

## FCC Test Report

### (PART 24)

**Report No.:** RF190212C40A-7

**FCC ID:** B32CM5P

**Test Model:** CM5P

**Received Date:** Feb. 13, 2019

**Test Date:** Feb. 27, 2019 ~ Mar. 07, 2019

**Issued Date:** Mar. 29, 2019

**Applicant:** Verifone, Inc.

**Address:** 1400 West Stanford Ranch Road Suite 200 Rocklin CA 95765 USA

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

**Lab Address:** No. 47-2, 14th Ling, Chia Pau Vil., Lin Kou Dist., New Taipei City, Taiwan ( R.O.C )

**Test Location (1):** No. 19, Hwa Ya 2nd Rd, Wen Hwa Vil, Kwei Shan Dist., Taoyuan City 33383, Taiwan (R.O.C)

**Test Location (2):** B2F., No.215, Sec. 3, Beixin Rd., Xindian Dist., New Taipei City 231, Taiwan, R.O.C

**FCC Registration /  
Designation Number:** 427177 / TW0011



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### Release Control Record

Issue No.	Description	Date Issued
RF190212C40A-7	Original Release	Mar. 29, 2019

## 1 Certificate of Conformity

**Product:** Point of Sale Terminal

**Brand:** Verifone

**Test Model:** CM5P

**Sample Status:** Identical Prototype

**Applicant:** Verifone, Inc.

**Test Date:** Feb. 27, 2019 ~ Mar. 07, 2019

**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:** \_\_\_\_\_

Mar. 29, 2019

Ivonne Wu / Supervisor

**Approved by :** \_\_\_\_\_



**Date:** \_\_\_\_\_

Mar. 29, 2019

Dylan Chiou / 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.
2.1046 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 -32.70 dB at 5729.40 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	3.0400 dB
	30 MHz ~ 200 MHz	2.0153 dB
	200 MHz ~ 1000 MHz	2.0224 dB
Radiated Emissions above 1 GHz	1 GHz ~ 18 GHz	1.0121 dB
	18 GHz ~ 40 GHz	1.1508 dB

## 2.2 Test Site and Instruments

Description & Manufacturer	Model No.	Serial No.	Date of Calibration	Due Date of Calibration
Test Receiver Agilent Technologies	N9038A	MY52260177	Aug. 20, 2018	Aug. 19, 2019
Spectrum Analyzer ROHDE & SCHWARZ	FSV40	100980	Apr. 17, 2018	Apr. 16, 2019
Spectrum Analyzer ROHDE & SCHWARZ	FSW26	102023	Oct. 11, 2018	Oct. 10, 2019
BILOG Antenna SCHWARZBECK	VULB9168	9168-616	Nov. 27, 2018	Nov. 26, 2019
HORN Antenna ETS-Lindgren	3117	00143293	Nov. 25, 2018	Nov. 24, 2019
HORN Antenna SCHWARZBECK	BBHA 9170	9170-480	Nov. 25, 2018	Nov. 24, 2019
HORN Antenna SCHWARZBECK	BBHA 9120D	9120D-969	Nov. 25, 2018	Nov. 24, 2019
Fixed Attenuator Mini-Circuits	MDCS18N-10	MDCS18N-10-01	Apr. 16, 2018	Apr. 15, 2019
MXG Vector signal generator Agilent	N5182B	MY53050430	Nov. 19, 2018	Nov. 18, 2019
Preamplifier Agilent	310N	187226	Jun. 19, 2018	Jun. 18, 2019
Preamplifier Agilent	83017A	MY39501357	Jun. 19, 2018	Jun. 18, 2019
RF signal cable ETS-LINDGREN	5D-FB	Cable-CH1-01(RF C-SMS-100-SMS- 120+RFC-SMS-1 00-SMS-400)	Jun. 19, 2018	Jun. 18, 2019
RF signal cable ETS-LINDGREN	8D-FB	Cable-CH1-02(RF C-SMS-100-SMS- 24)	Jun. 19, 2018	Jun. 18, 2019
Boresight Antenna Fixture	FBA-01	FBA-SIP01	NA	NA
Software BV ADT	E3 8.130425b	NA	NA	NA
Antenna Tower MF	NA	NA	NA	NA
Turn Table MF	NA	NA	NA	NA
Antenna Tower & Turn Table Controller MF	MF-7802	NA	NA	NA
Communications Tester-Wireless Agilent	8960 Series 10	MY53201073	Jun. 28, 2017	Jun. 27, 2019
Radio Communication Analyzer Anritsu	MT8820C	6201300640	Aug. 16, 2017	Aug. 15, 2019
Temperature & Humidity Chamber	GTH-120-40-CP-AR	MAA1306-019	Sep. 05, 2018	Sep. 04, 2019
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 HsinTien Chamber 1.
  3. The horn antenna and preamplifier (model: 83017A) are used only for the measurement of emission frequency above 1 GHz if tested.
  4. The IC Site Registration No. is 7450I-1.



### 3 General Information

#### 3.1 General Description of EUT

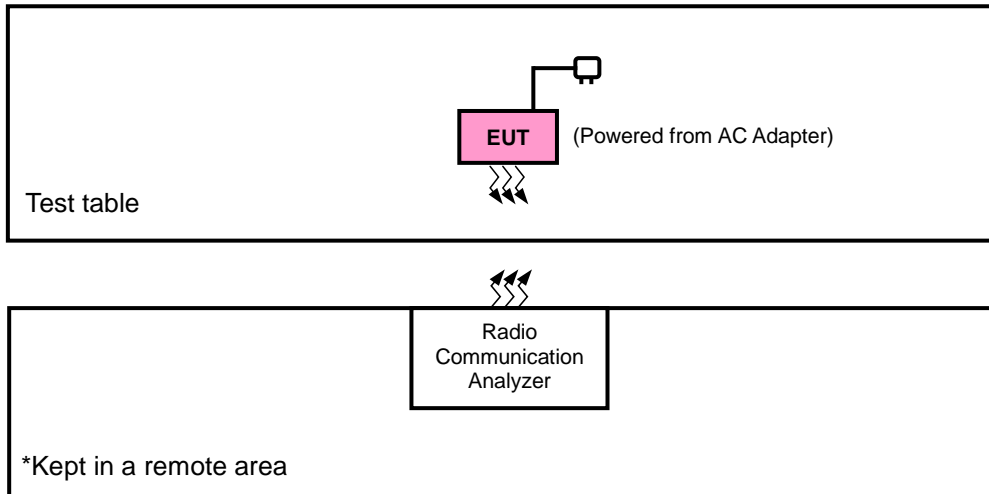
<b>Product</b>	Point of Sale Terminal	
<b>Brand</b>	Verifone	
<b>Test Model</b>	CM5P	
<b>Status of EUT</b>	Identical Prototype	
<b>Power Supply Rating</b>	5.0 Vdc (adapter or host equipment) 3.7 Vdc (Li-ion battery)	
<b>Modulation Type</b>	GPRS	GMSK
	EDGE	GMSK, 8PSK
	WCDMA	QPSK
<b>Frequency Range</b>	GPRS/EDGE	1850.2 ~ 1909.8 MHz
	WCDMA	1852.4 ~ 1907.6 MHz
<b>Max. EIRP Power</b>	GPRS	2317.39 mW
	EDGE	732.82 mW
	WCDMA	492.04 mW
<b>Emission Designator</b>	GPRS	247KGXW
	EDGE	245KG7W
	WCDMA	4M17F9W
<b>Antenna Type</b>	Fixed Internal Antenna with 3.2 dBi gain (Main) / 0 dBi gain (Aux.)	
<b>Accessory Device</b>	Refer to Note as below	
<b>Data Cable Supplied</b>	Refer to Note as below	

Note:

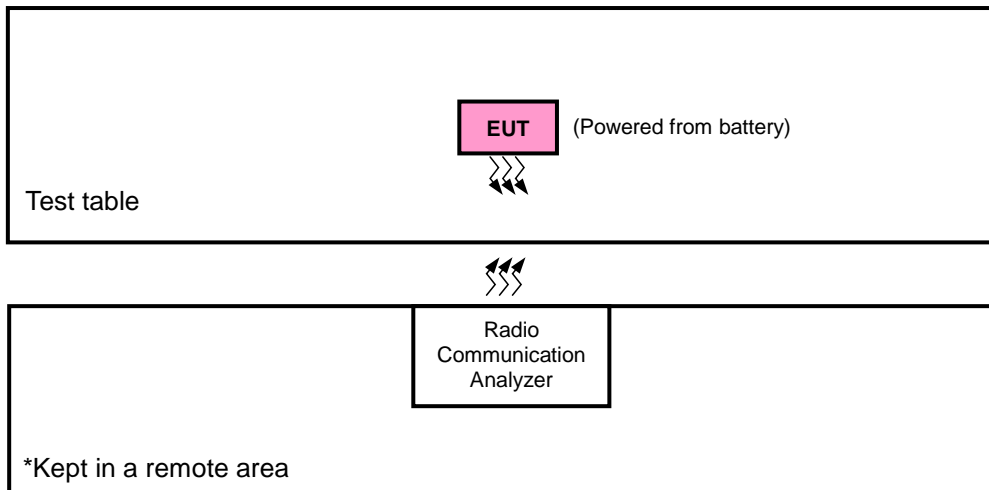
1. The EUT's accessories list refers to Ext. Pho.
2. The above EUT information is declared by manufacturer and for more detailed features description, please refers to the manufacturer's specifications or user's manual.

### 3.2 Configuration of System under Test

#### <Radiated Emission Test>



#### <E.I.R.P. 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.

### 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
GPRS	X-plane	X-axis
EDGE	X-plane	X-axis
WCDMA	X-plane	X-axis

#### GPRS

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

#### WCDMA

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

**Test Condition:**

Test Item	Environmental Conditions	Input Power	Tested By
EIRP	26 deg. C, 58 % RH	3.7 Vdc	Karl Lee
Modulation Characteristics	26 deg. C, 58 % RH	3.7 Vdc	Getaz Yang
Frequency Stability	26 deg. C, 58 % RH	3.7 Vdc	Getaz Yang
Occupied Bandwidth	26 deg. C, 58 % RH	3.7 Vdc	Getaz Yang
Band Edge	26 deg. C, 58 % RH	3.7 Vdc	Getaz Yang
Peak to Average Ratio	26 deg. C, 58 % RH	3.7 Vdc	Getaz Yang
Conducted Emission	26 deg. C, 58 % RH	3.7 Vdc	Getaz Yang
Radiated Emission	25 deg. C, 65 % RH	120 Vac, 60 Hz	Karl Lee

**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**

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

**FCC 47 CFR Part 2**

**FCC 47 CFR Part 24**

**KDB 971168 D01 Power Meas License Digital Systems v03r01**

**ANSI/TIA/EIA-603-E 2016**

**ANSI 63.26-2015**

**ANSI 63.2 -1996**

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

## 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

##### **EIRP / ERP Measurement:**

- a. All measurements were done at low, middle and high operational frequency range. RBW and VBW is 1 MHz for GPRS & EDGE, and 5 MHz for WCDMA mode.
- b. Substitution method is used for E.I.R.P measurement. In the semi-anechoic chamber, EUT placed on the 0.8 m (below or equal 1 GHz) and/or 1.5 m (above 1 GHz) height of Turn Table, rotated the table around 360 degrees to search the maximum radiation power and receiver antenna shall be rotated vertical and horizontal polarization and moved height from 1 m to 4 m to find the maximum polar radiated power. The "Read Value" is the spectrum reading the maximum power value.
- c. The substitution horn antenna is substituted for EUT at the same position and signals generator export the CW signal to the substitution antenna via a tx cable. Rotated the Turn Table and moved receiving antenna to find the maximum radiation power. Adjust output power level of S.G to get a Value of spectrum reading equal to "Read Value" of step b. Record the power level of S.G.
- d.  $EIRP = \text{Output power level of S.G} - \text{TX cable loss} + \text{Antenna gain of substitution horn}$ . E.R.P power can be calculated form E.I.R.P power by subtracting the gain of dipole,  $E.R.P \text{ power} = E.I.R.P \text{ power} - 2.15 \text{ dB}$ .

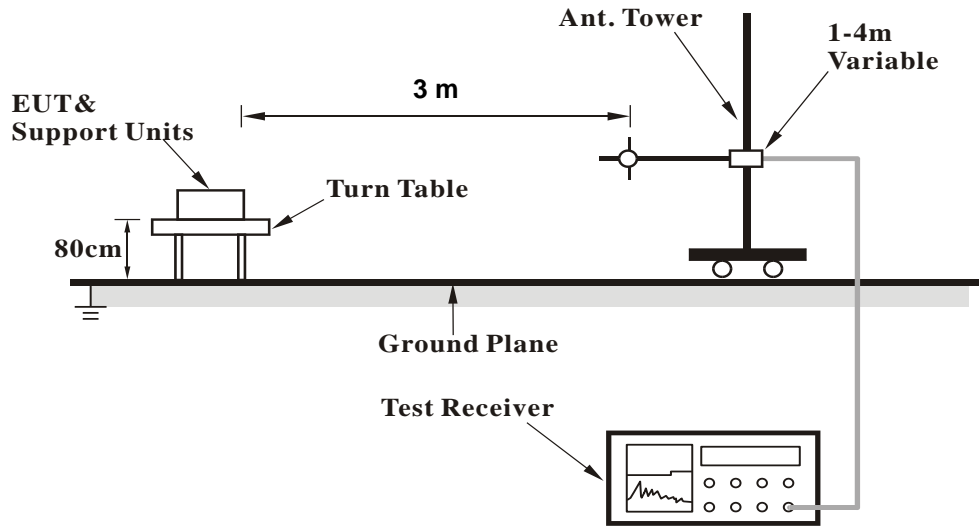
##### **Conducted Power Measurement:**

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

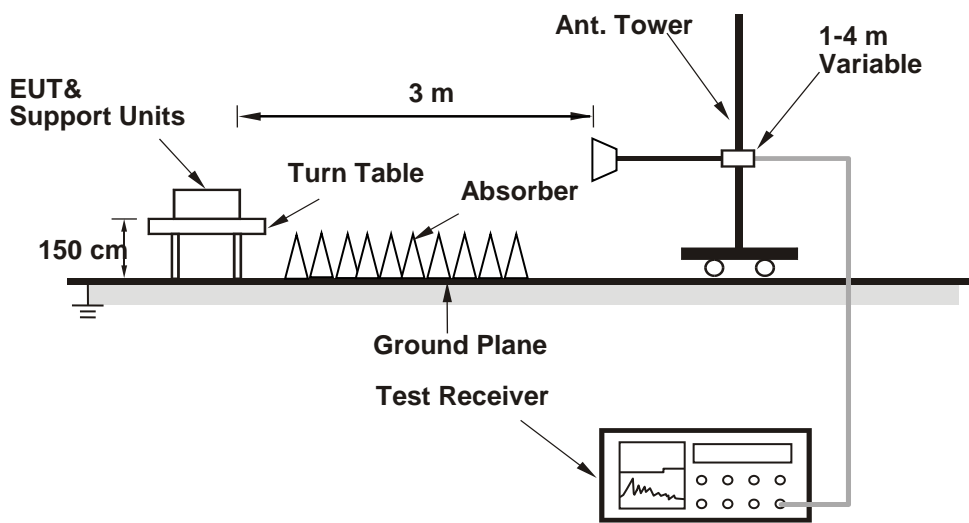
4.1.3 Test Setup

**EIRP / ERP Measurement:**

**<Radiated Emission below or equal 1 GHz>**

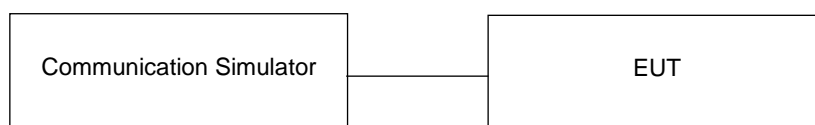


**<Radiated Emission above 1 GHz>**



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

**Conducted Power Measurement:**



#### 4.1.4 Test Results

##### Conducted Output Power (dBm)

Band	GPRS1900		
	512	661	810
Channel			
Frequency (MHz)	<b>1850.2</b>	<b>1880.0</b>	<b>1909.8</b>
GPRS (GMSK, 1Tx-slot)	30.38	30.33	30.41
GPRS (GMSK, 2Tx-slot)	29.05	29.18	29.11
GPRS (GMSK, 3Tx-slot)	26.67	27.00	27.22
GPRS (GMSK, 4Tx-slot)	25.31	25.65	25.86
EDGE (8PSK, 1Tx-slot)	25.32	25.45	25.28
EDGE (8PSK, 2Tx-slot)	25.10	25.20	25.10
EDGE (8PSK, 3Tx-slot)	25.09	24.95	24.94
EDGE (8PSK, 4Tx-slot)	24.94	24.86	24.80

Band	WCDMA II		
	9262	9400	9538
Channel			
Frequency (MHz)	<b>1852.4</b>	<b>1880.0</b>	<b>1907.6</b>
RMC 12.2K	23.63	23.46	23.57
HSDPA Subtest-1	22.72	22.55	22.66
HSDPA Subtest-2	22.70	22.53	22.64
HSDPA Subtest-3	22.23	22.06	22.17
HSDPA Subtest-4	22.22	22.05	22.16
DC-HSDPA Subtest-1	22.63	22.46	22.57
DC-HSDPA Subtest-2	22.61	22.44	22.55
DC-HSDPA Subtest-3	22.14	21.97	22.08
DC-HSDPA Subtest-4	22.13	21.96	22.07
HSUPA Subtest-1	22.45	22.28	22.39
HSUPA Subtest-2	21.46	21.29	21.40
HSUPA Subtest-3	20.99	20.82	20.93
HSUPA Subtest-4	21.65	21.48	21.59
HSUPA Subtest-5	22.67	22.50	22.61

**EIRP Power (dBm)**

GPRS							
Plane	Channel	Frequency (MHz)	Reading (dBm)	Correction Factor (dB)	EIRP (dBm)	EIRP (mW)	Polarization (H/V)
X	512	1850.2	-4.60	38.19	33.59	2285.60	H
	661	1880.0	-5.16	38.70	33.54	2259.44	
	810	1909.8	-5.70	39.35	33.65	2317.39	
	512	1850.2	-8.88	38.48	29.60	912.01	V
	661	1880.0	-9.08	38.59	29.51	893.31	
	810	1909.8	-9.24	38.87	29.63	918.33	

Note: EIRP (dBm) = Reading (dBm) + Correction Factor (dB)

EDGE							
Plane	Channel	Frequency (MHz)	Reading (dBm)	Correction Factor (dB)	EIRP (dBm)	EIRP (mW)	Polarization (H/V)
X	512	1850.2	-9.60	38.19	28.59	722.77	H
	661	1880.0	-10.16	38.70	28.54	714.50	
	810	1909.8	-10.70	39.35	28.65	732.82	
	512	1850.2	-13.90	38.48	24.58	287.08	V
	661	1880.0	-14.06	38.59	24.53	283.79	
	810	1909.8	-14.25	38.87	24.62	289.73	

Note: EIRP (dBm) = Reading (dBm) + Correction Factor (dB)

WCDMA							
Plane	Channel	Frequency (MHz)	Reading (dBm)	Correction Factor (dB)	EIRP (dBm)	EIRP (mW)	Polarization (H/V)
X	9262	1852.4	-11.34	38.19	26.85	484.17	H
	9400	1880.0	-11.90	38.70	26.80	478.63	
	9538	1907.6	-12.43	39.35	26.92	492.04	
	9262	1852.4	-15.60	38.48	22.88	194.09	V
	9400	1880.0	-15.80	38.59	22.79	190.11	
	9538	1907.6	-15.96	38.87	22.91	195.43	

Note: EIRP (dBm) = Reading (dBm) + Correction Factor (dB)



## 4.2 Modulation Characteristics Measurement

### 4.2.1 Limits of Modulation Characteristics

N/A

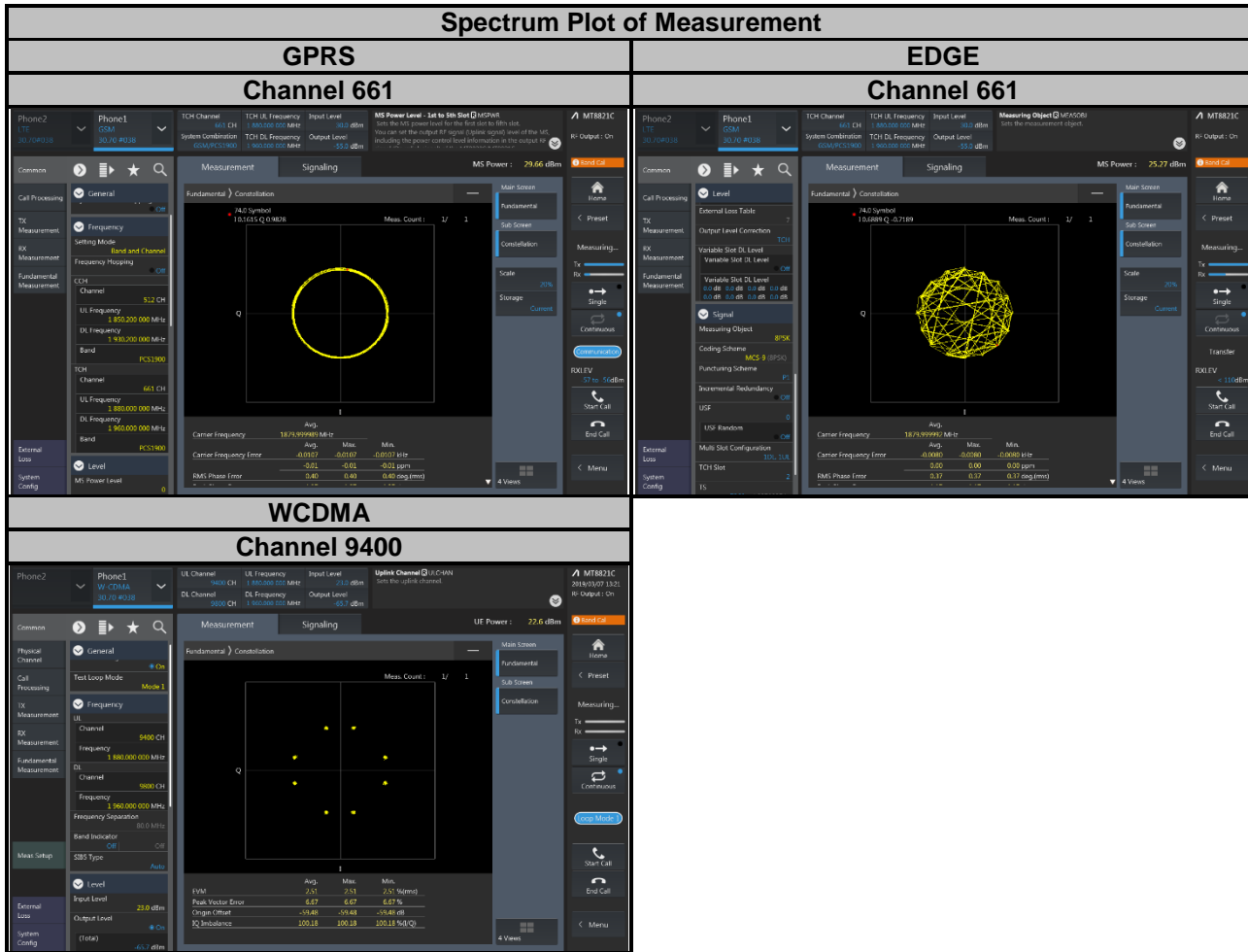
### 4.2.2 Test Setup



### 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

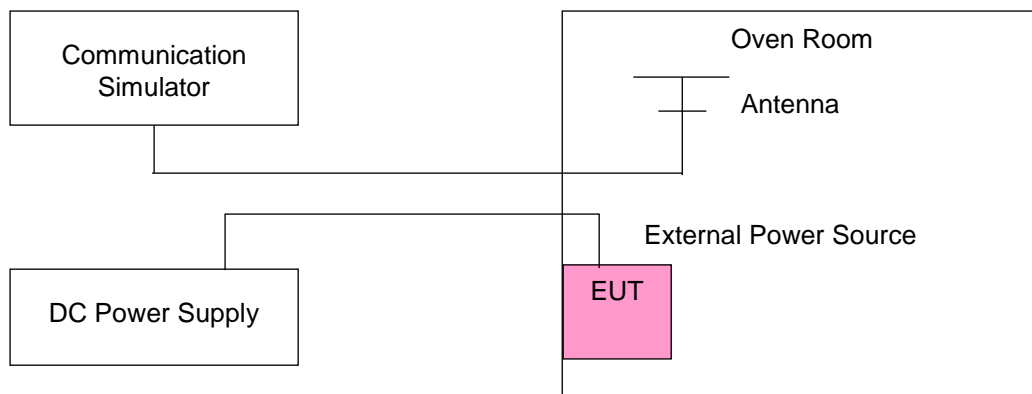
The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.

#### 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  $\pm 0.5$  °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)	GPRS			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
3.7	1850.200002	0.001	1909.800003	0.001
3.145	1850.200003	0.001	1909.800003	0.001
4.255	1850.200001	0.001	1909.800002	0.001

**Note:** The applicant defined the normal working voltage of the battery is from 3.145 Vdc to 4.255 Vdc.

##### Frequency Error vs. Temperature

Temp. (°C)	GPRS			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
-30	1850.200002	0.001	1909.800003	0.001
-20	1850.200001	0.001	1909.800004	0.002
-10	1850.200003	0.002	1909.800003	0.002
0	1850.200002	0.001	1909.800004	0.002
10	1850.200002	0.001	1909.800003	0.002
20	1850.199997	-0.001	1909.799998	-0.001
30	1850.199996	-0.002	1909.799999	-0.001
40	1850.199998	-0.001	1909.799997	-0.002
50	1850.199998	-0.001	1909.799999	-0.001

Frequency Error vs. Voltage

Voltage (Volts)	EDGE			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
3.7	1850.200004	0.002	1909.800004	0.002
3.145	1850.200002	0.001	1909.800003	0.002
4.255	1850.200002	0.001	1909.800003	0.002

**Note:** The applicant defined the normal working voltage of the battery is from 3.145 Vdc to 4.255 Vdc.

Frequency Error vs. Temperature

Temp. (°C)	EDGE			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
-30	1850.200003	0.002	1909.800001	0.001
-20	1850.200002	0.001	1909.800002	0.001
-10	1850.200004	0.002	1909.800004	0.002
0	1850.200002	0.001	1909.800002	0.001
10	1850.200002	0.001	1909.800004	0.002
20	1850.199999	-0.001	1909.799996	-0.002
30	1850.199997	-0.002	1909.799998	-0.001
40	1850.199998	-0.001	1909.799996	-0.002
50	1850.199997	-0.001	1909.799997	-0.002

## Frequency Error vs. Voltage

Voltage (Volts)	WCDMA			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
3.7	1852.400003	0.001	1907.600002	0.001
3.145	1852.400001	0.001	1907.600002	0.001
4.255	1852.400003	0.002	1907.600001	0.001

**Note:** The applicant defined the normal working voltage of the battery is from 3.145 Vdc to 4.255 Vdc.

## Frequency Error vs. Temperature

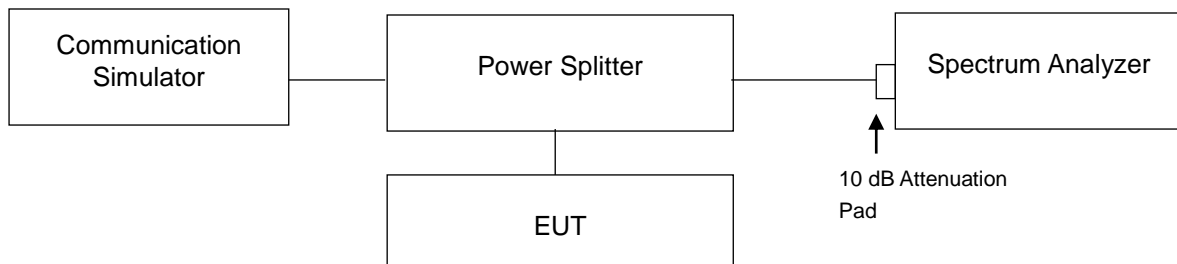
Temp. (°C)	WCDMA			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
-30	1852.400003	0.001	1907.600004	0.002
-20	1852.400002	0.001	1907.600003	0.001
-10	1852.400001	0.001	1907.600003	0.002
0	1852.400003	0.002	1907.600003	0.002
10	1852.400002	0.001	1907.600004	0.002
20	1852.399999	-0.001	1907.599999	-0.001
30	1852.399997	-0.001	1907.599996	-0.002
40	1852.399998	-0.001	1907.599997	-0.002
50	1852.399996	-0.002	1907.599999	-0.001

## 4.4 Occupied Bandwidth Measurement

### 4.4.1 Test Procedure

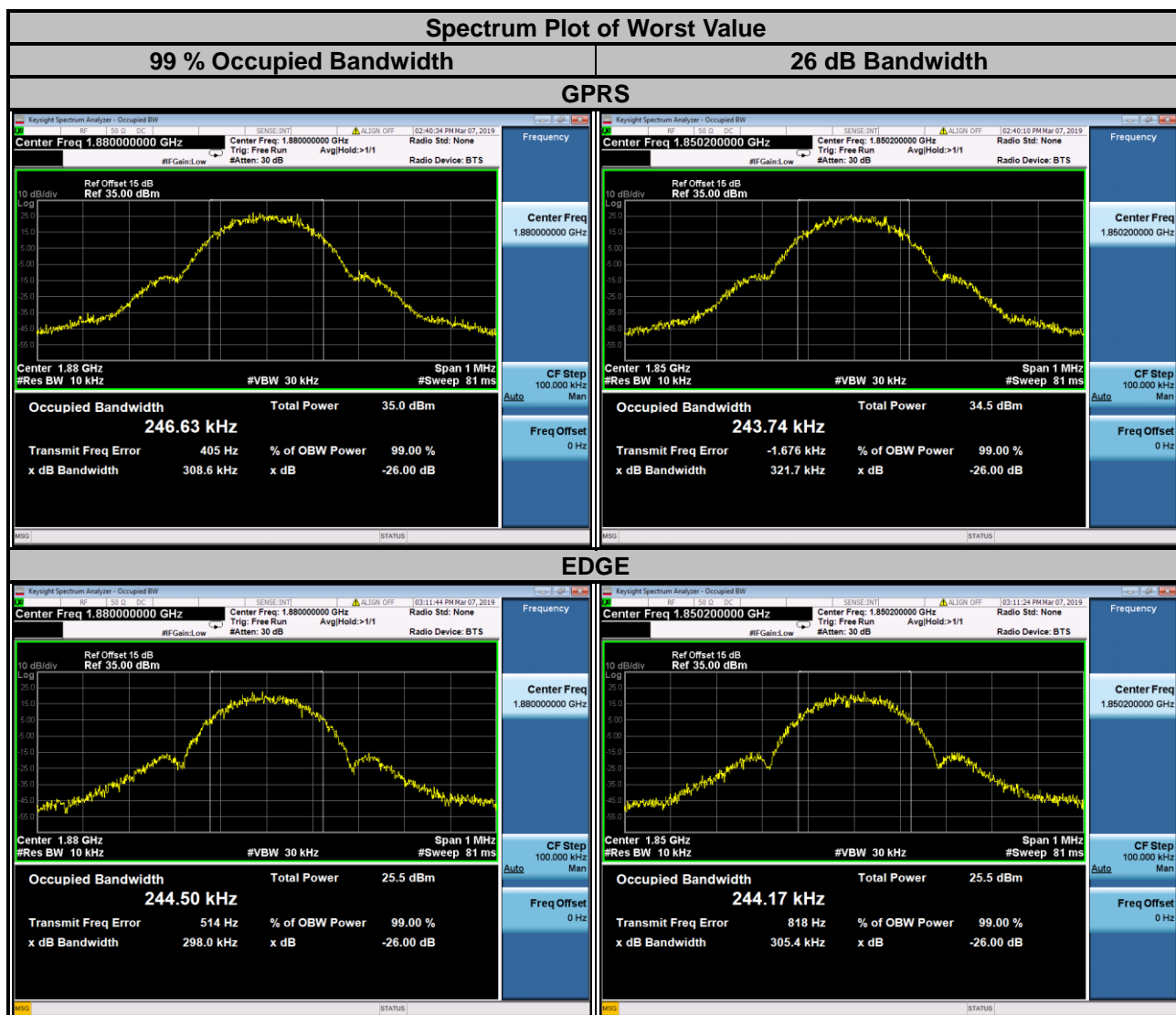
The EUT makes a call to the communication simulator. All measurements were done at low, middle and high operational frequency range. The communication simulator station system controlled a EUT to export maximum output power under transmission mode and specific channel frequency. Use OBW measurement function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

### 4.4.2 Test Setup



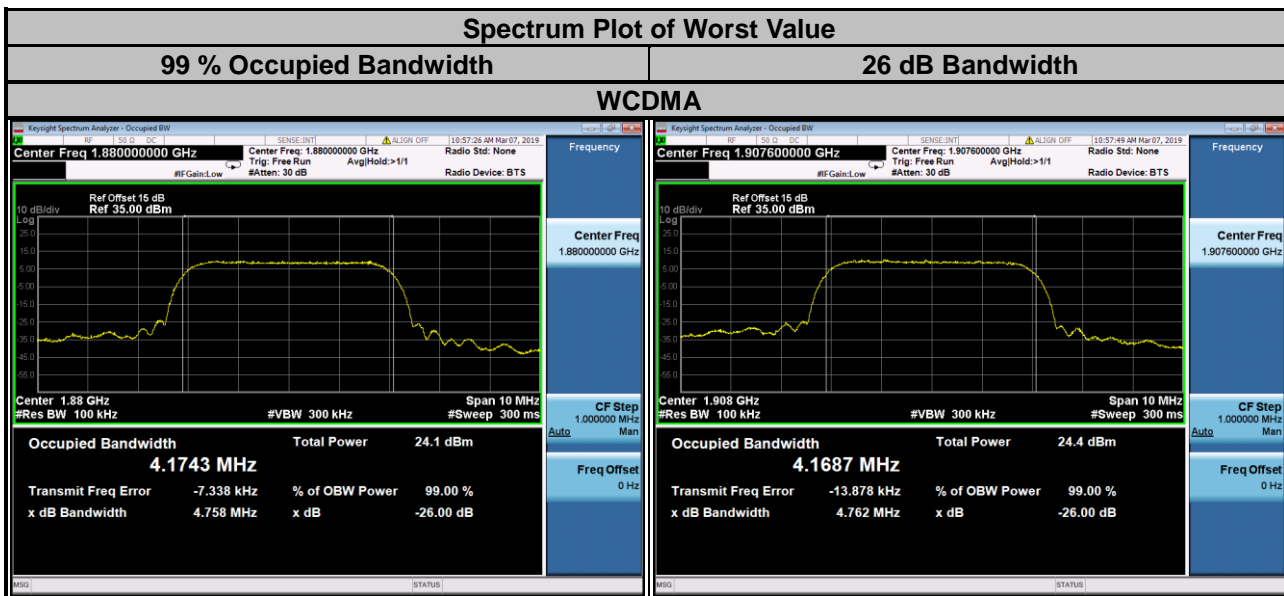
### 4.4.3 Test Result

GPRS				EDGE			
Channel	Frequency (MHz)	99 % Occupied Bandwidth (kHz)	26 dB Bandwidth (kHz)	Channel	Frequency (MHz)	99 % Occupied Bandwidth (kHz)	26 dB Bandwidth (kHz)
512	1850.2	243.74	321.70	512	1850.2	244.17	305.40
661	1880.0	246.63	308.60	661	1880.0	244.50	298.00
810	1909.8	246.10	312.00	810	1909.8	241.47	304.80





WCDMA			
Channel	Frequency (MHz)	99 % Occupied Bandwidth (MHz)	26 dB Bandwidth (MHz)
9262	1852.4	4.1702	4.751
9400	1880.0	4.1743	4.758
9538	1907.6	4.1687	4.762

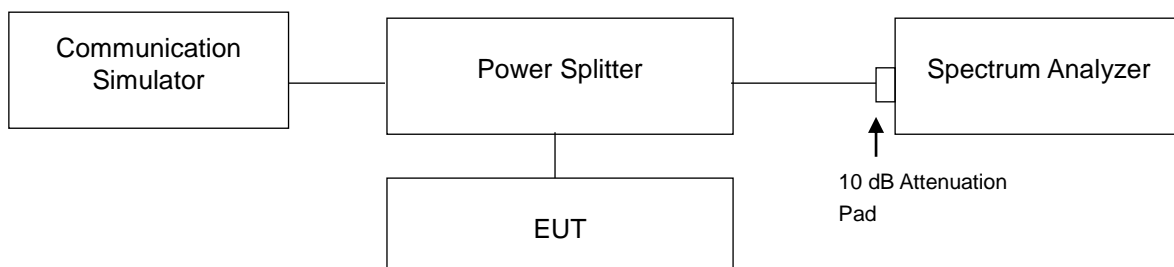


## 4.5 Band Edge Measurement

### 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.

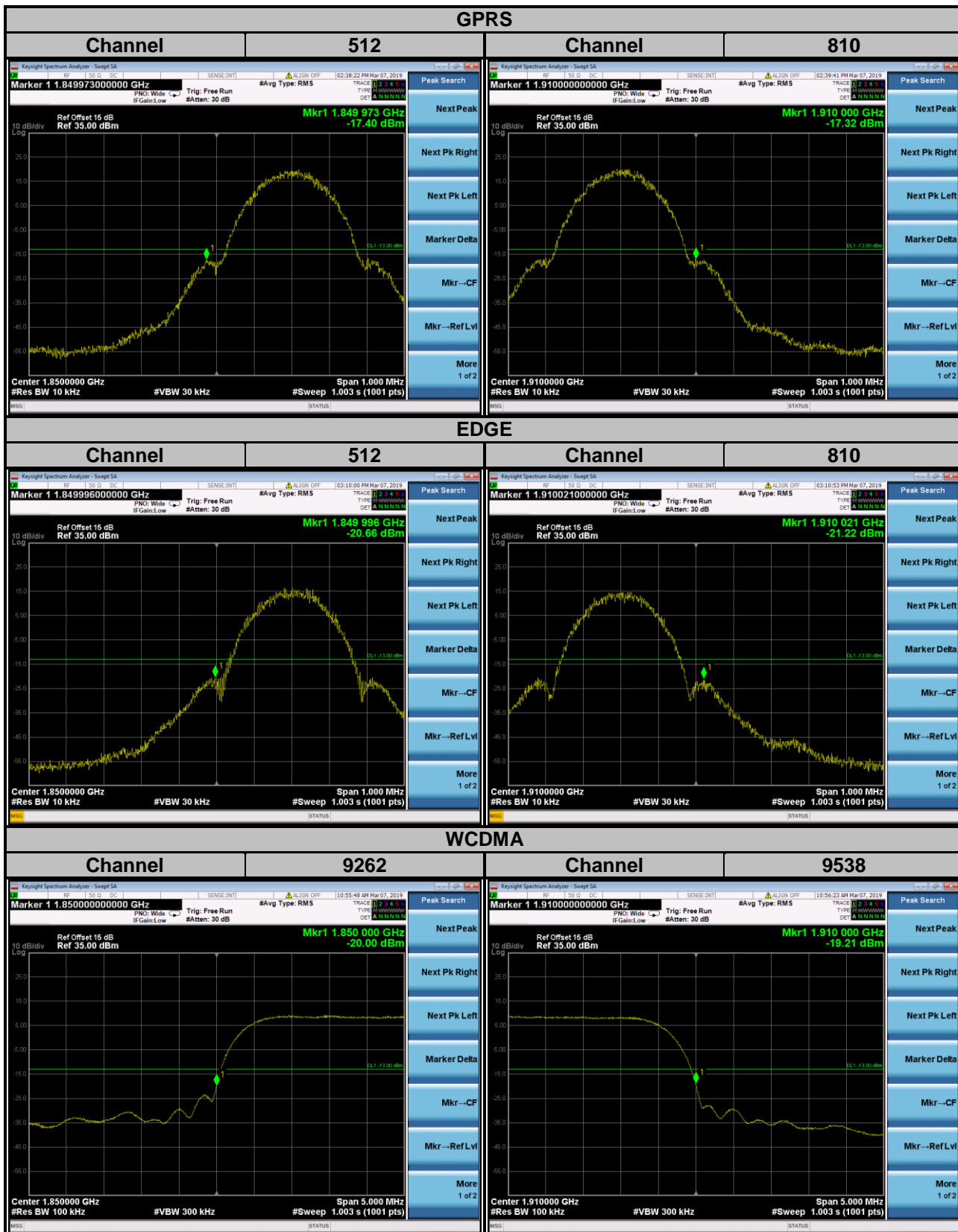
### 4.5.2 Test Setup



### 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 MHz. RB of the spectrum is 10 kHz and VB of the spectrum is 30 kHz (GPRS/EDGE).
- The center frequency of spectrum is the band edge frequency and span is 5 MHz. RB of the spectrum is 100 kHz and VB of the spectrum is 300 kHz (WCDMA).
- Record the max trace plot into the test report.

### 4.5.4 Test Results

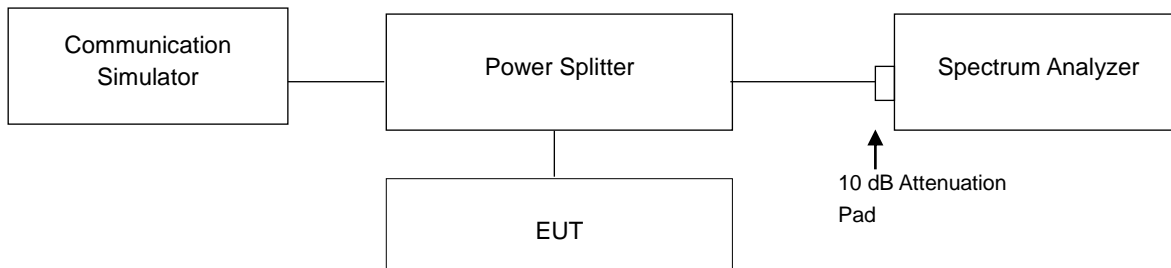


## 4.6 Peak to Average Ratio

### 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)		Channel	Frequency (MHz)	Peak to Average Ratio (dB)
		GPRS	EDGE			WCDMA
512	1850.2	0.43	3.77	9262	1852.4	3.01
661	1880.0	0.42	3.75	9400	1880.0	2.92
810	1909.8	0.40	3.77	9538	1907.6	2.82

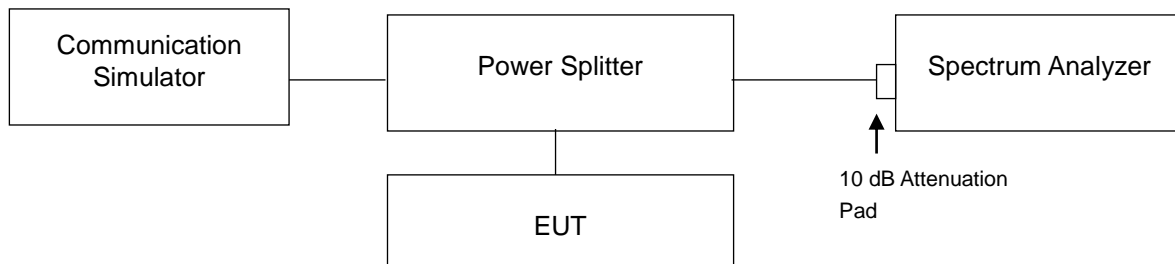


## 4.7 Conducted Spurious Emissions

### 4.7.1 Limits of Conducted Spurious Emissions Measurement

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

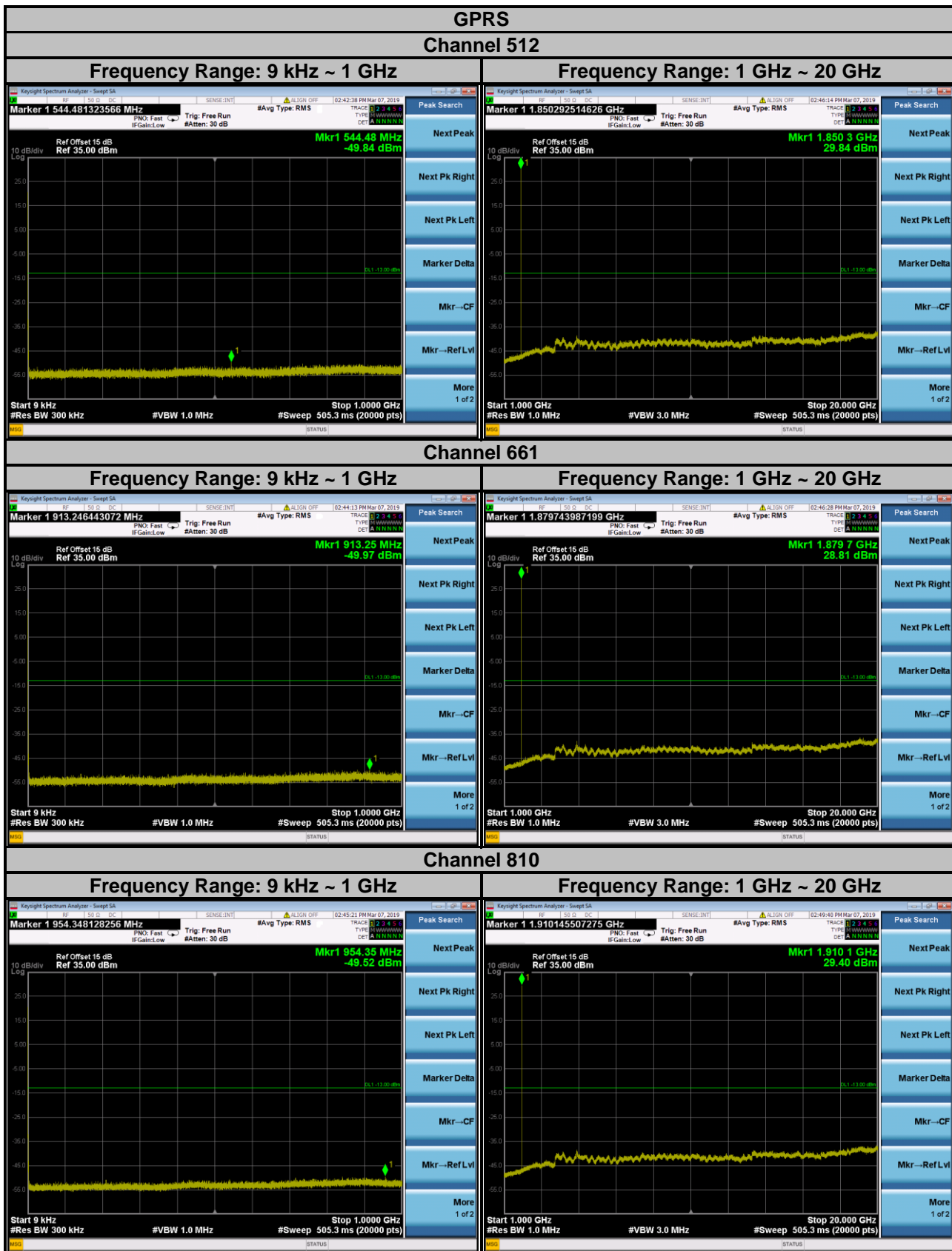
### 4.7.2 Test Setup



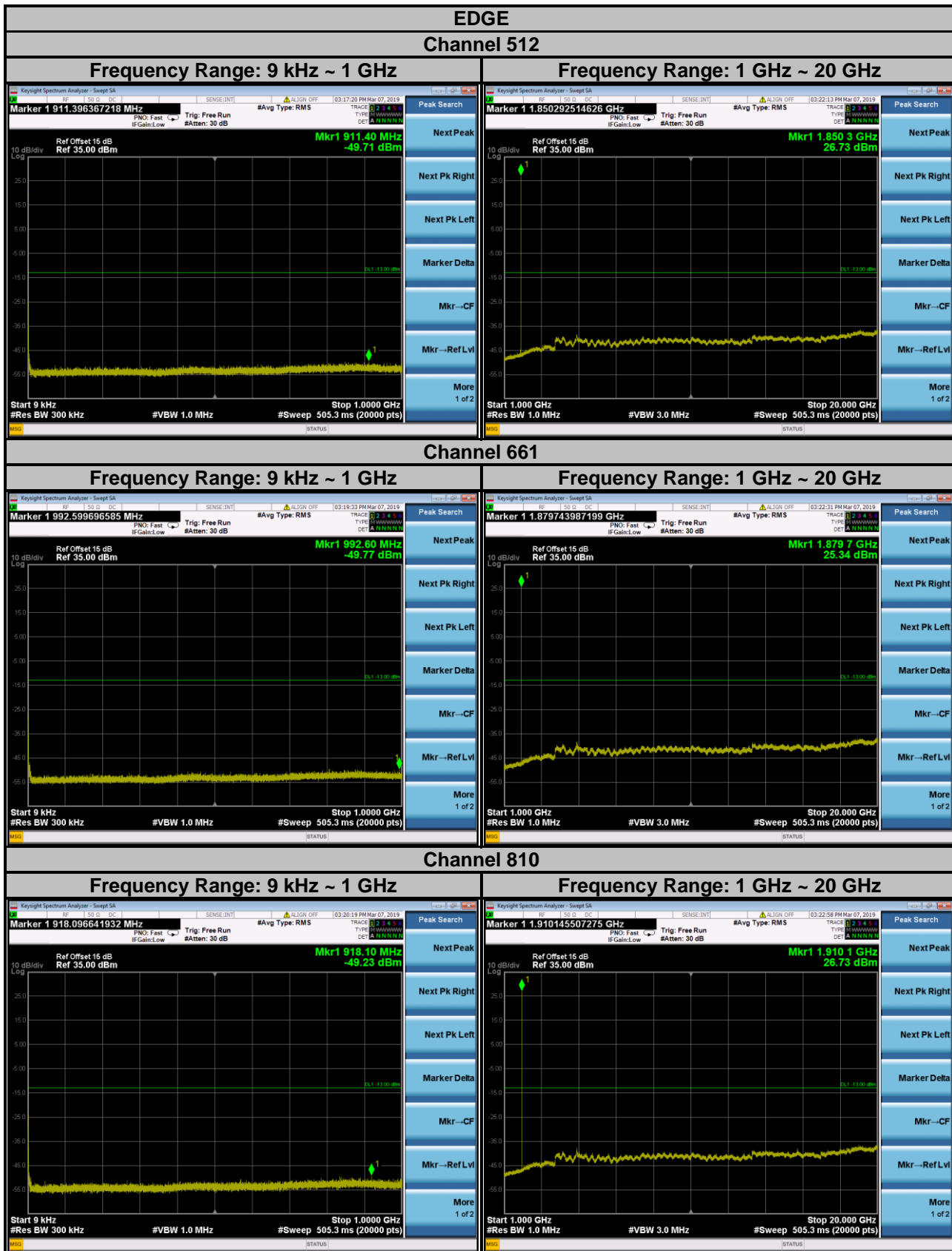
### 4.7.3 Test Procedure

- The EUT makes a phone call to the communication simulator. All measurements were done at low, middle and high operational frequency range.
- Measuring frequency range is from 9 kHz to 1 GHz. 10 dB attenuation pad is connected with spectrum. RBW = 100 kHz and VBW = 300 kHz is used for conducted emission measurement.
- Measuring frequency range is from 1 GHz to 20 GHz. 10 dB attenuation pad is connected with spectrum. RBW = 1 MHz and VBW = 3 MHz is used for conducted emission measurement.
- Spectrum RBW settings are referenced to ANSI 63.2-1996 section 8.2.2 and ANSI 63.26 section 5.7.2.

### 4.7.4 Test Results

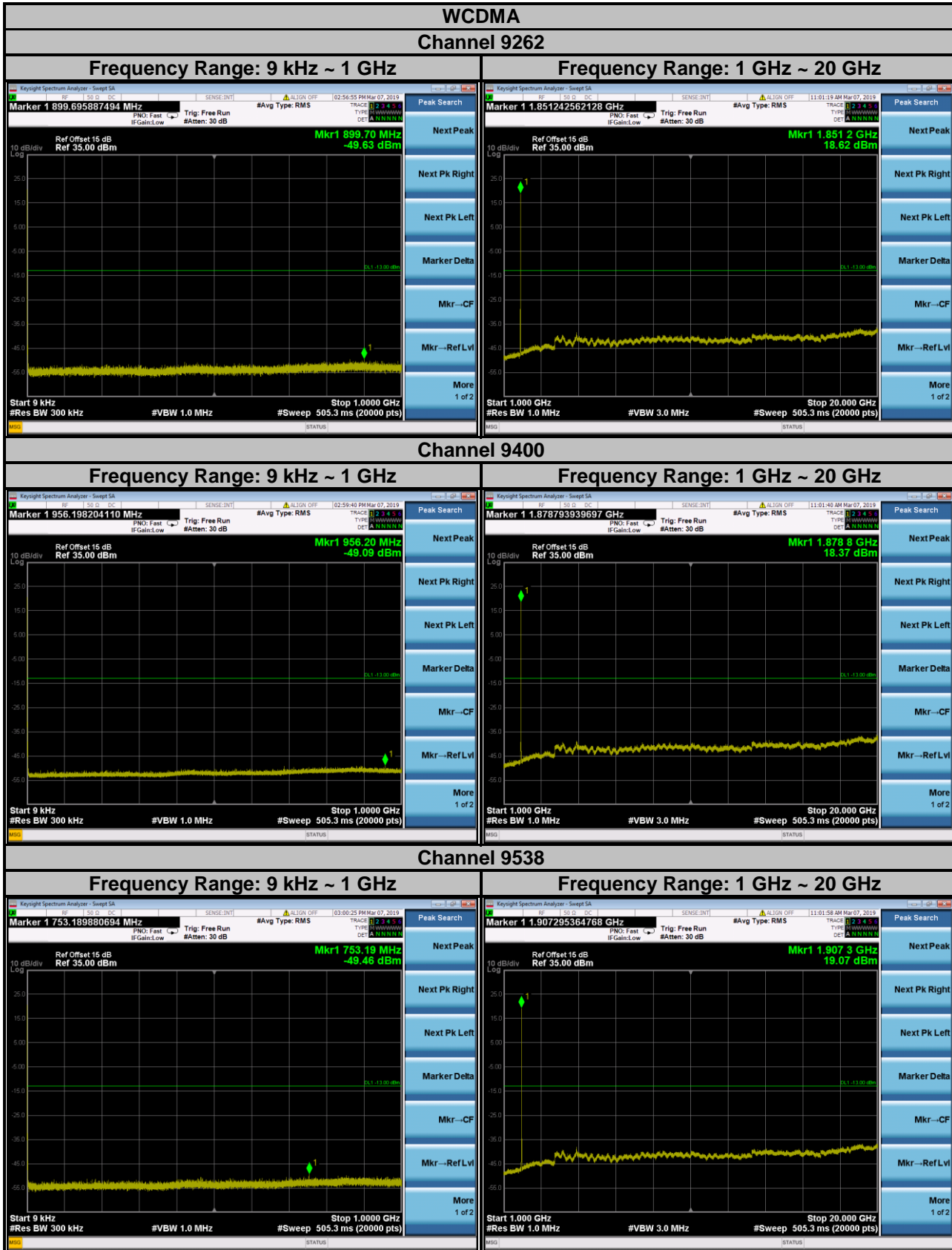


Note: The signal over the limit in 9 kHz is from spectrum analyzer.



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.

## 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.

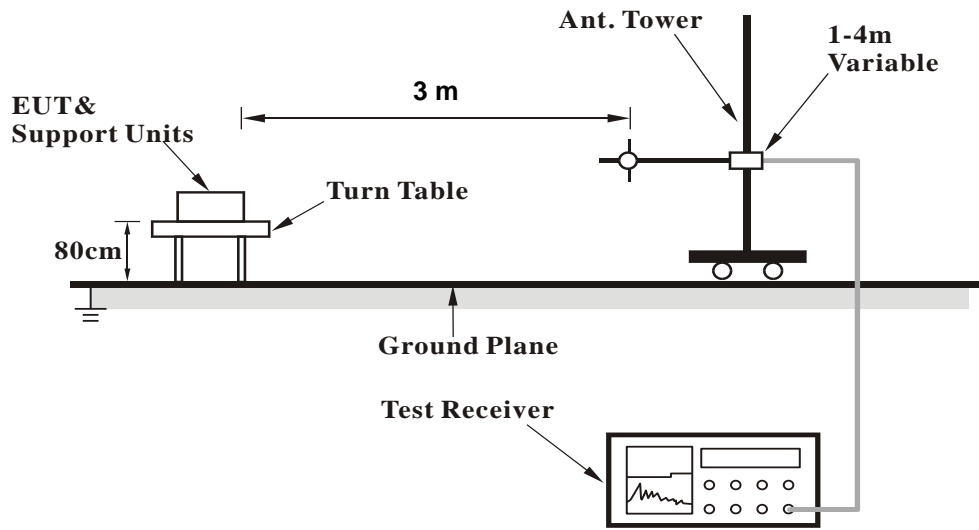
**NOTE:** The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 1 MHz/3 MHz.

### 4.8.3 Deviation from Test Standard

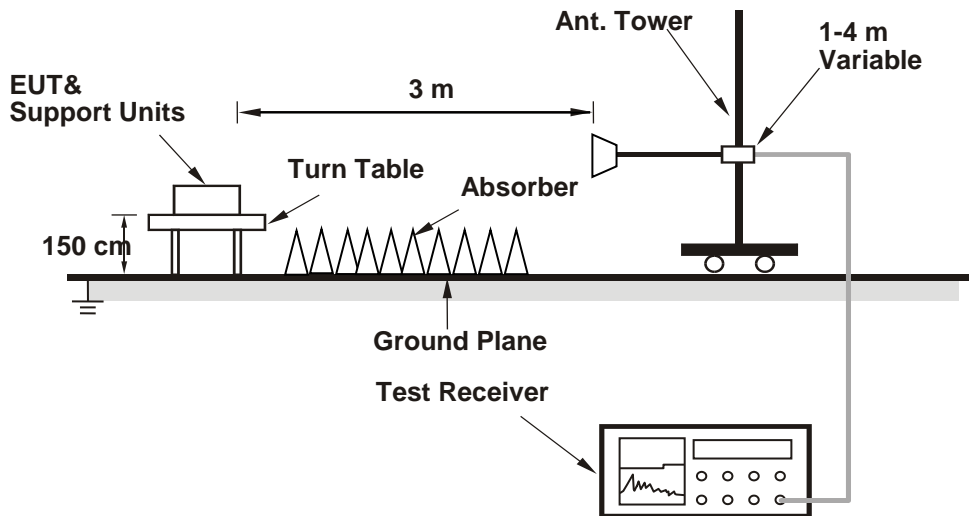
No deviation.

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

GPRS:

Low Channel

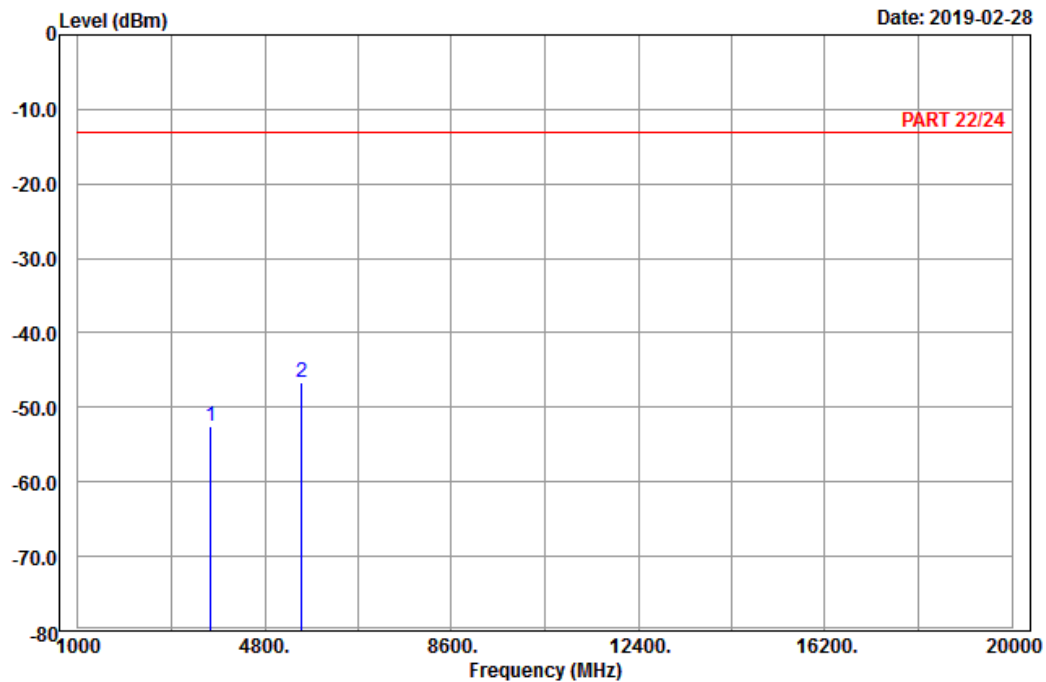


Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 9

Date: 2019-02-28



Site : 966 chamber 1  
 Condition: PART 22/24 Horizontal  
 Remark : GPRS 1900\_Link\_CH512  
 Tested by: Karl Lee

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1	3700.40	-52.54	-68.42	-13.00	-39.54	15.88	Peak
2 pp	5550.60	-46.63	-66.97	-13.00	-33.63	20.34	Peak

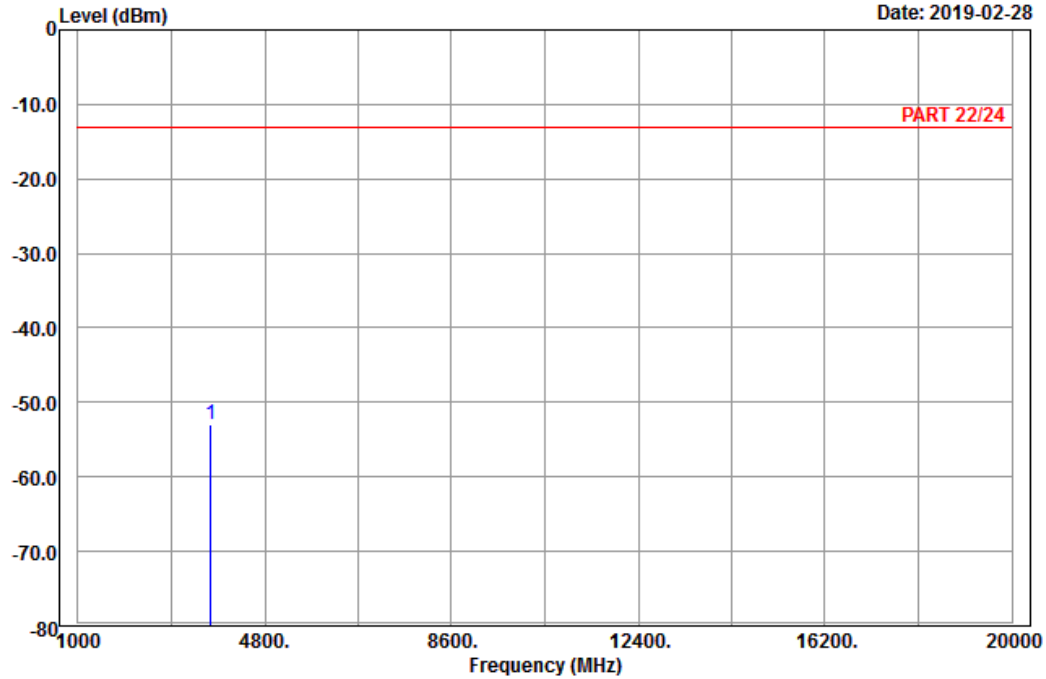


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A D T

Data: 10

Date: 2019-02-28



Site : 966 chamber 1  
 Condition: PART 22/24 Vertical  
 Remark : GPRS 1900\_Link\_CH512  
 Tested by: Karl Lee

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1 pp	3700.40	-52.94	-68.82	-13.00	-39.94	15.88	Peak

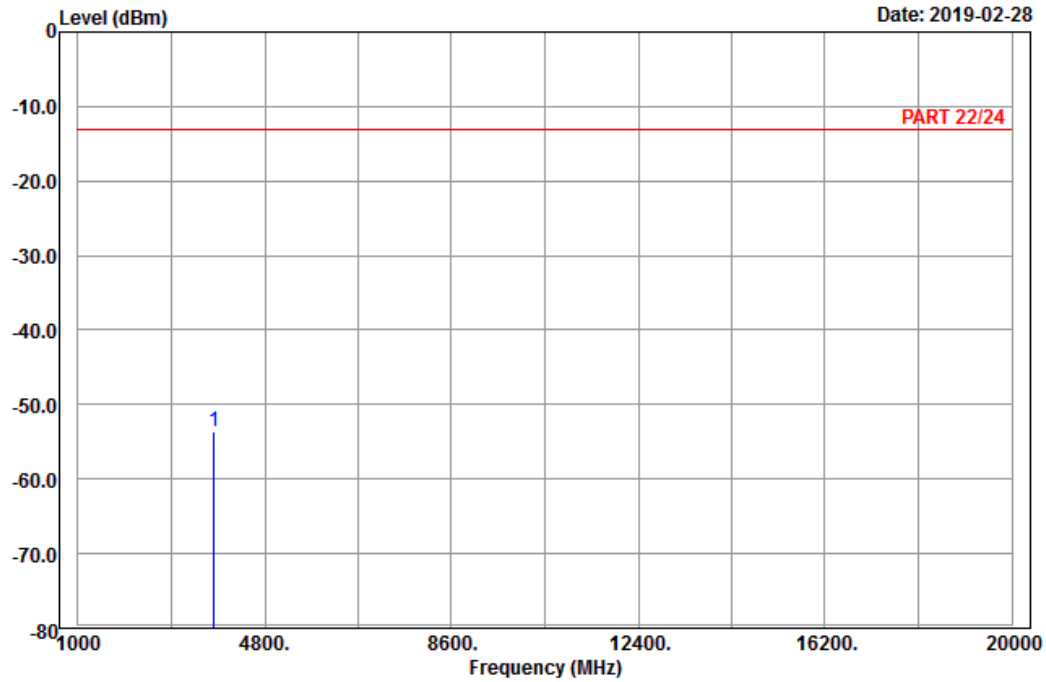
Middle Channel



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A D T

Data: 9



Site : 966 chamber 1  
 Condition: PART 22/24 Horizontal  
 Remark : GPRS 1900\_Link\_CH661  
 Tested by: Karl Lee

Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
MHz	dBm	dBm	dBm	dB	dB	
1 pp 3760.00	-53.53	-69.67	-13.00	-40.53	16.14	Peak

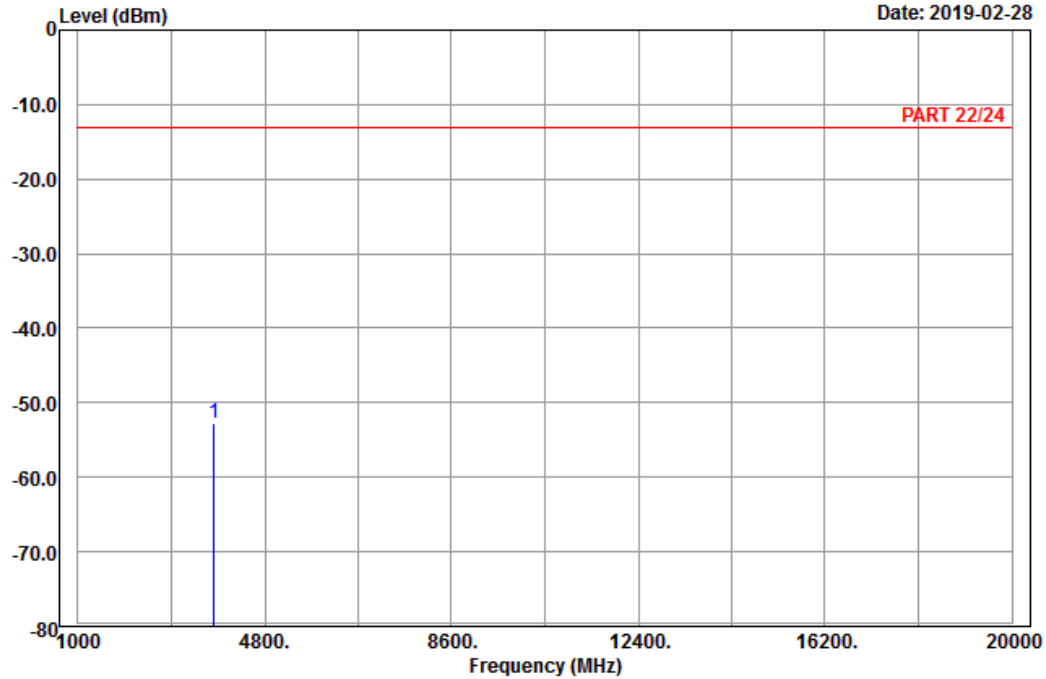


Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 10

Date: 2019-02-28



Site : 966 chamber 1  
 Condition: PART 22/24 Vertical  
 Remark : GPRS 1900\_Link\_CH661  
 Tested by: Karl Lee

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1 pp	3760.00	-52.84	-68.98	-13.00	-39.84	16.14	Peak

# High Channel

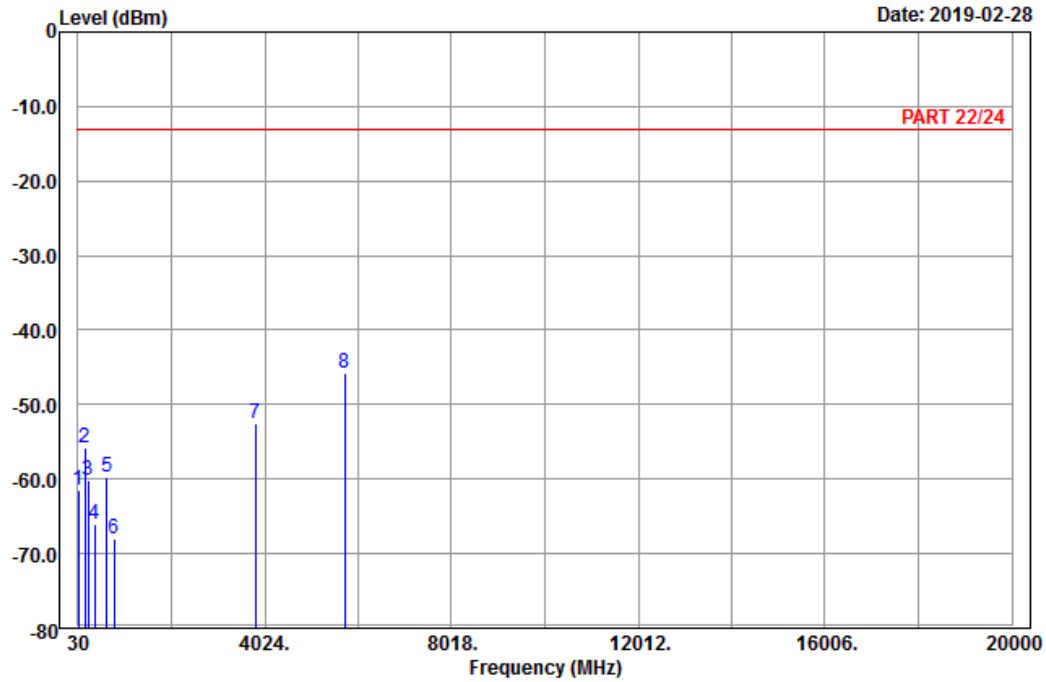


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A D T

Data: 13

Date: 2019-02-28



Site : 966 chamber 1  
 Condition: PART 22/24 Horizontal  
 Remark : GPRS 1900\_Link\_CH810  
 Tested by: Karl Lee

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1	41.61	-61.50	-51.10	-13.00	-48.50	-10.40	Peak
2	180.93	-55.87	-50.28	-13.00	-42.87	-5.59	Peak
3	248.16	-60.24	-54.71	-13.00	-47.24	-5.53	Peak
4	380.50	-65.97	-62.20	-13.00	-52.97	-3.77	Peak
5	643.00	-59.68	-59.62	-13.00	-46.68	-0.06	Peak
6	797.70	-67.91	-69.73	-13.00	-54.91	1.82	Peak
7	3819.60	-52.58	-69.08	-13.00	-39.58	16.50	Peak
8 pp	5729.40	-45.70	-66.04	-13.00	-32.70	20.34	Peak



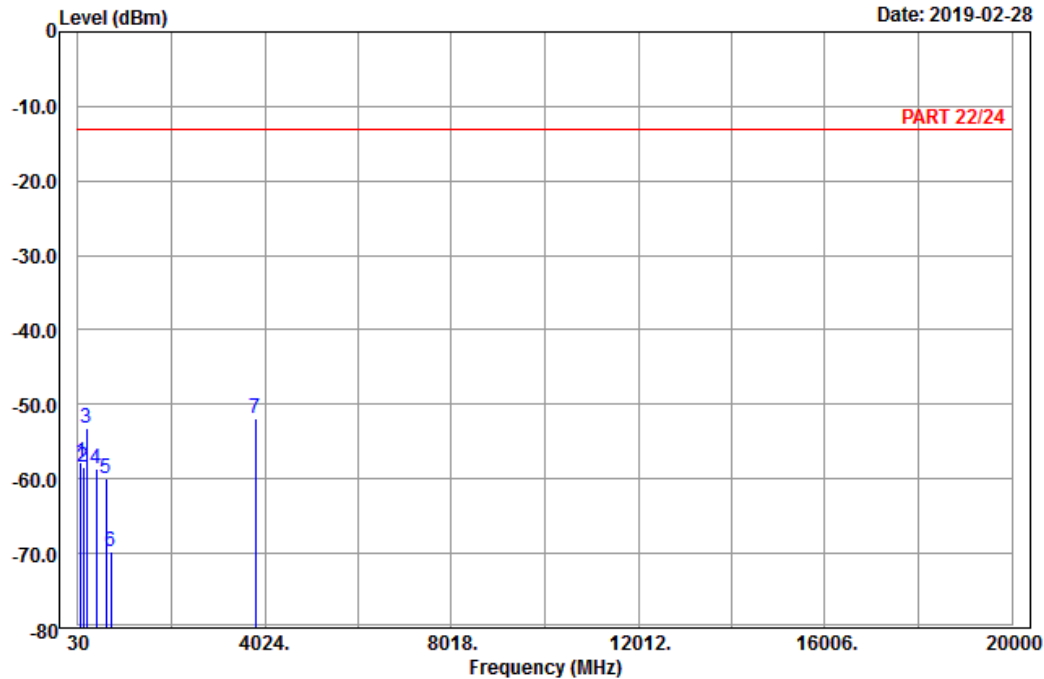


Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 14

Date: 2019-02-28



Site : 966 chamber 1  
 Condition: PART 22/24 Vertical  
 Remark : GPRS 1900\_Link\_CH810  
 Tested by: Karl Lee

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1	91.56	-57.73	-47.11	-13.00	-44.73	-10.62	Peak
2	147.99	-58.51	-50.61	-13.00	-45.51	-7.90	Peak
3	209.28	-53.09	-47.04	-13.00	-40.09	-6.05	Peak
4	423.90	-58.58	-55.31	-13.00	-45.58	-3.27	Peak
5	633.20	-60.02	-60.07	-13.00	-47.02	0.05	Peak
6	729.80	-69.72	-68.79	-13.00	-56.72	-0.93	Peak
7 pp	3819.60	-51.79	-68.29	-13.00	-38.79	16.50	Peak

EDGE:  
Low Channel

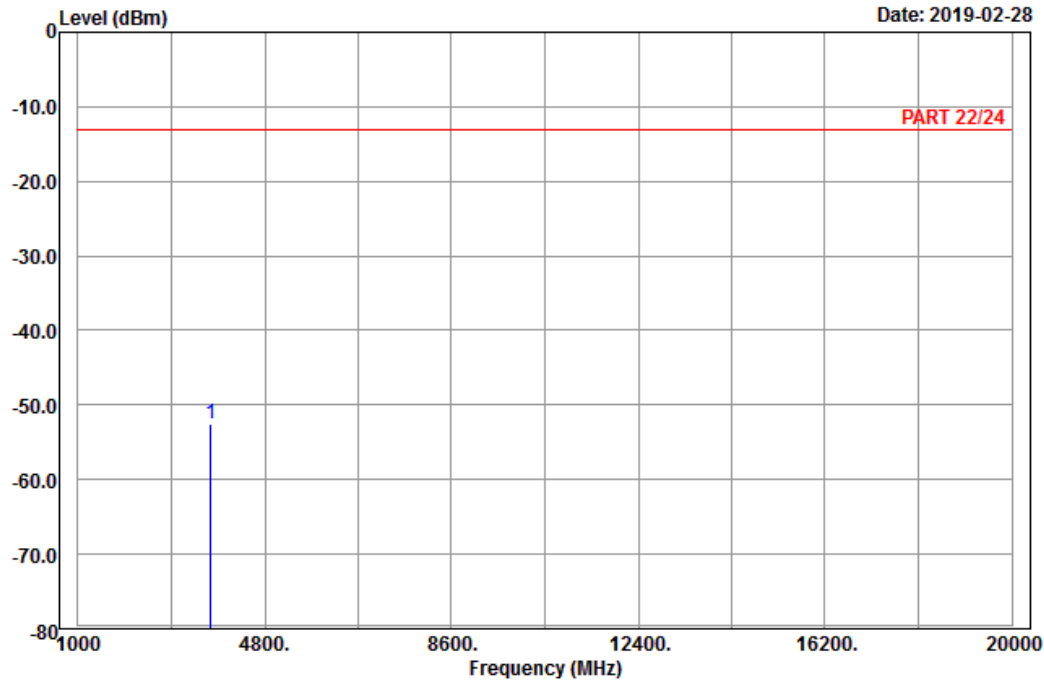


Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 9

Date: 2019-02-28



Site : 966 chamber 1  
Condition: PART 22/24 Horizontal  
Remark : EDGE 1900\_Link\_CH512  
Tested by: Karl Lee

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1	pp 3700.40	-52.58	-68.46	-13.00	-39.58	15.88	Peak

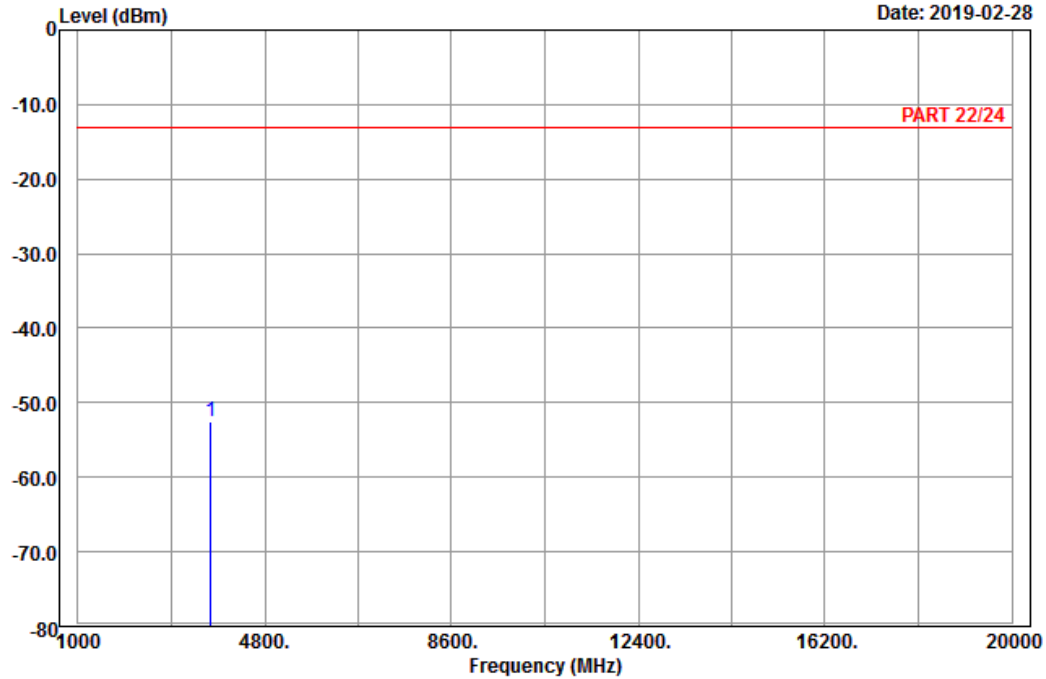


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A D T

Data: 10

Date: 2019-02-28



Site : 966 chamber 1  
 Condition: PART 22/24 Vertical  
 Remark : EDGE 1900\_Link\_CH512  
 Tested by: Karl Lee

	Read	Limit	Over			
Freq	Level	Level	Line	Limit	Factor	Remark
MHz	dBm	dBm	dBm	dB	dB	
1 pp 3700.40	-52.54	-68.42	-13.00	-39.54	15.88	Peak

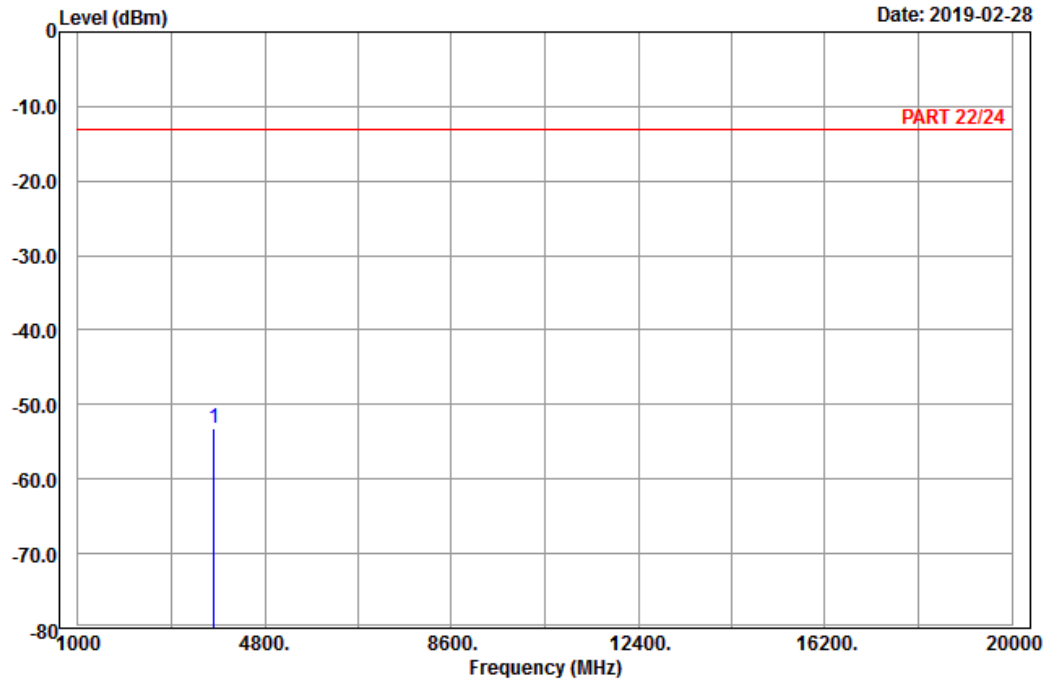
Middle Channel



Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 9



Site : 966 chamber 1  
 Condition: PART 22/24 Horizontal  
 Remark : EDGE 1900\_Link\_CH661  
 Tested by: Karl Lee

Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
MHz	dBm	dBm	dBm	dB	dB	
1 pp 3760.00	-53.10	-69.24	-13.00	-40.10	16.14	Peak

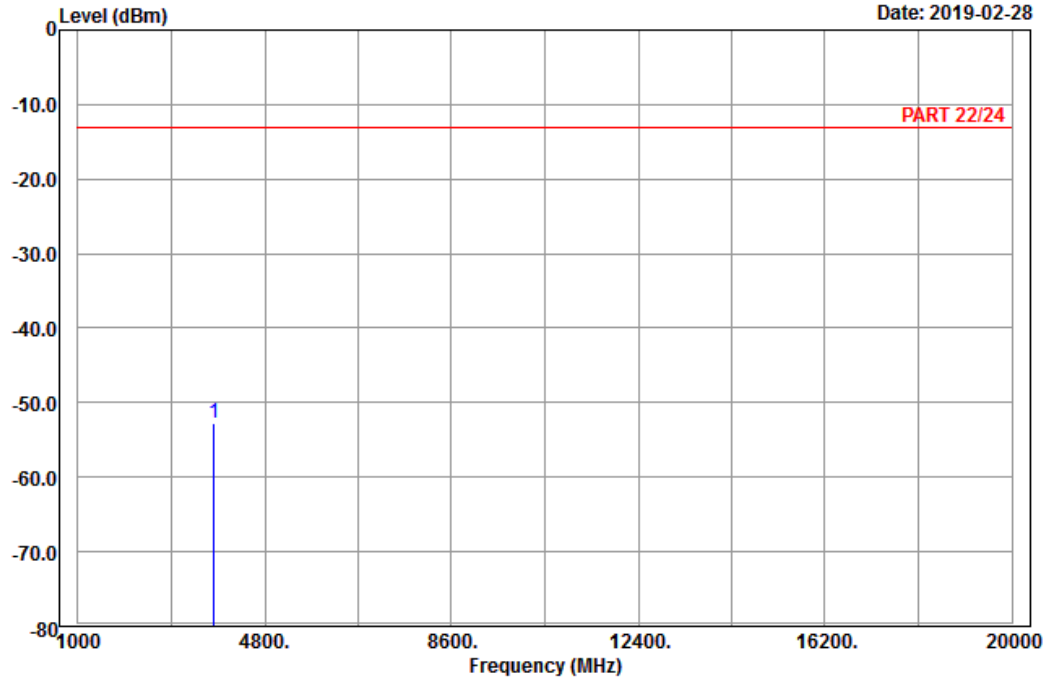


Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 10

Date: 2019-02-28



Site : 966 chamber 1  
 Condition: PART 22/24 Vertical  
 Remark : EDGE 1900\_Link\_CH661  
 Tested by: Karl Lee

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1 pp	3760.00	-52.86	-69.00	-13.00	-39.86	16.14	Peak

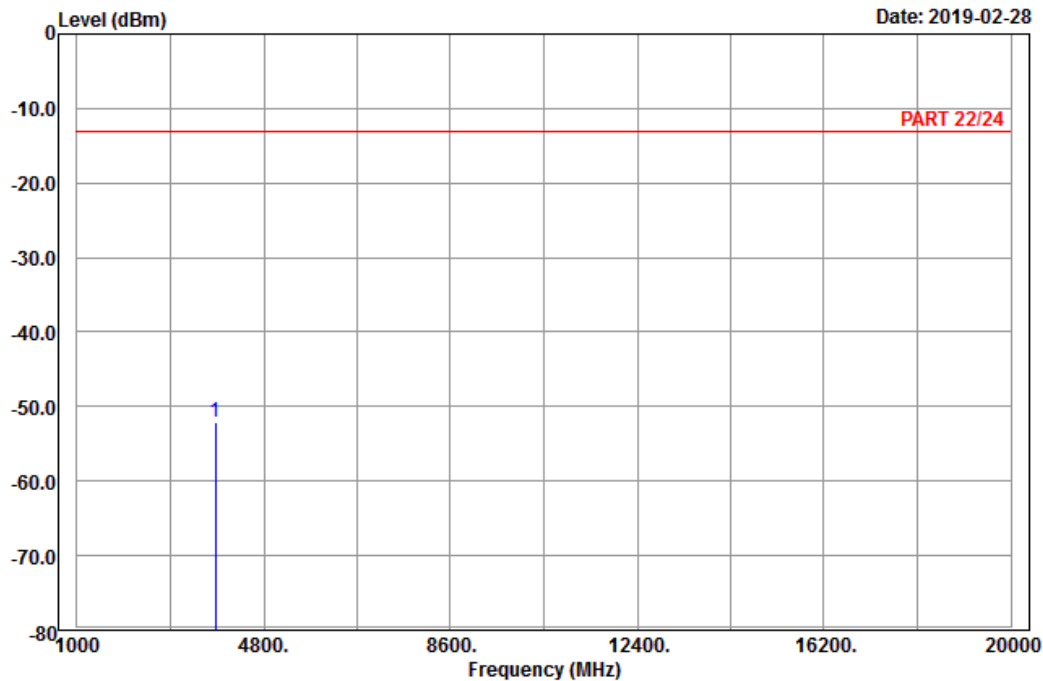
High Channel



Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 9



Site : 966 chamber 1  
 Condition: PART 22/24 Horizontal  
 Remark : EDGE 1900\_Link\_CH810  
 Tested by: Karl Lee

Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
MHz	dBm	dBm	dBm	dB	dB	
1 pp 3819.60	-52.11	-68.61	-13.00	-39.11	16.50	Peak

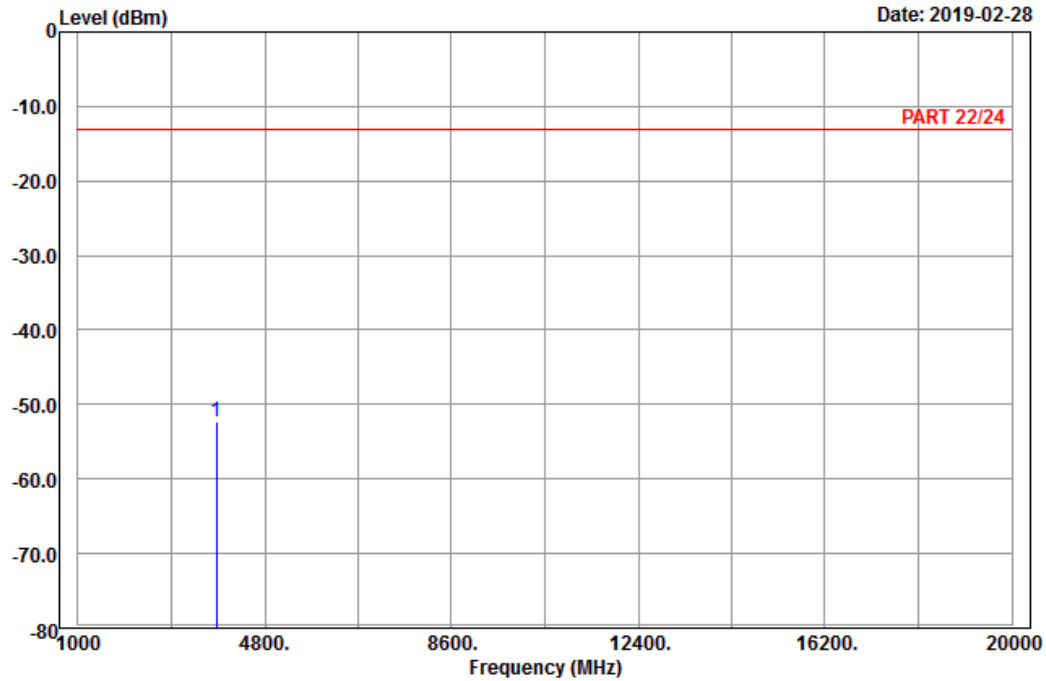


Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 10

Date: 2019-02-28



Site : 966 chamber 1  
 Condition: PART 22/24 Vertical  
 Remark : EDGE 1900\_Link\_CH810  
 Tested by: Karl Lee

	Read	Limit	Over			
Freq	Level	Level	Line	Limit	Factor	Remark
MHz	dBm	dBm	dBm	dB	dB	
1 pp 3819.60	-52.26	-68.76	-13.00	-39.26	16.50	Peak

WCDMA:  
Low Channel

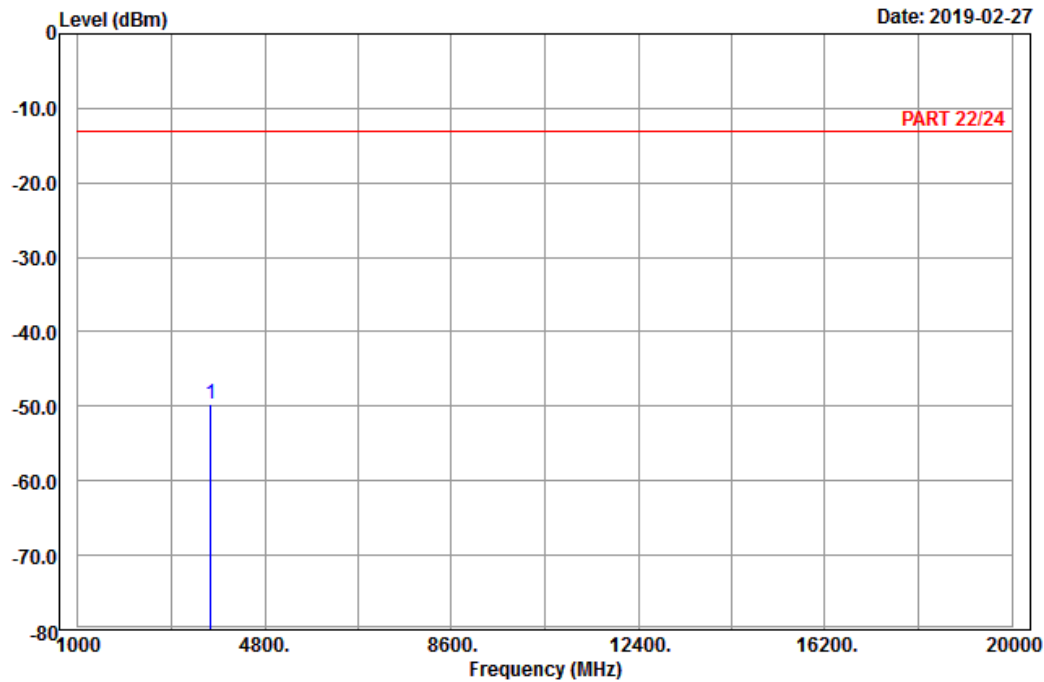


Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 9

Date: 2019-02-27



Site : 966 chamber 1  
Condition: PART 22/24 Horizontal  
Remark : Band II\_Link\_CH9262  
Tested by: Karl Lee

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1	pp 3704.80	-49.70	-65.58	-13.00	-36.70	15.88	Peak



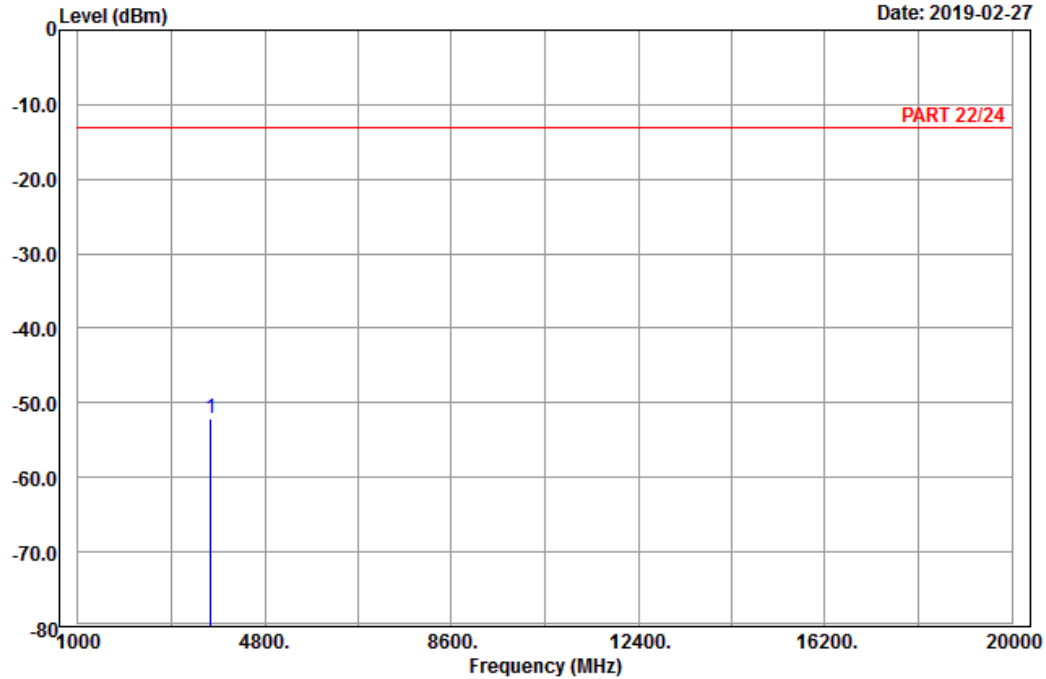


Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 10

Date: 2019-02-27



Site : 966 chamber 1  
 Condition: PART 22/24 Vertical  
 Remark : Band II\_Link\_CH9262  
 Tested by: Karl Lee

	Read	Limit	Over			
Freq	Level	Level	Line	Limit	Factor	Remark
MHz	dBm	dBm	dBm	dB	dB	
1 pp 3704.80	-52.08	-67.96	-13.00	-39.08	15.88	Peak

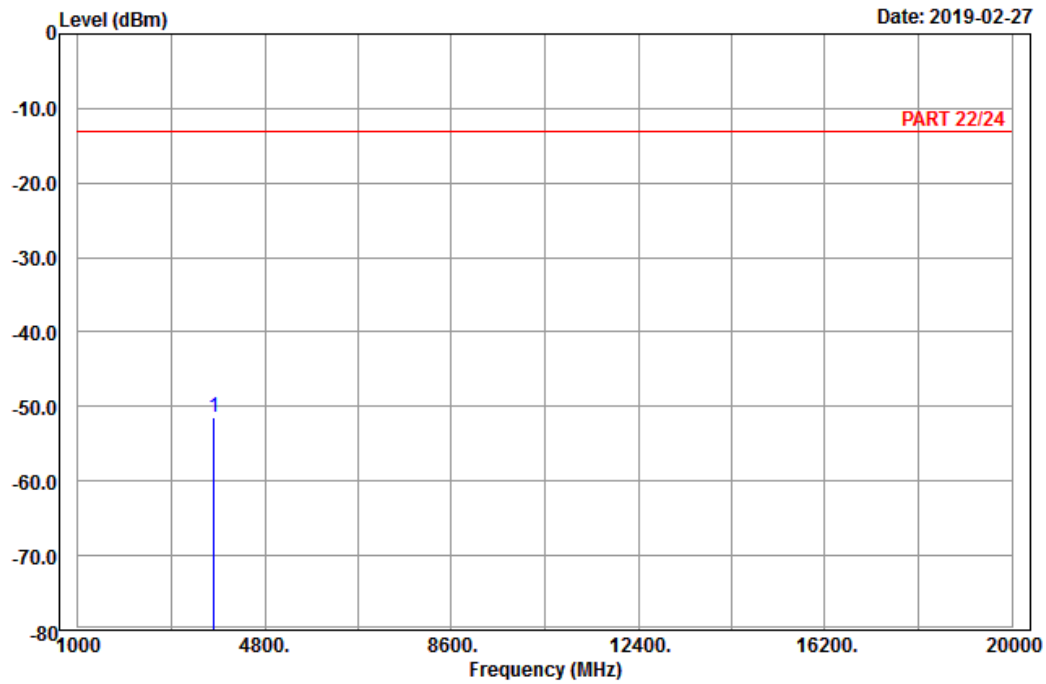
Middle Channel



Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 9



Site : 966 chamber 1  
 Condition: PART 22/24 Horizontal  
 Remark : Band II\_Link\_CH9400  
 Tested by: Karl Lee

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1	pp 3760.00	-51.54	-67.68	-13.00	-38.54	16.14	Peak

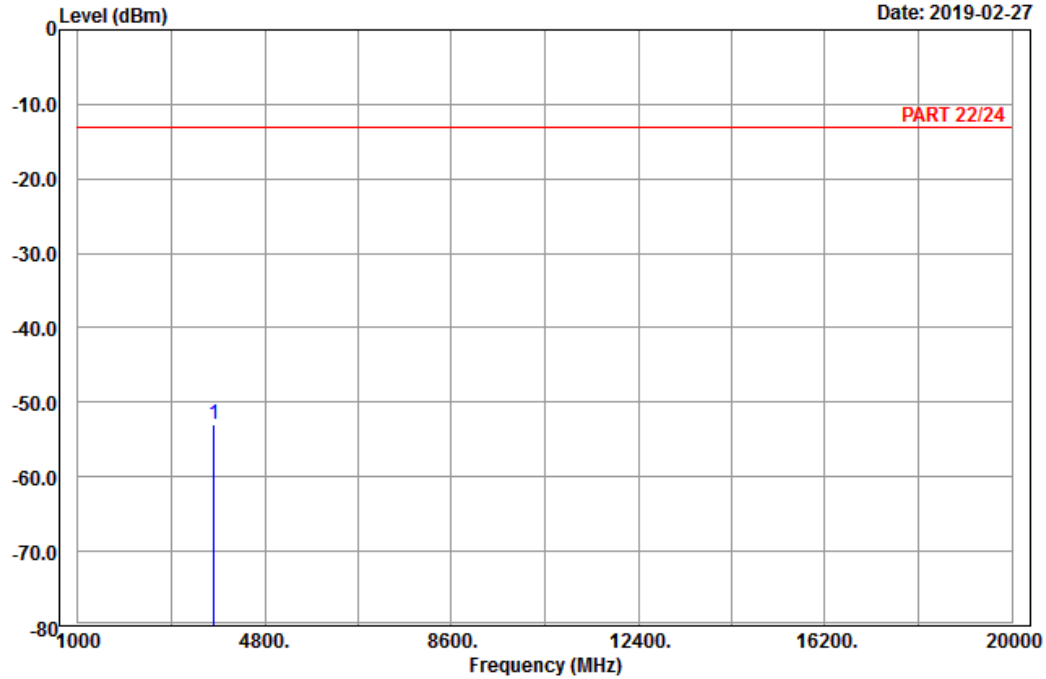


Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 10

Date: 2019-02-27



Site : 966 chamber 1  
 Condition: PART 22/24 Vertical  
 Remark : Band II\_Link\_CH9400  
 Tested by: Karl Lee

	Read	Limit	Over			
Freq	Level	Level	Line	Limit	Factor	Remark
MHz	dBm	dBm	dBm	dB	dB	
1 pp 3760.00	-53.05	-69.19	-13.00	-40.05	16.14	Peak

High Channel

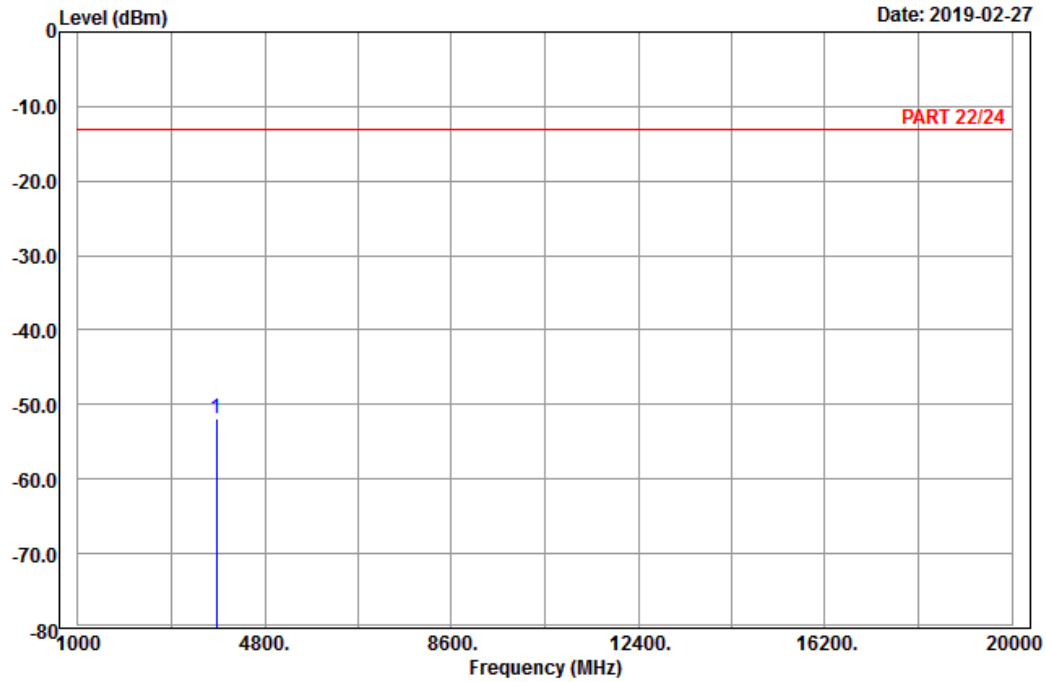


Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 9

Date: 2019-02-27



Site : 966 chamber 1  
 Condition: PART 22/24 Horizontal  
 Remark : Band II\_Link\_CH9538  
 Tested by: Karl Lee

Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
MHz	dBm	dBm	dBm	dB	dB	
1 pp 3815.20	-51.92	-68.33	-13.00	-38.92	16.41	Peak

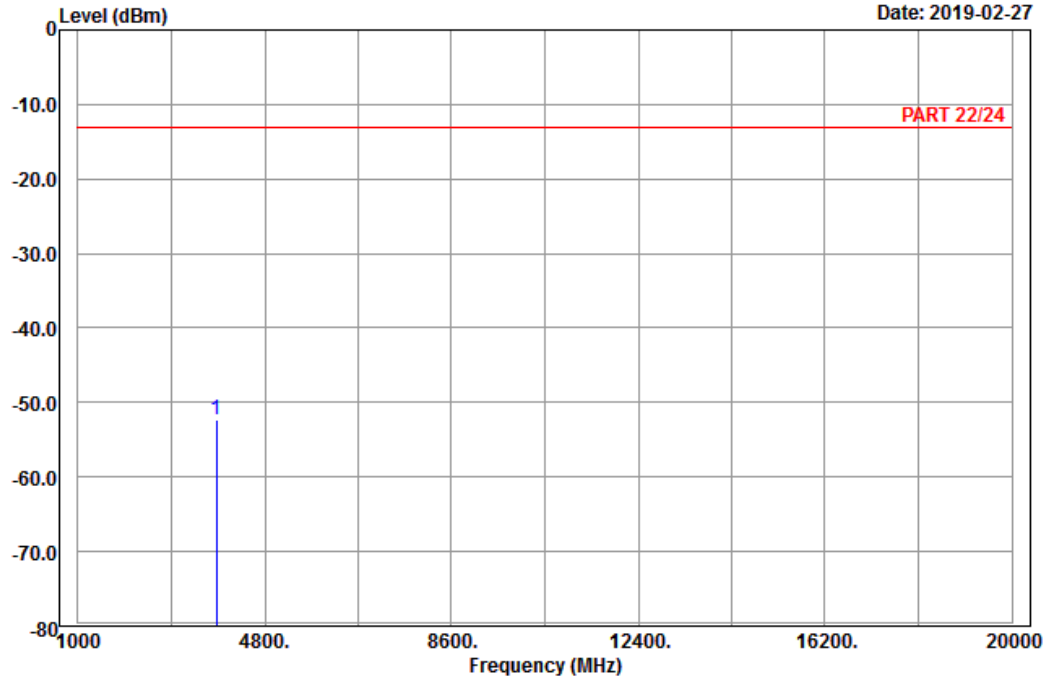


Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

A D T

Data: 10

Date: 2019-02-27



Site : 966 chamber 1  
 Condition: PART 22/24 Vertical  
 Remark : Band II\_Link\_CH9538  
 Tested by: Karl Lee

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1	pp 3815.20	-52.23	-68.64	-13.00	-39.23	16.41	Peak

## 5 Pictures of Test Arrangements

Please refer to the attached file (Test Setup Photo).

## Appendix – Information of the Testing Laboratories

We, Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch, were founded in 1988 to provide our best service in EMC, Radio, Telecom and Safety consultation. Our laboratories are FCC recognized accredited test firms and accredited according to ISO/IEC 17025.

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

**Lin Kou EMC/RF Lab**

Tel: 886-2-26052180

Fax: 886-2-26051924

**Hsin Chu EMC/RF/Telecom Lab**

Tel: 886-3-6668565

Fax: 886-3-6668323

**Hwa Ya EMC/RF/Safety**

Tel: 886-3-3183232

Fax: 886-3-3270892

**Email:** [service.adt@tw.bureauveritas.com](mailto:service.adt@tw.bureauveritas.com)

**Web Site:** [www.bureauveritas-adt.com](http://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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