Compliance Testing, LLC
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info@ComplianceTesting.com

Test Report

Prepared for: G-Wave Incorporated

Model: BDA-LTE/LABC-33/33-90-AB

Description: Commercial/Industrial Booster LTE Unit (700 MHz)

Serial Number: 18091002

FCC ID: Q8KLABC3390AB

To

FCC Part 20
FCC Part 27

Date of Issue: April 30, 2019

On the behalf of the applicant:	**G-Wave Incorporated** **38 Leuning St.** **South Hackensack, NJ 07606**
Attention of:	**Greg David, VP of Engineering** **Ph: (201)343-6388** **E-Mail: tech-support@gwaverf.com**

Prepared By
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Project No: p1940019

Greg Corbin
Project Test Engineer

Test Report Revision History

Revision	Date	Revised By	Reason for Revision
1.0	April 26, 2019	Greg Corbin	Original Document

Table of Contents

ILAC / A2LA

Compliance Testing, LLC, has been accredited in accordance with the recognized International Standard ISO/IEC 17025:2005. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (refer joint ISO-ILAC-IAF Communiqué dated January 2009)

The tests results contained within this test report all fall within our scope of accreditation, unless noted below.

Please refer to http://www.compliancetesting.com/labscope.html for current scope of accreditation.

Testing Certificate Number: **2152.01**

FCC Site Reg. #349717

IC Site Reg. #2044A-2

Non-accredited tests contained in this report:

N/A

The Applicant has been cautioned as to the following:

15.21: **Information to the User**

The user's manual or instruction manual for an intentional radiator shall caution the user that changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

15.27(a): **Special Accessories**

Equipment marketed to a consumer must be capable of complying with the necessary regulations in the configuration in which the equipment is marketed. Where special accessories, such as shielded cables and/or special connectors are required to enable an unintentional or intentional radiator to comply with the emission limits in this part, the equipment must be marketed with, i.e. shipped and sold with, those special accessories. However, in lieu of shipping or packaging the special accessories with the unintentional or intentional radiator, the responsible party may employ other methods of ensuring that the special accessories are provided to the consumer, without an additional charge.

Information detailing any alternative method used to supply the special accessories for a grant of equipment authorization or retained in the verification records, as appropriate. The party responsible for the equipment, as detailed in § 2.909 of this chapter, shall ensure that these special accessories are provided with the equipment. The instruction manual for such devices shall include appropriate instructions on the first page of text concerned with the installation of the device that these special accessories must be used with the device. It is the responsibility of the user to use the needed special accessories supplied with the equipment.

Test and Measurement Data
All tests and measurement data shown were performed in accordance with FCC Rules and Regulations, KDB 935210 D05 Indus Booster Basic Measurements v01 and FCC Part 2, Part 20.21, Part 27 where appropriate.

Standard Test Conditions and Engineering Practices
Except as noted herein, the following conditions and procedures were observed during the testing.

In accordance with ANSI/TIA 603C, and unless otherwise indicated in the specific measurement results, the ambient temperature of the actual EUT was maintained within the range of 10° to 40°C (50° to 104°F) unless the particular equipment requirements specify testing over a different temperature range. Also, unless otherwise indicated, the humidity levels were in the range of 10% to 90% relative humidity.

Environmental Conditions		
Temp (ºC)	**Humidity (%)**	**Pressure (mbar)**
23.9 – 25.2	31.5 – 33.8	965.2 – 967.2

Measurement results, unless otherwise noted, are worst-case measurements.

EUT Description
Model: BDA-LTE/LABC-33/33-90-AB
Description: Commercial/Industrial Booster LTE Unit (700 MHz unit)
Serial Number: 18091002

Additional Information:
This CRMS industrial signal booster operates in the frequency band listed in Table 1.

The internal components of this booster (FCC ID: Q8KLABC3390AB) are the same components installed in a different housing as used in CMRS industrial booster FCC ID: Q8KLABC3390R.

Test results from booster with FCC ID Q8KLABC3390R are used in this report following KDB 484596 D01 Referencing Test Data v01.

The Test Summary Table on page 8 clearly states what test data was used from FCC ID: Q8KLABC3390R.

Table 1 – Frequency Bands_ Modulation Types_ Emission Designators

Frequency Band (MHz)		Modulation Type	Emission Designator
Uplink	698 - 716	LTE	G7D
Downlink	728 - 746		

The emission designators listed are representative emission designators used by transmitters whose signal is amplified by this booster.

The EUT does not support GSM signaling, nor are GSM signals present in the passband.

EUT Operation during Tests

There is a 0 – 30 dB gain adjustment on the front panel. The gain control was set to (0) to provide maximum gain for all tests.
30 dB high power attenuators were installed on both the Base and Mobile RF ports for all tests. The insertion loss of the 30 dB attenuators plus the external test cables were accounted for in all measurements.

The EUT is powered by 120 VAC 60 Hz.

Cables:

Qty	Description	Length (M)	Shielding Y/N	Shielded Hood Y/N	Termination
1	Mains Power Cable	2	N	N	N/A

Accessories: None

Modifications: None

Test Result Summary

Specification	Test Name	Pass, Fail, N/A	Comments
KDB 935210 D05	AGC Threshold	Pass	New Test Data
KDB 935210 D05	Out-of-Band Rejection	Pass	New Test Data
KDB 935210 D05	Input-Versus-Output Signal Comparison	Pass	Test Results are from FCC ID: Q8KLABC3390R
2.1046 KDB 935210 D05	Mean Output Power and Amplifier gain	Pass	New Test Data
KDB 935210 D05	Out-Of-Band/Block Emissions Conducted	Pass	Test Results are from FCC ID: Q8KLABC3390R
2.1051 KDB 935210 D05	Spurious Emissions Conducted	Pass	New Test Data
KDB 935210 D05	Frequency Stability	N/A	Does not have Frequency translation
2.1053 KDB 935210 D05	Spurious Emissions Radiated	Pass	New Test Data

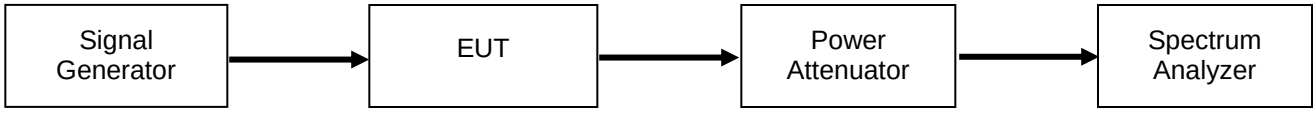
AGC Threshold
Engineer: Greg Corbin
Test Date: 4/25/2019

Test Procedure

A signal generator was connected to the input of the EUT. A spectrum analyzer was connected to the EUT in order to monitor the output power levels. The Signal Generator was configured to produce the necessary broadband and narrow band signals. The input power level was increase in 1 dB increments until the power no longer increased. The input levels were recorded in the table below.

Spectrum Analyzer settings
Power Channel integration
RBW = 1-5% of EBW
Video BW = 3x RBW

Test Setup



Downlink

Tuned Frequency (MHz)	AGC Threshold (dBm)	
	AWGN	GSM
737	-52.7	N/A

Uplink

Tuned Frequency (MHz)	AGC Threshold (dBm)	
	AWGN	GSM
716	-52.9	N/A

The EUT does not support GSM signaling, nor are GSM signals present in the passband.

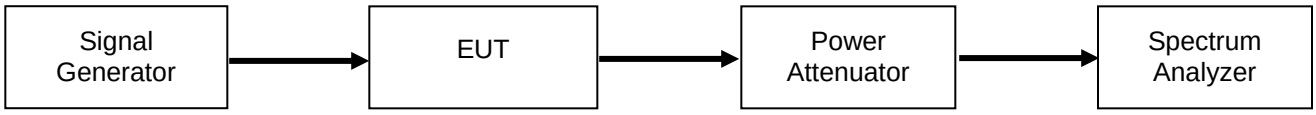
Out-Of-Band Rejection
Engineer: Greg Corbin
Test Date: 4/25/2019

Test Procedure

The EUT was connected to a spectrum analyzer through a 30 dB power attenuator. A signal generator was utilized to produce a swept CW signal with the RF input level set just below the AGC Threshold level. The Uplink and Downlink filter response and the -20 dB bandwidth were measured. The marker table function of the spectrum analyzer was used to show the peak amplitude in the passband and the -20 dB bandwidth of the pass band filter.

RBW = 100 KHz
Video BW = 3x RBW

Test Setup



Uplink Test Results

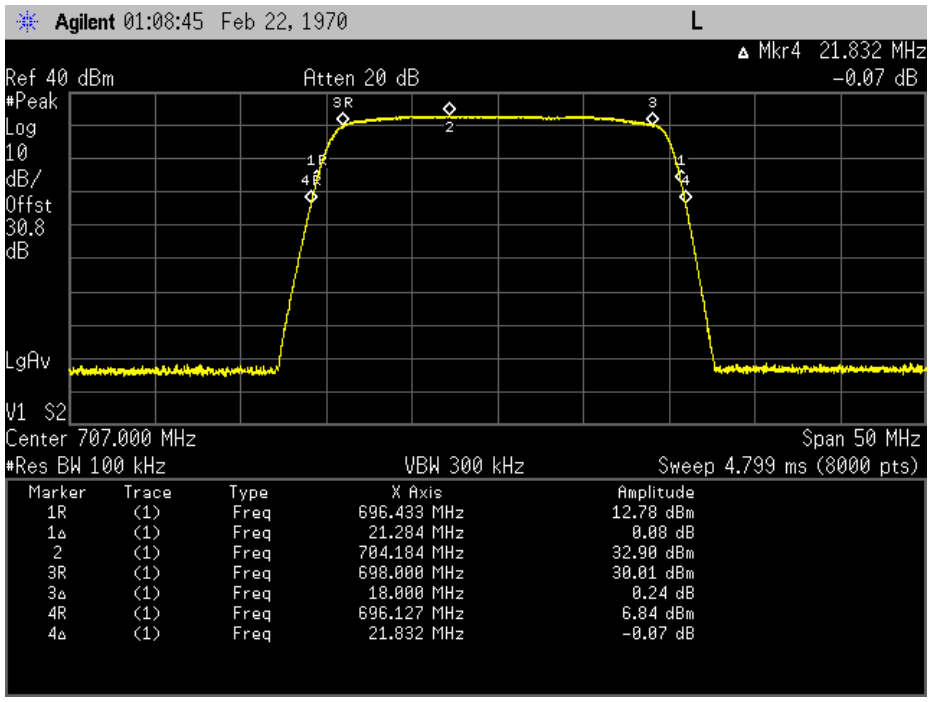
Frequency Band (MHz)	Start Frequency (MHz)	Stop Frequency (MHz)	20 dB Bandwidth (MHz)
698 - 716	696.433	717.717	21.284

Downlink Test Results

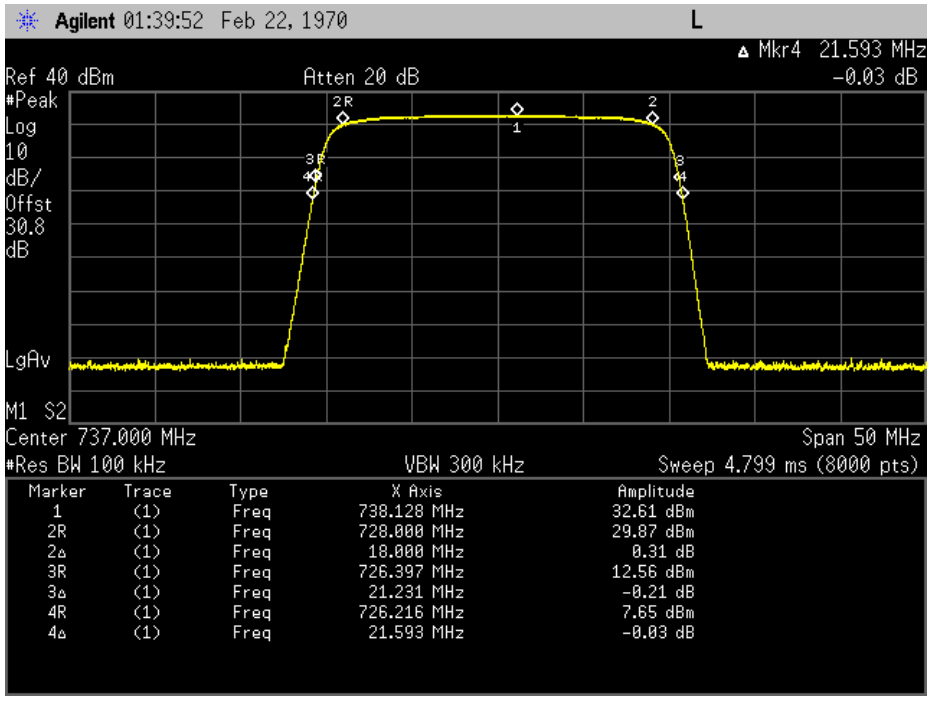
Frequency Band (MHz)	Start Frequency (MHz)	Stop Frequency (MHz)	20 dB Bandwidth (MHz)
728 - 746	726.397	747.628	21.131

Out of Band Rejection Test Results

Uplink 698 – 716 MHz



Downlink 728 – 746 MHz



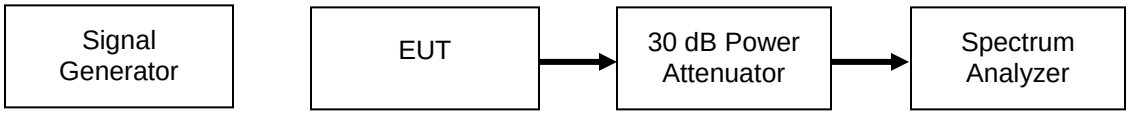
Input-Versus-Output Signal Comparison
Engineer: Christian Pawlak
Test Date: 9/14/2018

Test Procedure

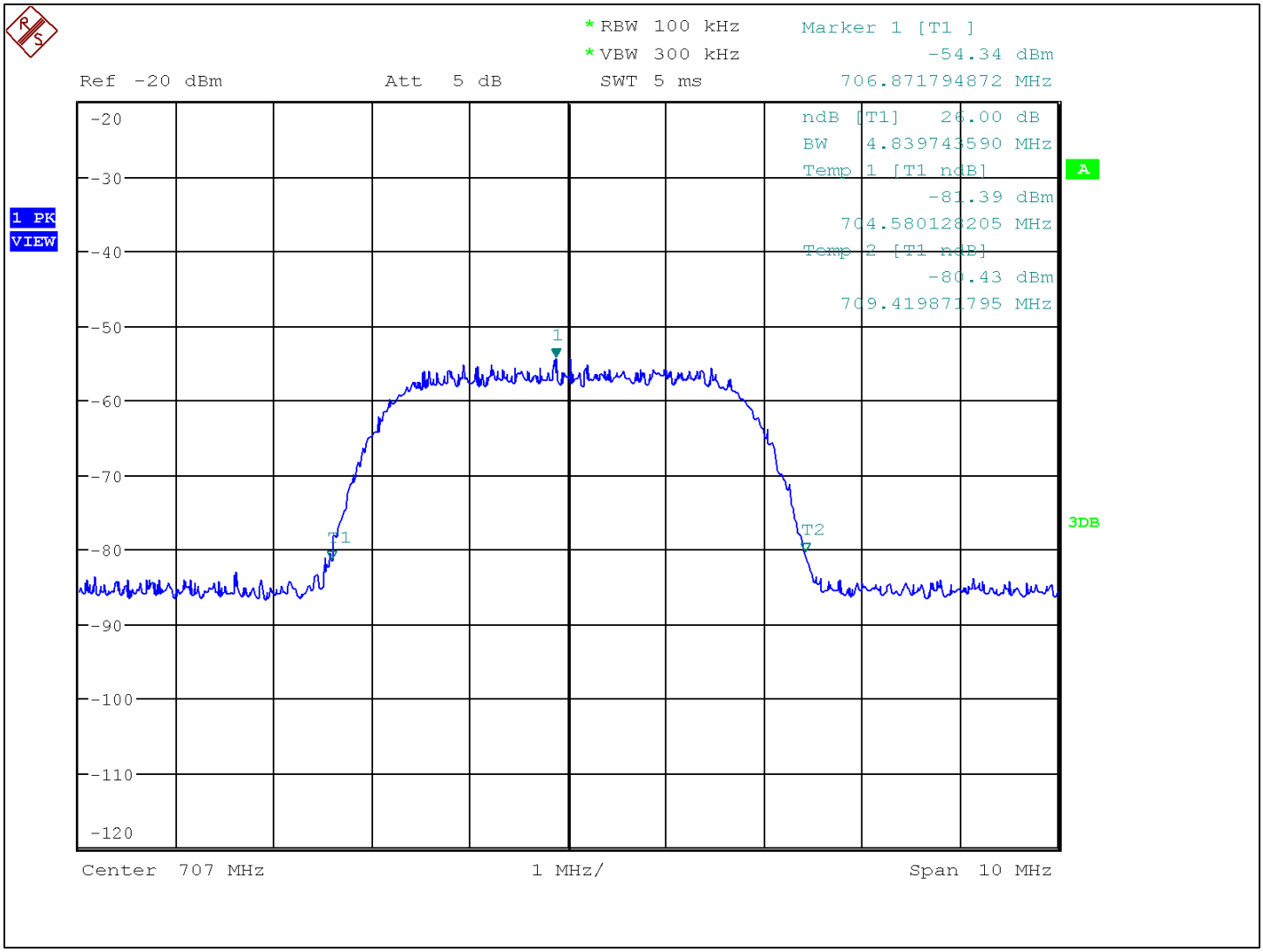
The Test Procedure used was ANSI C63.26-2015 7.2.2.3 with no deviations. EUT does not support narrowband signal.

This test data is from booster with FCC ID Q8KLABC3390R using KDB 484596 D01 Referencing Test Data v01 guidelines for re-using test data.

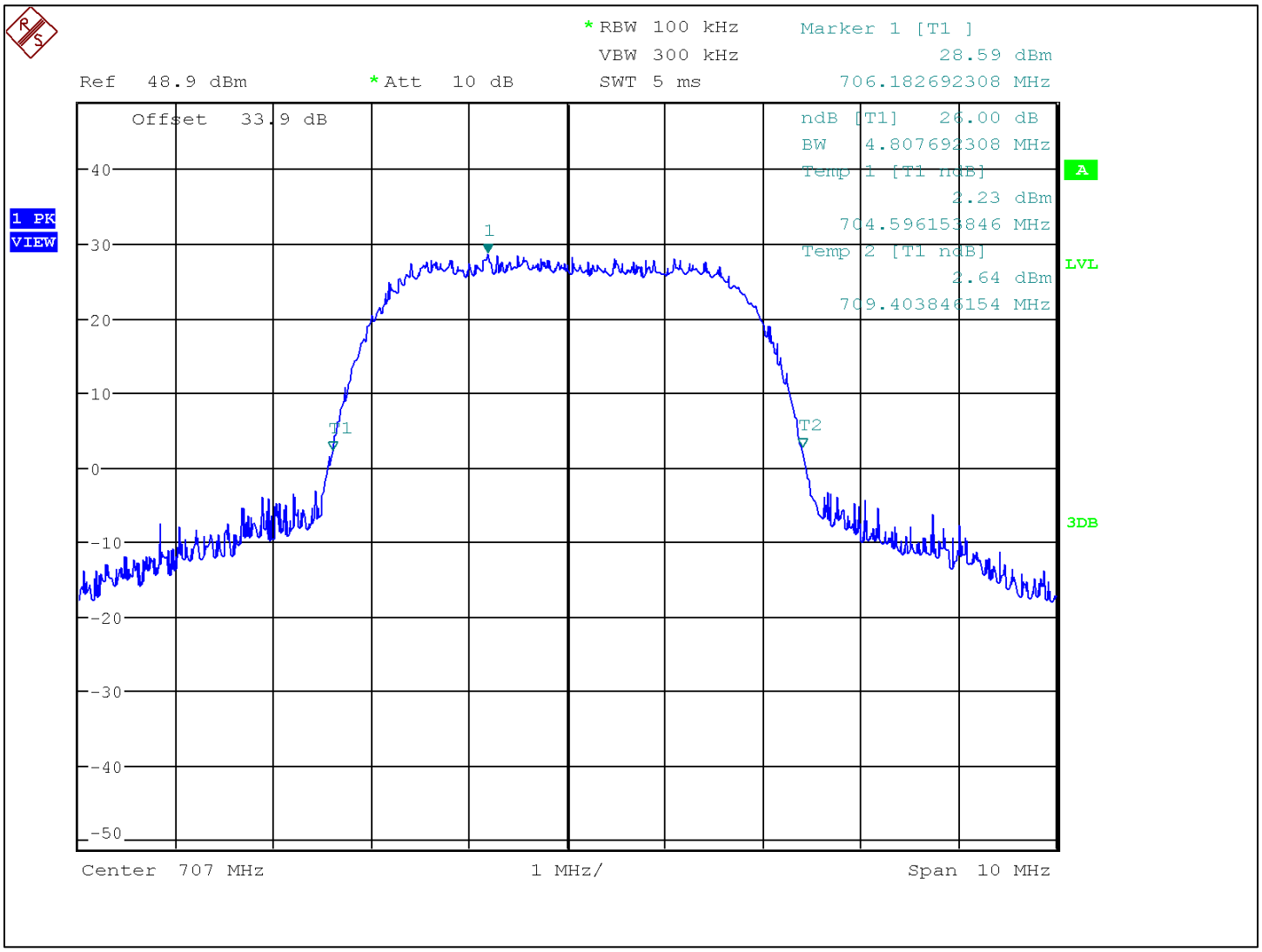
Test Setup



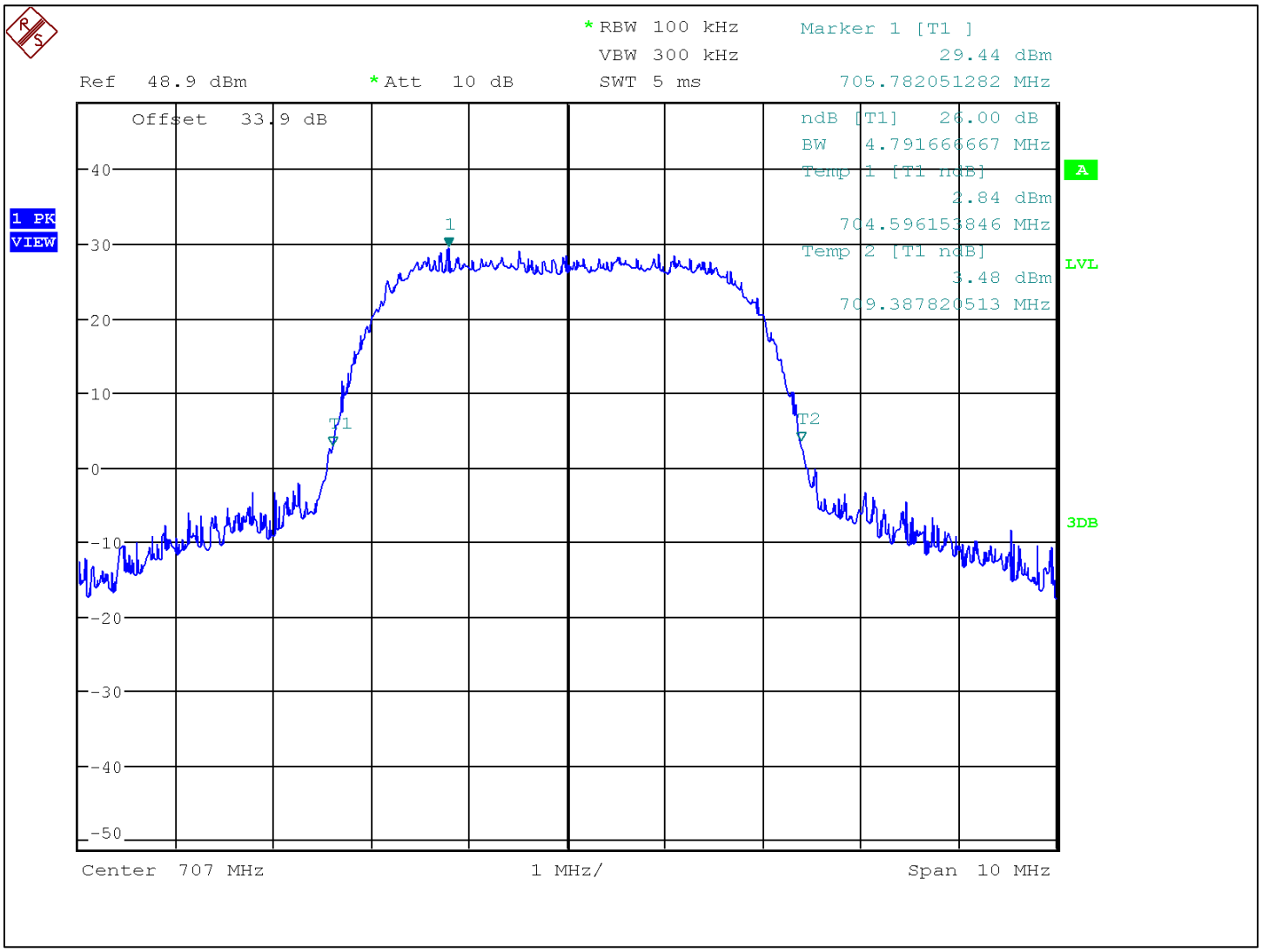
Input-versus-output spectrum – Input Signal



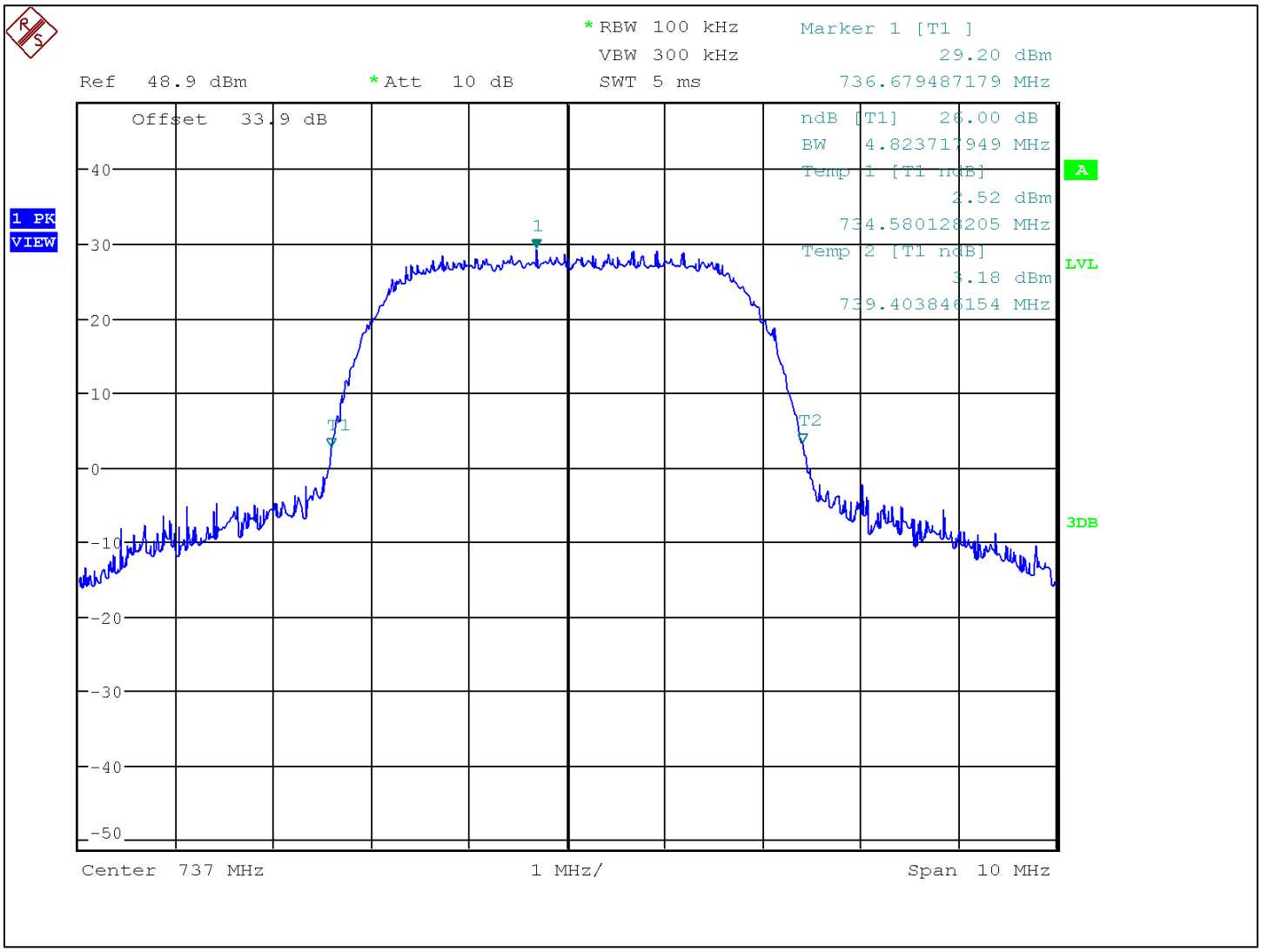
Input-versus-output spectrum – Uplink without AGC



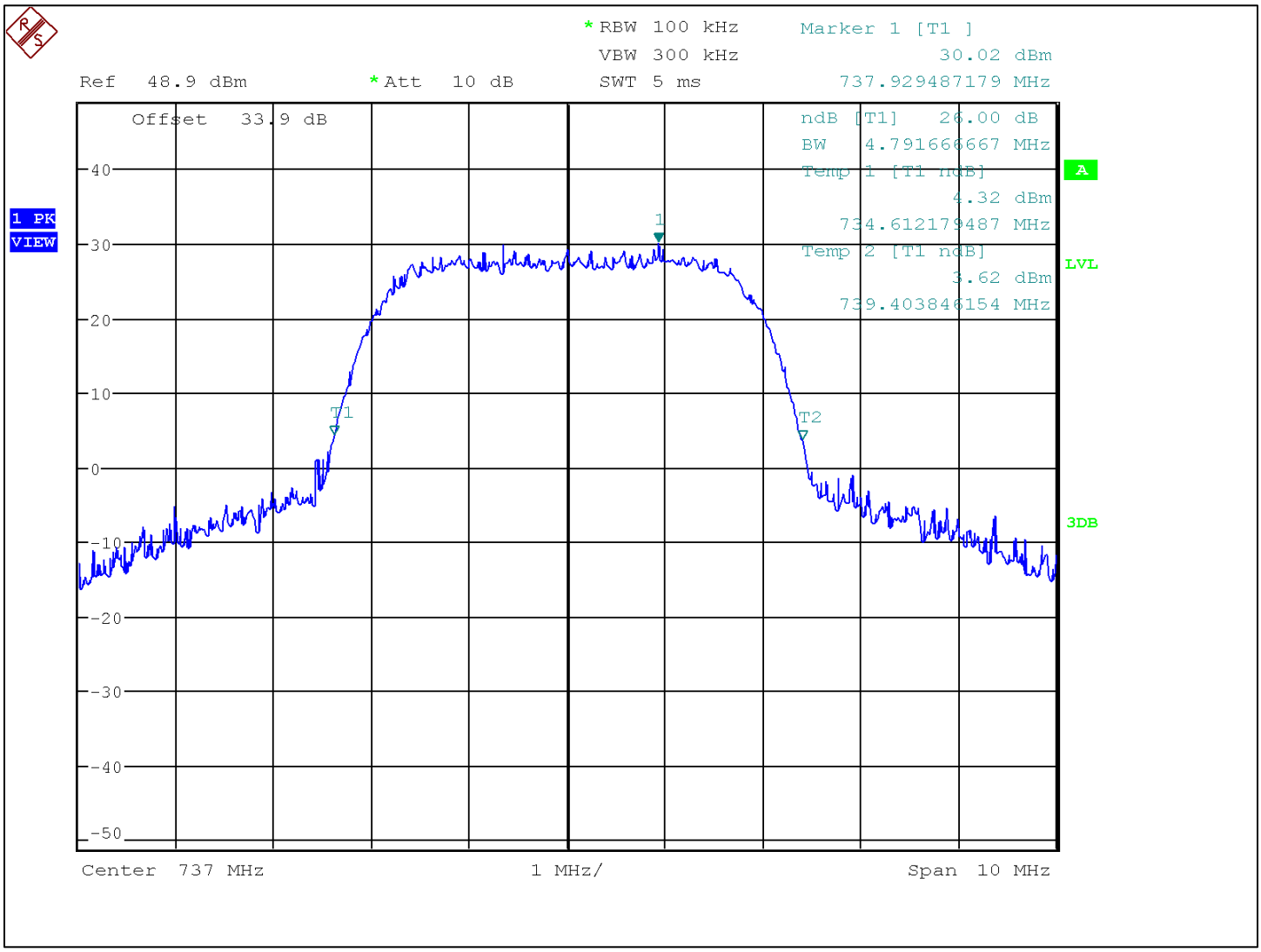
Input-versus-output spectrum – Uplink with AGC



Input-versus-output spectrum – Downlink without AGC



Input-versus-output spectrum – Downlink with AGC



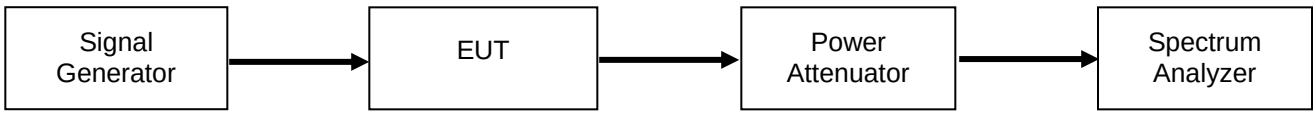
Mean Output and Amplifier Gain
Engineer: Greg Corbin
Test Date: 4/25/2019

Test Procedure

A signal generator tuned to the peak signal from the Out of Band Rejection data was connected to the input of the EUT.
A spectrum analyzer was connected to the EUT in order to monitor the output power levels.
The Signal Generator was configured to produce a AWGN signal.
EUT does not support narrowband signal.
The input power level was increase in 1 dB increments until the power no longer increased.
The input and output levels were recorded in the table below.
The amplifier gain was determined from the delta between the input and output levels.
The input level was increased 3 dB and the output power was recorded.

Spectrum Analyzer settings
Channel Power integration was used
RBW = 1-5% of EBW
Video BW = 3x RBW

Test Setup



Uplink Output Power and Gain

AWGN

Frequency Range (MHz)	Tuned Frequency (MHz)	Input Power (dBm)	Output Power (dBm)	Gain (dB)	(Input Power +3dB) Output Power (dBm)
698 - 716	704.18	-52.9	32.7	85.6	32.6

Downlink Output Power and Gain

AWGN

Frequency Range (MHz)	Tuned Frequency (MHz)	Input Power (dBm)	Output Power (dBm)	Gain (dB)	(Input Power +3dB) Output Power (dBm)
728 - 746	738.12	-52.7	32.9	85.6	32.7

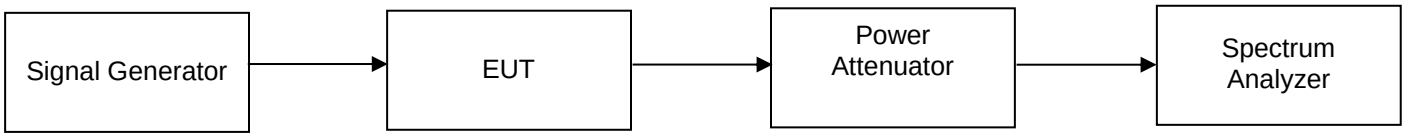
Out-Of-Band/Block Emission (Dual Carrier)
Engineer: Christian Pawlak
Test Date: 9/17/2018

Test Procedure

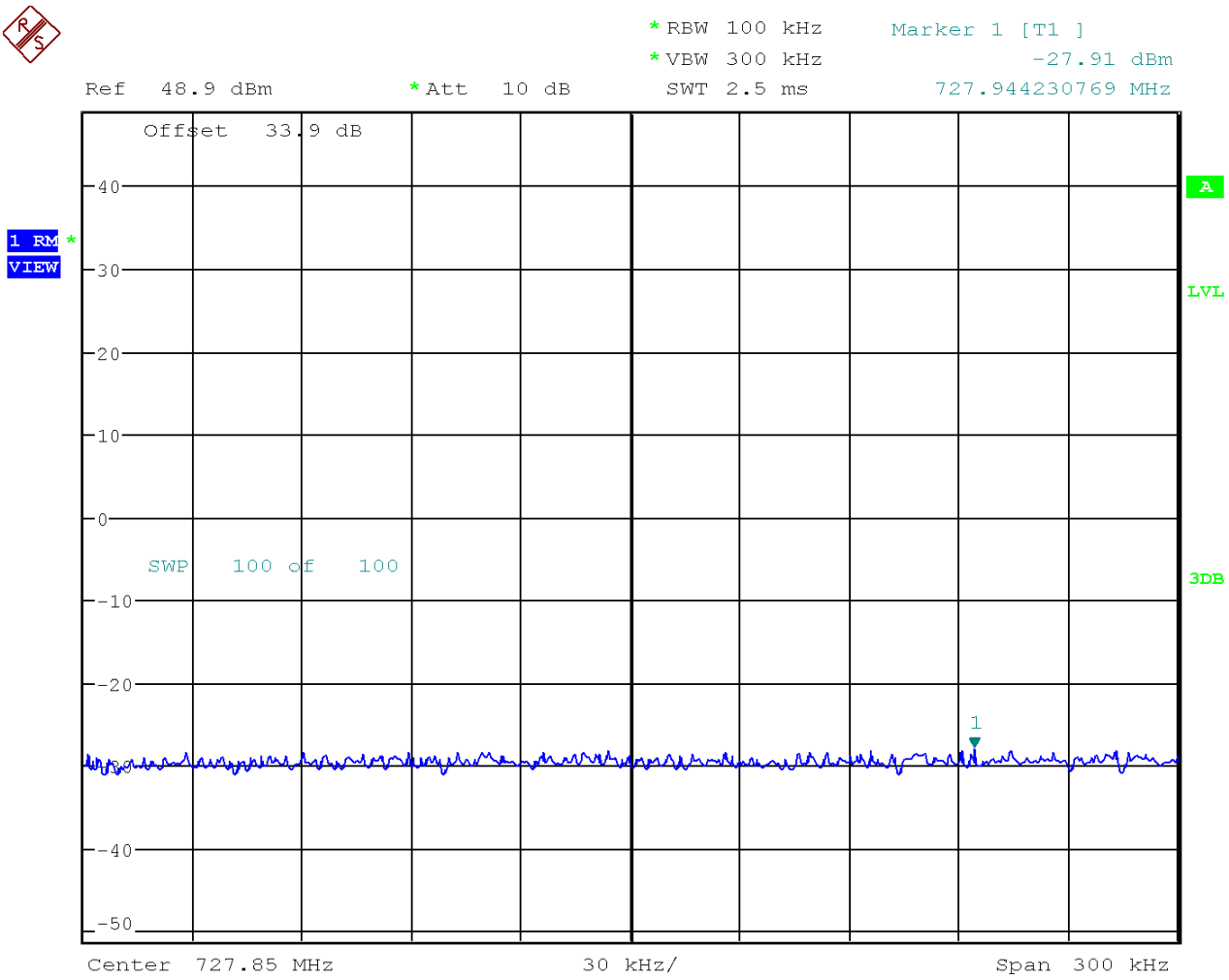
The Test Procedure used was ANSI C63.26-2015 7.2.2.5.2 with no deviations. EUT does not support narrowband signal.

This test data is from booster with FCC ID Q8KLABC3390R using KDB 484596 D01 Referencing Test Data v01 guidelines for re-using test data.

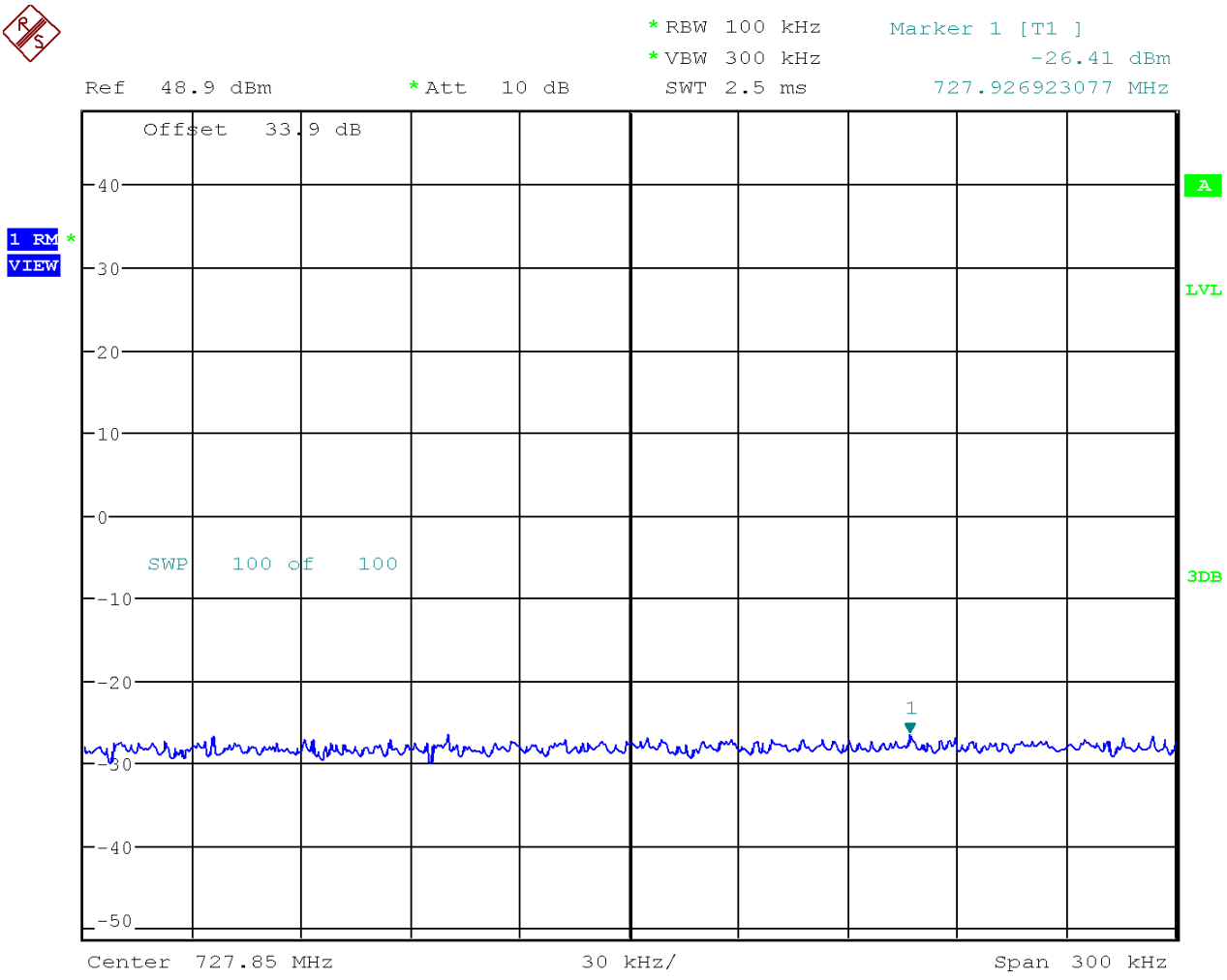
Test Setup



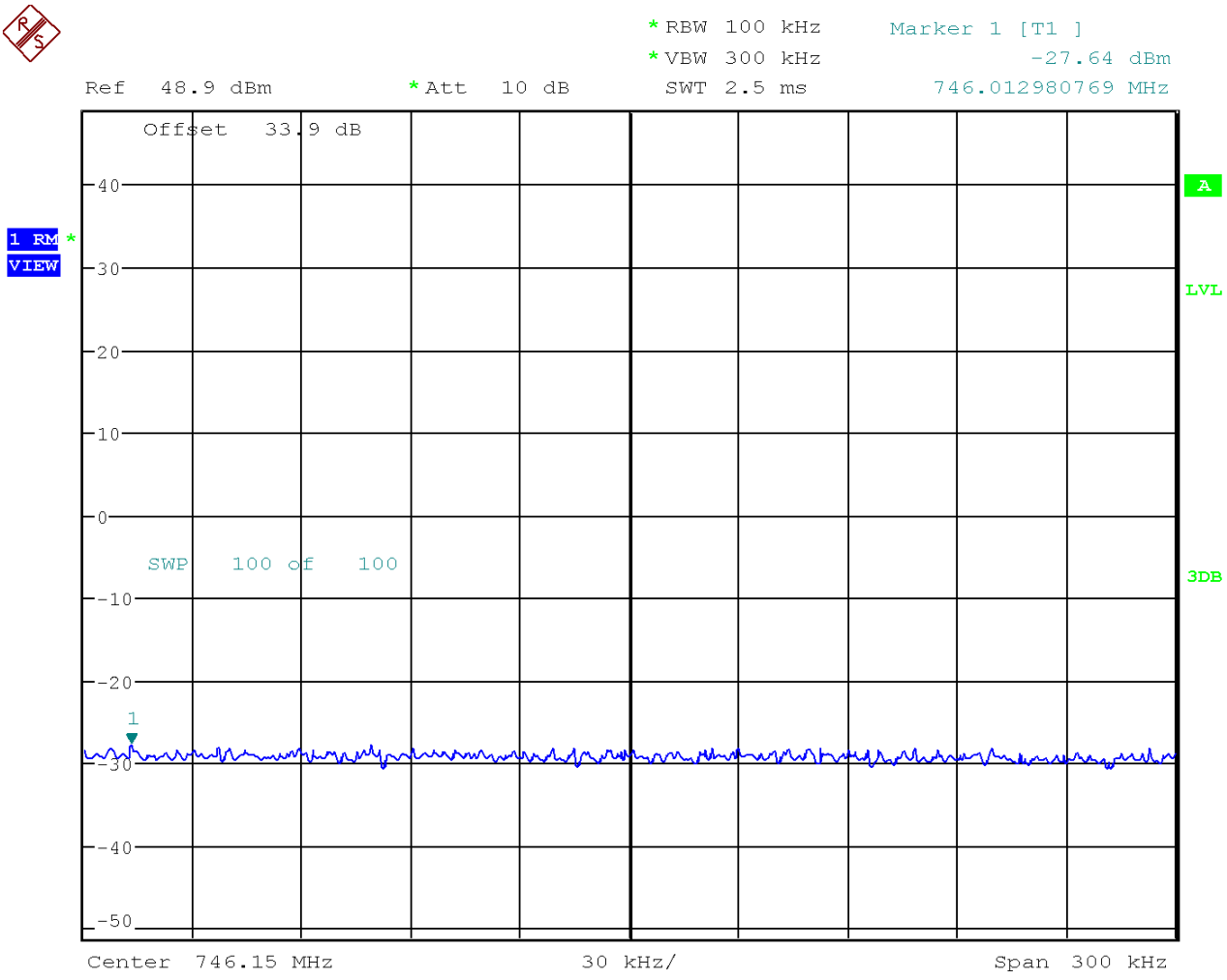
Out-Of-Band/Block Emission (Dual Carrier) – Downlink Lower Without AGC



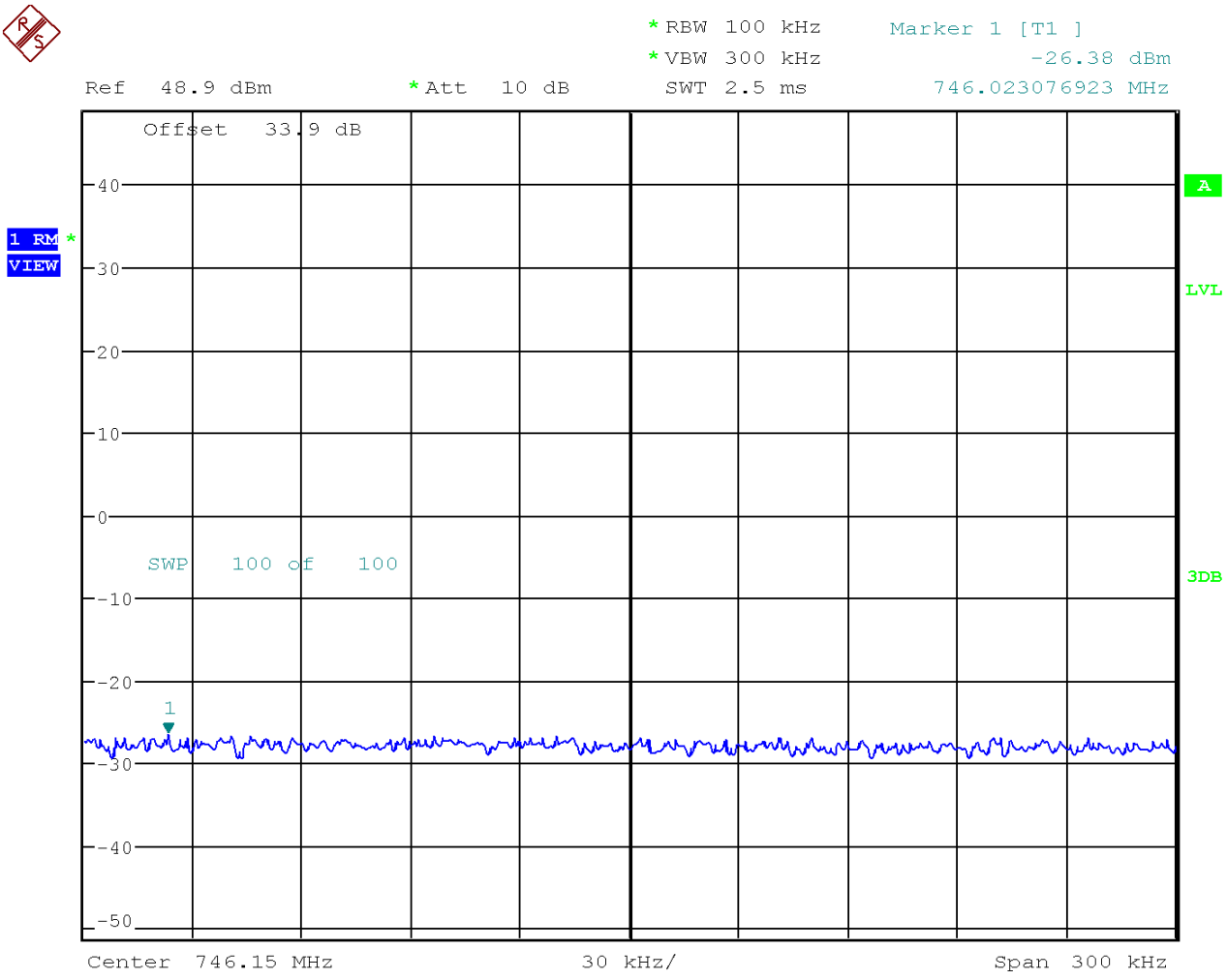
Out-Of-Band/Block Emission (Dual Carrier) – Downlink Lower With AGC



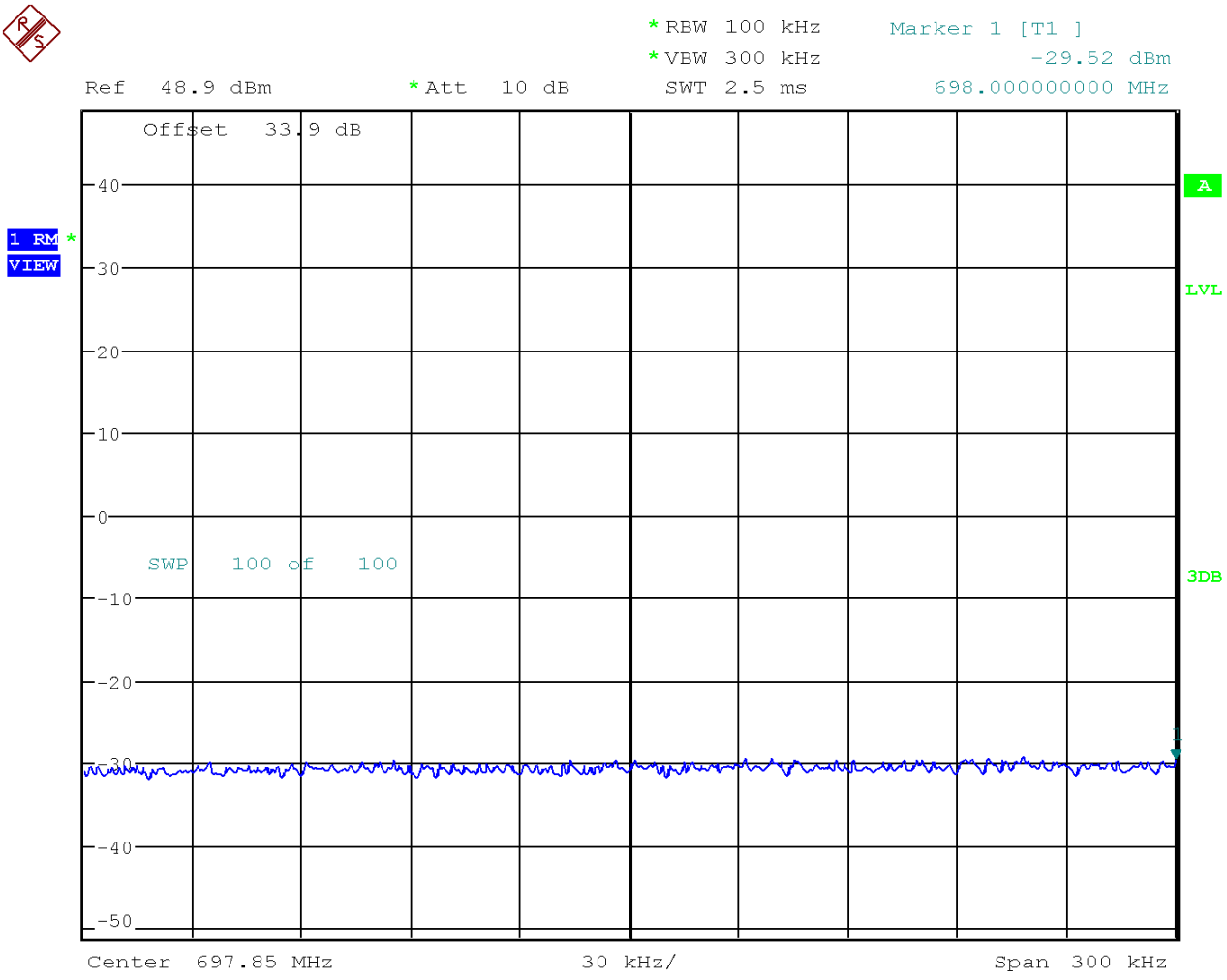
Out-Of-Band/Block Emission (Dual Carrier) – Downlink Upper Without AGC



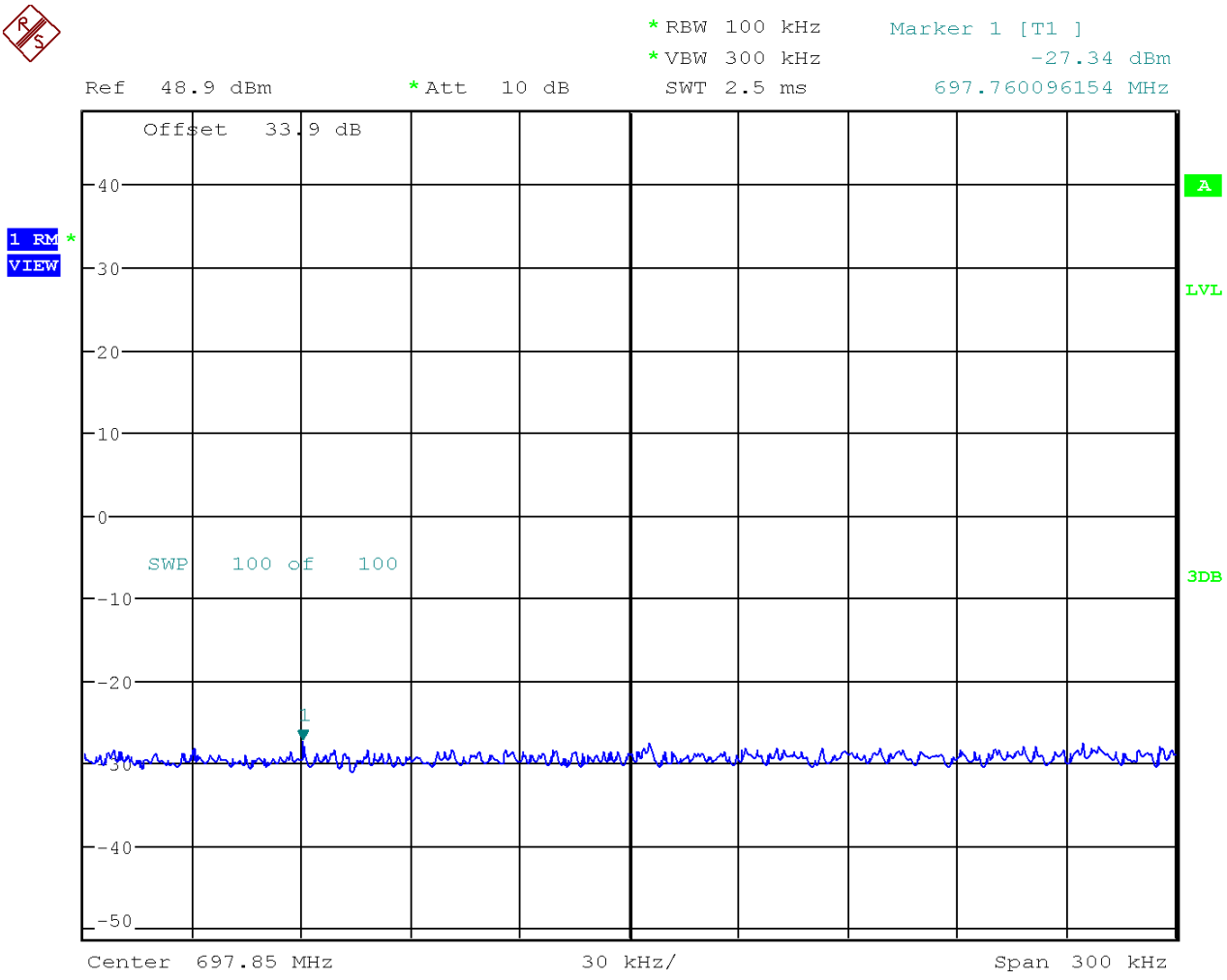
Out-Of-Band/Block Emission (Dual Carrier) – Downlink Upper With AGC



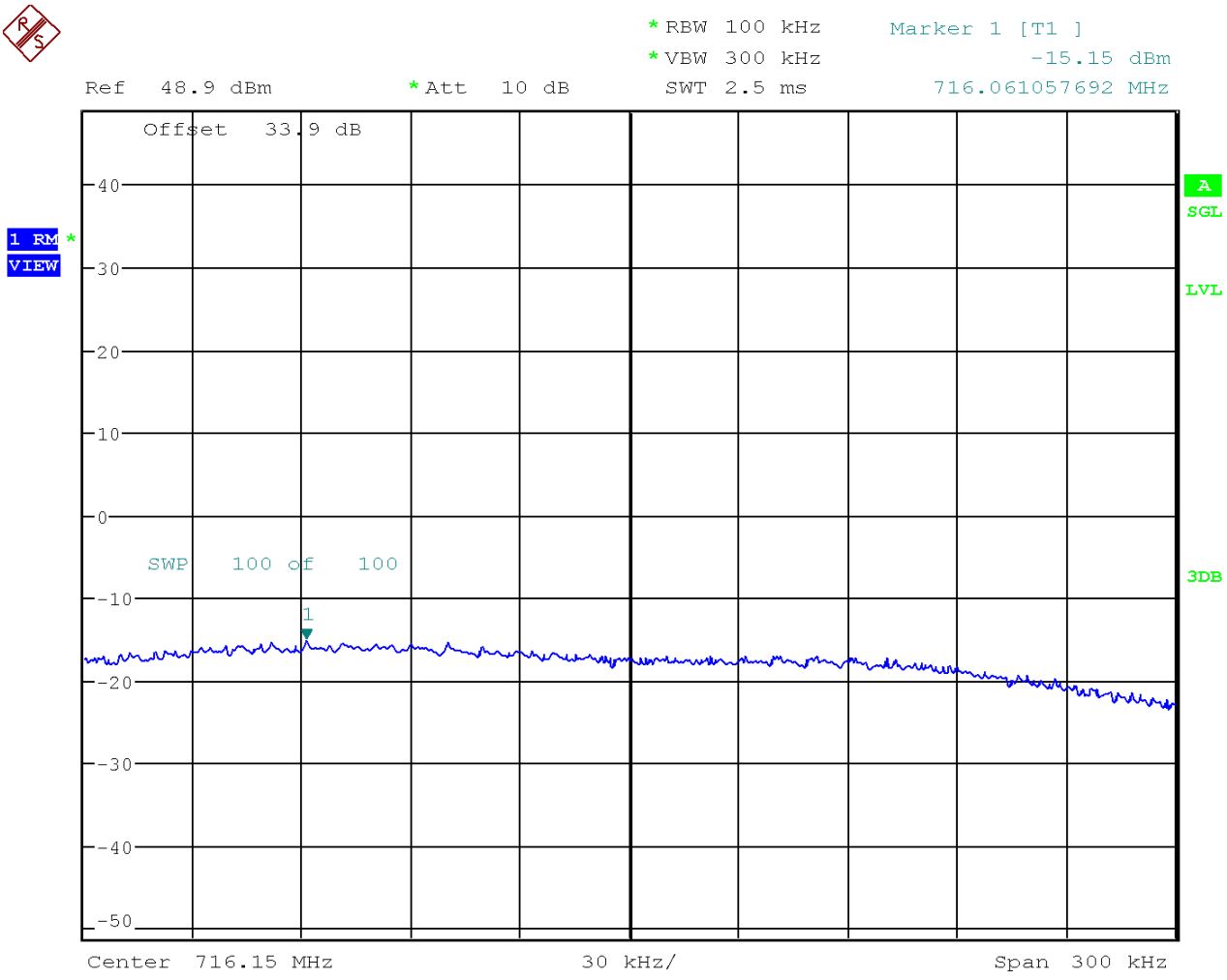
Out-Of-Band/Block Emission (Dual Carrier) – Uplink Lower Without AGC



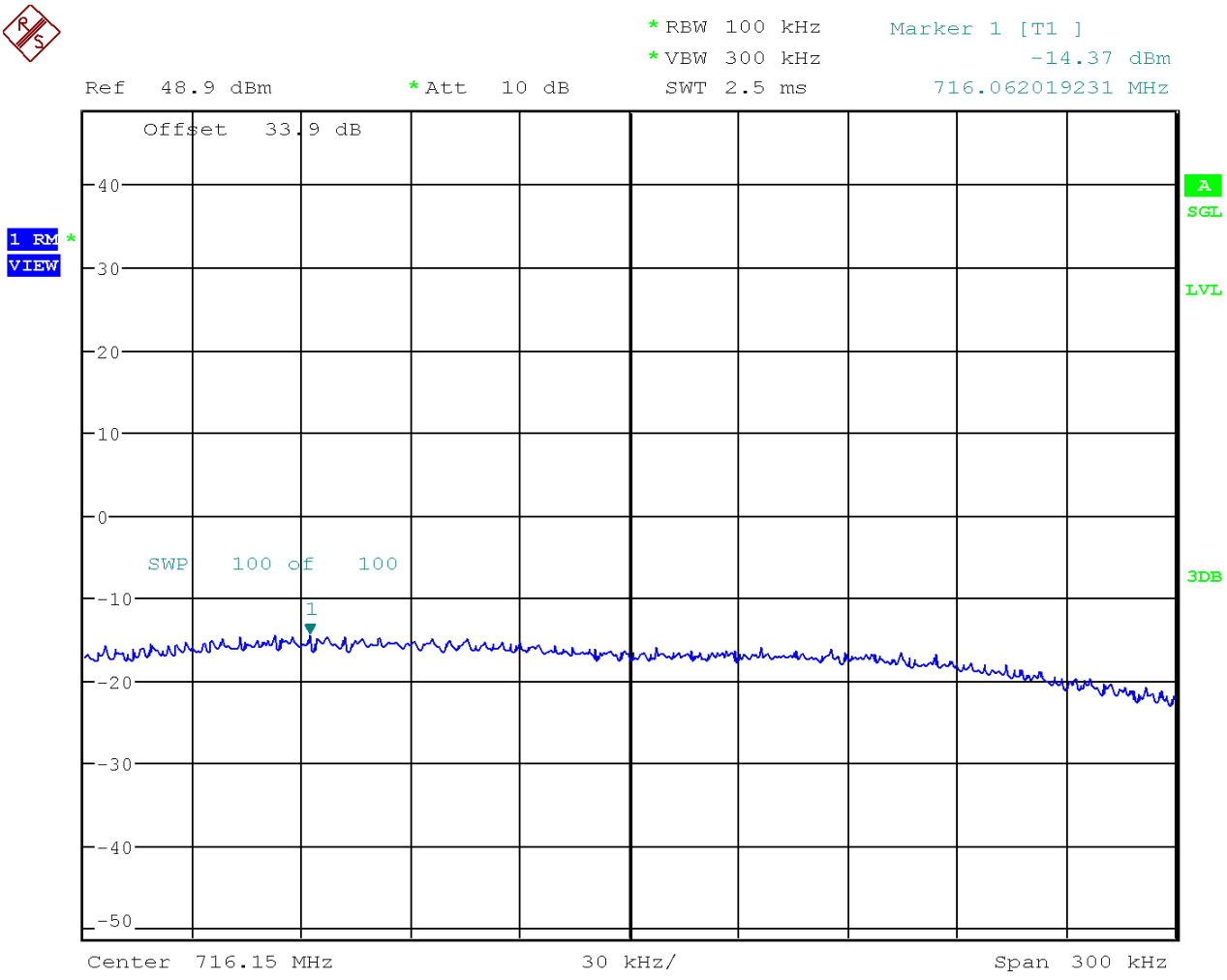
Out-Of-Band/Block Emission (Dual Carrier) – Uplink Lower With AGC



Out-Of-Band/Block Emission (Dual Carrier) – Uplink Upper Without AGC



Out-Of-Band/Block Emission (Dual Carrier) – Uplink Upper With AGC



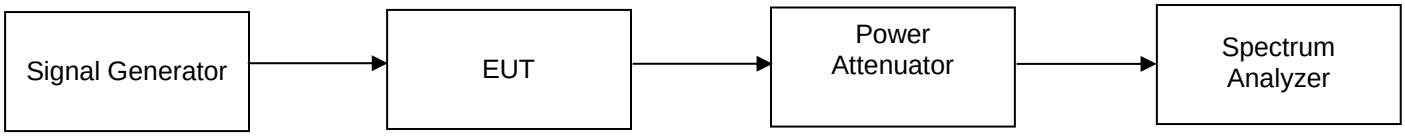
Out-Of-Band/Block Emission (Single Carrier)
Engineer: Christian Pawlak
Test Date: 9/17/2018

Test Procedure

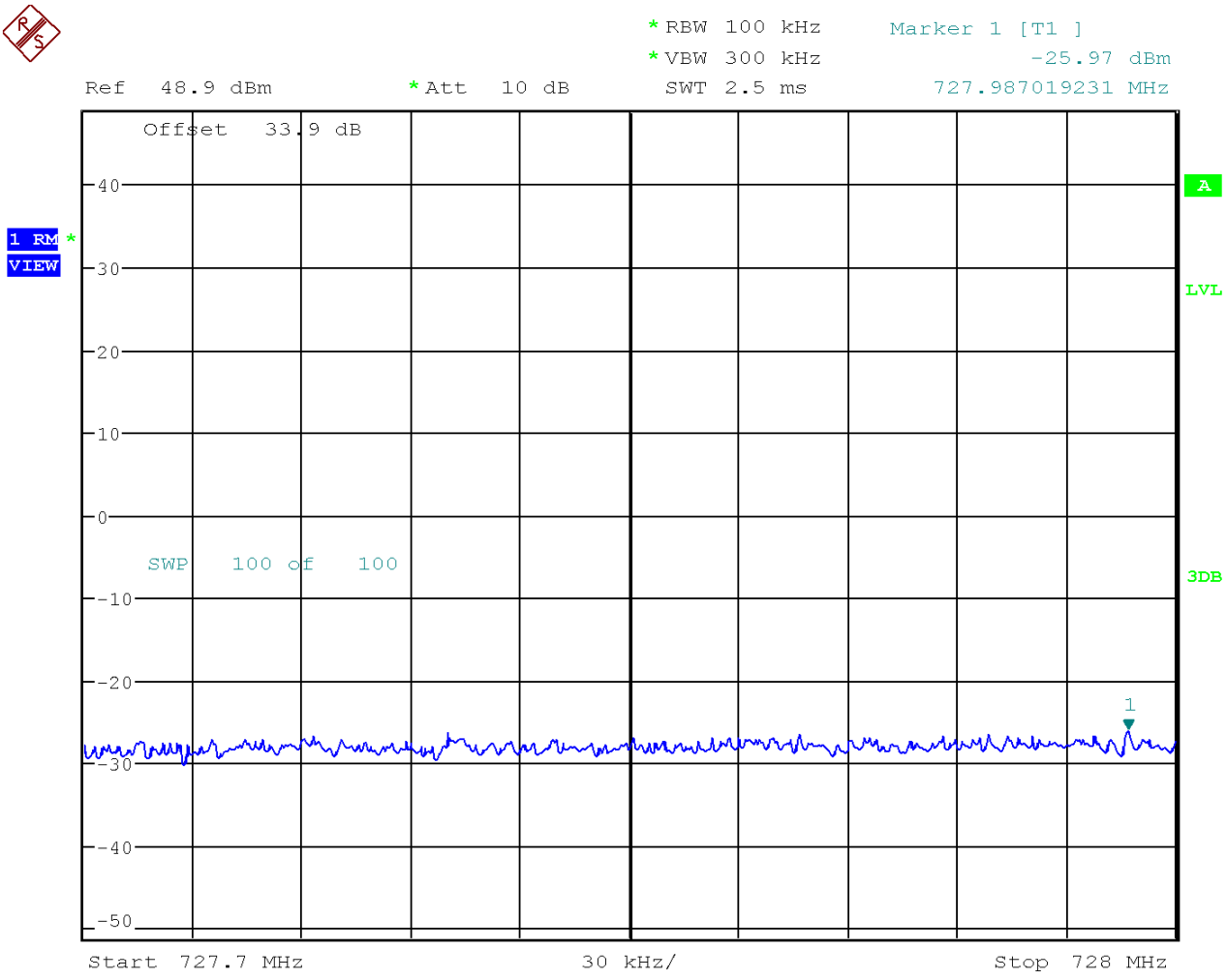
The Test Procedure used was ANSI C63.26-2015 7.2.2.5.2 with no deviations. EUT does not support narrowband signal.

This test data is from booster with FCC ID Q8KLABC3390R using KDB 484596 D01 Referencing Test Data v01 guidelines for re-using test data.

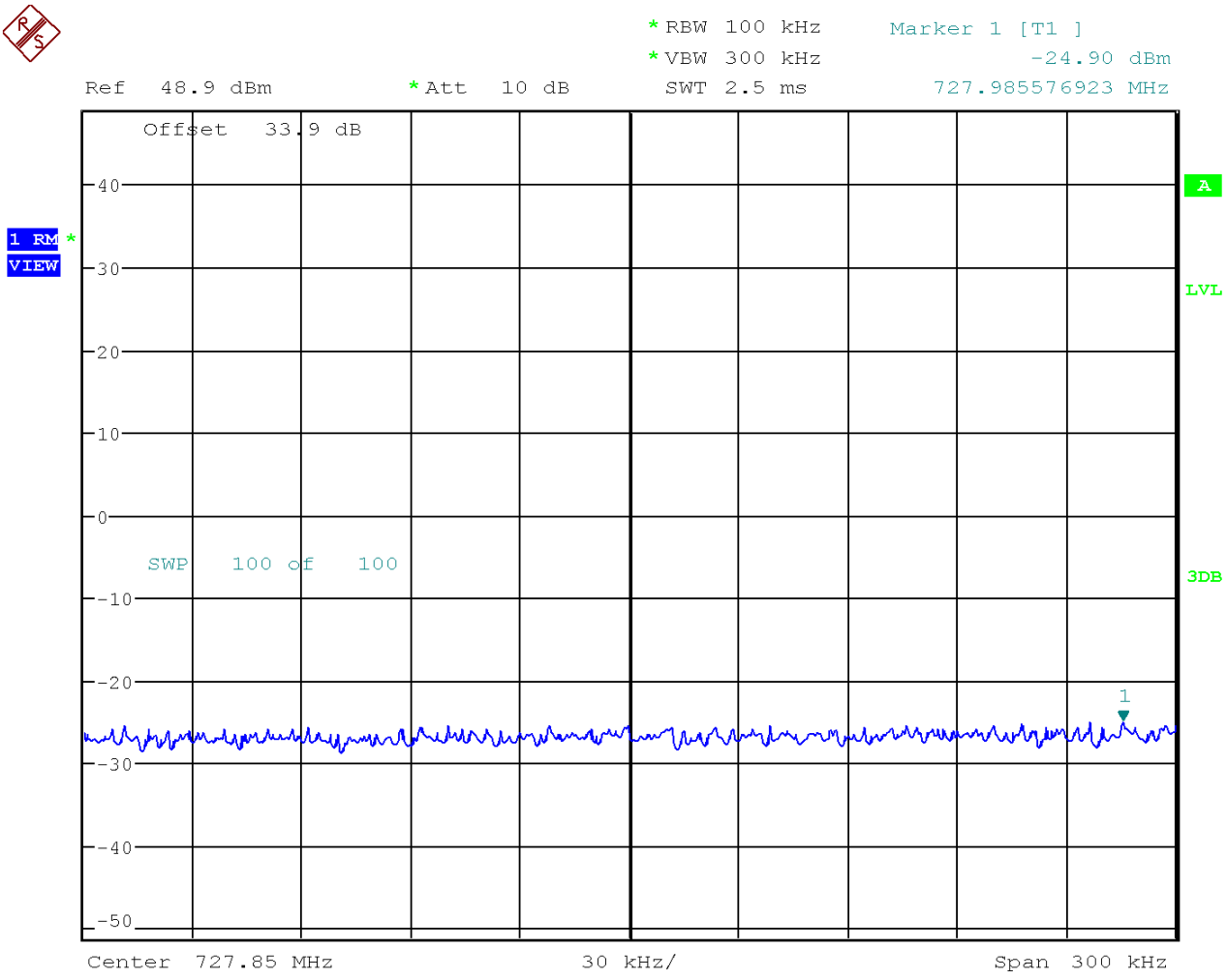
Test Setup



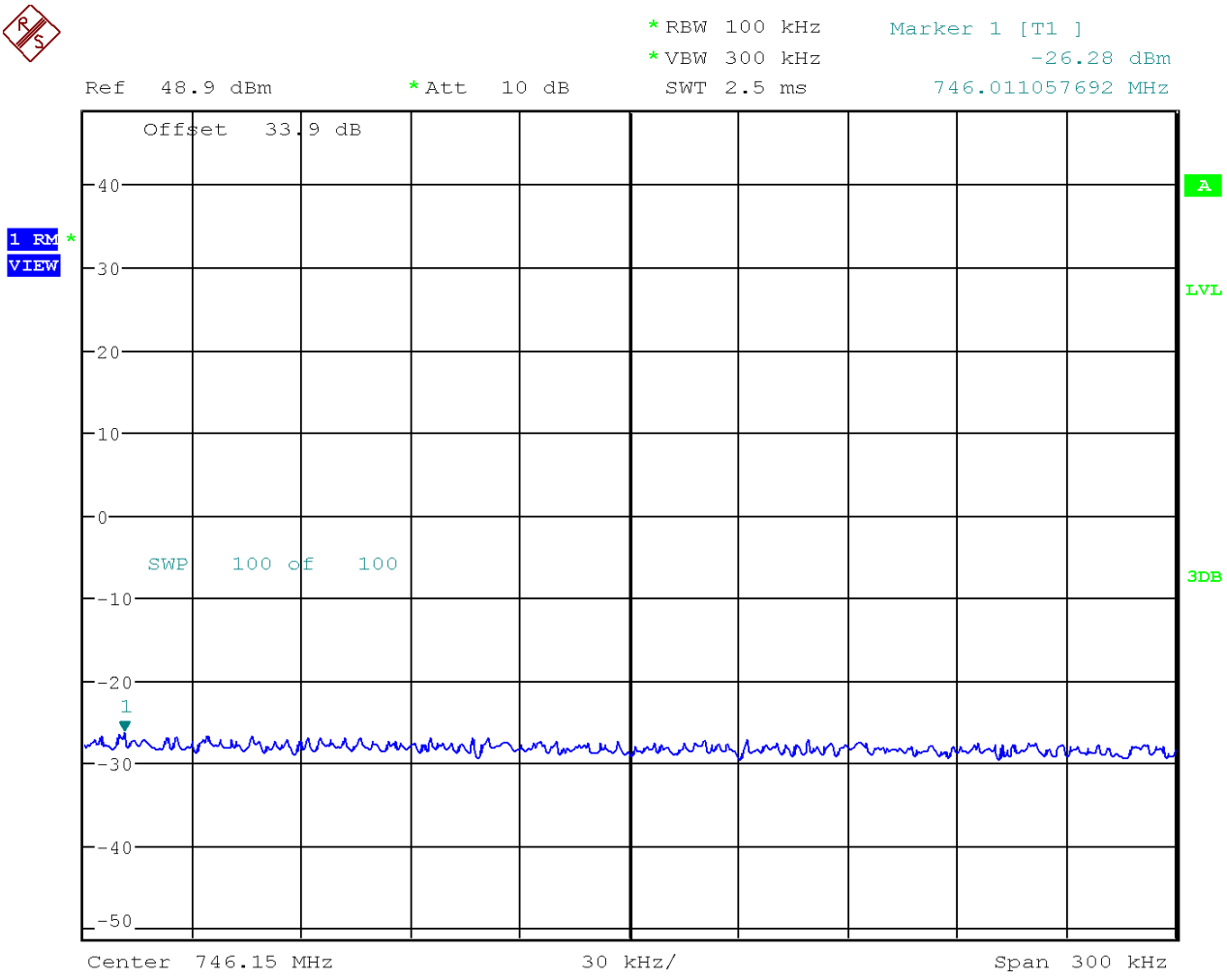
Out-Of-Band/Block Emission (Single Carrier) – Downlink Lower Without AGC



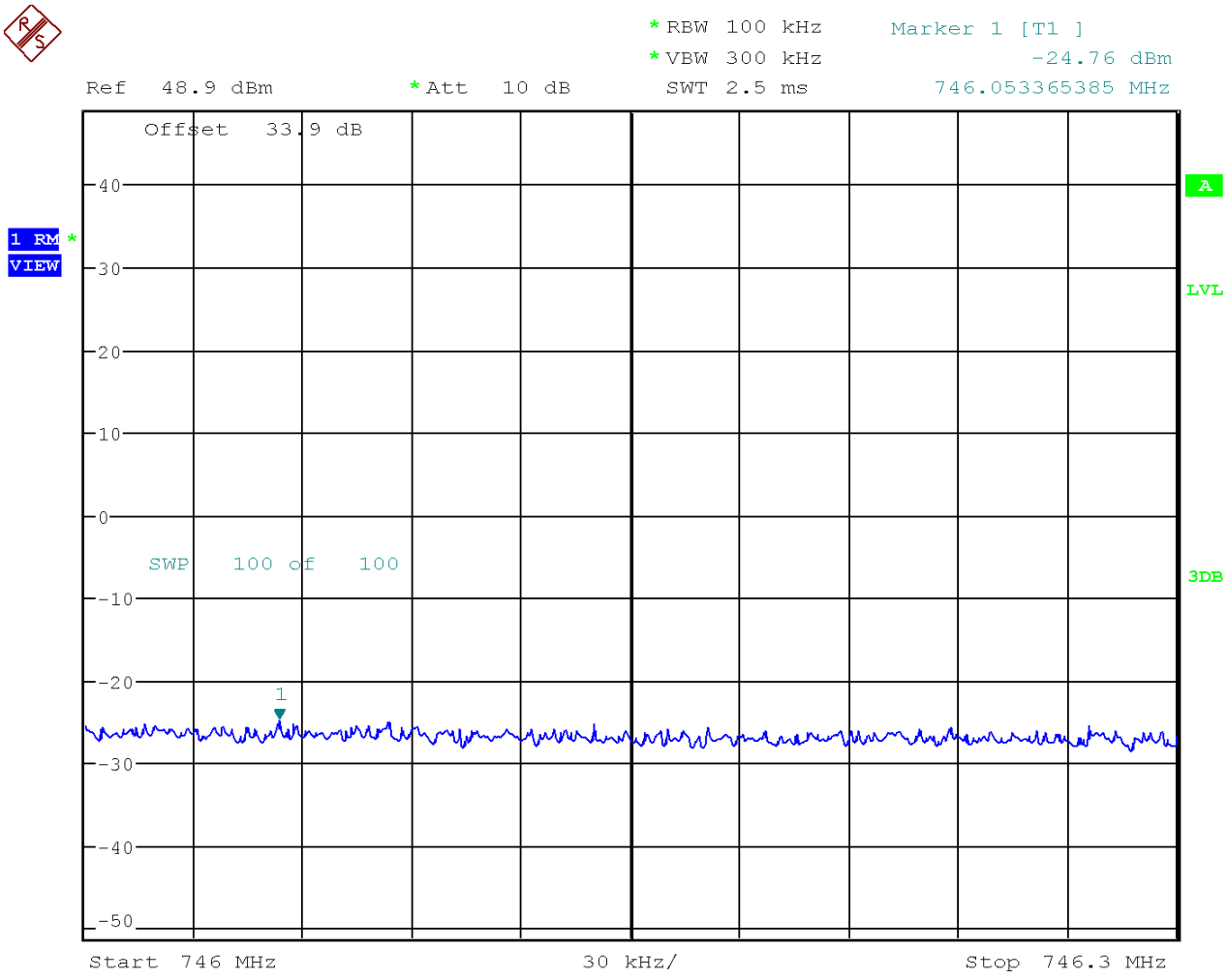
Out-Of-Band/Block Emission (Single Carrier) – Downlink Lower With AGC



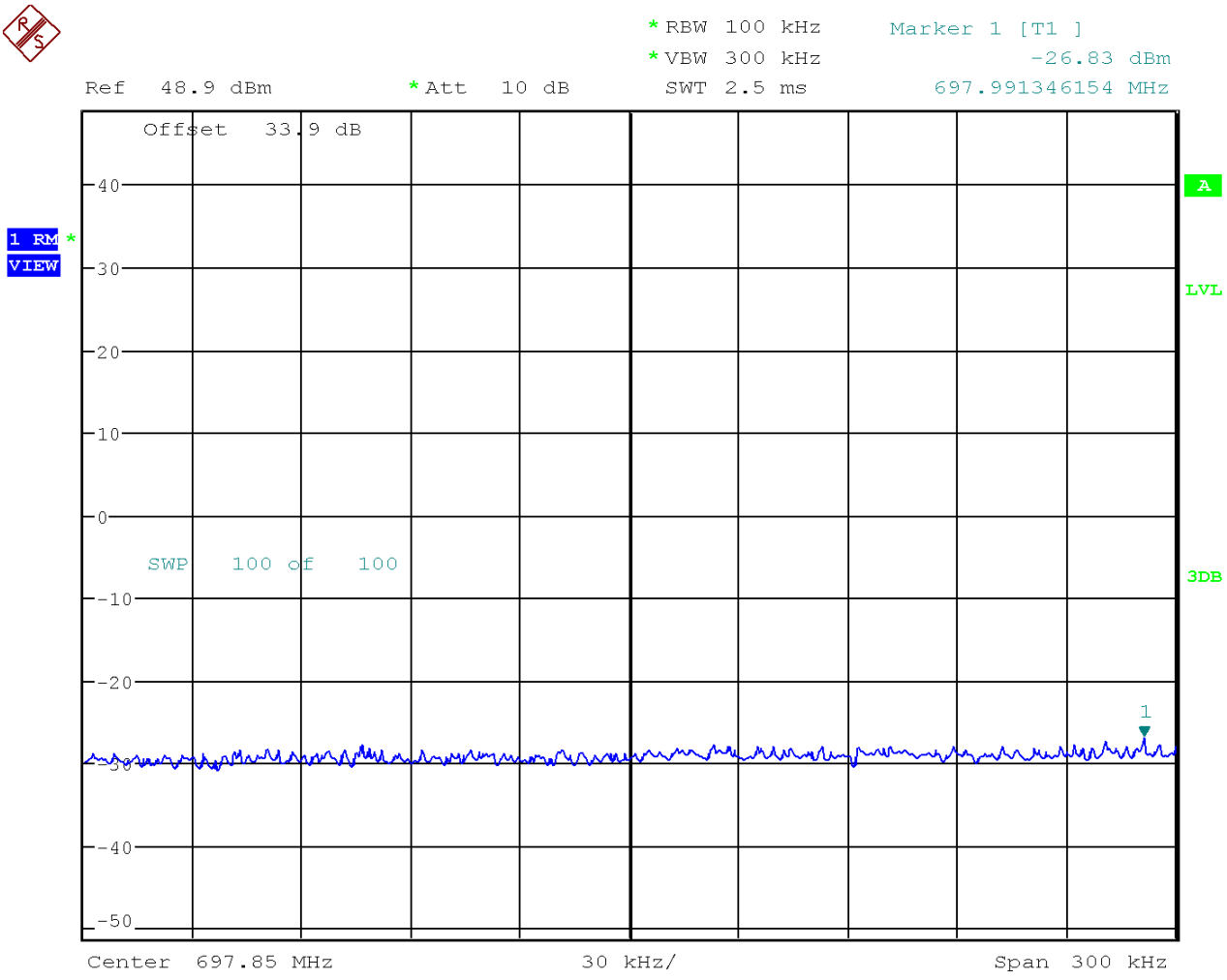
Out-Of-Band/Block Emission (Single Carrier) – Downlink Upper Without AGC



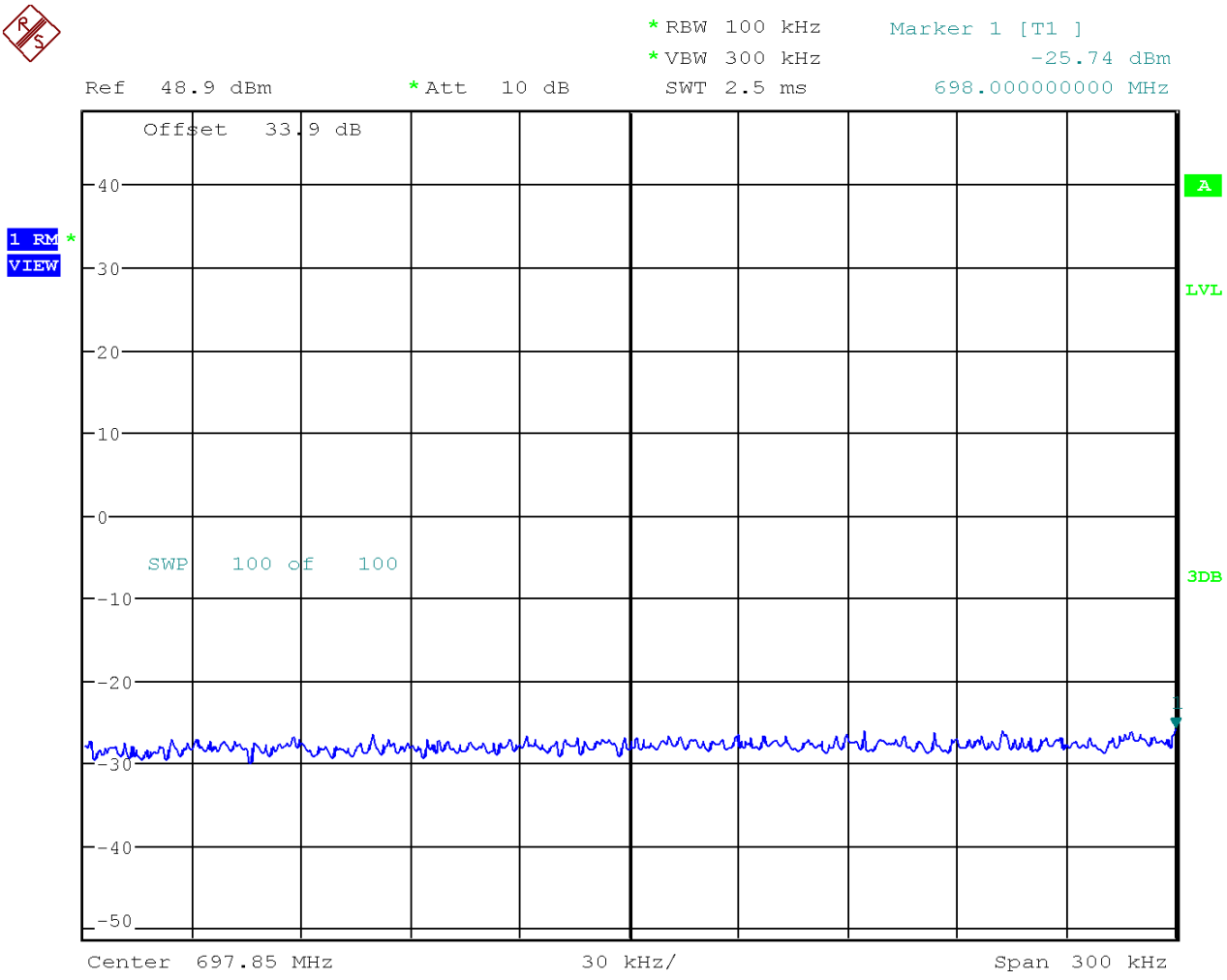
Out-Of-Band/Block Emission (Single Carrier) – Downlink Upper With AGC



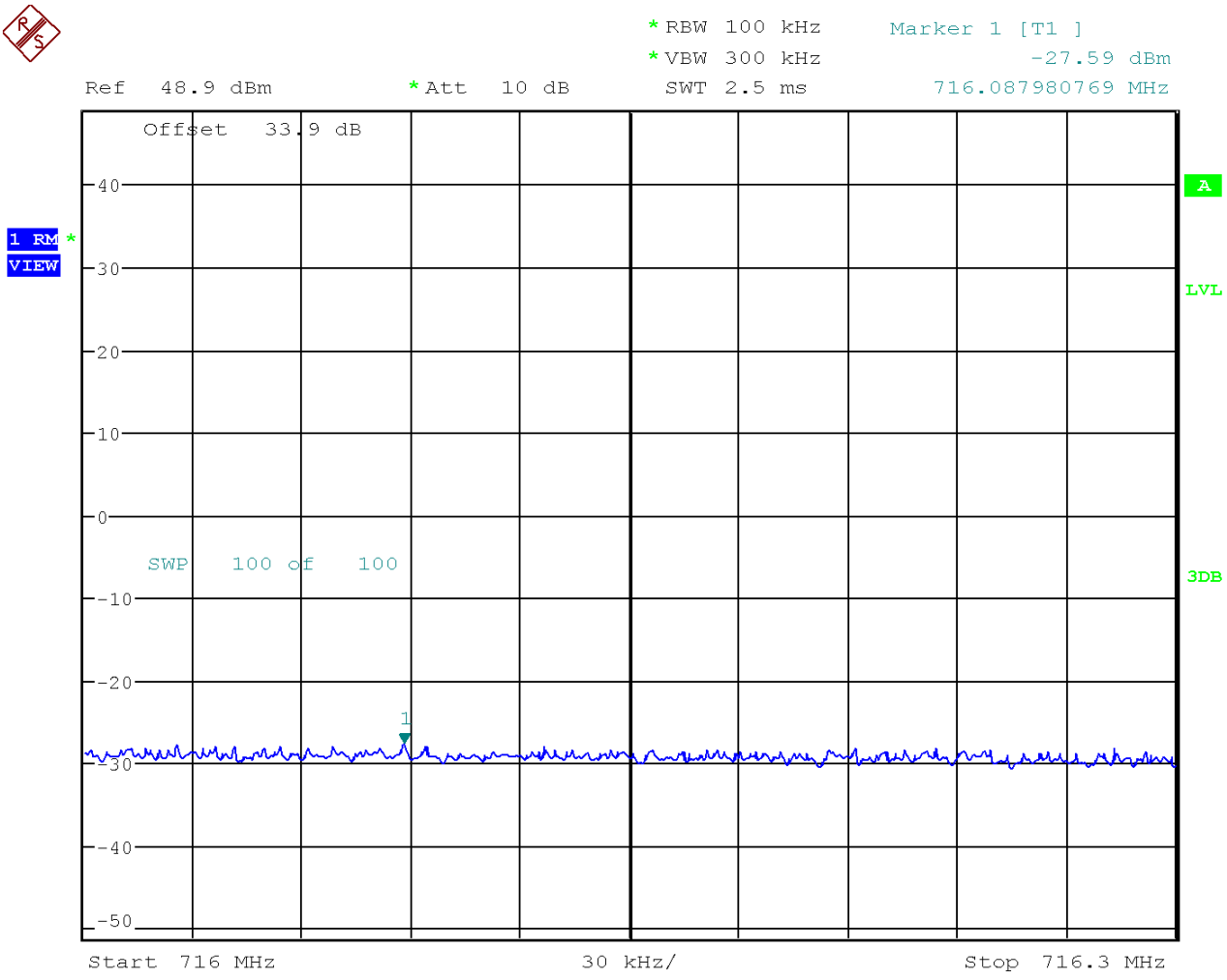
Out-Of-Band/Block Emission (Single Carrier) – Uplink Lower Without AGC



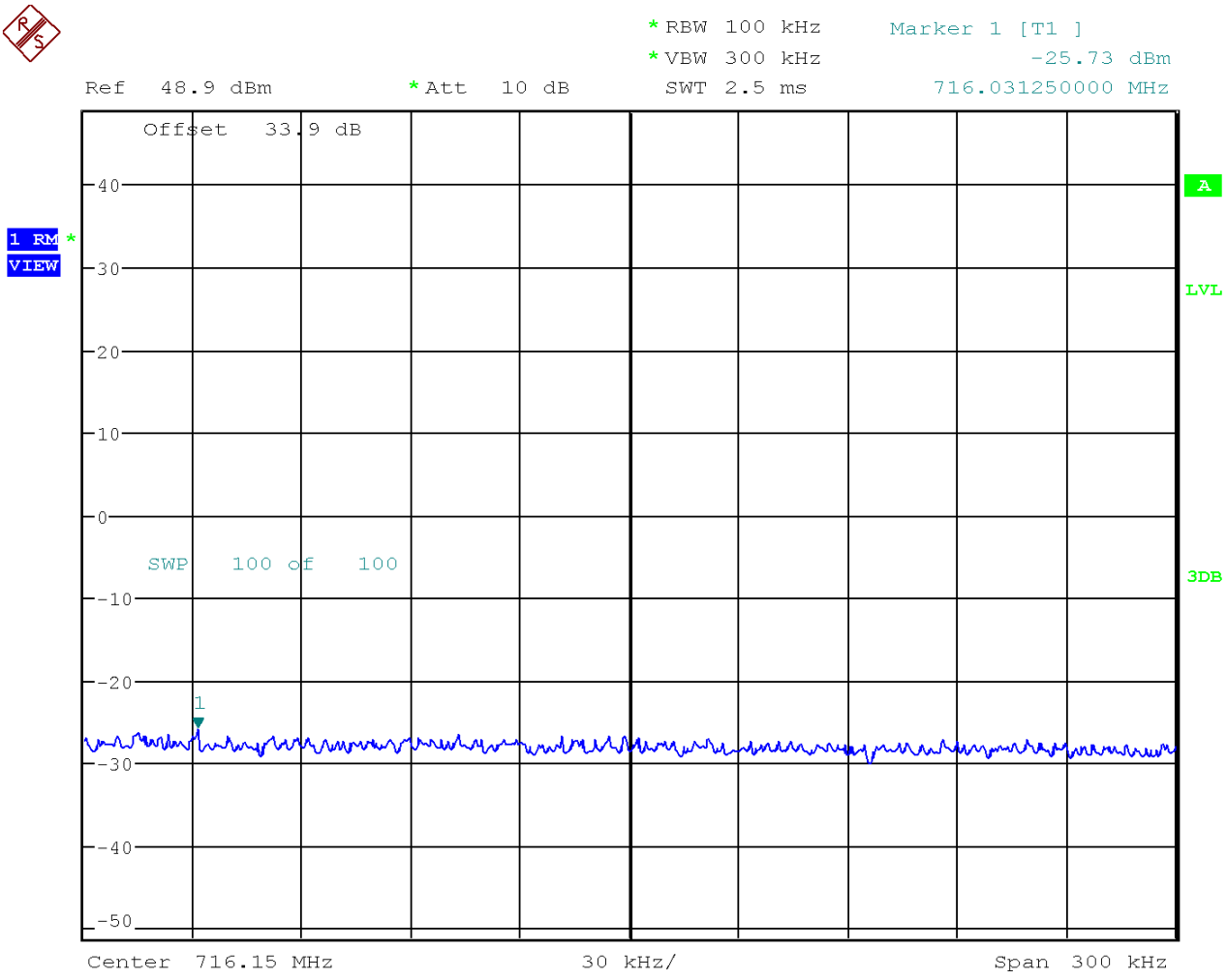
Out-Of-Band/Block Emission (Single Carrier) – Uplink Lower With AGC



Out-Of-Band/Block Emission (Single Carrier) – Uplink Upper Without AGC



Out-Of-Band/Block Emission (Single Carrier) – Uplink Upper With AGC



Conducted Spurious Emissions
Engineer: Greg Corbin
Test Date: 4/25/2019

Test Procedure

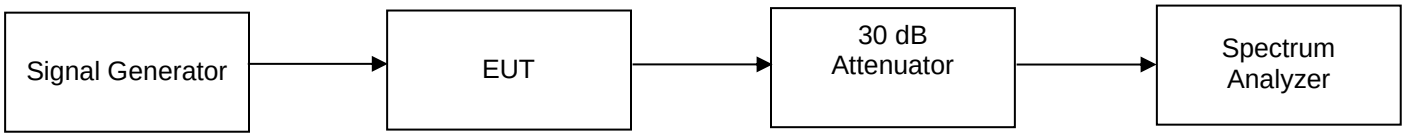
The Equipment Under Test (EUT) was connected to a spectrum analyzer through a 30 dB Power attenuator. All cable and attenuator losses were input into the spectrum analyzer as a combination of reference level offset and correction factor as needed to ensure accurate readings were obtained.

The test is performed with a wideband AWGN signal.
EUT does not support narrowband signal.
The RF input signal level was set to the AGC Threshold.
The RBW was set to 100 kHz for measurements below 1 GHz and 1 MHz for measurements above 1 GHz.
The VBW was set to 3 times the RBW.
The frequency range from 9 kHz to the 10th harmonic of the passband frequency was observed and plotted.
A peak marker was placed at the highest amplitude and the trace was recorded.

The following formula was used for calculating the limits.

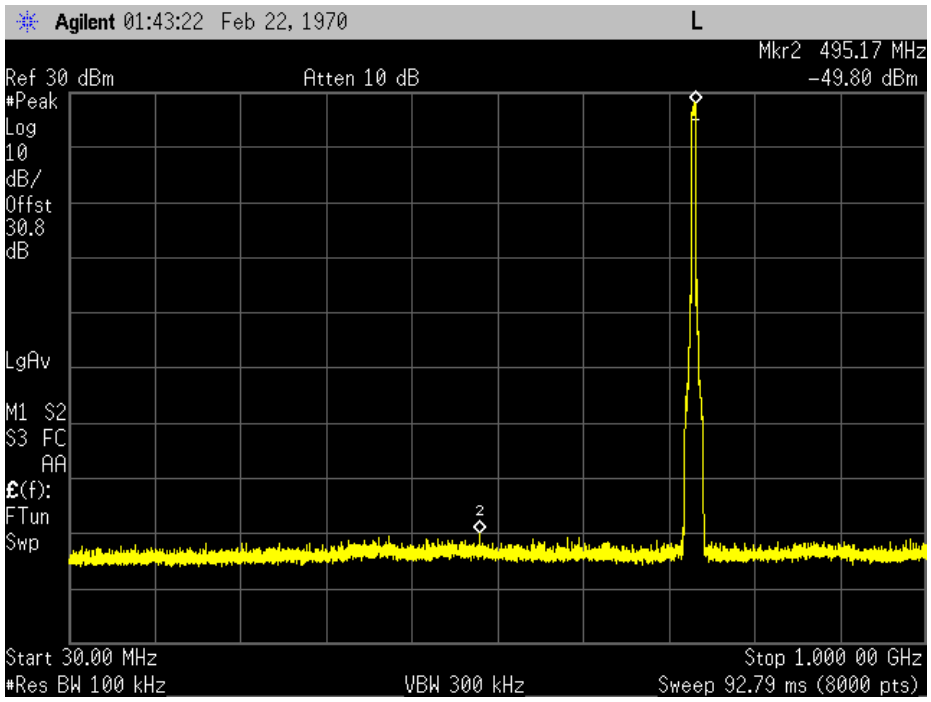
Conducted Spurious Emissions Limit = P1 – (43+ 10Log(P2)) = -13 dBm
P1 = power in dBm
P2 = power in Watts

Test Setup

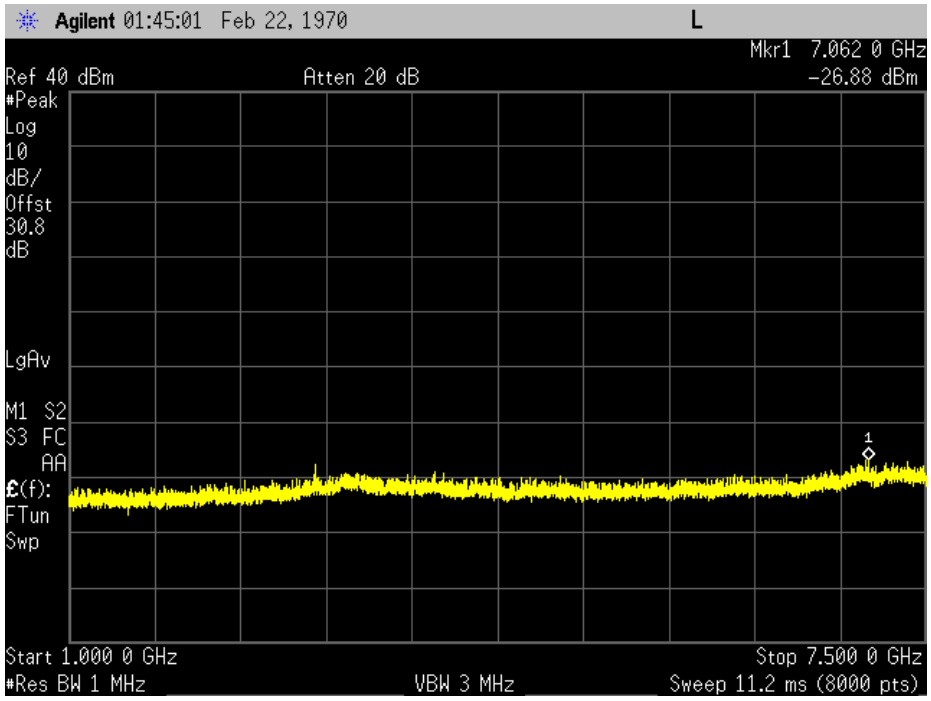


Conducted Spurious Emission Test Results

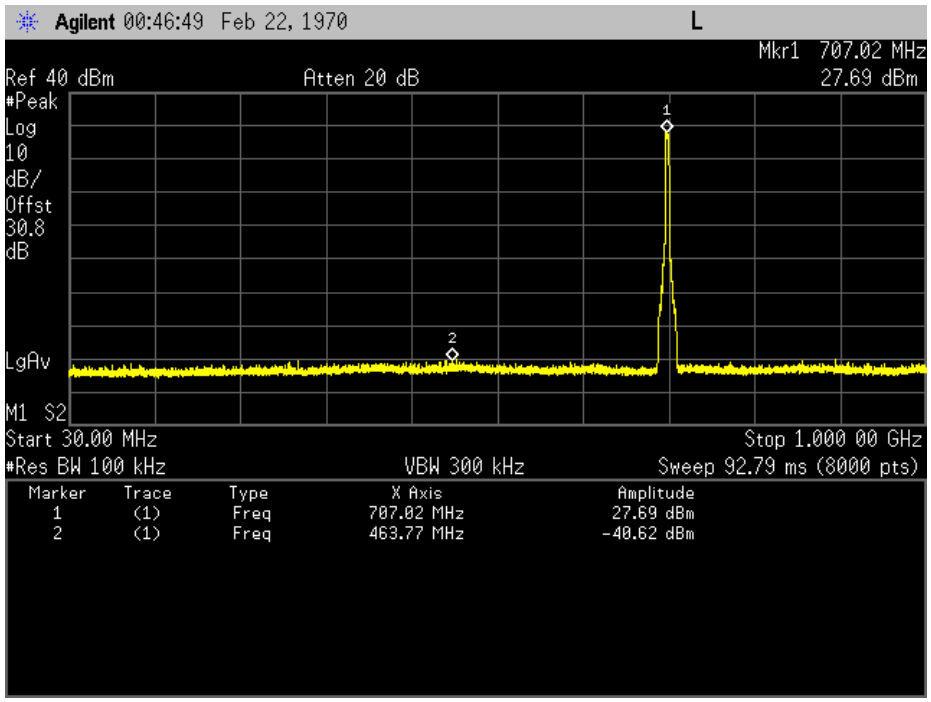
Base to Mobile_728 – 746 MHz_30 - 1000 MHz



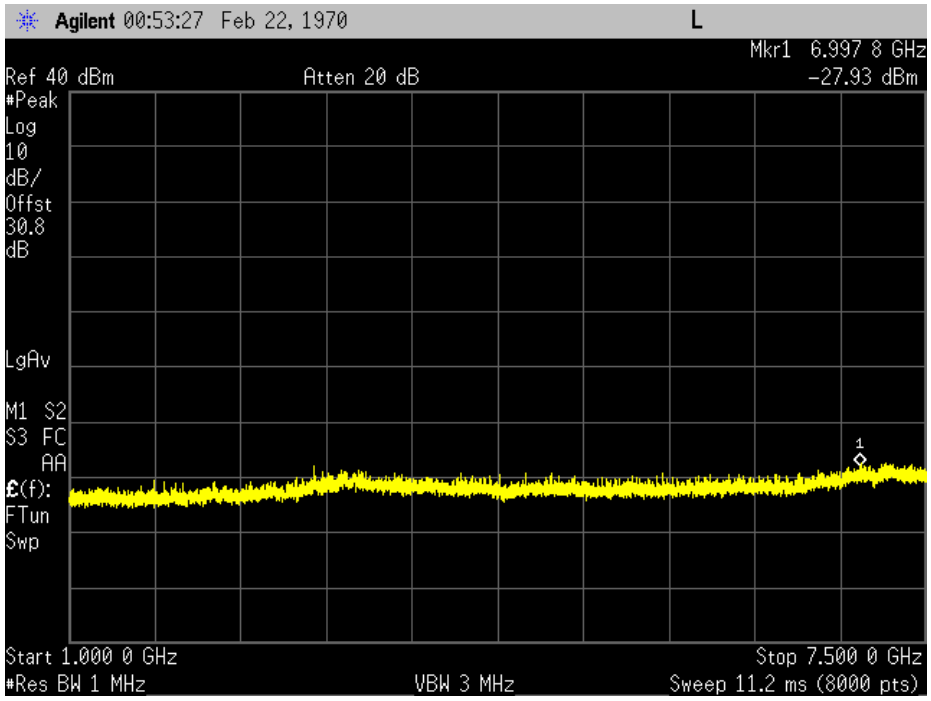
Base to Mobile_728 – 746 MHz_1 – 7.5 GHz



Mobile to Base_698 – 716 MHz_30 - 1000 MHz



Mobile to Base_698 – 716 MHz_1 – 7.5 GHz



Radiated Spurious Emissions
Engineer: Greg Corbin
Test Date: 4/25/2019

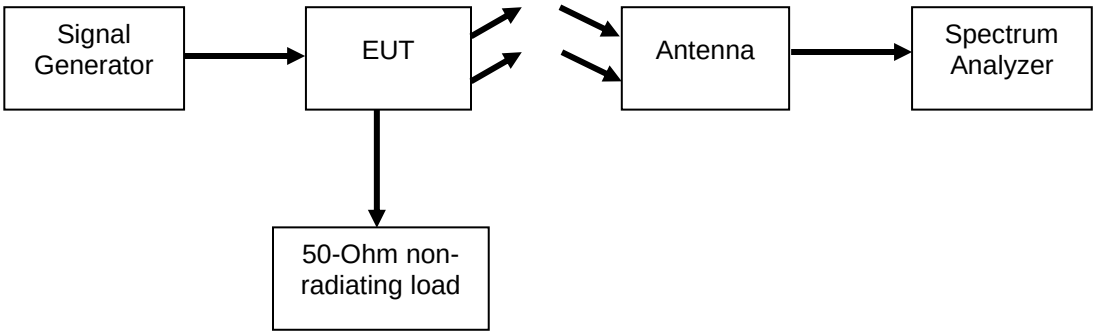
Test Procedure

The EUT was tested in a semi-anechoic chamber with the turntable set 3m from the receiving antenna. A spectrum analyzer was used to verify that the EUT met the requirements for Radiated Emissions. The EUT was tested by rotating it 360 degrees with the antenna in both the vertical and horizontal orientation while raised from 1 to 4 meters to ensure that the signal levels were maximized. All cable and antenna correction factors were input into the spectrum analyzer ensuring an accurate measurement in ERP/EIRP with the resultant power in dBm. A signal generator was used to provide a CW signal. The EUT output was terminated into a 50 Ohm non-radiating load.

The RBW was set to 100 kHz for measurements below 1 GHz and 1 MHz for measurements above 1 GHz.
The VBW was set to 3 times the RBW.

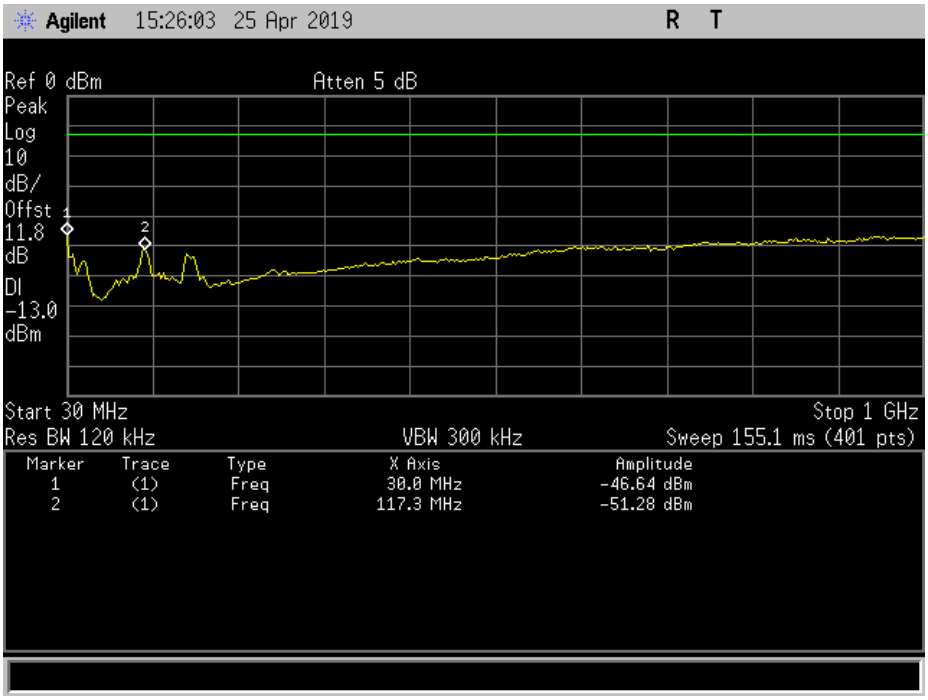
The following formula was used for calculating the limits:
Radiated Spurious Emissions Limit = P1 – (43+ 10Log(P2)) = -13dBm

Test Setup

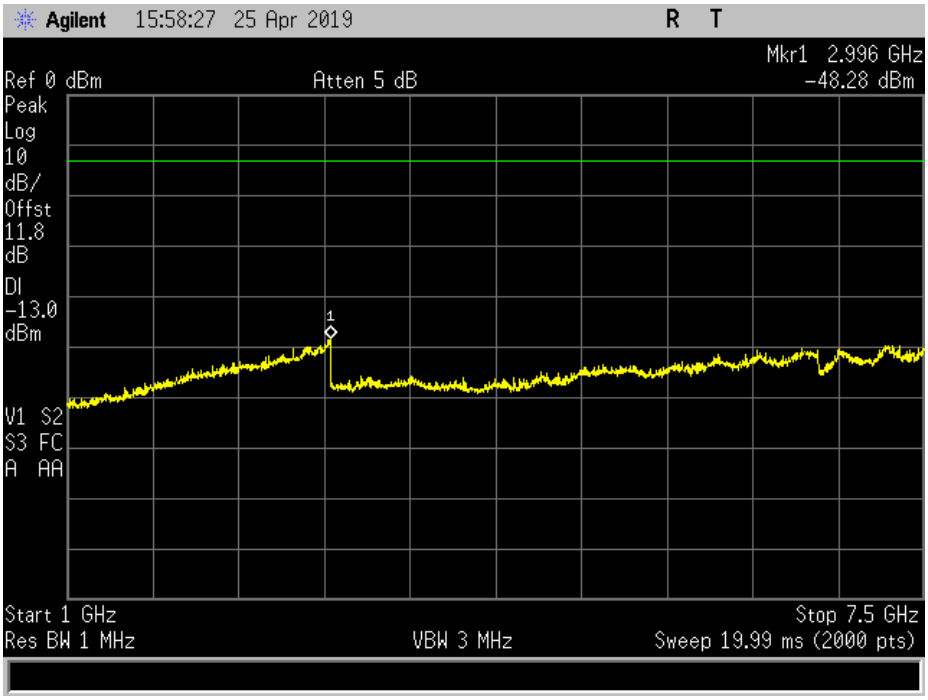


Radiated Spurious Emissions Test Results

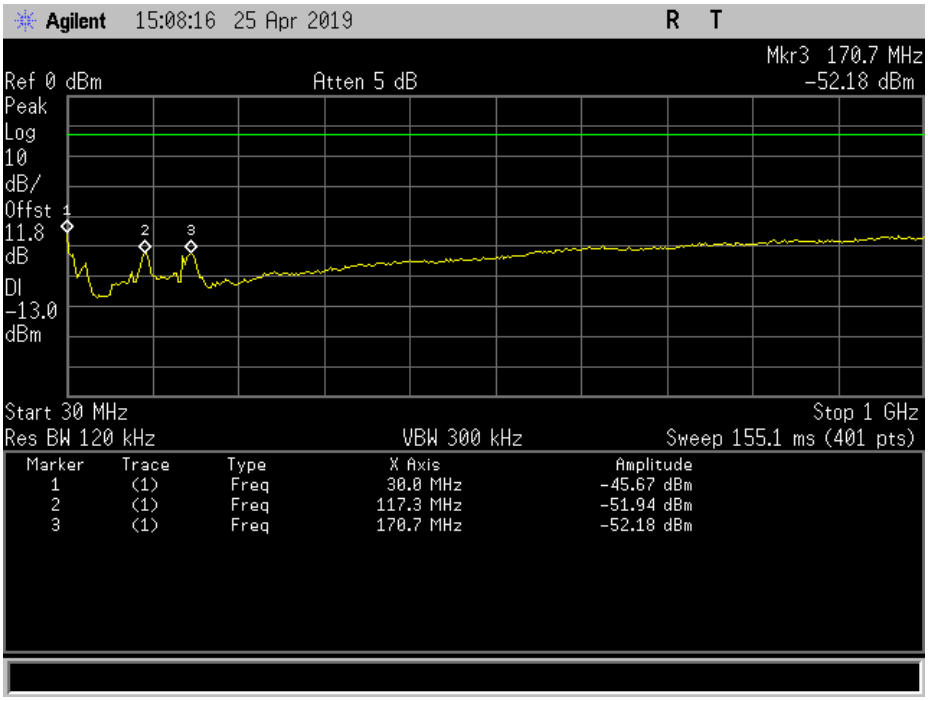
Base to Mobile_728 - 746 MHz_30 - 1000 MHz



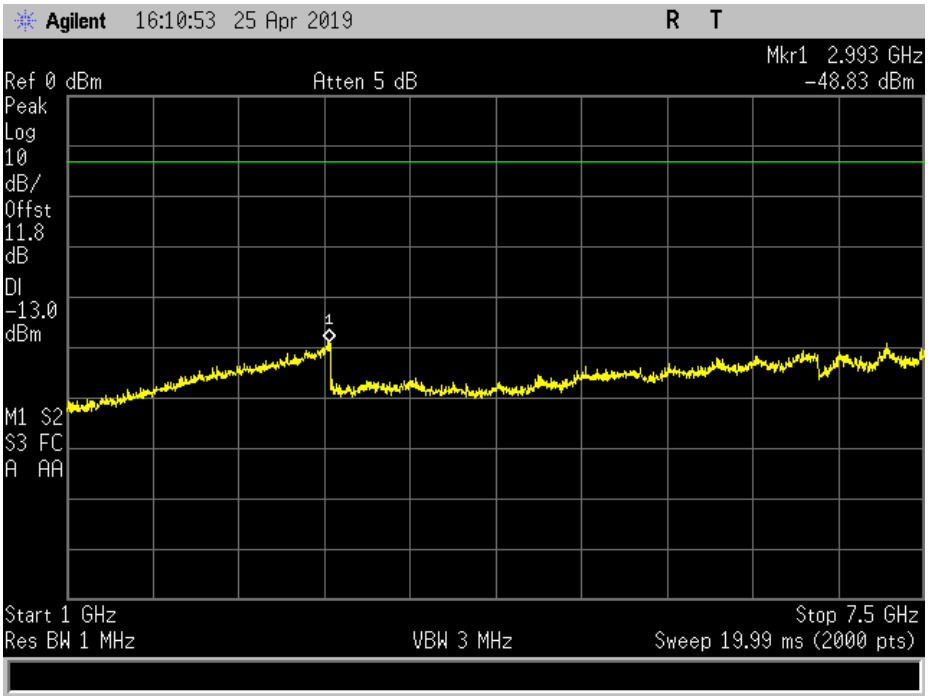
Base to Mobile_728 - 746 MHz_1 – 7.5 GHz



Mobile to Base_698 – 716 MHz_30 - 1000 MHz



Mobile to Base_698 – 716 MHz_1 – 7.5 GHz



Test Equipment Utilized

Description	Manufacturer	Model #	CT Asset #	Last Cal Date	Cal Due Date
Horn Antenna, Amplified	ARA	DRG-118/A	i00271	06/16/2018	06/16/2020
Bi-Log Antenna	Chase	CBL 6111C	i00267	03/08/2018	03/08/2020
Humidity / Temp Meter	Newport	IBTHX-W-5	i00282	06/29/2018	06/29/2020
EMI Analyzer	Agilent	E7405A	i00379	1/16/19	1/16/20
PSA Spectrum Analyzer	Agilent	E4445A	i00471	10/16/18	10/16/19
Signal Generator	Agilent	E4438C	i00457	10/15/18	10/15/19
Spectrum Analyzer	Rhode & Schwarz	FSU	i00501	4/2/19	4/2/20
Signal Generator	Rhode & Schwarz	SMU200A	i00405	5/10/18	5/10/19

In addition to the above listed equipment standard RF connectors and cables were utilized in the testing of the described equipment. Prior to testing these components were tested to verify proper operation.

END OF TEST REPORT