Engineering and Testing for EMC and Safety Compliance

Accredited under NVLAP Lab Code 200061-0

Certification Application Report
FCC Part 15.209 & Industry Canada RSS-210/RSS-Gen

Test Lab:	Applicant:
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FCC ID/ IC:	O2E-ILR-IM3/ 3538B-IM3	**Test Report Date:**	July 3, 2007
Platform:	N/A	**RTL Work Order #:**	2007198
Model Name/ Model Number:	i-Mark 3	**RTL Quote #:**	QRTL07-188
American National Standard Institute:	ANSI C63.4-2003: Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz		
FCC Classification:	DCD – Part 15 Low Power Transmitter Below 1705 kHz		
FCC Rule Part(s)/Guidance:	FCC Rules Part 15.209: Radiated emission limits; general requirements		
Industry Canada:	RSS-Gen Issue 2: General Requirements and Information for the Certification of Radiocommunication Equipment RSS-210 Issue 7: Low-power Licence-exempt Radiocommunication Devices (All Frequency Bands): Category I Equipment		
Digital Interface Information	Digital Interface was found to be compliant		

Frequency Range (MHz)	Output Power (W)	Frequency Tolerance	Emission Designator
0.125	N/A	N/A	17K9A1D

I, the undersigned, hereby declare that the equipment tested and referenced in this report conforms to the identified standard(s) as described in this test report. No modifications were made to the equipment during testing in order to achieve compliance with these standards. Furthermore, there was no deviation from, additions to, or exclusions from, the applicable parts of FCC Part 2, FCC Part 15, ANSI C63.4, RSS-210 and RSS Gen.

Signature: _____ Date: July 3, 2007

Typed/Printed Name: Desmond A. Fraser Position: President

Table of Contents

Figure Index

Table Index

Plot Index

Appendix Index

Photograph Index

1 General Information

1.1 Scope

This is an original certification application request.

Applicable Standards:

- FCC Rules Part 15.209: Frequency Hopping, Direct Spread Spectrum and Hybrid Systems that are in operation within the bands of 902-928 MHz, 2400-2483.5 MHz and 5725-5850 MHz.
- Industry Canada RSS-210: Low Power License-Exempt Communications Devices

1.2 Description of EUT

Equipment Under Test	Position Marker
Model Name/Number	i-Mark 3
Power Supply	10-30 VDC
Modulation Type	AM
Frequency Range	125 kHz
Antenna Connector Type	Internal
Antenna Types	Internal

1.3 Test Facility

The open area test site and conducted measurement facility used to collect the radiated data is located at 360 Herndon Parkway, Suite 1400, Herndon, Virginia 20170. This site has been fully described in a report and approved by the Federal Communications Commission to perform AC line conducted and radiated emissions testing (ANSI C63.4-2003).

1.4 Related Submittal(s)/Grant(s)

This is an original application for Identec Solutions Inc., for Model i-Mark 3, FCC ID: O2E-ILR-IM3, IC: 3538B-IM3.

1.5 Modifications

To pass unintentional radiated emissions, client-supplied clamp-on ferrites were added to the loop back lines.

2 Test Information

2.1 Description of Test Modes

In accordance with FCC 15.31(m), and because the EUT utilizes an operating band less than 1 MHz, the following frequencies were tested:

Table 2-1: Channels Tested

Channel	Frequency (kHz)
1	125

2.2 Exercising the EUT

The EUT was supplied with test firmware programmed to continuously transmit during testing. The carrier was also checked to verify that information was being transmitted. There were no deviations from the test standard(s) and/or methods. The test results reported relate only to the item tested.

2.3 Test Result Summary

Table 2-2: Test Result Summary – FCC Part 15, Subpart C (Section 15.247)

Standard	Test	Pass/Fail or N/A
FCC 15.207	AC Power Conducted Emissions	Pass
FCC 15.209	Radiated Emissions	Pass
IC RSS-Gen 4.6.1	20 dB Bandwidth	N/A

2.4 Test System Details

The test samples were received on June 27, 2007. The FCC identifiers for all applicable equipment, plus descriptions of all cables used in the tested system, are identified in the following table.

Table 2-3: Equipment Under Test

Part	Manufacturer	Model	Serial Number	FCC ID	RTL Bar Code
Position Marker	Identec Solutions Inc.	i-Mark 3	N/A	O2E-ILR-IM3	17974

2.5 Configuration of Tested System

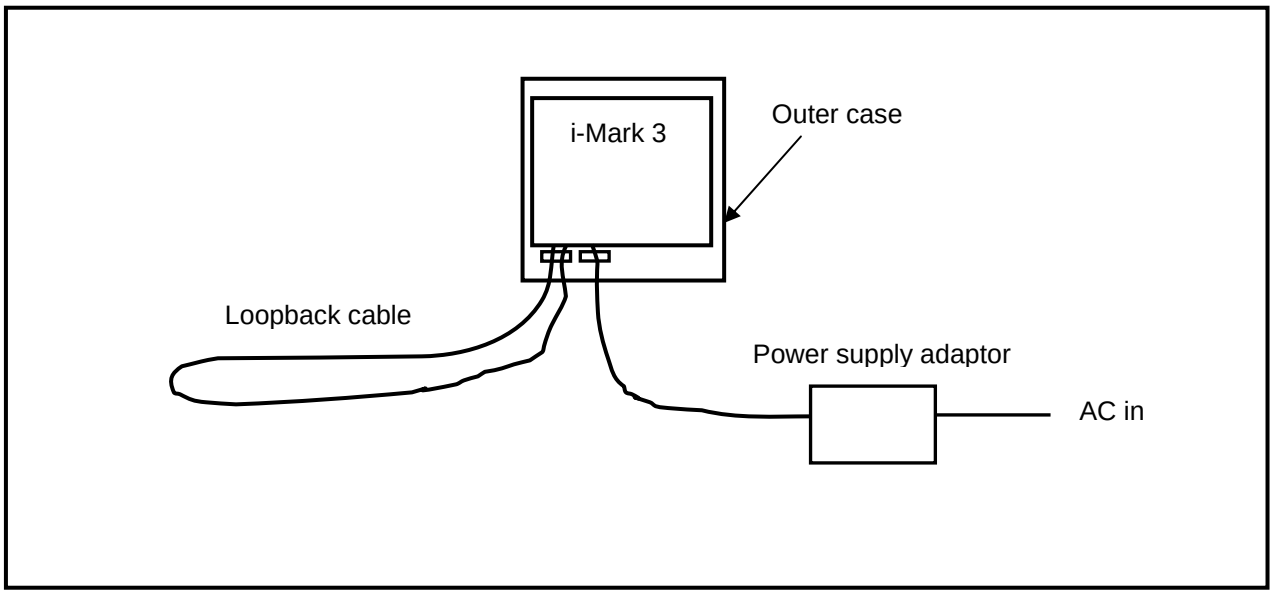


Figure 2-1: Configuration of System Under Test

3 Radiated Emissions - §15.209; RSS-210 2.6

3.1 Limits of Radiated Emissions Measurement

Frequency (MHz)	Field Strength (uV/m)	Measurement Distance (m)
0.009-0.490	2400/f (kHz)	300
0.490-1.705	2400/f (kHz)	30
1.705-30.0	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

As shown in 15.35(b), for frequencies above 1000 MHz, the field strength limits are based on average detector, however, the peak field strength of any emission shall not exceed the maximum permitted average limits, specified above by more than 20 dB under any circumstances of modulation.

3.2 §15.209; RSS-210 2.6 Radiated Emissions Measurement Test Procedure

Before final measurements of radiated emissions were made on the open-field three/ten meter range, the EUT was scanned indoors at one and three meter distances. This was done in order to determine its emissions spectrum signature. The physical arrangement of the test system and associated cabling was varied in order to determine the effect on the EUT's emissions in amplitude, direction and frequency. This process was repeated during final radiated emissions measurements on the open-field range, at each frequency, in order to ensure that maximum emission amplitudes were attained.

Final radiated emissions measurements were made on the three/ten-meter, open-field test site. The EUT was placed on a nonconductive turntable 0.8 meters above the ground plane. During testing the EUT was positioned in 3 orthogonal axes and the measurements were performed with a loop antenna. The spectrum was examined from 9 kHz to the 10^{th} harmonic of the highest fundamental transmitter frequency.

At each frequency, the EUT was rotated 360°, and the antenna was raised and lowered from 1 to 4 meters in order to determine the emission's maximum level. Measurements were taken using both horizontal and vertical antenna polarizations.

3.3 Extrapolation (Distance Correction) Factor

Testing was performed on an OATS site at a distance of 3 m. The results were extrapolated by using the square of an inverse linear distance factor DF.

DF = 40*log (d1/d2)

d1 = the 300 meter specified measurement distance
d2 = the 3 meter measurement distance

DF = 40*log (300/3) = 80dB

3.4 Intentional Radiated Emissions Test Results – §15.209

Table 3-1: Intentional Radiated Emissions Test Results

Emission Frequency (MHz)	Test Detector	Analyzer Reading (dBuV)	Site Crrection Factor (dB/m)	Corrected Analyzer Reading (dBuV)	Distance Correction Factor (dB/m)	Analyzer Corrected Level (dBuV)	300m Limit (dBuV/m)	Margin (dB)	Pass/ Fail
0.125	Av	64.0	20.3	84.3	80	4.3	19.2	17.1	Pass
0.250	Av	39.8	20.1	59.9	80	-20.1	19.6	39.7	Pass

Table 3-2: Intentional Radiated Emissions Test Equipment

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
900151	Rohde and Schwarz	HFH2-Z2	Loop Antenna (9 kHz - 30 MHz)	827525/019	09/15/09
900878	Rhein Tech Laboratories, Inc.	AM3-1197-0005	3 meter antenna mast, polarizing	Outdoor Range 1	Not Required
901242	Rhein Tech Laboratories, Inc.	WRT-000-0003	Wood rotating table	N/A	Not Required
900913	Hewlett Packard	85462A	EMI Receiver RF Section (9 KHz – 6.5 GHz)	3325A00159	03/21/08
901288	Belden	9273	Cables, 10 and 3 meters OATS 1	N/A	01/19/08

3.5 Unintentional Radiated Emissions Test Procedure

Before final measurements of radiated emissions were made on the open-field three/ten meter range, the EUT was scanned indoors at one and three meter distances. This was done in order to determine its emissions spectrum signature. The physical arrangement of the test system and associated cabling was varied in order to determine the effect on the EUT's emissions in amplitude, direction and frequency. This process was repeated during final radiated emissions measurements on the open-field range, at each frequency, in order to ensure that maximum emission amplitudes were attained.

Final radiated emissions measurements were made on the three/ten-meter, open-field test site. The EUT was placed on a nonconductive turntable 0.8 meters above the ground plane. During testing the EUT was positioned in 3 orthogonal axes and the measurements were performed with a loop antenna. The spectrum was examined from 9 kHz to the 10^{th} harmonic of the highest fundamental transmitter frequency.

At each frequency, the EUT was rotated 360°, and the antenna was raised and lowered from 1 to 4 meters in order to determine the emission's maximum level. Measurements were taken using both horizontal and vertical antenna polarizations. For frequencies between 30 and 1000 MHz, the spectrum analyzer's 6 dB bandwidth was set to 120 kHz, and the analyzer was operated in the CISPR quasi-peak detection mode. For emissions above 1000 MHz, emissions are measured using the average detector function with a minimum resolution bandwidth of 1 MHz. No video filter less than 10 times the resolution bandwidth was used. The highest emission amplitudes relative to the appropriate limit were measured and recorded in this report.

3.6 Unintentional Radiated Emissions Test Data

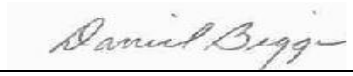
Table 3-3: Unintentional Radiated Emissions Test Results – §15.209

Temperature: 91°F Humidity: 42%										
Emission Frequency (MHz)	**Test Detector**	**Antenna Polarity (H/V)**	**Turntable Azimuth (deg)**	**Antenna Height (m)**	**Analyzer Reading (dBuV)**	**Site Correction Factor (dB/m)**	**Emission Level (dBuV/m)**	**Limit (dBuV/m)**	**Margin (dB)**	**Pass/ Fail**
149.297	Qp	V	180	1.0	44.5	-17.9	26.6	43.5	-16.9	Pass
149.301	Qp	H	30	1.5	46.1	-17.9	28.2	43.5	-15.3	Pass
199.073	Qp	H	0	1.0	41.9	-17.9	24.0	43.5	-19.5	Pass
199.241	Qp	V	30	1.0	46.2	-17.9	28.3	43.5	-15.2	Pass
248.832	Qp	V	160	1.5	49.0	-15.4	33.6	46.0	-12.4	Pass
248.835	Qp	H	350	1.0	53.8	-15.4	38.4	46.0	-7.6	Pass
309.659	Qp	H	350	1.0	38.0	-13.5	24.5	46.0	-21.5	Pass
309.659	Qp	V	350	1.5	34.4	-13.5	20.9	46.0	-25.1	Pass
348.365	Qp	V	90	1.5	47.3	-11.6	35.7	46.0	-10.3	Pass
348.366	Qp	H	350	1.0	56.8	-11.6	45.2	46.0	-0.8	Pass
447.898	Qp	H	0	1.0	45.7	-9.3	36.4	46.0	-9.6	Pass
447.898	Qp	V	180	2.0	46.6	-9.5	37.1	46.0	-8.9	Pass
547.431	Qp	V	30	1.0	50.9	-7.3	43.6	46.0	-2.4	Pass
547.431	Qp	H	350	1.5	51.7	-7.1	44.6	46.0	-1.4	Pass
746.498	Qp	H	350	1.0	45.6	-4.2	41.4	46.0	-4.6	Pass
746.498	Qp	V	45	1.0	43.4	-4.2	39.2	46.0	-6.8	Pass
945.564	Qp	H	0	1.0	45.1	-1.1	44.0	46.0	-2.0	Pass
945.564	Qp	V	30	1.5	39.8	-1.7	38.1	46.0	-7.9	Pass

Table 3-4: Unintentional Radiated Emissions Test Equipment

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
901053	Schaffner-Chase	CBL6112	Antenna (25 MHz – 2 GHz)	2648	11/01/07
900905	Rhein Tech Laboratories, Inc.	PR-1040	Amplifier (10 MHz - 2 GHz)	1006	05/16/08
900878	Rhein Tech Laboratories, Inc.	AM3-1197-0005	3 meter antenna mast, polarizing	Outdoor Range 1	Not Required
901242	Rhein Tech Laboratories, Inc.	WRT-000-0003	Wood rotating table	N/A	Not Required
900913	Hewlett Packard	85462A	EMI Receiver RF Section (9 KHz – 6.5 GHz)	3325A00159	03/21/08
901288	Belden	9273	Cables, 10 and 3 meters OATS 1	N/A	01/19/08

Test Personnel:



Daniel W. Biggs		June 29, 2007
Test Engineer	Signature	Date Of Test

4 Conducted Emissions Measurement Limits – FCC §15.207, RSS-Gen 7.2.2

4.1 Test Methodology for Conducted Line Emissions Measurements

The power line conducted emission measurements were performed in a Series 81 type shielded enclosure manufactured by Rayproof. The EUT was assembled on a wooden table 80 centimeters high. Power was fed to the EUT through a 50 ohm / 50 microhenry Line Impedance Stabilization Network (EUT LISN). The EUT LISN was fed power through an A.C. filter box on the outside of the shielded enclosure. The filter box and EUT LISN housing are bonded to the ground plane of the shielded enclosure. A second LISN, the peripheral LISN, provides isolation for the EUT test peripherals. This peripheral LISN was also fed A.C. power. A metal power outlet box, which is bonded to the ground plane and electrically connected to the peripheral LISN, powers the EUT host peripherals.

The spectrum analyzer was connected to the A.C. line through an isolation transformer. The 50 ohm output of the EUT LISN was connected to the spectrum analyzer input through a Solar high-pass filter. The filter is used to prevent overload of the spectrum analyzer from noise below 100 kHz. Conducted emission levels were measured on each current-carrying line with the spectrum analyzer operating in the CISPR quasi-peak mode (or peak mode if applicable). The analyzer's 6 dB bandwidth was set to 9 kHz. No video filter less than 10 times the resolution bandwidth was used. Average measurements are performed in linear mode using a 10 kHz resolution bandwidth, a 1 Hz video bandwidth, and by increasing the sweep time in order to obtain a calibrated measurement. The emission spectrum was scanned from 150 kHz to 30 MHz. The highest emission amplitudes relative to the appropriate limit were measured and have been recorded in this report.

Note: Rhein Tech Laboratories, Inc. has implemented procedures to minimize errors that occur from test instruments, calibration, procedures, and test setups. Test instrument and calibration errors are documented from the manufacturer or calibration lab. Other errors have been defined and calculated within the Rhein Tech Quality Manual, section 6.1. Rhein Tech implements the following procedures to minimize errors that may occur: yearly as well as daily calibration methods, technician training, and emphasis to employees on avoiding error.

4.2 Conducted Line Emissions Test Procedure

The conducted test was performed with the EUT in hopping mode and the emissions were scanned between 150 kHz to 30 MHz on the NEUTRAL SIDE and PHASE SIDE.

4.3 Conducted Line Emissions Test Data

Table 4-1: Conducted Line Emissions (Neutral Side)

Temperature: 74°F Humidity: 55%									
Emission Frequency (MHz)	Test Detector	Analyzer Reading (dBuV)	Site Correction Factor (dB)	Emission Level (dBuV)	QP Limit (dBuV)	QP Margin (dBuV)	AV Limit (dBuV)	AV Margin (dBuV)	Pass/ Fail
0.152	Pk	49.1	0.2	49.3	65.9	-16.6	55.9	-6.6	Pass
0.165	Pk	47.9	0.2	48.1	65.2	-17.1	55.2	-7.1	Pass
0.182	Pk	46.7	0.2	46.9	64.4	-17.5	54.4	-7.5	Pass
0.307	Pk	44.6	0.2	44.8	60.1	-15.3	50.1	-5.3	Pass
0.307	Qp	40.4	0.2	40.6	60.1	-19.5	50.1	-9.5	Pass
0.307	Av	26.2	0.2	26.4	60.1	-33.7	50.1	-23.7	Pass
0.334	Pk	45.6	0.2	45.8	59.4	-13.6	49.4	-3.6	Pass
0.334	Qp	43.1	0.2	43.3	59.4	-16.1	49.4	-6.1	Pass
0.334	Av	33.4	0.2	33.6	59.4	-25.8	49.4	-15.8	Pass
0.391	Pk	45.8	0.2	46.0	58.0	-12.0	48.0	-2.0	Pass
0.391	Qp	42.2	0.2	42.4	58.0	-15.6	48.0	-5.6	Pass
0.391	Av	35.8	0.2	36.0	58.0	-22.0	48.0	-12.0	Pass
0.498	Pk	41.4	0.2	41.6	56.0	-14.4	46.0	-4.4	Pass
0.498	Qp	39.3	0.2	39.5	56.0	-16.5	46.0	-6.5	Pass
0.498	Av	26.2	0.2	26.4	56.0	-29.6	46.0	-19.6	Pass
1.590	Pk	42.8	0.8	43.6	56.0	-12.4	46.0	-2.4	Pass
1.590	Qp	35.8	0.8	36.6	56.0	-19.4	46.0	-9.4	Pass
1.590	Av	31.5	0.8	32.3	56.0	-23.7	46.0	-13.7	Pass
16.930	Av	38.9	2.3	41.2	60.0	-18.8	50.0	-8.8	Pass
16.935	Qp	44.0	2.3	46.3	60.0	-13.7	50.0	-3.7	Pass
16.935	Pk	45.1	2.3	47.4	60.0	-12.6	50.0	-2.6	Pass
29.820	Pk	28.9	3.0	31.9	60.0	-28.1	50.0	-18.1	Pass

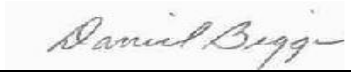
Table 4-2: Conducted Line Emissions (Phase Side)

Temperature: 74°F Humidity: 55%									
Emission Frequency (MHz)	**Test Detector**	**Analyzer Reading (dBuV)**	**Site Correction Factor (dB)**	**Emission Level (dBuV)**	**QP Limit (dBuV)**	**QP Margin (dBuV)**	**AV Limit (dBuV)**	**AV Margin (dBuV)**	**Pass/ Fail**
0.152	Pk	46.5	0.2	46.7	65.9	-19.2	55.9	-9.2	Pass
0.165	Pk	45.7	0.2	45.9	65.2	-19.3	55.2	-9.3	Pass
0.199	Pk	43.6	0.2	43.8	63.7	-19.9	53.7	-9.9	Pass
0.303	Pk	45.0	0.2	45.2	60.2	-15.0	50.2	-5.0	Pass
0.380	Pk	46.0	0.2	46.2	58.3	-12.1	48.3	-2.1	Pass
0.380	Av	36.2	0.2	36.4	58.3	-21.9	48.3	-11.9	Pass
0.380	Qp	43.3	0.2	43.5	58.3	-14.8	48.3	-4.8	Pass
0.430	Pk	44.5	0.2	44.7	57.3	-12.6	47.3	-2.6	Pass
0.430	Qp	40.0	0.2	40.2	57.3	-17.1	47.3	-7.1	Pass
0.430	Av	23.7	0.2	23.9	57.3	-33.4	47.3	-23.4	Pass
0.492	Pk	41.1	0.2	41.3	56.1	-14.8	46.1	-4.8	Pass
0.492	Qp	39.4	0.2	39.6	56.1	-16.5	46.1	-6.5	Pass
0.492	Av	23.2	0.2	23.4	56.1	-32.7	46.1	-22.7	Pass
1.589	Pk	44.0	0.8	44.8	56.0	-11.2	46.0	-1.2	Pass
1.589	Qp	35.8	0.8	36.6	56.0	-19.4	46.0	-9.4	Pass
1.589	Av	30.8	0.8	31.6	56.0	-24.4	46.0	-14.4	Pass
3.385	Pk	42.2	1.2	43.4	56.0	-12.6	46.0	-2.6	Pass
3.385	Qp	36.7	1.2	37.9	56.0	-18.1	46.0	-8.1	Pass
3.385	Av	30.0	1.2	31.2	56.0	-24.8	46.0	-14.8	Pass
16.923	Pk	45.7	2.3	48.0	60.0	-12.0	50.0	-2.0	Pass
16.923	Qp	44.8	2.3	47.1	60.0	-12.9	50.0	-2.9	Pass
16.925	Av	39.3	2.3	41.6	60.0	-18.4	50.0	-8.4	Pass
19.911	Pk	38.2	2.7	40.9	60.0	-19.1	50.0	-9.1	Pass
26.190	Pk	35.6	2.7	38.3	60.0	-21.7	50.0	-11.7	Pass
29.620	Pk	28.4	2.9	31.3	60.0	-28.7	50.0	-18.7	Pass

Table 4-3: Conducted Line Emissions Test Equipment

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
901215	Hewlett Packard	8596EM	Spectrum Analyzer (9 kHz - 12.8 GHz)	3826A00144	10/16/07
901084	AFJ International	LS16	16A LISN	16010020082	04/04/08

Test Personnel:

Daniel W. Biggs		June 27, 2007
Test Engineer	Signature	Date Of Test

5 20 dB Bandwidth – IC RSS-Gen 4.6.1

5.1 20 dB Bandwidth Test Procedure

The minimum 20 dB bandwidth per RSS Gen were measured using a 50 ohm spectrum analyzer. The modulated carrier was adjusted on the analyzer so that it was displayed entirely on the spectrum analyzer. The sweep time was auto and allowed through several sweeps with the max hold function used in peak detector mode. The resolution bandwidth was set to 1 kHz, and the video bandwidth set at 1 kHz. The minimum 20 dB bandwidths were measured using the spectrum analyzer delta marker set 20 dB down from the peak of the carrier. The table below contains the bandwidth measurement results.

5.2 20 dB Modulated Bandwidth Test Data

Table 5-1: 20 dB Modulated Bandwidth Test Data - Minimum 20 dB bandwidths

Channel Frequency (kHz)	20 dB Bandwidth (kHz)
125.0	17.9

5.3 20 dB Bandwidth Plots

Channel:	1
Channel Frequency (kHz):	125.0
Resolution Bandwidth (kHz):	1.0
Video Bandwidth (kHz):	1.0
Span (MHz):	0.150

Plot 5-1: 20 dB Bandwidth – 125.0 kHz

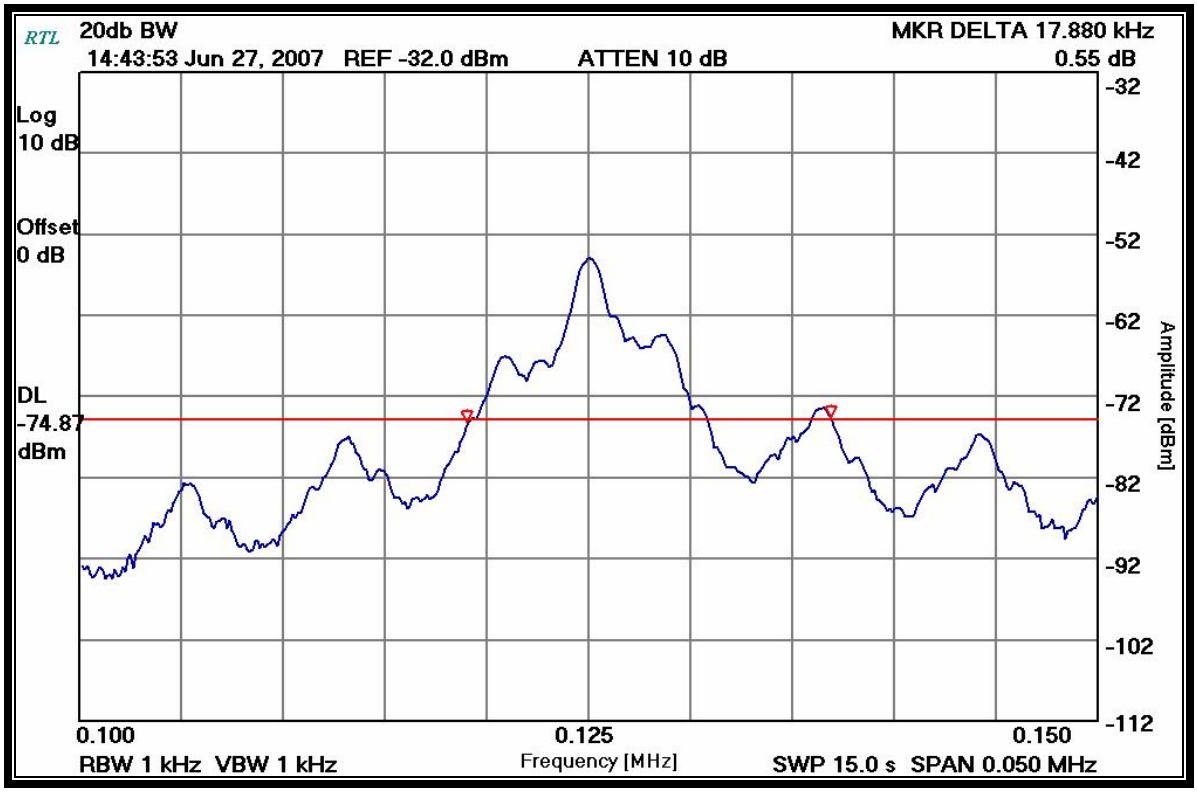


Table 5-2: 20 dB Bandwidth Test Equipment

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
900913	Hewlett Packard	85462A	EMI Receiver RF Section (9 kHz – 6.5 GHz)	3325A00159	03/21/08

Test Personnel:

Daniel W. Biggs	Daniel Biggs	June 27, 2007
Test Engineer	Signature	Date Of Test

6 Conclusion

The data in this measurement report shows that the EUT as tested, Identec Solutions Inc., Model: i-Mark 3, FCC ID: O2E-ILR-IM3, IC: 3538B-IM3, complies with all the applicable requirements of Parts 2 and 15 of the FCC Rules and Regulations and IC RSS-Gen/RSS-210.