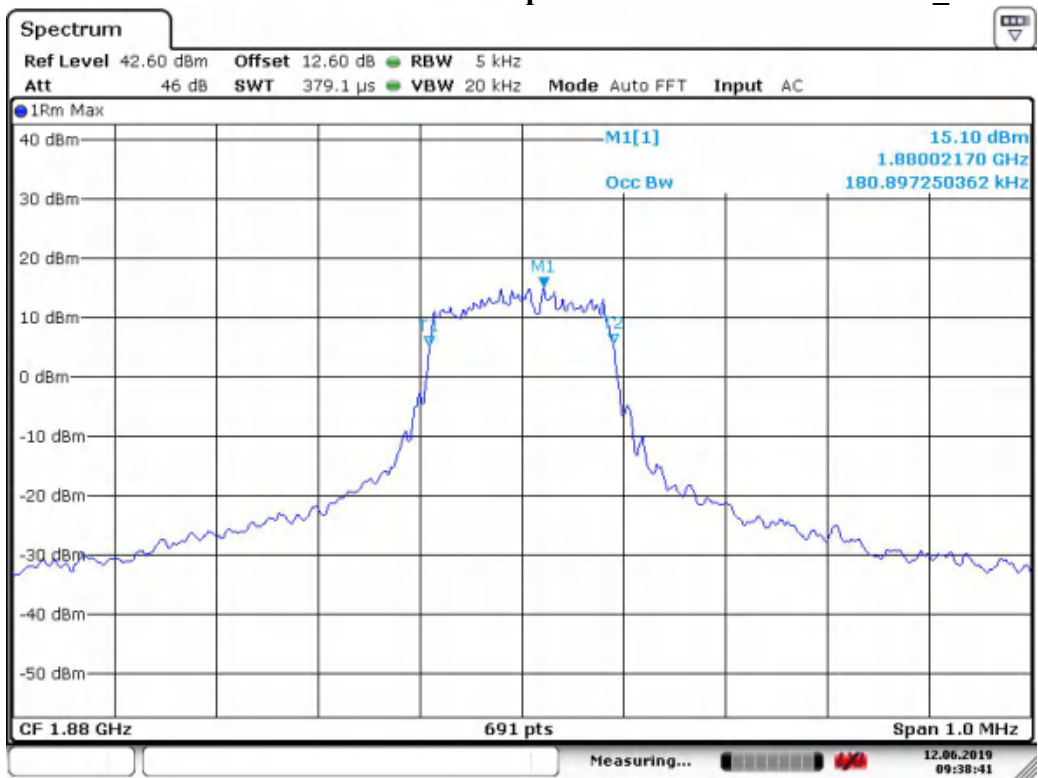
NB-IoT In-band band 2 18601 QPSK(26dB)



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

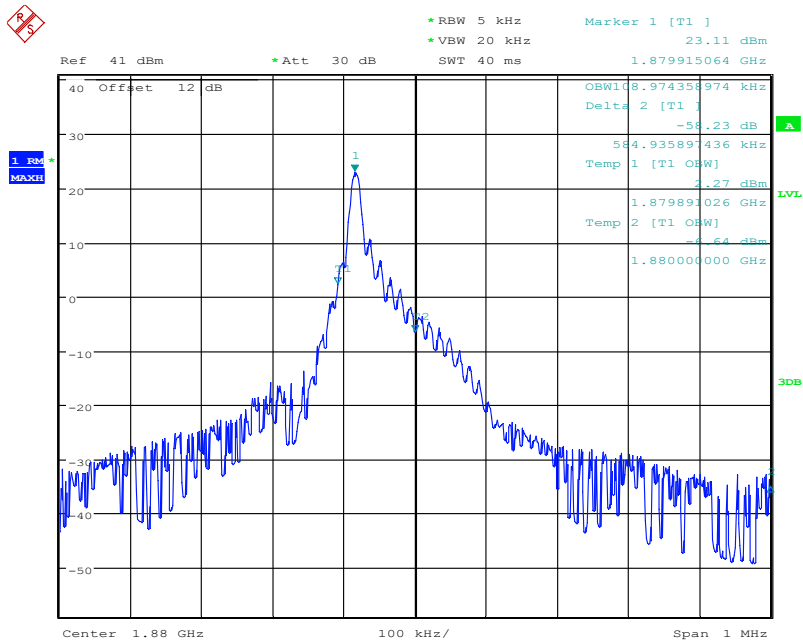
NB-IoT In-band band 2 18601 BPSK(26dB)

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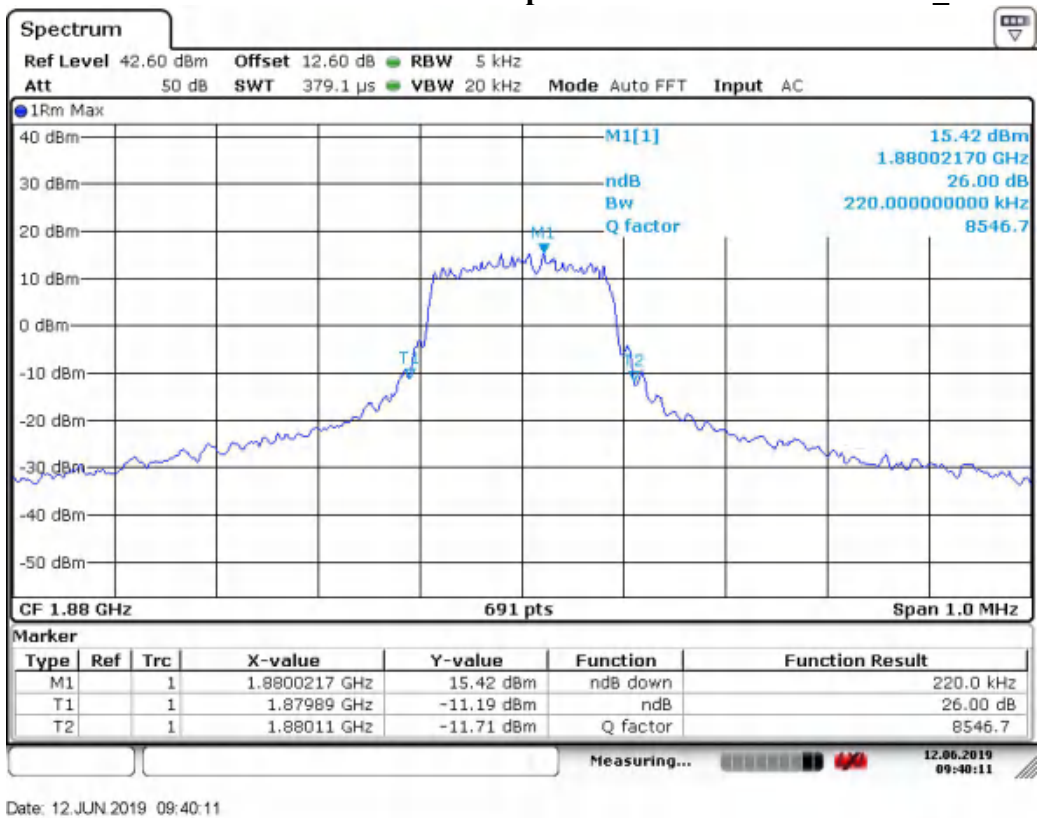
Date: 12.JUN.2019 09:38:41

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

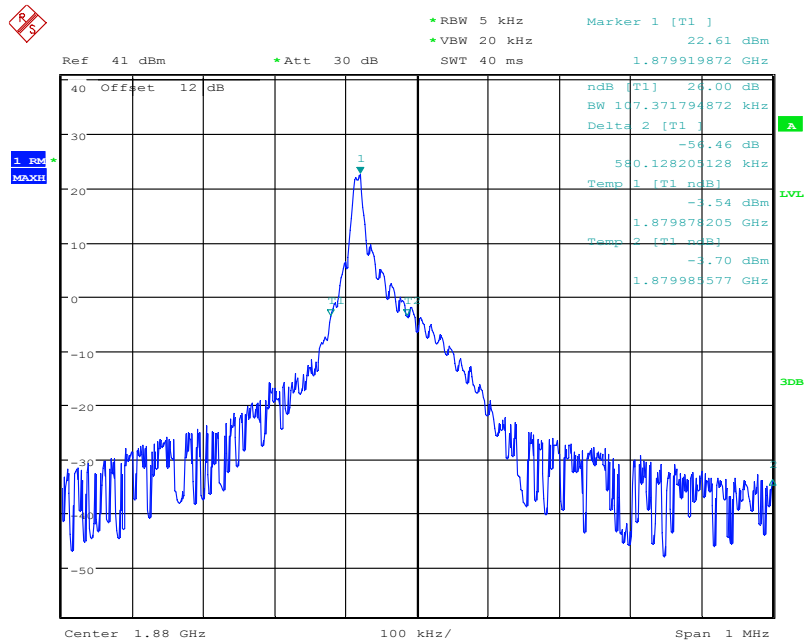


Date: 5.SEP.2019 14:17:20

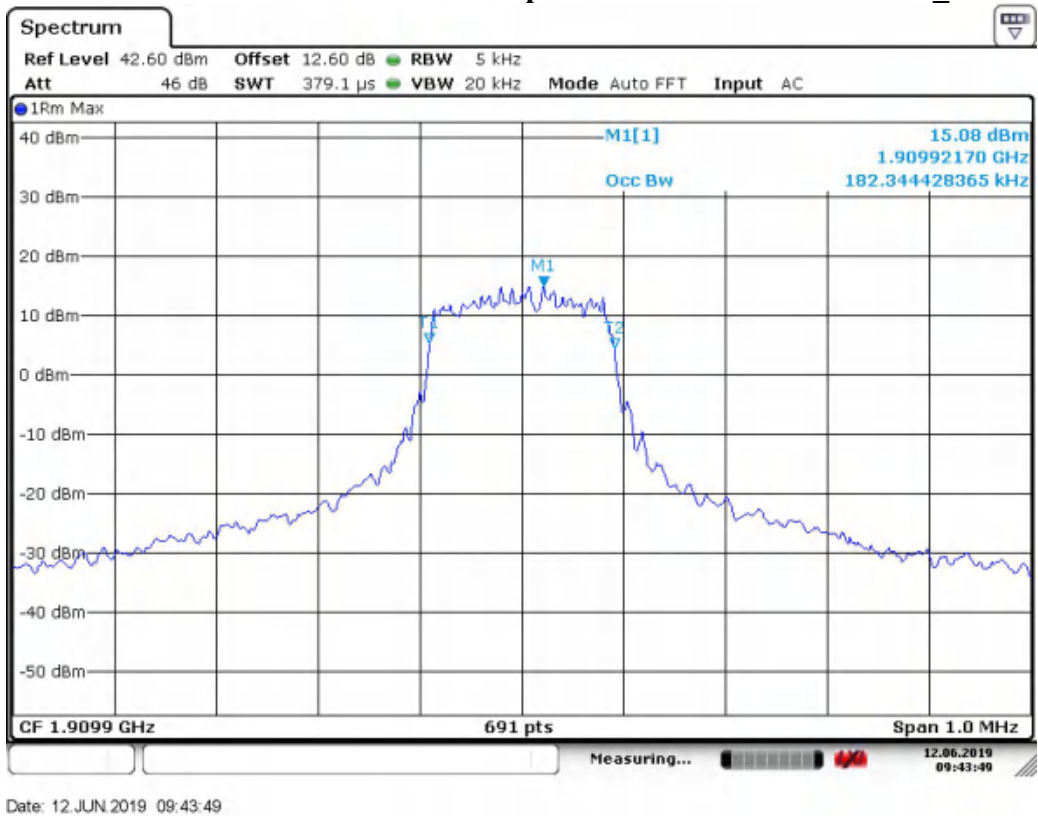
NB-IoT In-band band 2 18900 BPSK(99%)



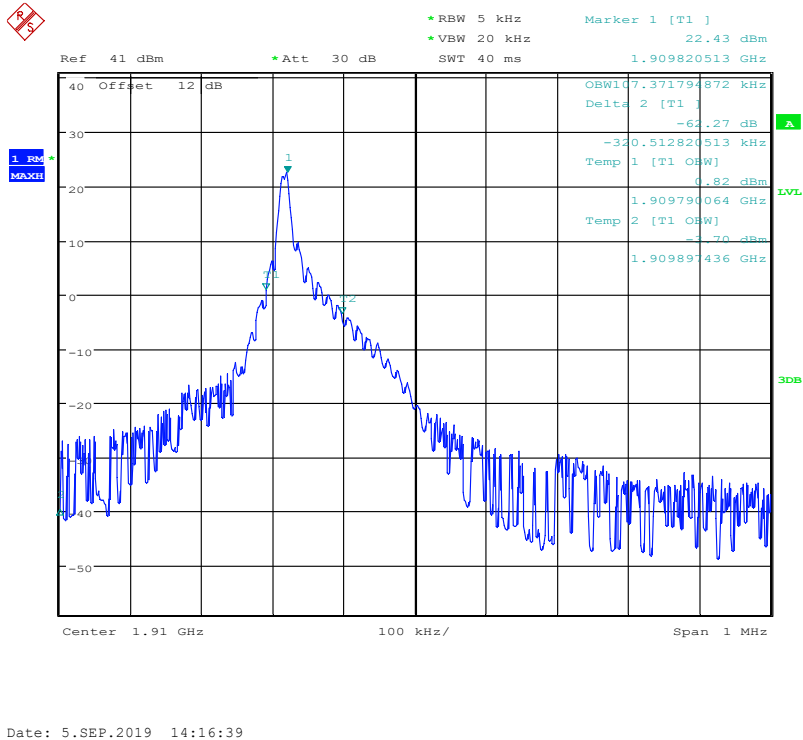
NB-IoT In-band band 2 18900 QPSK(26dB)



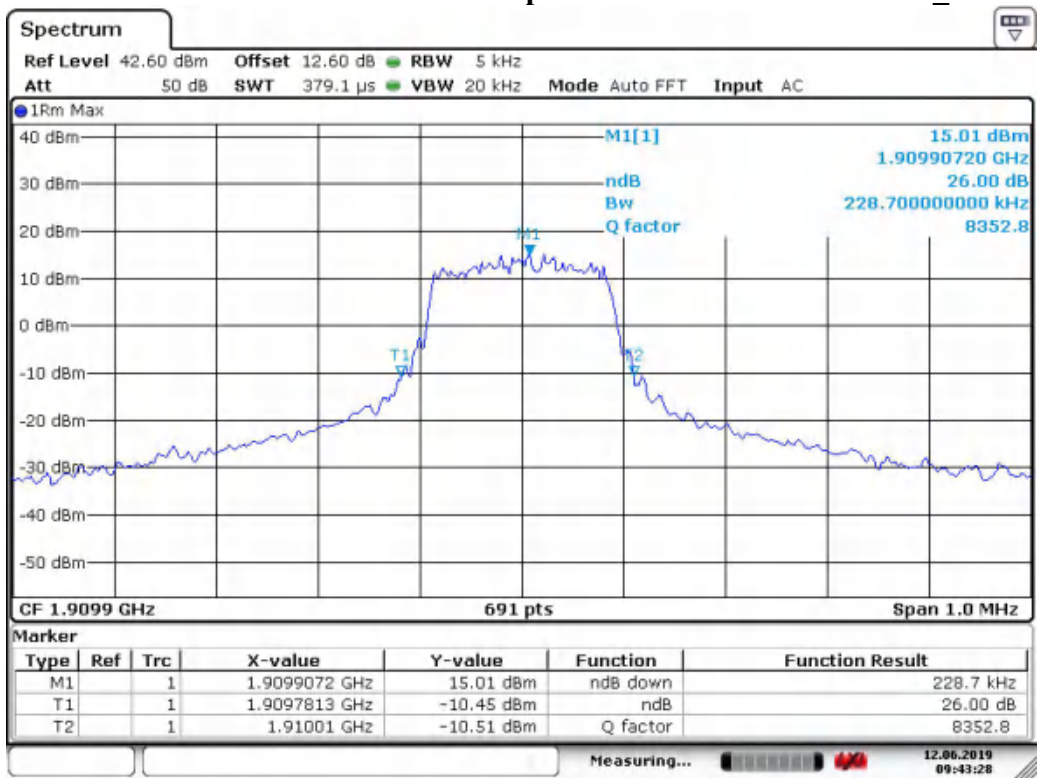
NB-IoT In-band band 2 18900 BPSK(26dB)



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

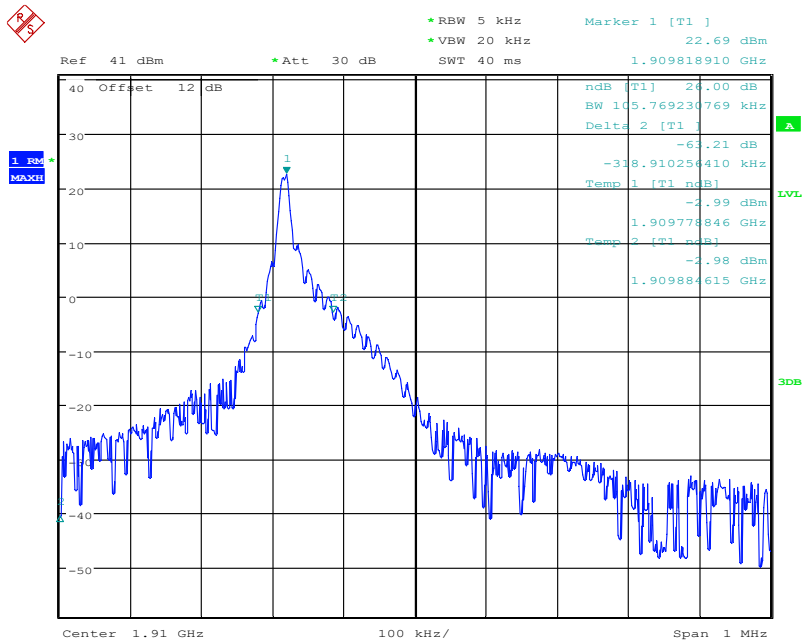


NB-IoT In-band band 2 19199 BPSK(99%)



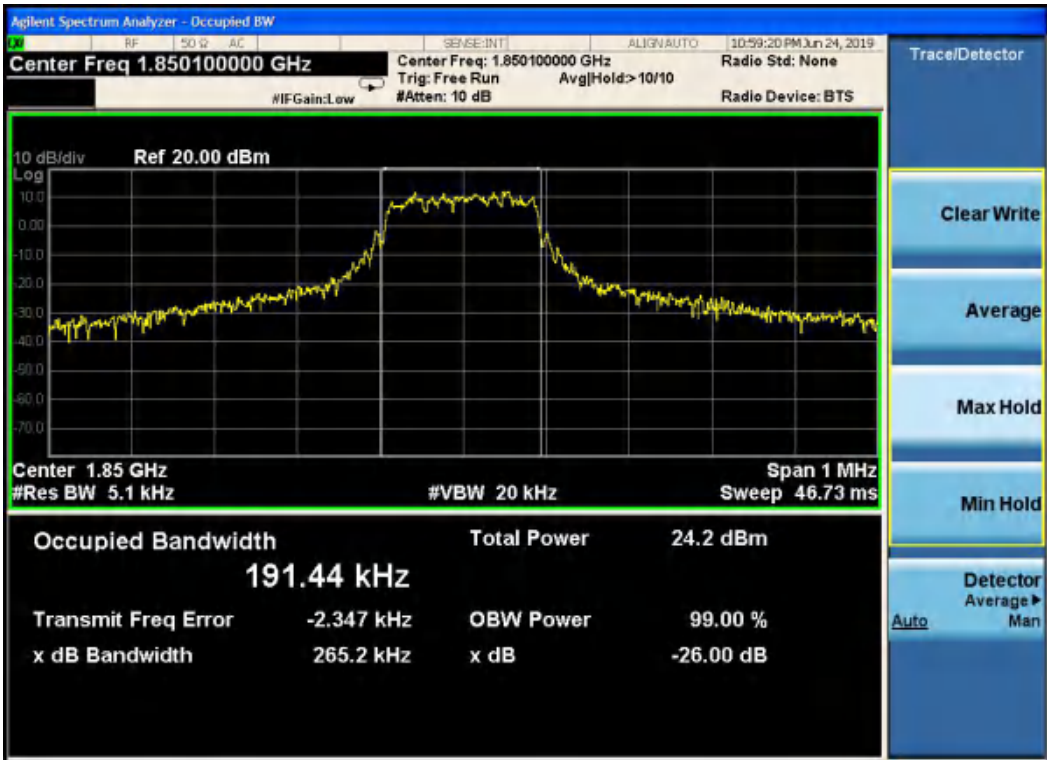
Date: 12 JUN 2019 09:43:28

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

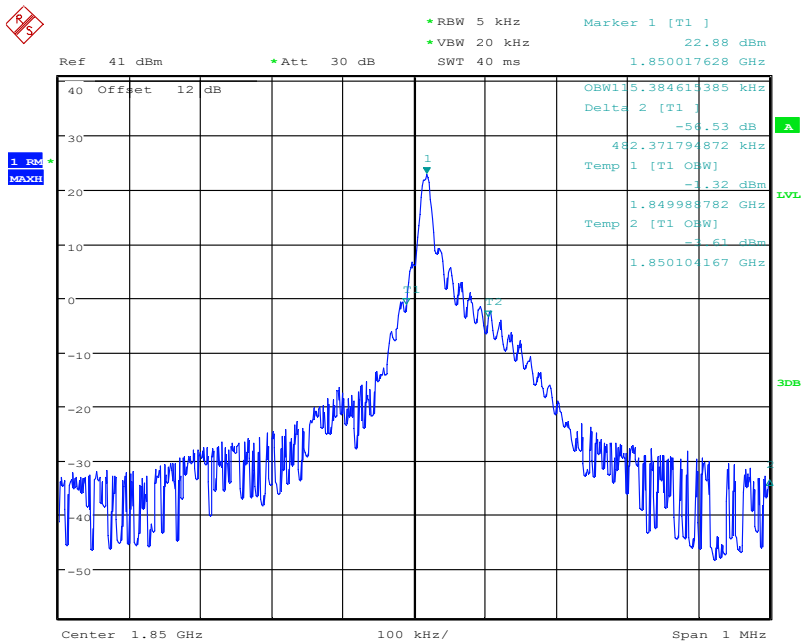


Date: 5.SEP.2019 14:16:27

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

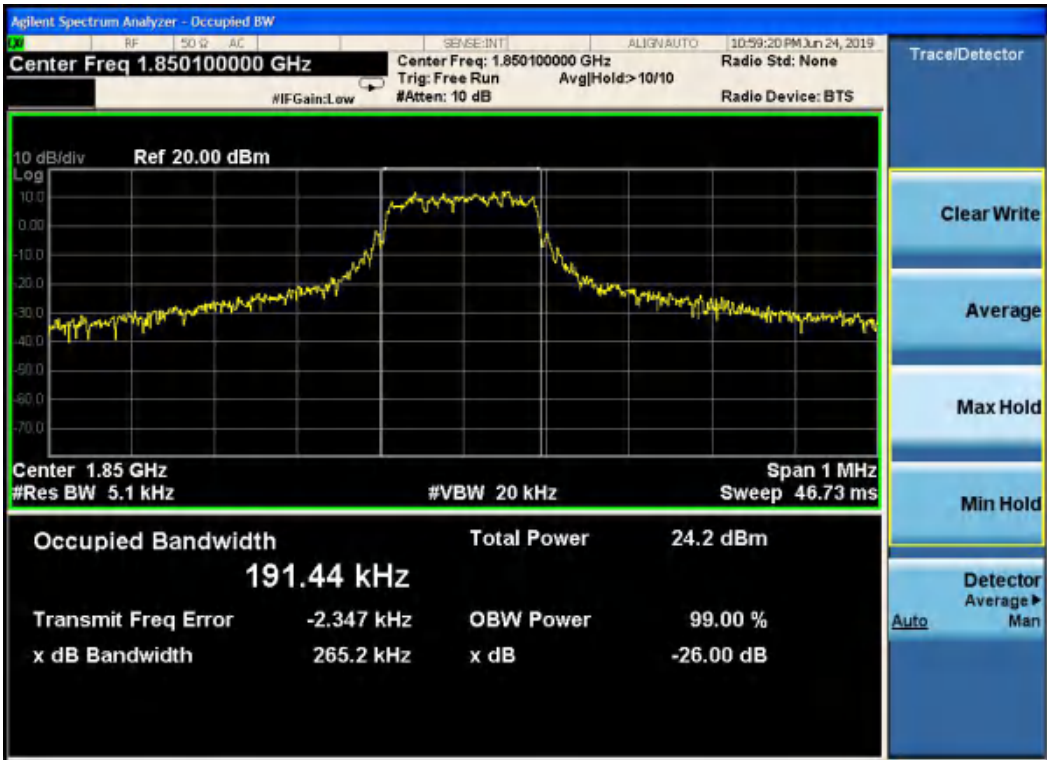


NB-IoT Guard-band band 2 18601 QPSK(99%)

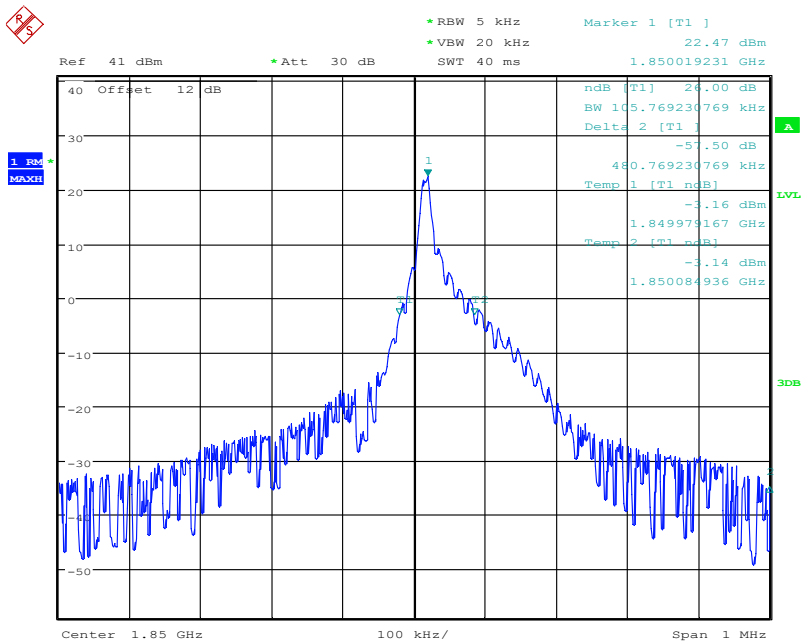


Date: 5.SEP.2019 14:19:39

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



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

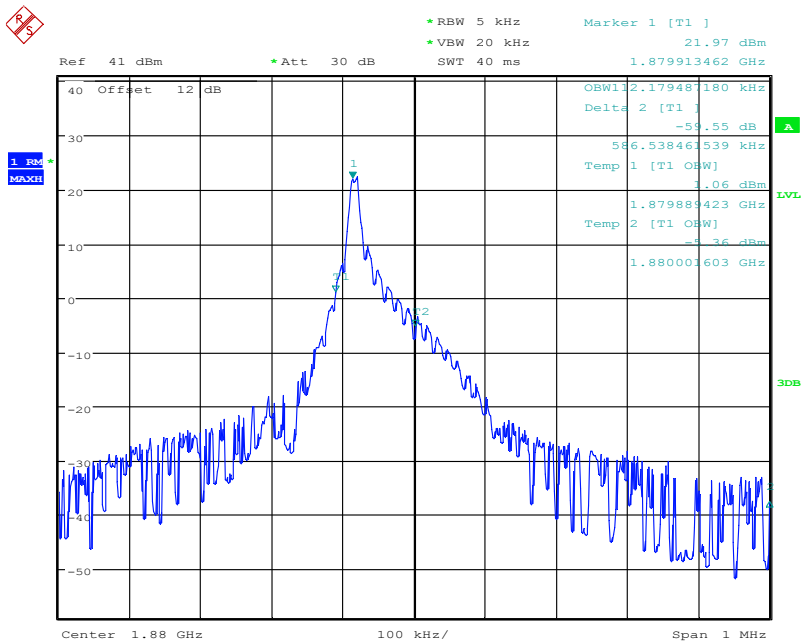


Date: 5.SEP.2019 14:19:52

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



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

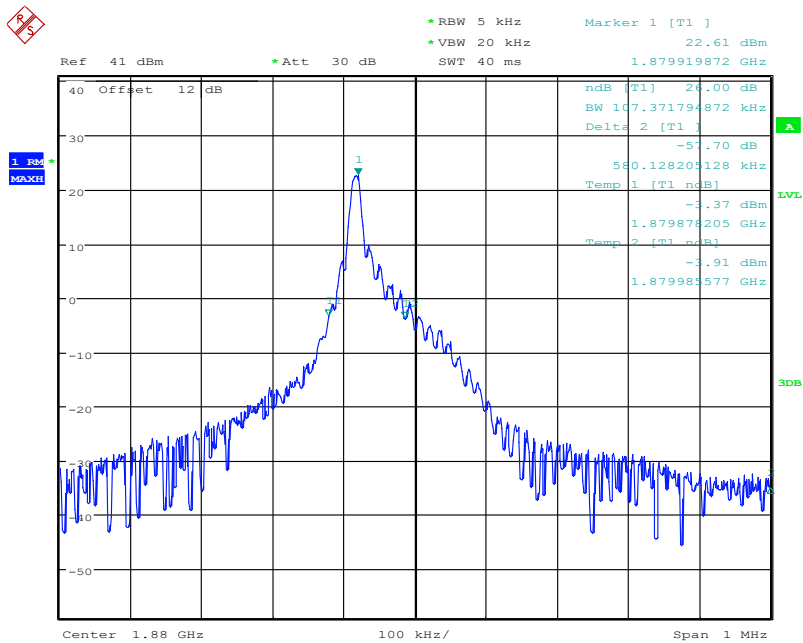


Date: 5.SEP.2019 14:18:59

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



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

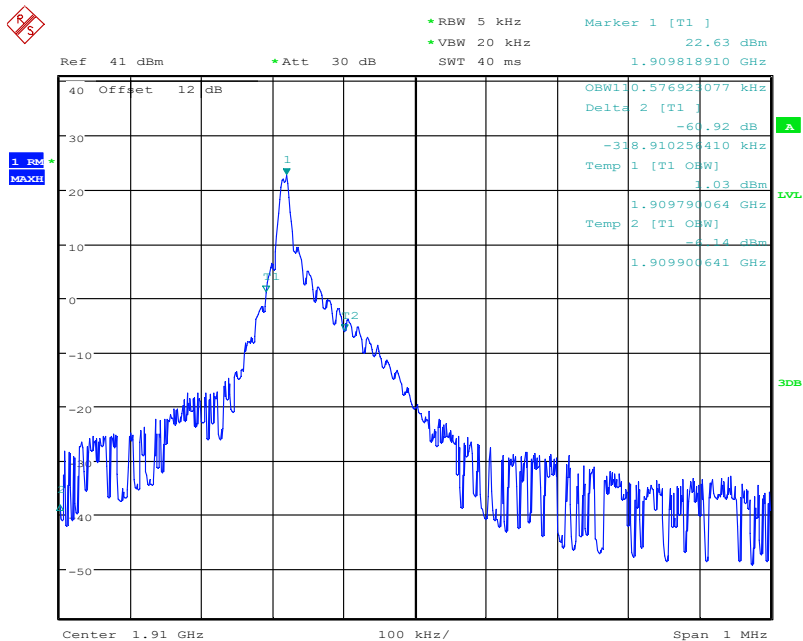


Date: 5.SEP.2019 14:18:46

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



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

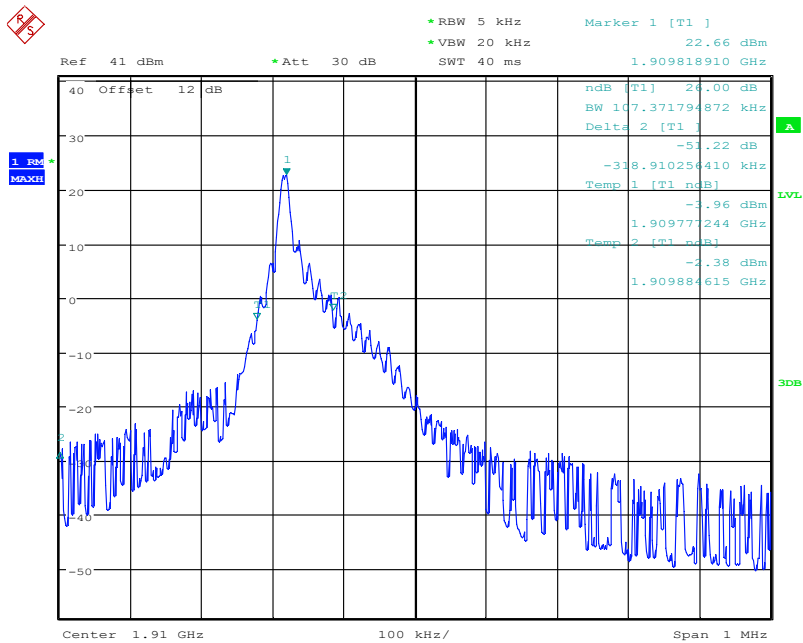


Date: 5.SEP.2019 14:20:42

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



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



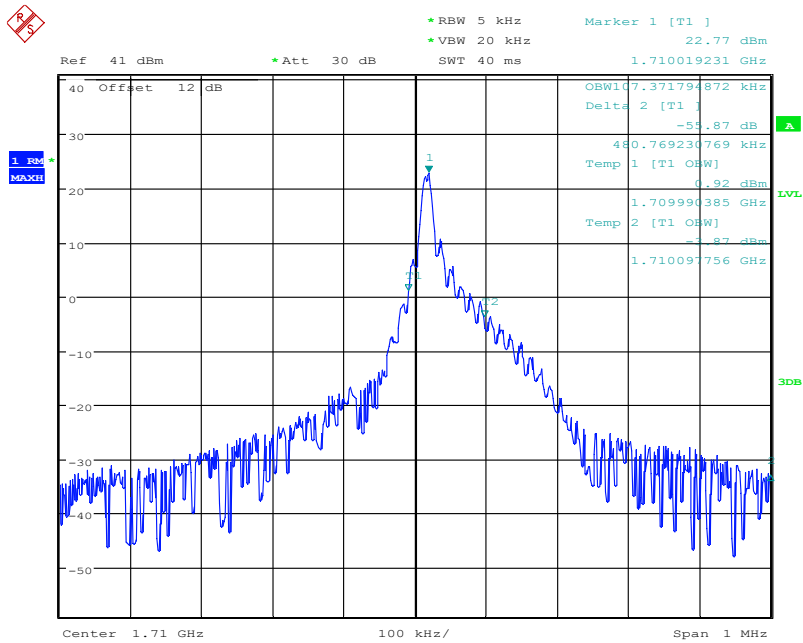
Date: 5.SEP.2019 14:20:28

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

Graphical results for Band4:



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

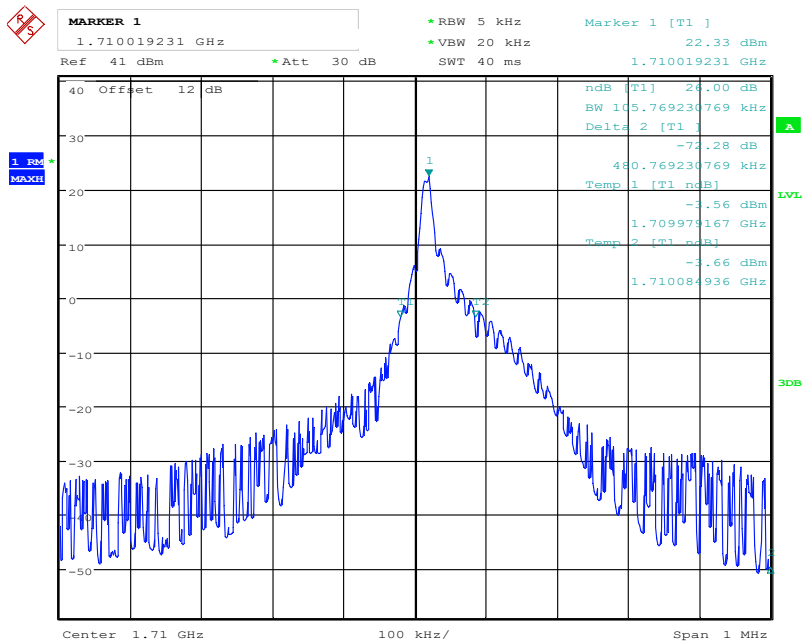


Date: 5.SEP.2019 14:28:52

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

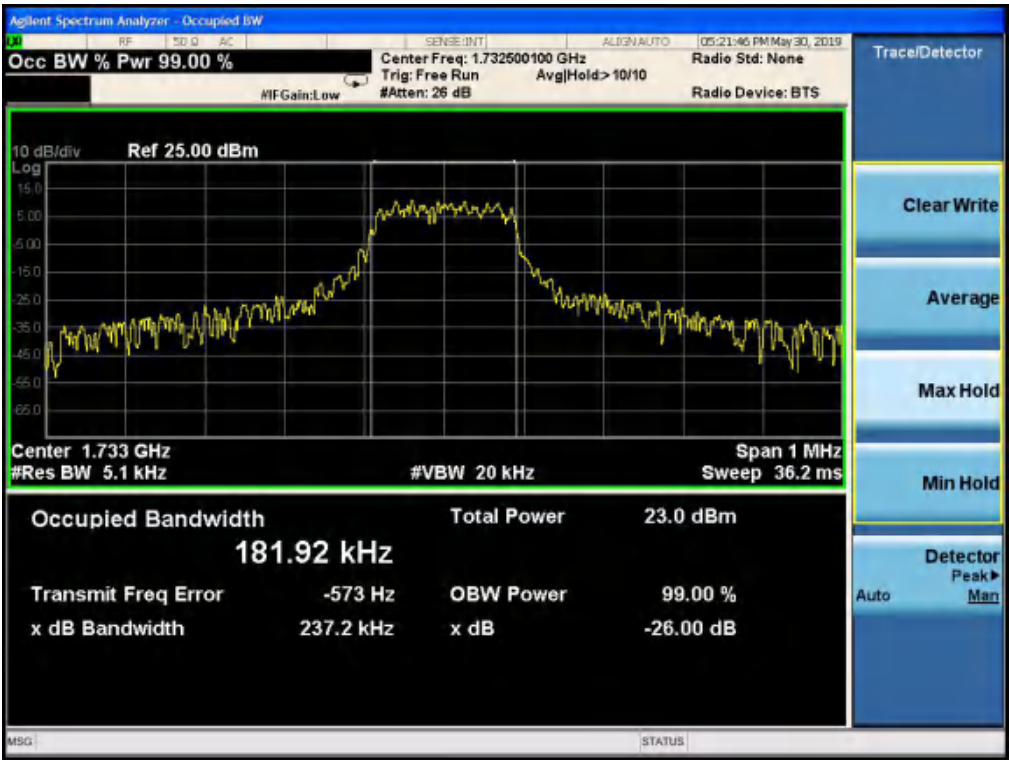


NB-IoT standalone band 4 19951 QPSK(26dB)

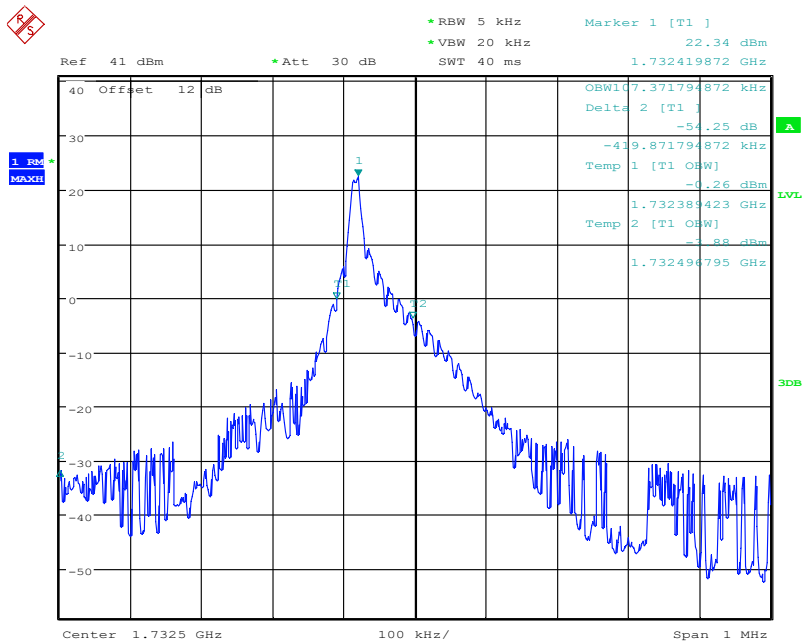


Date: 5.SEP.2019 14:29:03

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

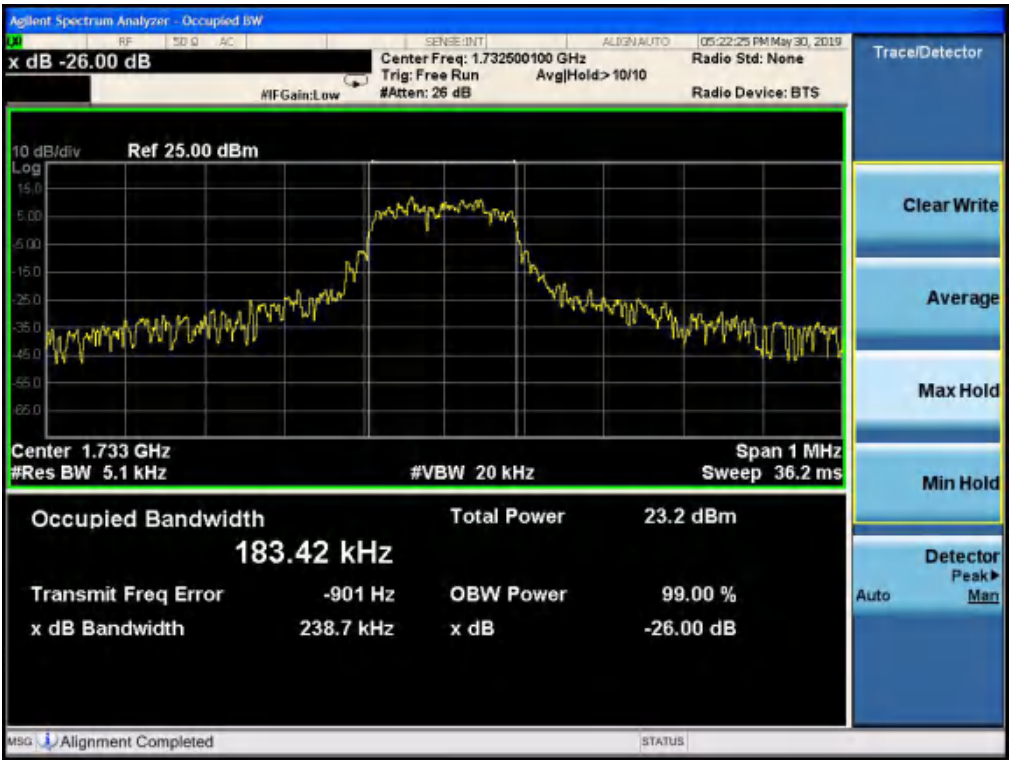


NB-IoT standalone band 4 20175 QPSK(99%)

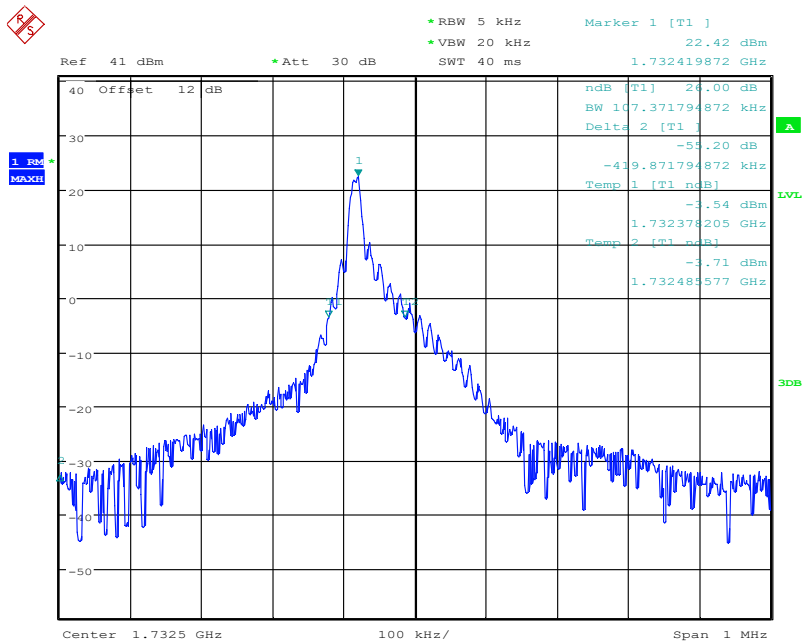


Date: 5.SEP.2019 14:30:01

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



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

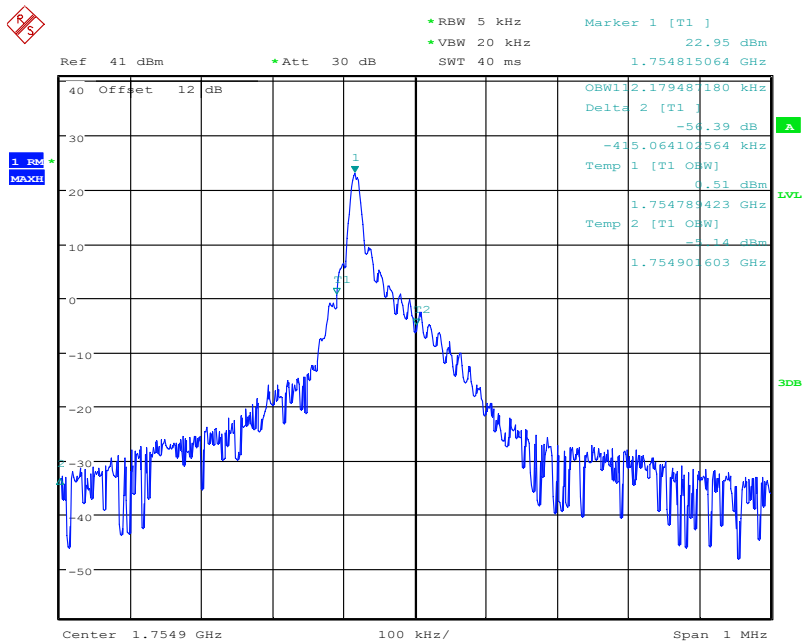


Date: 5.SEP.2019 14:29:48

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



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

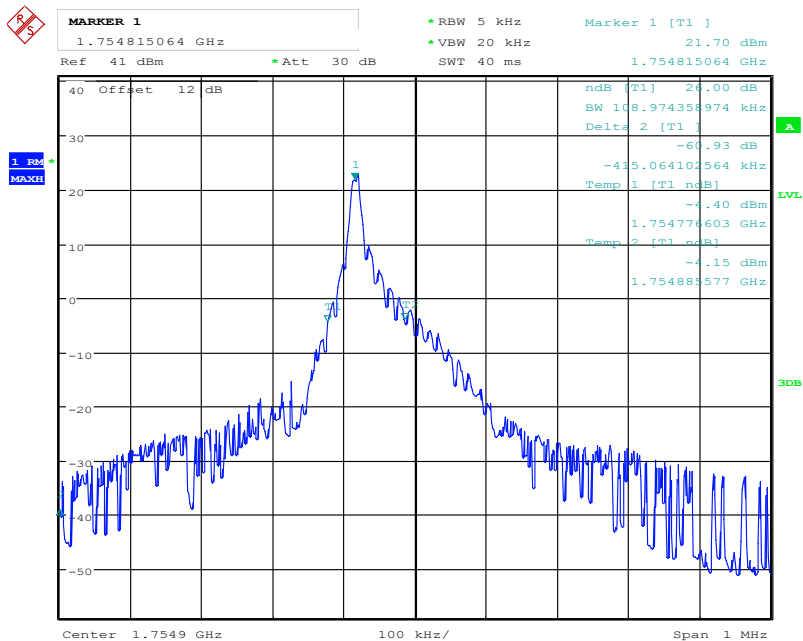


Date: 5.SEP.2019 14:30:33

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

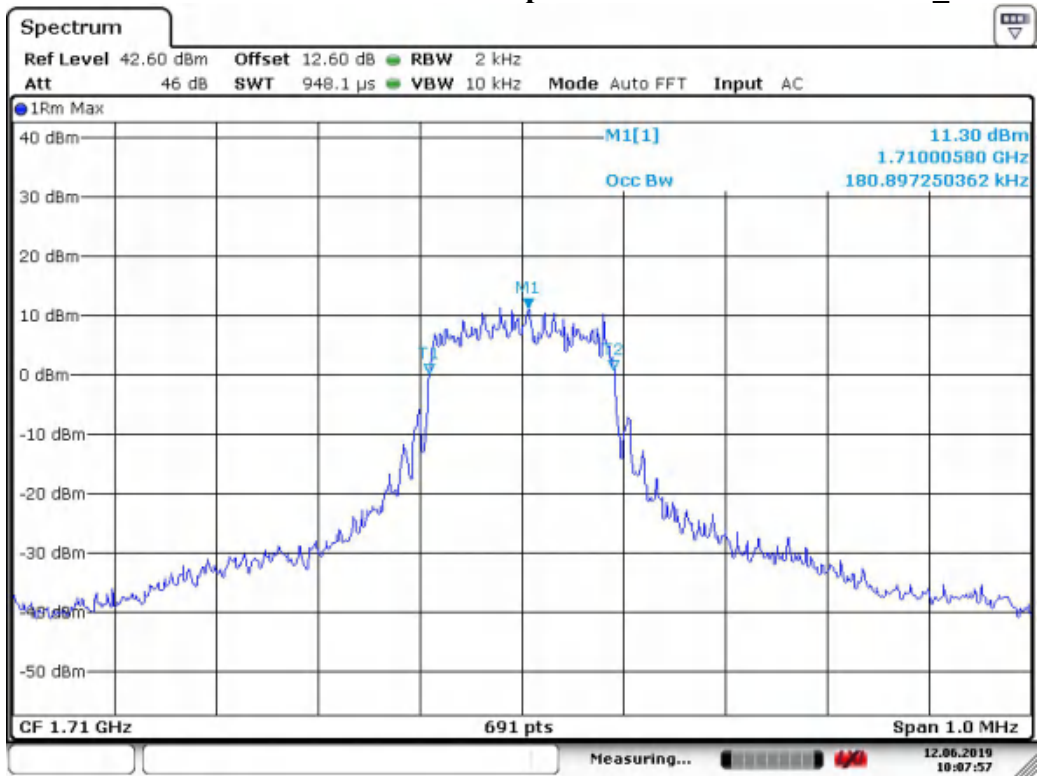


NB-IoT standalone band 4 20399 QPSK(26dB)



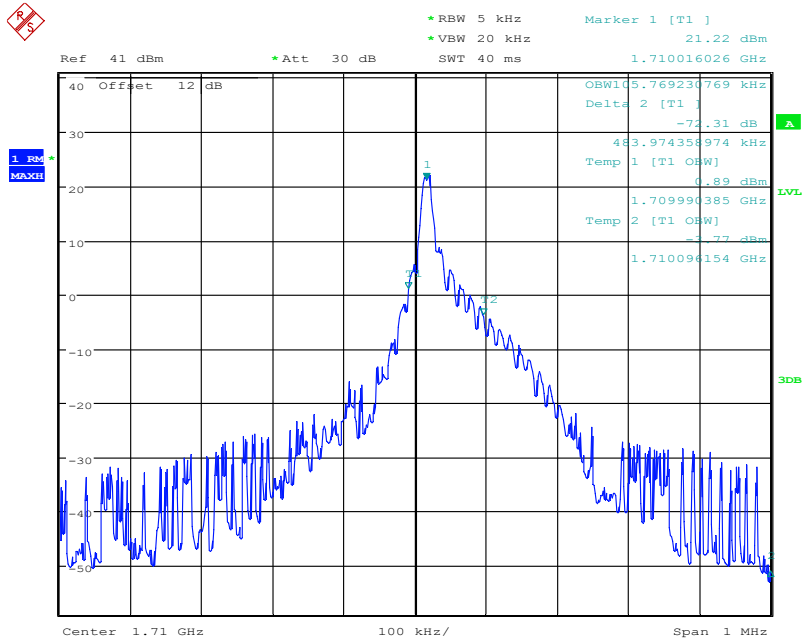
Date: 5.SEP.2019 14:30:43

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



Date: 12.JUN.2019 10:07:57

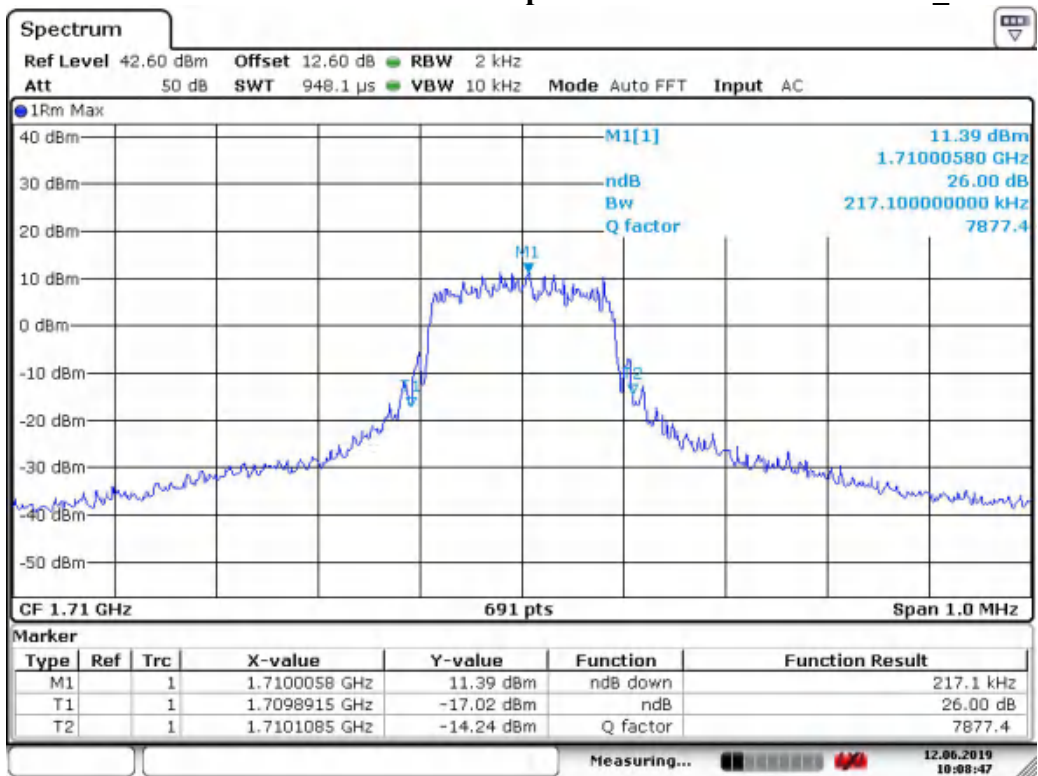
NB-IoT In-band band 4 19951 QPSK(99%)



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

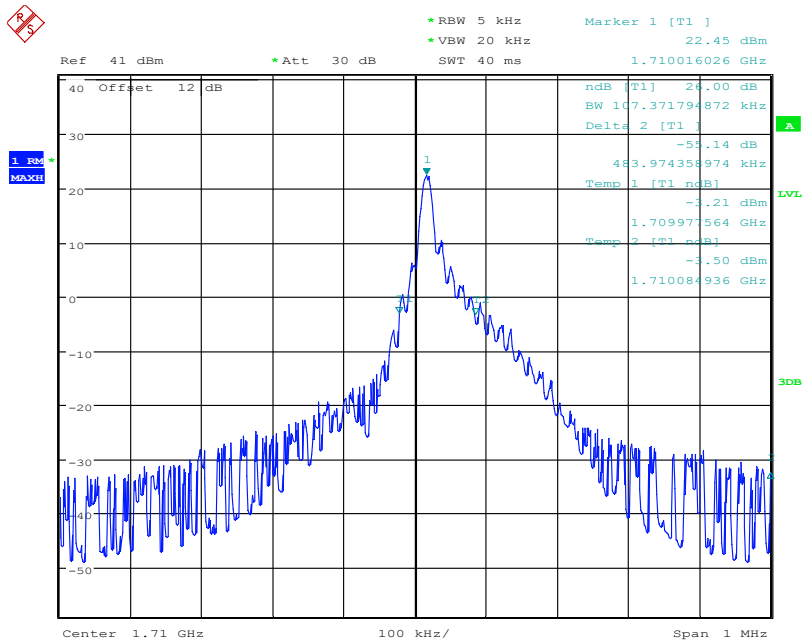
NB-IoT In-band band 4 19951 BPSK(99%)

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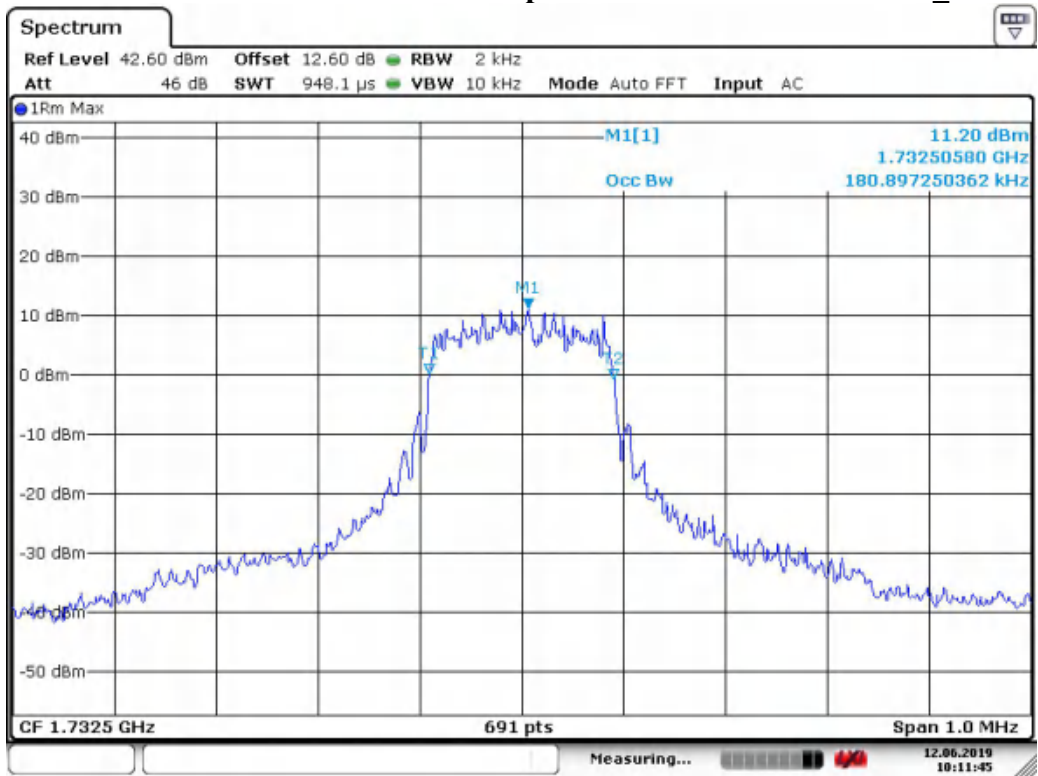
Date: 12 JUN 2019 10:08:47

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



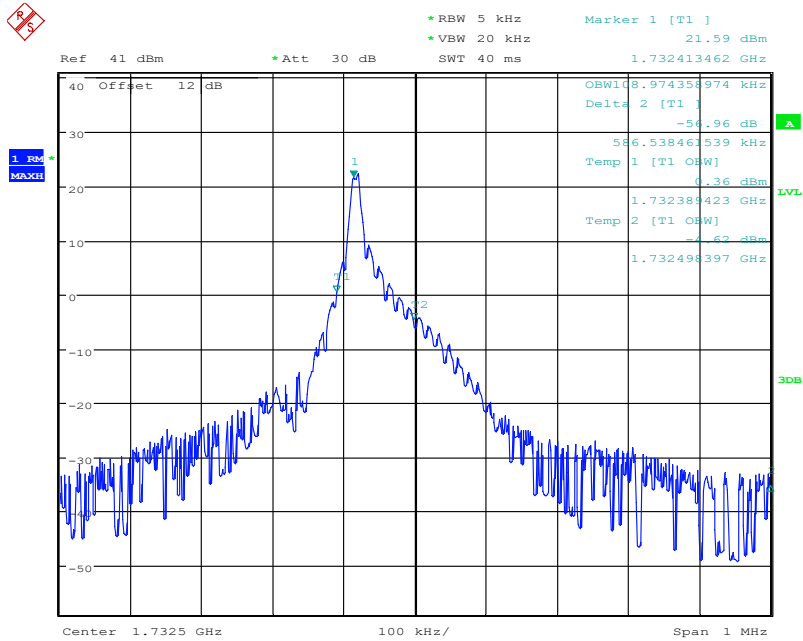
Date: 5.SEP.2019 14:28:08

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



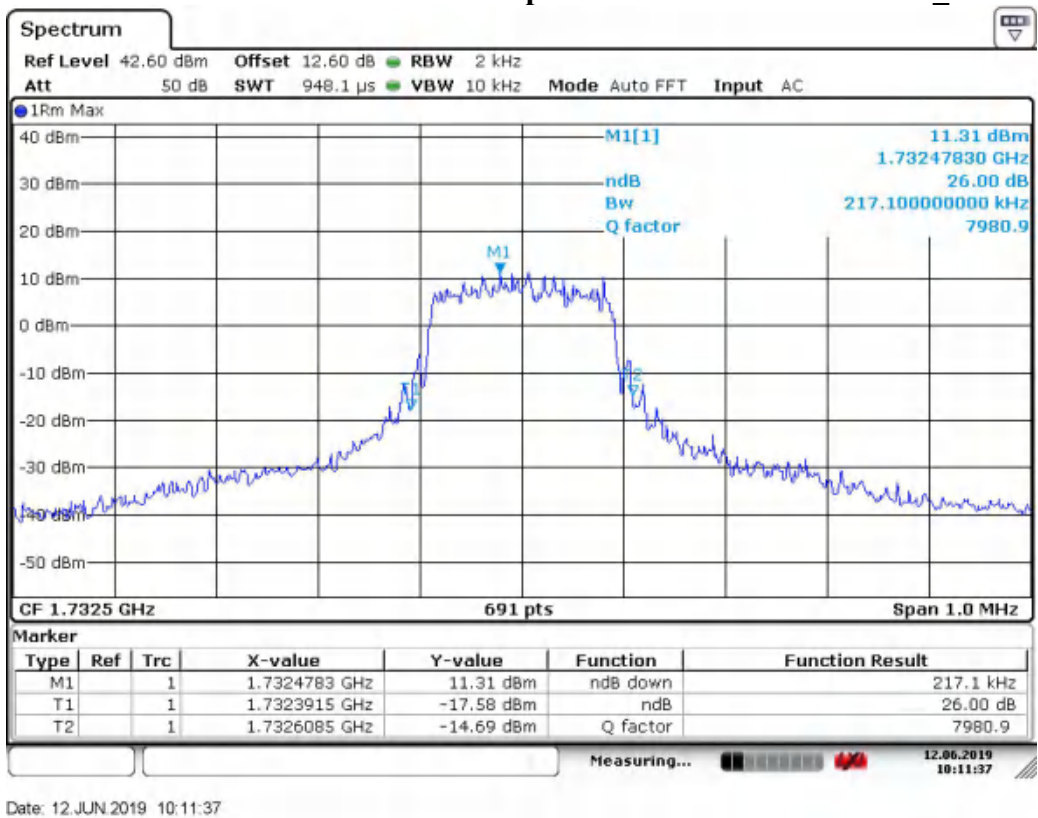
Date: 12.JUN.2019 10:11:46

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

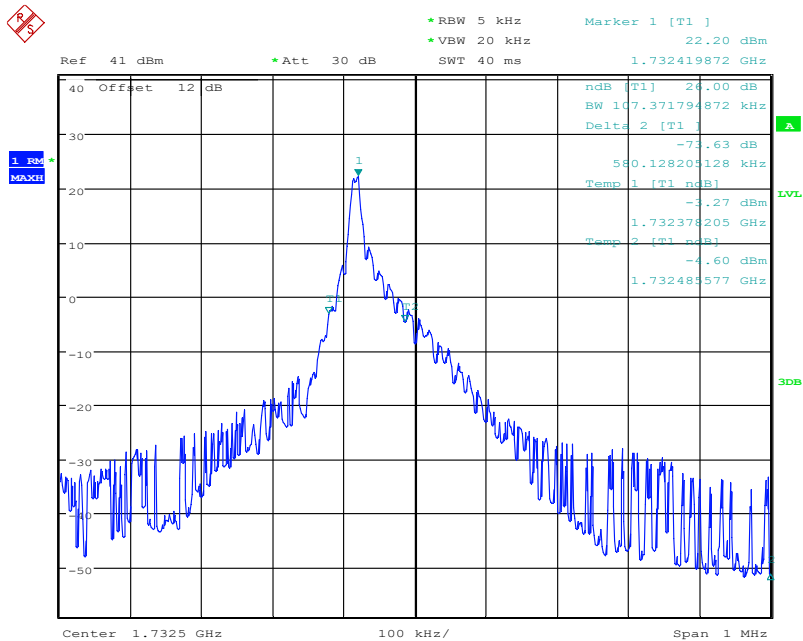


Date: 5.SEP.2019 14:27:31

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

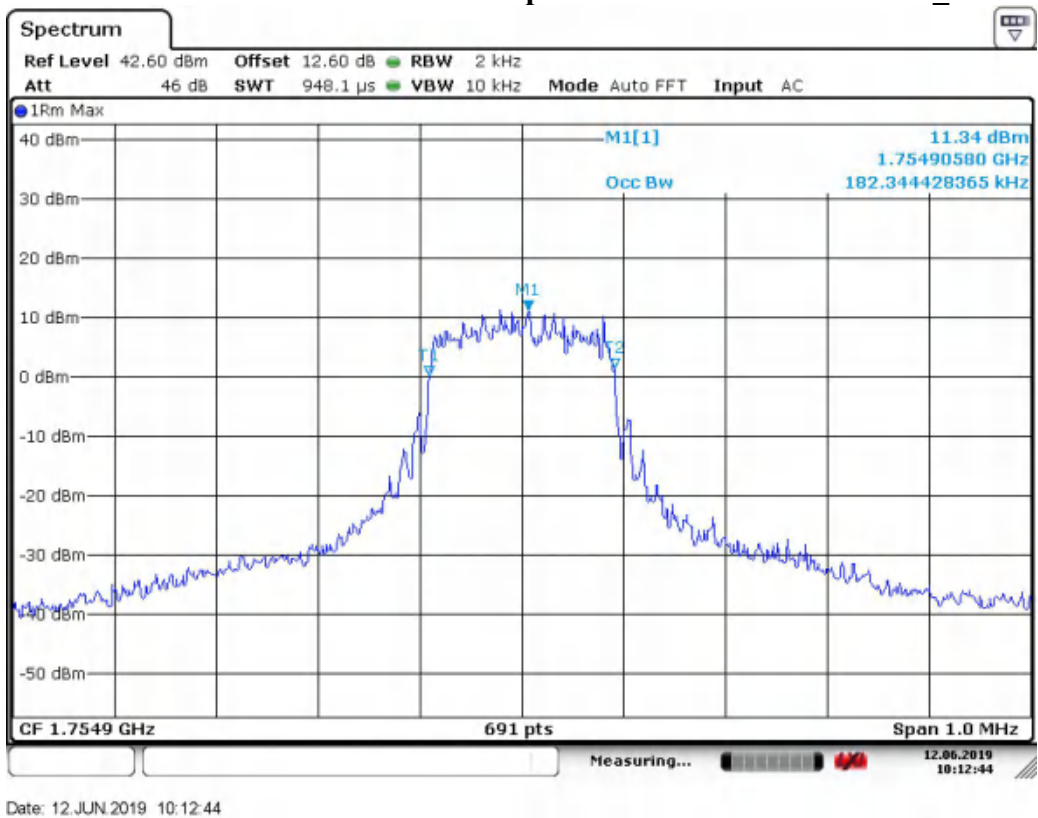


NB-IoT In-band band 4 20175 QPSK(26dB)

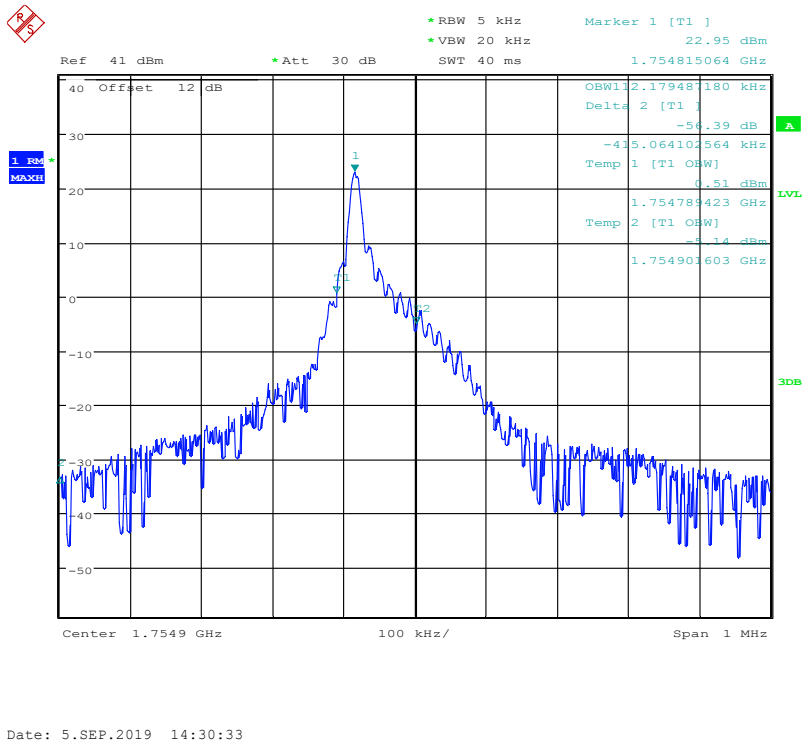


Date: 5.SEP.2019 14:27:42

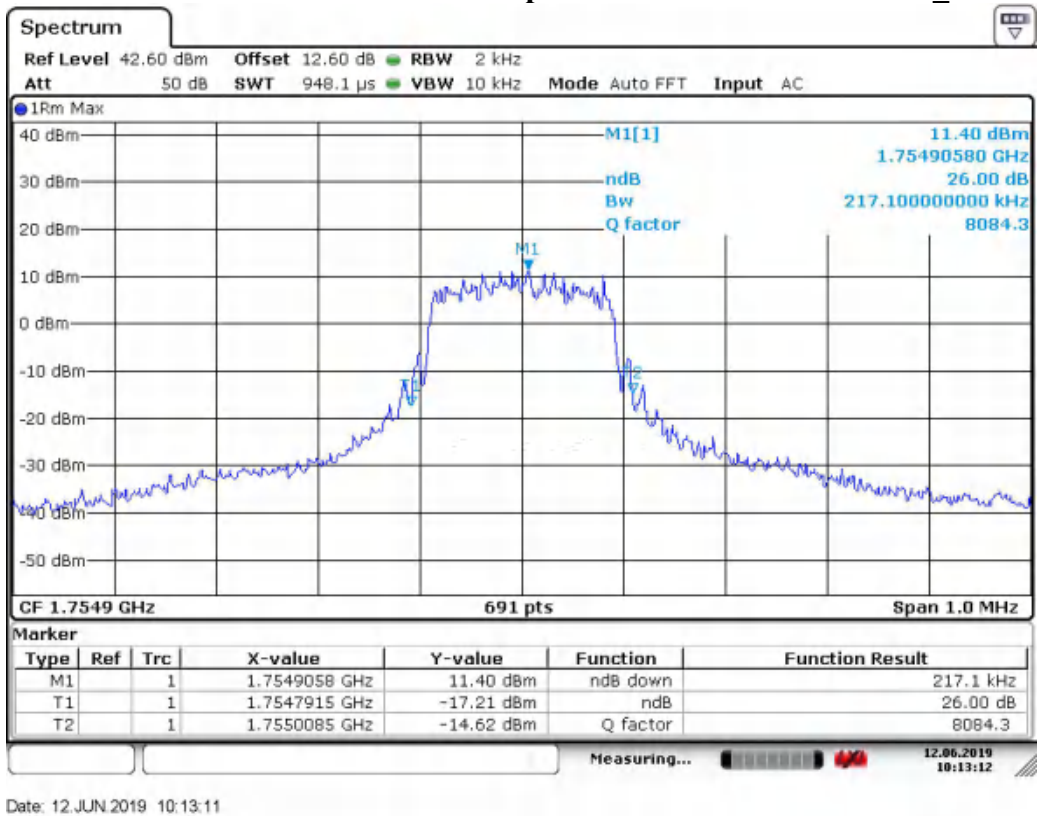
NB-IoT In-band band 4 20175 BPSK(26dB)



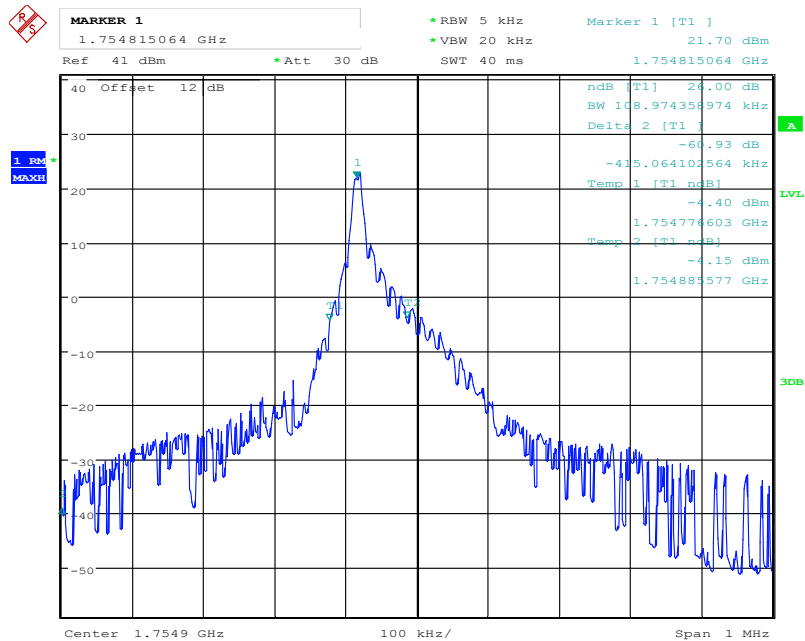
NB-IoT In-band band 4 20399 QPSK(99%)



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

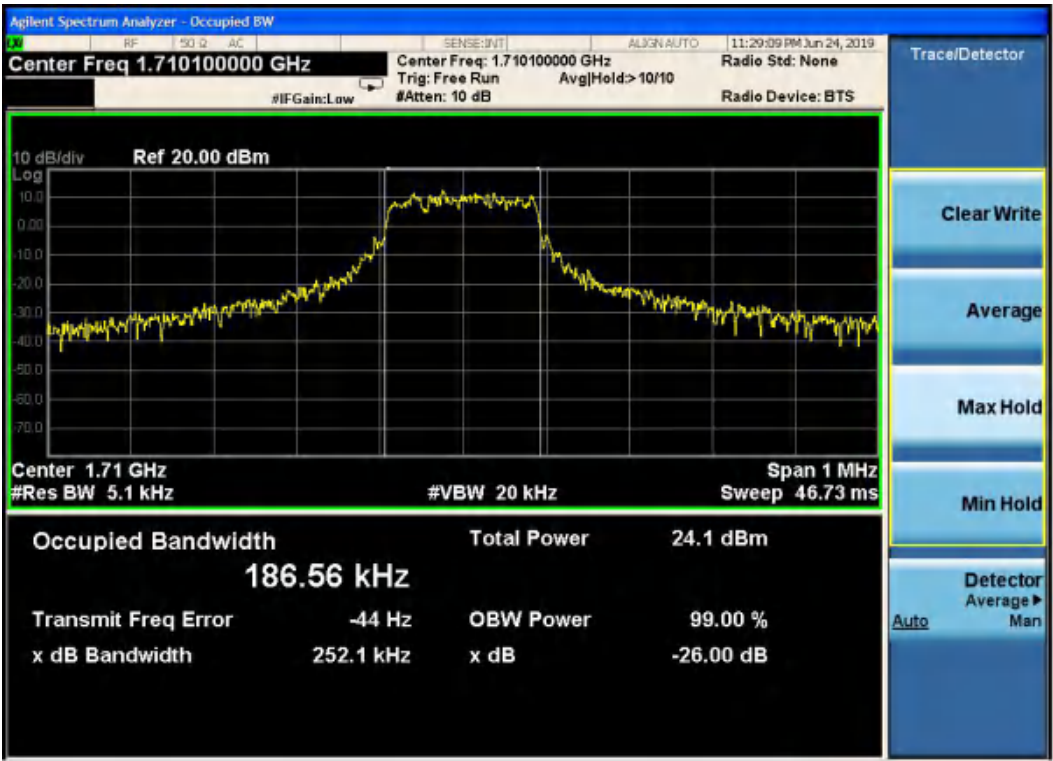


NB-IoT In-band band 4 20399 QPSK(26dB)

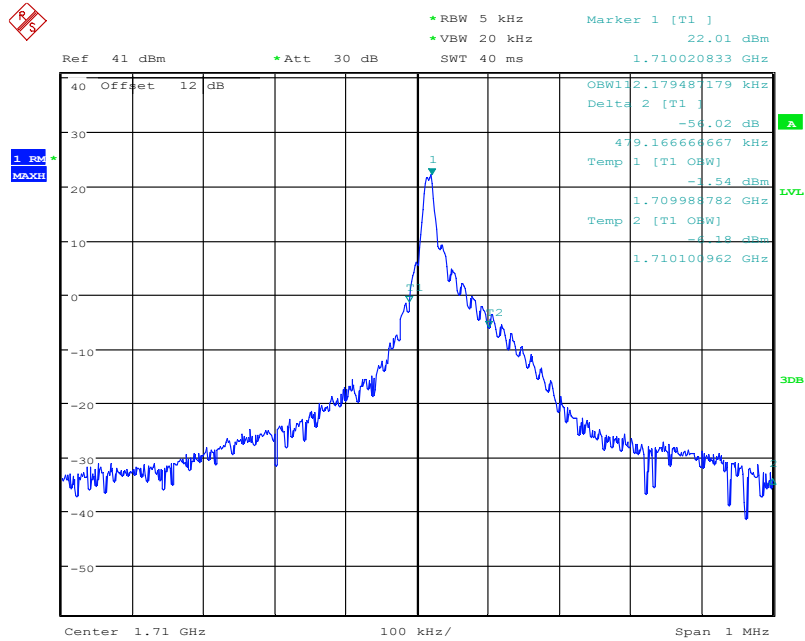


Date: 5.SEP.2019 14:30:43

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



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

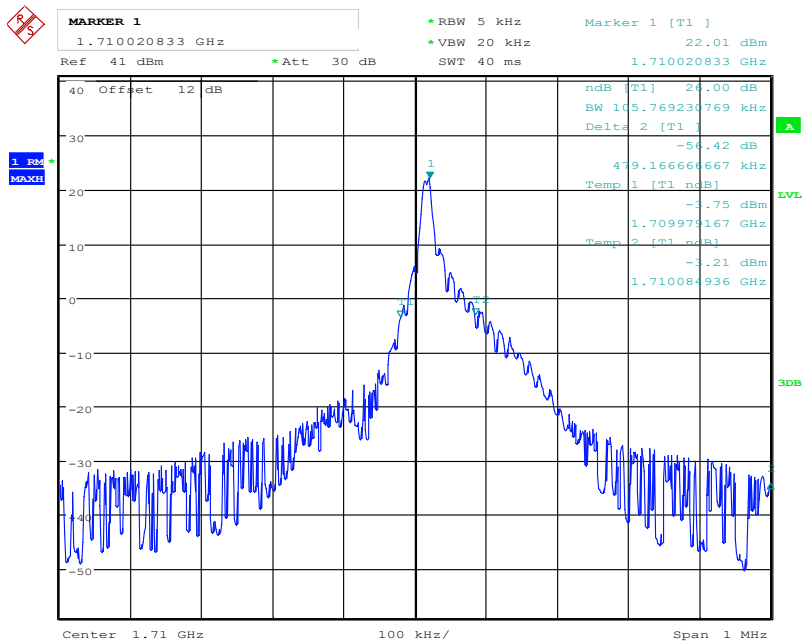


Date: 5.SEP.2019 14:24:14

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



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

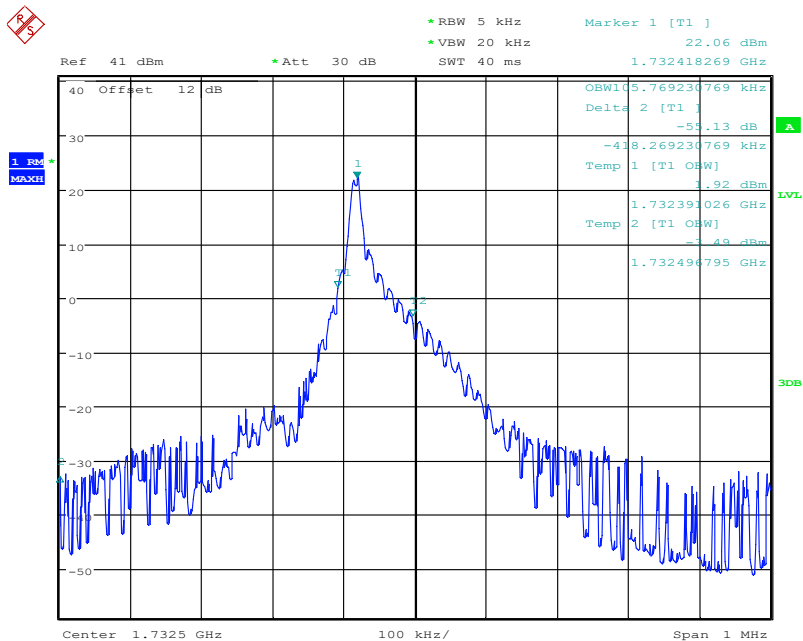


Date: 5.SEP.2019 14:24:29

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



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

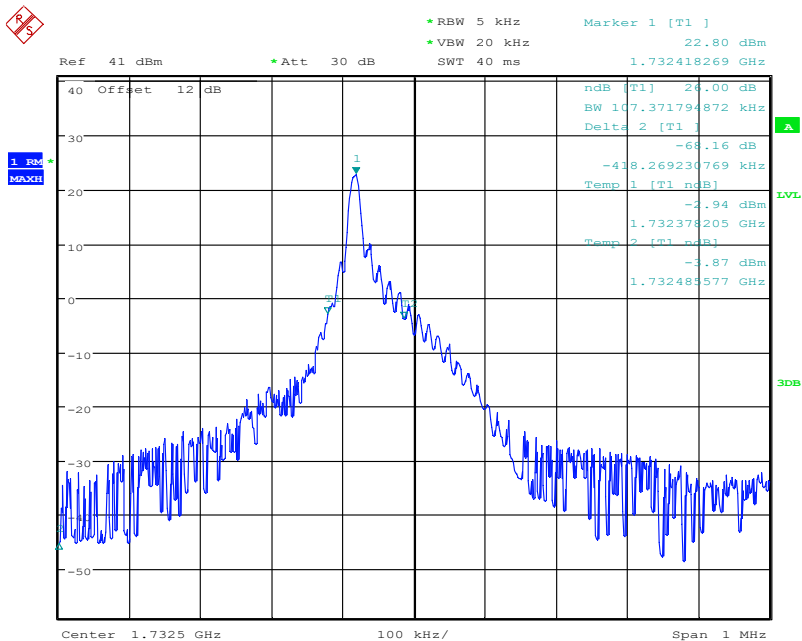


Date: 5.SEP.2019 14:25:17

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



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

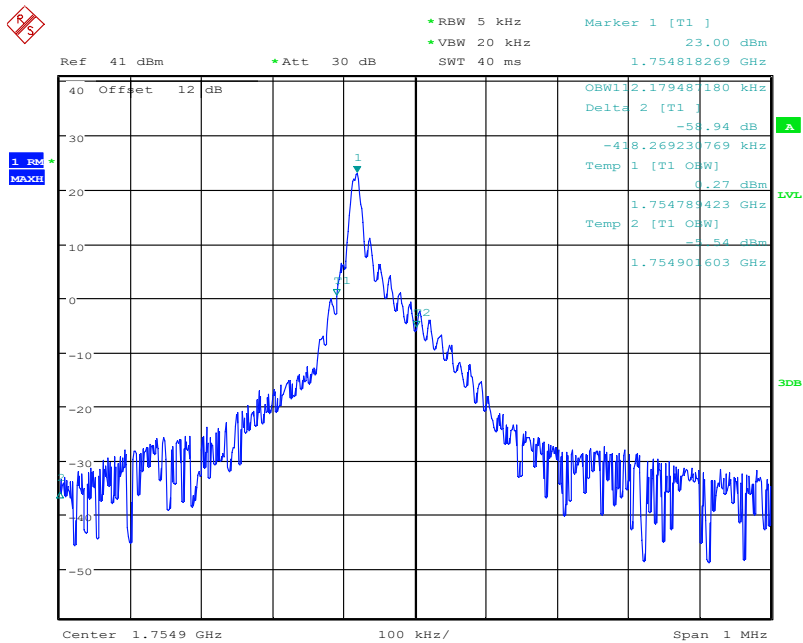


Date: 5.SEP.2019 14:25:05

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



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

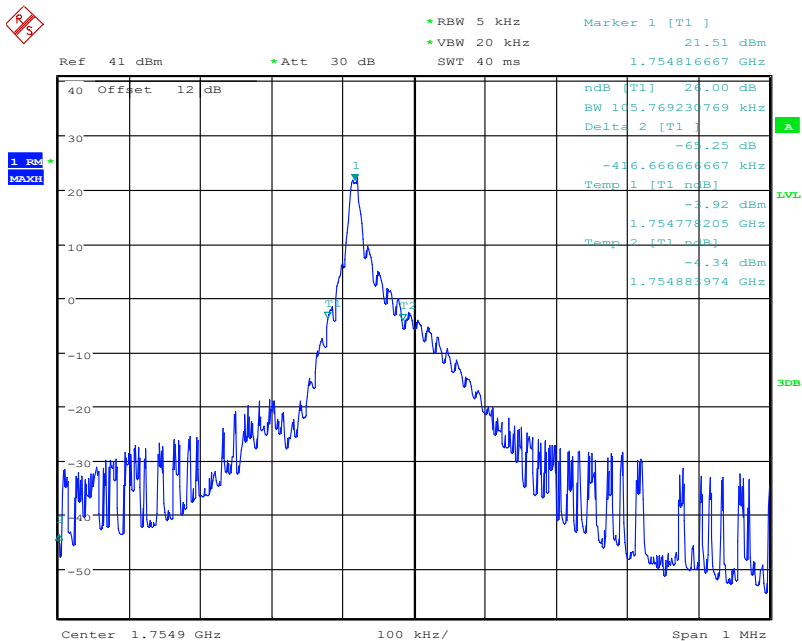


Date: 5.SEP.2019 14:25:50

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)

Agilent Spectrum Analyzer - Occupied BW

RF 150.0 AC SPAN: INT ALIGN: AUTO 05:30:32 PM May 30, 2019

Occ BW % Pwr 99.00 % Center Freq: 699.000000 MHz Radio Std: None
 Trig: Free Run Avg/Hold: >10/10
 #IF Gain: Low #Atten: 26 dB Radio Device: BTS

10 dB/div Ref 25.00 dBm

Center 699 MHz Span 1 MHz
 #Res BW 5.1 kHz #VBW 20 kHz Sweep 36.2 ms

Occupied Bandwidth		Total Power	
181.84 kHz		27.5 dBm	
Transmit Freq Error	-187 Hz	OBW Power	99.00 %
x dB Bandwidth	237.4 kHz	x dB	-26.00 dB

MSG STATUS

Ref 40 dBm * Att 30 dB SWT 40 ms 699.019871795 MHz

40 Offset 11 dB

30

20

10

0

-10

-20

-30

-40

-50

-60

1 RBW MAXH

1

2

OBW130.576923077 kHz

Delta 2 [T1]

-54.20 dB

580.128204128 kHz

Temp 1 [T1 OBW]

-1.48 dBm

698.991021641 MHz

Temp 2 [T1 OBW]

-6.04 dBm

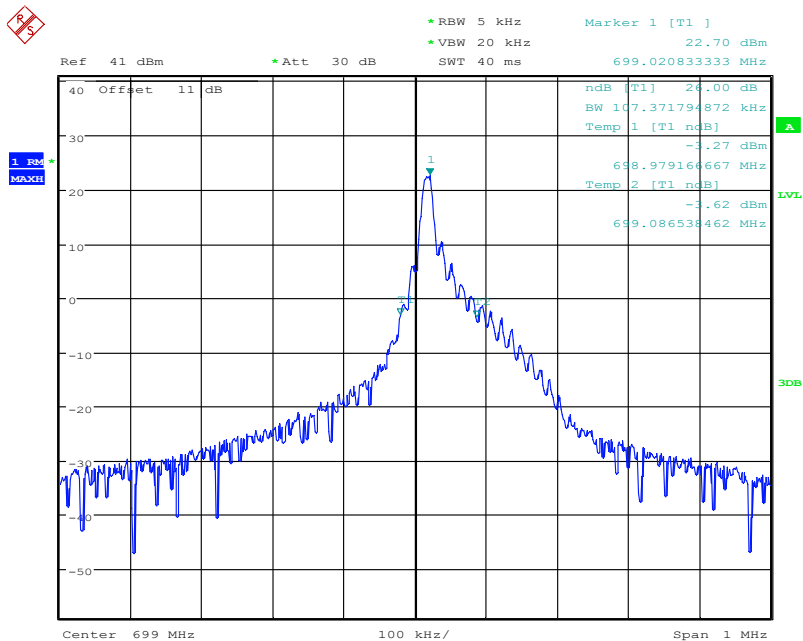
699.101602564 MHz

Center 699.1 MHz 100 kHz/ Span 1 MHz

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



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

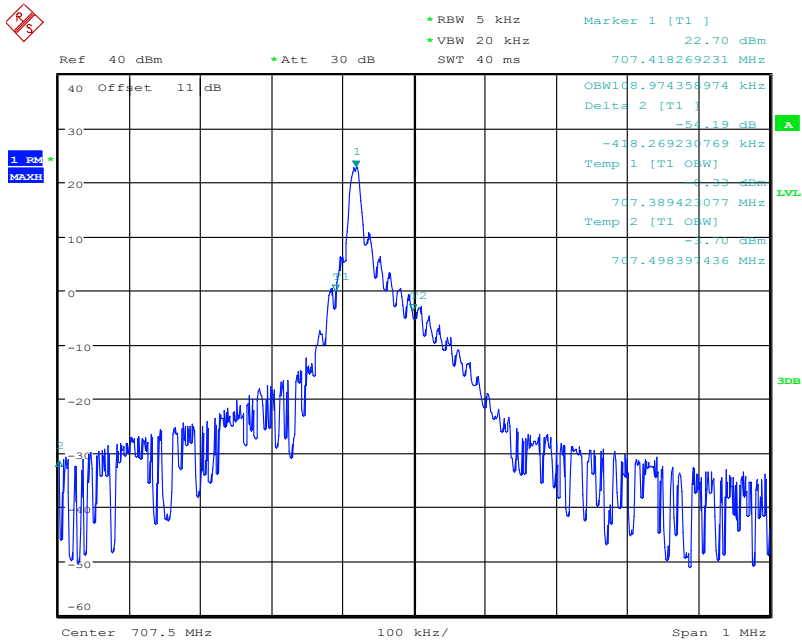


Date: 6.SEP.2019 13:15:44

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



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

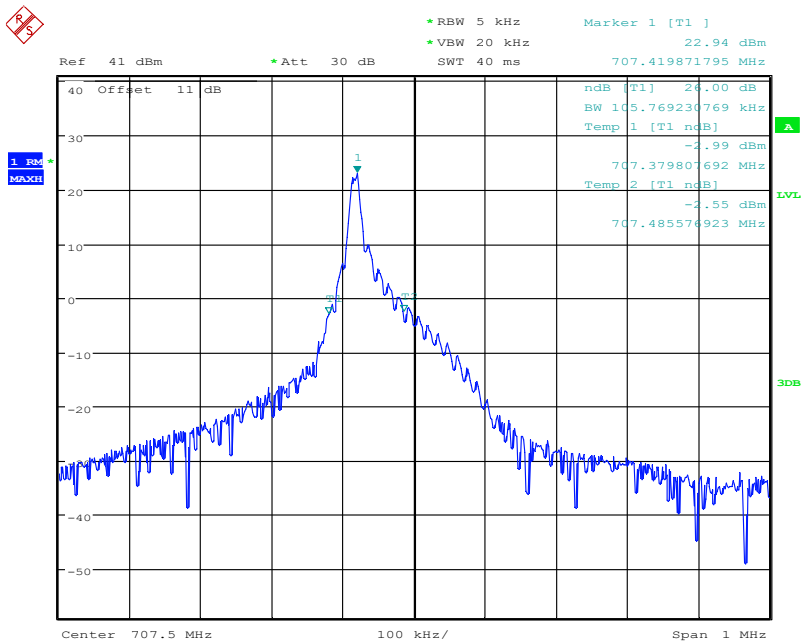


Date: 5.SEP.2019 14:33:18

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



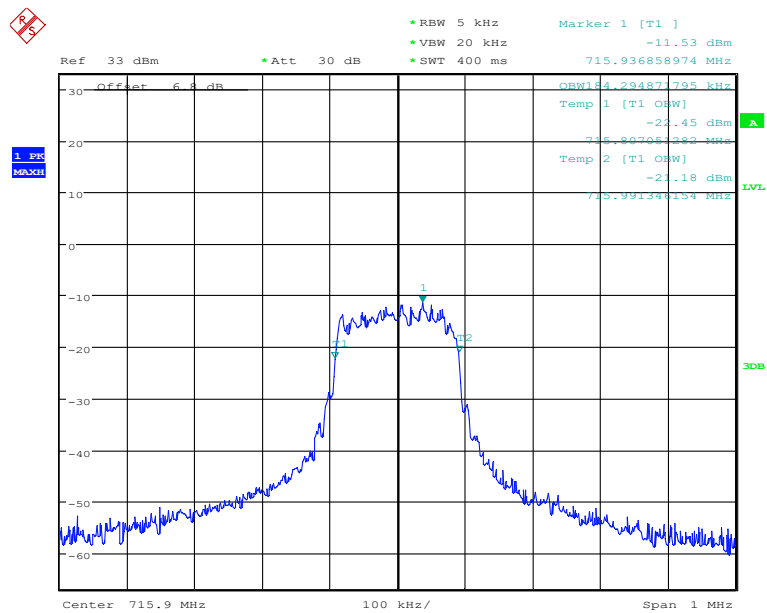
NB-IoT standalone band 12 23095 QPSK(26dB)



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

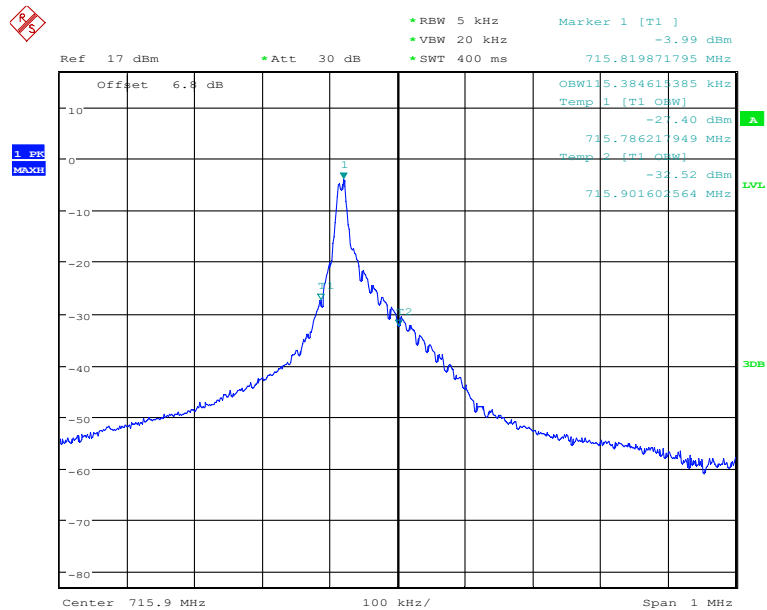
NB-IoT standalone band 12 23095 BPSK(26dB)

Report No.:B19W50105-WWAN_Rev7



Date: 2.JAN.2020 03:38:00

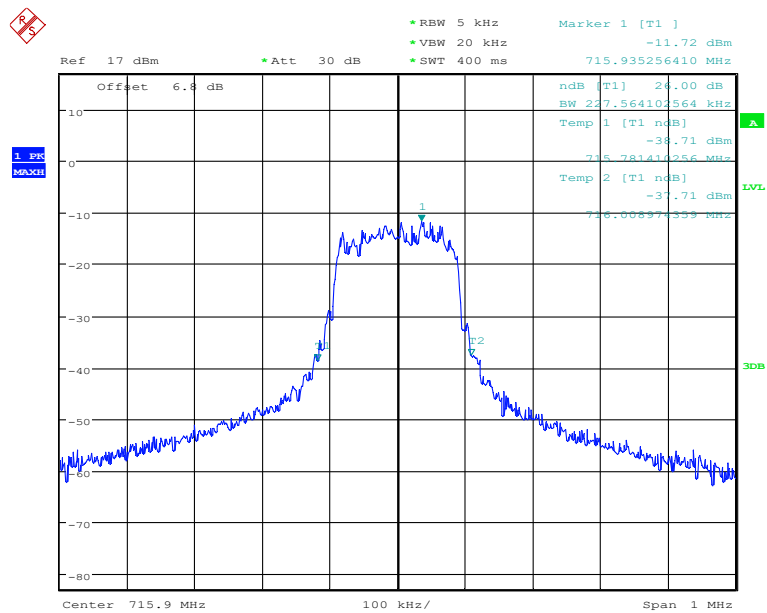
NB-IoT standalone band 12 23179 QPSK(99%)



Date: 2.JAN.2020 03:46:13

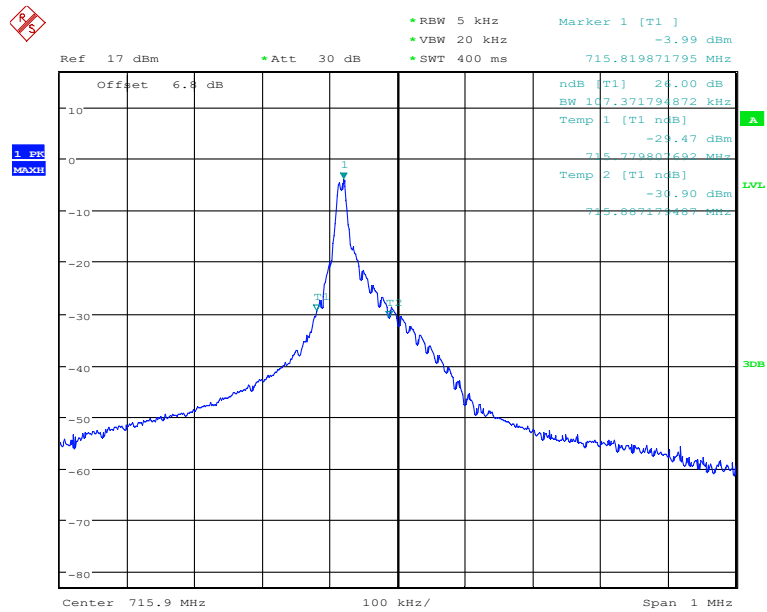
NB-IoT standalone band 12 23179 BPSK(99%)

Report No.:B19W50105-WWAN_Rev7



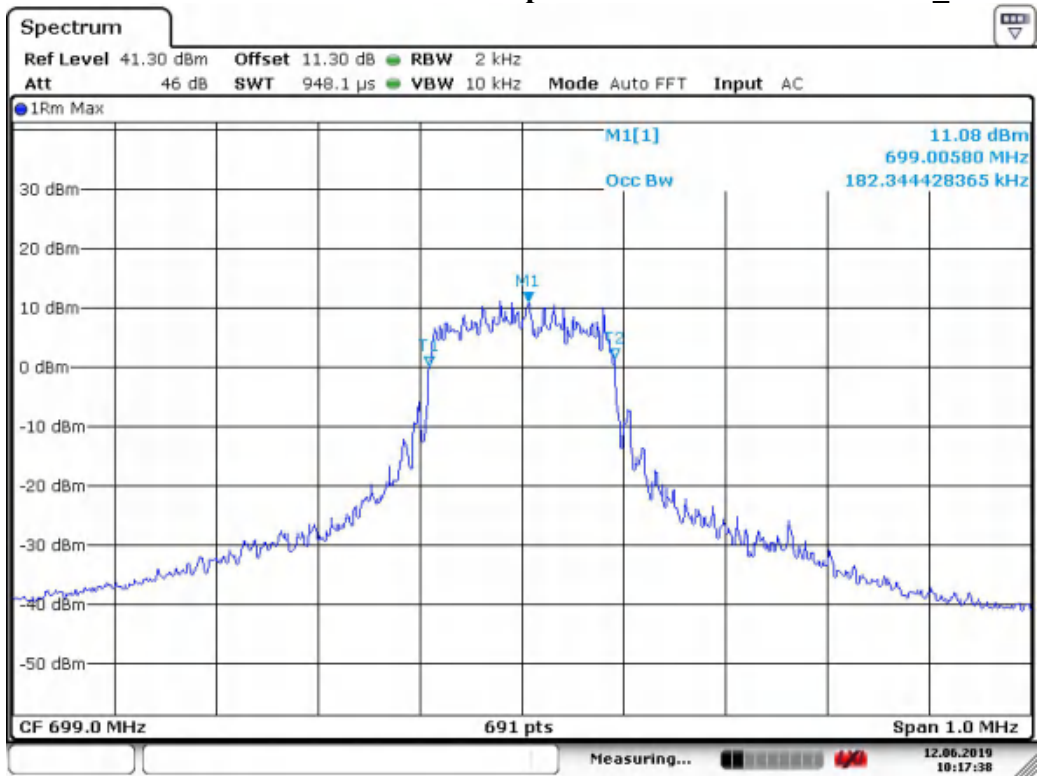
Date: 2.JAN.2020 03:43:40

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



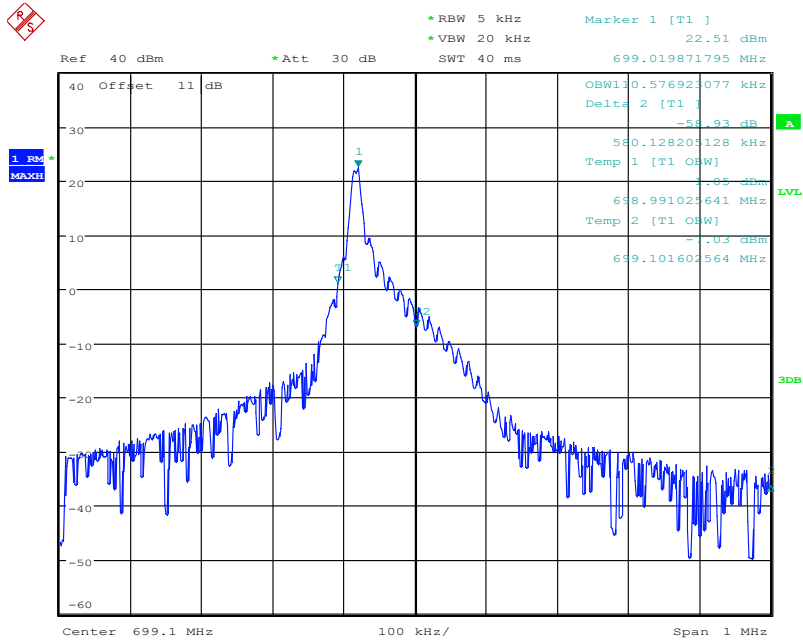
Date: 2.JAN.2020 03:57:02

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



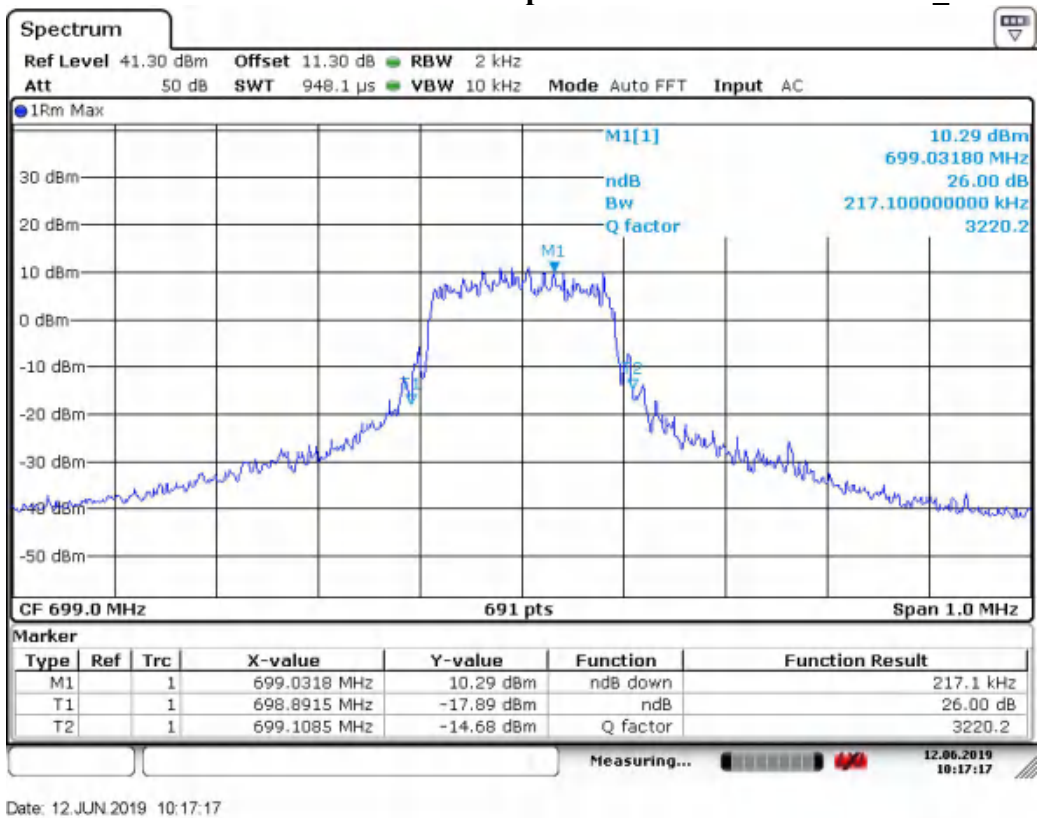
Date: 12.JUN.2019 10:17:39

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

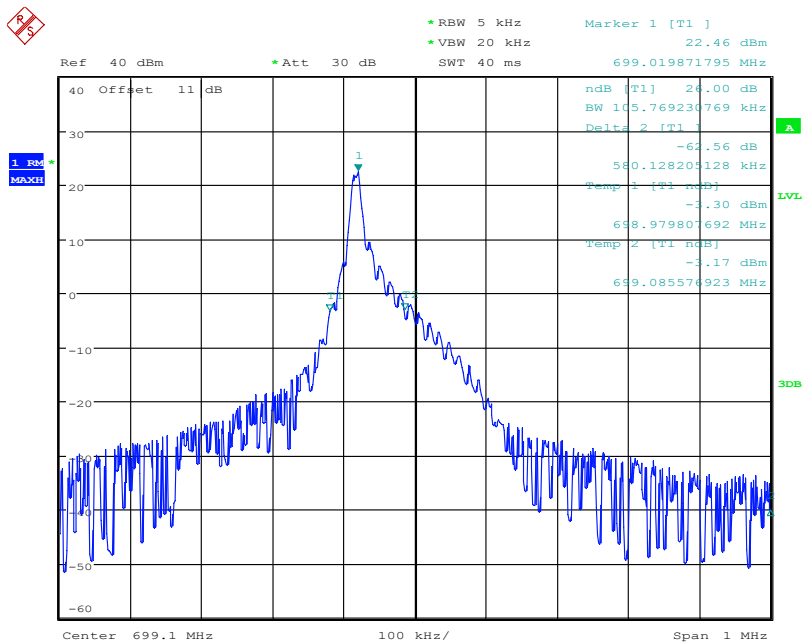


Date: 5.SEP.2019 14:36:16

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

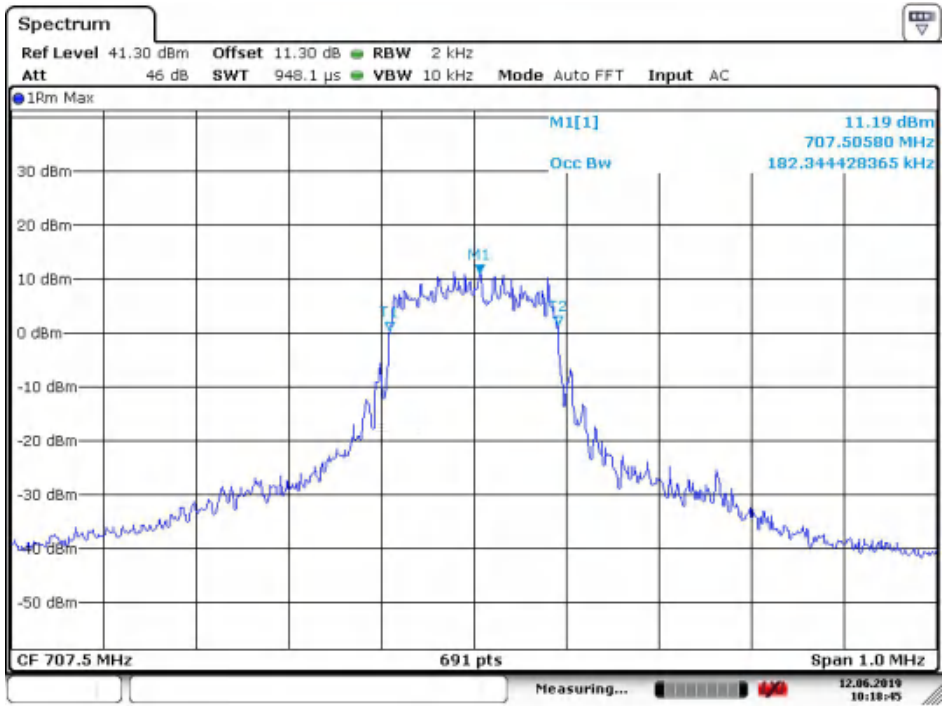


NB-IoT In-band band 12 23011 QPSK(26dB)



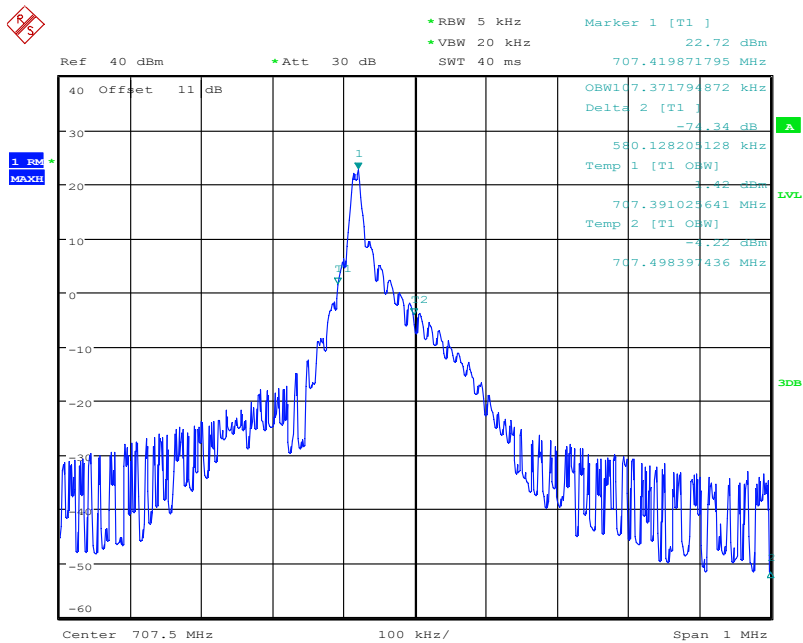
Date: 5.SEP.2019 14:36:28

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



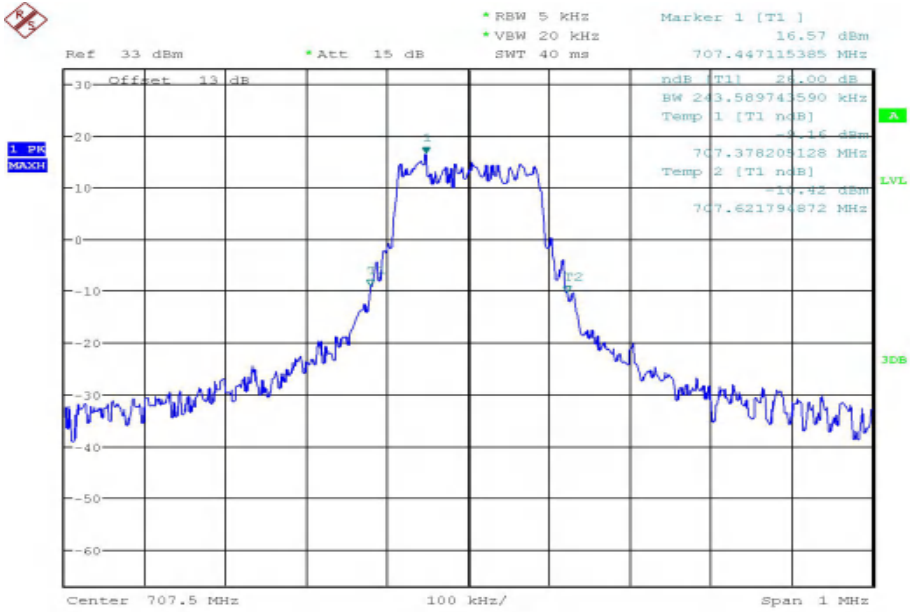
Date: 12 JUN. 2019 10:18:45

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



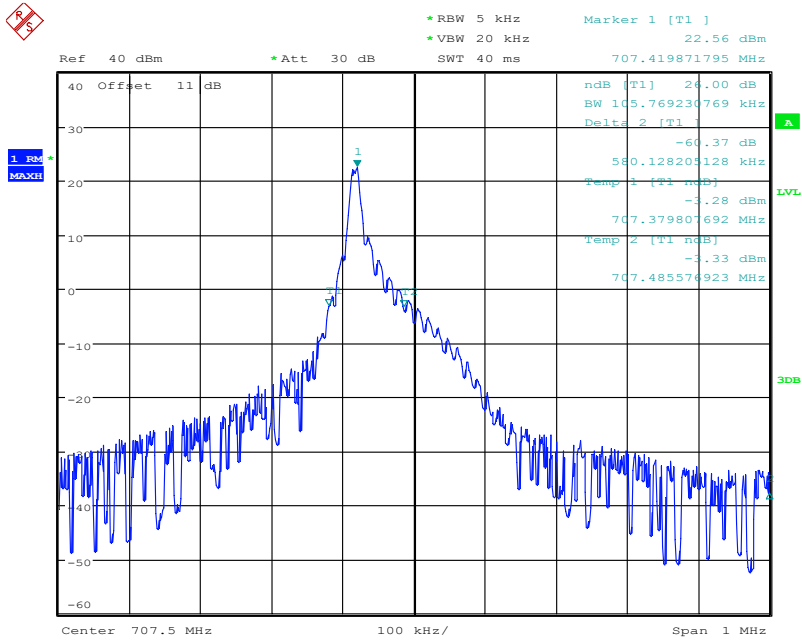
Date: 5 SEP. 2019 14:35:41

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



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

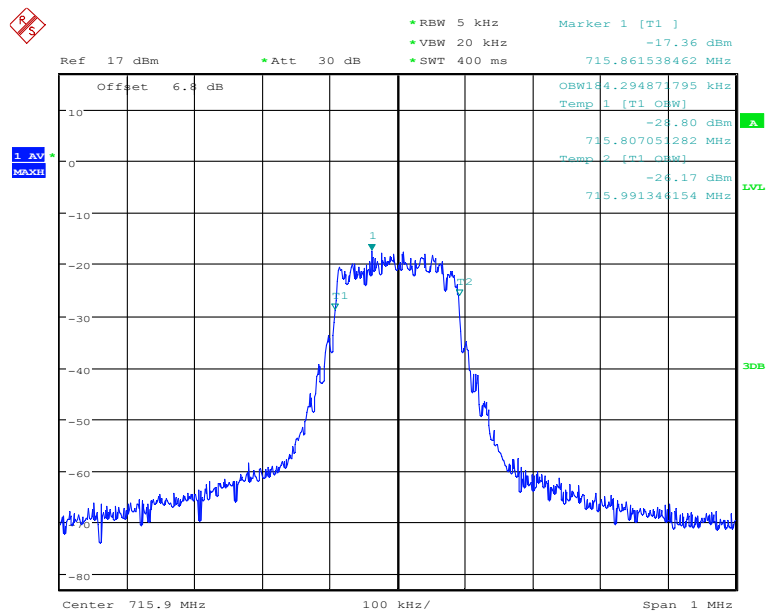
NB-IoT In-band band 12 23095 QPSK(26dB)



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

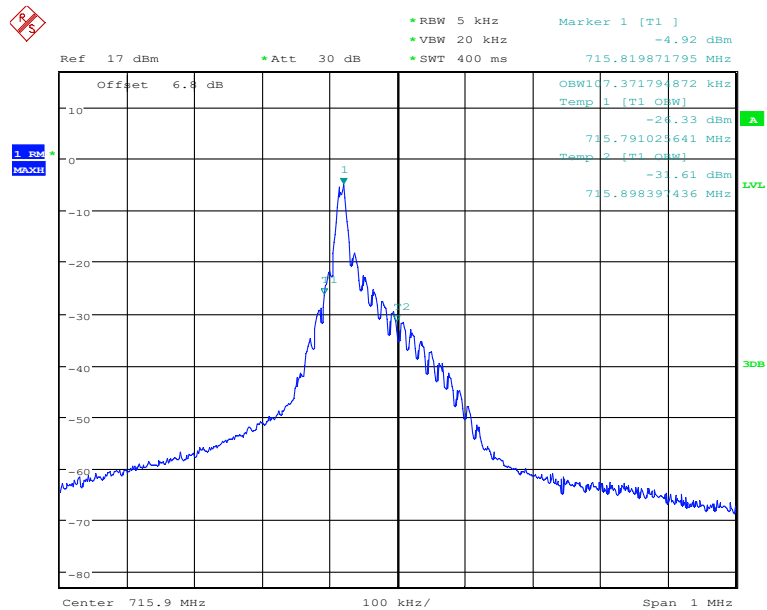
NB-IoT In-band band 12 23095 BPSK(26dB)

Report No.:B19W50105-WWAN_Rev7



Date: 2.JAN.2020 03:39:33

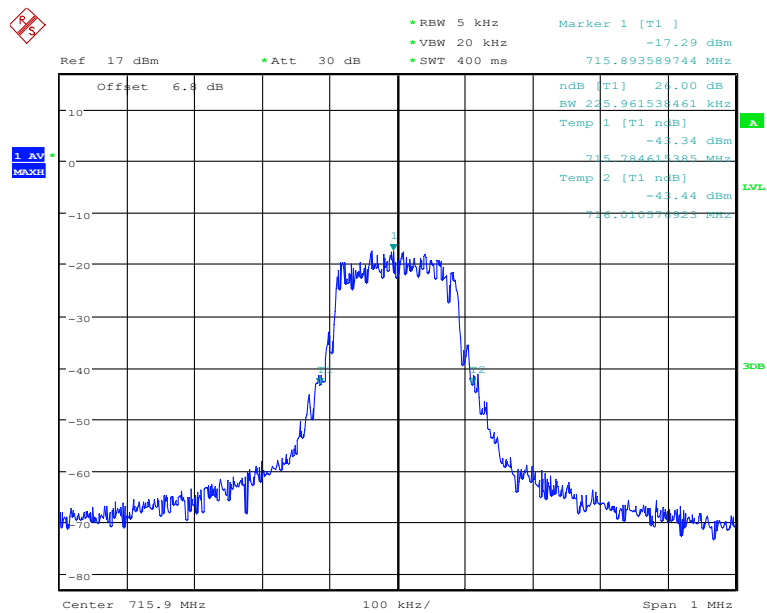
NB-IoT In-band band 12 23179 QPSK(99%)



Date: 2.JAN.2020 03:47:58

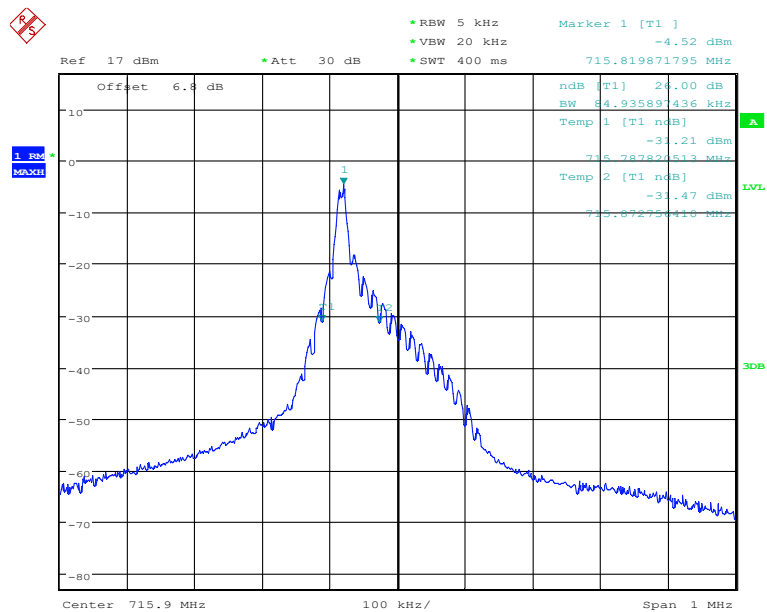
NB-IoT In-band band 12 23179 BPSK(99%)

Report No.:B19W50105-WWAN_Rev7



Date: 2.JAN.2020 03:42:53

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

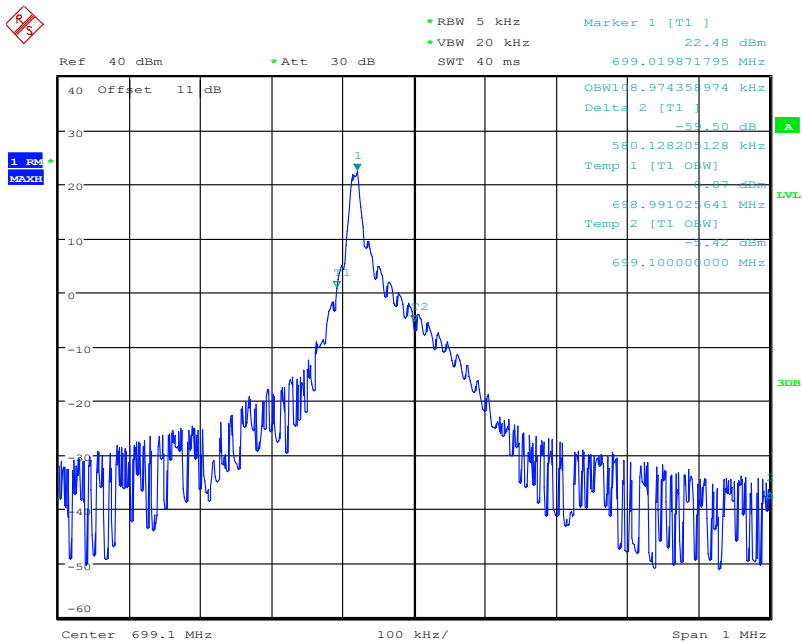


Date: 2.JAN.2020 03:55:35

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



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

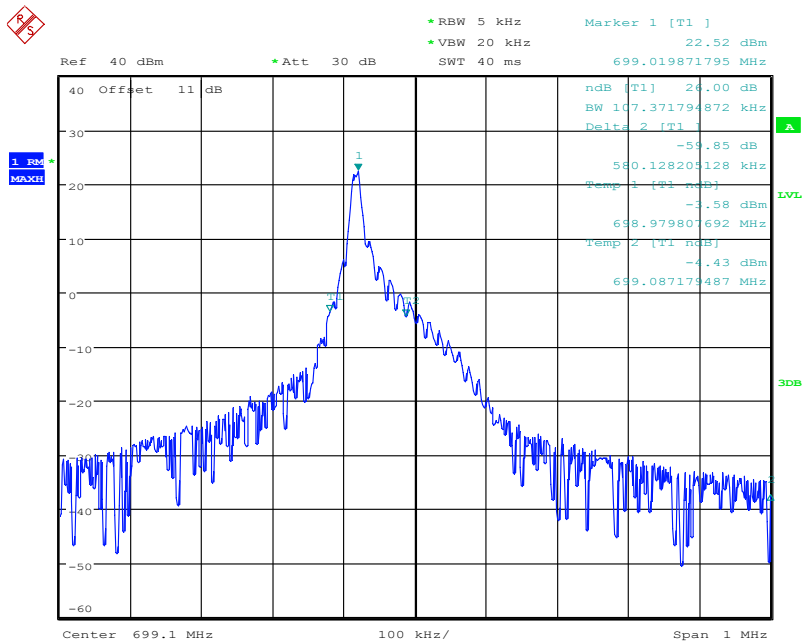


Date: 5.SEP.2019 14:37:12

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



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

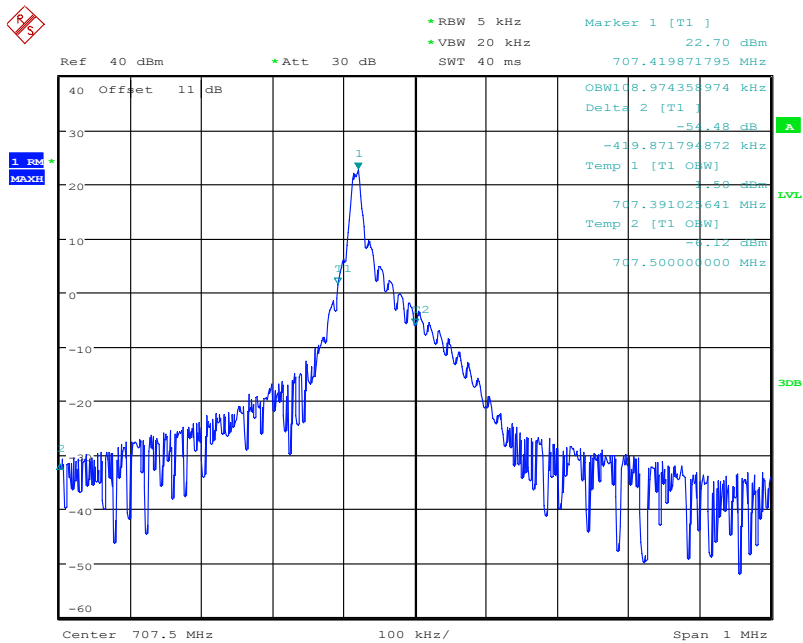


Date: 5.SEP.2019 14:36:59

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



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

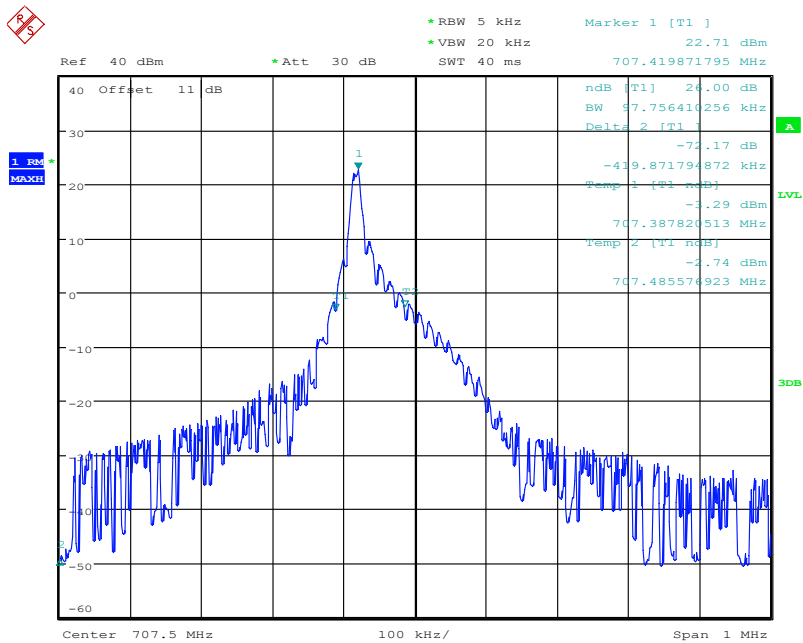


Date: 5.SEP.2019 14:37:54

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



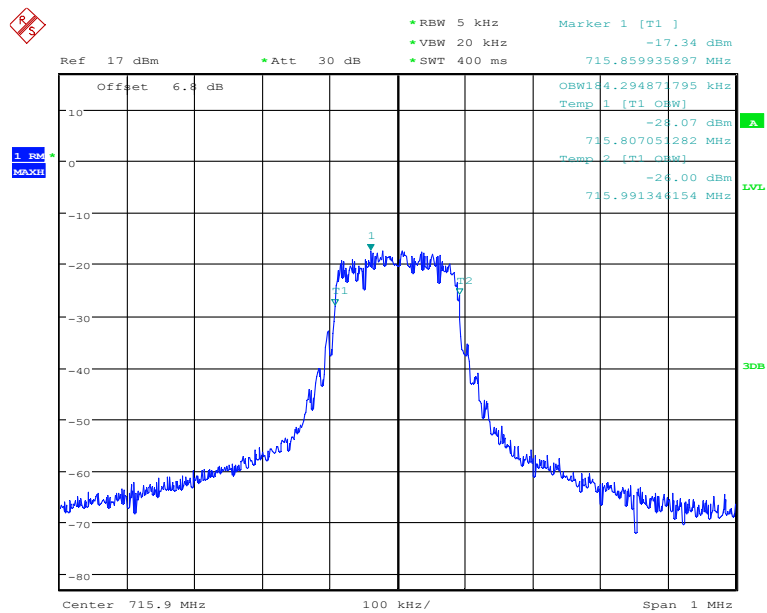
NB-IoT Guard-band band 12 23095 QPSK(26dB)



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

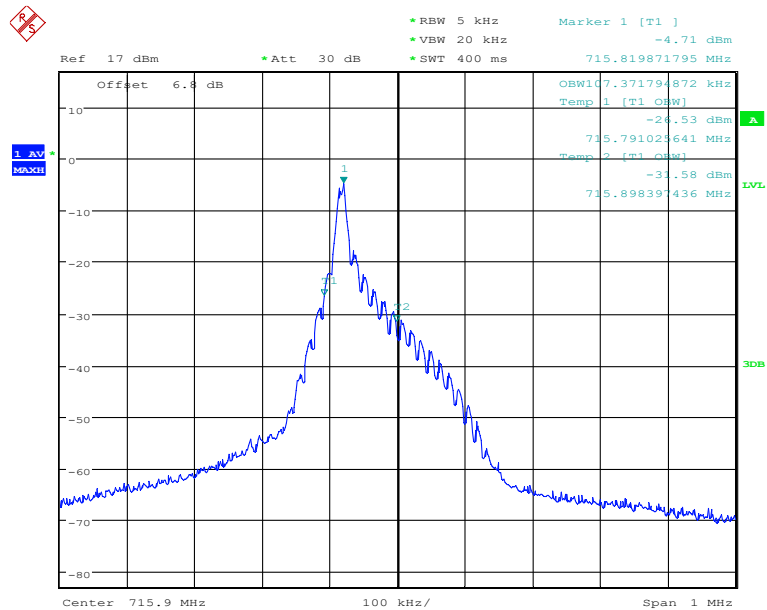
NB-IoT Guard-band band 12 23095 BPSK(26dB)

Report No.:B19W50105-WWAN_Rev7



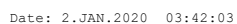
Date: 2.JAN.2020 03:40:19

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



Date: 2.JAN.2020 03:52:26

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



MARKER 1
715.8214744 MHz

Ref 17 dBm * Att 30 dB

* RBW 5 kHz
* VBW 20 kHz
* SWT 400 ms

715.821474359 MHz

Marker 1 [T1]
-5.55 dBm

Offset 6.8 dB

1. AV
MAXH

ndB [T1] 24.00 dB
BW 54.935897436 kHz
Temp 1 [T1 ndB]
-32.69 dBm
715.787920513 MHz
Temp 2 [T1 ndB]
-32.36 dBm
715.672750410 MHz

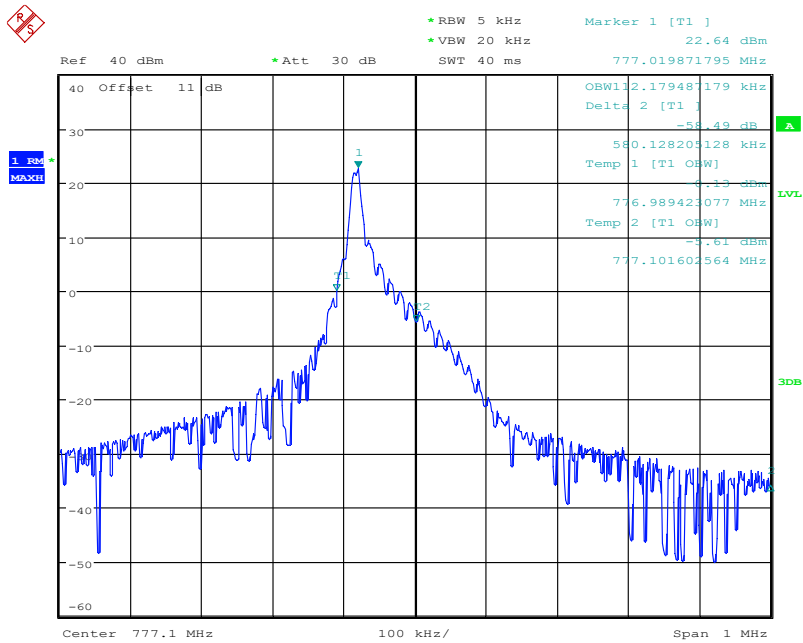
Center 715.9 MHz
100 kHz/
Span 1 MHz

Date: 2.JAN.2020 03:53:34

Graphical results for Band13:



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

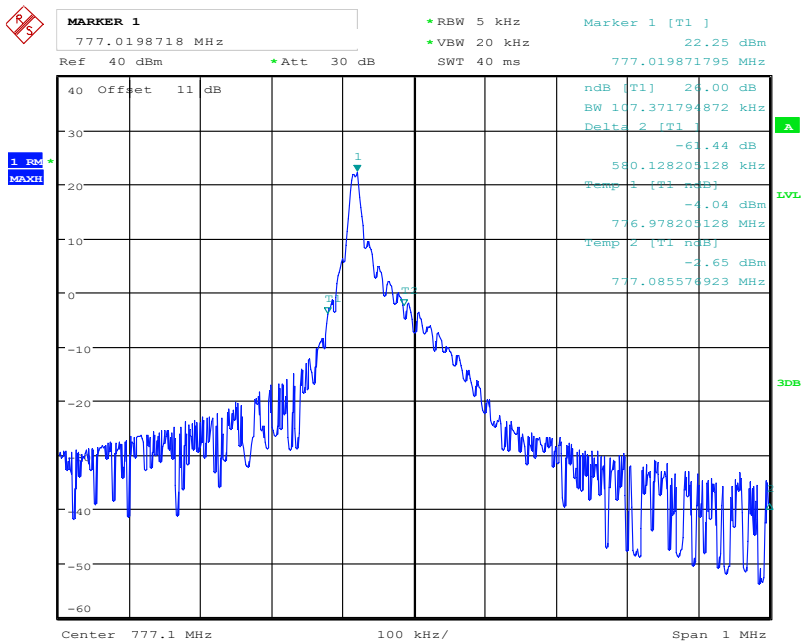


Date: 5.SEP.2019 14:45:31

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



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

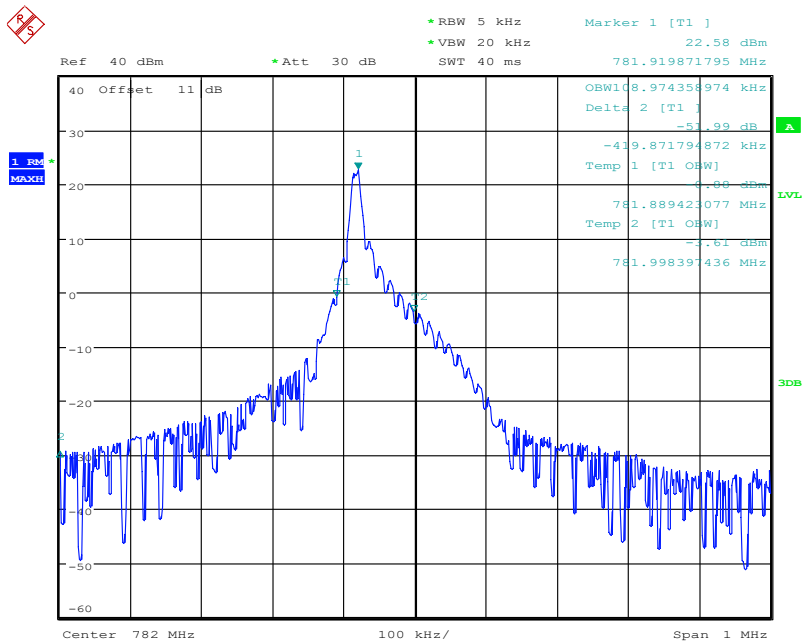


Date: 5.SEP.2019 14:45:47

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



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

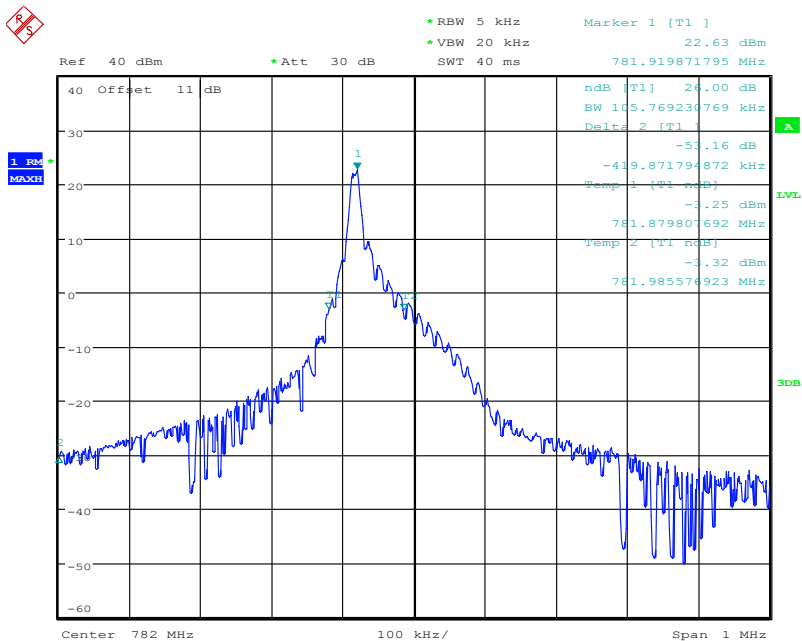


Date: 5.SEP.2019 14:46:51

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



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

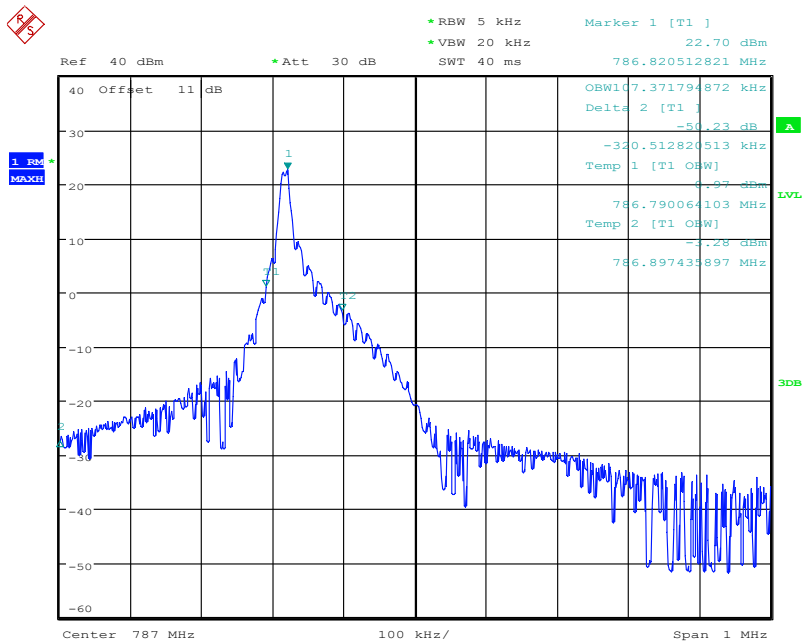


Date: 5.SEP.2019 14:46:35

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



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

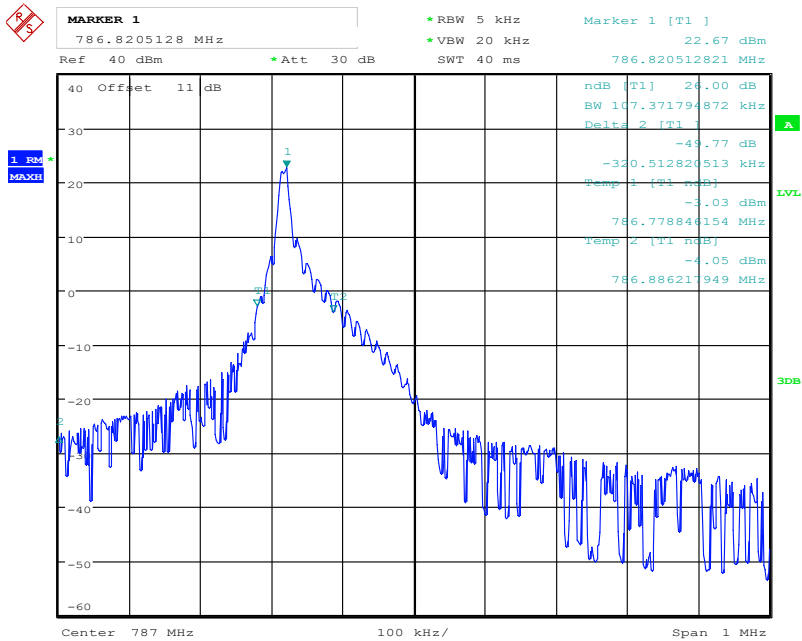


Date: 5.SEP.2019 14:47:42

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

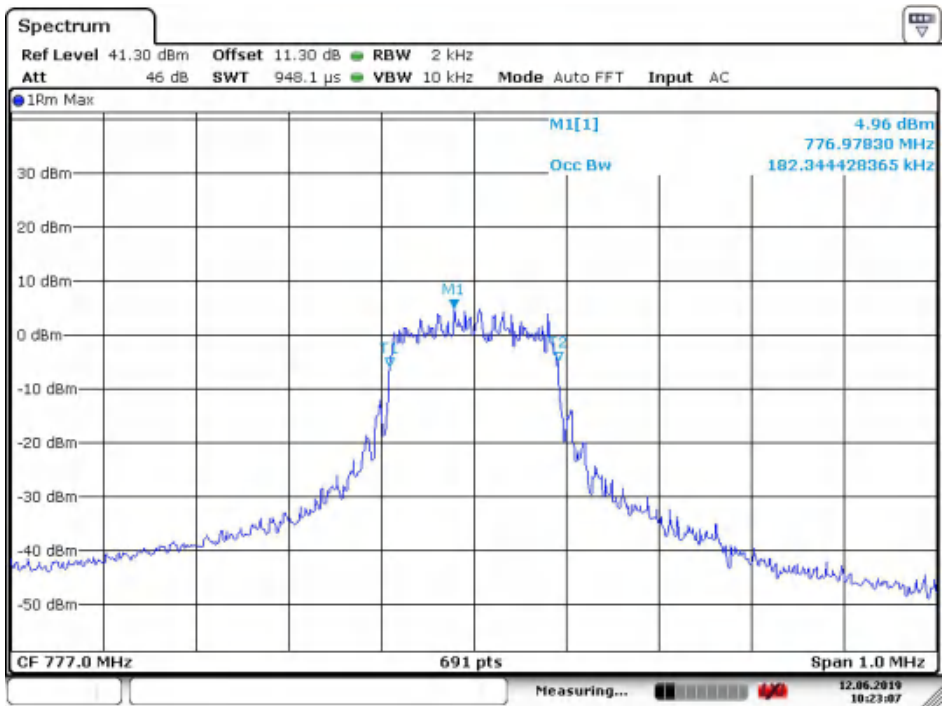


NB-IoT standalone band 13 23279 QPSK(26dB)



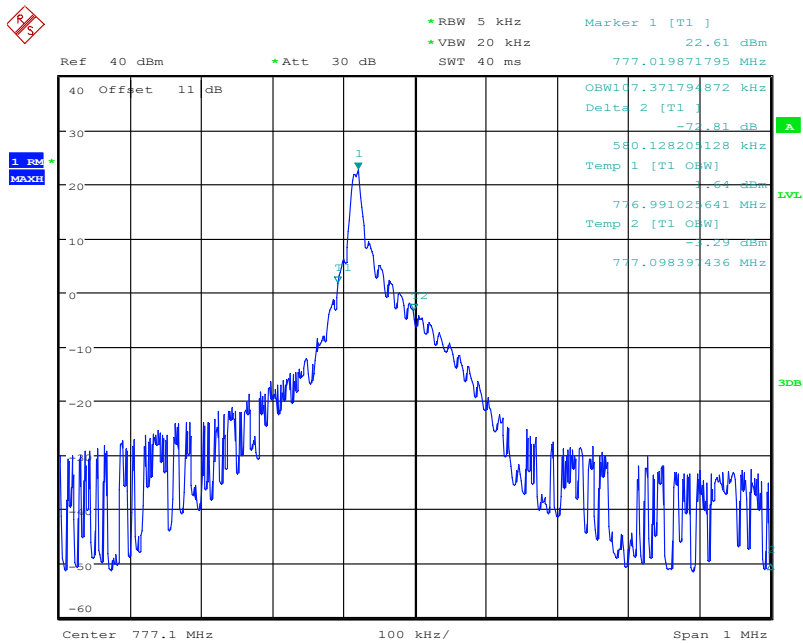
Date: 5.SEP.2019 14:48:04

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



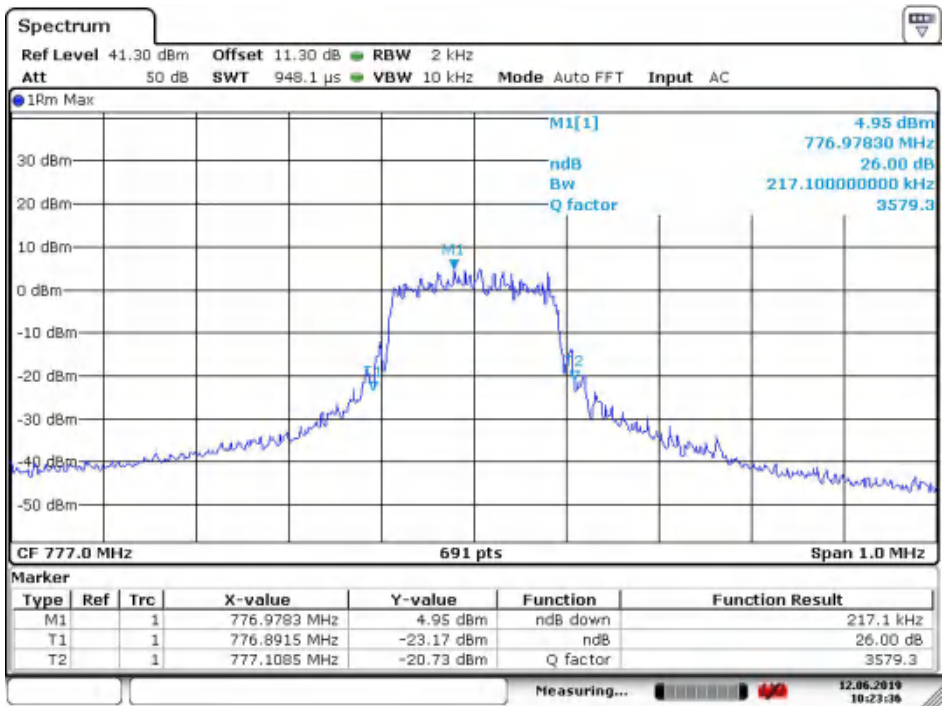
Date: 12 JUN. 2019 10:23:07

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



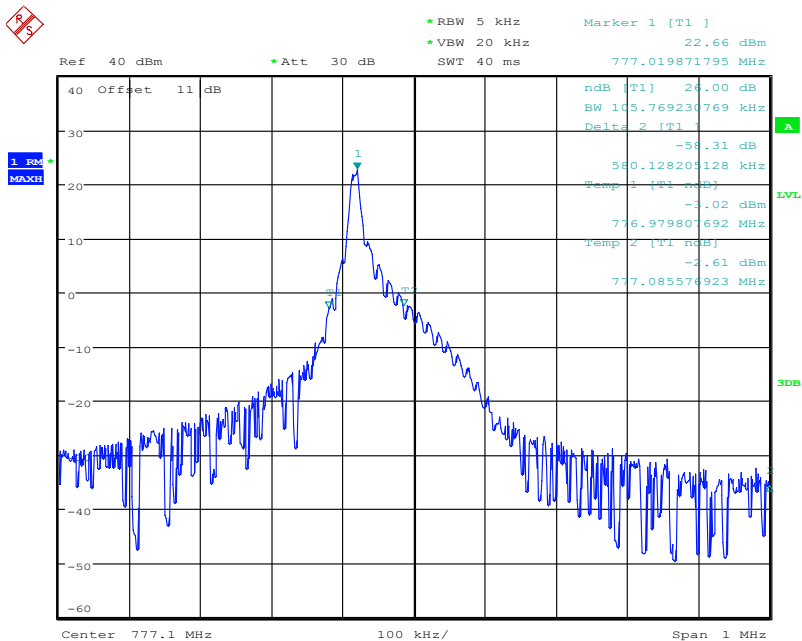
Date: 5.SEP.2019 14:44:55

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)

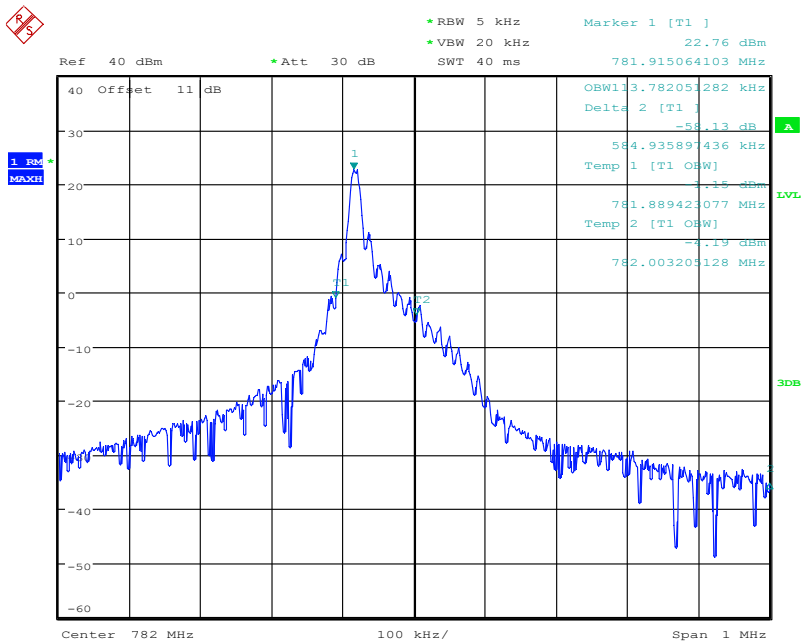


Date: 5.SEP.2019 14:44:39

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



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

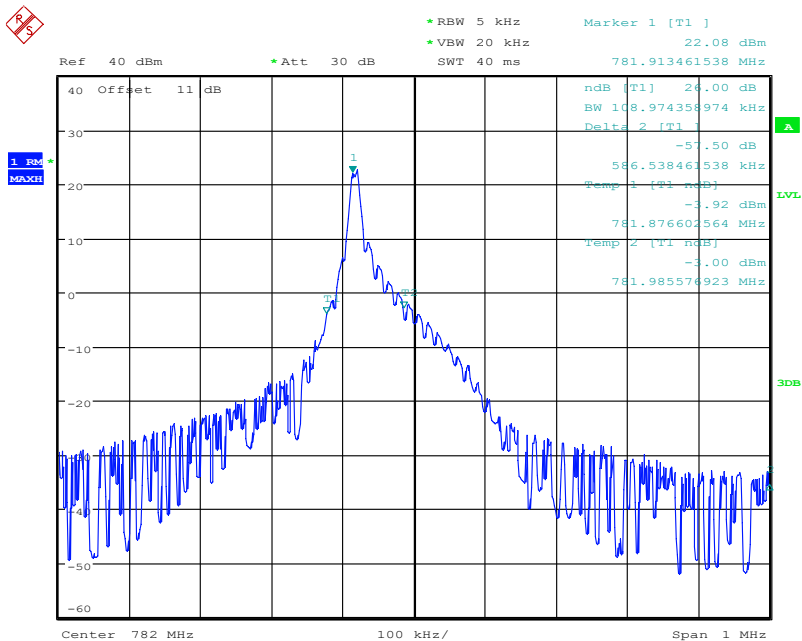


Date: 5.SEP.2019 14:43:51

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

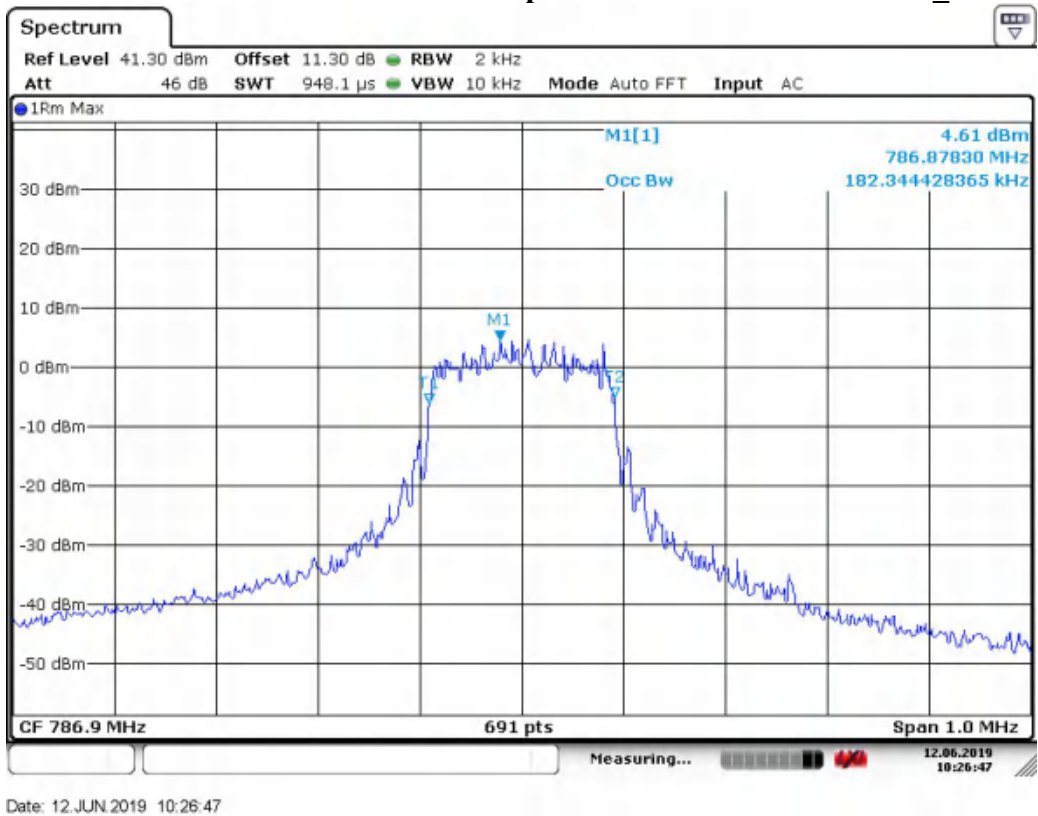


NB-IoT In-band band 13 23230 QPSK(26dB)

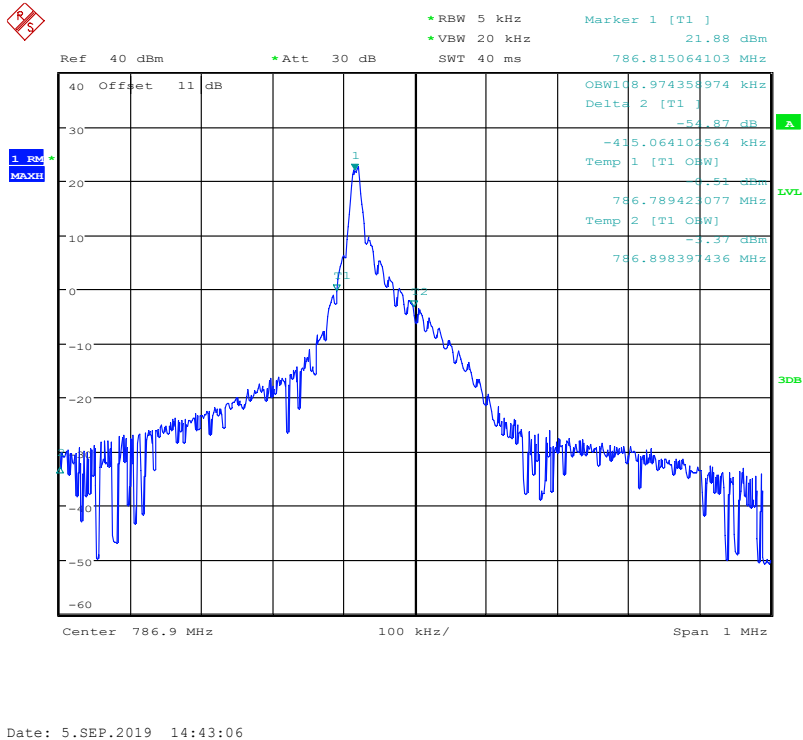


Date: 5.SEP.2019 14:44:03

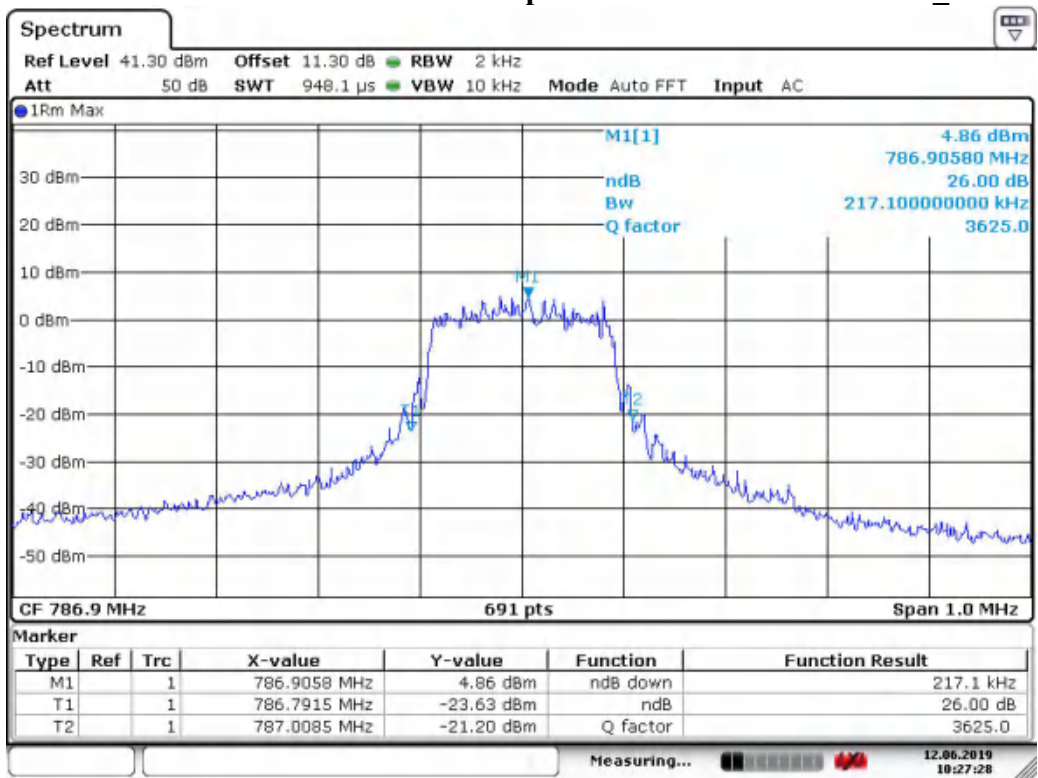
NB-IoT In-band band 13 23230 BPSK(26dB)



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

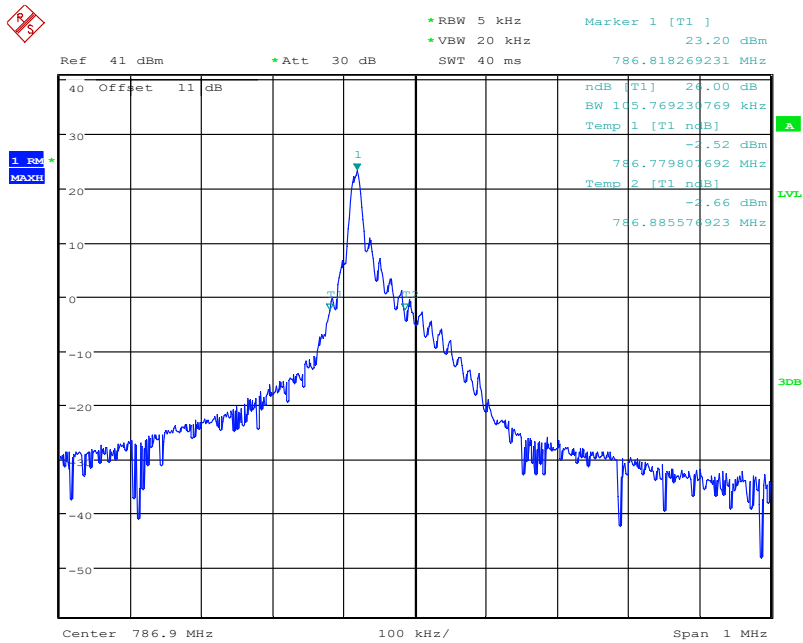


NB-IoT In-band band 13 23279 BPSK(99%)



Date: 12.JUN.2019 10:27:29

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

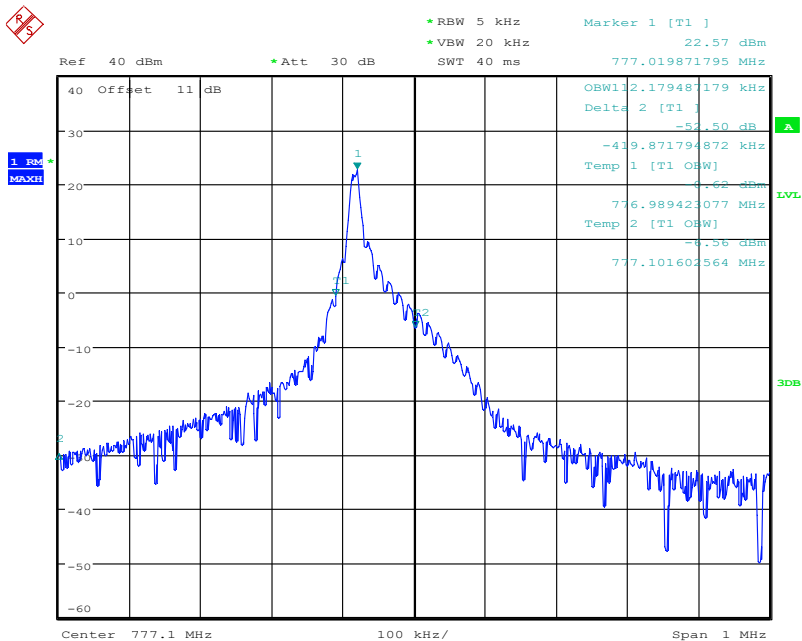


Date: 6.SEP.2019 13:20:01

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



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

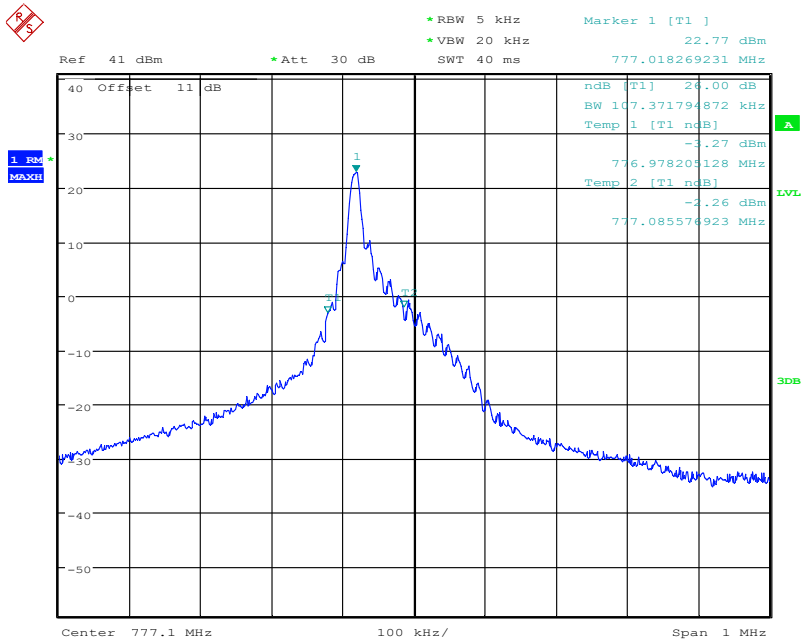


Date: 5.SEP.2019 14:40:38

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



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

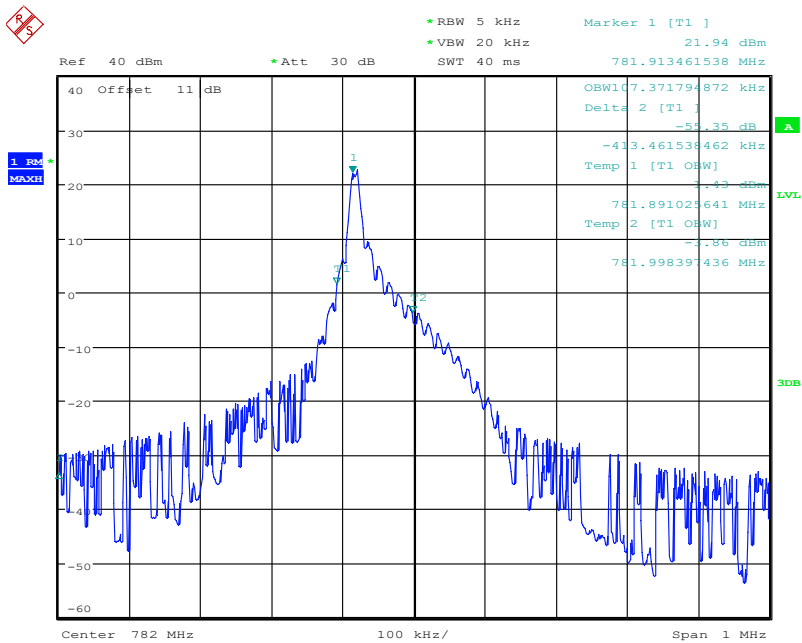


Date: 6.SEP.2019 13:22:17

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



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

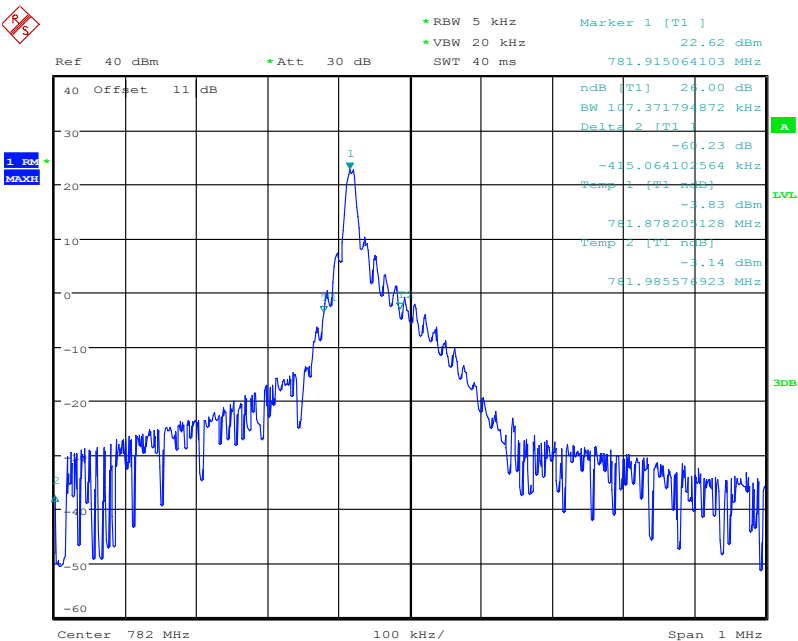


Date: 5.SEP.2019 14:41:37

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



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

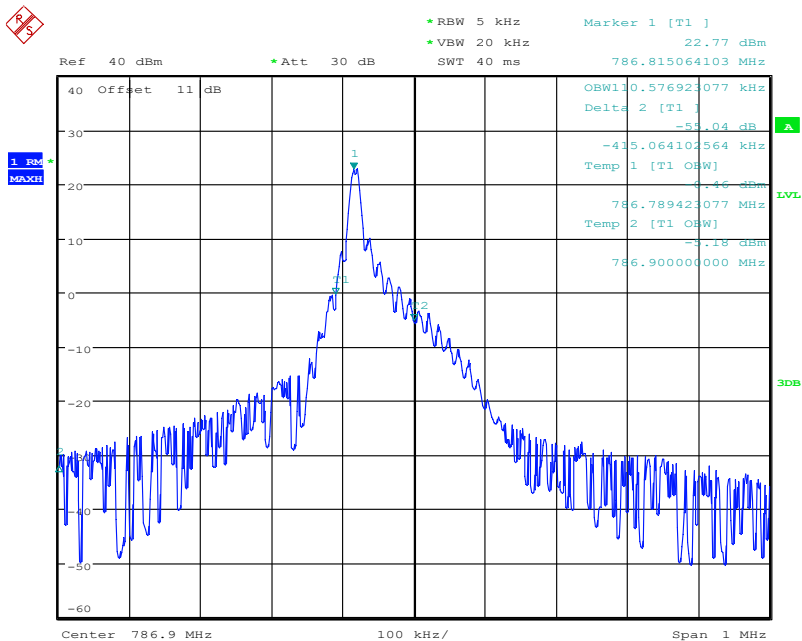


Date: 5.SEP.2019 14:41:25

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



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

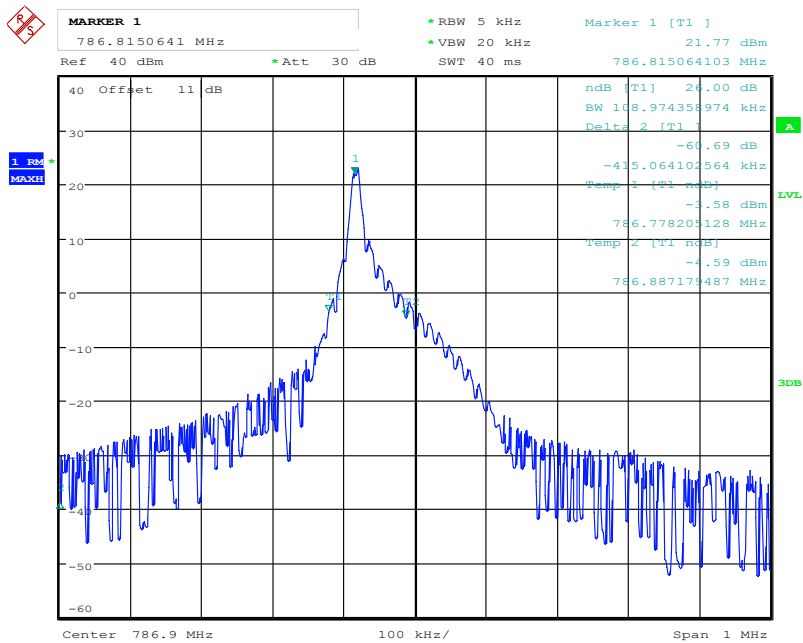


Date: 5.SEP.2019 14:42:10

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)