

### **Intentional Radiator Test Report**

For the

Wilson Electronics.

#### **Quint Band Bi-Directional Amplifier Model # 460035**

Tested under

FCC Part 20

For Direct Contact Coupling Consumer Signal Booster

#### **Prepared for:**

Wilson Electronics

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Cert # ATL-0062-E

Engineering Statement: The measurements shown in this report were made in accordance with the procedure indicated, I assume full responsibility for the accuracy and completeness of these measurements, and for the qualifications of all persons taking them. It is further stated that upon the basis of the measurement made, the equipment tested is capable of operation in accordance with the requirements of Part 20 of the FCC Rules under normal use and maintenance. All results contained herein relate only to the sample tested.



# **Report Status Sheet**

Revision #	Report Date	Reason for Revision
Ø	July 12, 2017	Initial Issue
1	July 26, 2017	TCB Comments, Correction of few typos
2	February 22, 2018	Intermodulation Re-Test with more sweep
		points



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# 1. Testing Summary

These tests were conducted on a sample of the equipment for the purpose of demonstrating compliance with FCC Part 20. All tests were conducted using measurement procedure from FCC Signal Booster Measurement KDB 935210 D03 v04 Feb 12, 2016 as appropriate.

Test Name	Test	Result	Comments
	Method/Standard		
Authorized Frequency	20.21(e)(3)	Pass	
Band			
Maximum Power &	20.21(e)(8)(i)(B)	Pass	
Booster Gain	20.21(e)(8)(i)(C)		
	20.21(e)(8)(i)(D)		
Intermodulation	20.21(e)(8)(i)(F)	Pass	
Out-of-Band Emissions	20.21(e)(8)(i)(E)	Pass	
Conducted Spurious	2.1051	Pass	
Emissions			
Noise Limits	20.21(e)(8)(i)(A)	Pass	If noise is less than -70dBm/MHz then
	20.21(e)(9)(i)(l)		EUT will not shut off therefore following
			1) Variable Unlink Noise Power
			Test
			2) Noise Timing Test
Uplink Inactivity	20.21(e)(8)(i)(l)	N/A	Since noise is less than -70dBm/MHz in
	20.21(e)(9)(i)(J)		normal mode the EUT will not exceed
			this level after 5 mins when not serving
			are N/A
Variable Booster Gain	20.21(e)(8)(i)(C)	Pass	
Occupied Bandwidth	2.1049	Pass	
Oscillation Detection	20.21(e)(8)(ii)(A)	Pass	
Radiated Spurious	2.1053	Pass	
Emissions			
Spectrum Block Filtering	20.21(e)(8)(i)(B)	N/A	Applies to devices utilizing
			spectrum block filtering, In this
			case this is not applicable



## **EQUIPMENT CONFIGURATION**

## 1. Overview

H.B Compliance Solutions was contracted by Wilson Electronics to perform testing on the Bi-Directional Amplifier Model # 460035 under the purchase order number 0033674.

This document describes the test setups, test methods, required test equipment, and the test limit criteria used to perform compliance testing of the Wilson Electronics, Bi-Directional Amplifier Model # 460035.

The tests were based on FCC Part 20 Rules. The tests described in this document were formal tests as described with the objective of the testing was to evaluate compliance of the Equipment Under Test (EUT) to the requirements of the aforementioned specifications. Wilson Electronics should retain a copy of this document and it should be kept on file for at least five years after the manufacturing of the EUT has been permanently discontinued. The results obtained relate only to the item(s) tested.

Product Name:	Quint Band Bi-Directional Amplifier				
Model(s) Tested:	460035				
FCC ID:	None				
Supply Voltage Input:	Primary Power : 12.0 Vdc				
Frequency Range:	Uplink 698-716, 776-787MHz, 824-849MHz,				
	1710-1755 & 1850-1915MHz,				
	Downlink 728-746MHz, 746-757MHz, 869-894MHz,				
	1930-1995MHz & 2110-2155MHz				
No. of Channels:	N/A				
Type(s) of Modulation:	CDMA, GSM, EDGE, HSPA, EVDO, LTE				
Range of Operation Power:	0.051 – 0.36W				
Emission Designator:	F9W, GXW, G7W & G7D				
Channel Spacing(s)	N/A				
Test Item:	Pre-Production				
Type of Equipment :	Direct Connect				
Antenna Requirement	External				
Environmental Test	Temperature: 15-35°C				
Conditions:	Humidity: 30-60%				
	Barometric Pressure: 860-1060 mbar				
Modification to the EUT:	None				
Evaluated By:	Staff at H.B. Compliance Solutions				
Test Date(s):	06/14/2017 till 07/07/2017				



Radiated Emission testing was performed at Artesyn Embedded Technologies. This facility is located at 2900 S. Diablo Way, Suite 190, Tempe, AZ 85282. All equipment used in making physical determination is accurate and bears recent traceability to the National Institute of Standards and Technology.

Test facility at Artesyn Embedded Technologies is an A2LA accredited test site. The A2LA certificate number is 2716.01. The scope of accreditation covers the FCC Method - 47 CFR Part 15, ICES-003, CISPR 22, AS/NZS 3548 and VCCI.

Conducted testing was performed at H.B. Compliance Solutions. This facility is located at 5005 S. Ash Avenue, Suite # A-10, Tempe AZ 85282.

Radiated Emissions measurements were performed in a semi-anechoic chamber (equivalent to an Open Area Test Site). In accordance with §2.948(a)(3), a complete site description is contained at Emerson Network Power.

## 3. Description of Test Sample

The Wilson Electronics is a quint band bi-directional amplifier used for enhancing the range of cell phones and data communication devices in only mobile applications. On the inside antenna port of the booster there is 15' of permanently attach cable. Connection to the host device is accomplished wirelessly by an antenna inside the cradle (the only antenna available with this device) that couples signals to and from the host device. The amplifier is connected to an external antenna mounted outside the vehicle. Power for the amplifier is obtained from external 12 VDC power adapter that is connected to the vehicle's 12 VDC battery. The components are contained in a plastic enclosure.

## 4. Equipment Configuration

Ref. ID	Name / Description	Model Number	Serial Number
#1	Quint Band Bi-Directional Amplifier	460035	N/A

Table 1. Equipment Configuration

### 5. Support Equipment

All support equipment supplied is listed in the following Support Equipment List.

Ref ID	Name / Description	Manufacturer	Model #	Serial #
N/A	-	-	-	-

Table 2. Support Equipment



## 6. Ports and Cabling Information

Ref ID	Port name on the EUT	Cable Description	Qty.	Length (m)	Shielded? (Y/N)	Termination Box ID & Port ID
#2	Power	2 wire	1	1	Ν	DC Power
						Supply

**Table 3. Ports and Cabling Information** 

## 7. Method of Monitoring EUT Operation

A test receiver will be used to monitor the data transmission from the EUT.

## 8. Mode of Operation

The EUT will be configured as defined in the FCC KDB 935210 D03 guidance document. These settings were created for testing purpose only.

### 9. Modifications

9.1 Modifications to EUT

No modifications were made to the EUT

9.2 Modifications to Test Standard

No Modifications were made to the test standard.

### **10. Disposition of EUT**

The test sample including all support equipment submitted to H.B Compliance Solutions for testing will be returned to Wilson Electronics upon completion of testing & certification



# **Criteria for Intentional Radiators**

## **1. Authorized Frequency Band**

Test Requirement(s):	§20.21(e)(3)	Test Engineer(s):	Hoosam B.
Test Results:	Pass	Test Date(s):	Jun/14/17

Test Procedures:As required by 47 CFR §20.21(e)(3), Authorized frequency band<br/>measurements were made at the RF output terminals of the EUT.

The EUT was connected through an attenuator to a Spectrum Analyzer. A signal generator was used for the input to the EUT to provide a CW signal tuned to the center channel of each uplink and downlink operational band. Measurements were made at the low and high channels of each uplink and downlink frequency band.

#### **Test Setup:**



Figure 1 – Band Verification





Plot 1 – 698-716MHz Band – Uplink



#### Plot 2 – 776-787MHz Band – Uplink



🛞 Ag	jilent 11	:13:59 Ju	n 14, 2017					R	Т		
Ref 40	dBm		Att	en 15 dB						Mkr3 849 9.0	9.10 MHz 072 dBm
Peak											
Log											
10			2		<u> </u>			3			
dB/			°	· · · · · · · · · · · · · · · · · · ·			+	<u>e</u>	~		
Offst 30	L							-	$\rightarrow$		
dB	L							-			
		1						-		$\wedge$	
		/								<u>                                     </u>	+
Center	836.5 MH	z						_	_	Spa	n 60 MHz
#Res B	W 100 kH	Z		<u> </u>	VBW 300 k	Hz		Swe	ep 6	.216 ms (4	01 pts)
Marker	r Trao	е Ту	pe	225 1/	Axis 5 MH <del>-</del>		Amplite 12 94 de	ude Pm			
2	(1)	Fre	=4 8q	824.0	5 MHz		9.417 dE	Bm			
3	(1)	Fre	eq	849.10	0 MHz		9.072 dE	Зm			
_											_

Plot 3 – 824-849MHz Band – Uplink



## Plot 4 – 1710-1755MHz Band – Uplink





Plot 5 – 1850-1915MHz Band – Uplink



#### Plot 6 – 728-746MHz Band – Downlink





Plot 7 – 746-757MHz Band – Downlink



#### Plot 8 – 869-894MHz Band – Downlink





Plot 9 – 1930-1995MHz Band – Downlink



#### Plot 10 – 2110-2155MHz Band – Downlink



## 2. Maximum Power and Gain

Test	§20.21(e)(8)(i)(D)	Test Engineer(s):	Hoosam B.
Requirement(s):			
Test Results:	Pass	Test Date(s):	Jun/15/17

**Test Procedure:** As required by 47 CFR 20.21(e)(8)(i)(D): Maximum power measurements were made at the RF output terminals of the EUT.

The EUT was connected as per Figure 1 through an attenuator to a Spectrum Analyzer. A signal generator was used for the input to the EUT to provide a GSM & AWGN with 4.1MHz bandwidth signal tuned to the highest frequency measured in Authorized frequency band test of each uplink and downlink operational band.

KDB Procedure 935210 D03 §7.2.2 and §7.3 was used to measure the maximum power and to calculate the maximum gain.

#### Test Results:

Frequency (MHz)	Input Level (dBm)	Output Power (dBm)	Lower Limit (dBm)	Upper Limit (dBm)
698-716 GSM	-4.7	17.04	17	30
698-716 AWGN	-2.34	18.74	17	30
776-787 GSM	0.9	21.57	17	30
776-787 AWGN	1.96	18.89	17	30
824-849 GSM	0.5	22.65	17	30
824-849 AWGN	0.7	19.44	17	30
1710-1755 GSM	7.2	25.56	17	30
1710-1755 AWGN	2.1	23.15	17	30
1850-1915 GSM	-0.2	19.19	17	30
1850-1915 AWGN	0.56	18.4	17	30

Table 1. Uplink Max Power Test Results



Frequency (MHz)	Input Level (dBm)	Output Power (dBm)	Upper Limit (dBm)
728-746 GSM	-20	2.07	17
728-746 AWGN	-20	0.97	17
746-757 GSM	-20	2.05	17
746-757 AWGN	-20	0.51	17
869-894 GSM	-20	-2.5	17
869-894 AWGN	-20	-2.91	17
1930-1995 GSM	-20	2.5	17
1930-1995 AWGN	-20	2.1	17
2110-2155 GSM	-20	-0.6	17
2110-2155 AWGN	-20	-0.62	17

333Table 2. Downlink Max Power Test Results

Modulation	Uplink Frequency (MHz	Downlink Frequency (MHz)	Uplink Gain (dB)	Uplink Limit (dB)	Downlink Gain (dB)	Downlink Limit (dB)	UL Gain - DL Gain (Delta in dB	Limit (dB)	Margin (dB)
GSM	708.37	735.92	21.74	23	22.07	23	1.81	9	-1.51
AWGN	708.37	735.92	21.08	23	20.97	23	0.29	9	-0.11
GSM	781.12	735.75	20.67	23	22.05	23	0.39	9	-1.38
AWGN	781.12	735.75	16.93	23	20.51	23	-0.25	9	-3.58
GSM	835.15	885.25	22.15	23	17.5	23	1.11	9	-4.65
AWGN	835.15	8885.25	18.74	23	17.09	23	0.01	9	-1.65
GSM	1750.5	1963.47	18.36	23	22.5	23	-0.03	9	-4.14
AWGN	1750.5	1963.47	21.04	23	22.1	23	-0.1	9	-1.056
GSM	1858.12	2129.25	19.39	23	19.4	23	0.87	9	-0.01
AWGN	1858.12	2129.25	17.84	23	19.38	23	-0.14	9	-1.54

Table 3. Maximum Booster Gain Test Results



## 3. Intermodulation

Test Requirement(s):	CFR §20.21(e)(8)(i)(F)	Test Engineer(s):	Keith T.
Test Results:	Pass	Test Date(s):	Feb/21/2018

**Test Procedures:** As required by 47 CFR §20.21(e)(8)(i)(F), Intermodulation measurements were made at the RF output terminals of the EUT.

The EUT was connected through an attenuator to a Spectrum Analyzer. Signal generator was setup for a two tone CW signal with 300kHz offset below and above the operational band frequency. Measurements were made as per KDB 935210 D03 §7.4 procedure.

Detector Setting	Resolution Bandwidth	Video Bandwidth	Span	
RMS	3kHz	≥3 x RBW	5MHz	
Table 4 — Analyzer Settings				

Table 4 – Analyzer Settings

Frequency Band (MHz)	Intermodulation Level (dBm)	Limit (dBm)	Margin (dB)
698-716	-33.37	-19	-14.37
776-787	-22.7	-19	-3.7
824-849	-20.8	-19	-1.8
1710-1755	-26.09	-19	-7.09
1850-1915	-28.88	-19	-9.88

Table 5. Summary Uplink Intermodulation, Test Results

Frequency (MHz)	Intermodulation Level (dBm)	Limit (dBm)	Margin (dB)
728-746	-32.83	-19	-13.22
746-757	-40.28	-19	-21.28
869-894	-49.03	-19	-30.03
1930-1995	-36.81	-19	-17.81
2110-2155	-44.12	-19	-25.12

 Table 6. Summary Downlink Intermodulation Test Results





Plot 11 698-716MHz Band – Uplink



Plot 12 – 776-787MHz Band – Uplink



















#### Plot 16 – 728-746MHz Band – Downlink















Plot 19 – 1930-1995MHz Band – Downlink



Plot 20 – 2110-2155MHz Band – Downlink



## 4. Out-of-band emissions

Test	§20.21§(8)(i)(E)	Test Engineer(s):	Hoosam B.
Requirement(s):			
Test Results:	Pass	Test Date(s):	Jun/20/2017

Test Procedures:As required by 47 CFR §20.21(8)(i)(E), Out-of-band emissions<br/>measurements were made at the RF output terminals of the EUT.The EUT was connected through an attenuator to a Spectrum<br/>Analyzer as per figure 1. Signal generator was setup to produce<br/>GSM, LTE & CDMA signals for all uplink and downlink bands.<br/>Measurements were made as per procedure defined in KDB<br/>935210 D03 §7.5.Out of Band Emission Limits = P1 - 6 - (43 \_ 10log (P2) = -19dBm

Where P1 = Power in dBm and P2 = Power in Watts

Frequency Band	Band Edge	Measured Level	Limit (dBm)
(IVIHZ)		(abm)	
698-716	Lower	-29.67	-19
698-716	Upper	-29.22	-19
776-787	Lower	-29.03	-19
776-787	Upper	-28.46	-19
824-849	Lower	-43.01	-19
824-849	Upper	-42.04	-19
1710-1755	Lower	-35.91	-19
1710-1755	Upper	-37.57	-19
1850-1915	Lower	-45.33	-19
1850-1915	Upper	-55.15	-19

Table 7. GSM Uplink – Out-of band Emissions, Test Results



Frequency Band	Band Edge	Measured Level	Limit (dBm)
(MHZ)		(dBm)	
698-716	Lower	-34.45	-19
698-716	Upper	-35.37	-19
776-787	Lower	-24.97	-19
776-787	Upper	-21.68	-19
824-849	Lower	-21.05	-19
824-849	Upper	-23.49	-19
1710-1755	Lower	-27.25	-19
1710-1755	Upper	-19.54	-19
1850-1915	Lower	-35.12	-19
1850-1915	Upper	-49.04	-19

Table 8. CDMA Uplink – Out-of band Emissions, Test Results

Frequency Band	Band Edge	Measured Level	Limit
(MHz)		(dBm)	(dBm)
698-716	Lower	-35.84	-19
698-716	Upper	-37.48	-19
776-787	Lower	-33.82	-19
776-787	Upper	-29.24	-19
824-849	Lower	-23.82	-19
824-849	Upper	-21.49	-19
1710-1755	Lower	-27.73	-19
1710-1755	Upper	-20.38	-19
1850-1915	Lower	-28.75	-19
1850-1915	Upper	-46.59	-19

Table 9. LTE Uplink – Out-of band Emissions, Test Results



Frequency Band (MHz)	Band Edge	Measured Level (dBm)	Limit (dBm)
728-746	Lower	-53.49	-19
728-746	Upper	-48.26	-19
746-757	Lower	-47.69	-19
746-757	Upper	-50.9	-19
869-894	Lower	-65.72	-19
869-894	Upper	-66.41	-19
1930-1995	Lower	-71.37	-19
1930-1995	Upper	-74.65	-19
2110-2155	Lower	-61.85	-19
2110-2155	Upper	-64.34	-19

Table 10. GSM Downlink – Out-of band Emissions, Test Results

Frequency Band (MHz)	Band Edge	Measured Level (dBm)	Limit (dBm)
728-746	Lower	-60.22	-19
728-746	Upper	-49.85	-19
746-757	Lower	-49.3	-19
746-757	Upper	-57.26	-19
869-894	Lower	-68.95	-19
869-894	Upper	-65.96	-19
1930-1995	Lower	-77.67	-19
1930-1995	Upper	-81.41	-19
2110-2155	Lower	-57.33	-19
2110-2155	Upper	-59.11	-19

Table 11. CDMA Downlink – Out-of band Emissions, Test Results



Frequency Band (MHz)	Band Edge	Measured Level (dBm)	Limit (dBm)
728-746	Lower	-35.36	-19
728-746	Upper	-30.0	-19
746-757	Lower	-29.49	-19
746-757	Upper	-34.13	-19
869-894	Lower	-30.01	-19
869-894	Upper	-30.65	-19
1930-1995	Lower	-33.43	-19
1930-1995	Upper	-36.56	-19
2110-2155	Lower	-25.61	-19
2110-2155	Upper	-27.43	-19

Table 12. LTE Downlink – Out-of band Emissions, Test Results





Plot 21 – 698-716MHz Band – GSM Uplink Lower Band Edge



#### Plot 22 - 698-716MHz Band – GSM Uplink Upper Band Edge





Plot 23 – 776-787MHz Band – GSM Uplink Lower Band Edge



Plot 24 – 776-787MHz Band – GSM Uplink Upper Band Edge



🔆 Ag	🔆 Agilent 13:55:34 Jun 20, 2017 🛛 🛛 🥂 🥂 🤆 🕹										
Ref 0 d	Bm		А	Atten 5 dB					1 823.985 -43.0	675 MHz 01 dBm	
Avg Log 10 dB/											
30.8 dB DI										1 MAR	
dBm PAvg 100	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	~~~ <u>~</u>	~~~~~	~~~~~	www.m	······	an man				
W1 S2 S3 FC AA											
Ctored C									C4	024 MUL	
start 8. #Res B	W 3 kHz			VBW 10 kHz				Stop 824 MHz Sweep 54.25 ms (401 pts)			





### Plot 26 – 824-849MHz Band – GSM Uplink Upper Band Edge



🔆 Aç	gilent 14	:31:53 Ju	n 20, 2017				RT		
Ref 0 d	IBm		A	tten 5 dB			Mkr	1 1.71000 -35.9	00 GHz 91 dBm
Avg Log 10 dB/ Offst 30.8 dB DI -19.0									
dBm PAvg 100 W1 S2 S3 FC AA	······································					~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	 ·····		
Start 1. #Res B	.707 GHz				VBW 10 k	Hz	Sweep 54	Stop 1 2.5 ms (40	.71 GHz )1 pts)





## Plot 27 – 1710-1755MHz Band – GSM Uplink Upper Band Edge



🔆 Ag	jilent 14	:44:42 Ju	n 20, 2017	,				R T			
Ref 0 d	Bm		А	Atten 5 dB					Mkr1	1.85000 -45.3	00 GHz 33 dBm
Avg Log 10 dB/ Offst 30.8 dB DI -19.0 dBm											
100 W1 S2 S3 FC AA		<u></u>									
Start 1	847 GHz									Stop 1	85 GHz
#Res B	W 3 kHz			VBW 10 kHz				Sweep	542	2.5 ms (40	.03 GHZ )1 pts)





Plot 29 – 1850-1915MHz Band – GSM Uplink Upper Band Edge



🔆 Ag	gilent 15	:18:50 Ju	n 20, 2017					RT				
Ref 10	dBm		Atten 5 dB					Mkr1 697.94675 MHz -34.45 dBm				
Avg Log 10 dB/ Offst 30.8 dB												
DI -19.0 dBm PAvg 100 W1 S2			~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	man		~~~~~	w~~~~	nharran a		norron		
S3 FC AA												
Start 69 #Res B	97.7 MHz W 30 kHz			١	/BW 100 k	Hz		Swe	Stop ep 8 ms (4	698 MHz 01 pts)		





Plot 31 – 698-716MHZ Band – CDMA Uplink Upper Band Edge



🔆 Ag	jilent 15	5:23:08 Ju	n 20, 2017	•				RT			
Ref 10	dBm		А	tten 5 dB		Mkr1 775.98875 Mł -24.97 dB					
Avg Log 10 dB/ Offst 30.8											
dB DI -19.0 dBm	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~		~~~~~			·····	·····	· · · · · · · · · · · · · · · · · · ·	~~~~~~	 	
PAvg 100 W1 S2 S3 FC AA											
Start 7 #Res B	75.7 MHz W 30 kHz		VBW 100 kHz					Stop 776 MHz Sweep 8 ms (401 pts)			

Plot 32 – 776-787MHz Band – CDMA Uplink Lower Band Edge



Plot 33 – 776-787MHz Band – CDMA Uplink Upper Band Edge



🔆 Ag	In Agilent 15:31:44 Jun 20, 2017 R T										
Ref 10	dBm		А	tten 5 dB				Mk	1 823.958 -21.0	875 MHz 05 dBm	
Avg Log 10											
dB/ Offst 30.8									1		
ab Dl -19.0 dBm											
PAvg 100 W1 S2											
S3 FC											
Start 82 #Res B	23.7 MHz W 30 kHz			\	/BW 100 k	Hz		Swee	Stop ep 8 ms (4	824 MHz 01 pts)	



🔆 Ag	Agilent 15:33:13 Jun 20, 2017 R T										
Ref 10	dBm		А	tten 5 dB				Mkr1 849.02700 MHz -23.49 dBm			
Avg Log 10											
dB/ Offst 30.8	,										
dB DI -19.0 dBm	******	····	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	~~~~~~	~~~~~~	·····	~~~~~	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	
PAvg 100 W1 S2											
S3 FC AA											
Start 84 #Res B	49 MHz W 30 kHz			<u> </u>	/BW 100 k	Hz		Swee	Stop 84 20 8 ms (4	9.3 MHz 01 pts)	

# Plot 35 – 824-849MHz Band – CDMA Uplink Upper Band Edge



🔆 Ag	₩ Agilent 15:36:40 Jun 20, 2017 R T									
Ref 10	dBm		А	Atten 5 dB					1 1.70994 _27.	100 GHz 25 dBm
Avg Log 10 dB/ Offst 30.8										
dB DI -19.0 dBm							and a survey			
100 W1 S2 S3 FC AA		www	~~~~~	pmm						
Start 1.	707 GHz								Stop 1	.71 GHz
#Res B	W 30 kHz			<u>۱</u>	/BW 100 k	Hz		Swee	ep 8 ms (4	01 pts)





## Plot 37 – 1710-1755MHz Band – CDMA Uplink Upper Band Edge



🔆 Ag	* Agilent 15:42:43 Jun 20, 2017 R T											
Ref 10	dBm	Atten 5 dB						Mkr1 1.8499025 GHz -35.12 dBm				
Avg Log 10 dB/ Offst												
30.8 dB DI -19.0 dBm										- Andrew		
PAvg 100 W1 S2 S3 FC												
AA												
Start 1. #Res B	.847 GHz W 30 kHz			\	/BW 100 k	Hz		Swee	Stop 1 ep 8 ms (4	.85 GHz 01 pts)		





Plot 39 – 1850-1915MHz Band – CDMA Uplink Upper Band Edge



🔆 Ag	jilent 15	5:47:40 Ju	n 20, 2017					RT			
Ref 10	dBm		А	tten 5 dB			Mkr1 697.76525 MHz -35.84 dBm				
Avg Log 10 dB/ Offst 30.8											
dB DI -19.0 dBm			۰ م	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~		~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~		www		~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	
PAvg 100 W1 S2 S3 FC											
AA											
Start 69 #Res B	97.7 MHz W 30 kHz			١	/BW 100 k	Hz		Swee	Stop ep 8 ms (4	698 MHz 01 pts)	

Plot 40 – 698-716MHz Band – LTE Uplink Lower Band Edge

🔆 Ag	jilent 15	5:48:54 Ju	n 20, 2017	t				RT		
Ref 10	dBm		А	tten 5 dB				Mkr	1 716.015 _37.4	75 MHz 48 dBm
Avg Log 10										
dB/ Offst 30.8										
dB DI										
dBm	màn	man			· · · · · · · · · · · · · · · · · · ·	hann				
PAvg 100										
W1 52 S3 FC										
~~										
Start 71 #Res B	16 MHz W 30 kHz			· · · · · ·	/BW 100 k	KHz		Stop 716.3 MHz Sweep 8 ms (401 pts)		

## Plot 41 – 698-716MHz Band – LTE Uplink Upper Band Edge


🔆 Ag	jilent 15	5:51:22 Ju	n 20, 2017				R	Т		
Ref 10	dBm		А	tten 5 dB				Mkr1	775.949 -33.	)75 MHz 82 dBm
Avg Log 10 dB/ Offst 30.8 dB										
DI -19.0 dBm PAvg 100 W1 S2		······		~~~~~	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	M	 		1 \$ ******	••••••
S3 FC AA										
Start 7 #Res B	/ 75.7 MHz W 30 kHz			\	/BW 100 k	Hz	;	Swee	Stop p 8 ms (4	776 MHz 01 pts)

Plot 42 – 776-787MHz Band – LTE Uplink Lower Band Edge



Plot 43 – 776-787MHz Band – LTE Uplink Upper Band Edge



🔆 Ag	jilent 15	5:54:41 Ju	n 20, 2017	·				RT		
Ref 10	dBm		А	tten 5 dB				Mkr	1 823.979 -23.	)75 MHz 82 dBm
Avg Log 10 dB/										
0ffst 30.8 dB DI -19.0	~~~~~		······································	warden of			~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	~~~~~~	~~~~~	- <u>1</u> \$
dBm PAvg 100 W1 S2										
Start 82 #Res B	23.7 MHz W 100 kH			\	/BW 300 k	Hz		Swee	Stop ep 8 ms (4	824 MHz 01 pts)

# Plot 44 – 824-849MHz Band – LTE Uplink Lower Band Edge

🔆 Ag	ilent 10	6:10:32 Ju	n 20, 2017				RТ		
Ref 10	dBm		А	tten 5 dB			Mkr	1 849.000 -21.4	00 MHz 19 dBm
Avg Log 10									
dB/ Offst									
30.8 dB			un an		~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	 	~~~~~	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
-19.0 dBm									
PAvg 100									
W1 S2 S3 FC AA									
Start 84 #Res B	19 MHz W 100 kH	z		١	/BW 300 k	Hz	Swee	Stop 84 p 8 ms (4	9.3 MHz 01 pts)

## Plot 45 – 824-849MHz Band – LTE Uplink Upper Band Edge



🔆 Ag	jilent 16	5:12:15 Ju	n 20, 2017	,				RT		
Ref 10	dBm		А	tten 5 dB				Mk	r1 1.70993 _27.1	825 GHz 73 dBm
Avg Log 10 dB/										
Offst 30.8 dB										1
DI -19.0 dBm			man and an			~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	~~~^~		~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
PAvg 100 W1 S2										
53 FC AA										
Start 1. #Res B	.707 GHz W 100 kH:	z		١	/BW 300 k	Hz		Swe	Stop 1 ep 8 ms (4	.71 GHz 01 pts)

Plot 46 – 1710-1755MHz Band – LTE Uplink Lower Band Edge



# Plot 47 – 1710-1755MHz Band – LTE Uplink Upper Band Edge



🔆 Ag	jilent 16	6:16:01 Ju	n 20, 2017	,				RT		
Ref 10	dBm		А	tten 5 dB				Mk	r1 1.84998 .28.	850 GHz 75 dBm
Avg Log 10 dB/ Offst										
30.8 dB DI -19.0 dBm				ya mutu wa ta	~~~~*~		~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~		S
PAvg 100 W1 S2 S3 FC		~~~^~								
AA										
Start 1. #Res B	.847 GHz W 100 kH	z		\\	/BW 300 k	Hz		Swe	Stop 1 ep 8 ms (4	.85 GHz 01 pts)





## Plot 49 – 1850-1915MHz Band – LTE Uplink Upper Band Edge









Plot 51 – 728-746MHz Band – GSM Downlink Upper Band Edge





Plot 52 – 746-757MHz Band – GSM Downlink Lower Band Edge



Plot 53 – 746-757MHz Band – GSM Downlink Upper Band Edge



🔆 Ag	jilent 11	1:59:10 Ju	n 21, 2017	,				RT		
Ref 0 d	Bm		Att	ten 10 dB				Mk	r1 868.988 -65.	00 MHz 72 dBm
Avg Log 10 dB/ Offst 0.8 dB DI -19.0 dBm										
PAvg 97 W1 S2 S3 FC AA	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	~~~~~	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	www	hunn	~~~~~	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	www.	www.w	1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1
Start 80 #Res B	68.7 MHz W 3 kHz				VBW 10 k	Hz		Sweep 54	Stop 4.25 ms (40	869 MHz )1 pts)

#### Plot 54 – 869-894MHz Band – GSM Downlink Lower Band Edge



### Plot 55 – 869-894MHz Band – GSM Downlink Upper Band Edge



🔆 Ag	jilent 1	2:03:30 Ju	n 21, 2017					R T		
Ref 0 d	IBm		Att	en 10 dB				м	kr1 1.9299 -71.	350 GHz 37 dBm
Avg Log 10 dB/ Offst 0.8										
dB DI -19.0 dBm										
PAvg 100 W1 S2 S3 FC										
AA							~~~~~		anna anna	
Start 1. #Res B	L	1		,	VBW 10 k	Hz		Sweep	Stop <sup>-</sup> 542.5 ms (4	1.93 GHz 01 pts)





Plot 57 – 1930-1995MHz Band – GSM Downlink Upper Band Edge



🔆 Ag	jilent 12	2:08:19 Ju	n 21, 2017	,				RΤ		
Ref 0 d	Bm		Att	ten 10 dB				Mk	r1 2.10999 -61.	925 GHz 85 dBm
Avg										
Log										
10										
dB/										
Offst										
0.8										
dB										
DI										
-19.0 dBm										
ubiii										
PAvg										
100										<hr/>
W1 S2										- and the second
AA								mm	m	
						······································	and many			
		m		~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~						
Start 2.	107 GHz								Stop 2	2.11 GHz
#Res B	W 3 kHz			,	VBW 10 k	Hz		Sweep 5	42.5 ms (4	01 pts)





Plot 59 – 2110-2155MHz Band – GSM Downlink Upper Band Edge



🔆 Ag	jilent 12	2:13:48 Ju	n 21, 2017	,			R	Т		
Ref 0 d	Bm		Att	en 10 dB				Mkr1	727.961 -60.1	00 MHz 22 dBm
Avg Log 10 dB/ Offst 0.8 dB DI -19.0 dBm										
PAvg 100 W1 S2 S3 FC AA	~~~~~						 		1 	
Start 72 #Res B	27.7 MHz W 30 kHz			\	/BW 100 k	Hz		Swee	Stop p 8 ms (4	728 MHz 01 pts)





Plot 61 – 728-746MHz Band – CDMA Downlink Upper Band Edge



🔆 Ag	gilent 12	2:16:39 Ju	n 21, 2017	,				R T		
Ref 0 d	IBm		Att	en 10 dB				м	kr1 745.98 -49	875 MHz ).3 dBm
Avg Log 10 dB/ Offst 0.8 dB										
DI -19.0 dBm PAvg 100	••	man	~~~~~				~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~			1 \$
W1 S2 S3 FC AA										
Start 74 #Res B	45.7 MHz W 30 kHz			\\	/BW 100 k	Hz		Sw	Stop eep 8 ms (4	746 MHz 101 pts)





Plot 63 – 746-757MHz Band – CDMA Downlink Upper Band Edge



🔆 🔆 Ag	jilent 12	2:20:32 Ju	n 21, 2017	,			R T			
Ref 0 d	Bm		Att	en 10 dB			N	/kr1	868.938 -68.9	50 MHz 95 dBm
Avg Log 10 dB/ Offst 0.8 dB DI -19.0 dBm										
100 W1 S2 S3 FC AA	mhan						 	, r	<u></u>	~~~~
Start 80 #Res B	68.7 MHz W 30 kHz			\\	/BW 100 k	:Hz	Sv	veel	Stop 8 p 8 ms (4	869 MHz 01 pts)

Plot 64 – 869-894MHz Band – CDMA Downlink Lower Band Edge



Plot 65 – 869-894MHz Band – CDMA Downlink Upper Band Edge



🔆 Aç	gilent 12	2:22:48 Ju	n 21, 2017	·			RT		
Ref 0 d	IBm		Att	ten 10 dB			Mk	r1 1.92999 .77.	)25 GHz 67 dBm
Avg Log 10 dB/ Offst 0.8 dB DI -19.0 dBm									
PAvg 100 W1 S2 S3 FC AA							 		man
Start 1. #Res B	.927 GHz W 30 kHz			\\	/BW 100 k	Hz	Swe	Stop 1 ep 8 ms (4	.93 GHz 01 pts)





Plot 67 – 1930-1955MHz Band – CDMA Downlink Upper Band Edge



🔆 Agil	🖗 Agilent 👘 12:27:04 Jun 21, 201				7				RT		
Ref 0 dB	m		Att	en 10 dB				N	/kr1	2.11000 -57.3	00 GHz 33 dBm
Avg Log 10 dB/ Offst 0.8 dB DI											
-19.0 dBm PAvg 100 _ W1 S2										~~~~~~	-
S3 FC AA	~~~~~~						~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	www.ww	1		
Start 2 1	07 GHz									Stop 2	11 GH7
#Res BW	/ 30 kHz			١	/BW 100 k	Hz		Sv	veep	o 8 ms (4	01 pts)

### Plot 68 – 2110-2155MHz Band – CDMA Downlink Lower Band Edge



Plot 69 – 2110-2155MHz Band – CDMA Downlink Upper Band Edge



🔆 Ag	🔆 Agilent 💿 12:31:22 Jun 21, 201			7				RT		
Ref 0 d	Bm		Att	en 10 dB				Mkr	1 727.995 .35.	50 MHz 36 dBm
Avg Log 10 dB/ Offst 0.8 dB										
DI -19.0 dBm PAvg 100	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~									~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
W1 S2 S3 FC AA										
Start 72 #Res B	27.7 MHz W 30 kHz			\\	/BW 100 k	Hz		Swee	Stop p 8 ms (4	728 MHz 01 pts)





Plot 71 – 728-746MHz Band – LTE Downlink Upper Band Edge



🔆 🔆 Ag	jilent 12	2:33:43 Ju	n 21, 2017					RТ		
Ref 0 d	Bm		Att	en 10 dB				Mk	r1 745.999 -29.	925 MHz 49 dBm
Avg Log 10 dB/ Offst										
0.8 dB DI -19.0 dBm					m	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	~~~~~		~~~~~
PAvg 100 W1 S2 S3 FC										
AA										
Start 74 #Res B	45.7 MHz W 30 kHz			١	/BW 100 k	Hz		Swe	Stop ep 8 ms (4	746 MHz 01 pts)

Plot 72 – 746-757MHz Band – LTE Downlink Lower Band Edge



Plot 73 – 746-757MHz Band – LTE Downlink Upper Band Edge



🔆 Ag	₩ Agilent 12:43:10 Jun 21, 2017 R T									
Ref 0 d	Bm		Att	en 10 dB				Mkı	1 868.997 -30.0	'00 MHz 01 dBm
Avg Log 10 dB/ Offst										
0.8 dB DI -19.0 dBm						~~~~~	~~~~~	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~		\$
PAvg 100 W1 S2 S3 FC										
Start 868.7 MHzStop 869 M#Res BW 100 kHzVBW 300 kHzSweep 8 ms (401 pts						869 MHz 01 pts)				





#### Plot 75 – 869-894MHz Band – LTE Downlink Upper Band Edge



🔆 Ag	₩ Agilent 12:38:48 Jun 21, 2017 R T									
Ref 0 d	Bm		Att	en 10 dB				Mk	r1 1.92999 -33.	)25 GHz 43 dBm
Avg Log 10 dB/ Offst										
0.8 dB DI -19.0 dBm										
PAvg 100 W1 S2 S3 FC										
AA					~~~~~~	rnnhm		•••••		
Start 1.927 GHz Stop 1.93 ( #Res BW 100 kHz VBW 300 kHz Sweep 8 ms (401 p							.93 GHz 01 pts)			

Plot 76 – 1930-1995MHz Band – LTE Downlink Lower Band Edge



Plot 77 – 1930-1995MHz Band – LTE Downlink Upper Band Edge



🔆 Ag	Agilent 12:45:18 Jun 21, 2017 R T									
Ref 0 d	Bm		Att	en 10 dB				Mkr	1 2.11000 -25.0	00 GHz 61 dBm
Avg Log 10 dB/ Offst										
0.8 dB DI -19.0 dBm										
PAvg 100 W1 S2 S3 FC	ny no w	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	-Marine		~~~~~	domum	mm		
AA										
Start 2. #Res B	.107 GHz W 100 kHz	z		\	/BW 300 k	Hz		Swee	Stop 2 ep 8 ms (4	2.11 GHz 01 pts)





Plot 79 – 2110-2155MHz Band – LTE Downlink Upper Band Edge



## 5. Conducted Spurious Emissions

Test	§2.1051	Test Engineer(s):	Hoosam B.
Requirement(s):			
Test Results:	Pass	Test Date(s):	Jun/21/2017

**Test Procedures:** As required by 47 CFR §2.1051, Spurious emissions measurements were made at antenna terminals in accordance with the procedures of the KDB 935210 D03.

The EUT was connected through an attenuator to a spectrum analyzer. A signal generator was used at the input of the EUT to produce a 4.1MHz AWGN signal at the center of each CMRS operating band. Measurements were made at the low and high frequency of the uplink and downlink operational band.

	Measured			
Frequency Band (MHz)	Frequency (MHz)	Measured Level (dBm)	Limit (dBm)	Margin
698-716	6825	-26.33	-13	-13.33
776-787	775	-22.38	-13	-9.38
824-849	7831	-28.33	-13	-15.33
1710-1755	6940	-25.67	-13	-12.67
1850-1915	19830	-24.17	-13	-11.17

Table 13 – Conducted Spurious Emission Data – Uplink Summary

Frequency Band (MHz)	Measured Frequency (MHz)	Measured Level (dBm)	Limit (dBm)	Margin
728-746	6848	-55.83	-13	-42.83
746-757	745	-50.11	-13	-37.11
869-894	6740	-57.5	-13	-44.5
1930-1995	19970	-55.5	-13	-42.5
2110-2155	21480	-54.50	-13	-41.5

 Table 14 – Conducted Spurious Emission Data – Downlink Summary



Per FCC § 27.53 (C) for frequency operating in 746 – 758MHz and 776-788MHz band following additional requirements apply

As per § 27.53 (C)(4) On all frequencies between 763-775MHz and 793-895MHz, by a factor not less than 65 + 10log (P) dB in a 6.25kHz band segment, for mobile and portable stations.

BW correction for 6.25kHz to 10kHz RBW is following

BW correction factor = 10log B1/B2

Therefore BW correction factor = 10log 6.25/10 = -2.04

Frequency Range (MHz)	Measured Frequency (MHz)	Measured Level (dBm)	RBW correction Factor (dB)	Corrected Level (dBm)	Limit (dBm)	Margin (dB)
763-775	774.94	-43.0	-2.04	-45.04	-35	-10.04
793-805	794.59	-65.9	-2.04	-67.94	-35	-32.94

 Table 15 – Conducted Spurious Emission Data – 776-787MHz Uplink Band Summary

Frequency Range (MHz)	Measured Frequency (MHz)	Measured Level (dBm)	RBW correction Factor (dB)	Corrected Level (dBm)	Limit (dBm)	Margin (dB)
763-775	769.24	-73.3	-2.04	-75.3	-35	-40.3
793-805	802.27	-73.2	-2.04	-75.24	-35	-40.24

Table 16 – Conducted Spurious Emission Data – 746-757MHz Downlink Band Summary



Per FCC § 27.53 (f) for frequency operating in 746 – 763MHz and 775-793MHz emissions in the band 1559-1610MHz shall be limited to -70dBW/MHz equivalent isotropically radiated power (EIRP) for wideband signals, and -80dBW EIRP for discrete emissions of less than 700Hz bandwidth.

Since the limit is in EIRP, the MSCL (Cable Loss) information supplied by manufacturer is added along with the bandwidth correction factor.

BW correction for 700Hz to 10kHz RBW is following

BW correction factor = 10log B1/B2

Therefore BW correction factor = 10log 700/1000 = -11.55

Frequency Range (MHz)	Measured Frequency (MHz)	Measured Level (dBm)	RBW correction Factor (dB)	Gain/Loss (dB) from Antenna Kitting Info (dB)	Corrected Level (dBm)	Limit (dBm)	Margin (dB)
1559-1610 (Wideband)	1565.76	-71.64	0	10	-61.64	-40	-21.64
1559-1610 (Narrowban d)	1567.29	-52.08	-11.55	10	-53.63	-50	-3.63

Table 17 – Conducted Spurious Emission Data – 776-787MHz Uplink Band Summary

Frequency Range (MHz)	Measured Frequency (MHz)	Measured Level (dBm)	RBW correction Factor (dB)	MSCL (dB)	Corrected Level (dBm)	Limit (dBm)	Margin (dB)
1559-1610	1562.44	-72.64	0	0	-72.64	-40	-32.64
(Wideband)							
1559-1610	1579.15	-53.54	-11.55	0	-65.09	-50	-15.09
(Narrowband)							

Table 18 – Conducted Spurious Emission Data – 746-757MHz Downlink Band Summary



Mkr1 697.0         Ref 0 dBm       Atten 5 dB       -40.01 d         Avg	٨Hz
Avg	3m
30.8	
DI	
dBm         dBm <td>~**</td>	~**
S3 FC AA	
Start 30 MHz Stop 697	<b>1H</b> 7
#Res BW 1 MHz VBW 3 MHz Sweep 8 ms (401 p	s)

Plot 80 – 698-716MHz Band – Uplink









Plot 82 – 698-716MHz Band – Uplink







🔆 Ag	jilent 13	3:44:23 Ju	n 21, 2017	,				RΤ			
Ref 0 d	Bm		А	tten 5 dB					Mkr1	788. -33.5	.00 MHz i9 dBm
Avg Log 10 dB/ Offst											
dB dB DI -13.0 dBm	<u>A</u>				<b>A a a</b>						
PAvg 10 W1 S2 S3 FC AA	4 many		www.w				maran				
Start 78 #Res B	88 MHz W 1 MHz				VBW 3 M	Hz		Swe	ep 8 n	Sto ns (40	p 3 GHz )1 pts)

Plot 84 – 776-787MHz Band – Uplink



Plot 85 – 776-787MHz Band – Uplink



🔆 Ag	ilent 13	3:45:53 Ju	n 21, 2017	,			RT		
Ref 0 d	Bm		А	tten 5 dB				Mkr1 82 -39.1	3.0 MHz 12 dBm
Avg Log 10 dB/ Offst 30.8									
ав DI -13.0 dBm				the college		more aske	 ria a andreada		- Mand
PAvg 10 W1 S2 S3 FC AA	~~~~~	when the su		1.01. if the					
Start 30 #Res B	0 MHz W 1 MHz				VBW 3 M	Hz	Swee	Stop ep 8 ms (4	823 MHz 01 pts)











Plot 88 - 824-849MHz Band – Uplink







🔆 Ag	jilent 13	3:50:50 Ju	n 21, 2017	,				RT		
Ref 0 d	Bm		А	tten 5 dB					Mkr1 1. -45.	756 GHz 53 dBm
Avg Log 10 dB/ Offst 30.8 dB DI -13.0										
dBm PAvg 10 W1 S2 S3 FC AA		Murr	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	a a han an a	www.www	·······	wa-wa	www		www.dwyw
Start 1. #Res B	.756 GHz W 1 MHz				VBW 3 M	Hz		Swee	Sto ep 8 ms (4	op 3 GHz 01 pts)

Plot 90 – 1710-1755MHz Band – Uplink



Plot 91 - 1710-1755MHz Band – Uplink





Plot 92 - 1710-1755MHz Band – Uplink



Plot 93 – 1850-1915MHz Band – Uplink



🔆 Ag	jilent 13	3:53:24 Ju	n 21, 2017					RΤ			
Ref 0 d	Bm		А	tten 5 dB					Mkr1	2.953 -51.0	93 GHz )7 dBm
Avg Log 10 dB/											
30.8 dB DI -13.0											
dBm PAvg 10 W1 S2	my	www.	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	mmm	m	www.	Mar Market	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	•••••	www	nitro
S3 FC AA											
Start 1. #Res B	.916 GHz W 1 MHz				VBW 3 M	Hz		Swe	ep 8 r	Sto ns (40	p 3 GHz 01 pts)

Plot 94 – 1850-1915MHz Band – Uplink



Plot 95 – 1850-1915MHz Band – Uplink





Plot 96 – 1850-1915MHz Band – Uplink







🔆 Ag	jilent <b>1</b> 3	3:57:56 Ju	n 21, 2017	•				RT		
Ref 0 d	Bm		Att	ten 10 dB					Mkr1 -63	747 MHz .8 dBm
Avg Log 10 dB/ Offst 0.8 dB										
DI -13.0 dBm PAvg 10 = W1 S2										
S3 FC AA										
Start 74 #Res B	47 MHz W 1 MHz	1	1	1	VBW 3 M	Hz	1	Swe	Sto ep 8 ms (4	op 3 GHz 01 pts)

Plot 98 – 728-746MHz Band – Downlink



Plot 99 – 728-746MHz Band – Downlink



🔆 Ag	jilent <b>1</b> 3	3:59:37 Ju	n 21, 2017	,				RT		
Ref 0 d	IBm		Att	en 10 dB					Mkr1 74 -50.1	5.0 MHz 11 dBm
Avg Log 10 dB/ Offst 0.8 dB DI -13.0										
abm PAvg 10 W1 S2				<u> </u>			mm	mmm		and the second
Start 30 #Res B	O MHz W 1 MHz				VBW 3 M	Hz		Swee	Stop ep 8 ms (4	745 MHz 01 pts)











Plot 102 – 746-757MHz Band – Downlink







🔆 Ag	jilent 14	4:02:11 Ju	n 21, 2017	,				RT		
Ref 0 d	Bm		Att	ten 10 dB					Mkr1 2. -66	947 GHz .3 dBm
Avg Log 10 dB/ Offst 0.8 dB DI -13.0										
dBm PAvg 10 W1 S2 S3 FC		A.H						~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~		1
AA										
Start 89 #Res B	95 MHz W 1 MHz	1		1	VBW 3 M	Hz	1	Swee	Sto Sto Sto	op 3 GHz 01 pts)





Plot 105 – 869-894MHz Band – Downlink



🔆 Ag	jilent 14	4:03:07 Ju	n 21, 2017	,				RT		
Ref 0 d	Bm		Att	en 10 dB					Mkr1 -65.	737 MHz 84 dBm
Avg Log 10 dB/ Offst 0.8										
ab DI -13.0 dBm PAvg										
10 W1 S2 S3 FC AA	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~		~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	~~~ <sup>1</sup>	mm	man an a	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~		~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
Start 30 #Res B	0 MHz W 1 MHz				VBW 3 M	Hz		Swe	Stop 1. ep 8 ms (4	929 GHz 01 pts)

Plot 106 – 1930-1995MHz Band – Downlink



#### Plot 107 – 1930-1995MHz Band – Downlink


					-					
RL	ØdBm			100	B/	7.	258GHz			
							Same			
www.whym	Myor Anyte	months	Mar March	March March	and monthly		deres to be about	- and the second	added to a server and	wordh in
										and the second
START		3.00	ØGHZ			STO	•	10.000GHz		
RH	1.0M	Hz		UBM	3.0M	Hz		SWP	140MS	

Plot 108 – 1930-1995MHz Band – Downlink



Plot 109 – 1930-1995MHz Band – Downlink



🔆 Ag	jilent 14	4:04:59 Ju	n 21, 2017	,			RT		
Ref 0 d	Bm		Att	en 10 dB			Mkr1 2.109 GHz -64.82 dBm		
Avg Log 10 dB/ Offst 0.8									
dB DI -13.0 dBm									
PAvg 10 W1 S2 S3 FC		~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~			~	w	 	www	man
AA									
Start 30 #Res B	0 MHz W 1 MHz				VBW 3 M	Hz	Swee	Stop 2. <sup>-</sup> ep 8 ms (4	109 GHz 01 pts)





Plot 111 –2110-2155MHz Band – Downlink



A	ATTEN	10dB	:			м	KR -	-54.50dBm		
R	RL 00	1Bm		100	iB/	21	.48GHz			
		wheel is	man m	man	manande	man	mound	manger	many	Angellingung
	all real and a	A								
s	START	10.0	ØGHz			STOP	•	22 <b>.00</b> GHz		
	PELI				0.014	-				

Plot 112 –2110-2155MHz Band – Downlink



🔆 Ag	gilent 15	5:06:40 Ju	n 22, 2017	,			RT		
Ref -4 o	dBm		А	tten 5 dB				Mkr1	774.94 MHz -43 dBm
#Avg Log 10 dB/ Offst 30.8									
dB DI -35.0 dBm									**************************************
M1 S2 S3 FC AA					, , , , , , , , , , , , , , , , , , ,		 New of the		
Start 7 #Res B	G3 MHz W 10 kHz				VBW 30 k	Hz	Sweep 1	S 96.6 m	top 775 MHz s (401 pts)



🔆 Ag									
Ref -4 o	dBm		А	tten 5 dB				Mkr1	794.59 MHz -65.9 dBm
#Avg Log 10 dB/ Offst 30.8									
dB DI -35.0 dBm		1							
M1 S2 S3 FC AA				•••••	mmann	*			******
Start 79 #Res B	93 MHz W 10 kHz			, 	VBW 30 kl	Hz	Sweep 1	St 96.6 ms	op 805 MHz s (401 pts)

## Plot 114 – 27.53c4 – Uplink



🔆 Ag	jilent 15	:35:13 Ju	n 22, 2017	22, 2017						
Ref -4 o	dBm		А	tten 5 dB					Mkr1 1.56 -71.	576 GHz 64 dBm
#Avg Log 10 dB/ Offst 30.8 dB										
DI -40.0 dBm										
M1 S2 S3 FC AA		1		w						
Start 1. #Res B	.559 GHz W 10 kHz			,	VBW 30 k	Hz		Sweep 8	Stop <sup>-</sup> 335.4 ms (4	1.61 GHz 01 pts)









🔆 Ag	jilent 15	5:41:12 Ju	n 22, 2017				RТ		
Ref -4 o	dBm		А	tten 5 dB				Mkr1 1.56 -72.	244 GHz 64 dBm
#Avg Log 10 dB/ Offst 30.8 dB									
DI -50.0 dBm PAvg 10									
W1 S2 S3 FC AA	1 \$						 		
Start 1. #Res B	.559 GHz W 10 kHz				VBW 30 k	Hz	Sweep 8	Stop 1 335.4 ms (4	1.61 GHz 01 pts)









🔆 Ag	jilent 15	5:42:32 Ju	n 22, 2017	,	RT					
Ref -4 o	dBm		А	tten 5 dB				Mkr1	769 -73	.24 MHz .3 dBm
#Avg Log 10 dB/ Offst 30.8 dB										
DI -35.0 dBm PAvg 10										
W1 S2 S3 FC AA						1 ••	 			
Start 76 #Res B	63 MHz W 10 kHz			,	VBW 30 k	Hz	Sweep 1	S 96.6 m	top 7 s (40	775 MHz 1 pts)









## 6. Noise Limits

Test	§20.21(e)(8)(i)(A	Test Engineer(s):	Hoosam B.
Requirement(s):			
Test Results:	Pass	Test Date(s):	Jun/16/2017

Test Procedures:As required by 47 CFR §20.21(e)(8)(i)(A), Noise limits measurements<br/>were made as per the FCC KDB 935210 D03 procedures defined in §7.7.

The EUT was set up as per Figure 2 and 3.

**Test Setup:** 



Figure 2 – Noise Limit



Figure 3 – Uplink Noise power in presence of a downlink signal



Frequency Band (MHz)	Measured Level (dBm)	Limit (dBm)	Margin (dB)
698-716	-72.45	-59	-13.45
776-787	-74.05	-59	-15.05
824-849	-73.94	-59	-14.94
1710-1755	-71.86	-59	-12.86
1850-1915	-73.68	-59	-14.68

Table 19 – Maximum Uplink Noise Summary



🔆 🔆 Ag	jilent 1	3:34:17 Ju	n 16, 2017	7 R						
Ref -32	.2 dBm		#A	tten 0 dB					Mkr1 70 -72.4	1.3 MHz 45 dBm
#Avg Log 10 dB/ Offst 0.8 dB										
DI -59.0 dBm PAvg 100			~~~~~	1 •		~~~~~	·····			
W1 S2 S3 FC AA										
Center #Res B	707.5 MH W 1 MHz	lz			VBW 3 M	Hz		Swee	Spar ep 8 ms (4	n 40 MHz 01 pts)









🔆 🔆 Agi	ilent 1:	3:36:46 Ju	n 16, 2017				R T		
Ref -32.	.2 dBm		#A	tten 0 dB				Mkr1 833. -73	625 MHz .94 dBm
#Avg Log 10 dB/ Offst 0.8 dB DI -59.0 dBm					1 		 		
PAvg 100 W1 S2 S3 FC AA									
Center #Res B\	836.5 MH W 1 MHz	lz			VBW 3 M	Hz	Swe	Spa eep 8 ms (4	n 50 MHz 401 pts)





## Plot 124 – 1710-1755MHz Band – Maximum Uplink Noise



🔆 Ag	ilent 13	3:41:14 Ju	n 16, 2017	,			RT				
Ref -32	.2 dBm		#A	tten 0 dB				M	kr1 1.8600 -73.	075 GHz 68 dBm	
#Avg Log 10 dB/ Offst 0.8 dB DI -59.0				1 •							
dBm PAvg 100 W1 S2 S3 FC AA											
Center #Res B	1.883 GH: W 1 MHz	Z			VBW 3 M	Hz		Swe	Span ep 8 ms (4	130 MHz 01 pts)	

Plot 125 – 1850-1915MHz Band – Maximum Uplink Noise



## 7. Variable Booster Gain

Test	§20.21(e)(8)(i)(c)(1)	Test Engineer(s):	Hoosam B.
Requirement(s):			
Test Results:	Pass	Test Date(s):	Jun/16/2017

Test Procedures:As required by 47 §20.21(e)(8)(i)(c)(1), Variable Booster Gain<br/>measurements were made as per FCC KDB procedures 935210 D03<br/>defined in §7.9.

The EUT was set up as per Figure 4.

Gain limits are based on §20.21(e)(8)(i)(C)(2)(iii) for Direct Contact coupling 23dB or 15dB.

### **Test Setup:**



### Figure 4 – Variable Gain

Detector	Resolution	Video	Sweep Time
Setting	Bandwidth	Bandwidth	
RMS	100 kHz	300 kHz	Auto

Table 20 – Analyzer Settings



RSSI (dBm)	Gain Limit (dBm)	P(in) (dBm)	P(out) dBm	Gain (dB)	Margin (dB)
-30	6	-7.34	-3.7	3.64	-2.36
-32	8	-7.34	0.3	7.64	-0.36
-35	11	-7.34	2.6	9.94	-1.06
-40	16	-7.34	7.5	14.84	-1.16
-43	19	-7.34	10.11	17.45	-1.55
-47	23	-7.34	13.8	21.14	-1.86

Table 21 – 698-716MHz Band – Uplink Data

RSSI (dBm)	Gain Limit (dBm)	P(in) (dBm)	P(out) dBm	Gain (dB)	Margin (dB)
-30	6	-3.04	-0.9	2.14	-3.86
-32	8	-3.04	1.23	4.27	-3.73
-35	11	-3.04	3.9	6.94	-4.06
-40	16	-3.04	8.87	11.91	-4.09
-43	19	-3.04	11.6	14.64	-4.36
-47	23	-3.04	13.88	16.92	-6.08

Table 22 – 776-787MHz Band – Uplink Data

RSSI (dBm)	Gain Limit (dBm)	P(in) (dBm)	P(out) dBm	Gain (dB)	Margin (dB)
-30	6	-4.3	-1.04	3.26	-2.74
-32	8	-4.3	1.73	6.03	-1.97
-35	11	-4.3	5.01	9.31	-1.69
-40	16	-4.3	10.06	14.36	-1.64
-43	19	-4.3	12.78	17.08	-1.92
-47	23	-4.3	16.72	21.02	-1.98

Table 23 – 824-849MHz Band – Uplink Data



RSSI (dBm)	Gain Limit (dBm)	P(in) (dBm)	P(out) dBm	Gain (dB)	Margin (dB)
-30	6	2.2	-1.14	-3.34	-9.34
-32	8	2.2	0.54	-1.66	-9.66
-35	11	2.2	3.22	1.02	-9.98
-40	16	2.2	8.8	6.6	-9.4
-43	19	2.2	11.59	9.39	-9.61
-47	23	2.2	14.4	12.2	-10.8

Table 24 – 1710-1755MHz Band – Uplink Data

RSSI (dBm)	Gain Limit (dBm)	P(in) (dBm)	P(out) dBm	Gain (dB)	Margin (dB)
-30	6	-4.44	-9.6	-5.16	-11.16
-32	8	-4.44	-7.85	-3.41	-11.41
-35	11	-4.44	-4.6	-0.16	-11.16
-40	16	-4.44	0.58	5.02	-10.98
-43	19	-4.44	3.24	7.68	-11.32
-47	23	-4.44	6.3	10.74	-12.26

Table 25 – 776-787MHz Band – Uplink Data

Frequency Band (MHz)	Measured Timing (Seconds)	Limit (Seconds)	Margin (Seconds)
698-716	0.250	1.0	-0.75
776-787	0.275	1.0	-0.725
824-849	0.275	1.0	-0.725
1710-1755	0.050	1.0	-0.95
1850-1915	0.225	1.0	-0.775

Table 26 – Variable Uplink Gain Timing - Summary Table

The following pages show measurements of Variable Booster Gain Timing plots:



i 🔆 Agilent	12:07:00 Ju	n 16, 2017				RT		
Ref 30.5 dB	m	Att	en 10 dB				Mkr1 ∆ -9.	250 ms .887 dB
Peak Log								
10 dB/	1R							
29.5 dB						 		
W1 S2								
<b>AA</b>								
Center 707.	5 MHz						s	pan 0 Hz
Res BW 100 kHz			<u>۱</u>	/BW 300 k	Hz	Swe	ep 10 s (4	01 pts)

## Plot 126 – 698-716MHz Band – Uplink Gain Timing

🔆 Agile	ent 12	2:18:50 Ju	n 16, 2017				RT		
Ref 30.5 d	dBm		Att	en 10 dB				Mkr1 ∆	275 ms 8.26 dB
Peak Log									
10 dB/		:							
Offst 29.5			Lō						
W1 S2									
AA									
Center 78	31.5 MH	z							Span 0 Hz
Res BW 1	100 kHz			<u>۱</u>	/BW 300 k	Hz	 Swe	ep 10 s (4	101 pts)

# Plot 127 – 776-787MHz Band – Uplink Gain Timing



🔆 Ag	jilent 12	2:26:57 Ju	n 16, 2017				RT		
Ref 30.	5 dBm		Att	en 10 dB				Mkr1 ∆ -7	275 ms .427 dB
Peak Log		lR							
10 dB/									
29.5 dB									
W1 S2 S3 FS									
АА									
Center	836.5 MH	z						S	ipan 0 Hz
Res BW 100 kHz				\\	/BW 300 k	Hz	Swe	ep 10 s (4	01 pts)

# Plot 128 – 824-849MHz Band – Uplink Gain Timing

🔆 Agilent 12:36:08 Jun 16, 2017						RT				
Ref 30.5 (	dBm		Att	ten 10 dB					Mkr1 ∆ -	50 ms 9.09 dB
Peak Log										
10 dB/			\$							
Offst 29.5 dB			<u>\</u>				 			
-										
W1 S2 S3 FS										
-										
Center 1. Res BW 1	732 GH	<b>Z</b>	1	<u> </u>	/BW 300	kHz		Swe	Seep 10 s (4	pan 0 Hz 01 pts)

## Plot 129 – 1710-1755MHz Band – Uplink Gain Timing



* Agilent 12:38:19 Jun 16, 2017				R			RT			
Ref 30.5 dBm		Att	en 10 dB					Mkr1 ∆ ₋9	225 ms 9.727 dB	
Peak Log 10 dB/		lR Ø								
Offst 29.5 dB									, ,	
W1 S2 S3 FS										
AA										
Center 1 883 G	H7								Span 0 Hz	
Res BW 100 kHz			VBW 300 kHz				Swe	Sweep 10 s (401 pts)		

Plot 130 – 776-787MHz Band – Uplink Gain Timing



# 8. Occupied Bandwidth

Test	§2.1049	Test Engineer(s):	Hoosam B.	
Requirement(s):				
Test Results:	Pass	Test Date(s):	Jun/22/2017	

Test Procedures:As required by CFR47 §2.1049, Occupied Bandwidth were made at the RF<br/>antenna output terminals of the EUT. Measurements were made as per<br/>the FCC KDB 935210 D03 procedures defined in §7.10

The EUT output was connected directly to a spectrum analyzer through an attenuator. A signal generator was connected to the EUT to produce GSM, CDMA & LTE signals to show the input and output signals were similar.

The following pages show measurements of Occupied Bandwidth plots:

Detector Setting	Resolution Bandwidth	Video Bandwidth	Sweep Time	Span
Peak	1% - 5%	≥3 x RBW	Auto	As per Modulation Type

Table 27 – Analyzer Settings



Ref 3 dBm

Peak Log 10 dB/ Offst 30.8 dB

13:39:34 Jun 22, 2017 🔆 Agilent

R Т Atten 5 dB



Plot 131 – 698-716MHz Band – Uplink Input – GSM



## Plot 132 – 698-716MHz Band – Uplink Output – GSM



🔆 Agilent 13:40:37 Jun 22, 2017



Plot 133 – 776-787MHz Band – Uplink Input – GSM



## Plot 134 – 776-787MHz Band – Uplink Output – GSM



\* Agilent 13:41:35 Jun 22, 2017

R T



Plot 135 – 824-849MHz Band – Uplink Input – GSM



Plot 136 – 824-849MHz Band – Uplink Output – GSM



\* Agilent 13:37:48 Jun 22, 2017

R T











🔆 Agilent 13:42:42 Jun 22, 2017

R T











🔆 Agilent 13:44:31 Jun 22, 2017

R T







Plot 142 – 728-746MHz Band – Downlink Output – GSM



🔆 Agilent 13:45:23 Jun 22, 2017







## Plot 144 – 746-757MHz Band – Downlink Output – GSM



🔆 Agilent 13:46:16 Jun 22, 2017







### Plot 146 – 869-894MHz Band – Uplink Output – GSM