ENGINEERING TEST REPORT

RTMS
MODEL NO.: RTMS X3

FCC ID: J7TRTMS-X3

Applicant:

EIS Electronic Integrated System Inc.
150 Bridgeland Ave. Suite 204
Toronto, Ontario
Canada, M6A 1Z5

Tested in Accordance With

FCC Part 15, Subpart C, Section 15.245
Field Disturbance Sensor
Operating in the Frequency Band 10500-10550 MHz

UltraTech's File No.: EIS-029F15C245

This Test report is Issued under the Authority of Tri M. Luu, Professional Engineer, Vice President of Engineering UltraTech Group of Labs Date: October 27, 2005	
Report Prepared by: JaeWook Choi, RF Engineer Issued Date: October 27, 2005	Tested by: Mr. Hung Trinh, EMC/RFI Technician Test Dates: September 20-22, 2005

- *The results in this Test Report apply only to the sample(s) tested, and the sample tested is randomly selected.*
- *This report must not be used by the client to claim product endorsement by NVLAP or any agency of the US Government.*

UltraTech

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EXHIBIT 1. SUBMITTAL CHECK LIST

Annex No.	Exhibit Type	Description of Contents	Quality Check (OK)
--	Test Report	Test Report	OK
1	Test Setup Photos	• AC Conducted Emissions Setup Photos • Radiated Emission Setup Photos	OK
2	External Photos of EUT	External EUT Photos	OK
3	Internal Photos of EUT	Internal EUT Photos	OK
4	Cover Letters	Letter from Ultratech for Certification Request	OK
5	Attestation Statements	• Letter from the Applicant to appoint Ultratech to act as an agent • Letter from the Applicant to request for Confidentiality Filing	OK OK
6	ID Label/Location Info	• ID Label • Location of ID Label	OK
7	Block Diagrams	Block Diagram	OK
8	Schematic Diagrams	Schematic Diagram	OK
9	Parts List/Tune Up Info	-	N/A
10	Operational Description	Operational Description	OK
11	RF Exposure Info	-	N/A
12	Users Manual	RTMS X3 User Guide	OK

EXHIBIT 2. INTRODUCTION

2.1. SCOPE

Reference:	FCC Part 15, Subpart C, Section 15.245
Title:	Code of Federal Regulations (CFR), Title 47 – Telecommunication, Part 15
Purpose of Test:	To gain FCC Certification Authorization for Field Disturbance Sensor operating in the Frequency Band 10500-10550 MHz.
Test Procedures:	Both conducted and radiated emissions measurements were conducted in accordance with American National Standards Institute ANSI C63.4 - 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.
Environmental Classification:	Commercial, industrial or business environment

2.2. RELATED SUBMITTAL(S)/GRANT(S)

None.

2.3. NORMATIVE REFERENCES

Publication	Year	Title
FCC CFR Parts 0-19	2004	Code of Federal Regulations – Telecommunication
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
CISPR 22 +A1 EN 55022	2003-04-10 2004-10-14 2003	Limits and Methods of Measurements of Radio Disturbance Characteristics of Information Technology Equipment
CISPR 16-1-1	2003	Specification for radio disturbance and immunity measuring apparatus and methods. Part 1-1: Measuring Apparatus
CISPR 16-2-1	2003	Specification for radio disturbance and immunity measuring apparatus and methods. Part 2-1: Conducted disturbance measurement
CISPR 16-2-3	2003	Specification for radio disturbance and immunity measuring apparatus and methods. Part 2-3: Radiated disturbance measurement

EXHIBIT 3. PERFORMANCE ASSESSMENT

3.1. CLIENT INFORMATION

APPLICANT	
Name:	EIS Electronic Integrated System Inc.
Address:	150 Bridgeland Ave. Suite 204 Toronto, Ontario Canada, M6A 1Z5
Contact Person:	Chris Gosciniak Phone #: (416) 785-9248 Fax #: (416) 785-9332 Email Address: chris.gosciniak@eistraffic.com

MANUFACTURER	
Name:	EIS Electronic Integrated System Inc.
Address:	150 Bridgeland Ave. Suite 204 Toronto, Ontario Canada, M6A 1Z5
Contact Person:	Chris Gosciniak Phone #: (416) 785-9248 Fax #: (416) 785-9332 Email Address: chris.gosciniak@eistraffic.com

3.2. EQUIPMENT UNDER TEST (EUT) INFORMATION

The following information (with the exception of the Date of Receipt) has been supplied by the applicant.

Equipment Identification:	EIS Electronic Integrated System Inc.
Brand or Trade Name:	RTMS
Model Name or Number:	RTMS X3
Serial Number:	Test Sample
Type of Equipment:	Field Disturbance Sensor
Input Power Supply Type:	12 - 24 Vac or Vdc Power Supply
Primary User Functions of EUT:	Radar based vehicular traffic detector

3.3. OPERATIONAL DESCRIPTION

1. The RTMS Model X3 consists of a Processor Board, a horn microwave Antenna and a Microwave X Band module assembly.

   A. The Microwave module is powered from the board and includes 3 microwave diodes; The Gunn diode which is placed in a cavity, is powered by 9 Volts, oscillates and generates microwave energy, which is transmitted through the antenna. A varactor diode controls (within a narrow band) the oscillation frequency. The diode voltage is controlled by the FGO circuit in the Processor Board. A Schottky barrier mixer diode performs the mixing of the transmitted (Gunn) signal with the received signal (coming through the antenna). The resulting (IF) signal is provided to the IF amplifier in the Processor board.

   B. A thermistor, which is attached to the microwave module, is connected to the processor board.

   C. The Processor board is fed by AC or DC low voltage power through an MS connector. All the output signals from the RTMS are sent through the same connector, including contact pairs and serial port.

2. The Processor Board (see circuit schematic) consists of the following:

   A. Power supply (DC/DC converter) based on a bridge rectifier, filter and switching regulator provides 3.3 Volts for logic circuits and 9 Volts for analog circuits.

   B. 9 Opto-isolators (OPTOs), providing translation of logic signals into dry relay contacts.

   C. IF Amplifier and filter receives the signal from the Mixer and amplifies it with proper filtering to the proper level which can be controlled by software.

   D. Frequency Generating Oscillator (FGO), which controls the microwave module Varactor diode. It is a software-generated signal, which is stored in the RAM chip and calculated by the microcontroller (MCU).

   E. ADC is an A/D converter, which converts the received analog signal into digital form.

   F. DSP is a Digital Signal Processor which runs at 36 MHz (generated internally by

   PLL from 3.6 MHz). It receives the digitized signal and processes it based on various sophisticated proprietary radar signal-processing algorithms. The DSP produces its reports on a digital bus to the microcomputer.

   G. MCU is a microcontroller, which performs additional processing on the received data from the DSP in real time. The microcontroller performs various tasks, such as communicating with internal devices on the board (including the opto-isolators) via CPLD (a proprietary programmable logic array) and with outside world through its serial port. The microcontroller controls various functions of the RTMS through its resident software (one time programmable), including presence of vehicles, calculation of traffic parameters, storage of setup parameters, Self-Test and other auxiliary functions. All software algorithms are proprietary.

   H. UART, DRIVER and OPTOs are RS-232 a level translation and isolation circuit, which translates the serial port of the microcomputer to the correct voltage levels.

3.4. EUT'S TECHNICAL SPECIFICATIONS

TRANSMITTER	
Equipment Type:	Transceiver
Intended Operating Environment:	Commercial, light industry & heavy industry
Power Supply Requirement:	12 to 24 Vac or Vdc Power Supply
Operating Frequency:	10500 – 10550 MHz
RF Output Impedance:	50 Ohms
20 dB Bandwidth:	43.888 MHz
Modulation Type:	FMCW (Frequency Modulated Continuous Wave)
Duty Cycle:	12.84 %
Antenna Connector Type:	Integral, Flange waveguide WR-90, UG-39/U
Antenna Description:	Manufacturer: Alpha Industries Type: Horn M/N: GAH3835-01 Frequency Range: 9.4 – 10.7 GHz Gain: 18 dBi

3.5. LIST OF EUT'S PORTS

Port Number	EUT's Port Description	Number of Identical Ports	Connector Type	Cable Type (Shielded/Non-shielded)
1	Power	2	MS 32-pins	Shielded
2	Serial port RS232	4	MS 32-pins	Shielded
3	Contact closure	18	MS 32-pins	Shielded

3.6. GENERAL TEST SETUP

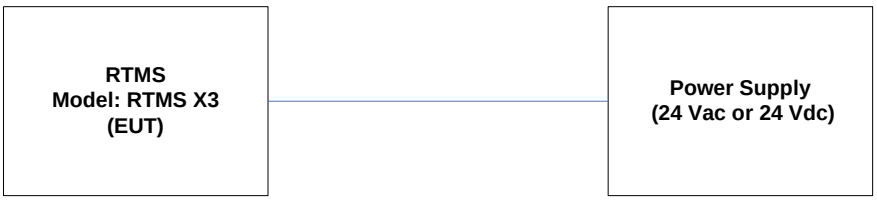


EXHIBIT 4. EUT OPERATING CONDITIONS AND CONFIGURATIONS DURING TESTS

4.1. CLIMATE TEST CONDITIONS

The climate conditions of the test environment are as follows:

Temperature:	21°C
Humidity:	55%
Pressure:	102 kPa
Power input source:	4.5 V DC

4.2. OPERATIONAL TEST CONDITIONS & ARRANGEMENT FOR TESTS

Operating Modes:	EUT was configured and put into built-in RF test mode to transmit burst with the designated duty cycle for measurements.
Special Test Software:	None
Special Hardware Used:	None
Transmitter Test Antenna:	The EUT is tested with the antenna fitted in a manner typical of normal intended use as integral antenna equipment.

Transmitter Test Signals:	
Frequency Band(s):	10500 – 10550 MHz
Test Frequency(ies):	10530 MHz
Transmitter Wanted Output Test Signals: • Max. Field Strength @ 3 meters : • Normal Test Modulation:	 112.91 dBuV/m average FMCW

EXHIBIT 5. SUMMARY OF TEST RESULTS

5.1. LOCATION OF TESTS

- All of the measurements described in this report were performed at Ultratech Group of Labs located in the city of Oakville, Province of Ontario, Canada.

- AC Powerline Conducted Emissions were performed in UltraTech's shielded room, 24'(L) by 16'(W) by 8'(H).

- Radiated Emissions were performed at the Ultratech's 3-10 TDK Semi-Anechoic Chamber situated in the Town of Oakville, province of Ontario. This test site been calibrated in accordance with ANSI C63.4, and found to be in compliance with the requirements of Sec. 2.948 of the FCC Rules. The descriptions and site measurement data of the Oakville 3-10 TDK Semi-Anechoic Chamber has been filed with FCC office (FCC File No.: 31040/SIT 1300B3) and Industry Canada office (Industry Canada File No.: IC2049-1). Last Date of Site Calibration: June. 20, 2005.

5.2. APPLICABILITY & SUMMARY OF EMC EMISSION TEST RESULTS

FCC Section(s)	Test Requirements	Compliance (Yes/No)
15.107(b) & 15.207	Power Line Conducted Emissions	Yes
--	20 dB Bandwidth	Yes
15.245, 15.209, 15.205	Transmitter Radiated Emissions, Harmonic Emissions and Band Edge Radiated Emissions	Yes

5.3. MODIFICATIONS INCORPORATED IN THE EUT FOR COMPLIANCE PURPOSES

None.

EXHIBIT 6. MEASUREMENTS, EXAMINATIONS & TEST DATA FOR EMC EMISSIONS

6.1. TEST PROCEDURES

This section contains test results only. Details of test methods and procedures can be found in ANSI C63.4 and ULTR-P001-2004.

6.2. MEASUREMENT UNCERTAINTIES

The measurement uncertainties stated were calculated in accordance with requirements of UKAS Document LAB 34 with a confidence level of 95%. Please refer to Exhibit 6 for Measurement Uncertainties.

6.3. MEASUREMENT EQUIPMENT USED

The measurement equipment used complied with the requirements of the Standards referenced in the Methods & Procedures ANSI C63.4 and CISPR 16-1.

6.4. ESSENTIAL/PRIMARY FUNCTIONS AS DECLARED BY THE MANUACTURER

The EUT is a remote control with 916.289 MHz RF link. The battery powered remote unit sends commands to an interface unit and receives command acknowledges and data from the same interface via RF link. The interface unit communicates via a serial link (I2C) with IQ2020 spa controller made by Invensys for Watkins. The interface unit is powered from the spa controller. The EUT incorporates and LCD graphic screen and 3 keys allowing spa control.

6.5. Power Line Conducted Emissions [§ 15.107 (B) & 15.207]

6.5.1. LIMITS

The equipment shall meet the limits of the following table:

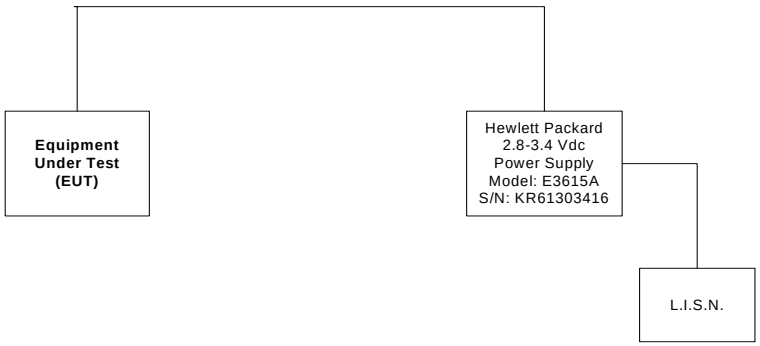
Frequency of emission (MHz)	Class A Conducted Limits (dBμV)		Measuring Bandwidth
	Quasi-peak	Average	
0.15–0.5 .....…….. 0.5–30 .....……...	79 ..... 73 ...……..	66 60	RBW = 9 kHz VBW ≥ 9 kHz for QP VBW = 1 Hz for Average

* Decreases linearly with logarithm of the frequency

6.5.2. METHOD OF MEASUREMENTS

Refer to Section 8.2 of this test report & ANSI C63.4.

6.5.3. TEST ARRANGEMENT



6.5.4. TEST EQUIPMENT LIST

Test Instruments	Manufacturer	Model No.	Serial No.	Frequency Range
Spectrum Analyzer/ EMI Receiver	Hewlett Packard	HP 8593EM	3412A00103	9 kHz – 26.5 GHz
Transient Limiter	Hewlett Packard	11947A	310701998	9 kHz – 200 MHz 10 dB attenuation
L.I.S.N.	EMCO	3825/2	89071531	9 kHz – 200 MHz 50 Ohms / 50 μH
24'(L) x 16'(W) x 8'(H) RF Shielded Chamber	Braden Shielding	…	…	…

6.5.5. SETUP PHOTOGRAPHS


80 CM HIGH

6.5.6. TEST DATA

Line Voltage: 24 VDC

Frequency (MHz)	RF Level (dBµV)	Receiver Detector (P/QP/AVG)	QP Limit (dBuV)	AVG Limit (dBuV)	Margin (dB)	Pass/ Fail	Line Tested (L1/L2)
Test Configuration : Transmitter Mode							
0.49	38.3	QP	79	66	-40.7	Pass	L1
0.49	35.6	AVG	79	66	-30.4	Pass	L1
19.38	49.9	QP	73	60	-23.1	Pass	L1
19.38	47.4	AVG	73	60	-12.6	Pass	L1
0.48	38.6	QP	79	66	-40.4	Pass	L2
0.48	37.2	AVG	79	66	-28.8	Pass	L2
19.36	49.8	QP	73	60	-23.2	Pass	L2
19.36	49.2	AVG	73	60	-10.8	Pass	L2

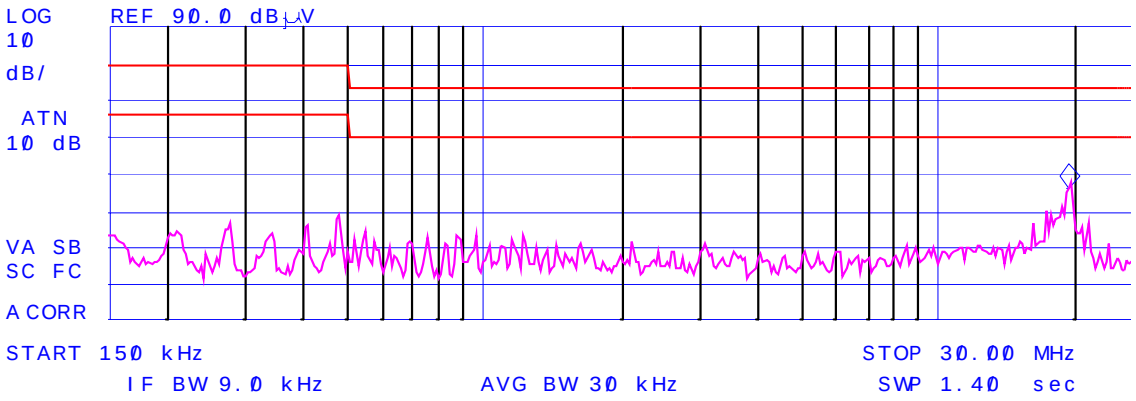
Line Voltage: 24 VAC

Frequency (MHz)	RF Level (dBµV)	Receiver Detector (P/QP/AVG)	QP Limit (dBuV)	AVG Limit (dBuV)	Margin (dB)	Pass/ Fail	Line Tested (L1/L2)
Test Configuration : Transmitter Mode							
19.29	48.5	QP	73	60	-24.5	Pass	L1
19.29	46.0	AVG	73	60	-14.0	Pass	L1
20.64	39.4	QP	73	60	-33.6	Pass	L1
20.64	38.2	AVG	73	60	-21.8	Pass	L1
19.31	49.0	QP	73	60	-24.0	Pass	L2
19.31	46.1	AVG	73	60	-13.9	Pass	L2
20.64	40.1	QP	73	60	-32.9	Pass	L2
20.64	38.9	AVG	73	60	-21.1	Pass	L2

Note: See the following test data plots for detailed measurements.

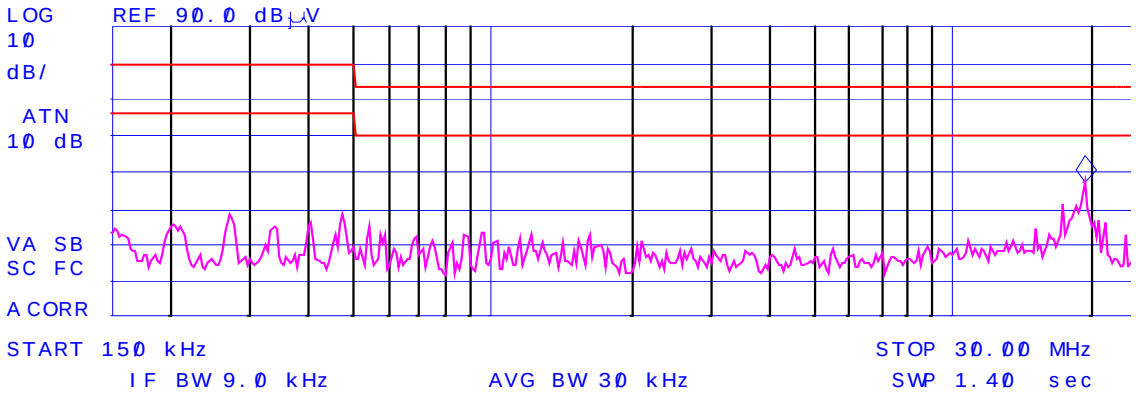
Plot 1:
AC Power Line Conducted Emissions
Test Configuration : Transmitter Mode
Line Voltage : 24 VDC
Line Tested: L1

Signal	Freq (MHz)	PK Amp	QP Amp	AV Amp	AV△L2
1	0.488225	40.8	38.3	35.6	-30.4
2	19.382295	52.2	49.9	47.4	-12.6



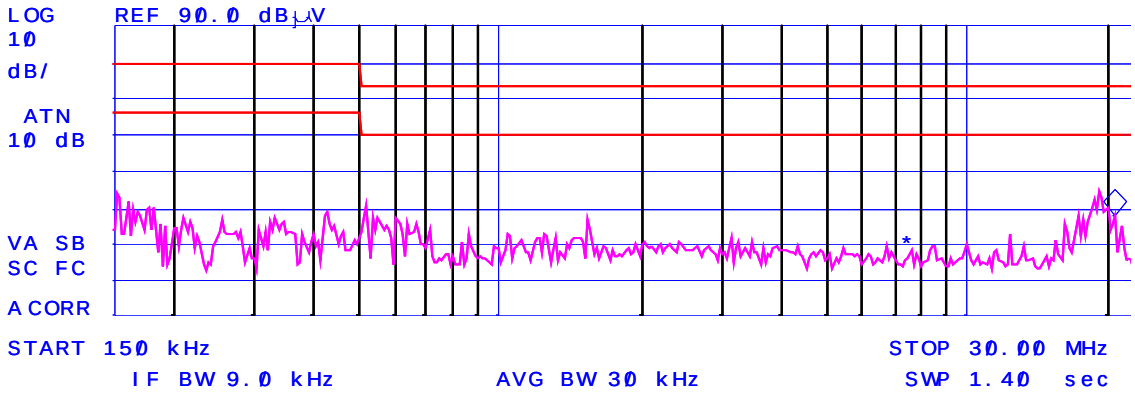
Plot 2:
AC Power Line Conducted Emissions
Test Configuration : Transmitter Mode
Line Voltage : 24 VDC
Line Tested: L2

Signal	Freq (MHz)	PK Amp	QP Amp	AV Amp	AV△L2
1	0.480350	40.3	38.6	37.2	-28.8
2	19.358000	51.3	49.8	49.2	-10.8



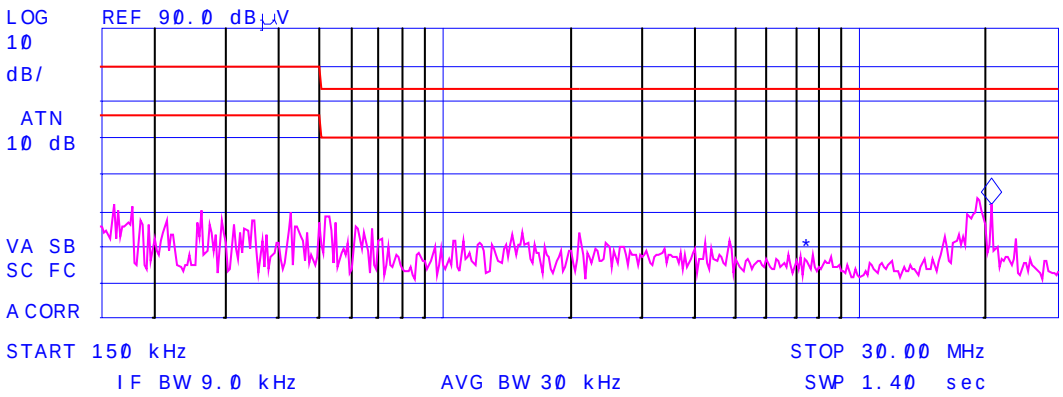
Plot 3:
AC Power Line Conducted Emissions
Test Configuration : Transmitter Mode
Line Voltage : 24 VAC
Line Tested: L1

Signal	Freq (MHz)	PK Amp	QP Amp	AV Amp	AV△L2
1	19.292920	51.5	48.5	46.0	-14.0
2	20.644450	41.0	39.4	38.2	-21.8



Plot 4:
AC Power Line Conducted Emissions
Test Configuration : Transmitter Mode
Line Voltage : 24 VAC
Line Tested: L2

Signal	Freq (MHz)	PK Amp	QP Amp	AV Amp	AV△L2
1	19.314735	50.7	49.0	46.1	-13.9
2	20.644445	42.4	40.1	38.9	-21.1



6.6. 20 dB BANDWIDTH

6.6.1. LIMITS

No limit. Test is performed for information only.

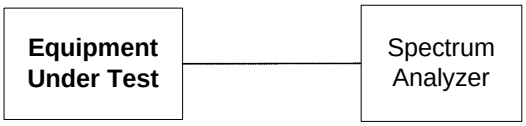
6.6.2. METHOD OF MEASUREMENTS

The transmitter output was loosely coupled to the spectrum analyzer through a receiving antenna and the bandwidth of bandwidth of the fundamental frequency was measured with the spectrum analyzer with the resolution bandwidth of the spectrum analyzer set per ANSI 63.4

6.6.3. TEST EQUIPMENT LIST

Test Instruments	Manufacturer	Model No.	Serial No.	Frequency Range
Spectrum Analyzer	Rohde & Schwarz	FSEK20/B4/B21	834157/005	9 kHz- 40 GHz
Log Periodic	EMCO	3148	23845	200 MHz – 2 GHz

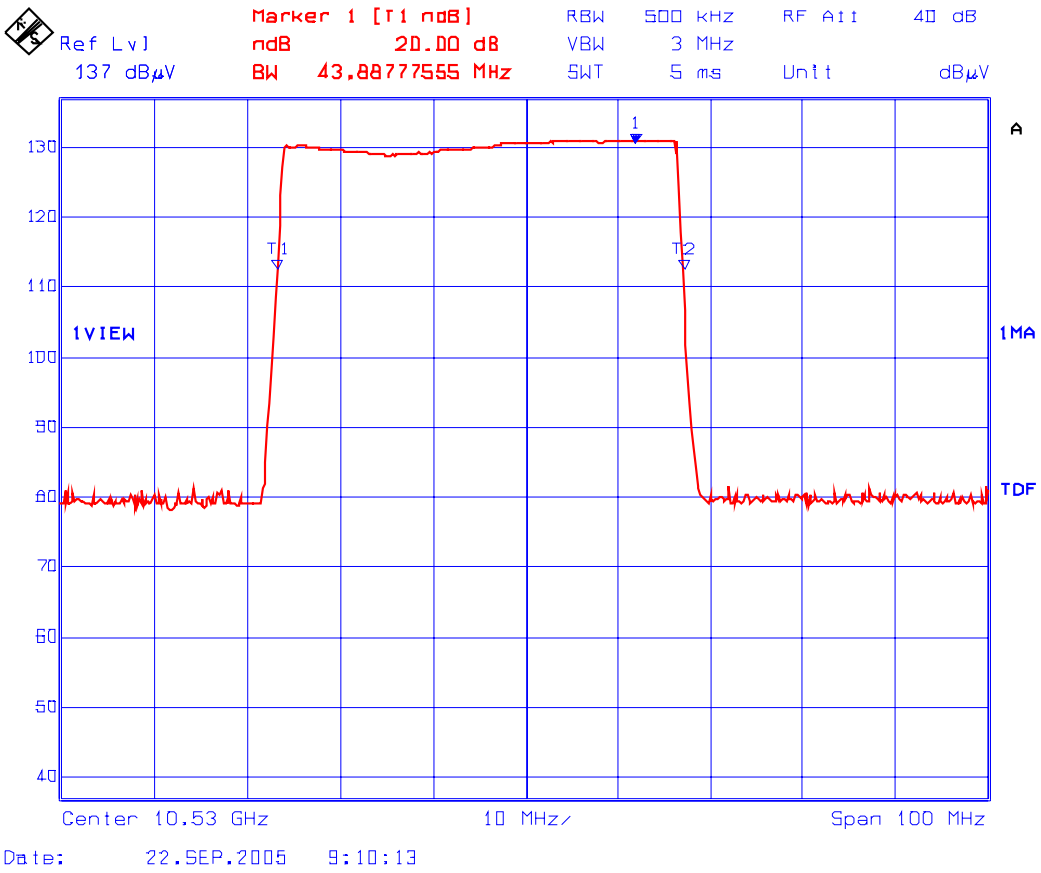
6.6.4. TEST ARRANGEMENT



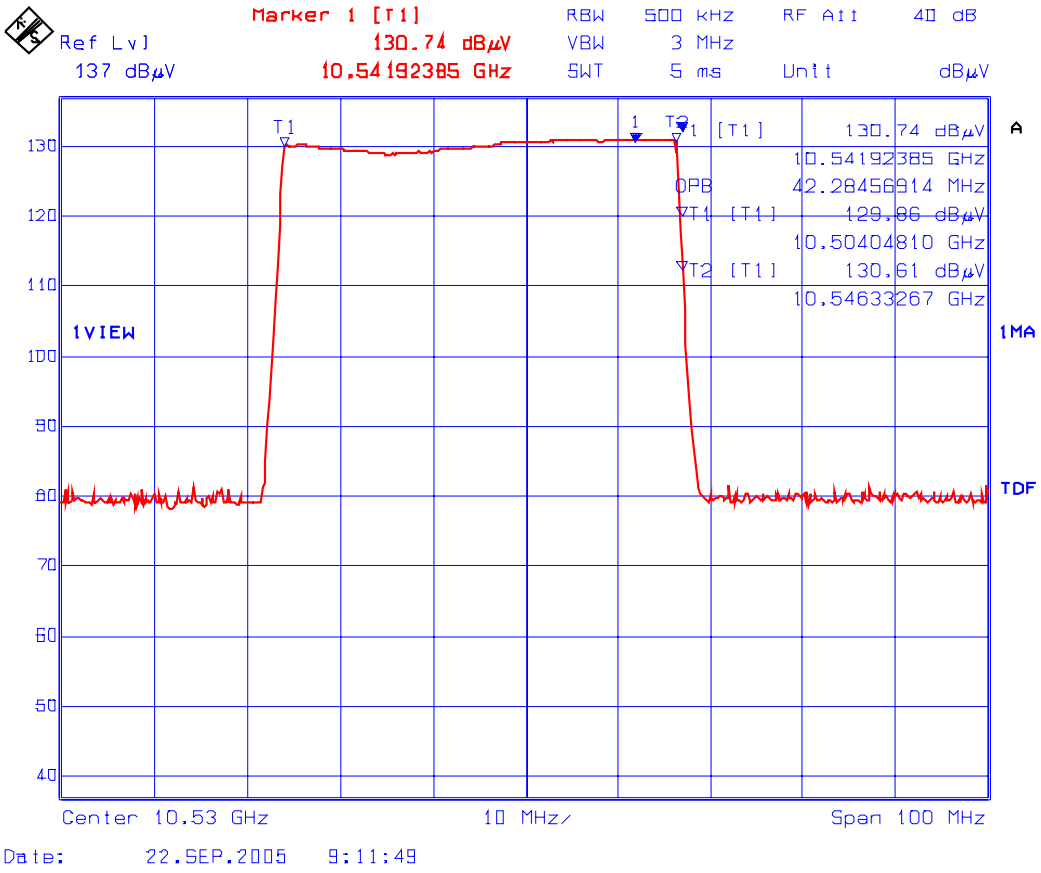
6.6.5. TEST DATA

Bandwidth	Channel Frequency (MHz)	(MHz)
20 dB	10530	43.888
99 %	10530	42.285

Plot 5: 20 dB Bandwidth
Test Frequency: 10530 MHz



Plot 6: 99% Occupied Bandwidth
Test Frequency: 10530 MHz



6.7. FUNDAMETAL FIELD STRENGTH AND HARMONIC EMISSIONS AND BAND-EDGE RADIATED EMISSONS (RADIATED @ 3 METERS) [§ 15.245, 15.209 & 15.205]

6.7.1. LIMITS

- The Field Strength of emissions from intentional radiators operated within these frequency bands shall comply with the following:

Fundamental Frequency (MHz)	Field Strength of Fundamental (mV/m)	Field Strength of Harmonics (μV/m)
10500-10550	50	500

- Regardless of the limits shown in the above table, harmonic emissions in the restricted bands below 17.7 GHz, as specified in 15.205, shall not exceed the field strength limits shown in 15.209. Harmonic emissions in the restricted bands at and above 17.7 GHz shall not exceed the following field strength limits:

  (ii) For all other field disturbance sensors, 7.5 mV/m.

- The fundamental frequency shall not fall within any restricted frequency band specified in 15.205 All rf other emissions that fall in the restricted bands shall not exceed the general radiated emission limits specified in @ 15.209(a).

FCC 47 CFR 15.205(a)
-- Restricted Frequency Bands --

MHz	MHz	MHz	GHz
0.090 - 0.110	162.0125 - 167.17	2310 - 2390	9.3 - 9.5
0.49 – 0.51	167.72 - 173.2	2483.5 - 2500	10.6 - 12.7
2.1735 - 2.1905	240 - 285	2655 - 2900	13.25 - 13.4
8.362 - 8.366	322 - 335.4	3260 - 3267	14.47 - 14.5
13.36 - 13.41	399.9 - 410	3332 - 3339	14.35 - 16.2
25.5 – 25.67	608 - 614	3345.8 - 3358	17.7 - 21.4
37.5 – 38.25	960 - 1240	3600 - 4400	22.01 - 23.12
73 - 75.4	1300 - 1427	4500 - 5250	23.6 - 24.0
108 – 121.94	1435 - 1626.5	5350 - 5460	31.2 - 31.8
123 – 138	1660 - 1710	7250 - 7750	36.43 - 36.5
149.9 – 150.05	1718.8 - 1722.2	8025 - 8500	Above 38.6
156.7 – 156.9	2200 – 2300	9000 - 9200	

FCC 47 CFR 15.209(a)
-- Field Strength Limits within Restricted Frequency Bands --

Frequency (MHz)	Field Strength Limits (μV/m)	Distance (Meters)
0.009 - 0.490	2,400 / F (KHz)	300
0.490 - 1.705	24,000 / 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

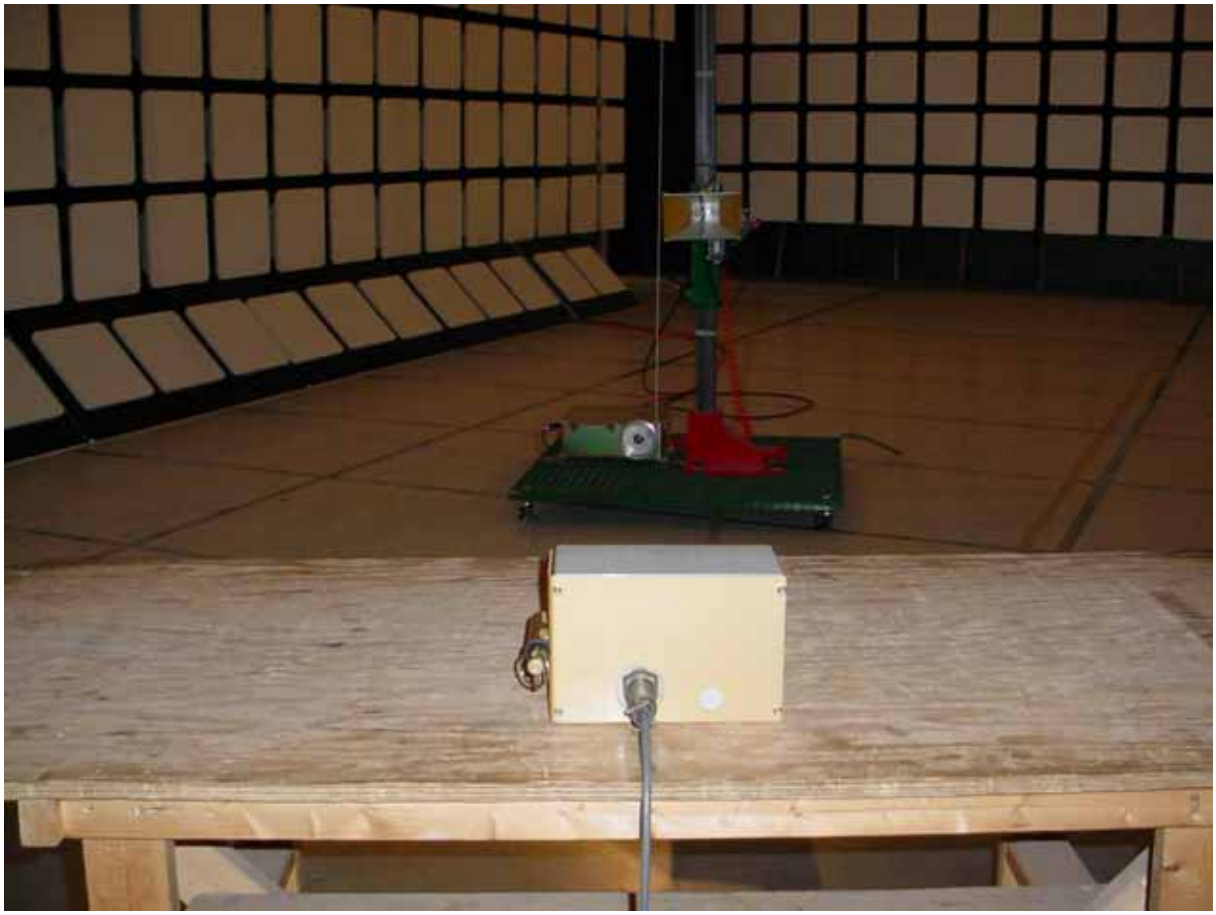
6.7.2. METHOD OF MEASUREMENTS

Refer to Ultratech Test Procedures, File # ULTR P001-2004 and ANSI C63.4 for measurement methods

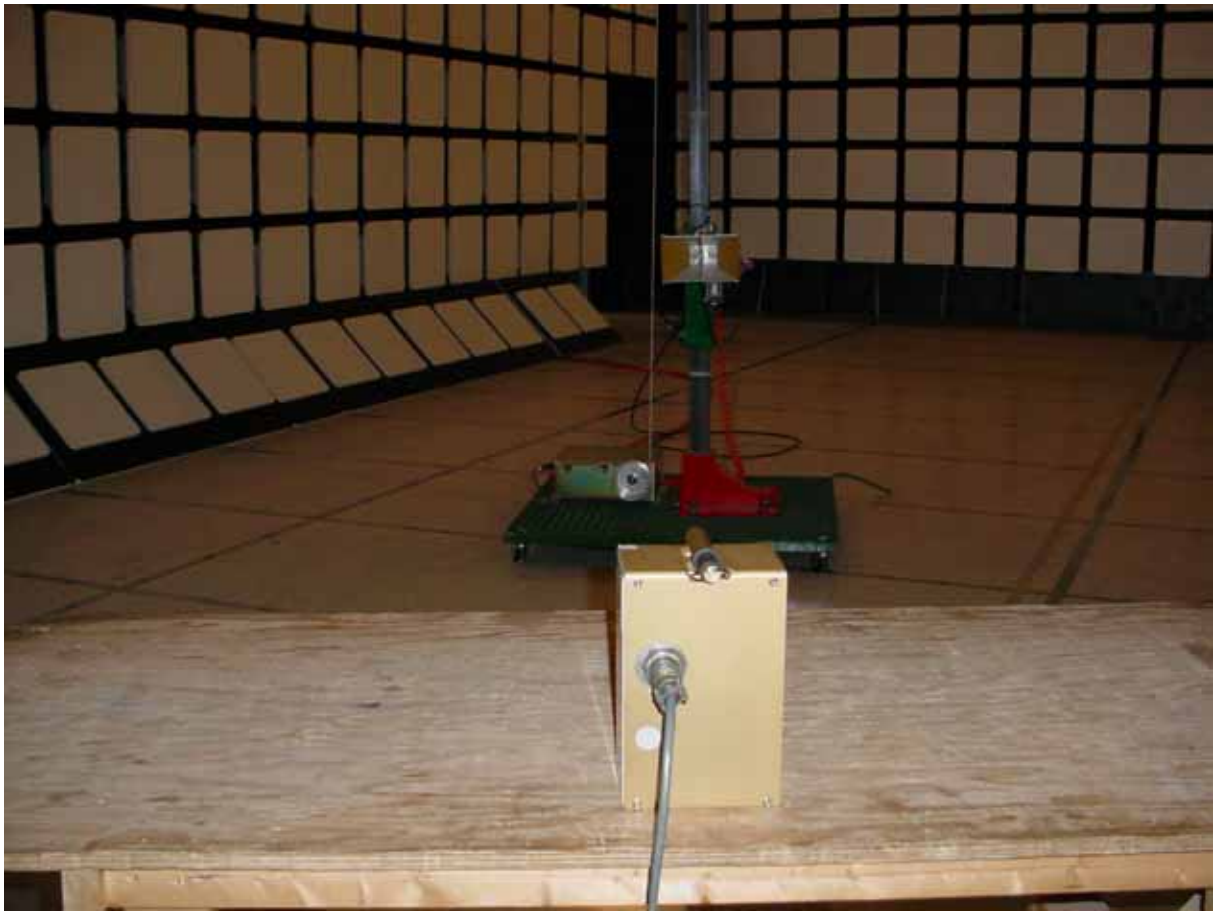
6.7.3. TEST EQUIPMENT LIST

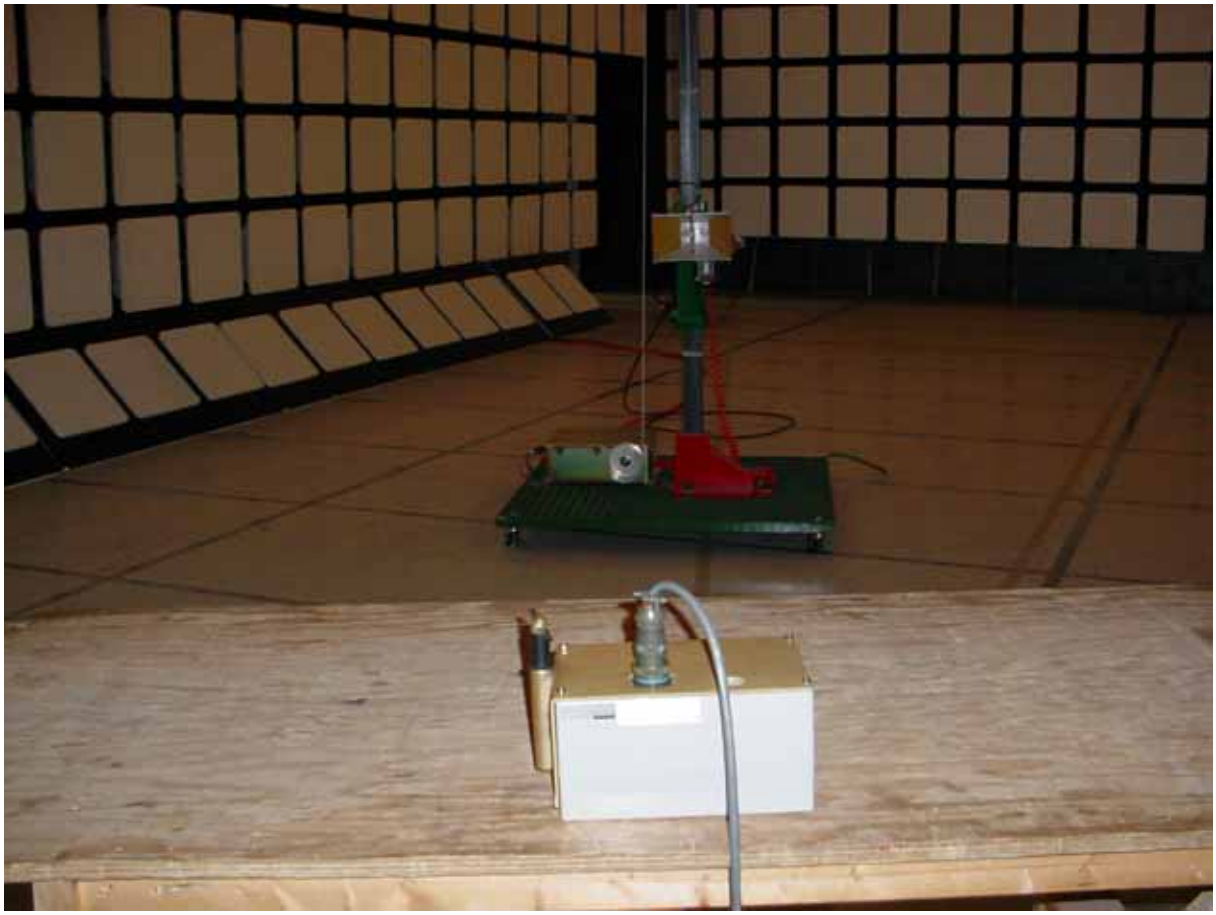
Test Instruments	Manufacturer	Model No.	Serial No.	Frequency Range
Spectrum Analyzer/ EMI Receiver	Rohde & Schwarz	FSEK20/B4/B21	834157/005	9 kHz – 40 GHz with external mixer
Microwave Amplifier	Hewlett Packard	HP 83017A		1 GHz to 26.5 GHz
Biconilog Antenna	EMCO	3143	1029	20 MHz to 2 GHz
Horn Antenna	EMCO	3155	9701-5061	1 GHz – 18 GHz
Horn Antenna	EMCO	3160-09	1007	18 GHz – 26.5 GHz
Horn Antenna	EMCO	3160-10	1001	26.5 GHz – 40 GHz
Mixer/Horn Antenna	OML	M19HW/FCC	U30625-1	40 GHz – 60 GHz

6.7.4. SETUP PHOTO

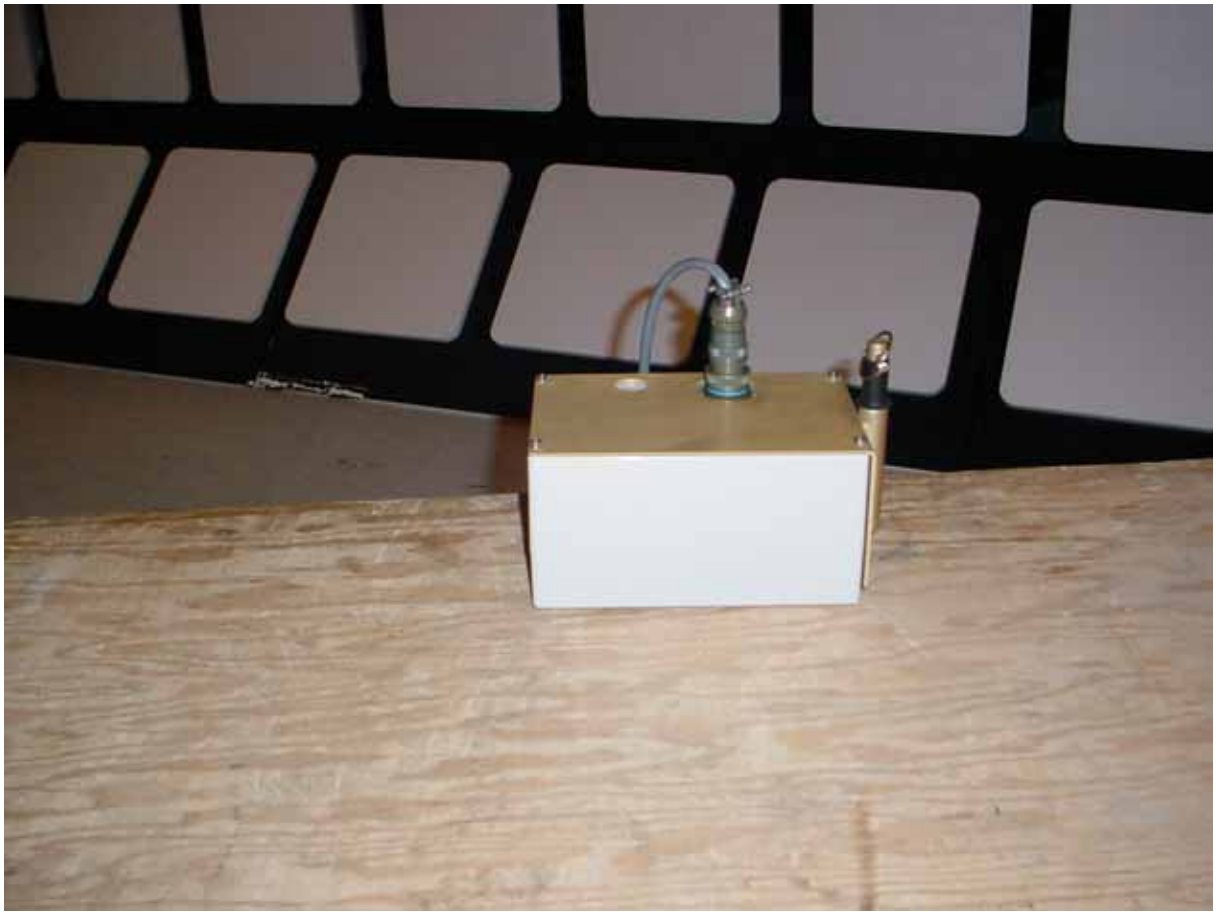



X3
RTMS





All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)



6.7.5. TEST DATA

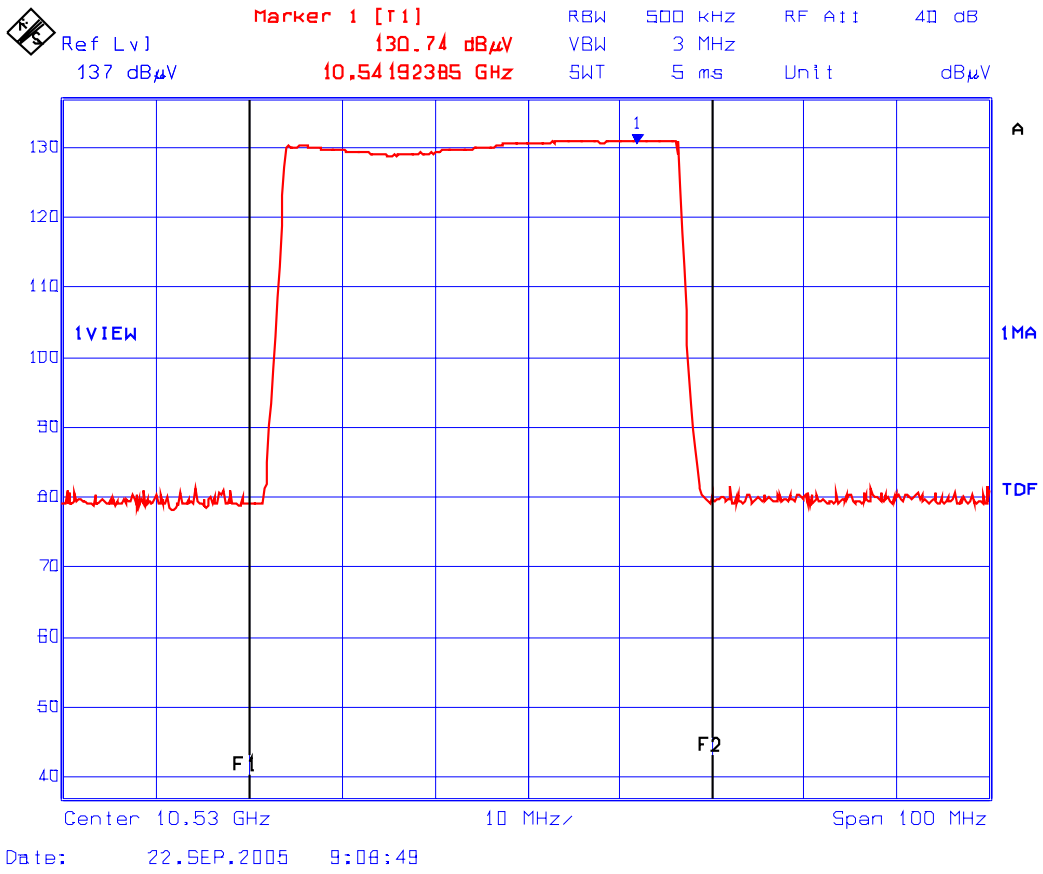
Duty Cycle Measurements: 12.84 % or Peak-Average Conversion factor = -17.83 dB
Please refer to the Plot # 9 for Plots of duty cycle measurements

Frequency 10530 MHz

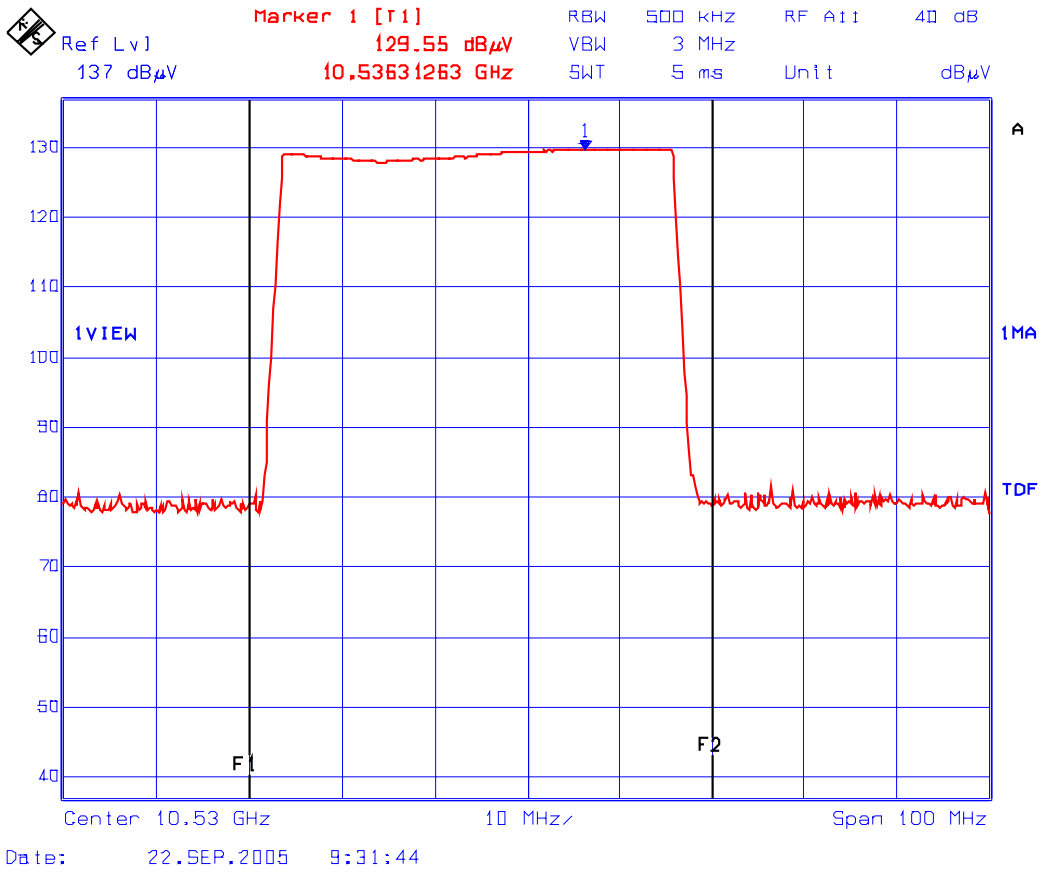
Frequency (MHz)	Peak E-Field @3m (dBµV/m)	Average E-Field @3m (dBµV/m)	Antenna Plane (H/V)	Field Strength Limit of Fundamental/Harmonic (dBµV/m)	Field Strength Limit of § 15.209 (dBµV/m)	Margin (dB)
10530	129.55	111.72	V	127.96	--	-16.24
10530	130.74	112.91	H	127.96	--	-15.05
21060	76.65	58.82	V	77.50	--	-18.68
21060	77.38	59.55	H	77.50	--	-17.95

The emissions were scanned from 30 MHz to 52.65 GHz and all emissions within 20 dB below the limits were recorded.

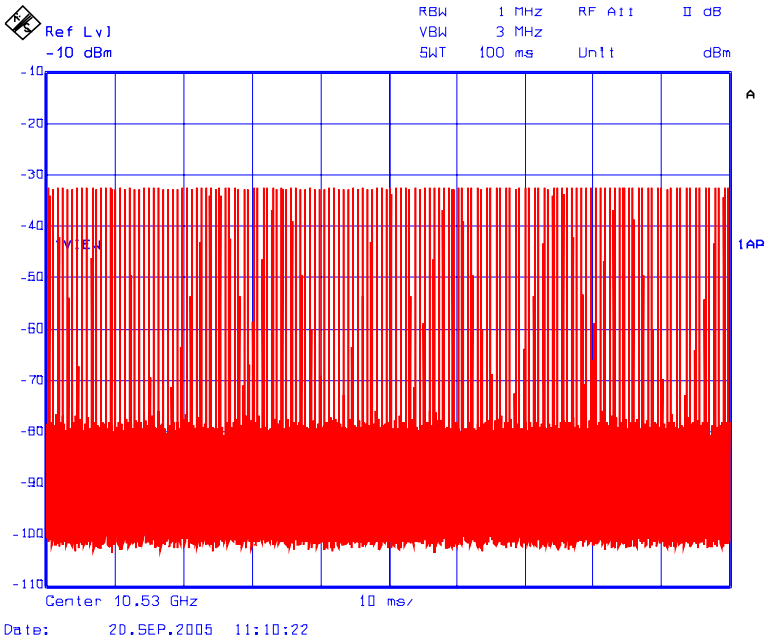
Plot 7: Band-Edge RF Radiated Emissions, Horizontal Polarization
Transmitter Frequency: 10530 MHz

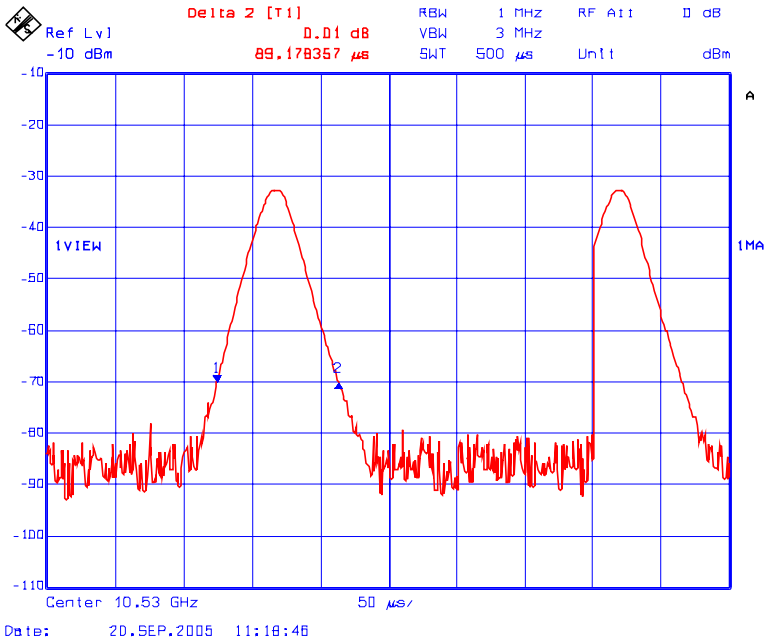


Plot 8: Band-Edge RF Radiated Emissions, Vertical Polarization
Transmitter Frequency: 10530 MHz



Plot 9 : Duty cycle analysis





TX_{ON} = 144 × 89.17 µs = 12.84 ms

TX_{ON} / (TX_{ON} + TX_{OFF}) = 12.84 ms / 100 ms = 0.1284 ≈ 20 log (0.1284) = -17.83 dB

EXHIBIT 7. MEASUREMENT UNCERTAINTY

The measurement uncertainties stated were calculated in accordance with the requirements of NIST Technical Note 1297 and LAB 34

7.1. LINE CONDUCTED EMISSION MEASUREMENT UNCERTAINTY

CONTRIBUTION (Line Conducted)	PROBABILITY DISTRIBUTION	UNCERTAINTY (dB)	
		9-150 kHz	0.15-30 MHz
EMI Receiver specification	Rectangular	±1.5	±1.5
LISN coupling specification	Rectangular	±1.5	±1.5
Cable and Input Transient Limiter calibration	Normal (k=2)	±0.3	±0.5
Mismatch: Receiver VRC Γ_1 = 0.03 LISN VRC Γ_R = 0.8(9 kHz) 0.2 (30 MHz) Uncertainty limits 20Log(1±$\Gamma_1\Gamma_R$)	U-Shaped	±0.2	±0.3
System repeatability	Std. deviation	±0.2	±0.05
Repeatability of EUT	--	--	--
Combined standard uncertainty	Normal	±1.25	±1.30
Expanded uncertainty U	Normal (k=2)	±2.50	±2.60

Sample Calculation for Measurement Accuracy in 450 kHz to 30 MHz Band:

$u_c(y) = \sqrt{\sum_{I=1}^{m} u_i^2(y)} = \pm \sqrt{(1.5^2 + 1.5^2)/3 + (0.5/2)^2 + (0.05/2)^2 + 0.35^2} = \pm 1.30$ dB

$U = 2u_c(y) = \pm 2.6$ dB

All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)

7.2. RADIATED EMISSION MEASUREMENT UNCERTAINTY

CONTRIBUTION (Radiated Emissions)	PROBABILITY DISTRIBUTION	UNCERTAINTY (± dB)	
		3 m	10 m
Antenna Factor Calibration	Normal (k=2)	±1.0	±1.0
Cable Loss Calibration	Normal (k=2)	±0.3	±0.5
EMI Receiver specification	Rectangular	±1.5	±1.5
Antenna Directivity	Rectangular	+0.5	+0.5
Antenna factor variation with height	Rectangular	±2.0	±0.5
Antenna phase center variation	Rectangular	0.0	±0.2
Antenna factor frequency interpolation	Rectangular	±0.25	±0.25
Measurement distance variation	Rectangular	±0.6	±0.4
Site imperfections	Rectangular	±2.0	±2.0
Mismatch: Receiver VRC Γ_1 = 0.2 Antenna VRC Γ_R = 0.67(Bi) 0.3 (Lp) Uncertainty limits 20Log(1±$\Gamma_1\Gamma_R$)	U-Shaped	+1.1 -1.25	±0.5
System repeatability	Std. Deviation	±0.5	±0.5
Repeatability of EUT		-	-
Combined standard uncertainty	Normal	+2.19 / -2.21	+1.74 / -1.72
Expanded uncertainty U	Normal (k=2)	+4.38 / -4.42	+3.48 / -3.44

Calculation for maximum uncertainty when 3m biconical antenna including a factor of k = 2 is used:

$U = 2u_c(y) = 2x(+2.19) = +4.38$ dB And $U = 2u_c(y) = 2x(-2.21) = -4.42$ dB