FCC Part 90 Test Report

On

Bi-Directional Amplifier Model: BDA510-S8 FCC ID: NVRBDA510-S8

Customer Name:	Westell Inc.
Customer P.O:	480897
Date of Report:	December 20, 2016
Test Report No:	R-6142N-4
Test Start Date:	November 24, 2016
Test Finish Date:	December 5, 2016
Test Technician:	M. Seamans
Report Approved By:	T. Hannemann
Report Prepared By:	J. Ramsey

Our letters, procedures and reports are for the exclusive use of the customer to whom they are addressed and their communication or the use of the name of Retlif Testing Laboratories must receive our prior written approval. Our letters, procedures and reports apply only to the sample tested and are not necessarily indicative of the qualities of apparently identical or similar products. The letters, procedures and reports and the name of Retlif Testing Laboratories or insignia are not to be used under any circumstances in advertising to the general public. This test report shall not be reproduced, except in full, without the written approval of Retlif Testing Laboratories.

Corporate Headquarters: 795 Marconi Avenue Ronkonkoma, NY 11779 USA Tel: (631) 737-1500 Fax: (631) 737-1497 3131 Detwiler Road Harleysville, PA 19438 USA Tel: (215) 256-4133 Fax: (215) 256-4130 7140 Weddington Road, Suite 140 Concord, NC 28027 Tel: (704) 787-8474 Fax: (704) 787-8479 Washington Regulatory Compliance 1600 North Oak Street, #1710 Arlington,VA 22209 USA Tel: (703) 528-3895

Technical Information			
Report Number:	R-6142N-4		
Customer:	Westell, Inc.		
Address:	670 North Commercial St.		
_	Manchester, NH 03101		
Manufacturer:	Westell, Inc.		
Manufacturer Address:	670 North Commercial St.		
_	Manchester, NH 03101		
Test Sample:	Bi-Directional Amplifier		
Model Number:	BDA510-S8		
Serial Number:	CPG62990		
FCC ID:	NVRBDA510-S8		
Туре: _	Class B Industrial Booster		
Power Requirements: _	120 VAC, 60 Hz		
Frequency of Operation:	817 MHz – 824 MHz, 862 MHz – 869 MHz		
Equipment Class:	B2I		

Test Specification:

Nemko Test Plan Document Number: 317856-2. Rev. 4, Dated: November 29, 2016

Test Procedures:

FCC KDB 935210 D02 V03r02 FCC Part 90 FCC KDB 971168

Test Facility: Retlif Testing Laboratories

101 New Boston Road Goffstown, NH 03045

FCC Registered Test Site Number: 90899



Retlif Testing Laboratories

Table 1 – Tests Performed				
Test Plan Paragraph	Lest Method			
4.1	AGC Threshold Level	See Test Data		
4.2	Out of Band Rejection	Complied		
4.3	Input-Versus-Output Signal Comparison	See Test Data		
4.4	Mean Output Power and Amplifier/Booster Gain	Complied		
4.5	Noise Figure Measurements	Complied		
4.6	Measuring Out-of-Band/Out-of-Block Emissions and Spurious Emissions	Complied		
4.8	Field Strength of Spurious Emissions	Complied		

EUT Operation: During testing, the EUT was amplifying RF signal(s).



Retlif Testing Laboratories

Certification and Signatures

We certify that this report is a true representation of the results obtained from the tests of the equipment stated. We further certify that the measurements shown in this report were made in accordance with the procedures indicated and vouch for the qualifications of all Retlif Testing Laboratories personnel taking them.

lato Wenter

Scott Wentworth Branch Manager NVLAP Approved Signatory

Todd Hannemann EMC Test Engineer iNARTE Certified Technician ATL-0255-T

Non-Warranty Provision

The testing services have been performed, findings obtained and reports prepared in accordance with generally accepted laboratory principles and practices. This warranty is in lieu of all others, either expressed or implied.

Non-Endorsement

This test report contains only findings and results arrived at after employing the specific test procedures and standards listed herein. It is not intended to constitute a recommendation, endorsement or certification of the product or material tested. This test report must not be used by the client to claim product endorsement by NVLAP or any agency of the U.S. Government.



Retlif Testing Laboratories

Revision History

Revisions to this document are listed below; the latest revised document supersedes all previous issues of this document:

Revision

Date December 20, 2016 Pages Affected Original Release



Retlif Testing Laboratories

Requirements and Test Results

NEMKO Test Plan Paragraph 4.1 – AGC Threshold Level

Using a signal generator configured to produce a LTE modulated sinusoidal signal at the center frequency of each uplink and downlink frequency band, the input level to the test sample was increased until a 1 dB increase in the input signal power no longer caused a 1 dB increase in the output signal power. This level was recorded as the AGC threshold level. This measurement was then repeated with a GSM modulated signal. See attached test data.

NEMKO Test Plan Paragraph 4.2 – Out-of-Band Rejection

Using a CW signal at a level 3 dB below the input level used during the AGC Threshold test, ±250 % of the manufacturer's specified pass band was swept. The spectrum analyzer was configured with the peak detector in Max-Hold. After the sweep was complete the 20 dB bandwidth of the test sample was measured. See attached test data.

NEMKO Test Plan Paragraph 4.3 – Input-versus-Output Signal Comparison

Measurements were made to compare the input signal to the output signal. The signal generator output was connected to the spectrum analyzer. The signal generator output level was set to a value that produces a EUT output level that is just below the AGC threshold. A LTE modulation signal was then applied to the carrier. Two markers were placed on the signal, one at the lowest and the other at the highest frequency of the envelope of the spectral display, each marker was placed at or slightly below the -26 dB down amplitude. Waveforms were then noted on an X-Y plot. Next, the signal generator was connected to the EUT input and the output of the EUT was connected to the spectrum analyzer. The output waveform after amplification was then compared to the original input signal to ensure that no significant differences occurred between the input signal and the amplified signal. Testing was performed at the center frequency of each passband on both the uplink and downlink. Testing was then repeated with the input signal set 3dB above the AGC threshold. Testing was then repeated with the GSM modulated signal. See attached test data.



Retlif Testing Laboratories

Requirements and Test Results (con't)

NEMKO Test Plan Paragraph 4.4 – Mean Output Power and Amplifier/Booster Gain

A signal generator was configured to produce a LTE signal at the center frequency of each uplink and downlink frequency band. The signal generator output level was set to a value that produced a EUT output level that was just below the AGC threshold, but not more than 0.5 dB below. The output power of the EUT was measured following "Power measurement Method 1: using a spectrum or signal analyzer" this value was recorded as the output power. The signal generator was connected directly to the signal analyzer (the EUT was removed from the test setup). Using the same signal generator settings, the power measurement was repeated at the signal generator port, which was used as the input signal to the EUT, and was record as the input power. The EUT gain was calculated by Gain (dB) = output power (dBm) – input power (dBm). Testing was then repeated with the GSM modulated signal. These measurements were repeated with the input signal analytical signal signal

NEMKO Test Plan Paragraph 4.5 – Noise Figure Measurements

Using a Low ENR noise source and a signal analyzer with a noise figure measurement option, the noise figure was measured on both the uplink and downlink frequency band with AGC disabled. The EUT complies with the noise figure requirements of 90.219(e)(2). See attached test data.

NEMKO Test Plan Paragraph 4.6 – Measuring Out-of-Band/Out-of-Block (including intermodulation) Emissions and Spurious Emissions

A signal generator was configured to produce two GSM signals, one at 817.300 MHz and one at 817.600 MHz on the input port of the uplink frequency band. The amplitude of the two signals was set to just below the AGC threshold. A Spectrum analyzer was connected to the output port of the EUT with a span of 100 KHz. Using a power averaging (RMS) detector the RF spectrum was swept and the markers were placed on the peak of the intermodulation signals. The EUT output plots were recorded. The input signals were increased so the composite input signal was 3dB over the AGC threshold (AGC activated) and plots of the EUT output were recorded. This was repeated for each of the following signal pairs.

Uplink upper edge: 823.400 MHz; 823.700 MHz Downlink lower edge: 862.300 MHz; 862.600 MHz Downlink upper edge: 868.400 MHz; 868.700 MHz

Retlif Testing Laboratories

Requirements and Test Results (con't)

Testing was only performed with GSM modulation as multiple 5 MHz channels cannot be accommodated in this band for the LTE signals

See attached test data.

NEMKO Test Plan Paragraph 4.8 – Field Strength of Spurious Emissions

• Spurious Emissions, Conducted Measurements

A signal generator was configured to produce a LTE signal at the center frequency of each uplink and downlink frequency band. The signal generator output level was set to a value that produces a EUT output level that is just below the AGC threshold. A spectrum analyzer was connected to the output of the EUT using a peak detector and Max-Hold. The input test frequencies used were three frequencies (Low, Mid and High) within each passband (uplink and downlink). A marker was placed on the highest emission(s) outside the passband. Testing was performed in the frequency range of 30MHz to 10GHz to a - 13dBm limit. Testing was repeated with a GSM modulated signal. See attached test data.

o Frequency Stability Measurements

As the test sample is designed to amplify input signals from a cellular network and contains no frequency determining components frequency stability measurements were not required/performed.

• Field Strength of Spurious Emissions

The test sample was placed on a 80cm high test stand which was located 3 meters from the test antenna on an FCC listed test site. A signal generator was connected to the input of the amplifier. The signal generator output was set to provide the input power level necessary to achieve maximum output power of the amplifier at 3 frequencies within each passband (uplink and downlink). The frequency range of the test was 30MHz – 10GHz to a -13dBm limit. See attached test data.



Retlif Testing Laboratories

Equipment List

AGC Threshold

EN	Manufacturer	Description	Range	Model No.	Cal Date	Due Date
1345	NARDA MICROWAV	E ATTENUATOR, COAXIAL	30 dB, DC - 18 GHz, 50	W 776B-30	10/10/2016	10/31/2017
5138	NARDA MICROWAV	E ATTENUATOR, COAXIAL	10 dB, DC - 11 GHz, 20	W 768-10	10/10/2016	10/31/2017
5179B	MICRO-COAX	CABLE, COAXIAL	10 kHz - 18 GHz	UFB311A-1- 036050U50U	10/7/2016	10/31/2017
R474 R476	AGILENT / HP AGILENT / HP	ANALYZER, SIGNAL GENERATOR, SIGNAL	10 Hz – 8.5 GHz 9 kHz - 6 GHz	N9020B N5182B	10/10/2016 9/9/2016	10/10/2017 9/9/2017

Out of Band Rejection

EN	Manufacturer	Description	Range	Model No.	Cal Date	Due Date
1345	NARDA MICROWAV	E ATTENUATOR, COAXIAL	30 dB, DC - 18 GHz, 50	W 776B-30	10/10/2016	10/31/2017
5138	NARDA MICROWAV	E ATTENUATOR, COAXIAL	10 dB, DC - 11 GHz, 20	W 768-10	10/10/2016	10/31/2017
5179B	MICRO-COAX	CABLE, COAXIAL	10 kHz - 18 GHz	UFB311A-1- 036050U50U	10/7/2016	10/31/2017
R474 R476	AGILENT / HP AGILENT / HP	ANALYZER, SIGNAL GENERATOR, SIGNAL	10 Hz – 8.5 GHz 9 kHz - 6 GHz	N9020B N5182B	10/10/2016 9/9/2016	10/10/2017 9/9/2017

Input-versus-Output Signal Comparison

EN	Manufacturer	Description	Range	Model No.	Cal Date	Due Date
1345	NARDA MICROWAV	E ATTENUATOR, COAXIAL	30 dB, DC - 18 GHz, 50	W 776B-30	10/10/2016	5 10/31/2017
5138	NARDA MICROWAV	E ATTENUATOR, COAXIAL	10 dB, DC - 11 GHz, 20	W 768-10	10/10/2016	5 10/31/2017
5179B	MICRO-COAX	CABLE, COAXIAL	10 kHz - 18 GHz	UFB311A-1- 036050U50U	10/7/2016	10/31/2017
R474 R476	AGILENT / HP AGILENT / HP	ANALYZER, SIGNAL GENERATOR, SIGNAL	10 Hz – 8.5 GHz 9 kHz - 6 GHz	N9020B N5182B	10/10/2016 9/9/2016	5 10/10/2017 9/9/2017

Mean Output Power and Amplifier/Booster Gain

EN	Manufacturer	Description	Range	Model No.	Cal Date	Due Date
1345	NARDA MICROWAV	E ATTENUATOR, COAXIAL	30 dB, DC - 18 GHz, 50	W 776B-30	10/10/2016	10/31/2017
5138	NARDA MICROWAV	E ATTENUATOR, COAXIAL	10 dB, DC - 11 GHz, 20	W 768-10	10/10/2016	10/31/2017
5179B	MICRO-COAX	CABLE, COAXIAL	10 kHz - 18 GHz	UFB311A-1- 036050U50U	10/7/2016	10/31/2017
R474 R476	AGILENT / HP AGILENT / HP	ANALYZER, SIGNAL GENERATOR, SIGNAL	10 Hz – 8.5 GHz 9 kHz - 6 GHz	N9020B N5182B	10/10/2016 9/9/2016	10/10/2017 9/9/2017



Retlif Testing Laboratories

Noise Figure Measurements

EN	Manufacturer	Description	Range	Model No.	Cal Date	Due Date
5179B	MICRO-COAX	CABLE, COAXIAL	10 kHz - 18 GHz	UFB311A-1- 036050U50U	10/7/2016	10/31/2017
R474	AGILENT / HP	ANALYZER, SIGNAL	10 Hz - 26 GHz	N9020B	10/10/2016	10/10/2017
R475	AGILENT / HP	NOISE SOURCE	10 MHz - 26.5 GHz	N4000A	10/11/2016	10/11/2017

Measuring Out-of-Band/Out-of-Block (including intermodulation) Emissions and Spurious Emissions

EN	Manufacturer	Description	Range	Model No.	Cal Date	Due Date
1232	AGILENT / HP	PRE-AMPLIFIER	1 - 26.5 GHz	8449B	6/16/2016	6/30/2017
3258	ETS / EMCO	ANTENNA, DOUBLE RIDGED GUIDE	1 - 18 GHz	3115	10/13/2016	4/30/2018
3427B	ETS / EMCO	ANTENNA, BICONICAL	20 - 200 MHz	3104	2/5/2016	8/31/2017
4029B	RETLIF	OPEN AREA TEST SITE, ATTENUATION	3 / 10 Meters	RNH	4/13/2016	4/30/2018
443	ELECTRO-METRICS	ANTENNA, LOG PERIODIC	200 MHz - 1000 MHz	LPA-25	10/6/2016	4/30/2018
5070	ROHDE & SCHWARZ	RECEIVER, EMI	20 Hz - 40 GHz	ESIB40	10/21/2016	10/31/2017
1345	NARDA MICROWAVI	E ATTENUATOR, COAXIAL	30 dB, DC - 18 GHz, 50	W 776B-30	10/10/2016	10/31/2017
5138	NARDA MICROWAVI	E ATTENUATOR, COAXIAL	10 dB, DC - 11 GHz, 20	W 768-10	10/10/2016	10/31/2017
5179B	MICRO-COAX	CABLE, COAXIAL	10 kHz - 18 GHz	UFB311A-1- 036050U50U	10/7/2016	10/31/2017
R474 R476 R469	AGILENT / HP AGILENT / HP AGILENT / HP	ANALYZER, SIGNAL GENERATOR, SIGNAL ANALYZER, SPECTRUM	10 Hz – 8.5 GHz 9 kHz - 6 GHz 100 Hz - 26.5 GHz	N9020B N5182B E7405A;A	10/10/2016 9/9/2016 12/1/2016	10/10/2017 9/9/2017 12/30/2017



Retlif Testing Laboratories



Test Setup



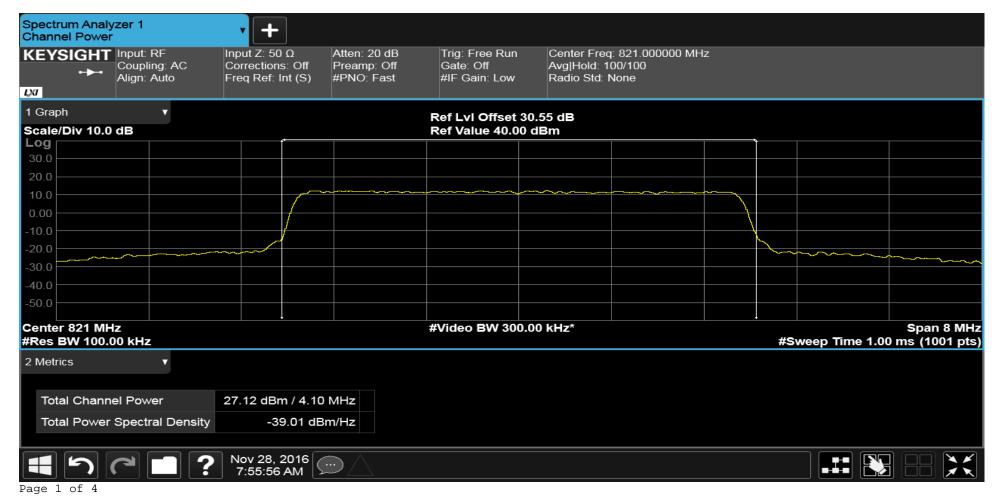
Retlif Testing Laboratories

AGC Threshold Test Data

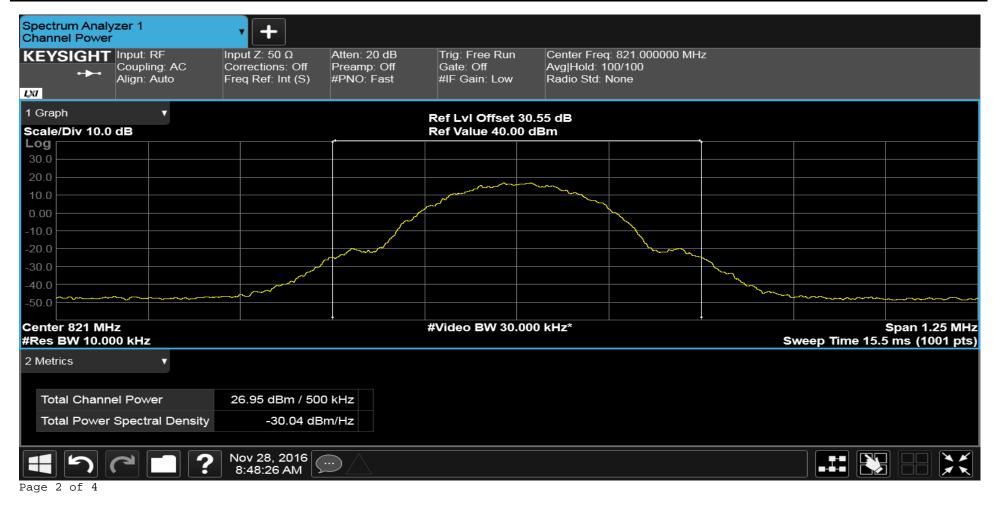


Retlif Testing Laboratories

Test Method	AGC Threshold			
Customer	Westell, Inc.	Job No.	R-6142N-4	
Test Sample	Bi-Directional Amplifier			
Model Number	BDA510-S8	Serial No.	CPG62990	
Operating Mode	Amplifying LTE signal at 821MHz			
Test Specification	Nemko Test Plan 317856-2			
Technician	M. Seamans	Date	November 28 th , 2016	
Climatic Conditions	Temp:19.3 °CRelative Humidity:29.6 %			
Notes	Uplink Signal Generator Setting: -54.20dBm (-53.35dBm measured signal g	generator output)		
	Amplifier Output: 27.12dBmGain: 80.47dB			

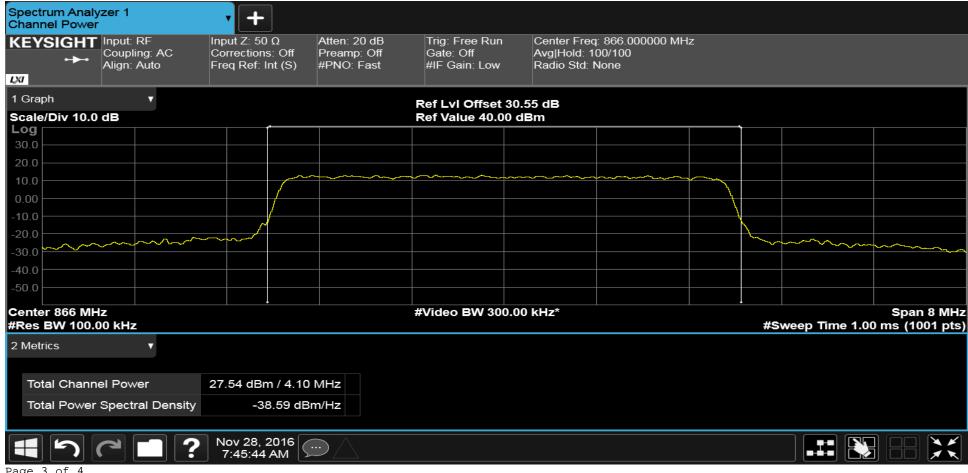


KEILIF IESIING LADOKAIOKIES				
Test Method	AGC Threshold			
Customer	Westell, Inc.	Job No.	R-6142N-4	
Test Sample	Bi-Directional Amplifier			
Model Number	BDA510-S8	Serial No.	CPG62990	
Operating Mode	Amplifying GSM signal at 821MHz			
Test Specification	Nemko Test Plan 317856-2			
Technician	M. Seamans	Date	November 28 th , 2016	
Climatic Conditions	Temp: 19.3 °C Relative Humidity: 29.6 %			
Notes	Uplink Signal Generator Setting: -54.30dBm (-53.50dBm measured signal generator output)			
	Amplifier Output: 26.95dBm Gain: 80.45dB			



DETI IE TESTINC I ARODATODIES

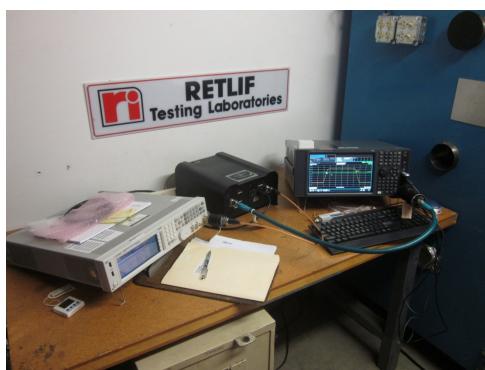
Test Method	AGC Threshold			
Customer	Westell, Inc.	Job No.	R-6142N-4	
Test Sample	Bi-Directional Amplifier			
Model Number	BDA510-S8	Serial No.	CPG62990	
Operating Mode	Amplifying LTE signal at 866MHz			
Test Specification	Nemko Test Plan 317856-2			
Technician	M. Seamans	Date	November 28 th , 2016	
Climatic Conditions	Temp: 19.3 °C Relative Humidity: 29.6 %			
Notes	Downlink Signal Generator Setting: -54.00dBm (-53.31dBm measured signal	al generator outp	put)	
	Amplifier Output: 27.54dBm Gain: 80.85dB			



Page 3 of 4

	 RETLIF TESTING LABORATORIES											
Test Method	AGC Thresho				LADU							
	Westell, Inc.	Jiu				Job No.	R-6142N-4					
Customer	-	1 4 1.0				JOD NO.	K-0142IN-4					
Test Sample	Bi-Directiona	al Amplifier				G . 1 N	CDC (2000					
Model Number	BDA510-S8		<u></u>			Serial No.	CPG62990					
Operating Mode		SSM signal at 860	5MHz									
Test Specification	-	Plan 317856-2				_	th					
Technician	M. Seamans					Date	November 28 th , 201	6				
Climatic Conditions	Temp: 19.3		Humidity: 29.									
Notes		Signal Generator tput: 27.31dBm	Setting: -53.70dl Gain: 80.32dE	Bm (-53.01dBm m 3	easured signa	ll generator out	tput)					
Spectrum Analyzer 1 Channel Power	, <u> </u>	+										
KEYSIGHT Input: RI	F Inp		Atten: 20 dB Preamp: Off	Trig: Free Run Gate: Off		req: 866.00000 I: 100/100	00 MHz					
Align: Au			#PNO: Fast	#IF Gain: Low	Radio Ste							
LNI												
1 Graph	•			Ref LvI Offset	30.55 d B							
Scale/Div 10.0 dB				Ref Value 40.0	0 dBm							
Log 30.0												
20.0												
10.0					~~~~~							
0.00			<i>ب</i>			~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~						
-10.0												
-20.0							~					
-30.0												
-40.0												
-50.0	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~											
Center 866 MHz #Res BW 10.000 kHz				#Video BW 30.	000 kHz*		s	weep Time 15.5	Span 1.25 MHz 5 ms (1001 pts)			
2 Metrics	•											
Total Channel Power	r 2	7.31 dBm / 500	kHz									
Total Power Spectra	I Density	-29.68 dBm	n/Hz									
		ov 28, 2016 0:01:04 AM										

Test Photographs Out of Band Rejection



Test Setup



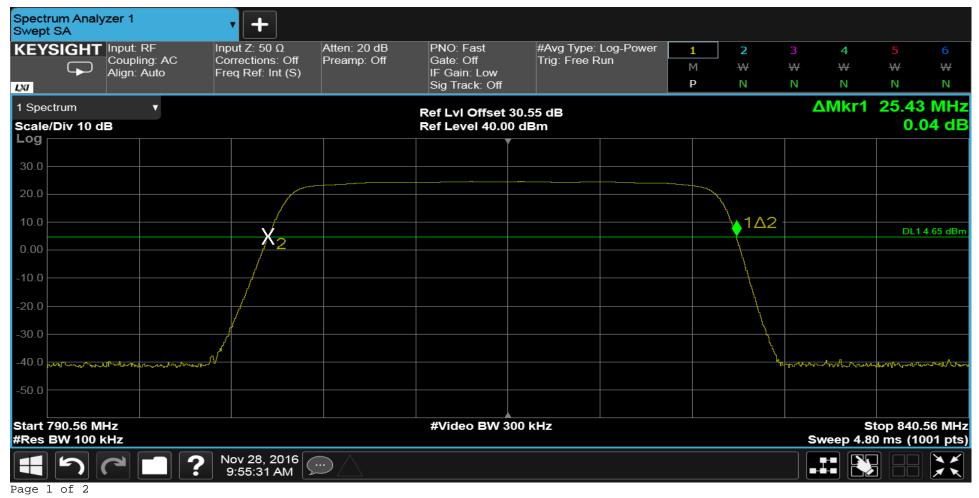
Retlif Testing Laboratories

Out of Band Rejection Test Data

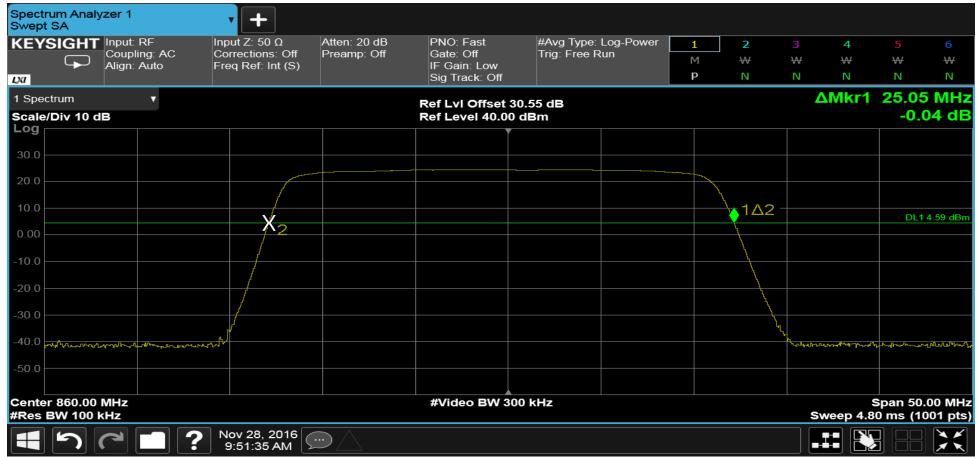


Retlif Testing Laboratories

Test Method	Out-of-Band Rejection		
Customer	Westell, Inc.	Job No.	R-6142N-4
Test Sample	Bi-Directional Amplifier		
Model Number	BDA510-S8	Serial No.	CPG62990
Operating Mode	Amplifying CW signals		
Test Specification	Nemko Test Plan 317856-2		
Technician	M. Seamans	Date	November 28 th , 2016
Climatic Conditions	Temp:19.3 °CRelative Humidity:29.6 %		
Notes	Uplink Signal Generator Setting: -57.00dBm (-56.31dBm measured signal g	generator output))
	20dB Bandwidth: 25.43 MHz		



		MAION	
Test Method	Out-of-Band Rejection		
Customer	Westell, Inc.	Job No.	R-6142N-4
Test Sample	Bi-Directional Amplifier		
Model Number	BDA510-S8	Serial No.	CPG62990
Operating Mode	Amplifying CW signals		
Test Specification	Nemko Test Plan 317856-2		
Technician	M. Seamans	Date	November 28 th , 2016
Climatic Conditions	Temp: 19.3 °C Relative Humidity: 29.6 %		
Notes	Downlink Signal Generator Setting: -57.00dBm (-56.31dBm measured signal	al generator outp	put)
	20dB Bandwidth: 25.05 MHz		



Page 2 of 2

Test Photographs Input-versus-Output Signal Comparison



Test Setup



Retlif Testing Laboratories

Input-versus-Output Signal Comparison Test Data

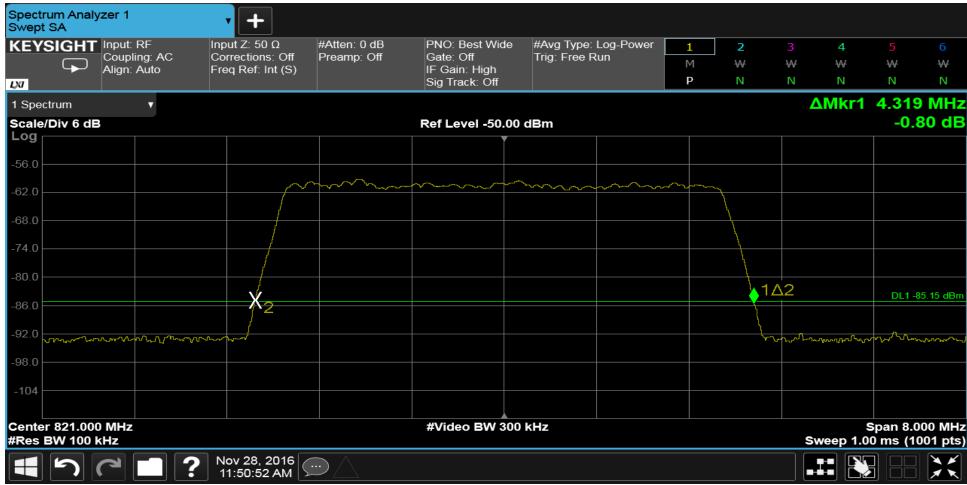


Retlif Testing Laboratories

		MAION	
Test Method	Input-v-Output Signal Comparison		
Customer	Westell, Inc.	Job No.	R-6142N-4
Test Sample	Bi-Directional Amplifier		
Model Number	BDA510-S8	Serial No.	CPG62990
Operating Mode	Amplifying LTE Signal at 821MHz		
Test Specification	Nemko Test Plan 317856-2		
Technician	M. Seamans	Date	November 28 th , 2016
Climatic Conditions	Temp:19.3 °CRelative Humidity:29.6 %		
Notes	Uplink 26dB Bandwidth: 4.317 MHz		

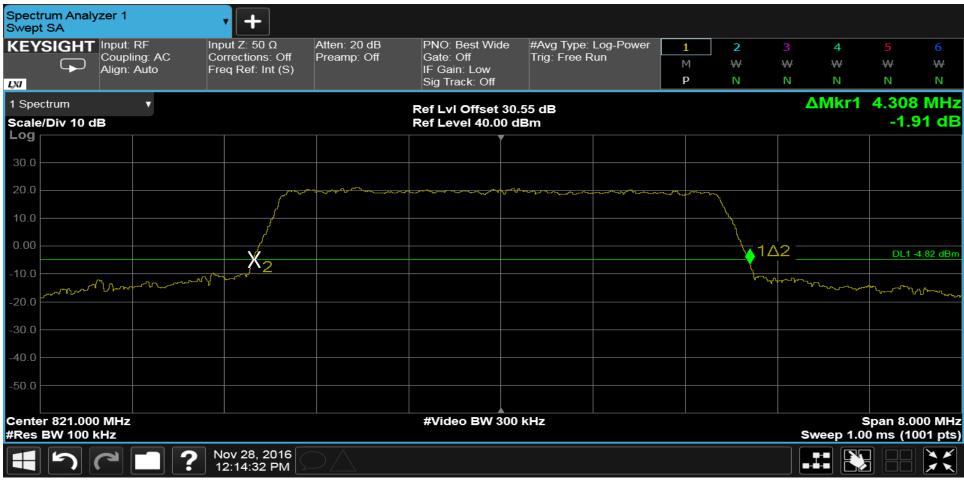


Test Method	Input-v-Output Signal Comparison		
Customer	Westell, Inc.	Job No.	R-6142N-4
Test Sample	Bi-Directional Amplifier		
Model Number	BDA510-S8	Serial No.	CPG62990
Operating Mode	Signal Generator LTE Output at 821MHz		
Test Specification	Nemko Test Plan 317856-2		
Technician	M. Seamans	Date	November 28 th , 2016
Climatic Conditions	Temp:19.3 °CRelative Humidity:29.6 %		
Notes	Uplink 26dB Bandwidth: 4.319 MHz		



Page 2 of 16

Test Method	Input-v-Output Signal Comparison		
Customer	Westell, Inc.	Job No.	R-6142N-4
Test Sample	Bi-Directional Amplifier		
Model Number	BDA510-S8	Serial No.	CPG62990
Operating Mode	Amplifying LTE Signal at 821MHz, AGC Activated		
Test Specification	Nemko Test Plan 317856-2		
Technician	M. Seamans	Date	November 28 th , 2016
Climatic Conditions	Temp:19.3 °CRelative Humidity:29.6 %		
Notes	Uplink 26dB Bandwidth: 4.308 MHz		



		ŀ	RETLIF T	TESTING L	ABORATO	RIES						
Test Method	Input-v-Outpu	ıt Signal Compa	rison									
Customer	Westell, Inc.				Job No.	R-6142N-	4					
Test Sample	Bi-Directional	l Amplifier			· · · · · · · · · · · · · · · · · · ·	-						
Model Number	BDA510-S8				Serial No.	CPG62990)					
Operating Mode	Signal Genera	tor LTE Output	at 821MHz, AGC	C Activated								
Test Specification	Nemko Test F	Plan 317856-2										
Technician	M. Seamans				Date	Date November 28 th , 2016						
Climatic Conditions	Temp: 19.3	°C Relativ	e Humidity: 29.6	5 %								
Notes	Uplink 26d	B Bandwidth: 4	.308 MHz									
Spectrum Analyzer 1 Swept SA	•	+										
KEYSIGHT Input: RI	F Inp	ut Z: 50 Ω	#Atten: 0 dB	PNO: Best Wide	#Avg Type: Log-Power	1	2	3 4	4	5	6	
Coupling Align: Al	0	rrections: Off q Ref: Int (S)	Preamp: Off	Gate: Off IF Gain: High	Trig: Free Run	М	₩	₩ +	₩	₩	₩	
L)A				Sig Track: Off		Р	N	N I	N	N	N	
	•			Definition 50.00				ΔΜ	kr1	4.308	3 MHz 06 dB	
Scale/Div 6 dB				Ref Level -50.00	авт					-0.0	JO UB	
-56.0		\sim	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	·····	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~						
-62.0						1						
		[1					
-68.0												
-74.0		/										
		f					<u>ا</u>					
-80.0							<u> </u> 1∆:	2		DL1 -8	82.17 dBm	
-86.0		-X ₂					l l					
-00.0		{										
-92.0 -92.0	ᠬᠬᡃᡅᡒᢇᡗᠧ᠕	<u>ا</u> ۲۰۰۰					\ \/~~~~	᠘᠕᠕ᡗᠺᡟᢥᡘᢇ	Amst	ሲ ፖኒፖ ^ዋ ኤ		
										~~~		
-98.0												
-104												
Center 821.000 MHz				#Video BW 300	kHz						000 MHz	
#Res BW 100 kHz								Swee	p 1.00	) ms (10	001 pts)	
<b>1</b> 7 7		ov 28, 2016 1:56:49 AM										

Page 4 of 16

		R	<b>ETLIF</b> T	<b>ESTING</b>	LABO	RATOR	RIES					
Test Method	Input-v-Out	put Signal Compa	rison									
Customer	Westell, Inc	•				Job No.	R-6142	N-4				
Test Sample	<b>Bi-Direction</b>	al Amplifier					-					
Model Number	BDA510-S8	8				Serial No.	CPG629	990				
<b>Operating Mode</b>	Amplifying	GSM Signal at 82	1MHz									
Test Specification	Nemko Test	Plan 317856-2					-					
Technician	M. Seamans					Date	Novemb	ber 28 th , 20	)16			
Climatic Conditions	Temp: 19.3	<u>³ °C Relative</u>	e Humidity: 29.6	5 %								
Notes	Uplink 26	dB Bandwidth: 33	30 kHz									
Spectrum Analyzer 1 Swept SA		<b>•</b> [+]										
KEYSIGHT Input: R	F In	put Z: 50 Ω	Atten: 20 dB	PNO: Best Wide		pe: Log-Power	1	2	3	4	5	6
Coupling Align: A	2	orrections: Off req Ref: Int (S)	Preamp: Off	Gate: Off IF Gain: Low	Trig: Fre	e Run	м	₩	₩	₩	₩	₩
L)/J				Sig Track: Off			Р	N	N	N	N	N
1 Spectrum	•			Ref LvI Offset 3	0.55 dB					ΔMk		0 kHz
Scale/Div 10 dB				Ref Level 40.00	dBm						0.	18 dB
Log				Ĭ								
30.0												
20.0					$\sim$							
				~								
10.0				4	- N							
0.00				X_	\	•1∆2					DL1	-2.30 dBm
-10.0				×2		1						
10.0			~~~~	-5		Vr_						
-20.0			<u> </u>									
-30.0			/			\						
	᠆᠆᠇ᠬᡊᡊᠴᡍᡄᡘ᠆ᢧᡏᠺᡅᡗᡀᡔᡖᢩᡘᡐᠬ	$\sim$	Jan and a start			~\	and the second	᠆ᢧᠰᢑᢩ᠆ᡔᠺᠵᠧ_ᡥᡅ᠆	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	ᡔᠽᡗᠵᠵᡘᢏᡊᢑ᠆ᡥᠯᡕ	w1	᠂ᢧᠬ᠇ᢪ᠋ᡞ᠆ᢌᡪᡀᡗᢧ᠘
-40.0												
-50.0												
Center 821.000 MHz #Res BW 10 kHz				#Video BW 30	0 kHz				Sv	s veep 19.		000 MHz 001 pts)
		Nov 28, 2016 10:45:02 AM	$\Box$									

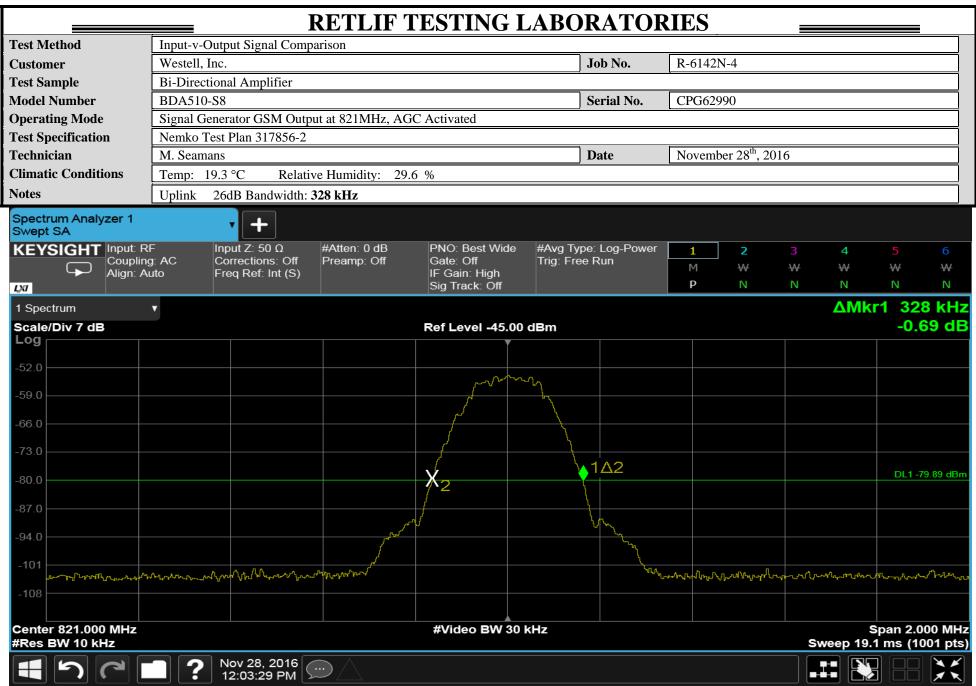
Page 5 of 16

	RETLIF TESTING LABORATORIES											
Test Method	Input-v-Outp	out Signal Compa	rison				·					
Customer	Westell, Inc.					Job No.	R-61421	<b>N</b> -4				
Test Sample	Bi-Direction	al Amplifier					-					
Model Number	BDA510-S8					Serial No.	CPG629	90				
<b>Operating Mode</b>	Signal Gener	rator GSM Output	t at 821MHz				-					
Test Specification	Nemko Test	Plan 317856-2										
Technician	M. Seamans					Date	Novemb	er 28 th , 20	16			
<b>Climatic Conditions</b>	Temp: 19.3	°C Relative	Humidity: 29.6	ō %								
Notes	Uplink 26	dB Bandwidth: 33	30 kHz									
Spectrum Analyzer 1 Swept SA		• +										
KEYSIGHT Input: RI			Atten: 6 dB Preamp: Off	PNO: Best Wide Gate: Off	e #Avg Iyj Trig: Fre	pe: Log-Power e Run	1	2	3	4	5	6
Align: Al	uto Fre	eq Ref: Int (S)		IF Gain: Low			M P	₩ N	₩ N	₩ N	₩ N	₩ N
				Sig Track: Off								
										Δινικι	1 330	
Scale/Div 6 dB				Ref Level -50.0	0 dBm						-1.4	4 dB
				Í								
-56.0				p v v v	~~.							
-62.0					۲ ( س							
-68.0				/	<u>`</u>							
-74.0												
					Ì							
-80.0				X ₂		1Δ2					DL1 -83	3.04 dBm
-86.0												
-92.0				/ /								
-98.0	ᡀ᠋ᡎᡗᠧ᠕ᡟᢦ᠊ᠬᡙᡗᡁᠰᢈ	ᡙᡡᡗᠰᢏᢛᡁᡙᠰᠾ᠇᠈᠋ᡎᡘᠰᡆ	my hat hat			الالالموموريني	֍ՠֈՠՠՠՠՠ	᠕ᡁᡅᠬᡌᡀᡣᡪᠼᠥ	᠕ᡊᠼᡗᠰ	^{ֈֈֈ} ֈֈֈֈֈֈֈֈ	man	ᡶᠬᡃᡅ _{ᡆᢧᢦ} ᠬ
-104												
Center 821.000 MHz #Res BW 10 kHz				#Video BW 3	0 kHz				SI	S weep 19.1	pan 2.00 ms (10	
		lov 28, 2016 11:40:37 AM										

Page 6 of 16

		ŀ	RETLIF T	<b>TESTING I</b>	ABORA	TOR	IES					
Test Method	Input-v-Outp	ut Signal Compa	arison									
Customer	Westell, Inc.				Job N	lo.	R-6142	N-4				
Test Sample	Bi-Directiona	al Amplifier					_					
Model Number	BDA510-S8				Serial	l No.	CPG62	990				
<b>Operating Mode</b>	Amplifying C	GSM Signal at 82	21MHz, AGC Act	ivated								
Test Specification	Nemko Test	Plan 317856-2										
Technician	M. Seamans				Date		Novem	ber 28 th , 2	016			
<b>Climatic Conditions</b>	Temp: 19.3	°C Relativ	e Humidity: 29.	6 %								
Notes	Uplink 260	dB Bandwidth: 3	328 kHz									
Spectrum Analyzer 1 Swept SA	, , , , , , , , , , , , , , , , , , ,	+										
KEYSIGHT Input: RI Coupling Align: Au	g:AC Co	out Z: 50 Ω rrections: Off eq Ref: Int (S)	Atten: 20 dB Preamp: Off	PNO: Best Wide Gate: Off IF Gain: Low	#Avg Type: Log Trig: Free Run	I-Power	1 M P	2 ₩ N	3 ₩ N	4 ₩ N	5 ₩ N	6 ₩ N
LXI				Sig Track: Off			Р	IN	IN			
	•			Ref LvI Offset 30.						ΔΜΚΙ	1 328	
Scale/Div 10 dB				Ref Level 40.00 d	Bm						-0.2	27 dB
209				Ĭ								
30.0												
20.0				porton	~							
20.0					brok .							
10.0												
0.00					<u>\</u> 1Δ2	2						2.45 dBm
0.00				X ₂							DETA	2.43 GDIII
-10.0					\							
-20.0					بر مردم النق الم	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~						
-20.0			f			N.						
-30.0						\						
-40.0 work a all the state			- Romand			رم بر	viele .					
-40.0 must have a strategies of the second secon	ᢉᠧᠾᠵᢞᠯ᠔ᡪᠿᢏᡣᢇ᠆᠇ᠥᠮ᠐ᡃᠬᠤᠯᡃᢦᢦ	ᢦ᠆ᠧᡙᡗᢦᡟ᠂ᠧᡒᢦ᠆ᢑᢋ᠂ᡔᡗᡟ <u></u> ᡜᡀᠰᡐ᠆ᢩ	1. T				v v	իլուհուշծերութեններութեն	very 12-20-07-076-	ᢏᢛ᠊ᢉᢦᠼᡗᡃᢑᡊᠬᡗᡫᢪᡄᠬ	᠘ᡔᡗᠯᢛᡒᢇᡊᡳ᠋ᢩ᠕ᠰᡀ᠇ᠯ᠘	ᡗᡗᡄ᠇ᡊᡃᠾᢉᡃᢧᡅ᠆
-50.0												
Center 821.000 MHz #Res BW 10 kHz				#Video BW 30	kHz				SI	S weep 19.1	5pan 2.0 1 ms (10	
		ov 28, 2016 2:11:40 PM										

Page 7 of 16



Page 8 of 16

		F	<b>RETLIF</b>	<b>FESTING L</b>	ABO	RATOR	RIES					
Test Method	Input-v-Outp	ut Signal Compa	rison									
Customer	Westell, Inc.					Job No.	R-61421	N-4				
Test Sample	Bi-Directiona	al Amplifier										
Model Number	BDA510-S8					Serial No.	CPG629	90				
Operating Mode	Amplifying L	LTE Signal at 860	6MHz									
Test Specification	Nemko Test l	Plan 317856-2										
Technician	M. Seamans				]	Date	Novemb	er 28 th , 20	16			
<b>Climatic Conditions</b>	Temp: 19.3	°C Relative	e Humidity: 29	.6 %								
Notes	Downlink	26dB Bandwidth	: 4.299 <b>MHz</b>									
Spectrum Analyzer 1 Swept SA		• +										
KEYSIGHT Input: R	F Inp	out Z: 50 Ω	Atten: 20 dB	PNO: Best Wide		be: Log-Power	1	2	3	4	5	6
Coupling Align: A	5	errections: Off eq Ref: Int (S)	Preamp: Off	Gate: Off IF Gain: Low	Trig: Free	e Run	М	₩	₩	₩	₩	₩
L)/I				Sig Track: Off			Р	Ν	Ν	Ν	N	N
1 Spectrum Scale/Div 10 dB	•			Ref LvI Offset 30 Ref Level 40.00 d						ΔMkr1		MHz 13 dB
Log				Rei Levei 40.00 d	ыш						<u>.</u>	
30.0												
20.0			and all the second second		وسيديج سي محرجت محر			~~~				
		ļ						N.				
10.0								- \ <u>`</u>				
0.00								1	Δ2 –		DI 1	4.12 dBm
		×2−−									DLI	4. 12 UDIII
-10.0	man and a way	h.v.*						لري بر	᠕᠇ᢆ᠆᠆	ᡰᡘᠬᢧ᠆ᡙᠬᢇᡀᡘᡔᡙ		
-20.0										50 GC-1/	ᡝᡙᢇᡳᢧᢉᠰ	Land Conner
-30.0												
-40.0												
-50.0												
Center 866.000 MHz #Res BW 100 kHz				#Video BW 300	KHZ					sweep 1.0	Span 8.0 0 ms (10	
	<b>?</b> 1	lov 28, 2016 2:22:17 PM										

Page 9 of 16

		F	RETLIF 7	<b>TESTING I</b>	ABORAT	ORII	ES					
Test Method	Input-v-Outp	out Signal Compa	rison									
Customer	Westell, Inc.				Job No.	R	-61421	N-4				
Test Sample	Bi-Direction	al Amplifier				-						
Model Number	BDA510-S8				Serial N	<b>o.</b> C	PG629	90				
<b>Operating Mode</b>	Signal Gener	ator LTE Output	at 866MHz			-						
Test Specification	Nemko Test	Plan 317856-2										
Technician	M. Seamans				Date	N	ovemb	er 28 th , 201	6			
Climatic Conditions	Temp: 19.3	°C Relative	e Humidity: 29.	6 %								
Notes	Downlink	26dB Bandwidth	: <b>4.308MHz</b>									
Spectrum Analyzer 1 Swept SA		• +										
KEYSIGHT Input: R	F Inj	put Z: 50 Ω prrections: Off	#Atten: 0 dB Preamp: Off	PNO: Best Wide Gate: Off	#Avg Type: Log-P Trig: Free Run	ower	1	2	3	4	5	6
Align: Align		eq Ref: Int (S)		IF Gain: High	ing. Free Run		М	₩	₩	₩	₩	₩
LXI				Sig Track: Off			Р	N	N	N	N	N
1 Spectrum	•									∆Mkr1		
Scale/Div 6 dB				Ref Level -45.00	dBm						0.2	21 dB
Log				Ţ								
-51.0												
57.0												
-57.0			~ ^ ^									
-63.0		$ \sim$				~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~		<u>`\</u>				
		<i> </i>										
-69.0		1						Ì				
-75.0		ļ/						<u>\</u>				
-81.0								<u>\</u> 12	12		DI 1 -8	5.47 dBm
-87.0		<u></u> X ₂										
	ь <u>и</u>							Ϋ́,				
-93.0 formation	᠕ᡩᡎᡘ᠕ᡎᡗᡀᢑ᠕ᡘ	wind						<u>ኪ</u> .ሌዮ	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	᠆ᢦᠧᢔᡘᠧᢞ ^{ᡐᠬᠴᡀ} ᠬᢋᡗᡪ		᠂᠕ᠮᠬ᠕ᡟ
-99.0												
Center 866.000 MHz #Res BW 100 kHz				#Video BW 300	kHz					s Sweep 1.00	Span 8.0 0 ms (10	
		lov 28, 2016 2:50:00 PM										$\mathbf{\mathbf{x}}$

Page 10 of 16

		ŀ	<b>RETLIF</b> 7	<b>FESTING I</b>	LABO	RATOR	RIES							
Test Method	Input-v-Output	ut Signal Compa	arison											
Customer	Westell, Inc.					Job No.	R-6142	N-4						
Test Sample	Bi-Directiona	al Amplifier												
Model Number	BDA510-S8					Serial No.	CPG62990							
<b>Operating Mode</b>	Amplifying L	TE Signal at 86	6MHz, AGC Acti	vated										
<b>Test Specification</b>	Nemko Test I	Plan 317856-2												
Technician	M. Seamans					Date	Novem	per 28 th , 20	16					
<b>Climatic Conditions</b>	Temp: 19.3	°C Relativ	e Humidity: 29.	6 %										
Notes	Downlink 2	26dB Bandwidtl	n: <b>4.317MHz</b>											
Spectrum Analyzer 1 Swept SA		• +												
KEYSIGHT Input: RI	F Inp	out Z: 50 Ω rrections: Off	Atten: 20 dB Preamp: Off	PNO: Best Wide Gate: Off	#Avg Ty Trig: Fre	pe: Log-Power	1	2	3	4	5	6		
Align: Au	<b>_</b>	eq Ref: Int (S)	Preamp. On	IF Gain: Low	Ing. Fre	e Rull	М	₩	₩	₩	₩	₩		
LXI				Sig Track: Off			Р	N	N	N	N	N		
	•			Ref LvI Offset 30						ΔMkr1				
Scale/Div 10 dB				Ref Level 40.00 c	dBm						0.:	28 dE		
209				Ť										
30.0														
20.0		~~			۳~~~~~			~						
10.0														
0.00								1	Δ2 _			-3.18 dBm		
		X ₂									DET	-3. 10 UDII		
-10.0	~~~~~										~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~		
-20.0														
-30.0														
-40.0														
-50.0														
Center 866.000 MHz #Res BW 100 kHz				#Video BW 300	) kHz				s	s Sweep 1.0	pan 8.0 ) ms (10			
Page 11 of 16		ov 28, 2016 2:25:45 PM												

		F	RETLIF T	<b>ESTING L</b>	ABORATC	<b>DRIES</b>						
Test Method	Input-v-Outpu	ut Signal Compa	rison									
Customer	Westell, Inc.			Job No.	R-6142N-4							
Test Sample	Bi-Directiona	ll Amplifier										
Model Number	BDA510-S8				Serial No.	CPG62990						
Operating Mode	Signal Genera	ator LTE Output	at 866MHz, AGC	C Activated								
Test Specification	Nemko Test I	Plan 317856-2										
Technician	M. Seamans				Date	November 28 th , 2016						
Climatic Conditions	Temp: 19.3	°C Relative	e Humidity: 29.6	5 %								
Notes	Downlink 2	26dB Bandwidth	: <b>4.351MHz</b>									
Spectrum Analyzer 1 Swept SA		• +										
KEYSIGHT Input: R	F Inp	ut Z: 50 Ω	Atten: 6 dB	PNO: Best Wide	#Avg Type: Log-Pow	/er 1	2	3	4	5	6	
Coupling Align: Al		rrections: Off eq Ref: Int (S)	Preamp: Off	Gate: Off IF Gain: Low	Trig: Free Run	М	₩	₩	₩	₩	₩	
LNI -				Sig Track: Off		Р	N	N	N	N	N	
1 Spectrum Scale/Div 6 dB	•			Bofloyol 45.00	dBm			Δ	Mkr1		l MHz 42 dB	
				Ref Level -45.00	авт					<u></u>	+2 UD	
-51.0												
-57.0					~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~							
		$\langle \rangle$										
-63.0		/					-\					
-69.0							<u>\</u>					
		/										
-75.0												
-81.0							`\1	Δ2		DL1-8	32.54 dBm	
87 0 marthan	᠈ᠵᠬᡨ ^ᡀ ᠬᠧᠧᡀᠬᡅᡀ᠆ᠬᠬᢛᠬ	×2					ĺ,	jh-rhan	 	and hall	<u>ა ბეე იი ი ძე</u>	
-87.0 -87.0	יישאיי איז איז איז איז איז איז איז איז איז							<u>, , , , , , , , , , , , , , , , , , , </u>			1-0-0-04-	
-93.0												
-99.0												
				#)/(inter-p)/(/ 000								
Center 866.000 MHz #Res BW 100 kHz				#Video BW 300	KHZ			Sw	eep 1.00		000 MHz 001 pts)	
		ov 28, 2016 2:45:48 PM										

Page 12 of 16

RETLIF TESTING LABORATORIES										
Test Method	Input-v-Output Signal	Comparison								
Customer	Westell, Inc.			Job No.	R-6142N-4					
Test Sample	Bi-Directional Amplifi	er								
Model Number	BDA510-S8			Serial No.	CPG62990					
Operating Mode	Amplifying GSM Sign	al at 866MHz								
Test Specification	Nemko Test Plan 3178	56-2								
Technician	M. Seamans			Date	November 28 th , 20	16				
Climatic Conditions	Temp: 19.3 °C	Relative Humidity: 29.6	5 %							
Notes	Downlink 26dB Bar	ndwidth:330kHz								
Spectrum Analyzer 1 Swept SA	• +									
KEYSIGHT Input: R	F Input Z: 50 C		PNO: Best Wide	#Avg Type: Log-Power	1 2	3 4 5	6			
Coupline Align: A			Gate: Off IF Gain: Low	Trig: Free Run	M ₩	₩ ₩ ₩	₩			
LXI			Sig Track: Off		P N	N N N	N			
1 Spectrum Scale/Div 10 dB	▼ Ref LvI Offset 30.55 dB △Mkr1 330 Ref Level 40.00 dBm -0.29									
Log			Ref Level 40.00 d				0.20 aD			
30.0										
20.0				~~						
			ford	hy l						
10.0										
0.00			V	<u></u> 1∆2		C	L1 1.76 dBm			
-10.0			<u>^2</u>							
-10.0			-5	John John						
-20.0										
-30.0										
-40.0	᠕᠆ᢧ᠋ᠧᠬᡊᡊᢪ᠆᠆ᡔᡳᡡᡊᡊᠺᡅᠺᡇᡐᠴᠩᢛ	when a fur and the			Law Mary Mary Marow and Same	mmmmmmmmmmmmmmmmmmmmmmmmmmmmmmmmmmmmmm	ᠵᠧ᠇ᢉᡳᢧᡅᠩᡰᢛᠬᡡ			
-50.0										
Center 866.000 MHz			#Video BW 30 I				2.000 MHz			
#Res BW 10 kHz			#VIGEO BVV 301	A1/2		Span Sweep 19.1 ms				
	Nov 28, 20 12:33:35 F									

Page 13 of 16

		F	RETLIF T	<b>ESTING</b>	LABO	RATOR	IES					
Test Method	Input-v-Outp	out Signal Compa	rison									
Customer	Westell, Inc.		Job No.	R-6142	N-4							
Test Sample	Bi-Direction											
Model Number	BDA510-S8					Serial No.	CPG629	990				
Operating Mode	Signal Gener	ator GSM Outpu	t at 866MHz									
Test Specification	Nemko Test	Plan 317856-2										
Technician	M. Seamans					Date	November 28 th , 2016					
<b>Climatic Conditions</b>	Temp: 19.3	°C Relative	e Humidity: 29.6	5 %								
Notes	Downlink	26dB Bandwidth	: 330kHz									
Spectrum Analyzer 1 Swept SA		• +										
KEYSIGHT Input: R	F Ing	out Z: 50 Ω	Atten: 6 dB	PNO: Best Wide		pe: Log-Power	1	2	3	4	5	6
Coupling Align: A		orrections: Off eq Ref: Int (S)	Preamp: Off	Gate: Off IF Gain: Low	Trig: Fre	e Run	М	₩	₩	₩	₩	₩
LXI				Sig Track: Off			Р	Ν	N	Ν	Ν	N
1 Spectrum	•									ΔΜκ	r1 330	) kHz
Scale/Div 6 dB				Ref Level -50.00	0 dBm						0.1	0 dB
Log				Ĭ								
-56.0												
				han your	$\sim_{b_1}$							
-62.0				<u>ا</u> ا	ŀr.							
-68.0				/	( 							
74.0					L.							
-74.0				ſ	Ţ							
-80.0					\	<u>1</u> Δ2 ——					DI 1 83	3.40 dBm
-86.0				X ₂							DET-0.	5.40 abiii
-00.0												
-92.0			- Ind									
-98.0 http://www.lan.	ᢔᢦᠯᡰᢩ᠆ᡁᡳᡘᠺᡁᡗᡳ᠋᠁	allangan ang	Nrswigggrad / P			~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	ᠾᡢᡶ᠋ᢧᡗᡳᢧᠧᡗ	Լառությունները	MUUU	$\sim\sim\sim\sim\sim$	֍ֈֈՠֈՠՠ	᠕ᡃᠬ᠕᠕
-104												
-104												
Center 866.000 MHz				#Video BW 30	kHz						5pan 2.00	
#Res BW 10 kHz									S	weep 19.	1 ms (10	01 pts)
		lov 28, 2016 2:38:12 PM										

Page 14 of 16

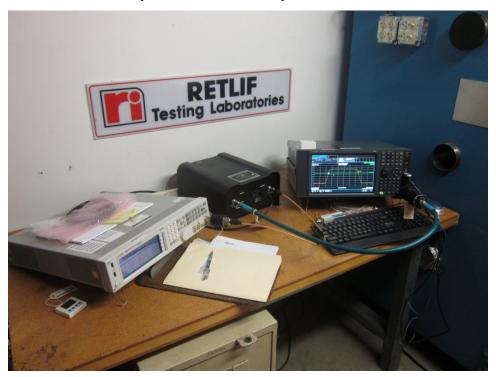
		ŀ	<b>RETLIF</b> 1	<b>FESTING</b>	LABO	RATOR	RIES					
Test Method	Input-v-Ou	tput Signal Compa	arison									
Customer	Westell, In	с.				Job No.	R-6142	N-4				
Test Sample	Bi-Directio	onal Amplifier										
Model Number	BDA510-S	8				Serial No.	CPG629	990				
<b>Operating Mode</b>	Amplifying	g GSM Signal at 8	66MHz, AGC Act	ivated								
Test Specification	Nemko Te	st Plan 317856-2					-					
Technician	M. Seamar	18				Date	Novem	per 28 th , 20	016			
Climatic Conditions	Temp: 19	.3 °C Relativ	e Humidity: 29.	6 %								
Notes	Downlink	26dB Bandwidth	h: <b>330kHz</b>									
Spectrum Analyzer 1 Swept SA		<b>•</b> +										
KEYSIGHT Input: RI	F I	nput Ζ: 50 Ω	Atten: 20 dB	PNO: Best Wide	#Avg Typ	be: Log-Power	1	2	3	4	5	6
Coupling Align: Au		Corrections: Off Freq Ref: Int (S)	Preamp: Off	Gate: Off IF Gain: Low	Trig: Free	e Run	М	₩	₩	₩	₩	₩
L)A				Sig Track: Off			Р	Ν	N	Ν	Ν	Ν
1 Spectrum Scale/Div 10 dB	•			Ref LvI Offset 3 Ref Level 40.00						ΔMkı	r1 330	) kHz 36 dB
				Rei Level 40.00	чып						0.0	
30.0					<b>D c</b>							
20.0					~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~							
					the second se							
10.0				}	ľ,	1Δ2						
0.00					Y						DL1 -	0.79 dBm
-10.0				A2								
-20.0												
-30.0			/									
	ᡔᠬᠰᢏᠽᡣ᠋᠋ᡗᢏᡀᢧᠬ	vi-man na n	Margan and a start			~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	Vorter .	ᡟᢏ᠕ᠼᠺᢦ᠋ᡔᡘᢧᢖᡕ		\~~~n./1./~~~n./1./		
-40.0 - 40.0								KY 11211		<u>∼∼∼t t t tat - ≁t f</u> t	₩₽ĸ₽₽ĸ₩₽₽₽₽	-1997-19543,114
-50.0												
Center 866.000 MHz				#Video BW 30							ipan 2.0	00 MH <del>3</del>
#Res BW 10 kHz				#VIGEO BVV SC					S	weep 19.1		
	2	Nov 28, 2016 12:31:04 PM										

Page 15 of 16

		F	RETLIF T	ESTING	LABO	RATOR	RIES					
Test Method	Input-v-Outp	out Signal Compa	rison									
Customer	Westell, Inc.	,				Job No.	R-6142	N-4				
Test Sample	Bi-Direction	al Amplifier										
Model Number	BDA510-S8					Serial No.	CPG629	990				
<b>Operating Mode</b>	Signal Gener	rator GSM Outpu	it at 866MHz, AGC	C Activated								
Test Specification	Nemko Test	Plan 317856-2										
Technician	M. Seamans					Date	Novemb	ber 28 th , 2	016			
<b>Climatic Conditions</b>	Temp: 19.3	°C Relative	e Humidity: 29.6	%								
Notes	Downlink	26dB Bandwidth	n: <b>330kHz</b>									
Spectrum Analyzer 1 Swept SA		• +										
KEYSIGHT Input: RI	F Ing	put Z: 50 Ω	Atten: 6 dB	PNO: Best Wide		e: Log-Power	1	2	3	4	5	6
Coupling Align: Au		orrections: Off eq Ref: Int (S)	Preamp: Off	Gate: Off IF Gain: Low	Trig: Free	e Run	м	₩	₩	₩	₩	₩
LXI				Sig Track: Off			Р	N	N	N	N	N
1 Spectrum	•									ΔΜκ	r <mark>1 3</mark> 2	
Scale/Div 6 dB				Ref Level -45.0	0 dBm						-0.0	)3 dB
Log				Ĭ								
-51.0												
-57.0				~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	$\sim$							
-51.0				1	۰ لر							
-63.0					<u>\</u>							
-69.0					<u> </u>							
-00.0				4	Ĺ							
-75.0					\	1Δ2						
-81.0				X ₂							DL1 -8	0.50 dBm
-87.0			r1/V	rf I		L ML						
-93.0		n	, www.									
-99.0	«ՙֈֈ ^{ֈ՟ա} լ, _Դ ով _ք Ղ _{ուվ} լ _{Րկ} ուս	ᠰᡅᡗ᠋᠋ᡀᡗᡟᠬᡙᡊ᠕᠈᠋᠕ᡁᠬᠬ	All Clarry Ma			• ~\v~v'	᠕᠊ᠬᠬ᠉᠘ᢆ	᠆ᡁᡁᡗᡃᡁᠬᡗᡀᠵ		ᡊ ^{ᡗᠠ} ᡅ᠕ᡘ᠕	<mark>୶</mark> ୗୣୄ୳୕ୄୗ୳ୖ୳୶୵ୄୄ୰ୗ	᠃ᢔ᠋᠕ᢇᠮ᠇ᡗ
Center 866.000 MHz				#Video BW 30	) kHz						Span 2.0	00 MHz
#Res BW 10 kHz									S	veep 19.		
		lov 28, 2016 2:41:31 PM										

Page 16 of 16

Test Photographs Mean Output Power and Amplifier/Booster Gain



Test Setup



**Retlif Testing Laboratories** 

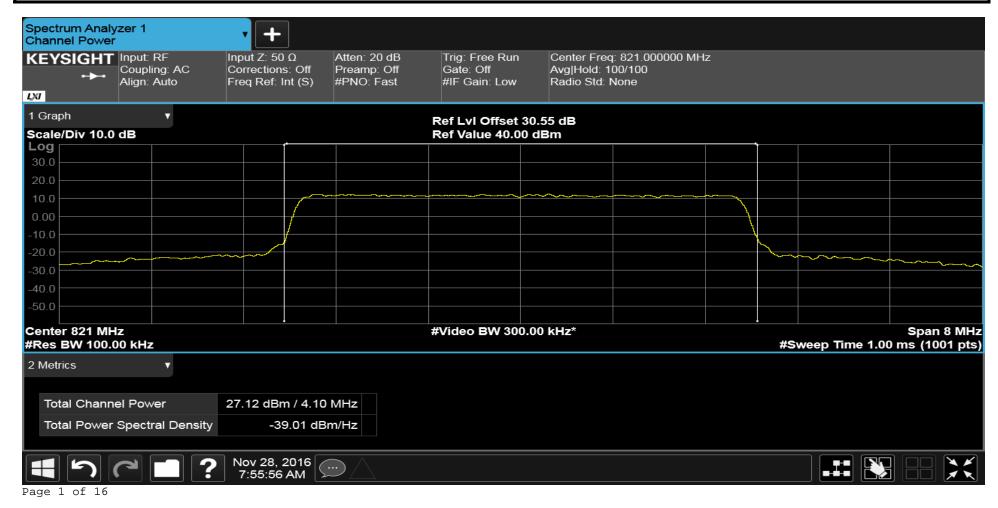
### Mean Output Power and Amplifier/Booster Gain Test Data



**Retlif Testing Laboratories** 

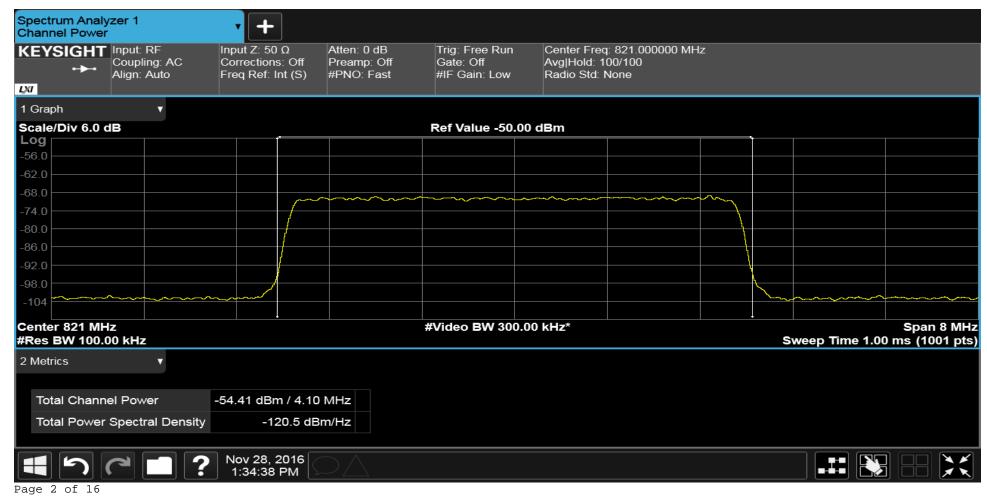
<b>RETLIF TESTING LABORATORIES</b>
------------------------------------

Test Method	Mean Output Power and Amplifier-Booster Gain						
Customer	Westell, Inc.	Job No.	R-6142N-4				
Test Sample	Bi-Directional Amplifier						
Model Number	BDA510-S8	Serial No.	CPG62990				
<b>Operating Mode</b>	Amplifying LTE signal at 821 MHz						
Test Specification	Nemko Test Plan 317856-2						
Technician	M. Seamans	Date	November 28 th , 2016				
Climatic Conditions	Temp:19.3 °CRelative Humidity:29.6 %						
Notes	Uplink Signal Generator Setting: -54.20dBm (-54.41dBm measured signal g	generator output)					
	Amplifier Output: 27.12dBm Gain: 81.53dB						

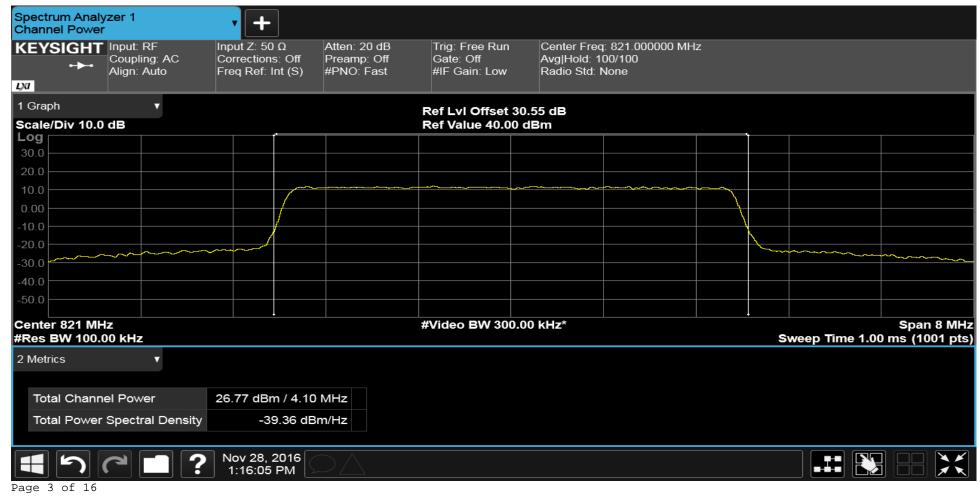


<b>RETLIF TESTING LABORATORIES</b>
------------------------------------

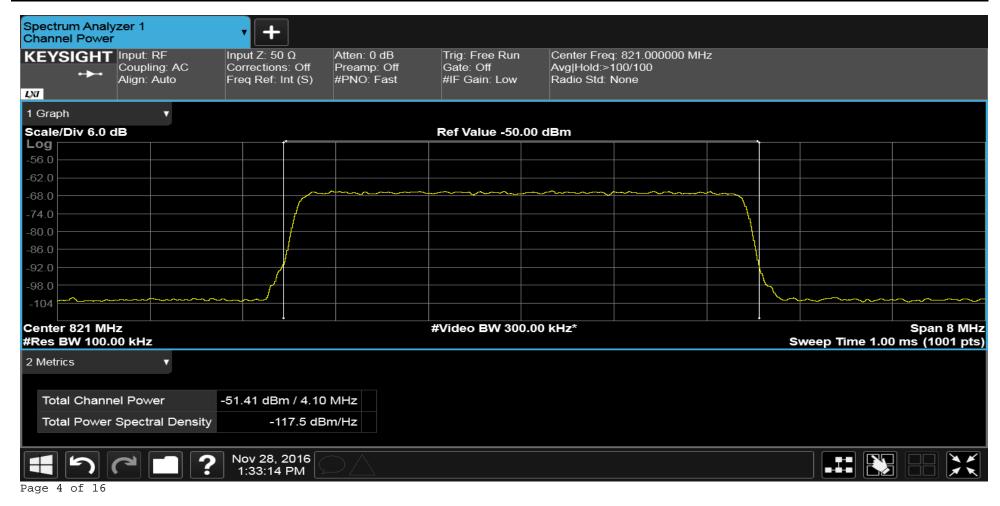
Test Method	Mean Output Power and Amplifier-Booster Gain		
Customer	Westell, Inc.	Job No.	R-6142N-4
Test Sample	Bi-Directional Amplifier		
Model Number	BDA510-S8	Serial No.	CPG62990
<b>Operating Mode</b>	Signal Generator LTE Output at 821MHz		
Test Specification	Nemko Test Plan 317856-2		
Technician	M. Seamans	Date	November 28 th , 2016
<b>Climatic Conditions</b>	Temp: 19.3 °C Relative Humidity: 29.6 %		
Notes	Signal Generator Setting: -54.20dBm (-54.41dBm measured signal generator of	output)	
	Amplifier Output: 27.12dBm Gain: 81.53dB		



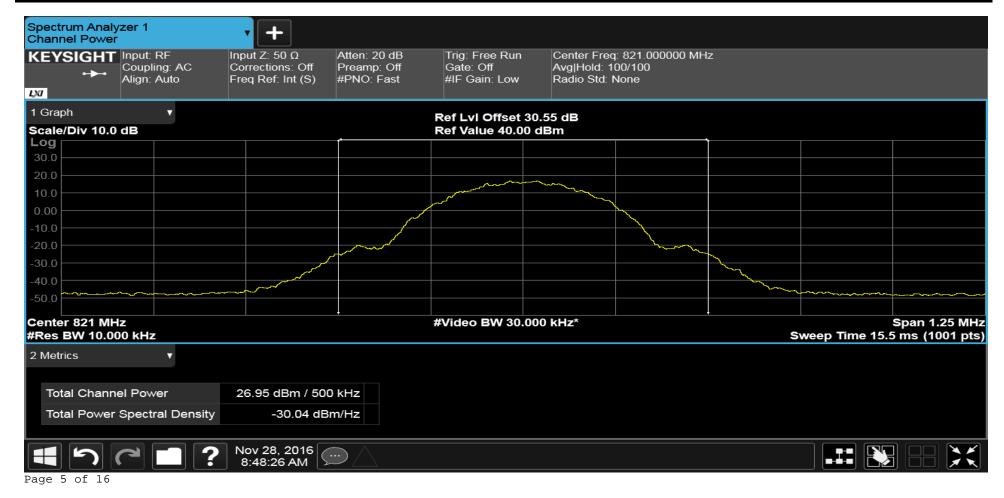
Test Method	Mean Output Power and Amplifier-Booster Gain		
Customer	Westell, Inc.	Job No.	R-6142N-4
Test Sample	Bi-Directional Amplifier		
Model Number	BDA510-S8	Serial No.	CPG62990
<b>Operating Mode</b>	Amplifying LTE signal at 821 MHz, AGC Activated		
Test Specification	Nemko Test Plan 317856-2		
Technician	M. Seamans	Date	November 28 th , 2016
Climatic Conditions	Temp: 19.3 °C Relative Humidity: 29.6 %		
Notes	Uplink with AGC Signal Generator Setting: -51.20dBm (measured signal g	enerator output)	
	Amplifier Output: <b>26.77dBm</b> Gain: <b>78.18dB</b>		



Test Method	Mean Output Power and Amplifier-Booster Gain		
Customer	Westell, Inc.	Job No.	R-6142N-4
Test Sample	Bi-Directional Amplifier		
Model Number	BDA510-S8	Serial No.	CPG62990
Operating Mode	Signal Generator LTE Output at 821MHz, AGC Activated		
Test Specification	Nemko Test Plan 317856-2		
Technician	M. Seamans	Date	November 28 th , 2016
Climatic Conditions	Temp:19.3 °CRelative Humidity:29.6 %		
Notes	Signal Generator Setting: -51.20dBm (-51.41dBm measured signal generator of	output)	
	Amplifier Output: 26.77dBm Gain: 78.18dB		



	RETLIF TESTING LABORATORIES										
Test Method	Mean Output Power and Amplifier-Booster Gain										
Customer	Westell, Inc.	Job No.	R-6142N-4								
Test Sample	Bi-Directional Amplifier										
Model Number	BDA510-S8	Serial No.	CPG62990								
<b>Operating Mode</b>	Amplifying GSM signal at 821 MHz										
Test Specification	Nemko Test Plan 317856-2										
Technician	M. Seamans	Date	November 28 th , 2016								
<b>Climatic Conditions</b>	Temp: 19.3 °C Relative Humidity: 29.6 %										
Notes	Uplink Signal Generator Setting: -54.30dBm (-54.74dBm measured signal g	generator output	)								
	Amplifier Output: 26.95dBm Gain: 81.69dB										



		R	ETLIF T	<b>ESTING</b>	LABO	RATO	RIES		
Test Method	Mean Outpu	t Power and Amp	lifier-Booster Gai	in					
Customer	Westell, Inc	•				Job No.	R-6142N-4		
Test Sample	Bi-Directional Amplifier						_		
Model Number	BDA510-S8	BDA510-S8				Serial No.	CPG62990		
<b>Operating Mode</b>	Signal Gene	rator GSM Output	t at 821MHz						
Test Specification	Nemko Test	Plan 317856-2							
Technician	M. Seamans					Date	November 28 th , 20	16	
<b>Climatic Conditions</b>	Temp: 19.3	3 °C Relative	e Humidity: 29.0	6 %					
Notes		rator Setting: -54.2 utput: <b>26.95dBm</b>	30dBm ( <b>-54.74dH</b> Gain: <b>81.69dH</b>	<b>3m</b> measured signal B	generator ou	itput)			
Spectrum Analyzer 1 Channel Power		• +							
KEYSIGHT Input: R Couplin Align: A	ig: AC C	orrections: Off	Atten: 0 dB Preamp: Off #PNO: Fast	Trig: Free Run Gate: Off #IF Gain: Low	Center Fi Avg Hold Radio Ste	req: 821.0000 l: 100/100 d: None	00 MHz		
LXI									
1 Graph	•								
Scale/Div 6.0 dB		_	·	Ref Value -55.0	0 dBm				
Log -61.0									
-67.0					~~~				
-73.0				Jon -	- Vonder				
-79.0						<u> </u>			
-85.0									
-91.0			(						
-97.0			/						
-103			$\sim$				$\sim$		
-109									
Center 821 MHz #Res BW 10.000 kHz	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~		Ļ	#Video BW 30.0	00 kHz*			-ہے۔  S  Sweep Time 15.5 r	pan 1.25 MHz ms (1001 pts)
2 Metrics	•								
Total Channel Powe	ar a	54.74 dBm / 500	kHz						
Total Power Spectra	al Density	-111.7 dBn	n/Hz						
		Nov 28, 2016 1:37:24 PM							

Page 6 of 16

		R	<b>ETLIF</b> 1	resting	LABO	RATO	RIES	
Test Method	Mean Output	t Power and Amp	lifier-Booster Ga	in				
Customer	Westell, Inc.					Job No.	R-6142N-4	
Test Sample	Bi-Direction	al Amplifier						
Model Number	BDA510-S8					Serial No.	CPG62990	
<b>Operating Mode</b>	Amplifying 0	GSM signal at 82	1 MHz, AGC Ac	tivated				
<b>Test Specification</b>	Nemko Test	Plan 317856-2						
Technician	M. Seamans					Date	November 28 th , 2016	
<b>Climatic Conditions</b>	Temp: 19.3	°C Relative	e Humidity: 29.	6 %				
Notes	Uplink with Amplifier Ou	AGC Signal Go atput: <b>26.81dBm</b>		-51.30dBm ( <b>-51.68</b> <b>B</b>	dBm measur	ed signal gene	rator output)	
Spectrum Analyzer 1 Channel Power		<b>•</b> +						
KEYSIGHT	g:AC Co	out Z: 50 Ω prrections: Off eq Ref: Int (S)	Atten: 20 dB Preamp: Off #PNO: Fast	Trig: Free Run Gate: Off #IF Gain: Low		req: 821.0000 l:>100/100 d: None	00 MHz	
LXI								
1 Graph	•			Ref LvI Offset 3	0.55 dB			
Scale/Div 10.0 dB				Ref Value 40.00				
<b>Log</b> 30.0								
20.0								
10.0					~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~			
0.00						~		
-10.0								
-20.0								
-30.0		/						
-40.0								
-50.0								~ <u>~</u>
Center 821 MHz			Ļ	#Video BW 30.0	00 ku-*			Span 1.25 MHz
#Res BW 10.000 kHz							Sw	eep Time 15.5 ms (1001 pts)
2 Metrics	•							
Total Channel Powe	r 2	6.81 dBm / 500	kHz					
Total Power Spectra	l Density	-30.18 dBn	n/Hz					
Page 7 of 16		lov 28, 2016 1:14:04 PM						

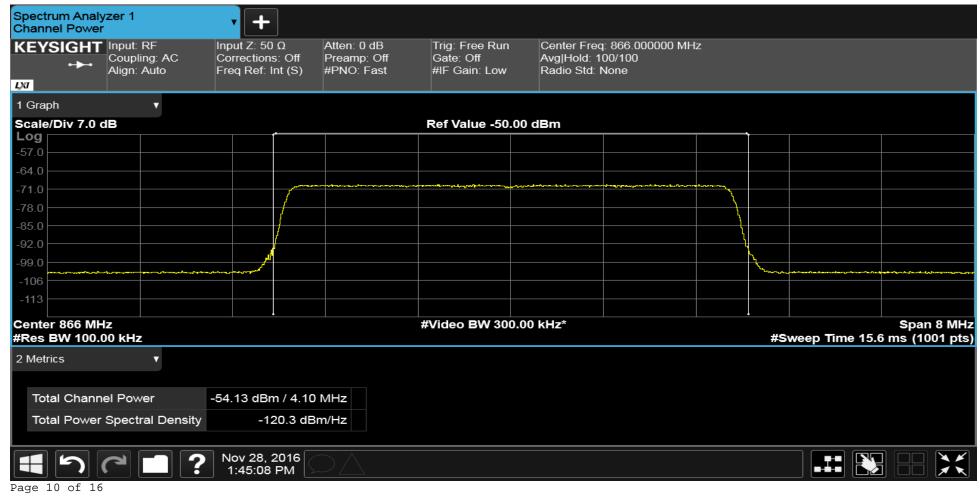
Page 47 of 98

		R	ETLIF T	ESTING I	LABOR	ATOR	RIES		
Test Method	Mean Output	Power and Amp	lifier-Booster Gair	n					
Customer	Westell, Inc.				Jo	b No.	R-6142N-4		
Test Sample	Bi-Directiona	l Amplifier			{		L		
Model Number	BDA510-S8				Se	rial No.	CPG62990		
<b>Operating Mode</b>	Signal Genera	al Generator GSM Output at 821MHz, AGC Activated							
Test Specification	Nemko Test F	Plan 317856-2							
Technician	M. Seamans				Da	Date November 28 th , 2016			
<b>Climatic Conditions</b>	Temp: 19.3	°C Relative	Humidity: 29.6	i %					
Notes		ator Setting: -51.3 tput: <b>26.81dBm</b>	30dBm ( <b>-51.68dB</b> Gain: <b>78.49dB</b>	<b>m</b> measured signal	generator outpu	ut)			
Spectrum Analyzer 1 Channel Power	,	• +							
KEYSIGHT Input: R Coupling Align: A	g: AC Co	out Z: 50 Ω rrections: Off eq Ref: Int (S)	Atten: 0 dB Preamp: Off #PNO: Fast	Trig: Free Run Gate: Off #IF Gain: Low	Center Free Avg Hold: 1 Radio Std:		00 MHz		
	_								
1 Graph Scale/Div 7.0 dB	•			Ref Value -50.0	0 dBm				
Log			ſ	Nel Value -50:0	o abiii		<b>i</b>		
-57.0					~				
-64.0									
-71.0			,						
-85.0									
-92.0			/			<u> </u>			
-99.0							~		
-106									
-113	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	~~~~~~							
Center 821 MHz #Res BW 10.000 kHz			+	#Video BW 30.0	00 kHz*		+	Sweep Time 15.	Span 1.25 MHz 5 ms (1001 pts)
2 Metrics	•								
Total Channel Power	r -5	1.68 dBm / 500	kHz						
Total Power Spectra	I Density	-108.7 dBn	n/Hz						
Page 8 of 16		ov 28, 2016 :38:58 PM							

		Ι	<b>RETLIF</b> '	TESTING	LABO	RATO	RIES			
Test Method	Mean Output	Power and Am	plifier-Booster Ga	ain			·			
Customer	Westell, Inc.					Job No.	R-6142N-4			
Test Sample	Bi-Directiona	l Amplifier					-			
Model Number	BDA510-S8					Serial No.	CPG62990			
<b>Operating Mode</b>	Amplifying L	TE signal at 86	6 MHz							
Test Specification	Nemko Test F	Plan 317856-2								
Technician	M. Seamans					Date	November 2	28 th , 2016		
Climatic Conditions	Temp: 19.3	°C Relativ	ve Humidity: 29	.6 %						
Notes		Signal Generato tput: <b>27.54dBm</b>		lBm ( <b>-54.13dBm</b> r <b>B</b>	neasured signa	al generator ou	tput)			
Spectrum Analyzer 1 Channel Power	•	+								
Align: A	Input: RFInput Z: 50 ΩAtten: 20 dBTrig: Free RunCenter Freq: 866.000000 MHzCoupling: ACCorrections: OffPreamp: OffGate: OffAvg Hold: 100/100Align: AutoFreq Ref: Int (S)#PNO: Fast#IF Gain: LowRadio Std: None									
1,70										
1 Graph	•			Ref LvI Offset						
Scale/Div 10.0 dB		f*		Ref Value 40.0	0 dBm	1				
30.0										
20.0										
10.0							~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~			
0.00		/								
-10.0							\			
-20.0	~~~~	~								
-30.0									* ~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	
-40.0										
-50.0										
Center 866 MHz #Res BW 100.00 kHz		ł		#Video BW 300	).00 kHz*			#Sweep	Time 1.00	Span 8 MHz ms (1001 pts)
2 Metrics	•									
Total Channel Powe	er 27.9	54 dBm / 4.10	MHz							
Total Power Spectra	al Density	-38.59 dBr	m/Hz							
Page 9 of 16		ov 28, 2016 :45:44 AM								

<b>RETLIF TESTING LABORATORIES</b>
------------------------------------

Test Method	Mean Output Power and Amplifier-Booster Gain						
Customer	Westell, Inc.	Job No.	R-6142N-4				
Test Sample	Bi-Directional Amplifier						
Model Number	BDA510-S8	Serial No.	CPG62990				
Operating Mode	Signal Generator LTE Output at 866MHz						
Test Specification	Nemko Test Plan 317856-2						
Technician	M. Seamans	Date	November 28 th , 2016				
Climatic Conditions	Temp: 19.3 °C Relative Humidity: 29.6 %						
Notes	Signal Generator Setting: -54.00dBm (-54.13dBm measured signal generator of	output)					
	Amplifier Output: 27.54dBm Gain: 81.67dB						



		R	ETLIF 1	resting	LABO	RATO	RIES			
Test Method	Mean Output Pe	ower and Amp	lifier-Booster Ga	in						
Customer	Westell, Inc.					Job No.	R-6142N-4			
Test Sample	Bi-Directional	Amplifier					-			
Model Number	BDA510-S8					Serial No.	CPG62990			
<b>Operating Mode</b>	Amplifying LT	E signal at 866	MHz, AGC Acti	vated						
Test Specification	Nemko Test Pla	nko Test Plan 317856-2								
Technician	M. Seamans					Date	November 2	8 th , 2016	)	
<b>Climatic Conditions</b>	Temp: 19.3 °C	C Relative	Humidity: 29.	6 %						
Notes	Downlink with Amplifier Outp		Generator Settin Gain: <b>78.10d</b>	g: -51.00dBm ( <b>-51</b> <b>3</b>	.13dBm mea	sured signal g	enerator output)			
Spectrum Analyzer 1 Channel Power	•	+								
KEYSIGHT Couplin Align: A	g: AC Corre									
1 Graph	•			Ref LvI Offset						
Scale/Div 10.0 dB				Ref Value 40.00						
Log								<b>Ì</b>		
30.0										
20.0										
10.0										
0.00		/								
-10.0		~								
-30.0		~								
-40.0										
-50.0										
Center 866 MHz #Res BW 100.00 kHz				#Video BW 300	.00 kHz*			Sv	weep Time 1.0	Span 8 MHz 00 ms (1001 pts)
2 Metrics	•									
Total Channel Powe	er 26.97	7 dBm / 4.10 M	MHz							
Total Power Spectra	al Density	-39.16 dBm	ı/Hz							
Page 11 of 16		28, 2016 6:30 PM								

			I	<b>RETLIF</b> 2	<b>FESTING</b>	LABC	<b>RATO</b>	RIES			
Test Method	Mean Output	Power	and Am _l	olifier-Booster Ga	in						
Customer	Westell, Inc.						Job No.	R-6142N-4			
Test Sample	Bi-Directiona	ıl Ampl	ifier					-			
Model Number	BDA510-S8						Serial No.	CPG62990			
<b>Operating Mode</b>	Signal Genera	ator LT	E Output	t at 866MHz, AG	C Activated		-	-			
Test Specification	Nemko Test I	Plan 31'	7856-2								
Technician	M. Seamans						Date	November 28 th , 2016			
<b>Climatic Conditions</b>	Temp: 19.3	°C	Relativ	e Humidity: 29	.6 %		_				
Notes	Signal Genera	ator Set	ting: -51	.00dBm ( <b>-51.13d</b>	<b>Bm</b> measured signa	l generator o	output)				
	Amplifier Ou					U	1 /				
Spectrum Analyzer 1 Channel Power	,	+									
KEYSIGHT Input: R	F Inp	ut Z: 50		Atten: 0 dB	Trig: Free Run		Freq: 866.0000	00 MHz			
← Coupling Align: A		rrection: eq Ref: I		Preamp: Off #PNO: Fast	Gate: Off #IF Gain: Low		ld: 100/100 Std: None				
1,37											
1 Graph	•										
Scale/Div 7.0 dB					Ref Value -50.0	00 dBm					
Log			í								
-57.0											
-64.0				<u></u>	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~		~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	man and a second			
-71.0			/					<u> </u>			
-85.0			/								
-92.0			[					}			
-99.0		/							<u>u</u>		
-106		- Andrew C							hanne	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	
-113											
									ļ		
Center 866 MHz #Res BW 100.00 kHz					#Video BW 300	.00 kHz*			#S	weep Time 1	Span 8 MHz 5.6 ms (1001 pts)
2 Metrics	•										
	Total Channel Power -51.13 dBm / 4.10 MHz										
Total Power Spectra	I Density	-1	17.3 dBi	m/Hz							
		ov 28, : :46:46									
Page 12 of 16											

		R	<b>RETLIF</b>	<b>FESTING</b> I	LABO	RATO	RIES		
Test Method	Mean Outpu	t Power and Amp	lifier-Booster Ga	ain					
Customer	Westell, Inc.					Job No.	R-6142N-4		
Test Sample	Bi-Direction	al Amplifier					-		
Model Number	BDA510-S8					Serial No.	CPG62990		
<b>Operating Mode</b>	Amplifying	nplifying GSM signal at 866 MHz							
Test Specification	Nemko Test	Plan 317856-2							
Technician	M. Seamans					Date	November 28 th , 2	016	
<b>Climatic Conditions</b>	Temp: 19.3	°C Relative	e Humidity: 29	.6 %					
Notes	Downlink       Signal Generator Setting: -53.70dBm (-53.95dBm measured signal generator output)         Amplifier Output:       27.31dBm       Gain:       81.26dB								
Spectrum Analyzer 1 Channel Power		<b>•</b> +							
KEYSIGHT Input: R Coupling Align: A	g:AC Co	put Ζ: 50 Ω prrections: Off eq Ref: Int (S)	Atten: 20 dB Preamp: Off #PNO: Fast	Trig: Free Run Gate: Off #IF Gain: Low		req: 866.0000 : 100/100 d: None	000 MHz		
LXI									
1 Graph	•			Ref LvI Offset 30	) 55 dB				
Scale/Div 10.0 dB				Ref Value 40.00					
Log			1						
30.0									
20.0					~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~				
0.00					~	$\sim$			
-10.0						- North - Internet			
-20.0							~~		
-30.0							- ~~ 		
-40.0									
-50.0		- And a start and a start a st						~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
			Ļ						
Center 866 MHz #Res BW 10.000 kHz				#Video BW 30.00	JU KHZ*			Sweep Time 1	Span 1.25 MHz 5.5 ms (1001 pts)
2 Metrics	•								
Total Channel Powe	er 🗾 🤉	27.31 dBm / 500	kHz						
Total Power Spectra		-29.68 dBn							
		-29.66 UBI							
Page 13 of 16	■?	Nov 28, 2016 9:01:04 AM							

		R	ETLIF T	ESTING I	LABOI	RATO	RIES		
Test Method	Mean Output	t Power and Ampl	ifier-Booster Gai	n					
Customer	Westell, Inc.				J	lob No.	R-6142N-4		
Test Sample	Bi-Direction	al Amplifier					_		
Model Number	BDA510-S8				5	Serial No.	CPG62990		
<b>Operating Mode</b>	Signal Gener	ator GSM Output	at 866MHz						
Test Specification	Nemko Test	Plan 317856-2							
Technician	M. Seamans				I	Date	November 28 th , 2016		
<b>Climatic Conditions</b>	Temp: 19.3	°C Relative	Humidity: 29.6	5 %					
Notes	Signal Gener		70dBm ( <b>-53.95dB</b> Gain <b>: 81.26dB</b>	<b>m</b> measured signal	generator out	eput)			
Spectrum Analyzer 1 Channel Power		<b>•</b> +							
KEYSIGHT Input: R Couplin	g:AC Co	orrections: Off	Atten: 0 dB Preamp: Off	Trig: Free Run Gate: Off	Avg Hold		000 MHz		
Align: A	uto Fr	eq Ref: Int (S)	#PNO: Fast	#IF Gain: Low	Radio Sto	1: None			
1 Graph	•								
Scale/Div 7.0 dB				Ref Value -50.0	0 dBm				
Log			ĺ						
-57.0									
-64.0				~~~~~	mark the				
-71.0				ممم		~~			
-78.0			ſ						
-85.0									
-92.0									
-106							$\sim \sim$		
-113	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	m							
Center 866 MHz #Res BW 10.000 kHz			ļ	#Video BW 30.0	00 kHz*		Ļ	Sweep Time 15	Span 1.25 MHz .5 ms (1001 pts)
2 Metrics	•								
Total Channel Powe	er –5	53.95 dBm / 500	kHz						
Total Power Spectra	al Density	-110.9 dBn	n/Hz						
		lov 28, 2016 1:40:52 PM							

Page 14 of 16

		F	<b>RETLIF</b> 7	<b>FESTING</b>	LABOR	ATO	RIES	
Test Method	Mean Outp	out Power and Amp	lifier-Booster Ga	in				
Customer	Westell, In	с.			Jo	b No.	R-6142N-4	
Test Sample	Bi-Directio	onal Amplifier						
Model Number	BDA510-S	18			Se	rial No.	CPG62990	
<b>Operating Mode</b>	Amplifying	g GSM signal at 86	6 MHz, AGC Ac	tivated				
Test Specification	Nemko Te	st Plan 317856-2						
Technician	M. Seamar	18			Da	ite	November 28 th , 2016	
<b>Climatic Conditions</b>	Temp: 19	.3 °C Relative	e Humidity: 29.	.6 %	<u> </u>			
Notes	Downlink Amplifier	with AGC Signa Output: <b>27.29dBm</b>		ng: -50.70dBm ( <b>-51.0</b> <b>B</b>	1dBm measure	ed signal ge	enerator output)	
Spectrum Analyzer 1 Channel Power		<b>•</b> +						
KEYSIGHT Input: R Couplin Align: A	ng: AC	Input Ζ: 50 Ω Corrections: Off Freq Ref: Int (S)	Atten: 20 dB Preamp: Off #PNO: Fast	Trig: Free Run Gate: Off #IF Gain: Low	Center Frec Avg Hold: 1 Radio Std: I	00/100	000 MHz	
LXI								
1 Graph	•			Ref LvI Offset 3	0.55 dB			
Scale/Div 10.0 dB				Ref Value 40.00	dBm			
Log 30.0								
20.0								
10.0					~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~			
0.00								
-10.0								
-20.0							~	
-30.0								
-40.0								
-50.0								
			ļ				ļ	
Center 866 MHz #Res BW 10.000 kHz				#Video BW 30.0	00 kHz*		Sw	Span 1.25 MHz eep Time 15.5 ms (1001 pts)
2 Metrics	•							
Total Channel Powe	ər	27.29 dBm / 500	) kHz					
Total Power Spectra	al Density	-29.70 dBr	n/Hz					
Page 15 of 16	<b>?</b>	Nov 28, 2016 1:09:46 PM						

		R	<b>ETLIF</b> T	ESTING	LABO	RATO	RIES		
Test Method	Mean Outpu	It Power and Amp	lifier-Booster Gaiı	n			·		
Customer	Westell, Inc					Job No.	R-6142N-4		
Test Sample	Bi-Direction	nal Amplifier							
Model Number	BDA510-S8	3				Serial No.	CPG62990		
<b>Operating Mode</b>	Signal Gene	nal Generator GSM Output at 866MHz, AGC Activated							
Test Specification	Nemko Test	nko Test Plan 317856-2							
Technician	M. Seamans	5				Date	November 28 th , 20	016	
<b>Climatic Conditions</b>	Temp: 19.3	3 °C Relative	Humidity: 29.6	%					
Notes		erator Setting: -50. ² Putput: <b>27.29dBm</b>	70dBm ( <b>-51.01dB</b> Gain <b>: 78.30dB</b>	<b>m</b> measured signal	generator of	utput)			
Spectrum Analyzer 1 Channel Power		• +							
KEYSIGHT Coupling Align: Align: Ali	g:AC C	orrections: Off	Atten: 0 dB Preamp: Off #PNO: Fast	Trig: Free Run Gate: Off #IF Gain: Low	Avg Hold	Freq: 866.0000 d: 100/100 td: None	000 MHz		
1 Graph	▼								
Scale/Div 7.0 dB	•			Ref Value -50.0	0 dBm				
Log			ſ	Rei value -50.0	U UBIII				
-57.0									
-64.0					~~~~				
-71.0						~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~			
-78.0									
-85.0						$\rightarrow$			
-92.0									
-99.0			$\sim$			_	$\sim$		
-106									
-113	~								
Center 866 MHz #Res BW 10.000 kHz			ł	#Video BW 30.0	00 kHz*		+#	Span 1.25 MHz Sweep Time 15.6 ms (1001 pts	
2 Metrics	•								
Total Channel Power	r -	51.01 dBm / 500	kHz						
Total Power Spectra	I Density	-108.0 dBn	n/Hz						
Page 16 of 16	<b>?</b>	Nov 28, 2016 1:42:15 PM							

### Test Photographs Noise Figure Measurements



**Test Configuration** 



**Retlif Testing Laboratories** 

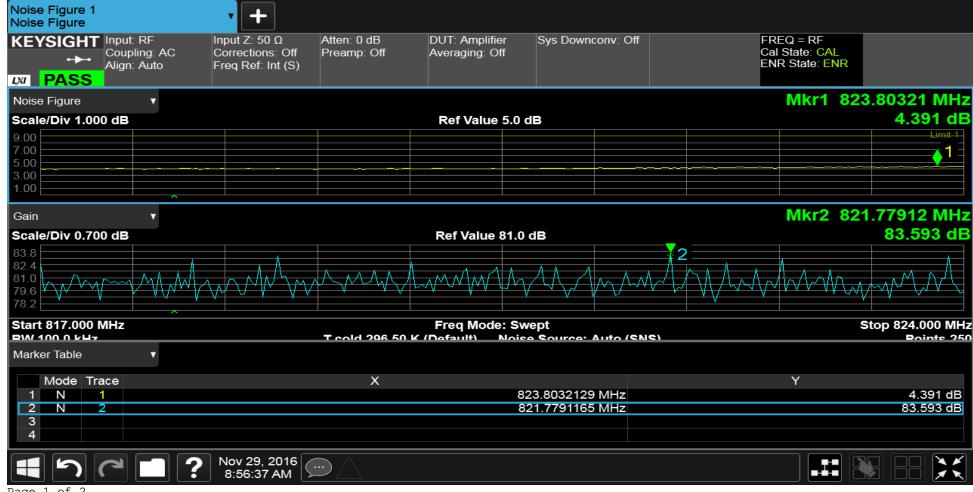
Noise Figure Measurements Test Data



**Retlif Testing Laboratories** 

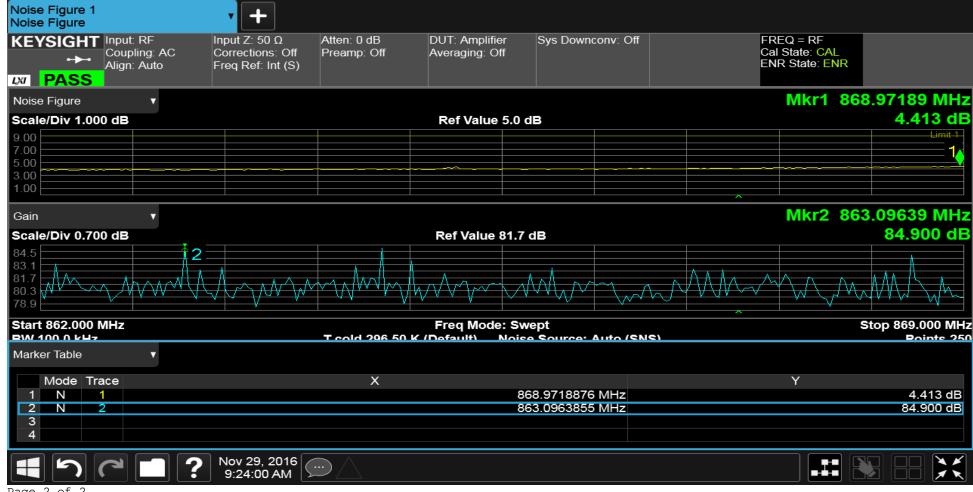
### DETLIE TESTING I ADODATODIES

	<b>KEILIF IESIING LADU</b>		
Test Method	Noise Figure		
Customer	Westell, Inc.	Job No.	R-6142N-4
Test Sample	Bi-Directional Amplifier		
Model Number	BDA510-S8	Serial No.	CPG62990
<b>Operating Mode</b>	Amplifying signals		
<b>Test Specification</b>	Nemko Test Plan 317856-2		
Technician	M. Seamans	Date	November 29 th , 2016
<b>Climatic Conditions</b>	Temp:19.7 °CRelative Humidity:28.5 %		
Notes	Uplink Noise Figure: 4.391dB Gain: 83.593dB		



### DETI IE TESTINC I ADODATODIES

	<u> </u>								
Test Method	Noise Figure								
Customer	Westell, Inc.	Job No.	R-6142N-4						
Test Sample	Bi-Directional Amplifier								
Model Number	BDA510-S8	Serial No.	CPG62990						
<b>Operating Mode</b>	Amplifying signals								
Test Specification	Nemko Test Plan 317856-2								
Technician	M. Seamans	Date	November 29 th , 2016						
<b>Climatic Conditions</b>	Temp:19.7 °CRelative Humidity:28.5 %								
Notes	Downlink Noise Figure: 4.413dB Gain: 84.90dB								





Out of Band/Out of Block, Test Setup



Spurious Emissions Conducted, Test Setup



**Retlif Testing Laboratories** 



Spurious Emissions, Radiated, Test Setup



Spurious Emissions, Biconical, 30 MHz to 200 MHz, Horizontal Polarization



**Retlif Testing Laboratories** 



Spurious Emissions, Biconical, 30 MHz to 200 MHz, Vertical Polarization



Spurious Emissions, Log Periodic, 200 MHz to 1 GHz, Horizontal Polarization



**Retlif Testing Laboratories** 



Spurious Emissions, Log Periodic, 200 MHz to 1 GHz, Vertical Polarization



Spurious Emissions, Double Ridge Guide, 1-10 GHz, Horizontal Polarization



**Retlif Testing Laboratories** 



Spurious Emissions, Double Ridge Guide, 1-10 GHz, Vertical Polarization



**Retlif Testing Laboratories** 

### Measuring Out-of-Band/Out-of-Block (including intermodulation) Emissions and Spurious Emissions Test Data



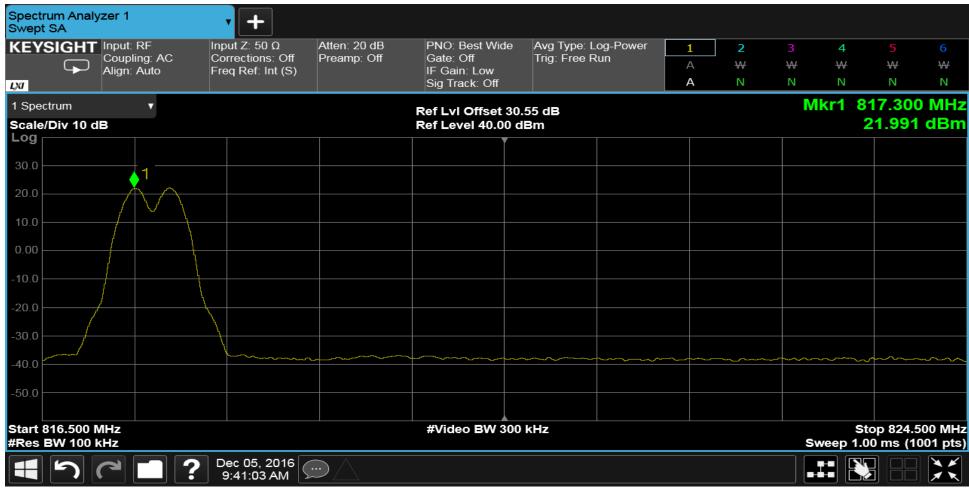
**Retlif Testing Laboratories** 

Measuring Out-of-Band/Out-of-Block Test Data



**Retlif Testing Laboratories** 

		NAION					
Test Method	Out-of-Band/Out-of-Block						
Customer	Westell, Inc.	Job No.	R-6142N-4				
Test Sample	Bi-Directional Amplifier						
Model Number	BDA510-S8	Serial No.	CPG62990				
<b>Operating Mode</b>	Amplifying Multi-tone signals						
Test Specification	Nemko Test Plan 317856-2						
Technician	M. Seamans	Date	December 5 th , 2016				
Climatic Conditions	Temp: 19.3 °C Relative Humidity: 29.6 %						
Notes	Uplink: GSM 817.3MHz and 817.6MHz						



Page 1 of 16

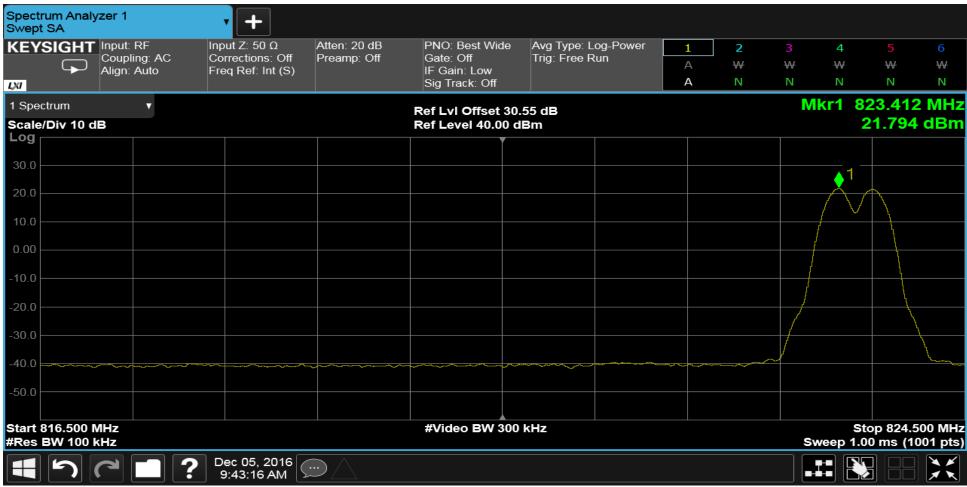
Test Method	Out-of-Band/Out-of-Block				
Customer	Westell, Inc.	Job No.	R-6142N-4		
Test Sample	Bi-Directional Amplifier				
Model Number	BDA510-S8	Serial No.	CPG62990		
<b>Operating Mode</b>	Amplifying Multi-tone signals, AGC Activated				
Test Specification	Nemko Test Plan 317856-2				
Technician	M. Seamans	Date	December 5 th , 2016		
<b>Climatic Conditions</b>	Temp:19.3 °CRelative Humidity:29.6 %				
Notes	Uplink: GSM 817.3MHz and 817.6MHz				



Test Method	Out-of-Band/Out-of-Block				
Customer	Westell, Inc.	Job No.	R-6142N-4		
Test Sample	Bi-Directional Amplifier				
Model Number	BDA510-S8	Serial No.	CPG62990		
<b>Operating Mode</b>	Amplifying Multi-tone signals				
Test Specification	Nemko Test Plan 317856-2				
Technician	M. Seamans	Date	December 5 th , 2016		
Climatic Conditions	Temp: 19.3 °C Relative Humidity: 29.6 %				
Notes	Uplink: GSM 823.4MHz and 823.7MHz				

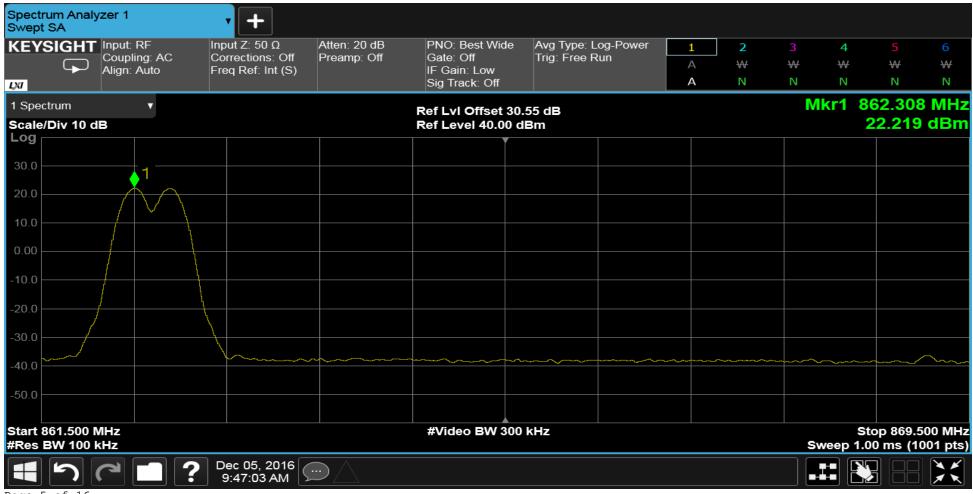
Spectrum Analy Swept SA	yzer 1	• +						
KEYSIGHT	Input: RF Coupling: AC	Input Z: 50 Ω Corrections: Off	Atten: 20 dB Preamp: Off	PNO: Best Wide Gate: Off	Avg Type: Log-Power Trig: Free Run	1 2	3 4	5 6
$\frown$	Align: Auto	Freq Ref: Int (S)		IF Gain: Low Sig Track: Off	ing. Free Kan	A ₩ A N	₩ ₩ N N	₩ ₩ N N
	_			SIG HACK. OII				
1 Spectrum Scale/Div 10 d	T			Ref LvI Offset 30 Ref Level 40.00			IVIKI	823.404 MHz 20.622 dBm
Log				Rei Level 40.00	авт			20.022 ubm
30.0								
30.0							1	
20.0								7
10.0								
0.00								
0.00								
-10.0								
-20.0								
-30.0								
-30.0								
-40.0	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~							
-50.0								
Start 816.500 I #Res BW 100				#Video BW 30	) kHz		Sweep 1	Stop 824.500 MHz I.00 ms (1001 pts)
15	C [ ?	Dec 05, 2016 9:43:51 AM						

Test Method	Out-of-Band/Out-of-Block				
Customer	Westell, Inc.	Job No.	R-6142N-4		
Test Sample	Bi-Directional Amplifier				
Model Number	BDA510-S8	Serial No.	CPG62990		
<b>Operating Mode</b>	Amplifying Multi-tone signals, AGC Activated				
Test Specification	Nemko Test Plan 317856-2				
Technician	M. Seamans	Date	December 5 th , 2016		
<b>Climatic Conditions</b>	Temp:19.3 °CRelative Humidity:29.6 %				
Notes	Uplink: GSM 823.4MHz and 823.7MHz				



Page 4 of 16

Test Method	Out-of-Band/Out-of-Block				
Customer	Westell, Inc.	Job No.	R-6142N-4		
Test Sample	Bi-Directional Amplifier				
Model Number	BDA510-S8	Serial No.	CPG62990		
<b>Operating Mode</b>	Amplifying Multi-tone signals				
Test Specification	Nemko Test Plan 317856-2				
Technician	M. Seamans	Date	December 5 th , 2016		
Climatic Conditions	Temp: 19.3 °C Relative Humidity: 29.6 %				
Notes	Downlink: GSM 862.3MHz and 862.6MHz				



Page 5 of 16

Test Method	Out-of-Band/Out-of-Block		
Customer	Westell, Inc.	Job No.	R-6142N-4
Test Sample	Bi-Directional Amplifier		
Model Number	BDA510-S8	Serial No.	CPG62990
Operating Mode	Amplifying Multi-tone signals, AGC Activated		
Test Specification	Nemko Test Plan 317856-2		
Technician	M. Seamans	Date	December 5 th , 2016
<b>Climatic Conditions</b>	Temp:19.3 °CRelative Humidity:29.6 %		
Notes	Downlink: GSM 862.3MHz and 862.6MHz		



Page 6 of 16

		MAION	
Test Method	Out-of-Band/Out-of-Block		
Customer	Westell, Inc.	Job No.	R-6142N-4
Test Sample	Bi-Directional Amplifier		
Model Number	BDA510-S8	Serial No.	CPG62990
<b>Operating Mode</b>	Amplifying Multi-tone signals		
Test Specification	Nemko Test Plan 317856-2		
Technician	M. Seamans	Date	December 5 th , 2016
<b>Climatic Conditions</b>	Temp:19.3 °CRelative Humidity:29.6 %		
Notes	Downlink: GSM 862.3MHz and 862.6MHz		

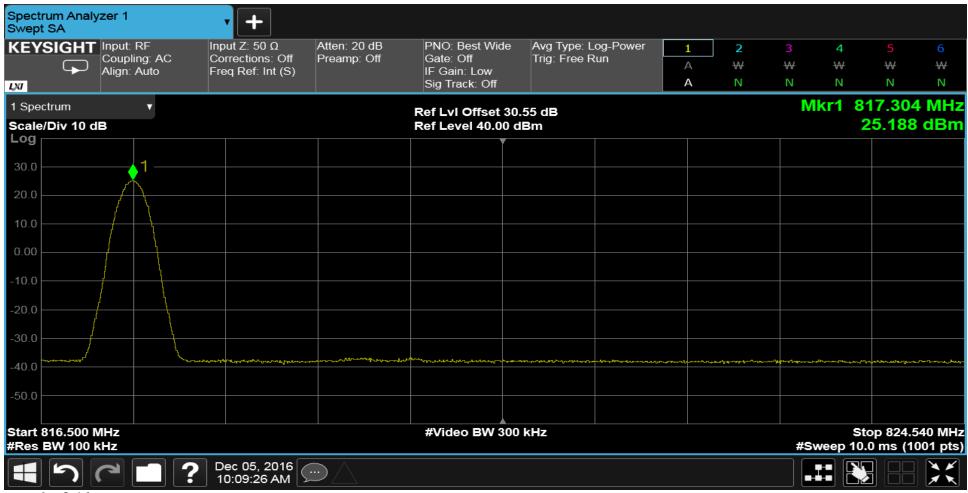
Spectrum Anal Swept SA	yzer 1	• +									
KEYSIGHT	Input: RF Coupling: AC	Input Z: 50 Ω Corrections: Off	Atten: 20 dB Preamp: Off	PNO: Best Wide Gate: Off	Avg Type: Log-Power Trig: Free Run	1	2	3	4	5	6
$\frown$	Align: Auto	Freq Ref: Int (S)	Freamp. On	IF Gain: Low		А	₩	₩	₩	₩	₩
LXI				Sig Track: Off		A	N	N	N	N	N
1 Spectrum	•			Ref LvI Offset 30	.55 dB			N	lkr1 8	68.40	4 MHz
Scale/Div 10 c	IB			Ref Level 40.00 d					2	21.32	7 dBm
Log				Ţ							
30.0											
									• • 1		
20.0											
10.0									$\downarrow$		
0.00									/		
0.00											
-10.0											
20.0											
-20.0										ļ	l
-30.0											1
-40.0						~~~~~	~~~~	~/			\
-40.0											
-50.0											
Start 861.500 #Res BW 100				#Video BW 300	kHz			s			.500 MHz 1001 pts)
	? 🗖 ۲	Dec 05, 2016 9:48:57 AM									
Page 7 of 16											

Test Method	Out-of-Band/Out-of-Block		
Customer	Westell, Inc.	Job No.	R-6142N-4
Test Sample	Bi-Directional Amplifier		
Model Number	BDA510-S8	Serial No.	CPG62990
Operating Mode	Amplifying Multi-tone signals, AGC Activated		
Test Specification	Nemko Test Plan 317856-2		
Technician	M. Seamans	Date	December 5 th , 2016
<b>Climatic Conditions</b>	Temp:19.3 °CRelative Humidity:29.6 %		
Notes	Downlink: GSM 862.3MHz and 862.6MHz		

Spectrum Analy Swept SA	yzer 1	• +									
KEYSIGHT	Input: RF Coupling: AC	Input Z: 50 Ω Corrections: Off	Atten: 20 dB Preamp: Off	PNO: Best Wide Gate: Off	Avg Type: Log-Powe Trig: Free Run	er <u>1</u>	2	3	4	5	6
	Align: Auto	Freq Ref: Int (S)		IF Gain: Low	ing. Free Run	A	₩	₩	₩	₩	₩
LXI				Sig Track: Off		A	N	N	N	N	N
1 Spectrum	•			Ref LvI Offset 3				M			4 MHz
Scale/Div 10 d	B			Ref Level 40.00	dBm				2	21.393	dBm
LUg				T T							
30.0									<b>▲</b> 1		
20.0										<u> </u>	
									$/ \vee$		
10.0									1	+	
0.00								{		_	
10.0											
-10.0											
-20.0											
-30.0											
-30.0								/			4
-40.0				~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	• ~	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	~			~~~~
-50.0											
00.0											
Start 861.500   #Res BW 100				#Video BW 30	0 kHz			Sv	Sto Storever Storever	_ op 869.: 0 ms (1	500 MHz 001 pts)
		Dec 05, 2016 9:48:21 AM									

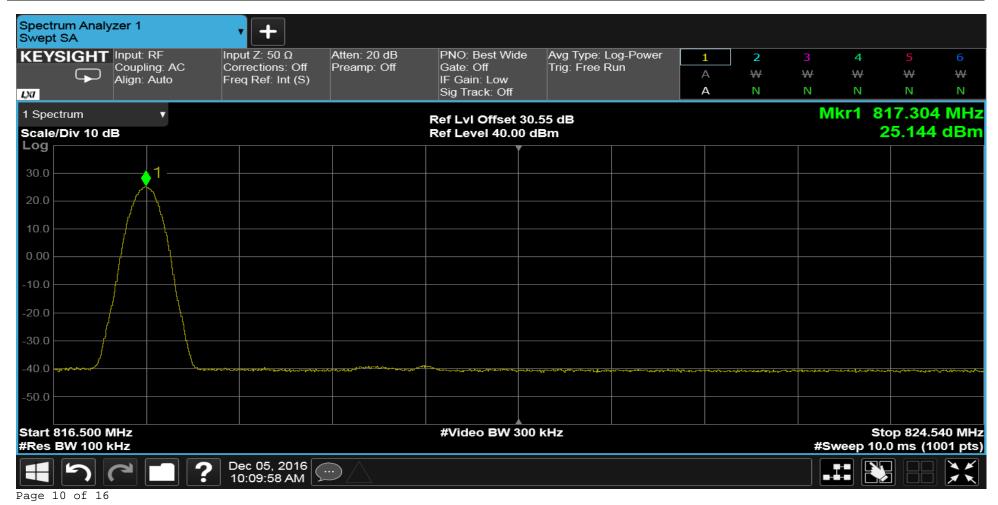
Page 8 of 16

		MAION	
Test Method	Out-of-Band/Out-of-Block		
Customer	Westell, Inc.	Job No.	R-6142N-4
Test Sample	Bi-Directional Amplifier		
Model Number	BDA510-S8	Serial No.	CPG62990
<b>Operating Mode</b>	Amplifying GSM signal		
Test Specification	Nemko Test Plan 317856-2		
Technician	M. Seamans	Date	December 5 th , 2016
Climatic Conditions	Temp: 19.3 °C Relative Humidity: 29.6 %		
Notes	Uplink: GSM 817.3MHz		



Page 9 of 16

Test Method	Out-of-Band/Out-of-Block		
Customer	Westell, Inc.	Job No.	R-6142N-4
Test Sample	Bi-Directional Amplifier		
Model Number	BDA510-S8	Serial No.	CPG62990
<b>Operating Mode</b>	Amplifying GSM signal, AGC Activated		
Test Specification	Nemko Test Plan 317856-2		
Technician	M. Seamans	Date	December 5 th , 2016
<b>Climatic Conditions</b>	Temp:19.3 °CRelative Humidity:29.6 %		
Notes	Uplink: GSM 817.3MHz		



		F	<b>ETLIF T</b>	ESTING	LABO	RATO	RIES					
Test Method	Out-of-Band/O	out-of-Block					-					
Customer	Westell, Inc.					Job No.	R-61421	N-4				
Test Sample	Bi-Directional	Amplifier										
Model Number	BDA510-S8					Serial No.	CPG629	990				
Operating Mode	Amplifying GS											
Test Specification	Nemko Test Pl	an 317856-2										
Technician	M. Seamans					Date	Decemb	er 5 th , 201	6			
Climatic Conditions	Temp: 19.3 °C	C Relative	e Humidity: 29.6	5 %								
Notes	Uplink: GSM 8	823.7MHz										
Spectrum Analyzer 1 Swept SA	•	+										
KEYSIGHT Input: RI	F Input	t Z: 50 Ω ections: Off	Atten: 20 dB Preamp: Off	PNO: Best Wide Gate: Off	<ul> <li>Avg Type</li> <li>Trig: Fre</li> </ul>	e: Log-Power	1	2	3	4	5	6
Align: Ali		Ref: Int (S)	Freamp. On	IF Gain: Low	IIIg. FIE	e Run	А	₩	₩	₩	₩	₩
LXI				Sig Track: Off			A	N	N	N	N	N
1 Spectrum	•			Ref LvI Offset 3	30.55 dB				Mk		23.390	
Scale/Div 10 dB				Ref Level 40.00	dBm					2	4.876	dBm
Log				Ĭ								
30.0										<u> </u>		
20.0										Δ		
10.0												
0.00												
-10.0												
-20.0												
-30.0												
-40.0	w.FF	ᠬᠰᢛᡊᡎᠬ᠆ᢦᠳ᠕ᠬ᠇ᡮᢩ᠕ᡥᠬᡃᠲᡄ᠇ᠬ	๛๛๛๛๛๛๛๛๛๛๛๛๛๛๛๛๛๛๛๛๛๛๛๛๛๛๛๛๛๛๛๛๛๛๛๛๛๛๛	<b>৻ℯ</b> ℊ℩ <i>ℷ</i> ℯℊ℩୶ <del>ⅆ</del> ℴ _ℯ ℴ	ℯ⅄ℴⅆℴ⅀℠℆ℸℊℸℸ℁ℴℊℯℰⅉ℩ℷՠ	han and the second second	᠆᠂ᡔᠼᠰᢧ᠆᠆᠂ᠳᡱᢛᡅ᠕ᠰ᠆	مهرمة المرجع	~~~		Lynes al - al -	৵ <b>₋</b> ∩⊕₽₽ _₽ √ ¹ ∩∼∽
-50.0												
Start 816.500 MHz #Res BW 100 kHz				#Video BW 30	00 kHz				#Sw		op 824.54 ) ms (10	
	<b>2 2</b> Dec 10:	c 05, 2016 :08:58 AM	$\supset \triangle$									

Page 11 of 16

		F	<b>RETLIF</b> 1	<b>TESTING</b>	LABO	RATO	RIES					
Test Method	Out-of-Band	/Out-of-Block										
Customer	Westell, Inc.					Job No.	R-61421	N-4				
Test Sample	Bi-Direction	al Amplifier					-					
Model Number	BDA510-S8					Serial No.	CPG629	990				
Operating Mode	Amplifying (	GSM signal, AG	C Activated									
Test Specification	Nemko Test	Plan 317856-2										
Technician	M. Seamans					Date	Decemb	er 5 th , 201	16			
Climatic Conditions	Temp: 19.3	°C Relative	e Humidity: 29.	6 %								
Notes	Uplink: GSM	nk: GSM 823.7MHz										
Spectrum Analyzer 1 Swept SA		• +										
KEYSIGHT Input: R	F Ing a: AC Co	out Z: 50 Ω prrections: Off	Atten: 20 dB Preamp: Off	PNO: Best Wide Gate: Off	<ul> <li>Avg Type</li> <li>Trig: Fre</li> </ul>	e: Log-Power e Run	1	2	3	4	5	6
Align: A		eq Ref: Int (S)		IF Gain: Low			A	₩ N	₩ N	₩ N	₩ N	₩
1)(1				Sig Track: Off			A	IN				N
1 Spectrum	•			Ref LvI Offset 3					M		23.414	
Scale/Div 10 dB				Ref Level 40.00	dBm					2	24.671	aBm
=09				Ĭ								
30.0										— <u> </u>		
20.0										$\bigwedge$		
										$\langle \rangle$		
10.0												
0.00												
-10.0												
-20.0												
20.0											A r	
-30.0											1,	
-40.0		┍╺ [┲] ┙╼┍ <mark>┲╶╴╸</mark> ┲ [╋] ╻╍┯			للمحميسولىمىلاتەتىرىمىرمايىرالە		and the second second		······		-	The second second second
50.0												
-50.0												
Start 816.500 MHz				#Video BW 30						C+	op 824.5	40 MHz
#Res BW 100 kHz				"video BW St					#S		0 ms (10	
		0ec 05, 2016 0:08:28 AM										X

Page 12 of 16

		]	<b>RETLIF</b>	<b>FESTING I</b>	LABOR	ATOF	RIES					
Test Method	Out-of-Band	/Out-of-Block										
Customer	Westell, Inc.				Јо	b No.	R-6142N	<b>N</b> -4				
Test Sample	Bi-Direction	al Amplifier										
Model Number	BDA510-S8				Se	rial No.	CPG629	90				
<b>Operating Mode</b>	Amplifying (	GSM signal										
Test Specification	Nemko Test	Plan 317856-2										
Technician	M. Seamans				Da	nte	Decemb	er 5 th , 201	16			
<b>Climatic Conditions</b>	Temp: 19.3	Yemp:   19.3 °C   Relative Humidity:   29.6 %										
Notes	Downlink: G	ownlink: GSM 862.3MHz										
Spectrum Analyzer 1 Swept SA		• +										
KEYSIGHT Input: R	F Ing	put Z: 50 Ω	Atten: 20 dB	PNO: Best Wide	Avg Type: L		1	2	3	4	5	6
Coupling Align: A	<b>.</b>	orrections: Off eq Ref: Int (S)	Preamp: Off	Gate: Off IF Gain: Low	Trig: Free R	un	А	₩	₩	₩	₩	₩
LXI				Sig Track: Off			Α	Ν	N	N	Ν	N
1 Spectrum	•			Ref LvI Offset 30					N	lkr1	862.39	
Scale/Div 10 dB				Ref Level 40.00 c	dBm						25.321	l dBm
LUY				Ť								
30.0	1											
20.0	La contra											
	1 1											
10.0	<u>\</u>											
0.00	<u> </u>											
0.00												
-10.0	<u>\</u>											
-20.0	<u>\</u>											
-20.0												
-30.0	<u>\</u>											
-40.0	Low	and the second		มา-กะเการกาะสองเหราะรางการการการการการการการการการการการการการก		୷ <b>୷୶୶୶୷୶୷</b> ୲ୗ୳୵୷୶ୢୄଌ୵୶ଌ	A-6-5-7-10-0-0-0-0-0-0-0-0-0-0-0-0-0-0-0-0-0-	┍╾╾┲ <u>╹</u> ┟╌┯ <u>┲⁷╋╱╍╌┱╄</u> ╻┡	وي والارتيان والديني والدين	₽┺┍┰┲┨┠┱╼═┸┸┫┠	๛๛๛๛๛๛๛๛๛๛๛๛๛๛๛๛๛๛๛๛๛๛๛๛๛๛๛๛๛๛๛๛๛๛๛๛๛๛๛	, and the second
-40.0												
-50.0												
Start 861.500 MHz #Res BW 100 kHz				#Video BW 300	) kHz				#S		Stop 869. 10.0 ms (1	
150	<b>?</b>	Dec 05, 2016										
	1	0:05:19 AM										

Page 13 of 16

		F	<b>RETLIF</b> 7	<b>FESTING</b>	LABC	RATO	RIES		_			
Test Method	Out-of-Band	/Out-of-Block										
Customer	Westell, Inc.					Job No.	R-6142N	N-4				
Test Sample	Bi-Direction	al Amplifier				4						
Model Number	BDA510-S8					Serial No.	CPG629	90				
<b>Operating Mode</b>	Amplifying 0	GSM signal, AG	C Activated			·						
Test Specification	Nemko Test	Nemko Test Plan 317856-2										
Technician	M. Seamans					Date	Decemb	er 5 th , 201	6			
Climatic Conditions	Temp: 19.3	emp: 19.3 °C Relative Humidity: 29.6 %										
Notes	Downlink: G	SM 862.3MHz										
Spectrum Analyzer 1 Swept SA		• <b>+</b>										
KEYSIGHT Input: RI		out Z: 50 Ω	Atten: 20 dB	PNO: Best Wide		be: Log-Power	1	2	3	4	5	6
Coupling Align: Au		orrections: Off eq Ref: Int (S)	Preamp: Off	Gate: Off IF Gain: Low	Trig: Fr	ee Run	А	₩	₩	₩	₩	₩
LNI				Sig Track: Off			A	N	N	Ν	Ν	Ν
1 Spectrum	•			Ref LvI Offset 3					Μ	lkr1	862.388	
Scale/Div 10 dB				Ref Level 40.00	dBm						26.307	dBm
LOG				l i								
30.0	1											
20.0	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~											
20.0	X											
10.0	<u>\</u>											
0.00	<u> </u>											
	l											
-10.0	<u>\</u>											
-20.0	1											
-30.0												
-40.0	Luna	Manufactor and	and the second	مود الحقور	ورواني ويورون والمحادر	و. هر الار - و و وال			~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~			An margan
-50.0												
											<b>.</b>	
Start 861.500 MHz #Res BW 100 kHz				#Video BW 30	U KHZ				#S		Stop 869.5 10.0 ms (10	
		0:04:47 AM										

Page 14 of 16

<b></b> RETLIF TESTING LABORATORIES <b></b>												
Test Method	Out-of-Band	l/Out-of-Block					-					
Customer	Westell, Inc.	•				Job No.	R-61421	N-4				
Test Sample	Bi-Direction	al Amplifier				•	-					
Model Number	BDA510-S8					Serial No.	CPG629	90				
Operating Mode	Amplifying	GSM signal										
Test Specification	Nemko Test	Plan 317856-2										
Technician	M. Seamans					Date	Decemb	er 5 th , 201	6			
Climatic Conditions	Temp: 19.3	⁸ °C Relativ	e Humidity: 29.	.6 %								
Notes	Downlink: C	Downlink: GSM 868.7MHz										
Spectrum Analyzer 1 Swept SA		▼ <b>+</b>										
KEYSIGHT Input: R	F In	put Z: 50 Ω	Atten: 20 dB	PNO: Best Wide	0 /1	e: Log-Power	1	2	3	4	5	6
Coupling Align: A		orrections: Off eq Ref: Int (S)	Preamp: Off	Gate: Off IF Gain: Low	Trig: Fre	ee Run	A	₩	₩	₩	₩	₩
L)(I				Sig Track: Off			A	N	N	N	N	N
1 Spectrum	•			Ref LvI Offset 3	30.55 dB				M		68.404	
Scale/Div 10 dB				Ref Level 40.00	dBm						24.499	dBm
Log				Ĭ								
30.0										1 -		
20.0										Å.		
20.0										$\langle \rangle$		
10.0										{\		
0.00												
-10.0										1	<u> </u>	
											l l	
-20.0												
-30.0									+		\ \	
-40.0	┍ <u>╷┈╶┈╝┉</u> ┎╍╍┇┱╘╌╧┑ _╊ ┲┵╌┙	and the second	╺╈┍╼╫╟╍┲╼╲┍╇┲╌╌┍┺┲╌╢┍╍╍╌╸		᠂ᡣ᠋ᠴᡧ᠆ᠰᢔᠵᠬᡛᢞᢦᠴᡊᢦ᠆ᢣ	and the second sec		-lat <u>e + - Boonstan</u> oo	Love			and the second
-50.0												
Start 861.500 MHz #Res BW 100 kHz				#Video BW 30	00 kHz				#Sw		top 869.: .0 ms (1	500 MHz 001 pts)
	<b>?</b>	Dec 05, 2016 10:03:21 AM										

Page 15 of 16

		R	<b>RETLIF T</b>	ESTING	LABO	RATOR	RIES					
Test Method	Out-of-Band/	Out-of-Block										
Customer	Westell, Inc.					Job No.	R-61421	N-4				
Test Sample	Bi-Directional Amplifier											
Model Number	BDA510-S8					Serial No.	CPG629	990				
<b>Operating Mode</b>	Amplifying C	SSM signal, AGC	C Activated									
Test Specification	Nemko Test I	Plan 317856-2										
Technician	M. Seamans					Date	Decemb	er 5 th , 2016	5			
Climatic Conditions	Temp: 19.3	°C Relative	e Humidity: 29.6	5 %								
Notes	Downlink: GS	SM 868.7MHz										
Spectrum Analyzer 1 Swept SA		+										
KEYSIGHT Input: RI	F Inp	ut Z: 50 Ω rrections: Off	Atten: 20 dB Preamp: Off	PNO: Best Wide Gate: Off	Avg Type Trig: Fre	e: Log-Power	1	2	3	4	5	6
Align: Au	-	q Ref: Int (S)	reamp. On	IF Gain: Low	ing. i ie	ertun	A	₩	₩	₩	₩	₩
LNI				Sig Track: Off			A	N	N	N	N	N
1 Spectrum	•			Ref LvI Offset 3	0.55 dB				Mk		8.396	
Scale/Div 10 dB				Ref Level 40.00	dBm					2	5.542	dBm
Log				Ĭ								
30.0										<b>⊸</b> 1 —		
20.0												
10.0									/			
0.00												
-10.0												
-20.0												
-30.0											<u> </u>	
-40.0	s olipelos <del>sectos territi</del> a	a aa jii Cab-1850 da 1800 da - da - B	<del>ന് പാന് പ്രം പാഞ്ഞം, കുറിക്രം, കുറ</del> ുക്	مدرور محمومين محموم مرمو	مرب من الحصور العن معر من معرف العرف ا	re-	المطاحب سامي	blocki aktive			L	The second
-50.0												
Start 861.500 MHz #Res BW 100 kHz				#Video BW 30	10 kHz				#Swe		p 869.50 ms (10	
		ec 05, 2016 D:04:01 AM										

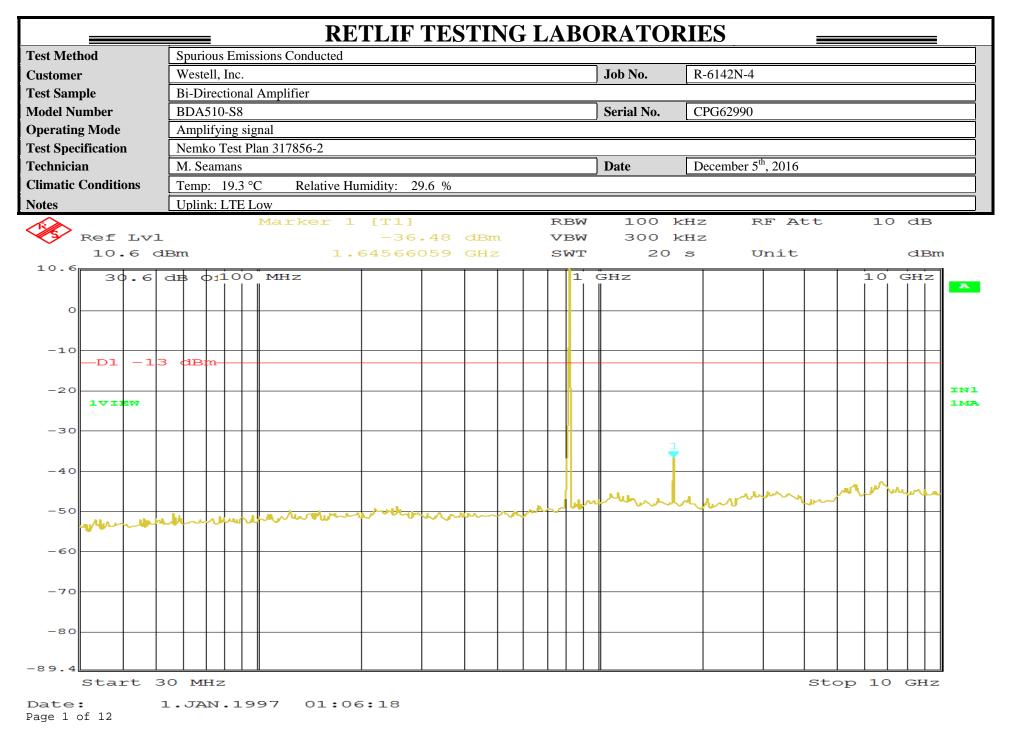
Page 16 of 16

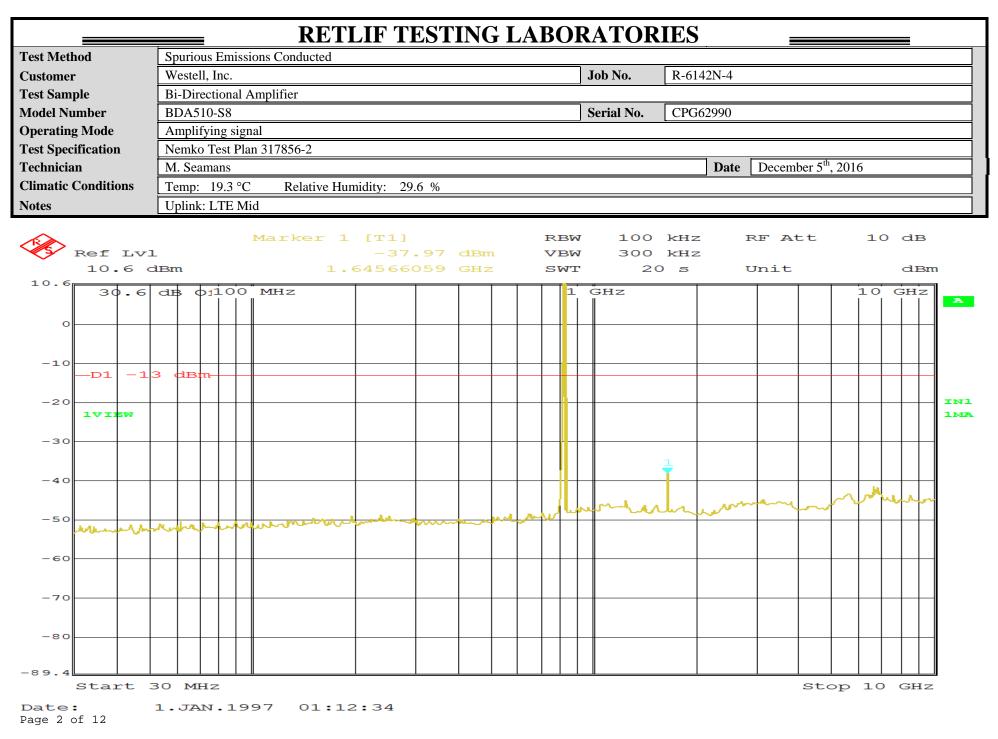
Spurious Emissions Conducted Test Data

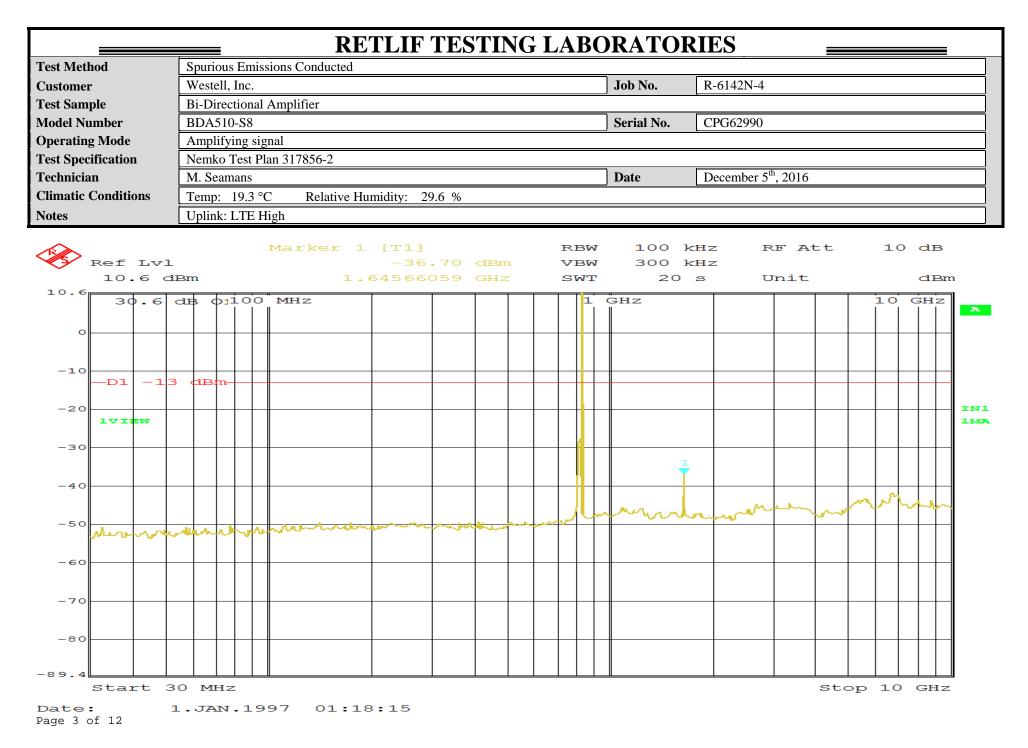


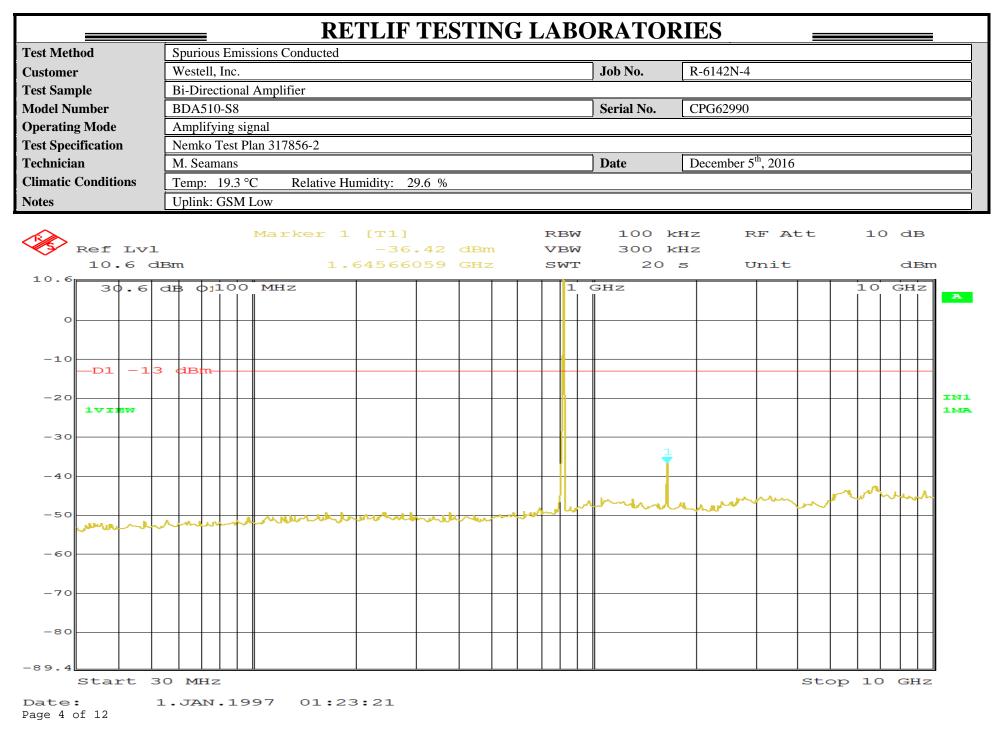
**Retlif Testing Laboratories** 

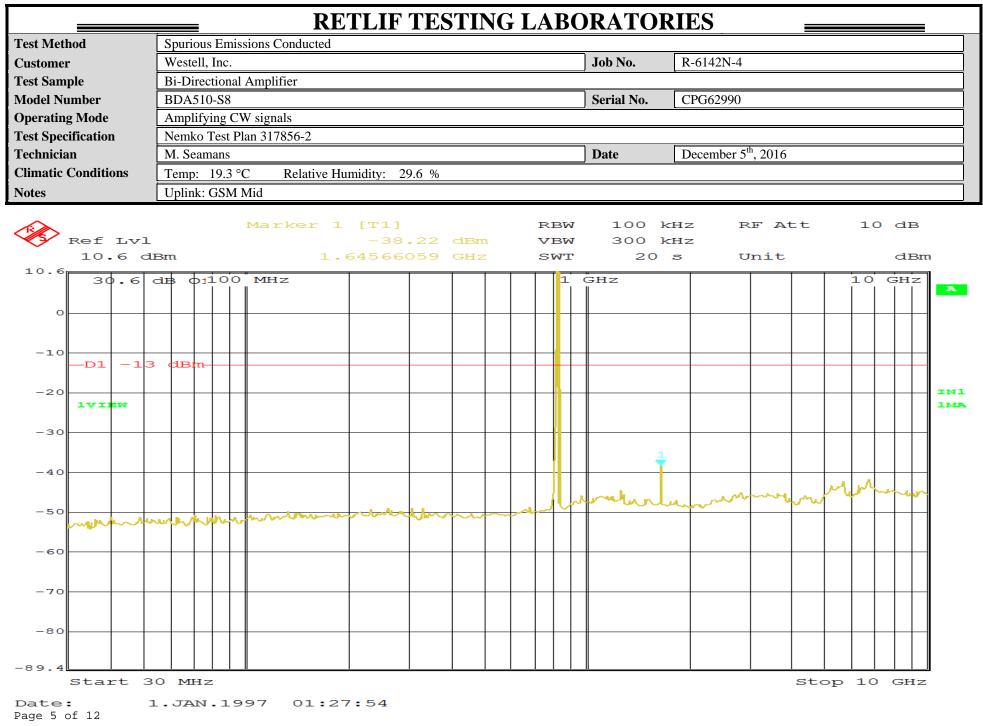
Report No. R-6142N-4

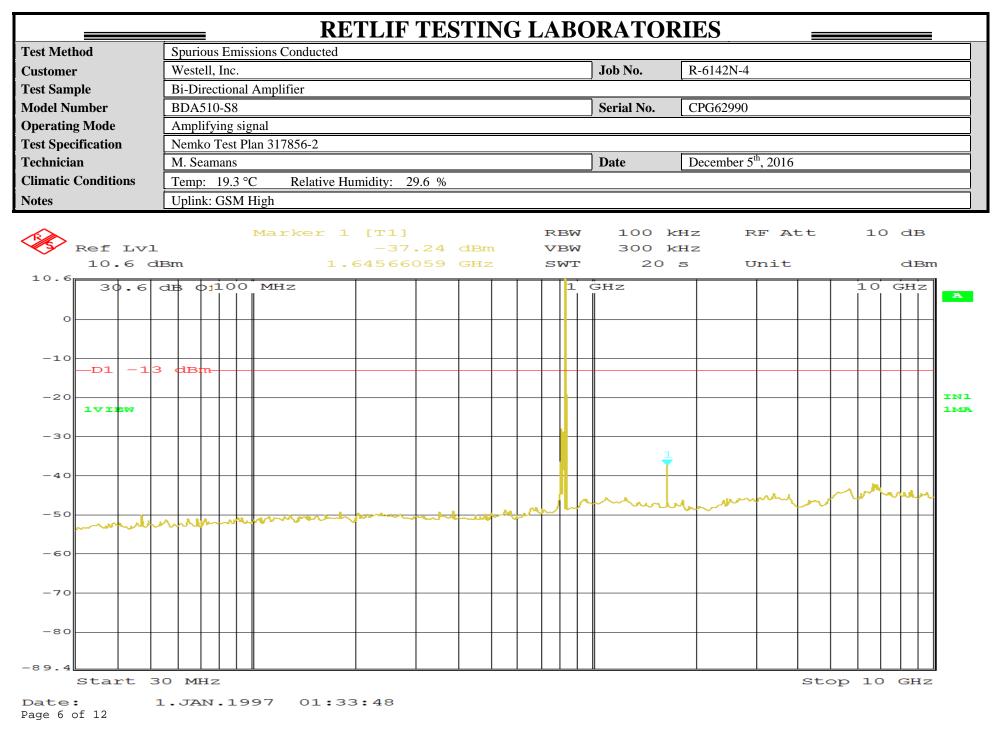


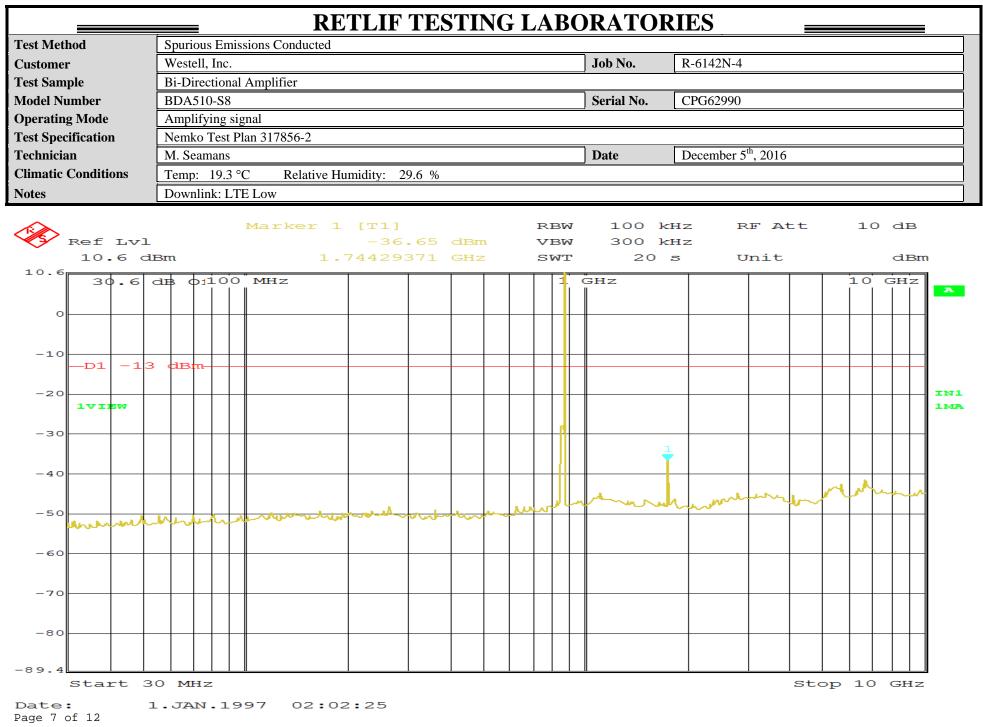


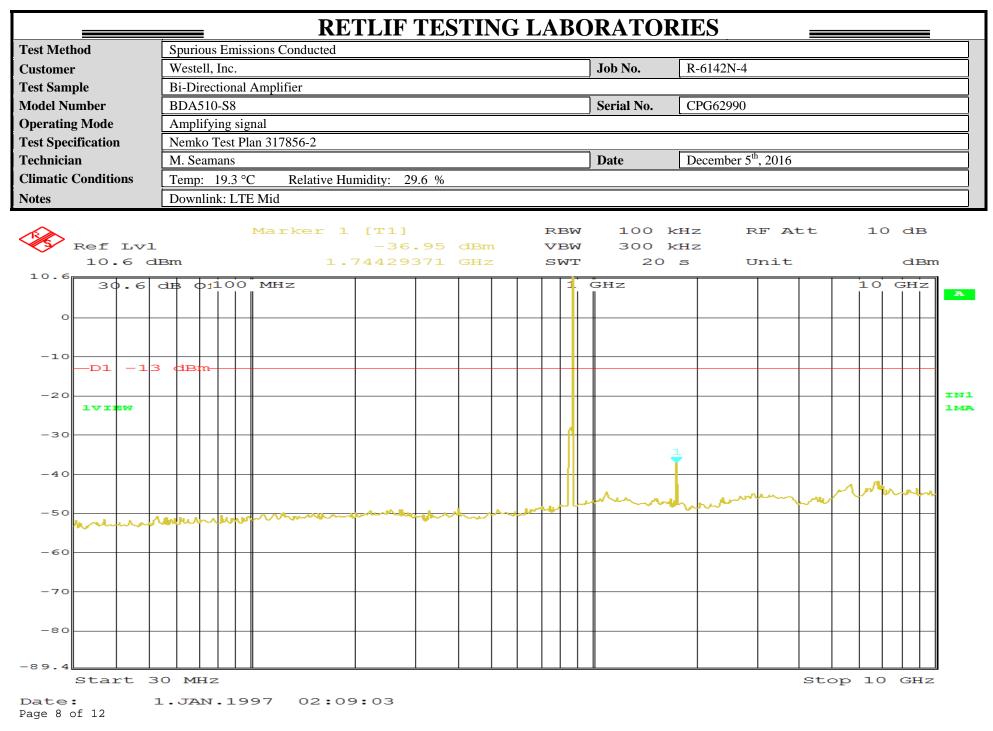


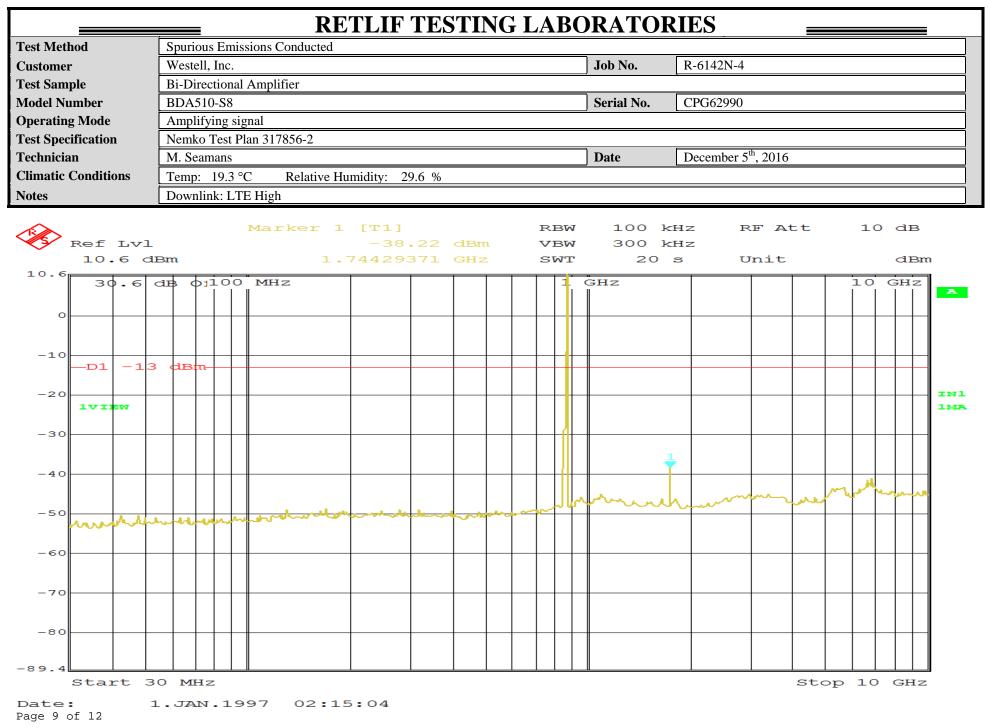


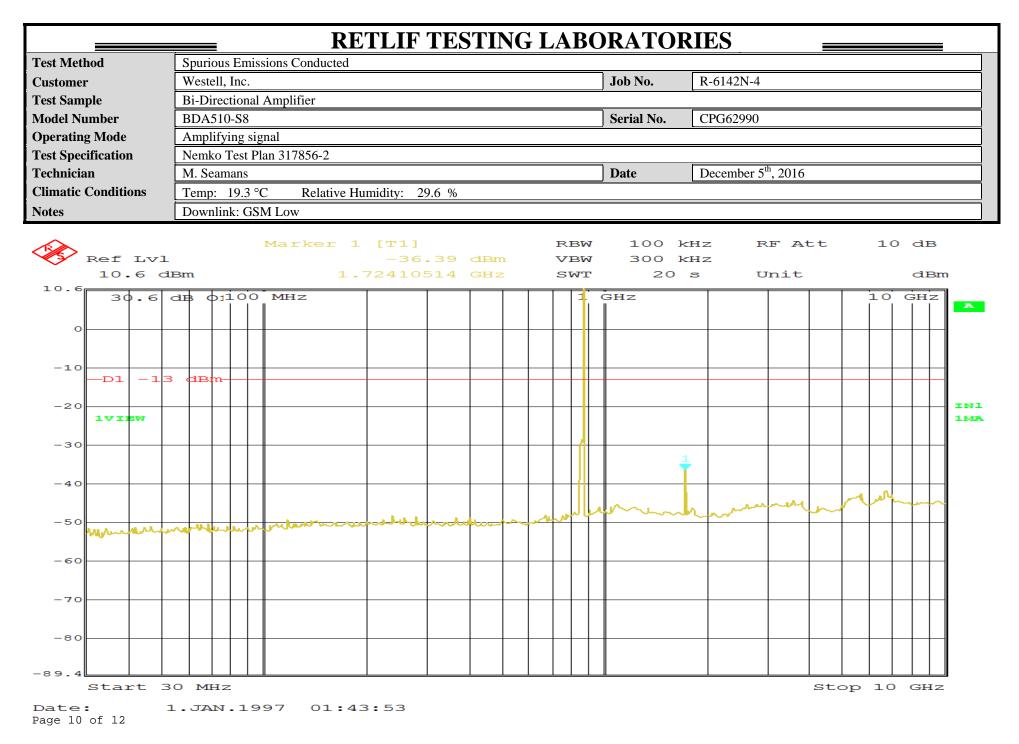


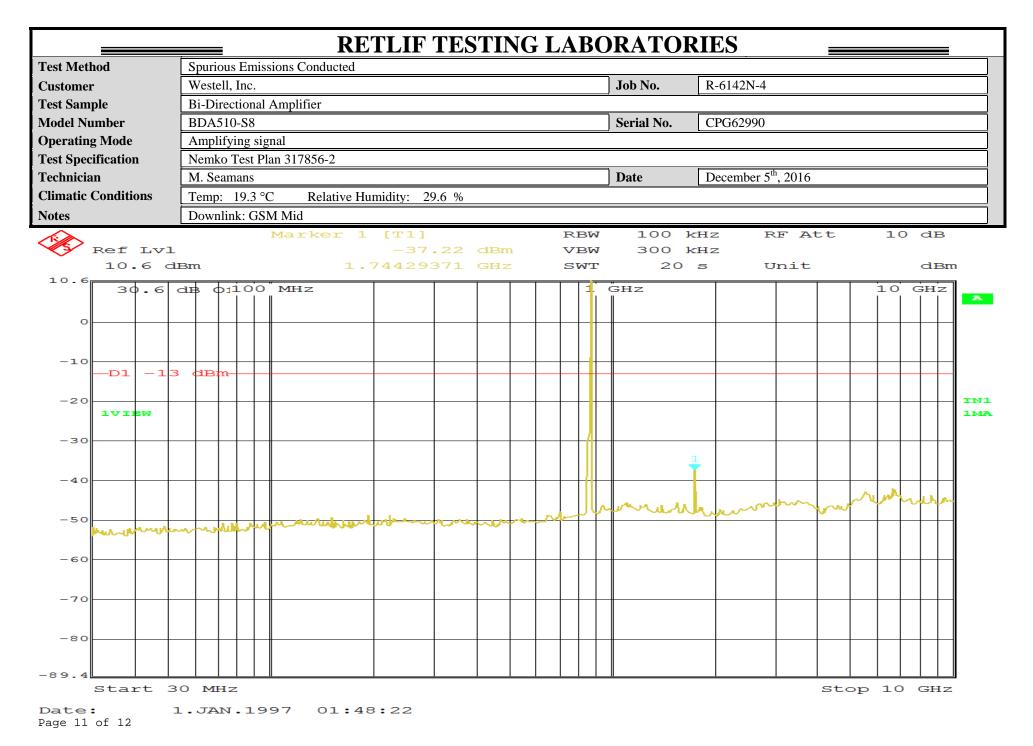




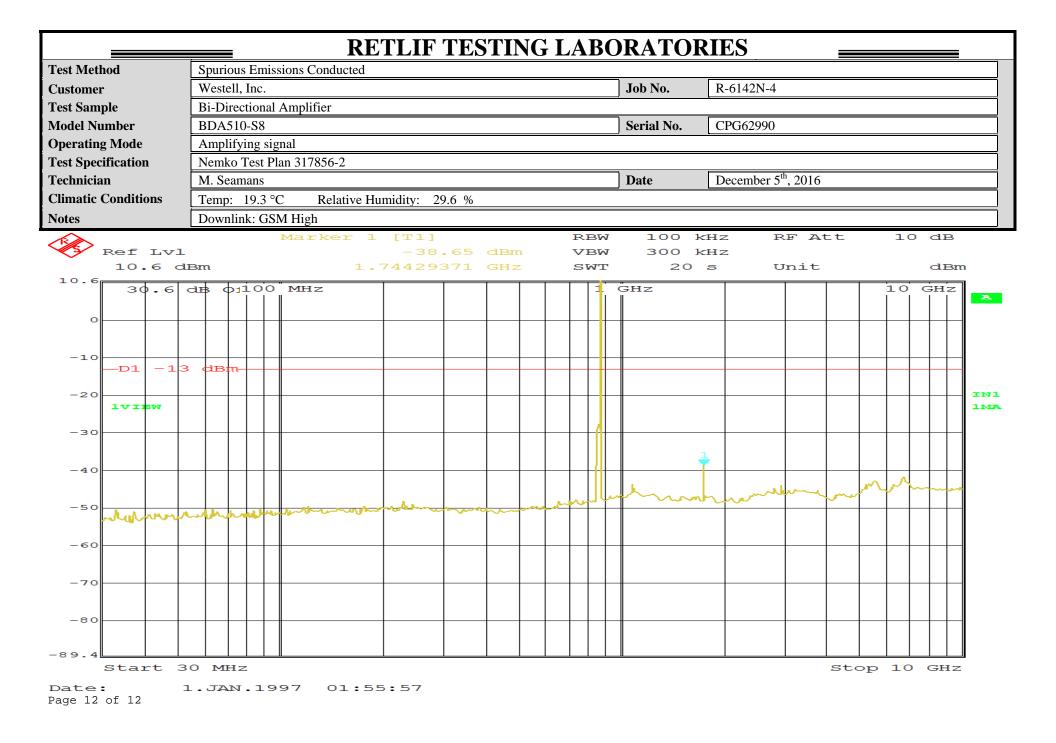








Page 95 of 98



Field Strength of Spurious Emissions Test Data



**Retlif Testing Laboratories** 

Report No. R-6142N-4

<b>I</b>						
<b>EXAMPLE 1 RETLIF TESTING LABORATORIES</b>						
EMISSIONS TEST DATA SHEET						
Test Method	thod Spurious Emissions Radiated					
Customer	Westell, Inc.					
Job Number	R-6142N-4					
Test Sample	Bi-Directional Amplifier					
Model Number	BDA510-S8					
Serial Number	CPG62990					
Test Specification	Nemko Test Plan 317856-2					
<b>Operating Mode</b>	Amplifying signals					
Technician	M. Seamans					
Date	December 2 nd , 2016					
Notes: Antenna Test Distance: 3 meters						
Detector: Peak						
3 Input frequencies tested, Low Mid and High in each band.						

TEST PARAMETERS								
Frequency	Antenna Position	Antenna Ref Level	Signal Gen Level					Limit
MHz	(H/V) / Position	dBuV	dBm					dBm
30.00	-	-	-					-13.00
	-	-	-					
	-	-	-					
	-	-	-					
_	-	-	-					
_	-	-	-					
	-	-	-					
_	-	-	-					
10000.00	-	-	-					-13.00

No EUT emissions within 20 dB of the specified test limit were observed at the specified test distance throughout the given frequency spectrum.

Data Sheet 1 of 1



Report No. R-6142N-4

**Retlif Testing Laboratories**