



FCC Test Report

Report Reference No. : HK2411207047-11E

FCC ID. : 2A4FR-LS4G-6-G

Compiled by

(position+printedname+signature) .. : Testing Engineer Len Liao

Supervised by

(position+printedname+signature) ... : Technical Manager Sliver Wan

Approved by

(position+printedname+signature) ... : Authorized Signatory Jason Zhou

Date of issue : Dec. 24, 2024

Testing Laboratory Name : Shenzhen HUAKE Testing Technology Co., Ltd.

Address : 1-2/F., Building B2, Junfeng Zhongcheng Zhizao Innovation Park,
Heping, Fuhai Street, Bao'an District, Shenzhen, Guangdong,
China

Applicant's name : IGEN TECH CO.,Ltd.

Address : Block F4, No. 200, Linghu Avenue, Wuxi, Jiangsu, P. R. China
225400

Test specification :

Standard : FCC CFR Title 47 Part 2, Part 22H

TRF Originator : Shenzhen HUAKE Testing Technology Co., Ltd.

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Test item description..... : Stick Logger(4G)

Trade Mark..... : N/A

Manufacturer : IGEN TECH CO.,Ltd.

Model/Type reference..... : LS4G-6-G

Series Models : LS4G-6, LS4G-6-D, LS4G-6-C, LS4G-6K-D

Modulation Type : BPSK, QPSK

Rating..... : DC 5~12V 4W

Hardware version..... : V2.0

Software version : V2.0

Result..... : PASS



TEST REPORT

Test Report No. :	HK2411207047-11E	Dec. 24, 2024
		Date of issue

Equipment under Test : Stick Logger(4G)

Model /Type : LS4G-6-G

Series Models : LS4G-6, LS4G-6-D, LS4G-6-C, LS4G-6K-D

Applicant : IGEN TECH CO.,Ltd.

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Manufacturer : IGEN TECH CO.,Ltd.

Address : Block F4, No. 200, Linghu Avenue, Wuxi, Jiangsu, P. R. China 225400

Test Result:	PASS
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The test report merely corresponds to the test sample.
It is not permitted to copy extracts of these test result without the written permission of the test laboratory.



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**** Modified History ****

Revision	Description	Issued Data	Remark
Revision 1.0	Initial Test Report Release	Dec. 24, 2024	Jason Zhou



1 Test Standards

The tests were performed according to following standards:

[FCC Part 2](#): FREQUENCY ALLOCATIONS AND RADIO TREATY MATTERS; GENERAL RULES AND REGULATIONS.

[FCC Part 22 Subpart H](#): PRIVATE LAND MOBILE RADIO SERVICES.

[ANSI/TIA-603-E-2016](#): Land Mobile FM or PM Communications Equipment Measurement and Performance Standards.

[ANSI C63.26-2015](#): IEEE/ANSI Standard for Compliance Testing of Transmitters Used in Licensed Radio Services.

[KDB971168 D01:v03r01](#): Measurement Guidance For Certification Of Licensed Digital Transmitters.



2 Summary

2.1 General Remarks

Date of receipt of test sample	:	Nov. 20, 2024
Testing commenced on	:	Nov. 20, 2024
Testing concluded on	:	Dec. 24, 2024

2.2 Product Description

Name of EUT:	Stick Logger(4G)
Model/Type reference:	LS4G-6-G
Series Models:	LS4G-6, LS4G-6-D, LS4G-6-C, LS4G-6K-D
Model Difference:	All model's the function, software and electric circuit are the same, only with model named different. Test sample model: LS4G-6-G.
Power supply:	DC 5~12V 4W
Modulation Type:	BPSK, QPSK
Antenna Type:	External Antenna
Antenna Gain:	2dBi
Operation Frequency Band:	LTE BAND 5
Operation frequency:	LTE BAND 5:824~849 MHz
LTE Release:	R8
Extreme temp. Tolerance:	-30°C to +50°C
Extreme vol. Limits:	4.25VDC to 5.75VDC (nominal: 5.0VDC)
Note: 1. For a more detailed features description, please refer to the manufacturer's specifications or the User's Manual. 2. Antenna gain Refer to the antenna specifications. 3. The cable loss data is obtained from the supplier. 4. The test results in the report only apply to the tested sample.	

2.3 Equipment under Test

Power supply system utilised

Power supply voltage	:	☐ 120V/ 60 Hz	☐ 115V/60Hz
		☐ 12 V DC	☐ 24 V DC
		☒ Other (specified in blank below)	

DC 5~12V 4W



2.4 Normal Accessory Setting

Fully charged battery was used during the test.

2.5 EUT Configuration

The following peripheral devices and interface cables were connected during the measurement:

- - supplied by the manufacturer
- - supplied by the lab

○ Power Cable	Length (m) :	/
	Shield :	/
	Detachable :	/
○ Multimeter	Manufacturer :	/
	Model No. :	/

2.6 Related Submittal(s) / Grant (s)

This submittal(s) (test report) is intended filing to comply with FCC Part 22H, Rules.

2.7 Modifications

No modifications were implemented to meet testing criteria.

2.8 General Test Conditions/Configurations

2.10.1 Test Environment

Environment Parameter	Selected Values During Tests	
Relative Humidity	Ambient	
Temperature	TN	Ambient
Voltage	VL	4.25V
	VN	5.0V
	VH	5.75V

NOTE: VL=lower extreme test voltage VN=nominal voltage
VH=upper extreme test voltage TN=normal temperature



3 Test Environment

3.1 Information of the Test Laboratory

Shenzhen HUAKE Testing Technology Co., Ltd.
Add.: 1-2/F., Building B2, Junfeng Zhongcheng Zhizao Innovation Park, Heping,
Fuhai Street, Bao'an District, Shenzhen, Guangdong, China

Testing Laboratory Authorization:

A2LA Accreditation Code is 4781.01.
FCC Designation Number is CN1229.
Canada IC CAB identifier is CN0045.
CNAS Registration Number is L9589.

3.2 Environmental Conditions

During the measurement the environmental conditions were within the listed ranges:

Temperature:	15-35 ° C
Humidity:	30-60 %
Atmospheric pressure:	950-1050mbar

3.3 Test Description

Band 5 (824~849 MHz)

Test Item	FCC Rule No.	Requirements	Verdict
Effective(Isotropic) Radiated Output Power	§2.1046, §22.913(a)(2)	FCC: ERP ≤ 7W.	Pass
Peak-Average Ratio	§24.232(d)	FCC: Limit ≤ 13dB	Pass
Modulation Characteristics	§2.1047	Digital modulation	Pass
Bandwidth	§2.1049	OBW: No limit. EBW: No limit.	Pass
Band Edges Compliance	§2.1051, §22.917	≤ -13dBm/1%*EBW, In 1MHz bands immediately outside and adjacent to The frequency block.	Pass
Spurious Emission at Antenna Terminals	§2.1051, §22.917	≤ -13dBm/1MHz, from 9kHz to 10th harmonics but outside authorized Operating frequency ranges.	Pass
Field Strength of Spurious Radiation	§2.1053, §22.917	≤ -13dBm/1MHz.	Pass
Frequency Stability	§2.1055, §22.355,	FCC: within authorized frequency block.	Pass

NOTE 1: For the verdict, the "N/A" denotes "not applicable", the "N/T" denotes "not tested".

Remark:

1. The measurement uncertainty is not included in the test result.



3.4 Equipments Used During The Test

Item	Test Equipment	Manufacturer	Model No.	Serial No.	Calibration Date	Calibration Due Date
1	L.I.S.N.	R&S	ENV216	HKE-002	2024/02/20	2025/02/19
2	L.I.S.N.	R&S	ENV216	HKE-059	2024/02/20	2025/02/19
3	EMI Test Receiver	R&S	ESR	HKE-005	2024/02/20	2025/02/19
4	Spectrum analyzer	Agilent	N9020A	HKE-117	2024/02/20	2025/02/19
5	Spectrum analyzer	R&S	FSV3044	HKE-126	2024/02/20	2025/02/19
6	Preamplifier	EMCI	EMC051845S	HKE-006	2024/02/20	2025/02/19
7	Preamplifier	Schwarzbeck	BBV 9743	HKE-016	2024/02/20	2025/02/19
8	Preamplifier	A.H. Systems	SAS-574	HKE-182	2024/02/20	2025/02/19
9	6d Attenuator	Pasternack	6db	HKE-184	2024/02/20	2025/02/19
10	EMI Test Receiver	Rohde & Schwarz	ESR-7	HKE-010	2024/02/20	2025/02/19
11	Broadband Antenna	Schwarzbeck	VULB9168	HKE-167	2024/02/21	2026/02/20
12	Loop Antenna	COM-POWER	AL-130R	HKE-014	2024/02/21	2026/02/20
13	Horn Antenna	Schwarzbeck	9120D	HKE-013	2024/02/21	2026/02/20
14	EMI Test Software	Tonscend	JS32-CE 2.5.0.6	HKE-081	/	/
15	EMI Test Software	Tonscend	JS32-RE 5.0.0	HKE-082	/	/
16	RF Automatic control unit	Tonscend	JS0806-1	HKE-096	2024/02/20	2025/02/19
17	High pass filter unit	Tonscend	JS0806-F	HKE-055	2024/02/20	2025/02/19
18	Wireless Communication Test Set	R&S	CMU200	HKE-026	2024/02/20	2025/02/19
19	Wireless Communication Test Set	R&S	CMW500	HKE-027	2024/02/20	2025/02/19
20	High-low temperature chamber	Guangke	HT-80L	HKE-118	2024/06/10	2025/06/09
21	Temperature and humidity meter	Boyang	HTC-1	HKE-075	2024/06/10	2025/06/09
22	RF Test Software	Tonscend	JS1120 Version 3.1.46	HKE-183	/	/
23	RSE Test Software	Tonscend	JS36-RSE 5.0.0	HKE-184	/	/

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TEL : +86-755 2302 9901 FAX : +86-755 2302 9901 E-mail : service@cer-mark.com

Add: 1-2F., Building B2, Junfeng Zhongcheng Zhizao Innovation Park, Heping Community, Fuhai Street, Bao'an District, Shenzhen, Guangdong, China



4 Test Conditions and Results

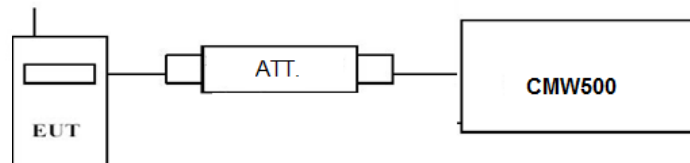
4.1 Output Power

4.1.1 Conducted Output Power

TEST APPLICABLE

During the process of testing, the EUT was controlled via R&S Digital Radio Communication tester (CMW500) to ensure max power transmission and proper modulation. This result contains output power and EIRP measurements for the EUT. In all cases, output power is within the specified limits.

TEST CONFIGURATION



TEST PROCEDURE

Conducted Power Measurement:

- Place the EUT on a bench and set it in transmitting mode.
- Connect a low loss RF cable from the antenna port to a CMW500 by an Att.
- EUT Communicate with CMW500 then selects a channel for testing.
- Add a correction factor to the display CMW500, and then test.

TEST RESULTS

compliance *

Remark:

- We measured all RB Configuration refer 3GPP TS136 521 for each Channel Bandwidth of LTE FDD Band 5;

LTE FDD Band 5				
Modulation	Sub-carrier spacing (KHz)	Tones	Frequency (MHz)	Average Power [dBm]
BPSK	3.75	1@0	824.1	22.92
		1@47	824.1	22.81
		1@0	836.5	23.18
		1@47	836.5	23.11
		1@0	848.9	23.25
		1@47	848.9	23.21
	15	1@0	824.1	22.32
		1@11	824.1	23.18
		12@0	824.1	23.10
		1@0	836.5	22.62
		1@11	836.5	22.59
		12@0	836.5	23.52
		1@0	848.9	22.75
		1@11	848.9	22.64
		12@0	848.9	23.69



QPSK	3.75	1@0	824.1	22.91
		1@47	824.1	22.85
		1@0	836.5	23.17
		1@47	836.5	23.13
		1@0	848.9	23.31
		1@47	848.9	23.31
	15	1@0	824.1	23.33
		1@11	824.1	22.28
		12@0	824.1	23.13
		1@0	836.5	23.75
		1@11	836.5	22.69
		12@0	836.5	23.54
		1@0	848.9	22.89
		1@11	848.9	22.81
		12@0	848.9	23.70



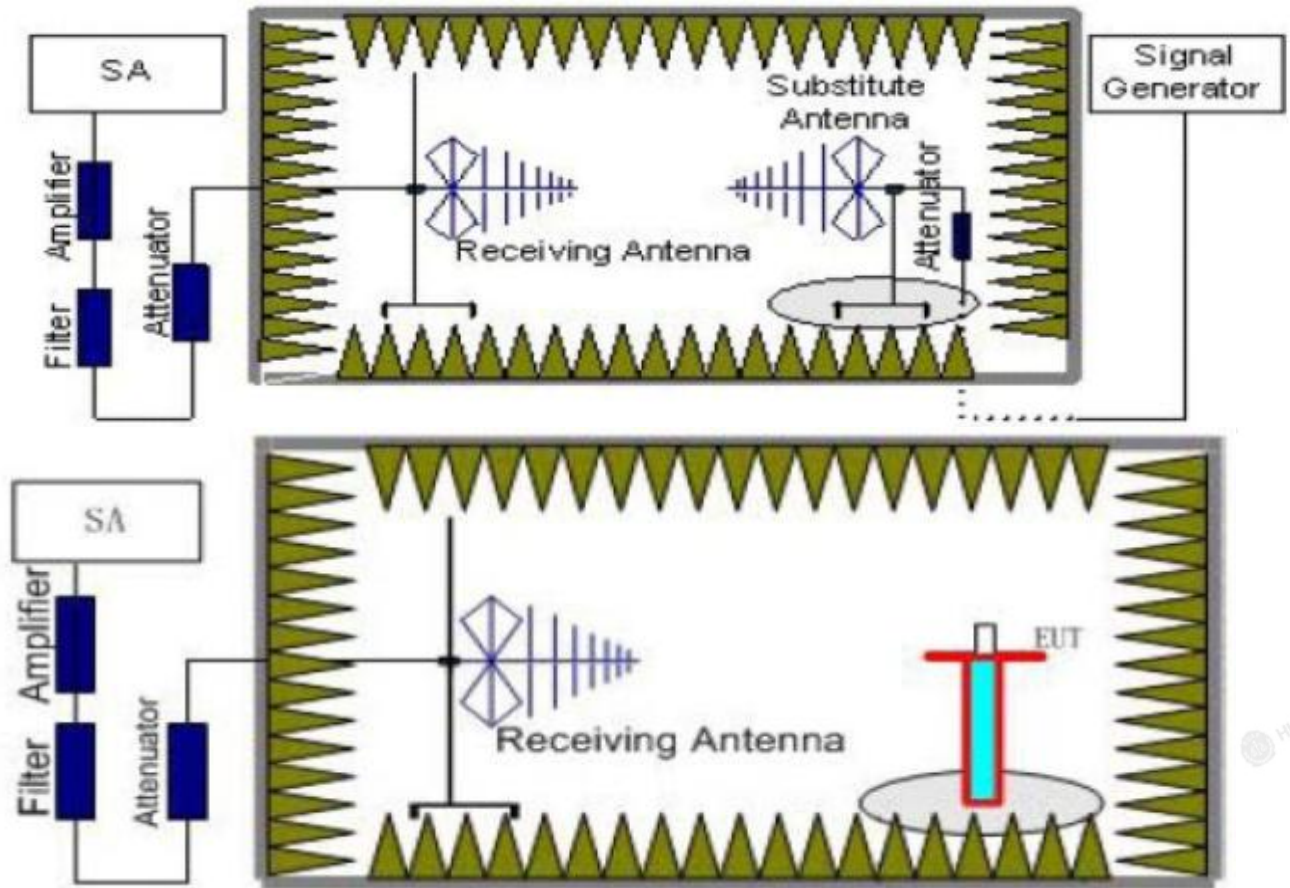
4.1.2. Radiated Output Power

LIMIT

This is the test for the maximum radiated power from the EUT.

Rule Part 22H.913(a)(2) specifies, "Mobile/portable stations are limited to 7 watts ERP.

TEST CONFIGURATION



TEST PROCEDURE

1. EUT was placed on a 0.1 meter high non-conductive stand at a 3 meter test distance from the receive antenna. A receiving antenna was placed on the antenna mast 3 meters from the EUT for emission measurements. The height of receiving antenna is 0.1m. Detected emissions were maximized at each frequency by rotating the EUT through 360° and adjusting the receiving antenna polarization. The radiated emission measurements of all transmit frequencies in three channels (High, Middle, Low) were measured with peak detector.
2. A log-periodic antenna or double-ridged waveguide horn antenna shall be substituted in place of the EUT. The log-periodic antenna will be driven by a signal generator and the level will be adjusted till the same power value on the spectrum analyzer or receiver. The level of the spurious emissions can be calculated through the level of the signal generator, cable loss, the gain of the substitution antenna and the reading of the spectrum analyzer or receiver.
3. The EUT is then put into continuously transmitting mode at its maximum power level during the test. Set Test Receiver or Spectrum RBW=1MHz, VBW=3MHz, And the maximum value of the receiver should be recorded as (P_r).
4. The EUT shall be replaced by a substitution antenna. In the chamber, a substitution antenna for the frequency band of interest is placed at the reference point of the chamber. An RF Signal source for the frequency band of interest is disconnected to the substitution antenna with a cable that has been constructed to not interfere with the radiation pattern of the antenna. A power (P_{Mea}) is applied to the input of the substitution antenna, and adjust the level of the signal generator output until the value of the receiver.



- reach the previously recorded (P_r). The power of signal source (P_{Mea}) is recorded. The test should be performed by rotating the test item and adjusting the receiving antenna polarization.
- A amplifier should be connected to the Signal Source output port. And the cable should be connect between the Amplifier and the Substitution Antenna. The cable loss (P_{cl}), the Substitution Antenna Gain (G_a) and the Amplifier Gain (P_{Ag}) should be recorded after test.

The measurement results are obtained as described below: $\text{Power(EIRP)} = P_{Mea} - P_{Ag} - P_{cl} + G_a$

We used SMF100A microware signal generator which signal level can up to 33dBm, so we not used power Amplifier for substitution test; The measurement results are amend as described below:

$\text{Power(EIRP)} = P_{Mea} - P_{cl} + G_a$

- This value is EIRP since the measurement is calibrated using an antenna of known gain (2.15 dBi) and known input power.
- ERP can be calculated from EIRP by subtracting the gain of the dipole, $\text{ERP} = \text{EIRP} - 2.15\text{dBi}$.

TEST RESULTS

Radiated Measurement:

Remark:

- We measured all RB Configuration refer 3GPP TS136 521 for each Channel Bandwidth of LTE FDD Band 5; recorded worst case for each Channel Bandwidth of LTE FDD Band 5.
- $\text{EIRP} = P_{Mea}(\text{dBm}) - P_{cl}(\text{dB}) + P_{Ag}(\text{dB}) + G_a(\text{dBi})$
- $\text{Margin} = \text{Limit} - \text{ERP}$
- We measured both Horizontal and Vertical direction, recorded worst case direction.

LTE FDDBand 5-3.75KHz-BPSK

Frequency (MHz)	P_{Mea} (dBm)	P_{cl} (dB)	G_a Antenna Gain(dB)	P_{Ag} (dB)	EIRP (dBm)	ERP (dBm)	Limit (dBm)	Margin (dB)	Polarization
824.1	-18.84	2.42	8.45	36.82	24.01	21.86	38.45	16.59	V
836.5	-17.61	3.46	8.45	36.82	24.2	22.05	38.45	16.4	V
848.9	-18.48	2.53	8.36	36.82	24.17	22.02	38.45	16.43	V

LTE FDDBand 5-15KHz-BPSK

Frequency (MHz)	P_{Mea} (dBm)	P_{cl} (dB)	G_a Antenna Gain(dB)	P_{Ag} (dB)	EIRP (dBm)	ERP (dBm)	Limit (dBm)	Margin (dB)	Polarization
824.1	-19.49	2.42	8.45	36.82	23.36	21.21	38.45	17.24	V
836.5	-17.73	3.46	8.45	36.82	24.08	21.93	38.45	16.52	V
848.9	-18.04	2.53	8.36	36.82	24.61	22.46	38.45	15.99	V

LTE FDDBand 5-3.75KHz-QPSK

Frequency (MHz)	P_{Mea} (dBm)	P_{cl} (dB)	G_a Antenna Gain(dB)	P_{Ag} (dB)	EIRP (dBm)	ERP (dBm)	Limit (dBm)	Margin (dB)	Polarization
824.1	-18.97	2.42	8.45	36.82	23.88	21.73	38.45	16.72	V
836.5	-17.16	3.46	8.45	36.82	24.65	22.5	38.45	15.95	V
848.9	-17.62	2.53	8.36	36.82	25.03	22.88	38.45	15.57	V

LTE FDDBand 5-15KHz-QPSK

Frequency (MHz)	P_{Mea} (dBm)	P_{cl} (dB)	G_a Antenna Gain(dB)	P_{Ag} (dB)	EIRP (dBm)	ERP (dBm)	Limit (dBm)	Margin (dB)	Polarization
824.1	-17.44	2.42	8.45	36.82	25.41	23.26	38.45	15.19	V
836.5	-17.31	3.46	8.45	36.82	24.5	22.35	38.45	16.1	V
848.9	-19.18	2.53	8.36	36.82	23.47	21.32	38.45	17.13	V

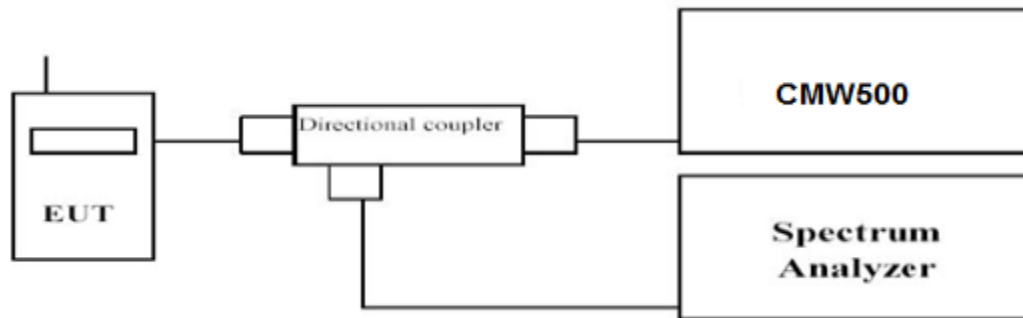


4.2 Peak-to-Average Ratio (PAR)

LIMIT

The Peak-to-Average Ratio (PAR) of the transmission may not exceed 13 dB.

TEST CONFIGURATION



TEST PROCEDURE

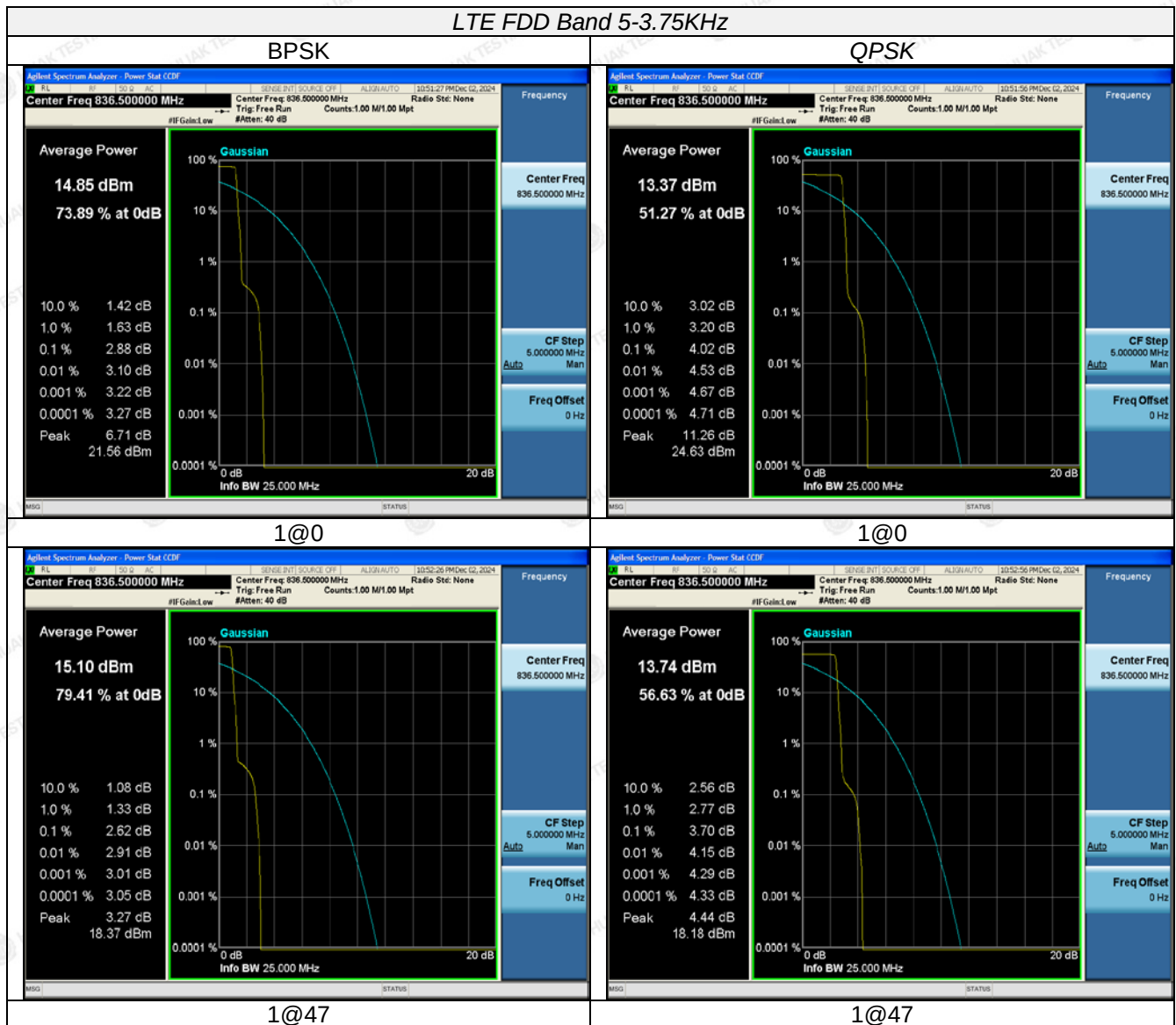
1. Refer to instrument's analyzer instruction manual for details on how to use the power statistics/CCDF function;
2. Set resolution/measurement bandwidth $\geq$ signal's occupied bandwidth;
3. Set the number of counts to a value that stabilizes the measured CCDF curve;
4. Set the measurement interval as follows:
 - 1). for continuous transmissions, set to 1 ms;
 - 2). for burst transmissions, employ an external trigger that is synchronized with the EUT burst timing sequence, or use the internal burst trigger with a trigger level that allows the burst to stabilize and set the measurement interval to a time that is less than or equal to the burst duration.
5. Record the maximum PAPR level associated with a probability of 0.1%.

TEST RESULTS

Remark:

1. We measured all RB Configuration refer 3GPP TS136 521 for each Channel Bandwidth of LTE FDD Band 5; recorded worst case for each Channel Bandwidth of LTE FDD Band 5.

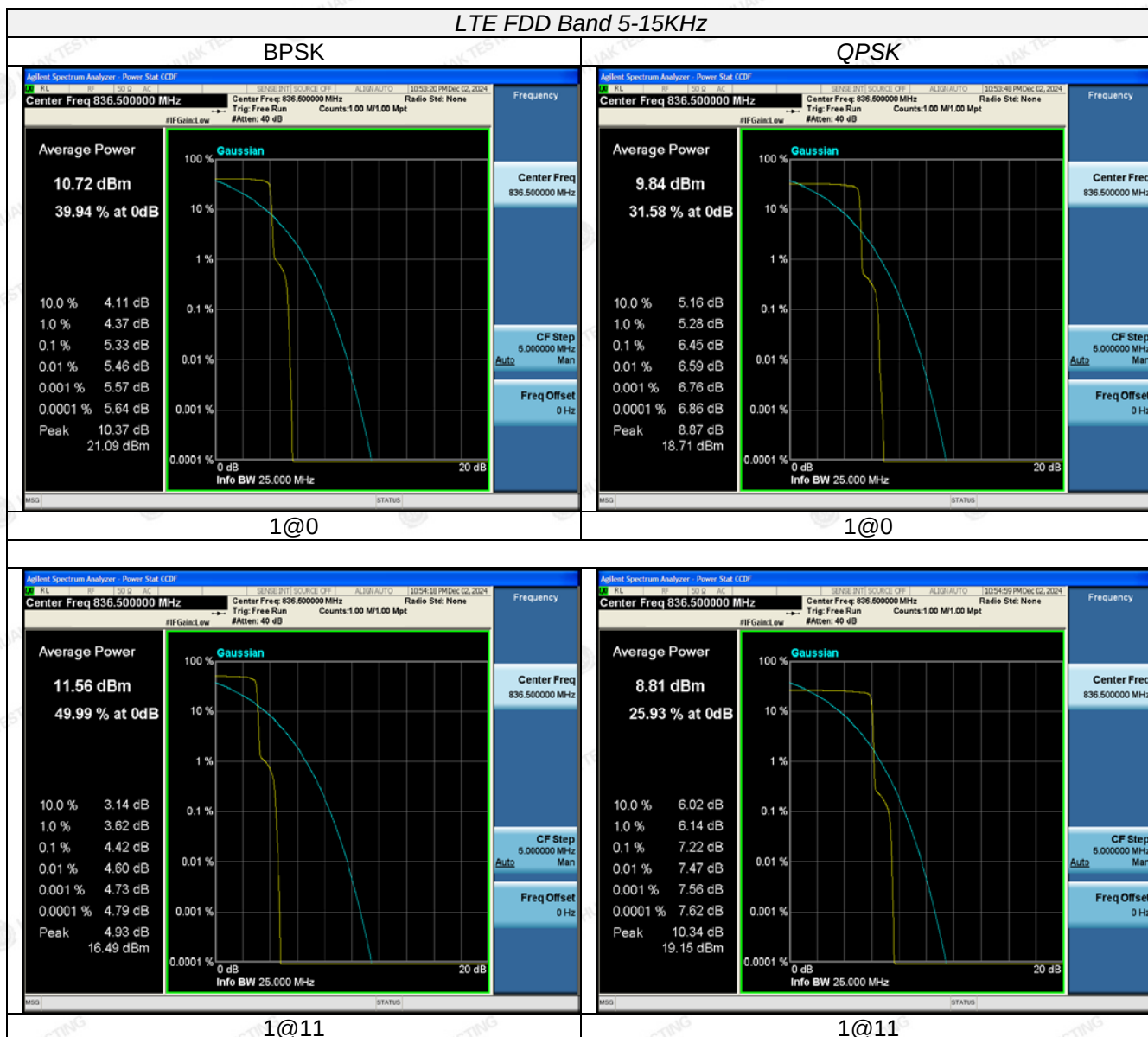
LTE FDD Band 5				
Frequency (MHz)	Sub-carrier spacing (KHz)	Tones	Modulation PAPR (dB)	
			BPSK	QPSK
836.5	3.75	1@0	2.88	4.02
		1@47	2.62	3.70
836.5	15	1@0	5.33	6.45
		1@11	4.42	7.22



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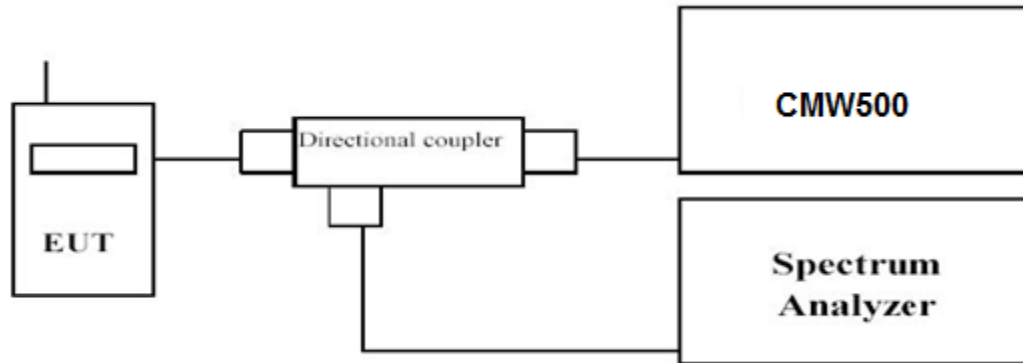


4.3 Occupied Bandwidth and Emission Bandwidth

LIMIT

N/A

TEST CONFIGURATION



TEST PROCEDURE

The transmitter output was connected to a calibrated coaxial cable and coupler, the other end of which was connected to a spectrum analyzer. The occupied bandwidth was measured with the spectrum analyzer at low, middle and high channel in each band. The -26dBc Emission bandwidth was also measured and recorded. Set RBW was set to about 1% of emission BW, VBW ≥ 3 times RBW.

-26dBc display line was placed on the screen (or 99% bandwidth), the occupied bandwidth is the delta frequency between the two points where the display line intersects the signal trace.

TEST RESULTS

Remark:

1. We were tested all RB Configuration refer 3GPP TS136 521 for each Channel Bandwidth of LTE FDD Band 5; recorded worst case for each Channel Bandwidth of LTE FDD Band 5.

LTE FDD Band 5						
Sub-carrier spacing (KHz)	Tones	Frequency (MHz)	-26dBc Emission bandwidth (KHz)		99% Occupied bandwidth (KHz)	
			BPSK	QPSK	BPSK	QPSK
3.75	1@0	824.1	51.22	50.98	68.998	80.336
	1@0	836.5	51.51	50.93	68.261	80.280
	1@0	848.9	47.53	48.76	66.970	78.102
15	1@0	824.1	106.0	116.1	126.18	126.46
	1@0	836.5	105.8	117.5	126.47	128.05
	1@0	848.9	105.6	117.2	123.76	122.65
	12@0	824.1	248.6	248.1	186.13	184.32
	12@0	836.5	239.9	248.9	185.05	188.23
	12@0	848.9	240.1	249.1	185.14	189.22



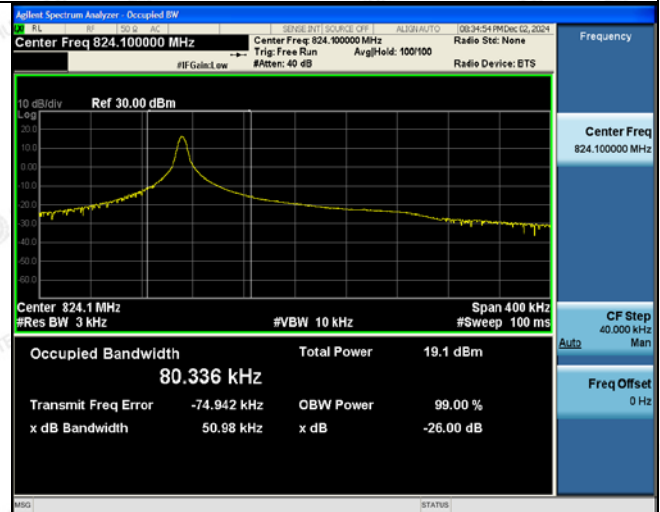
LTE FDD Band 5-3.75KHz

BPSK



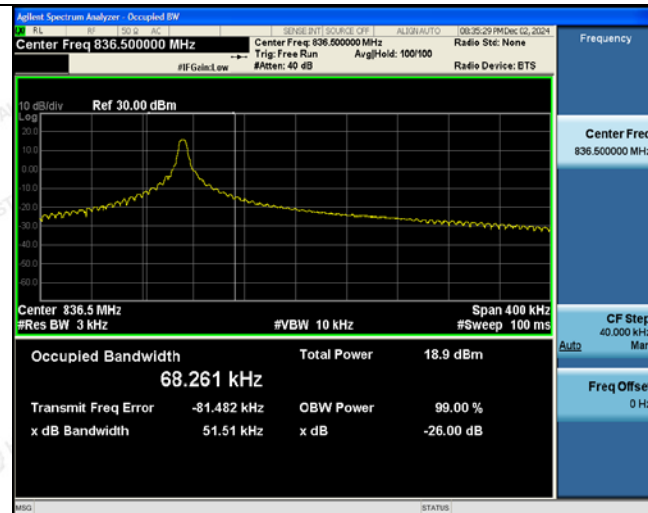
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QPSK

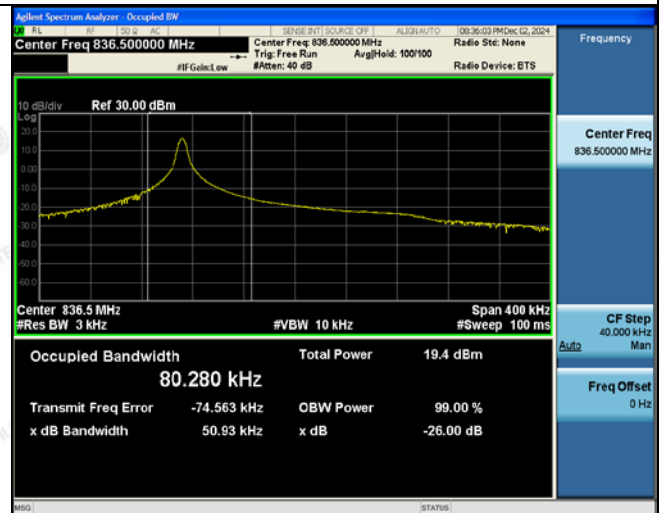


1@0

Low Channel

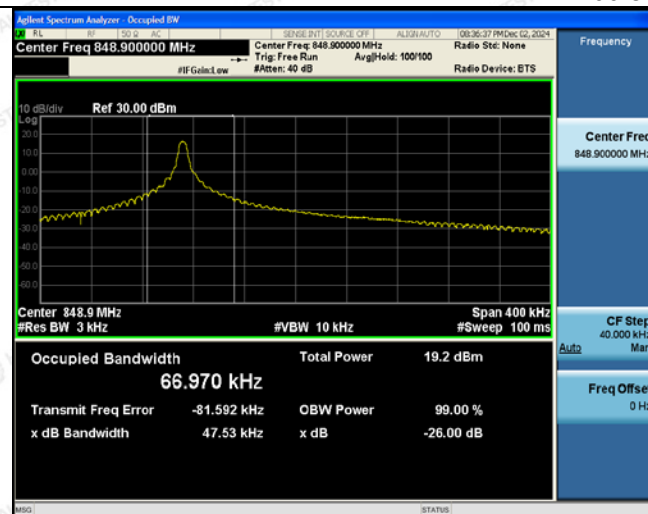


1@0

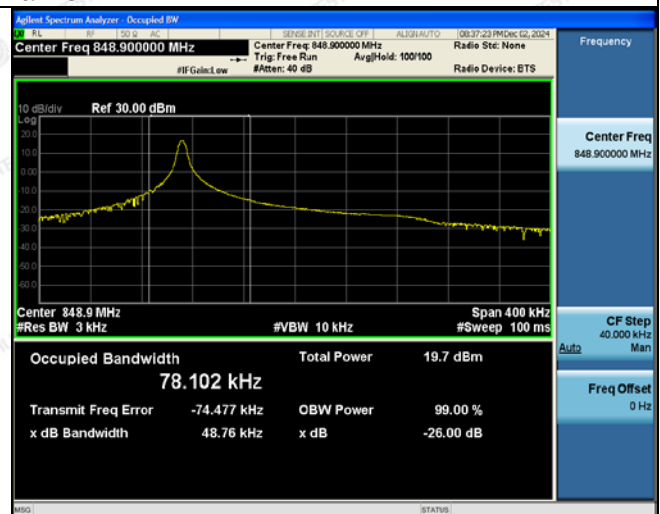


1@0

Middle Channel

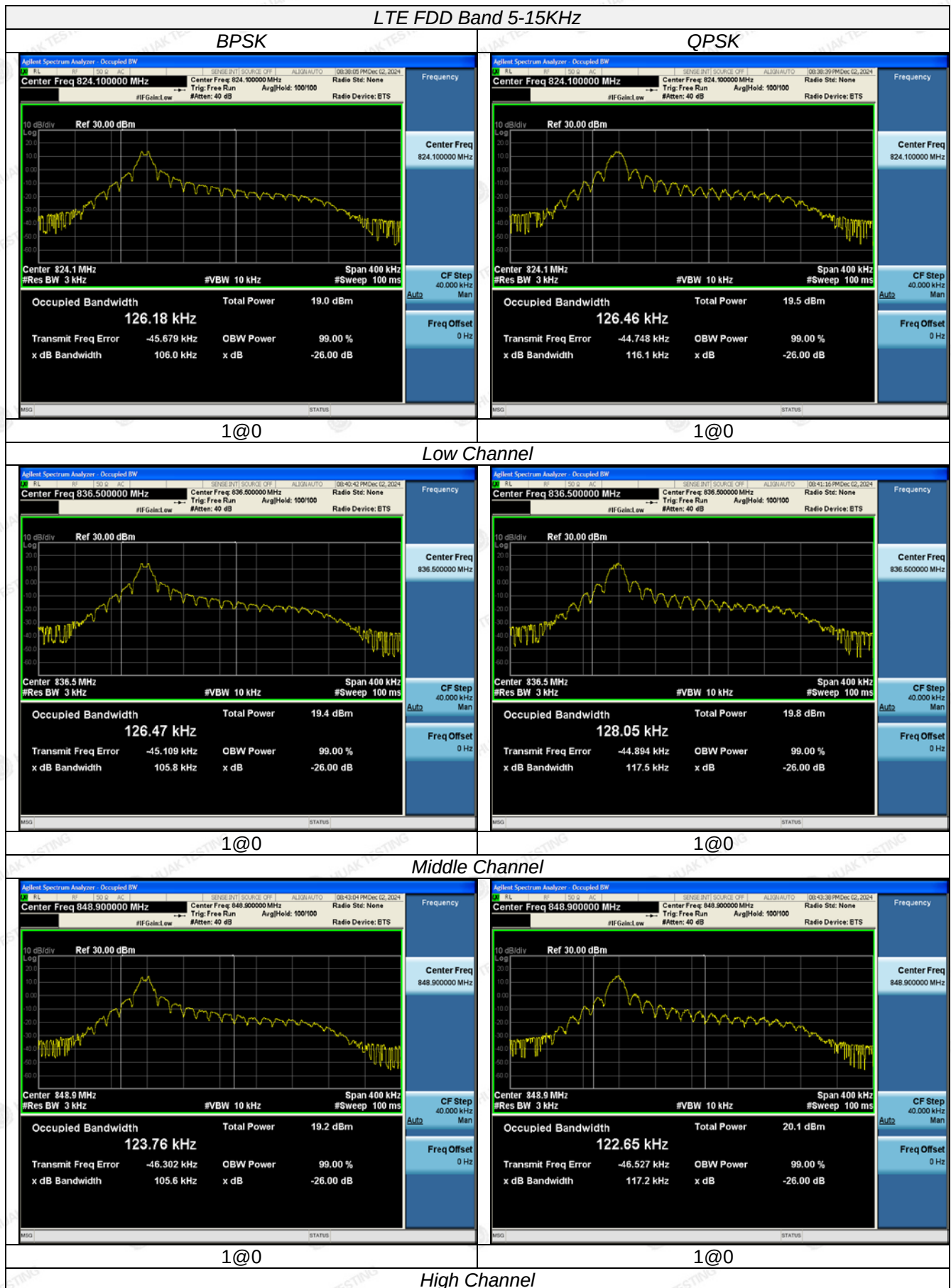


1@0



1@0

High Channel



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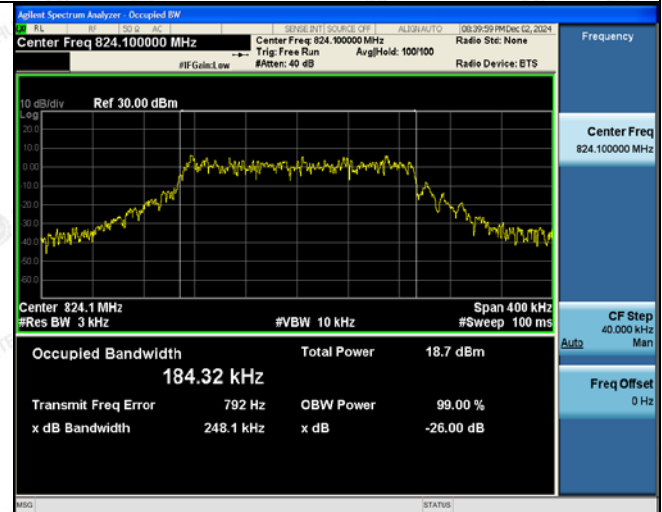
LTE FDD Band 5-15KHz

BPSK



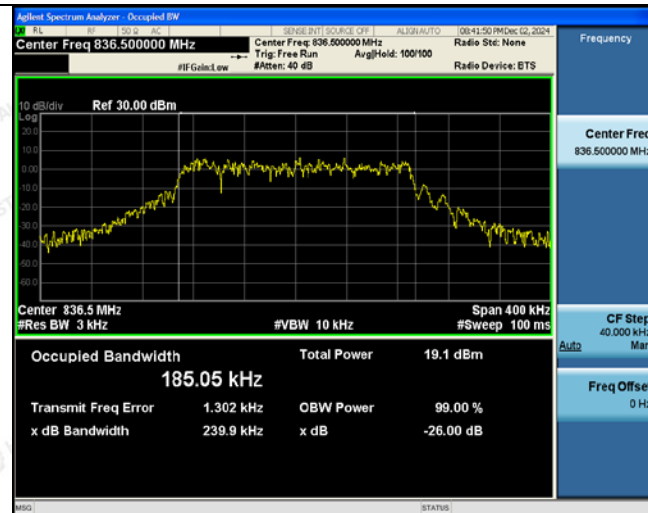
12@0

QPSK

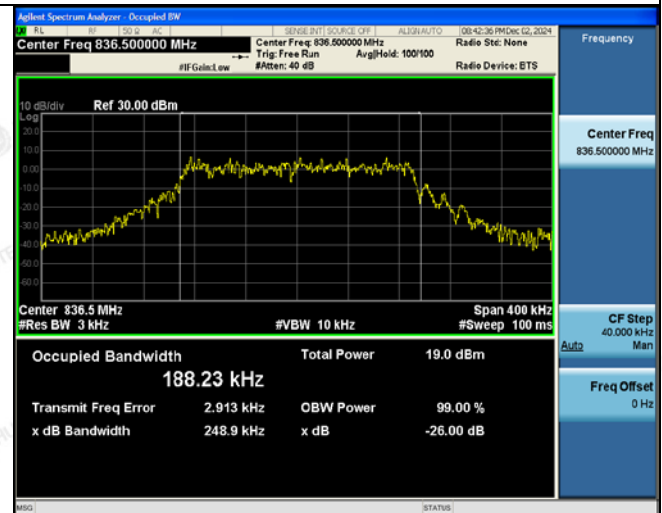


12@0

Low Channel

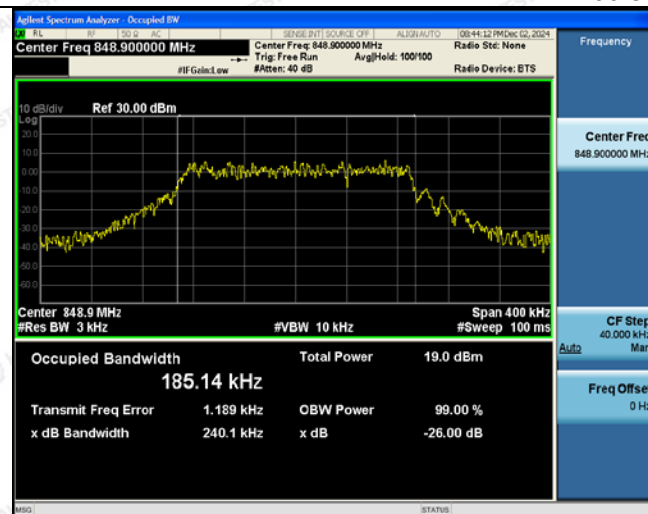


12@0

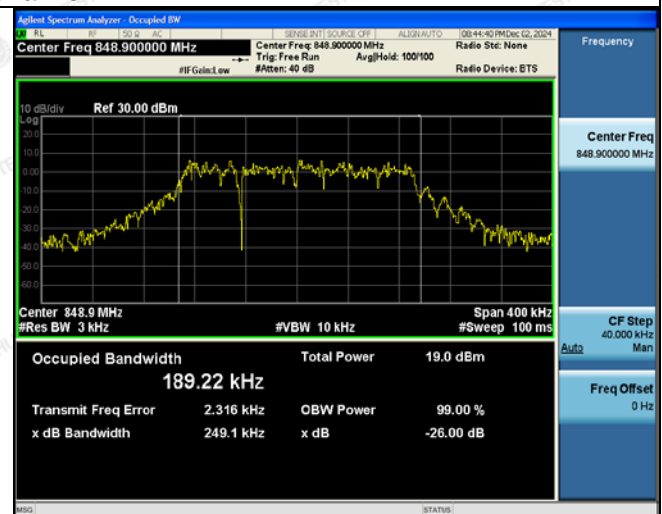


12@0

Middle Channel



12@0



12@0

High Channel

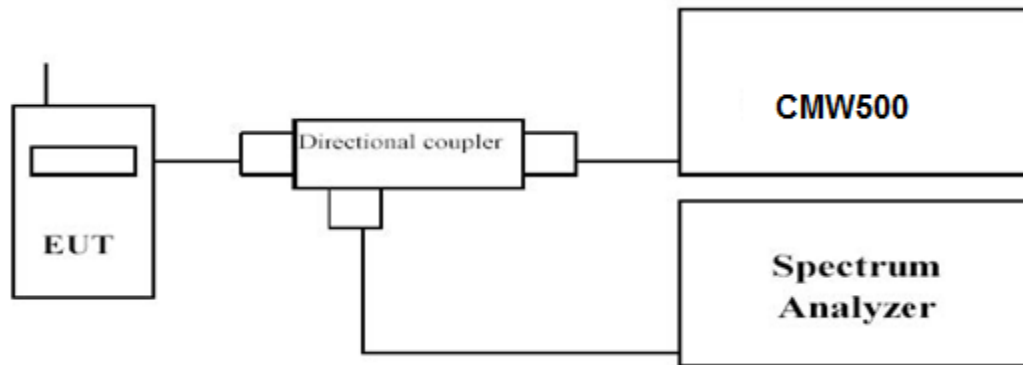


4.4 Band Edge Compliance

LIMIT

Per FCC §22.917 the power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least $43 + 10\log(P)$ dB.

TEST CONFIGURATION



TEST PROCEDURE

1. The transmitter output port was connected to base station.
2. The RF output of EUT was connected to the power meter by RF cable and attenuator, the path loss was compensated to the results for each measurement.
3. Set EUT at maximum power through base station.
4. Select lowest and highest channels for each band and different modulation.
5. Measure Band edge using RMS (Average) detector by spectrum.

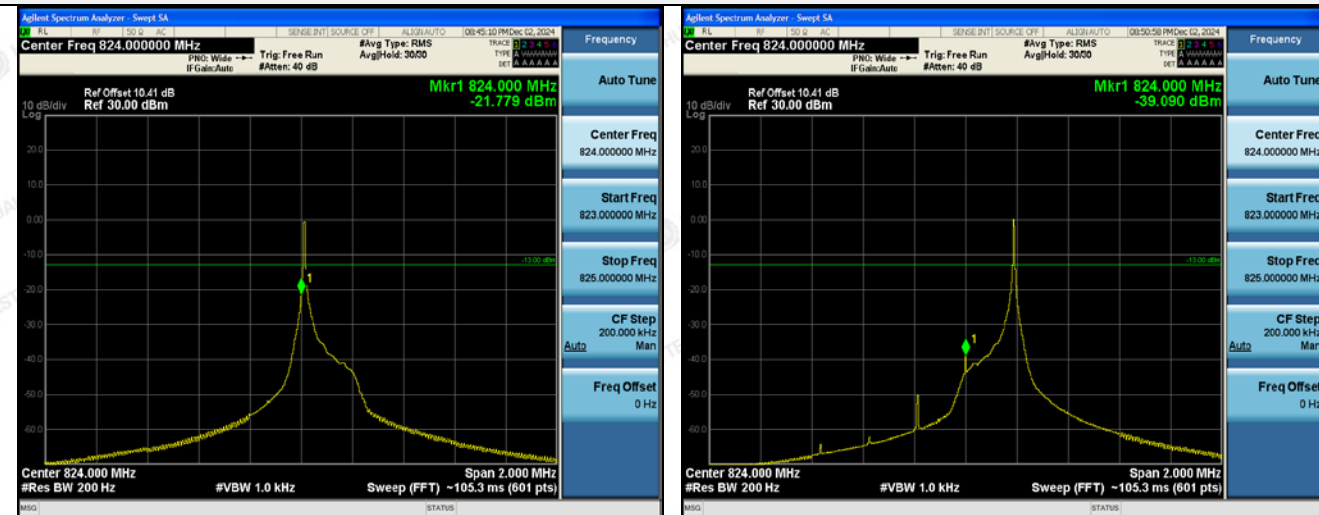
TEST RESULTS

Remark:

1. *We were tested all RB Configuration refer 3GPP TS136 521 for each Channel Bandwidth of LTE FDD Band 5; recorded worst case for each Channel Bandwidth of LTE FDD Band 5.*



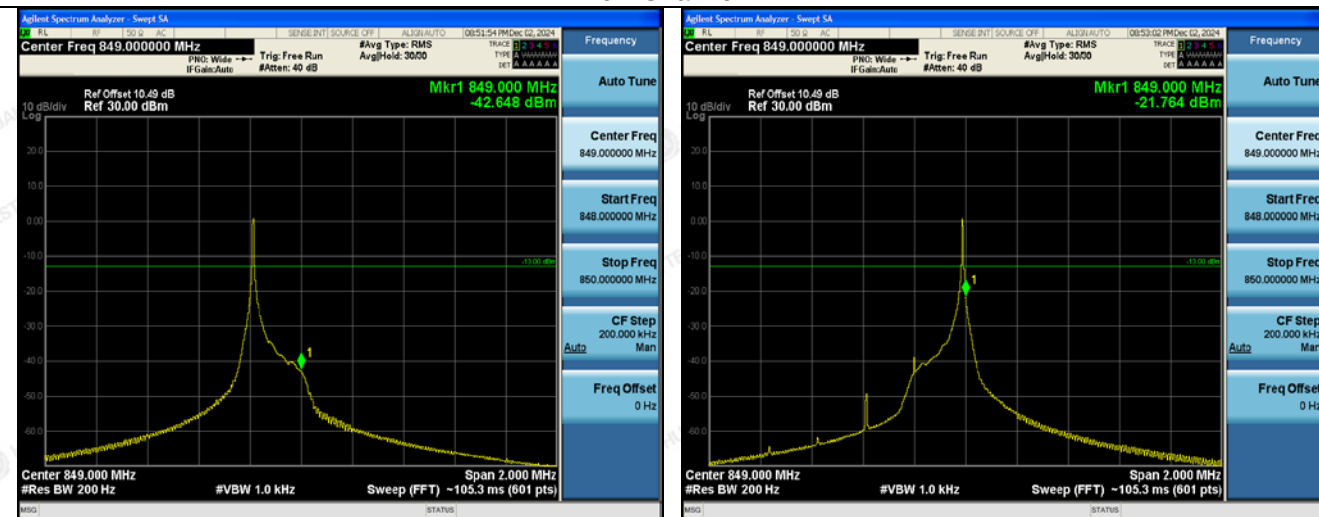
LTE FDD Band 5-BPSK- 3.75KHz



1@0

1@47

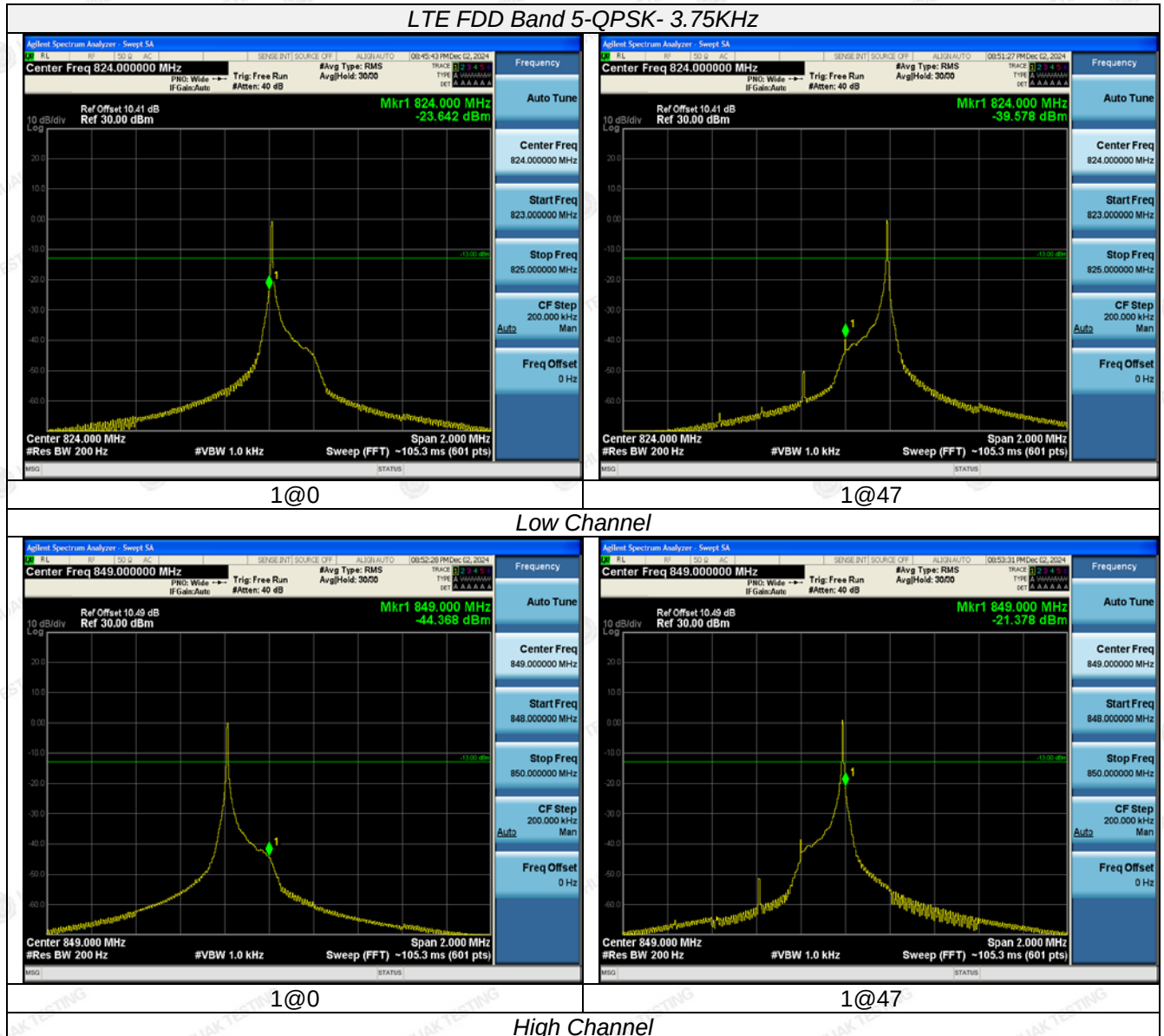
Low Channel



1@0

1@47

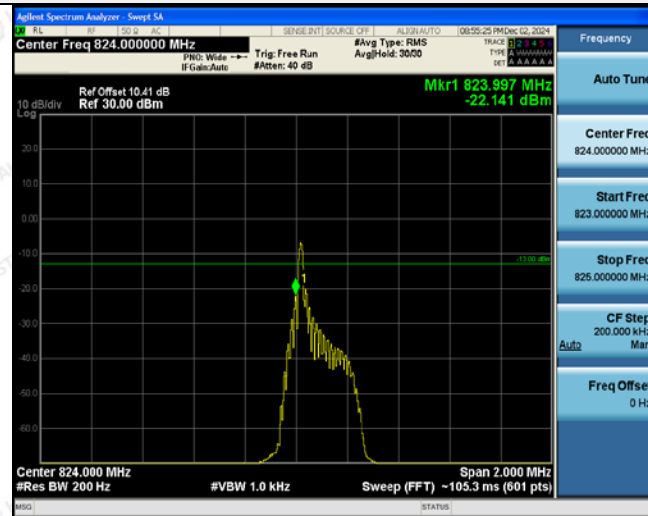
High Channel





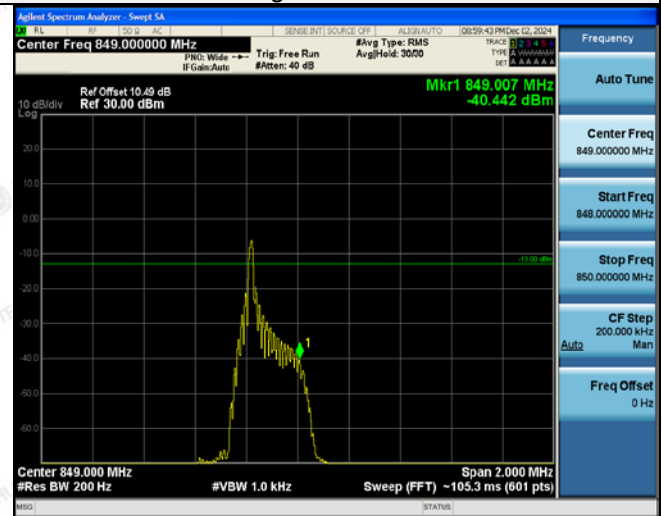
LTE FDD Band 5-BPSK- 15KHz

Low Channel

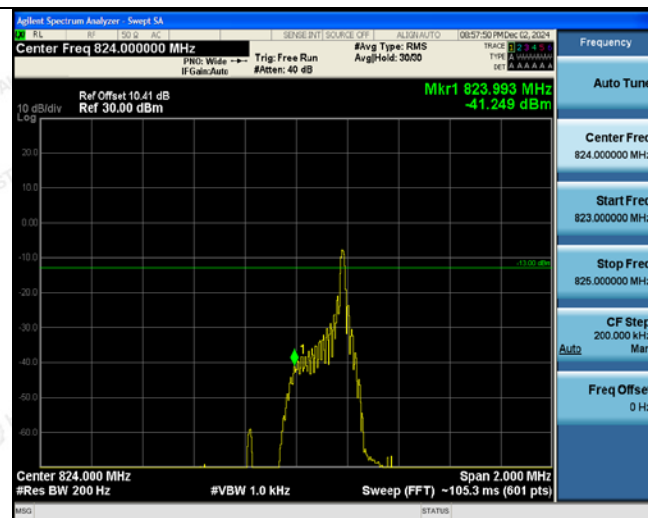


1@0

High Channel



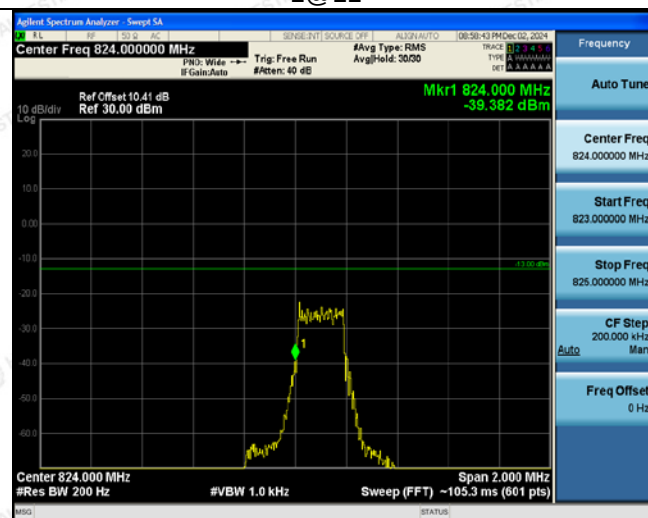
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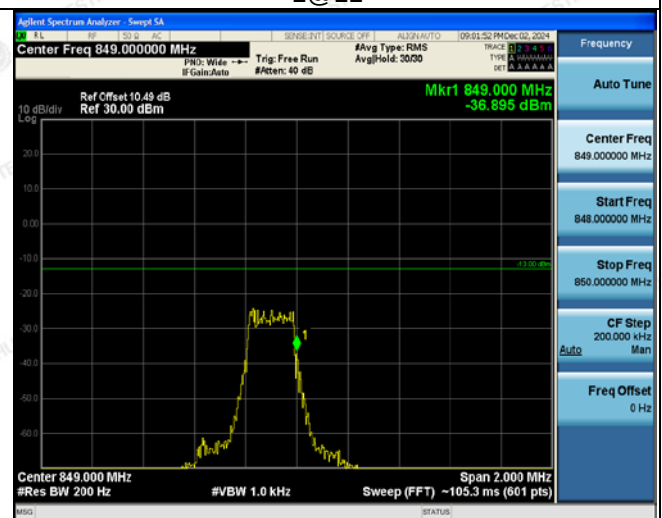
1@11



1@11



12@0



12@0



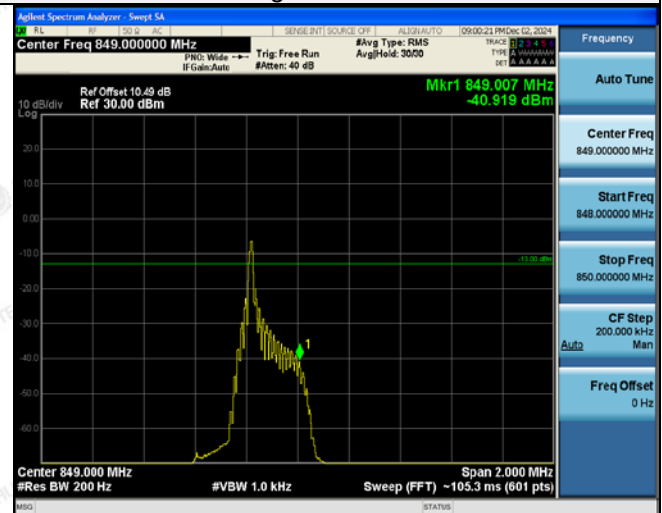
LTE FDD Band 5-QPSK- 15KHz

Low Channel

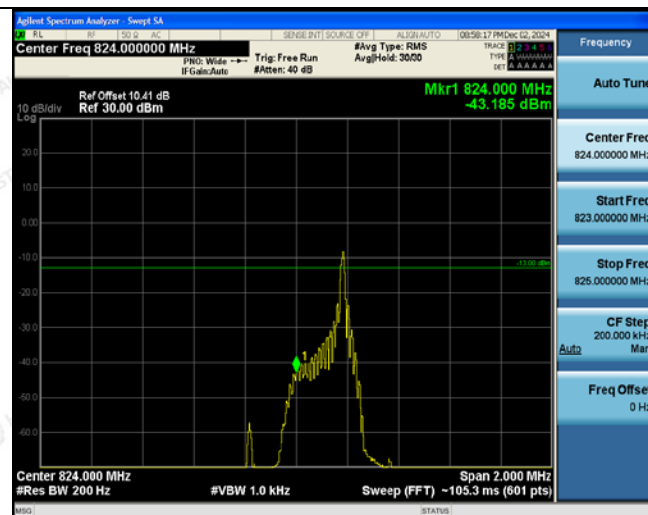


1@0

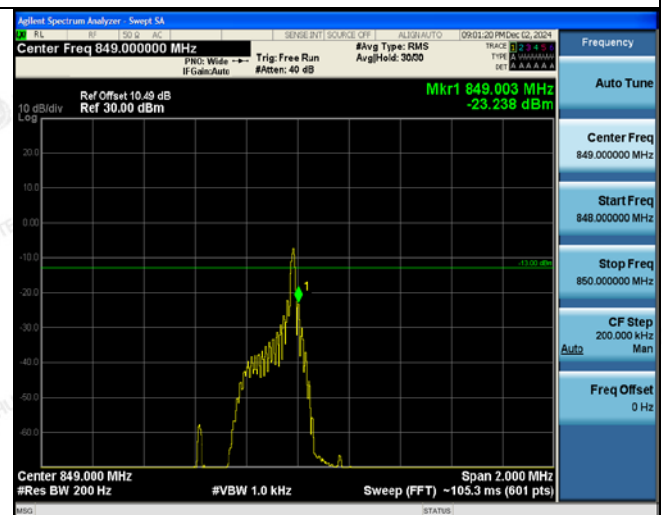
High Channel



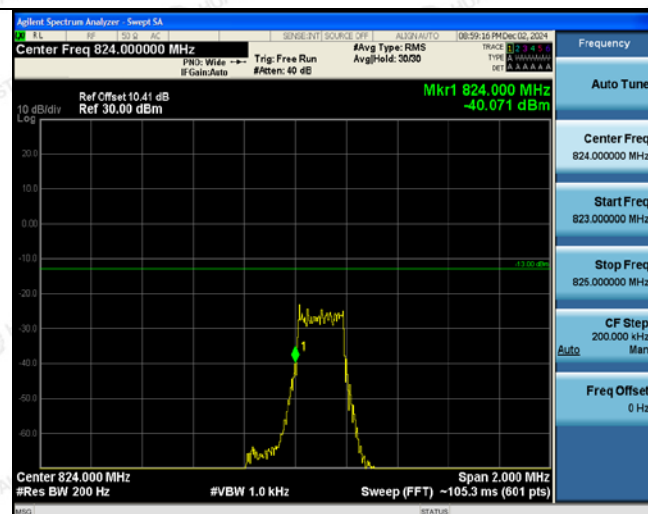
1@0



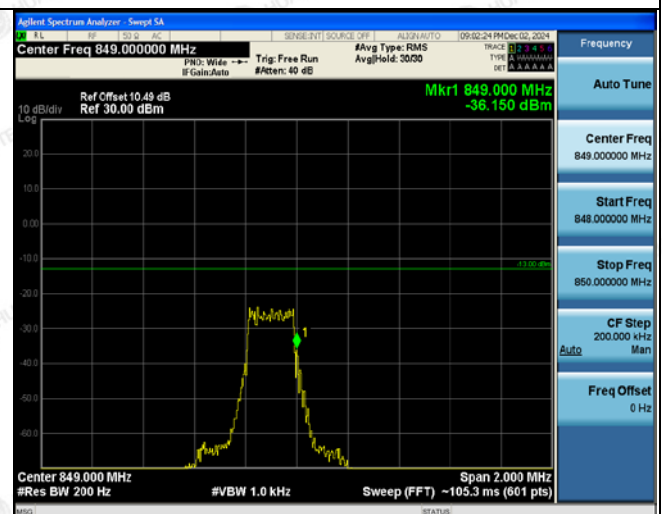
1@11



1@11



12@0



12@0

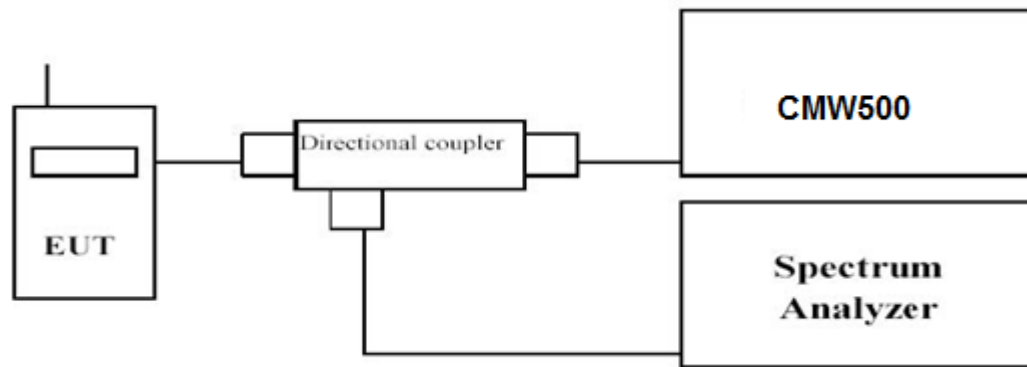


4.5 Spurious Emission on Antenna Port

LIMIT

Per FCC §22.917, the power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least $43 + 10\log(P)$ dB.

TEST CONFIGURATION



TEST PROCEDURE

The EUT was setup according to EIA/TIA 603D.

- Place the EUT on a bench and set it in transmitting mode.
- Connect a low loss RF cable from the antenna port to a spectrum analyzer and CMW500 by a Directional Coupler.
- EUT Communicate with CMW500, then select a channel for testing.
- Add a correction factor to the display of spectrum, and then test.
- The resolution bandwidth of the spectrum analyzer was set sufficient scans were taken to show the out of band Emission if any up to 10^{th} harmonic.
- Please refer to following tables for test antenna conducted emissions.

Working Frequency	Sub range (GHz)	RBW	VBW	Sweep time (s)
LTE FDD Band 5	0.01~26.5	1 MHz	3 MHz	Auto

TEST RESULTS

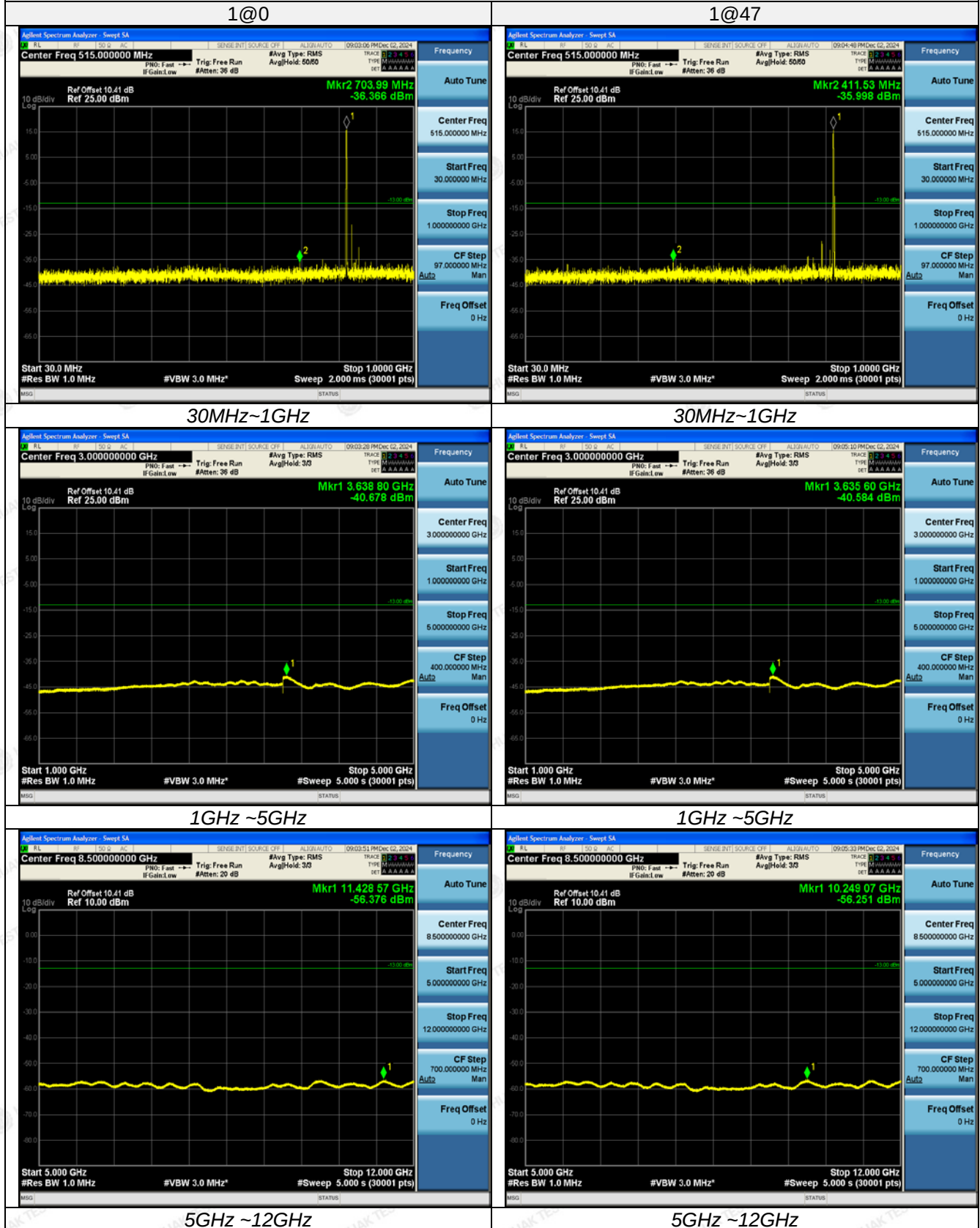
Remark:

- We were tested all RB Configuration refer 3GPP TS136 521 for each Channel Bandwidth of LTE FDD Band 5; recorded worst case at the QPSK Mode for each Channel Bandwidth of LTE FDD Band 5.



LTE FDD Band 5-QPSK-3.75KHz

Low Channel



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