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## Report On

FCC Testing of the Sharp Quad-band LTE (B1/B3/B17/B26), Dual-band WCDMA (FDD I / V), Quad-band GSM (850/900/1800/1900) & WiMAX2+ (TDD41) multi mode Smart phone with Bluetooth, WLAN, and GPS in accordance with FCC 47 CFR Part 22 and FCC 47 CFR Part 2 (GSM 850)

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FCC ID: APYHRO00238

Document 75934711 Report 13 Issue 1

June 2016



Product Service

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COMMERCIAL-IN-CONFIDENCE

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FCC Testing of the Sharp Quad-band LTE (B1/B3/B17/B26), Dual-band WCDMA (FDD I / V), Quad-band GSM (850/900/1800/1900) & WiMAX2+ (TDD41) multi mode Smart phone with Bluetooth, WLAN, and GPS in accordance with FCC 47 CFR Part 22 and FCC 47 CFR Part 2 (GSM 850)

Document 75934711 Report 13 Issue 1

June 2016

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Authorised Signatory

**DATED**

24 June 2016

**ENGINEERING STATEMENT**

The measurements shown in this report were made in accordance with the procedures described on test pages. All reported testing was carried out on a sample equipment to demonstrate limited compliance with FCC 47 CFR Part 22 and FCC 47 CFR Part 2. The sample tested was found to comply with the requirements defined in the applied rules.

Test Engineer(s);

M Russell

G Lawler





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## SECTION 1

### REPORT SUMMARY

FCC Testing of the  
Sharp Quad-band LTE (B1/B3/B17/B26), Dual-band WCDMA (FDD I / V), Quad-band GSM  
(850/900/1800/1900) & WiMAX2+ (TDD41) multi mode Smart phone with Bluetooth, WLAN, and  
GPS  
in accordance with FCC 47 CFR Part 22 and FCC 47 CFR Part 2 (GSM 850)



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## 1.1 INTRODUCTION

The information contained in this report is intended to show the verification of FCC Testing of the Sharp Quad-band LTE (B1/B3/B17/B26), Dual-band WCDMA (FDD I / V), Quad-band GSM (850/900/1800/1900) & WiMAX2+ (TDD41) multi mode Smart phone with Bluetooth, WLAN, and GPS to the requirements of FCC 47 CFR Part 22 and FCC 47 CFR Part 2.

Objective	To perform FCC Testing to determine the Equipment Under Test's (EUT's) compliance with the Test Specification, for the series of tests carried out.
Manufacturer	Sharp Corporation
Serial Number(s)	IMEI 004401115813228 IMEI 004401115813517
Number of Samples Tested	2
Test Specification/Issue/Date	FCC 47 CFR Part 22 (2015) FCC 47 CFR Part 2 (2015)
Disposal	Held Pending Disposal
Reference Number	Not Applicable
Date	Not Applicable
Order Number	10829
Date	31 May 2016
Start of Test	31 May 2016
Finish of Test	3 June 2016
Name of Engineer(s)	M Russell G Lawler
Related Document(s)	ANSI C63.4 (2014) ANSI TIA-603-C (2004) ANSI C63.26 (2015)



## 1.2 BRIEF SUMMARY OF RESULTS

A brief summary of the tests carried out in accordance with FCC 47 CFR Part 22 and FCC 47 CFR Part 2 is shown below.

Section	Specification Clause		Test Description	Result	Comments/Base Standard
	Part 22	Part 2			
GSM 850					
2.1	22.355	2.1055	Frequency Tolerance	Pass	
2.2	22.905	2.1051	Spurious Emissions at Band Edge	Pass	
2.3	22.913 (a)	2.1046	Maximum Conducted Output Power	Pass	
2.4	22.917	-	Emission Limitations for Cellular Equipment	Pass	
2.5	22.917 (a)	2.1051	Spurious Emissions at Antenna Terminals	Pass	
2.6	22.917 (b)	2.1049 (h)	26 dB Bandwidth	Pass	
2.7	-	2.1047 (d)	Modulation Characteristics	-	Customer Declaration



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### **1.3 PRODUCT TECHNICAL DESCRIPTION**

Refer to Model Description APYHRO00238 Rev 4.0 document.

### **1.4 PRODUCT INFORMATION**

#### **1.4.1 Technical Description**

The Equipment Under Test (EUT) was a Sharp Quad-band LTE (B1/B3/B17/B26), Dual-band WCDMA (FDD I / V), Quad-band GSM (850/900/1800/1900) & WiMAX2+ (TDD41) multi mode Smart phone with Bluetooth, WLAN, and GPS. A full technical description can be found in the manufacturer's documentation.

### **1.5 TEST CONDITIONS**

For all tests the EUT was set up in accordance with the relevant test standard and to represent typical operating conditions. Tests were applied with the EUT situated in a shielded enclosure.

The EUT was powered from a 4.0 V DC supply.

FCC Measurement Facility Registration Number  
90987 Octagon House, Fareham Test Laboratory

### **1.6 DEVIATIONS FROM THE STANDARD**

No deviations from the applicable test standard were made during testing

### **1.7 MODIFICATION RECORD**

Modification 0 - No modifications were made to the test sample during testing.



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## **SECTION 2**

### **TEST DETAILS**

FCC Testing of the  
Sharp Quad-band LTE (B1/B3/B17/B26), Dual-band WCDMA (FDD I / V), Quad-band GSM  
(850/900/1800/1900) & WiMAX2+ (TDD41) multi mode Smart phone with Bluetooth, WLAN, and  
GPS  
in accordance with FCC 47 CFR Part 22 and FCC 47 CFR Part 2 (GSM 850)



Product Service

## 2.1 FREQUENCY TOLERANCE

### 2.1.1 Specification Reference

FCC 47 CFR Part 22, Clause 22.355  
FCC 47 CFR Part 2, Clause 2.1055

### 2.1.2 Equipment Under Test and Modification State

S/N: IMEI 004401115813228 - Modification State 0

### 2.1.3 Date of Test

3 June 2016

### 2.1.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

### 2.1.5 Test Procedure

This test was performed in accordance with FCC 47 CFR Part 2, clause 2.1055.

#### Remarks

A radio communications test set frequency measurement function was used to measure the frequency error. The radio communications test set was configured for an uplink frequency of 836.4 MHz and the frequency reference was set to an external 10 MHz rubidium frequency standard.

### 2.1.6 Environmental Conditions

Ambient Temperature	23.5°C
Relative Humidity	39.8%



Product Service

**2.1.7 Test Results**

4.0 V DC Supply

GSM 850, 836.40 MHz, Circuit-Switched, GMSK, Frequency Tolerance Under Temperature Variations Results

Temperature	Fundamental Frequency Deviation (ppm)
-30 °C	-0.019
-20 °C	-0.018
-10 °C	-0.013
0 °C	-0.014
+10 °C	-0.013
+20 °C	-0.014
+30 °C	-0.014
+40 °C	-0.017
+50 °C	-0.014

GSM 850, 836.40 MHz, Circuit-Switched, GMSK, Frequency Tolerance Under Voltage Variations Results

Voltage	Fundamental Frequency Deviation (ppm)
4.0 V DC	-0.014
3.7 V DC	-0.013

FCC 47 CFR Part 22, Limit Clause 22.355

Frequency Range (MHz)	Base, Fixed (ppm)	Mobile ≤ 3 watts (ppm)	Mobile ≤ 3 watts (ppm)
25 to 50	20	20	50
50 to 450	5	5	50
450 to 512	2.5	5	5
821 to 896	1.5	2.5	2.5
928 to 929	5.0	-	-
929 to 960	1.5	-	-
2110 to 2220	10	-	-



Product Service

## 2.2 SPURIOUS EMISSIONS AT BAND EDGE

### 2.2.1 Specification Reference

FCC 47 CFR Part 22, Clause 22.905  
FCC 47 CFR Part 2, Clause 2.1051

### 2.2.2 Equipment Under Test and Modification State

S/N: IMEI 004401115813228 - Modification State 0

### 2.2.3 Date of Test

31 May 2016

### 2.2.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

### 2.2.5 Test Procedure

The test was performed in accordance with KDB 971168 D01 v02 r02, clause 6.

### 2.2.6 Environmental Conditions

Ambient Temperature	23.6°C
Relative Humidity	47.5%



Product Service

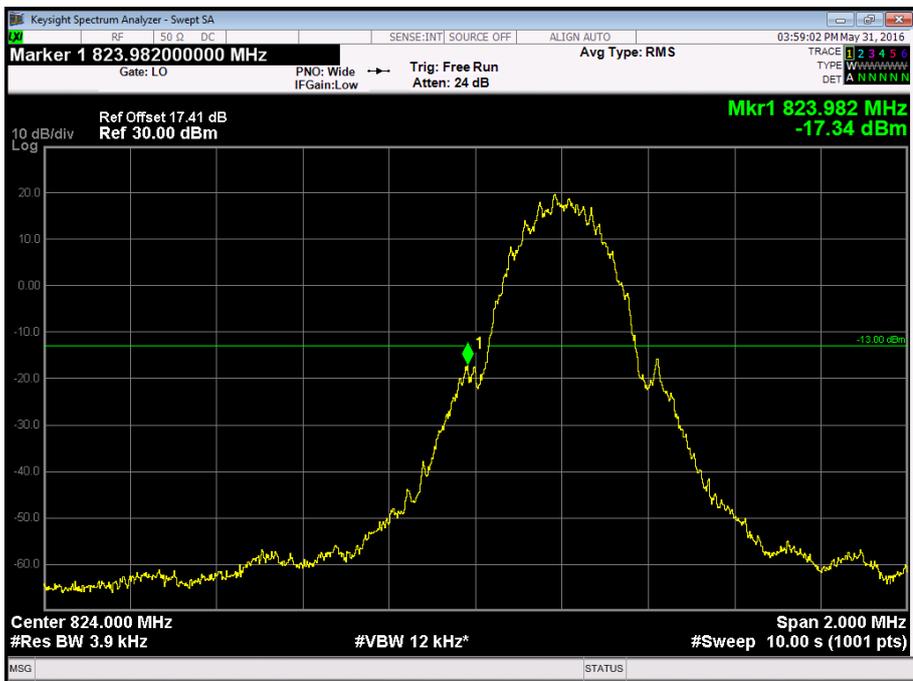
2.2.7 Test Results

4.0 V DC Supply

GSM 850, Circuit-Switched, GMSK, Spurious Emissions at Band Edge Results

Block Edge	Frequency Block (MHz)	
	A :824.0 MHz – 835.0 MHz	B :846.5 MHz – 849.0 MHz
Lower	Channel: 128 824.2 MHz	-
Upper	-	Channel: 251 848.8 MHz

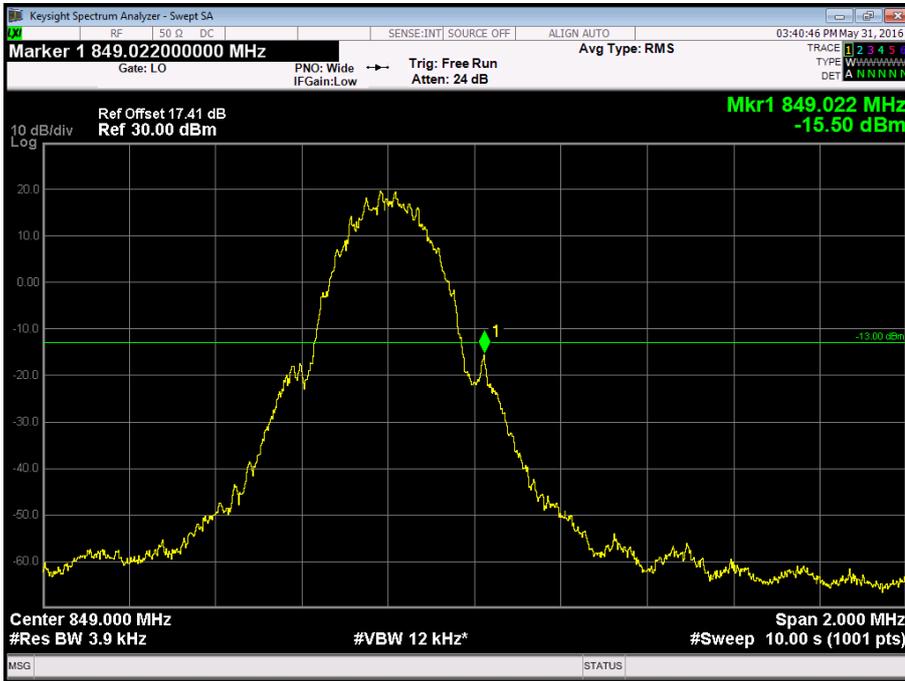
GSM 850, Circuit-Switched, GMSK, Frequency Block A, Spurious Emissions at Band Edge Plot





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GSM 850, Circuit-Switched, GMSK, Frequency Block B, Spurious Emissions at Band Edge Plot



FCC 47 CFR Part 22, Limit Clause 22.905 and 22.917

-13 dBm at block edge.



Product Service

## 2.3 MAXIMUM CONDUCTED OUTPUT POWER

### 2.3.1 Specification Reference

FCC 47 CFR Part 22, Clause 22.913 (a)  
FCC 47 CFR Part 2, Clause 2.1046

### 2.3.2 Equipment Under Test and Modification State

S/N: IMEI 004401115813228 - Modification State 0

### 2.3.3 Date of Test

31 May 2016

### 2.3.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

### 2.3.5 Test Procedure

The test was performed in accordance with KDB 971168 D01 v02r02, clause 5.1.2.

#### Remarks

The antenna gain was declared by the manufacturer as 2.0 dBi. As per KDB 412172 D01 v01r01 results are recorded in ERP therefore reported results are calculated as per the following calculation:

$ERP = P_{out} \text{ (dBm)} + \text{ANT Gain (dBi)} - 2.15 \text{ (dB)}$ .

### 2.3.6 Environmental Conditions

Ambient Temperature	23.6°C
Relative Humidity	47.5%



Product Service

**2.3.7 Test Results**

4.0 V DC Supply

GSM 850, Circuit-Switched, Maximum Conducted Output Power Results

Frequency	Conducted Power (dBm)	Antenna Gain	ERP (dBm)	ERP (W)
824.20 MHz	32.98	2.0 dBi	32.83	1.92
836.40 MHz	33.09	2.0 dBi	32.94	1.97
848.80 MHz	32.90	2.0 dBi	32.75	1.88

FCC 47 CFR Part 22, Limit Clause 22.913 (a)(2)

Mobile Transmitters: 7 W or 38.45 dBm



Product Service

## **2.4 EMISSION LIMITATIONS FOR CELLULAR EQUIPMENT**

### **2.4.1 Specification Reference**

FCC 47 CFR Part 22, Clause 22.917

### **2.4.2 Equipment Under Test and Modification State**

S/N: IMEI 004401115813517 - Modification State 0

### **2.4.3 Date of Test**

5 June 2016

### **2.4.4 Test Equipment Used**

The major items of test equipment used for the above tests are identified in Section 3.1.

### **2.4.5 Test Procedure**

Testing was performed in accordance with ANSI C63.26 clause 5.5.

### **2.4.6 Environmental Conditions**

Ambient Temperature	16.9°C
Relative Humidity	70.0%



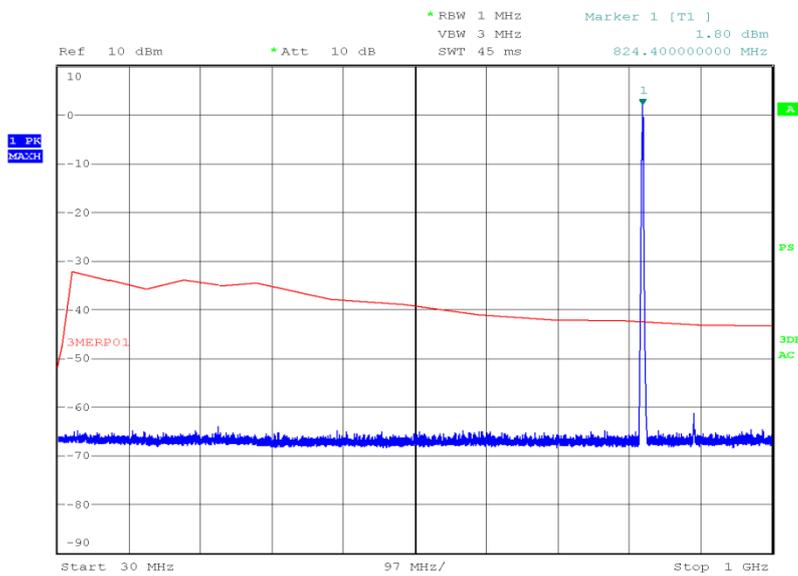
**2.4.7 Test Results**

GSM 850, 824.20 MHz, Emission Limitations for Cellular Equipment Results

Frequency (MHz)	Emission Results (dBm)
*	

\*No emissions were detected within 10 dB of the limit.

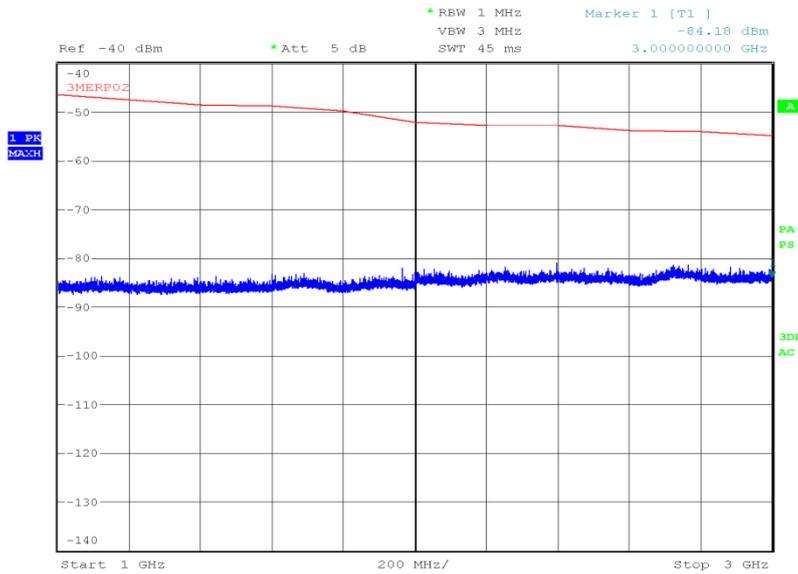
GSM 850, 824.20 MHz, 30 MHz to 1 GHz, Emission Limitations for Cellular Equipment Plot



Date: 5.JUN.2016 11:56:25

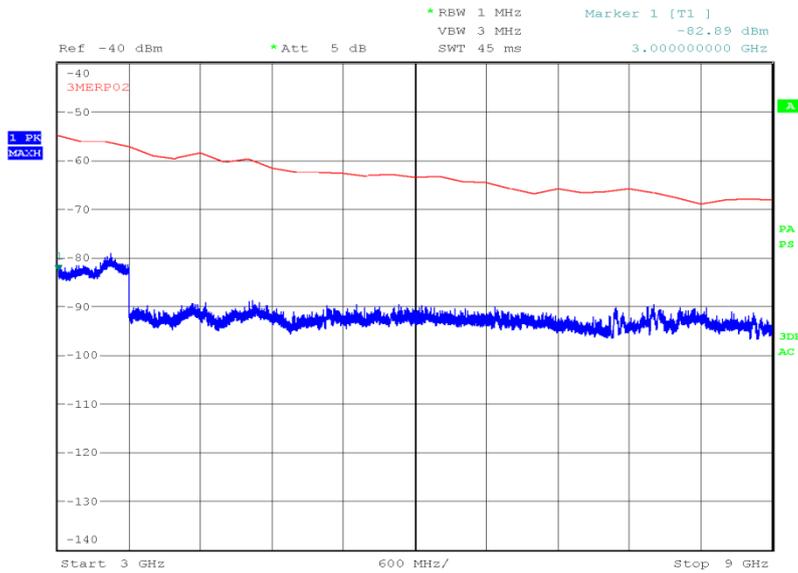


GSM 850, 824.20 MHz, 1 GHz to 3 GHz, Emission Limitations for Cellular Equipment Plot



Date: 5.JUN.2016 12:02:58

GSM 850, 824.20 MHz, 3 GHz to 9 GHz, Emission Limitations for Cellular Equipment Plot



Date: 5.JUN.2016 12:04:31



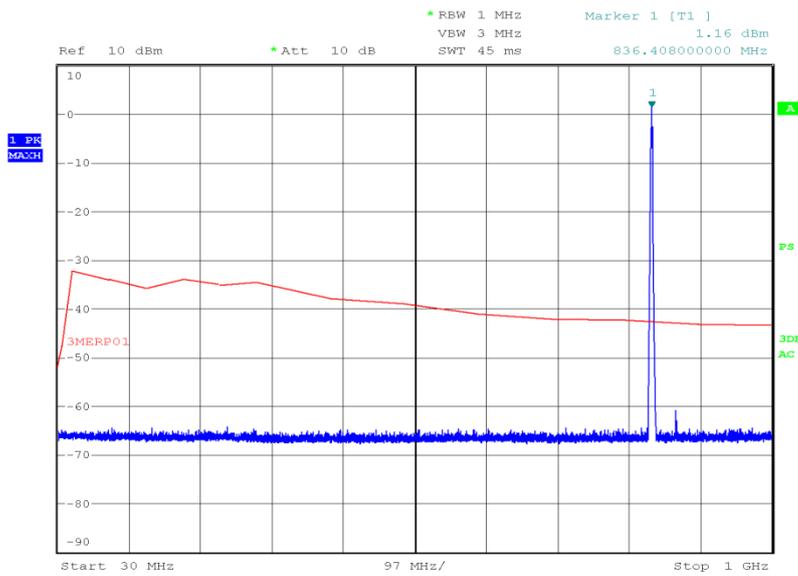
Product Service

GSM 850, 836.40 MHz, Emission Limitations for Cellular Equipment Results

Frequency (MHz)	Emission Results (dBm)
*	

No emissions were detected within 10 dB of the limit.

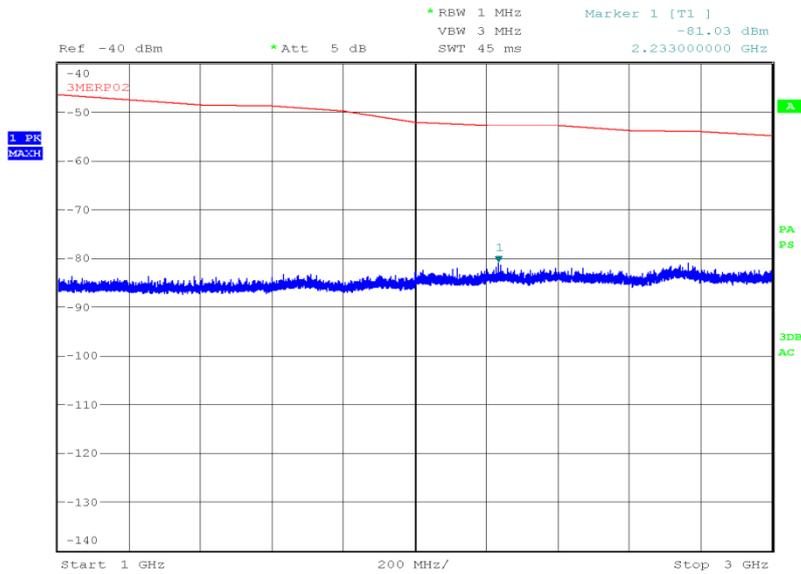
GSM 850, 836.40 MHz, 30 MHz to 1 GHz, Emission Limitations for Cellular Equipment Plot



Date: 5.JUN.2016 11:42:42

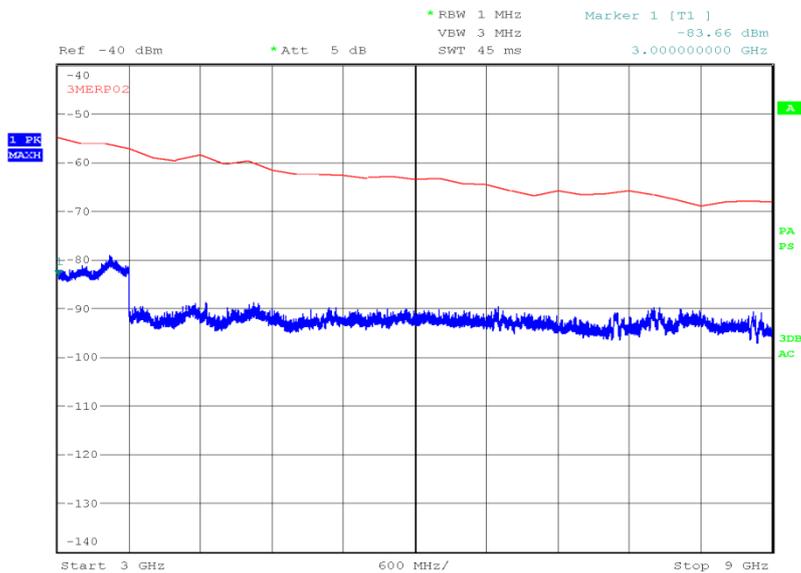


GSM 850, 836.40 MHz, 1 GHz to 3 GHz, Emission Limitations for Cellular Equipment Plot



Date: 5.JUN.2016 12:10:04

GSM 850, 836.40 MHz, 3 GHz to 9 GHz, Emission Limitations for Cellular Equipment Plot



Date: 5.JUN.2016 12:08:27



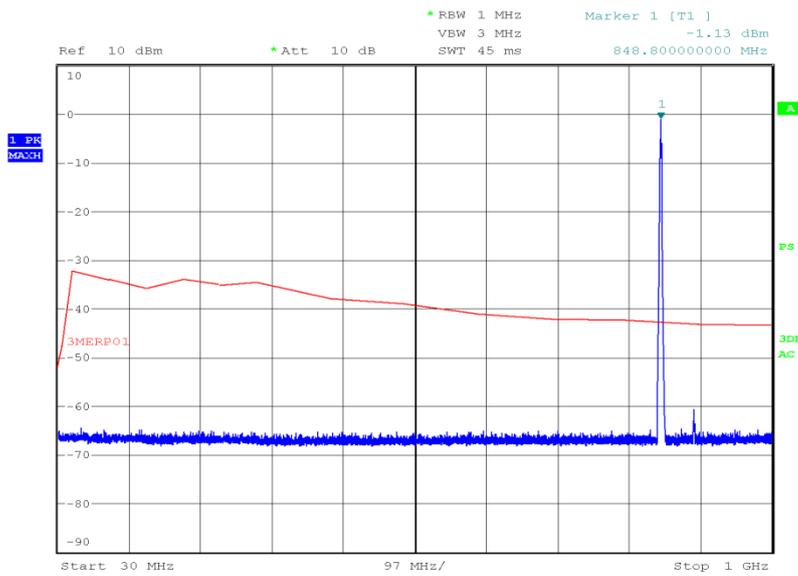
Product Service

GSM 850, 848.80 MHz, Emission Limitations for Cellular Equipment Results

Frequency (MHz)	Emission Results (dBm)
*	

\*No emissions were detected within 10 dB of the limit.

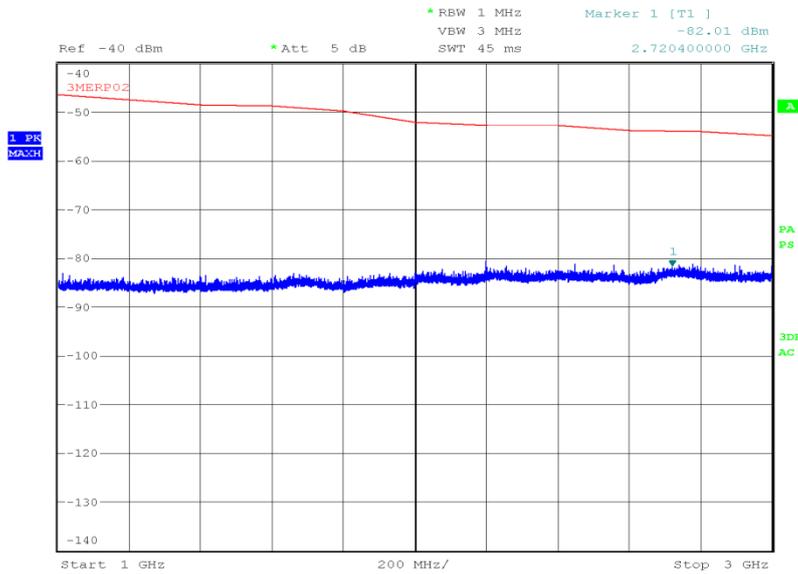
GSM 850, 848.80 MHz, 30 MHz to 1 GHz, Emission Limitations for Cellular Equipment Plot



Date: 5.JUN.2016 11:54:44

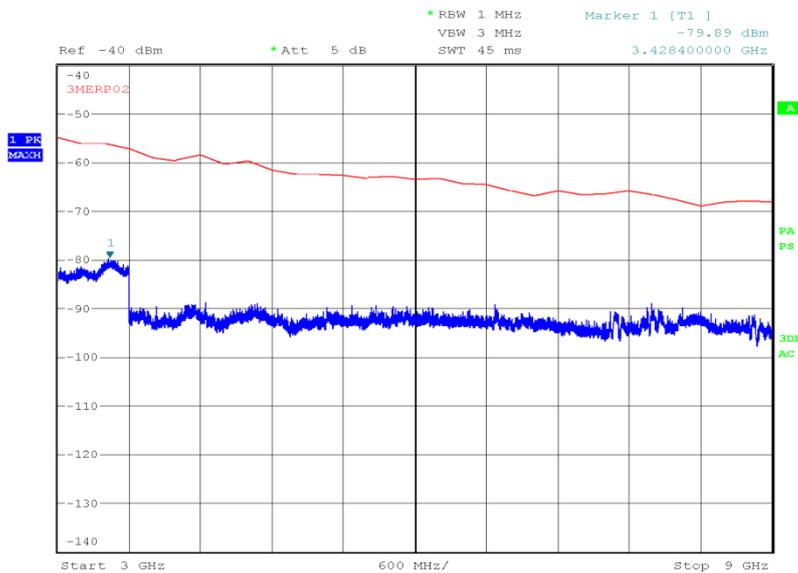


GSM 850, 848.80 MHz, 1 GHz to 3 GHz, Emission Limitations for Cellular Equipment Plot



Date: 5.JUN.2016 12:12:45

GSM 850, 848.80 MHz, 3 GHz to 9 GHz, Emission Limitations for Cellular Equipment Plot



Date: 5.JUN.2016 12:15:41

FCC 47 CFR Part 22, Limit Clause 22.917 (a)

43+10log(P) or -13 dBm



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## **2.5 SPURIOUS EMISSIONS AT ANTENNA TERMINALS**

### **2.5.1 Specification Reference**

FCC 47 CFR Part 22, Clause 22.917 (a)  
FCC 47 CFR Part 2, Clause 2.1051

### **2.5.2 Equipment Under Test and Modification State**

S/N: IMEI 004401115813228 - Modification State 0

### **2.5.3 Date of Test**

1 June 2016

### **2.5.4 Test Equipment Used**

The major items of test equipment used for the above tests are identified in Section 3.1.

### **2.5.5 Test Procedure**

This test was performed in accordance with KDB 971168 D01 v02 r02, clause 6.

### **2.5.6 Environmental Conditions**

Ambient Temperature	23.1°C
Relative Humidity	47.8%



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**2.5.7 Test Results**

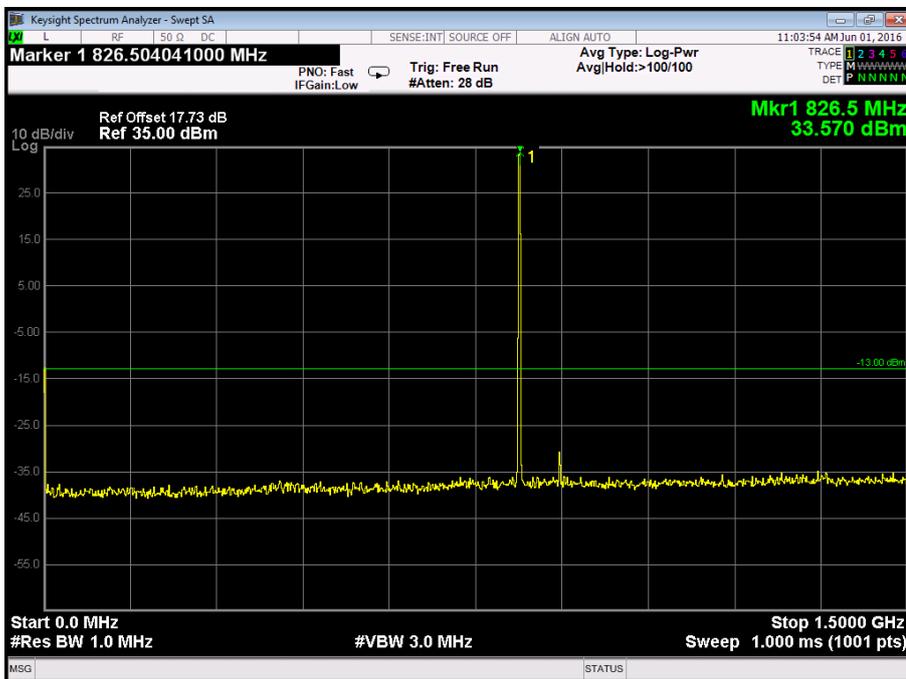
4.0 V DC Supply

GSM 850, 824.20 MHz, Spurious Emissions at Antenna Terminals Results

Frequency (MHz)	Emission Results (dBm)
*	

\*No emissions were detected within 10 dB of the limit.

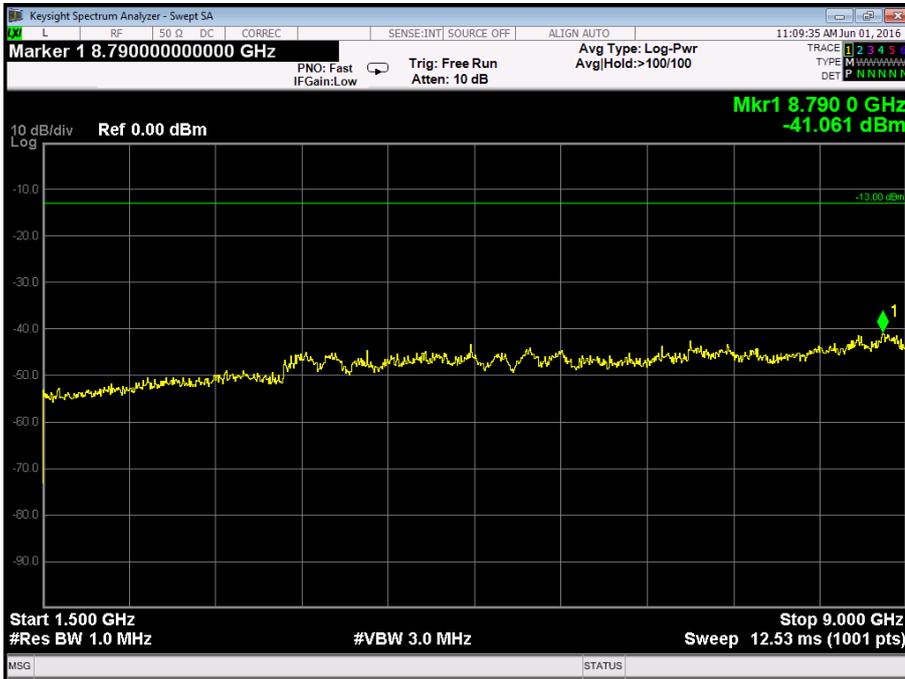
GSM 850, 824.20 MHz, 9 kHz to 1.5 GHz, Spurious Emissions at Antenna Terminals Plot





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GSM 850, 824.20 MHz, 1.5 GHz to 9 GHz, Spurious Emissions at Antenna Terminals Plot





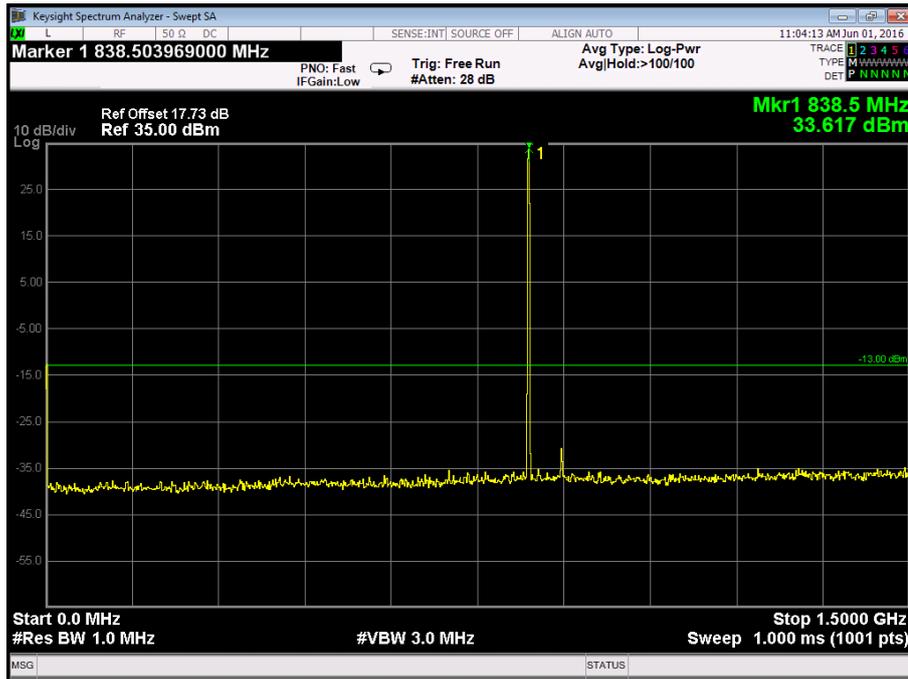
Product Service

GSM 850, 836.40 MHz, Spurious Emissions at Antenna Terminals Results

Frequency (MHz)	Emission Results (dBm)
*	

\*No emissions were detected within 10 dB of the limit.

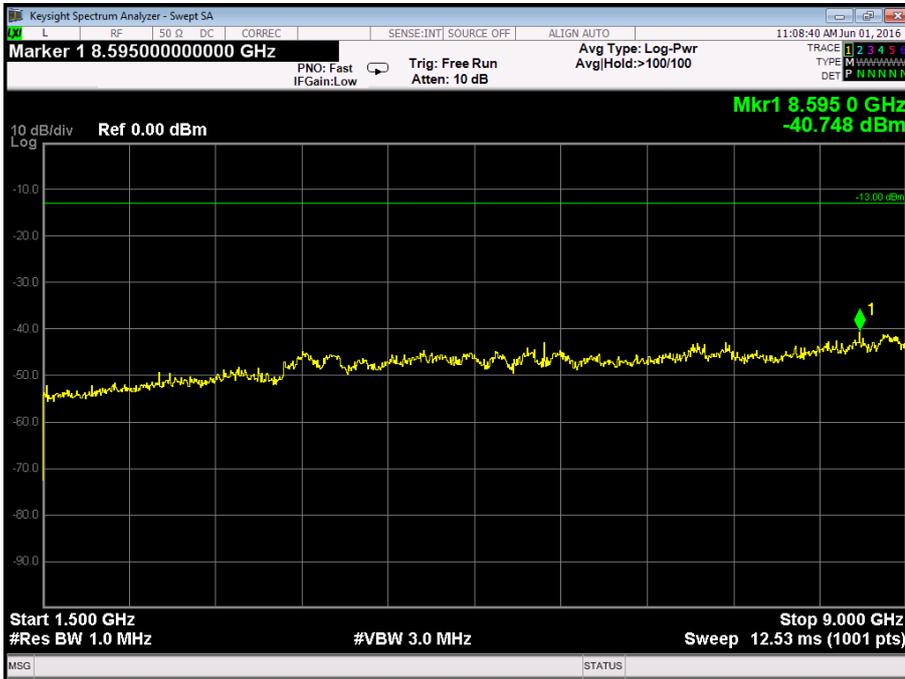
GSM 850, 836.40 MHz, 9 kHz to 1.5 GHz, Spurious Emissions at Antenna Terminals Plot





Product Service

GSM 850, 836.40 MHz, 1.5 GHz to 9 GHz, Spurious Emissions at Antenna Terminals Plot

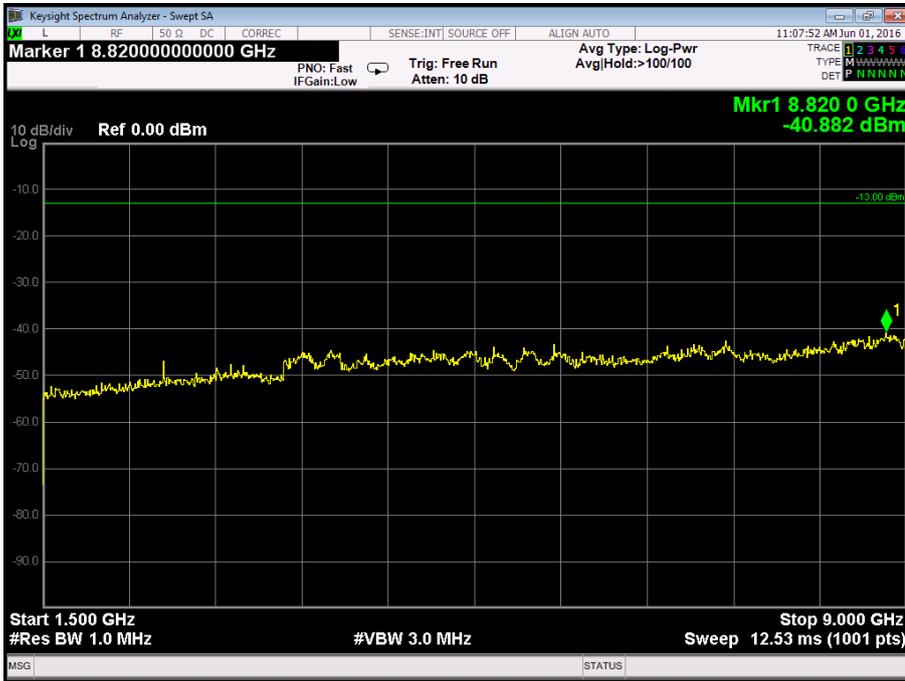






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GSM 850, 848.80 MHz, 1.5 GHz to 9 GHz, Spurious Emissions at Antenna Terminals Plot



FCC 47 CFR Part 22, Limit Clause 22.917 (a)

$43+10\log(P)$  or -13 dBm



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**2.6 26 dB BANDWIDTH****2.6.1 Specification Reference**

FCC 47 CFR Part 22, Clause 22.917 (b)  
FCC 47 CFR Part 2, Clause 2.1049 (h)

**2.6.2 Equipment Under Test and Modification State**

S/N: IMEI 004401115813228 - Modification State 0

**2.6.3 Date of Test**

31 May 2016

**2.6.4 Test Equipment Used**

The major items of test equipment used for the above tests are identified in Section 3.1.

**2.6.5 Test Procedure**

The test was performed in accordance with KDB 971168 D01 v02 r02, clause 4.1

**2.6.6 Environmental Conditions**

Ambient Temperature	23.6°C
Relative Humidity	47.5%



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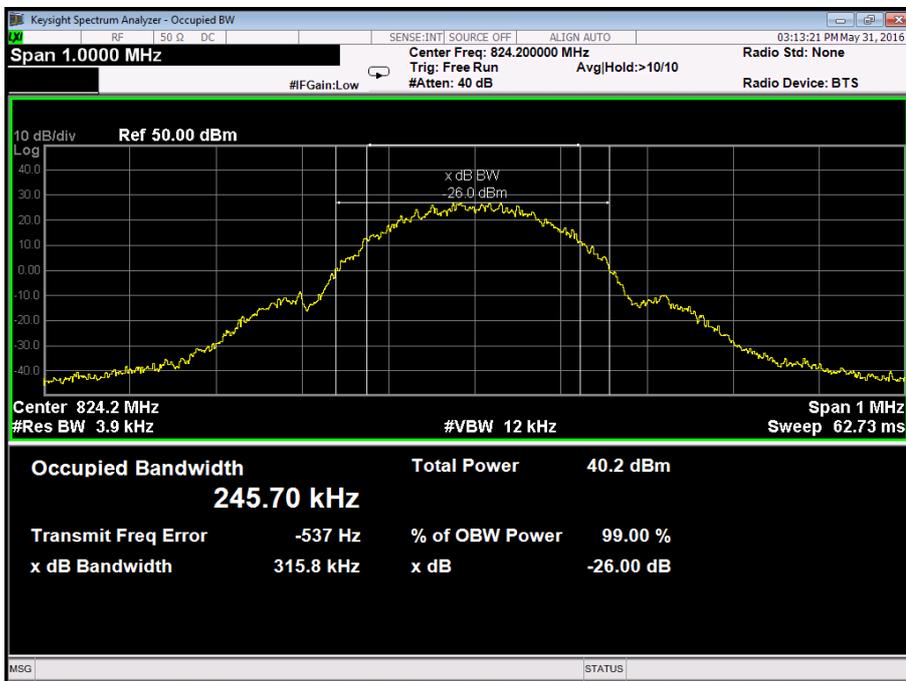
2.6.7 Test Results

4.0 V DC Supply

GSM 850, GMSK, 26 dB Bandwidth Results

824.20 MHz	836.40 MHz	848.80 MHz
kHz	kHz	kHz
315.8	313.8	312.5

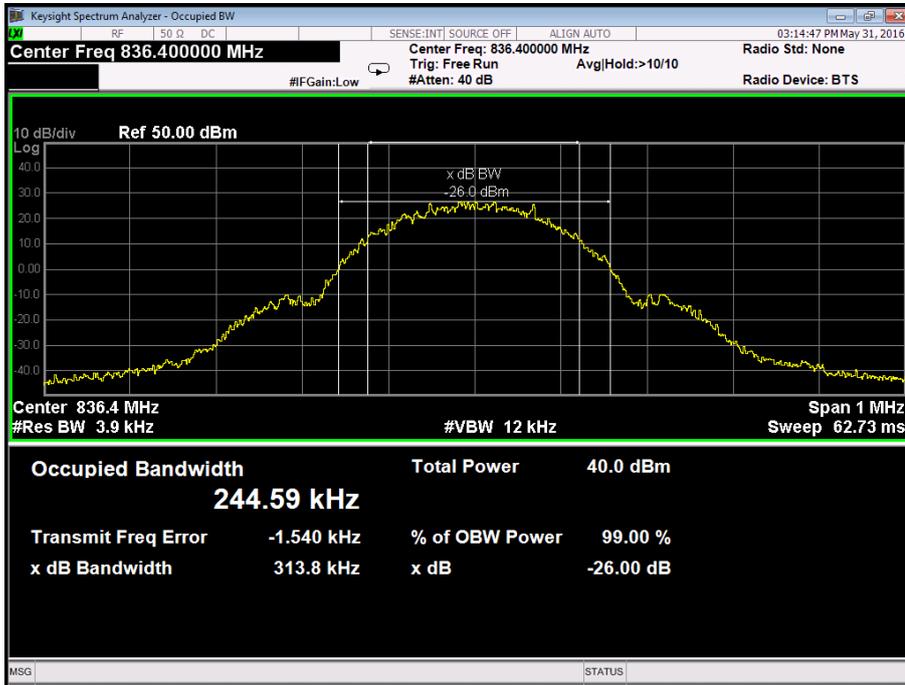
GSM 850, 824.20 MHz, GMSK, 26 dB Bandwidth Plot



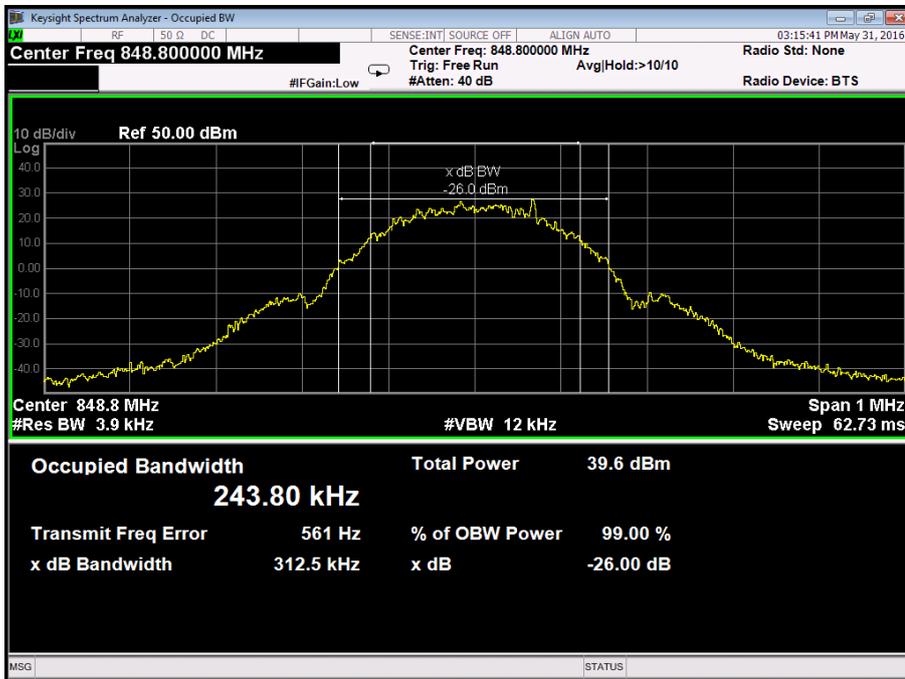


Product Service

GSM 850, 836.40 MHz, GMSK, 26 dB Bandwidth Plot



GSM 850, 848.80 MHz, GMSK, 26 dB Bandwidth Plot



FCC 47 CFR Part 22, Limit Clause

None specified.



## 2.7 MODULATION CHARACTERISTICS

### 2.7.1 Specification Reference

FCC 47 CFR Part 2, Clause 2.1047 (d)

### 2.7.2 Test Results

#### GSM 850, Modulation Characteristics, Customer Description

The modulation scheme used in GSM is called Gaussian Minimum Shift Keying (GMSK). GMSK facilitates the use of narrow bandwidth and allows for both coherent and non coherent detection capabilities. It is a scheme in which the transitions from One to Zero or Zero to One do not occur quickly, but over a period of time. If pulses are transmitted quickly harmonics are transmitted. The power spectrum for a square wave is rich in harmonics, and the power within the side lobes is wasted, and can be a cause of potential interference.

A method to reduce the harmonics is to round off the edges of the pulses thus lowering the spectral components of the signal. In GSM this is done by using a Gaussian pre-filter which typically has a bandwidth of 81.25kHz. The output from the Gaussian filter then phase modulates the carrier. As there are no dramatic phase transitions of the carrier this gives a constant envelope and low spectral component output from the transmitter.

The spectral efficiency is calculated by

$\text{bit rate} / \text{Channel bandwidth} = 270.83333 \text{ kbit/s} / 200 \text{ kHz} = 1.354 \text{ bit/s/Hz}$ .

The bandwidth product  $BT = \text{Bandwidth} \times \text{bit duration} = 81.25 \text{ kHz} \times 3.6923 \text{ micros} = 0.3$

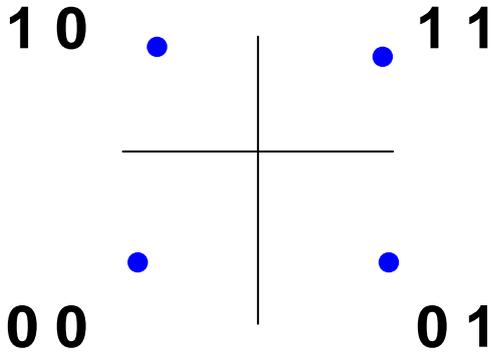
#### **GMSK OVERVIEW**

The modulation scheme used for the EUT is GMSK.

A brief overview of how GMSK works is shown below.

#### **GMSK (Gaussian Minimum Shift Keying)**

The fundamental principal behind GMSK is Phase shift keying. This splits a data stream into a series of 2-digit phase shifts, using the following phase shifts to represent data pairs.



Therefore for the BIT sequence 0 0 1 1 1 0 0 1 The corresponding phase shift will be used

BIT SEQUENCE	0 0	1 1	1 0	0 1
PHASE	225°	45°	135°	315°

This is called QPSK (Quadratic Phase Shift Keying)

**However**

There is a problem with QPSK: transition from e.g. 00 to 11 gives phase shift of 180° ( $\pi$  radians). This has the effect of inverting the carrier waveform and this can lead to detection errors at the receiver.

Solution: restrict phase changes to  $\pm 90^\circ$

1. Split bitstream into 2 streams e.g.

	0 0		1 1		0 1		1 0	
I Stream	0		1		0		1	
Q stream		0		1		1		0

2. Modulate each stream with PSK (1 = 90° or  $\pi/2$ , 0 = -90° or  $-\pi/2$  phase shift)

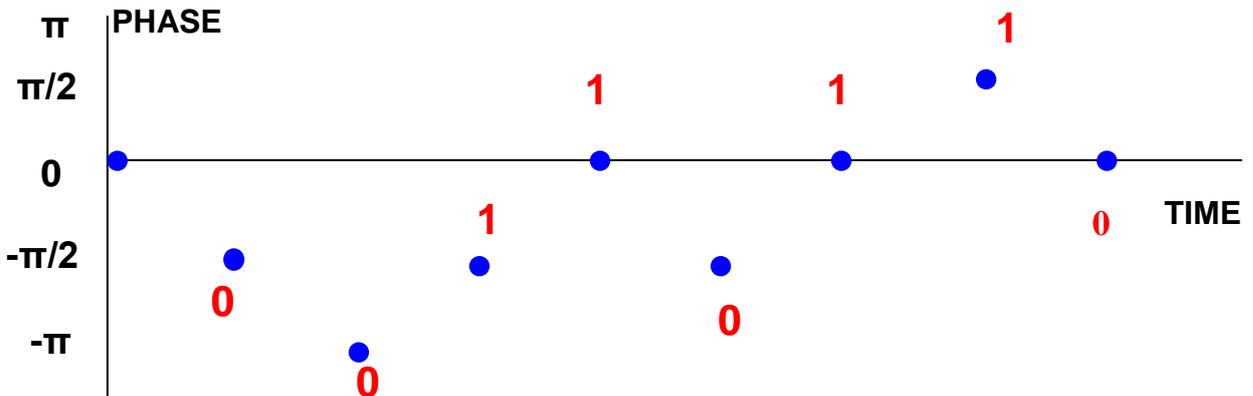
I Stream	0		1		0		1	
	$-\pi/2$		$-\pi/2$		$-\pi/2$		$\pi/2$	
Q stream		0		1		1		0
		$-\pi/2$		$\pi/2$		$\pi/2$		$-\pi/2$



3. Combine (add) the two PSK signals:

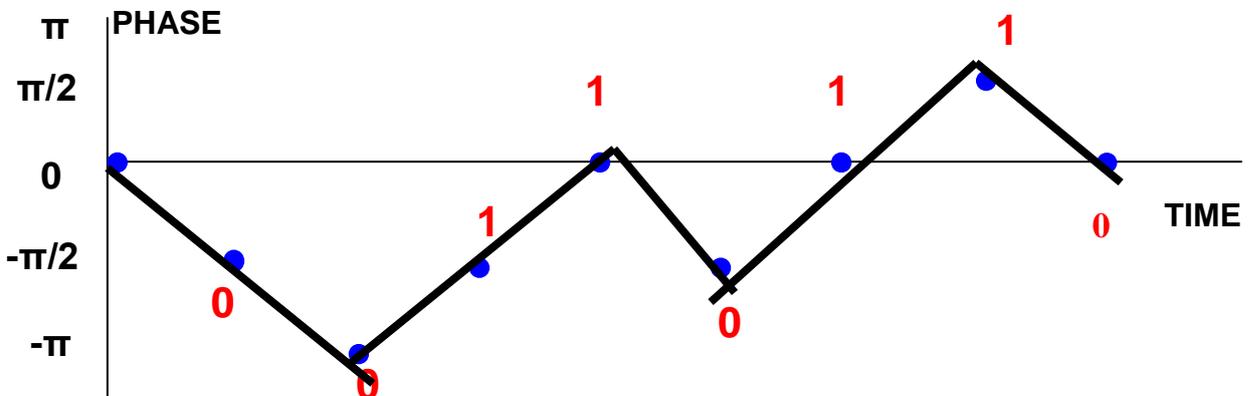
Combined Phase	$-\pi/2$	$-\pi$	$-\pi/2$	0	$-\pi/2$	0	$\pi/2$	0
----------------	----------	--------	----------	---	----------	---	---------	---

Result: offset - QPSK, phase change is restricted to  $\pm \pi/2$  radians:



It would be preferable to have "gradual" changes in place between each pair of bits (Continuous-phase modulation). Replacing each "rectangular" shaped pulse (for 1 or 0) with a sinusoidal pulse can do this:

Result: Minimum Shift Keying (MSK):



**Gaussian Minimum Shift Keying**

MSK has high sidebands relative to the main lobes in the frequency domain - this can lead to interference with adjacent signals.

If the rectangular pulses corresponding to the bitstream are filtering using a Gaussian-shaped impulse response filter, we get Gaussian MSK (GMSK) - this has low sidelobes compared to MSK.

FCC 47 CFR Part 2, Limit Clause 2.1047 (d)

A curve or equivalent data which shows that the equipment will meet the modulation requirements of the rules under which the equipment is to be licensed.



Product Service

### **SECTION 3**

#### **TEST EQUIPMENT USED**



### 3.1 TEST EQUIPMENT USED

List of absolute measuring and other principal items of test equipment.

Instrument	Manufacturer	Type No.	TE No.	Calibration Period (months)	Calibration Due
<b>Section 2.1 - Frequency Tolerance</b>					
Attenuator 10dB/25W	Weinschel	46-10-43	400	12	18-Jun-2016
Temperature Chamber	Montford	2F3	467	-	O/P Mon
Rubidium Standard	Rohde & Schwarz	XSRM	1316	6	3-Sep-2016
Radio Communications Test Set	Rohde & Schwarz	CMU 200	2809	12	9-Jul-2016
Thermocouple Thermometer	Fluke	51	3174	12	9-Dec-2016
Hygrometer	Rotronic	I-1000	3220	12	19-Aug-2016
TRUE RMS MULTIMETER	Fluke	179	4006	0	9-Dec-2016
Frequency Standard	Spectracom	Secure Sync 1200-0408-0601	4393	6	3-Sep-2016
<b>Section 2.2 - Spurious Emissions at Band Edge</b>					
Radio Communications Test Set	Rohde & Schwarz	CMU 200	442	12	18-Jan-2017
Power Splitter	Weinschel	1506A	606	12	24-Mar-2017
Rubidium Standard	Rohde & Schwarz	XSRM	1316	6	3-Sep-2016
Programmable Power Supply	Iso-tech	IPS 2010	2435	-	O/P Mon
Hygrometer	Rotronic	I-1000	3220	12	19-Aug-2016
Attenuator (10dB, 20W)	Lucas Weinschel	1	3225	12	16-Dec-2016
Network Analyser	Rohde & Schwarz	ZVA 40	3548	12	2-Sep-2016
TRUE RMS MULTIMETER	Fluke	179	4006	0	9-Dec-2016
Calibration Unit	Rohde & Schwarz	ZV-Z54	4368	12	7-Sep-2016
Frequency Standard	Spectracom	Secure Sync 1200-0408-0601	4393	6	3-Sep-2016
Wideband Radio Test Set	Rohde & Schwarz	CMW500	4546	12	3-Feb-2017
PXA Signal Analyser	Keysight Technologies	N9030A	4654	12	8-Oct-2016
<b>Section 2.3 - Maximum Conducted Output Power</b>					
Radio Communications Test Set	Rohde & Schwarz	CMU 200	442	12	18-Jan-2017
Power Splitter	Weinschel	1506A	606	12	24-Mar-2017
Programmable Power Supply	Iso-tech	IPS 2010	2435	-	O/P Mon
Hygrometer	Rotronic	I-1000	3220	12	19-Aug-2016
Attenuator (10dB, 20W)	Lucas Weinschel	1	3225	12	16-Dec-2016
Network Analyser	Rohde & Schwarz	ZVA 40	3548	12	2-Sep-2016
P-Series Power Meter	Agilent Technologies	N1911A	3981	12	25-Sep-2016
50 MHz-18 GHz Wideband Power Sensor	Agilent Technologies	N1921A	3983	12	25-Sep-2016
TRUE RMS MULTIMETER	Fluke	179	4006	0	9-Dec-2016
Fan Heater	Master	B 3 EPB	4363	-	TU
Calibration Unit	Rohde & Schwarz	ZV-Z54	4368	12	7-Sep-2016
Wideband Radio Test Set	Rohde & Schwarz	CMW500	4546	12	3-Feb-2017
PXA Signal Analyser	Keysight Technologies	N9030A	4654	12	8-Oct-2016



Instrument	Manufacturer	Type No.	TE No.	Calibration Period (months)	Calibration Due
<b>Section 2.4 - Emission Limitations for Cellular Equipment</b>					
Radio Communications Test Set	Rohde & Schwarz	CMU 200	442	12	18-Jan-2017
Screened Room (5)	Rainford	Rainford	1545	36	20-Dec-2017
Turntable Controller	Inn-Co GmbH	CO 1000	1606	-	TU
Antenna (Bilog)	Chase	CBL6143	2904	24	11-Jun-2017
EMI Test Receiver	Rohde & Schwarz	ESU40	3506	12	2-Nov-2016
9m RF Cable (N Type)	Rhophase	NPS-2303-9000-NPS	3791	-	TU
Tilt Antenna Mast	matur GmbH	TAM 4.0-P	3916	-	TU
Mast Controller	matur GmbH	NCD	3917	-	TU
Hygropalm Temperature and Humidity Meter	Rotronic	HP21	4410	12	27-Apr-2017
Wideband Radio Test Set	Rohde & Schwarz	CMW500	4546	12	3-Feb-2017
Double Ridged Waveguide Horn Antenna	ETS-Lindgren	3117	4722	12	29-Dec-2016
<b>Section 2.5 - Spurious Emissions at Antenna Terminals</b>					
Radio Communications Test Set	Rohde & Schwarz	CMU 200	442	12	18-Jan-2017
Power Splitter	Weinschel	1506A	606	12	24-Mar-2017
Rubidium Standard	Rohde & Schwarz	XSRM	1316	6	3-Sep-2016
Programmable Power Supply	Iso-tech	IPS 2010	2435	-	O/P Mon
Filter	Daden Anthony Ass	MH-1500-7SS	2778	12	5-Feb-2017
Hygrometer	Rotronic	I-1000	3220	12	19-Aug-2016
Attenuator (10dB, 20W)	Lucas Weinschel	1	3225	12	16-Dec-2016
Network Analyser	Rohde & Schwarz	ZVA 40	3548	12	2-Sep-2016
TRUE RMS MULTIMETER	Fluke	179	4006	0	9-Dec-2016
Calibration Unit	Rohde & Schwarz	ZV-Z54	4368	12	7-Sep-2016
Frequency Standard	Spectracom	Secure Sync 1200-0408-0601	4393	6	3-Sep-2016
Suspended Substrate Highpass Filter	Advance Power Components	11SH10-3000/X18000-O/O	4412	12	23-Mar-2017
Wideband Radio Test Set	Rohde & Schwarz	CMW500	4546	12	3-Feb-2017
PXA Signal Analyser	Keysight Technologies	N9030A	4654	12	8-Oct-2016
<b>Section 2.6 - 26 dB Bandwidth</b>					
Radio Communications Test Set	Rohde & Schwarz	CMU 200	442	12	18-Jan-2017
Power Splitter	Weinschel	1506A	606	12	24-Mar-2017
Programmable Power Supply	Iso-tech	IPS 2010	2435	-	O/P Mon
Hygrometer	Rotronic	I-1000	3220	12	19-Aug-2016
Attenuator (10dB, 20W)	Lucas Weinschel	1	3225	12	16-Dec-2016
Network Analyser	Rohde & Schwarz	ZVA 40	3548	12	2-Sep-2016
TRUE RMS MULTIMETER	Fluke	179	4006	0	9-Dec-2016
Calibration Unit	Rohde & Schwarz	ZV-Z54	4368	12	7-Sep-2016
PXA Signal Analyser	Keysight Technologies	N9030A	4654	12	8-Oct-2016

TU – Traceability Unscheduled

O/P MON – Output Monitored with Calibrated Equipment



Product Service

**3.2 MEASUREMENT UNCERTAINTY**

For a 95% confidence level, the measurement uncertainties for defined systems are:-

Test Discipline	MU
Frequency Tolerance	± 46.70 Hz
Modulation Characteristics	-
Maximum Conducted Output Power	± 0.70 dB
Spurious Emissions at Antenna Terminals	± 3.454 dB
Emission Limitations for Cellular Equipment	30 MHz to 1 GHz: ± 5.1 dB 1 GHz to 40 GHz: ± 6.3 dB
26 dB Bandwidth	± 16.74 kHz
Spurious Emissions at Band Edge	30 MHz to 1 GHz: ± 5.1 dB 1 GHz to 40 GHz: ± 6.3 dB



Product Service

## **SECTION 4**

### **ACCREDITATION, DISCLAIMERS AND COPYRIGHT**



Product Service

#### 4.1 ACCREDITATION, DISCLAIMERS AND COPYRIGHT



This report relates only to the actual item/items tested.

Our UKAS Accreditation does not cover opinions and interpretations and any expressed are outside the scope of our UKAS Accreditation.

Results of tests not covered by our UKAS Accreditation Schedule are marked NUA (Not UKAS Accredited).

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