

---

# TEST REPORT FOR GSM TESTING

---

Report No.: SRTC2019-9004(F)-19122601(A)

Product Name: Smartphone

Product Model: HLTE230E

Applicant: Hisense International Co., Ltd.

Manufacturer: Hisense Communications Co., Ltd.

Specification: FCC Part 24E, Part 22H, Part 2 (2019)

FCC ID: 2ADOBHLTE230E

The State Radio\_monitoring\_center Testing Center (SRTC)

15th Building, No.30 Shixing Street, Shijingshan District,

Beijing, P.R.China

Tel: 86-10-57996183 Fax: 86-10-57996388

## CONTENTS

<b>1. GENERAL INFORMATION .....</b>	<b>2</b>
1.1 NOTES OF THE TEST REPORT .....	2
1.2 INFORMATION ABOUT THE TESTING LABORATORY .....	2
1.3 APPLICANT’S DETAILS .....	2
1.4 MANUFACTURER’S DETAILS .....	2
1.5 TEST ENVIRONMENT .....	3
<b>2 DESCRIPTION OF THE DEVICE UNDER TEST .....</b>	<b>4</b>
2.1 FINAL EQUIPMENT BUILD STATUS .....	4
2.2 SUPPORT EQUIPMENT .....	5
2.3 SUMMARY TABLE .....	6
<b>3 REFERENCE SPECIFICATION .....</b>	<b>6</b>
<b>4 KEY TO NOTES AND RESULT CODES .....</b>	<b>6</b>
<b>5 RESULT SUMMARY .....</b>	<b>7</b>
<b>6 TEST RESULT .....</b>	<b>8</b>
6.1 RF POWER OUTPUT .....	8
6.2 EFFECTIVE RADIATED POWER .....	9
6.3 OCCUPIED BANDWIDTH .....	11
6.4 EMISSION BANDWIDTH .....	12
6.5 SPURIOUS EMISSIONS AT ANTENNA TERMINAL .....	13
6.6 BAND EDGES COMPLIANCE .....	14
6.7 FREQUENCY STABILITY .....	15
6.8 RADIATED SPURIOUS EMISSIONS .....	16
6.9 PEAK-AVERAGE RATIO .....	18
<b>7 MEASUREMENT UNCERTAINTIES .....</b>	<b>19</b>
<b>8 TEST EQUIPMENTS .....</b>	<b>20</b>
<b>APPENDIX A – TEST DATA OF CONDUCTED EMISSION .....</b>	<b>21</b>
<b>APPENDIX B – TEST DATA OF RADIATED EMISSION .....</b>	<b>43</b>

## 1. GENERAL INFORMATION

### 1.1 Notes of the test report

The test report may only be reproduced or published in full. Reproduction or publication of extracts from the report requires the prior written permission of The State Radio\_monitoring\_center Testing Center (SRTC). The test results relate only to individual items of the samples which have been tested. The certification and accreditation identifiers used in this report shall not be applicable to the tested or calibrated samples thereof. The manufacturer shall not mark the tested samples or items (or a separate part of the item) with the identifiers of certification and accreditation to mislead relevant parties about the tested samples or items.

### 1.2 Information about the testing laboratory

Company:	The State Radio_monitoring_center Testing Center (SRTC)
Address:	15th Building, No.30 Shixing Street, Shijingshan District, P.R.China
City:	Beijing
Country or Region:	P.R.China
Contacted person:	Liu Jia
Tel:	+86 10 57996183
Fax:	+86 10 57996388
Email:	liujiat@srtc.org.cn

### 1.3 Applicant's details

Company:	Hisense International Co., Ltd.
Address:	Floor 22, Hisense Tower, 17 Donghai Xi Road, Qingdao, 266071, China
City:	Qingdao
Country or Region:	China
Contacted person:	Geng Ruifeng
Tel:	+86-532-80877742
Fax:	---
Email:	gengruifeng@hisense.com

### 1.4 Manufacturer's details

Company:	Hisense Communications Co., Ltd.
Address:	No.218 Qianwangang Road, Economic & Technological Development Zone, Qingdao, China
City:	Qingdao
Country or Region:	China
Contacted person:	Deng Tingting
Tel:	+86-532-55753708
Fax:	---
Email:	dengtingting@hisense.com

## 1.5 Test Environment

Date of Receipt of test sample at SRTC:	2019-12-26
Testing Start Date:	2019-12-26
Testing End Date:	2020-02-11

Environmental Data:	Temperature (°C)	Humidity (%)
Ambient	25	30
Maximum Extreme	55	---
Minimum Extreme	0	---

Normal Supply Voltage (V d.c.):	3.80
Maximum Extreme Supply Voltage (V d.c.):	4.35
Minimum Extreme Supply Voltage (V d.c.):	3.50

## 2 DESCRIPTION OF THE DEVICE UNDER TEST

### 2.1 Final Equipment Build Status

Frequency Range	GSM850: Tx:824~849MHz Rx:869~894MHz PCS1900: Tx:1850~1910MHz Rx:1930~1990MHz
Modulation Type	GPRS:GMSK EDGE: GMSK/8PSK
Emission Designator	300KGXW/300KG7W
Duplex Mode	FDD
Duplex Spacing	GSM850:45MHz PCS1900:80MHz
Antenna Type	Fixed Internal Antenna
Antenna Gain	GSM850: -1.6dBi/DCS1800: -0.3dBi
Power Supply	Battery/Charger
Hardware Version	V0.1
Software Version	Hisense_HLTE230E_11_S02_03
IMEI	867400020316612

Note: The equipments have two supplies, is different on the supplier of Memory/Camera/LCD.

#### Main Supply

Part Name	Model	Supplier(Brand)	Description
Memory	UNMEN06GC2C31AS	UNIC2	eMMC5.1 Module,64GB,FBGA-153Ball
Memory	MT53E768M32D2NP-053 RS	Micron	LPDDR4X,24Gb(768 Meg x 32 (2 channels x 16 I/O)),WFBGA-200Ball
Camera	H8B13-KS230FF	Kingcome	HI1336,COB,S1326A
Camera	H7B8-KS230BF	Kingcome	HI-846,COB,S0883A
Camera	H9B13-KS230BA	Kingcome	HI1336,COB,3933C-400
Camera	BC12903V0	CXT	GC2385,CSP,HX-M0207H-H3 06
Camera	BC12904V0	CXT	GC02M1B,CSP,HX-M0207B-H 201
LCD+TP	HTF065H029	HOLITECH	ICNL9911S,MLAF065WE51
fingerprint	TW-SW331B-KS230-V 1	TOWO	SW331B
Battery	PLV436190	ShenzhenAerospaceElectronicCo ,Ltd	

## Secondary Supply

Part Name	Model Name	supplier	Remark
Memory	NCEMASLD-64G	FORESEE	eMMC5.1 Module,64GB,FBGA-153Ball
Memory	RS768M32LB4D2BDS-53BT	RAYSON	LPDDR4X,24Gb(768Mb x 16I/O x 2 channels),WFBGA-200Ball
Camera	TW-13OV53-KS230F-V1	TOWO	OV13853,COB,S1326
Camera	TW-08GC34-KS230B-V1	TOWO	GC8034,COB,1368XX
Camera	TW-13OV53-KS230B-V1	TOWO	OV13853,COB,50064B17
Camera	ST-CFKS230-WJBF-V1	Union Image co.,ltd	GC2375H,CSP,HX-M0207H-H306
Camera	ST-CFKS230-JSBF-V1	Union Image co.,ltd	GC2375H,CSP,DL2002B10-BP
LCD+TP	EQT651WKF003G	easyquick	FT8006, MLAF065WE51X
fingerprint	FS22483BJN	HOLITECH	ICNF7332-A2
Battery	436191P	Shenzhen Tianjin New Energy Technology Co., Ltd.	

## 2.2 Support Equipment

The following support equipment was used to exercise the DUT during testing:

Equipment	Battery 1
Manufacturer	ShenzhenAerospaceElectronicCo.,Ltd
Model Number	PLV436190

Equipment	Battery 2
Manufacturer	Shenzhen Tianjin New Energy Technology Co., Ltd.
Model Number	436191P

Equipment	Charger
Manufacturer	SHENZHENTIANYIN ELECTRONICS CO., LTD.
Model Number	TPA-46050200UU

Equipment	USB Cable
Manufacturer	kelinDongguan Keling Electronic Technology Co., Ltd
Model Number	KS230B

Equipment	Headset
Manufacturer	kelinDongguan Keling Electronic Technology Co., Ltd
Model Number	KS230B

### 2.3 Summary table.

FCC Rule Part	Mode	Frequency Range (MHz)	ERP/ EIRP (dBm)	ERP/ EIRP (W)	Frequency Tolerance (ppm)	Emission Designator
22H	GSM850	824.2-848.8	33.33	2.153	0.099	248KGXW
22H	EDGE850	824.2-848.8	26.03	0.401	-0.100	246KG7W
24E	GSM1900	1850.2-1909.8	31.36	1.368	0.097	248KGXW
24E	EDGE1900	1850.2-1909.8	26.94	0.494	0.099	250KG7W

### 3 REFERENCE SPECIFICATION

Specification	Version	Title
FCC Part2	2019	Frequency allocations and radio treaty matters; general rules and regulations
FCC Part22	2019	Public mobile services
FCC Part24	2019	Personal communications services
ANSI C63.26	2015	American national standard for compliance testing of transmitters used in licensed radio services
KDB 971168 D01	April 9, 2018	Measurement guidance for certification of licensed digital transmitters
TIA-603-E-2016	March 2016	Land Mobile FM or PM Communications Equipment Measurement and Performance Standards

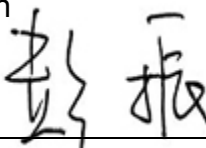

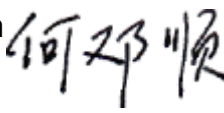
### 4 KEY TO NOTES AND RESULT CODES

The following are the definition of the test result.

Code	Meaning
PASS	Test result shows that the requirements of the relevant specification have been met.
FAIL	Test result shows that the requirements of the relevant specification have not been met.
NT	Normal Temperature
NV	Nominal voltage
HV	High voltage
LV	Low voltage

## 5 RESULT SUMMARY

No.	Test case	FCC reference	Verdict
1	RF Power Output	2.1046	Pass
2	Effective Radiated Power and Effective Isotropic Radiated Power	22.913(a)(5)/24.232(c)	Pass
3	Occupied Bandwidth	2.1049	Pass
4	Emission Bandwidth	2.1049	Pass
5	Spurious Emissions at antenna terminals	2.1051/22.917(a)/24.238(a)	Pass
6	Band Edges Compliance	2.1051/22.917(a)/24.238(a)	Pass
7	Frequency Stability	2.1055/22.355/24.235	Pass
8	Radiated Spurious Emissions	2.1053/22.917(a)/24.238(a)	Pass
9	Peak-Average Ratio	24.232(d)	Pass

This Test Report Is Issued by: Mr. Peng Zhen 	Checked by: Mr. Li Bin 
Tested by: Mr. He Dengshun 	Issued date:  20200212



## **6 TEST RESULT**

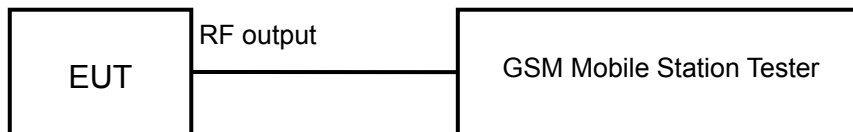
### **6.1 RF Power Output**

Rule Part(s)  
 FCC Part 2.1046

Ambient condition:

Temperature	Relative humidity	Pressure
25°C	30%	101.9kPa

Test Setup:



Test procedure:

After a radio link has been established between EUT and Tester, the output power of the cell signal of the testing equipment will be decreased until the output power of the EUT reach a maximum value. Then the test data can be read at the tester screen. The loss between RF output port of the EUT and the input port of the tester will be taken into consideration. The measurement will be conducted at three channels (Low, Middle and High channels)

Limits: No specific conduct power requirements in part 2.1046.

Test result:

The test results are shown in Appendix A.

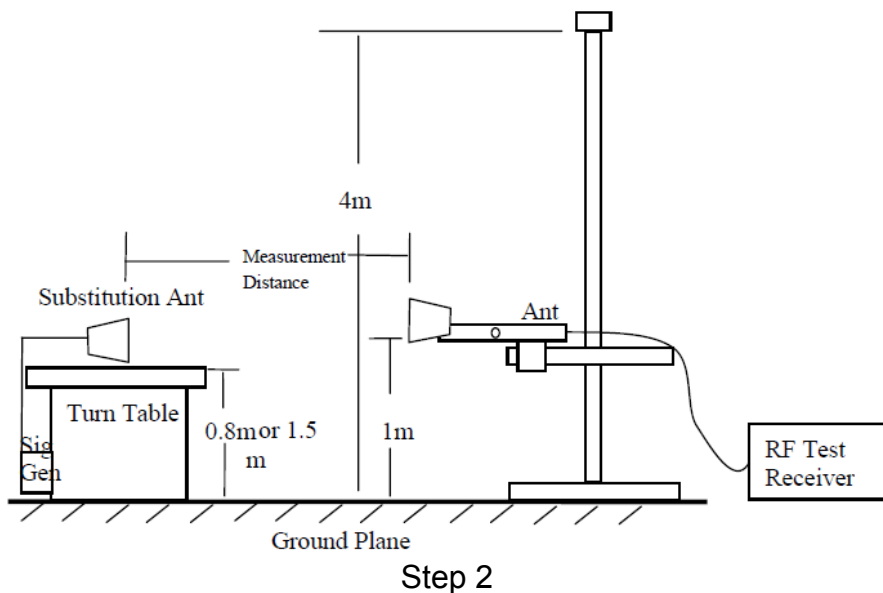
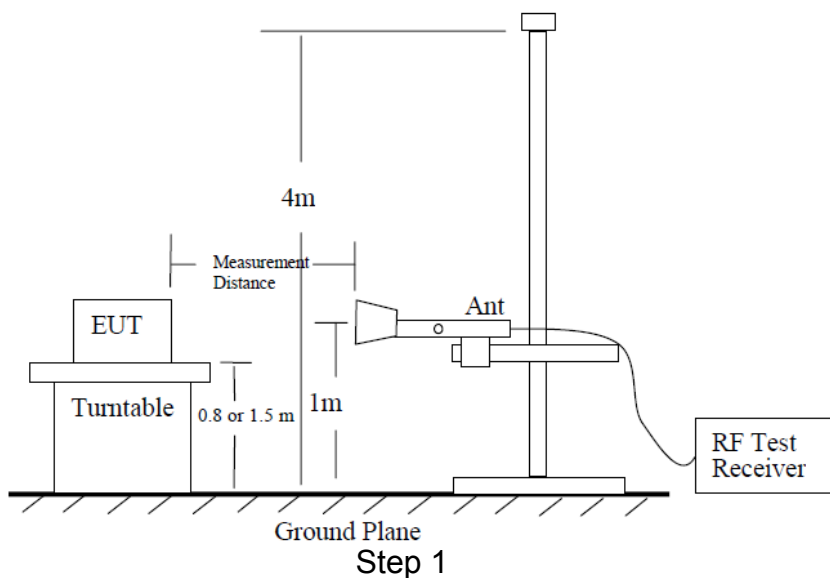
## 6.2 Effective Radiated Power

Rule Part(s)  
FCC Part 22.913(a)(5)/Part 24.232(c)

Ambient condition:

Temperature	Relative humidity	Pressure
25°C	30%	101.9kPa

Test setup:



**Test procedure:**

The measurements procedures in TIA-603-E-2016 are used.

**Step 1:**

The measurement is carried out in the chamber. EUT was placed on a 0.8m (f<1GHz)/ 1.5m (f>1GHz) high non-conductive table at a 3 meters test distance from the test receive antenna. A receiving antenna was placed on the antenna mast 3 meters from the EUT. The height of receiving antenna from 1m to 4m and varies in certain range to find the maximum power value. A radio link shall be established between EUT and Tester. The output power of the cell signal of the tester will be decreased until the output power of the EUT reach a maximum value. A peak detector is used and RBW is set to 100KHz(f<1GHz)/1MHz (f>1GHz). The antenna shall be performed under horizontal and vertical polarization. The turn table shall be rotated from 0 to 360 degrees for detecting the maximum power value on spectrum analyzer or receiver. And the maximum value of the receiver should be recorded as (Pr).

**Step 2:**

A log-periodic antenna or double-ridged waveguide horn antenna shall be substituted in place of the EUT. The log-periodic antenna will be driven by a signal generator. To repeat the same procedure as step1 and the level of signal generator will be adjusted till the same power value on the spectrum analyzer or receiver. The ERP/EIRP of the EUT can be calculated through the level of the signal generator, cable loss, the gain of the substitution antenna.

A power (Pmea) is applied to the input of the substitution antenna, and adjusts the level of the signal generator output until the value of the receiver reach the previously recorded (Pr). The power of signal source (Pmea) is recorded. The test should be performed by rotating the test item and adjusting the receiving antenna polarization.

A “reference path loss” should be calculated after test. The attenuation of “reference path loss” is the cable loss between the Signal Source with the Substitution Antenna (Pca) and the Substitution Antenna Gain (Ga).

The measurement results are obtained as described below:

$$\text{Power (EIRP)} = P_{mea} + P_{ca} + G_a$$

This value is EIRP since the measurement is calibrated using an antenna of known gain (2.15dB) and known input power. ERP can be calculated from EIRP by subtracting the gain of the dipole, ERP = EIRP – 2.15 (dB).

**Limits for GSM850:**

Operation Mode	Power Step	E.R.P. (dBm)
GSM	5	≤38.45
GPRS	3	≤38.45
EDGE	6	≤38.45

**Limits for PCS1900:**

Operation Mode	Power Step	E.I.R.P. (dBm)
GSM	0	≤33
GPRS	3	≤33
EDGE	5	≤33

**Test result:**

The test results are shown in Appendix B.

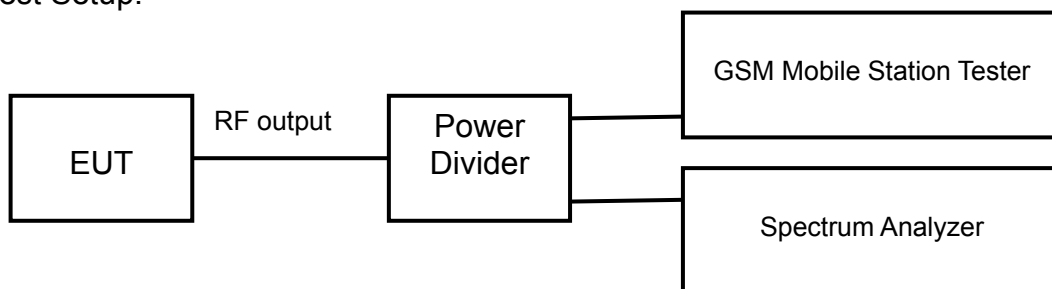
### 6.3 Occupied Bandwidth

Rule Part(s)  
Part 2.1049

Ambient condition:

Temperature	Relative humidity	Pressure
25°C	30%	101.9kPa

Test Setup:



Test procedure:

KDB 971168 D01 v03r01 – Section 4.2

#### Test Settings

1. The signal analyzer's automatic bandwidth measurement capability was used to perform the 99% occupied bandwidth and the 26dB bandwidth. The bandwidth measurement was not influenced by any intermediate power nulls in the fundamental emission.
2. RBW = 1 – 5% of the expected OBW
3. VBW  $\geq$  3 x RBW
4. Detector = Peak
5. Trace mode = max hold
6. Sweep = auto couple
7. The trace was allowed to stabilize
8. If necessary, steps 2 – 7 were repeated after changing the RBW such that it would be within 1 – 5% of the 99% occupied bandwidth observed in Step 7

Limits: No specific occupied bandwidth requirements in part 2.1049

Test result:

The test results are shown in Appendix A.

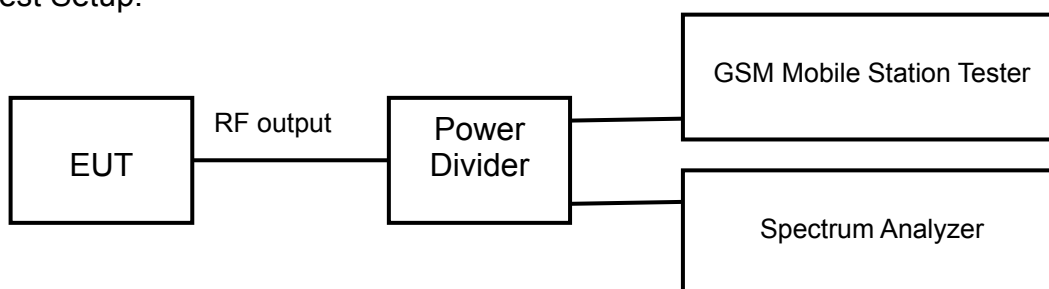
## 6.4 Emission Bandwidth-

Rule Part(s)  
Part 2.1049

Ambient condition:

Temperature	Relative humidity	Pressure
25°C	30%	101.9kPa

Test Setup:



Test procedure:

KDB 971168 D01 v03r01 – Section 4.2

Test Settings

1. The signal analyzer's automatic bandwidth measurement capability was used to perform the 26dB occupied bandwidth and the 26dB bandwidth. The bandwidth measurement was not influenced by any intermediate power nulls in the fundamental emission.
2. RBW = 1 – 5% of the expected OBW
3. VBW  $\geq$  3 x RBW
4. Detector = Peak
5. Trace mode = max hold
6. Sweep = auto couple
7. The trace was allowed to stabilize
8. If necessary, steps 2 – 7 were repeated after changing the RBW such that it would be within 1 – 5% of the emission bandwidth observed in Step 7

Limits: No specific occupied bandwidth requirements in part 2.1049

Test result:

The test results are shown in Appendix A.

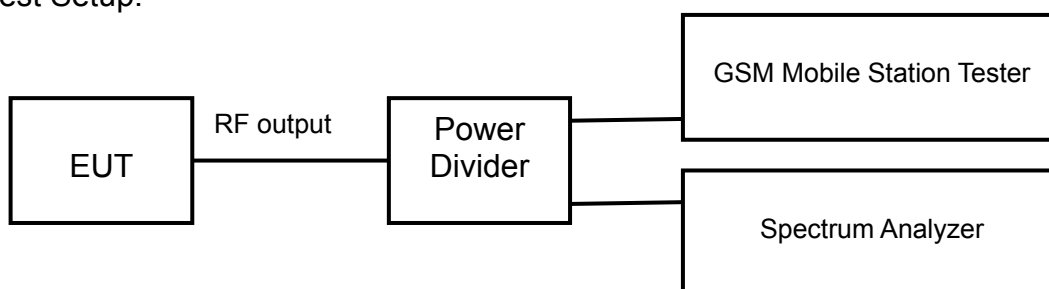
## 6.5 Spurious Emissions at antenna terminal

Rule Part(s)  
FCC Part 2.1053/22.917 (a)/ 24.238(a)

Ambient condition:

Temperature	Relative humidity	Pressure
25°C	30%	101.9kPa

Test Setup:



Test procedure:  
KDB 971168 D01 v03r01 – Section 6.0

### Test Settings

1. Start frequency was set to 30MHz and stop frequency was set to 10GHz for Cell, 20GHz for PCS
2. RBW=100 kHz (For below 1GHz), 1MHz (For above 1GHz)
3. VBW ≥ 3 x RBW
4. Detector = RMS
5. Trace mode = trace average for continuous emissions, max hold for pulse emissions
6. Sweep time = auto couple
7. The trace was allowed to stabilize

### Limits:

The minimum permissible attenuation level of any spurious emission is  $43 + \log_{10}(P_{\text{[Watts]}})$ , where P is the transmitter power in Watts.

### Test result:

The test results are shown in Appendix A.

## 6.6 Band Edges Compliance

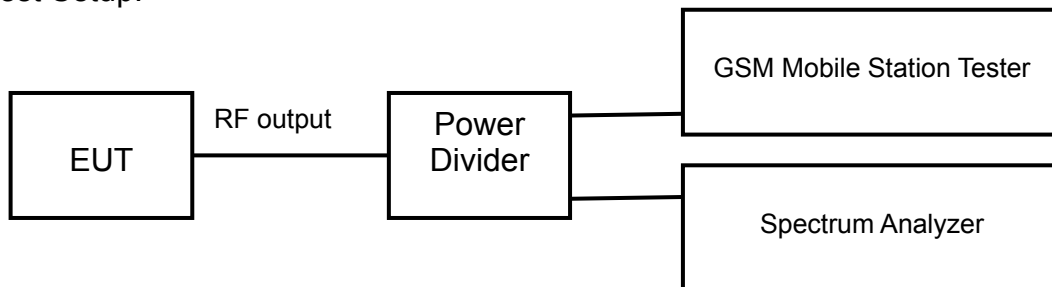
Rule Part (s)

FCC Part 2.1051/ 22.917(a) /Part 24.238(a)

Ambient condition:

Temperature	Relative humidity	Pressure
25°C	30%	101.9kPa

Test Setup:



Test procedure:

KDB 971168 D01 v03r01 – Section 6.0

Test Settings

1. Start and stop frequency were set such that the band edge would be placed in the center of the plot
2. Span=2MHz
3. RBW > 1% of the emission bandwidth
4. VBW > 3 x RBW
5. Detector = RMS
6. Number of sweep points  $\geq 2 \times \text{Span}/\text{RBW}$
7. Trace mode = trace average for continuous emissions, max hold for pulse emissions
8. Sweep time = auto couple
9. The trace was allowed to stabilize

Limit: The minimum permissible attenuation level of any spurious emission is  $43 + \log_{10}(P_{\text{[Watts]}})$ , where P is the transmitter power in Watts.

Test result:

The test results are shown in Appendix A.

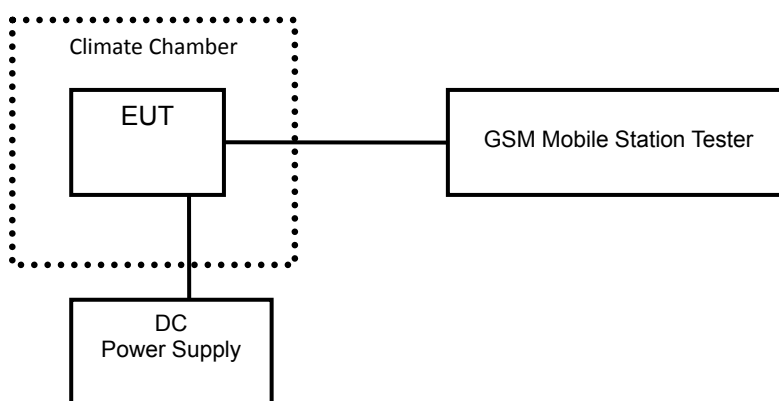
## 6.7 Frequency Stability

Rule Part(s)  
FCC Part 2.1055/22.355 /Part 24.235

Ambient condition:

Temperature	Relative humidity	Pressure
25°C	30%	101.9kPa

Test setup:



Test Procedure:  
ANSI/TIA-603-E-2016

### Test Settings

1. The carrier frequency of the transmitter is measured at room temperature (20°C to provide a reference).
2. The equipment is turned on in a “standby” condition for fifteen minutes before applying power to the transmitter. Measurement of the carrier frequency of the transmitter is made within one minute after applying power to the transmitter.
3. Frequency measurements are made at 10°C intervals ranging from -30°C to +50°C (The temperature range can be declared by the manufacturer). A period of at least one half-hour is provided to allow stabilization of the equipment at each temperature level.

Limits: For Part 22, the frequency stability of the transmitter shall be maintained within  $\pm 0.00025\%$  ( $\pm 2.5$  ppm) of the center frequency. For Part 24, the frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.

Test result:  
The test results are shown in Appendix A.



## 6.8 Radiated Spurious Emissions

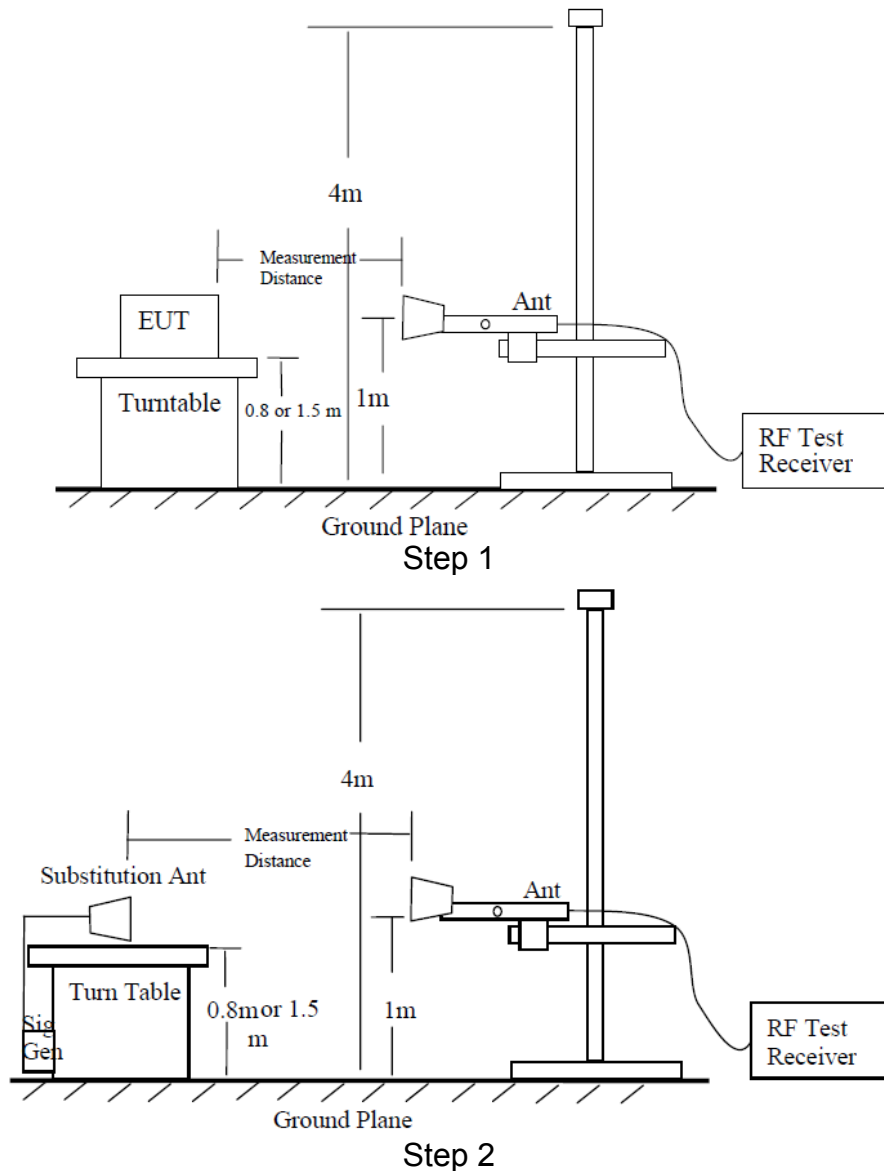
Rule Part(s)

FCC Part2.1053/ 22.917(a)/Part 24.238(a)

Ambient condition:

Temperature	Relative humidity	Pressure
25°C	30%	101.9kPa

Test Setup:



**Test procedure:**

The measurements procedures in TIA-603-E-2016 are used.

The spectrum was scanned from 30MHz to the 10th harmonic of the highest frequency generated within the equipment.

**Step 1:**

The measurement is carried out in the chamber. EUT was placed on a 0.8m ( $f < 1\text{GHz}$ )/1.5m ( $f > 1\text{GHz}$ ) high non-conductive table at a 3 meters test distance from the test receive antenna. A receiving antenna was placed on the antenna mast 3 meters from the EUT. The height of receiving antenna from 1m to 4m and varies in certain range to find the maximum power value. A radio link shall be established between EUT and Tester. The output power of the cell signal of the tester will be decreased until the output power of the EUT reach a maximum value. A peak detector is used and RBW is set to 100 kHz ( $f < 1\text{GHz}$ )/1MHz ( $f > 1\text{GHz}$ ). The antenna shall be performed under horizontal and vertical polarization. The turn table shall be rotated from 0 to 360 degrees for detecting the maximum power value on spectrum analyzer or receiver. The spectrum analyzer scans from 30MHz to 10th harmonic of the carrier. A notch filter is necessary in the band near to the carrier frequency. A high pass filter is needed to avoid the distortion of the testing equipment in the band above the carrier frequency.

**Step 2:**

A log-periodic antenna or double-ridged waveguide horn antenna shall be substituted in place of the EUT. The log-periodic antenna will be driven by a signal generator and the level will be adjusted till the same power value on the spectrum analyzer or receiver. The level of the spurious emissions can be calculated through the level of the signal generator, cable loss, the gain of the substitution antenna and the reading of the spectrum analyzer or receiver.

A power ( $P_{mea}$ ) is applied to the input of the substitution antenna, and adjusts the level of the signal generator output until the value of the receiver reach the previously recorded ( $P_r$ ). The power of signal source ( $P_{mea}$ ) is recorded. The test should be performed by rotating the test item and adjusting the receiving antenna polarization.

A "reference path loss" should be calculated after test. The attenuation of "reference path loss" is the cable loss between the Signal Source with the Substitution Antenna ( $P_{ca}$ ) and the Substitution Antenna Gain ( $G_a$ ).

**Calculation procedure:**

The data of cable loss and antenna gain has been calibrated in full testing frequency range before the testing.

The power of the Radiated Spurious Emissions is calculated by adding the cable loss and antenna gain. The basic equation with a sample calculation is as followed:

$$\text{Power (EIRP)} = P_{mea} + P_{ca} + G_a$$

This value is EIRP since the measurement is calibrated using an antenna of known gain (2.15dB) and known input power. ERP can be calculated from EIRP by subtracting the gain of the dipole,  $ERP = EIRP - 2.15 \text{ (dB)}$ .

Assumed the power of signal source record is -20dBm. A cable loss of -30dB, and an antenna gain of 11dB are added.

$$P = P_{mea} + P_{ca} + G_a = (-20\text{dBm}) + (-30\text{dB}) + (11\text{dB}) = -39\text{dBm}$$

**Test result:**

The test results are shown in Appendix B.

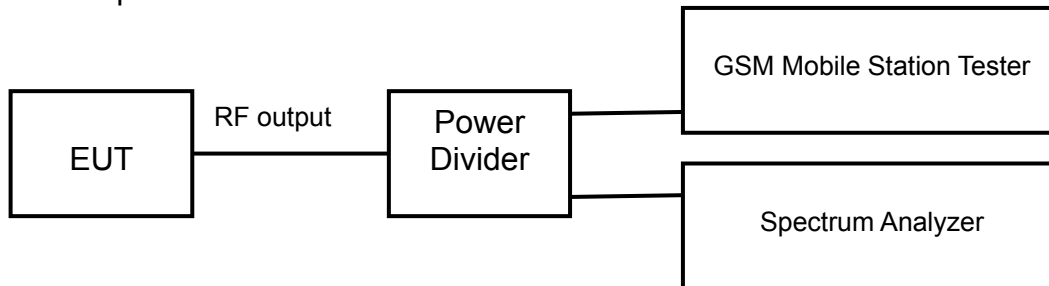
## 6.9 Peak-Average Ratio

Rule Part(s)  
FCC Part 24.232(d)

Ambient condition:

Temperature	Relative humidity	Pressure
25°C	30%	101.9kPa

Test Setup:



Test procedure:  
KDB 971168 D01 v03r01 – Section 5.7.1

Test settings:

1. The signal analyzer's CCDF measurement profile is enabled
2. Frequency = carrier center frequency
3. Measurement BW > Emission bandwidth of signal
4. The signal analyzer was set to collect one million samples to generate the CCDF curve
5. The measurement interval was set depending on the type of signal analyzed. For continuous signals (>98% duty cycle), the measurement interval was set to 1ms. For burst transmissions, the spectrum analyzer is set to use an internal "RF Burst" trigger that is synced with an incoming pulse and the measurement interval is set to less than the duration of the "on time" of one burst to ensure that energy is only captured during a time in which the transmitter is operating at maximum power

Limits: the peak-to-average ratio (PAR) of the transmission may not exceed 13 dB.

Test result:

The test results are shown in Appendix A

## 7 MEASUREMENT UNCERTAINTIES

Items	Uncertainty	
Occupied Bandwidth	3kHz	
Peak power output	0.67dB	
Band edge compliance	1.20dB	
Spurious emissions	30MHz~1GHz	2.83dB
	1GHz~12.75GHz	2.50dB
	12.75GHz~25GHz	2.75dB

## **8 TEST EQUIPMENTS**

No.	Name/Model	Manufacturer	S/N	Calibration Date	Calibration Due Date
1	E5515C(8960) Mobile Station Tester	Agilent	MY50266302	2019.08.20	2020.08.19
2	N9020A Spectrum Analyzer	Agilent	MY48010771	2019.08.20	2020.08.19
3	6007 Power Divider	Weinschel	6007-GJ-1	2019.08.20	2020.08.19
4	DC Power Supply E3645A	Agilent	MY40000741	2019.03.01	2020.02.29
5	Temperature chamber SH241	ESPEC	92013758	2019.08.20	2020.08.19
6	12.65m×8.03m×7.50m Fully-Anechoic Chamber	FRANKONIA	----	----	----
7	23.18m×16.88m×9.60m Semi-Anechoic Chamber	FRANKONIA	---	----	----
8	Turn table Diameter:1m	FRANKONIA	----	----	----
9	Turn table Diameter:5m	FRANKONIA	----	----	----
10	Antenna master FAC(MA4.0)	MATURO	----	----	----
11	Antenna master SAC(MA4.0)	MATURO	----	----	----
12	9.080m×5.255m×3.525m Shielding room	FRANKONIA	----	----	----
13	HF 907 Double-Ridged Waveguide Horn Antenna	R&S	100512	2019.08.20	2020.08.19
14	HF 907 Double-Ridged Waveguide Horn Antenna	R&S	100513	2019.08.20	2020.08.19
15	HL562 Ultra log antenna	R&S	100016	2019.08.20	2020.08.19
16	3160-09 Receive antenna	SCHWARZ-BECK	002058-002	2019.08.20	2020.08.19
17	ESI 40 EMI test receiver	R&S	100015	2019.08.20	2020.08.19
18	ESCS30 EMI test receiver	R&S	100029	2019.08.20	2020.08.19
19	HL562 Receive antenna	R&S	100167	2019.08.20	2020.08.19
20	ENV216 AMN	R&S	3560.6550.12	2019.08.20	2020.08.19

## APPENDIX A – TEST DATA OF CONDUCTED EMISSION

### RF Power Output

GSM850

GSM Measured Power:

Carrier frequency (MHz)	Channel No.	RF Power Output (dBm)
824.2	128	33.26
836.4	189	33.15
848.8	251	33.14

GPRS/EGPRS (GMSK) Measured Power:

Carrier frequency (MHz)	Channel No.	TX Mode	RF Power Output (dBm)
824.2	128	4Downlink1uplink	33.26
836.4	189		33.15
848.8	251		33.14
824.2	128	3Downlink2uplink	31.18
836.4	189		31.05
848.8	251		30.93
824.2	128	2Downlink3uplink	29.27
836.4	189		29.14
848.8	251		29.04
824.2	128	1Downlink4uplink	27.14
836.4	189		27.06
848.8	251		26.98

EGPRS (8PSK) Measured Power:

Carrier frequency (MHz)	Channel No.	TX Mode	RF Power Output (dBm)
824.2	128	8PSK 4Downlink1uplink	26.31
836.4	189		26.56
848.8	251		26.41
824.2	128	8PSK 3Downlink2uplink	25.25
836.4	189		25.32
848.8	251		25.14
824.2	128	8PSK 2Downlink3uplink	22.75
836.4	189		22.84
848.8	251		22.68
824.2	128	8PSK 1Downlink4uplink	20.43
836.4	189		20.48
848.8	251		20.16

PCS1900

GSM Measured Power:

Carrier frequency (MHz)	Channel No.	RF Power Output (dBm)
1850.2	512	30.47
1880.0	661	30.38
1909.8	810	30.23

GPRS/EGPRS (GMSK) Measured Power:

Carrier frequency (MHz)	Channel No.	TX Mode	RF Power Output (dBm)
1850.2	512	4Downlink1uplink	30.47
1880.0	661		30.38
1909.8	810		30.23
1850.2	512	3Downlink2uplink	28.22
1880.0	661		28.13
1909.8	810		27.97
1850.2	512	2Downlink3uplink	26.57
1880.0	661		26.47
1909.8	810		26.30
1850.2	512	1Downlink4uplink	24.37
1880.0	661		24.28
1909.8	810		24.14

EGPRS (8PSK) Measured Power:

Carrier frequency (MHz)	Channel No.	TX Mode	RF Power Output (dBm)
1850.2	512	8PSK 4Downlink1uplink	26.15
1880.0	661		26.76
1909.8	810		26.40
1850.2	512	8PSK 3Downlink2uplink	24.57
1880.0	661		25.43
1909.8	810		24.82
1850.2	512	8PSK 2Downlink3uplink	22.23
1880.0	661		23.10
1909.8	810		22.50
1850.2	512	8PSK 1Downlink4uplink	19.16
1880.0	661		20.02
1909.8	810		19.34

### Occupied Bandwidth

GSM850

GPRS MODE:

Carrier frequency (MHz)	Channel No.	Bandwidth of 99% Power (kHz)
824.2	128	240.43
836.4	189	241.49
848.8	251	247.62

EDGE (8PSK) MODE:

Carrier frequency (MHz)	Channel No.	Bandwidth of 99% Power (kHz)
824.2	128	245.82
836.4	189	246.18
848.8	251	246.47

PCS1900

GPRS MODE:

Carrier frequency (MHz)	Channel No.	Bandwidth of 99% Power (kHz)
1850.2	512	248.45
1880.0	661	241.48
1909.8	810	240.14

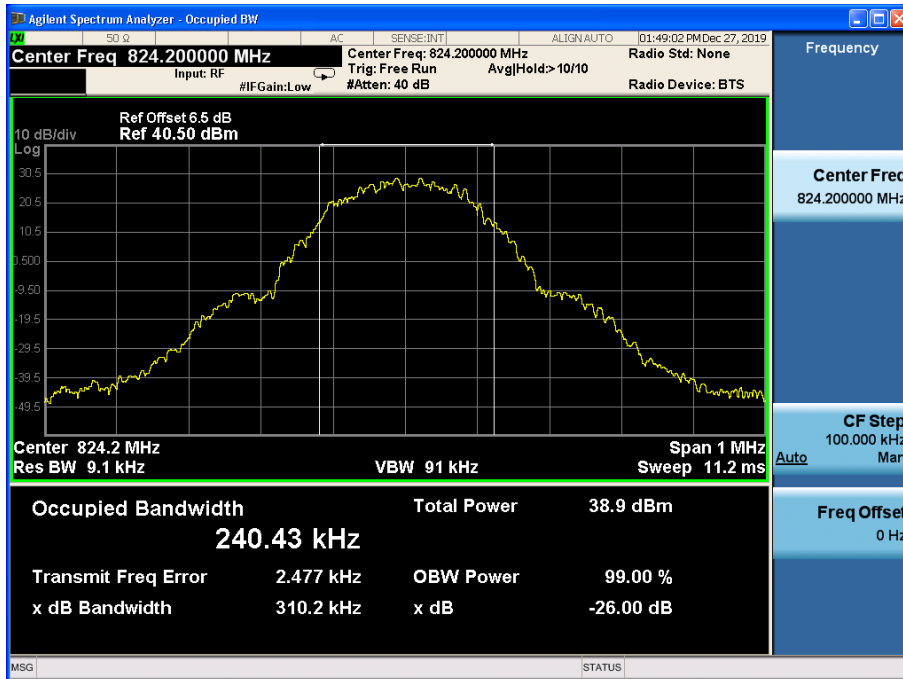
EDGE (8PSK) MODE:

Carrier frequency (MHz)	Channel No.	Bandwidth of 99% Power (kHz)
1850.2	512	243.47
1880.0	661	250.07
1909.8	810	240.14

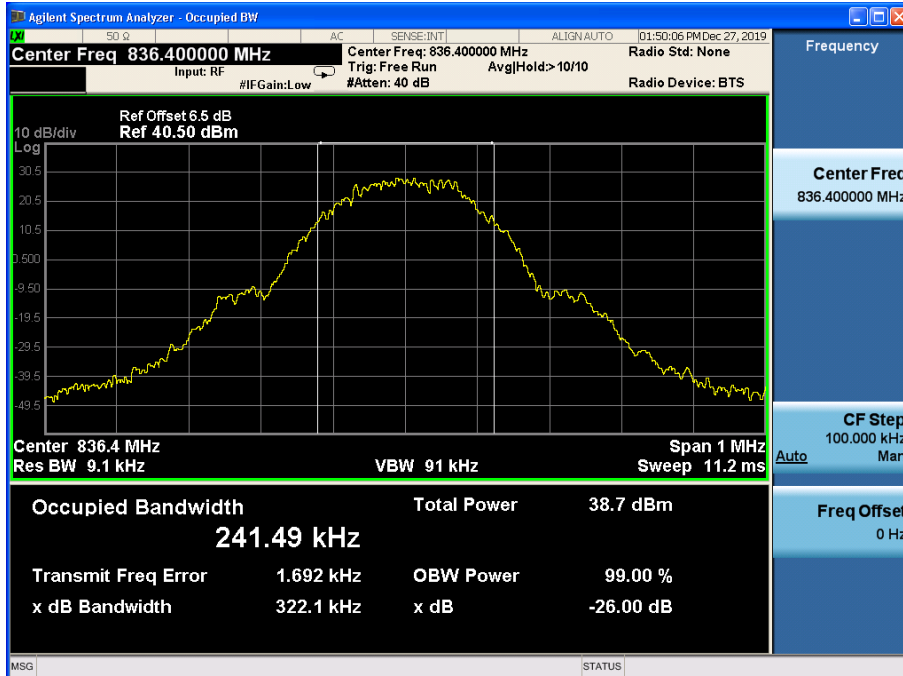


GSM850

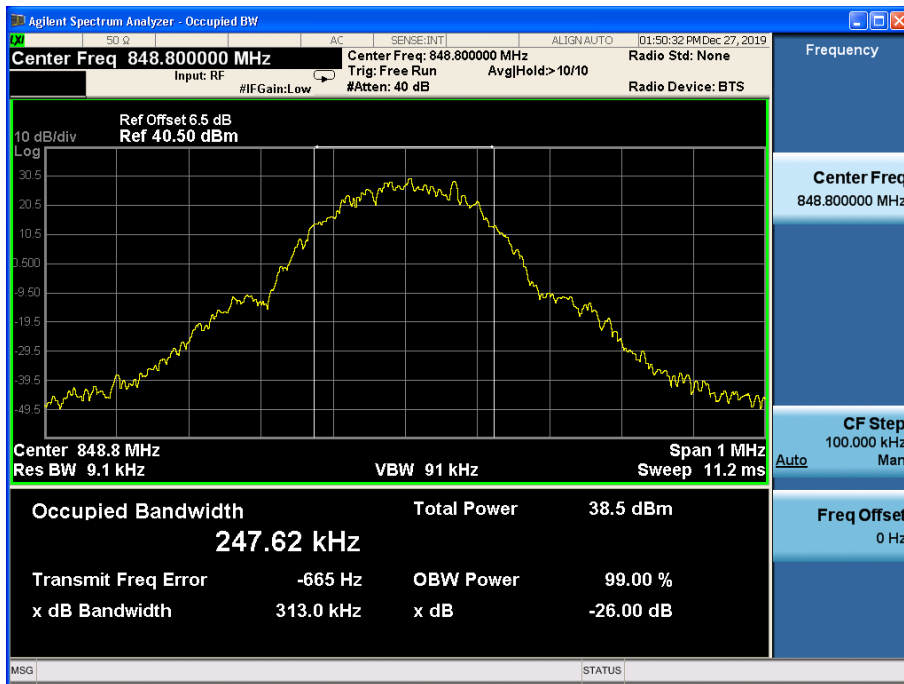
GPRS MODE:



Channel 128



Channel 189

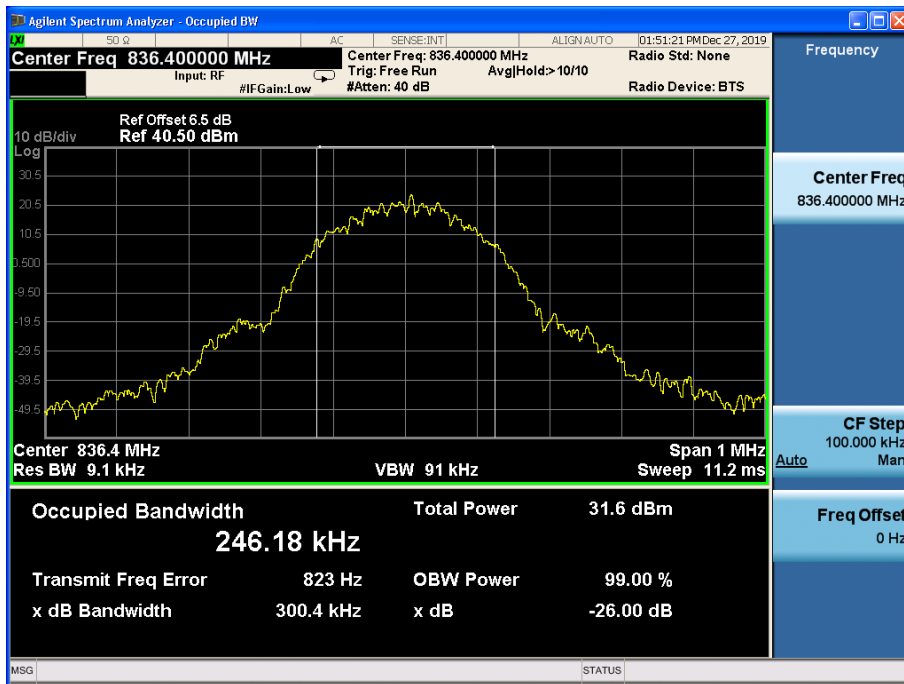


Channel 251

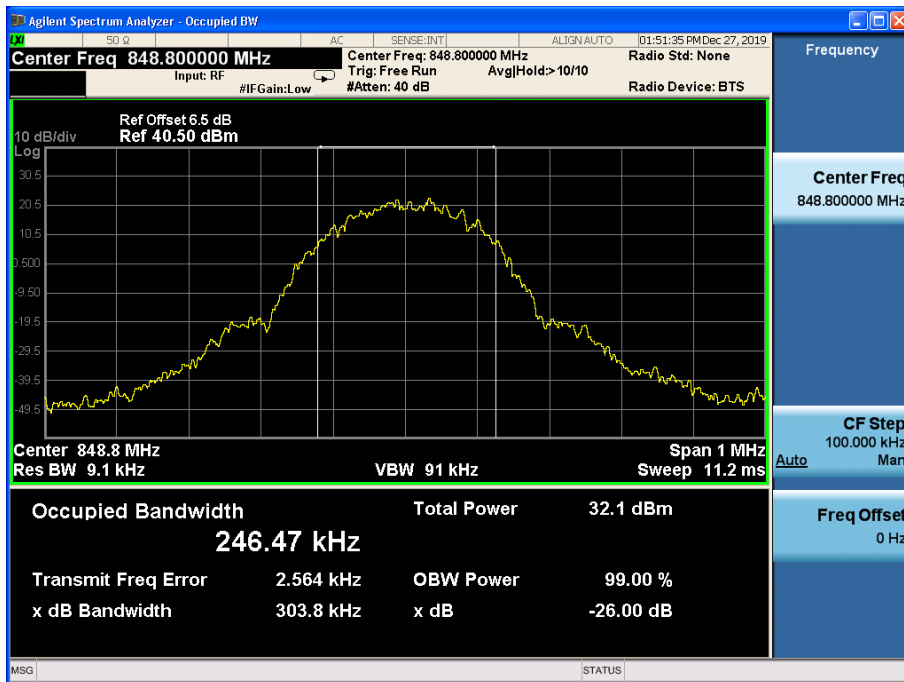
EDGE (8PSK) MODE:



Channel 128



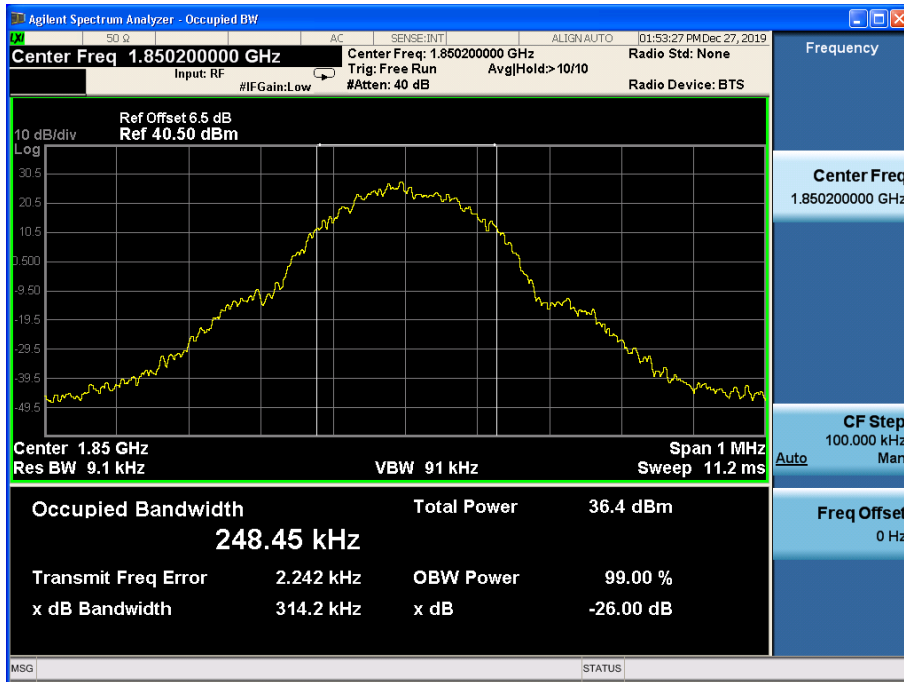
Channel 189



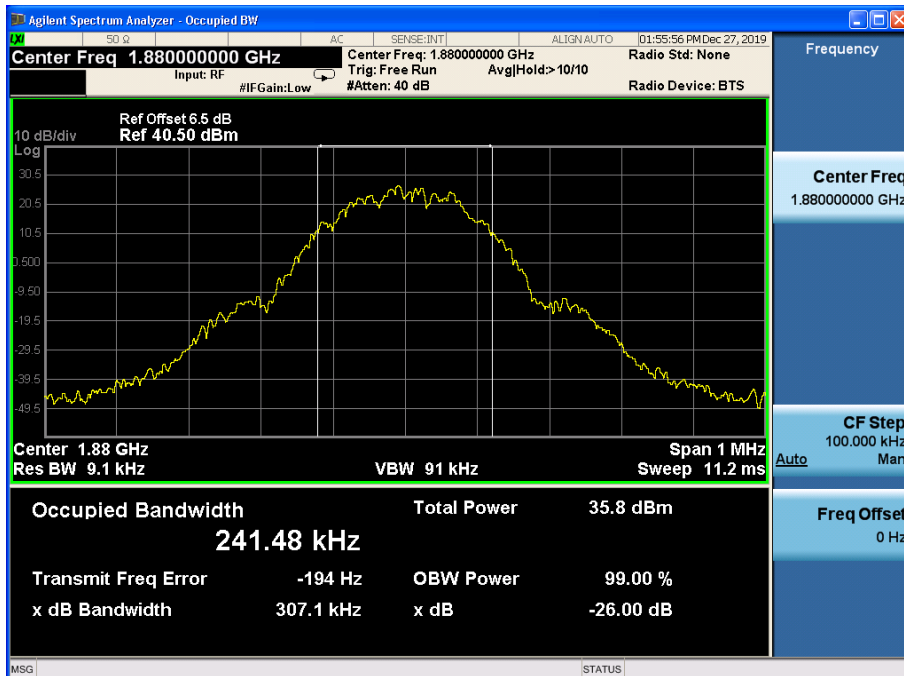
Channel 251

PCS1900

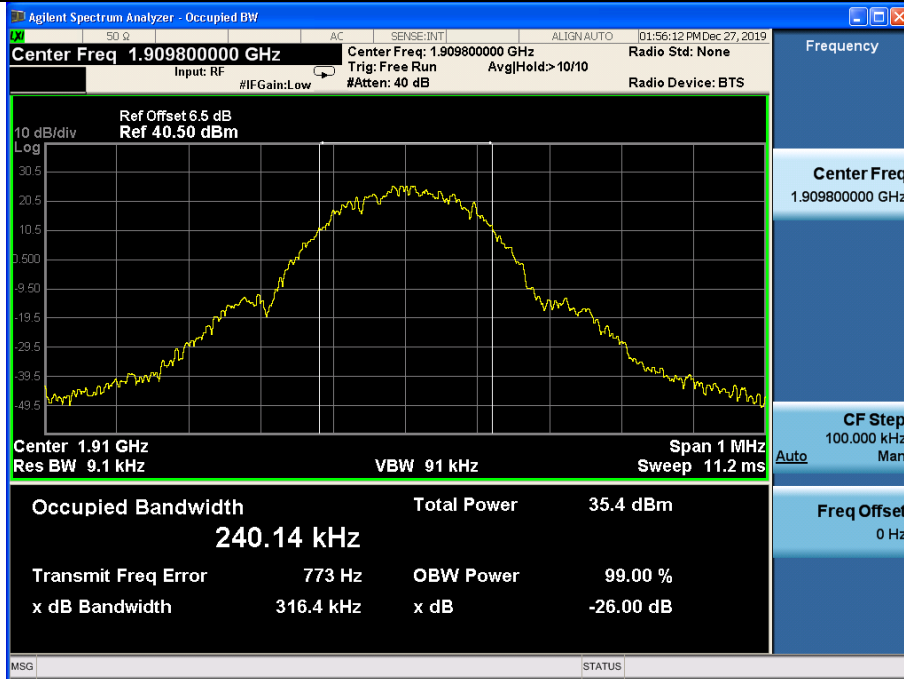
GPRS MODE:



Channel 512

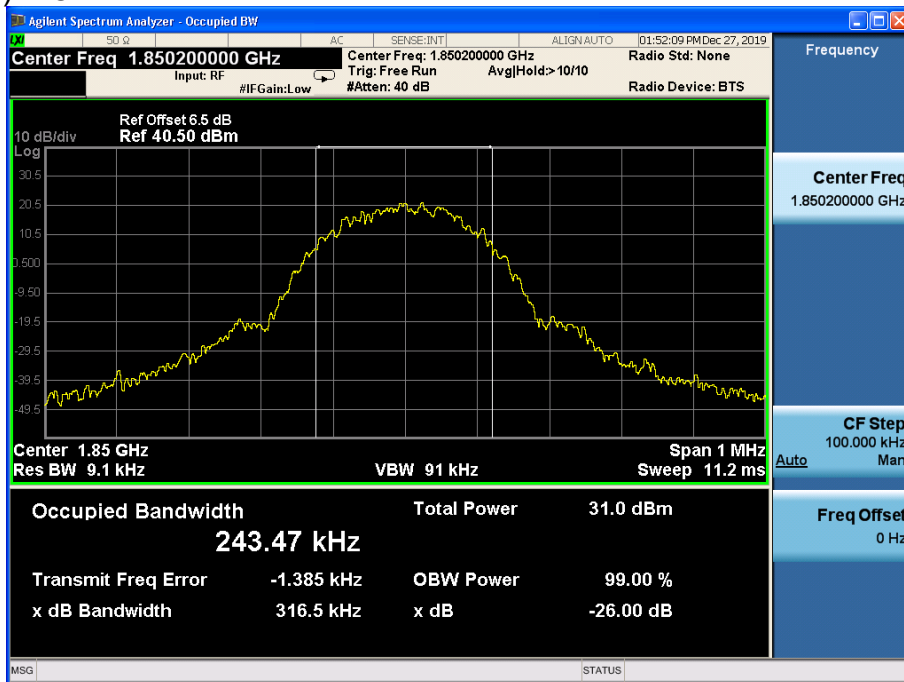


Channel 661

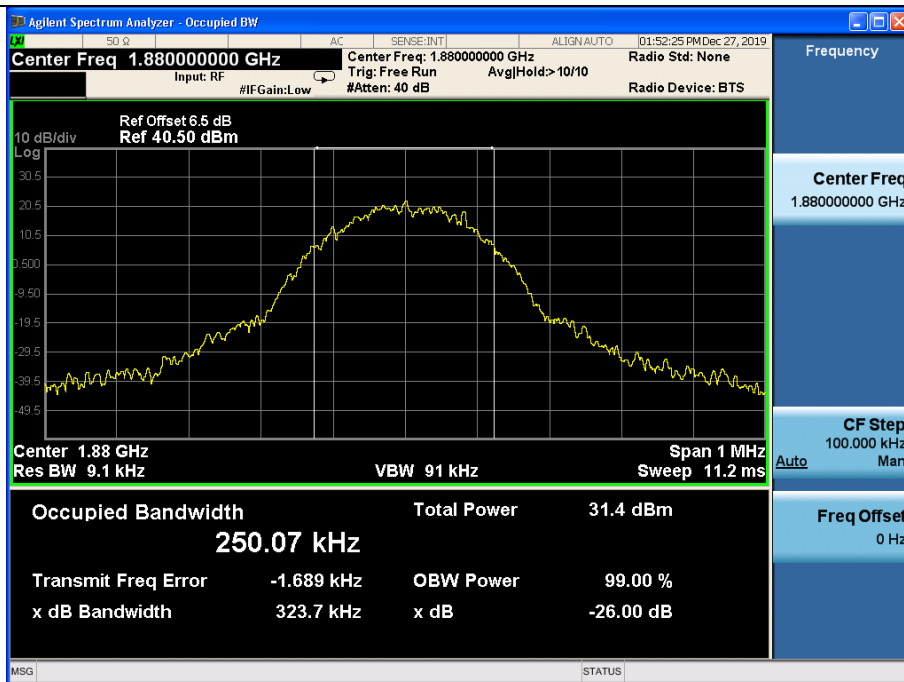


Channel 810

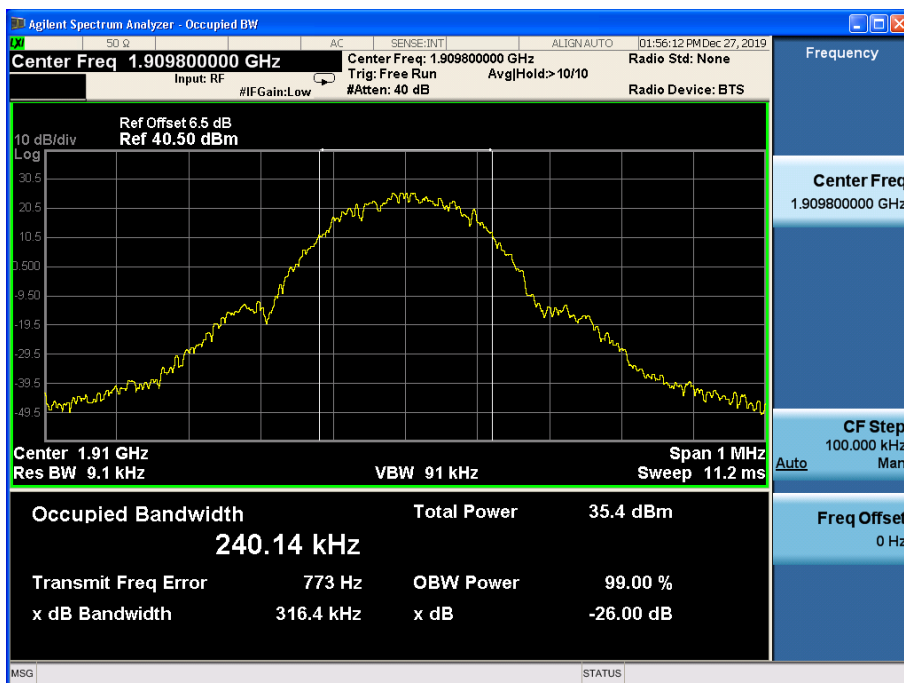
EDGE (8PSK) MODE:



Channel 512



Channel 661



Channel 810

## Emission Bandwidth

GSM850

GSM/GPRS MODE:

Carrier frequency (MHz)	Channel No.	Bandwidth of -26dB transmitter power (kHz)
824.2	128	310.2
836.4	189	322.1
848.8	251	313.0

EDGE (8PSK) MODE:

Carrier frequency (MHz)	Channel No.	Bandwidth of -26dB transmitter power (kHz)
824.2	128	317.9
836.4	189	300.4
848.8	251	303.8

PCS1900

GSM/GPRS MODE:

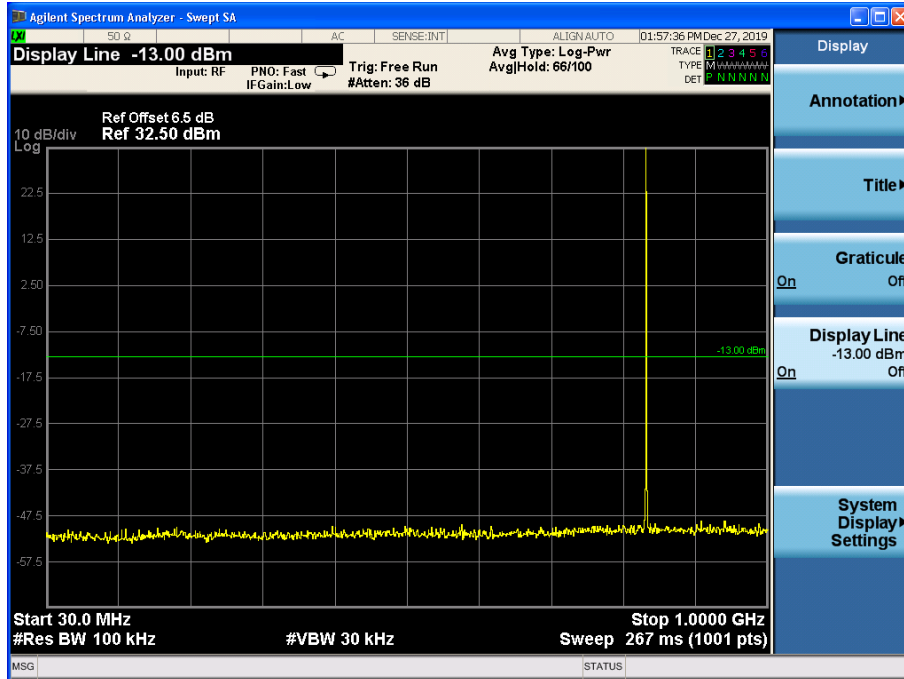
Carrier frequency (MHz)	Channel No.	Bandwidth of -26dB transmitter power (kHz)
1850.2	512	314.2
1880.0	661	307.1
1909.8	810	316.4

EDGE (8PSK) MODE:

Carrier frequency (MHz)	Channel No.	Bandwidth of -26dB transmitter power (kHz)
1850.2	512	316.5
1880.0	661	323.7
1909.8	810	316.4

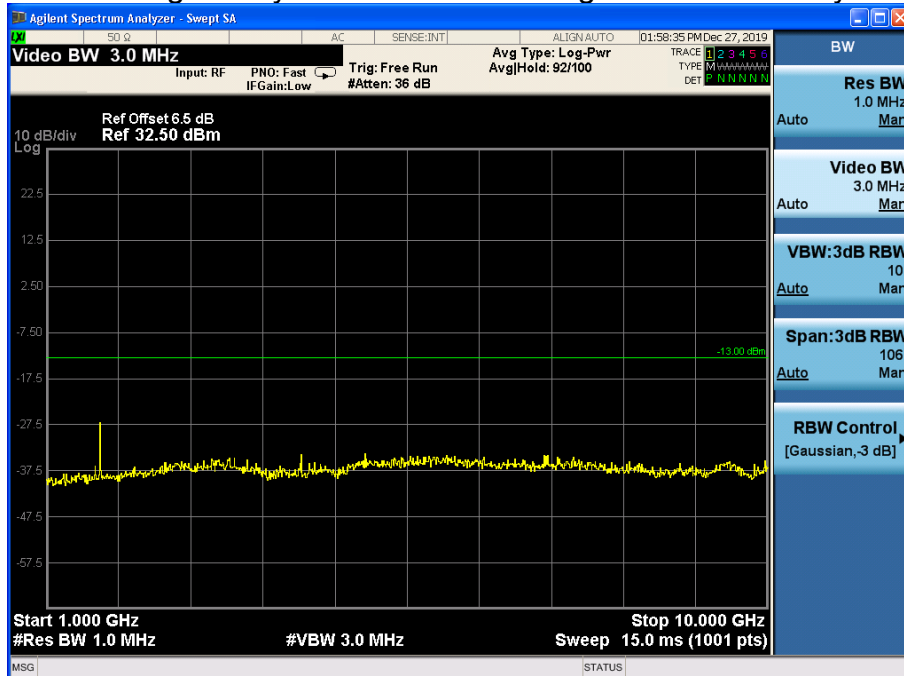
## Spurious Emissions at antenna terminal GSM850

GPRS MODE:



Channel 189, 30MHz~1GHz

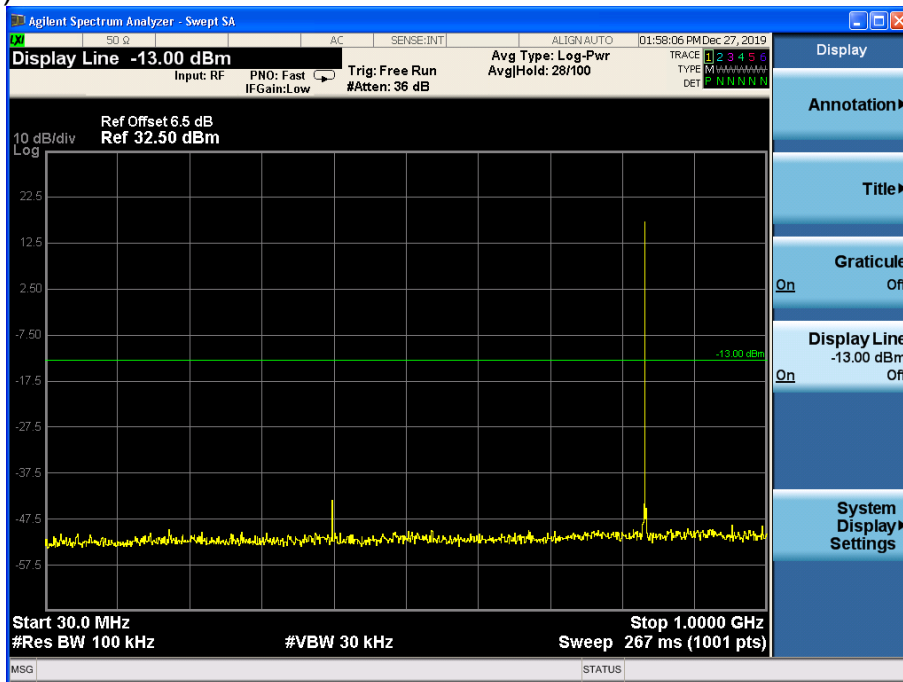
Note: The signal beyond the limit is the signal transmitted by EUT.



Channel 189, 1GHz~10GHz

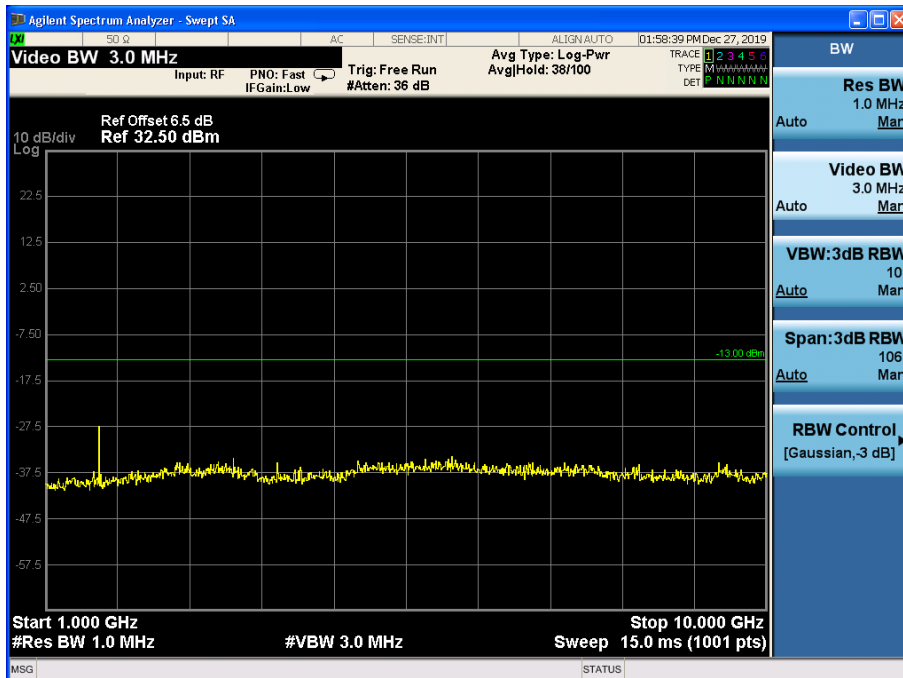


EDGE (8PSK) MODE:



Channel 189, 30MHz~1GHz

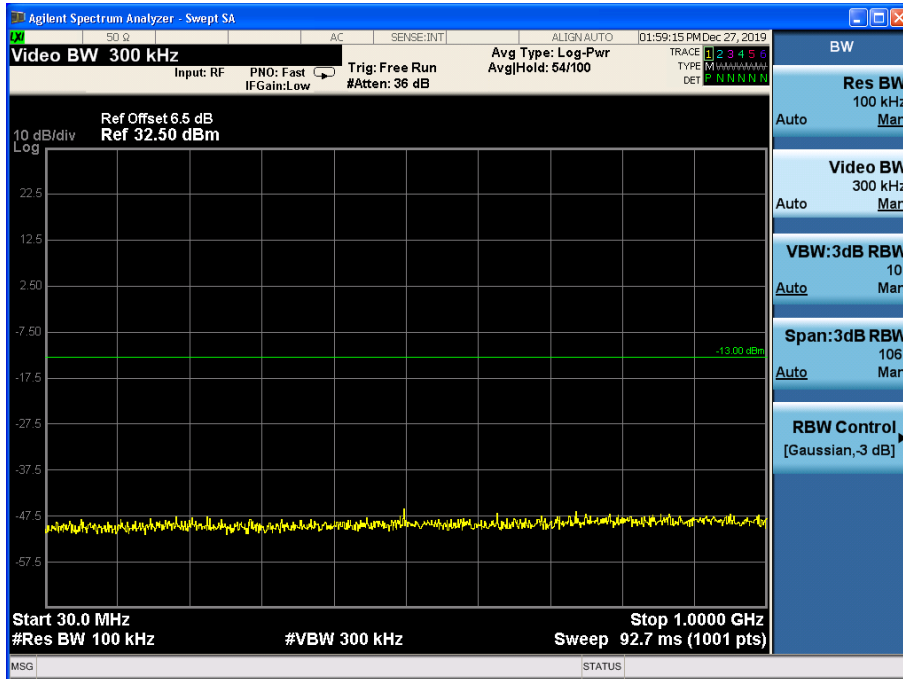
Note: The signal beyond the limit is the signal transmitted by EUT.



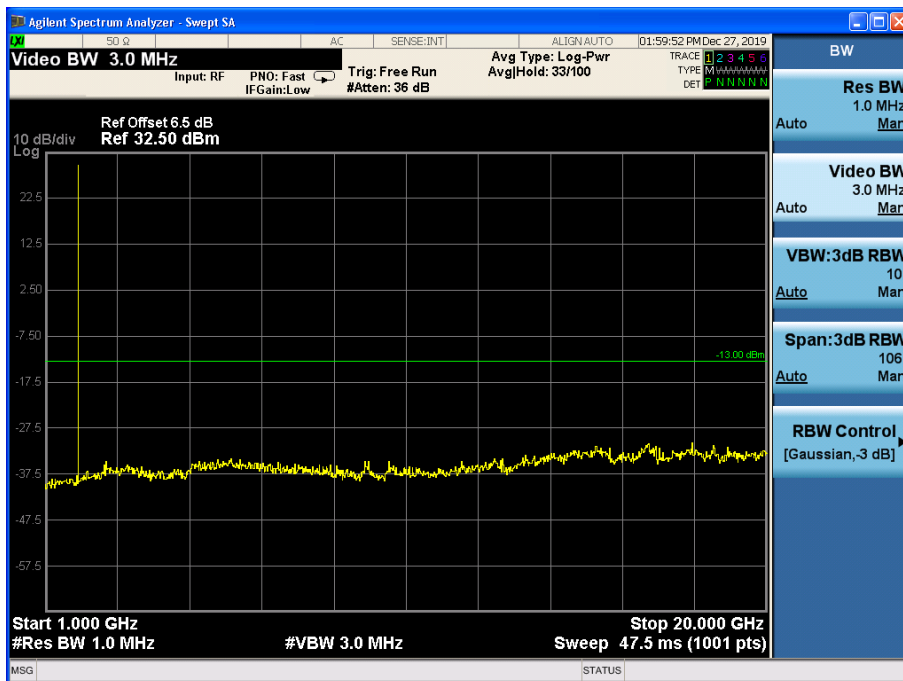
Channel 189, 1GHz~10GHz

PCS1900

GPRS MODE:



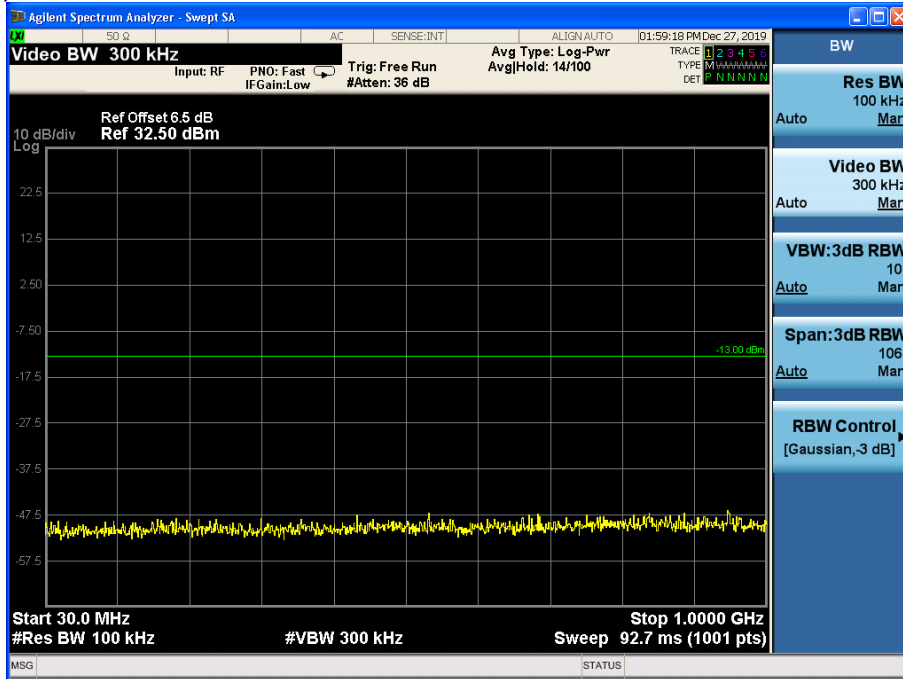
Channel 661, 30MHz~1GHz



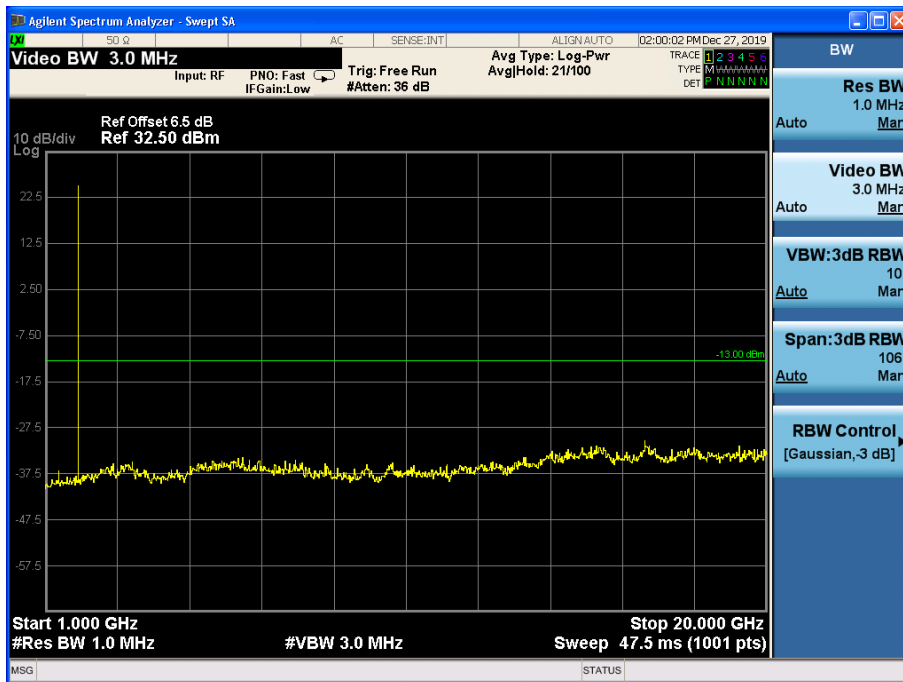
Channel 661, 1GHz~20GHz

Note: The signal beyond the limit is the signal transmitted by EUT.

EDGE (8PSK) MODE:



Channel 661, 30MHz~1GHz



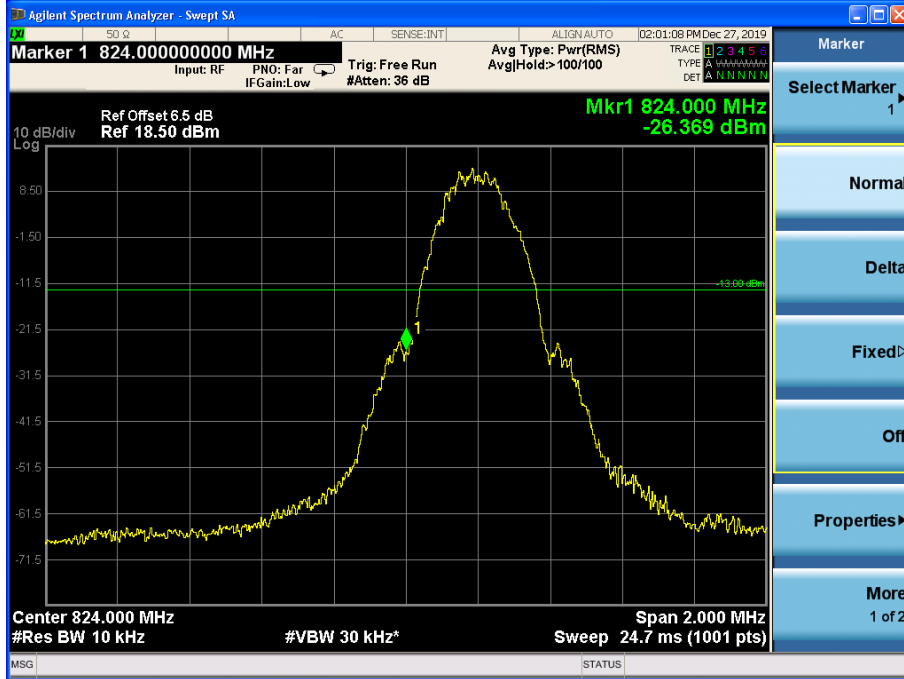
Channel 661, 1GHz~20GHz

Note: The signal beyond the limit is the signal transmitted by EUT.

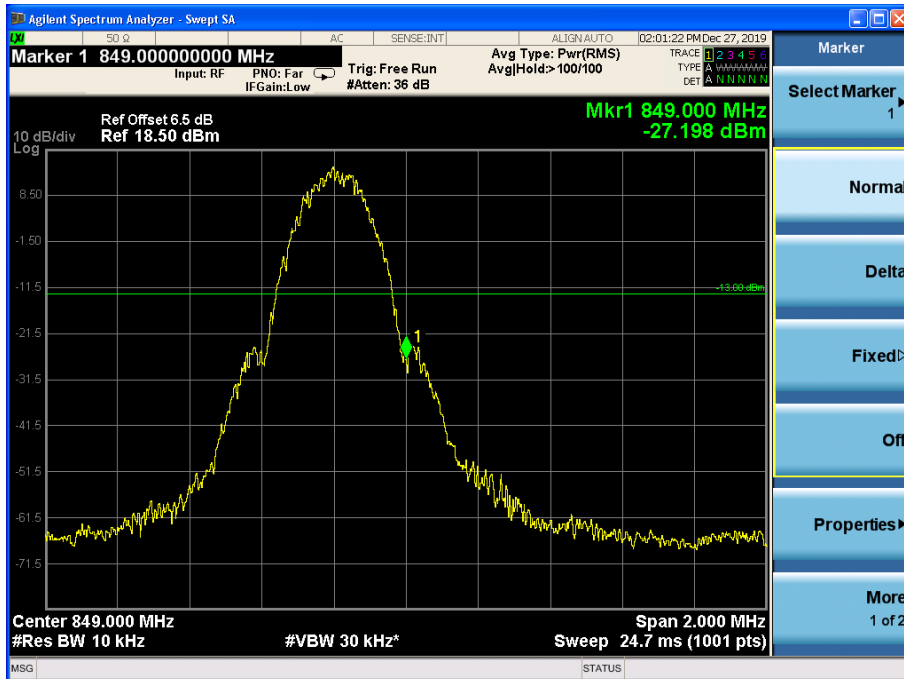
## Band Edges Compliance

GSM850

GPRS MODE:

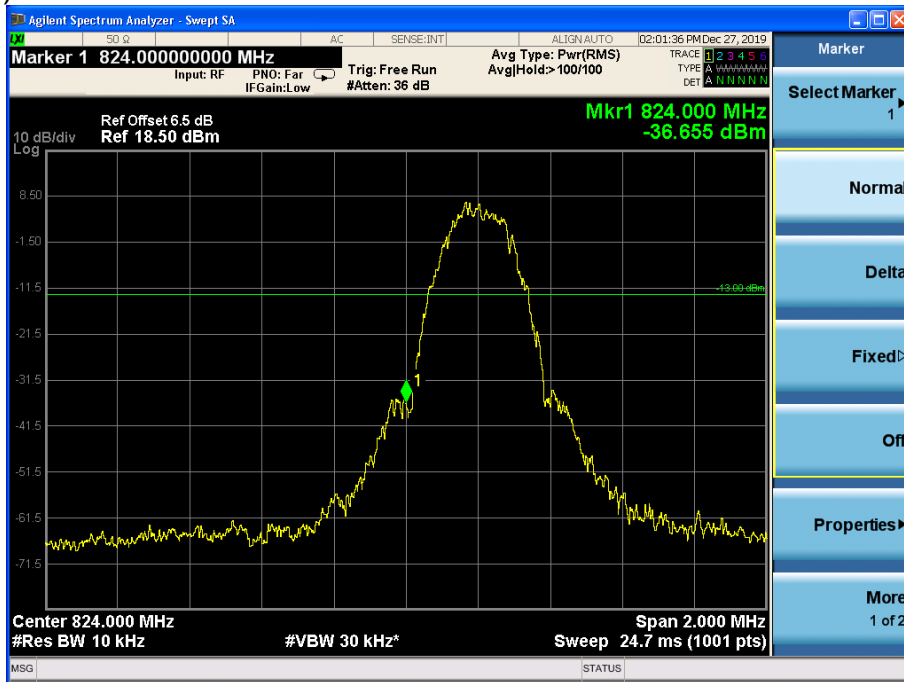


Channel 128

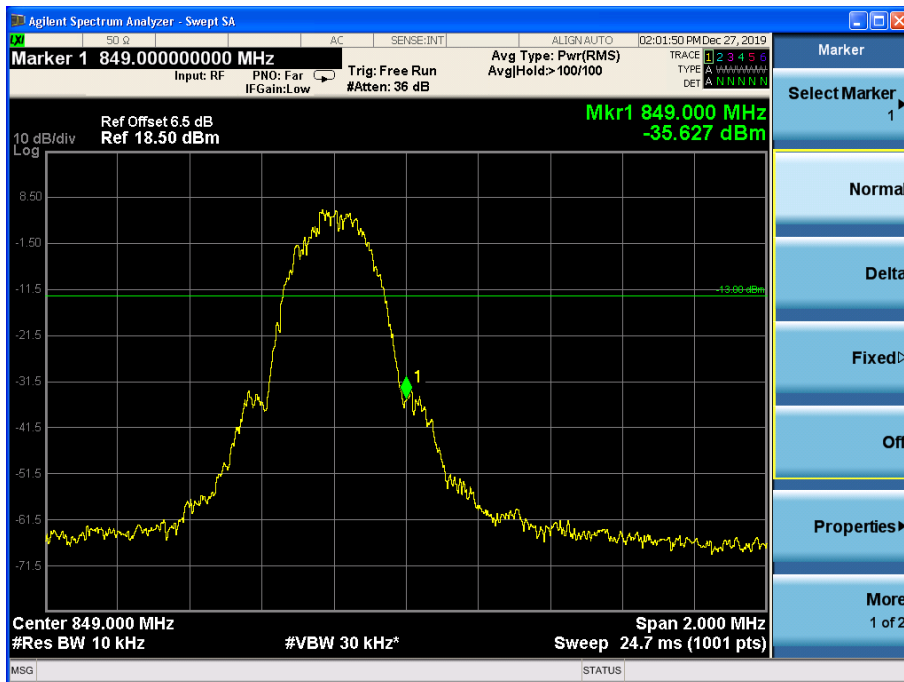


Channel 251

EDGE (8PSK) MODE:



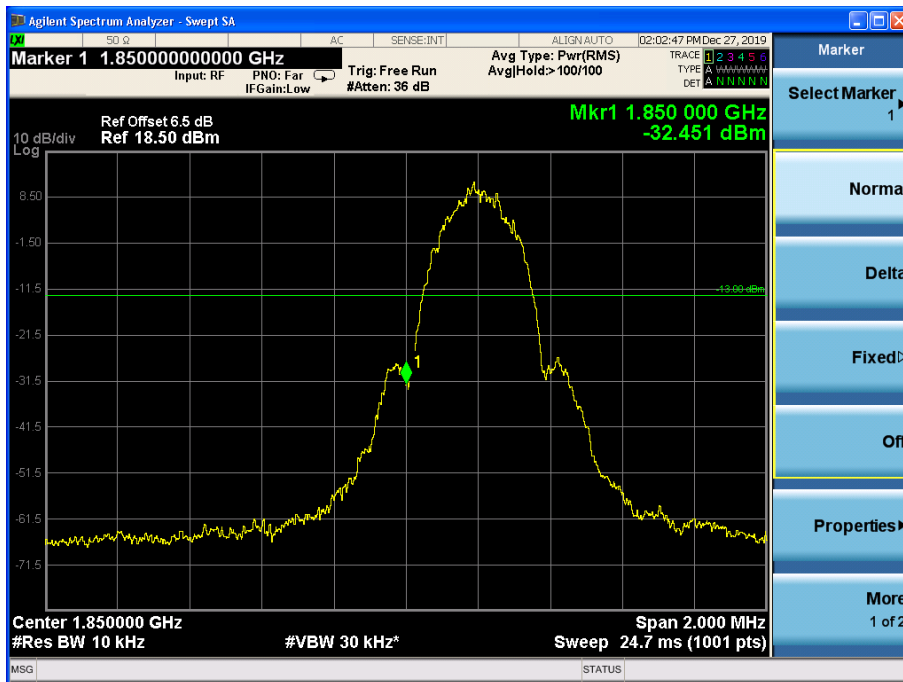
Channel 128



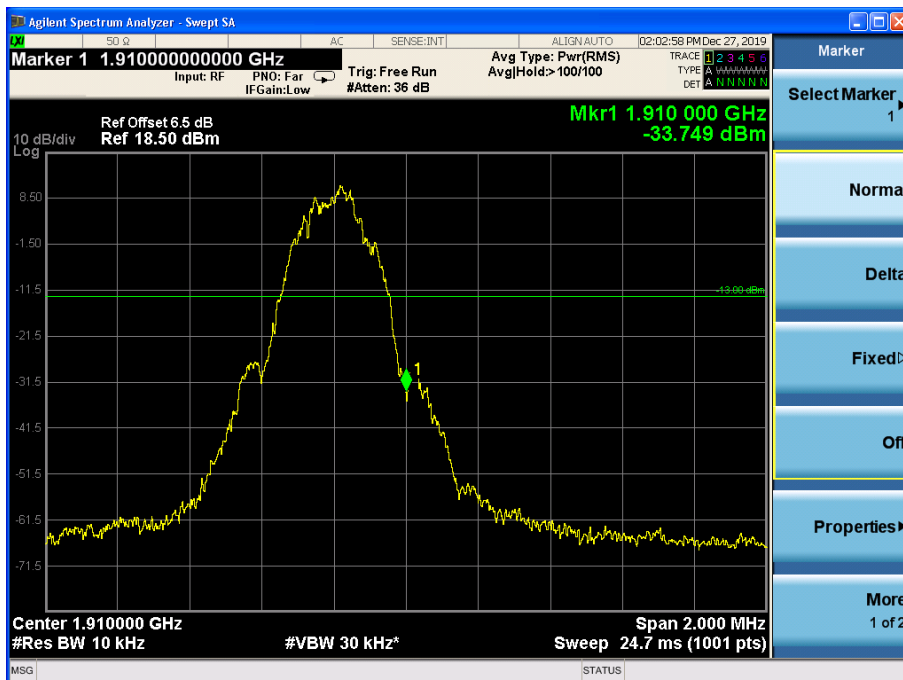
Channel 251

PCS1900

GPRS MODE:

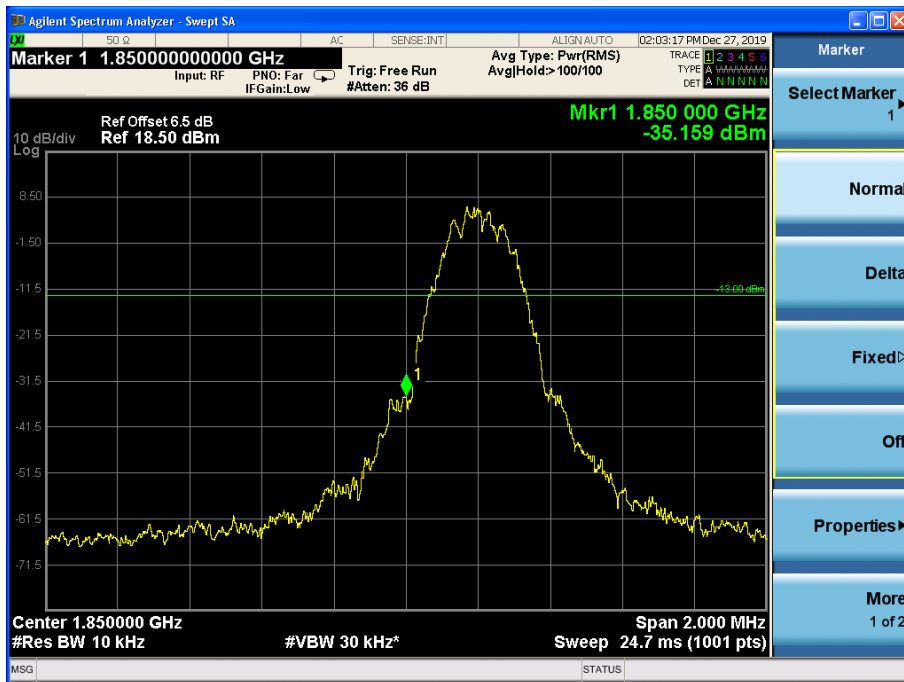


Channel 512

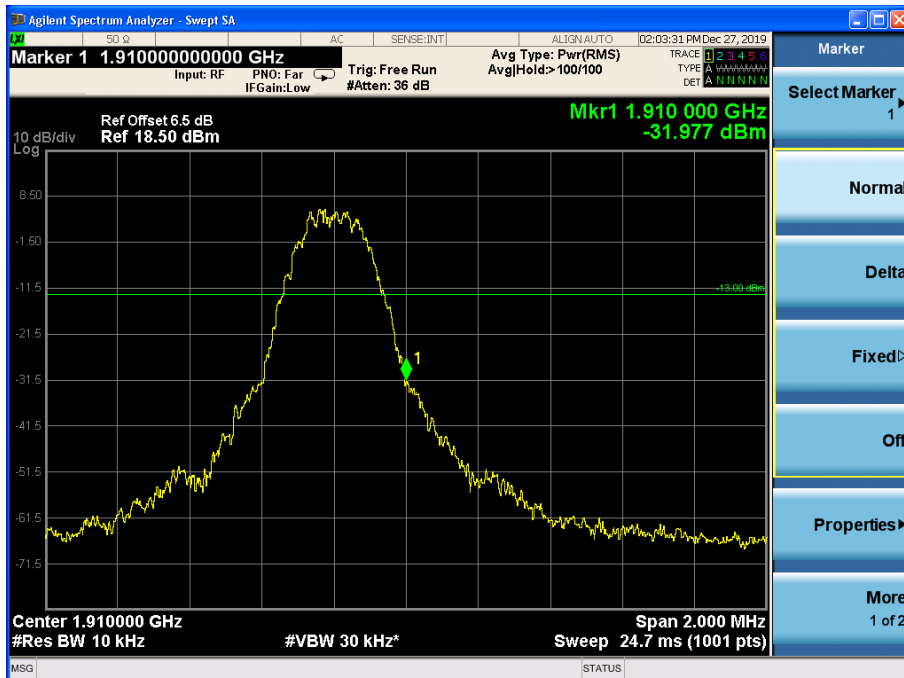


Channel 810

EDGE (8PSK) MODE:



Channel 512



Channel 810

## Frequency Stability

GSM850

GPRS MODE:

Temperature(°C)	Test Result (ppm)@NV		
	Channel 128	Channel 189	Channel 251
0	0.020	0.078	-0.022
+10	0.077	-0.078	-0.029
+20	0.000	0.000	0.000
+30	-0.025	-0.031	-0.006
+40	-0.088	-0.023	-0.063
+50	0.078	-0.044	0.027
+55	0.011	0.099	-0.072
Voltage	Test Result (ppm)@NT		
	Channel 128	Channel 189	Channel 251
LV	0.002	0.006	-0.083
HV	-0.055	-0.004	0.065

EDGE (8PSK) MODE:

Temperature(°C)	Test Result (ppm)@NV		
	Channel 128	Channel 189	Channel 251
0	0.077	0.086	-0.047
+10	0.056	0.035	-0.067
+20	0.000	0.000	0.000
+30	0.057	0.009	-0.081
+40	0.044	-0.092	0.020
+50	-0.084	0.002	-0.076
+55	-0.008	0.058	0.007
Voltage	Test Result (ppm)@NT		
	Channel 128	Channel 189	Channel 251
LV	-0.002	-0.091	0.033
HV	0.038	-0.021	-0.100



PCS1900

GPRS MODE:

Temperature(°C)	Test Result (ppm)@NV		
	Channel 512	Channel 661	Channel 810
0	0.007	0.065	0.094
+10	0.037	-0.066	-0.072
+20	0.000	0.000	0.000
+30	0.065	0.029	0.082
+40	0.036	0.020	-0.066
+50	0.031	0.011	0.021
+55	0.040	-0.027	0.067
Voltage	Test Result (ppm)@NT		
	Channel 512	Channel 661	Channel 810
LV	-0.074	0.001	-0.012
HV	-0.083	-0.032	0.097

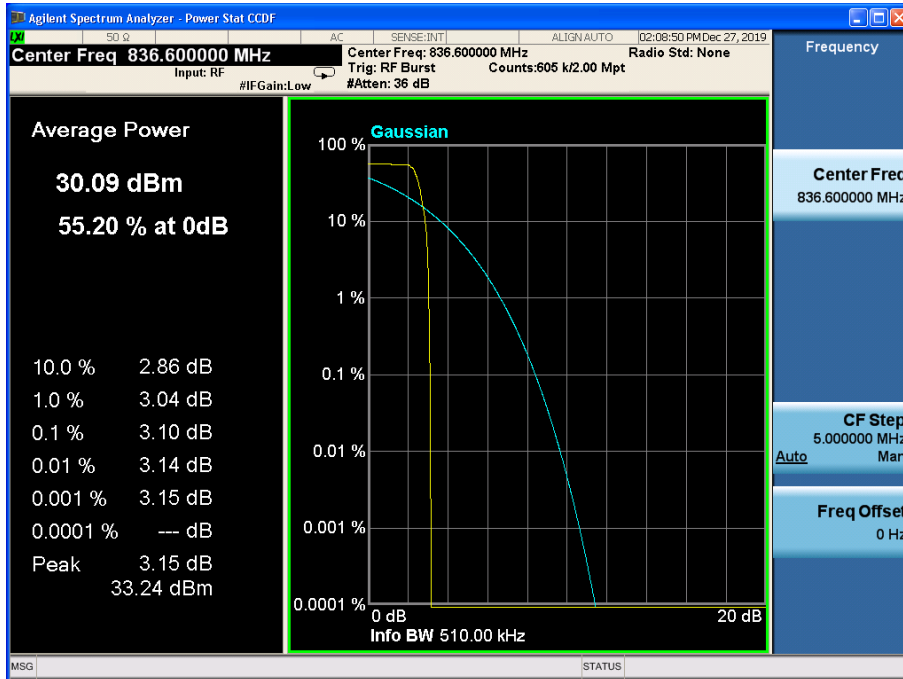
EDGE (8PSK) MODE:

Temperature(°C)	Test Result (ppm)@NV		
	Channel 512	Channel 661	Channel 810
0	-0.051	0.065	0.093
+10	0.004	0.076	-0.054
+20	0.000	0.000	0.000
+30	0.003	0.012	-0.081
+40	0.030	0.099	0.027
+50	-0.063	-0.075	0.074
+55	-0.074	-0.060	-0.025
Voltage	Test Result (ppm)@NT		
	Channel 512	Channel 661	Channel 810
LV	0.038	0.063	0.036
HV	0.081	-0.034	-0.030

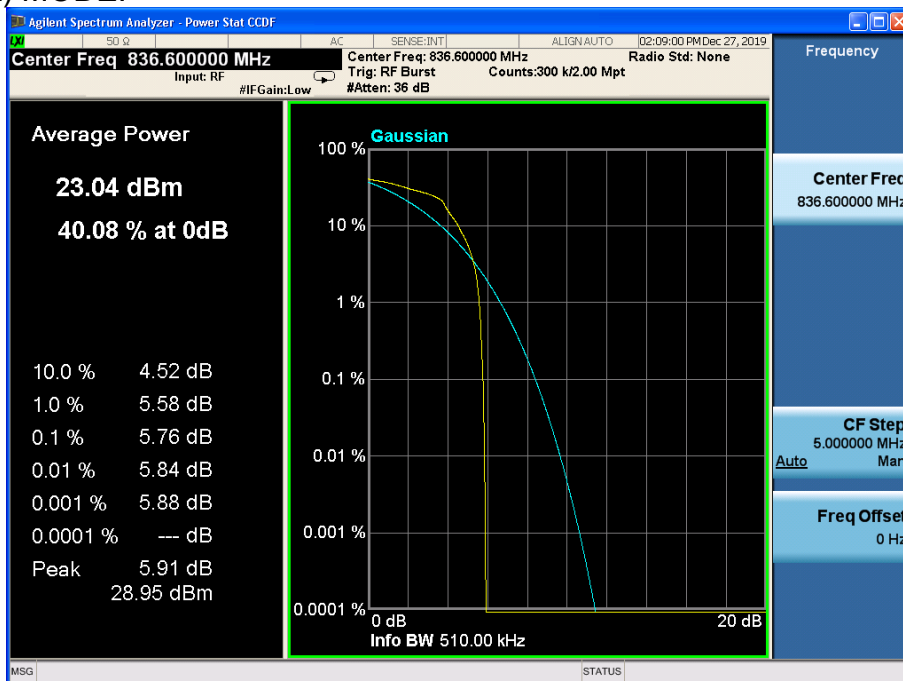
## Peak-Average Ratio

GSM850

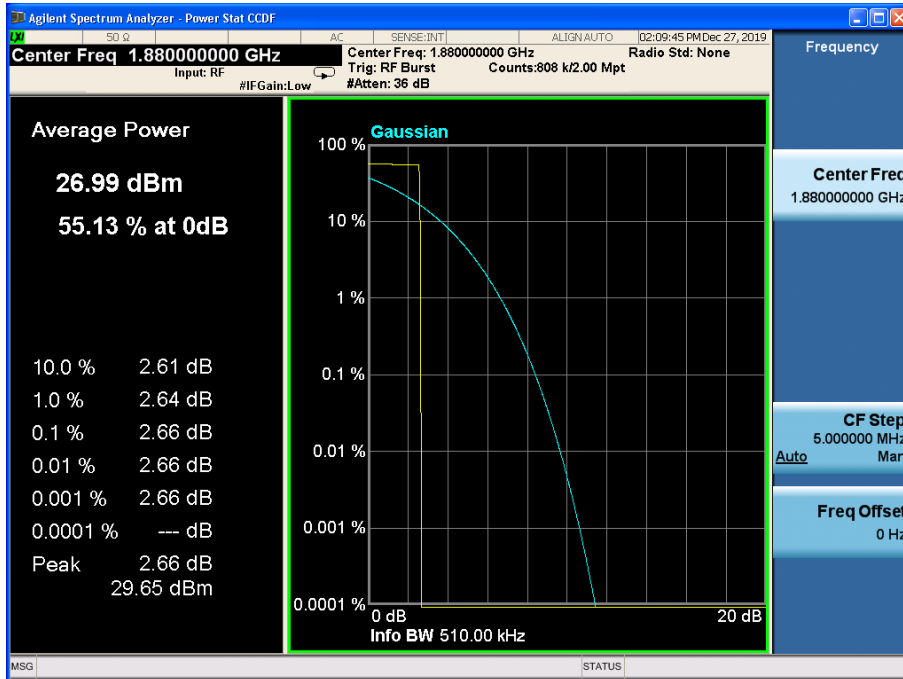
GPRS MODE:



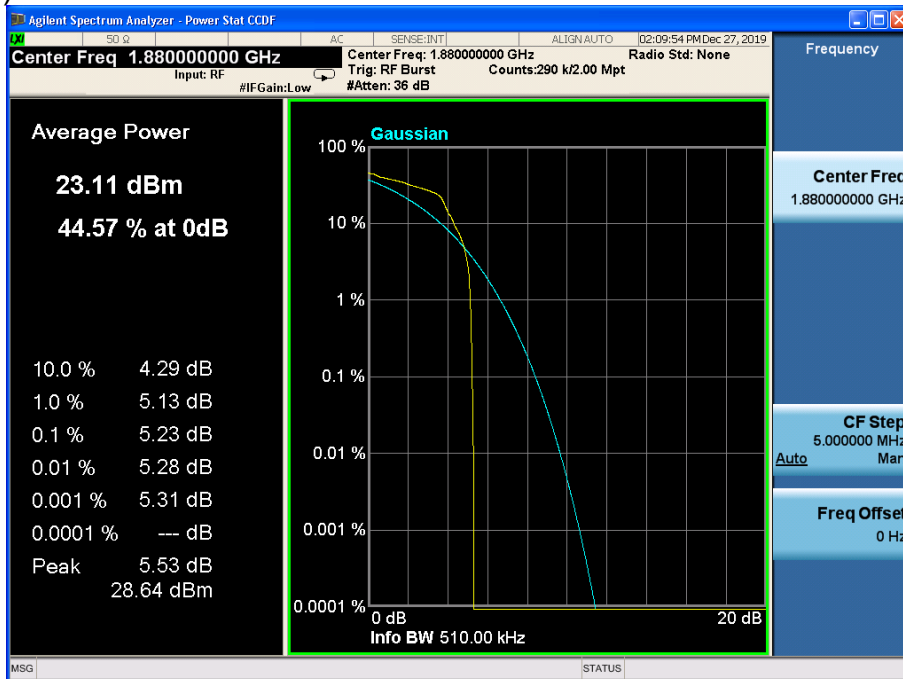
EDGE (8PSK) MODE:



PCS1900  
GPRS MODE:



EDGE (8PSK) MODE:



## **APPENDIX B – TEST DATA OF RADIATED EMISSION**

### **GSM850 Test result:**

The measurement results are obtained as described below:

Peak ERP = Pmea + Pca Cable loss+ Ga Antenna Gain- Correction

Sample calculation: (32.82 dBm) = (30.07 dBm) + (-3.4 dB) + (8.3 dB)- (2.15 dB), the corresponding frequency is 824.2MHz.

Frequency (MHz)	Power step	Peak ERP (dBm)	Pca Cable loss(dB)	Ga Antenna Gain (dB)	Correction (dB)	Pmea (dBm)	Polarization
824.2	5	32.82	-3.4	8.3	2.15	30.07	Vertical

### **GSM/GPRS MODE:**

Frequency (MHz)	Power step	Peak ERP (dBm)	Pca Cable loss(dB)	Ga Antenna Gain (dB)	Correction (dB)	Pmea (dBm)	Polarization
824.2	5	32.82	-3.4	8.3	2.15	30.07	Vertical
836.6	5	33.33	-3.4	8.3	2.15	30.58	Vertical
848.8	5	32.78	-3.4	8.3	2.15	30.03	Vertical

### **EDGE MODE:**

Frequency (MHz)	Power step	Peak ERP (dBm)	Pca Cable loss(dB)	Ga Antenna Gain (dB)	Correction (dB)	Pmea (dBm)	Polarization
824.2	5	25.98	-3.4	8.3	2.15	23.23	Vertical
836.6	5	25.78	-3.4	8.3	2.15	23.03	Vertical
848.8	5	26.03	-3.4	8.3	2.15	23.28	Vertical

Test result:

GSM/GPRS MODE Channel 128:

Frequency (MHz)	Power (dBm)	Limited (dBm)	Polarization
1645.75	-52.96	-13	Vertical
1669.08	-51.54	-13	Vertical
2534.53	-44.17	-13	Vertical
2576.18	-44.33	-13	Vertical
8964.41	-39.21	-13	Vertical
9973.85	-36.07	-13	Vertical

EDGE (8PSK) MODE Channel 128:

Frequency (MHz)	Power (dBm)	Limited (dBm)	Polarization
1649.94	-53.20	-13	Vertical
1666.77	-51.64	-13	Vertical
2532.53	-44.38	-13	Vertical
2576.92	-44.52	-13	Horizontal
8960.25	-39.97	-13	Vertical
9973.81	-36.20	-13	Vertical

GSM/GPRS MODE Channel 189:

Frequency (MHz)	Power (dBm)	Limited (dBm)	Polarization
1650.30	-53.53	-13	Vertical
1669.60	-51.57	-13	Vertical
2531.13	-44.39	-13	Horizontal
2576.59	-44.17	-13	Vertical
8964.64	-39.73	-13	Vertical
9972.26	-36.47	-13	Vertical

EDGE (8PSK) MODE Channel 189:

Frequency (MHz)	Power (dBm)	Limited (dBm)	Polarization
1648.64	-52.91	-13	Vertical
1665.55	-51.40	-13	Vertical
2533.48	-44.42	-13	Vertical
2577.11	-44.38	-13	Vertical
8961.44	-39.30	-13	Horizontal
9973.45	-36.77	-13	Vertical

GSM/GPRS MODE Channel 251:

Frequency (MHz)	Power (dBm)	Limited (dBm)	Polarization
1648.45	-53.49	-13	Vertical
1665.60	-50.68	-13	Vertical
2533.37	-44.07	-13	Vertical
2580.36	-44.27	-13	Horizontal
8961.40	-38.99	-13	Vertical
9969.71	-35.91	-13	Vertical

EDGE (8PSK) MODE Channel 251:

Frequency (MHz)	Power (dBm)	Limited (dBm)	Polarization
1649.73	-52.59	-13	Vertical
1667.61	-51.87	-13	Horizontal
2534.34	-44.27	-13	Vertical
2576.24	-43.94	-13	Vertical
8965.68	-38.68	-13	Vertical
9973.68	-37.19	-13	Vertical

**GSM1900 Test result:**

GSM/GPRS MODE:

Frequency (MHz)	Power step	Peak EIRP(dBm)	Pca Cable loss(dB)	Ga Antenna Gain (dB)	Pmea (dBm)	Polarization
1850.2	0	30.97	-3.8	8.6	26.17	Vertical
1880.0	0	31.36	-3.8	8.6	26.56	Vertical
1909.8	0	30.56	-3.8	8.6	25.76	Vertical

EDGE MODE:

Frequency (MHz)	Power step	Peak EIRP(dBm)	Pca Cable loss(dB)	Ga Antenna Gain (dB)	Pmea (dBm)	Polarization
1850.2	0	25.64	-3.8	8.6	20.84	Vertical
1880.0	0	26.94	-3.8	8.6	22.14	Vertical
1909.8	0	26.70	-3.8	8.6	21.90	Vertical

Test result:

GSM/GPRS MODE Channel 512

Frequency (MHz)	Power (dBm)	Limited (dBm)	Polarization
2458.89	-48.95	-13	Vertical
2780.94	-47.54	-13	Vertical
3727.05	-41.21	-13	Horizontal
6677.41	-39.63	-13	Vertical
9959.58	-37.53	-13	Vertical
17820.78	-33.61	-13	Vertical

EDGE (8PSK) MODE Channel 512:

Frequency (MHz)	Power (dBm)	Limited (dBm)	Polarization
2459.45	-48.28	-13	Vertical
2779.88	-47.07	-13	Vertical
3726.62	-40.74	-13	Vertical
6674.38	-39.88	-13	Horizontal
9957.90	-37.78	-13	Vertical
17818.30	-33.78	-13	Vertical

GSM/GPRS MODE Channel 661:

Frequency (MHz)	Power (dBm)	Limited (dBm)	Polarization
2459.63	-48.33	-13	Vertical
2783.45	-47.14	-13	Vertical
3726.28	-41.05	-13	Vertical
6678.52	-39.59	-13	Vertical
9962.19	-37.54	-13	Horizontal
17819.25	-33.63	-13	Vertical

EDGE (8PSK) MODE Channel 661:

Frequency (MHz)	Power (dBm)	Limited (dBm)	Polarization
2457.41	-49.82	-13	Vertical
2779.05	-47.95	-13	Vertical
3726.76	-40.20	-13	Vertical
6678.69	-39.91	-13	Horizontal
9961.37	-37.51	-13	Vertical
17820.58	-34.30	-13	Vertical

GSM/GPRS MODE Channel 810:

Frequency (MHz)	Power (dBm)	Limited (dBm)	Polarization
2461.23	-48.79	-13	Vertical
2781.10	-47.44	-13	Vertical
3726.46	-41.33	-13	Vertical
6680.61	-39.10	-13	Horizontal
9963.05	-36.91	-13	Vertical
17818.14	-34.37	-13	Vertical

EDGE (8PSK) MODE Channel 810:

Frequency (MHz)	Power (dBm)	Limited (dBm)	Polarization
2458.98	-49.24	-13	Vertical
2779.61	-47.92	-13	Vertical
3727.39	-40.90	-13	Vertical
6677.53	-38.71	-13	Horizontal
9959.14	-37.29	-13	Vertical
17816.81	-33.98	-13	Vertical

Test with secondary supply:

GSM1900 GSM/GPRS MODE Channel 512 is selected as the worst point for RSE.

GSM/GPRS MODE Channel 512

Frequency (MHz)	Power (dBm)	Limited (dBm)	Polarization
2458.06	-48.96	-13	Vertical
2780.71	-47.86	-13	Vertical
3728.36	-41.36	-13	Vertical
6678.00	-39.26	-13	Horizontal
9960.85	-37.49	-13	Vertical
17821.48	-34.04	-13	Vertical

---End of Test Report---