

# FCC Test Report

## (PART 90S)

**Report No.:** RF181126C15-3

**FCC ID:** N7NHL78

**Test Model:** HL7800

**Received Date:** Nov. 26, 2018

**Test Date:** Jul. 03 ~ Jul. 06, 2018 (Cat-M1)  
Dec. 06, 2018 ~ May 17, 2019 (NB-IoT)

**Issued Date:** May 30, 2019

**Applicant:** Sierra Wireless Inc.

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**Issued By:** Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch

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( R.O.C )

**Test Location:** No. 19, Hwa Ya 2nd Rd, Wen Hwa Vil, Kwei Shan Dist., Taoyuan City  
33383, Taiwan (R.O.C)

**FCC Registration /  
Designation Number:** 788550 / TW0003



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### Release Control Record

Issue No.	Description	Date Issued
RF181126C15-3	Original Release	May 30, 2019

## 1 Certificate of Conformity

**Product:** Embedded Module

**Brand:** AirPrime

**Test Model:** HL7800


**Sample Status:** Engineering Sample


**Applicant:** Sierra Wireless Inc.

**Test Date:** Jul. 03 ~ Jul. 06, 2018 (Cat-M1)  
Dec. 06, 2018 ~ May 17, 2019 (NB-IoT)

**Standards:** FCC Part 90, Subpart I, S, R  
FCC Part 2

The above equipment has been tested by **Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch**, and found compliance with the requirement of the above standards. The test record, data evaluation & Equipment Under Test (EUT) configurations represented herein are true and accurate accounts of the measurements of the sample's RF characteristics under the conditions specified in this report.

**Prepared by :** , **Date:** May 30, 2019  
Ivonne Wu / Supervisor

**Approved by :** , **Date:** May 30, 2019  
Dylan Chiou / Project Engineer

## 2 Summary of Test Results

Applied Standard: FCC Part 90 & Part 2 (LTE 14)			
FCC Clause	Test Item	Result	Remarks
2.1046 90.542 (a)(7)	Effective Radiated Power	Pass	Meet the requirement of limit.
2.1047	Modulation Characteristics	Pass	Meet the requirement.
2.1055 90.539 (e)	Frequency Stability	Pass	Meet the requirement of limit.
2.1049	Occupied Bandwidth	Pass	Meet the requirement of limit.
90.210 (n)	Emission Masks	Pass	Meet the requirement of limit.
2.1051 90.543 (e)(2)(3)	Band Edge Measurements	Pass	Meet the requirement of limit.
2.1051 90.543 (e)(3)	Conducted Spurious Emissions	Pass	Meet the requirement of limit.
2.1053 90.543 (e)(f)	Radiated Spurious Emissions	Pass	Meet the requirement of limit. Minimum passing margin is -12.69 dB at 1586.00 MHz.

Applied Standard: FCC Part 90 & Part 2 (LTE 26)			
FCC Clause	Test Item	Result	Remarks
2.1046 90.635 (b)	Effective Radiated Power	Pass	Meet the requirement of limit.
2.1047	Modulation Characteristics	Pass	Meet the requirement.
2.1055 90.213	Frequency Stability	Pass	Meet the requirement of limit.
2.1049 90.209	Occupied Bandwidth	Pass	Meet the requirement of limit.
2.1051 90.210	Emission Masks	Pass	Meet the requirement of limit.
2.1051 90.691	Conducted Spurious Emissions	Pass	Meet the requirement of limit.
2.1053 90.691	Radiated Spurious Emissions	Pass	Meet the requirement of limit. Minimum passing margin is -35.72 dB at 2457.00 MHz.

Note: Determining compliance based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty.

## 2.1 Measurement Uncertainty

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2:

Measurement	Frequency	Expanded Uncertainty (k=2) ( $\pm$ )
Radiated Emissions up to 1 GHz	9 kHz ~ 30 MHz	3.04 dB
	30 MHz ~ 200 MHz	2.93 dB
	200 MHz ~ 1000 MHz	2.95 dB
Radiated Emissions above 1 GHz	1 GHz ~ 18 GHz	2.26 dB
	18 GHz ~ 40 GHz	1.94 dB

## 2.2 Test Site and Instruments

Test Date: Jul. 03 ~ Jul. 06, 2018

Description & Manufacturer	Model No.	Serial No.	Date of Calibration	Due Date of Calibration
Test Receiver Agilent	N9038A	MY51210203	Mar. 16, 2018	Mar. 15, 2019
Spectrum Analyzer Agilent	N9010A	MY52220314	Nov. 24, 2017	Nov. 23, 2018
Spectrum Analyzer ROHDE & SCHWARZ	FSU43	101261	Jan. 11, 2018	Jan. 10, 2019
Double Ridge Guide Horn Antenna EMCO	3115	5619	Nov. 30, 2017	Nov. 29, 2018
BILOG Antenna SCHWARZBECK	VULB 9168	9168-153	Dec. 06, 2017	Dec. 05, 2018
Radio Communication Analyzer Anritsu	MT8820C	6201300640	Aug. 16, 2017	Aug. 15, 2019
Preamplifier EMCI	EMC 012645	980115	Oct. 20, 2017	Oct. 19, 2018
Preamplifier EMCI	EMC 184045	980116	Oct. 20, 2017	Oct. 19, 2018
Preamplifier EMCI	EMC 330H	980112	Oct. 13, 2017	Oct. 12, 2018
Power Meter Anritsu	ML2495A	1012010	Aug. 15, 2017	Aug. 14, 2018
Power Sensor Anritsu	MA2411B	1315050	Aug. 15, 2017	Aug. 14, 2018
RF Coaxial Cable HUBER+SUHNNER	EMC104-SM-SM-800 0&3000	140811+170717	Oct. 20, 2017	Oct. 19, 2018
RF Coaxial Cable HUBER+SUHNNER	SUCOFLEX 104	EMC104-SM-SM- 1000(140807)	Oct. 20, 2017	Oct. 19, 2018
RF Coaxial Cable Worken	8D-FB	Cable-Ch10-01	Oct. 20, 2017	Oct. 19, 2018
Software BV ADT	E3 6.120103	NA	NA	NA
Antenna Tower MF	MFA-440H	NA	NA	NA
Turn Table MF	MFT-201SS	NA	NA	NA
Antenna Tower & Turn Table Controller MF	MF-7802	NA	NA	NA
DC Power Supply Topward	33010D	807748	Oct. 25, 2016	Oct. 24, 2018
STANDARD TEMPERATURE & HUMIDITY CHAMBER TERCHY	MHU-225AU	920842	Jun. 01, 2018	May 30, 2019

Note: 1. The calibration interval of the above test instruments is 12 / 24 months and the calibrations are traceable to NML/ROC and NIST/USA.

2. The test was performed in HwaYa Chamber 10.



**Test Date: Dec. 06, 2018 ~ May 17, 2019**

Description & Manufacturer	Model No.	Serial No.	Date of Calibration	Due Date of Calibration
Test Receiver Agilent	N9038A	MY52260177	Aug. 20, 2018	Aug. 19, 2019
Spectrum Analyzer Keysight	N9010A	MY56070348	Sep. 06, 2018	Sep. 05, 2019
Spectrum Analyzer ROHDE & SCHWARZ	FSW26	102023	Oct. 11, 2018	Oct. 10, 2019
HORN Antenna SCHWARZBECK	BBHA 9120 D	9120D-969	Nov. 25, 2018	Nov. 24, 2019
BILOG Antenna SCHWARZBECK	VULB9168	9168-472	Nov. 23, 2018	Nov. 22, 2019
Double Ridge Guide Horn Antenna EMCO	3115	5619	Nov. 25, 2018	Nov. 24, 2019
BILOG Antenna SCHWARZBECK	VULB 9168	9168-153	Nov. 23, 2018	Nov. 22, 2019
Fixed Attenuator Mini-Circuits	MDCS18N-10	MDCS18N-10-01	Apr. 16, 2018	Apr. 15, 2019
			Apr. 15, 2019	Apr. 14, 2020
MXG Vector signal generator Agilent	N5182B	MY53050430	Nov. 19, 2018	Nov. 18, 2019
Preamplifier EMCI	EMC 012645	980115	Oct. 12, 2018	Oct. 11, 2019
Preamplifier EMCI	EMC 330H	980112	Oct. 12, 2018	Oct. 11, 2019
RF Coaxial Cable HUBER+SUHNNER	EMC104-SM-SM-800 0&3000	140811+170717	Oct. 12, 2018	Oct. 11, 2019
RF Coaxial Cable HUBER+SUHNNER	SUCOFLEX 104	EMC104-SM-SM-1 000(140807)	Oct. 12, 2018	Oct. 11, 2019
RF Coaxial Cable WOKEN	8D-FB	Cable-Ch10-01	Oct. 12, 2018	Oct. 11, 2019
Boresight Antenna Fixture	FBA-01	FBA-SIP01	NA	NA
Software BV ADT	E3 6.120103	NA	NA	NA
Antenna Tower MF	MFA-440H	NA	NA	NA
Turn Table MF	MFT-201SS	NA	NA	NA
Antenna Tower & Turn Table Controller MF	MF-7802	NA	NA	NA
Radio Communication Analyzer ANRITSU	MT8821C	6201664741	Jul. 04, 2018	Jul. 03, 2019
Temperature & Humidity Chamber	GTH-120-40-CP-AR	MAA1306-019	Sep. 05, 2018	Sep. 04, 2019
DC Power Supply Topward	33010D	807748	NA	NA

Note: 1. The calibration interval of the above test instruments is 12 / 24 months and the calibrations are traceable to NML/ROC and NIST/USA.

2. The test was performed in HwaYa Chamber 10.

### 3 General Information

#### 3.1 General Description of EUT

<b>Product</b>	Embedded Module		
<b>Brand</b>	AirPrime		
<b>Test Model</b>	HL7800		
<b>Status of EUT</b>	Engineering Sample		
<b>Power Supply Rating</b>	5.0 Vdc (host equipment)		
<b>Modulation Type</b>	<b>Cat-M1</b>	QPSK, 16QAM	
	<b>NB-IoT</b>	BPSK, QPSK	
<b>Frequency Range</b>	<b>Cat-M1</b>	LTE Band 14 (Channel Bandwidth: 5 MHz)	790.5 ~ 795.5 MHz
		LTE Band 14 (Channel Bandwidth: 10 MHz)	793 MHz
		LTE Band 26 (Channel Bandwidth: 1.4 MHz)	814.7 ~ 823.3 MHz
		LTE Band 26 (Channel Bandwidth: 3 MHz)	815.5 ~ 822.5 MHz
		LTE Band 26 (Channel Bandwidth: 5 MHz)	816.5 ~ 821.5 MHz
		LTE Band 26 (Channel Bandwidth: 10 MHz)	819 MHz
	<b>NB-IoT</b>	LTE Band 14	790.1 ~ 795.9 MHz
		LTE Band 26	814.1 ~ 823.9 MHz
<b>Emission Designator</b>	<b>Cat-M1</b>	LTE Band 14 (Channel Bandwidth: 5 MHz)	1M08G7D
		LTE Band 14 (Channel Bandwidth: 10 MHz)	1M09G7D
		LTE Band 26 (Channel Bandwidth: 1.4 MHz)	1M09G7D
		LTE Band 26 (Channel Bandwidth: 3 MHz)	1M08G7D
		LTE Band 26 (Channel Bandwidth: 5 MHz)	1M08G7D
		LTE Band 26 (Channel Bandwidth: 10 MHz)	1M09G7D
	<b>NB-IoT</b>	LTE Band 14	1K92G7D
		LTE Band 26	1K96G7D
<b>Max. ERP Power</b>	<b>Cat-M1</b>	LTE Band 14 (Channel Bandwidth: 5 MHz)	262.42 mW
		LTE Band 14 (Channel Bandwidth: 10 MHz)	229.09 mW
		LTE Band 26 (Channel Bandwidth: 1.4 MHz)	254.68 mW
		LTE Band 26 (Channel Bandwidth: 3 MHz)	240.44 mW
		LTE Band 26 (Channel Bandwidth: 5 MHz)	228.03 mW
		LTE Band 26 (Channel Bandwidth: 10 MHz)	199.53 mW
	<b>NB-IoT</b>	LTE Band 14	146.89 mW (BPSK) 177.83 mW (QPSK)
		LTE Band 26	139.96 mW (BPSK) 169.82 mW (QPSK)
<b>Antenna Type</b>	Dipole Antenna with 2 dBi gain		
<b>Accessory Device</b>	Refer to Note as below		
<b>Data Cable Supplied</b>	Refer to Note as below		

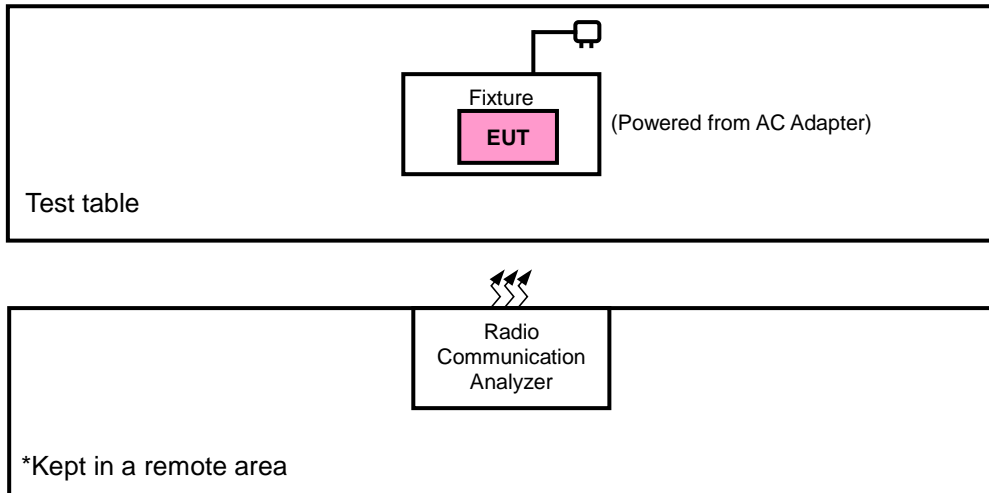
Note:

1. This report is issued as a supplementary report to BV CPS report no.: RF180425C07A-3. The difference compared with original report is enabled NB-IoT function via software (as listed below). All the test items for NB-IoT were tested. For Cat-M1, only the worst case of radiated spurious emissions for LTE B4/B14 and effective radiated power for LTE B12/B25 in the original report were verified, and the other test data from the original report are kept in this report.

Report No.	FCC ID	Model	Difference
RF180425C07A-3	N7NHL78M	HL7800-M	Support Cat-M1
RF181126C15-3	N7NHL78	HL7800	Support Cat-M1 and NB-IoT

2. The above EUT information is declared by manufacturer and for more detailed features description, please refers to the manufacturer's specifications or user's manual.

### 3.2 Configuration of System under Test



#### 3.2.1 Description of Support Units

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

No.	Product	Brand	Model No.	Serial No.	FCC ID
1.	Adapter	N/A	N/A	N/A	N/A

No.	Signal Cable Description Of The Above Support Units
1.	N/A

Note:

1. All power cords of the above support units are non-shielded (1.8m).
2. Item 1 was provided by client.

### 3.3 Test Mode Applicability and Tested Channel Detail

Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates, XYZ axis, and antenna ports

The worst case was found when positioned as the table below. Following channel(s) was (were) selected for the final test as listed below:

Band	ERP	Radiated Emission
LTE Band 14	X-plane	Z-axis (Cat-M1) X-axis (NB-IoT)
LTE Band 26	X-plane (Cat-M1) Z-plane (NB-IoT)	Z-axis (Cat-M1) X-axis (NB-IoT)

#### Cat-M1

#### LTE Band 14

EUT Configure Mode	Test Item	Available Channel	Tested Channel	Channel Bandwidth	Modulation	Mode		
-	ERP	23305 to 23355	23305, 23330, 23355	5 MHz	QPSK, 16QAM	1 RB / 0 RB Offset		
		23330	23330	10 MHz	QPSK, 16QAM	1 RB / 24 RB Offset		
-	Modulation characteristics	23305 to 23355	23330	5 MHz	QPSK, 16QAM	5 RB / 0 RB Offset		
-	Frequency Stability	23305 to 23355	23305, 23330, 23355	5 MHz	QPSK	1 RB / 0 RB Offset		
		23330	23330	10 MHz	QPSK	1 RB / 24 RB Offset		
-	Occupied Bandwidth	23305 to 23355	23305, 23330, 23355	5 MHz	QPSK, 16QAM	25 RB / 0 RB Offset		
		23330	23330	10 MHz	QPSK, 16QAM	50 RB / 0 RB Offset		
-	Peak to Average Ratio	23305 to 23355	23305, 23330, 23355	5 MHz	QPSK, 16QAM	1 RB / 0 RB Offset		
		23330	23330	10 MHz	QPSK, 16QAM	1 RB / 0 RB Offset		
-	Band Edge	23305 to 23355	23305	5 MHz	QPSK	1 RB / 0 RB Offset 25 RB / 0 RB Offset		
			23355	5 MHz	QPSK	1 RB / 24 RB Offset 25 RB / 0 RB Offset		
		23330	23330	10 MHz	QPSK	1 RB / 0 RB Offset 50 RB / 0 RB Offset		
			23330	10 MHz	QPSK	1 RB / 49 RB Offset 50 RB / 0 RB Offset		
		-	Conducted Emission	23305 to 23355	23305, 23330, 23355	5 MHz	QPSK	1 RB / 0 RB Offset
				23330	23330	10 MHz	QPSK	1 RB / 0 RB Offset
-	Radiated Emission	23330	23330	10 MHz	QPSK	1 RB / 24 RB Offset		
						1 RB / 50 RB Offset		

**Note:** This device was tested under all bandwidths, RB configurations and modulations. The worst case was found in QPSK modulation.

### LTE Band 26

EUT Configure Mode	Test Item	Available Channel	Tested Channel	Channel Bandwidth	Modulation	Mode
-	ERP	26697 to 26783	26697, 26740, 26783	1.4 MHz	QPSK, 16QAM	1 RB / 2 RB Offset
		26705 to 26775	26705, 26740, 26775	3 MHz	QPSK, 16QAM	1 RB / 7 RB Offset
		26715 to 26765	26715, 26740, 26765	5 MHz	QPSK, 16QAM	1 RB / 12 RB Offset
		26740	26740	10 MHz	QPSK, 16QAM	1 RB / 49 RB Offset
-	Modulation characteristics	26715 to 26765	26740	5 MHz	QPSK, 16QAM	5 RB / 0 RB Offset
-	Frequency Stability	26697 to 26783	26697, 26783	1.4 MHz	QPSK	1 RB / 2 RB Offset
		26705 to 26775	26705, 26775	3 MHz	QPSK	1 RB / 7 RB Offset
		26715 to 26765	26715, 26765	5 MHz	QPSK	1 RB / 12 RB Offset
		26740	26740	10 MHz	QPSK	1 RB / 49 RB Offset
-	Occupied Bandwidth	26697 to 26783	26697, 26740, 26783	1.4 MHz	QPSK, 16QAM	6 RB / 0 RB Offset
		26705 to 26775	26705, 26740, 26775	3 MHz	QPSK, 16QAM	15 RB / 0 RB Offset
		26715 to 26765	26715, 26740, 26765	5 MHz	QPSK, 16QAM	25 RB / 0 RB Offset
		26740	26740	10 MHz	QPSK, 16QAM	50 RB / 0 RB Offset
-	Emission Mask	26697 to 26783	26697, 26740, 26783	1.4 MHz	QPSK, 16QAM	6 RB / 0 RB Offset
		26705 to 26775	26705, 26740, 26775	3 MHz	QPSK, 16QAM	15 RB / 0 RB Offset
		26715 to 26765	26715, 26740, 26765	5 MHz	QPSK, 16QAM	25 RB / 0 RB Offset
		26740	26740	10 MHz	QPSK, 16QAM	50 RB / 0 RB Offset
-	Conducted Emission	26697 to 26783	26697, 26740, 26783	1.4 MHz	QPSK	1 RB / 0 RB Offset
		26705 to 26775	26705, 26740, 26775	3 MHz	QPSK	1 RB / 0 RB Offset
		26715 to 26765	26715, 26740, 26765	5 MHz	QPSK	1 RB / 0 RB Offset
		26740	26740	10 MHz	QPSK	1 RB / 0 RB Offset
-	Radiated Emission	26740	26740	10 MHz	QPSK	1 RB / 49 RB Offset

**Note:** This device was tested under all bandwidths, RB configurations and modulations. The worst case was found in QPSK modulation.

## NB-IoT

### LTE Band 14

EUT Configure Mode	Test Item	Available Channel	Tested Channel	Sub-carrier Bandwidth	Modulation	N <sub>tones</sub>
-	ERP	23301 to 23359	23301, 23330, 23359	3.75 kHz	BPSK	1@0
				15 kHz	QPSK	3@3
-	Modulation Characteristics	20401 to 20649	23330	3.75 kHz	BPSK	1@0
				15 kHz	QPSK	1@0
-	Frequency Stability	23301 to 23359	23301, 23359	15 kHz	QPSK	3@3
-	Occupied Bandwidth	23301 to 23359	23301	3.75 kHz	BPSK	1@0
				15 kHz	QPSK	1@0
						3@3
						12@0
			23330	3.75 kHz	BPSK	1@0
				15 kHz	QPSK	1@0
						3@3
						12@0
			23359	3.75 kHz	BPSK	1@47
				15 kHz	QPSK	1@11
						3@3
						12@0
-	Band Edge	23301 to 23359	23301	3.75 kHz	BPSK	1@0
				15 kHz	QPSK	1@0
						3@3
						12@0
			23359	3.75 kHz	BPSK	1@47
				15 kHz	QPSK	1@11
						3@3
						12@0
-	Peak to Average Ratio	23301 to 23359	23330	3.75 kHz	BPSK	1@0
				15 kHz	QPSK	1@0
						3@3
-	Conducted Emission	23301 to 23359	23301, 23330, 23359	15 kHz	QPSK	3@3
-	Radiated Emission	23301 to 23359	23301, 23330, 23359	15 kHz	QPSK	3@3

#### Note:

1. Selection is tested with Stand-alone, In-band and Guard-band, the worst case was found in Stand-alone.
2. For radiated emission and conducted emission test, pre-tested BPSK, QPSK modulation type and found QPSK was the worst, therefore chosen for the final test.
3. The emission measurement was based on the worst maximum conducted power.

### LTE Band 26

EUT Configure Mode	Test Item	Available Channel	Tested Channel	Sub-carrier Bandwidth	Modulation	N <sub>tones</sub>			
-	ERP	26691 to 26789	26691, 26740, 26789	3.75 kHz	BPSK	1@0			
				15 kHz	QPSK	3@3			
-	Modulation Characteristics	26691 to 26789	26740	3.75 kHz	BPSK	1@0			
				15 kHz	QPSK	1@0			
-	Frequency Stability	26691 to 26789	26691, 26789	15 kHz	QPSK	3@3			
-	Occupied Bandwidth	26691 to 26789	26691	3.75 kHz	BPSK	1@0			
				15 kHz	QPSK	1@0			
						3@3			
			26740	3.75 kHz	BPSK	1@0			
				15 kHz	QPSK	3@3			
						12@0			
			26789	3.75 kHz	BPSK	1@47			
				15 kHz	QPSK	1@11			
						3@3			
			-	Band Edge	26691 to 26789	26691	3.75 kHz	BPSK	1@0
							15 kHz	QPSK	1@0
									3@3
26789	3.75 kHz	BPSK				1@47			
	15 kHz	QPSK				1@11			
						3@3			
26789	3.75 kHz	BPSK				1@0			
	15 kHz	QPSK				1@0			
						3@3			
-	Peak to Average Ratio	26691 to 26789				26740	3.75 kHz	BPSK	1@0
							15 kHz	QPSK	3@3
-	Conducted Emission	26691 to 26789				26691, 26740, 26789	15 kHz	QPSK	3@3
-	Radiated Emission	26691 to 26789	26691, 26740, 26789	15 kHz	QPSK	3@3			

**Note:**

1. Selection is tested with Stand-alone, In-band and Guard-band, the worst case was found in Stand-alone.
2. For radiated emission and conducted emission test, pre-tested BPSK, QPSK modulation type and found QPSK was the worst, therefore chosen for the final test.
3. The emission measurement was based on the worst maximum conducted power.



**Test Condition:**

Test Item	Environmental Conditions	Input Power	Tested By
ERP	25 deg. C, 65 % RH	12 Vdc	Jisyong Wang / Thomas Wei
Frequency Stability	25 deg. C, 65 % RH	12 Vdc	Getaz Yang
Occupied Bandwidth	25 deg. C, 65 % RH	12 Vdc	Getaz Yang
Peak to Average Ratio	25 deg. C, 65 % RH	12 Vdc	Getaz Yang
Emission Mask	25 deg. C, 65 % RH	12 Vdc	Getaz Yang
Band Edge	25 deg. C, 65 % RH	12 Vdc	Getaz Yang
Conducted Emission	25 deg. C, 65 % RH	12 Vdc	Getaz Yang
Radiated Emission	25 deg. C, 65 % RH	12 Vdc	Jisyong Wang / Thomas Wei

**3.4 EUT Operating Conditions**

The EUT makes a call to the communication simulator. The communication simulator station system controlled a EUT to export maximum output power under transmission mode and specific channel frequency

**3.5 General Description of Applied Standards**

The EUT is a RF Product. According to the specifications of the manufacturer, it must comply with the requirements of the following standards:

**FCC 47 CFR Part 2**

**FCC 47 CFR Part 90**

**KDB 971168 D01 Power Meas License Digital Systems v03r01**

**KDB 971168 D02 Misc Rev Approv License Devices v02r01**

**ANSI/TIA/EIA-603-E 2016**

**ANSI 63.26-2015**

**Note:** All test items have been performed and recorded as per the above standards.

## 4 Test Types and Results

### 4.1 Output Power Measurement

#### 4.1.1 Limits of Output Power Measurement

##### LTE Band 14

Portable stations (hand-held devices) transmitting in the 758-768 MHz band and the 788-798 MHz band are limited to 3 watts ERP.

##### LTE Band 26

The maximum output power of the transmitter for mobile stations is 100 watts (20 dBw) ERP.

#### 4.1.2 Test Procedures

##### **EIRP / ERP Measurement:**

- a. All measurements were done at low, middle and high operational frequency range. RBW and VBW is 10 MHz for LTE mode.
- b. Substitution method is used for E.I.R.P measurement. In the semi-anechoic chamber, EUT placed on the 0.8 m (below or equal 1 GHz) and/or 1.5 m (above 1 GHz) height of Turn Table, rotated the table around 360 degrees to search the maximum radiation power and receiver antenna shall be rotated vertical and horizontal polarization and moved height from 1 m to 4 m to find the maximum polar radiated power. The "Read Value" is the spectrum reading the maximum power value.
- c. The substitution horn antenna is substituted for EUT at the same position and signals generator export the CW signal to the substitution antenna via a tx cable. Rotated the Turn Table and moved receiving antenna to find the maximum radiation power. Adjust output power level of S.G to get a Value of spectrum reading equal to "Read Value" of step b. Record the power level of S.G.
- d.  $EIRP = \text{Output power level of S.G} - \text{TX cable loss} + \text{Antenna gain of substitution horn}$ . E.R.P power can be calculated form E.I.R.P power by subtracting the gain of dipole,  $E.R.P \text{ power} = E.I.P.R \text{ power} - 2.15 \text{ dB}$ .

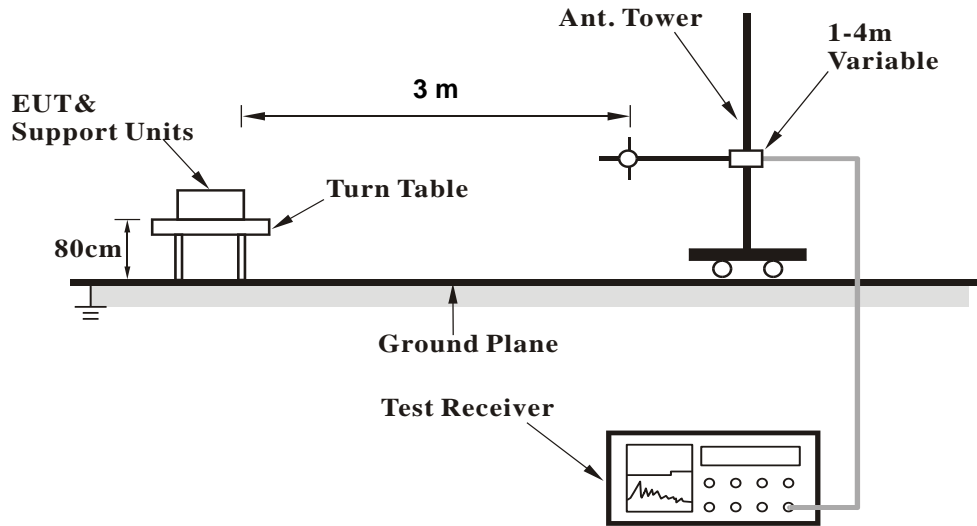
##### **Conducted Power Measurement:**

- a. The EUT was set up for the maximum power with LTE link data modulation and link up with simulator.
- b. Set the EUT to transmit under low, middle and high channel and record the power level shown on simulator.

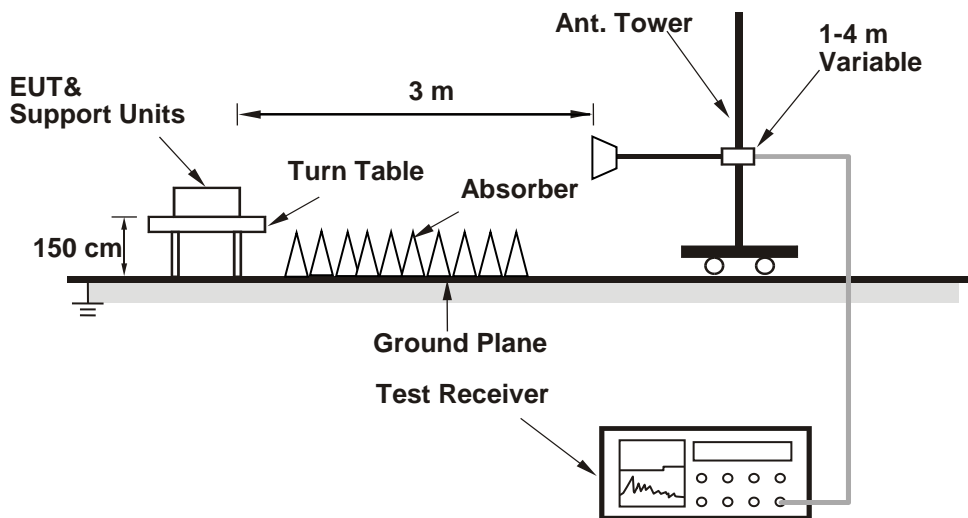
4.1.3 Test Setup

**EIRP / ERP Measurement:**

**<Radiated Emission below or equal 1 GHz>**



**<Radiated Emission above 1 GHz>**



For the actual test configuration, please refer to the attached file (Test Setup Photo).

**Conducted Power Measurement:**



4.1.4 Test Results

**Conducted Output Power (dBm)**

**Cat-M1**

LTE Band 14								
BW (MHz): 5								
Test Frequency ID	N <sub>UL</sub>	Frequency of Uplink (MHz)	Test Configuration Initial of Power				EUT	
			Modulation	RB Size	RB Offset	Narrowband Index	Cell Power (dBm/15 kHz)	Power (dBm)
Low Range	23305	790.5	QPSK	1	0	0	-85	23.55
			QPSK	1	5	0	-85	23.54
			QPSK	1	0	1	-85	23.51
			QPSK	1	5	1	-85	23.48
			QPSK	1	0	3	-85	23.47
			QPSK	1	5	3	-85	23.46
			QPSK	3	0	0	-85	22.83
			QPSK	3	3	3	-85	22.59
			QPSK	6	0	0	-85	22.82
			QPSK	6	0	1	-85	22.84
			QPSK	6	0	3	-85	22.79
			16QAM	1	0	0	-85	22.83
			16QAM	1	5	0	-85	22.85
			16QAM	1	0	1	-85	22.91
			16QAM	1	5	1	-85	22.87
			16QAM	1	0	3	-85	22.84
			16QAM	1	5	3	-85	22.81
			16QAM	3	0	0	-85	22.45
16QAM	3	3	3	-85	22.45			
16QAM	5	0	0	-85	21.36			
16QAM	5	0	1	-85	21.29			
16QAM	5	0	3	-85	21.17			
Mid. Range	23330	793	QPSK	1	0	0	-85	23.48
			QPSK	1	5	0	-85	23.44
			QPSK	1	0	1	-85	23.45
			QPSK	1	5	1	-85	23.41
			QPSK	1	0	3	-85	23.43
			QPSK	1	5	3	-85	23.39
			QPSK	3	0	0	-85	22.76
			QPSK	3	3	3	-85	22.73
			QPSK	6	0	0	-85	22.79
			QPSK	6	0	1	-85	22.77
			QPSK	6	0	3	-85	22.69
			16QAM	1	0	0	-85	22.81
			16QAM	1	5	0	-85	22.78
			16QAM	1	0	1	-85	22.66
			16QAM	1	5	1	-85	22.68
			16QAM	1	0	3	-85	22.81
			16QAM	1	5	3	-85	22.77
			16QAM	3	0	0	-85	22.48
			16QAM	3	3	3	-85	22.33
			16QAM	5	0	0	-85	21.22
16QAM	5	0	1	-85	21.24			
16QAM	5	0	3	-85	21.19			

LTE Band 14								
BW (MHz): 5								
Test Frequency ID	N <sub>UL</sub>	Frequency of Uplink (MHz)	Test Configuration Initial of Power				EUT	
			Modulation	RB Size	RB Offset	Narrowband Index	Cell Power (dBm/15 kHz)	Power (dBm)
High Range	23355	795.5	QPSK	1	0	0	-85	23.46
			QPSK	1	5	0	-85	23.48
			QPSK	1	0	1	-85	23.41
			QPSK	1	5	1	-85	23.44
			QPSK	1	0	3	-85	23.41
			QPSK	1	5	3	-85	23.39
			QPSK	3	0	0	-85	22.79
			QPSK	3	3	3	-85	22.75
			QPSK	6	0	0	-85	22.77
			QPSK	6	0	1	-85	22.79
			QPSK	6	0	3	-85	22.76
			16QAM	1	0	0	-85	22.82
			16QAM	1	5	0	-85	22.78
			16QAM	1	0	1	-85	22.87
			16QAM	1	5	1	-85	22.83
			16QAM	1	0	3	-85	22.69
			16QAM	1	5	3	-85	22.41
			16QAM	3	0	0	-85	22.39
16QAM	3	3	3	-85	22.34			
16QAM	5	0	0	-85	21.36			
16QAM	5	0	1	-85	21.21			
16QAM	5	0	3	-85	21.22			

LTE Band 14								
BW (MHz): 10								
Test Frequency ID	N <sub>UL</sub>	Frequency of Uplink (MHz)	Test Configuration Initial of Power				EUT	
			Modulation	RB Size	RB Offset	Narrowband Index	Cell Power (dBm/15 kHz)	Power (dBm)
Mid. Range	23330	793	QPSK	1	0	0	-85	23.51
			QPSK	1	5	0	-85	23.38
			QPSK	1	0	3	-85	23.12
			QPSK	1	5	3	-85	23.39
			QPSK	1	0	7	-85	23.34
			QPSK	1	5	7	-85	23.45
			QPSK	4	0	0	-85	23.47
			QPSK	4	2	7	-85	23.33
			QPSK	6	0	0	-85	22.89
			QPSK	6	0	7	-85	22.61
			16QAM	1	0	0	-85	23.14
			16QAM	1	5	0	-85	23.25
			16QAM	1	0	3	-85	23.06
			16QAM	1	5	3	-85	23.22
			16QAM	1	0	7	-85	23.14
			16QAM	1	5	7	-85	23.33
			16QAM	4	2	0	-85	23.03
			16QAM	4	2	7	-85	23.27
16QAM	6	0	0	-85	22.77			
16QAM	6	0	7	-85	22.56			

LTE Band 26								
BW (MHz): 1.4								
Test Frequency ID	N <sub>UL</sub>	Frequency of Uplink (MHz)	Test Configuration Initial of Power				EUT	
			Modulation	RB Size	RB Offset	Narrowband Index	Cell Power (dBm/15 kHz)	Power (dBm)
Low Range	26697	814.7	QPSK	1	0	0	-85	23.67
			QPSK	1	5	0	-85	23.62
			QPSK	3	3	0	-85	22.06
			QPSK	6	0	0	-85	21.45
			16QAM	1	0	0	-85	23.28
			16QAM	1	5	0	-85	23.18
Mid. Range	26740	819	16QAM	3	0	0	-85	22.27
			16QAM	5	0	0	-85	22.29
			QPSK	1	0	0	-85	23.55
			QPSK	1	5	0	-85	23.54
			QPSK	3	3	0	-85	21.97
			QPSK	6	0	0	-85	21.37
			16QAM	1	0	0	-85	23.13
			16QAM	1	5	0	-85	23.18
High Range	26783	823.3	16QAM	3	0	0	-85	22.27
			16QAM	5	0	0	-85	22.18
			QPSK	1	0	0	-85	23.61
			QPSK	1	5	0	-85	23.51
			QPSK	3	3	0	-85	22.18
			QPSK	6	0	0	-85	21.39
			16QAM	1	0	0	-85	23.14
			16QAM	1	5	0	-85	23.12

LTE Band 26								
BW (MHz): 3								
Test Frequency ID	N <sub>UL</sub>	Frequency of Uplink (MHz)	Test Configuration Initial of Power				EUT	
			Modulation	RB Size	RB Offset	Narrowband Index	Cell Power (dBm/15 kHz)	Power (dBm)
Low Range	26705	815.5	QPSK	1	0	0	-85	23.16
			QPSK	1	5	0	-85	23.18
			QPSK	1	0	1	-85	23.39
			QPSK	1	5	1	-85	23.28
			QPSK	3	3	0	-85	22.9
			QPSK	3	3	1	-85	22.15
			QPSK	6	0	0	-85	21.47
			QPSK	6	0	1	-85	20.97
			16QAM	1	0	0	-85	23.34
			16QAM	1	5	0	-85	23.01
			16QAM	1	0	1	-85	23.13
			16QAM	1	5	1	-85	23.13
			16QAM	3	0	0	-85	22.37
			16QAM	3	3	1	-85	22.21
16QAM	5	0	0	-85	22.01			
16QAM	5	0	1	-85	22.14			
Mid. Range	26740	819	QPSK	1	0	0	-85	23.42
			QPSK	1	5	0	-85	23.46
			QPSK	1	0	1	-85	23.52
			QPSK	1	5	1	-85	23.33
			QPSK	3	3	0	-85	22.14
			QPSK	3	3	1	-85	22.17
			QPSK	6	0	0	-85	21.15
			QPSK	6	0	1	-85	20.87
			16QAM	1	0	0	-85	23.19
			16QAM	1	5	0	-85	23.16
			16QAM	1	0	1	-85	23.21
			16QAM	1	5	1	-85	23.05
			16QAM	3	0	0	-85	22.52
			16QAM	3	3	1	-85	22.16
16QAM	5	0	0	-85	22.29			
16QAM	5	0	1	-85	22.03			
High Range	26775	822.5	QPSK	1	0	0	-85	23.36
			QPSK	1	5	0	-85	23.45
			QPSK	1	0	1	-85	23.49
			QPSK	1	5	1	-85	23.36
			QPSK	3	3	0	-85	22.09
			QPSK	3	3	1	-85	22.11
			QPSK	6	0	0	-85	21.17
			QPSK	6	0	1	-85	20.91
			16QAM	1	0	0	-85	23.12
			16QAM	1	5	0	-85	23.09
			16QAM	1	0	1	-85	23.19
			16QAM	1	5	1	-85	23.07
			16QAM	3	0	0	-85	22.29
			16QAM	3	3	1	-85	22.13
16QAM	5	0	0	-85	22.26			
16QAM	5	0	1	-85	21.93			

LTE Band 26								
BW (MHz): 5								
Test Frequency ID	N <sub>UL</sub>	Frequency of Uplink (MHz)	Test Configuration Initial of Power				EUT	
			Modulation	RB Size	RB Offset	Narrowband Index	Cell Power (dBm/15 kHz)	Power (dBm)
Low Range	26715	819	QPSK	1	0	0	-85	23.27
			QPSK	1	5	0	-85	23.37
			QPSK	1	0	1	-85	23.29
			QPSK	1	5	1	-85	23.24
			QPSK	1	0	3	-85	23.12
			QPSK	1	5	3	-85	23.16
			QPSK	3	0	0	-85	22.44
			QPSK	3	3	3	-85	22.21
			QPSK	6	0	0	-85	22.13
			QPSK	6	0	1	-85	22.34
			QPSK	6	0	3	-85	22.17
			16QAM	1	0	0	-85	23.28
			16QAM	1	5	0	-85	23.41
			16QAM	1	0	1	-85	23.31
			16QAM	1	5	1	-85	23.35
			16QAM	1	0	3	-85	23.26
			16QAM	1	5	3	-85	23.21
			16QAM	3	0	0	-85	22.37
			16QAM	3	3	3	-85	22.18
			16QAM	5	0	0	-85	22.29
16QAM	5	0	1	-85	22.34			
16QAM	5	0	3	-85	22.24			
Mid. Range	26740	819	QPSK	1	0	0	-85	23.57
			QPSK	1	5	0	-85	23.48
			QPSK	1	0	1	-85	23.33
			QPSK	1	5	1	-85	23.31
			QPSK	1	0	3	-85	23.25
			QPSK	1	5	3	-85	23.27
			QPSK	3	0	0	-85	22.87
			QPSK	3	3	3	-85	22.99
			QPSK	6	0	0	-85	22.58
			QPSK	6	0	1	-85	22.65
			QPSK	6	0	3	-85	22.33
			16QAM	1	0	0	-85	23.43
			16QAM	1	5	0	-85	23.42
			16QAM	1	0	1	-85	23.33
			16QAM	1	5	1	-85	23.42
			16QAM	1	0	3	-85	23.22
			16QAM	1	5	3	-85	23.19
			16QAM	3	0	0	-85	22.57
			16QAM	3	3	3	-85	22.46
			16QAM	5	0	0	-85	22.64
16QAM	5	0	1	-85	22.67			
16QAM	5	0	3	-85	22.31			



LTE Band 26								
BW (MHz): 5								
Test Frequency ID	N <sub>UL</sub>	Frequency of Uplink (MHz)	Test Configuration Initial of Power				EUT	
			Modulation	RB Size	RB Offset	Narrowband Index	Cell Power (dBm/15 kHz)	Power (dBm)
High Range	26765	821.5	QPSK	1	0	0	-85	23.13
			QPSK	1	5	0	-85	23.01
			QPSK	1	0	1	-85	23.04
			QPSK	1	5	1	-85	23.11
			QPSK	1	0	3	-85	23.21
			QPSK	1	5	3	-85	23.18
			QPSK	3	0	0	-85	22.44
			QPSK	3	3	3	-85	22.39
			QPSK	6	0	0	-85	22.47
			QPSK	6	0	1	-85	22.45
			QPSK	6	0	3	-85	22.37
			16QAM	1	0	0	-85	23.53
			16QAM	1	5	0	-85	23.33
			16QAM	1	0	1	-85	23.34
			16QAM	1	5	1	-85	23.24
			16QAM	1	0	3	-85	23.16
			16QAM	1	5	3	-85	23.18
			16QAM	3	0	0	-85	22.25
16QAM	3	3	3	-85	22.19			
16QAM	5	0	0	-85	22.31			
16QAM	5	0	1	-85	23.32			
16QAM	5	0	3	-85	23.25			

LTE Band 26								
BW (MHz): 10								
Test Frequency ID	N <sub>UL</sub>	Frequency of Uplink (MHz)	Test Configuration Initial of Power				EUT	
			Modulation	RB Size	RB Offset	Narrowband Index	Cell Power (dBm/15 kHz)	Power (dBm)
Mid. Range	819	8740	QPSK	1	0	0	-85	23.07
			QPSK	1	5	0	-85	23.13
			QPSK	1	0	3	-85	23.02
			QPSK	1	5	3	-85	23.27
			QPSK	1	0	7	-85	23.22
			QPSK	1	5	7	-85	23.24
			QPSK	4	0	0	-85	23.19
			QPSK	4	2	7	-85	23.64
			QPSK	6	0	0	-85	22.37
			QPSK	6	0	7	-85	22.72
			16QAM	1	0	0	-85	23.24
			16QAM	1	5	0	-85	23.12
			16QAM	1	0	3	-85	23.31
			16QAM	1	5	3	-85	23.14
			16QAM	1	0	7	-85	23.41
			16QAM	1	5	7	-85	23.55
			16QAM	4	2	0	-85	23.24
			16QAM	4	2	7	-85	23.41
16QAM	5	0	0	-85	22.17			
16QAM	5	0	7	-85	22.61			

## NB-IoT

LTE Band 14							
Stand-alone							
N <sub>UL</sub>	M <sub>UL</sub>	Frequency of Uplink (MHz)	Test Configuration Initial of Power			EUT	
			Modulation	N <sub>tones</sub>	Sub-carrier Spacing (kHz)	Cell Power (dBm/15 kHz)	Power (dBm)
23301	0	790.1	BPSK	1@0	3.75	-110	23.72
			QPSK	1@0	15	-110	23.65
			QPSK	3@3	15	-110	23.83
			QPSK	12@0	15	-110	21.26
23330	0	793	BPSK	1@0	3.75	-110	23.64
			BPSK	1@47	3.75	-110	23.58
			QPSK	1@0	15	-110	23.59
			QPSK	1@11	15	-110	23.74
23359	0	795.9	QPSK	3@3	15	-110	23.64
			QPSK	12@0	15	-110	23.52
			BPSK	1@47	3.75	-110	23.42
			QPSK	1@11	15	-110	23.57
23359	0	795.9	QPSK	3@3	15	-110	23.6
			QPSK	12@0	15	-110	23.61
			QPSK	12@0	15	-110	23.61

LTE Band 14							
In-Band	BW (MHz): 5						
N <sub>UL</sub>	M <sub>UL</sub>	Frequency of Uplink (MHz)	Test Configuration Initial of Power			EUT	
			Modulation	N <sub>tones</sub>	Sub-carrier Spacing (kHz)	Cell Power (dBm/15 kHz)	Power (dBm)
23307	0	790.7	BPSK	1@0	3.75	-110	23.76
			QPSK	1@0	15	-110	23.62
			QPSK	3@3	15	-110	23.58
			QPSK	12@0	15	-110	23.75
23321	0	792.1	BPSK	1@0	3.75	-110	23.7
			BPSK	1@47	3.75	-110	23.6
			QPSK	1@0	15	-110	23.56
			QPSK	1@11	15	-110	23.67
			QPSK	3@3	15	-110	23.42
23353	0	795.3	QPSK	12@0	15	-110	23.58
			BPSK	1@47	3.75	-110	23.56
			QPSK	1@11	15	-110	23.47
			QPSK	3@3	15	-110	23.53
23353	0	795.3	QPSK	12@0	15	-110	23.59

LTE Band 14							
In-Band	BW (MHz): 10	NB-IoT PRB: 30					
N <sub>UL</sub>	M <sub>UL</sub>	Frequency of Uplink (MHz)	Test Configuration Initial of Power			EUT	
			Modulation	N <sub>tones</sub>	Sub-carrier Spacing (kHz)	Cell Power (dBm/15 kHz)	Power (dBm)
23360	-2	795.99	BPSK	1@0	3.75	-110	23.52
			BPSK	1@47	3.75	-110	23.48
			QPSK	1@0	15	-110	23.62
			QPSK	1@11	15	-110	23.54
			QPSK	3@3	15	-110	23.57
			QPSK	12@0	15	-110	23.61

LTE Band 14							
In-Band	BW (MHz): 10	NB-IoT PRB: 35	Test Configuration Initial of Power			EUT	
N <sub>UL</sub>	M <sub>UL</sub>	Frequency of Uplink (MHz)	Modulation	N <sub>tones</sub>	Sub-carrier Spacing (kHz)	Cell Power (dBm/15 kHz)	Power (dBm)
			23369	-2	796.89	BPSK	1@0
			BPSK	1@47	3.75	-110	23.65
			QPSK	1@0	15	-110	23.52
			QPSK	1@11	15	-110	23.53
			QPSK	3@3	15	-110	23.47
			QPSK	12@0	15	-110	23.62

LTE Band 14							
Guard-Band	BW (MHz): 5	Frequency of Uplink (MHz)	Test Configuration Initial of Power			EUT	
N <sub>UL</sub>	M <sub>UL</sub>		Modulation	N <sub>tones</sub>	Sub-carrier Spacing (kHz)	Cell Power (dBm/15 kHz)	Power (dBm)
23301	0	790.1	BPSK	1@0	3.75	-110	23.73
			QPSK	1@0	15	-110	23.64
			QPSK	3@3	15	-110	23.67
			QPSK	12@0	15	-110	23.81
23306	0	790.6	BPSK	1@0	3.75	-110	23.66
			BPSK	1@47	3.75	-110	23.72
			QPSK	1@0	15	-110	23.62
			QPSK	1@11	15	-110	23.57
			QPSK	3@3	15	-110	23.67
23359	0	795.9	QPSK	12@0	15	-110	23.8
			BPSK	1@47	3.75	-110	23.36
			QPSK	1@11	15	-110	23.23
			QPSK	3@3	15	-110	23.52
			QPSK	12@0	15	-110	23.43

LTE Band 26							
Stand-alone							
N <sub>UL</sub>	M <sub>UL</sub>	Frequency of Uplink (MHz)	Test Configuration Initial of Power			EUT	
			Modulation	N <sub>tones</sub>	Sub-carrier Spacing (kHz)	Cell Power (dBm/15 kHz)	Power (dBm)
26691	0	814.1	BPSK	1@0	3.75	-110	16.15
			QPSK	1@0	15	-110	14.41
			QPSK	3@3	15	-110	23.15
			QPSK	12@0	15	-110	16.6
26740	0	819	BPSK	1@0	3.75	-110	23.02
			BPSK	1@47	3.75	-110	23.04
			QPSK	1@0	15	-110	23.1
			QPSK	1@11	15	-110	23.15
			QPSK	3@3	15	-110	23.28
26789	0	823.9	QPSK	12@0	15	-110	23.17
			BPSK	1@47	3.75	-110	16.47
			QPSK	1@11	15	-110	14.79
			QPSK	3@3	15	-110	23.21
			QPSK	12@0	15	-110	16.54

LTE Band 26							
In-Band							
N <sub>UL</sub>	M <sub>UL</sub>	Frequency of Uplink (MHz)	Test Configuration Initial of Power			EUT	
			Modulation	N <sub>tones</sub>	Sub-carrier Spacing (kHz)	Cell Power (dBm/15 kHz)	Power (dBm)
26696	0	814.6	BPSK	1@0	3.75	-110	22.97
			QPSK	1@0	15	-110	22.98
			QPSK	3@3	15	-110	23.01
			QPSK	12@0	15	-110	22.93
26731	0	818.1	BPSK	1@0	3.75	-110	23.01
			BPSK	1@47	3.75	-110	23.02
			QPSK	1@0	15	-110	23.01
			QPSK	1@11	15	-110	23.01
			QPSK	3@3	15	-110	23.02
26784	0	823.4	QPSK	12@0	15	-110	22.98
			BPSK	1@47	3.75	-110	23.09
			QPSK	1@11	15	-110	23.02
			QPSK	3@3	15	-110	23.05
			QPSK	12@0	15	-110	23.01

LTE Band 26							
In-Band							
N <sub>UL</sub>	M <sub>UL</sub>	Frequency of Uplink (MHz)	Test Configuration Initial of Power			EUT	
			Modulation	N <sub>tones</sub>	Sub-carrier Spacing (kHz)	Cell Power (dBm/15 kHz)	Power (dBm)
26750	-2	819.99	BPSK	1@0	3.75	-110	23
			BPSK	1@47	3.75	-110	22.93
			QPSK	1@0	15	-110	22.91
			QPSK	1@11	15	-110	22.95
			QPSK	3@3	15	-110	23.02
			QPSK	12@0	15	-110	23.01

LTE Band 26							
In-Band	BW (MHz): 10	NB-IoT PRB: 35	Test Configuration Initial of Power			EUT	
N <sub>UL</sub>	M <sub>UL</sub>	Frequency of Uplink (MHz)	Modulation	N <sub>tones</sub>	Sub-carrier Spacing (kHz)	Cell Power (dBm/15 kHz)	Power (dBm)
			26759	-2	820.89	BPSK	1@0
			BPSK	1@47	3.75	-110	23.01
			QPSK	1@0	15	-110	23.03
			QPSK	1@11	15	-110	23.01
			QPSK	3@3	15	-110	23.12
			QPSK	12@0	15	-110	23.05

LTE Band 26							
Guard-Band	BW (MHz): 5	Frequency of Uplink (MHz)	Test Configuration Initial of Power			EUT	
N <sub>UL</sub>	M <sub>UL</sub>		Modulation	N <sub>tones</sub>	Sub-carrier Spacing (kHz)	Cell Power (dBm/15 kHz)	Power (dBm)
26691	0	814.1	BPSK	1@0	3.75	-110	23.02
			QPSK	1@0	15	-110	23.01
			QPSK	3@3	15	-110	23.07
			QPSK	12@0	15	-110	23.02
26716	0	816.6	BPSK	1@0	3.75	-110	23.01
			BPSK	1@47	3.75	-110	23.11
			QPSK	1@0	15	-110	23.11
			QPSK	1@11	15	-110	23.12
26789	0	823.9	QPSK	3@3	15	-110	23.21
			QPSK	12@0	15	-110	22.96
			BPSK	1@47	3.75	-110	23.09
			QPSK	1@11	15	-110	23.05
			QPSK	3@3	15	-110	23.17
			QPSK	12@0	15	-110	23.05

**ERP Power (dBm)**

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LTE Band 14							
Channel Bandwidth: 5 MHz / QPSK							
Plane	Channel	Frequency (MHz)	LVL (dBm)	Correction Factor (dB)	ERP (dBm)	ERP (mW)	Polarization (H/V)
X	23305	790.5	-5.90	32.24	24.19	262.42	H
	23330	793.0	-6.17	32.17	23.85	242.66	
	23355	795.5	-5.93	32.11	24.03	252.93	
	23305	790.5	-10.43	32.43	19.85	96.61	V
	23330	793.0	-10.85	32.42	19.42	87.50	
	23355	795.5	-10.64	32.46	19.67	92.68	
Channel Bandwidth: 5 MHz / 16QAM							
X	23305	790.5	-6.92	32.24	23.17	207.49	H
	23330	793.0	-7.19	32.17	22.83	191.87	
	23355	795.5	-6.95	32.11	23.01	199.99	
	23305	790.5	-11.45	32.43	18.83	76.38	V
	23330	793.0	-11.87	32.42	18.40	69.18	
	23355	795.5	-11.66	32.46	18.65	73.28	

Note: ERP (dBm) = Reading (dBm) + Correction Factor (dB) – 2.15

LTE Band 14							
Channel Bandwidth: 10 MHz / QPSK							
Plane	Channel	Frequency (MHz)	LVL (dBm)	Correction Factor (dB)	ERP (dBm)	ERP (mW)	Polarization (H/V)
X	23330	793.0	-6.42	32.17	23.60	229.09	H
	23330	793.0	-10.85	32.42	19.42	87.50	V
Channel Bandwidth: 10 MHz / 16QAM							
X	23330	793.0	-7.44	32.17	22.58	181.13	H
	23330	793.0	-11.87	32.42	18.40	69.18	V

Note: ERP (dBm) = Reading (dBm) + Correction Factor (dB) – 2.15

LTE Band 26							
Channel Bandwidth: 1.4 MHz / QPSK							
Plane	Channel	Frequency (MHz)	LVL (dBm)	Correction Factor (dB)	ERP (dBm)	ERP (mW)	Polarization (H/V)
Z	26697	814.7	-5.80	32.01	24.06	254.68	H
	26740	819.0	-6.17	32.11	23.79	239.33	
	26783	823.3	-6.25	32.32	23.92	246.60	
	26697	814.7	-12.14	32.54	18.25	66.83	V
	26740	819.0	-12.50	32.51	17.86	61.09	
	26783	823.3	-12.35	32.51	18.01	63.24	
Channel Bandwidth: 1.4 MHz / 16QAM							
Z	26697	814.7	-6.82	32.01	23.04	201.37	H
	26740	819.0	-7.19	32.11	22.77	189.23	
	26783	823.3	-7.27	32.32	22.90	194.98	
	26697	814.7	-13.16	32.54	17.23	52.84	V
	26740	819.0	-13.52	32.51	16.84	48.31	
	26783	823.3	-13.37	32.51	16.99	50.00	

Note: ERP (dBm) = Reading (dBm) + Correction Factor (dB) – 2.15

LTE Band 26							
Channel Bandwidth: 3 MHz / QPSK							
Plane	Channel	Frequency (MHz)	LVL (dBm)	Correction Factor (dB)	ERP (dBm)	ERP (mW)	Polarization (H/V)
Z	26705	815.5	-6.06	32.02	23.81	240.44	H
	26740	819.0	-6.42	32.11	23.54	225.94	
	26775	822.5	-6.36	32.18	23.67	232.81	
	26705	815.5	-12.35	32.5	18.00	63.10	V
	26740	819.0	-12.75	32.51	17.61	57.68	
	26775	822.5	-12.56	32.47	17.76	59.70	
Channel Bandwidth: 3 MHz / 16QAM							
Z	26705	815.5	-7.05	32.02	22.82	191.43	H
	26740	819.0	-7.41	32.11	22.55	179.89	
	26775	822.5	-7.35	32.18	22.68	185.35	
	26705	815.5	-13.34	32.5	17.01	50.23	V
	26740	819.0	-13.74	32.51	16.62	45.92	
	26775	822.5	-13.55	32.47	16.77	47.53	

Note: ERP (dBm) = Reading (dBm) + Correction Factor (dB) – 2.15

LTE Band 26							
Channel Bandwidth: 5 MHz / QPSK							
Plane	Channel	Frequency (MHz)	LVL (dBm)	Correction Factor (dB)	ERP (dBm)	ERP (mW)	Polarization (H/V)
Z	26715	816.5	-6.31	32.04	23.58	228.03	H
	26740	819.0	-6.65	32.11	23.31	214.29	
	26765	821.5	-6.20	31.79	23.44	220.80	
	26715	816.5	-12.60	32.52	17.77	59.84	V
	26740	819.0	-12.98	32.51	17.38	54.70	
	26765	821.5	-12.49	32.17	17.53	56.62	
Channel Bandwidth: 5 MHz / 16QAM							
Z	26715	816.5	-7.32	32.04	22.57	180.72	H
	26740	819.0	-7.66	32.11	22.30	169.82	
	26765	821.5	-7.21	31.79	22.43	174.98	
	26715	816.5	-13.61	32.52	16.76	47.42	V
	26740	819.0	-13.99	32.51	16.37	43.35	
	26765	821.5	-13.50	32.17	16.52	44.87	

Note: ERP (dBm) = Reading (dBm) + Correction Factor (dB) – 2.15

LTE Band 26							
Channel Bandwidth: 10 MHz / QPSK							
Plane	Channel	Frequency (MHz)	LVL (dBm)	Correction Factor (dB)	ERP (dBm)	ERP (mW)	Polarization (H/V)
Z	26740	819.0	-6.96	32.11	23.00	199.53	H
	26740	819.0	-13.29	32.51	17.07	50.93	V
Channel Bandwidth: 10 MHz / 16QAM							
Z	26740	819.0	-7.97	32.11	21.99	158.12	H
	26740	819.0	-14.30	32.51	16.06	40.36	V

Note: ERP (dBm) = Reading (dBm) + Correction Factor (dB) – 2.15



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LTE Band 14							
BPSK							
Plane	Channel	Frequency (MHz)	Reading (dBm)	Correction Factor (dB)	ERP (dBm)	ERP (mW)	Polarization (H/V)
X	23301	790.1	-8.42	32.24	21.67	146.89	H
	23330	793.0	-8.46	32.17	21.56	143.22	
	23359	795.9	-8.36	32.11	21.60	144.54	
	23301	790.1	-14.33	32.43	15.95	39.36	V
	23330	793.0	-14.53	32.42	15.74	37.50	
	23359	795.9	-14.48	32.46	15.83	38.28	
QPSK							
X	23301	790.1	-7.59	32.24	22.50	177.83	H
	23330	793.0	-7.68	32.17	22.34	171.40	
	23359	795.9	-7.57	32.11	22.39	173.38	
	23301	790.1	-13.54	32.43	16.74	47.21	V
	23330	793.0	-13.87	32.42	16.40	43.65	
	23359	795.9	-13.74	32.46	16.57	45.39	

Note: ERP (dBm) = Reading (dBm) + Correction Factor (dB) – 2.15

LTE Band 26							
BPSK							
Plane	Channel	Frequency (MHz)	Reading (dBm)	Correction Factor (dB)	ERP (dBm)	ERP (mW)	Polarization (H/V)
Z	26691	814.1	-14.54	32.01	15.32	34.04	H
	26740	819	-14.57	32.11	15.39	34.59	
	26789	823.9	-14.91	32.32	15.26	33.57	
	26691	814.1	-9.02	32.54	21.37	137.09	V
	26740	819	-8.90	32.51	21.46	139.96	
	26789	823.9	-9.03	32.51	21.33	135.83	
QPSK							
Z	26691	814.1	-13.74	32.01	16.12	40.93	H
	26740	819	-13.78	32.11	16.18	41.50	
	26789	823.9	-14.14	32.32	16.03	40.09	
	26691	814.1	-8.21	32.54	22.18	165.20	V
	26740	819	-8.06	32.51	22.30	169.82	
	26789	823.9	-8.25	32.51	22.11	162.55	

Note: ERP (dBm) = Reading (dBm) + Correction Factor (dB) – 2.15

## 4.2 Modulation Characteristics Measurement

### 4.2.1 Limits of Modulation Characteristics

N/A

### 4.2.2 Test Setup

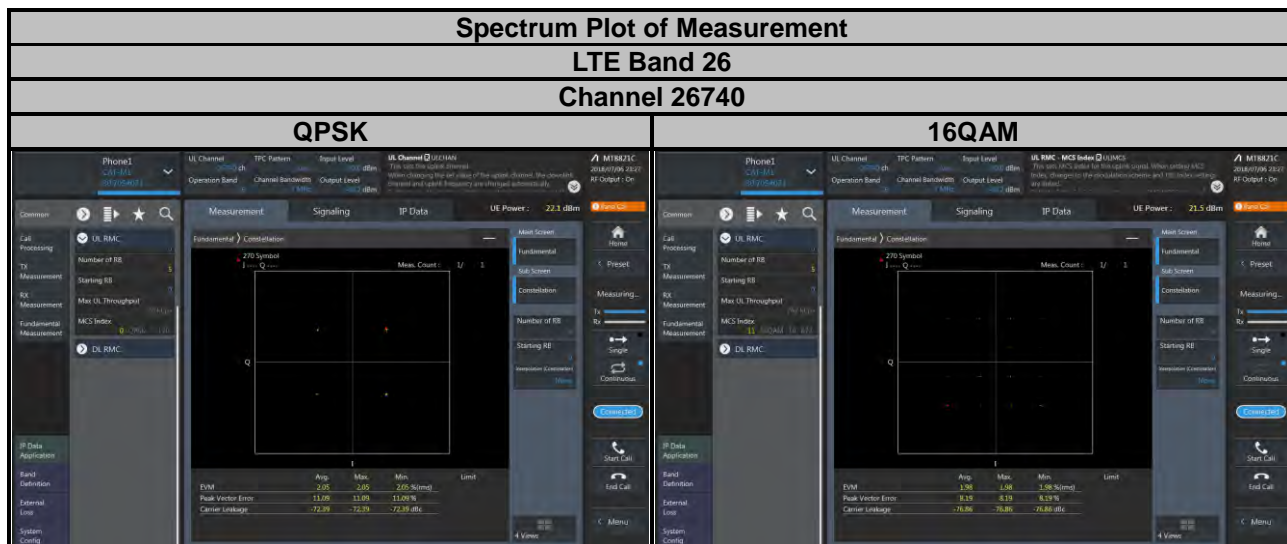
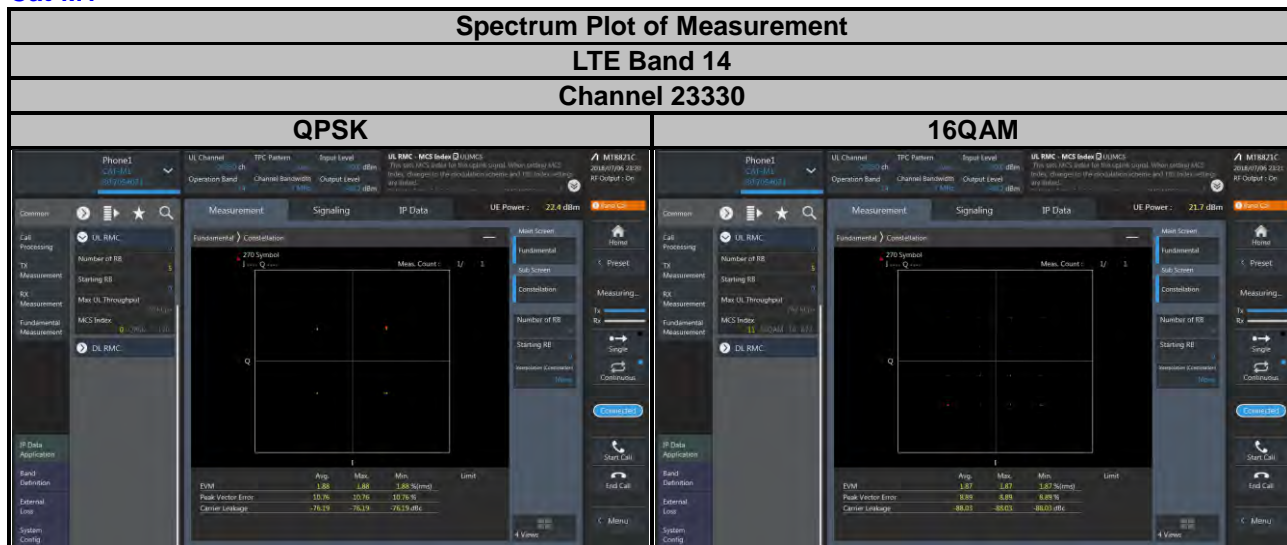


### 4.2.3 Test Procedure

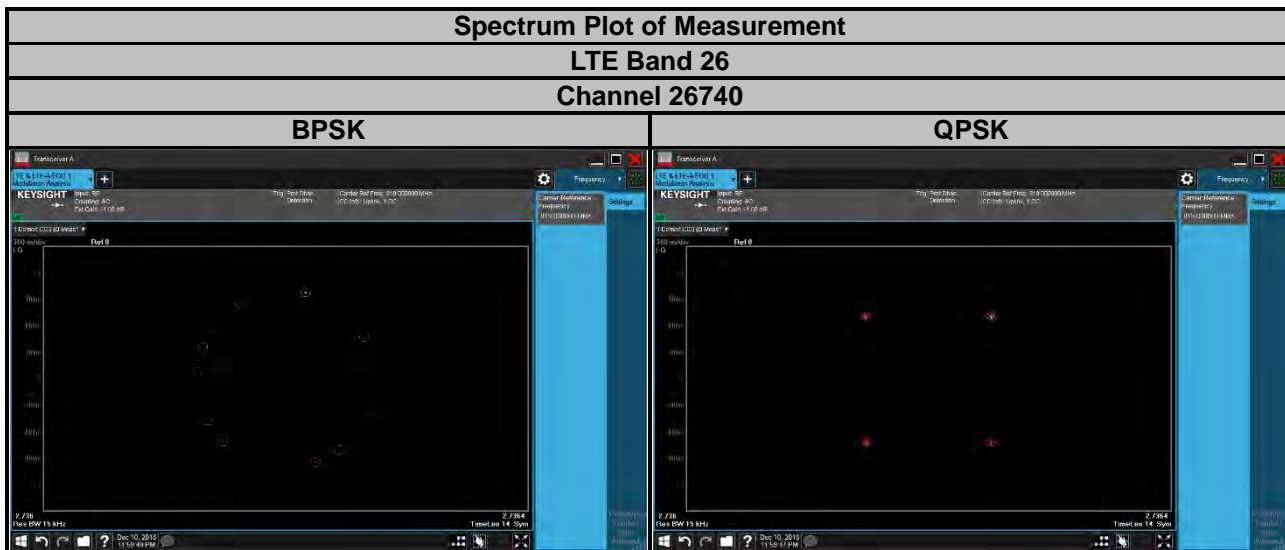
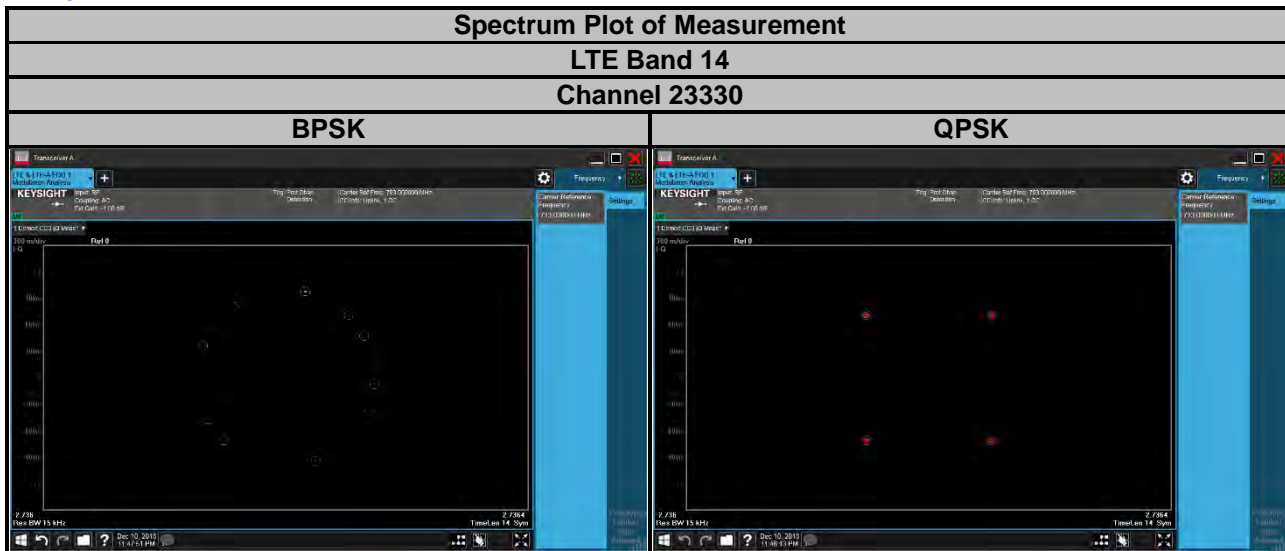
Connect the EUT to Communication Simulator via the antenna connector. The frequency band is set as EUT supported Modulation and Channels, the EUT output is matched with 50 ohm load, the waveform quality and constellation of the EUT was tested.

## 4.2.4 Test Results

### Cat-M1



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### 4.3 Frequency Stability Measurement

#### 4.3.1 Limits of Frequency Stability Measurement

##### LTE Band 14

The frequency stability of mobile, portable and control transmitters operating in the wideband segment must be 1.25 parts per million or better when AFC is locked to a base station, and 5 parts per million or better when AFC is not locked.

##### LTE Band 26

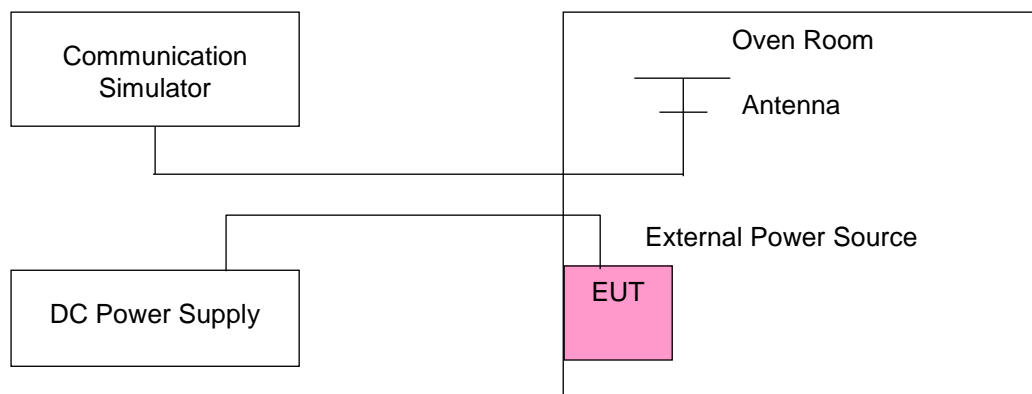
1.5 ppm is for base and fixed station. 2.5 ppm is for mobile station.

#### 4.3.2 Test Procedure

- Device is placed at the oven room. The oven room could control the temperatures and humidity. Power warm up is at least 15 min and power applied should perform before recording frequency error.
- EUT is connected the external power supply to control the DC input power. The test voltage range is from minimum to maximum working voltage. Each step shall be record the frequency error rate.
- The temperature range step is 10 degrees in this test items. All temperature levels shall be hold the  $\pm 0.5$  °C during the measurement testing. The each temperature step shall be at least 0.5 hours, consider the EUT could be test under the stability condition.

**NOTE:** The frequency error was recorded frequency error from the communication simulator.

#### 4.3.3 Test Setup



4.3.4 Test Results

**Cat-M1**

Frequency Error vs. Voltage

Voltage (Volts)	LTE Band 14				Limit (ppm)
	Channel Bandwidth: 5 MHz				
	Low Channel		High Channel		
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)	
12	790.500002	0.002	795.500003	0.004	1.25
10.2	790.500002	0.003	795.500003	0.004	1.25
13.8	790.500003	0.004	795.500004	0.005	1.25

**Note:** The fixture defined the normal working voltage of the adapter is from 10.2 Vdc to 13.8 Vdc.

Frequency Error vs. Temperature

Temp. (°C)	LTE Band 14				Limit (ppm)
	Channel Bandwidth: 5 MHz				
	Low Channel		High Channel		
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)	
-30	790.500003	0.003	795.500002	0.003	1.25
-20	790.500004	0.004	795.500004	0.005	1.25
-10	790.500002	0.002	795.500003	0.004	1.25
0	790.500003	0.004	795.500002	0.002	1.25
10	790.500003	0.004	795.500003	0.004	1.25
20	790.500002	0.002	795.500003	0.004	1.25
30	790.499998	-0.003	795.499996	-0.005	1.25
40	790.499998	-0.002	795.499998	-0.002	1.25
50	790.499997	-0.004	795.499999	-0.002	1.25
60	790.499996	-0.005	795.499998	-0.002	1.25
70	790.499997	-0.004	795.499999	-0.002	1.25
80	790.499997	-0.004	795.499999	-0.002	1.25
85	790.499998	-0.003	795.499997	-0.004	1.25

Frequency Error vs. Voltage

Voltage (Volts)	LTE Band 14		Limit (ppm)
	Channel Bandwidth: 10 MHz		
	Frequency (MHz)	Frequency Error (ppm)	
12	793.000002	0.002	1.25
10.2	793.000002	0.003	1.25
13.8	793.000004	0.005	1.25

**Note:** The fixture defined the normal working voltage of the adapter is from 10.2 Vdc to 13.8 Vdc.

Frequency Error vs. Temperature

Temp. (°C)	LTE Band 14		Limit (ppm)
	Channel Bandwidth: 10 MHz		
	Frequency (MHz)	Frequency Error (ppm)	
-30	793.000002	0.003	1.25
-20	793.000003	0.004	1.25
-10	793.000004	0.005	1.25
0	793.000003	0.004	1.25
10	793.000001	0.002	1.25
20	793.000002	0.003	1.25
30	792.999999	-0.002	1.25
40	792.999997	-0.003	1.25
50	792.999997	-0.004	1.25
60	792.999996	-0.005	1.25
70	792.999999	-0.001	1.25
50	792.999998	-0.002	1.25
85	792.999997	-0.004	1.25

## Frequency Error vs. Voltage

Voltage (Volts)	LTE Band 26				Limit (ppm)
	Channel Bandwidth: 1.4 MHz				
	Low Channel		High Channel		
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)	
12	814.700001	0.002	823.300004	0.005	2.5
10.2	814.700004	0.005	823.300002	0.003	2.5
13.8	814.700001	0.002	823.300003	0.004	2.5

**Note:** The fixture defined the normal working voltage of the adapter is from 10.2 Vdc to 13.8 Vdc.

## Frequency Error vs. Temperature

Temp. (°C)	LTE Band 26				Limit (ppm)
	Channel Bandwidth: 1.4 MHz				
	Low Channel		High Channel		
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)	
-30	814.700002	0.003	823.300004	0.005	2.5
-20	814.700001	0.001	823.300004	0.004	2.5
-10	814.700003	0.004	823.300003	0.003	2.5
0	814.700002	0.003	823.300002	0.003	2.5
10	814.700004	0.004	823.300003	0.004	2.5
20	814.700004	0.004	823.300003	0.004	2.5
30	814.699999	-0.002	823.299996	-0.004	2.5
40	814.699998	-0.002	823.299997	-0.004	2.5
50	814.699997	-0.004	823.299999	-0.002	2.5
60	814.699997	-0.004	823.299996	-0.004	2.5
70	814.699998	-0.002	823.299997	-0.003	2.5
80	814.699997	-0.003	823.299999	-0.001	2.5
85	814.699996	-0.005	823.299998	-0.003	2.5



Frequency Error vs. Voltage

Voltage (Volts)	LTE Band 26				Limit (ppm)
	Channel Bandwidth: 3 MHz				
	Low Channel		High Channel		
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)	
12	815.500004	0.005	822.500002	0.002	2.5
10.2	815.500002	0.002	822.500001	0.002	2.5
13.8	815.500003	0.004	822.500002	0.002	2.5

**Note:** The fixture defined the normal working voltage of the adapter is from 10.2 Vdc to 13.8 Vdc.

Frequency Error vs. Temperature

Temp. (°C)	LTE Band 26				Limit (ppm)
	Channel Bandwidth: 3 MHz				
	Low Channel		High Channel		
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)	
-30	815.500002	0.003	822.500003	0.004	2.5
-20	815.500002	0.002	822.500003	0.004	2.5
-10	815.500001	0.001	822.500002	0.003	2.5
0	815.500003	0.003	822.500001	0.001	2.5
10	815.500004	0.005	822.500001	0.001	2.5
20	815.500003	0.004	822.500003	0.004	2.5
30	815.499999	-0.001	822.499999	-0.002	2.5
40	815.499996	-0.005	822.499998	-0.002	2.5
50	815.499998	-0.003	822.499996	-0.005	2.5
60	815.499997	-0.003	822.499998	-0.002	2.5
70	815.499996	-0.005	822.499996	-0.005	2.5
80	815.499997	-0.003	822.499999	-0.002	2.5
85	815.499997	-0.004	822.499997	-0.004	2.5

Frequency Error vs. Voltage

Voltage (Volts)	LTE Band 26				Limit (ppm)
	Channel Bandwidth: 5 MHz				
	Low Channel		High Channel		
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)	
12	816.500001	0.001	821.500002	0.003	2.5
10.2	816.500001	0.001	821.500002	0.003	2.5
13.8	816.500002	0.002	821.500001	0.002	2.5

**Note:** The fixture defined the normal working voltage of the adapter is from 10.2 Vdc to 13.8 Vdc.

Frequency Error vs. Temperature

Temp. (°C)	LTE Band 26				Limit (ppm)
	Channel Bandwidth: 5 MHz				
	Low Channel		High Channel		
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)	
-30	816.500003	0.004	821.500002	0.003	2.5
-20	816.500003	0.004	821.500002	0.003	2.5
-10	816.500003	0.004	821.500001	0.002	2.5
0	816.500004	0.005	821.500001	0.002	2.5
10	816.500002	0.003	821.500001	0.001	2.5
20	816.500001	0.001	821.500003	0.003	2.5
30	816.499998	-0.002	821.499998	-0.003	2.5
40	816.499998	-0.003	821.499997	-0.003	2.5
50	816.499998	-0.002	821.499996	-0.004	2.5
60	816.499998	-0.002	821.499998	-0.002	2.5
70	816.499997	-0.004	821.499998	-0.003	2.5
80	816.499997	-0.004	821.499999	-0.001	2.5
85	816.499998	-0.003	821.499999	-0.002	2.5

Frequency Error vs. Voltage

Voltage (Volts)	LTE Band 26		Limit (ppm)
	Channel Bandwidth: 10 MHz		
	Frequency (MHz)	Frequency Error (ppm)	
12	819.000003	0.003	2.5
10.2	819.000002	0.003	2.5
13.8	819.000002	0.002	2.5

**Note:** The fixture defined the normal working voltage of the adapter is from 10.2 Vdc to 13.8 Vdc.

Frequency Error vs. Temperature

Temp. (°C)	LTE Band 26		Limit (ppm)
	Channel Bandwidth: 10 MHz		
	Frequency (MHz)	Frequency Error (ppm)	
-30	819.000001	0.001	2.5
-20	819.000003	0.004	2.5
-10	819.000003	0.003	2.5
0	819.000003	0.003	2.5
10	819.000004	0.005	2.5
20	819.000004	0.004	2.5
30	818.999997	-0.004	2.5
40	818.999999	-0.001	2.5
50	818.999997	-0.004	2.5
60	818.999997	-0.004	2.5
70	818.999997	-0.004	2.5
80	818.999997	-0.003	2.5
85	818.999999	-0.001	2.5

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### Frequency Error vs. Voltage

Voltage (Volts)	LTE Band 14				Limit (ppm)
	Low Channel		High Channel		
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)	
12	790.100002	0.003	795.900002	0.003	1.25
10.2	790.100001	0.001	795.900003	0.003	1.25
13.8	790.100002	0.003	795.900002	0.003	1.25

**Note:** The fixture defined the normal working voltage of the adapter is from 10.2 Vdc to 13.8 Vdc.

### Frequency Error vs. Temperature

Temp. (°C)	LTE Band 14				Limit (ppm)
	Low Channel		High Channel		
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)	
-30	790.100003	0.003	795.900003	0.003	1.25
-20	790.100002	0.003	795.900002	0.002	1.25
-10	790.100004	0.005	795.900001	0.001	1.25
0	790.100002	0.003	795.900003	0.004	1.25
10	790.100001	0.001	795.900003	0.004	1.25
20	790.099997	-0.004	795.899996	-0.005	1.25
30	790.099998	-0.002	795.899996	-0.005	1.25
40	790.099999	-0.002	795.899997	-0.004	1.25
50	790.099999	-0.002	795.899996	-0.005	1.25
60	790.099998	-0.003	795.899998	-0.003	1.25
70	790.099998	-0.003	795.899998	-0.002	1.25
80	790.099998	-0.002	795.899997	-0.004	1.25
85	790.099999	-0.002	795.899999	-0.001	1.25

Frequency Error vs. Voltage

Voltage (Volts)	LTE Band 26				Limit (ppm)
	Low Channel		High Channel		
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)	
12	814.100003	0.003	823.900002	0.002	2.5
10.2	814.100002	0.002	823.900004	0.005	2.5
13.8	814.100001	0.002	823.900004	0.004	2.5

**Note:** The fixture defined the normal working voltage of the adapter is from 10.2 Vdc to 13.8 Vdc.

Frequency Error vs. Temperature

Temp. (°C)	LTE Band 26				Limit (ppm)
	Low Channel		High Channel		
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)	
-30	814.100002	0.002	823.900003	0.004	2.5
-20	814.100003	0.004	823.900004	0.004	2.5
-10	814.100004	0.005	823.900003	0.004	2.5
0	814.100003	0.003	823.900003	0.004	2.5
10	814.100002	0.003	823.900002	0.002	2.5
20	814.099997	-0.004	823.899998	-0.002	2.5
30	814.099997	-0.004	823.899998	-0.002	2.5
40	814.099997	-0.003	823.899998	-0.002	2.5
50	814.099997	-0.004	823.899996	-0.004	2.5
60	814.099997	-0.003	823.899996	-0.005	2.5
70	814.099999	-0.001	823.899999	-0.001	2.5
80	814.099998	-0.003	823.899997	-0.004	2.5
85	814.099998	-0.002	823.899998	-0.002	2.5

## 4.4 Occupied Bandwidth Measurement

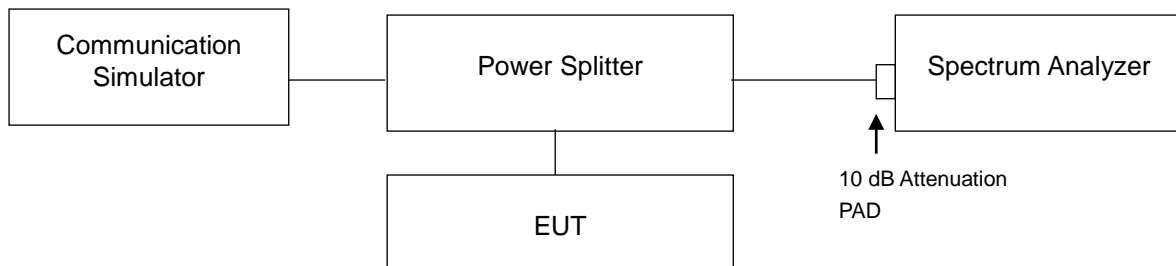
### 4.4.1 Limits of Occupied Bandwidth Measurement

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.

### 4.4.2 Test Procedure

The EUT makes a call to the communication simulator. All measurements were done at low, middle and high operational frequency range. 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.

### 4.4.3 Test Setup



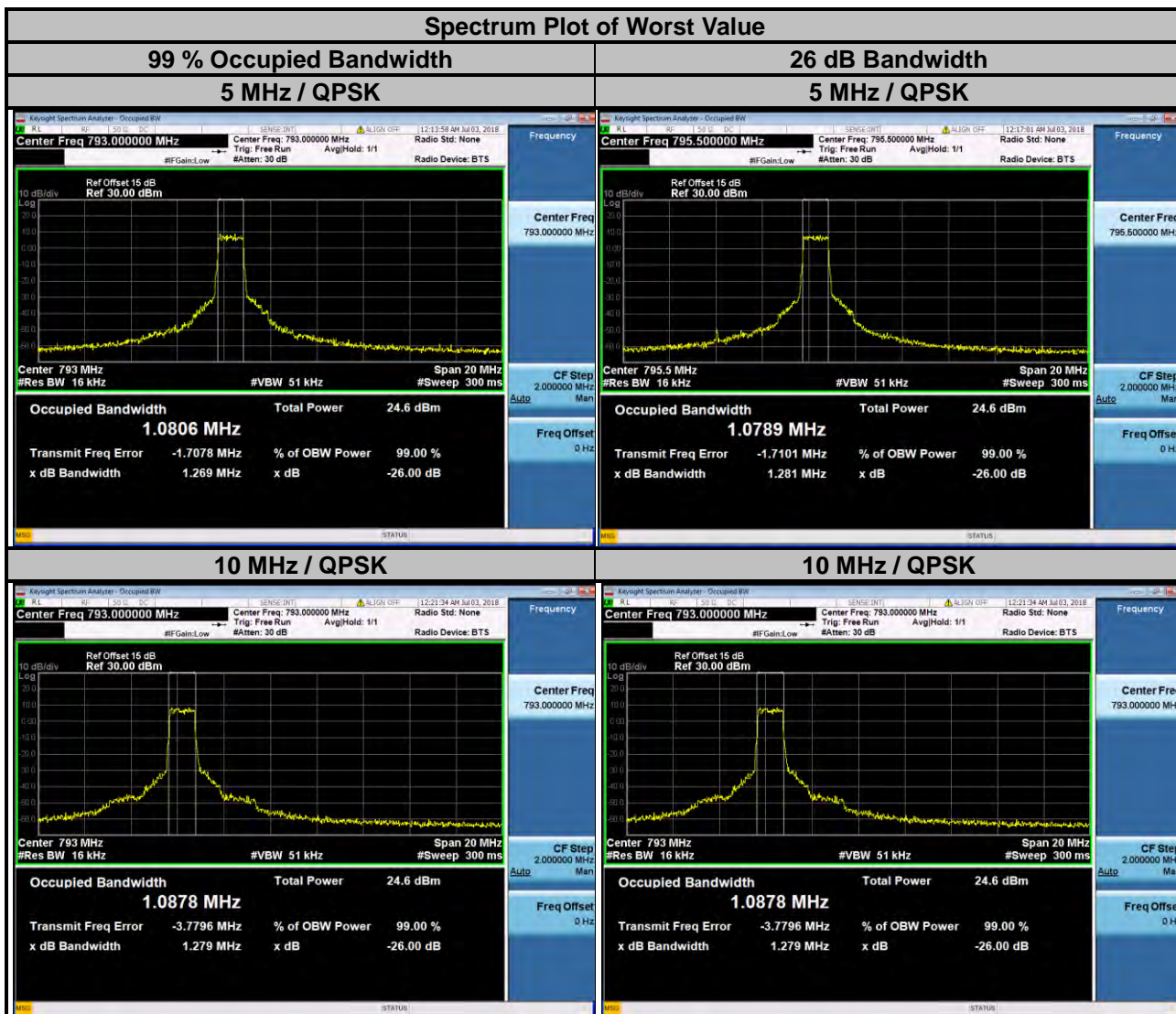
#### 4.4.4 Test Results

#### Cat-M1

LTE Band 14					
Channel Bandwidth: 5 MHz					
Channel	Frequency (MHz)	99 % Occupied Bandwidth (MHz)		26 dB Bandwidth (MHz)	
		QPSK	16QAM	QPSK	16QAM
23305	790.5	1.0776	0.8899	1.273	1.183
23330	793.0	1.0806	0.9120	1.269	1.245
23355	795.5	1.0789	0.9127	1.281	1.220

Channel Bandwidth: 10 MHz					
Channel	Frequency (MHz)	99 % Occupied Bandwidth (MHz)		26 dB Bandwidth (MHz)	
		QPSK	16QAM	QPSK	16QAM
23330	793.0	1.0878	0.9120	1.279	1.206

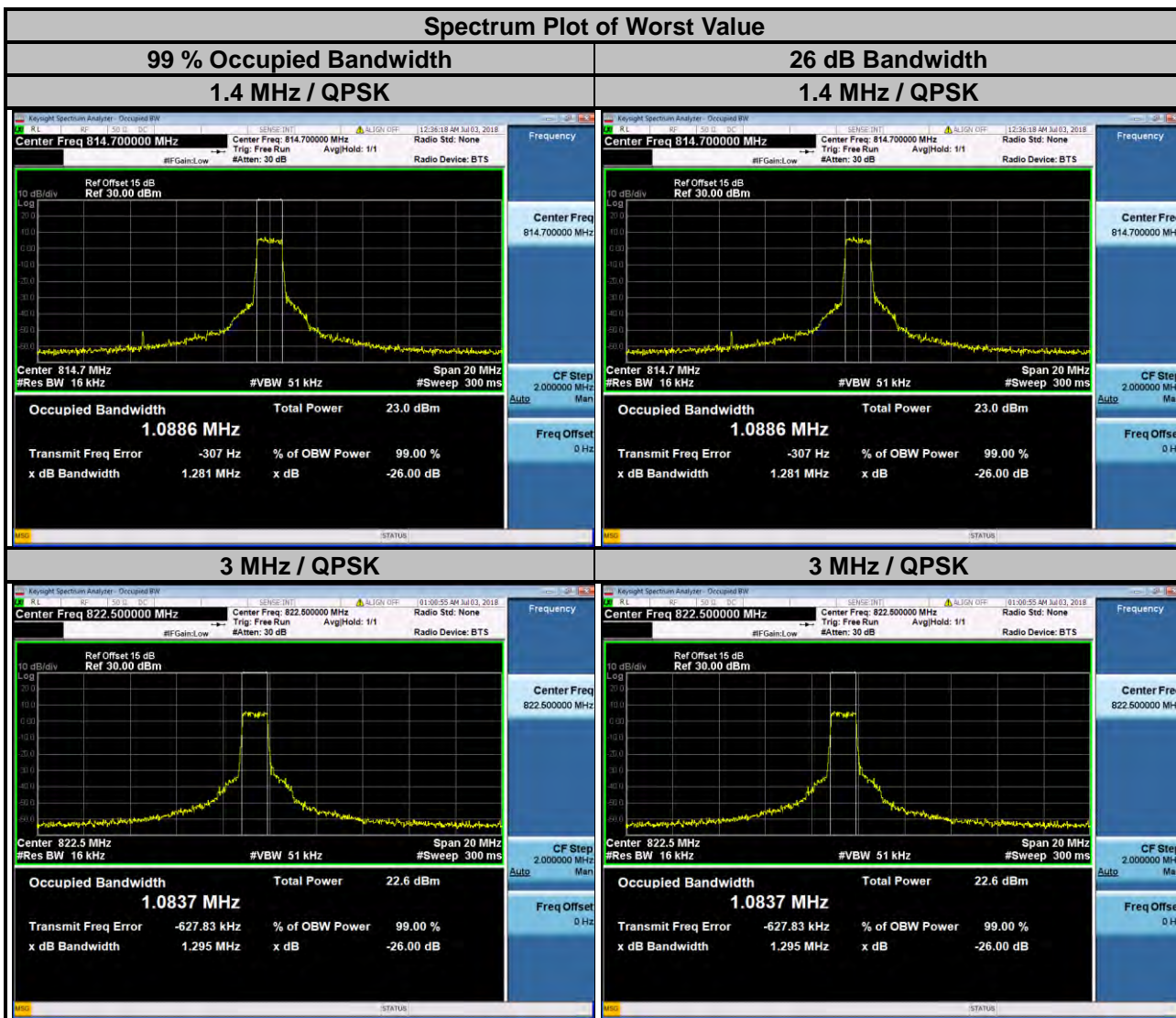




LTE Band 26					
Channel Bandwidth: 1.4 MHz					
Channel	Frequency (MHz)	99 % Occupied Bandwidth (MHz)		26 dB Bandwidth (MHz)	
		QPSK	16QAM	QPSK	16QAM
26697	814.7	1.0886	0.9107	1.281	1.210
26740	819.0	1.0866	0.9121	1.276	1.215
26783	823.3	1.0877	0.9137	1.279	1.230

Channel Bandwidth: 3 MHz					
Channel	Frequency (MHz)	99 % Occupied Bandwidth (MHz)		26 dB Bandwidth (MHz)	
		QPSK	16QAM	QPSK	16QAM
26705	815.5	1.0836	0.9052	1.279	1.231
26740	819.0	1.0793	0.9164	1.261	1.202
26775	822.5	1.0837	0.9147	1.295	1.228

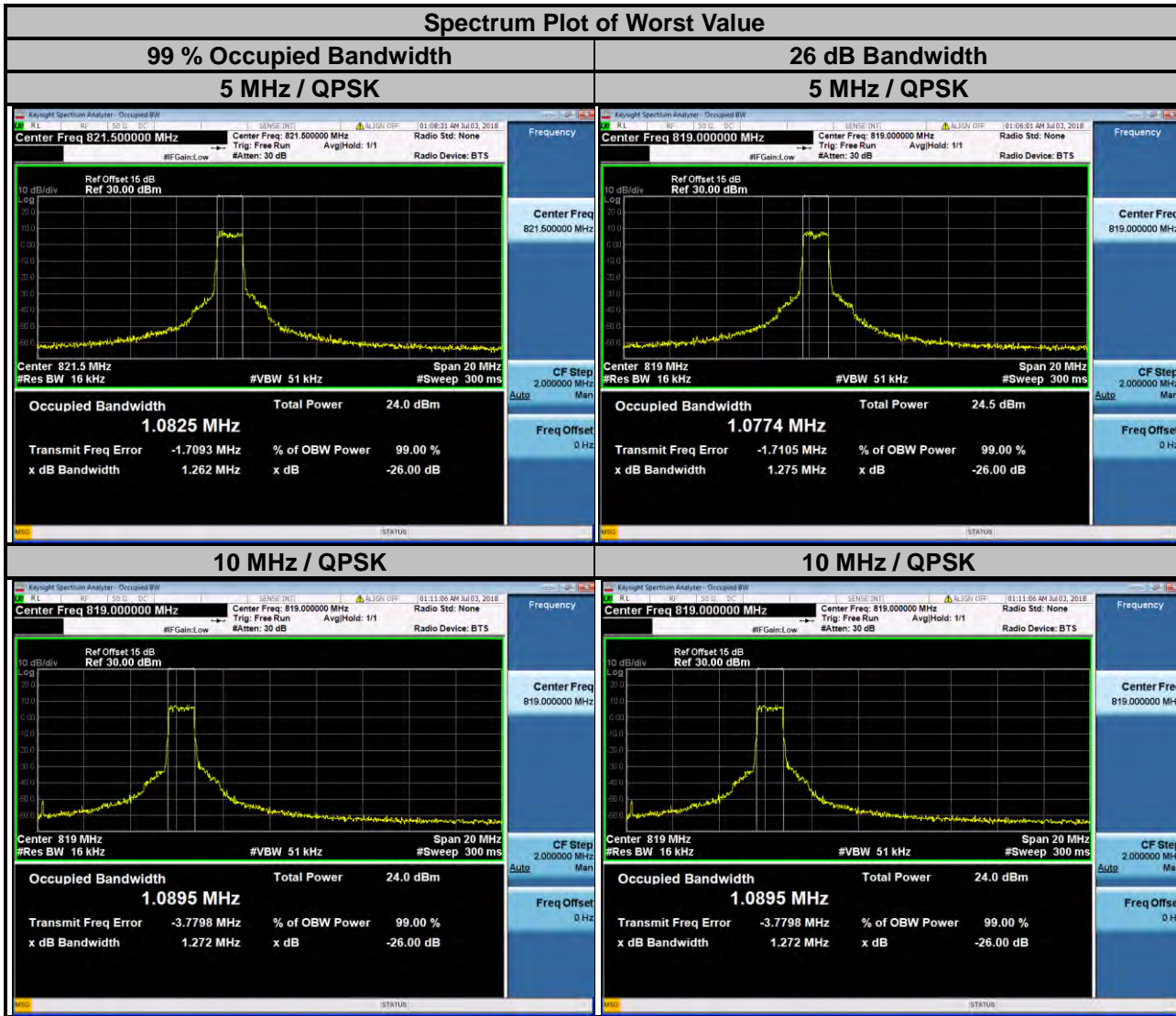




LTE Band 26					
Channel Bandwidth: 5 MHz					
Channel	Frequency (MHz)	99 % Occupied Bandwidth (MHz)		26 dB Bandwidth (MHz)	
		QPSK	16QAM	QPSK	16QAM
26715	816.5	1.0818	0.9183	1.265	1.217
26740	819.0	1.0774	0.9171	1.275	1.182
26765	821.5	1.0825	0.9043	1.262	1.205

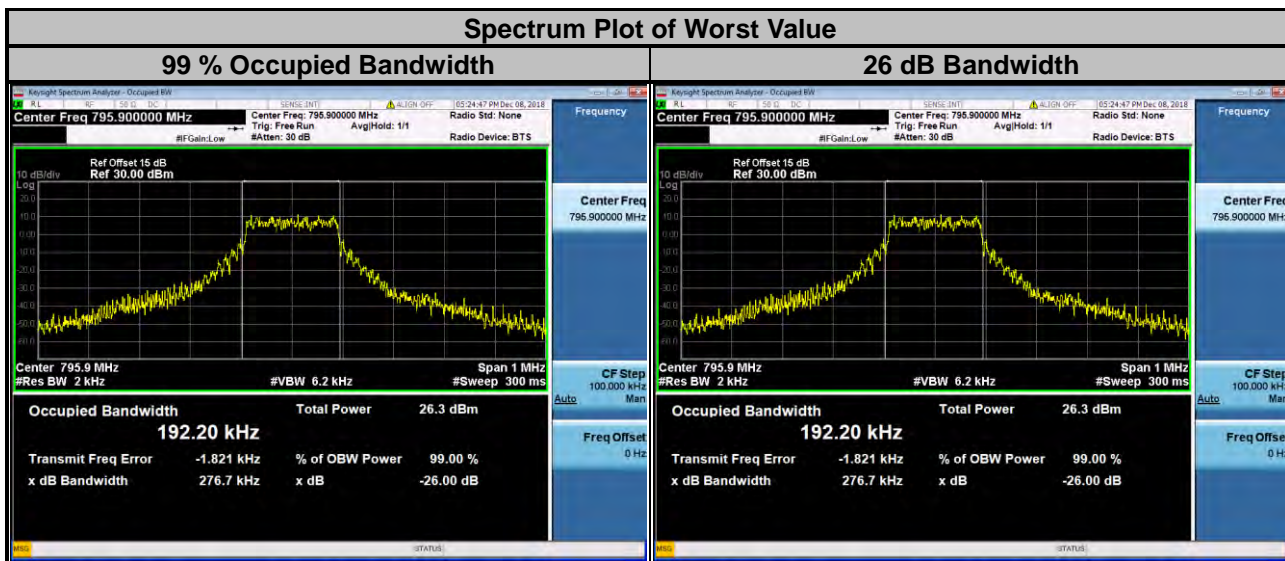
  

Channel Bandwidth: 10 MHz					
Channel	Frequency (MHz)	99 % Occupied Bandwidth (MHz)		26 dB Bandwidth (MHz)	
		QPSK	16QAM	QPSK	16QAM
26740	819.0	1.0895	0.9102	1.272	1.181

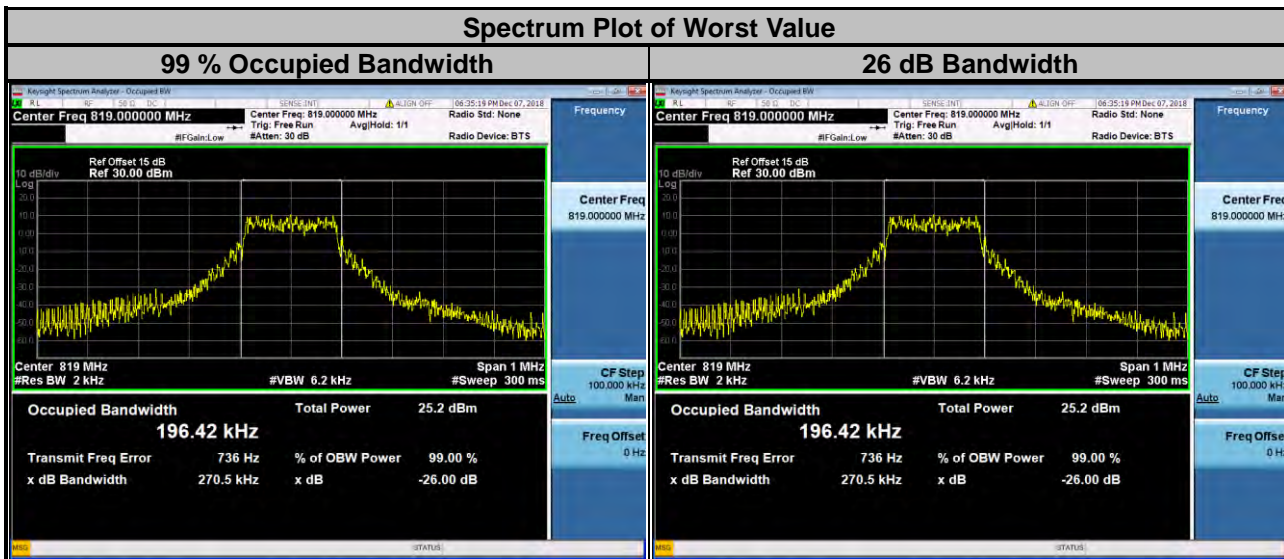


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LTE Band 14						
Channel	Frequency (MHz)	Modulation	N <sub>tones</sub>	Sub-carrier Spacing (kHz)	99 % Occupied Bandwidth (kHz)	26 dB Bandwidth (kHz)
23301	790.1	BPSK	1@0	3.75	52.47	37.30
		QPSK	1@0	15	98.14	124.20
		QPSK	3@3	15	102.82	168.90
		QPSK	12@0	15	185.64	261.20
23330	793	BPSK	1@0	3.75	52.19	37.94
		QPSK	1@0	15	95.10	114.60
		QPSK	3@3	15	100.37	153.20
		QPSK	12@0	15	181.60	264.70
23359	795.9	BPSK	1@47	3.75	51.57	36.93
		QPSK	1@11	15	93.92	112.90
		QPSK	3@3	15	104.23	167.50
		QPSK	12@0	15	192.20	276.70



LTE Band 26						
Channel	Frequency (MHz)	Modulation	N <sub>tones</sub>	Sub-carrier Spacing (kHz)	99 % Occupied Bandwidth (kHz)	26 dB Bandwidth (kHz)
26691	814.1	BPSK	1@0	3.75	52.99	37.61
		QPSK	1@0	15	93.39	111.80
		QPSK	3@3	15	114.33	194.40
		QPSK	12@0	15	189.82	264.30
26740	819	BPSK	1@0	3.75	52.59	37.47
		QPSK	1@0	15	97.94	114.60
		QPSK	3@3	15	100.40	141.70
		QPSK	12@0	15	196.42	270.50
26789	823.9	BPSK	1@47	3.75	51.18	37.22
		QPSK	1@11	15	96.38	112.00
		QPSK	3@3	15	103.93	169.60
		QPSK	12@0	15	188.24	260.70



## 4.5 Emission Mask Measurement

### 4.5.1 Limits of Emission Mask Measurement

#### LTE Band 14

1. On any frequency removed from the assigned frequency by more than 50 percent, but not more than 100 percent of the authorized bandwidth: At least 25 dB.
2. On any frequency removed from the assigned frequency by more than 100 percent, but not more than 250 percent of the authorized bandwidth: At least 35 dB.
3. On any frequency removed from the assigned frequency by more than 250 percent of the authorized bandwidth: At least  $43 + 10 \log(P)$  dB.

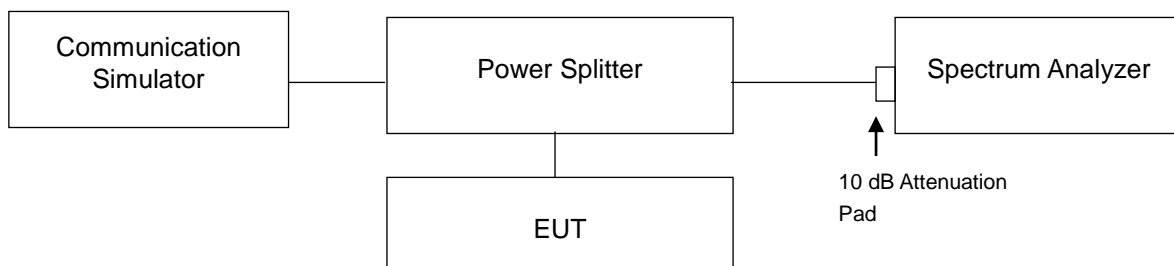
#### LTE Band 26

According to FCC part 90.691 shall be tested the emission mask. For any frequency removed from the EA licensee's frequency block by up to and including 37.5 kHz, the power of any emission shall be attenuated below the transmitter power (P) in watts by at least  $116 \log_{10}(f/6.1)$  decibels or  $50 + 10 \log_{10}(P)$  decibels or 80 decibels, whichever is the lesser attenuation, where f is the frequency removed from the center of the outer channel in the block in kilohertz and where f is greater than 12.5 kHz.

For any frequency removed from the EA licensee's frequency block greater than 37.5 kHz, the power of any emission shall be attenuated below the transmitter power (P) in watts by at least  $43 + 10 \log_{10}(P)$  decibels or 80 decibels, whichever is the lesser attenuation, where f is the frequency removed from the center of the outer channel in the block in kilohertz and where f is greater than 37.5 kHz.

For §90.691(a), RBW=300 Hz for offset less than 37.5 kHz from channel edge and RBW=100 kHz for offsets greater than 37.5 kHz is allowed.

### 4.5.2 Test Setup

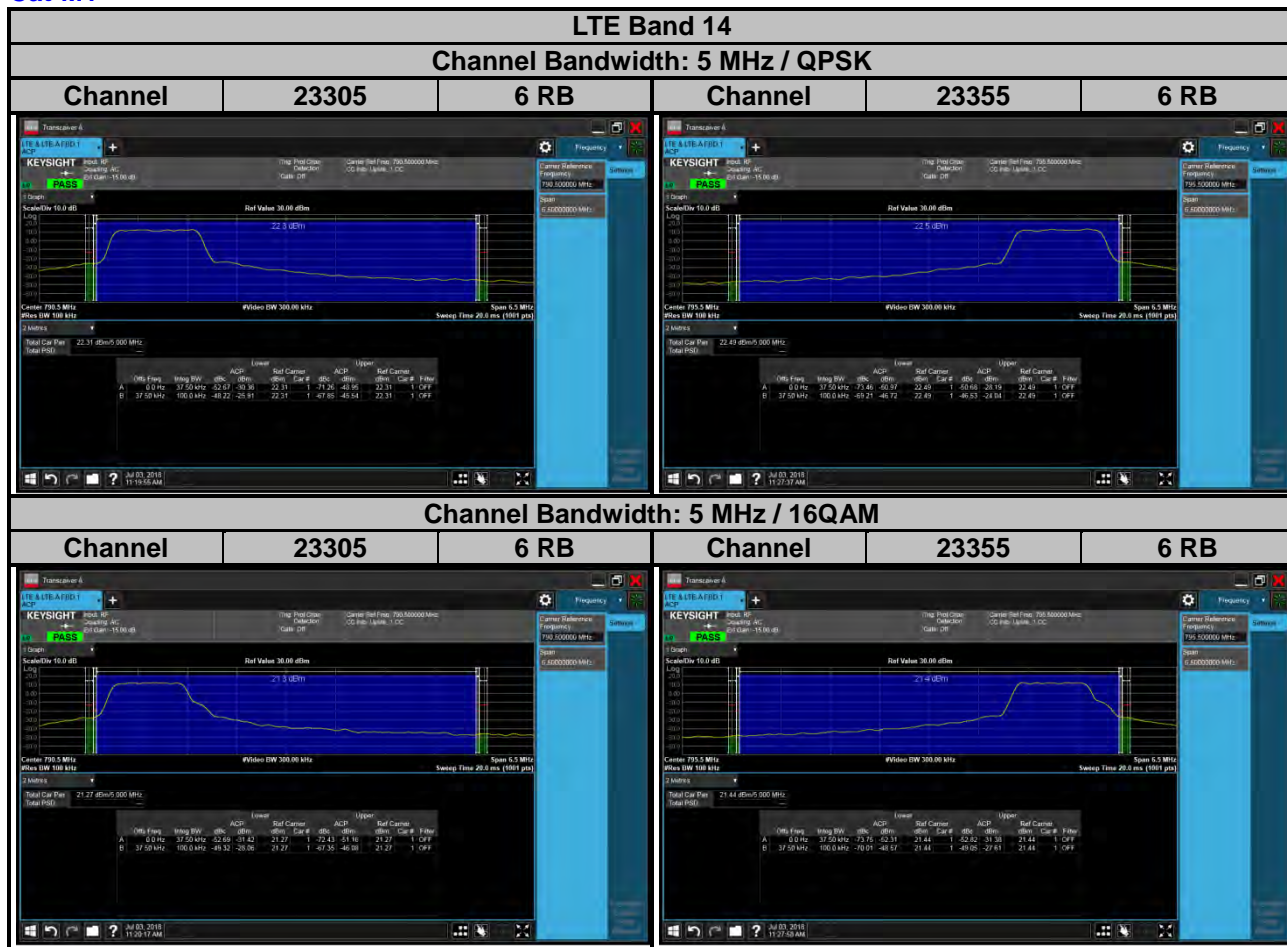


### 4.5.3 Test Procedures

- a. The measurement used the power splitter via EUT RF power connector between simulation base station and spectrum analyzer.
- b. Record the test plot.

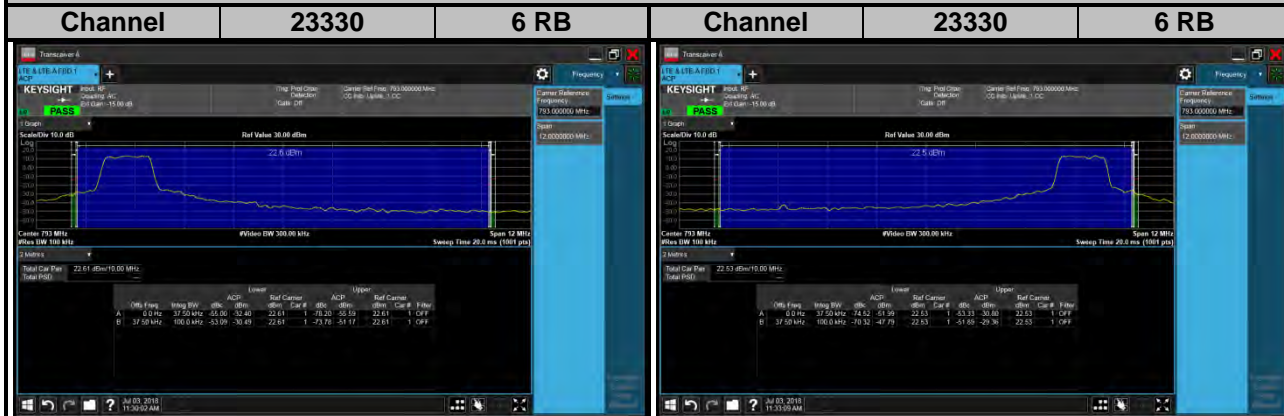
### 4.5.4 Test Results

#### Cat-M1





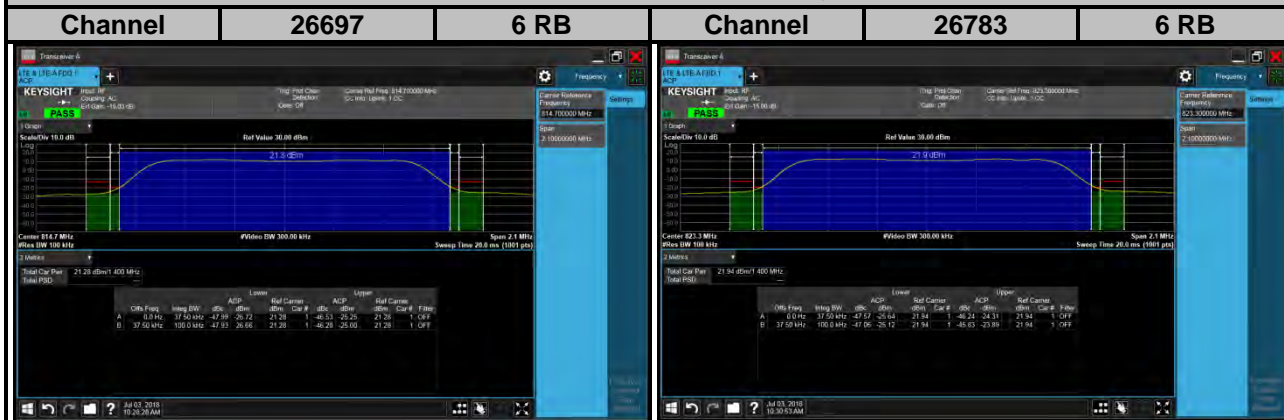
**LTE Band 14**  
**Channel Bandwidth: 10 MHz / QPSK**



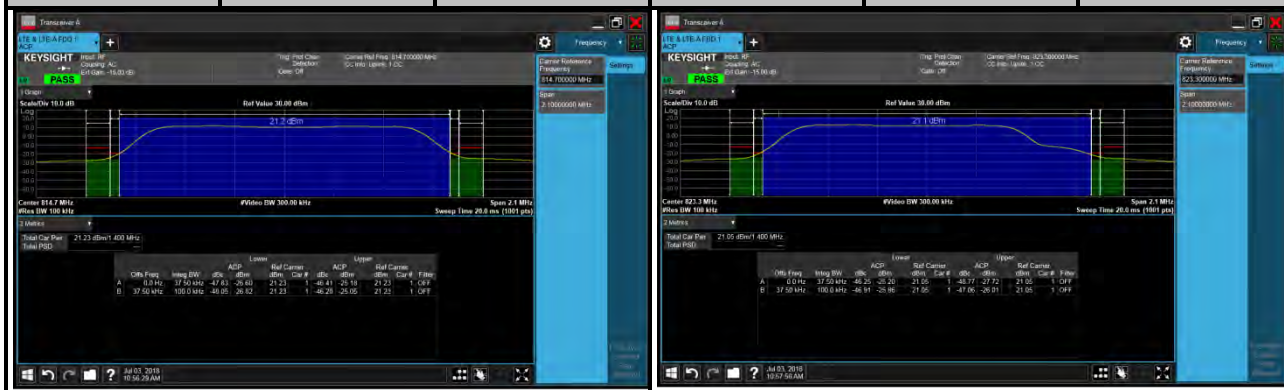
**Channel Bandwidth: 10 MHz / 16QAM**



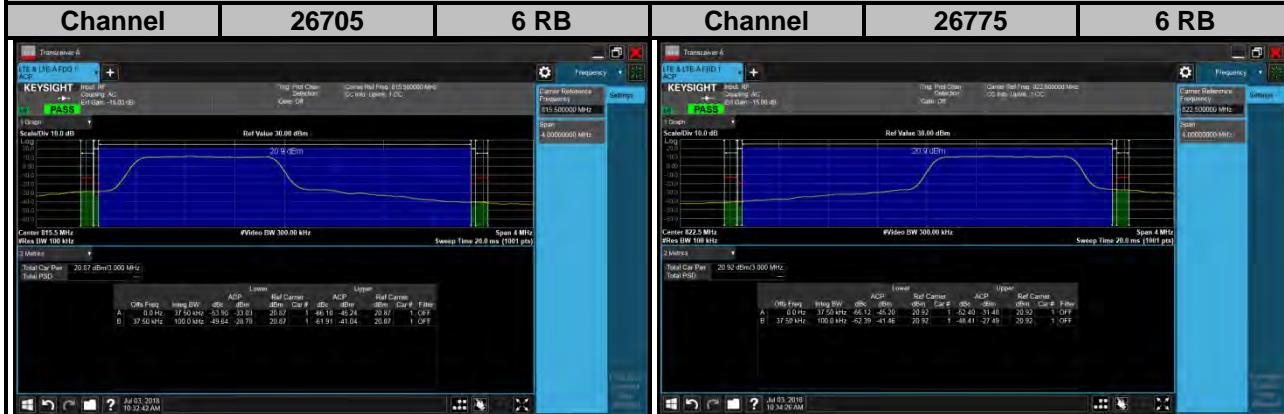
**LTE Band 26**  
**Channel Bandwidth: 1.4 MHz / QPSK**



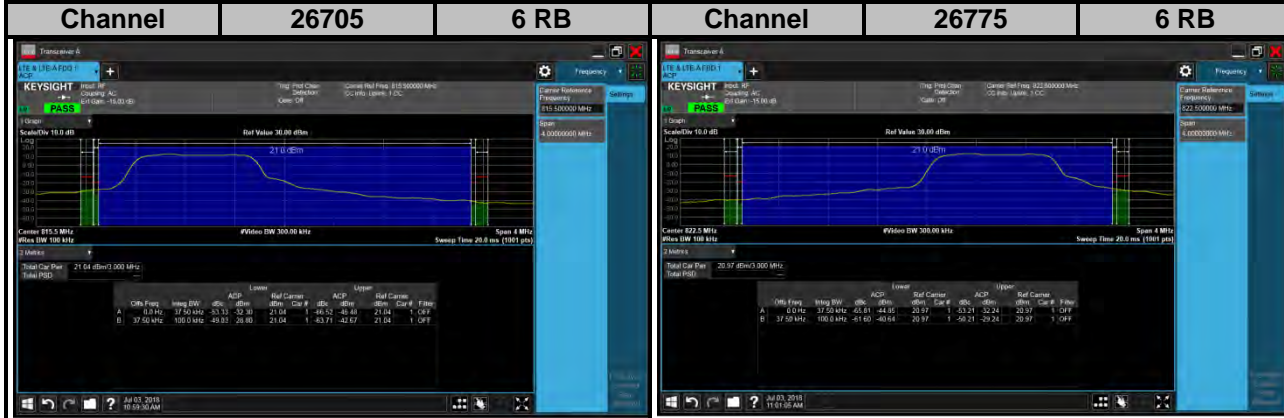
**Channel Bandwidth: 1.4 MHz / 16QAM**



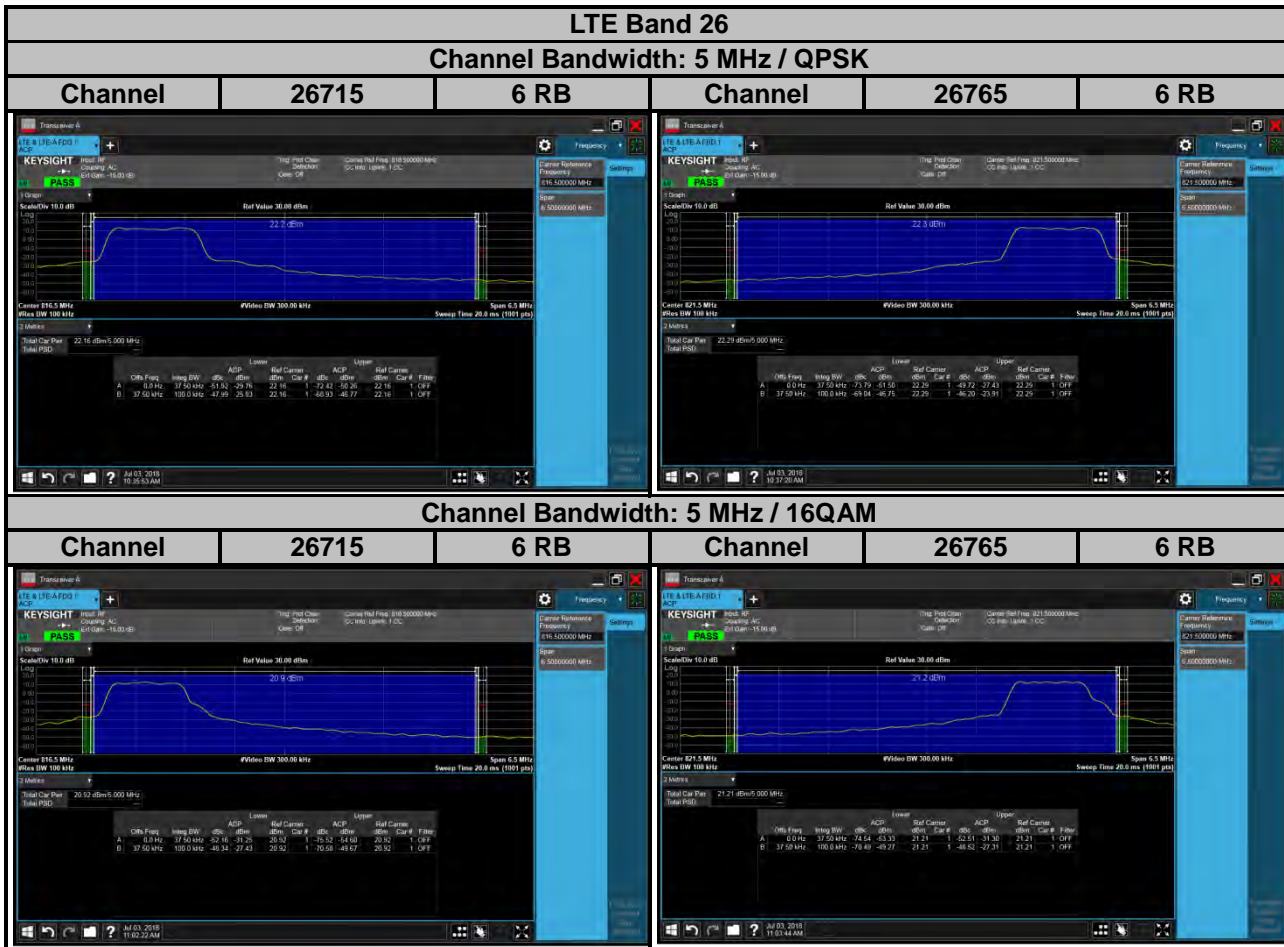
**LTE Band 26**  
**Channel Bandwidth: 3 MHz / QPSK**



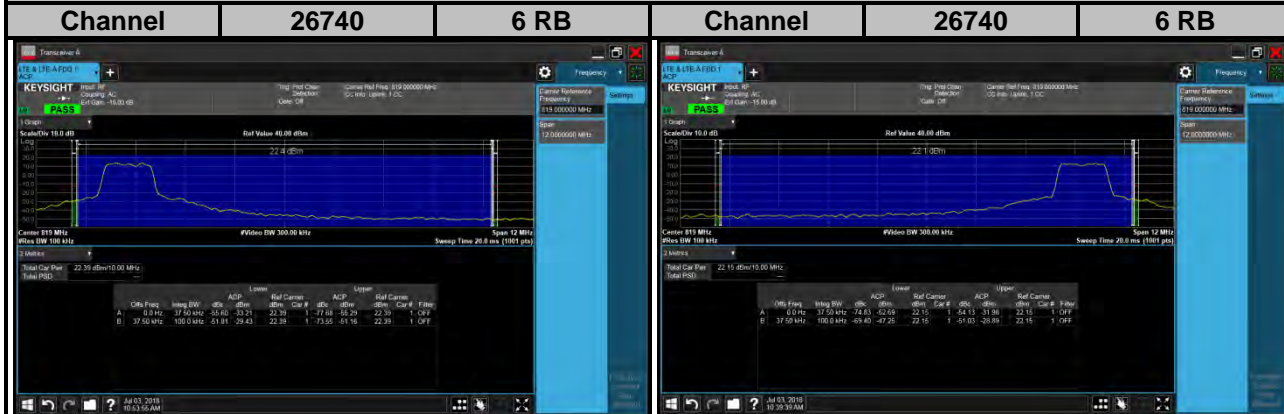
**Channel Bandwidth: 3 MHz / 16QAM**







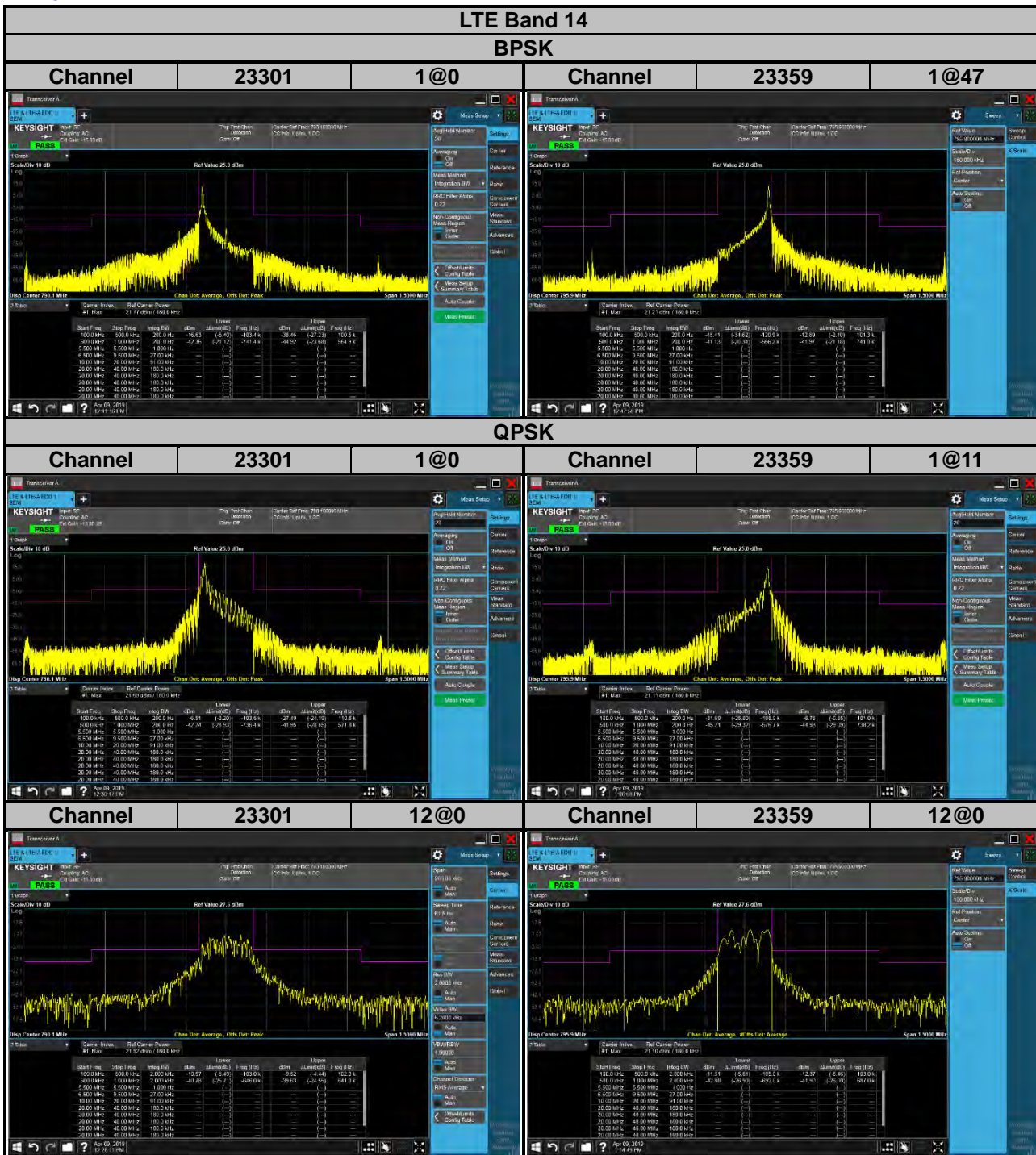
**LTE Band 26**  
**Channel Bandwidth: 10 MHz / QPSK**



**Channel Bandwidth: 10 MHz / 16QAM**

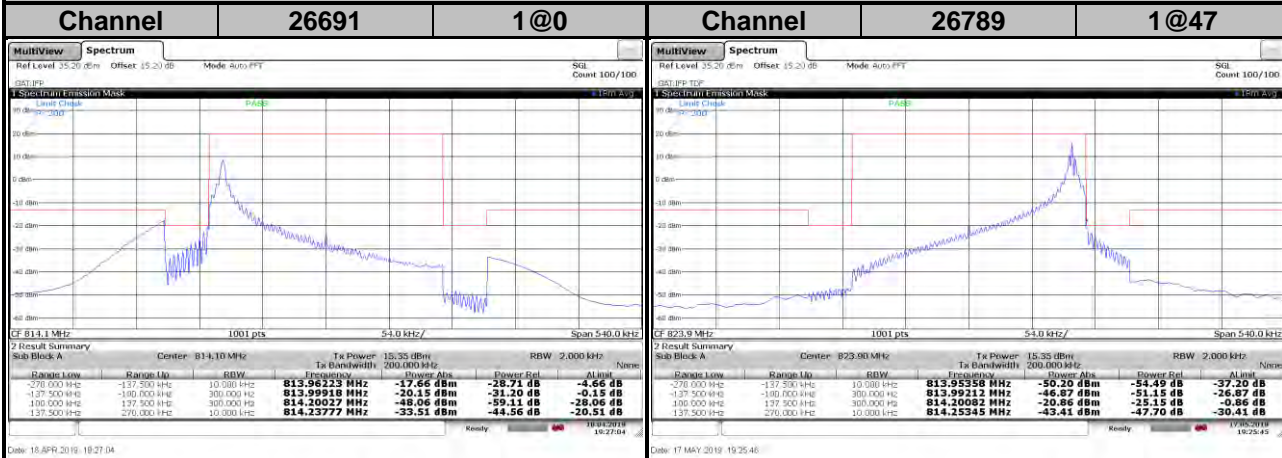


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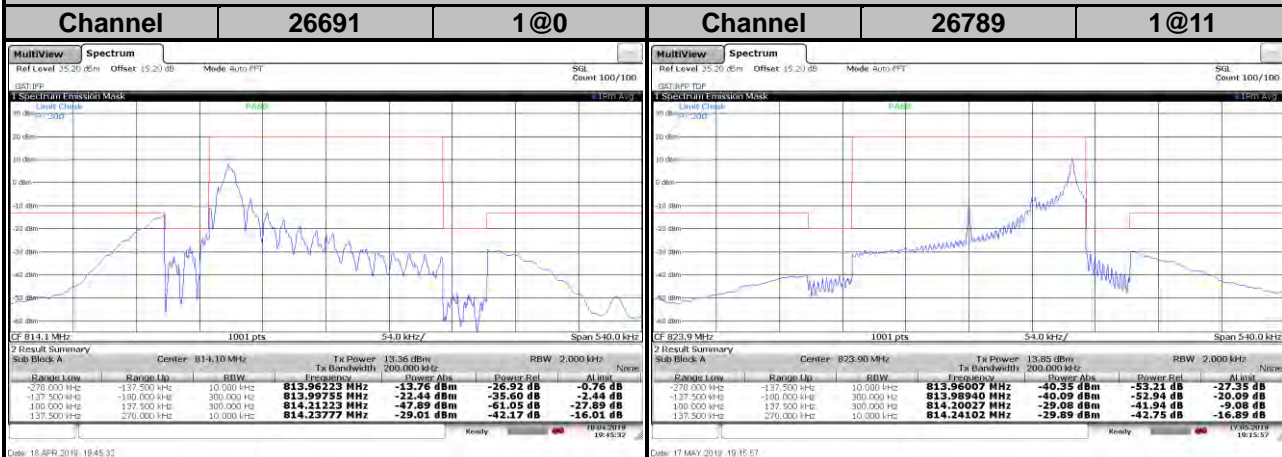




### LTE Band 26 BPSK



### QPSK

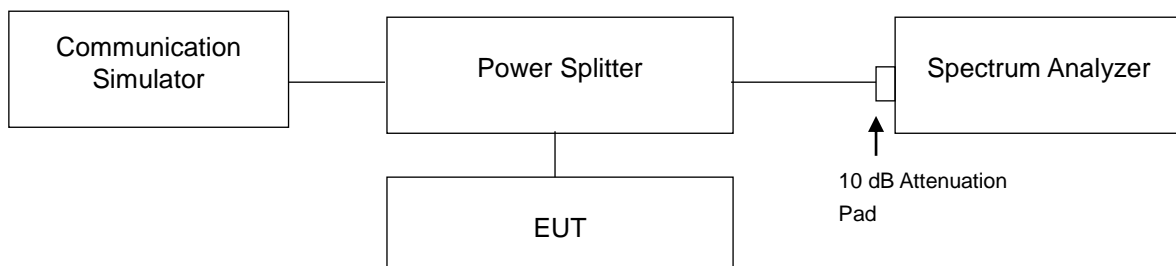


## 4.6 Band Edge Measurement

### 4.6.1 Limits of Band Edge Measurement

- (1) On all frequencies between 769 - 775 MHz and 799 - 805 MHz, by a factor not less than  $76 + 10 \log (P)$  dB in a 6.25 kHz band segment, for base and fixed stations.
- (2) On all frequencies between 769 - 775 MHz and 799 - 805 MHz, by a factor not less than  $65 + 10 \log (P)$  dB in a 6.25 kHz band segment, for mobile and portable stations.
- (3) On any frequency between 775 - 788 MHz, above 805 MHz, and below 758 MHz, by at least  $43 + 10 \log (P)$ .

### 4.6.2 Test Setup

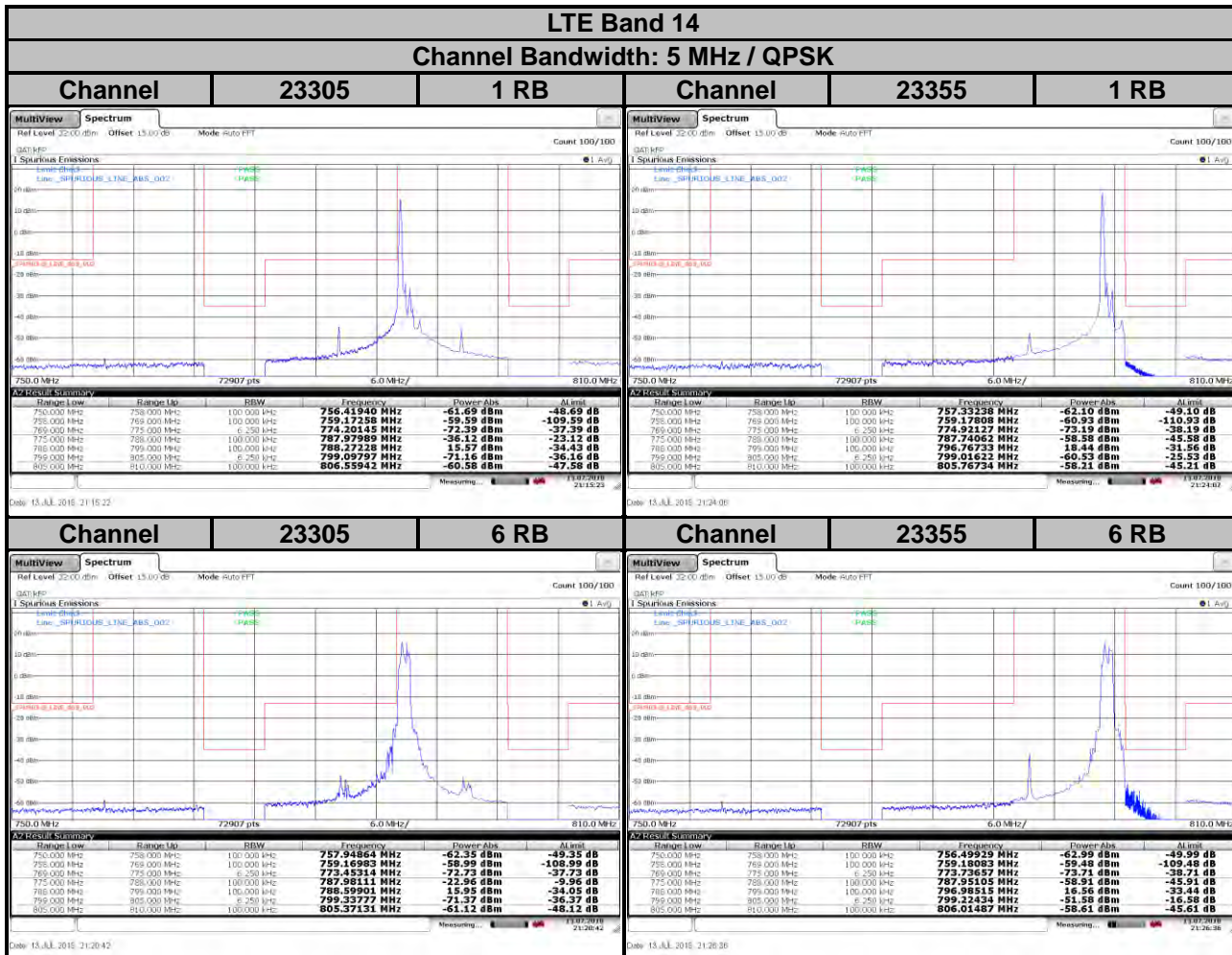


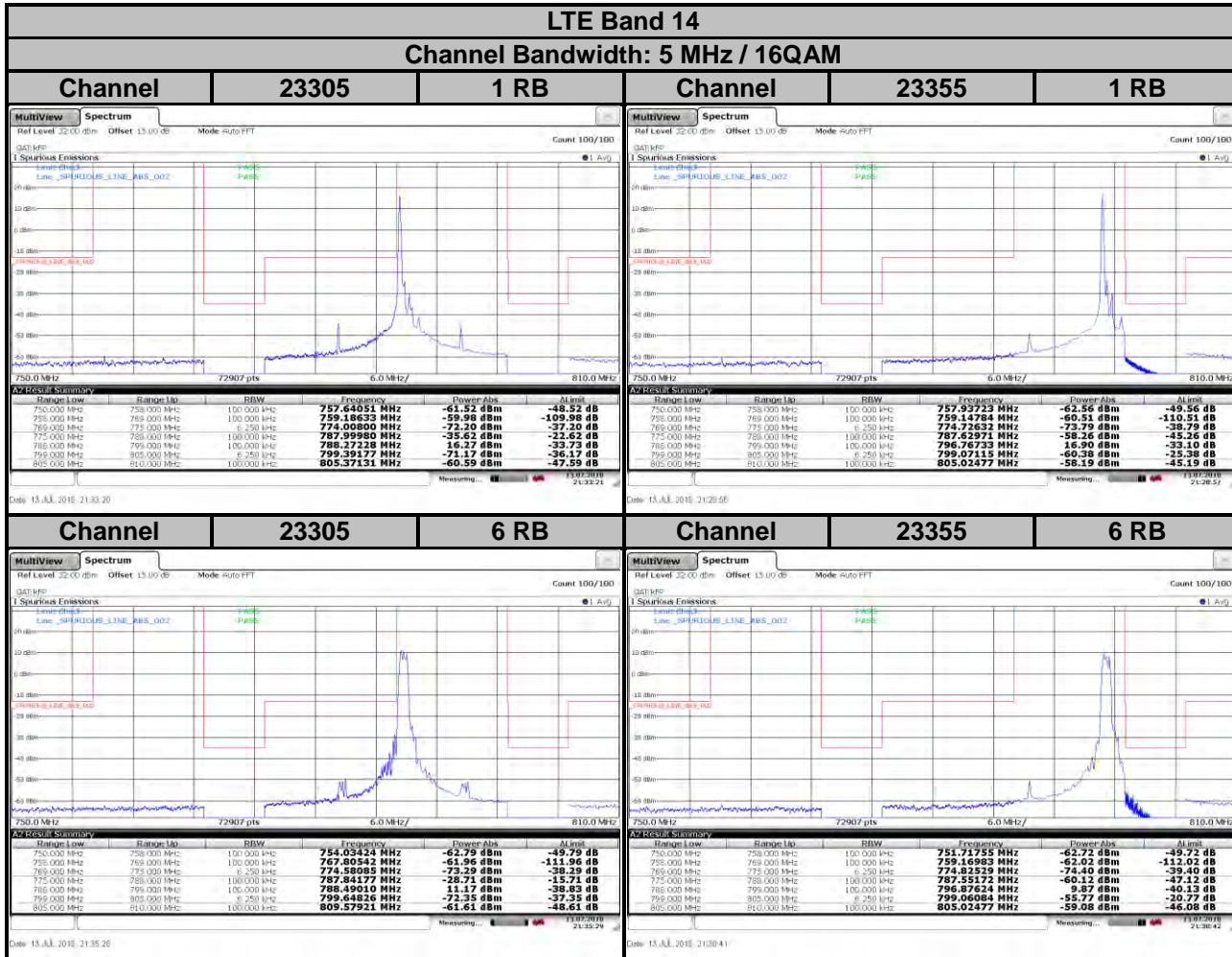
### 4.6.3 Test Procedures

- a. All measurements were done at low and high operational frequency range.
- b. The band edge measurement used the power splitter via EUT RF power connector between signal generator and spectrum analyzer. This splitter loss, attenuator loss and cable loss are the worst loss 15 dB in the transmitted path track.
- c. Record the max. trace plot into the test report.

### 4.6.4 Test Results

#### Cat-M1





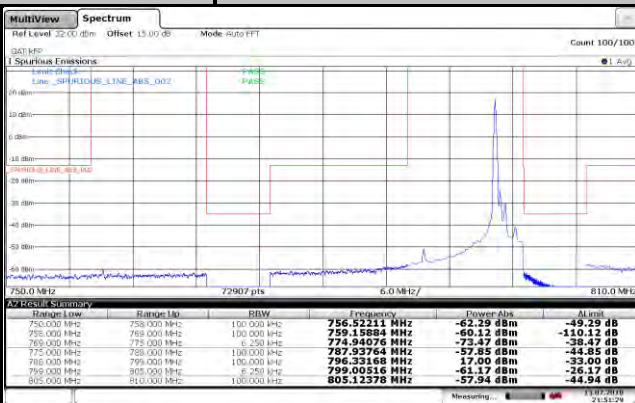
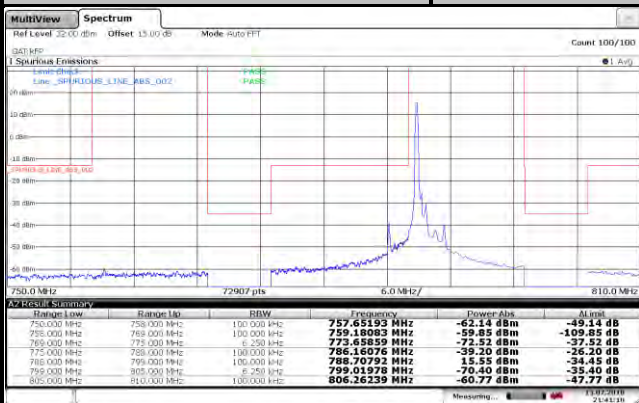


**LTE Band 14**  
**Channel Bandwidth: 10 MHz / QPSK**

**Channel**

**2330**

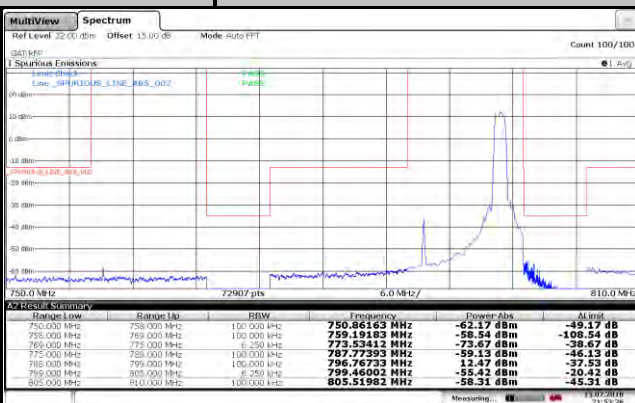
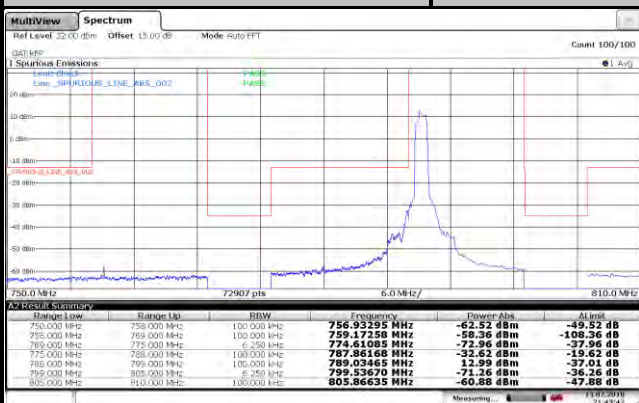
**1 RB**



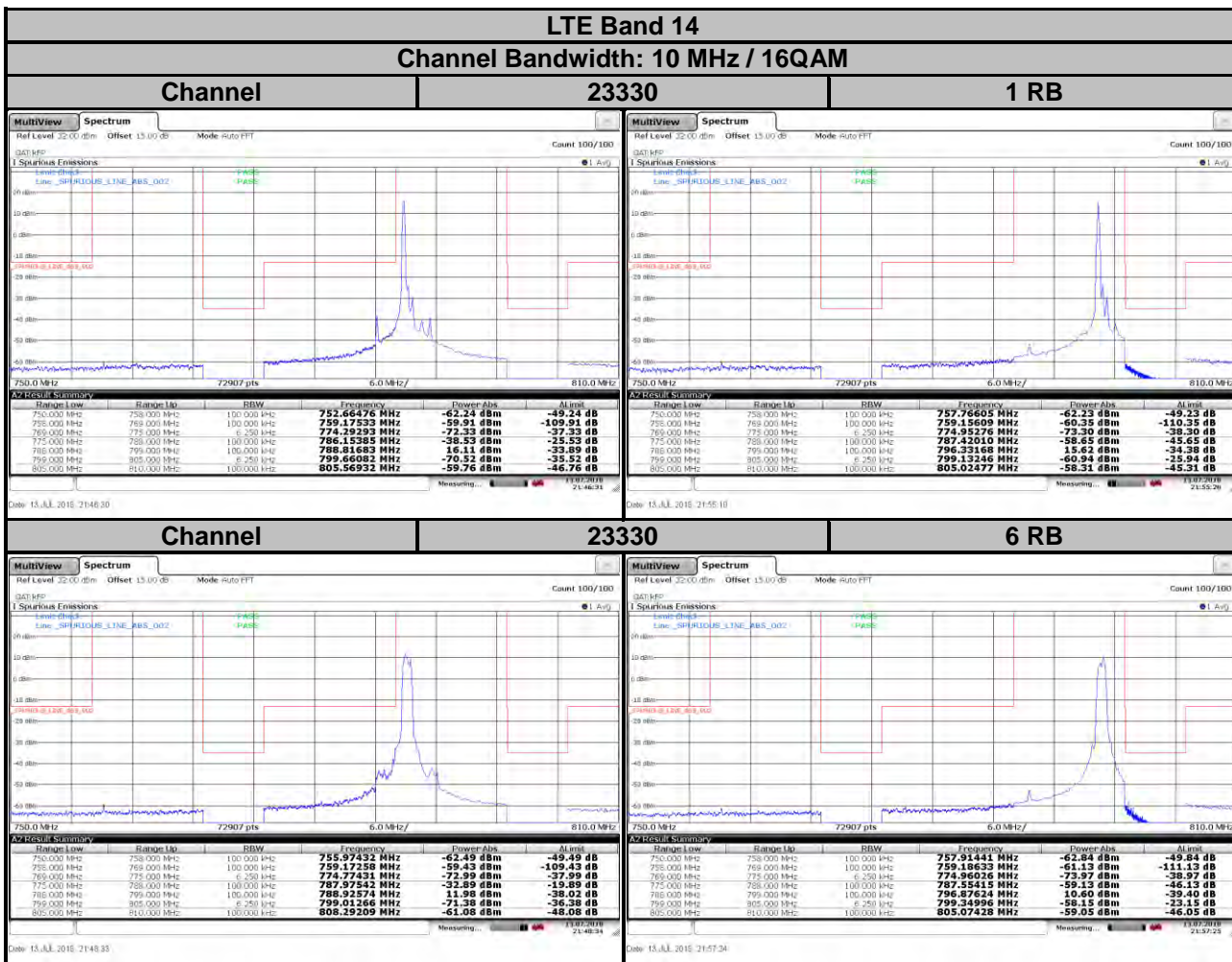
**Channel**

**2330**

**6 RB**

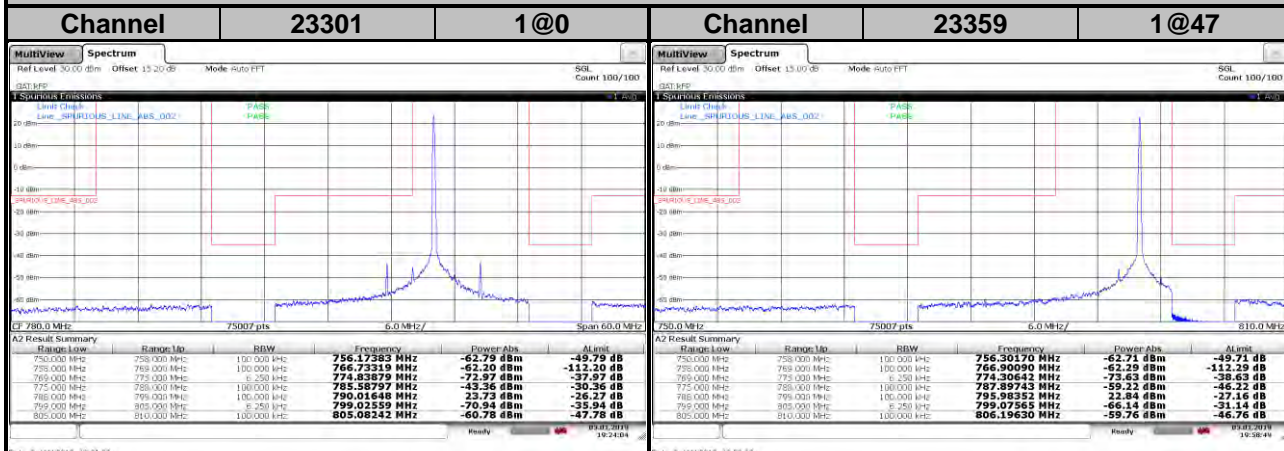






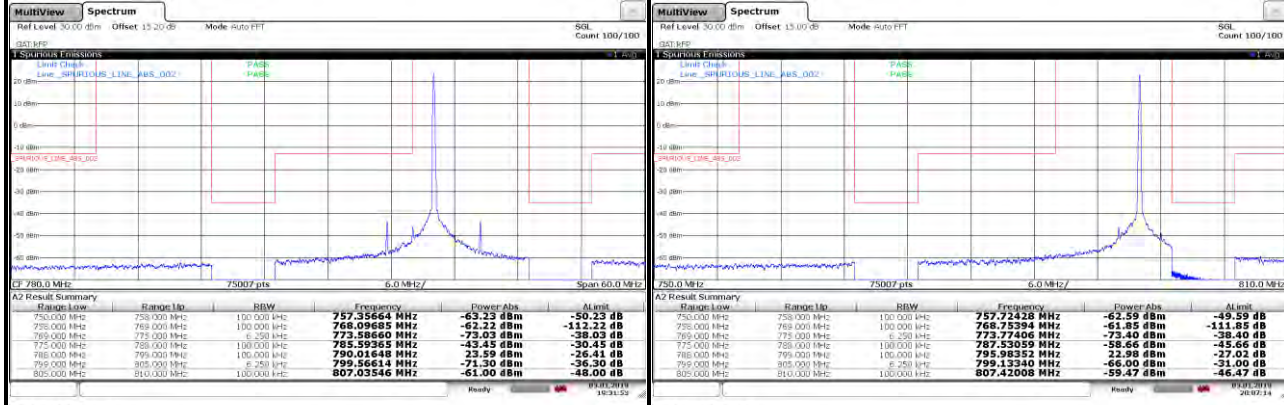
NB-IoT

**LTE Band 14  
BPSK**



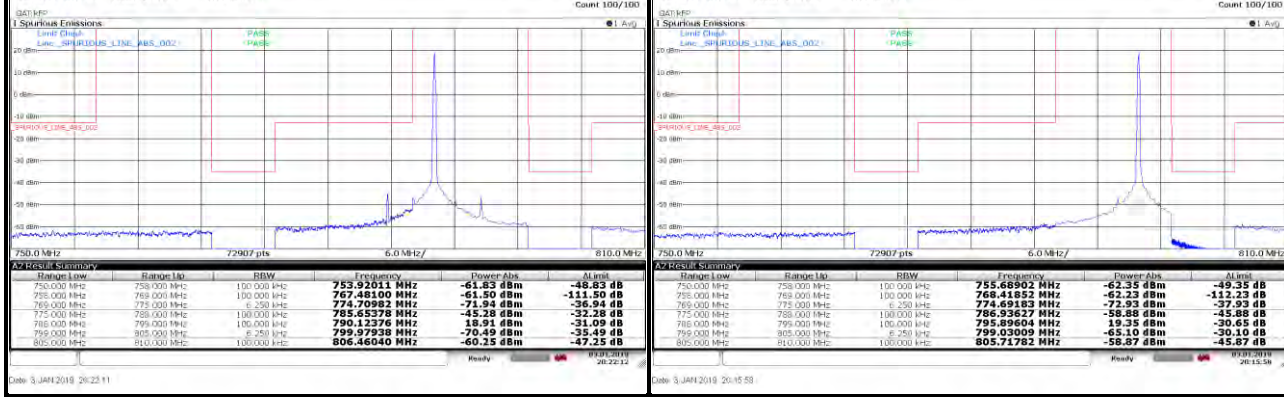
Date: 3, JAN 2018 19:28:03

**QPSK**

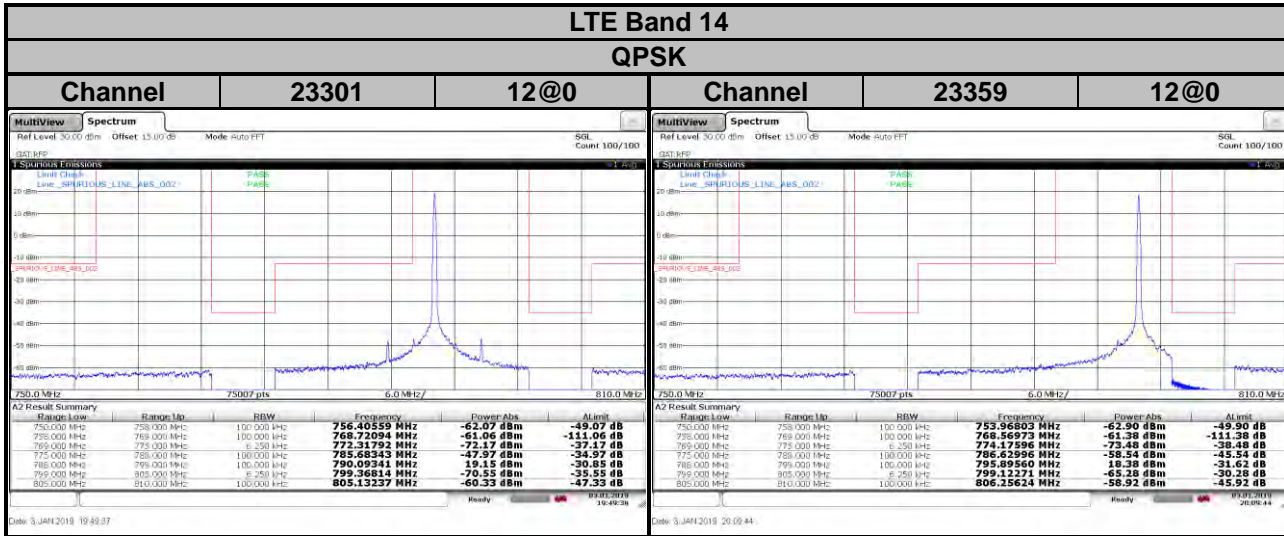


Date: 3, JAN 2018 19:28:49

**QPSK**



Date: 3, JAN 2018 20:15:59



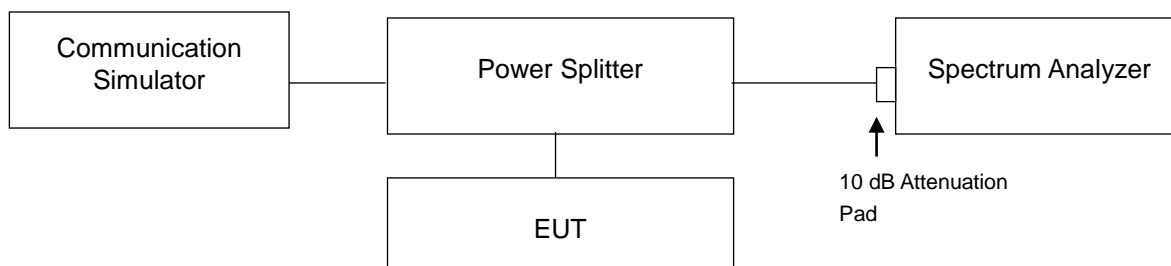
## 4.7 Conducted Spurious Emissions

### 4.7.1 Limits of Conducted Spurious Emissions Measurement

The power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) by at least  $43 + 10 \log_{10}(P)$  dB. The limit of emission is equal to -13 dBm.

On all frequencies between 769 – 775 MHz and 799 – 805 MHz, by a factor not less than  $65 + 10 \log (P)$  dB in a 6.25 kHz band segment, for mobile and portable stations.

### 4.7.2 Test Setup

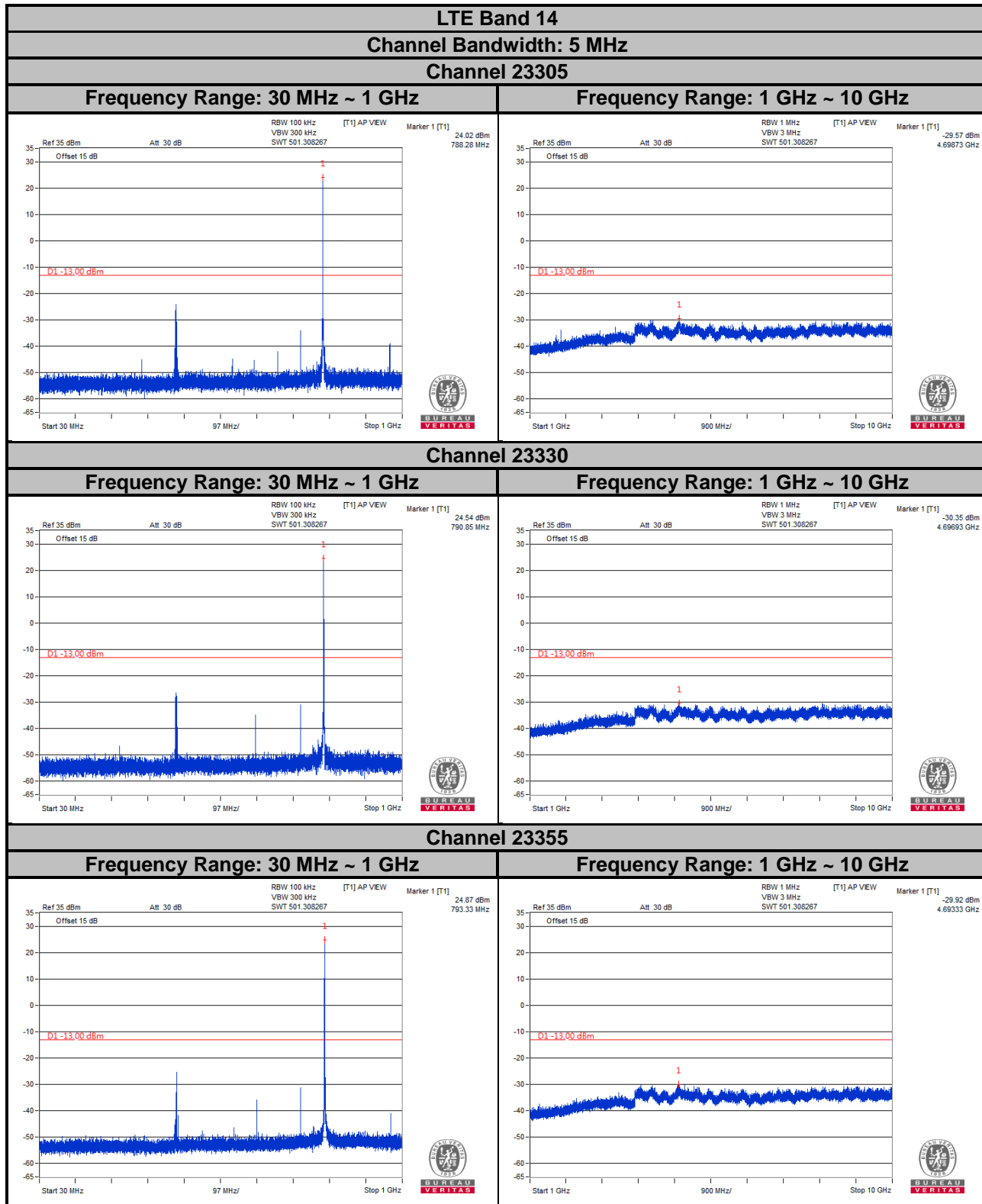


### 4.7.3 Test Procedure

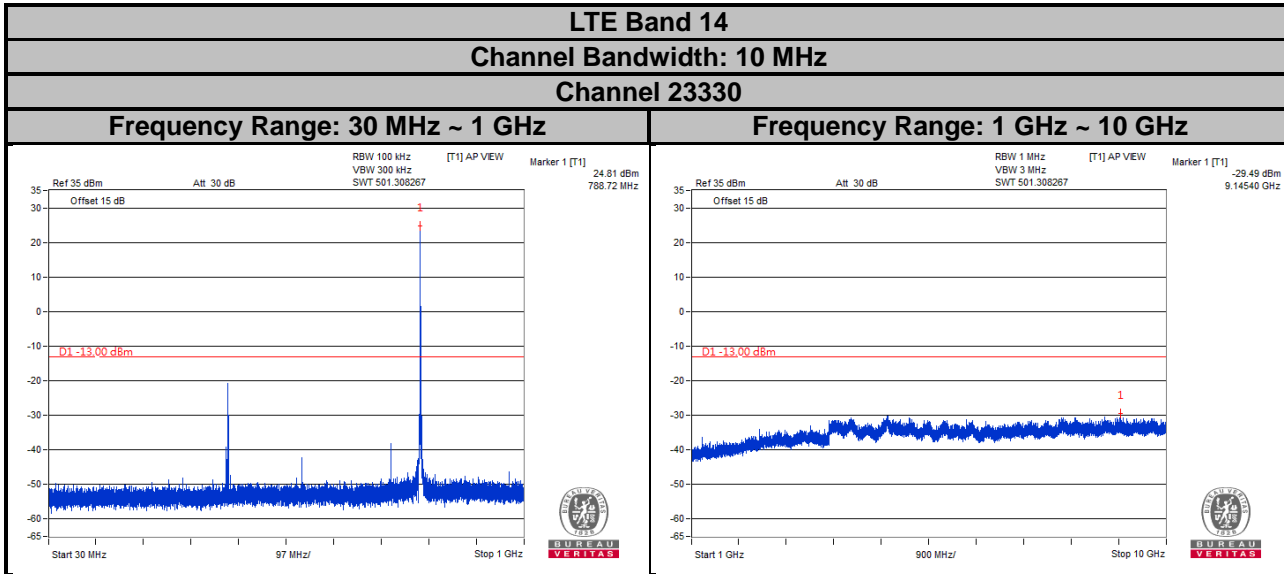
- The EUT makes a phone call to the communication simulator. All measurements were done at low, middle and high operational frequency range.
- Measuring frequency range is from 9 kHz to 1 GHz. 10 dB attenuation pad is connected with spectrum. RBW = 100 kHz and VBW = 300 kHz are used for conducted emission measurement.
- Measuring frequency range is from 1 GHz to 9 / 10 GHz. 10 dB attenuation pad is connected with spectrum. RBW = 1 MHz and VBW = 3 MHz are used for conducted emission measurement.

### 4.7.4 Test Results

#### Cat-M1



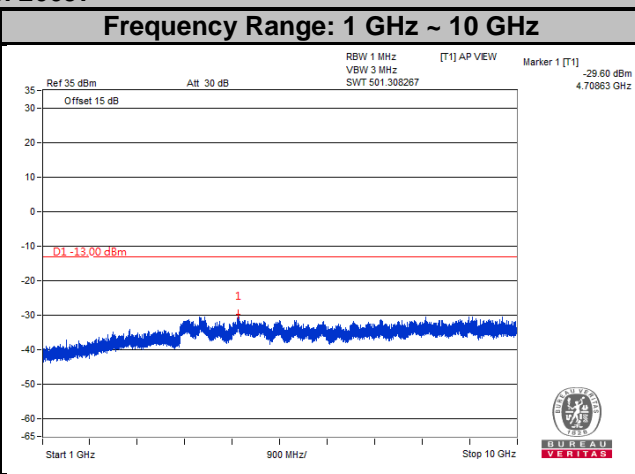
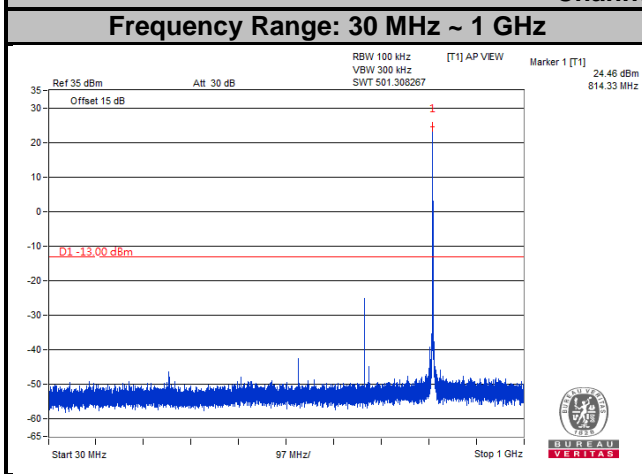
Note: The signal over the limit in 9 kHz is from spectrum analyzer.



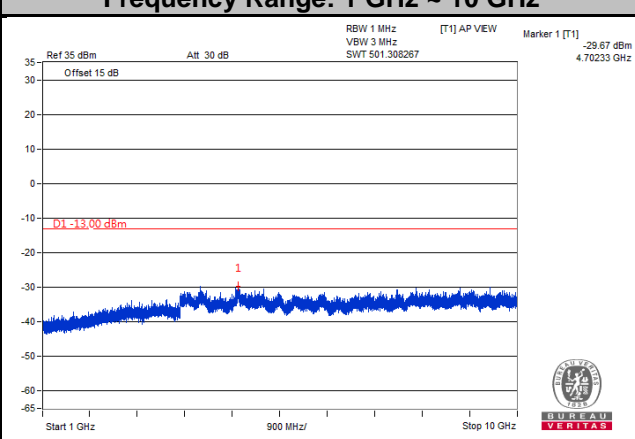
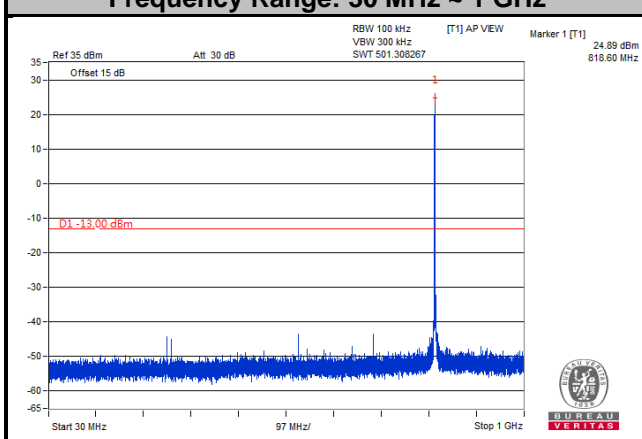
Note: The signal over the limit in 9 kHz is from spectrum analyzer.



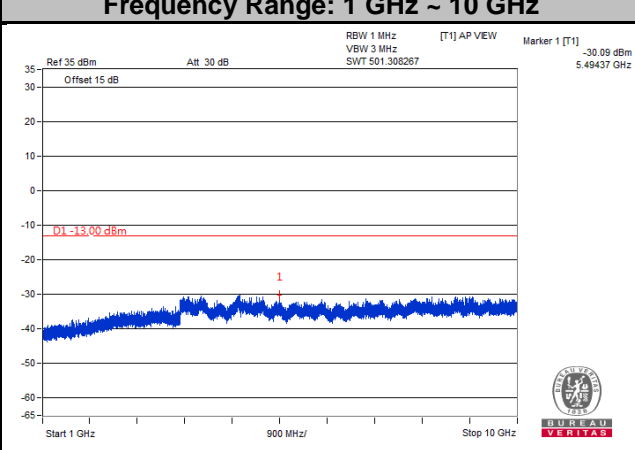
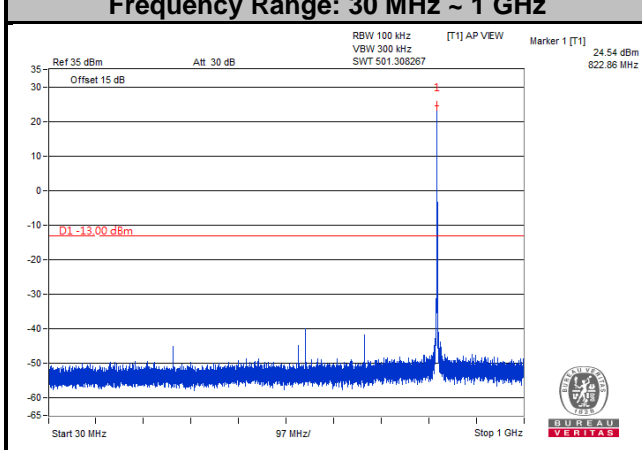
**LTE Band 26**  
**Channel Bandwidth: 1.4 MHz**  
**Channel 26697**



**Channel 26740**

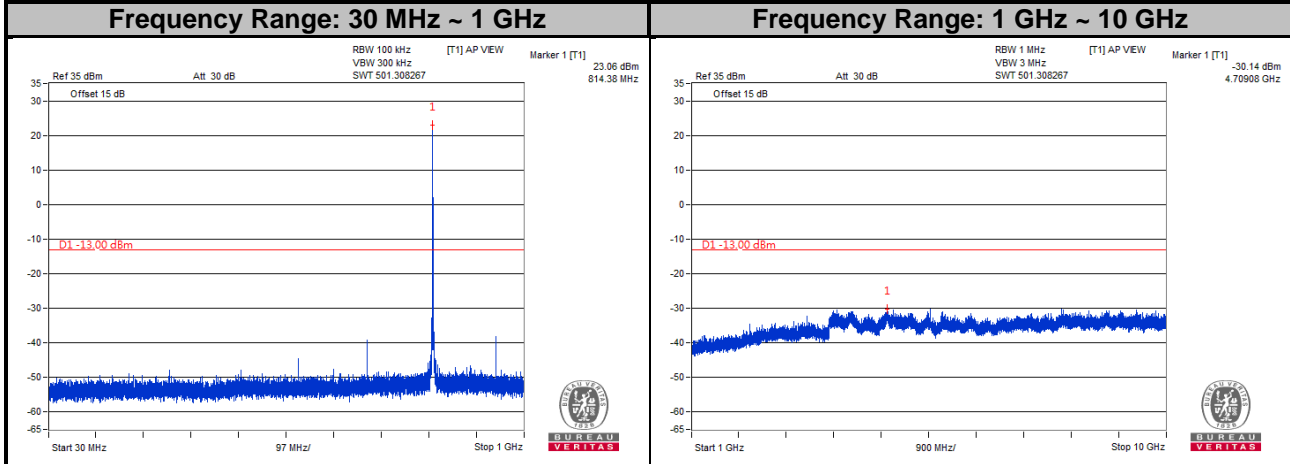


**Channel 26783**

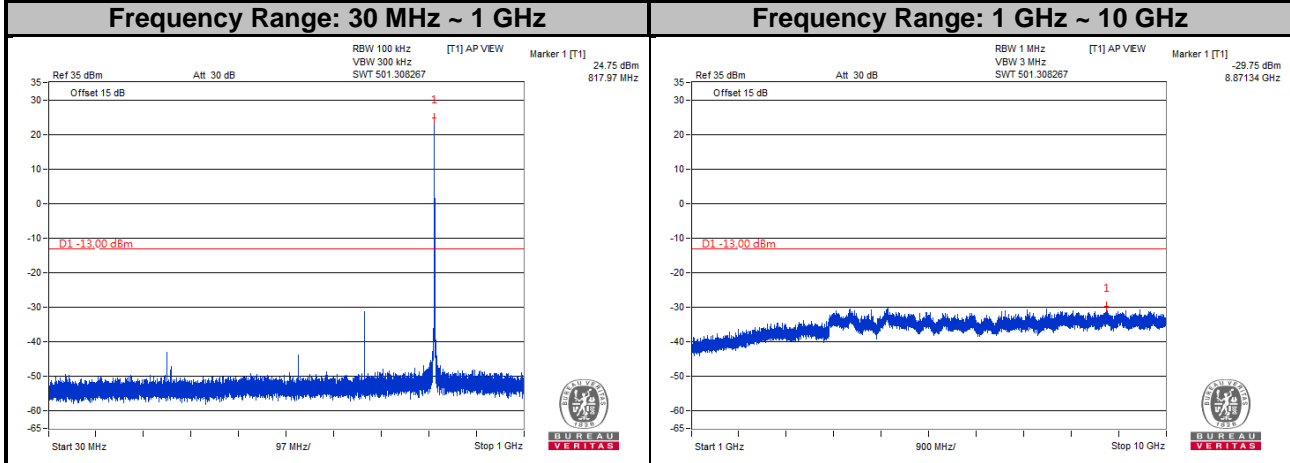


Note: The signal over the limit in 9 kHz is from spectrum analyzer.

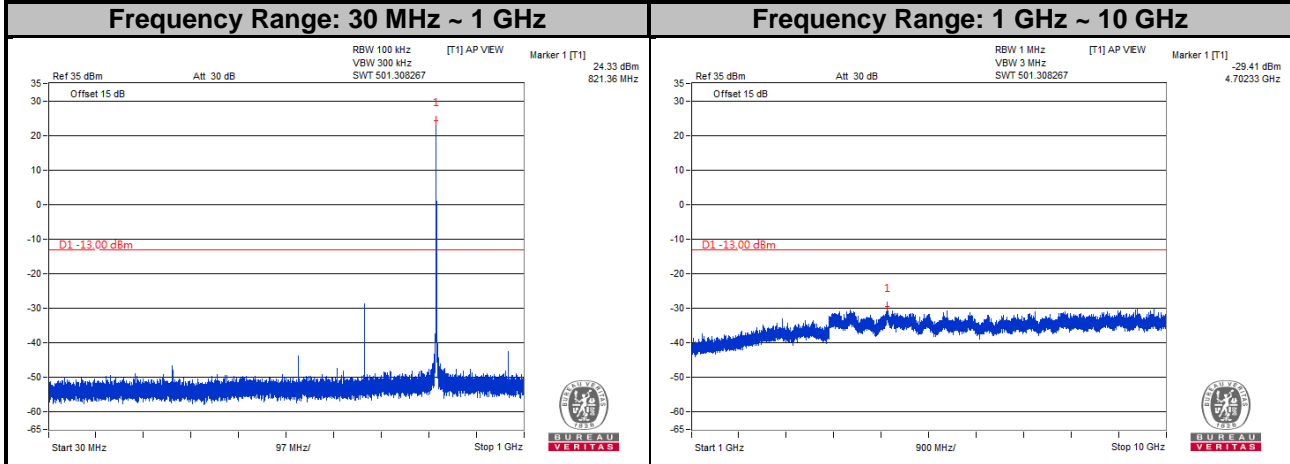
**LTE Band 26**  
**Channel Bandwidth: 3 MHz**  
**Channel 26705**



**Channel 26740**



**Channel 26775**

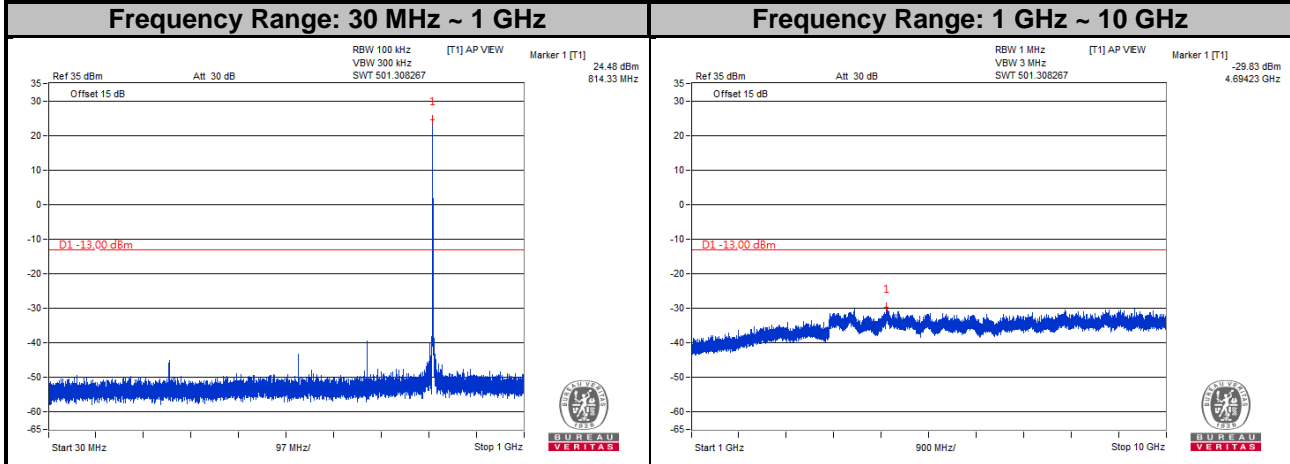


Note: The signal over the limit in 9 kHz is from spectrum analyzer.

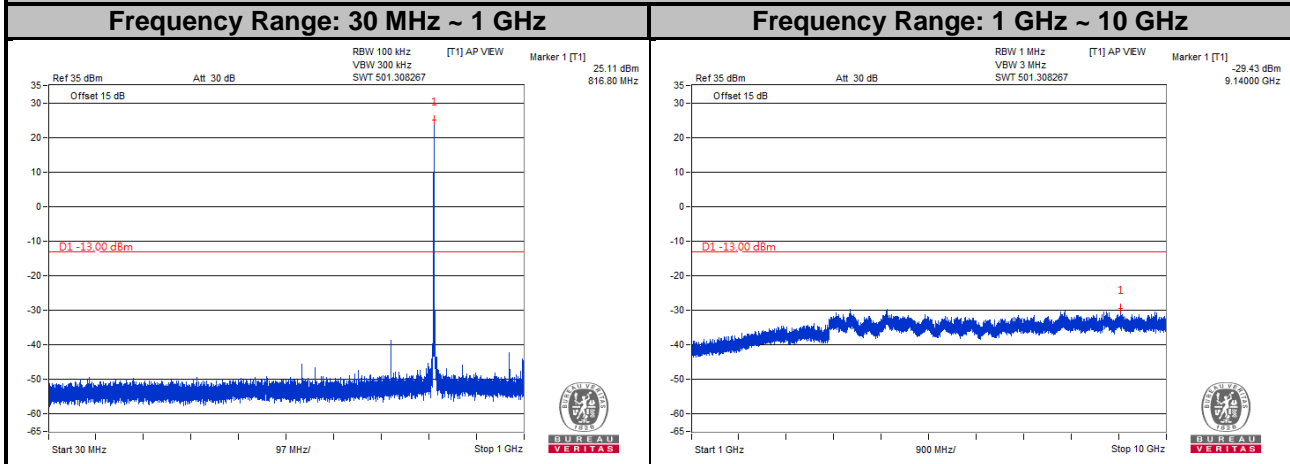


**LTE Band 26**  
**Channel Bandwidth: 5 MHz**

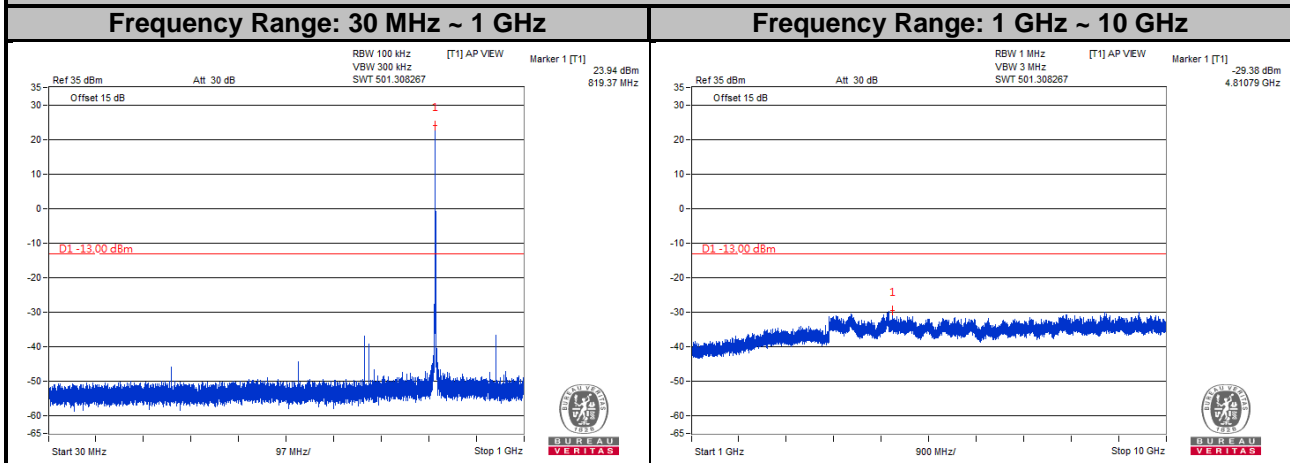
**Channel 26715**



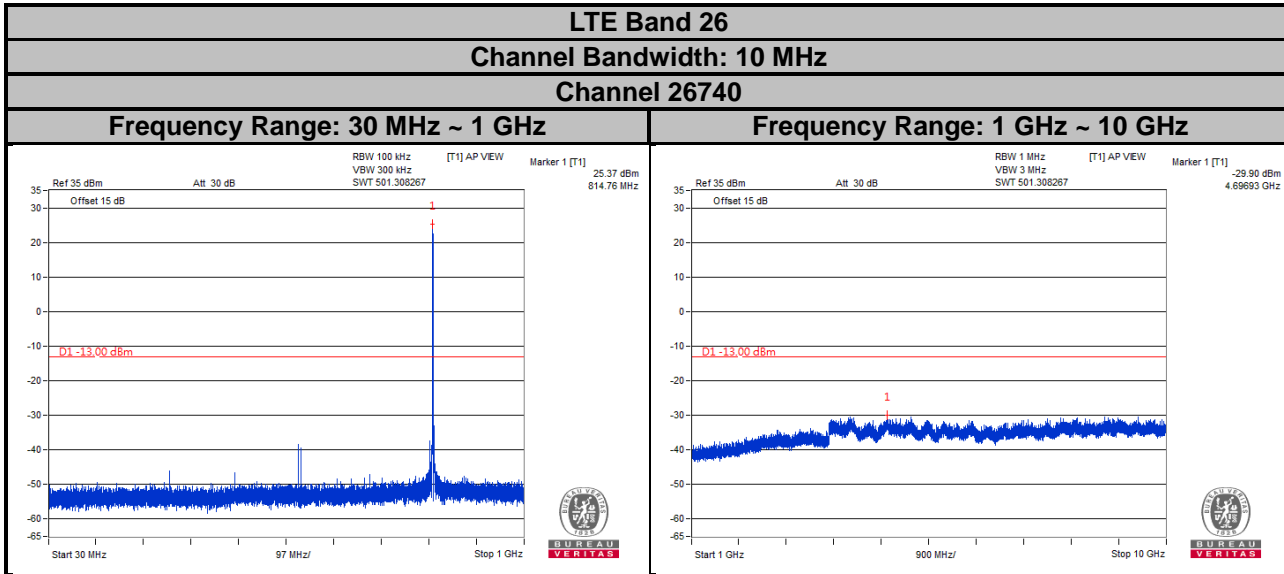
**Channel 26740**



**Channel 26765**



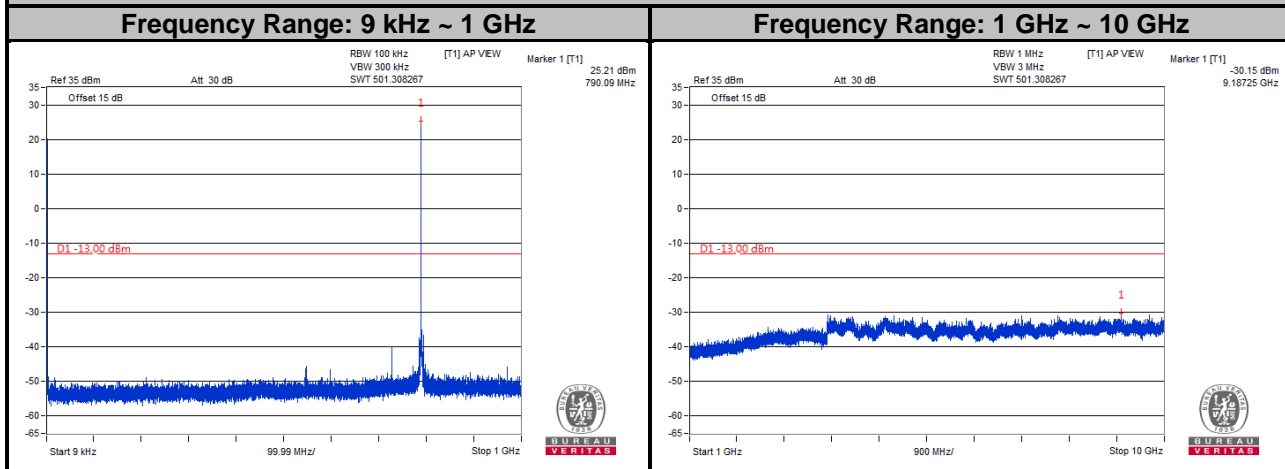
Note: The signal over the limit in 9 kHz is from spectrum analyzer.



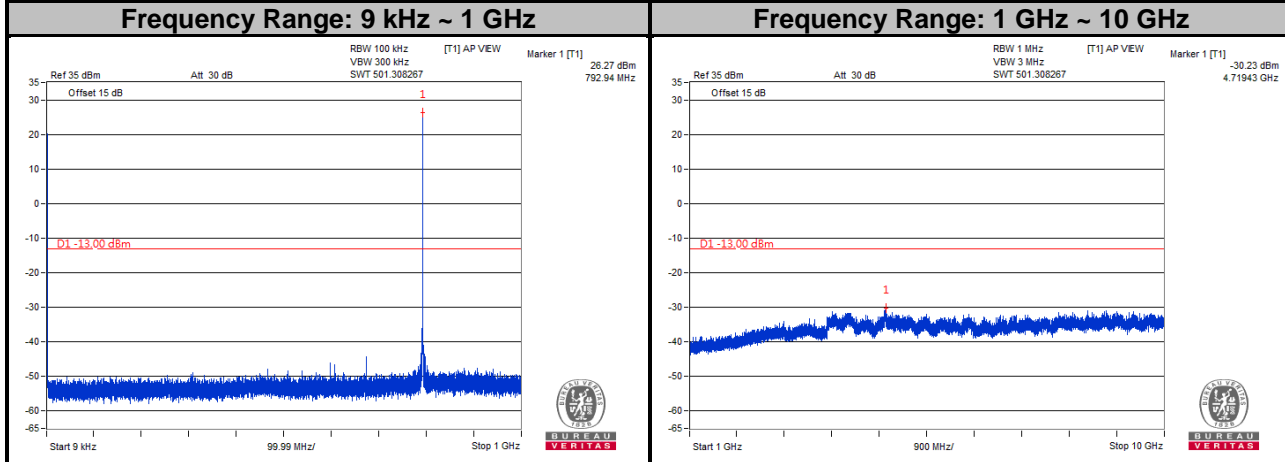
Note: The signal over the limit in 9 kHz is from spectrum analyzer.

NB-IoT

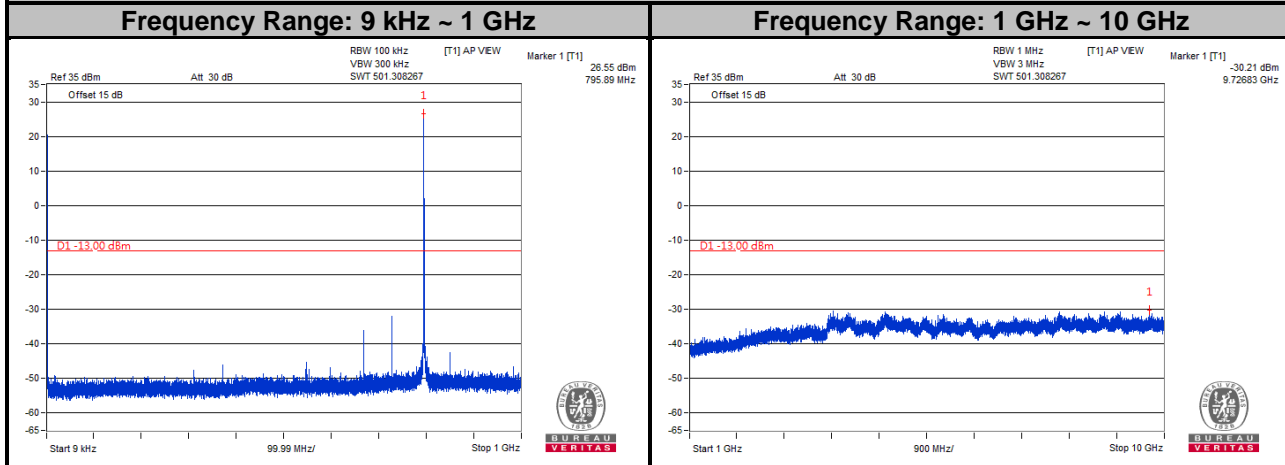
**LTE Band 14**  
**Channel 23301**



**Channel 23330**



**Channel 23359**

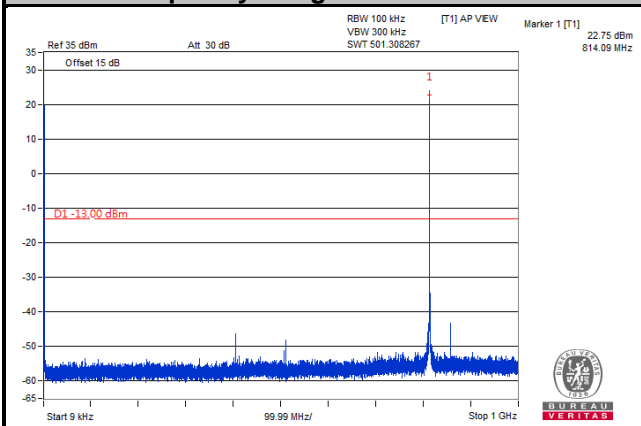


Note: The signal over the limit in 9 kHz is from spectrum analyzer.

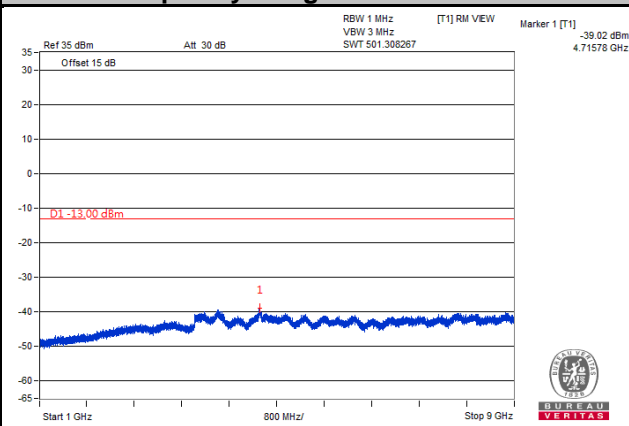
### LTE Band 26

### Channel 26691

#### Frequency Range: 9 kHz ~ 1 GHz

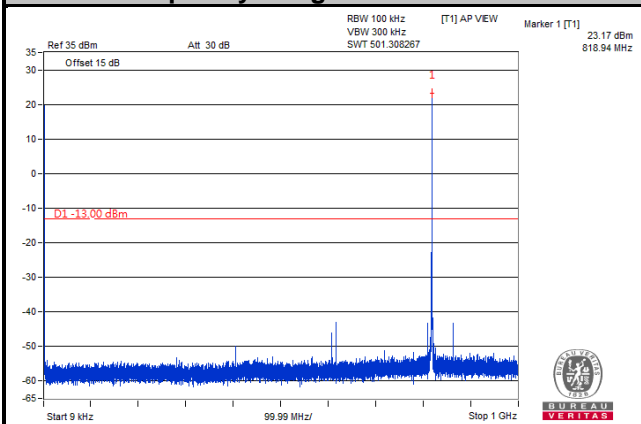


#### Frequency Range: 1 GHz ~ 9 GHz

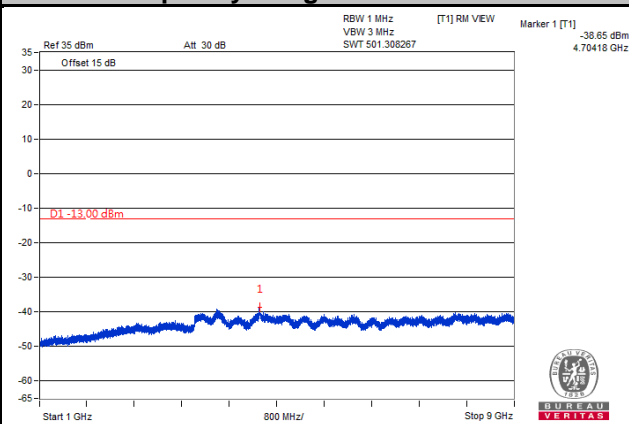


### Channel 26740

#### Frequency Range: 9 kHz ~ 1 GHz

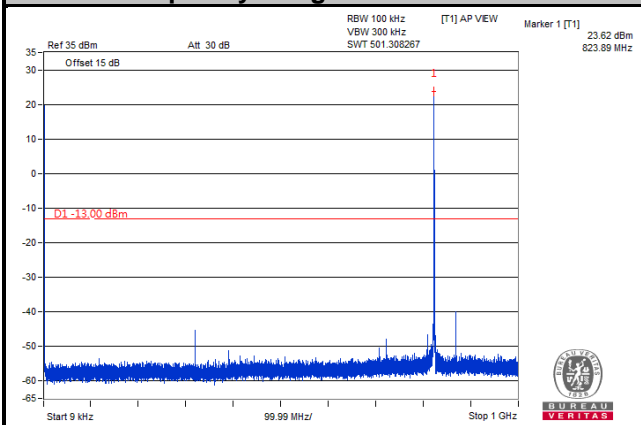


#### Frequency Range: 1 GHz ~ 9 GHz

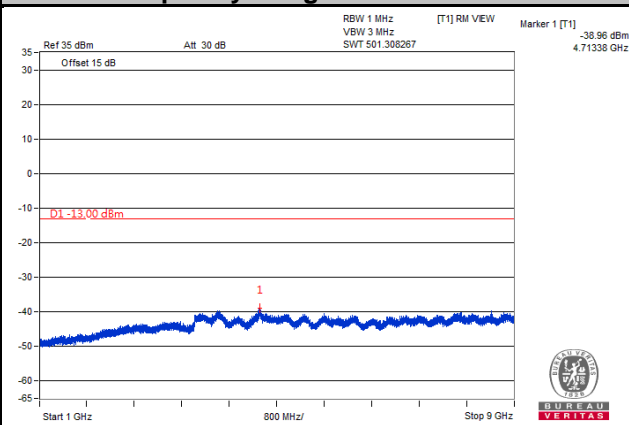


### Channel 26789

#### Frequency Range: 9 kHz ~ 1 GHz



#### Frequency Range: 1 GHz ~ 9 GHz



Note: The signal over the limit in 9 kHz is from spectrum analyzer.

## 4.8 Radiated Emission Measurement

### 4.8.1 Limits of Radiated Emission Measurement

- (1) The power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) by at least  $43 + 10 \log (P)$  dB. The limit of emission is equal to -13 dBm.
- (2) For operations in the 758-775 MHz and 788-805 MHz bands, all emissions including harmonics in the band 1559-1610 MHz shall be limited to -70 dBW/MHz equivalent isotropically radiated power (EIRP) for wideband signals, and -80 dBW EIRP for discrete emissions of less than 700 Hz bandwidth.

### 4.8.2 Test Procedure

- a. Substitution method is used for E.I.R.P measurement. In the semi-anechoic chamber, EUT placed on the 0.8 m (below or equal 1 GHz) and/or 1.5 m (above 1 GHz) height of Turn Table, rotated the table around 360 degrees to search the maximum radiation power and receiver antenna shall be rotated vertical and horizontal polarization and moved height from 1 m to 4 m to find the maximum polar radiated power. The "Read Value" is the spectrum reading the maximum power value.
- b. The substitution horn antenna is substituted for EUT at the same position and signals generator export the CW signal to the substitution antenna via a TX cable. Rotated the Turn Table and moved receiving antenna to find the maximum radiation power. Adjust output power level of S.G to get a Value of spectrum reading equal to "Read Value" of step a. Record the power level of S.G.
- c.  $EIRP = \text{Output power level of S.G} - \text{TX cable loss} + \text{Antenna gain of substitution horn}$ .
- d. E.R.P power can be calculated form E.I.R.P power by subtracting the gain of dipole,  $E.R.P \text{ power} = E.I.P.R \text{ power} - 2.15 \text{ dB}$ .

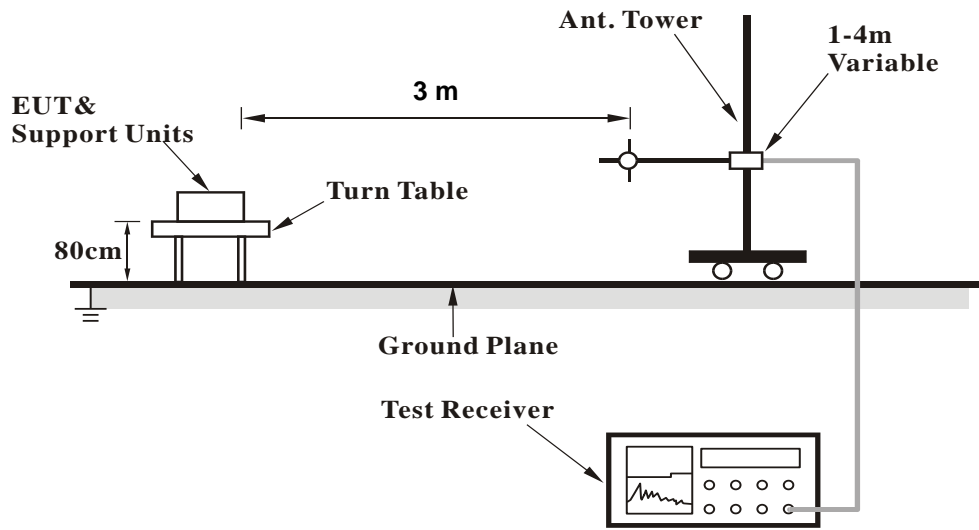
**Note:** The resolution bandwidth of spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz.

### 4.8.3 Deviation from Test Standard

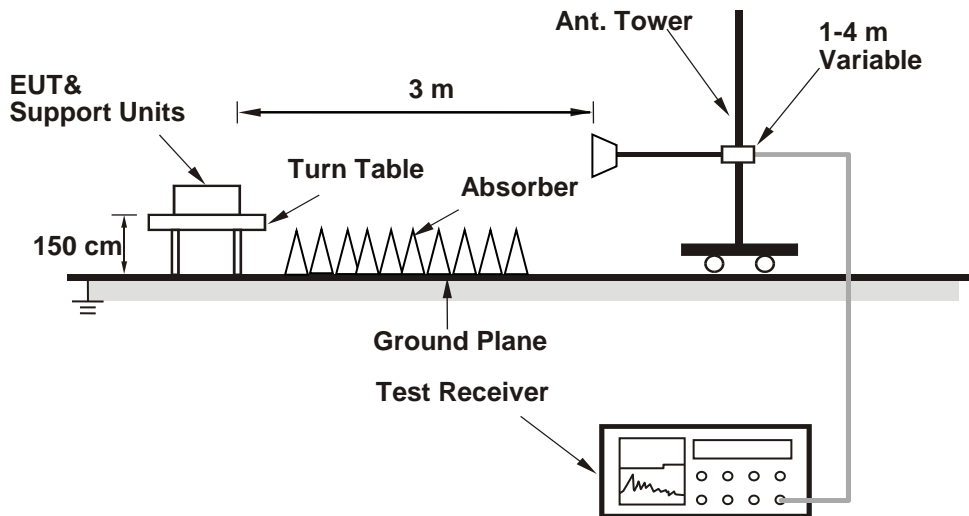
No deviation.

4.8.4 Test Setup

<Radiated Emission below or equal 1 GHz>



<Radiated Emission above 1 GHz>



For the actual test configuration, please refer to the attached file (Test Setup Photo).

4.8.5 Test Results

Cat-M1

LTE Band 14\_1 RB

Channel Bandwidth: 5 MHz / QPSK

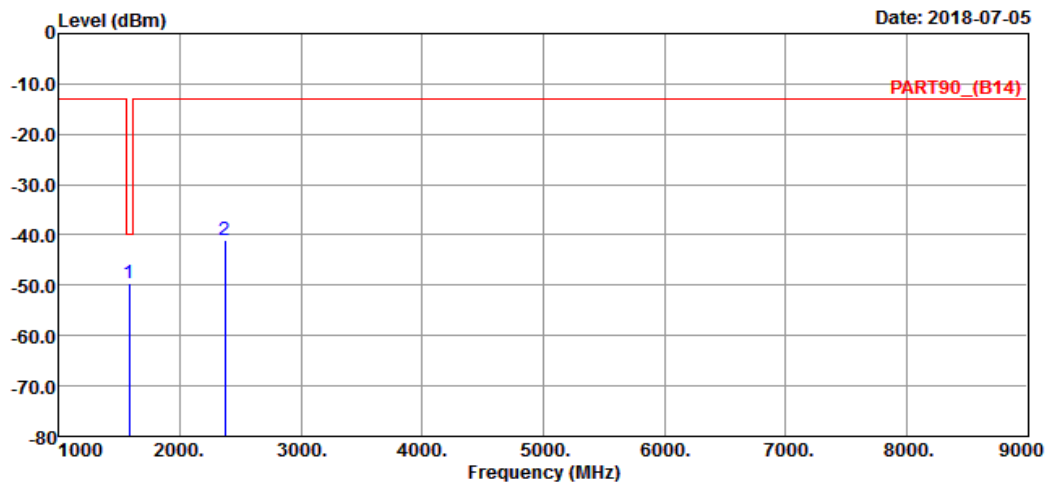
Low Channel



Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 1



Site : 966 Chamber 5  
 Condition: PART90\_(B14) HORIZONTAL  
 Remak : Cat-M1 Band 14 QPSK\_5M Link\_L-CH  
 Tested by: Thomas Wei

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1 pp	1581.00	-49.55	-36.17	-40.00	-9.55	-13.38	Peak
2	2371.50	-40.89	-31.26	-13.00	-27.89	-9.63	Peak

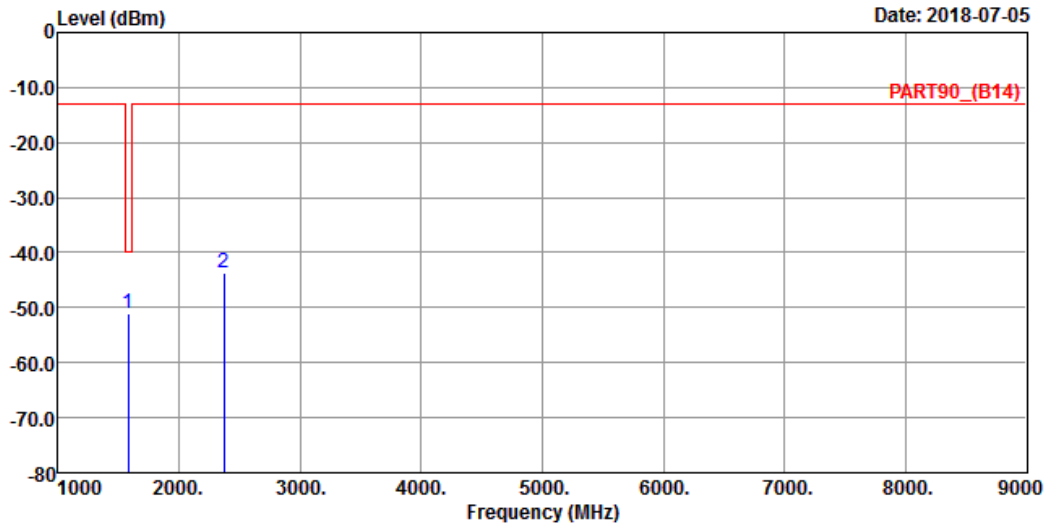




A D T

Data: 2

Date: 2018-07-05



Site : 966 Chamber 5  
 Condition: PART90\_(B14) VERTICAL  
 Remak : Cat-M1 Band 14 QPSK\_5M Link\_L-CH  
 Tested by: Thomas Wei

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1 pp	1581.00	-51.18	-37.80	-40.00	-11.18	-13.38	Peak
2	2371.50	-43.60	-33.97	-13.00	-30.60	-9.63	Peak

Middle Channel

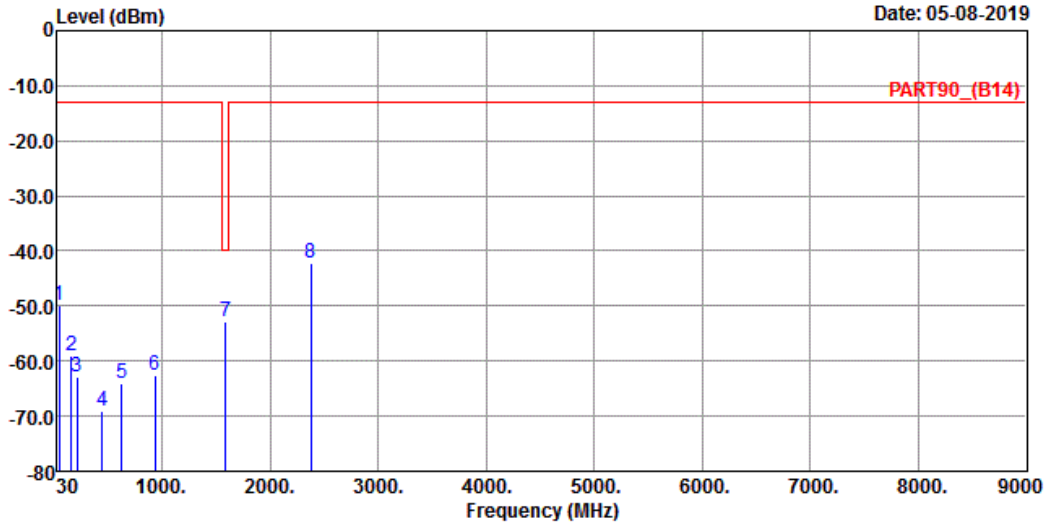


Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 5

Date: 05-08-2019



Site : 966 Chamber 5  
 Condition: PART90\_(B14) HORIZONTAL  
 Remak : Cat-M1 Band 14 QPSK\_5M Link\_M-CH  
 Tested by: Getaz Yang

	Freq	Level	Read	Limit	Over		
	MHz	dBm	Level	Line	Factor	Limit	Remark
			dBm	dBm	dB	dB	
1	44.55	-49.96	-47.97	-13.00	-1.99	-36.96	Peak
2	160.95	-58.95	-54.04	-13.00	-4.91	-45.95	Peak
3	210.42	-62.74	-55.15	-13.00	-7.59	-49.74	Peak
4	442.25	-69.16	-63.55	-13.00	-5.61	-56.16	Peak
5	624.61	-63.93	-63.11	-13.00	-0.82	-50.93	Peak
6	933.07	-62.47	-63.86	-13.00	1.39	-49.47	Peak
7 pp	1586.00	-52.85	-39.46	-40.00	-13.39	-12.85	Peak
8	2379.00	-42.36	-32.67	-13.00	-9.69	-29.36	Peak

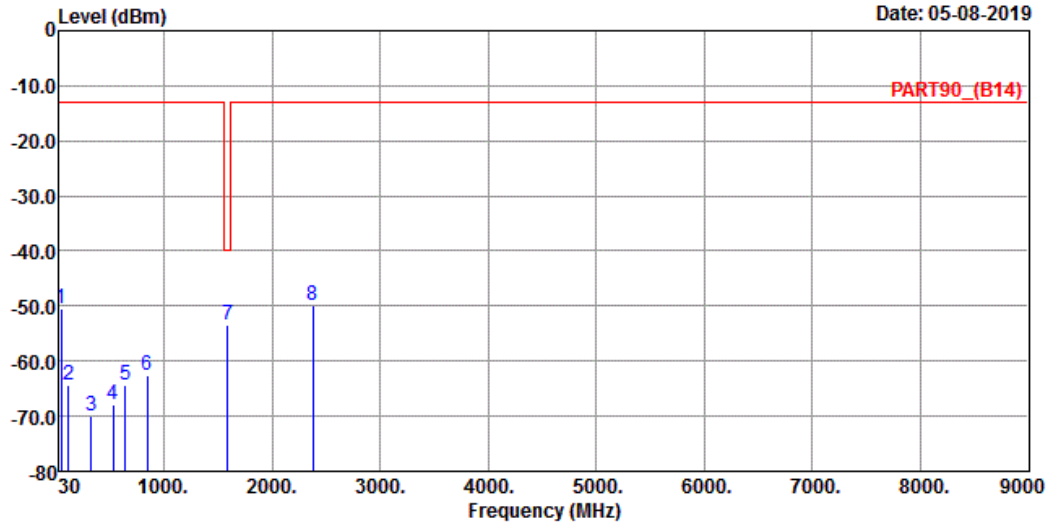


Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 6

Date: 05-08-2019



Site : 966 Chamber 5  
 Condition: PART90\_(B14) VERTICAL  
 Remak : Cat-M1 Band 14 QPSK\_5M Link\_M-CH  
 Tested by: Getaz Yang

	Freq	Level	Read Level	Limit Line	Over Factor	Over Limit	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1	44.55	-50.46	-48.47	-13.00	-1.99	-37.46	Peak
2	112.45	-64.28	-54.08	-13.00	-10.20	-51.28	Peak
3	321.97	-70.00	-63.33	-13.00	-6.67	-57.00	Peak
4	526.64	-67.76	-64.08	-13.00	-3.68	-54.76	Peak
5	644.01	-64.49	-63.62	-13.00	-0.87	-51.49	Peak
6	841.89	-62.48	-62.84	-13.00	0.36	-49.48	Peak
7 pp	1586.00	-53.36	-39.97	-40.00	-13.39	-13.36	Peak
8	2379.00	-49.81	-40.12	-13.00	-9.69	-36.81	Peak

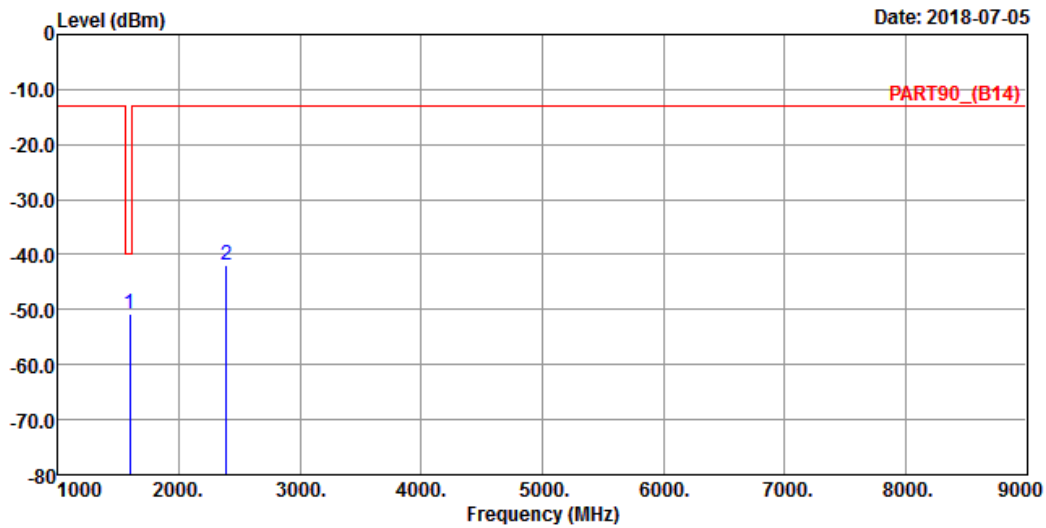
# High Channel



Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 1



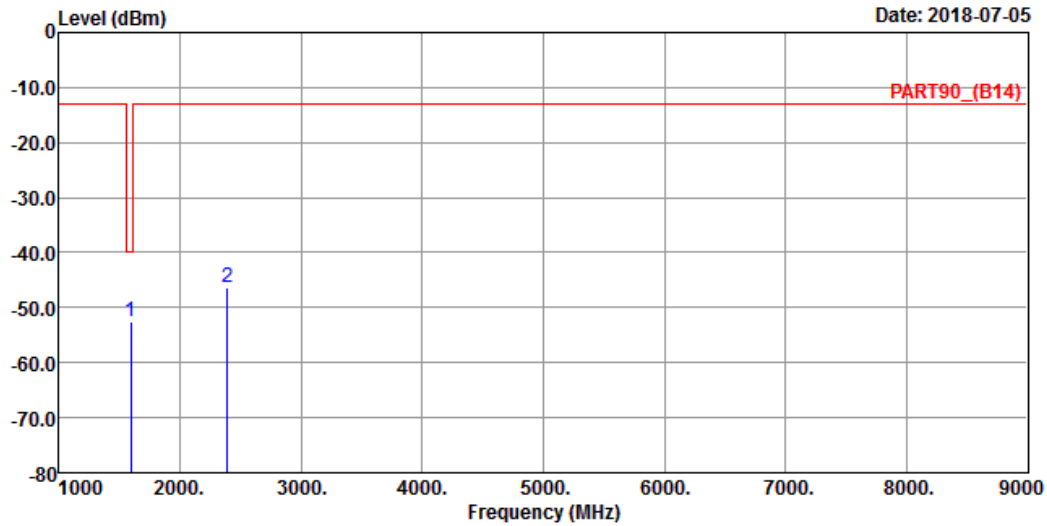
Site : 966 Chamber 5  
 Condition: PART90\_(B14) HORIZONTAL  
 Remak : Cat-M1 Band 14 QPSK\_5M Link\_H-CH  
 Tested by: Thomas Wei

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1 pp	1591.00	-50.78	-37.37	-40.00	-10.78	-13.41	Peak
2	2386.50	-42.01	-32.26	-13.00	-29.01	-9.75	Peak



A D T

Data: 2



Site : 966 Chamber 5  
 Condition: PART90\_(B14) VERTICAL  
 Remak : Cat-M1 Band 14 QPSK\_5M Link\_H-CH  
 Tested by: Thomas Wei

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1 pp	1591.00	-52.44	-39.03	-40.00	-12.44	-13.41	Peak
2	2386.50	-46.26	-36.51	-13.00	-33.26	-9.75	Peak

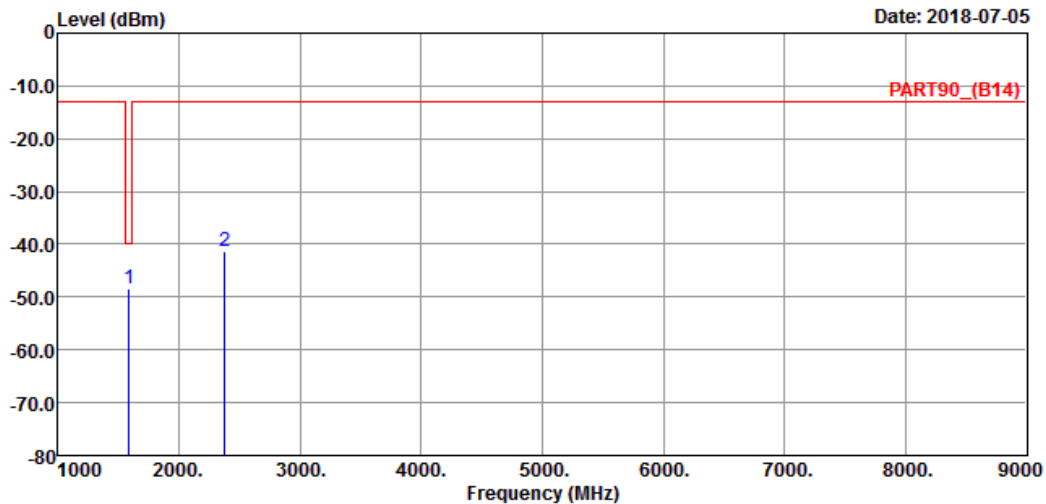
Channel Bandwidth: 10 MHz / QPSK  
Middle Channel



Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 1



Site : 966 Chamber 5  
Condition: PART90\_(B14) HORIZONTAL  
Remak : Cat-M1 Band 14 QPSK\_10M Link\_M-CH  
Tested by: Thomas Wei

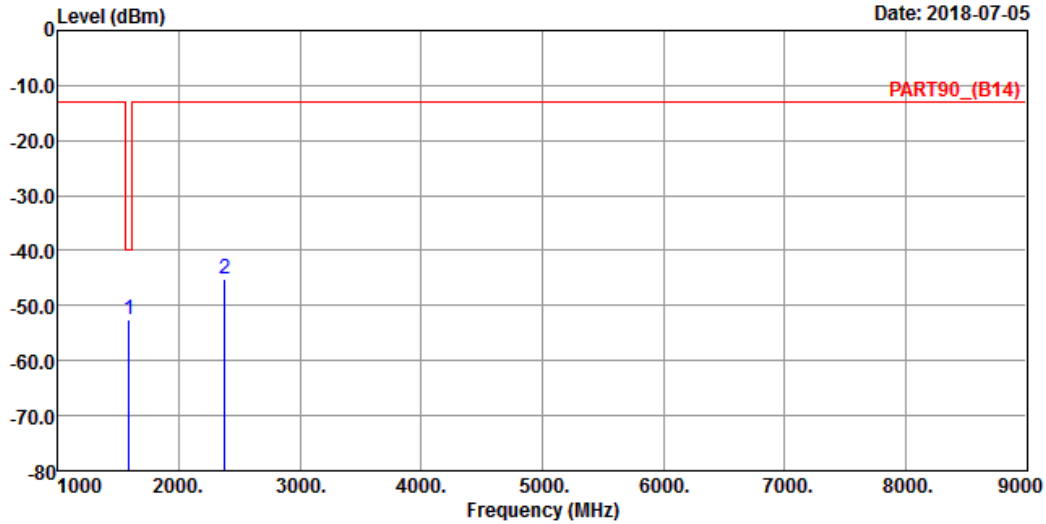
	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1 pp	1586.00	-48.32	-34.93	-40.00	-8.32	-13.39	Peak
2	2379.00	-41.27	-31.58	-13.00	-28.27	-9.69	Peak



A D T

Data: 2

Date: 2018-07-05



Site : 966 Chamber 5  
 Condition: PART90\_(B14) VERTICAL  
 Remak : Cat-M1 Band 14 QPSK\_10M Link\_M-CH  
 Tested by: Thomas Wei

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1 pp	1586.00	-52.64	-39.25	-40.00	-12.64	-13.39	Peak
2	2379.00	-45.29	-35.60	-13.00	-32.29	-9.69	Peak



LTE Band 14\_Full RB  
 Channel Bandwidth: 5 MHz / QPSK  
 Low Channel

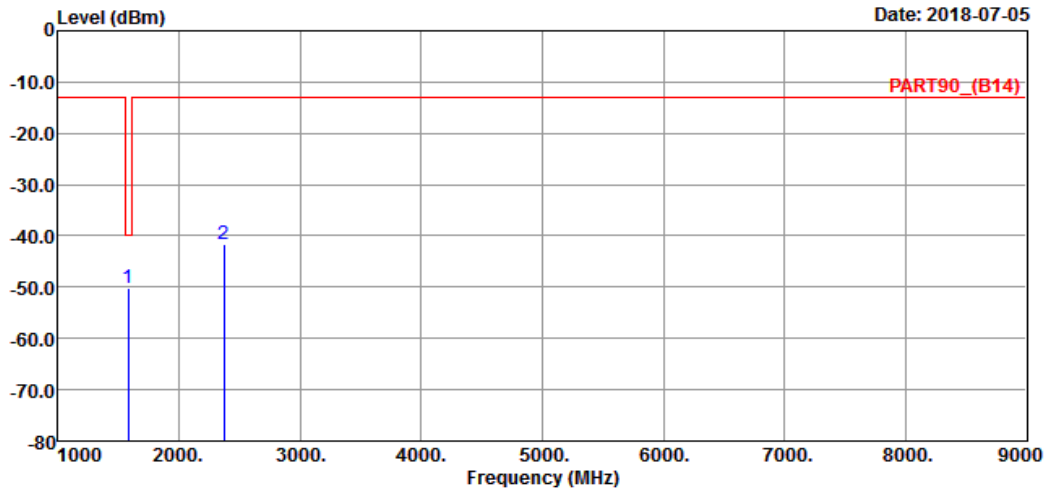


Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 1

Date: 2018-07-05



Site : 966 Chamber 5  
 Condition: PART90\_(B14) HORIZONTAL  
 Remak : Cat-M1 Band 14 QPSK\_5M Link\_L-CH  
 Tested by: Thomas Wei

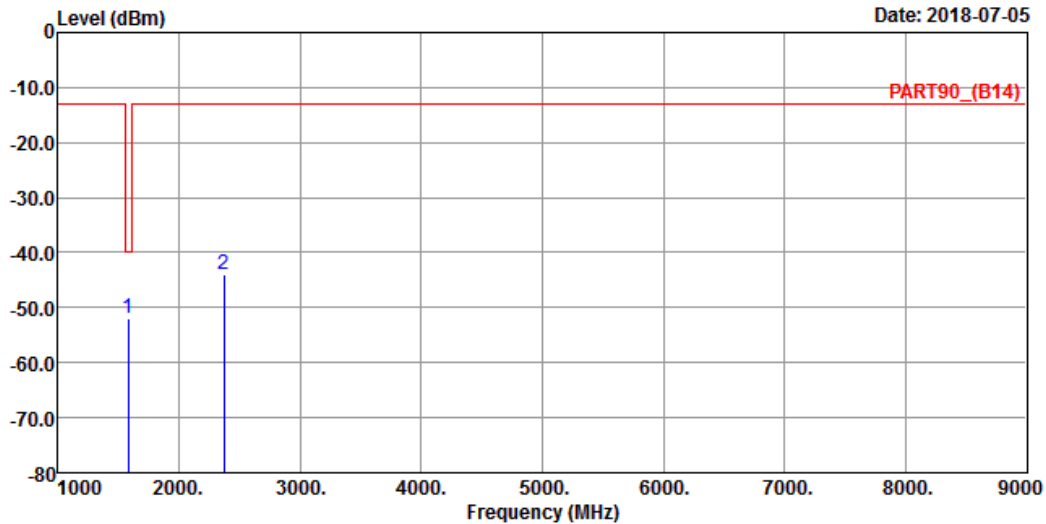
	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1	pp 1581.00	-50.11	-36.73	-40.00	-10.11	-13.38	Peak
2	2371.50	-41.58	-31.95	-13.00	-28.58	-9.63	Peak



A D T

Data: 2

Date: 2018-07-05



Site : 966 Chamber 5  
 Condition: PART90\_(B14) VERTICAL  
 Remak : Cat-M1 Band 14 QPSK\_5M Link\_L-CH  
 Tested by: Thomas Wei

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1 pp	1581.00	-51.87	-38.49	-40.00	-11.87	-13.38	Peak
2	2371.50	-44.06	-34.43	-13.00	-31.06	-9.63	Peak

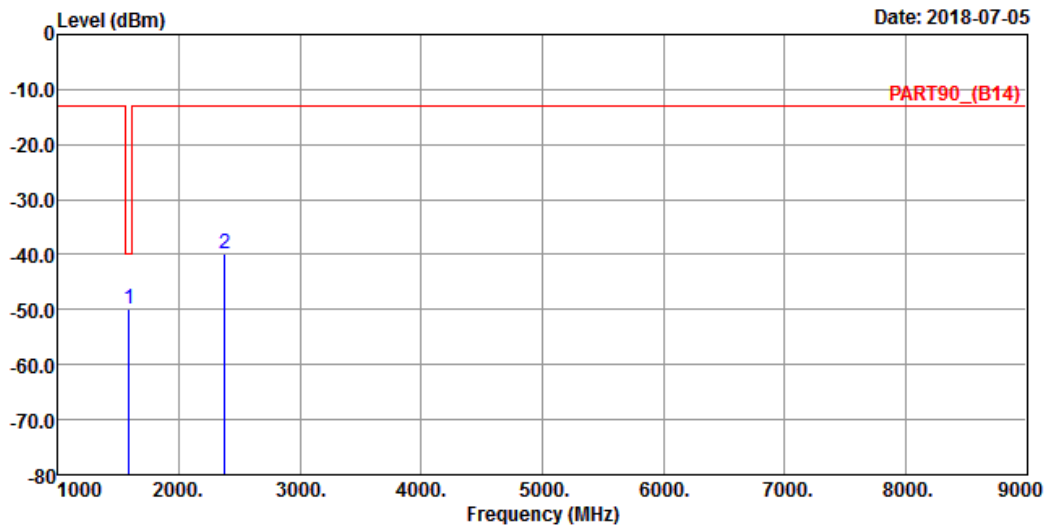
Middle Channel



Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 1



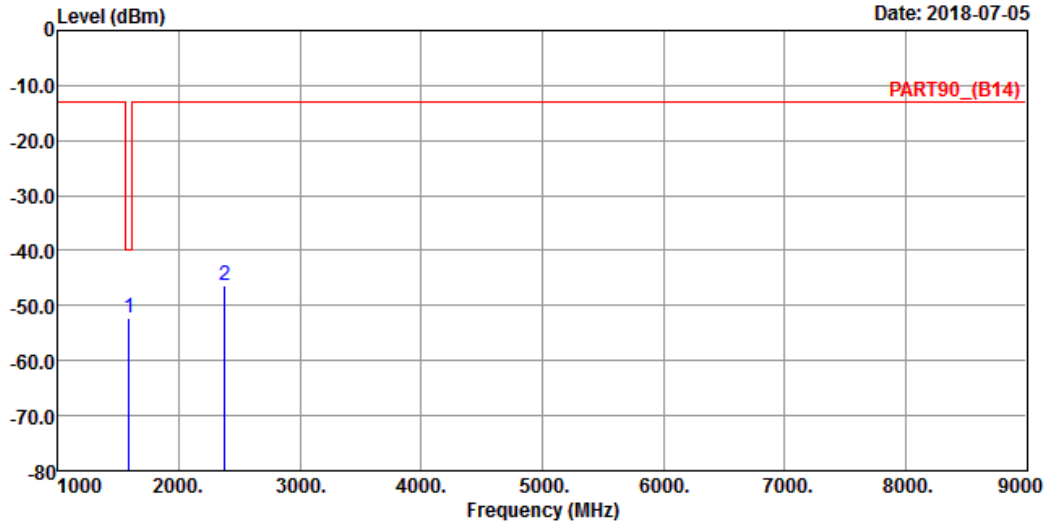
Site : 966 Chamber 5  
 Condition: PART90\_(B14) HORIZONTAL  
 Remak : Cat-M1 Band 14 QPSK\_5M Link\_M-CH  
 Tested by: Thomas Wei

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1 pp	1586.00	-49.83	-36.44	-40.00	-9.83	-13.39	Peak
2	2379.00	-39.91	-30.22	-13.00	-26.91	-9.69	Peak



A D T

Data: 2



Site : 966 Chamber 5  
 Condition: PART90\_(B14) VERTICAL  
 Remak : Cat-M1 Band 14 QPSK\_5M Link\_M-CH  
 Tested by: Thomas Wei

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1 pp	1586.00	-52.29	-38.90	-40.00	-12.29	-13.39	Peak
2	2379.00	-46.48	-36.79	-13.00	-33.48	-9.69	Peak

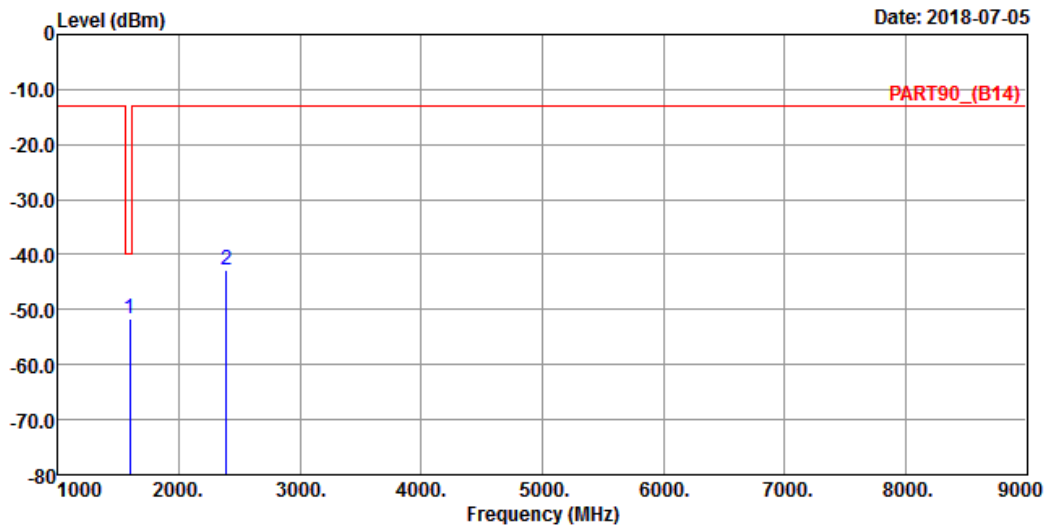
# High Channel



Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 1



Date: 2018-07-05

Site : 966 Chamber 5  
 Condition: PART90\_(B14) HORIZONTAL  
 Remak : Cat-M1 Band 14 QPSK\_5M Link\_H-CH  
 Tested by: Thomas Wei

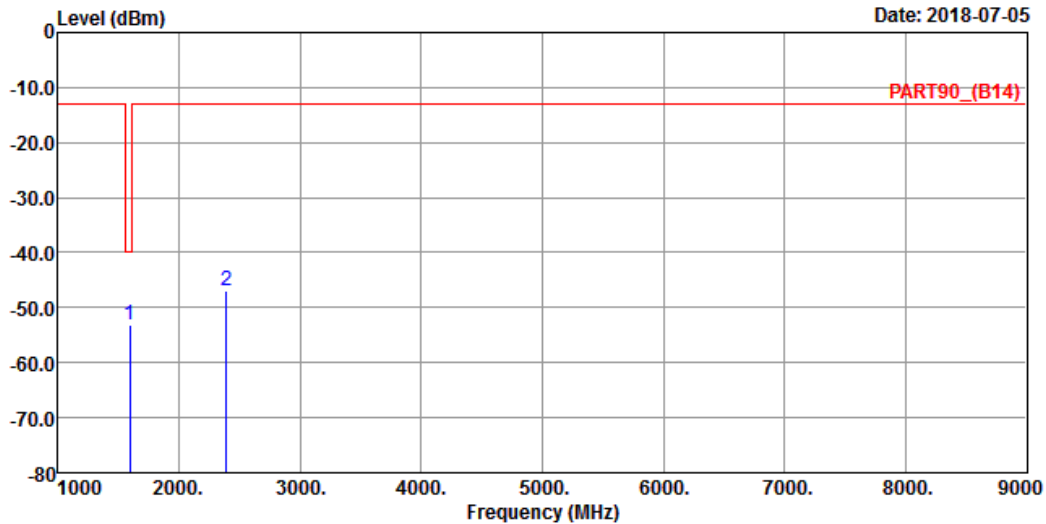
	Read	Limit	Over				
Freq	Level	Level	Line	Limit	Factor	Remark	
MHz	dBm	dBm	dBm	dB	dB		
1 pp 1591.00	-51.55	-38.14	-40.00	-11.55	-13.41	Peak	
2 2386.50	-42.79	-33.04	-13.00	-29.79	-9.75	Peak	



A D T

Data: 2

Date: 2018-07-05



Site : 966 Chamber 5  
 Condition: PART90\_(B14) VERTICAL  
 Remak : Cat-M1 Band 14 QPSK\_5M Link\_H-CH  
 Tested by: Thomas Wei

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1 pp	1591.00	-53.06	-39.65	-40.00	-13.06	-13.41	Peak
2	2386.50	-46.92	-37.17	-13.00	-33.92	-9.75	Peak

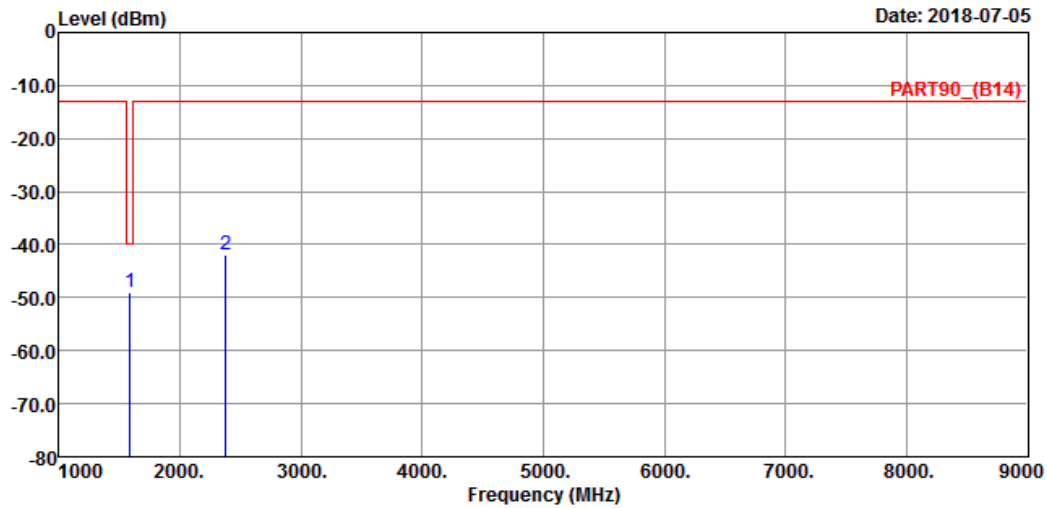
Channel Bandwidth: 10 MHz / QPSK  
Middle Channel



Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 1



Site : 966 Chamber 5  
Condition: PART90\_(B14) HORIZONTAL  
Remak : Cat-M1 Band 14 QPSK\_10M Link\_M-CH  
Tested by: Thomas Wei

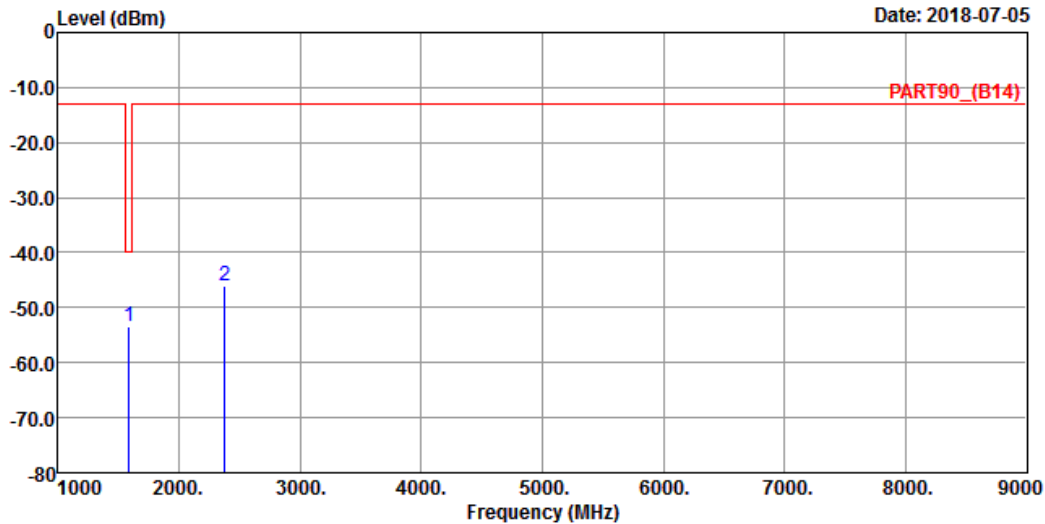
	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1	pp 1586.00	-48.97	-35.58	-40.00	-8.97	-13.39	Peak
2	2379.00	-41.88	-32.19	-13.00	-28.88	-9.69	Peak



A D T

Data: 2

Date: 2018-07-05



Site : 966 Chamber 5  
 Condition: PART90\_(B14) VERTICAL  
 Remak : Cat-M1 Band 14 QPSK\_10M Link\_M-CH  
 Tested by: Thomas Wei

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1 pp	1586.00	-53.29	-39.90	-40.00	-13.29	-13.39	Peak
2	2379.00	-46.00	-36.31	-13.00	-33.00	-9.69	Peak



LTE Band 26  
 Channel Bandwidth: 1.4 MHz / QPSK  
 Low Channel

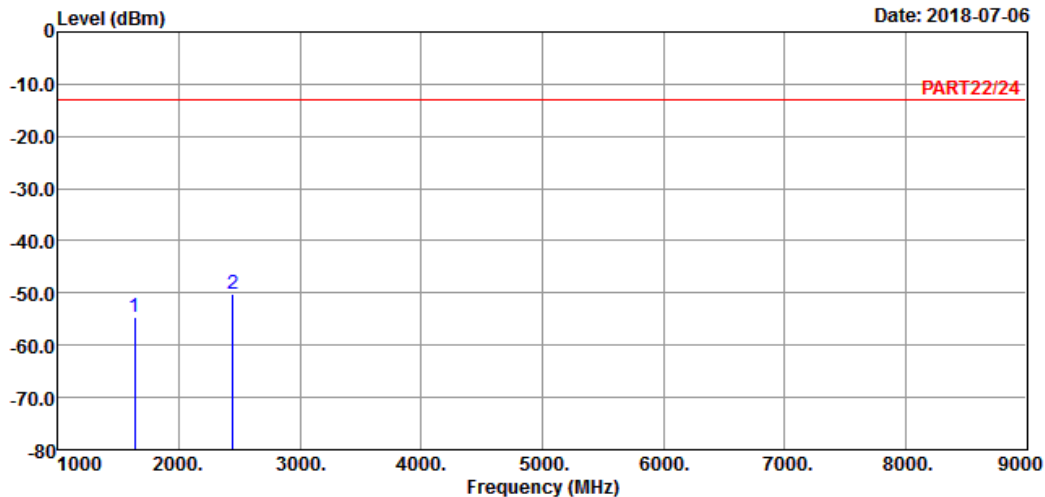


Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 1

Date: 2018-07-06



Site : 966 Chamber 5  
 Condition: PART22/24 HORIZONTAL  
 Remak : Cat-M1 Band 26 QPSK\_1.4M Link\_L-CH  
 Tested by: Thomas Wei

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1	1629.40	-54.67	-41.05	-13.00	-41.67	-13.62	Peak
2	pp 2444.10	-50.22	-40.26	-13.00	-37.22	-9.96	Peak

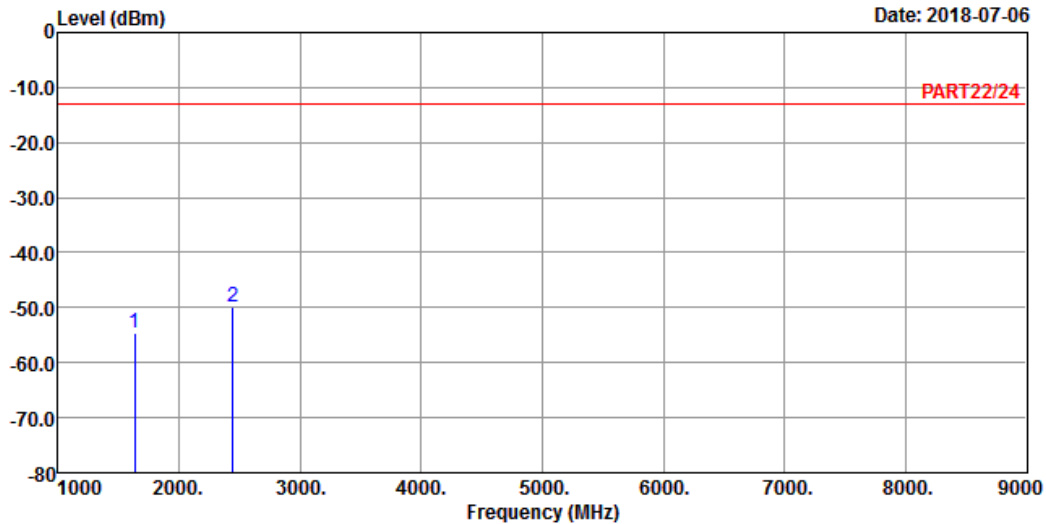


Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 2

Date: 2018-07-06



Site : 966 Chamber 5  
 Condition: PART22/24 VERTICAL  
 Remak : Cat-M1 Band 26 QPSK\_1.4M Link\_L-CH  
 Tested by: Thomas Wei

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1	1629.40	-54.60	-40.98	-13.00	-41.60	-13.62	Peak
2 pp	2444.10	-49.75	-39.79	-13.00	-36.75	-9.96	Peak

Middle Channel

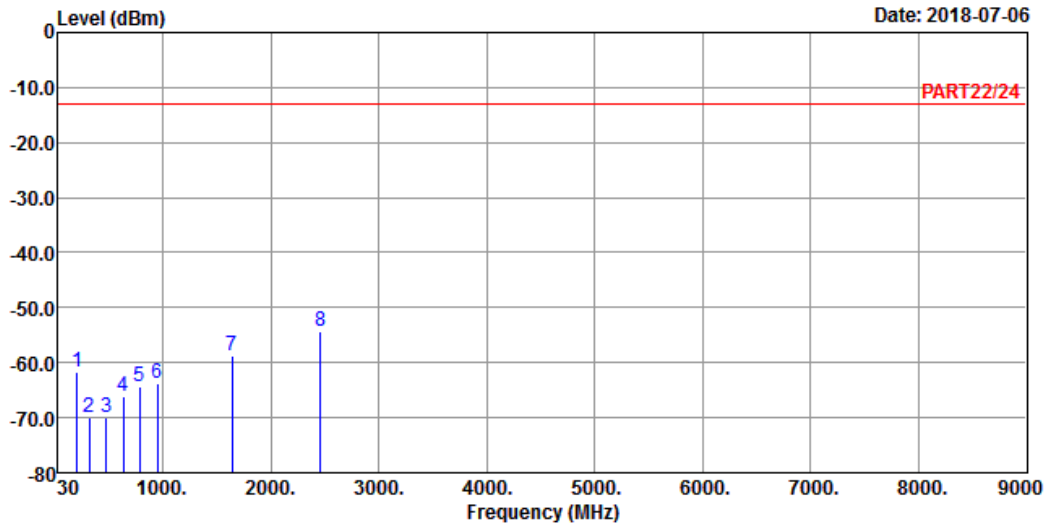


Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 5

Date: 2018-07-06



Site : 966 Chamber 5  
 Condition: PART22/24 HORIZONTAL  
 Remak : Cat-M1 Band 26 QPSK\_1.4M Link\_M-CH  
 Tested by: Thomas Wei

	Read	Limit	Over				
Freq	Level	Level	Line	Limit	Factor	Remark	
MHz	dBm	dBm	dBm	dB	dB		
1	202.66	-61.81	-53.91	-13.00	-48.81	-7.90	Peak
2	316.15	-69.83	-63.07	-13.00	-56.83	-6.76	Peak
3	479.11	-70.00	-64.99	-13.00	-57.00	-5.01	Peak
4	630.43	-66.06	-65.23	-13.00	-53.06	-0.83	Peak
5	780.78	-64.28	-65.07	-13.00	-51.28	0.79	Peak
6	952.47	-63.67	-65.57	-13.00	-50.67	1.90	Peak
7	1638.00	-58.78	-45.10	-13.00	-45.78	-13.68	Peak
8 pp	2457.00	-54.21	-44.22	-13.00	-41.21	-9.99	Peak

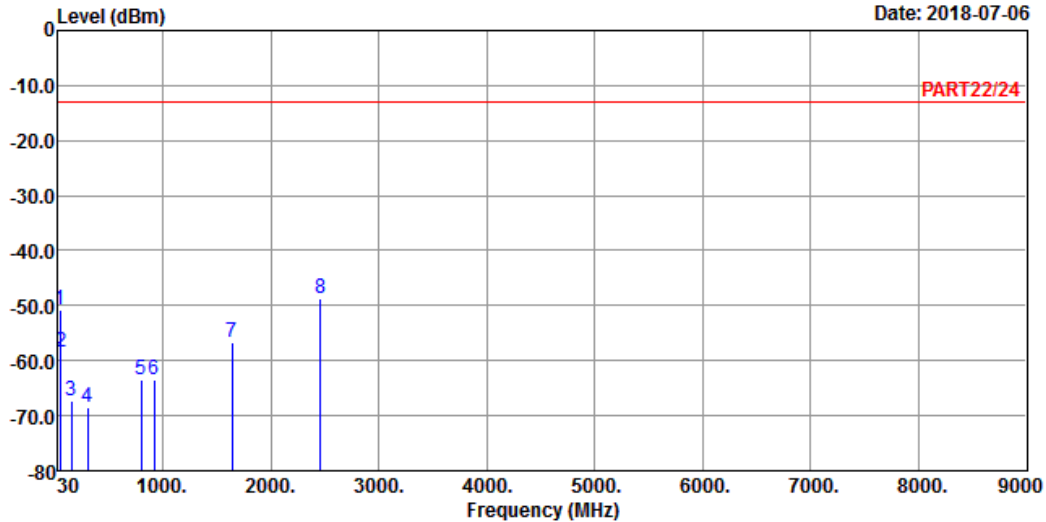


Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 6

Date: 2018-07-06



Site : 966 Chamber 5  
 Condition: PART22/24 VERTICAL  
 Remak : Cat-M1 Band 26 QPSK\_1.4M Link\_M-CH  
 Tested by: Thomas Wei

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1	44.55	-50.64	-48.65	-13.00	-37.64	-1.99	Peak
2	54.25	-58.57	-52.50	-13.00	-45.57	-6.07	Peak
3	155.13	-67.24	-61.03	-13.00	-54.24	-6.21	Peak
4	299.66	-68.58	-61.57	-13.00	-55.58	-7.01	Peak
5	795.33	-63.41	-64.16	-13.00	-50.41	0.75	Peak
6	915.61	-63.34	-64.30	-13.00	-50.34	0.96	Peak
7	1638.00	-56.72	-43.04	-13.00	-43.72	-13.68	Peak
8 pp	2457.00	-48.72	-38.73	-13.00	-35.72	-9.99	Peak

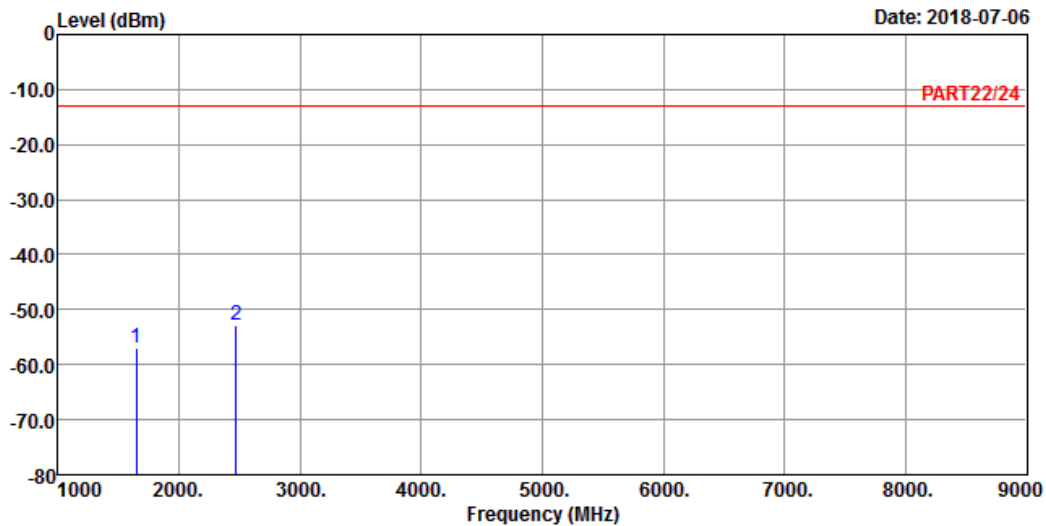
# High Channel



Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 1



Site : 966 Chamber 5  
 Condition: PART22/24 HORIZONTAL  
 Remak : Cat-M1 Band 26 QPSK\_1.4M Link\_H-CH  
 Tested by: Thomas Wei

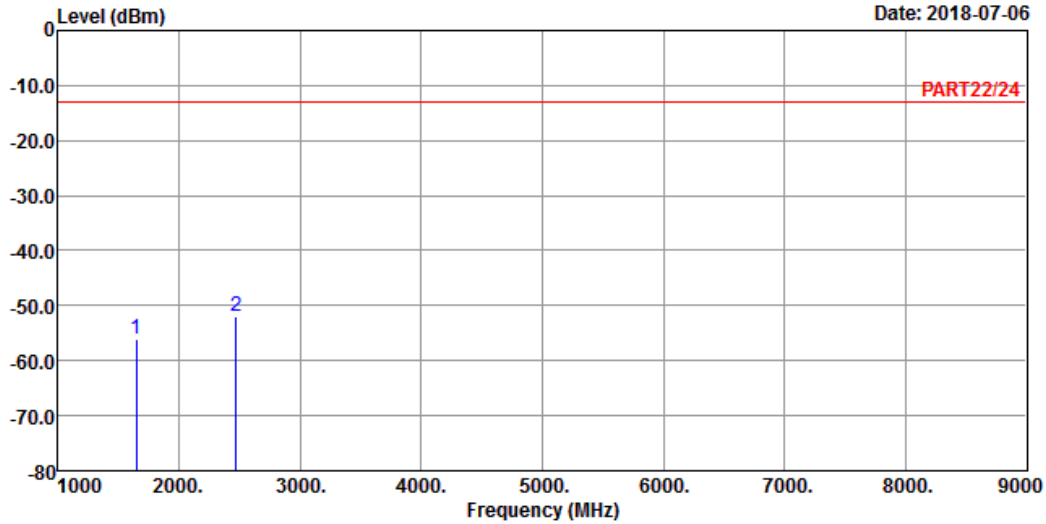
	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1	1646.60	-57.06	-43.35	-13.00	-44.06	-13.71	Peak
2 pp	2469.90	-52.73	-42.71	-13.00	-39.73	-10.02	Peak



Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 2



Site : 966 Chamber 5  
 Condition: PART22/24 VERTICAL  
 Remak : Cat-M1 Band 26 QPSK\_1.4M Link\_H-CH  
 Tested by: Thomas Wei

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1	1646.60	-56.20	-42.49	-13.00	-43.20	-13.71	Peak
2 pp	2469.90	-52.05	-42.03	-13.00	-39.05	-10.02	Peak

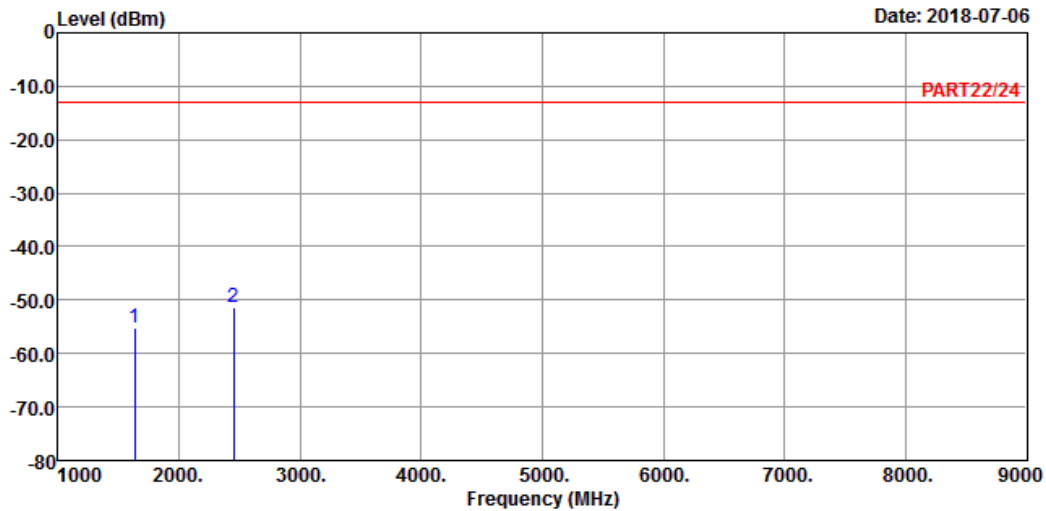
Channel Bandwidth: 5 MHz / QPSK  
Low Channel



Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 1



Site : 966 Chamber 5  
Condition: PART22/24 HORIZONTAL  
Remak : Cat-M1 Band 26 QPSK\_5M Link\_L-CH  
Tested by: Thomas Wei

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1	1633.00	-55.23	-41.61	-13.00	-42.23	-13.62	Peak
2 pp	2449.50	-51.33	-41.37	-13.00	-38.33	-9.96	Peak

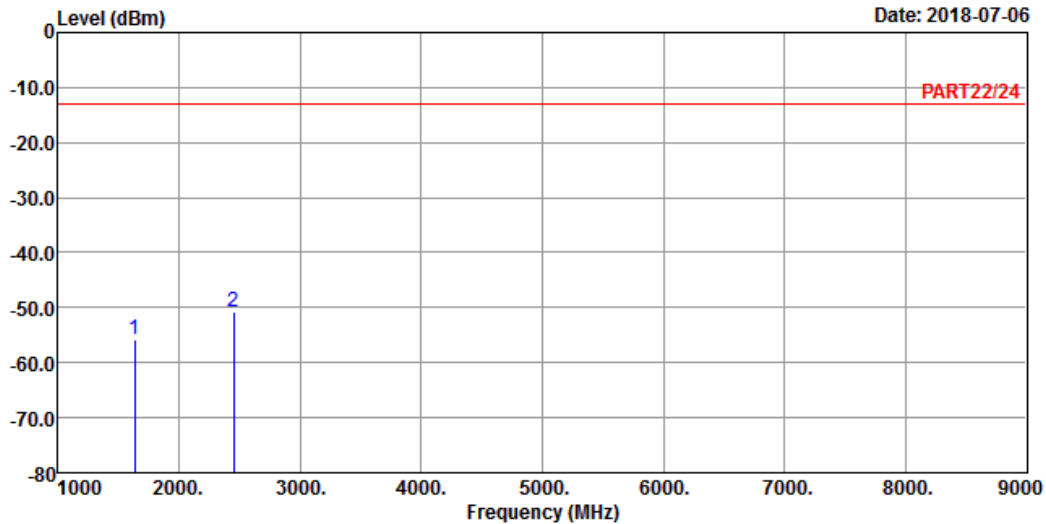


Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 2

Date: 2018-07-06



Site : 966 Chamber 5  
 Condition: PART22/24 VERTICAL  
 Remak : Cat-M1 Band 26 QPSK\_5M Link\_L-CH  
 Tested by: Thomas Wei

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1	1633.00	-55.89	-42.27	-13.00	-42.89	-13.62	Peak
2	pp 2449.50	-50.66	-40.70	-13.00	-37.66	-9.96	Peak



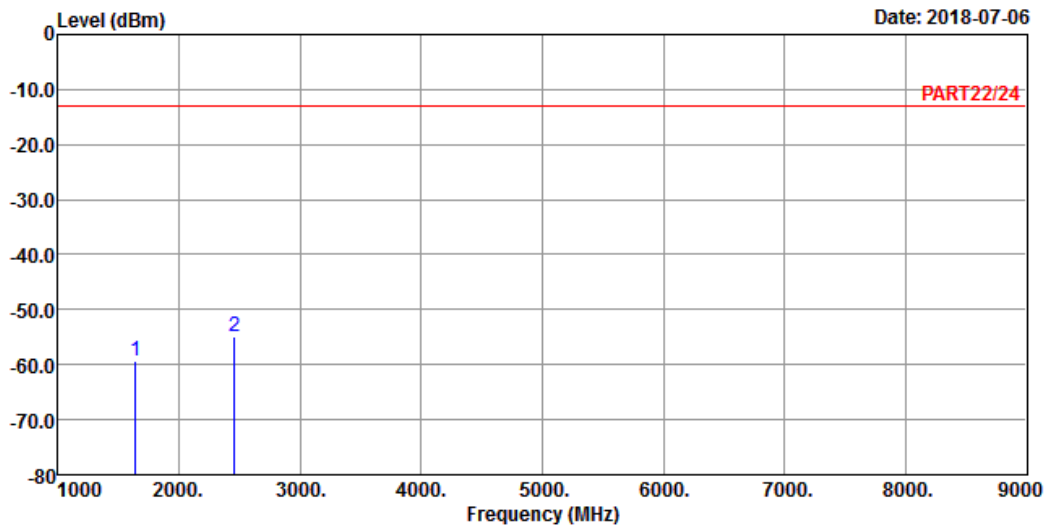
Middle Channel



Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 1



Site : 966 Chamber 5  
 Condition: PART22/24 HORIZONTAL  
 Remak : Cat-M1 Band 26 QPSK\_5M Link\_M-CH  
 Tested by: Thomas Wei

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1	1638.00	-59.33	-45.65	-13.00	-46.33	-13.68	Peak
2 pp	2457.00	-54.79	-44.80	-13.00	-41.79	-9.99	Peak

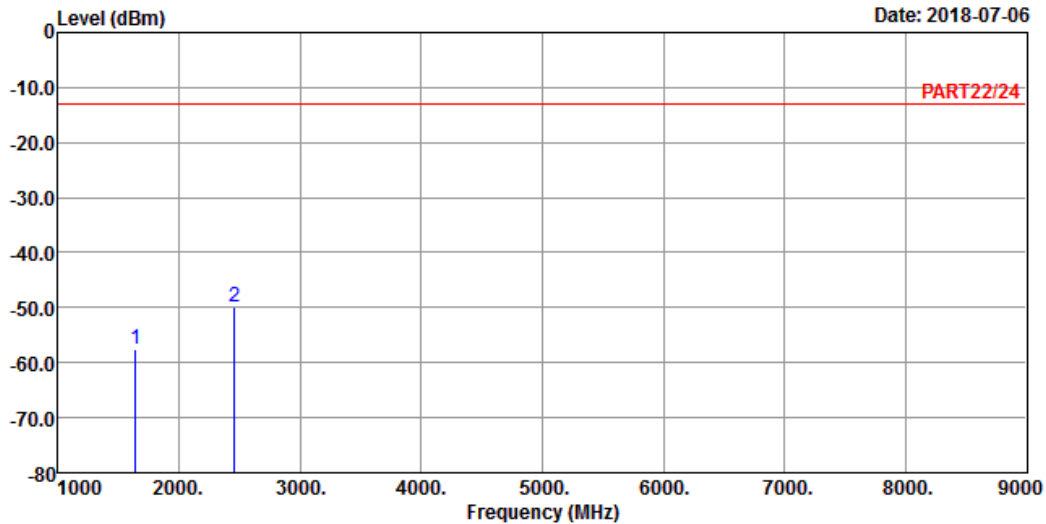


Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 2

Date: 2018-07-06



Site : 966 Chamber 5  
 Condition: PART22/24 VERTICAL  
 Remak : Cat-M1 Band 26 QPSK\_5M Link\_M-CH  
 Tested by: Thomas Wei

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1	1638.00	-57.49	-43.81	-13.00	-44.49	-13.68	Peak
2 pp	2457.00	-49.88	-39.89	-13.00	-36.88	-9.99	Peak

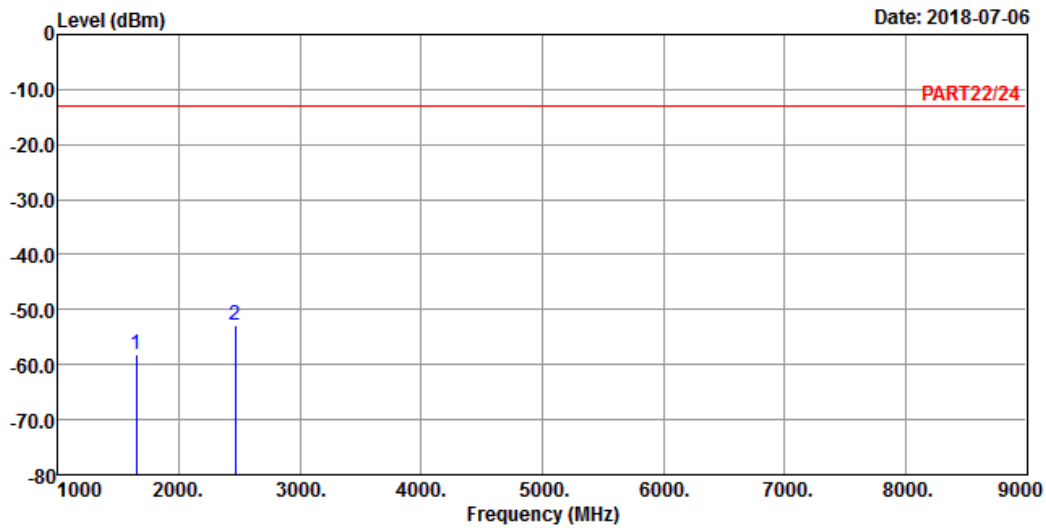
# High Channel



Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 1



Site : 966 Chamber 5  
 Condition: PART22/24 VERTICAL  
 Remak : Cat-M1 Band 26 QPSK\_5M Link\_H-CH  
 Tested by: Thomas Wei

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1	1643.00	-58.07	-44.36	-13.00	-45.07	-13.71	Peak
2 pp	2464.50	-52.93	-42.91	-13.00	-39.93	-10.02	Peak

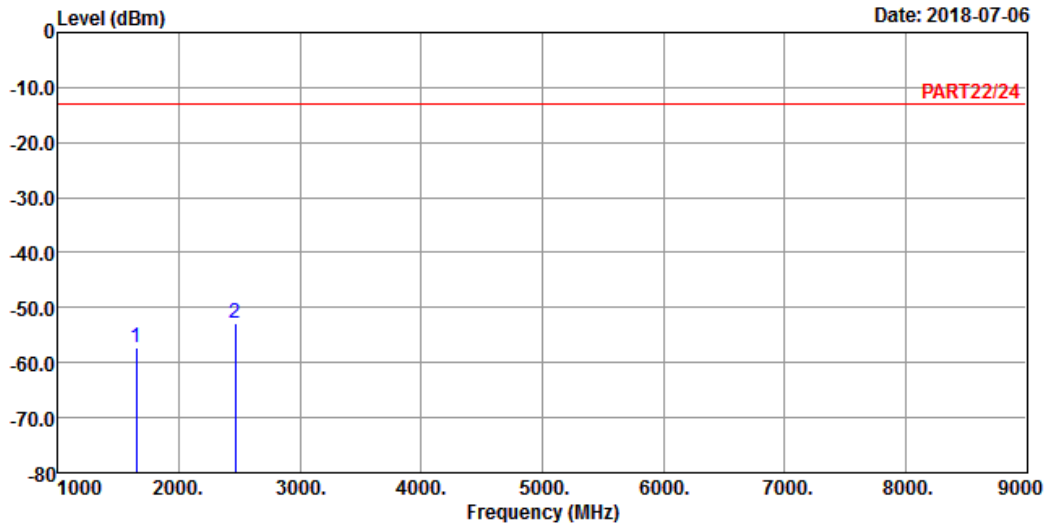


Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 2

Date: 2018-07-06



Site : 966 Chamber 5  
 Condition: PART22/24 VERTICAL  
 Remak : Cat-M1 Band 26 QPSK\_5M Link\_H-CH  
 Tested by: Thomas Wei

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1	1643.00	-57.14	-43.43	-13.00	-44.14	-13.71	Peak
2 pp	2464.50	-52.98	-42.96	-13.00	-39.98	-10.02	Peak

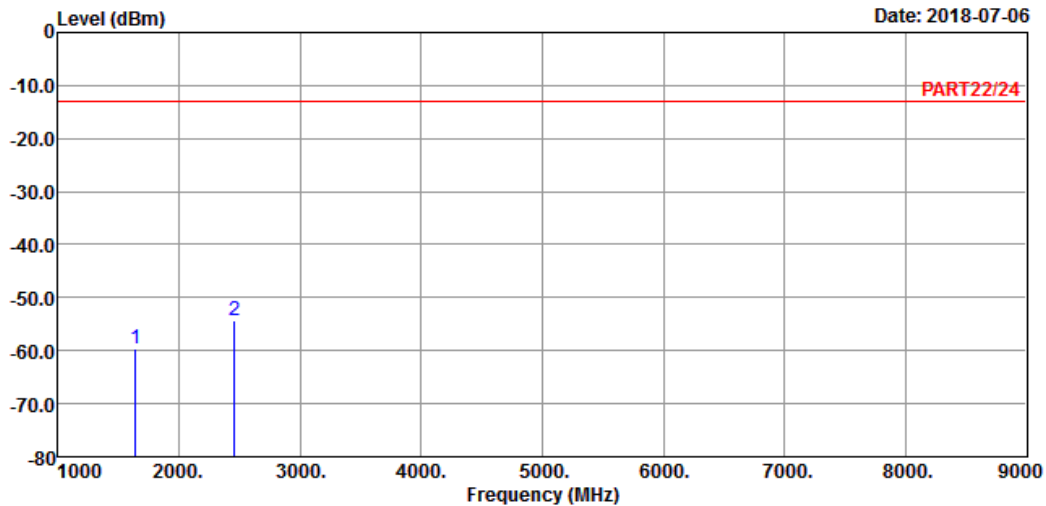
Channel Bandwidth: 10 MHz / QPSK  
Middle Channel



Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 1



Site : 966 Chamber 5  
Condition: PART22/24 HORIZONTAL  
Remak : Cat-M1 Band 26 QPSK\_10M Link\_M-CH  
Tested by: Thomas Wei

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1	1638.00	-59.68	-46.00	-13.00	-46.68	-13.68	Peak
2 pp	2457.00	-54.19	-44.20	-13.00	-41.19	-9.99	Peak

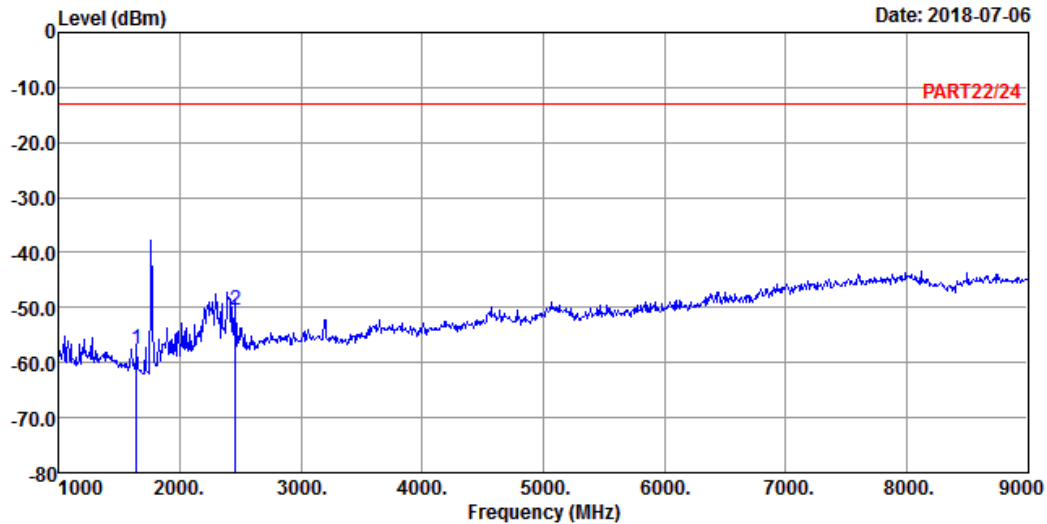


Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 2

Date: 2018-07-06



Site : 966 Chamber 5  
 Condition: PART22/24 VERTICAL  
 Remak : Cat-M1 Band 26 QPSK\_10M Link\_M-CH  
 Tested by: Thomas Wei

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1	1638.00	-57.66	-43.98	-13.00	-44.66	-13.68	Peak
2	pp 2457.00	-50.41	-40.42	-13.00	-37.41	-9.99	Peak

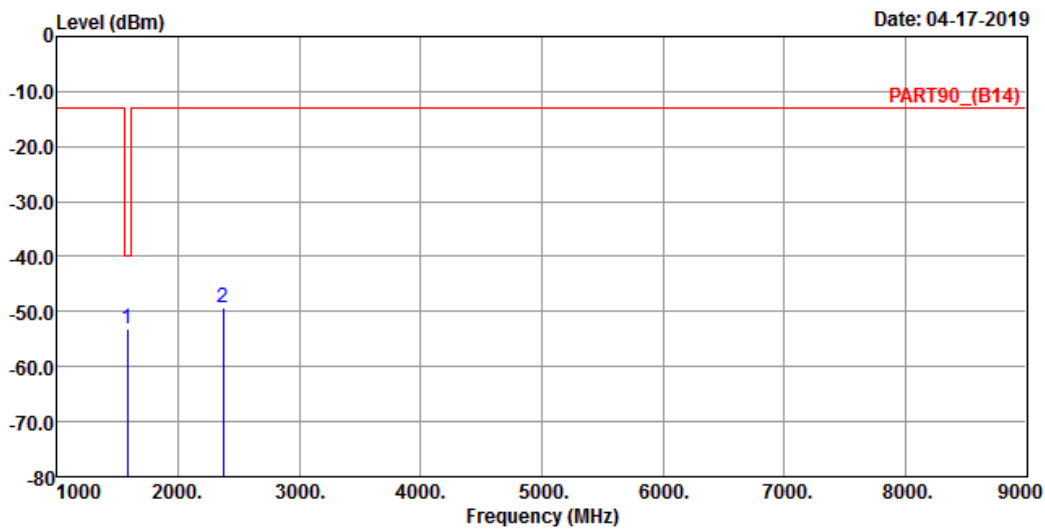
NB-IoT  
 LTE Band 14  
 Low Channel



Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 3



Site : 966 Chamber 5  
 Condition: PART90\_(B14) HORIZONTAL  
 Remak : NB-IOT Band 14 Stand-alone\_Link\_L-Ch  
 Tested by: Thomas Wei

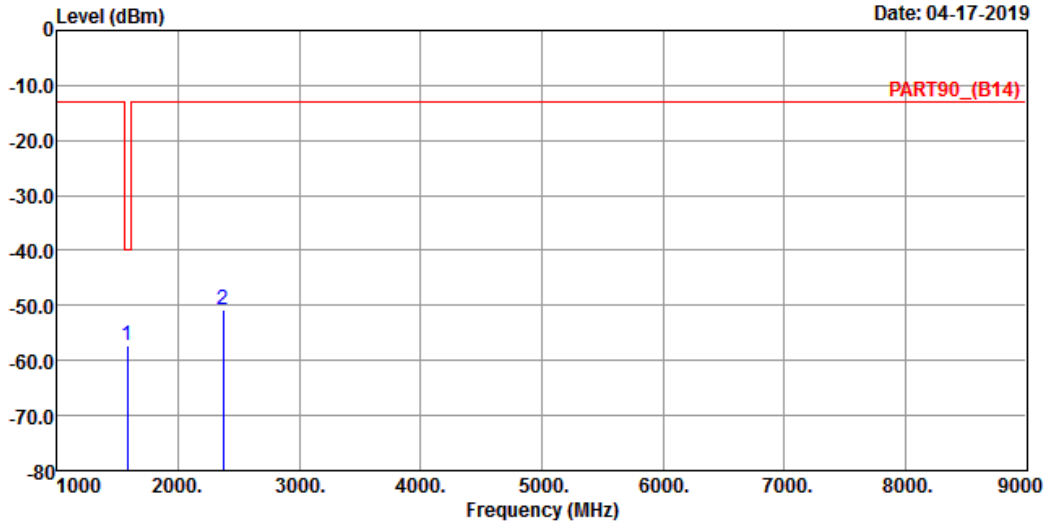
	Freq	Level	Read Level	Limit	Line Factor	Over Limit	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1	pp 1580.20	-53.15	-39.77	-40.00	-13.38	-13.15	Peak
2	2370.30	-49.31	-39.68	-13.00	-9.63	-36.31	Peak



Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 4



Site : 966 Chamber 5  
 Condition: PART90\_(B14) VERTICAL  
 Remak : NB-IOT Band 14 Stand-alone\_Link\_L-Ch  
 Tested by: Thomas Wei

	Freq	Level	Read Level	Limit	Line Factor	Over Limit	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1 pp	1580.20	-57.41	-44.03	-40.00	-13.38	-17.41	Peak
2	2370.30	-50.78	-41.15	-13.00	-9.63	-37.78	Peak



Middle Channel

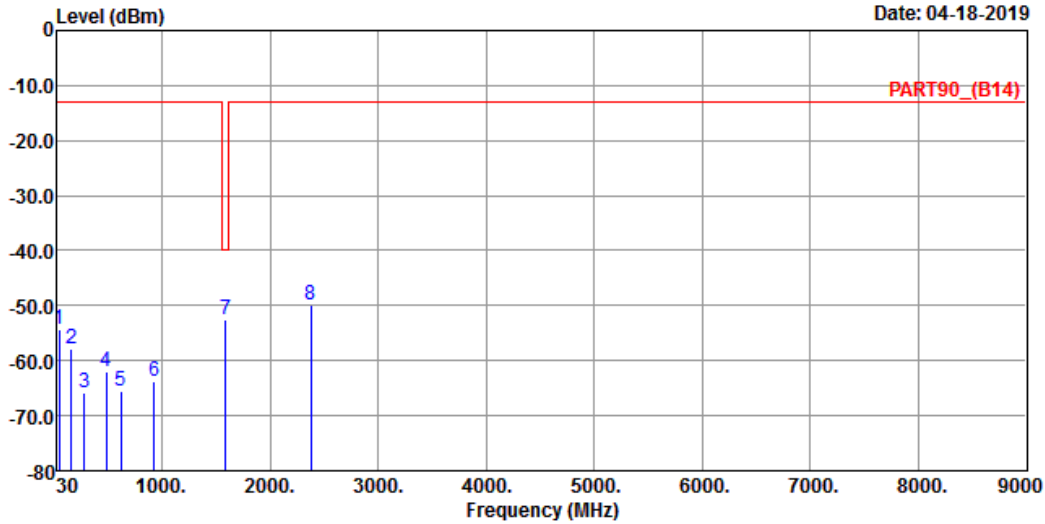


Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 7

Date: 04-18-2019



Site : 966 Chamber 5  
 Condition: PART90\_(B14) HORIZONTAL  
 Remak : NB-IOT Band 14 Stand-alone\_Link\_M-Ch  
 Tested by: Thomas Wei

	Freq	Level	Read Level	Limit	Line Factor	Over Limit	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1	43.58	-54.23	-52.76	-13.00	-1.47	-41.23	Peak
2	160.95	-57.90	-52.99	-13.00	-4.91	-44.90	Peak
3	278.32	-65.76	-59.19	-13.00	-6.57	-52.76	Peak
4	481.05	-62.06	-57.09	-13.00	-4.97	-49.06	Peak
5	617.82	-65.44	-64.64	-13.00	-0.80	-52.44	Peak
6	928.22	-63.62	-64.89	-13.00	1.27	-50.62	Peak
7 pp	1586.00	-52.69	-39.30	-40.00	-13.39	-12.69	Peak
8	2379.00	-49.85	-40.16	-13.00	-9.69	-36.85	Peak

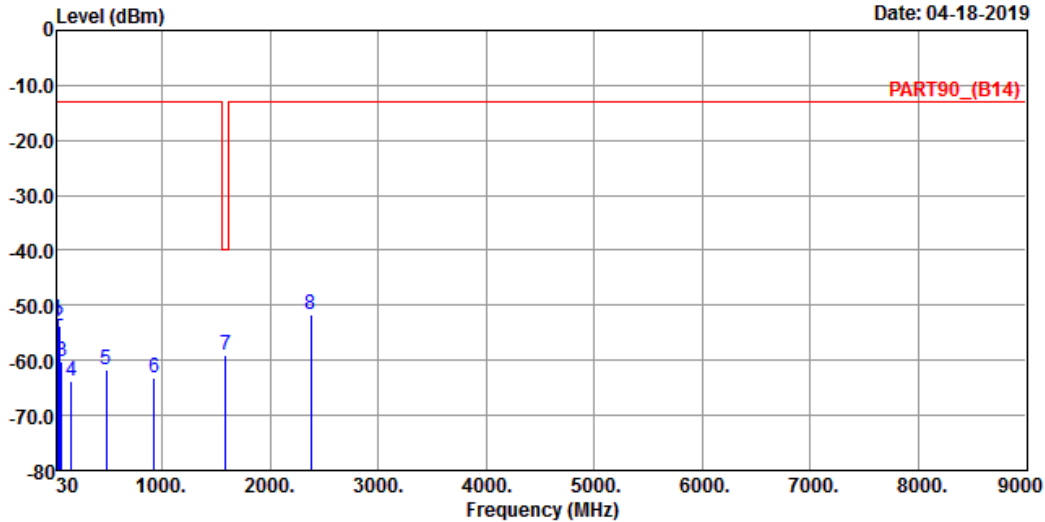


Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 8

Date: 04-18-2019



Site : 966 Chamber 5  
 Condition: PART90\_(B14) VERTICAL  
 Remak : NB-IOT Band 14 Stand-alone\_Link\_M-Ch  
 Tested by: Thomas Wei

	Freq	Level	Read Level	Limit	Line Factor	Over Limit	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1	30.00	-52.54	-52.92	-13.00	0.38	-39.54	Peak
2	43.58	-53.75	-52.28	-13.00	-1.47	-40.75	Peak
3	68.80	-60.25	-51.93	-13.00	-8.32	-47.25	Peak
4	158.04	-63.85	-58.46	-13.00	-5.39	-50.85	Peak
5	481.05	-61.59	-56.62	-13.00	-4.97	-48.59	Peak
6	930.16	-63.16	-64.48	-13.00	1.32	-50.16	Peak
7 pp	1586.00	-58.97	-45.58	-40.00	-13.39	-18.97	Peak
8	2379.00	-51.56	-41.87	-13.00	-9.69	-38.56	Peak

# High Channel

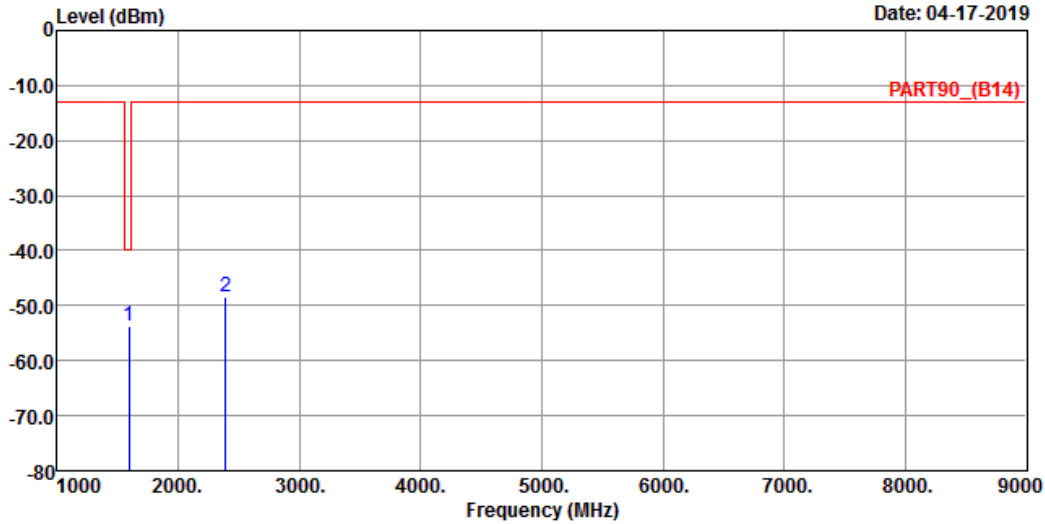


Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 3

Date: 04-17-2019



Site : 966 Chamber 5  
 Condition: PART90\_(B14) HORIZONTAL  
 Remak : NB-IOT Band 14 Stand-alone\_Link\_H-Ch  
 Tested by: Thomas Wei

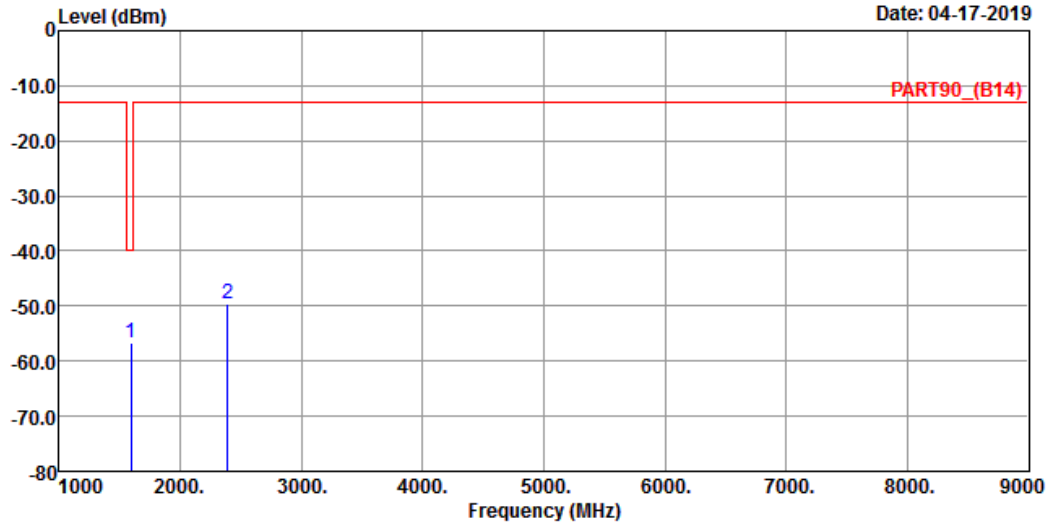
	Freq	Level	Read Level	Limit	Line Factor	Over Limit	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1	pp 1591.80	-53.75	-40.34	-40.00	-13.41	-13.75	Peak
2	2387.70	-48.44	-38.63	-13.00	-9.81	-35.44	Peak



Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 4



Site : 966 Chamber 5  
 Condition: PART90\_(B14) VERTICAL  
 Remak : NB-IOT Band 14 Stand-alone\_Link\_H-Ch  
 Tested by: Thomas Wei

	Freq	Level	Read Level	Limit	Line Factor	Over Limit	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1 pp	1591.80	-56.70	-43.29	-40.00	-13.41	-16.70	Peak
2	2387.70	-49.52	-39.71	-13.00	-9.81	-36.52	Peak

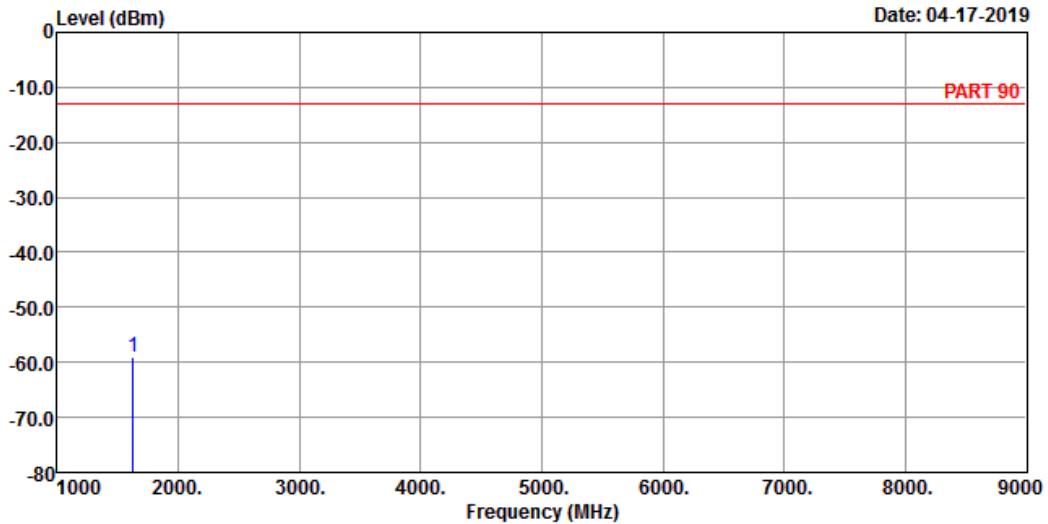
LTE Band 26  
Low Channel



Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 3



Site : 966 Chamber 5  
 Condition: PART 90 HORIZONTAL  
 Remak : NB-IOT Band 26 Stand-alone\_Link\_L-Ch  
 Tested by: Thomas Wei

Freq	Level	Read Level	Limit	Line Factor	Over Limit	Remark
MHz	dBm	dBm	dBm	dB	dB	

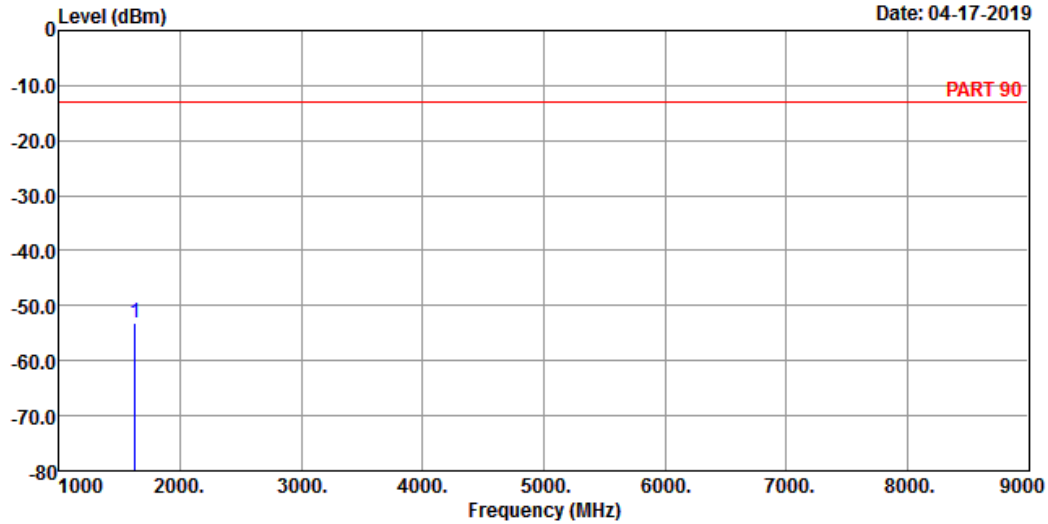
1 pp 1628.20 -59.16 -44.37 -13.00 -14.79 -46.16 Peak



Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 4



Site : 966 Chamber 5  
 Condition: PART 90 VERTICAL  
 Remak : NB-IOT Band 26 Stand-alone\_Link\_L-Ch  
 Tested by: Thomas Wei

Freq	Level	Read Level	Limit	Line Factor	Over Limit	Remark
MHz	dBm	dBm	dBm	dB	dB	
1 pp 1628.20	-53.08	-38.29	-13.00	-14.79	-40.08	Peak

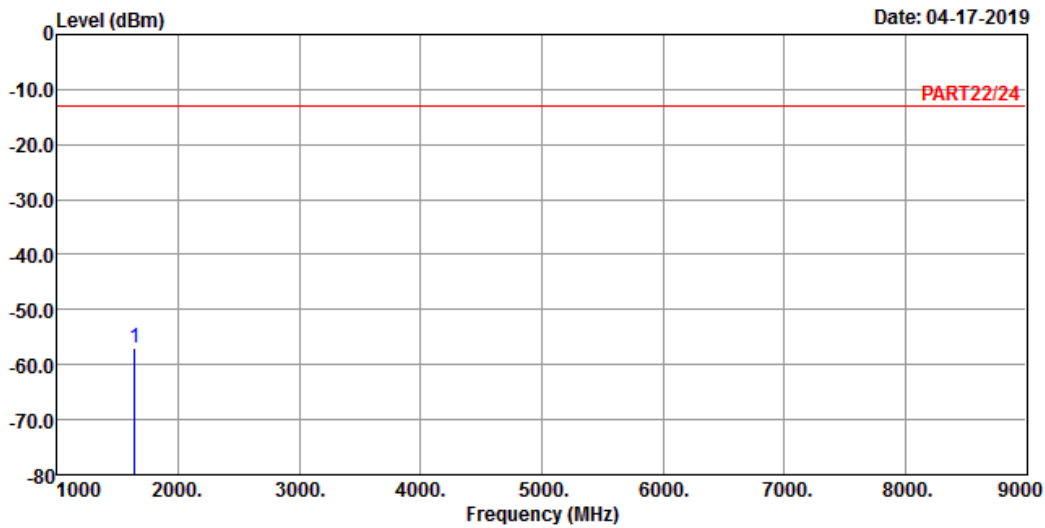
Middle Channel



Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 1



Site : 966 Chamber 5  
 Condition: PART22/24 HORIZONTAL  
 Remak : NB-IOT Band 26 Stand-alone\_Link\_M-Ch  
 Tested by: Thomas Wei

Freq	Level	Read Level	Limit	Line Factor	Over Limit	Remark
MHz	dBm	dBm	dBm	dB	dB	

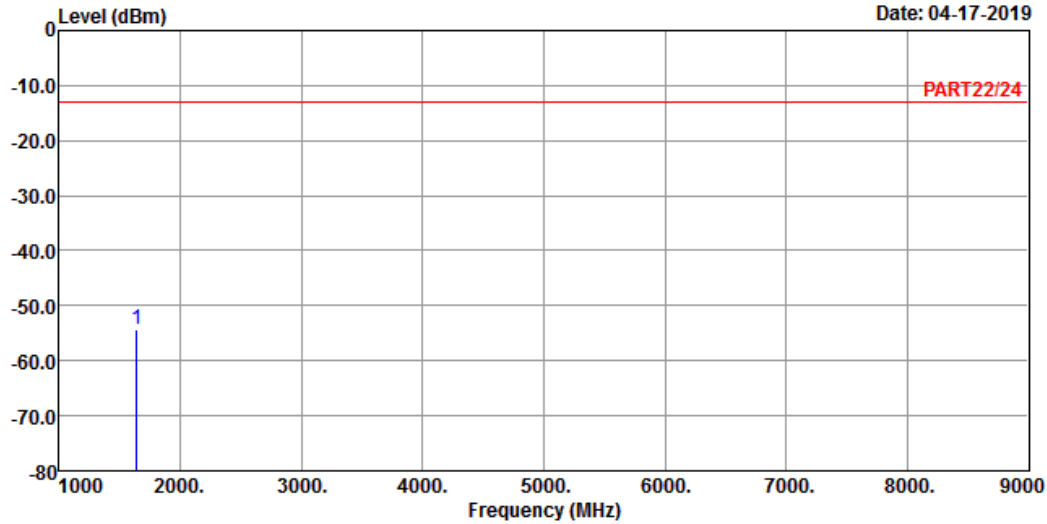
1 pp 1638.00 -57.05 -43.37 -13.00 -13.68 -44.05 Peak



Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 2



Site : 966 Chamber 5  
 Condition: PART22/24 VERTICAL  
 Remak : NB-IOT Band 26 Stand-alone\_Link\_M-Ch  
 Tested by: Thomas Wei

Freq	Level	Read Level	Limit	Line Factor	Over Limit	Remark
MHz	dBm	dBm	dBm	dB	dB	
1 pp 1638.00	-54.34	-40.66	-13.00	-13.68	-41.34	Peak



# High Channel

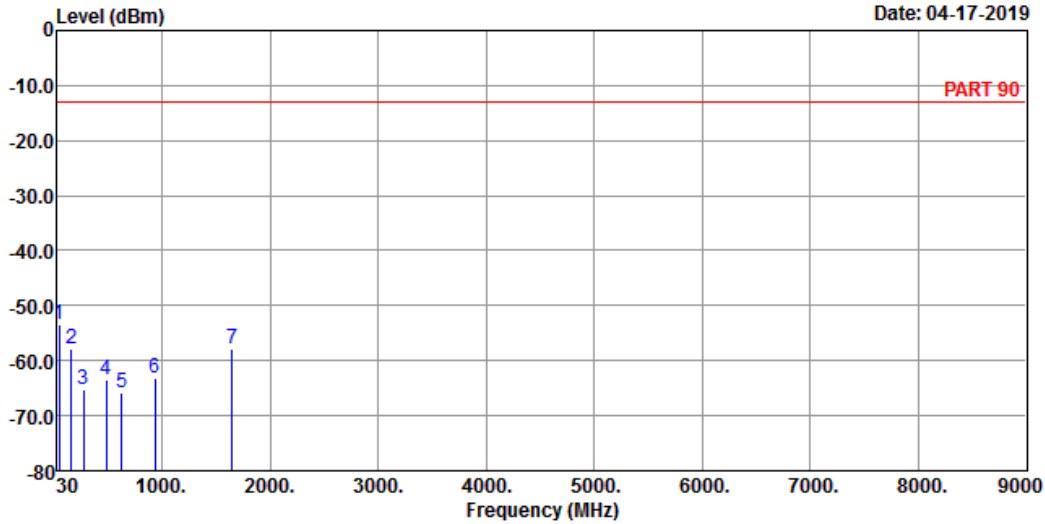


Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 5

Date: 04-17-2019



Site : 966 Chamber 5  
 Condition: PART 90 HORIZONTAL  
 Remak : NB-IOT Band 26 Stand-alone\_Link\_H-Ch  
 Tested by: Thomas Wei

	Read	Limit	Over			
Freq	Level	Level	Line	Factor	Limit	Remark
MHz	dBm	dBm	dBm	dB	dB	
1 pp	43.58	-53.33	-51.86	-13.00	-1.47	-40.33 Peak
2	162.89	-57.82	-52.77	-13.00	-5.05	-44.82 Peak
3	275.41	-65.23	-58.72	-13.00	-6.51	-52.23 Peak
4	481.05	-63.57	-58.60	-13.00	-4.97	-50.57 Peak
5	629.46	-65.81	-64.98	-13.00	-0.83	-52.81 Peak
6	931.13	-63.19	-64.53	-13.00	1.34	-50.19 Peak
7	1647.80	-57.95	-43.22	-13.00	-14.73	-44.95 Peak

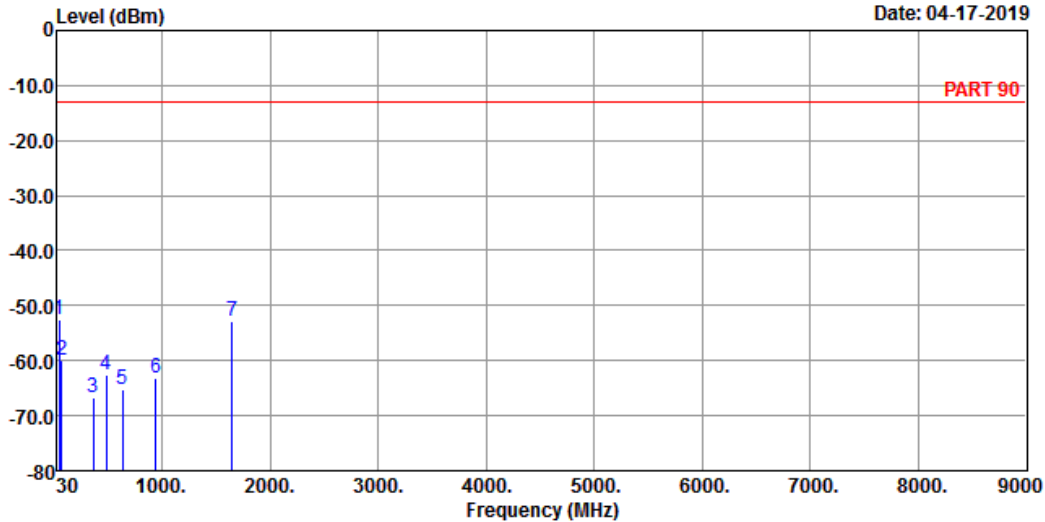


Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 6

Date: 04-17-2019



Site : 966 Chamber 5  
 Condition: PART 90 VERTICAL  
 Remak : NB-IOT Band 26 Stand-alone\_Link\_H-Ch  
 Tested by: Thomas Wei

	Freq	Level	Read Level	Limit	Line Factor	Over Limit	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1 pp	43.58	-52.61	-51.14	-13.00	-1.47	-39.61	Peak
2	68.80	-59.98	-51.66	-13.00	-8.32	-46.98	Peak
3	361.74	-66.58	-60.41	-13.00	-6.17	-53.58	Peak
4	481.05	-62.61	-57.64	-13.00	-4.97	-49.61	Peak
5	635.28	-65.11	-64.26	-13.00	-0.85	-52.11	Peak
6	940.83	-63.21	-64.79	-13.00	1.58	-50.21	Peak
7	1647.80	-52.82	-38.09	-13.00	-14.73	-39.82	Peak

## 5 Pictures of Test Arrangements

Please refer to the attached file (Test Setup Photo).

## Appendix – Information of the Testing Laboratories

We, Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch, were founded in 1988 to provide our best service in EMC, Radio, Telecom and Safety consultation. Our laboratories are FCC recognized accredited test firms and accredited according to ISO/IEC 17025.

If you have any comments, please feel free to contact us at the following:

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The address and road map of all our labs can be found in our web site also.

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