



**POWERWAVE TECHNOLOGIES, INC. ADDENDUM TEST REPORT**

**FOR THE**

**900MHZ CELLULAR REPEATER, ALR 1200**

**FCC PART 90**

**COMPLIANCE**

**DATE OF ISSUE: FEBRUARY 23, 2006**

**PREPARED FOR:**

Powerwave Technologies, Inc.  
1801 E. St. Andrew Place  
Santa Ana, CA 92705

P.O. No.: 71687  
W.O. No.: 83984

**PREPARED BY:**

Mary Ellen Clayton  
CKC Laboratories, Inc.  
5046 Sierra Pines Drive  
Mariposa, CA 95338

Date of test: July 18, 2005 –  
February 23, 2006

**Report No.: FC05-051A**

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## ADMINISTRATIVE INFORMATION

**DATE OF TEST:** July 18, 2005 – February 23, 2006

**DATE OF RECEIPT:** July 18, 2005

**FREQUENCY RANGE TESTED:** 9kHz-10GHz

**MANUFACTURER:** Powerwave Technologies, Inc.  
1801 E. St. Andrew Place  
Santa Ana, CA 92705

**REPRESENTATIVE:** Jeffrey Dale

**TEST LOCATION:** CKC Laboratories, Inc.  
110 Olinda Place  
Brea, CA 92621

**TEST METHOD:** FCC Part 90, ANSI/TIA/EIA-603-B (2002)

**PURPOSE OF TEST:** To demonstrate the compliance of the 900MHz Cellular Repeater, ALR 1200 with the requirements for FCC Part 90 devices.  
**Addendum A** is to add new test data for the bi-directional portion of the EUT.

**CONDITIONS FOR COMPLIANCE**

No modifications to the EUT were necessary to comply.

**APPROVALS**

Steve Behm, Director of Engineering Services

**QUALITY ASSURANCE:**



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Joyce Walker, Quality Assurance Administrative  
Manager

**TEST PERSONNEL:**



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Eddie Wong, EMC Engineer

## **EQUIPMENT UNDER TEST (EUT) DESCRIPTION**

The customer declares the EUT tested by CKC Laboratories was representative of a production unit.

## **EQUIPMENT UNDER TEST**

### **900MHz Cellular Repeater**

Manuf: Powerwave Technologies  
Model: ALR 1200  
Serial: NA  
FCC ID: pending

## **PERIPHERAL DEVICES**

The EUT was not tested with peripheral devices.

**TEMPERATURE AND HUMIDITY DURING TESTING**

The temperature during testing was within +15°C and + 35°C.  
The relative humidity was between 20% and 75%.

**FCC 2.1033(c)(3) USER'S MANUAL**

The necessary information is contained in a separate document.

**FCC 2.1033 (c)(4) TYPE OF EMISSIONS**

16K0F3E and iDEN

**FCC 2.1033 (c)(5) FREQUENCY RANGE**

935MHz – 940MHz (downlink) and 896MHz – 901MHz (uplink)

**FCC 2.1033 (c)(6) OPERATING POWER**

16K0F3E – 0.3162 Watts, iDEN – 0.0800 Watts

**FCC 2.1033 (c)(7) MAXIMUM POWER RATING**

500 Watts

**FCC 2.1033 (c)(8) DC VOLTAGES**

The necessary information is contained in a separate document.

**FCC 2.1033 (c)(9) TUNE-UP PROCEDURE**

The necessary information is contained in a separate document.

**FCC 2.1033(c)(10) SCHEMATICS AND CIRCUITRY DESCRIPTION**

The necessary information is contained in a separate document.

**FCC 2.1033(c)(11) LABEL AND PLACEMENT**

The necessary information is contained in a separate document.

**FCC 2.1033(c)(12) SUBMITTAL PHOTOS**

The necessary information is contained in a separate document.

**FCC 2.1033 (c)(13) MODULATION INFORMATION**

AMP

**FCC 2.1033(c)(14)/2.1046/90.635(b) - RF POWER OUTPUT**

Power and Antenna Height Limit: (b) The effective radiated power and antenna height, for base stations used in suburban-conventional systems of communications shall be no greater than 500 watts (27 dBw) and 152 m. (500 ft.) above average terrain (AAT) respectively. The EUT is a RF repeater. The manufacture does not provide an antenna for sale with the product, hence ERP is not measured nor calculated. The end user of this product is to exercise proper engineering judgement to select the appropriate antenna to comply with the EIRP limitation set forth by FCC90.635 (b). The RF power of the EUT was measured at the antenna port. The measurement satisfies the above requirement by demonstrating the measured power is below 500watts.

Test setup: The EUT is placed on the wooden table. RF Input port is connected to a remote support Signal Amplifier and a signal generators. The RF Output is connected to a remote RF load and a directional coupler. The RF power of the EUT is monitored at the output of the directional coupler and the RF input signal is adjusted to maintain the output power.

**Downlink**

<b>Modulation</b>	<b>Frequency</b>	<b>Measure Power</b>
iDEN	935.0 MHz	0.0800W
iDEN	937.5 MHz	0.0800W
iDEN	940.0 MHz	0.0800W
16K0F3E	935.0 MHz	0.3162W
16K0F3E	937.5 MHz	0.3162W
16K0F3E	940.0 MHz	0.3162W

**Uplink (2/21/06)**

<b>Modulation</b>	<b>Frequency</b>	<b>Measure Power</b>
iDEN	896.0 MHz	0.0800W
iDEN	898.5 MHz	0.0800W
iDEN	901.0 MHz	0.0800W
16K0F3E	896.0 MHz	0.3162W
16K0F3E	898.5 MHz	0.3162W
16K0F3E	901.0 MHz	0.3162W

Conclusion: As indicated above, the measured power does not exceed the 500 Watt power limit.

**Test Equipment**

<b>Equipment</b>	<b>Asset #</b>	<b>Manufacturer</b>	<b>Model #</b>	<b>Serial #</b>	<b>Cal Date</b>	<b>Cal Due</b>
RF Power meter	02082	HP	435B	2445A11881	061704	061706
Power Sensor	02036	HP	8482A	1551A01004	061806	061806

**Testing 2/21/06**

Power Sensor	02777	Agilent	E4412A	MY41499662	012706	012708
RF Power meter	02778	Agilent	EPM-441A	GB37170458	012706	012708

## RF Output Power



**FCC 2.1033(c)(14)/2.1047(a) - MODULATION CHARACTERISTICS - AUDIO FREQUENCY RESPONSE**

**Not applicable to this unit.**

**FCC 2.1033(c)(14)/2.1047(b) MODULATION CHARACTERISTICS- Modulation Limiting Response**

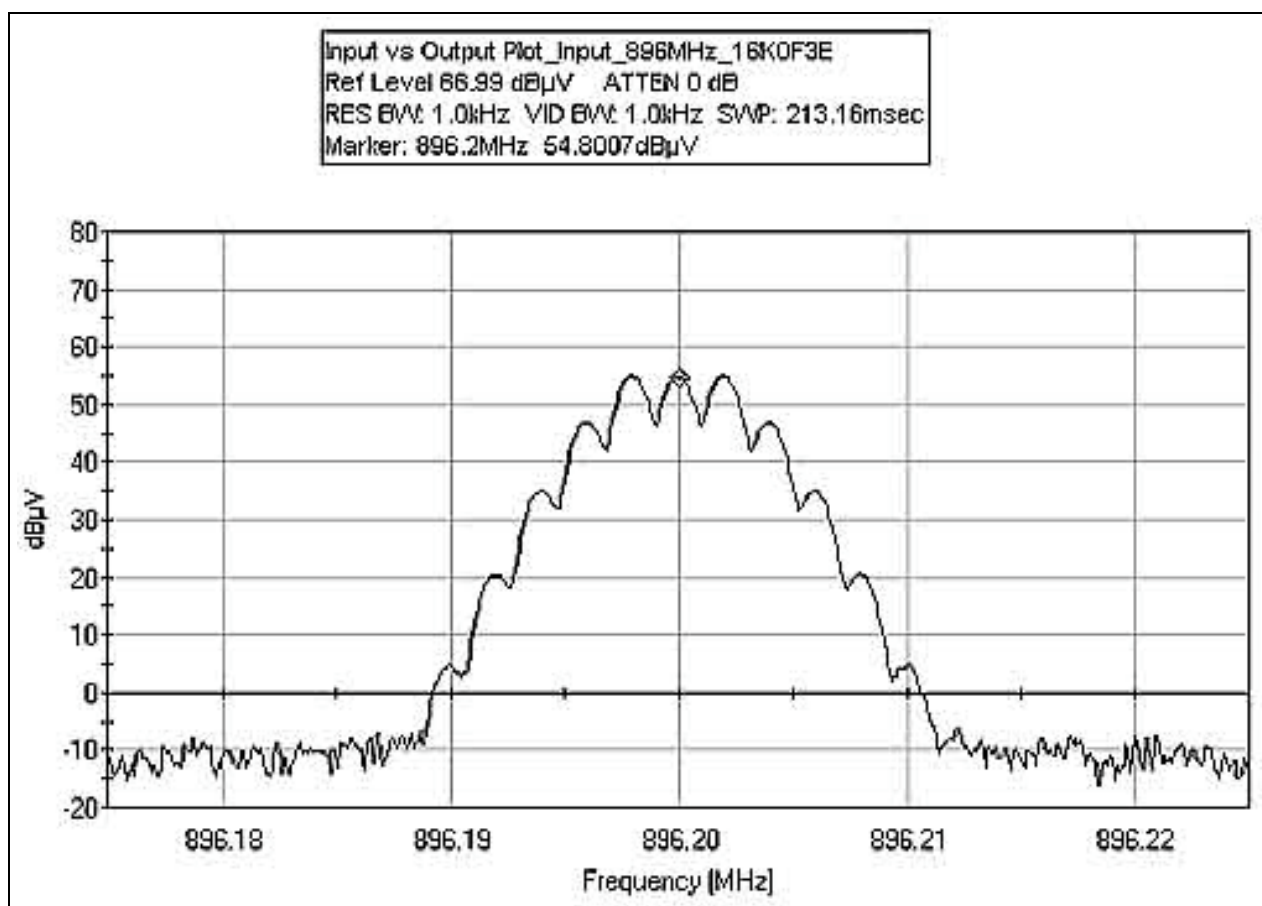
**Not applicable to this unit.**



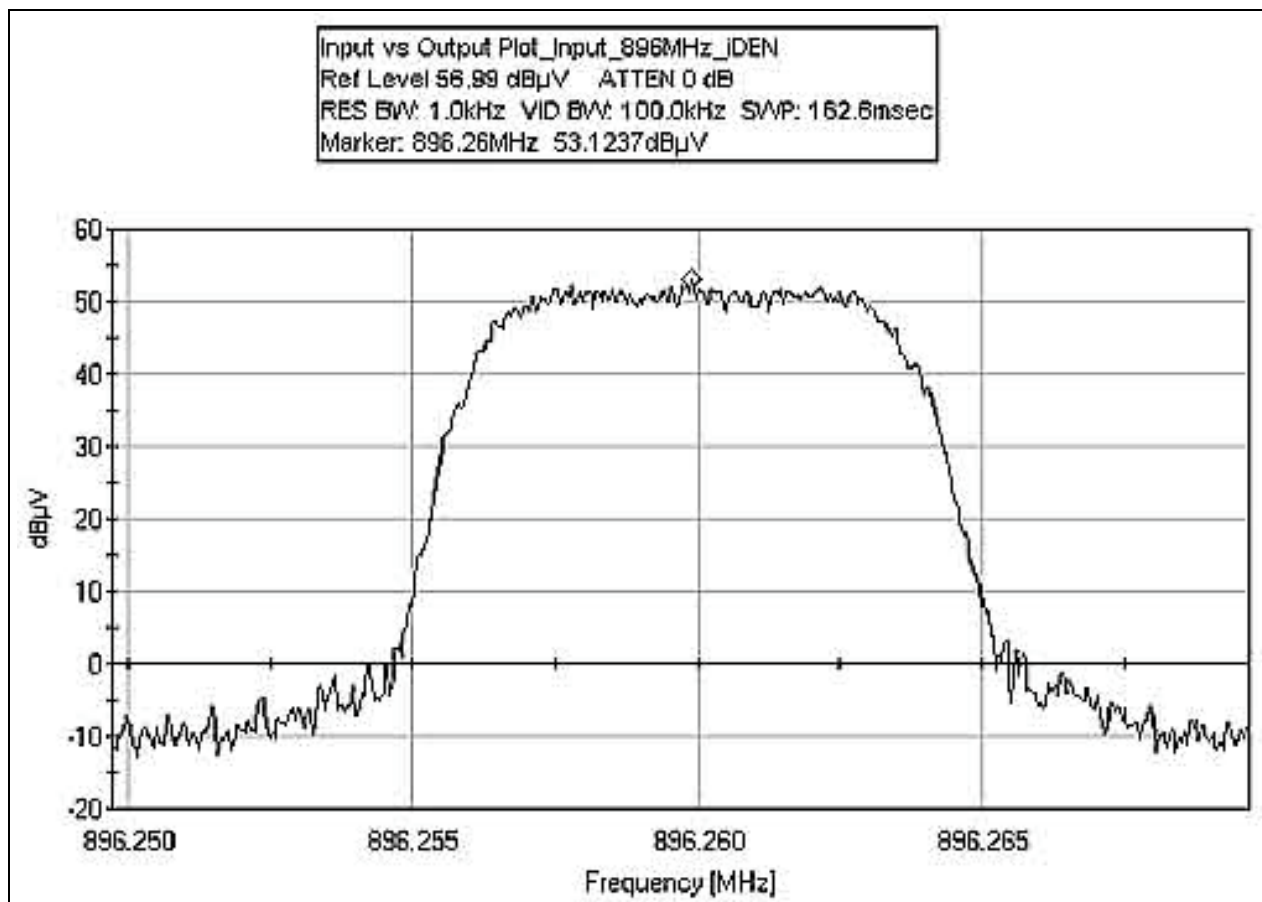
**FCC 2.1033(c)(14)/2.1049(i)- INPUT PLOTS**

**Test Conditions:** The EUT is placed on the wooden table. RF Input port is connected to a remote support signal amplifier and a signal generator. The RF Output is connected to a remote RF load and a directional coupler. The RF power of the EUT is monitored at the output of the directional coupler and the RF input signal is adjusted to maintain the output power. Signal is measured at the antenna port. Modulation: AMP. Emission Designator: iDEN. Power = 19 dBm = 0.08 Watts. Emission Designator: 16K0F3E. Power = 25 dBm = 0.3162 Watts. Frequency: 935MHz, 937.5MHz and 940MHz. 24°C, 60% relative humidity.

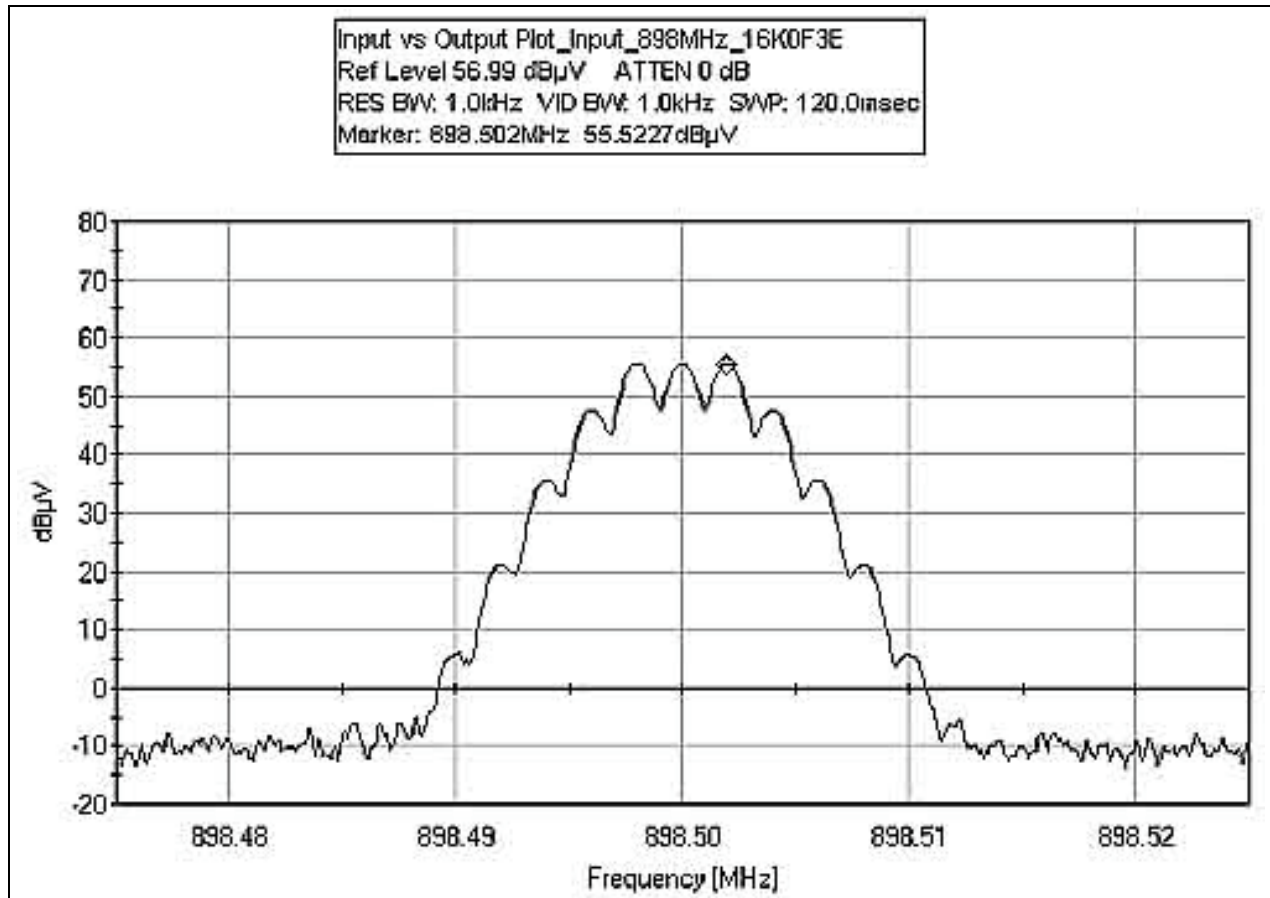
**INPUT PLOT 896MHz - 16K0F3E**



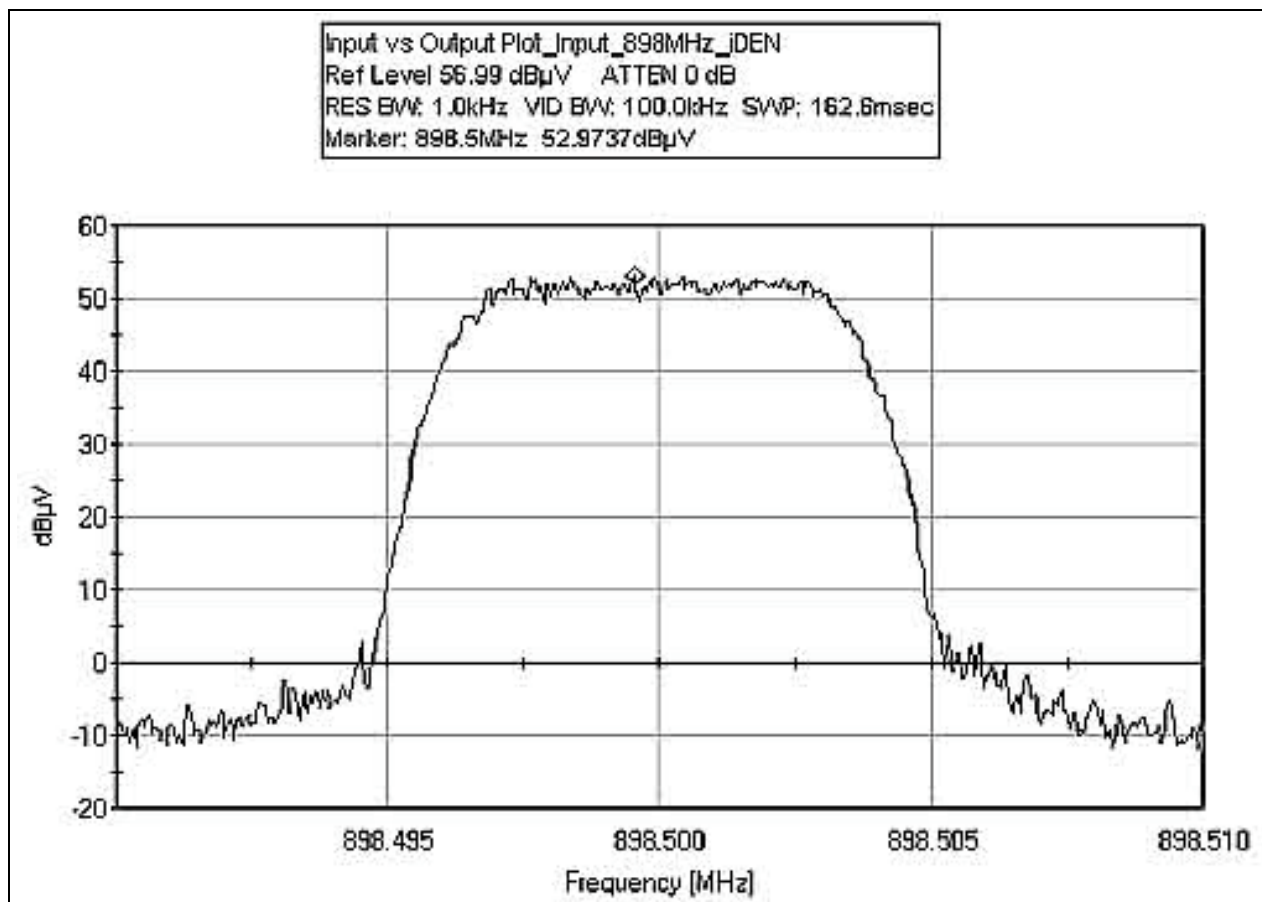
### INPUT PLOT 896MHz - IDEN



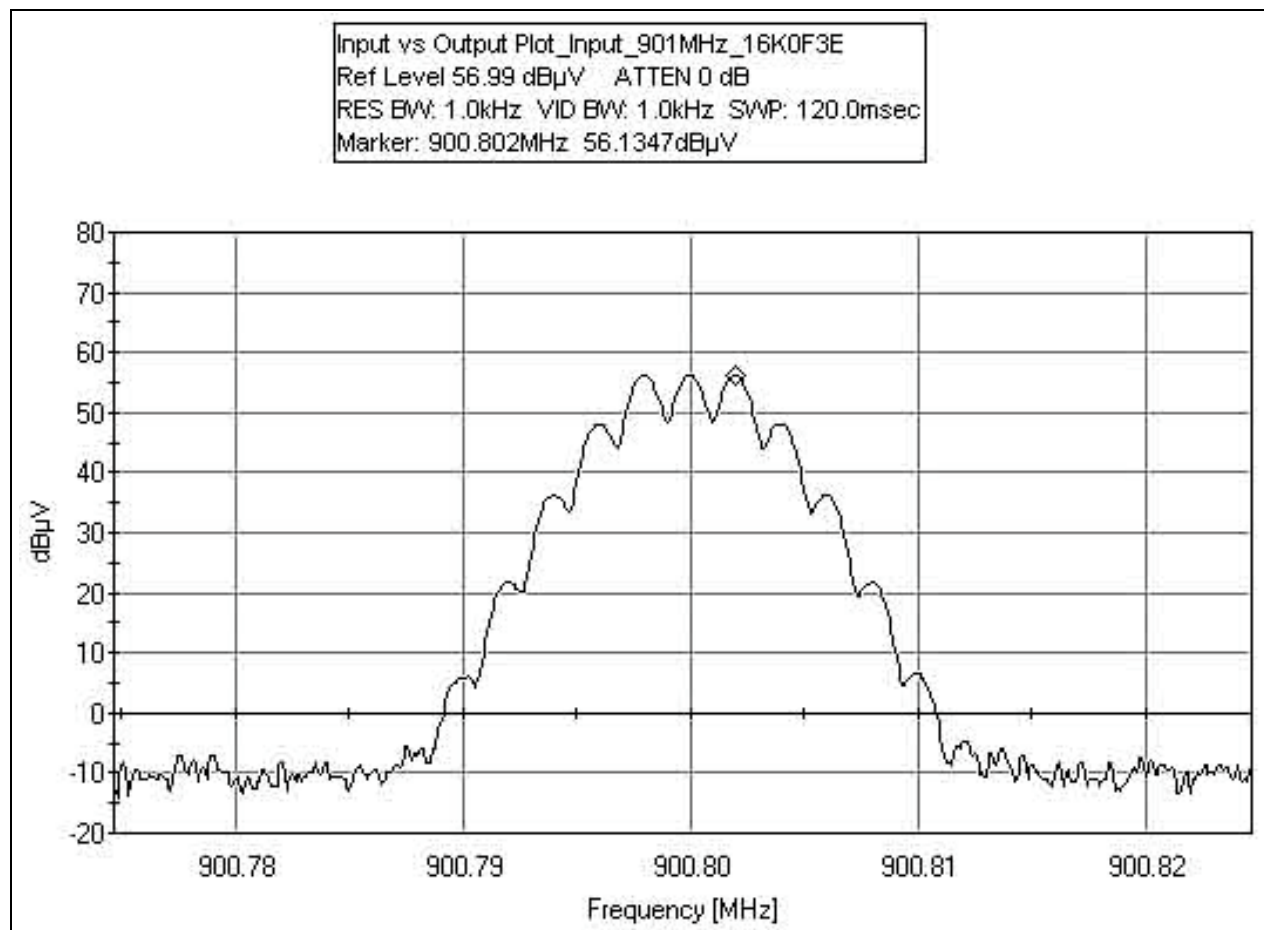
### INPUT PLOT 898MHz - 16K0F3E



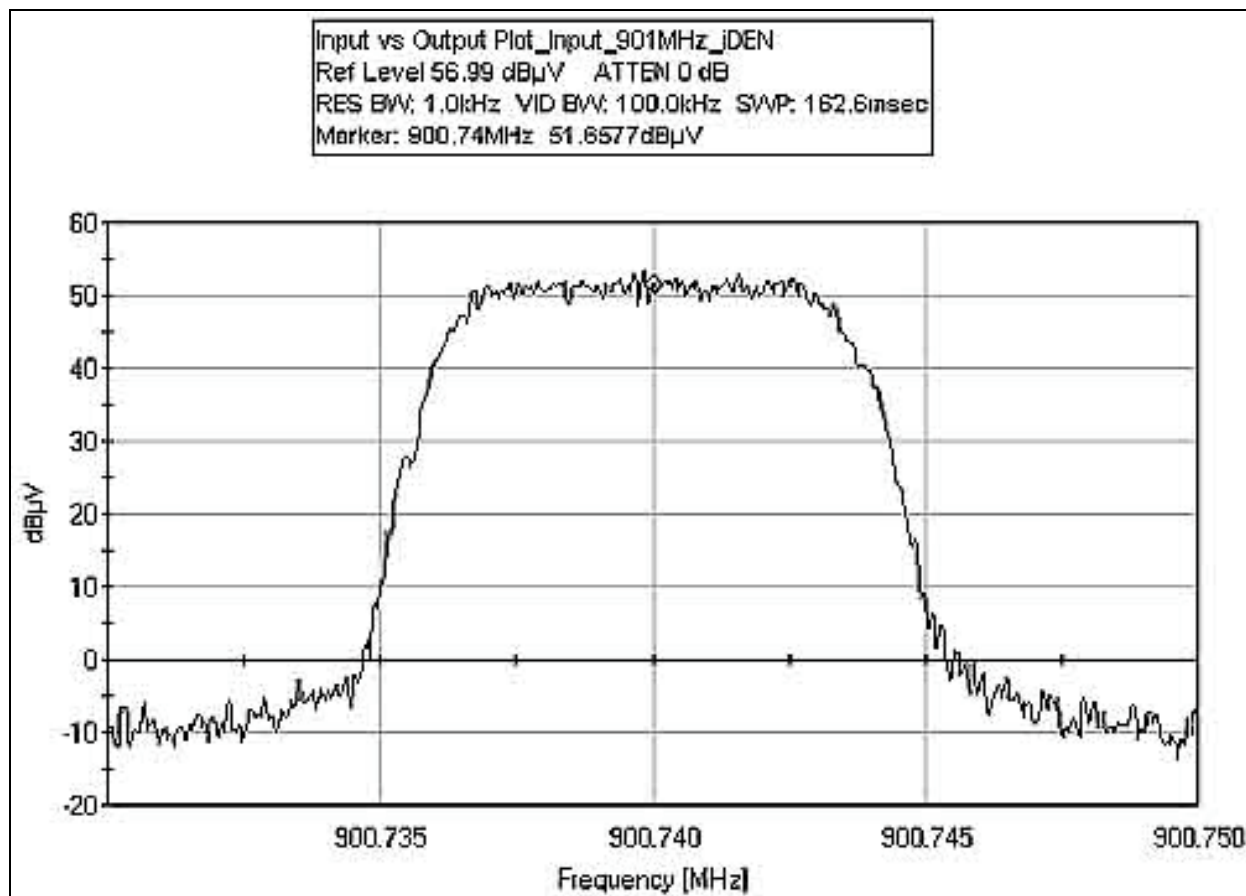
### INPUT PLOT 898MHz - IDEN



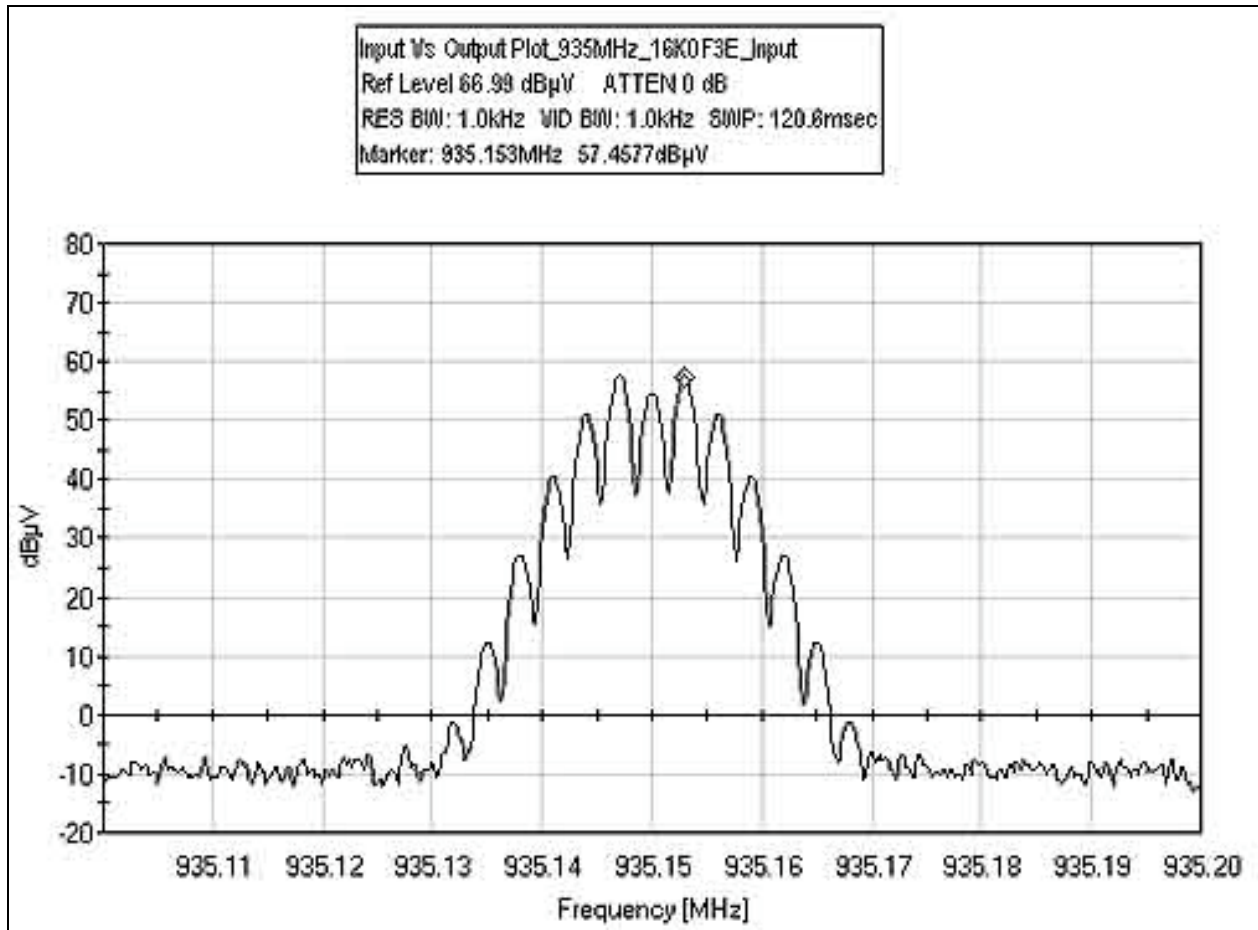
### INPUT PLOT 901MHz - 16K0F3E



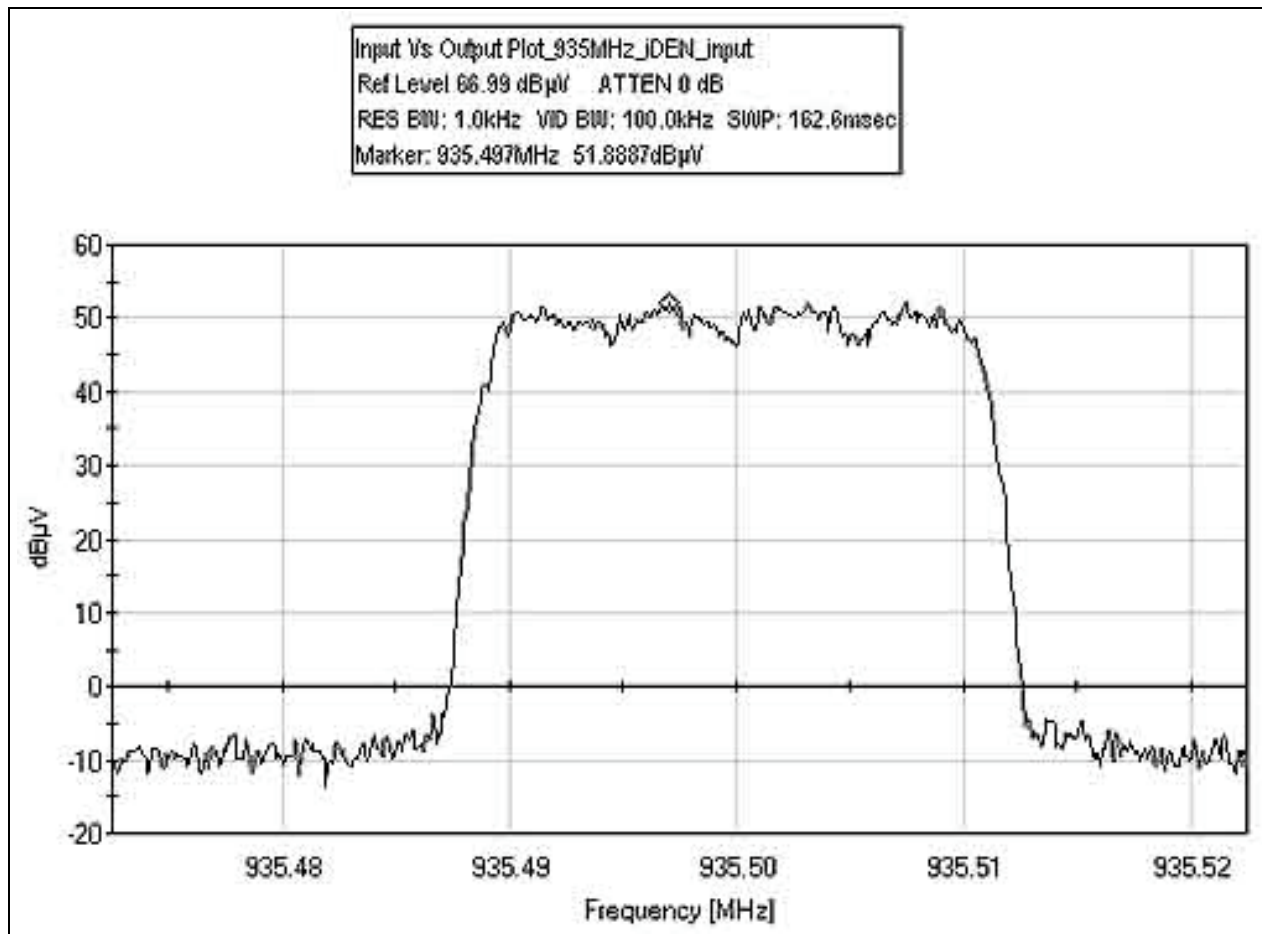
### INPUT PLOT 901MHz - IDEN



### INPUT PLOT 935MHz - 16K0F3E

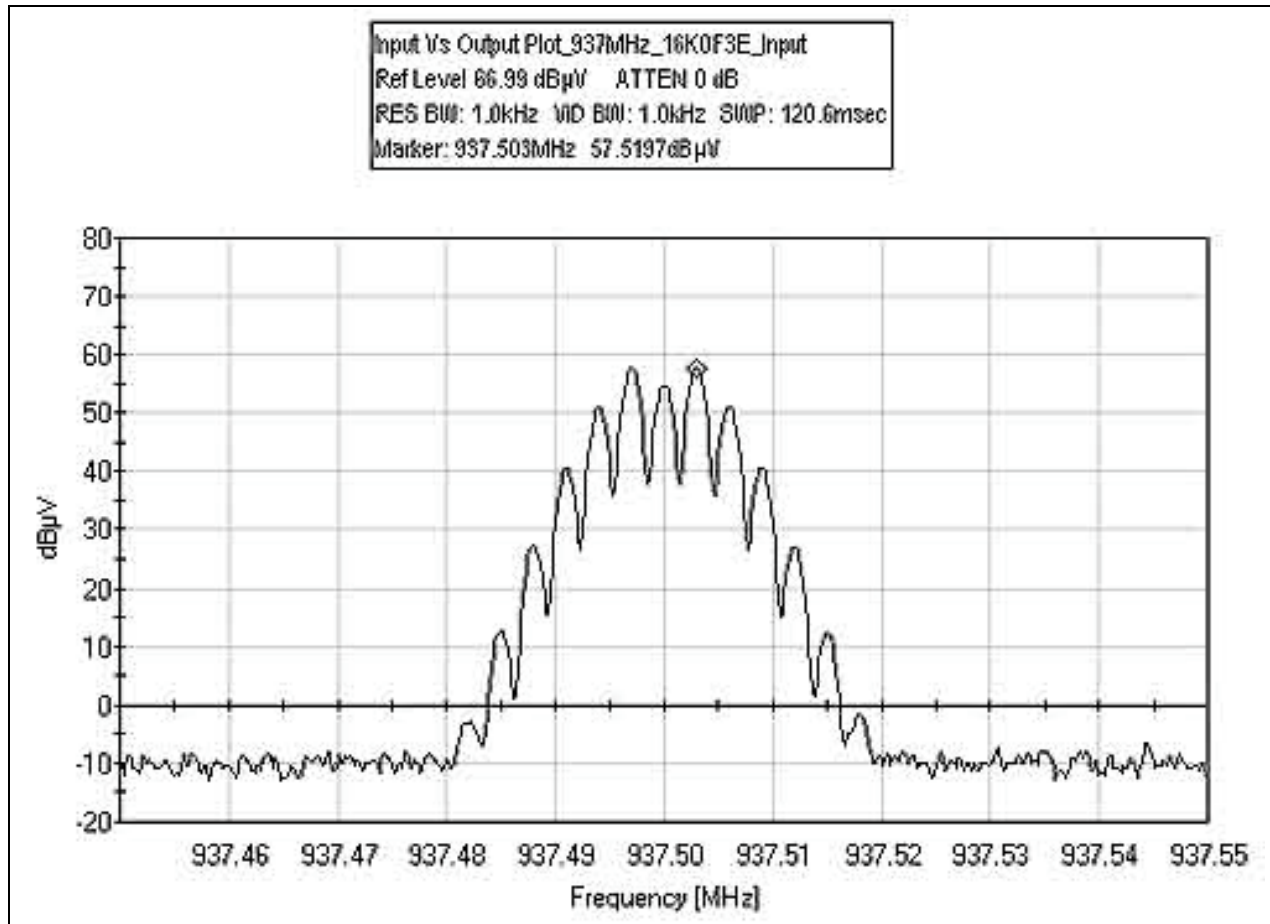


**INPUT PLOT 935MHz - IDEN**

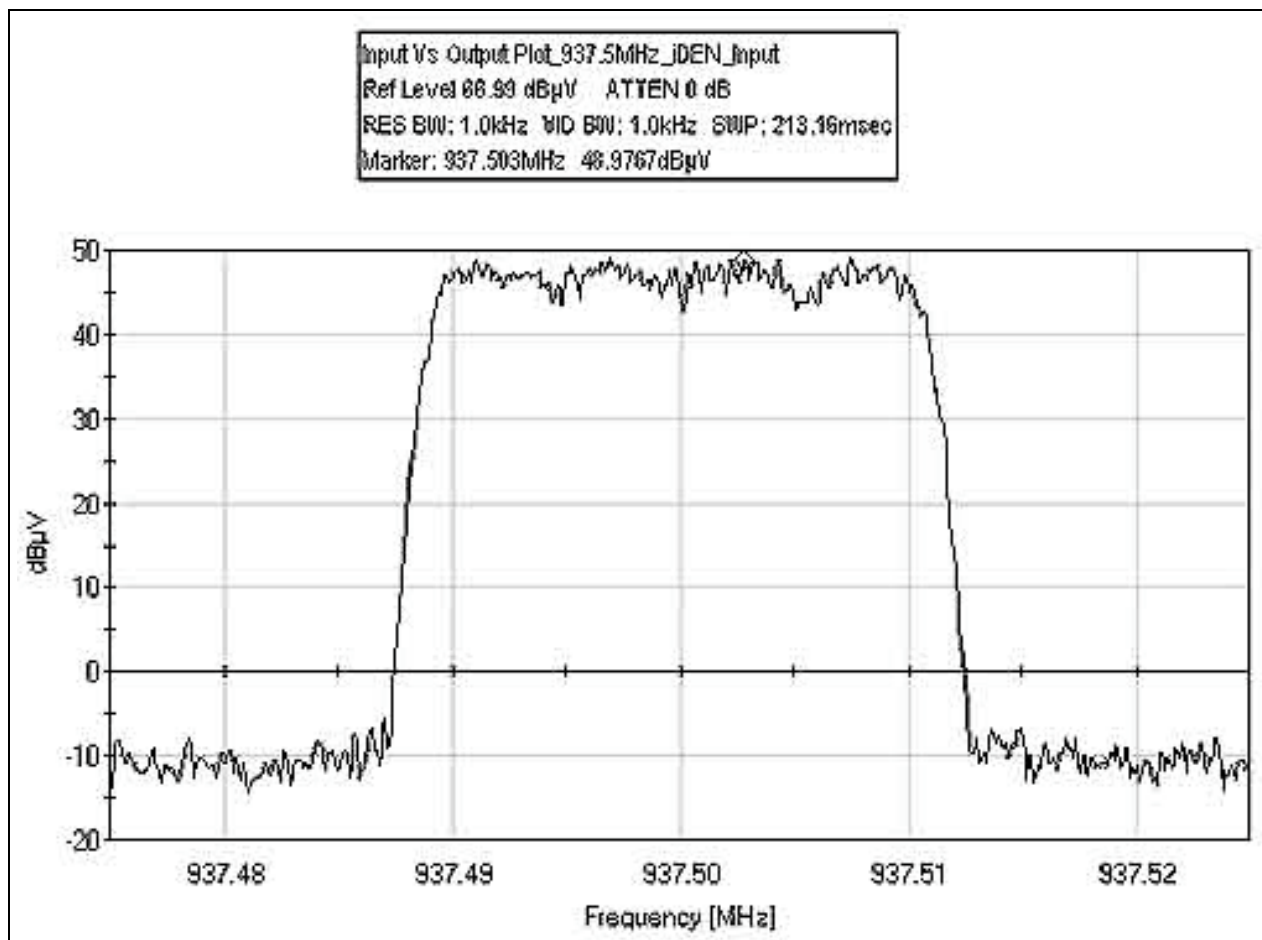




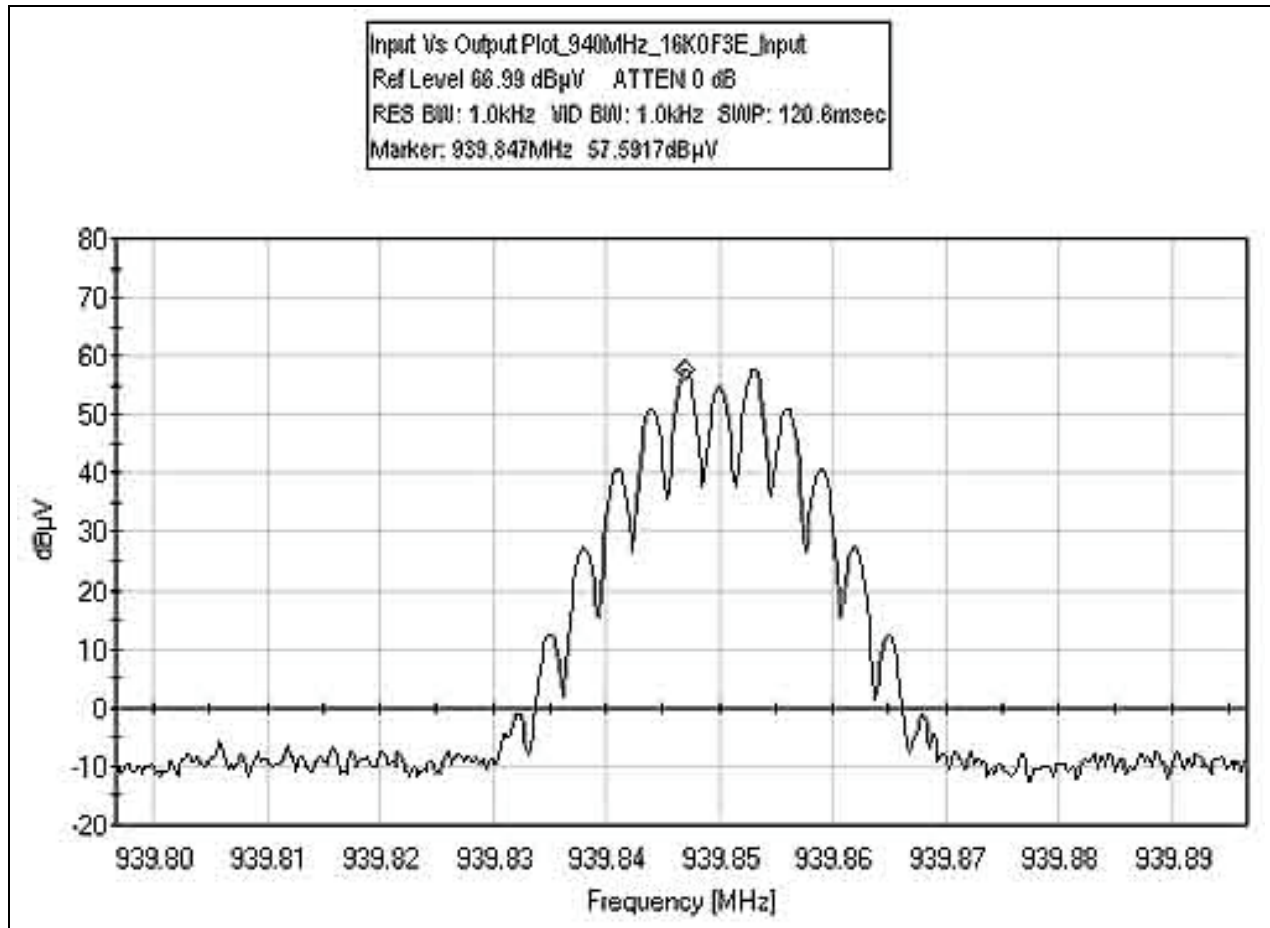
### INPUT PLOT 937MHz - 16K0F3E



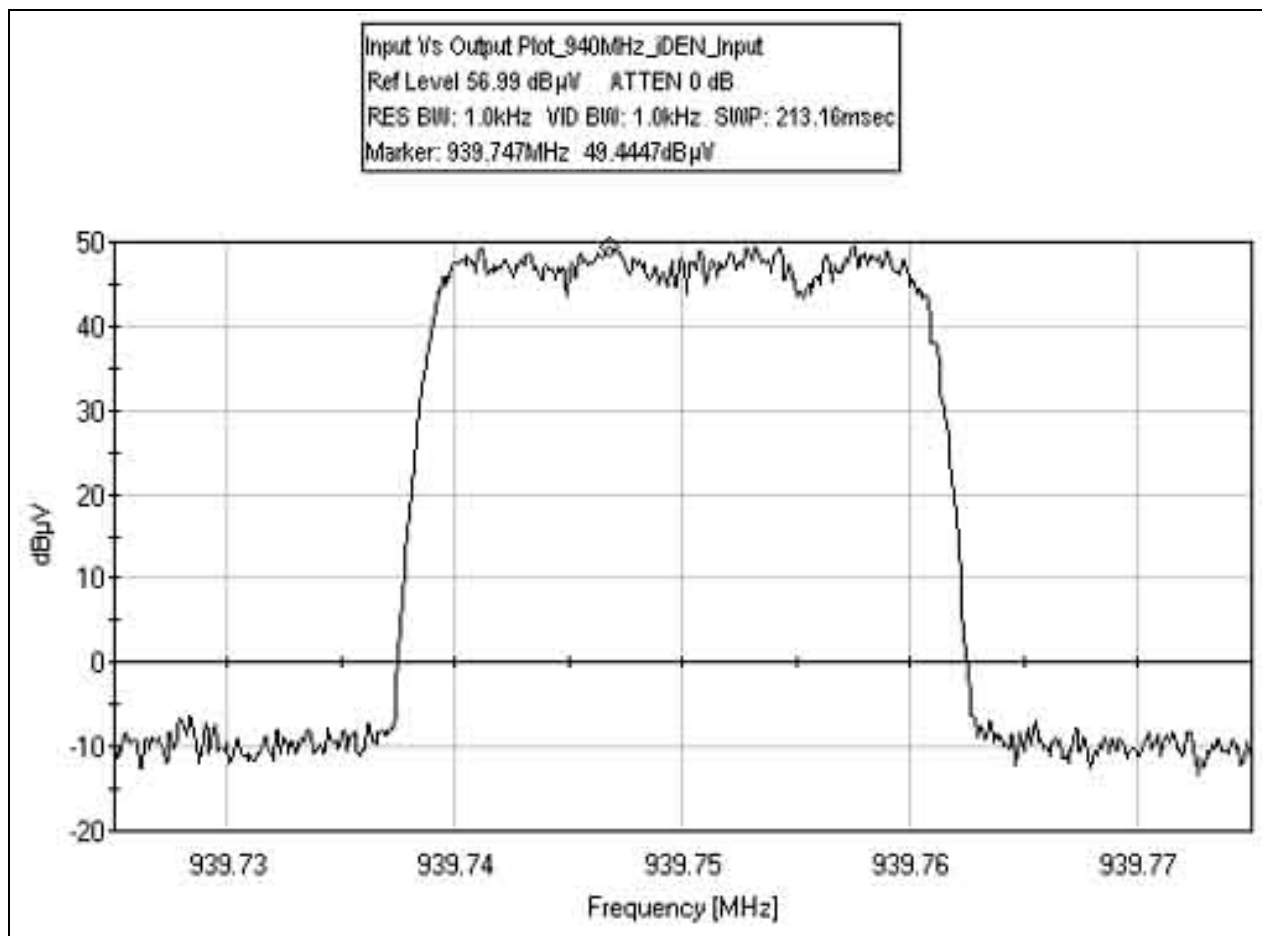
### INPUT PLOT 937MHz - IDEN



### INPUT PLOT 940MHz - 16K0F3E



### INPUT PLOT 940MHz - IDEN



**Test Equipment**

Equipment	Asset #	Manufacturer	Model #	Serial #	Cal Date	Cal Due
Spectrum Analyzer	02672	Agilent	E4446A	US44300438	011405	011407
24" SMA Cable (White)	P05204	Pasteurneck	35591-48	1-40GHz_white	020805	020807

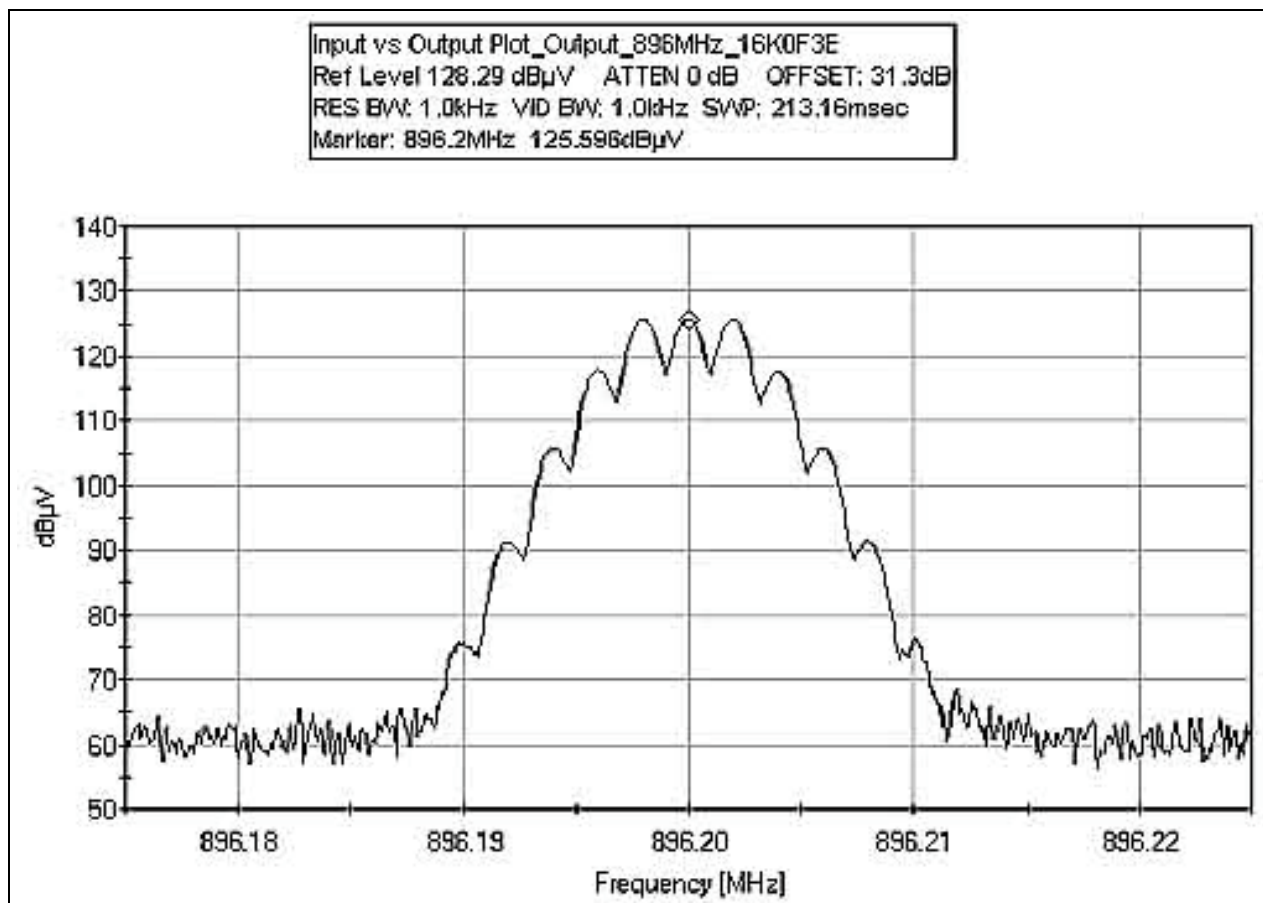
**PHOTOGRAPH SHOWING DIRECT CONNECT TEST SETUP**



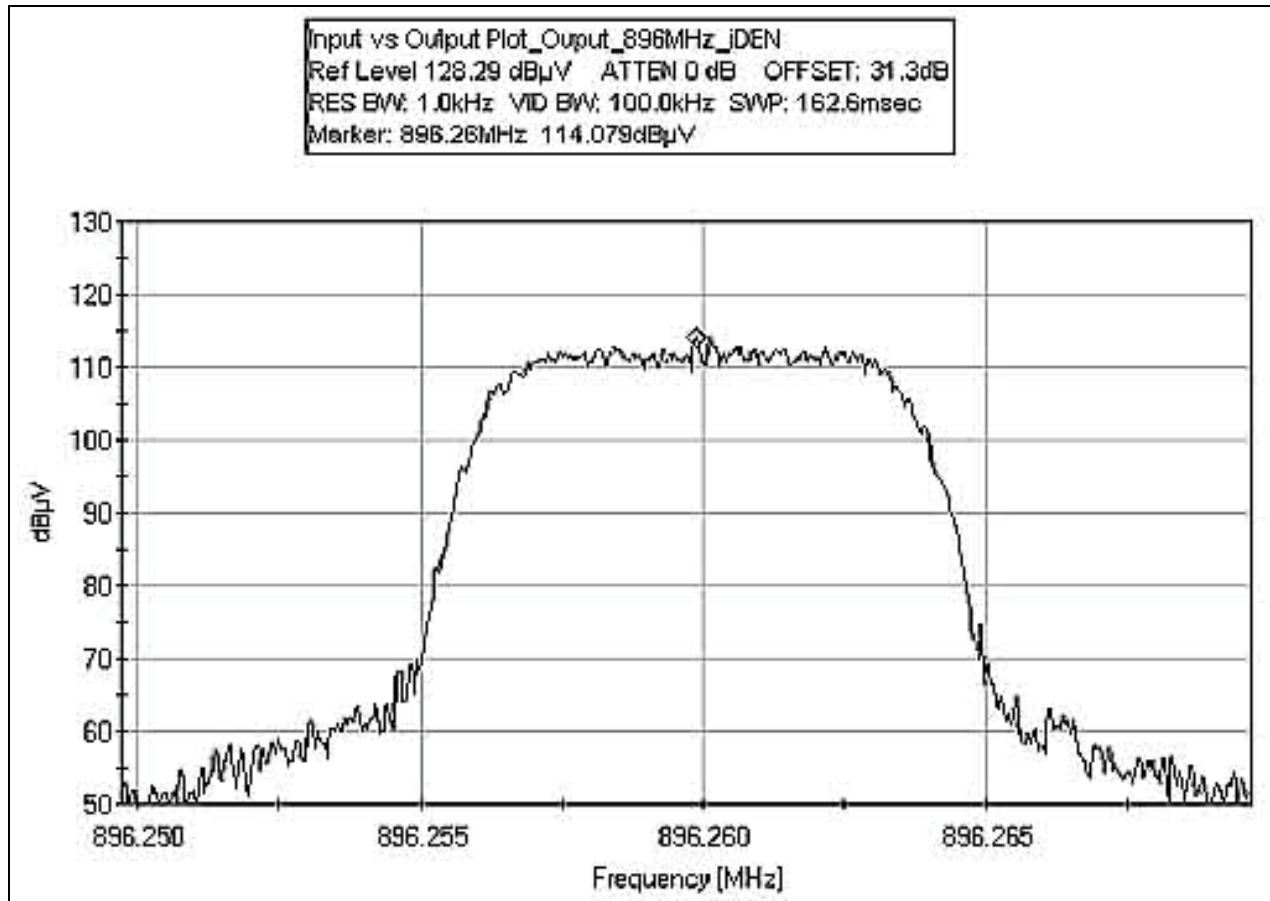
**FCC 2.1033(c)(14)/2.1049(i)- OUTPUT PLOTS**

**Test Conditions:** The EUT is placed on the wooden table. RF Input port is connected to a remote support signal amplifier and a signal generator. The RF Output is connected to a remote RF load and a directional coupler. The RF power of the EUT is monitored at the output of the directional coupler and the RF input signal is adjusted to maintain the output power. Signal is measured at the antenna port. Modulation: AMP. Emission Designator: iDEN. Power = 19 dBm = 0.08 Watts. Emission Designator: 16K0F3E. Power = 25 dBm = 0.3162 Watts. Frequency: 935MHz, 937.5MHz and 940MHz. 24°C, 60% relative humidity.

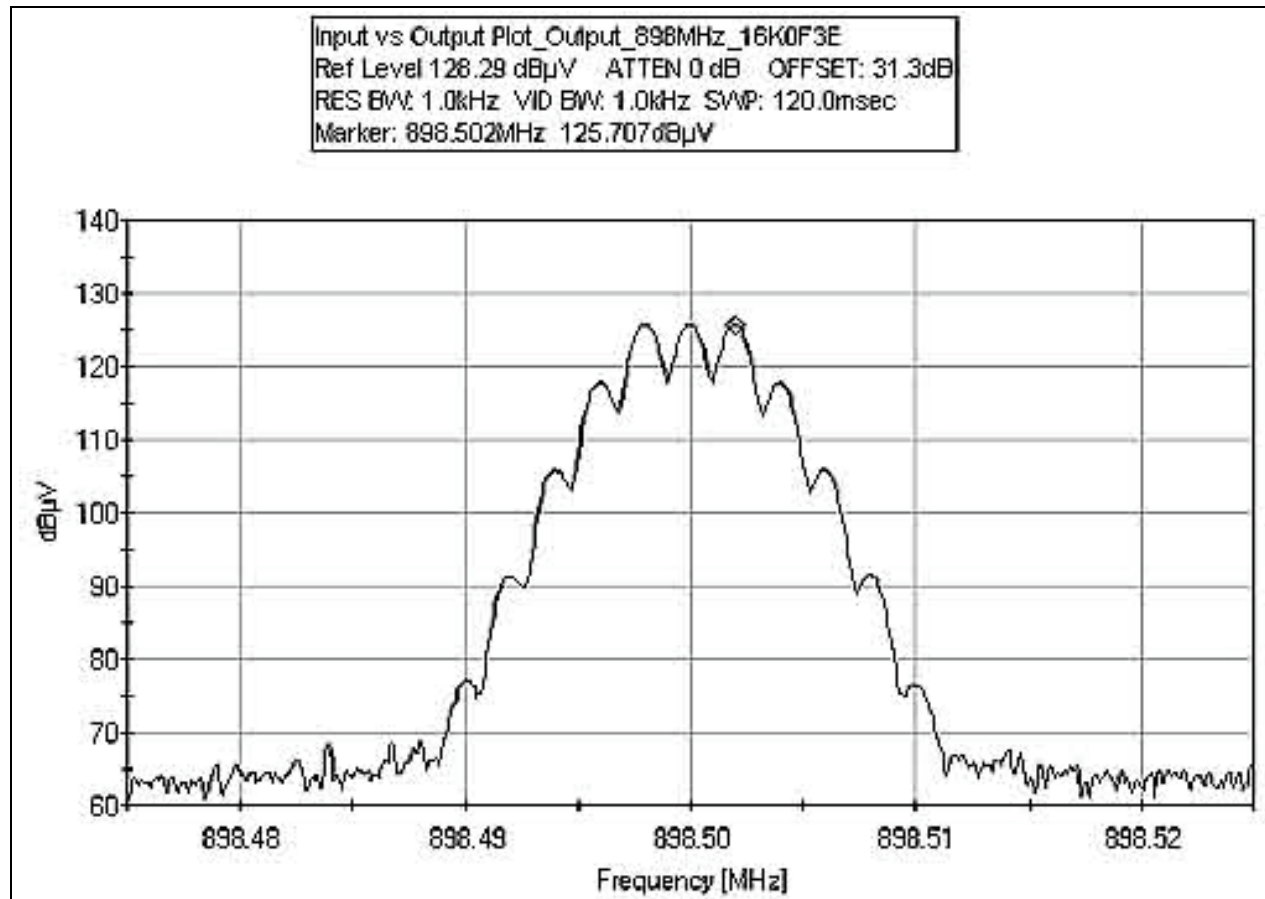
**OUTPUT PLOT 896MHz - 16K0F3E**



### OUTPUT PLOT 896MHz - IDEN

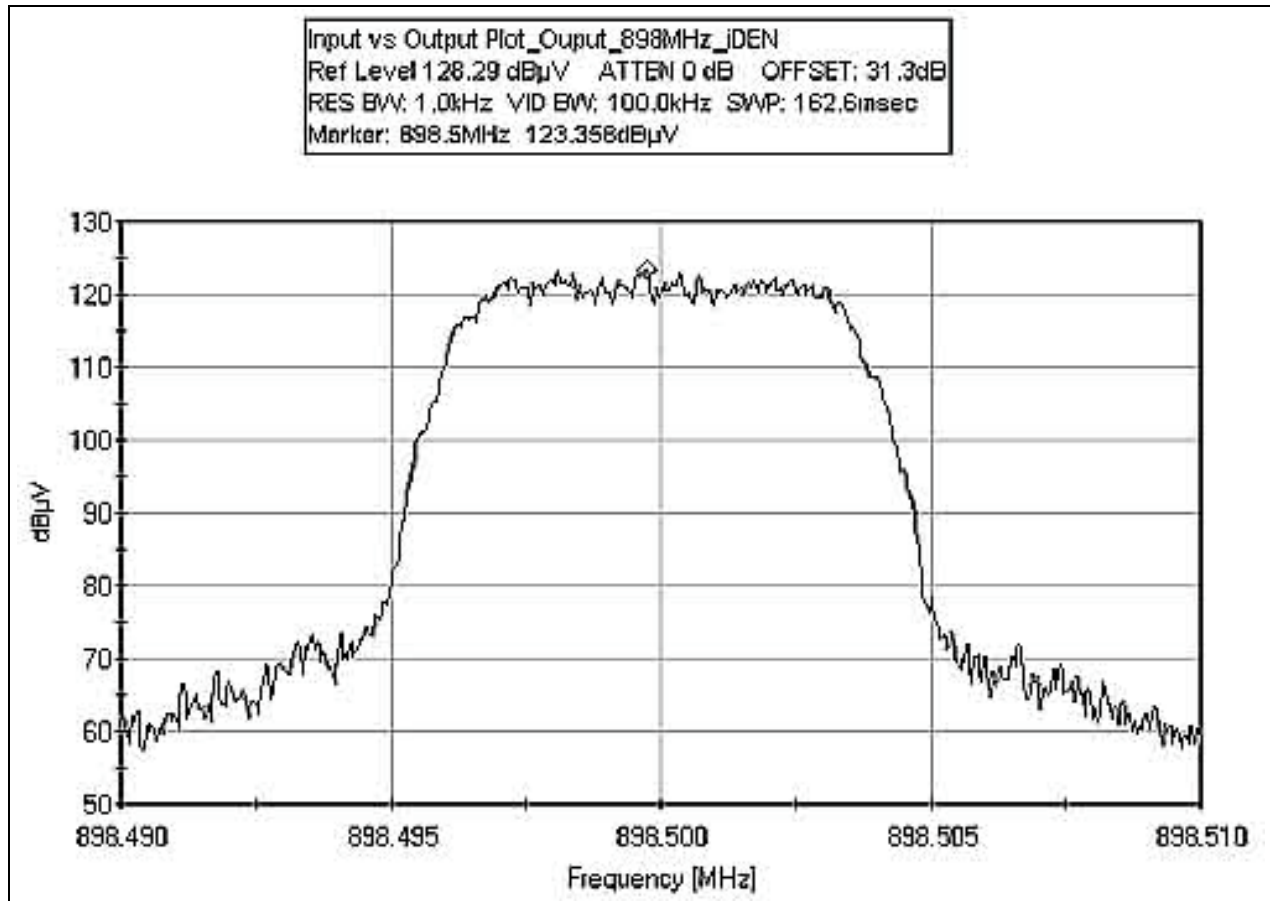


### OUTPUT PLOT 898MHz - 16K0F3E

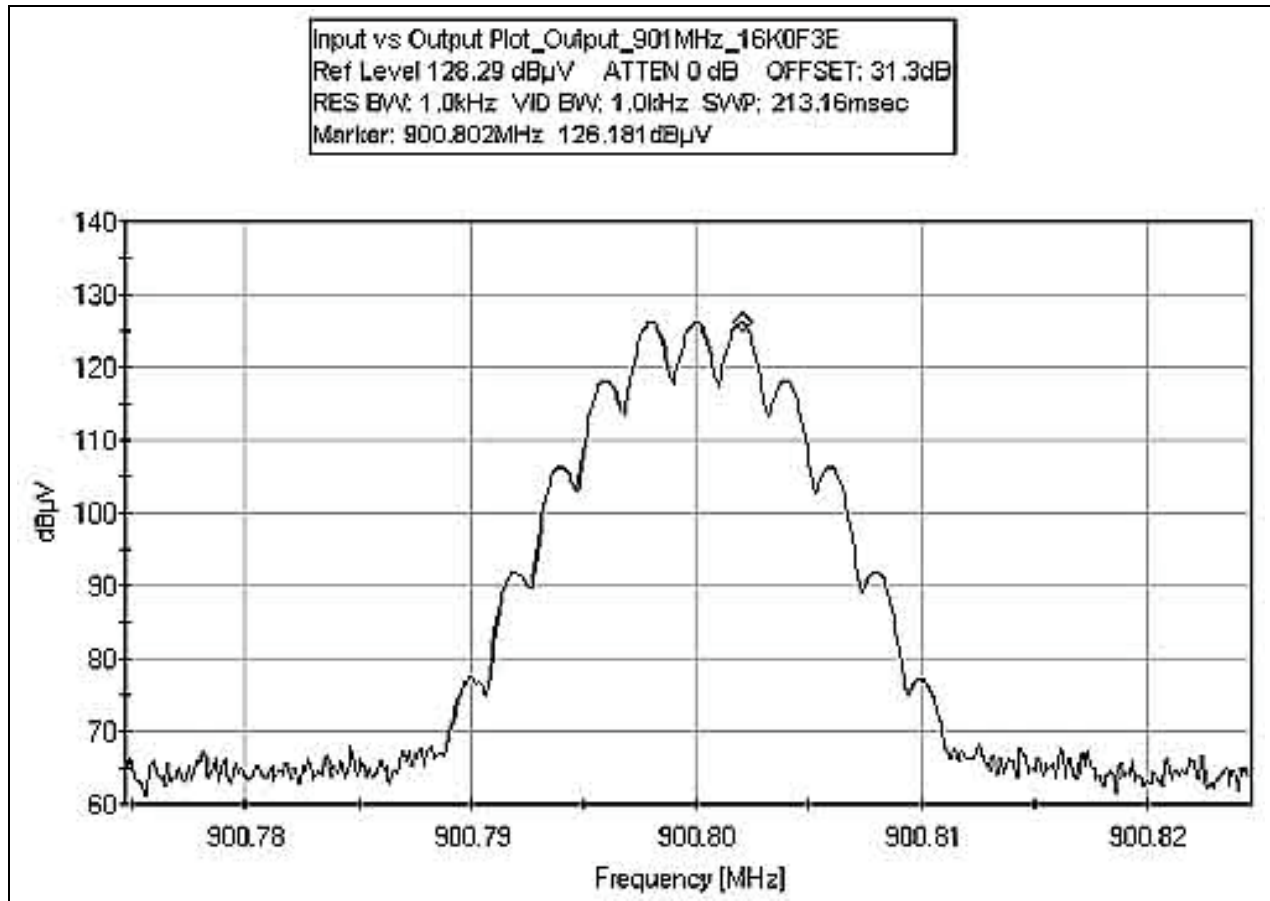




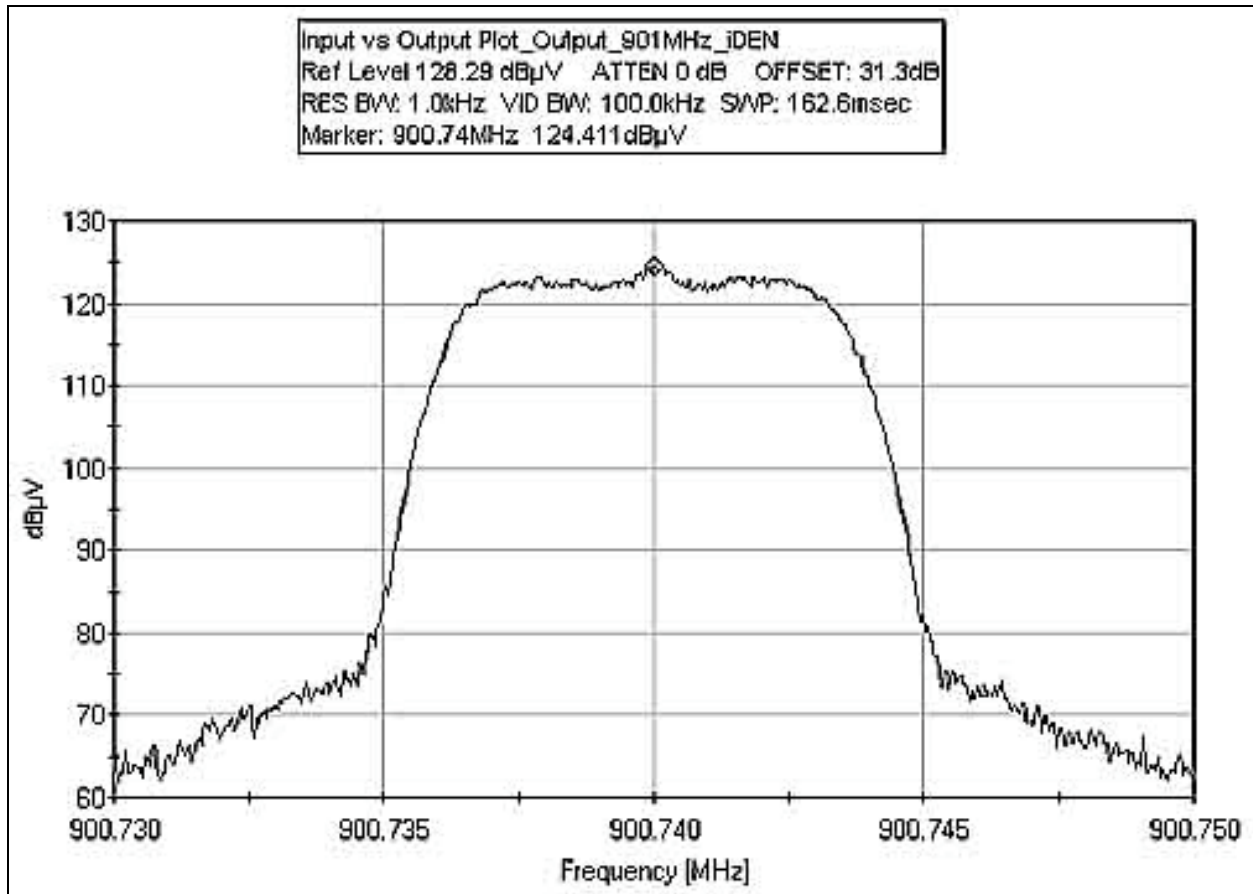
### OUTPUT PLOT 898MHz - IDEN



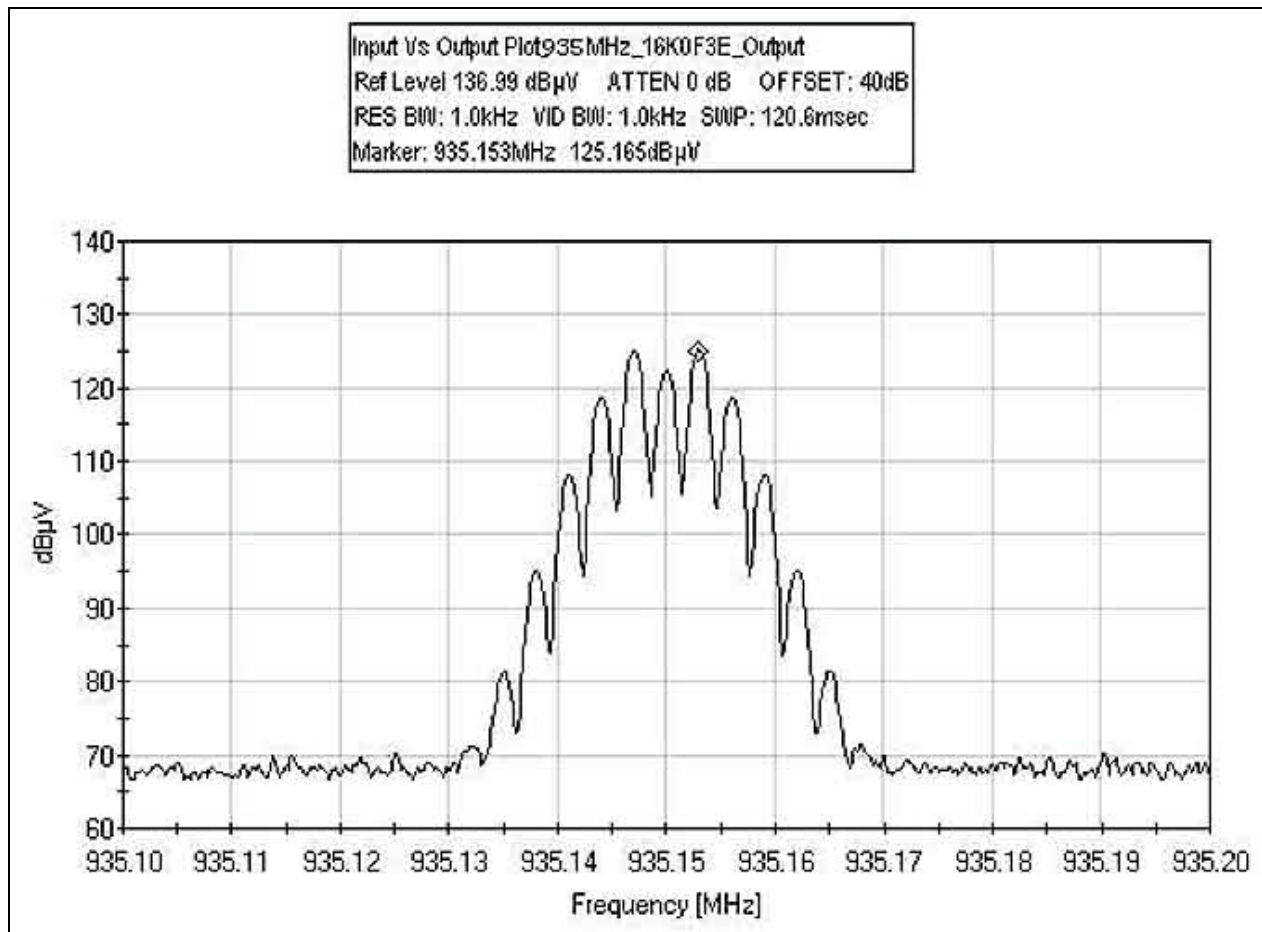
**OUTPUT PLOT 901MHz - 16K0F3E**



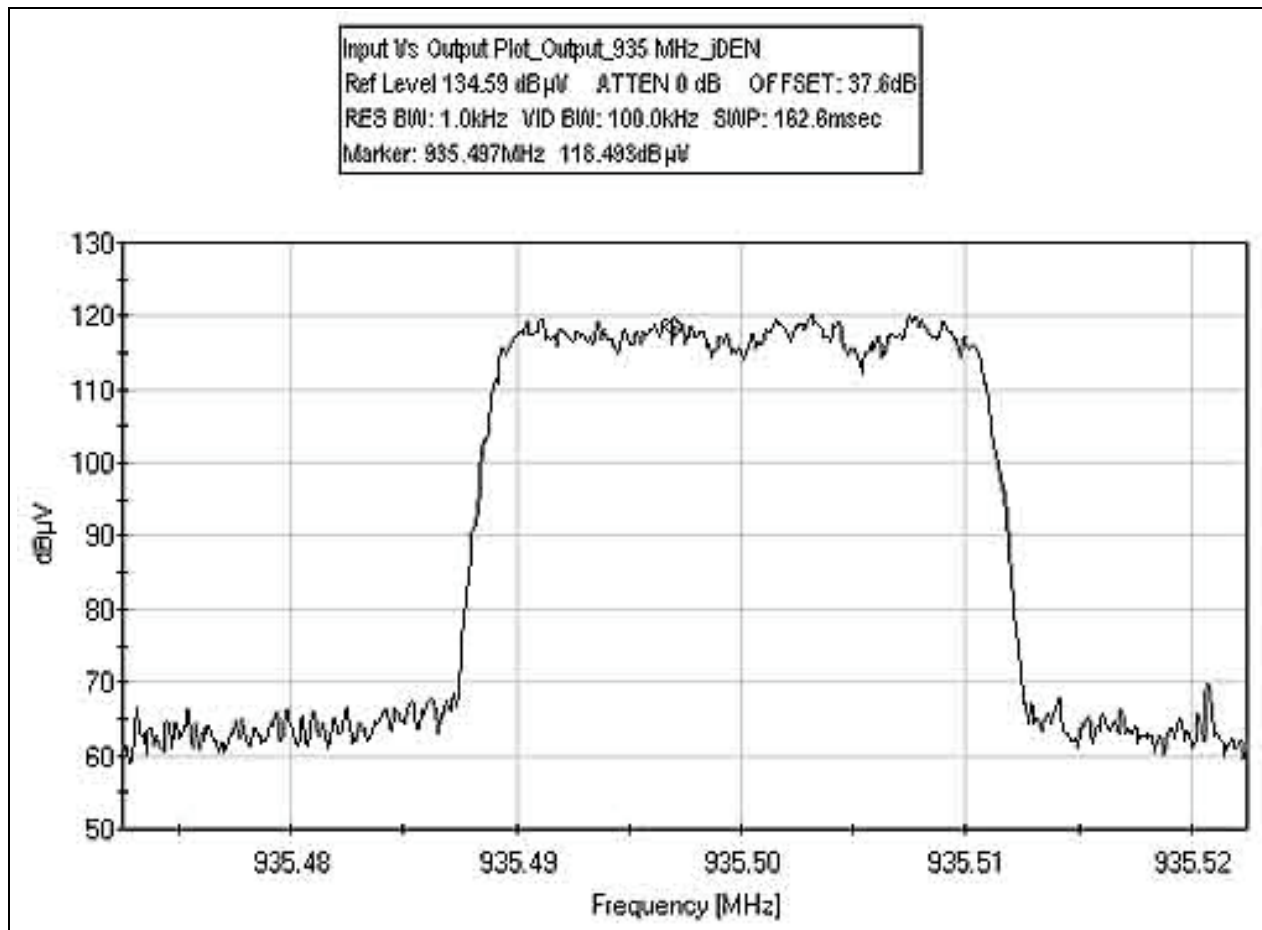
### OUTPUT PLOT 901MHz - IDEN



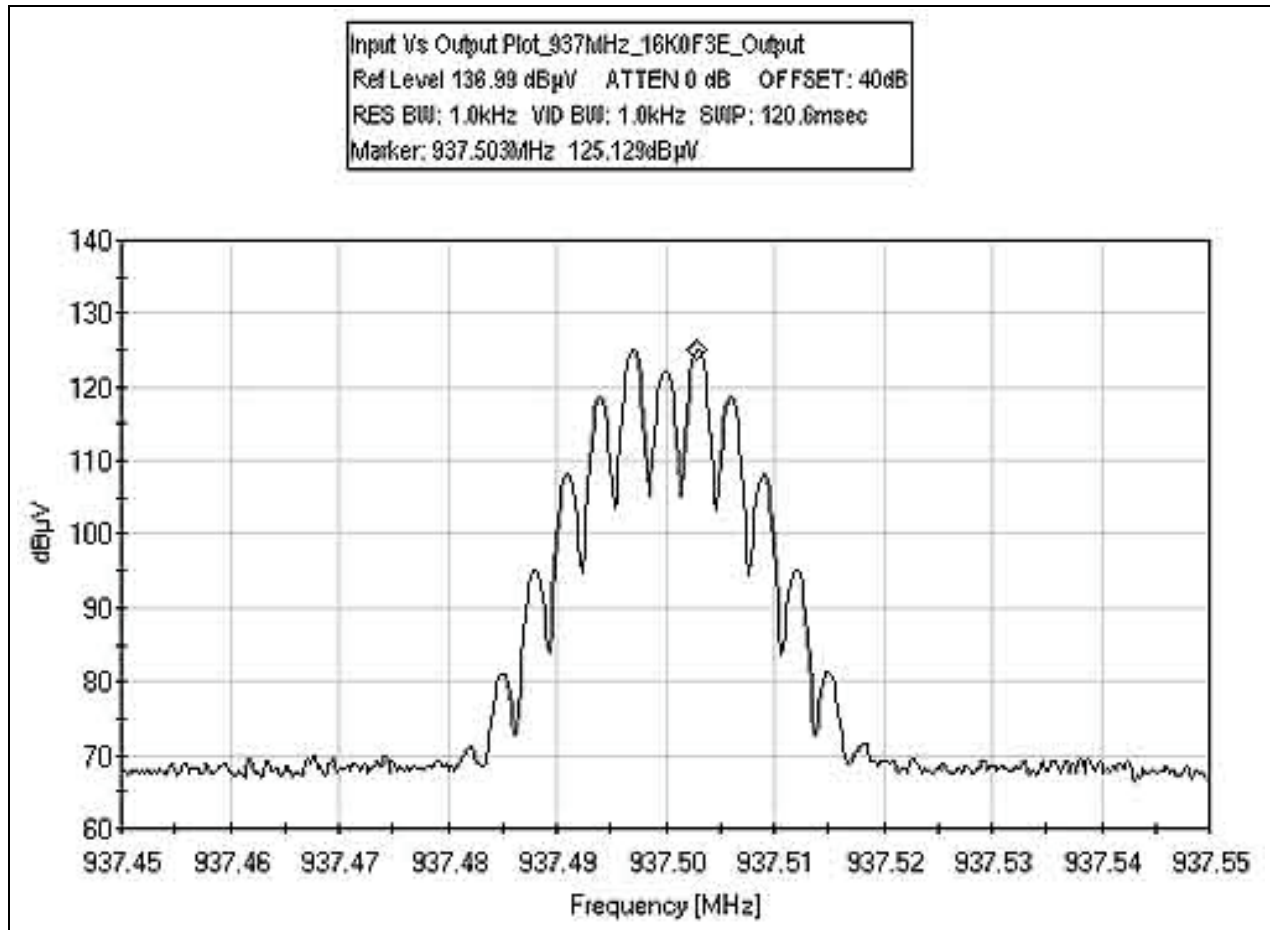
### OUTPUT PLOT 935MHz - 16K0F3E



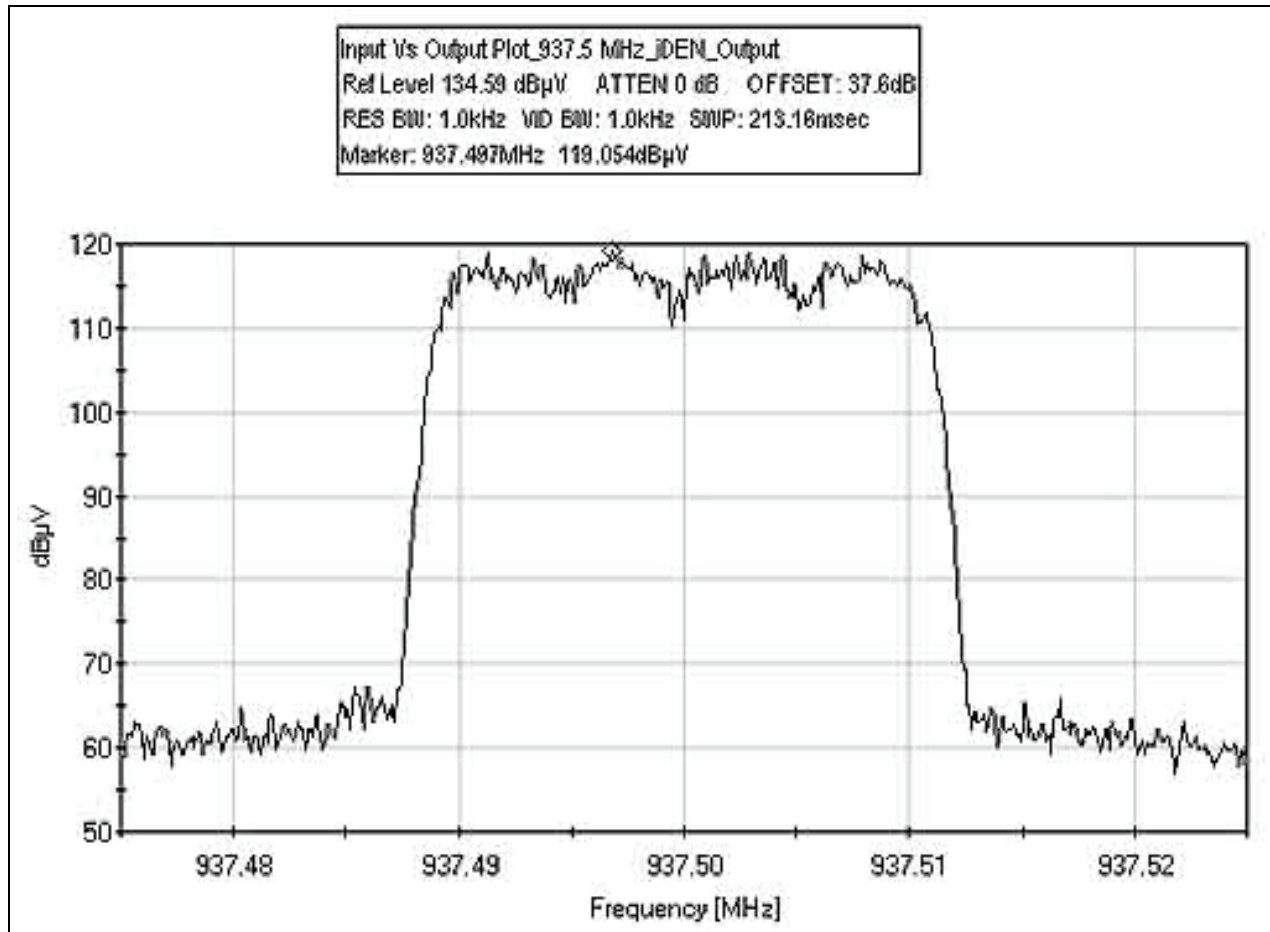
### OUTPUT PLOT 935MHz - IDEN



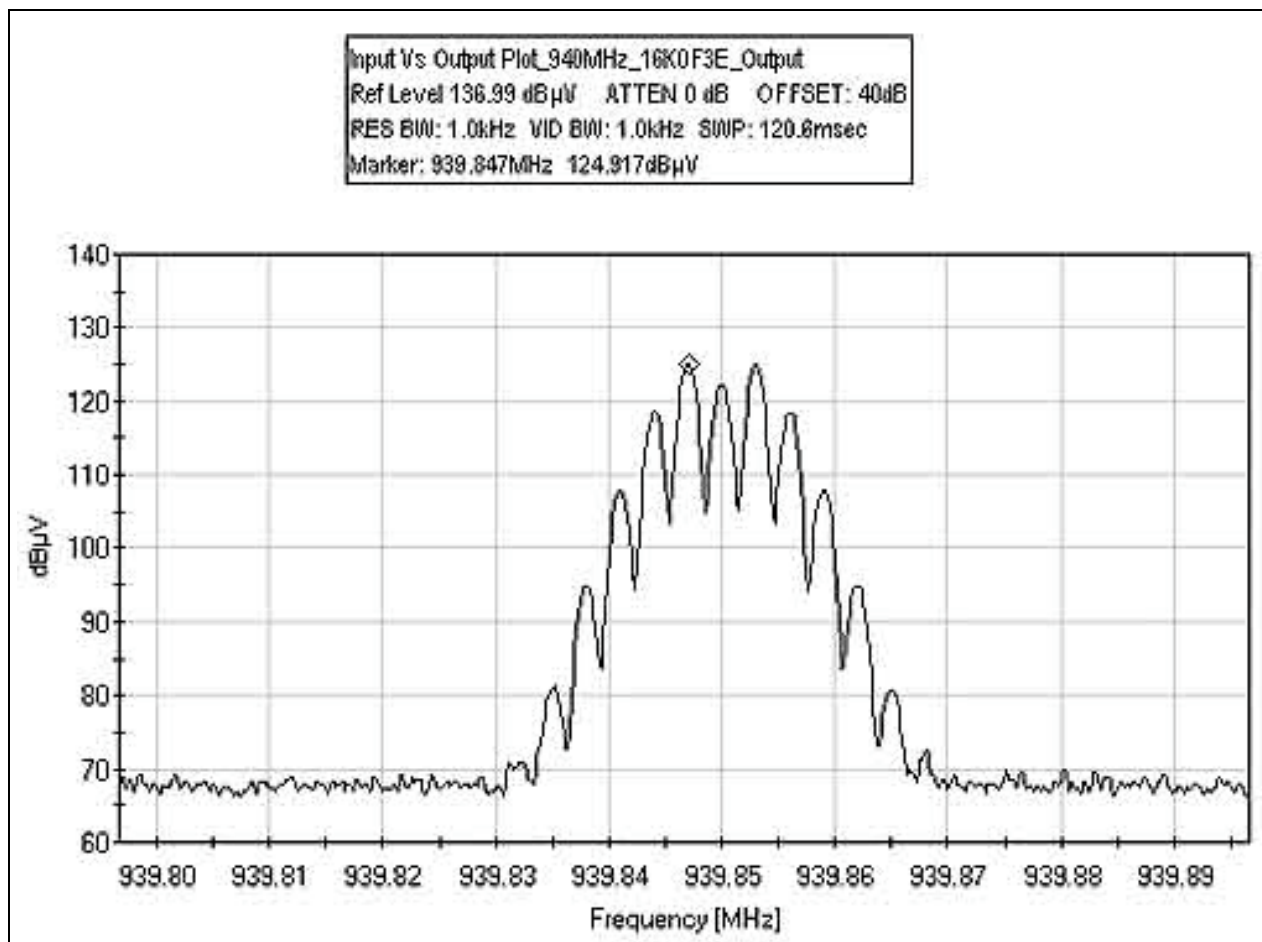
### OUTPUT PLOT 937MHz - 16K0F3E



### OUTPUT PLOT 937MHz - IDEN

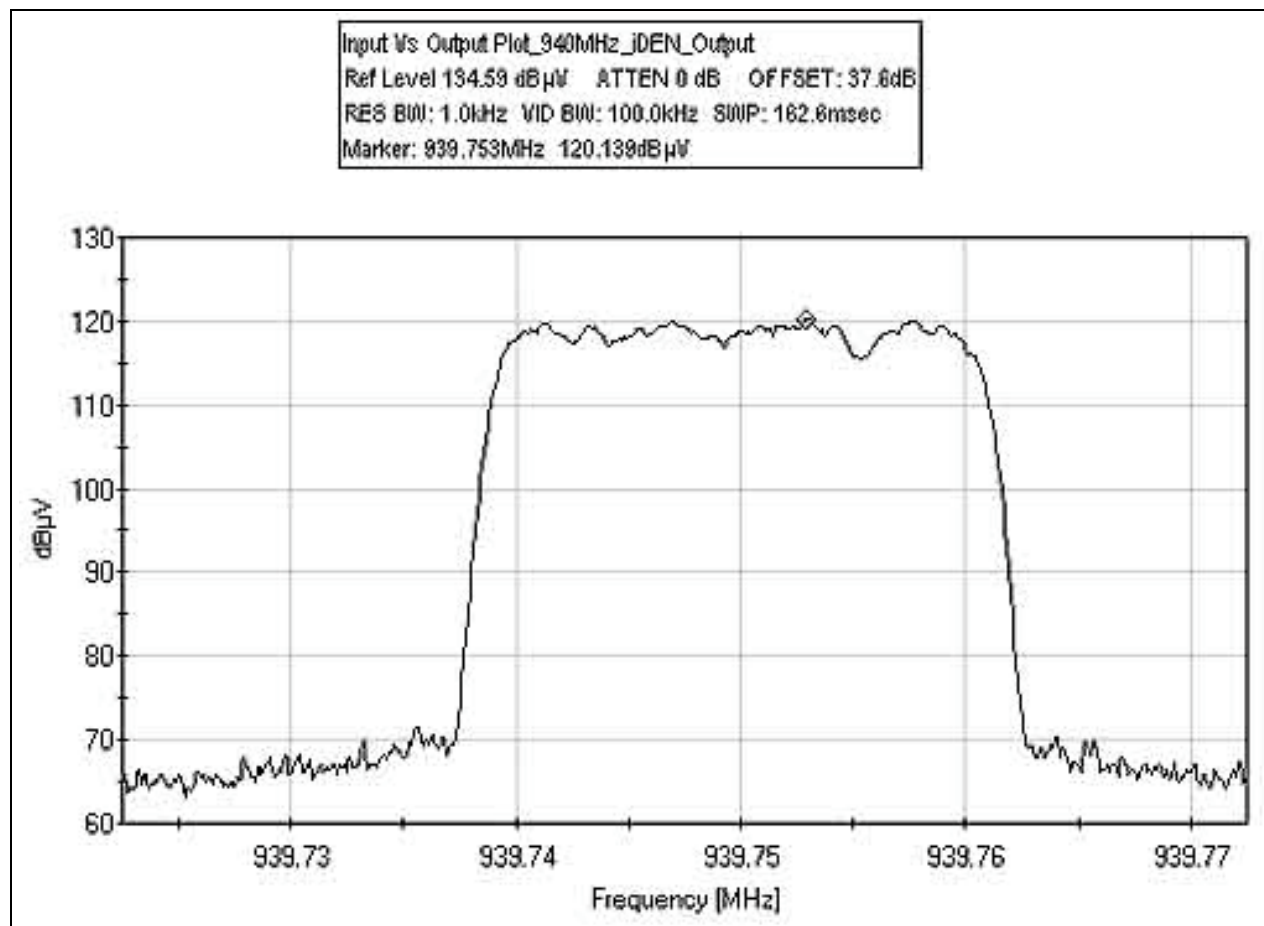


### OUTPUT PLOT 940MHz - 16K0F3E





### OUTPUT PLOT 940MHz - IDEN



**Test Equipment**

Equipment	Asset #	Manufacturer	Model #	Serial #	Cal Date	Cal Due
Spectrum Analyzer	02672	Agilent	E4446A	US44300438	011405	011407
24" SMA Cable (White)	P05204	Pasteurneck	35591-48	1-40GHz_white	020805	020807

**PHOTOGRAPH SHOWING DIRECT CONNECT TEST SETUP**



**FCC 2.1033(c)(14)/2.1051/90.669(a) - SPURIOUS EMISSIONS AT ANTENNA TERMINAL**

**Test Conditions:** The EUT is placed on the wooden table. RF Input port is connected to a remote support signal amplifier and a signal generator. The RF Output is connected to a remote RF load and a directional coupler. The RF power of the EUT is monitored at the output of the directional coupler and the RF input signal is adjusted to maintain the output power. Signal is measured at the antenna port. Modulation: AMP. Emission Designator: iDEN. Power = 19 dBm = 0.08 Watts. Frequency: 935MHz, 937.5MHz and 940MHz. Emission Designator: 16K0F3E. Power = 25 dBm = 0.3162 Watts. Frequency: 935MHz, 937.5MHz and 940MHz. Emission Designator :iDEN, Power = 19 dBm = 0.08 watts. Frequency: 896MHz, 898.5MHz and 901MHz. Emission Designator: 16K0F3E, Power = 25 dBm = 0.3162 watts. Frequency: 896MHz, 898.5MHz and 901MHz. Frequency range of measurement = 9kHz-10GHz. 9kHz-150kHz; RBW=200Hz, VBW=200Hz; 150kHz-30MHz; RBW=9kHz, VBW=9kHz; 30MHz-1000MHz; RBW=120kHz,VBW=120kHz, 1000MHz-10000MHz; RBW=1MHz, VBW=1MHz. 24°C, 60% relative humidity. **No emissions detected.**

**Test Equipment**

Equipment	Asset #	Manufacturer	Model #	Serial #	Cal Date	Cal Due
Spectrum Analyzer	02672	Agilent	E4446A	US44300438	011405	011407

**PHOTOGRAPH SHOWING DIRECT CONNECT TEST SETUP**



**FCC 2.1033(c)(14)/2.1053/90.669(a) - FIELD STRENGTH OF SPURIOUS RADIATION**

Test Location: CKC Laboratories, Inc. •110 N. Olinda Place • Brea, CA 92823 • (714) 993-6112

Customer: **Powerwave Technologies, Inc.**  
 Specification: **90.669(a) Radiated Spurious Emission**  
 Work Order #: **83984** Date: 10/5/2005  
 Test Type: **Radiated Scan** Time: 09:31:31  
 Equipment: **Pager/ SMR Repeater** Sequence#: 21  
 Manufacturer: Powerwave Technologies Tested By: E. Wong  
 Model: ALR 1200  
 S/N: NA

***Equipment Under Test (\* = EUT):***

Function	Manufacturer	Model #	S/N
Pager/ SMR Repeater*	Powerwave Technologies	ALR 1200	NA

***Support Devices:***

Function	Manufacturer	Model #	S/N
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***Test Conditions / Notes:***

The EUT is placed on the wooden table. RF Input port is connected to a remote support signal amplifier and a signal generator. The RF Output is connected to a remote RF load and a directional coupler. The RF power of the EUT is monitored at the output of the directional coupler and the RF input signal is adjusted to maintain the output power. Modulation: AMP. Emission Designator: iDEN. Power = 19 dBm = 0.08 Watts. Emission Designator: 16K0F3E. Power = 25 dBm = 0.3162 Watts. Frequency: 935MHz, 937.5MHz and 940MHz. Frequency range of measurement = 9kHz-10GHz. 9kHz-150kHz; RBW=200Hz, VBW=200Hz; 150kHz-30MHz; RBW=9kHz, VBW=9kHz; 30MHz-1000MHz; RBW=120kHz, VBW=120kHz, 1000MHz-10000MHz; RBW=1MHz, VBW=1MHz. 20°C, 60% relative humidity.

Operating Frequency: 935MHz - 940MHz  
 Channels: Low, Mid and High - 16K0F3E  
 Highest Measured Output Power: 25.00 ERP(dBm)= 0.3162 ERP(Watts)  
 Distance: 3 meters  
 Limit: 43+10Log(P) 38.00 dBc

Freq. (MHz)	Reference Level (dBm)	Antenna Polarity (H/V)	dBc
2,805.00	-64.4	Horiz	89.40
1,870.00	-64.4	Horiz	89.40
2,805.00	-68	Horiz	93.00
2,812.50	-62.8	Horiz	87.80
1,875.00	-67.1	Horiz	92.10
2,820.00	-64.9	Horiz	89.90
1,880.00	-65.7	Horiz	90.70

Operating Frequency: 935MHz - 940MHz  
 Channels: Low, Mid and High - iDEN  
 Highest Measured Output Power: 19.03 ERP(dBm)= 0.08 ERP(Watts)  
 Distance: 3 meters  
 Limit: 43+10Log(P) 32.03 dBc

Freq. (MHz)	Reference Level (dBm)	Antenna Polarity (H/V)	dBc
2,805.00	-65.4	Horiz	84.43
1,870.00	-67.6	Horiz	86.63
1,875.00	-56.4	Vert	75.43
2,812.50	-56.6	Vert	75.63
3,750.00	-59	Vert	78.03
1,880.00	-59	Horiz	78.03
2,820.00	-59.4	Horiz	78.43

**Test Equipment**

Equipment	Asset #	Manufacturer	Model #	Serial #	Cal Date	Cal Due
Spectrum Analyzer	02672	Agilent	E4446A	US44300438	011405	011407
9kHz-30MHz						
Loop Antenna	00314	EMCO	6502	2014	062804	062806
30-1000MHz						
Bicon Antenna	306	AH	SAS200/540	220	061305	061307
Log Periodic Antenna	300	AH	SAS 00/516	331	061305	061307
Pre-amp	00309	HP	8447D	1937A02548	071404	071406
Antenna cable	NA	NA	RG214	Cable#15	010305	010306
Pre-amp to SA cable	NA	Pasternack	RG223/U	Cable#10	051605	051606
1000-10000MHz						
Horn Antenna	0849	EMCO	3115	6246	072204	072206
Microwave Pre-amp	00786	HP	83017A	3123A00281	081204	081206
Heliac Antenna cable	NA	Andrew	LDF1-50	Cable#20	091604	091606
24" SMA Cable	2604	Argosy	UFA147A	0-0360-200200	012304	012306

Test Location: CKC Laboratories, Inc. • 110 N. Olinda Place • Brea, CA 92823 • (714) 993-6112

Customer: **Powerwave Technologies, Inc.**  
 Specification: **FCC 90.210 Radiated Spurious Emissions**  
 Work Order #: **83984** Date: 2/23/2006  
 Test Type: **Radiated Scan** Time: 14:09:07  
 Equipment: **Pager/ SMR Repeater** Sequence#: 40  
 Manufacturer: Powerwave Technologies Tested By: E. Wong  
 Model: ALR 1200  
 S/N: NA

**Equipment Under Test (\* = EUT):**

Function	Manufacturer	Model #	S/N
Pager/ SMR Repeater*	Powerwave Technologies	ALR 1200	NA

**Support Devices:**

Function	Manufacturer	Model #	S/N
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**Test Conditions / Notes:**

The EUT is placed on the wooden table. RF Input port is connected to a remote support signal amplifier and a signal generator. The RF Output is connected to a remote RF load and a directional coupler. The RF power of the EUT is monitored at the output of the directional coupler and the RF input signal is adjusted to maintain the output power. Modulation: AMP. Emission Designator :iDEN, Power = 19 dBm = 0.08 watts. Frequency: 896MHz, 898.5MHz and 901MHz. Emission Designator: 16K0F3E, Power = 25 dBm = 0.3162 watts. Frequency: 896MHz, 898.5MHz and 901MHz. Frequency range of measurement = 9kHz - 10GHz. 9kHz - 150kHz; RBW=200 Hz, VBW=200 Hz; 150kHz - 30MHz; RBW=9kHz, VBW=9kHz; 30MHz - 1000MHz; RBW=120kHz, VBW=120kHz, 1000 MHz - 10000MHz; RBW=1MHz, VBW=1MHz. 24°C, 60% relative humidity.

Operating Frequency: 896 MHz - 901 MHz  
 Channels: Low, Mid and High -16K0F3E  
 Highest Measured Output Power: 25.00 ERP(dBm)= 0.3162 ERP(Watts)  
 Distance: 3 meters  
 Limit: 43+10Log(P) 38.00 dBc

Freq. (MHz)	Reference Level (dBm)	Antenna Polarity (H/V)	dBc
4,479.96	-46.6	Horiz	71.60
2,688.04	-51.6	Horiz	76.60
5,391.01	-44.4	Vert	69.40
3,593.50	-48.7	Horiz	73.70
2,695.28	-50.3	Vert	75.30
2,702.93	-51.1	Horiz	76.10

Operating Frequency: 896 MHz - 901 MHz  
 Channels: Low, Mid and High -iDEN  
 Highest Measured Output Power: 19.03 ERP(dBm)= 0.08 ERP(Watts)  
 Distance: 3 meters  
 Limit:  $43+10\text{Log}(P)$  32.03 dBc

Freq. (MHz)	Reference Level (dBm)	Antenna Polarity (H/V)	dBc
5,375.98	-46	Vert	65.03
2,687.98	-49.3	Vert	68.33
1,791.98	-53.7	Vert	72.73
3,593.93	-49.6	Vert	68.63
2,695.15	-51.2	Vert	70.23
2,695.45	-51.3	Horiz	70.33
5,405.86	-45.4	Vert	64.43
4,505.11	-47.5	Vert	66.53
2,702.69	-50.4	Vert	69.43

#### Test Equipment

Equipment	Asset #	Manufacturer	Model #	Serial #	Cal Date	Cal Due
Spectrum Analyzer	02467	Agilent	E7405A	US40240225	032205	032207
Bilog Antenna	01995	Chase	CBL6111C	2451	020206	020208
Pre-amp	00309	HP	8447D	1937A02548	071404	071406
Antenna cable	P05198	Belden	8268 (RG-214)	Cable#15	010305	010307
Pre-amp to SA cable	P05050	Pasternack	RG223/U	Cable#10	051605	051607
Horn Antenna	00849	EMCO	3115	6246	072204	072206
Microwave Pre-amp	00786	HP	83017A	3123A00281	081204	081206
HeliAx Antenna cable	P04384	Andrew	LDF1-50	Cable#20	091604	091606
24" SMA Cable (White)	P05204	Pasterneck	35591-48	1-40GHz_white	020805	020807

**PHOTOGRAPH SHOWING RADIATED EMISSIONS**



Radiated Emissions - Front View



**PHOTOGRAPH SHOWING RADIATED EMISSIONS**



Radiated Emissions - Back View

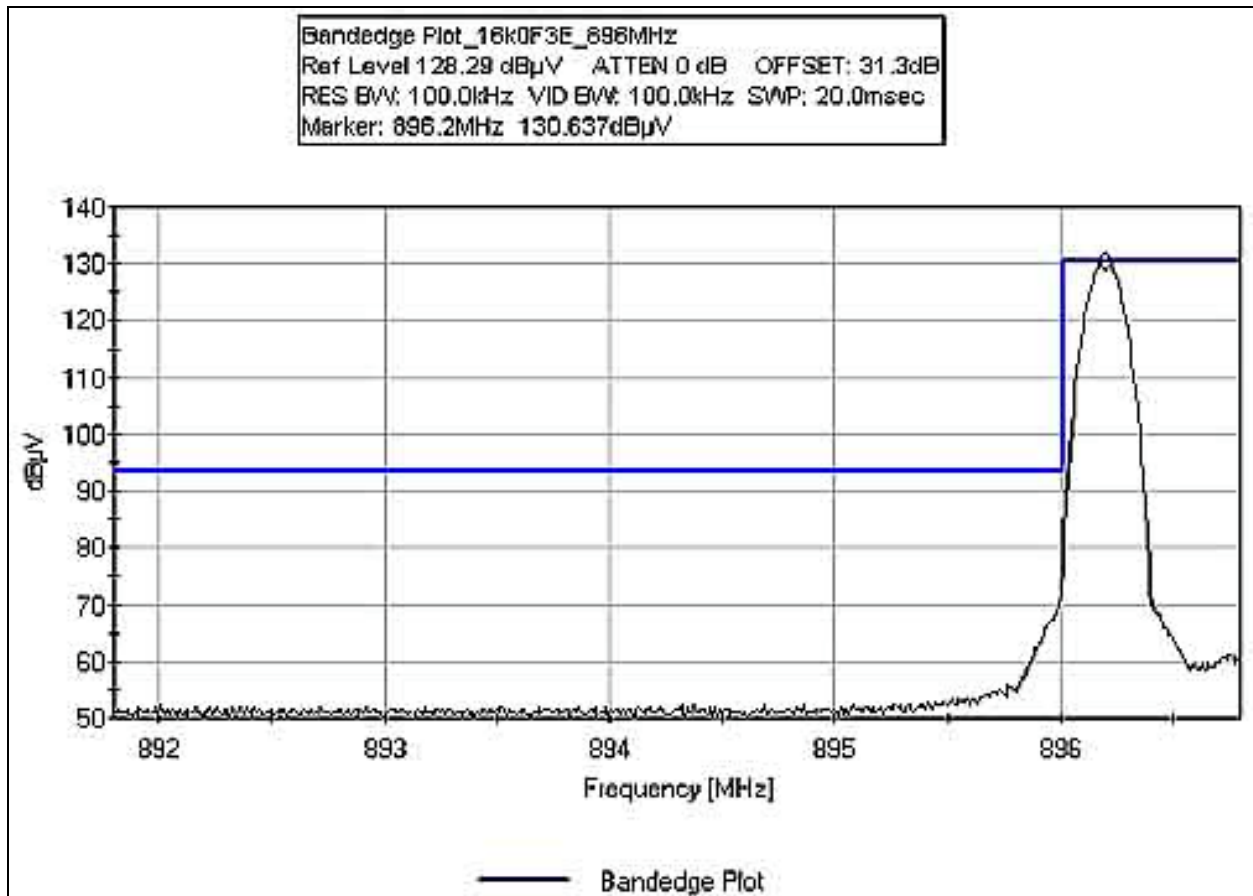
**PHOTOGRAPH SHOWING RADIATED EMISSIONS**



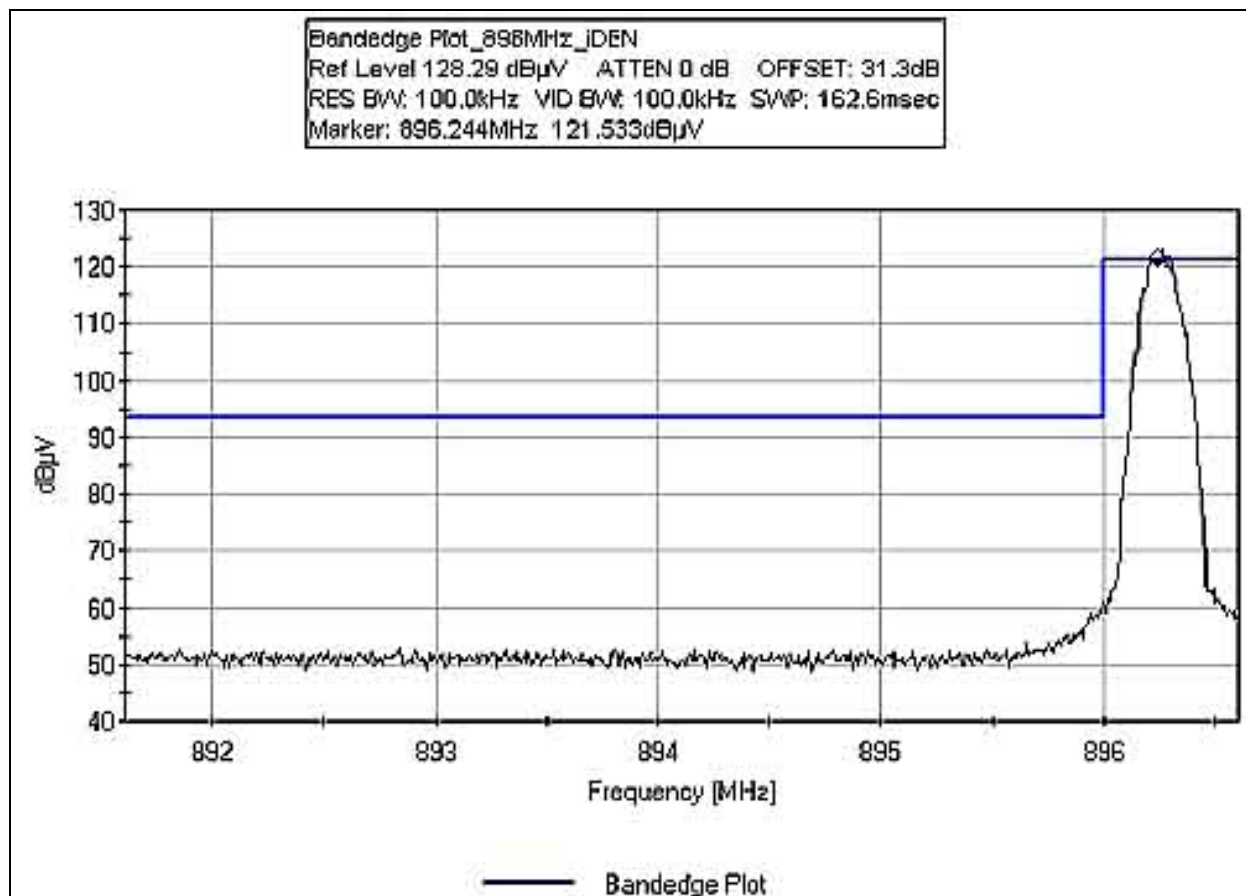
Radiated Emissions - Loop Antenna

### BANDEDGE 896MHz - 16K0F3E

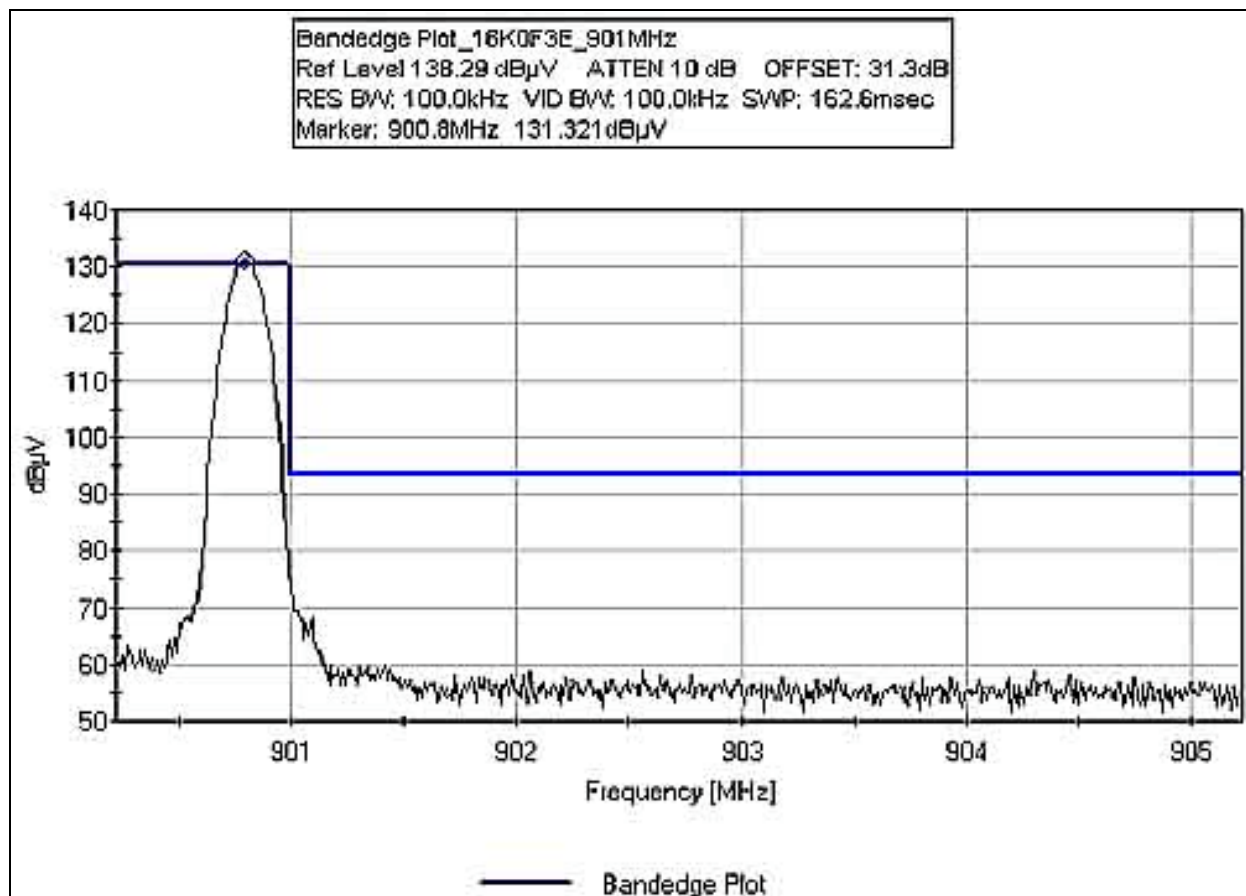
**Test Conditions:** The EUT is placed on the wooden table. RF Input port is connected to a remote support signal amplifier and a signal generator. The RF Output is connected to a remote RF load and a directional coupler. The RF power of the EUT is monitored at the output of the directional coupler and the RF input signal is adjusted to maintain the output power. Signal is measured at the antenna port. Modulation: AMP. Emission Designator: iDEN. Power = 19 dBm = 0.08 Watts. Emission Designator: 16K0F3E. Power = 25 dBm = 0.3162 Watts. Frequency: 935MHz, 937.5MHz and 940MHz. 24°C, 60% relative humidity.



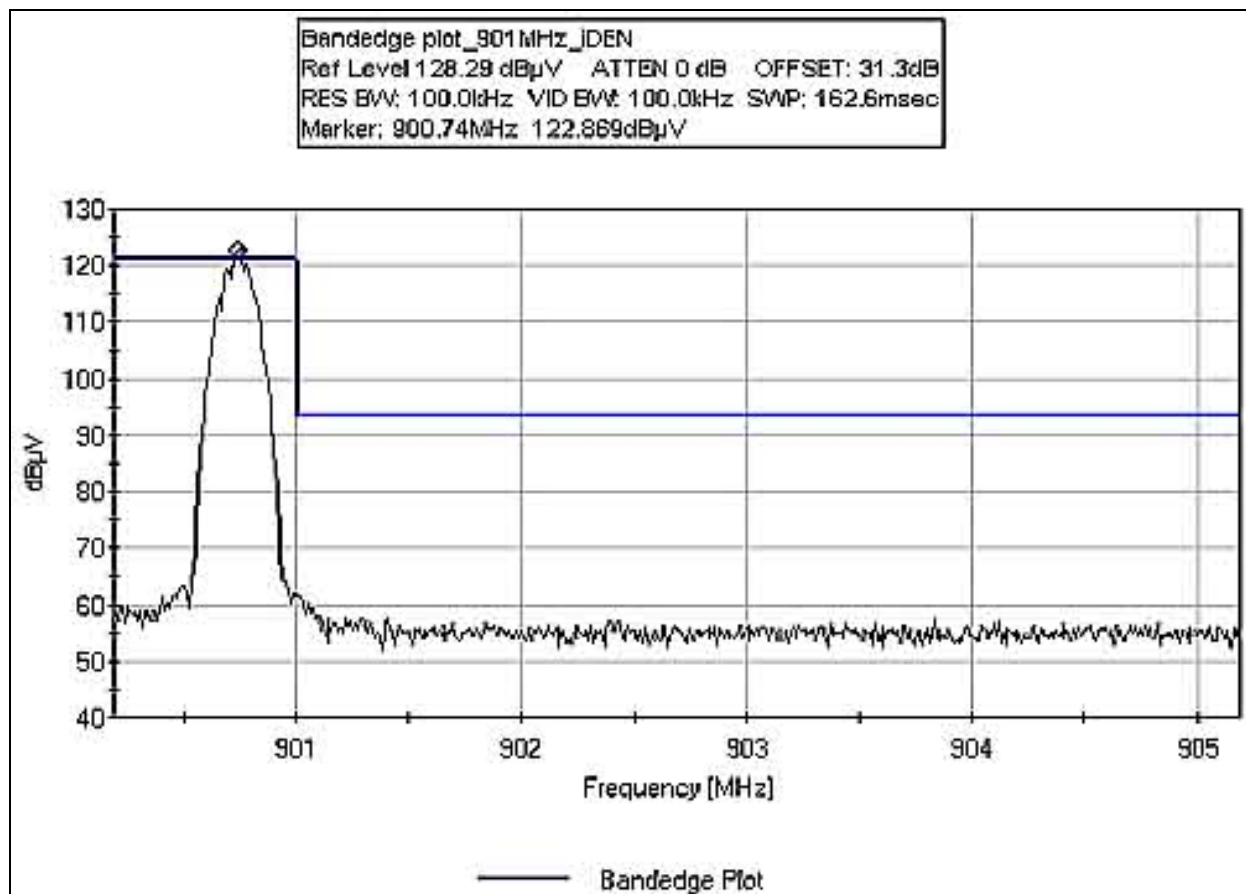
**BANDEGE 896MHz - IDEN**



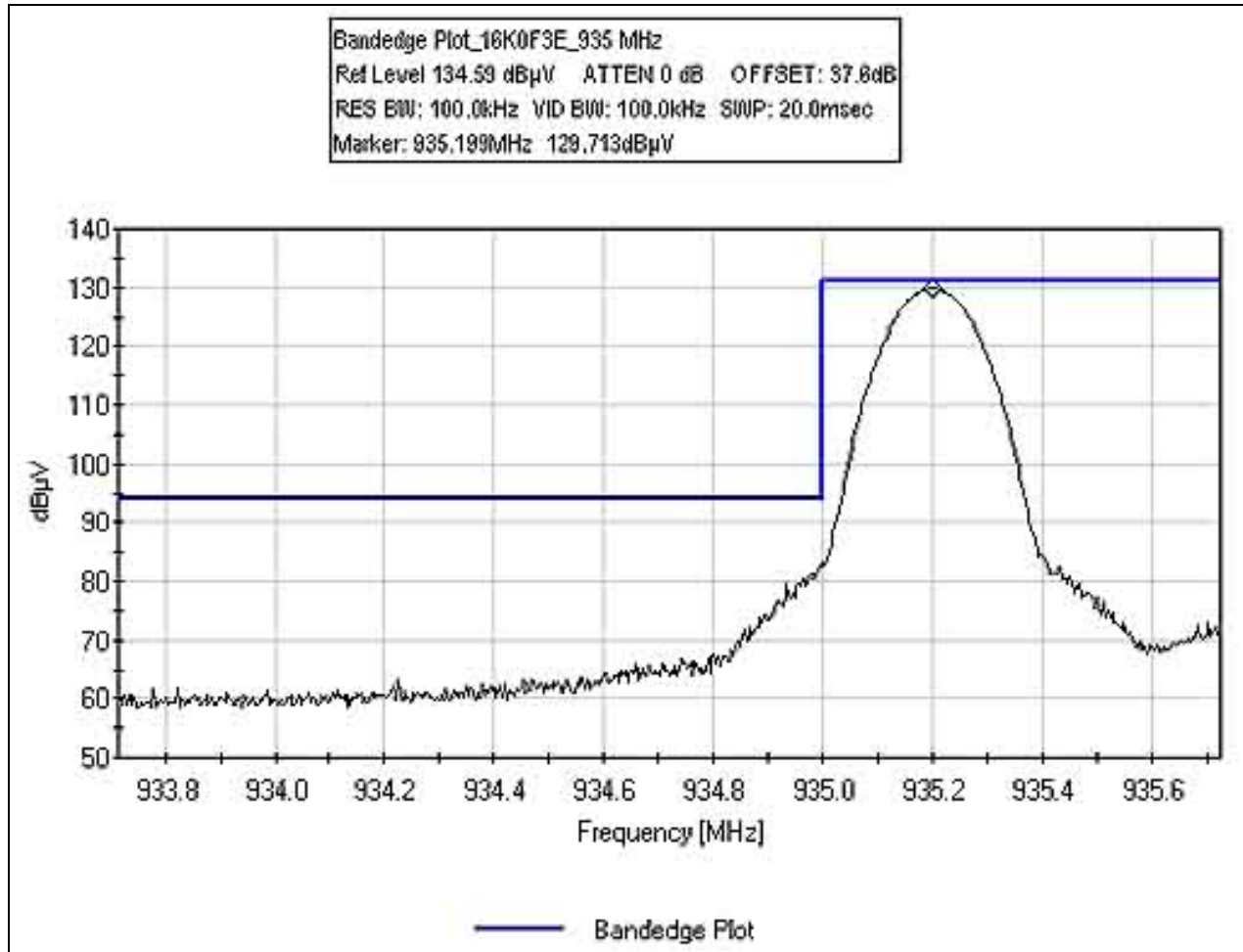
**BANDEDGE 901MHz - 16K0F3E**



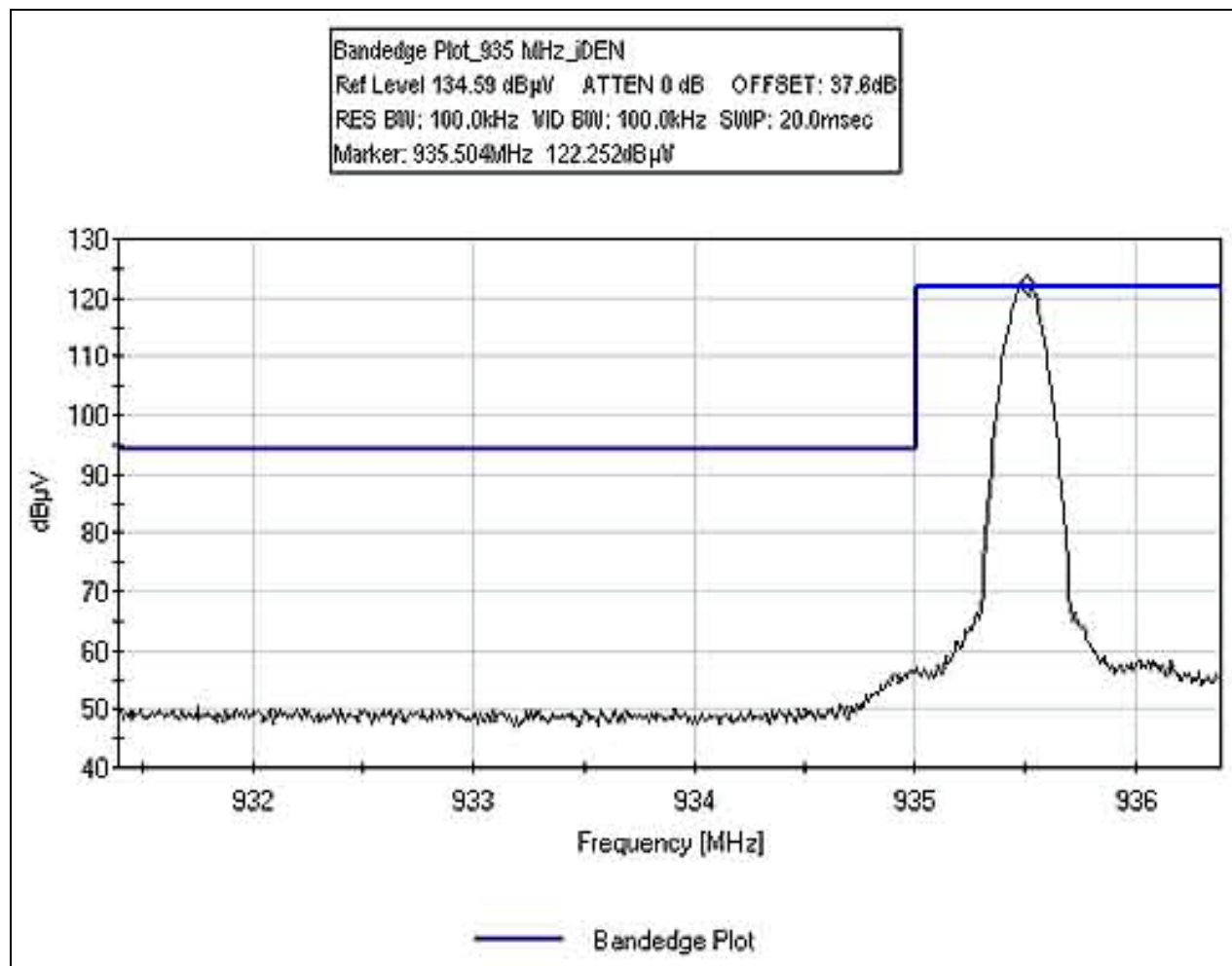
### BANDEGE 901MHz - IDEN



**BANDEDGE 935MHz - 16K0F3E**

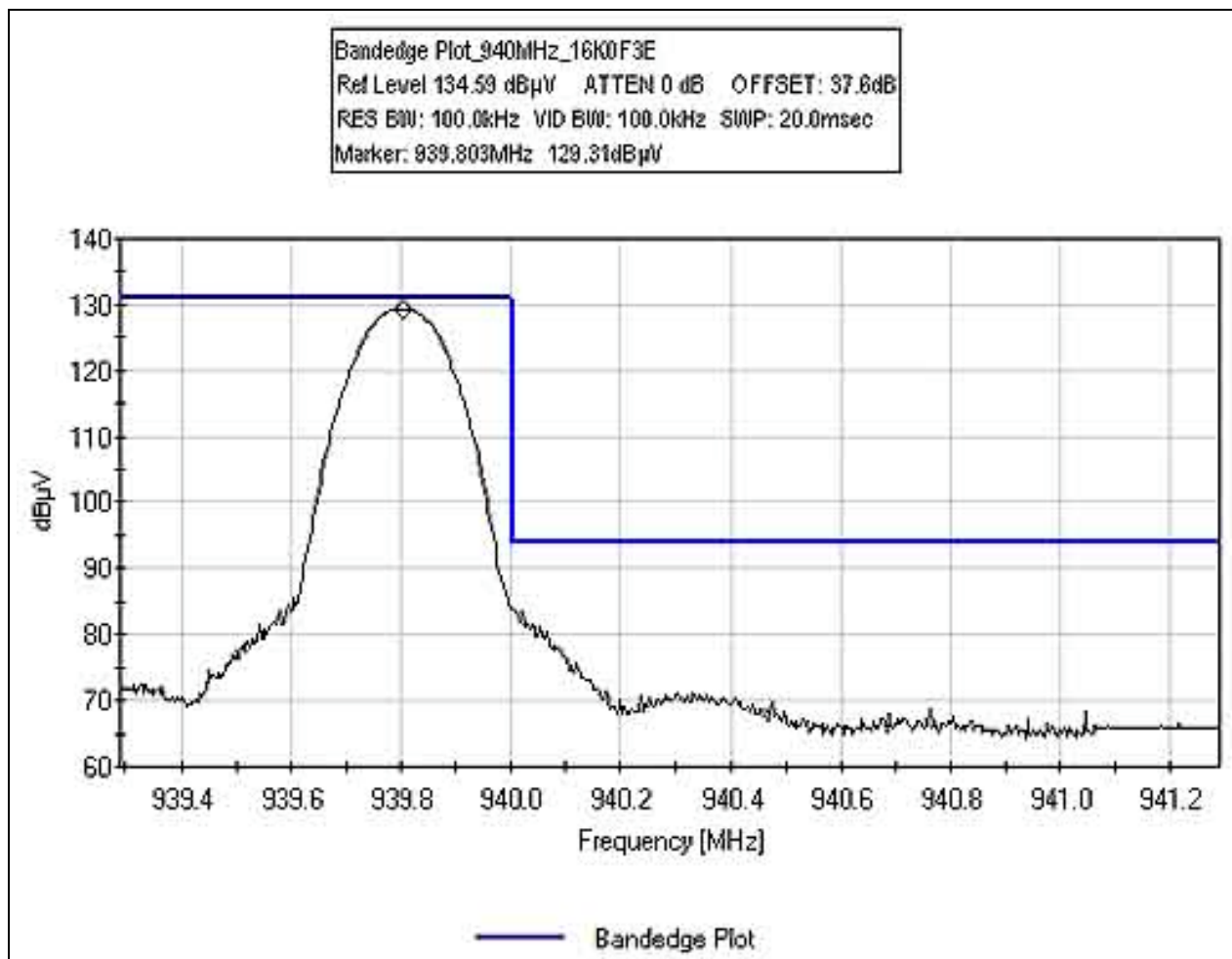


**BANDEGE 935MHz - IDEN**

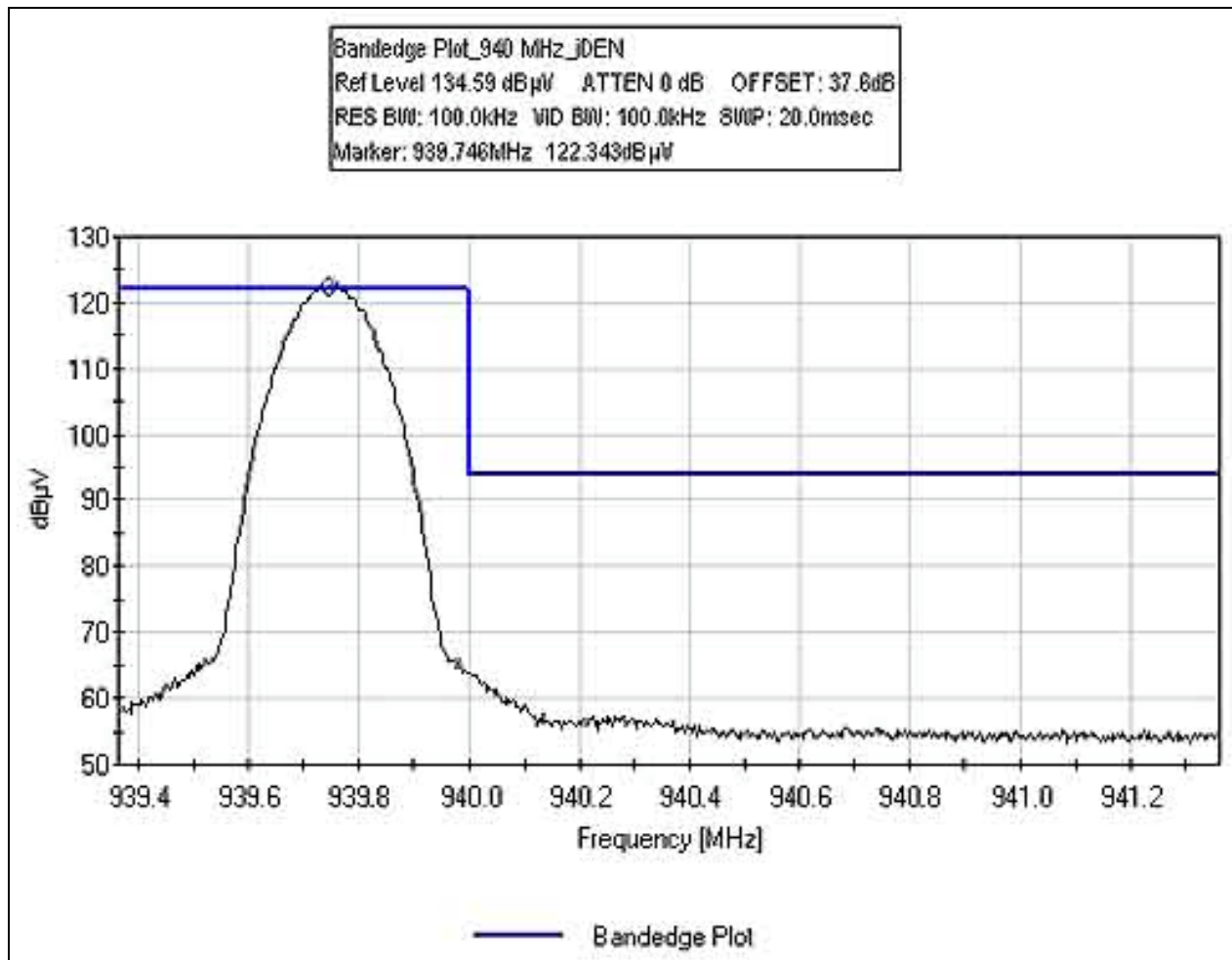




**BANDEDGE 940MHz - 16K0F3E**



### BANDEGE 940MHz - IDEN



**Test Equipment**

Equipment	Asset #	Manufacturer	Model #	Serial #	Cal Date	Cal Due
Spectrum Analyzer	02672	Agilent	E4446A	US44300438	011405	011407

**PHOTOGRAPH SHOWING DIRECT CONNECT TEST SETUP**

