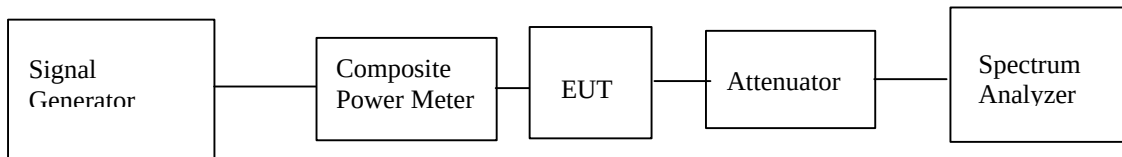


Out of Band Emissions Test for ADC Inc. Digivance 800 Remote Interface Unit Models DGVI-110000RIU (Band A) and DGVI-120000RIU (Band B). Per FCC CFR 47 Part 22.917 Emission Limitations for Cellular

The out of band emissions were measured directly from the EUT output with a spectrum analyzer from 30MHz to the 10th harmonic of the highest carrier frequency. Three tests were done for each band EUT. A CW signal at the low, mid and high parts of the band was input one at a time to the EUT. In all cases, the out of band emissions were less than -13dBm from the equation $(29.5\text{dBm} - [43 + 10 \log(.9W)])$

For the in-band emissions, on any frequency removed from the carrier frequency by more than 20KHz, but not more than 45KHz, the emissions are at least 26dB below the carrier power level. On any frequency removed from the carrier by more than 45KHz, the emissions are at least -13dBm from the above formula. These plots also demonstrate band edge compliance.

Test Set-up

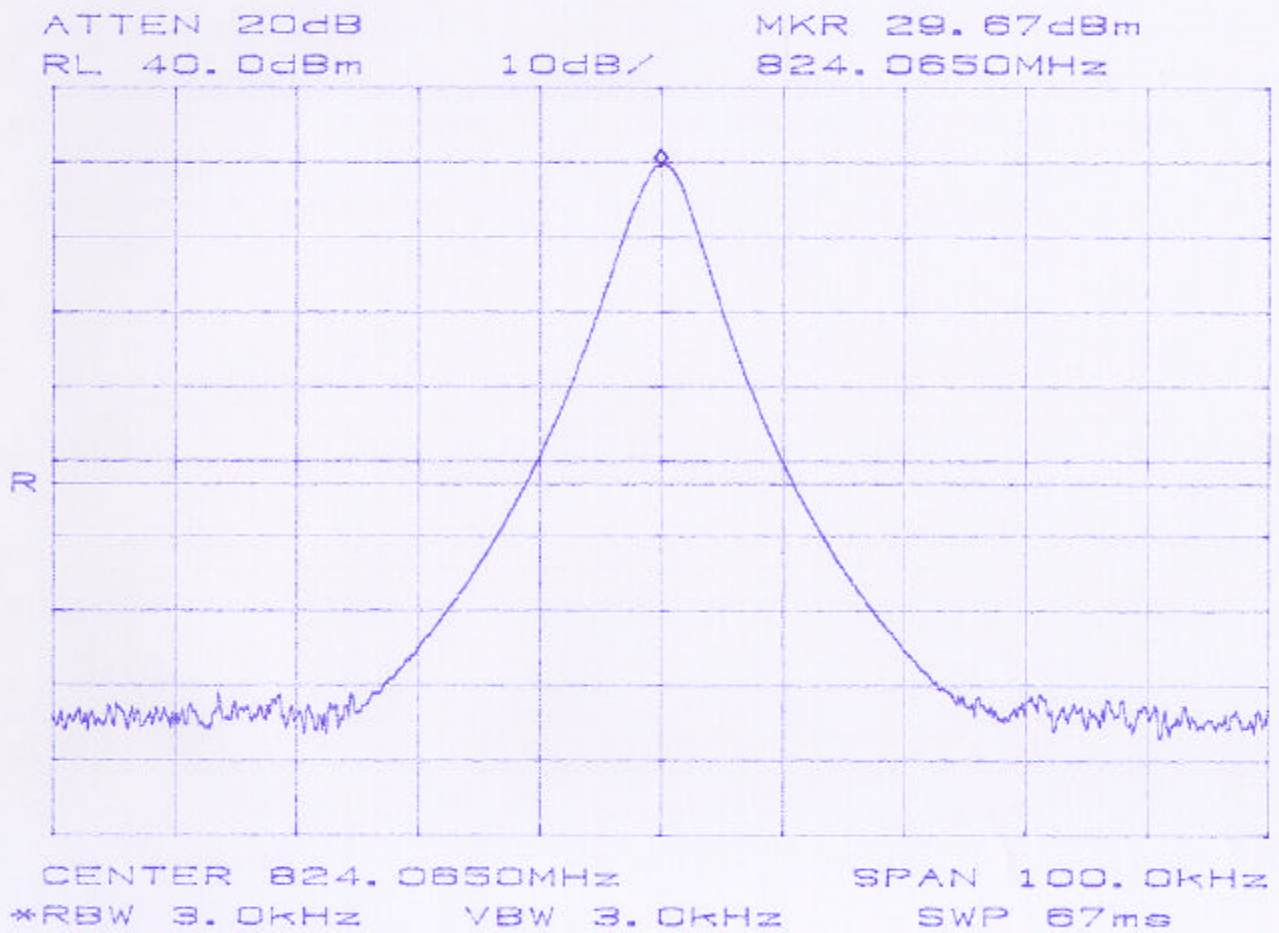


Results:

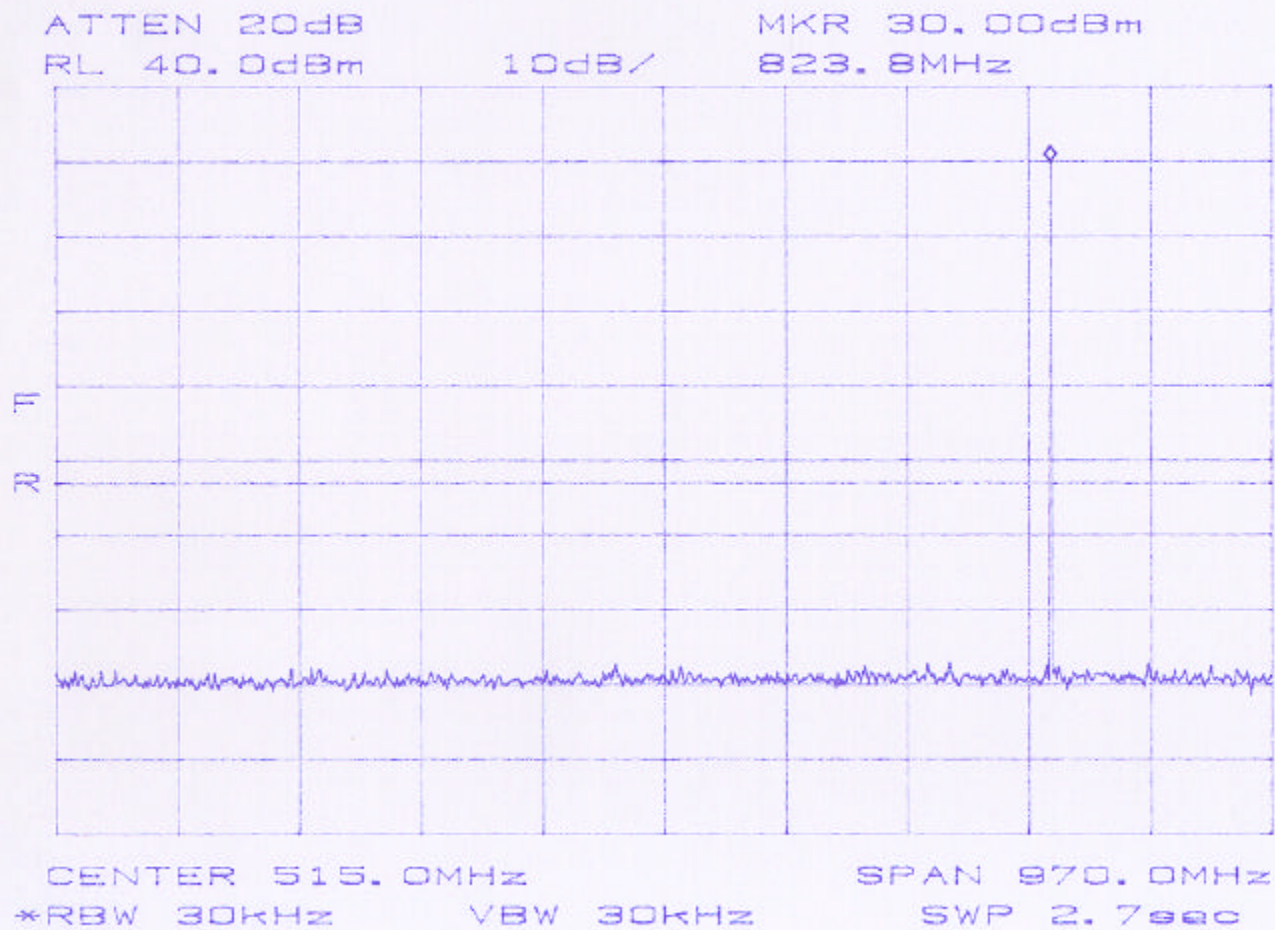
Pass (see plots)

Band A EUT Data

A



A spur



A

824.065 MHz CW Spec

ATTEN 20dB

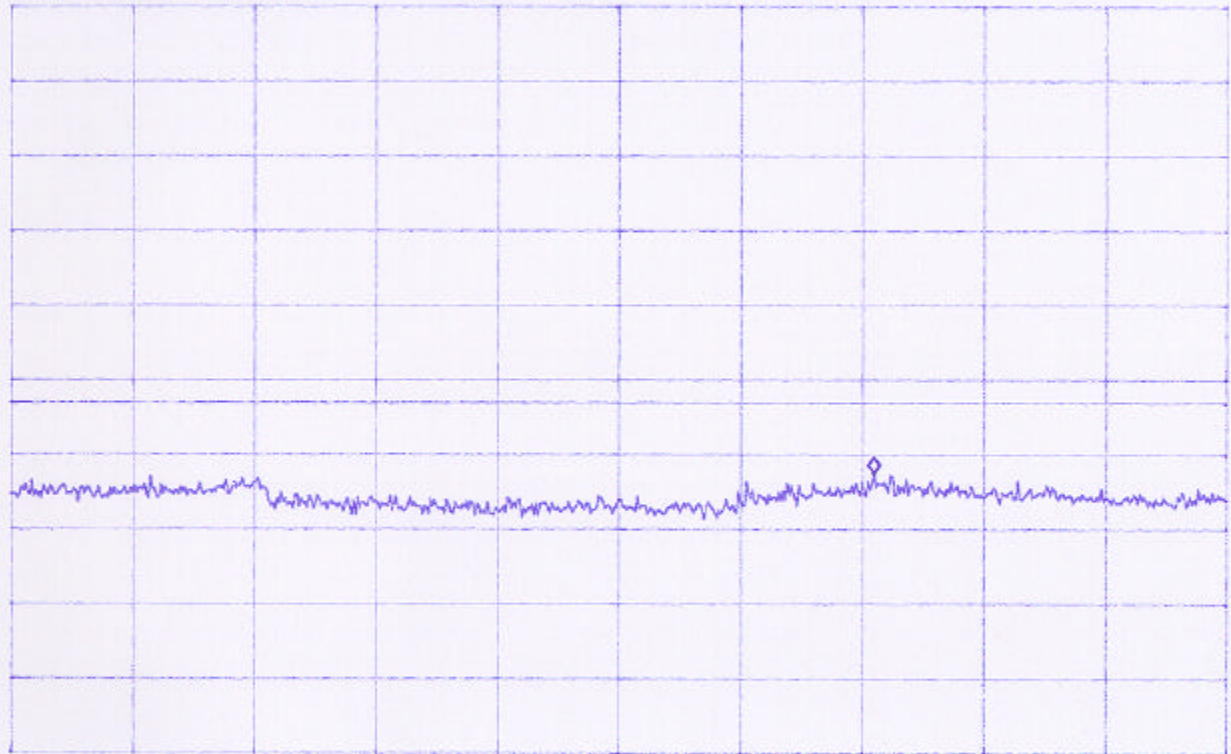
MKR -22.33dBm

RL 40.0dBm

10dB/

7.39066 GHz

dB



START 1.000GHz

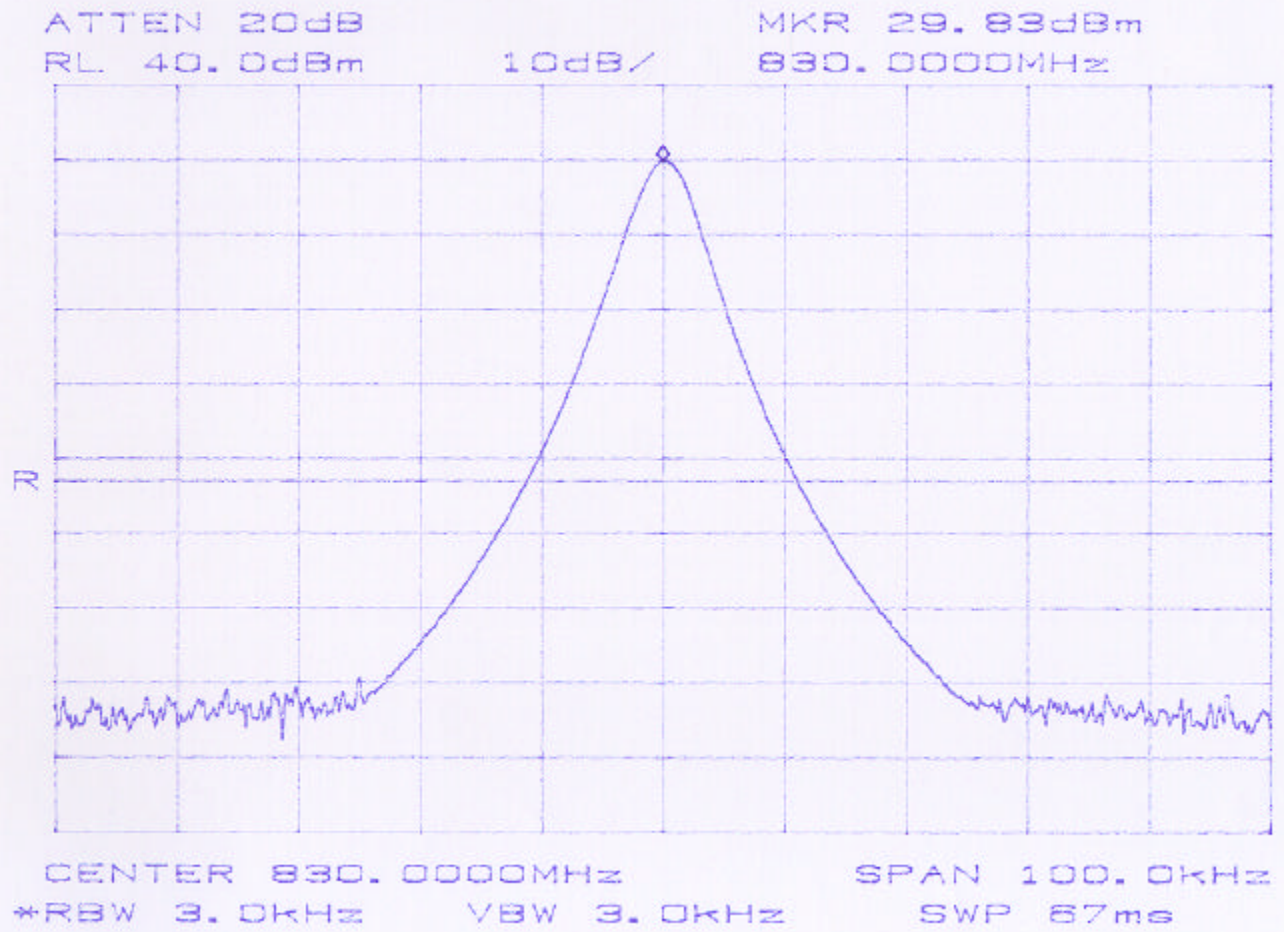
STOP 10.000GHz

*RBW 1.0MHz

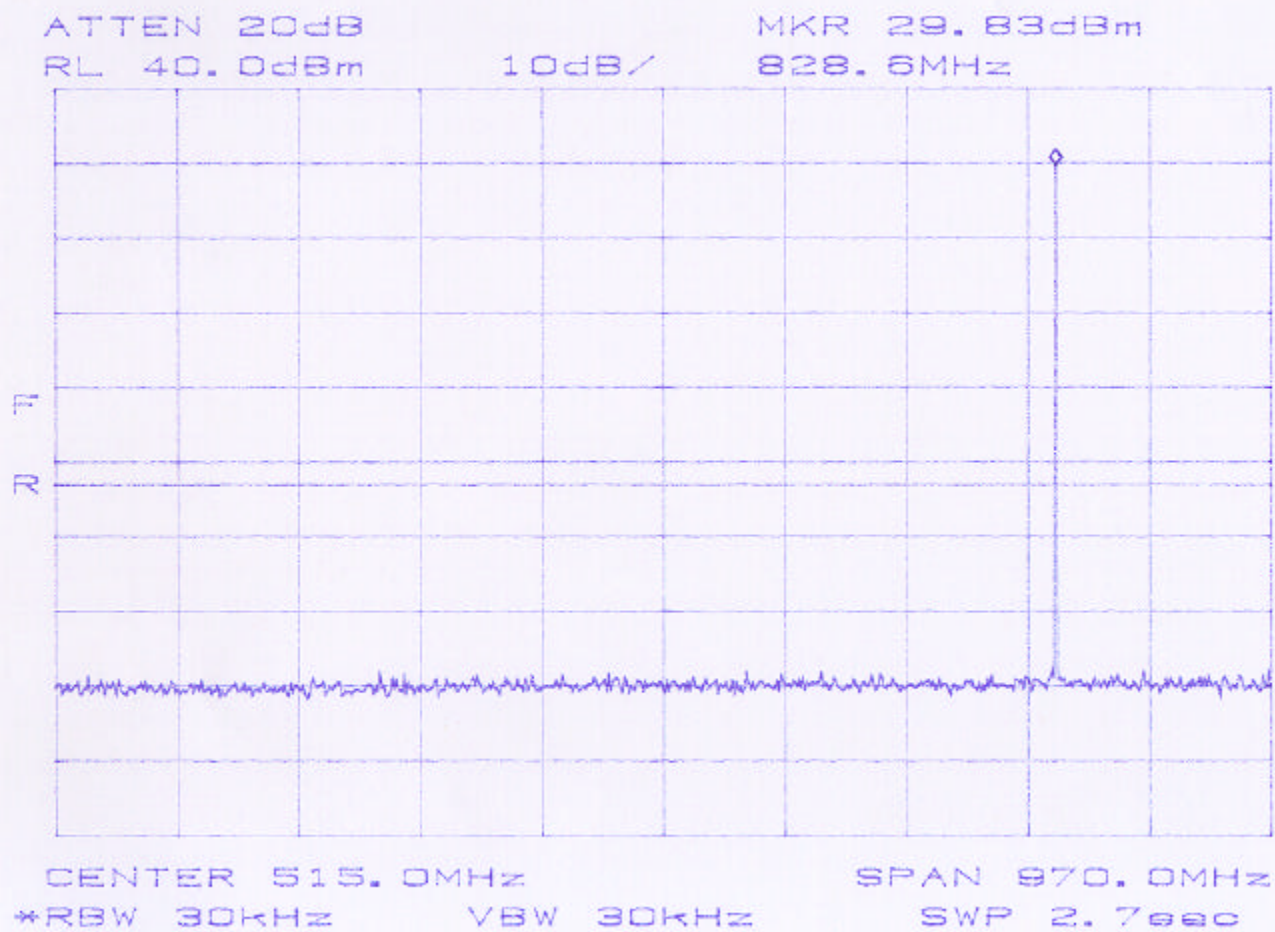
VBW 1.0MHz

SWP 180ms

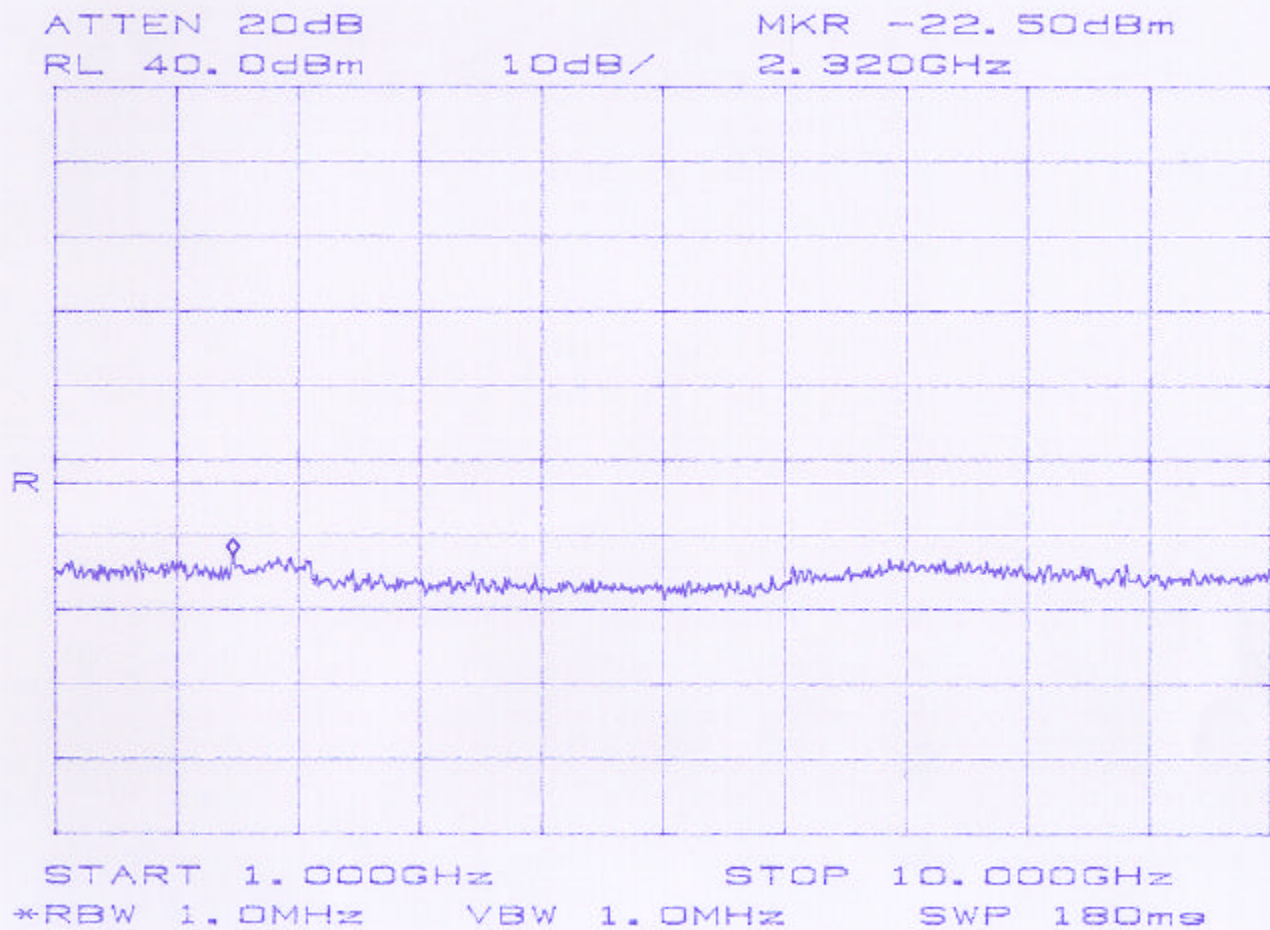
A



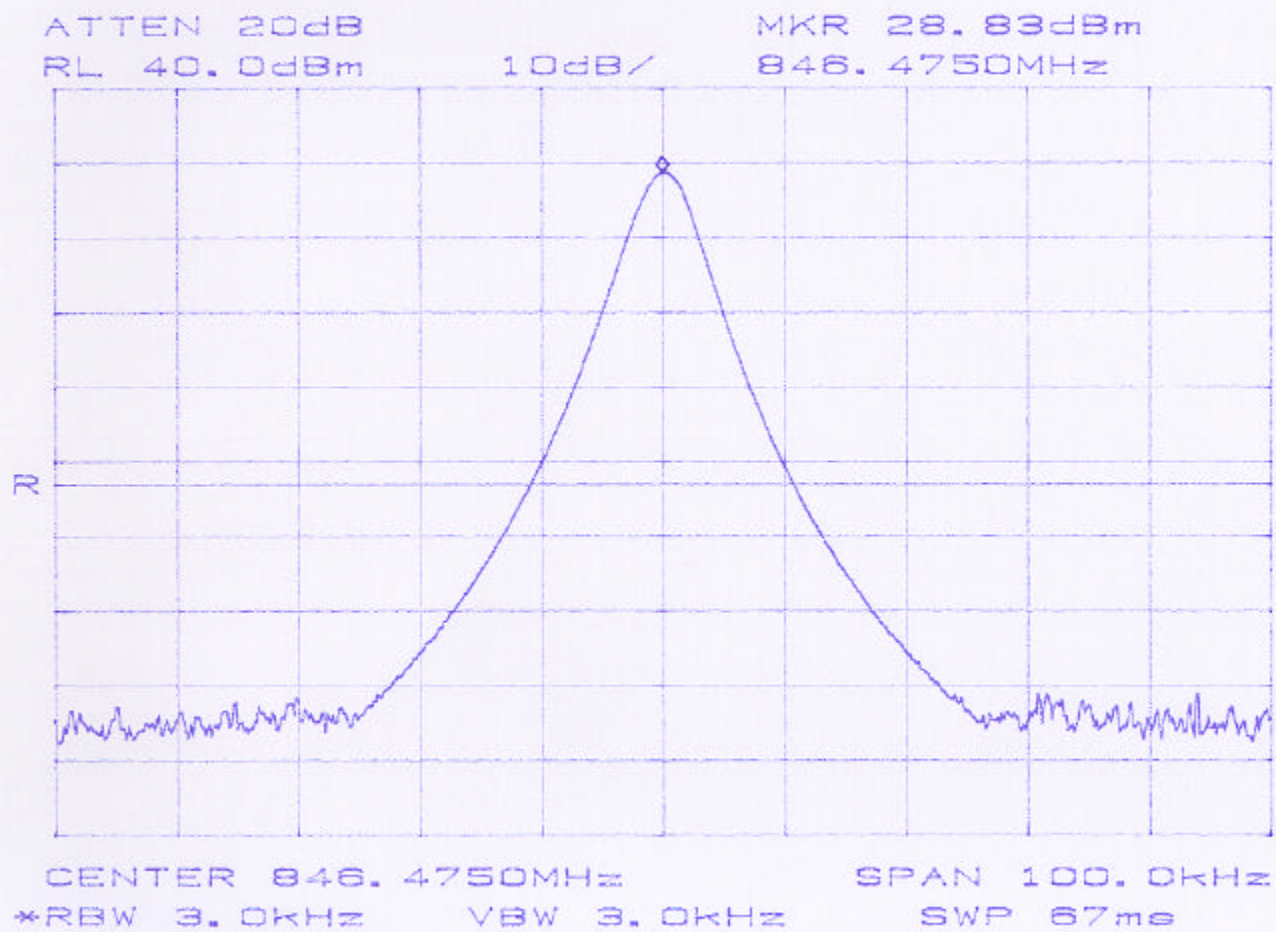
A spur



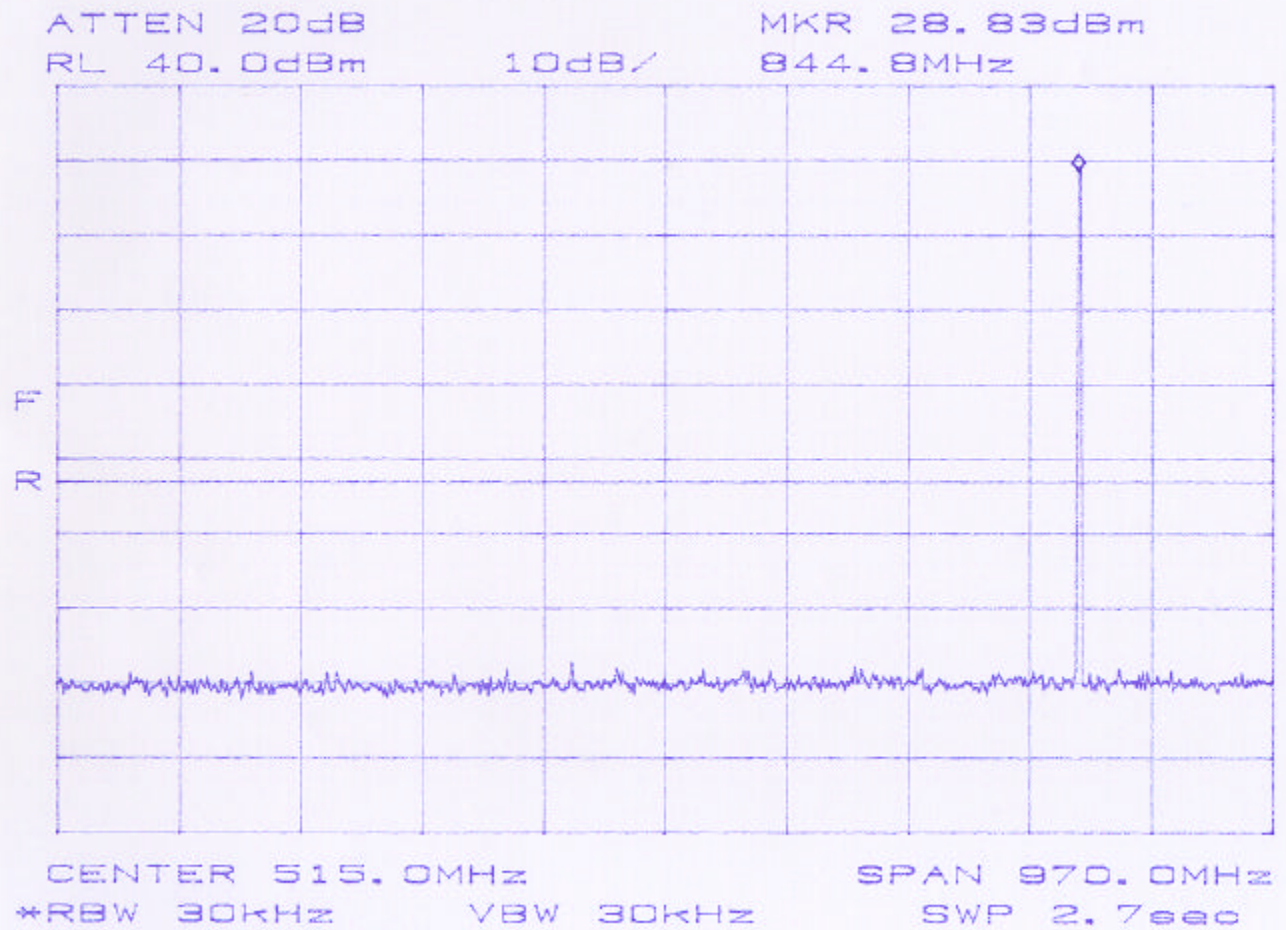
A 830MHz CW Spur



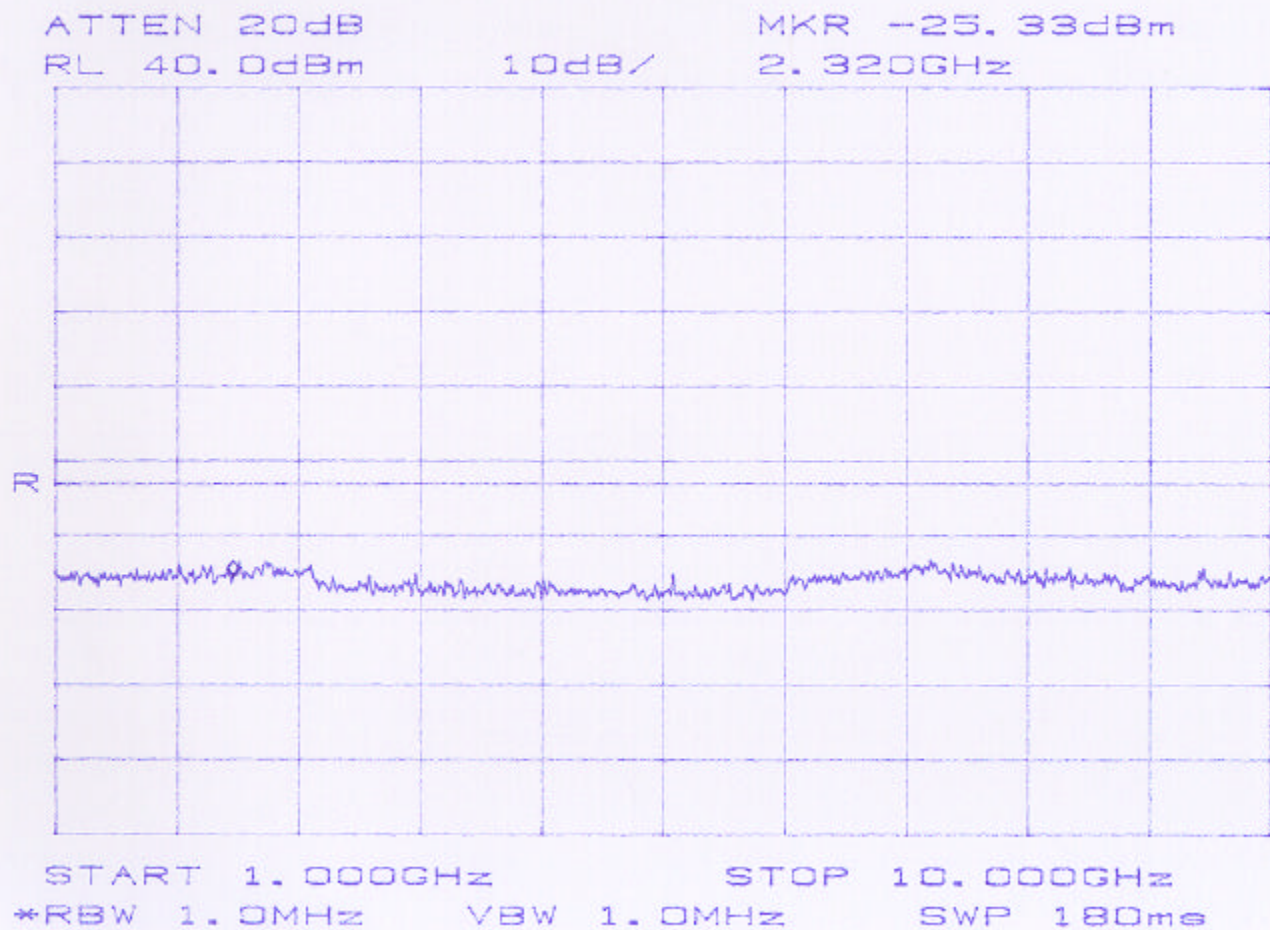
A



A spur



A 8 46.475 MHz CW Span.



Band B EUT Data

B

Band Edge

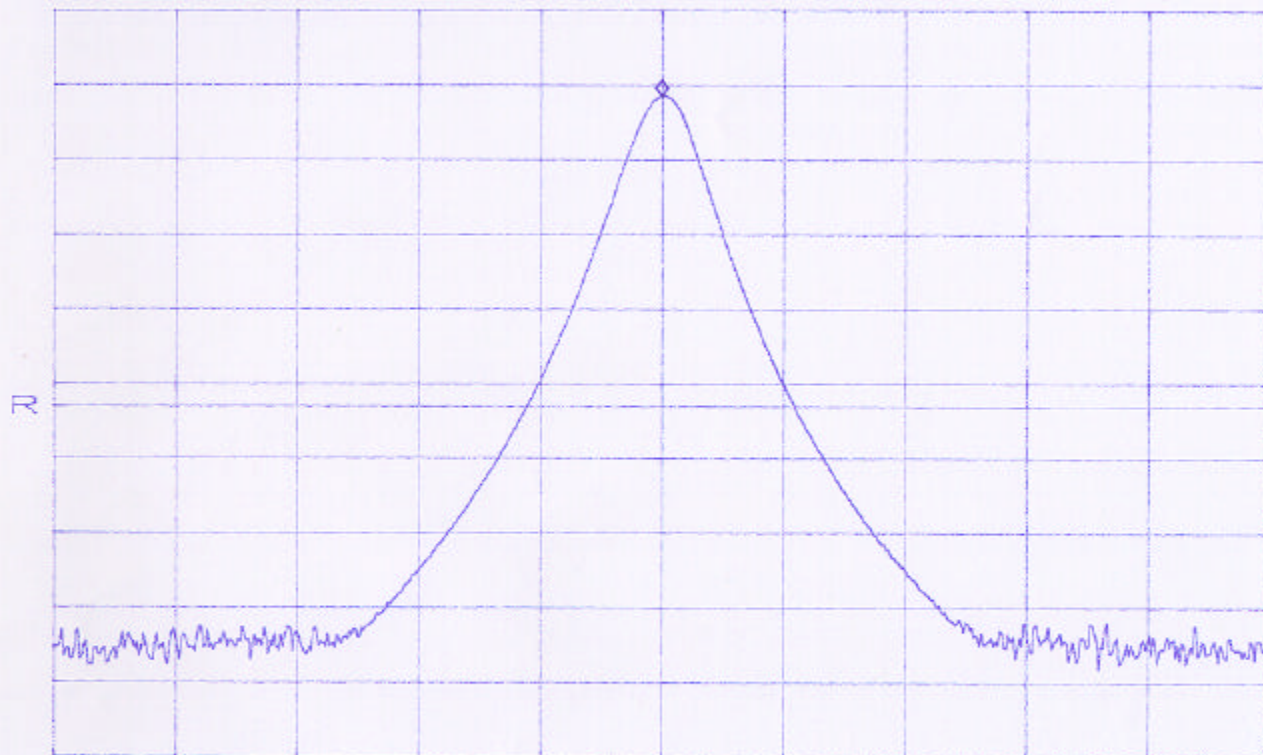
ATTEN 20dB

RL 40.0dBm

10dB/

MKR 28.67dBm

835.0450MHz



CENTER 835.0450MHz

SPAN 100.0kHz

*RBW 3.0kHz

VBW 3.0kHz

SWP 67ms

B

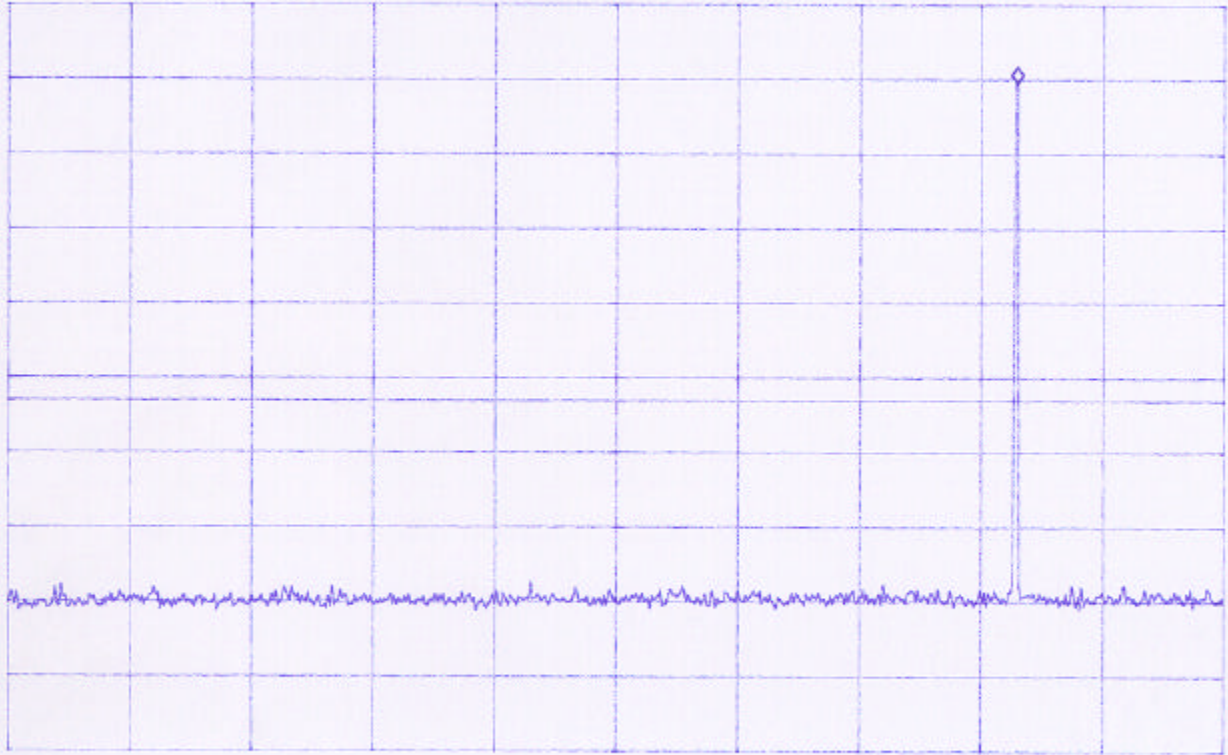
spur

ATTEN 20dB
RL 40.0dBm

10dB/

MKR 29.67dBm
835.1MHz

μV



START 30.0MHz STOP 1.0000GHz
*RBW 30kHz VBW 30kHz SWP 2.7sec

B 835.045MHz CW Spect

ATTEN 20dB

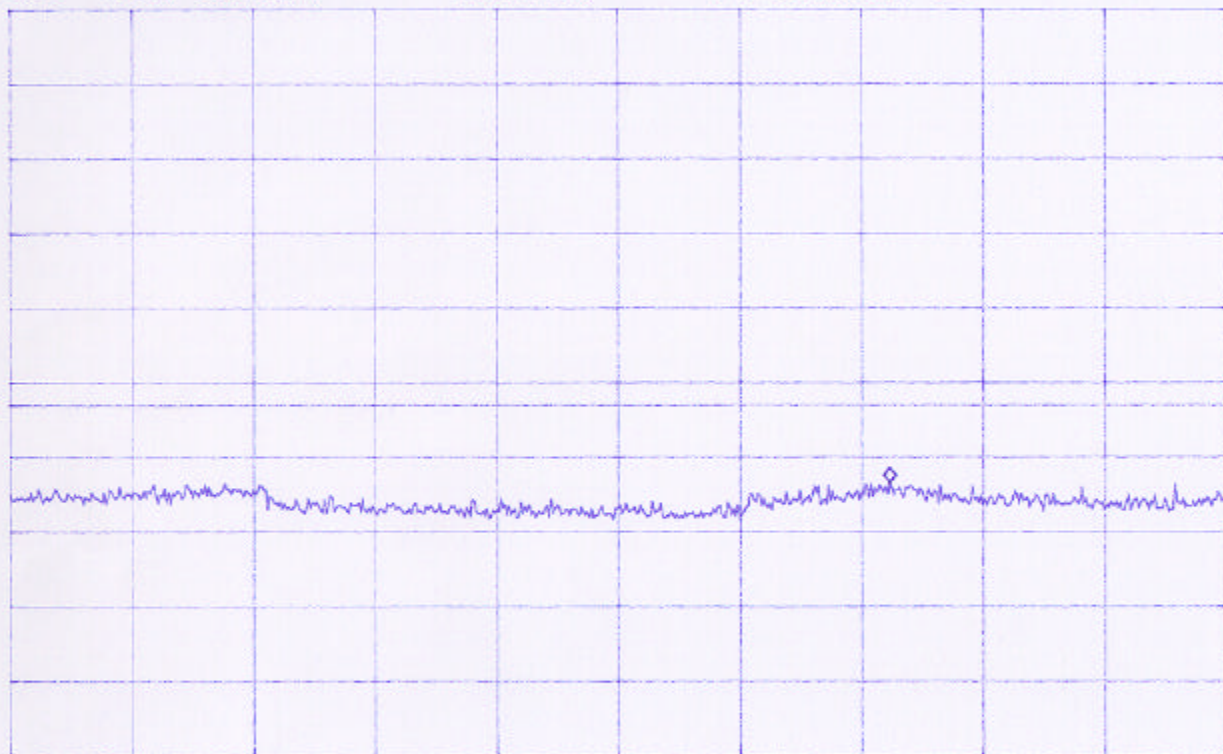
MKR -23.33dBm

RL 40.0dBm

10dB/

7.510GHz

μ



START 1.000GHz

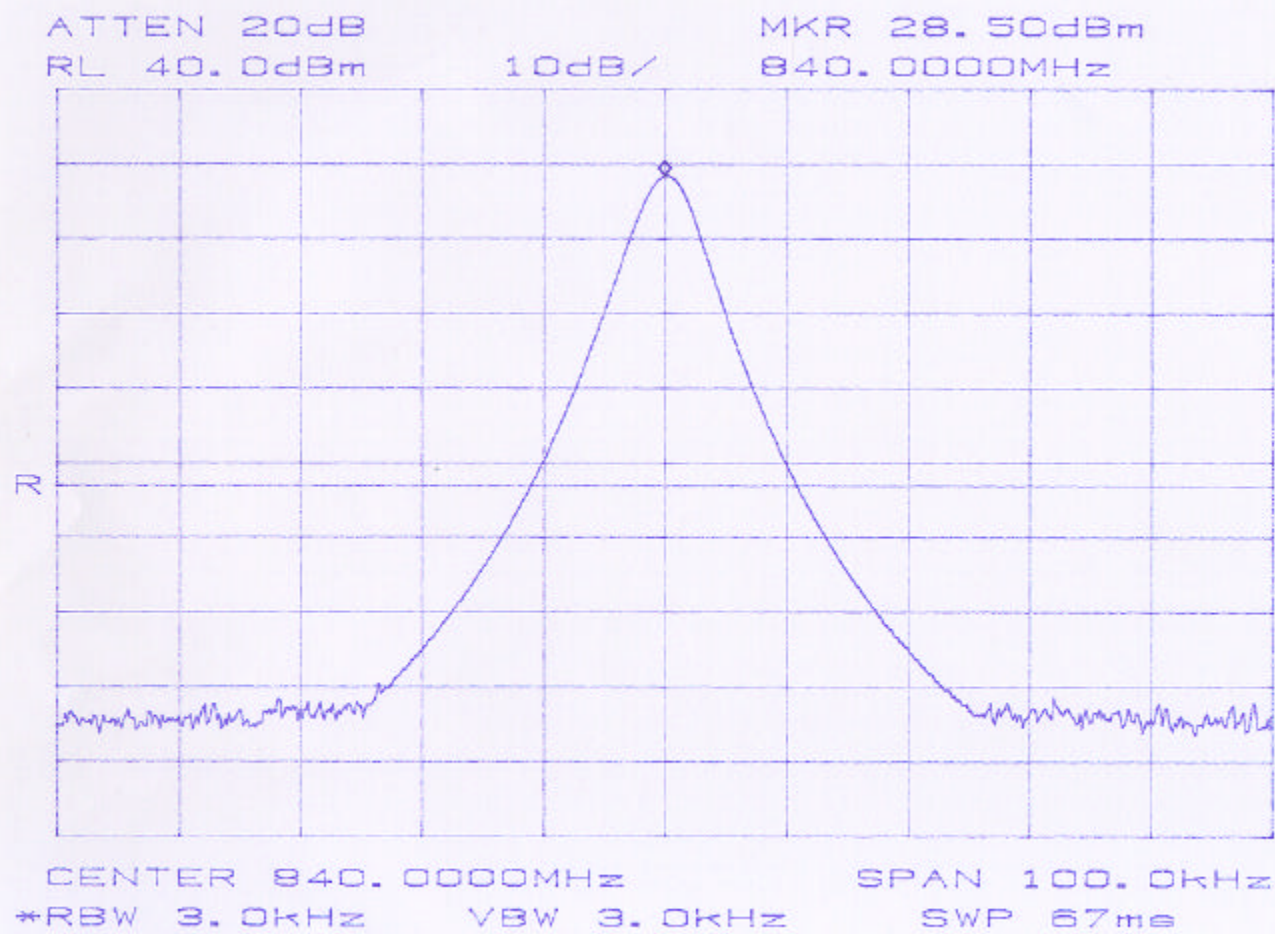
STOP 10.000GHz

*RBW 1.0MHz

VBW 1.0MHz

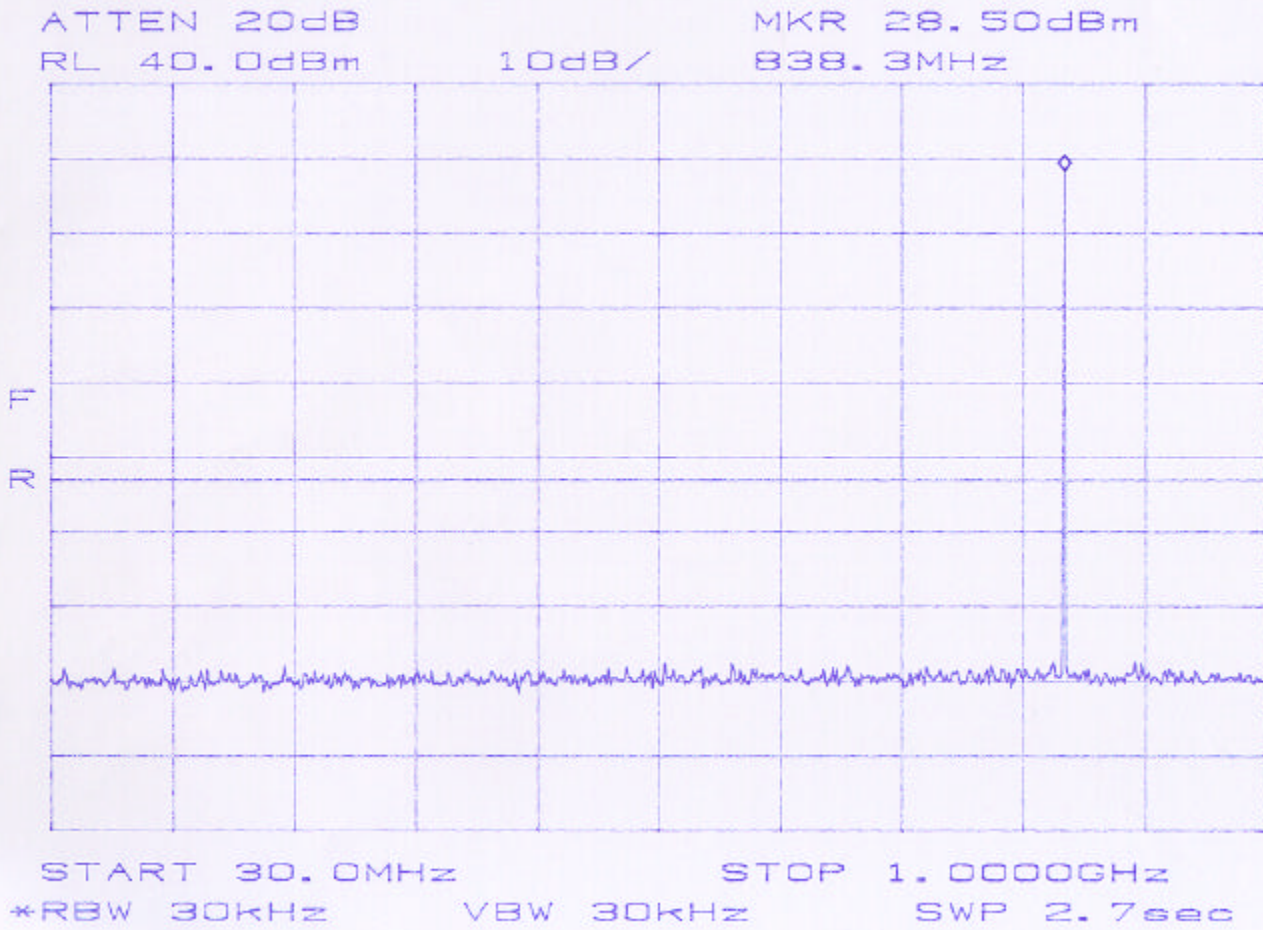
SWP 180ms

B

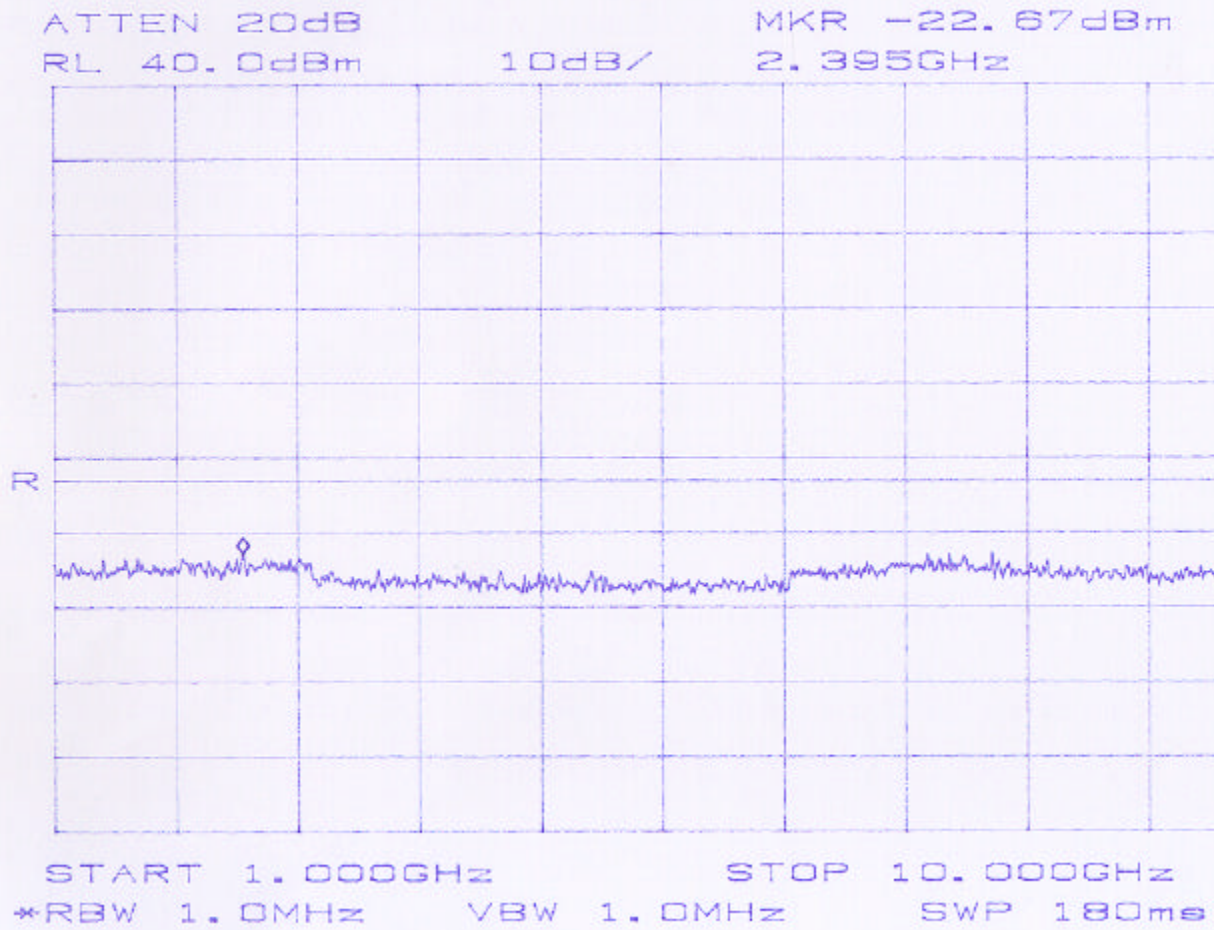


B

spur



B 840 MHz CW Spur



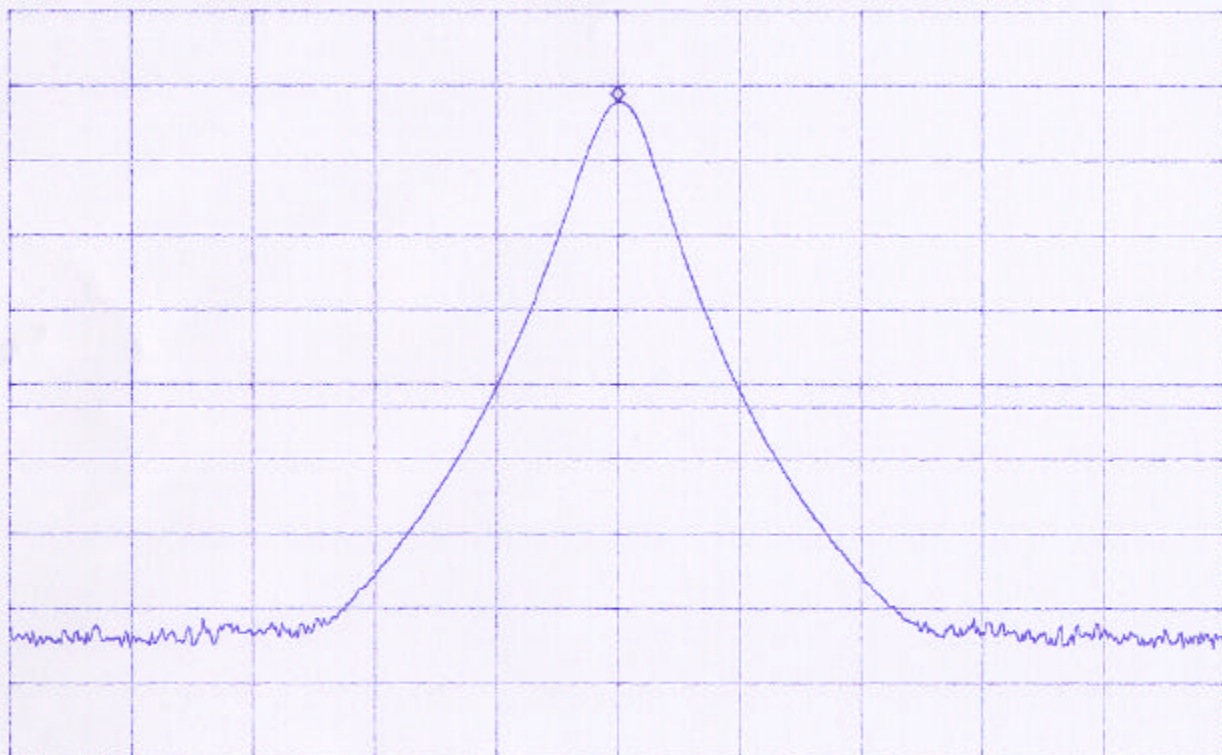
8

ATTEN 20dB
RL 40.0dBm

10dB/

MKR 28.00dBm
848.9750MHz

μ



CENTER 848.9750MHz SPAN 100.0kHz
*RBW 3.0kHz VBW 3.0kHz SWP 67ms

B

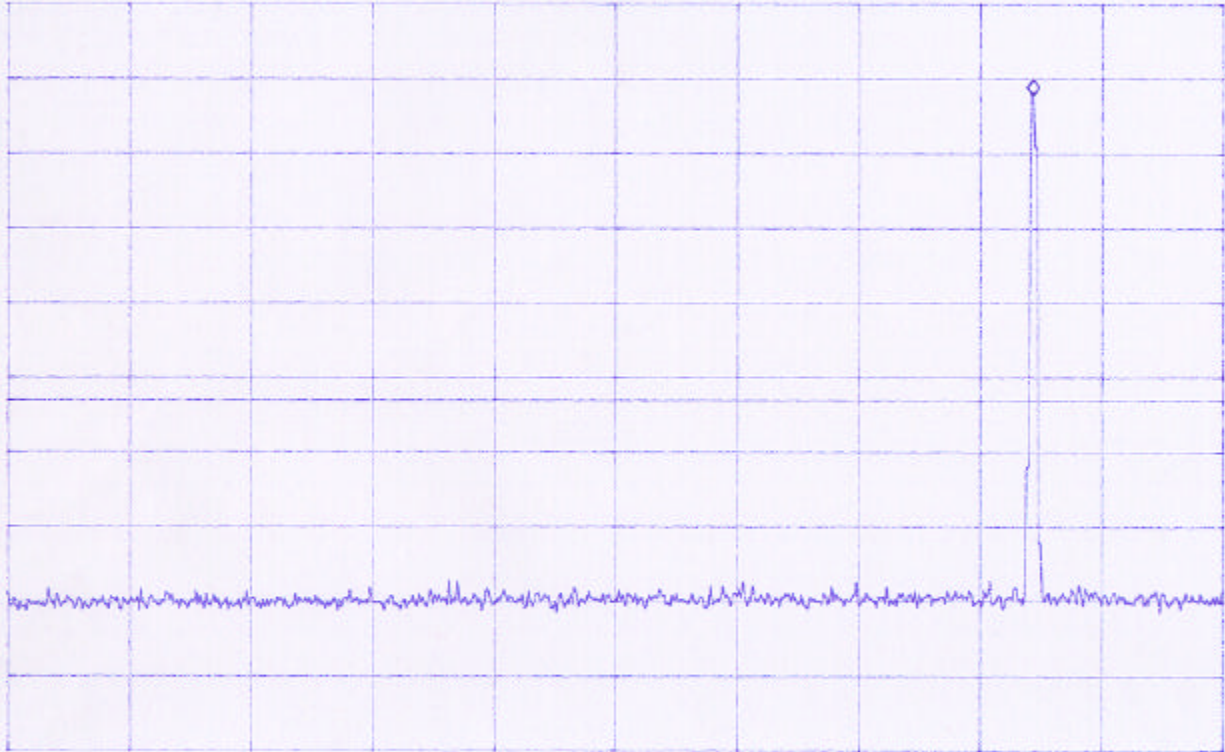
Spur

ATTEN 20dB
RL 40.0dBm

10dB/

MKR 28.00dBm
848.0MHz

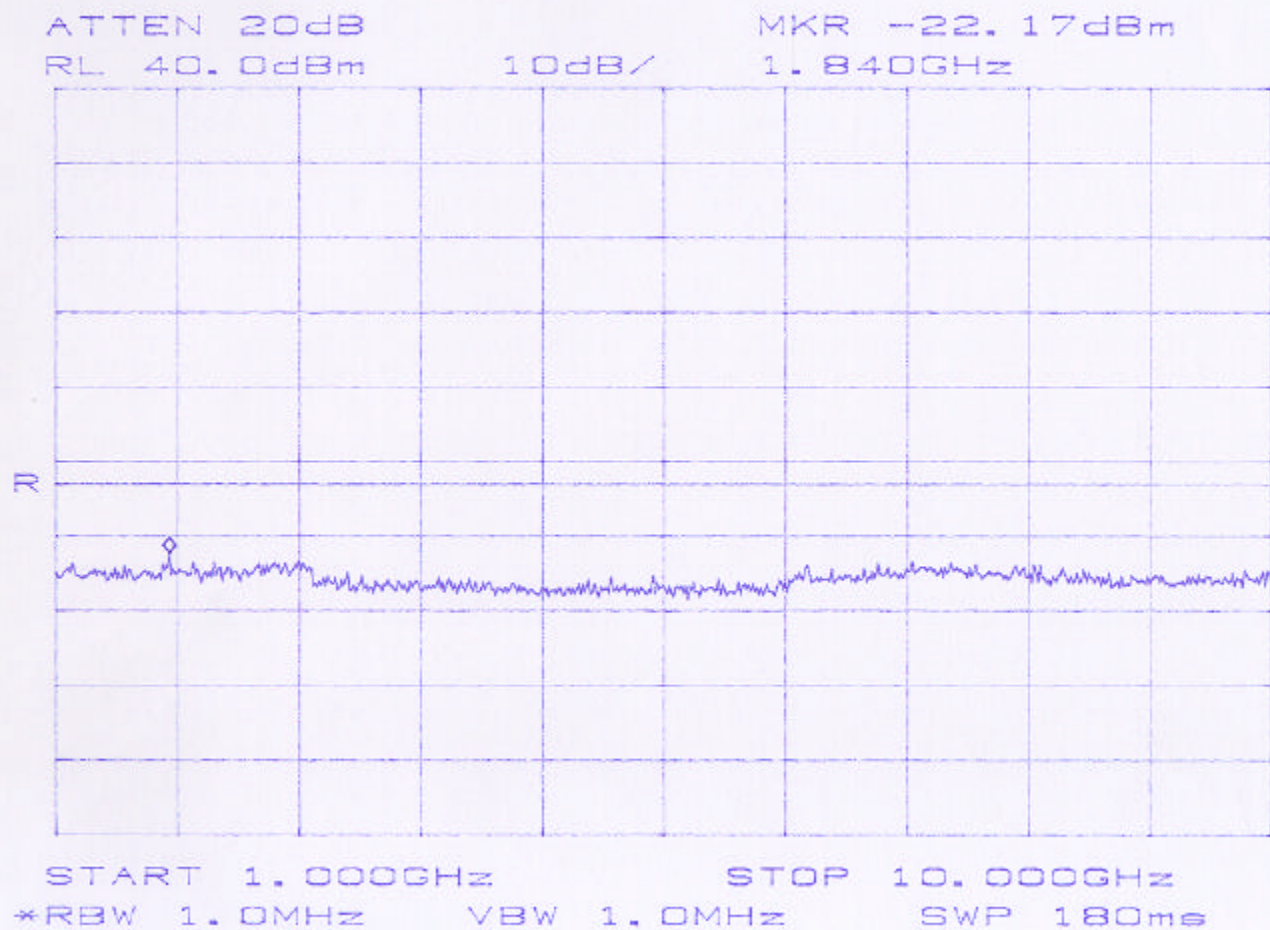
dBm



CENTER 515.0MHz
*RBW 30kHz VBW 30kHz

SPAN 970.0MHz
SWP 2.7sec

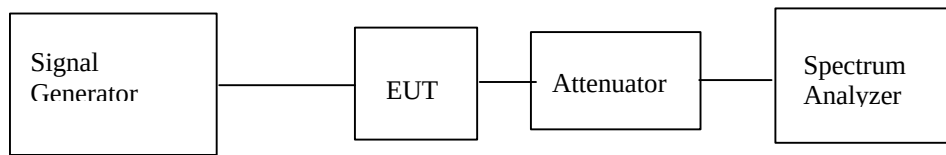
B 848,975MHz Cw. spur



**Conducted Spurious Emissions (TDMA Modulation) Test for ADC Inc. Digivance 800
Remote Interface Unit
Models DGV1-110000RIU (Band A) and DGV1-120000RIU (Band B).**

This measurement was made as a direct conducted emission measurement. The output from the EUT antenna connector was connected to the spectrum analyzer as shown below. A typical TDMA type signal was input to the EUT and a search was made from 30MHz to the 10th harmonic of the highest fundamental frequency (10 GHz) for any spurious emissions greater than -13dBm.

Test Set-up



Results:
Pass (See plots)

RIU.

Conducted spur

TDMA

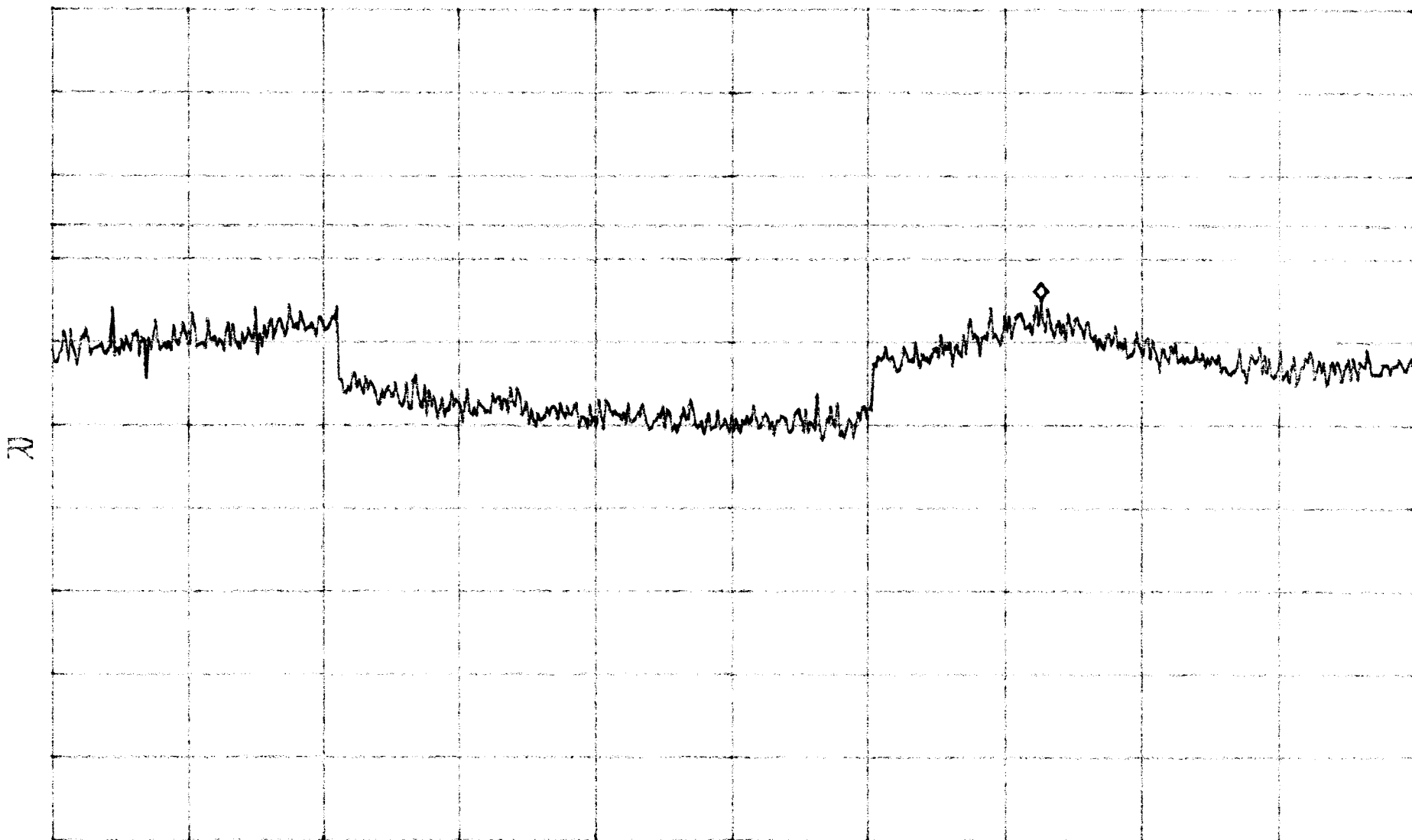
*ATTEN 0dB

MKR -17.42dBm

RL 0dBm

5dB/

7.540GHz



START 1.000GHz

STOP 10.000GHz

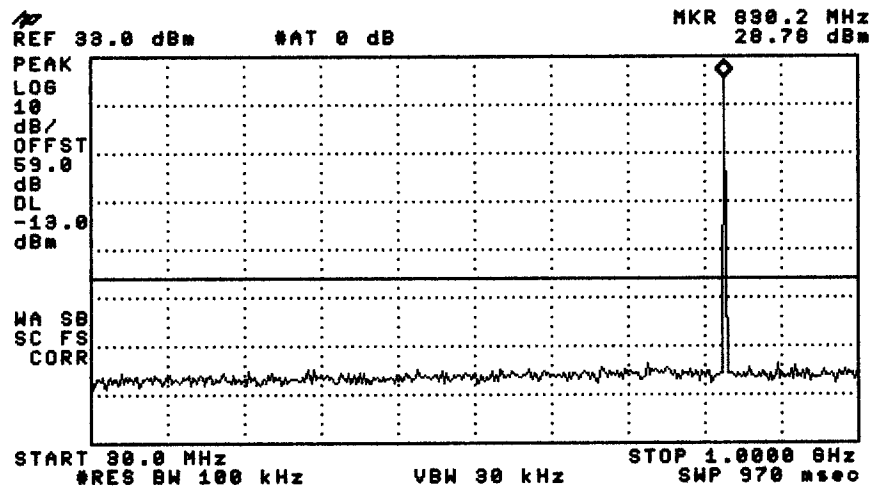
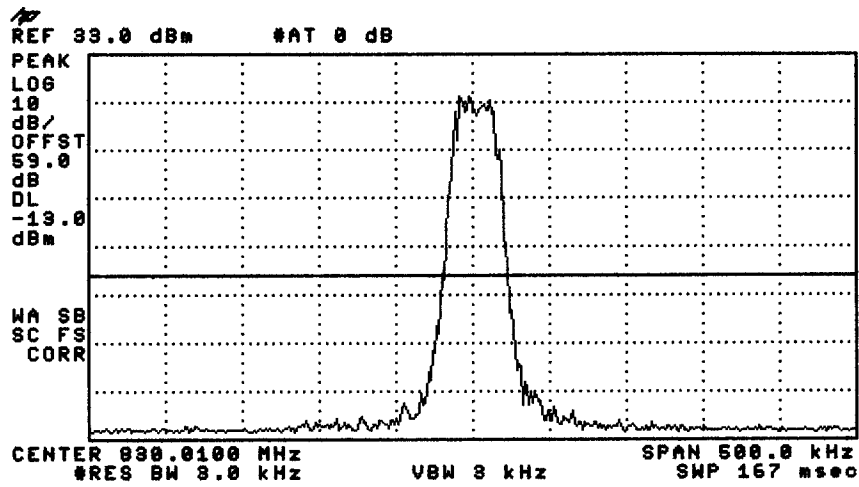
RBW 1.0MHz

VBW 1.0MHz

SWP 180ms

Conducted Spec.

TDMA

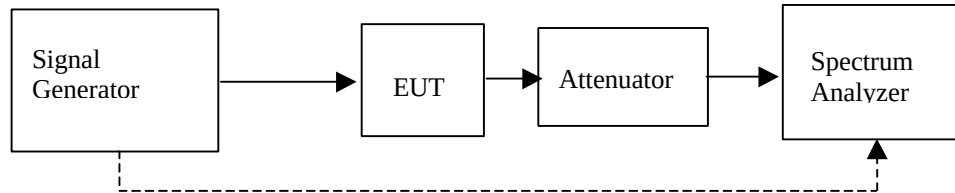


RIU

Occupied Bandwidth Modulation Test for ADC Inc. Digivance 800 Remote Interface Unit Models DGVI-110000RIU (Band A) and DGVI-120000RIU (Band B).

An input/output Occupied Bandwidth test was done with 3 different modulation types: FM (8KHz, 1KHz), TDMA, and CDMA. The purpose was to determine the amount of distortion added to different types of modulation schemes by the EUT. The following plots show input signals vs. output signals.

Test Set-up

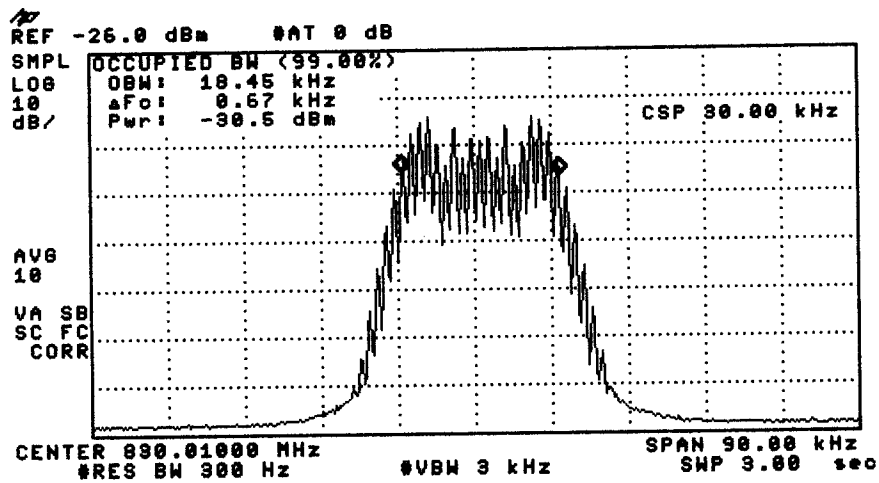


Results:

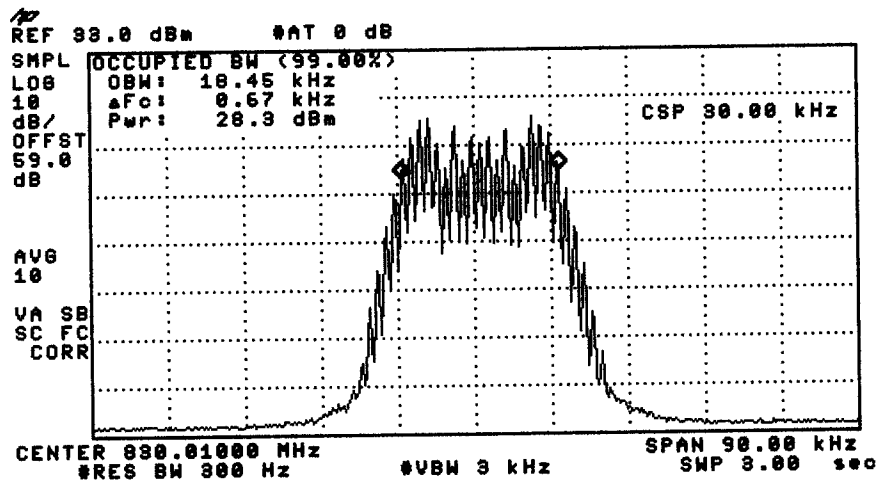
Pass (see plots)

occ BW

(8k, 1k)



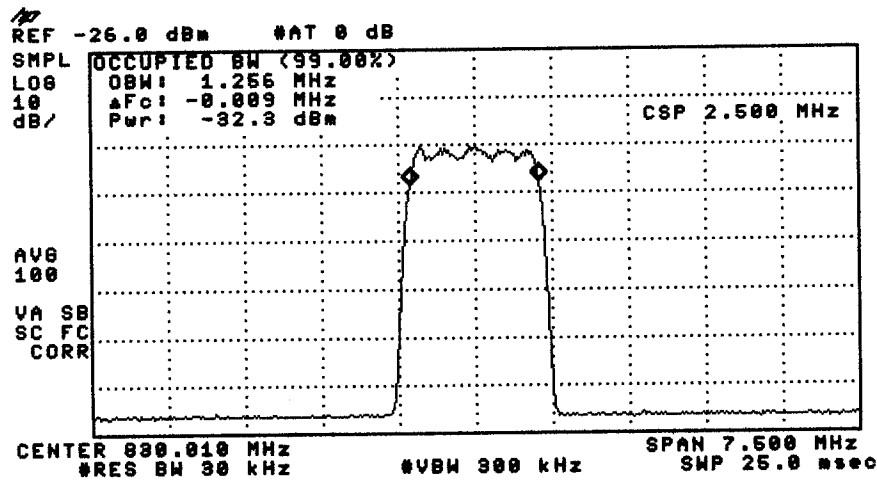
FM IN



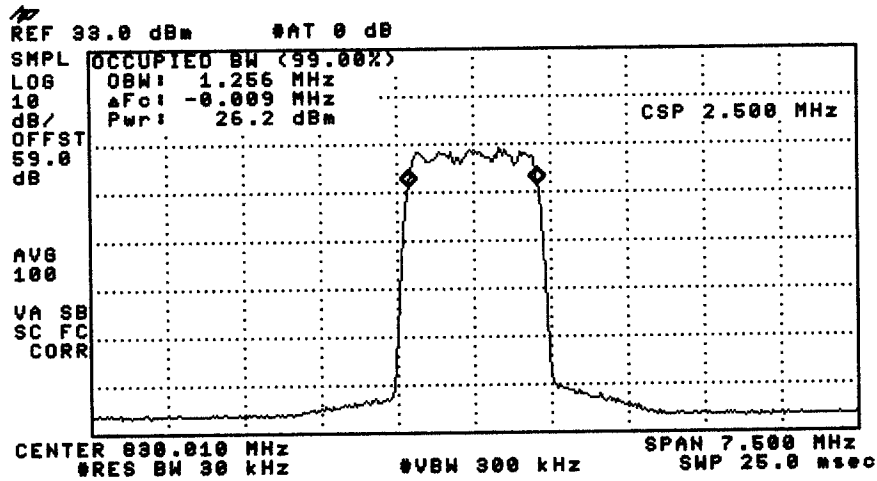
FM out

RIU

OCC BW



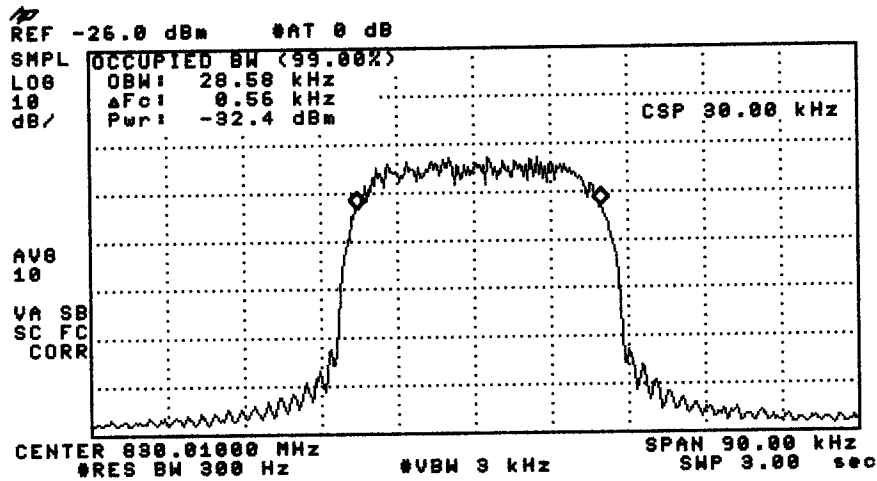
CDMA IN.



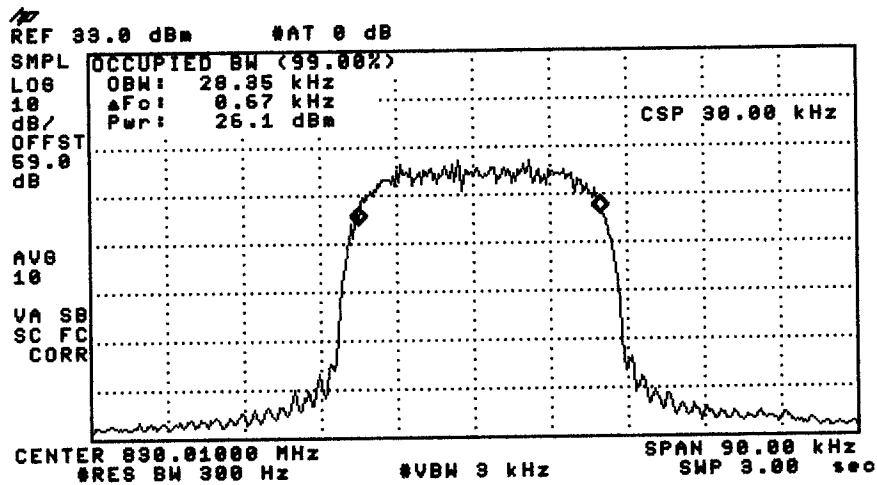
CDMA
out

RIU

OCC BW



TDMA IN,



TDMA out

RTU

A radiated emission scan was also made with the EUT's antenna replaced with a termination to demonstrate case radiation compliance to the -13 dBm requirement at the 3 carrier frequencies. Radiated emissions from the EUT are measured in the frequency range of 30 to 9000 MHz using a spectrum analyzer and appropriate broadband linearly polarized antennas. Measurements between 30 MHz and 1000 MHz are made with 120 kHz/6 dB bandwidth and quasi-peak detection and measurements above 1000 MHz are made with a 1 MHz/6 dB bandwidth and peak detection. Table top equipment is placed on a 1.0 X 1.5 meter non-conducting table 80 centimeters above the ground plane. Floor standing equipment is placed directly on the turntable/ground plane. Interface cables that are closer than 40 centimeters to the ground plane are bundled in the center in a serpentine fashion so they are at least 40 centimeters from the ground plane. Cables to simulators/testers (if used in this test) are routed through the center of the table and to a screen room located outside the test area. The antenna is positioned 10 meters horizontally from the EUT. To locate maximum emissions from the test sample the antenna is varied in height from 1 to 4 meters, measurement scans are made with both horizontal and vertical antenna polarizations and the EUT are rotated 360 degrees. The field strength levels were measured per ANSI C63.4. The EUT is then replaced with a tuned dipole antenna (below 1 GHz) or horn antenna (above 1 GHz). The substitute antenna was placed in the same polarization as the test antenna. A signal generator was used to generate a signal level that matched the level measured from the EUT. The signal generator level minus the cable loss from the signal generator to the substitute antenna plus the substitute antenna gain equals the spurious power level. The 10 highest frequencies are listed below.

Frequency MHz	dBuV/m(from EUT)	Substitution power level - dBm
840	59.9	-31
830	53.3	-37
73.38	33.7	-57
72.94	30.3	-60
172.1	30.2	-60
56.0	30.0	-60
43.2	28.9	-62
477.24	28.2	-62
156.34	27.4	-63
173.0	27.1	-63

Equipment Under Test (EUT) Test Operation Mode - Emission tests :

The device under test was operated under the following conditions during emissions testing:

- ☐ - Standby
- ☐ - Test program (H - Pattern)
- ☐ - Test program (color bar)
- ☐ - Test program (customer specific)
- ☐ - Practice operation
- ☒ - Normal Operating Mode
- ☐ - _____

Configuration of the device under test:

The following peripheral devices and interface cables were connected during the measurement:

- | | |
|--|----------------|
| ☐ - _____ | Type : _____ |
| ☐ - _____ | Type : _____ |
| ☐ - _____ | Type : _____ |
| ☐ - _____ | Type : _____ |
| ☐ - _____ | Type : _____ |
| ☐ - _____ | Type : _____ |
| ☐ - _____ | Type : _____ |
| ☐ - _____ | Type : _____ |
| ☐ - _____ | Type : _____ |
| ☒ - unshielded power cable | |
| ☒ - unshielded cables | |
| ☒ - shielded cables | MPS.No.: _____ |
| ☐ - customer specific cables | |
| ☐ - _____ | |
| ☐ - _____ | |

DEVIATIONS FROM STANDARD:

None

GENERAL REMARKS:

SUMMARY:

The requirements according to the technical regulations are

■ - met

□ - **not** met.

The device under test does

■ - fulfill the general approval requirements mentioned on page 3.

□ - **not** fulfill the general approval requirements mentioned on page 3.

Testing Start Date: 25 April 2001

Testing End Date: 24 May 2001

- TÜV PRODUCT SERVICE INC -

Joel T. Schneider

Reviewed By:
J. T. Schneider

J. C. Sausen

Tested By:
J. C. Sausen

TEST SETUP FOR EMISSIONS TESTING

WILD RIVER LAB
Screen Room

WILD RIVER LAB
Large Test Site

See Test Setup Exhibit



Test setup photos of AC line conducted emissions

See Test Setup Exhibit



Radiated emission (case radiation) test setup photos

See Test Setup Exhibit



Appendix A

Product Information Form



EMC Test Plan and Constructional Data Form



PLEASE COMPLETE THIS DOCUMENT IN FULL, ENTERING N/A IF THE FIELD IS NOT APPLICABLE.

Applicant -- NOTE: This information will be input into your test report as shown below.
Press the F1 key at any time to get HELP for the current field selected.

Company: ADC, Inc.

Address: P. O. Box 1101
Minneapolis MN 55440-1101

Contact: Merritt Pulkrabek Position: Approval Engineer

Phone: 952-233-6495 Fax: _____

E-mail Address: Merritt_Pulkrabek@adc.com

General Equipment Description -- NOTE: This information will be input into your test report as shown below.

EUT Description Cellular Amplifier

EUT Name Digivance Remote Interface Unit

Model No.: DGVI-110000RIU (A Band) Serial No.: 214090058 (A Band)
DGVI-120000RIU (B Band) 214090059 (B Band)

Product Options: N/A Standard Product – No Options

Configurations to be tested: _____

Test Objective

- | | |
|---|---|
| ☐ EMC Directive 89/336/EEC (EMC)
Std: _____ | ☐ FCC: Class ☐ A ☒ B Part <u>22 H</u> |
| ☐ Machinery Directive 89/392/EEC (EMC)
Std: _____ | ☐ VCCI: Class ☐ A ☐ B |
| ☐ Medical Device Directive 93/42/EEC (EMC)
Std: _____ | ☐ BCIQ: Class ☐ A ☐ B |
| ☐ Vehicle Directive 72/245/EEC (EMC)
Std: _____ | ☐ Canada: Class ☐ A ☐ B |
| ☐ FDA Reviewers Guidance for Premarket
Notification Submissions (EMC) | ☐ Australia: Class ☐ A ☐ B |
| | ☐ Other: _____ |

TÜV Product Service Certification Requested

- | | |
|--|---|
| ☐ Attestation of Conformity (AoC) | ☐ International EMC Mark (IEM) |
| ☐ Certificate of Conformity (CoC) | ☐ Compliance Document |
| Protection Class (N/A for vehicles) | ☐ Class I ☐ Class II ☐ Class III |
- (Press **F1** when field is selected to show additional information on Protection Class.)

EMC Test Plan and Constructional Data Form

**Attendance**Test will be: ☒ Attended by the customer ☐ Unattended by the customer**Failure - Complete this section if testing will not be attended by the customer.**

If a failure occurs, TUV Product Service should:

- ☐ Call contact listed above, if not available then stop testing. (After hrs phone): _____
- ☐ Continue testing to complete test series.
- ☐ Continue testing to define corrective action.
- ☐ Stop testing.

EUT Specifications and RequirementsLength: 12" Width: 12" Height: 4" Weight: 15 lb.**Power Requirements***Regulations require testing to be performed at typical power ratings in the countries of intended use. (i.e., European power is typically 230 VAC 50 Hz or 400 VAC 50 Hz, single and three phase, respectively)*Voltage: 115 VAC (If battery powered, make sure battery life is sufficient to complete testing.)# of Phases: 1Current (Amps/phase(max)): 2.8 A Current (Amps/phase(nominal)): 2.0 A

Other _____

Other Special Requirements**Typical Installation and/or Operating Environment**(ie. Hospital, Small Business, Industrial/Factory, etc.)
Office, Inside a Telecom closet.**EUT Power Cable**

☐ Permanent OR ☒ Removable Length (in meters): 3

☐ Shielded OR ☒ Unshielded

☐ Not Applicable

EMC Test Plan and Constructional Data Form

EUT Interface Ports and Cables												
Interface			Shielding									
Type	Analog	Digital	Qty	Yes	No	Type	Termination	Connector Type	Port Termination	Length (in meters)	Removable	Permanent
Alarm	☒	☐	1	☐	☒	None	Variable	6 Pin Terminal	Relay From C	>1	☒	☐
RF	☒	☒	3	☒	☐	Braided Coax	Coaxial	N	50 Ohm	>1	☒	☐
	☐	☐		☐	☐						☐	☐
	☐	☐		☐	☐						☐	☐
	☐	☐		☐	☐						☐	☐
	☐	☐		☐	☐						☐	☐
	☐	☐		☐	☐						☐	☐
	☐	☐		☐	☐						☐	☐
	☐	☐		☐	☐						☐	☐
	☐	☐		☐	☐						☐	☐
	☐	☐		☐	☐						☐	☐
	☐	☐		☐	☐						☐	☐
	☐	☐		☐	☐						☐	☐

EMC Test Plan and Constructional Data Form

**EUT Software.**

Revision Level: N/A

Description: No Software

EUT Operating Modes to be Tested -- list the operating modes to be used during test. It is recommended the equipment be tested while operating in a typical operation mode. FCC testing of personal computers and/or peripherals requires that a simple program generate a complete line of upper case H's. Provide a general description of all software, firmware, and PLD algorithms used in the equipment. List all code modules as described above, with the revision level used during testing. Consult with your TÜV Product Service Representative if additional assistance is required.

1. N/A – No Software, Firmware, or Algorithms.
- 2.
- 3.

EUT System Components -- List and describe all components which are part of the EUT. For FCC testing a minimum configuration is required. (ie. Mouse, Printer, Monitor, External Disk Drive, Motherboard, etc.)

Description	Model #	Serial #	FCC ID #

EMC Test Plan and Constructional Data Form

Support Equipment -- List and describe all support equipment which is not part of the EUT. (i.e. peripherals, simulators, etc)			
<i>Description</i>	<i>Model #</i>	<i>Serial #</i>	<i>FCC ID #</i>
Signal Generator			

Oscillator Frequencies			
<i>Frequency</i>	<i>Derived Frequency</i>	<i>Component # / Location</i>	<i>Description of Use</i>
See Power Supply Info			

Power Supply			
<i>Manufacturer</i>	<i>Model #</i>	<i>Serial #</i>	<i>Type</i>
Power One	MAP110-4001-T		☒ Switched-mode: (Frequency) 20 – 25 kHz ☐ Linear ☐ Other: _____
			☐ Switched-mode: (Frequency) _____ ☐ Linear ☐ Other: _____

Power Line Filters		
<i>Manufacturer</i>	<i>Model #</i>	<i>Location in EUT</i>
None		

EMC Test Plan and Constructional Data Form

**Critical EMI Components (Capacitors, ferrites, etc.)**

<i>Description</i>	<i>Manufacturer</i>	<i>Part # or Value</i>	<i>Qty</i>	<i>Component # / Location</i>
N/A – No EMI Control Component Used				

EMC Critical Detail -- Describe other EMC Design details used to reduce high frequency noise.(PLEASE INSERT “**ELECTRONIC SIGNATURE**” BELOW IF POSSIBLE)**Authorization Signatures**

Customer authorization to perform tests
according to this test plan.

Date

Test Plan/CDF Prepared By (please print)

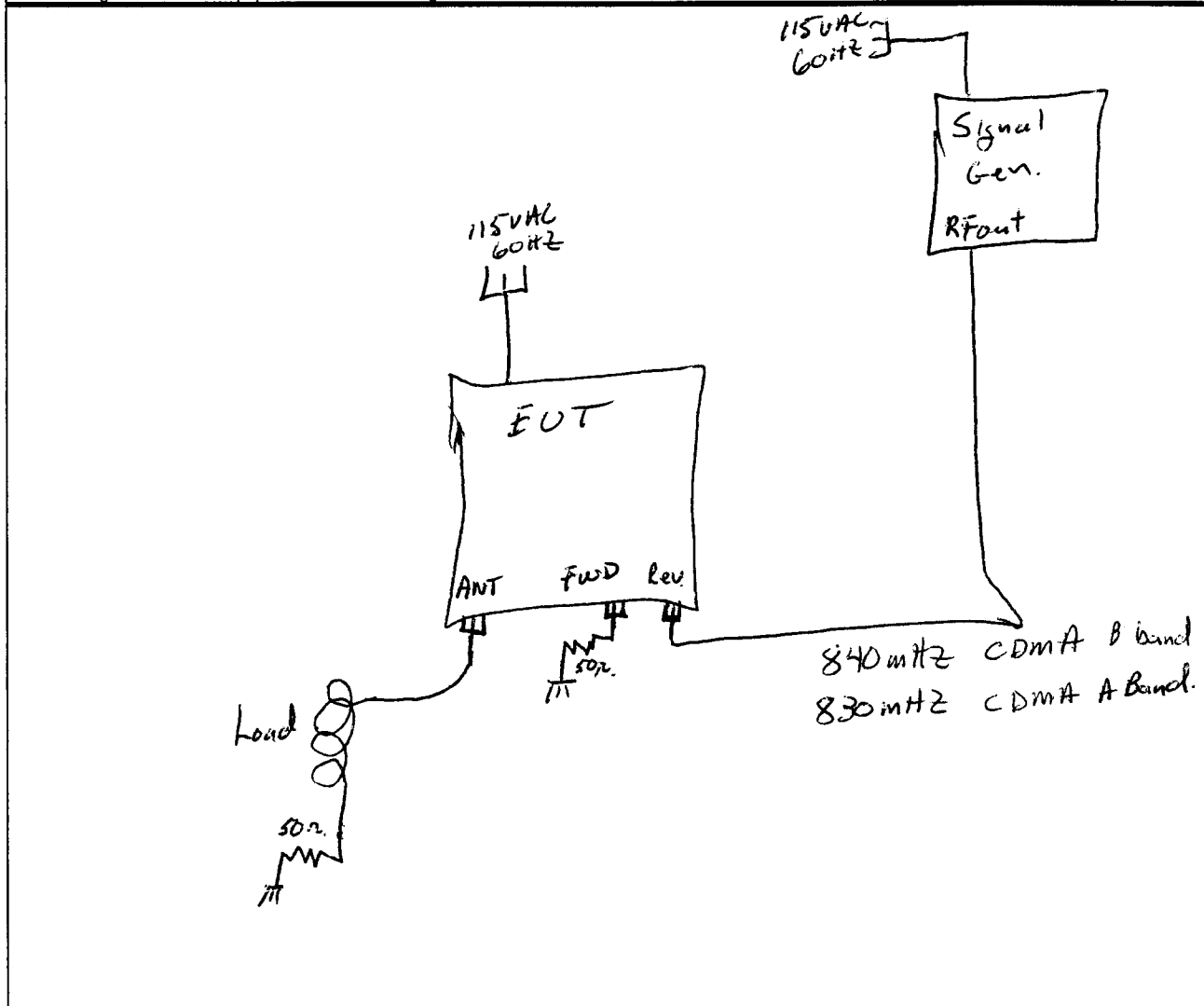
Date

Reviewed by TÜV Product Service Associate

Date

EMC Block Diagram Form

System Configuration Block Diagram -- Provide a line drawing identifying the EUT, simulators, support equipment, I/O cables, power cables, and any other pertinent components to be used during testing. Use a dashed line to separate the equipment in the testing field versus equipment outside testing field.

**Authorization Signatures**

Customer authorization to perform tests
according to this test plan.

Date

Test Plan/CDF Prepared By (please print)

Date

Reviewed by TÜV Product Service Associate

Date