FCC TEST REPORT

Applicant	:	LEOTEK Electronics Corp.
Address	:	1955 Lundy Ave, San Jose, CA 95131 San Jose, California, United States
Equipment	:	Smart Node Control
Model No.	:	SN-NB10
Trade Name	:	Leotek
FCC ID.	:	2BAJFSN-NB10

I HEREBY CERTIFY THAT:

The sample was received on Mar. 06, 2023 and the testing was completed on Aug. 14, 2023 at Cerpass Technology Corp. The test result refers exclusively to the test presented test model / sample. Without written approval of Cerpass Technology Corp., the test report shall not be reproduced except in full.

Approved by:

Mark Liao / Supervisor

Laboratory Accreditation:

Cerpass Technology Corporation Test Laboratory

CONTENTS

History of this test report

Report No.	Issued Date	Description
22030345-TRFCC01	Aug. 18, 2023	Original

1. Summary of Test Procedure and Test Results

FCC 47 CFR PART 22 subpart H

ANSI C63.26: 2015

KDB 971168 Power Meas License Digital Systems

For Band V (824MHz ~ 849MHz)

FCC Rules	Test items	Measured	Result
2.1046 / 22.913 (a)(2)	Effective Radiated Poiwer	Meet the requirement of limit	PASS
---	Equivalent Isotropically Radiated Power	Meet the requirement of limit	PASS
2.1053 / 22.917 (a)	Radiated Emissions	Meet the requirement of limit	PASS
2.1051 / 22.917 (a)	Conducted Emissions	Meet the requirement of limit	PASS
2.1051 / 22.917 (a)	Band Edge	Meet the requirement of limit	PASS
2.1049 / 22.917 (a)	Occupied Bandwidth	Meet the requirement of limit	PASS
---	Peak to Average Ratio	Meet the requirement of limit	PASS
2.1055 / 22.355	Frequency Stability	Meet the requirement of limit	PASS

For Band 26 (824MHz ~ 849 MHz)

FCC Rules	Test items	Measured	Result
2.1046 / 22.913 (a)(2)	Effective Radiated power	Meet the requirement of limit	PASS
---	Equivalent Isotropically Radiated Power	Meet the requirement of limit	PASS
2.1053 / 22.917 (a)	Radiated Emissions	Meet the requirement of limit	PASS
2.1051 / 22.917 (a)	Conducted Emissions	Meet the requirement of limit	PASS
2.1051 / 22.917 (a)	Band Edge	Meet the requirement of limit	PASS
2.1049 / 22.917 (a)	Occupied Bandwidth	Meet the requirement of limit	PASS
---	Peak To Average Ratio	Meet the requirement of limit	PASS
2.1055 / 22.355	Frequency Stability	Meet the requirement of limit	PASS

*The lab has reduced the uncertainty risk factor from test equipment, environment and staff technicians which according to the standard on contract. Therefore, the test result will only be determined by standard requirement, measurement uncertainty evaluation is not considered.
*This EUT has been also tested and compiled with the requirement of FCC Part 15, Subpart B, recorded in a separate test report(22030345-TEFV01).

2. Test Configuration of Equipment under Test

2.1. Feature of Equipment under Test

Band	B2, B4, B5, B12, B13, B26
Antenna Type	PIFA
Antenna Gain	LTE Band 2: 2.29dBi LTE Band 4: 2.31dBi LTE Band 5: -1.15dBi LTE Band 12: -0.62dBi LTE Band 13: -1.4dBi LTE Band 26(Part 22): -1.15dBi LTE Band 26(Part 90): -1.51dBi

Note: For more details, please refer to the User's manual of the EUT.

2.2. Carrier Frequency of Channels

Cat M1

Band	UL Frequency (MHz)	Modulation
LTE Band 5	824.7 ~ 848.3	QPSK, 16QAM
LTE Band 26	824.7 ~ 848.3	QPSK, 16QAM

NB-IoT

Band	UL Frequency (MHz)	Modulation
LTE Band 5	824.2~848.8	BPSK, QPSK
LTE Band 26	824.2~848.8	BPSK, QPSK

2.3. Test Mode and Test Software

a. During testing, the interface cables and equipment positions were varied according to ANSI C63.4.
b. The following test modes were performed for the test:

Radiated Emissions and RF Conducted	
Test Mode 1	Cat M1
Test Mode 2	NB-IoT

2.4. General Information of Test

Test Site	**Cerpass Technology Corporation Test Laboratory** Address: No.10, Ln. 2, Lianfu St., Luzhu Dist., Taoyuan City 33848, Taiwan (R.O.C.) Tel: +886-3-3226-888 Fax: +886-3-3226-881	
	FCC	TW1439, TW1079
	IC	4934E-1, 4934E-2
Frequency Range Investigated:	Radiation: from 30 MHz to 20,000MHz	
Test Distance:	The test distance of radiated emission from antenna to EUT is 3 M.	

Cat M1

Test Item	Test Site	Test period	Environmental Conditions	Tested By
RF Conducted	RFCON01-NK	2023/04/22~ 2023/08/01	23~26.5°C / 39~60%	Dian Chen
Radiated Emissions	3M02-NK	2023/06/02~ 2023/06/14	23~25°C / 30~32%	Leon Huang

NB-IoT

Test Item	Test Site	Test period	Environmental Conditions	Tested By
RF Conducted	RFCON02-NK	2023/05/03~ 2023/08/14	23.2~25.7°C / 45~56%	Dian Chen
Radiated Emissions	3M02-NK	2023/06/02	23°C / 32%	Leon Huang

2.5. Measurement Uncertainty

ISO/IEC 17025 requires that an estimate of the measurement uncertainties associated with the emissions test results be included in the report. The measurement uncertainties given below are based on a 95% confidence level (based on a coverage factor (k=2).

Test date before 2023/05/03

Measurement Item	Uncertainty
Equivalent Isotropically Radiated Power (Radiated)	±5.5dB
Conducted Spurious Emission	±2.0dB
Output Power(Conducted)	±1.07dB
Frequency Error	±0.17KHz
Occupied Channel Bandwidth	±4.4%
26dB Bandwidth	±4.4%
Peak to average ratio	±2.0dB
Temperature	±1.3°C
Humidity	±2.7%
Voltages(DC)	±4mV/V

Test date after 2023/05/03

Measurement Item	Uncertainty
Equivalent Isotropically Radiated Power (Radiated)	±5.6dB
Conducted Spurious Emission	±2.2dB
Output Power(Conducted)	±1.07dB
Frequency Error	±0.22KHz
Occupied Channel Bandwidth	±4.4%
26dB Bandwidth	±4.4%
Peak to average ratio	±2.0dB
Temperature	±1.4°C
Humidity	±2.8%
Voltages(DC)	±2mV/V

3. Test Equipment and Ancillaries Used for Tests

Test Item	Radiated Emissions (Cat M1)				
Test Site	Semi Anechoic Room(3M02-NK)				
Instrument	Manufacturer	Model No	Serial No	Calibration Date	Valid Date
Bilog Antenna	Schwarzbeck	VULB9168	275	2022/11/18	2023/11/17
Active Loop Antenna	Schwarzbeck	FMZB 1513	414	2023/02/03	2024/02/02
Horn Antenna	EMCO	3115	31589	2023/03/23	2024/03/22
Horn Antenna	EMCO	3116	31970	2023/03/03	2024/03/02
EMI Receiver	ROHDE & SCHWARZ	ESCI	101423	2022/07/05	2023/07/04
Spectrum Analyzer	ROHDE & SCHWARZ	FSV 40-N	102151	2022/08/19	2023/08/18
Preamplifier	Agilent	8449B	3008A01954	2023/03/08	2024/03/07
Preamplifier	EMC INSTRUMENTS	EMC184045	980065	2022/11/11	2023/11/10
Preamplifier	EM Electronics corp.	EM330	60659	2023/03/10	2024/03/09
Cable-4m(9k-3G)	EMEC	RG-223	18274M	2022/07/27	2023/07/26
Cable-3in1 (30M-1G)	HARBOUR INDUSTRIES	LL142	CCE1315	2023/02/25	2024/02/24
Cable-0.5m (1G-40G)	HUBER SUHNER	SUCOFLEX 104	805443/4	2023/03/07	2024/03/06
Cable-3m (1G-40G)	HUBER SUHNER	SUCOFLEX 104	805796/4	2023/03/07	2024/03/06
Cable-8m (1G-26.5G)	WOKEN	WCBA-WCA203SM	CCE1374	2023/03/07	2024/03/06
Cable-0.5m (30M-40G)	HUBER SUHNER	SUCOFLEX 102	28420/2	2023/03/07	2024/03/06
Cable-3m (30M-40G)	HUBER SUHNER	SUCOFLEX 102	MY2608/2	2023/03/07	2024/03/06
Cable-0.5m (1G-40G)	Rapidtek	40GHZ 50CM	38MS-38MS50314	2023/03/07	2024/03/06
Cable-3m (1G-40G)	Rapidtek	40GHZ 300CM	38MS-38MS300314	2023/03/07	2024/03/06
E3	AUDIX	v8.2014-8-6	RK-000529	NA	NA
Radio Comnunication Analyzer	Anritsu	MT8821C	6261830569	2023/03/12	2024/03/11

Test Item	RF Conducted (Cat M1)				
Test Site	RFCON01-NK				
Instrument	Manufacturer	Model No	Serial No	Calibration Date	Valid Date
CAX Signal Analyzer	KEYSIGHT	N9000B	MY57100339	2022/11/29	2023/11/28
Radio Comnunication Analyzer	Anritsu	MT8821C	6261830569	2023/03/12	2024/03/11
TEMP & HUMI CHAMBER	T-MACHINE	TMJ-9712	T-12-040111	2022/08/15	2023/08/14

Test Item	Radiated Emissions (NB-IoT)				
Test Site	Semi Anechoic Room(3M02-NK)				
Instrument	Manufacturer	Model No	Serial No	Calibration Date	Valid Date
Bilog Antenna	Schwarzbeck	VULB9168	275	2022/11/18	2023/11/17
Active Loop Antenna	Schwarzbeck	FMZB 1513	414	2023/02/03	2024/02/02
Horn Antenna	EMCO	3115	31589	2023/03/23	2024/03/22
Horn Antenna	EMCO	3116	31970	2023/03/03	2024/03/02
EMI Receiver	ROHDE & SCHWARZ	ESCI	101423	2022/07/05	2023/07/04
Spectrum Analyzer	ROHDE & SCHWARZ	FSV 40-N	102151	2022/08/19	2023/08/18
Preamplifier	Agilent	8449B	3008A01954	2023/03/08	2024/03/07
Preamplifier	EMC INSTRUMENTS	EMC184045	980065	2022/11/11	2023/11/10
Preamplifier	EM Electronics corp.	EM330	60659	2023/03/10	2024/03/09
Cable-4m(9k-3G)	EMEC	RG-223	18274M	2022/07/27	2023/07/26
Cable-3in1 (30M-1G)	HARBOUR INDUSTRIES	LL142	CCE1315	2023/02/25	2024/02/24
Cable-0.5m (1G-40G)	HUBER SUHNER	SUCOFLEX 104	805443/4	2023/03/07	2024/03/06
Cable-3m (1G-40G)	HUBER SUHNER	SUCOFLEX 104	805796/4	2023/03/07	2024/03/06
Cable-8m (1G-26.5G)	WOKEN	WCBA-WCA203SM	CCE1374	2023/03/07	2024/03/06
Cable-0.5m (30M-40G)	HUBER SUHNER	SUCOFLEX 102	28420/2	2023/03/07	2024/03/06
Cable-3m (30M-40G)	HUBER SUHNER	SUCOFLEX 102	MY2608/2	2023/03/07	2024/03/06
Cable-0.5m (1G-40G)	Rapidtek	40GHZ 50CM	38MS-38MS50314	2023/03/07	2024/03/06
Cable-3m (1G-40G)	Rapidtek	40GHZ 300CM	38MS-38MS300314	2023/03/07	2024/03/06
E3	AUDIX	v8.2014-8-6	RK-000529	NA	NA
Radio Comnunication Analyzer	Anritsu	MT8821C	6261830569	2023/03/12	2024/03/11

Test Item	RF Conducted (NB-IoT)				
Test Site	RFCON01-NK				
Instrument	Manufacturer	Model No	Serial No	Calibration Date	Valid Date
CAX Signal Analyzer	KEYSIGHT	N9000B	MY57100339	2022/11/29	2023/11/28
Radio Comnunication Analyzer	Anritsu	MT8821C	6261830569	2023/03/12	2024/03/11
TEMP & HUMI CHAMBER	T-MACHINE	TMJ-9712	T-12-040111	2022/08/15	2023/08/14

4. RF Output Power Test

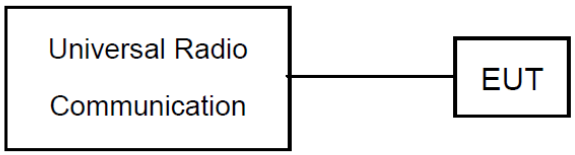
4.1 Test Limit

N/A

4.2 Test Procedures

1. The EUT was set up for the maximum power with simulator.
2. Set the EUT to transmit under low, middle and high channel and record the power level shown on simulator.

4.3 Test Setup



4.4 Test Result and Data

Cat M1

LTE Band 5

BW (MHz)	Opration Channel/ Frequency(MHz)	Index	RB size	RB offset	Conducted Power (dBm)	
					Moduration	
					QPSK	16QAM
1.4	20407/824.7	0	1	0	18.77	17.78
		0	6	0	16.97	16.88
	20525/836.5	0	1	0	19.07	18.07
		0	6	0	16.93	16.78
	20643/848.3	0	1	5	18.88	17.72
		0	6	0	16.79	16.81

BW (MHz)	Opration Channel/ Frequency(MHz)	Index	RB size	RB offset	Conducted Power (dBm)	
					Moduration	
					QPSK	16QAM
3	20415/825.5	0	1	0	19.82	17.73
		0	3	0	17.91	16.88
	20525/836.5	0	1	0	19.04	17.99
		0	3	0	17.95	17.11
	20635/847.5	1	1	5	18.84	17.7
		1	3	0	17.94	17.08

BW (MHz)	Opration Channel/ Frequency(MHz)	Index	RB size	RB offset	Conducted Power (dBm)	
					Moduration	
					QPSK	16QAM
5	20425/826.5	1	1	0	18.86	18.78
		1	6	0	17.9	17.88
	20525/836.5	1	1	0	18.91	18.8
		1	6	0	17.82	17.9
	20625/846.5	3	1	5	18.63	18.71
		3	6	0	17.83	17.72

Cat M1

LTE Band 5

BW (MHz)	Opration Channel/ Frequency(MHz)	Index	RB size	RB offset	Conducted Power (dBm)	
					Moduration	
					QPSK	16QAM
10	20450/829	0	1	0	19.06	19.07
		0	5	0	18.06	19.28
	20525/836.5	0	1	0	18.73	18.68
		0	5	0	18.86	18.75
	20600/844	7	1	5	18.57	18.57
		7	5	1	18.85	18.92

Cat M1

LTE Band 26

BW (MHz)	Opration Channel/ Frequency(MHz)	Index	RB size	RB offset	Conducted Power (dBm) Moduration	
					QPSK	16QAM
1.4	26797/824.7	0	1	0	19.86	18.84
		0	6	0	17.69	17.71
	26915/836.5	0	1	0	19.92	18.71
		0	6	0	17.93	17.78
	27033/848.3	0	1	5	19.59	18.54
		0	6	0	17.77	17.44

BW (MHz)	Opration Channel/ Frequency(MHz)	Index	RB size	RB offset	Conducted Power (dBm) Opration Channel/Frequency(MHz)	
					QPSK	16QAM
3	26805/825.5	0	1	0	19.8	18.83
		0	6	0	17.71	17.65
	26915/836.5	0	1	0	19.91	18.85
		0	6	0	17.87	17.72
	27025/847.5	1	1	5	19.64	18.51
		1	6	0	17.77	17.55

BW (MHz)	Opration Channel/ Frequency(MHz)	Index	RB size	RB offset	Conducted Power (dBm) Opration Channel/Frequency(MHz)	
					QPSK	16QAM
5	26815/826.5	3	1	0	19.59	19.67
		0	6	0	18.7	18.78
	26915/836.5	0	1	0	19.65	19.63
		0	6	0	18.78	18.85
	27015/846.5	0	1	5	19.45	19.33
		3	6	0	18.7	18.68

Cat M1

LTE Band 26

BW (MHz)	Opration Channel/ Frequency(MHz)	Index	RB size	RB offset	Conducted Power (dBm) Opration Channel/Frequency(MHz)	
					QPSK	16QAM
10	26840/829	3	1	0	19.58	19.54
		0	4	0	19.73	19.5
	26915/836.5	0	1	0	19.74	19.71
		0	4	0	19.82	19.38
	26990/844	4	1	5	19.51	19.41
		7	4	2	19.67	19.48

BW (MHz)	Opration Channel/ Frequency(MHz)	Index	RB size	RB offset	Conducted Power (dBm) Opration Channel/Frequency(MHz)	
					QPSK	16QAM
15	26865/831.5	3	1	0	19.59	19.51
		0	6	0	19.81	19.8
	26915/836.5	0	1	0	19.66	19.67
		0	6	0	19.8	19.75
	26965/841.5	8	1	5	19.68	19.69
		11	6	0	19.82	19.88

Note: All conducted measurements are based on a RMS detector.

NB-IoT
LTE Band 5

Modulation	Sub-carrier spacing (KHz)	Opration Channel/ Frequency(MHz)	Nltones	Conducted Power (dBm)
BPSK	3.75	20402/824.2	1@0	20.16
			1@47	20.09
	15		1@0	20.08
			1@11	19.98
QPSK	3.75		1@0	20.17
			1@47	20.12
	15		1@0	20.06
			1@11	20.04
	15		12@0	18.29
BPSK	3.75	20525/836.5	1@0	20.85
			1@47	20.69
	15		1@0	20.89
			1@11	20.80
QPSK	3.75		1@0	21.06
			1@47	21.03
	15		1@0	20.89
			1@11	20.77
	15		12@0	18.85
BPSK	3.75	20648/848.8	1@0	20.10
			1@47	19.91
	15		1@0	20.23
			1@11	20.00
QPSK	3.75		1@0	20.17
			1@47	20.02
	15		1@0	20.00
			1@11	19.85
	15		12@0	18.09

NB-IoT

LTE Band 26

Modulation	Sub-carrier spacing (KHz)	Opration Channel/ Frequency(MHz)	Nltones	Conducted Power (dBm)
BPSK	3.75	26792/824.2	1@0	21.01
			1@47	20.89
	15		1@0	21.07
			1@11	20.93
QPSK	3.75		1@0	21.06
			1@47	20.96
	15		1@0	20.90
			1@11	20.93
	15		12@0	19.14
BPSK	3.75	26915/836.5	1@0	21.06
			1@47	20.79
	15		1@0	21.08
			1@11	20.99
QPSK	3.75		1@0	21.11
			1@47	20.97
	15		1@0	20.97
			1@11	20.83
	15		12@0	18.94
BPSK	3.75	27038/848.8	1@0	20.34
			1@47	20.24
	15		1@0	20.44
			1@11	20.23
QPSK	3.75		1@0	20.53
			1@47	20.61
	15		1@0	20.37
			1@11	20.39
	15		12@0	18.55

5. Effective Radiated Power / Equivalent Isotropic Radiated Power Test

5.1. Test Limit

For FCC Part 22.913(a)(2): The ERP of mobile transmitters and auxiliary test transmitters must not exceed 7 Watts.

5.2. Test Procedures

For Conducted power measurement:

1. The EUT links up with simulator and is set to maximum output power level at low / middel / high channel.
2. Measure the output power of low / middle / high channel of the EUT.

For ERP measurement:

ERP can be calculated by below formula from ANSI C63.26.

1. EIRP = PT + GT - LC

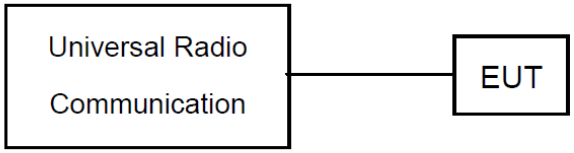
   PT= transmitter output power, in dBm.

   GT= gain of the transmitting antenna, in dBi (EIRP).

   LC= signal attenuation in the connecting cable between the transmitter and antenna, in dB.

3. ERP = EIRP – 2.15 dB.

5.3. Test Setup



5.4. Test Result and Data

Cat M1

LTE Band5 1.4M QPSK

Channel	Frequency (MHz)	RB size	Conducted Power (dBm)	Gain (dBi)	E.R.P. (dBm)	E.R.P. (W)	Limit (dBm)	Margin (dB)
20407	824.7	1	18.77	-1.15	15.47	0.04	38.45	-22.98
		Full	16.97	-1.15	13.67	0.02	38.45	-24.78
20525	836.5	1	19.07	-1.15	15.77	0.04	38.45	-22.68
		Full	16.93	-1.15	13.63	0.02	38.45	-24.82
20643	848.3	1	18.88	-1.15	15.58	0.04	38.45	-22.87
		Full	16.79	-1.15	13.49	0.02	38.45	-24.96

LTE Band5 1.4M 16QAM

Channel	Frequency (MHz)	RB size	Conducted Power (dBm)	Gain (dBi)	E.R.P. (dBm)	E.R.P. (W)	Limit (dBm)	Margin (dB)
20407	824.7	1	17.78	-1.15	14.48	0.03	38.45	-23.97
		Full	16.88	-1.15	13.58	0.02	38.45	-24.87
20525	836.5	1	18.07	-1.15	14.77	0.03	38.45	-23.68
		Full	16.78	-1.15	13.48	0.02	38.45	-24.97
20643	848.3	1	17.72	-1.15	14.42	0.03	38.45	-24.03
		Full	16.81	-1.15	13.51	0.02	38.45	-24.94

LTE Band5 3M QPSK

Channel	Frequency (MHz)	RB size	Conducted Power (dBm)	Gain (dBi)	E.R.P. (dBm)	E.R.P. (W)	Limit (dBm)	Margin (dB)
20415	825.5	1	19.82	-1.15	16.52	0.04	38.45	-21.93
		Full	17.91	-1.15	14.61	0.03	38.45	-23.84
20525	836.5	1	19.04	-1.15	15.74	0.04	38.45	-22.71
		Full	17.95	-1.15	14.65	0.03	38.45	-23.80
20635	847.5	1	18.84	-1.15	15.54	0.04	38.45	-22.91
		Full	17.94	-1.15	14.64	0.03	38.45	-23.81

Cat M1

LTE Band5 3M 16QAM

Channel	Frequency (MHz)	RB size	Conducted Power (dBm)	Gain (dBi)	E.R.P. (dBm)	E.R.P. (W)	Limit (dBm)	Margin (dB)
20415	825.5	1	17.73	-1.15	14.43	0.03	38.45	-24.02
		Full	16.88	-1.15	13.58	0.02	38.45	-24.87
20525	836.5	1	17.99	-1.15	14.69	0.03	38.45	-23.76
		Full	17.11	-1.15	13.81	0.02	38.45	-24.64
20635	847.5	1	17.7	-1.15	14.4	0.03	38.45	-24.05
		Full	17.08	-1.15	13.78	0.02	38.45	-24.67

LTE Band5 5M QPSK

Channel	Frequency (MHz)	RB size	Conducted Power (dBm)	Gain (dBi)	E.R.P. (dBm)	E.R.P. (W)	Limit (dBm)	Margin (dB)
20425	826.5	1	18.86	-1.15	15.56	0.04	38.45	-22.89
		Full	17.9	-1.15	14.6	0.03	38.45	-23.85
20525	836.5	1	18.91	-1.15	15.61	0.04	38.45	-22.84
		Full	17.82	-1.15	14.52	0.03	38.45	-23.93
20625	846.5	1	18.63	-1.15	15.33	0.03	38.45	-23.12
		Full	17.83	-1.15	14.53	0.03	38.45	-23.92

LTE Band5 5M 16QAM

Channel	Frequency (MHz)	RB size	Conducted Power (dBm)	Gain (dBi)	E.R.P. (dBm)	E.R.P. (W)	Limit (dBm)	Margin (dB)
20425	826.5	1	18.78	-1.15	15.48	0.04	38.45	-22.97
		Full	17.88	-1.15	14.58	0.03	38.45	-23.87
20525	836.5	1	18.8	-1.15	15.5	0.04	38.45	-22.95
		Full	17.9	-1.15	14.6	0.03	38.45	-23.85
20625	846.5	1	18.71	-1.15	15.41	0.03	38.45	-23.04
		Full	17.72	-1.15	14.42	0.03	38.45	-24.03

Cat M1

LTE Band5 10M QPSK

Channel	Frequency (MHz)	RB size	Conducted Power (dBm)	Gain (dBi)	E.R.P. (dBm)	E.R.P. (W)	Limit (dBm)	Margin (dB)
20450	829	1	19.06	-1.15	15.76	0.04	38.45	-22.69
		Full	18.06	-1.15	14.76	0.03	38.45	-23.69
20525	836.5	1	18.73	-1.15	15.43	0.03	38.45	-23.02
		Full	18.86	-1.15	15.56	0.04	38.45	-22.89
20600	844	1	18.57	-1.15	15.27	0.03	38.45	-23.18
		Full	18.85	-1.15	15.55	0.04	38.45	-22.90

LTE Band5 10M 16QAM

Channel	Frequency (MHz)	RB size	Conducted Power (dBm)	Gain (dBi)	E.R.P. (dBm)	E.R.P. (W)	Limit (dBm)	Margin (dB)
20450	829	1	19.07	-1.15	15.77	0.04	38.45	-22.68
		Full	19.28	-1.15	15.98	0.04	38.45	-22.47
20525	836.5	1	18.68	-1.15	15.38	0.03	38.45	-23.07
		Full	18.75	-1.15	15.45	0.04	38.45	-23.00
20600	844	1	18.57	-1.15	15.27	0.03	38.45	-23.18
		Full	18.92	-1.15	15.62	0.04	38.45	-22.83

Cat M1

LTE Band26 1.4M QPSK

Channel	Frequency (MHz)	RB size	Conducted Power (dBm)	Gain (dBi)	E.R.P. (dBm)	E.R.P. (W)	Limit (dBm)	Margin (dB)
26797	824.7	1	19.86	-1.15	16.56	0.05	38.45	-21.89
		Full	17.69	-1.15	14.39	0.03	38.45	-24.06
26915	836.5	1	19.92	-1.15	16.62	0.05	38.45	-21.83
		Full	17.93	-1.15	14.63	0.03	38.45	-23.82
27033	848.3	1	19.59	-1.15	16.29	0.04	38.45	-22.16
		Full	17.77	-1.15	14.47	0.03	38.45	-23.98

LTE Band26 1.4M 16QAM

Channel	Frequency (MHz)	RB size	Conducted Power (dBm)	Gain (dBi)	E.R.P. (dBm)	E.R.P. (W)	Limit (dBm)	Margin (dB)
26797	824.7	1	18.84	-1.15	15.54	0.04	38.45	-22.91
		Full	17.71	-1.15	14.41	0.03	38.45	-24.04
26915	836.5	1	18.71	-1.15	15.41	0.03	38.45	-23.04
		Full	17.78	-1.15	14.48	0.03	38.45	-23.97
27033	848.3	1	18.54	-1.15	15.24	0.03	38.45	-23.21
		Full	17.44	-1.15	14.14	0.03	38.45	-24.31

LTE Band26 3M QPSK

Channel	Frequency (MHz)	RB size	Conducted Power (dBm)	Gain (dBi)	E.R.P. (dBm)	E.R.P. (W)	Limit (dBm)	Margin (dB)
26805	825.5	1	19.8	-1.15	16.5	0.04	38.45	-21.95
		Full	17.71	-1.15	14.41	0.03	38.45	-24.04
16915	836.5	1	19.91	-1.15	16.61	0.05	38.45	-21.84
		Full	17.87	-1.15	14.57	0.03	38.45	-23.88
27025	847.5	1	19.64	-1.15	16.34	0.04	38.45	-22.11
		Full	17.77	-1.15	14.47	0.03	38.45	-23.98

Cat M1

LTE Band26 3M 16QAM

Channel	Frequency (MHz)	RB size	Conducted Power (dBm)	Gain (dBi)	E.R.P. (dBm)	E.R.P. (W)	Limit (dBm)	Margin (dB)
26805	825.5	1	18.83	-1.15	15.53	0.04	38.45	-22.92
		Full	17.65	-1.15	14.35	0.03	38.45	-24.10
16915	836.5	1	18.85	-1.15	15.55	0.04	38.45	-22.90
		Full	17.72	-1.15	14.42	0.03	38.45	-24.03
27025	847.5	1	18.51	-1.15	15.21	0.03	38.45	-23.24
		Full	17.55	-1.15	14.25	0.03	38.45	-24.20

LTE Band26 5M QPSK

Channel	Frequency (MHz)	RB size	Conducted Power (dBm)	Gain (dBi)	E.R.P. (dBm)	E.R.P. (W)	Limit (dBm)	Margin (dB)
26815	826.5	1	19.59	-1.15	16.29	0.04	38.45	-22.16
		Full	18.7	-1.15	15.4	0.03	38.45	-23.05
26915	836.5	1	19.65	-1.15	16.35	0.04	38.45	-22.10
		Full	18.78	-1.15	15.48	0.04	38.45	-22.97
27015	846.5	1	19.45	-1.15	16.15	0.04	38.45	-22.30
		Full	18.7	-1.15	15.4	0.03	38.45	-23.05

LTE Band26 5M 16QAM

Channel	Frequency (MHz)	RB size	Conducted Power (dBm)	Gain (dBi)	E.R.P. (dBm)	E.R.P. (W)	Limit (dBm)	Margin (dB)
26815	826.5	1	19.67	-1.15	16.37	0.04	38.45	-22.08
		Full	18.78	-1.15	15.48	0.04	38.45	-22.97
26915	836.5	1	19.63	-1.15	16.33	0.04	38.45	-22.12
		Full	18.85	-1.15	15.55	0.04	38.45	-22.90
27015	846.5	1	19.33	-1.15	16.03	0.04	38.45	-22.42
		Full	18.68	-1.15	15.38	0.03	38.45	-23.07

Cat M1

LTE Band26 10M QPSK

Channel	Frequency (MHz)	RB size	Conducted Power (dBm)	Gain (dBi)	E.R.P. (dBm)	E.R.P. (W)	Limit (dBm)	Margin (dB)
26840	829	1	19.58	-1.15	16.28	0.04	38.45	-22.17
		Full	19.73	-1.15	16.43	0.04	38.45	-22.02
26915	836.5	1	19.74	-1.15	16.44	0.04	38.45	-22.01
		Full	19.82	-1.15	16.52	0.04	38.45	-21.93
26990	844	1	19.51	-1.15	16.21	0.04	38.45	-22.24
		Full	19.67	-1.15	16.37	0.04	38.45	-22.08

LTE Band26 10M 16QAM

Channel	Frequency (MHz)	RB size	Conducted Power (dBm)	Gain (dBi)	E.R.P. (dBm)	E.R.P. (W)	Limit (dBm)	Margin (dB)
26840	829	1	19.54	-1.15	16.24	0.04	38.45	-22.21
		Full	19.5	-1.15	16.2	0.04	38.45	-22.25
26915	836.5	1	19.71	-1.15	16.41	0.04	38.45	-22.04
		Full	19.38	-1.15	16.08	0.04	38.45	-22.37
26990	844	1	19.41	-1.15	16.11	0.04	38.45	-22.34
		Full	19.48	-1.15	16.18	0.04	38.45	-22.27

LTE Band26 15M QPSK

Channel	Frequency (MHz)	RB size	Conducted Power (dBm)	Gain (dBi)	E.R.P. (dBm)	E.R.P. (W)	Limit (dBm)	Margin (dB)
26865	829	1	19.59	-1.15	16.29	0.04	38.45	-22.16
		Full	19.81	-1.15	16.51	0.04	38.45	-21.94
26915	836.5	1	19.66	-1.15	16.36	0.04	38.45	-22.09
		Full	19.8	-1.15	16.5	0.04	38.45	-21.95
26965	844	1	19.68	-1.15	16.38	0.04	38.45	-22.07
		Full	19.82	-1.15	16.52	0.04	38.45	-21.93

Cat M1

LTE Band26 15M 16QAM

Channel	Frequency (MHz)	RB size	Conducted Power (dBm)	Gain (dBi)	E.R.P. (dBm)	E.R.P. (W)	Limit (dBm)	Margin (dB)
26865	829	1	19.51	-1.15	16.21	0.04	38.45	-22.24
		Full	19.8	-1.15	16.5	0.04	38.45	-21.95
26915	836.5	1	19.67	-1.15	16.37	0.04	38.45	-22.08
		Full	19.75	-1.15	16.45	0.04	38.45	-22.00
26965	844	1	19.69	-1.15	16.39	0.04	38.45	-22.06
		Full	19.88	-1.15	16.58	0.05	38.45	-21.87

NB-IoT
LTE Band5

Channel	Frequency (MHz)	Modulation	Sub-carrier spacing (KHz)	Nltones	Conducted Power (dBm)	Gain (dBi)	E.R.P. (dBm)	E.R.P. (W)	Limit (W)	Margin (dB)
20402	824.2	BPSK	3.75	1@0	20.16	-1.15	16.86	0.05	38.45	-21.59
		QPSK	3.75	1@0	20.17	-1.15	16.87	0.05	38.45	-21.58
		BPSK	15	1@0	20.08	-1.15	16.78	0.05	38.45	-21.67
		QPSK	15	1@0	20.06	-1.15	16.76	0.05	38.45	-21.69
20525	836.5	BPSK	3.75	1@0	20.85	-1.15	17.55	0.06	38.45	-20.90
		QPSK	3.75	1@0	21.06	-1.15	17.76	0.06	38.45	-20.69
		BPSK	15	1@0	20.89	-1.15	17.59	0.06	38.45	-20.86
		QPSK	15	1@0	20.89	-1.15	17.59	0.06	38.45	-20.86
20648	848.8	BPSK	3.75	1@0	20.10	-1.15	16.80	0.05	38.45	-21.65
		QPSK	3.75	1@0	20.17	-1.15	16.87	0.05	38.45	-21.58
		BPSK	15	1@0	20.23	-1.15	16.93	0.05	38.45	-21.52
		QPSK	15	1@0	20.00	-1.15	16.70	0.05	38.45	-21.75

LTE Band26

Channel	Frequency (MHz)	Modulation	Sub-carrier spacing (KHz)	Nltones	Conducted Power (dBm)	Gain (dBi)	E.R.P. (dBm)	E.R.P. (W)	Limit (W)	Margin (dB)
26792	824.2	BPSK	3.75	1@0	21.01	-1.15	17.71	0.06	38.45	-20.74
		QPSK	3.75	1@0	21.06	-1.15	17.76	0.06	38.45	-20.69
		BPSK	15	1@0	21.07	-1.15	17.77	0.06	38.45	-20.68
		QPSK	15	1@0	20.90	-1.15	17.60	0.06	38.45	-20.85
26915	836.5	BPSK	3.75	1@0	21.06	-1.15	17.76	0.06	38.45	-20.69
		QPSK	3.75	1@0	21.11	-1.15	17.81	0.06	38.45	-20.64
		BPSK	15	1@0	21.08	-1.15	17.78	0.06	38.45	-20.67
		QPSK	15	1@0	20.97	-1.15	17.67	0.06	38.45	-20.78
27038	848.8	BPSK	3.75	1@0	20.34	-1.15	17.04	0.05	38.45	-21.41
		QPSK	3.75	1@0	20.53	-1.15	17.23	0.05	38.45	-21.22
		BPSK	15	1@0	20.44	-1.15	17.14	0.05	38.45	-21.31
		QPSK	15	1@0	20.37	-1.15	17.07	0.05	38.45	-21.38

6. Emission Bandwidth & Occupied Bandwidth Test

6.1. Test Limit

The width of a frequency band such that, below the lower and above the upper frequency limits, the mean powers emitted are each equal to a specified percentage 0.5 %of the total mean power of a given emission.

The emission bandwidth is defined as the width of the signal between two points, located at the 2 sides of the carrier frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.

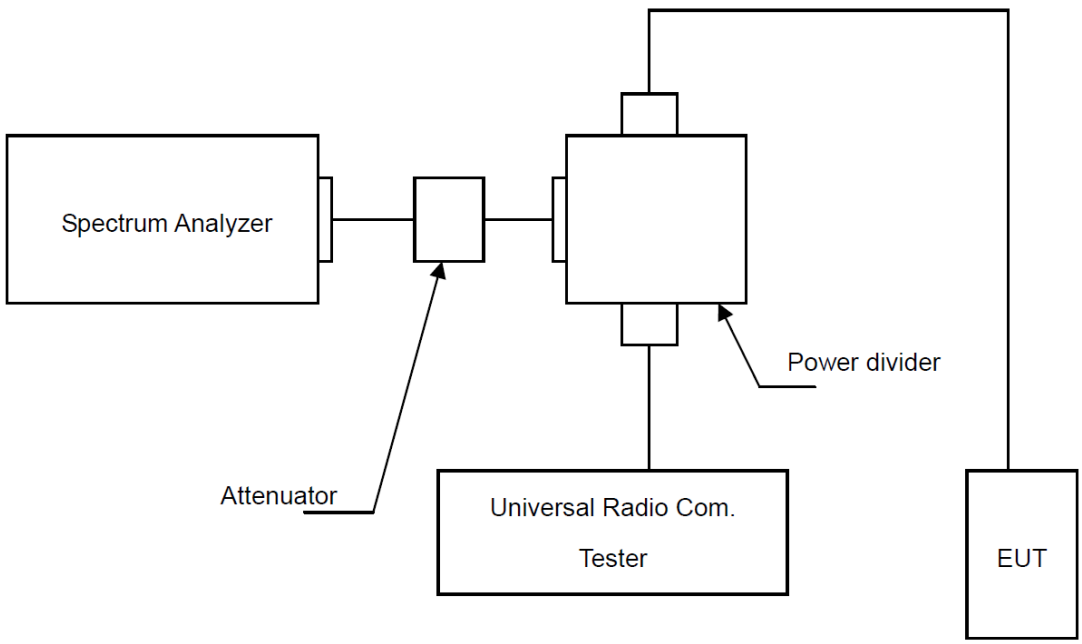
6.2. Test Procedures

a. The EUT makes a phone call to the communication simulator. The power was measured with Spectrum Analyzer.

b. The conducted occupied bandwidth used the power splitter via EUT RF power connector between simulation base station and spectrum analyzer.

c. The communication simulator station system controlled a EUT to export maximum output power under transmission mode and specific channel frequency. Use OBW measurement function of Spectrum analyzer to measure 99 % occupied bandwidth.

6.3. Test Setup



6.4. Test Result and Data

Cat M1

LTE Band5

Moduration type	RB	Bandwidth (MHz)	Channel No.	Frequency (MHz)	-26dBc Occupied Bandwidth (MHz)	99% Occupied Bandwidth (MHz)
QPSK	100%	1.4	20525	836.5	1.2950	1.0993
		3	20525	836.5	1.3040	1.1197
		5	20525	836.5	1.2700	1.1052
		10	20525	836.5	1.3060	1.1072
16QAM	100%	1.4	20525	836.5	1.1130	0.9339
		3	20525	836.5	1.1510	0.9416
		5	20525	836.5	1.1130	0.9489
		10	20525	836.5	1.1270	0.9460

LTE Band26

Moduration type	RB	Bandwidth (MHz)	Channel No.	Frequency (MHz)	-26dBc Occupied Bandwidth (MHz)	99% Occupied Bandwidth (MHz)
QPSK	100%	1.4	26915	836.5	1.2920	1.1052
		3	26915	836.5	1.3670	1.1259
		5	26915	836.5	1.3220	1.1054
		10	26915	836.5	1.3330	1.1150
		15	26915	836.5	1.3330	1.1140
16QAM	100%	1.4	26915	836.5	1.2600	0.9339
		3	26915	836.5	1.1400	0.9387
		5	26915	836.5	1.1050	0.9562
		10	26915	836.5	1.1820	0.9490
		15	26915	836.5	1.1670	0.9644

NB-IoT

LTE Band5

Moduration type	Sub-carrier spacing (KHz)	Nltones	Channel No.	Frequency (MHz)	-26dBc Occupied Bandwidth (KHz)	99% Occupied Bandwidth (KHz)
QPSK	3.75	1@0	20402	824.2	40.230	67.909
QPSK	15	1@0	20402	824.2	101.400	119.450
QPSK	15	12@0	20402	824.2	250.200	183.050
BPSK	3.75	1@0	20402	824.2	41.880	59.824
BPSK	15	1@0	20402	824.2	103.800	119.050
QPSK	3.75	1@0	20525	836.5	39.970	65.300
QPSK	15	1@0	20525	836.5	116.900	121.620
QPSK	15	12@0	20525	836.5	254.600	186.220
BPSK	3.75	1@0	20525	836.5	41.550	58.650
BPSK	15	1@0	20525	836.5	106.300	119.720
QPSK	3.75	1@0	20648	848.8	39.790	65.045
QPSK	15	1@0	20648	848.8	129.900	121.520
QPSK	15	12@0	20648	848.8	258.100	185.450
BPSK	3.75	1@0	20648	848.8	41.040	57.445
BPSK	15	1@0	20648	848.8	104.700	119.100

NB-IoT

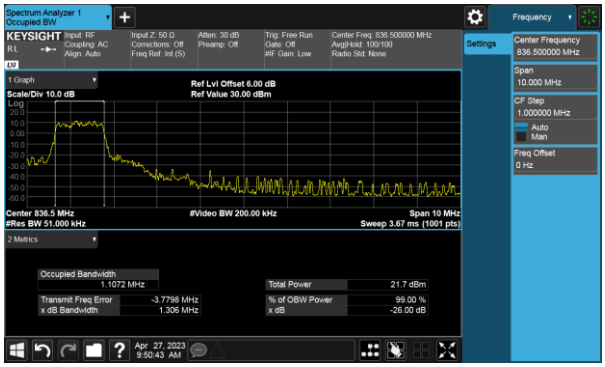
LTE Band26

Moduration type	Sub-carrier spacing (KHz)	Nltones	Channel No.	Frequency (MHz)	-26dBc Occupied Bandwidth (KHz)	99% Occupied Bandwidth (KHz)
QPSK	3.75	1@0	26792	824.2	39.700	66.894
QPSK	15	1@0	26792	824.2	130.000	120.970
QPSK	15	12@0	26792	824.2	241.900	184.940
BPSK	3.75	1@0	26792	824.2	41.680	57.573
BPSK	15	1@0	26792	824.2	106.200	119.940
QPSK	3.75	1@0	26915	836.5	39.740	67.141
QPSK	15	1@0	26915	836.5	130.400	131.030
QPSK	15	12@0	26915	836.5	252.000	186.620
BPSK	3.75	1@0	26915	836.5	40.860	58.200
BPSK	15	1@0	26915	836.5	106.500	122.890
QPSK	3.75	1@0	27038	848.8	39.860	66.033
QPSK	15	1@0	27038	848.8	114.400	120.890
QPSK	15	12@0	27038	848.8	258.400	184.520
BPSK	3.75	1@0	27038	848.8	41.040	56.545
BPSK	15	1@0	27038	848.8	104.100	120.750

Cat M1

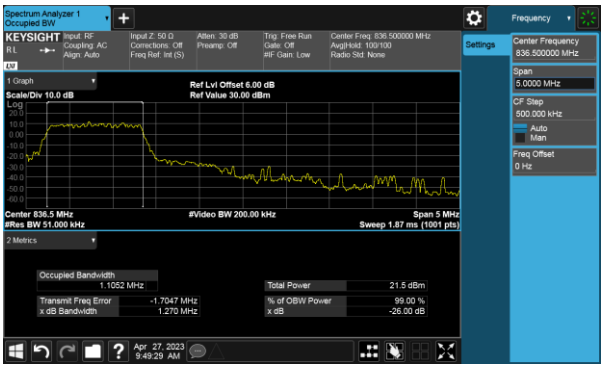
LTE Band 5 QPSK 1.4MHz, CH 20525

LTE Band 5 QPSK 10MHz, CH 20525



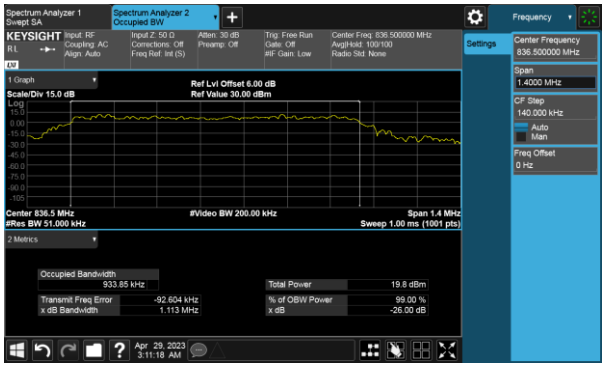
LTE Band 5 QPSK 3MHz, CH 20525

LTE Band 5 QPSK 5MHz, CH 20525

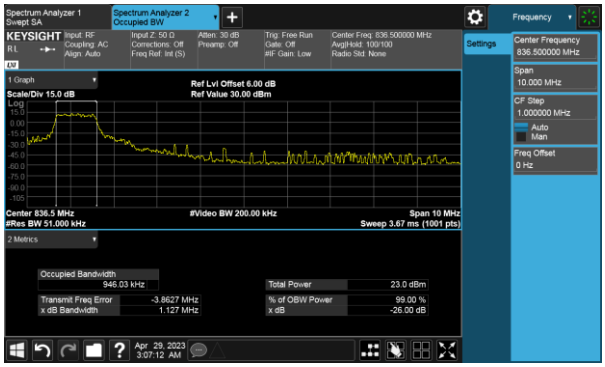


Cat M1

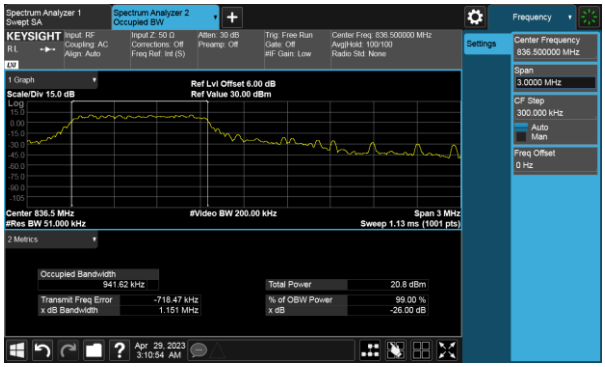
LTE Band 5 16QAM 1.4MHz, CH 20525



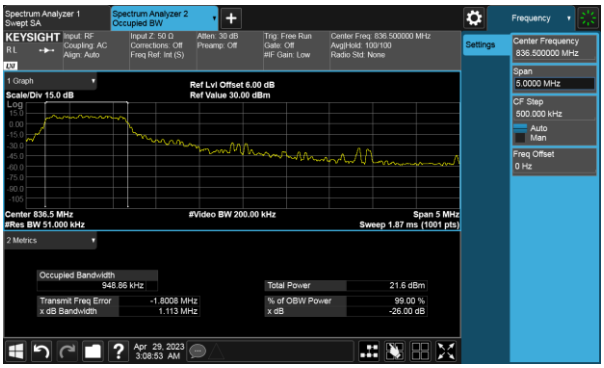
LTE Band 5 16QAM 10MHz, CH 20525



LTE Band 5 16QAM 3MHz, CH 20525



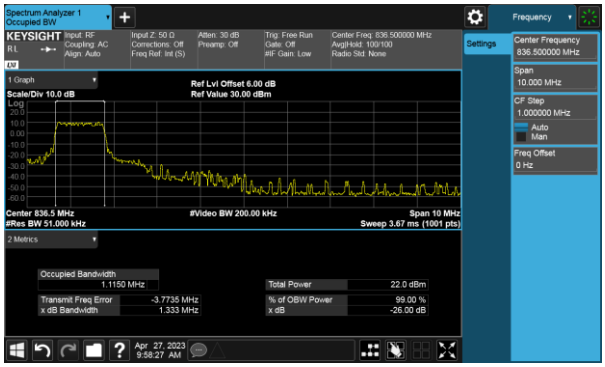
LTE Band 5 16QAM 5MHz, CH 20525



Cat M1

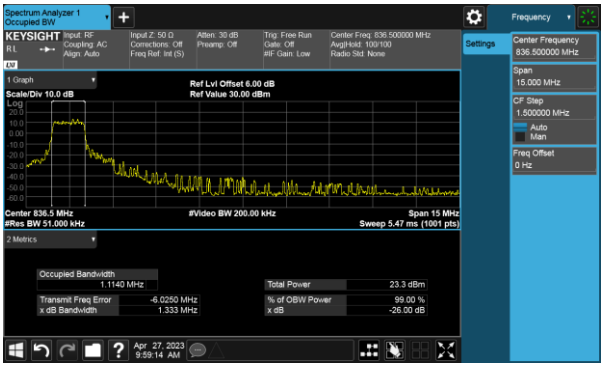
LTE Band 26 QPSK 1.4MHz, CH 26915

LTE Band 26 QPSK 10MHz, CH 26915

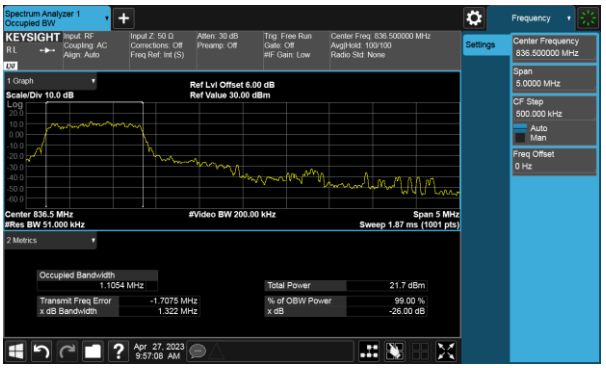


LTE Band 26 QPSK 3MHz, CH 26915

LTE Band 26 QPSK 15MHz, CH 26915

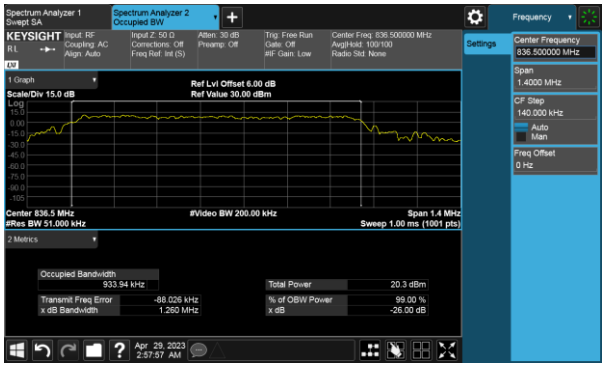


LTE Band 26 QPSK 5MHz, CH 26915

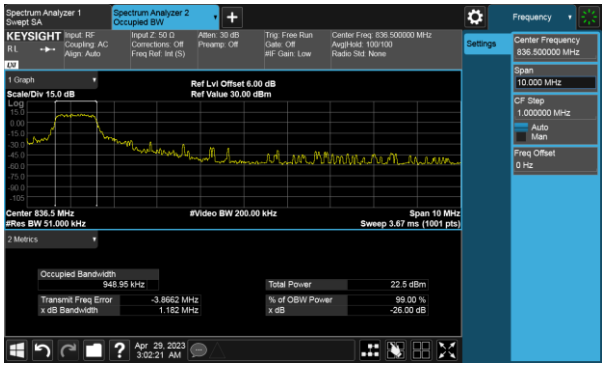


Cat M1

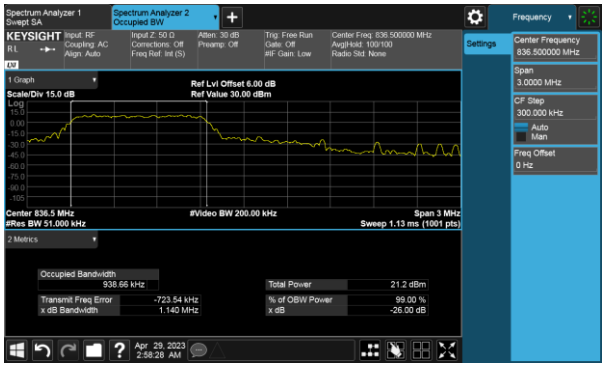
LTE Band 26 16QAM 1.4MHz, CH 26915



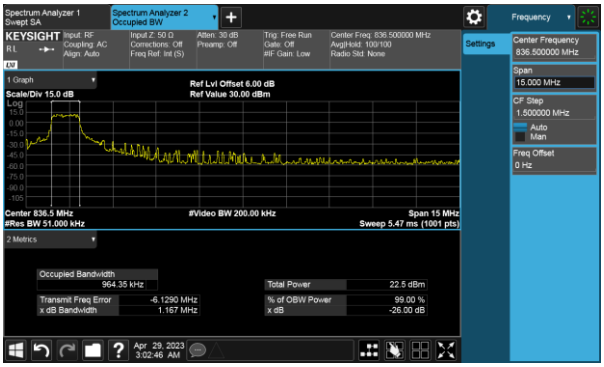
LTE Band 26 16QAM 10MHz, CH 26915



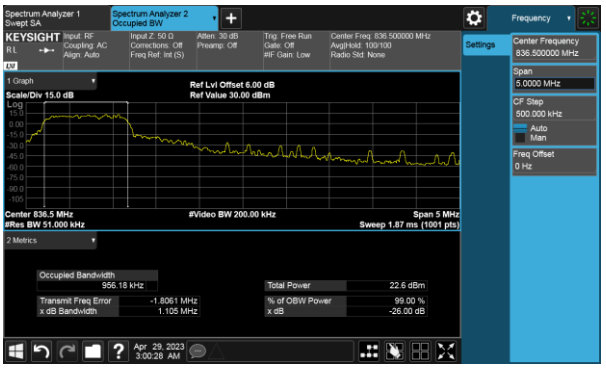
LTE Band 26 16QAM 3MHz, CH 26915



LTE Band 26 16QAM 15MHz, CH 26915

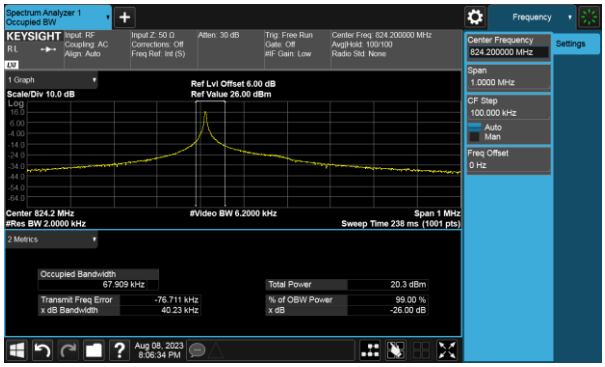


LTE Band 26 16QAM 5MHz, CH 26915

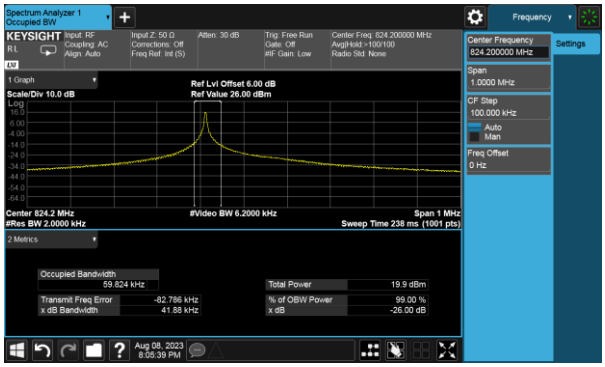


NB-IoT

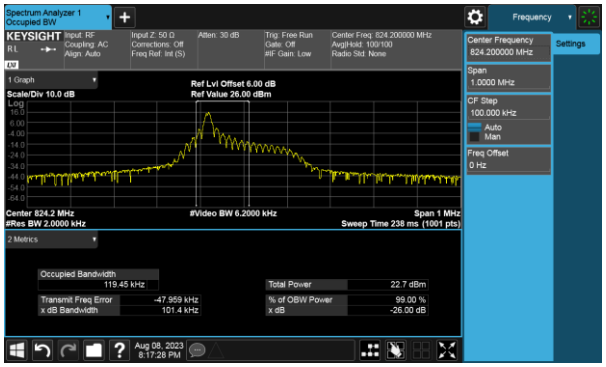
LTE Band 5 QPSK 3.75KHz 1@0 CH 20402



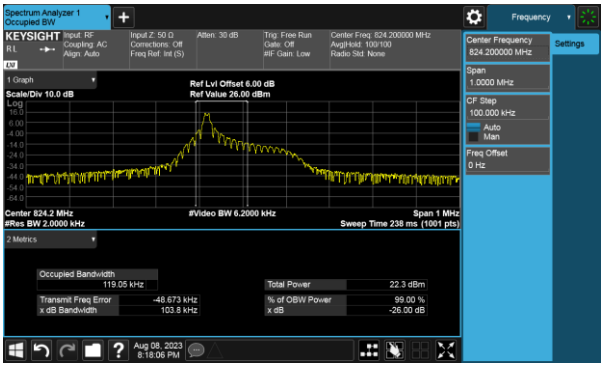
LTE Band 5 BPSK 3.75KHz 1@0 CH 20402



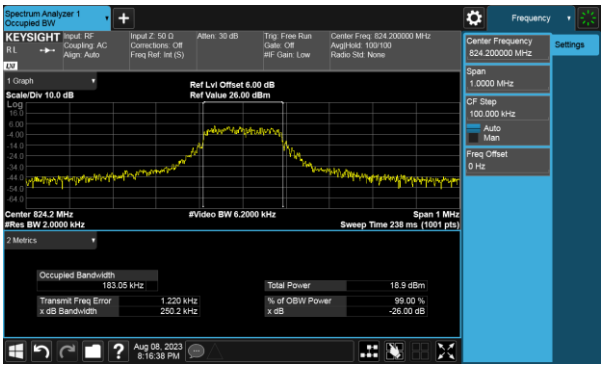
LTE Band 5 QPSK 15KHz 1@0 CH 20402



LTE Band 5 BPSK 15KHz 1@0 CH 20402

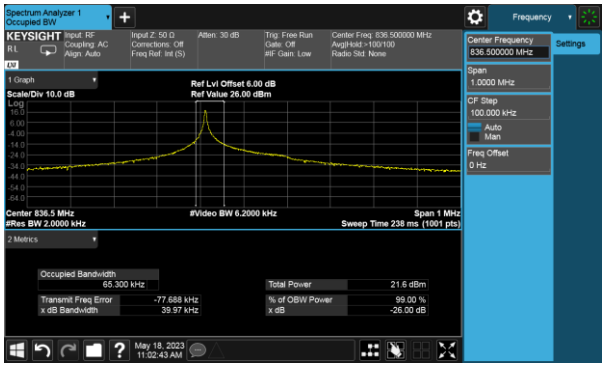


LTE Band 5 QPSK 15KHz 12@0 CH 20402

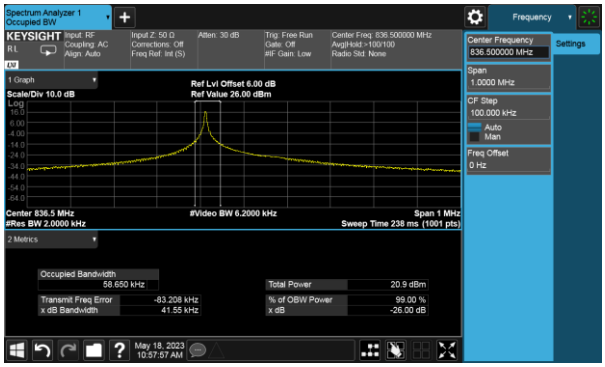


NB-IoT

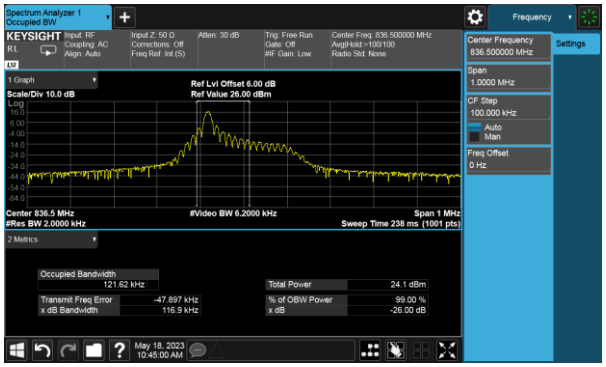
LTE Band 5 QPSK 3.75KHz 1@0 CH 20525



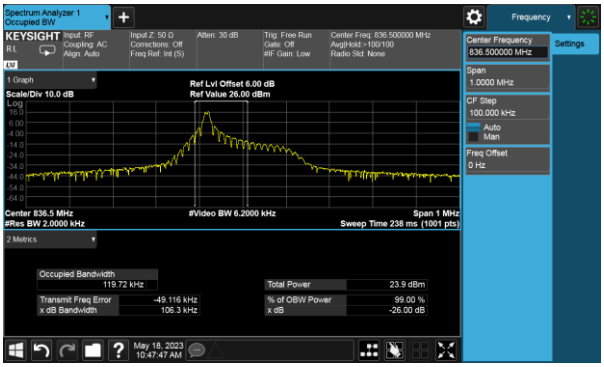
LTE Band 5 BPSK 3.75KHz 1@0 CH 20525



LTE Band 5 QPSK 15KHz 1@0 CH 20525



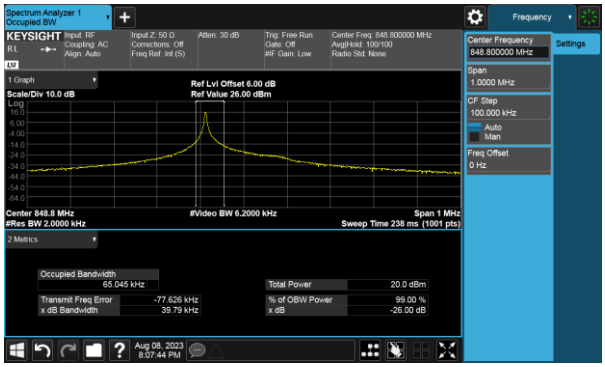
LTE Band 5 BPSK 15KHz 1@0 CH 20525



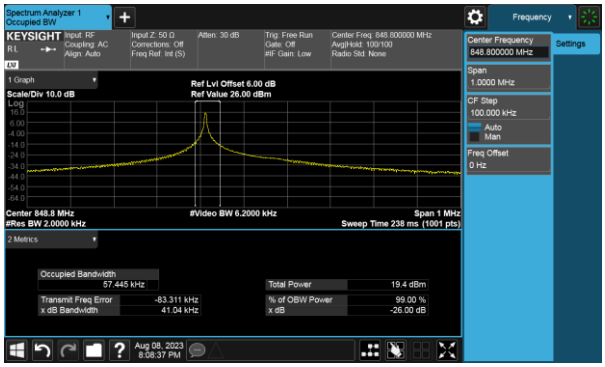
LTE Band 5 QPSK 15KHz 12@0 CH 20525

NB-IoT

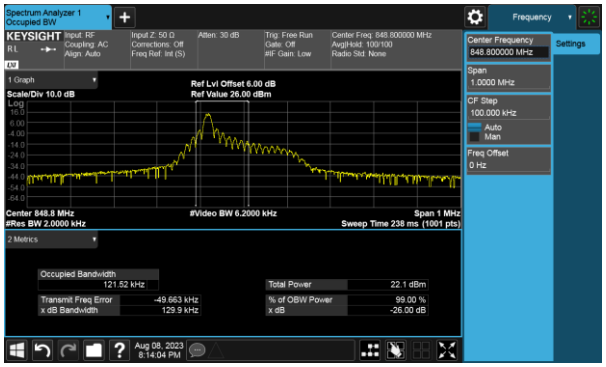
LTE Band 5 QPSK 3.75KHz 1@0 CH 20648



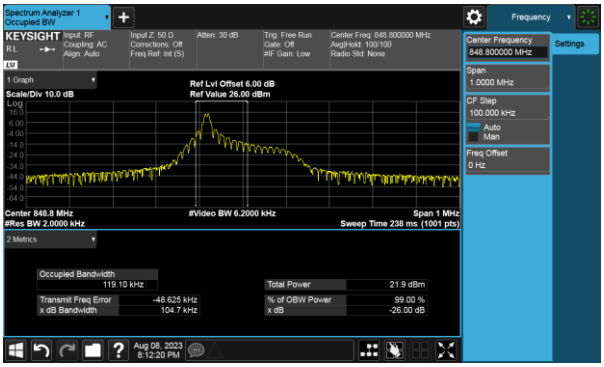
LTE Band 5 BPSK 3.75KHz 1@0 CH 20648



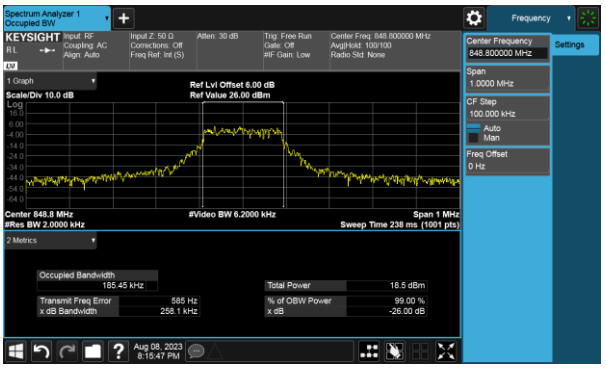
LTE Band 5 QPSK 15KHz 1@0 CH 20648



LTE Band 5 BPSK 15KHz 1@0 CH 20648

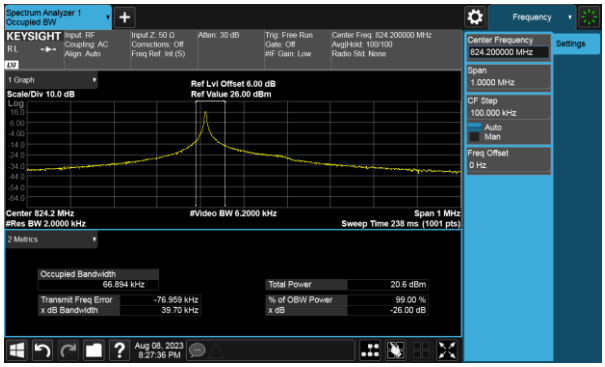


LTE Band 5 QPSK 15KHz 12@0 CH 20648

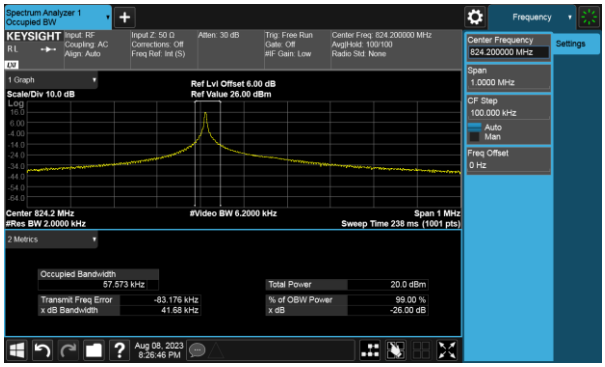


NB-IoT

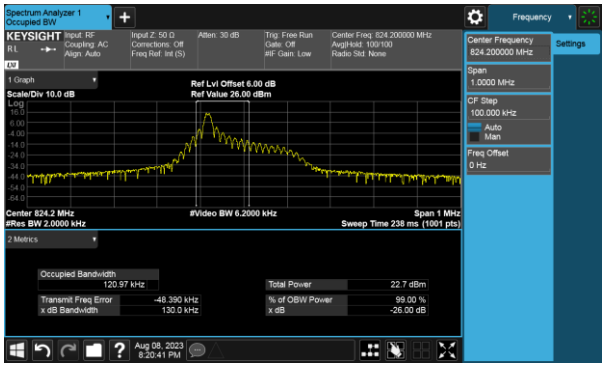
LTE Band 26 QPSK 3.75KHz 1@0 CH 26792



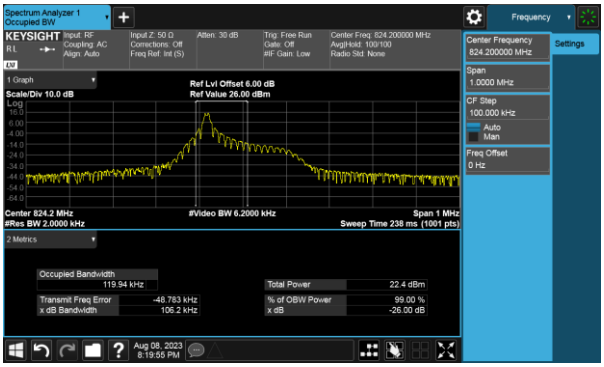
LTE Band 26 BPSK 3.75KHz 1@0 CH 26792



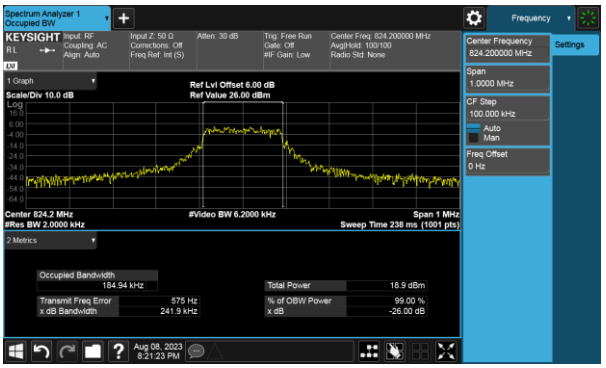
LTE Band 26 QPSK 15KHz 1@0 CH 26792



LTE Band 26 BPSK 15KHz 1@0 CH 26792

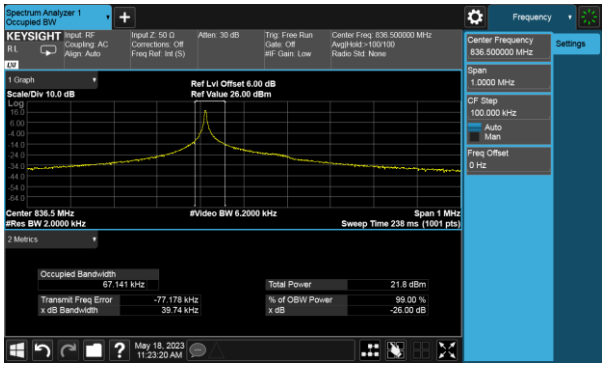


LTE Band 26 QPSK 15KHz 12@0 CH 26792

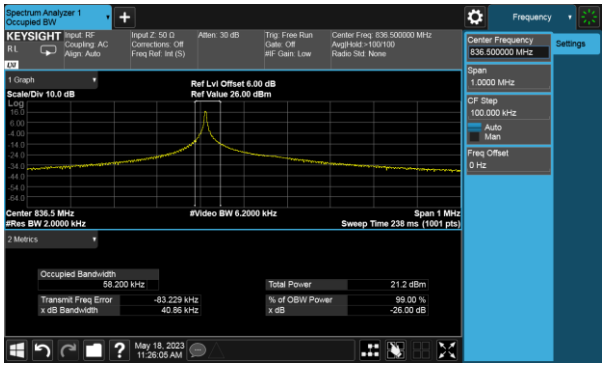


NB-IoT

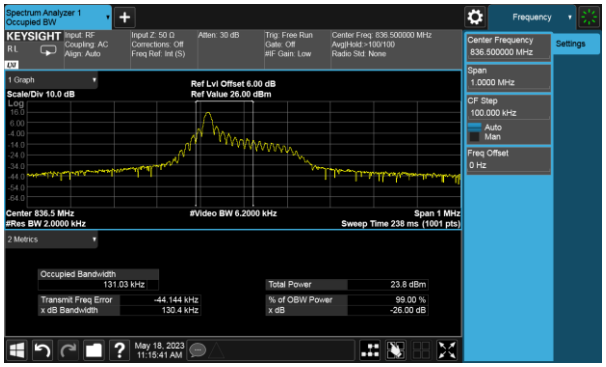
LTE Band 26 QPSK 3.75KHz 1@0 CH 26915



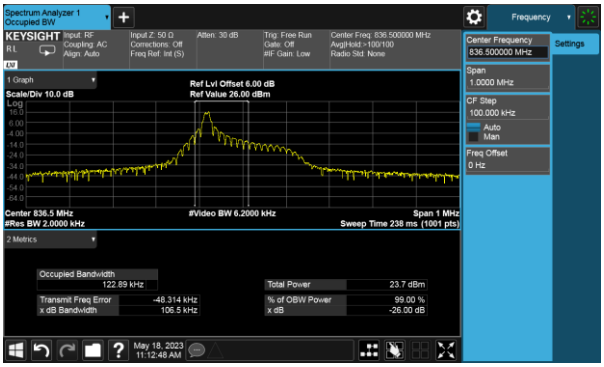
LTE Band 26 BPSK 3.75KHz 1@0 CH 26915



LTE Band 26 QPSK 15KHz 1@0 CH 26915



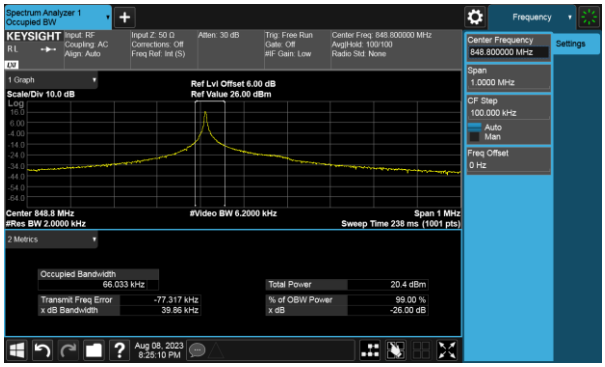
LTE Band 26 BPSK 15KHz 1@0 CH 26915



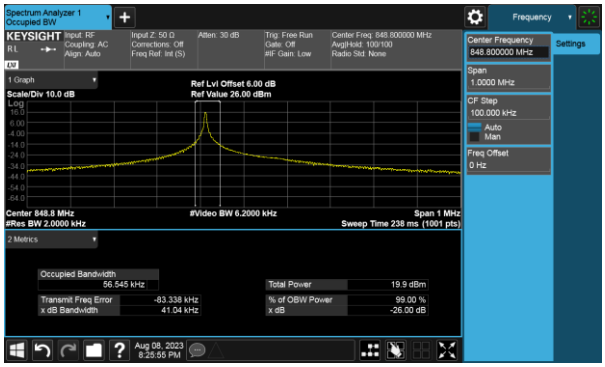
LTE Band 26 QPSK 15KHz 12@0 CH 26915

NB-IoT

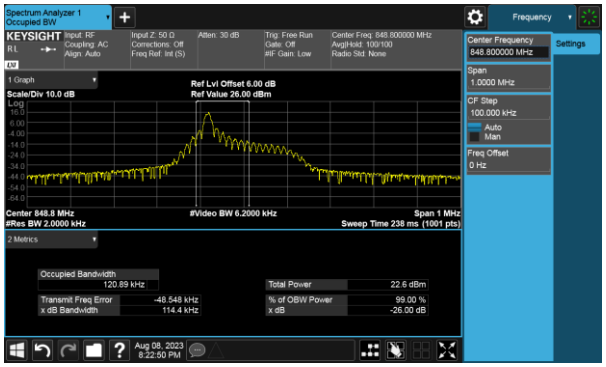
LTE Band 26 QPSK 3.75KHz 1@0 CH 27038



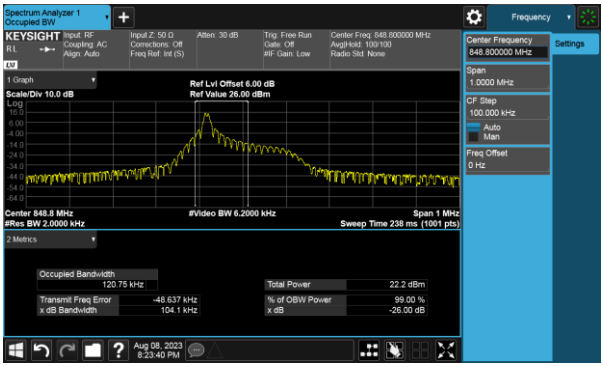
LTE Band 26 BPSK 3.75KHz 1@0 CH 27038



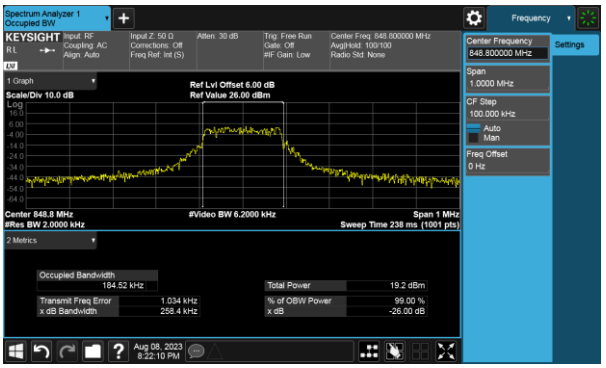
LTE Band 26 QPSK 15KHz 1@0 CH 27038



LTE Band 26 BPSK 15KHz 1@0 CH 27038



LTE Band 26 QPSK 15KHz 12@0 CH 27038



7. Peak to Average Ratio Test

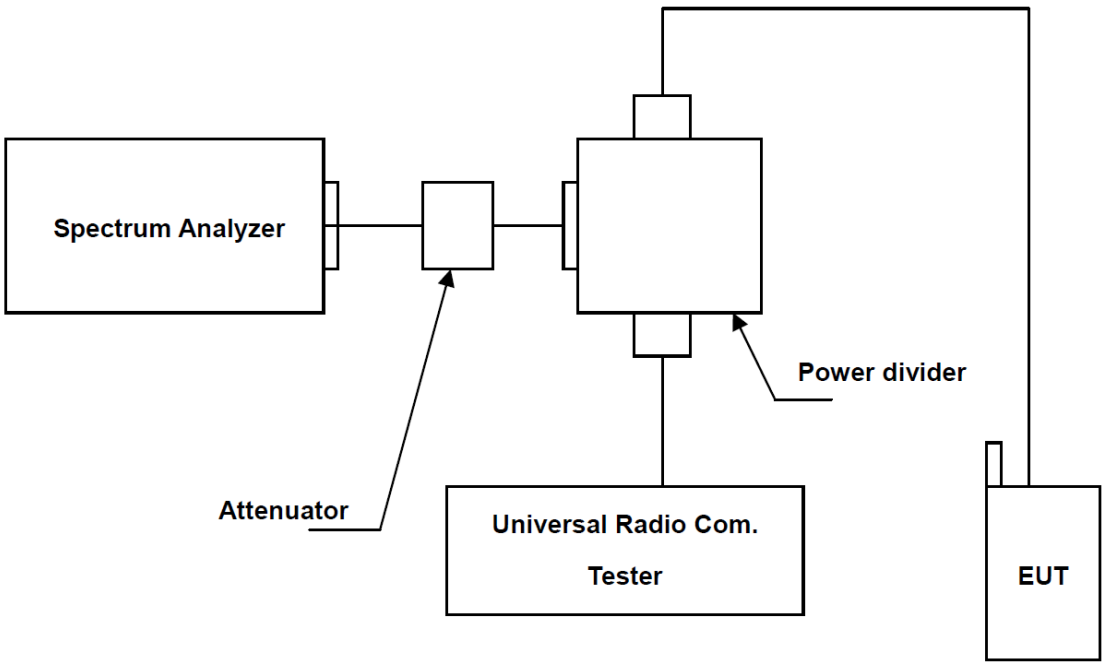
7.1. Test Limit

In measuring transmissions in this band using an average power technique, the peak to-average ratio (PAR) of the transmission may not exceed 13 dB.

7.2. Test Procedures

a. Set resolution/measurement bandwidth signal's occupied bandwidth
b. Set the number of counts to a value that stabilizes the measured CCDF curve
c. Record the maximum PAPR level associated with a probability of 0.1%

7.3. Test Setup



7.4. Test Result and Data

Cat M1

Band	Mode	Bandwidth (MHz)	RB size	Channel	Frequency (MHz)	PAR (dB)	Limit	Result
LTE Band 5	QPSK	1.4	1RB	20525	836.5	10.33	13	Pass
	16QAM			20525	836.5	11.79	13	Pass
	QPSK	3		20525	836.5	9.97	13	Pass
	16QAM			20525	836.5	10.27	13	Pass
	QPSK	5		20525	836.5	9.28	13	Pass
	16QAM			20525	836.5	9.95	13	Pass
	QPSK	10		20525	836.5	9.1	13	Pass
	16QAM			20525	836.5	10.1	13	Pass

Band	Mode	Bandwidth (MHz)	RB size	Channel	Frequency (MHz)	PAR (dB)	Limit	Result
LTE Band 26	QPSK	1.4	1RB	26915	836.5	9.91	13	Pass
	16QAM			26915	836.5	11.23	13	Pass
	QPSK	3		26915	836.5	8.89	13	Pass
	16QAM			26915	836.5	9.98	13	Pass
	QPSK	5		26915	836.5	9.78	13	Pass
	16QAM			26915	836.5	10.12	13	Pass
	QPSK	10		26915	836.5	9.26	13	Pass
	16QAM			26915	836.5	9.52	13	Pass
	QPSK	15		26915	836.5	9.5	13	Pass
	16QAM			26915	836.5	9.21	13	Pass

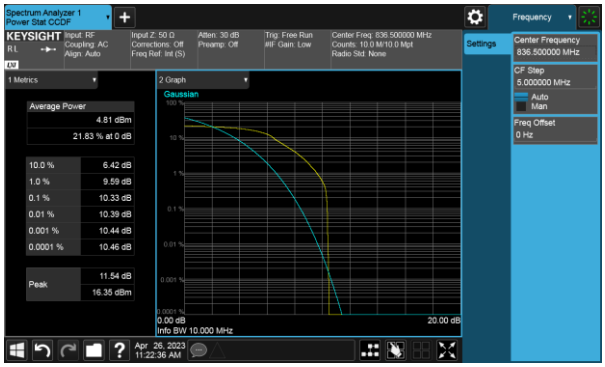
NB-IoT

Band	Mode	Sub-carrier spacing (KHz)	Opration Channel/ Frequency(MHz)	PAR (dB)	Limit	Result
LTE Band 5	BPSK	3.75	20525/836.5	5.14	13	Pass
	QPSK	3.75	20525/836.5	4.76	13	Pass
	BPSK	15	20525/836.5	8.57	13	Pass
	QPSK	15	20525/836.5	8.42	13	Pass

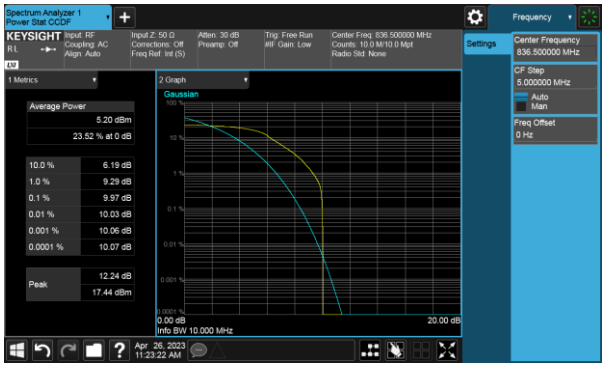
Band	Mode	Sub-carrier spacing (KHz)	Opration Channel/ Frequency(MHz)	PAR (dB)	Limit	Result
LTE Band 26	BPSK	3.75	26915/836.5	5.06	13	Pass
	QPSK	3.75	26915/836.5	4.59	13	Pass
	BPSK	15	26915/836.5	8.56	13	Pass
	QPSK	15	26915/836.5	8.76	13	Pass

Cat M1

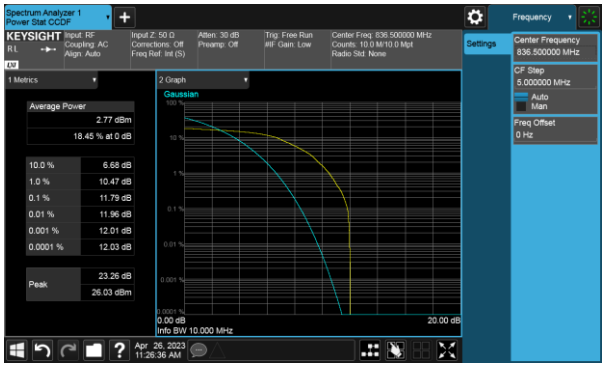
LTE Band 5 QPSK 1.4MHz, CH 20525



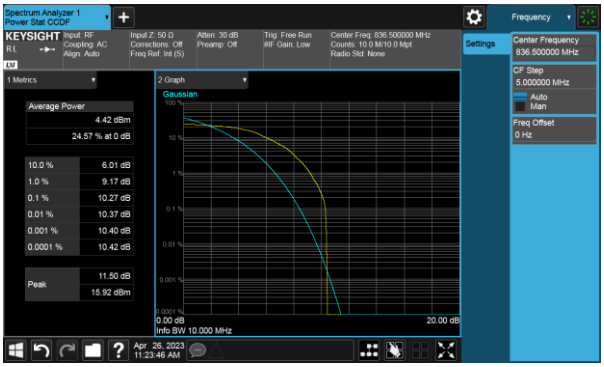
LTE Band 5 QPSK 3MHz, CH 20525



LTE Band 5 16QAM 1.4MHz, CH 20525

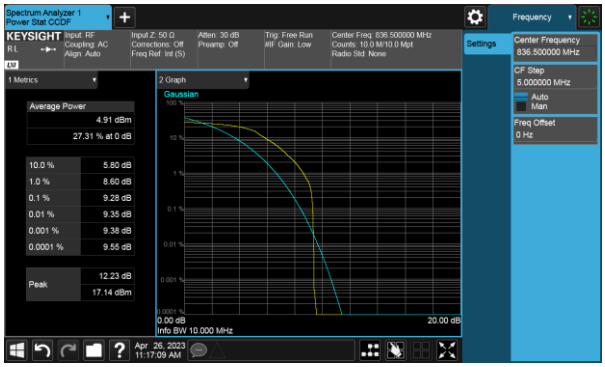


LTE Band 5 16QAM 3MHz, CH 20525

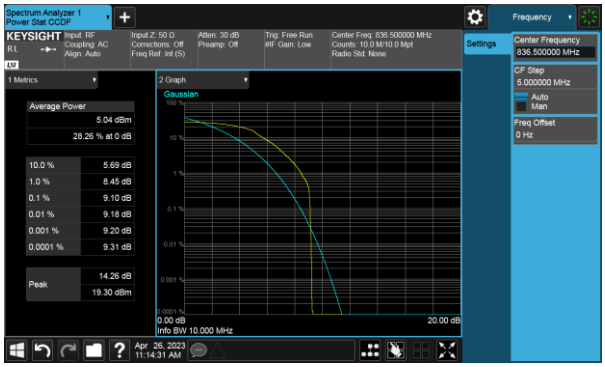


Cat M1

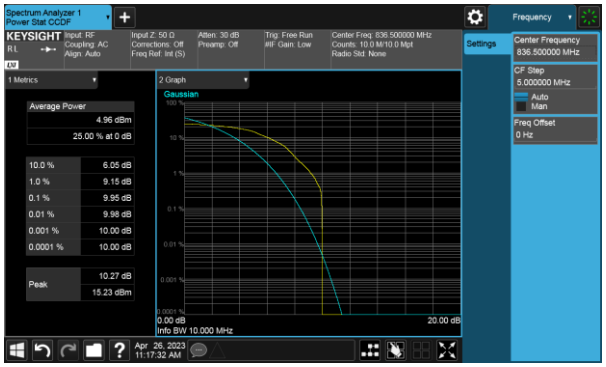
LTE Band 5 QPSK 5MHz, CH 20525



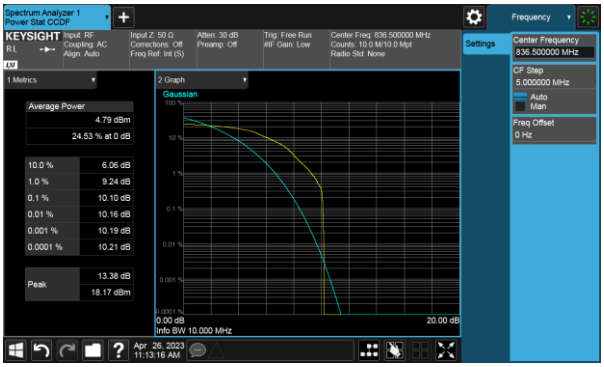
LTE Band 5 QPSK 10MHz, CH 20525



LTE Band 5 16QAM 5MHz, CH 20525

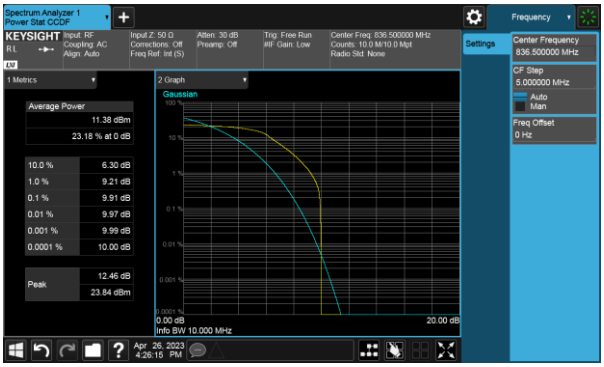


LTE Band 5 16QAM 10MHz, CH 20525

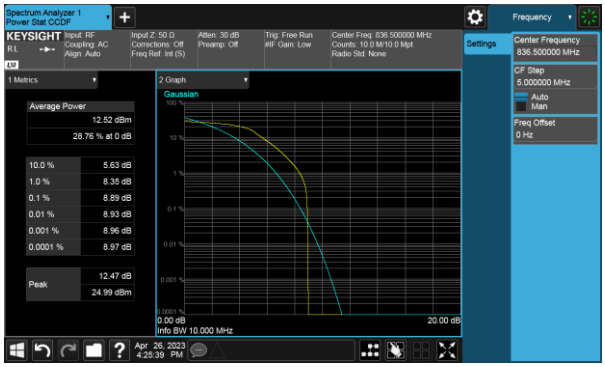


Cat M1

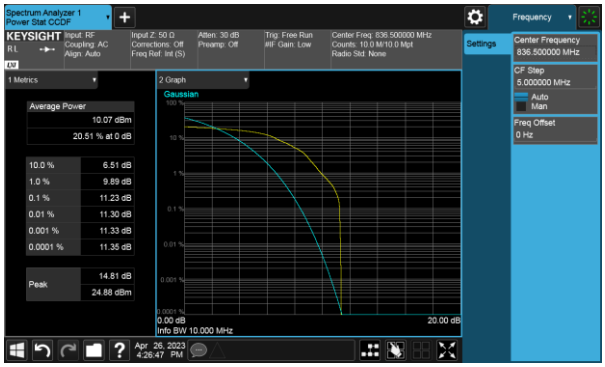
LTE Band 26 QPSK 1.4MHz, CH 26915



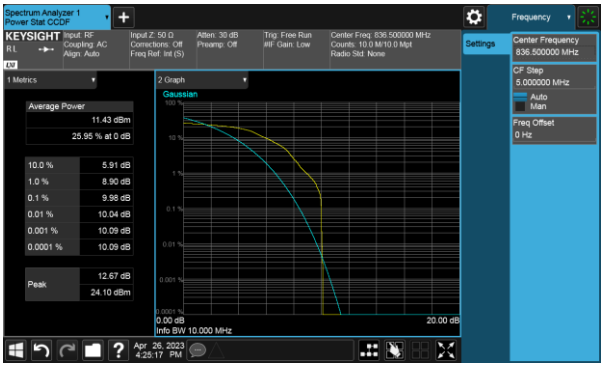
LTE Band 26 QPSK 3MHz, CH 26915



LTE Band 26 16QAM 1.4MHz, CH 26915

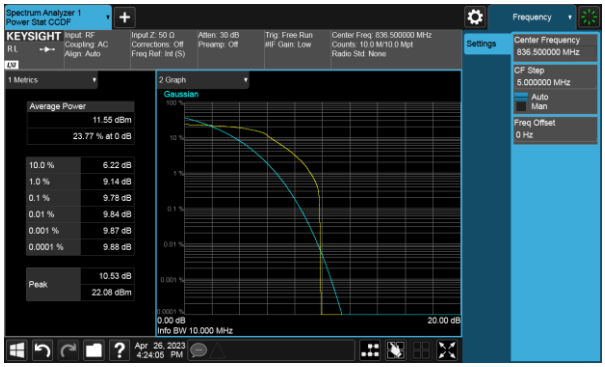


LTE Band 26 16QAM 3MHz, CH 26915

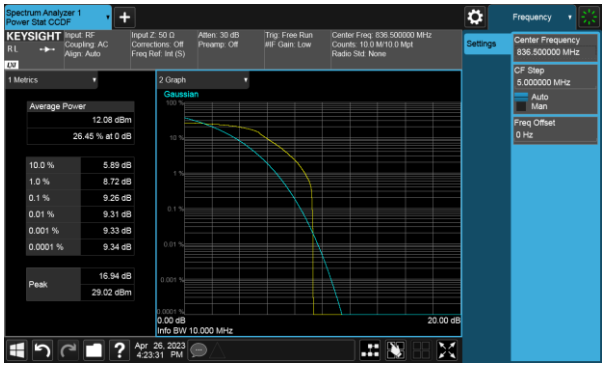


Cat M1

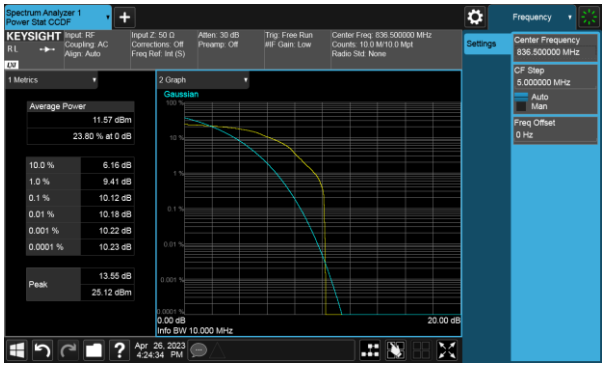
LTE Band 26 QPSK 5MHz, CH 26915



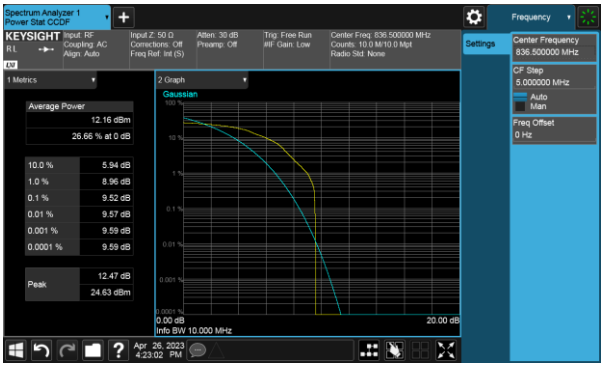
LTE Band 26 QPSK 10MHz, CH 26915



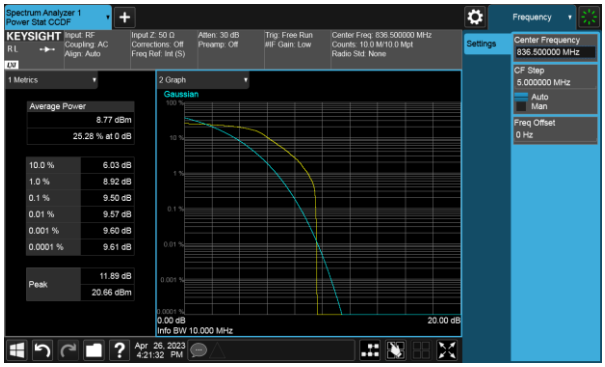
LTE Band 26 16QAM 5MHz, CH 26915



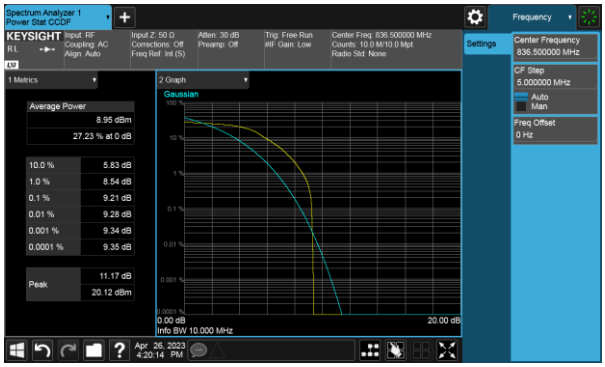
LTE Band 26 16QAM 10MHz, CH 26915



Cat M1
LTE Band 26 QPSK 15MHz, CH 26915

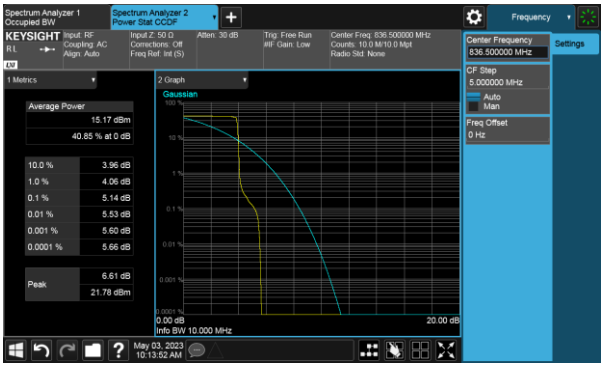


LTE Band 26 16QAM 15MHz, CH 26915

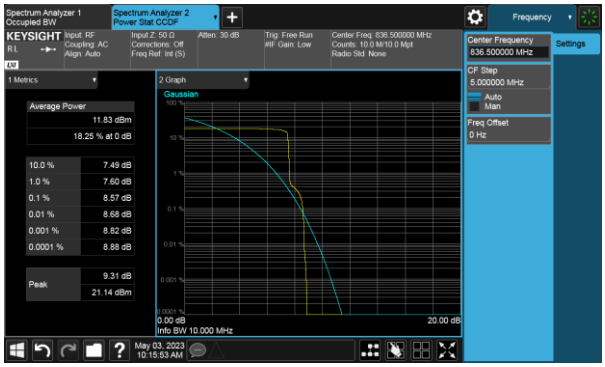


NB-IoT

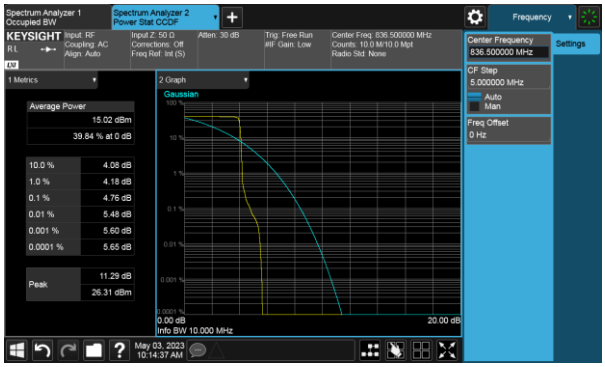
LTE Band 5 BPSK 3.75KHz, CH 20525



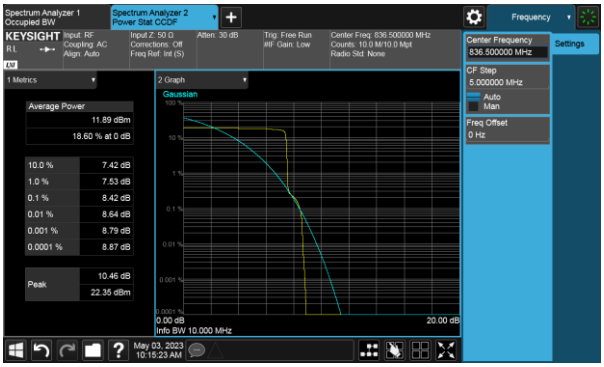
LTE Band 5 BPSK 15KHz, CH 20525



LTE Band 5 QPSK 3.75KHz, CH 20525

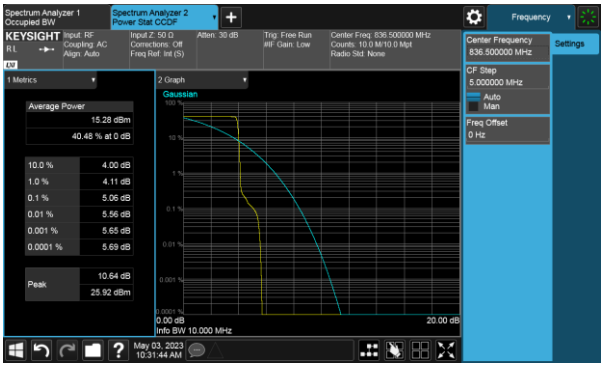


LTE Band 5 QPSK 15KHz, CH 20525

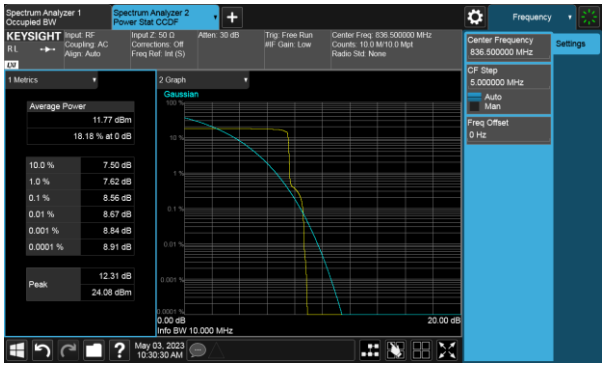


NB-IoT

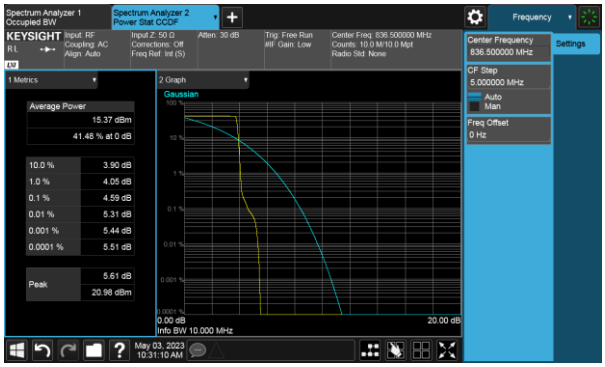
LTE Band 26 BPSK 3.75KHz, CH 26915



LTE Band 26 BPSK 15KHz, CH 26915



LTE Band 26 QPSK 3.75KHz, CH 26915



LTE Band 26 QPSK 15KHz, CH 26915