

FCC Test Report

(PART 24)

Report No.: RF200616C19-1

FCC ID: T8GSAN9000

Test Model: SA-N9000 OEM D1

Received Date: Jun. 16, 2020

Test Date: Jun. 16, 2020 ~ Jun. 22, 2020

Issued Date: Aug. 21, 2020

Applicant: Harman Becker Automotive Systems

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



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Release Control Record

Issue No.	Description	Date Issued
RF200616C19-1	Original Release	Aug. 21, 2020

1 Certificate of Conformity

Product: Network Accessory Device

Brand: Harman

Test Model: SA-N9000 OEM D1

Sample Status: Standard Sample


Applicant: Harman Becker Automotive Systems

Test Date: Jun. 16, 2020 ~ Jun. 22, 2020

Standards: FCC Part 24, Subpart E

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

Prepared by : , **Date:** Aug. 21, 2020
Vera Huang / Specialist

Approved by : , **Date:** Aug. 21, 2020
Dylan Chiou / Senior Project Engineer

2 Summary of Test Results

Applied Standard: FCC Part 24 & Part 2			
FCC Clause	Test Item	Result	Remarks
2.1046 24.232	Effective Isotropic Radiated Power	Pass	Meet the requirement of limit.
2.1047	Modulation Characteristics	Pass	Meet the requirement.
24.232(d)	Peak to Average Ratio	Pass	Meet the requirement of limit.
2.1055 24.235	Frequency Stability	Pass	Meet the requirement of limit.
2.1049	Occupied Bandwidth	Pass	Meet the requirement of limit.
24.238	Band Edge Measurements	Pass	Meet the requirement of limit.
2.1051 24.238	Conducted Spurious Emissions	Pass	Meet the requirement of limit.
2.1053 24.238	Radiated Spurious Emissions	Pass	Meet the requirement of limit. Minimum passing margin is -36.70 dB at 3700.40 MHz.

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

2.1 Measurement Uncertainty

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

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

2.2 Test Site and Instruments

Description & Manufacturer	Model No.	Serial No.	Date of Calibration	Due Date of Calibration
Test Receiver KEYSIGHT	N9038A	MY55420137	Apr. 16, 2020	Apr. 15, 2021
Spectrum Analyzer ROHDE & SCHWARZ	FSP40	100039	Jun. 12, 2020	Jun. 11, 2021
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
Preamplifier Agilent (Below 1GHz)	8447D	2944A10638	Jul. 11, 2019	Jul. 10, 2020
Preamplifier Agilent (Above 1GHz)	8449B	3008A02367	Feb. 18, 2020	Feb. 17, 2021
RF signal cable HUBER+SUHNER&EMCI	SUCOFLEX 104 & EMC104-SM-SM800 0	CABLE-CH9-02 (248780+171006)	Jan. 18, 2020	Jan. 17, 2021
RF signal cable HUBER+SUHNER	SUCOFLEX 104	CABLE-CH9-(2507 95/4)	Jul. 11, 2019	Jul. 10, 2020
RF signal cable Woken	8D-FB	Cable-CH9-01	Jul. 30, 2019	Jul. 29, 2020
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
WIT Standard Temperature And Humidity Chamber	TH-4S-C	W981030	Jun. 01, 2020	May 31, 2021
JFW 20dB attenuation	50HF-020-SMA	NA	NA	NA
True RMS Clamp Meter Fluke	325	31130711WS	Jun. 06, 2020	Jun. 05, 2021
Communications Tester-Wireless Agilent	8960 Series 10	MY53201073	Jul. 01, 2019	Jun. 30, 2021
Temperature & Humidity Chamber	GTH-120-40-CP-AR	MAA1306-019	Sep. 10, 2019	Sep. 09, 2020
DC Power Supply Topward	33010D	807748	NA	NA

- Note: 1. The calibration interval of the above test instruments is 12 / 24 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. The test was performed in HwaYa Chamber 9.

3 General Information

3.1 General Description of EUT

Product	Network Accessory Device	
Brand	Harman	
Test Model	SA-N9000 OEM D1	
Status of EUT	Standard Sample	
Power Supply Rating	4.2 Vdc	
Modulation Type	GSM/GPRS	GMSK
	EDGE	GMSK, 8PSK
	WCDMA	QPSK
Frequency Range	GSM/GPRS/EDGE	1850.2 ~ 1909.8 MHz
	WCDMA	1852.4 ~ 1907.6 MHz
Max. EIRP Power	GSM/GPRS	1967.886 mW (32.94 dBm)
	EDGE	1678.804 mW (32.25 dBm)
	WCDMA	497.737 mW (26.97 dBm)
Emission Designator	GSM/GPRS	260KGXW
	EDGE	260KG7W
	WCDMA	4M18F9W
Antenna Type	Refer to Note	
Accessory Device	N/A	
Data Cable Supplied	N/A	

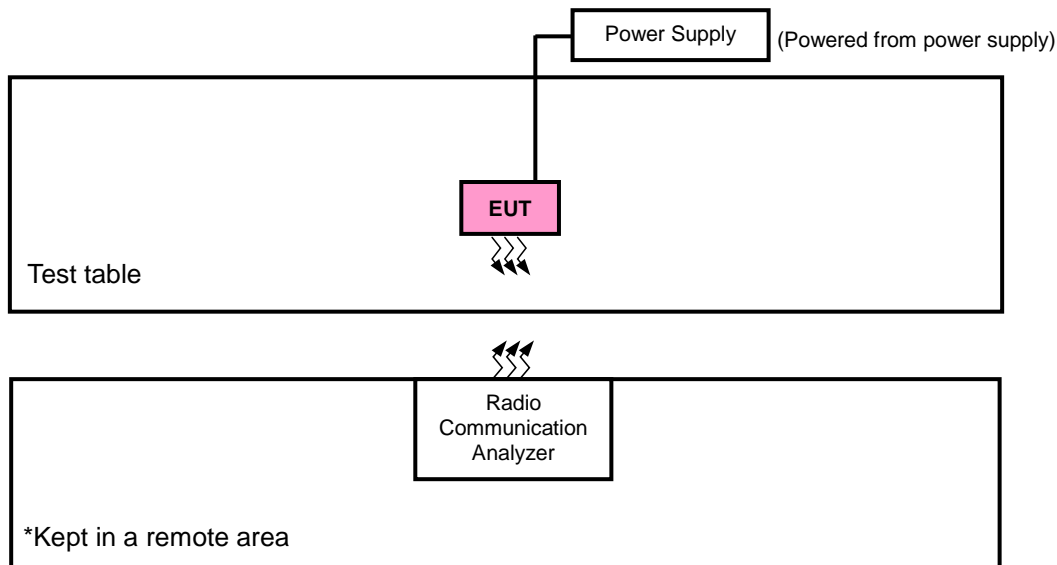
Note:

1. The antenna information is listed as below.

Operating frequency band	Antenna	Gain (dBi)	Connector Type
GSM/ WCDMA Band 2	5G/4G Terminal Mount Monopole Antenna	2.92	SMA
WCDMA Band 4		3.44	
GSM/ WCDMA Band 5		1.01	

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

3.2 Configuration of System under Test



3.2.1 Description of Support Units

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

No.	Product	Brand	Model No.	Serial No.	FCC ID
1.	Power Supply	N/A	N/A	N/A	N/A
2.	Radio Communication Analyzer	Anritsu	MT8821C	N/A	N/A

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

Note:

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

3.3 Test Mode Applicability and Tested Channel Detail

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

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

Band	EIRP	Radiated Emission
GSM	X-plane	X-plane
EDGE	X-plane	X-plane
WCDMA	X-plane	X-plane

GSM

EUT Configure Mode	Test Item	Available Channel	Tested Channel	Mode
-	EIRP	512 to 810	512, 661, 810	GSM, GPRS, EDGE
-	Modulation Characteristics	512 to 810	661	GSM, GPRS, EDGE
-	Frequency Stability	512 to 810	512, 810	GSM, EDGE
-	Occupied Bandwidth	512 to 810	512, 661, 810	GSM, GPRS, EDGE
-	Band Edge	512 to 810	512, 810	GSM, GPRS, EDGE
-	Peak to Average Ratio	512 to 810	512, 661, 810	GSM, GPRS, EDGE
-	Conducted Emission	512 to 810	512, 661, 810	GSM, GPRS, EDGE
-	Radiated Emission Below 1 GHz	512 to 810	512	GSM
-	Radiated Emission Above 1 GHz	512 to 810	512, 661, 810	GSM

WCDMA

EUT Configure Mode	Test Item	Available Channel	Tested Channel	Mode
-	EIRP	9262 to 9538	9262, 9400, 9538	WCDMA, HSDPA, HSUPA
-	Modulation Characteristics	9262 to 9538	9400	WCDMA, HSDPA, HSUPA
-	Frequency Stability	9262 to 9538	9262, 9538	WCDMA
-	Occupied Bandwidth	9262 to 9538	9262, 9400, 9538	WCDMA, HSDPA, HSUPA
-	Band Edge	9262 to 9538	9262, 9538	WCDMA, HSDPA, HSUPA
-	Peak to Average Ratio	9262 to 9538	9262, 9400, 9538	WCDMA, HSDPA, HSUPA
-	Conducted Emission	9262 to 9538	9262, 9400, 9538	WCDMA, HSDPA, HSUPA
-	Radiated Emission Below 1 GHz	9262 to 9538	9538	WCDMA
-	Radiated Emission Above 1 GHz	9262 to 9538	9262, 9400, 9538	WCDMA

Test Condition:

Test Item	Environmental Conditions	Input Power	Tested By
EIRP	26 deg. C, 58 % RH	4.2 Vdc	Han Wu
Modulation Characteristics	26 deg. C, 58 % RH	4.2 Vdc	Willy Cheng
Frequency Stability	26 deg. C, 58 % RH	4.2 Vdc	Willy Cheng
Occupied Bandwidth	26 deg. C, 58 % RH	4.2 Vdc	Willy Cheng
Band Edge	26 deg. C, 58 % RH	4.2 Vdc	Willy Cheng
Peak to Average Ratio	26 deg. C, 58 % RH	4.2 Vdc	Willy Cheng
Conducted Emission	26 deg. C, 58 % RH	4.2 Vdc	Willy Cheng
Radiated Emission	25 deg. C, 65 % RH	120 Vac, 60 Hz	Han Wu

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 24

ANSI 63.26-2015

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

References Test Guidance:

KDB 971168 D01 Power Meas License Digital Systems v03r01

ANSI/TIA/EIA-603-E 2016

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

4 Test Types and Results

4.1 Output Power Measurement

4.1.1 Limits of Output Power Measurement

Mobile / Portable station are limited to 2 watts e.i.r.p.

4.1.2 Test Procedures

Conducted Power Measurement:

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

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)

4.1.3 Test Setup

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	GSM1900		
Channel	512	661	810
Frequency (MHz)	1850.2	1880.0	1909.8
GSM (GMSK, 1Tx-slot)	29.93	30.02	29.90
GPRS (GMSK, 1Tx-slot)	29.90	29.99	29.89
GPRS (GMSK, 2Tx-slot)	29.88	29.97	29.81
GPRS (GMSK, 3Tx-slot)	29.85	29.94	29.79
GPRS (GMSK, 4Tx-slot)	29.84	29.90	29.74
DTM (GMSK, 2Tx-slot)	29.41	29.48	29.33
DTM (GMSK, 3Tx-slot)	29.35	29.42	29.27
EDGE (8PSK, 1Tx-slot)	29.28	29.33	29.20
EDGE (8PSK, 2Tx-slot)	29.23	29.28	29.12
EDGE (8PSK, 3Tx-slot)	29.16	29.23	29.05
EDGE (8PSK, 4Tx-slot)	29.08	29.17	28.97
DTM (8PSK, 2Tx-slot)	28.67	28.69	28.53
DTM (8PSK, 3Tx-slot)	28.62	28.63	28.48

Band	WCDMA II		
Channel	9262	9400	9538
Frequency (MHz)	1852.4	1880.0	1907.6
RMC 12.2K	23.90	23.95	24.05
HSDPA Subtest-1	23.85	23.89	23.96
HSDPA Subtest-2	23.82	23.85	23.90
HSDPA Subtest-3	23.41	23.53	23.61
HSDPA Subtest-4	23.35	23.50	23.55
HSUPA Subtest-1	23.81	23.82	23.92
HSUPA Subtest-2	22.98	23.13	23.37
HSUPA Subtest-3	22.62	22.81	22.96
HSUPA Subtest-4	22.13	22.33	22.49
HSUPA Subtest-5	22.36	22.48	23.17

EIRP Power (dBm)

Band	GSM1900		
Channel	512	661	810
Frequency (MHz)	1850.2	1880.0	1909.8
GSM (GMSK, 1Tx-slot)	32.85	32.94	32.82
GPRS (GMSK, 1Tx-slot)	32.82	32.91	32.81
GPRS (GMSK, 2Tx-slot)	32.80	32.89	32.73
GPRS (GMSK, 3Tx-slot)	32.77	32.86	32.71
GPRS (GMSK, 4Tx-slot)	32.76	32.82	32.66
DTM (GMSK, 2Tx-slot)	32.33	32.40	32.25
DTM (GMSK, 3Tx-slot)	32.27	32.34	32.19
EDGE (8PSK, 1Tx-slot)	32.20	32.25	32.12
EDGE (8PSK, 2Tx-slot)	32.15	32.20	32.04
EDGE (8PSK, 3Tx-slot)	32.08	32.15	31.97
EDGE (8PSK, 4Tx-slot)	32.00	32.09	31.89
DTM (8PSK, 2Tx-slot)	31.59	31.61	31.45
DTM (8PSK, 3Tx-slot)	31.54	31.55	31.40

*EIRP = Conducted + antenna gain (3.09dBi)

Band	WCDMA II		
Channel	9262	9400	9538
Frequency (MHz)	1852.4	1880.0	1907.6
RMC 12.2K	26.82	26.87	26.97
HSDPA Subtest-1	26.77	26.81	26.88
HSDPA Subtest-2	26.74	26.77	26.82
HSDPA Subtest-3	26.33	26.45	26.53
HSDPA Subtest-4	26.27	26.42	26.47
HSUPA Subtest-1	26.73	26.74	26.84
HSUPA Subtest-2	25.90	26.05	26.29
HSUPA Subtest-3	25.54	25.73	25.88
HSUPA Subtest-4	25.05	25.25	25.41
HSUPA Subtest-5	25.28	25.40	26.09

* EIRP = Conducted + antenna gain (3.09dBi)

4.2 Modulation Characteristics Measurement

4.2.1 Limits of Modulation Characteristics

N/A

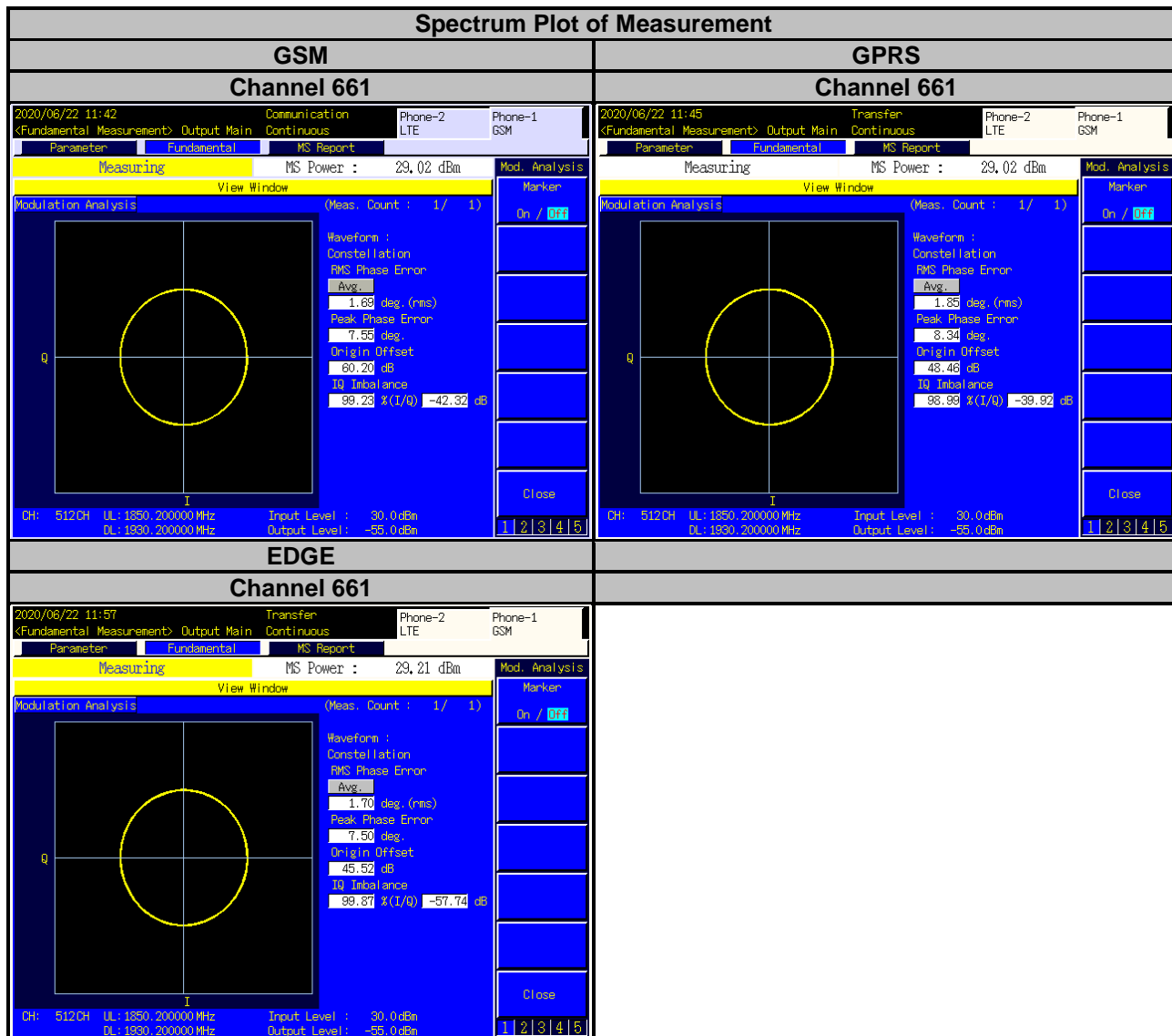
4.2.2 Test Setup

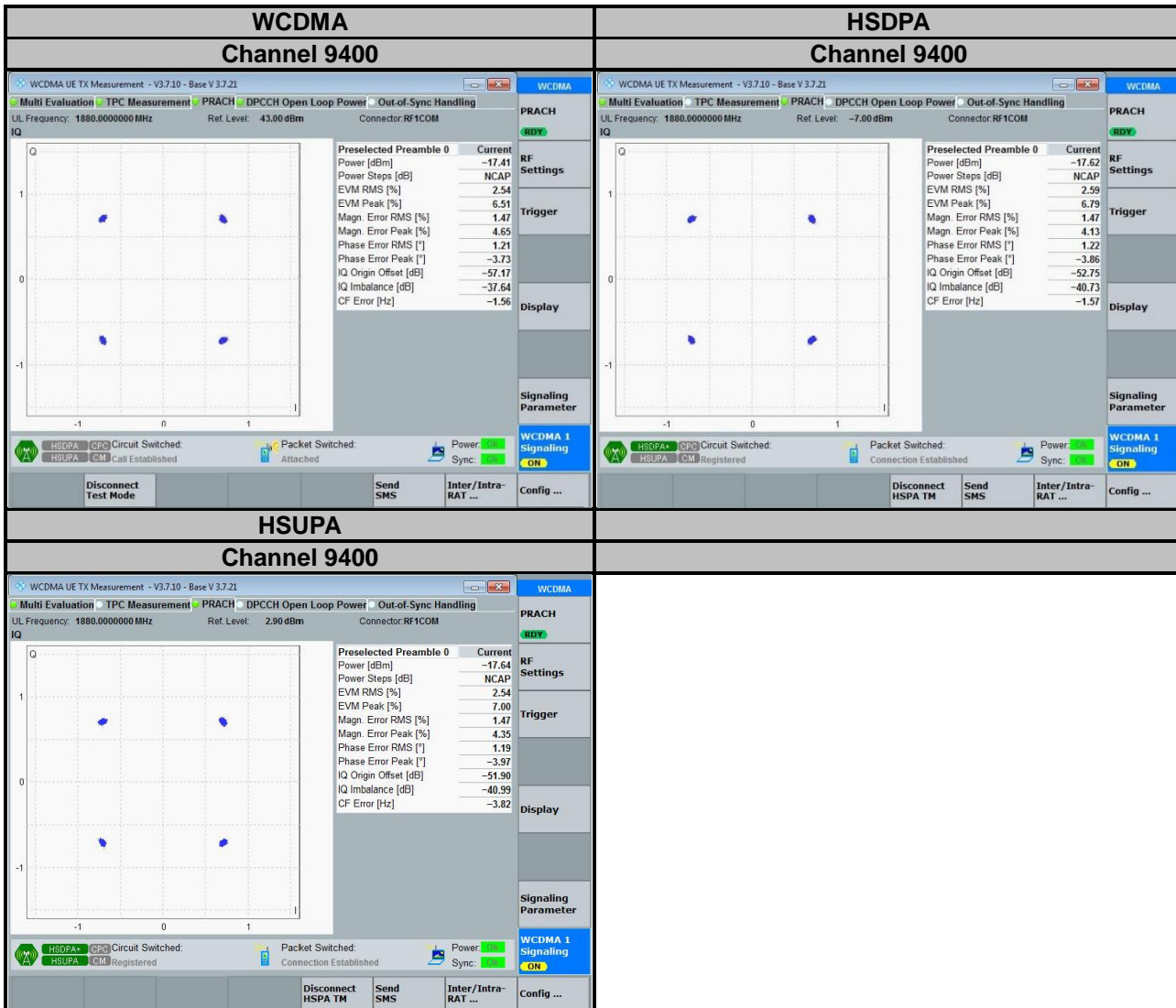


4.2.3 Test Procedure

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

4.2.4 Test Results





4.3 Frequency Stability Measurement

4.3.1 Limits of Frequency Stability Measurement

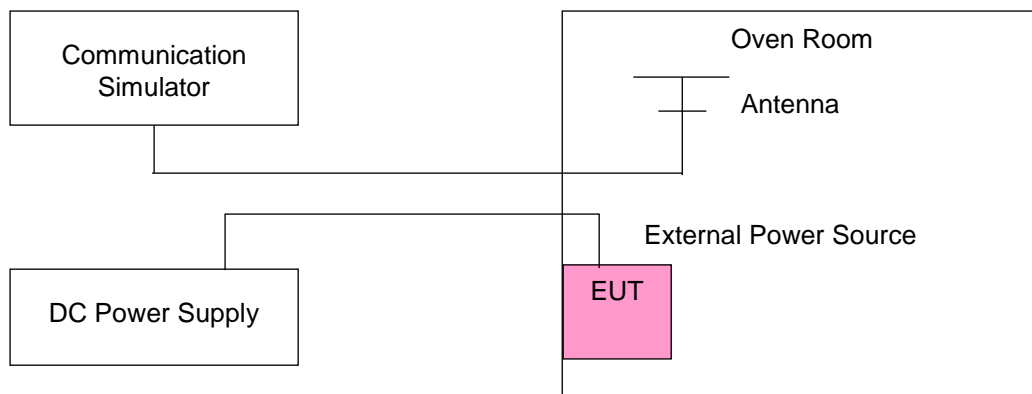
The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.

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 Setup



4.3.4 Test Results

Frequency Error vs. Voltage

Voltage (Volts)	GSM			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
4.0	1850.200004	0.002	1909.800004	0.002
4.2	1850.200004	0.002	1909.800003	0.002
4.4	1850.200001	0.001	1909.800003	0.002

Note: The applicant defined the normal working voltage of the battery is from 4.0 Vdc to 4.4 Vdc.

Frequency Error vs. Temperature

Temp. (°C)	GSM			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
-20	1850.200004	0.002	1909.800002	0.001
-10	1850.200003	0.002	1909.800004	0.002
0	1850.200002	0.001	1909.800001	0.001
10	1850.200003	0.001	1909.800001	0.001
20	1850.199998	-0.001	1909.799998	-0.001
30	1850.199997	-0.001	1909.799998	-0.001
40	1850.199997	-0.002	1909.799996	-0.002
50	1850.199997	-0.002	1909.799997	-0.001

Note:

1. The applicant declared that the normal operating temperature of the EUT is from -20°C to 50°C.
2. The EUT would shut down automatically as below -20°C.

Frequency Error vs. Voltage

Voltage (Volts)	EDGE			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
4.0	1850.200001	0.001	1909.800002	0.001
4.2	1850.200002	0.001	1909.800001	0.001
4.4	1850.200002	0.001	1909.800002	0.001

Note: The applicant defined the normal working voltage of the battery is from 4.0 Vdc to 4.4 Vdc.

Frequency Error vs. Temperature

Temp. (°C)	EDGE			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
-20	1850.200003	0.002	1909.800004	0.002
-10	1850.200004	0.002	1909.800001	0.001
0	1850.200002	0.001	1909.800001	0.001
10	1850.200004	0.002	1909.800004	0.002
20	1850.199999	-0.001	1909.799998	-0.001
30	1850.199997	-0.001	1909.799998	-0.001
40	1850.199996	-0.002	1909.799997	-0.001
50	1850.199996	-0.002	1909.799996	-0.002

Note:

1. The applicant declared that the normal operating temperature of the EUT is from -20°C to 50°C.
2. The EUT would shut down automatically as below -20°C.

Frequency Error vs. Voltage

Voltage (Volts)	WCDMA			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
4.0	1852.400003	0.001	1907.600002	0.001
4.2	1852.400002	0.001	1907.600003	0.002
4.4	1852.400002	0.001	1907.600002	0.001

Note: The applicant defined the normal working voltage of the battery is from 4.0 Vdc to 4.4 Vdc.

Frequency Error vs. Temperature

Temp. (°C)	WCDMA			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
-20	1852.400001	0.001	1907.600002	0.001
-10	1852.400002	0.001	1907.600003	0.001
0	1852.400001	0.001	1907.600001	0.001
10	1852.400002	0.001	1907.600002	0.001
20	1852.399999	-0.001	1907.599999	-0.001
30	1852.399997	-0.002	1907.599996	-0.002
40	1852.399999	-0.001	1907.599998	-0.001
50	1852.399996	-0.002	1907.599997	-0.002

Note:

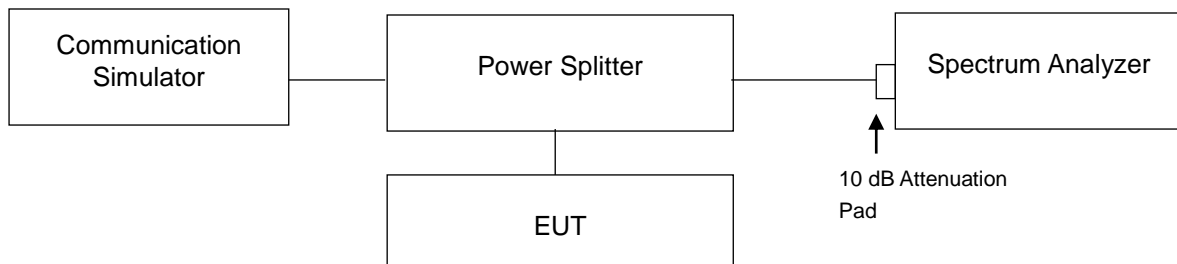
1. The applicant declared that the normal operating temperature of the EUT is from -20°C to 50°C.
2. The EUT would shut down automatically as below -20°C.

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.

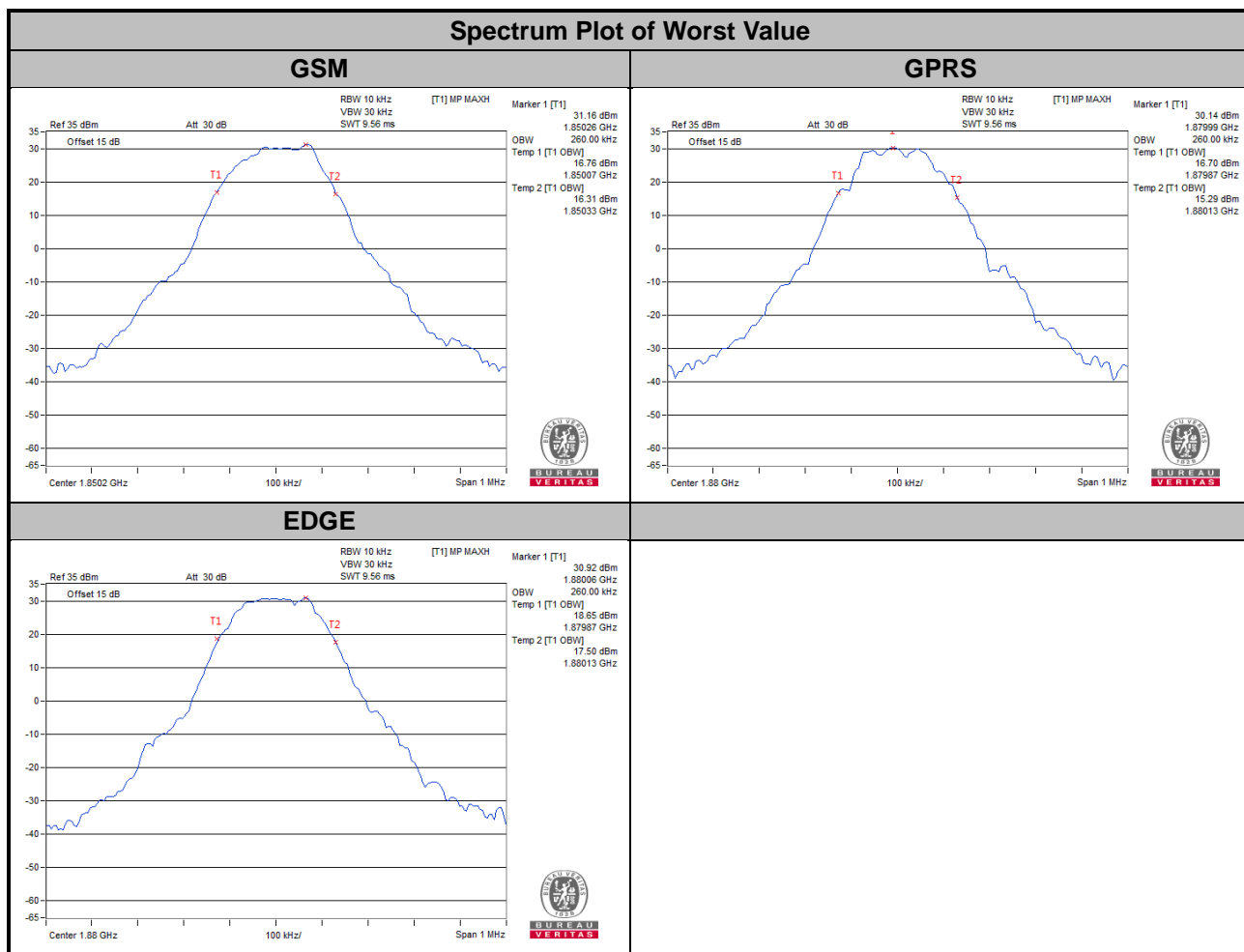
4.4.2 Test Setup



4.4.3 Test Result

Occupied Bandwidth

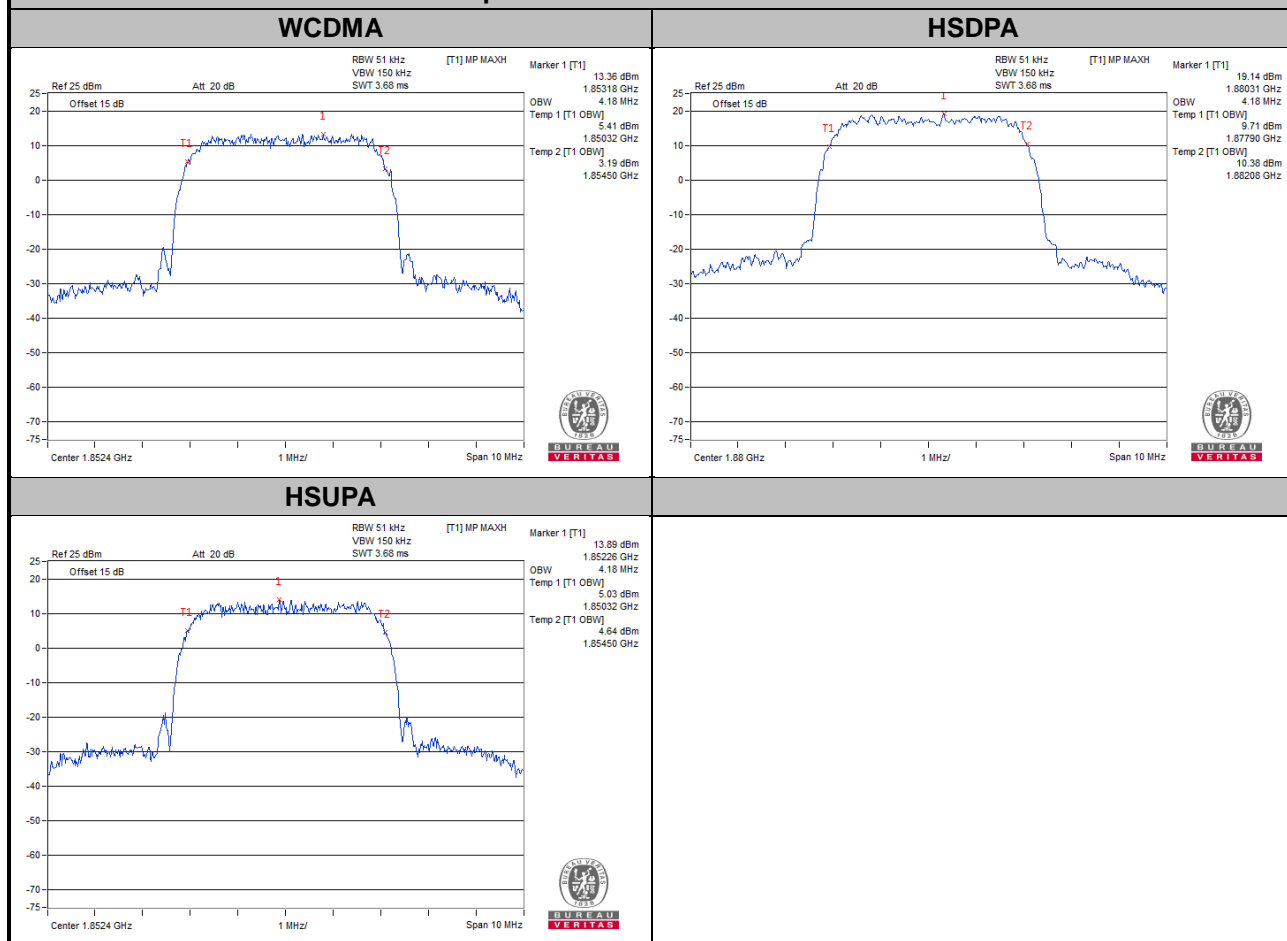
Channel	Frequency (MHz)	99% Occupied Bandwidth (kHz)		
		GSM	GPRS	EDGE
512	1850.2	260.0	250.0	250.0
661	1880.0	260.0	260.0	260.0
810	1909.8	260.0	260.0	250.0



WCDMA Band 2

Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)		
		WCDMA	HSDPA	HSUPA
9262	1852.4	4.18	4.17	4.18
9400	1880.0	4.16	4.18	4.16
9538	1907.6	4.16	4.16	4.15

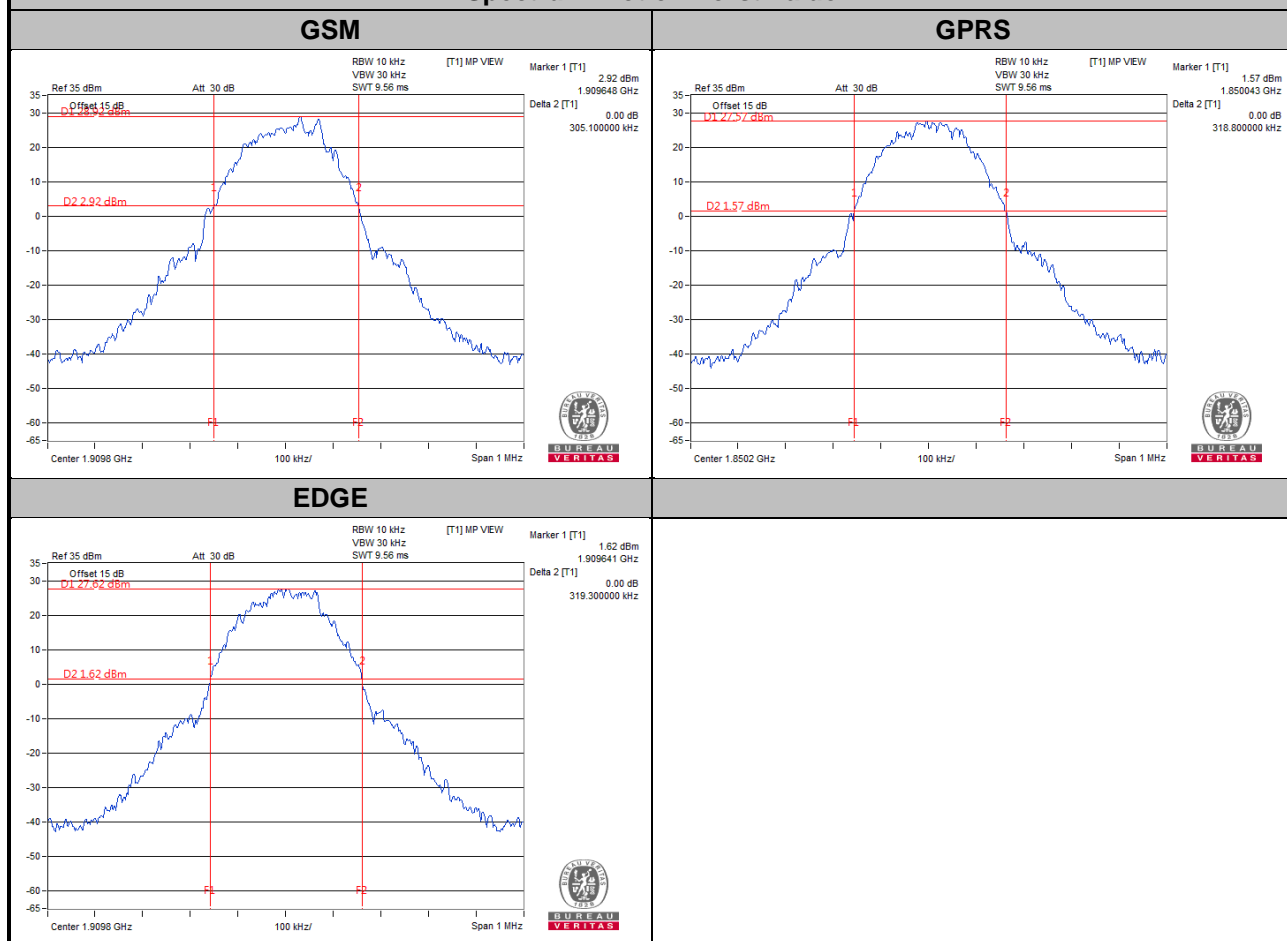
Spectrum Plot of Worst Value



26dB Bandwidth

Channel	Frequency (MHz)	26dB Bandwidth (kHz)		
		GSM	GPRS	EDGE
512	1850.2	302.0	318.8	317.0
661	1880.0	304.9	317.6	315.1
810	1909.8	305.1	315.2	319.3

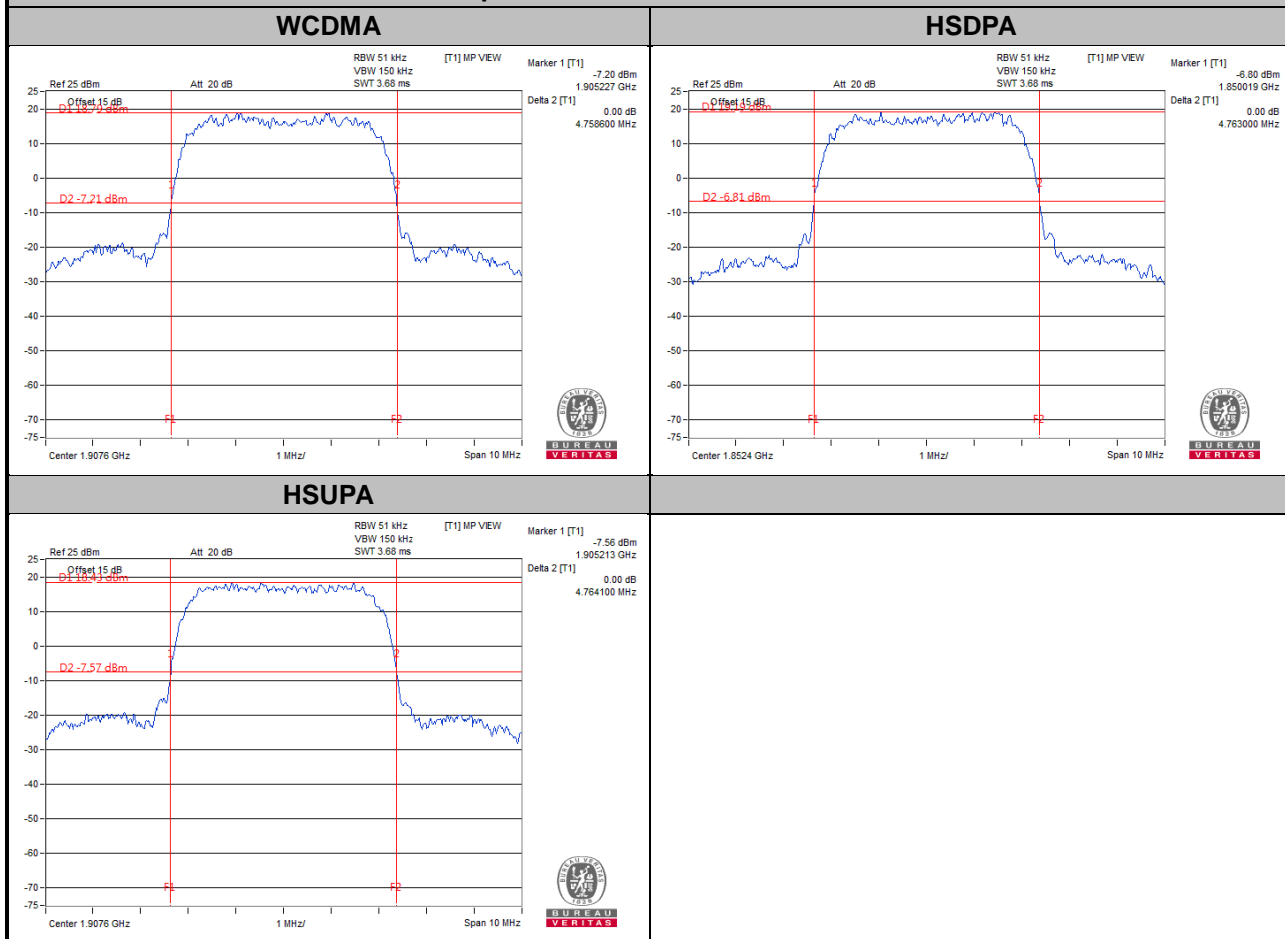
Spectrum Plot of Worst Value



WCDMA Band 2

Channel	Frequency (MHz)	26dB Bandwidth (kHz)		
		WCDMA	HSDPA	HSUPA
9262	1852.4	4.73	4.76	4.74
9400	1880.0	4.75	4.72	4.76
9538	1907.6	4.76	4.73	4.76

Spectrum Plot of Worst Value

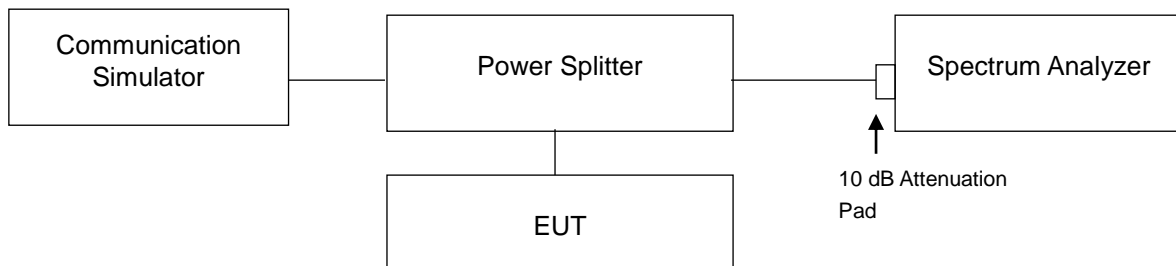


4.5 Band Edge Measurement

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.

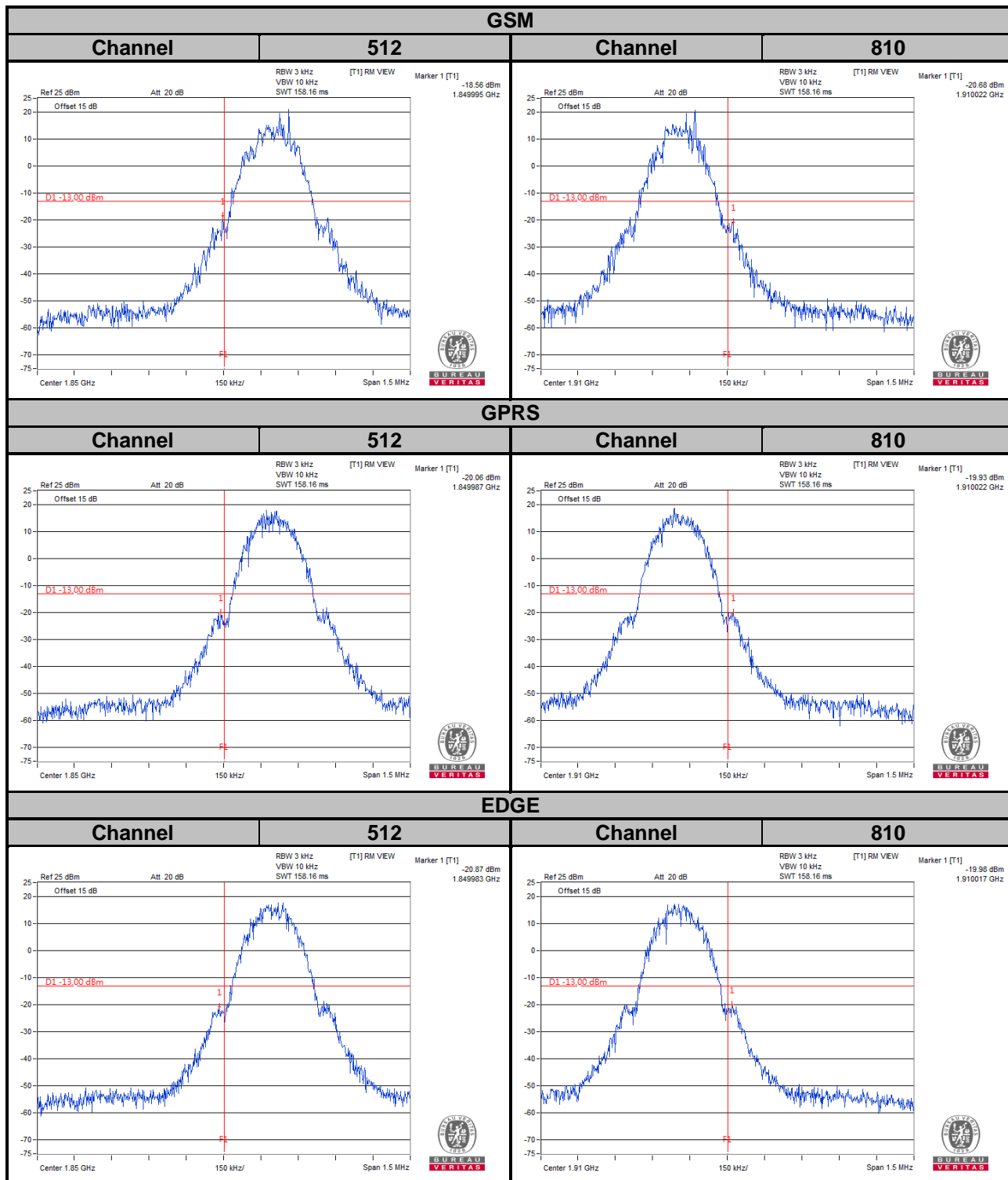
4.5.2 Test Setup



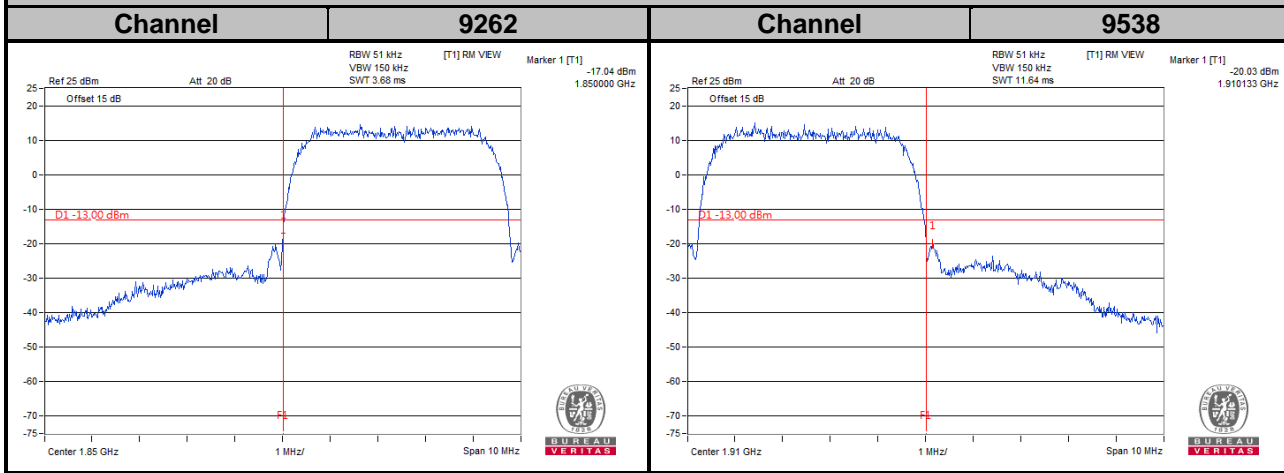
4.5.3 Test Procedures

- All measurements were done at low and high operational frequency range.
- The center frequency of spectrum is the band edge frequency and span is 1.5 MHz. RB of the spectrum is 3 kHz and VB of the spectrum is 10 kHz (GSM/GPRS/EDGE).
- The center frequency of spectrum is the band edge frequency and span is 10 MHz. RB of the spectrum is 51 kHz and VB of the spectrum is 150 kHz (WCDMA).
- Record the max trace plot into the test report.

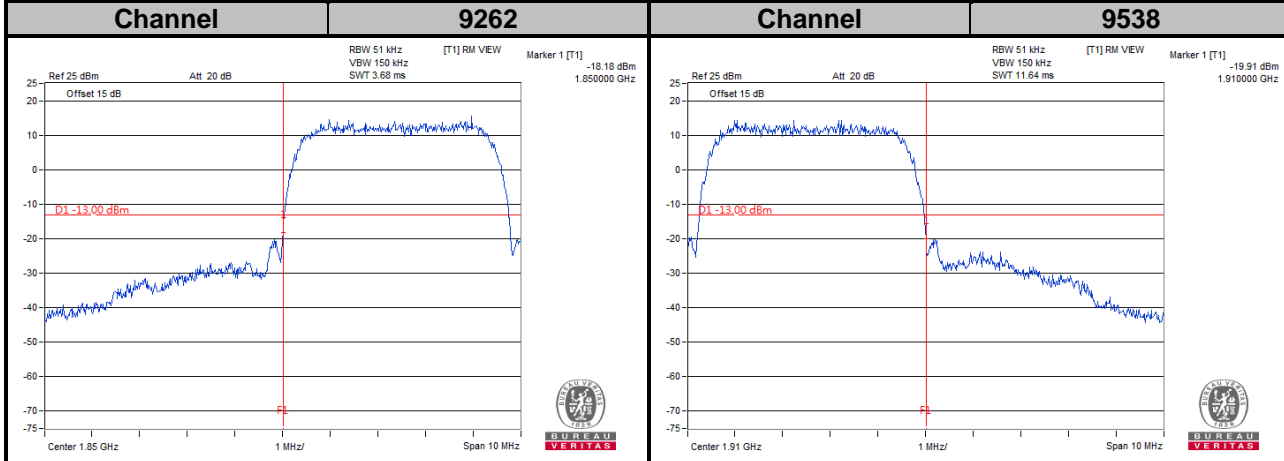
4.5.4 Test Results



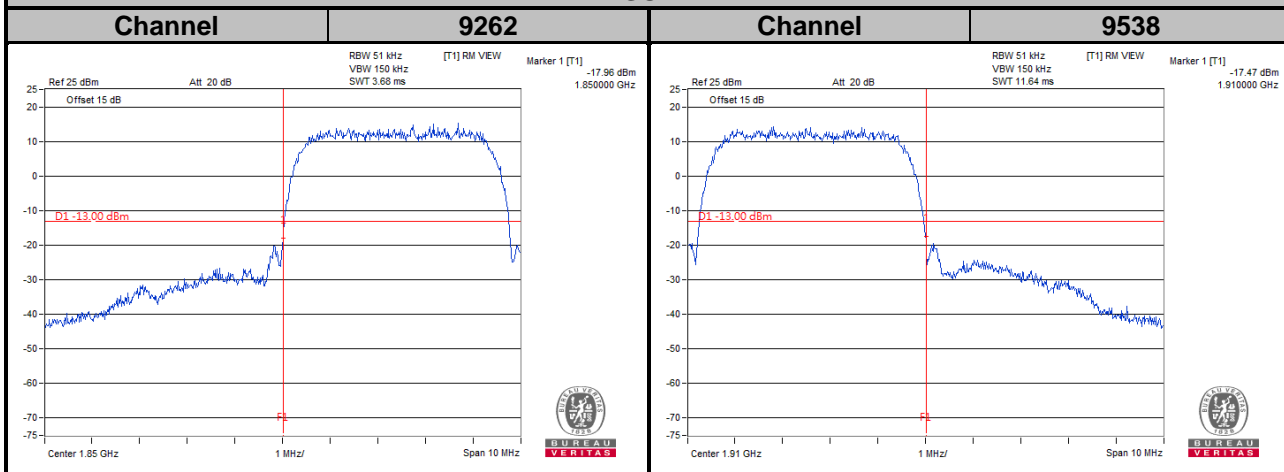
WCDMA



HSDPA



HSUPA

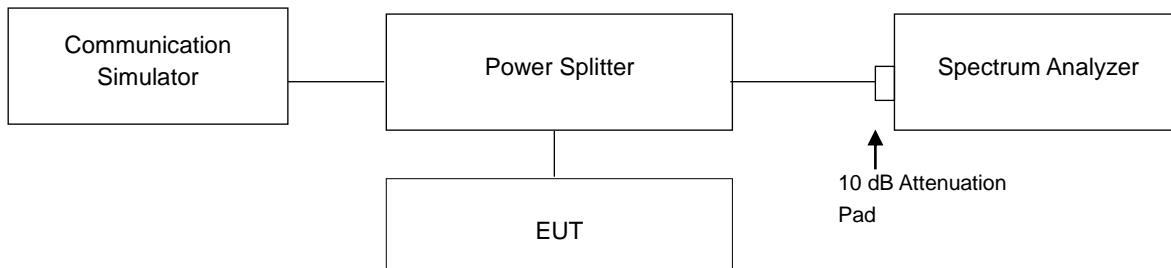


4.6 Peak to Average Ratio

4.6.1 Limits of Peak to Average Ratio Measurement

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

4.6.2 Test Setup

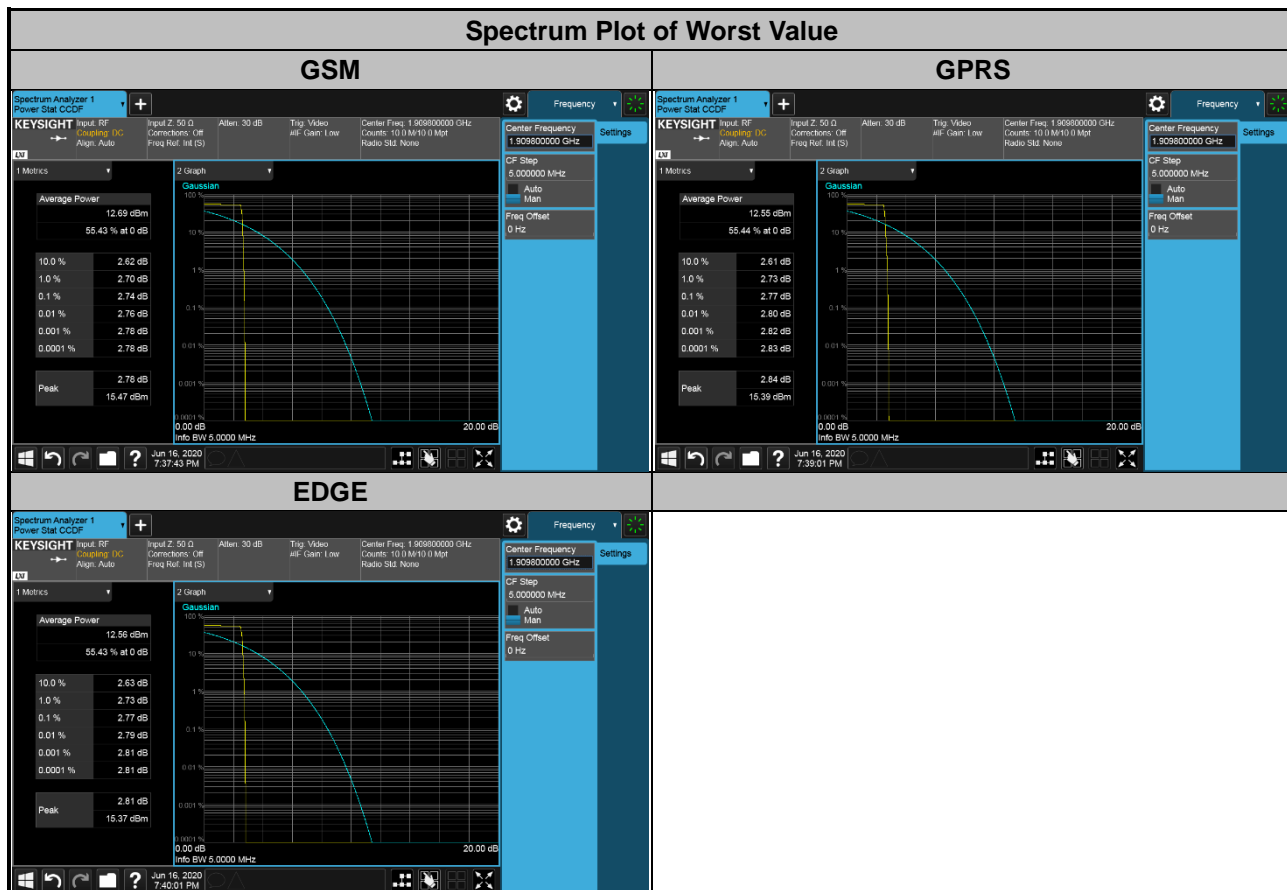


4.6.3 Test Procedures

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

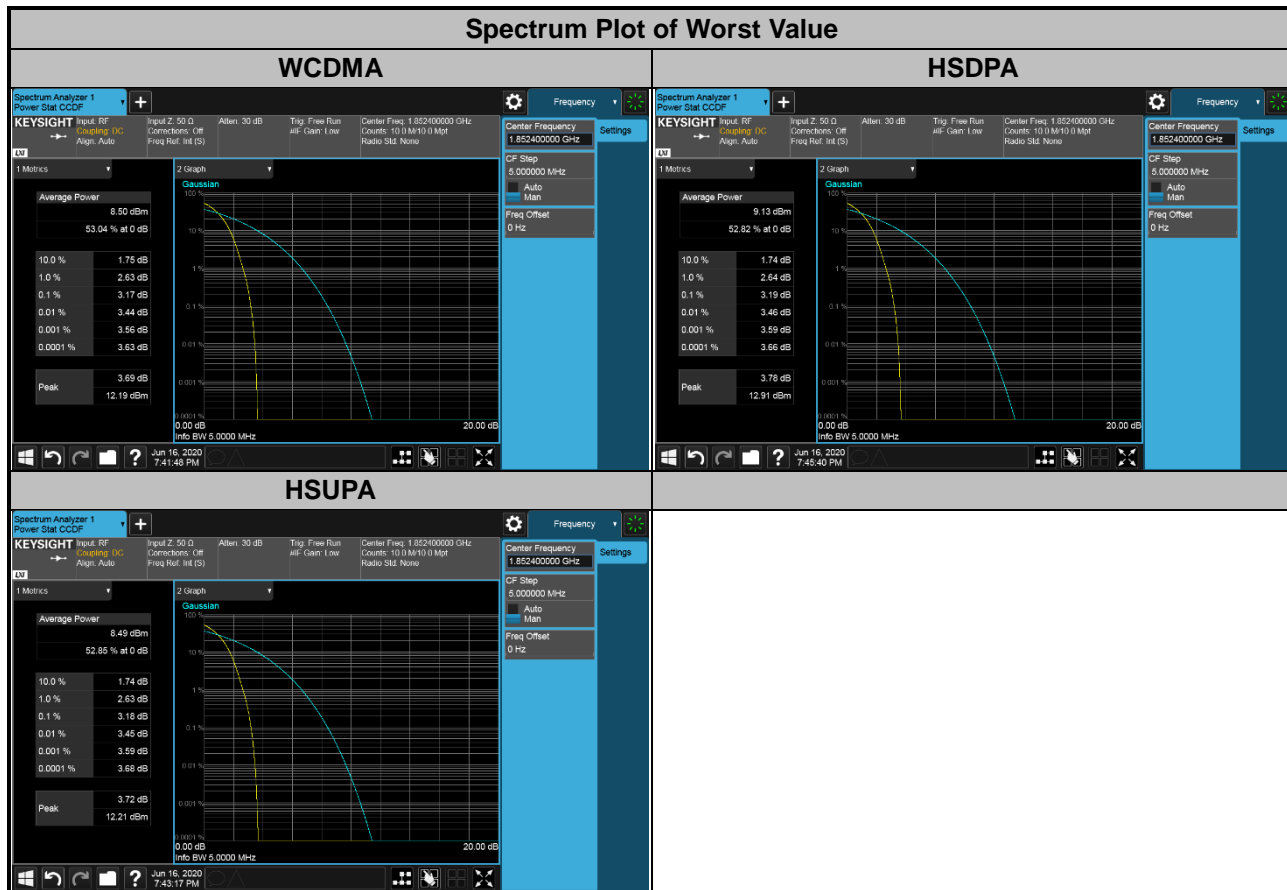
4.6.4 Test Results

Channel	Frequency (MHz)	Peak To Average Ratio (dB)		
		GSM	GPRS	EDGE
512	1850.2	2.68	2.70	2.72
661	1880.0	2.70	2.73	2.71
810	1909.8	2.74	2.77	2.77



WCDMA Band 2

Channel	Frequency (MHz)	Peak To Average Ratio (dB)		
		WCDMA	HSDPA	HSUPA
9262	1852.4	3.17	3.19	3.18
9400	1880.0	2.92	3.01	2.91
9538	1907.6	3.01	3.00	3.02

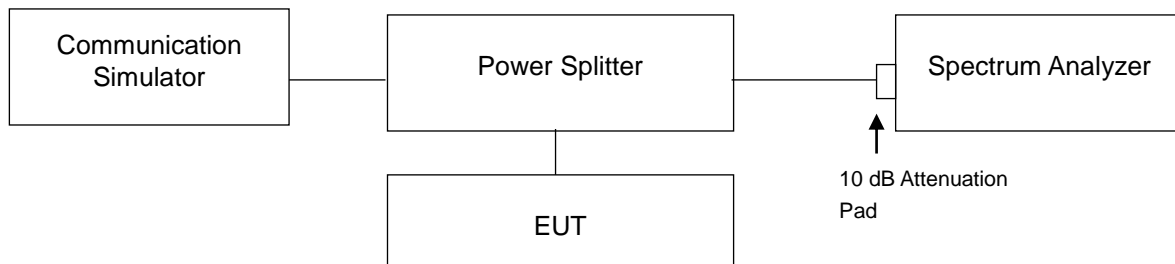


4.7 Conducted Spurious Emissions

4.7.1 Limits of Conducted Spurious Emissions Measurement

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

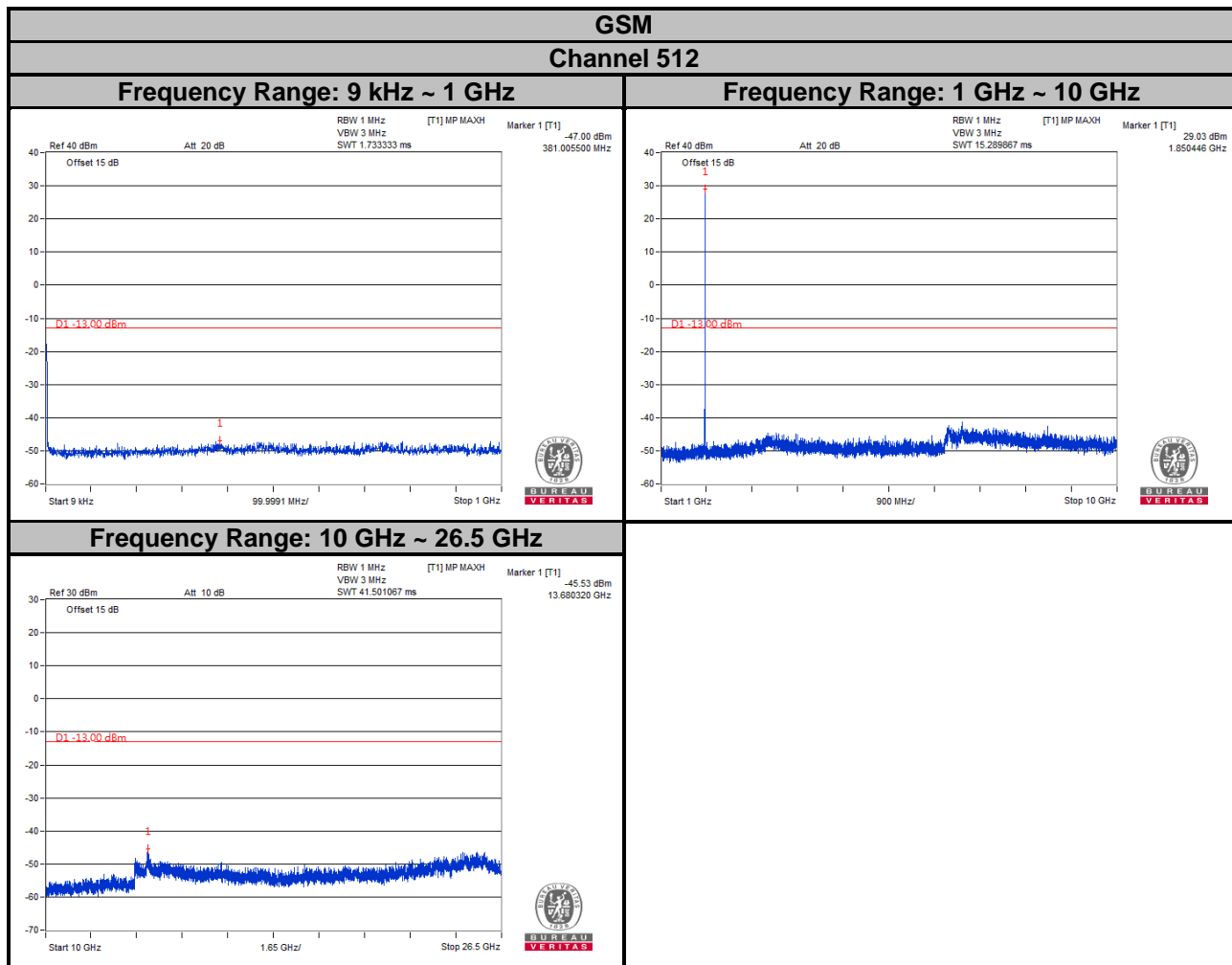
4.7.2 Test Setup



4.7.3 Test Procedure

- The EUT makes a phone call to the communication simulator. All measurements were done at low, middle and high operational frequency range.
- Measuring frequency range is from 9 kHz to 26.5 GHz. 10 dB attenuation pad is connected with spectrum. RBW = 1 MHz and VBW = 3 MHz is used for conducted emission measurement.

4.7.4 Test Results

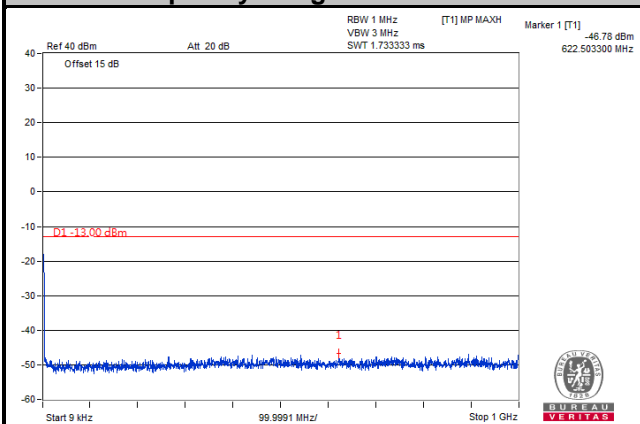


Note: The signal over the limit in 9 kHz is from spectrum analyzer.

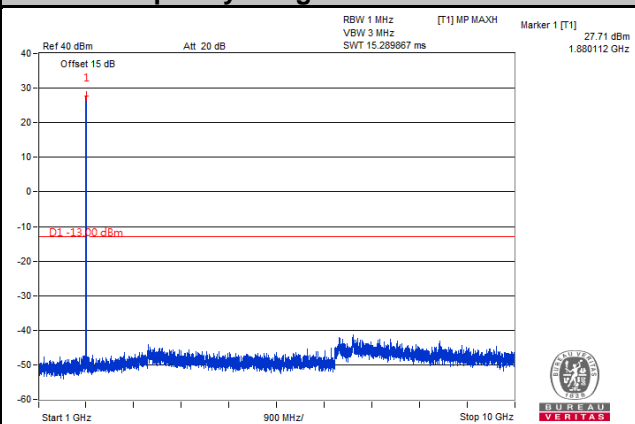
GSM

Channel 661

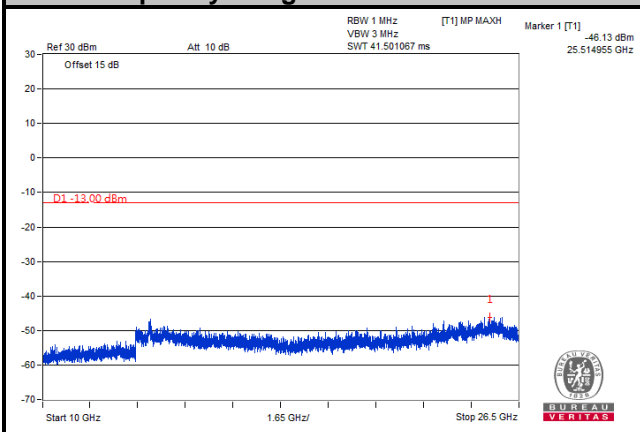
Frequency Range: 9 kHz ~ 1 GHz



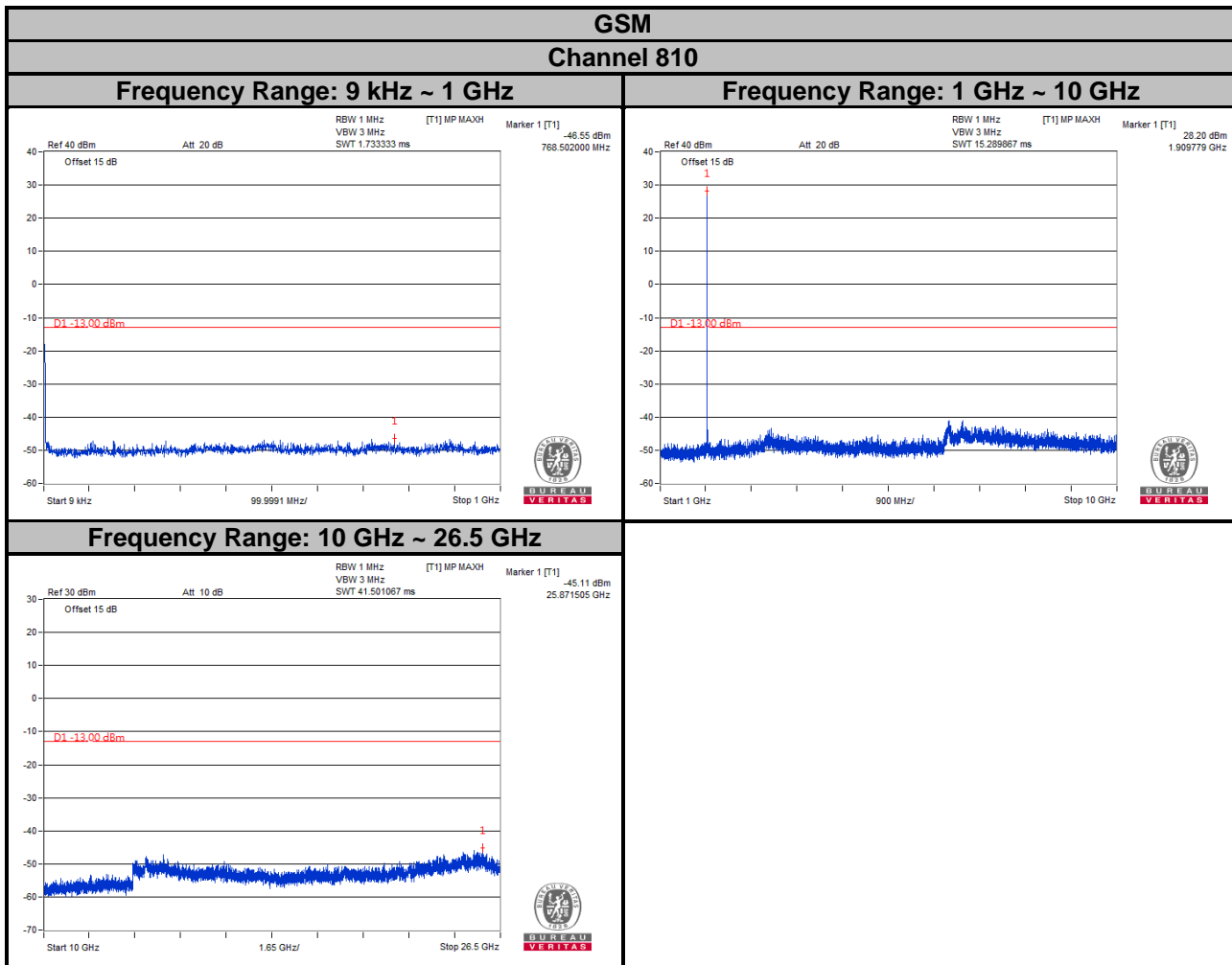
Frequency Range: 1 GHz ~ 10 GHz



Frequency Range: 10 GHz ~ 26.5 GHz



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

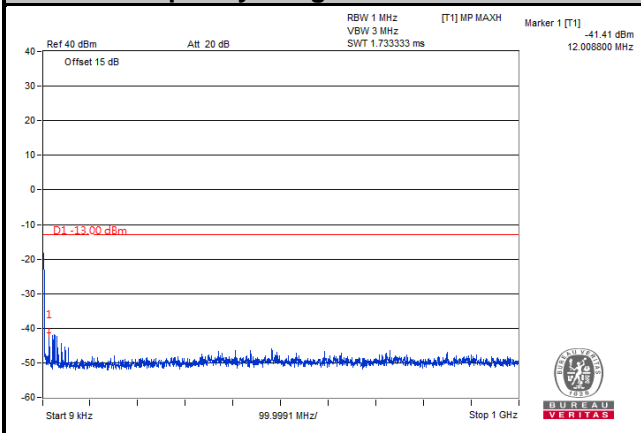


Note: The signal over the limit in 9 kHz is from spectrum analyzer.

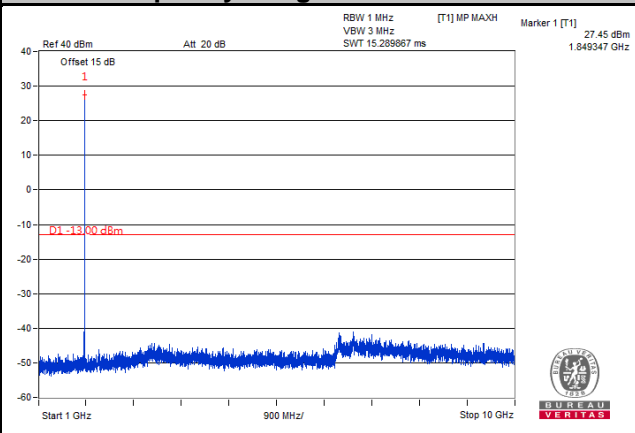
GPRS

Channel 512

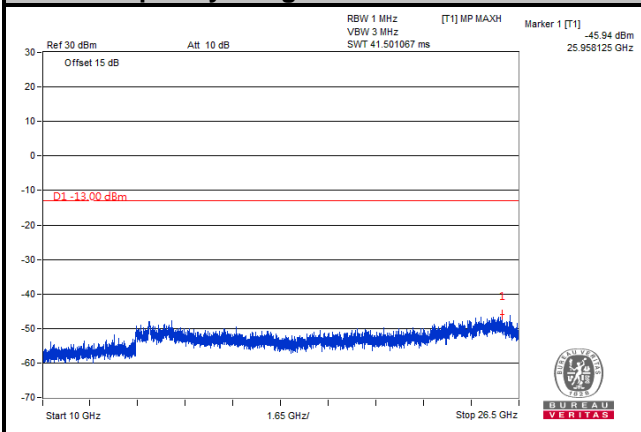
Frequency Range: 9 kHz ~ 1 GHz



Frequency Range: 1 GHz ~ 10 GHz



Frequency Range: 10 GHz ~ 26.5 GHz

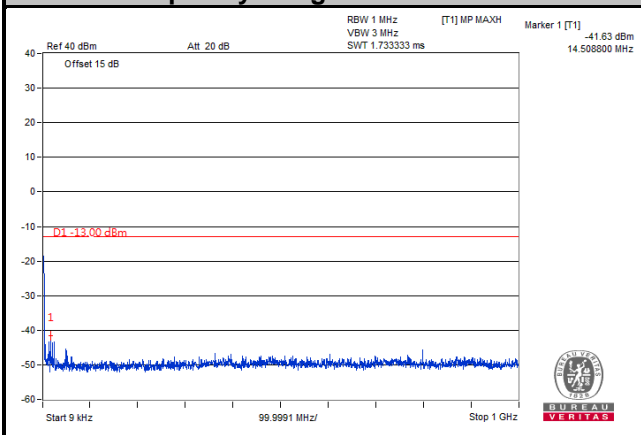


Note: The signal over the limit in 9 kHz is from spectrum analyzer.

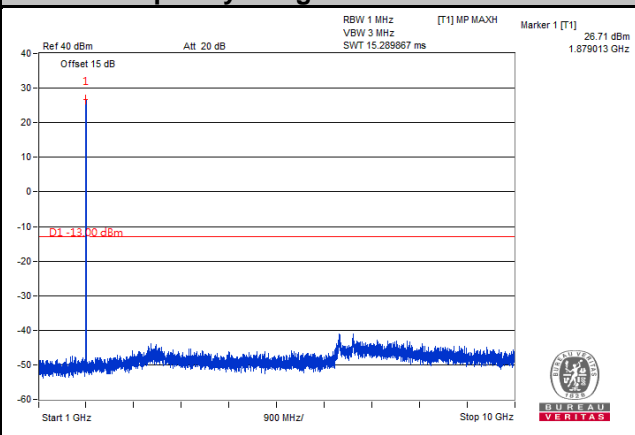
GPRS

Channel 661

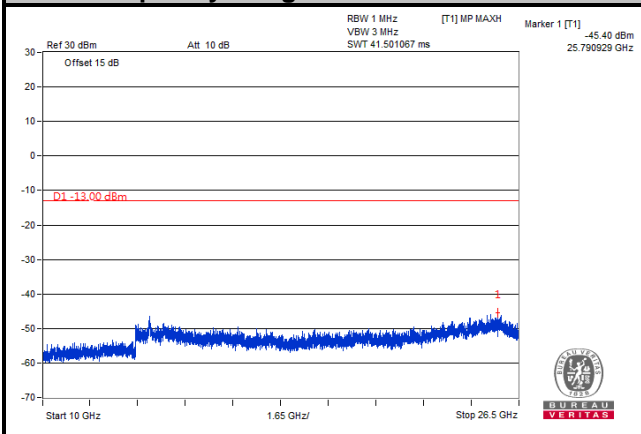
Frequency Range: 9 kHz ~ 1 GHz



Frequency Range: 1 GHz ~ 10 GHz



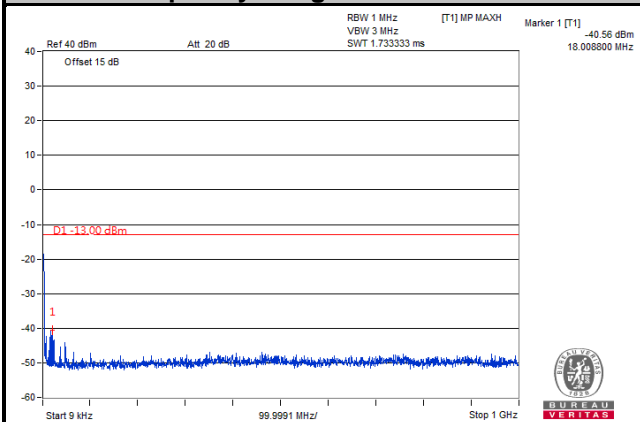
Frequency Range: 10 GHz ~ 26.5 GHz



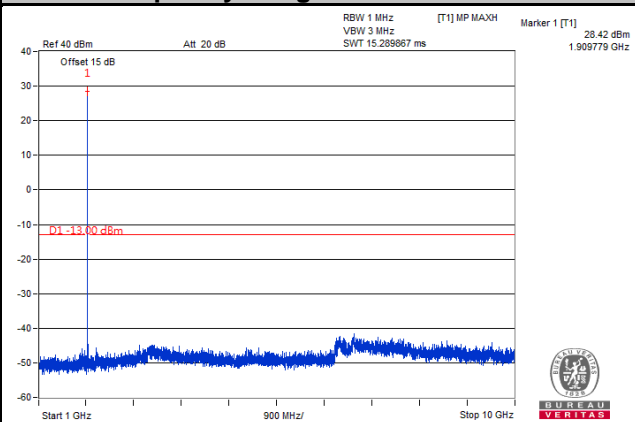
Note: The signal over the limit in 9 kHz is from spectrum analyzer.

GPRS
Channel 810

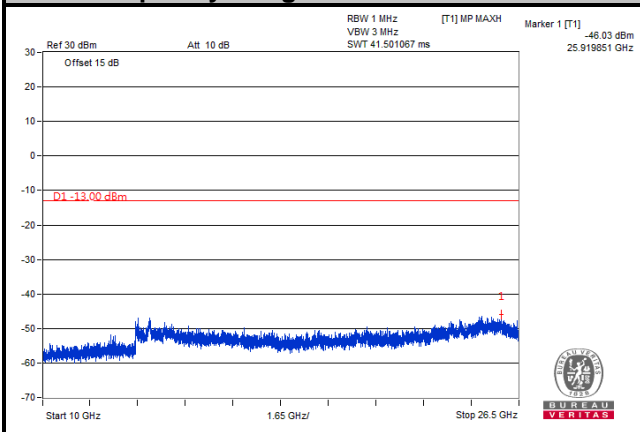
Frequency Range: 9 kHz ~ 1 GHz



Frequency Range: 1 GHz ~ 10 GHz



Frequency Range: 10 GHz ~ 26.5 GHz

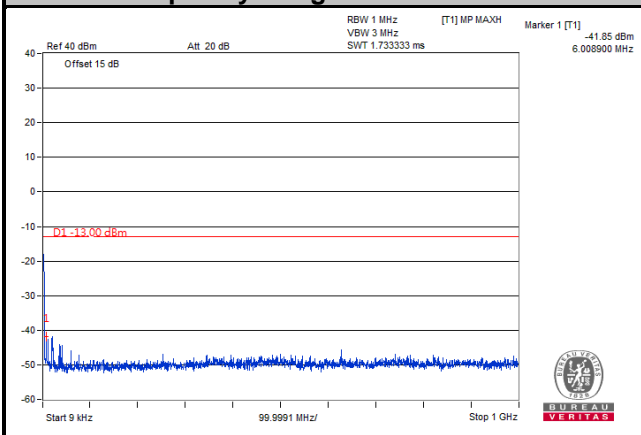


Note: The signal over the limit in 9 kHz is from spectrum analyzer.

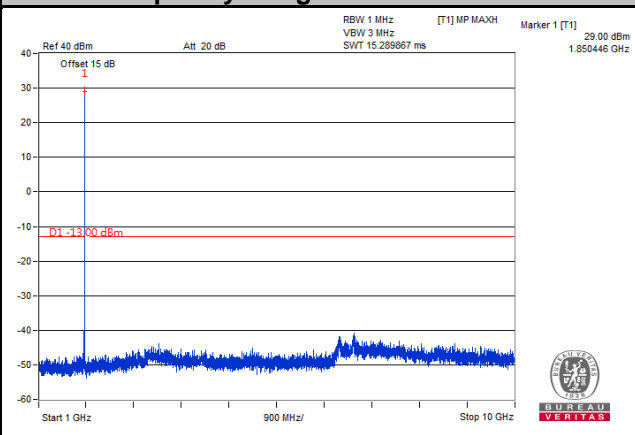
EDGE

Channel 512

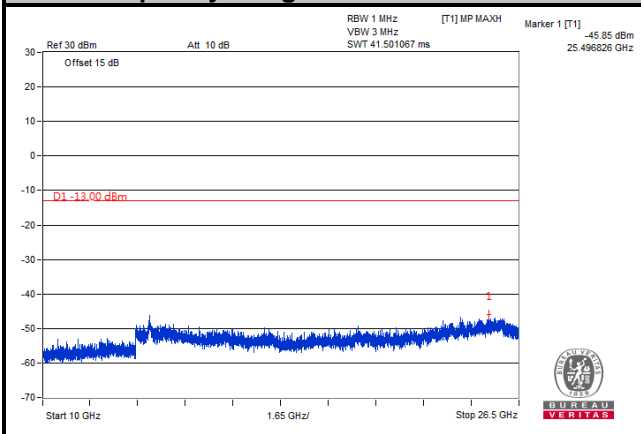
Frequency Range: 9 kHz ~ 1 GHz



Frequency Range: 1 GHz ~ 10 GHz



Frequency Range: 10 GHz ~ 26.5 GHz

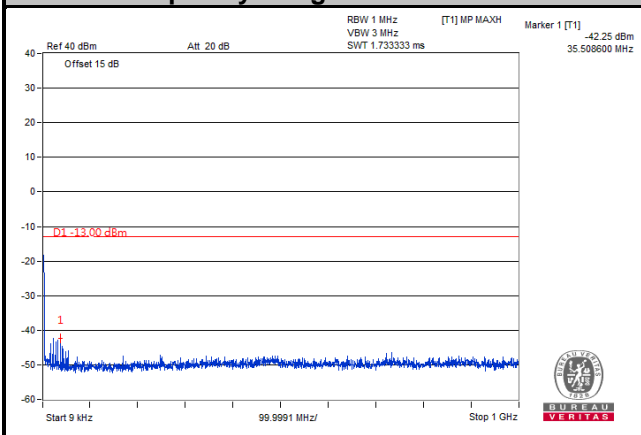


Note: The signal over the limit in 9 kHz is from spectrum analyzer.

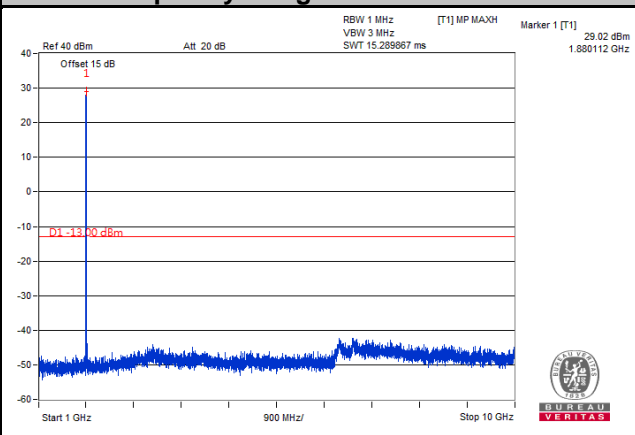
EDGE

Channel 661

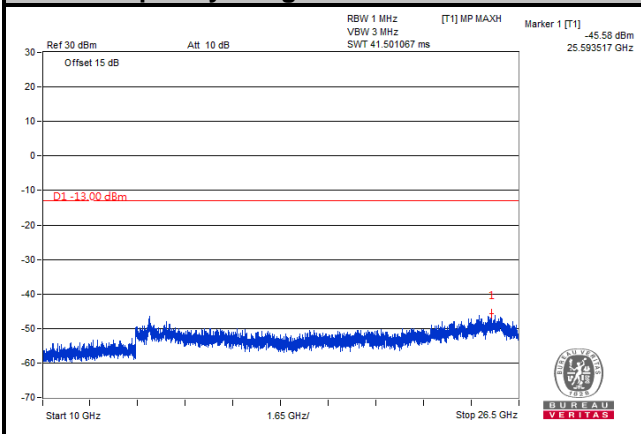
Frequency Range: 9 kHz ~ 1 GHz



Frequency Range: 1 GHz ~ 10 GHz



Frequency Range: 10 GHz ~ 26.5 GHz

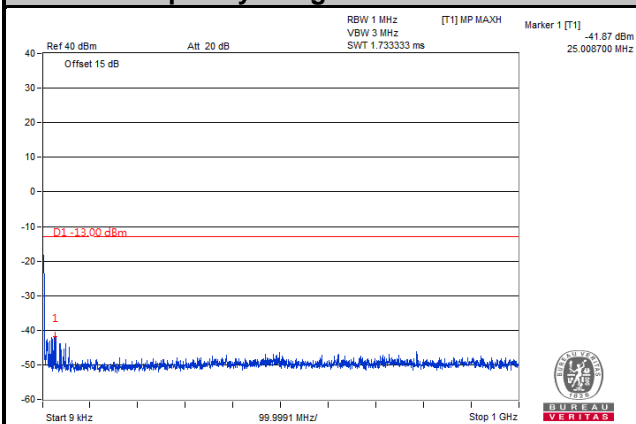


Note: The signal over the limit in 9 kHz is from spectrum analyzer.

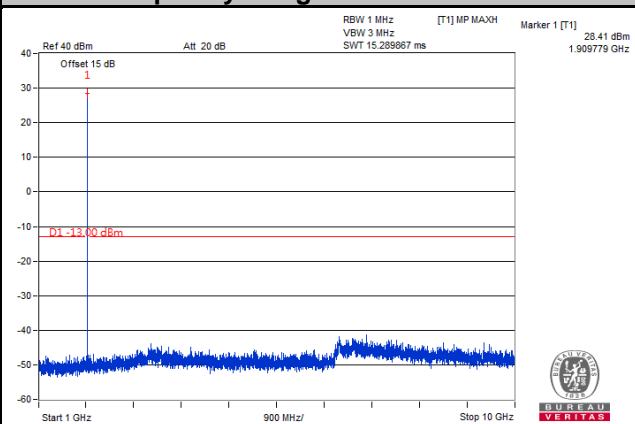
EDGE

Channel 810

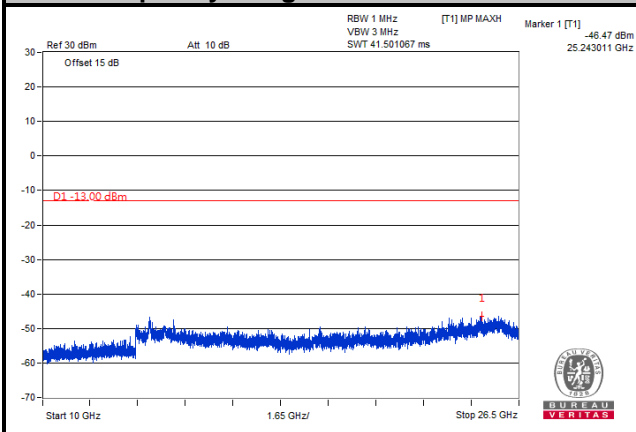
Frequency Range: 9 kHz ~ 1 GHz



Frequency Range: 1 GHz ~ 10 GHz



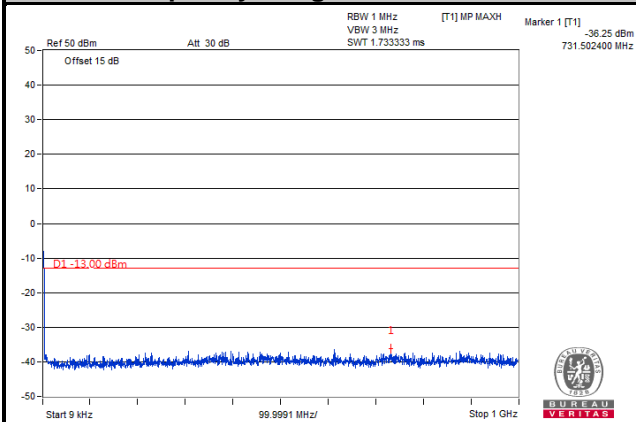
Frequency Range: 10 GHz ~ 26.5 GHz



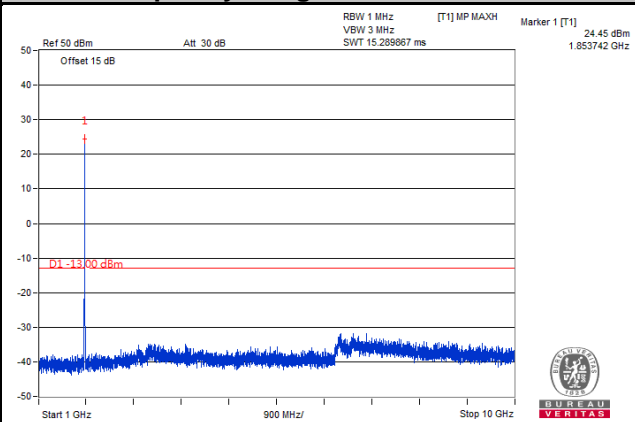
Note: The signal over the limit in 9 kHz is from spectrum analyzer.

**WCDMA
Channel 9262**

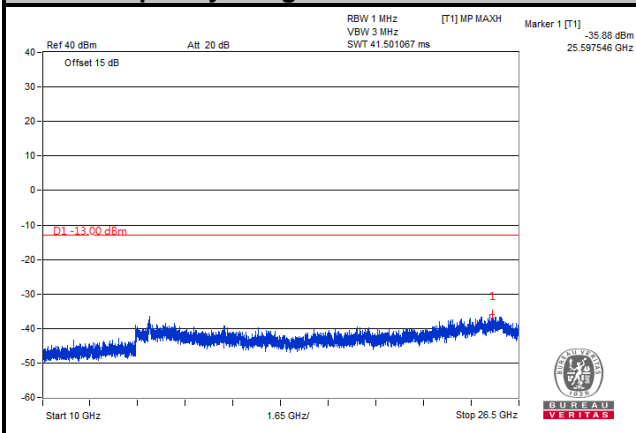
Frequency Range: 9 kHz ~ 1 GHz



Frequency Range: 1 GHz ~ 10 GHz



Frequency Range: 10 GHz ~ 26.5 GHz

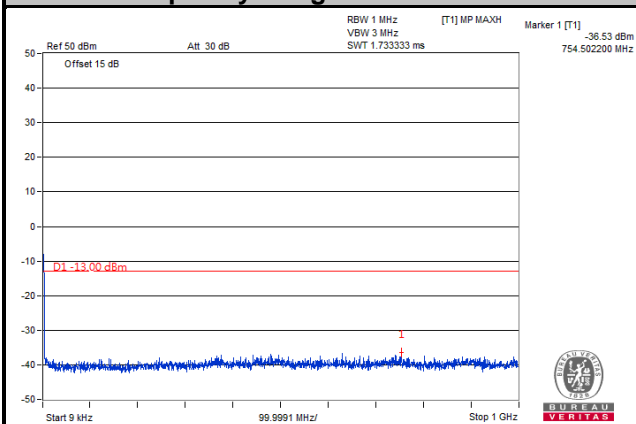


Note: The signal over the limit in 9 kHz is from spectrum analyzer.

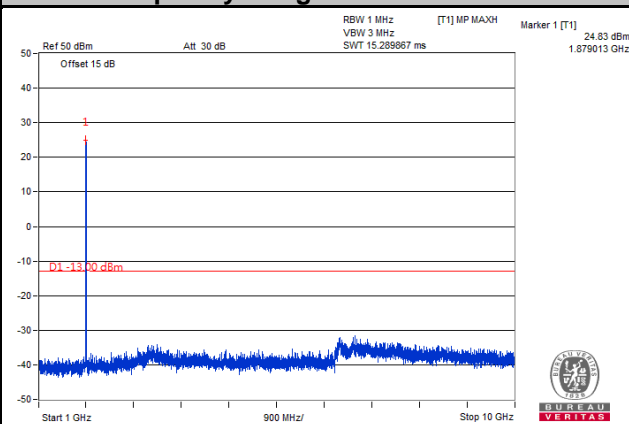
WCDMA

Channel 9400

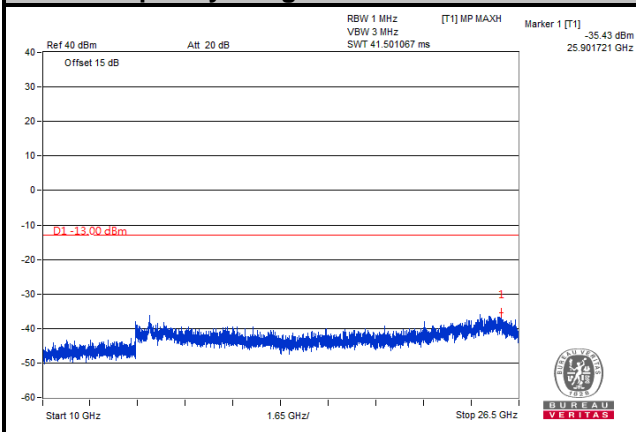
Frequency Range: 9 kHz ~ 1 GHz



Frequency Range: 1 GHz ~ 10 GHz



Frequency Range: 10 GHz ~ 26.5 GHz

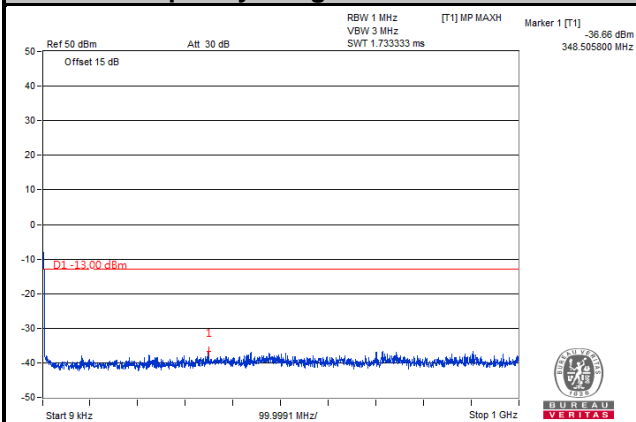


Note: The signal over the limit in 9 kHz is from spectrum analyzer.

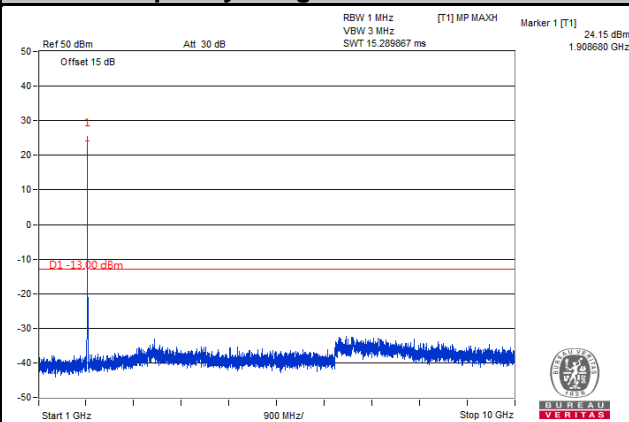
WCDMA

Channel 9538

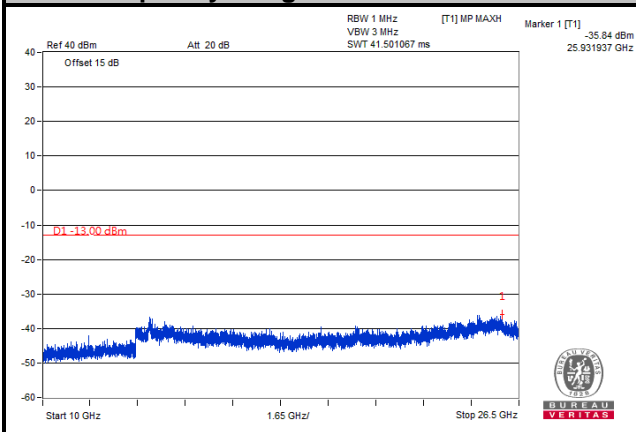
Frequency Range: 9 kHz ~ 1 GHz



Frequency Range: 1 GHz ~ 10 GHz



Frequency Range: 10 GHz ~ 26.5 GHz

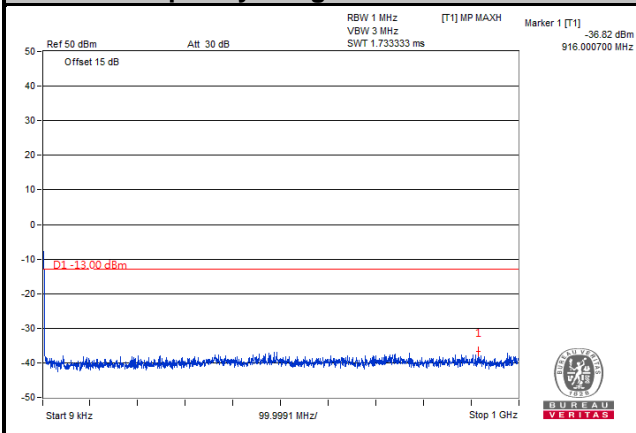


Note: The signal over the limit in 9 kHz is from spectrum analyzer.

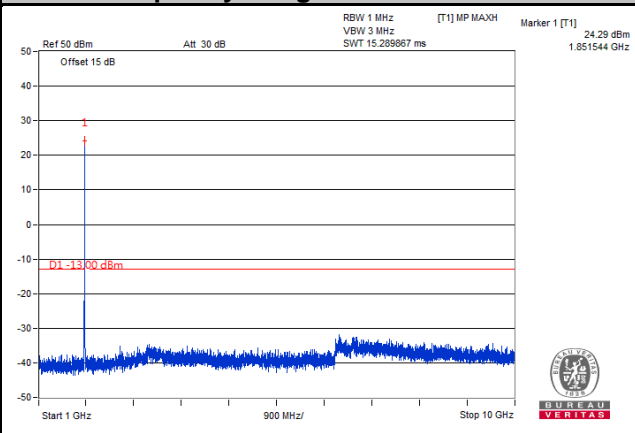
HSDPA

Channel 9262

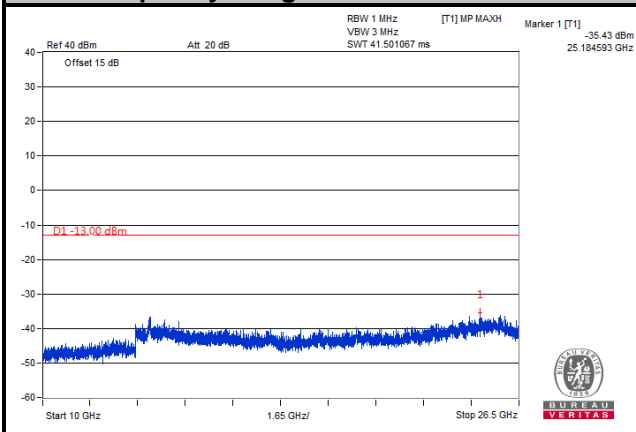
Frequency Range: 9 kHz ~ 1 GHz



Frequency Range: 1 GHz ~ 10 GHz



Frequency Range: 10 GHz ~ 26.5 GHz

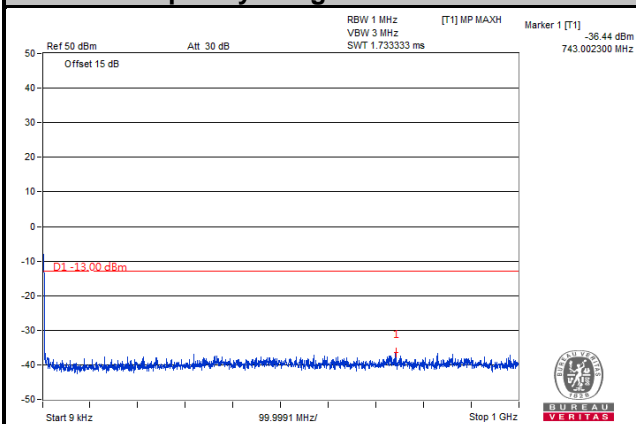


Note: The signal over the limit in 9 kHz is from spectrum analyzer.

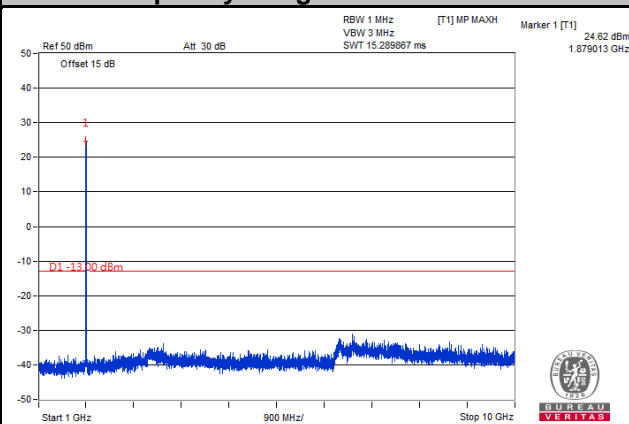
HSDPA

Channel 9400

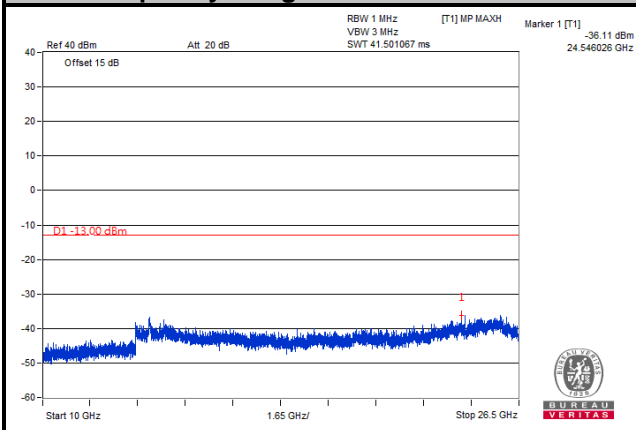
Frequency Range: 9 kHz ~ 1 GHz



Frequency Range: 1 GHz ~ 10 GHz



Frequency Range: 10 GHz ~ 26.5 GHz

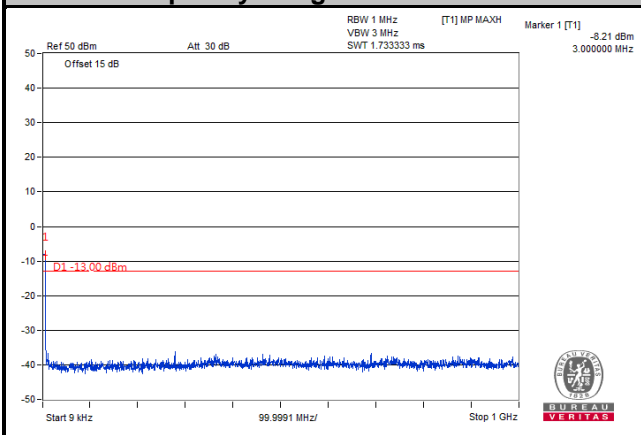


Note: The signal over the limit in 9 kHz is from spectrum analyzer.

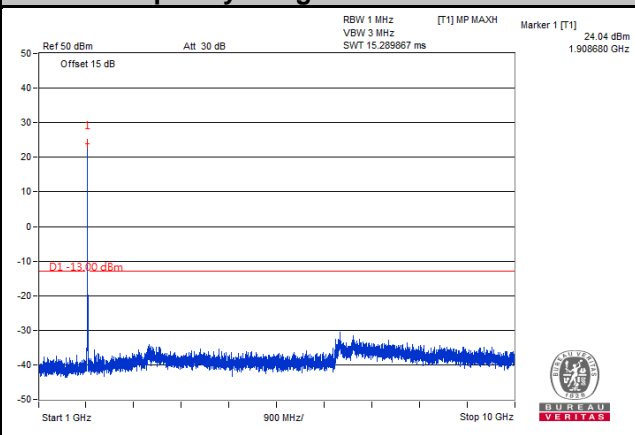
HSDPA

Channel 9538

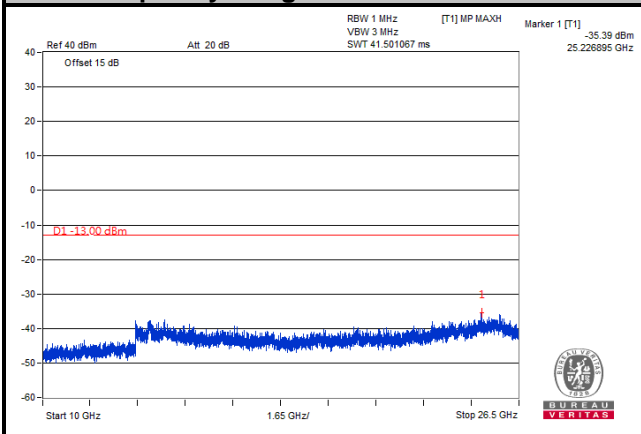
Frequency Range: 9 kHz ~ 1 GHz



Frequency Range: 1 GHz ~ 10 GHz



Frequency Range: 10 GHz ~ 26.5 GHz

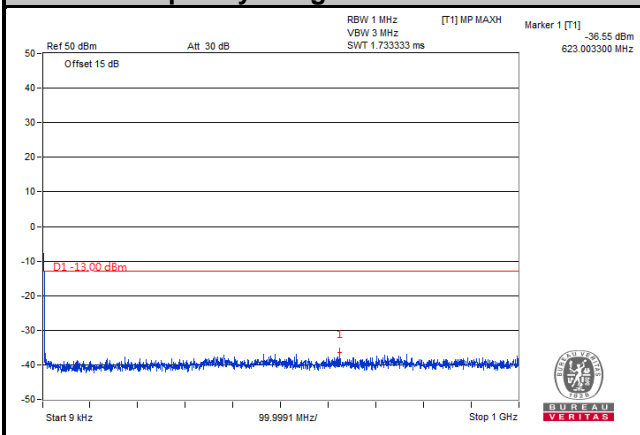


Note: The signal over the limit in 9 kHz is from spectrum analyzer.

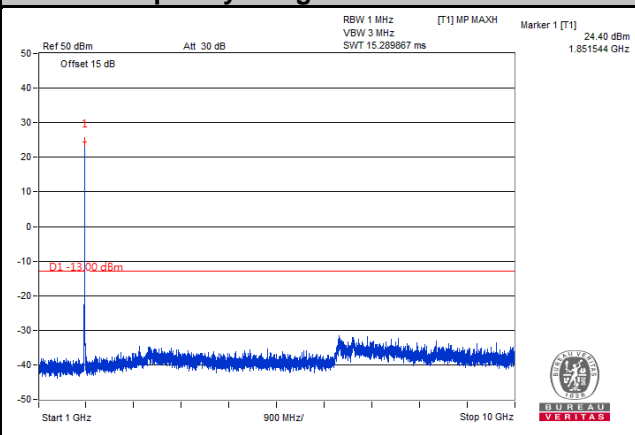
HSUPA

Channel 9262

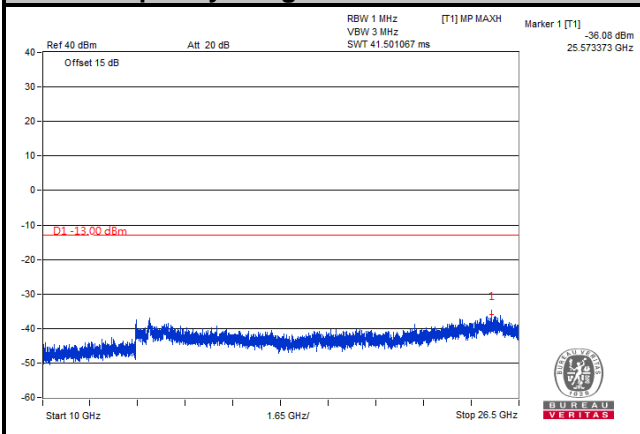
Frequency Range: 9 kHz ~ 1 GHz



Frequency Range: 1 GHz ~ 10 GHz



Frequency Range: 10 GHz ~ 26.5 GHz

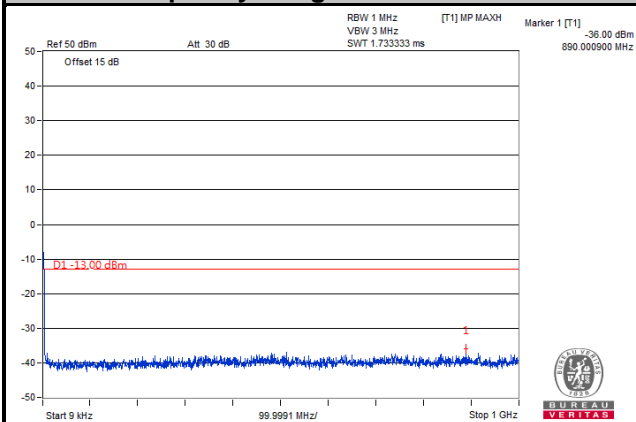


Note: The signal over the limit in 9 kHz is from spectrum analyzer.

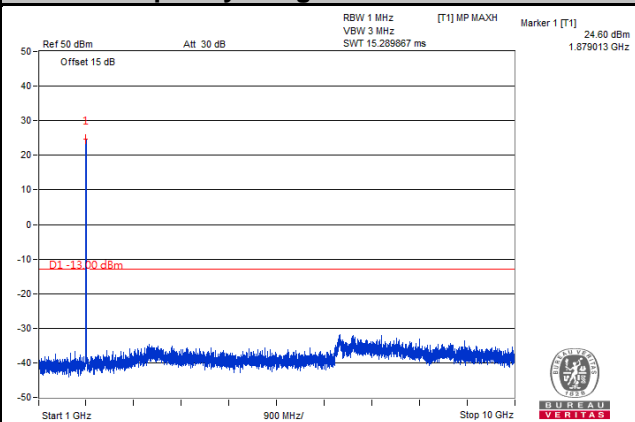
HSUPA

Channel 9400

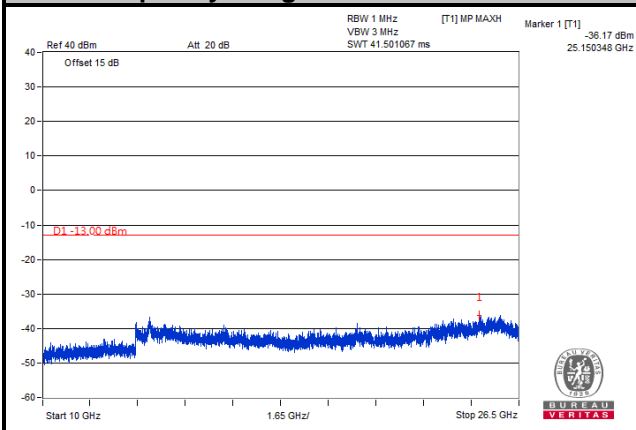
Frequency Range: 9 kHz ~ 1 GHz



Frequency Range: 1 GHz ~ 10 GHz



Frequency Range: 10 GHz ~ 26.5 GHz

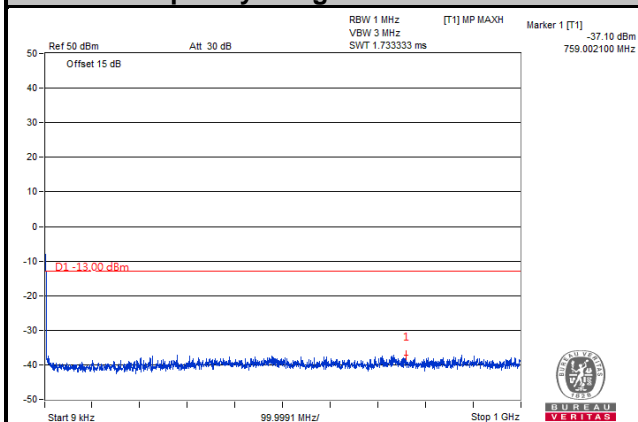


Note: The signal over the limit in 9 kHz is from spectrum analyzer.

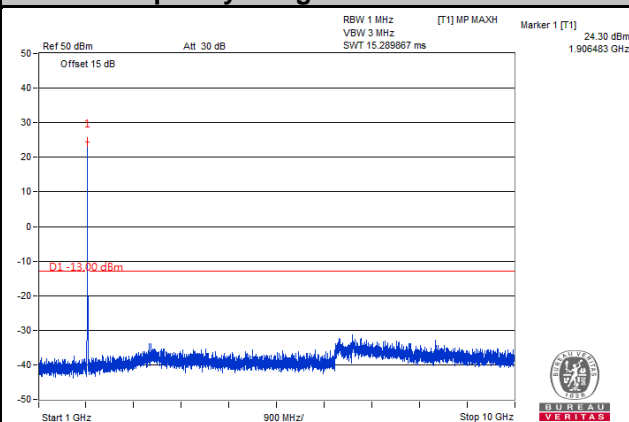
HSUPA

Channel 9538

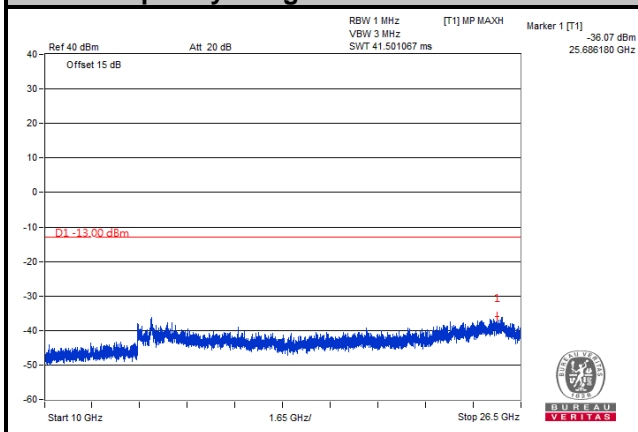
Frequency Range: 9 kHz ~ 1 GHz



Frequency Range: 1 GHz ~ 10 GHz



Frequency Range: 10 GHz ~ 26.5 GHz



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

4.8 Radiated Emission Measurement

4.8.1 Limits of Radiated Emission Measurement

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

4.8.2 Test Procedure

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

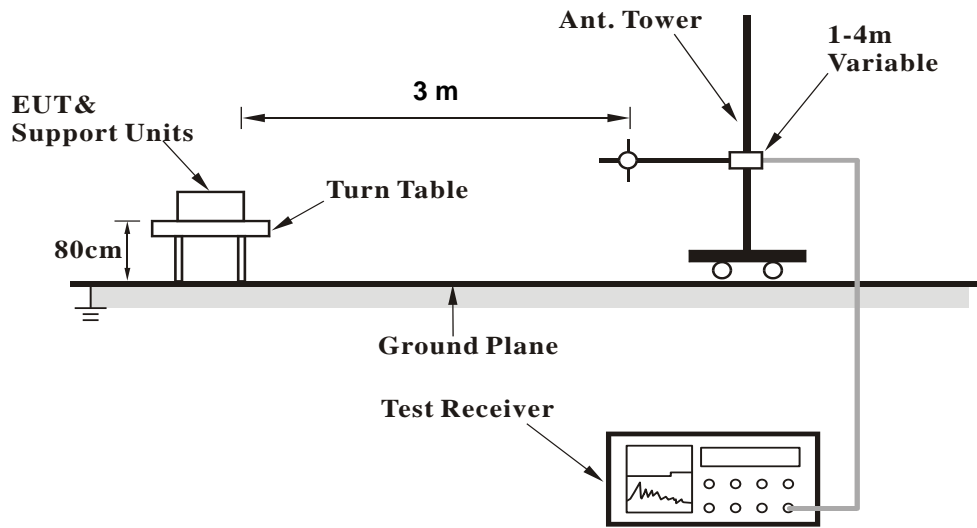
NOTE: The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 1 MHz/3 MHz.

4.8.3 Deviation from Test Standard

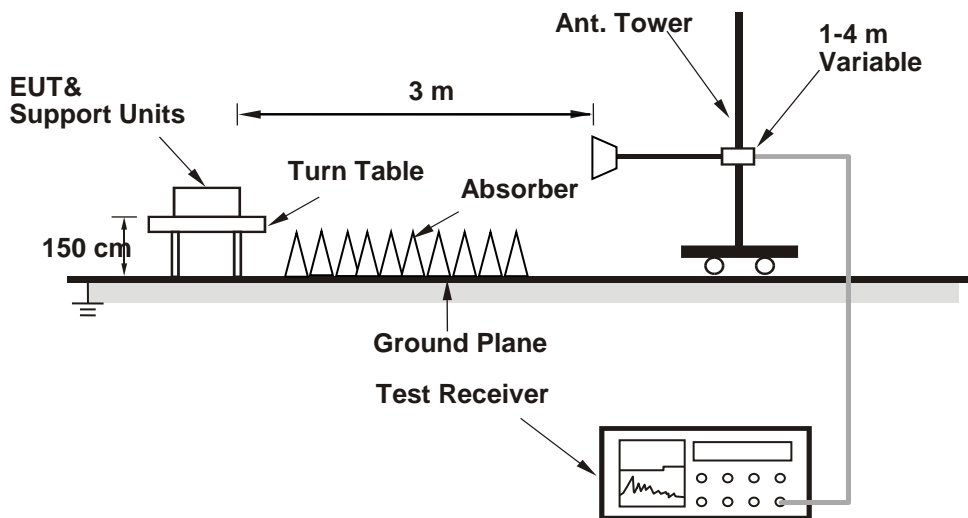
No deviation.

4.8.4 Test Setup

<Radiated Emission below or equal 1 GHz>



<Radiated Emission above 1 GHz>



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

4.8.5 Test Results

<Below 1GHz>

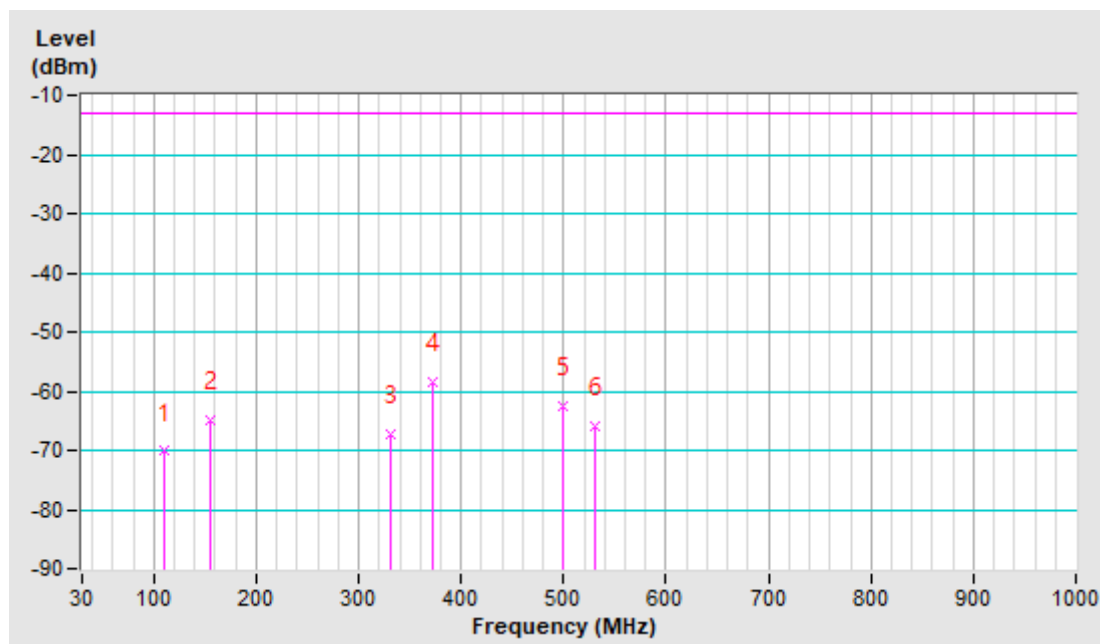
GSM:

Mode	TX channel 512	Frequency Range	Below 1000 MHz
Environmental Conditions	22deg. C, 66%RH	Input Power	120Vac, 60Hz
Tested By	Han Wu		

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	109.54	-62.30	-67.70	-2.50	-70.20	-13.00	-57.20
2	156.10	-60.20	-62.00	-2.90	-64.90	-13.00	-51.90
3	330.70	-63.50	-71.40	4.00	-67.40	-13.00	-54.40
4	371.44	-56.50	-62.50	3.90	-58.60	-13.00	-45.60
5	499.48	-62.30	-66.20	3.80	-62.40	-13.00	-49.40
6	530.52	-66.10	-69.70	3.90	-65.80	-13.00	-52.80

Remarks:

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

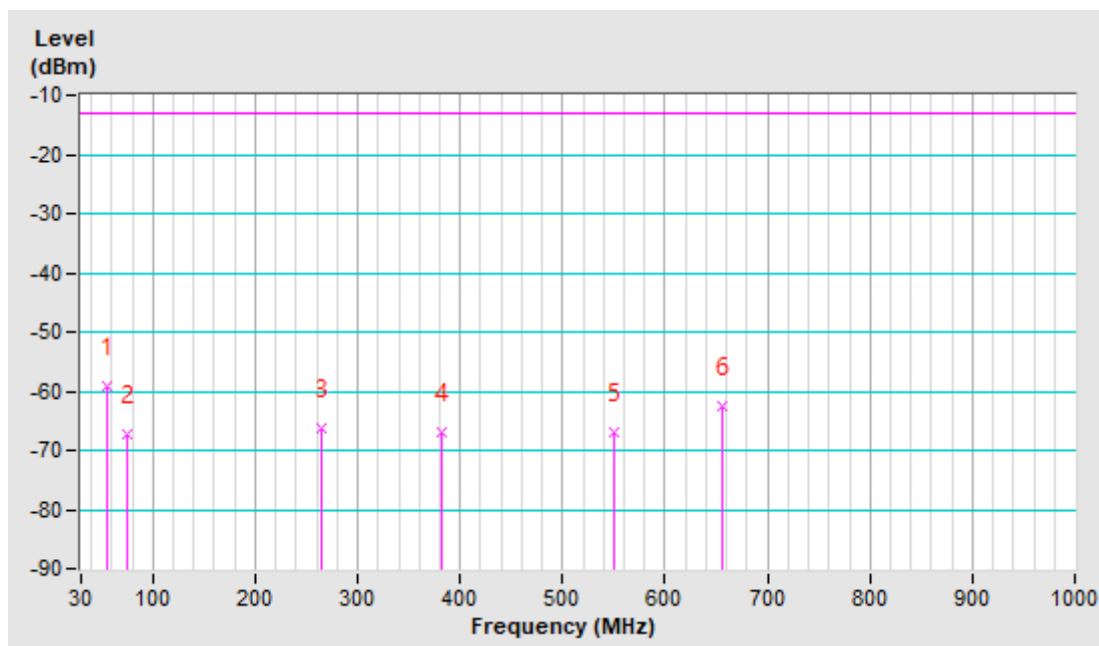


Mode	TX channel 512	Frequency Range	Below 1000 MHz
Environmental Conditions	22deg. C, 66%RH	Input Power	120Vac, 60Hz
Tested By	Han Wu		

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	55.22	-52.20	-53.70	-5.40	-59.10	-13.00	-46.10
2	74.62	-61.80	-67.50	0.10	-67.40	-13.00	-54.40
3	264.74	-67.40	-64.80	-1.60	-66.40	-13.00	-53.40
4	381.14	-66.30	-70.50	3.60	-66.90	-13.00	-53.90
5	549.92	-68.50	-70.60	3.80	-66.80	-13.00	-53.80
6	656.62	-68.10	-66.10	3.60	-62.50	-13.00	-49.50

Remarks:

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



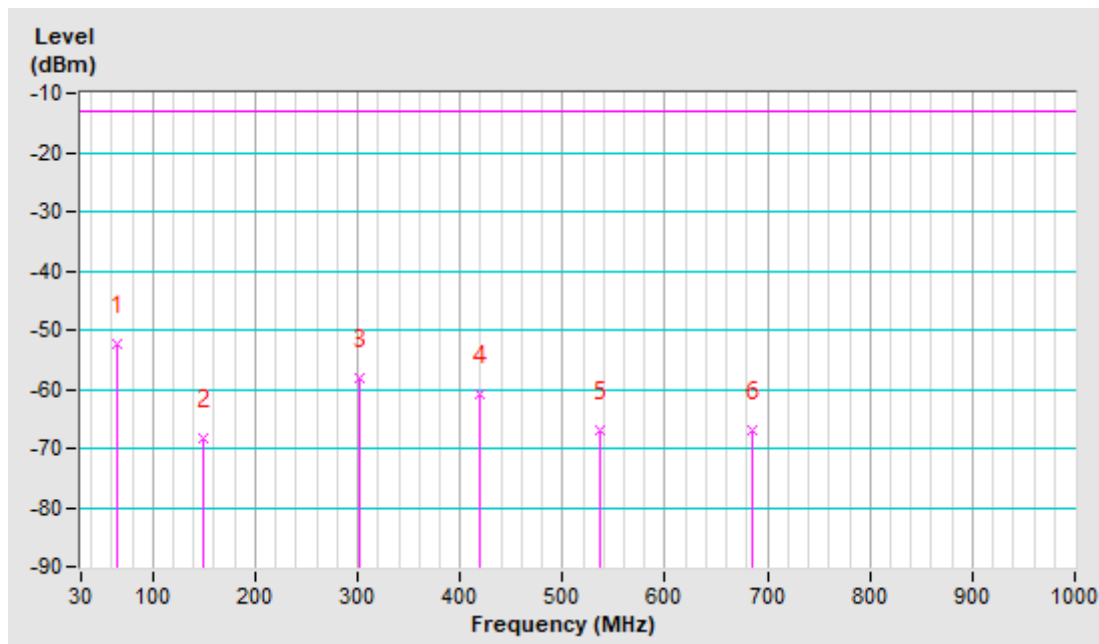
WCDMA Band 2:

Mode	TX channel 9538	Frequency Range	Below 1000 MHz
Environmental Conditions	22deg. C, 66%RH	Input Power	120Vac, 60Hz
Tested By	Han Wu		

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	64.92	-45.80	-50.50	-1.90	-52.40	-13.00	-39.40
2	148.34	-63.50	-65.30	-3.00	-68.30	-13.00	-55.30
3	301.60	-53.80	-62.00	3.70	-58.30	-13.00	-45.30
4	419.94	-60.50	-64.30	3.50	-60.80	-13.00	-47.80
5	536.34	-67.40	-70.90	3.80	-67.10	-13.00	-54.10
6	685.72	-69.70	-70.50	3.40	-67.10	-13.00	-54.10

Remarks:

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

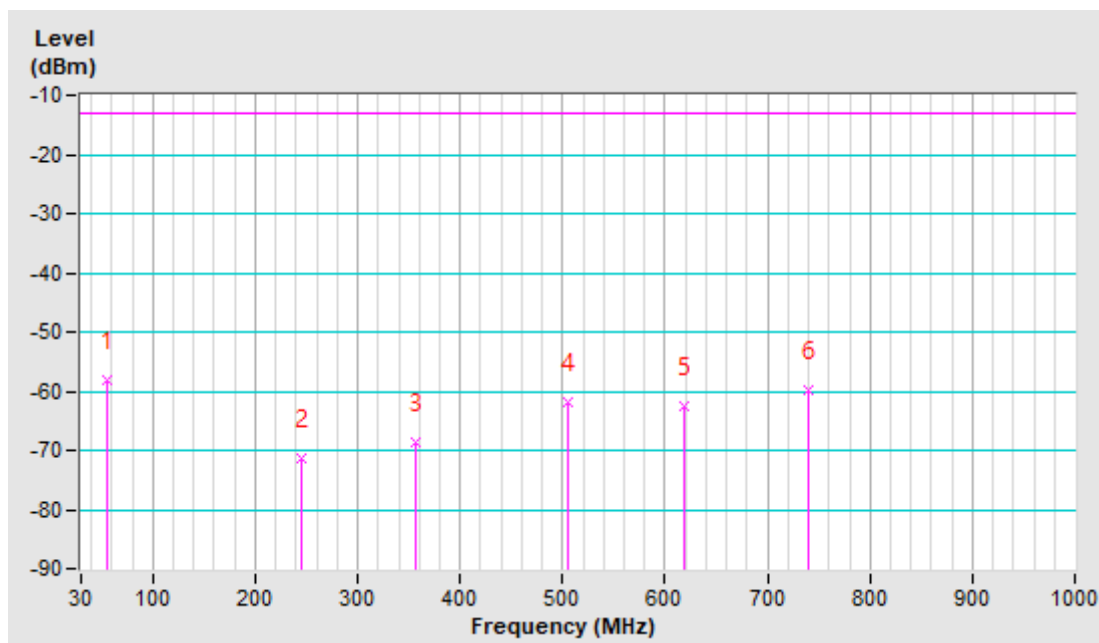


Mode	TX channel 9538	Frequency Range	Below 1000 MHz
Environmental Conditions	22deg. C, 66%RH	Input Power	120Vac, 60Hz
Tested By	Han Wu		

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	55.22	-51.10	-52.60	-5.40	-58.00	-13.00	-45.00
2	245.34	-70.30	-69.90	-1.60	-71.50	-13.00	-58.50
3	355.92	-68.30	-72.70	4.00	-68.70	-13.00	-55.70
4	505.30	-61.80	-65.80	3.90	-61.90	-13.00	-48.90
5	617.82	-67.20	-66.10	3.70	-62.40	-13.00	-49.40
6	740.04	-66.50	-63.40	3.70	-59.70	-13.00	-46.70

Remarks:

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



<Above 1GHz>

GSM:

Mode	TX channel 512	Frequency Range	1GH~18GHz
Environmental Conditions	22deg. C, 66%RH	Input Power	120Vac, 60Hz
Tested By	Han Wu		

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	3700.40 (PK)	-62.80	-54.30	1.40	-52.90	-13.00	-39.90
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	3700.40 (PK)	-59.30	-51.10	1.40	-49.70	-13.00	-36.70

Remarks:

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

Mode	TX channel 661	Frequency Range	1GH~18GHz
Environmental Conditions	22deg. C, 66%RH	Input Power	120Vac, 60Hz
Tested By	Han Wu		

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	3760.00 (PK)	-62.40	-53.90	1.30	-52.60	-13.00	-39.60
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	3760.00 (PK)	-59.40	-51.10	1.30	-49.80	-13.00	-36.80

Remarks:

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

Mode	TX channel 810	Frequency Range	1GH~18GHz
Environmental Conditions	22deg. C, 66%RH	Input Power	120Vac, 60Hz
Tested By	Han Wu		

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	3819.60 (PK)	-62.60	-54.30	1.40	-52.90	-13.00	-39.90
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	3819.60 (PK)	-59.70	-51.50	1.40	-50.10	-13.00	-37.10

Remarks:

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

WCDMA Band 2:

Mode	TX channel 9262	Frequency Range	1GH~18GHz
Environmental Conditions	22deg. C, 66%RH	Input Power	120Vac, 60Hz
Tested By	Han Wu		

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	3704.80 (PK)	-64.30	-55.80	1.40	-54.40	-13.00	-41.40
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	3704.80 (PK)	-64.40	-56.20	1.40	-54.80	-13.00	-41.80

Remarks:

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

Mode	TX channel 9400	Frequency Range	1GH~18GHz
Environmental Conditions	22deg. C, 66%RH	Input Power	120Vac, 60Hz
Tested By	Han Wu		

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	3760.00 (PK)	-64.70	-56.20	1.30	-54.90	-13.00	-41.90
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	3760.00 (PK)	-64.50	-56.20	1.30	-54.90	-13.00	-41.90

Remarks:

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

Mode	TX channel 9538	Frequency Range	1GH~18GHz
Environmental Conditions	22deg. C, 66%RH	Input Power	120Vac, 60Hz
Tested By	Han Wu		

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	3815.20 (PK)	-64.10	-55.80	1.40	-54.40	-13.00	-41.40
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	3815.20 (PK)	-64.30	-56.10	1.40	-54.70	-13.00	-41.70

Remarks:

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

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.

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Web Site: www.bureauveritas-adt.com

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

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