REPORT ON ELECTROMAGNETIC COMPATIBILITY TESTS

Performed at:

TWENTY PENCE TEST SITE

Twenty Pence Road,
Cottenham,
Cambridge
U.K.
CB4 4PS

on

DATALOGIC SPA

DLL6000-R Series

dated

13 October 1999

CFR 47 : 1998	*Code of Federal Regulations: Part 15 Subpart C - Radio Frequency Devices - Intentional Radiators* - **PASS**

Equipment Under Test (EUT):	DLL6000-R Series
Test Commissioned by:	DATALOGIC SPA Via Candini, 2 40012 Lippo di Calderara di Reno Bologna Italy
Representative:	Maurizio De Girolami
Test Started:	6 October 1999
Test Completed:	11 October 1999
Test Engineer:	Dave Smith
Date of Report:	13 October 1999
Report:	

Written by: Dave Smith Checked by: _____

Signature: _____ Signature: _____

Date: _____ Date: _____

Test Standards Applied

Test Results Summary

CFR 47 : 1998 PASS

Test	Port	Method	Limit	PASS/FAIL	*Notes*
Conducted Emissions	ac power	ANSI C63.4:1992	FCC15 sub C	PASS	
Radiated Emissions		ANSI C63.4:1992	FCC15 sub C	PASS	

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1 EUT Details

1.1 General

The EUT was a DataLogic DLL6000-R series cordless bar code reader. The unit is a hand held gun which uses a laser to scan a bar code and then transmits the information to a base station using a radio link. The radio link operates at 910MHz.

The device was therefore considered as an intentional radiator (CFR47 part 15 sub-section C - section 15.249)

The EUT is powered from internal batteries and normally operates at some distance from the base station and therefore the units were tested separately - this report covers the gun only.

The batteries may be recharged by placing the gun in the base station cradle. This report therefore also covers conducted emissions on the base station while charging the gun.

This report covers two variants of the DLL6000-R series. The DLL6110-R-NM has a built-in LCD display and keypad. The DLL6010-R-NM is identical except it does not contain the display, keypad and associated circuitry. The unit with the display was considered to be most likely to produce higher emission levels and therefore a full set of tests was performed on this unit. Radiated pre-scans and measurements at the intentional transmitter frequency were repeated on the unit without the display.

Details of the EUT and associated peripherals used during the tests are listed below. Figure 1 shows the interconnections between the EUT and peripherals.

Item	Manufacturer	Model	Description	Serial No:	Notes
1	Datalogic	DLL6010-R-NM DLL6110-R-NM	EUT without display EUT with display	A98P00147 C90E09730	OMJ0000
2	Datalogic	OM6010R	Cradle	098N05041	OMJ0001
3	DataLogic	PG11/DVE	ac adaptor	A9909	N/A
4	Dell	SYS 210	Computer	SYS210031921	E2K50YDELL210
5	Hewlett Packard	Deskjet 850C	Printer	SG563160GC	B94C2145X
6	Dell	SK-1000REW	Keyboard	M951222710	GYUR26SK
7	Olivetti	DSM 28-142 PS	Monitor	7042360	BEJCY410
8	Dell	MR-829FDL	mouse	LT079010457	DZL6QBC

1.2 Modifications to EUT and Peripherals

Details of any modifications that were required to achieve compliance are listed below. The modification numbers are referred to in the results sections as appropriate.

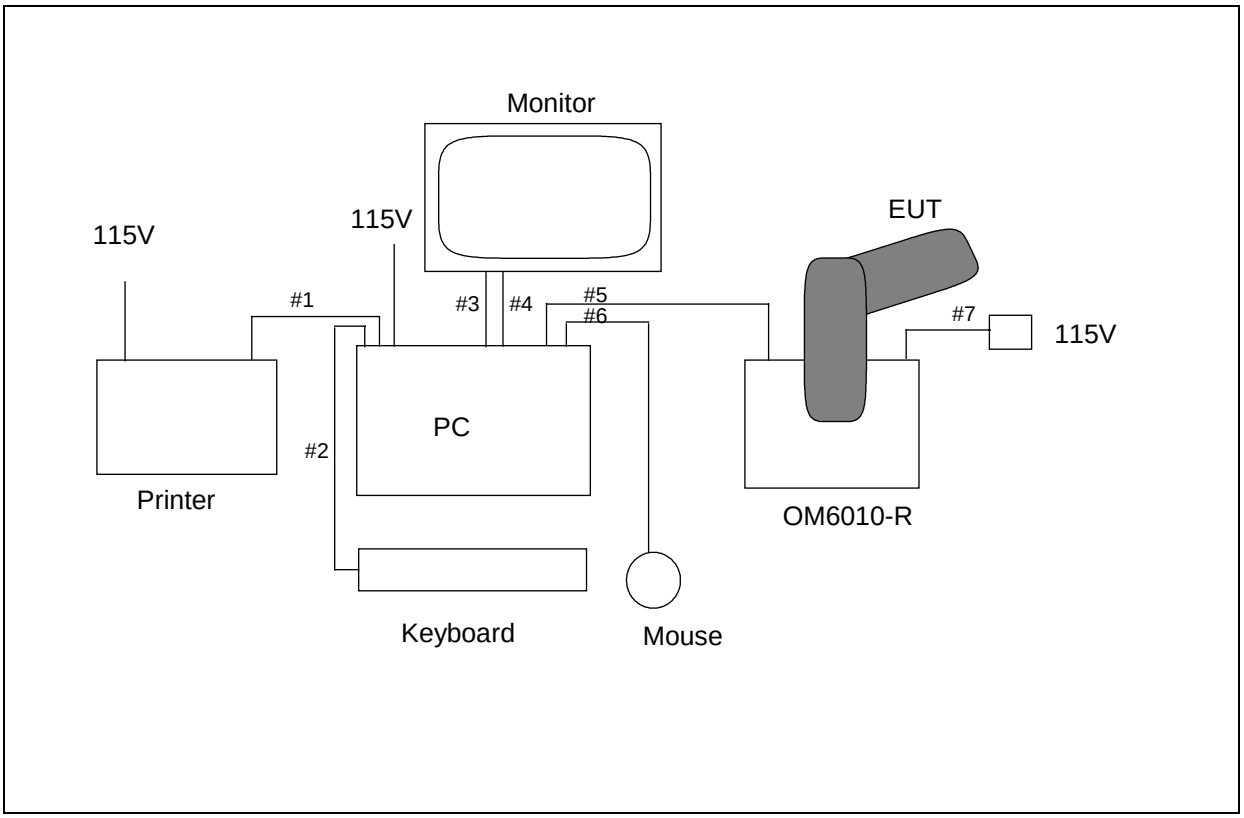
Mod No:	Details
1	C18 changed to 220R resistor in order to reduce radio transmit level.

1.3 EUT Operating Modes

The EUT was tested in the following operating mode or modes. Generally, operating modes are chosen that will exercise the functions of the EUT as fully as possible and in a manner likely to produce maximum emission levels or susceptibility. Individual test result sheets reference the operating mode of the EUT.

Operating Mode	Details
1	Set to test mode which permanently activates barcode reader.
2	Set to test mode which permanently activates radio transmitter.
3	Located in cradle with battery charging.

Figure 1: General Arrangement of EUT and Peripherals - Conducted Emissions



#1 2m screened printer cable
#2 1.5m screened keyboard cable
#3 1.5m screened video cable
#4 1m unscreened power cable
#5 1.5m unscreened cable from cradle to serial port
#6 1.5m screened mouse cable
#7 1.5m unscreened power cable

Note: this set up was used only for conducted emissions with the EUT charging via the cradle. Radiated emissions were measured in normal operating mode where the charger and peripherals would not be present.

Photograph 1: EUT and Peripherals - Conducted Emissions - Back

See Test Setup Photograph File

Photograph 2: EUT and Peripherals - Conducted Emissions - Front

See Test Setup Photograph File

Photograph 3: EUT and Peripherals - Radiated Emissions

See Test Setup Photograph File

2 Test Equipment

The test equipment used during the tests was one or more of the items listed below. Individual test result sheets indicate which items were used.

Ref No:	Manufacturer	Model	Description	Serial	Cal Date
R1	Chase	LHR7000	RF Receiver 10kHz - 30MHz	1056	30 June 99
R4	Rohde and Schwarz	ESVHS10	RF Receiver 20MHz - 1GHz	843744/00	23 June 99
R5 R5B	Hewlett Packard Hewlett Packard	HP 8595E HP87405A	Spectrum Analyser Pre-amp	3412A00701 3207A00322	1 Oct 98
R6	Marconi Instruments	2390	Spectrum Analyser	23901010	16 Sep 99
L1	EMCO	1912.5	LISN	1358	18 Mar 99
L2	Rohde and Schwarz	ESH3-Z5	LISN	843862/009	18 Mar 99
A2	EMCO	3146	Log Periodic Antenna 200MHz - 1GHz	2011	15 Jul 99
DR	EMCO	3115	Waveguide Ridge Antenna 1GHz - 20GHz	9605-4793	20 May 99
A4	Chase	CBL6112	Bilog Antenna 30MHz - 2GHz	2027	15 Jul 99
A5	Chase	CBL111A	Bilog Antenna 30MHz - 1GHz	1760	15 Jul 99

3 Test Methods

3.1 Conducted Emissions - ac power

This section describes the general method of performing this test. The specific method used and any deviations from this general method are listed in the appropriate results section.

Bench top EUTs and peripheral equipment are normally placed on a 0.8m high non-conducting bench, positioned 0.4m from one of the metallic walls of a screened room. Floor standing EUTs are normally placed 0.1m above the metallic floor of the screened room. Mains leads are bundled so as not to exceed 1m.

The EUT is powered using a 50ohm/50uH Line Impedance Stabilisation Network (LISN). Peripherals are powered using a second a 50ohm/50uH LISN. These LISNs are bonded to the screened room floor.

With the correct supply voltage applied to the EUT scans are performed on both the live and neutral line outputs of the LISN using quasi-peak detection over the specified frequency range. The results of these scans are shown in the plots section at the end of the report.

Significant emissions identified by the scans are measured and the results tabulated. The table of results is shown in the conducted emissions results section.

3.2 Radiated Emissions

This section describes the general method of performing this test. The specific method used and any deviations from this general method are listed in the appropriate results section.

Initial scans are performed in a semi-anechoic screened room at a distance of 3m. Scans are performed over the frequency range 30MHz to 1GHz with the antenna both horizontally and vertically polarised. During these scans the EUT and peripherals are rotated through 360°. Bench top EUTs are placed on a non-conducting bench at a height of 0.8m above the ground plane. Floor standing EUTs are placed 0.1m above the ground plane. The results of the scans are shown in the plots included at the end of the report.

Significant emissions identified by the scans are measured on an open area test site at the appropriate test distance using a CISPR16 quasi-peak receiver. Maximised readings are obtained by rotating the EUT through 360° and adjusting the height of the antenna from 1m to 4m. Measurements are made with the antenna both horizontally and vertically polarised and the results tabulated.

4 Test Results

The following sections contain tabulated test results. Plots of various scans are included at the back of this section.

4.1 Conducted Emission Results

Test Equipment:	Factor Set 1: EMLISN	RG214	10 m cable

Conducted Emissions

Company:	DATALOGIC SPA	*Product:*	DLL6000-R Series
Date:	6 October 1999	*Test Eng:*	Dave Smith
Ports:	ac power		
Test:	ANSI C63.4:1992 using limits of		FCC15 sub C
Ports:			
Test:			

Test	Op Mode	Mod State	Line (L/N)	Fact Set	Freq. MHz	Det qp/ av	Rec. Level dBuV	Corr'n Factor dB	Total Level dBuV	Limit FCCB dBuV/m	Margin FCCB dBuV/m	Limit	Margin	Notes
1	3	1	L	1	3.752	qp	36.0	0.1	36.1	48.0	11.9			
1	3	1	L	1	4.075	qp	42.1	0.1	42.2	48.0	5.8			
1	3	1	L	1	4.341	qp	38.7	0.1	38.8	48.0	9.2			
1	3	1	L	1	5.161	qp	35.2	0.2	35.4	48.0	12.6			
1	3	1	L	1	6.250	qp	31.0	0.2	31.2	48.0	16.8			
1	3	1	L	1	22.175	qp	36.9	0.3	37.2	48.0	10.8			
1	3	1	N	1	3.760	qp	46.0	0.1	46.1	48.0	1.9			
1	3	1	N	1	4.295	qp	46.6	0.1	46.7	48.0	1.3			
1	3	1	N	1	4.564	qp	38.9	0.2	39.1	48.0	8.9			
1	3	1	N	1	5.099	qp	41.0	0.2	41.2	48.0	6.8			
1	3	1	N	1	5.634	qp	38.5	0.2	38.7	48.0	9.3			
1	3	1	N	1	22.176	qp	38.3	0.3	38.6	48.0	9.4			

Results	**Minimum Margin**	**1.3 dB**	
	PASS/FAIL	**PASS**	

Notes	Comments and Observations
	Results of scans shown in Plot 1 and Plot 2. Measured using display version of gun.

4.2 Radiated Emissions Results - Intentional Transmitter Off

Test Equipment:	Factor Set 1:	HFBilog	RG214	25 m cable
	Factor Set 2:	Dridge	Sucoflex	3 m cable

Radiated Emissions

Company:	DATALOGIC SPA	*Product:*	DLL6000-R Series
Date:	11 October 1999	*Test Eng:*	Dave Smith
Test:	ANSI C63.4:1992 using limits of		FCC15 sub C
Test:			

Test	Op Mode	Mod State	Dist m	Fact Set	Freq. MHz	Ant Pol	Rec. Level dBuV	Corr'n Factor dB/m	Total Level dBuV/m	Limit FCCB dBuV/m	Margin FCCB dBuV/m	Limit	Margin	Notes
1	2	1	3	1	154.753	H	13.0	12.5	25.5	43.5	18.0			
1	2	1	3	1	154.753	V	4.6	12.5	17.1	43.5	26.4			
1	2	1	3	1	158.470	H	5.9	12.4	18.3	43.5	25.2			
1	2	1	3	1	158.470	V	3.6	12.4	16.0	43.5	27.5			
1	2	1	3	1	265.279	H	16.3	16.0	32.3	46.0	13.7			
1	2	1	3	1	265.279	V	5.7	16.0	21.7	46.0	24.3			
1	2	1	3	1	276.344	H	19.9	16.1	36.0	46.0	10.0			
1	2	1	3	1	276.344	V	8.0	16.1	24.1	46.0	21.9			
1	2	1	3	1	386.874	H	15.6	19.4	35.0	46.0	11.0			
1	2	1	3	1	386.874	V	8.6	19.4	28.0	46.0	18.0			
1	2	1	3	1	405.284	H	15.2	20.0	35.2	46.0	10.8			
1	2	1	3	1	405.284	V	5.8	20.0	25.8	46.0	20.2			
1	2	1	3	1	438.460	H	12.6	20.8	33.4	46.0	12.6			
1	2	1	3	1	438.460	V	5.3	20.8	26.1	46.0	19.9			
Results								Minimum Margin		10.0	dB			
								PASS/FAIL		PASS				

Notes	Comments and Observations
	Results of screened room scans shown in Plot 3 to Plot 6 Scans show unit with display gives generally higher emissions. The tabulated results above are open area test site measurements of the unit with the display.

4.3 Radiated Emissions Results - Intentional Transmitter On

Test Equipment:	Factor Set 1:	HFBilog	RG214	25 m cable
	Factor Set 2:	Dridge	Sucoflex	3 m cable

Radiated Emissions

Company: DATALOGIC SPA *Product:* DLL6000-R Series

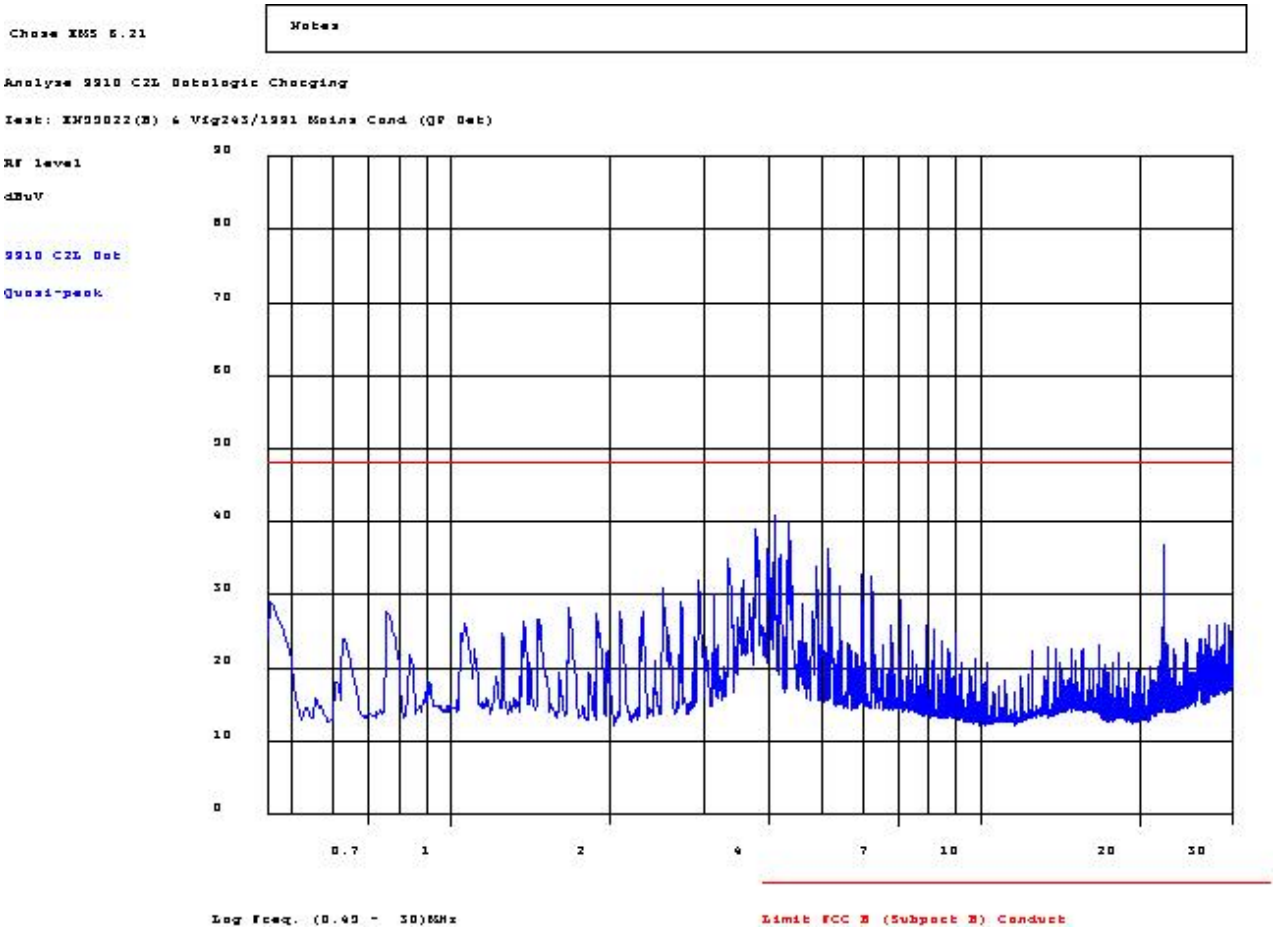
Date: 11 October 1999 *Test Eng:* Dave Smith

Test: ANSI C63.4:1992 using limits of FCC15 sub C

Test:

Test	Op Mode	Mod State	Dist m	Fact Set	Freq. MHz	Ant Pol	Rec. Level dBuV	Corr'n Factor dB/m	Total Level dBuV/m	Limit FCCB dBuV/m	Margin FCCB dBuV/m	Limit	Margin	Notes
1	3	1	3	1	910.000	H	64.7	26.6	91.3	93.4	2.1			#1
2	3	1	3	1	910.000	V	62.0	26.6	88.6	93.4	4.8			#1
3	3	1	3	1	910.000	H	64.4	26.6	91.0	93.4	2.4			#2
4	3	1	3	1	910.000	V	61.4	26.6	88.0	93.4	5.4			#2
5	3	1	3	2	1820.000	H	23.0	28.4	51.4	54.0	2.6			#1
Results							Minimum Margin PASS/FAIL			2.1 dB PASS				

Notes	Comments and Observations
	Results of screened room scans shown in Plot 7 to Plot 20 The levels recorded above were the only significant emissions detected from the system between the operating frequency of the intentional radiator (910MHz) and the 10th harmonic of the operating frequency (9.1GHz).
#1	Unit with display
#2	Unit without display
	Limits of 15.249 applied.

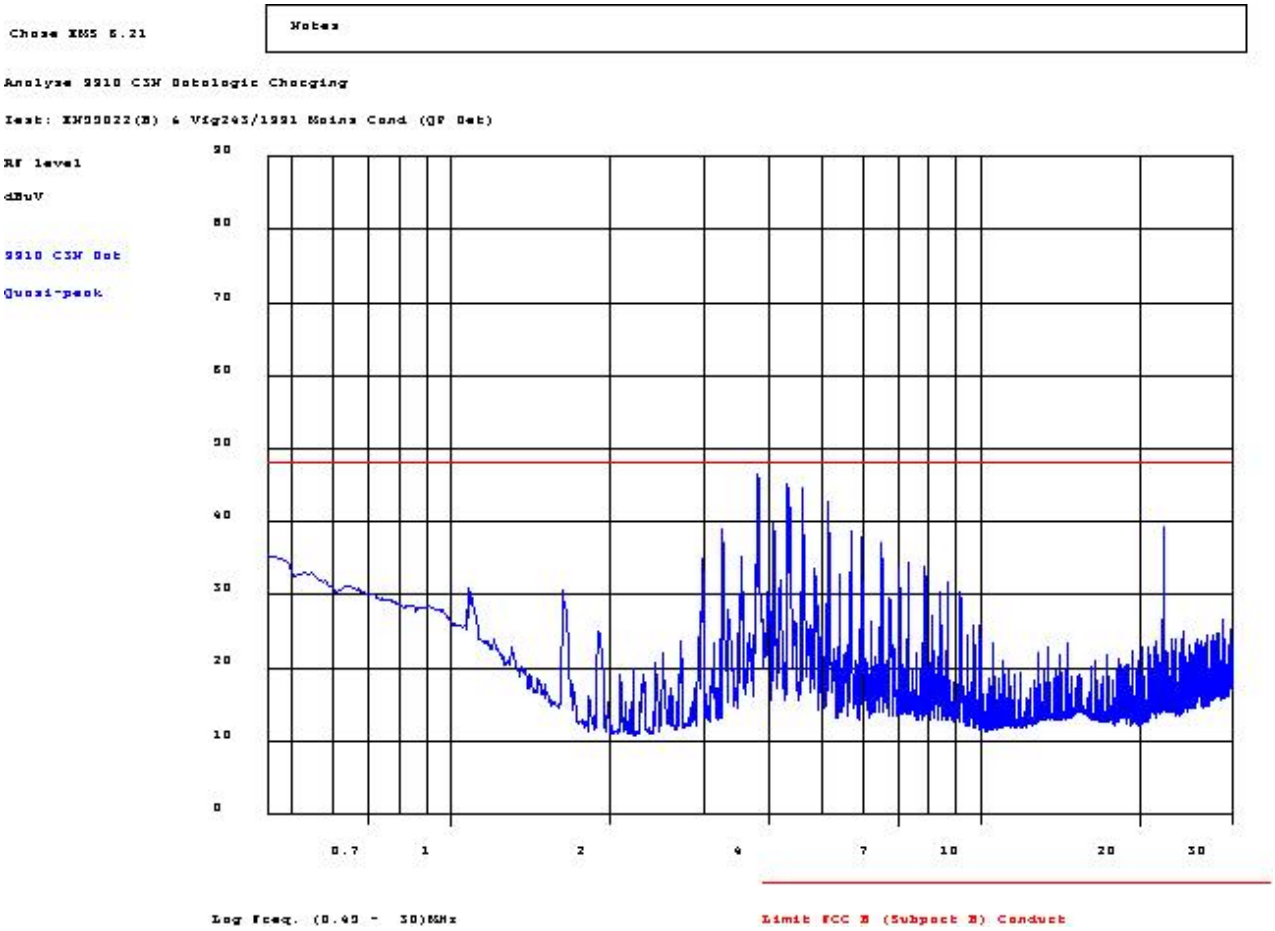


Frequency List (MHz)

3.752	22.175		
4.075			
4.341			
5.161			
6.250			

PLOT 1 Conducted Emission Scan - Charging

Test	Line	Mod	Op. Mode	Test Engineer	Date
C1	L	1	3	DS	11 Oct 99

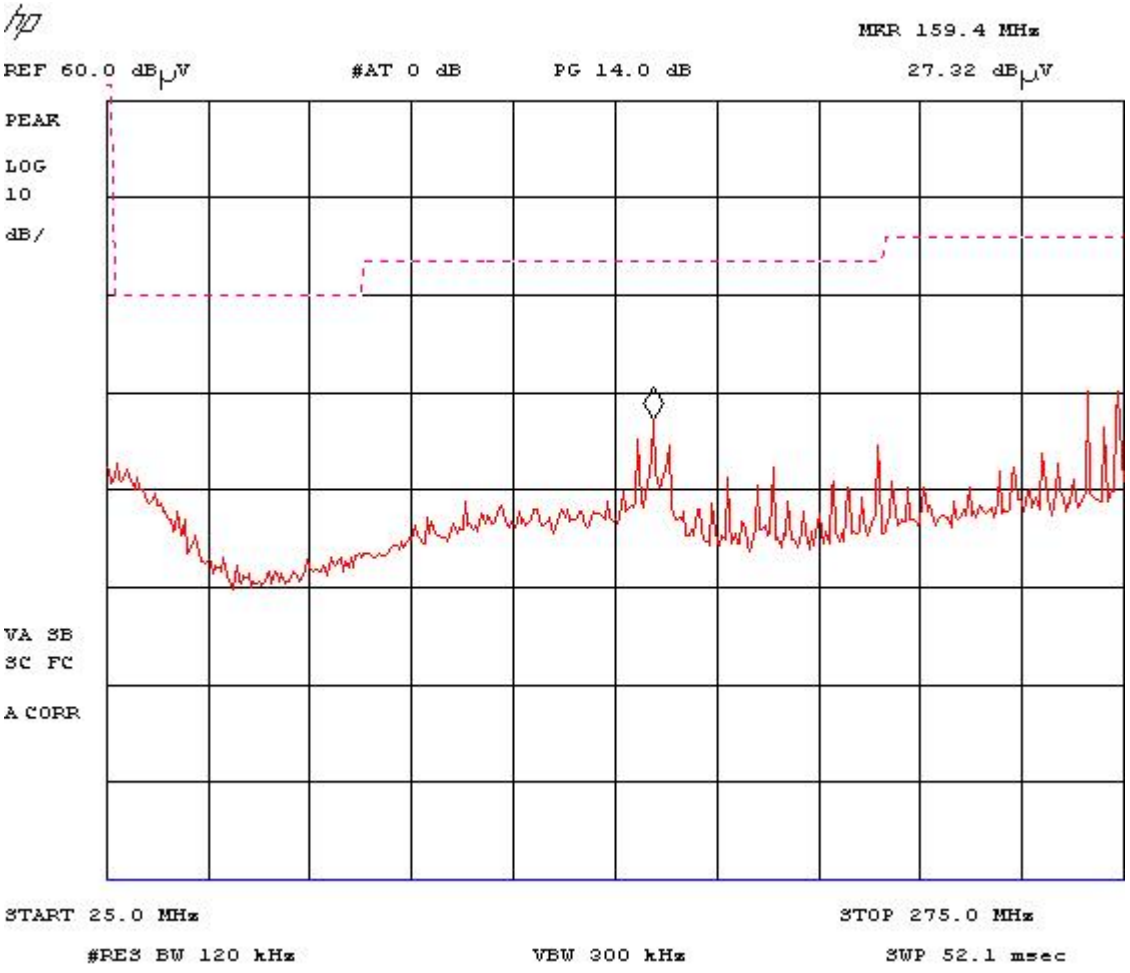


Frequency List (MHz)

3.760	22.176		
4.295			
4.564			
5.099			
5.634			

PLOT 2 Conducted Emission Scan - Charging

Test	Line	Mod	Op. Mode	Test Engineer	Date
C2	N	2	3	DS	11 Oct 99

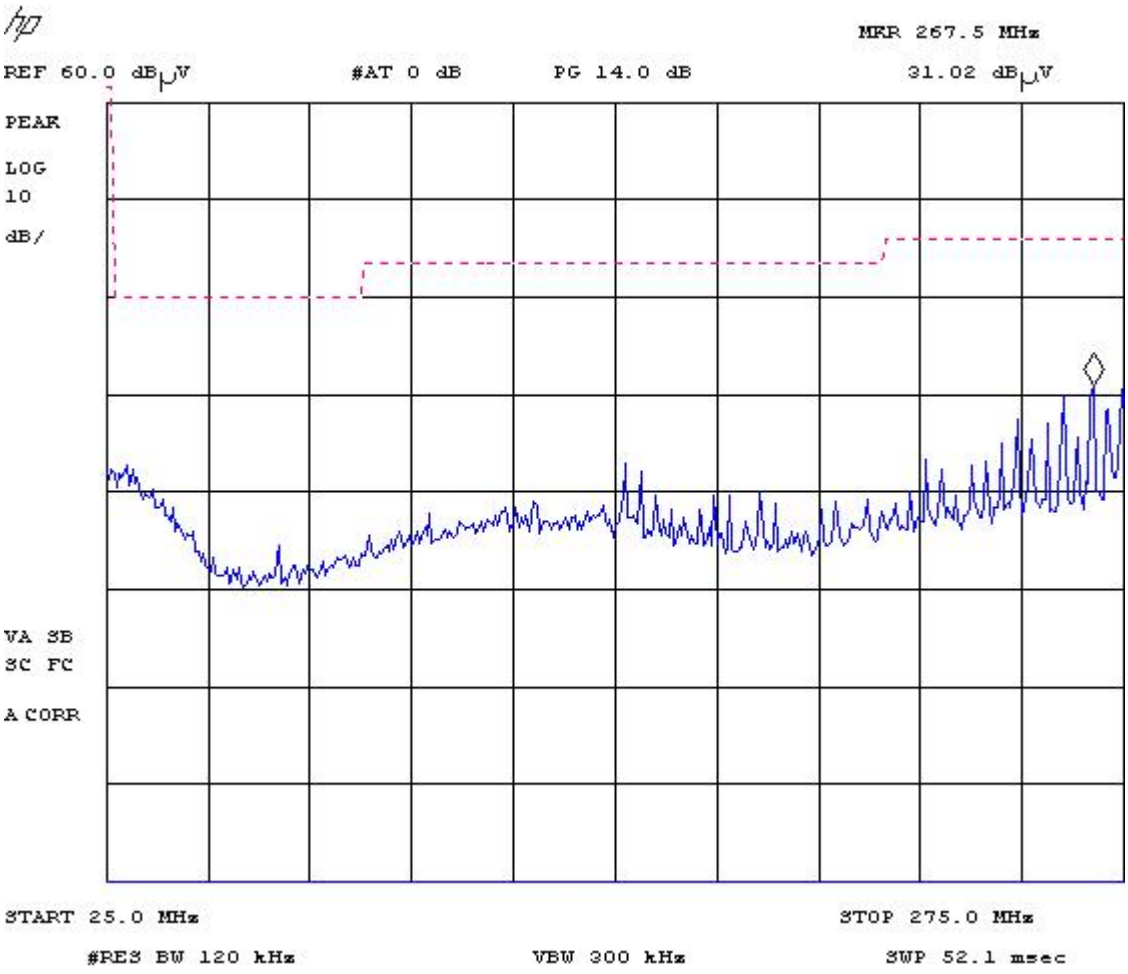


Frequency List (MHz)

154.753			
158.470			
265.279			

PLOT 3 Radiated Scan: 25MHz - 275MHz - With Display - Tx Off

Test	Pol	Dist. (m)	Height (m)	Mod	Op. Mode	Test Engineer	Date
R	V+H	3	1	1	1	DS	6 Oct 99

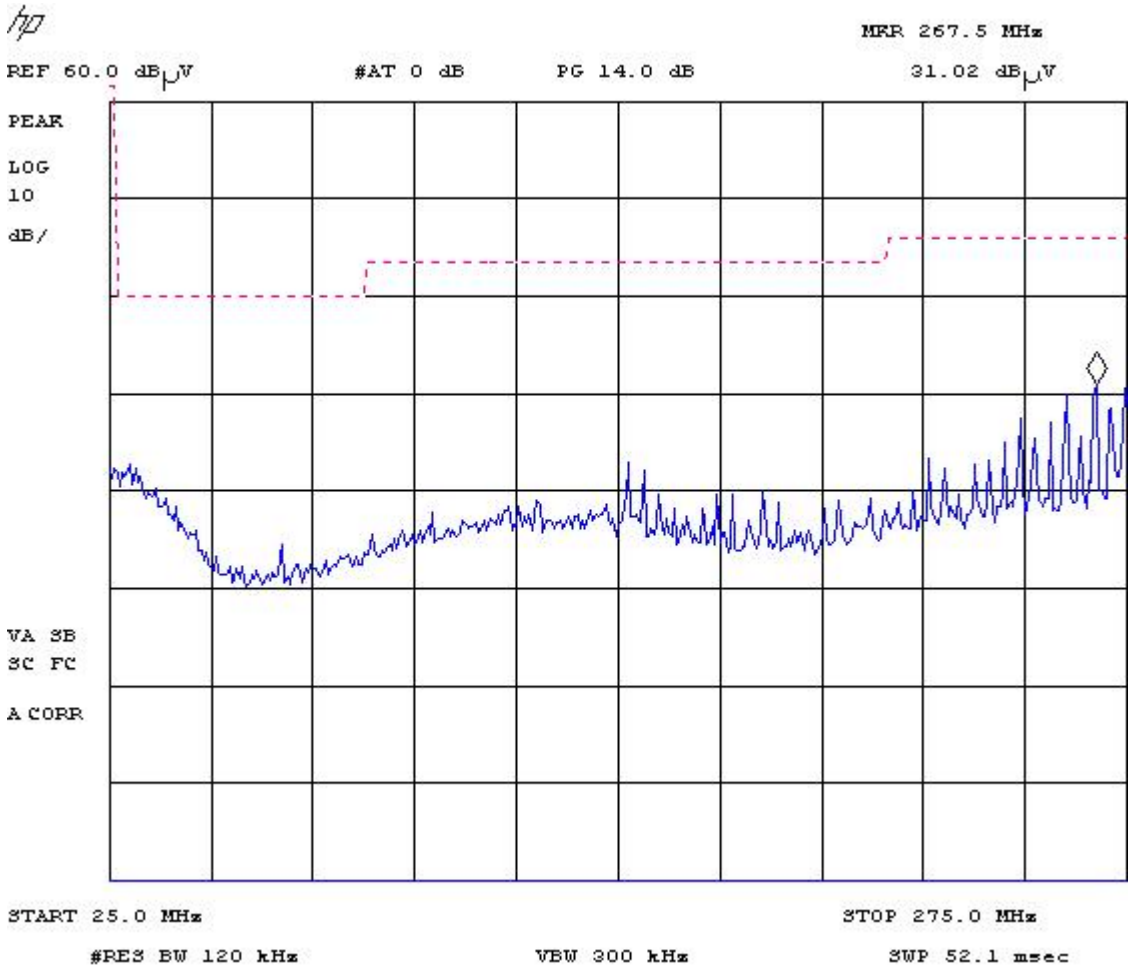


Frequency List (MHz)

276.344			
386.874			
405.284			
438.460			

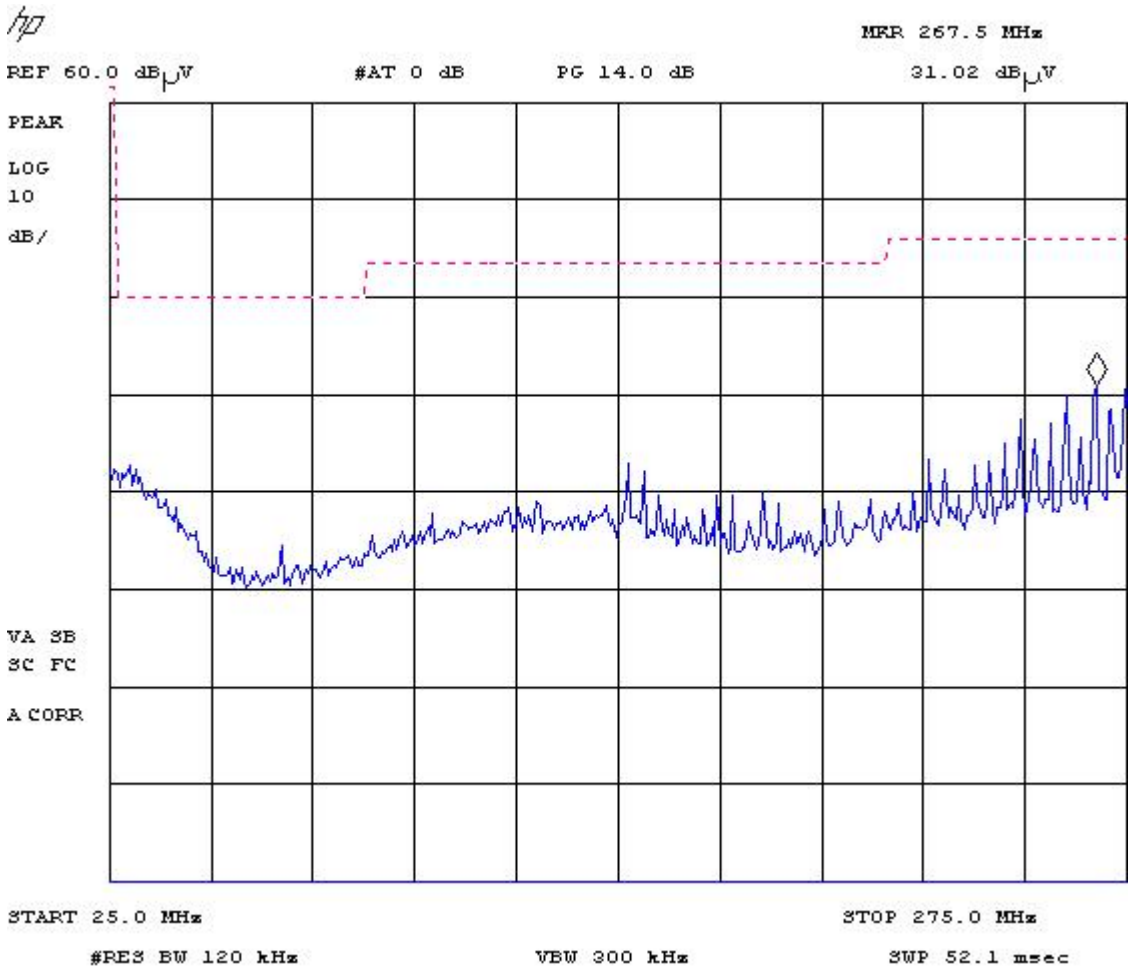
PLOT 4 Radiated Scan: 250MHz - 1GHz - With Display - Tx Off

Test	Pol	Dist. (m)	Height (m)	Mod	Op. Mode	Test Engineer	Date
R	V+H	3	1	1	1	DS	6 Oct 99



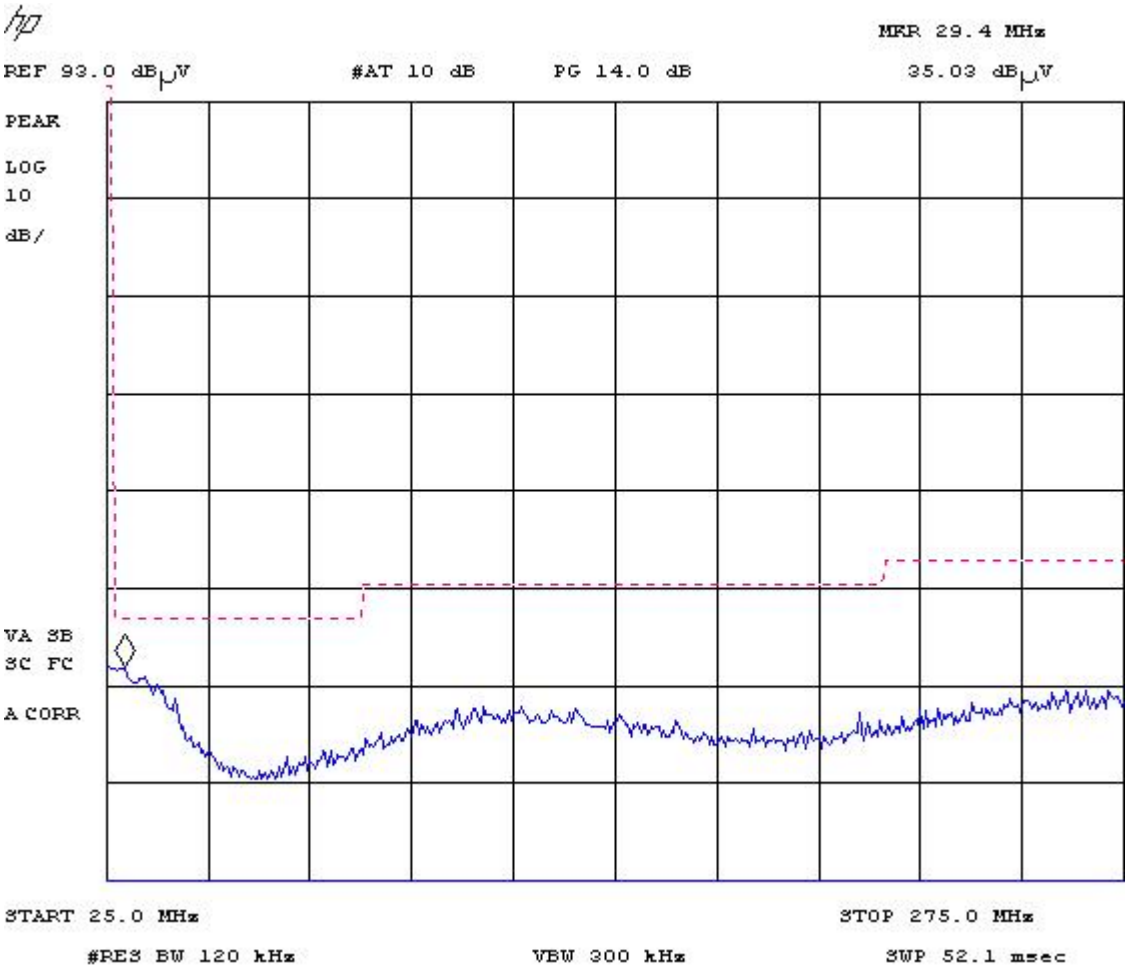
PLOT 5 Radiated Scan: 25MHz - 275MHz - No Display - Tx Off

Test	Pol	Dist. (m)	Height (m)	Mod	Op. Mode	Test Engineer	Date
R	V+H	3	1	1	1	DS	6 Oct 99



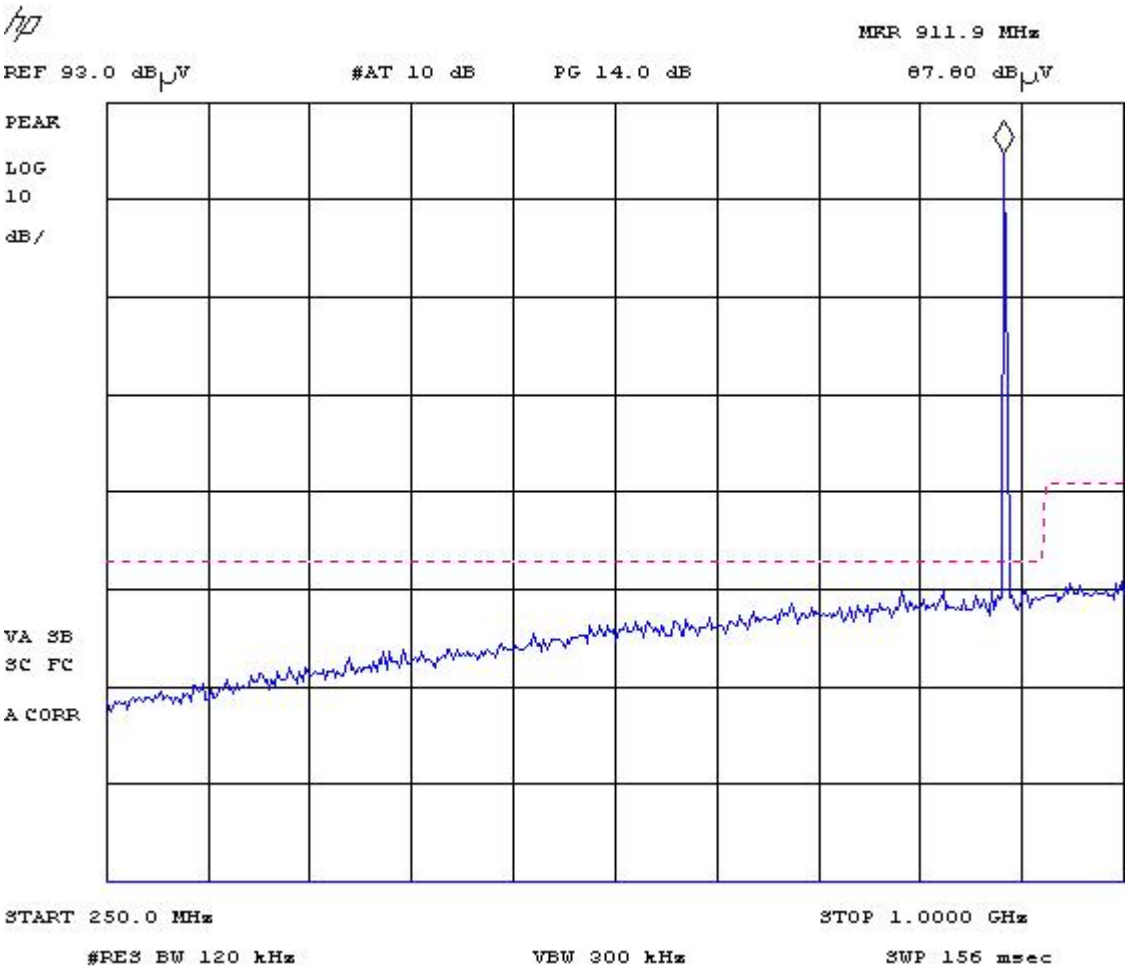
PLOT 6 Radiated Scan: 250MHz - 1GHz - No Display - Tx Off

Test	Pol	Dist. (m)	Height (m)	Mod	Op. Mode	Test Engineer	Date
R	V+H	3	1	1	1	DS	6 Oct 99



PLOT 7 Radiated Scan: 25MHz - 275MHz - No Display - Tx On

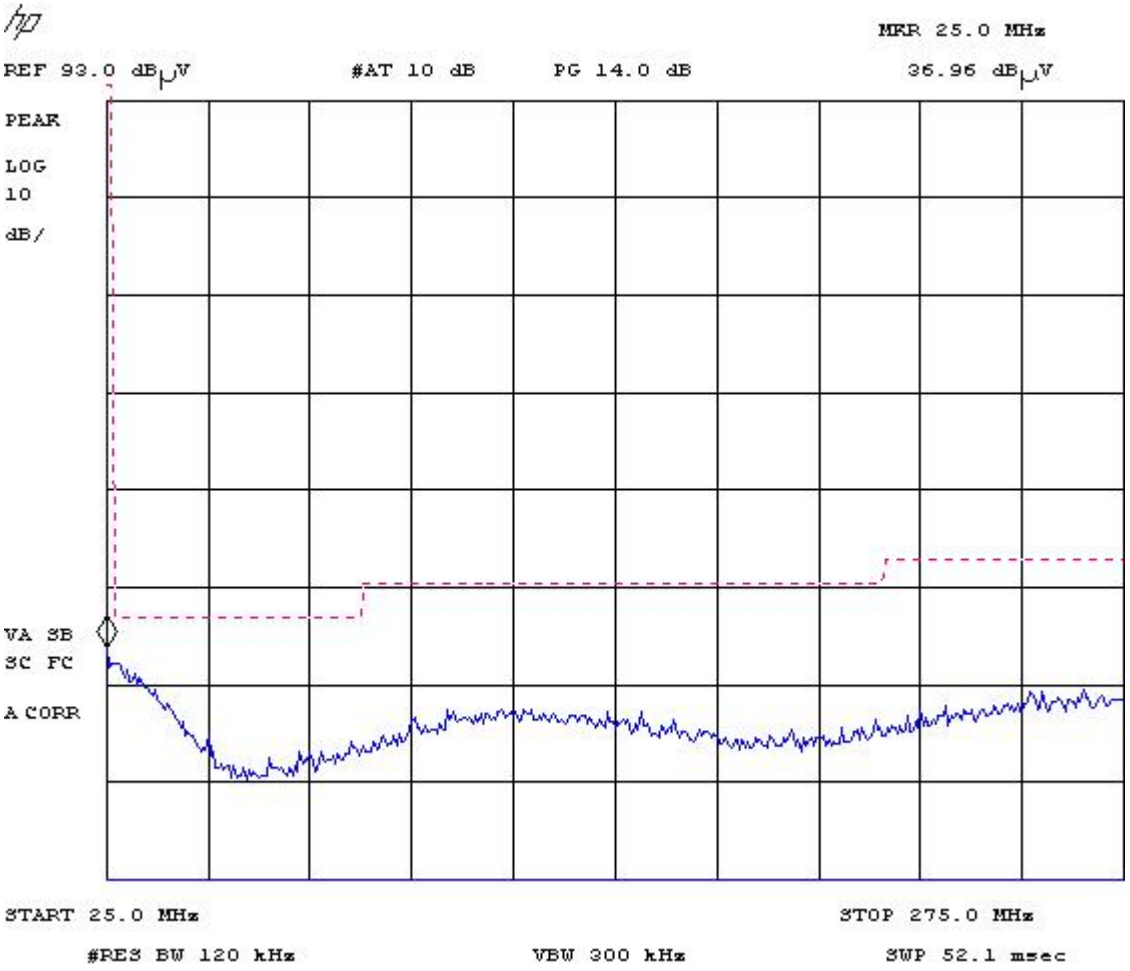
Test	Pol	Dist. (m)	Height (m)	Mod	Op. Mode	Test Engineer	Date
R	V+H	3	1	1	2	DS	6 Oct 99



Note: only emission significantly higher when transmitter turned on = 910MHz

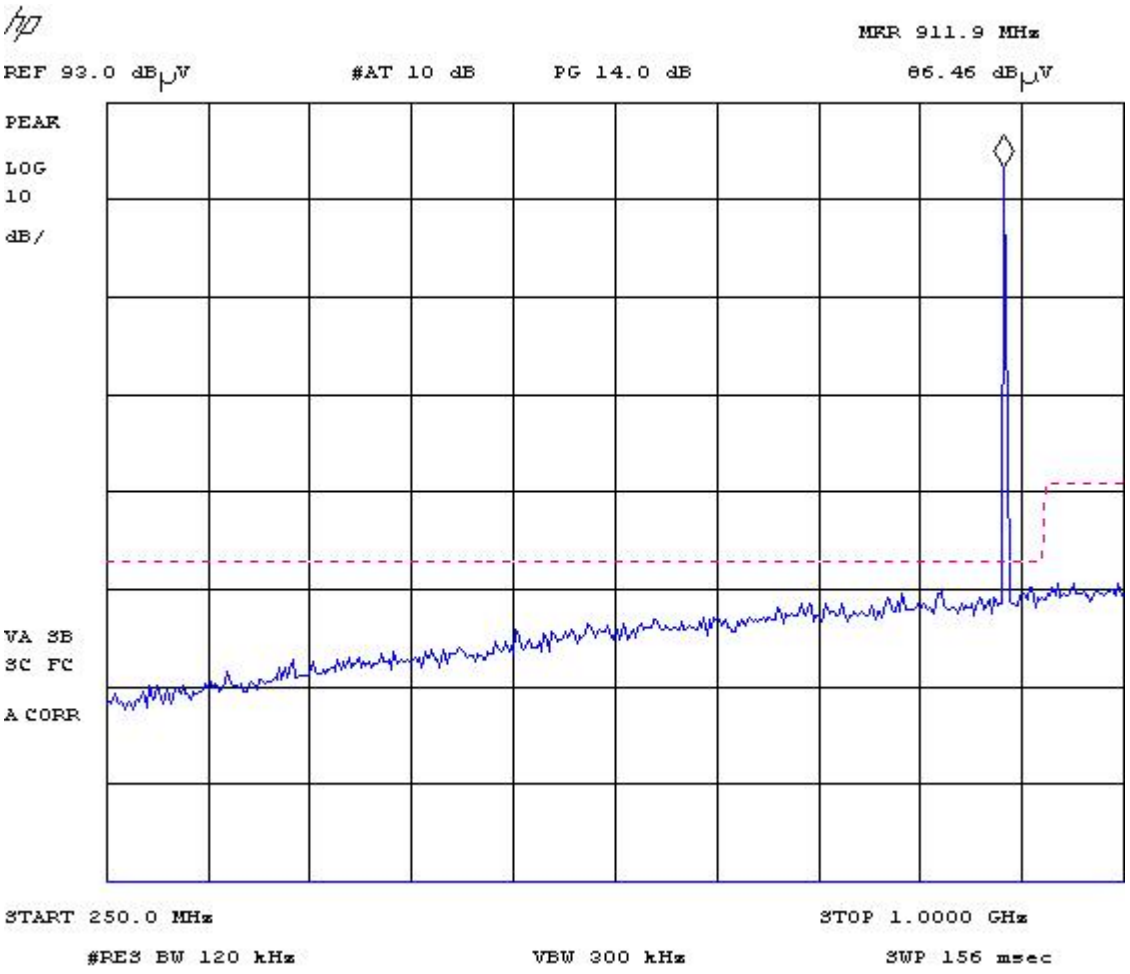
PLOT 8 Radiated Scan: 250MHz - 1GHz - No Display - Tx On

Test	Pol	Dist. (m)	Height (m)	Mod	Op. Mode	Test Engineer	Date
R	V+H	3	1	1	2	DS	6 Oct 99



PLOT 9 Radiated Scan: 25MHz - 275MHz - With Display - Tx On

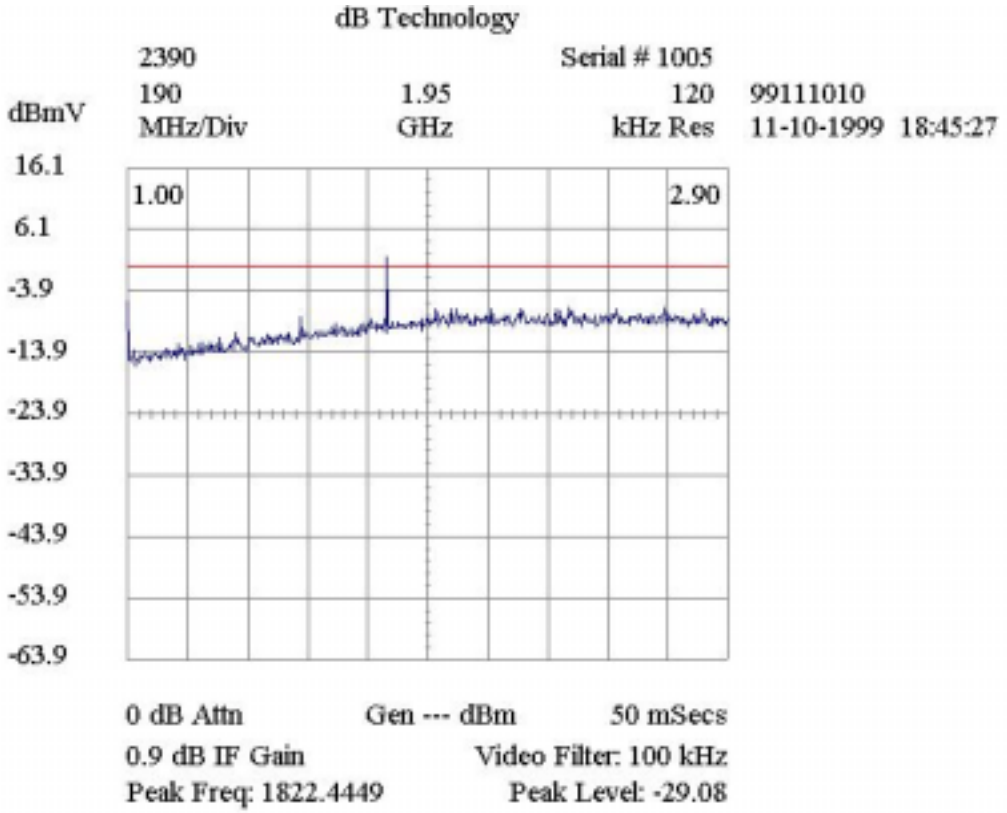
Test	Pol	Dist. (m)	Height (m)	Mod	Op. Mode	Test Engineer	Date
R	V+H	3	1	1	2	DS	6 Oct 99



Note: only emission significantly higher when transmitter turned on = 910MHz

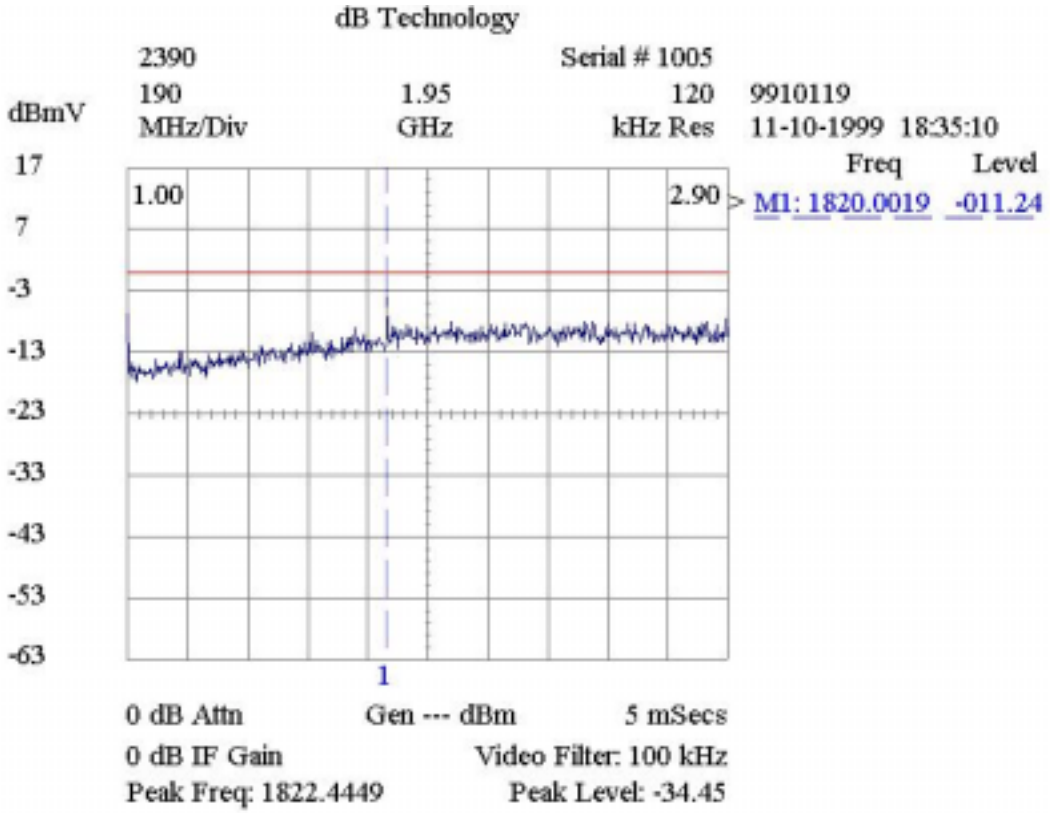
PLOT 10 Radiated Scan: 250MHz - 1GHz - with Display - Tx On

Test	Pol	Dist. (m)	Height (m)	Mod	Op. Mode	Test Engineer	Date
R	V+H	3	1	1	2	DS	6 Oct 99



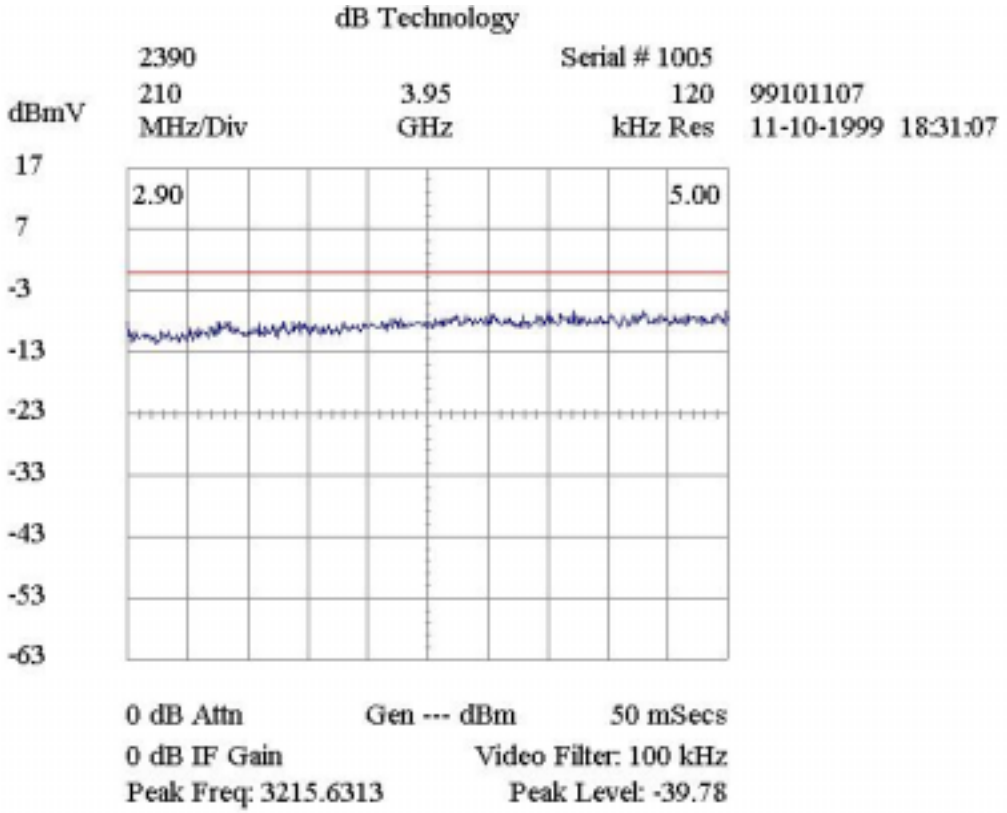
PLOT 11 Radiated Scan: 1GHz - 2.9GHz - with Display - Tx On

Test	Pol	Dist. (m)	Height (m)	Mod	Op. Mode	Test Engineer	Date
R	H	1	1	1	2	DS	11 Oct 99



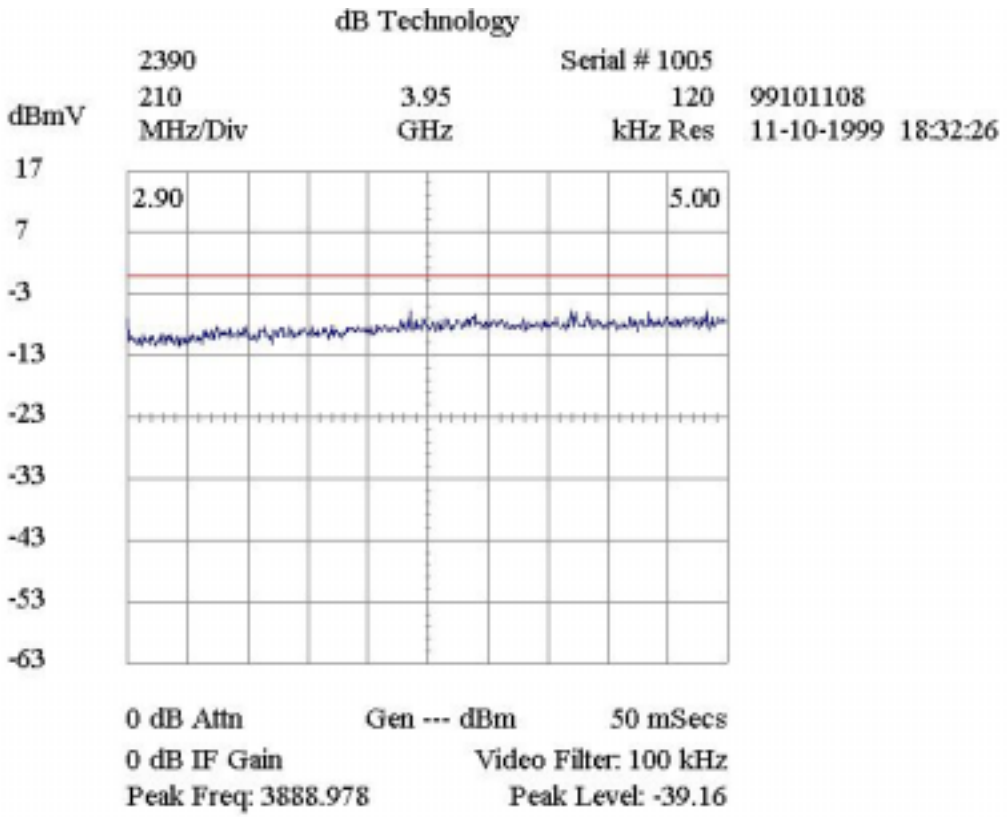
PLOT 12 Radiated Scan: 1GHz - 2.9GHz - with Display - Tx On

Test	Pol	Dist. (m)	Height (m)	Mod	Op. Mode	Test Engineer	Date
R	V	1	1	1	2	DS	11 Oct 99



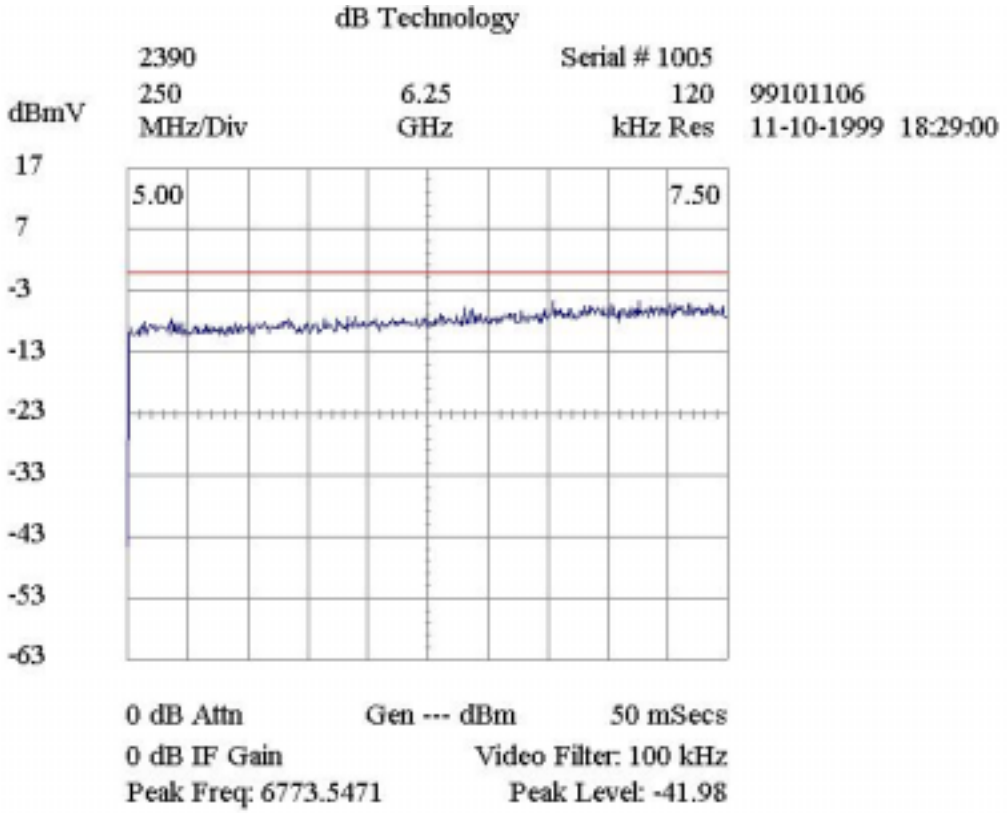
PLOT 13 Radiated Scan: 2.9GHz - 5GHz - with Display - Tx On

Test	Pol	Dist. (m)	Height (m)	Mod	Op. Mode	Test Engineer	Date
R	H	1	1	1	2	DS	11 Oct 99



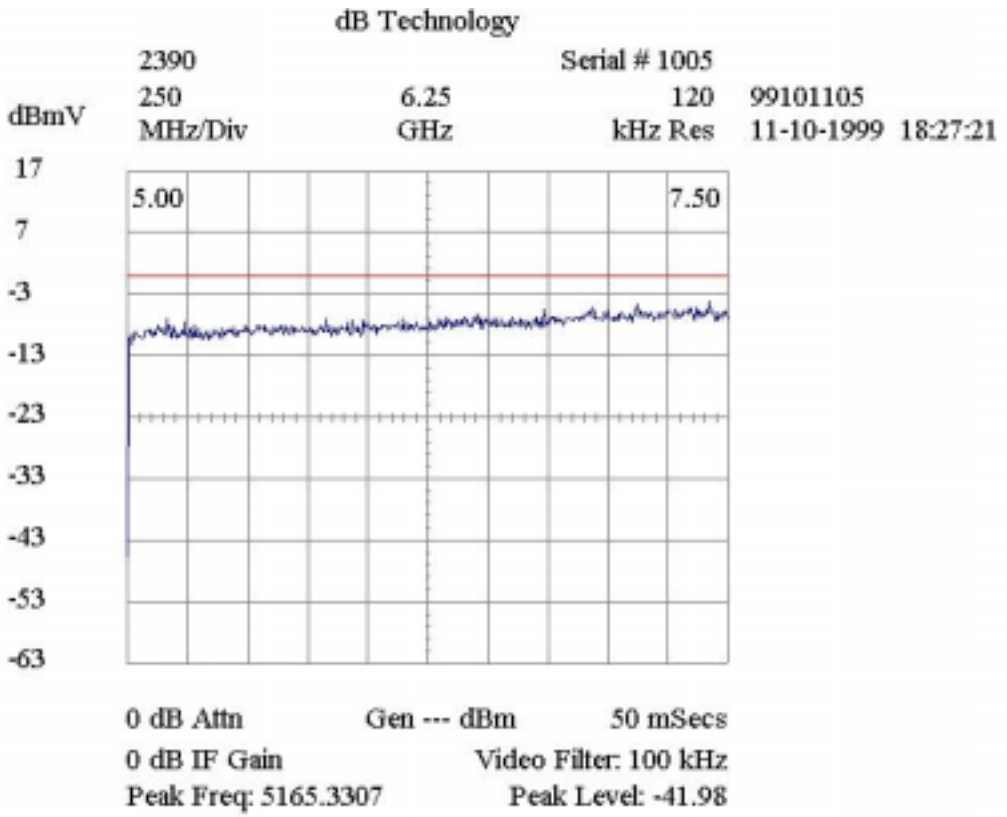
PLOT 14 Radiated Scan: 2.9GHz - 5GHz - with Display - Tx On

Test	Pol	Dist. (m)	Height (m)	Mod	Op. Mode	Test Engineer	Date
R	V	1	1	1	2	DS	11 Oct 99



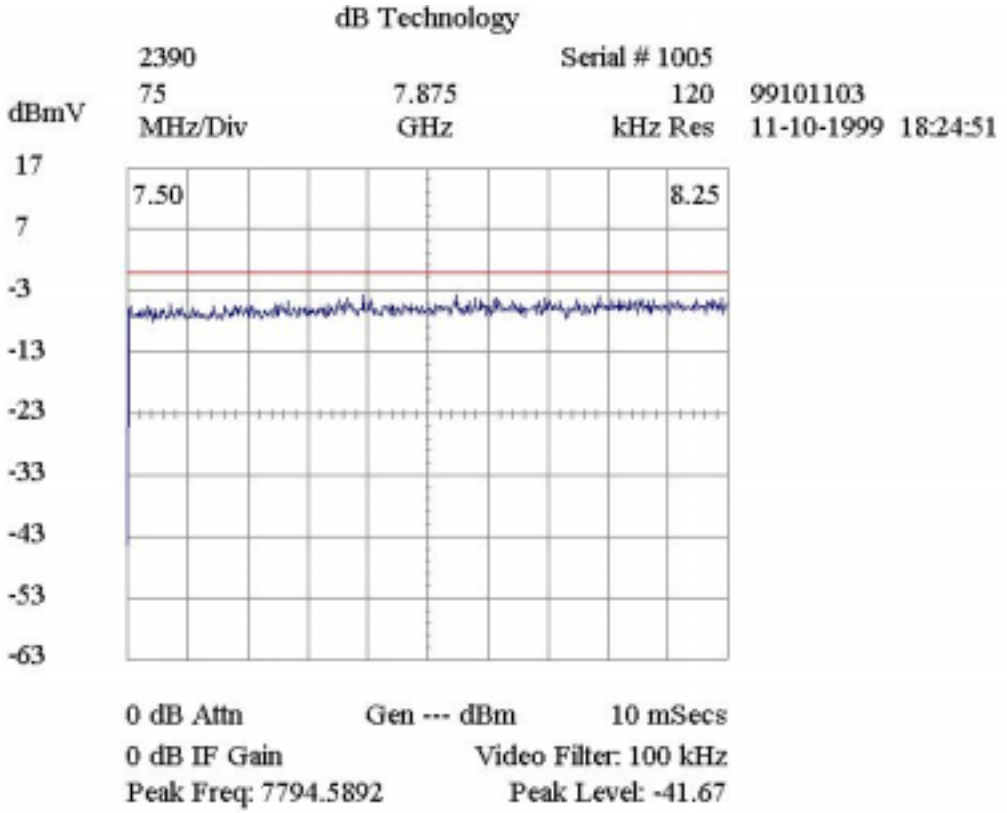
PLOT 15 Radiated Scan: 5.0GHz - 7.5GHz - with Display - Tx On

Test	Pol	Dist. (m)	Height (m)	Mod	Op. Mode	Test Engineer	Date
R	H	1	1	1	2	DS	11 Oct 99



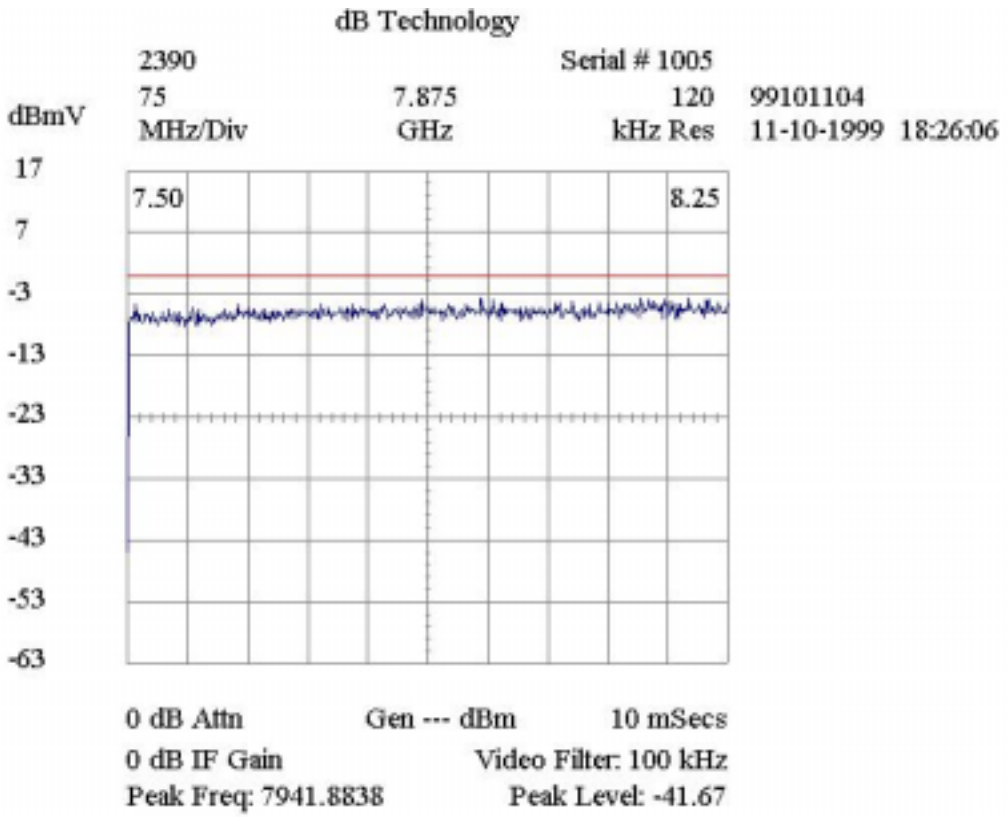
PLOT 16 Radiated Scan: 5.0GHz - 7.5GHz - with Display - Tx On

Test	Pol	Dist. (m)	Height (m)	Mod	Op. Mode	Test Engineer	Date
R	V	1	1	1	2	DS	11 Oct 99



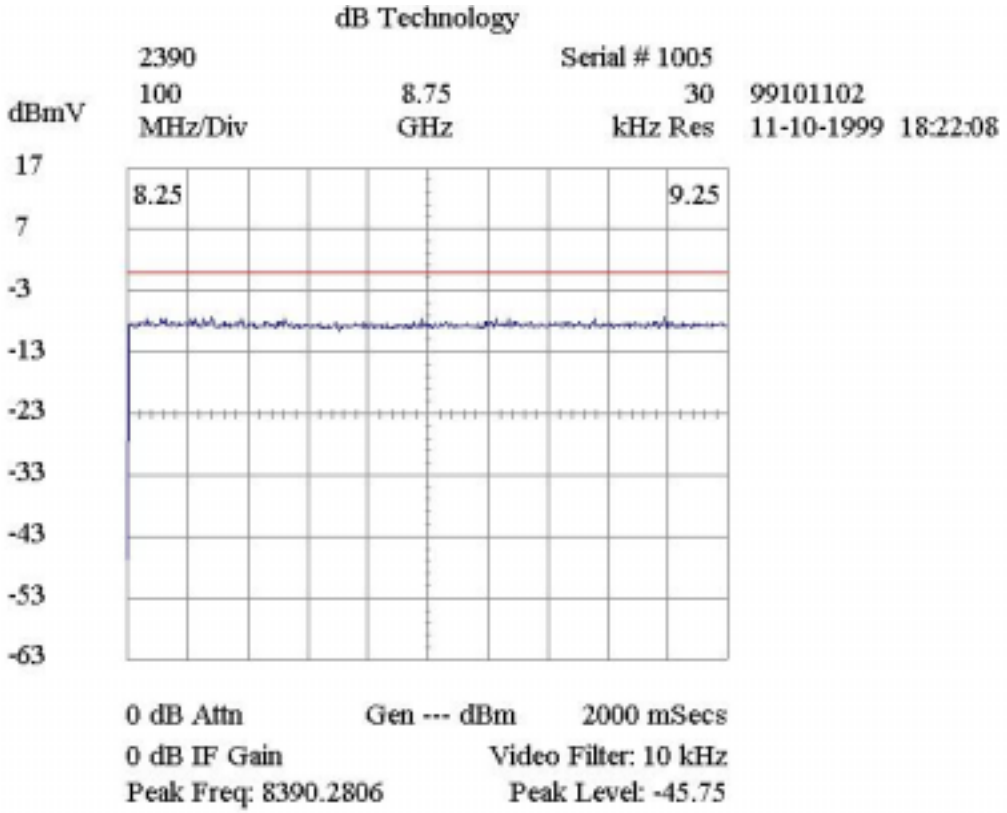
PLOT 17 Radiated Scan: 7.5GHz - 8.25GHz - with Display - Tx On

Test	Pol	Dist. (m)	Height (m)	Mod	Op. Mode	Test Engineer	Date
R	H	1	1	1	2	DS	11 Oct 99



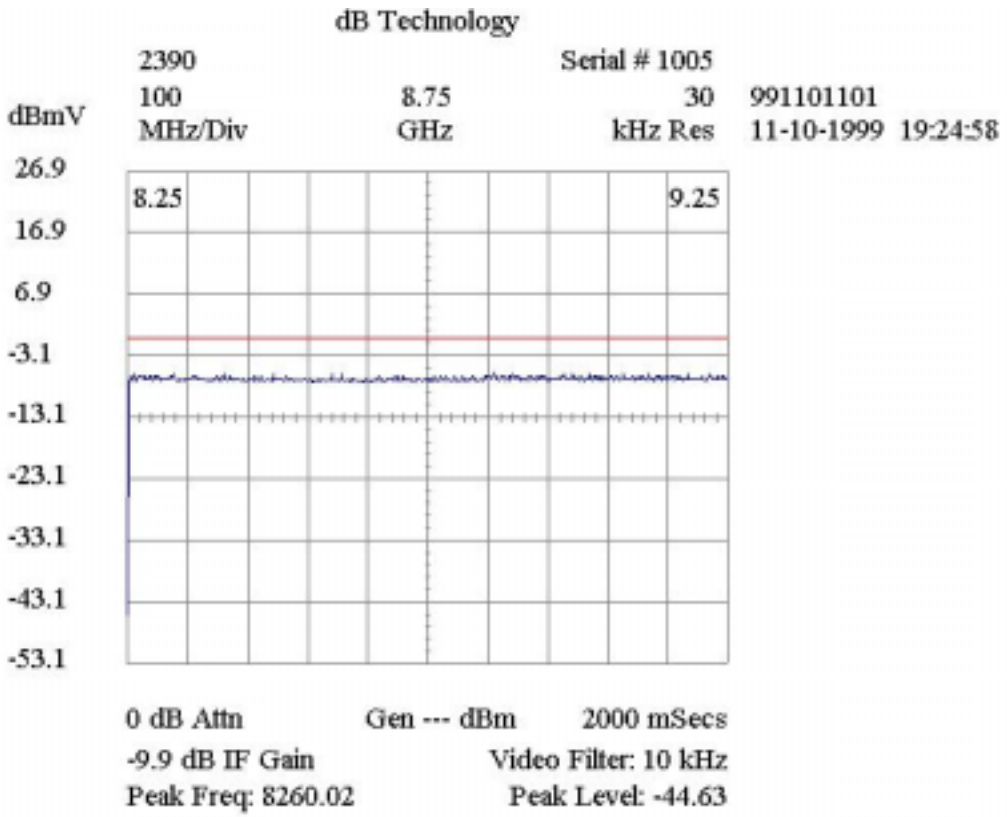
PLOT 18 Radiated Scan: 7.5GHz - 8.25GHz - with Display - Tx On

Test	Pol	Dist. (m)	Height (m)	Mod	Op. Mode	Test Engineer	Date
R	V	1	1	1	2	DS	11 Oct 99



PLOT 19 Radiated Scan: 8.25GHz - 9.25GHz - with Display - Tx On

Test	Pol	Dist. (m)	Height (m)	Mod	Op. Mode	Test Engineer	Date
R	H	1	1	1	2	DS	11 Oct 99



PLOT 20 Radiated Scan: 8.25GHz - 9.25GHz - with Display - Tx On

Test	Pol	Dist. (m)	Height (m)	Mod	Op. Mode	Test Engineer	Date
R	H	1	1	1	2	DS	11 Oct 99