

FCC Test Report

(PART 22)

Report No.: RF200616C19

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	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 22, Subpart H

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

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

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

2 Summary of Test Results

Applied Standard: FCC Part 22 & Part 2			
FCC Clause	Test Item	Result	Remarks
2.1046 22.913 (a)	Effective Radiated Power	Pass	Meet the requirement of limit.
2.1047 22.913 (d)	Modulation Characteristics Peak to Average Ratio	Pass	Meet the requirement of limit.
2.1055 22.355	Frequency Stability	Pass	Meet the requirement of limit.
2.1049	Occupied Bandwidth	Pass	Meet the requirement of limit.
22.917	Band Edge Measurements	Pass	Meet the requirement of limit.
2.1051 22.917	Conducted Spurious Emissions	Pass	Meet the requirement of limit.
2.1053 22.917	Radiated Spurious Emissions	Pass	Meet the requirement of limit. Minimum passing margin is -18.90 dB at 1673.20 MHz.

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

2.1 Measurement Uncertainty

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

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

2.2 Test Site and Instruments

Description & Manufacturer	Model No.	Serial No.	Date of Calibration	Due Date of Calibration
Test Receiver 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	824.2 ~ 848.8 MHz
	WCDMA	826.4 ~ 846.6 MHz
Max. ERP Power	GSM/GPRS	1409.289 mW (31.49 dBm)
	EDGE	1185.769 mW (30. 74 dBm)
	WCDMA	222.331 mW (23.47 dBm)
Emission Designator	GSM/GPRS	260KGXW
	EDGE	250KG7W
	WCDMA	4M20F9W
Antenna Type	Refer to Note	
Accessory Device	N/A	
Data Cable Supplied	N/A	

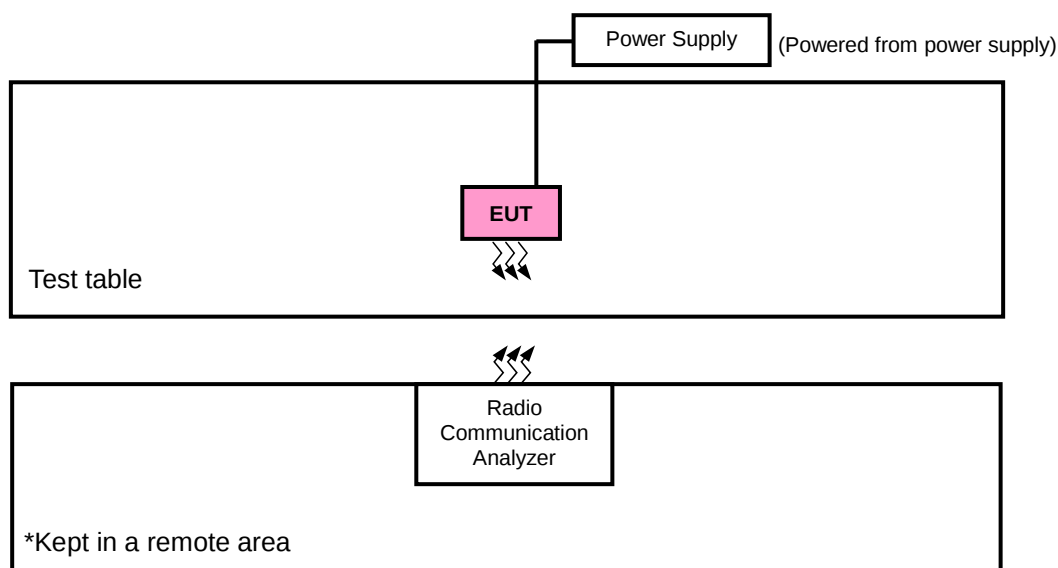
Note:

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	ERP	Radiated Emission
GSM	X-plane	X-axis
EDGE	X-plane	X-axis
WCDMA	X-plane	X-axis

GSM

EUT Configure Mode	Test Item	Available Channel	Tested Channel	Mode
-	ERP	128 to 251	128, 189, 251	GSM, GPRS, EDGE
-	Modulation Characteristics	128 to 251	128	GSM, GPRS, EDGE
-	Frequency Stability	128 to 251	128, 251	GSM, EDGE
-	Occupied Bandwidth	128 to 251	128, 189, 251	GSM, GPRS, EDGE
-	Band Edge	128 to 251	128, 251	GSM, GPRS, EDGE
-	Peak to Average Ratio	128 to 251	128, 189, 251	GSM, GPRS, EDGE
-	Conducted Emission	128 to 251	128, 189, 251	GSM, GPRS, EDGE
-	Radiated Emission Below 1 GHz	128 to 251	189	GSM
-	Radiated Emission Above 1 GHz	128 to 251	128, 189, 251	GSM

WCDMA

EUT Configure Mode	Test Item	Available Channel	Tested Channel	Mode
-	ERP	4132 to 4233	4132, 4182, 4233	WCDMA, HSDPA, HSUPA
-	Modulation Characteristics	4132 to 4233	4182	WCDMA, HSDPA, HSUPA
-	Frequency Stability	4132 to 4233	4132, 4233	WCDMA
-	Occupied Bandwidth	4132 to 4233	4132, 4182, 4233	WCDMA, HSDPA, HSUPA
-	Band Edge	4132 to 4233	4132, 4233	WCDMA, HSDPA, HSUPA
-	Peak to Average Ratio	4132 to 4233	4132, 4182, 4233	WCDMA, HSDPA, HSUPA
-	Conducted Emission	4132 to 4233	4132, 4182, 4233	WCDMA, HSDPA, HSUPA
-	Radiated Emission Below 1 GHz	4132 to 4233	4182	WCDMA
-	Radiated Emission Above 1 GHz	4132 to 4233	4132, 4182, 4233	WCDMA

Test Condition:

Test Item	Environmental Conditions	Input Power	Tested By
ERP	25 deg. C, 65 % RH	4.2 Vdc	Han Wu
Modulation Characteristics	25 deg. C, 65 % RH	4.2 Vdc	Willy Cheng
Frequency Stability	25 deg. C, 65 % RH	4.2 Vdc	Willy Cheng
Occupied Bandwidth	25 deg. C, 65 % RH	4.2 Vdc	Willy Cheng
Band Edge	25 deg. C, 65 % RH	4.2 Vdc	Willy Cheng
Peak to Average Ratio	25 deg. C, 65 % RH	4.2 Vdc	Willy Cheng
Conducted Emission	25 deg. C, 65 % 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 22

ANSI 63.26-2015

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

References Test Guidance:

KDB 971168 D01 Power Meas License Digital Systems v03r01

ANSI/TIA/EIA-603-E 2016

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

4 Test Types and Results

4.1 Output Power Measurement

4.1.1 Limits of Output Power Measurement

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

4.1.2 Test Procedures

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	GSM850		
Channel	128	189	251
Frequency (MHz)	824.2	836.4	848.8
GSM (GMSK, 1Tx-slot)	32.40	32.62	32.63
GPRS (GMSK, 1Tx-slot)	32.39	32.59	32.60
GPRS (GMSK, 2Tx-slot)	32.36	32.55	32.58
GPRS (GMSK, 3Tx-slot)	32.34	32.51	32.55
GPRS (GMSK, 4Tx-slot)	32.25	32.44	32.50
DTM (GMSK, 2Tx-slot)	31.82	31.90	32.03
DTM (GMSK, 3Tx-slot)	31.75	31.82	31.97
EDGE (8PSK, 1Tx-slot)	31.68	31.74	31.88
EDGE (8PSK, 2Tx-slot)	31.62	31.69	31.80
EDGE (8PSK, 3Tx-slot)	31.53	31.63	31.70
EDGE (8PSK, 4Tx-slot)	31.47	31.57	31.63
DTM (8PSK, 2Tx-slot)	30.93	31.08	31.14
DTM (8PSK, 3Tx-slot)	30.88	30.99	31.04

Band	WCDMA V		
Channel	4132	4182	4233
Frequency (MHz)	826.4	836.4	846.6
RMC 12.2K	24.61	24.46	24.35
HSDPA Subtest-1	24.38	24.41	24.31
HSDPA Subtest-2	24.34	24.38	24.25
HSDPA Subtest-3	23.84	23.92	23.88
HSDPA Subtest-4	23.81	23.85	23.67
HSUPA Subtest-1	24.35	24.21	24.27
HSUPA Subtest-2	23.38	23.25	23.39
HSUPA Subtest-3	23.34	23.19	22.92
HSUPA Subtest-4	22.36	23.03	22.61
HSUPA Subtest-5	23.33	23.18	23.42

ERP Power (dBm)

Band	GSM850		
Channel	128	189	251
Frequency (MHz)	824.2	836.4	848.8
GSM (GMSK, 1Tx-slot)	31.26	31.48	31.49
GPRS (GMSK, 1Tx-slot)	31.25	31.45	31.46
GPRS (GMSK, 2Tx-slot)	31.22	31.41	31.44
GPRS (GMSK, 3Tx-slot)	31.20	31.37	31.41
GPRS (GMSK, 4Tx-slot)	31.11	31.30	31.36
DTM (GMSK, 2Tx-slot)	30.68	30.76	30.89
DTM (GMSK, 3Tx-slot)	30.61	30.68	30.83
EDGE (8PSK, 1Tx-slot)	30.54	30.60	30.74
EDGE (8PSK, 2Tx-slot)	30.48	30.55	30.66
EDGE (8PSK, 3Tx-slot)	30.39	30.49	30.56
EDGE (8PSK, 4Tx-slot)	30.33	30.43	30.49
DTM (8PSK, 2Tx-slot)	29.79	29.94	30.00
DTM (8PSK, 3Tx-slot)	29.74	29.85	29.90

*ERP = Conducted + antenna gain (0.58dBi)-2.15

Band	WCDMA V		
Channel	4132	4182	4233
Frequency (MHz)	826.4	836.4	846.6
RMC 12.2K	23.47	23.32	23.21
HSDPA Subtest-1	23.24	23.27	23.17
HSDPA Subtest-2	23.20	23.24	23.11
HSDPA Subtest-3	22.70	22.78	22.74
HSDPA Subtest-4	22.67	22.71	22.53
HSUPA Subtest-1	23.21	23.07	23.13
HSUPA Subtest-2	22.24	22.11	22.25
HSUPA Subtest-3	22.20	22.05	21.78
HSUPA Subtest-4	21.22	21.89	21.47
HSUPA Subtest-5	22.19	22.04	22.28

*ERP = Conducted + antenna gain (0.58dBi)-2.15

4.2 Modulation Characteristics Measurement

4.2.1 Limits of Modulation Characteristics

N/A

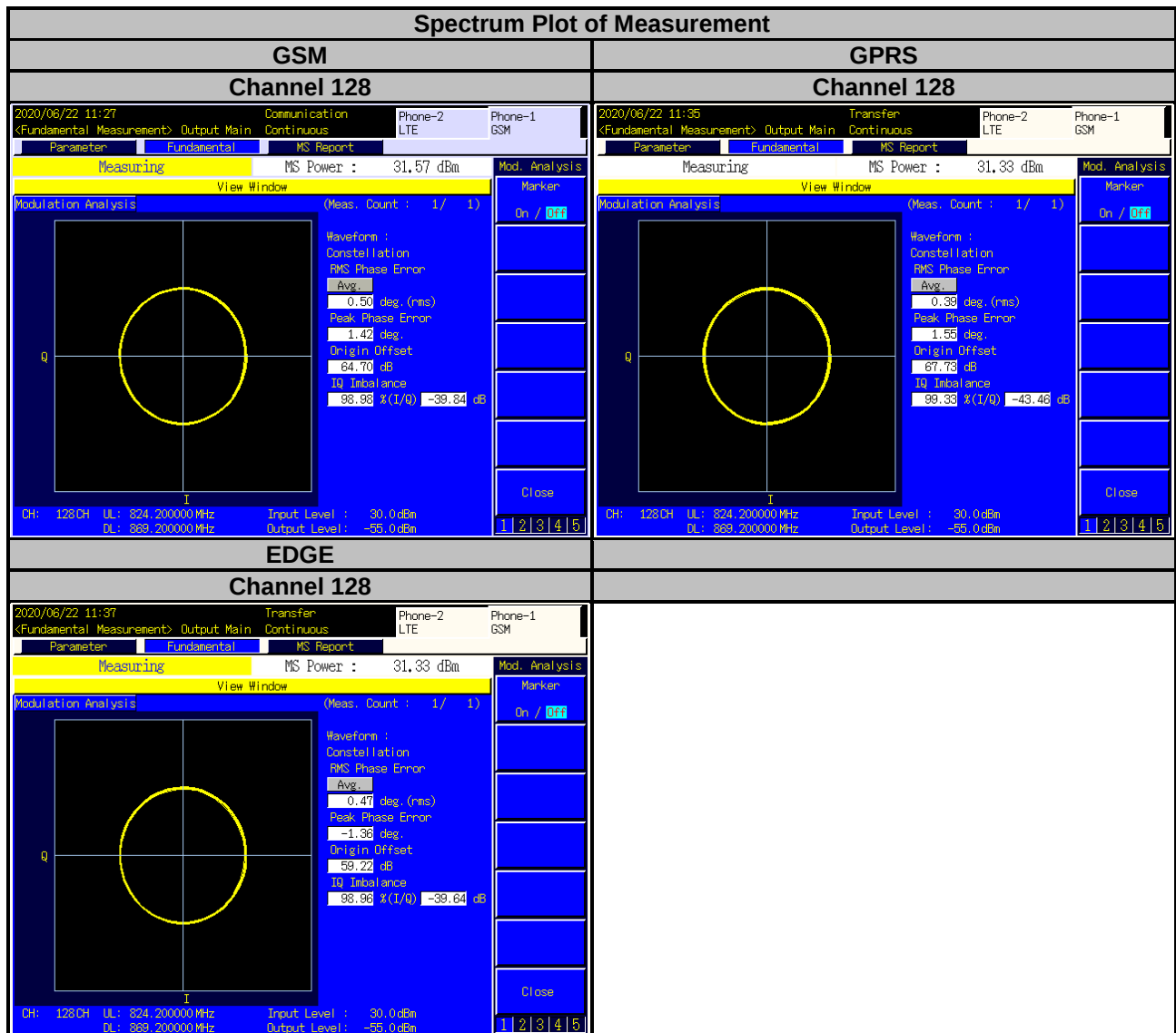
4.2.2 Test Setup

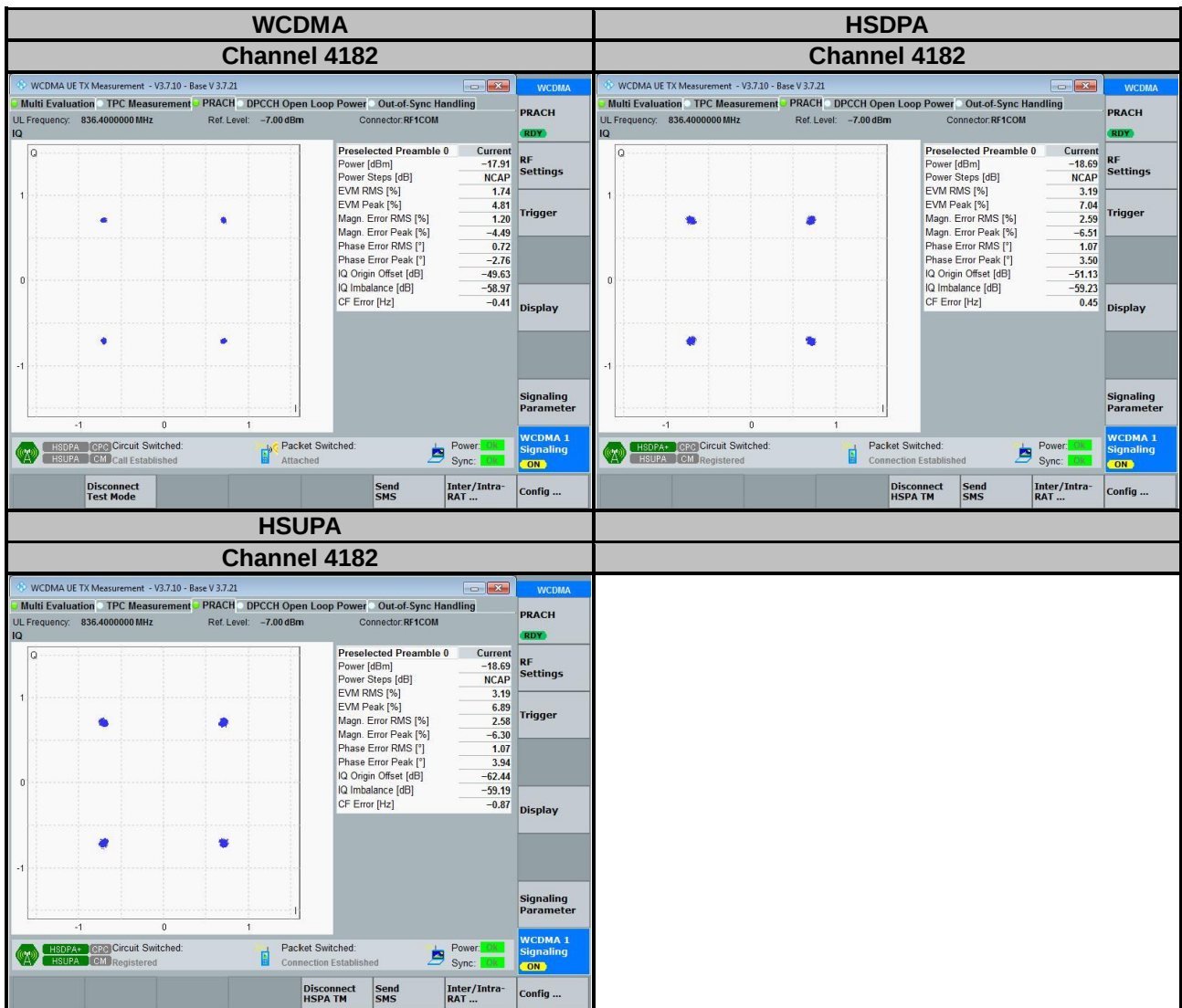


4.2.3 Test Procedure

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

4.2.4 Test Results





4.3 Frequency Stability Measurement

4.3.1 Limits of Frequency Stability Measurement

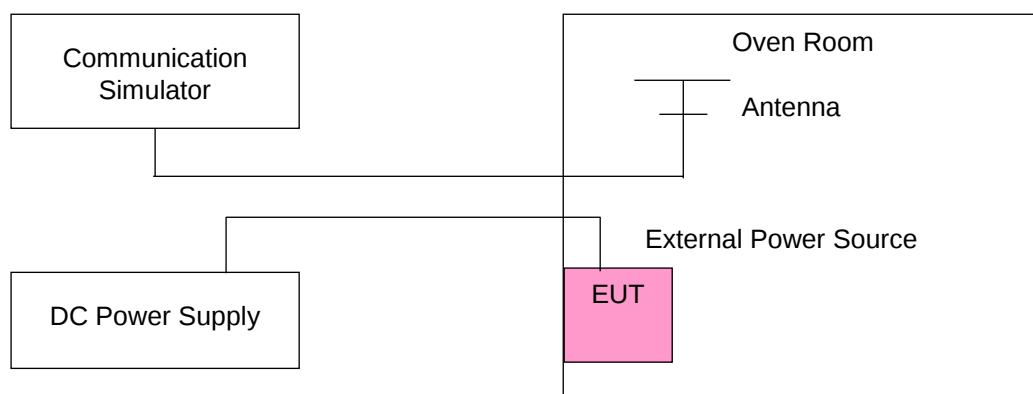
1.5 ppm is for base and fixed station. 2.5 ppm is for mobile station.

4.3.2 Test Procedure

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

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

4.3.3 Test Setup



4.3.4 Test Results

Frequency Error vs. Voltage

Voltage (Volts)	GSM				Limit (ppm)
	Low Channel		High Channel		
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)	
4.0	824.200001	0.002	848.800002	0.002	2.5
4.2	824.200004	0.005	848.800003	0.003	2.5
4.4	824.200004	0.005	848.800002	0.002	2.5

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				Limit (ppm)
	Low Channel		High Channel		
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)	
-20	824.200002	0.002	848.800003	0.004	2.5
-10	824.200003	0.004	848.800003	0.003	2.5
0	824.200004	0.004	848.800003	0.003	2.5
10	824.200003	0.004	848.800002	0.003	2.5
20	824.199998	-0.002	848.799997	-0.004	2.5
30	824.199998	-0.002	848.799997	-0.004	2.5
40	824.199998	-0.002	848.799998	-0.002	2.5
50	824.199997	-0.003	848.799997	-0.003	2.5

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				Limit (ppm)
	Low Channel		High Channel		
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)	
4.0	824.200003	0.004	848.800003	0.004	2.5
4.2	824.200003	0.004	848.800004	0.004	2.5
4.4	824.200004	0.004	848.800001	0.001	2.5

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				Limit (ppm)
	Low Channel		High Channel		
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)	
-20	824.200004	0.005	848.800003	0.003	2.5
-10	824.200003	0.004	848.800003	0.003	2.5
0	824.200002	0.002	848.800004	0.005	2.5
10	824.200002	0.002	848.800002	0.003	2.5
20	824.199997	-0.004	848.799998	-0.003	2.5
30	824.199997	-0.003	848.799996	-0.004	2.5
40	824.199997	-0.004	848.799998	-0.003	2.5
50	824.199999	-0.001	848.799997	-0.004	2.5

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				Limit (ppm)
	Low Channel		High Channel		
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)	
4.0	826.400003	0.004	846.600002	0.002	2.5
4.2	826.400004	0.004	846.600004	0.004	2.5
4.4	826.400002	0.002	846.600003	0.003	2.5

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				Limit (ppm)
	Low Channel		High Channel		
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)	
-20	826.400002	0.003	846.600001	0.001	2.5
-10	826.400003	0.004	846.600002	0.002	2.5
0	826.400003	0.004	846.600002	0.002	2.5
10	826.400004	0.005	846.600003	0.004	2.5
20	826.399997	-0.004	846.599998	-0.003	2.5
30	826.399999	-0.001	846.599997	-0.004	2.5
40	826.399999	-0.001	846.599997	-0.003	2.5
50	826.399998	-0.002	846.599997	-0.004	2.5

Note:

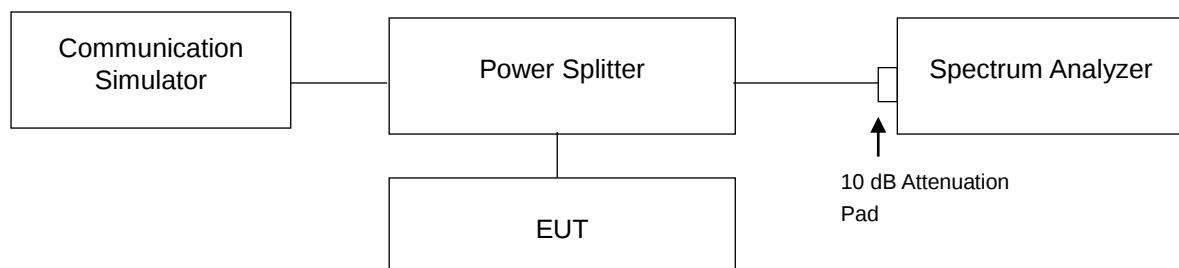
1. The applicant declared that the normal operating temperature of the EUT is from -20°C to 50°C.
2. The EUT would shut down automatically as below -20°C.

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.

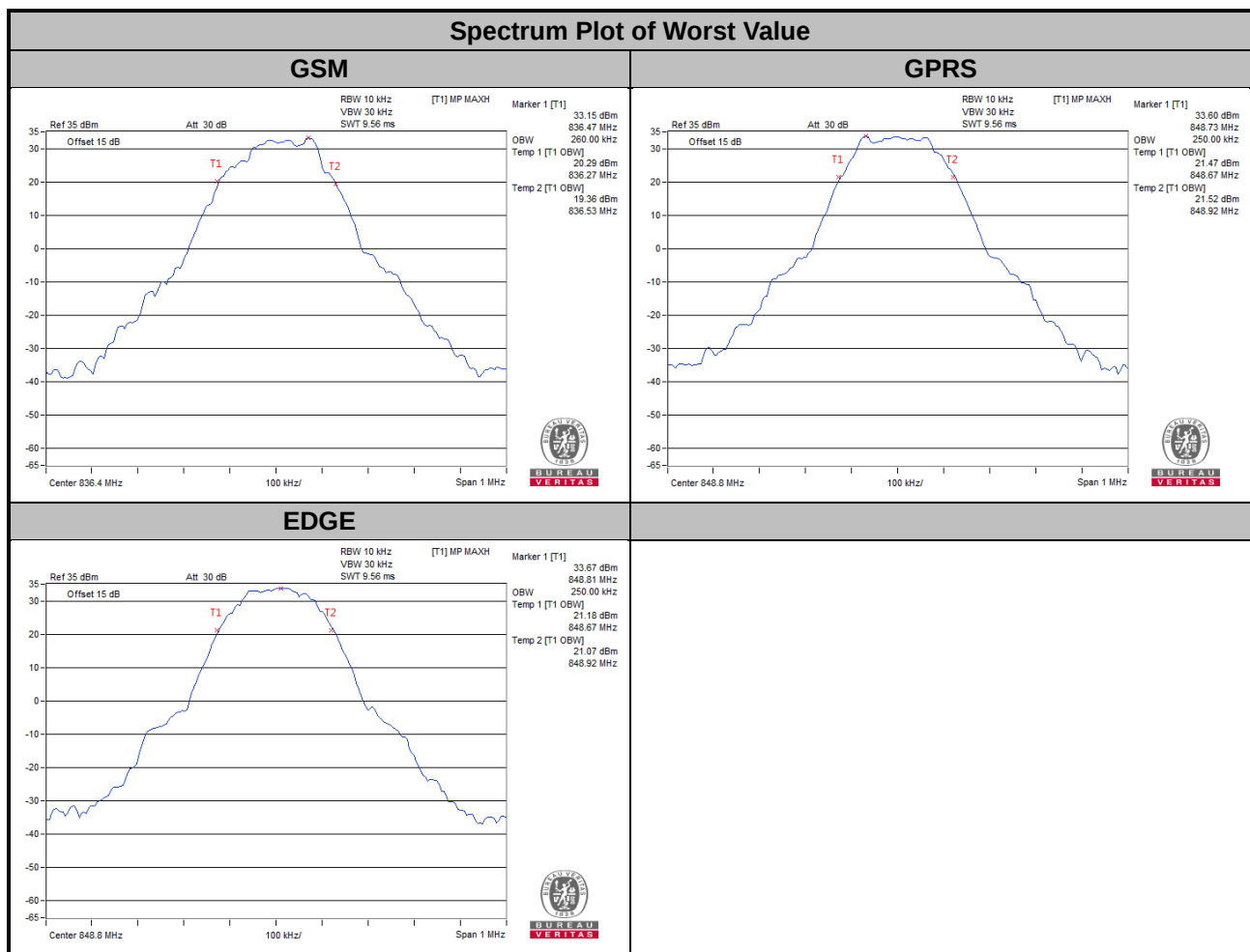
4.4.2 Test Setup



4.4.3 Test Result

Occupied Bandwidth

Channel	Frequency (MHz)	99% Occupied Bandwidth (kHz)		
		GSM	GPRS	EDGE
128	824.2	250.0	250.0	250.0
189	836.4	260.0	250.0	250.0
251	848.8	250.0	250.0	250.0

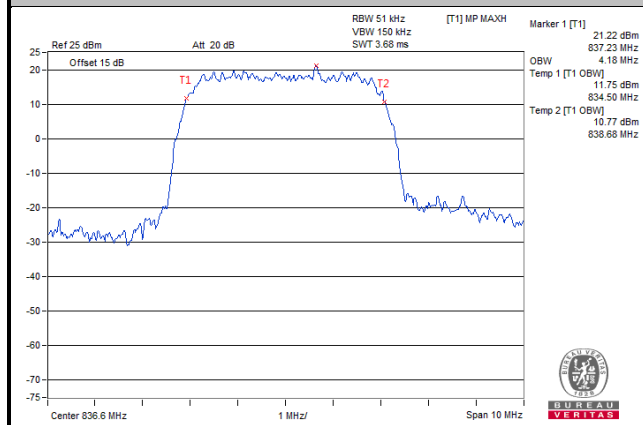


WCDMA Band 5

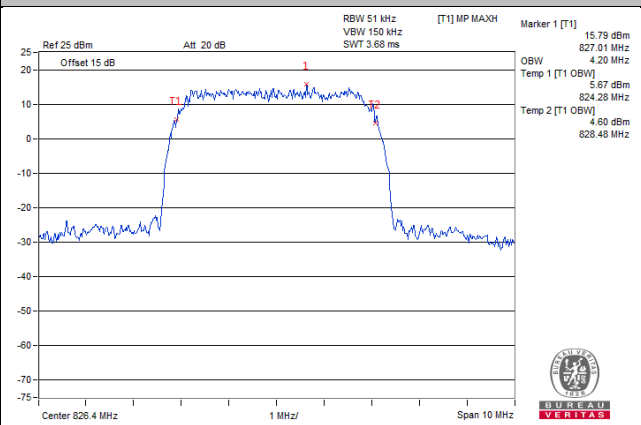
Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)		
		WCDMA	HSDPA	HSUPA
4132	826.4	4.17	4.20	4.18
4182	836.4	4.18	4.18	4.20
4233	846.6	4.18	4.16	4.20

Spectrum Plot of Worst Value

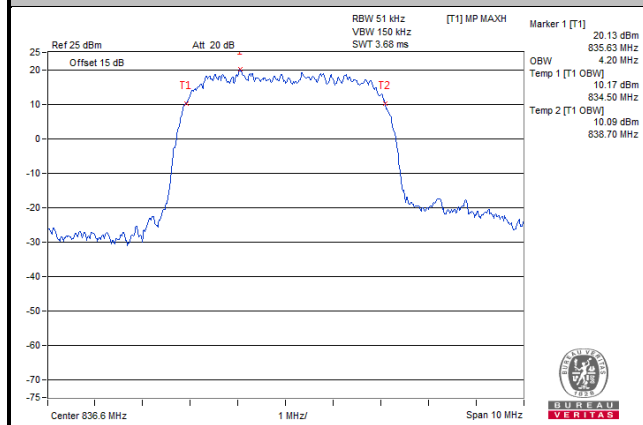
WCDMA



HSDPA

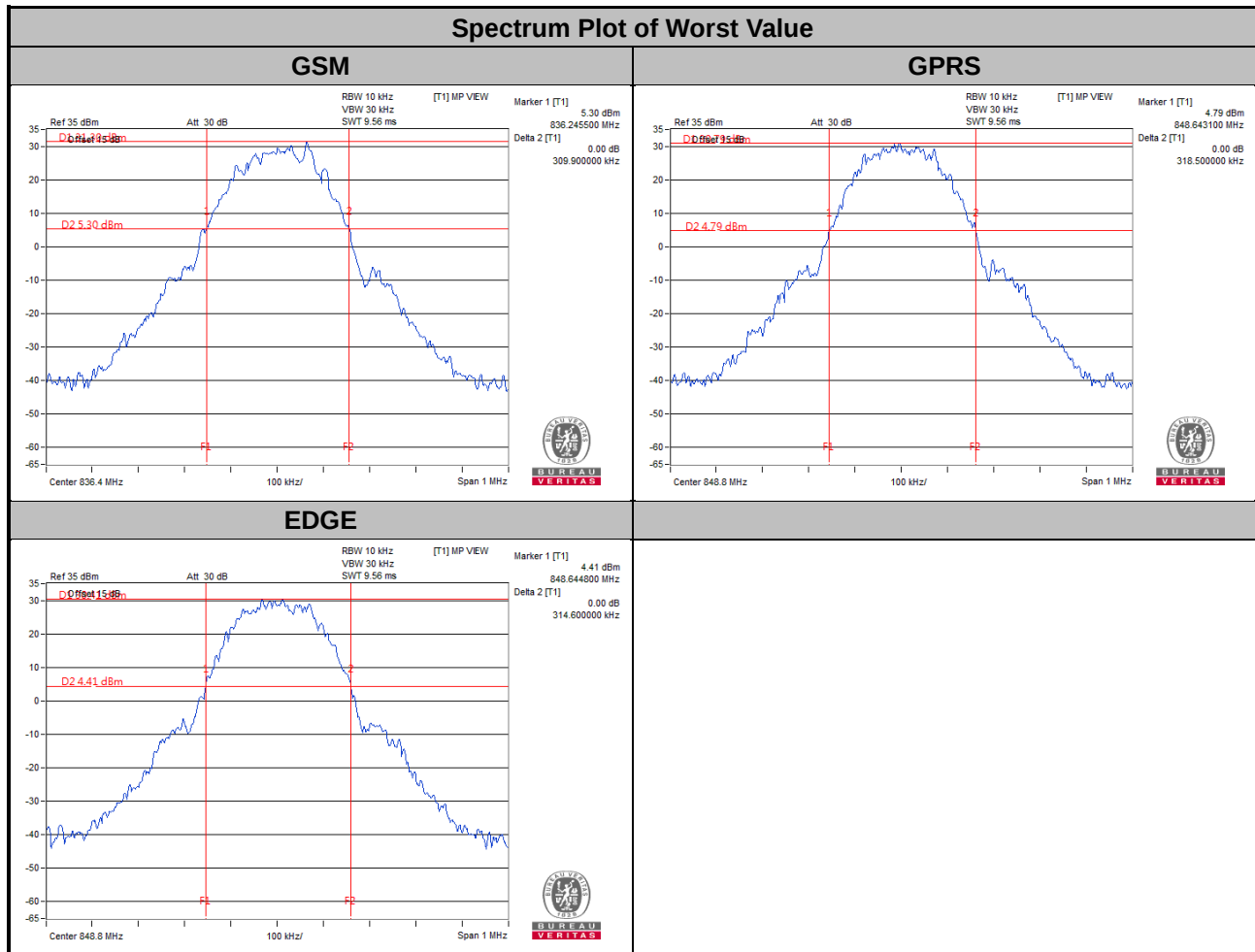


HSUPA



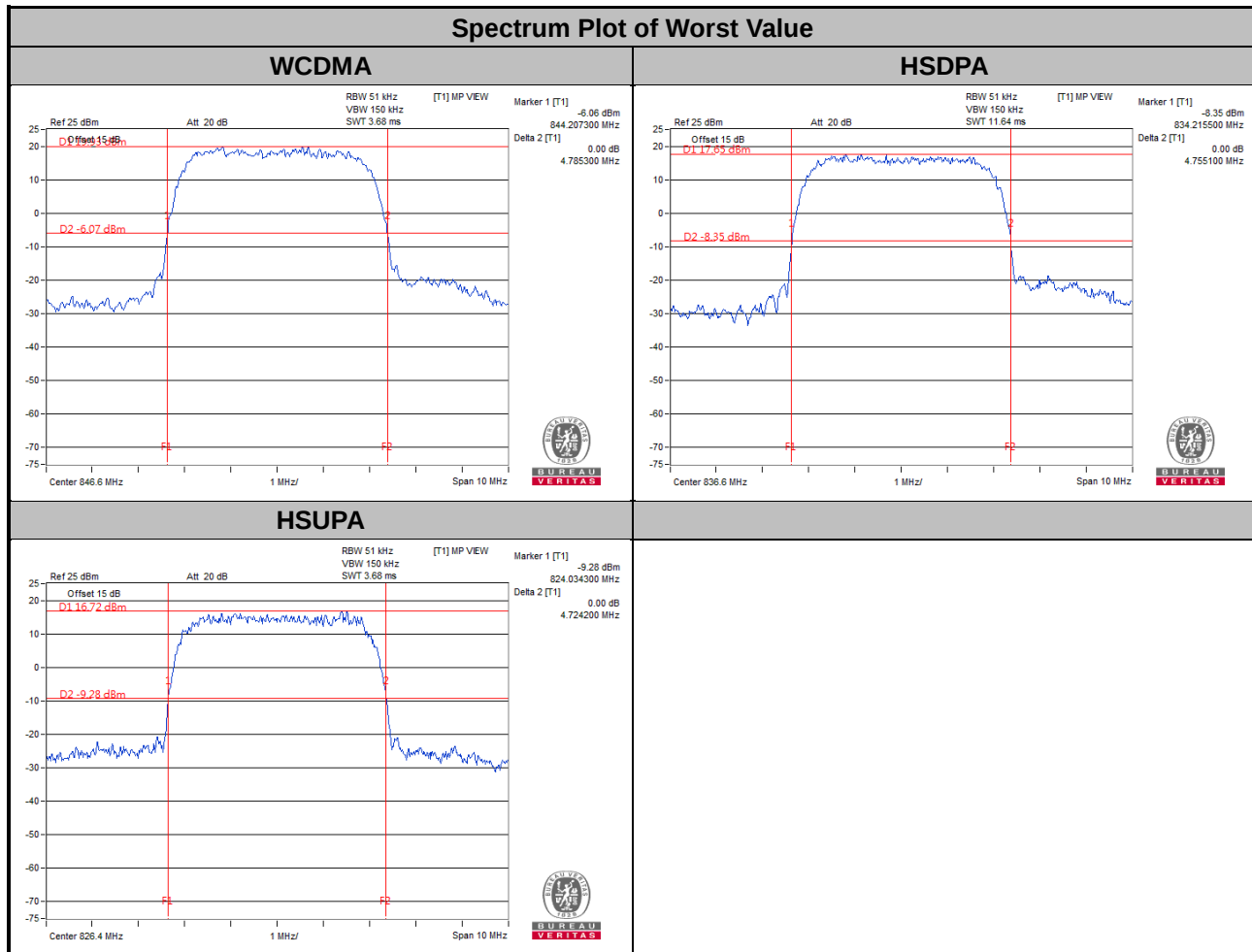
26dB Bandwidth

Channel	Frequency (MHz)	26dB Bandwidth (kHz)		
		GSM	GPRS	EDGE
128	824.2	303.0	314.0	313.3
189	836.4	309.9	314.6	307.5
251	848.8	305.6	318.5	314.6



WCDMA Band 5

Channel	Frequency (MHz)	26dB Bandwidth (MHz)		
		WCDMA	HSDPA	HSUPA
4132	826.4	4.75	4.74	4.72
4182	836.4	4.76	4.76	4.69
4233	846.6	4.79	4.71	4.72

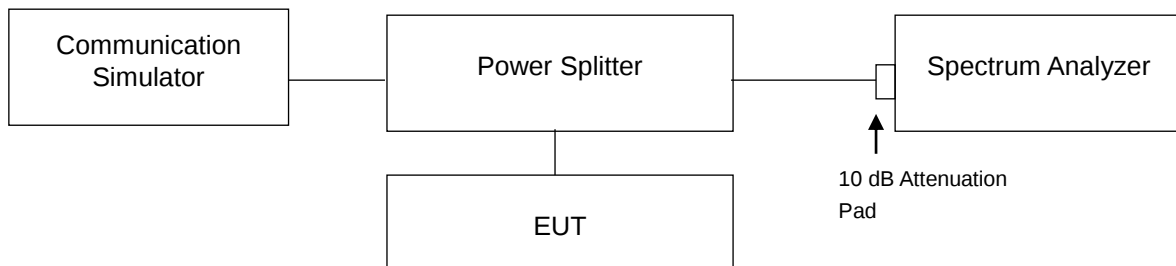


4.5 Band Edge Measurement

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.

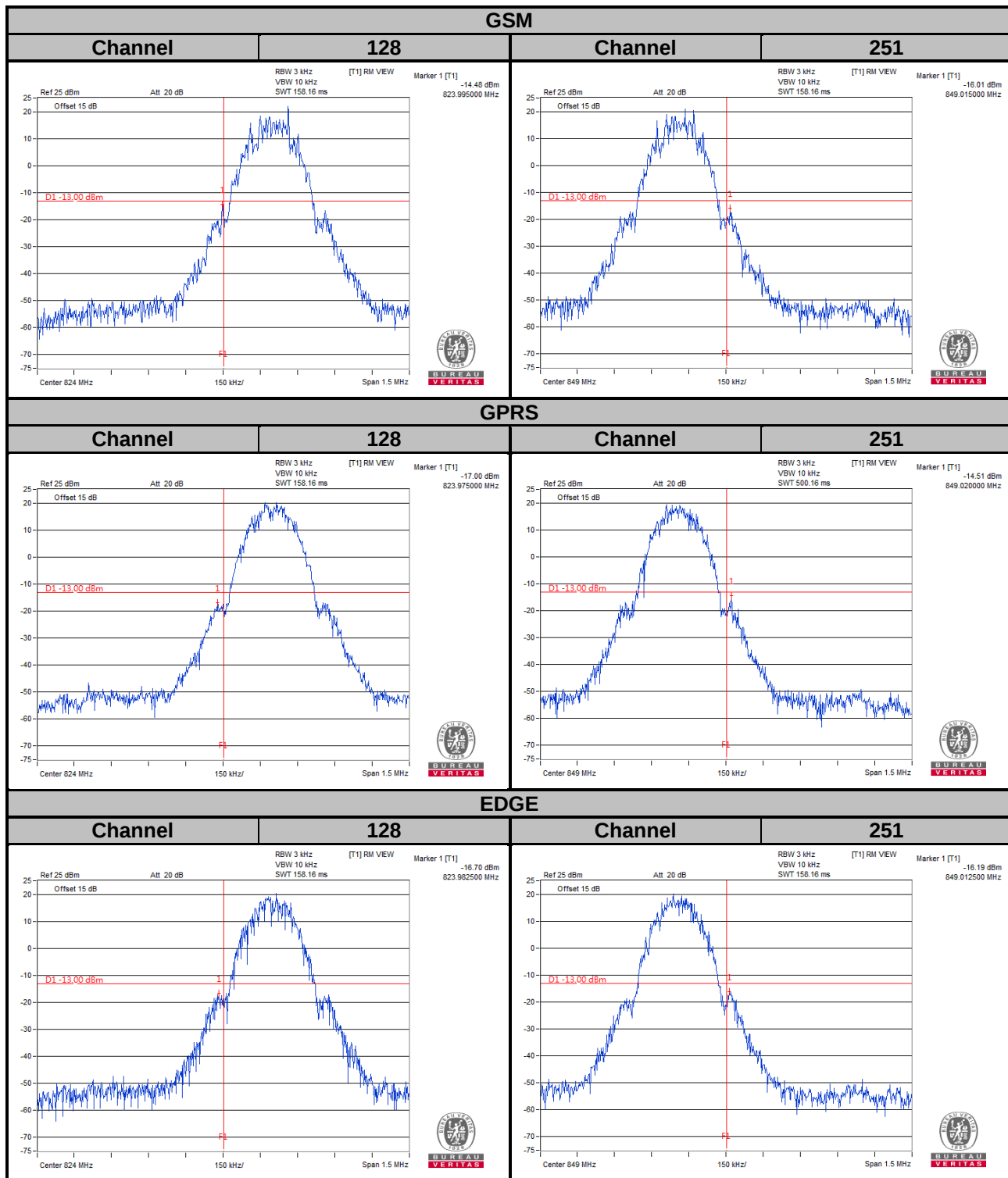
4.5.2 Test Setup

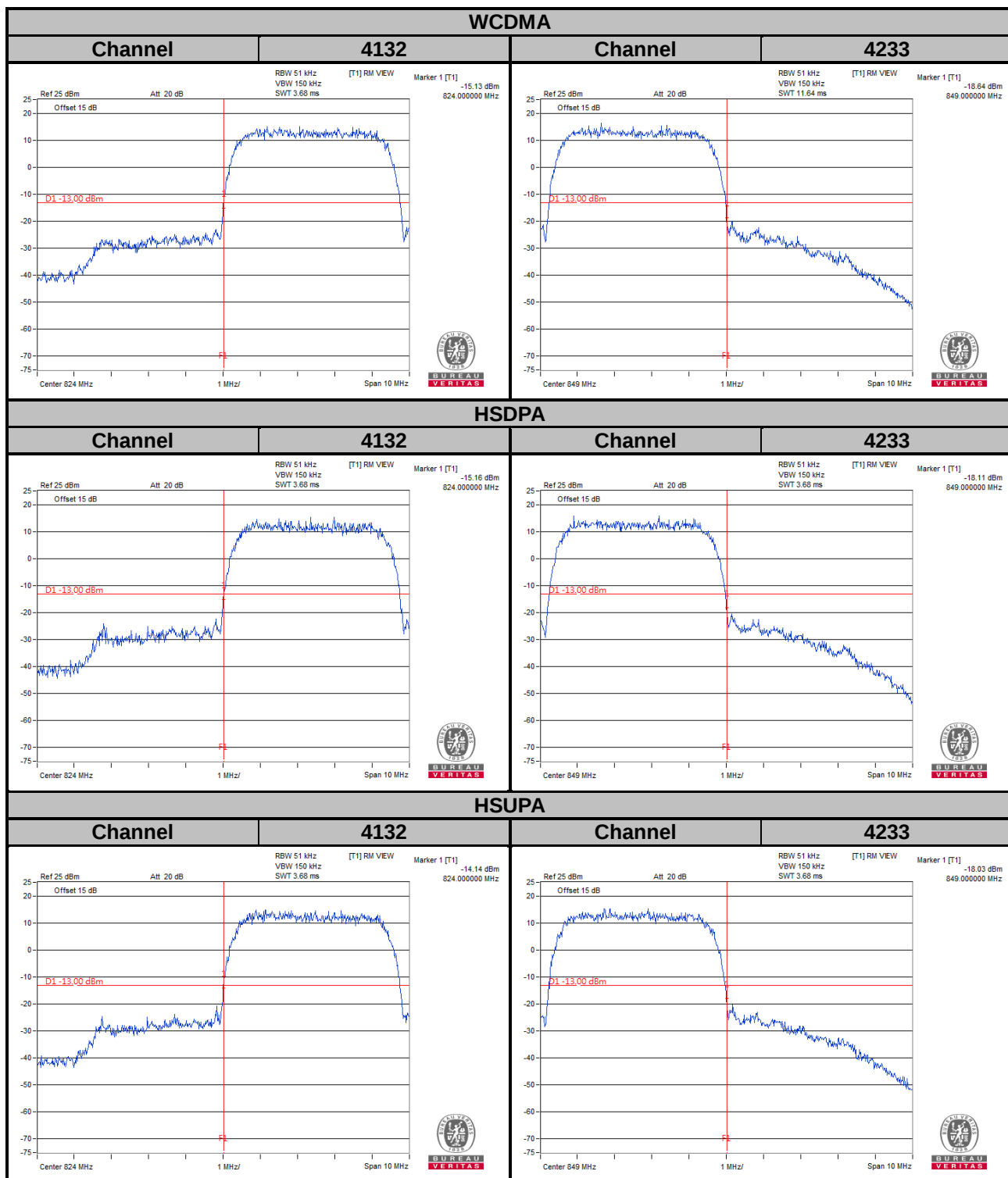


4.5.3 Test Procedures

- 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



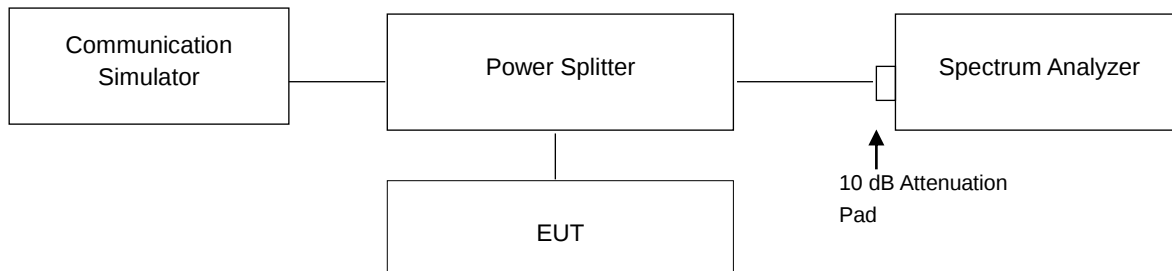


4.6 Peak to Average Ratio

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

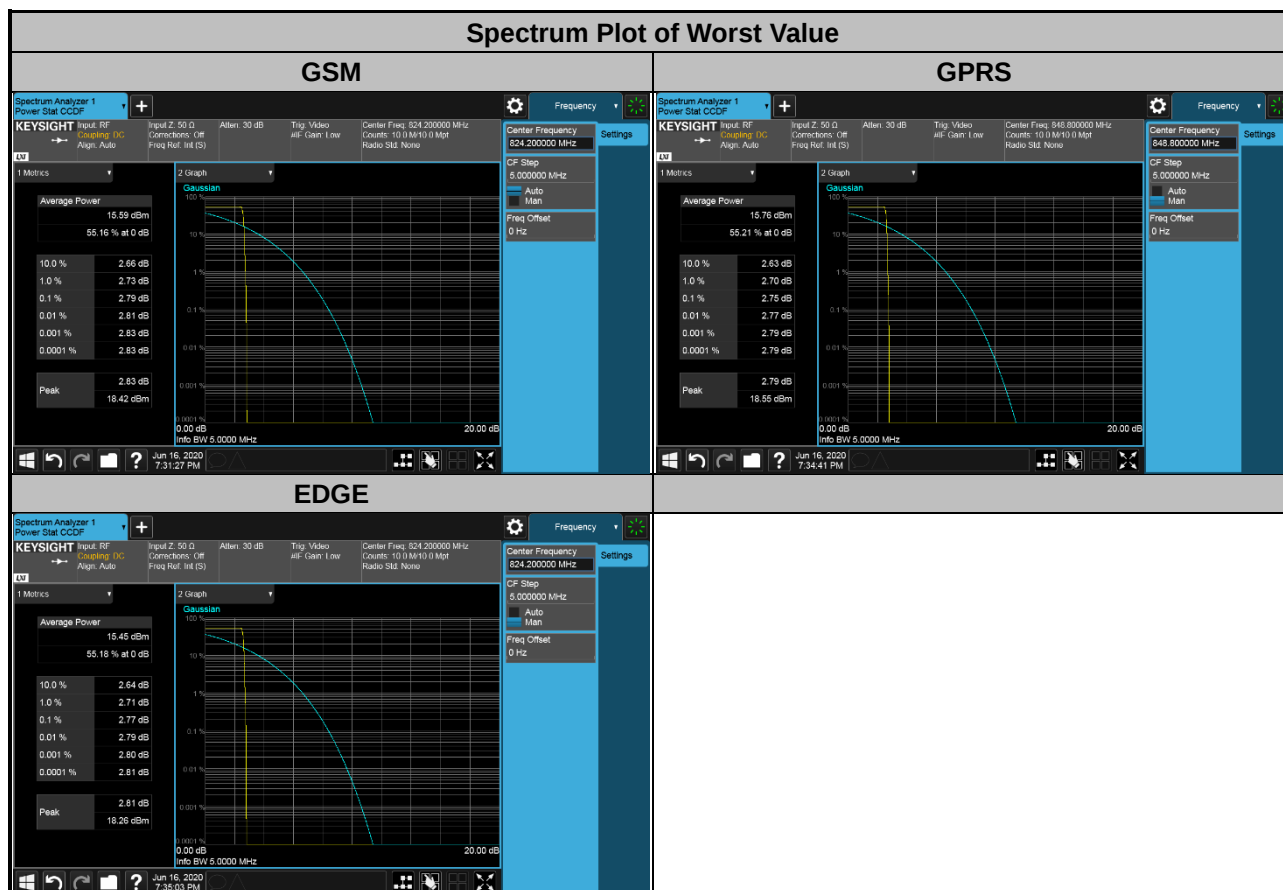


4.6.3 Test Procedures

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 %.

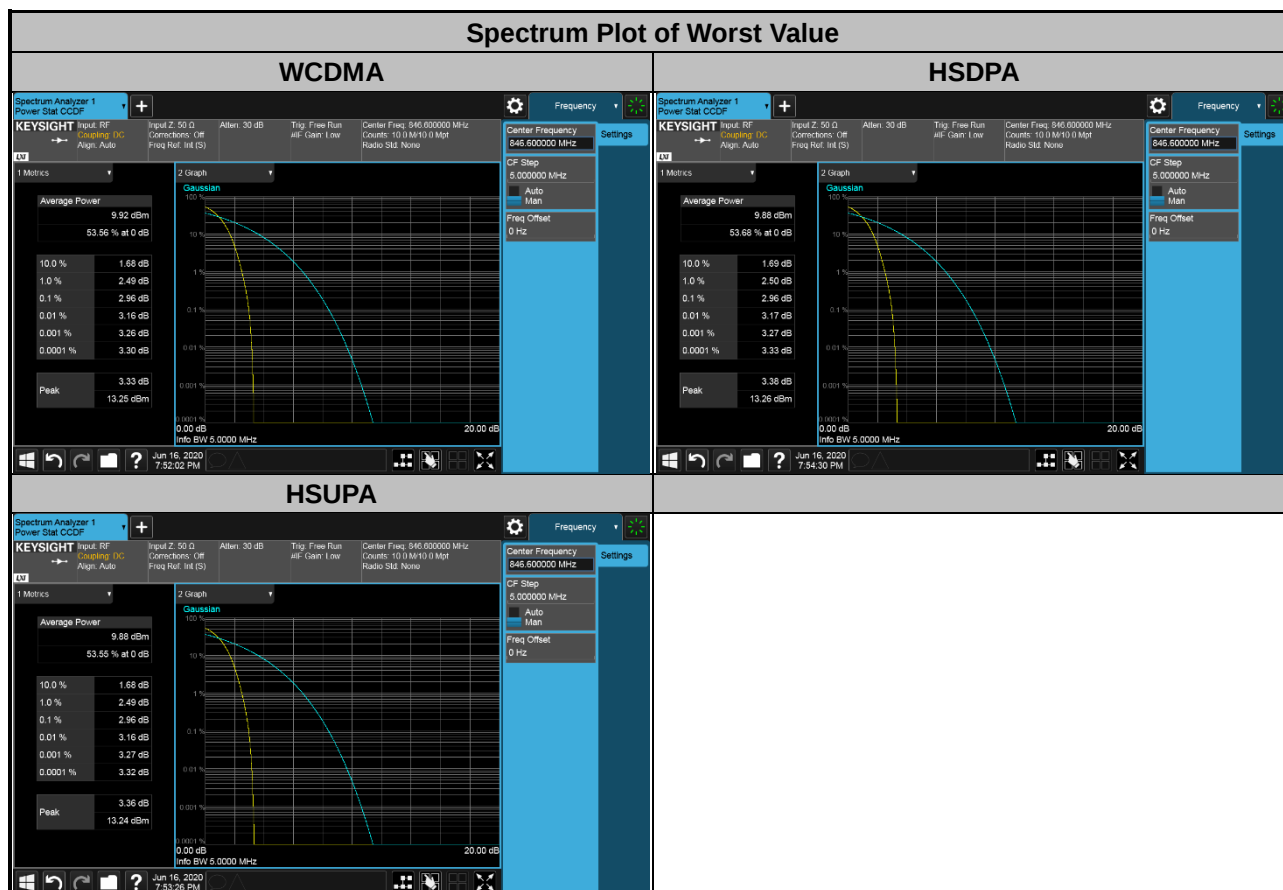
4.6.4 Test Results

Channel	Frequency (MHz)	Peak To Average Ratio (dB)		
		GSM	GPRS	EDGE
128	824.2	2.79	2.75	2.77
189	836.4	2.77	2.75	2.75
251	848.8	2.75	2.75	2.74



WCDMA Band 5

Channel	Frequency (MHz)	Peak To Average Ratio (dB)		
		WCDMA	HSDPA	HSUPA
4132	826.4	2.91	2.89	2.90
4182	836.4	2.93	2.91	2.92
4233	846.6	2.96	2.96	2.96

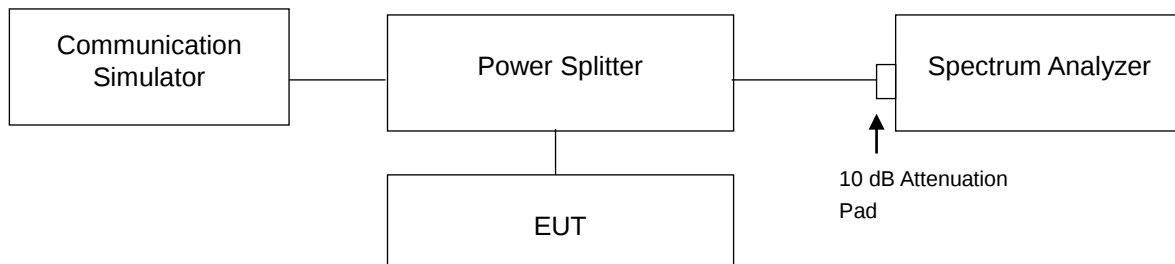


4.7 Conducted Spurious Emissions

4.7.1 Limits of Conducted Spurious Emissions Measurement

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

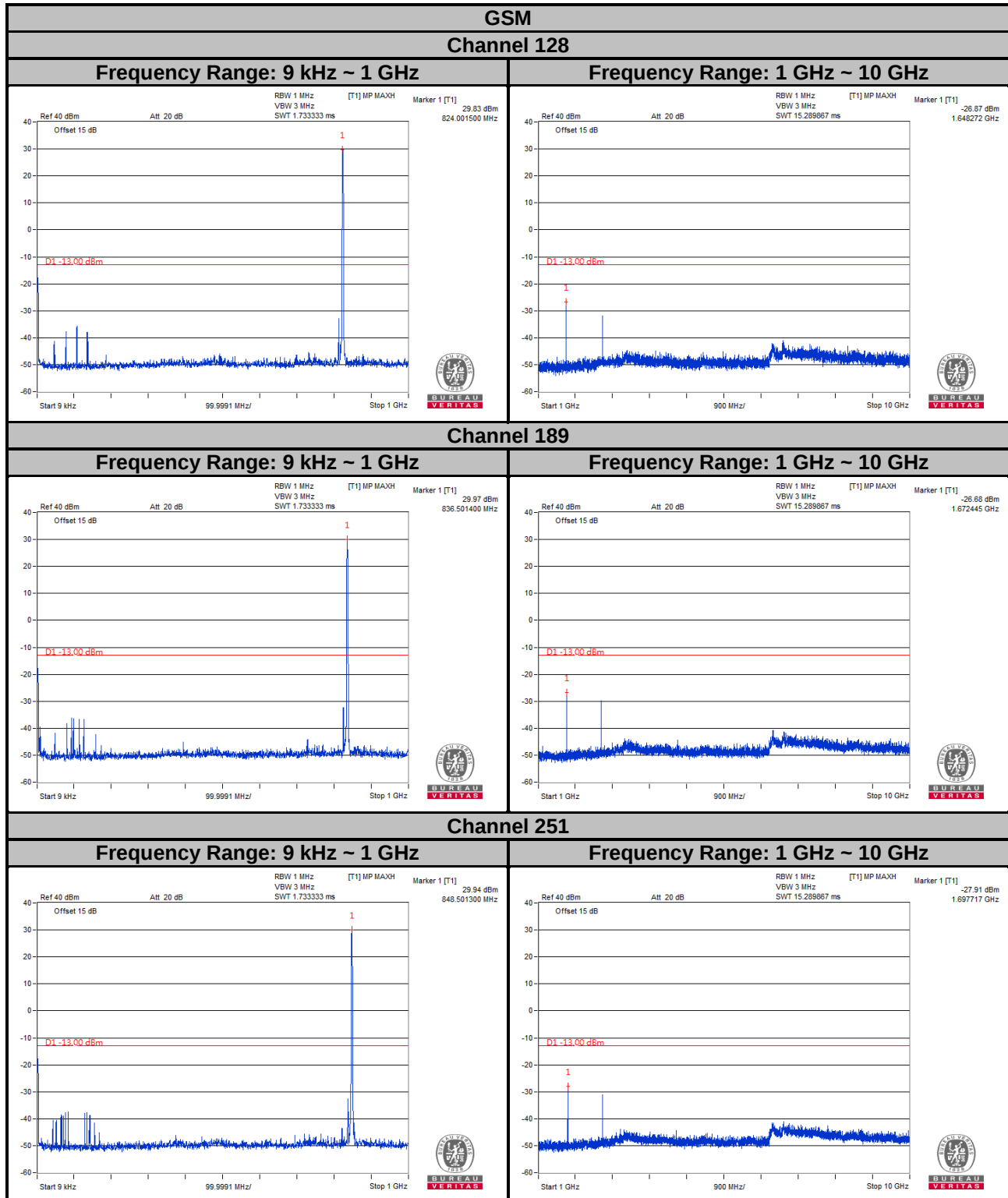
4.7.2 Test Setup



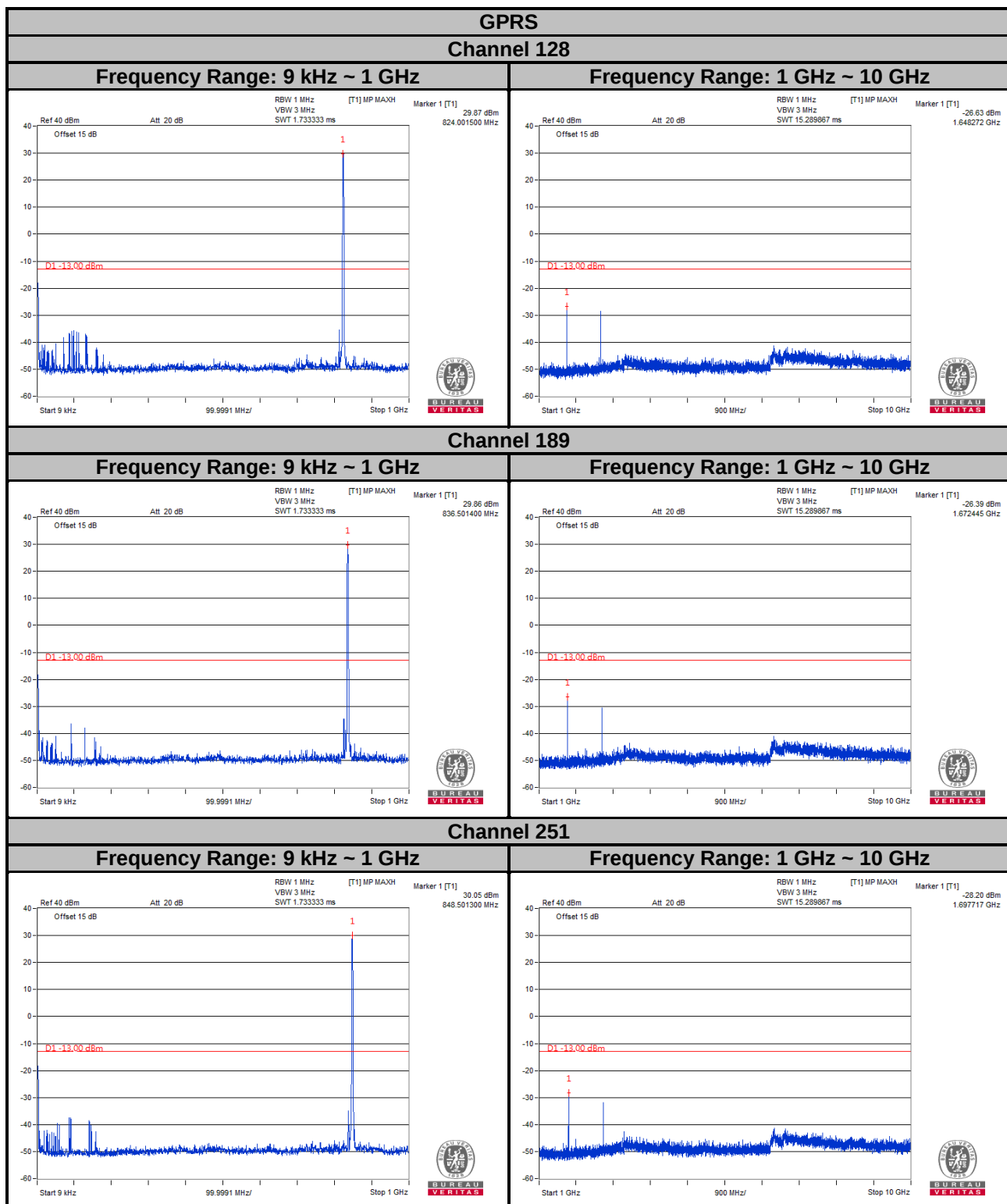
4.7.3 Test Procedure

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

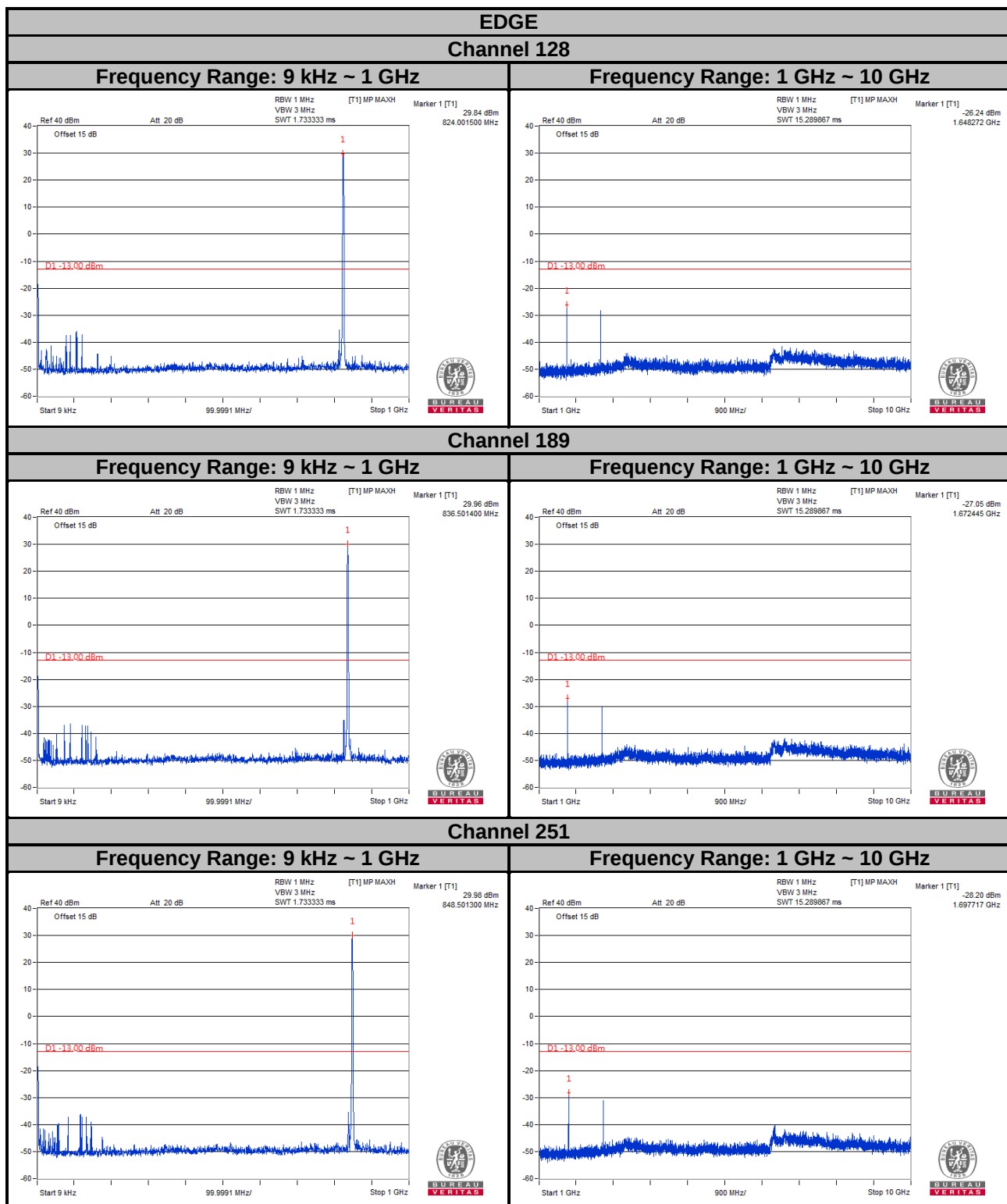
4.7.4 Test Results



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



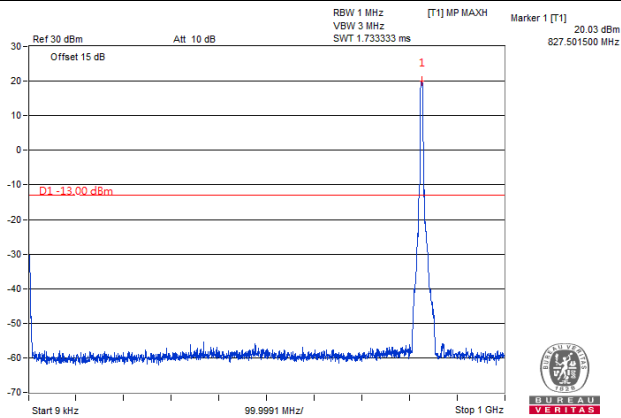
Note: The signal over the limit in 9 kHz is from spectrum analyzer.



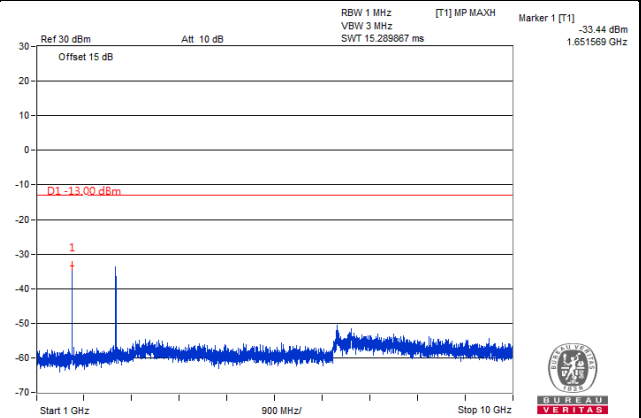
Note: The signal over the limit in 9 kHz is from spectrum analyzer.

WCDMA Channel 4132

Frequency Range: 9 kHz ~ 1 GHz

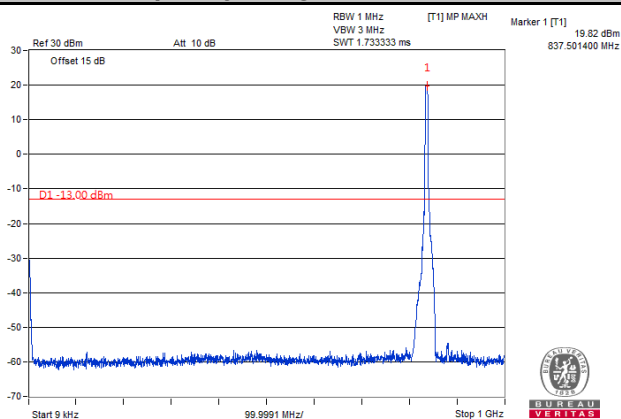


Frequency Range: 1 GHz ~ 10 GHz

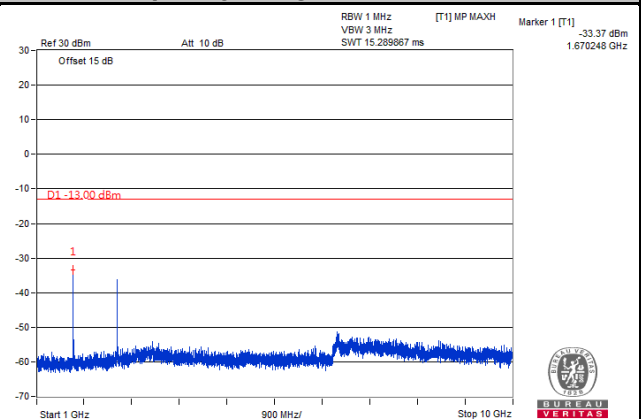


Channel 4182

Frequency Range: 9 kHz ~ 1 GHz

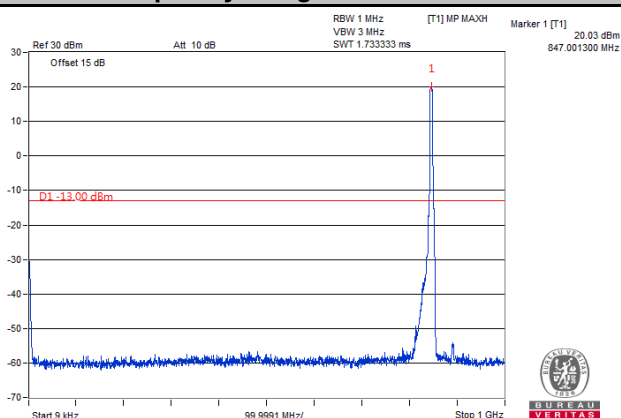


Frequency Range: 1 GHz ~ 10 GHz

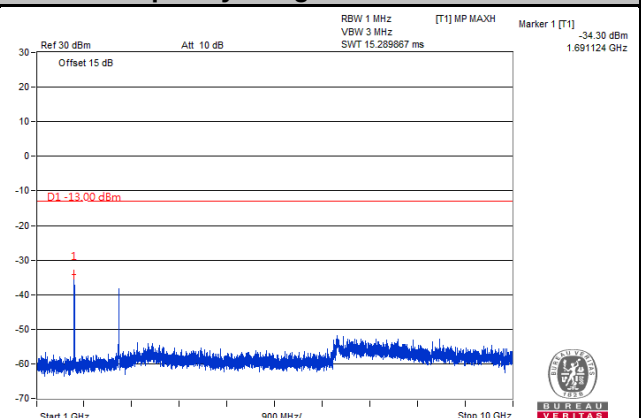


Channel 4233

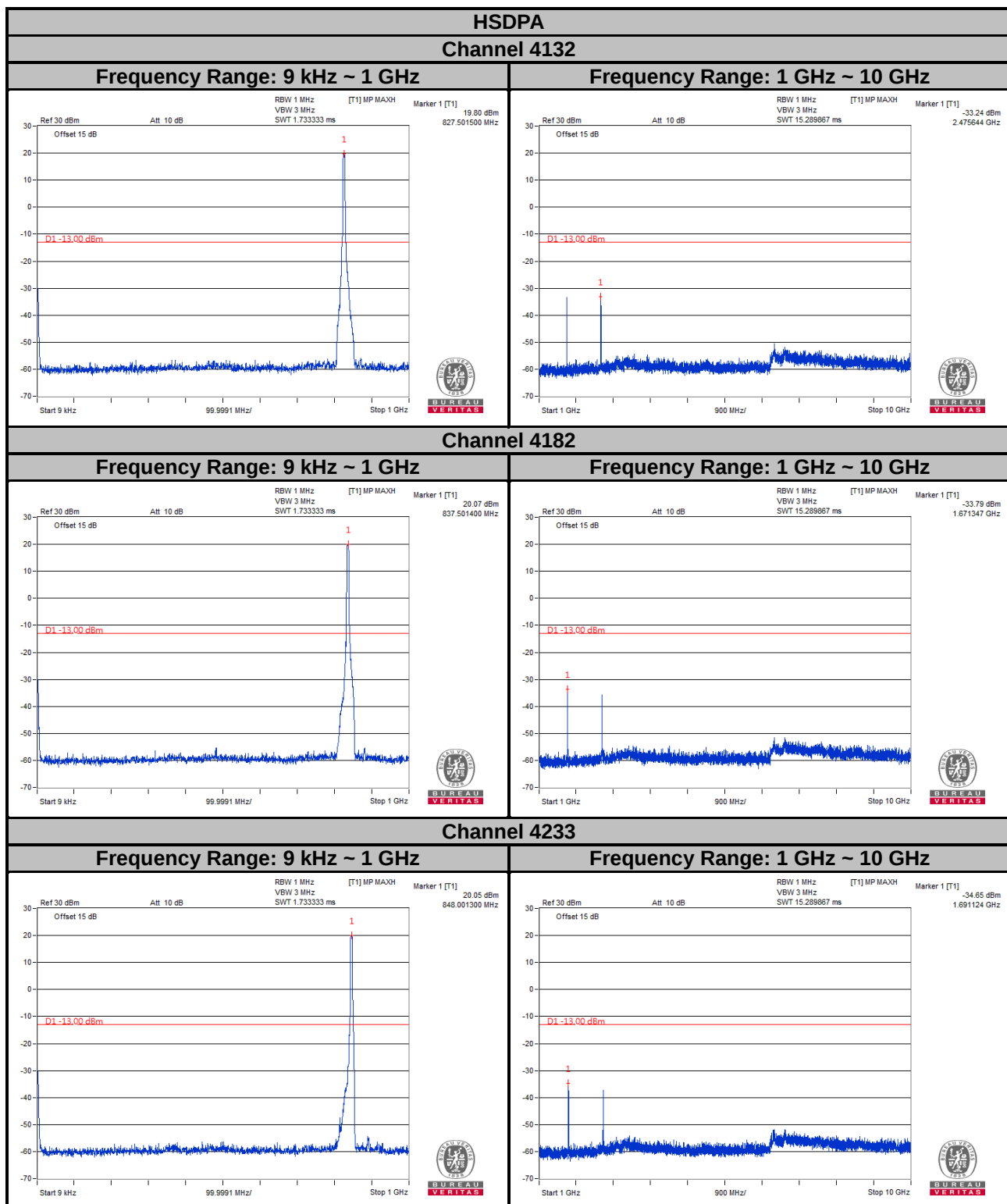
Frequency Range: 9 kHz ~ 1 GHz



Frequency Range: 1 GHz ~ 10 GHz



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

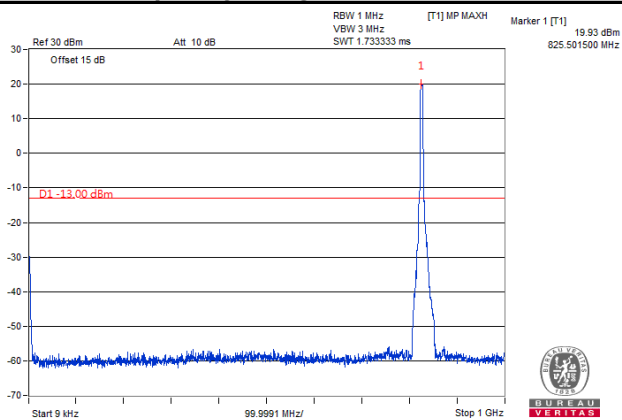


Note: The signal over the limit in 9 kHz is from spectrum analyzer.

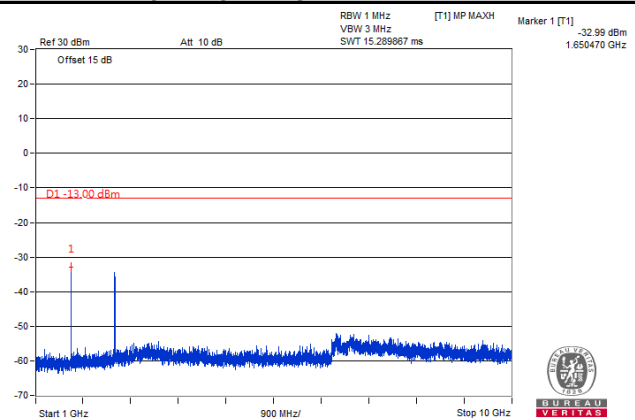
HSUPA

Channel 4132

Frequency Range: 9 kHz ~ 1 GHz

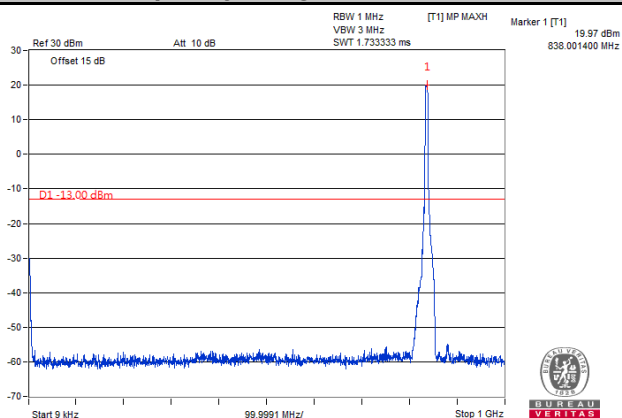


Frequency Range: 1 GHz ~ 10 GHz

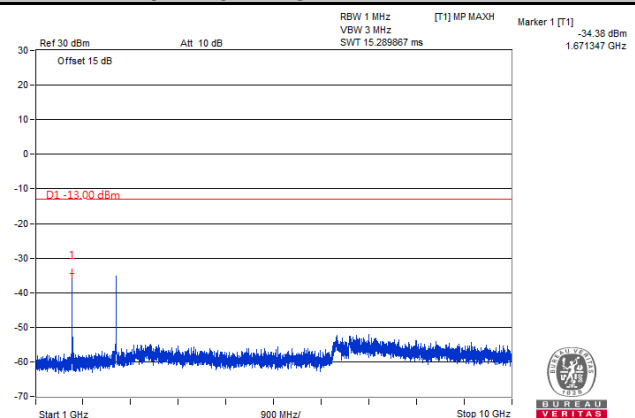


Channel 4182

Frequency Range: 9 kHz ~ 1 GHz

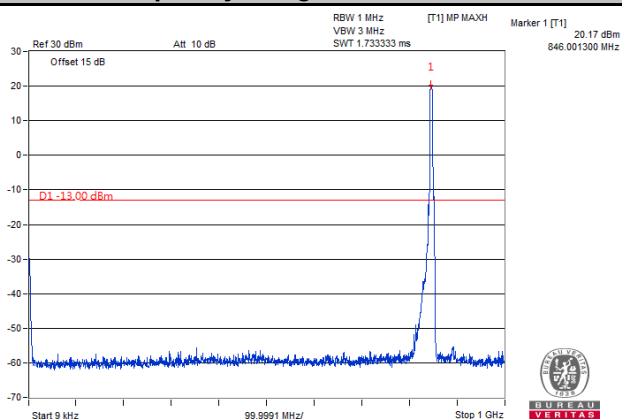


Frequency Range: 1 GHz ~ 10 GHz

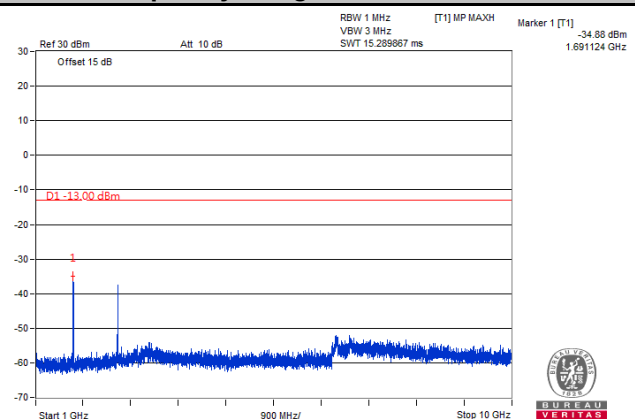


Channel 4233

Frequency Range: 9 kHz ~ 1 GHz



Frequency Range: 1 GHz ~ 10 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.

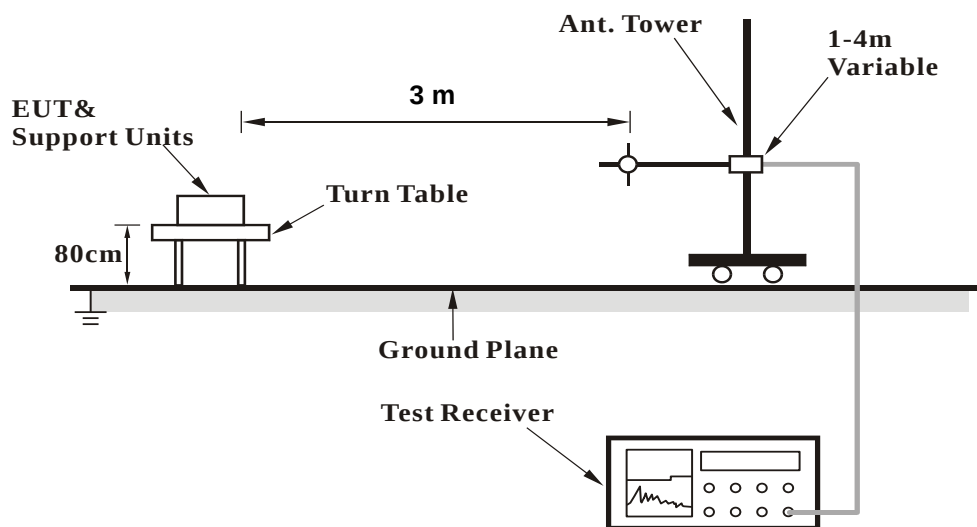
NOTE: The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 1 MHz/3 MHz.

4.8.3 Deviation from Test Standard

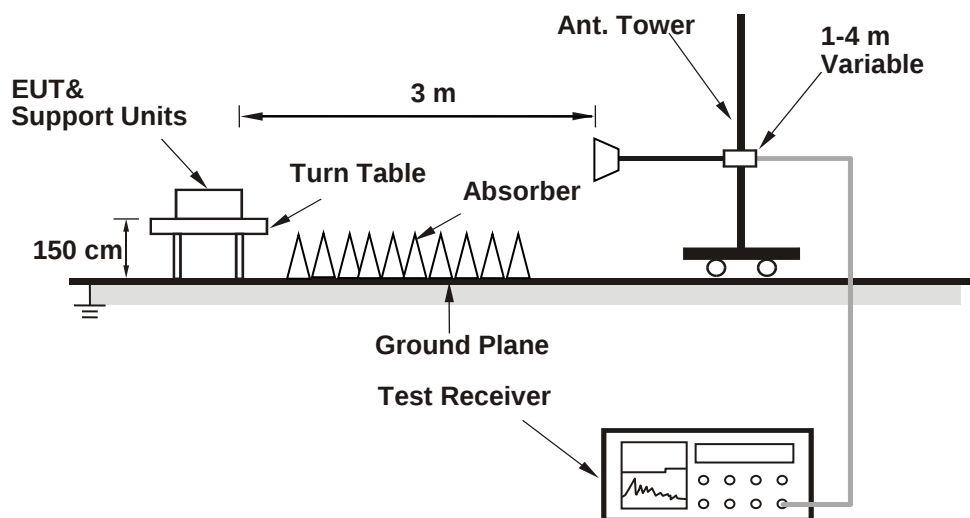
No deviation.

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>

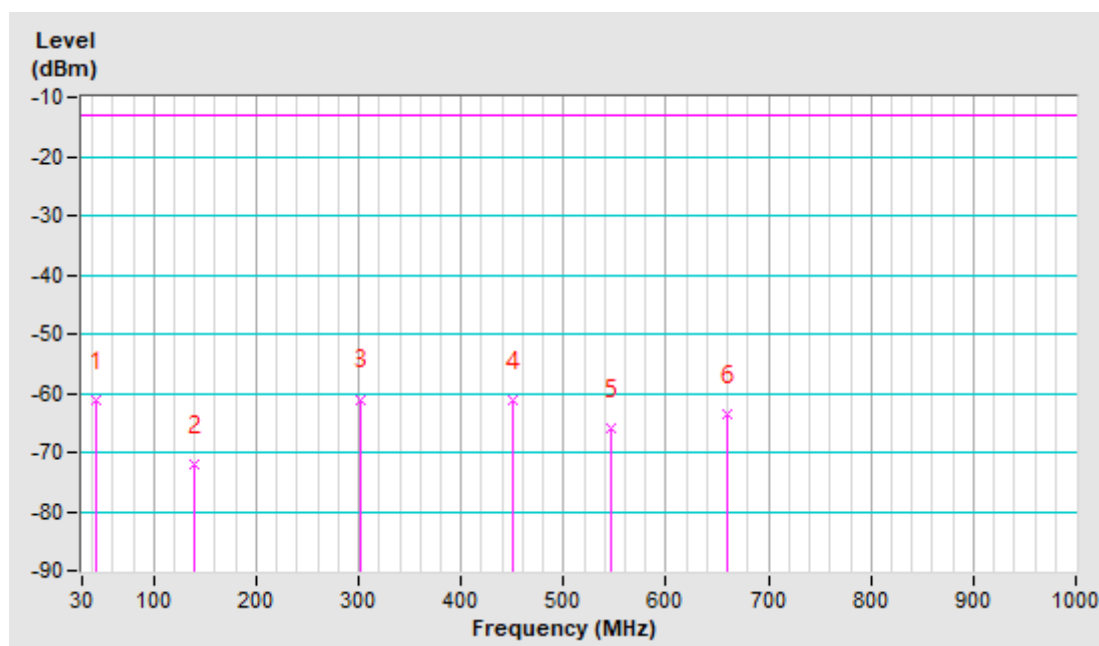
GSM:

Mode	TX channel 189	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)	ERP (dBm)	Limit (dBm)	Margin (dB)
1	43.58	-60.80	-50.00	-11.30	-61.30	-13.00	-48.30
2	138.64	-63.90	-68.80	-3.20	-72.00	-13.00	-59.00
3	301.60	-54.40	-64.70	3.70	-61.00	-13.00	-48.00
4	450.98	-59.00	-64.50	3.40	-61.10	-13.00	-48.10
5	546.04	-64.40	-70.00	3.90	-66.10	-13.00	-53.10
6	660.50	-64.00	-67.40	3.70	-63.70	-13.00	-50.70

Remarks:

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

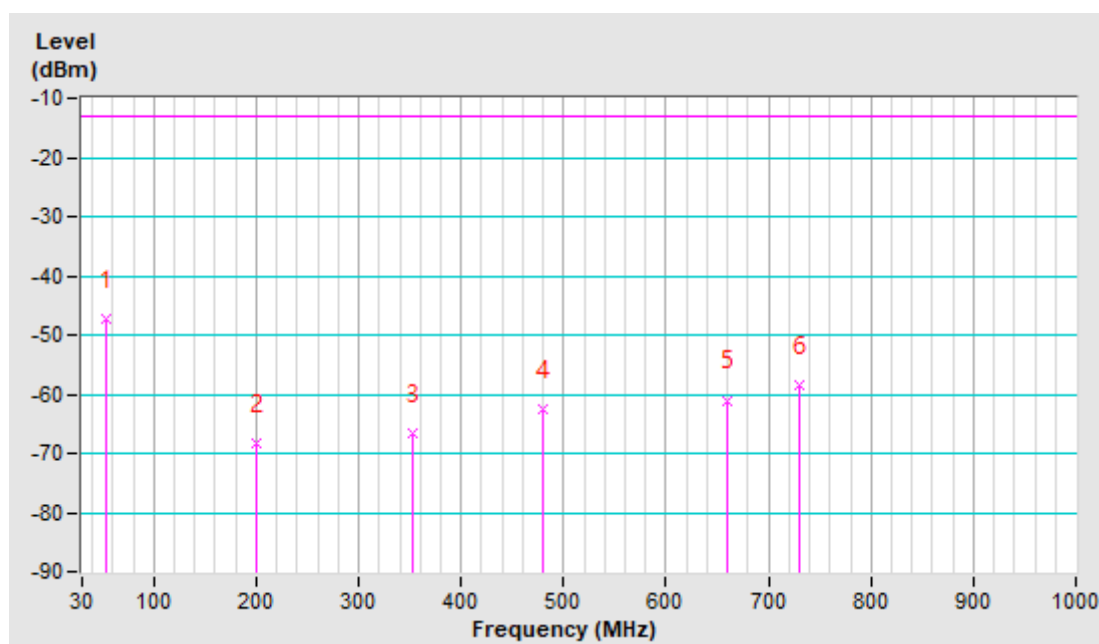


Mode	TX channel 189	Frequency Range	Below 1000 MHz
Environmental Conditions	22deg. C, 66%RH	Input Power	120Vac, 60Hz
Tested By	Han Wu		

Antenna Polarity & Test Distance: Vertical at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)
1	53.28	-38.20	-41.10	-6.20	-47.30	-13.00	-34.30
2	200.72	-65.10	-66.10	-2.30	-68.40	-13.00	-55.40
3	352.04	-64.20	-70.60	3.90	-66.70	-13.00	-53.70
4	480.08	-60.10	-66.10	3.60	-62.50	-13.00	-49.50
5	660.50	-64.50	-64.70	3.70	-61.00	-13.00	-48.00
6	730.34	-62.90	-62.10	3.60	-58.50	-13.00	-45.50

Remarks:

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



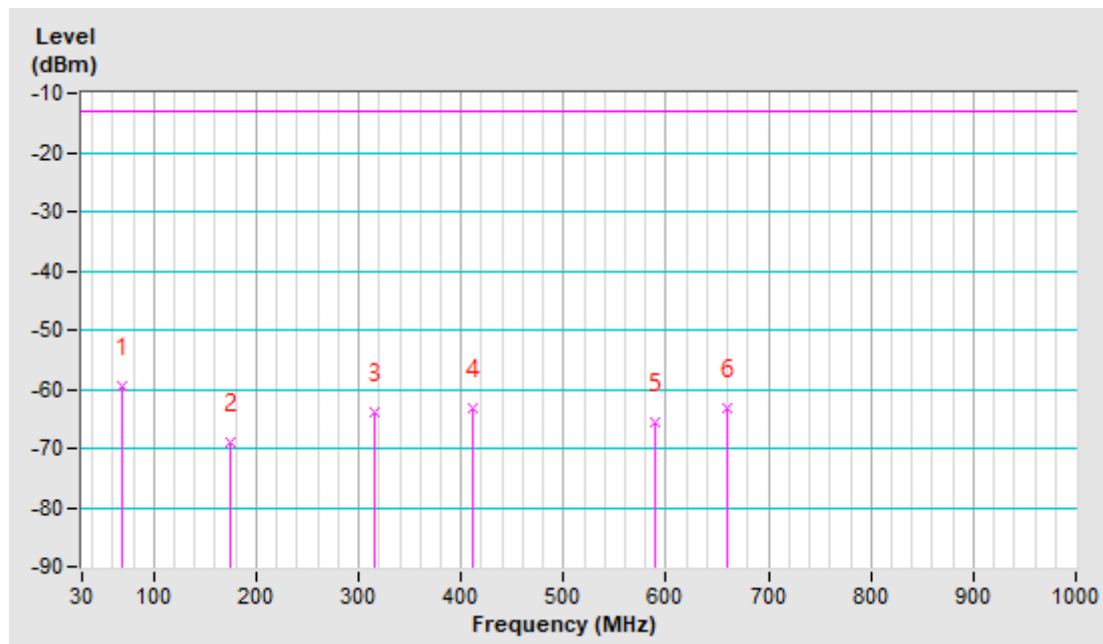
WCDMA Band 5:

Mode	TX channel 4182	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)	ERP (dBm)	Limit (dBm)	Margin (dB)
1	68.80	-50.60	-58.60	-0.80	-59.40	-13.00	-46.40
2	175.50	-59.20	-66.10	-2.80	-68.90	-13.00	-55.90
3	315.18	-57.90	-68.00	4.00	-64.00	-13.00	-51.00
4	412.18	-61.00	-66.60	3.30	-63.30	-13.00	-50.30
5	588.72	-64.60	-69.40	3.80	-65.60	-13.00	-52.60
6	660.50	-63.40	-66.80	3.70	-63.10	-13.00	-50.10

Remarks:

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

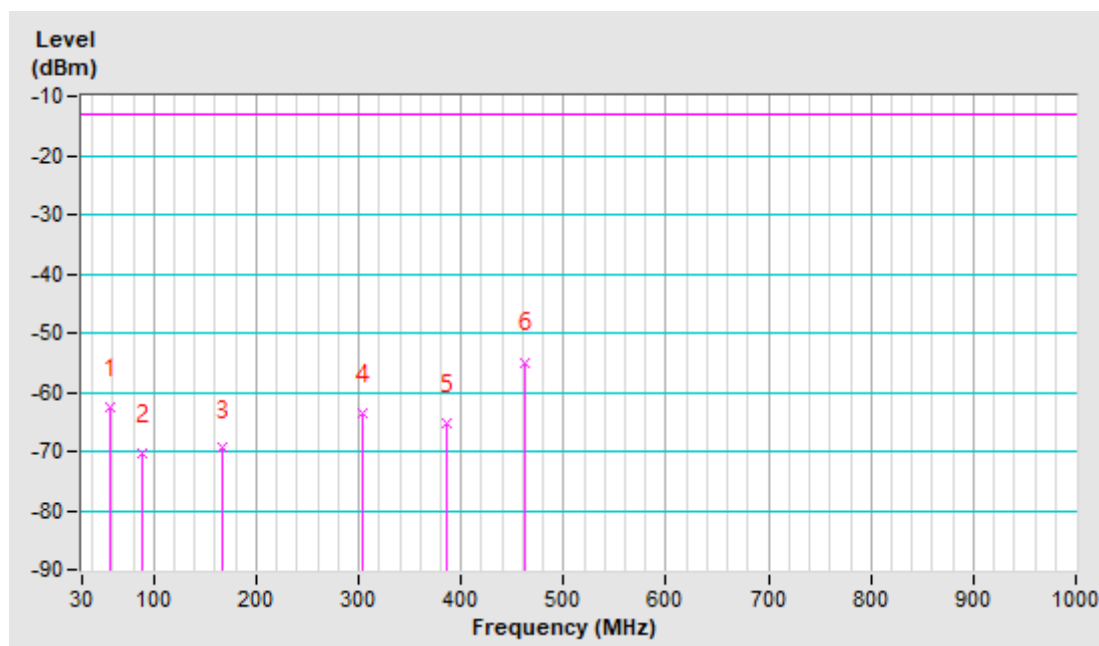


Mode	TX channel 4182	Frequency Range	Below 1000 MHz
Environmental Conditions	22deg. C, 66%RH	Input Power	120Vac, 60Hz
Tested By	Han Wu		

Antenna Polarity & Test Distance: Vertical at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)
1	57.16	-53.30	-57.70	-4.70	-62.40	-13.00	-49.40
2	88.20	-62.00	-70.30	-0.20	-70.50	-13.00	-57.50
3	167.74	-64.20	-66.60	-2.90	-69.50	-13.00	-56.50
4	303.54	-61.50	-67.20	3.70	-63.50	-13.00	-50.50
5	385.02	-62.80	-68.80	3.50	-65.30	-13.00	-52.30
6	462.62	-52.60	-58.30	3.40	-54.90	-13.00	-41.90

Remarks:

1. ERP (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 128	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)	ERP (dBm)	Limit (dBm)	Margin (dB)
1	1648.40 (PK)	-62.90	-55.10	0.90	-54.20	-13.00	-41.20
Antenna Polarity & Test Distance: Vertical at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)
1	1648.40 (PK)	-60.20	-52.90	0.90	-52.00	-13.00	-39.00

Remarks:

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

Mode	TX channel 189	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)	ERP (dBm)	Limit (dBm)	Margin (dB)
1	1672.80 (PK)	-62.80	-55.10	0.80	-54.30	-13.00	-41.30
Antenna Polarity & Test Distance: Vertical at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)
1	1672.80 (PK)	-60.00	-52.70	0.80	-51.90	-13.00	-38.90

Remarks:

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

Mode	TX channel 251	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)	ERP (dBm)	Limit (dBm)	Margin (dB)
1	1697.60 (PK)	-63.40	-55.80	0.70	-55.10	-13.00	-42.10
Antenna Polarity & Test Distance: Vertical at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)
1	1697.60 (PK)	-60.80	-53.50	0.70	-52.80	-13.00	-39.80

Remarks:

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

WCDMA Band 5:

Mode	TX channel 4132	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)	ERP (dBm)	Limit (dBm)	Margin (dB)
1	1652.80 (PK)	-45.00	-37.30	0.90	-36.40	-13.00	-23.40
Antenna Polarity & Test Distance: Vertical at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)
1	1652.80 (PK)	-40.20	-33.00	0.90	-32.10	-13.00	-19.10

Remarks:

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

Mode	TX channel 4182	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)	ERP (dBm)	Limit (dBm)	Margin (dB)
1	1672.80 (PK)	-45.80	-38.10	0.80	-37.30	-13.00	-24.30
Antenna Polarity & Test Distance: Vertical at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)
1	1673.20 (PK)	-40.00	-32.70	0.80	-31.90	-13.00	-18.90

Remarks:

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

Mode	TX channel 4233	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)	ERP (dBm)	Limit (dBm)	Margin (dB)
1	1693.20 (PK)	-46.10	-38.60	0.70	-37.90	-13.00	-24.90
Antenna Polarity & Test Distance: Vertical at 3 M							
No.	Freq. (MHz)	Reading (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)
1	1693.20 (PK)	-41.20	-33.90	0.70	-33.20	-13.00	-20.20

Remarks:

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

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.

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

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

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