

FCC Test Report

(PART 22)

Report No.: RF181123D01D

FCC ID: P27-TPM540

Test Model: TPM540; TPM540M; TPM540S; TPM540MS

Received Date: Jan. 17, 2020

Test Date: Feb. 10 ~ Feb. 27, 2020

Issued Date: Mar. 06, 2020

Applicant: Sercomm Corp.

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Issued By: Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch
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**FCC Registration /
Designation Number:** 788550 / TW0003



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Release Control Record

Issue No.	Description	Date Issued
RF181123D01D	Original Release	Mar. 06, 2020

1 Certificate of Conformity

Product: Cat-M1 Module

Brand: Sercomm

Test Model: TPM540; TPM540M; TPM540S; TPM540MS

Sample Status: Engineering Sample

Applicant: Sercomm Corp.

Test Date: Feb. 10 ~ Feb. 27, 2020

Standards: FCC Part 22, Subpart H

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 : Gina Liu, **Date:** Mar. 06, 2020
Gina Liu / Specialist

Approved by : Dylan Chiou, **Date:** Mar. 06, 2020
Dylan Chiou / Senior Project Engineer

2 Summary of Test Results

Applied Standard: FCC Part 22 & Part 2			
FCC Clause	Test Item	Result	Remarks
2.1046 22.913 (a)	Effective Radiated Power	Pass	Meet the requirement of limit.
2.1047	Modulation Characteristics	Pass	Meet the requirement.
22.913 (d)	Peak to Average Ratio	Pass	Meet the requirement of limit.
2.1055 22.355	Frequency Stability	Pass	Meet the requirement of limit.
2.1049	Occupied Bandwidth	Pass	Meet the requirement of limit.
22.917	Band Edge Measurements	Pass	Meet the requirement of limit.
2.1051 22.917	Conducted Spurious Emissions	Pass	Meet the requirement of limit.
2.1053 22.917	Radiated Spurious Emissions	Pass	Meet the requirement of limit. Minimum passing margin is -24.59 dB at 2509.50 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

Description & Manufacturer	Model No.	Serial No.	Date of Calibration	Due Date of Calibration
Test Receiver Agilent	N9038A	MY51210203	Mar. 18, 2019	Mar. 17, 2020
Spectrum Analyzer Agilent	N9010A	MY52220314	Dec. 12, 2019	Dec. 11, 2020
Spectrum Analyzer ROHDE & SCHWARZ	FSU43	101261	Apr. 15, 2019	Apr. 14, 2020
HORN Antenna SCHWARZBECK	BBHA 9120D	9120D-969	Nov. 24, 2019	Nov. 23, 2020
BILOG Antenna SCHWARZBECK	VULB 9168	9168-160	Nov. 07, 2019	Nov. 06, 2020
BILOG Antenna SCHWARZBECK	VULB 9168	9168-472	Nov. 08, 2019	Nov. 07, 2020
Fixed Attenuator Mini-Circuits	MDCS18N-10	MDCS18N-10-01	Apr. 15, 2019	Apr. 14, 2020
MXG Vector signal generator Agilent	N5182B	MY53050430	Oct. 25, 2019	Oct. 24, 2020
Preamplifier EMCI	EMC 012645	980115	Oct. 08, 2019	Oct. 07, 2020
Preamplifier EMCI	EMC 330H	980112	Oct. 08, 2019	Oct. 07, 2020
RF Coaxial Cable HUBER+SUHNNER	EMC104-SM-SM-800 0&3000	140811+170717	Oct. 08, 2019	Oct. 07, 2020
RF Coaxial Cable HUBER+SUHNNER	SUCOFLEX 104	EMC104-SM-SM-1 000(140807)	Oct. 08, 2019	Oct. 07, 2020
RF Coaxial Cable WOKEN	8D-FB	Cable-Ch10-01	Oct. 08, 2019	Oct. 07, 2020
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	6261806803	Jan. 18, 2020	Jan. 17, 2021
Temperature & Humidity Chamber	GTH-120-40-CP-AR	MAA1306-019	Sep. 06, 2019	Sep. 05, 2020
DC Power Supply Topward	33010D	807748	N/A	N/A

- Note:
1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
 2. The test was performed in HwaYa Chamber 10.
 3. The horn antenna and preamplifier (model: EMC 184045) are used only for the measurement of emission frequency above 1 GHz if tested.

3 General Information

3.1 General Description of EUT

Product	Cat-M1 Module	
Brand	Sercomm	
Test Model	TPM540; TPM540M; TPM540S; TPM540MS	
Status of EUT	Engineering Sample	
Power Supply Rating	5.0 Vdc (adapter)	
Modulation Type	LTE	QPSK, 16QAM
Frequency Range	LTE 26 (Channel Bandwidth: 1.4 MHz)	824.7 ~ 848.3 MHz
	LTE 26 (Channel Bandwidth: 3 MHz)	825.5 ~ 847.5 MHz
	LTE 26 (Channel Bandwidth: 5 MHz)	826.5 ~ 846.5 MHz
	LTE 26 (Channel Bandwidth: 10 MHz)	829 ~ 844 MHz
	LTE 26 (Channel Bandwidth: 15 MHz)	831.5 ~ 841.5 MHz
Max. ERP Power	LTE 26 (Channel Bandwidth: 1.4 MHz)	304.79 mW
	LTE 26 (Channel Bandwidth: 3 MHz)	306.90 mW
	LTE 26 (Channel Bandwidth: 5 MHz)	316.96 mW
	LTE 26 (Channel Bandwidth: 10 MHz)	318.42 mW
	LTE 26 (Channel Bandwidth: 15 MHz)	321.37 mW
Emission Designator	LTE 26 (Channel Bandwidth: 1.4 MHz)	1M09D7W
	LTE 26 (Channel Bandwidth: 3 MHz)	1M08D7W
	LTE 26 (Channel Bandwidth: 5 MHz)	1M08D7W
	LTE 26 (Channel Bandwidth: 10 MHz)	1M09D7W
	LTE 26 (Channel Bandwidth: 15 MHz)	1M09G7D
Antenna Type	Monopole (PCB) Antenna with 2.41 dBi gain	
Accessory Device	N/A	
Data Cable Supplied	N/A	

Note:

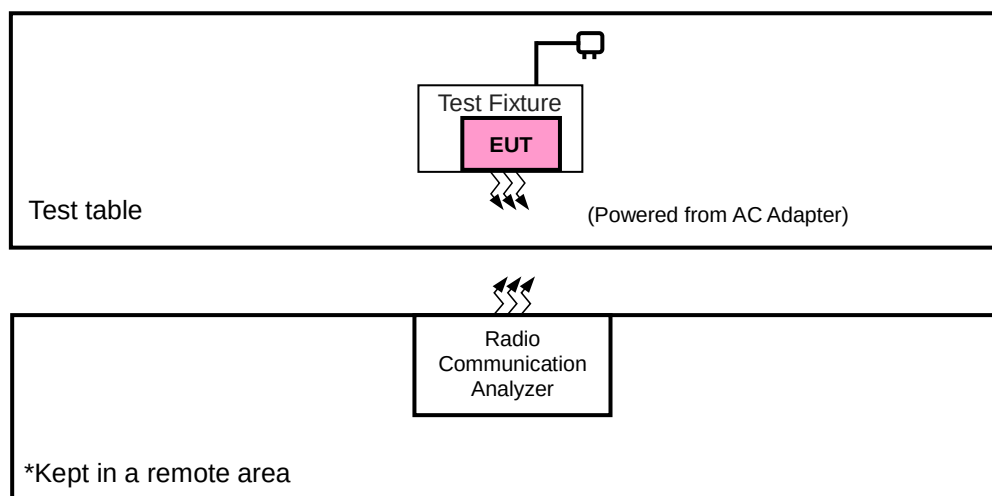
1. All models are listed as below.

Brand	Model	Difference
Sercomm	TPM540	GNSS embedded
	TPM540M	MCU/GNSS embedded
	TPM540S	Pure Modem
	TPM540MS	MCU embedded

* Above models had been pre-tested, and the worst case was found on model TPM540. Therefore, only this model was chosen for the final test and presented in the test report.

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	Kted	KSA0050500100VUD	N/A	N/A
2.	Test Fixture	N/A	N/A	N/A	N/A
3.	Radio Communication Analyzer	Anritsu	MT8821C	626180680	N/A

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

Note:

1. All power cords of the above support units are non-shielded (1.8m).
2. Item 1-2 were 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 26	X-plane	X-axis

LTE Band 26

EUT Configure Mode	Test Item	Available Channel	Tested Channel	Channel Bandwidth	Modulation	Mode
-	ERP	26797 to 27033	26797, 26915, 27033	1.4 MHz	QPSK, 16QAM	1 RB / 0 RB Offset
		26805 to 27025	26805, 26915, 27025	3 MHz	QPSK, 16QAM	1 RB / 0 RB Offset
		26815 to 27015	26815, 26915, 27015	5 MHz	QPSK, 16QAM	1 RB / 0 RB Offset
		26840 to 26990	26840, 26915, 26990	10 MHz	QPSK, 16QAM	1 RB / 0 RB Offset
		26865 to 26965	26865, 26915, 26965	15 MHz	QPSK, 16QAM	1 RB / 0 RB Offset
-	Modulation Characteristics	26865 to 26965	26915	15 MHz	QPSK, 16QAM	6 RB / 0 RB Offset
-	Frequency Stability	26797 to 27033	26797, 27033	1.4 MHz	QPSK	6 RB / 0 RB Offset
		26805 to 27025	26805, 27025	3 MHz	QPSK	6 RB / 0 RB Offset
		26815 to 27015	26815, 27015	5 MHz	QPSK	6 RB / 0 RB Offset
		26840 to 26990	26840, 26990	10 MHz	QPSK	6 RB / 0 RB Offset
		26865 to 26965	26865, 26965	15 MHz	QPSK	6 RB / 0 RB Offset
-	Occupied Bandwidth	26797 to 27033	26797, 26915, 27033	1.4 MHz	QPSK, 16QAM	6 RB / 0 RB Offset
		26805 to 27025	26805, 26915, 27025	3 MHz	QPSK, 16QAM	6 RB / 0 RB Offset
		26815 to 27015	26815, 26915, 27015	5 MHz	QPSK, 16QAM	6 RB / 0 RB Offset
		26840 to 26990	26840, 26915, 26990	10 MHz	QPSK, 16QAM	6 RB / 0 RB Offset
		26865 to 26965	26865, 26915, 26965	15 MHz	QPSK, 16QAM	6 RB / 0 RB Offset
-	Band Edge	26797 to 27033	26797	1.4 MHz	QPSK	1 RB / 0 RB Offset
			27033	1.4 MHz	QPSK	6 RB / 0 RB Offset
		26805 to 27025	26805	3 MHz	QPSK	1 RB / 5 RB Offset
			27025	3 MHz	QPSK	6 RB / 0 RB Offset
		26815 to 27015	26815	5 MHz	QPSK	1 RB / 0 RB Offset
			27015	5 MHz	QPSK	6 RB / 0 RB Offset
		26840 to 26990	26840	10 MHz	QPSK	1 RB / 5 RB Offset
			26990	10 MHz	QPSK	6 RB / 0 RB Offset
		26865 to 26965	26865	15 MHz	QPSK	1 RB / 0 RB Offset
			26965	15 MHz	QPSK	6 RB / 0 RB Offset
						1 RB / 5 RB Offset
						6 RB / 0 RB Offset
						1 RB / 0 RB Offset
						6 RB / 0 RB Offset
						1 RB / 5 RB Offset
						6 RB / 0 RB Offset

EUT Configure Mode	Test Item	Available Channel	Tested Channel	Channel Bandwidth	Modulation	Mode
-	Peak to Average Ratio	26797 to 27033	26797, 26915, 27033	1.4 MHz	QPSK, 16QAM	1 RB / 0 RB Offset
		26805 to 27025	26805, 26915, 27025	3 MHz	QPSK, 16QAM	1 RB / 0 RB Offset
		26815 to 27015	26815, 26915, 27015	5 MHz	QPSK, 16QAM	1 RB / 0 RB Offset
		26840 to 26990	26840, 26915, 26990	10 MHz	QPSK, 16QAM	1 RB / 0 RB Offset
		26865 to 26965	26865, 26915, 26965	15 MHz	QPSK, 16QAM	1 RB / 0 RB Offset
-	Conducted Emission	26797 to 27033	26797, 26915, 27033	1.4 MHz	QPSK	1 RB / 0 RB Offset
		26805 to 27025	26805, 26915, 27025	3 MHz	QPSK	1 RB / 0 RB Offset
		26815 to 27015	26815, 26915, 27015	5 MHz	QPSK	1 RB / 0 RB Offset
		26840 to 26990	26840, 26915, 26990	10 MHz	QPSK	1 RB / 0 RB Offset
		26865 to 26965	26865, 26915, 26965	15 MHz	QPSK	1 RB / 0 RB Offset
-	Radiated Emission	26797 to 27033	26797, 26915, 27033	1.4 MHz	QPSK	1 RB / 0 RB Offset
		26815 to 27015	26815, 26915, 27015	5 MHz	QPSK	1 RB / 0 RB Offset
		26865 to 26965	26865, 26915, 26965	15 MHz	QPSK	1 RB / 0 RB Offset

Note:

1. This device was tested under all bandwidths, RB configurations and modulations. The worst case was found in QPSK modulation. Therefore, only ERP, modulation characteristics, occupied bandwidth and peak to average ratio items had been tested under QPSK, 16QAM mode, the other items were performed under QPSK mode only.
2. For radiated emission above 1 GHz, according to 3GPP 36.521 Section 6.6.3.1.4, choose the lowest, 5 MHz & highest channel bandwidth for final test.
3. For radiated emissions below 1 GHz, select the worst radiated emission channel for final testing.

Test Condition:

Test Item	Environmental Conditions	Input Power	Tested By
ERP	25 deg. C, 65 % RH	120 Vac, 60 Hz	Getaz Yang
Modulation Characteristics	25 deg. C, 65 % RH	120 Vac, 60 Hz	Willy Cheng
Frequency Stability	25 deg. C, 65 % RH	120 Vac, 60 Hz	Willy Cheng
Occupied Bandwidth	25 deg. C, 65 % RH	120 Vac, 60 Hz	Willy Cheng
Band Edge	25 deg. C, 65 % RH	120 Vac, 60 Hz	Willy Cheng
Peak to Average Ratio	25 deg. C, 65 % RH	120 Vac, 60 Hz	Willy Cheng
Conducted Emission	25 deg. C, 65 % RH	120 Vac, 60 Hz	Willy Cheng
Radiated Emission	25 deg. C, 65 % RH	120 Vac, 60 Hz	Getaz Yang

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 and references

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

Test Standard:

FCC 47 CFR Part 2

FCC 47 CFR Part 22

ANSI 63.26-2015

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

References Test Guidance:

KDB 971168 D01 Power Meas License Digital Systems v03r01

ANSI/TIA/EIA-603-E 2016

Note: All test items have been performed as a reference to the above KDB test guidance.

4 Test Types and Results

4.1 Output Power Measurement

4.1.1 Limits of Output Power Measurement

Mobile / Portable station are limited to 7 watts e.r.p.

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 15 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, $E.R.P \text{ power} = E.I.R.P \text{ power} - 2.15 \text{ dB}$.

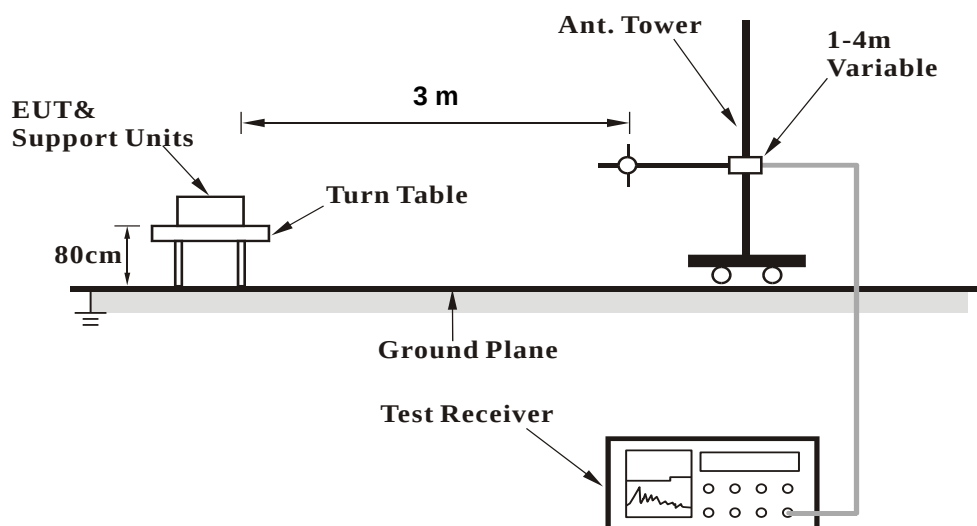
Conducted Power Measurement:

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

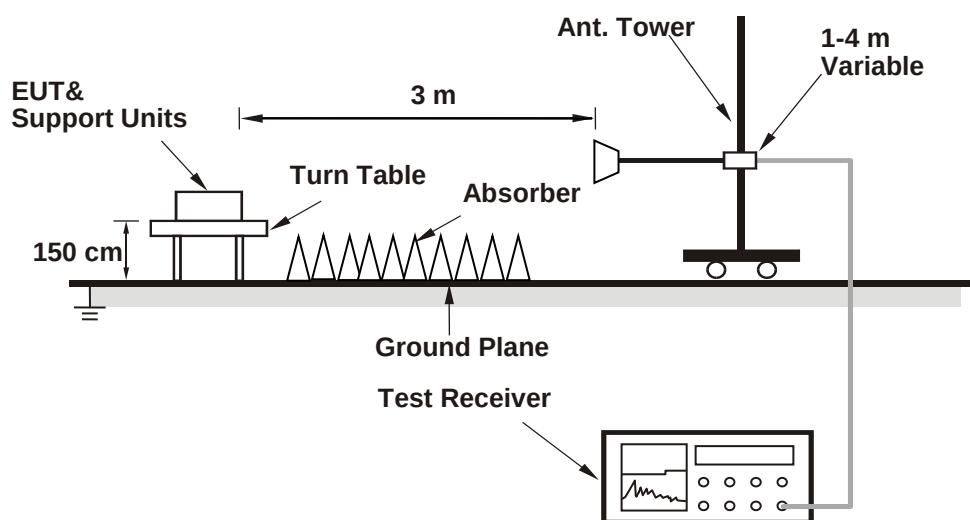
4.1.3 Test Setup

EIRP / ERP Measurement:

<Radiated Emission below or equal 1 GHz>

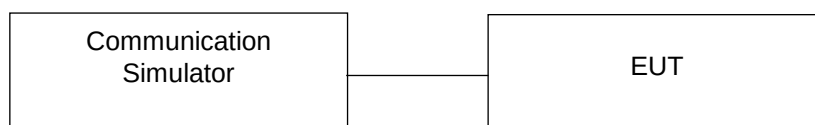


<Radiated Emission above 1 GHz>



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)

Band 26

BW(MHz):	1.4
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Test Frequency ID	N _{UL}	Frequency of Uplink [MHz]	Test Configuration Initial of Power				EUT	
			Modulation	RB Size	RB Offset	Narrowband Index	Cell power (dBm/15kHz)	power (dBm)
Low Range	26797	824.7	QPSK	1	0	0	-85	24.47
			QPSK	1	5	0	-85	24.44
			QPSK	3	3	0	-85	23.75
			QPSK	6	0	0	-85	22.51
			16QAM	1	0	0	-85	23.35
			16QAM	1	5	0	-85	23.27
			16QAM	3	0	0	-85	22.27
			16QAM	5	0	0	-85	22.58
Mid Range	26915	836.5	QPSK	1	0	0	-85	24.38
			QPSK	1	5	0	-85	24.36
			QPSK	3	3	0	-85	23.65
			QPSK	6	0	0	-85	22.51
			16QAM	1	0	0	-85	23.29
			16QAM	1	5	0	-85	23.24
			16QAM	3	0	0	-85	22.23
			16QAM	5	0	0	-85	22.49
High Range	27033	848.3	QPSK	1	0	0	-85	24.22
			QPSK	1	5	0	-85	24.16
			QPSK	3	3	0	-85	23.44
			QPSK	6	0	0	-85	24.13
			16QAM	1	0	0	-85	23.19
			16QAM	1	5	0	-85	23.06
			16QAM	3	0	0	-85	22.09
			16QAM	5	0	0	-85	22.47

BW(MHz):		3						
Test Frequency ID	N _{UL}	Frequency of Uplink [MHz]	Test Configuration Initial of Power				EUT	
			Modulation	RB Size	RB Offset	Narrowband Index	Cell power (dBm/15kHz)	power (dBm)
Low Range	26805	825.5	QPSK	1	0	0	-85	24.32
			QPSK	1	5	0	-85	24.31
			QPSK	1	0	1	-85	24.29
			QPSK	1	5	1	-85	24.28
			QPSK	3	3	0	-85	23.35
			QPSK	3	3	1	-85	23.21
			QPSK	6	0	0	-85	22.35
			QPSK	6	0	1	-85	22.39
			16QAM	1	0	0	-85	23.22
			16QAM	1	5	0	-85	23.13
			16QAM	1	0	1	-85	23.25
			16QAM	1	5	1	-85	23.11
			16QAM	3	0	0	-85	22.34
			16QAM	3	3	1	-85	22.22
			16QAM	5	0	0	-85	22.42
			16QAM	5	0	1	-85	22.43
Mid Range	26915	836.5	QPSK	1	0	0	-85	24.34
			QPSK	1	5	0	-85	24.29
			QPSK	1	0	1	-85	24.3
			QPSK	1	5	1	-85	24.27
			QPSK	3	3	0	-85	23.25
			QPSK	3	3	1	-85	23.26
			QPSK	6	0	0	-85	22.38
			QPSK	6	0	1	-85	22.37
			16QAM	1	0	0	-85	23.28
			16QAM	1	5	0	-85	23.15
			16QAM	1	0	1	-85	23.26
			16QAM	1	5	1	-85	23.09
			16QAM	3	0	0	-85	22.34
			16QAM	3	3	1	-85	22.24
			16QAM	5	0	0	-85	22.42
			16QAM	5	0	1	-85	22.39

Test Frequency ID	N _{UL}	Frequency of Uplink [MHz]	Test Configuration Initial of Power				EUT	
			Modulation	RB Size	RB Offset	Narrowband Index	Cell power (dBm/15kHz)	power (dBm)
High Range	27025	847.5	QPSK	1	0	0	-85	24.08
			QPSK	1	5	0	-85	24.04
			QPSK	1	0	1	-85	24.04
			QPSK	1	5	1	-85	23.97
			QPSK	3	3	0	-85	22.93
			QPSK	3	3	1	-85	22.93
			QPSK	6	0	0	-85	22.31
			QPSK	6	0	1	-85	22.24
			16QAM	1	0	0	-85	23.08
			16QAM	1	5	0	-85	22.95
			16QAM	1	0	1	-85	23.03
			16QAM	1	5	1	-85	22.89
			16QAM	3	0	0	-85	22.27
			16QAM	3	3	1	-85	22.16
			16QAM	5	0	0	-85	22.16
			16QAM	5	0	1	-85	22.11

BW(MHz): 5

Test Frequency ID	N _{UL}	Frequency of Uplink [MHz]	Test Configuration Initial of Power				EUT	
			Modulation	RB Size	RB Offset	Narrowband Index	Cell power (dBm/15kHz)	power (dBm)
Low Range	26815	826.5	QPSK	1	0	0	-85	24.42
			QPSK	1	5	0	-85	24.41
			QPSK	1	0	1	-85	24.49
			QPSK	1	5	1	-85	24.45
			QPSK	1	0	3	-85	24.41
			QPSK	1	5	3	-85	24.41
			QPSK	3	0	0	-85	23.35
			QPSK	3	3	3	-85	23.34
			QPSK	6	0	0	-85	23.34
			QPSK	6	0	1	-85	23.39
			QPSK	6	0	3	-85	23.36
			16QAM	1	0	0	-85	24.33
			16QAM	1	5	0	-85	24.39
			16QAM	1	0	1	-85	24.68
			16QAM	1	5	1	-85	24.68
			16QAM	1	0	3	-85	24.74
			16QAM	1	5	3	-85	24.68
			16QAM	3	0	0	-85	23.64
			16QAM	3	3	3	-85	23.62
			16QAM	5	0	0	-85	22.41
			16QAM	5	0	1	-85	22.38
			16QAM	5	0	3	-85	22.37

Test Frequency ID	N _{UL}	Frequency of Uplink [MHz]	Test Configuration Initial of Power				EUT	
			Modulation	RB Size	RB Offset	Narrowband Index	Cell power (dBm/15kHz)	power (dBm)
Mid Range	26915	836.5	QPSK	1	0	0	-85	24.42
			QPSK	1	5	0	-85	24.39
			QPSK	1	0	1	-85	24.44
			QPSK	1	5	1	-85	24.42
			QPSK	1	0	3	-85	24.38
			QPSK	1	5	3	-85	24.37
			QPSK	3	0	0	-85	23.38
			QPSK	3	3	3	-85	23.17
			QPSK	6	0	0	-85	23.39
			QPSK	6	0	1	-85	23.33
			QPSK	6	0	3	-85	23.32
			16QAM	1	0	0	-85	24.65
			16QAM	1	5	0	-85	24.59
			16QAM	1	0	1	-85	24.61
			16QAM	1	5	1	-85	24.58
			16QAM	1	0	3	-85	24.57
			16QAM	1	5	3	-85	24.56
			16QAM	3	0	0	-85	23.54
			16QAM	3	3	3	-85	23.49
			16QAM	5	0	0	-85	22.32
			16QAM	5	0	1	-85	22.31
			16QAM	5	0	3	-85	22.28
High Range	27015	846.5	QPSK	1	0	0	-85	24.31
			QPSK	1	5	0	-85	24.29
			QPSK	1	0	1	-85	24.33
			QPSK	1	5	1	-85	24.29
			QPSK	1	0	3	-85	24.19
			QPSK	1	5	3	-85	24.18
			QPSK	3	0	0	-85	23.28
			QPSK	3	3	3	-85	23.11
			QPSK	6	0	0	-85	23.26
			QPSK	6	0	1	-85	23.23
			QPSK	6	0	3	-85	23.18
			16QAM	1	0	0	-85	24.56
			16QAM	1	5	0	-85	24.49
			16QAM	1	0	1	-85	24.52
			16QAM	1	5	1	-85	24.51
			16QAM	1	0	3	-85	24.43
			16QAM	1	5	3	-85	24.44
			16QAM	3	0	0	-85	23.52
			16QAM	3	3	3	-85	23.47
			16QAM	5	0	0	-85	22.25
			16QAM	5	0	1	-85	22.21
			16QAM	5	0	3	-85	22.13

BW(MHz):		10						
Test Frequency ID	N _{UL}	Frequency of Uplink [MHz]	Test Configuration Initial of Power				EUT	
			Modulation	RB Size	RB Offset	Narrowband Index	Cell power (dBm/15kHz)	power (dBm)
Low Range	26840	829	QPSK	1	0	0	-85	24.51
			QPSK	1	5	0	-85	24.42
			QPSK	1	0	3	-85	24.53
			QPSK	1	5	3	-85	24.52
			QPSK	1	0	7	-85	24.49
			QPSK	1	5	7	-85	24.45
			QPSK	4	0	0	-85	24.42
			QPSK	4	2	7	-85	24.61
			QPSK	6	0	0	-85	23.41
			QPSK	6	0	7	-85	23.45
			16QAM	1	0	0	-85	24.68
			16QAM	1	5	0	-85	24.62
			16QAM	1	0	3	-85	24.73
			16QAM	1	5	3	-85	24.7
			16QAM	1	0	7	-85	24.75
			16QAM	1	5	7	-85	24.74
			16QAM	4	2	0	-85	23.61
			16QAM	4	2	7	-85	23.65
			16QAM	5	0	0	-85	23.36
			16QAM	5	0	7	-85	23.39
Mid Range	26915	836.5	QPSK	1	0	0	-85	24.53
			QPSK	1	5	0	-85	24.49
			QPSK	1	0	3	-85	24.44
			QPSK	1	5	3	-85	24.42
			QPSK	1	0	7	-85	24.35
			QPSK	1	5	7	-85	24.25
			QPSK	4	0	0	-85	24.45
			QPSK	4	2	7	-85	24.42
			QPSK	6	0	0	-85	23.44
			QPSK	6	0	7	-85	23.32
			16QAM	1	0	0	-85	24.75
			16QAM	1	5	0	-85	24.67
			16QAM	1	0	3	-85	24.71
			16QAM	1	5	3	-85	24.69
			16QAM	1	0	7	-85	24.62
			16QAM	1	5	7	-85	24.57
			16QAM	4	2	0	-85	23.62
			16QAM	4	2	7	-85	23.48
			16QAM	5	0	0	-85	23.42
			16QAM	5	0	7	-85	23.34

Test Frequency ID	N _{UL}	Frequency of Uplink [MHz]	Test Configuration Initial of Power				EUT	
			Modulation	RB Size	RB Offset	Narrowband Index	Cell power (dBm/15kHz)	power (dBm)
High Range	26990	844	QPSK	1	0	0	-85	24.43
			QPSK	1	5	0	-85	24.41
			QPSK	1	5	7	-85	24.21
			QPSK	1	0	3	-85	24.35
			QPSK	1	5	3	-85	24.32
			QPSK	1	0	7	-85	24.22
			QPSK	4	0	0	-85	24.31
			QPSK	4	2	7	-85	24.32
			QPSK	6	0	0	-85	23.36
			QPSK	6	0	7	-85	23.23
			16QAM	1	0	0	-85	24.62
			16QAM	1	5	0	-85	24.61
			16QAM	1	0	3	-85	24.61
			16QAM	1	5	3	-85	24.58
			16QAM	1	0	7	-85	24.52
			16QAM	1	5	7	-85	24.46
			16QAM	4	2	0	-85	23.51
			16QAM	4	2	7	-85	23.39
			16QAM	5	0	0	-85	23.41
			16QAM	5	0	7	-85	23.21

BW(MHz): 15

Test Frequency ID	N _{UL}	Frequency of Uplink [MHz]	Test Configuration Initial of Power				EUT	
			Modulation	RB Size	RB Offset	Narrowband Index	Cell power (dBm/15kHz)	power (dBm)
Low Range	26865	831.5	QPSK	1	0	0	-85	24.5
			QPSK	1	5	0	-85	24.48
			QPSK	1	0	5	-85	24.52
			QPSK	1	5	5	-85	24.51
			QPSK	1	0	11	-85	24.39
			QPSK	1	5	11	-85	24.36
			QPSK	3	0	0	-85	24.46
			QPSK	3	3	11	-85	24.23
			QPSK	6	0	0	-85	24.41
			QPSK	6	0	11	-85	24.28
			16QAM	1	0	0	-85	24.74
			16QAM	1	5	0	-85	24.69
			16QAM	1	0	5	-85	24.79
			16QAM	1	5	5	-85	24.74
			16QAM	1	0	11	-85	24.64
			16QAM	1	5	11	-85	24.61
			16QAM	3	0	0	-85	24.58
			16QAM	3	3	11	-85	24.49
			16QAM	5	0	0	-85	24.41
			16QAM	5	0	11	-85	24.28

Test Frequency ID	N _{UL}	Frequency of Uplink [MHz]	Test Configuration Initial of Power				EUT	
			Modulation	RB Size	RB Offset	Narrowband Index	Cell power (dBm/15kHz)	power (dBm)
Mid Range	26915	836.5	QPSK	1	0	0	-85	24.82
			QPSK	1	5	0	-85	24.72
			QPSK	1	0	5	-85	24.4
			QPSK	1	5	5	-85	24.39
			QPSK	1	0	11	-85	24.24
			QPSK	1	5	11	-85	24.22
			QPSK	3	0	0	-85	24.54
			QPSK	3	3	11	-85	24.16
			QPSK	6	0	0	-85	24.42
			QPSK	6	0	11	-85	24.23
			16QAM	1	0	0	-85	24.69
			16QAM	1	5	0	-85	24.65
			16QAM	1	0	5	-85	24.68
			16QAM	1	5	5	-85	24.66
			16QAM	1	0	11	-85	24.55
			16QAM	1	5	11	-85	24.51
			16QAM	3	0	0	-85	24.66
			16QAM	3	3	11	-85	24.39
			16QAM	5	0	0	-85	24.43
			16QAM	5	0	11	-85	24.19
High Range	26965	841.5	QPSK	1	0	0	-85	24.4
			QPSK	1	5	0	-85	24.41
			QPSK	1	0	5	-85	24.42
			QPSK	1	5	5	-85	24.4
			QPSK	1	0	11	-85	24.24
			QPSK	1	5	11	-85	24.23
			QPSK	3	0	0	-85	24.56
			QPSK	3	3	11	-85	24.14
			QPSK	6	0	0	-85	24.49
			QPSK	6	0	11	-85	24.24
			16QAM	1	0	0	-85	24.73
			16QAM	1	5	0	-85	24.69
			16QAM	1	0	5	-85	24.65
			16QAM	1	5	5	-85	24.64
			16QAM	1	0	11	-85	24.52
			16QAM	1	5	11	-85	24.46
			16QAM	3	0	0	-85	24.6
			16QAM	3	3	11	-85	24.34
			16QAM	5	0	0	-85	24.43
			16QAM	5	0	11	-85	24.23

ERP Power (dBm)

LTE Band 26							
Channel Bandwidth: 1.4 MHz / QPSK							
Plane	Channel	Frequency (MHz)	Reading (dBm)	Correction Factor (dB)	ERP (dBm)	ERP (mW)	Polarization (H/V)
X	26797	824.7	-5.97	32.62	24.50	281.84	H
	26915	836.5	-5.53	32.52	24.84	304.79	
	27033	848.3	-6.15	32.65	24.35	272.27	
	26797	824.7	-16.02	32.76	14.59	28.77	V
	26915	836.5	-15.47	32.39	14.77	29.99	
	27033	848.3	-15.87	32.54	14.52	28.31	
Channel Bandwidth: 1.4 MHz / 16QAM							
X	26797	824.7	-7.29	32.62	23.18	207.97	H
	26915	836.5	-6.82	32.52	23.55	226.46	
	27033	848.3	-7.56	32.65	22.94	196.79	
	26797	824.7	-17.28	32.76	13.33	21.53	V
	26915	836.5	-16.72	32.39	13.52	22.49	
	27033	848.3	-17.30	32.54	13.09	20.37	

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

LTE Band 26							
Channel Bandwidth: 3 MHz / QPSK							
Plane	Channel	Frequency (MHz)	Reading (dBm)	Correction Factor (dB)	ERP (dBm)	ERP (mW)	Polarization (H/V)
X	26805	825.5	-5.93	32.62	24.54	284.45	H
	26915	836.5	-5.50	32.52	24.87	306.90	
	27025	847.5	-6.13	32.65	24.37	273.53	
	26805	825.5	-15.94	32.76	14.67	29.31	V
	26915	836.5	-15.44	32.39	14.80	30.20	
	27025	847.5	-15.84	32.54	14.55	28.51	
Channel Bandwidth: 3 MHz / 16QAM							
X	26805	825.5	-7.08	32.62	23.39	218.27	H
	26915	836.5	-6.72	32.52	23.65	231.74	
	27025	847.5	-7.42	32.65	23.08	203.24	
	26805	825.5	-17.18	32.76	13.43	22.03	V
	26915	836.5	-16.61	32.39	13.63	23.07	
	27025	847.5	-17.15	32.54	13.24	21.09	

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

LTE Band 26							
Channel Bandwidth: 5 MHz / QPSK							
Plane	Channel	Frequency (MHz)	Reading (dBm)	Correction Factor (dB)	ERP (dBm)	ERP (mW)	Polarization (H/V)
X	26815	826.5	-5.81	32.62	24.66	292.42	H
	26915	836.5	-5.36	32.52	25.01	316.96	
	27015	846.5	-6.01	32.65	24.49	281.19	
	26815	826.5	-15.91	32.76	14.70	29.51	V
	26919	836.5	-15.37	32.39	14.87	30.69	
	27015	846.5	-15.81	32.54	14.58	28.71	
Channel Bandwidth: 5 MHz / 16QAM							
X	26815	826.5	-7.09	32.62	23.38	217.77	H
	26915	836.5	-6.61	32.52	23.76	237.68	
	27015	846.5	-7.19	32.65	23.31	214.29	
	26815	826.5	-17.11	32.76	13.50	22.39	V
	26919	836.5	-16.52	32.39	13.72	23.55	
	27015	846.5	-16.99	32.54	13.40	21.88	

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

LTE Band 26							
Channel Bandwidth: 10 MHz / QPSK							
Plane	Channel	Frequency (MHz)	Reading (dBm)	Correction Factor (dB)	ERP (dBm)	ERP (mW)	Polarization (H/V)
X	26840	829.0	-5.76	32.62	24.71	295.80	H
	26915	836.5	-5.34	32.52	25.03	318.42	
	26990	844.0	-6.02	32.65	24.48	280.54	
	26840	829.0	-15.84	32.76	14.77	29.99	V
	26919	836.5	-15.33	32.39	14.91	30.97	
	26990	844.0	-15.74	32.54	14.65	29.17	
Channel Bandwidth: 10 MHz / 16QAM							
X	26840	829.0	-6.92	32.62	23.55	226.46	H
	26915	836.5	-6.52	32.52	23.85	242.66	
	26990	844.0	-7.16	32.65	23.34	215.77	
	26840	829.0	-17.00	32.76	13.61	22.96	V
	26919	836.5	-16.45	32.39	13.79	23.93	
	26990	844.0	-16.87	32.54	13.52	22.49	

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

LTE Band 26							
Channel Bandwidth: 15 MHz / QPSK							
Plane	Channel	Frequency (MHz)	Reading (dBm)	Correction Factor (dB)	ERP (dBm)	ERP (mW)	Polarization (H/V)
X	26865	831.5	-5.73	32.62	24.74	297.85	H
	26915	836.5	-5.30	32.52	25.07	321.37	
	26965	841.5	-5.94	32.65	24.56	285.76	
	26865	831.5	-15.79	32.76	14.82	30.34	V
	26915	836.5	-15.26	32.39	14.98	31.48	
	26965	841.5	-15.69	32.54	14.70	29.51	
Channel Bandwidth: 15 MHz / 16QAM							
X	26865	831.5	-6.82	32.62	23.65	231.74	H
	26915	836.5	-6.34	32.52	24.03	252.93	
	26965	841.5	-7.02	32.65	23.48	222.84	
	26865	831.5	-16.82	32.76	13.79	23.93	V
	26915	836.5	-16.33	32.39	13.91	24.60	
	26965	841.5	-16.70	32.54	13.69	23.39	

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

4.3 Frequency Stability Measurement

4.3.1 Limits of Frequency Stability Measurement

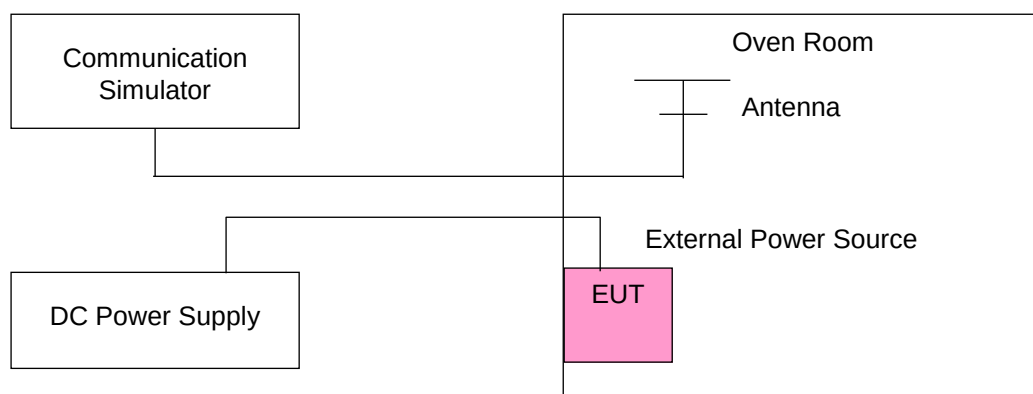
1.5 ppm is for base and fixed station. 2.5 ppm is for mobile station.

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 ± 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

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)	
4.25	824.700002	0.002	848.300003	0.003	2.5
5.00	824.700002	0.002	848.300003	0.004	2.5
5.75	824.700001	0.001	848.300002	0.002	2.5

Note: The applicant defined the normal working voltage of the adapter is from 4.25 Vdc to 5.75 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	824.700004	0.004	848.300001	0.001	2.5
-20	824.700003	0.004	848.300003	0.004	2.5
-10	824.700002	0.002	848.300001	0.001	2.5
0	824.700002	0.002	848.300002	0.002	2.5
10	824.700003	0.004	848.300003	0.004	2.5
20	824.699998	-0.002	848.299996	-0.004	2.5
30	824.699998	-0.003	848.299997	-0.003	2.5
40	824.699998	-0.002	848.299999	-0.002	2.5
50	824.699996	-0.005	848.299997	-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)	
4.25	825.500002	0.003	847.500004	0.004	2.5
5.00	825.500003	0.004	847.500002	0.002	2.5
5.75	825.500004	0.004	847.500001	0.002	2.5

Note: The applicant defined the normal working voltage of the adapter is from 4.25 Vdc to 5.75 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	825.500001	0.002	847.500003	0.003	2.5
-20	825.500002	0.003	847.500004	0.005	2.5
-10	825.500002	0.002	847.500002	0.002	2.5
0	825.500002	0.003	847.500001	0.002	2.5
10	825.500003	0.004	847.500002	0.003	2.5
20	825.499998	-0.002	847.499997	-0.004	2.5
30	825.499996	-0.005	847.499999	-0.001	2.5
40	825.499997	-0.003	847.499999	-0.002	2.5
50	825.499998	-0.003	847.499998	-0.003	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)	
4.25	826.500004	0.004	846.500003	0.003	2.5
5.00	826.500004	0.004	846.500002	0.002	2.5
5.75	826.500002	0.002	846.500004	0.004	2.5

Note: The applicant defined the normal working voltage of the adapter is from 4.25 Vdc to 5.75 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	826.500003	0.003	846.500003	0.003	2.5
-20	826.500003	0.003	846.500002	0.002	2.5
-10	826.500001	0.002	846.500004	0.004	2.5
0	826.500003	0.003	846.500001	0.001	2.5
10	826.500003	0.003	846.500003	0.003	2.5
20	826.499996	-0.004	846.499997	-0.004	2.5
30	826.499998	-0.002	846.499999	-0.002	2.5
40	826.499999	-0.002	846.499998	-0.003	2.5
50	826.499998	-0.002	846.499998	-0.003	2.5

Frequency Error vs. Voltage

Voltage (Volts)	LTE Band 26				Limit (ppm)
	Channel Bandwidth: 10 MHz				
	Low Channel		High Channel		
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)	
4.25	829.000003	0.004	844.000002	0.003	2.5
5.00	829.000002	0.002	844.000003	0.003	2.5
5.75	829.000002	0.002	844.000002	0.002	2.5

Note: The applicant defined the normal working voltage of the adapter is from 4.25 Vdc to 5.75 Vdc.

Frequency Error vs. Temperature

Temp. (°C)	LTE Band 26				Limit (ppm)
	Channel Bandwidth: 10 MHz				
	Low Channel		High Channel		
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)	
-30	829.000002	0.002	844.000003	0.003	2.5
-20	829.000001	0.001	844.000004	0.004	2.5
-10	829.000004	0.004	844.000003	0.003	2.5
0	829.000001	0.001	844.000002	0.002	2.5
10	829.000002	0.002	844.000002	0.002	2.5
20	828.999998	-0.002	843.999999	-0.002	2.5
30	828.999998	-0.002	843.999997	-0.004	2.5
40	828.999998	-0.002	843.999999	-0.002	2.5
50	828.999997	-0.003	843.999996	-0.004	2.5

Frequency Error vs. Voltage

Voltage (Volts)	LTE Band 26				Limit (ppm)
	Channel Bandwidth: 15 MHz				
	Low Channel		High Channel		
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)	
4.25	831.500002	0.002	841.500003	0.004	2.5
5.00	831.500002	0.003	841.500002	0.003	2.5
5.75	831.500004	0.005	841.500003	0.003	2.5

Note: The applicant defined the normal working voltage of the adapter is from 4.25 Vdc to 5.75 Vdc.

Frequency Error vs. Temperature

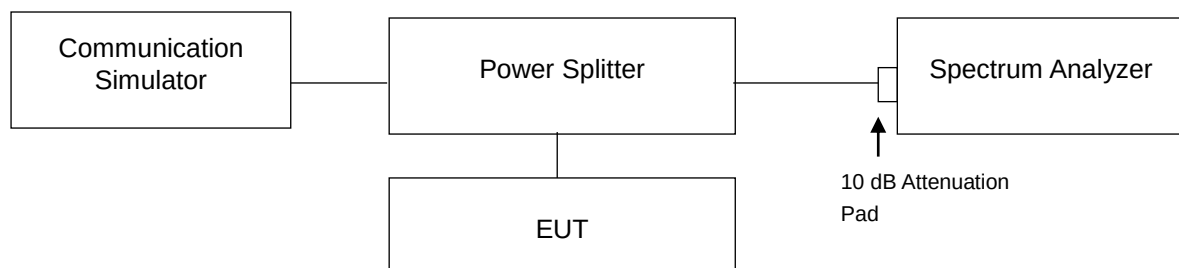
Temp. (°C)	LTE Band 26				Limit (ppm)
	Channel Bandwidth: 15 MHz				
	Low Channel		High Channel		
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)	
-30	831.500002	0.002	841.500002	0.002	2.5
-20	831.500003	0.004	841.500002	0.002	2.5
-10	831.500003	0.004	841.500004	0.005	2.5
0	831.500004	0.004	841.500002	0.002	2.5
10	831.500002	0.003	841.500002	0.002	2.5
20	831.499997	-0.004	841.499997	-0.004	2.5
30	831.499996	-0.004	841.499998	-0.003	2.5
40	831.499996	-0.005	841.499998	-0.002	2.5
50	831.499998	-0.003	841.499998	-0.003	2.5

4.4 Occupied Bandwidth Measurement

4.4.1 Test Procedure

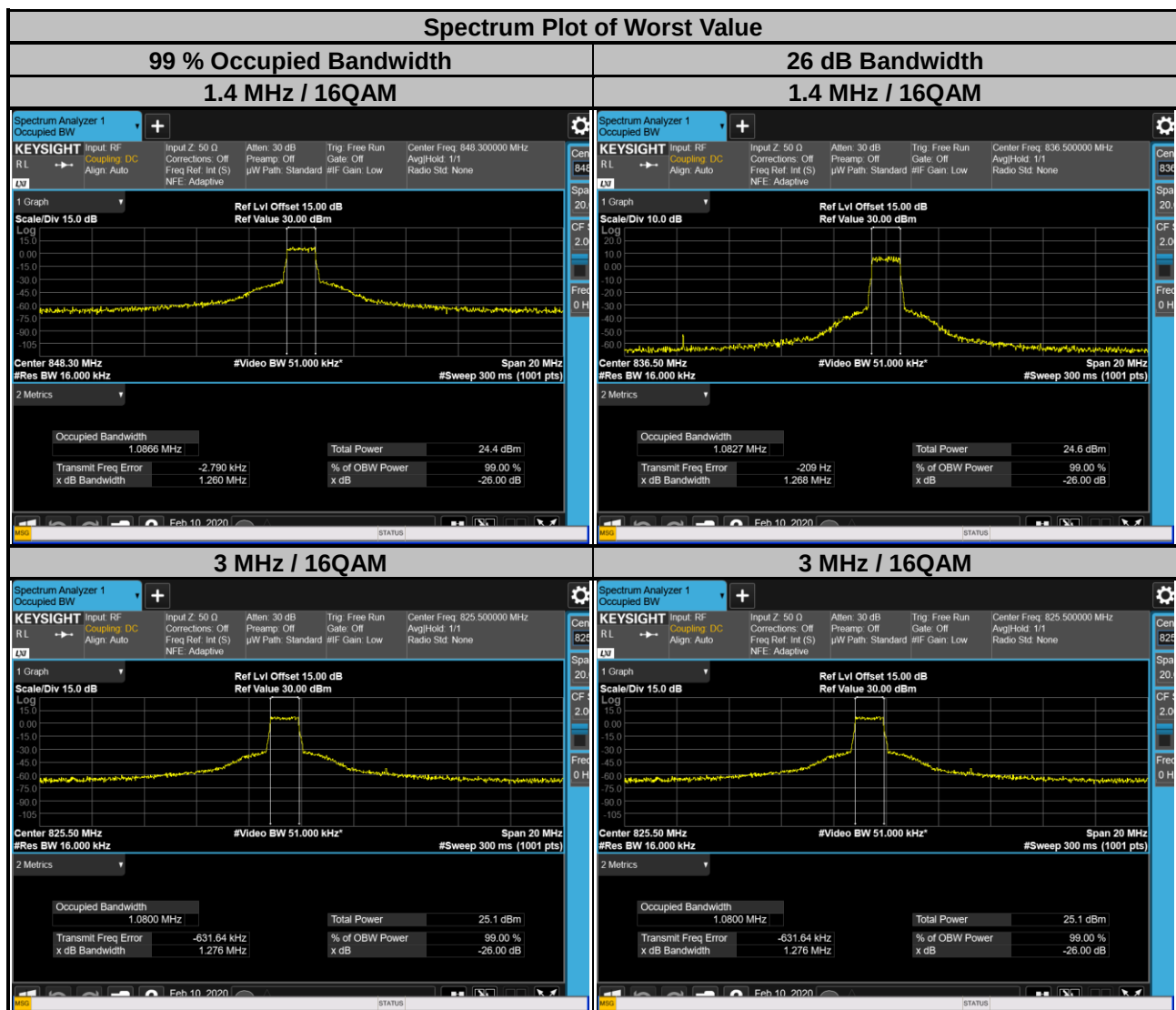
The EUT makes a call to the communication simulator. All measurements were done at low, middle and high operational frequency range. The communication simulator station system controlled a EUT to export maximum output power under transmission mode and specific channel frequency. Use OBW measurement function of Spectrum analyzer to measure 99 % occupied bandwidth.

4.4.2 Test Setup

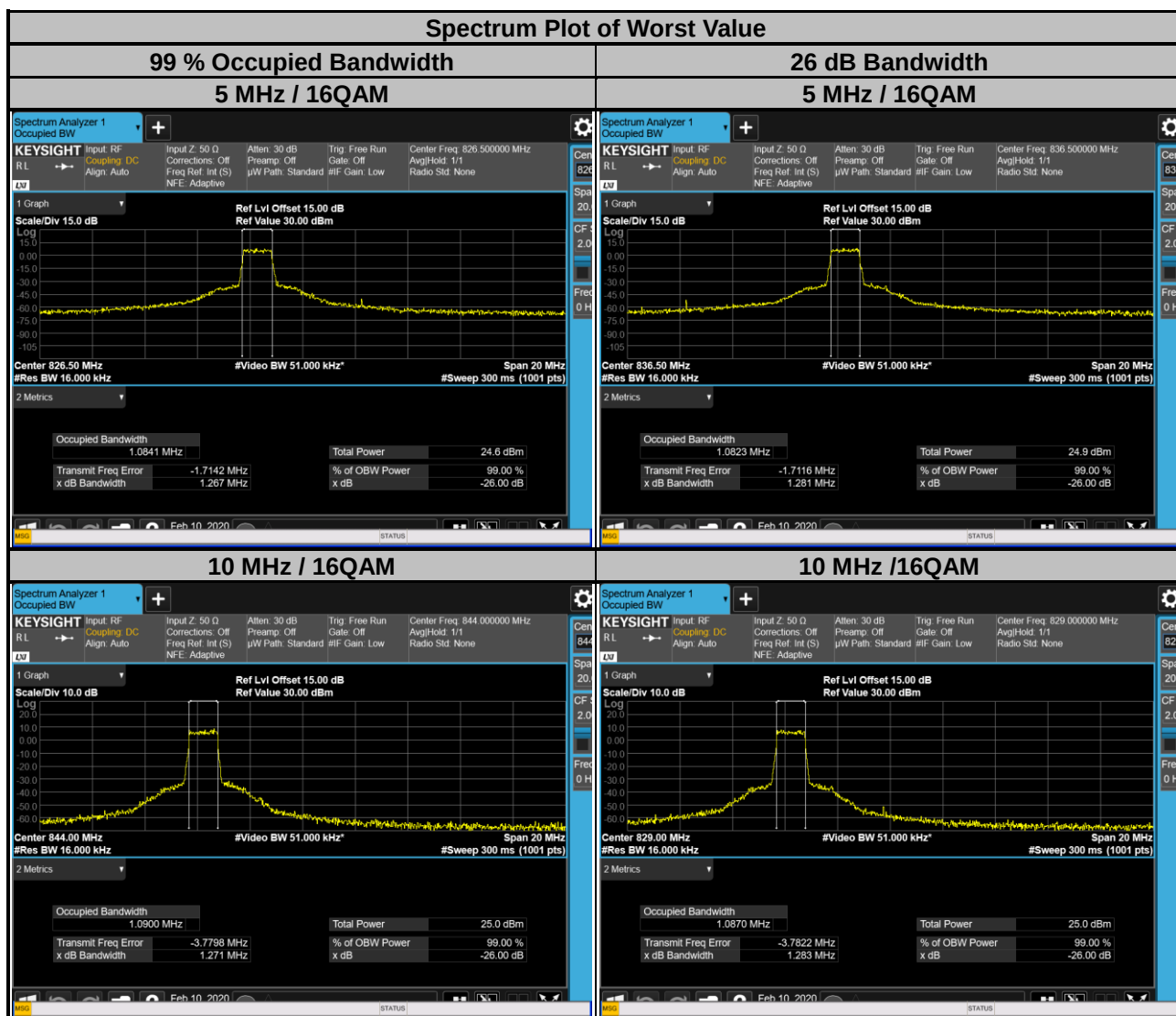


4.4.3 Test Result

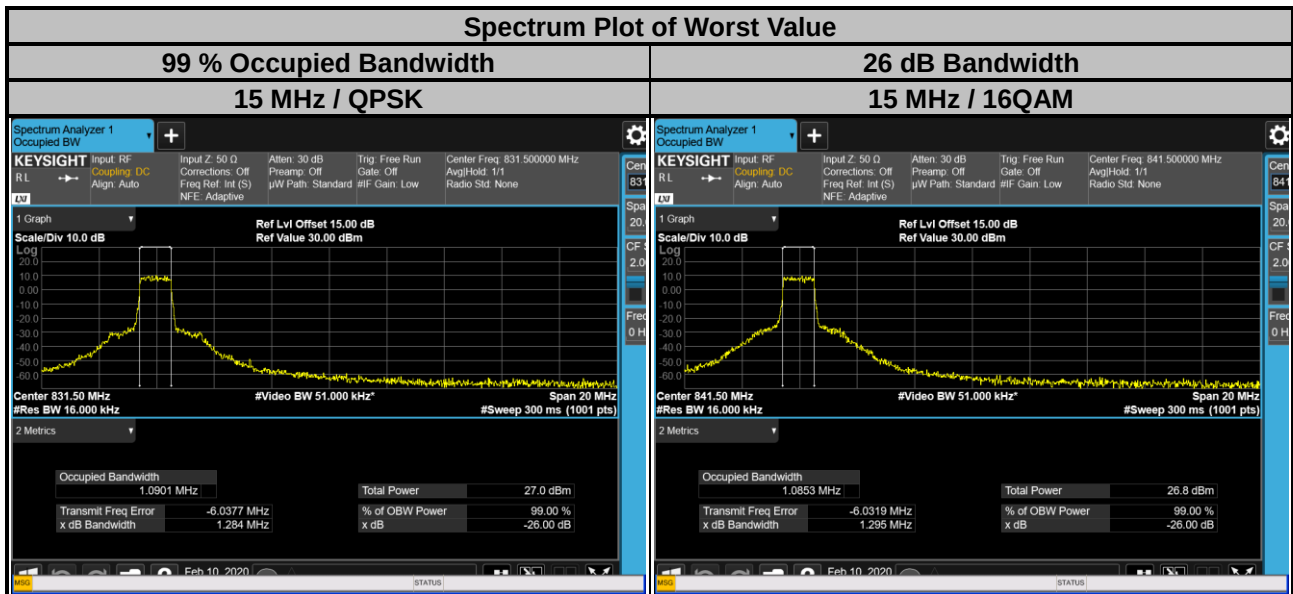
LTE Band 26					
Channel Bandwidth: 1.4 MHz					
Channel	Frequency (MHz)	99 % Occupied Bandwidth (MHz)		26 dB Bandwidth (MHz)	
		QPSK	16QAM	QPSK	16QAM
26797	824.7	1.0844	1.0851	1.266	1.266
26915	836.5	1.0833	1.0827	1.261	1.268
27033	848.3	1.0824	1.0866	1.256	1.260
Channel Bandwidth: 3 MHz					
Channel	Frequency (MHz)	99 % Occupied Bandwidth (MHz)		26 dB Bandwidth (MHz)	
		QPSK	16QAM	QPSK	16QAM
26805	825.5	1.0761	1.0800	1.250	1.276
26915	836.5	1.0778	1.0765	1.273	1.271
27025	847.5	1.0776	1.0777	1.256	1.266



LTE Band 26					
Channel Bandwidth: 5 MHz					
Channel	Frequency (MHz)	99 % Occupied Bandwidth (MHz)		26 dB Bandwidth (MHz)	
		QPSK	16QAM	QPSK	16QAM
26815	826.5	1.0767	1.0841	1.270	1.267
26915	836.5	1.0788	1.0823	1.278	1.281
27015	846.5	1.0775	1.0837	1.260	1.280
Channel Bandwidth: 10 MHz					
Channel	Frequency (MHz)	99 % Occupied Bandwidth (MHz)		26 dB Bandwidth (MHz)	
		QPSK	16QAM	QPSK	16QAM
26840	829.0	1.0840	1.0870	1.264	1.283
26915	836.5	1.0838	1.0875	1.257	1.281
26990	844.0	1.0839	1.0900	1.263	1.271



LTE Band 26					
Channel Bandwidth: 15 MHz					
Channel	Frequency (MHz)	99 % Occupied Bandwidth (MHz)		26 dB Bandwidth (MHz)	
		QPSK	16QAM	QPSK	16QAM
26865	831.5	1.0901	1.0858	1.284	1.275
26915	836.5	1.0826	1.0807	1.271	1.293
26965	841.5	1.0842	1.0853	1.280	1.295

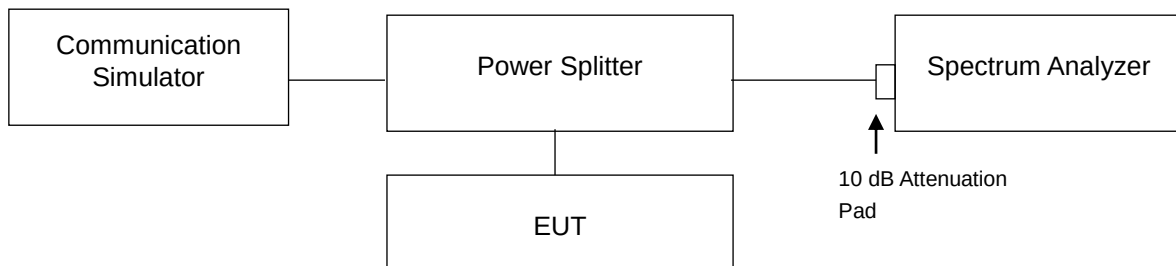


4.5 Band Edge Measurement

4.5.1 Limits of Band Edge Measurement

Power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least $43 + 10 \log(P)$ dB. In the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed.

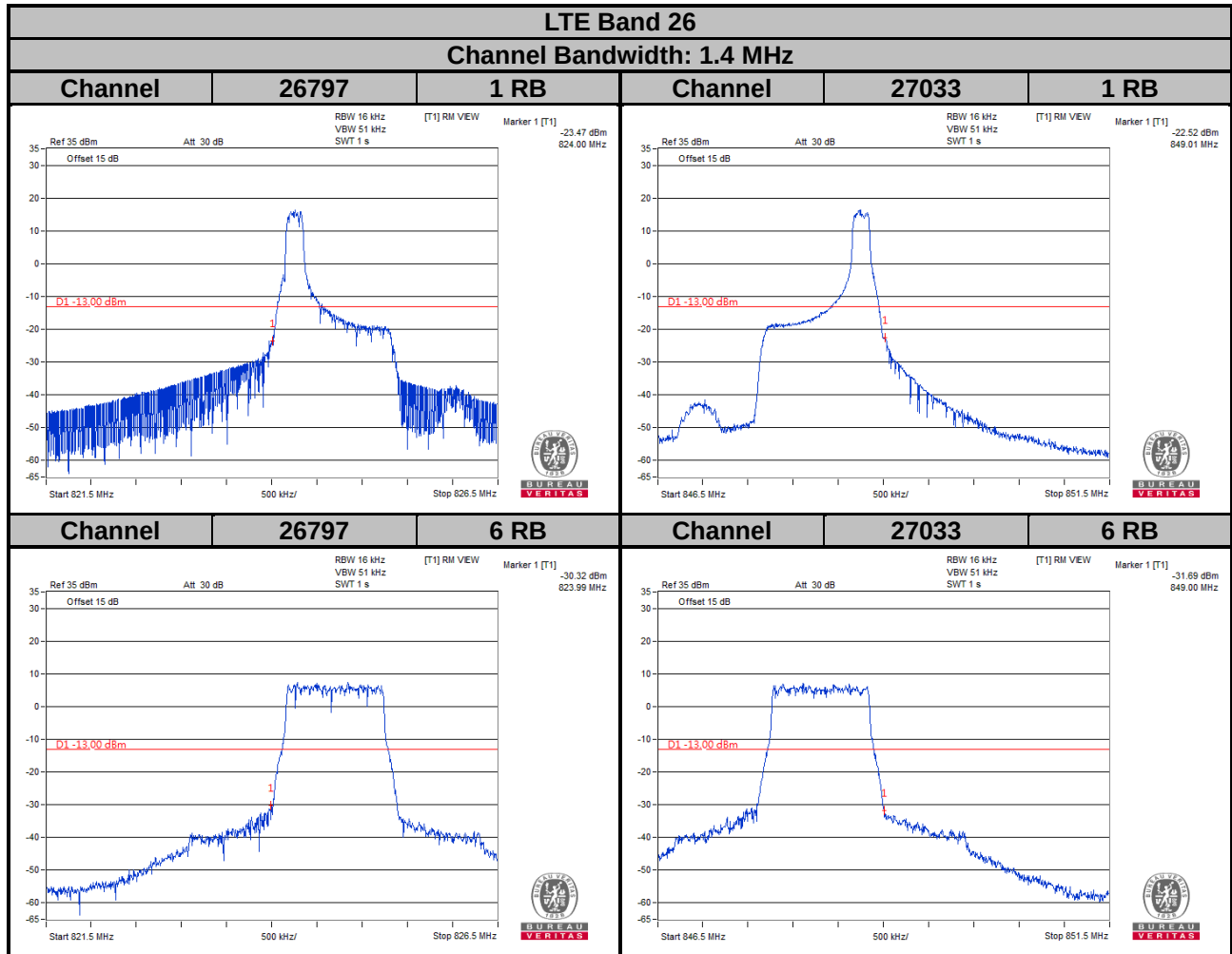
4.5.2 Test Setup

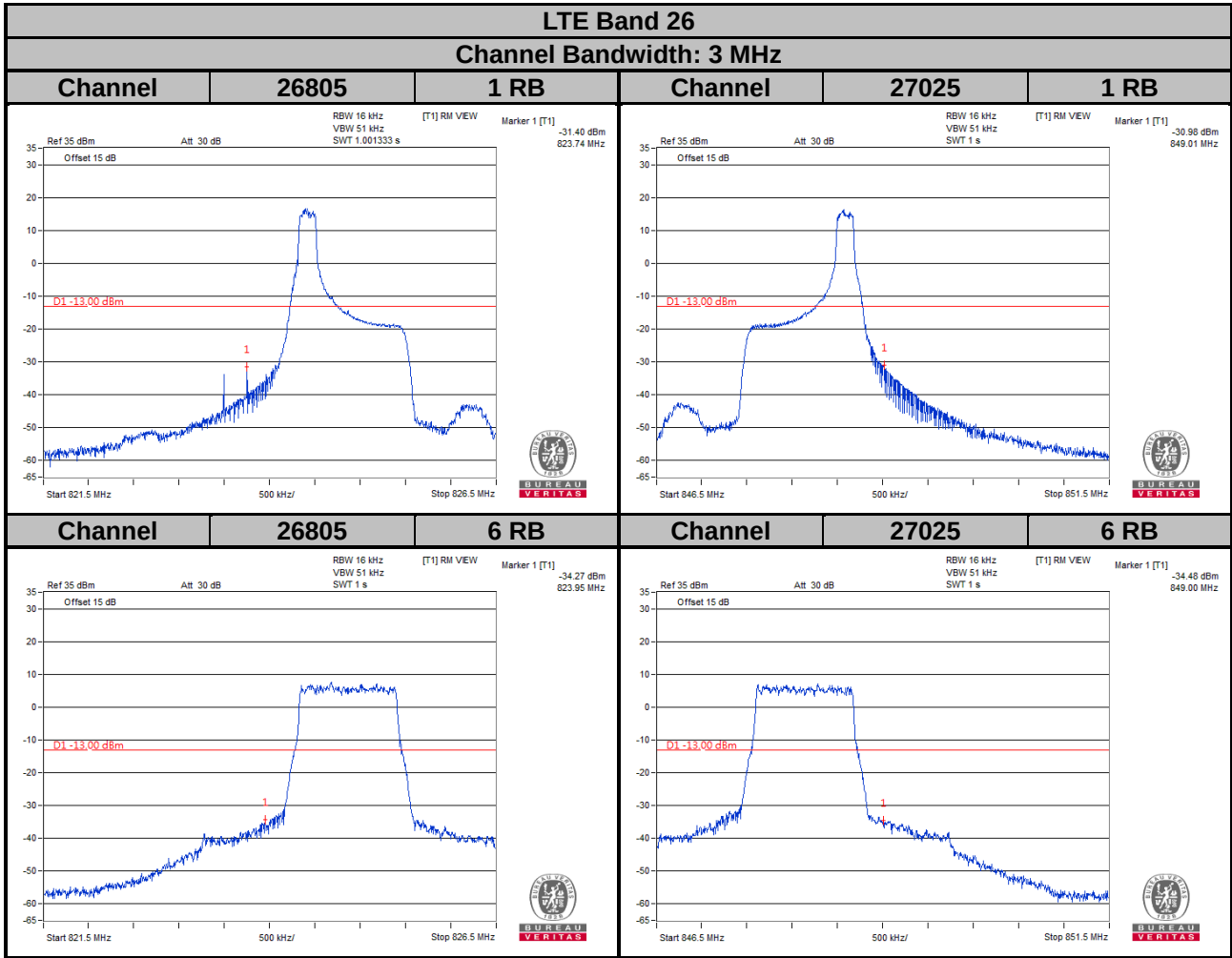


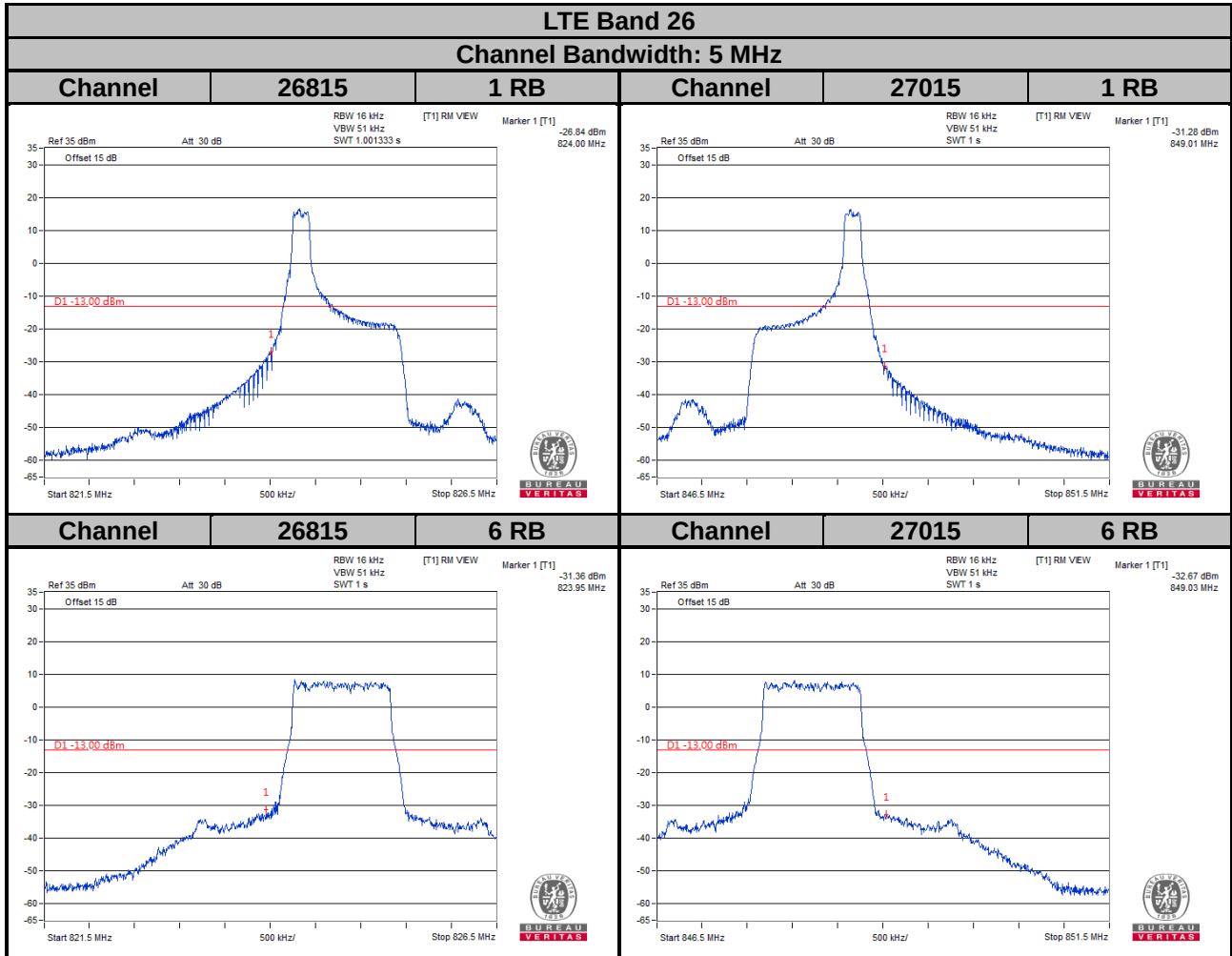
4.5.3 Test Procedures

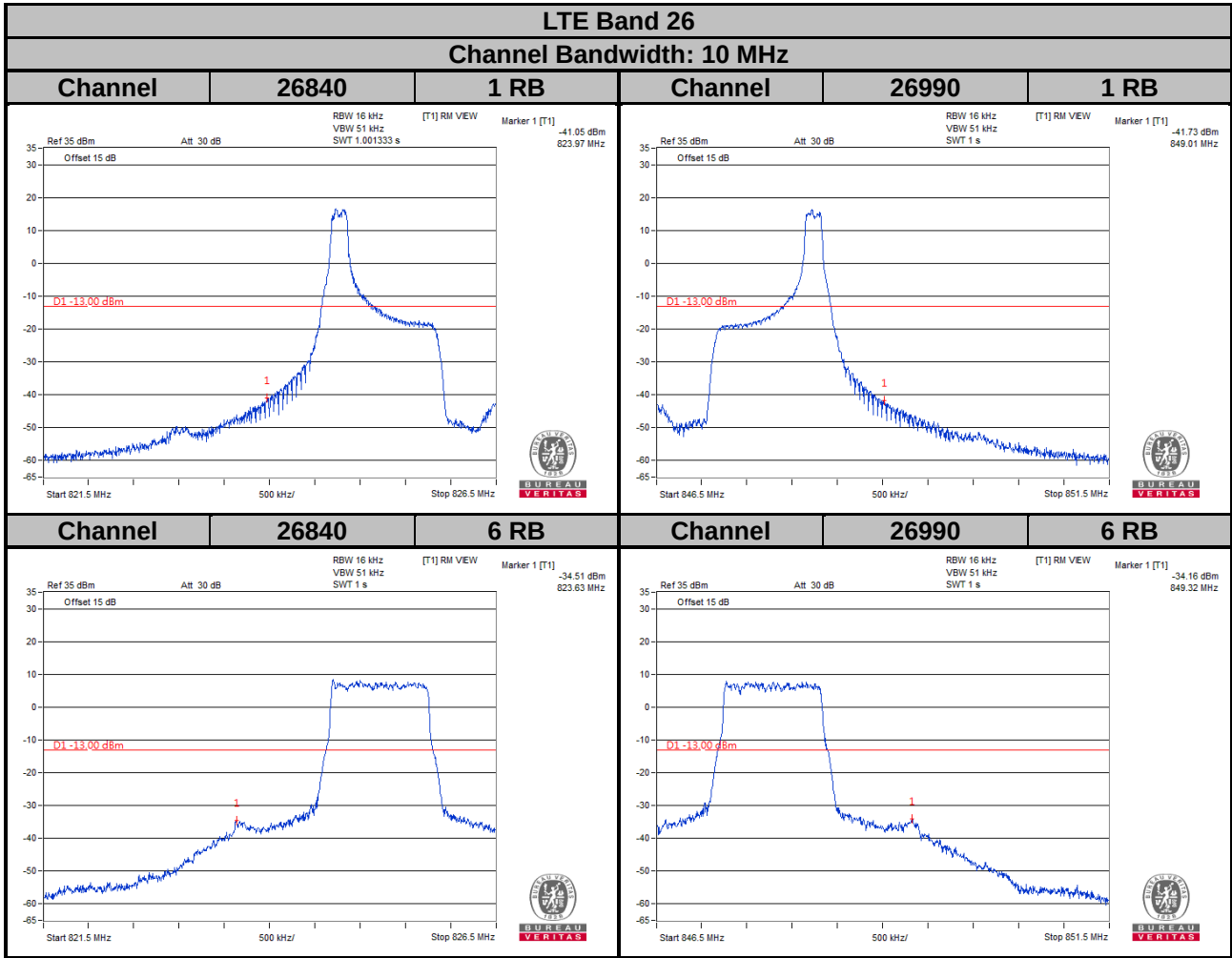
- All measurements were done at low and high operational frequency range.
- The center frequency of spectrum is the band edge frequency and span is 5 MHz. RB of the spectrum is 16 kHz and VB of the spectrum is 51 kHz (LTE Bandwidth 1.4 MHz).

4.5.4 Test Results



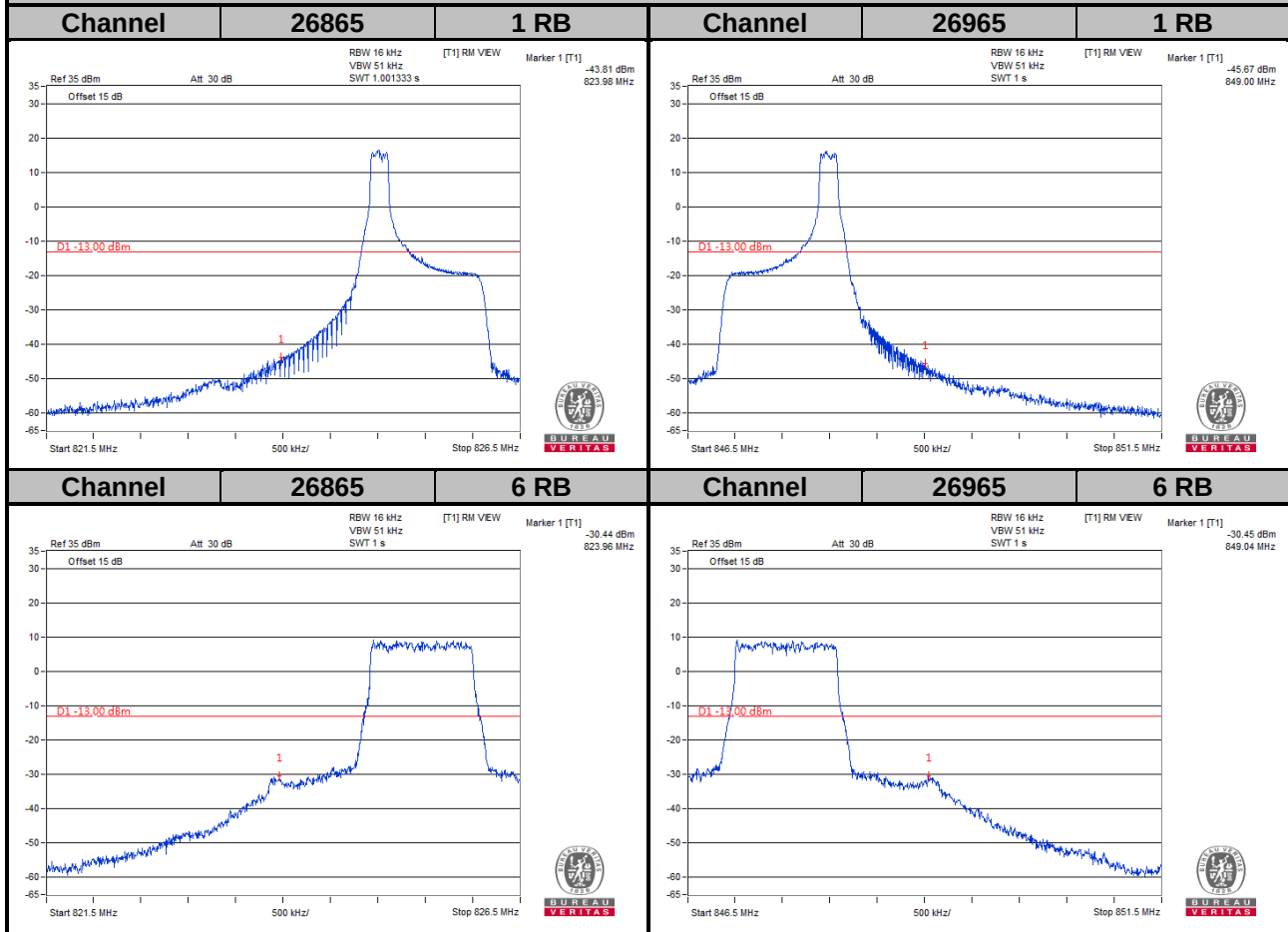






LTE Band 26

Channel Bandwidth: 15 MHz

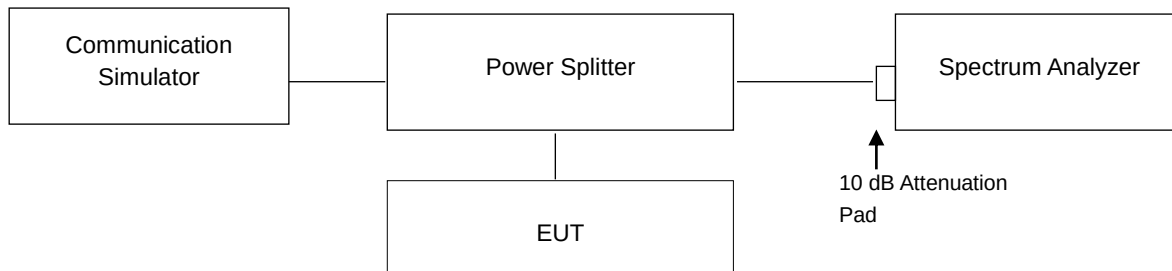


4.6 Peak to Average Ratio

4.6.1 Limits of Peak to Average Ratio Measurement

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

4.6.2 Test Setup

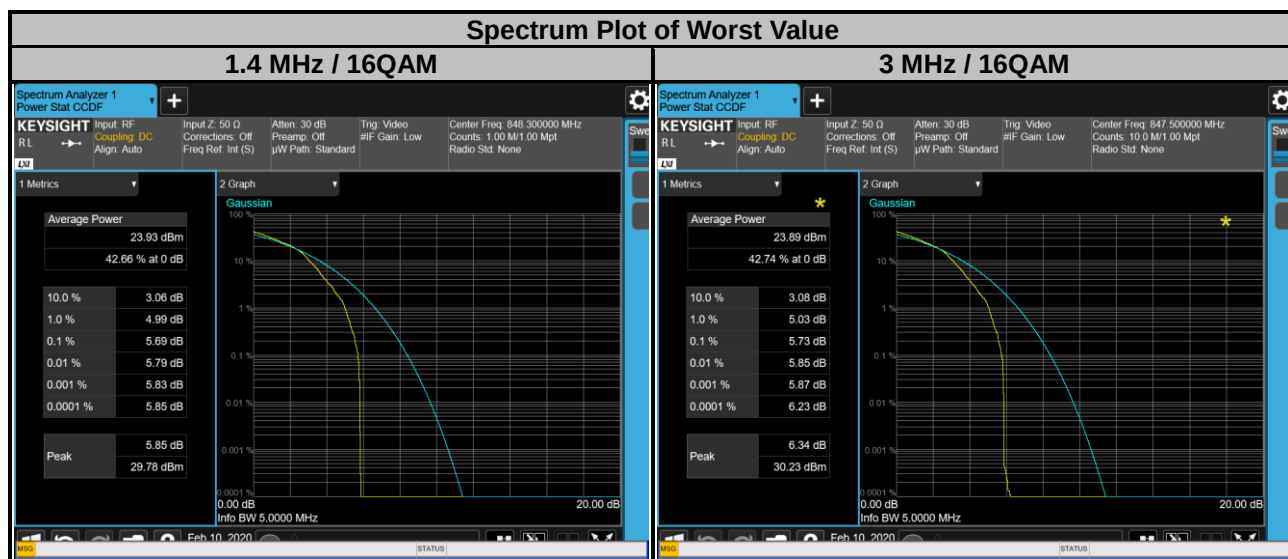


4.6.3 Test Procedures

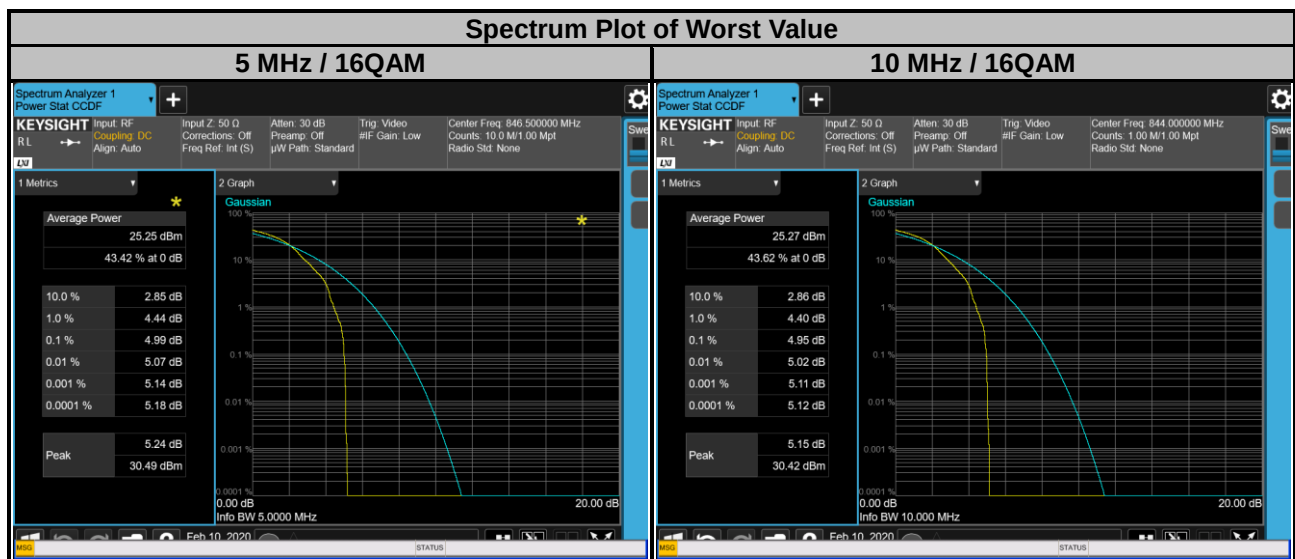
1. Set resolution/measurement bandwidth $\geq$ signal's occupied bandwidth;
2. Set the number of counts to a value that stabilizes the measured CCDF curve;
3. Record the maximum PAPR level associated with a probability of 0.1 %.

4.6.4 Test Results

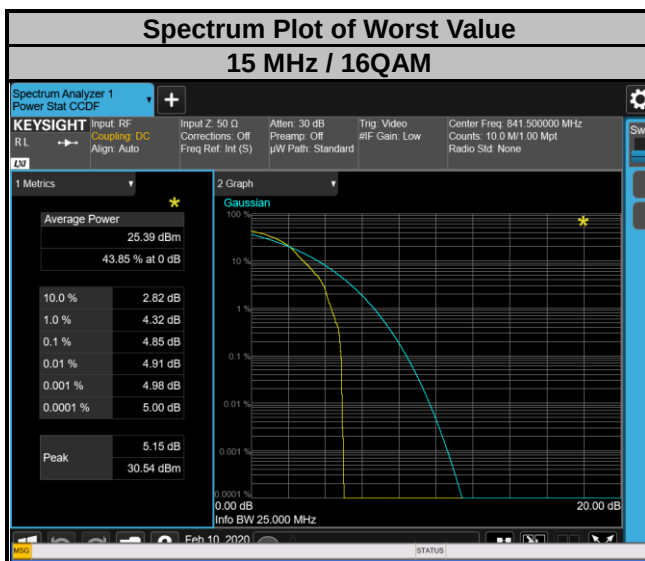
LTE Band 26							
Channel Bandwidth: 1.4 MHz				Channel Bandwidth: 3 MHz			
Channel	Frequency (MHz)	Peak to Average Ratio (dB)		Channel	Frequency (MHz)	Peak to Average Ratio (dB)	
		QPSK	16QAM			QPSK	16QAM
26797	824.7	4.78	5.50	26805	825.5	4.49	5.54
26915	836.5	4.50	5.58	26915	836.5	4.56	5.61
27033	848.3	4.65	5.69	27025	847.5	4.68	5.73



LTE Band 26							
Channel Bandwidth: 5 MHz				Channel Bandwidth: 10 MHz			
Channel	Frequency (MHz)	Peak to Average Ratio (dB)		Channel	Frequency (MHz)	Peak to Average Ratio (dB)	
		QPSK	16QAM			QPSK	16QAM
26815	826.5	4.56	4.80	26840	829.0	4.84	4.87
26915	836.5	4.67	4.84	26915	836.5	4.60	4.81
27015	846.5	4.83	4.99	26990	844.0	4.69	4.95



LTE Band 26			
Channel Bandwidth: 15 MHz			
Channel	Frequency (MHz)	Peak to Average Ratio (dB)	
		QPSK	16QAM
26865	831.5	4.57	4.80
26915	836.5	4.60	4.82
26965	841.5	4.64	4.85

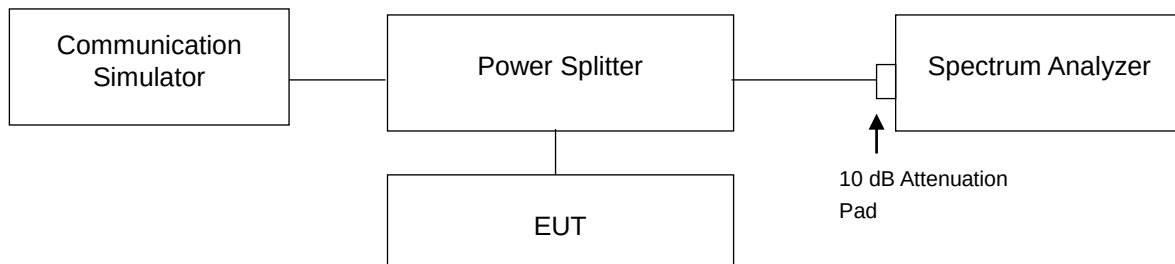


4.7 Conducted Spurious Emissions

4.7.1 Limits of Conducted Spurious Emissions Measurement

The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least $43 + 10 \log(P)$ dB. The emission limit equal to -13 dBm.

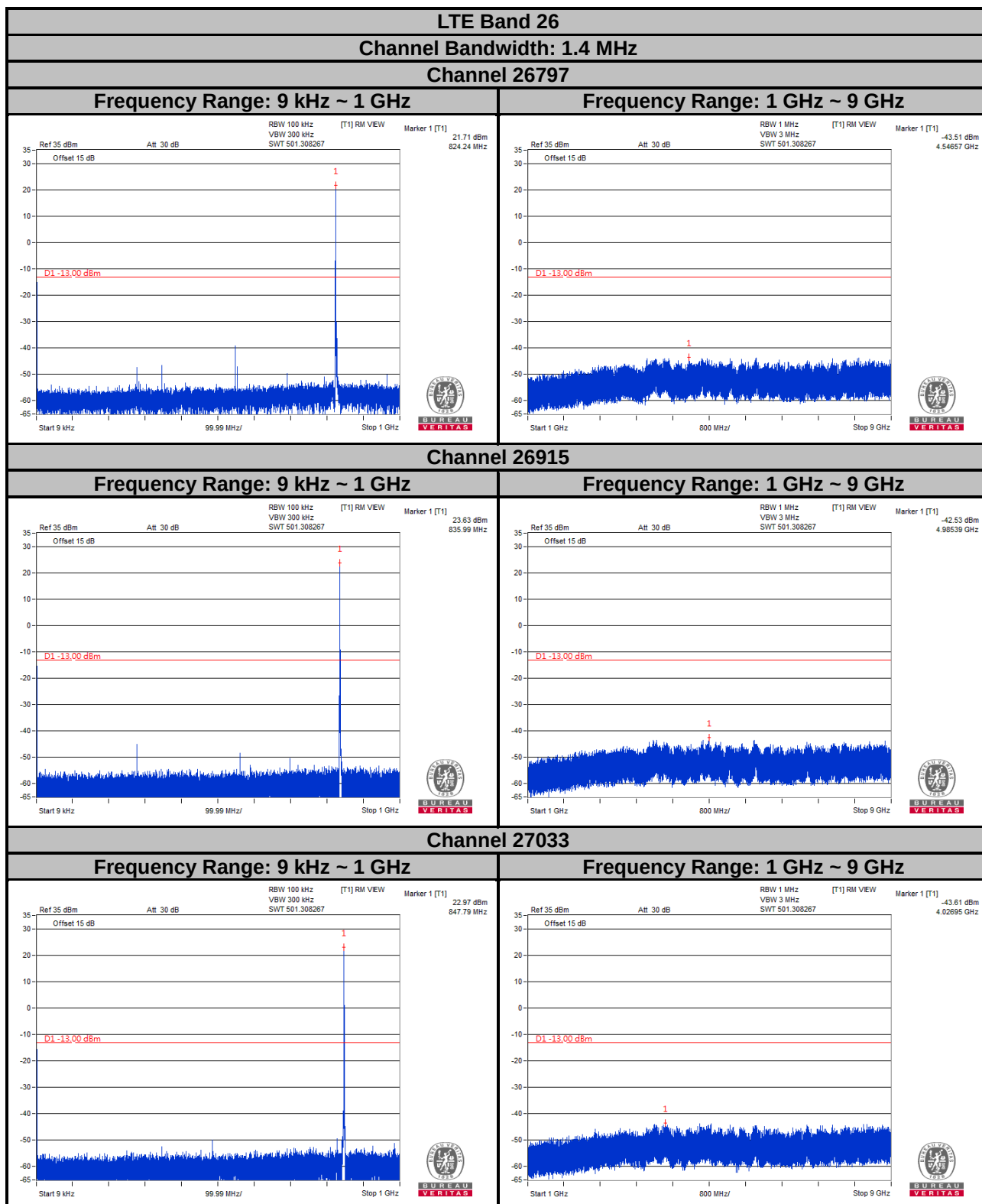
4.7.2 Test Setup



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 is used for conducted emission measurement.
- Measuring frequency range is from 1 GHz to 9 GHz. 10 dB attenuation pad is connected with spectrum. RBW = 1 MHz and VBW = 3 MHz is used for conducted emission measurement.

4.7.4 Test Results



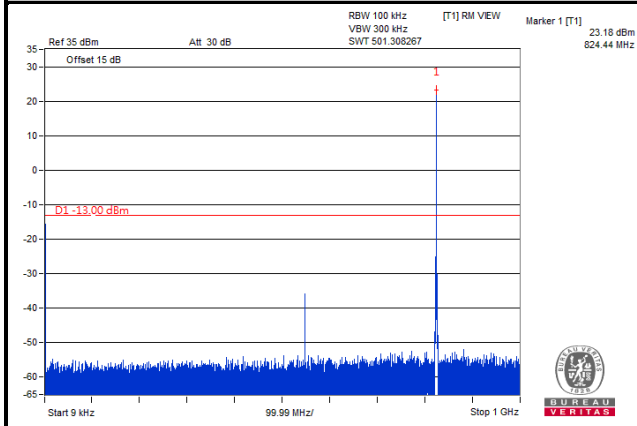
Note: The signal over the limit in 9 kHz is from spectrum analyzer.

LTE Band 26

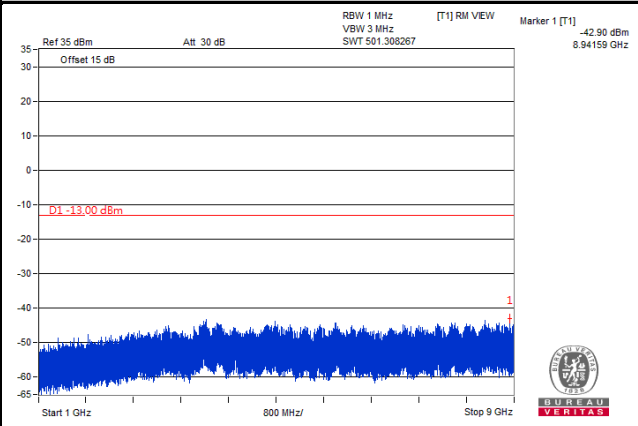
Channel Bandwidth: 3 MHz

Channel 26805

Frequency Range: 9 kHz ~ 1 GHz

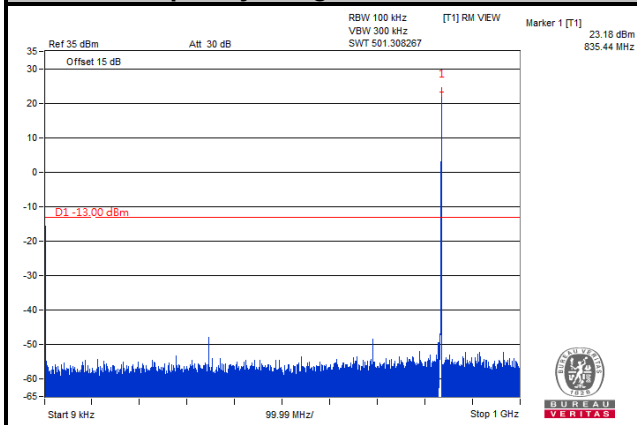


Frequency Range: 1 GHz ~ 9 GHz

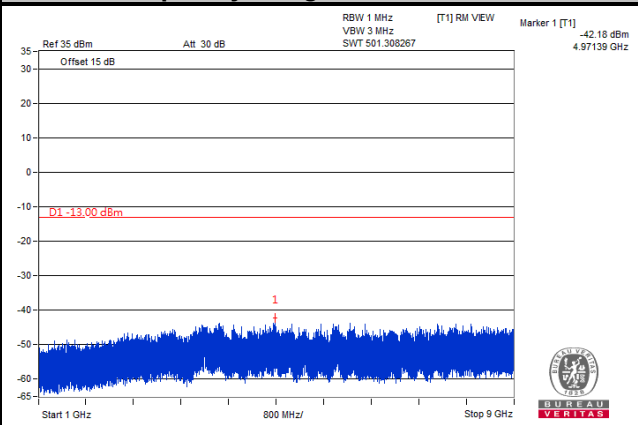


Channel 26915

Frequency Range: 9 kHz ~ 1 GHz

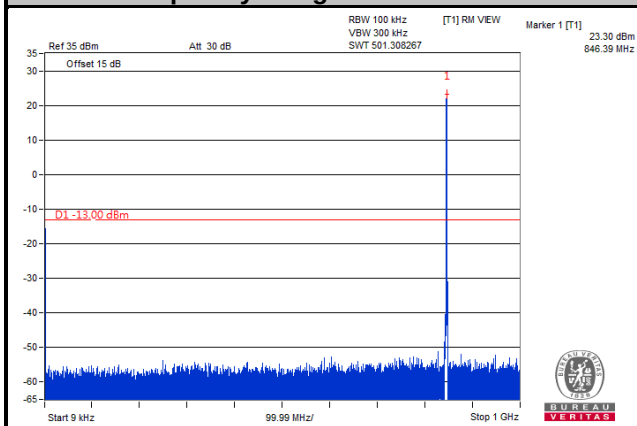


Frequency Range: 1 GHz ~ 9 GHz

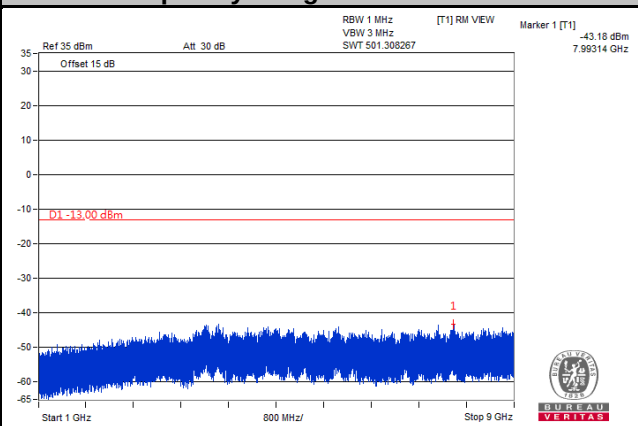


Channel 27025

Frequency Range: 9 kHz ~ 1 GHz



Frequency Range: 1 GHz ~ 9 GHz



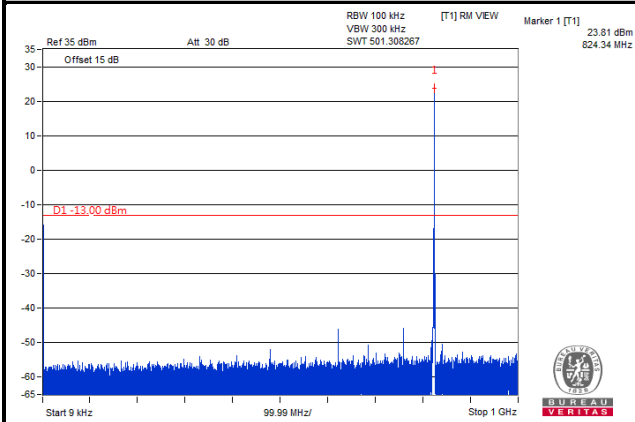
Note: The signal over the limit in 9 kHz is from spectrum analyzer.

LTE Band 26

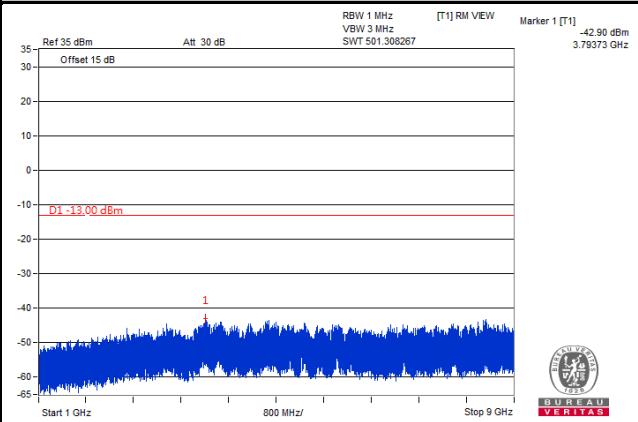
Channel Bandwidth: 5 MHz

Channel 26815

Frequency Range: 9 kHz ~ 1 GHz

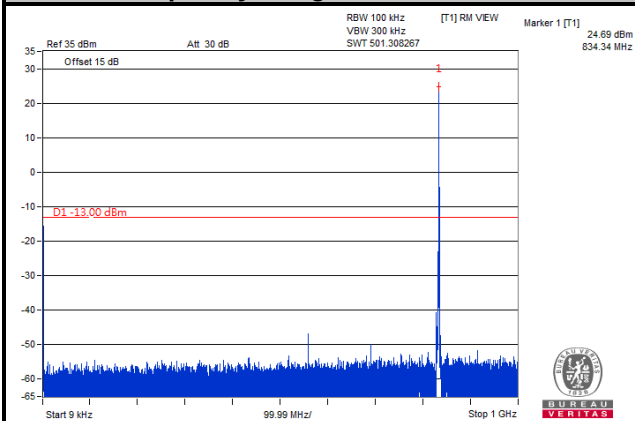


Frequency Range: 1 GHz ~ 9 GHz

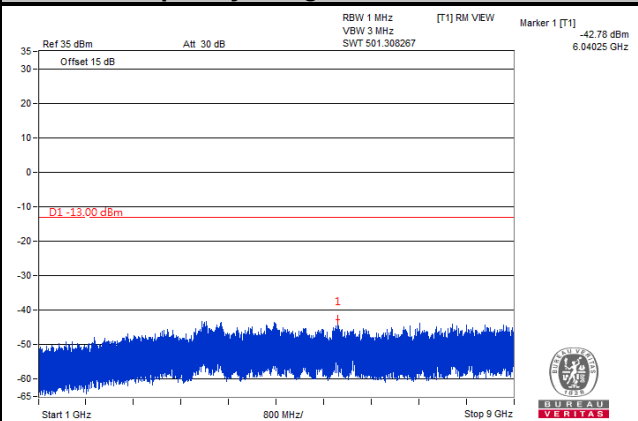


Channel 26915

Frequency Range: 9 kHz ~ 1 GHz

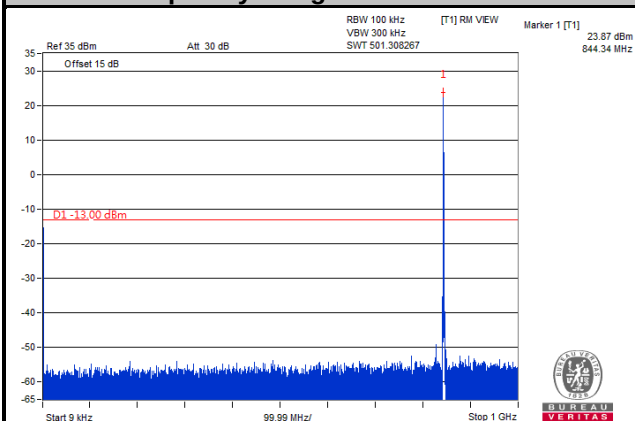


Frequency Range: 1 GHz ~ 9 GHz

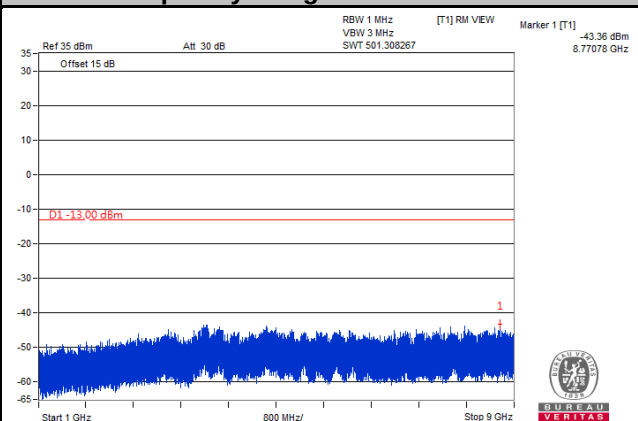


Channel 27015

Frequency Range: 9 kHz ~ 1 GHz



Frequency Range: 1 GHz ~ 9 GHz



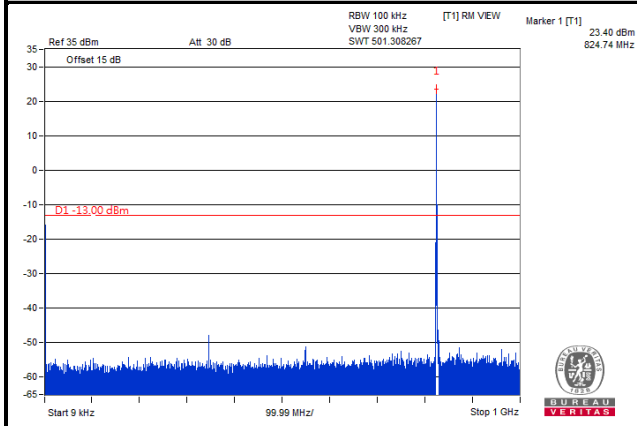
Note: The signal over the limit in 9 kHz is from spectrum analyzer.

LTE Band 26

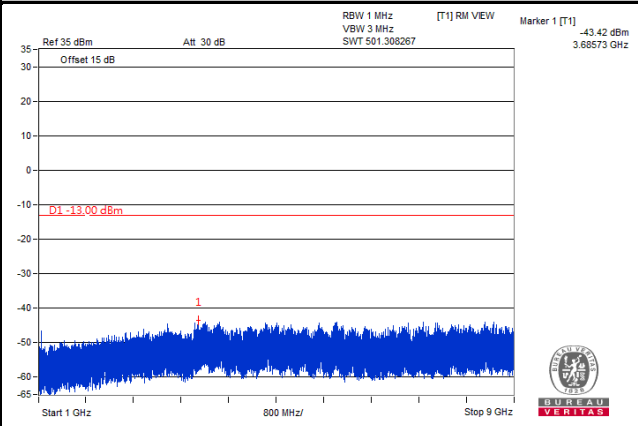
Channel Bandwidth: 10 MHz

Channel 26840

Frequency Range: 9 kHz ~ 1 GHz

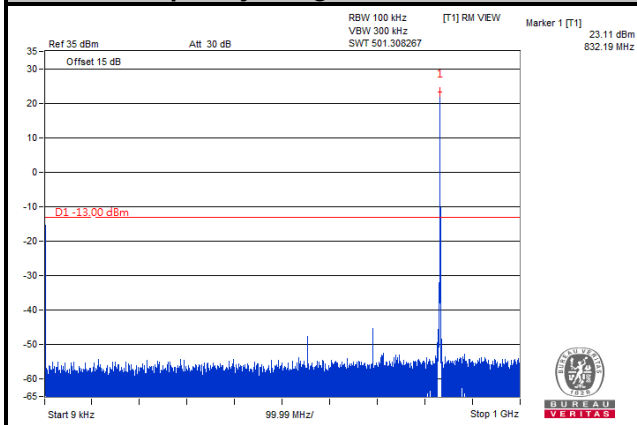


Frequency Range: 1 GHz ~ 9 GHz

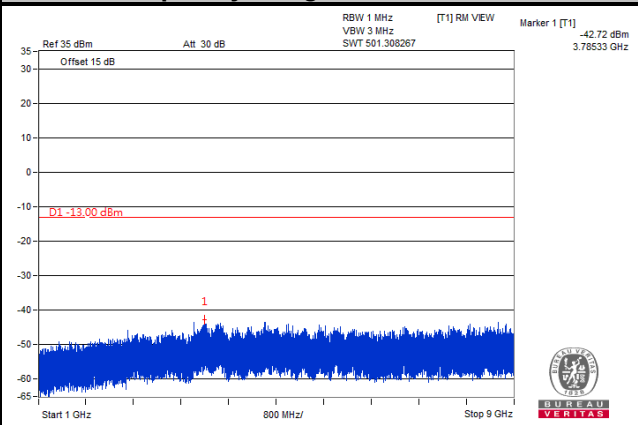


Channel 26915

Frequency Range: 9 kHz ~ 1 GHz

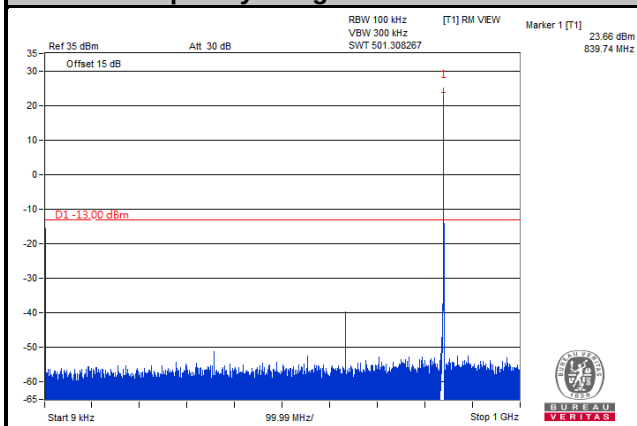


Frequency Range: 1 GHz ~ 9 GHz

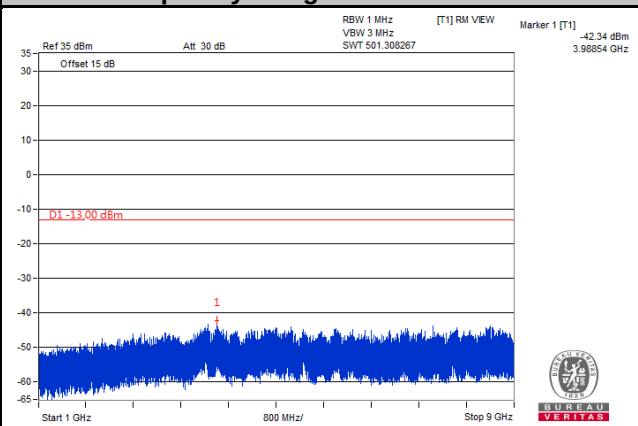


Channel 26990

Frequency Range: 9 kHz ~ 1 GHz



Frequency Range: 1 GHz ~ 9 GHz



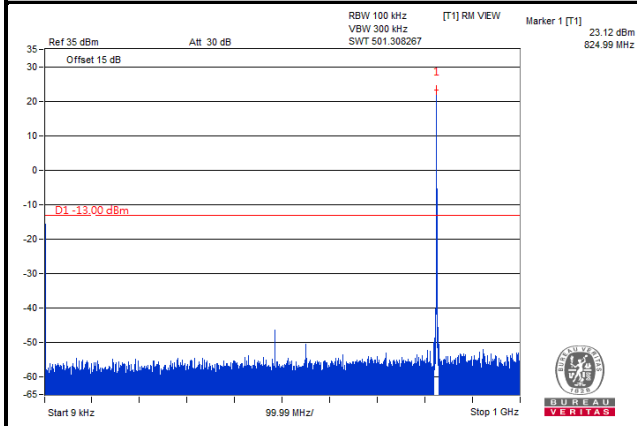
Note: The signal over the limit in 9 kHz is from spectrum analyzer.

LTE Band 26

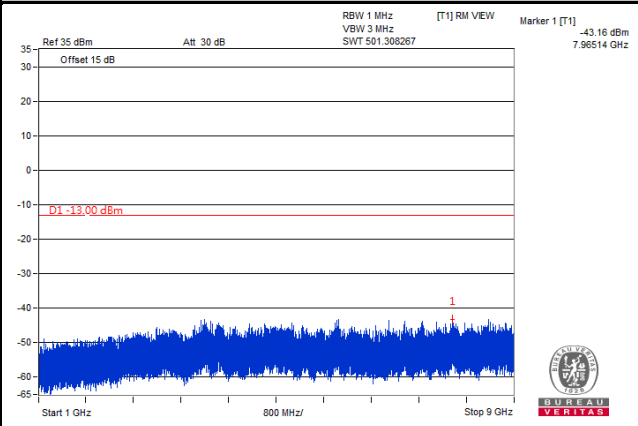
Channel Bandwidth: 15 MHz

Channel 26865

Frequency Range: 9 kHz ~ 1 GHz

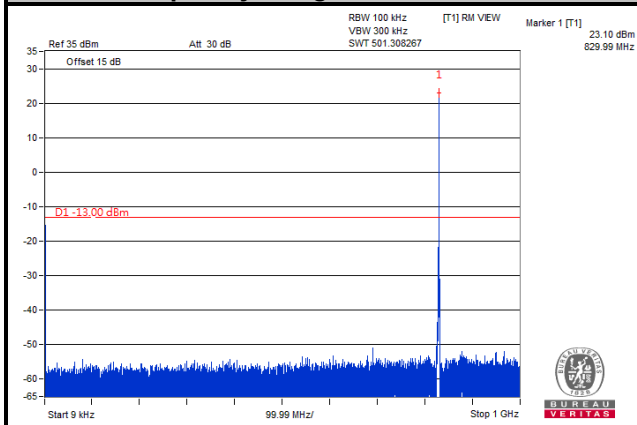


Frequency Range: 1 GHz ~ 9 GHz

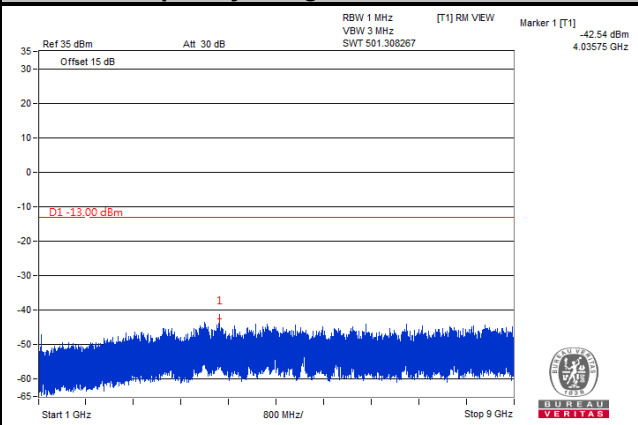


Channel 26915

Frequency Range: 9 kHz ~ 1 GHz

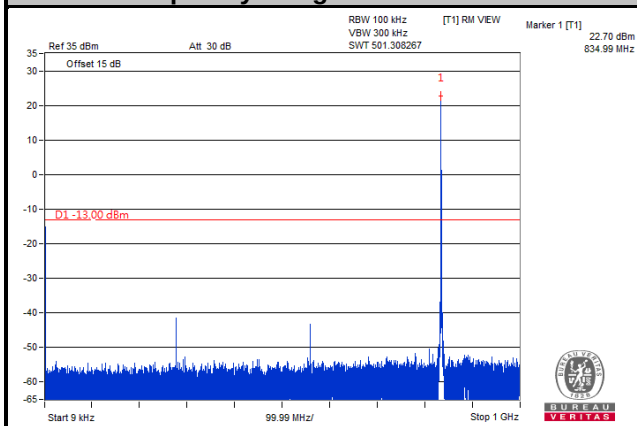


Frequency Range: 1 GHz ~ 9 GHz

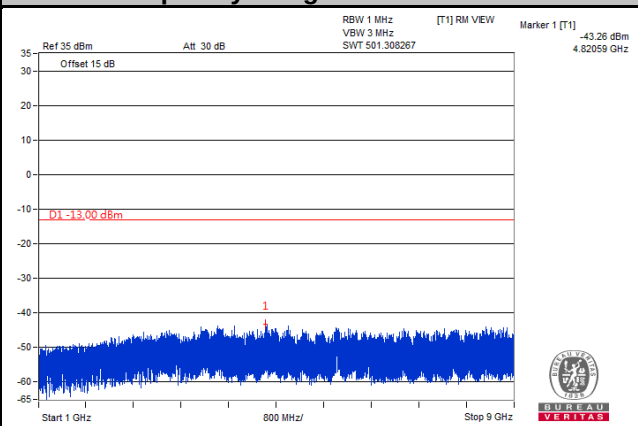


Channel 26965

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

The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least $43 + 10 \log(P)$ dB. The emission limit is equal to -13 dBm.

4.8.2 Test Procedure

- 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.
- 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
- $EIRP = \text{Output power level of S.G} - \text{TX cable loss} + \text{Antenna gain of substitution horn}.$
- E.R.P power can be calculated form E.I.R.P power by subtracting the gain of dipole, $E.R.P \text{ power} = E.I.R.P \text{ power} - 2.15 \text{ dB}.$

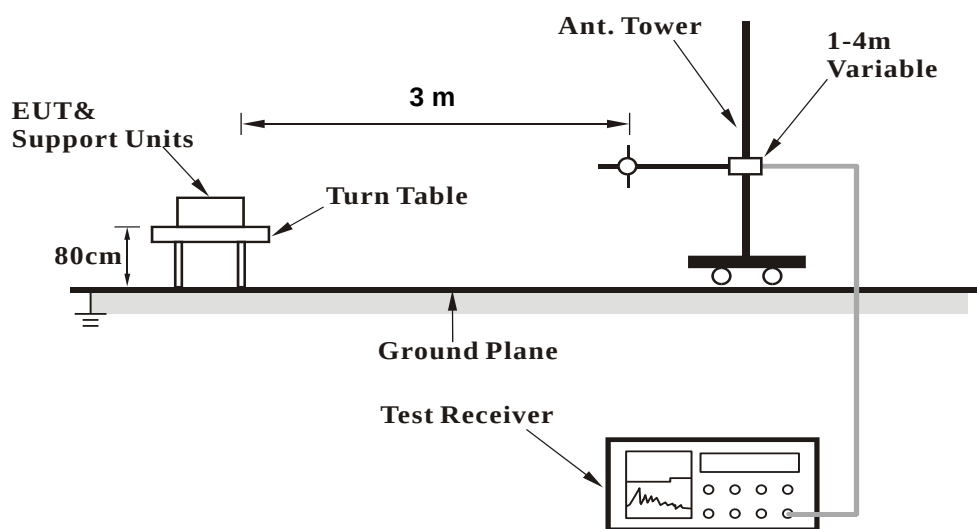
NOTE: The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 1 MHz/3 MHz.

4.8.3 Deviation from Test Standard

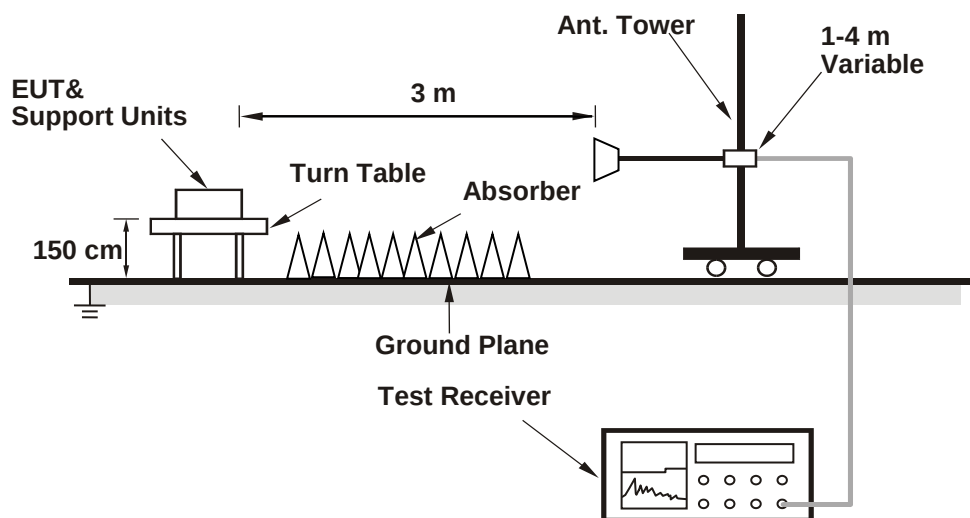
No deviation.

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

LTE Band 26

Channel Bandwidth: 1.4 MHz / QPSK

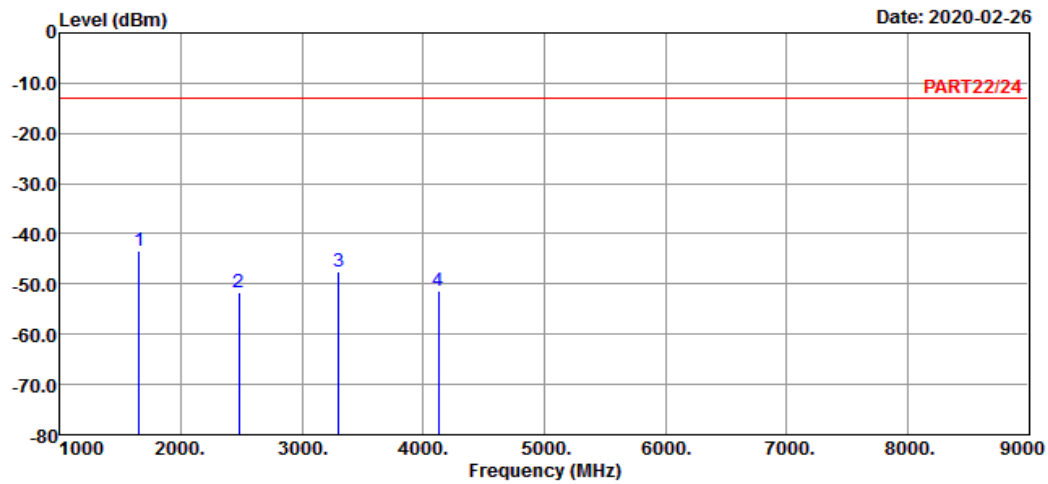
Low Channel



Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 3



Site : 966 Chamber 5
 Condition: PART22/24 HORIZONTAL
 Remak : Cat-M1 Band 26 QPSK_1.4M Link_L-CH
 Tested by: Getaz Yang

	Freq	Level	Read Level	Limit Line	Factor	Over Limit	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1 pp	1649.40	-43.51	-29.77	-13.00	-13.74	-30.51	Peak
2	2474.10	-51.66	-41.64	-13.00	-10.02	-38.66	Peak
3	3298.80	-47.44	-38.58	-13.00	-8.86	-34.44	Peak
4	4123.50	-51.28	-45.17	-13.00	-6.11	-38.28	Peak

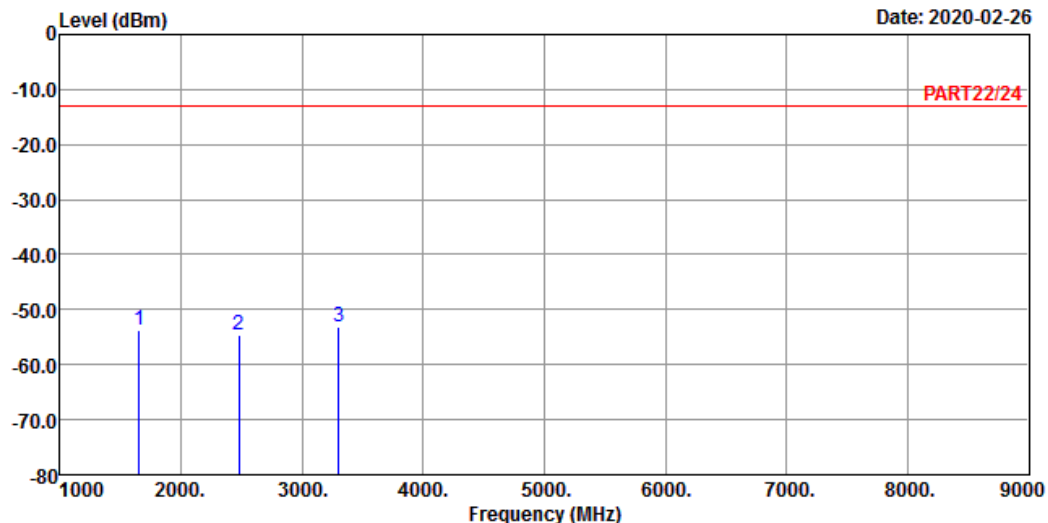


Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 4

Date: 2020-02-26



Site : 966 Chamber 5

Condition: PART22/24 VERTICAL

Remak : Cat-M1 Band 26 QPSK_1.4M Link_L-CH

Tested by: Getaz Yang

	Freq	Level	Read Level	Limit	Line Factor	Over Limit	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1	1649.40	-53.87	-40.13	-13.00	-13.74	-40.87	Peak
2	2474.10	-54.74	-44.72	-13.00	-10.02	-41.74	Peak
3 pp	3298.80	-53.11	-44.25	-13.00	-8.86	-40.11	Peak

Middle Channel

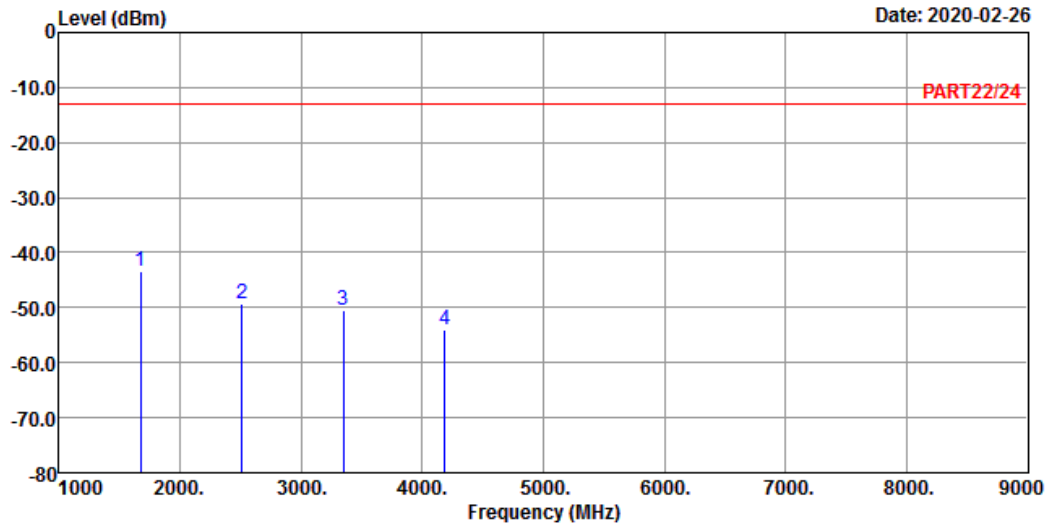


Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 3

Date: 2020-02-26



Site : 966 Chamber 5

Condition: PART22/24 HORIZONTAL

Remak : Cat-M1 Band 26 QPSK_1.4M Link_M-CH

Tested by: Getaz Yang

	Freq	Level	Read Level	Limit	Over	
	MHz	dBm	dBm	dBm	Factor	Limit Remark
					dB	dB
1 pp	1673.00	-43.49	-29.59	-13.00	-13.90	-30.49 Peak
2	2509.50	-49.31	-39.23	-13.00	-10.08	-36.31 Peak
3	3346.00	-50.54	-41.78	-13.00	-8.76	-37.54 Peak
4	4182.50	-53.98	-48.30	-13.00	-5.68	-40.98 Peak

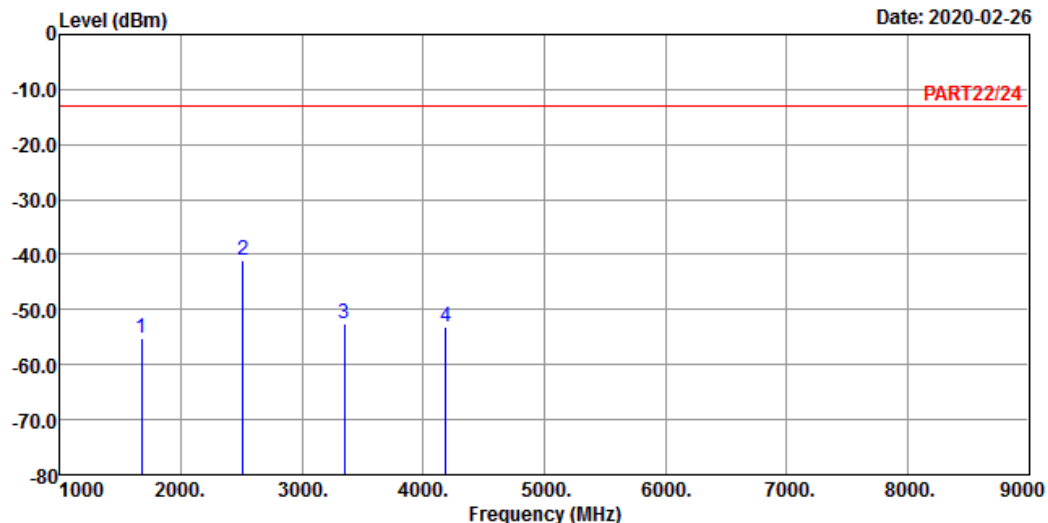


Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 4

Date: 2020-02-26



Site : 966 Chamber 5

Condition: PART22/24 VERTICAL

Remak : Cat-M1 Band 26 QPSK_1.4M Link_M-CH

Tested by: Getaz Yang

	Freq	Level	Read Level	Limit	Over	
	MHz	dBm	dBm	dBm	Factor	Limit Remark
	MHz	dBm	dBm	dBm	dB	dB
1	1673.00	-55.19	-41.29	-13.00	-13.90	-42.19 Peak
2 pp	2509.50	-40.98	-30.90	-13.00	-10.08	-27.98 Peak
3	3346.00	-52.64	-43.88	-13.00	-8.76	-39.64 Peak
4	4182.50	-52.99	-47.31	-13.00	-5.68	-39.99 Peak

High Channel

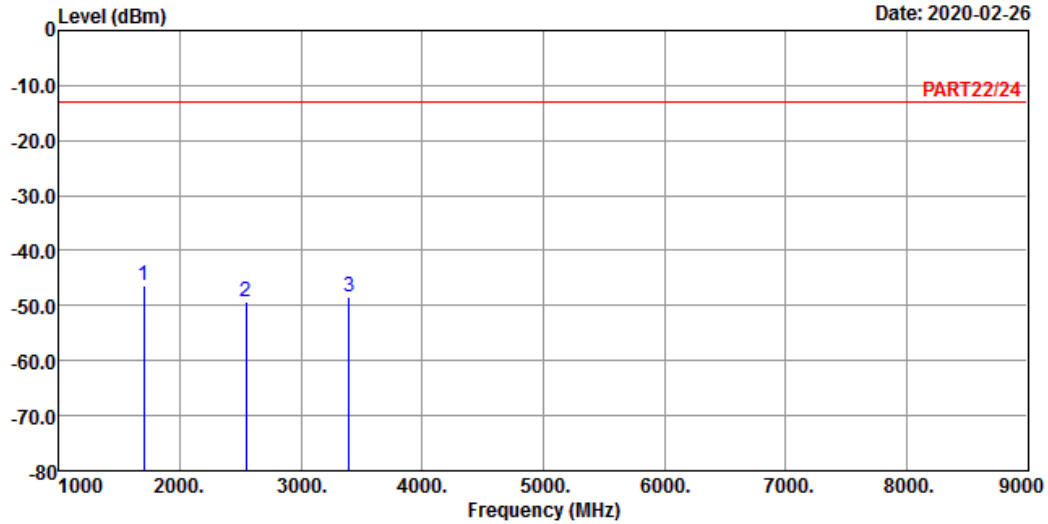


Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 3

Date: 2020-02-26



Site : 966 Chamber 5

Condition: PART22/24 HORIZONTAL

Remak : Cat-M1 Band 26 QPSK_1.4M Link_H-CH

Tested by: Getaz Yang

	Freq	Level	Read Level	Limit	Over	
	MHz	dBm	dBm	dBm	Factor	Limit Remark
1 pp	1696.60	-46.22	-32.20	-13.00	-14.02	-33.22 Peak
2	2544.90	-49.19	-39.13	-13.00	-10.06	-36.19 Peak
3	3393.20	-48.54	-39.94	-13.00	-8.60	-35.54 Peak

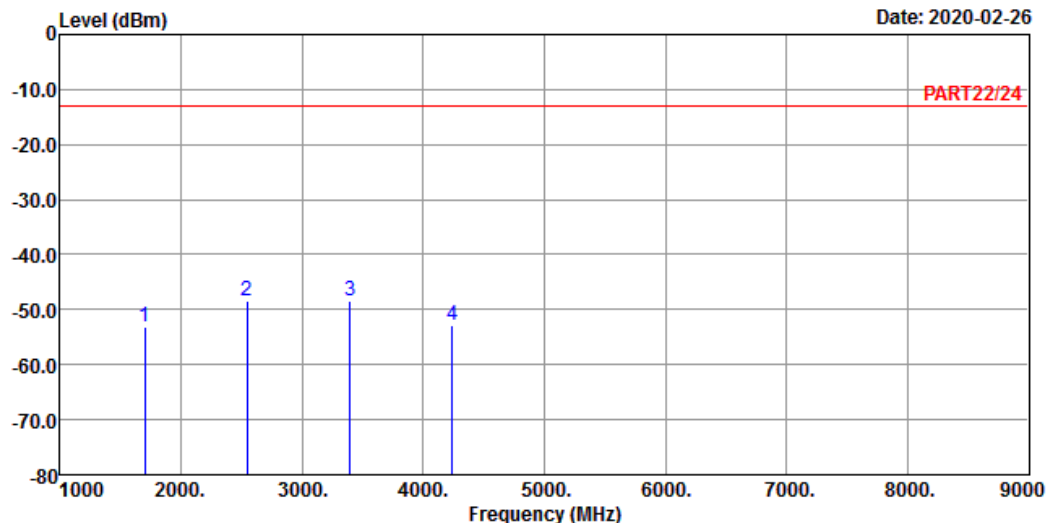


Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 4

Date: 2020-02-26



Site : 966 Chamber 5

Condition: PART22/24 VERTICAL

Remak : Cat-M1 Band 26 QPSK_1.4M Link_H-CH

Tested by: Getaz Yang

	Freq	Level	Read Level	Limit	Over	
	MHz	dBm	dBm	dBm	Factor	Limit Remark
1	1696.60	-53.26	-39.24	-13.00	-14.02	-40.26 Peak
2 pp	2544.90	-48.31	-38.25	-13.00	-10.06	-35.31 Peak
3	3393.20	-48.34	-39.74	-13.00	-8.60	-35.34 Peak
4	4241.50	-52.94	-47.39	-13.00	-5.55	-39.94 Peak

Channel Bandwidth: 5 MHz / QPSK
Low Channel

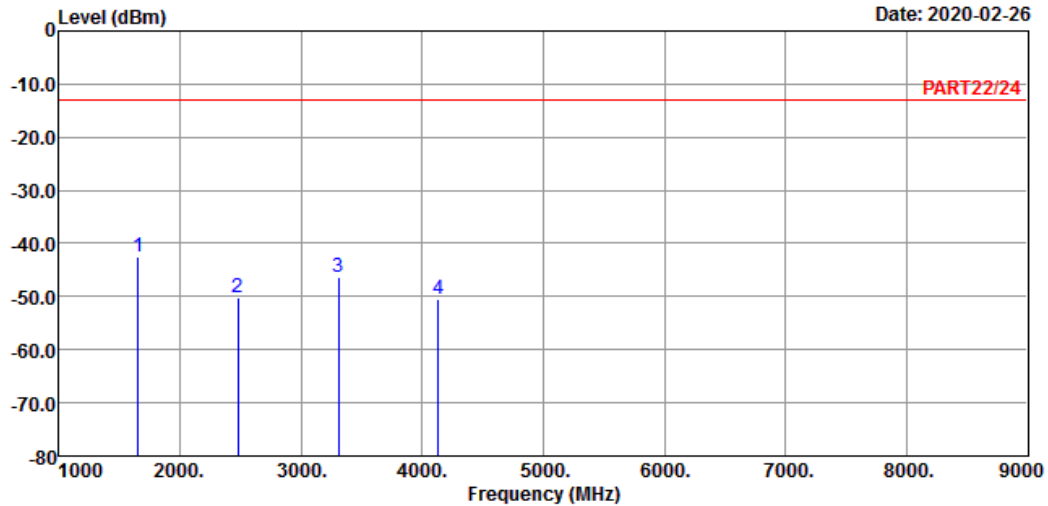


Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 3

Date: 2020-02-26



Site : 966 Chamber 5

Condition: PART22/24 HORIZONTAL

Remak : Cat-M1 Band 26 QPSK_5M Link_L-CH

Tested by: Getaz Yang

	Freq	Level	Read Level	Limit	Line Factor	Over Limit	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1 pp	1653.00	-42.48	-28.71	-13.00	-13.77	-29.48	Peak
2	2479.50	-50.19	-40.16	-13.00	-10.03	-37.19	Peak
3	3306.00	-46.25	-37.36	-13.00	-8.89	-33.25	Peak
4	4132.50	-50.48	-44.45	-13.00	-6.03	-37.48	Peak

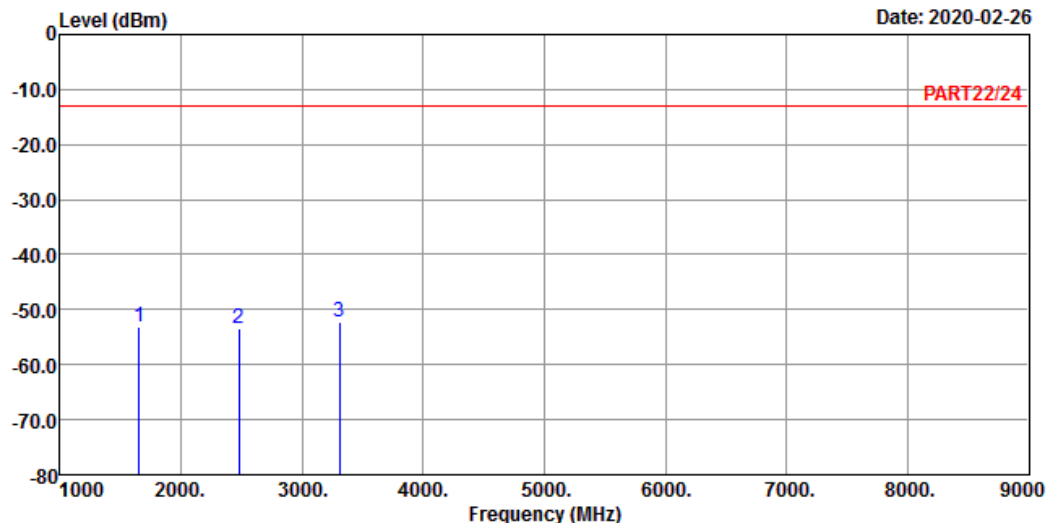


Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 4

Date: 2020-02-26



Site : 966 Chamber 5

Condition: PART22/24 VERTICAL

Remak : Cat-M1 Band 26 QPSK_5M Link_L-CH

Tested by: Getaz Yang

	Freq	Level	Read Level	Limit	Line Factor	Over Limit	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1	1653.00	-53.05	-39.28	-13.00	-13.77	-40.05	Peak
2	2479.50	-53.37	-43.34	-13.00	-10.03	-40.37	Peak
3 pp	3306.00	-52.21	-43.32	-13.00	-8.89	-39.21	Peak

Middle Channel

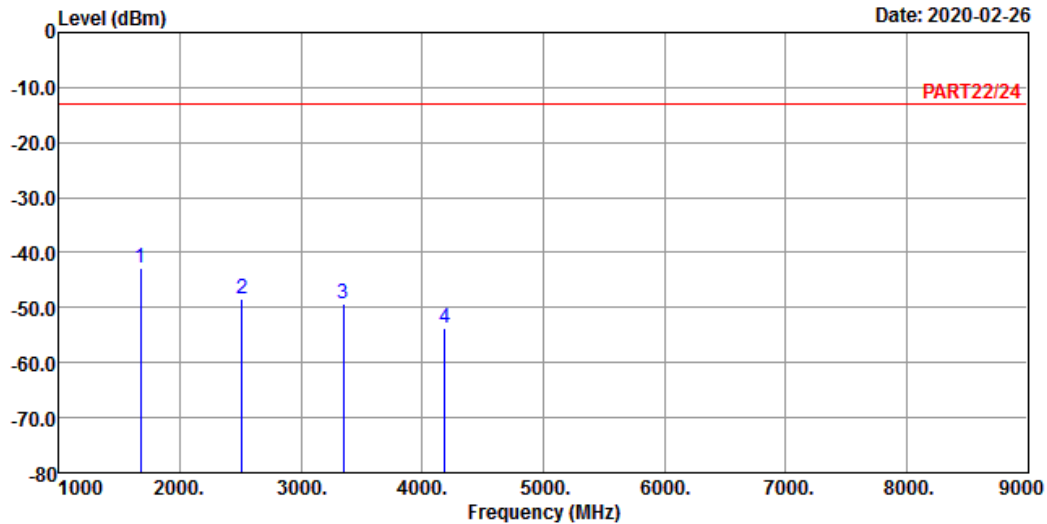


Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 3

Date: 2020-02-26



Site : 966 Chamber 5

Condition: PART22/24 HORIZONTAL

Remak : Cat-M1 Band 26 QPSK_5M Link_M-CH

Tested by: Getaz Yang

	Freq	Level	Read Level	Limit	Over	
	MHz	dBm	dBm	dBm	Factor	Limit Remark
1 pp	1673.00	-42.74	-28.84	-13.00	-13.90	-29.74 Peak
2	2509.50	-48.32	-38.24	-13.00	-10.08	-35.32 Peak
3	3346.00	-49.17	-40.41	-13.00	-8.76	-36.17 Peak
4	4182.50	-53.74	-48.06	-13.00	-5.68	-40.74 Peak

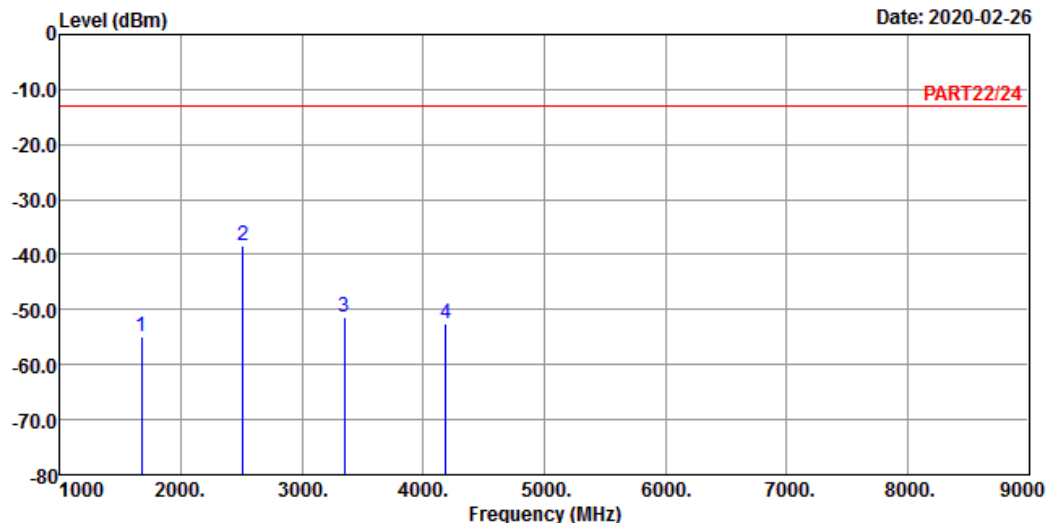


Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 4

Date: 2020-02-26



Site : 966 Chamber 5

Condition: PART22/24 VERTICAL

Remak : Cat-M1 Band 26 QPSK_5M Link_M-CH

Tested by: Getaz Yang

	Freq	Level	Read Level	Limit	Over	
	MHz	dBm	dBm	dBm	Factor	Limit Remark
					dB	dB
1	1673.00	-54.81	-40.91	-13.00	-13.90	-41.81 Peak
2 pp	2509.50	-38.25	-28.17	-13.00	-10.08	-25.25 Peak
3	3346.00	-51.44	-42.68	-13.00	-8.76	-38.44 Peak
4	4182.50	-52.58	-46.90	-13.00	-5.68	-39.58 Peak

High Channel

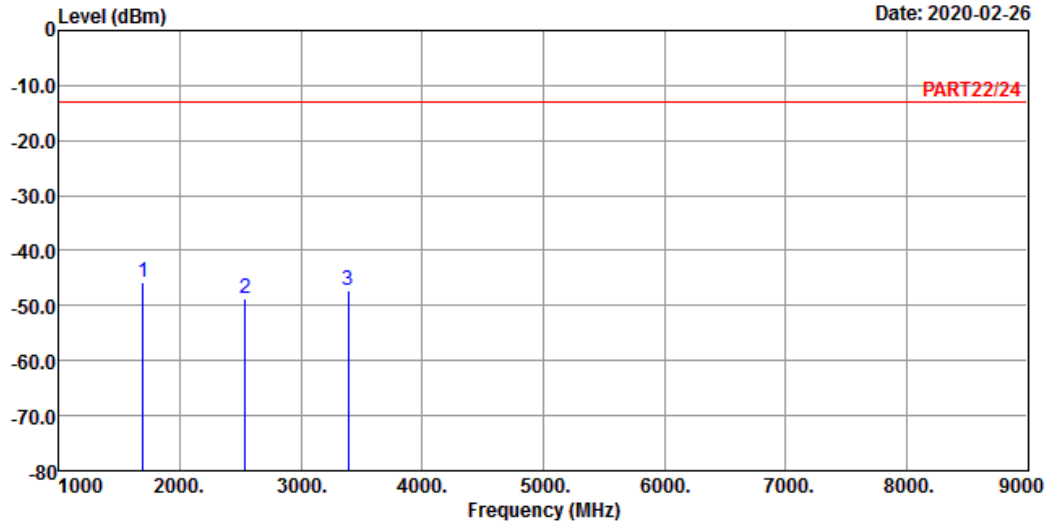


Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 3

Date: 2020-02-26



Site : 966 Chamber 5

Condition: PART22/24 HORIZONTAL

Remak : Cat-M1 Band 26 QPSK_5M Link_H-CH

Tested by: Getaz Yang

	Freq	Level	Read Level	Limit Line	Factor	Over Limit	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1 pp	1693.00	-45.78	-31.76	-13.00	-14.02	-32.78	Peak
2	2539.50	-48.81	-38.75	-13.00	-10.06	-35.81	Peak
3	3386.00	-47.37	-38.74	-13.00	-8.63	-34.37	Peak

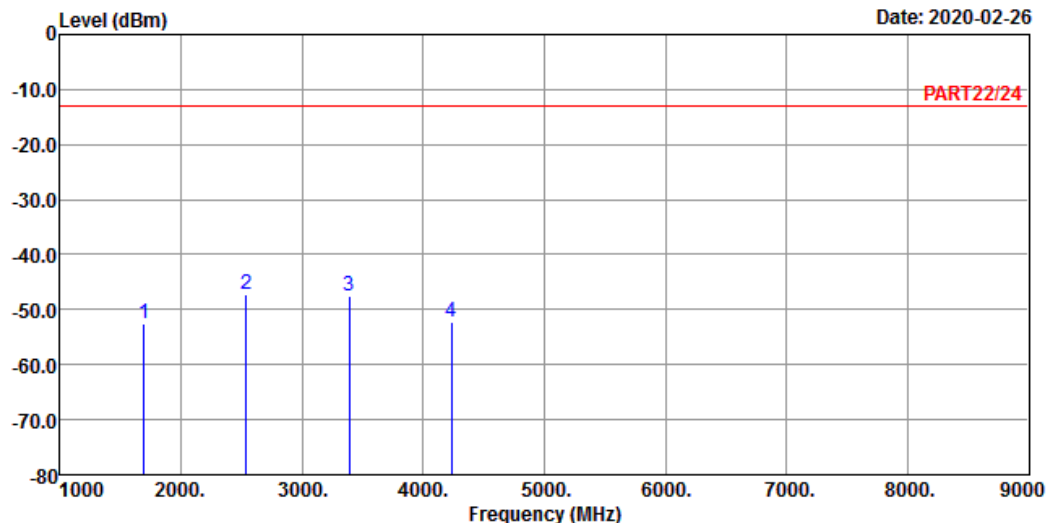


Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 4

Date: 2020-02-26



Site : 966 Chamber 5

Condition: PART22/24 VERTICAL

Remak : Cat-M1 Band 26 QPSK_5M Link_H-CH

Tested by: Getaz Yang

	Freq	Level	Read Level	Limit	Over	
	MHz	dBm	dBm	dBm	Factor	Limit Remark
1	1693.00	-52.44	-38.42	-13.00	-14.02	-39.44 Peak
2 pp	2539.50	-47.27	-37.21	-13.00	-10.06	-34.27 Peak
3	3386.00	-47.44	-38.81	-13.00	-8.63	-34.44 Peak
4	4232.50	-52.17	-46.62	-13.00	-5.55	-39.17 Peak

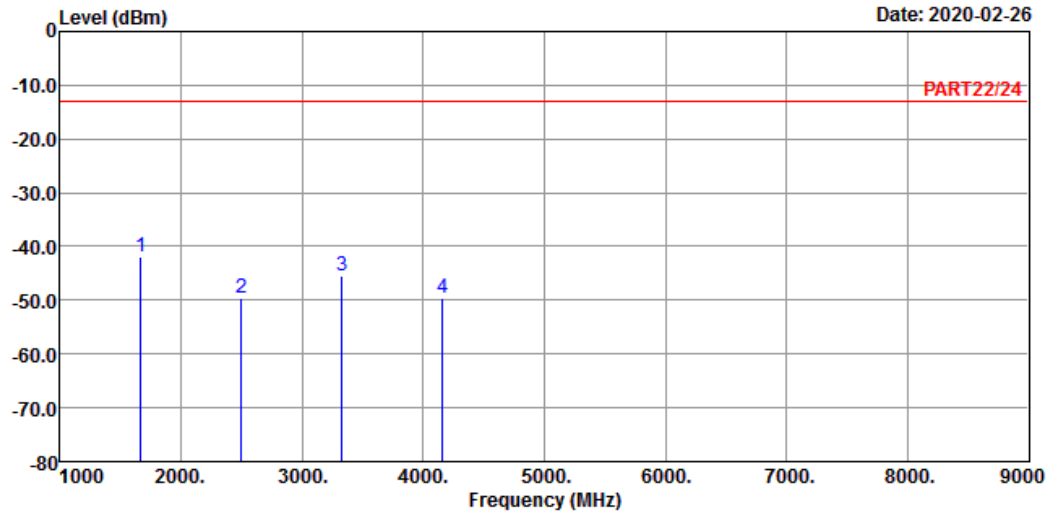
Channel Bandwidth: 15 MHz / QPSK
Low Channel



Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 3



Site : 966 Chamber 5
Condition: PART22/24 HORIZONTAL
Remak : Cat-M1 Band 26 QPSK_15M Link_L-CH
Tested by: Getaz Yang

	Freq	Level	Read Level	Limit Line	Over Factor	Over Limit	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1 pp	1663.00	-41.83	-28.00	-13.00	-13.83	-28.83	Peak
2	2494.50	-49.63	-39.57	-13.00	-10.06	-36.63	Peak
3	3326.00	-45.35	-36.52	-13.00	-8.83	-32.35	Peak
4	4157.50	-49.59	-43.73	-13.00	-5.86	-36.59	Peak

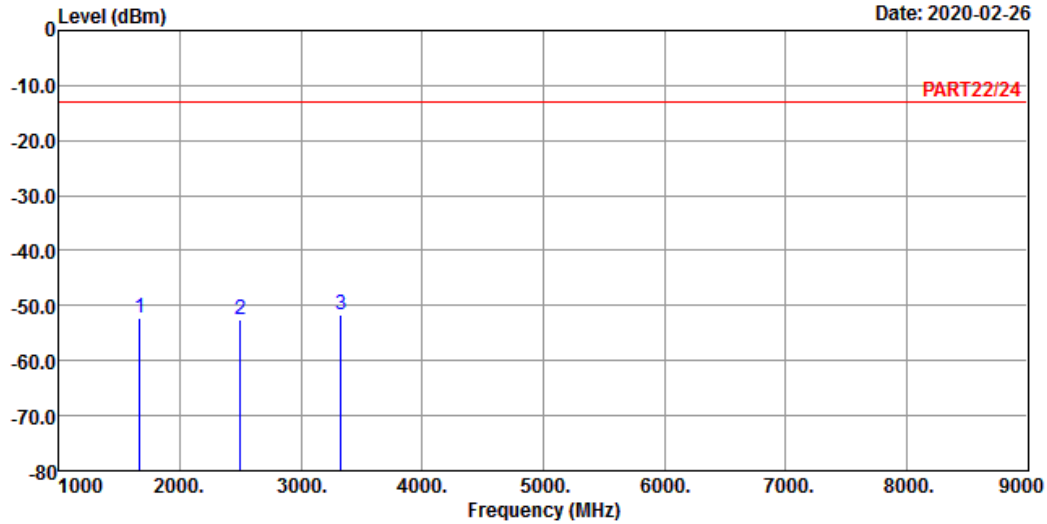


Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 4

Date: 2020-02-26



Site : 966 Chamber 5

Condition: PART22/24 VERTICAL

Remak : Cat-M1 Band 26 QPSK_15M Link_L-CH

Tested by: Getaz Yang

	Freq	Level	Read Level	Limit	Line Factor	Over Limit	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1	1663.00	-52.22	-38.39	-13.00	-13.83	-39.22	Peak
2	2494.50	-52.67	-42.61	-13.00	-10.06	-39.67	Peak
3 pp	3326.00	-51.74	-42.91	-13.00	-8.83	-38.74	Peak

Middle Channel

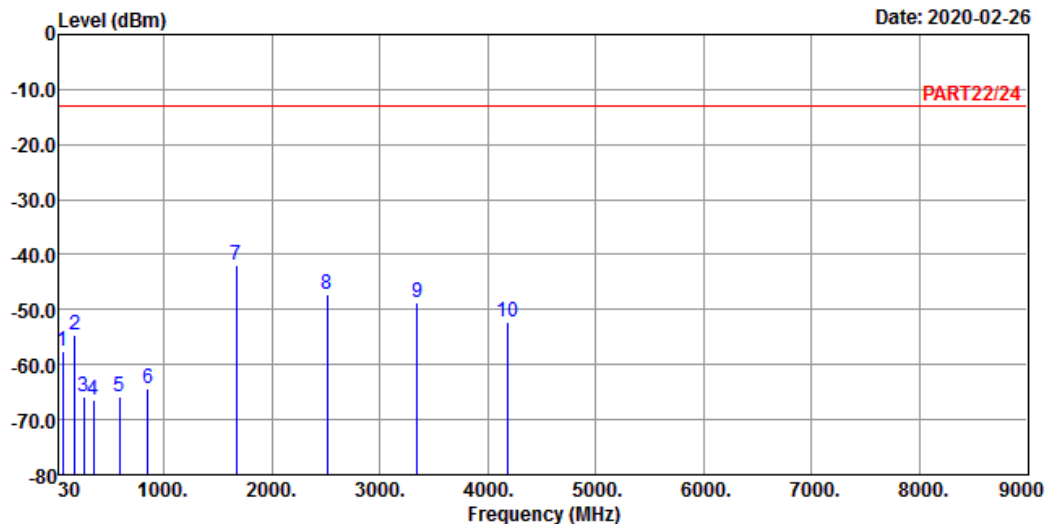


Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 5

Date: 2020-02-26



Site : 966 Chamber 5

Condition: PART22/24 HORIZONTAL

Remak : Cat-M1 Band 26 QPSK_15M Link_M-CH

Tested by: Getaz Yang

	Freq	Level	Read	Limit	Over	
	MHz	dBm	Level	Line	Factor	Limit Remark
	MHz	dBm	dBm	dBm	dB	dB
1	60.07	-57.68	-50.02	-13.00	-7.66	-44.68 Peak
2	171.62	-54.75	-48.88	-13.00	-5.87	-41.75 Peak
3	260.86	-65.77	-59.56	-13.00	-6.21	-52.77 Peak
4	350.10	-66.50	-60.26	-13.00	-6.24	-53.50 Peak
5	590.66	-65.96	-64.80	-13.00	-1.16	-52.96 Peak
6	849.65	-64.29	-64.58	-13.00	0.29	-51.29 Peak
7 pp	1673.00	-41.81	-27.91	-13.00	-13.90	-28.81 Peak
8	2509.50	-47.25	-37.17	-13.00	-10.08	-34.25 Peak
9	3346.00	-48.68	-39.92	-13.00	-8.76	-35.68 Peak
10	4182.50	-52.14	-46.46	-13.00	-5.68	-39.14 Peak

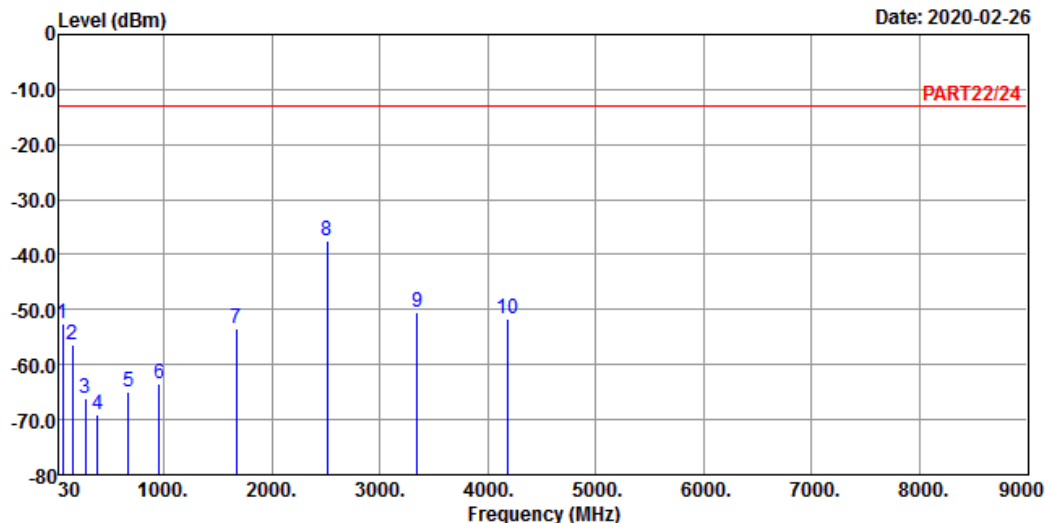


Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 6

Date: 2020-02-26



Site : 966 Chamber 5

Condition: PART22/24 VERTICAL

Remak : Cat-M1 Band 26 QPSK_15M Link_M-CH

Tested by: Getaz Yang

	Freq	Level	Read Level	Limit	Over	
	MHz	dBm	dBm	Line	Factor	Limit Remark
				dBm	dB	dB
1	62.98	-52.56	-44.68	-13.00	-7.88	-39.56 Peak
2	155.13	-56.40	-50.19	-13.00	-6.21	-43.40 Peak
3	271.53	-66.03	-59.60	-13.00	-6.43	-53.03 Peak
4	383.08	-69.09	-63.05	-13.00	-6.04	-56.09 Peak
5	669.23	-64.83	-64.25	-13.00	-0.58	-51.83 Peak
6	959.26	-63.60	-65.74	-13.00	2.14	-50.60 Peak
7	1673.00	-53.40	-39.50	-13.00	-13.90	-40.40 Peak
8 pp	2509.50	-37.59	-27.51	-13.00	-10.08	-24.59 Peak
9	3346.00	-50.42	-41.66	-13.00	-8.76	-37.42 Peak
10	4182.50	-51.74	-46.06	-13.00	-5.68	-38.74 Peak

High Channel

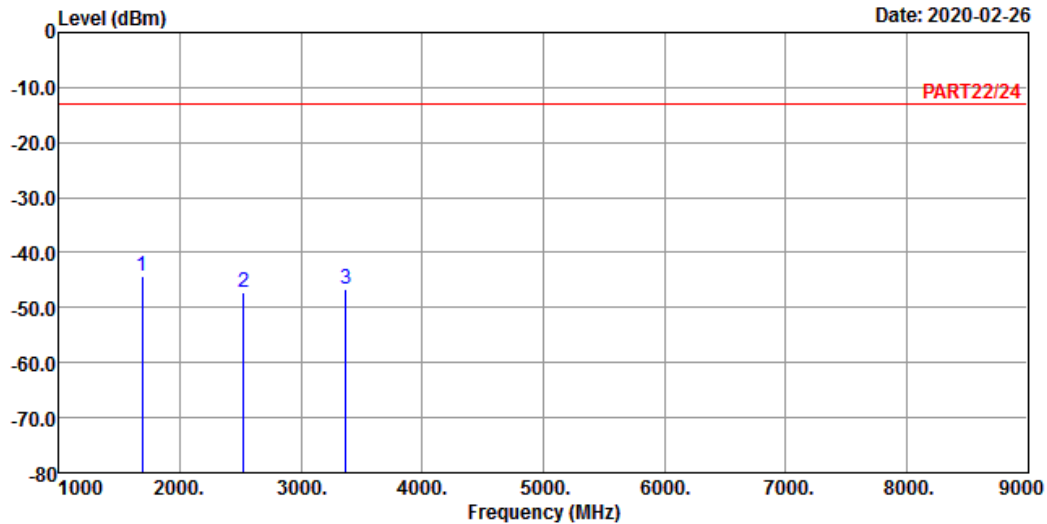


Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 3

Date: 2020-02-26



Site : 966 Chamber 5

Condition: PART22/24 HORIZONTAL

Remak : Cat-M1 Band 26 QPSK_15M Link_H-CH

Tested by: Getaz Yang

	Freq	Level	Read Level	Limit Line	Factor	Over Limit	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1 pp	1683.00	-44.39	-30.43	-13.00	-13.96	-31.39	Peak
2	2524.50	-47.34	-37.27	-13.00	-10.07	-34.34	Peak
3	3366.00	-46.63	-37.93	-13.00	-8.70	-33.63	Peak

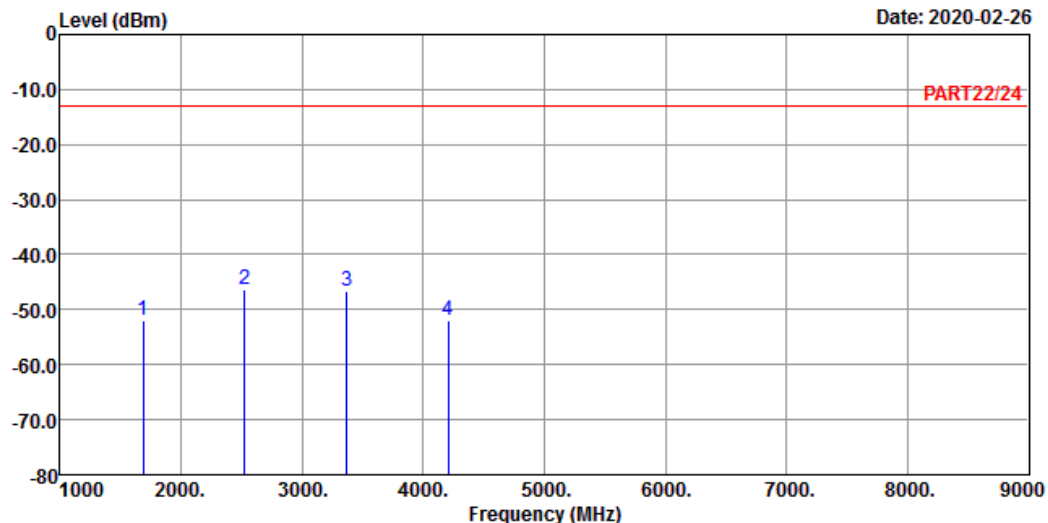


Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 4

Date: 2020-02-26



Site : 966 Chamber 5

Condition: PART22/24 VERTICAL

Remak : Cat-M1 Band 26 QPSK_15M Link_H-CH

Tested by: Getaz Yang

	Freq	Level	Read Level	Limit	Over	
	MHz	dBm	dBm	dBm	Factor	Limit Remark
1	1683.00	-51.84	-37.88	-13.00	-13.96	-38.84 Peak
2 pp	2524.50	-46.36	-36.29	-13.00	-10.07	-33.36 Peak
3	3366.00	-46.58	-37.88	-13.00	-8.70	-33.58 Peak
4	4207.50	-51.87	-46.29	-13.00	-5.58	-38.87 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:

Lin Kou EMC/RF Lab

Tel: 886-2-26052180

Fax: 886-2-26051924

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Tel: 886-3-6668565

Fax: 886-3-6668323

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Tel: 886-3-3183232

Fax: 886-3-3270892

Email: service.adt@tw.bureauveritas.com

Web Site: www.bureauveritas-adt.com

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

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