



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

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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

Type: 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



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Table 1 – Tests Performed

Test Plan Paragraph	Test Method	Test Results
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).



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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.



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.



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Revision History

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

Revision	Date	Pages Affected
-	December 20, 2016	Original Release



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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.



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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 $\text{Gain (dB)} = \text{output power (dBm)} - \text{input power (dBm)}$. Testing was then repeated with the GSM modulated signal. These measurements were repeated with the input signal amplitude set to 3 dB above the AGC threshold level. See attached test data.

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



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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

o 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.

o 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.



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Equipment List

AGC Threshold

EN	Manufacturer	Description	Range	Model No.	Cal Date	Due Date
1345	NARDA MICROWAVE	ATTENUATOR, COAXIAL	30 dB, DC - 18 GHz, 50 W	776B-30	10/10/2016	10/31/2017
5138	NARDA MICROWAVE	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	AGILENT / HP	ANALYZER, SIGNAL	10 Hz – 8.5 GHz	N9020B	10/10/2016	10/10/2017
R476	AGILENT / HP	GENERATOR, SIGNAL	9 kHz - 6 GHz	N5182B	9/9/2016	9/9/2017

Out of Band Rejection

EN	Manufacturer	Description	Range	Model No.	Cal Date	Due Date
1345	NARDA MICROWAVE	ATTENUATOR, COAXIAL	30 dB, DC - 18 GHz, 50 W	776B-30	10/10/2016	10/31/2017
5138	NARDA MICROWAVE	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	AGILENT / HP	ANALYZER, SIGNAL	10 Hz – 8.5 GHz	N9020B	10/10/2016	10/10/2017
R476	AGILENT / HP	GENERATOR, SIGNAL	9 kHz - 6 GHz	N5182B	9/9/2016	9/9/2017

Input-versus-Output Signal Comparison

EN	Manufacturer	Description	Range	Model No.	Cal Date	Due Date
1345	NARDA MICROWAVE	ATTENUATOR, COAXIAL	30 dB, DC - 18 GHz, 50 W	776B-30	10/10/2016	10/31/2017
5138	NARDA MICROWAVE	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	AGILENT / HP	ANALYZER, SIGNAL	10 Hz – 8.5 GHz	N9020B	10/10/2016	10/10/2017
R476	AGILENT / HP	GENERATOR, SIGNAL	9 kHz - 6 GHz	N5182B	9/9/2016	9/9/2017

Mean Output Power and Amplifier/Booster Gain

EN	Manufacturer	Description	Range	Model No.	Cal Date	Due Date
1345	NARDA MICROWAVE	ATTENUATOR, COAXIAL	30 dB, DC - 18 GHz, 50 W	776B-30	10/10/2016	10/31/2017
5138	NARDA MICROWAVE	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	AGILENT / HP	ANALYZER, SIGNAL	10 Hz – 8.5 GHz	N9020B	10/10/2016	10/10/2017
R476	AGILENT / HP	GENERATOR, SIGNAL	9 kHz - 6 GHz	N5182B	9/9/2016	9/9/2017



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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 MICROWAVE	ATTENUATOR, COAXIAL	30 dB, DC - 18 GHz, 50 W	776B-30	10/10/2016	10/31/2017
5138	NARDA MICROWAVE	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	AGILENT / HP	ANALYZER, SIGNAL	10 Hz - 8.5 GHz	N9020B	10/10/2016	10/10/2017
R476	AGILENT / HP	GENERATOR, SIGNAL	9 kHz - 6 GHz	N5182B	9/9/2016	9/9/2017
R469	AGILENT / HP	ANALYZER, SPECTRUM	100 Hz - 26.5 GHz	E7405A;A	12/1/2016	12/30/2017



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Test Photographs
AGC Threshold



Test Setup



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**AGC Threshold
Test Data**

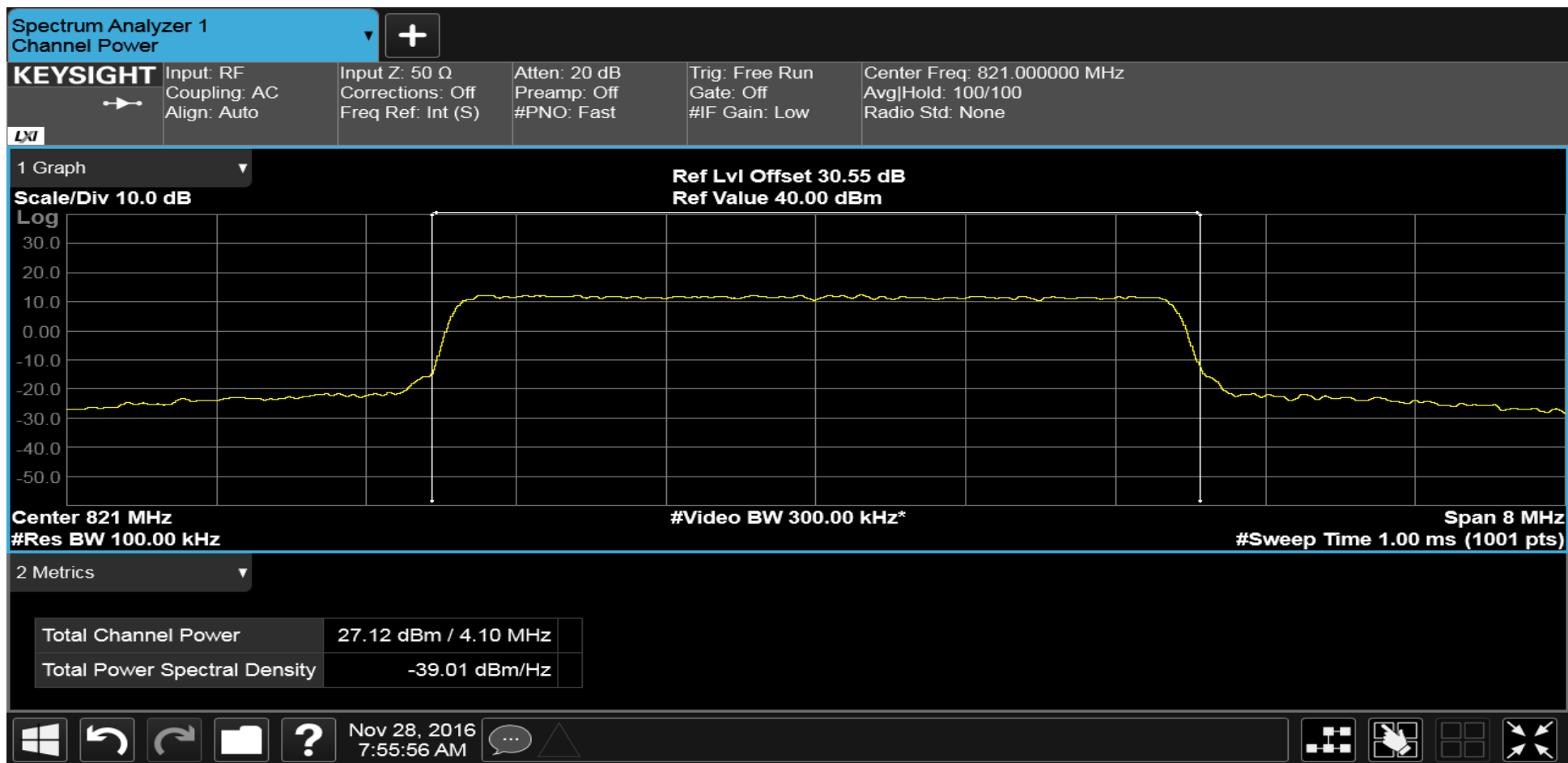


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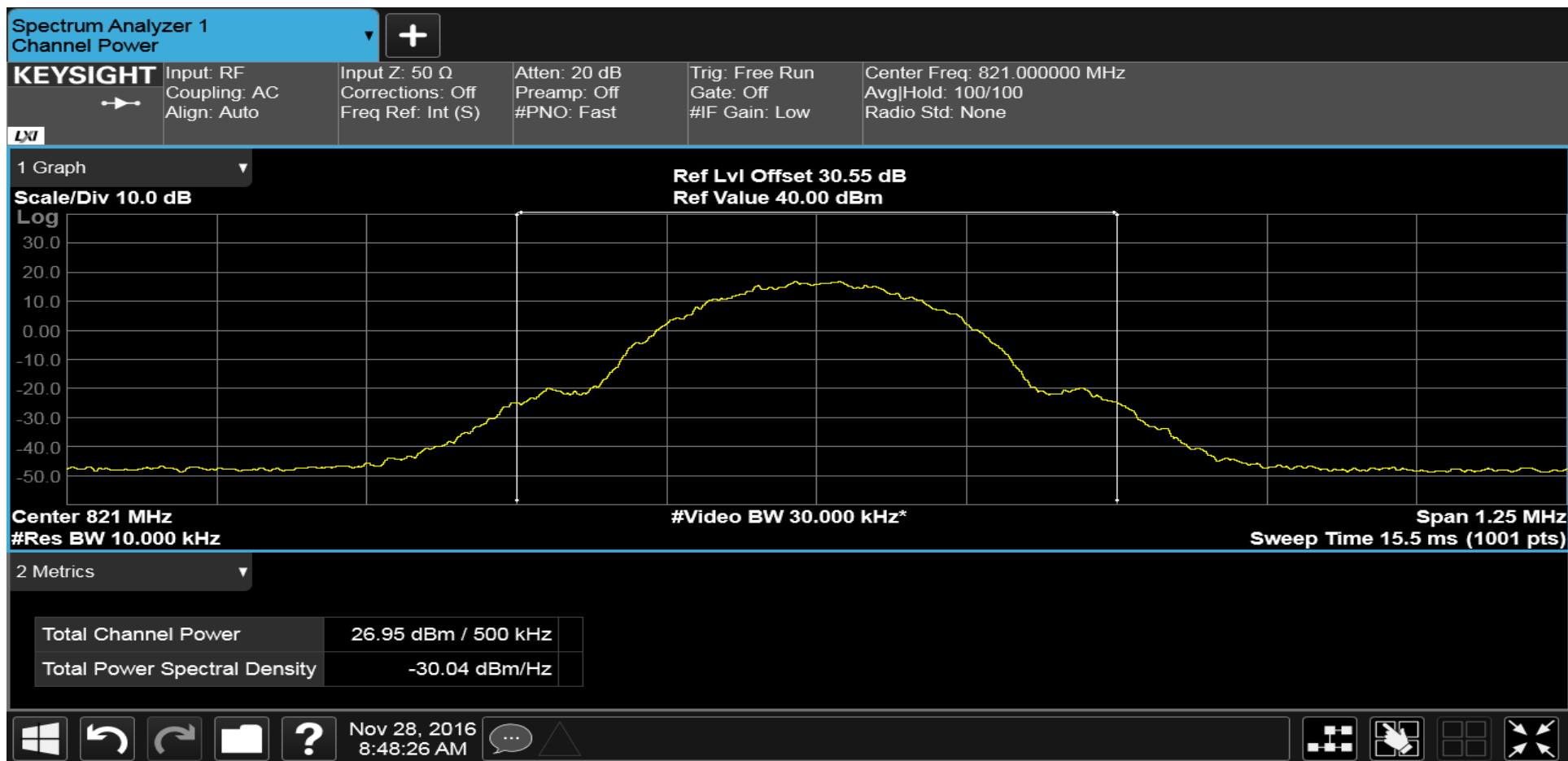
RETLIF TESTING LABORATORIES

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 °C Relative Humidity: 29.6 %		
Notes	Uplink Signal Generator Setting: -54.20dBm (-53.35dBm measured signal generator output) Amplifier Output: 27.12dBm Gain: 80.47dB		



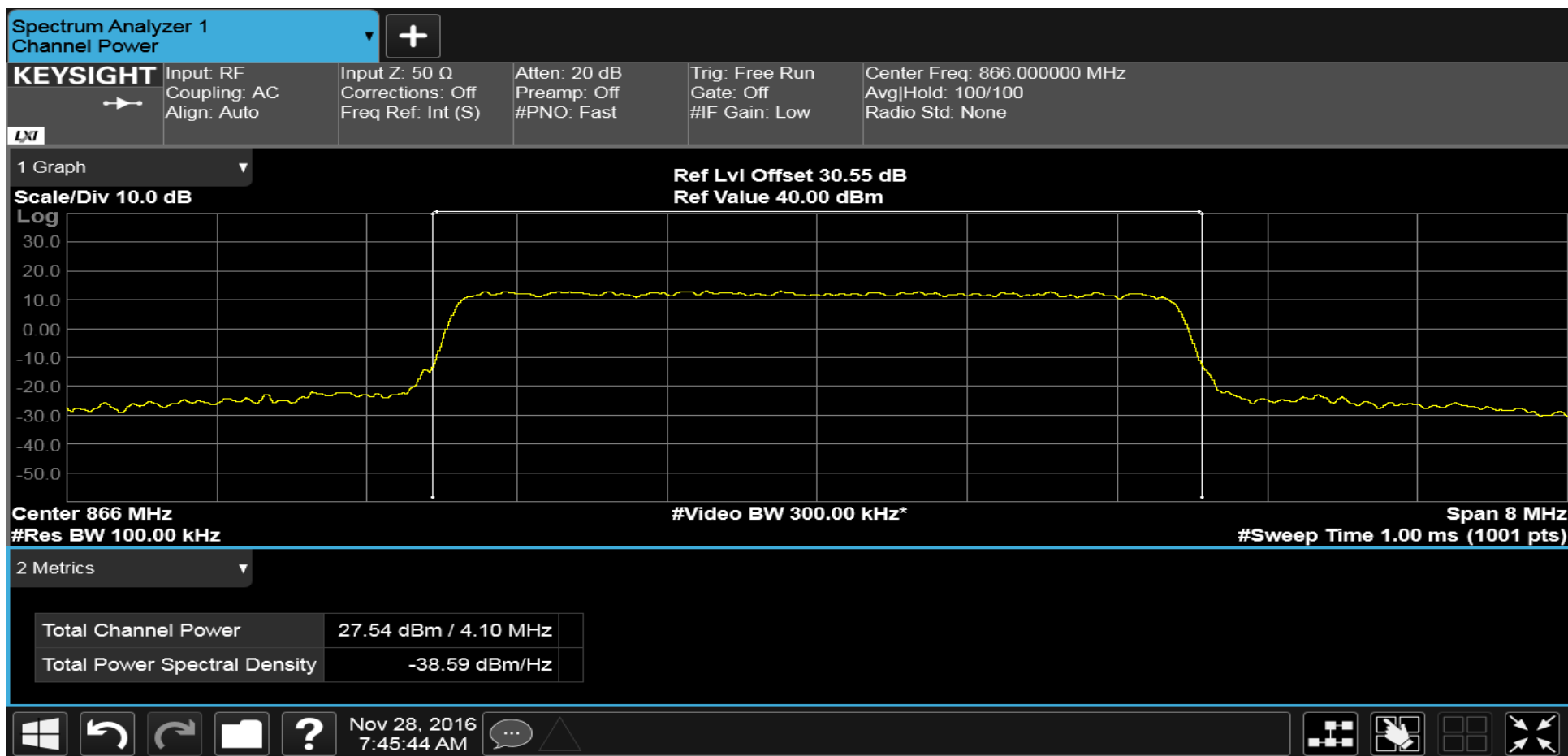
RETLIF TESTING LABORATORIES

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 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		



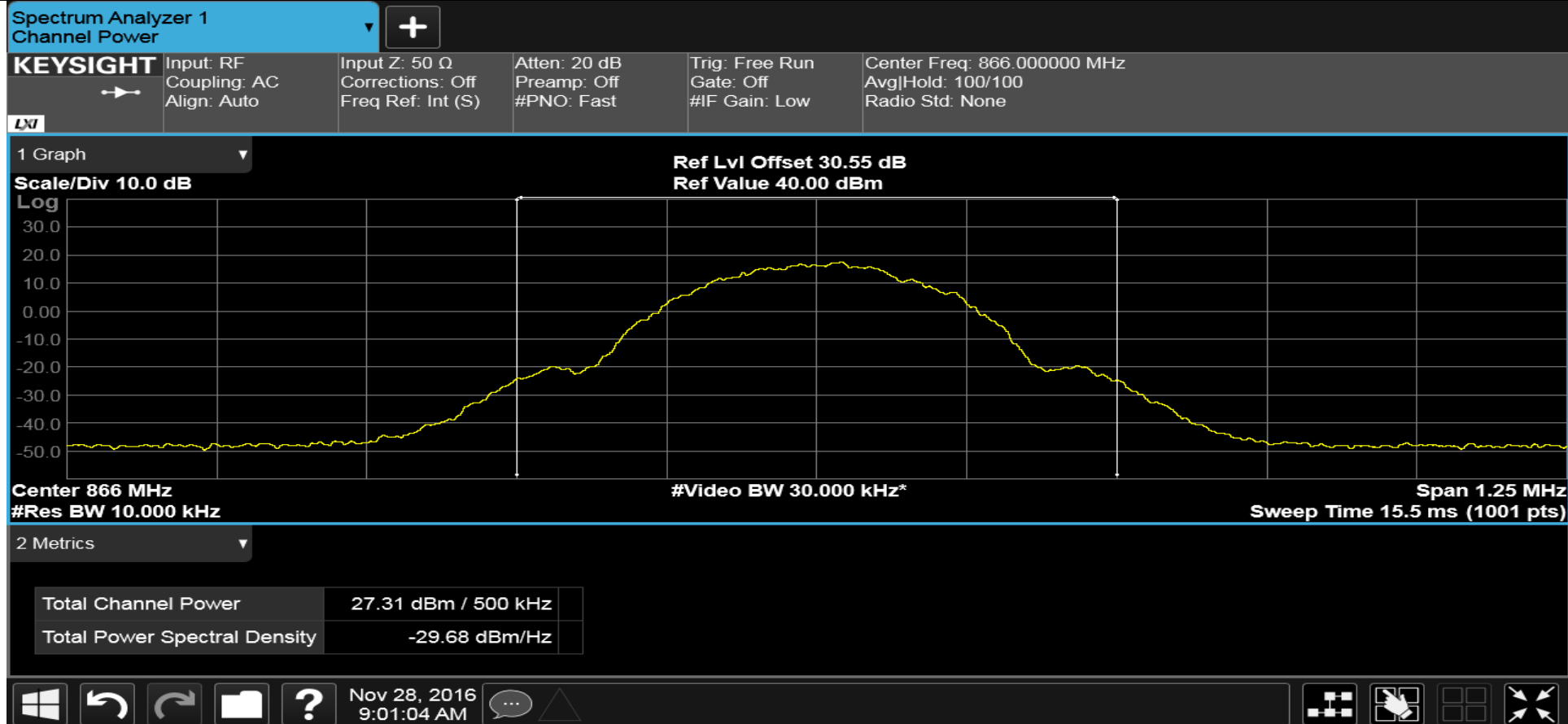
RETLIF TESTING LABORATORIES

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 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 generator output) Amplifier Output: 27.54dBm Gain: 80.85dB		



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 GSM 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: -53.70dBm (-53.01dBm measured signal generator output) Amplifier Output: 27.31dBm Gain: 80.32dB		



Test Photographs
Out of Band Rejection



Test Setup



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**Out of Band Rejection
Test Data**

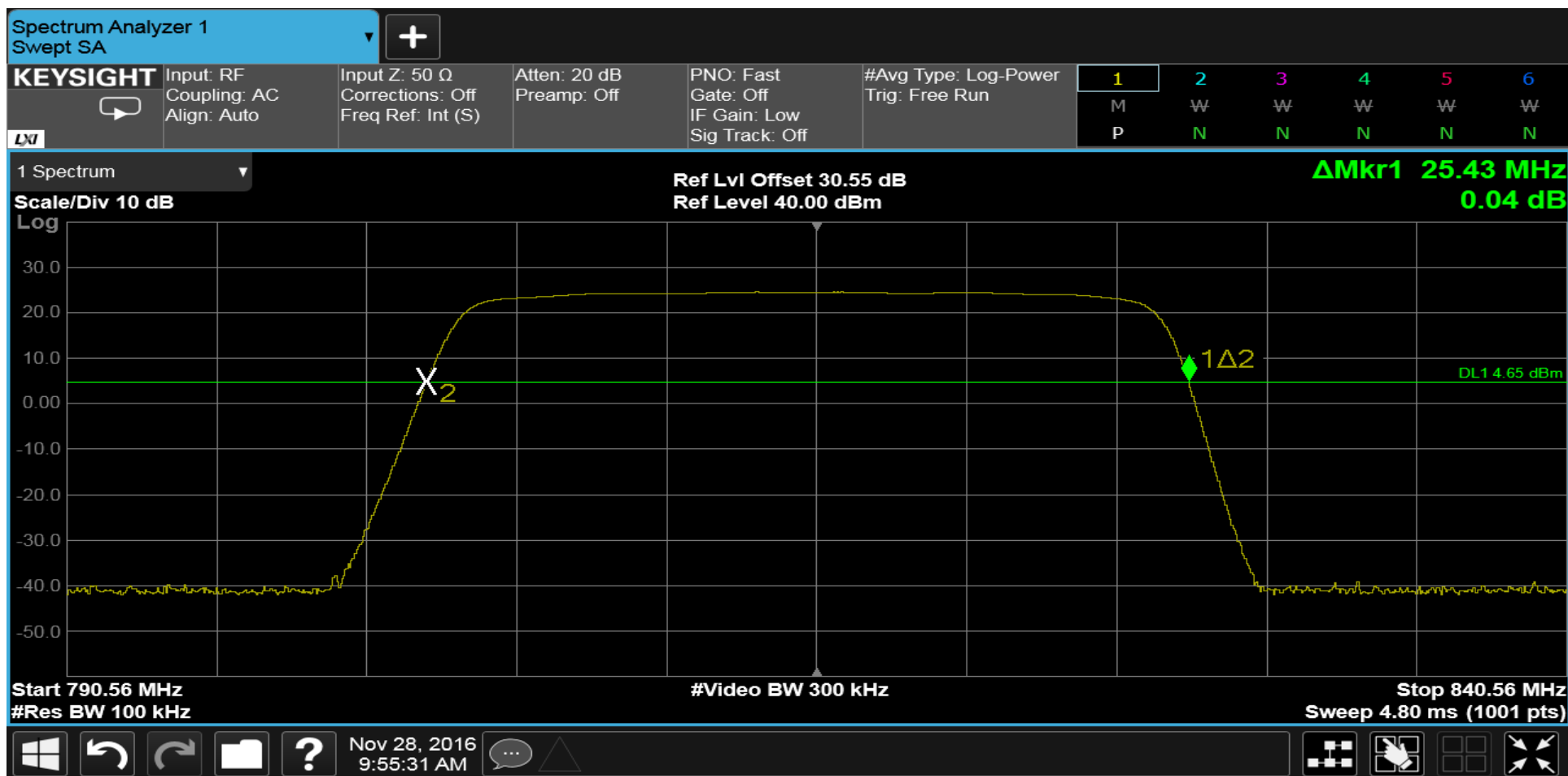


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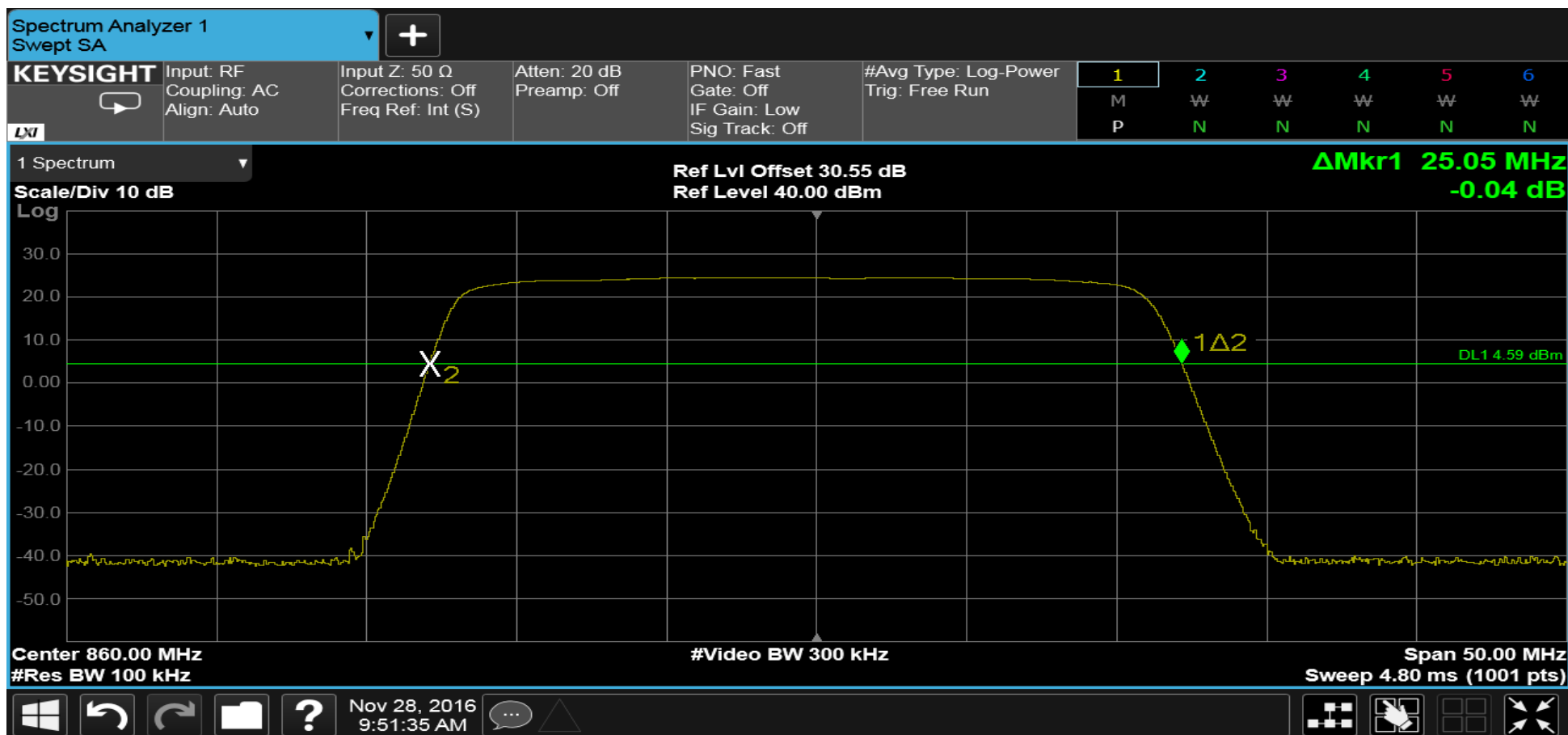
RETLIF TESTING LABORATORIES

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 °C Relative Humidity: 29.6 %		
Notes	Uplink Signal Generator Setting: -57.00dBm (-56.31dBm measured signal generator output) 20dB Bandwidth: 25.43 MHz		



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 °C Relative Humidity: 29.6 %		
Notes	Downlink Signal Generator Setting: -57.00dBm (-56.31dBm measured signal generator output) 20dB Bandwidth: 25.05 MHz		



Test Photographs
Input-versus-Output Signal Comparison



Test Setup



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**Input-versus-Output Signal Comparison
Test Data**

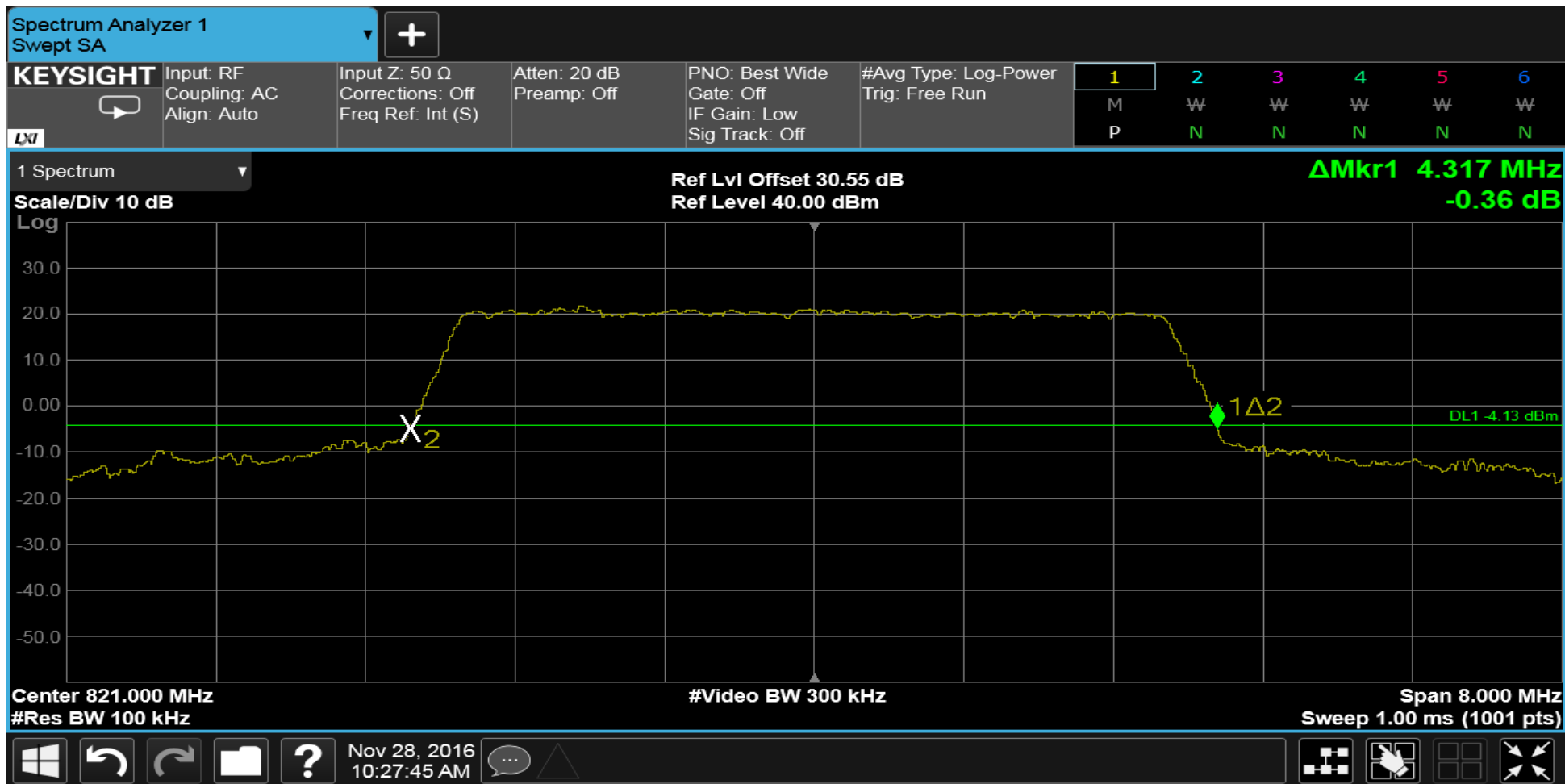


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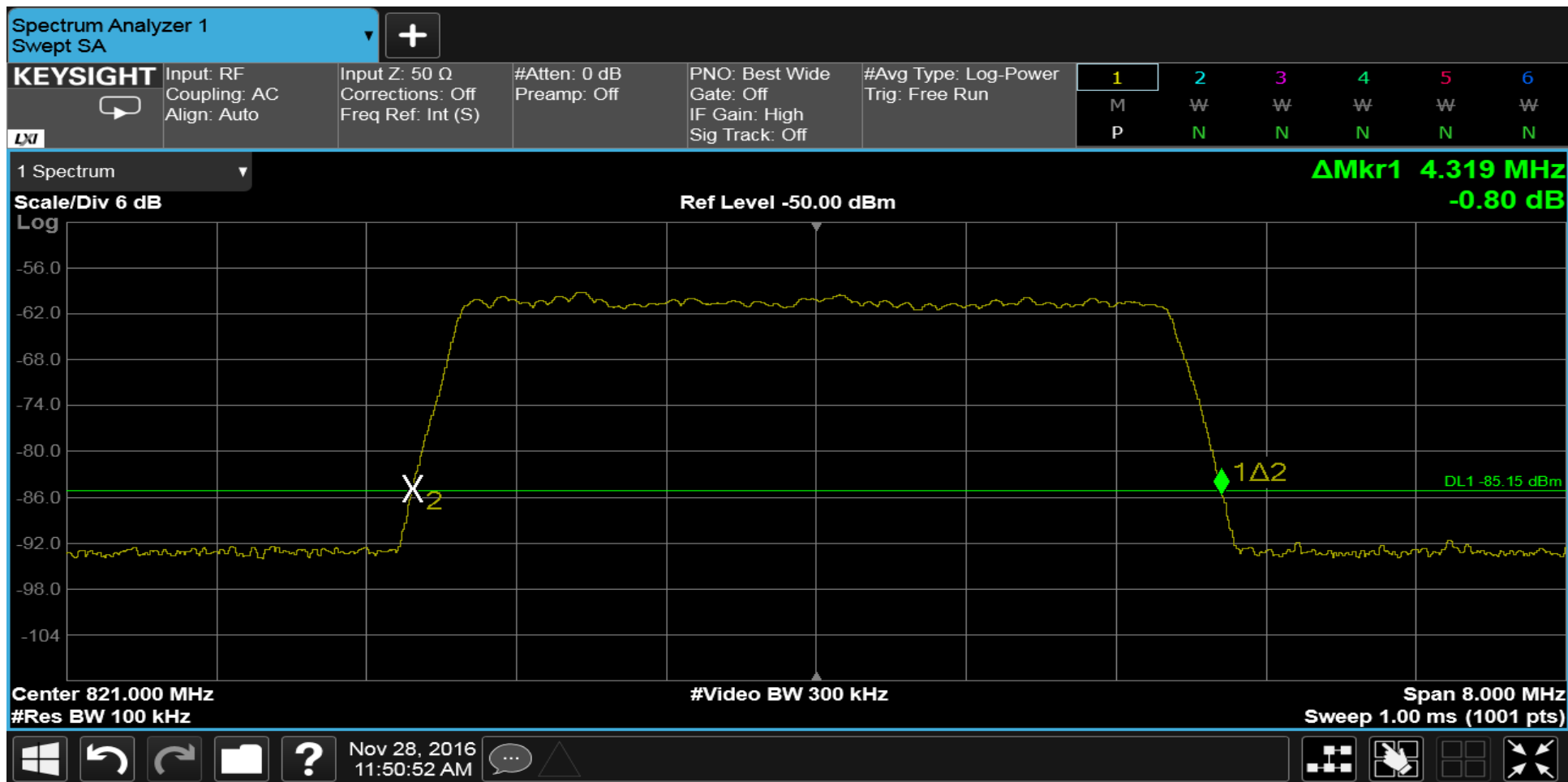
RETLIF TESTING LABORATORIES

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 °C Relative Humidity: 29.6 %		
Notes	Uplink 26dB Bandwidth: 4.317 MHz		



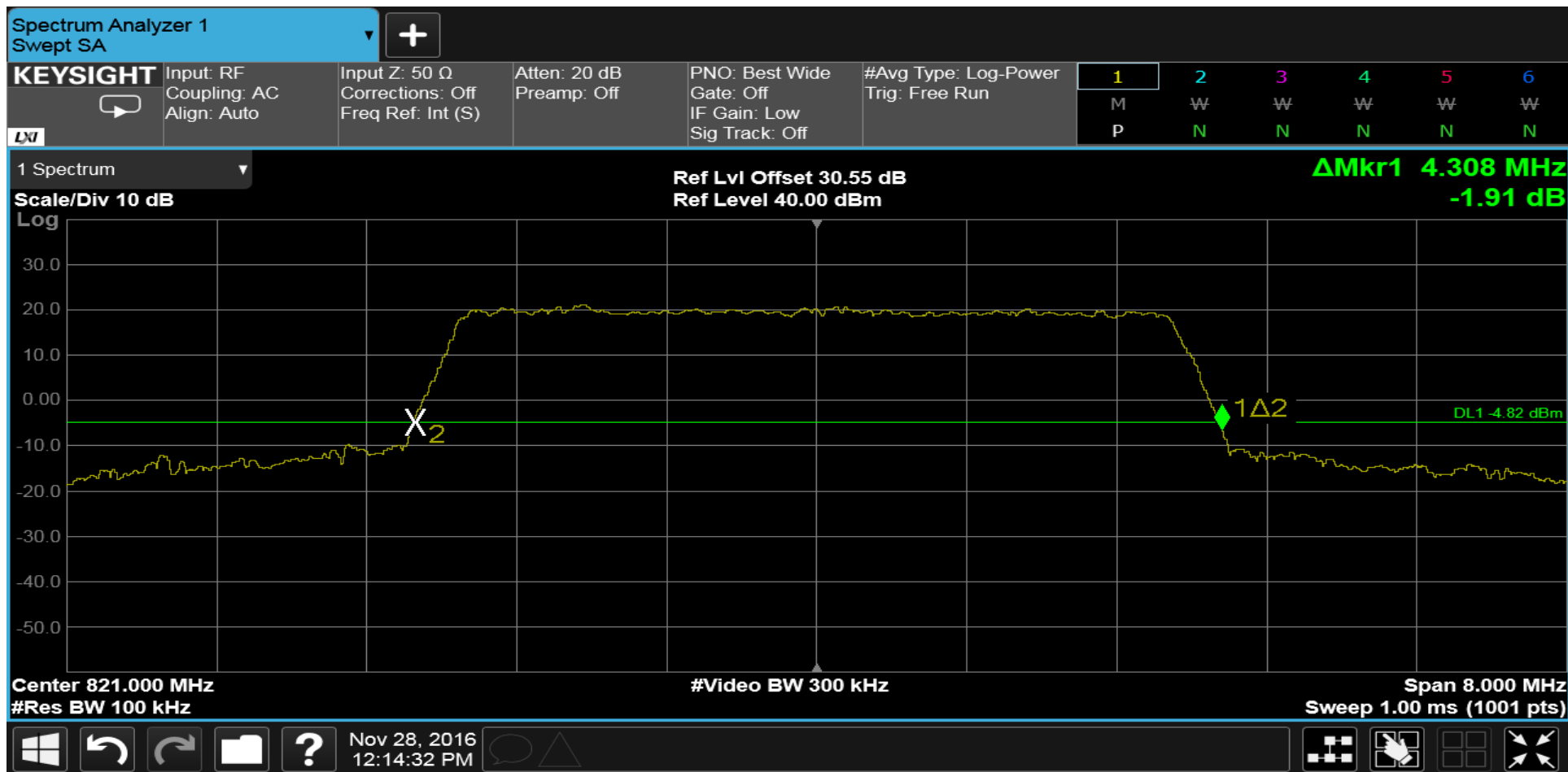
RETLIF TESTING LABORATORIES

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 °C Relative Humidity: 29.6 %		
Notes	Uplink 26dB Bandwidth: 4.319 MHz		



RETLIF TESTING LABORATORIES

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 °C Relative Humidity: 29.6 %		
Notes	Uplink 26dB Bandwidth: 4.308 MHz		



RETLIF TESTING LABORATORIES

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, 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 26dB Bandwidth: 4.308 MHz		

Spectrum Analyzer 1
Swept SA



KEYSIGHT

Input: RF
Coupling: AC
Align: Auto

Input Z: 50 Ω
Corrections: Off
Freq Ref: Int (S)

#Atten: 0 dB
Preamp: Off

PNO: Best Wide
Gate: Off
IF Gain: High
Sig Track: Off

#Avg Type: Log-Power
Trig: Free Run

1	2	3	4	5	6
M	W	W	W	W	W
P	N	N	N	N	N

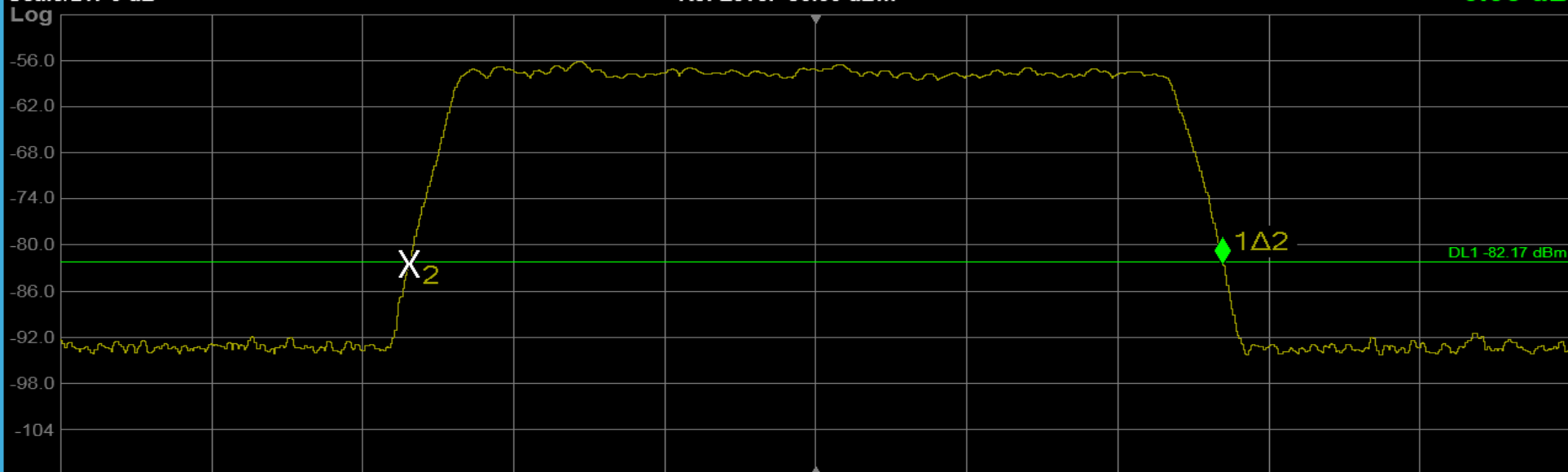
DL1

1 Spectrum

Scale/Div 6 dB

Ref Level -50.00 dBm

ΔMkr1 4.308 MHz
-0.06 dB



Center 821.000 MHz
#Res BW 100 kHz

#Video BW 300 kHz

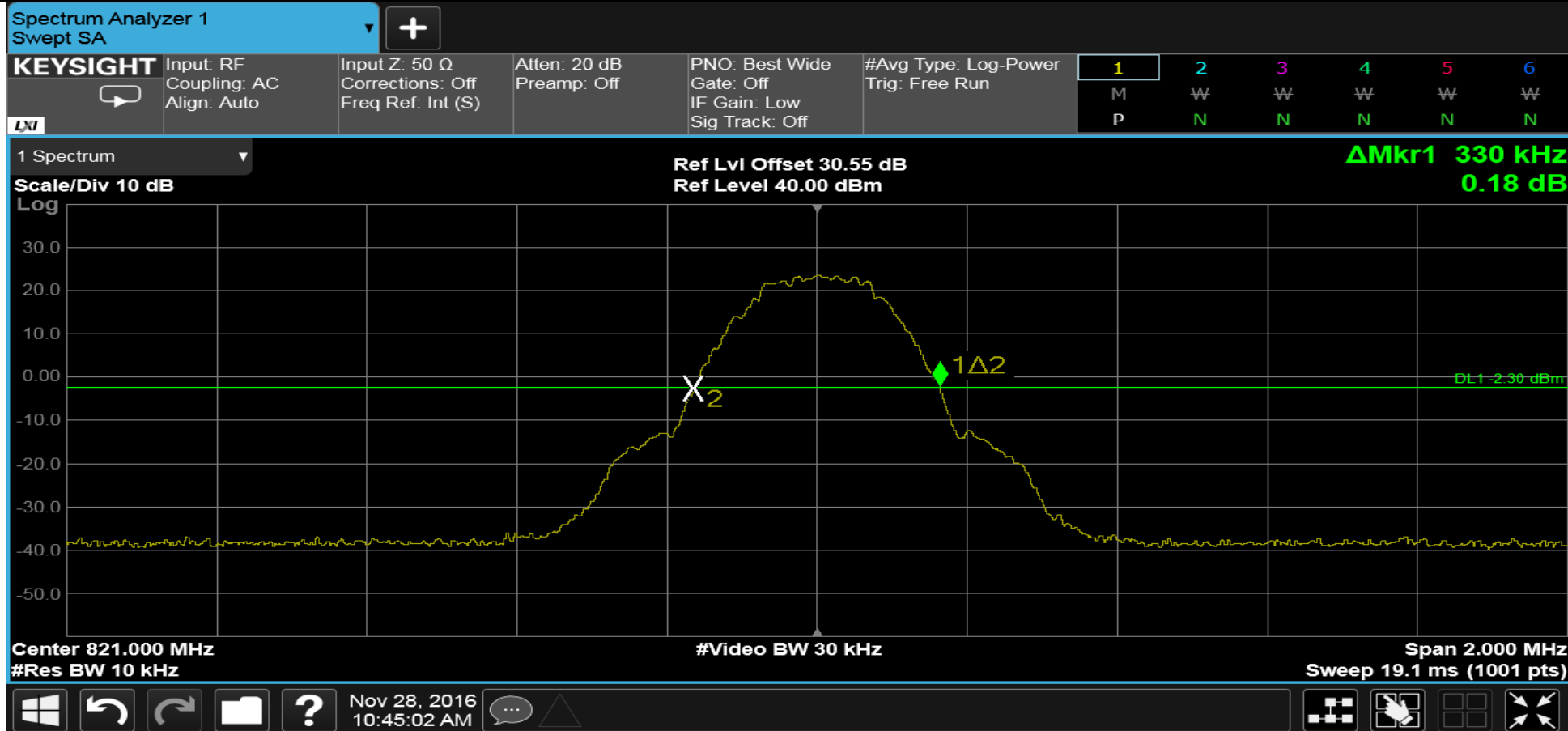
Span 8.000 MHz
Sweep 1.00 ms (1001 pts)

Windows logo, Refresh, Undo, Redo, Help, Nov 28, 2016 11:56:49 AM, and other icons.

Zoom in, Zoom out, and other navigation icons.

RETLIF TESTING LABORATORIES

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 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 26dB Bandwidth: 330 kHz		



RETLIF TESTING LABORATORIES

Test Method Customer Test Sample Model Number Operating Mode Test Specification Technician Climatic Conditions Notes	Input-v-Output Signal Comparison		
	Westell, Inc.	Job No.	R-6142N-4
	Bi-Directional Amplifier		
	BDA510-S8	Serial No.	CPG62990
	Signal Generator GSM Output at 821MHz		
	Nemko Test Plan 317856-2		
	M. Seamans	Date	November 28 th , 2016
	Temp: 19.3 °C Relative Humidity: 29.6 %		
	Uplink 26dB Bandwidth: 330 kHz		

Spectrum Analyzer 1
Swept SA



KEYSIGHT

Input: RF
Coupling: AC
Align: Auto

Input Z: 50 Ω
Corrections: Off
Freq Ref: Int (S)

Atten: 6 dB
Preamp: Off

PNO: Best Wide
Gate: Off
IF Gain: Low
Sig Track: Off

#Avg Type: Log-Power
Trig: Free Run

1	2	3	4	5	6
M	W	W	W	W	W
P	N	N	N	N	N

DL1

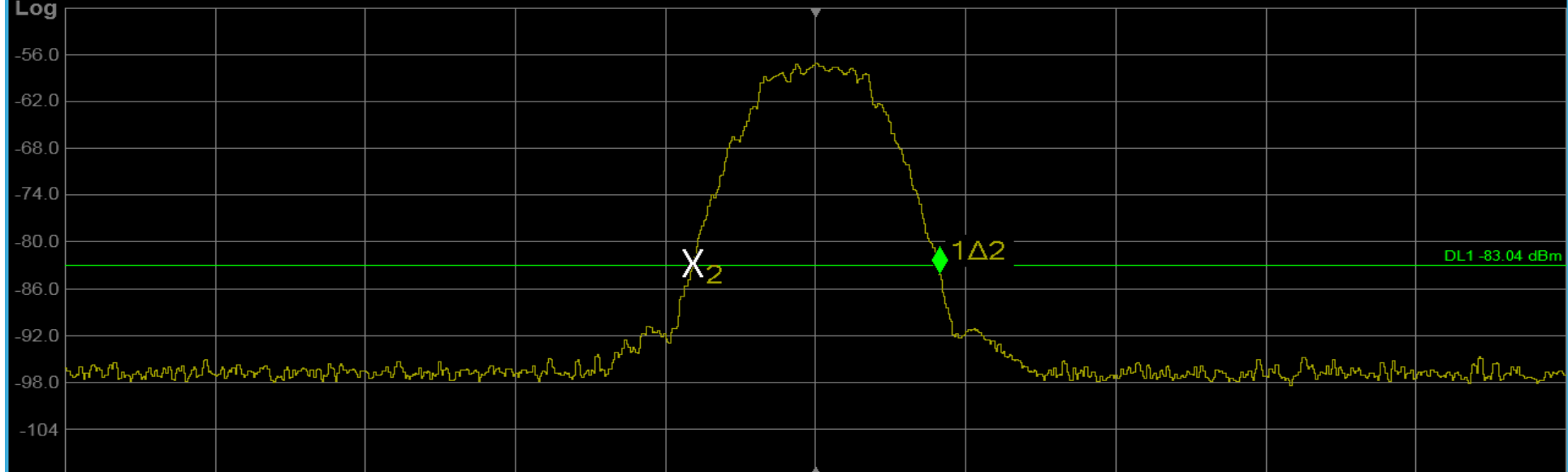
1 Spectrum

Scale/Div 6 dB

Log

Ref Level -50.00 dBm

ΔMkr1 330 kHz
-1.44 dB



Center 821.000 MHz

#Res BW 10 kHz

#Video BW 30 kHz

Span 2.000 MHz

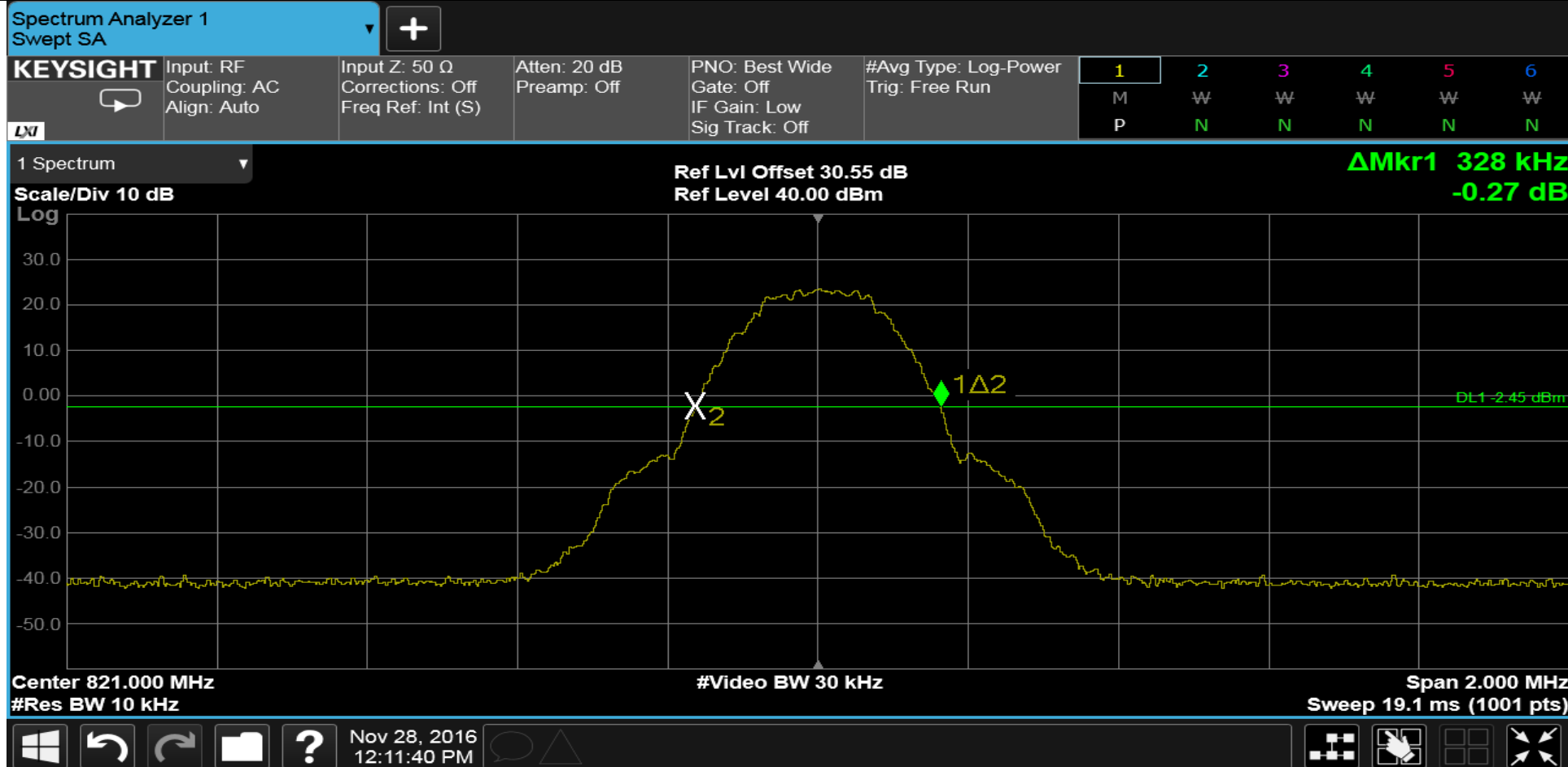
Sweep 19.1 ms (1001 pts)

Windows logo, Refresh, Undo, Save, Help, Nov 28, 2016 11:40:37 AM, Chat icon, Triangle icon

Zoom in, Zoom out, Pan, Rotate, Full screen, Exit

RETLIF TESTING LABORATORIES

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 GSM 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 °C Relative Humidity: 29.6 %		
Notes	Uplink 26dB Bandwidth: 328 kHz		



RETLIF TESTING LABORATORIES

Test Method Customer Test Sample Model Number Operating Mode Test Specification Technician Climatic Conditions Notes	Input-v-Output Signal Comparison		
	Westell, Inc.	Job No.	R-6142N-4
	Bi-Directional Amplifier		
	BDA510-S8	Serial No.	CPG62990
	Signal Generator GSM Output at 821MHz, AGC Activated		
	Nemko Test Plan 317856-2		
	M. Seamans	Date	November 28 th , 2016
	Temp: 19.3 °C Relative Humidity: 29.6 %		
	Uplink 26dB Bandwidth: 328 kHz		

Spectrum Analyzer 1
Swept SA



KEYSIGHT

Input: RF
Coupling: AC
Align: Auto

Input Z: 50 Ω
Corrections: Off
Freq Ref: Int (S)

#Atten: 0 dB
Preamp: Off

PNO: Best Wide
Gate: Off
IF Gain: High
Sig Track: Off

#Avg Type: Log-Power
Trig: Free Run

1	2	3	4	5	6
M	W	W	W	W	W
P	N	N	N	N	N

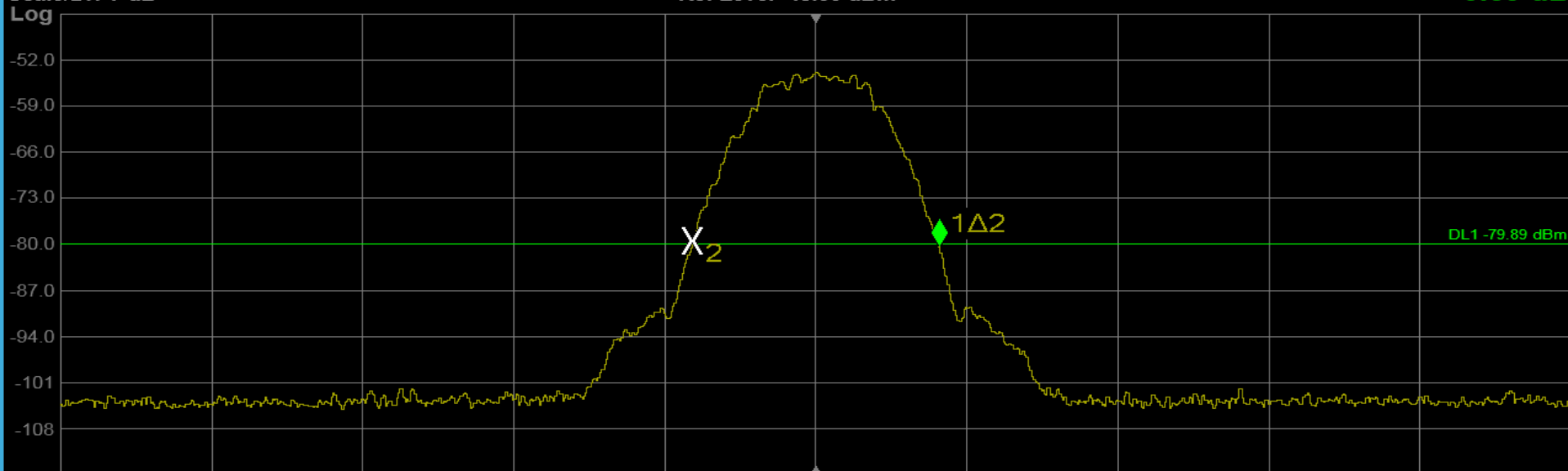
DL1

1 Spectrum

Scale/Div 7 dB

Ref Level -45.00 dBm

ΔMkr1 328 kHz
-0.69 dB



Center 821.000 MHz
#Res BW 10 kHz

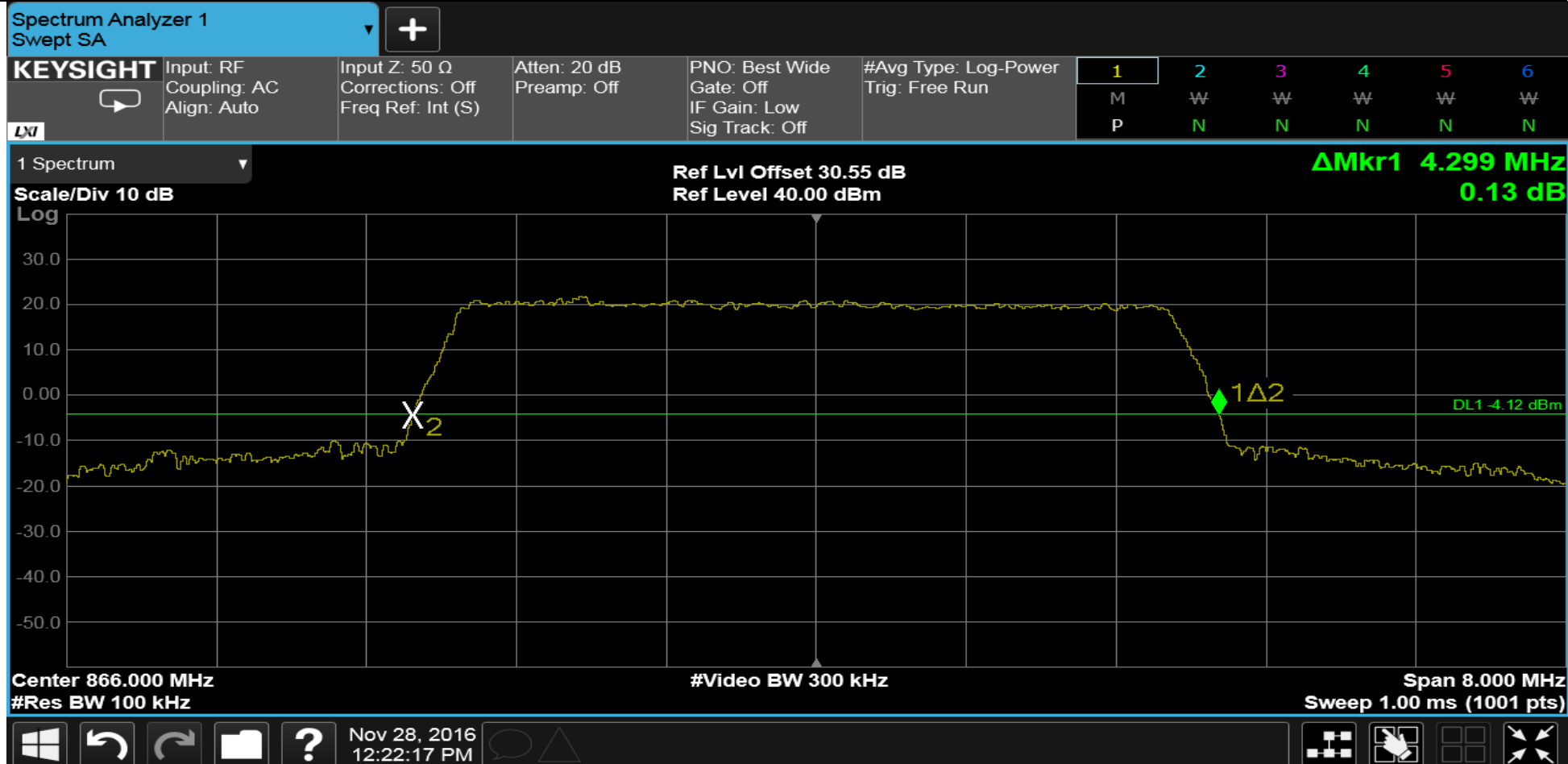
#Video BW 30 kHz

Span 2.000 MHz
Sweep 19.1 ms (1001 pts)

Nov 28, 2016
12:03:29 PM

RETLIF TESTING LABORATORIES

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 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 26dB Bandwidth: 4.299MHz		



RETLIF TESTING LABORATORIES

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 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 26dB Bandwidth: 4.308MHz		

Spectrum Analyzer 1
Swept SA



KEYSIGHT

Input: RF
Coupling: AC
Align: Auto

Input Z: 50 Ω
Corrections: Off
Freq Ref: Int (S)

#Atten: 0 dB
Preamp: Off

PNO: Best Wide
Gate: Off
IF Gain: High
Sig Track: Off

#Avg Type: Log-Power
Trig: Free Run

1	2	3	4	5	6
M	W	W	W	W	W
P	N	N	N	N	N

DL1

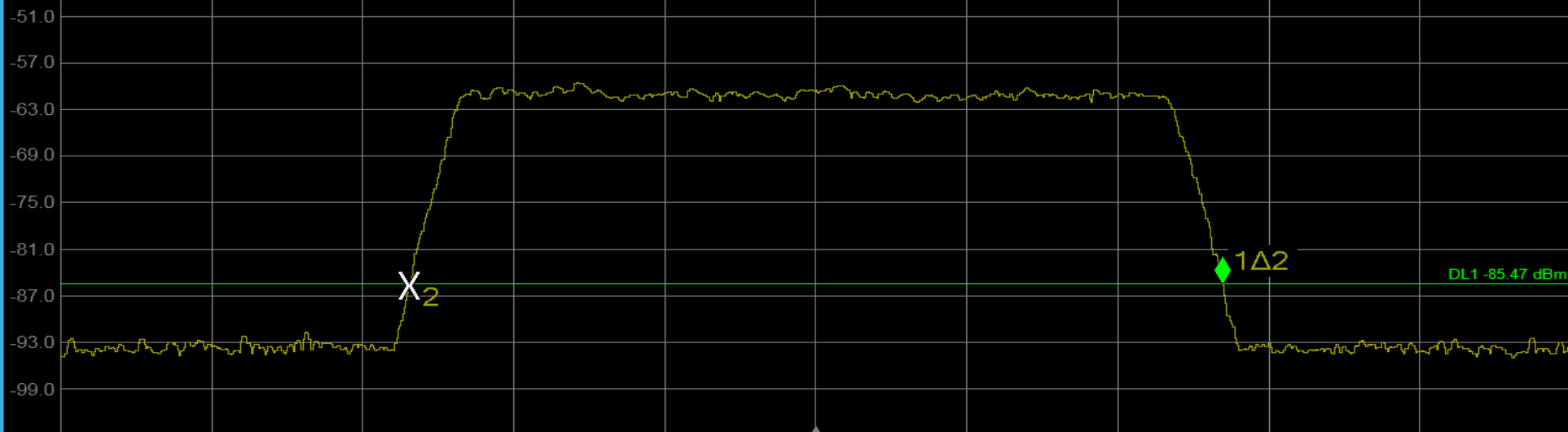
1 Spectrum

Scale/Div 6 dB

Ref Level -45.00 dBm

ΔMkr1 4.308 MHz
0.21 dB

Log

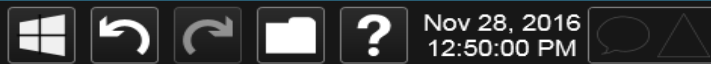


Center 866.000 MHz

#Video BW 300 kHz

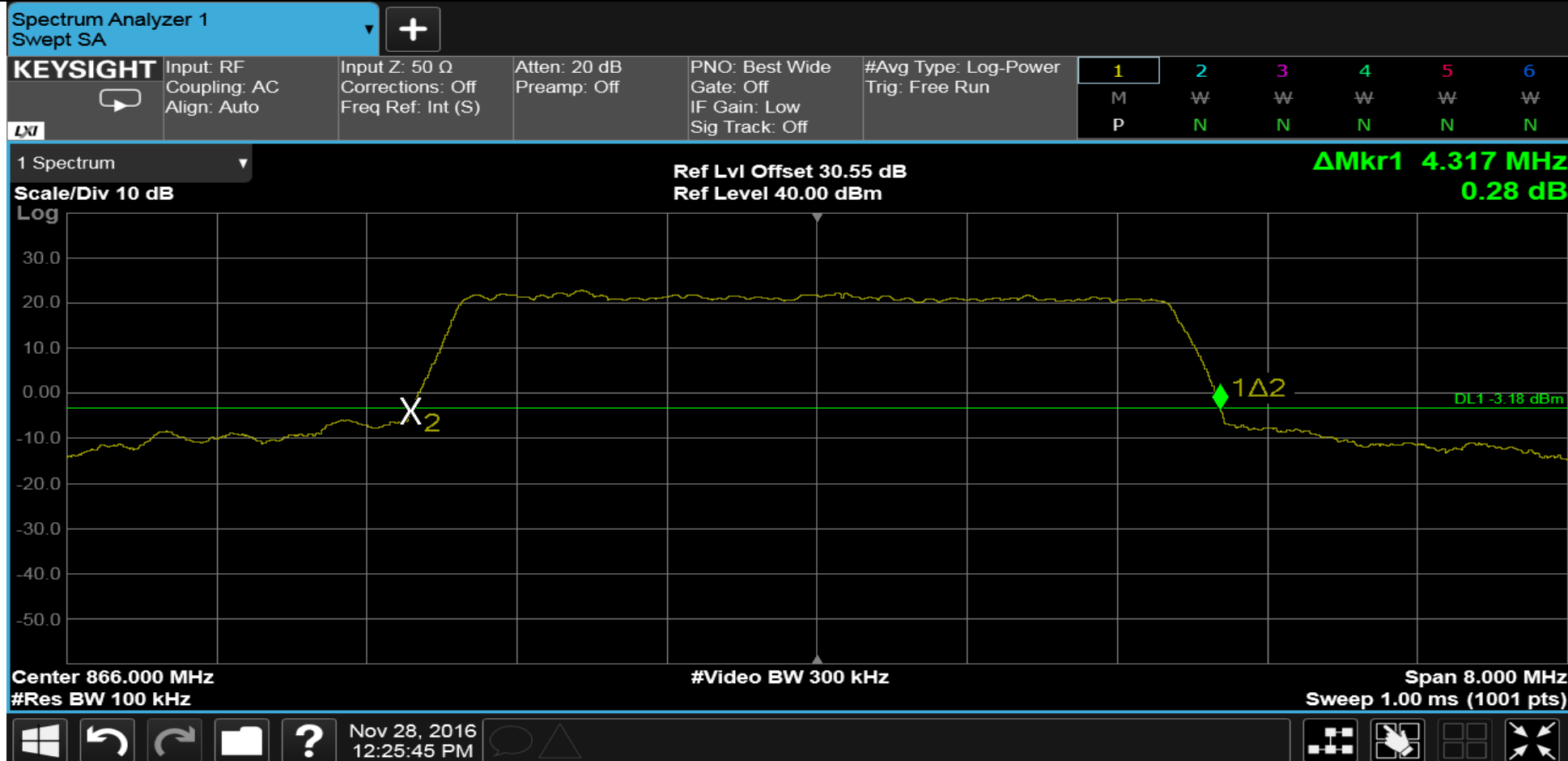
#Res BW 100 kHz

Span 8.000 MHz
Sweep 1.00 ms (1001 pts)



RETLIF TESTING LABORATORIES

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 866MHz, 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	Downlink 26dB Bandwidth: 4.317MHz		



RETLIF TESTING LABORATORIES

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 866MHz, 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	Downlink 26dB Bandwidth: 4.351MHz		

Spectrum Analyzer 1
Swept SA



KEYSIGHT

Input: RF
Coupling: AC
Align: Auto

Input Z: 50 Ω
Corrections: Off
Freq Ref: Int (S)

Atten: 6 dB
Preamp: Off

PNO: Best Wide
Gate: Off
IF Gain: Low
Sig Track: Off

#Avg Type: Log-Power
Trig: Free Run

1	2	3	4	5	6
M	W	W	W	W	W
P	N	N	N	N	N

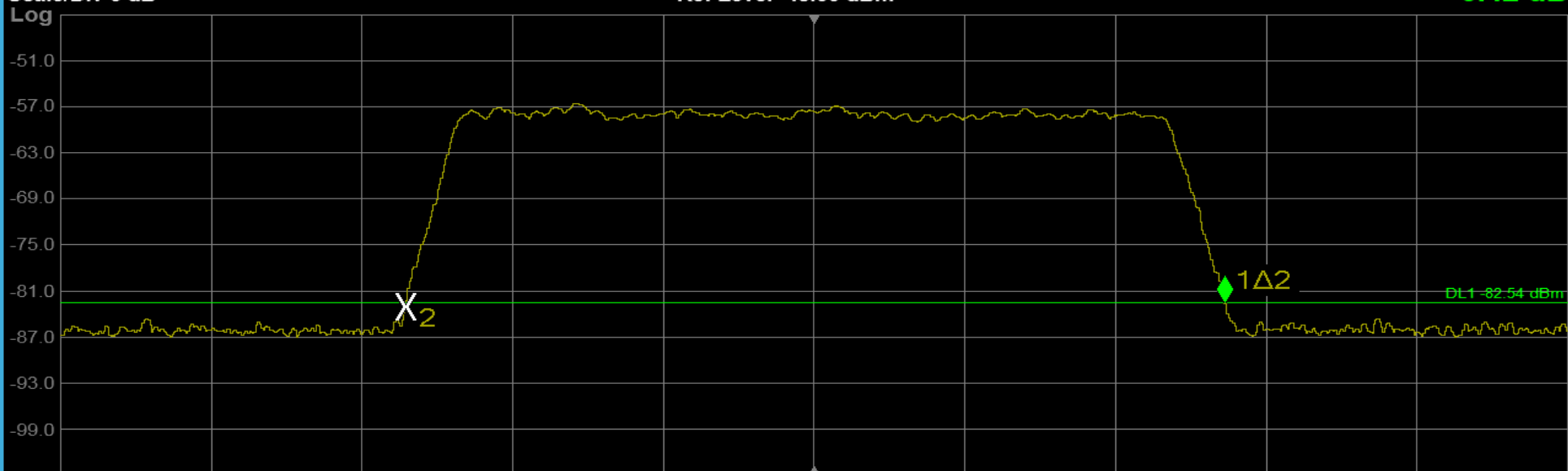
DL1

1 Spectrum

Scale/Div 6 dB

Ref Level -45.00 dBm

ΔMkr1 4.351 MHz
0.42 dB



Center 866.000 MHz
#Res BW 100 kHz

#Video BW 300 kHz

Span 8.000 MHz
Sweep 1.00 ms (1001 pts)

Windows icons: Start, Back, Forward, Home, Search, Nov 28, 2016 12:45:48 PM, and other utility icons.

Navigation icons: Zoom, Pan, and other utility icons.

RETLIF TESTING LABORATORIES

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 GSM 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 26dB Bandwidth:330kHz		

Spectrum Analyzer 1
Swept SA



KEYSIGHT

Input: RF
Coupling: AC
Align: Auto

Input Z: 50 Ω
Corrections: Off
Freq Ref: Int (S)

Atten: 20 dB
Preamp: Off

PNO: Best Wide
Gate: Off
IF Gain: Low
Sig Track: Off

#Avg Type: Log-Power
Trig: Free Run

1	2	3	4	5	6
M	W	W	W	W	W
P	N	N	N	N	N

DL1

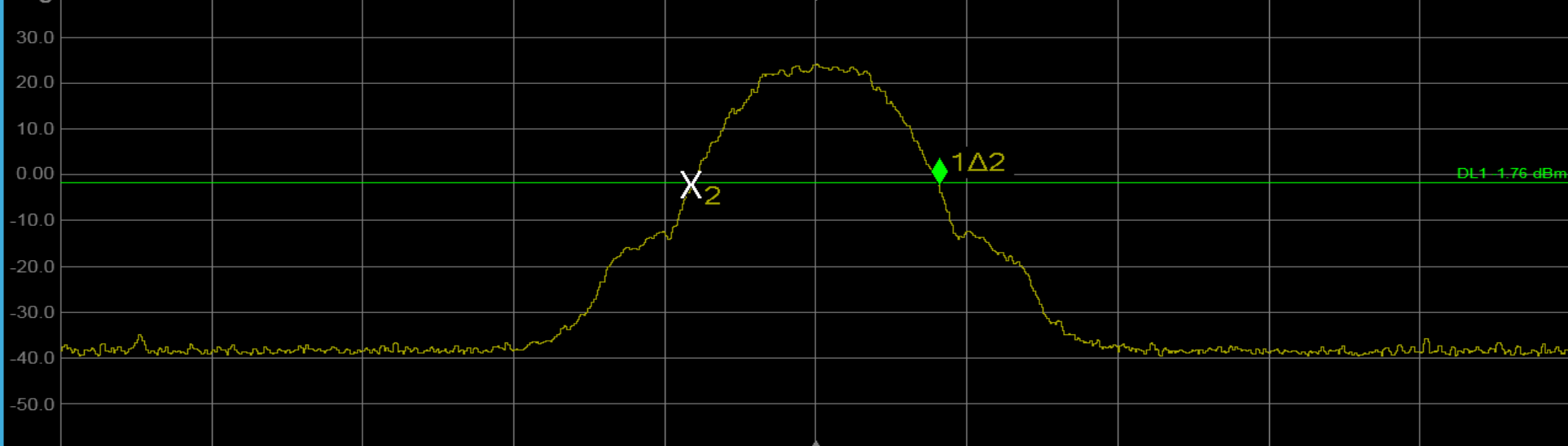
1 Spectrum

Ref Lvl Offset 30.55 dB
Ref Level 40.00 dBm

ΔMkr1 330 kHz
-0.29 dB

Scale/Div 10 dB

Log



Center 866.000 MHz

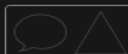
#Video BW 30 kHz

Span 2.000 MHz
Sweep 19.1 ms (1001 pts)

#Res BW 10 kHz



Nov 28, 2016
12:33:35 PM



RETLIF TESTING LABORATORIES

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 GSM 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	Downlink 26dB Bandwidth: 330kHz		

Spectrum Analyzer 1
Swept SA



KEYSIGHT

Input: RF
Coupling: AC
Align: Auto

Input Z: 50 Ω
Corrections: Off
Freq Ref: Int (S)

Atten: 6 dB
Preamp: Off

PNO: Best Wide
Gate: Off
IF Gain: Low
Sig Track: Off

#Avg Type: Log-Power
Trig: Free Run

1	2	3	4	5	6
M	W	W	W	W	W
P	N	N	N	N	N

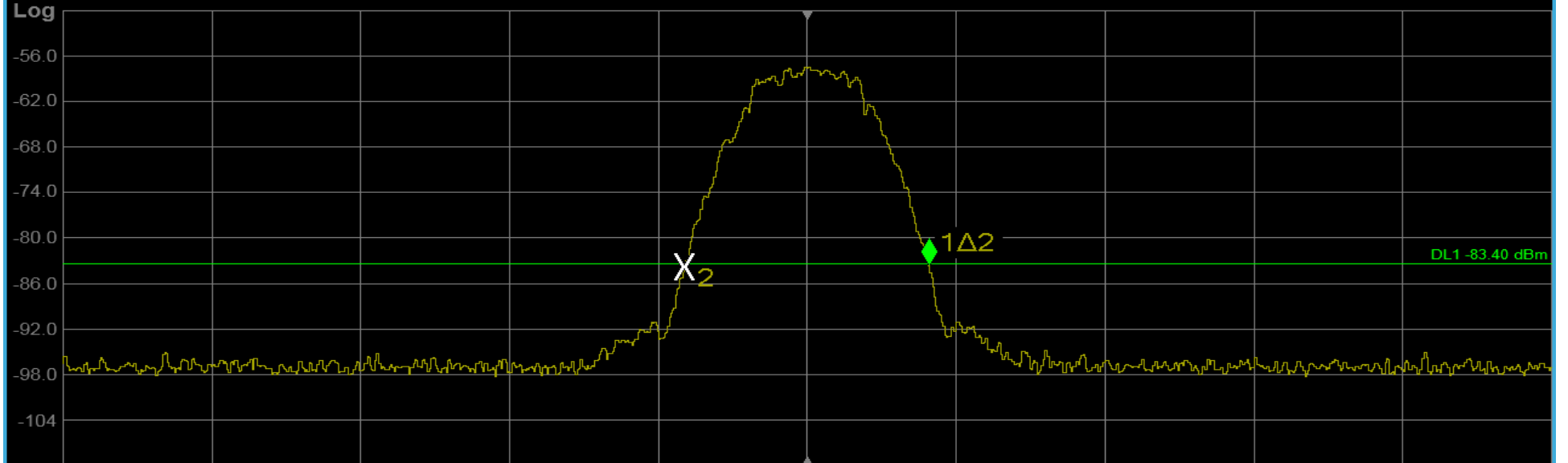
DL1

1 Spectrum

Scale/Div 6 dB

Ref Level -50.00 dBm

ΔMkr1 330 kHz
0.10 dB



Center 866.000 MHz

#Res BW 10 kHz

#Video BW 30 kHz

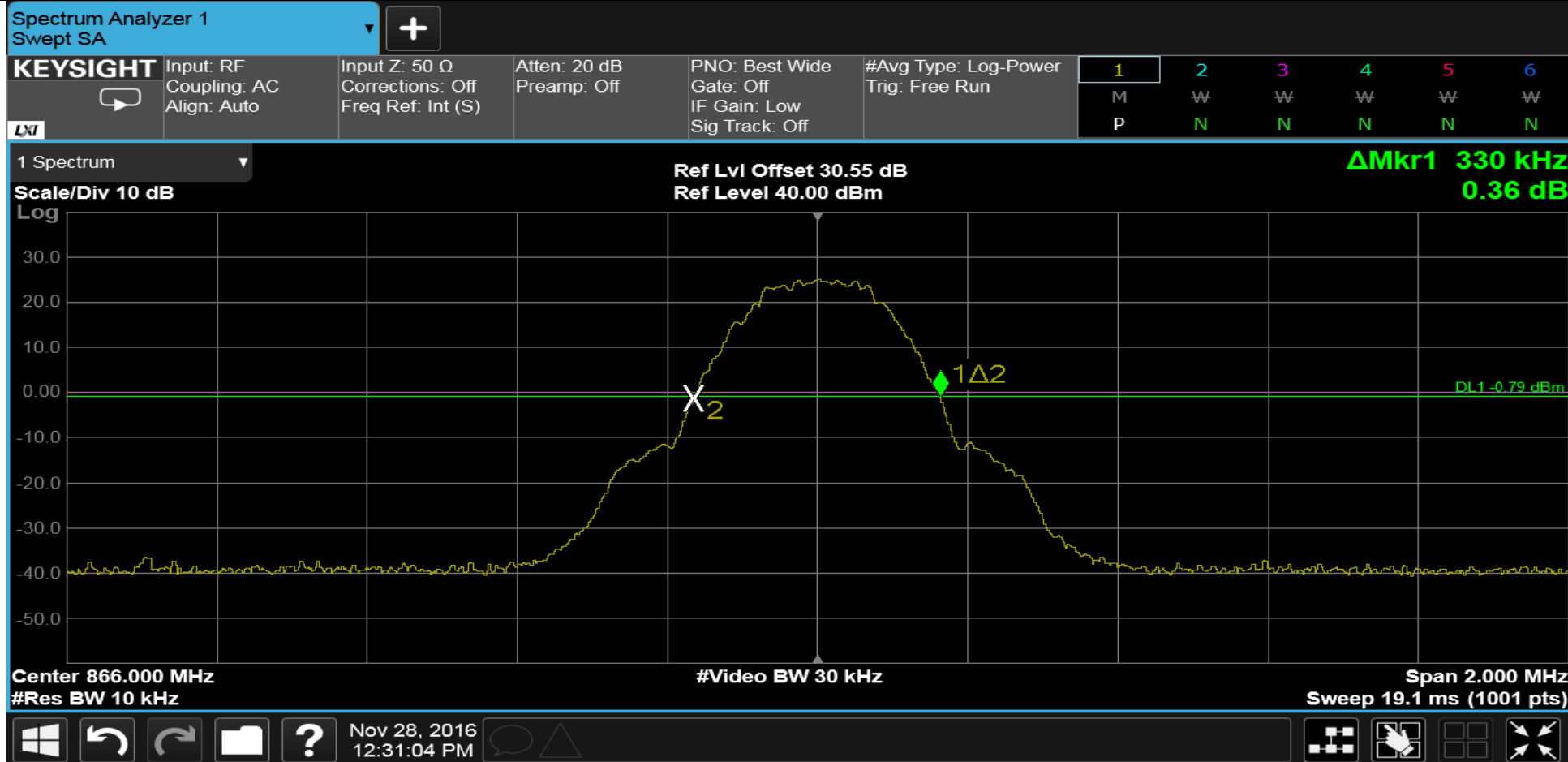
Span 2.000 MHz

Sweep 19.1 ms (1001 pts)

Nov 28, 2016 12:38:12 PM

RETLIF TESTING LABORATORIES

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 GSM Signal at 866MHz, 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	Downlink 26dB Bandwidth: 330kHz		



RETLIF TESTING LABORATORIES

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 GSM Output at 866MHz, 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	Downlink 26dB Bandwidth: 330kHz		

Spectrum Analyzer 1
Swept SA



KEYSIGHT

Input: RF
Coupling: AC
Align: Auto

Input Z: 50 Ω
Corrections: Off
Freq Ref: Int (S)

Atten: 6 dB
Preamp: Off

PNO: Best Wide
Gate: Off
IF Gain: Low
Sig Track: Off

#Avg Type: Log-Power
Trig: Free Run

1

2

3

4

5

6

M

W

W

W

W

W

P

N

N

N

N

N

DL1

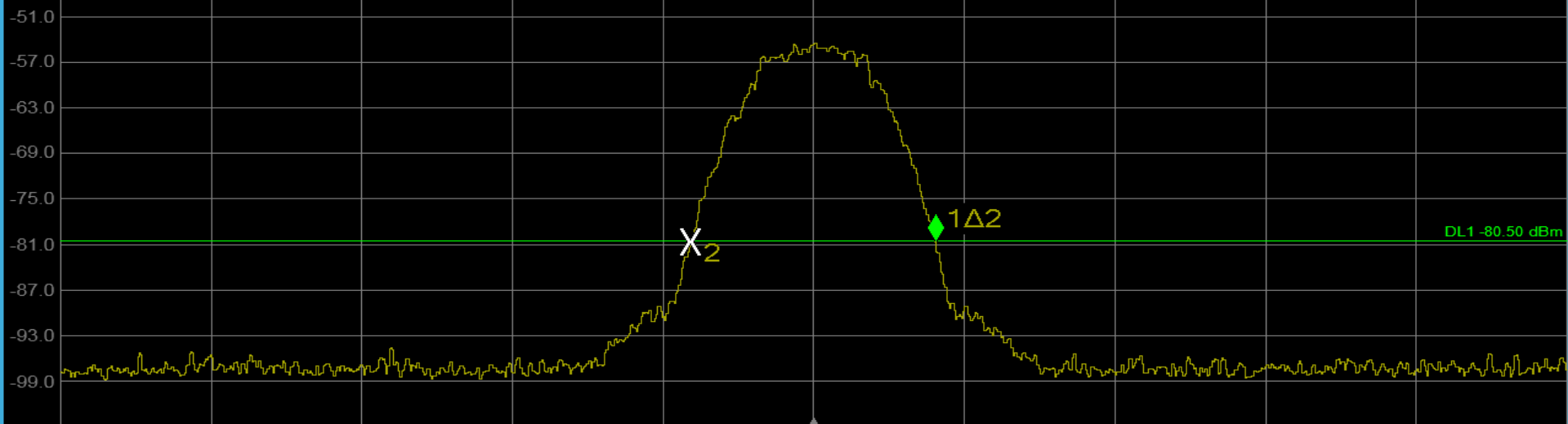
1 Spectrum

Scale/Div 6 dB

Ref Level -45.00 dBm

ΔMkr1 325 kHz
-0.03 dB

Log



Center 866.000 MHz

#Video BW 30 kHz

Span 2.000 MHz

#Res BW 10 kHz

Sweep 19.1 ms (1001 pts)

Nov 28, 2016
12:41:31 PM



Test Photographs
Mean Output Power and Amplifier/Booster Gain



Test Setup



Retlif Testing Laboratories

Report No. R-6142N-4

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

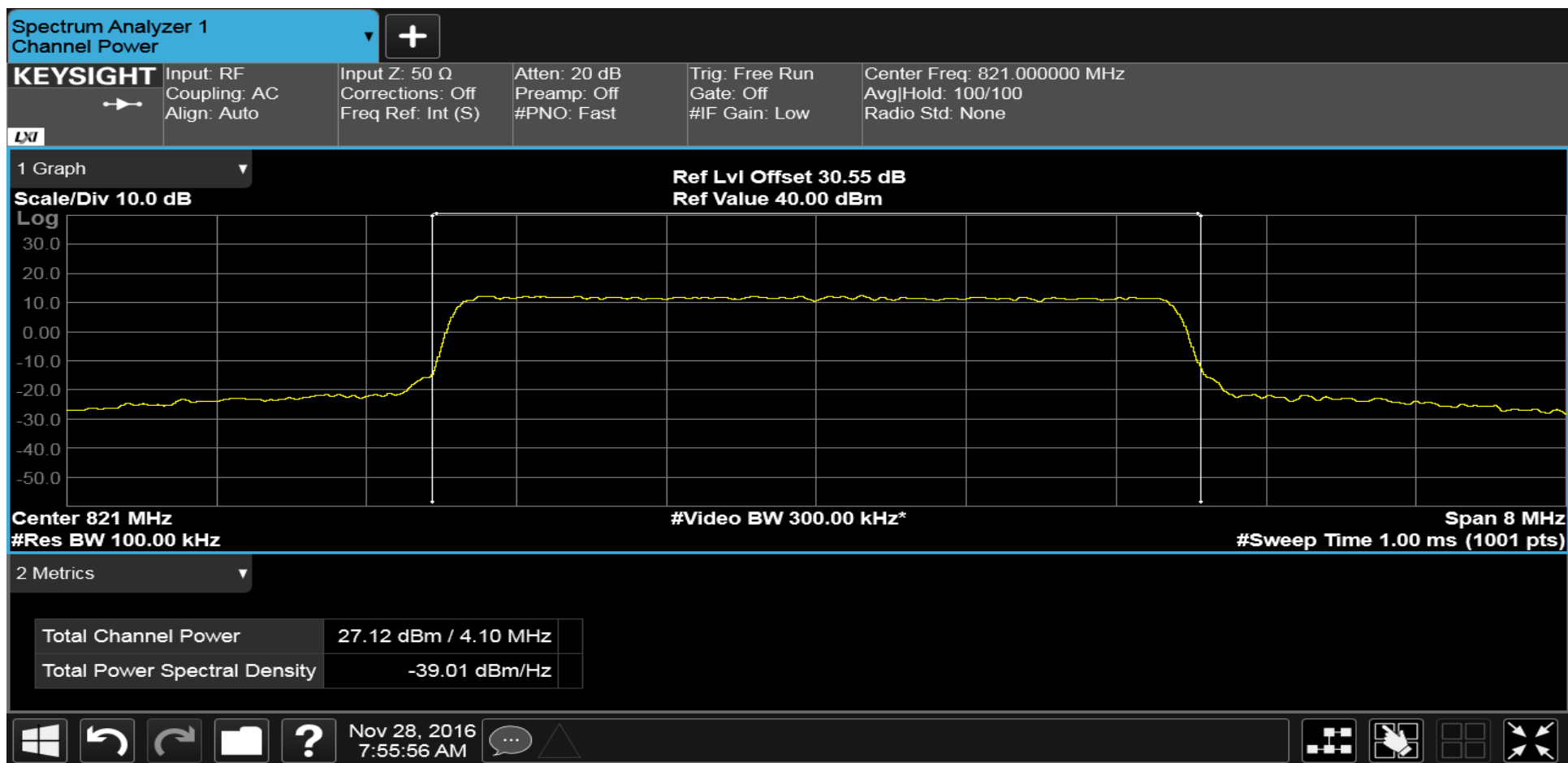


Retlif Testing Laboratories

Report No. R-6142N-4

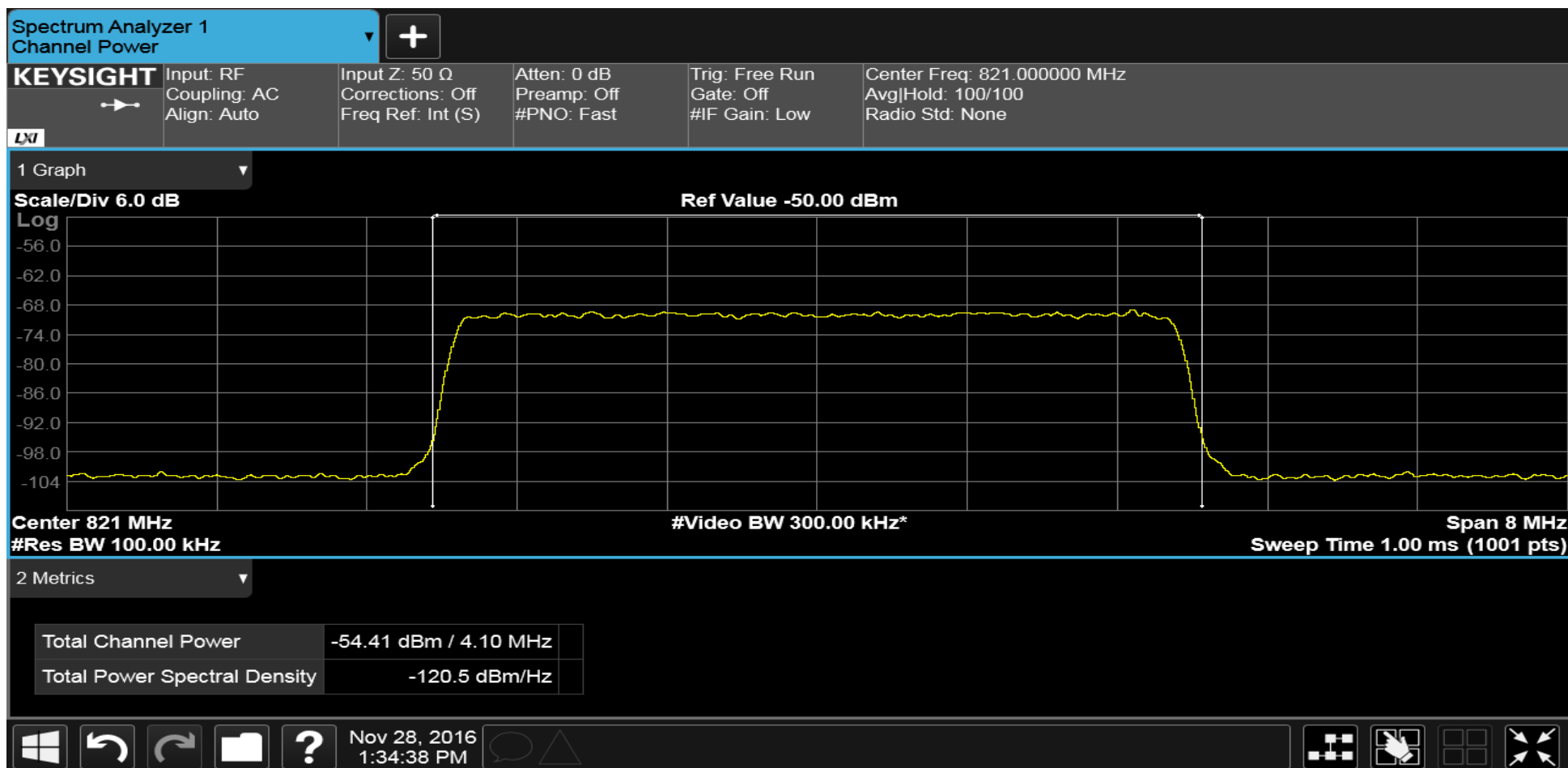
RETLIF TESTING LABORATORIES

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
Operating Mode	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 °C Relative Humidity: 29.6 %		
Notes	Uplink Signal Generator Setting: -54.20dBm (-54.41dBm measured signal generator output) Amplifier Output: 27.12dBm Gain: 81.53dB		



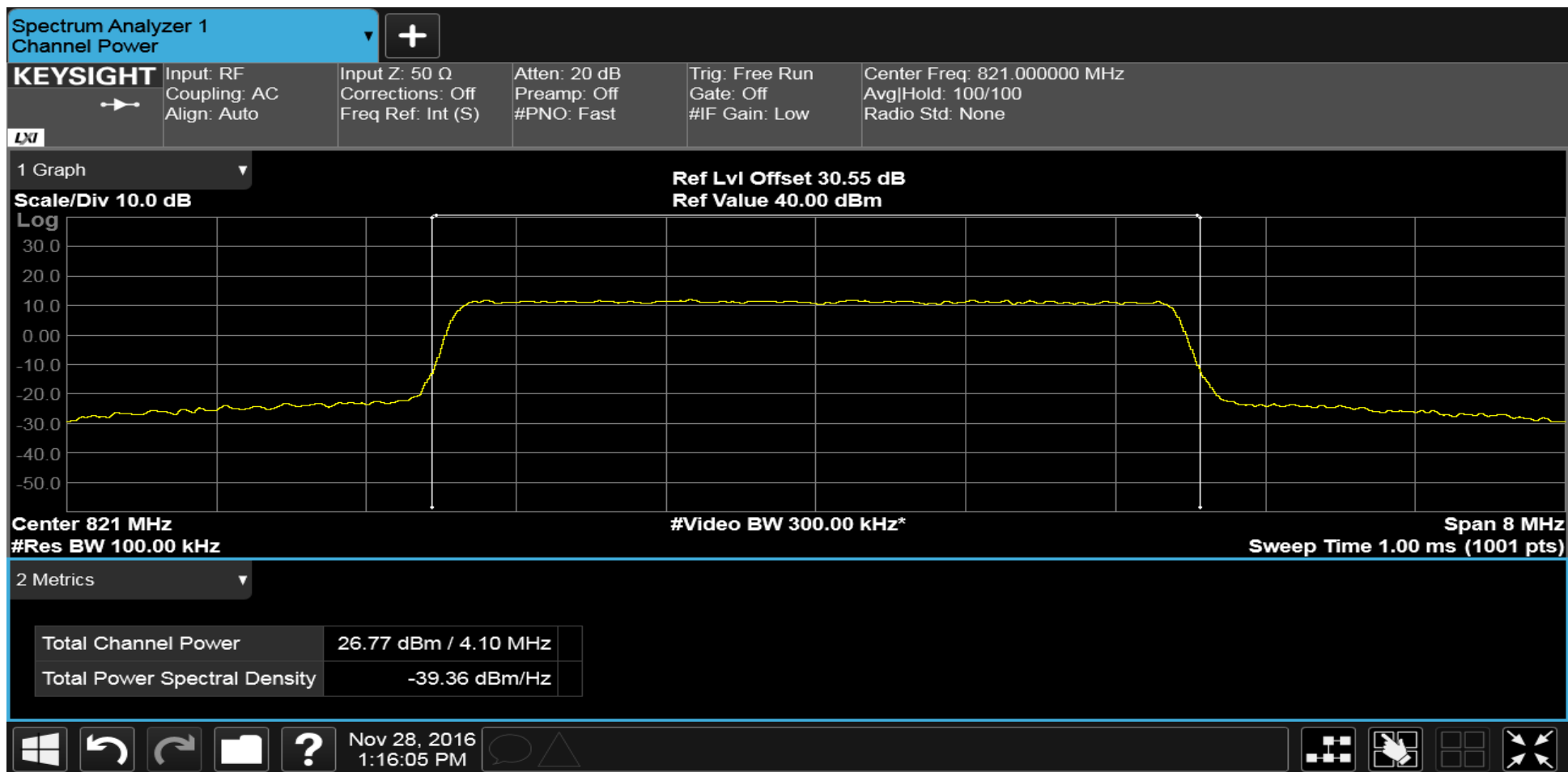
RETLIF TESTING LABORATORIES

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
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 °C Relative Humidity: 29.6 %		
Notes	Signal Generator Setting: -54.20dBm (-54.41dBm measured signal generator output) Amplifier Output: 27.12dBm Gain: 81.53dB		



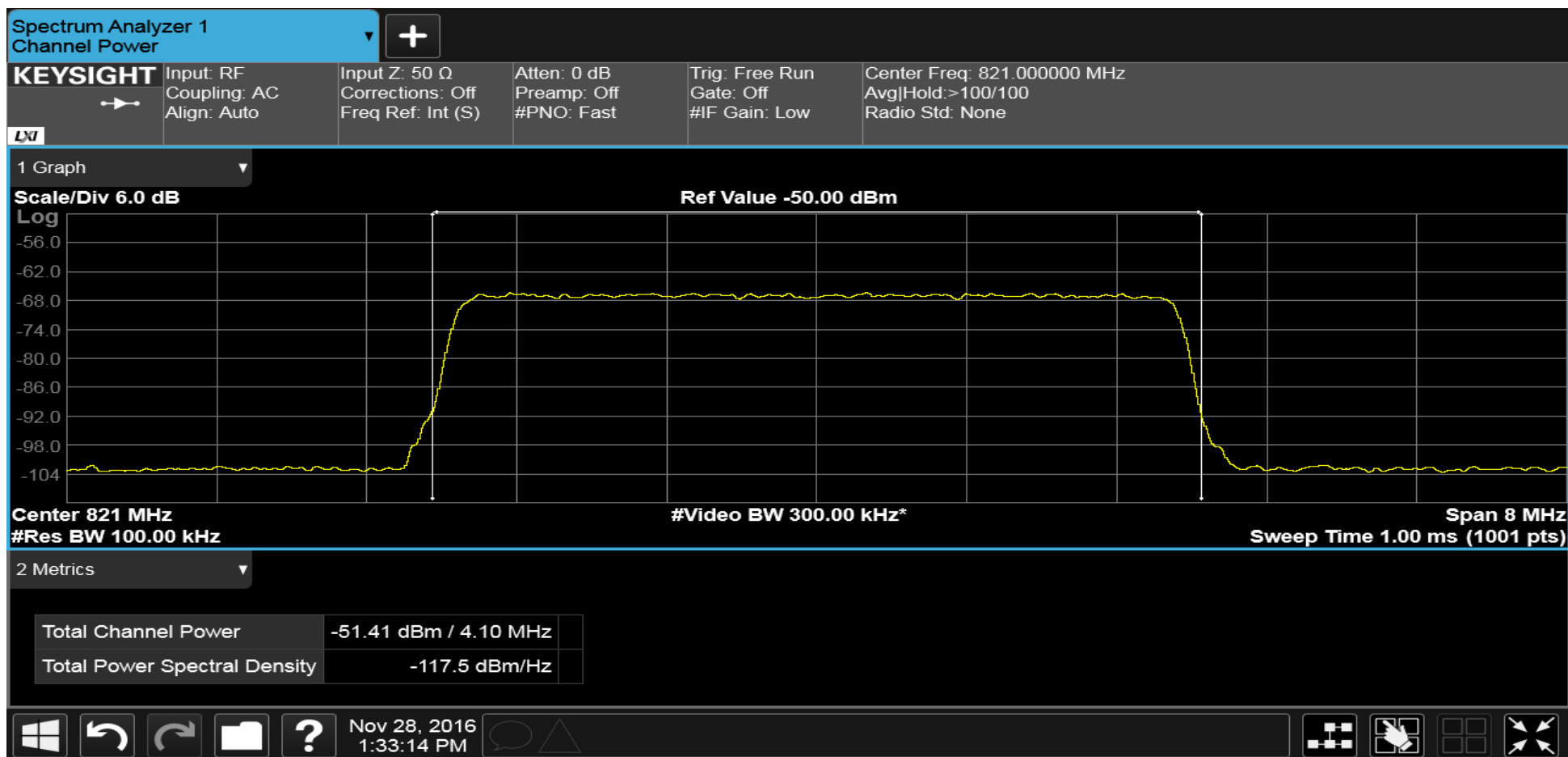
RETLIF TESTING LABORATORIES

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
Operating Mode	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 generator output) Amplifier Output: 26.77dBm Gain: 78.18dB		



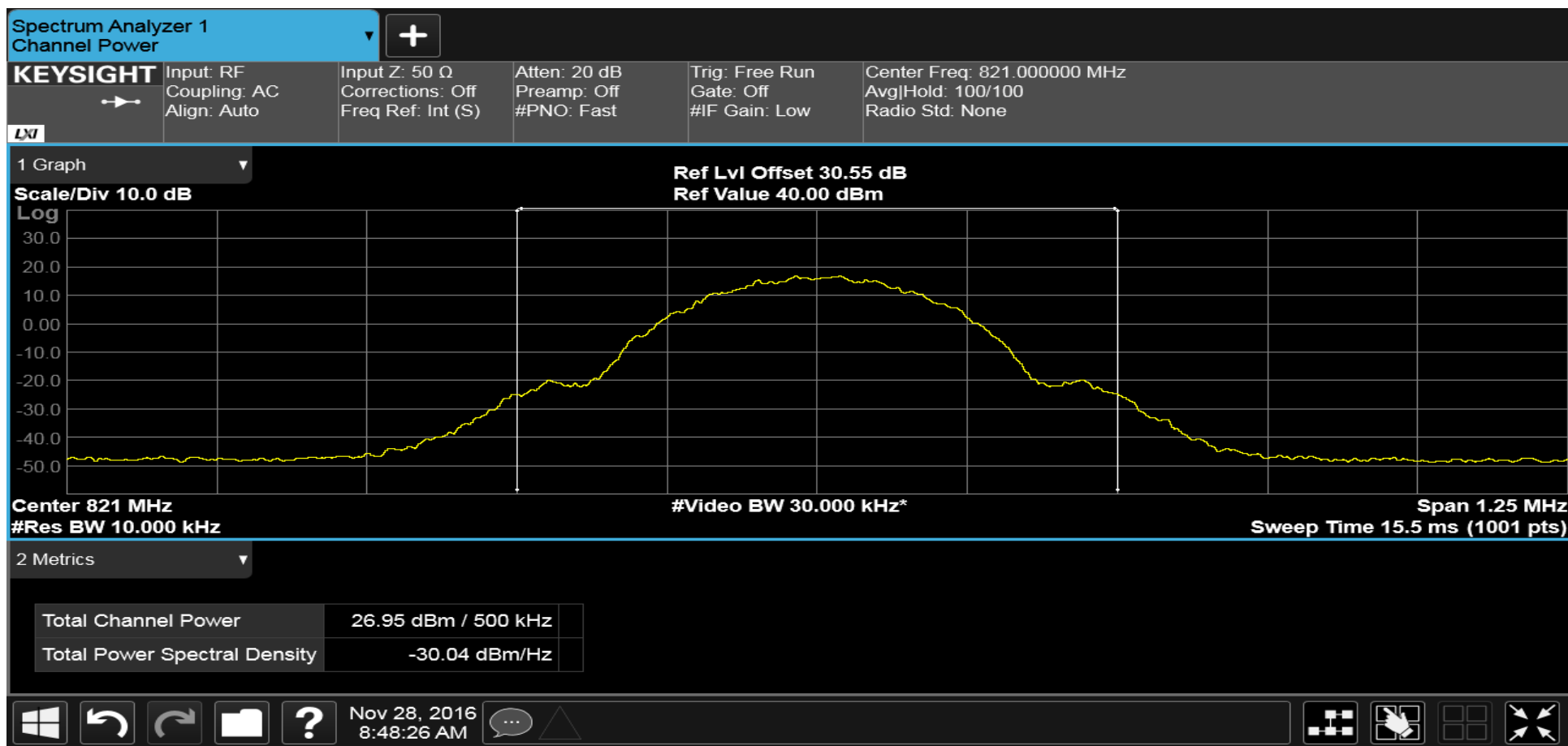
RETLIF TESTING LABORATORIES

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
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 °C Relative Humidity: 29.6 %		
Notes	Signal Generator Setting: -51.20dBm (-51.41dBm measured signal generator 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
Operating Mode	Amplifying GSM signal at 821 MHz		
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 (-54.74dBm measured signal generator output) Amplifier Output: 26.95dBm Gain: 81.69dB		



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
Operating Mode	Signal Generator GSM Output 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	Signal Generator Setting: -54.30dBm (-54.74dBm measured signal generator output) Amplifier Output: 26.95dBm Gain: 81.69dB		

Spectrum Analyzer 1
Channel Power



KEYSIGHT



Input: RF
Coupling: AC
Align: Auto

Input Z: 50 Ω
Corrections: Off
Freq Ref: Int (S)

Atten: 0 dB
Preamp: Off
#PNO: Fast

Trig: Free Run
Gate: Off
#IF Gain: Low

Center Freq: 821.000000 MHz
Avg/Hold: 100/100
Radio Std: None

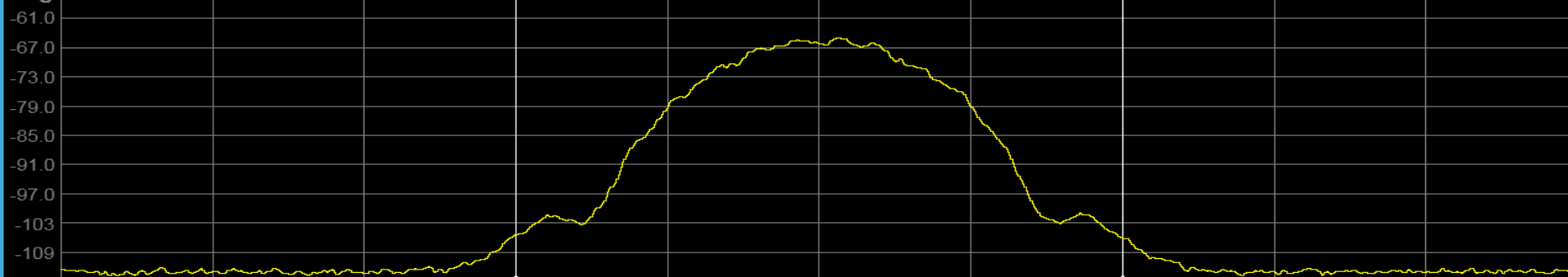
LN

1 Graph

Scale/Div 6.0 dB

Ref Value -55.00 dBm

Log



Center 821 MHz

#Video BW 30.000 kHz*

Span 1.25 MHz

#Res BW 10.000 kHz

Sweep Time 15.5 ms (1001 pts)

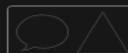
2 Metrics

Total Channel Power -54.74 dBm / 500 kHz

Total Power Spectral Density -111.7 dBm/Hz



Nov 28, 2016
1:37:24 PM



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
Operating Mode	Amplifying GSM 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: -51.30dBm (-51.68dBm measured signal generator output) Amplifier Output: 26.81dBm Gain: 78.49dB		

Spectrum Analyzer 1
Channel Power



KEYSIGHT



Input: RF
Coupling: AC
Align: Auto

Input Z: 50 Ω
Corrections: Off
Freq Ref: Int (S)

Atten: 20 dB
Preamp: Off
#PNO: Fast

Trig: Free Run
Gate: Off
#IF Gain: Low

Center Freq: 821.000000 MHz
Avg/Hold: >100/100
Radio Std: None

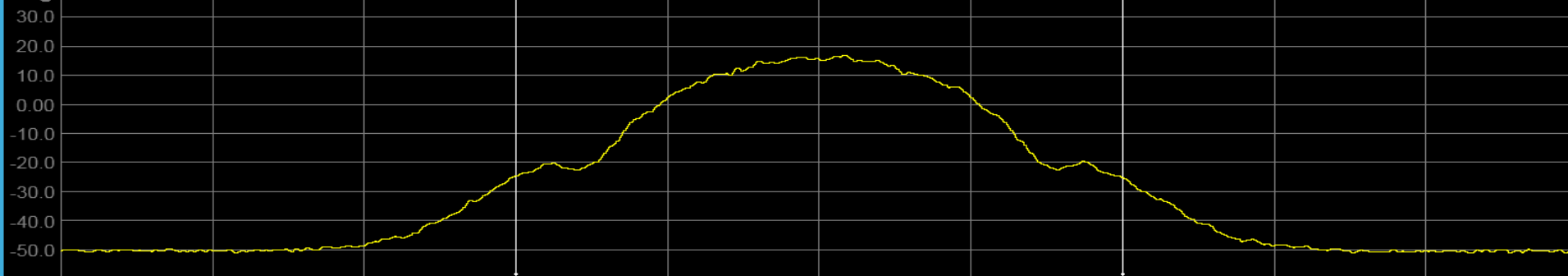
LVI

1 Graph

Ref Lvl Offset 30.55 dB
Ref Value 40.00 dBm

Scale/Div 10.0 dB

Log



Center 821 MHz

#Video BW 30.000 kHz*

Span 1.25 MHz

#Res BW 10.000 kHz

Sweep Time 15.5 ms (1001 pts)

2 Metrics

Total Channel Power

26.81 dBm / 500 kHz

Total Power Spectral Density

-30.18 dBm/Hz



Nov 28, 2016
1:14:04 PM



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
Operating Mode	Signal Generator GSM 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 °C Relative Humidity: 29.6 %		
Notes	Signal Generator Setting: -51.30dBm (-51.68dBm measured signal generator output) Amplifier Output: 26.81dBm Gain: 78.49dB		

Spectrum Analyzer 1
Channel Power



KEYSIGHT



Input: RF
Coupling: AC
Align: Auto

Input Z: 50 Ω
Corrections: Off
Freq Ref: Int (S)

Atten: 0 dB
Preamp: Off
#PNO: Fast

Trig: Free Run
Gate: Off
#IF Gain: Low

Center Freq: 821.000000 MHz
Avg/Hold: 100/100
Radio Std: None

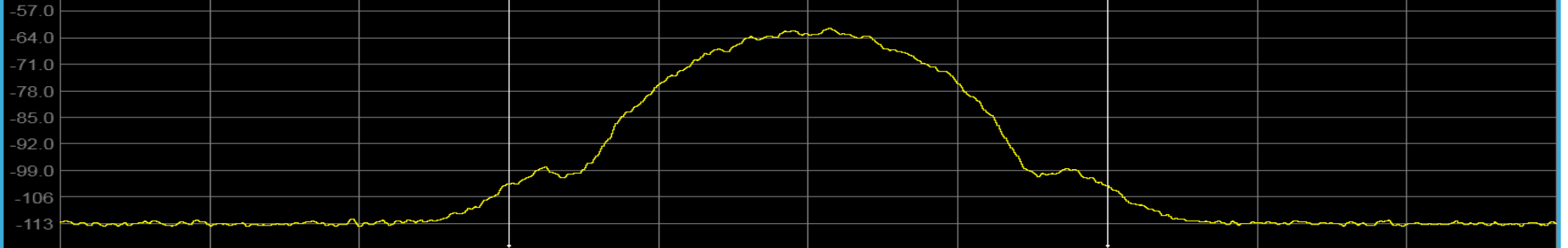
DI

1 Graph

Scale/Div 7.0 dB

Ref Value -50.00 dBm

Log



Center 821 MHz

#Video BW 30.000 kHz*

Span 1.25 MHz

#Res BW 10.000 kHz

Sweep Time 15.5 ms (1001 pts)

2 Metrics

Total Channel Power	-51.68 dBm / 500 kHz
Total Power Spectral Density	-108.7 dBm/Hz

Nov 28, 2016
1:38:58 PM

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
Operating Mode	Amplifying LTE signal at 866 MHz		
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 (-54.13dBm measured signal generator output) Amplifier Output: 27.54dBm Gain: 81.67dB		

Spectrum Analyzer 1
Channel Power



KEYSIGHT



Input: RF
Coupling: AC
Align: Auto

Input Z: 50 Ω
Corrections: Off
Freq Ref: Int (S)

Atten: 20 dB
Preamp: Off
#PNO: Fast

Trig: Free Run
Gate: Off
#IF Gain: Low

Center Freq: 866.000000 MHz
Avg/Hold: 100/100
Radio Std: None

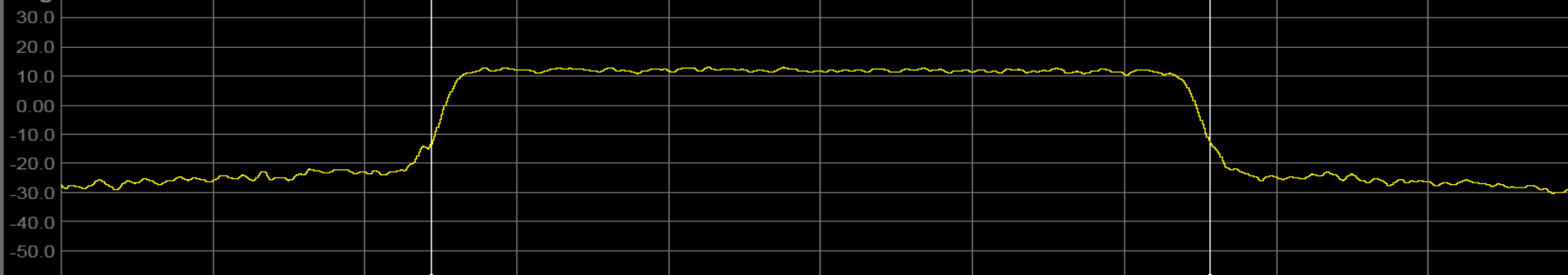
LI

1 Graph

Ref Lvl Offset 30.55 dB
Ref Value 40.00 dBm

Scale/Div 10.0 dB

Log



Center 866 MHz

#Video BW 300.00 kHz*

Span 8 MHz

#Res BW 100.00 kHz

#Sweep Time 1.00 ms (1001 pts)

2 Metrics

Total Channel Power 27.54 dBm / 4.10 MHz

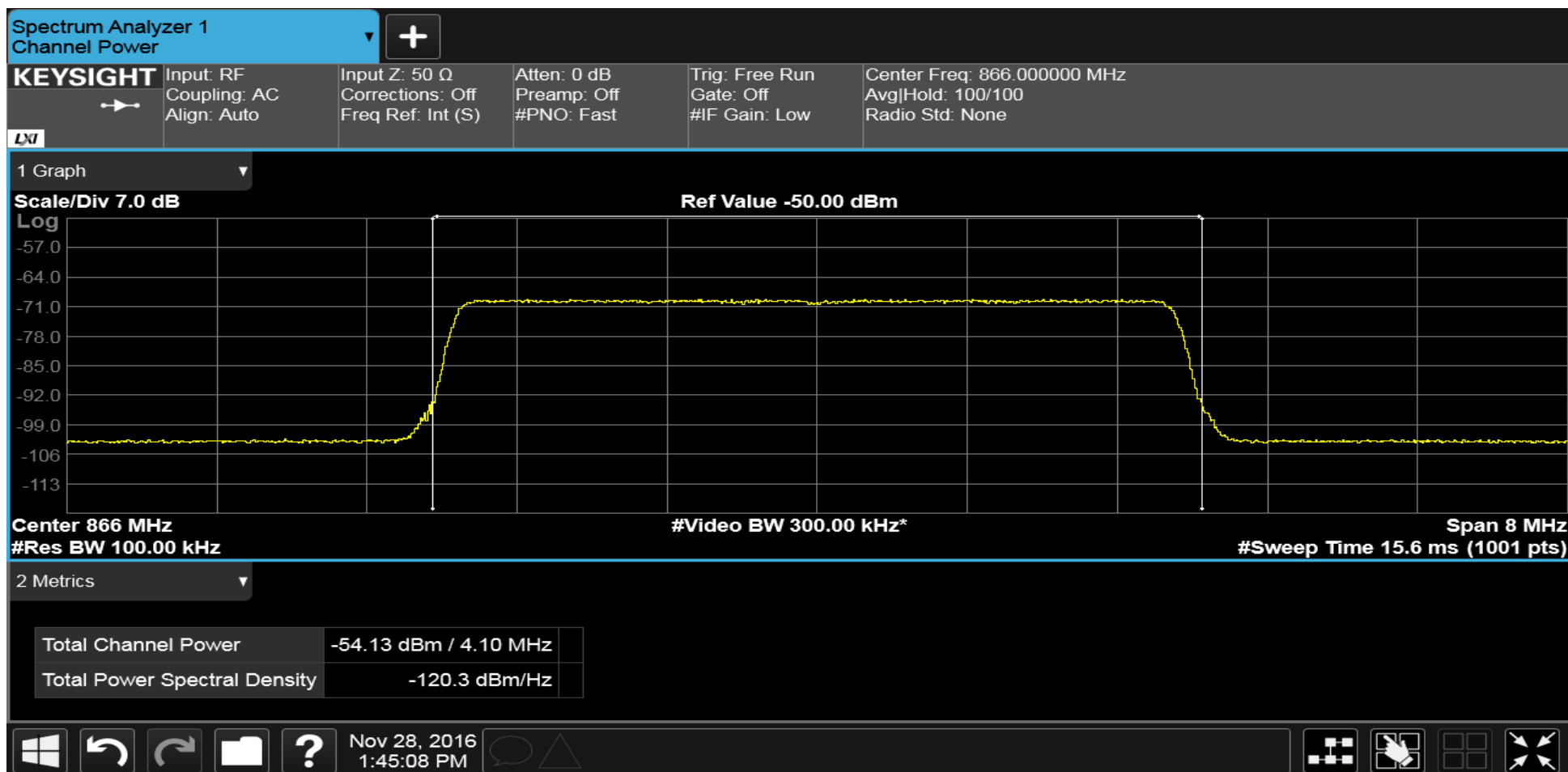
Total Power Spectral Density -38.59 dBm/Hz

Nov 28, 2016 7:45:44 AM



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
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 output) Amplifier Output: 27.54dBm Gain: 81.67dB		



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
Operating Mode	Amplifying LTE signal at 866 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	Downlink with AGC Signal Generator Setting: -51.00dBm (-51.13dBm measured signal generator output) Amplifier Output: 26.97dBm Gain: 78.10dB		

Spectrum Analyzer 1
Channel Power



KEYSIGHT



Input: RF
Coupling: AC
Align: Auto

Input Z: 50 Ω
Corrections: Off
Freq Ref: Int (S)

Atten: 20 dB
Preampl: Off
#PNO: Fast

Trig: Free Run
Gate: Off
#IF Gain: Low

Center Freq: 866.000000 MHz
Avg/Hold: 100/100
Radio Std: None

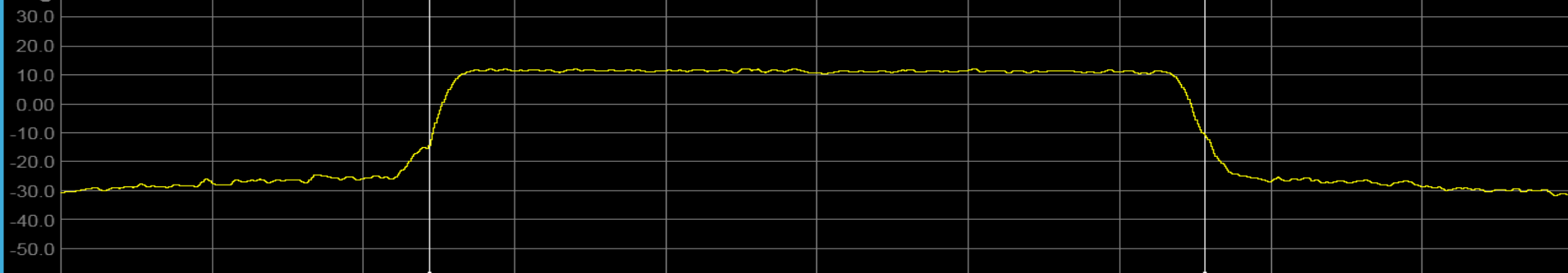
LXI

1 Graph

Ref Lvl Offset 30.55 dB
Ref Value 40.00 dBm

Scale/Div 10.0 dB

Log



Center 866 MHz

#Video BW 300.00 kHz*

Span 8 MHz

#Res BW 100.00 kHz

Sweep Time 1.00 ms (1001 pts)

2 Metrics

Total Channel Power 26.97 dBm / 4.10 MHz

Total Power Spectral Density -39.16 dBm/Hz

Nov 28, 2016
1:06:30 PM



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
Operating Mode	Signal Generator LTE Output at 866MHz, 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	Signal Generator Setting: -51.00dBm (-51.13dBm measured signal generator output) Amplifier Output: 26.97dBm Gain: 78.10dB		

Spectrum Analyzer 1
Channel Power



KEYSIGHT



Input: RF
Coupling: AC
Align: Auto

Input Z: 50 Ω
Corrections: Off
Freq Ref: Int (S)

Atten: 0 dB
Preampl: Off
#PNO: Fast

Trig: Free Run
Gate: Off
#IF Gain: Low

Center Freq: 866.000000 MHz
Avg/Hold: 100/100
Radio Std: None

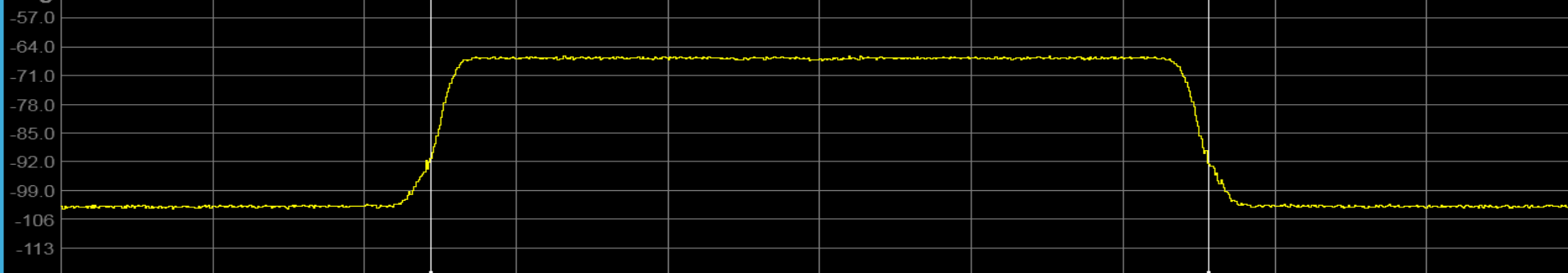
DI

1 Graph

Scale/Div 7.0 dB

Ref Value -50.00 dBm

Log



Center 866 MHz

#Video BW 300.00 kHz*

Span 8 MHz

#Res BW 100.00 kHz

#Sweep Time 15.6 ms (1001 pts)

2 Metrics

Total Channel Power	-51.13 dBm / 4.10 MHz
Total Power Spectral Density	-117.3 dBm/Hz

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
Operating Mode	Amplifying GSM signal at 866 MHz		
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: -53.70dBm (-53.95dBm measured signal generator output) Amplifier Output: 27.31dBm Gain: 81.26dB		

Spectrum Analyzer 1
Channel Power



KEYSIGHT



Input: RF
Coupling: AC
Align: Auto

Input Z: 50 Ω
Corrections: Off
Freq Ref: Int (S)

Atten: 20 dB
Preamp: Off
#PNO: Fast

Trig: Free Run
Gate: Off
#IF Gain: Low

Center Freq: 866.000000 MHz
Avg/Hold: 100/100
Radio Std: None

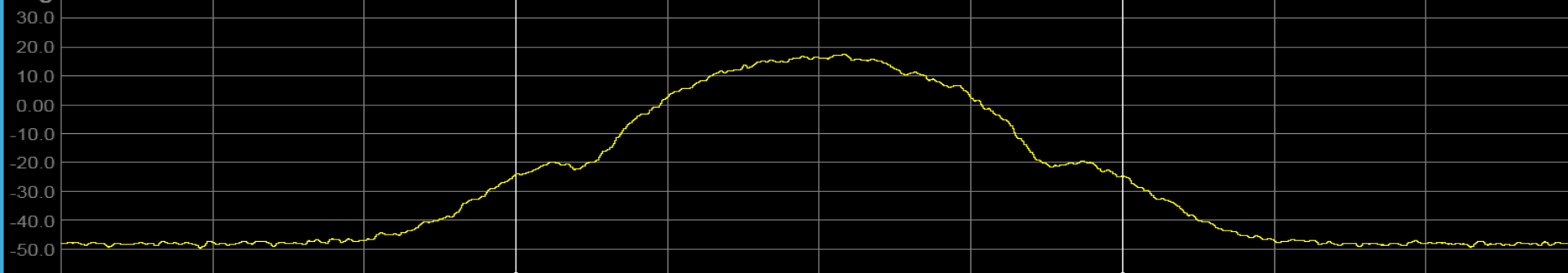
LI

1 Graph

Ref Lvl Offset 30.55 dB
Ref Value 40.00 dBm

Scale/Div 10.0 dB

Log



Center 866 MHz

#Video BW 30.000 kHz*

#Res BW 10.000 kHz

Span 1.25 MHz
Sweep Time 15.5 ms (1001 pts)

2 Metrics

Total Channel Power

27.31 dBm / 500 kHz

Total Power Spectral Density

-29.68 dBm/Hz



Nov 28, 2016
9:01:04 AM



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
Operating Mode	Signal Generator GSM 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: -53.70dBm (-53.95dBm measured signal generator output) Amplifier Output: 27.31dBm Gain: 81.26dB		

Spectrum Analyzer 1
Channel Power



KEYSIGHT



Input: RF
Coupling: AC
Align: Auto

Input Z: 50 Ω
Corrections: Off
Freq Ref: Int (S)

Atten: 0 dB
Preamp: Off
#PNO: Fast

Trig: Free Run
Gate: Off
#IF Gain: Low

Center Freq: 866.000000 MHz
Avg|Hold: 100/100
Radio Std: None

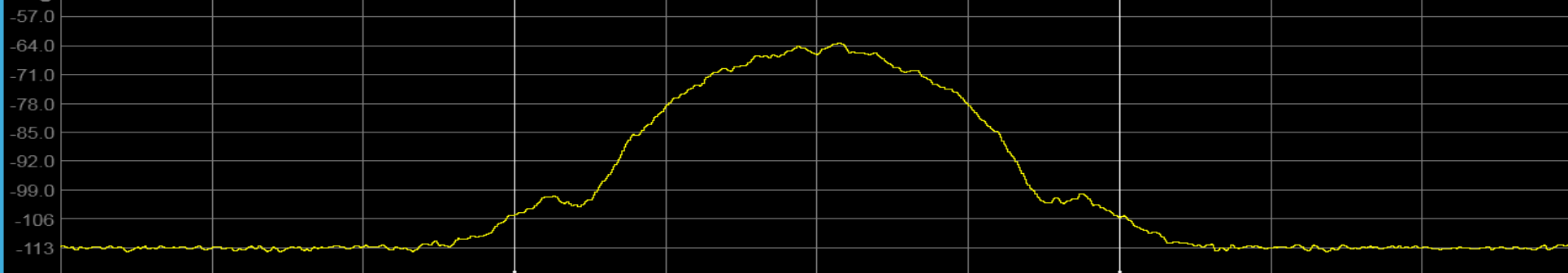
LI

1 Graph

Scale/Div 7.0 dB

Ref Value -50.00 dBm

Log



Center 866 MHz

#Res BW 10.000 kHz

#Video BW 30.000 kHz*

Span 1.25 MHz

Sweep Time 15.5 ms (1001 pts)

2 Metrics

Total Channel Power	-53.95 dBm / 500 kHz
Total Power Spectral Density	-110.9 dBm/Hz

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
Operating Mode	Amplifying GSM signal at 866 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	Downlink with AGC Signal Generator Setting: -50.70dBm (-51.01dBm measured signal generator output) Amplifier Output: 27.29dBm Gain: 78.30dB		

Spectrum Analyzer 1
Channel Power



KEYSIGHT



Input: RF
Coupling: AC
Align: Auto

Input Z: 50 Ω
Corrections: Off
Freq Ref: Int (S)

Atten: 20 dB
Preamp: Off
#PNO: Fast

Trig: Free Run
Gate: Off
#IF Gain: Low

Center Freq: 866.000000 MHz
Avg|Hold: 100/100
Radio Std: None

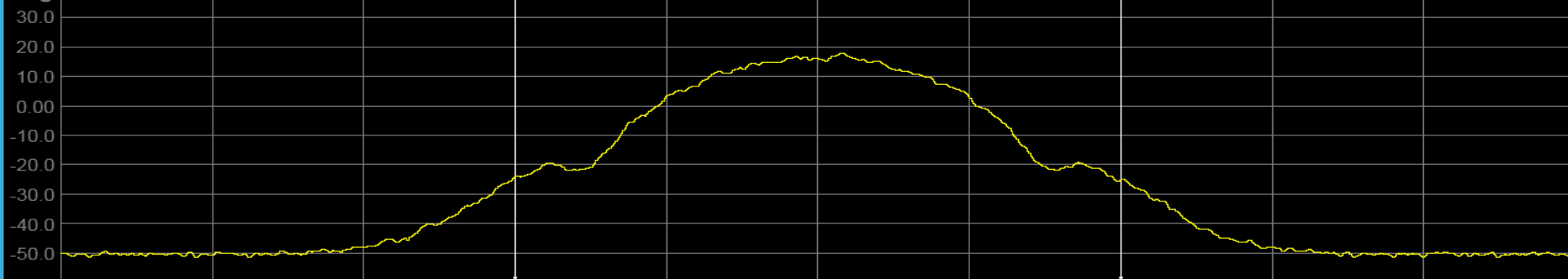
LN

1 Graph

Ref Lvl Offset 30.55 dB
Ref Value 40.00 dBm

Scale/Div 10.0 dB

Log



Center 866 MHz

#Res BW 10.000 kHz

#Video BW 30.000 kHz*

Span 1.25 MHz

Sweep Time 15.5 ms (1001 pts)

2 Metrics

Total Channel Power	27.29 dBm / 500 kHz
Total Power Spectral Density	-29.70 dBm/Hz

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
Operating Mode	Signal Generator GSM Output at 866MHz, 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	Signal Generator Setting: -50.70dBm (-51.01dBm measured signal generator output) Amplifier Output: 27.29dBm Gain: 78.30dB		

Spectrum Analyzer 1
Channel Power



KEYSIGHT



Input: RF
Coupling: AC
Align: Auto

Input Z: 50 Ω
Corrections: Off
Freq Ref: Int (S)

Atten: 0 dB
Preamp: Off
#PNO: Fast

Trig: Free Run
Gate: Off
#IF Gain: Low

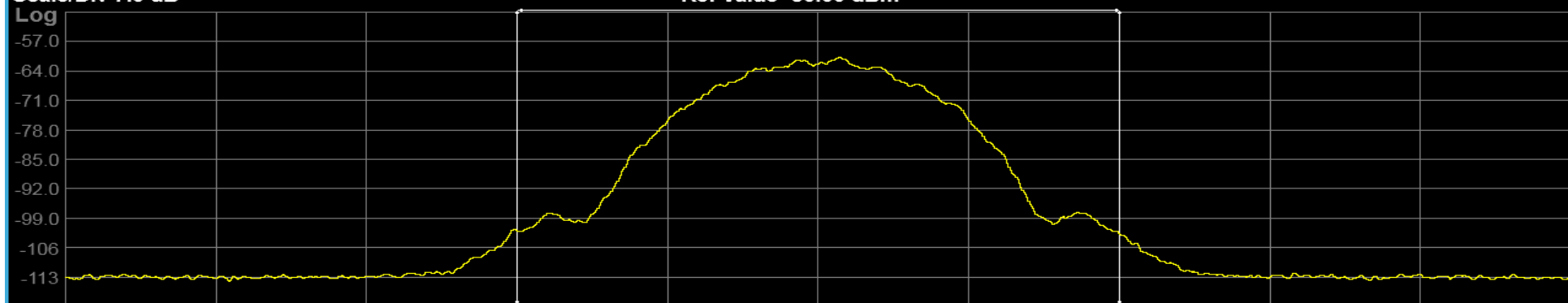
Center Freq: 866.000000 MHz
Avg|Hold: 100/100
Radio Std: None

LN

1 Graph

Scale/Div 7.0 dB

Ref Value -50.00 dBm



Center 866 MHz

#Video BW 30.000 kHz*

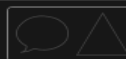
Span 1.25 MHz

#Res BW 10.000 kHz

#Sweep Time 15.6 ms (1001 pts)

2 Metrics

Total Channel Power	-51.01 dBm / 500 kHz
Total Power Spectral Density	-108.0 dBm/Hz



Test Photographs

Noise Figure Measurements



Test Configuration



Retlif Testing Laboratories

Report No. R-6142N-4

**Noise Figure Measurements
Test Data**

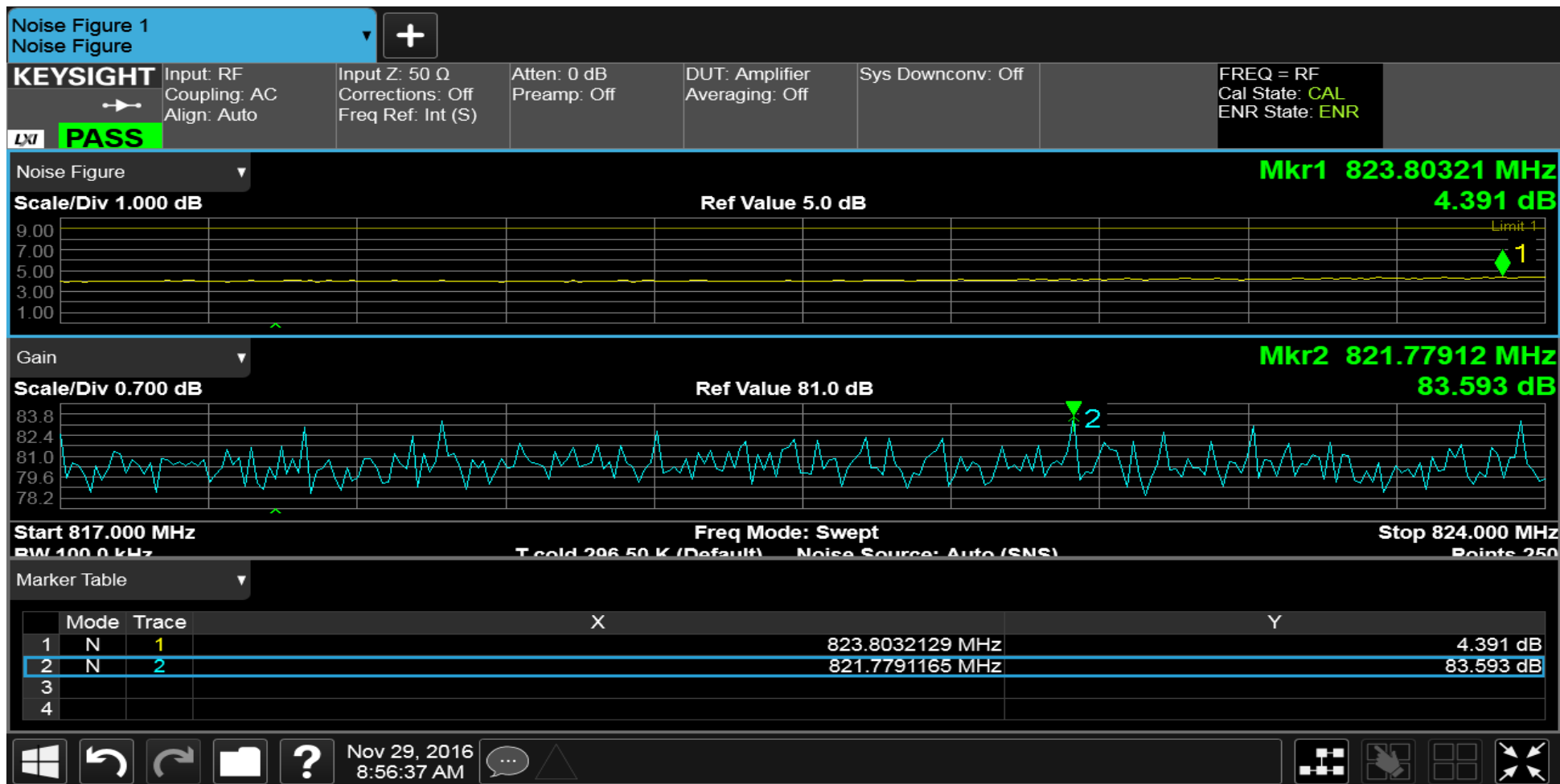


Retlif Testing Laboratories

Report No. R-6142N-4

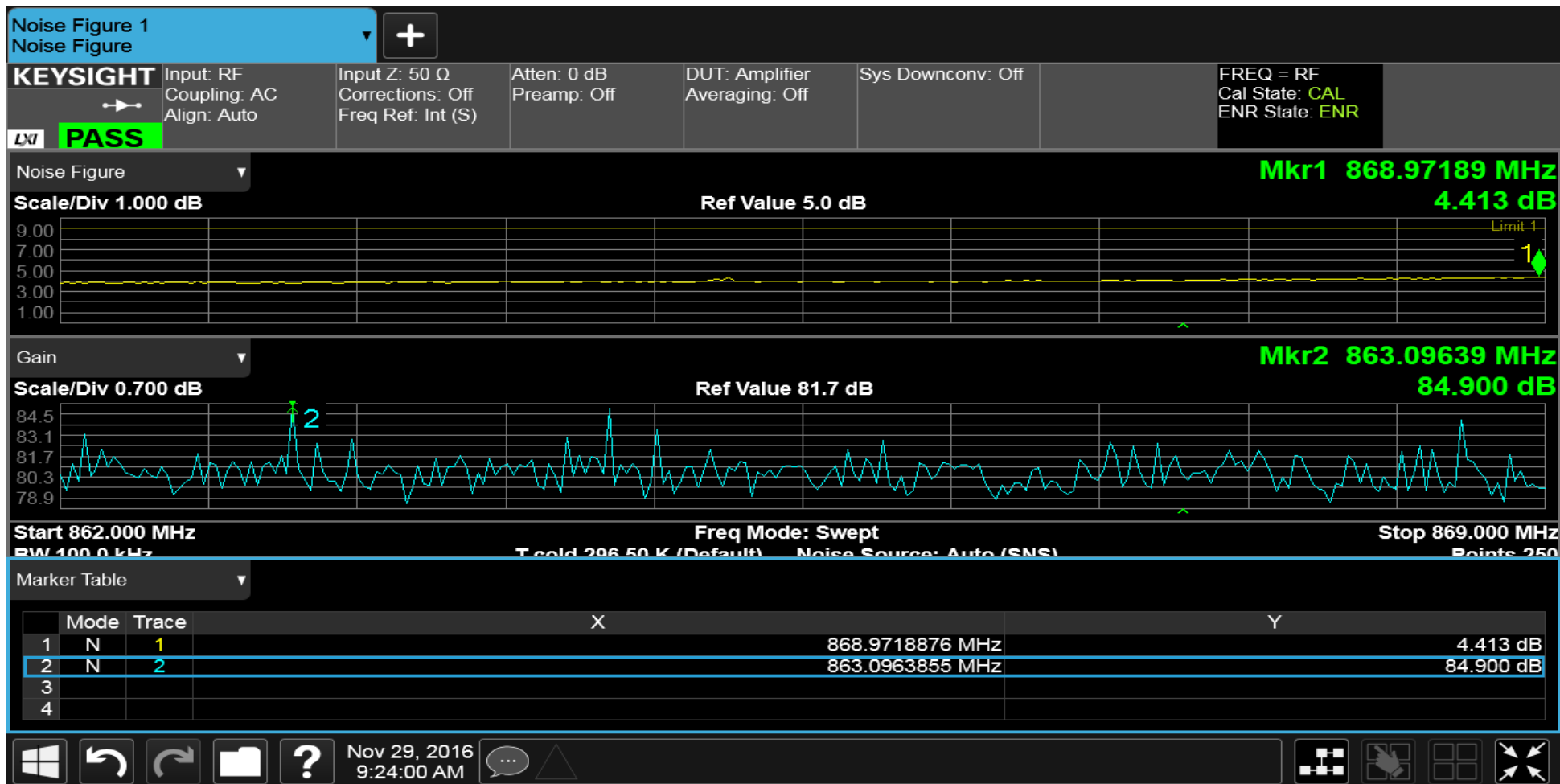
RETLIF TESTING LABORATORIES

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



RETLIF TESTING LABORATORIES

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



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



Out of Band/Out of Block, Test Setup



Spurious Emissions Conducted, Test Setup



Retlif Testing Laboratories

Report No. R-6142N-4

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



Spurious Emissions, Radiated, Test Setup



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



Retlif Testing Laboratories

Report No. R-6142N-4

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



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



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



Retlif Testing Laboratories

Report No. R-6142N-4

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



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



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



Retlif Testing Laboratories

Report No. R-6142N-4

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



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



Retlif Testing Laboratories

Report No. R-6142N-4

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



Retlif Testing Laboratories

Report No. R-6142N-4

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

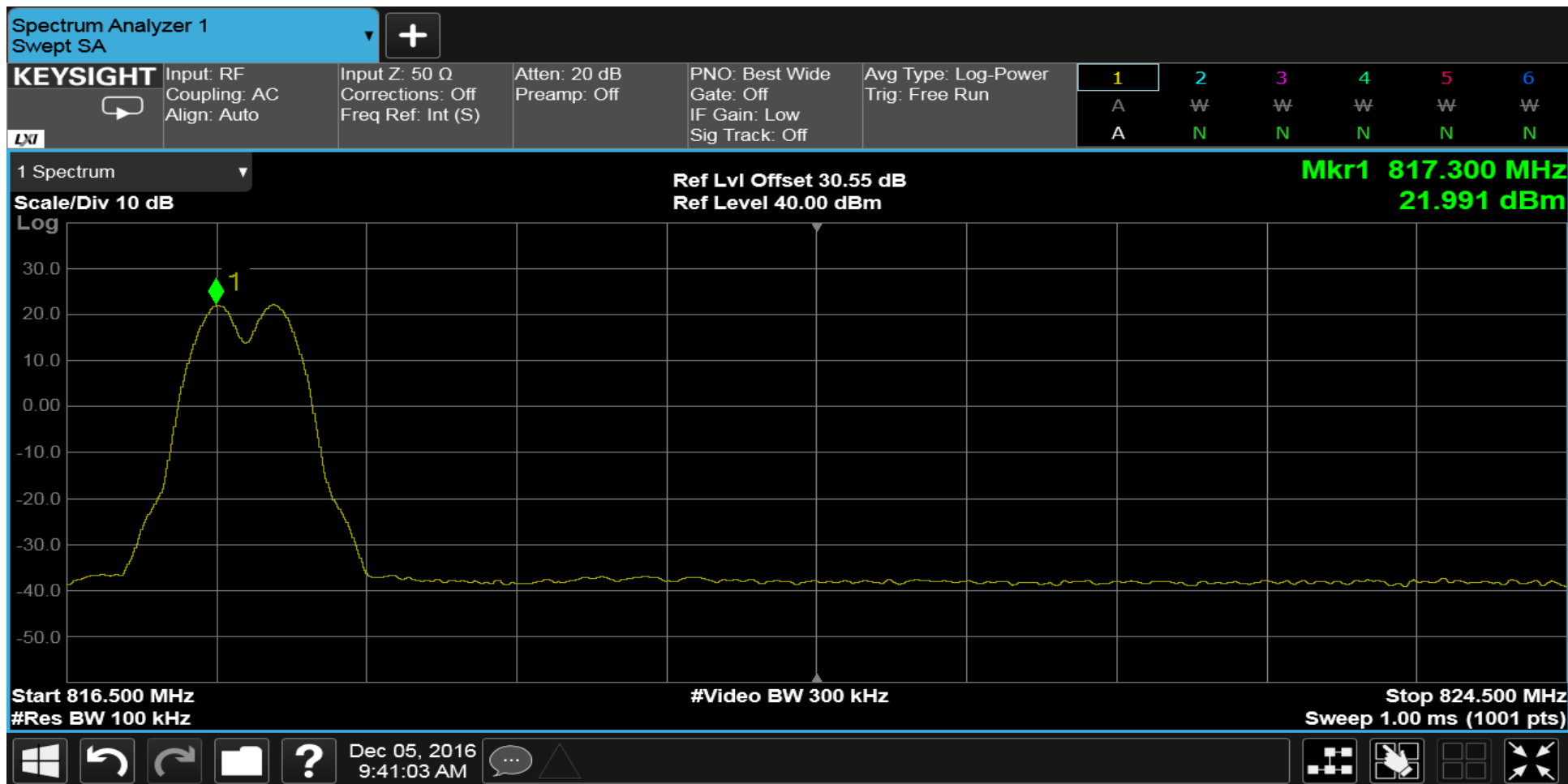


Retlif Testing Laboratories

Report No. R-6142N-4

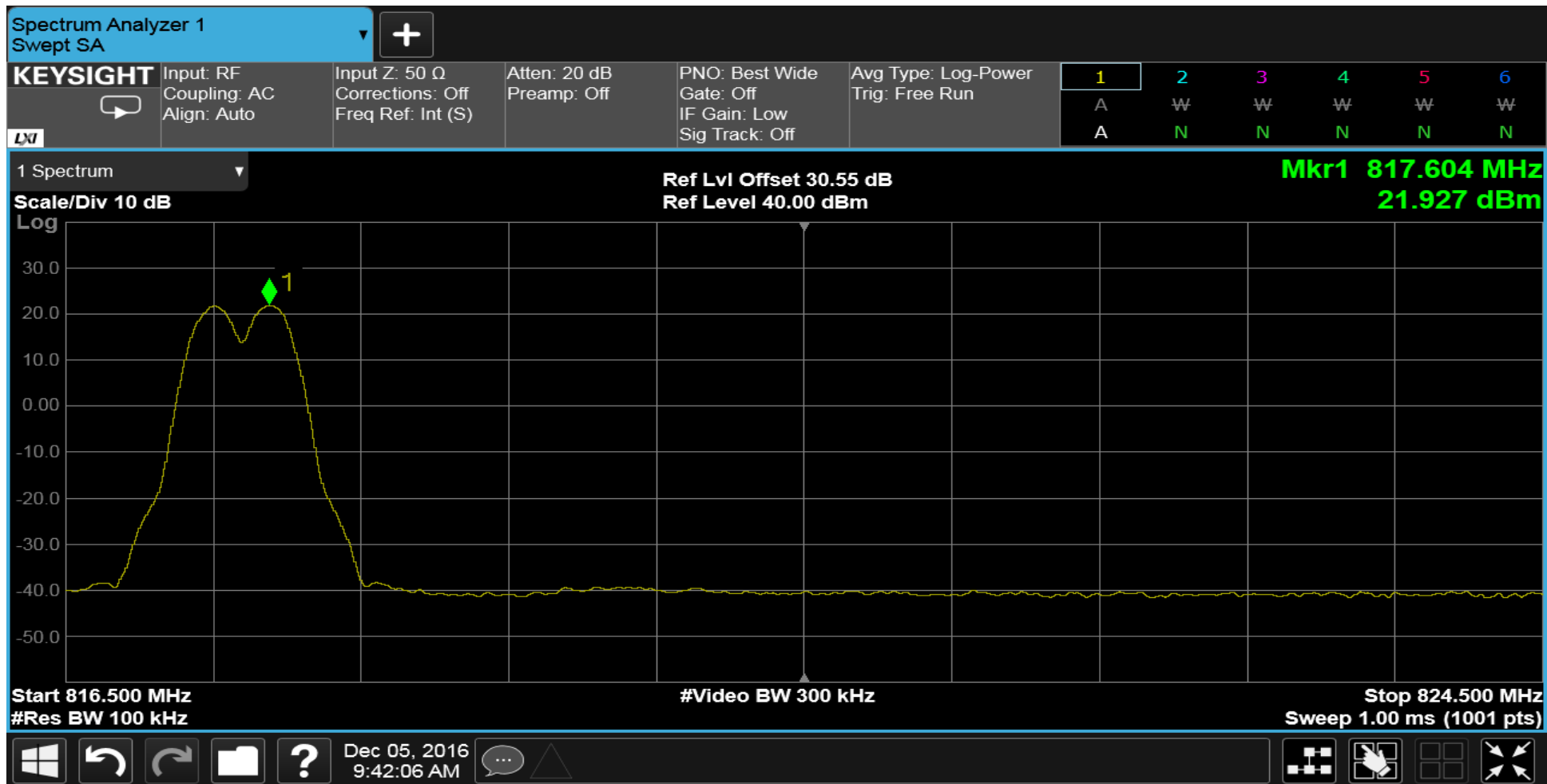
RETLIF TESTING LABORATORIES

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		
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		



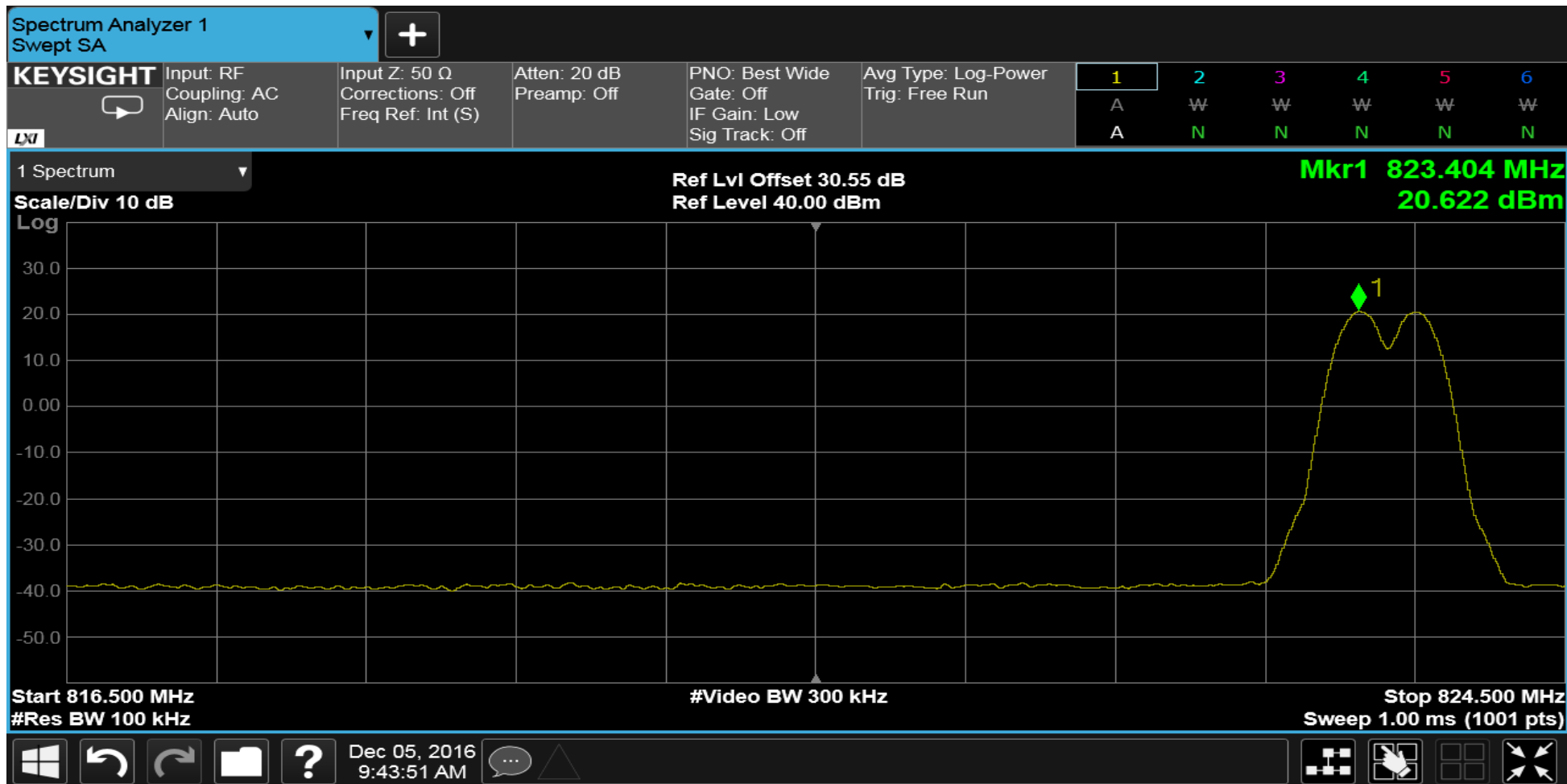
RETLIF TESTING LABORATORIES

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
Climatic Conditions	Temp: 19.3 °C Relative Humidity: 29.6 %		
Notes	Uplink: GSM 817.3MHz and 817.6MHz		



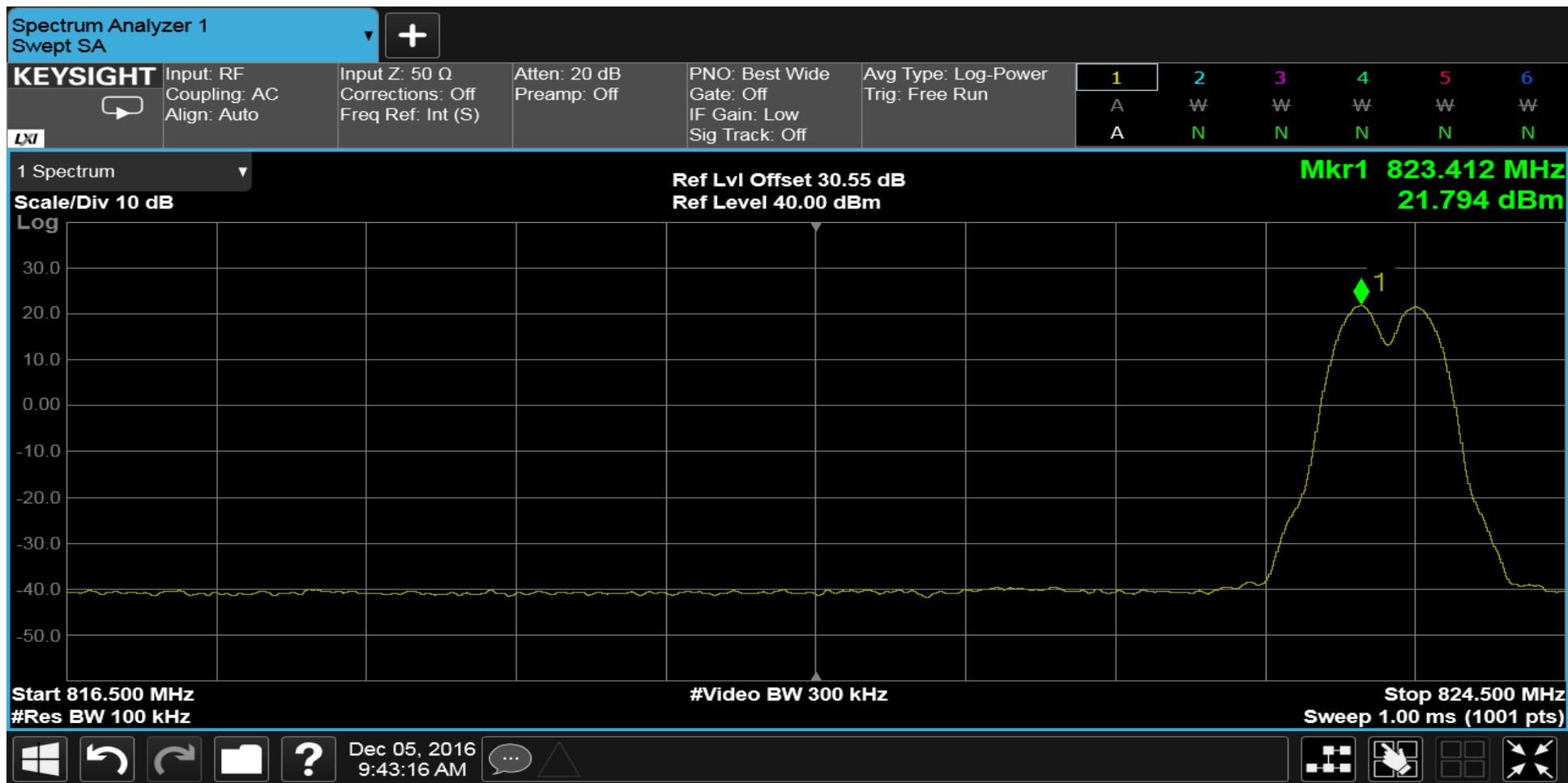
RETLIF TESTING LABORATORIES

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		
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		



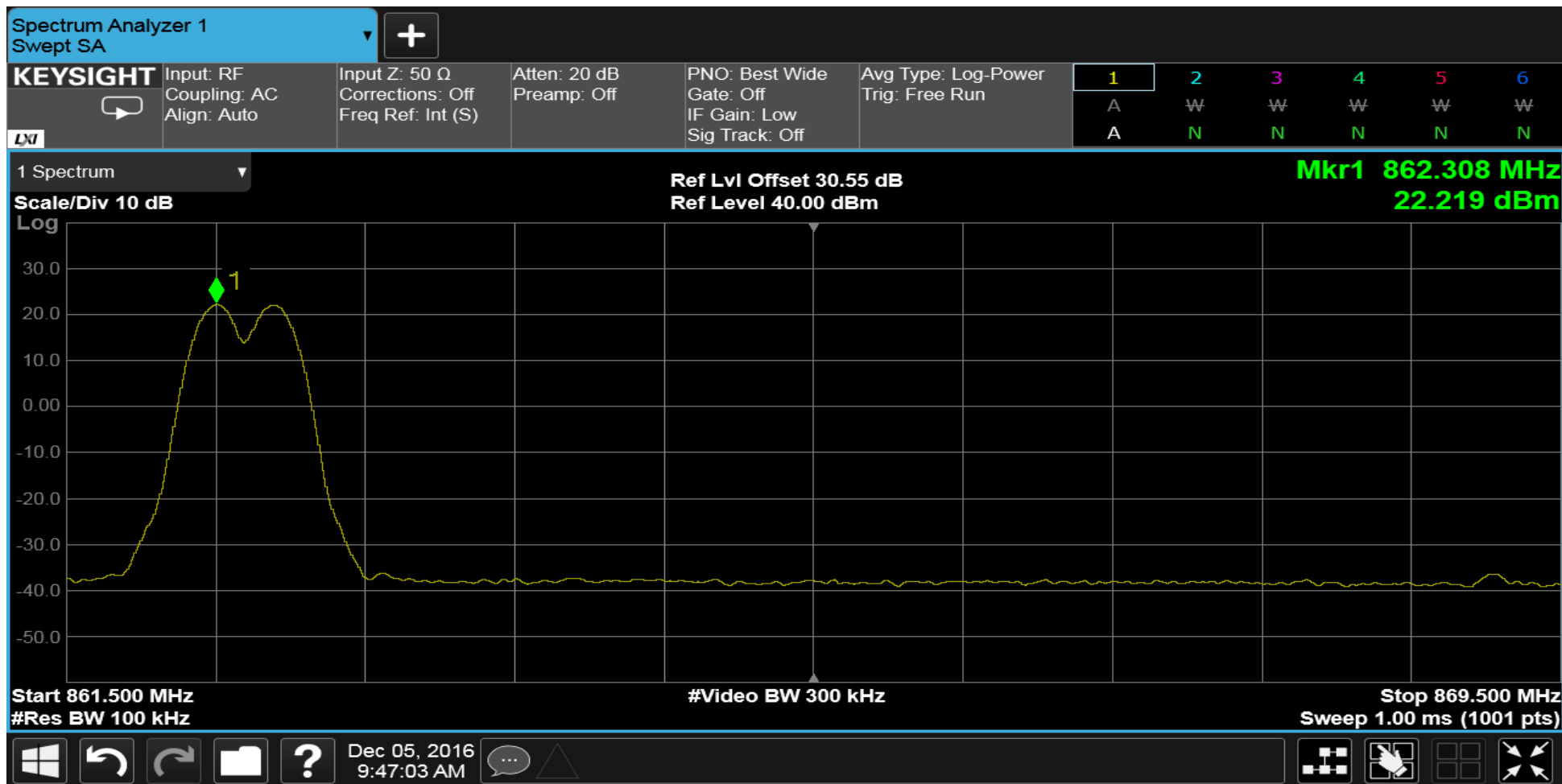
RETLIF TESTING LABORATORIES

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
Climatic Conditions	Temp: 19.3 °C Relative Humidity: 29.6 %		
Notes	Uplink: GSM 823.4MHz and 823.7MHz		



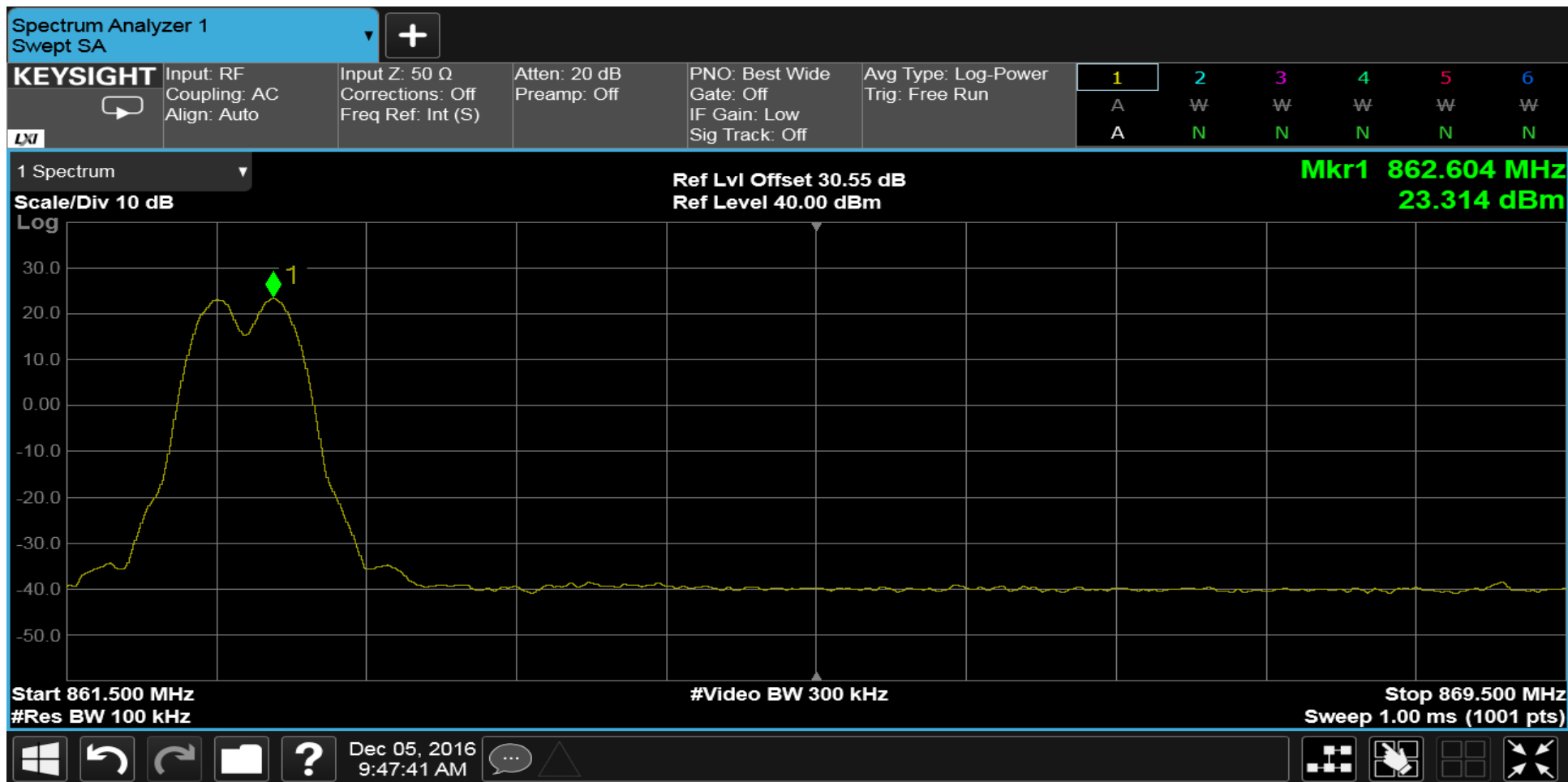
RETLIF TESTING LABORATORIES

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		
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		



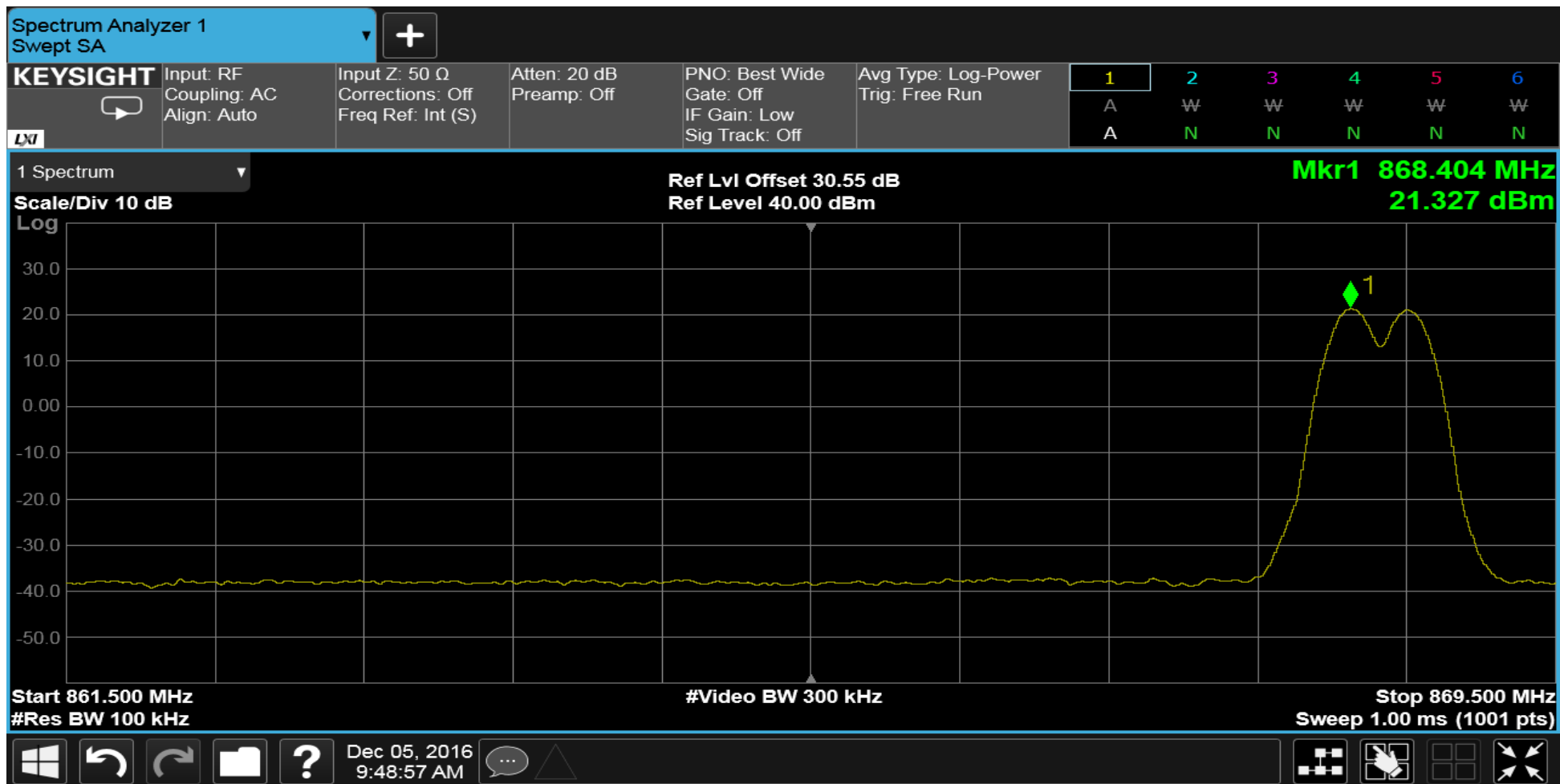
RETLIF TESTING LABORATORIES

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
Climatic Conditions	Temp: 19.3 °C Relative Humidity: 29.6 %		
Notes	Downlink: GSM 862.3MHz and 862.6MHz		



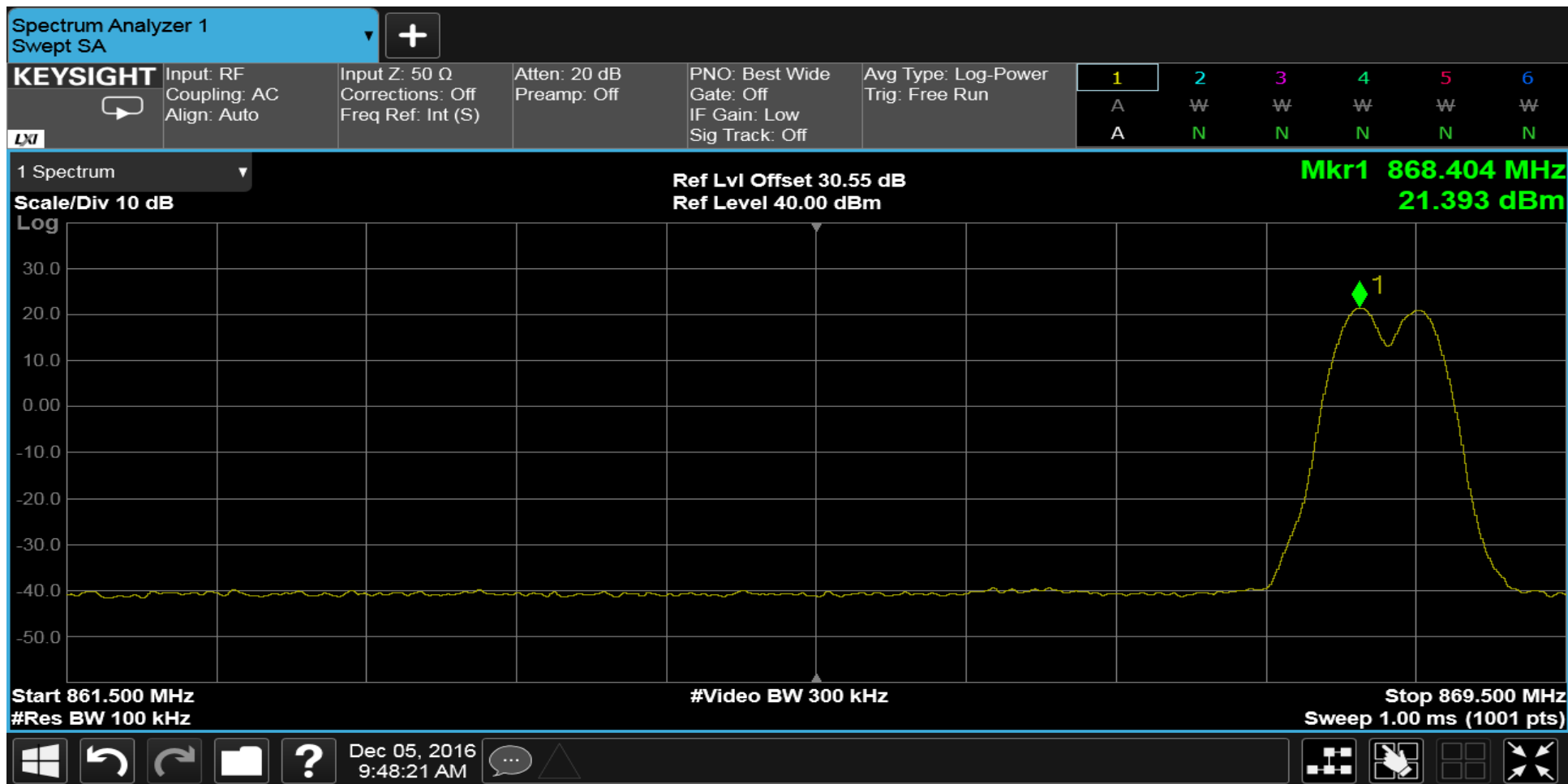
RETLIF TESTING LABORATORIES

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		
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		



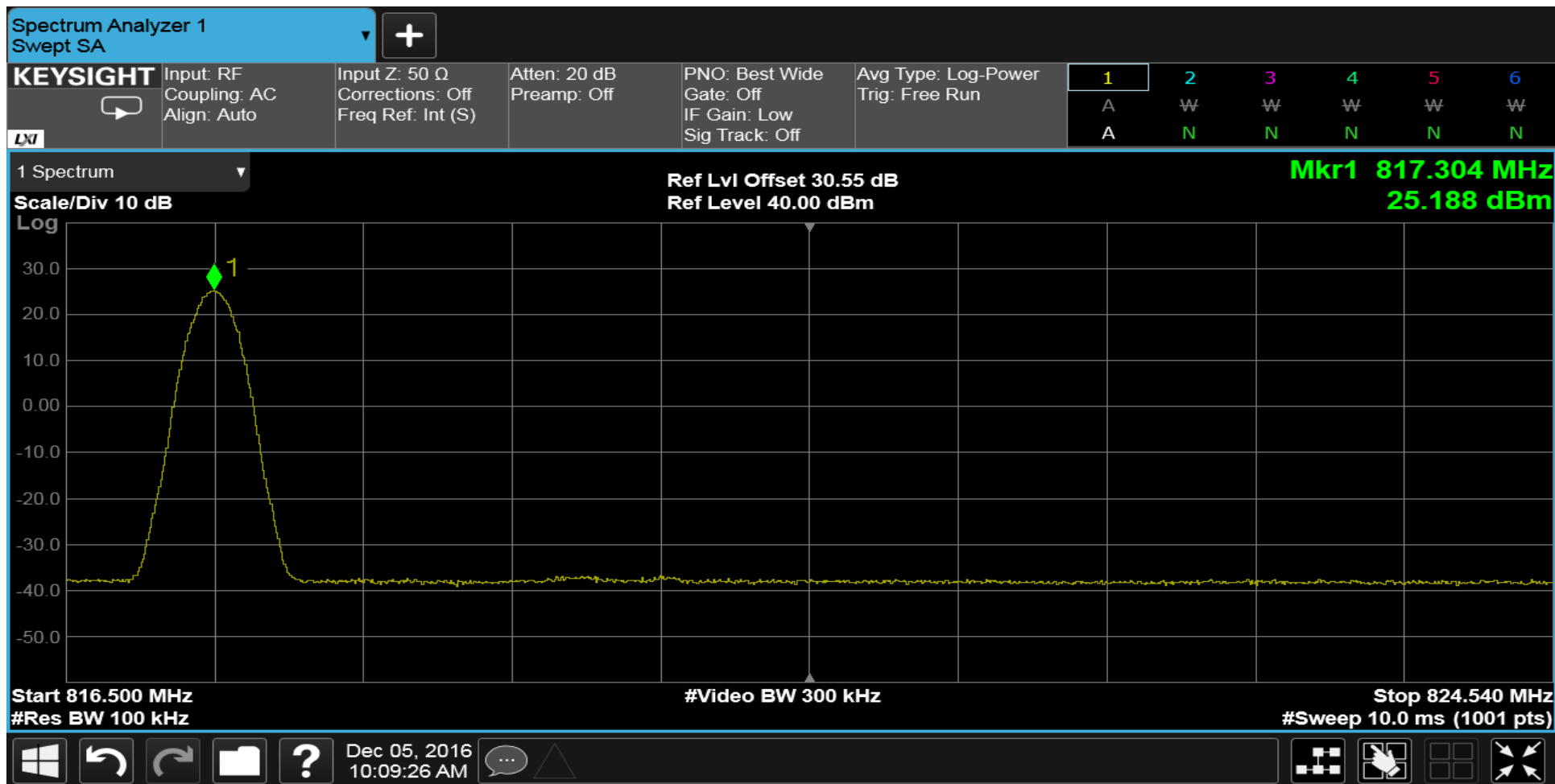
RETLIF TESTING LABORATORIES

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
Climatic Conditions	Temp: 19.3 °C Relative Humidity: 29.6 %		
Notes	Downlink: GSM 862.3MHz and 862.6MHz		



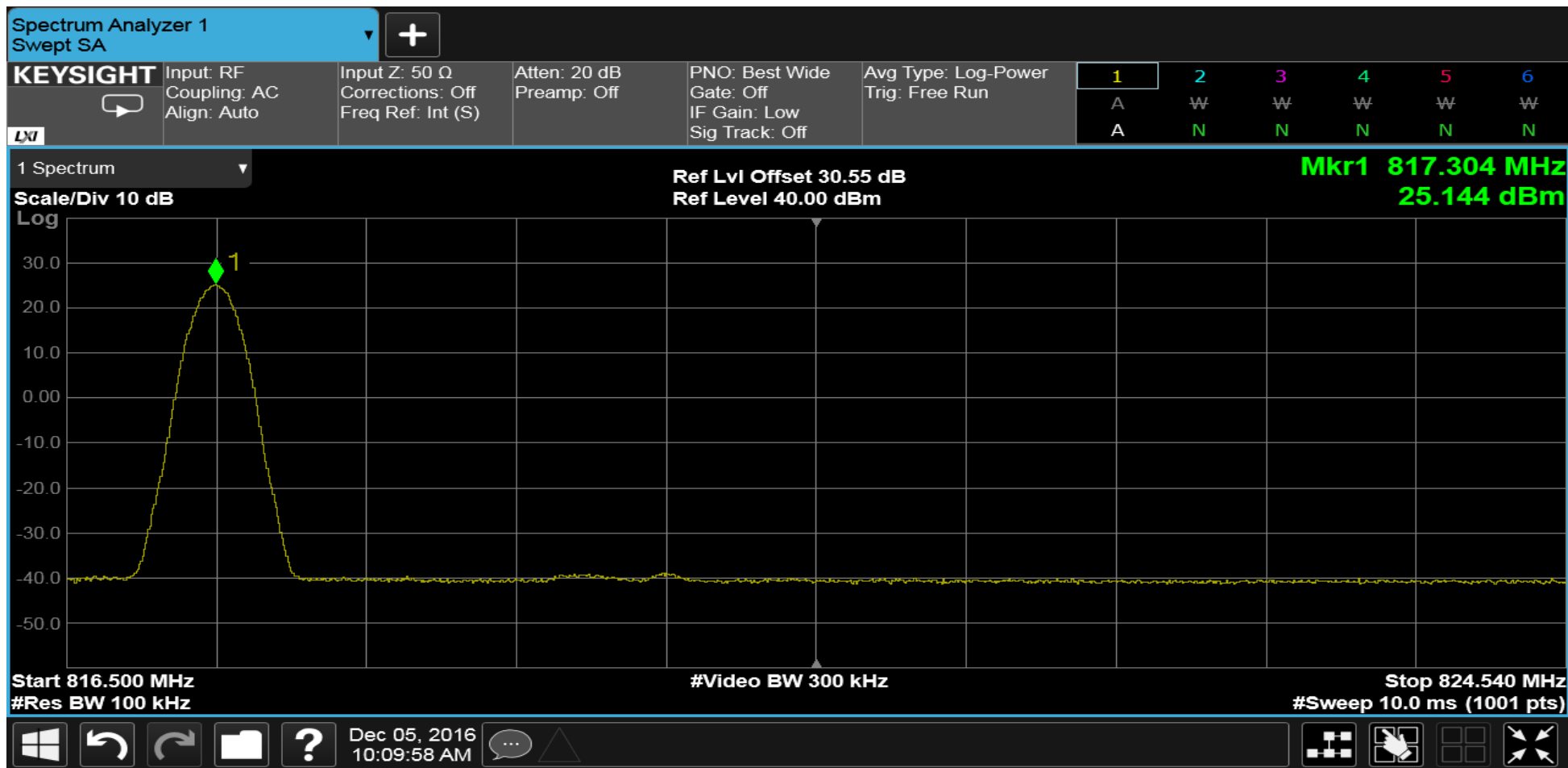
RETLIF TESTING LABORATORIES

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 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		



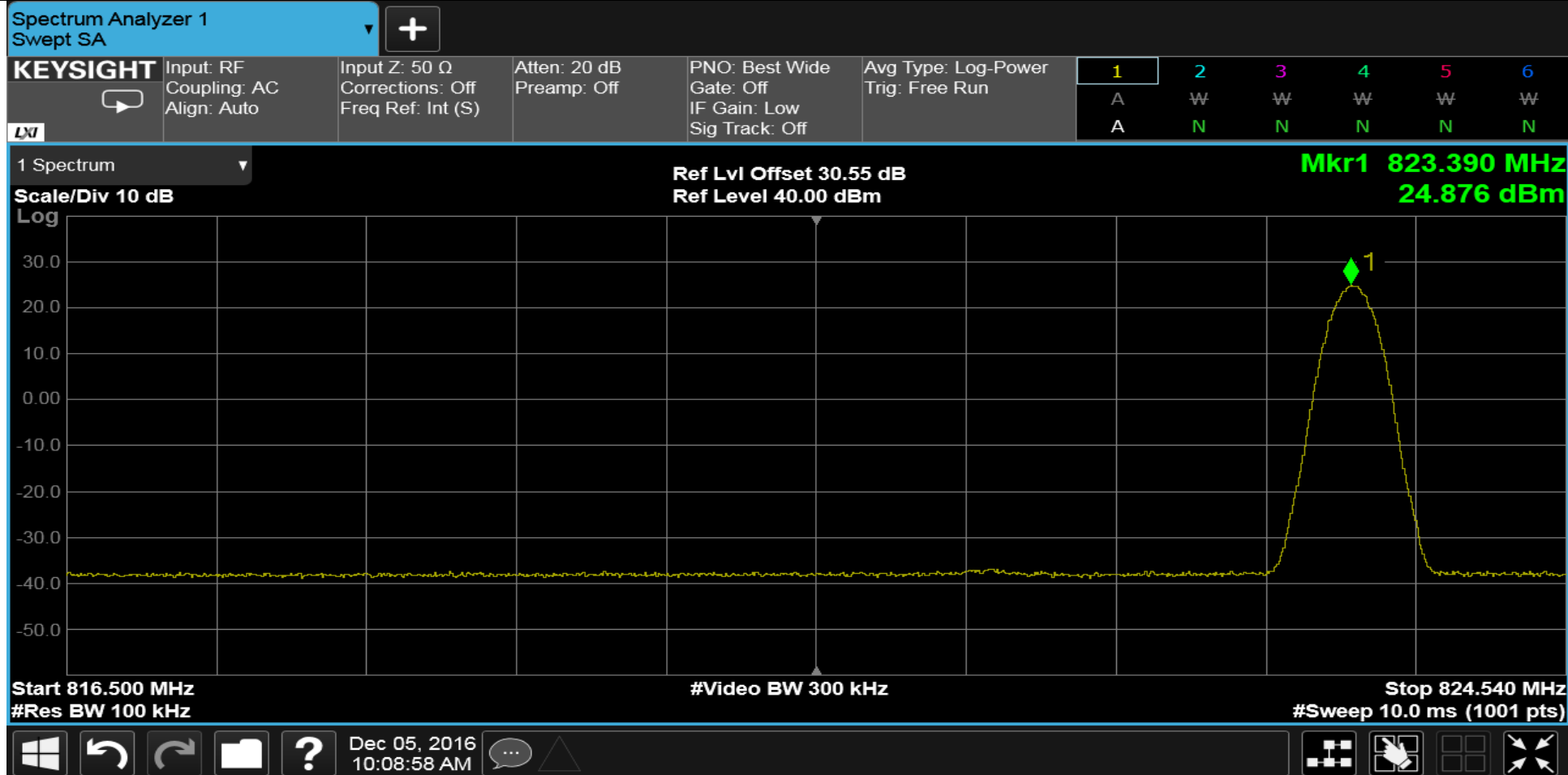
RETLIF TESTING LABORATORIES

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 GSM signal, AGC Activated		
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		



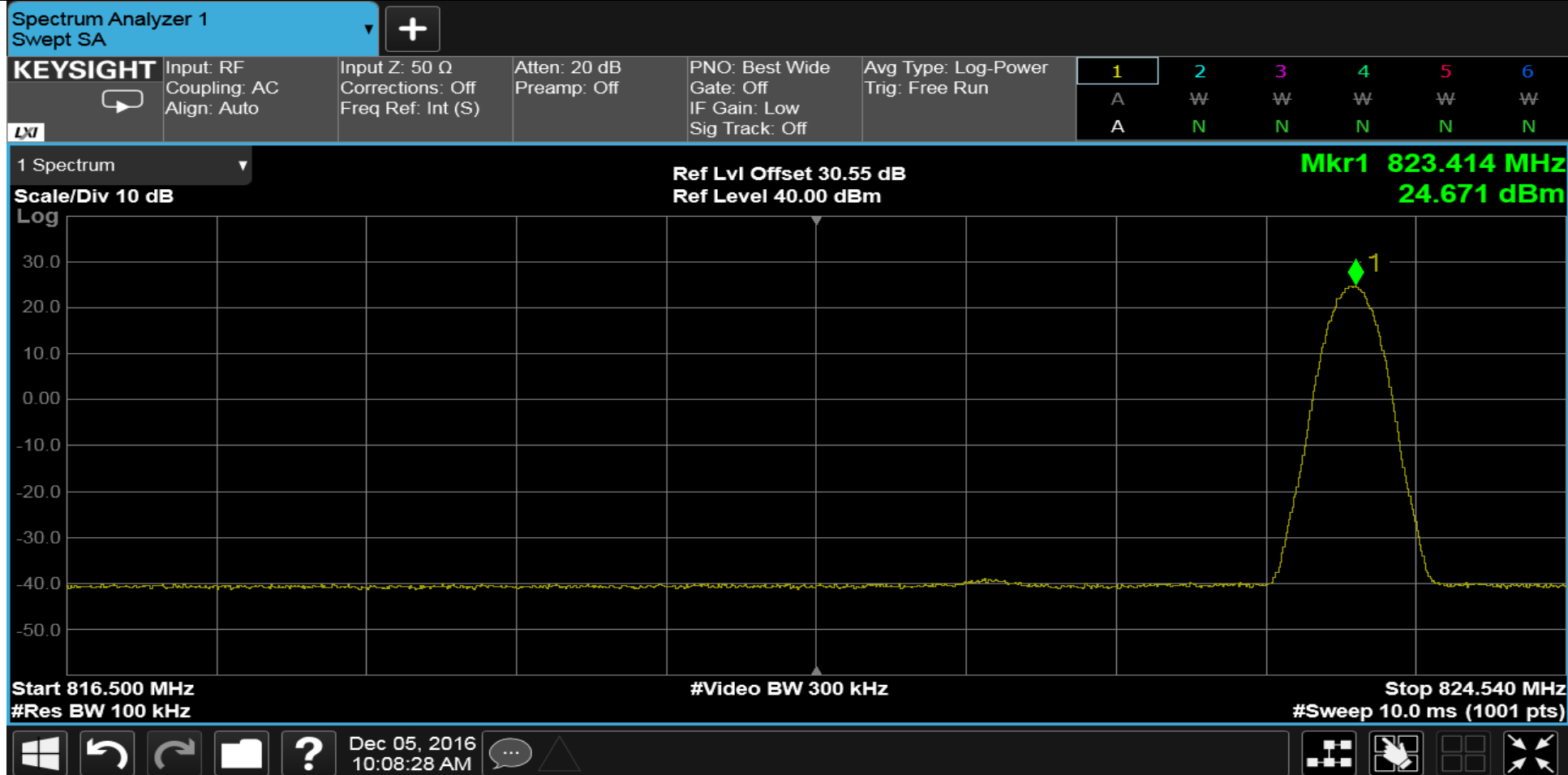
RETLIF TESTING LABORATORIES

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 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 823.7MHz		



RETLIF TESTING LABORATORIES

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 GSM signal, AGC Activated		
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 823.7MHz		



RETLIF TESTING LABORATORIES

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 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	Downlink: GSM 862.3MHz		

Spectrum Analyzer 1
Swept SA



KEYSIGHT

Input: RF
Coupling: AC
Align: Auto

Input Z: 50 Ω
Corrections: Off
Freq Ref: Int (S)

Atten: 20 dB
Preamp: Off

PNO: Best Wide
Gate: Off
IF Gain: Low
Sig Track: Off

Avg Type: Log-Power
Trig: Free Run

1	2	3	4	5	6
A	W	W	W	W	W
A	N	N	N	N	N

LT

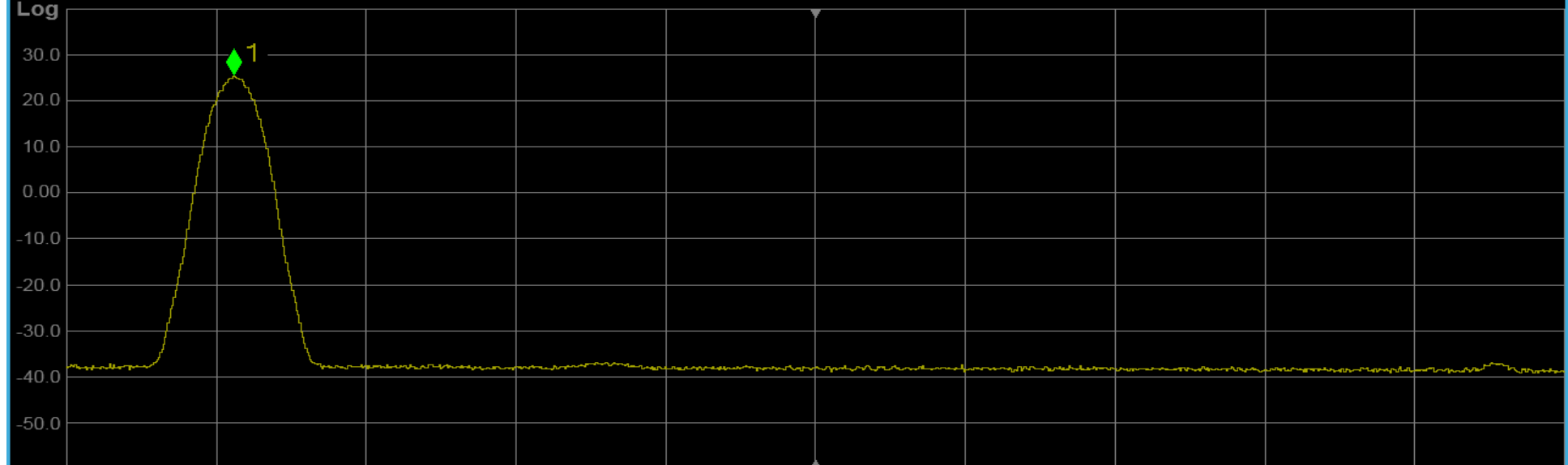
1 Spectrum

Scale/Div 10 dB

Log

Ref Lvl Offset 30.55 dB
Ref Level 40.00 dBm

Mkr1 862.396 MHz
25.321 dBm



Start 861.500 MHz

#Res BW 100 kHz

#Video BW 300 kHz

Stop 869.500 MHz

#Sweep 10.0 ms (1001 pts)

Dec 05, 2016 10:05:19 AM

RETLIF TESTING LABORATORIES

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 GSM signal, AGC Activated		
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		

Spectrum Analyzer 1
Swept SA



KEYSIGHT

Input: RF
Coupling: AC
Align: Auto

Input Z: 50 Ω
Corrections: Off
Freq Ref: Int (S)

Atten: 20 dB
Preamp: Off

PNO: Best Wide
Gate: Off
IF Gain: Low
Sig Track: Off

Avg Type: Log-Power
Trig: Free Run

1

2

3

4

5

6

A

W

W

W

W

W

A

N

N

N

N

N

DI

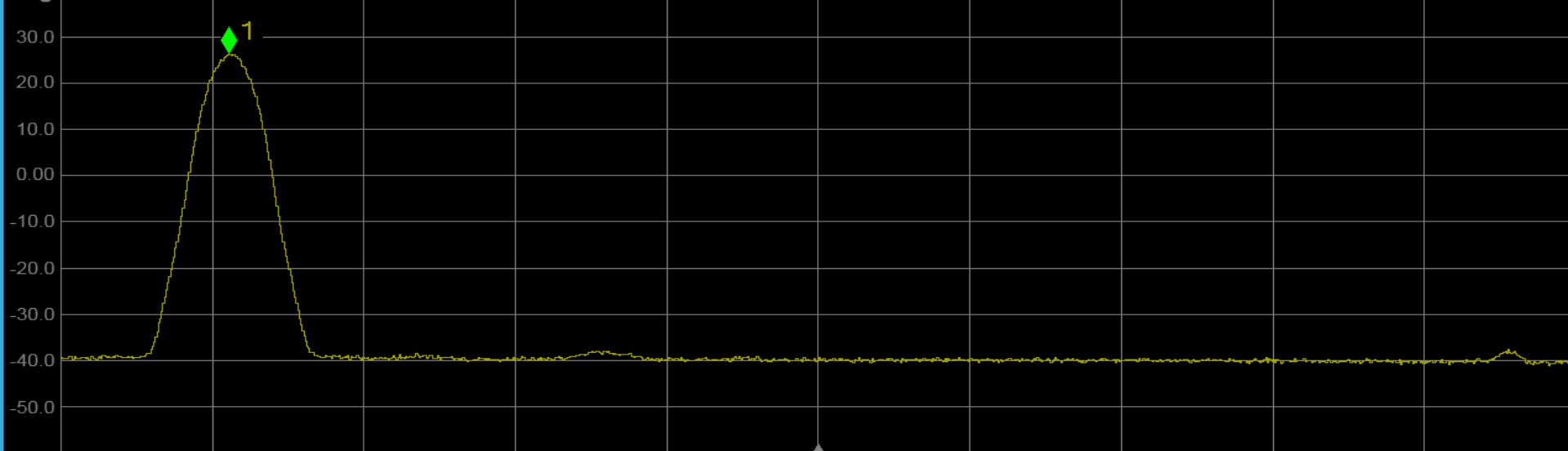
1 Spectrum

Ref Lvl Offset 30.55 dB
Ref Level 40.00 dBm

Mkr1 862.388 MHz
26.307 dBm

Scale/Div 10 dB

Log



Start 861.500 MHz
#Res BW 100 kHz

#Video BW 300 kHz

Stop 869.500 MHz
#Sweep 10.0 ms (1001 pts)



Dec 05, 2016
10:04:47 AM



RETLIF TESTING LABORATORIES

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 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	Downlink: GSM 868.7MHz		

Spectrum Analyzer 1

Swept SA

KEYSIGHT

Input: RF
Coupling: AC
Align: Auto

Input Z: 50 Ω
Corrections: Off
Freq Ref: Int (S)

Atten: 20 dB
Preamp: Off

PNO: Best Wide
Gate: Off
IF Gain: Low
Sig Track: Off

Avg Type: Log-Power
Trig: Free Run

1

2

3

4

5

6

A

W

W

W

W

W

A

N

N

N

N

N

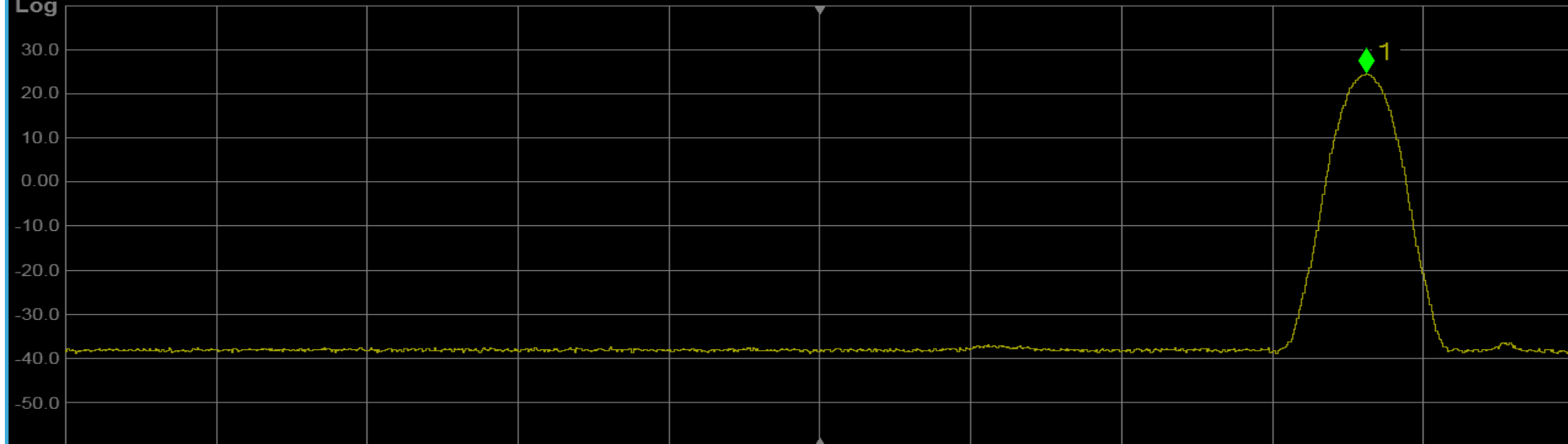
1 Spectrum

Scale/Div 10 dB

Log

Ref Lvl Offset 30.55 dB
Ref Level 40.00 dBm

Mkr1 868.404 MHz
24.499 dBm



Start 861.500 MHz

#Res BW 100 kHz

#Video BW 300 kHz

Stop 869.500 MHz

#Sweep 10.0 ms (1001 pts)

Dec 05, 2016
10:03:21 AM

RETLIF TESTING LABORATORIES

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 GSM signal, AGC Activated		
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 868.7MHz		

Spectrum Analyzer 1

Swept SA



KEYSIGHT

Input: RF
Coupling: AC
Align: Auto

Input Z: 50 Ω
Corrections: Off
Freq Ref: Int (S)

Atten: 20 dB
Preamp: Off

PNO: Best Wide
Gate: Off
IF Gain: Low
Sig Track: Off

Avg Type: Log-Power
Trig: Free Run

1

2

3

4

5

6

A

W

W

W

W

W

A

N

N

N

N

N

DI

1 Spectrum

Scale/Div 10 dB

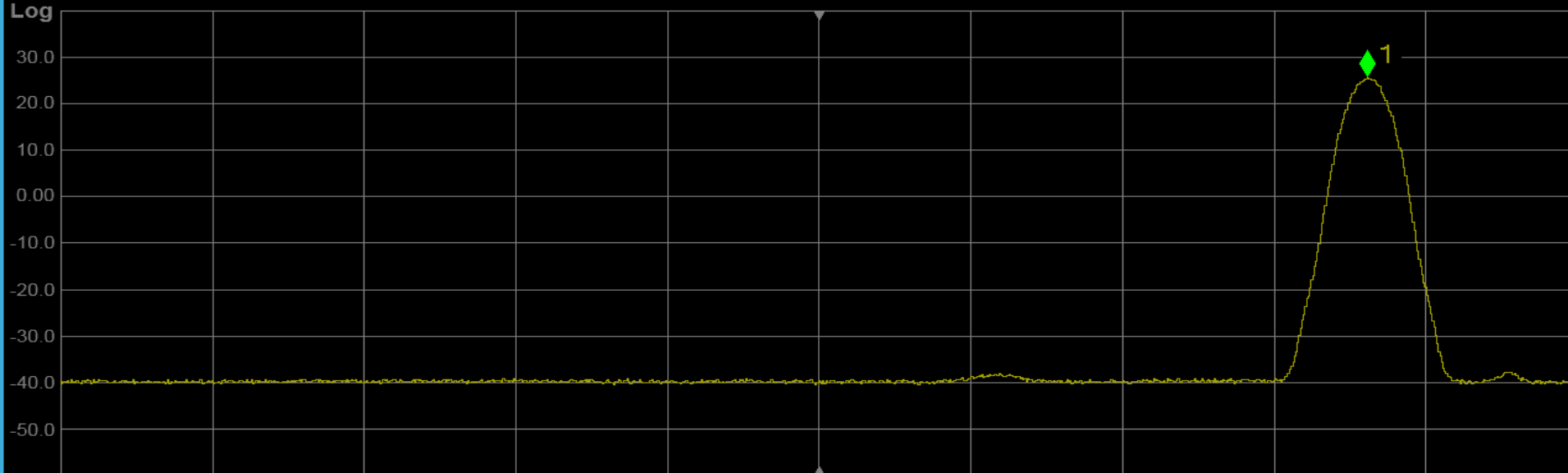
Log

Ref Lvl Offset 30.55 dB

Ref Level 40.00 dBm

Mkr1 868.396 MHz

25.542 dBm



Start 861.500 MHz

#Res BW 100 kHz

#Video BW 300 kHz

Stop 869.500 MHz

#Sweep 10.0 ms (1001 pts)

Dec 05, 2016
10:04:01 AM

**Spurious Emissions Conducted
Test Data**

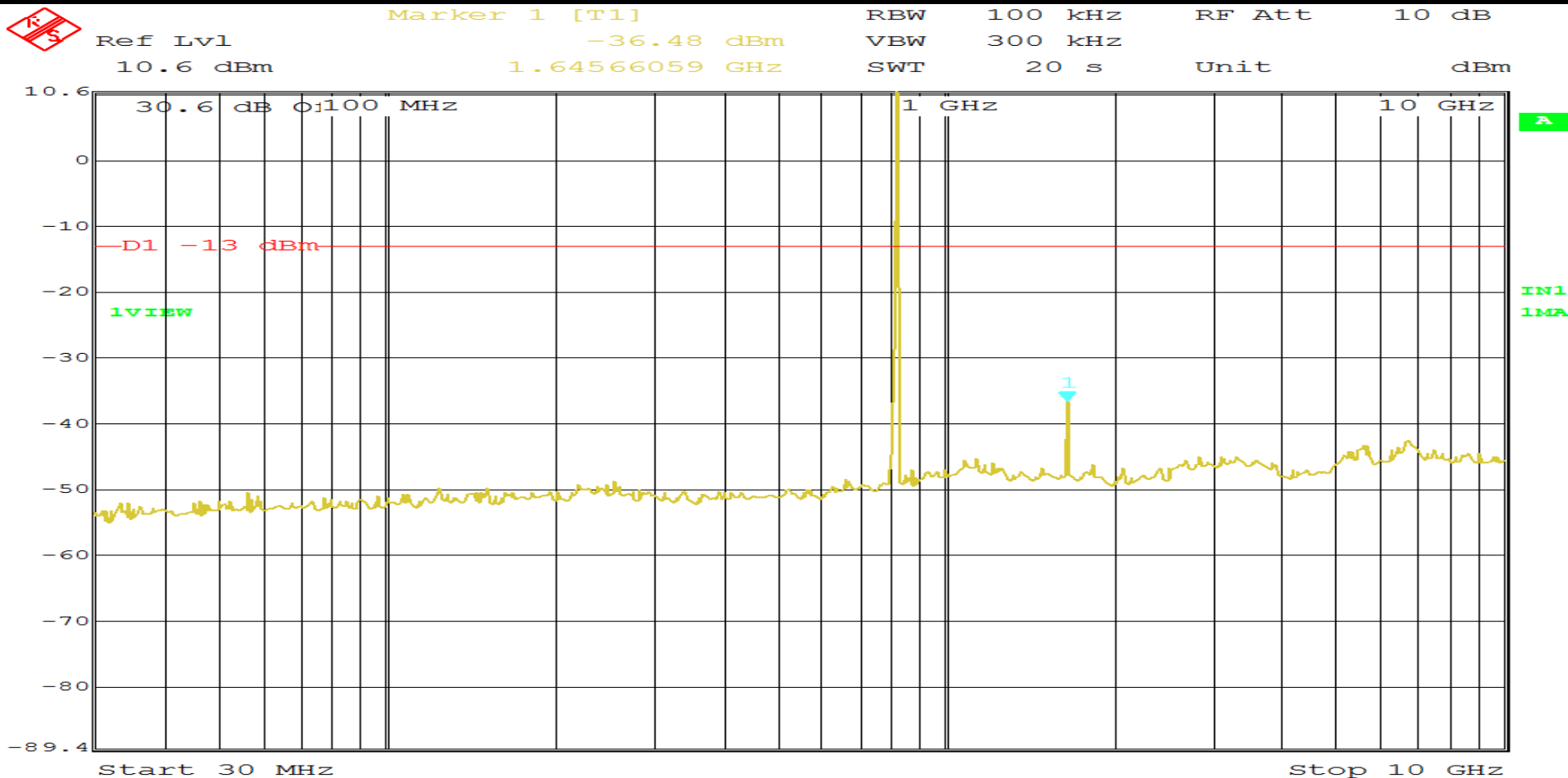


Retlif Testing Laboratories

Report No. R-6142N-4

RETLIF TESTING LABORATORIES

Test Method	Spurious Emissions Conducted		
Customer	Westell, Inc.	Job No.	R-6142N-4
Test Sample	Bi-Directional Amplifier		
Model Number	BDA510-S8	Serial No.	CPG62990
Operating Mode	Amplifying 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: LTE Low		

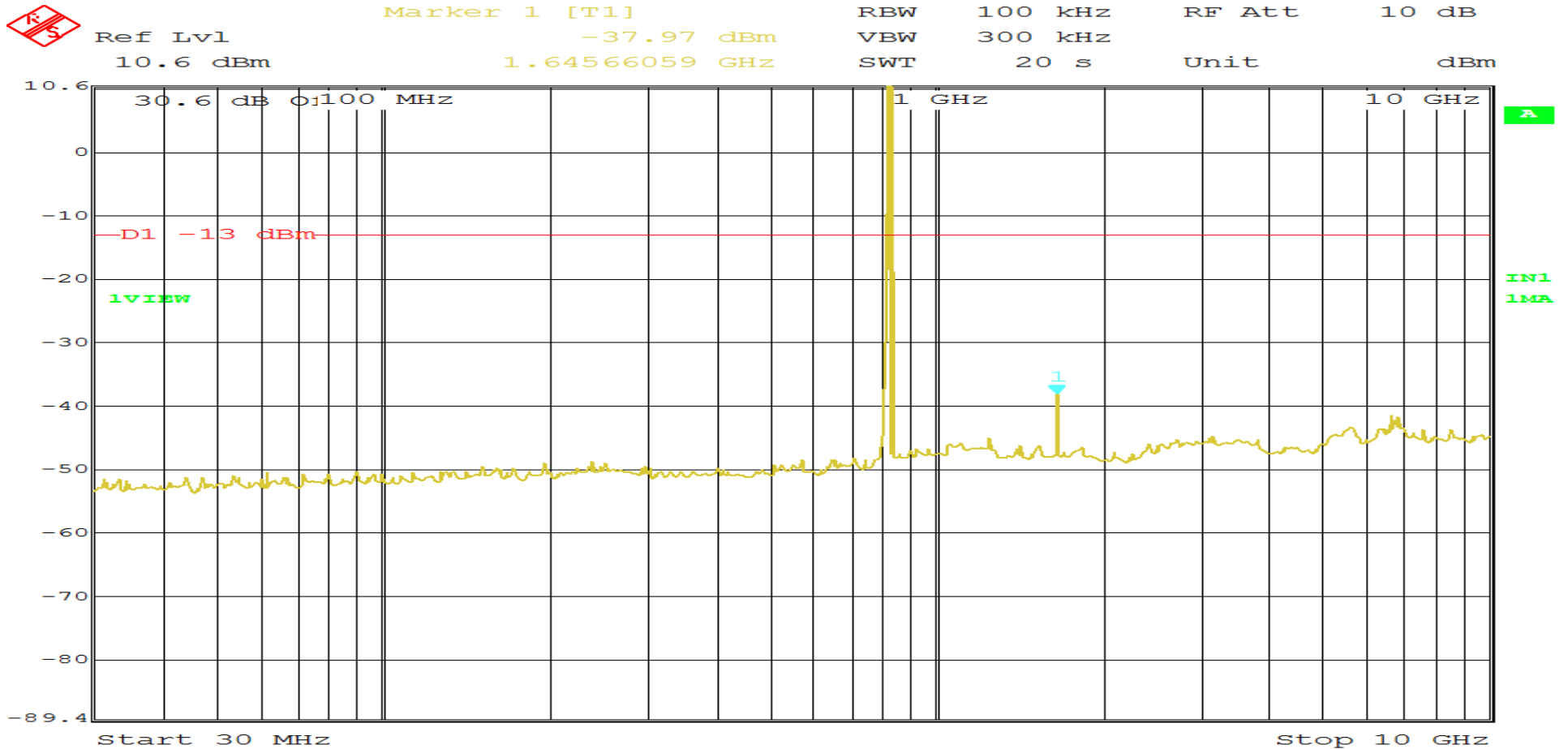


Date: 1.JAN.1997 01:06:18

Page 1 of 12

RETLIF TESTING LABORATORIES

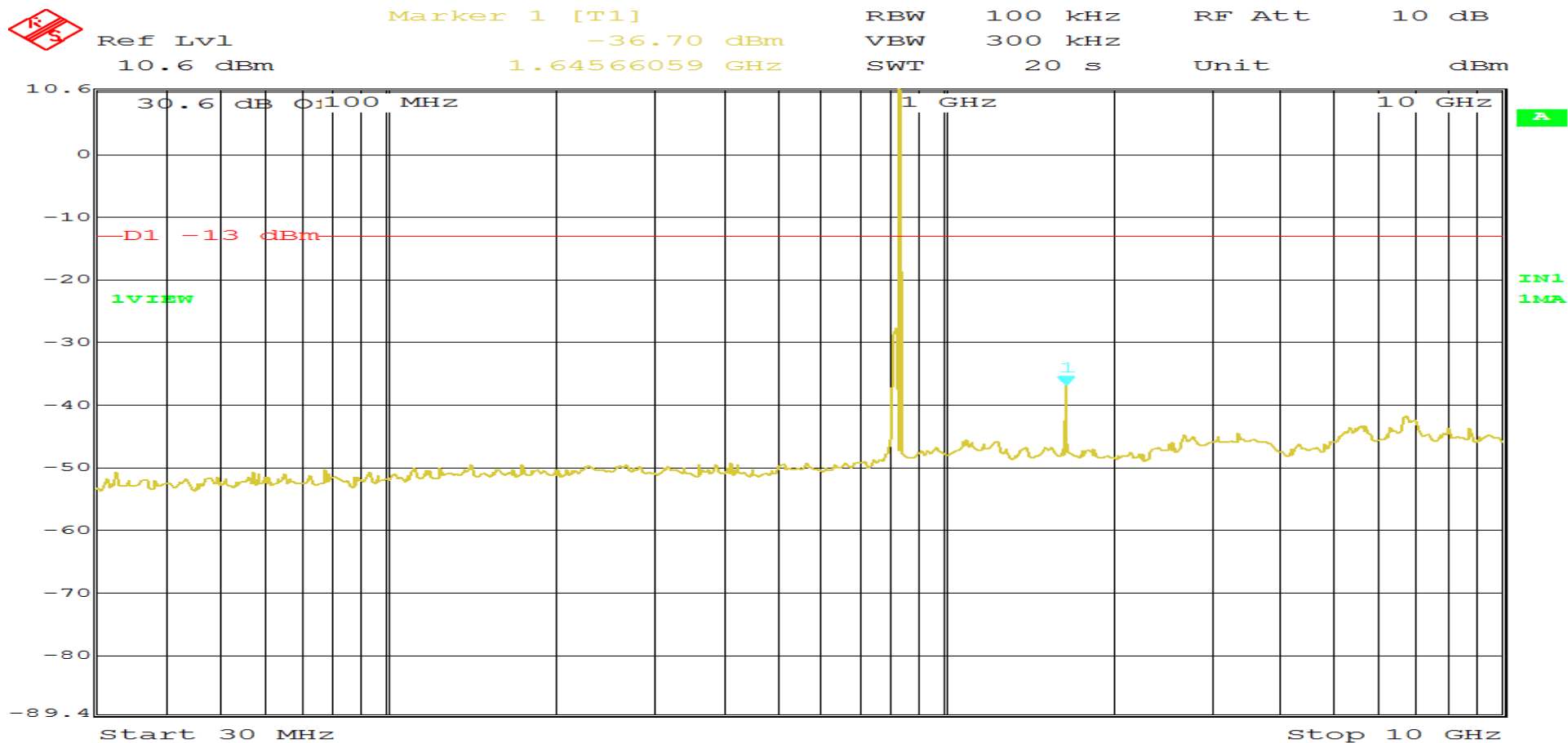
Test Method	Spurious Emissions Conducted		
Customer	Westell, Inc.	Job No.	R-6142N-4
Test Sample	Bi-Directional Amplifier		
Model Number	BDA510-S8	Serial No.	CPG62990
Operating Mode	Amplifying signal		
Test Specification	Nemko Test Plan 317856-2		
Technician	M. Seamans	Date	December 5 th , 2016
Climatic Conditions	Temp: 19.3 °C Relative Humidity: 29.6 %		
Notes	Uplink: LTE Mid		



Date: 1.JAN.1997 01:12:34
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RETLIF TESTING LABORATORIES

Test Method	Spurious Emissions Conducted		
Customer	Westell, Inc.	Job No.	R-6142N-4
Test Sample	Bi-Directional Amplifier		
Model Number	BDA510-S8	Serial No.	CPG62990
Operating Mode	Amplifying 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: LTE High		

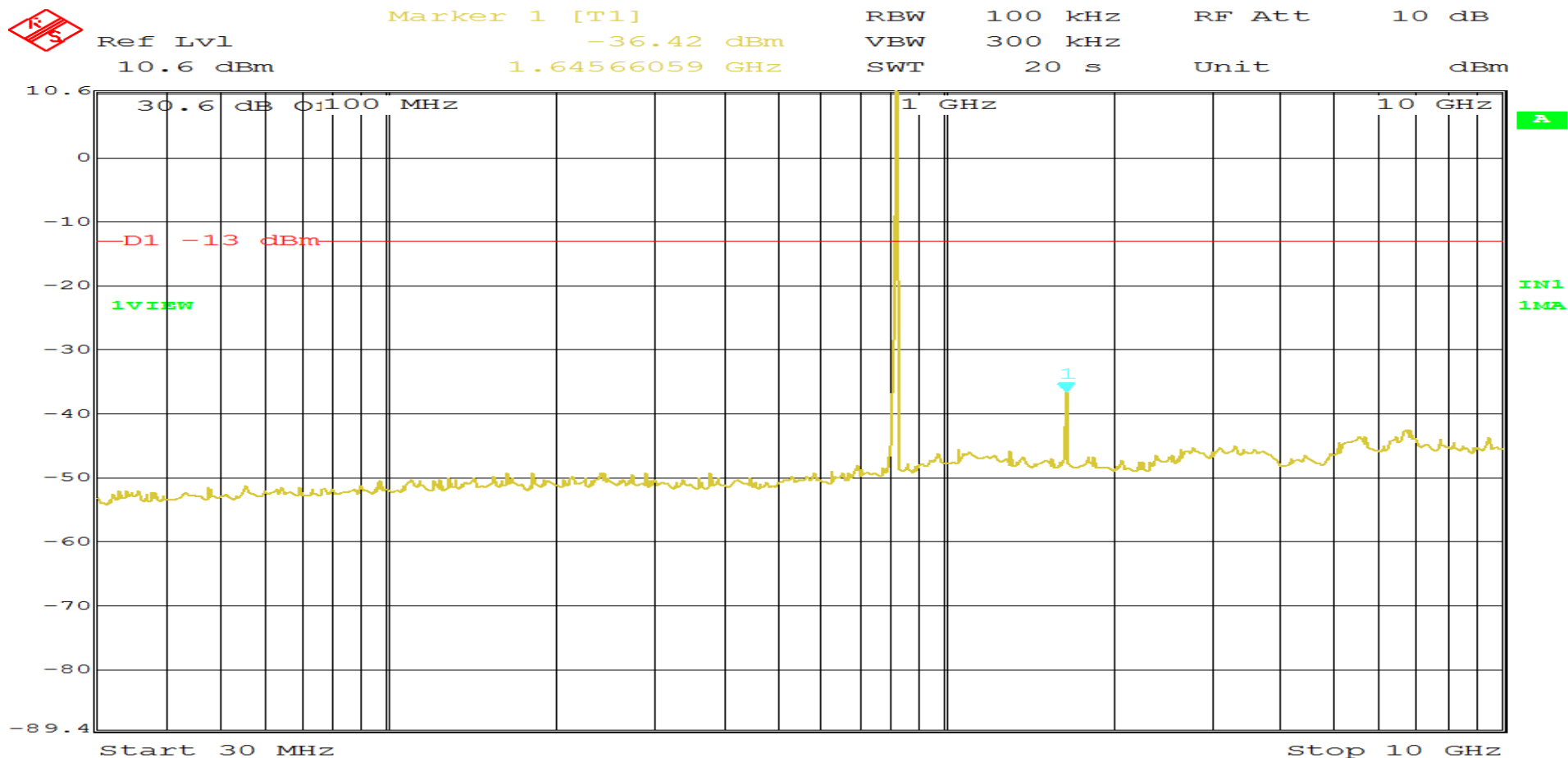


Date: 1.JAN.1997 01:18:15

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RETLIF TESTING LABORATORIES

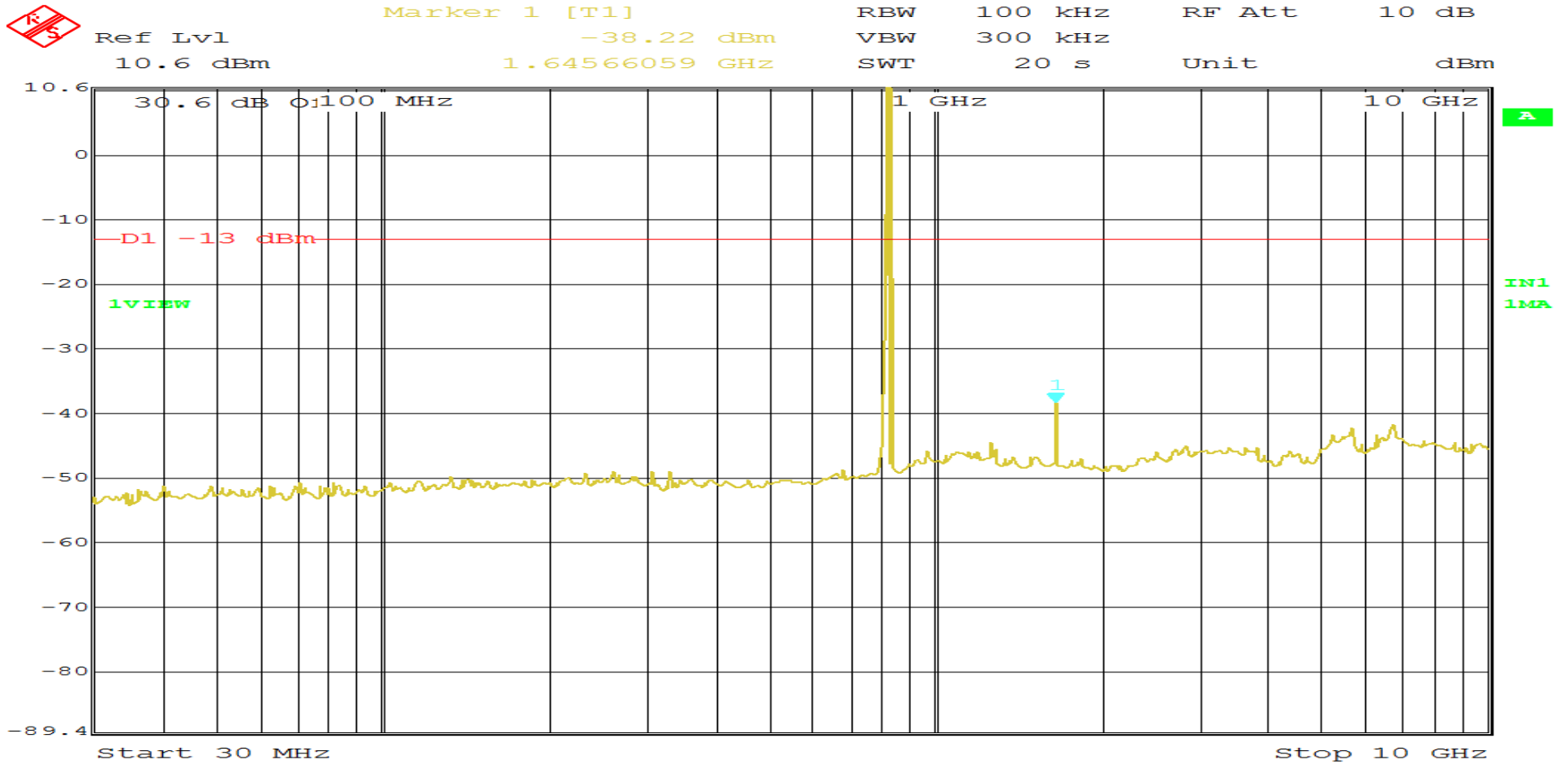
Test Method	Spurious Emissions Conducted		
Customer	Westell, Inc.	Job No.	R-6142N-4
Test Sample	Bi-Directional Amplifier		
Model Number	BDA510-S8	Serial No.	CPG62990
Operating Mode	Amplifying signal		
Test Specification	Nemko Test Plan 317856-2		
Technician	M. Seamans	Date	December 5 th , 2016
Climatic Conditions	Temp: 19.3 °C Relative Humidity: 29.6 %		
Notes	Uplink: GSM Low		



Date: 1.JAN.1997 01:23:21
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RETLIF TESTING LABORATORIES

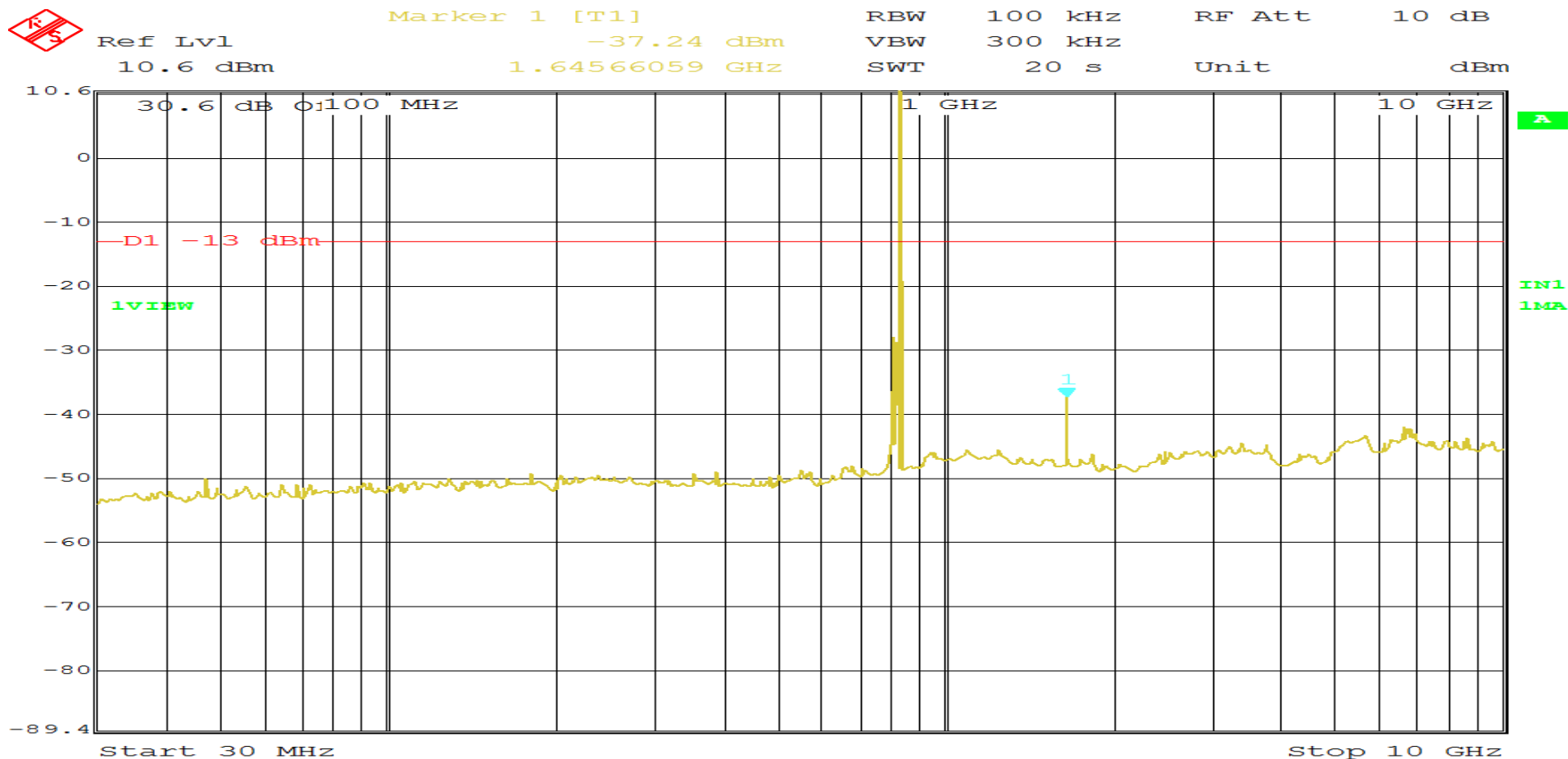
Test Method	Spurious Emissions Conducted		
Customer	Westell, Inc.	Job No.	R-6142N-4
Test Sample	Bi-Directional Amplifier		
Model Number	BDA510-S8	Serial No.	CPG62990
Operating Mode	Amplifying CW signals		
Test Specification	Nemko Test Plan 317856-2		
Technician	M. Seamans	Date	December 5 th , 2016
Climatic Conditions	Temp: 19.3 °C Relative Humidity: 29.6 %		
Notes	Uplink: GSM Mid		



Date: 1.JAN.1997 01:27:54
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RETLIF TESTING LABORATORIES

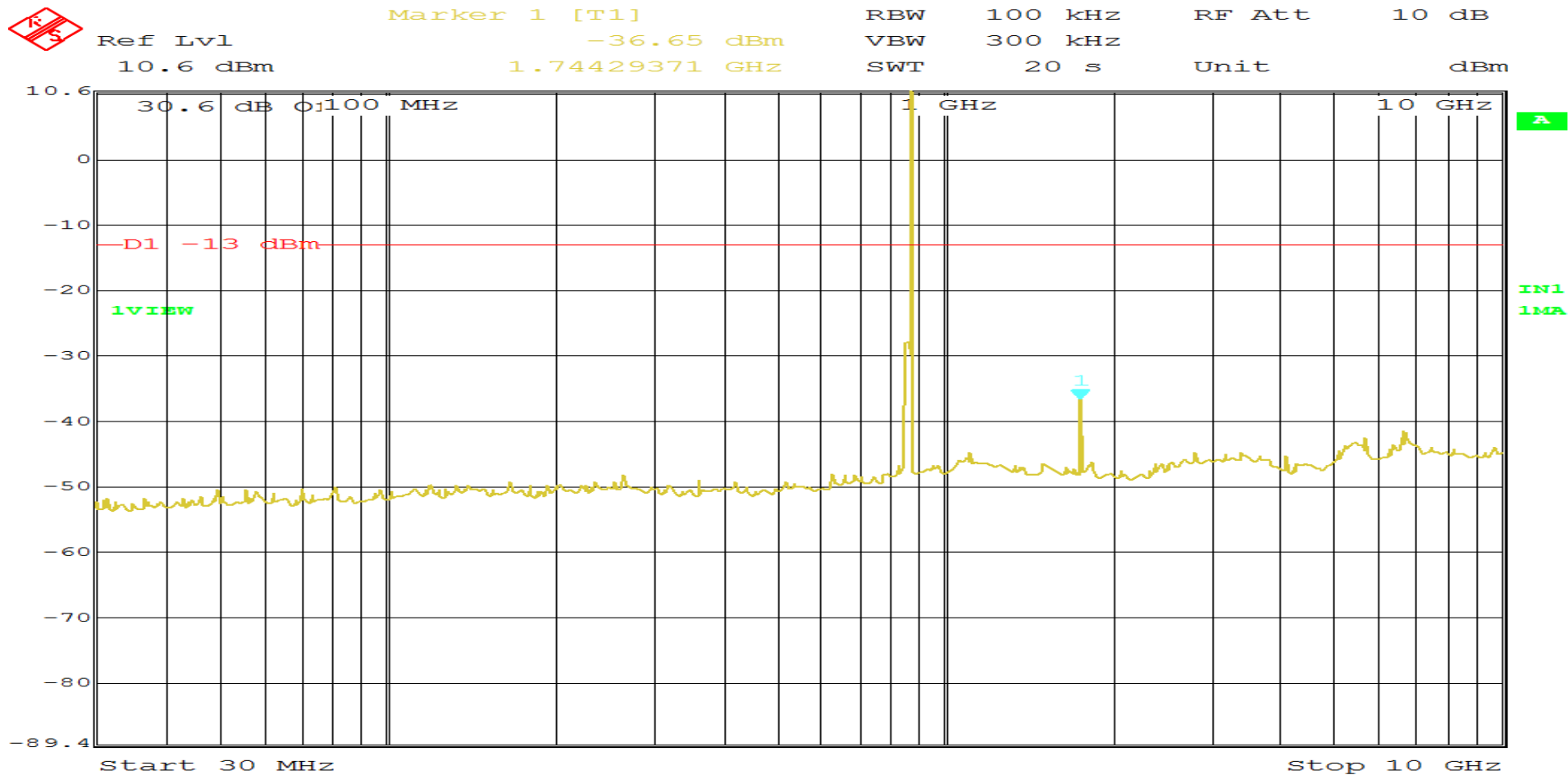
Test Method	Spurious Emissions Conducted		
Customer	Westell, Inc.	Job No.	R-6142N-4
Test Sample	Bi-Directional Amplifier		
Model Number	BDA510-S8	Serial No.	CPG62990
Operating Mode	Amplifying signal		
Test Specification	Nemko Test Plan 317856-2		
Technician	M. Seamans	Date	December 5 th , 2016
Climatic Conditions	Temp: 19.3 °C Relative Humidity: 29.6 %		
Notes	Uplink: GSM High		



Date: 1.JAN.1997 01:33:48
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RETLIF TESTING LABORATORIES

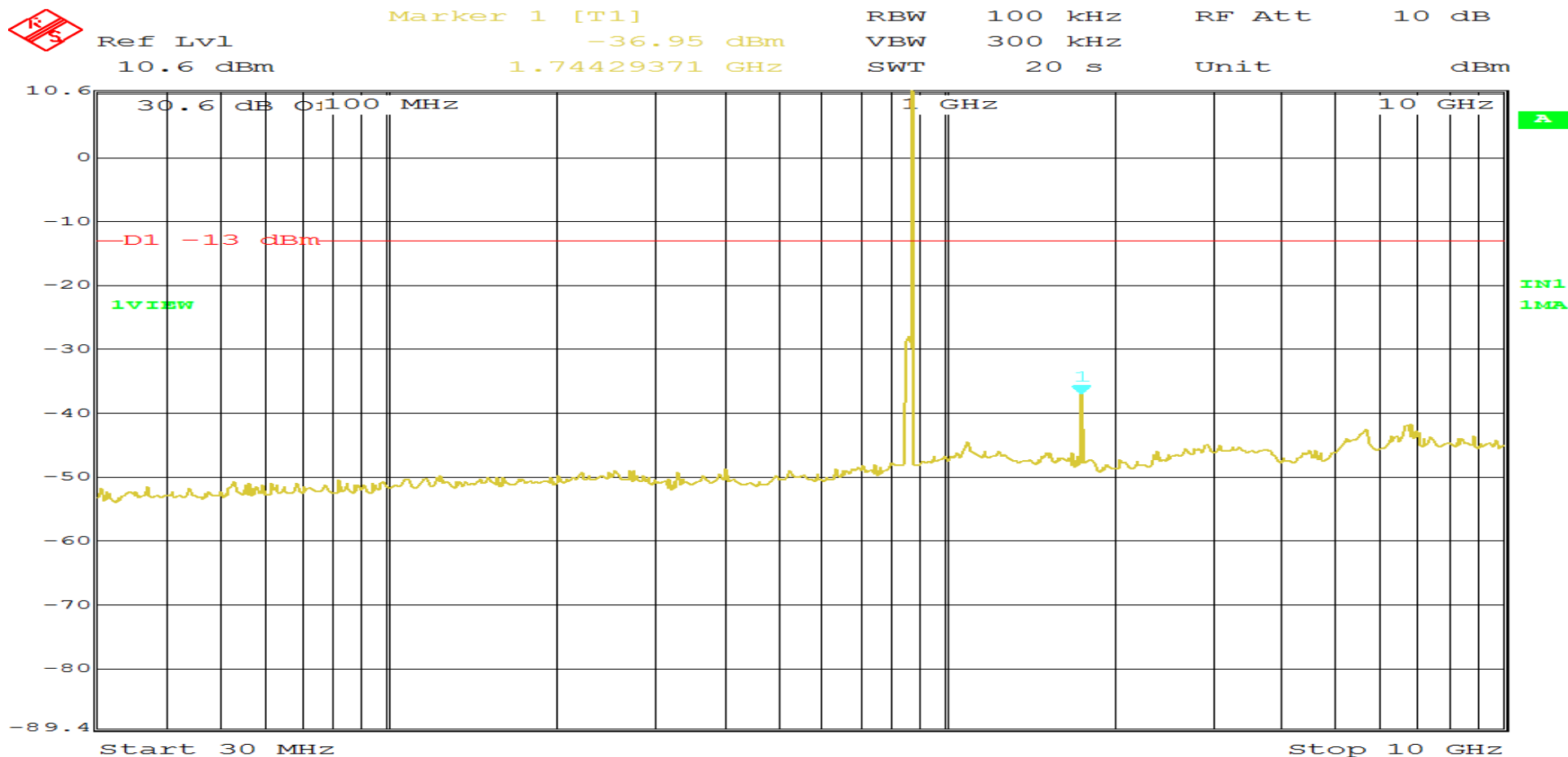
Test Method	Spurious Emissions Conducted		
Customer	Westell, Inc.	Job No.	R-6142N-4
Test Sample	Bi-Directional Amplifier		
Model Number	BDA510-S8	Serial No.	CPG62990
Operating Mode	Amplifying signal		
Test Specification	Nemko Test Plan 317856-2		
Technician	M. Seamans	Date	December 5 th , 2016
Climatic Conditions	Temp: 19.3 °C Relative Humidity: 29.6 %		
Notes	Downlink: LTE Low		



Date: 1.JAN.1997 02:02:25
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RETLIF TESTING LABORATORIES

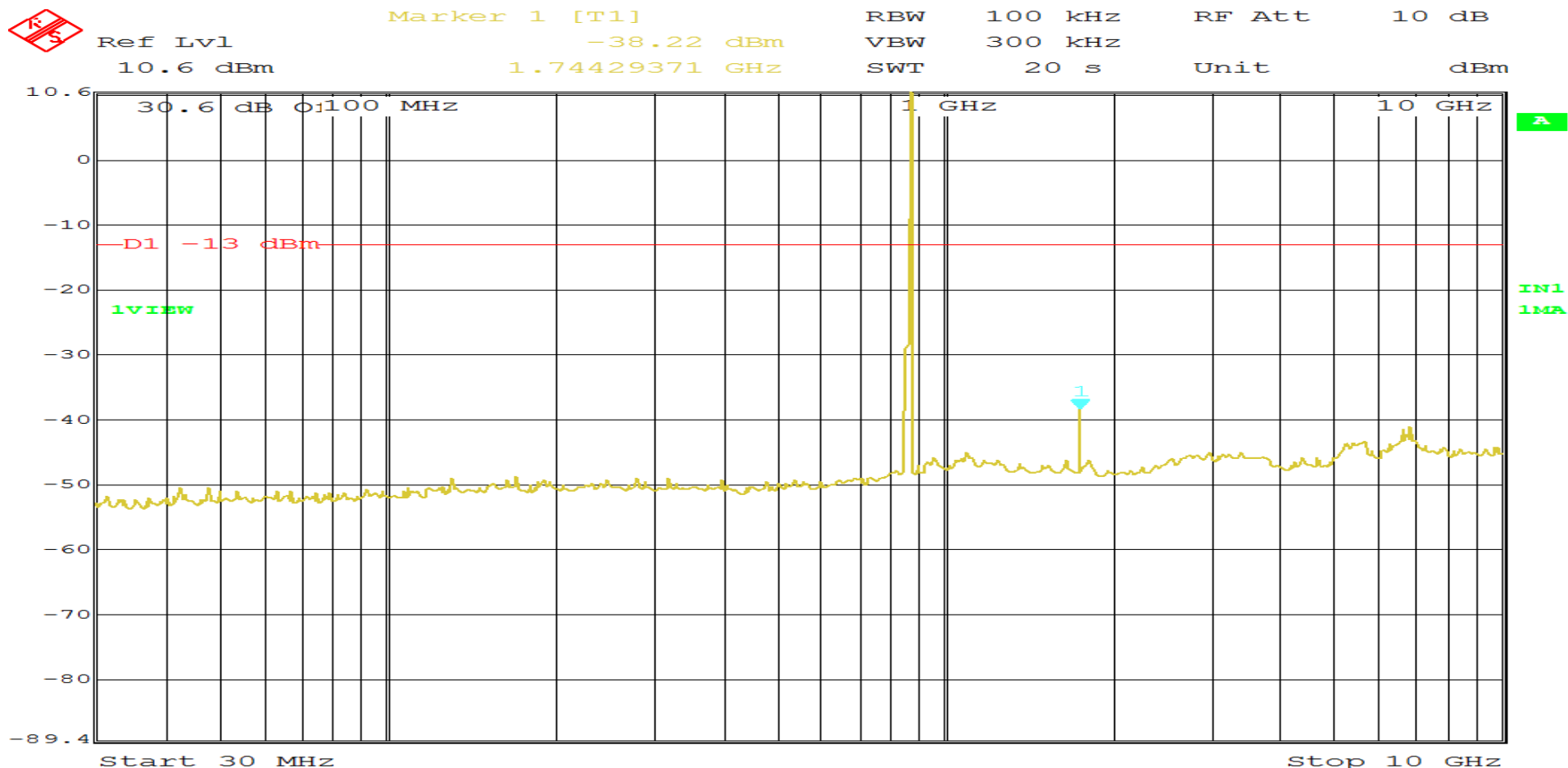
Test Method	Spurious Emissions Conducted		
Customer	Westell, Inc.	Job No.	R-6142N-4
Test Sample	Bi-Directional Amplifier		
Model Number	BDA510-S8	Serial No.	CPG62990
Operating Mode	Amplifying signal		
Test Specification	Nemko Test Plan 317856-2		
Technician	M. Seamans	Date	December 5 th , 2016
Climatic Conditions	Temp: 19.3 °C Relative Humidity: 29.6 %		
Notes	Downlink: LTE Mid		



Date: 1.JAN.1997 02:09:03
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RETLIF TESTING LABORATORIES

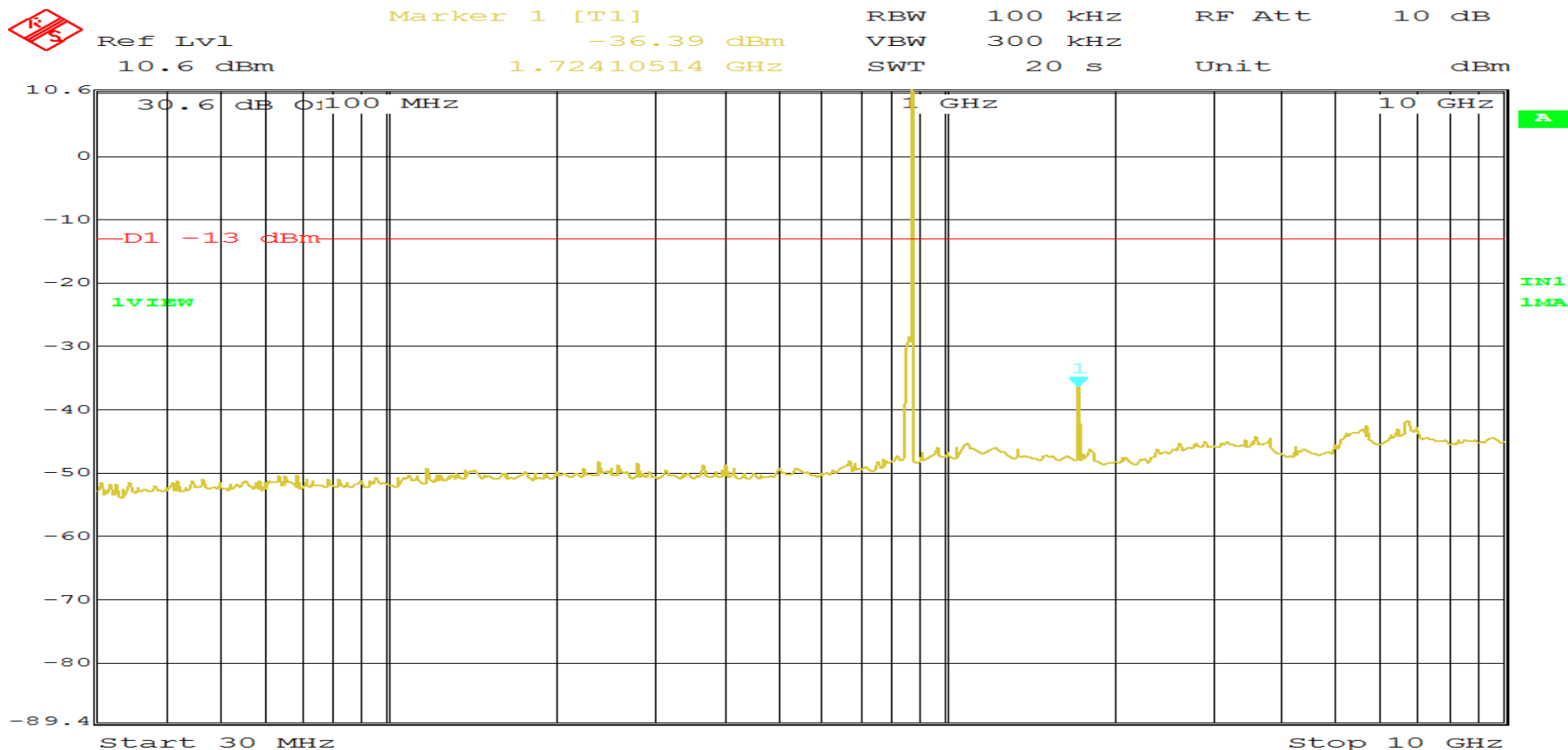
Test Method	Spurious Emissions Conducted		
Customer	Westell, Inc.	Job No.	R-6142N-4
Test Sample	Bi-Directional Amplifier		
Model Number	BDA510-S8	Serial No.	CPG62990
Operating Mode	Amplifying signal		
Test Specification	Nemko Test Plan 317856-2		
Technician	M. Seamans	Date	December 5 th , 2016
Climatic Conditions	Temp: 19.3 °C Relative Humidity: 29.6 %		
Notes	Downlink: LTE High		



Date: 1.JAN.1997 02:15:04
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RETLIF TESTING LABORATORIES

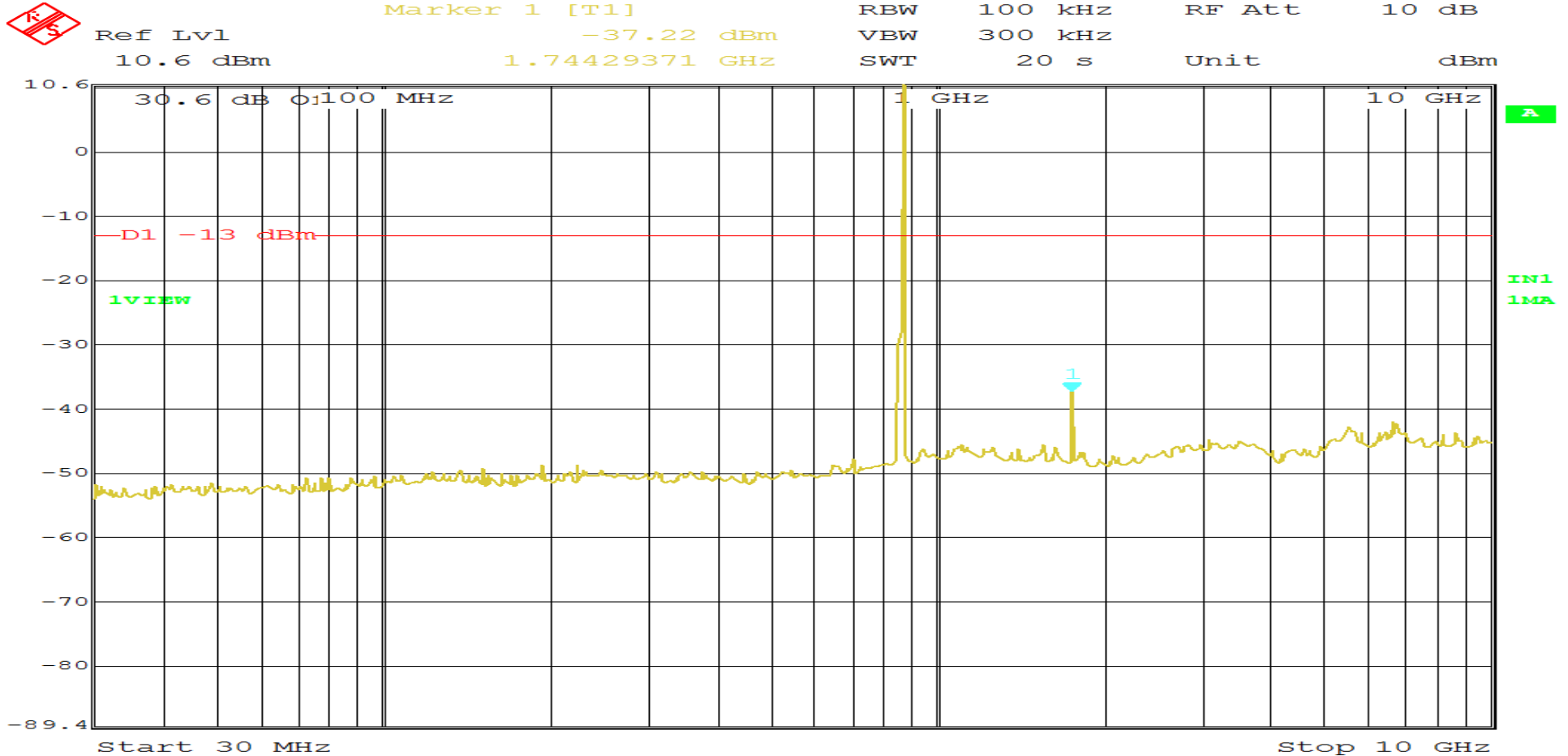
Test Method	Spurious Emissions Conducted		
Customer	Westell, Inc.	Job No.	R-6142N-4
Test Sample	Bi-Directional Amplifier		
Model Number	BDA510-S8	Serial No.	CPG62990
Operating Mode	Amplifying signal		
Test Specification	Nemko Test Plan 317856-2		
Technician	M. Seamans	Date	December 5 th , 2016
Climatic Conditions	Temp: 19.3 °C Relative Humidity: 29.6 %		
Notes	Downlink: GSM Low		



Date: 1.JAN.1997 01:43:53
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RETLIF TESTING LABORATORIES

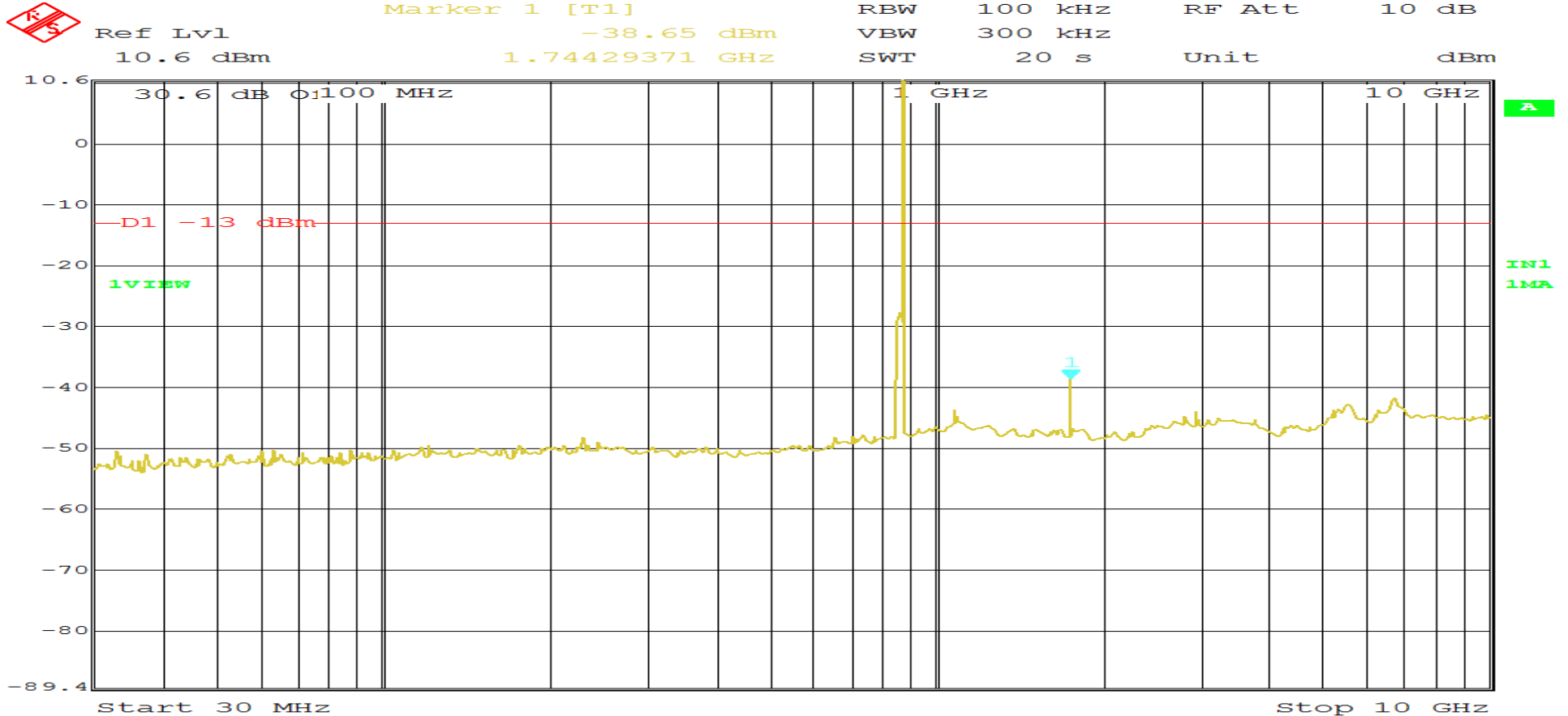
Test Method	Spurious Emissions Conducted		
Customer	Westell, Inc.	Job No.	R-6142N-4
Test Sample	Bi-Directional Amplifier		
Model Number	BDA510-S8	Serial No.	CPG62990
Operating Mode	Amplifying signal		
Test Specification	Nemko Test Plan 317856-2		
Technician	M. Seamans	Date	December 5 th , 2016
Climatic Conditions	Temp: 19.3 °C Relative Humidity: 29.6 %		
Notes	Downlink: GSM Mid		



Date: 1.JAN.1997 01:48:22
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RETLIF TESTING LABORATORIES

Test Method	Spurious Emissions Conducted		
Customer	Westell, Inc.	Job No.	R-6142N-4
Test Sample	Bi-Directional Amplifier		
Model Number	BDA510-S8	Serial No.	CPG62990
Operating Mode	Amplifying 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	Downlink: GSM High		



Date: 1.JAN.1997 01:55:57
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**Field Strength of Spurious Emissions
Test Data**



Retlif Testing Laboratories

Report No. R-6142N-4

RETLIF TESTING LABORATORIES

EMISSIONS TEST DATA SHEET

Test Method	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
Operating Mode	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

[illegible]

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



Retlif Testing Laboratories

Report No. R-6142N-4