Standards Council of Canada
Accredited Laboratory
Scope of Accreditation 75

Conseil canadien des normes
Laboratoire accrédité
Portée d'accréditation 75

TM

Test Report:	2R04801.2
Applicant:	Novra Technologies Inc. 100-330 St. Mary Ave. Winnipeg, Manitoba R3C 3Z5
Equipment Under Test (EUT):	S75 Satellite Receiver
In Accordance With:	**FCC 47 CFR Part 15, Subpart B: 1999** **Class B Certification**
Tested By:	Nemko Canada Inc. 303 River Road, R.R. 5 Ottawa, Ontario K1V 1H2
Authorized By:	J. Harrington, RF Group Manager
Date:	17 May 2002
Total Number of Pages:	19

Table Of Contents

Section 1. Summary of Test Results

General:

All measurements are traceable to national standards.

These tests were conducted on a sample of the equipment for the purpose of demonstrating compliance with FCC Part 15, Subpart B for Class B Digital Devices.

These tests were conducted using measurement procedures of ANSI C63.4-1992.

The equipment was tested for conducted emissions from 0.45 MHz to 30 MHz using a 50 microhenry line impedance stabilization network (L.I.S.N.) as described in ANSI C63.4-1992. Peripheral equipment was also operated through a 50 microhenry L.I.S.N.

Abstract:

Name Of Test	Para. No.	Results
Conducted Emissions	15.107	Complied
Radiated Emissions	15.109	Complied

THIS TEST REPORT APPLIES ONLY TO THE ITEM(S) TESTED.

Test Performed By: _____ Date: 17 May 2002

Daniel Hynes, EMC Specialist

Measurement Uncertainty

Accuracy of Measurement

The measurement uncertainty was calculated using the methods described in NAMAS document NIS81 May 1994, with the confidence level of 95%.

Radiated Measurements

OATS #1 (A) 3 meter [UN9902B]

Contribution	Distribution	Uncertainty (+/-)
Field Strength Variation	Random	0.2089 dBµV^2
Measurement Equipment	Normal	0.3275 dBµV^2
Measurement Equipment	Rectangular	0.4167 dBµV^2
Total Combined Uncertainty		0.9762 dBµV^2

Expanded Uncertainty @ 95% Confidence = ± 2.0013 dBmV

OATS #1 (B) 10 meter [UN9906B]

Contribution	Distribution	Uncertainty (+/-)
Field Strength Variation	Random	0.1388 dBµV^2
Measurement Equipment	Normal	0.3275 dBµV^2
Measurement Equipment	Rectangular	0.4167 dBµV^2
Total Combined Uncertainty		0.9694 dBµV^2

Expanded Uncertainty @ 95% Confidence = ± 1.926 dBmV

OATS #2 (B) 3 meter [UN9912B]

Contribution	Distribution	Uncertainty (+/-)
Field Strength Variation	Random	0.4516 dBµV^2
Measurement Equipment	Normal	0.3275 dBµV^2
Measurement Equipment	Rectangular	0.4167 dBµV^2
Total Combined Uncertainty		1.0935 dBµV^2

Expanded Uncertainty @ 95% Confidence = ± 2.2417 dBmV

Radiated Measurements, continued

OATS #2 (C) 10 meter [UN9917B]

Contribution	Distribution	Uncertainty (+/-)
Field Strength Variation	Random	0.1211 dBµV^2
Measurement Equipment	Normal	0.3275 dBµV^2
Measurement Equipment	Rectangular	0.4167 dBµV^2
Total Combined Uncertainty		0.9302 dBµV^2

Expanded Uncertainty @ 95% Confidence = ± 1.9069 dBmV

Conducted Measurements

Shielded Room #1 [UN9920]

Contribution	Distribution	Uncertainty (+/-)
Amplitude Variation	Random	0.0400 dBµV^2
Measurement Equipment	Normal	0.7500 dBµV^2
Measurement Equipment	Rectangular	0.2500 dBµV^2
Total Combined Uncertainty		1.0198 dBµV^2

Expanded Uncertainty @ 95% Confidence = ± 2.0396 dBmV

Section 2. Equipment Under Test

Brand Name:	Novra
Manufacturer:	Novra Technologies Inc.
Model No.:	S75-0100
Serial No.:	1301
Date Received In Laboratory:	May 6, 2002
Nemko Identification No.:	Item #3

☒ Production Unit ☐ Pre-Production Unit

Description of EUT

The S75 is a DVB (Digital Video Broadcast) satellite receiver with a tuning frequency of 950-2150MHz.

Modifications Incorporated in EUT

The EUT was not modified from what is described by the brand name and unique type identification stated above.

Theory of Operation

The receiver is connected to a LNB (Low Noise Block) via a 75Ω coax and via Ethernet cable to a PC. The user configures the unit via a Management Console on the PC. The main parameters set are the network parameters and the receiver parameters (symbol rate and receive frequency).

Justification

The EUT was configured for testing as per typical installation. Position and bundling of cables were investigated to establish maximum amplitude of emissions.

The following combinations were investigated to establish worst case configuration:

(1) Sat In port was terminated during testing

(2) Unit was tested while the f_{lo} was set for 2150MHz and set at a bite rate of 20Msps; it was determined to be worst case by prescans

Exercise Mode:

The EUT exercise program used during radiated and conducted testing was designed to exercise the various system components in a manner similar to typical use.

Exercise Program:

(1) The EUT was tested while connected to a laptop and communicating via the Ethernet port.

(2) The software in the laptop used to control the EUT was “S75 Management Console Version 1.0.17” and “S75 E2D Version 1.14”

(3) The software in the EUT was “S75 Hardware Version 5.0 Revision 0.0”

Section 3. Equipment Configuration

Equipment Configuration List:

Item	Description	Model No.	Serial No.	Rev.
(A)	S75 Satellite Receiver (EUT)	S75-0100	1301	----
(B)	Sceptre AC/DC Power Converter	SPU24-6	None	----
(C)	Apple Laptop Computer	M5884	QT10619FK6B	----

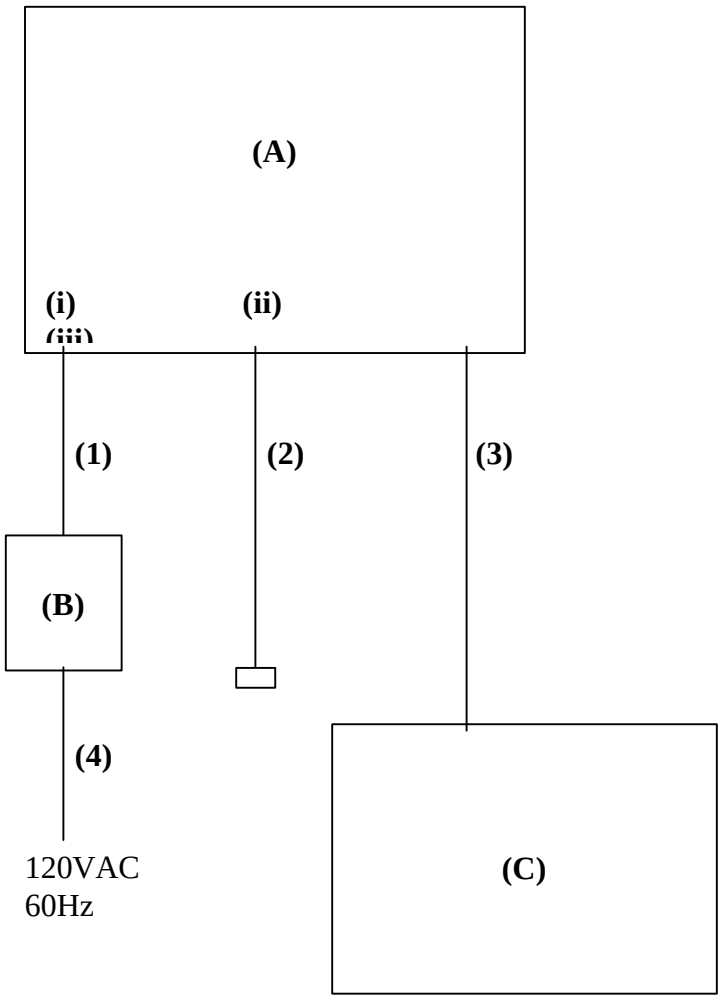
Equipment Ports:

Item	Description	Number
(i)	24V DC Power Input	1
(ii)	Sat In	1
(iii)	Ethernet	1

Inter-Connection Cables:

Item	Description	Length (m)
(1)	2 Conductor DC Power Cable	1.8
(2)	75Ω Terminated Coax Cable	2
(3)	Cat 5 Unshielded Ethernet Crossover Cable	1.8
(4)	North American Power Cord	1.8

Configuration of the Equipment Under Test (EUT)



Section 4. Conducted Emissions

Para. No.: 15.107

Test Performed By: Daniel Hynes	**Date of Test:** May 6, 2002

Test Conditions: Test Voltage: 120VAC
Temperature: 24°C
Humidity: 25%

Minimum Standard:

Frequency (MHz)	**Maximum Powerline Conducted RF Voltage**	
	µV	**dBµV**
0.45 - 30.0	250	48

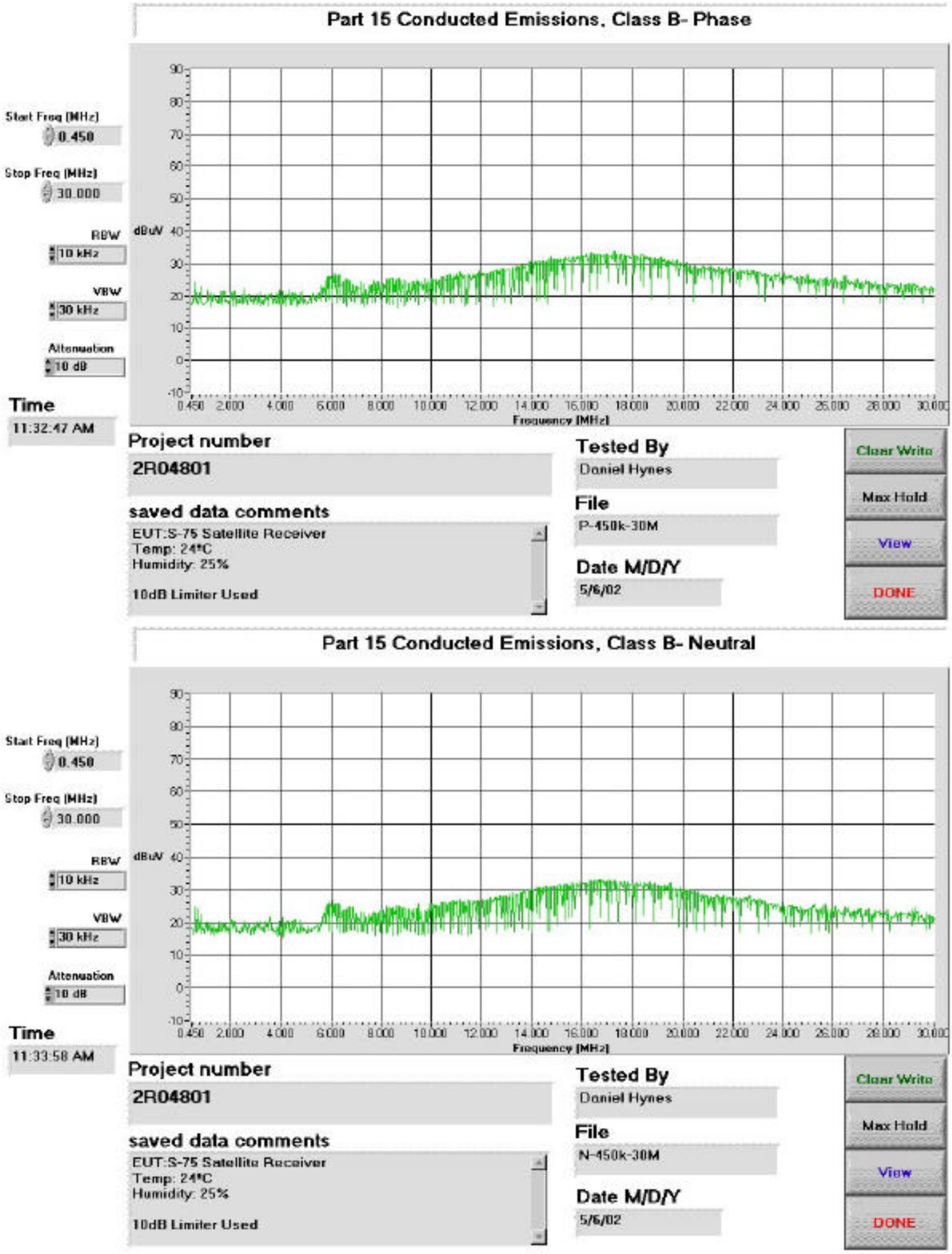
Test Results: Complied. See attached graphs.

Measurement Data: See attached graphs and table.

Method Of Measurement: (Procedure ANSI C63.4-1992)

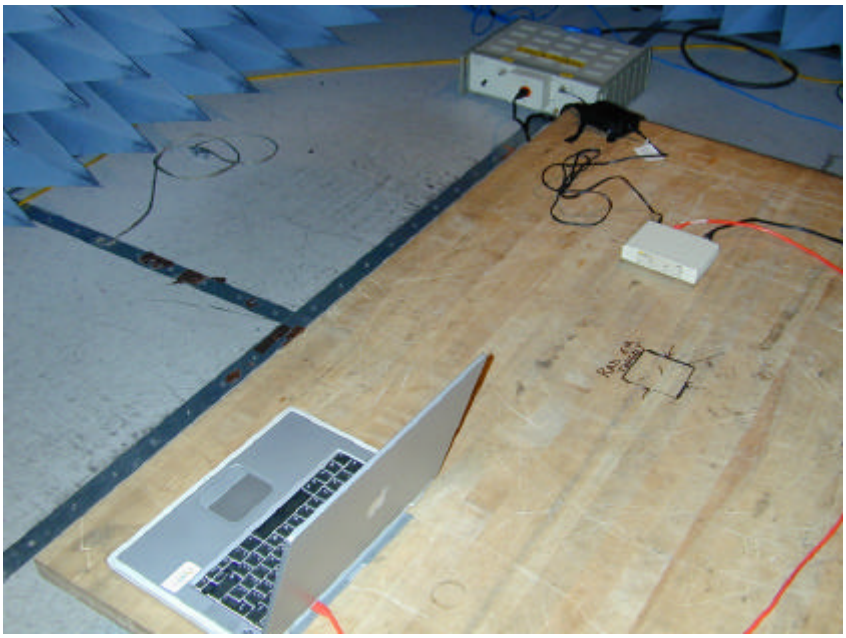
Measurements were made using a spectrum analyzer with 10 kHz RBW, Peak detector. Any emissions that were close to the limit are measured using a test receiver with 10 kHz bandwidth, CISPR Quasi-Peak detector.

Broadband emissions were identified by switching the receiver detector function from Quasi-Peak to Average. If the amplitude of the emission drops by 6 dB or more then the emission was classified as broadband and the Quasi-Peak level was reduced by a factor of 13 dB.

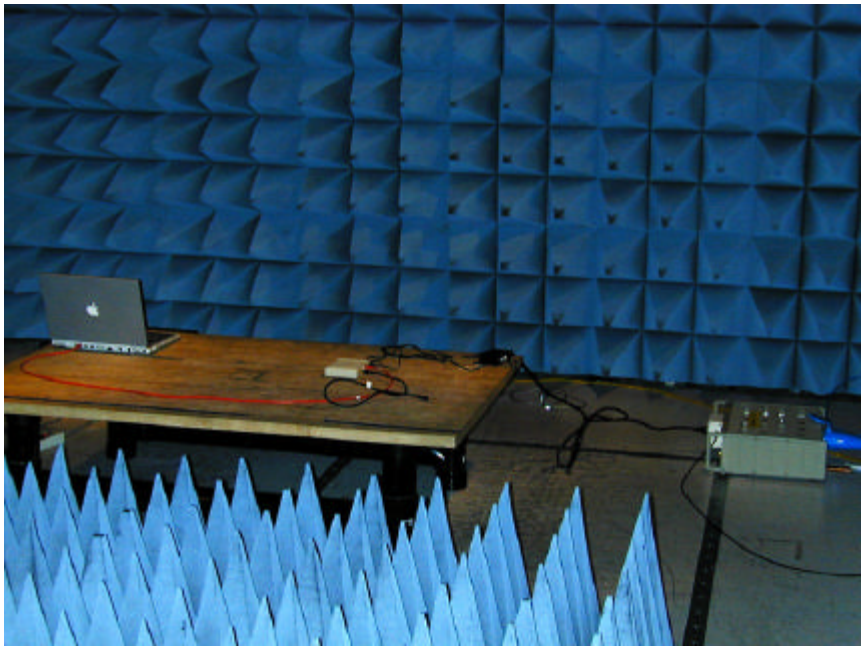

Part 15 Conducted Emissions, Class B- Phase
Start Freq (MHz)
0.450
Stop Freq (MHz)
30.000
RBW
10 kHz
VBW
30 kHz
Attenuation
10 dB
Time
11:32:47 AM
dBuV
Frequency (MHz)
Project number
2R04801
Tested By
Daniel Hynes
File
P-450k-30M
Date M/D/Y
5/6/02
saved data comments
EUT:S-75 Satellite Receiver
Temp: 24°C
Humidity: 25%
10dB Limiter Used
Clear Write
Max Hold
View
DONE
Part 15 Conducted Emissions, Class B- Neutral
Start Freq (MHz)
0.450
Stop Freq (MHz)
30.000
RBW
10 kHz
VBW
30 kHz
Attenuation
10 dB
Time
11:33:58 AM
dBuV
Frequency (MHz)
Project number
2R04801
Tested By
Daniel Hynes
File
N-450k-30M
Date M/D/Y
5/6/02
saved data comments
EUT:S-75 Satellite Receiver
Temp: 24°C
Humidity: 25%
10dB Limiter Used
Clear Write
Max Hold
View
DONE

Conducted Photographs

Side View



Front View



Section 5. Radiated Emissions

Para. No.: 15.109

Test Performed By: Daniel Hynes	**Date of Test:** May 6, 2002

Test Conditions:

Test Voltage: 120VAC
Temperature: 22°C
Humidity: 47%

Minimum Standard:

Frequency (MHz)	**Maximum Field Strength at 3m**	
	µV/m	**dBµV/m**
30 - 88	100	40.0
88 - 216	150	43.5
216 - 960	200	46.0
Above 960	500	54.0

Test Results:

Complied. The worst-case emission level was 51.6 dBµV/m @ 3m at 2152.13 MHz. This was 2.4 dB below the specification limit.

Measurement Data:

The equipment was prescanned in a shielded room using a spectrum analyzer and broadband antenna. A list of frequencies was compiled for investigation in the open field. The equipment was then moved to an open area test site where amplitude measurements were made at a distance of 3 meters. The bandwidth was set to 120 kHz and the detector function was CISPR Quasi-Peak. Any emission within 3 dB of the specification limit is re-measured using a reference tuned dipole antenna per ANSI C63.4.

Emissions detected above 1 GHz were measured with horn antenna and low noise pre-amplifier at a distance of 3 meters.

The spectrum was investigated from 30MHz up to the frequency shown in the following table.

Highest Frequency Generated or Used in the Device Which the Device Operates or Tunes (MHz)	**Upper Frequency of Measurement Range (MHz)**
Below 1.075	30
1.705 – 108	1000
108 – 500	2000
500 – 1000	5000
Above 1000	5^{th} harmonic of the highest frequency or 40 GHz, whichever is lower.

The highest operational frequency used in the EUT was 2150 MHz.

The top six (6) emissions within 20 dB of the limit have been recorded.

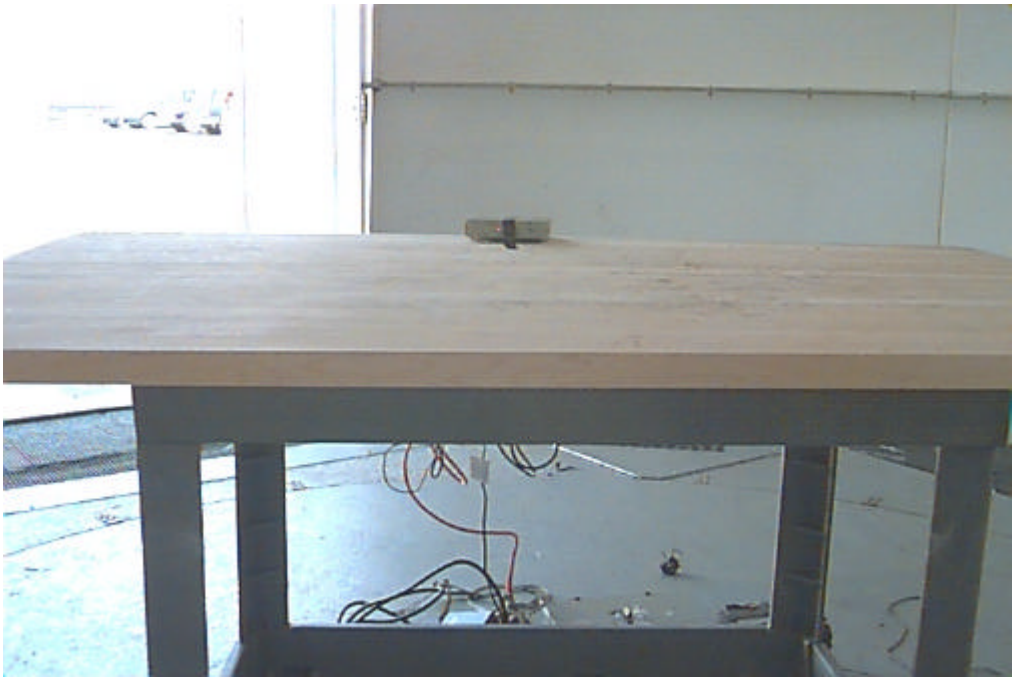
Test Data - Radiated Emissions

Test Distance (meters) : 3		**Range: A**		**Receiver: ESVS 30**			**RBW(kHz): 120**		**Detector: Q-Peak**	
No.	**Freq. (MHz)**	**Ant.**	**Pol (V/H)**	**RCVD Signal (dBµV/m)**	**Ant. Factor (dB)****	**Amp. Gain (dB)*****	**Dist. Corr. (dB)**	**Field Strength (dBµV/m)**	**Limit (dBµV/m)**	**Margin (dB)**
1	2152.13	Hrn1	V	76.9	33.1	58.4		51.6	54	2.4
2	2158.1	Hrn1	H	74.7	33.1	58.5		49.3	54	4.7
3	47.802	B/C2	V	22.4	12.6			35	40	5
4	45.572	B/C2	V	21.9	12.9			34.8	40	5.2
5	479.998	L/P1	V	16.3	23.3			39.6	46	6.4
6	399.998	L/P1	H	18.4	20.7			39.1	46	6.9

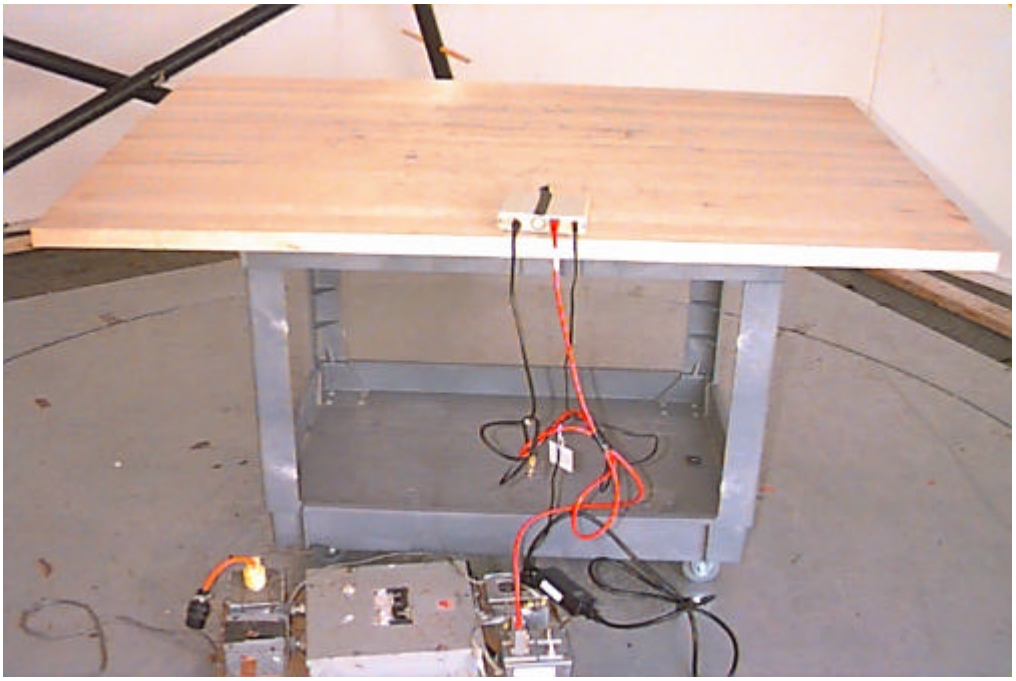
Notes:
B/C = Biconical, BL = Bilog, L/P = Log-Periodic, H = Horn, D/P = Dipole, E/D = EMCO Dipole
* Re-measured using dipole antenna.
** Includes cable loss when amplifier is not used.
*** Includes cable loss.
( ) Denotes failing emission level.
N.D. = Not Detected

Radiated Photographs

Front View



Rear View



Section 6. Sample Calculations

Conducted Emissions

If the Quasi-Peak to Average ratio was greater than 6 dB, then the emission was classified as broadband and its Quasi-Peak level was reduced by 13 dB for comparison to the limit.

i.e. Quasi-Peak level = 40 dBµV
Average level = 34 dBµV
Corrected level = 40 - 13 = 27 dBµV

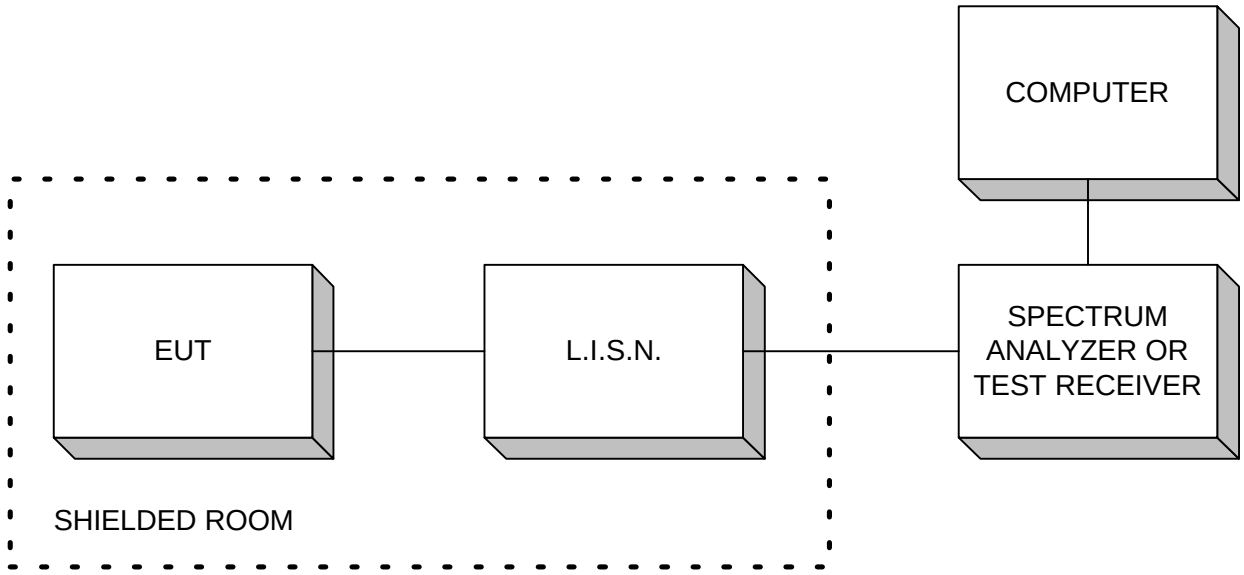
Radiated Emissions

Emissions were measured at a distance of 3 meters and corrected for antenna factor and cable loss.

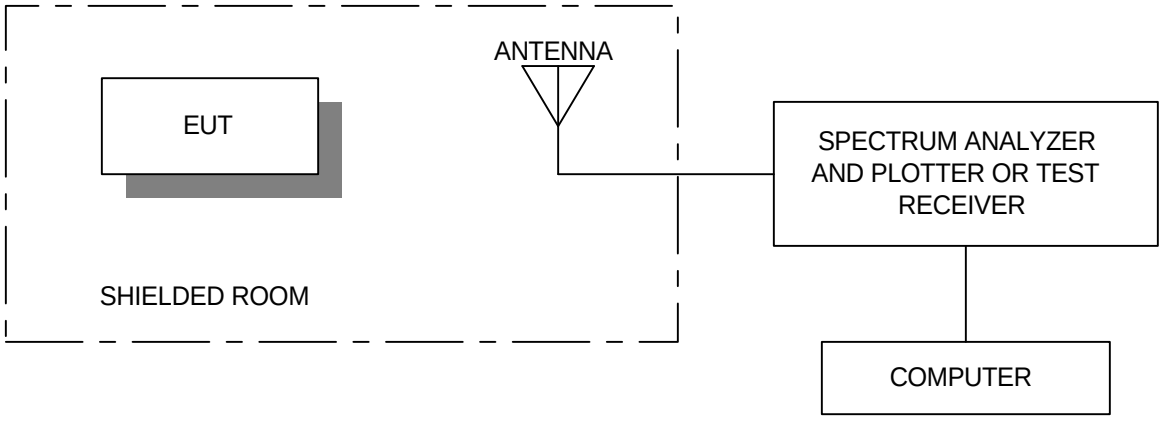
i.e. Received Signal = 25 dBµV @ 100 MHz
Antenna Factor & Cable Loss = 9.8 dB
Field Intensity = 25 + 9.8 = 34.8 dBµV/m @ 3 m

Section 7. Block Diagrams

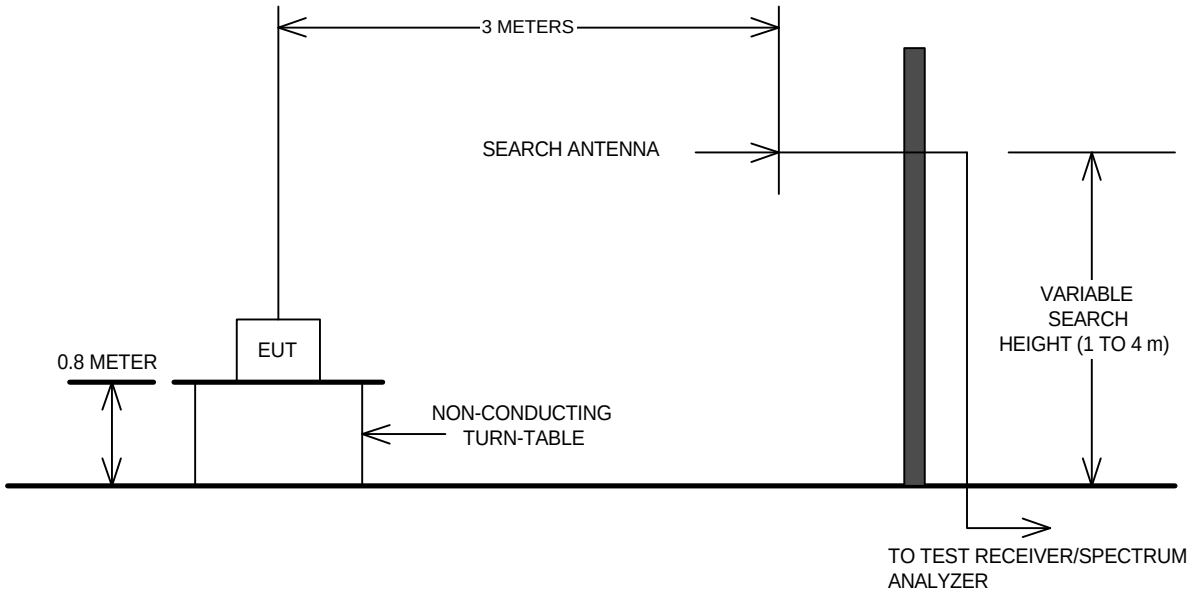
Conducted Emissions



Radiated Prescan



Outdoor Test Site For Radiated Emissions



The spectrum was searched up to 1GHz or the 5th harmonic of the highest oscillator frequency, which ever was higher, up to a maximum of 40GHz.

Section 8. Test Equipment List

Equipment List – Conducted Emissions - Anechoic Chamber

CAL Cycle	Equipment	Manufacturer	Model No.	Asset/Serial No.	Last Cal.	Next Cal.
1 Year	LISN	EMCO	4825/2	FA001545	Oct. 09/01	Oct. 09/02
1 Year	Receiver	Rohde & Schwarz	ESH3	FA000872	Oct. 18/01	Oct. 18/02
1 Year	Spectrum Analyzer	Hewlett-Packard	8566B	FA001309	Nov. 27/01	Nov. 27/02
1 Year	Spectrum Analyzer Display	Hewlett-Packard	85662A	FA001309	Nov. 27/01	Nov. 27/02
1 Year	Quasi-Peak Adapter	Hewlett-Packard	85650A	FA000801	Nov. 27/01	Nov. 27/02
1 Year	Transient Limiter	Hewlett-Packard	1194 7A	FA000975	Oct. 19/01	Oct. 19/02

Equipment List – Prescan for Radiated Emissions - Anechoic Chamber

CAL Cycle	Equipment	Manufacturer	Model No.	Asset/Serial No.	Last Cal.	Next Cal.
1 Year	Spectrum Analyzer	Hewlett-Packard	8566B	FA001309	Nov. 27/01	Nov. 27/02
1 Year	Spectrum Analyzer Display	Hewlett-Packard	85662A	FA001309	Nov. 27/01	Nov. 27/02
1 Year	Quasi-Peak Adapter	Hewlett-Packard	85650A	FA000801	Nov. 27/01	Nov. 27/02
	Bilog Antenna	Schaffner	CBL6612B	FA001503	NCR	NCR
1 Year	Horn Antenna #1	EMCO	3115	FA000649	Dec. 19/01	Dec. 19/02
1 Year	0.1 – 1300 MHz Amplifier	Hewlett Packard	8447D	FA001748	May. 14/01	May. 14/02
1 Year	1.0 – 2.0 GHz Amplifier	JCA	12-400	FA001498	May. 30/01	May. 30/02
1 Year	2.0 – 4.0 GHz Amplifier	JCA	24-600	FA001496	May. 30/01	May. 30/02
1 Year	4.0 – 8.0 GHz Amplifier	JCA	48-600	FA001498	May. 30/01	May. 30/02
COU	5.0 – 18.0 GHz Amplifier	NARDA	DWT-186N23U40	FA001409		

Equipment List - Radiated Emissions

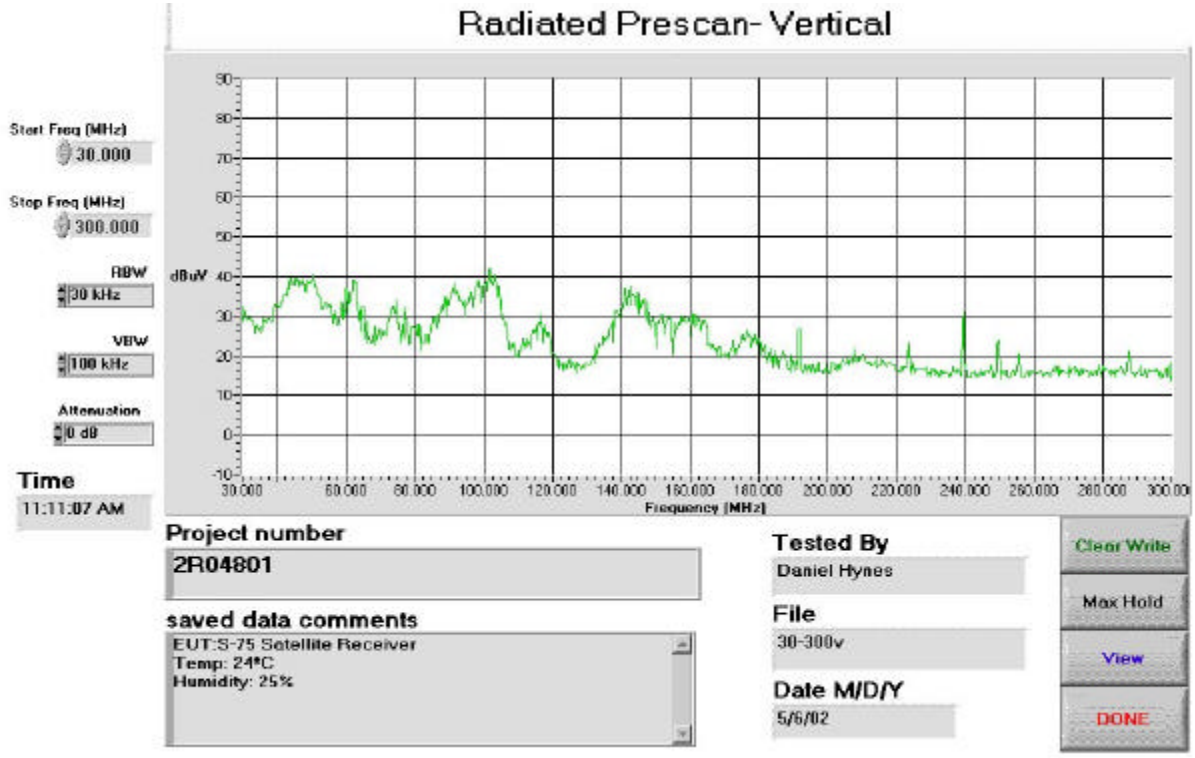
CAL Cycle	Equipment	Manufacturer	Model No.	Asset/Serial No.	Last Cal.	Next Cal.
1 Year	Receiver	Rohde & Schwarz	ESVS-30	FA001437	June. 27/01	June. 27/02
1 Year	Spectrum Analyzer	Hewlett-Packard	8565E	FA000981	June. 08/01	June. 08/02
1 Year	Biconical (2) Antenna	EMCO	3109	FA000904	June. 28/01	June. 28/02
1 Year	Horn Antenna #1	EMCO	3115	FA000649	Dec. 19/01	Dec. 19/02
1 Year	Log Periodic Antenna #1	EMCO	LPA-25	FA000477	Aug. 28/01	Aug. 28/02
1 Year	1.0 – 2.0 GHz Amplifier	JCA	12-400	FA001498	May. 30/01	May. 30/02
1 Year	2.0 – 4.0 GHz Amplifier	JCA	24-600	FA001496	May. 30/01	May. 30/02
1 Year	4.0 – 8.0 GHz Amplifier	JCA	48-600	FA001498	May. 30/01	May. 30/02
COU	5.0 – 18.0 GHz Amplifier	NARDA	DWT-186N23U40	FA001409		

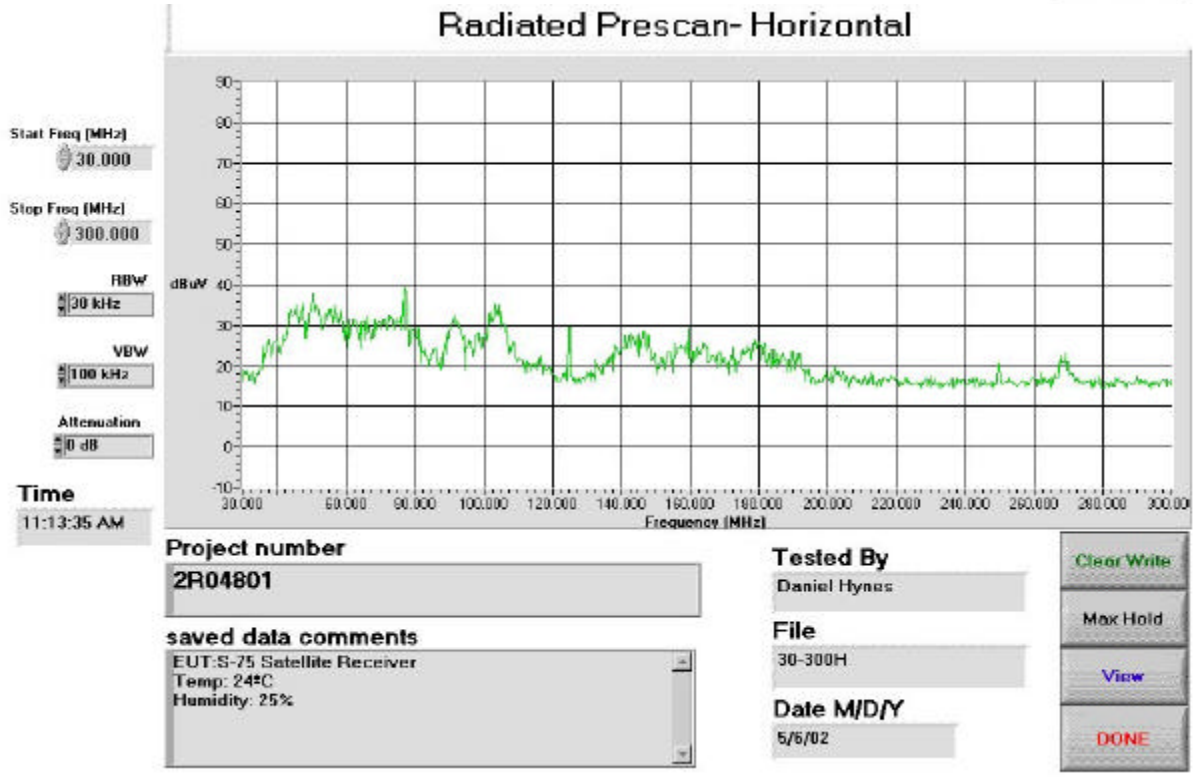
Note: N/A = Not Applicable
NCR = No Cal Required
COU = CAL On Use
OUT = Out For CAL/Repair

Annex A

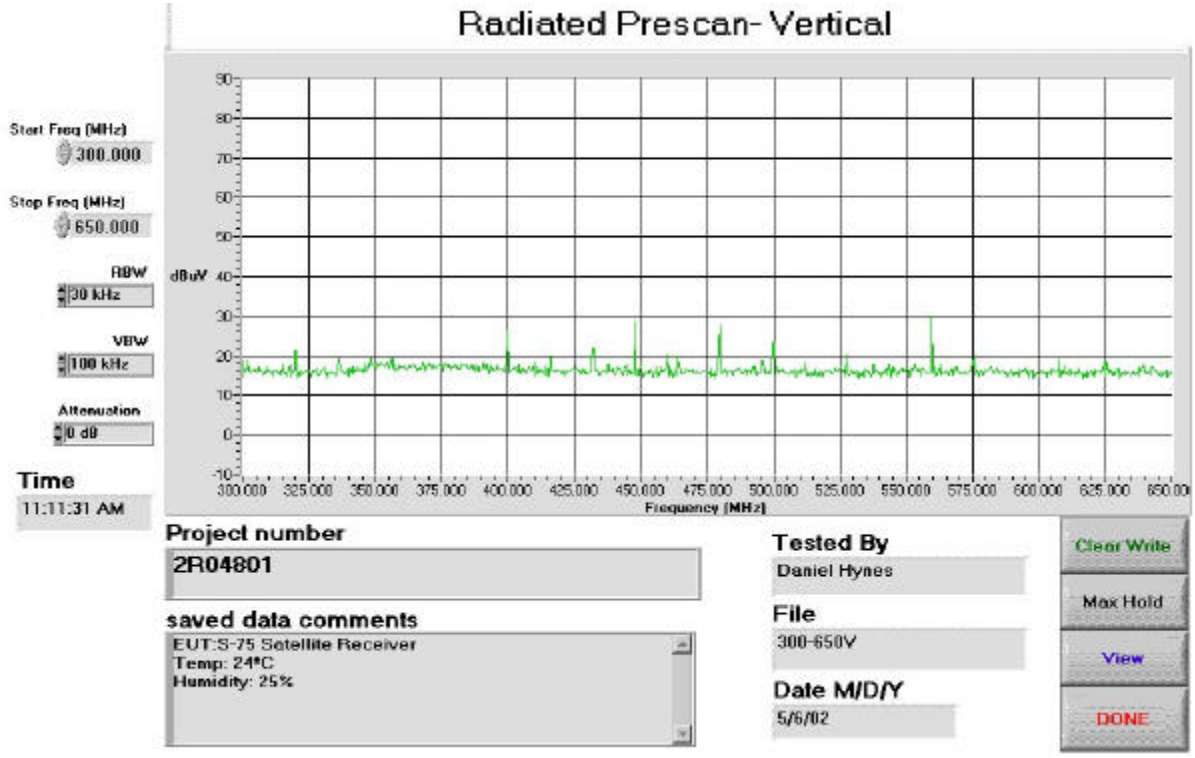
Prescans For Engineering Evaluation Only

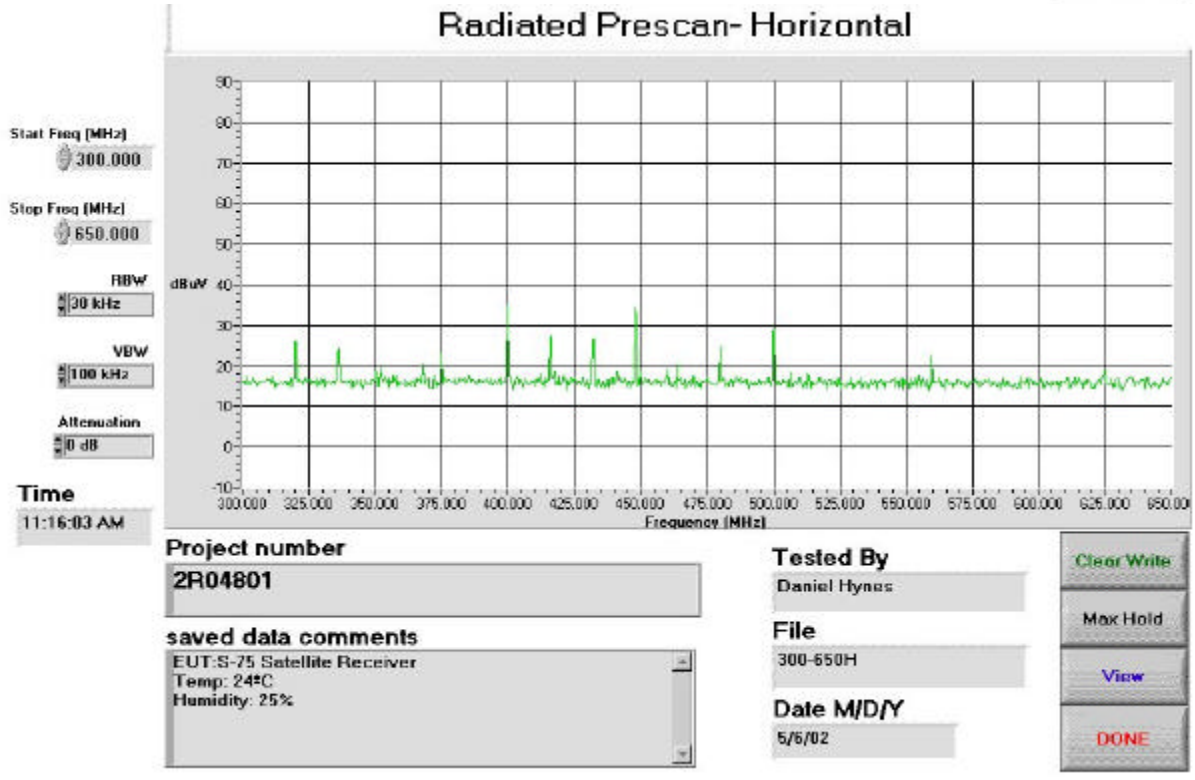
EQUIPMENT: S75 Satellite Receiver



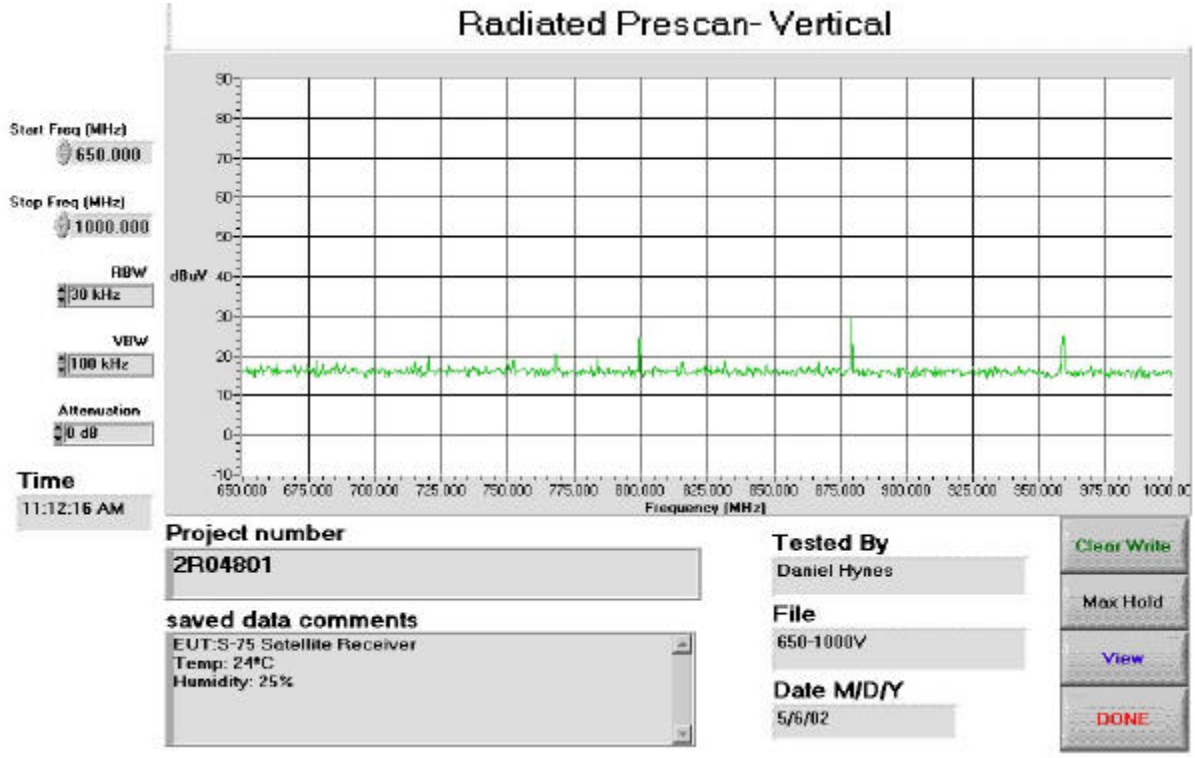


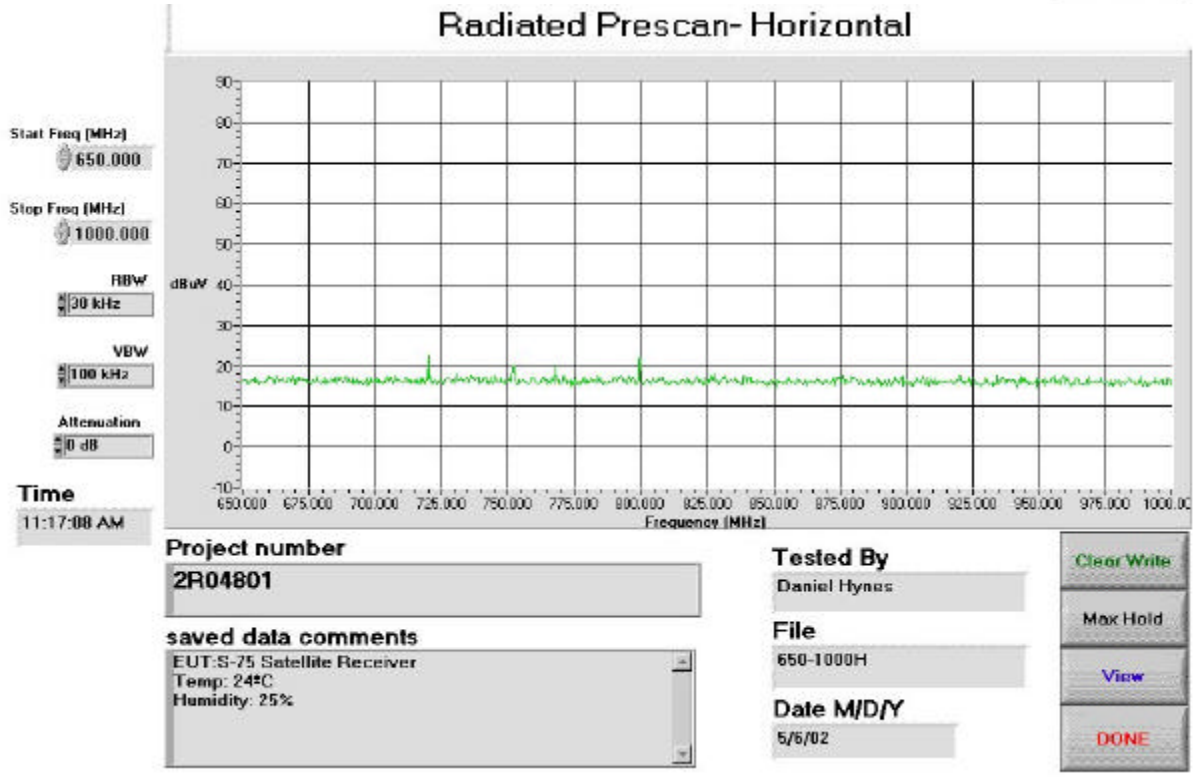
EQUIPMENT: S75 Satellite Receiver

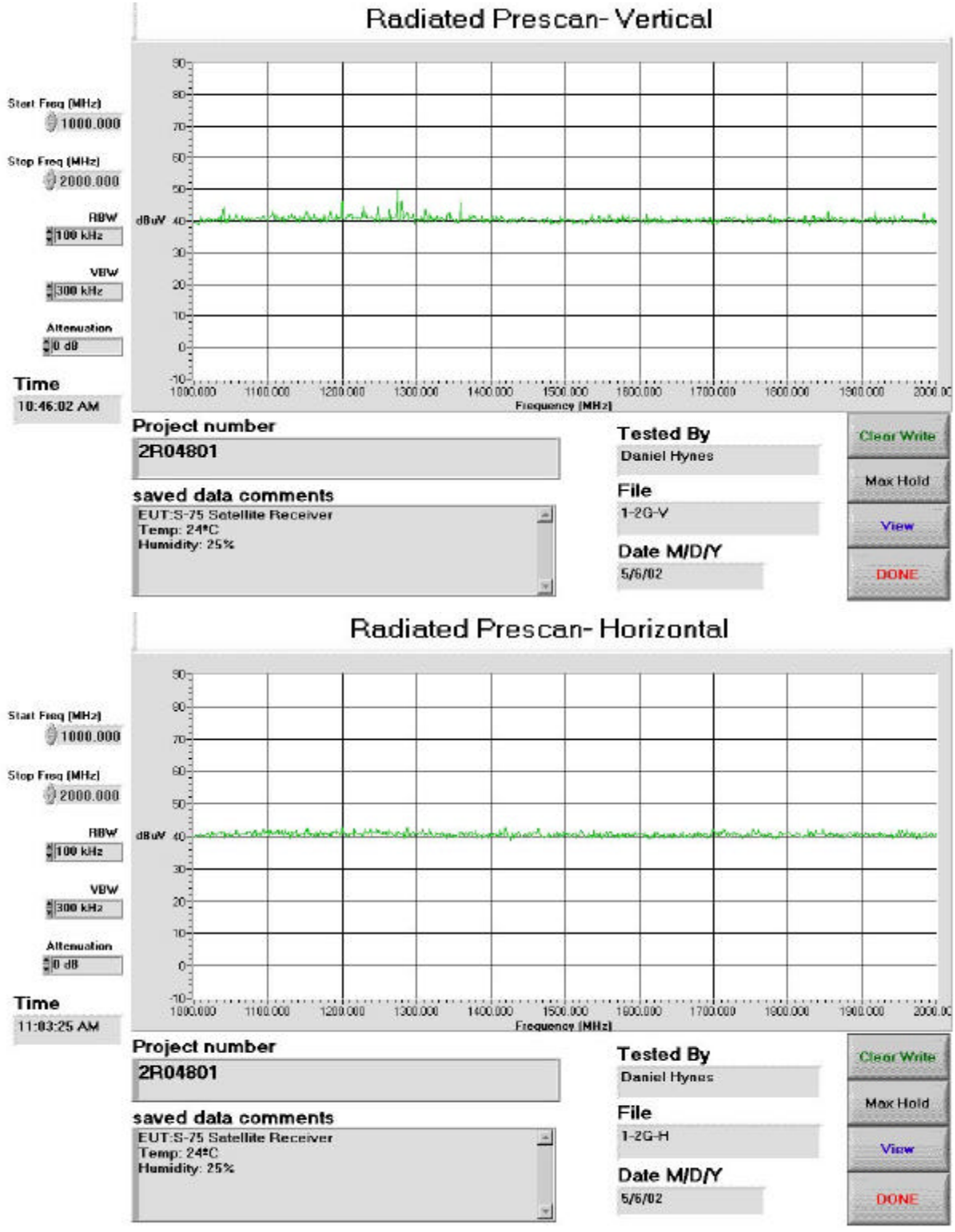


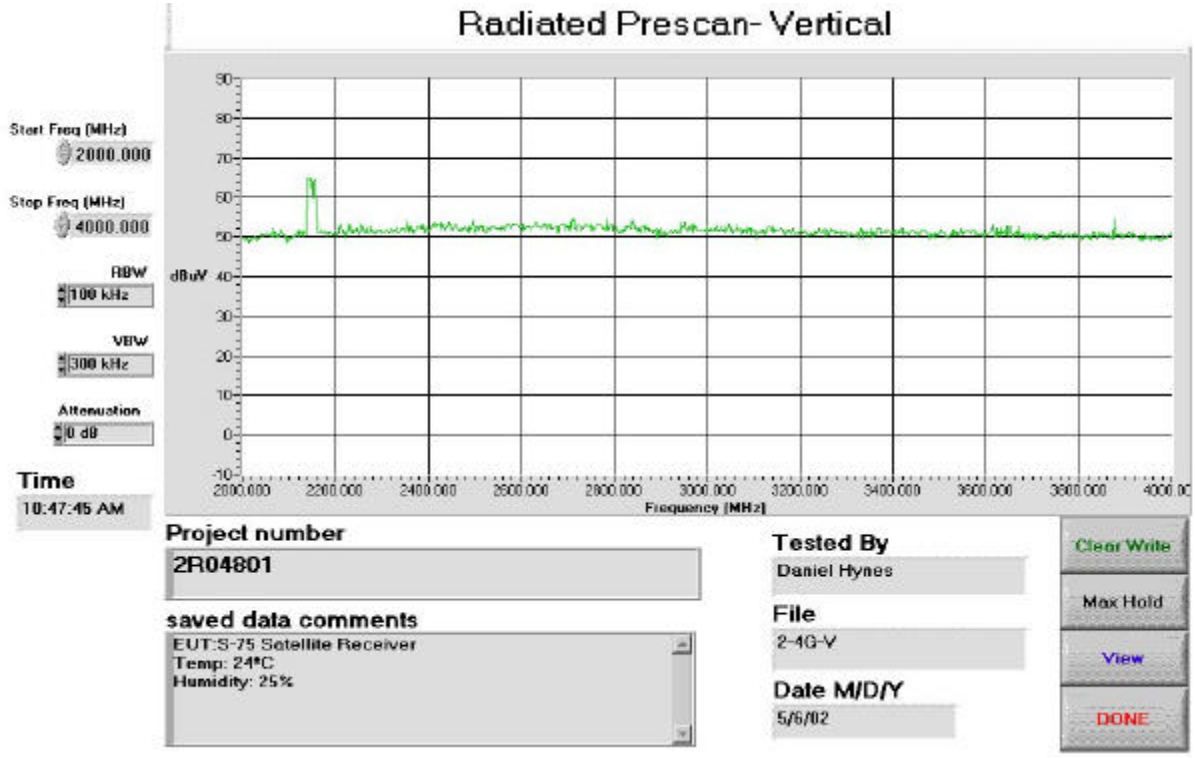


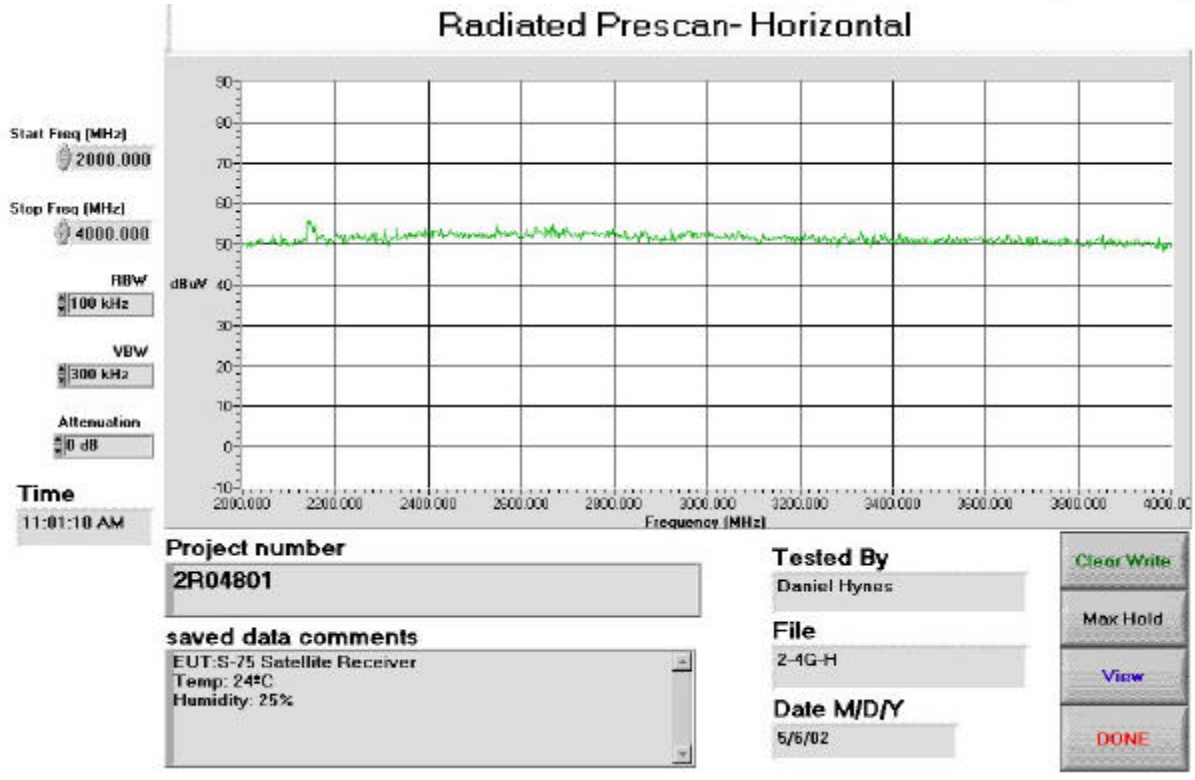
EQUIPMENT: S75 Satellite Receiver

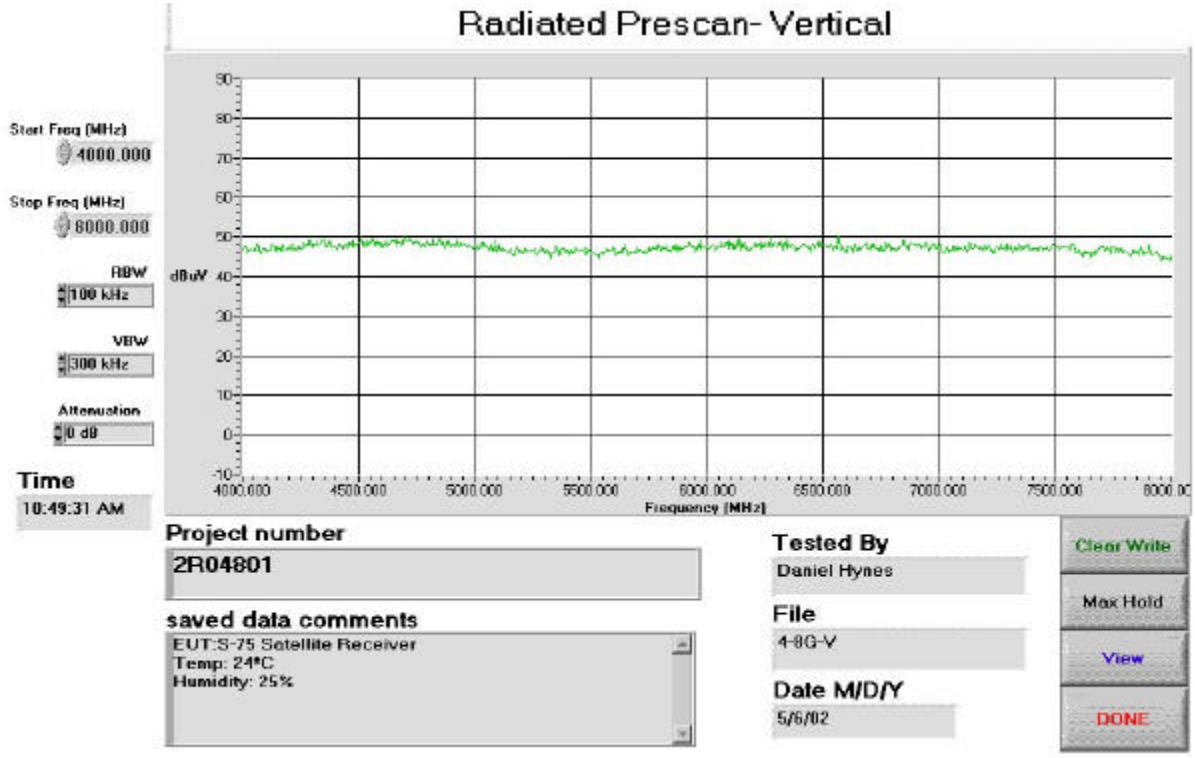


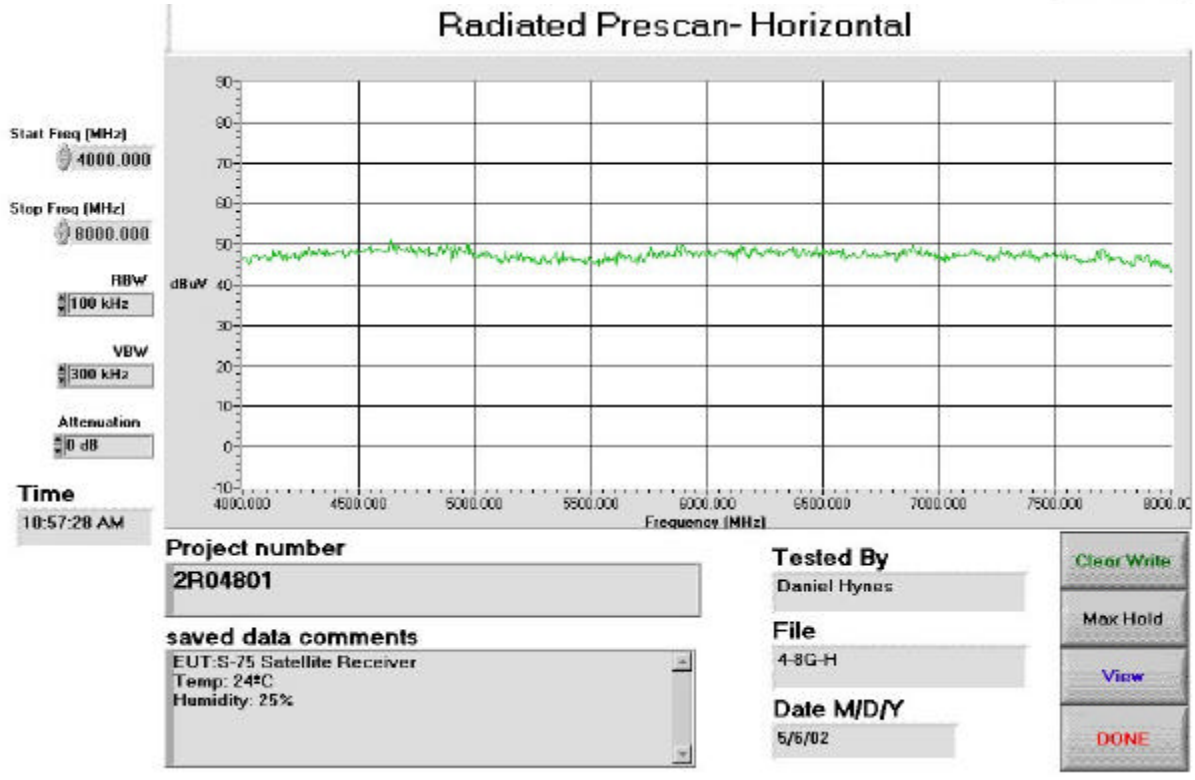


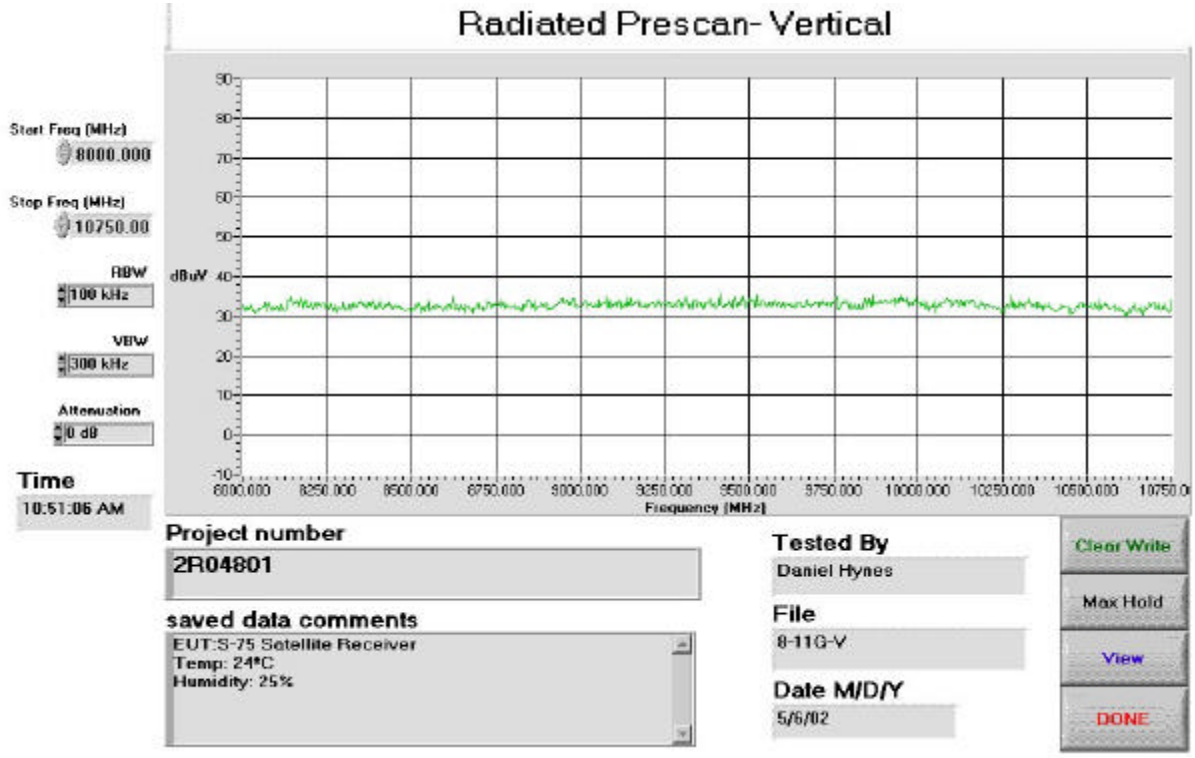

Radiated Prescan- Vertical
Start Freq (MHz)
1000.000
Stop Freq (MHz)
2000.000
RBW
100 kHz
VBW
300 kHz
Attenuation
0 dB
Time
10:46:02 AM
dBuV
Frequency (MHz)
Project number
2R04801
saved data comments
EUT:S-75 Satellite Receiver
Temp: 24°C
Humidity: 25%
Tested By
Daniel Hynes
File
1-2G-V
Date M/D/Y
5/6/02
Clear Write
Max Hold
View
DONE
Radiated Prescan- Horizontal
Start Freq (MHz)
1000.000
Stop Freq (MHz)
2000.000
RBW
100 kHz
VBW
300 kHz
Attenuation
0 dB
Time
11:03:25 AM
dBuV
Frequency (MHz)
Project number
2R04801
saved data comments
EUT:S-75 Satellite Receiver
Temp: 24°C
Humidity: 25%
Tested By
Daniel Hynes
File
1-2G-H
Date M/D/Y
5/6/02
Clear Write
Max Hold
View
DONE

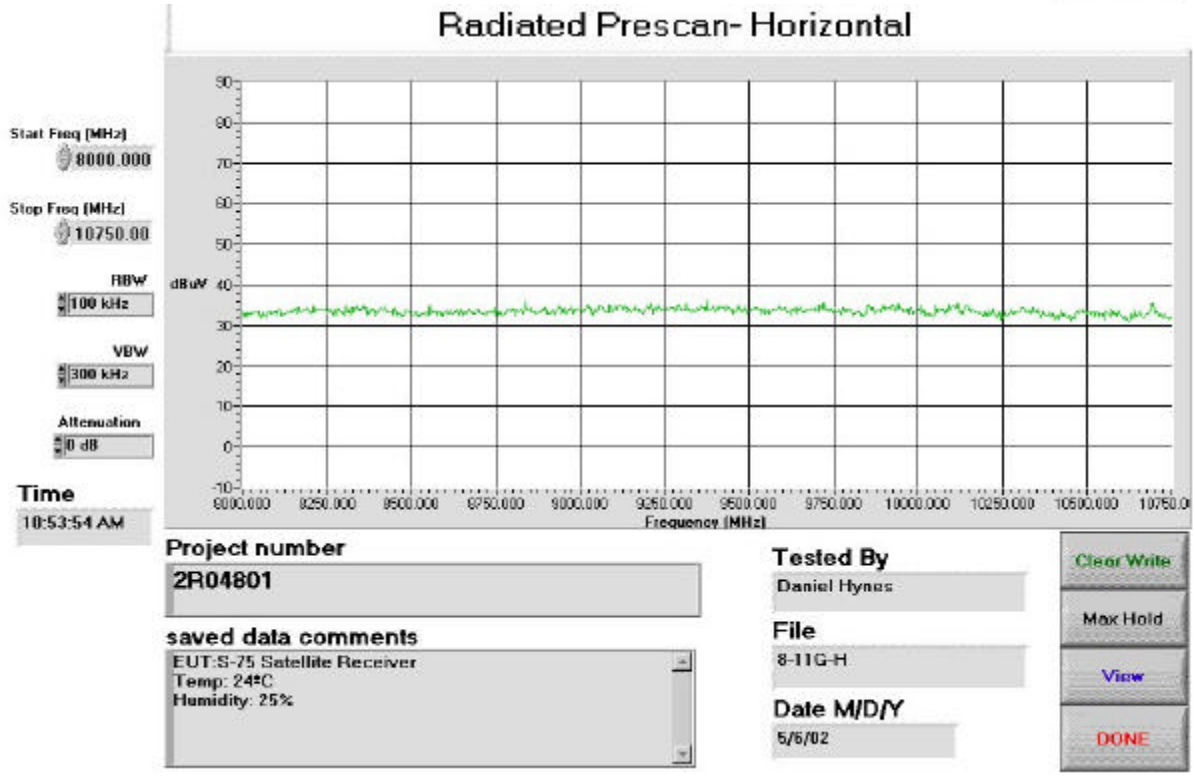

Radiated Prescan- Vertical
Start Freq (MHz)
2000.000
Stop Freq (MHz)
4000.000
RBW
100 kHz
VBW
300 kHz
Attenuation
0 dB
Time
10:47:45 AM
dBuV
Frequency (MHz)
Project number
2R04801
saved data comments
EUT:S-75 Satellite Receiver
Temp: 24°C
Humidity: 25%
Tested By
Daniel Hynes
File
2-4G-V
Date M/D/Y
5/6/02
Clear Write
Max Hold
View
DONE


Radiated Prescan- Horizontal
Start Freq (MHz)
2000.000
Stop Freq (MHz)
4000.000
RBW
100 kHz
VBW
300 kHz
Attenuation
0 dB
Time
11:01:10 AM
dBuV
Frequency (MHz)
Project number
2R04801
saved data comments
EUT:S-75 Satellite Receiver
Temp: 24°C
Humidity: 25%
Tested By
Daniel Hynes
File
2-4G-H
Date M/D/Y
5/6/02
Clear Write
Max Hold
View
DONE


Radiated Prescan- Vertical
Start Freq (MHz)
4000.000
Stop Freq (MHz)
8000.000
RBW
100 kHz
VBW
300 kHz
Attenuation
0 dB
Time
10:49:31 AM
dBuV
Frequency (MHz)
Project number
2R04801
saved data comments
EUT:S-75 Satellite Receiver
Temp: 24°C
Humidity: 25%
Tested By
Daniel Hynes
File
4-8G-V
Date M/D/Y
5/6/02
Clear Write
Max Hold
View
DONE


Radiated Prescan- Horizontal
Start Freq (MHz)
4000.000
Stop Freq (MHz)
8000.000
RBW
100 kHz
VBW
300 kHz
Attenuation
0 dB
Time
10:57:28 AM
dBuV
Frequency (MHz)
Project number
2R04801
saved data comments
EUT:S-75 Satellite Receiver
Temp: 24°C
Humidity: 25%
Tested By
Daniel Hynes
File
4-8G-H
Date M/D/Y
5/6/02
Clear Write
Max Hold
View
DONE


Radiated Prescan- Vertical
Start Freq (MHz)
8000.000
Stop Freq (MHz)
10750.00
RBW
100 kHz
VBW
300 kHz
Attenuation
0 dB
Time
10:51:06 AM
dBuV
Frequency (MHz)
Project number
2R04801
saved data comments
EUT:S-75 Satellite Receiver
Temp: 24°C
Humidity: 25%
Tested By
Daniel Hynes
File
8-11G-V
Date M/D/Y
5/6/02
Clear Write
Max Hold
View
DONE


Radiated Prescan- Horizontal
Start Freq (MHz)
8000.000
Stop Freq (MHz)
10750.00
RBW
100 kHz
VBW
300 kHz
Attenuation
0 dB
Time
10:53:54 AM
dBuV
Frequency (MHz)
Project number
2R04801
saved data comments
EUT:S-75 Satellite Receiver
Temp: 24°C
Humidity: 25%
Tested By
Daniel Hynes
File
8-11G-H
Date M/D/Y
5/6/02
Clear Write
Max Hold
View
DONE