

FCC Test Report (Part 22)

Report No.: RF200428C03

FCC ID: PZWBHTM80QWG

Test Model: BHT-M80-QWG

Received Date: Apr. 28, 2020

Test Date: May 05 ~ Jun. 22, 2020 (Test Mode A)
Oct. 21, 2020 (Test Mode B, C)

Issued Date: Oct. 26, 2020

Applicant: DENSO WAVE INCORPORATED

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

Designation Number:



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Release Control Record

Issue No.	Description	Date Issued
RF200428C03	Original release	Oct. 26, 2020

1 Certificate of Conformity

Product: 2D Code Handy Terminal

Brand: DENSO

Test Model: BHT-M80-QWG

Sample Status: Engineering sample

Applicant: DENSO WAVE INCORPORATED

Test Date: May 05 ~ Jun. 22, 2020 (Test Mode A)
Oct. 21, 2020 (Test Mode B, C)

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 : Pettie Chen , **Date:** Oct. 26, 2020
Pettie Chen / Senior Specialist

Approved by : Bruce Chen , **Date:** Oct. 26, 2020
Bruce Chen / 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 -15.6dB at 30.00MHz.

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	9kHz ~ 30MHz	3.04 dB
	30MHz ~ 200MHz	3.59 dB
	200MHz ~ 1000MHz	3.60 dB
Radiated Emissions above 1 GHz	1GHz ~ 18GHz	2.29 dB
	18GHz ~ 40GHz	2.29 dB

2.2 Test Site and Instruments

Description & Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
Test Receiver KEYSIGHT	N9038A	MY55420137	Apr. 16, 2020	Apr. 15, 2021
Spectrum Analyzer ROHDE & SCHWARZ	FSP40	100039	Jun. 12, 2020	Jun. 11, 2021
Spectrum Analyzer ROHDE & SCHWARZ	FSW43	101582	Mar. 31, 2020	Mar. 30, 2021
MXG Vector signal generator Agilent	N5182B	MY53050162	Jan. 14, 2020	Jan. 13, 2021
Radio Communication Analyzer Anritsu	MT8821C	6201462755	Feb. 13, 2020	Feb. 12, 2021
BILOG Antenna SCHWARZBECK	VULB9168	9168-472	Nov. 08, 2019	Nov. 07, 2020
BILOG Antenna SCHWARZBECK	VULB9168	9168-160	Nov. 07, 2019	Nov. 06, 2020
HORN Antenna SCHWARZBECK	BBHA 9120 D	9120D-1169	Nov. 24, 2019	Nov. 23, 2020
HORN Antenna SCHWARZBECK	BBHA 9170	BBHA9170241	Nov. 24, 2019	Nov. 23, 2020
Loop Antenna TESEQ	HLA 6121	45745	Jul. 01, 2019	Jun. 30, 2020
			Jul. 06, 2020	Jul. 05, 2021
Preamplifier Agilent (Below 1GHz)	8447D	2944A10638	Jul. 11, 2019	Jul. 10, 2020
			Jun. 08, 2020	Jun. 07, 2021
Preamplifier Agilent (Above 1GHz)	8449B	3008A02367	Feb. 18, 2020	Feb. 17, 2021
RF signal cable HUBER+SUHNER&EMCI	SUCOFLEX 104 & EMC104-SM-SM8000	CABLE-CH9-02 (248780+171006)	Jan. 18, 2020	Jan. 17, 2021
RF signal cable HUBER+SUHNER	SUCOFLEX 104	CABLE-CH9-(250795 /4)	Jul. 11, 2019	Jul. 10, 2020
			Jan. 18, 2020	Jan. 17, 2021
RF signal cable Woken	8D-FB	Cable-CH9-01	Jul. 30, 2019	Jul. 29, 2020
			Jun. 08, 2020	Jun. 07, 2021
Software BV ADT	ADT_Radiated_ V7.6.15.9.5	NA	NA	NA
Antenna Tower EMCO	2070/2080	512.835.4684	NA	NA
Turn Table EMCO	2087-2.03	NA	NA	NA
Antenna Tower & Turn BV ADT	AT100	AT93021705	NA	NA
Turn Table BV ADT	TT100	TT93021705	NA	NA
Turn Table Controller BV ADT	SC100	SC93021705	NA	NA
Boresight Antenna Fixture	FBA-01	FBA-SIP01	NA	NA
Standard Temperature And Humidity Chamber TERCHY	HRM-120RF	931022	Dec. 12, 2019	Dec. 11, 2020
JFW 20dB attenuation	50HF-020-SMA	NA	NA	NA
Digital Multimeter Fluke	87-III	70360742	Jun. 27, 2019	Jun. 26, 2020
			Jun. 23, 2020	Jun. 22, 2021
DC power supply Keysight	U8002A	MY56330015	NA	NA

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 9.

3 General Information

3.1 General Description of EUT

Product	2D Code Handy Terminal		
Brand	DENSO		
Test Model	BHT-M80-QWG		
Sample Status	Engineering sample		
Power Supply Rating	3.85Vdc (Battery) 5.0Vdc / 9.0Vdc / 12.0Vdc (from adapter)		
Modulation Type	GSM, GPRS: GMSK EDGE: 8PSK WCDMA: BPSK, QPSK HSDPA: BPSK HSUPA: QPSK LTE: QPSK, 16QAM		
Operating Frequency	GSM/GPRS/EDGE	824.2~848.8MHz	
	WCDMA Band 5	826.4~846.6MHz	
	LTE Band 5 (Channel Bandwidth 1.4MHz)	824.7~848.3MHz	
	LTE Band 5 (Channel Bandwidth 3MHz)	825.5~847.5MHz	
	LTE Band 5 (Channel Bandwidth 5MHz)	826.5~846.5MHz	
	LTE Band 5 (Channel Bandwidth 10MHz)	829.0~844.0MHz	
Max. ERP Power	GSM	954.993mW (29.8dBm)	
	WCDMA Band 5	213.796mW (23.3dBm)	
		QPSK	16QAM
	LTE Band 5 (Channel Bandwidth 1.4MHz)	154.882mW (21.9dBm)	128.825mW (21.1dBm)
	LTE Band 5 (Channel Bandwidth 3MHz)	154.882mW (21.9dBm)	125.893mW (21.0dBm)
	LTE Band 5 (Channel Bandwidth 5MHz)	158.489mW (22.0dBm)	131.826mW (21.2dBm)
	LTE Band 5 (Channel Bandwidth 10MHz)	154.882mW (21.9dBm)	117.490mW (20.7dBm)
Emission Designator	GSM/GPRS	264KGXW	
	EDGE	261KG7W	
	WCDMA Band 5	4M15F9W	
		QPSK	16QAM
	LTE Band 5 (Channel Bandwidth 1.4MHz)	1M09G7D	1M09D7W
	LTE Band 5 (Channel Bandwidth 3MHz)	2M70G7D	2M70D7W
	LTE Band 5 (Channel Bandwidth 5MHz)	4M49G7D	4M49D7W
	LTE Band 5 (Channel Bandwidth 10MHz)	8M98G7D	8M98D7W
Antenna Type	Refer to note		
Antenna Connector	Refer to note		
Accessory Device	Refer to note		
Cable Supplied	Refer to note		

Note:

1. The EUT contains following accessory devices.

Battery 1	
Brand	DENSO
Model	BT1
Rating	3.85Vdc, 4020mAh, 15.47Wh

Battery 2	
Brand	DENSO
Model	BT1S
Rating	3.85Vdc, 2900mAh, 11.16Wh

Adapter	
Brand	CHANNEL WELL TECHNOLOGY
Model	2ACP0183C
Input Power	100-240Vac~0.5A , 50/60Hz
Output Power	5.0Vdc / 3.0A, 15.0W 9.0Vdc / 2.0A, 18.0W 12.0Vdc / 1.5A, 18.0W
Data Cable	1.45 m shielded USB cable without core

Cradle 1: QC3.0 charge single Cradle (Option)	
Brand	DENSO
Model	CU-M80UQ
Adapter	
Brand	CHANNEL WELL TECHNOLOGY
Model	2ACP0183C
Input Power	100-240Vac, 50/60Hz, 0.5A
Output Power	5.0Vdc / 3.0A, 15.0W 9.0Vdc / 2.0A, 18.0W 12.0Vdc / 1.5A, 18.0W
Data Cable	1.45 m shielded USB cable without core

Cradle 2: USB Cradle with spare battery charge (Option)	
Brand	DENSO
Model	CU-M80U
Adapter	
Brand	Sunny
Model	SYS1548-5012-T3
Input Power	100-240Vac, 1.5A MAX, 50-60Hz
Output Power	+12.0Vdc, 4.16A
Power cable	DC: 1.16m cable with one core AC: 1.71m non-shielded cable without core
Data Cable	1.45 m shielded USB cable without core

2. The EUT uses the following antennas.

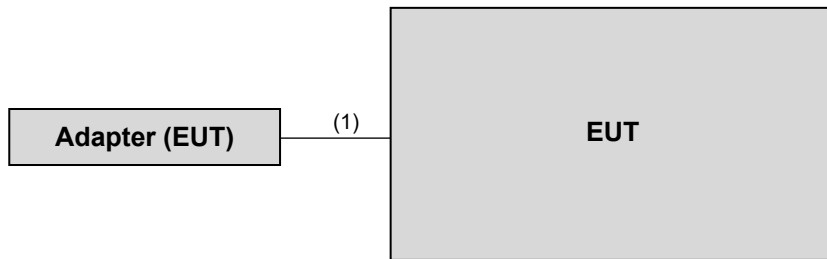
Ant. Type	PIFA		
Ant. Connector	Spring		
GSM850/WCDMA Band 5/LTE Band 5			
Frequency (MHz)	824	836	849
Peak Gain (dBi)	0.18	0.35	0.69

* The max. gain was chosen for final tests.

* The above Antenna information is declared by manufacturer and for more detailed features description, please refer to the manufacturer's specifications, the laboratory shall not be held responsible.

3.2 Configuration of System under Test

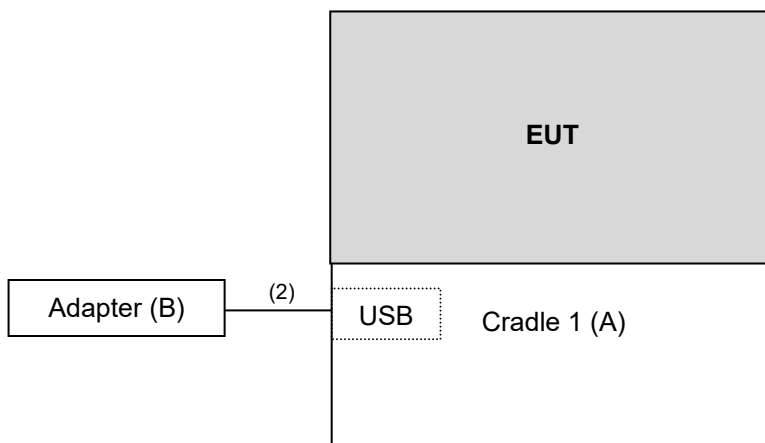
Mode A



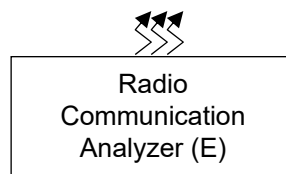
Remote site



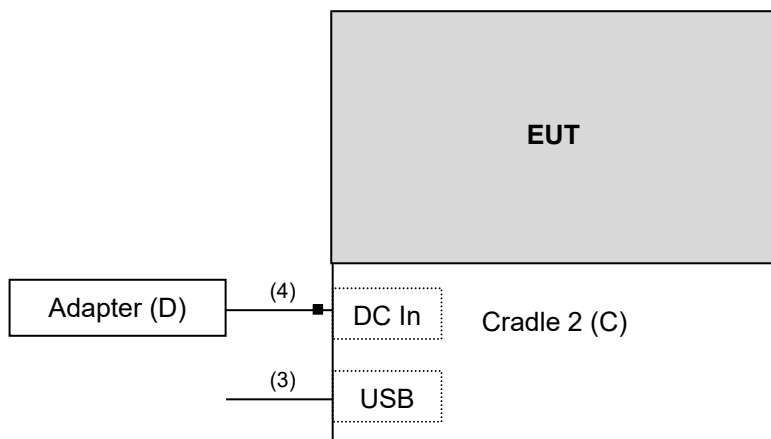
Mode B



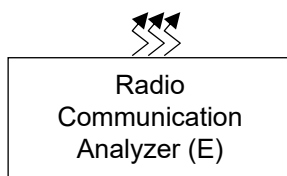
Remote site



Mode C



Remote site



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.

ID	Product	Brand	Model No.	Serial No.	FCC ID	Remarks
A.	Cradle 1	DENSO	CU-M80UQ	NA	NA	Provided by manufacturer
B.	Adapter	CWT	2ACP0183C	NA	NA	Provided by manufacturer
C.	Cradle 2	DENSO	CU-M80U	NA	NA	Provided by manufacturer
D.	Adapter	Sunny	SYS1548-5012-T3	NA	NA	Provided by manufacturer
E.	Radio Communication Analyzer	Anritsu	MT8821C	6201462755	NA	-

Note:

1. All power cords of the above support units are non-shielded (1.8m).
2. Item E acted as a communication partner to transfer data.

ID	Descriptions	Qty.	Length (m)	Shielding (Yes/No)	Cores (Qty.)	Remarks
1.	USB cable	1	1.45	Y	0	Accessory of EUT
2.	USB cable	1	1.45	Y	0	Provided by manufacturer
3.	USB cable	1	1.45	Y	0	Provided by manufacturer
4.	Power cable	1	1.16	-	1	Provided by manufacturer

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 on Y-plane. Following channel(s) was (were) selected for the final test as listed below.

Test results are presented in the report as below.

Test Mode	Test Condition
A	EUT with adapter
B	EUT with Cradle 1
C	EUT with Cradle 2

GSM Mode

EUT Configure Mode	Test Item	Available Channel	Tested Channel	Mode
A	ERP	128 to 251	128(824.2MHz), 189(836.4MHz), 251(848.8MHz)	GSM
A	Modulation Characteristics	128 to 251	128(824.2MHz)	GSM, GPRS, EDGE
A	Frequency Stability	128 to 251	128(824.2MHz), 251(848.8MHz)	GSM, EDGE
A	Occupied Bandwidth	128 to 251	128(824.2MHz), 189(836.4MHz), 251(848.8MHz)	GSM, GPRS, EDGE
A	Band Edge	128 to 251	128(824.2MHz), 251(848.8MHz)	GSM, GPRS, EDGE
A	Peak To Average Ratio	128 to 251	128(824.2MHz), 189(836.4MHz), 251(848.8MHz)	GSM, GPRS, EDGE
A	Conducted Emission	128 to 251	128(824.2MHz), 189(836.4MHz), 251(848.8MHz)	GSM, GPRS, EDGE
A, B, C	Radiated Emission Below 1GHz	128 to 251	189(836.4MHz)	GSM
A	Radiated Emission Above 1GHz	128 to 251	128(824.2MHz), 189(836.4MHz), 251(848.8MHz)	GSM

Note: For radiated emissions below 1 GHz, select the worst radiated emission (above 1GHz) channel for final testing.

WCDMA Band 5

EUT Configure Mode	Test Item	Available Channel	Tested Channel	Mode
A	ERP	4132 to 4233	4132 (826.4MHz), 4182 (836.4MHz), 4233 (846.6MHz)	WCDMA
A	Modulation Characteristics	4132 to 4233	4182 (836.4MHz)	WCDMA, HSDPA, HSUPA
A	Frequency Stability	4132 to 4233	4132 (826.4MHz), 4233 (846.6MHz)	WCDMA
A	Occupied Bandwidth	4132 to 4233	4132 (826.4MHz), 4182 (836.4MHz), 4233 (846.6MHz)	WCDMA, HSDPA, HSUPA
A	Band Edge	4132 to 4233	4132 (826.4MHz), 4233 (846.6MHz)	WCDMA, HSDPA, HSUPA
A	Peak To Average Ratio	4132 to 4233	4132 (826.4MHz), 4182 (836.4MHz), 4233 (846.6MHz)	WCDMA, HSDPA, HSUPA
A	Conducted Emission	4132 to 4233	4132 (826.4MHz), 4182 (836.4MHz), 4233 (846.6MHz)	WCDMA, HSDPA, HSUPA
A	Radiated Emission Below 1GHz	4132 to 4233	4132 (826.4MHz)	WCDMA
A	Radiated Emission Above 1GHz	4132 to 4233	4132 (826.4MHz), 4182 (836.4MHz), 4233 (846.6MHz)	WCDMA

Note: For radiated emissions below 1 GHz, select the worst radiated emission (above 1GHz) channel for final testing.

LTE Band 5

EUT Configure Mode	Test item	Available channel	Tested channel	Channel Bandwidth	Modulation	Mode
A	ERP	20407 to 20643	20407(824.7MHz), 20525(836.5MHz), 20643(848.3MHz)	1.4MHz	QPSK / 16QAM	1 RB / 0 RB Offset
		20415 to 20635	20415(825.5MHz), 20525(836.5MHz), 20635(847.5MHz)	3MHz	QPSK / 16QAM	1 RB / 0 RB Offset
		20425 to 20625	20425(826.5MHz), 20525(836.5MHz), 20625(846.5MHz)	5MHz	QPSK / 16QAM	1 RB / 0 RB Offset
		20450 to 20600	20450(829.0MHz), 20525(836.5MHz), 20600(844.0MHz)	10MHz	QPSK / 16QAM	1 RB / 0 RB Offset
A	Modulation characteristics	20450 to 20600	20525(836.5MHz)	10MHz	QPSK / 16QAM	50 RB / 0 RB Offset
A	Frequency Stability	20407 to 20643	20407(824.7MHz), 20643(848.3MHz)	1.4MHz	QPSK	1 RB / 0 RB Offset
		20415 to 20635	20415(825.5MHz), 20635(847.5MHz)	3MHz	QPSK	1 RB / 0 RB Offset
		20425 to 20625	20425(826.5MHz), 20625(846.5MHz)	5MHz	QPSK	1 RB / 0 RB Offset
		20450 to 20600	20450(829.0MHz), 20600(844.0MHz)	10MHz	QPSK	1 RB / 0 RB Offset
A	Occupied Bandwidth	20407 to 20643	20407(824.7MHz), 20525(836.5MHz), 20643(848.3MHz)	1.4MHz	QPSK / 16QAM	6 RB / 0RB Offset
		20415 to 20635	20415(825.5MHz), 20525(836.5MHz), 20635(847.5MHz)	3MHz	QPSK / 16QAM	15 RB / 0RB Offset
		20425 to 20625	20425(826.5MHz), 20525(836.5MHz), 20625(846.5MHz)	5MHz	QPSK / 16QAM	25RB / 0RB Offset
		20450 to 20600	20450(829.0MHz), 20525(836.5MHz), 20600(844.0MHz)	10MHz	QPSK / 16QAM	50RB / 0RB Offset
A	Band Edge	20407 to 20643	20407(824.7MHz), 20643(848.3MHz)	1.4MHz	QPSK	1 RB / 0 RB Offset 1 RB / 5 RB Offset 6 RB / 0 RB Offset
		20415 to 20635	20415(825.5MHz), 20635(847.5MHz)	3MHz	QPSK	1 RB / 0 RB Offset 1 RB / 14 RB Offset 15 RB / 0 RB Offset
		20425 to 20625	20425(826.5MHz), 20625(846.5MHz)	5MHz	QPSK	1 RB / 0 RB Offset 1 RB / 24 RB Offset 25 RB / 0 RB Offset
		20450 to 20600	20450(829.0MHz), 20600(844.0MHz)	10MHz	QPSK	1 RB / 0 RB Offset 1 RB / 49 RB Offset 50 RB / 0 RB Offset

EUT Configure Mode	Test item	Available channel	Tested channel	Channel Bandwidth	Modulation	Mode
A	Peak to Average Ratio	20407 to 20643	20407(824.7MHz), 20525(836.5MHz), 20643(848.3MHz)	1.4MHz	QPSK / 16QAM	1 RB / 0 RB Offset
		20415 to 20635	20415(825.5MHz), 20525(836.5MHz), 20635(847.5MHz)	3MHz	QPSK / 16QAM	1 RB / 0 RB Offset
		20425 to 20625	20425(826.5MHz), 20525(836.5MHz), 20625(846.5MHz)	5MHz	QPSK / 16QAM	1 RB / 0 RB Offset
		20450 to 20600	20450(829.0MHz), 20525(836.5MHz), 20600(844.0MHz)	10MHz	QPSK / 16QAM	1 RB / 0 RB Offset
A	Conducted Emission	20407 to 20643	20407(824.7MHz), 20525(836.5MHz), 20643(848.3MHz)	1.4MHz	QPSK	1 RB / 0 RB Offset
		20415 to 20635	20415(825.5MHz), 20525(836.5MHz), 20635(847.5MHz)	3MHz	QPSK	1 RB / 0 RB Offset
		20425 to 20625	20425(826.5MHz), 20525(836.5MHz), 20625(846.5MHz)	5MHz	QPSK	1 RB / 0 RB Offset
		20450 to 20600	20450(829.0MHz), 20525(836.5MHz), 20600(844.0MHz)	10MHz	QPSK	1 RB / 0 RB Offset
A	Radiated Emission Below 1GHz	20425 to 20625	20625(846.5MHz)	5MHz	QPSK	1 RB / 0 RB Offset
A	Radiated Emission Above 1GHz	20407 to 20643	20407(824.7MHz), 20525(836.5MHz), 20643(848.3MHz)	1.4MHz	QPSK	1 RB / 0 RB Offset
		20425 to 20625	20425(826.5MHz), 20525(836.5MHz), 20625(846.5MHz)	5MHz	QPSK	1 RB / 0 RB Offset
		20450 to 20600	20450(829.0MHz), 20525(836.5MHz), 20600(844.0MHz)	10MHz	QPSK	1 RB / 0 RB Offset

Note:

1. For radiated emission above 1GHz, according to 3GPP 36.521 Section 6.6.3.1.4, choose the lowest, 5MHz & highest channel bandwidth for final test. For radiated emissions below 1 GHz, select the worst radiated emission (above 1GHz) channel for final testing.
2. The conducted output power for QPSK and 16QAM, measured value of QPSK is higher than 16QAM mode. Therefore, only Modulation characteristics, occupied bandwidth and Peak to average ratio items had been tested under QPSK and 16QAM modes, the other test items were performed under QPSK mode only.

Test Condition:

Test Item	Environmental Conditions	Input Power (system)	Tested By
ERP	22deg. C, 66%RH	120Vac, 60Hz	Han Wu
Modulation Characteristics	24deg. C, 64%RH	120Vac, 60Hz	James Yang
Frequency Stability	24deg. C, 64%RH	120Vac, 60Hz	James Yang
Occupied Bandwidth	24deg. C, 64%RH	120Vac, 60Hz	James Yang
Band Edge	24deg. C, 64%RH	120Vac, 60Hz	James Yang
Peak To Average Ratio	24deg. C, 64%RH	120Vac, 60Hz	James Yang
Conducted Emission	24deg. C, 64%RH	120Vac, 60Hz	James Yang
Radiated Emission	22deg. C, 66%RH 22deg. C, 68%RH	120Vac, 60Hz	Han Wu Greg Lin

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

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

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 is 1MHz for GSM, 5MHz for WCDMA mode, 10MHz for LTE mode, and VBW $\geq 3 \times$ RBW.
- b. Substitution method is used for E.I.R.P measurement. In the semi-anechoic chamber, EUT placed on the 0.8m(below or equal 1GHz) and/or 1.5m(above 1GHz) 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 1m to 4m to find the maximum polar radiated power. The "Read Value" is the spectrum reading the maximum power value.
- c. EIRP = Output power level of S.G – TX cable loss + 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 power = E.I.R.P power - 2.15dBi.

Where:

$$\text{ERP/EIRP} = P_{\text{Meas}} + G_T - L_C$$

P_{Meas} : Measure transmitter output power.

G_T : Gain of the transmitting antenna.

L_C : signal attenuation in the connecting cable between the transmitter and antenna.

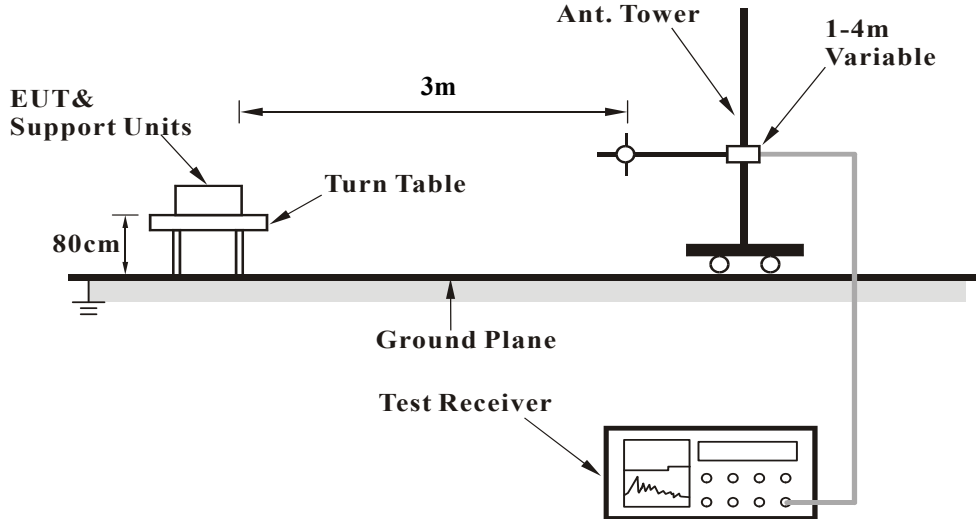
Conducted Power Measurement:

The EUT was set up for the maximum power with GSM, WCDMA, 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.

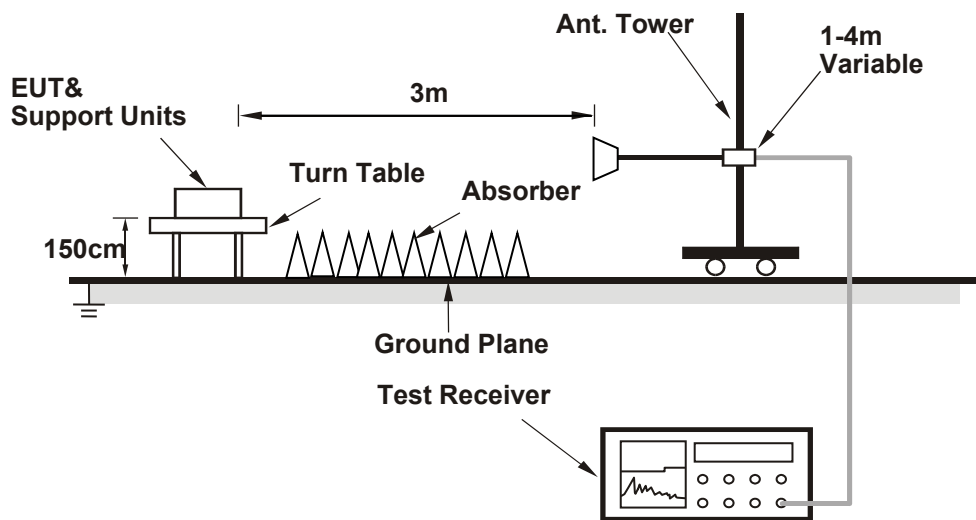
4.1.3 Test Setup

EIRP / ERP Measurement:

For radiated emission 30MHz to 1GHz



For radiated emission above 1GHz



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

Conducted Power Measurement:



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

4.1.4 Test Results

Conducted Output Power (dBm)

Band	GSM850		
Channel	128	189	251
Frequency (MHz)	824.2	836.4	848.8
GSM	31.99	31.83	31.98
GPRS 1Tx Slot	31.97	31.81	31.96
GPRS 2Tx Slot	31.59	31.43	31.58
GPRS 3Tx Slot	30.49	30.33	30.48
GPRS 4Tx Slot	29.72	29.56	29.71
EDGE 1Tx Slot (MCS9)	26.49	26.39	26.48
EDGE 2Tx Slot (MCS9)	25.13	24.97	25.12
EDGE 3Tx Slot (MCS9)	24.42	24.26	24.41
EDGE 4Tx Slot (MCS9)	23.27	23.11	23.26

Band	WCDMA V		
TX Channel	4132	4182	4233
Frequency (MHz)	826.4	836.4	846.6
RMC 12.2K	24.42	24.32	24.35
HSDPA Subtest-1	23.37	23.44	23.39
HSDPA Subtest-2	23.47	23.46	23.41
HSDPA Subtest-3	22.96	22.96	22.90
HSDPA Subtest-4	22.85	22.95	22.80
DC-HSDPA Subtest-1	23.33	23.41	23.34
DC-HSDPA Subtest-2	23.40	23.45	23.40
DC-HSDPA Subtest-3	22.91	22.93	22.88
DC-HSDPA Subtest-4	22.87	22.90	22.82
HSUPA Subtest-1	23.49	23.37	23.42
HSUPA Subtest-2	21.40	21.29	21.33
HSUPA Subtest-3	22.40	22.38	22.41
HSUPA Subtest-4	21.48	21.37	21.40
HSUPA Subtest-5	23.44	23.40	23.40

LTE Band 5							
BW	MCS Index	RB Size	RB Offset	Low	Mid	High	3GPP MPR (dB)
		Channel		20407	20525	20643	
		Frequency (MHz)		824.7	836.5	848.3	
1.4M	QPSK	1	0	23.22	23.39	23.32	0
		1	2	23.22	23.31	23.32	0
		1	5	23.24	23.22	23.19	0
		3	0	23.37	23.22	23.31	0
		3	1	23.34	23.35	23.36	0
		3	3	23.29	23.30	23.25	0
	16QAM	1	0	22.48	22.38	22.35	1
		1	2	22.40	22.37	22.32	1
		1	5	22.26	22.34	22.19	1
		3	0	22.43	22.31	22.27	1
		3	1	22.38	22.30	22.29	1
		3	3	22.21	22.18	22.32	1
		6	0	21.30	21.26	21.26	2

LTE Band 5							
BW	MCS Index	RB Size	RB Offset	Low	Mid	High	3GPP MPR (dB)
		Channel		20415	20525	20635	
		Frequency (MHz)		825.5	836.5	847.5	
3M	QPSK	1	0	23.24	23.38	23.23	0
		1	7	23.30	23.21	23.02	0
		1	14	23.34	23.22	23.18	0
		8	0	22.36	22.23	22.27	1
		8	3	22.33	22.27	22.31	1
		8	7	22.29	22.31	22.35	1
	16QAM	15	0	22.32	22.39	22.19	1
		1	0	22.30	22.33	22.28	1
		1	7	22.34	22.35	22.26	1
		1	14	22.23	22.30	22.30	1
		8	0	21.41	21.34	21.35	2
		8	3	21.35	21.19	21.33	2
		8	7	21.26	21.24	21.29	2
15	0	21.31	21.22	21.27	2		

LTE Band 5							
BW	MCS Index	RB Size	RB Offset	Low	Mid	High	3GPP MPR (dB)
		Channel		20425	20525	20625	
		Frequency (MHz)		826.5	836.5	846.5	
5M	QPSK	1	0	23.26	23.33	23.31	0
		1	12	23.25	23.30	23.30	0
		1	24	23.26	23.13	23.15	0
		12	0	22.44	22.36	22.21	1
		12	6	22.39	22.26	22.28	1
		12	13	22.34	22.24	22.24	1
		25	0	22.34	22.22	22.31	1
	16QAM	1	0	22.34	22.41	22.25	1
		1	12	22.32	22.26	22.32	1
		1	24	22.42	22.29	22.25	1
		12	0	21.36	21.37	21.37	2
		12	6	21.44	21.42	21.32	2
		12	13	21.37	21.18	21.16	2
		25	0	21.41	21.24	21.22	2

LTE Band 5							
BW	MCS Index	RB Size	RB Offset	Low	Mid	High	3GPP MPR (dB)
		Channel		20450	20525	20600	
		Frequency (MHz)		829	836.5	844	
10M	QPSK	1	0	23.36	23.44	23.46	0
		1	24	23.33	23.41	23.43	0
		1	49	23.29	23.37	23.39	0
		25	0	22.39	22.47	22.49	1
		25	12	22.36	22.44	22.46	1
		25	25	22.33	22.41	22.43	1
		50	0	22.34	22.42	22.44	1
	16QAM	1	0	22.37	22.45	22.47	1
		1	24	22.33	22.41	22.43	1
		1	49	22.29	22.37	22.39	1
		25	0	21.38	21.46	21.48	2
		25	12	21.36	21.44	21.46	2
		25	25	21.32	21.40	21.42	2
		50	0	21.34	21.42	21.44	2

ERP Power

GSM Mode

Mode		TX channel 128, 189, 251					
Antenna Polarity & Test Distance: Horizontal at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)
1	824.2	-1.9	25.7	3.9	29.6	38.5	-8.9
2	836.4	-1.4	26.0	3.8	29.8	38.5	-8.7
3	848.8	-1.7	26.0	3.4	29.4	38.5	-9.1
Antenna Polarity & Test Distance: Vertical at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)
1	824.2	-4.4	24.0	3.9	27.9	38.5	-10.6
2	836.4	-4.1	24.0	3.8	27.8	38.5	-10.7
3	848.8	-4.8	23.3	3.4	26.7	38.5	-11.8

Note: ERP (dBm) = S.G Power Value (dBm) + Correction Factor (dB).

WCDMA Band 5

Mode		TX channel 4132, 4182, 4233					
Antenna Polarity & Test Distance: Horizontal at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)
1	826.4	-8.2	19.4	3.9	23.3	38.5	-15.2
2	836.4	-8.1	19.4	3.8	23.2	38.5	-15.3
3	846.6	-8.6	19.0	3.4	22.4	38.5	-16.1
Antenna Polarity & Test Distance: Vertical at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)
1	826.4	-10.6	17.7	3.9	21.6	38.5	-16.9
2	836.4	-10.2	17.9	3.8	21.7	38.5	-16.8
3	846.6	-10.8	17.4	3.4	20.8	38.5	-17.7

Note: ERP (dBm) = S.G Power Value (dBm) + Correction Factor (dB).

Modulation Type: QPSK

LTE Band 5, Channel Bandwidth: 1.4MHz

Mode		TX channel 20407, 20525, 20643					
Antenna Polarity & Test Distance: Horizontal at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)
1	824.7	-9.9	17.7	3.9	21.6	38.5	-16.9
2	836.5	-9.4	18.1	3.8	21.9	38.5	-16.6
3	848.3	-9.4	18.3	3.4	21.7	38.5	-16.8
Antenna Polarity & Test Distance: Vertical at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)
1	824.7	-16.6	11.7	3.9	15.6	38.5	-22.9
2	836.5	-16.2	11.9	3.8	15.7	38.5	-22.8
3	848.3	-16.8	11.3	3.4	14.7	38.5	-23.8

Note: ERP (dBm) = S.G Power Value (dBm) + Correction Factor (dB).

LTE Band 5, Channel Bandwidth: 3MHz

Mode		TX channel 20415, 20525, 20635					
Antenna Polarity & Test Distance: Horizontal at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)
1	825.5	-9.7	17.9	3.9	21.8	38.5	-16.7
2	836.5	-9.4	18.1	3.8	21.9	38.5	-16.6
3	847.5	-9.8	17.8	3.4	21.2	38.5	-17.3
Antenna Polarity & Test Distance: Vertical at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)
1	825.5	-16.9	11.5	3.9	15.4	38.5	-23.1
2	836.5	-16.4	11.7	3.8	15.5	38.5	-23.0
3	847.5	-16.5	11.7	3.4	15.1	38.5	-23.4

Note: ERP (dBm) = S.G Power Value (dBm) + Correction Factor (dB).

LTE Band 5, Channel Bandwidth: 5MHz

Mode		TX channel 20425, 20525, 20625					
Antenna Polarity & Test Distance: Horizontal at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)
1	826.5	-9.5	18.1	3.9	22.0	38.5	-16.5
2	836.5	-9.4	18.0	3.8	21.8	38.5	-16.7
3	846.5	-9.8	17.8	3.4	21.2	38.5	-17.3
Antenna Polarity & Test Distance: Vertical at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)
1	826.5	-16.6	11.7	3.9	15.6	38.5	-22.9
2	836.5	-16.4	11.7	3.8	15.5	38.5	-23.0
3	846.5	-17.1	11.1	3.4	14.5	38.5	-24.0

Note: ERP (dBm) = S.G Power Value (dBm) + Correction Factor (dB).

LTE Band 5, Channel Bandwidth: 10MHz

Mode		TX channel 20450, 20525, 20600					
Antenna Polarity & Test Distance: Horizontal at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)
1	829.0	-9.7	18.0	3.9	21.9	38.5	-16.6
2	836.5	-10.1	17.4	3.8	21.2	38.5	-17.3
3	844.0	-10.1	17.5	3.7	21.2	38.5	-17.3
Antenna Polarity & Test Distance: Vertical at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)
1	829.0	-16.9	11.3	3.9	15.2	38.5	-23.3
2	836.5	-16.9	11.2	3.8	15.0	38.5	-23.5
3	844.0	-16.9	11.5	3.7	15.2	38.5	-23.3

Note: ERP (dBm) = S.G Power Value (dBm) + Correction Factor (dB).

Modulation Type: 16QAM

LTE Band 5, Channel Bandwidth: 1.4MHz

Mode		TX channel 20407, 20525, 20643					
Antenna Polarity & Test Distance: Horizontal at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)
1	824.7	-10.7	16.9	3.9	20.8	38.5	-17.7
2	836.5	-10.1	17.3	3.8	21.1	38.5	-17.4
3	848.3	-10.6	17.1	3.4	20.5	38.5	-18.0
Antenna Polarity & Test Distance: Vertical at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)
1	824.7	-17.6	10.7	3.9	14.6	38.5	-23.9
2	836.5	-17.1	11.0	3.8	14.8	38.5	-23.7
3	848.3	-17.8	10.3	3.4	13.7	38.5	-24.8

Note: ERP (dBm) = S.G Power Value (dBm) + Correction Factor (dB).

LTE Band 5, Channel Bandwidth: 3MHz

Mode		TX channel 20415, 20525, 20635					
Antenna Polarity & Test Distance: Horizontal at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)
1	825.5	-10.6	17.0	3.9	20.9	38.5	-17.6
2	836.5	-10.2	17.2	3.8	21.0	38.5	-17.5
3	847.5	-10.7	16.9	3.4	20.3	38.5	-18.2
Antenna Polarity & Test Distance: Vertical at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)
1	825.5	-17.9	10.5	3.9	14.4	38.5	-24.1
2	836.5	-17.2	10.9	3.8	14.7	38.5	-23.8
3	847.5	-17.6	10.6	3.4	14.0	38.5	-24.5

Note: ERP (dBm) = S.G Power Value (dBm) + Correction Factor (dB).

LTE Band 5, Channel Bandwidth: 5MHz

Mode		TX channel 20425, 20525, 20625					
Antenna Polarity & Test Distance: Horizontal at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)
1	826.5	-10.3	17.3	3.9	21.2	38.5	-17.3
2	836.5	-10.4	17.1	3.8	20.9	38.5	-17.6
3	846.5	-10.9	16.7	3.4	20.1	38.5	-18.4
Antenna Polarity & Test Distance: Vertical at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)
1	826.5	-17.4	11.0	3.9	14.9	38.5	-23.6
2	836.5	-17.2	10.9	3.8	14.7	38.5	-23.8
3	846.5	-18.0	10.2	3.4	13.6	38.5	-24.9

Note: ERP (dBm) = S.G Power Value (dBm) + Correction Factor (dB).

LTE Band 5, Channel Bandwidth: 10MHz

Mode		TX channel 20450, 20525, 20600					
Antenna Polarity & Test Distance: Horizontal at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)
1	829.0	-10.9	16.8	3.9	20.7	38.5	-17.8
2	836.5	-11.1	16.3	3.8	20.1	38.5	-18.4
3	844.0	-10.9	16.7	3.7	20.4	38.5	-18.1
Antenna Polarity & Test Distance: Vertical at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)
1	829.0	-17.9	10.3	3.9	14.2	38.5	-24.3
2	836.5	-18.1	10.0	3.8	13.8	38.5	-24.7
3	844.0	-17.7	10.7	3.7	14.4	38.5	-24.1

Note: ERP (dBm) = S.G Power Value (dBm) + Correction Factor (dB).

4.2 Modulation Characteristics Measurement

4.2.1 Limits of Modulation Characteristics

N/A

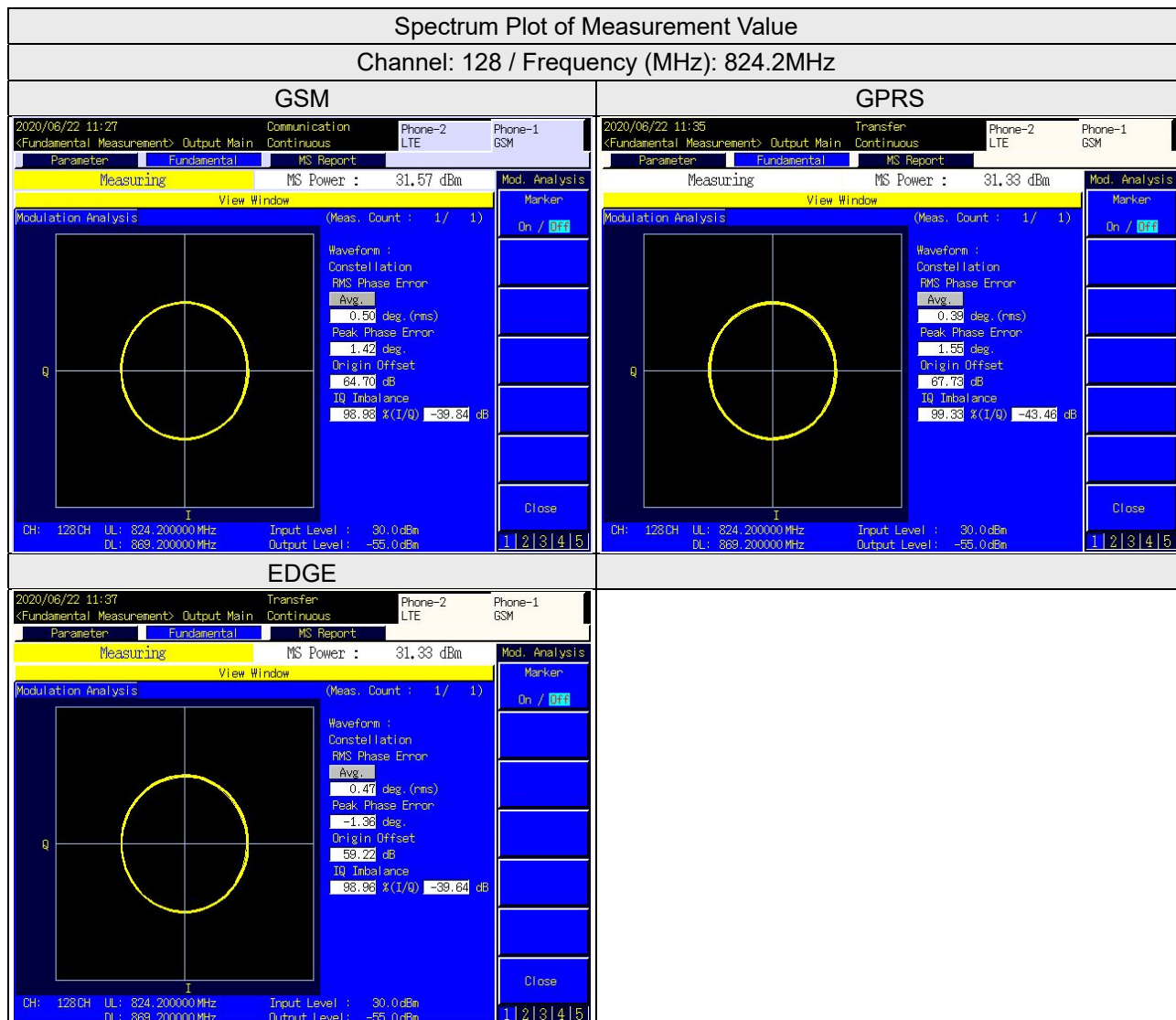
4.2.2 Test Procedure

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.

4.2.3 Test Setup



4.2.4 Test Results

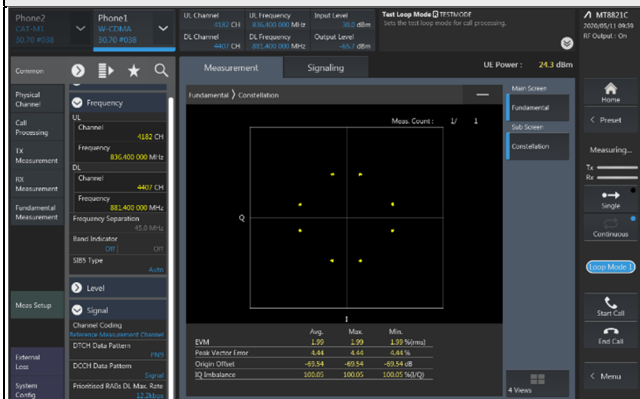


WCDMA Band 5

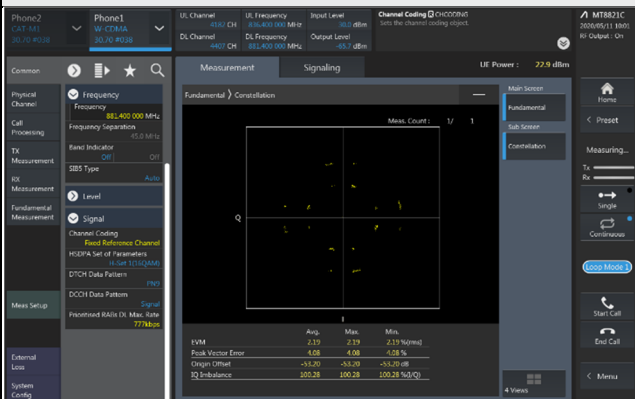
Spectrum Plot of Measurement Value

Channel: 4182 / Frequency (MHz): 836.4MHz

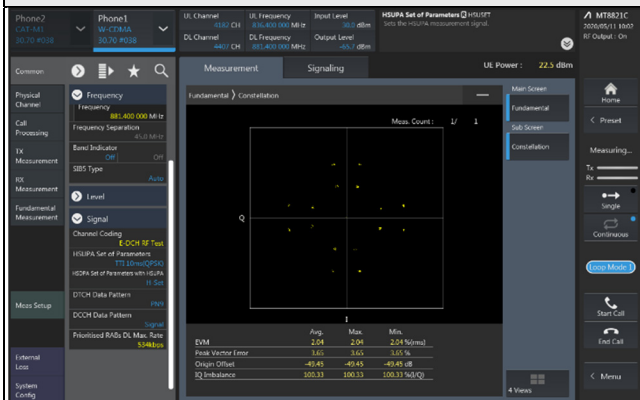
WCDMA



HSDPA



HSUPA

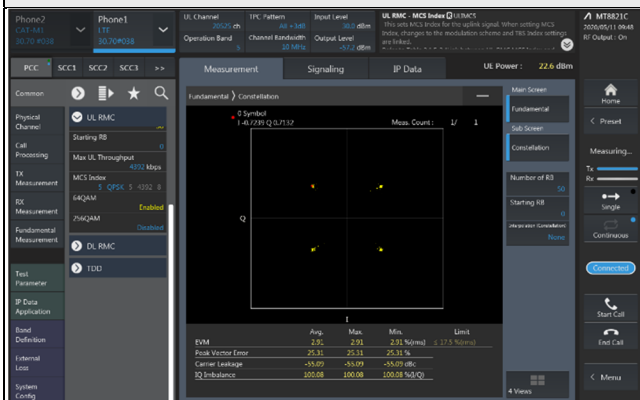


LTE Band 5

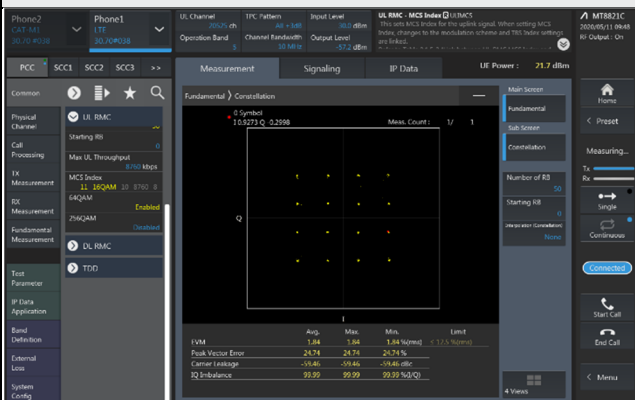
Spectrum Plot of Measurement Value

Channel: 20525 / Frequency (MHz): 836.5MHz

QPSK



16QAM



4.3 Frequency Stability Measurement

4.3.1 Limits of Frequency Stability Measurement

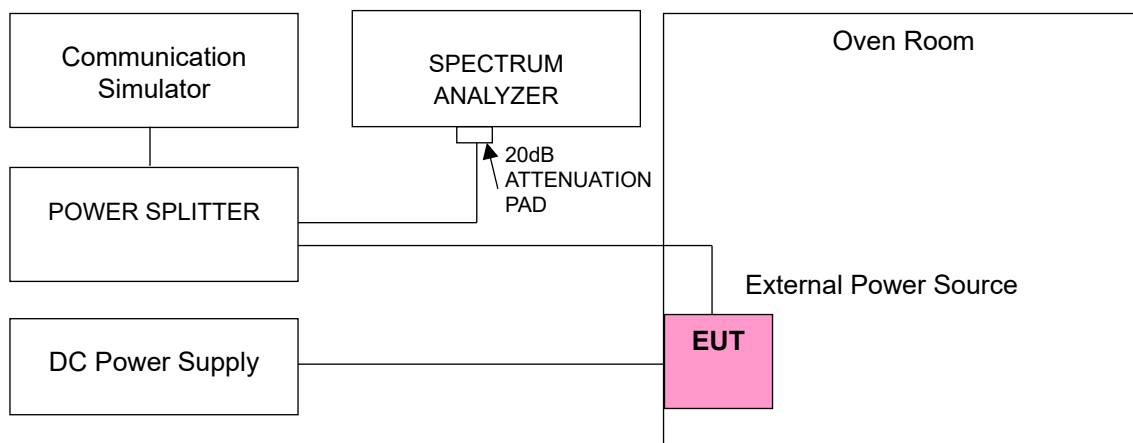
1.5 ppm is for base and fixed station. 2.5 ppm is for mobile station.

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)	GSM 850			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
3.85	824.200004	0.005	848.800003	0.004
3.27	824.200004	0.005	848.800001	0.001
4.42	824.200003	0.003	848.800002	0.002

Note: The applicant defined the normal working voltage is from 3.27Vdc to 4.42Vdc.

Frequency Error vs. Temperature

Temp. (°C)	GSM 850			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
-30	824.200004	0.004	848.800001	0.002
-20	824.200004	0.004	848.800004	0.004
-10	824.200003	0.004	848.800003	0.004
0	824.200004	0.005	848.800002	0.002
10	824.200003	0.004	848.800002	0.002
20	824.199998	-0.003	848.799997	-0.004
30	824.199999	-0.002	848.799997	-0.004
40	824.199999	-0.002	848.799998	-0.003
50	824.199997	-0.004	848.799997	-0.003

Frequency Error vs. Voltage

Voltage (Volts)	EDGE 850			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
3.85	824.200001	0.001	848.800004	0.005
3.27	824.200003	0.004	848.800002	0.002
4.42	824.200004	0.005	848.800003	0.003

Note: The applicant defined the normal working voltage is from 3.27Vdc to 4.42Vdc.

Frequency Error vs. Temperature

Temp. (°C)	EDGE 850			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
-30	824.200003	0.003	848.800003	0.004
-20	824.200002	0.003	848.800002	0.002
-10	824.200002	0.002	848.800003	0.003
0	824.200004	0.004	848.800003	0.004
10	824.200003	0.004	848.800004	0.004
20	824.199996	-0.004	848.799997	-0.004
30	824.199998	-0.002	848.799999	-0.002
40	824.199998	-0.003	848.799997	-0.004
50	824.199999	-0.002	848.799996	-0.005

Frequency Error vs. Voltage

Voltage (Volts)	WCDMA Band 5			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
3.85	826.400003	0.003	846.600004	0.004
3.27	826.400003	0.003	846.600002	0.002
4.42	826.400002	0.002	846.600002	0.002

Note: The applicant defined the normal working voltage is from 3.27Vdc to 4.42Vdc.

Frequency Error vs. Temperature

Temp. (°C)	WCDMA Band 5			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
-30	826.400002	0.002	846.600001	0.002
-20	826.400003	0.004	846.600003	0.004
-10	826.400004	0.005	846.600003	0.004
0	826.400002	0.002	846.600001	0.002
10	826.400003	0.004	846.600001	0.002
20	826.399997	-0.004	846.599998	-0.002
30	826.399999	-0.002	846.599998	-0.003
40	826.399997	-0.004	846.599998	-0.002
50	826.399998	-0.002	846.599996	-0.004

Frequency Error vs. Voltage

Voltage (Volts)	LTE Band 5			
	Channel Bandwidth: 1.4 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
3.85	824.700002	0.002	848.300003	0.003
3.27	824.700003	0.004	848.300002	0.002
4.42	824.700003	0.003	848.300002	0.002

Note: The applicant defined the normal working voltage is from 3.27Vdc to 4.42Vdc.

Frequency Error vs. Temperature

Temp. (°C)	LTE Band 5			
	Channel Bandwidth: 1.4 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
-30	824.700001	0.001	848.300002	0.002
-20	824.700004	0.005	848.300004	0.004
-10	824.700003	0.004	848.300003	0.003
0	824.700004	0.005	848.300002	0.002
10	824.700002	0.002	848.300002	0.002
20	824.699999	-0.002	848.299996	-0.005
30	824.699999	-0.001	848.299998	-0.002
40	824.699996	-0.005	848.299997	-0.004
50	824.699997	-0.004	848.299997	-0.003

Frequency Error vs. Voltage

Voltage (Volts)	LTE Band 5			
	Channel Bandwidth: 3 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
3.85	825.500002	0.003	847.500002	0.002
3.27	825.500002	0.002	847.500003	0.004
4.42	825.500003	0.004	847.500001	0.001

Note: The applicant defined the normal working voltage is from 3.27Vdc to 4.42Vdc.

Frequency Error vs. Temperature

Temp. (°C)	LTE Band 5			
	Channel Bandwidth: 3 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
-30	825.500002	0.002	847.500002	0.003
-20	825.500001	0.002	847.500004	0.004
-10	825.500001	0.001	847.500002	0.002
0	825.500004	0.004	847.500002	0.003
10	825.500004	0.004	847.500002	0.002
20	825.499997	-0.003	847.499998	-0.003
30	825.499998	-0.003	847.499998	-0.003
40	825.499997	-0.004	847.499998	-0.003
50	825.499997	-0.003	847.499996	-0.005

Frequency Error vs. Voltage

Voltage (Volts)	LTE Band 5			
	Channel Bandwidth: 5 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
3.85	826.500002	0.003	846.500003	0.003
3.27	826.500001	0.001	846.500001	0.001
4.42	826.500002	0.002	846.500002	0.002

Note: The applicant defined the normal working voltage is from 3.27Vdc to 4.42Vdc.

Frequency Error vs. Temperature

Temp. (°C)	LTE Band 5			
	Channel Bandwidth: 5 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
-30	826.500003	0.004	846.500001	0.001
-20	826.500002	0.003	846.500002	0.002
-10	826.500002	0.002	846.500002	0.002
0	826.500003	0.004	846.500001	0.001
10	826.500001	0.002	846.500003	0.003
20	826.499998	-0.003	846.499998	-0.002
30	826.499998	-0.003	846.499999	-0.001
40	826.499998	-0.003	846.499997	-0.003
50	826.499997	-0.004	846.499997	-0.004

Frequency Error vs. Voltage

Voltage (Volts)	LTE Band 5			
	Channel Bandwidth: 10 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
3.85	829.000002	0.002	844.000002	0.002
3.27	829.000002	0.003	844.000002	0.002
4.42	829.000003	0.004	844.000003	0.004

Note: The applicant defined the normal working voltage is from 3.27Vdc to 4.42Vdc.

Frequency Error vs. Temperature

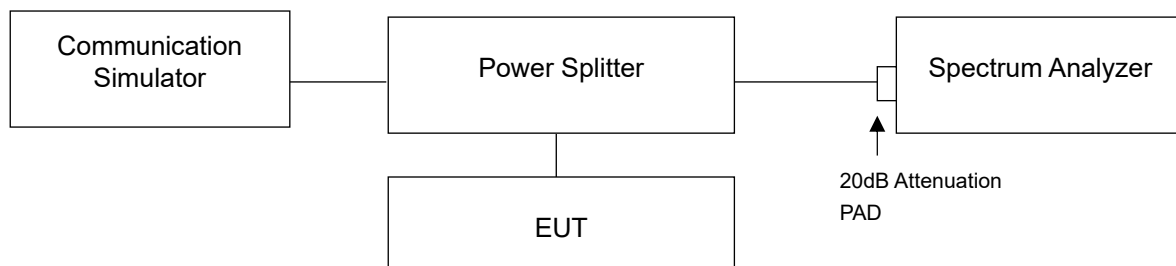
Temp. (°C)	LTE Band 5			
	Channel Bandwidth: 10 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
-30	829.000001	0.001	844.000002	0.003
-20	829.000002	0.003	844.000004	0.005
-10	829.000003	0.004	844.000002	0.003
0	829.000003	0.003	844.000002	0.002
10	829.000002	0.002	844.000003	0.003
20	828.999998	-0.003	843.999997	-0.004
30	828.999996	-0.005	843.999999	-0.002
40	828.999997	-0.004	843.999997	-0.004
50	828.999997	-0.004	843.999996	-0.004

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

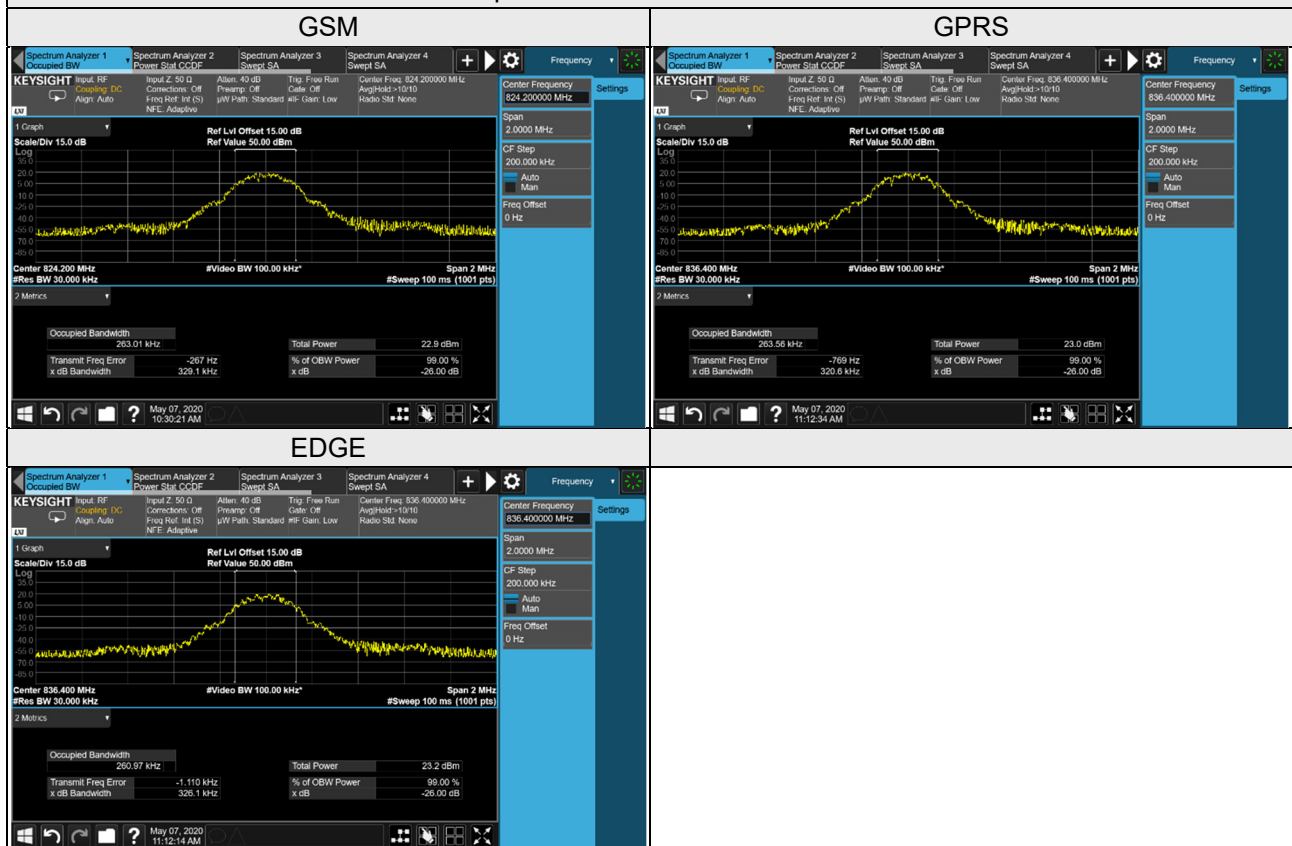


4.4.3 Test Result

Occupied Bandwidth GSM

Channel	Frequency (MHz)	99% Occupied Bandwidth (kHz)		
		GSM	GPRS	EDGE
128	824.2	263.01	255.95	257.38
189	836.4	259.73	263.56	260.97
251	848.8	255.20	250.24	258.78

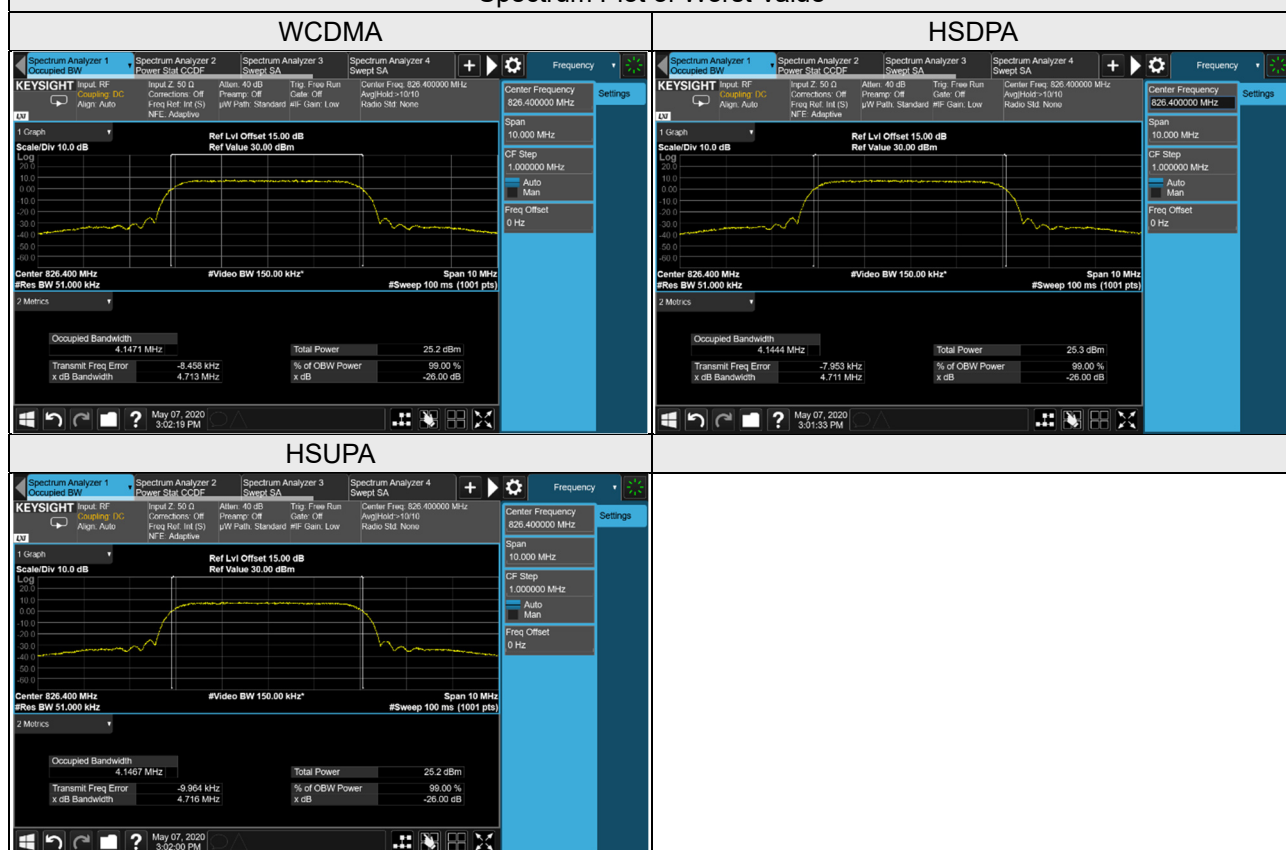
Spectrum Plot of Worst Value



WCDMA Band 5

Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)		
		WCDMA	HSDPA	HSUPA
4132	826.4	4.147	4.144	4.147
4182	836.4	4.142	4.139	4.144
4233	846.6	4.140	4.137	4.138

Spectrum Plot of Worst Value

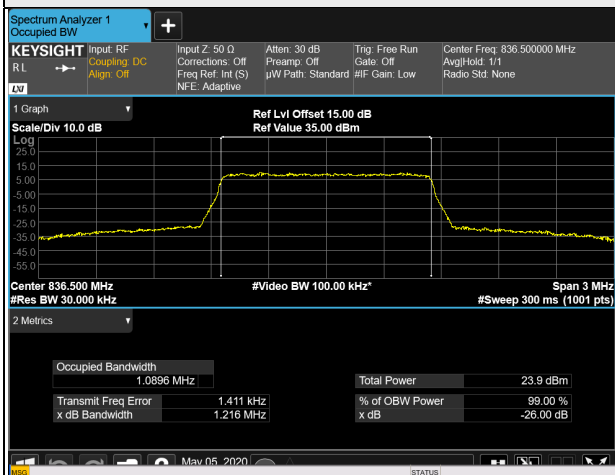


LTE Band 5

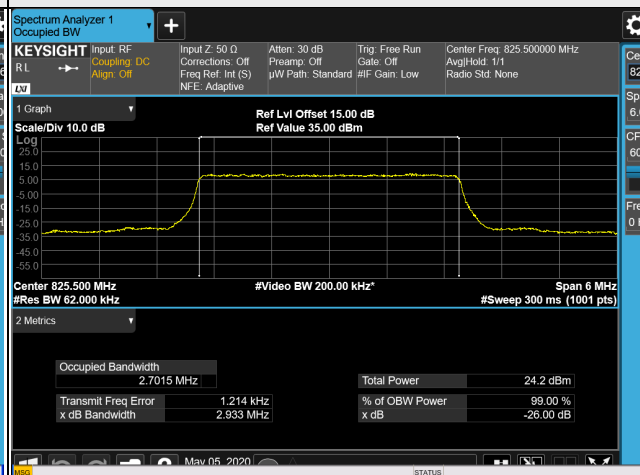
LTE Band 5, Channel Bandwidth 1.4MHz			
Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)	
		QPSK	16QAM
20407	824.7	1.09	1.09
20525	836.5	1.09	1.09
20643	848.3	1.09	1.09
LTE Band 5, Channel Bandwidth 3MHz			
Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)	
		QPSK	16QAM
20415	825.5	2.70	2.70
20525	836.5	2.70	2.70
20635	847.5	2.70	2.70
LTE Band 5, Channel Bandwidth 5MHz			
Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)	
		QPSK	16QAM
20425	826.5	4.49	4.49
20525	836.5	4.49	4.49
20625	846.5	4.49	4.49
LTE Band 5, Channel Bandwidth 10MHz			
Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)	
		QPSK	16QAM
20450	829.0	8.98	8.98
20525	836.5	8.96	8.96
20600	844.0	8.97	8.97

Spectrum Plot of Worst Value

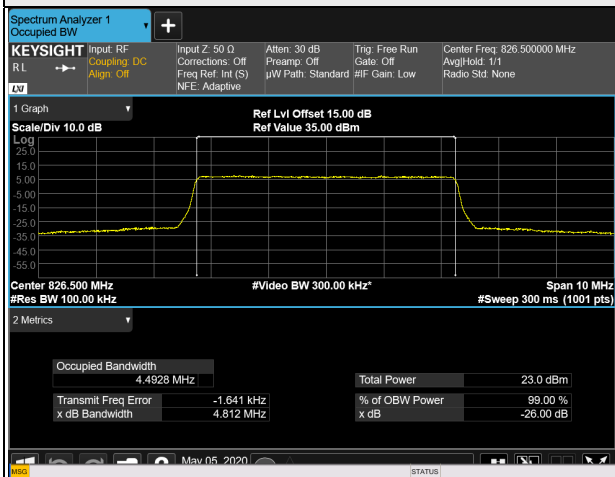
1.4MHz / 16QAM



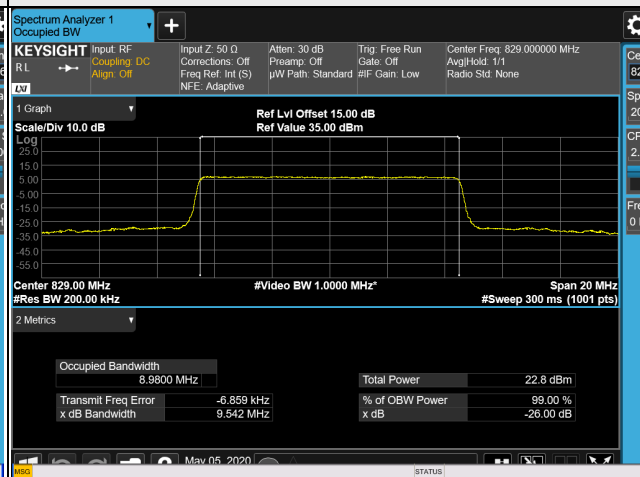
3MHz / QPSK



5MHz / 16QAM



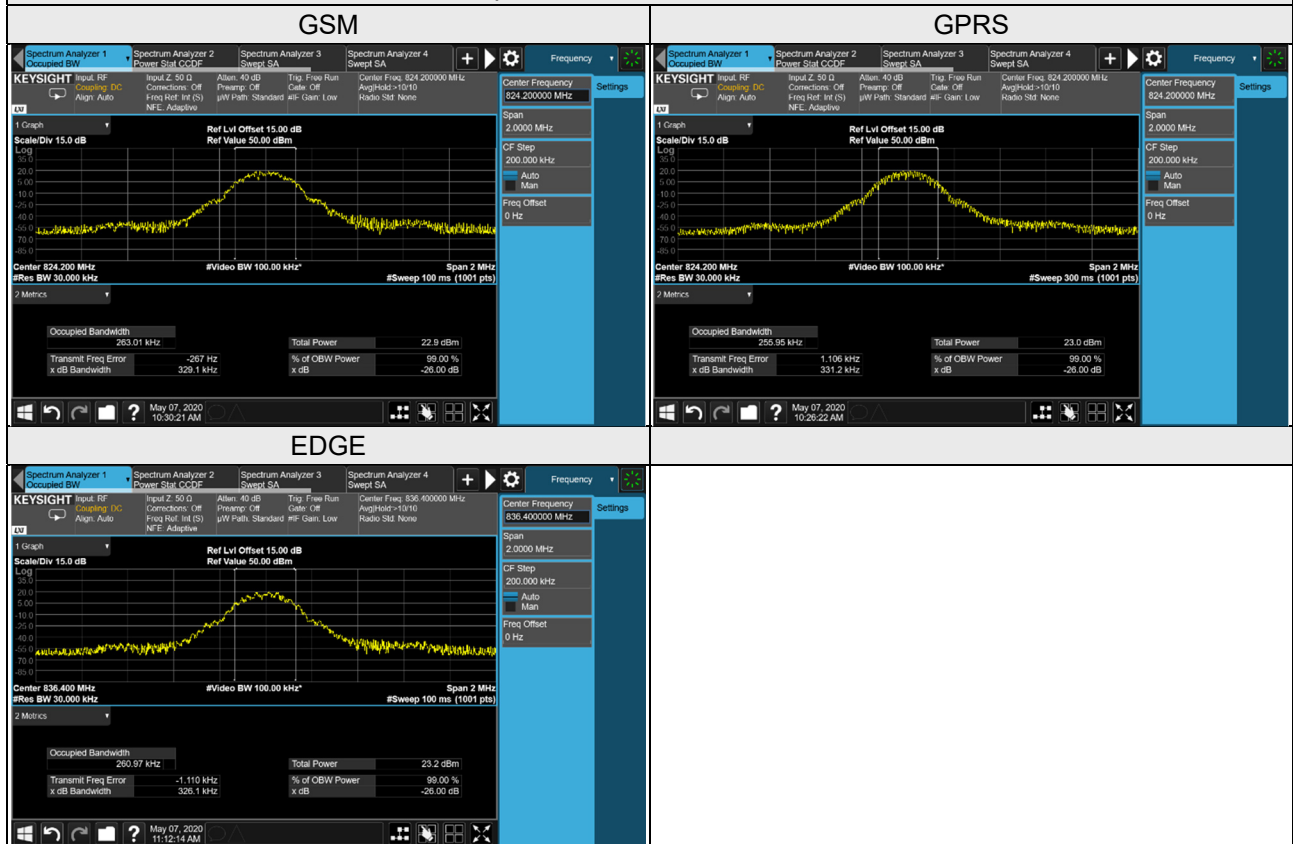
10MHz / 16QAM



26dB Bandwidth
GSM

Channel	Frequency (MHz)	26dB Bandwidth (kHz)		
		GSM	GPRS	EDGE
128	824.2	329.10	331.2	322.7
189	836.4	326.30	320.6	326.1
251	848.8	317.70	317.3	322.9

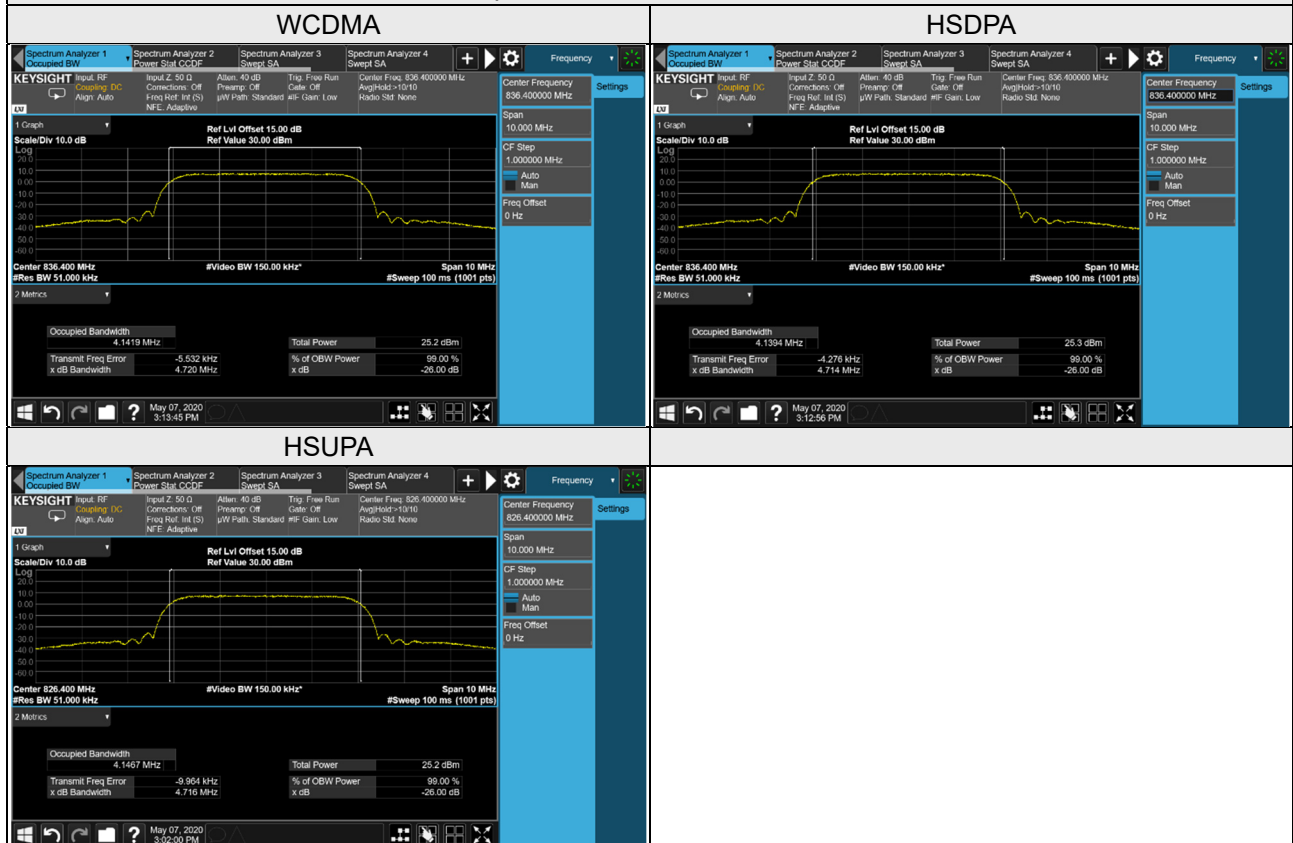
Spectrum Plot of Worst Value



WCDMA Band 5

Channel	Frequency (MHz)	26dB Bandwidth (MHz)		
		WCDMA	HSDPA	HSUPA
4132	826.4	4.713	4.711	4.716
4182	836.4	4.720	4.714	4.711
4233	846.6	4.713	4.702	4.712

Spectrum Plot of Worst Value

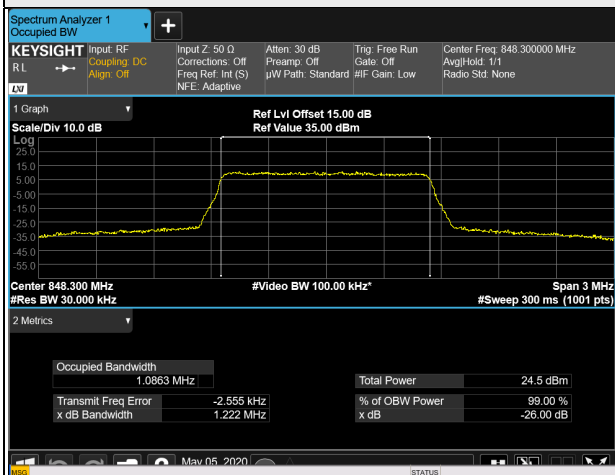


LTE Band 5

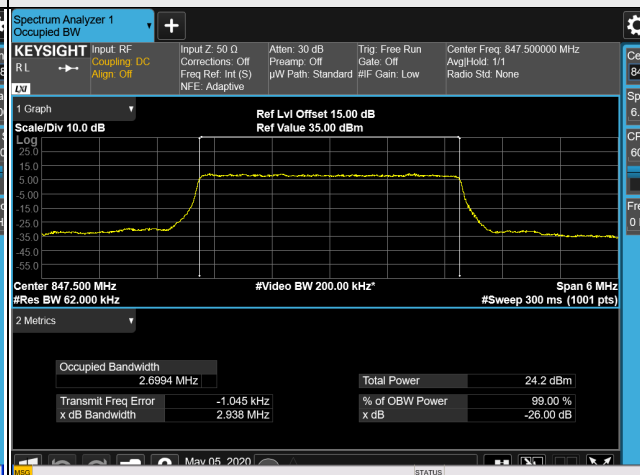
LTE Band 5, Channel Bandwidth 1.4MHz			
Channel	Frequency (MHz)	26dB Bandwidth (MHz)	
		QPSK	16QAM
20407	824.7	1.22	1.22
20525	836.5	1.22	1.22
20643	848.3	1.22	1.22
LTE Band 5, Channel Bandwidth 3MHz			
Channel	Frequency (MHz)	26dB Bandwidth (MHz)	
		QPSK	16QAM
20415	825.5	2.93	2.92
20525	836.5	2.94	2.94
20635	847.5	2.94	2.93
LTE Band 5, Channel Bandwidth 5MHz			
Channel	Frequency (MHz)	26dB Bandwidth (MHz)	
		QPSK	16QAM
20425	826.5	4.83	4.81
20525	836.5	4.82	4.81
20625	846.5	4.82	4.81
LTE Band 5, Channel Bandwidth 10MHz			
Channel	Frequency (MHz)	26dB Bandwidth (MHz)	
		QPSK	16QAM
20450	829.0	9.53	9.54
20525	836.5	9.54	9.50
20600	844.0	9.53	9.52

Spectrum Plot of Worst Value

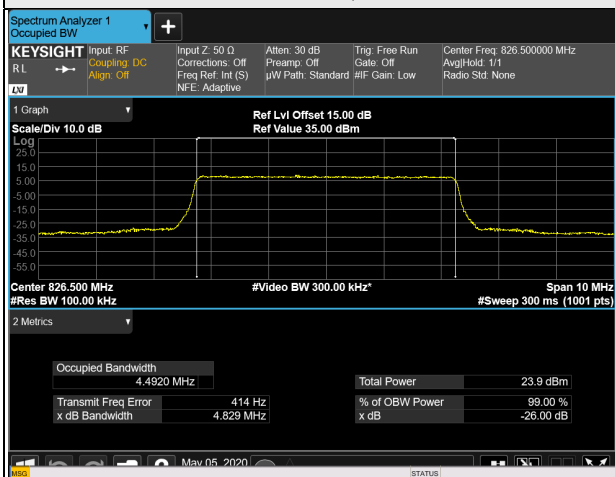
1.4MHz / QPSK



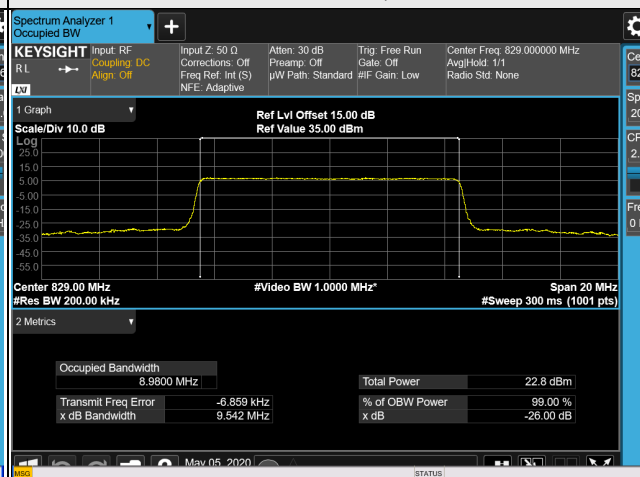
3MHz / QPSK



5MHz / QPSK



10MHz / 16QAM

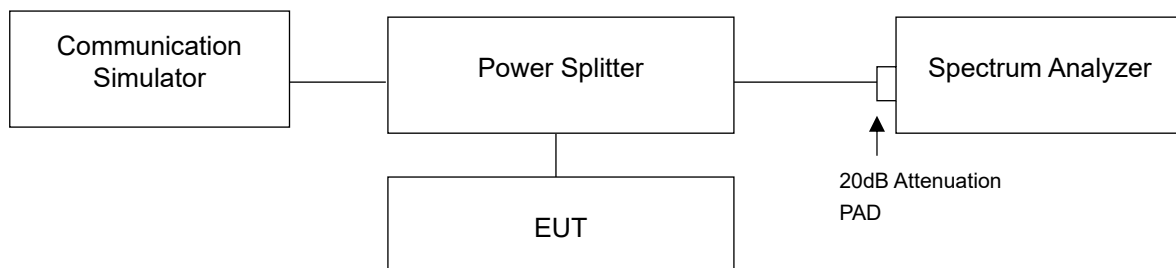


4.5 Band Edge Measurement

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 2MHz. RB of the spectrum is 10kHz and VB of the spectrum is 30kHz (GSM / GPRS / EDGE).
- The center frequency of spectrum is the band edge frequency and span is 5MHz. RB of the spectrum is 51kHz and VB of the spectrum is 150kHz (WCDMA / HSDPA / HSUPA).
- The center frequency of spectrum is the band edge frequency and span is 1MHz. RB of the spectrum is 30kHz and VB of the spectrum is 100kHz (LTE Channel Bandwidth 1.4MHz/3MHz).
- The center frequency of spectrum is the band edge frequency and span is 1MHz. RB of the spectrum is 51kHz and VB of the spectrum is 160kHz (LTE Channel Bandwidth 5MHz).
- The center frequency of spectrum is the band edge frequency and span is 1MHz. RB of the spectrum is 100kHz and VB of the spectrum is 300kHz (LTE Channel Bandwidth 10MHz).
- Record the max trace plot into the test report.

4.5.4 Test Results

