

REV	Δ	Description	Sheet Effected	Date	Drawn	Checked
A				22.06.05	D.Lanuel	S.Cohen

EMC Laboratory

IDEU 810-4

FCCID: LSQ-IDEU-810-4

Manufactured by
Elmotech Ltd.

EMC Test Report

According FCC Part 15 Requirements

May 2005

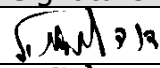
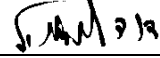

	Function/Title	Name	Signature	Date
Prepared by	Test Engineer	D.Lanuel		22.06.05
Checked by	Test Engineer	D.Lanuel		22.06.05
Approved by	EMC Lab. Manager	S.Cohen		22.06.05

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1 Introduction

a. Scope

This document describes the measurement procedures and tests for FCC part 15 of the IDEU 810-4 Manufactured by Elmotech Ltd.

Equipment Under Test:	IDEU-810-4
FCCID	LSQ-IDEU-810-4
Manufacturer:	Elmotech System Ltd.
Serial Numbers:	10150
Mode of Operation:	TX & STBY MODE
Receiver operating frequency:	433.92MHZ
Year of Manufacture:	2005

b. Applicant Information:

Applicant:	Elmotech System Ltd.
Applicant Address	2, Habarzel Street Tel-Aviv
Telephone:	+972-3-6478871
FAX:	+972-3-6478872
The testing was observed by:	LEV ROSMAN
Following applicant's personnel:	

c. Test Performance:

Date of reception for testing:	06.06.05
Dates of testing	06.06.05
Test Laboratory Location	TADIRAN EMC LAB, Hashoftim 26 Holon 5810-42 ISRAEL Tel: 972-3-5574476 Fax: 972-3-5575320

Applicable EMC Specification:	Federal Communication Commission (FCC), Code of Federal Regulations 47, FCC Docket 89-103,Part 15: Radio Frequency Devices, Sections 15.109, 15.209,15.107, 15.207 & 15.231.
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Applicable EMC Specification:	Federal Communication Commission (FCC), FCC Part 15: Radio Frequency Devices, Sections 15.109, 15.209 & 15.231.15.207
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2 Test Summary and Signatures.

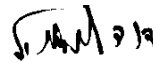
TADIRAN EMC Laboratory has completed testing of E.U.T in accordance with the requirements of the FCC Part 15 Regulations for Class B equipment.

The E.U.T was found to comply with the requirements of the FCC Part 15 Regulations given below

Test	Test Description	Section	PASS/FAIL
1	Bandwidth of the emission	15.231	PASS
2	Field strength of fundamental	15.231	PASS
3	Radiation emission	15.109	PASS
4	Radiation emission	15.231 & 15.205	PASS
5	Conducted emission	15.207	PASS

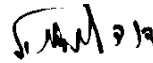
a. **Test performed by:**

Mr. D. Lanuel Test Engineer



b. **Test Report prepared by:**

Mr. D. Lanuel Test Engineer



c. **Test Report Approved by:**

Mr. Samuel Cohen EMC Lab. Manager



3 E.U.T information

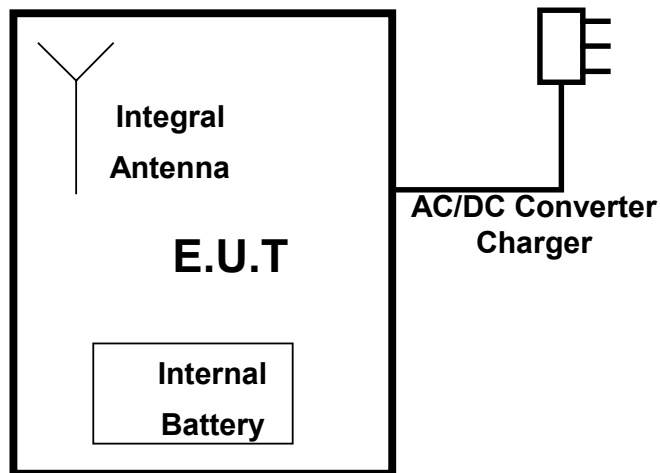
a. E.U.T description

The EUT, Wireless Monitoring Unit (iDEU-810-4), is a wall mounted microprocessor transceiver, operating at 433.92MHz. It is a part of wandering prevention system. The iDEU extends the reception range of an electronic monitoring receiver by receiving and re-transmitting data. It utilized single antenna.

The EUT powered from mains via AC/DC adapter 7.5V and includes a 3.6V back-up battery.

b. E.U.T Test Configuration

E.U.T. Test configuration is shown in figure bellow



c. E.U.T Mode of Operation description

- (1) 433.92MHz TX Mode
- (2) STBY Mode

4 BANDWIDTH OF THE EMISSION part 15.231.c—TEST RESULTS

E.U.T: IDEU 810-4 S/N 10150
 Test Method: ANSI C63.4
 Date: 06/06/05
 Relative Humidity: 37%
 Ambient Temperature: 22c
 Air Pressure: 1042hpa
 Test Setup: Figure 1

Testing Engineer: D.Lanuel *[Signature]* **Date** 06/06/05

a. Test Results Summary & Conclusions

The E.U.T was found in compliance with Bandwidth of Radiated Emission fundamental frequency requirement according to section 15.231.c

b. Limits of bandwidth

The test unit shall meet the limits of Table 1

Table- 1 Limits For Bandwidth

Frequency (MHz)	Bandwidth Max Limits (%)	Bandwidth Max Limits (KHz)
433.92.01000	0.25	1085

c. Test Instrumentation and Equipment

Table- 2 Test Instrumentation and Equipment

Item	Model	Manufacturer	Next Date Calibration
Spectrum Analyzer	8593E	HP	31/01/06
Broadband Antenna	BTA-L	FRANKONIA	10.04.06

d. Results

Table- 3 Bandwidth Test Result

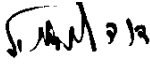
Frequency (MHz)	Bandwidth (KHz)	Bandwidth Max Limit (KHz)	Plot No	PASS/FAIL
433.92.00	227.5	1085	1	PASS

e. Procedure

The Bandwidth is determined at the point 20db down from the modulated carrier, while the spectrum analyzer was set to "max hold" and VBW –10KHz.

5 Field strength of fundamental part 15.231-TEST RESULTS

E.U.T: IDEU 810-4 S/N 10150
 Test Method: ANSI C63.4
 Date: 06/06/05
 Relative Humidity: 37%
 Ambient Temperature: 22c
 Air Pressure: 1042hpa
 Test Setup: Figure 1

Testing Engineer: D.Lanuel  **Date** 06/06/05

a. Test Results Summary & Conclusions

The E.U.T was found in compliance with fundamental frequency requirement

b. Limits of Field Strength for fundamental according 15.231

The test unit shall meet the limits of Table 4.

Table- 4 Limits For Fundamental

Frequency (MHz)	Average Max Limits (dB μ V/m)	Peak Max Limits (dB μ V/m)
433.92.01000	81	100.8

c. Test Instrumentation and Equipment

Table- 5 Test Instrumentation and Equipment

Item	Model	Manufacturer	Next Date Calibration
Spectrum Analyzer	8593E	HP	31/01/06
Broadband Antenna	BTA-L	FRANKONIA	10.04.06

d. Test Results
Table- 6 Average Factor

TX Period (min)	Duty Cycle (min)	Average Factor (db)	Plots Reference
5ms	$5/100=0.05$	$20\log 0.05=-26$	17, 18

Table- 7 Peak Result of Fundamental

Frequency (MHz)	Peak Result (dB μ V/m)	Peak Limits (dB μ V/m)	Margin (dB)	Plot No	Pass/ Fail
433.92.02	99.1	100.8	1.7	Plot-2	PASS

Table- 8 Average Result of Fundamental

Peak Result (dB μ V/m)	Average Factor	Calculation Results	Average Limits (dB μ V/m)	Margin (dB)	Pass/ Fail
99.1	-26	73.1	81	7.9	PASS


e. Test Procedure

The EUT was placed on the top of rotating table 0.8 meters above the ground and the table was rotated 360°, the height of antenna is varied from one to 4 meters (vertical and horizontal polarization) to determine the max field strength of fundamental

6 Radiated emission part 15.231 & 15.205-test results

E.U.T: IDEU 810-4 S/N 10150
 Test Method: ANSI C63.4
 Date: 06/06/05
 Relative Humidity: 37%
 Ambient Temperature: 22c
 Air Pressure: 1042hpa
 Test Setup: Figure 1

Testing Engineer: D.Lanuel



Date 06/06/05

a. Test Results Summary & Conclusions

The E.U.T was found in compliance with 15.231

b. Limits of Radiated Interference Field Strength according 15.231

The test unit shall meet the limits of Table 9.

Table- 9 Limits For 15.231(b)

Frequency range (MHz)	Average Limits (dB μ V/m)	Peak Limits (dB μ V/m)
0.009 – 4000	61	81

c. Test Instrumentation and Equipment

Table- 10 Test Instrumentation and Equipment

Item	Model	Manufacturer	Next Date Calibration
Spectrum Analyzer	8593E	HP	31/01/06
Rode Antenna (10KHz-30MHz)	95010-1	ETN	13.11.06
Double Ridge Guide Antenna (1-18GHz)	3105	EMCO	24.04.06
Broadband Antenna	BTA-L	FRANKONIA	10.04.06
Low Noise Amplifier (0-1GHz)	AM-1300-N	MITEQ	14.01.06
Low Noise Amplifier (1-2GHz)	SMC-09	MITEQ	14.01.06
Low Noise Amplifier (2-6GHz)	SMC-09	MITEQ	14.01.06

d. **Preliminary Results**

Table- 11 **Preliminary Test Results for intentional Emissions in TX Mode 15.231**

Antenna Polarization	Freq. Range MHz	Res. BW (kHz)	Plot No.	Pass/Fail
Vertical	0.009 – 0.15	0.2	Plot-3	Pass
Horizontal			Plot-4	Pass
Vertical	0.15 - 30	9	Plot-5	Pass
Horizontal			Plot-6	Pass
Both Hor.& Ver	30-1000	120	Plot-7	Pass
	1,000-2.800	1000	Plot-8	Pass
	2.800-4,400	1000	Plot-9	Pass

e. **Final Results**

Table- 12 Six Highest Peak Emission Test Results

Freq. (MHz)	Peak Reading (*) (dB μ V/m)	Limit dB μ V/m	Margin (dB)	Pass/Fail
The Emission are at least 20db below the limit				

f. Test Procedure**(1) Preliminary Test Procedure**

- a) The EUT was placed on the top of a rotating table 0.8 meters above the ground at a chamber shielded
- b) The E.U.T was set 3 meters away from the receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c) The Antenna height varied from one meter above the ground over its full-allowed range of travel and the table was rotated 360° to determine the maximum value of the field strength
- d) The antenna was set both horizontal and vertical polarization.

(2) Final Test Procedure

- a) The EUT was tested at open area for each suspected emission
- b) The test procedure was performed according paragraph (1) and figure 11

g. **Final Test Setup**

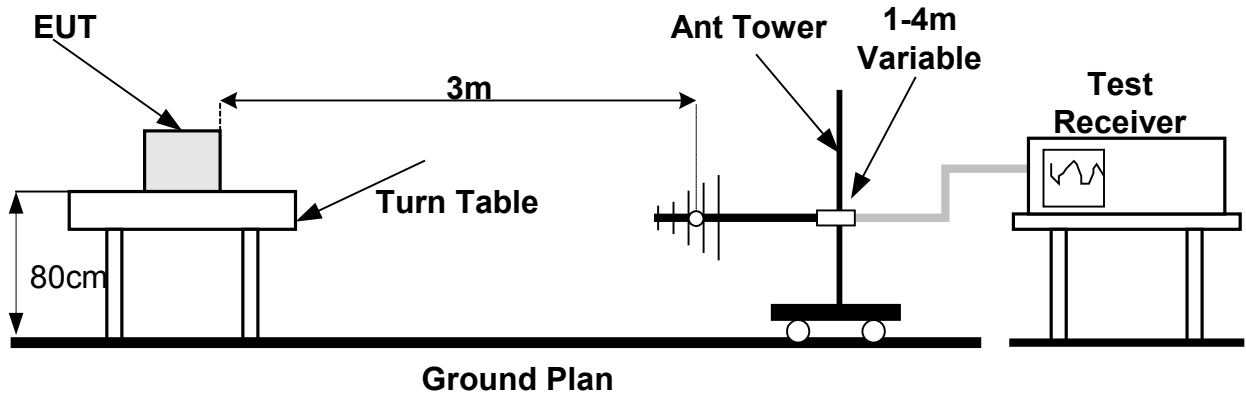


Figure 1 Radiated Emission Set up

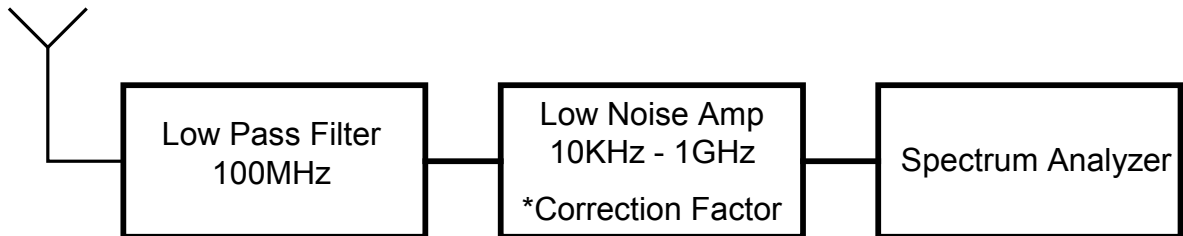


Figure 2 Radiated Emission test 10KHz – 30MHz

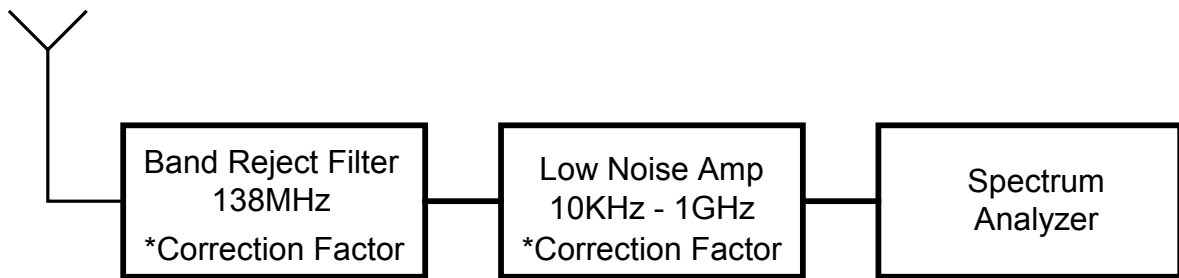


Figure 3 Radiated Emission test 30MHz – 1GHz

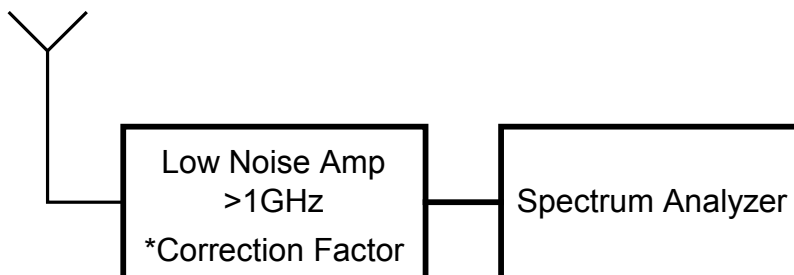
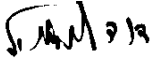


Figure 4 Radiated Emission test above 1GHz

7 Radiated emission part 15.109-test results (for STBY mode).

a. Preliminary Radiated emission Test Result According Part 15.109

E.U.T: IDEU 810-4 S/N 10150
 Test Method: ANSI C63.4
 Date: 06/06/05
 Relative Humidity: 37%
 Ambient Temperature: 22c
 Air Pressure: 1042hpa
 Test Setup: Figure 1

Testing Engineer: D.Lanuel  **Date** 06/06/05

b. Test Results Summary & Conclusions
The E.U.T was found in compliance with 15.109

c. Limits of Radiated Interference Field Strength according 15.109
 The test unit shall meet the limits of Table 14 for Class B equipment.

Table- 13 Limits For 15.109 Class B equipment

Frequency Range (MHz)	Quasi-peak Limits (dB μ V/m)
30 - 88	40
88 - 216	43
216 - 960	46
960 - 2000	54

d. **Test Instrumentation and Equipment**

Table- 14 Test Instrumentation and Equipment

Item	Model	Manufacturer	Next Date Calibration
Spectrum Analyzer	8593E	HP	31/01/06
Double Ridge Guide Antenna (1-18GHz)	3105	EMCO	24.04.06
Broadband Antenna (30-1000MHz)	BTA-L	FRANKONIA	10.04.06
Low Noise Amplifier (0-1GHz)	AM-1300-N	MITEQ	14.01.06
Low Noise Amplifier (1-2GHz)	SMC-09	MITEQ	14.01.06
Low Noise Amplifier (2-6GHz)	SMC-09	MITEQ	14.01.06

e. **Results**

(1) **Preliminary Test Results**

Table- 15 **Preliminary Test Results for Unintentional Emissions in RX Mode 15.109**

Antenna Polarization	Freq. Range MHz	Res. BW (kHz)	Plot No.	PASS/F AIL
Both	30-1000	120	Plot-10	Pass
	1000-2.800	120	Plot-11	Pass
	2,800-4,400	1000	Plot-12	Pass

(2) **Final Test Results**

Table- 16 Six Highest RX Mode 15.109

Freq. (MHz)	Q peak Reading (*) (dB μ V/m)	Limit dB μ V/m	Margin (dB)	Polarity Ver/Hor	Height (m)
433.92	36	46	10		
2710	45.4	54	8.6		

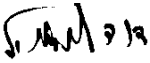
f. **Test Procedure**

See paragraph 7.f

8 Conducted Emission, AC Power Leads According to FCC 15.107

Frequency Range: 150 kHz – 30 MHz

E.U.T: IDEU 810-4 S/N 10150
 Test Method: ANSI C63.4
 Date: 06/06/05
 Relative Humidity: 37%
 Ambient Temperature: 22c
 Air Pressure: 1042hpa
 Test Setup: Figure 5

Testing Engineer: D.Lanuel  Date: 06/06/05

a. Test Results Summary & Conclusions

The LSQ-LPU-800 complies with FCC, Part 15.107 conducted emissions requirement.

b. Limits of Conducted Emission at Mains Terminals

The test unit shall meet the limits of Table CE-1 for FCC Part 15 Para 15.107 equipment.

Table- 17 **Limits for intentional radiator according 15.107**

Frequency Range MHz	Quasi-peak Limits dB μ V
0.15 – 0.50	66 to 56*
0.50 - 5	56
5 - 30	60

*Decreases with the logarithm of the frequency

c. Test Instrumentation and Equipment

Table- 18 – **Test Instrumentation and Equipment**

Item	Model	Manufacturer	Next Date Calibration
Spectrum Analyzer	8593E	HP	31/01/06
Signal Generator	2017	Marconi	21/06/05
LISN	FCC-LISN-3B	FISCHER	31/08/06

d. Results

Table- 19 Test Results 15.207

Lead P/N	Mode of Operation	Frequency Range (MHz)	Resolution BW (kHz)	Plot No.	Comply. Y/N
Neutral	TX	0.15 – 30	9	Plot 13	Y
Phase			9	Plot 14	Y
Neutral	RX	0.15 – 30	9	Plot 15	Y
Phase			9	Plot 16	Y

Table- 20 Six Highest Emission Test Results

Freq. (MHz)	Quasi Peak Reading (*) (dB μ V/m)	Limit dB μ V/m	Margin (dB)	Pass/Fail
The Emission are at least 10db below the limit				

e. Test Procedure

- a) The EUT was placed on the top of table 1m by 1.5m, raised 0.8 meters above the conducting ground plane
- b) The rear panel of the EUT was located 40cm to the vertical wall of the screen room
- c) Each EUT power leads were individually connected through an LISN to the input power source. Unused 50 ohm connector of the LISN was terminated in 50ohm and other was connected to the spectrum analyzer through 20db attenuator for maximum conducted interference

f. Test setup

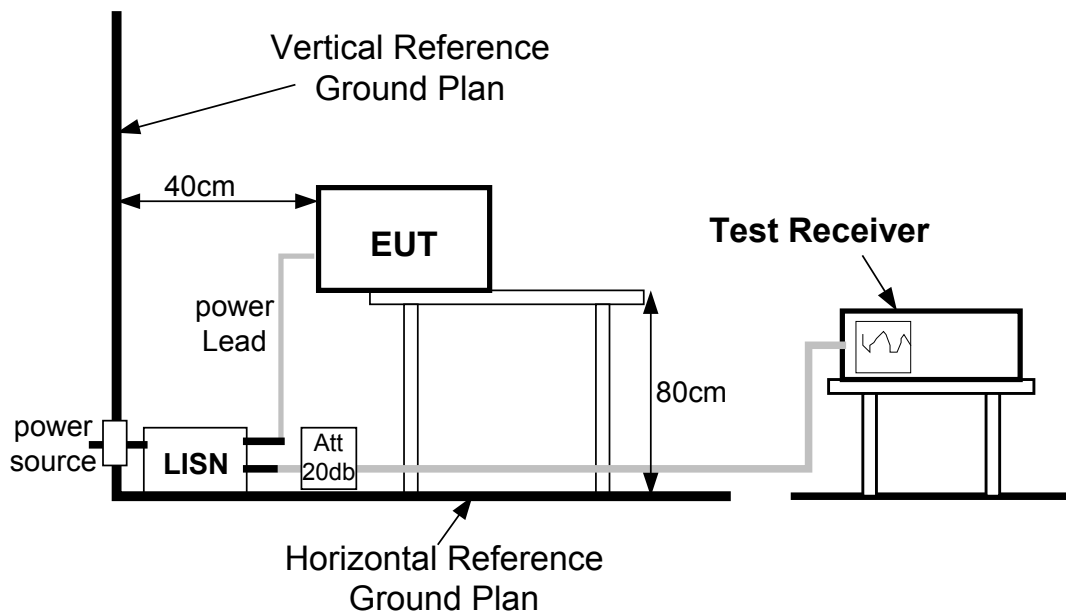


Figure 5 Conducted emission Test Configuration

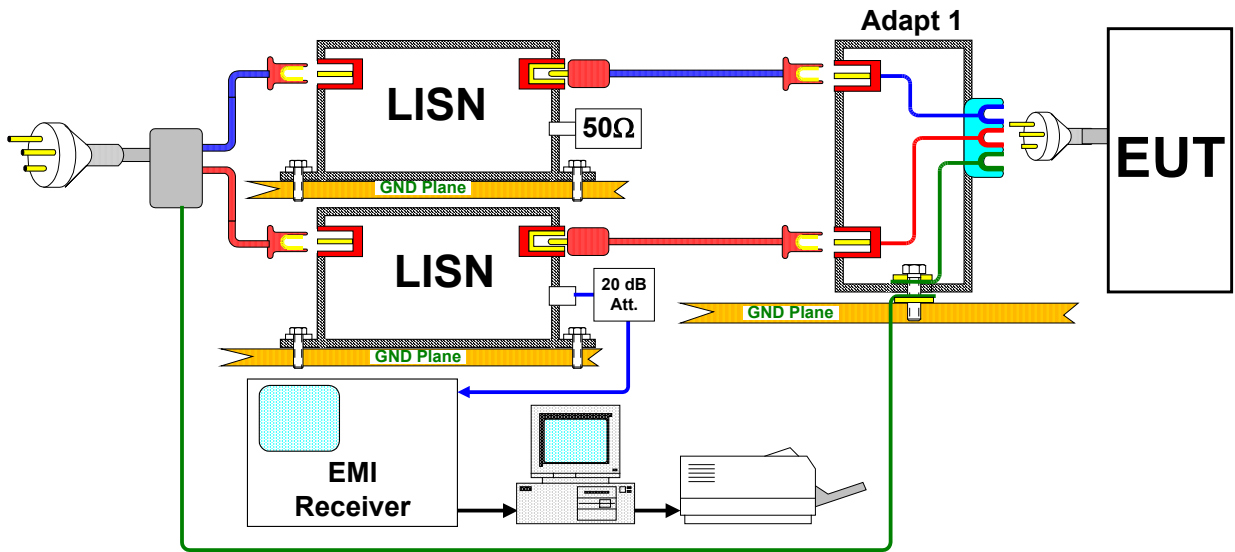
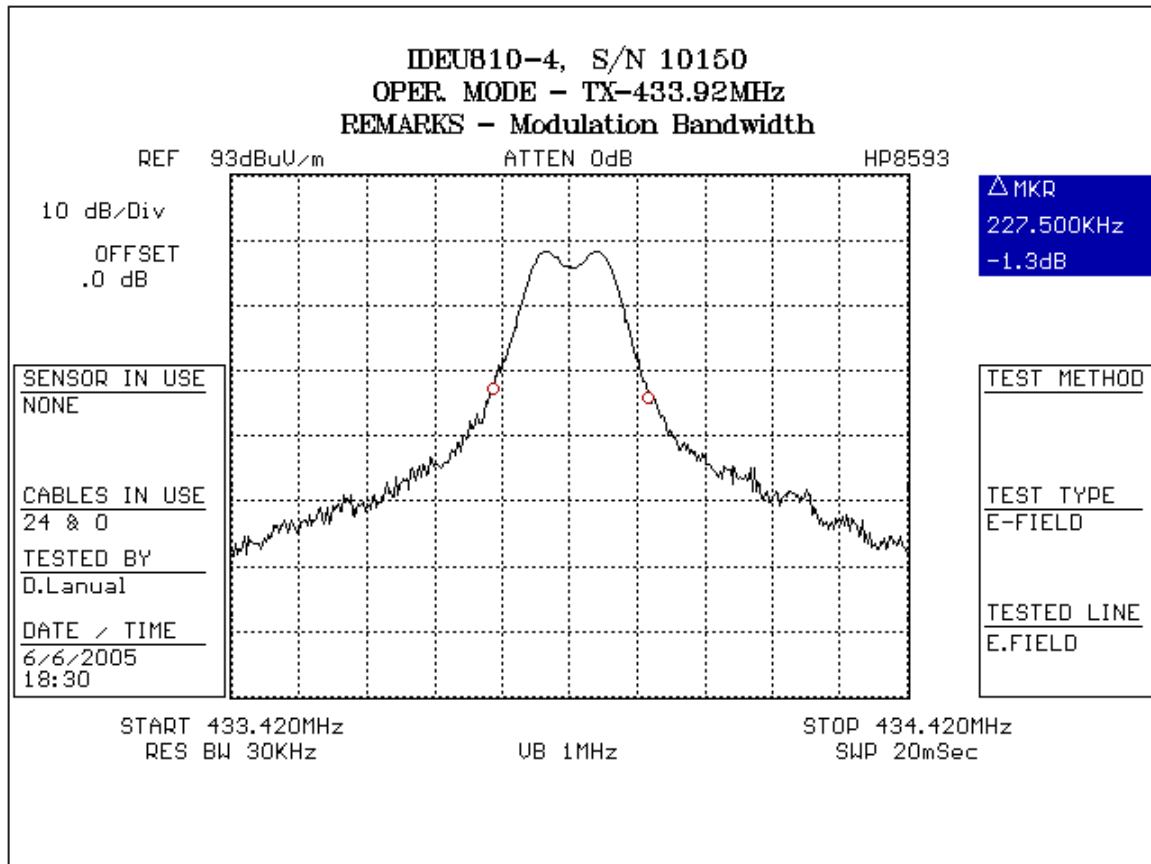


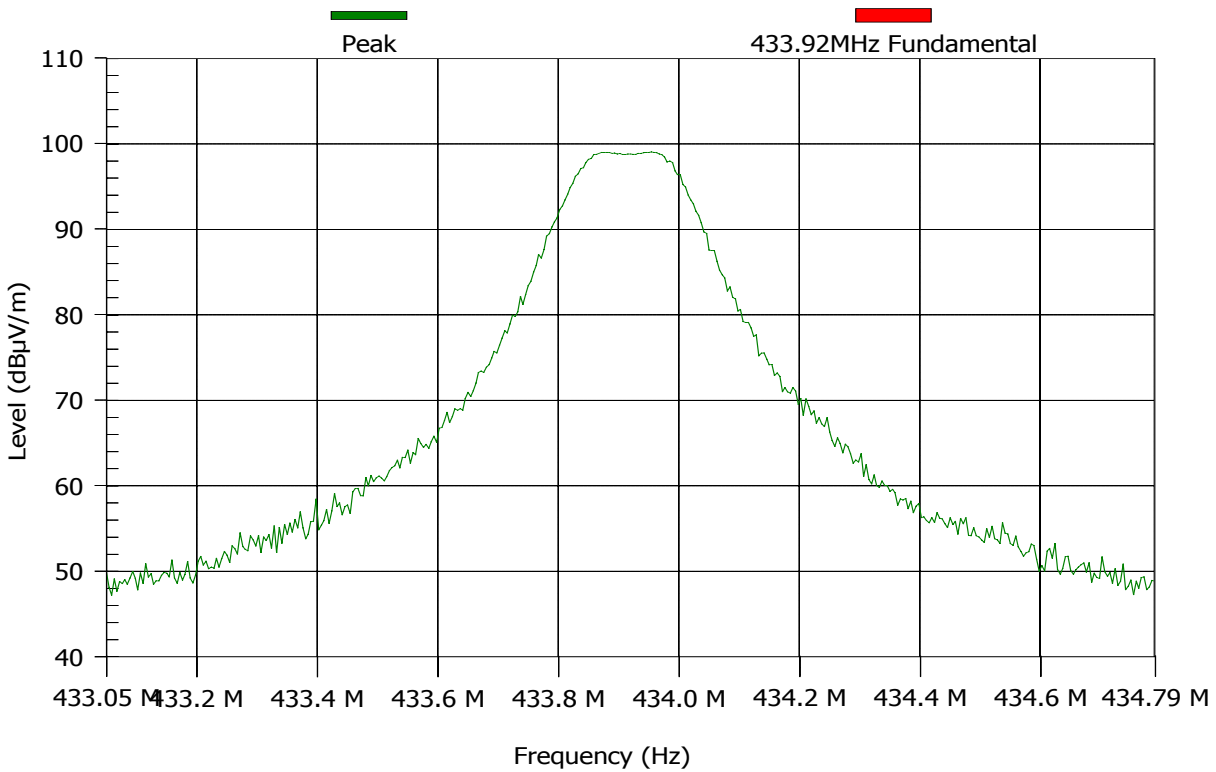
Figure 6 Conducted emission Test setup

9 Plots

Plot/ 1 Modulation Bandwidth



Plot/ 2 Field Strength of Fundamental



TEST REMARKS:06-06-2005

ID=10150

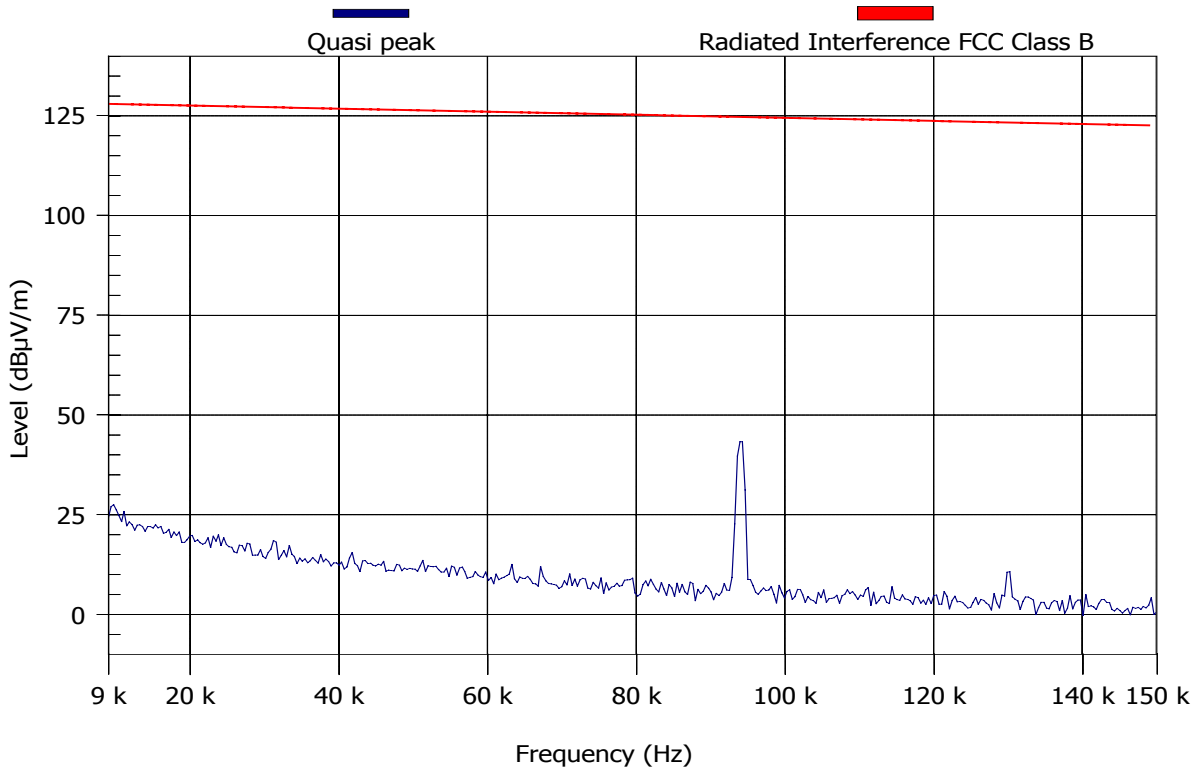
F=433.92MHz

MAXIMUM RESULT DEVIATION:

Detect all peaks above 6 dB below the limit line with a maximum of 6 peaks.

Nr	Frequency (MHz)	PK MaxHold (dBµV/m)	PK Limit (dBµV/m)	Result	Angle (degrees)	Height (m)	H/V
1	433.961	99.1	100.8	Pass	60	1.6	V

Plot/ 3 Radiated Emission Part 231



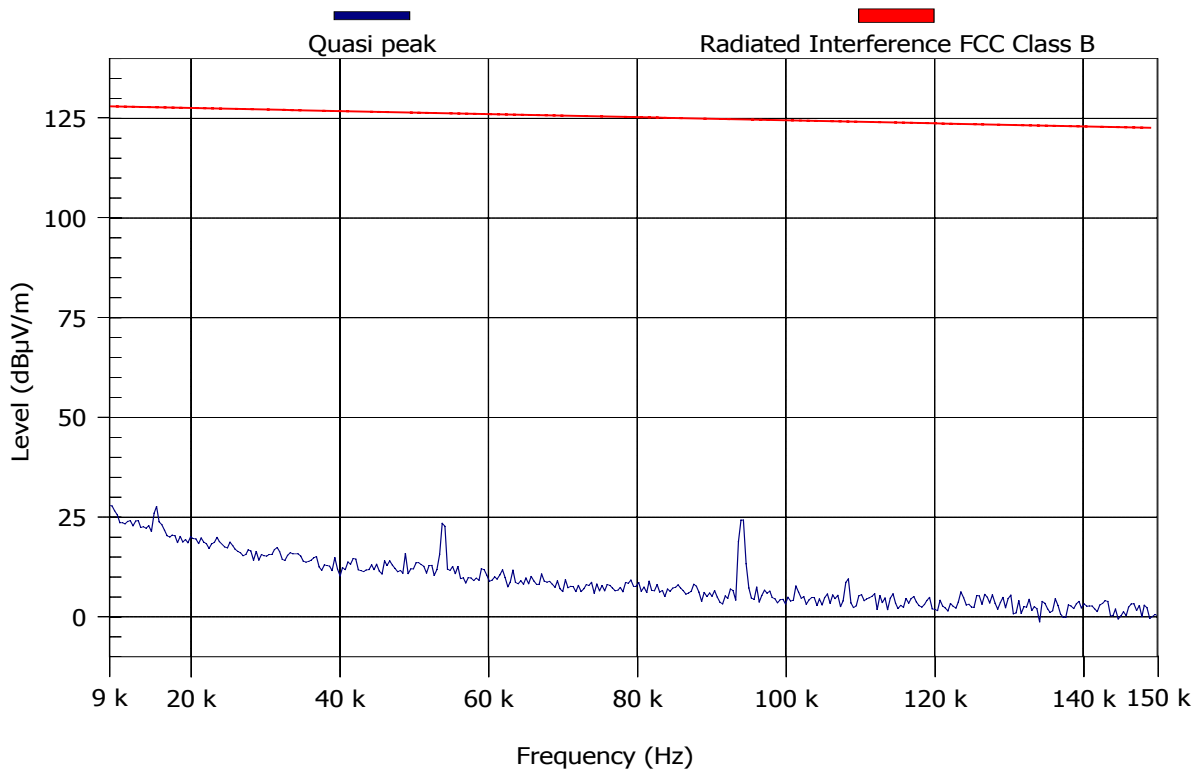
TEST REMARKS:06-06-2005

ID=10150

F=433.92MHz

Vertical Antenna

Plot/ 4 Radiated Emission Part 231



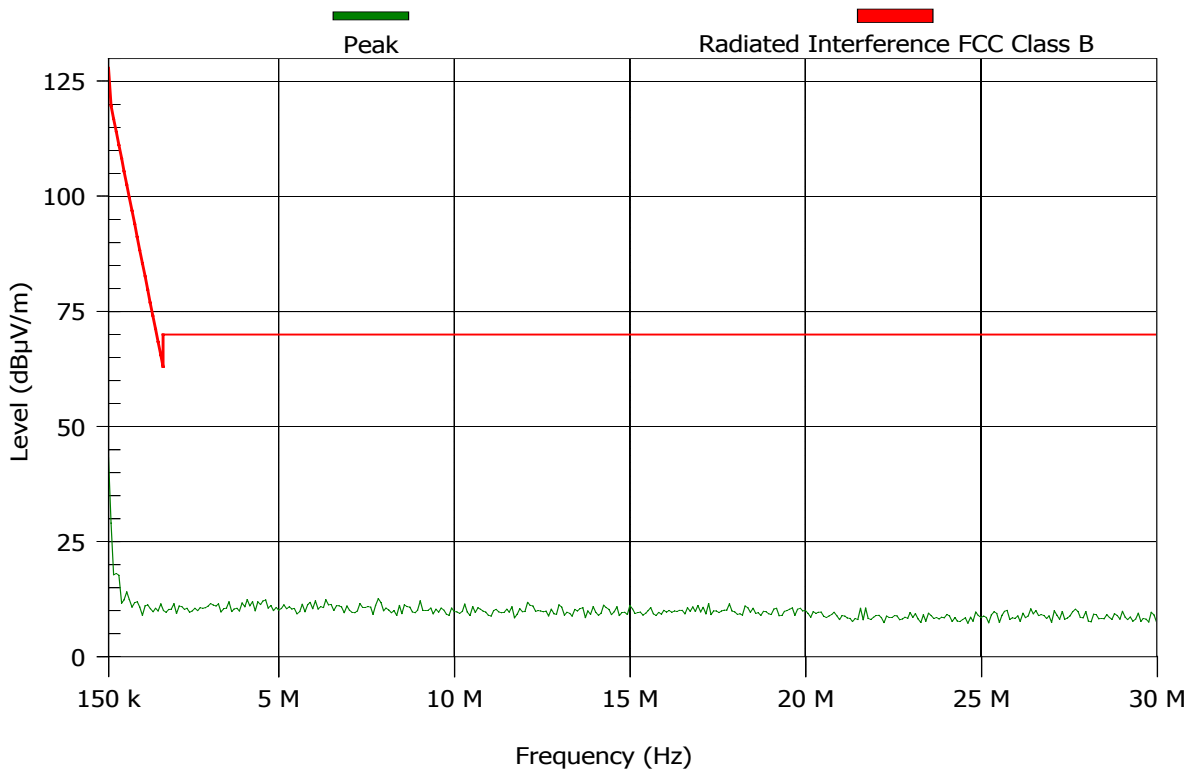
TEST REMARKS:06-06-2005

ID=10150

F=433.92MHz

Horizontal Antenna

Plot/ 5 Radiated Emission Part 231



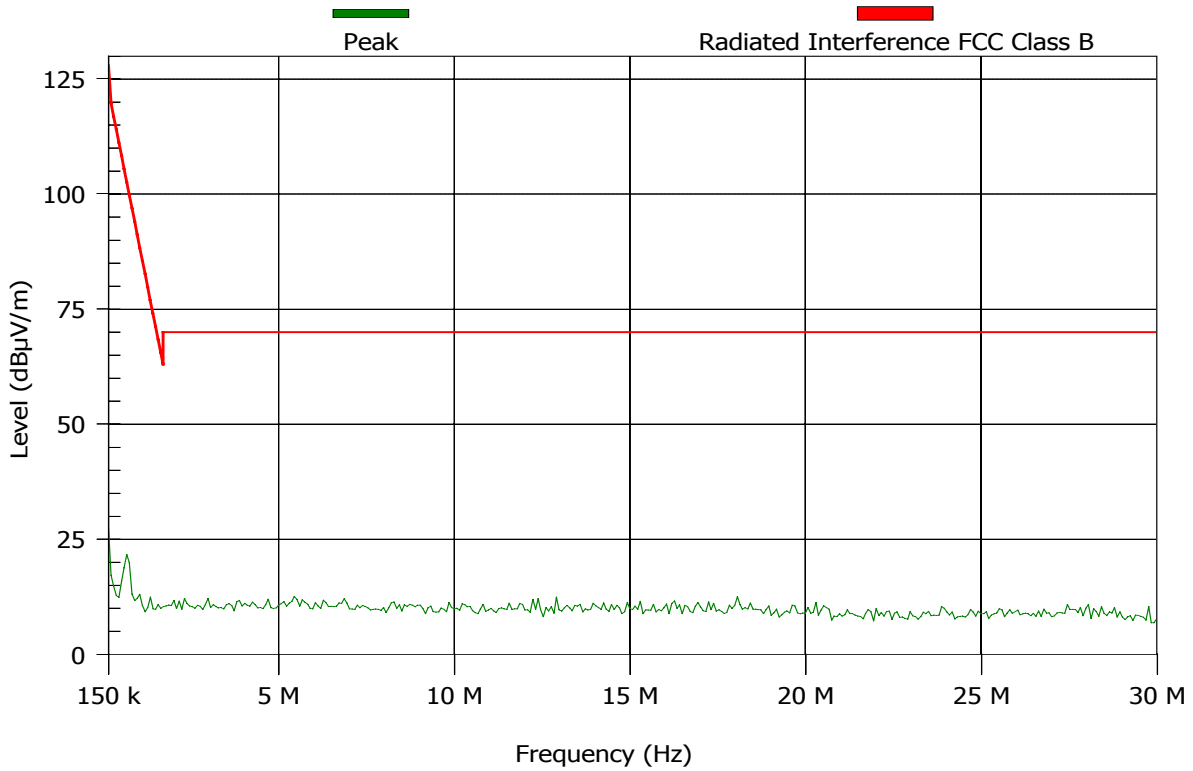
TEST REMARKS:06-06-2005

ID=10150

F=433.92MHz

Vertical Antenna

Plot/ 6 Radiated Emission Part 231

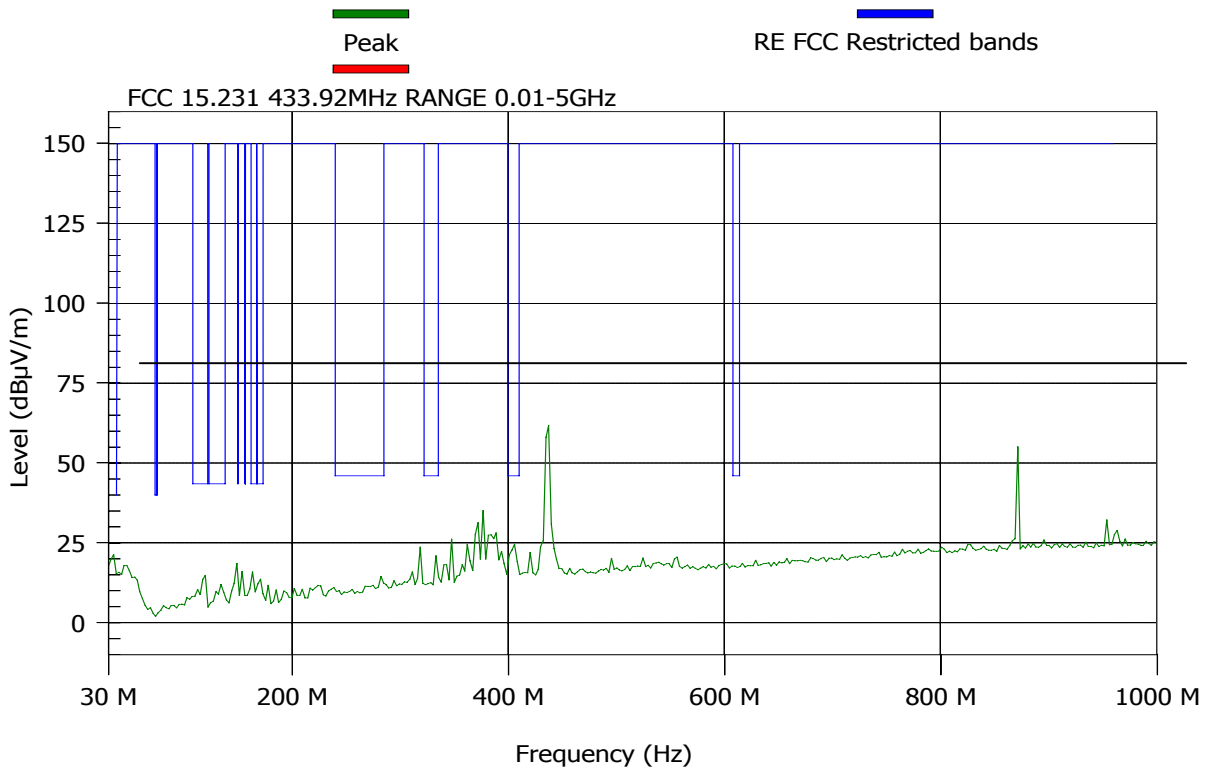


TEST REMARKS:06-06-2005

Frequency (Hz)
ID=10150 F=433.92MHz

Horizontal Antenna

Plot/ 7 Radiated Emission Part 231

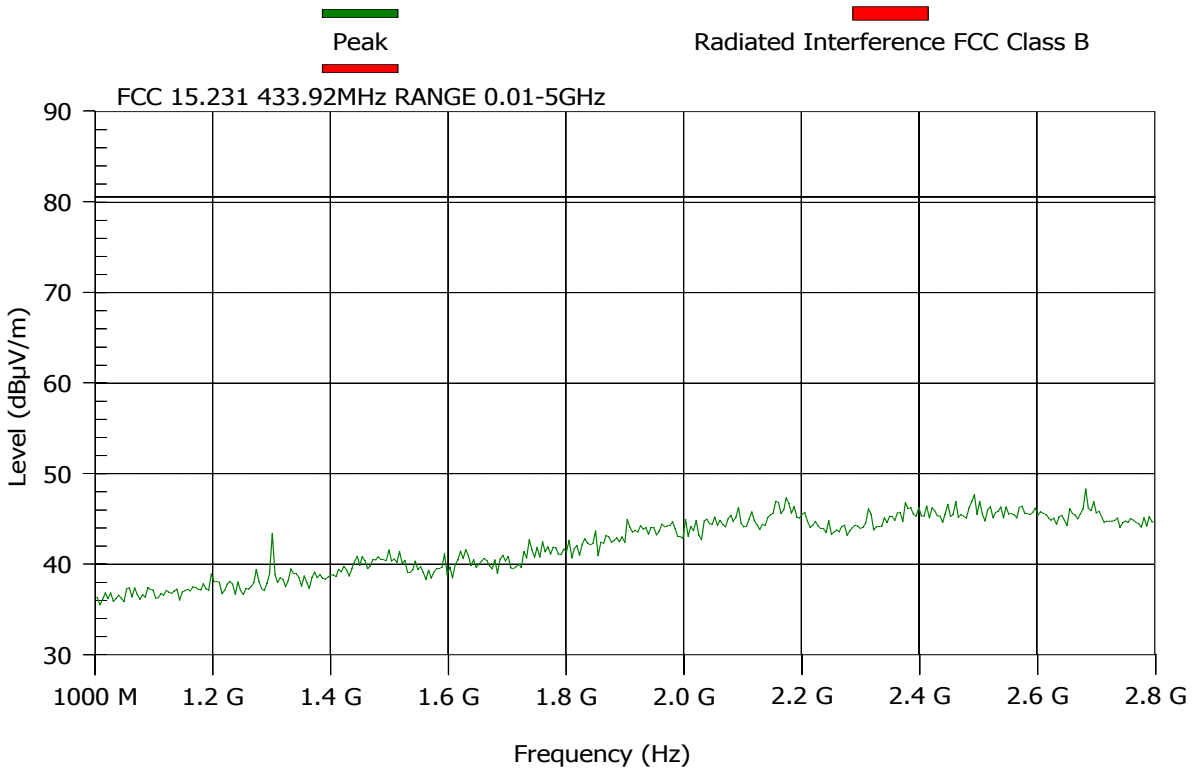


TEST REMARKS:06-06-2005

ID=10150

F=433.92MHz

Plot/ 8 Radiated Emission Part 231



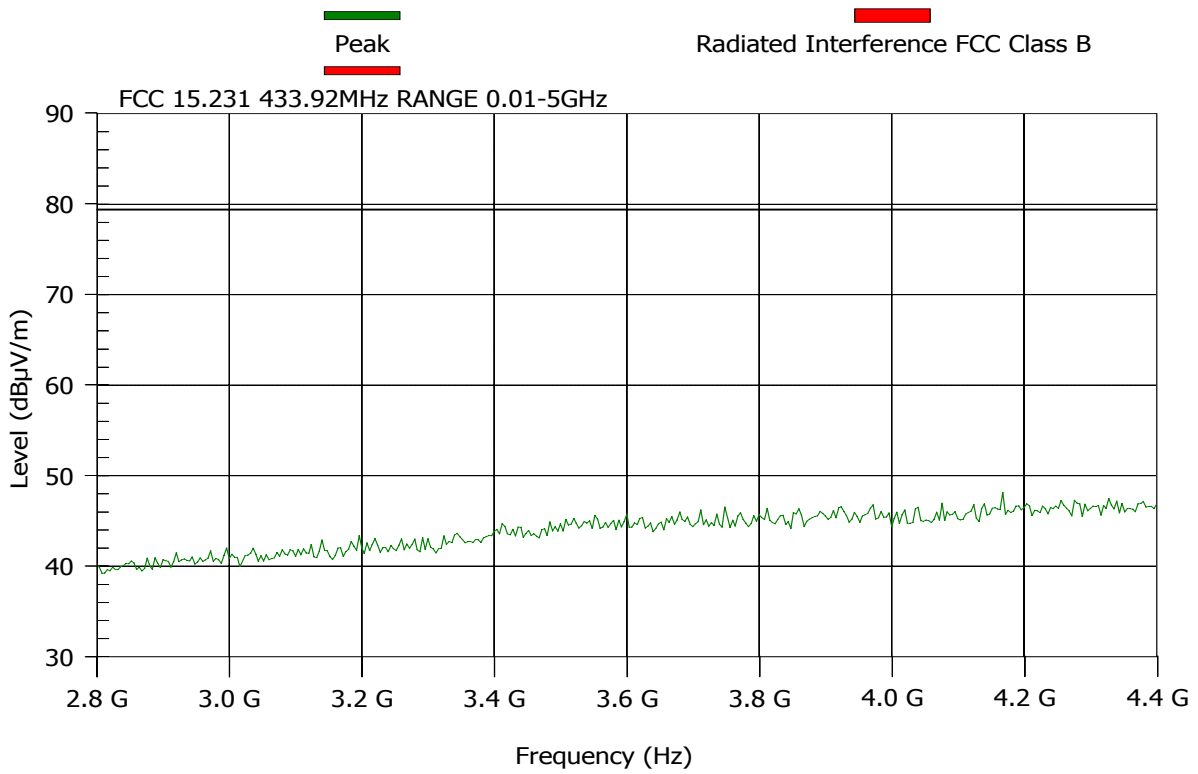
TEST REMARKS:06-06-2005
ID=10150
F=433.92MHz

MAXIMUM RESULT DEVIATION:

Detect all peaks above 6 dB below the limit line with a maximum of 6 peaks.

Nr	Frequency (MHz)	PK MaxHold (dBµV/m)	PK Limit (dBµV/m)	Result	Angle (degrees)	Height (m)	H/V
1	2683	46.9	80		60	1	H

Plot/ 9 Radiated Emission Part 231



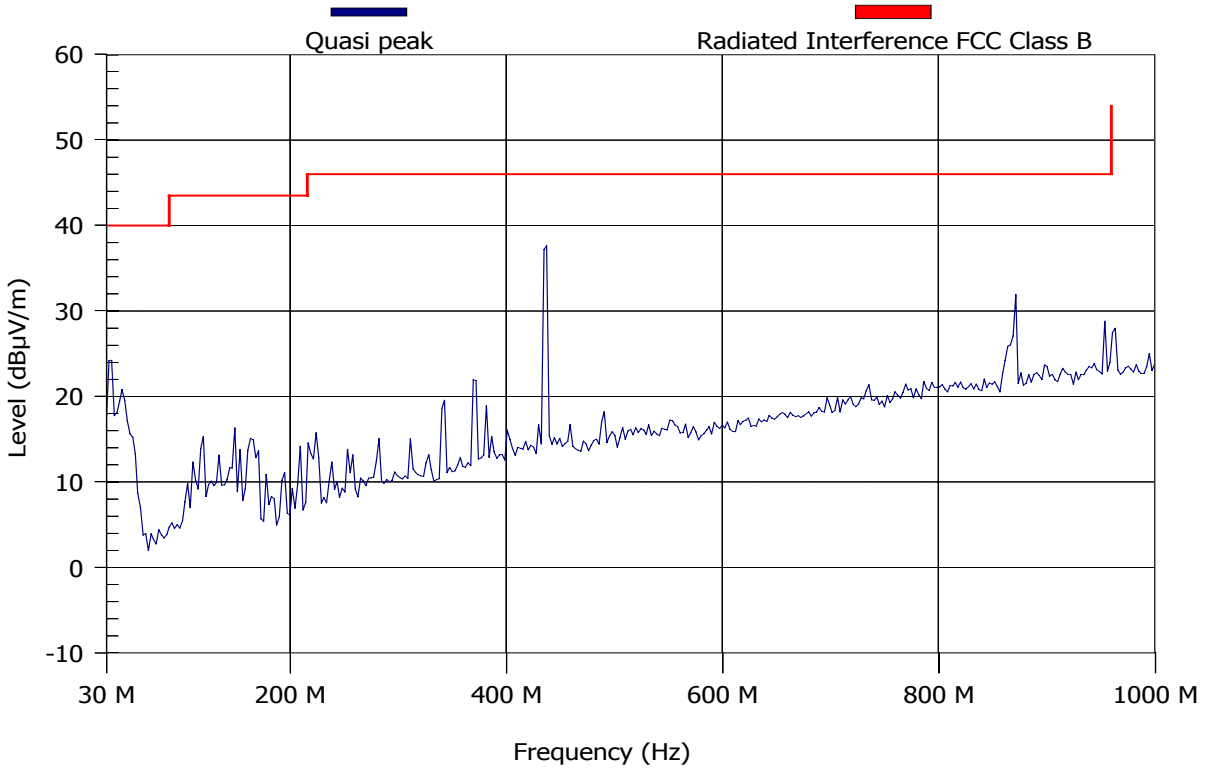
TEST REMARKS:06-06-2005

ID=10150

F=433.92MHz

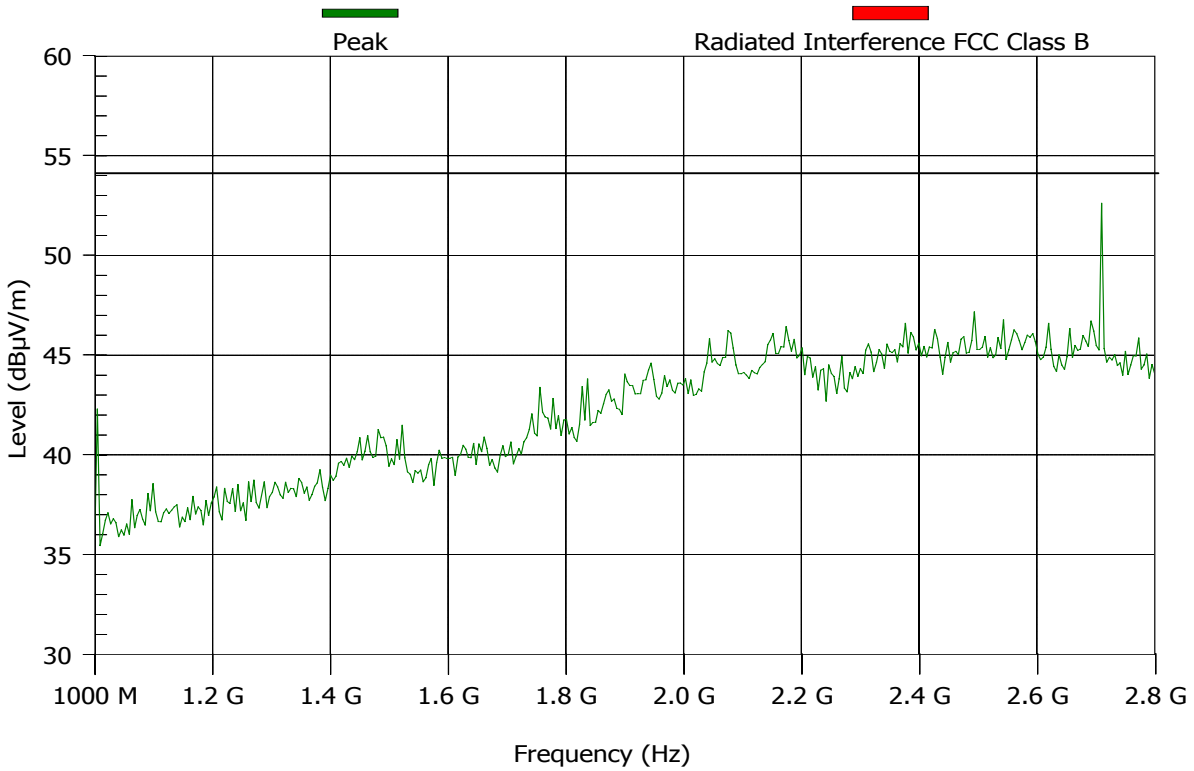
Plot/ 10 Radiated Emission Part 109

FCC 30-1000MHz STBY AC-DC



TEST REMARKS:06-06-2005
ID=10150
F=433.92MHz

Plot/ 11 Radiated Emission Part 109



TEST REMARKS:06-06-2005

ID=10150

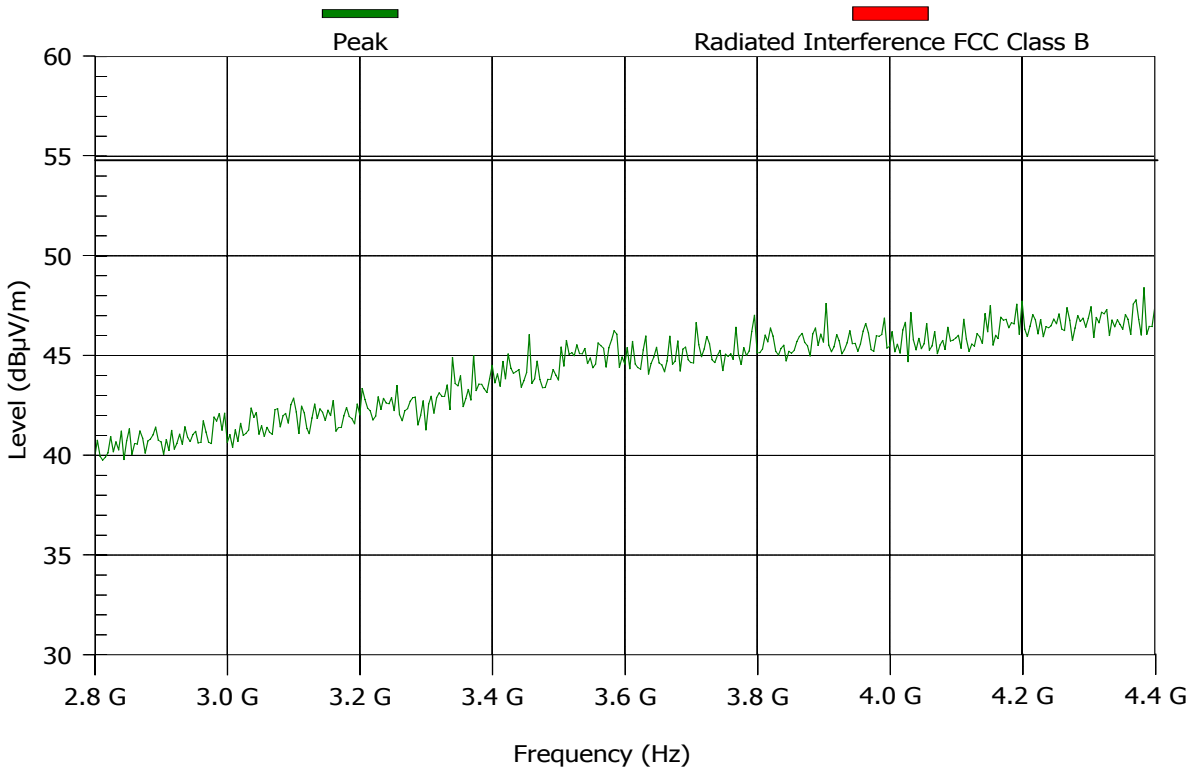
F=433.92MHz

MAXIMUM RESULT DEVIATION:

Detect all peaks above 6 dB below the limit line with a maximum of 6 peaks.

Nr	Frequency (MHz)	PK MaxHold (dBµV/m)	Result	Angle (degrees)	Height (m)	H/V
1	2710	45.4		180	1.6	V

Plot/ 12 Radiated Emission Part 109



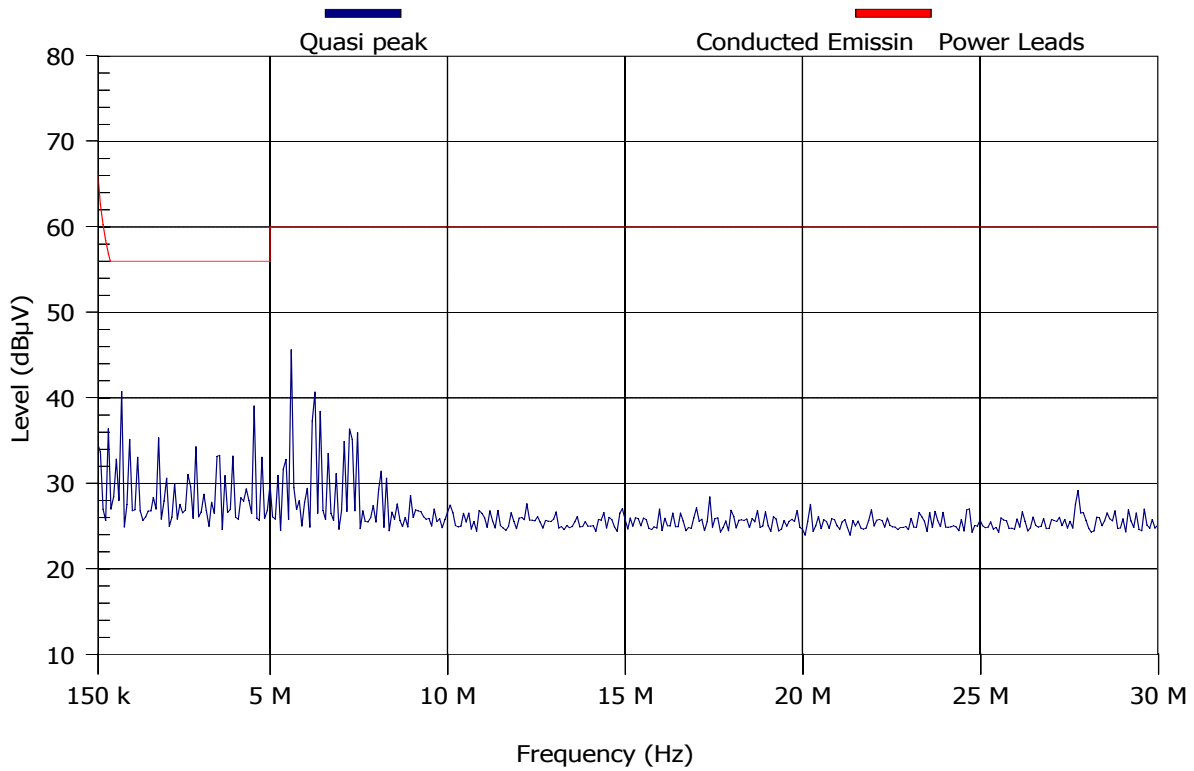
TEST REMARKS:06-06-2005
ID=10150
F=433.92MHz

MAXIMUM RESULT DEVIATION:

Detect all peaks above 6 dB below the limit line with a maximum of 6 peaks.

Nr	Frequency (MHz)	PK MaxHold (dBµV/m)	Result	Angle (degrees)	Height (m)	H/V
1	4384	48.3		300	1	H

Plot/ 13 Conducted Emission TX Mode-Neutral Line

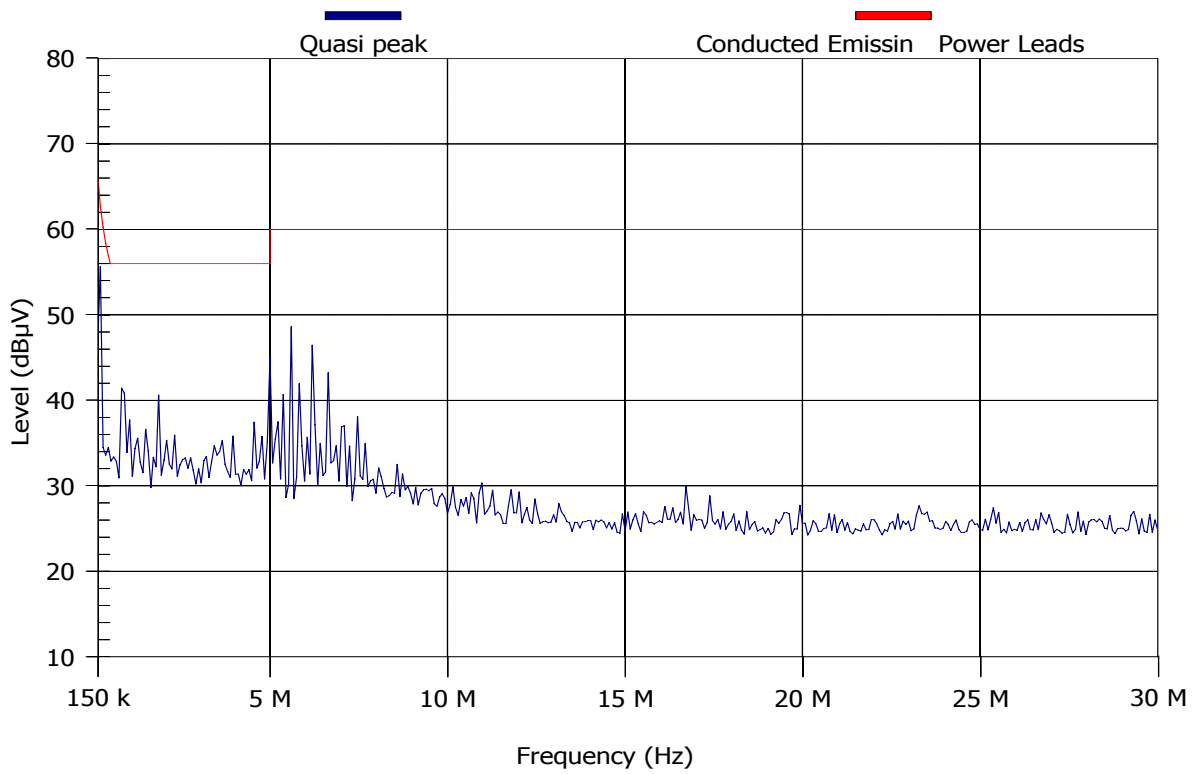


TEST REMARKS:06-06-2005

ID=10150

F=433.92MHz

Plot/ 14 Conducted Emission TX Mode-Phase Line

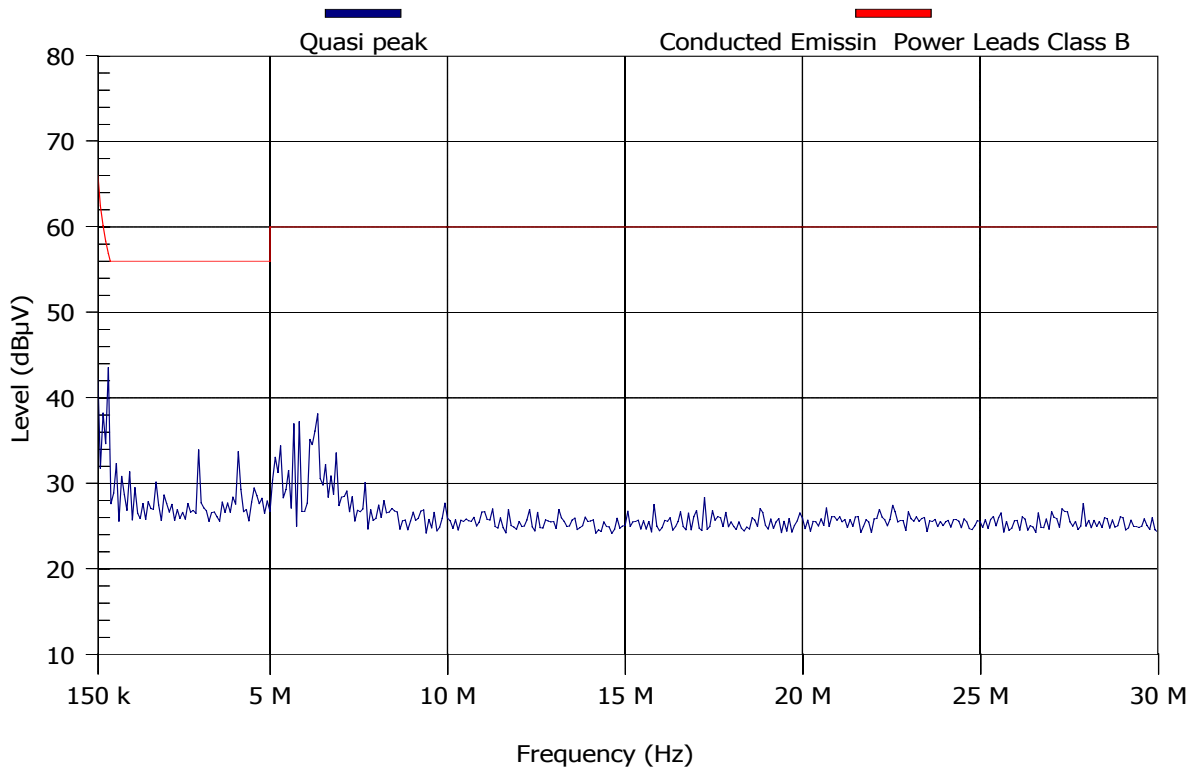


TEST REMARKS:06-06-2005

ID=10150

F=433.92MHz

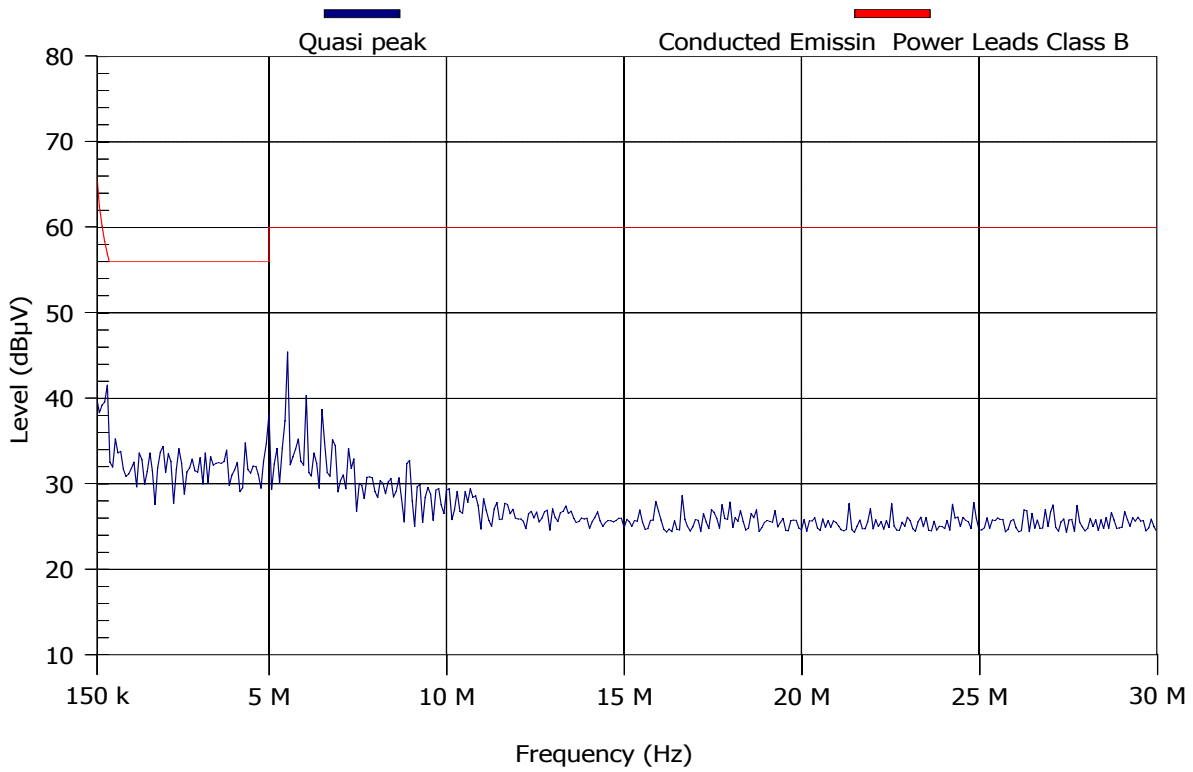
Plot/ 15 Conducted Emission RX Mode-Neutral Line



TEST REMARKS:06-06-2005

Frequency (Hz)
ID=10151 F=418MHz

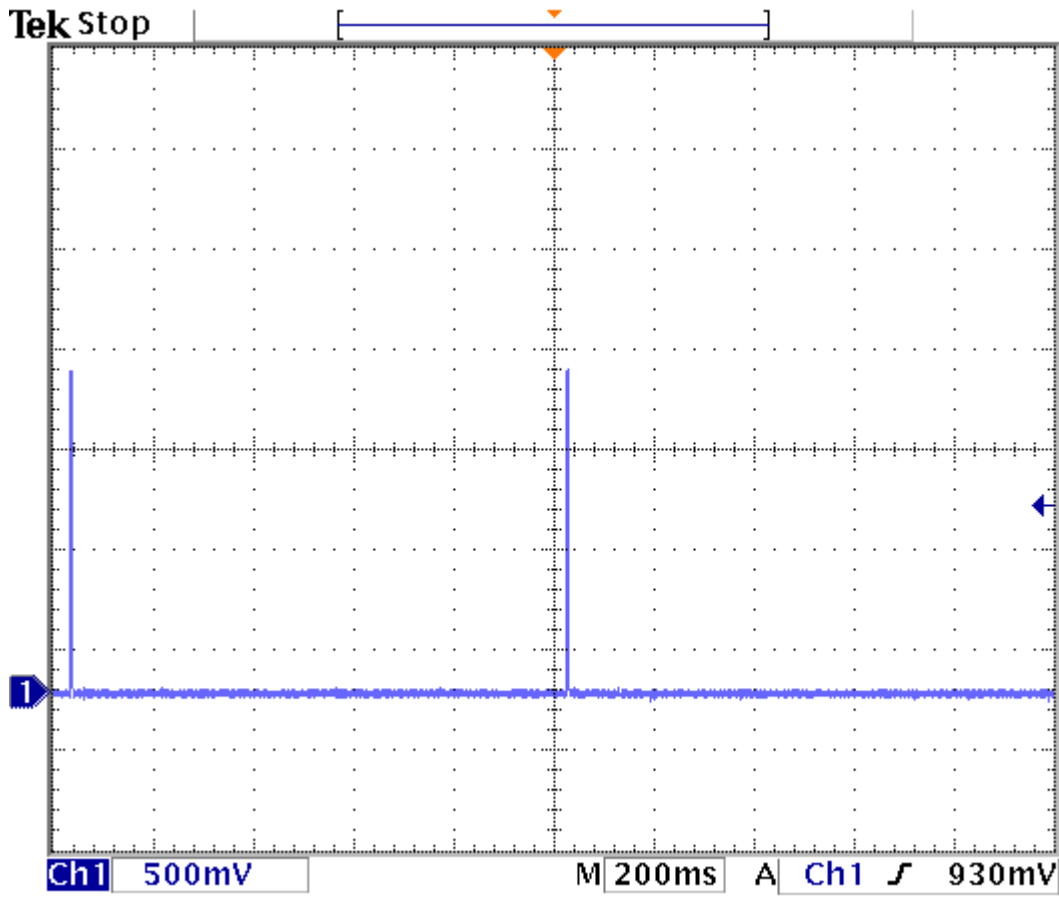
Plot/ 16 Conducted Emission RX Mode-Phase Line



TEST REMARKS:06-06-2005

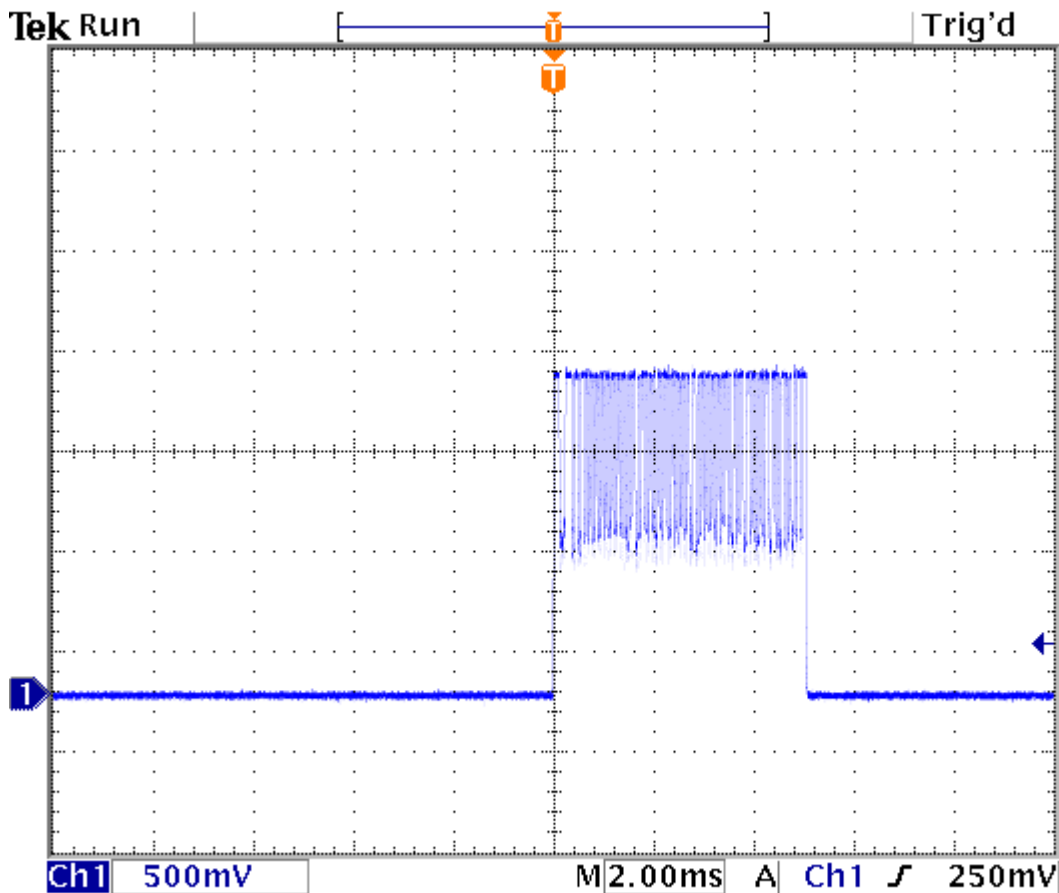
Frequency (Hz)
ID=10150 F=433.92MHz

Plot/ 17 Duty Cycle



8 Jun 2005
13:18:23

Plot/ 18 Duty Cycle



8 Jun 2005
13:17:33



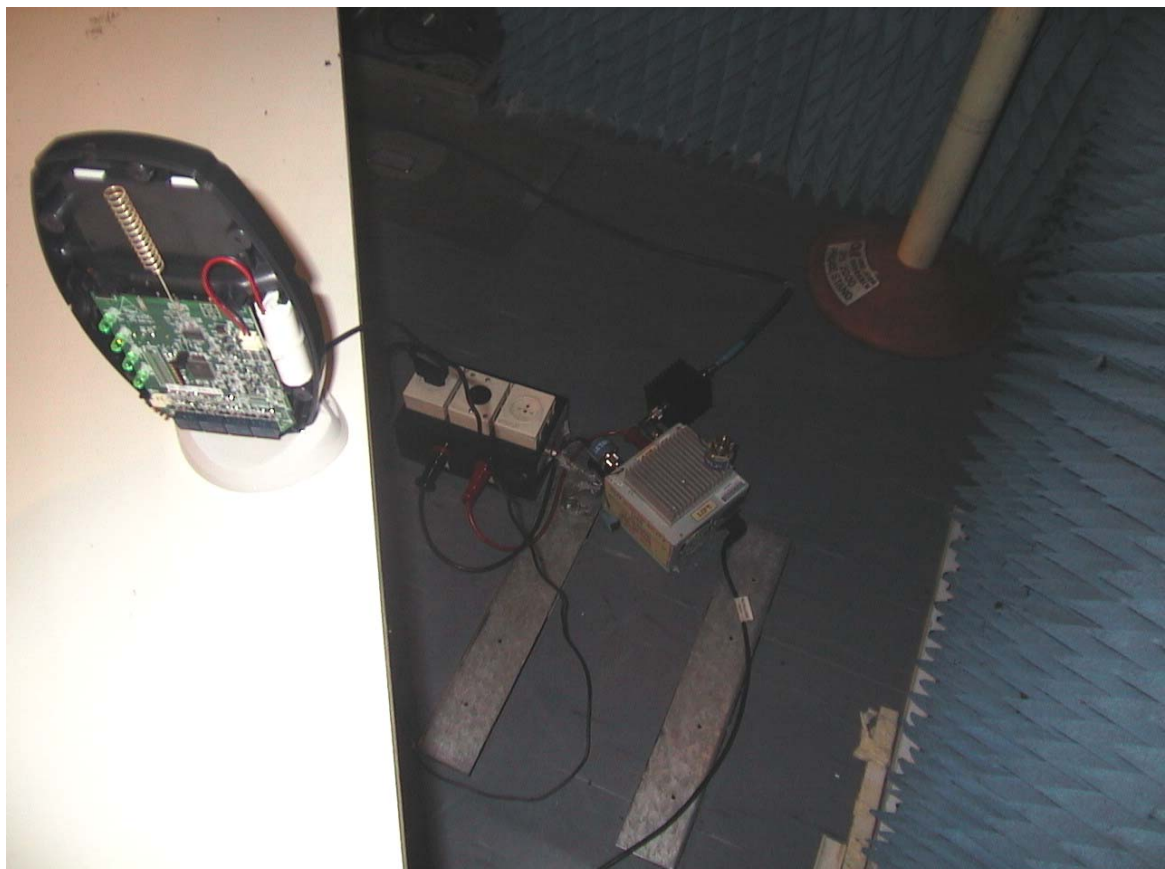
Radiated Emission Test Setup up to 30MHz



Radiated Emission Test Setup 30MHz-1GHz



Radiated Emission Test Setup 1GHz-18GHz



Conducted Emission Set Up