Electromagnetic Compatibility Test Report

Prepared in accordance with

FCC Part 15C, RSS-210 Issue 7 and ANSI C63.10

On

CLAMP METER

FLUKE 381 - BASE

Fluke Electronics Corp.
6920 Seaway Blvd. Everett, WA 98203, USA
PO Box 9090 Everett, WA 98206, USA

Prepared by:

TUV Rheinland of North America, Inc.

Client:	Fluke Electronics Corp. 6920 Seaway Blvd. Everett, WA 98203, USA PO Box 9090 Everett, WA 98206, USA	Joe Swanzy 425-347-6100 joe.swanzy@fluke.com	
Identification:	CLAMP METER	***Serial No.:***	RADIATED - 00500030 CONDUCTED - 00500071
Test item:	FLUKE 381 - BASE	***Date tested:***	16 June 2010
Testing location:	TUV Rheinland of North America 762 Park Avenue Youngsville, NC 27596-9470 U.S.A.	Tel: (919) 554-3668 Fax: (919) 554-3542	
Test specification:	**Emissions:** FCC Part 15, Subpart C, RSS-210 Issue 7: FCC Parts 15.107(c), 15.207(c) and RSS-GEN 7.2.2 FCC Parts 15.247(d), 15.205, 15.209, 15.215(c) and RSS-210 A8.5 and RSS-GEN 7.2.1 FCC Part 15.247(a)(2) and RSS-210 A1.1.3, FCC Part 15.247 and RSS-210 Annex 8, FCC Part 15.247(b)(3) and RSS-210 A8.4(4), FCC Part 15.247(d) and RSS-210 2.2, FCC Parts 15.109(a) and RSS-210 2.2, 2.6,A8.5, RSS-GEN 7.2.3.2 FCC Parts 15.247(i) and RSS-102, Issue 4,		
Test Result	**The above product was found to be Compliant to the above test standard(s)**		

tested by: Mark Ryan	***reviewed by:*** Michael Moranha
22 June 2010 ***Signature***	Michael Moranha 2010.06.28 15:50:35 -04'00' 28 June 2010 ***Signature***
Other Aspects:	**None**

Abbreviations: OK, Pass, Compliant, Complies = passed
Fail, Not Compliant, Does Not Comply = failed
N/A = not applicable

FC	NVLAP	**Industry Canada**
90552 and 100881	**NVLAP Lab Code (200094-0)**	**IC-2932H**

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1 General Information

1.1 Scope

This report is intended to document the status of conformance with the requirements of the FCC Part 15C, RSS-210 Issue 7 and ANSI C63.10 based on the results of testing performed on 16 June 2010 on the CLAMP METER, Model No. FLUKE 381 - BASE, manufactured by Fluke Electronics Corp. This report only applies to the specific samples tested under the stated test conditions. It is the responsibility of the manufacturer to assure that additional production units of this model are manufactured with identical or EMI equivalent electrical and mechanical components. This report is further intended to document changes and modifications to the EUT throughout its life cycle. All documentation will be included as a supplement.

1.2 Purpose

Testing was performed to evaluate the EMC performance of the EUT (Equipment Under Test) in accordance with the applicable requirements, procedures, and criteria defined in the application of regulations and application of standards listed in this report.

1.3 *Summary of Test Results*

Applicant	Fluke Electronics Corp. 6920 Seaway Blvd. Everett, WA 98203, USA PO Box 9090 Everett, WA 98206, USA	**Tel**	425-347-6100	**Contact**	Joe Swanzy
		Fax	425-446-6490	**e-mail**	joe.swanzy@fluke.com

Description	CLAMP METER	**Fluke 381 - Base**	FLUKE 381 - BASE
Serial Number	RADIATED - 00500030 CONDUCTED - 00500071	**Test Voltage/Freq.**	4.5 VDC battery
Test Date Completed:	16 June 2010	**Test Engineer**	Mark Ryan

Standards	Description	Severity Level or Limit	Criteria	Test Result
FCC Part 15, Subpart C Standard	Radio Frequency Devices-Subpart C: Intentional Radiators	See called out parts below	See Below	**Complies**
RSS-210 Issue 7 Standard	Low-Power Licence-exempt Radiocommunication Devices Category I Equipment	See called out parts below	See Below	**Complies**
FCC Part 15.247 and RSS-210 Annex 8	Operation within the band 2400 to 2483.5 MHz	See called out parts below	Below Limit	Complies
FCC Parts 15.247(d), 15.205, 15.209, 15.215(c) and RSS-210 A8.5 and RSS-GEN 7.2.1	Out-of-Band Spurious and Harmonic Emissions (EUT in Transmit Mode)	Below the applicable limits	Below Limit	Complies
FCC Parts 15.107(c), 15.207(c) and RSS-GEN 7.2.2	Conducted Emissions on AC Mains	NA, EUT is battery operated	NA	NA
FCC Part 15.247(d) and RSS-210 2.2	Band Edge Radiated Emission	Per requirements of the standard	Below Limit	Complies
FCC Part 15.247(b)(3) and RSS-210 A8.4(4)	Conducted Output Power	Shall not exceed 1.0 Watts	Below Limit	Complies
FCC Part 15.247(a)(2) and RSS-210 A1.1.3	Occupied Bandwidth	6 dB ≥ 500 kHz 99% BW ≤ 0.5% of center freq.	Within Limit	Complies
FCC Part 15.247(e) and RSS-210, Section A8.2(b)	Peak Power Spectrial Denesity	≤ 8 dBm in any 3 kHz	Below Limit	Complies
FCC Part 15.31(e)	Voltage Requirements	Output at 0.85% and 1.15% of Nominal Voltage	Below Limit	Complies
FCC Parts 15.109(a) and RSS-210 2.2, 2.6,A8.5, RSS-GEN 7.2.3.2	Radiated Emissions while EUT in Receive Mode	Below limit of section 15.109(a) Class B	Below Limit	Complies
FCC Parts 15.247(i) and RSS-102, Issue 4	RF Exposure	SAR or MPE Requirements	Below Limit	Complies (without testing)

2 Laboratory Information

2.1 Accreditations and Endorsements

2.1.1 US Federal Communications Commission

TUV Rheinland of North America located at 762 Park Avenue, Youngsville, NC 27596-9470 is accredited by the commission for performing testing services for the general public on a fee basis. This laboratory test facilities have been fully described in reports submitted to and accepted by the FCC (Registration No 90552 and 100881). The laboratory scope of accreditation includes: Title 47 CFR Part 15, and 18. The accreditation is updated every 3 years.

2.1.2 NIST / NVLAP

Program, which is administered under the auspices of the National Institute of Standards and Technology. The laboratory has been assessed and accredited in accordance with ISO Standard 17025:2005 (Lab code: 200094-0). The scope of laboratory accreditation includes emission and immunity testing. The accreditation is updated annually.

2.1.3 Industry Canada

Registration No.: IC-2932H The OATS has been accepted by Industry Canada to perform testing to 3 and to 10m, based on the test procedures described in ANSI C63.10-2009.

2.1.4 Japan – VCCI

The Voluntary Control Council for Interference by Information Technology Equipment (VCCI) is a group that consists of Information Technology Equipment (ITE) manufacturers and EMC test laboratories. The purpose of the Council is to take voluntary control measures against electromagnetic interference from Information Technology Equipment, and thereby contribute to the development of a socially beneficial and responsible state of affairs in the realm of Information Technology Equipment in Japan. TUV Rheinland at the 762 Park Ave. Youngsville, N.C 27596 address has been assessed and approved in accordance with the Regulations for Voluntary Control Measures. (Registration No. R-1174, R-1679, C-1790 and C-1791).

2.1.5 Sample Calculation – radiated & conducted emissions

The field strength is calculated by subtracting the Amplifier Gain and adding the Cable Loss and Antenna Correction Factor to the measured reading. The basic equation is as follows:

Field Strength (dBμV/m) = RAW - AMP + CBL + ACF

Where: RAW = Measured level before correction (dBμV)

AMP = Amplifier Gain (dB)

CBL = Cable Loss (dB)

ACF = Antenna Correction Factor (dB/m)

$$\mu V/m = 10^{\frac{dB\mu V/m}{20}}$$

Sample radiated emissions calculation @ 30 MHz

Measurement +Antenna Factor–Amplifier Gain+Cable loss=Radiated Emissions (dBuV/m)

25 dBuV/m + 17.5 dB – 20 dB + 1.0 dB = 23.5 dBuV/m

2.2 Measurement Uncertainty Emissions

	U_{lab}	U_{cispr}
Radiated Disturbance @ 10m		
30 MHz – 1,000 MHz	3.3 dB	5.2 dB
Conducted Disturbance @ Mains Terminals		
150 kHz – 30 MHz	1.18 dB	3.6 dB
Disturbance Power		
30 MHz – 300 MHz	3.88 dB	4.5 dB

2.3 Calibration Traceability

All measurement instrumentation is traceable to the National Institute of Standards and Technology (NIST). Measurement method complies with ANSI/NCSL Z540-1-1994 and ISO Standard 17025:2005. Equipment calibration records are kept on file at the test facility.

2.4 Measurement Equipment Used

Equipment	Manufacturer	Model #	Serial/Inst #	Last Cal dd/mm/yy	Next Cal dd/mm/yy
Radiated and Conducted RF Emissions (5 Meter Chamber)					
Amplifier, preamp	Agilent Technologies	8449B	3008A01480	24-Feb-10	24-Feb-11
Ant. BiconiLog	Chase	CBL6140A	1108	13-Jun-08	13-Jun-10
Antenna Horn 1-18GHz	EMCO	3115	2236	12-Mar-09	12-Mar-11
Receiver, EMI	Rohde & Schwarz	ESIB40	100043	29-Jun-09	29-Jun-10
Spectrum Analyzer	Agilent Tec.	E7405A	US39440157	04-Dec-09	04-Dec-10
Micro wave Frequency Counter	EIP	458A	01576	24-Feb-10	24-Feb-11
Cable, Coax	Andrew	FSJ1-50A	003	14-Dec-09	14-Dec-10
Cable, Coax	Andrew	FSJ1-50A	030	14-Dec-09	14-Dec-10
Cable, Coax	Andrew	FSJ1-50A	045	14-Dec-09	14-Dec-10
Cable, Coax	Andrew	FSJ1-50A	049	14-Dec-09	14-Dec-10
1.5 GHz High Pass Filter	Bonn Electronik	BHF 1500	025155	16-Feb-10	16-Feb-11
General Laboratory Equipment					
Meter, Temp/Humid/Barom	Fisher	02-400	01	28-Dec-09	28-Dec-10
Meter, Temp/Humidity	Dickson Company	TH550	6215304	19-Mar-09	19-Mar-11
Meter, Multi	Fluke	179	90580752	01-Dec-10	01-Dec-11
Attenuator	Pasternack	PE7015-20	NA	22-Jan-09	22-Jan-10

3 Product Information

3.1 Product Description

See Description in the test plan in Appendix A of this report

3.2 Equipment Modifications

No modifications were needed to bring product into compliance.

4 Radiated Emissions

4.1 Spurious Emissions Outside the band - FCC 15.247(d), RSS-210 A8.5

In any 100kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of desired power, based on either RF conducted or radiated measurements. Conducted antenna port measurements are provided below to show that the EUT meets these requirements at the band edges.

4.1.1 Over View of Test

Results	**Complies** (as tested per this report)					**Date**	2 & 8 June 2010
Standard	FCC Parts 15.205, 15.209, 15.215(c), 15.247(d), RSS-210 A8.5, and RSS-GEN 7.2.1						
Product Model	FLUKE 381 - BASE			**Serial#**	00500030		
Test Set-up	Tested in a 5m Semi Anechoic chamber, placed on a 1.0m x 1.5m non-conductive table 80cm above the ground plane on a turn-table. See test plans for details						
EUT Powered By	4.5 VDC battery	**Temp**	76 ºF	**Humidity**	36%	**Pressure**	1007 mbar
Perf. Criteria	(Below Limit)			**Perf. Verification**	Readings Under Limit		
Mod. to EUT	None			**Test Performed By**	Mark Ryan		

4.1.2 Test Procedure

Testing was performed in accordance with 47 CFR Part 15, ANSI C63.10:2009, RSS-GEN Issue 2. These test methods are listed under the laboratory's NVLAP Scope of Accreditation. This test measures the levels emanating from the EUT, thus evaluating the potential for the EUT to cause radio frequency interference to other electronic devices.

4.1.3 Deviations

There were no deviations from the test methodology listed in the test plan for the radiated emission test.

4.1.4 Final Test

All final radiated spurious emissions measurements were below (in compliance) the limits.

The worst –case emissions are shown below. All other emissions are on file at TUV Rheinland.

4.1.4.1 Emissions Outside the Frequency Band

In any 100kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of desired power, based on either RF conducted or radiated measurements. Conducted antenna port measurements are provided below to show that the EUT meets these requirements at the band edges.

Radiated Emissions of Fundamental
Highest Emission Investigation

Emission Freq (MHz)	ANT Polar (H/V)	ANT Pos (m)	Table Pos (deg)	FIM Value (dBuV)	Amp Gain (dB)	Cable Loss (dB)	ANT Factor (dB/m)	E-Field Value (dBuV/m)	Spec Limit (dBuV/m)	Spec Margin (dB)
2440.00	H	1.74	3	59.98	0.00	6.00	28.38	94.36	NA	NA
2440.00	V	1.4	114	58.31	0.00	6.00	28.24	92.55	NA	NA
2440.00	H	1.1	288	57.91	0.00	6.00	28.38	92.29	NA	NA
2440.00	V	1.4	111	57.12	0.00	6.00	28.24	91.36	NA	NA
2440.00	H	1.2	10	58.17	0.00	6.00	28.38	92.55	NA	NA
2440.00	V	1	193	59.54	0.00	6.00	28.24	93.78	NA	NA

Spec Margin = E-Field Value - Limit, E-Field Value = FIM Value - Amp Gain + Cable Loss + ANT Factor ± Uncertainty

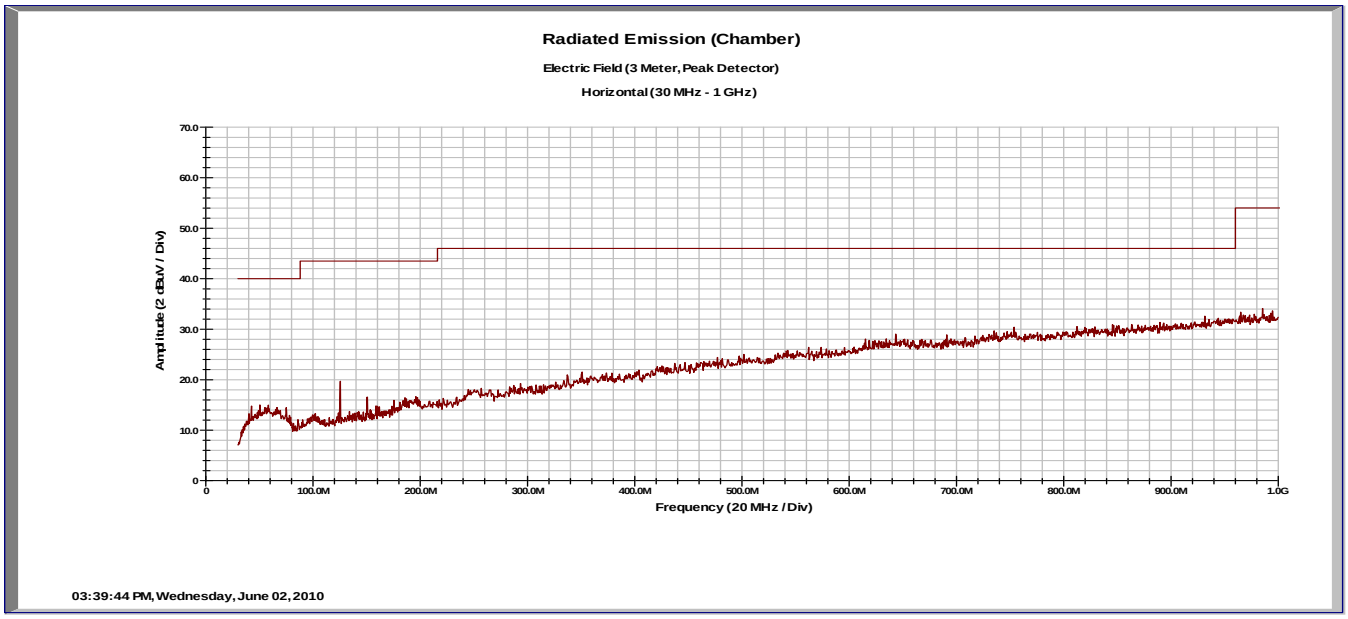
Combined Standard Uncertainty $u_c(y)$ = ± 1.6dB Expanded Uncertainty $U = ku_c(y)$ k = 2 for 95% confidence

Notes: The emissions shown in **RED** are Orientation 1. This produces the highest emissions output.
The emissions shown in **GREEN** are Orientation 2.
The emissions shown in **BLUE** are Orientation 3.

(Refer to Test Setup Photos.)

Worst-Case Radiated Emissions 30MHz to 1000MHz

Horizontal

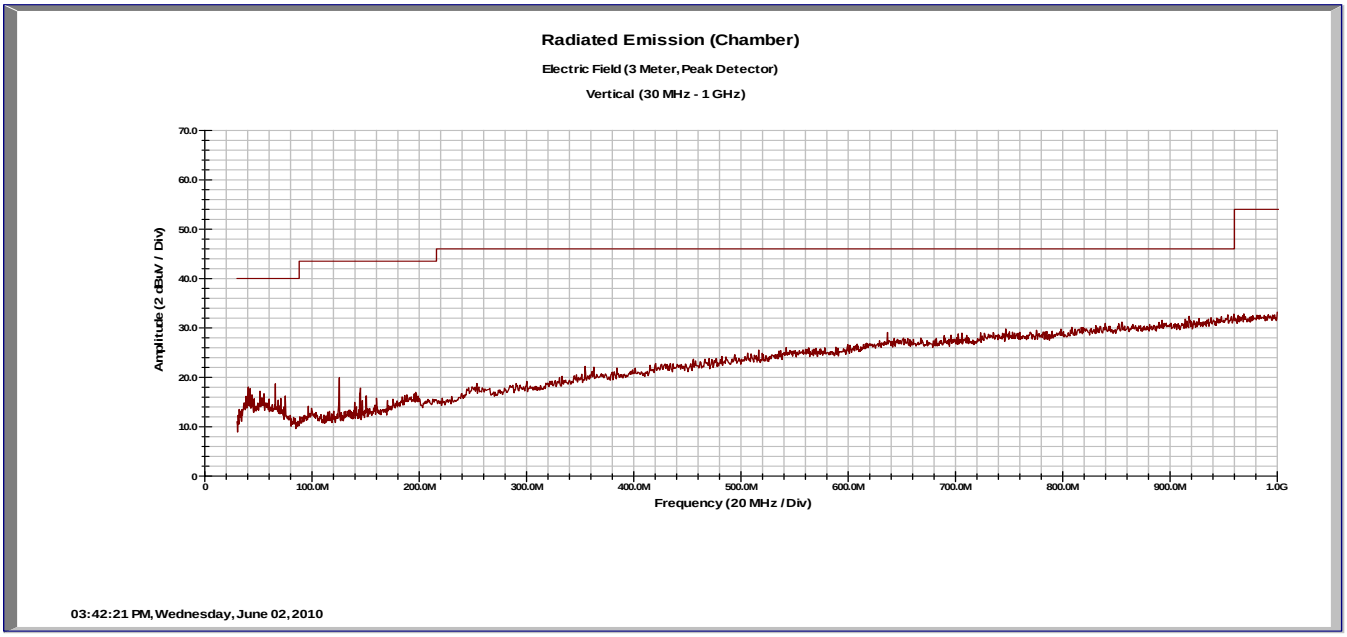


Emission Freq (MHz)	ANT Polar (H/V)	ANT Pos (m)	Table Pos (deg)	FIM Value (dBuV)	Amp Gain (dB)	Cable Loss (dB)	ANT Factor (dB/m)	E-Field Value (dBuV/m)	Spec Limit (dBuV/m)	Spec Margin (dB)

Notes: limits of 15.209 shown
All emissions are more than 20 dB below the limit, or are below the noise floor of the receiver.
The emissions shown below 120MHz are anomalies of the receiver.
This represents the EUT operating on the mid-band (channel 7)

Worst-Case Radiated Emissions 30MHz to 1000MHz

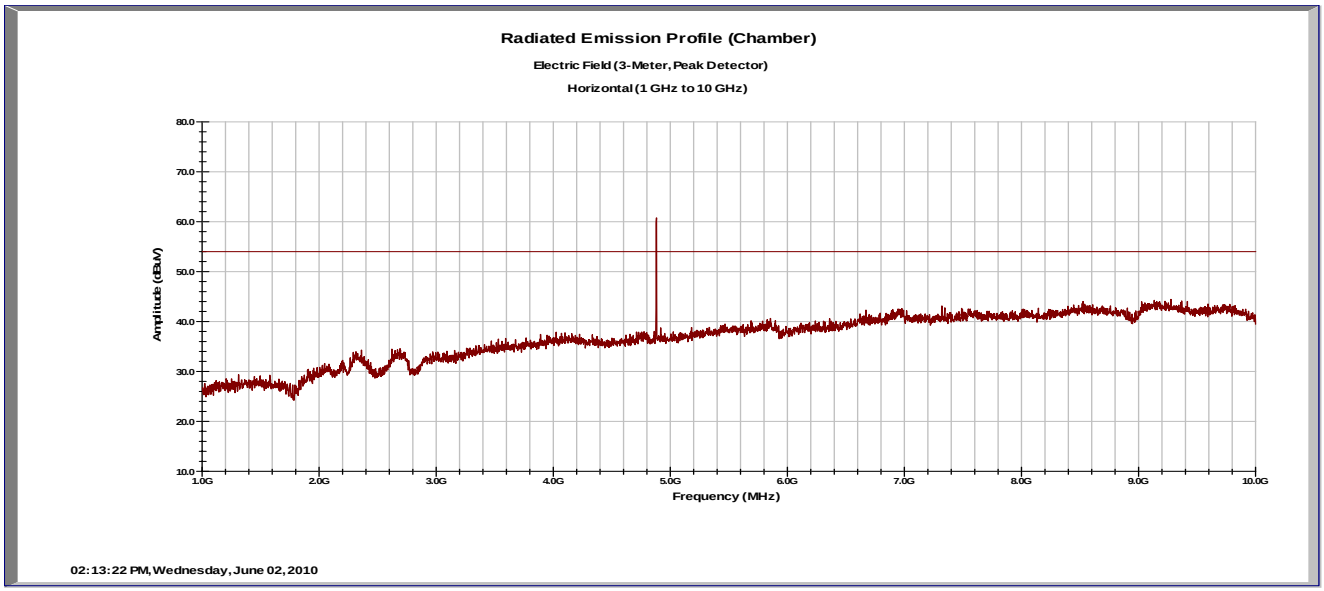
Vertical



Emission Freq (MHz)	ANT Polar (H/V)	ANT Pos (m)	Table Pos (deg)	FIM Value (dBuV)	Amp Gain (dB)	Cable Loss (dB)	ANT Factor (dB/m)	E-Field Value (dBuV/m)	Spec Limit (dBuV/m)	Spec Margin (dB)

Notes: limits of 15.209 shown
All emissions are more than 20 dB below the limit, or are below the noise floor of the receiver.
The emissions shown below 120MHz are anomalies of the receiver.
This represents the EUT operating on the mid-band (channel 7)

Worst-Case Radiated Emissions 1GHz to 10GHz
Horizontal

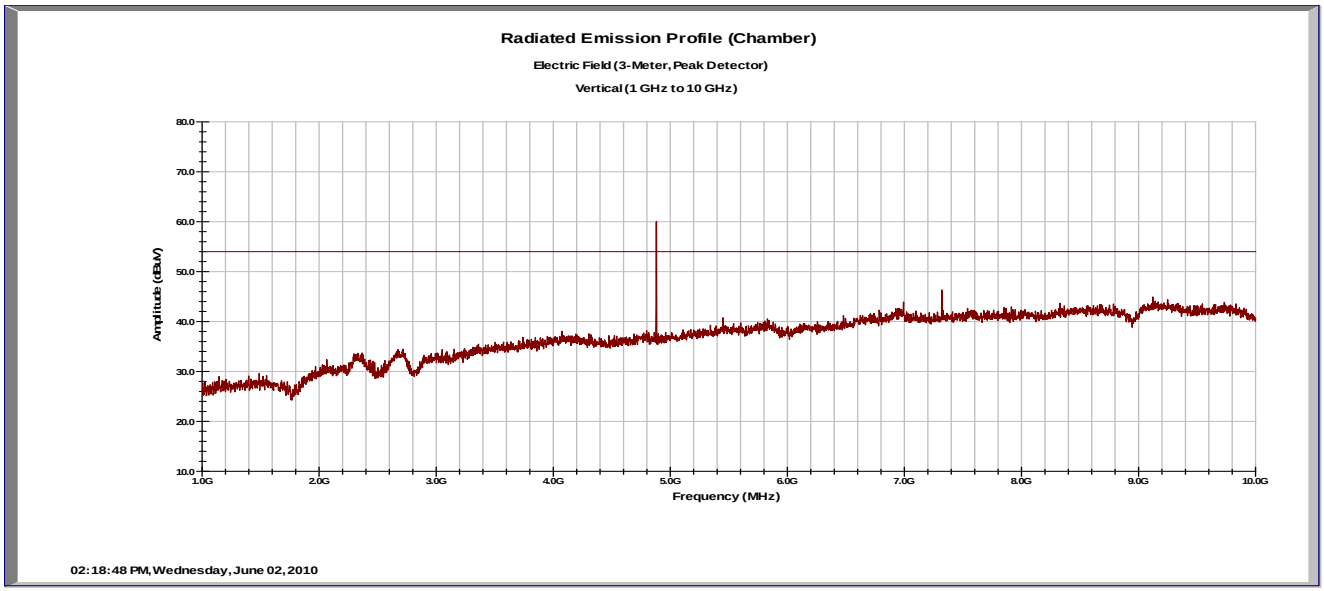


Emission Freq (MHz)	ANT Polar (H/V)	ANT Pos (m)	Table Pos (deg)	FIM Value (dBuV)	Amp Gain (dB)	Cable Loss (dB)	ANT Factor (dB/m)	E-Field Value (dBuV/m)	Spec Limit (dBuV/m)	Spec Margin (dB)
4881.00	H	1.1	51	44.12	35.49	11.11	32.96	52.70	54.00	-1.30
4881.00	H	1.1	51	55.50	35.49	11.11	32.96	64.08	74.00	-9.92

Notes: Average limit line shown
Emissions shown in **Green** were measured using the Average detector.
The Emissions shown in **Blue** were measured using the Peak detector.
Worst Case Emissions shown was using orientation 1, at mid band.
ALL EMISSIONS including those outside Restricted Bands are below the limits of Part FCC 15.209.
The Fundamental Emissions at 2440 MHz is attenuated by use of a notch filter.

Worst-Case Radiated Emissions 1GHz to 10GHz

Vertical

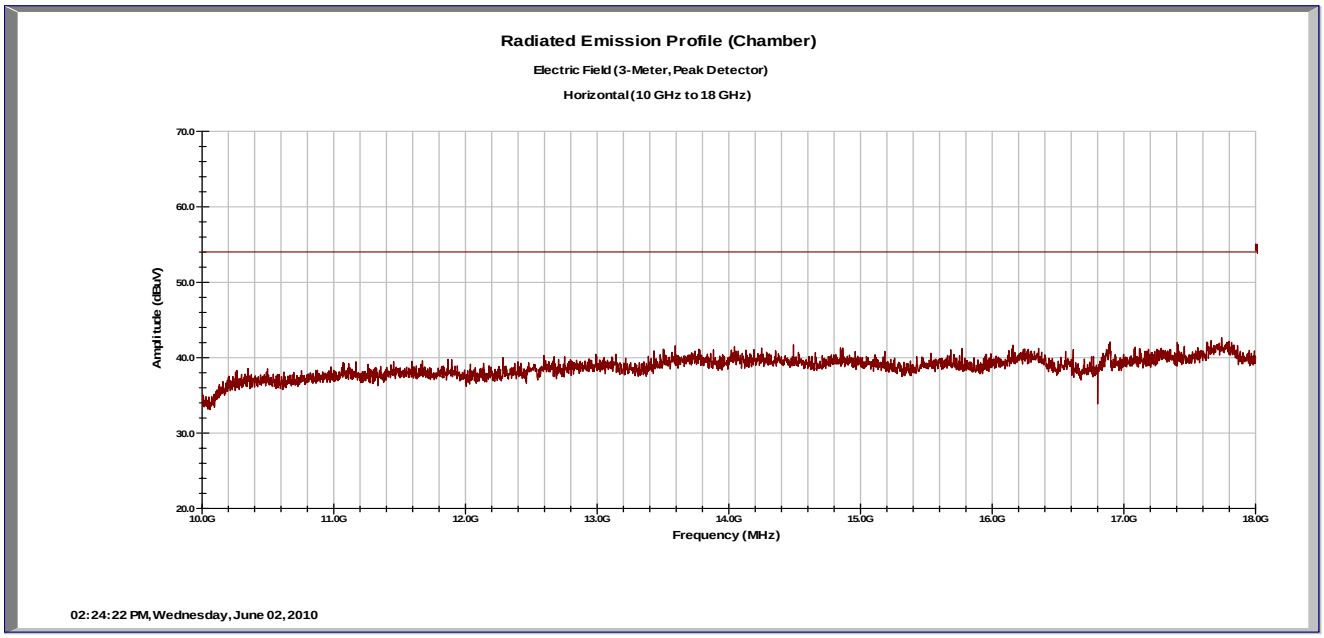


Emission Freq (MHz)	ANT Polar (H/V)	ANT Pos (m)	Table Pos (deg)	FIM Value (dBuV)	Amp Gain (dB)	Cable Loss (dB)	ANT Factor (dB/m)	E-Field Value (dBuV/m)	Spec Limit (dBuV/m)	Spec Margin (dB)
4880.00	V	1.1	286	43.88	35.49	11.11	32.96	52.46	54.00	-1.54
7320.00	V	1.5	354	29.40	35.36	14.71	36.54	45.29	54.00	-8.71
4880.00	V	1.1	286	55.50	35.49	11.11	32.96	64.08	74.00	-9.92
7320.00	V	1.5	354	42.43	35.36	14.71	36.54	58.32	74.00	-15.68

Notes: Average limit line shown
Emissions shown in **Green** were measured using the Average detector.
The Emissions shown in **Blue** were measured using the Peak detector.
Worst Case Emissions shown was using orientation 1, at mid band.
ALL EMISSIONS including those outside Restricted Bands are below the limits of Part FCC 15.209.
The Fundamental Emissions at 2440 MHz is attenuated by use of a notch filter.

Worst-Case Radiated Emissions 10GHz to 18GHz

Horizontal

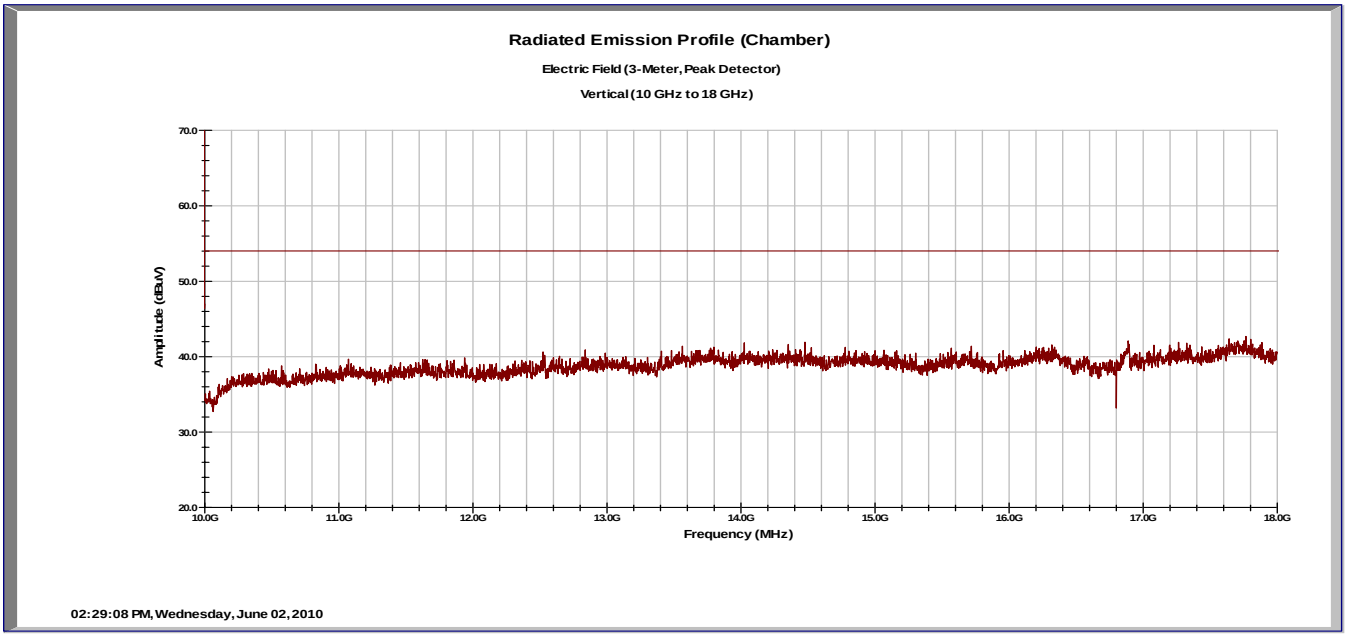


Emission Freq (MHz)	ANT Polar (H/V)	ANT Pos (m)	Table Pos (deg)	FIM Value (dBuV)	Amp Gain (dB)	Cable Loss (dB)	ANT Factor (dB/m)	E-Field Value (dBuV/m)	Spec Limit (dBuV/m)	Spec Margin (dB)

Notes: ALL EMISSIONS including those outside Restricted Bands are below the limits of Part FCC 15.209.
The Fundamental Emissions is attenuated by use of a notch filter.

Worst-Case Radiated Emissions 10GHz to 18GHz

Vertical

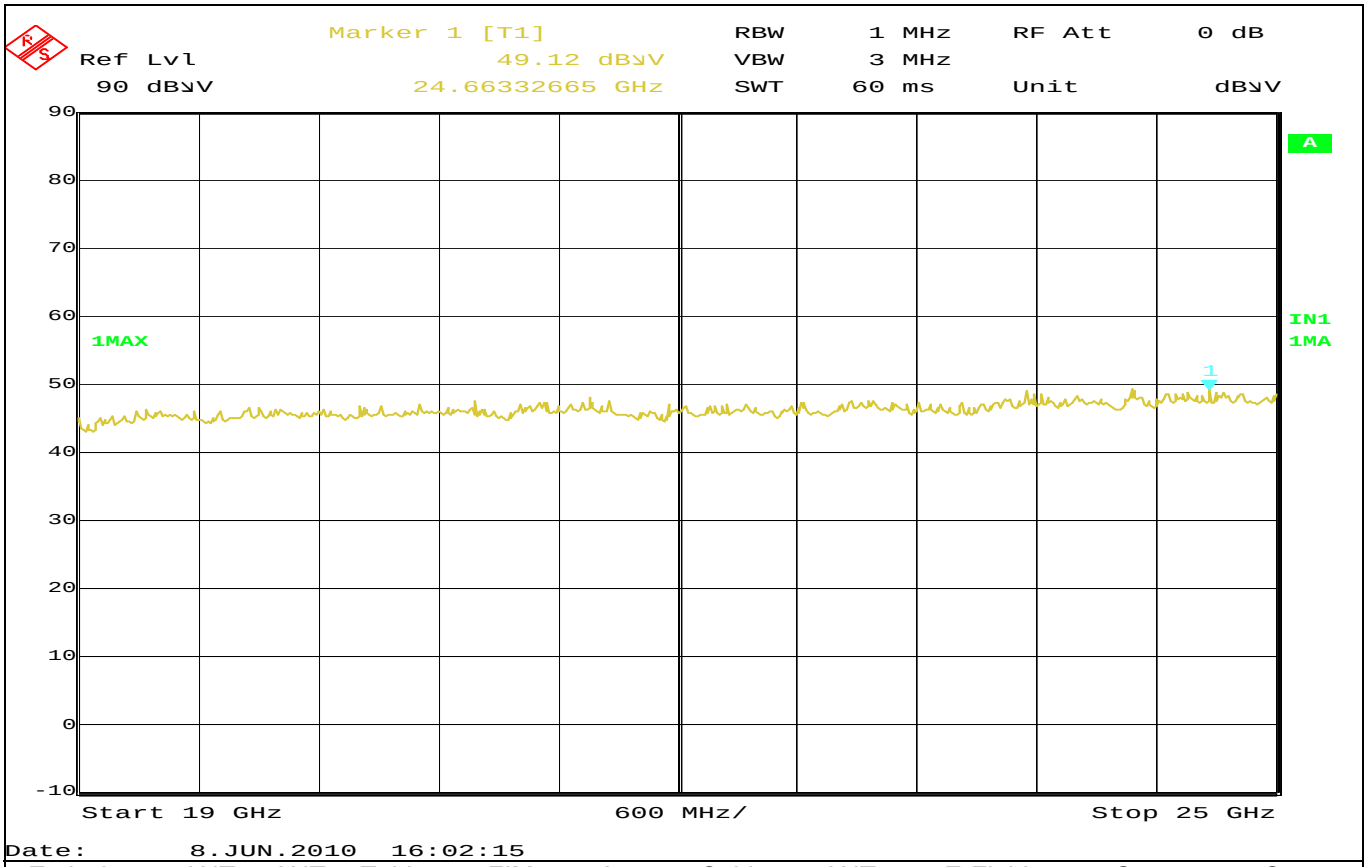


Emission Freq (MHz)	ANT Polar (H/V)	ANT Pos (m)	Table Pos (deg)	FIM Value (dBuV)	Amp Gain (dB)	Cable Loss (dB)	ANT Factor (dB/m)	E-Field Value (dBuV/m)	Spec Limit (dBuV/m)	Spec Margin (dB)

Notes: ALL EMISSIONS including those outside Restricted Bands are below the limits of Part FCC 15.209.
The Fundamental Emissions is attenuated by use of a notch filter.

Worst-Case Radiated Emissions 18GHz to 25GHz

Horizontal



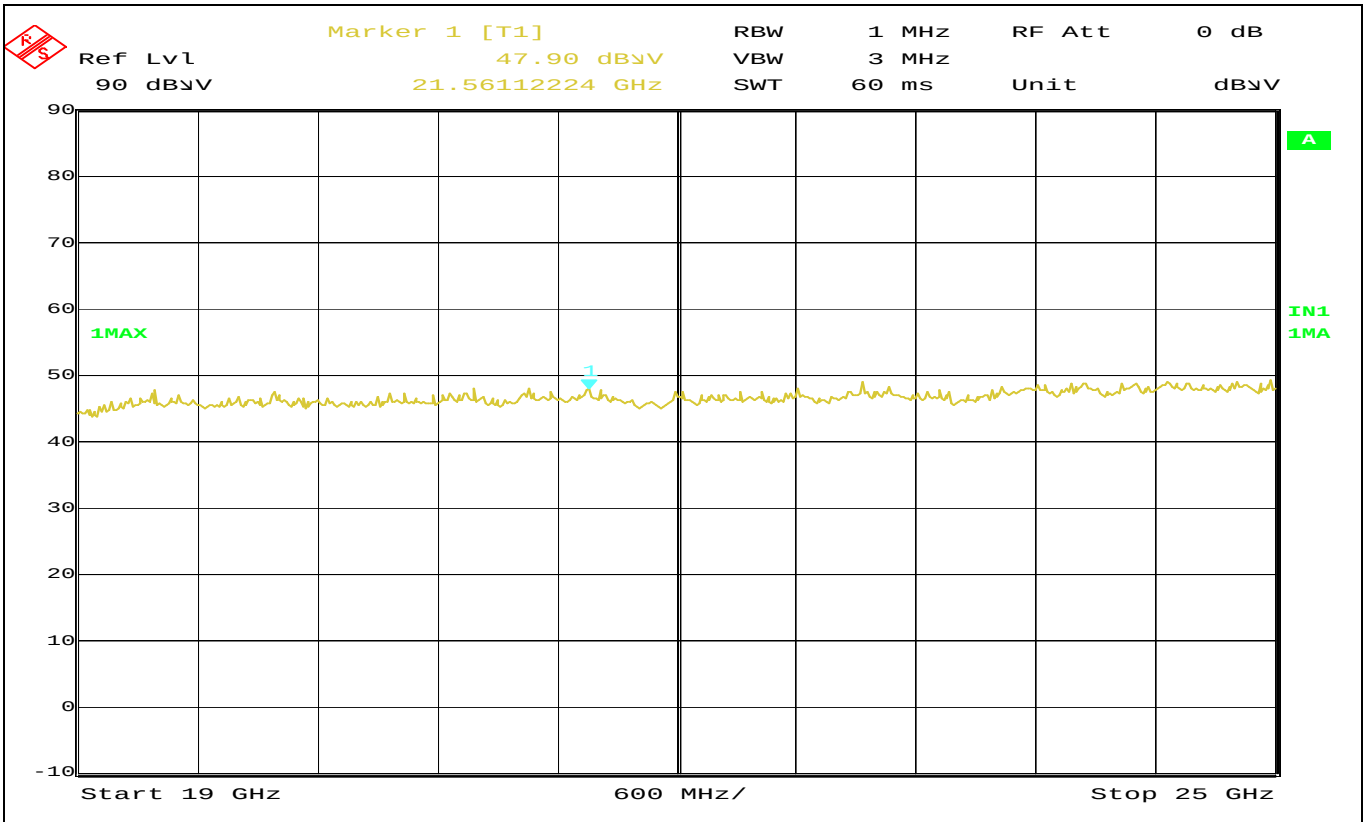
Emission Freq (MHz)	ANT Polar (H/V)	ANT Pos (m)	Table Pos (deg)	FIM Value (dBuV)	Amp Gain (dB)	Cable Loss (dB)	ANT Factor (dB/m)	E-Field Value (dBuV/m)	Spec Limit (dBuV/m)	Spec Margin (dB)

Notes: All emissions were below the noise floor of the EMC Receiver.
The Trace shown above is raw data, without the application of correction factors.
Transmitter operating on CH 7

The emission of 49.12 dBµV/m at 1m is equivalent to 39.58 dBµV/m at 3m. This is a peak reading.

Worst-Case Radiated Emissions 18GHz to 25GHz

Vertical



Emission Freq (MHz)	ANT Polar (H/V)	ANT Pos (m)	Table Pos (deg)	FIM Value (dBuV)	Amp Gain (dB)	Cable Loss (dB)	ANT Factor (dB/m)	E-Field Value (dBuV/m)	Spec Limit (dBuV/m)	Spec Margin (dB)

Notes: All emissions were below the noise floor of the EMC Receiver.
The Trace shown above is raw data, without the application of correction factors.
Transmitter operating on CH 7

The emission of

4.2 Band Edge

4.2.1 Test Over View

Results	**Complies** (as tested per this report)				**Date**	14 June 2010	
Standard	FCC Part 15.247(d), RSS 210 2.2						
Product Model	FLUKE 381 - BASE			**Serial#**	00500030		
Test Set-up	Direct Measurement from antenna port						
EUT Powered By	4.5 VDC battery	**Temp**	76º F	**Humidity**	46%	**Pressure**	1002 mbar
Perf. Criteria	(Below Limit)		**Perf. Verification**		Readings Under Limit		
Mod. to EUT	None		**Test Performed By**		Mark Ryan		

4.2.2 Test Procedure

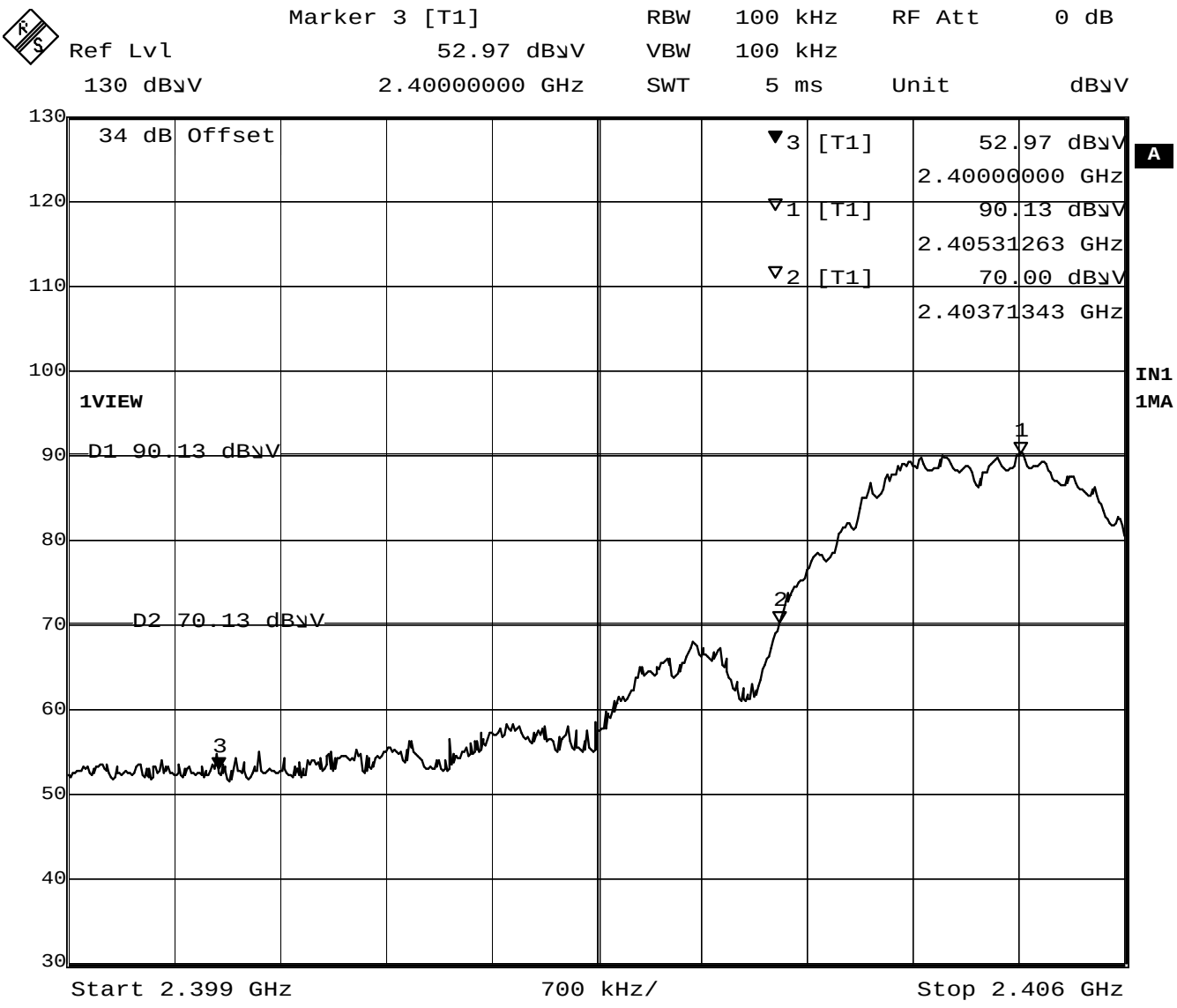
Intentional radiators operating under the alternative provisions to the general emission limits must be designed to ensure that the 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated. The requirement to contain the designated bandwidth of the emission within the specified frequency band includes the effects from frequency sweeping, frequency hopping and other modulation techniques that may be employed as well as the frequency stability of the transmitter over expected variations in temperature and supply voltage. If frequency stability is not specified in the regulations, it is recommended that the fundamental emission be kept within at least the central 80% of the permitted band in order to minimize the possibility of out-of-band operation.

4.2.3 Deviations

There were no deviations from the test methodology listed in the test plan for the Radiated Immunity test.

4.2.4 Final Test

The EUT met the performance criteria requirement as specified in the standards.



Date: 14.JUN.2010 09:27:05

Notes: Measured using the Peak detector. Band Edge is at 2.4 GHz (Marker 3).

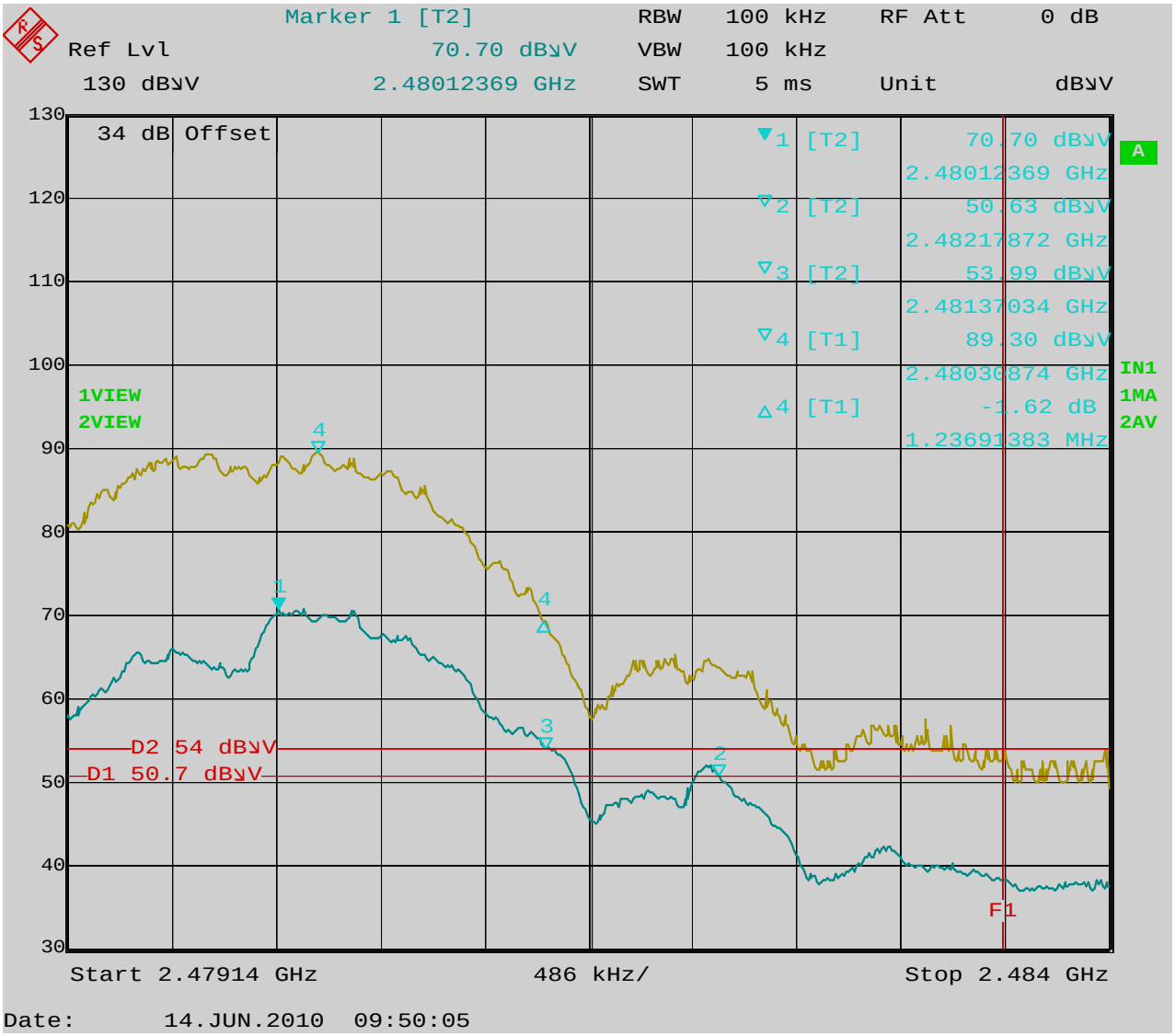
The nearest restricted band (2390MHz) is 10 MHz below the band edge

At the lowest channel, the 20dB down point (Marker 2) is at 2403.713 MHz.

The band edge (Marker 3) is at 2400 MHz

Figure 1: Lower Band Edge Measurement (Radiated Emission)

The EUT is compliant with the rules.



Note: Measured using the Peak and Average detectors.

Band edge (F1) at 2483.5 MHz is also the start of a restricted band, so the rules of 15.205 apply.

The 20dB down point is below the limit of 15.205.
At the band edge of 2483.5 MHz: Peak = 53.5 dBµV/m which is 20.5 dB below the 74 dBµV/m limit.
Average = 38.1 dBµV/m which is 15.9 dB below the 54 dBµV/m limit.

Figure 2: Upper Band Edge Measurement (Radiated Emission)

The EUT is compliant with the rules.

4.1 Conducted Emissions on AC Mains

This test measures the electromagnet levels of spurious signals generated by the EUT on the AC power line that may affect the performance of other near by electronic equipment.

4.1.1 Over View of Test

Results	**NA** (as tested per this report)				**Date**	NA	
Standard	FCC Parts 15.107(c), 15.207(c) and RSS-GEN 7.2.2						
Product Model	FLUKE 381 - BASE			**Serial#**	NA		
Test Set-up	Tested in shielded room. EUT placed on table, see test plans for details						
EUT Powered By	4.5VDC battery	**Temp**	73º F	**Humidity**	25%	**Pressure**	1011 mbar
Frequency Range	150 kHz – 30 MHz						
Perf. Criteria	(Below Limit)	**Perf. Verification**	Readings Under Limit for L1 & Neutral				
Mod. to EUT	None	**Test Performed By**	Mark Ryan				

4.1.2 Test Procedure

This device is battery powered, therefore per FCC Part 15.207(c) this test is not required.

4.1.3 Final Test

Since the EUT is a battery powered at 3.0VDC battery device, this test is not applicable.

5 Antenna Port Conducted Emissions

For conducted tests, the emissions were measured at the antenna port.

Testing was performed in accordance with 47 CFR Part 15, ANSI C63.10:2009, RSP-100 Issue 9. These test methods are listed under the laboratory's NVLAP Scope of Accreditation. This test measures the levels emanating from the EUT, thus evaluating the potential for the EUT to cause radio frequency interference to other electronic devices.

5.1 Conducted Output Power, FCC 15.247(b)(3) and RSS-210 A8.4(4)

5.1.1 For systems using digital modulation in the 2400–2483.5 MHz bands: 1 Watt. As an alternative to a peak power measurement, compliance with the one Watt limit can be based on a measurement of the maximum conducted output power. Maximum Conducted Output Power is defined as the total transmit power delivered to all antennas and antenna elements averaged across all symbols in the signaling alphabet when the transmitter is operating at its maximum power control level. Power must be summed across all antennas and antenna elements. The average must not include any time intervals during which the transmitter is off or is transmitting at a reduced power level. If multiple modes of operation are possible (e.g., alternative modulation methods), the *maximum conducted output power* is the highest total transmit power occurring in any mode.

5.1.2 Test Over View

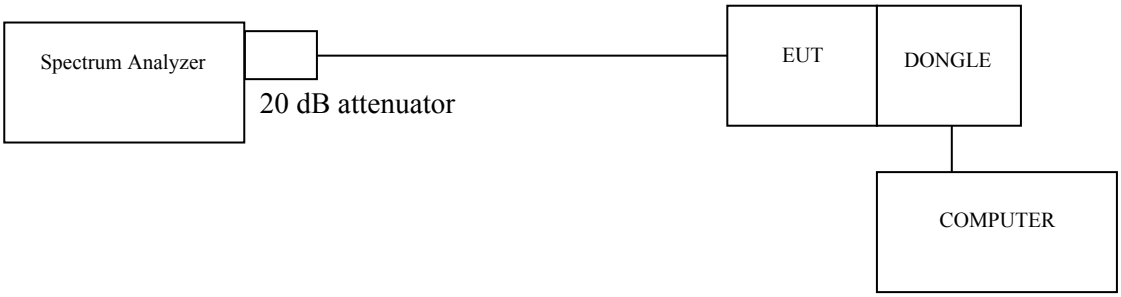
Results	**Complies** (as tested per this report)					**Date**	10 June 2010
Standard	FCC Part 15.247(b)(3) and RSS-210 A8.4(4)						
Product Model	FLUKE 381 - BASE			**Serial#**	00500071		
Test Set-up	Direct Measurement from antenna port						
EUT Powered By	4.5 VDC battery	**Temp**	74º F	**Humidity**	32%	**Pressure**	1010mbar
Perf. Criteria	(Below Limit)		**Perf. Verification**		Readings Under Limit		
Mod. to EUT	None		**Test Performed By**		Mark Ryan		

5.1.3 Test Procedure

The peak output power was measured at the low, mid and high band frequencies. The measurement was made using a direct connection between the RF output of the EUT and the spectrum analyzer. The cable loss and the attenuator was measured and added in the reference level offset in the spectrum analyzer. The spectrum analyzer's resolution bandwidth was greater than the 20dB bandwidth of the modulated carrier and the video bandwidth was equal to the resolution bandwidth.

Wires were soldered onto the battery terminals of the EUT and connected to an adjustable power supply.

Test Setup:



5.1.4 Deviations

There were no deviations from the test methodology listed in the test plan for the Surge Immunity test.

5.1.5 Final Test

The EUT met the performance criteria requirement as specified in the test plan of this report and in the standards.

5.1.6 Peak Power Output

Peak Output Conducted Power Measurements

Emission Freq (MHz)	Value (dBm)	Spec Limit (dBm)	Spec Margin (dB)
2405.00 (f_H)	-8.29	+30.00	-38.29
2440.00 (f_M)	-7.77	+30.00	-37.77
2480.00 (f_H)	**-6.86**	**+30.00**	**-36.86**

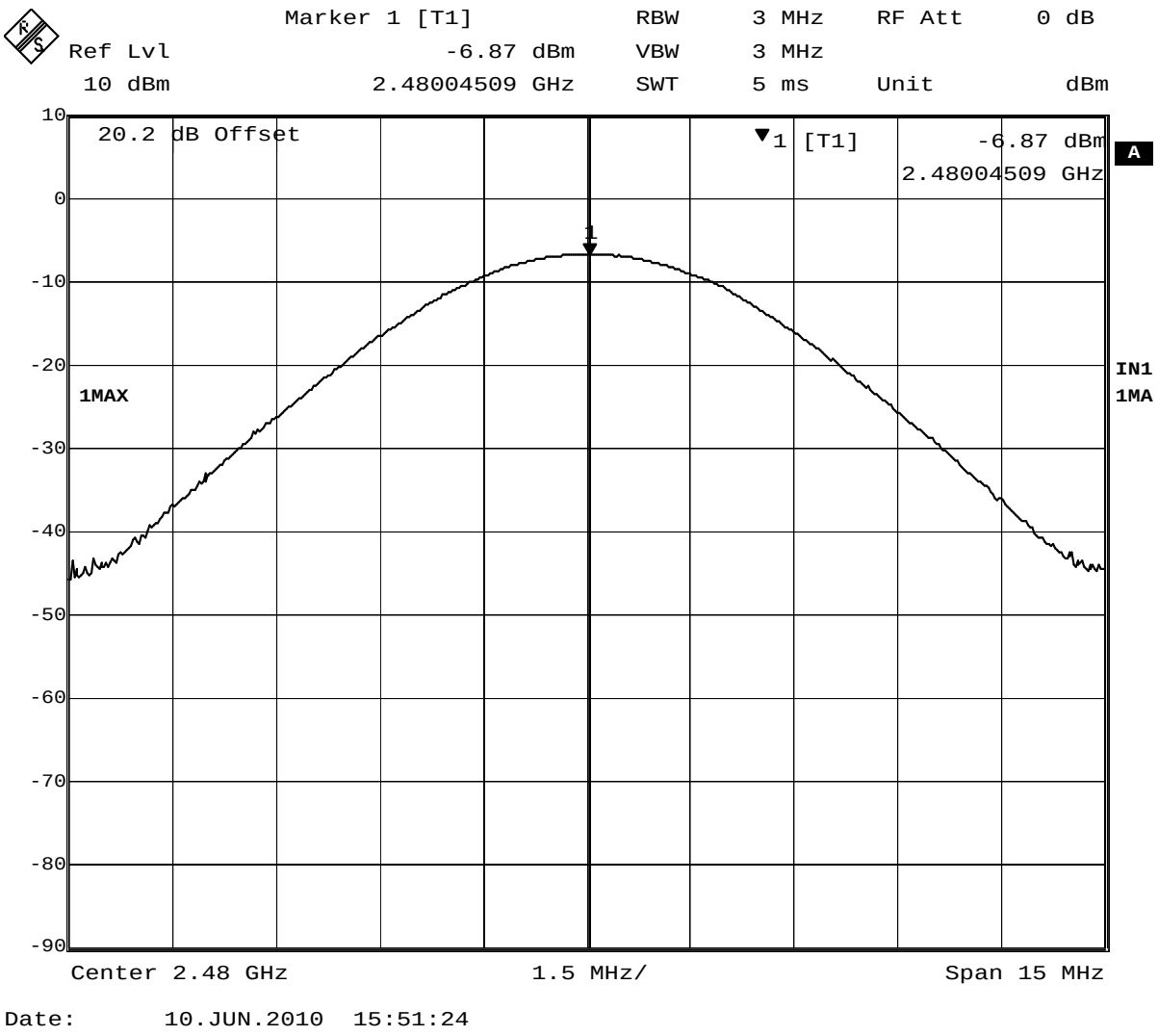


Figure 3 – Highest Peak Conducted Power Output for EUT.

Graphs of the other frequencies are on file at the manufacturer and at TUV.

Antenna Gain

The Antenna used is below 6dBi gain.

The EUT is also compliant to FCC Part 15.247(b)(4)

Results

As tested, the EUT was found to be compliant to the requirements of the test standard.

5.2 Peak Power Spectral Density

5.2.1 Test Over View

Results	**Complies** (as tested per this report)				**Date**	10 June 2010	
Standard	FCC Part 15.247(e) and RSS 210 A8.2(b)						
Product Model	FLUKE 381 - BASE			**Serial#**	00500071		
Test Set-up	Direct Measurement from antenna port						
EUT Powered By	4.5 VDC battery	**Temp**	74º F	**Humidity**	32%	**Pressure**	1010mbar
Perf. Criteria	Below Limit (10dBm)		**Perf. Verification**		≤8 dBm in any 3 kHz		
Mod. to EUT	None		**Test Performed By**		Mark Ryan		

5.2.2 Test Procedure

Using the methods of ANSI C63.10:1999, section 6.11.2.3 were used.

5.2.3 Deviations

There were no deviations from the test methodology listed in the test plan for the Radiated Immunity test.

5.2.4 Final Test

The EUT met the performance criteria requirement as specified in the test plan of this report and in the standards.

Power Spectral Density Measurements

Emission Freq (MHz)	Corrected Value (dBm)	Spec Limit (dBm)	Spec Margin (dB)
2405.00 (f_H)	-22.69	+8	-30.69
2440.00 (f_M)	-23.4	+8	-31.4
2480.00 (f_H)	**-21.42**	**+8**	**-29.42**

Note: worst Case PSD measurement plots are shown below; the other plots are on file at TUV Rheinland.

5.2.5 Final Data

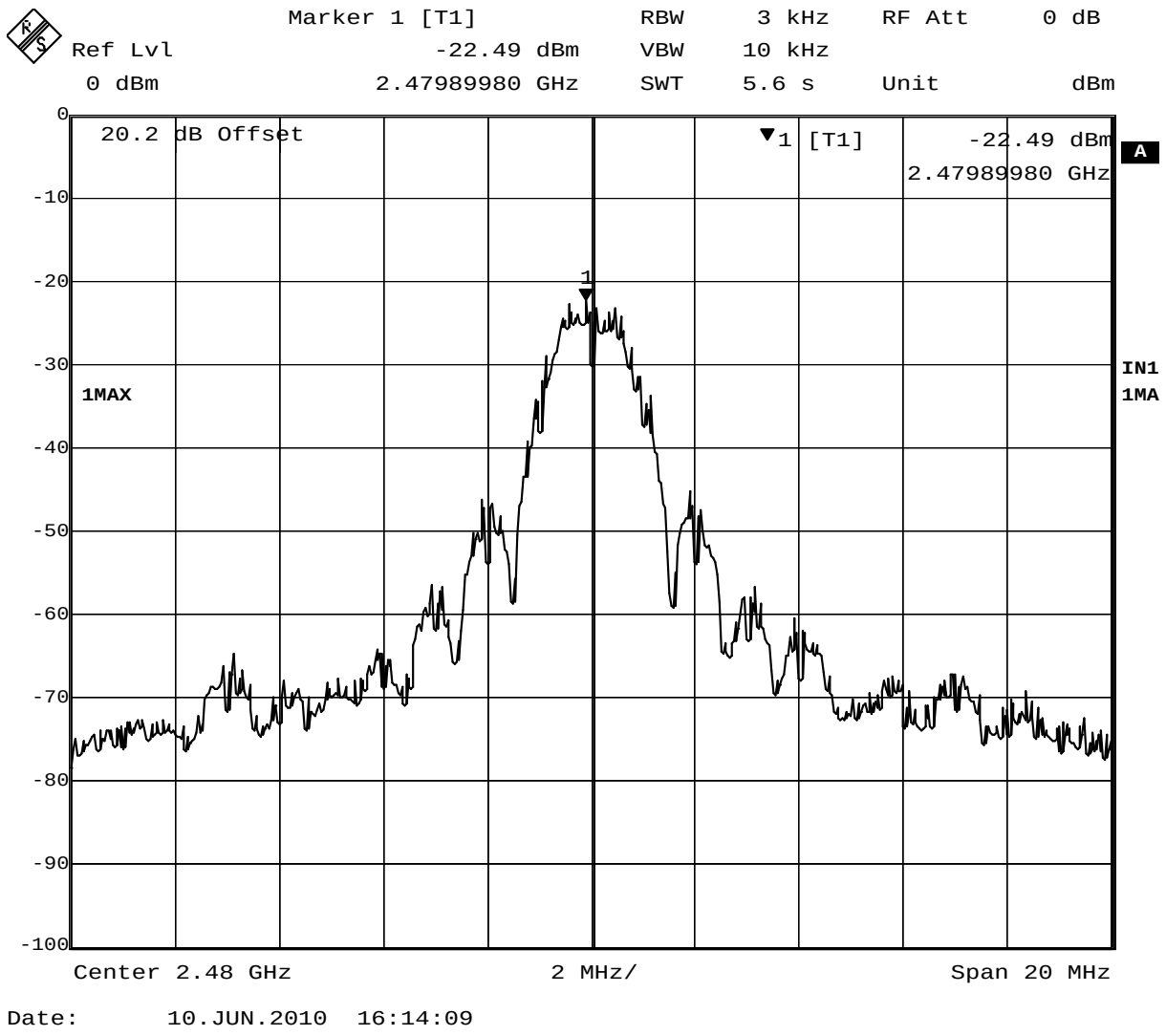


Figure 4: Peak Reference Frequency

Spectrum Analyzer Parameters:
RBW= 3kHz
Span= 20MHz
VBW= 10kHz
LOG dB/div.= 10dB
Sweep = Auto
Detector = sample detector, max hold

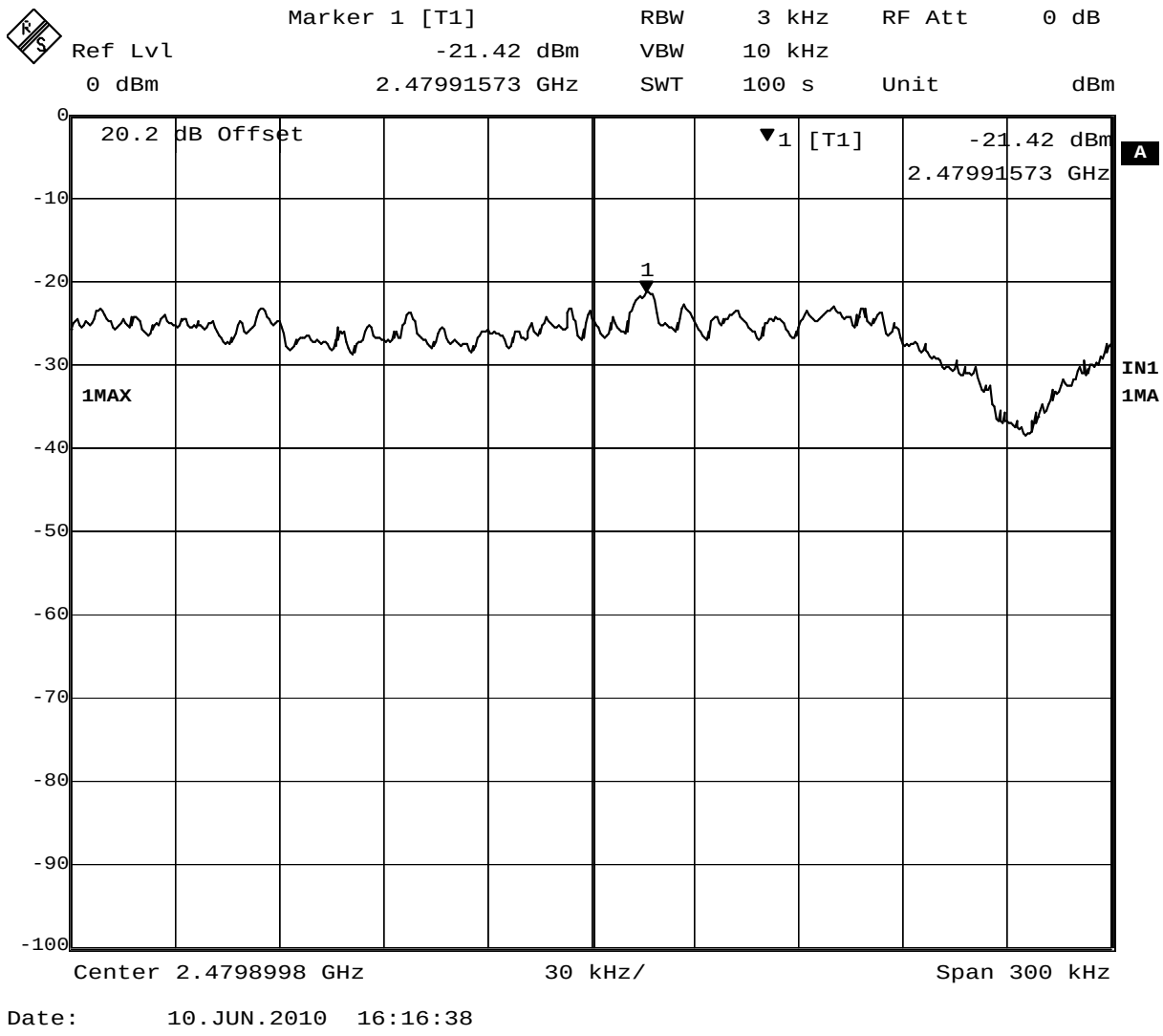


Figure 5: Power Spectral Density measurement

Spectrum Analyzer Parameters:
RBW= 3kHz
Span= 300kHz
VBW= 10kHz
LOG dB/div.= 10dB
Sweep = 100 Seconds
Detector = Sample detector, max hold

5.3 Occupied Bandwidth

Systems using digital modulation techniques may operate in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.

5.3.1 Test Over View

Results	**Complies** (as tested per this report)				**Date**	10 June 2010	
Standard	FCC Part 15.247(a)(2)						
Product Model	FLUKE 381 - BASE		**Serial#**	00500071			
Test Set-up	Direct Measurement from antenna port						
EUT Powered By	4.5 VDC battery	**Temp**	74º F	**Humidity**	32%	**Pressure**	1010 mbar
Perf. Criteria	(Below Limit)		**Perf. Verification**		Readings Under Limit		
Mod. to EUT	None		**Test Performed By**		Mark Ryan		

5.3.2 Test Procedure

Minimum allowed 6dB Bandwidth = 500 kHz

5.3.3 Deviations

There were no deviations from the test methodology listed in the test plan for the Radiated Immunity test.

5.3.4 Final Test

6dB Band width is 1.60 MHz which is > 500 kHz

The EUT met the performance criteria requirement as specified in the standards.

5.3.5 Final Data

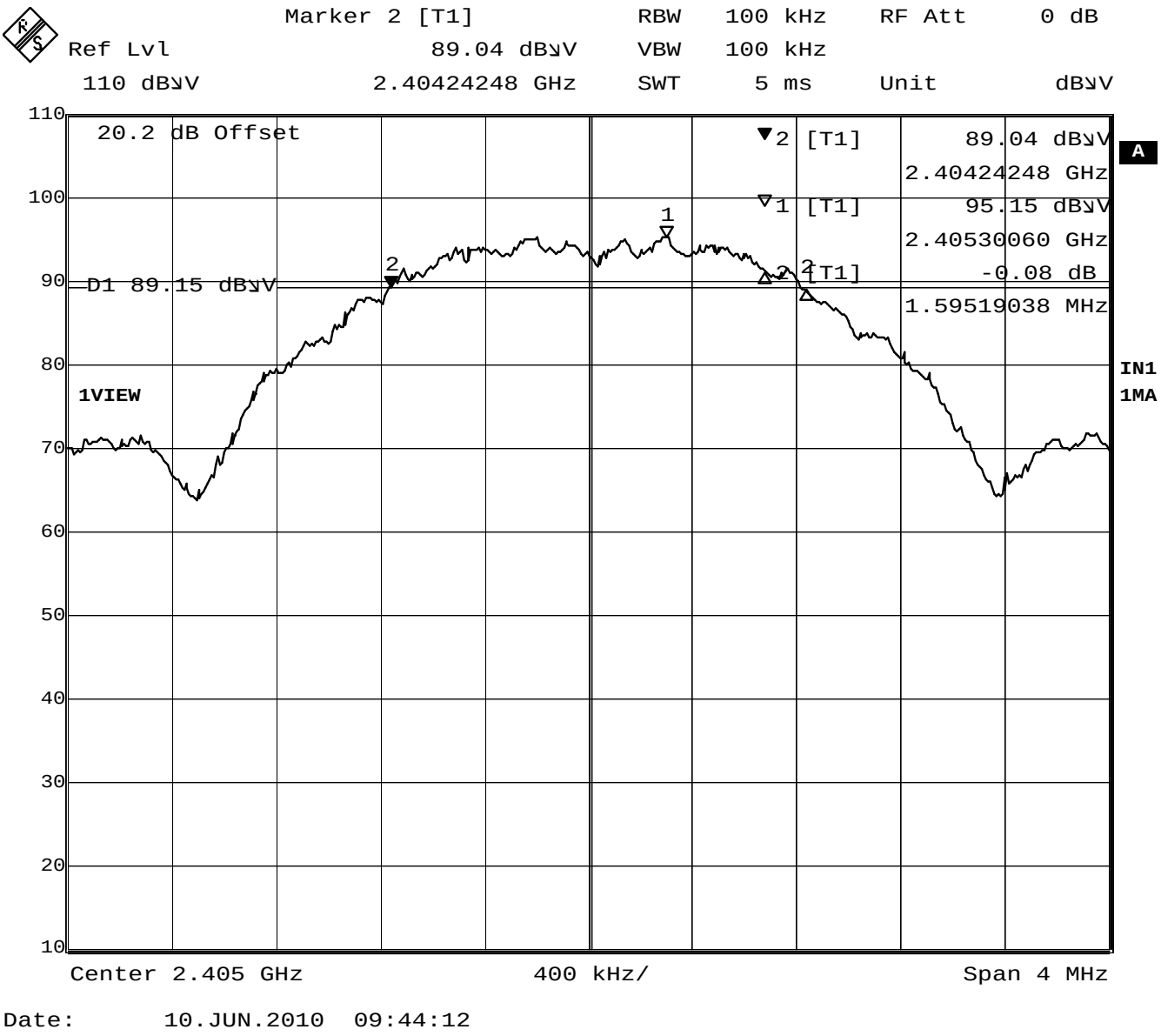


Figure 6: 6dB Occupied Bandwidth

Note: The above plot is the worst case.

6dB Band width is 1.60 MHz which is > 500 kHz

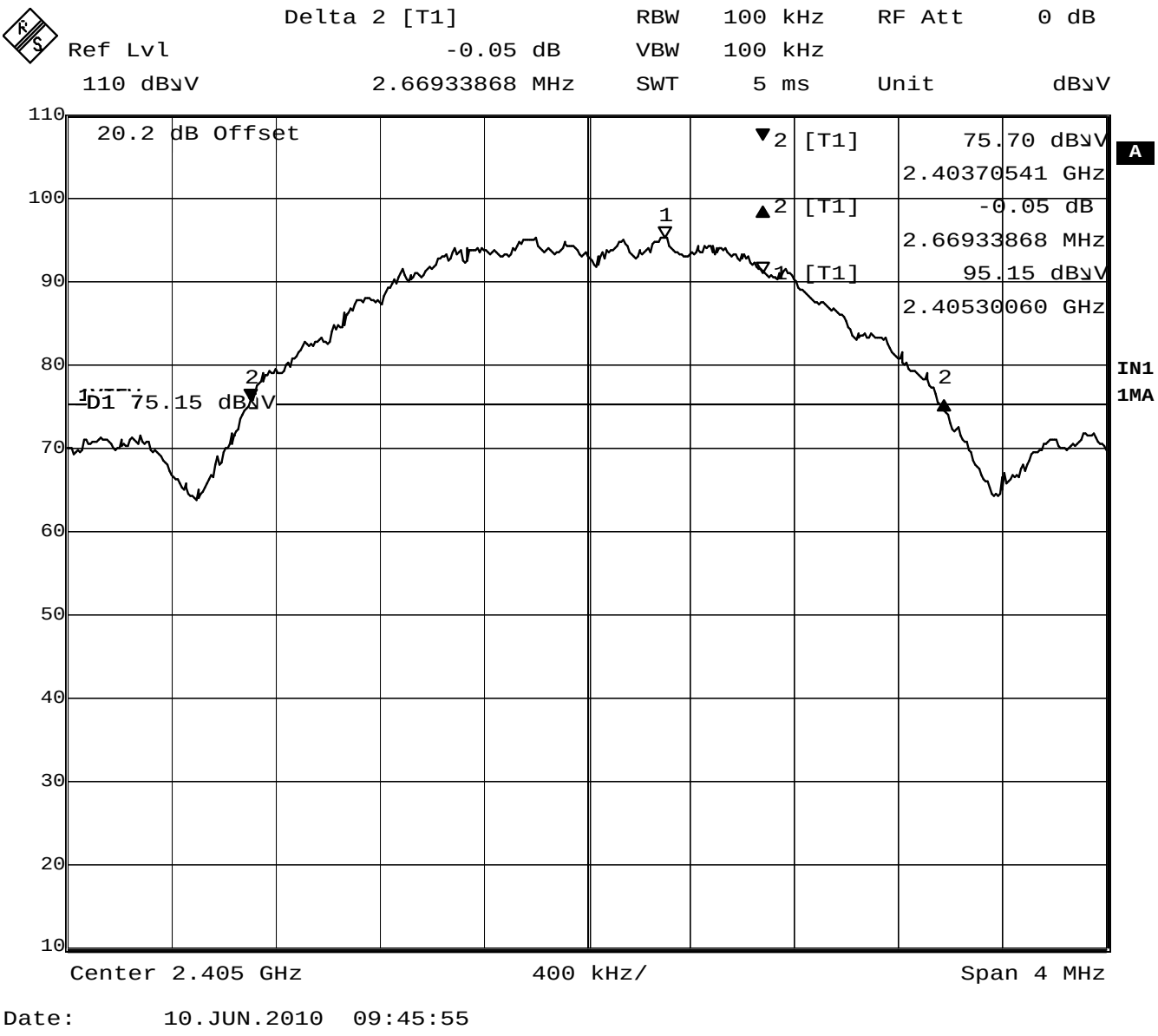


Figure 7: 20 dB Occupied Bandwidth

Note: The above plot is the worst case.

20dB Band width is 2.67 MHz

5.3.6 99% Power Bandwidth

For the purpose of Section A1.1, the 99% bandwidth shall be no wider than .25% of the center frequency for devices operating between 70-900MHz. Foe devices operating above 900 MHz, the emission shall be no wider than 0.5% of the center frequency.

5.3.7 Test Over View

Results	**Complies** (as tested per this report)					**Date**	10 June 2010
Standard	RSS-210 Section A1.1.3						
Product Model	FLUKE 381 - BASE			**Serial#**	00500071		
Test Set-up	Direct Measurement from antenna port						
EUT Powered By	4.5 VDC battery	**Temp**	74º F	**Humidity**	32%	**Pressure**	1010mbar
Perf. Criteria	(Below Limit)		**Perf. Verification**		Readings Under Limit		
Mod. to EUT	None		**Test Performed By**		Mark Ryan		

5.3.8 Test Procedure

Using the procedures of RSS-GEN section 4.6.1, the 1 kHz resolution bandwidth is 1% of the 1 MHz span. The Video bandwidth is 3 times that of the resolution bandwidth.

The limit of the bandwidth would be 0.5% of 2.4 GHz or 12 MHz.

5.3.9 Deviations

There were no deviations from the test methodology listed in the test plan for the Electrical Fast transients (EFT) Immunity test.

5.3.10 Final Results

The measured 99% bandwidth is 2.41 MHz, which is well below the 12 MHz limit.

The EUT met the performance criteria requirement as specified in the test plan of this report and in the standards.

5.3.11 Final Data

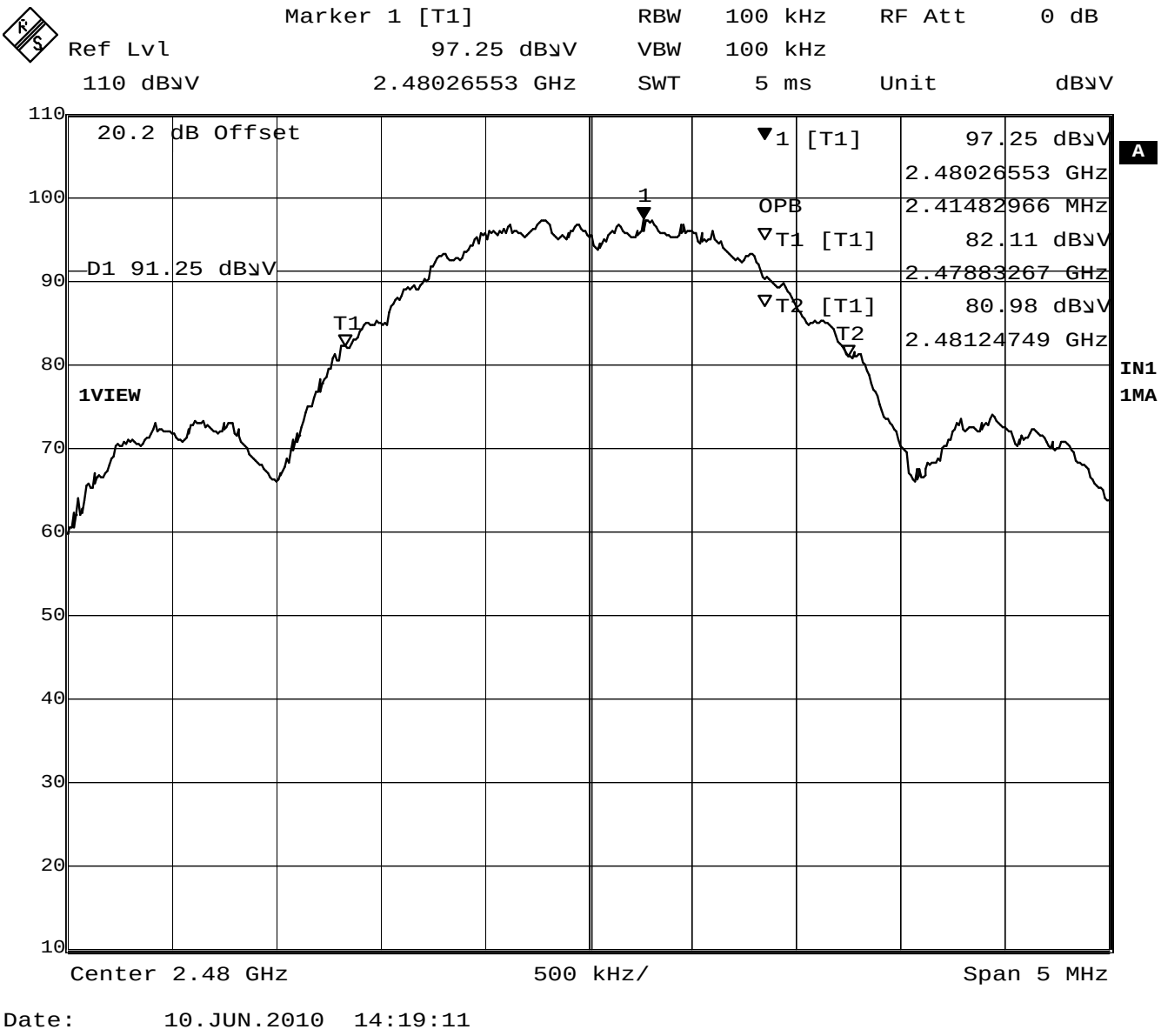


Figure 8 – 99% Power Bandwidth = 2.41 MHz

The EUT is compliant to the requirements of RSS-210 A1.1.3

5.4 Voltage Requirements FCC Part 15.31(e)

FCC Part 15.31 states that for intentional radiators, measurements of the variation of the input power or the radiated signal level of the fundamental frequency component of the emission, as appropriate, shall be performed with the supply voltage varied between 85% and 115% of the nominal rated supply voltage. For battery operated equipment, the equipment tests shall be performed using a new battery.

5.4.1 Over View of Test

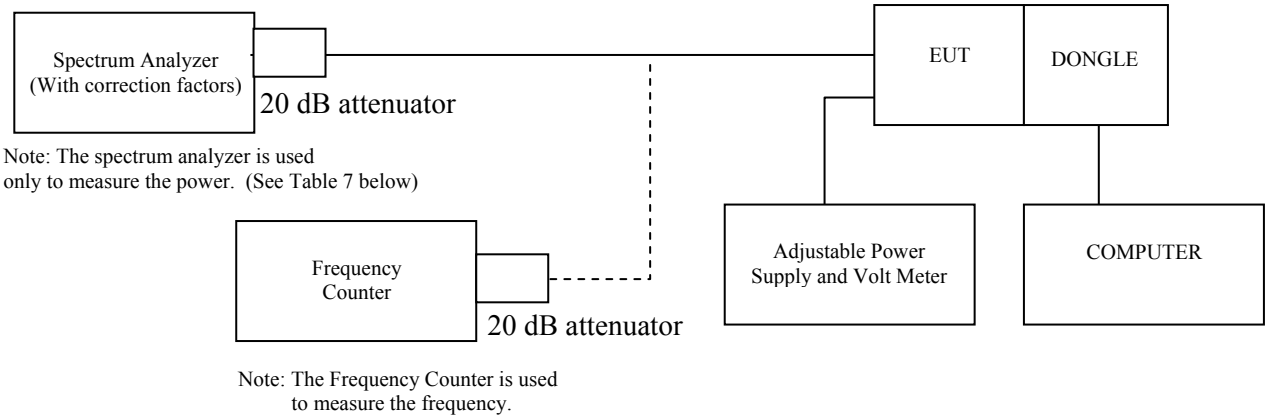
Results	**Complies** (as tested per this report)	**Date**	15 June 2010
Standard	FCC Part 15.31(e)		
Product Model	FLUKE 381 - BASE	**Serial#**	00500071
Test Set-up	Tested in shielded room. EUT placed on table, see test plans for details		
Mod. to EUT	None	**Test Performed By**	Mark Ryan

5.4.2 Test Procedure

Since this module could be used in many different applications, including battery operation, the manufacturer selected that worst-case testing suite to be performed. The power source test was performed using the ±15% of rated voltage

Manufacturer Rated voltage: 4.5VDC, the test will be performed at ±15% of rated voltage.

Test Setup:



Reference at nominal temperature; +20º C

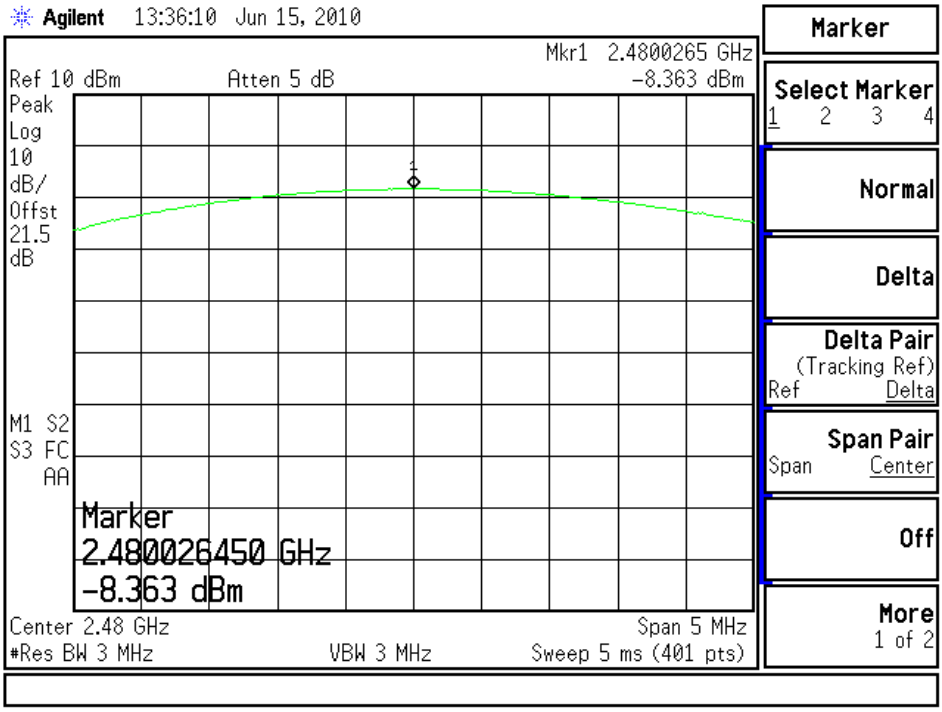
Volts	P(dBm)	Frequency in Hz	Δ to nominal Power (dB)	Δ to nominal Frequency (Hz)
4.500	-8.371	2,480,038,950	0.00	0
3.825	-8.375	2,480,038,950	0.00	0
5.175	-8.363	2,480,026,450	0.01	-12,500

Note: Reading highlighted in Yellow is the reference frequency and power.

Nominal Rated Voltage (V_{Nom}): 4.500 Volts
+15% Max Voltage (V_{max}): 3.825 Volts
-15% Minimum Voltage (V_{min}): 5.175 Volts

5.4.3 Final Test

As tested, the EUT was found to be compliant to the requirements of the test standard.



Worst Case power shift at +5.175VDC from -8.371 dBm to -8.363 dBm.

Note: All other plots of the extreme voltage tests are on file at TUV Rheinland.

6 Emissions in Receive Mode.

6.1 Radiated Emissions

This test measures the electromagnetic levels of spurious signals generated by the EUT that radiated from the EUT and may affect the performance of other nearby electronic equipment.

6.1.1 Over View of Test

Results	**Complies** (as tested per this report)				**Date**	08 June 2010	
Standard	FCC Parts 15.109(a) and RSS-210 2.2, 2.6,A8.5, RSS-GEN 7.2.3.2						
Product Model	FLUKE 381 - BASE			**Serial#**	00500030		
Configuration	See test plan for details						
Test Set-up	Tested in a 5m Semi Anechoic chamber, placed on a 1.0m x 1.5m non-conductive table 80cm above the ground plane on a turn-table. See test plans for details						
EUT Powered By	4.5 VDC battery	**Temp**	74º F	**Humidity**	32%	**Pressure**	1010mbar
Frequency Range	30 MHz to 13 GHz @ 3m						
Perf. Criteria	(Below Limit)			**Perf. Verification**	Readings Under Limit		
Mod. to EUT	None			**Test Performed By**	Mark Ryan		

6.1.2 Test Procedure

Radiated and FCC emissions tests were performed using the procedures of ANSI C63.4:2003 including methods for signal maximizations and EUT configuration. The photos included with the report show the EUT in its maximized configuration.

The frequency range from 30 MHz to 13 GHz was investigated for radiated emissions.

Radiated emission testing was performed at a distance of 3 meters in a 5 meter semi-anechoic chamber.

6.1.3 Deviations

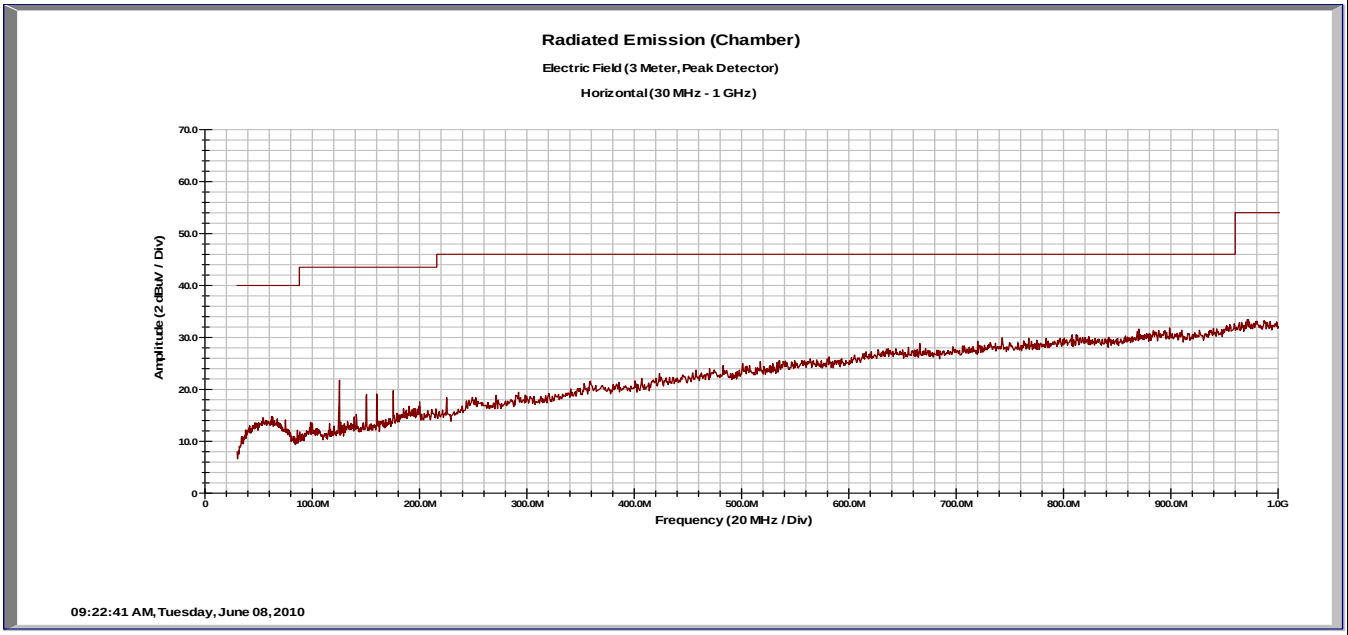
There were no deviations from the test methodology listed in the test plan for the radiated emission test.

6.1.4 Final Test

All final radiated emissions measurements were below (in compliance) the limits.

6.1.5 Final Graphs and Tabulated Data

Radiated Emissions – 30MHz to 1 GHz
Horizontal



Emission Freq (MHz)	ANT Polar (H/V)	ANT Pos (m)	Table Pos (deg)	FIM Value (dBuV)	Amp Gain (dB)	Cable Loss (dB)	ANT Factor (dB/m)	E-Field Value (dBuV/m)	Spec Limit (dBuV/m)	Spec Margin (dB)

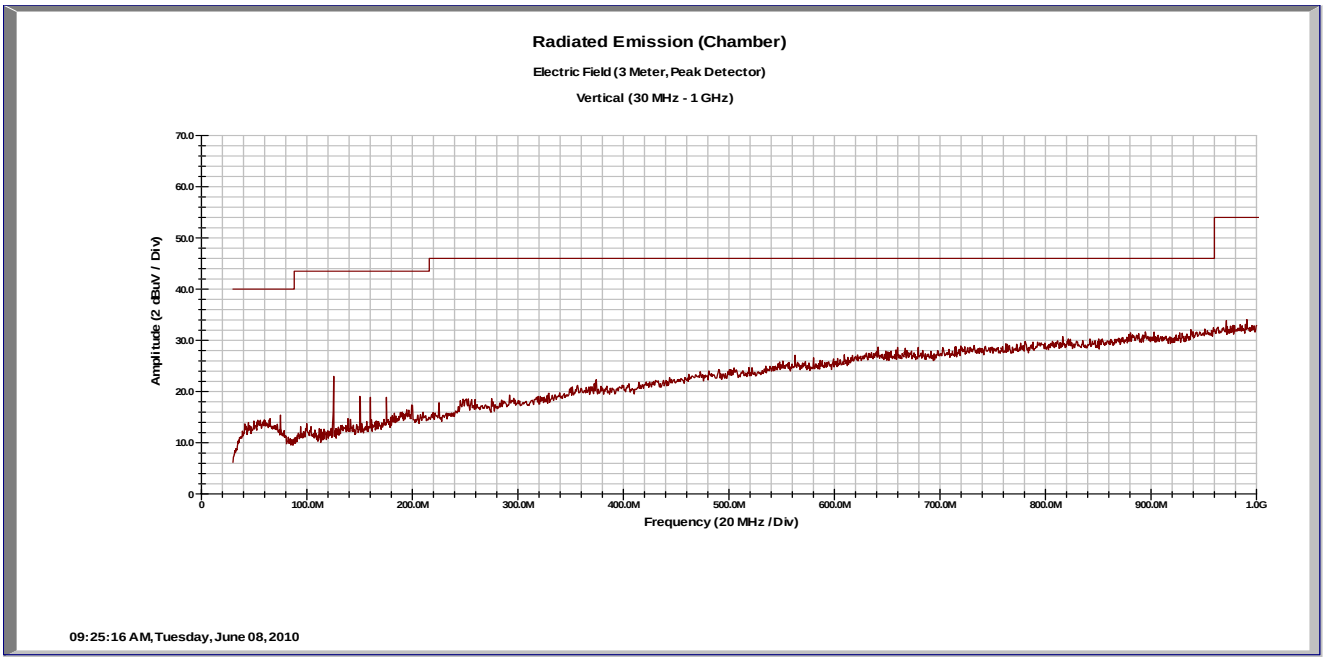
Spec Margin = E-Field Value - Limit, E-Field Value = FIM Value - Amp Gain + Cable Loss + ANT Factor ± Uncertainty

Combined Standard Uncertainty $u_c(y)$ = ± 1.6dB Expanded Uncertainty $U = ku_c(y)$ k = 2 for 95% confidence

Notes: All emissions are either more than 20dB below the limit, or below the noise floor of the receiver.
The signals below 120MHz are anomalies in the receiver.

Radiated Emissions – 30MHz to 1 GHz

Vertical



Emission Freq (MHz)	ANT Polar (H/V)	ANT Pos (m)	Table Pos (deg)	FIM Value (dBuV)	Amp Gain (dB)	Cable Loss (dB)	ANT Factor (dB/m)	E-Field Value (dBuV/m)	Spec Limit (dBuV/m)	Spec Margin (dB)

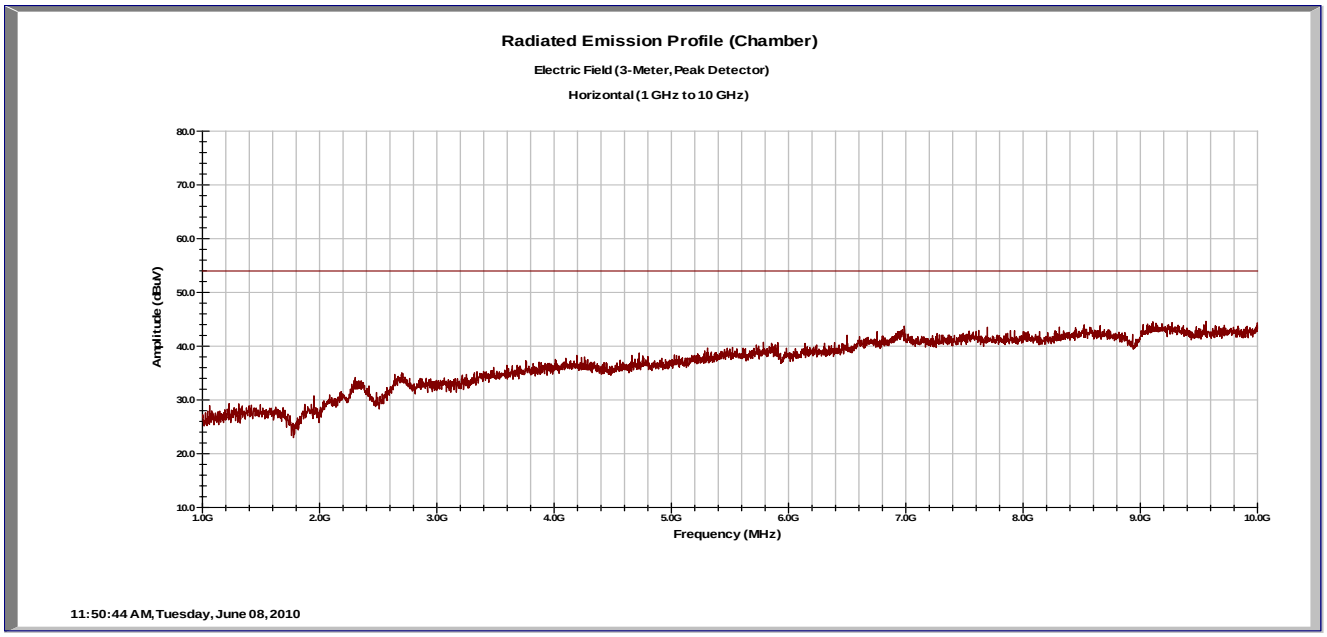
Spec Margin = E-Field Value - Limit, E-Field Value = FIM Value - Amp Gain + Cable Loss + ANT Factor ± Uncertainty

Combined Standard Uncertainty $u_c(y)$ = ± 1.6dB Expanded Uncertainty $U = ku_c(y)$ k = 2 for 95% confidence

Notes: All emissions are either more than 20dB below the limit, or below the noise floor of the receiver.
The signals below 120MHz are anomalies in the receiver.

Radiated Emissions – 1 GHz to 10 GHz

Horizontal



Emission Freq (MHz)	ANT Polar (H/V)	ANT Pos (m)	Table Pos (deg)	FIM Value (dBuV)	Amp Gain (dB)	Cable Loss (dB)	ANT Factor (dB/m)	E-Field Value (dBuV/m)	Spec Limit (dBuV/m)	Spec Margin (dB)

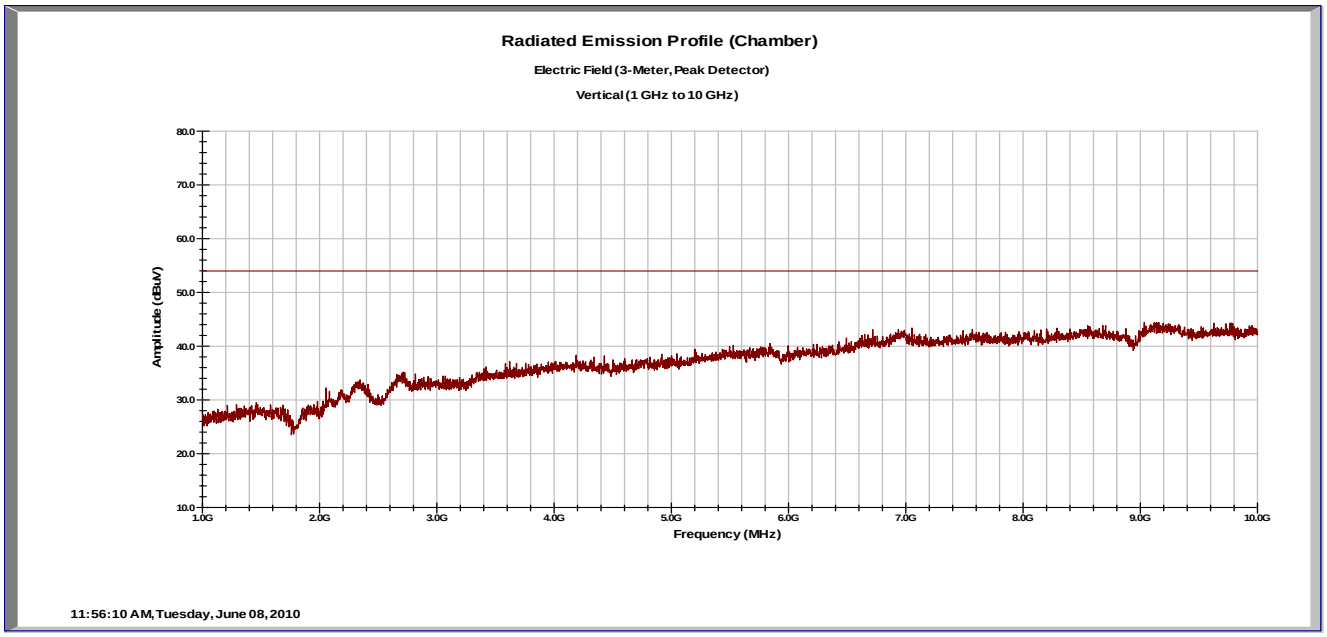
Spec Margin = E-Field Value - Limit, E-Field Value = FIM Value - Amp Gain + Cable Loss + ANT Factor ± Uncertainty

Combined Standard Uncertainty $u_c(y)$ = ± 1.6dB Expanded Uncertainty $U = ku_c(y)$ k = 2 for 95% confidence

Notes: All emissions are either more than 20dB below the limit, or below the noise floor of the receiver.

Radiated Emissions – 1 GHz to 10 GHz

Vertical



Emission Freq (MHz)	ANT Polar (H/V)	ANT Pos (m)	Table Pos (deg)	FIM Value (dBuV)	Amp Gain (dB)	Cable Loss (dB)	ANT Factor (dB/m)	E-Field Value (dBuV/m)	Spec Limit (dBuV/m)	Spec Margin (dB)

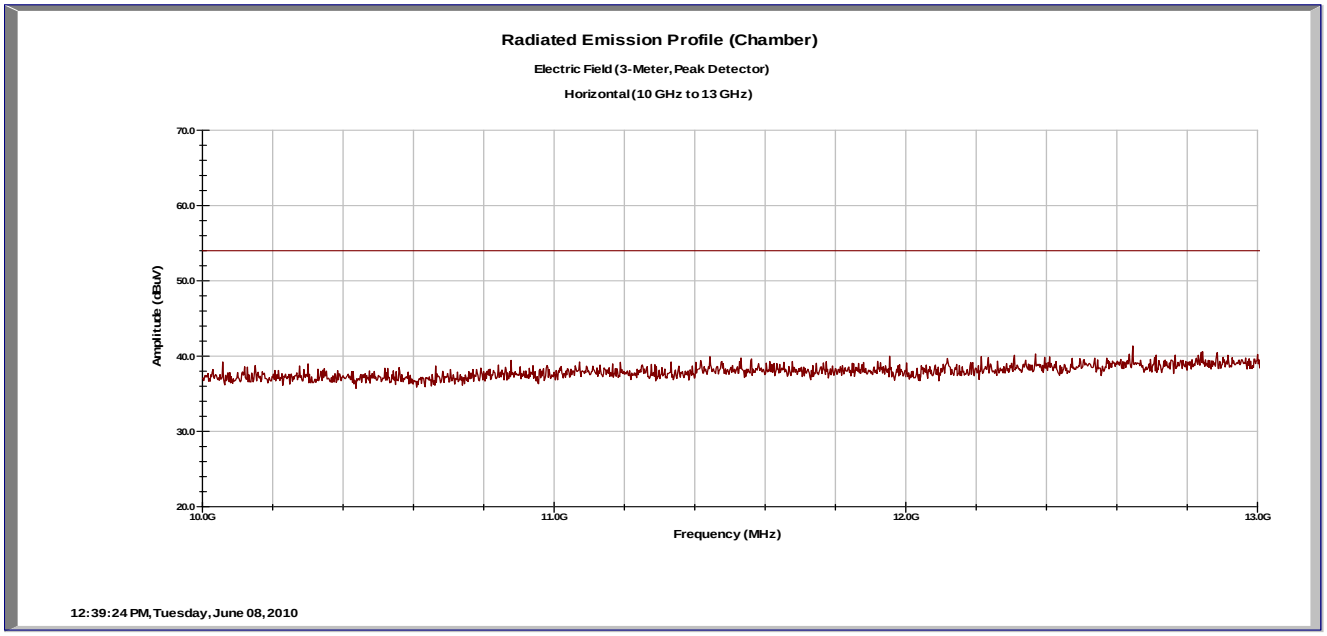
Spec Margin = E-Field Value - Limit, E-Field Value = FIM Value - Amp Gain + Cable Loss + ANT Factor ± Uncertainty

Combined Standard Uncertainty $u_c(y)$ = ± 1.6dB Expanded Uncertainty $U = ku_c(y)$ k = 2 for 95% confidence

Notes: All emissions are either more than 20dB below the limit, or below the noise floor of the receiver.

Radiated Emissions – 10 GHz to 13 GHz

Horizontal



Emission Freq (MHz)	ANT Polar (H/V)	ANT Pos (m)	Table Pos (deg)	FIM Value (dBuV)	Amp Gain (dB)	Cable Loss (dB)	ANT Factor (dB/m)	E-Field Value (dBuV/m)	Spec Limit (dBuV/m)	Spec Margin (dB)

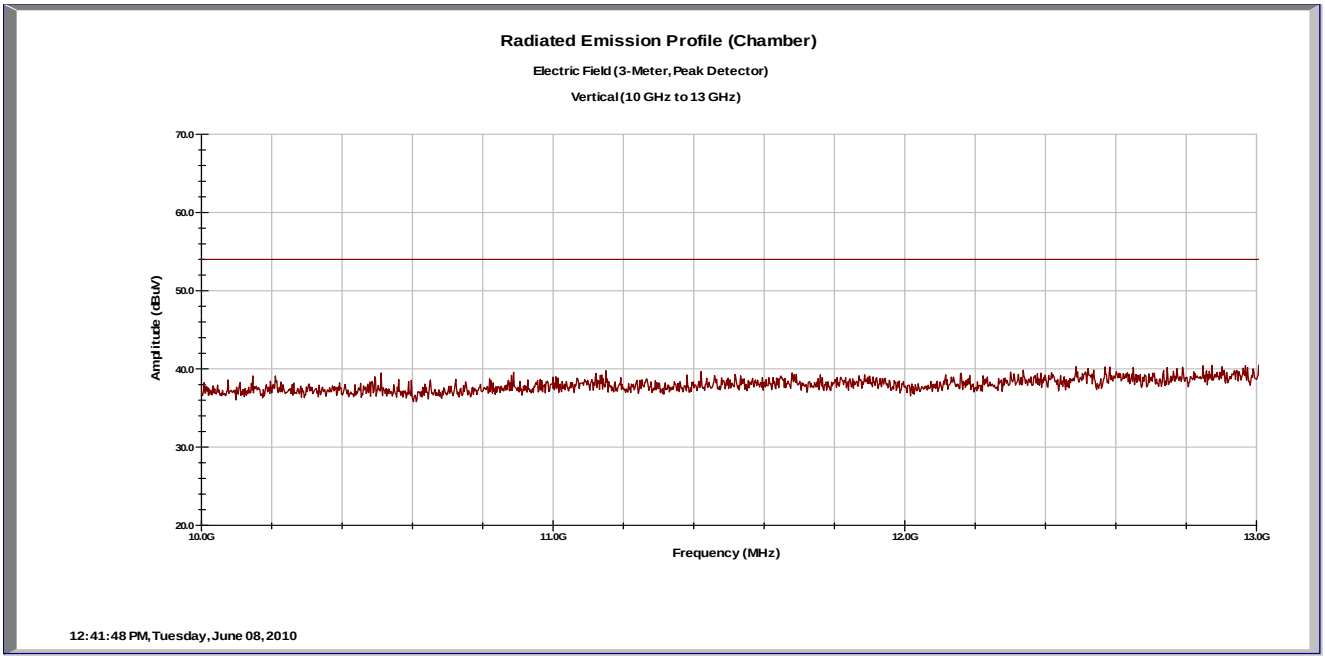
Spec Margin = E-Field Value - Limit, E-Field Value = FIM Value - Amp Gain + Cable Loss + ANT Factor ± Uncertainty

Combined Standard Uncertainty $u_c(y)$ = ± 1.6dB Expanded Uncertainty $U = ku_c(y)$ k = 2 for 95% confidence

Notes: All emissions are either more than 20dB below the limit, or below the noise floor of the receiver.

Radiated Emissions – 10 GHz to 13 GHz

Vertical



Emission Freq (MHz)	ANT Polar (H/V)	ANT Pos (m)	Table Pos (deg)	FIM Value (dBuV)	Amp Gain (dB)	Cable Loss (dB)	ANT Factor (dB/m)	E-Field Value (dBuV/m)	Spec Limit (dBuV/m)	Spec Margin (dB)

Spec Margin = E-Field Value - Limit, E-Field Value = FIM Value - Amp Gain + Cable Loss + ANT Factor ± Uncertainty

Combined Standard Uncertainty $u_c(y)$ = ± 1.6dB Expanded Uncertainty $U = ku_c(y)$ k = 2 for 95% confidence

Notes: All emissions are either more than 20dB below the limit, or below the noise floor of the receiver.

7 RF Exposure

7.1 Exposure Requirements – FCC Parts 2.1091, 15.247(d), and RSS-102 Issue 7

FCC Part 15.247(d) states that SAR evaluation in not required if "Systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy levels in excess of the Commission's guidelines. *See* §1.1307(b)(1) of CFR 47."

RSS-102 section 2.5.1 states that a device is exempt from SAR evaluation if the frequency is "above 2.2 GHz and up to 3 GHz inclusively, and with output power (i.e. the higher of the conducted or radiated (e.i.r.p.) source-based, time-averaged output power) that is less than or equal to 20 mW for general public use…".

7.1.1 Test Procedure

If the antenna is located > 20cm from the user, then an MPE calculation is acceptable.

If the antenna is located < 20cm (portable / mobile / hand-held device) from the user, then SAR evaluation is required.

7.1.2 Evaluation

The EUT is a hand-held portable device where the antenna can be located less than 20cm from the user, therefore SAR evaluation is required.

7.1.2.1 Evaluation for FCC

FCC 447498 D01 Mobile Portable RF Exposure v04, Paragraph 2) section a) i) states:
"A device may be used in portable exposure conditions with no restrictions on host platforms when either the source-based time-averaged output power is $\leq 60/f_{(GHz)}$ mW or all measured 1-g SAR are < 0.4 W/kg.[11] ".

The minimum power that requires SAR is 60 / 2.4 GHz or 25 mW.

The maximum power output plus maximum antenna gain of the EUT is:

-6.68dBm + 3dBi (antenna) = -3.68dBm = 0.43 mW.

The EUT is well below the 25mW power.

7.1.2.2 Evaluation for Industry Canada

The maximum power output plus maximum antenna gain of the EUT is:

-6.68dBm + 3dBi (antenna) = -3.68dBm = 0.43 mW.

The EUT is well below the 20mW power.

7.1.3 Conclusion

SAR testing is not required for either FCC or Industry Canada.

Appendix A

Test Plan

This test report is intended to follow this test plan outlined here in unless other wise stated in this here report. The following test plan will give details on product information, standards to be used, test set ups and refer to TUV test procedures. The test procedures will give the steps to be taken when performing the stated test. The product information below came via client, product manual, product itself and or the internet.

GENERAL INFORMATION

EUT: Display **Clamp meter**

Product Description: **Measure amperage, voltage, and ohms and provide remote display capability so the user can view the measurement at a distance or outside an electrical cabinet etc.**

Model: **Fluke 381 (Base)**

Operation: **A procedure was provided to the testing lab to control modulation, Frequency, and Mode of the device. Two test samples are provided; one with normal operating internal antenna, and a model with a cable connected directly to the transmitter output for conducted RF measurements.**

Test Plan Summary

Table 1: **EMC Test Plan Summary FCC& IC**

Test	Test Method ANSI C63.10	Test Parameters (from Standard)
Spurious Emission in Received Mode	CFR47 15.109, RSS-GEN Sect.7.2.3	Class B
Spurious Emission in Transmitted Mode	CFR47 15.209, RSS-GEN Sect.7.2.3	Class B
Restricted Bands of Operation	CFR47 15.205, RSS 210 Sect.2.6	Class B
AC Power Conducted Emission	CFR47 15.207, RSS-GEN Sect.7.2.2	Class B
Occupied Bandwidth	CFR47 15.247 (a2), RSS GEN Sect.4.4.1	500kHz minimum
Maximum Transmitted Power	CFR47 15.247 (b3), RSS 210 Sect. A.8.4	30dBm w/ 6dBi antenna
Peak Power Spectral Density	CFR47 15.247 (e), RSS 210 Sect. A.8.2	8dBm/ 3kHz.
Band edge Measurement	CFR47 15.247 (d), RSS 210 Sect. A.8.5	20dBr
RF Exposure	CFR47 15.247 (i), 2.1091	General Population