

FCC Test Report (Part 96)

Report No.: RF191108D01

FCC ID: P27OC1101

Test Model: OC1101

Received Date: Nov. 8, 2019

Test Date: Feb. 20 to May 29, 2020

Issued Date: Jun. 1, 2020

Applicant: Sercomm Corp.

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

Issue No.	Description	Date Issued
RF191108D01	Original release.	Jun. 1, 2020

1 Certificate of Conformity

Product: Industrial LTE CPE

Brand: Sercomm

Test Model: OC1101

Sample Status: Engineering sample

Applicant: Sercomm Corp.

Test Date: Feb. 20 to May 29, 2020

Standards: 47 CFR FCC Part 96

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 :



Celia Chen / Supervisor

Date: Jun. 1, 2020

Approved by :



Rex Lai / Associate Technical Manager

Date: Jun. 1, 2020

2 Summary of Test Results

47 CFR FCC Part 96			
FCC Clause	Test Item	Result	Remarks
2.1046 96.41(b)	Maximum Average Output Power and Maximum EIRP	Pass	Meet the requirement of limit.
2.1047 96.41(a)	Modulation Characteristics	Pass	Meet the requirement.
96.41(g)	Peak to Average Ratio	Pass	Meet the requirement of limit.
2.1049	Emission Bandwidth	Pass	Meet the requirement of limit.
2.1055	Frequency Stability	Pass	Meet the requirement of limit.
2.1051 96.41(e)	Conducted Spurious Emissions	Pass	Meet the requirement of limit.
2.1053 96.41(e)	Radiated Spurious Emissions	Pass	Meet the requirement of limit. Minimum passing margin is -17.42dB at 7387.63MHz.
2.1046 96.41(c)(2)	Transmit Power Control (TPC)	Pass	Meet the requirement.

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) (±)
Radiated Emissions up to 1 GHz	9kHz ~ 30MHz	2.61 dB
	30MHz ~ 1GHz	5.43 dB
Radiated Emissions above 1 GHz	Above 1GHz	5.14 dB

2.2 Modification Record

There were no modifications required for compliance.

3 General Information

3.1 General Description of EUT

Product	Industrial LTE CPE	
Brand	Sercomm	
Test Model	OC1101	
Status of EUT	Engineering sample	
Power Supply Rating	12-24Vdc	
Modulation Type	QPSK, 16QAM	
Operating Frequency	Channel Bandwidth 5MHz	TX: 3552.5 ~ 3697.5 MHz
		RX: 3552.5 ~ 3697.5 MHz
	Channel Bandwidth 10MHz	TX: 3555 ~ 3695 MHz
		RX: 3555 ~ 3695 MHz
	Channel Bandwidth 15MHz	TX: 3557.5 ~ 3692.5 MHz
		RX: 3557.5 ~ 3692.5 MHz
	Channel Bandwidth 20MHz	TX: 3560 ~ 3690 MHz
		RX: 3560 ~ 3690 MHz
Channel Bandwidth	5MHz, 10MHz, 15MHz & 20MHz	
Max. EIRP Power (dBm/10MHz)	Channel Bandwidth 5MHz	22.96 dBm/10MHz
	Channel Bandwidth 10MHz	22.94 dBm/10MHz
	Channel Bandwidth 15MHz	20.95 dBm/10MHz
	Channel Bandwidth 20MHz	20.28 dBm/10MHz
Max. FULL EIRP Power (dBm)	Channel Bandwidth 5MHz	22.96 dBm
	Channel Bandwidth 10MHz	22.94 dBm
	Channel Bandwidth 15MHz	23.45 dBm
	Channel Bandwidth 20MHz	23.46 dBm
Emission Designator	Channel Bandwidth 5MHz	QPSK: 4M49G7D
		16QAM: 4M48D7W
	Channel Bandwidth 10MHz	QPSK: 8M94G7D
		16QAM: 8M94D7W
	Channel Bandwidth 15MHz	QPSK: 13M4G7D
		16QAM: 13M4D7W
	Channel Bandwidth 20MHz	QPSK: 17M9G7D
		16QAM: 17M9D7W
Antenna Type	Refer to note as below	
Antenna Connector	Refer to note as below	
Accessory Device	N/A	
Data Cable Supplied	Non-shielded DC cable (4.8m)	

Note:

1. The EUT provides 1 completed transmitter and 2 receivers. The antenna provided to the EUT, please refer to the following table:

Antenna Type	Antenna Connector	Antenna Gain (dBi)	Frequency Range (MHz)
Dipole	N-type	4.5	3300-3800

2. After pre-tested input power 12Vdc or 24Vdc, the 24Vdc was the worst case, therefore, only its test data was recorded in this report.
3. The above EUT information is declared by manufacturer and for more detailed features description, please refer to the manufacturer's specifications or user's manual.

3.2 Description of Test Modes

Channel Bandwidth (MHz)	Channel
5	Low
	Middle
	High
10	Low
	Middle
	High
15	Low
	Middle
	High
20	Low
	Middle
	High

3.2.1 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 Z-plane. Following channel(s) was (were) selected for the final test as listed below:

Test Item	Available Channel (MHz)	Tested Channel (MHz)	Channel Bandwidth	Modulation
EIRP	3552.5 to 3697.5	3552.5, 3625, 3697.5	5MHz	QPSK, 16QAM
	3555 to 3695	3555, 3625, 3695	10MHz	QPSK, 16QAM
	3557.5 to 3692.5	3557.5, 3625, 3692.5	15MHz	QPSK, 16QAM
	3560 to 3690	3560, 3625, 3690	20MHz	QPSK, 16QAM
Modulation Characteristics	3552.5 to 3697.5	3625	20MHz	QPSK, 16QAM
Frequency Stability	3552.5 to 3697.5	3625	5MHz	QPSK
	3555 to 3695	3625	10MHz	QPSK
	3557.5 to 3692.5	3625	15MHz	QPSK
	3560 to 3690	3625	20MHz	QPSK
Emission Bandwidth	3552.5 to 3697.5	3552.5, 3625, 3697.5	5MHz	QPSK, 16QAM
	3555 to 3695	3555, 3625, 3695	10MHz	QPSK, 16QAM
	3557.5 to 3692.5	3557.5, 3625, 3692.5	15MHz	QPSK, 16QAM
	3560 to 3690	3560, 3625, 3690	20MHz	QPSK, 16QAM
Peak to Average Ratio	3552.5 to 3697.5	3552.5, 3625, 3697.5	5MHz	QPSK
	3555 to 3695	3555, 3625, 3695	10MHz	QPSK
	3557.5 to 3692.5	3557.5, 3625, 3692.5	15MHz	QPSK
	3560 to 3690	3560, 3625, 3690	20MHz	QPSK
Conducted Emission	3552.5 to 3697.5	3552.5, 3625, 3697.5	5MHz	QPSK
	3555 to 3695	3555, 3625, 3695	10MHz	QPSK
	3557.5 to 3692.5	3557.5, 3625, 3692.5	15MHz	QPSK
	3560 to 3690	3560, 3625, 3690	20MHz	QPSK
Radiated Emission Above 1GHz	3552.5 to 3697.5	3552.5, 3625, 3697.5	5MHz	QPSK
	3555 to 3695	3555, 3625, 3695	10MHz	QPSK
	3557.5 to 3692.5	3557.5, 3625, 3692.5	15MHz	QPSK
	3560 to 3690	3560, 3625, 3690	20MHz	QPSK
Radiated Emission Below 1GHz	3552.5 to 3697.5	3697.5	5MHz	QPSK
	3555 to 3695	3695	10MHz	QPSK
	3557.5 to 3692.5	3692.5	15MHz	QPSK
	3560 to 3690	3690	20MHz	QPSK

NOTE:

1. All supported modulation types were evaluated. The Worst case of QPSK was selected. Therefore, the Frequency Stability, Peak to Average Ratio, Conducted Emission and Radiated Emission were presented under QPSK mode only.
2. For radiated emission below 1GHz, low, mid and high channels were pre-tested in chamber. High channel was found to be the worst case and therefore had been chosen for all final tests.

Test Condition:

Test Item	Environmental Conditions	Input Power	Tested By
EIRP	20deg. C, 76%RH	24Vdc	Saxon Lee
Modulation Characteristics	20deg. C, 76%RH	24Vdc	Saxon Lee
Frequency Stability	20deg. C, 76%RH	24Vdc	Saxon Lee
Emission Bandwidth	20deg. C, 76%RH	24Vdc	Saxon Lee
Peak to Average Ratio	20deg. C, 76%RH	24Vdc	Saxon Lee
Conducted Emission	20deg. C, 76%RH	24Vdc	Saxon Lee
Radiated Emission	23deg. C, 76%RH	24Vdc	Starltaly Wu

3.3 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.	DC Power Supply	HILA	DP6010	1616AP051502087	N/A	Provided by Lab
B.	Notebook PC	SONY	SVS151A12P	275548477000760	N/A	Provided by Lab
C.	Radio Communication Analyzer	Anritsu	MT8820C	6201010284	N/A	Provided by Lab

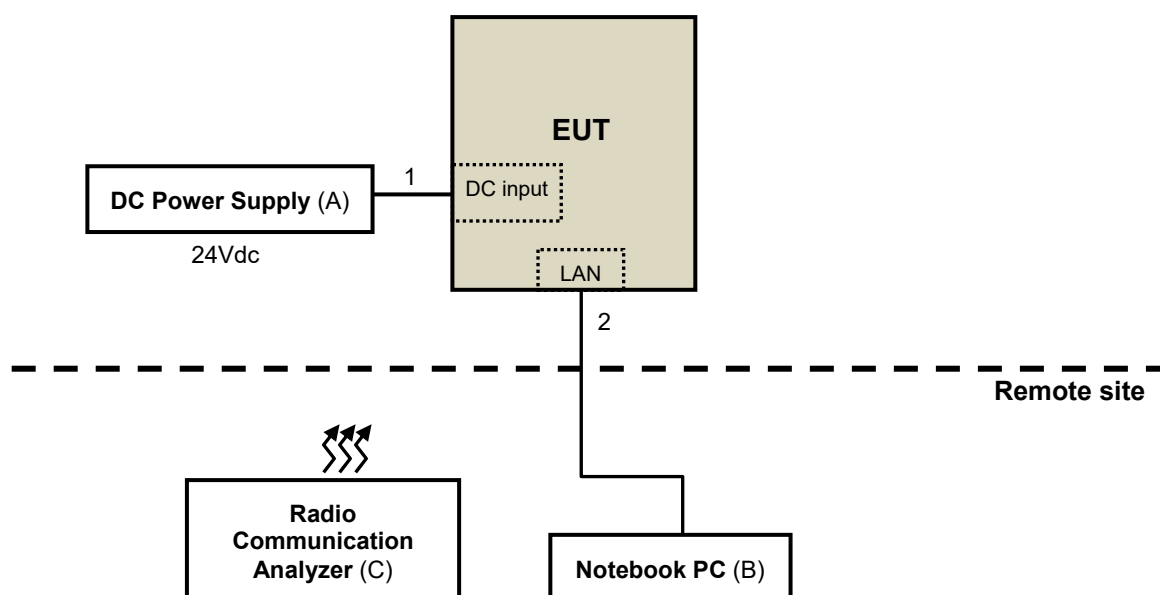
Note:

1. All power cords of the above support units are non-shielded (1.8m).
2. Items B-C acted as communication partners to transfer data.

ID	Descriptions	Qty.	Length (m)	Shielding (Yes/No)	Cores (Qty.)	Remarks
1.	DC power cable	1	4.8	N	0	Supplied by client
2.	LAN cable	1	10	N	0	Provided by Lab

Note: The core(s) is(are) originally attached to the cable(s).

3.3.1 Configuration of System under Test



3.4 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:

47 CFR FCC Part 96

ANSI/TIA/EIA-603-E 2016

ANSI C63.26-2015

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

KDB 940660 D01 Part 96 CBRS Equipment v02

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

4 Test Types and Results

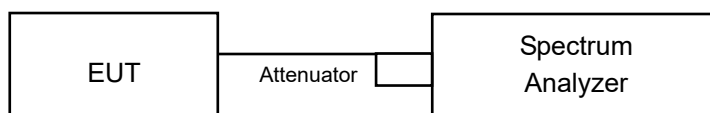
4.1 Maximum EIRP Measurement

4.1.1 Limits of Maximum EIRP Measurement

Device		Maximum EIRP (dBm/10 MHz)
☒	End User Device	23
☐	Category A CBSD	30
☐	Category B CBSD	47

4.1.2 Test Setup

Conducted Measurement Method



4.1.3 Test Instruments

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
HP Preamplifier	8447D	2432A03504	Feb. 19, 2020	Feb. 18, 2021
HP Preamplifier	8449B	3008A01201	Feb. 20, 2020	Feb. 19, 2021
MITEQ Preamplifier	AMF-6F-260400-33-8P	892164	Feb. 19, 2020	Feb. 18, 2021
Agilent TEST RECEIVER	N9038A	MY51210129	Mar. 18, 2019	Mar. 17, 2020
			Mar. 18, 2020	Mar. 17, 2021
Schwarzbeck Antenna	VULB 9168	139	Nov. 7, 2019	Nov. 6, 2020
Schwarzbeck Antenna	VHBA 9123	480	Jun. 3, 2019	Jun. 2, 2021
Schwarzbeck Horn Antenna	BBHA-9170	212	Nov. 24, 2019	Nov. 23, 2020
Schwarzbeck Horn Antenna	BBHA 9120-D1	D130	Nov. 24, 2019	Nov. 23, 2020
ADT. Turn Table	TT100	0306	NA	NA
ADT. Tower	AT100	0306	NA	NA
Software	Radiated_V7.6.15.9.5	NA	NA	NA
SUHNER RF cable With 4dB PAD	SF102	Cable-CH6-01	Jul. 10, 2019	Jul. 9, 2020
SUHNER RF cable With 3/4dB PAD	SF102	Cable-CH8-3.6m	Jul. 10, 2019	Jul. 9, 2020
KEYSIGHT MIMO Powermeasurement Test set	U2021XA	U2021XA-001	Jun. 11, 2019	Jun. 10, 2020
KEYSIGHT Spectrum Analyzer	N9030A	MY54490260	Jul. 30, 2019	Jul. 29, 2020
Loop Antenna EMCI	LPA600	270	Aug. 23, 2019	Aug. 22, 2021
EMCO Horn Antenna	3115	00028257	Nov. 24, 2019	Nov. 23, 2020
Highpass filter Wainwright Instruments	WHK 3.1/18G-10SS	SN 8	NA	NA
ROHDE & SCHWARZ Spectrum Analyzer	FSV40	101042	Sep. 23, 2019	Sep. 22, 2020
Anritsu Power Sensor	MA2411B	0738404	Apr. 13, 2019	Apr. 12, 2020
			Apr. 13, 2020	Apr. 12, 2021
Anritsu Power Meter	ML2495A	0842014	Apr. 13, 2019	Apr. 12, 2020
			Apr. 13, 2020	Apr. 12, 2021

- NOTE:** 1. The calibration interval of the above test instruments is 12/24 months. And the calibrations are traceable to NML/ROC and NIST/USA.
2. The horn antenna and HP preamplifier (model: 8449B) are used only for the measurement of emission frequency above 1GHz if tested.
3. The test was performed in Chamber No. 6.

4.1.4 Test Procedures

Conducted Measurement Method

1. Connect the DUT transmitter output to the spectrum analyzer via coaxial cable while ensuring proper impedance matching.
2. Set span to at least 1.5 times the OBW.
3. Set RBW = 1-5% of the OBW, not to exceed 1 MHz.
4. Set VBW $\geq 3 \times$ RBW.
5. Set number of points in sweep $\geq 2 \times$ span / RBW.
6. Sweep time = auto-couple.
7. Detector = RMS (power averaging).
8. If the EUT can be configured to transmit continuously (i.e., burst duty cycle $\geq 98\%$), then set the trigger to free run.
9. If the EUT cannot be configured to transmit continuously (i.e., burst duty cycle $< 98\%$), then use a sweep trigger with the level set to enable triggering only on full power bursts and configure the EUT to transmit at full power for the entire duration of each sweep. Ensure that the sweep time is less than or equal to the transmission burst duration.
10. Trace average at least 100 traces in power averaging (i.e., RMS) mode.
11. Compute the power by integrating the spectrum across the OBW of the signal using the instrument's band or channel power measurement function, with the band/channel limits set equal to the OBW band edges. If the instrument does not have a band or channel power function, then sum the spectrum levels (in linear power units) at intervals equal to the RBW extending across the entire OBW of the spectrum.
12. For per 10MHz method, channel power integrating bandwidth 10MHz is used for bandwidth 5M, 10M, 15M and 20M.
13. For all power method, channel power integrating bandwidth 5MHz is used for bandwidth 5M, integrating bandwidth 10MHz is used for bandwidth 10M, integrating bandwidth 15MHz is used for bandwidth 15M, integrating bandwidth 20MHz is used for bandwidth 20M.

Maximum EIRP

The relevant equation for determining the maximum ERP or EIRP from the measured RF output power is given in Equation as follows:

$$\text{ERP or EIRP} = P_{\text{Meas}} + G_T$$

where

ERP or EIRP effective radiated power or equivalent isotropically radiated power, respectively
(expressed in the same units as P_{Meas} , e.g., dBm or dBW)

P_{Meas} measured transmitter output power or PSD, in dBm or dBW

G_T gain of the transmitting antenna, in dBd (ERP) or dBi (EIRP)

4.1.5 Deviation from Test Standard

No deviation.

4.1.6 EUT Operating Conditions

The software provided by client to enable the EUT under transmission condition continuously at lowest, middle and highest channel frequencies individually.

4.1.7 Test Results

Conducted Output Power & EIRP Power (dBm/10MHz)

Band / BW	RB Size	RB Offset	QPSK					
			Low Channel		Middle Channel		High Channel	
			3552.5 MHz		3625 MHz		3697.5 MHz	
			Conducted Output Power (dBm/10MHz)	EIRP (dBm/10MHz)	Conducted Output Power (dBm/10MHz)	EIRP (dBm/10MHz)	Conducted Output Power (dBm/10MHz)	EIRP (dBm/10MHz)
48 / 5M	1	0	17.89	22.39	18.32	22.82	18.46	22.96
	1	12	17.80	22.30	18.24	22.74	18.37	22.87
	1	24	17.80	22.30	18.28	22.78	18.40	22.90
	12	0	17.82	22.32	18.24	22.74	18.40	22.90
	12	6	17.84	22.34	18.22	22.72	18.42	22.92
	12	13	17.80	22.30	18.22	22.72	18.39	22.89
	25	0	17.84	22.34	18.30	22.80	18.41	22.91
Band / BW	RB Size	RB Offset	16QAM					
			Low Channel		Middle Channel		High Channel	
			3552.5 MHz		3625 MHz		3697.5 MHz	
			Conducted Output Power (dBm/10MHz)	EIRP (dBm/10MHz)	Conducted Output Power (dBm/10MHz)	EIRP (dBm/10MHz)	Conducted Output Power (dBm/10MHz)	EIRP (dBm/10MHz)
48 / 5M	1	0	16.97	21.47	17.44	21.94	17.56	22.06
	1	12	16.87	21.37	17.41	21.91	17.45	21.95
	1	24	16.84	21.34	17.36	21.86	17.44	21.94
	12	0	16.87	21.37	17.40	21.90	17.41	21.91
	12	6	16.86	21.36	17.36	21.86	17.41	21.91
	12	13	16.85	21.35	17.40	21.90	17.44	21.94
	25	0	16.88	21.38	17.41	21.91	17.46	21.96

Note: EIRP (dBm / 10MHz) = Conducted Output Power (dBm / 10MHz) + Antenna Gain

Band / BW	RB Size	RB Offset	QPSK					
			Low Channel		Middle Channel		High Channel	
			3555 MHz		3625 MHz		3695 MHz	
			Conducted Output Power (dBm/10MHz)	EIRP (dBm/10MHz)	Conducted Output Power (dBm/10MHz)	EIRP (dBm/10MHz)	Conducted Output Power (dBm/10MHz)	EIRP (dBm/10MHz)
48 / 10M	1	0	17.61	22.11	18.22	22.72	18.44	22.94
	1	24	17.47	21.97	18.15	22.65	18.36	22.86
	1	49	17.51	22.01	18.11	22.61	18.32	22.82
	25	0	17.46	21.96	18.16	22.66	18.37	22.87
	25	12	17.52	22.02	18.16	22.66	18.35	22.85
	25	25	17.51	22.01	18.09	22.59	18.34	22.84
	50	0	17.56	22.06	18.18	22.68	18.40	22.90
Band / BW	RB Size	RB Offset	16QAM					
			Low Channel		Middle Channel		High Channel	
			3555 MHz		3625 MHz		3695 MHz	
			Conducted Output Power (dBm/10MHz)	EIRP (dBm/10MHz)	Conducted Output Power (dBm/10MHz)	EIRP (dBm/10MHz)	Conducted Output Power (dBm/10MHz)	EIRP (dBm/10MHz)
48 / 10M	1	0	16.78	21.28	17.31	21.81	17.49	21.99
	1	24	16.70	21.20	17.20	21.70	17.40	21.90
	1	49	16.72	21.22	17.19	21.69	17.38	21.88
	25	0	16.71	21.21	17.22	21.72	17.33	21.83
	25	12	16.68	21.18	17.20	21.70	17.37	21.87
	25	25	16.70	21.20	17.21	21.71	17.33	21.83
	50	0	16.76	21.26	17.28	21.78	17.41	21.91

Note: EIRP (dBm / 10MHz) = Conducted Output Power (dBm / 10MHz) + Antenna Gain

Band / BW	RB Size	RB Offset	QPSK					
			Low Channel		Middle Channel		High Channel	
			3557.5 MHz		3625 MHz		3692.5 MHz	
			Conducted Output Power (dBm/10MHz)	EIRP (dBm/10MHz)	Conducted Output Power (dBm/10MHz)	EIRP (dBm/10MHz)	Conducted Output Power (dBm/10MHz)	EIRP (dBm/10MHz)
48 / 15M	1	0	15.08	19.58	16.18	20.68	16.45	20.95
	1	37	14.99	19.49	16.05	20.55	16.32	20.82
	1	74	14.92	19.42	16.02	20.52	16.28	20.78
	36	0	14.91	19.41	16.04	20.54	16.33	20.83
	36	19	14.93	19.43	16.05	20.55	16.30	20.80
	36	39	14.95	19.45	16.02	20.52	16.34	20.84
	75	0	15.02	19.52	16.11	20.61	16.35	20.85
Band / BW	RB Size	RB Offset	16QAM					
			Low Channel		Middle Channel		High Channel	
			3557.5 MHz		3625 MHz		3692.5 MHz	
			Conducted Output Power (dBm/10MHz)	EIRP (dBm/10MHz)	Conducted Output Power (dBm/10MHz)	EIRP (dBm/10MHz)	Conducted Output Power (dBm/10MHz)	EIRP (dBm/10MHz)
48 / 15M	1	0	14.25	18.75	14.92	19.42	14.94	19.44
	1	37	14.18	18.68	14.83	19.33	14.81	19.31
	1	74	14.10	18.60	14.78	19.28	14.85	19.35
	36	0	14.13	18.63	14.82	19.32	14.83	19.33
	36	19	14.12	18.62	14.81	19.31	14.81	19.31
	36	39	14.15	18.65	14.77	19.27	14.82	19.32
	75	0	14.18	18.68	14.82	19.32	14.88	19.38

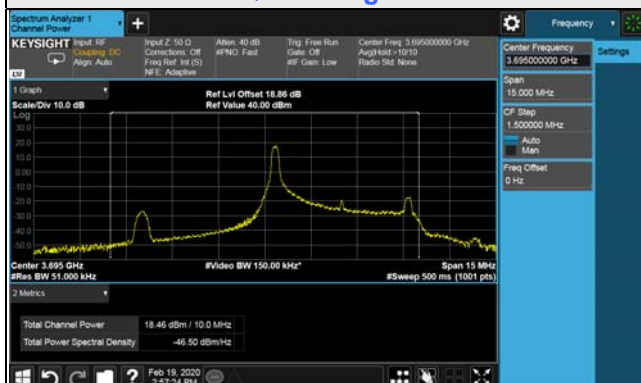
Note: EIRP (dBm / 10MHz) = Conducted Output Power (dBm / 10MHz) + Antenna Gain

Band / BW	RB Size	RB Offset	QPSK					
			Low Channel		Middle Channel		High Channel	
			3560 MHz		3625 MHz		3690 MHz	
			Conducted Output Power (dBm/10MHz)	EIRP (dBm/10MHz)	Conducted Output Power (dBm/10MHz)	EIRP (dBm/10MHz)	Conducted Output Power (dBm/10MHz)	EIRP (dBm/10MHz)
48 / 20M	1	0	15.57	20.07	15.67	20.17	15.78	20.28
	1	50	15.50	20.00	15.58	20.08	15.72	20.22
	1	99	15.48	19.98	15.62	20.12	15.69	20.19
	50	0	15.44	19.94	15.61	20.11	15.67	20.17
	50	25	15.51	20.01	15.55	20.05	15.65	20.15
	50	50	15.50	20.00	15.62	20.12	15.71	20.21
	100	0	15.55	20.05	15.63	20.13	15.74	20.24
Band / BW	RB Size	RB Offset	16QAM					
			Low Channel		Middle Channel		High Channel	
			3560 MHz		3625 MHz		3690 MHz	
			Conducted Output Power (dBm/10MHz)	EIRP (dBm/10MHz)	Conducted Output Power (dBm/10MHz)	EIRP (dBm/10MHz)	Conducted Output Power (dBm/10MHz)	EIRP (dBm/10MHz)
48 / 20M	1	0	14.82	19.32	14.58	19.08	14.72	19.22
	1	50	14.75	19.25	14.45	18.95	14.63	19.13
	1	99	14.69	19.19	14.42	18.92	14.65	19.15
	50	0	14.72	19.22	14.48	18.98	14.62	19.12
	50	25	14.68	19.18	14.46	18.96	14.64	19.14
	50	50	14.71	19.21	14.52	19.02	14.59	19.09
	100	0	14.73	19.23	14.53	19.03	14.68	19.18

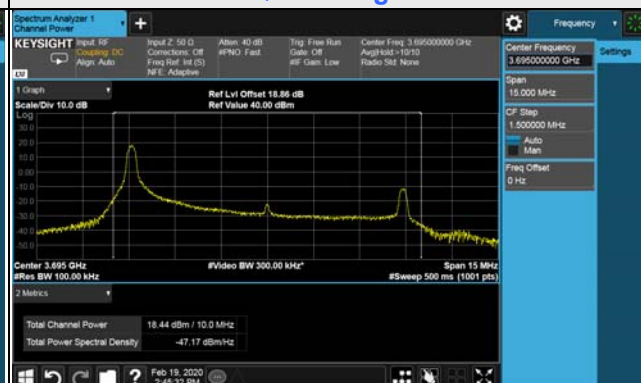
Note: EIRP (dBm / 10MHz) = Conducted Output Power (dBm / 10MHz) + Antenna Gain

Spectrum Plot of Worst Value

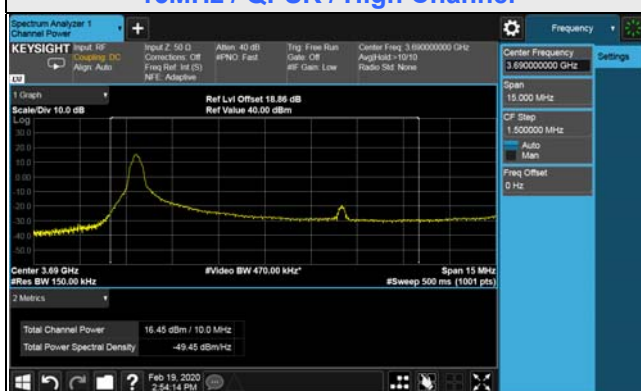
5MHz / QPSK / High Channel



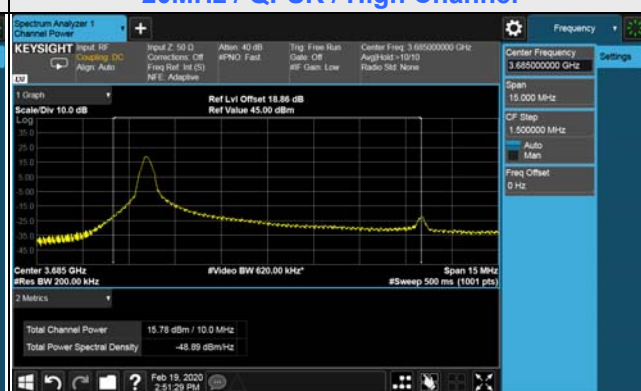
10MHz / QPSK / High Channel



15MHz / QPSK / High Channel



20MHz / QPSK / High Channel



For FULL EIRP Power

Band / BW	RB Size	RB Offset	QPSK								
			Low Channel			Middle Channel			High Channel		
			3552.5 MHz			3625 MHz			3697.5 MHz		
			Conducted Output Power (dBm)	EIRP (dBm)	EIRP (W)	Conducted Output Power (dBm)	EIRP (dBm)	EIRP (W)	Conducted Output Power (dBm)	EIRP (dBm)	EIRP (W)
48 / 5M	1	0	17.89	22.39	0.17	18.32	22.82	0.19	18.46	22.96	0.20
	1	12	17.80	22.30	0.17	18.24	22.74	0.19	18.37	22.87	0.19
	1	24	17.80	22.30	0.17	18.28	22.78	0.19	18.40	22.90	0.19
	12	0	17.82	22.32	0.17	18.24	22.74	0.19	18.40	22.90	0.19
	12	6	17.84	22.34	0.17	18.22	22.72	0.19	18.42	22.92	0.20
	12	13	17.80	22.30	0.17	18.22	22.72	0.19	18.39	22.89	0.19
	25	0	17.84	22.34	0.17	18.30	22.80	0.19	18.41	22.91	0.20
Band / BW	RB Size	RB Offset	16QAM								
			Low Channel			Middle Channel			High Channel		
			3552.5 MHz			3625 MHz			3697.5 MHz		
			Conducted Output Power (dBm)	EIRP (dBm)	EIRP (W)	Conducted Output Power (dBm)	EIRP (dBm)	EIRP (W)	Conducted Output Power (dBm)	EIRP (dBm)	EIRP (W)
48 / 5M	1	0	16.97	21.47	0.14	17.44	21.94	0.16	17.56	22.06	0.16
	1	12	16.87	21.37	0.14	17.41	21.91	0.16	17.45	21.95	0.16
	1	24	16.84	21.34	0.14	17.36	21.86	0.15	17.44	21.94	0.16
	12	0	16.87	21.37	0.14	17.40	21.90	0.15	17.41	21.91	0.16
	12	6	16.86	21.36	0.14	17.36	21.86	0.15	17.41	21.91	0.16
	12	13	16.85	21.35	0.14	17.40	21.90	0.15	17.44	21.94	0.16
	25	0	16.88	21.38	0.14	17.41	21.91	0.16	17.46	21.96	0.16

Note: EIRP (dBm) = Conducted Output Power (dBm) + Antenna Gain

Band / BW	RB Size	RB Offset	QPSK								
			Low Channel			Middle Channel			High Channel		
			3555 MHz			3625 MHz			3695 MHz		
			Conducted Output Power (dBm)	EIRP (dBm)	EIRP (W)	Conducted Output Power (dBm)	EIRP (dBm)	EIRP (W)	Conducted Output Power (dBm)	EIRP (dBm)	EIRP (W)
48 / 10M	1	0	17.61	22.11	0.16	18.22	22.72	0.19	18.44	22.94	0.20
	1	24	17.47	21.97	0.16	18.15	22.65	0.18	18.36	22.86	0.19
	1	49	17.51	22.01	0.16	18.11	22.61	0.18	18.32	22.82	0.19
	25	0	17.46	21.96	0.16	18.16	22.66	0.18	18.37	22.87	0.19
	25	12	17.52	22.02	0.16	18.16	22.66	0.18	18.35	22.85	0.19
	25	25	17.51	22.01	0.16	18.09	22.59	0.18	18.34	22.84	0.19
	50	0	17.56	22.06	0.16	18.18	22.68	0.19	18.40	22.90	0.19
Band / BW	RB Size	RB Offset	16QAM								
			Low Channel			Middle Channel			High Channel		
			3555 MHz			3625 MHz			3695 MHz		
			Conducted Output Power (dBm)	EIRP (dBm)	EIRP (W)	Conducted Output Power (dBm)	EIRP (dBm)	EIRP (W)	Conducted Output Power (dBm)	EIRP (dBm)	EIRP (W)
48 / 10M	1	0	16.78	21.28	0.13	17.31	21.81	0.15	17.49	21.99	0.16
	1	24	16.70	21.20	0.13	17.20	21.70	0.15	17.40	21.90	0.15
	1	49	16.72	21.22	0.13	17.19	21.69	0.15	17.38	21.88	0.15
	25	0	16.71	21.21	0.13	17.22	21.72	0.15	17.33	21.83	0.15
	25	12	16.68	21.18	0.13	17.20	21.70	0.15	17.37	21.87	0.15
	25	25	16.70	21.20	0.13	17.21	21.71	0.15	17.33	21.83	0.15
	50	0	16.76	21.26	0.13	17.28	21.78	0.15	17.41	21.91	0.16

Note: EIRP (dBm) = Conducted Output Power (dBm) + Antenna Gain

Band / BW	RB Size	RB Offset	QPSK								
			Low Channel			Middle Channel			High Channel		
			3557.5 MHz			3625 MHz			3692.5 MHz		
			Conducted Output Power (dBm)	EIRP (dBm)	EIRP (W)	Conducted Output Power (dBm)	EIRP (dBm)	EIRP (W)	Conducted Output Power (dBm)	EIRP (dBm)	EIRP (W)
48 / 15M	1	0	17.57	22.07	0.16	18.65	23.15	0.21	18.95	23.45	0.22
	1	37	17.51	22.01	0.16	18.55	23.05	0.20	18.83	23.33	0.22
	1	74	17.46	21.96	0.16	18.53	23.03	0.20	18.79	23.29	0.21
	36	0	17.46	21.96	0.16	18.58	23.08	0.20	18.82	23.32	0.21
	36	19	17.45	21.95	0.16	18.53	23.03	0.20	18.85	23.35	0.22
	36	39	17.49	21.99	0.16	18.55	23.05	0.20	18.87	23.37	0.22
	75	0	17.52	22.02	0.16	18.60	23.10	0.20	18.88	23.38	0.22
Band / BW	RB Size	RB Offset	16QAM								
			Low Channel			Middle Channel			High Channel		
			3557.5 MHz			3625 MHz			3692.5 MHz		
			Conducted Output Power (dBm)	EIRP (dBm)	EIRP (W)	Conducted Output Power (dBm)	EIRP (dBm)	EIRP (W)	Conducted Output Power (dBm)	EIRP (dBm)	EIRP (W)
48 / 15M	1	0	16.74	21.24	0.13	17.44	21.94	0.16	17.47	21.97	0.16
	1	37	16.64	21.14	0.13	17.33	21.83	0.15	17.36	21.86	0.15
	1	74	16.61	21.11	0.13	17.31	21.81	0.15	17.39	21.89	0.15
	36	0	16.66	21.16	0.13	17.32	21.82	0.15	17.38	21.88	0.15
	36	19	16.62	21.12	0.13	17.32	21.82	0.15	17.36	21.86	0.15
	36	39	16.66	21.16	0.13	17.31	21.81	0.15	17.40	21.90	0.15
	75	0	16.69	21.19	0.13	17.38	21.88	0.15	17.44	21.94	0.16

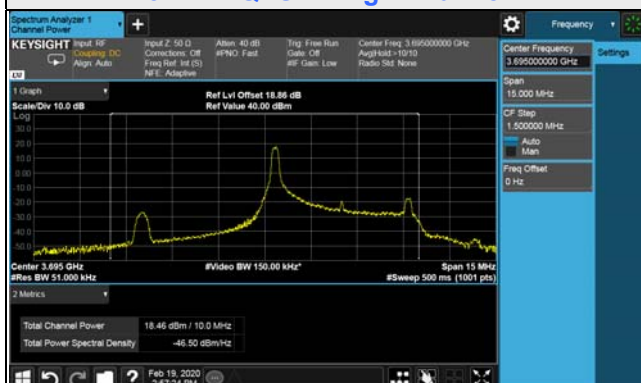
Note: EIRP (dBm) = Conducted Output Power (dBm) + Antenna Gain

Band / BW	RB Size	RB Offset	QPSK								
			Low Channel			Middle Channel			High Channel		
			3560 MHz			3625 MHz			3690 MHz		
			Conducted Output Power (dBm)	EIRP (dBm)	EIRP (W)	Conducted Output Power (dBm)	EIRP (dBm)	EIRP (W)	Conducted Output Power (dBm)	EIRP (dBm)	EIRP (W)
48 / 20M	1	0	18.75	23.25	0.21	18.84	23.34	0.22	18.96	23.46	0.22
	1	50	18.68	23.18	0.21	18.74	23.24	0.21	18.91	23.41	0.22
	1	99	18.67	23.17	0.21	18.77	23.27	0.21	18.89	23.39	0.22
	50	0	18.63	23.13	0.21	18.78	23.28	0.21	18.84	23.34	0.22
	50	25	18.69	23.19	0.21	18.74	23.24	0.21	18.84	23.34	0.22
	50	50	18.68	23.18	0.21	18.78	23.28	0.21	18.88	23.38	0.22
	100	0	18.70	23.20	0.21	18.81	23.31	0.21	18.93	23.43	0.22
Band / BW	RB Size	RB Offset	16QAM								
			Low Channel			Middle Channel			High Channel		
			3560 MHz			3625 MHz			3690 MHz		
			Conducted Output Power (dBm)	EIRP (dBm)	EIRP (W)	Conducted Output Power (dBm)	EIRP (dBm)	EIRP (W)	Conducted Output Power (dBm)	EIRP (dBm)	EIRP (W)
48 / 20M	1	0	17.97	22.47	0.18	17.74	22.24	0.17	17.90	22.40	0.17
	1	50	17.87	22.37	0.17	17.63	22.13	0.16	17.78	22.28	0.17
	1	99	17.84	22.34	0.17	17.63	22.13	0.16	17.79	22.29	0.17
	50	0	17.89	22.39	0.17	17.64	22.14	0.16	17.80	22.30	0.17
	50	25	17.85	22.35	0.17	17.65	22.15	0.16	17.81	22.31	0.17
	50	50	17.89	22.39	0.17	17.68	22.18	0.17	17.77	22.27	0.17
	100	0	17.91	22.41	0.17	17.70	22.20	0.17	17.85	22.35	0.17

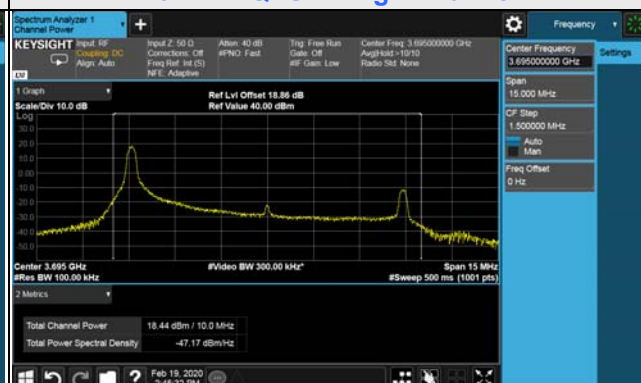
Note: EIRP (dBm) = Conducted Output Power (dBm) + Antenna Gain

Spectrum Plot of Worst Value

5MHz / QPSK / High Channel



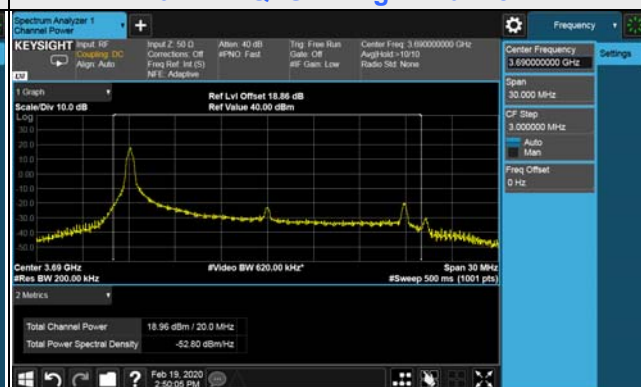
10MHz / QPSK / High Channel



15MHz / QPSK / High Channel



20MHz / QPSK / High Channel



4.2 Modulation Characteristics Measurement

4.2.1 Limits of Modulation Characteristics

N/A

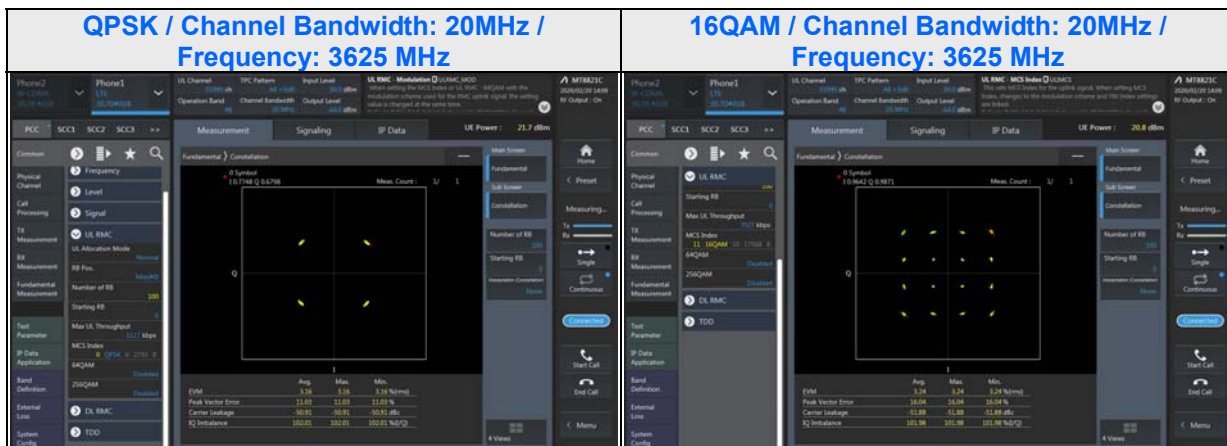
4.2.2 Test Procedure

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



4.3 Frequency Stability Measurement

4.3.1 Limits of Frequency Stability Measurement

The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency band.

4.3.2 Test Procedure

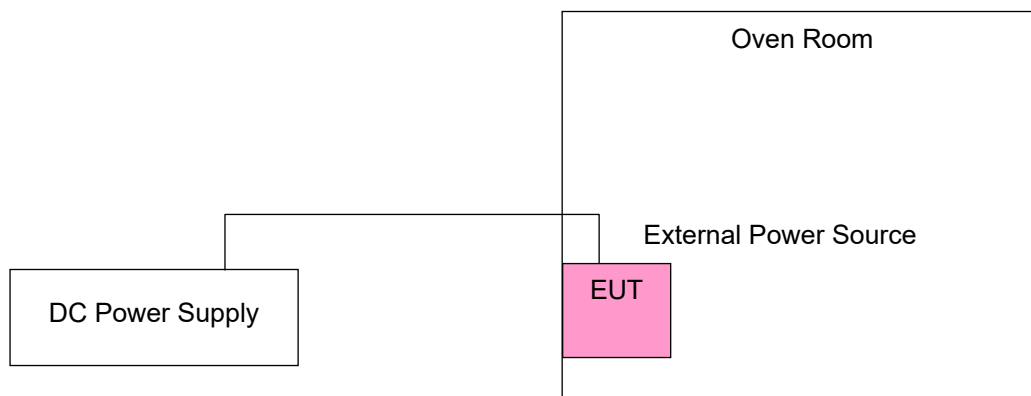
- Device is placed at the oven room. The oven room could control the temperatures and humidity. Power warm up is at least 15 min and power applied should perform before recording frequency error.
- EUT is connected the external power supply to control the DC input power. The test voltage range is from minimum to maximum working voltage. Each step shall be record the frequency error rate.
- The temperature range step is 10 degrees in this test items. All temperature levels shall be hold the $\pm 0.5^{\circ}\text{C}$ 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 Instruments

Refer to section 4.1.3 to get information of above instrument.

4.3.4 Test Setup



4.3.5 Test Results

Frequency vs. Voltage

Voltage (Vdc)	Frequency (MHz)				Pass/Fail
	5MHz	10MHz	15MHz	20MHz	
21.6	3625.000003	3625.000004	3625.000004	3625.000002	Pass
24	3625.000002	3625.000003	3625.000004	3625.000003	Pass
26.4	3625.000003	3625.000001	3625.000003	3625.000002	Pass

NOTE: The applicant defined the normal working voltage of the DC power is from 21.6Vdc to 26.4Vdc.

Frequency vs. Temperature.

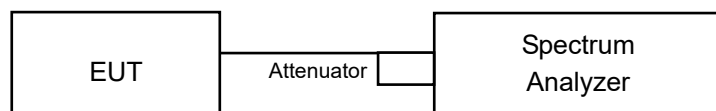
TEMP. (°C)	Frequency (MHz)				Pass/Fail
	5MHz	10MHz	15MHz	20MHz	
-30	3625.000002	3625.000002	3625.000002	3625.000001	Pass
-20	3625.000001	3625.000003	3625.000001	3625.000003	Pass
-10	3625.000003	3625.000001	3625.000003	3625.000002	Pass
0	3625.000002	3625.000002	3625.000003	3625.000003	Pass
10	3625.000002	3625.000002	3625.000001	3625.000002	Pass
20	3624.999998	3624.999997	3624.999999	3624.999999	Pass
30	3624.999997	3624.999997	3624.999997	3624.999996	Pass
40	3624.999997	3624.999997	3624.999996	3624.999998	Pass
50	3624.999998	3624.999996	3624.999996	3624.999998	Pass
60	3624.999999	3624.999998	3624.999997	3624.999996	Pass
70	3624.999998	3624.999998	3624.999997	3624.999996	Pass
75	3624.999998	3624.999998	3624.999997	3624.999996	Pass

4.4 Emission Bandwidth Measurement

4.4.1 Limit of Emission Bandwidth Measurement

Reference only

4.4.2 Test Setup



4.4.3 Test Instruments

Refer to section 4.1.3 to get information of above instrument.

4.4.4 Test Procedure

26dBc Bandwidth:

The transmitter output was connected to the spectrum analyzer through an attenuator. The bandwidth of the fundamental frequency was measured by spectrum analyzer with RBW = 51 kHz (5 MHz bandwidth), RBW = 100 kHz (10 MHz bandwidth), RBW = 150 kHz (15 MHz bandwidth), RBW = 200 kHz (20 MHz bandwidth). The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.

Occupied Bandwidth:

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.

4.4.5 Deviation from Test Standard

No deviation.

4.4.6 EUT Operating Conditions

The software provided by client to enable the EUT under transmission condition continuously at lowest, middle and highest channel frequencies individually.

4.4.7 Test Result (-26dB Bandwidth)

Channel	Freq. (MHz)	26dB Down Bandwidth (MHz)	
		5MHz	
		QPSK	16QAM
Low	3552.5	5.00	4.91
Middle	3625	5.33	5.06
High	3697.5	5.03	5.02

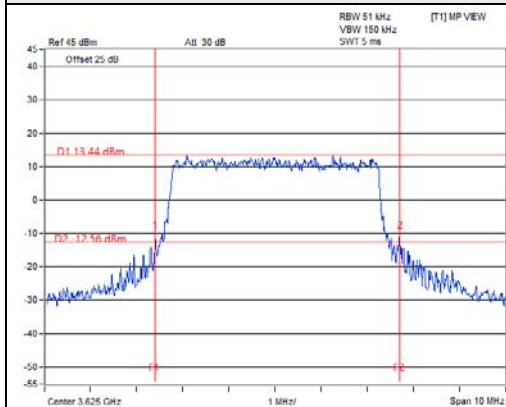
Channel	Freq. (MHz)	26dB Down Bandwidth (MHz)	
		10MHz	
		QPSK	16QAM
Low	3555	9.78	9.93
Middle	3625	9.48	9.58
High	3695	9.80	9.40

Channel	Freq. (MHz)	26dB Down Bandwidth (MHz)	
		15MHz	
		QPSK	16QAM
Low	3557.5	16.44	16.60
Middle	3625	14.33	13.98
High	3692.5	14.44	13.90

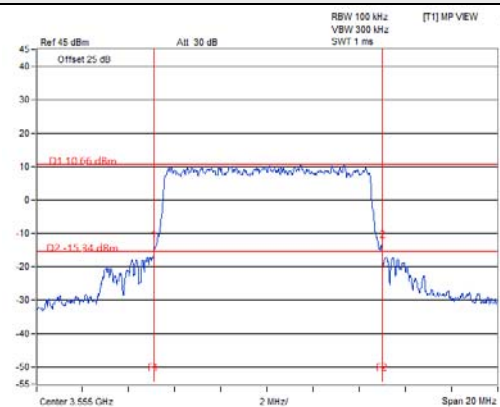
Channel	Freq. (MHz)	26dB Down Bandwidth (MHz)	
		20MHz	
		QPSK	16QAM
Low	3560	21.37	20.75
Middle	3625	18.62	20.56
High	3690	19.08	19.17

Spectrum Plot of Worst Value

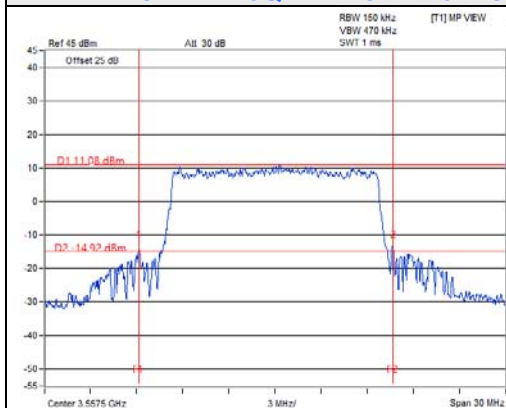
5MHz / QPSK / Middle Channel



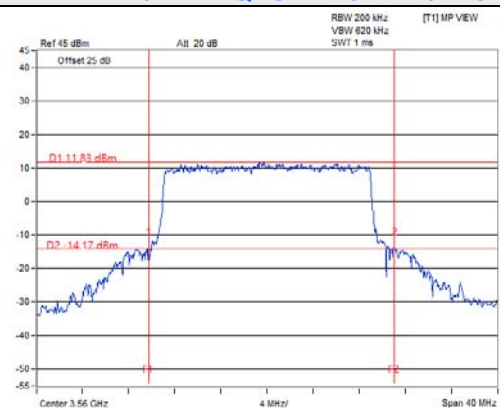
10MHz / 16QAM / Low Channel



15MHz / 16QAM / Low Channel



20MHz / QPSK / Low Channel



4.4.8 Test Result (Occupied Bandwidth)

Channel	Freq. (MHz)	OCP 99 Bandwidth (MHz)	
		5MHz	
		QPSK	16QAM
Low	3552.5	4.48	4.48
Middle	3625	4.47	4.46
High	3697.5	4.49	4.45

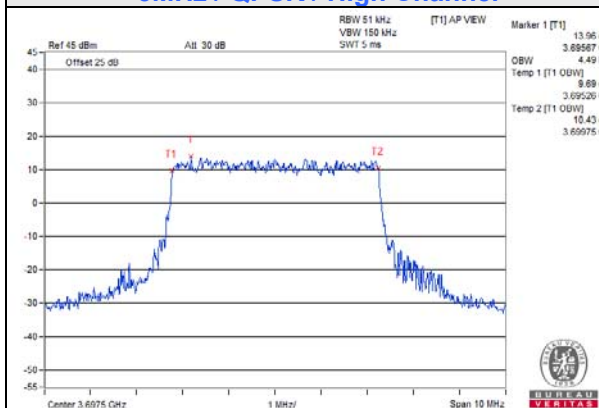
Channel	Freq. (MHz)	OCP 99 Bandwidth (MHz)	
		10MHz	
		QPSK	16QAM
Low	3555	8.94	8.92
Middle	3625	8.94	8.94
High	3695	8.92	8.92

Channel	Freq. (MHz)	OCP 99 Bandwidth (MHz)	
		15MHz	
		QPSK	16QAM
Low	3557.5	13.44	13.38
Middle	3625	13.41	13.38
High	3692.5	13.41	13.44

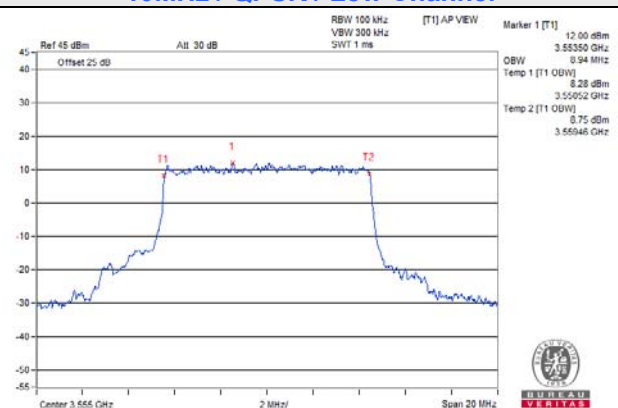
Channel	Freq. (MHz)	OCP 99 Bandwidth (MHz)	
		20MHz	
		QPSK	16QAM
Low	3560	17.88	17.88
Middle	3625	17.76	17.84
High	3690	17.80	17.80

Spectrum Plot of Worst Value

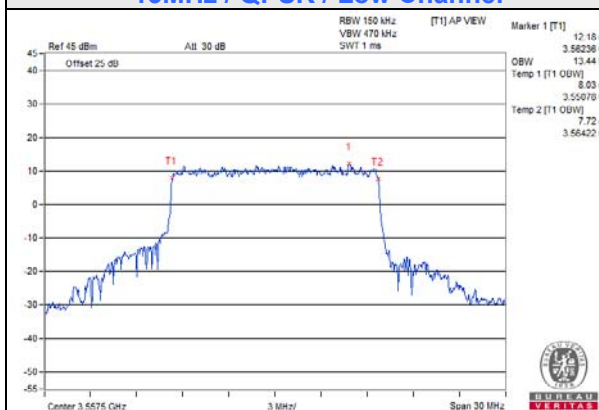
5MHz / QPSK / High Channel



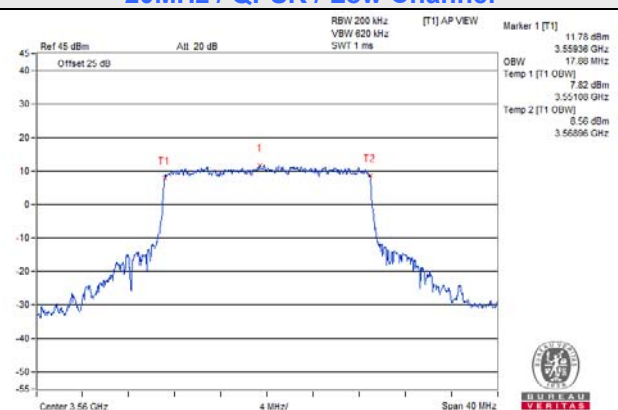
10MHz / QPSK / Low Channel



15MHz / QPSK / Low Channel



20MHz / QPSK / Low Channel

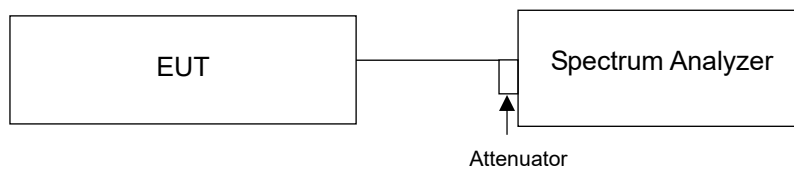


4.5 Peak to Average Ratio

4.5.1 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

4.5.2 Test Setup



4.5.3 Test Procedures

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

4.5.4 Test Results

Channel	Freq. (MHz)	Peak to Average Ratio (dB)	Limit (dB)	Pass / Fail
		5MHz		
		QPSK		
Low	3552.5	6.00	13	Pass
Middle	3625	6.11	13	Pass
High	3697.5	6.05	13	Pass

Channel	Freq. (MHz)	Peak to Average Ratio (dB)	Limit (dB)	Pass / Fail
		10MHz		
		QPSK		
Low	3555	6.04	13	Pass
Middle	3625	6.07	13	Pass
High	3695	6.08	13	Pass

Channel	Freq. (MHz)	Peak to Average Ratio (dB)	Limit (dB)	Pass / Fail
		15MHz		
		QPSK		
Low	3557.5	5.96	13	Pass
Middle	3625	5.93	13	Pass
High	3692.5	5.89	13	Pass

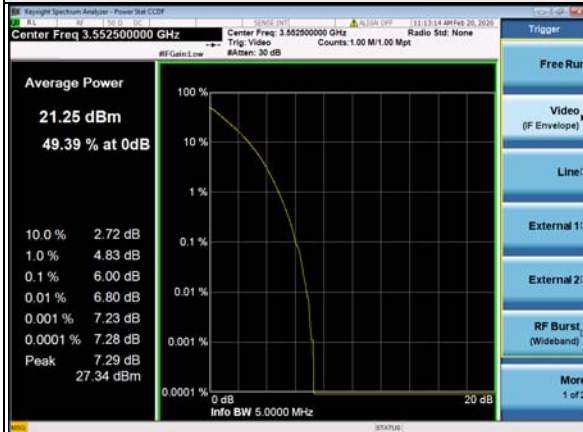
Channel	Freq. (MHz)	Peak to Average Ratio (dB)	Limit (dB)	Pass / Fail
		20MHz		
		QPSK		
Low	3560	6.76	13	Pass
Middle	3625	6.64	13	Pass
High	3690	6.71	13	Pass

5MHz:

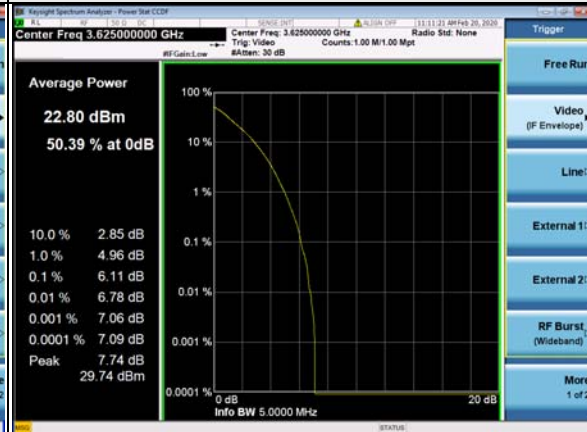
Spectrum Plot of Worst Value

QPSK

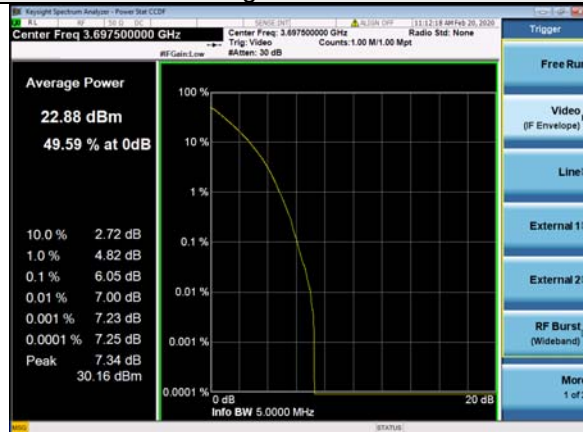
Low Channel



Middle Channel



High Channel

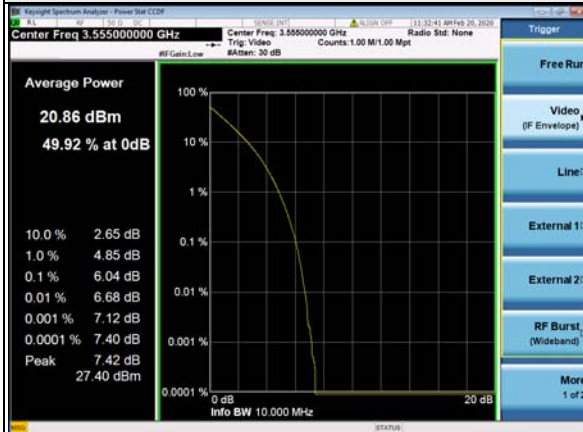


10MHz:

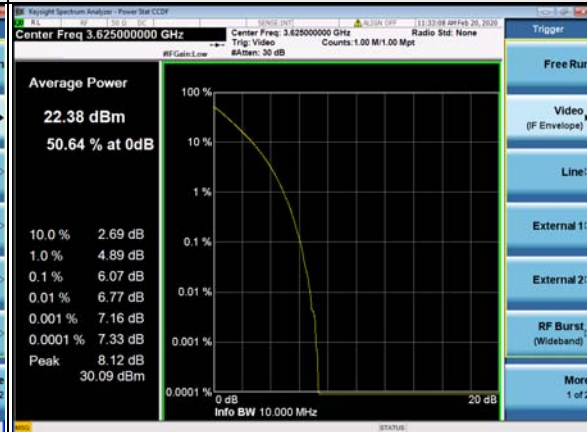
Spectrum Plot of Worst Value

QPSK

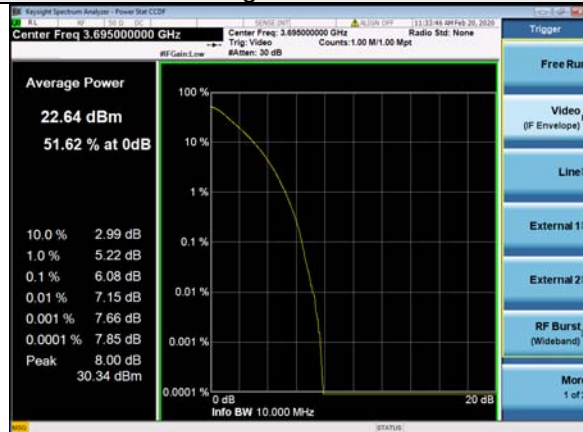
Low Channel



Middle Channel



High Channel

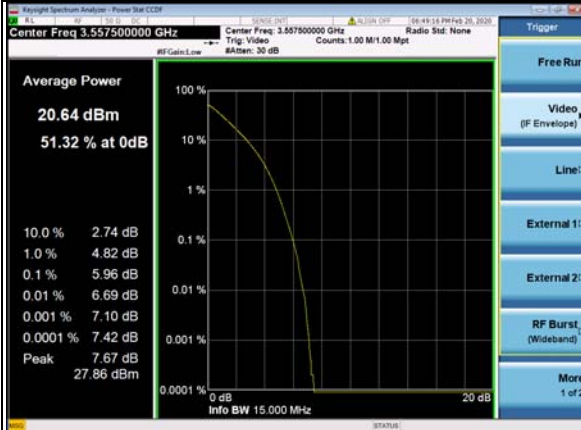


15MHz:

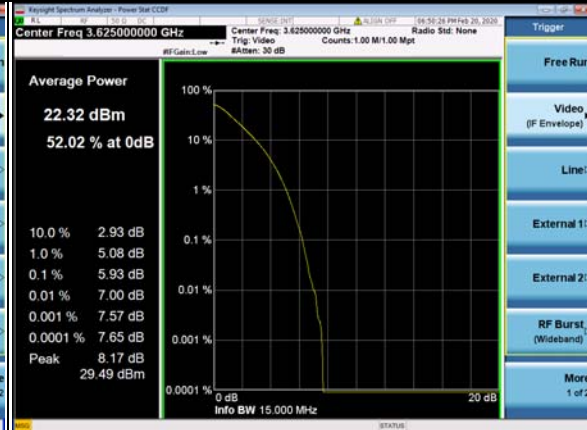
Spectrum Plot of Worst Value

QPSK

Low Channel



Middle Channel



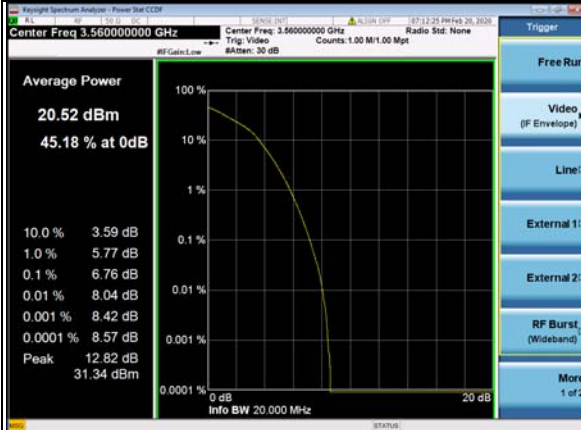
High Channel



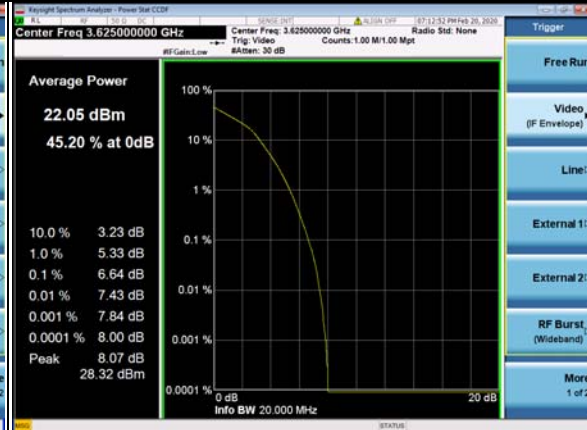
20MHz:

Spectrum Plot of Worst Value
QPSK

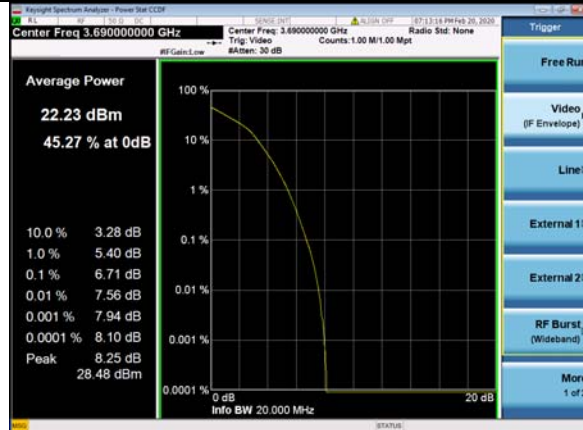
Low Channel



Middle Channel



High Channel

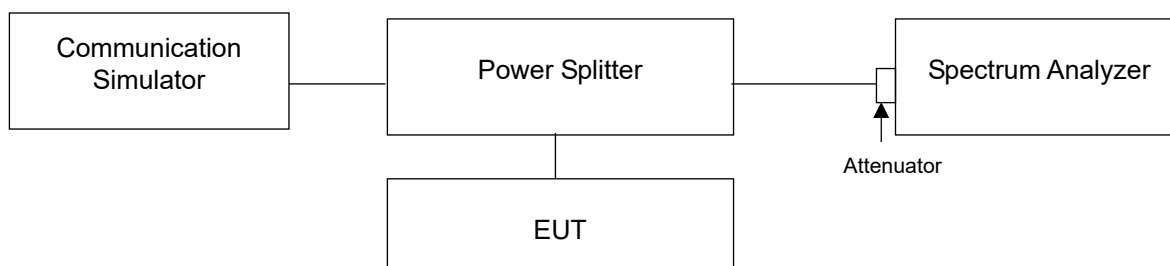


4.6 Conducted Spurious Emissions

4.6.1 Limits of Conducted Spurious Emissions Measurement

Power of any emissions outside the Fundamental	Limit
Within 0-10MHz above the Assigned Channel	-13 dBm/MHz
Within 0-10MHz below the Assigned Channel	
Greater than 0-10MHz above the Assigned Channel	-25 dBm/MHz
Greater than 0-10MHz below the Assigned Channel	
Power of any emission below 3530MHz	-40 dBm/MHz
Power of any emission above 3720MHz	

4.6.2 Test Setup



4.6.3 Test Instruments

Refer to section 4.1.3 to get information of above instrument.

4.6.4 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 30 MHz to 37 GHz. 20dB attenuation pad is connected with spectrum. RBW=1MHz and VBW=3MHz is used for conducted emission measurement.
- Measuring frequency band edge, 20dB attenuation pad is connected with spectrum. 1% of the fundamental emission bandwidth is used for conducted emission measurement.
- For 5 MHz and 10 MHz channel BW mode, extend the 1% range from 1M to 2M above and below the channel edge and then reduce the limit further by $10 \log(1000/51) = 13\text{dB}$ (i.e. total $-13 + -13 = -26\text{dB}$) to compensate for the integration from 51k to 1M.

4.6.5 Test Results

5MHz / QPSK / Low Channel

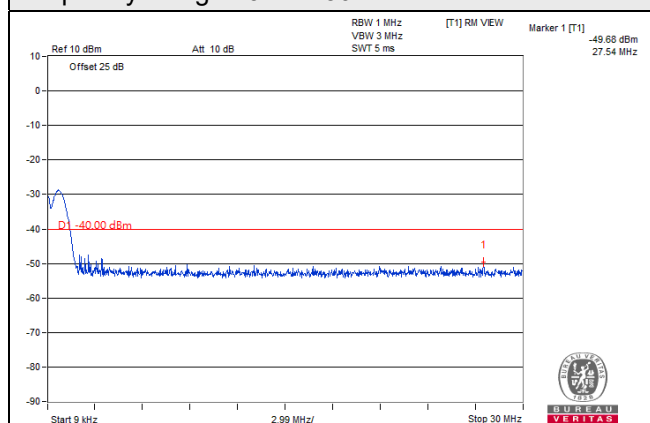
1RB



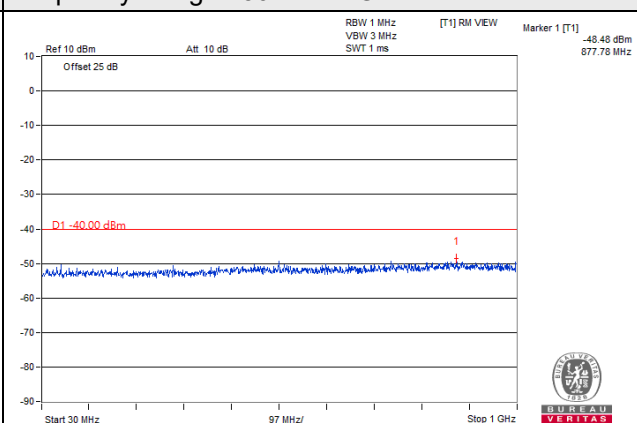
Full RB



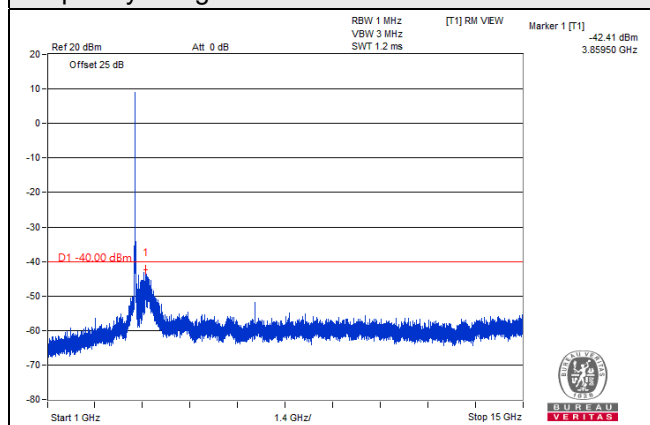
Frequency Range : 9kHz~30MHz



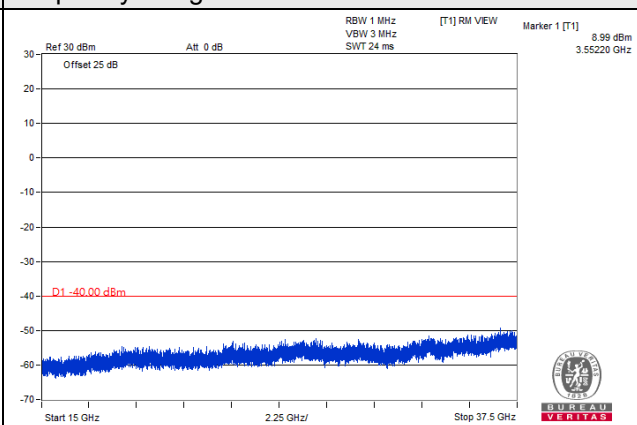
Frequency Range : 30MHz~1GHz



Frequency Range : 1GHz~15GHz

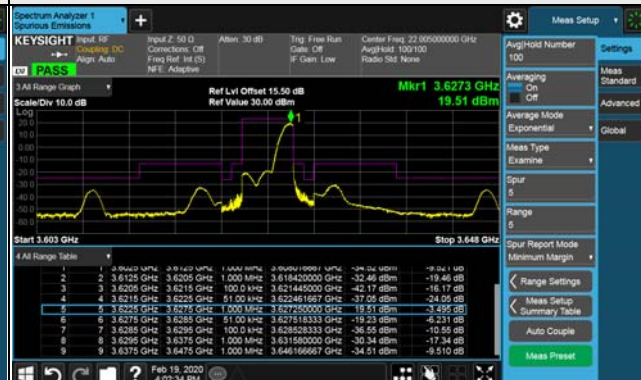


Frequency Range : 15GHz~37GHz

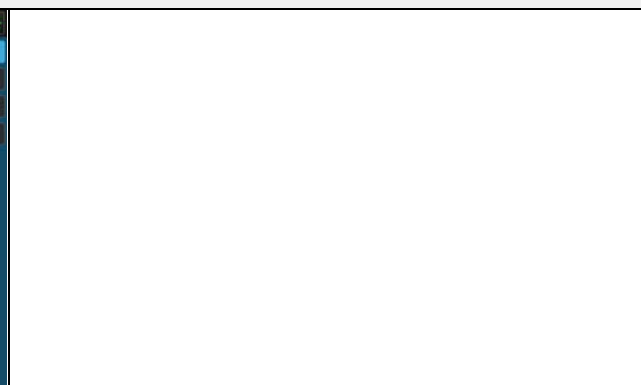


5MHz / QPSK / Middle Channel

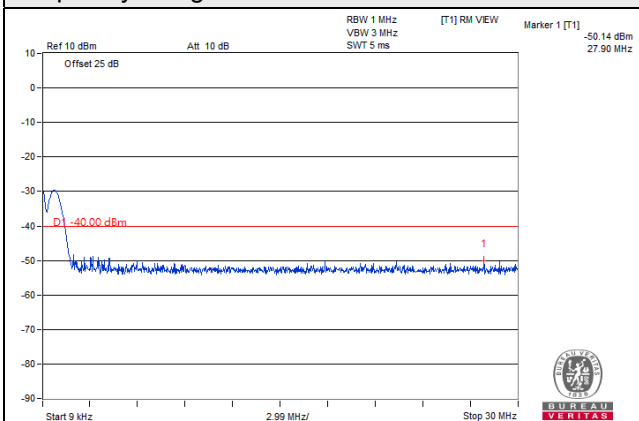
1RB



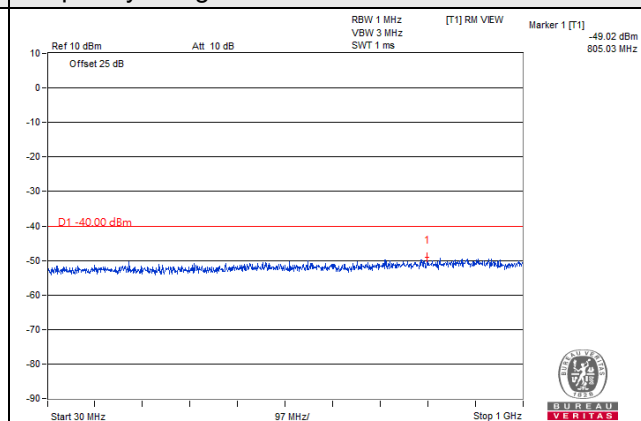
Full RB



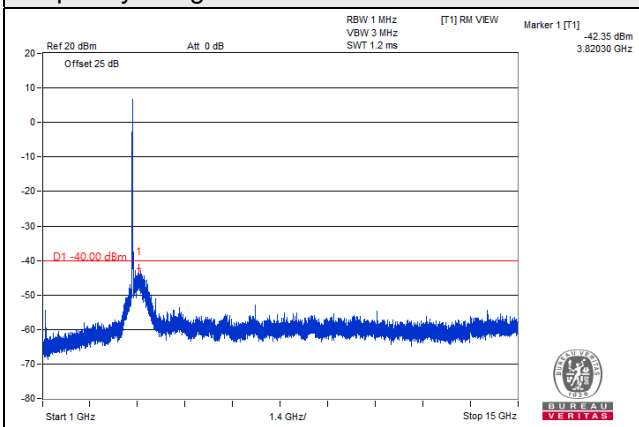
Frequency Range : 9kHz~30MHz



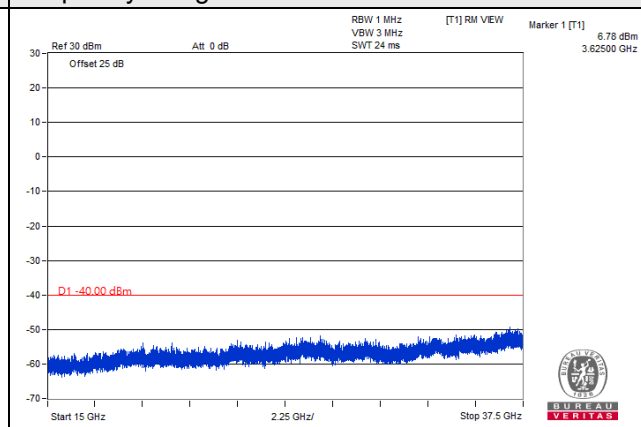
Frequency Range : 30MHz~1GHz

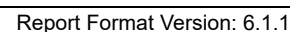


Frequency Range : 1GHz~15GHz



Frequency Range : 15GHz~37GHz



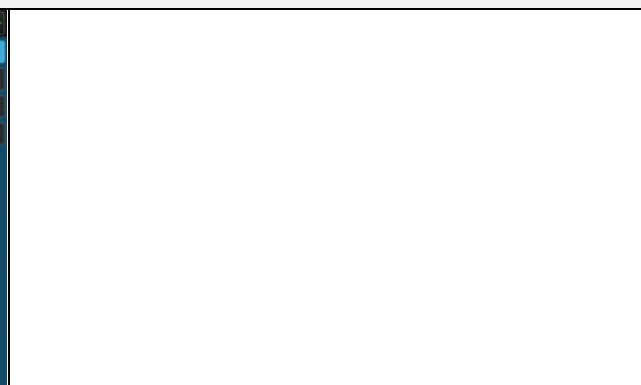


10MHz / QPSK / Low Channel

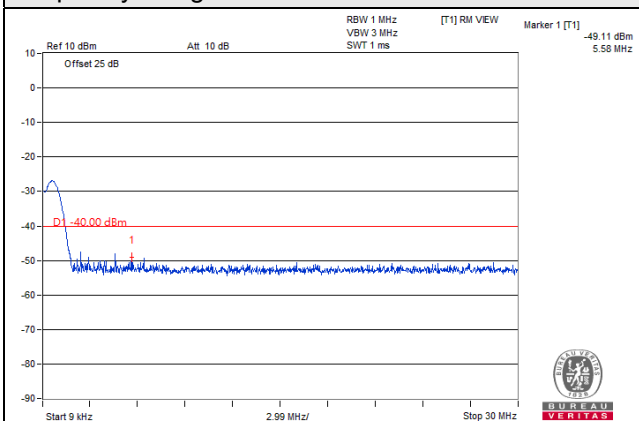
1RB



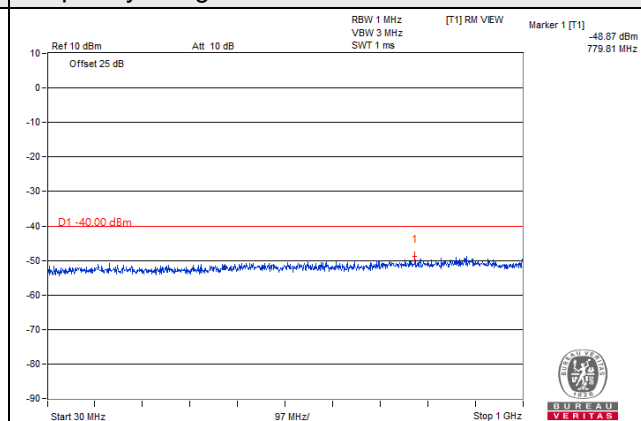
Full RB



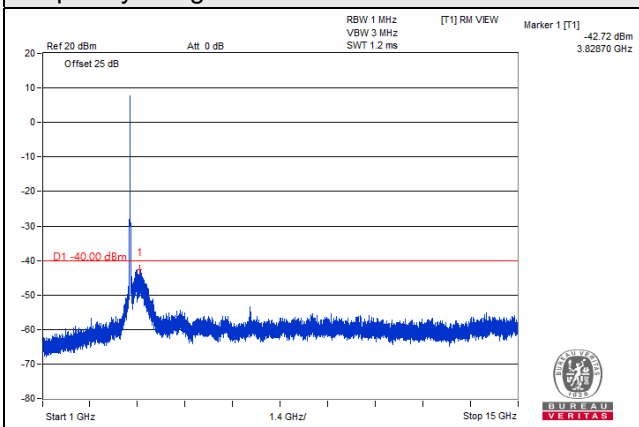
Frequency Range : 9kHz~30MHz



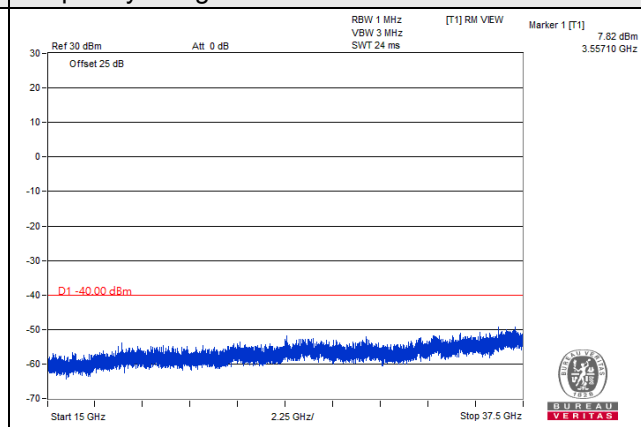
Frequency Range : 30MHz~1GHz



Frequency Range : 1GHz~15GHz

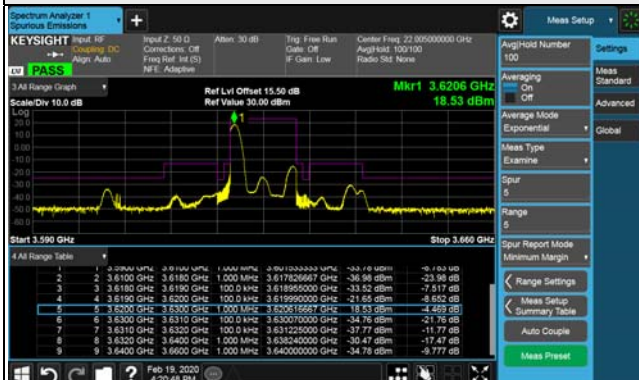


Frequency Range : 15GHz~37GHz

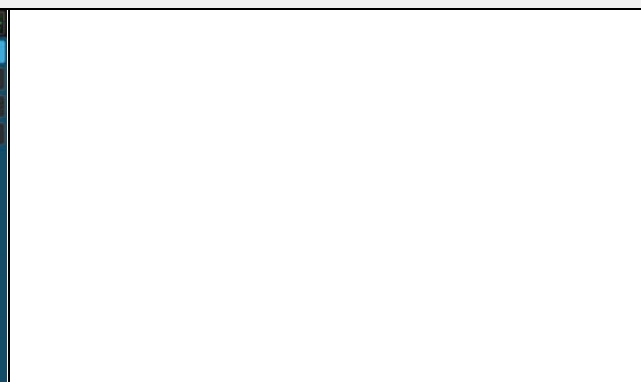
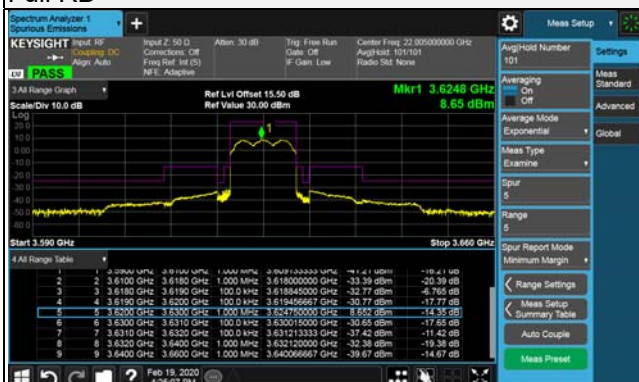


10MHz / QPSK / Middle Channel

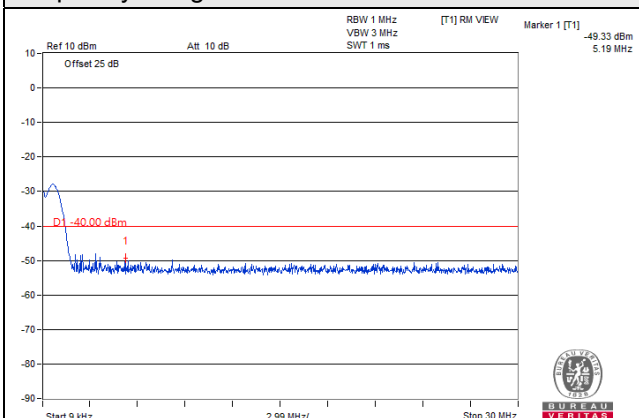
1RB



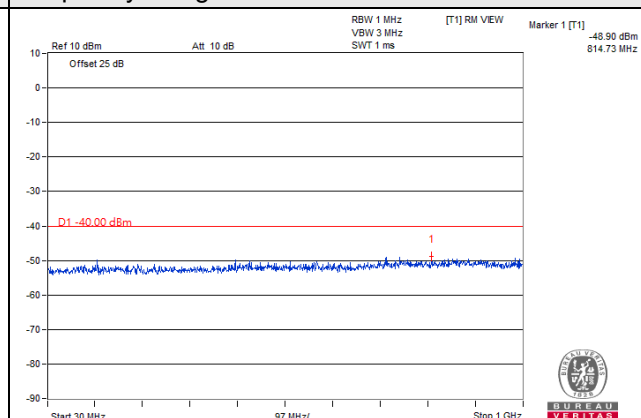
Full RB



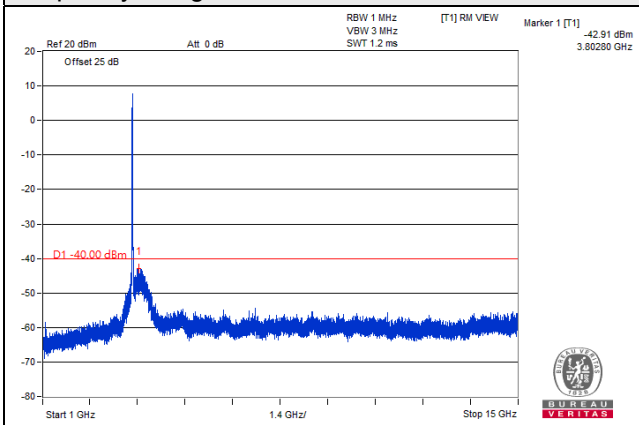
Frequency Range : 9kHz~30MHz



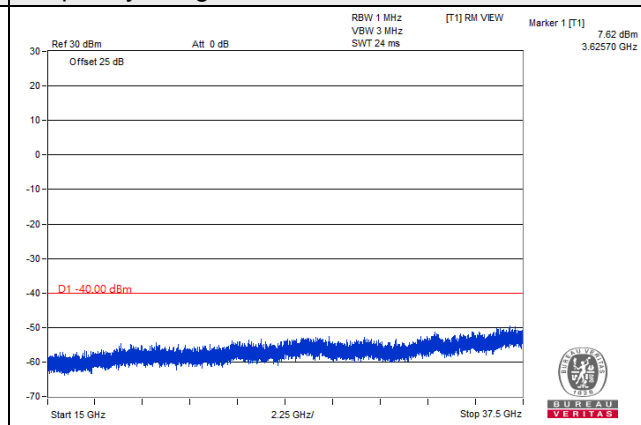
Frequency Range : 30MHz~1GHz



Frequency Range : 1GHz~15GHz

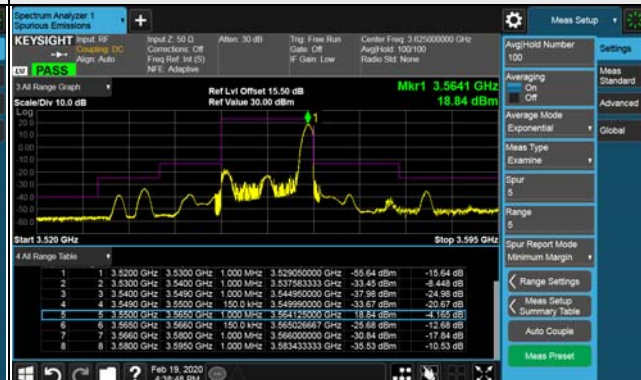
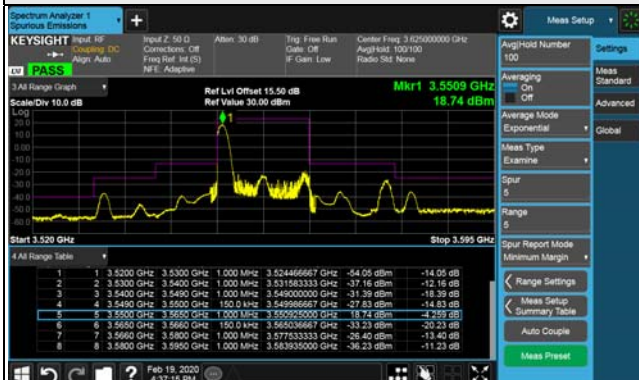


Frequency Range : 15GHz~37GHz

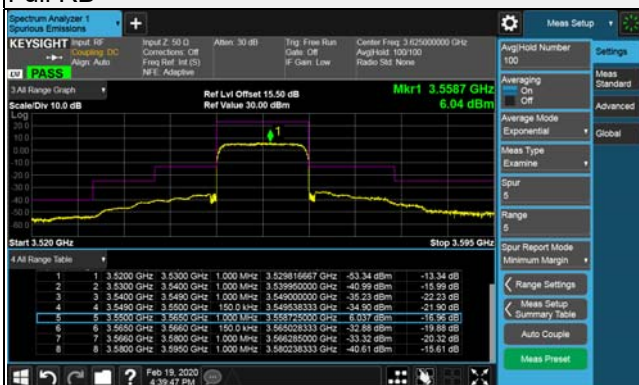


15MHz / QPSK / Low Channel

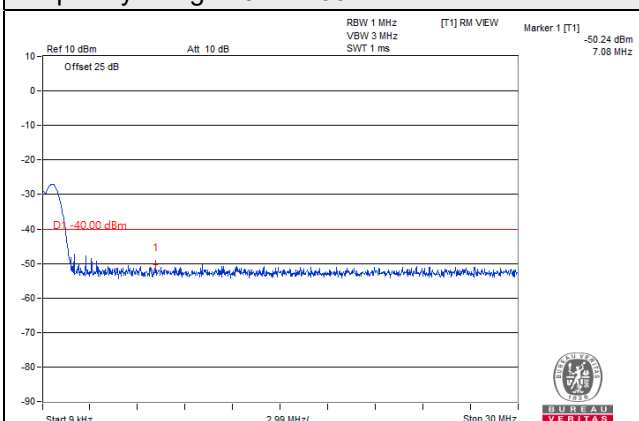
1RB



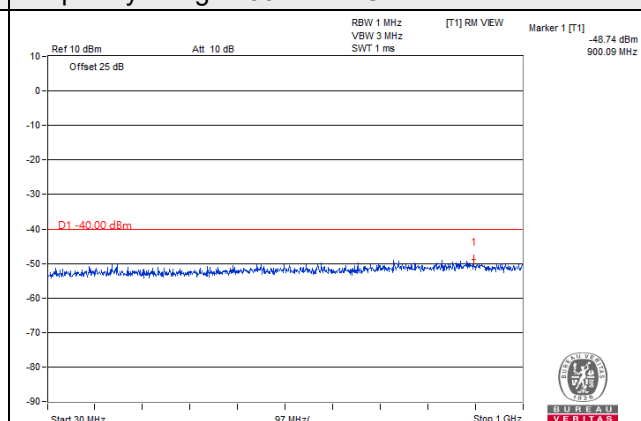
Full RB



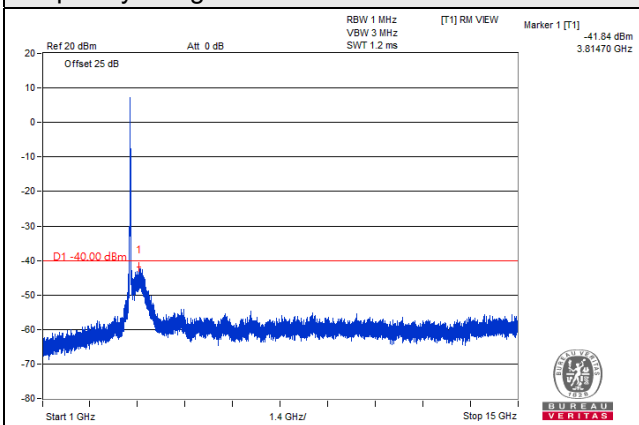
Frequency Range : 9kHz~30MHz



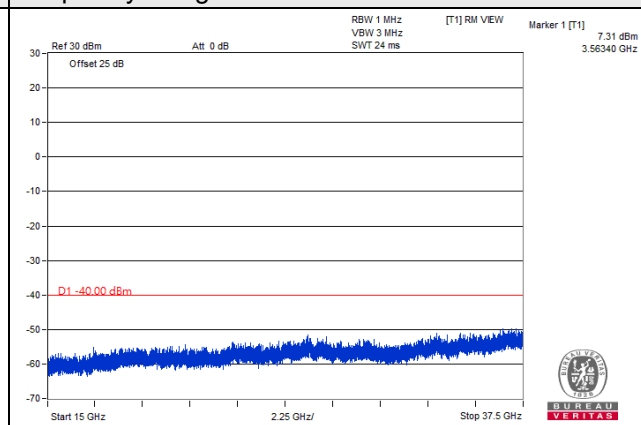
Frequency Range : 30MHz~1GHz



Frequency Range : 1GHz~15GHz

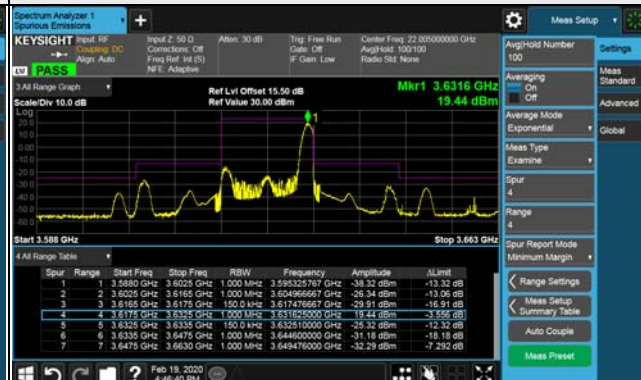
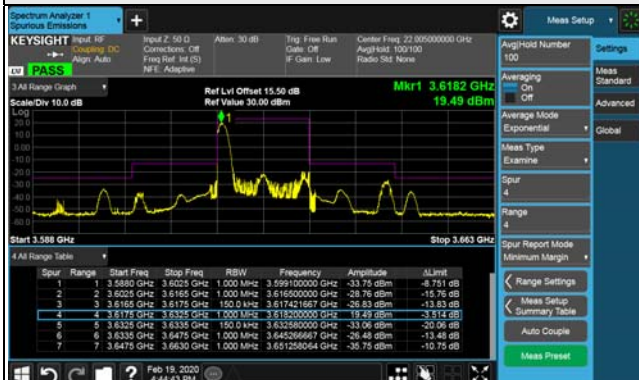


Frequency Range : 15GHz~37GHz

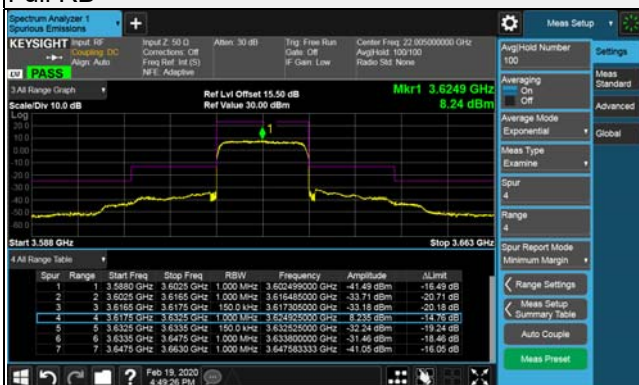


15MHz / QPSK / Middle Channel

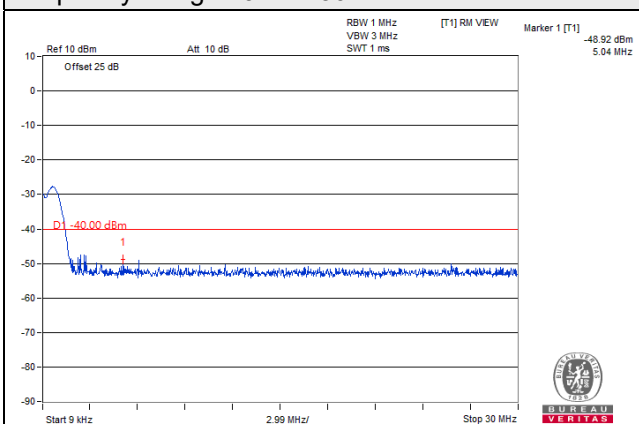
1RB



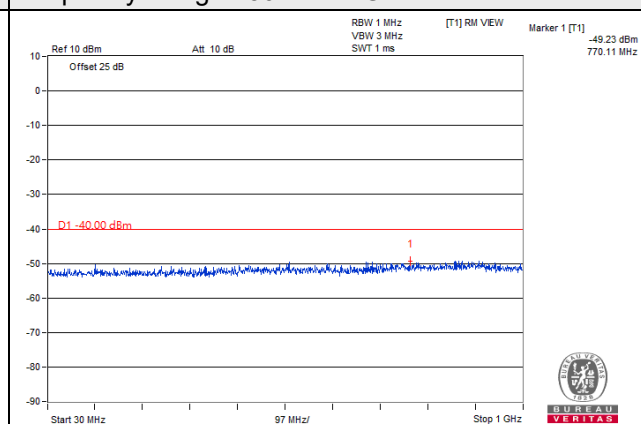
Full RB



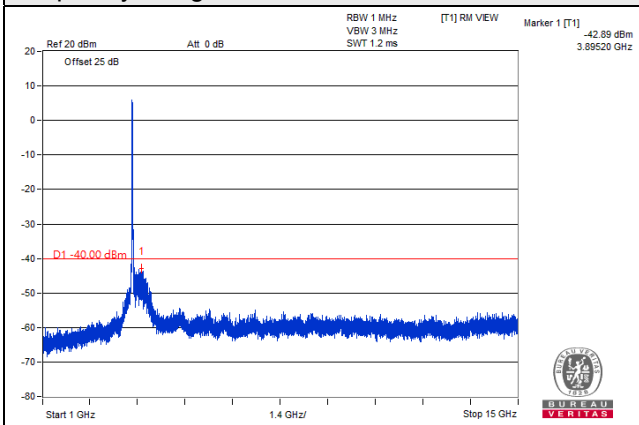
Frequency Range : 9kHz~30MHz



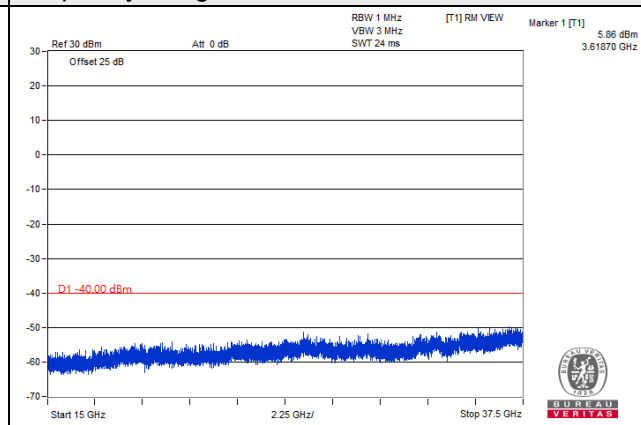
Frequency Range : 30MHz~1GHz



Frequency Range : 1GHz~15GHz

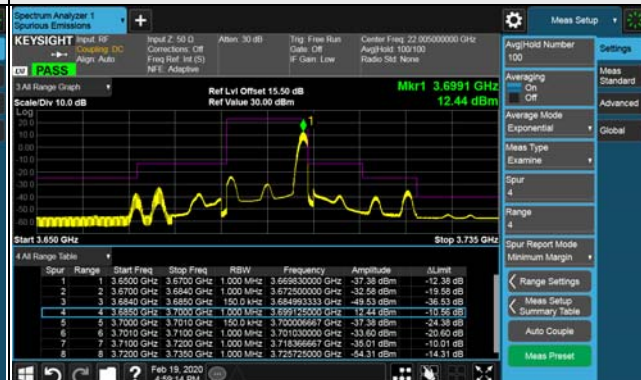


Frequency Range : 15GHz~37GHz

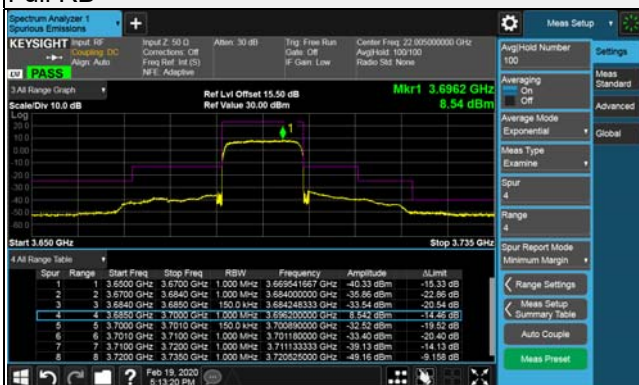


15MHz / QPSK / High Channel

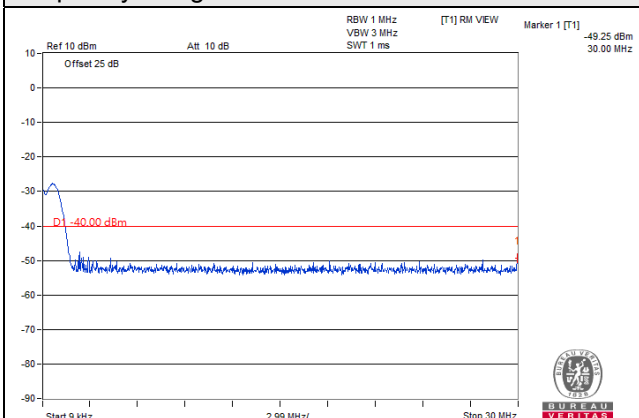
1RB



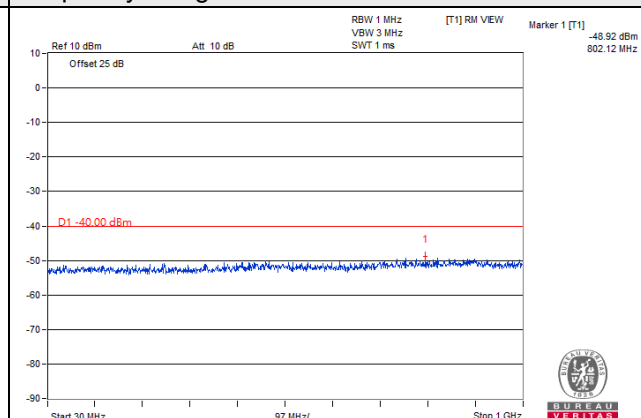
Full RB



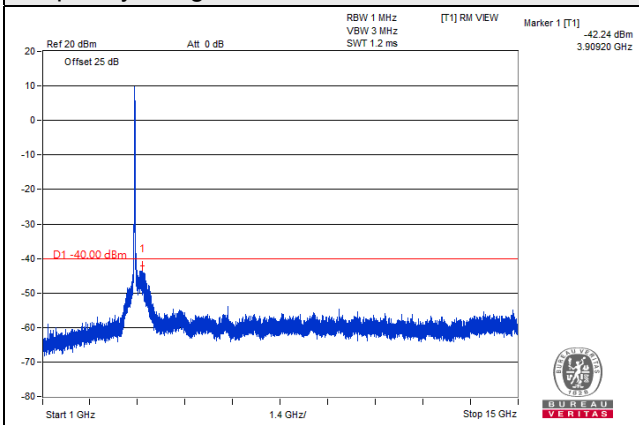
Frequency Range : 9kHz~30MHz



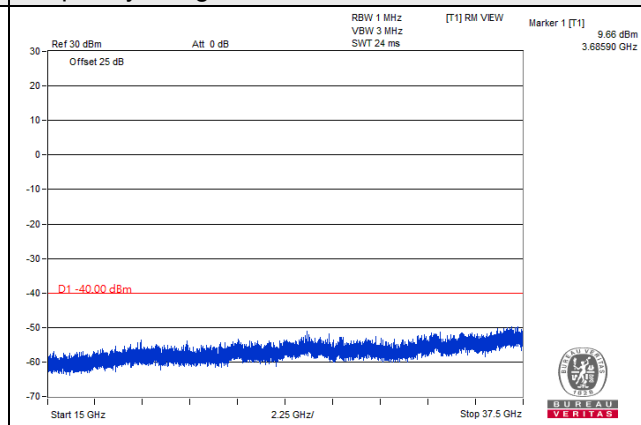
Frequency Range : 30MHz~1GHz



Frequency Range : 1GHz~15GHz

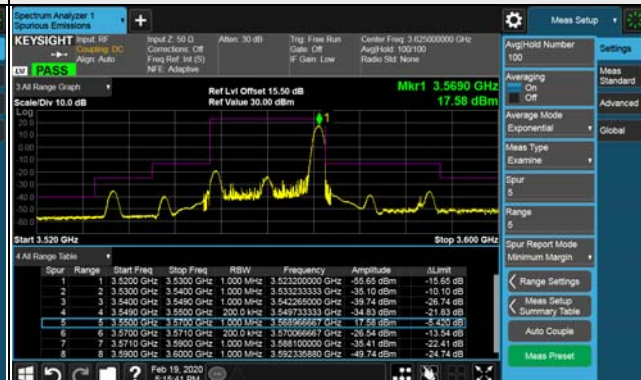
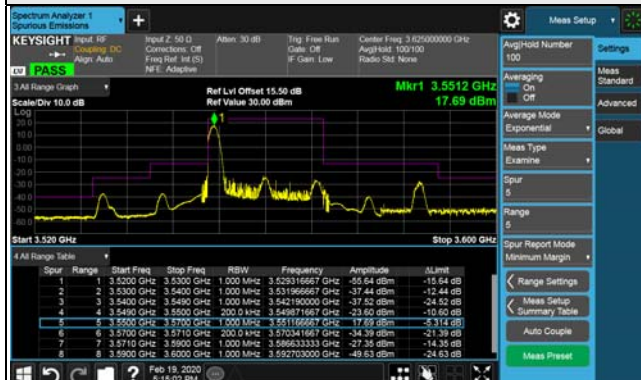


Frequency Range : 15GHz~37GHz

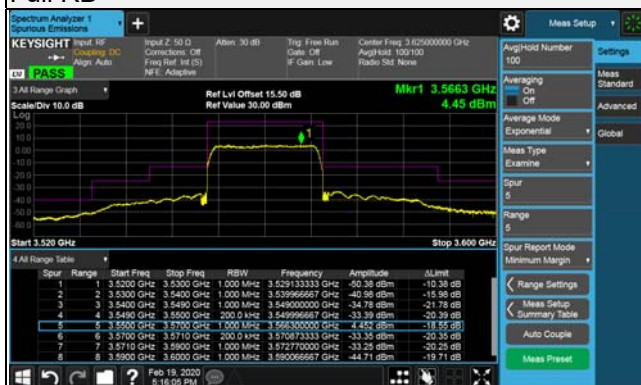


20MHz / QPSK / Low Channel

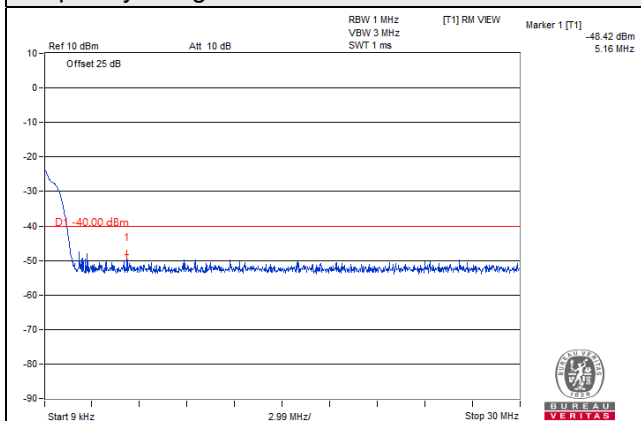
1RB



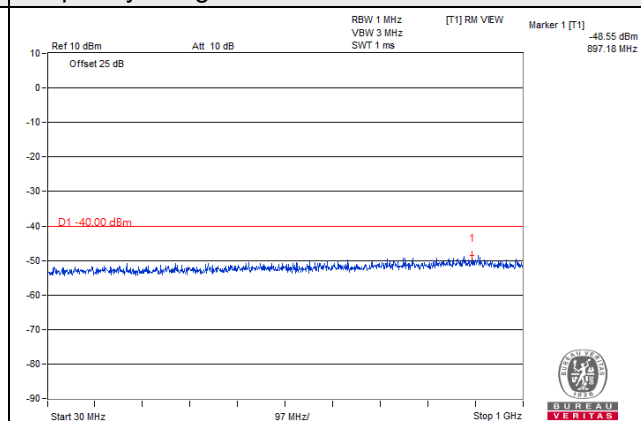
Full RB



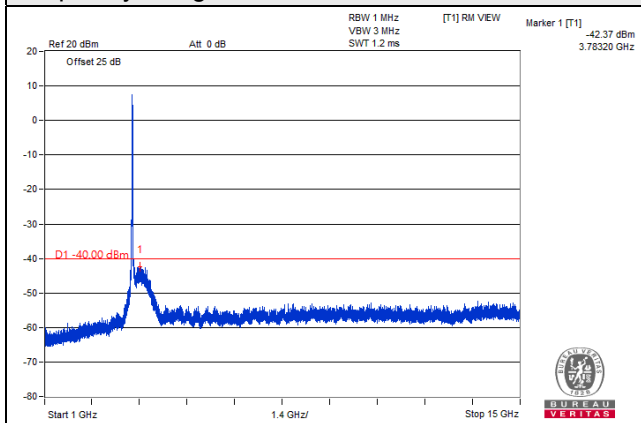
Frequency Range : 9kHz~30MHz



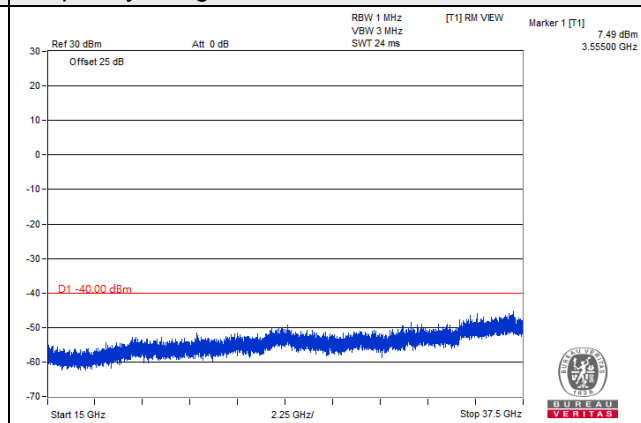
Frequency Range : 30MHz~1GHz



Frequency Range : 1GHz~15GHz

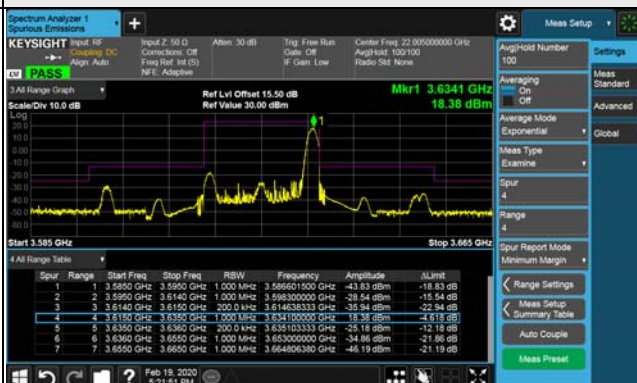
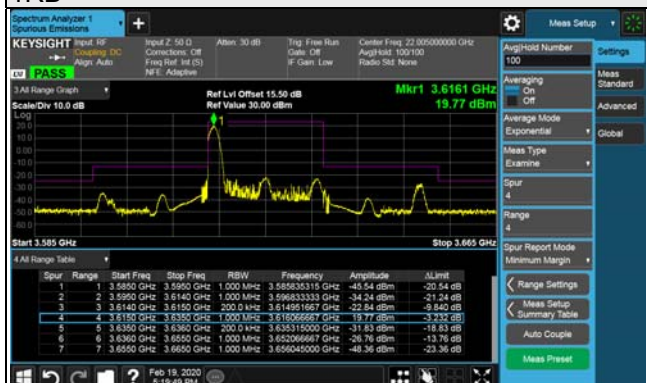


Frequency Range : 15GHz~37GHz

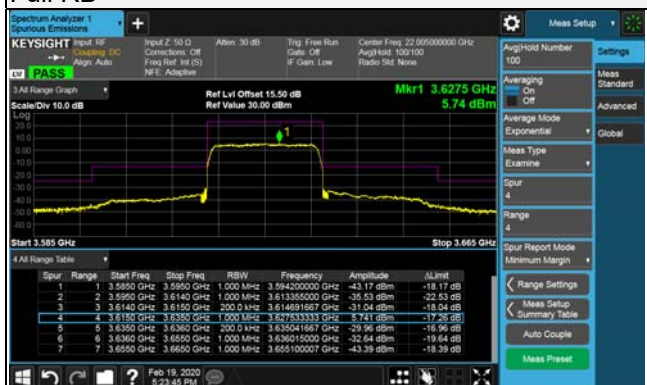


20MHz / QPSK / Middle Channel

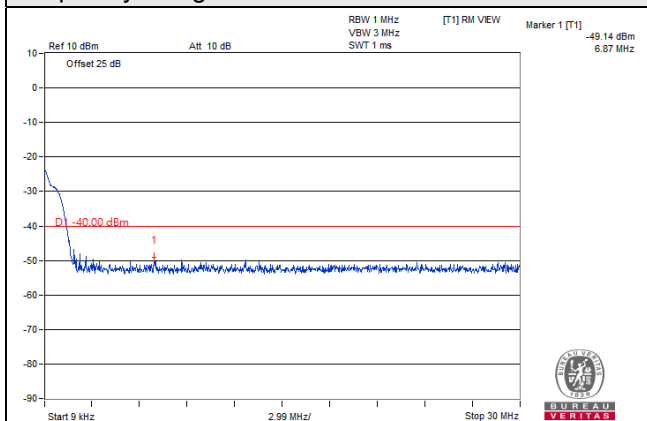
1RB



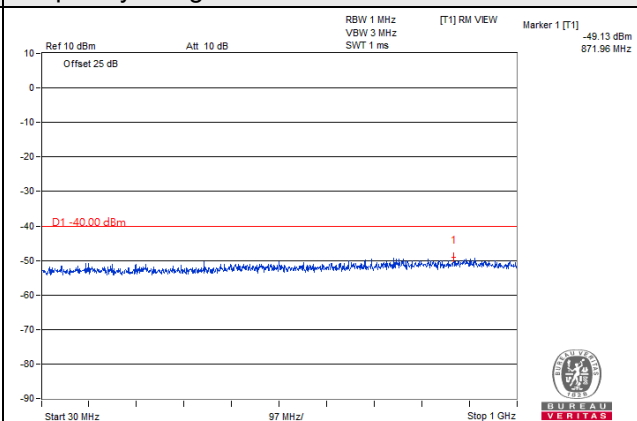
Full RB



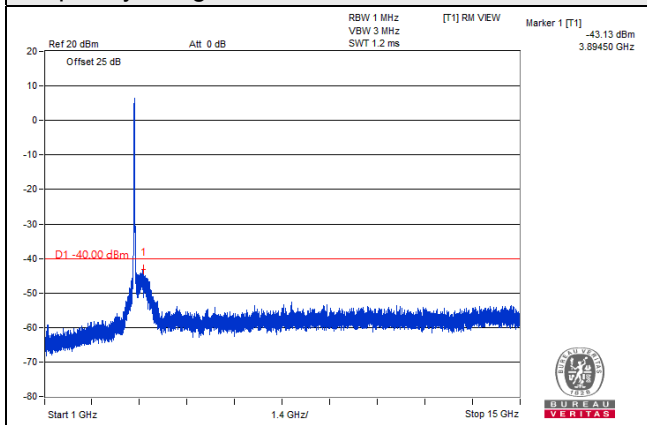
Frequency Range : 9kHz~30MHz



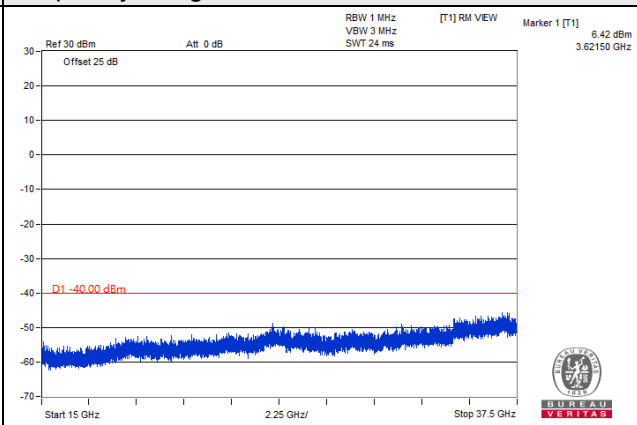
Frequency Range : 30MHz~1GHz



Frequency Range : 1GHz~15GHz

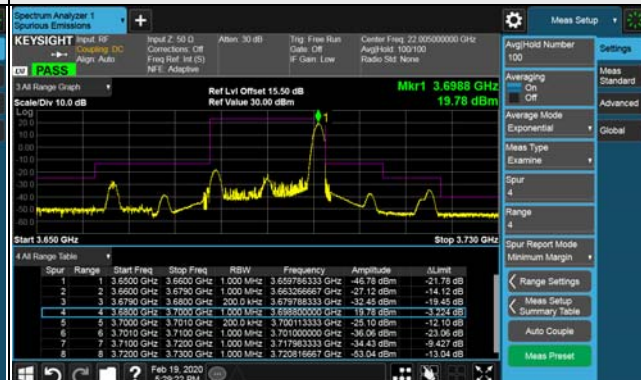


Frequency Range : 15GHz~37GHz

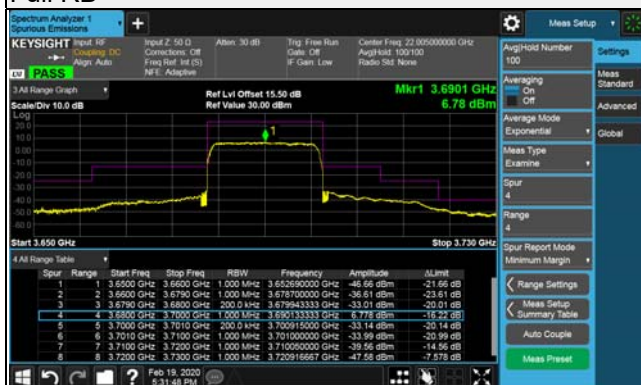


20MHz / QPSK / High Channel

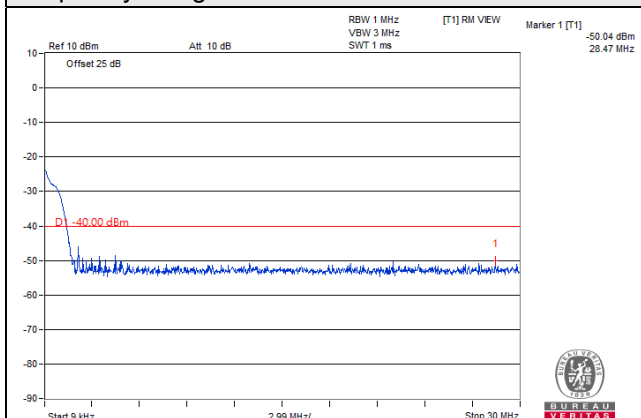
1RB



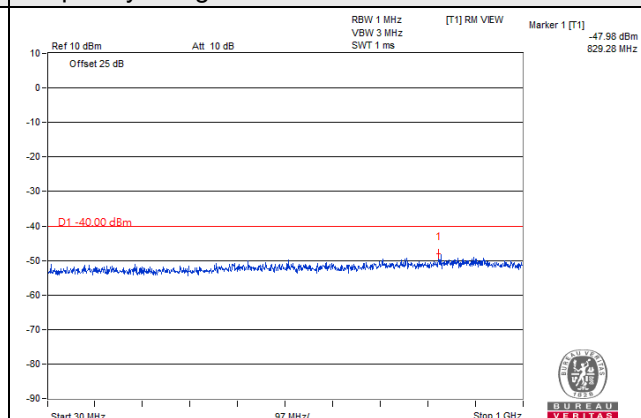
Full RB



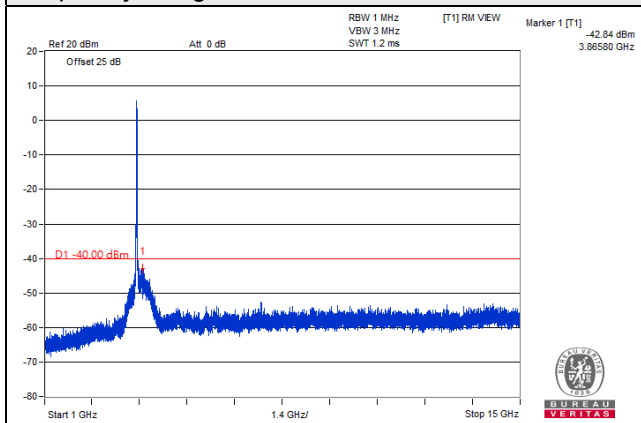
Frequency Range : 9kHz~30MHz



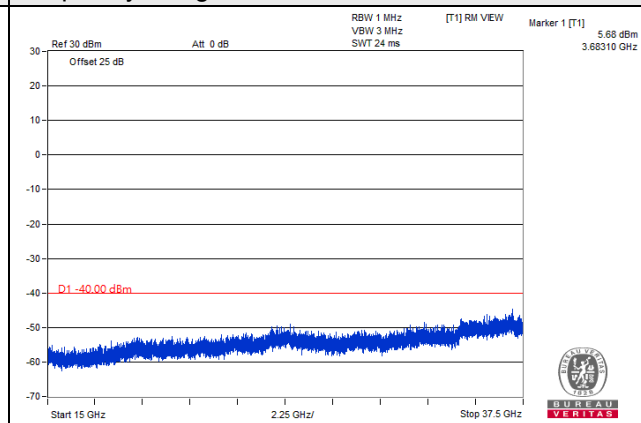
Frequency Range : 30MHz~1GHz



Frequency Range : 1GHz~15GHz



Frequency Range : 15GHz~37GHz



4.7 Radiated Emission Measurement

4.7.1 Limits of Radiated Emission Measurement

The power of any emissions below 3530 MHz or above 3720 MHz shall not exceed -40dBm/MHz.

4.7.2 Test Instruments

Refer to section 4.1.3 to get information of above instrument.

4.7.3 Test Procedures

- a. Substitution method is used for EIRP measurement. In the semi-anechoic chamber, EUT placed on the 0.8m / 1.5m 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.
- b. The substitution antenna is substituted for EUT at the same position and signals generator export the CW signal to the substitution antenna via a TX cable. Rotated the Turn Table and moved receiving antenna to find the maximum radiation power. Adjust output power level of S.G to get a Value of spectrum reading equal to "Read Value" of step a. Record the power level of S.G.
- c. $EIRP = \text{Output power level of S.G} - \text{TX cable loss} + \text{Antenna gain of substitution horn}.$

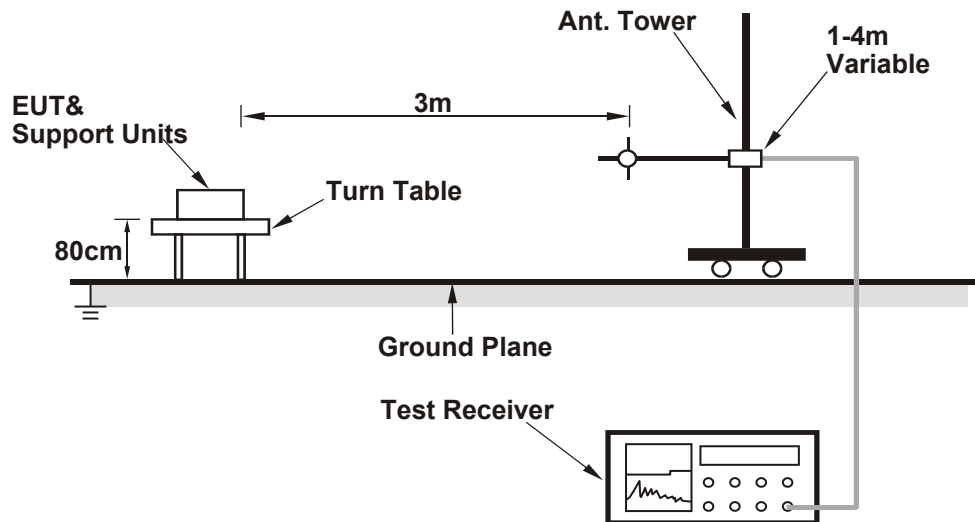
Note: The resolution bandwidth of spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz.

4.7.4 Deviation from Test Standard

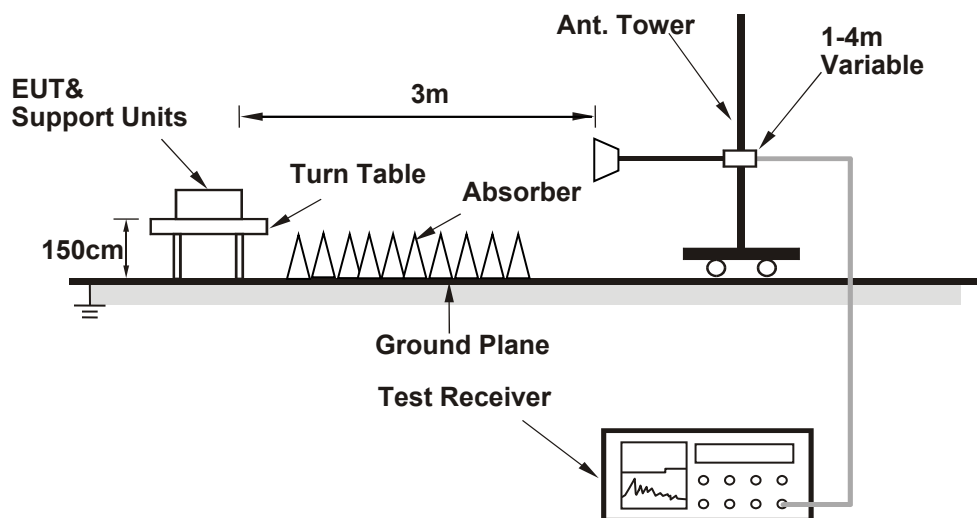
No deviation.

4.7.5 Test Set Up

<Frequency Range below 1GHz>



<Frequency Range above 1GHz>



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

4.7.6 Test Results

Above 1GHz Data :

5MHz

Channel	TX Low	Frequency Range	Above 1000 MHz
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Antenna Polarity & Test Distance: Horizontal at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)
1	7105.57	-72.05	-112.10	49.37	-62.73	-40.00	-22.73
Antenna Polarity & Test Distance: Vertical at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)
1	7105.79	-67.61	-107.77	49.37	-58.40	-40.00	-18.40

Remarks:

1. $EIRP (dBm) = S.G \text{ Value (dBm)} + \text{Correction Factor (dB)}$.
2. $\text{Correction Factor (dB)} = \text{Substitution Antenna Gain (dB)} + \text{Cable Loss (dB)}$.

Channel	TX Middle	Frequency Range	Above 1000 MHz
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Antenna Polarity & Test Distance: Horizontal at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)
1	7251.03	-72.12	-112.20	49.43	-62.77	-40.00	-22.77
Antenna Polarity & Test Distance: Vertical at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)
1	7251.17	-67.66	-107.85	49.43	-58.42	-40.00	-18.42

Remarks:

1. $EIRP (dBm) = S.G \text{ Value (dBm)} + \text{Correction Factor (dB)}$.
2. $\text{Correction Factor (dB)} = \text{Substitution Antenna Gain (dB)} + \text{Cable Loss (dB)}$.

Channel	TX High	Frequency Range	Above 1000 MHz
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Antenna Polarity & Test Distance: Horizontal at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)
1	7394.49	-72.17	-112.44	49.66	-62.78	-40.00	-22.78
Antenna Polarity & Test Distance: Vertical at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)
1	7394.63	-67.79	-108.18	49.66	-58.52	-40.00	-18.52

Remarks:

1. $EIRP (dBm) = S.G \text{ Value (dBm)} + \text{Correction Factor (dB)}$.
2. $\text{Correction Factor (dB)} = \text{Substitution Antenna Gain (dB)} + \text{Cable Loss (dB)}$.

10MHz

Channel	TX Low	Frequency Range	Above 1000 MHz
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Antenna Polarity & Test Distance: Horizontal at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)
1	7108.43	-71.39	-111.44	49.37	-62.07	-40.00	-22.07
Antenna Polarity & Test Distance: Vertical at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)
1	7108.57	-67.47	-107.63	49.37	-58.26	-40.00	-18.26

Remarks:

1. $EIRP (dBm) = S.G \text{ Value (dBm)} + \text{Correction Factor (dB)}$.
2. $\text{Correction Factor (dB)} = \text{Substitution Antenna Gain (dB)} + \text{Cable Loss (dB)}$.

Channel	TX Middle	Frequency Range	Above 1000 MHz
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Antenna Polarity & Test Distance: Horizontal at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)
1	7250.11	-72.39	-112.47	49.43	-63.04	-40.00	-23.04
Antenna Polarity & Test Distance: Vertical at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)
1	7250.07	-67.45	-107.64	49.43	-58.21	-40.00	-18.21

Remarks:

1. $EIRP (dBm) = S.G \text{ Value (dBm)} + \text{Correction Factor (dB)}$.
2. $\text{Correction Factor (dB)} = \text{Substitution Antenna Gain (dB)} + \text{Cable Loss (dB)}$.

Channel	TX High	Frequency Range	Above 1000 MHz
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Antenna Polarity & Test Distance: Horizontal at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)
1	7387.92	-71.91	-112.19	49.66	-62.53	-40.00	-22.53
Antenna Polarity & Test Distance: Vertical at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)
1	7387.88	-67.21	-107.60	49.66	-57.94	-40.00	-17.94

Remarks:

1. $EIRP (dBm) = S.G \text{ Value (dBm)} + \text{Correction Factor (dB)}$.
2. $\text{Correction Factor (dB)} = \text{Substitution Antenna Gain (dB)} + \text{Cable Loss (dB)}$.

15MHz

Channel	TX Low	Frequency Range	Above 1000 MHz
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Antenna Polarity & Test Distance: Horizontal at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)
1	7110.52	-72.39	-112.44	49.37	-63.07	-40.00	-23.07
Antenna Polarity & Test Distance: Vertical at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)
1	7110.78	-67.05	-107.21	49.37	-57.84	-40.00	-17.84

Remarks:

1. EIRP (dBm) = S.G Value (dBm) + Correction Factor (dB).
2. Correction Factor (dB) = Substitution Antenna Gain (dB) + Cable Loss (dB).

Channel	TX Middle	Frequency Range	Above 1000 MHz
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Antenna Polarity & Test Distance: Horizontal at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)
1	7247.40	-72.64	-112.71	49.42	-63.29	-40.00	-23.29
Antenna Polarity & Test Distance: Vertical at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)
1	7247.17	-67.50	-107.68	49.42	-58.26	-40.00	-18.26

Remarks:

1. EIRP (dBm) = S.G Value (dBm) + Correction Factor (dB).
2. Correction Factor (dB) = Substitution Antenna Gain (dB) + Cable Loss (dB).

Channel	TX High	Frequency Range	Above 1000 MHz
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Antenna Polarity & Test Distance: Horizontal at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)
1	7387.56	-73.20	-113.48	49.66	-63.82	-40.00	-23.82
Antenna Polarity & Test Distance: Vertical at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)
1	7387.63	-66.69	-107.08	49.66	-57.42	-40.00	-17.42

Remarks:

1. EIRP (dBm) = S.G Value (dBm) + Correction Factor (dB).
2. Correction Factor (dB) = Substitution Antenna Gain (dB) + Cable Loss (dB).

20MHz

Channel	TX Low	Frequency Range	Above 1000 MHz
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Antenna Polarity & Test Distance: Horizontal at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)
1	7119.99	-72.25	-112.31	49.38	-62.93	-40.00	-22.93
Antenna Polarity & Test Distance: Vertical at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)
1	7120.03	-67.38	-107.55	49.38	-58.17	-40.00	-18.17

Remarks:

1. $EIRP (dBm) = S.G \text{ Value (dBm)} + \text{Correction Factor (dB)}$.
2. $\text{Correction Factor (dB)} = \text{Substitution Antenna Gain (dB)} + \text{Cable Loss (dB)}$.

Channel	TX Middle	Frequency Range	Above 1000 MHz
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Antenna Polarity & Test Distance: Horizontal at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)
1	7250.19	-72.13	-112.21	49.43	-62.78	-40.00	-22.78
Antenna Polarity & Test Distance: Vertical at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)
1	7250.32	-67.68	-107.87	49.43	-58.44	-40.00	-18.44

Remarks:

1. $EIRP (dBm) = S.G \text{ Value (dBm)} + \text{Correction Factor (dB)}$.
2. $\text{Correction Factor (dB)} = \text{Substitution Antenna Gain (dB)} + \text{Cable Loss (dB)}$.

Channel	TX High	Frequency Range	Above 1000 MHz
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Antenna Polarity & Test Distance: Horizontal at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)
1	7379.82	-72.42	-112.69	49.65	-63.04	-40.00	-23.04
Antenna Polarity & Test Distance: Vertical at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)
1	7379.74	-67.35	-107.74	49.65	-58.09	-40.00	-18.09

Remarks:

1. $EIRP (dBm) = S.G \text{ Value (dBm)} + \text{Correction Factor (dB)}$.
2. $\text{Correction Factor (dB)} = \text{Substitution Antenna Gain (dB)} + \text{Cable Loss (dB)}$.

Below 1GHz Data :

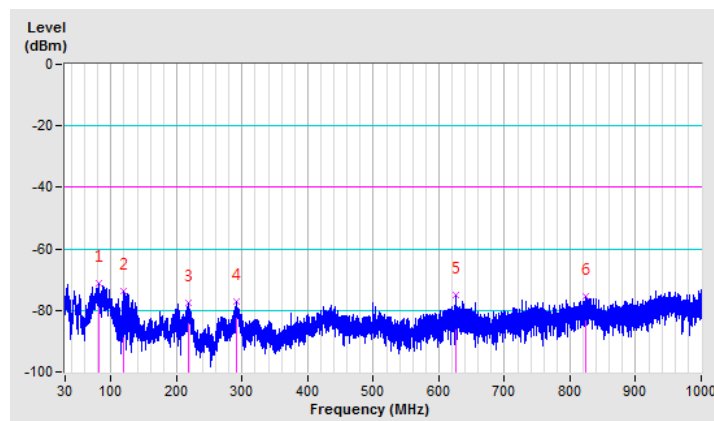
5MHz

Channel	TX High	Frequency Range	Below 1000 MHz
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Antenna Polarity & Test Distance: Horizontal at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)
1	80.68	-65.39	-81.26	9.92	-71.34	-40.00	-31.34
2	118.51	-68.30	-86.44	12.58	-73.86	-40.00	-33.86
3	218.42	-68.78	-89.72	12.14	-77.58	-40.00	-37.58
4	290.81	-76.00	-93.01	15.85	-77.16	-40.00	-37.16
5	624.97	-82.12	-99.30	24.23	-75.07	-40.00	-35.07
6	824.31	-85.55	-102.82	27.28	-75.54	-40.00	-35.54

Remarks:

1. $EIRP (dBm) = S.G \text{ Value (dBm)} + \text{Correction Factor (dB)}$.
2. $\text{Correction Factor (dB)} = \text{Substitution Antenna Gain (dB)} + \text{Cable Loss (dB)}$.

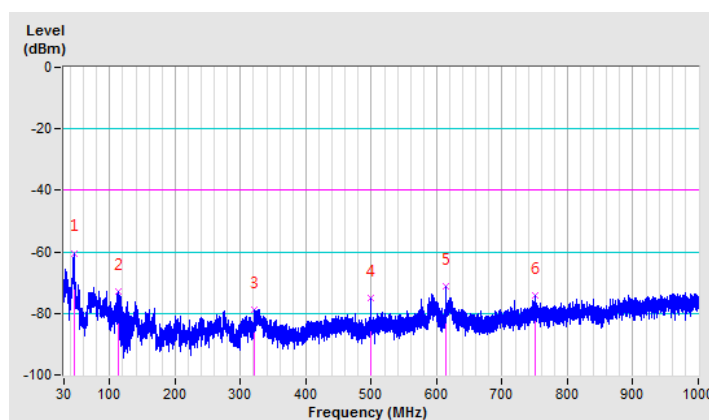


Channel	TX High	Frequency Range	Below 1000 MHz
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Antenna Polarity & Test Distance: Vertical at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)
1	45.03	-60.93	-74.48	14.10	-60.38	-40.00	-20.38
2	113.42	-67.35	-84.87	12.13	-72.74	-40.00	-32.74
3	321.73	-78.48	-95.50	16.78	-78.72	-40.00	-38.72
4	499.96	-78.05	-96.40	21.21	-75.19	-40.00	-35.19
5	614.42	-76.84	-95.19	24.07	-71.12	-40.00	-31.12
6	749.98	-81.95	-100.43	26.33	-74.10	-40.00	-34.10

Remarks:

1. $EIRP (dBm) = S.G \text{ Value (dBm)} + \text{Correction Factor (dB)}$.
2. $\text{Correction Factor (dB)} = \text{Substitution Antenna Gain (dB)} + \text{Cable Loss (dB)}$.



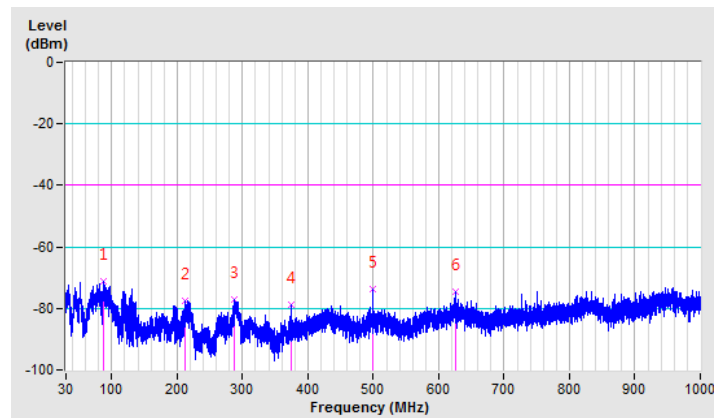
10MHz

Channel	TX High	Frequency Range	Below 1000 MHz
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Antenna Polarity & Test Distance: Horizontal at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)
1	87.96	-64.58	-80.39	9.07	-71.32	-40.00	-31.32
2	212.97	-68.33	-89.52	12.16	-77.36	-40.00	-37.36
3	287.05	-75.68	-92.84	15.77	-77.07	-40.00	-37.07
4	374.96	-79.26	-97.14	18.25	-78.89	-40.00	-38.89
5	499.96	-77.50	-94.73	21.21	-73.52	-40.00	-33.52
6	624.97	-81.50	-98.68	24.23	-74.45	-40.00	-34.45

Remarks:

1. $EIRP (dBm) = S.G \text{ Value (dBm)} + \text{Correction Factor (dB)}$.
2. $\text{Correction Factor (dB)} = \text{Substitution Antenna Gain (dB)} + \text{Cable Loss (dB)}$.

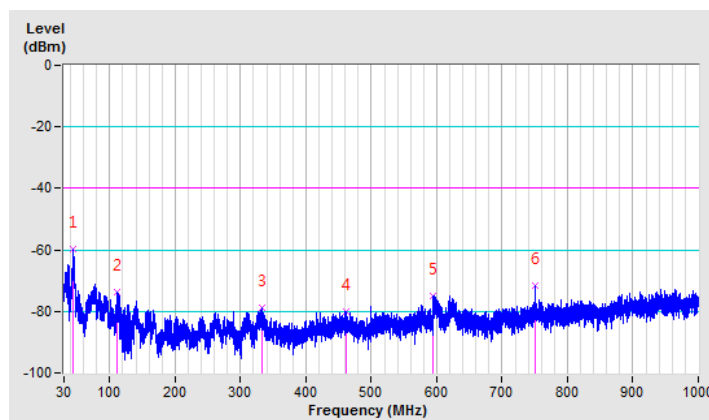


Channel	TX High	Frequency Range	Below 1000 MHz
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Antenna Polarity & Test Distance: Vertical at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)
1	44.31	-60.33	-73.65	13.99	-59.66	-40.00	-19.66
2	111.97	-68.04	-85.64	12.02	-73.62	-40.00	-33.62
3	333.25	-79.39	-95.99	17.02	-78.97	-40.00	-38.97
4	461.17	-82.06	-100.51	20.55	-79.96	-40.00	-39.96
5	594.18	-80.70	-98.53	23.54	-74.99	-40.00	-34.99
6	749.98	-79.47	-97.95	26.33	-71.62	-40.00	-31.62

Remarks:

1. EIRP (dBm) = S.G Value (dBm) + Correction Factor (dB).
2. Correction Factor (dB) = Substitution Antenna Gain (dB) + Cable Loss (dB).



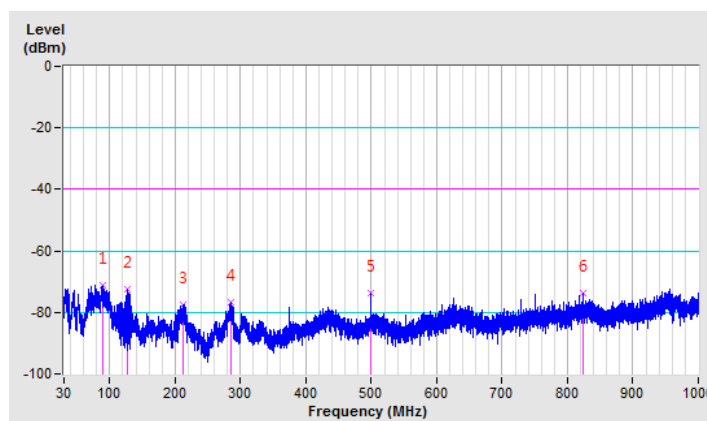
15MHz

Channel	TX High	Frequency Range	Below 1000 MHz
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Antenna Polarity & Test Distance: Horizontal at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)
1	88.69	-64.19	-80.17	9.05	-71.12	-40.00	-31.12
2	126.64	-67.93	-85.67	13.18	-72.49	-40.00	-32.49
3	212.60	-68.64	-89.78	12.16	-77.62	-40.00	-37.62
4	285.72	-75.11	-92.32	15.74	-76.58	-40.00	-36.58
5	499.96	-77.77	-95.00	21.21	-73.79	-40.00	-33.79
6	824.19	-83.65	-100.92	27.28	-73.64	-40.00	-33.64

Remarks:

1. $EIRP (dBm) = S.G \text{ Value (dBm)} + \text{Correction Factor (dB)}$.
2. $\text{Correction Factor (dB)} = \text{Substitution Antenna Gain (dB)} + \text{Cable Loss (dB)}$.

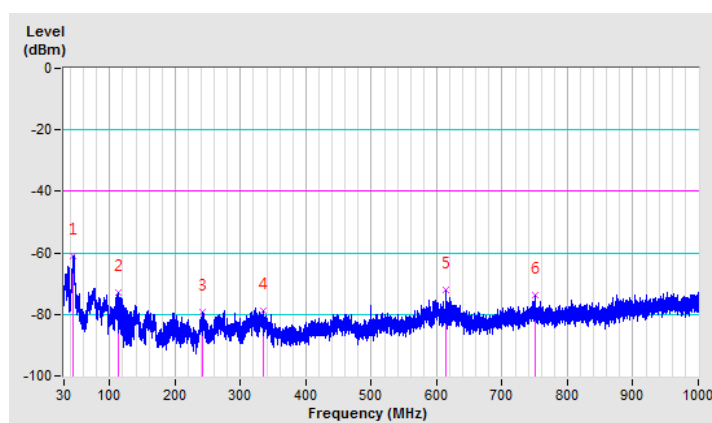


Channel	TX High	Frequency Range	Below 1000 MHz
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Antenna Polarity & Test Distance: Vertical at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)
1	44.19	-61.69	-74.97	13.98	-60.99	-40.00	-20.99
2	112.81	-67.46	-85.01	12.08	-72.93	-40.00	-32.93
3	241.82	-74.50	-93.12	13.78	-79.34	-40.00	-39.34
4	334.82	-79.30	-95.86	17.05	-78.81	-40.00	-38.81
5	614.42	-77.86	-96.21	24.07	-72.14	-40.00	-32.14
6	749.98	-81.70	-100.18	26.33	-73.85	-40.00	-33.85

Remarks:

1. EIRP (dBm) = S.G Value (dBm) + Correction Factor (dB).
2. Correction Factor (dB) = Substitution Antenna Gain (dB) + Cable Loss (dB).



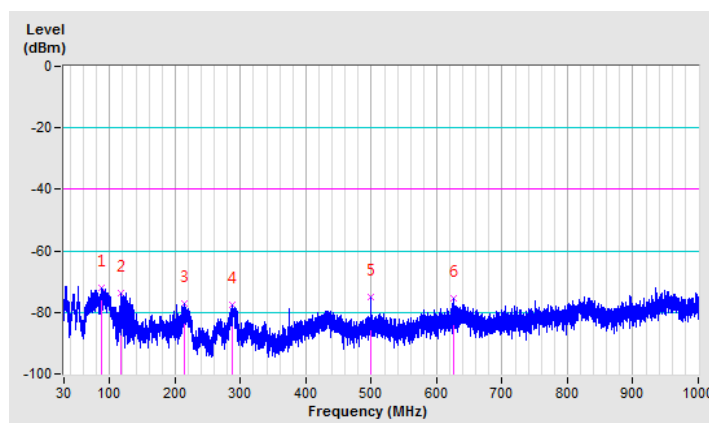
20MHz

Channel	TX High	Frequency Range	Below 1000 MHz
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Antenna Polarity & Test Distance: Horizontal at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)
1	87.84	-65.16	-80.93	9.07	-71.86	-40.00	-31.86
2	117.42	-68.49	-86.36	12.51	-73.85	-40.00	-33.85
3	214.54	-67.67	-89.11	12.17	-76.94	-40.00	-36.94
4	288.14	-76.25	-93.36	15.79	-77.57	-40.00	-37.57
5	499.96	-79.05	-96.28	21.21	-75.07	-40.00	-35.07
6	624.97	-82.44	-99.62	24.23	-75.39	-40.00	-35.39

Remarks:

1. $EIRP (dBm) = S.G \text{ Value (dBm)} + \text{Correction Factor (dB)}$.
2. $\text{Correction Factor (dB)} = \text{Substitution Antenna Gain (dB)} + \text{Cable Loss (dB)}$.

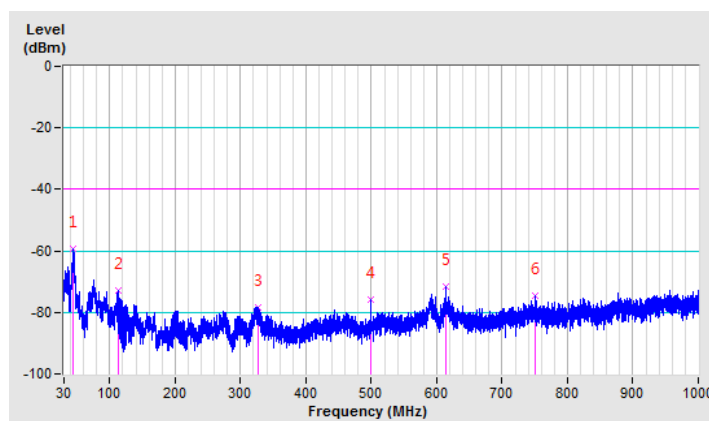


Channel	TX High	Frequency Range	Below 1000 MHz
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Antenna Polarity & Test Distance: Vertical at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)
1	44.43	-59.77	-73.13	14.01	-59.12	-40.00	-19.12
2	112.81	-67.25	-84.80	12.08	-72.72	-40.00	-32.72
3	326.33	-78.34	-95.08	16.87	-78.21	-40.00	-38.21
4	499.96	-78.89	-97.24	21.21	-76.03	-40.00	-36.03
5	614.42	-77.23	-95.58	24.07	-71.51	-40.00	-31.51
6	749.98	-82.43	-100.91	26.33	-74.58	-40.00	-34.58

Remarks:

1. EIRP (dBm) = S.G Value (dBm) + Correction Factor (dB).
2. Correction Factor (dB) = Substitution Antenna Gain (dB) + Cable Loss (dB).



4.8 Transmit Power Control (TPC)

4.8.1 Definition

End User Devices shall include transmit power control capability and the capability to limit their maximum EIRP in response to instructions from their associated CBSDs.

4.8.2 Requirement

The EUT can adjust a transmitter's output power based on the signal level present at the receiver.
TPC is auto controlled by software.

Manufacturer provides declaration form to meet this requirement.

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

Hsin Chu EMC/RF/Telecom Lab

Tel: 886-3-6668565

Fax: 886-3-6668323

Hwa Ya EMC/RF/Safety Lab

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.

--- END ---