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# Report On

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

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FCC ID: APYHRO00236

Document 75933584 Report 16 Issue 1

May 2016



**Product Service** 

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**REPORT ON**FCC Testing of the Sharp Dual-band LTE (B1 / B26), Dual-band<br/>WCDMA (FDD I / V) &,Quad-band GSM (850/900/1800/1900) multi<br/>mode Cellular phone with Bluetooth, WLAN, SRD (NFC,FeliCa) and<br/>GPS in accordance with FCC 47 CFR Part 22 and FCC 47 CFR Part<br/>2 (WCDMA FDD V)

Document 75933584 Report 16 Issue 1

May 2016

PREPARED FOR

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**APPROVED BY** 

yn Herle

Ryan Henley Authorised Signatory

DATED

18 May 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

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# **SECTION 1**

# **REPORT SUMMARY**

FCC Testing of the Sharp Dual-band LTE (B1 / B26), Dual-band WCDMA (FDD I / V) &,Quad-band GSM (850/900/1800/1900) multi mode Cellular phone with Bluetooth, WLAN, SRD (NFC,FeliCa) and GPS In accordance with FCC 47 CFR Part 22 and FCC 47 CFR Part 2 (WCDMA FDD V)



# 1.1 INTRODUCTION

The information contained in this report is intended to show the verification of FCC Testing of the Sharp Dual-band LTE (B1 / B26), Dual-band WCDMA (FDD I / V) &,Quad-band GSM (850/900/1800/1900) multi mode Cellular phone with Bluetooth, WLAN, SRD (NFC,FeliCa) 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 004401115792604 IMEI 004401115794196
Number of Samples Tested	2
Test Specification/Issue/Date	FCC 47 CFR Part 22 (2015) FCC 47 CFR Part 2 (2015)
Disposal Reference Number Date	Held Pending Disposal Not Applicable Not Applicable
Order Number Date	10753 17 February 2016
Start of Test	21 April 2016
Finish of Test	3 May 2016
Name of Engineer(s)	M Russell S Bennett T Guy
Related Document(s)	ANSI C63.4 (2014) ANSI TIA-603-C (2004)



# 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
Section	Part 22	Part 2	Test Description		
WCDMA FDD V					
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



# 1.3 PRODUCT TECHNICAL DESCRIPTION

Refer to Model Description APYHRO00236 Rev 1.0 document.

# 1.4 **PRODUCT INFORMATION**

#### 1.4.1 Technical Description

The Equipment Under Test (EUT) was a Sharp Dual-band LTE (B1 / B26), Dual-band WCDMA (FDD I / V) &,Quad-band GSM (850/900/1800/1900) multi mode Cellular phone with Bluetooth, WLAN, SRD (NFC,FeliCa) 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.



**SECTION 2** 

# **TEST DETAILS**

FCC Testing of the Sharp Dual-band LTE (B1 / B26), Dual-band WCDMA (FDD I / V) &,Quad-band GSM (850/900/1800/1900) multi mode Cellular phone with Bluetooth, WLAN, SRD (NFC,FeliCa) and GPS In accordance with FCC 47 CFR Part 22 and FCC 47 CFR Part 2 (WCDMA FDD V)



# 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 004401115792604 - Modification State 0

#### 2.1.3 Date of Test

3 May 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

The test was performed in accordance with KDB 971168 D01 v02r02, Clause 9.

#### Remarks

Using a communication test set, frequency error measurements were made over the temperature range - $30^{\circ}$ C to + $50^{\circ}$ C in 10° steps. At 20°C, the voltage was varied in accordance with 2.1055 (d).

The communication test set was connected to an external frequency standard to improve measurement accuracy.

#### 2.1.6 Environmental Conditions

Ambient Temperature	25.1°C
Relative Humidity	24.1%



# 2.1.7 Test Results

4.0 V DC Supply

WCDMA FDD V, 835.00 MHz, RMC, QPSK, Frequency Tolerance Under Temperature Variations Results

Temperature	Fundamental Frequency Deviation (ppm)
-30 °C	-0.007
-20 °C	0.0014
-10 °C	0.0014
0 °C	-0.007
+10 °C	-0.006
+20 °C	-0.007
+30 °C	-0.007
+40 °C	0.007
+50 °C	0.007

#### WCDMA FDD V, 835.00 MHz, RMC, QPSK, Frequency Tolerance Under Voltage Variations Results

Voltage	Fundamental Frequency Deviation (ppm)	
4.0 V DC	-0.007	
3.7 V DC	-0.007	

# 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	-	-



# 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 004401115792604 - Modification State 0

# 2.2.3 Date of Test

23 April 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 v02r02, Clause 6.

# 2.2.6 Environmental Conditions

Ambient Temperature22.8°CRelative Humidity28.2%



# 2.2.7 Test Results

4.0 V DC Supply

WCDMA FDD V, RMC, QPSK, Spurious Emissions at Band Edge Results

Block Edge	Frequency Block (MHz)			
BIOCK Edge	A :824.0 MHz – 835.0 MHz	B :846.5 MHz – 849.0 MHz		
Lower	Channel: 4132 826.4 MHz	-		
Upper	-	Channel: 4233 846.6 MHz		

# WCDMA FDD V, RMC, QPSK, Frequency Block A, Spurious Emissions at Band Edge Plot

Keysight Spectrum Analyzer - Swept SA RL RF 50 Ω DC	1 1	SENSE:EXT	ALIGN AUTO	09:57:38 AM Apr 23, 2016
ef Level 21.95 dBm Ref Offset 26.95 dB	PNO: Wide ++ IFGain:Low	. Trig: Free Run #Atten: 6 dB	Avg Type: RMS	TRACE 1 2 3 4 5 TYPE DET A NNNN Mkr1 824.000 MHz
0 dB/div Ref 21.95 dBm				-31.83 dBm
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3.05				-13.00 dBr
8.1		- /		
8.1				
8.1				
8.1				
8.1				
8.1				
enter 824.000 MHz Res BW 47 kHz	#VB	W 150 kHz*		Span 2.000 MHz #Sweep 5.000 s (1001 pts
sg 🔀 File name error; C:\testres al	Iready exists		STATUS	



# WCDMA FDD V, RMC, QPSK, Frequency Block B, Spurious Emissions at Band Edge Plot

Keysight Spectrum Analyzer - Si RL RF 50	wept SA Ω DC		ENSE:EXT	11700 AUTO		10-02-0	- 🗇 🜌
enter Freq 849.00	0000 MHz	PNO: Wide	Trig: Free Run #Atten: 8 dB	ALIGN AUTO Avg Type:	RMS	T	RACE 1 2 3 4 5 TYPE WWWWW DET A NNNN
Ref Offset 2 0 dB/div Ref 18.96						Mkr1 849 -3	.000 MH: 1.12 dBn
.96							
.04	and a second second						
1.0	_		$\mathbf{i}$	_			-13.00 dB
1.0			1	_			
1.0							
1.0							
1.0							
1.0							
enter 849.000 MHz Res BW 47 kHz		#VBV	V 150 kHz*		#Sw	Spar eep 5.000	n 2.000 MH s (1001 pts
sG				STATUS		-	

#### FCC 47 CFR Part 22, Limit Clause 22.905 and 22.917

-13 dBm at block edge.



# 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 004401115792604 - Modification State 0

#### 2.3.3 Date of Test

23 April 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 5.2.1

#### 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 = Pout (dBm) + ANT Gain (dBi) - 2.15 (dB).

# 2.3.6 Environmental Conditions

Ambient Temperature	22.8°C
Relative Humidity	28.2%



# 2.3.7 Test Results

4.0 V DC Supply

# WCDMA FDD V, RMC, Maximum Conducted Output Power Results

Frequency	Conducted Power (dBm)	Antenna Gain	ERP (dBm)	EIRP (W)
826.40 MHz	23.12	2.0 dBi	22.97	0.20
835.00 MHz	23.12	2.0 dBi	22.97	0.20
846.60 MHz	23.26	2.0 dBi	23.11	0.20

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

Mobile Transmitters: 7 W or 38.45 dBm



# 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 004401115794196 - Modification State 0

# 2.4.3 Date of Test

21 April 2016 & 22 April 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

The test was performed in accordance with KDB 971168 D01 v02r02, Clause 5.8 and 7 and ANSI TIA-603-C, Clause 2.2.12. The EUT was configured as defined in ANSI C63.26.

#### 2.4.6 Environmental Conditions

Ambient Temperature20.5 - 21.7°CRelative Humidity34.2 - 34.5%



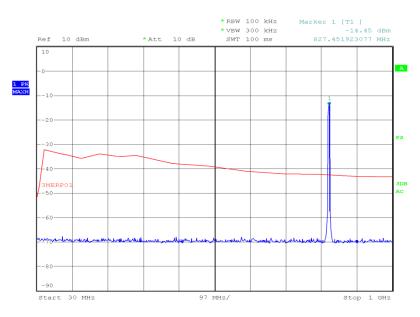
# 2.4.7 Test Results

WCDMA FDD V, 826.40 MHz, Emission Limitations for Cellular Equipment Results

Frequency (MHz)	Emission Results (dBm)
*	

\*No emissions were detected within 20 dB of the limit.

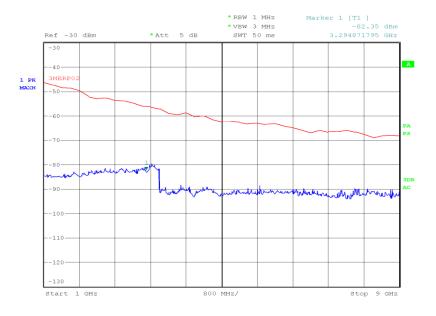
WCDMA FDD V, 826.40 MHz, 30 MHz to 1 GHz, Emission Limitations for Celluar Equipment Plot



Date: 22.APR.2016 03:15:00



# WCDMA FDD V, 826.40 MHz, 1 GHz to 9 GHz, Emission Limitations for Celluar Equipment Plot



Date: 21.APR.2016 03:31:52

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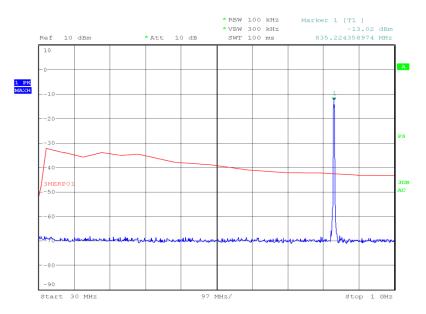


# WCDMA FDD V, 835.00 MHz, Emission Limitations for Cellular Equipment Results

Frequency (MHz)	Emission Results (dBm)
*	

\*No emissions were detected within 20 dB of the limit.

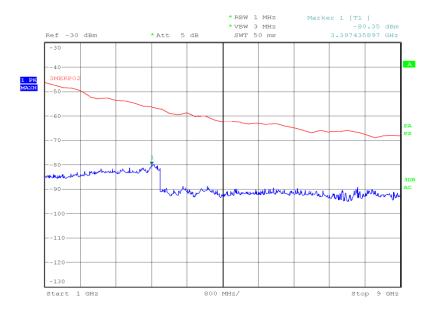
WCDMA FDD V, 835.00 MHz, 30 MHz to 1 GHz, Emission Limitations for Celluar Equipment Plot



Date: 22.APR.2016 03:17:34



# WCDMA FDD V, 835.00 MHz, 1 GHz to 9 GHz, Emission Limitations for Celluar Equipment Plot



Date: 21.APR.2016 03:33:03

# COMMERCIAL-IN-CONFIDENCE

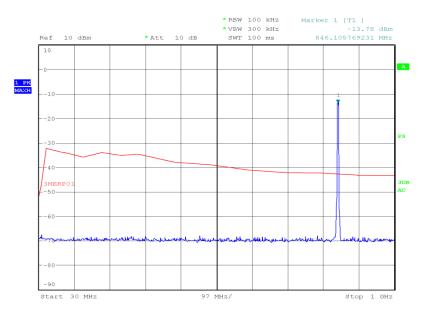


# WCDMA FDD V, 846.60 MHz, Emission Limitations for Cellular Equipment Results

Frequency (MHz)	Emission Results (dBm)
*	

\*No emissions were detected within 20 dB of the limit.

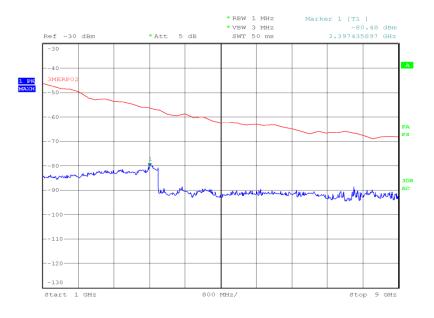
WCDMA FDD V, 846.60 MHz, 30 MHz to 1 GHz, Emission Limitations for Celluar Equipment Plot



Date: 22.APR.2016 03:21:54



# WCDMA FDD V, 846.60 MHz, 1 GHz to 9 GHz, Emission Limitations for Celluar Equipment Plot



Date: 21.APR.2016 03:34:36

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

43+10log(P) or -13 dBm



# 2.5 SPURIOUS EMISSIONS AT ANTENNA TERMINALS

### 2.5.1 Specification Reference

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

# 2.5.2 Equipment Under Test and Modification State

S/N: IMEI 004401115792604 - Modification State 0

#### 2.5.3 Date of Test

23 April 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

The test was performed in accordance with KDB 971168 D01 v02r02, Clause 6.

# Remarks

Testing was carried out with an RBW of 100 kHz as defined in 22.917(b). Measurements were made with a Peak detector and the trace set to Max Hold.

# 2.5.6 Environmental Conditions

Ambient Temperature	22.8°C
Relative Humidity	28.2%



# 2.5.7 Test Results

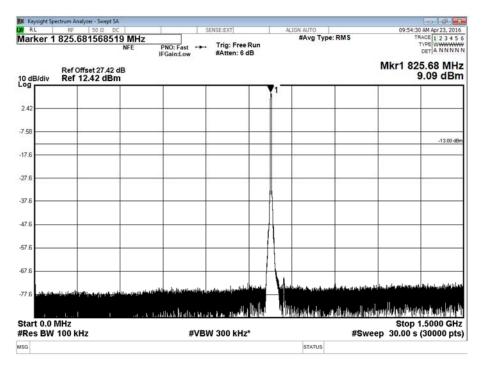
4.0 V DC Supply

WCDMA FDD V, 826.40 MHz, Spurious Emissions at Antenna Terminals Results

Frequency (MHz)	Emission Results (dBm)
*	

\*No emissions were detected within 20 dB of the limit.

WCDMA FDD V, 826.40 MHz, 9 kHz to 1.5 GHz, Spurious Emissions at Antenna Terminals Plot





# WCDMA FDD V, 826.40 MHz, 1.5 GHz to 9 GHz, Spurious Emissions at Antenna Terminals Plot

RL RL	RF 50 Q DC	T T	SENSE:EXT	ALIGN AUTO		10:22	😑 🖨 💽
	reg 5.250000000 G	Hz	SENSELEXI	#Avg Type:	RMS	10.25	TRACE 1 2 3 4 5
orner r	100 3.230000000 0	PNO: Fast -+	_ Trig: Free Run				TRACE 1 2 3 4 5 TYPE WWWWWW DET A NNNN
	PREAMP	IFGain:Low	#Atten: 10 dB				DETANNNN
	Ref Offset 24.1 dB					Mkr1 1.6	54 13 GH
0 dB/div	Ref -10.90 dBm						74.27 dBn
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0.9			<u> </u>				
101							
tart 1.50							p 9.000 GH
Res BW	100 kHz	#VE	3W 300 kHz*		#Sv	veep 150.0	s (40001 pts
sg				STATUS		-	



# WCDMA FDD V, 835.00 MHz, Spurious Emissions at Antenna Terminals Results

Frequency (MHz)	Emission Results (dBm)
*	

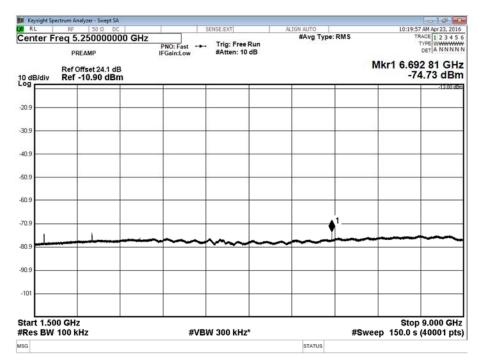
\*No emissions were detected within 20 dB of the limit.

WCDMA FDD V, 835.00 MHz, 9 kHz to 1.5 GHz, Spurious Emissions at Antenna Terminals Plot

Keysight Spectrum Analyzer - Sw RL RF 50 G	rept SA	n 1-	SENSE:EXT		41	IGN AUTO		10:11:0	
arker 1 837.88190		PNO: Fast	Tain: Free D	lun 3	AL	#Avg Type:	RMS		RACE 1 2 3 4 5 TYPE WWWW DET A NNNN
Ref Offset 27 dB/div Ref 12.42			-						7.88 MH 8.90 dBn
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art 0.0 MHz tes BW 100 kHz		#VB	W 300 kHz*				#Swee	Stop p 30.00 s	1.5000 GH (30000 pts
						STATUS		•	· ·



# WCDMA FDD V, 835.00 MHz, 1.5 GHz to 9 GHz, Spurious Emissions at Antenna Terminals Plot





# WCDMA FDD V, 846.60 MHz, Spurious Emissions at Antenna Terminals Results

Frequency (MHz)	Emission Results (dBm)
*	

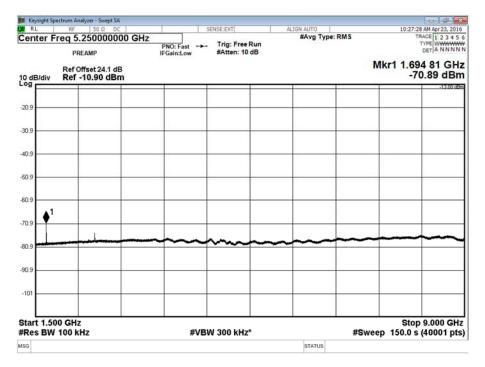
\*No emissions were detected within 20 dB of the limit.

WCDMA FDD V, 846.60 MHz, 9 kHz to 1.5 GHz, Spurious Emissions at Antenna Terminals Plot

Keysight Spectrum Analyzer - Swe					- 22				
RL RF 50 R arker 1 845.082098			ENSE:EXT		AL	#Avg Type:	RMS		5 AM Apr 23, 2016 RACE 1 2 3 4 5
arker 1 645.062090	NFE	PNO: Fast	Trig: Free I #Atten: 6 d	Run		artig type.			DET A NNNN
Ref Offset 27. dB/div Ref 12.42 d									5.08 MH: 8.98 dBn
<sup>yg</sup>					1				
42	_				-				
58									
					_				-13.00 dB
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tart 0.0 MHz Res BW 100 kHz		#VBI	№ 300 kHz'	•			#Swee	Stop p 30.00 s	1.5000 GH (30000 pts
G						STATUS			



# WCDMA FDD V, 846.60 MHz, 1.5 GHz to 9 GHz, Spurious Emissions at Antenna Terminals Plot



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

43+10log(P) or -13 dBm



#### 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 004401115792604 - Modification State 0

#### 2.6.3 Date of Test

23 April 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 v02r02, Clause 4.1.

# 2.6.6 Environmental Conditions

Ambient Temperature22.8°CRelative Humidity28.2%



# 2.6.7 Test Results

4.0 V DC Supply

WCDMA FDD V, QPSK, 26 dB Bandwidth Results

826.40 MHz	835.00 MHz	846.60 MHz
kHz	kHz	kHz
4632	4614	4624

# WCDMA FDD V, 826.40 MHz, QPSK, 26 dB Bandwidth Plot

Keysight Spectrum Analyzer - Occupied BW RL RF 50 Ω DC		SENSE:EXT ALI	SN AUTO	09:55:35 AM Apr 23, 201
enter Freq 826.400000 N	#IFGain:Low	Center Freq: 826.400000 M		Radio Std: None Radio Device: BTS
0 dB/div Ref 30.15 dBm	Ú Ú	<u>г т</u> т	Ú	
0.2	man	munhangener	mm	
50	1 de la companya de l		h	
85				
9.9	~			
9.9 monthermone	~		- Jon	manne
9.9				
9.9				
enter 826.4 MHz Res BW 51 kHz		#VBW 160 kHz		Span 10 MH Sweep 5 m
Occupied Bandwidt	h	Total Power	32.0 dBm	
4.1	1585 MHz			
Transmit Freq Error	-4.033 kHz	% of OBW Power	99.00 %	
x dB Bandwidth	4.632 MHz	x dB	-26.00 dB	



#### 10:09:51 AM Apr 23, 2016 Radio Std: None ISE:EXT ALIGN AUTO Center Freq: 836.600000 MHz Trig: Free Run Avg|Hold: 1000/1000 #Atten: 10 dB -Radio Device: BTS #IFGain:Low Ref 31.10 dBm 10 dB/div .00 21 11. 1.1 8.90 18.9 28.9 38. 48.9 58. Center 836.6 MHz #Res BW 51 kHz Span 10 MHz Sweep 5 ms #VBW 160 kHz **Occupied Bandwidth Total Power** 32.3 dBm 4.1482 MHz 8.228 kHz % of OBW Power Transmit Freq Error 99.00 % x dB Bandwidth 4.614 MHz -26.00 dB x dB STATUS MSG

#### WCDMA FDD V, 835.00 MHz, QPSK, 26 dB Bandwidth Plot

# WCDMA FDD V, 846.60 MHz, QPSK, 26 dB Bandwidth Plot

Keysight Spectrum Analyzer - Occupied BW RL RF 50 Q DC	T of T	SENSE:EXT ALIO	SN AUTO	10:01:44 AM Apr 23, 20
enter Freg 846.600000 N	AH7	Center Freg: 846.600000 N		Radio Std: None
51101 1104 040.000000 M		. Trig: Free Run	Avg Hold: 1000/1000	
	#IFGain:Low	#Atten: 10 dB		Radio Device: BTS
dB/div Ref 30.73 dBm	·	27. (1) (1) (1) (1) (1)		11
9g				
0.7				3
0.7	man	anon more growing	man	
30	A		74	a
	1			
27	- /			
.3	M			-
13 month and the second	~~~		1 min	mannen a
.3		+ + +		
13				
9.3				
enter 846.6 MHz	11			Span 10 MH
Res BW 51 kHz		#VBW 160 kHz		Sweep 5 m
		#VBVV 100 KHZ		Sweep 5 n
	L.	Total Power	32.2 dBm	
Occupied Bandwidt	n	Total Power	32.2 dBm	
4.1	1599 MHz			
	7 004 111-	% of OBW Power	99.00 %	
Transmit Freq Error	-7.804 kHz			
-			26.00 dB	
Transmit Freq Error x dB Bandwidth	-7.804 KHZ 4.624 MHz	x dB	-26.00 dB	
-			-26.00 dB	
-			-26.00 dB	
-			-26.00 dB	
-			-26.00 dB	

# 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

WCDMA FDD V, Modulation Characteristics, Customer Description

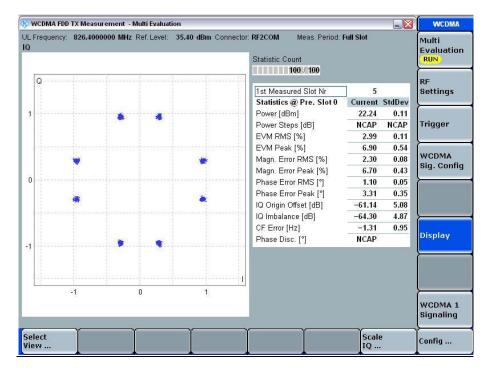
For the period of test the EUT met the requirements of FCC CFR 47 Part 2 for Modulation Characteristics.

The test results are shown below.

4.0 V DC Supply

<u>QPSK</u>

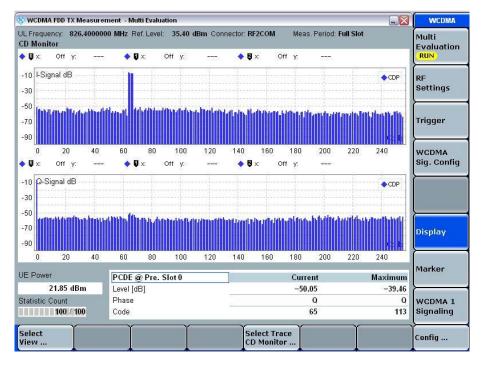
**Constellation Diagram** 



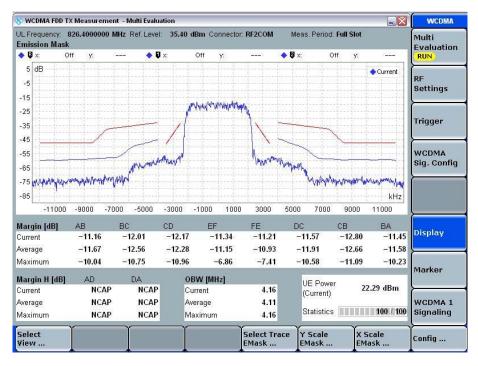
# COMMERCIAL-IN-CONFIDENCE



# I and Q Code Domain



# Spectrum Emission Mask



# 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.



**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	Calibration Due
				(months)	
Section 2.1 - Frequency Tolera		140000	100		04.14 0040
Multimeter	White Gold	WG022	190	12	24-Nov-2016
Digital Temperature Indicator + T/C	Fluke	51	412	12	2-Mar-2017
Temperature Chamber	Montford	2F3	467	-	O/P Mon
Rubidium Standard	Rohde & Schwarz	XSRM	1316	6	3-Sep-2016
Power Supply	Hewlett Packard	6104A	1948	-	TU
Radio Communications Test Set	Rohde & Schwarz	CMU 200	3035	12	16-Nov-2016
Frequency Standard	Spectracom	Secure Sync 1200- 0408-0601	4393	6	3-Sep-2016
Section 2.2 - Spurious Emission	ons at Band Edge				·
Attenuator 10dB/25W	Weinschel	46-10-43	400	12	18-Jun-2016
Radio Communications Test Set	Rohde & Schwarz	CMU 200	442	12	18-Jan-2017
Power Splitter	Weinschel	1506A	607	12	31-Mar-2017
Rubidium Standard	Rohde & Schwarz	XSRM	1316	6	3-Sep-2016
Power Supply	Hewlett Packard	6104A	1948	-	TU
Multimeter	Iso-tech	IDM101	2424	12	29-Sep-2016
Programmable Power Supply	Iso-tech	IPS 2010	2436	-	O/P Mon
Attenuator (20dB, 2W)	Pasternack	PE7004-20	2943	12	4-Apr-2017
Hygrometer	Rotronic	I-1000	3220	12	19-Aug-2016
Network Analyser	Rohde & Schwarz	ZVA 40	3548	12	2-Sep-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
PXA Signal Analyser	Agilent Technologies	N9030A PXA	4409	12	8-Mar-2017
Section 2.3 - Maximum Condu	cted Output Power				
Multimeter	White Gold	WG022	190	12	24-Nov-2016
Attenuator 10dB/25W	Weinschel	46-10-43	400	12	18-Jun-2016
Radio Communications Test Set	Rohde & Schwarz	CMU 200	442	12	18-Jan-2017
Attenuator (20dB/ 2W)	Pasternack	PE7004-20	489	12	30-Oct-2016
Power Splitter	Weinschel	1506A	607	12	31-Mar-2017
Rubidium Standard	Rohde & Schwarz	XSRM	1316	6	3-Sep-2016
Power Supply	Hewlett Packard	6104A	1948	-	TU
Multimeter	Iso-tech	IDM101	2424	12	29-Sep-2016
Programmable Power Supply	Iso-tech	IPS 2010	2436	-	O/P Mon
Attenuator (20dB, 2W)	Pasternack	PE7004-20	2943	12	4-Apr-2017
Hygrometer	Rotronic	I-1000	3220	12	19-Aug-2016
Network Analyser	Rohde & Schwarz	ZVA 40	3548	12	2-Sep-2016
Combiner/Splitter	Weinschel	1506A	3878	12	2-Jun-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
Calibration Unit	Rohde & Schwarz	ZV-Z54	4368	12	7-Sep-2016
Frequency Standard	Spectracom	Secure Sync 1200- 0408-0601	4393	6	3-Sep-2016
PXA Signal Analyser	Agilent Technologies	N9030A PXA	4409	12	8-Mar-2017

#### COMMERCIAL-IN-CONFIDENCE



Instrument	Manufacturer	Туре No.	TE No.	Calibration Period (months)	Calibration Due
Section 2.4 - Emission Limitat			•		
Turntable Controller	Inn-Co GmbH	CO 1000	1606	-	TU
Antenna (Bilog)	Chase	CBL6143	2904	24	11-Jun-2017
Radio Communications Test Set	Rohde & Schwarz	CMU 200	3035	12	16-Nov-2016
Signal Generator (10MHz to 40GHz)	Rohde & Schwarz	SMR40	3171	12	28-Sep-2016
EMI Test Receiver	Rohde & Schwarz	ESU40	3506	12	2-Nov-2016
Tilt Antenna Mast	maturo Gmbh	TAM 4.0-P	3916	-	TU
Mast Controller	maturo Gmbh	NCD	3917	-	TU
Double Ridged Waveguide Horn Antenna	ETS-Lindgren	3117	4722	12	29-Dec-2016
Section 2.5 - Spurious Emission	ons at Antenna Termina	ls			
Attenuator 10dB/25W	Weinschel	46-10-43	400	12	18-Jun-2016
Radio Communications Test Set	Rohde & Schwarz	CMU 200	442	12	18-Jan-2017
Power Splitter	Weinschel	1506A	607	12	31-Mar-2017
Rubidium Standard	Rohde & Schwarz	XSRM	1316	6	3-Sep-2016
Power Supply	Hewlett Packard	6104A	1948	-	TU
High Pass Filter (7GHz)	Lorch	9HP7-7000-SR	2246	0	Class 1 (Int)
Multimeter	Iso-tech	IDM101	2424	12	29-Sep-2016
Programmable Power Supply	Iso-tech	IPS 2010	2436	-	O/P Mon
Filter	Daden Anthony Ass	MH-1500-7SS	2778	12	5-Feb-2017
Attenuator (20dB, 2W)	Pasternack	PE7004-20	2943	12	4-Apr-2017
Hygrometer	Rotronic	I-1000	3220	12	19-Aug-2016
Network Analyser	Rohde & Schwarz	ZVA 40	3548	12	2-Sep-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
PXA Signal Analyser	Agilent Technologies	N9030A PXA	4409	12	8-Mar-2017
Suspended Substrate Highpass Filter	Advance Power Components	11SH10- 3000/X18000-O/O	4411	12	23-Mar-2017
Section 2.6 - 26 dB Bandwidth	l				
Attenuator 10dB/25W	Weinschel	46-10-43	400	12	18-Jun-2016
Amplifier	Miteq Corp	AM-4A-0510-1103	422	-	TU
Radio Communications Test Set	Rohde & Schwarz	CMU 200	442	12	18-Jan-2017
Power Splitter	Weinschel	1506A	607	12	31-Mar-2017
Rubidium Standard	Rohde & Schwarz	XSRM	1316	6	3-Sep-2016
Power Supply	Hewlett Packard	6104A	1948	-	TU
Multimeter	Iso-tech	IDM101	2424	12	29-Sep-2016
Programmable Power Supply	Iso-tech	IPS 2010	2436	-	O/P Mon
Attenuator (20dB, 2W)	Pasternack	PE7004-20	2943	12	4-Apr-2017
Hygrometer	Rotronic	I-1000	3220	12	19-Aug-2016
Network Analyser	Rohde & Schwarz	ZVA 40	3548	12	2-Sep-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
PXA Signal Analyser	Agilent Technologies	N9030A PXA	4409	12	8-Mar-2017

TU – Traceability Unscheduled O/P MON – Output Monitored with Calibrated Equipment



# 3.2 MEASUREMENT UNCERTAINTY

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

Test Discipline	MU
Frequency Tolerance	± 44.32 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	± 93.71 kHz
Spurious Emissions at Band Edge	30 MHz to 1 GHz: ± 5.1 dB 1 GHz to 40 GHz: ± 6.3 dB



**SECTION 4** 

# ACCREDITATION, DISCLAIMERS AND COPYRIGHT



# 4.1 ACCREDITATION, DISCLAIMERS AND COPYRIGHT



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