

*FCC PART 15, SUBPART C  
TEST REPORT*

*for*

**TUNECAST AUTO**

**MODEL: F8Z439**

Prepared for

**BELKIN INTERNATIONAL, INC.  
501 W. WALNUT STREET  
COMPTON, CA 90220-5221**

Prepared by: \_\_\_\_\_

**JOSH HANSEN**

Approved by: \_\_\_\_\_

**JEFF KLINGER**

**COMPATIBLE ELECTRONICS INC.  
20621 Pascal Way  
LAKE FOREST, CA 92630  
(949) 587-0400**

DATE: May 20<sup>th</sup> 2009

	REPORT BODY	APPENDICES					TOTAL
		<i>A</i>	<i>B</i>	<i>C</i>	<i>D</i>	<i>E</i>	
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## GENERAL REPORT SUMMARY

This electromagnetic emission test report is generated by Compatible Electronics Inc., which is an independent testing and consulting firm. The test report is based on testing performed by Compatible Electronics personnel according to the measurement procedures described in the test specifications given below and in the "Test Procedures" section of this report.

The measurement data and conclusions appearing herein relate only to the sample tested and this report may not be reproduced without the written permission of Compatible Electronics, unless done so in full.

This report must not be used to claim product endorsement by NVLAP, NIST or any other agency of the U.S. Government.

Device Tested: TUNECAST AUTO  
Model: F8Z439  
S/N: 2

Product Description: See Expository Statement

Modifications: The EUT was not modified.

Manufacturer: Belkin International, inc.  
501 W. Walnut Street  
Compton, CA 90220-5221

Test Date: May 7<sup>th</sup>, 2009

Test Specifications: CFR Title 47, Part 15 Subpart C, Sections 15.205, 15.209 and 15.239

Test Procedure: ANSI C63.4: 2003

Test Deviations: The test procedure was not deviated from during the testing.

## SUMMARY OF TEST RESULTS

TEST	DESCRIPTION	RESULTS
1	Radiated RF Emissions, 9 kHz – 1080 MHz	Complies with the limits of CFR Title 47, Part 15, Subpart C, section 15.205, 15.209, 15.239 (b), and 15.239 (c).
2	-20 dB Bandwidth of the Fundamental	Complies with the limits of CFR Title 47, Part 15, Subpart C, section 15.239 (a).

**1. PURPOSE**

This document is a qualification test report based on the Electromagnetic Interference (EMI) tests performed on the TUNECAST AUTO Model: F8Z439. The EMI measurements were performed according to the measurement procedure described in ANSI C63.4. The tests were performed in order to determine whether the electromagnetic emissions from the equipment under test, referred to as EUT hereafter, are within the specification limits defined by CFR Title 47, Part 15, Subpart C, sections 15.205, 15.209, and 15.239.



## 2. ADMINISTRATIVE DATA

### 2.1 Location of Testing

The EMI tests described herein were performed at the test facility of Compatible Electronics, 20621 Pascal Way, Lake Forest, California 92630.

### 2.2 Traceability Statement

The calibration certificates of all test equipment used during the test are on file at the location of the test. The calibration is traceable to the National Institute of Standards and Technology (NIST).

### 2.3 Cognizant Personnel

Belkin International, inc.

Daniel Wesey Compliance Engineer

Compatible Electronics, Inc.

Josh Hansen Test Engineer  
Jeff Klinger Director of Engineering

### 2.4 Date Test Sample was Received

The test sample was received on May 7<sup>th</sup> 2009.

### 2.5 Disposition of the Test Sample

The sample has not yet been returned to Belkin International, inc. as of May 7<sup>th</sup> 2009.

### 2.6 Abbreviations and Acronyms

The following abbreviations and acronyms may be used in this document.

RF	Radio Frequency
CLA	Cigar Lighter Adaptor
EMI	Electromagnetic Interference
EUT	Equipment Under Test
P/N	Part Number
S/N	Serial Number
HP	Hewlett Packard
ITE	Information Technology Equipment
CML	Corrected Meter Limit
LISN	Line Impedance Stabilization Network

**3. APPLICABLE DOCUMENTS**

The following documents are referenced or used in the preparation of this EMI Test Report.

<b>SPEC</b>	<b>TITLE</b>
CFR Title 47, Part 15	FCC Rules – Radio frequency devices (including digital devices)
ANSI C63.4 2003	American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz

#### 4. DESCRIPTION OF TEST CONFIGURATION

##### 4.1 Description Of Test Configuration - EMI

Setup and operation of the equipment under test.

Specifics of the EUT and Peripherals Tested

The TUNECAST AUTO Model: F8Z439 (EUT) was investigated for worst case configuration. An Apple iPod was connected to the EUT via the EUT 3.5mm Audio jack. 12v DC was supplied via integral CLA (Cigar Lighter Adaptor), which was connected to a CLA socket receptacle, which in turn was connected to a 12v battery. The EUT was receiving audio from the iPod and transmitting the audio in the FM band, the iPod and the music being played was provided by the customer, the song was Linkin Park "Don't Stay" 0dB encode rate at max amplitude. The EUT's transmit antenna was soldered to the Radio PCB of the EUT, which is contained in the face of the EUT. Another iPod was being charged by the USB port on the EUT CLA.

The low, middle, and high channels were investigated.  
The final data was taken in the modes above. Please see Appendix E for the data sheets.

*(Setup Photo)*





**4.1.1 Cable Construction and Termination**

Cable 1 USB cable 1 meter long with a USB connector at one end and a 30pin iPod dock connector at the other end.

Cable 2 Audio cable .5 meter long with a 3.5mm Audio jack at one end and hardwired to the EUT at the other.

Cable 3 Power cable .5 meter long hard wired at the EUT and CLA ends.



**5. LISTS OF EUT, ACCESSORIES AND TEST EQUIPMENT****5.1 EUT and Accessory List**

<b>EQUIPMENT</b>	<b>MANUFACTURER</b>	<b>MODEL NUMBER</b>	<b>SERIALNUMBER</b>	<b>FCC ID</b>
TUNECAST AUTO (EUT)	BELKIN INTERNATIONAL, INC.	F8Z439	N/A	<b>K7SF8Z439</b>
iPod	Apple	A1136	JQ542XTQSZ9	N/A
iPod	Apple	A1236	7N742NBPYOP	N/A
Speakers	N/A	N/A	N/A	N/A
12v Battery	N/A	N/A	N/A	N/A

**5.2 EMI Test Equipment**

<b>EQUIPMENT TYPE</b>	<b>MANUFACTURER</b>	<b>MODEL NUMBER</b>	<b>SERIAL NUMBER</b>	<b>CALIBRATION DATE</b>	<b>CALIBRATION DUE DATE</b>
<b>GENERAL TEST EQUIPMENT USED FOR ALL RF EMISSIONS TESTS</b>					
Computer	Compatible Electronics	N/A	N/A	N/A	N/A
EMI Receiver	Rohde & Schwarz	ESIB40	100172	Jan. 7, 2009	Jan. 7, 2011
Monitor	ICS Advent	N/A	N/A	N/A	N/A
<b>RF RADIATED EMISSIONS TEST EQUIPMENT</b>					
CombyLog Antenna	Com-Power	AC-220	001	Sept. 3, 2008	Sept. 3, 2009
Loop Antenna	Com-Power	AL-130	17085	Aug. 1, 2008	Aug. 1, 2010
Antenna Mast	Sunol Sciences Corporation	TWR 95-4	020808-3	N/A	N/A
Turntable	Sunol Sciences Corporation	FM 2001	N/A	N/A	N/A
Mast and Turntable Controller	Sunol Sciences Corporation	SC104V	020808-1	N/A	N/A

**6. TEST SITE DESCRIPTION****6.1 Test Facility Description**

Please refer to section 2.1 and 7.1 of this report for EMI test location.

**6.2 EUT Mounting, Bonding and Grounding**

The EUT, iPod, and Cigar Lighter receptacle were mounted on a 1.0 by 1.5 meter non-conductive table 0.8 meters above the ground plane.

The EUT was placed in the center, and on the back edge of the table, in accordance with ANSI C63.4:2003. The test site receive antenna distance was measured from the closest periphery of the EUT setup. Each accessory was placed 10 cm to either side of the EUT. The battery was placed on the ground, using an 80 cm length of wire to connect to a cigar lighter receptacle, which was mounted on the table.

The EUT and accessories were investigated for worst case placement; the above yielded the worst case configuration.

The EUT was not grounded.

## 7. TEST PROCEDURES

The following sections describe the test methods and the specifications for the tests. Test results are also included in this section.

### 7.1 RF Emissions

#### 7.1.1 Conducted Emissions Test

EUT is DC powered, this test was not performed.

**Test Results:**

Test not performed.



### 7.1.2 Radiated Emissions (Spurious and Harmonics) Test

The receiver was used as a measuring meter along with the quasi-peak adapter. The receiver was used in the peak detect mode with the "Max Hold" feature activated. In this mode, the receiver records the highest measured reading over all the sweeps.

The frequencies above 1 GHz and the fundamental for the low, middle, and high channels were investigated with the built in average detector.

The measurement bandwidths and transducers used for the radiated emissions (Spurious) tests were:

FREQUENCY RANGE	EFFECTIVE MEASUREMENT BANDWIDTH	TRANSDUCER
9 kHz to 150 kHz	200 Hz	Active Loop Antenna
150 kHz to 30 MHz	9 kHz	Active Loop Antenna
30 MHz to 1 GHz	100 kHz	CombiLog Antenna
1 GHz to 1.08 GHz	1 MHz	CombiLog Antenna

The Semi-Anechoic test site of Compatible Electronics, Inc, Lab P, was used for radiated emission testing. This test site is set up according to ANSI C63.4. Please see section 6.2 of this report for mounting, bonding and grounding of the EUT. The turntable supporting the EUT is remote controlled using a motor. The turntable permits EUT rotation of 360 degrees in order to maximize emissions. Also, the antenna mast allows height variation of the antenna from 1 meter to 4 meters. Final data was collected in the worst case (highest emission) configuration of the EUT (Channel 88.1MHz). At each reading, the EUT was rotated 360 degrees and the antenna height was varied from 1 to 4 meters (for E field radiated field strength). The gun sight method was used when measuring with the horn antenna in order to ensure accurate results. The loop antenna was also rotated in the horizontal and vertical axis in order to ensure accurate results.

### 7.1.3 Radiated Emissions (Spurious and Harmonics) Test (Continued)

The emissions from the EUT were investigated with the EUT while operated on each of three channels, 88.1MHz, 98.1MHz and 107.9MHz. The EUT was receiving a 0 dB encoded file from the audio source at max amplitude. This file represents maximum audio input level. The EUT was tested at a 3-meter test distance to obtain the final test data. The worst case scanned and presented was channel 88.1MHz. The final qualification data sheets are located in Appendix E.

#### **Test Results:**

The EUT complies with the **Class B** limits of CFR Title 47, Part 15, Subpart B; and CFR Title 47, Part 15, Subpart C, sections 15.205, 15.209, and 15.239.

### 7.1.4 Peak radiated EMI

The EUT was tested at a 3-meter test distance to obtain the final test data. The EUT was maximized for position. The EUT was receiving a 0 dB encoded file from the audio source at max amplitude. This file represents maximum audio input level. The resolution bandwidth was 100 KHz and video bandwidth 300 KHz. The final qualification data sheets are located in Appendix E. This data also shows compliance at the band edges.

#### **Test Results:**

The EUT complies with Part 15, Subpart C, section 15.239.

## 7.2 Bandwidth of the Fundamental

The -20 dB bandwidth was checked using the EMI Receiver to see that it was wholly within the 200 kHz band centered on the operating frequency. The RBW was set to 10 kHz and the VBW was set to 30 kHz, but no less than 3kHz RBW and 10kHz VBW. The low, middle, and high channels were investigated. Plots of the -20 dB bandwidth are located in Appendix E.

### Test Results:

The EUT complies with the requirements of CFR Title 47, Part 15, Subpart C, section 15.239 (a) for the -20 dB bandwidth of the fundamental. The EUT has a -20 dB bandwidth that is wholly within the 200 kHz band centered on the operating frequency.





**8. CONCLUSIONS**

The TUNECAST AUTO Model: F8Z439 meets all of the specification limits defined in CFR Title 47, Part 15, Subpart B for the digital portion; and the limits defined in Subpart C, sections 15.205, 15.209, and 15.239 for the transmitter portion.





**APPENDIX A**

***LABORATORY RECOGNITIONS***

---

**Brea Division**  
114 Olinda Drive  
Brea, CA 92823  
(714) 579-0500

**Agoura Division**  
2337 Troutdale Drive  
Agoura, CA 91301  
(818) 597-0600

**Silverado Division**  
19121 El Toro Road  
Silverado, CA 92676  
(949) 589-0700

**Lake Forest Division**  
20621 Pascal Way  
Lake Forest, CA 92630  
(949) 587-0400

---

## ***LABORATORY RECOGNITIONS***

### **Compatible Electronics has the following agency accreditations:**

National Voluntary Laboratory Accreditation Program - Lab Code: 200527-0

Voluntary Control Council for Interference - Registration Numbers: R-2848, C-3142, T-1450

Bureau of Standards and Metrology Inspection - Reference Number: SL2-IN-E-1031

Conformity Assessment Body for the EMC Directive Under the US/EU MRA Appointed by NIST

### **Compatible Electronics is recognized or on file with the following agencies:**

Industry Canada  
Site Number: 2154C-1

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**Brea Division**  
114 Olinda Drive  
Brea, CA 92823  
(714) 579-0500

**Agoura Division**  
2337 Troutdale Drive  
Agoura, CA 91301  
(818) 597-0600

**Silverado Division**  
19121 El Toro Road  
Silverado, CA 92676  
(949) 589-0700

**Lake Forest Division**  
20621 Pascal Way  
Lake Forest, CA 92630  
(949) 587-0400



**APPENDIX B**

***MODIFICATIONS TO THE EUT***

## **MODIFICATIONS TO THE EUT**

The modifications listed below were made to the EUT to pass FCC 15.239 or FCC Class B specifications.

No modifications were made to the EUT.





**APPENDIX C**

***ADDITIONAL MODELS COVERED  
UNDER THIS REPORT***

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## **ADDITIONAL MODELS COVERED UNDER THIS REPORT**

USED FOR THE PRIMARY TEST

TUNECAST AUTO  
Model: F8Z439  
S/N: 2

Additional Model Numbers:

NO ADDITIONAL MODELS



**APPENDIX D**

***DIAGRAMS, CHARTS, AND PHOTOS***





**COM-POWER AC-220****COMBYLOG ANTENNA**

S/N: 001

CALIBRATION DATE: 9/3/08

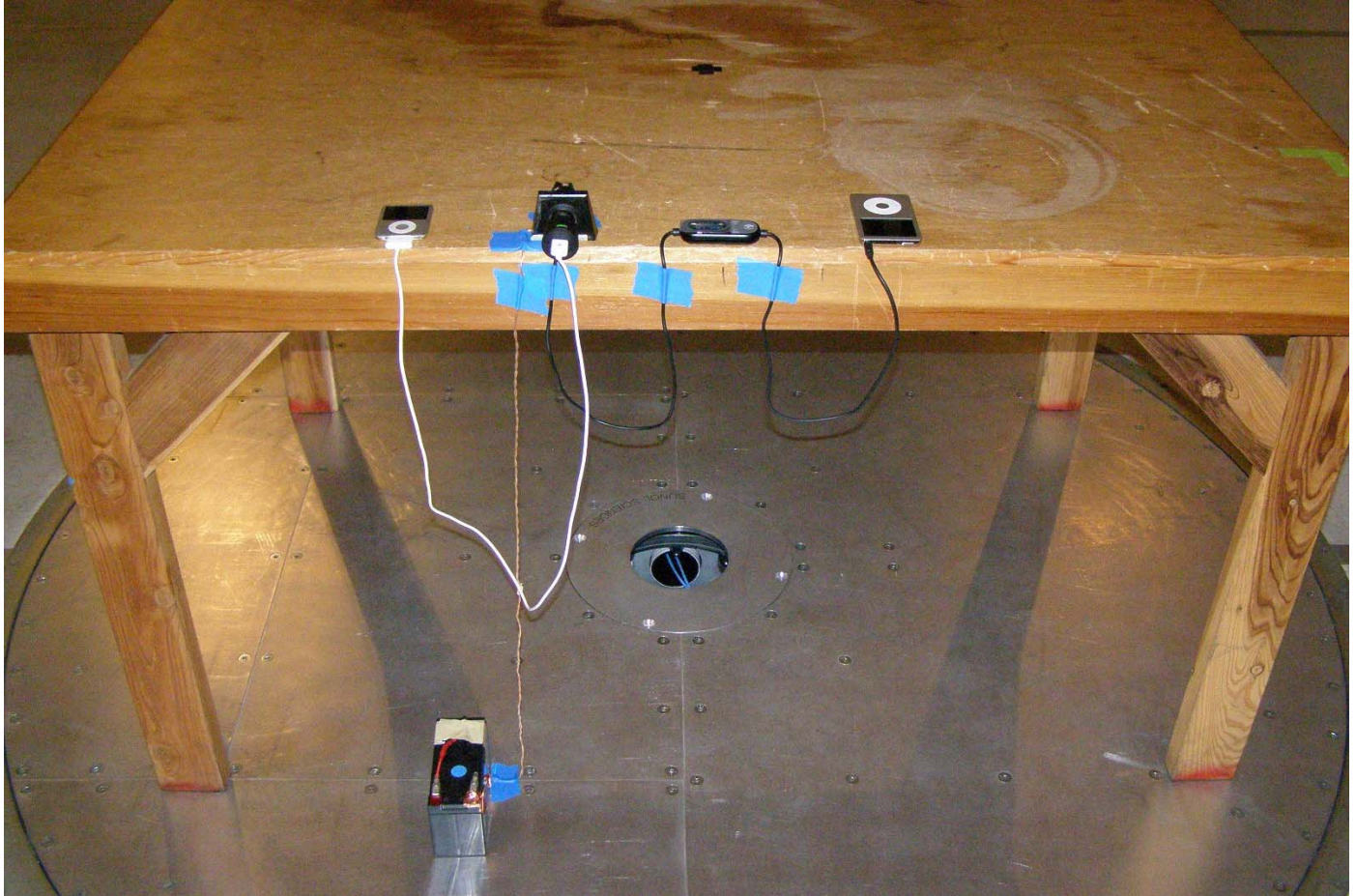
<b>FREQUENCY (MHz)</b>	<b>FACTOR (dB)</b>	<b>FREQUENCY (MHz)</b>	<b>FACTOR (dB)</b>
20.0	22.1	300.0	14.9
25.0	21.1	400.0	16.5
30.0	20.6	500.0	18.5
40.0	19.8	700.0	21.1
50.0	19.0	900.0	23.2
60.0	13.8	1000.0	24.6
70.0	9.6	1100.0	24.8
80.0	8.7	1300.0	24.9
100.0	11.6	1500.0	27.2
150.0	9.4	1700.0	27.2
200.0	10.8	2000.0	29.0
250.0	14.9	2100.0	29.0

**COM-POWER AL-130****LOOP ANTENNA**

S/N: 17085

CALIBRATION DATE: 8/1/08

<b>FREQUENCY (MHz)</b>	<b>MAGNETIC (dB/m)</b>	<b>ELECTRIC (dB/m)</b>	<b>FREQUENCY (MHz)</b>	<b>MAGNETIC (dB/m)</b>	<b>ELECTRIC (dB/m)</b>
0.009	-43	8.5	0.8	-41.53	9.97
0.01	-41.93	9.57	0.9	-41.46	10.04
0.02	-41.29	10.21	1	-41.29	10.21
0.03	-40.73	10.77	2	-40.97	10.53
0.04	-41.03	10.47	3	-41.1	10.4
0.05	-42.37	9.13	4	-41.36	10.14
0.06	-41.6	9.9	5	-40.93	10.57
0.07	-41.96	9.54	6	-40.67	10.83
0.08	-42.1	9.4	7	-41.07	10.43
0.09	-41.83	9.67	8	-40.9	10.6
0.1	-41.83	9.67	9	-40.1	11.4
0.2	-44.46	7.04	10	-41.16	10.34
0.3	-41.73	9.77	15	-47.97	3.53
0.4	-41.8	9.7	20	-40.77	10.73
0.5	-41.8	9.7	25	-44.37	7.13
0.6	-41.33	10.17	30	-43.1	8.4
0.7	-41.36	10.14			



**BACK VIEW**

BELKIN INTERNATIONAL, INC.  
TUNECAST AUTO  
MODEL: F8Z439  
FCC SUBPART B AND C – RADIATED EMISSIONS

**PHOTOGRAPH SHOWING THE EUT CONFIGURATION  
FOR MAXIMUM EMISSIONS**



**FRONT VIEW (Y-Axis)**

BELKIN INTERNATIONAL, INC.  
TUNECAST AUTO  
MODEL: F8Z439  
FCC SUBPART B AND C – RADIATED EMISSIONS

**PHOTOGRAPH SHOWING THE EUT CONFIGURATION  
FOR MAXIMUM EMISSIONS**



**APPENDIX E**

***DATA SHEETS***



***RADIATED EMISSIONS***

SPURIOUS AND HARMONICS

***DATA SHEETS***

***RADIATED EMISSIONS***  
**9kHz – 30MHz**

**9 kHz - 150 kHz:**

No Emissions Found

**150 kHz - 30 MHz:**

No Emissions Found

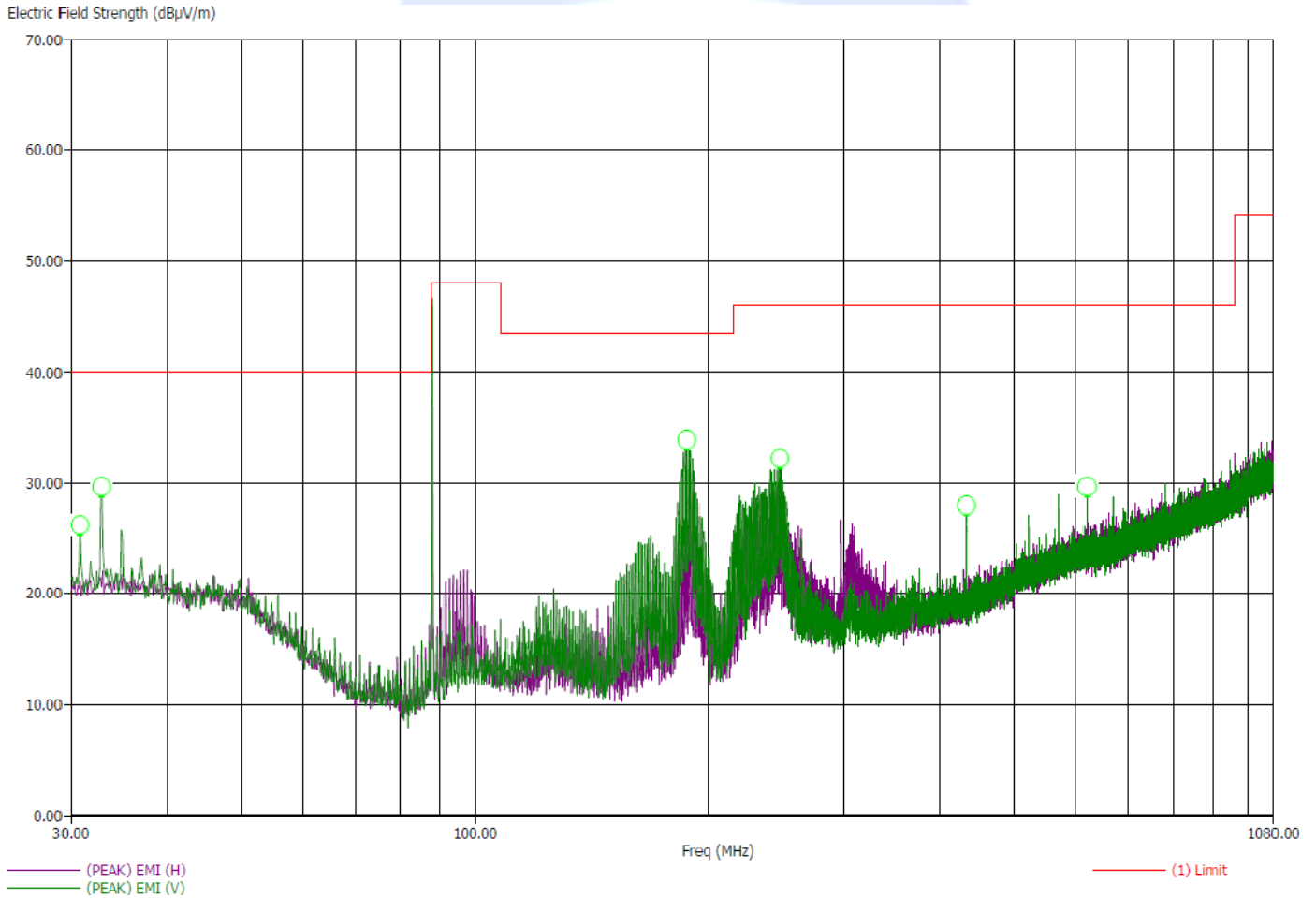




Title: FCC 15.239  
File: Radiated Pre-scan 30-1000Mhz 88-1.set  
Operator: Josh Hansen  
EUT Type: TuneCast Auto (F8Z439)  
EUT Condition: Song played: Linkin Park "Don't Stay" 0dB encode  
Comments: Ipod connected to USB to charger  
Temp: 68F  
Hum: 56%

5/7/2009 9:17:16 AM  
Sequence: Preliminary Scan

Compatible Electronics, Inc. FAC-3



Title: FCC 15.239

5/7/2009 9:43:22 AM

File: Radiated Final 30-1000Mhz 88-1.set

Sequence: Final Measurements

Operator: Josh Hansen

EUT Type: TuneCast Auto (F8Z439)

EUT Condition: Song played: Linkin Park "Don't Stay" 0dB encode

Comments: Ipod connected to USB to charger

Temp: 68F

Hum: 56%

## Compatible Electronics, Inc. FAC-3

Freq (MHz)	(QP) Margin (dB)	(QP) EMI (dB $\mu$ V/m)	(PEAK) EMI (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Pol	Ttbl Agl (deg)	Twr Ht (cm)
30.80	-15.92	24.08	27.08	40.00	V	154.75	164.88
32.90	-13.35	26.65	29.70	40.00	V	-0.25	164.52
188.20	-9.54	33.96	35.95	43.50	V	221.25	156.88
247.90	-16.37	29.63	31.81	46.00	V	76.50	333.82
432.10	-20.10	25.90	27.17	46.00	V	77.00	368.52
619.50	-21.16	24.84	28.84	46.00	V	202.25	260.47

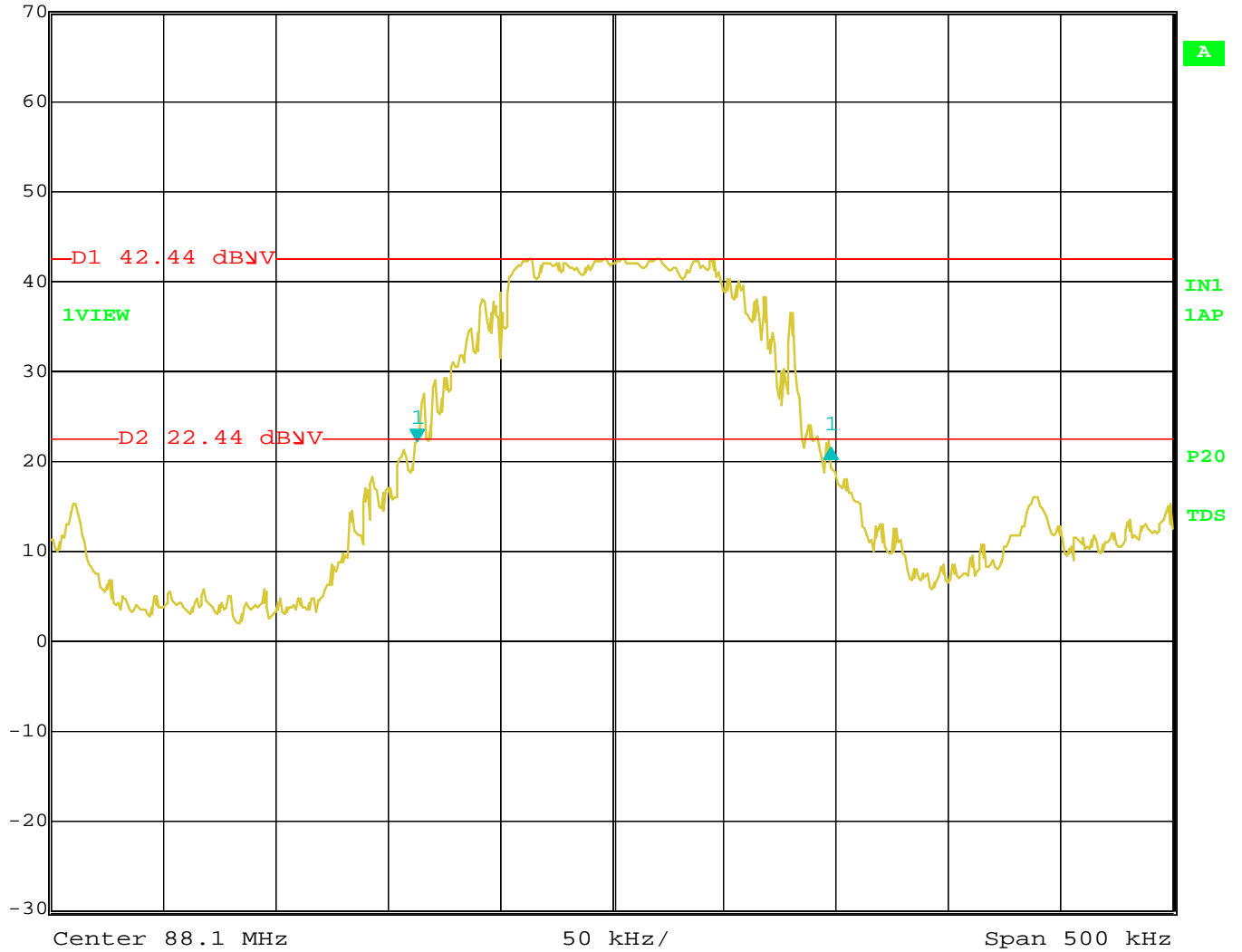


***-20 dB BANDWIDTH***

***DATA SHEETS***



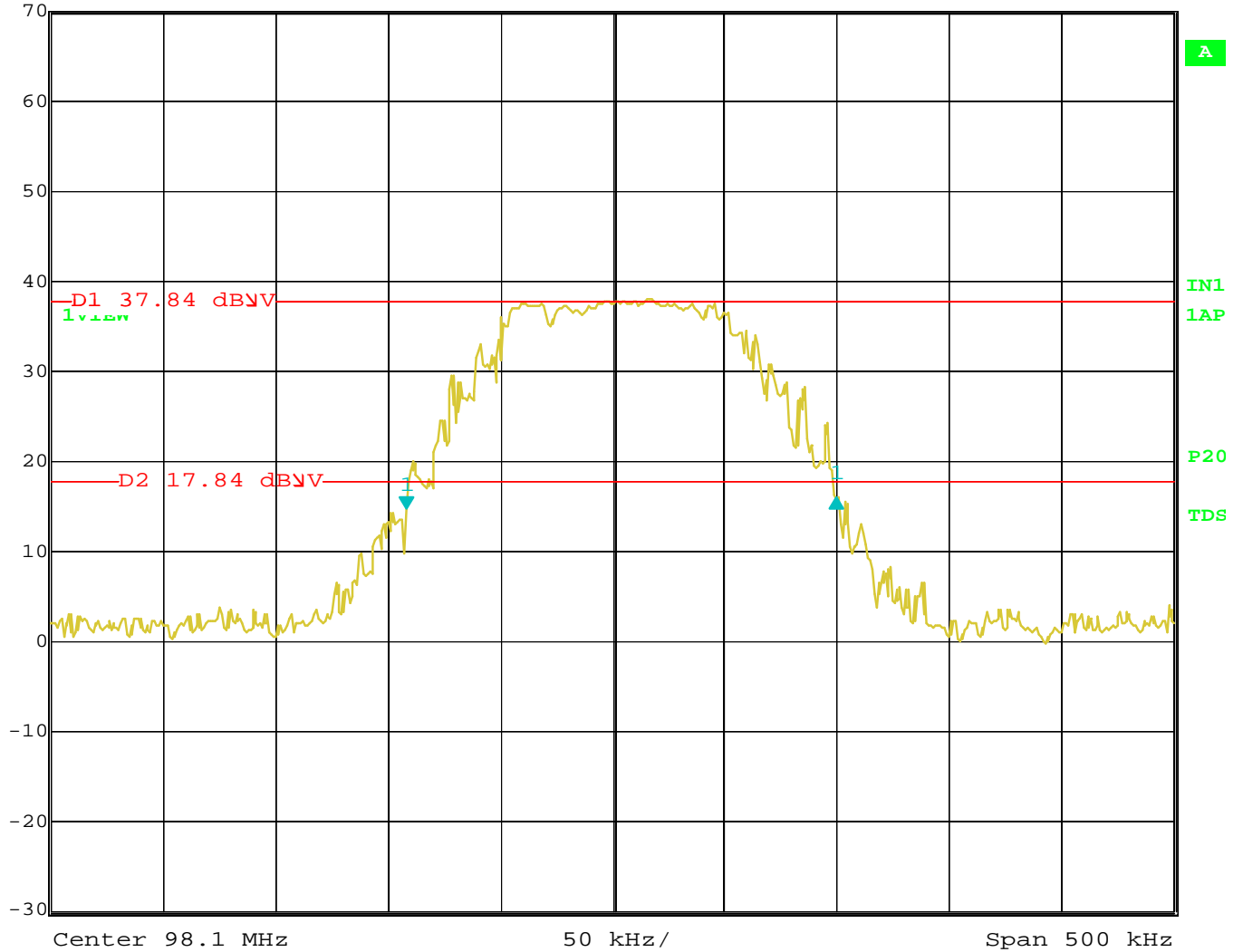
Delta 1 [T1]      RBW    10 kHz    RF Att    0 dB  
 Ref Lvl                    -0.81 dB    VBW    30 kHz  
 70 dBμV                    184.36873747 kHz    SWT    15 ms    Unit            dBμV



Date:      7.MAY.2009    12:55:13



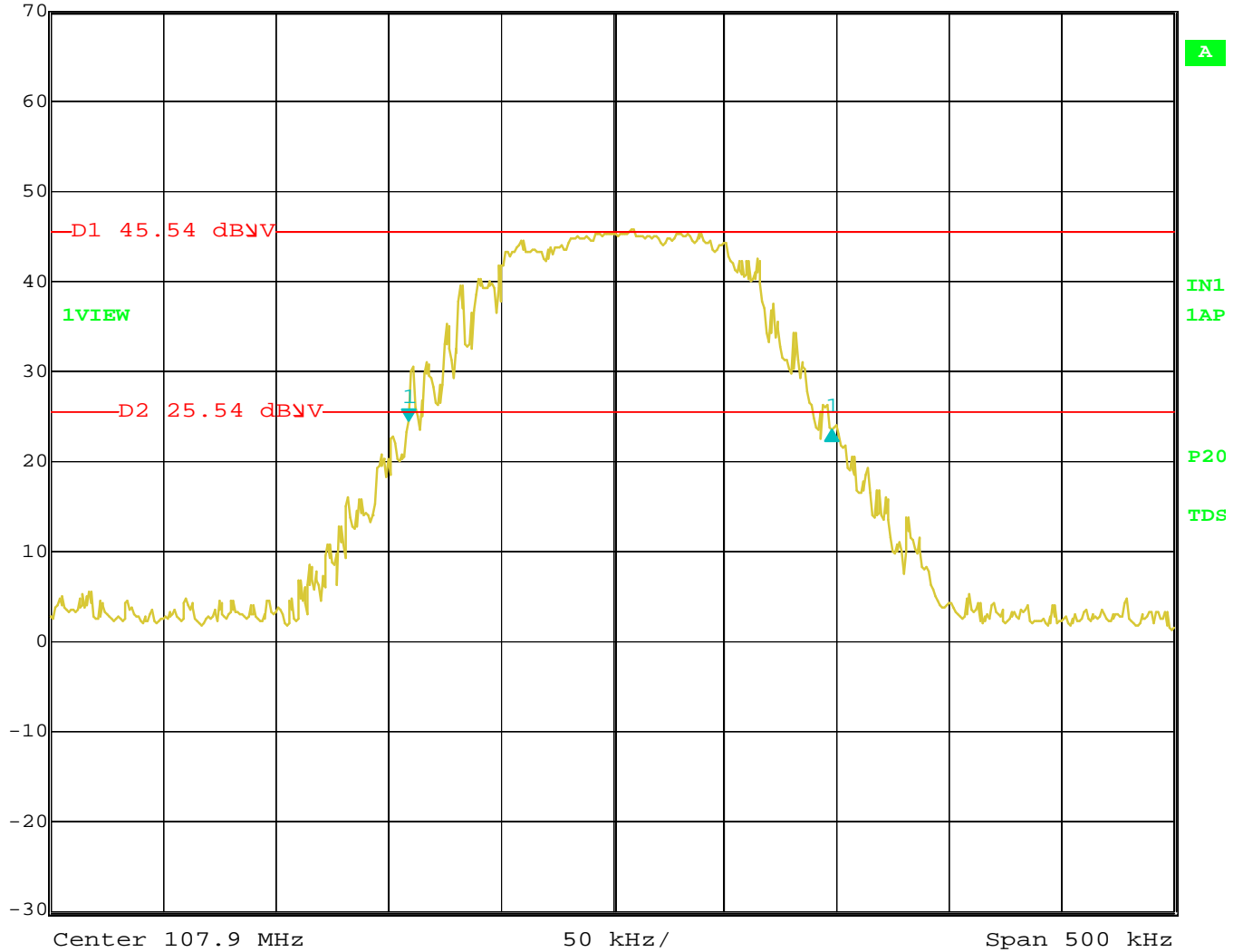
Delta 1 [T1]      RBW    10 kHz    RF Att    0 dB  
 Ref Lvl                    1.34 dB    VBW    30 kHz  
 70 dBμV                    191.38276553 kHz    SWT    15 ms    Unit    dBμV



Date:      7.MAY.2009    12:57:37



Delta 1 [T1]      RBW    10 kHz    RF Att    0 dB  
 Ref Lvl                    -0.77 dB    VBW    30 kHz  
 70 dBμV                    188.37675351 kHz    SWT    15 ms    Unit    dBμV



Date:      7.MAY.2009    12:59:30

***PEAK TRANSMIT EMI and BAND EDGE***

***DATA SHEETS***

Title: FCC 15.239

5/7/2009 11:22:31 AM

File: Final ETSI 15.239-2.set

Sequence: Final Measurements

Operator: Josh Hansen

EUT Type: TuneCast Auto (F8Z439)

EUT Condition: Song played: Linkin Park "Don't Stay" 0dB encode

Comments: Another iPod connected to USB to charger

Temp: 68F

Hum: 56%

Compatible Electronics, Inc. FAC-3

Freq (MHz)	(AVG) Margin (dB)	(AVG) EMI (dB $\mu$ V/m)	(PEAK) EMI (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Pol	Ttbl Agl (deg)	Twr Ht (cm)
88.10	-6.04	41.91	43.62	47.95	H	194.50	340.76
88.10	-3.55	44.40	46.52	47.95	V	212.25	151.52
98.10	-14.72	33.23	38.89	47.95	H	360.00	352.94
98.10	-6.86	41.09	42.49	47.95	V	53.75	151.70
107.90	-3.68	44.27	45.36	47.95	H	222.50	380.94
107.90	-7.73	40.22	46.20	47.95	V	360.00	151.29

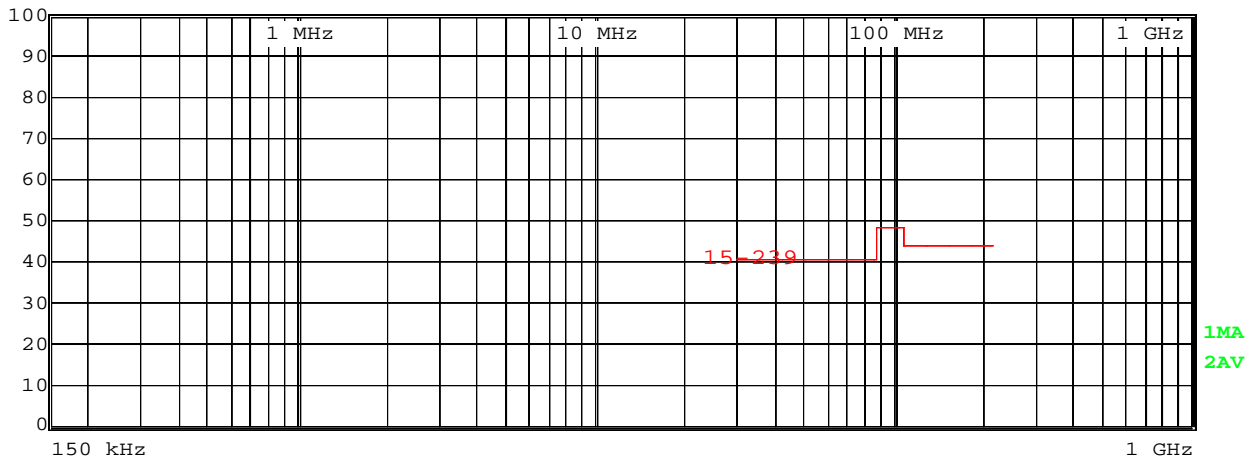
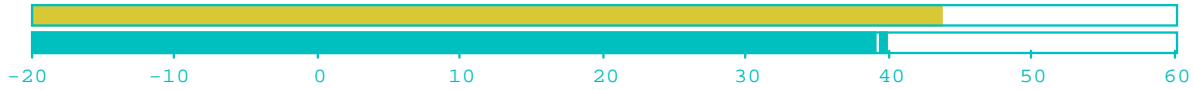




Att 10 dB AUTO  
 Preamp INPUT 1

Det	MA/QP	Trd	FAC
ResBW	120 kHz		
Meas T	100 ms	Unit	dBV

FREQUENCY	88.00000000 MHz		
LEVEL	PK+	43.51	dBV
	QPK	38.56	dBV



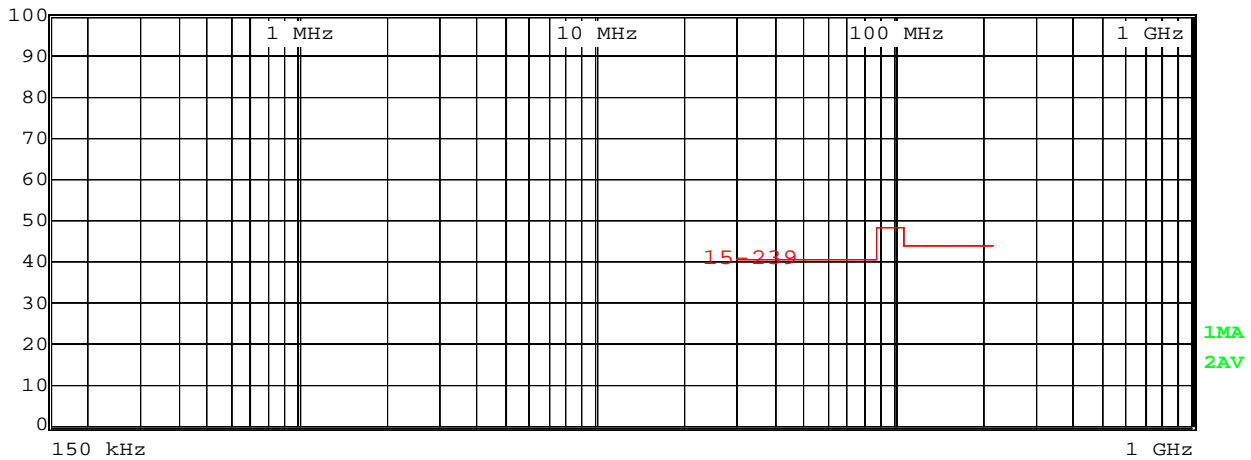
Date: 7.MAY.2009 12:51:17



Att 10 dB AUTO  
 Preamp INPUT 1

Det	MA/QP	Trd	FAC
ResBW	120 kHz		
Meas T	100 ms	Unit	dBV

FREQUENCY	108.0000000 MHz		
LEVEL	PK+	46.24	dBV
	QPK	42.44	dBV



Date: 7.MAY.2009 12:49:26