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;

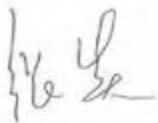**PART 24, PERSONAL COMMUNICATIONS SERVICES;**

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.

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	--

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.

Chongqing Academy of Information and Communications Technology

CONTENTS

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.

Chongqing Academy of Information and Communications Technology authorizes the applicant or manufacturer (see section 1.4) to reproduce this report provided, and the test report may only be reproduced or published in full. Reproduction or publication of extracts from the report requires the prior written approval of Chongqing Academy of Information and Communications Technology. Mr. Zhang Yan.

Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of such third parties. Chongqing Institute of Telecommunications accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.

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:

Chongqing Academy of Information and Communications Technology

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:	------

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.

Address：No. 8,Yuma Road, Chayuan New City, Nan'an District, Chongqing, P. R. China,401336
Tel: 0086-23-88069965   FAX: 0086-23-88608777

Page 8 of 361

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.

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:--		

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×6.5 m×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℃-35℃ 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.
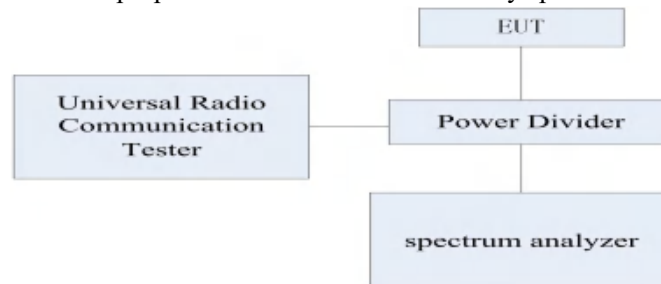
Test Method:

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

Address：No. 8,Yuma Road, Chayuan New City, Nan'an District, Chongqing, P. R. China,401336
Tel: 0086-23-88069965   FAX: 0086-23-88608777

Page 13 of 361

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

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

Maximum Average Conducted Power（dBm）

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

Address：No. 8,Yuma Road, Chayuan New City, Nan'an District, Chongqing, P. R. China,401336
Tel: 0086-23-88069965   FAX: 0086-23-88608777

Page 17 of 361

Chongqing Academy of Information and Communications Technology

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℃-35℃ 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.
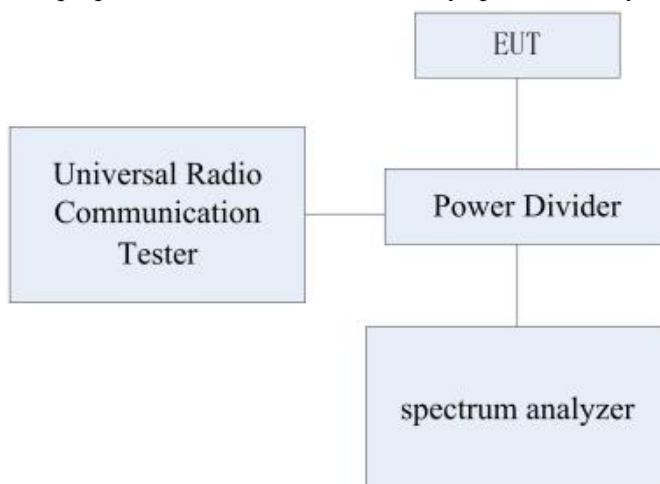
Measurement Uncertainty:

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.

Chongqing Academy of Information and Communications Technology

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		182.98	112.18	234.6	107.37
Mid Range	18900	15	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		182.34	115.38	221.40	105.77
Mid Range	18900	15	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		191.44	115.38	265.2	105.76
Mid Range	18900	15	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		183.43	107.37	235.20	105.77
Mid Range	20175	15	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		180.89	105.77	217.10	107.37
Mid Range	20175	15	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		186.56	112.18	252.10	105.77
Mid Range	20175	15	181.69	105.77	237.60	107.37
High Range	20399		182.28	112.18	236.80	105.77

Chongqing Academy of Information and Communications Technology

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		181.84	110.57	238.90	107.37
Mid Range	23095	15	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		182.34	110.58	217.10	105.77
Mid Range	23095	15	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		210.03	108.97	299.70	107.37
Mid Range	23095	15	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		180.76	112.18	237.90	107.37
Mid Range	23230	15	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		182.34	107.37	217.10	105.76
Mid Range	23230	15	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		212.62	112.18	313.60	107.37
Mid Range	23230	15	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_{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		182.69	107.37	232.37	107.37
Mid Range	26915	15	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		182.69	108.98	229.16	108.98
Mid Range	26915	15	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		182.69	107.38	219.55	107.37
Mid Range	26915	15	184.29	112.18	229.16	110.58
High Range	27039		182.69	108.97	229.16	107.37

Chongqing Academy of Information and Communications Technology

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

Chongqing Academy of Information and Communications Technology

Report No.:B19W50105-WWAN_Rev7

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		181.57	105.76	245.60	113.78
Mid Range	133297	15	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		183.79	110.57	244.60	105.77
Mid Range	133297	15	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		213.34	112.18	336.00	105.77
Mid Range	133297	15	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%)
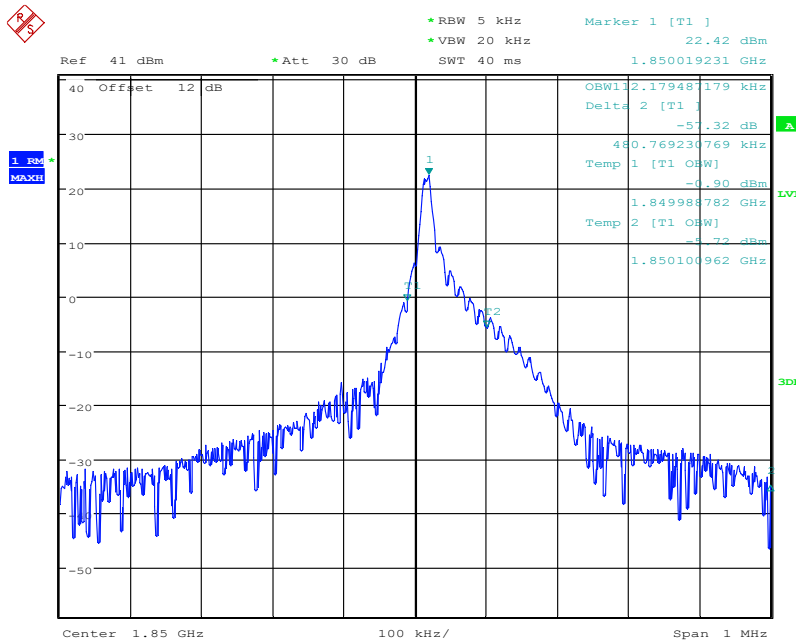
Date: 5.SEP.2019 14:13:52

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

Chongqing Academy of Information and Communications Technology
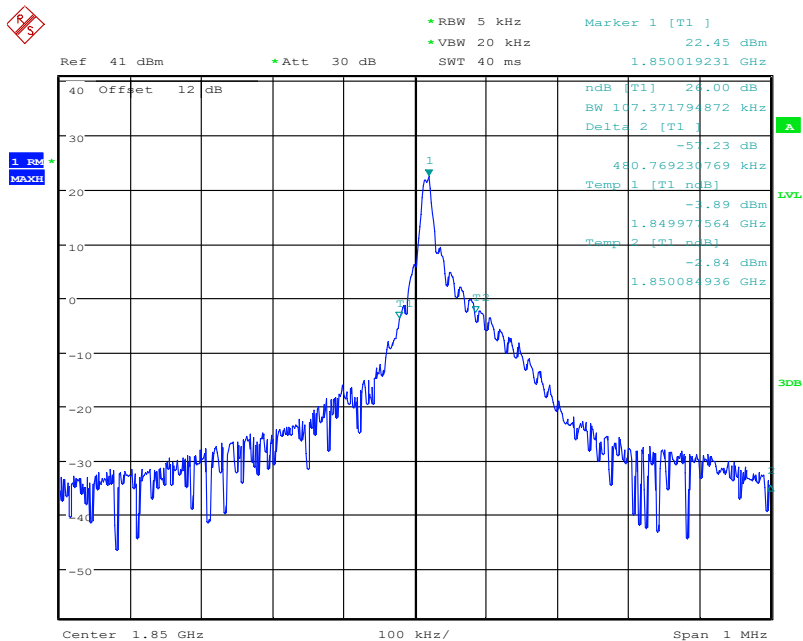
NB-IoT standalone band 2 18601 QPSK(26dB)
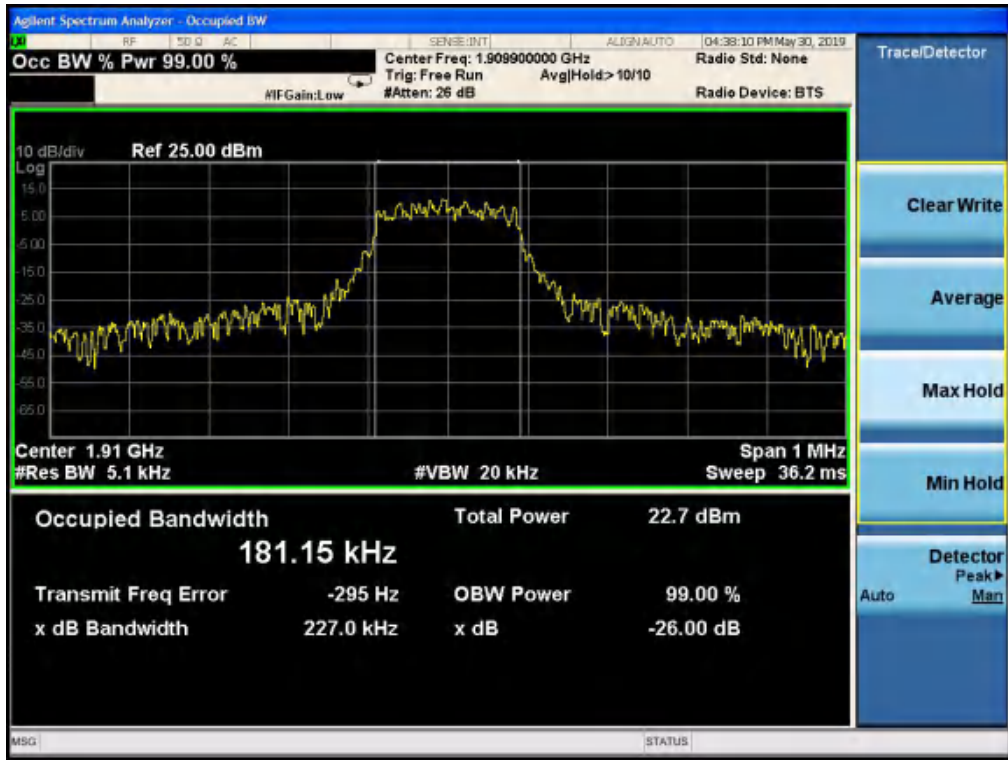

NB-IoT standalone band 2 18601 BPSK(26dB)
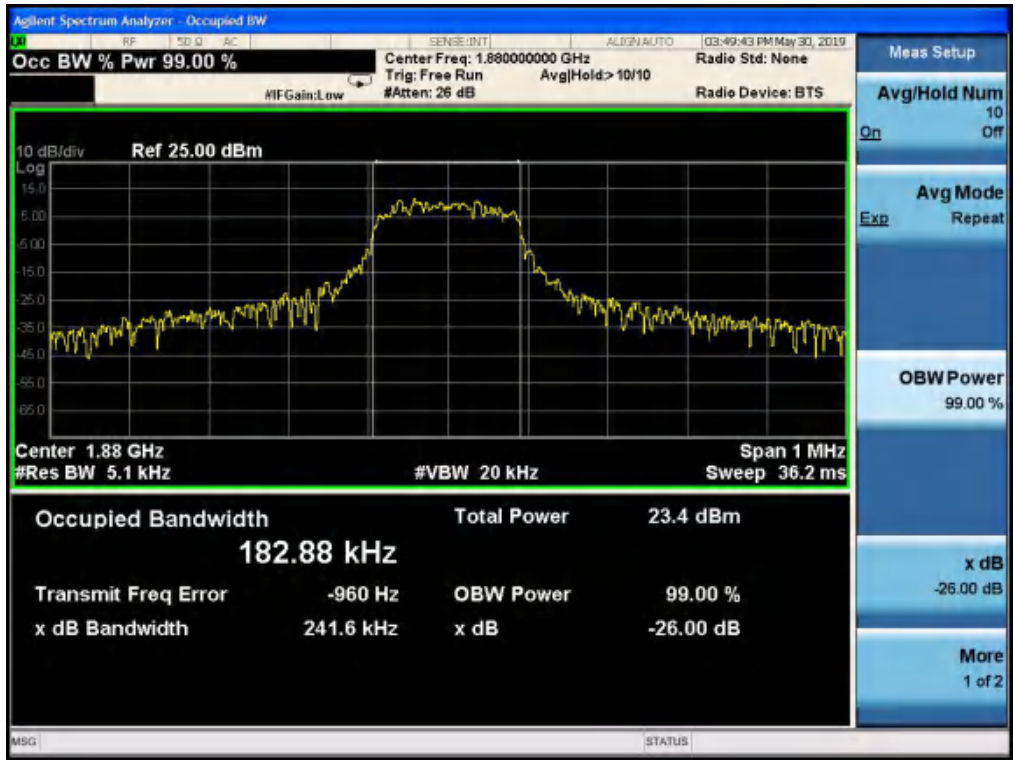
NB-IoT standalone band 2 18900 QPSK(99%)
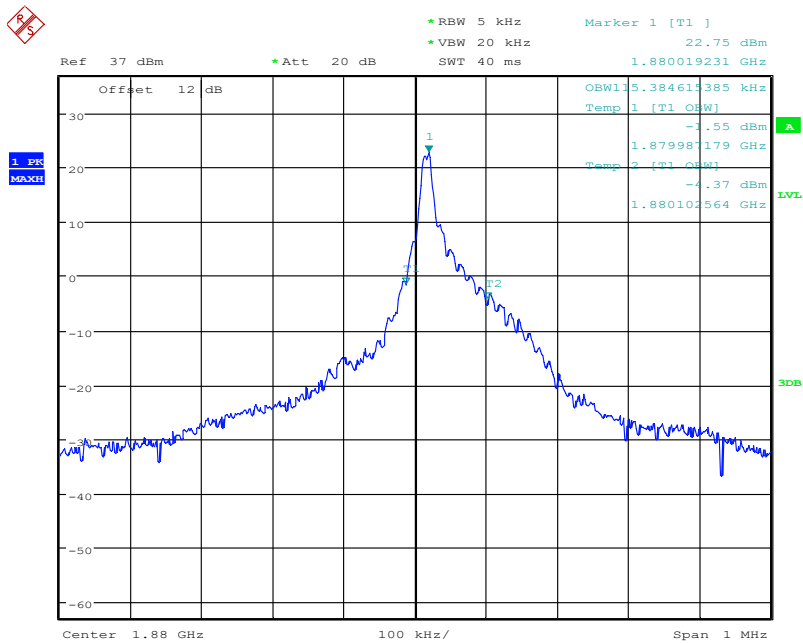
Date: 5.SEP.2019 13:36:07

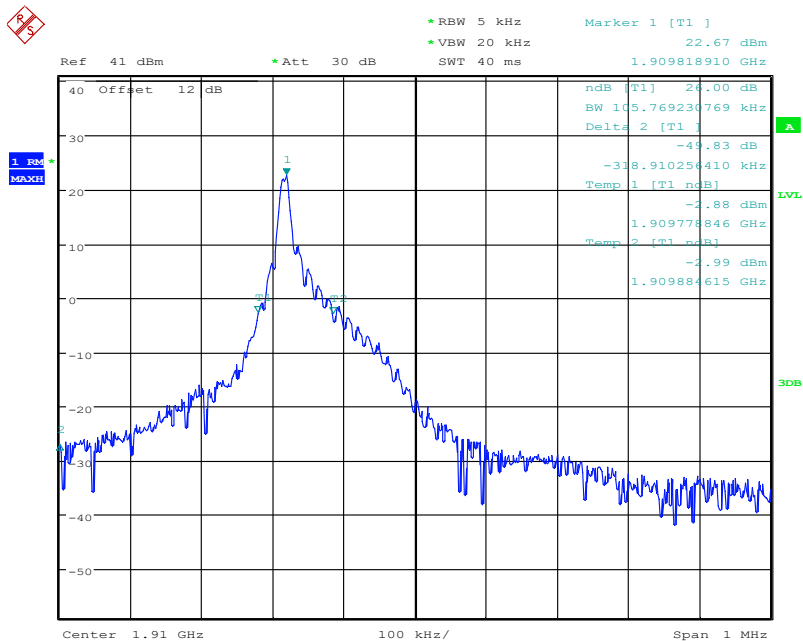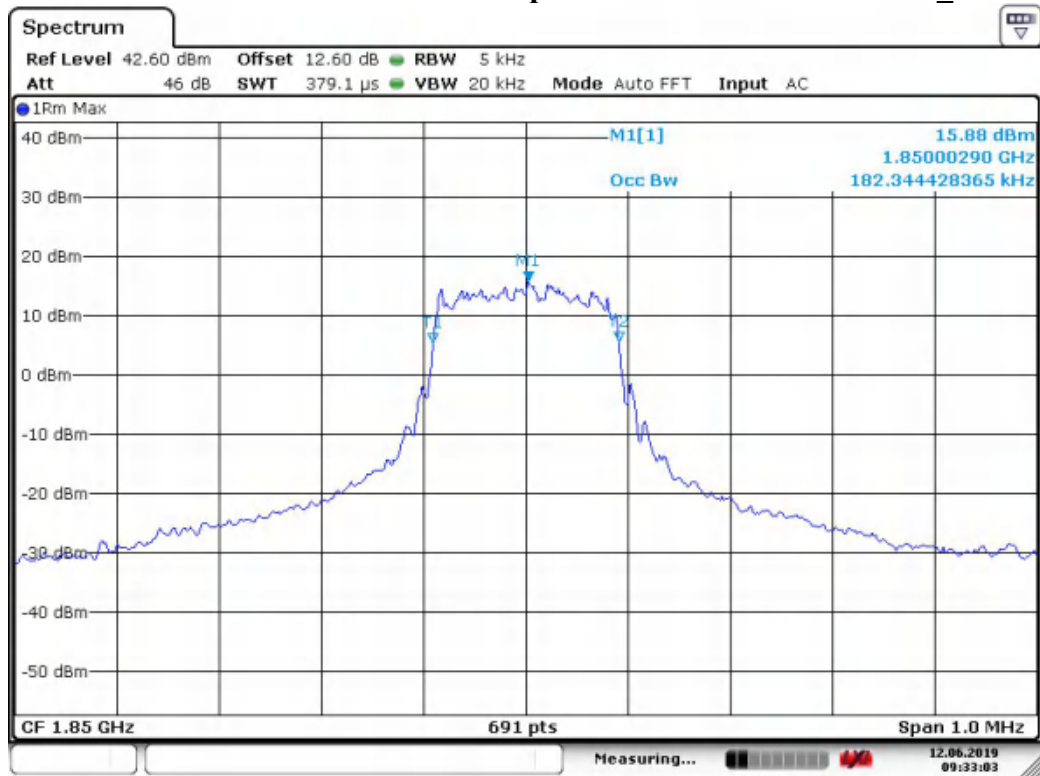NB-IoT standalone band 2 18900 BPSK(99%)
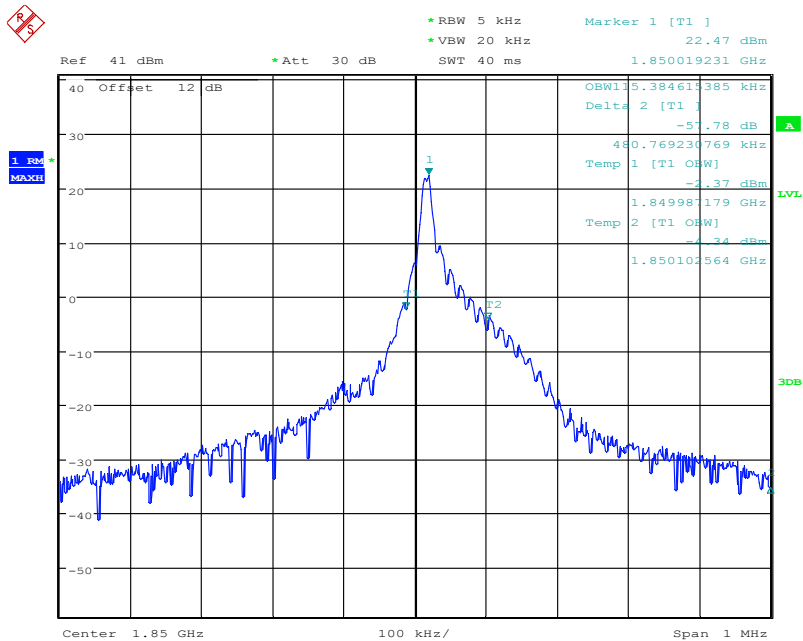
NB-IoT standalone band 2 18900 QPSK(26dB)
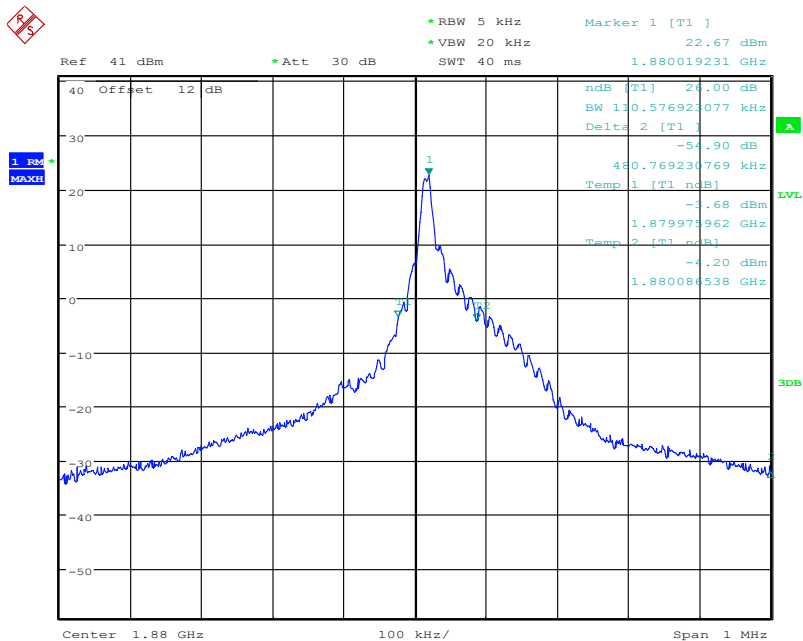
NB-IoT standalone band 2 18900 BPSK(26dB)

Agilent Spectrum Analyzer - Occupied BW

Occ BW % Pwr 99.00 % Center Freq: 1.909900000 GHz Radio Std: None
Trig: Free Run 04:38:10 PM May 30, 2019
#IFGain:Low #Atten: 26 dB Avg|Hold:> 10/10 Radio Device: BTS

Ref 25.00 dBm 10 dB/div Log

Center 1.91 GHz Span 1 MHz
#Res BW 5.1 kHz #VBW 20 kHz Sweep 36.2 ms

Occupied Bandwidth		Total Power	22.7 dBm
181.15 kHz			
Transmit Freq Error	-295 Hz	OBW Power	99.00 %
x dB Bandwidth	227.0 kHz	x dB	-26.00 dB

NB-IoT standalone band 2 19199 QPSK(99%)
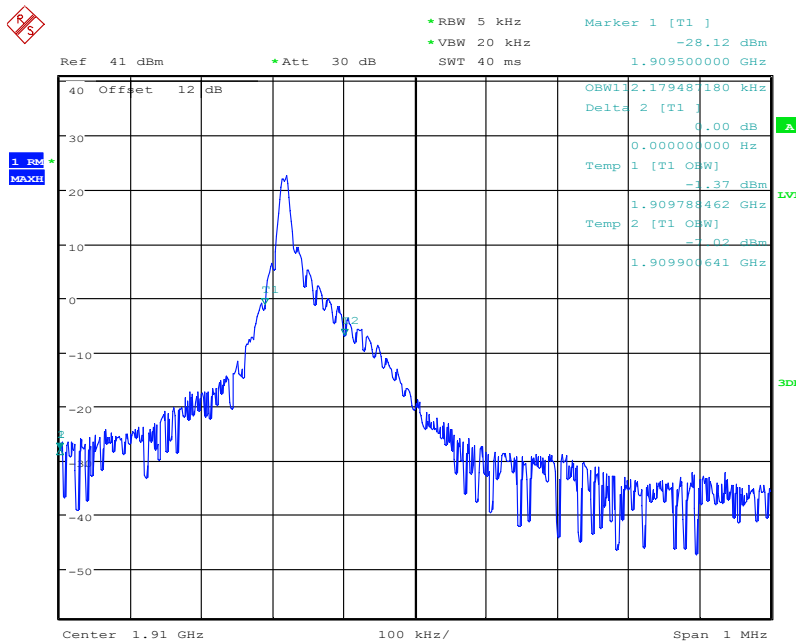
Date: 5.SEP.2019 14:11:24

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)

Chongqing Academy of Information and Communications Technology

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

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

Chongqing Academy of Information and Communications Technology

Spectrum								
Ref Level 42.60 dBm	Offset 12.60 dB	RBW 5 kHz						
Att 50 dB	SWT 379.1 µs	VBW 20 kHz	Mode Auto FFT	Input AC				

Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	1.8500058 GHz	14.84 dBm	ndB down	221.4 kHz
T1		1	1.8498886 GHz	-11.30 dBm	ndB	26.00 dB
T2		1	1.85011 GHz	-10.30 dBm	Q factor	8355.3
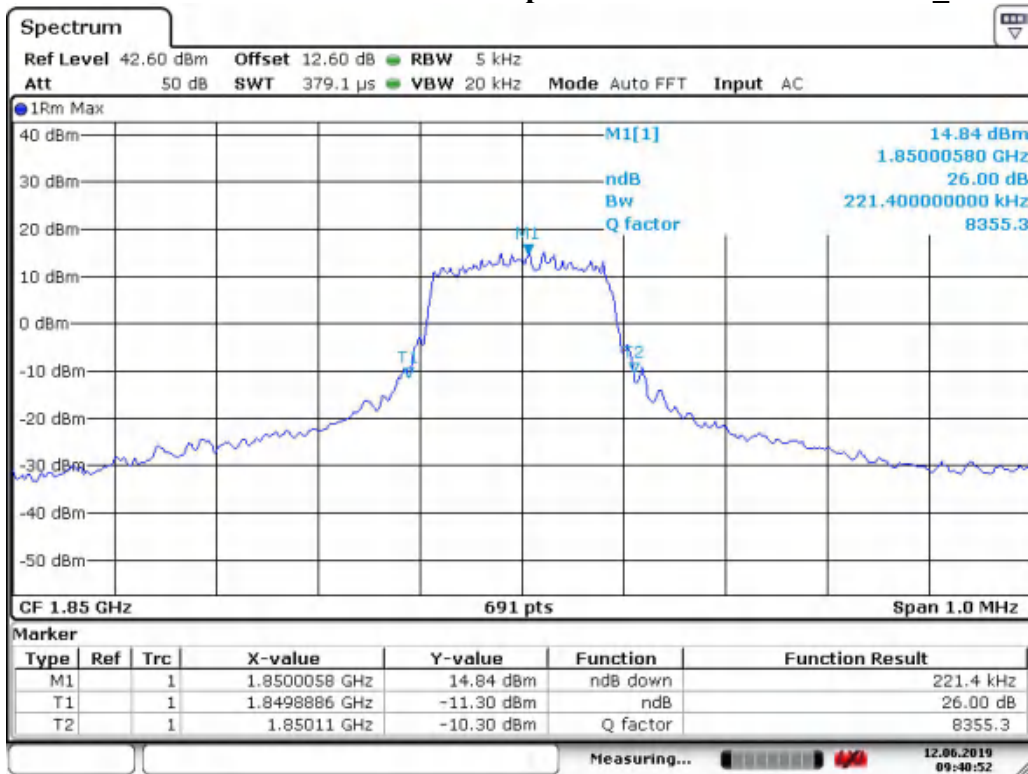
Date: 12.JUN.2019 09:40:52

NB-IoT In-band band 2 18601 QPSK(26dB)
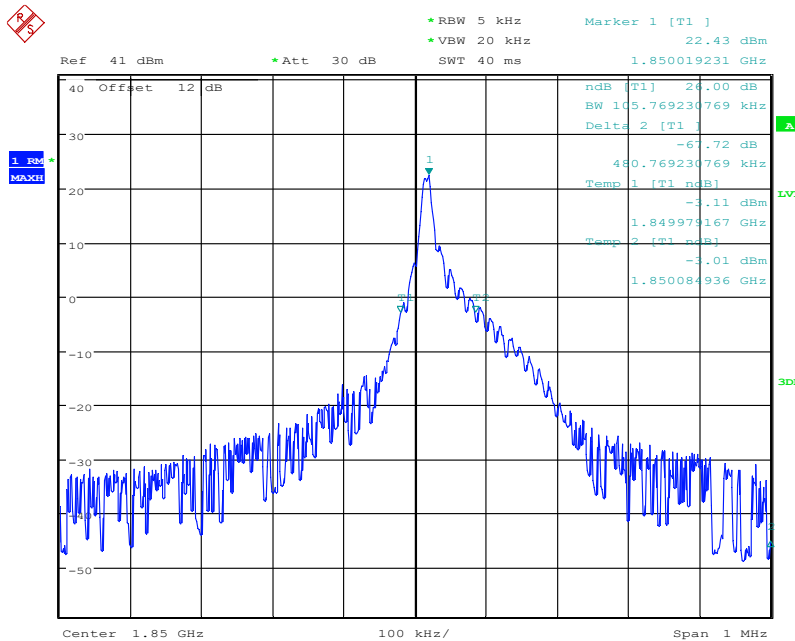
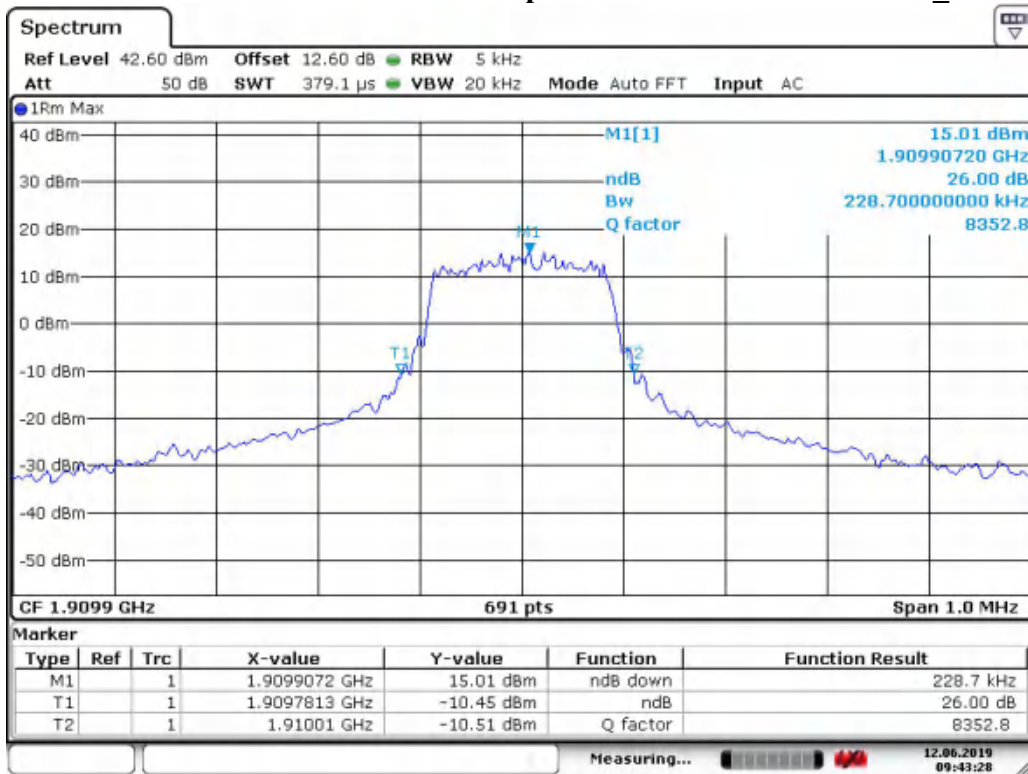Date: 5.SEP.2019 14:15:29

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

Address：No. 8,Yuma Road, Chayuan New City, Nan'an District, Chongqing, P. R. China,401336
Tel: 0086-23-88069965　　　　　　　　　　　　　　　　FAX: 0086-23-88608777

Page 35 of 361
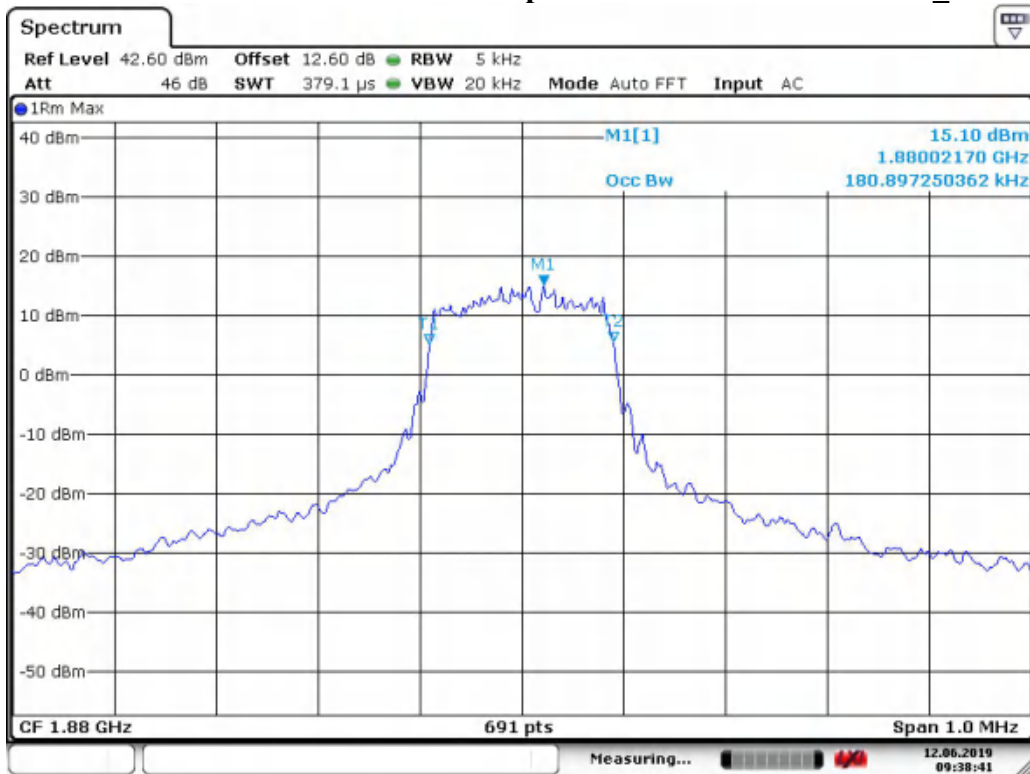
NB-IoT In-band band 2 18900 QPSK(99%)
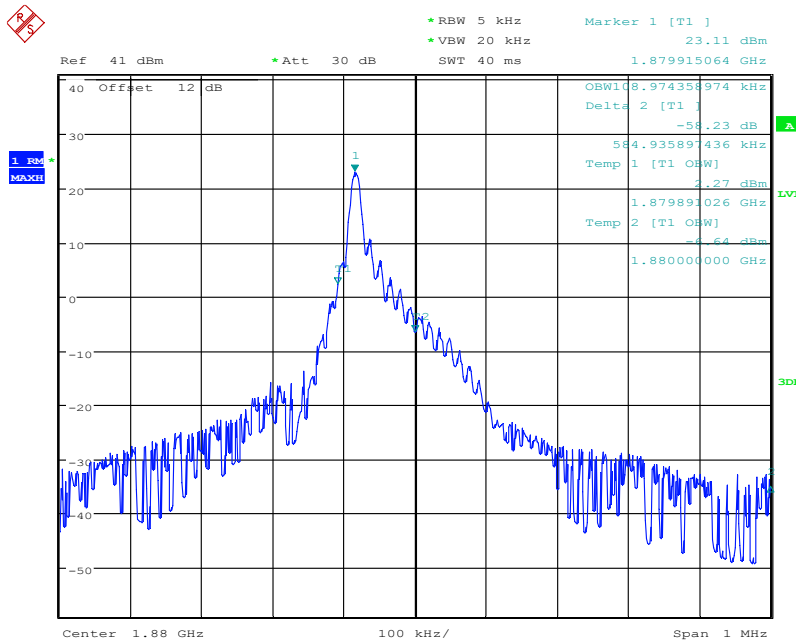
Date: 5.SEP.2019 14:17:20

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

Address：No. 8,Yuma Road, Chayuan New City, Nan'an District, Chongqing, P. R. China,401336
Tel: 0086-23-88069965   FAX: 0086-23-88608777

Page 36 of 361

Chongqing Academy of Information and Communications Technology
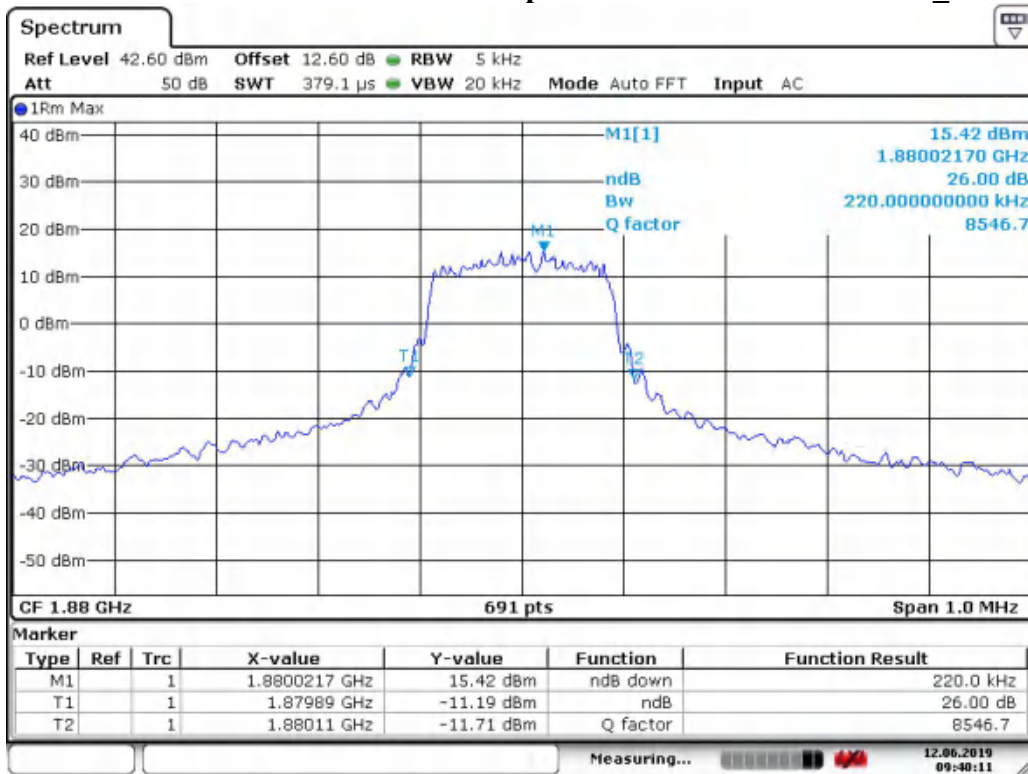
NB-IoT In-band band 2 18900 QPSK(26dB)

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

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

Chongqing Academy of Information and Communications Technology
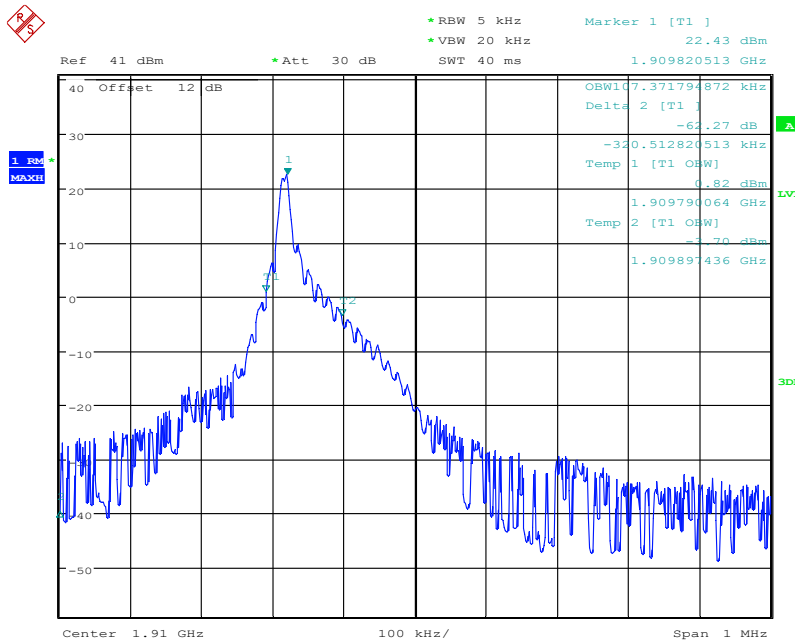
NB-IoT In-band band 2 19199 QPSK(99%)

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

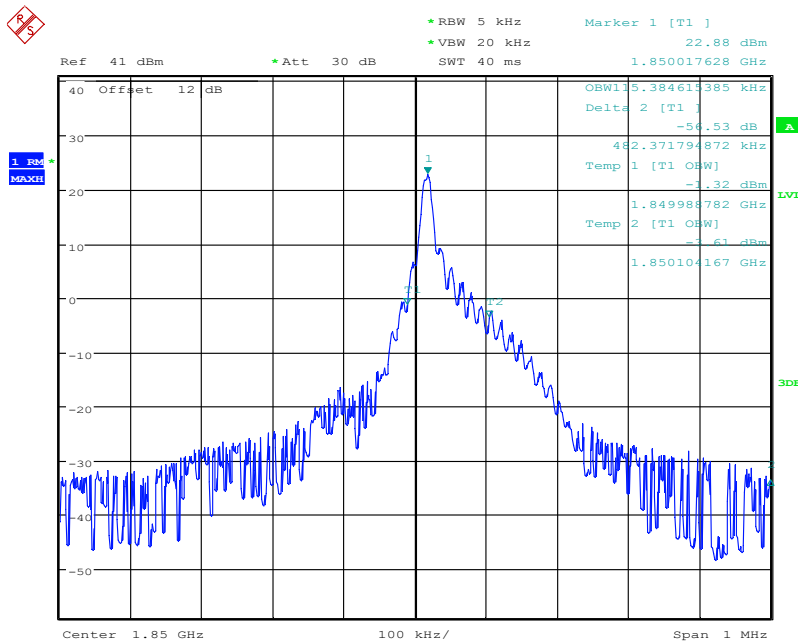Date: 12.JUN.2019 09:43:28

NB-IoT In-band band 2 19199 QPSK(26dB)
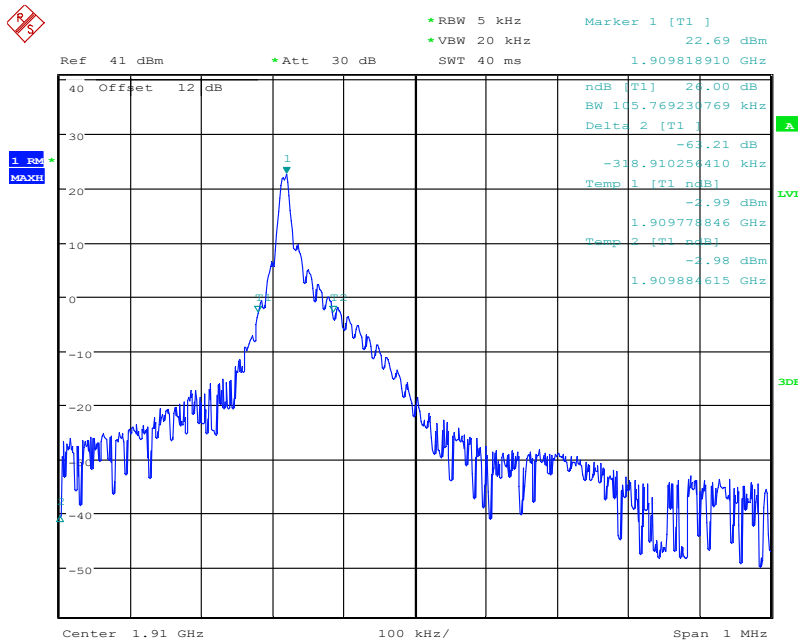
Date: 5.SEP.2019 14:16:27
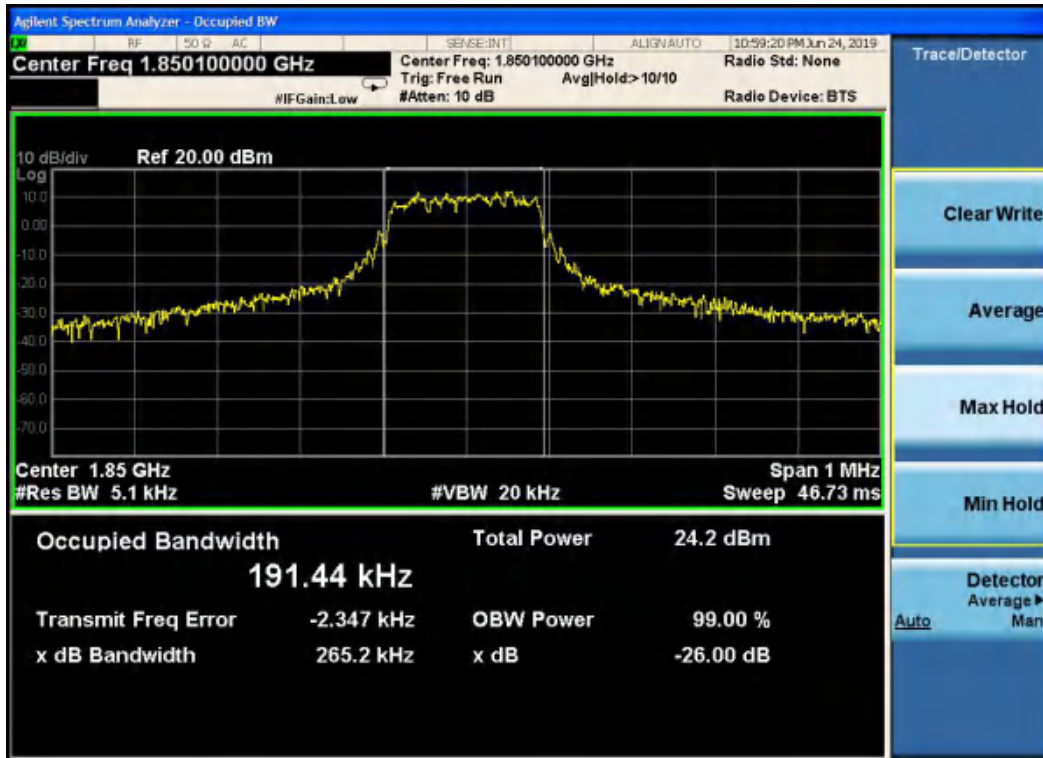
NB-IoT In-band band 2 19199 BPSK(26dB)

Chongqing Academy of Information and Communications Technology
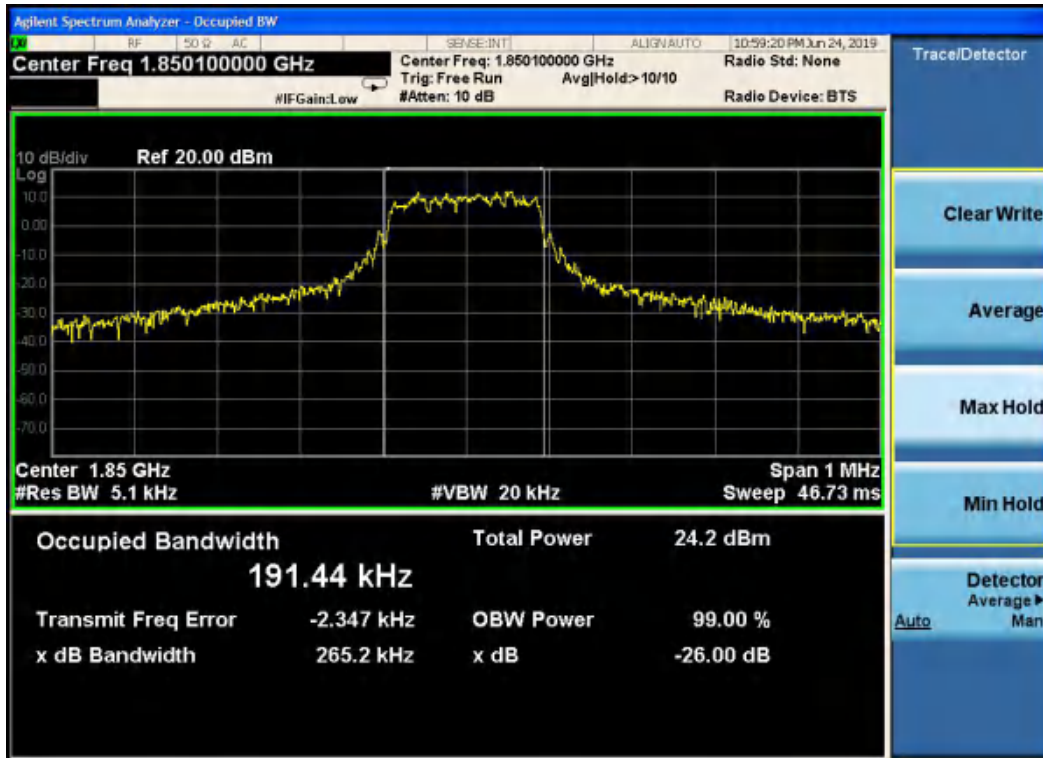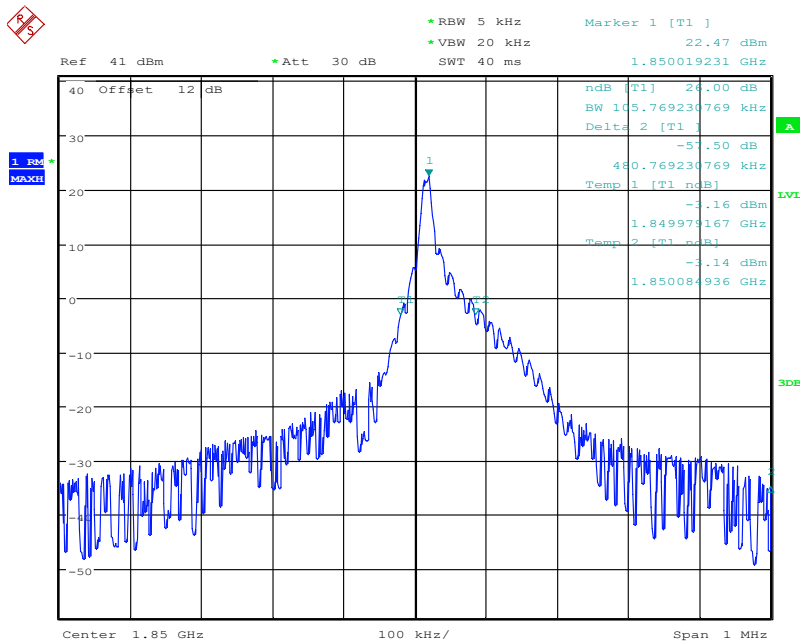
NB-IoT Guard-band band 2 18601 QPSK(99%)

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

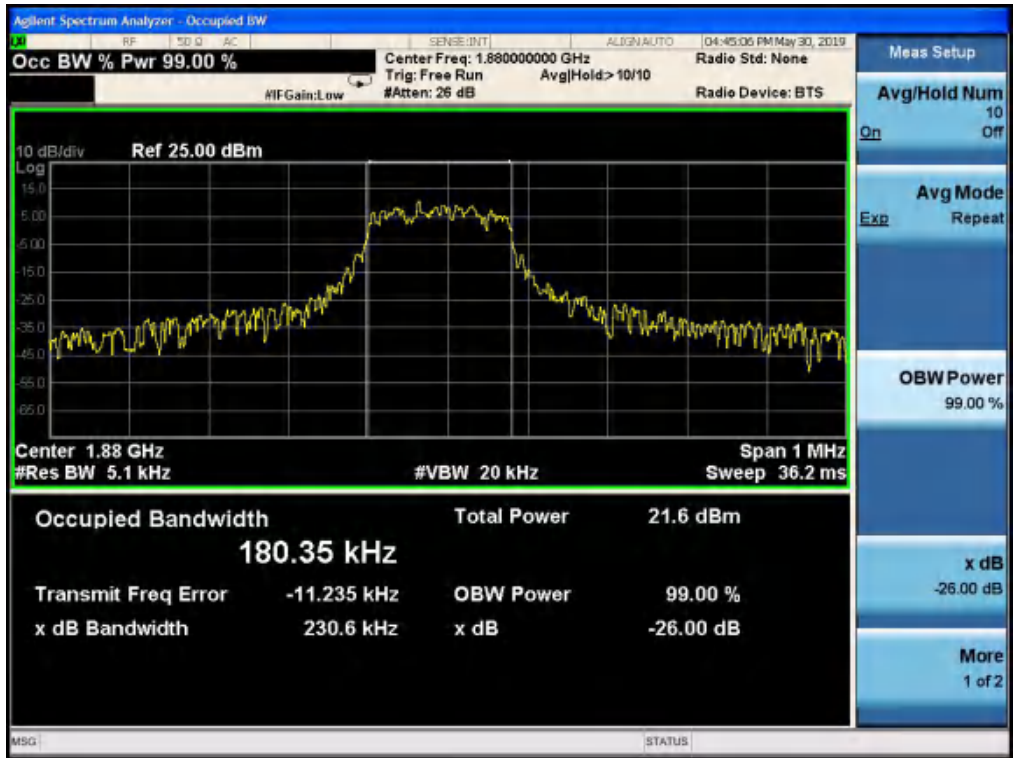NB-IoT Guard-band band 2 18601 BPSK(99%)

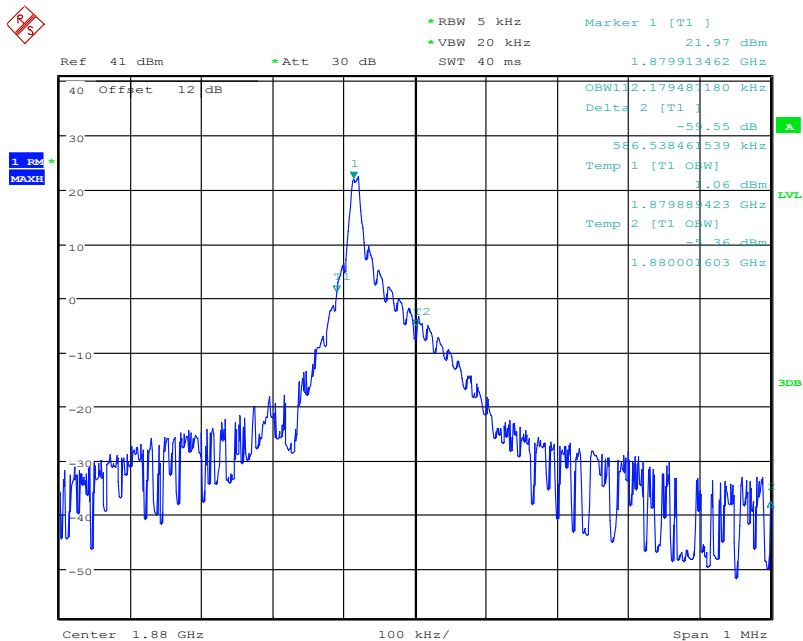NB-IoT Guard-band band 2 18601 QPSK(26dB)

Date: 5.SEP.2019 14:19:52
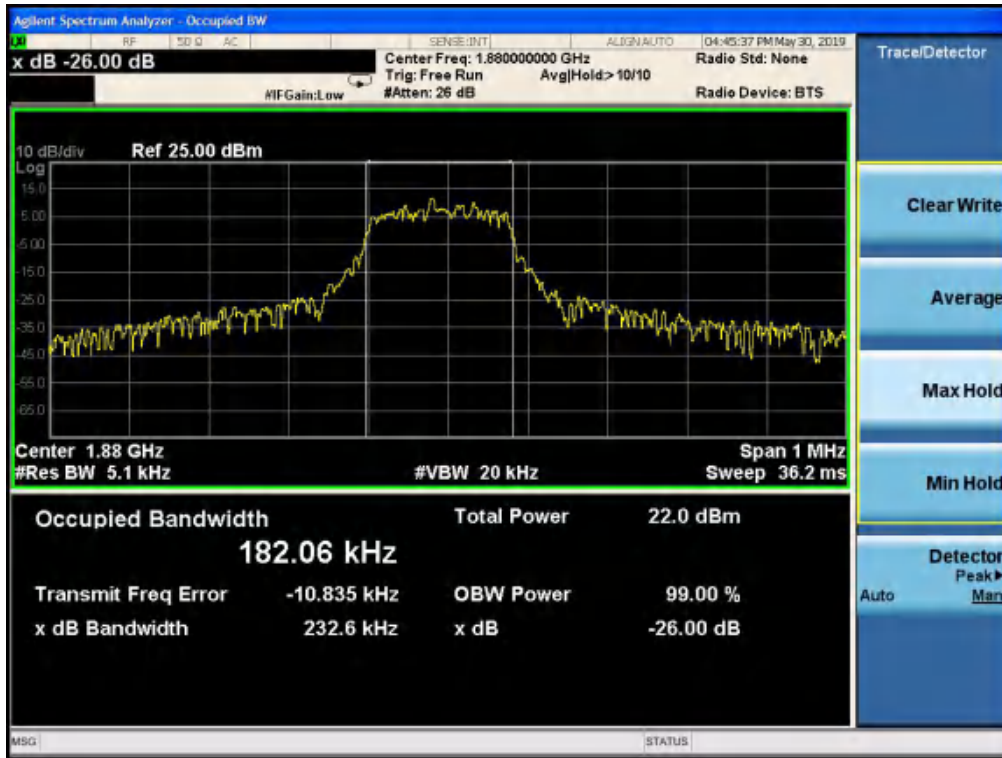
NB-IoT Guard-band band 2 18601 BPSK(26dB)

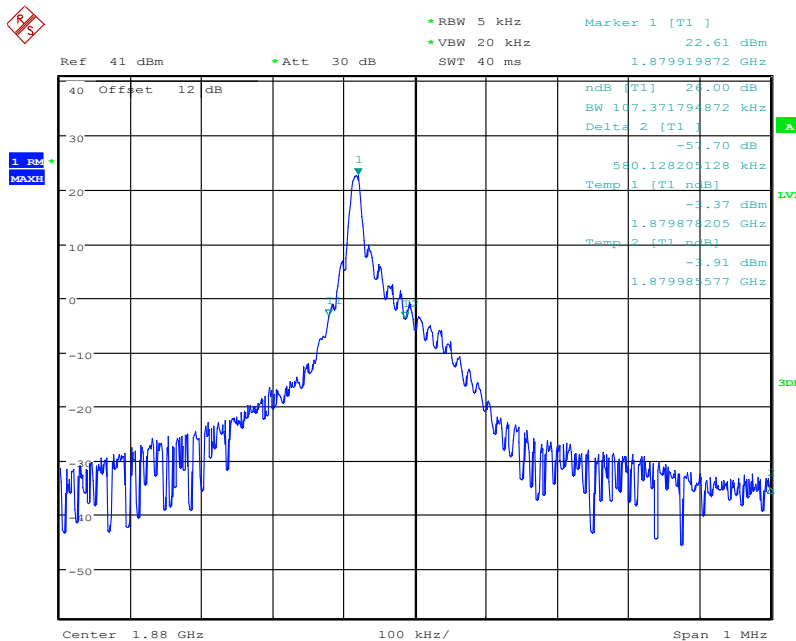NB-IoT Guard-band band 2 18900 QPSK(99%)

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

NB-IoT Guard-band band 2 18900 BPSK(99%)
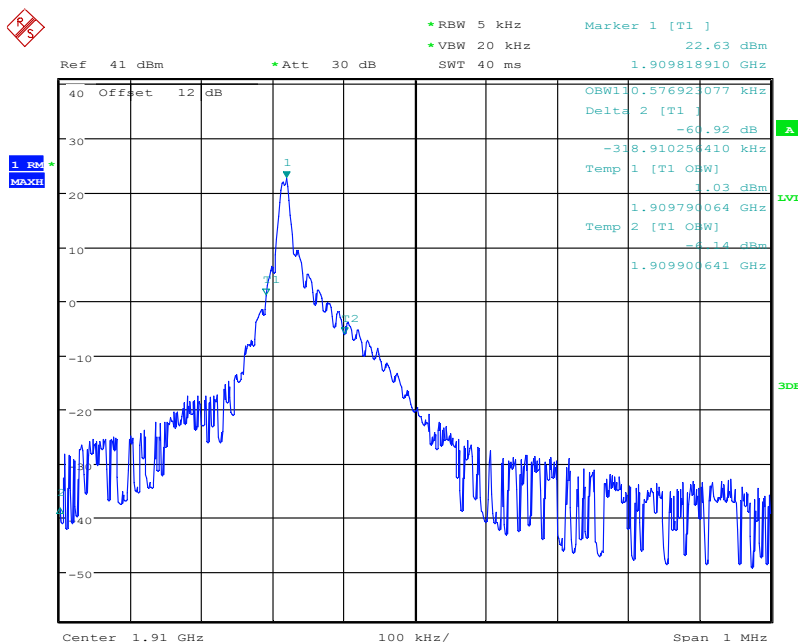
NB-IoT Guard-band band 2 18900 QPSK(26dB)

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

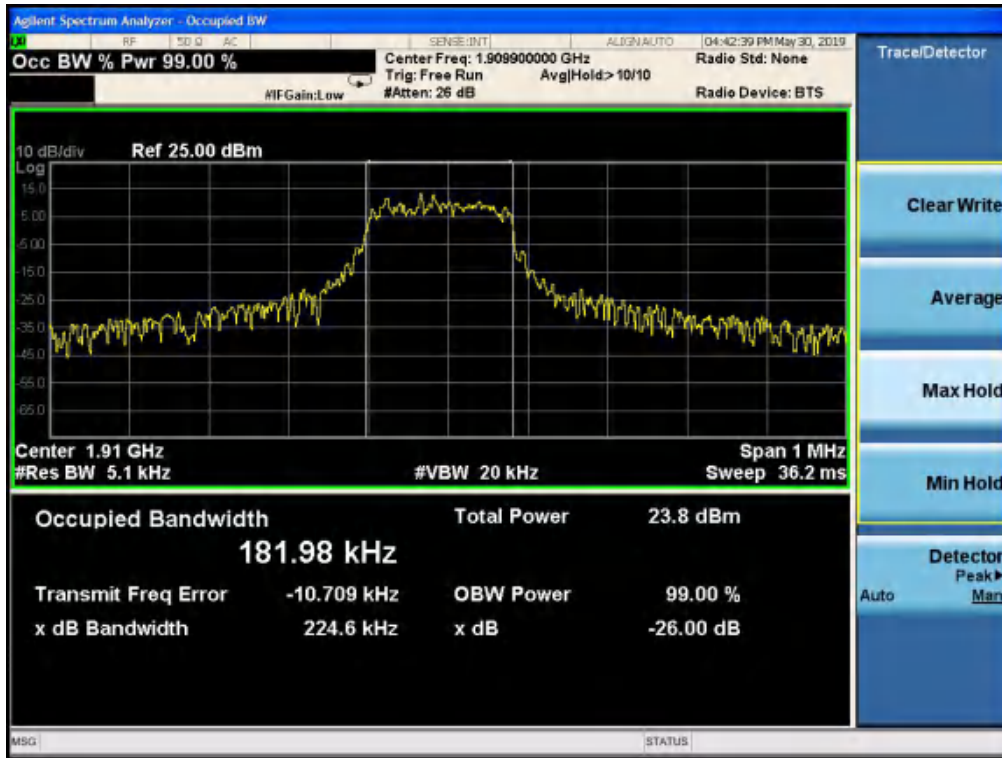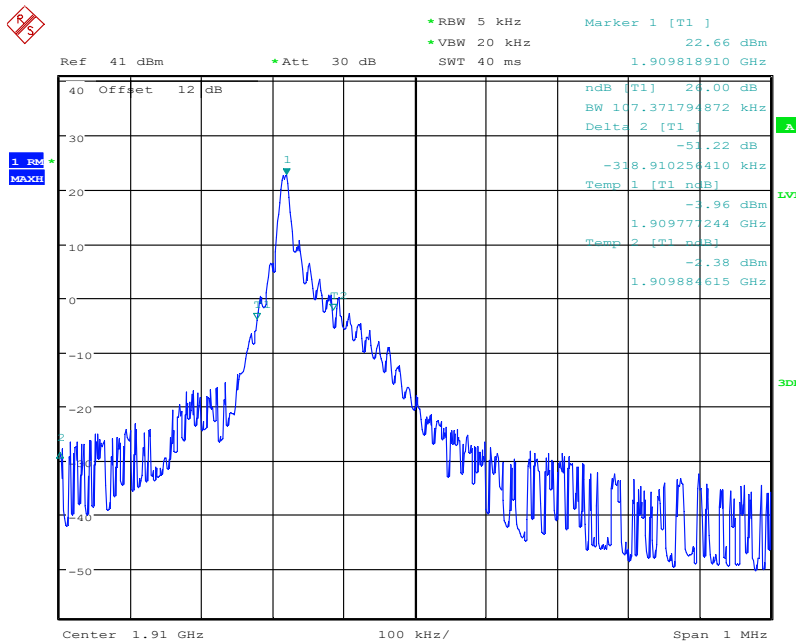NB-IoT Guard-band band 2 18900 BPSK(26dB)

Agilent Spectrum Analyzer - Occupied BW

Occ BW % Pwr 99.00 %

Center Freq: 1.909900000 GHz
Trig: Free Run
#Atten: 26 dB
#IFGain:Low

Radio Std: None
04:42:39 PM May 30, 2019
Avg|Hold:> 10/10
Radio Device: BTS

Trace/Detector

10 dB/div
Log
Ref 25.00 dBm
15.0
5.00
-5.00
-15.0
-25.0
-35.0
-45.0
-55.0
-65.0

Center 1.91 GHz
#Res BW 5.1 kHz

#VBW 20 kHz

Span 1 MHz
Sweep 36.2 ms

Clear Write

Average

Max Hold

Min Hold

Occupied Bandwidth		Total Power	23.8 dBm
	181.98 kHz		
Transmit Freq Error	-10.709 kHz	OBW Power	99.00 %
x dB Bandwidth	224.6 kHz	x dB	-26.00 dB

Detector
Peak▶
Auto   Man

MSG   STATUS

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

*RBW 5 kHz
*VBW 20 kHz
SWT 40 ms

Marker 1 [T1]
22.63 dBm
1.909818910 GHz

Ref 41 dBm   *Att 30 dB

40 Offset 12 dB
30
20
10
0
-10
-20
-30
-40
-50

1 RM *
MAXH

OBW1 0.576923077 kHz
Delta 2 [T1]
-60.92 dB
-318.910256410 kHz
Temp 1 [T1 OBW]
1.03 dBm
1.909790064 GHz
Temp 2 [T1 OBW]
-6.14 dBm
1.909900641 GHz

A
LVL
3DB

Center 1.91 GHz   100 kHz/   Span 1 MHz
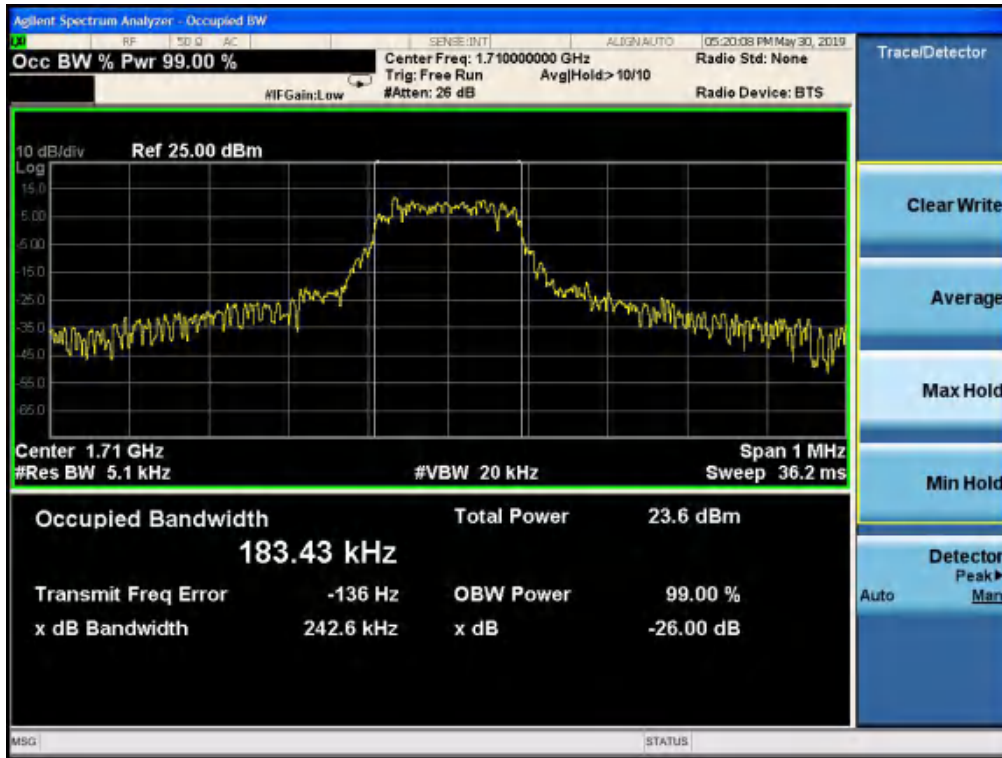
Date: 5.SEP.2019 14:20:42

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

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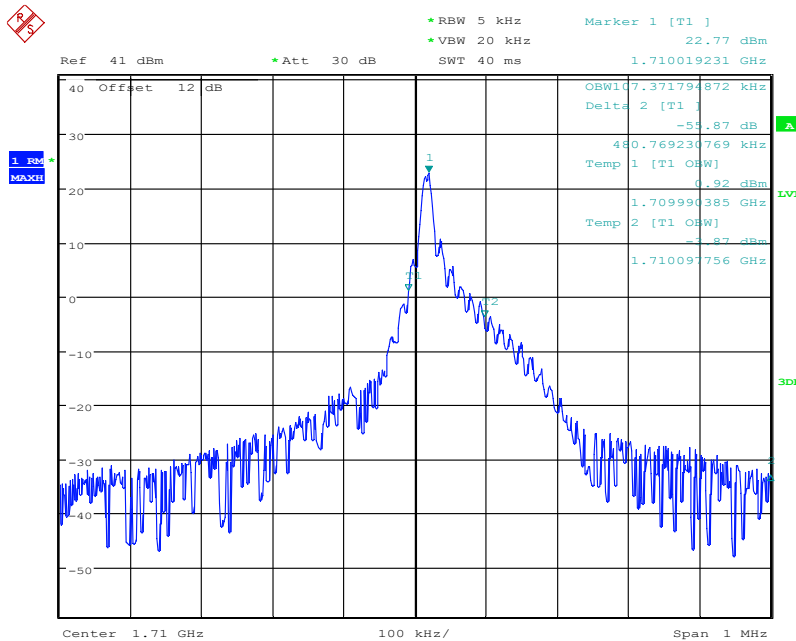

NB-IoT Guard-band band 2 19199 BPSK(26dB)

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%)

Address：No. 8,Yuma Road, Chayuan New City, Nan'an District, Chongqing, P. R. China,401336
Tel: 0086-23-88069965   FAX: 0086-23-88608777

Page 46 of 361

Chongqing Academy of Information and Communications Technology

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

NB-IoT standalone band 4 19951 BPSK(26dB)
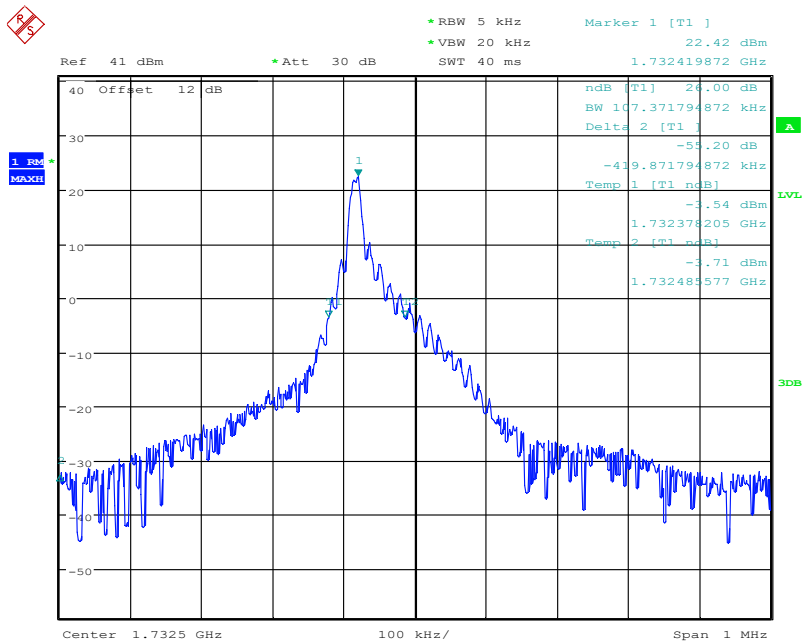
NB-IoT standalone band 4 20175 QPSK(99%)

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

Agilent Spectrum Analyzer - Occupied BW

x dB -26.00 dB

Center Freq: 1.732500100 GHz   Radio Std: None   05:22:25 PM May 30, 2019
Trig: Free Run   Avg|Hold:> 10/10
#IFGain:Low   #Atten: 26 dB   Radio Device: BTS

10 dB/div   Ref 25.00 dBm
Log
15.0
5.00
-5.00
-15.0
-25.0
-35.0
-45.0
-55.0
-65.0

Center 1.733 GHz   Span 1 MHz
#Res BW 5.1 kHz   #VBW 20 kHz   Sweep 36.2 ms

Occupied Bandwidth		Total Power	23.2 dBm
183.42 kHz			
Transmit Freq Error	-901 Hz	OBW Power	99.00 %
x dB Bandwidth	238.7 kHz	x dB	-26.00 dB

Trace/Detector

Clear Write

Average

Max Hold

Min Hold

Detector
Peak▶
Auto   Man

MSG ⓘ Alignment Completed   STATUS

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

* RBW 5 kHz   Marker 1 [T1]
* VBW 20 kHz   22.42 dBm
Ref 41 dBm   * Att 30 dB   SWT 40 ms   1.732419872 GHz

40   Offset   12 dB   ndB [T1]   26.00 dB
BW 107.371794872 kHz
Delta 2 [T1]
30   -55.20 dB
-419.871794872 kHz
20   Temp 1 [T1 ndB]
-3.54 dBm
1.732378205 GHz
10   Temp 2 [T1 ndB]
-3.71 dBm
0   1.732485577 GHz

-10

-20

-30

-40

-50

Center 1.7325 GHz   100 kHz/   Span 1 MHz

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

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

Chongqing Academy of Information and Communications Technology

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

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

Agilent Spectrum Analyzer - Occupied BW

x dB -26.00 dB

Center Freq: 1.754900000 GHz
Trig: Free Run
#Atten: 26 dB

#IFGain:Low

Radio Std: None
05:23:10 PM May 30, 2019
Avg|Hold:> 10/10
Radio Device: BTS

Trace/Detector

10 dB/div Log

Ref 25.00 dBm

Center 1.755 GHz
#Res BW 5.1 kHz

#VBW 20 kHz

Span 1 MHz
Sweep 36.2 ms

Clear Write

Average

Max Hold

Min Hold

Occupied Bandwidth		Total Power	22.5 dBm
	179.41 kHz		
Transmit Freq Error	-281 Hz	OBW Power	99.00 %
x dB Bandwidth	243.8 kHz	x dB	-26.00 dB

Detector
Peak▶
Auto   Man

MSG

STATUS

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

MARKER 1
1.754815064 GHz
Ref 41 dBm

*RBW 5 kHz
*VBW 20 kHz
*Att 30 dB   SWT 40 ms

Marker 1 [T1]
21.70 dBm
1.754815064 GHz

40 Offset 12 dB

ndB [T1]   26.00 dB
BW 108.974358974 kHz
Delta 2 [T1]
-60.93 dB
-415.064102564 kHz
Temp 1 [T1 ndB]
-4.40 dBm
1.754776603 GHz
Temp 2 [T1 ndB]
-4.15 dBm
1.754885577 GHz

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

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

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

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

Address：No. 8,Yuma Road, Chayuan New City, Nan'an District, Chongqing, P. R. China,401336
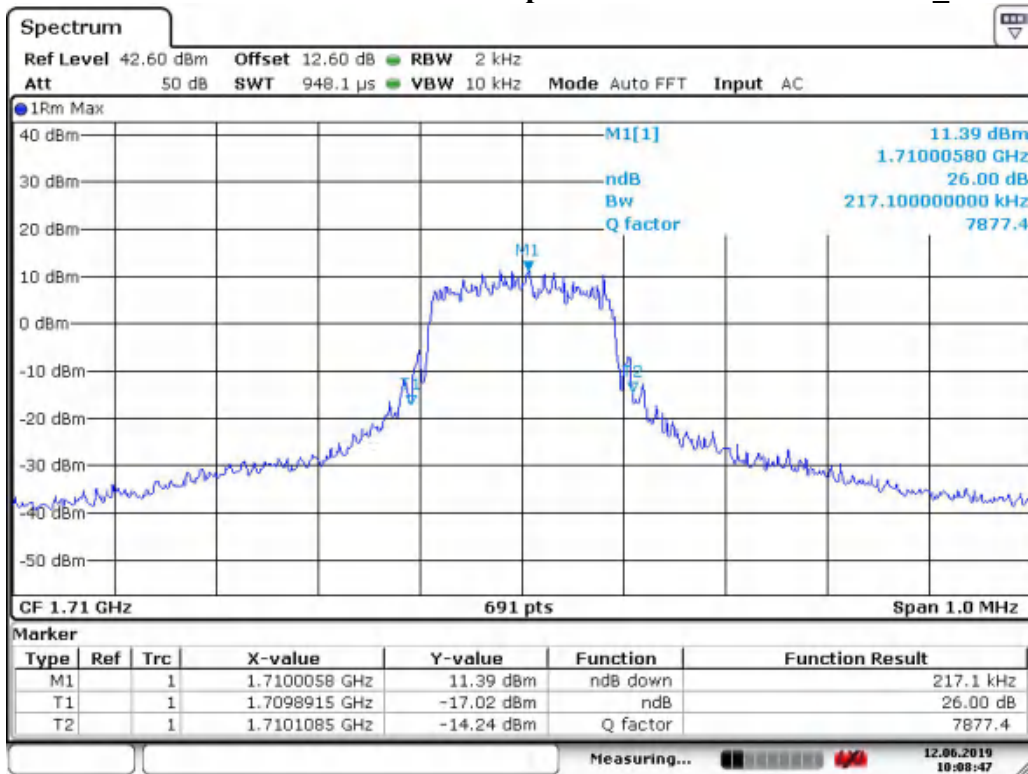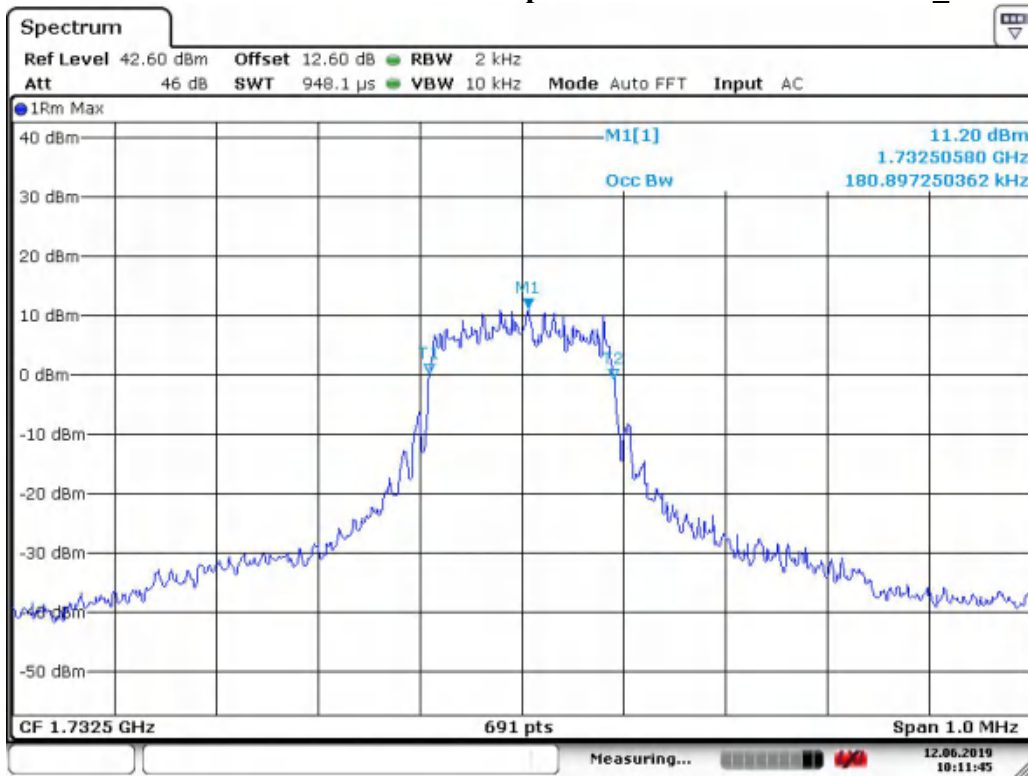Tel: 0086-23-88069965   FAX: 0086-23-88608777

Page 52 of 361

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)

Report No.:B19W50105-WWAN_Rev7

Spectrum

Ref Level 42.60 dBm Offset 12.60 dB RBW 2 kHz
Att 46 dB SWT 948.1 µs VBW 10 kHz Mode Auto FFT Input AC

1Rm Max

M1[1] 11.20 dBm
1.73250580 GHz
Occ Bw 180.897250362 kHz

CF 1.7325 GHz 691 pts Span 1.0 MHz

Measuring... 12.06.2019 10:11:45

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

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

*RBW 5 kHz Marker 1 [T1]
*VBW 20 kHz 21.59 dBm
Ref 41 dBm *Att 30 dB SWT 40 ms 1.732413462 GHz

40 Offset 12 dB OBW 108.974358974 kHz
Delta 2 [T1]
-56.96 dB
586.538461539 kHz
Temp 1 [T1 OBW]
0.36 dBm
1.732389423 GHz
Temp 2 [T1 OBW]
-1.62 dBm
1.732498397 GHz

Center 1.7325 GHz 100 kHz/ Span 1 MHz
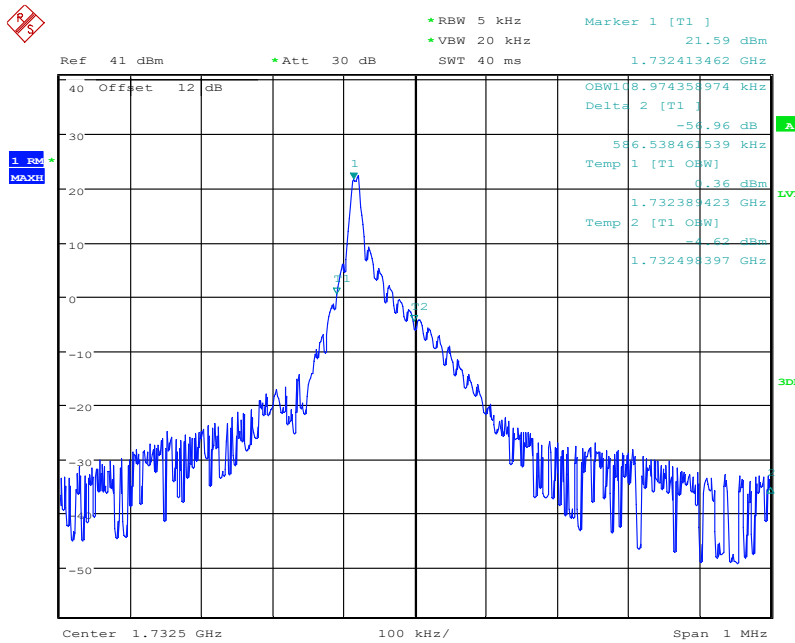
Date: 5.SEP.2019 14:27:31

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

Address：No. 8,Yuma Road, Chayuan New City, Nan'an District, Chongqing, P. R. China,401336
Tel: 0086-23-88069965 FAX: 0086-23-88608777

Page 54 of 361

Chongqing Academy of Information and Communications Technology

Spectrum

| Ref Level | 42.60 dBm | Offset | 12.60 dB | RBW | 2 kHz |
| Att | 50 dB | SWT | 948.1 µs | VBW | 10 kHz | Mode Auto FFT | Input AC |

1Rm Max

M1[1]   11.31 dBm
        1.73247830 GHz
ndB   26.00 dB
Bw   217.100000000 kHz
Q factor   7980.9

CF 1.7325 GHz   691 pts   Span 1.0 MHz

Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	1.7324783 GHz	11.31 dBm	ndB down	217.1 kHz
T1		1	1.7323915 GHz	-17.58 dBm	ndB	26.00 dB
T2		1	1.7326085 GHz	-14.69 dBm	Q factor	7980.9

Measuring...   12.06.2019 10:11:37

Date: 12.JUN.2019 10:11:37

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

* RBW 5 kHz   Marker 1 [T1]
* VBW 20 kHz   22.20 dBm
Ref 41 dBm   * Att 30 dB   SWT 40 ms   1.732419872 GHz

40 Offset 12 dB   ndB [T1] 26.00 dB
                                BW 107.371794872 kHz
                                Delta 2 [T1]
                                         -73.63 dB
                                580.128205128 kHz
                                Temp 1 [T1 ndB]
                                         -3.27 dBm
                                1.732378205 GHz
                                Temp 3 [T1 ndB]
                                         -4.60 dBm
                                1.732485577 GHz

Center 1.7325 GHz   100 kHz/   Span 1 MHz
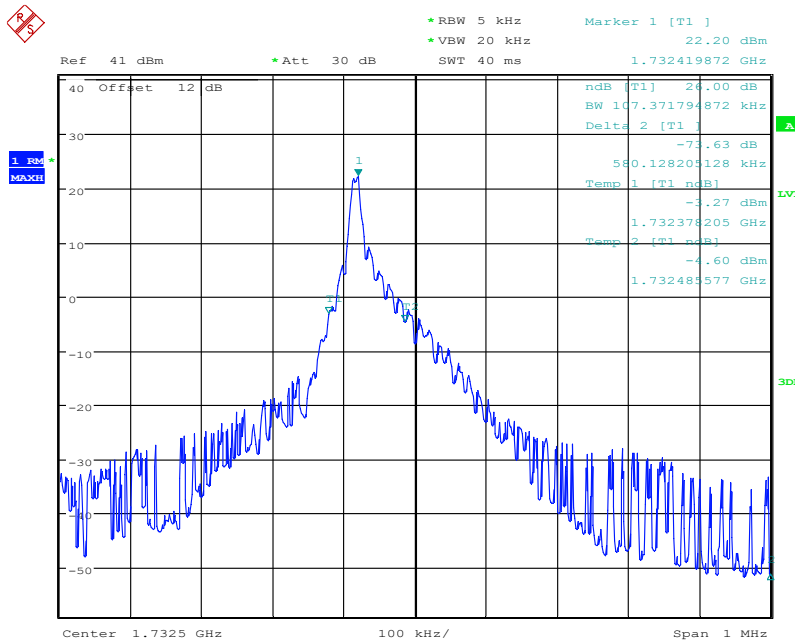
Date: 5.SEP.2019 14:27:42

NB-IoT In-band band 4 20175 BPSK(26dB)
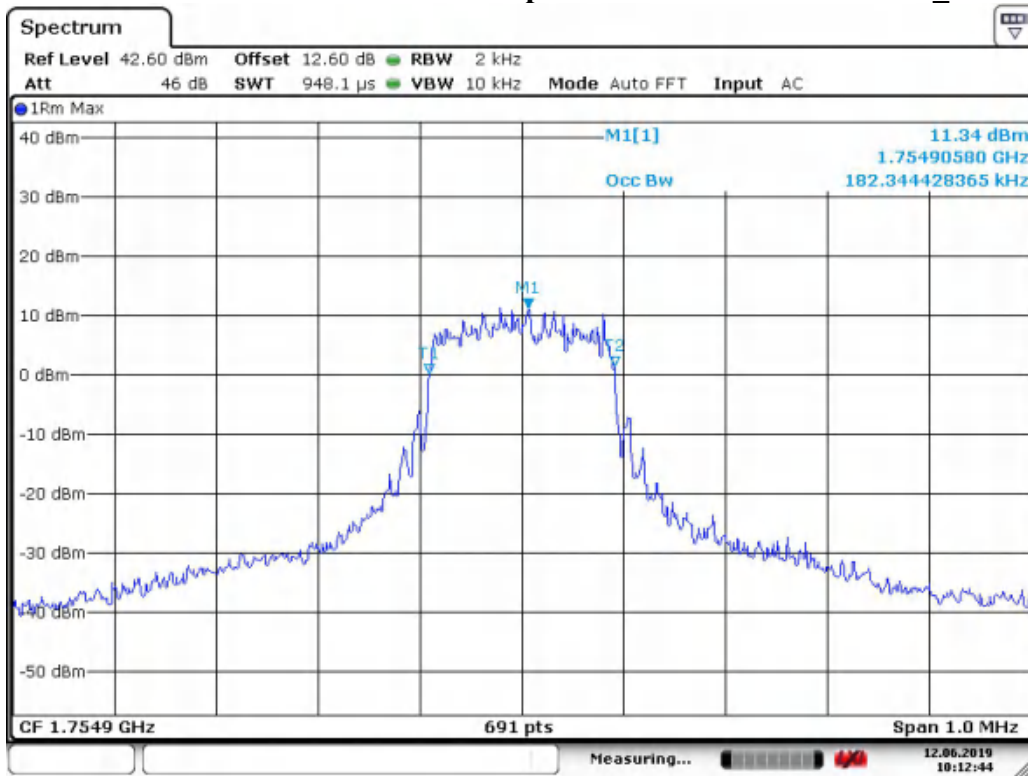
NB-IoT In-band band 4 20399 QPSK(99%)

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

Address：No. 8,Yuma Road, Chayuan New City, Nan'an District, Chongqing, P. R. China,401336
Tel: 0086-23-88069965   FAX: 0086-23-88608777

Page 56 of 361

Chongqing Academy of Information and Communications Technology

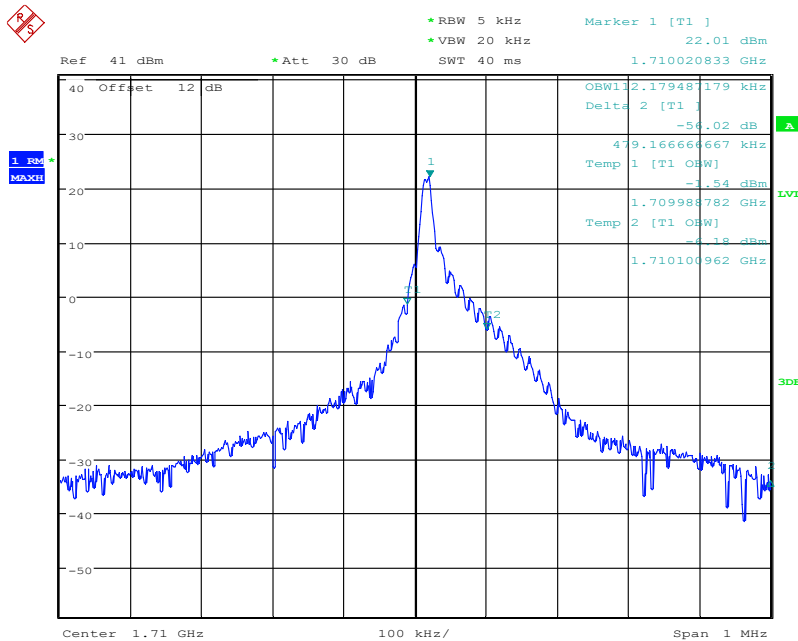| Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	1.7549058 GHz	11.40 dBm	ndB down	217.1 kHz
T1		1	1.7547915 GHz	-17.21 dBm	ndB	26.00 dB
T2		1	1.7550085 GHz	-14.62 dBm	Q factor	8084.3
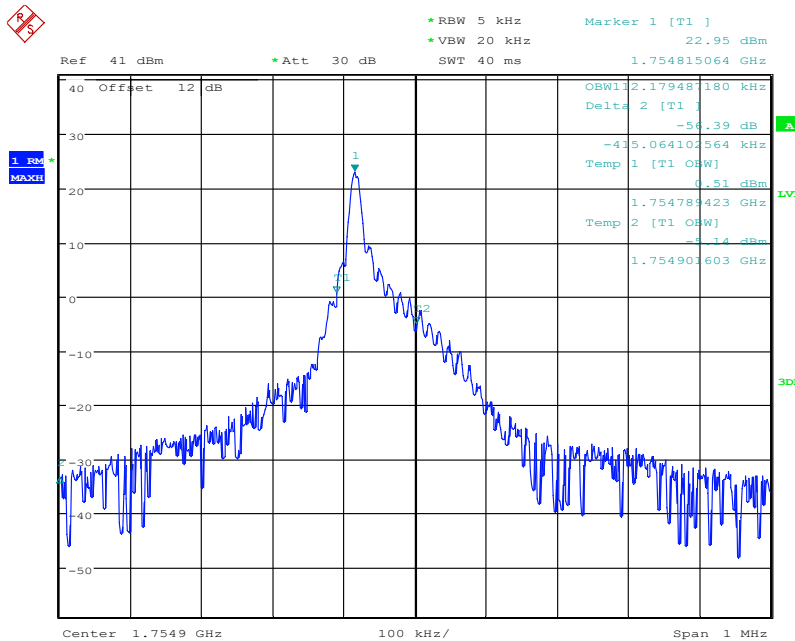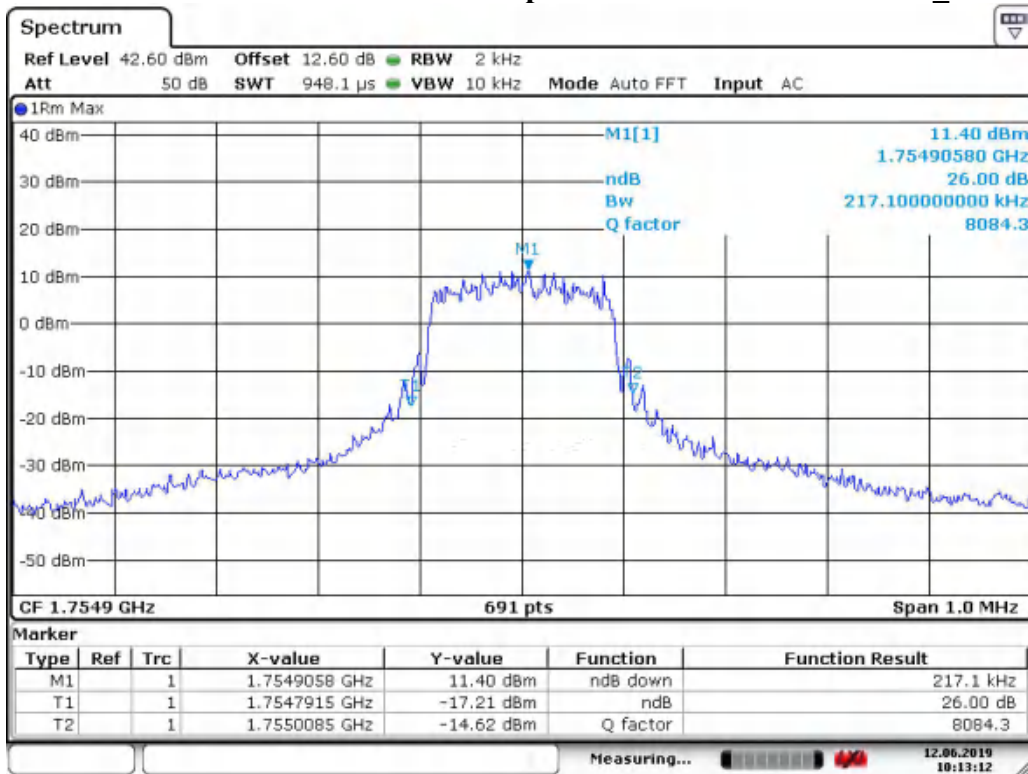
Date: 12.JUN.2019 10:13:11

NB-IoT In-band band 4 20399 QPSK(26dB)
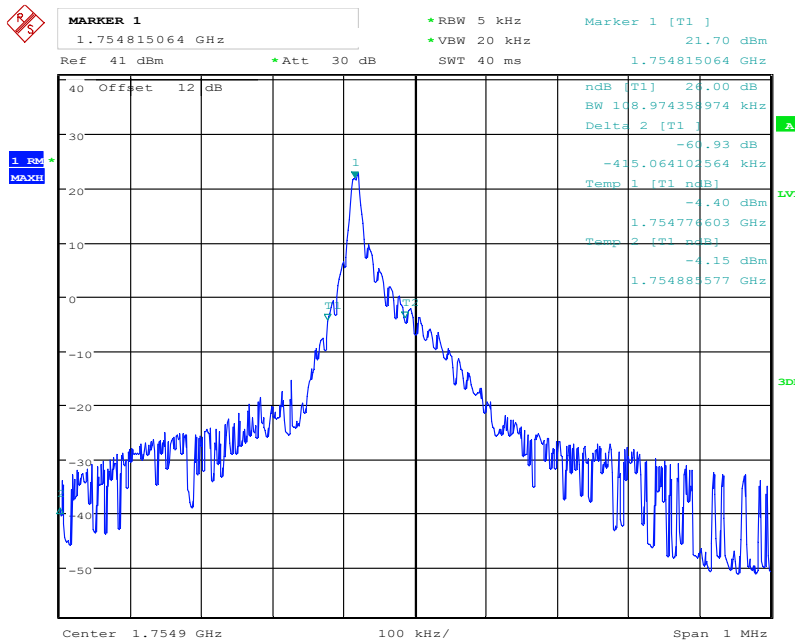
Date: 5.SEP.2019 14:30:43

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

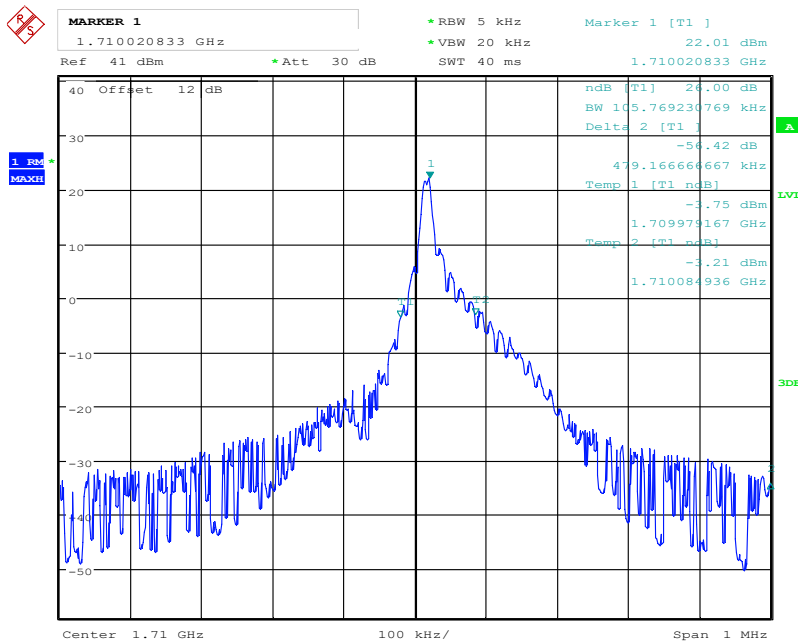NB-IoT Guard-band band 4 19951 QPSK(99%)

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

Address：No. 8,Yuma Road, Chayuan New City, Nan'an District, Chongqing, P. R. China,401336
Tel: 0086-23-88069965   FAX: 0086-23-88608777

Page 58 of 361

Chongqing Academy of Information and Communications Technology

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

Date: 5.SEP.2019 14:24:29
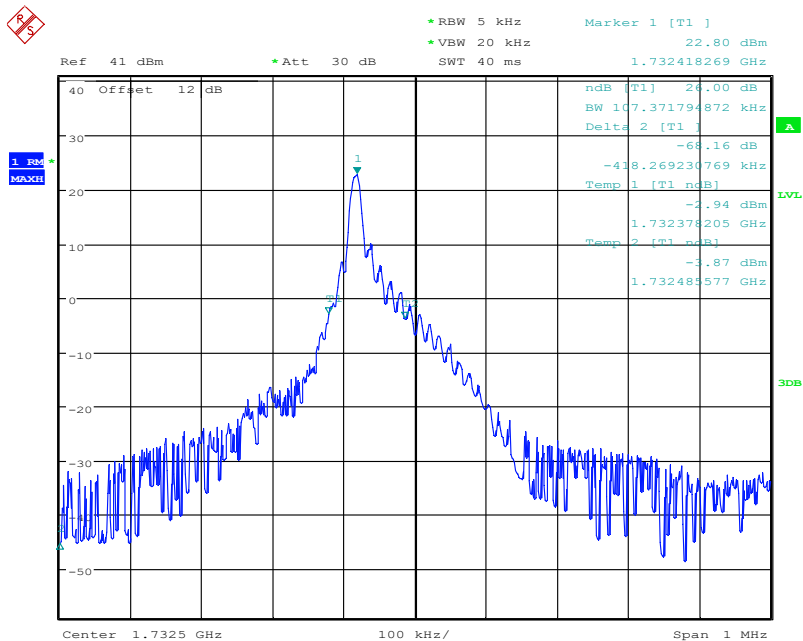
NB-IoT Guard-band band 4 19951 BPSK(26dB)

Occ BW % Pwr 99.00 %

Center Freq: 1.732500000 GHz Radio Std: None
Trig: Free Run Avg|Hold:> 10/10
#Atten: 26 dB Radio Device: BTS
#IFGain:Low

10 dB/div Ref 25.00 dBm
Log

Center 1.733 GHz Span 1 MHz
#Res BW 5.1 kHz #VBW 20 kHz Sweep 36.2 ms

Occupied Bandwidth		Total Power	25.3 dBm
	181.69 kHz		
Transmit Freq Error	-10.101 kHz	OBW Power	99.00 %
x dB Bandwidth	214.7 kHz	x dB	-26.00 dB

Trace/Detector
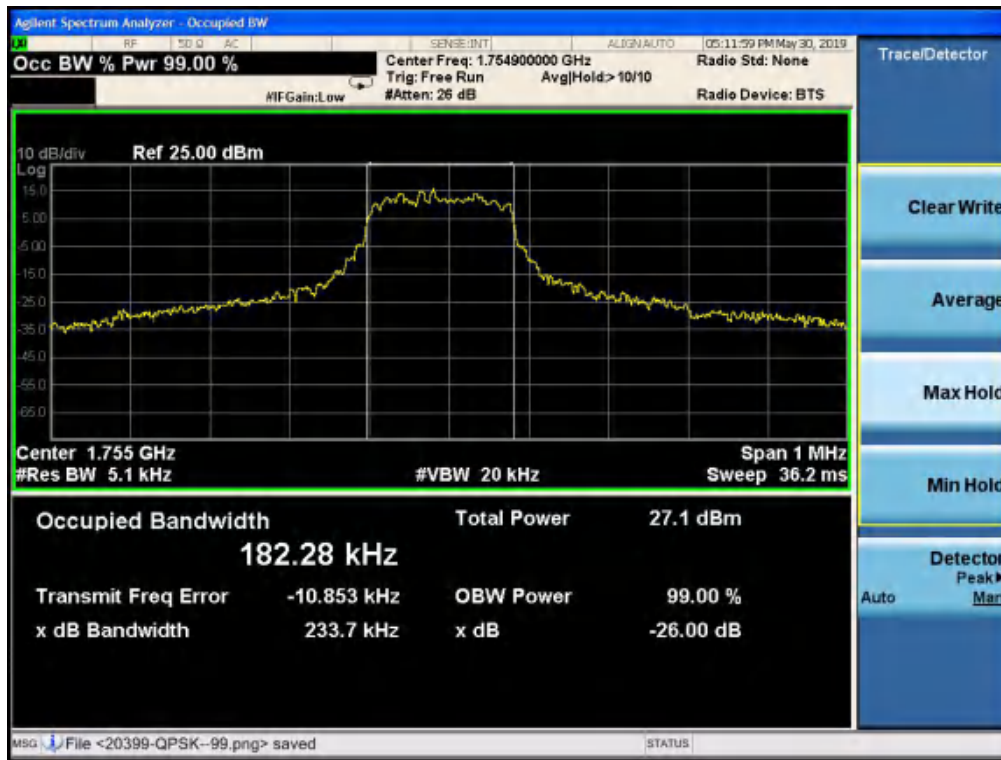Clear Write
Average
Max Hold
Min Hold
Detector Peak▶
Auto Man

NB-IoT Guard-band band 4 20175 QPSK(99%)
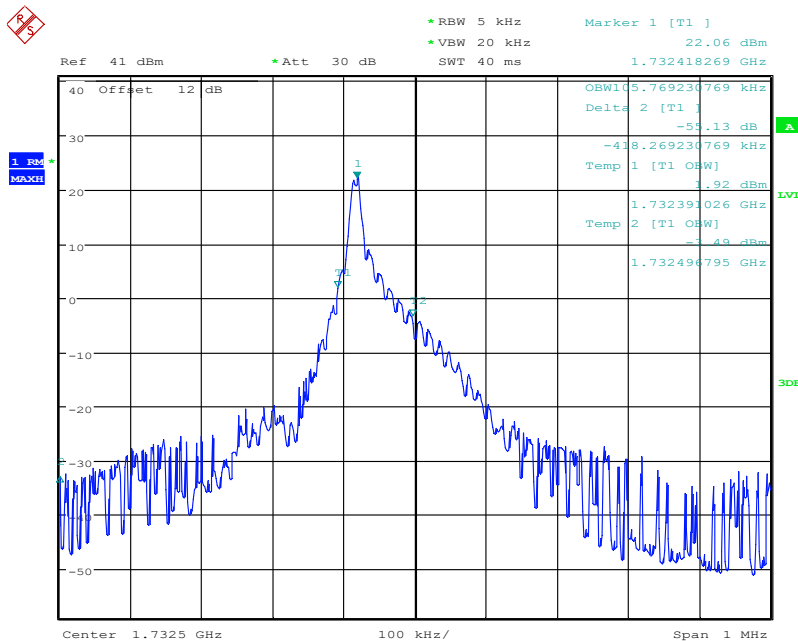
Date: 5.SEP.2019 14:25:17

NB-IoT Guard-band band 4 20175 BPSK(99%)
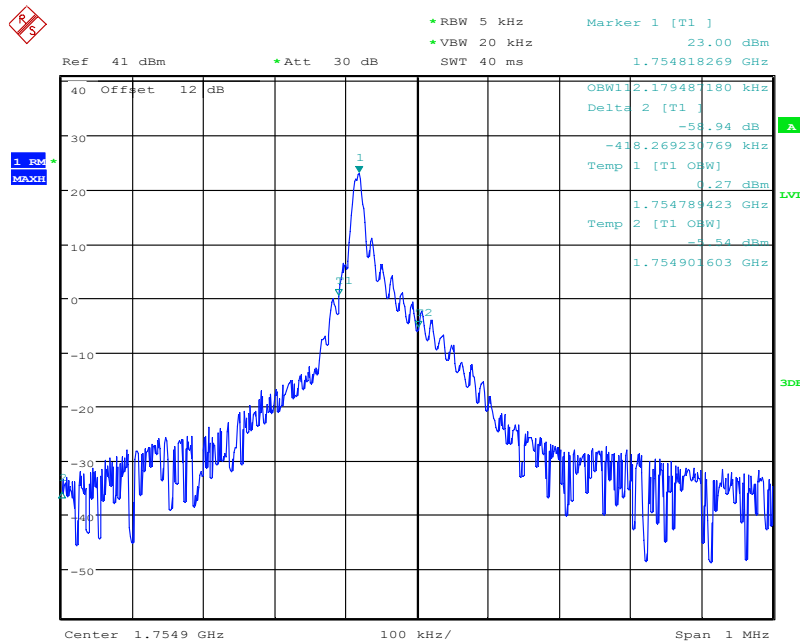
NB-IoT Guard-band band 4 20175 QPSK(26dB)

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

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

Chongqing Academy of Information and Communications Technology

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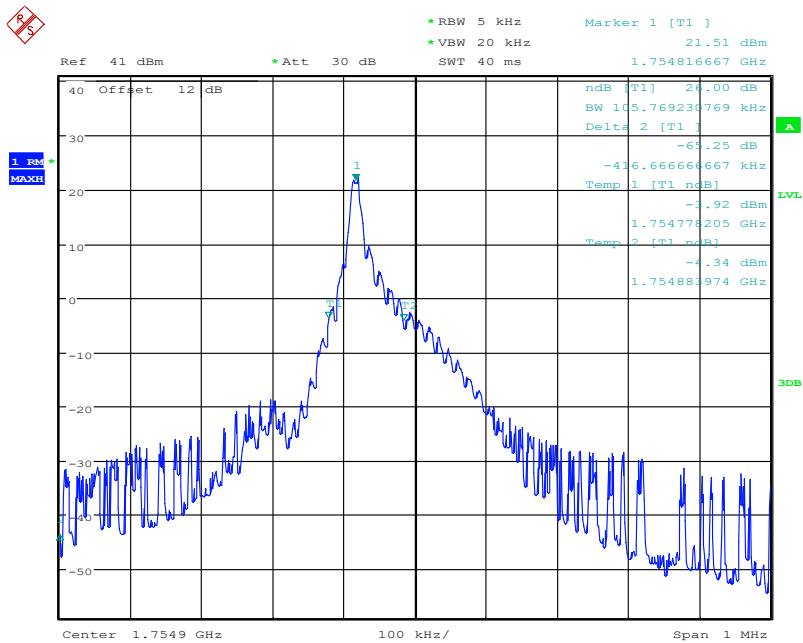

NB-IoT Guard-band band 4 20399 BPSK(99%)
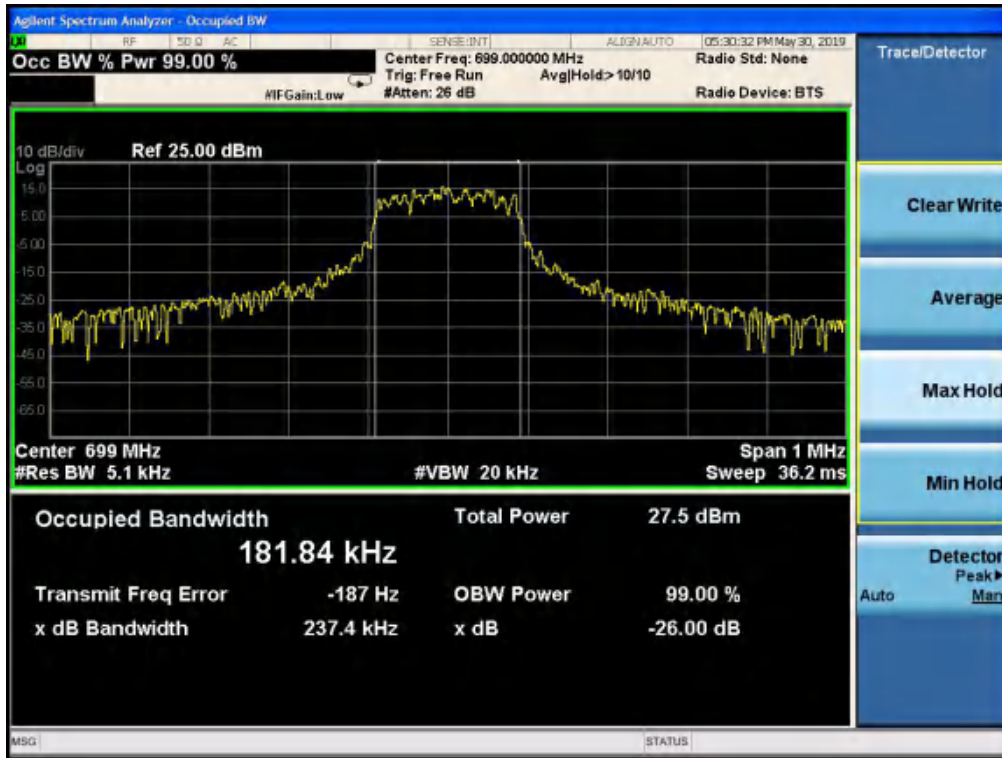
NB-IoT Guard-band band 4 20399 QPSK(26dB)

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

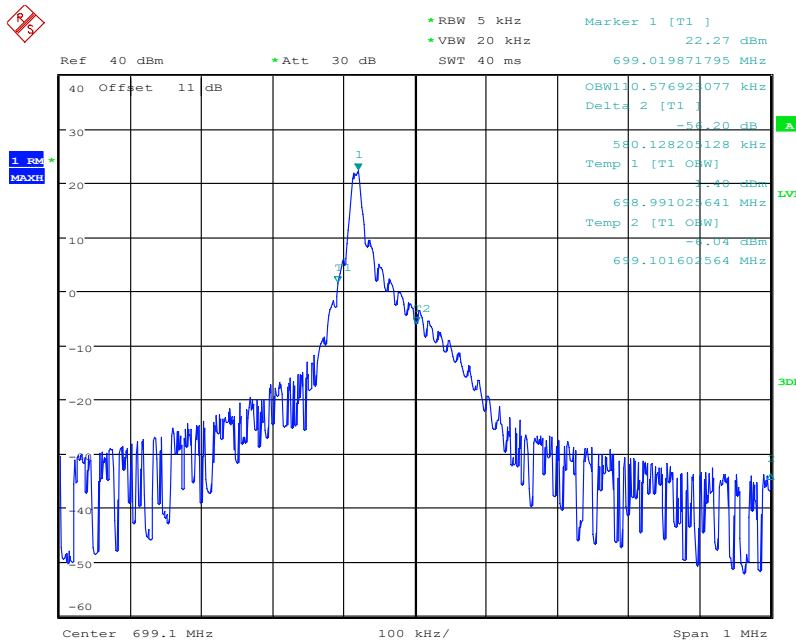NB-IoT Guard-band band 4 20399 BPSK(26dB)

Chongqing Academy of Information and Communications Technology

Graphical results for Band12:

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

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

Chongqing Academy of Information and Communications Technology

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

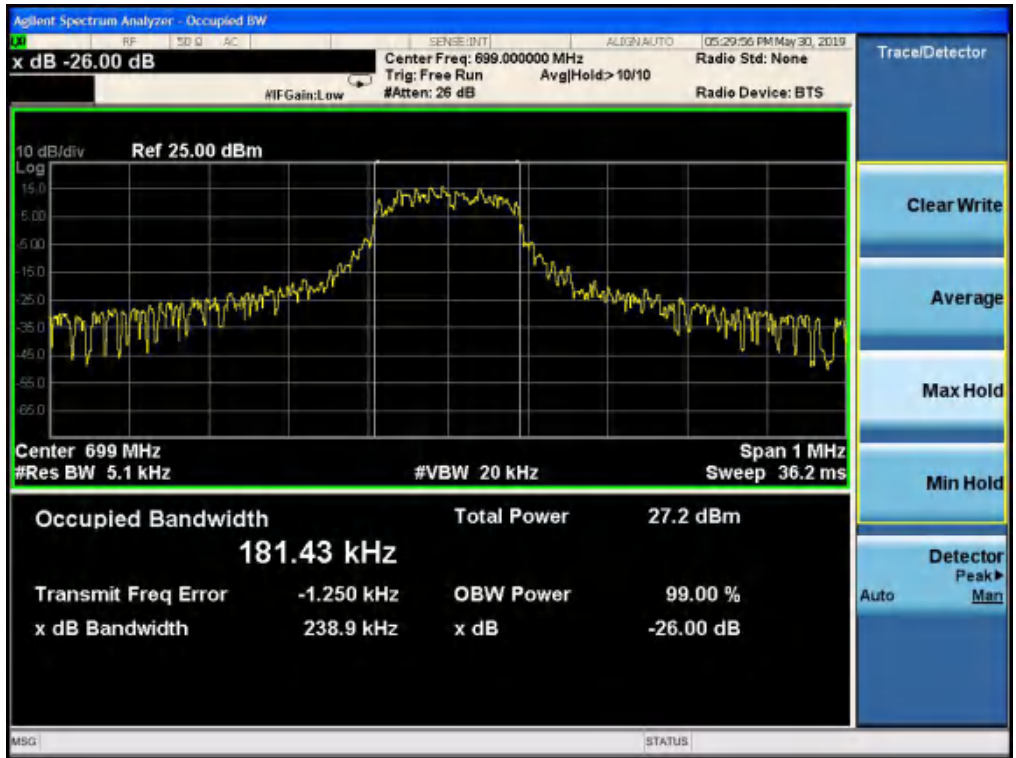NB-IoT standalone band 12 23011 BPSK(26dB)

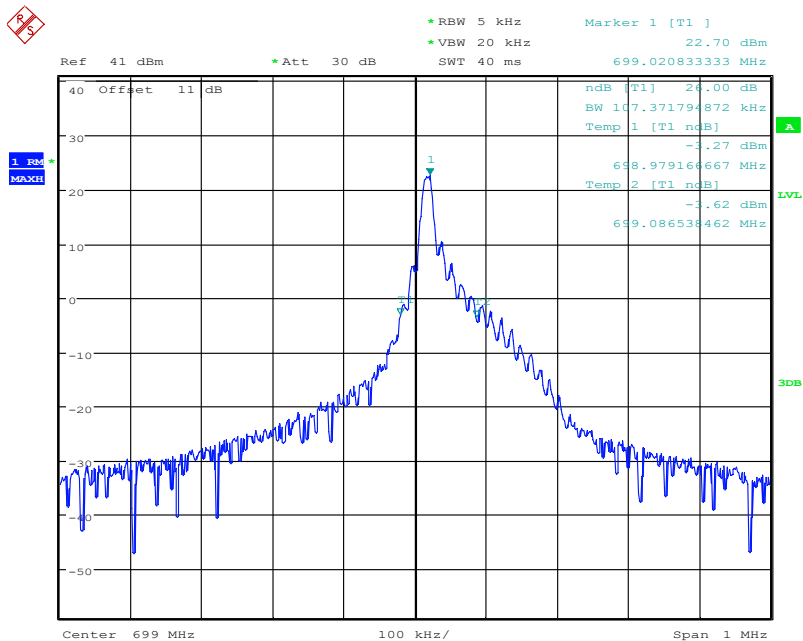NB-IoT standalone band 12 23095 QPSK(99%)
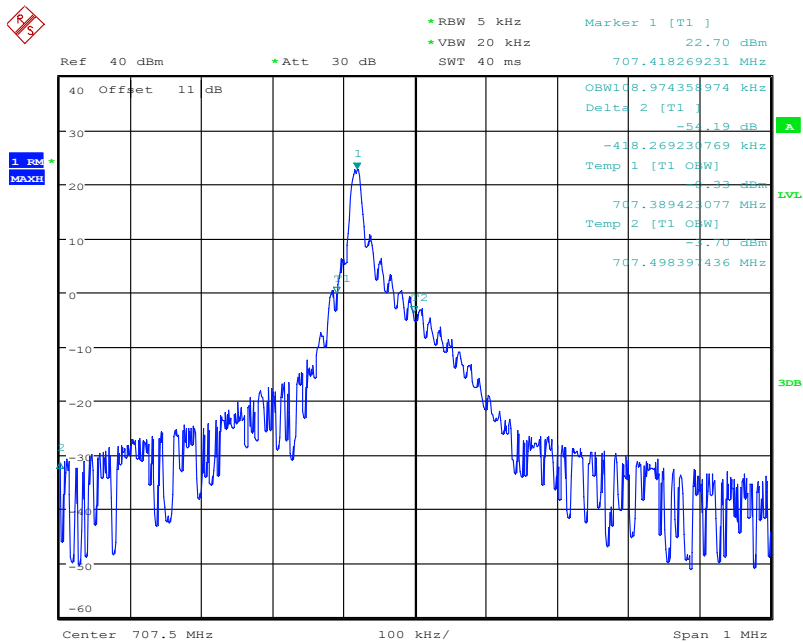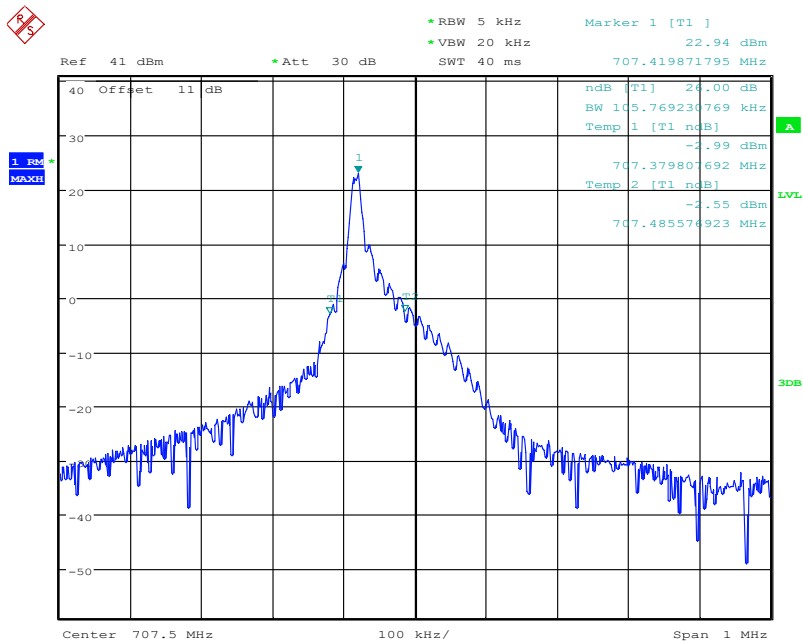

Date: 5.SEP.2019 14:33:18

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

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

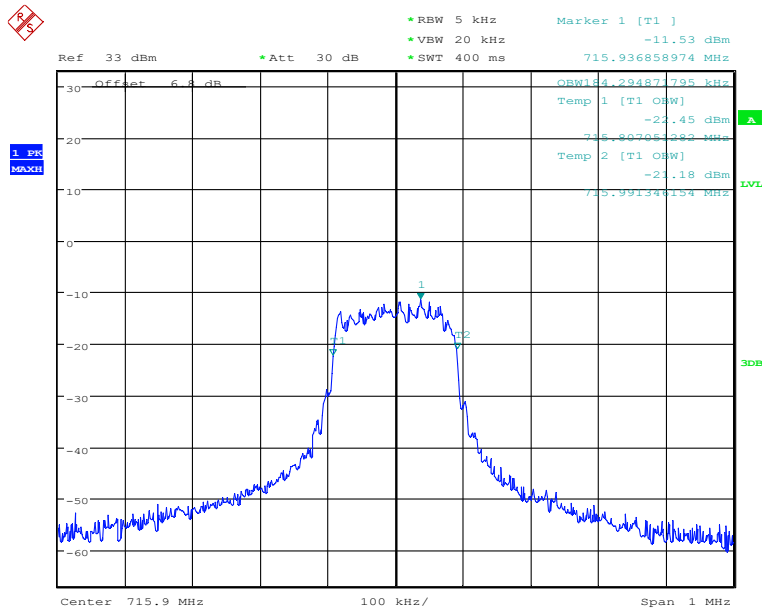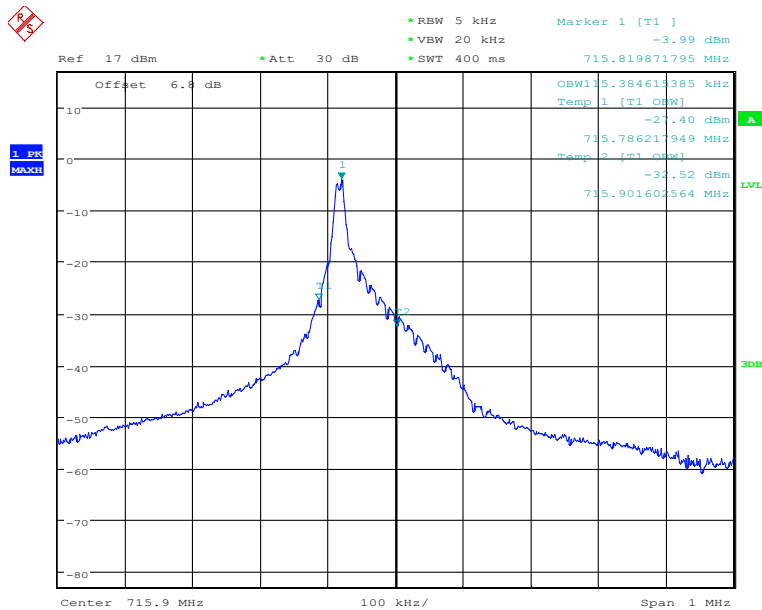Date: 6.SEP.2019 13:16:46

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

Address：No. 8,Yuma Road, Chayuan New City, Nan'an District, Chongqing, P. R. China,401336
Tel: 0086-23-88069965   FAX: 0086-23-88608777

Page 67 of 361

Chongqing Academy of Information and Communications Technology

```
*RBW  5 kHz                Marker 1 [T1 ]
*VBW  20 kHz                          -11.53 dBm
Ref  33 dBm        *Att  30 dB    *SWT 400 ms      715.936858974 MHz
   -30  Offset   6.8 dB                            OBW184.294871795 kHz
                                                   Temp 1 [T1 OBW]
   -20                                                      -22.45 dBm      A
                                                   715.807051282 MHz
                                                   Temp 2 [T1 OBW]
   -10                                                      -21.18 dBm     LVL
                                                   715.991346154 MHz
     0

   -10                              1

   -20              T1          T2                                          3DB

   -30

   -40

   -50

   -60
Center 715.9 MHz           100 kHz/              Span 1 MHz
```

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

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


```
*RBW  5 kHz                Marker 1 [T1 ]
*VBW  20 kHz                          -3.99 dBm
Ref  17 dBm        *Att  30 dB    *SWT 400 ms      715.819871795 MHz
       Offset   6.8 dB                             OBW115.384615385 kHz
                                                   Temp 1 [T1 OBW]
   10                                                       -27.40 dBm      A
                                                   715.786217949 MHz
                                                   Temp 2 [T1 OBW]
    0                                 1                     -32.52 dBm      LVL
                                                   715.901602564 MHz
  -10

  -20

  -30          T1          T2                                              3DB

  -40

  -50

  -60

  -70

  -80
Center 715.9 MHz           100 kHz/              Span 1 MHz
```

Date: 2.JAN.2020 03:46:13
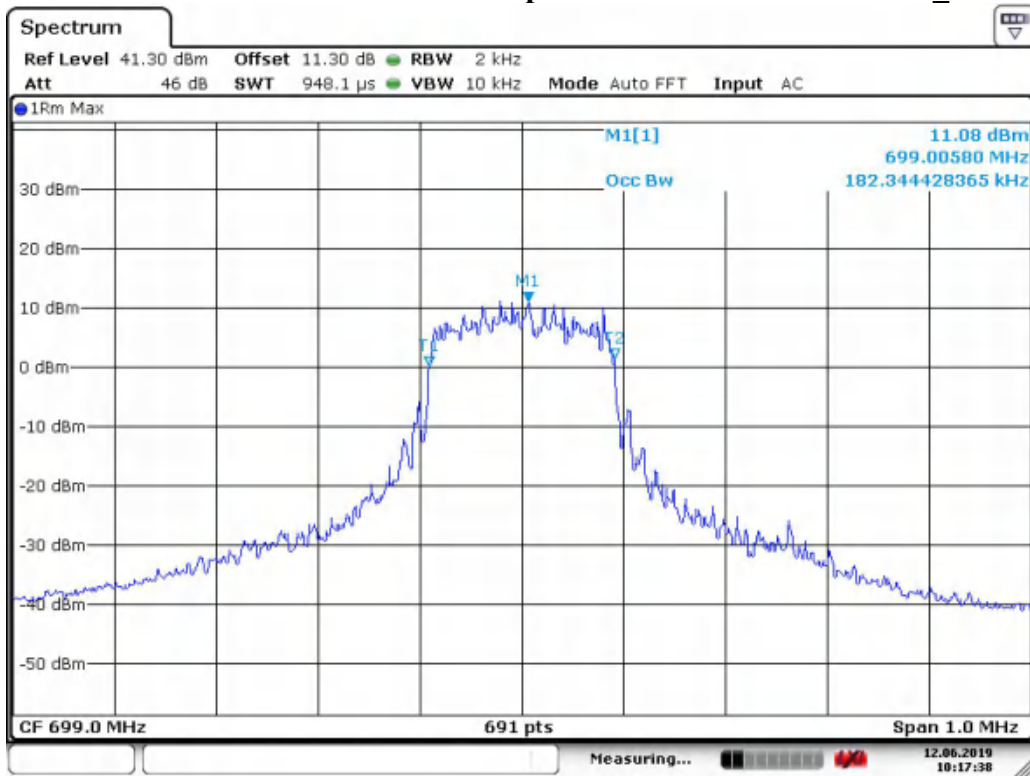
NB-IoT standalone band 12 23179 BPSK(99%)

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

NB-IoT standalone band 12 23179 QPSK(26dB)
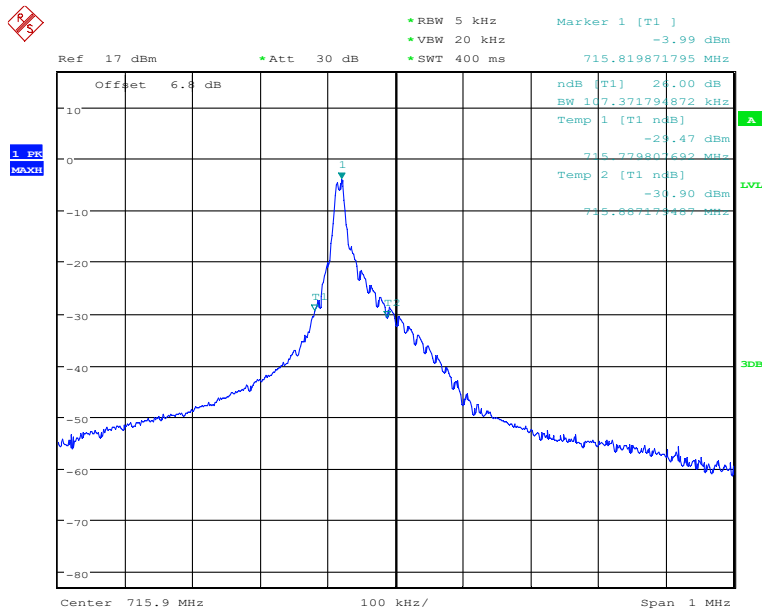
Date: 2.JAN.2020 03:57:02
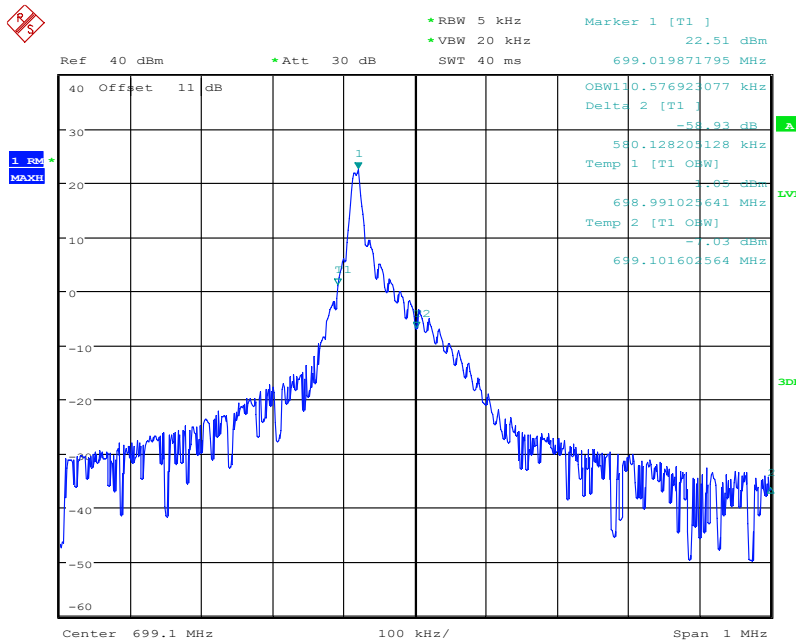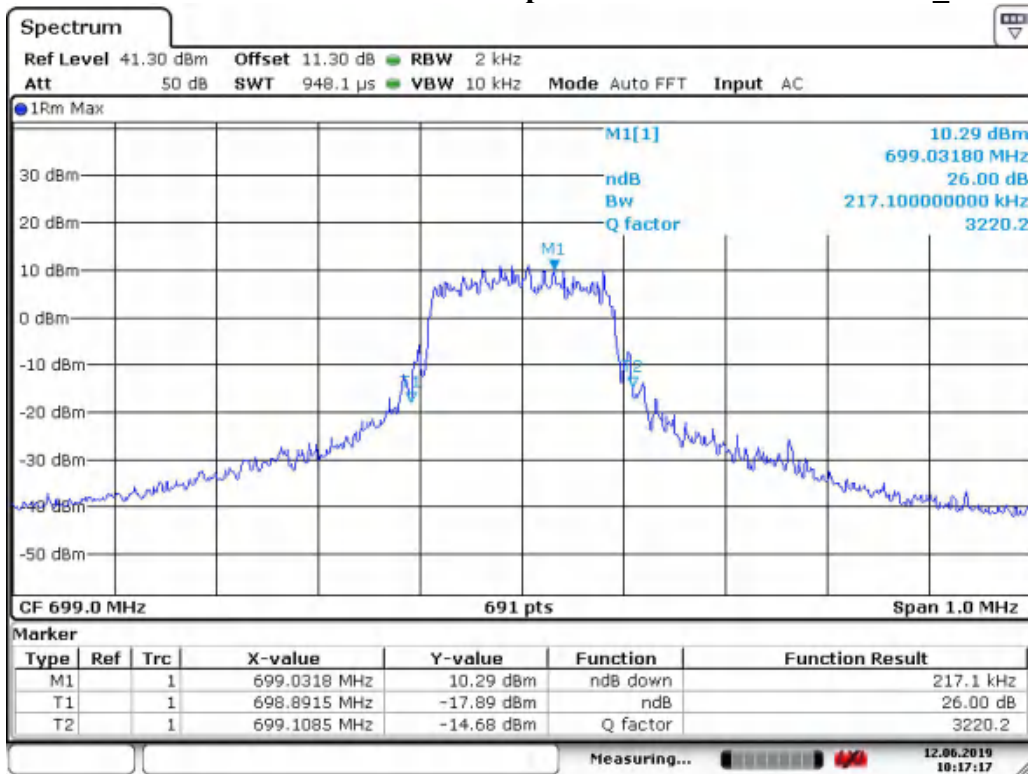
NB-IoT standalone band 12 23179 BPSK(26dB)

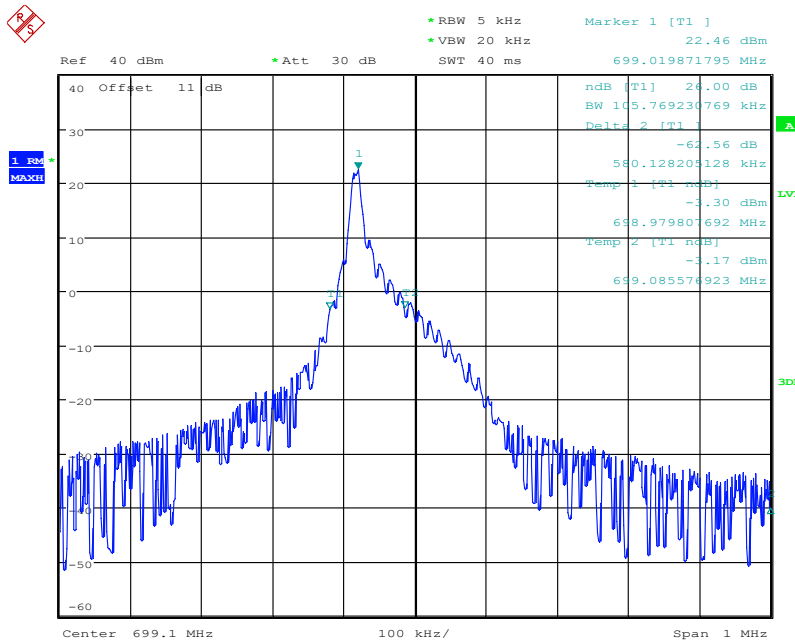Date: 12.JUN.2019 10:17:39

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%)

Report No.:B19W50105-WWAN_Rev7
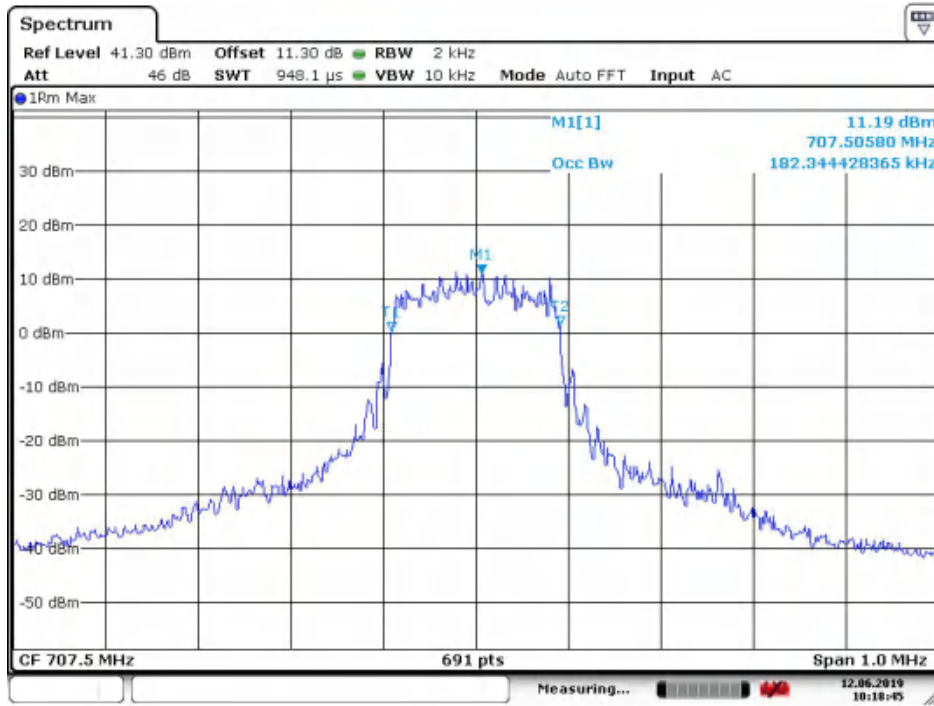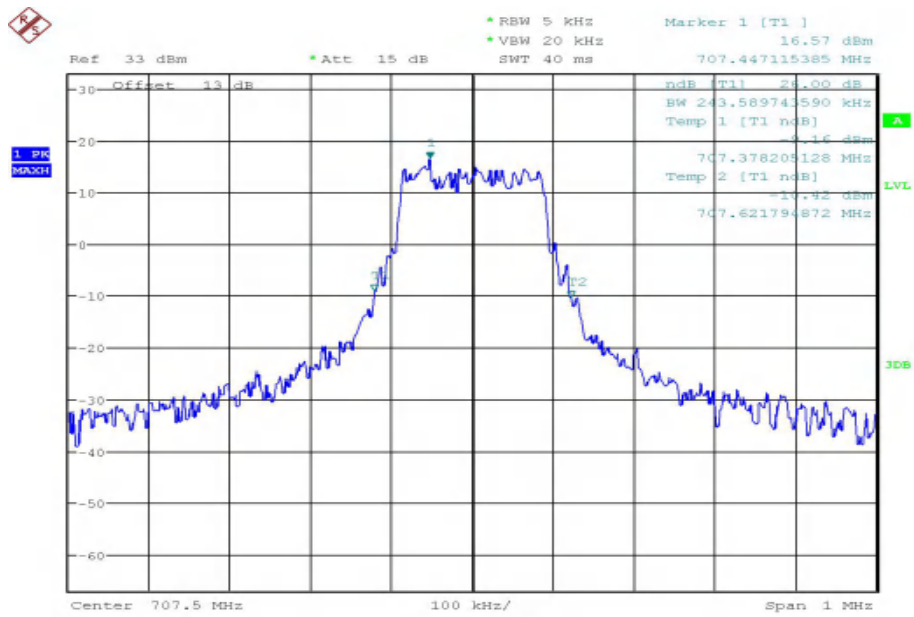
```
Spectrum
Ref Level 41.30 dBm   Offset 11.30 dB  RBW  2 kHz
Att        50 dB   SWT   948.1 µs  VBW 10 kHz   Mode Auto FFT   Input  AC
●1Rm Max
                                                    M1[1]              10.29 dBm
30 dBm                                                            699.03180 MHz
                                                    ndB               26.00 dB
20 dBm                                              Bw        217.100000000 kHz
                                                    Q factor            3220.2
10 dBm
 0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
CF 699.0 MHz                    691 pts                        Span 1.0 MHz
```

Marker						
Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	699.0318 MHz	10.29 dBm	ndB down	217.1 kHz
T1		1	698.8915 MHz	-17.89 dBm	ndB	26.00 dB
T2		1	699.1085 MHz	-14.68 dBm	Q factor	3220.2

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

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

```
                              *RBW  5 kHz      Marker 1 [T1 ]
                              *VBW 20 kHz             22.46 dBm
Ref   40 dBm       *Att  30 dB   SWT 40 ms    699.019871795 MHz
40  Offset  11 dB                ndB [T1]    26.00 dB
                                 BW 105.769230769 kHz
30                               Delta 2 [T1 ]
                                             -62.56 dBm
20                               580.128205128 kHz
                                 Temp 1 [T1 ndB]
10                                           -3.30 dBm
                                 698.979807692 MHz
 0                               Temp 2 [T1 ndB]
                                             -3.17 dBm
-10                              699.085576923 MHz
-20
-30
-40
-50
-60
Center  699.1 MHz        100 kHz/              Span 1 MHz
```

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

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

Chongqing Academy of Information and Communications Technology

Date: 12.JUN.2019 10:18:45

NB-IoT In-band band 12 23095 QPSK(99%)
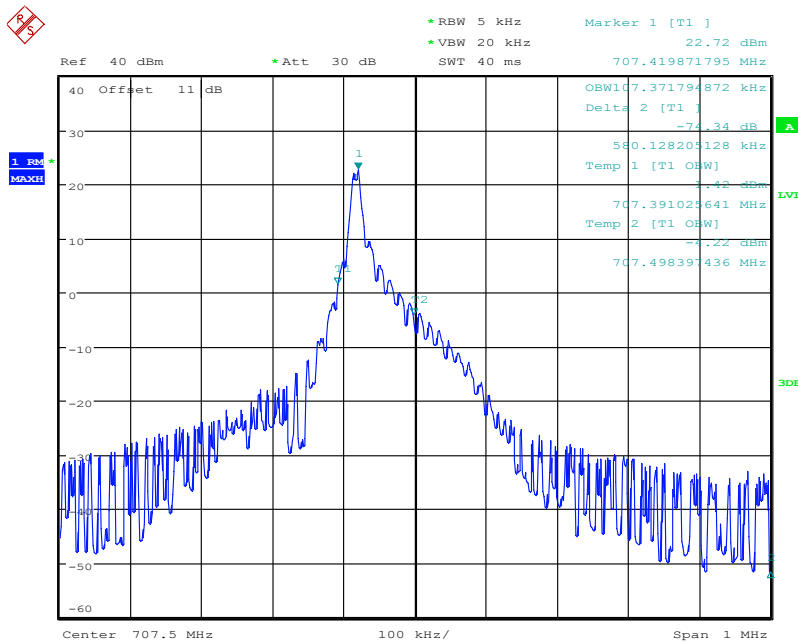
Date: 5.SEP.2019 14:35:41

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

Chongqing Academy of Information and Communications Technology

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

NB-IoT In-band band 12 23095 QPSK(26dB)
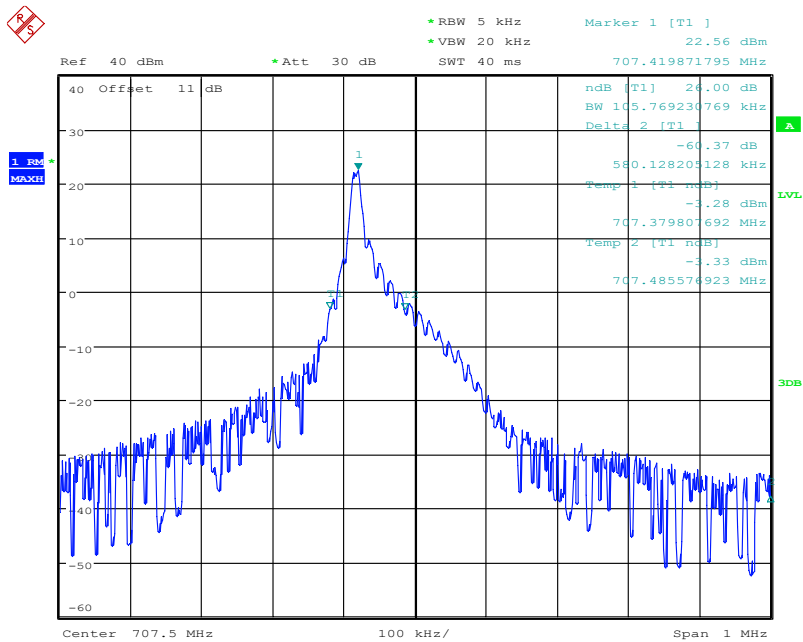
Date: 5.SEP.2019 14:35:23

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

Address：No. 8,Yuma Road, Chayuan New City, Nan'an District, Chongqing, P. R. China,401336
Tel: 0086-23-88069965   FAX: 0086-23-88608777

Page 73 of 361

Chongqing Academy of Information and Communications Technology
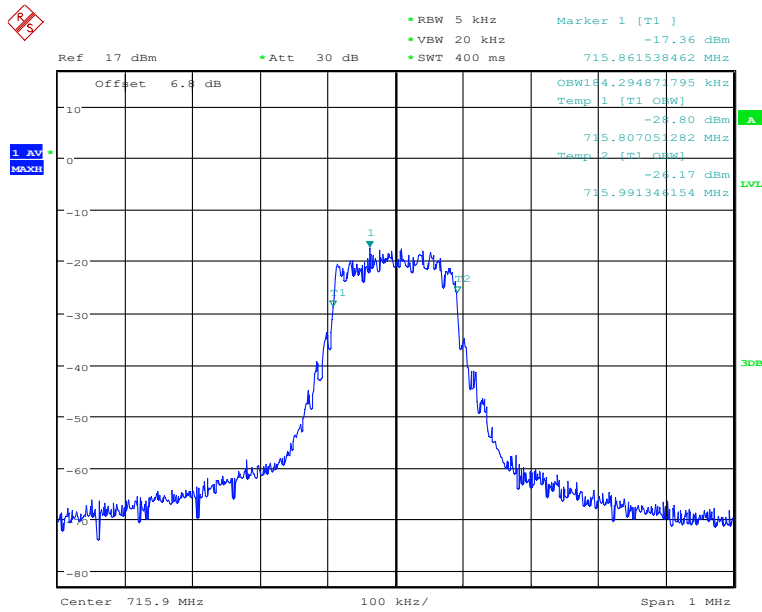
Date: 2.JAN.2020 03:39:33

NB-IoT In-band band 12 23179 QPSK(99%)
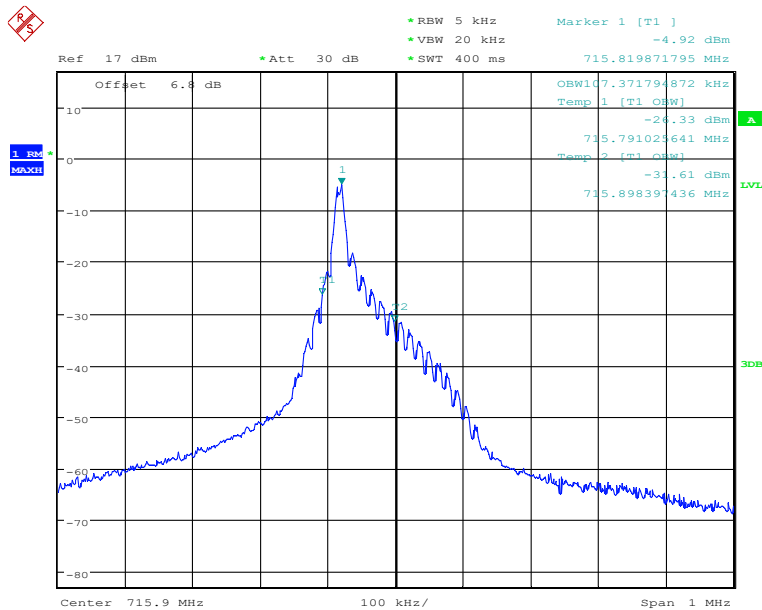
Date: 2.JAN.2020 03:47:58

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

Chongqing Academy of Information and Communications Technology

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

NB-IoT In-band band 12 23179 QPSK(26dB)
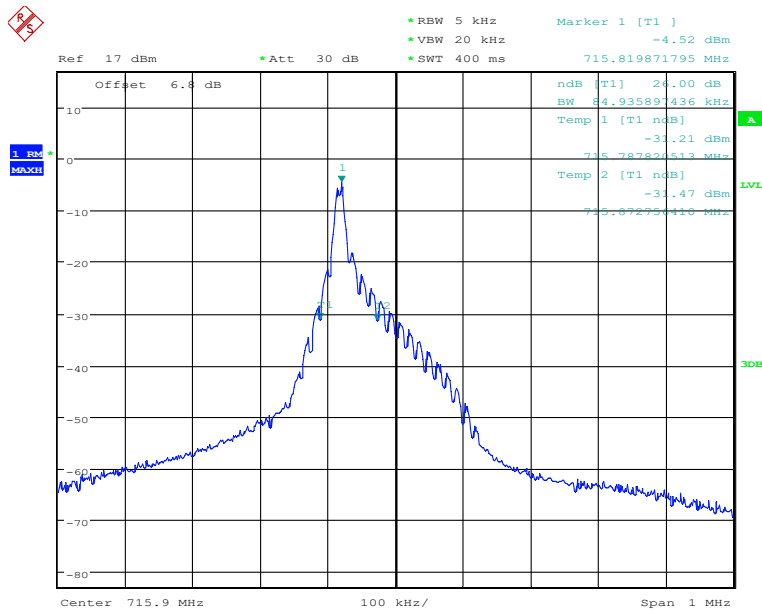
Date: 2.JAN.2020 03:55:35

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

Agilent Spectrum Analyzer - Occupied BW

Center Freq 699.100000 MHz

Center Freq: 699.100000 MHz	Radio Std: None
Trig: Free Run Avg|Hold:>10/10	
#Atten: 6 dB	Radio Device: BTS

#IFGain:Low

10 dB/div   Ref 23.00 dBm
Log

Center 699.1 MHz   Span 1 MHz
#Res BW 5.1 kHz   #VBW 20 kHz   Sweep 46.73 ms

Occupied Bandwidth	Total Power	21.6 dBm
210.03 kHz		
Transmit Freq Error -414 Hz	OBW Power	99.00 %
x dB Bandwidth 299.7 kHz	x dB	-26.00 dB

Trace/Detector — Clear Write — Average — Max Hold — Min Hold — Detector Average Auto Man

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

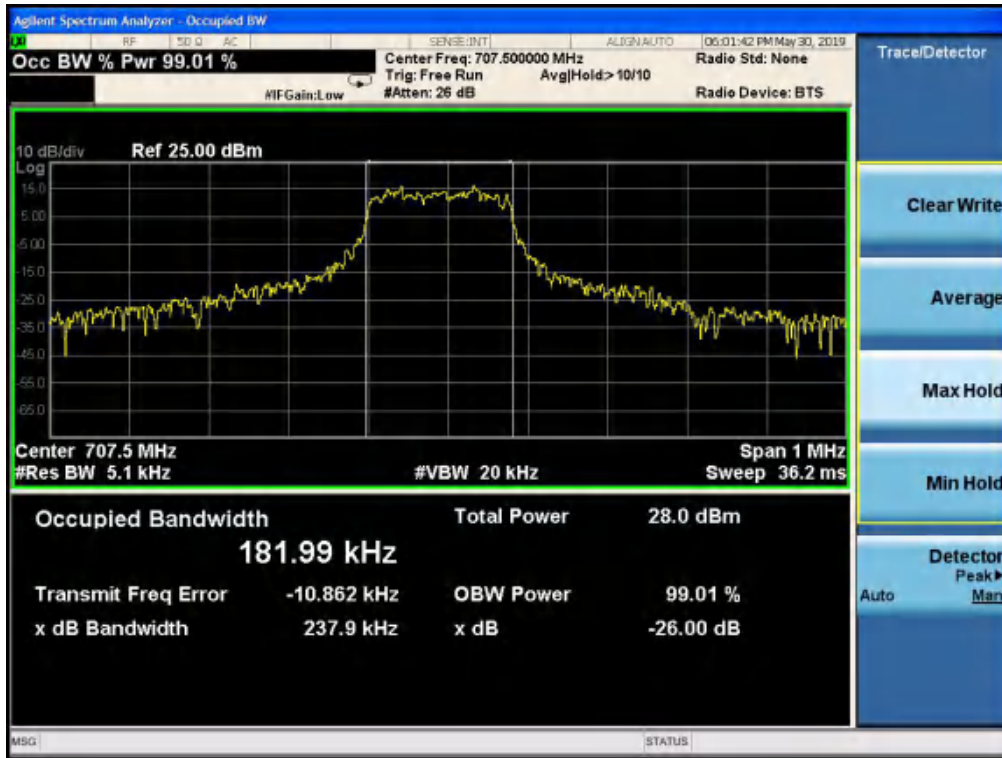Date: 5.SEP.2019 14:37:12
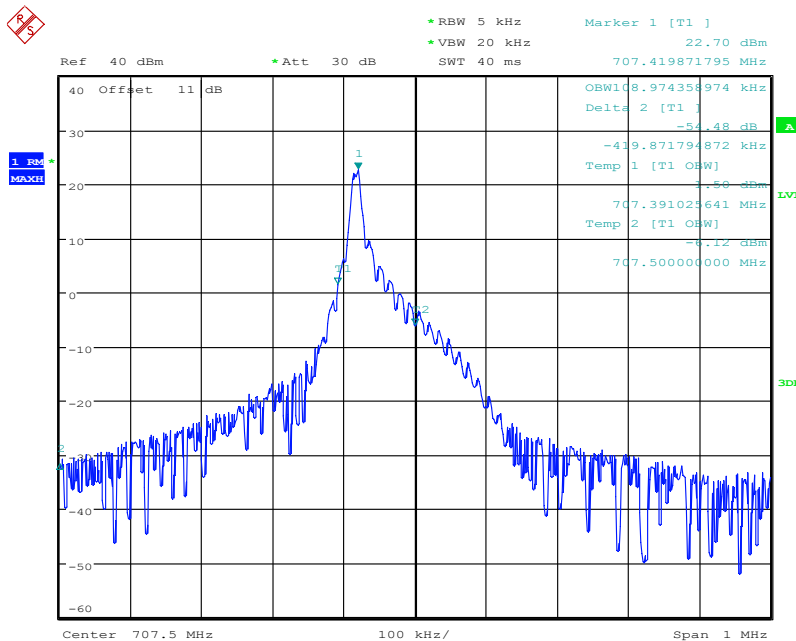
NB-IoT Guard-band band 12 23011 BPSK(99%)

Address：No. 8,Yuma Road, Chayuan New City, Nan'an District, Chongqing, P. R. China,401336
Tel: 0086-23-88069965   FAX: 0086-23-88608777

Page 76 of 361

NB-IoT Guard-band band 12 23011 QPSK(26dB)
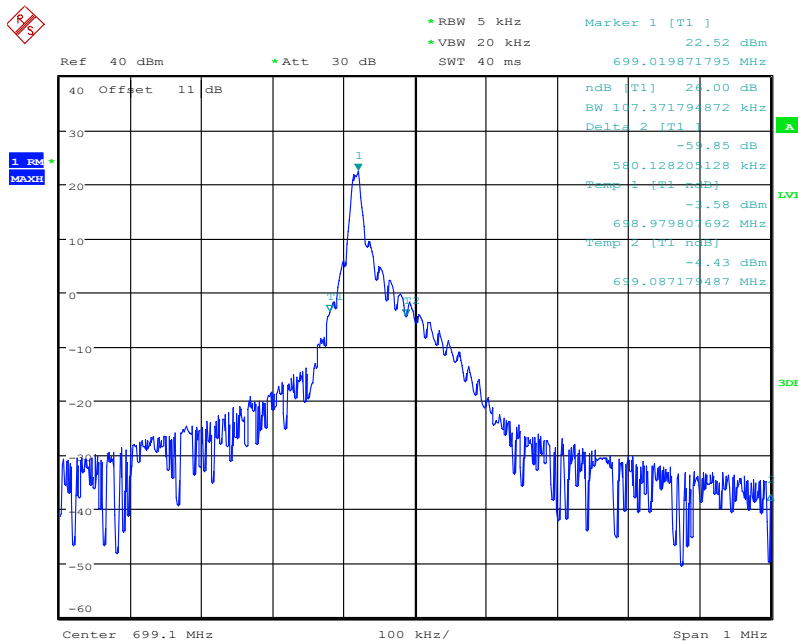
Date: 5.SEP.2019 14:36:59

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

Occ BW % Pwr 99.01 %

Center Freq: 707.500000 MHz
Trig: Free Run
#Atten: 26 dB

Radio Std: None
Avg|Hold:> 10/10
Radio Device: BTS

06:01:42 PM May 30, 2019

Ref 25.00 dBm

Center 707.5 MHz
#Res BW 5.1 kHz

#VBW 20 kHz

Span 1 MHz
Sweep 36.2 ms

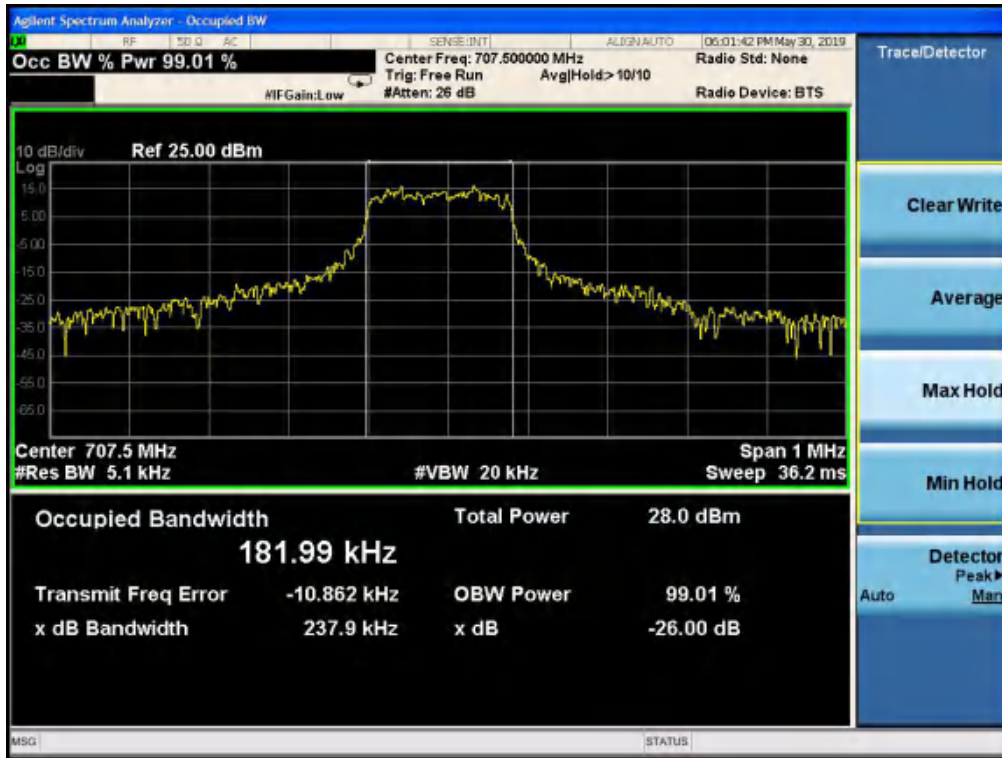| Occupied Bandwidth		Total Power	28.0 dBm
181.99 kHz			
Transmit Freq Error	-10.862 kHz	OBW Power	99.01 %
x dB Bandwidth	237.9 kHz	x dB	-26.00 dB

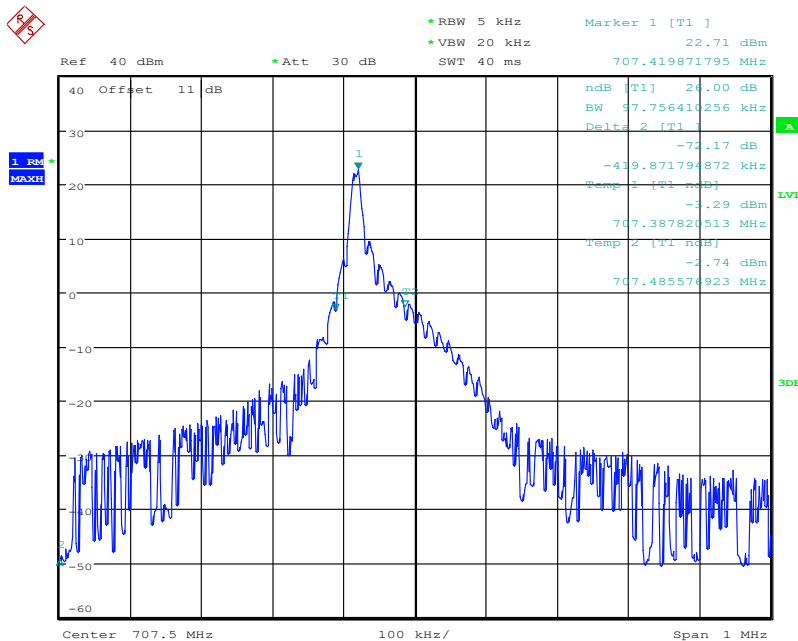NB-IoT Guard-band band 12 23095 QPSK(99%)

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

NB-IoT Guard-band band 12 23095 BPSK(99%)
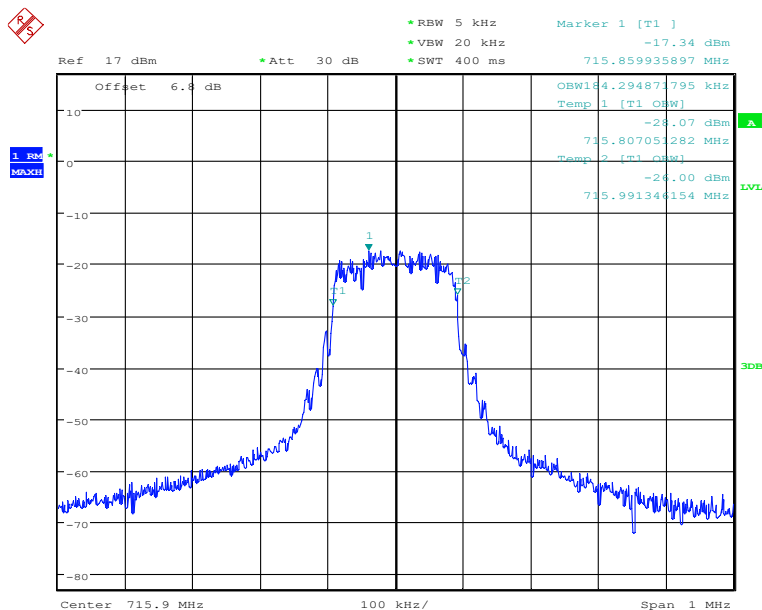
NB-IoT Guard-band band 12 23095 QPSK(26dB)

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

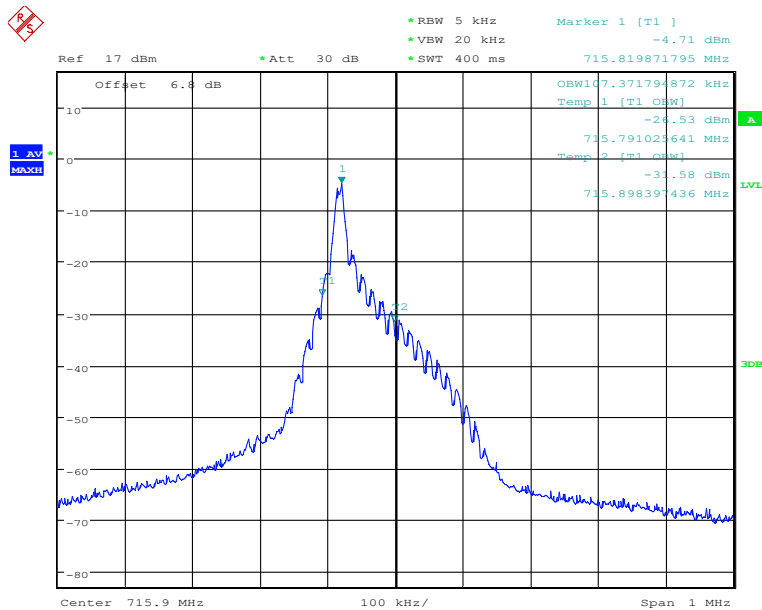NB-IoT Guard-band band 12 23095 BPSK(26dB)

Chongqing Academy of Information and Communications Technology

Report No.:B19W50105-WWAN_Rev7


```
                                    *RBW  5 kHz          Marker 1 [T1 ]
                                    *VBW  20 kHz               -17.34 dBm
        Ref  17 dBm      *Att  30 dB  *SWT 400 ms        715.859935897 MHz
           Offset  6.8 dB                                OBW154.294871795 kHz
                                                         Temp 1 [T1 OBW]
        10                                                    -28.07 dBm
                                                         715.807051282 MHz
                                                         Temp 2 [T1 OBW]
         0                                                    -26.00 dBm
                                                         715.991346154 MHz
       -10
       -20
       -30
       -40
       -50
       -60
       -70
       -80
        Center 715.9 MHz      100 kHz/            Span 1 MHz
```

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

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


```
                                    *RBW  5 kHz          Marker 1 [T1 ]
                                    *VBW  20 kHz                -4.71 dBm
        Ref  17 dBm      *Att  30 dB  *SWT 400 ms        715.819871795 MHz
           Offset  6.8 dB                                OBW107.371794872 kHz
                                                         Temp 1 [T1 OBW]
        10                                                    -26.53 dBm
                                                         715.791025641 MHz
         0                                               Temp 2 [T1 OBW]
                                                              -31.58 dBm
       -10                                                715.898397436 MHz
       -20
       -30
       -40
       -50
       -60
       -70
       -80
        Center 715.9 MHz      100 kHz/            Span 1 MHz
```

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

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

Address：No. 8,Yuma Road, Chayuan New City, Nan'an District, Chongqing, P. R. China,401336
Tel: 0086-23-88069965   FAX: 0086-23-88608777
Page 80 of 361

Chongqing Academy of Information and Communications Technology
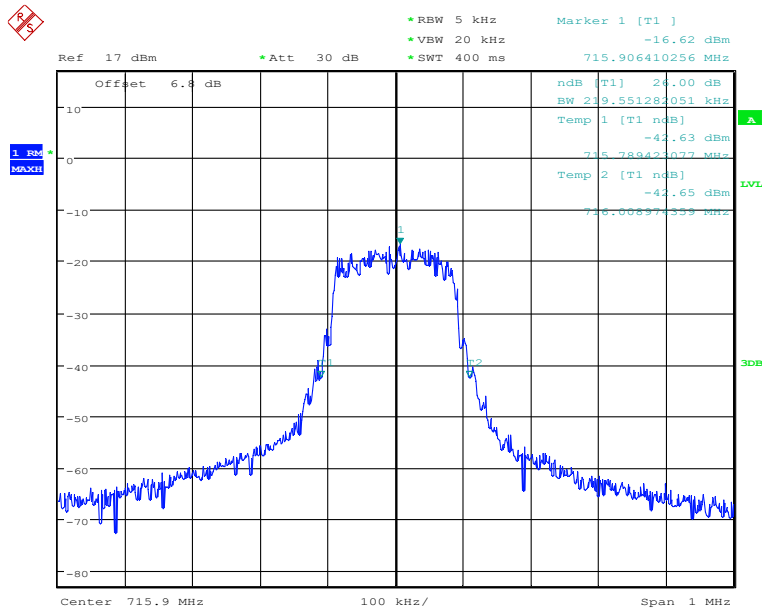
Date: 2.JAN.2020 03:42:03

NB-IoT Guard-band band 12 23179 QPSK(26dB)
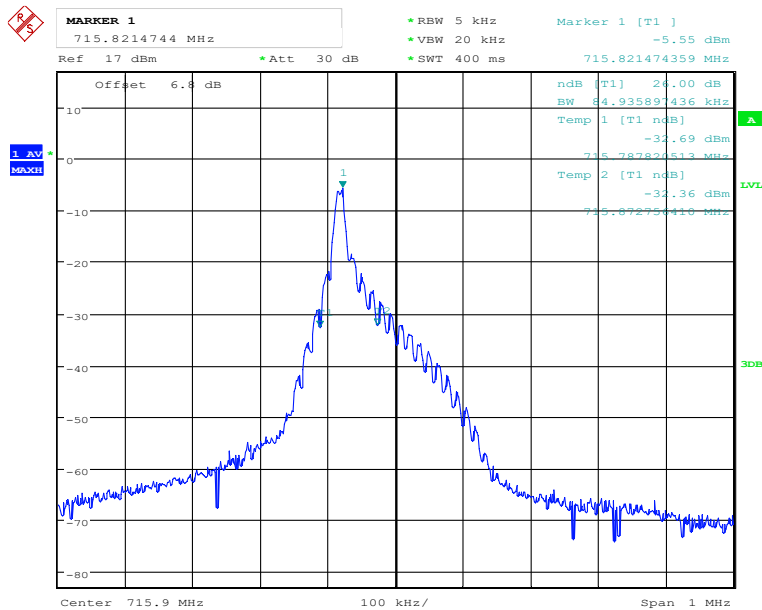
Date: 2.JAN.2020 03:53:34

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

Chongqing Academy of Information and Communications Technology

Graphical results for Band13:

Agilent Spectrum Analyzer - Occupied BW

LXI	RF	50 Ω	AC	SENSE:INT	ALIGN AUTO	06:17:00 PM May 30, 2019

Occ BW % Pwr 99.01 %

Center Freq: 777.000000 MHz   Radio Std: None
Trig: Free Run   Avg|Hold:> 10/10
#IFGain:Low   #Atten: 26 dB   Radio Device: BTS

10 dB/div   **Ref 25.00 dBm**
Log

Center 777 MHz   Span 1 MHz
#Res BW 5.1 kHz   #VBW 20 kHz   Sweep 36.2 ms

Occupied Bandwidth		Total Power	27.3 dBm
180.76 kHz			
Transmit Freq Error	-6 Hz	OBW Power	99.01 %
x dB Bandwidth	237.9 kHz	x dB	-26.00 dB

Trace/Detector · Clear Write · Average · Max Hold · Min Hold · Detector Peak▶ Auto Man

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

* RBW 5 kHz   Marker 1 [T1]
* VBW 20 kHz   22.64 dBm
Ref 40 dBm   * Att 30 dB   SWT 40 ms   777.019871795 MHz

40 Offset 11 dB   OBW 112.179487179 kHz
Delta 2 [T1]
-58.49 dB
580.128205128 kHz
Temp 1 [T1 OBW]
4.15 dBm
776.989423077 MHz
Temp 2 [T1 OBW]
-5.61 dBm
777.101602564 MHz

Center 777.1 MHz   100 kHz/   Span 1 MHz

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

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

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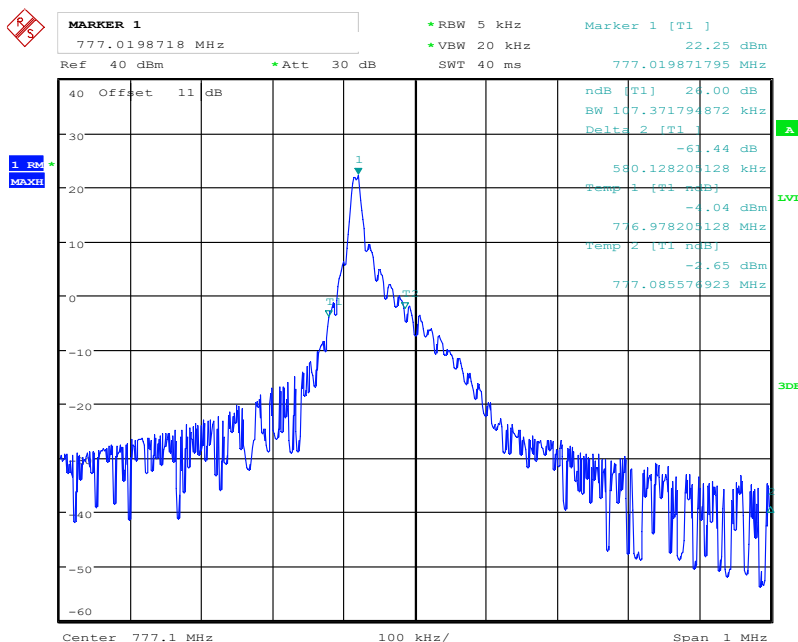
NB-IoT standalone band 13 23181 BPSK(26dB)

NB-IoT standalone band 13 23230 QPSK(99%)
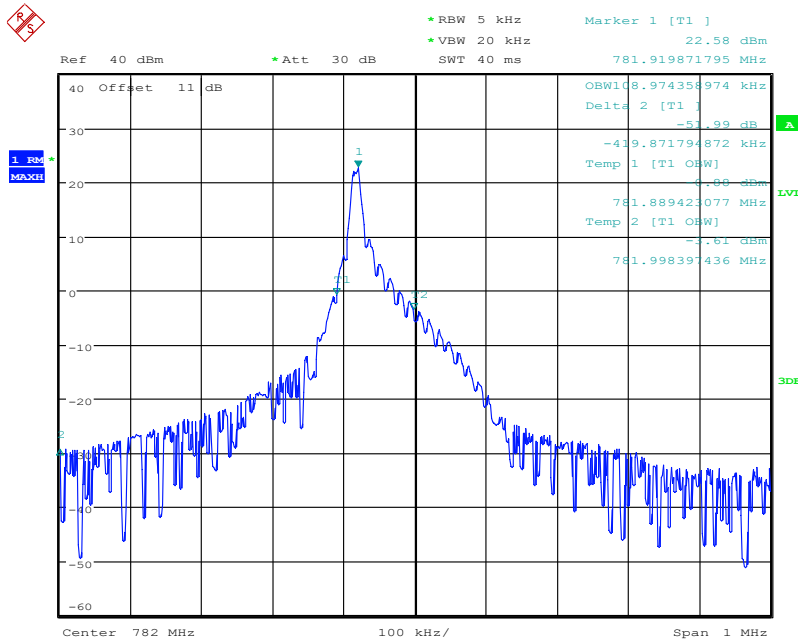
Date: 5.SEP.2019 14:46:51

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

Chongqing Academy of Information and Communications Technology
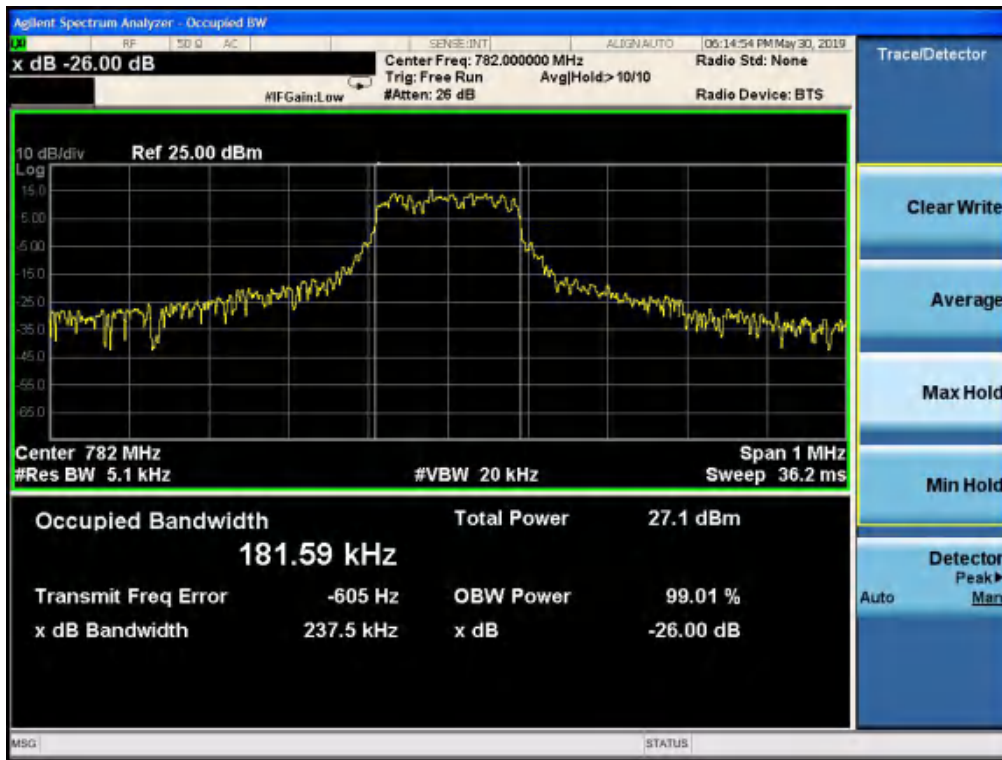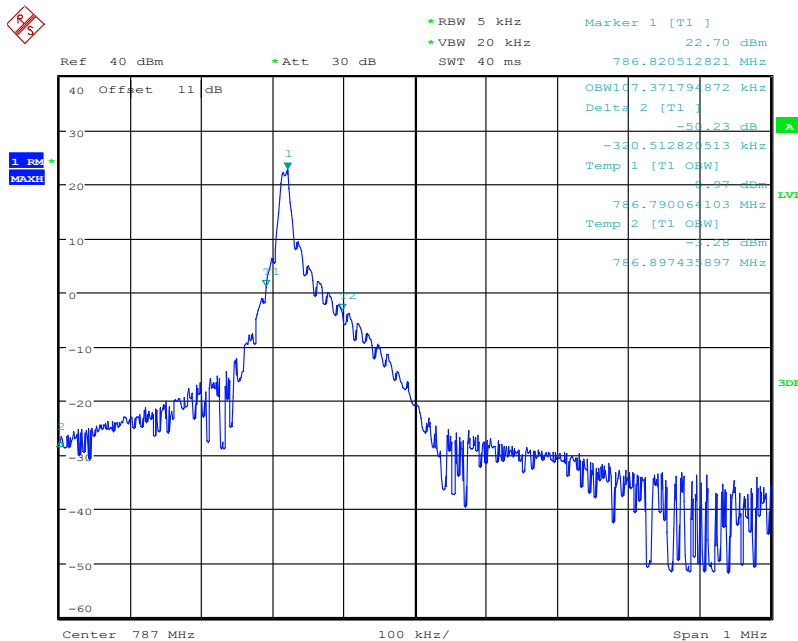
NB-IoT standalone band 13 23230 QPSK(26dB)
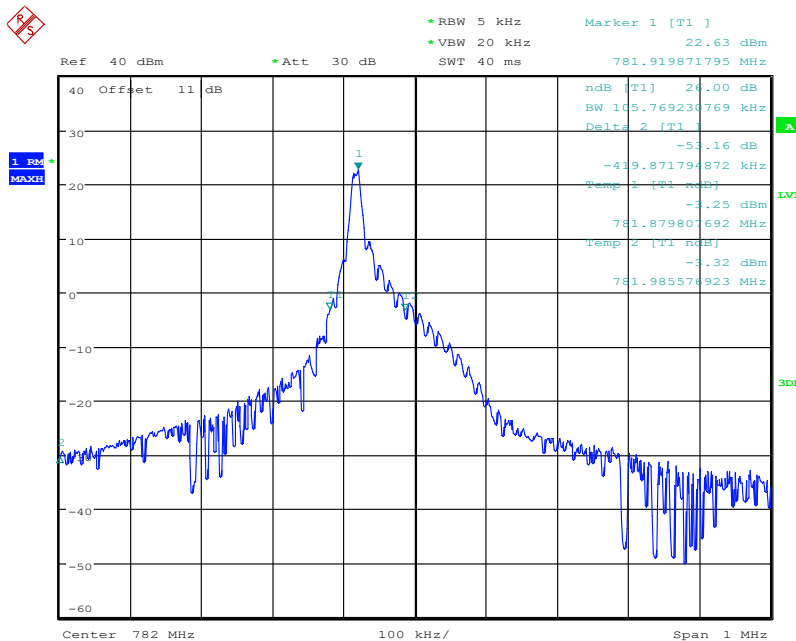
Date: 5.SEP.2019 14:46:35

NB-IoT standalone band 13 23230 BPSK(26dB)
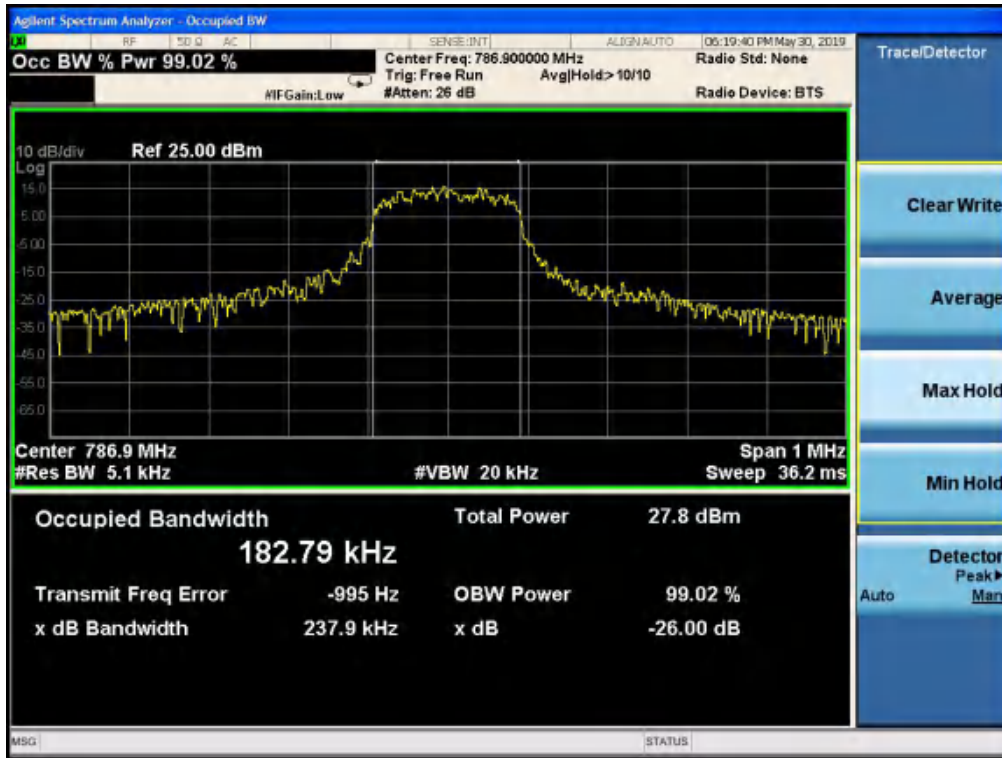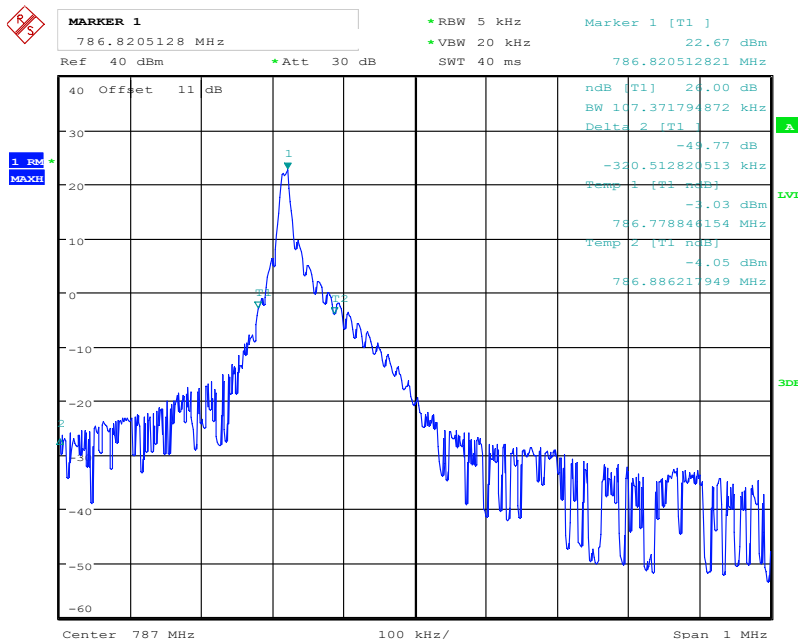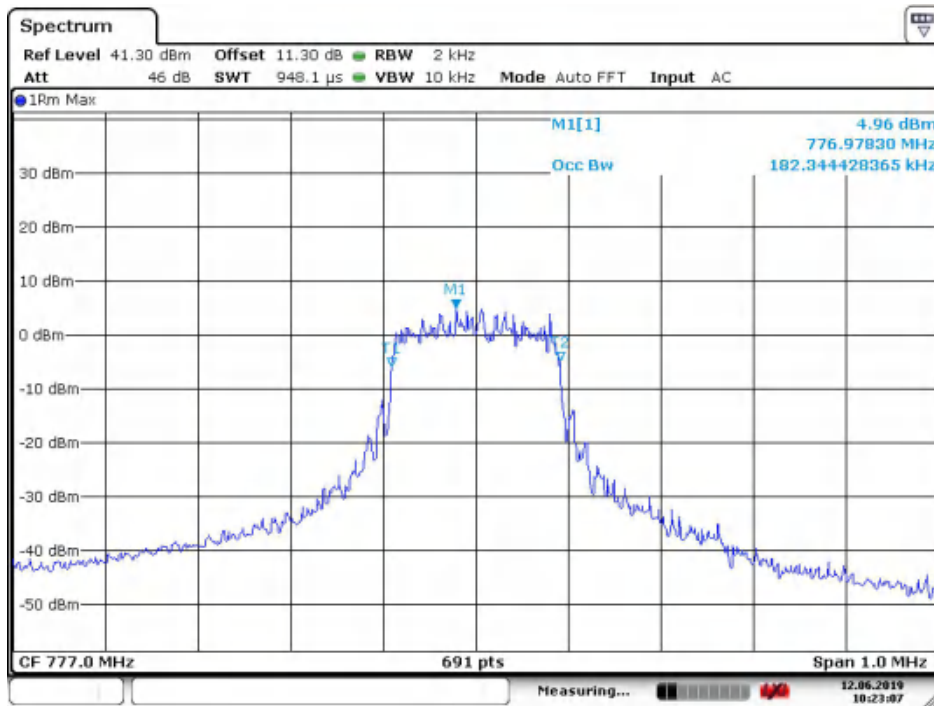
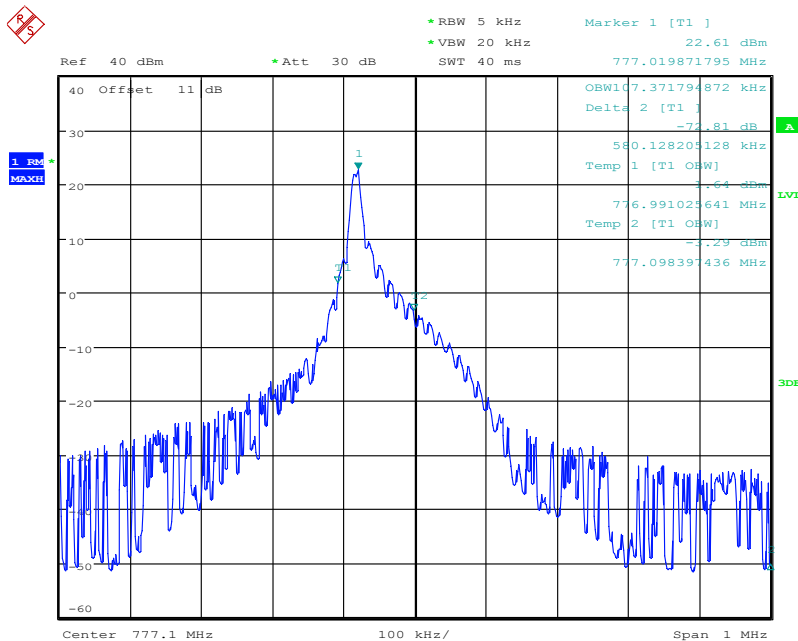NB-IoT standalone band 13 23279 QPSK(99%)

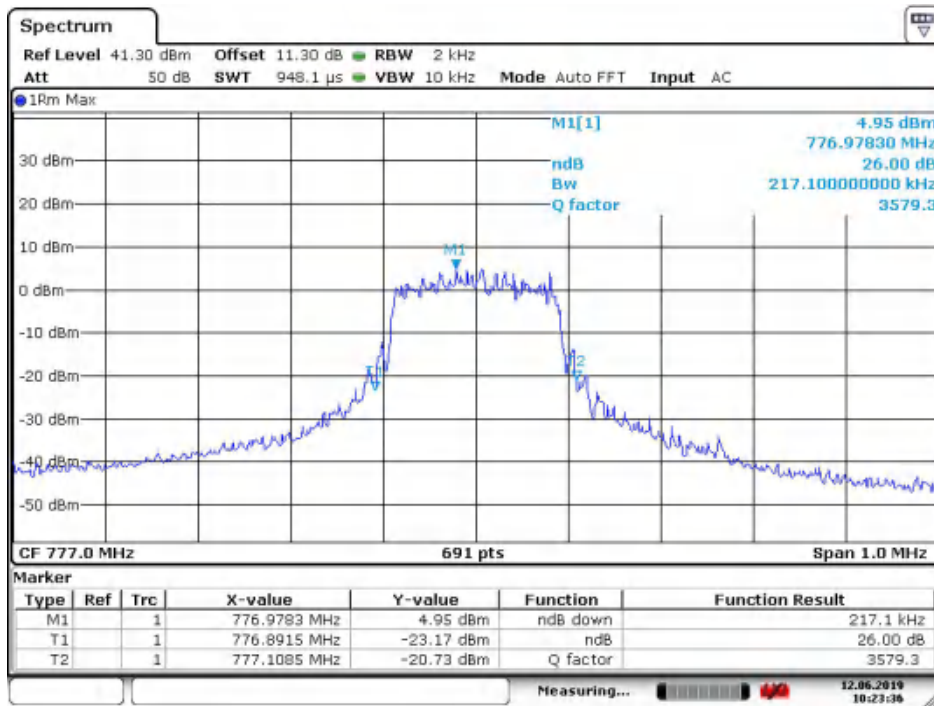Date: 5.SEP.2019 14:47:42

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

Chongqing Academy of Information and Communications Technology

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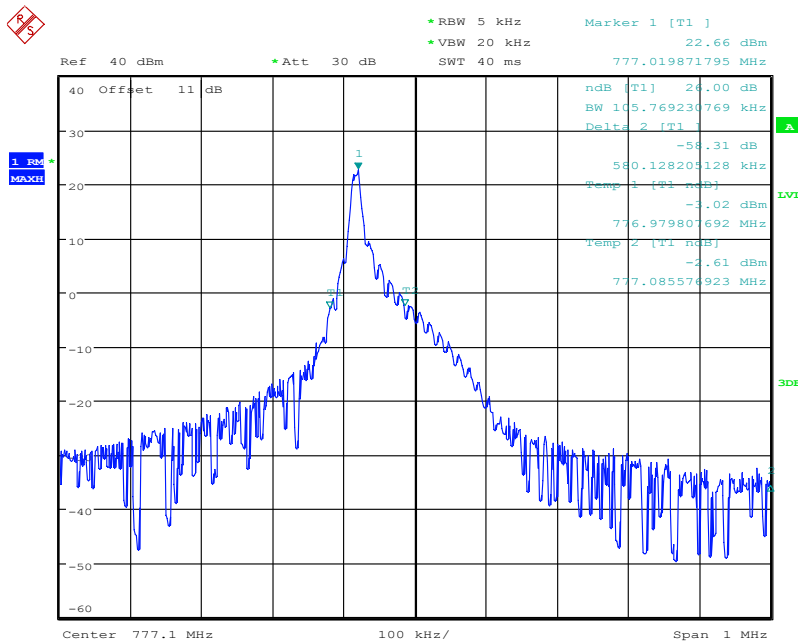
NB-IoT In-band band 13 23181 QPSK(99%)

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

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

Address：No. 8,Yuma Road, Chayuan New City, Nan'an District, Chongqing, P. R. China,401336
Tel: 0086-23-88069965   FAX: 0086-23-88608777

Page 88 of 361

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

NB-IoT In-band band 13 23181 BPSK(26dB)
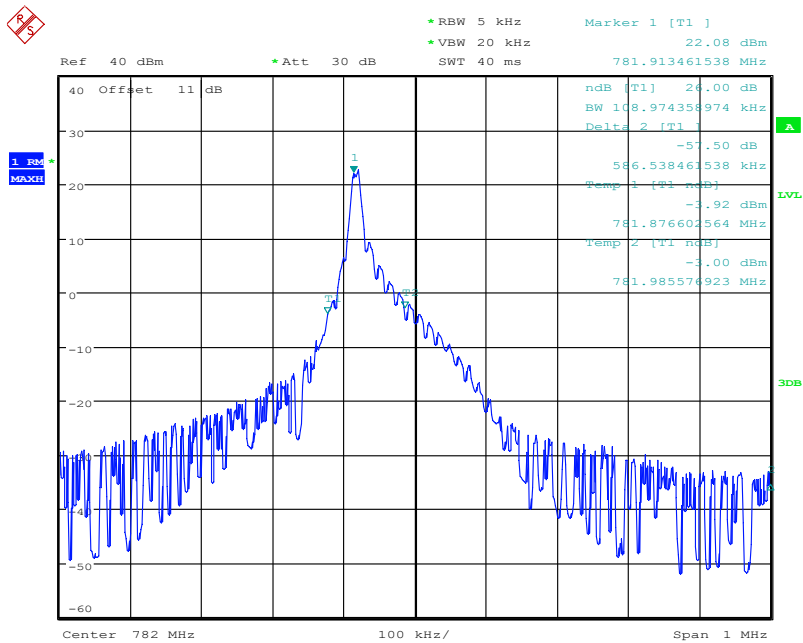
NB-IoT In-band band 13 23230 QPSK(99%)
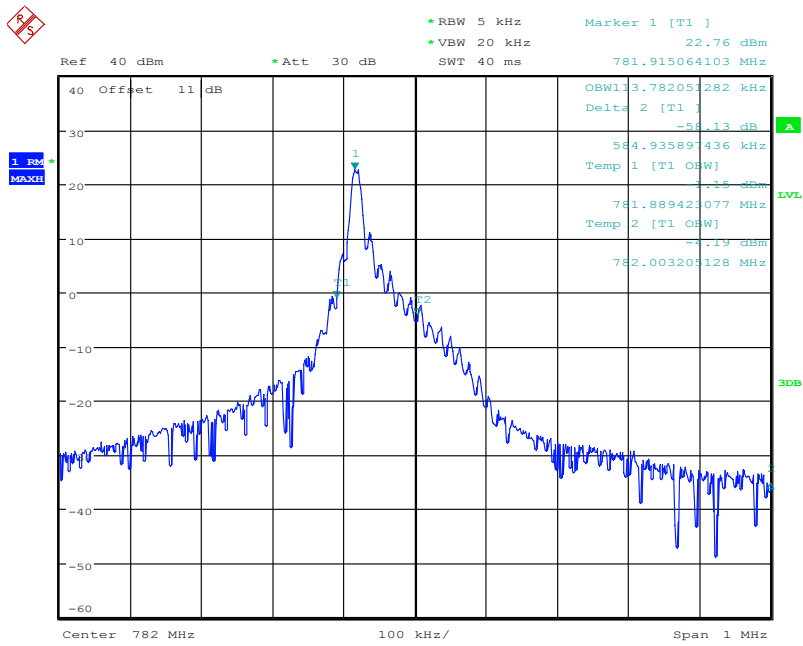
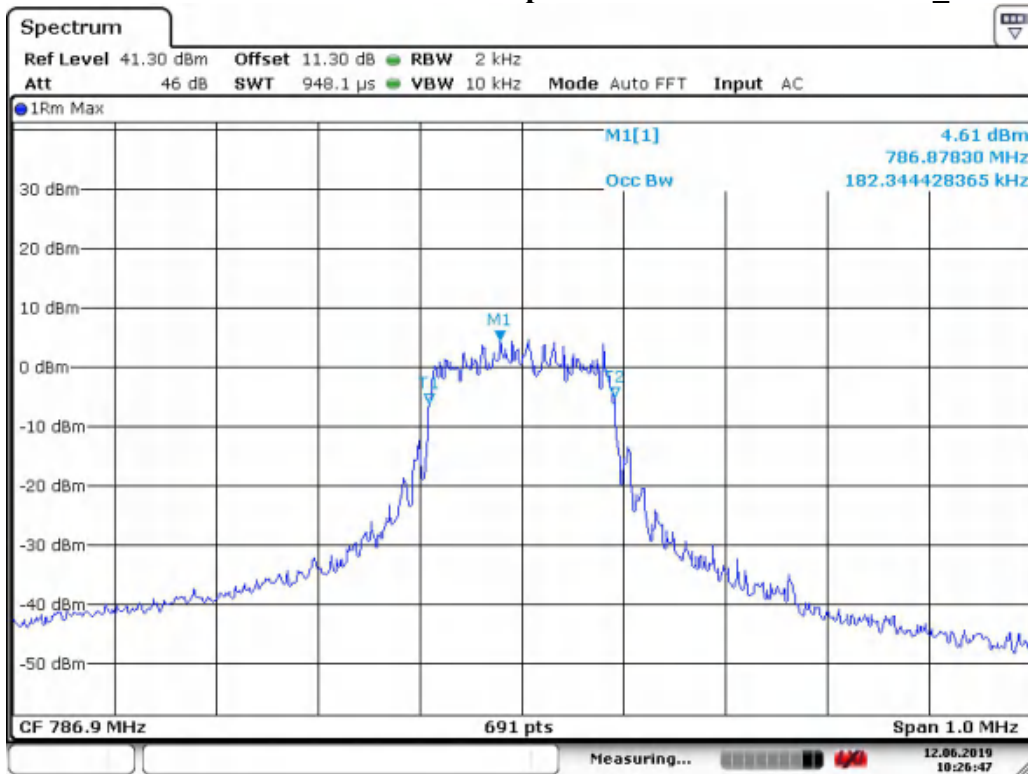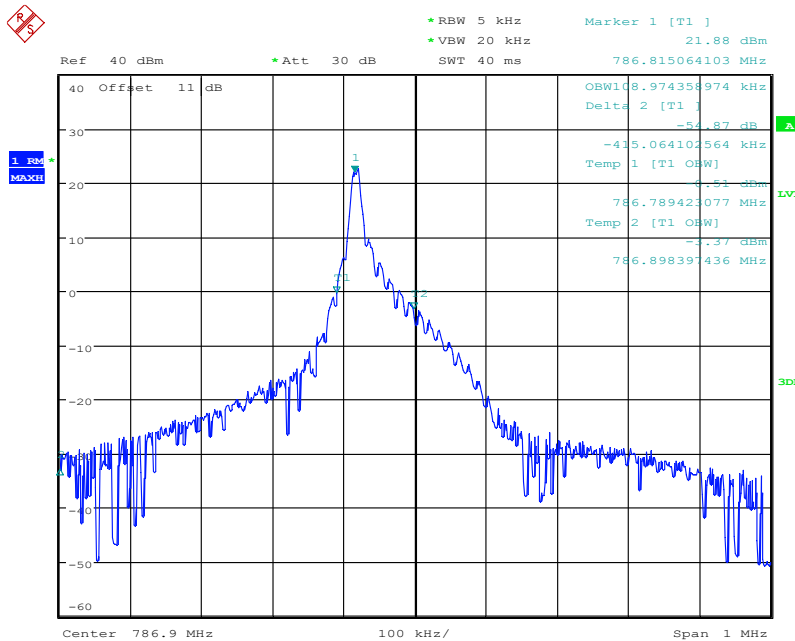Date: 5.SEP.2019 14:43:51

NB-IoT In-band band 13 23230 BPSK(99%)
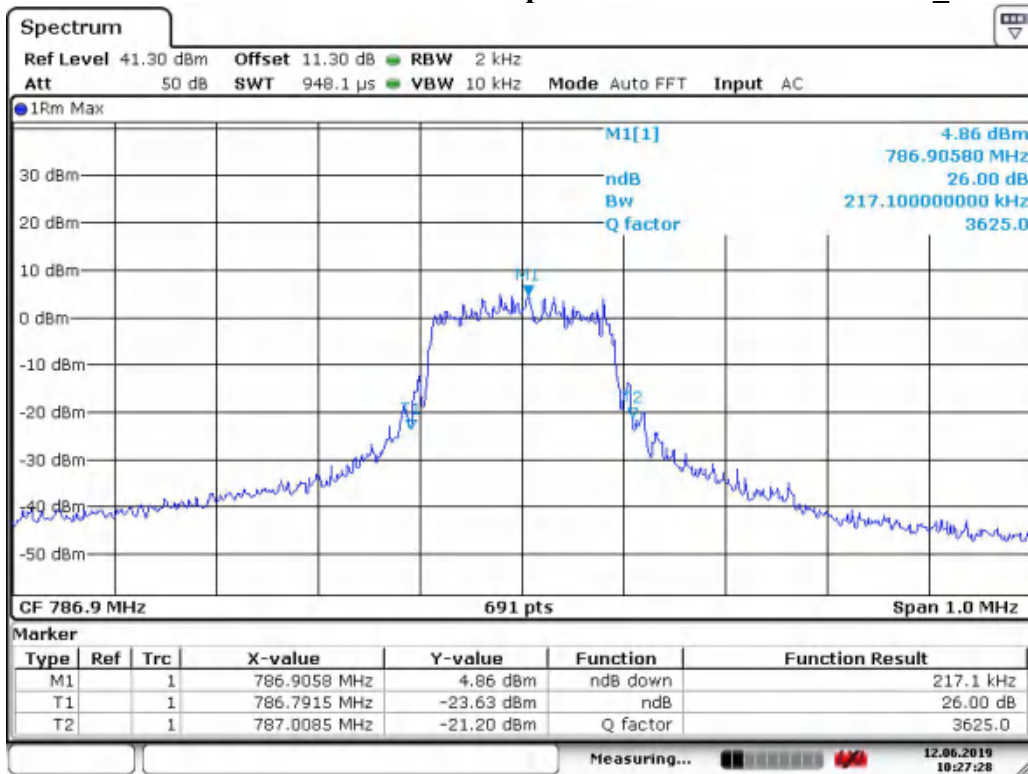
Agilent Spectrum Analyzer - Occupied BW

x dB -26.00 dB

Center Freq: 781.999800 MHz
Trig: Free Run
#IFGain:Low
#Atten: 26 dB

Radio Std: None
Avg|Hold:> 10/10
Radio Device: BTS

06:24:30 PM May 30, 2019

Ref 25.00 dBm   10 dB/div   Log

Center 782 MHz
#Res BW 5.1 kHz   #VBW 20 kHz   Span 1 MHz   Sweep 36.2 ms

Occupied Bandwidth		Total Power	28.5 dBm
183.09 kHz			
Transmit Freq Error	9.565 kHz	OBW Power	99.02 %
x dB Bandwidth	235.2 kHz	x dB	-26.00 dB

Trace/Detector: Clear Write, Average, Max Hold, Min Hold, Detector Peak Auto Man

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

Ref 40 dBm   *Att 30 dB
*RBW 5 kHz
*VBW 20 kHz
SWT 40 ms

Marker 1 [T1]   22.08 dBm   781.913461538 MHz

40 Offset 11 dB

ndB [T1]   26.00 dB
BW 108.974358974 kHz
Delta 2 [T1]   -57.50 dB   586.538461538 kHz
Temp 1 [T1 ndB]   -3.92 dBm   781.876601564 MHz
Temp 2 [T1 ndB]   -3.00 dBm   781.985576923 MHz

Center 782 MHz   100 kHz/   Span 1 MHz

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%)

Address：No. 8,Yuma Road, Chayuan New City, Nan'an District, Chongqing, P. R. China,401336
Tel: 0086-23-88069965   FAX: 0086-23-88608777

Page 92 of 361

Marker						
Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	786.9058 MHz	4.86 dBm	ndB down	217.1 kHz
T1		1	786.7915 MHz	-23.63 dBm	ndB	26.00 dB
T2		1	787.0085 MHz	-21.20 dBm	Q factor	3625.0

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

NB-IoT In-band band 13 23279 QPSK(26dB)
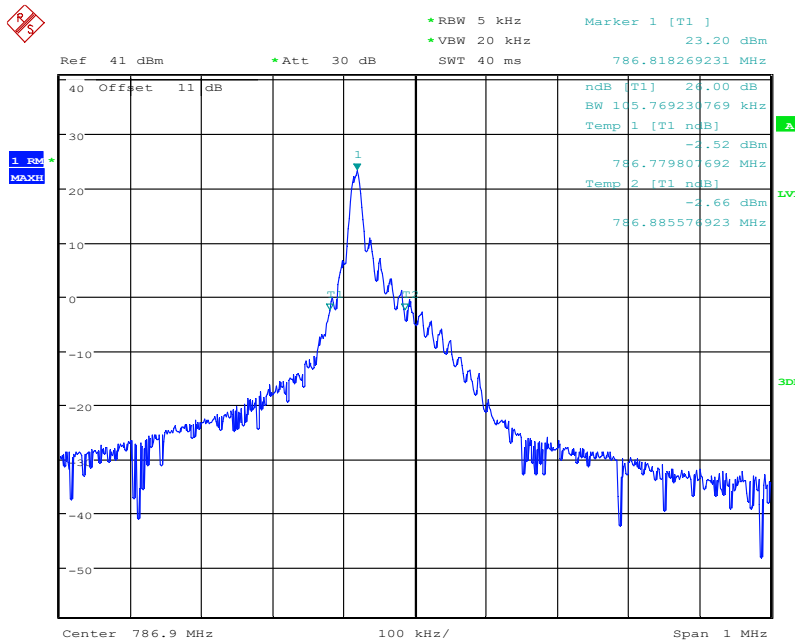
Date: 6.SEP.2019 13:20:01

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

Address：No. 8,Yuma Road, Chayuan New City, Nan'an District, Chongqing, P. R. China,401336
Tel: 0086-23-88069965   FAX: 0086-23-88608777
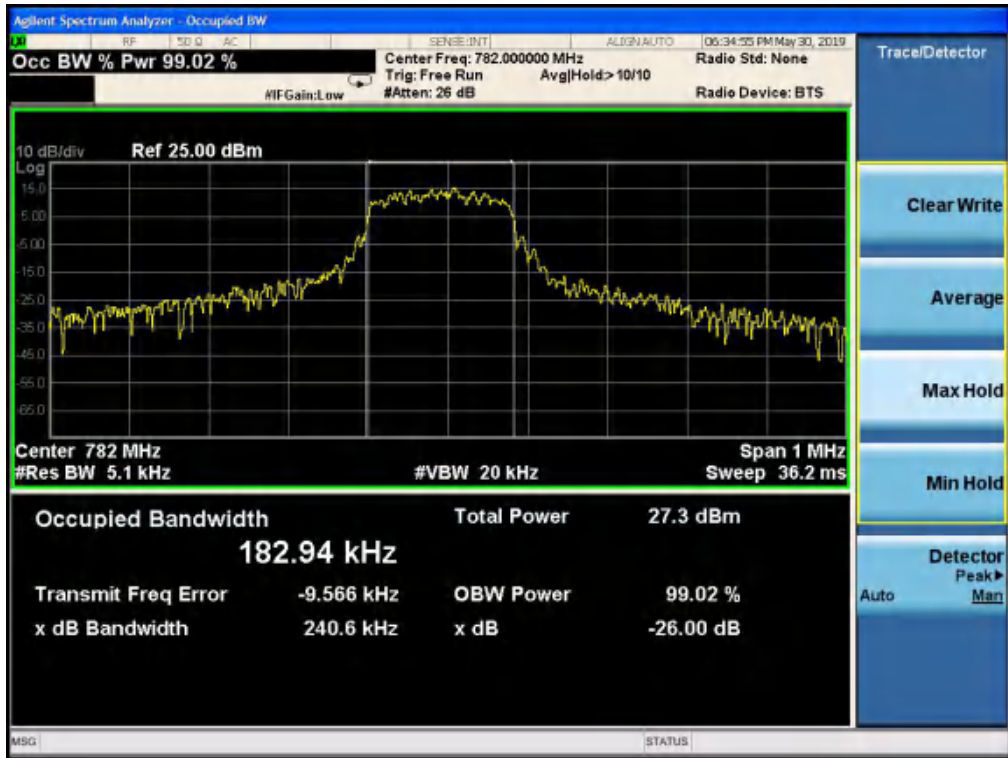
Page 93 of 361

NB-IoT Guard-band band 13 23181 QPSK(99%)
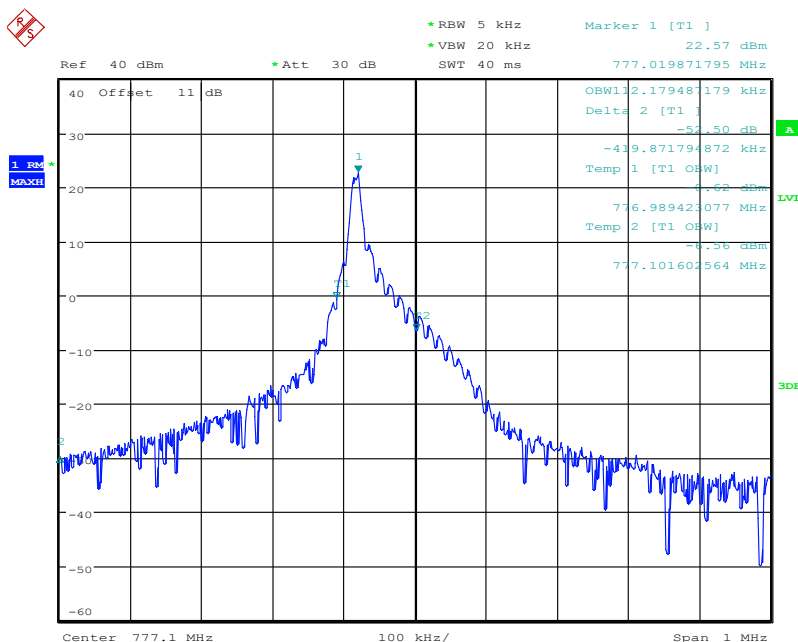
Date: 5.SEP.2019 14:40:38

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

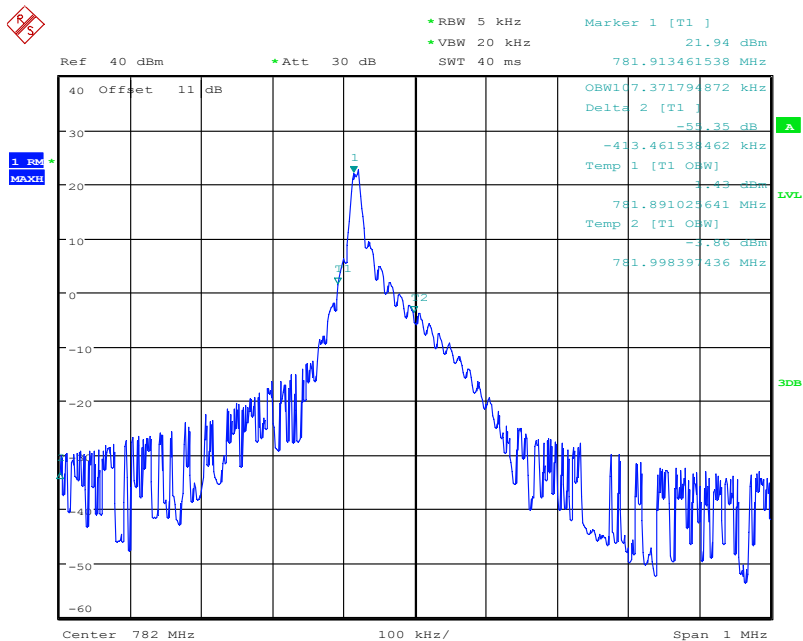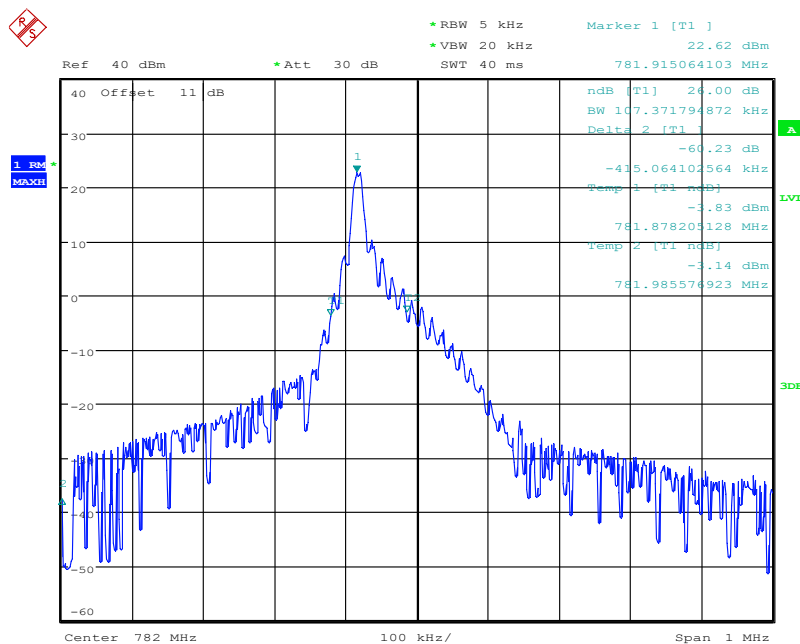NB-IoT Guard-band band 13 23181 QPSK(26dB)
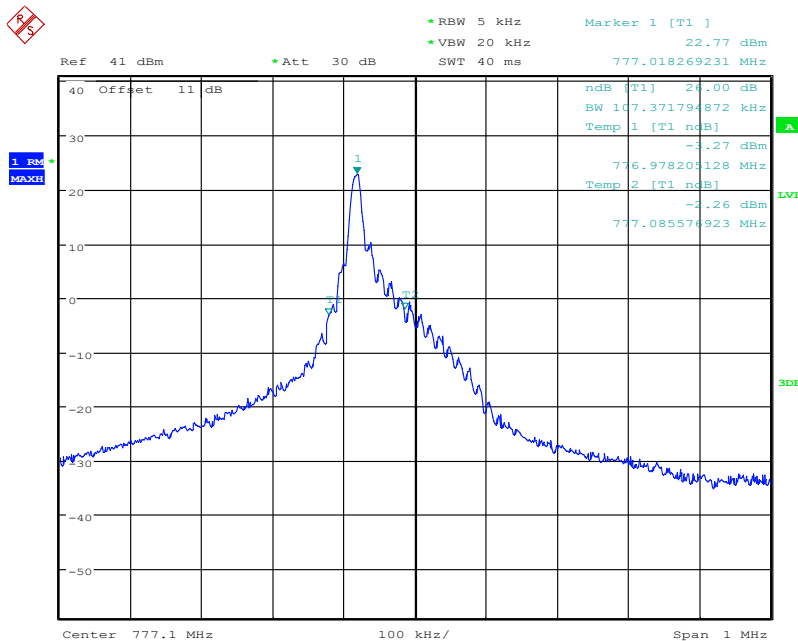
Date: 6.SEP.2019 13:22:17

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

Chongqing Academy of Information and Communications Technology

Agilent Spectrum Analyzer - Occupied BW

Occ BW % Pwr 99.02 %	Center Freq: 782.000000 MHz	Radio Std: None
	Trig: Free Run Avg|Hold:> 10/10	
#IFGain:Low	#Atten: 26 dB	Radio Device: BTS

Ref 25.00 dBm

Center 782 MHz   Span 1 MHz
#Res BW 5.1 kHz   #VBW 20 kHz   Sweep 36.2 ms

Occupied Bandwidth	Total Power	27.3 dBm
182.94 kHz		
Transmit Freq Error -9.566 kHz	OBW Power	99.02 %
x dB Bandwidth 240.6 kHz	x dB	-26.00 dB

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

Date: 5.SEP.2019 14:41:37
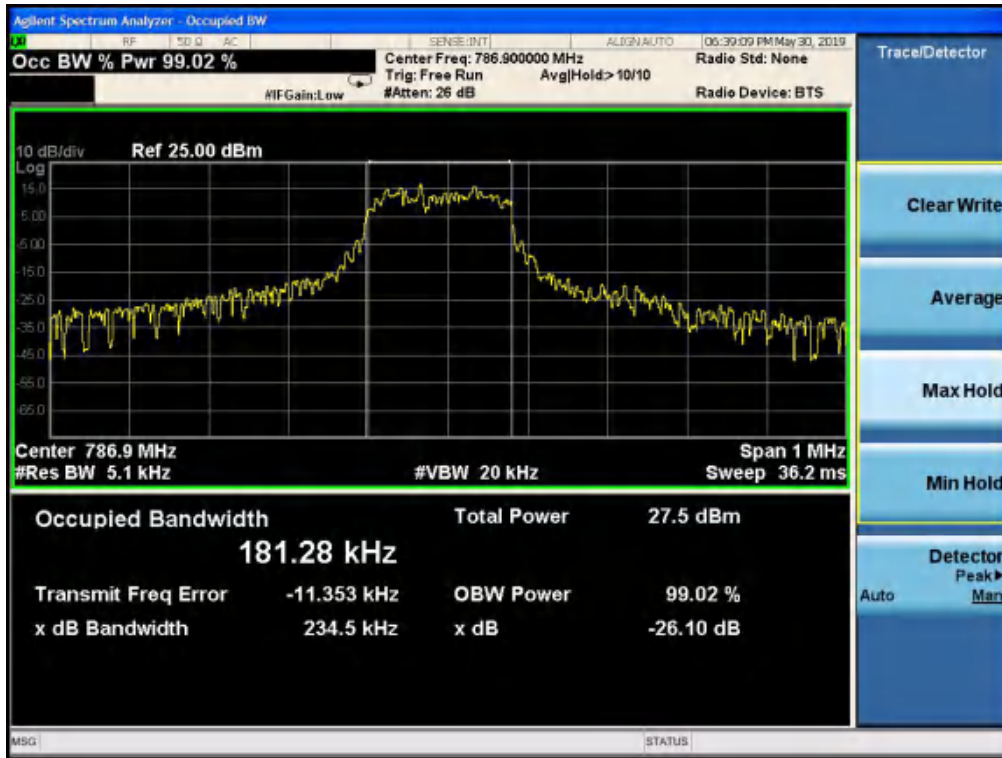
NB-IoT Guard-band band 13 23230 BPSK(99%)

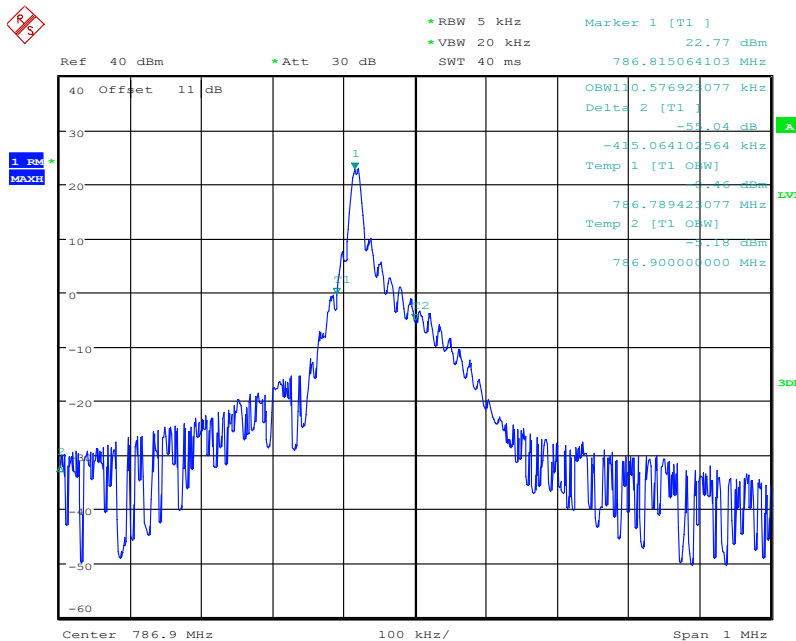NB-IoT Guard-band band 13 23230 QPSK(26dB)

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

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

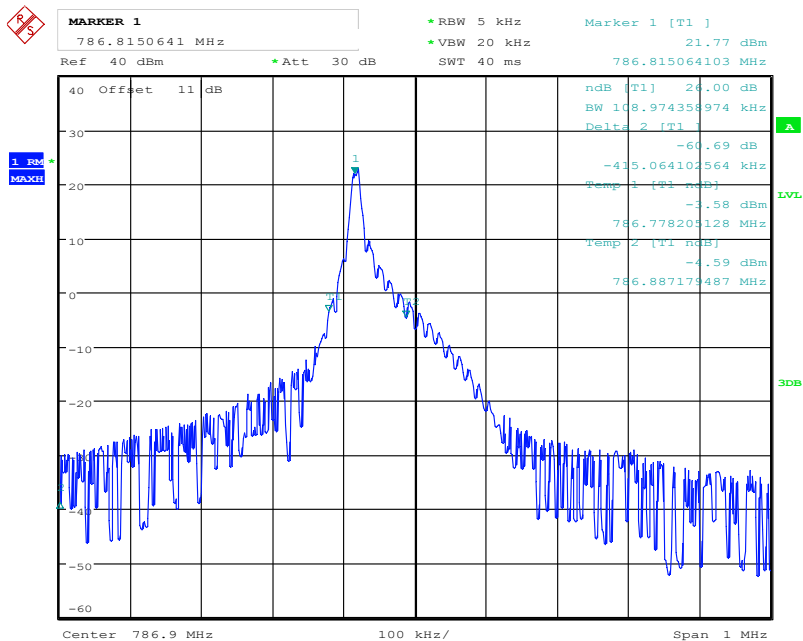NB-IoT Guard-band band 13 23279 QPSK(99%)

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)