

Electromagnetic Compatibility Test Report

Prepared in accordance with

FCC Part 15C and ANSI C63.10

On

Wireless Kitchen Management System

SCK Direct II

Food Automation – Service Techniques, Inc. (FAST)
905 Honeyspot Rd
Stratford, CT 06615

Prepared by:

TUV Rheinland of North America, Inc.

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Client:	Food Automation – Service Techniques, Inc. (FAST) 905 Honeyspot Rd Stratford, CT 06615	Stan Vreeland 203-380-3510 / 203-377-8187 svreeland@fastinc.com	
Identification:	Wireless Kitchen Management System	Serial No.:	00V08916008
Test item:	SCK Direct II	Date tested:	12/2/2010
Testing location:	TUV Rheinland of North America 336 Initiative Drive Rochester, NY 14624 U.S.A.	Tel: (585) 426-5555 Fax: (585)-568-8338	
Test specification:	Emissions: FCC Part 15 subpart C FCC Part 15.249(a) FCC Part 15.205(a) FCC Part 15.215(a) FCC Part 15.249(a), FCC Part 15.215(c) FCC Part 15.249(3), FCC Part 2.1093,		
Test Result:	The above product was found to be Compliant to the above test standard(s)		
tested by: Randall Masline	reviewed by: Cecil Gittens		
16 November 2011	<u>Date</u>	<u>Name</u>	<u>Signature</u>
Other Aspects:	None		
Abbreviations: OK, Pass, Compliant, Complies = passed Fail, Not Compliant, Does Not Comply = failed N/A = not applicable	16 November 2011	<u>Date</u>	<u>Name</u>
	 NVLAP Lab Code (200313-0)	Industry Canada	BSMI
US5253		34661C-1	SL2-IN-E-050R

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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 and ANSI C63.10 based on the results of testing performed on 12/2/2010 on the Wireless Kitchen Management System, Model No. SCK Direct II, manufactured by Food Automation – Service Techniques, Inc. (FAST). 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 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.

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1.3 Summary of Test Results

Applicant	Food Automation – Service Techniques, Inc. (FAST) 905 Honeyspot Rd Stratford, CT 06615	Tel	203-380-3510	Contact	Stan Vreeland
		Fax	203-377-8187	e-mail	svreeland@fastinc.com
Description		Model Number		SCK Direct II	
Serial Number		Test Voltage/Freq.		100-240 VAC 50/60Hz	
Test Date Completed:		Test Engineer		Randall Masline	
Standards		Description		Severity Level or Limit	Criteria
FCC Part 15 subpart C Standard		Radio Frequency Devices - Subpart C: Intentional Radiators		See called out parts below	See Below
FCC Part 15.249(a) FCC Part 15.205(a) FCC Part 15.215(a)		Radiated Emissions Restricted Bands		Class B, 30 - 1000 MHz	Limit
FCC Part 15.207(a)		Conducted Emissions		Class B, 150kHz - 30MHz	Limit
FCC Part 15.249(a)		Operation within the bands 902-928 MHz, 2400-2483.5 MHz, 5725-5875 MHz and 24.0-24.25 GHz		50mv/m Fundamental	Limit
FCC Part 15.215(c)		Band Edge Requirements		Per Section 15.215(c) of the standard	Limit
FCC Part 15.249(3)		Frequency Tolerance		Carrier Maintained to 0.001% of frequency at -20°C to +50°C	Limit
FCC Part 2.1093		RF Exposure		MPE or SAR Requirements (Mobile)	Limit
					Complies

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2 Laboratory Information

2.1 *Accreditations & Endorsements*

2.1.1 US Federal Communications Commission (Expires 12/7/2013)

TUV Rheinland of North America located at 336 Initiative Dr, Rochester NY 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 US90575). 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 (Expires 6/30/2011)

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: 200313-0). The scope of laboratory accreditation includes emission and immunity testing. The accreditation is updated annually.

2.1.3 VCCI

VCCI Accredited test lab. Registration numbers R-1065, C-1120, C-1121

2.1.4 Industry Canada (Expires 1/22/2012)

Registration No.: 3466C-1. The OATS has been accepted by Industry Canada to perform testing to 3 and to 10m, based on the test procedures described in ANSI C63.4-2003.

2.1.5 BSMI

Registration No.: SL2-IN-E-050R. The BSMI accreditation was obtained by NIST MRA with the BSMI.

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2.1.6 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:

$$\text{Field Strength (dB}\mu\text{V/m)} = \text{RAW} - \text{AMP} + \text{CBL} + \text{ACF}$$

Where: RAW = Measured level before correction (dB μ V)

AMP = Amplifier Gain (dB)

CBL = Cable Loss (dB)

ACF = Antenna Correction Factor (dB/m)

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

Sample radiated emissions calculation @ 30 MHz

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

$$25 \text{ dBuV/m} + 17.5 \text{ dB} - 20 \text{ dB} + 1.0 \text{ dB} = 23.5 \text{ dBuV/m}$$

2.2 Measurement Uncertainty Emissions

Measurement	<i>U</i> _{lab}	<i>U</i> _{cispr}
Radiated Disturbance @ 10m		
30 MHz – 1000 MHz	4.57 dB	5.2 dB
Conducted Disturbance @ Mains Terminals		
150 kHz – 30 MHz	2.62 dB	3.6 dB
Disturbance Power		
30 MHz – 300 MHz	3.88 dB	4.5 dB

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Measurement Uncertainty

The estimated combined standard uncertainty for radiated emissions measurements is ± 1.6 dB.

The estimated combined standard uncertainty for conducted emissions measurements is ± 1.2 dB.

The expanded uncertainty at a level of 95% confidence is obtained by multiplying the combined standard uncertainty by a coverage factor of 2. Compliance criteria are not based on measurement uncertainty.

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.

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2.4 Measurement Equipment Used

Equipment	Manufacturer	Model #	Ref.	Serial #	Last Cal dd/mm/yy	Next Cal dd/mm/yy	Test
Horn	EMCO	3115	C031	9812-5635	16-Mar 10	16-Mar 12	RE
BiLog	Chase	CBL6111	C041	1170	1-Mar-10	1-Mar-11	RE
EMI Receiver	Rohde & Schwarz	ESVS 30	C310	826006/015	12-Dec-10	12-Dec-11	RE
Analyzer w RF Filter Section 85460A	HP	8546A	C311	3325A00127	28-Jul-10	28-Jul-11	RE, CE
Receiver (20Hz-40GHz)	Rohde & Schwarz	ESI 40	C320	839283/005	11-Dec-10	11-Dec-11	RE,CE
Temp./Humidity Chart Recorder	Honeywell		C419	639971	30-Dec-09	30-Dec-10	RE
Horn	EMCO	3160-09	C447	03-0338-018	17-Nov-10	17-Nov-12	RE
BiLog	Chase	CBL6111B	C448	2081	16-Nov-10	16-Nov-11	RE
Multimeter	Fluke	8062A	C452	4715199	12-Dec-10	12-Dec-11	All tests
Digital Pressure/Temp/RH	Davis	Perception II	C470	PB00218A16	23-Jun-10	23-Jun-11	All tests
Analyzer w RF Filter Section 85460A	HP	8546A	D004	3625A00356	28-Jul-10	28-Jul-11	CE

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3 Product Information

3.1 Product Description

See Appendix A

3.2 Equipment Modifications

No modifications were needed to bring product into compliance.

3.3 Test Plan

The EUT product information, test configuration, mode of operation, test types, test procedures, test levels, pass/failure criteria, in this report were carried out per the product test plan located in appendix A of this report

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Figure 1 – External Photo of EUT

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4 Emissions

4.1 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.

4.1.1 Over View of Test

Results	Complies (as tested per this report)			Date	11/23/2010		
Standard	FCC Part 15.249(a) FCC Part 15.205(a) FCC Part 15.215(a)						
Product Model	SCK Direct II			Serial#	00V08916008		
Configuration	See test plan for details						
Test Set-up	Tested on 10m O.A.T.S. at 3 meters, placed on turn-table, see test plans for details						
EUT Powered By	100-240 VAC 50/60Hz	Temp	21°C	Humidity	46%	Pressure	1006mbar
Frequency Range	30 - 1000 MHz @ 10m						
Perf. Criteria	Class B. (Below Limit)		Perf. Verification	Readings Under Limit			
Mod. to EUT	None		Test Performed By	Randall Masline			

4.1.2 Test Procedure

Radiated and FCC emissions tests were performed using the procedures of ANSI C63.10 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 - 1000 MHz was investigated for radiated emissions.

Radiated emission testing was first performed at a distance of 3 meters in the semi-anechoic chamber in order to identify the specific frequencies for which these measurements will be made on the 10 m OATS.

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 emissions measurements were below (in compliance) the limits.

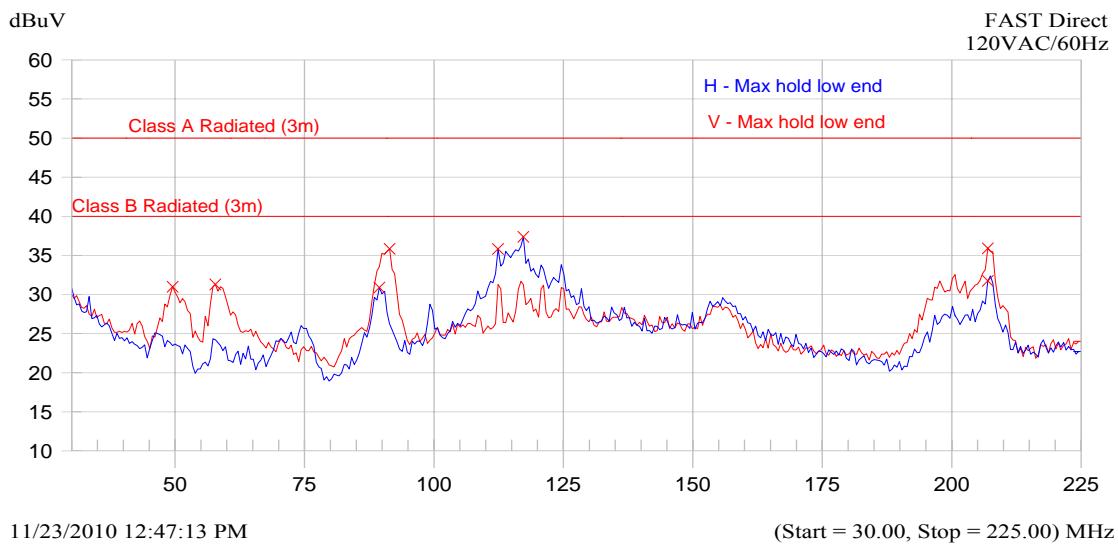
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4.1.5 Final Graphs

NOTES:

Radiated Emissions Prescan Vertical / Horizontal

Direct low end



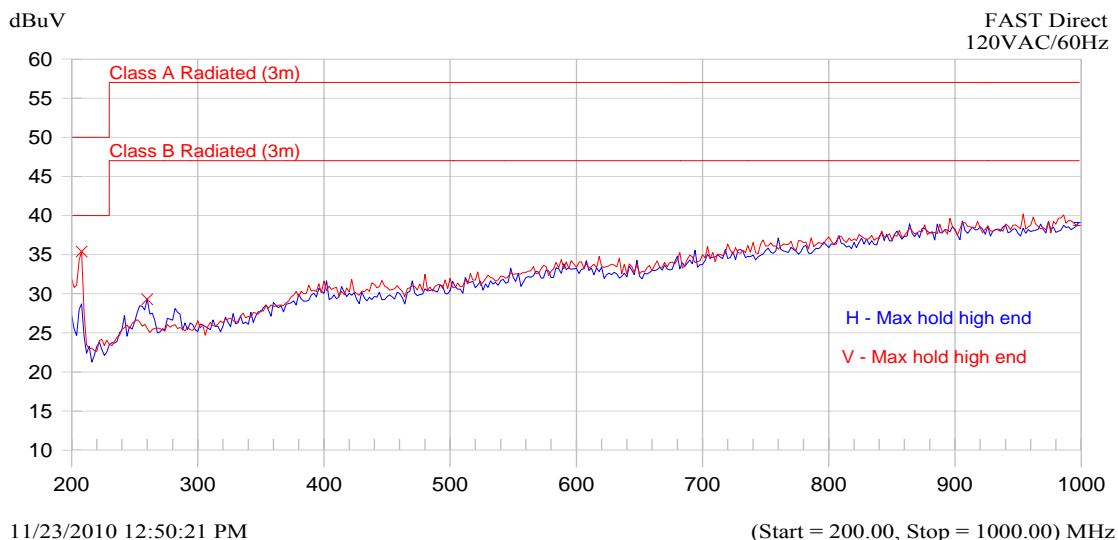
Frequency MHz	Peak dBuV	QP dBuV	Class B-QP dB	Class A-QP dB	Trace Name
89.475	30.9				H - Max hold low end
112.388	35.8				H - Max hold low end
117.263	37.4				H - Max hold low end
206.963	31.7				H - Max hold low end
49.500	31.0				V - Max hold low end
57.788	31.3				V - Max hold low end
91.425	35.8				V - Max hold low end
206.963	35.9				V - Max hold low end

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NOTES:

Radiated Emissions Prescan
Vertical / Horizontal

Direct high end



Frequency	Peak	QP	Class B-QP	Class A-QP	Trace Name
MHz	dBuV	dBuV	dB	dB	
208.000	35.4				V - Max hold high end
260.000	29.3				H - Max hold high end

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4.1.6 Final Tabulated Data

Radiated Emissions Measurements									
<i>Standard:</i>		Class B/FCC Part 15.209(a)		Final		<i>Date:</i>		11/23/2010	
<i>Device Tested:</i>		FAST XWIRE-DIRECT		3m		<i>File .xls:</i>			
Measured Level									
Meas #	Freq (MHz)	Quasi-Peak	Quasi-Peak Limit	Quasi-Peak Δ	Result	Antenna Polarization	Angle (degrees)	Antenna Height (meters)	Comment
1	49.5000	28.90	40.00	-11.10	Complied	Vertical	0	1.00	
2	57.7880	28.70	40.00	-11.30	Complied	Vertical	0	1.00	
3	91.4250	34.65	40.00	-5.35	Complied	Vertical	0	1.00	
4	206.9630	33.50	40.00	-6.50	Complied	Vertical	0	1.00	
5	112.3880	32.45	40.00	-7.55	Complied	Horizontal	0	1.00	
6	117.2630	35.60	40.00	4.40	Complied	Horizontal	0	1.00	Maximum Emissions

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4.2 Conducted Emissions

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

4.2.1 Over View of Test

Results	Complies (as tested per this report)			Date	11/23/2010			
Standard	FCC Part 15.249(a) FCC Part 15.205(a) FCC Part 15.215(a)							
Product Model	SCK Direct II		Serial#	00V08916008				
Configuration	See test plan for details							
Test Set-up	Tested in shielded room			EUT placed on table	see test plans for details			
EUT Powered By	100-240 VAC 50/60Hz	Temp	21° C	Humidity	46%	Pressure	1009mbar	
Frequency Range	150kHz - 30MHz							
Perf. Criteria	Class B (Below Limit)	Perf. Verification		Readings Under Limit for L1 & Neutral				
Mod. to EUT	None	Test Performed By		Randall Masline				

4.2.2 Test Procedure

Conducted and FCC emissions tests were performed using the procedures of ANSI C63.10 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 150kHz - 30MHz was investigated for conducted emissions.

Conducted Emissions measurements were performed in the shielded room using procedures specified in the test plan and standard.

4.2.3 Deviations

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

4.2.4 Final Test

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

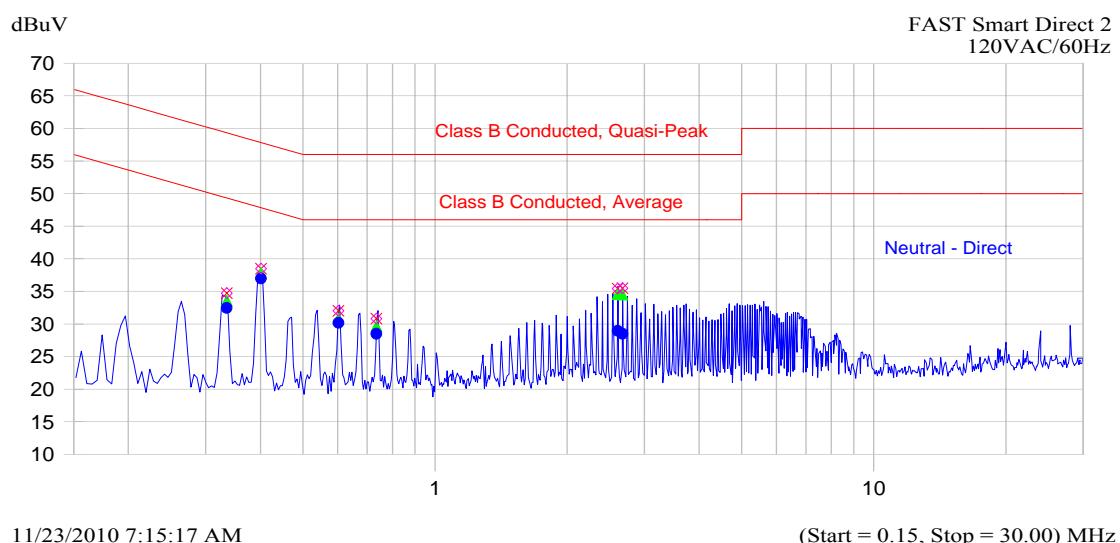
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4.2.5 Final Graphs

NOTES:

Conducted Emissions @ 120V/60Hz
Line / Neutral

Neutral - Direct



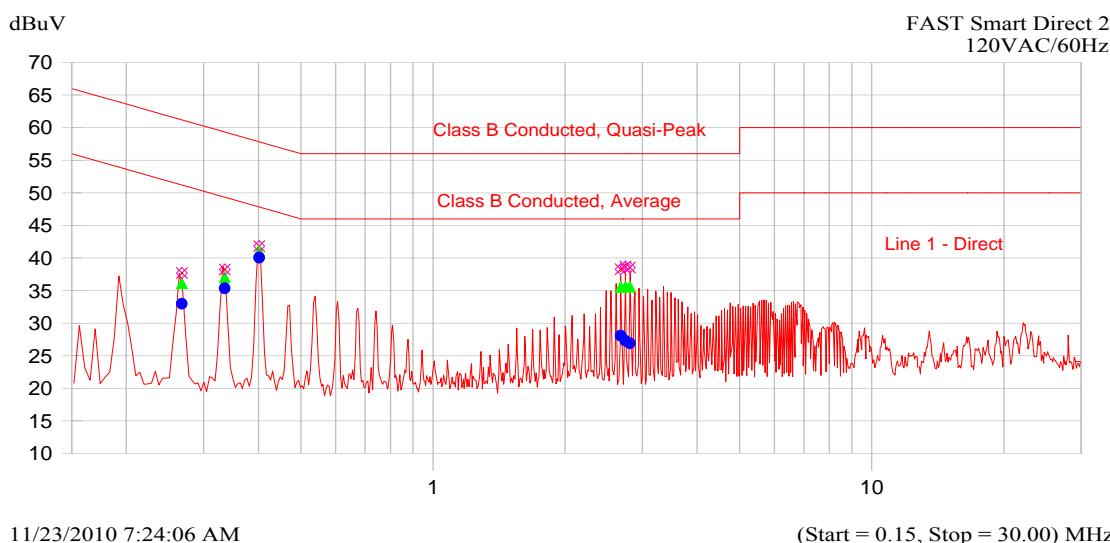
Frequency MHz	Peak dBuV	QP dBuV	Delta QP-QP Limit dB	Avg dBuV	Delta Avg-Avg Limit dB	Transducer Correction dB	Cable Correction dB
0.335	34.7	33.6	-25.8	32.5	-16.9	-0.1	10.1
0.401	38.5	37.7	-20.1	37.0	-10.9	-0.1	10.1
0.603	32.0	30.8	-25.2	30.2	-15.8	-0.1	10.1
0.735	30.8	29.6	-26.4	28.5	-17.5	-0.1	10.2
2.609	35.4	34.6	-21.4	28.9	-17.1	-0.1	10.4
2.675	35.5	34.5	-21.5	28.5	-17.5	-0.1	10.4

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NOTES:

Conducted Emissions @ 120V/60Hz
Line / Neutral

Line 1 - Direct



Frequency MHz	Peak dBuV	QP dBuV	Delta QP-QP Limit dB	Avg dBuV	Delta Avg-Avg Limit dB	Transducer Correction dB	Cable Correction dB
0.268	37.7	36.1	-25.1	33.0	-18.2	-0.1	10.1
0.335	38.2	37.0	-22.3	35.3	-14.0	-0.1	10.1
0.402	41.8	41.1	-16.8	40.0	-7.8	-0.1	10.1
2.676	38.3	35.6	-20.4	28.1	-17.9	-0.1	10.4
2.744	38.7	35.6	-20.4	27.3	-18.7	-0.1	10.4
2.811	38.5	35.6	-20.4	26.9	-19.1	-0.1	10.4

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4.3 Field Strength of Fundamental and Harmonic Emissions

This test measures the electromagnetic levels of fundamental and spurious signals generated by the EUT that radiated from the EUT.

4.3.1 Test Over View

Results	Complies (as tested per this report)				Date	12/2/2010			
Standard	FCC Part 15.249(a)								
Product Model	SCK Direct II			Serial#	00V08916008				
Configuration	See test plan for details								
Test Set-up	Tested at O.A.T.S.		EUT placed on table		See test plan for details				
EUT Powered By	100-240 VAC 50/60Hz	Temp	22° C	Humidity	47%	Pressure	996mbar		
Perf. Criteria	50mv/m (Below Limit)		Perf. Verification	Readings under Limit					
Mod to EUT	None		Test Performed By	Randall Masline					

4.3.2 Test Procedure

Field Strength and FCC emissions tests were performed using the procedures of ANSI C63.10 including methods for signal maximizations and EUT configuration. The photos included with the report show the EUT in its maximized configuration.

Radiated emission testing measurements will be made on the 10 m OATS, at a 3m distance.

4.3.3 Deviations

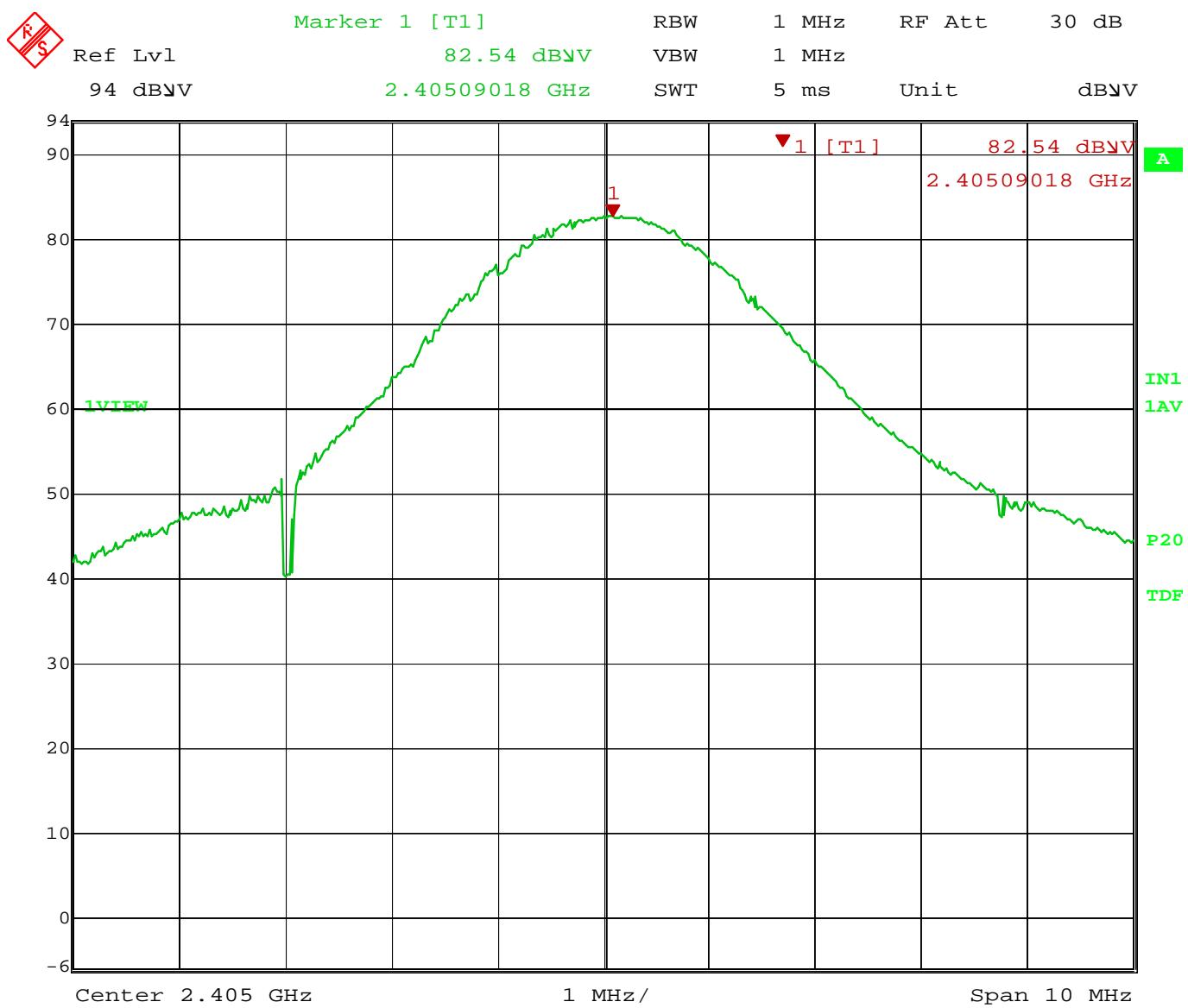
There were no deviations from the test methodology listed in the test plan for the radiated emission test.

4.3.4 Final Test

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

The highest average measurement was made on channel 3 in the horizontal polarization at 93.03 dBuV at 2408.14028 MHz. The limit is 94dBuV

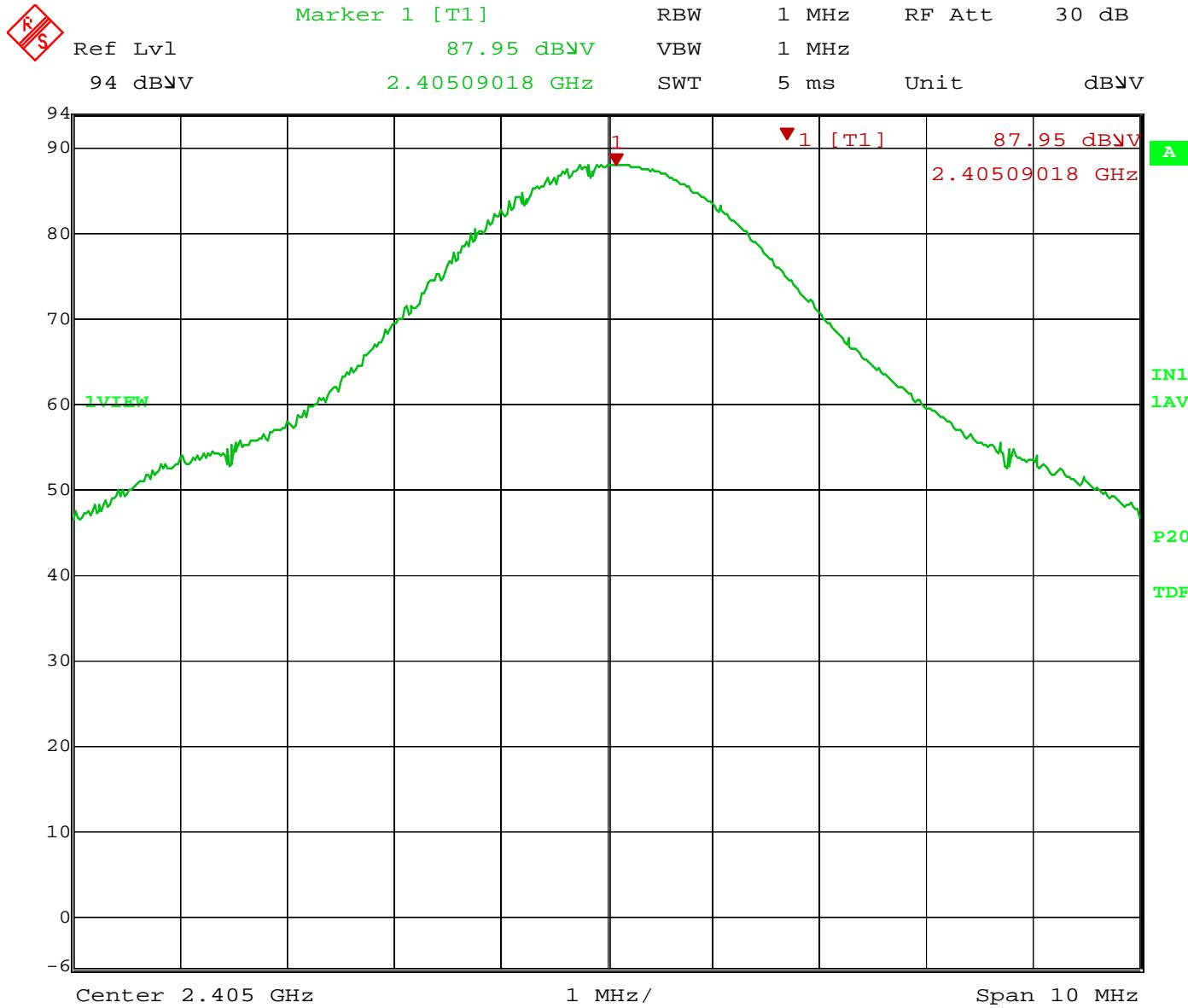
4.3.5 Final Data



Date: 2.DEC.2010 14:25:37

Figure 2 – Channel 1 Horizontal

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Date: 2.DEC.2010 14:27:57

Figure 3 – Channel 1 Vertical

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Ref Lvl
94 dB_VV

Marker 1 [T1]

86.82 dB_VV

2.44506012 GHz

RBW

1 MHz

RF Att

30 dB

VBW

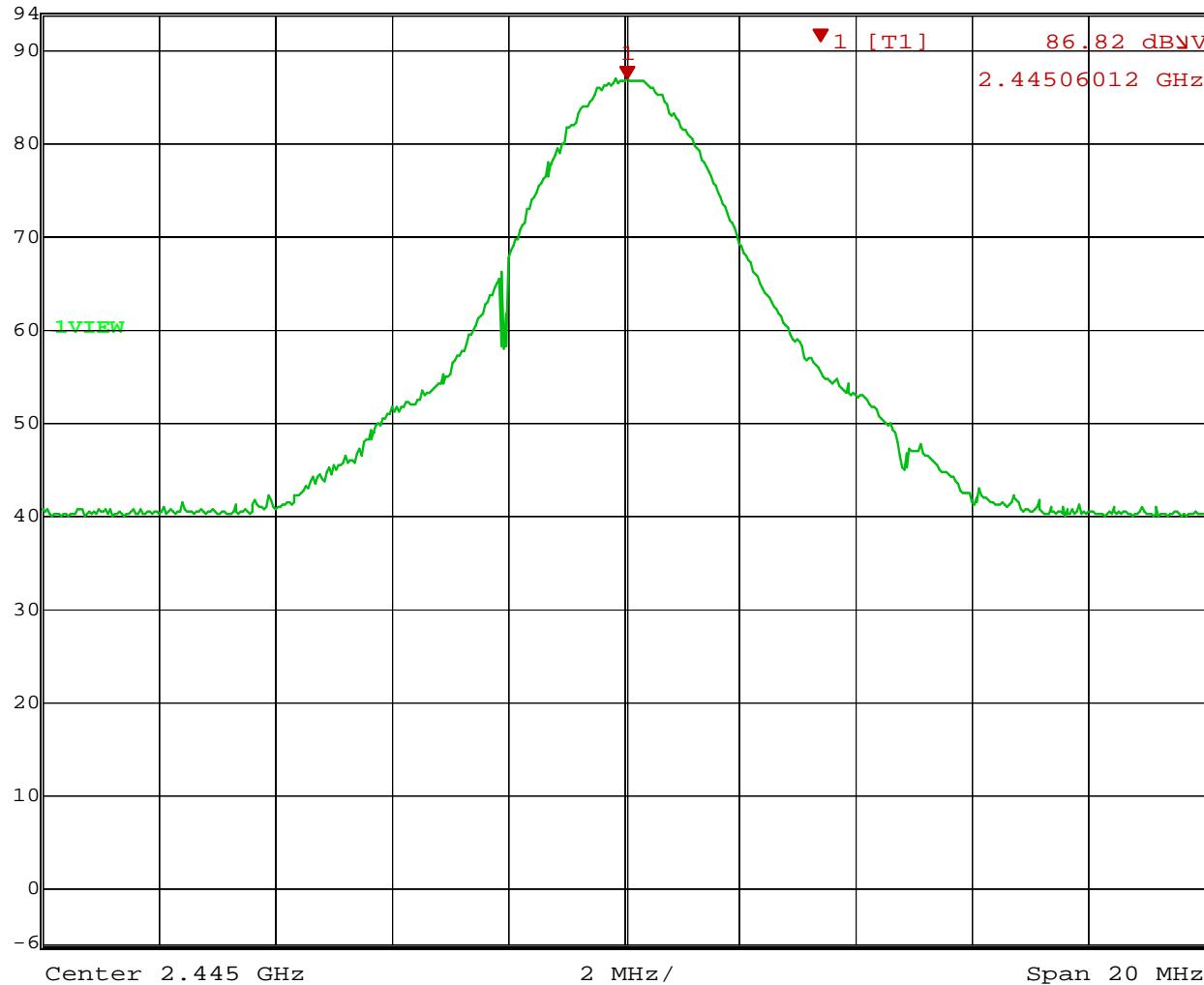
1 MHz

SWT

5 ms

Unit

dB_VV



Date: 2.DEC.2010 16:38:04

Figure 4 – Channel 2 Horizontal

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Ref Lvl
94 dB_V

Marker 1 [T1]

86.23 dB_V

2.44510020 GHz

RBW

VBW

SWT

1 MHz

1 MHz

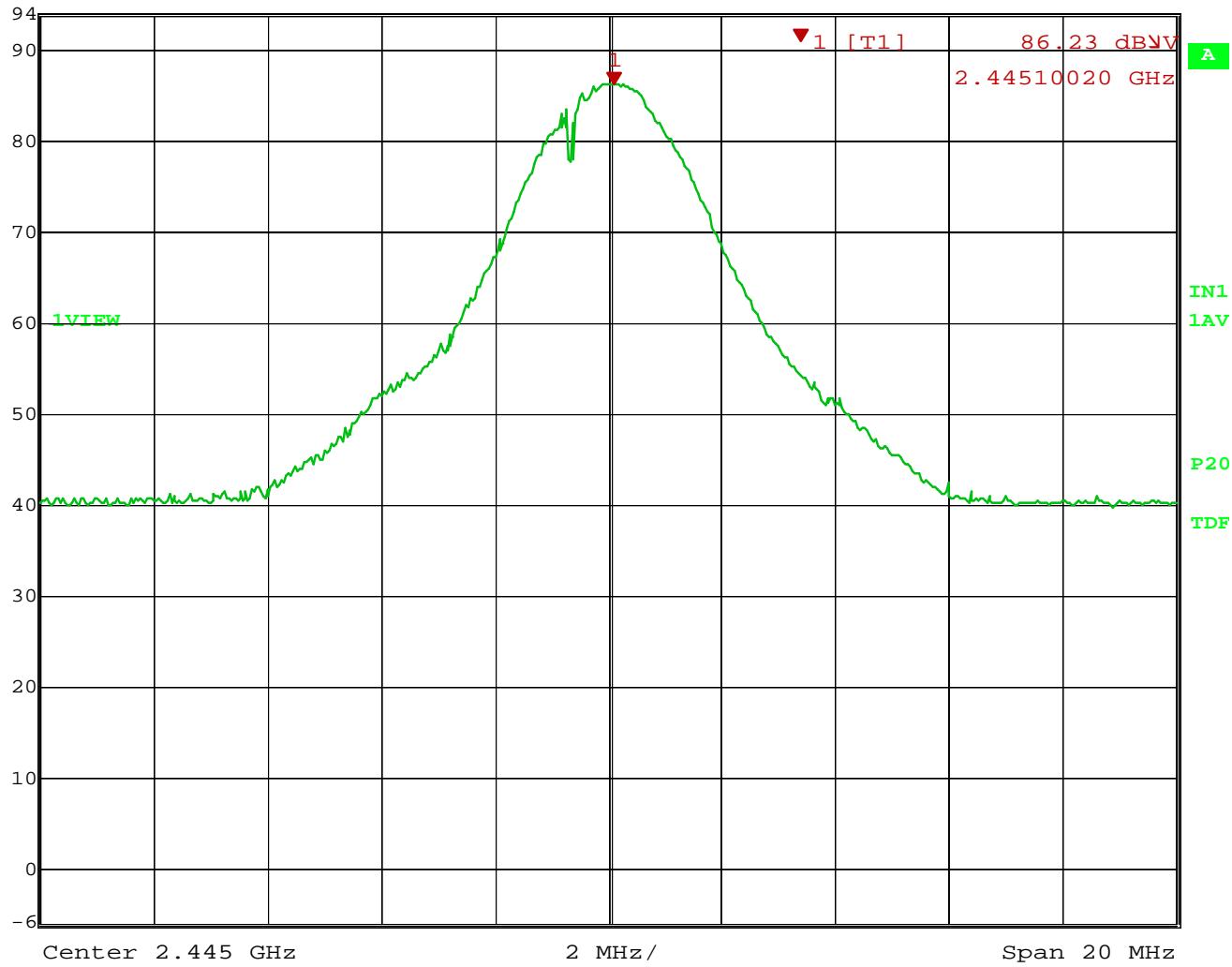
5 ms

RF Att

Unit

30 dB

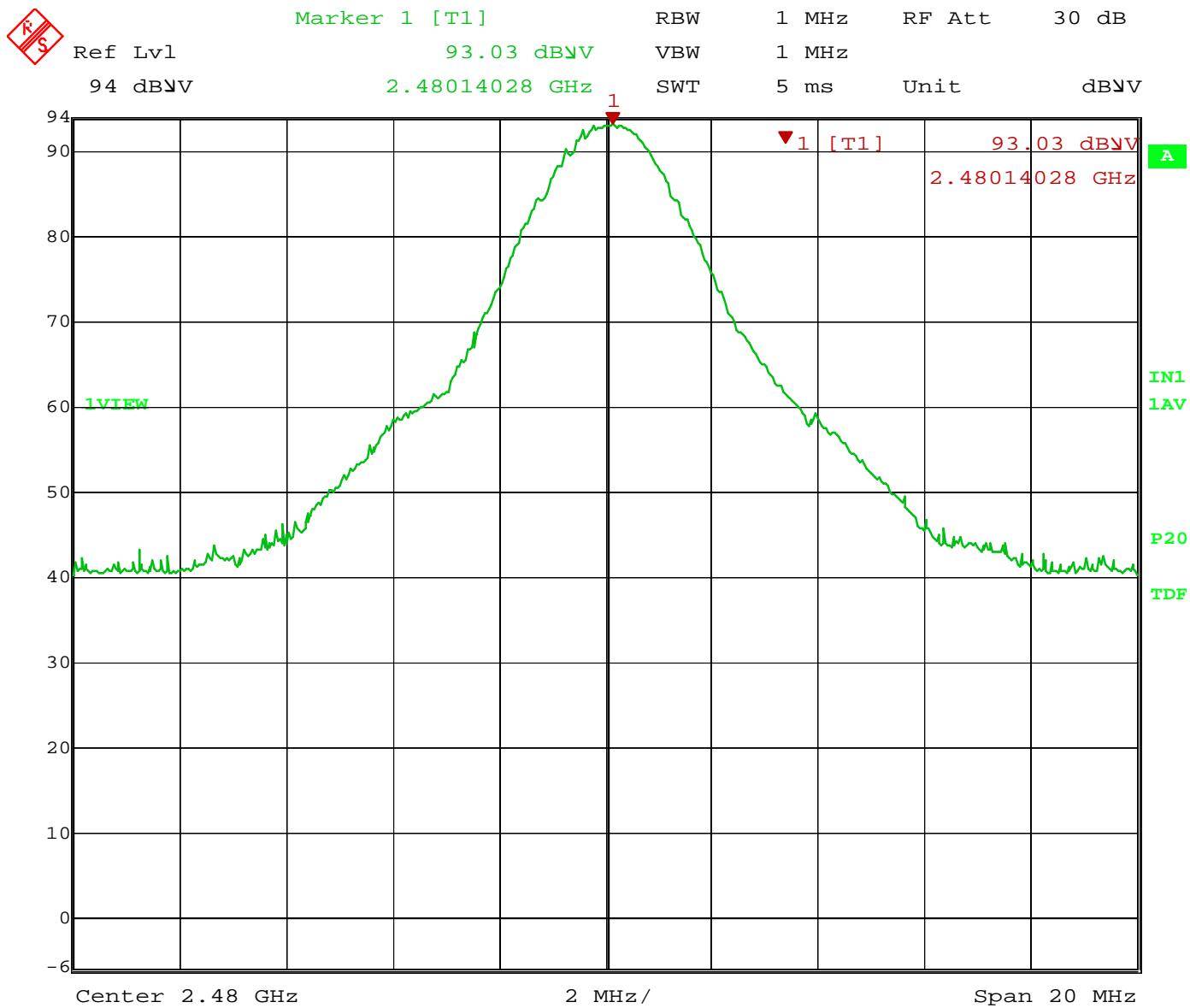
dB_V



Date: 2.DEC.2010 16:39:11

Figure 5 – Channel 2 Vertical

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Date: 2.DEC.2010 16:44:18

Figure 6 – Channel 3 Horizontal

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Ref Lvl
94 dB_VV

Marker 1 [T1]

81.23 dB_VV

2.48002004 GHz

RBW

1 MHz

RF Att

30 dB

VBW

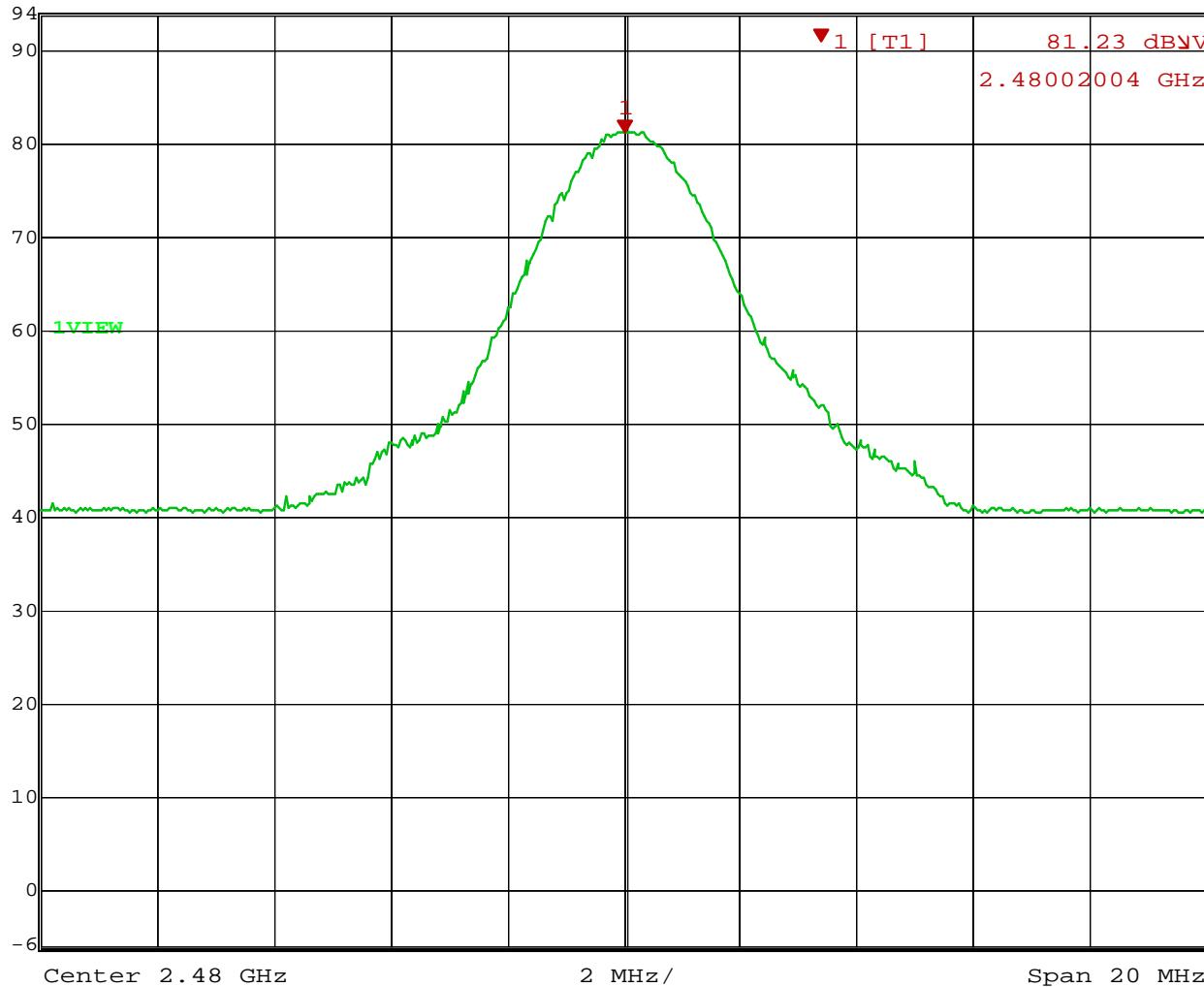
1 MHz

SWT

5 ms

Unit

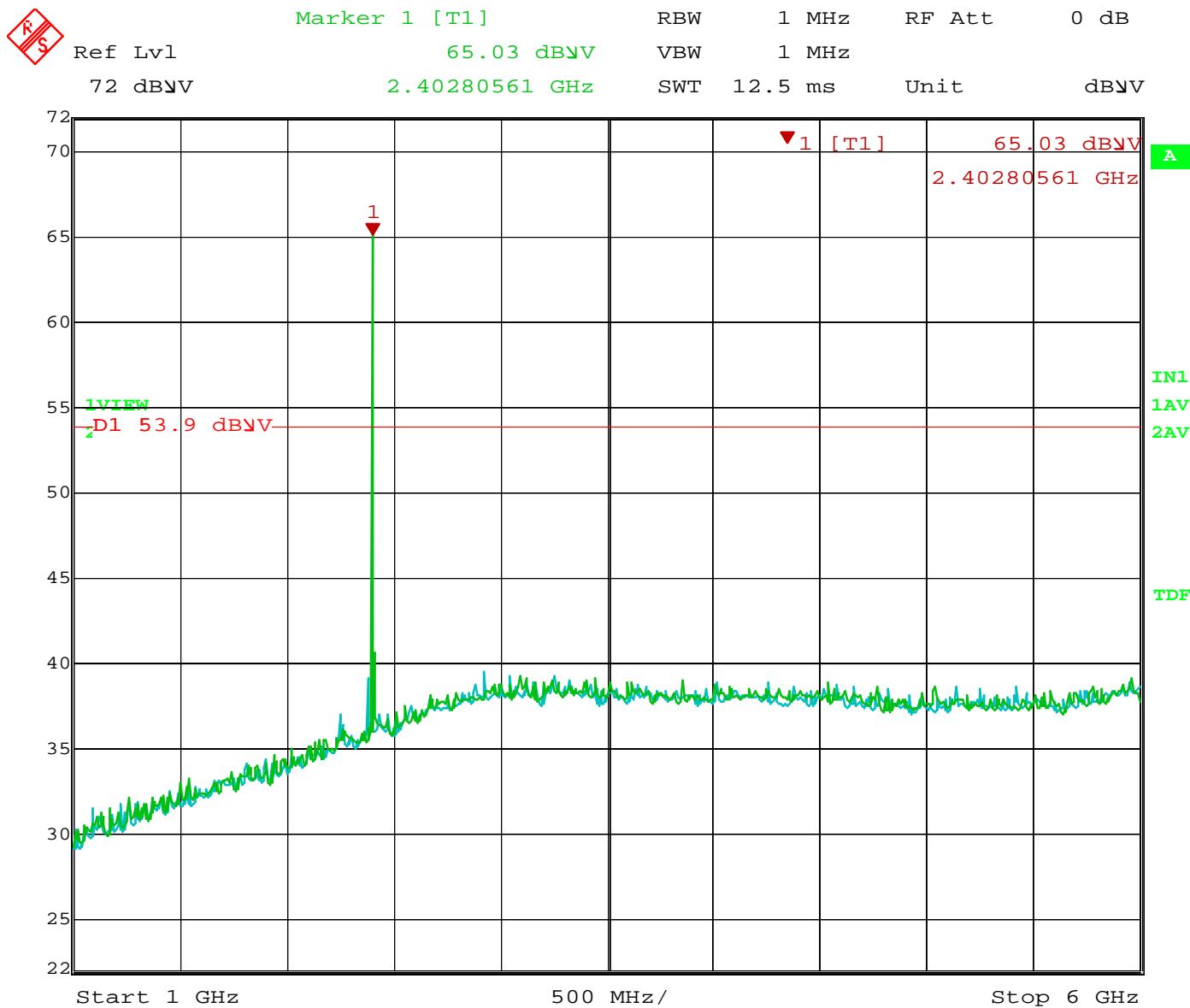
dB_VV



Date: 2.DEC.2010 16:42:15

Figure 7 – Channel 3 Vertical

The test results contained in this report refer exclusively to the product(s) presented for testing. No liability may be assumed for models or products not referred to herein. This test report may not be published or duplicated in part without permission of the testing body. This test report by itself does not constitute authorization for the use of any TUV Rheinland test mark. The report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the Federal Government.



Date: 17.JAN.2011 11:27:25

Figure 8 – 1 to 6 GHz

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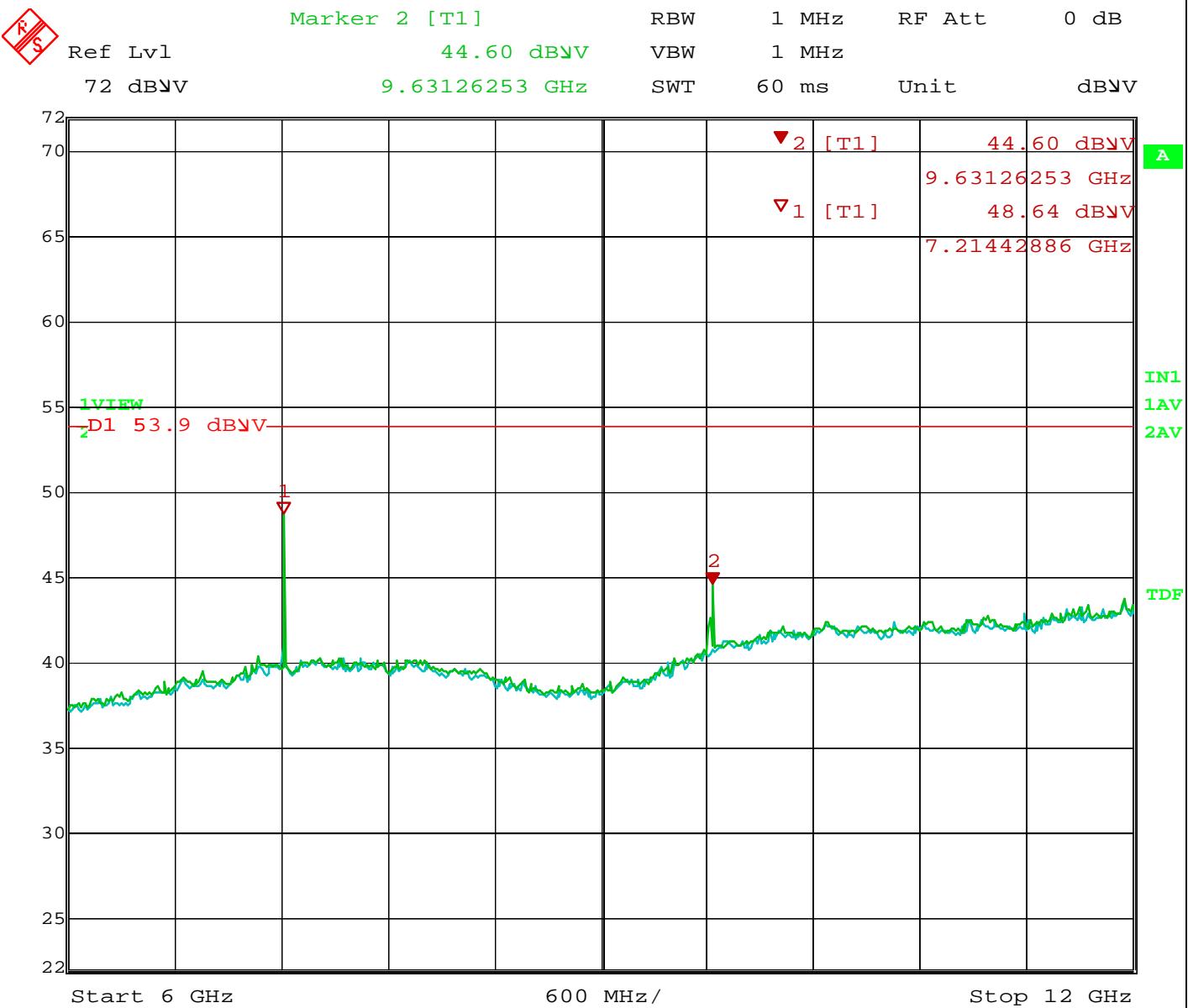
**FCC ID: U7JXWIRE-
DIRECT**



Report No.:

31053510.001 XWIRE-DIRECT.doc

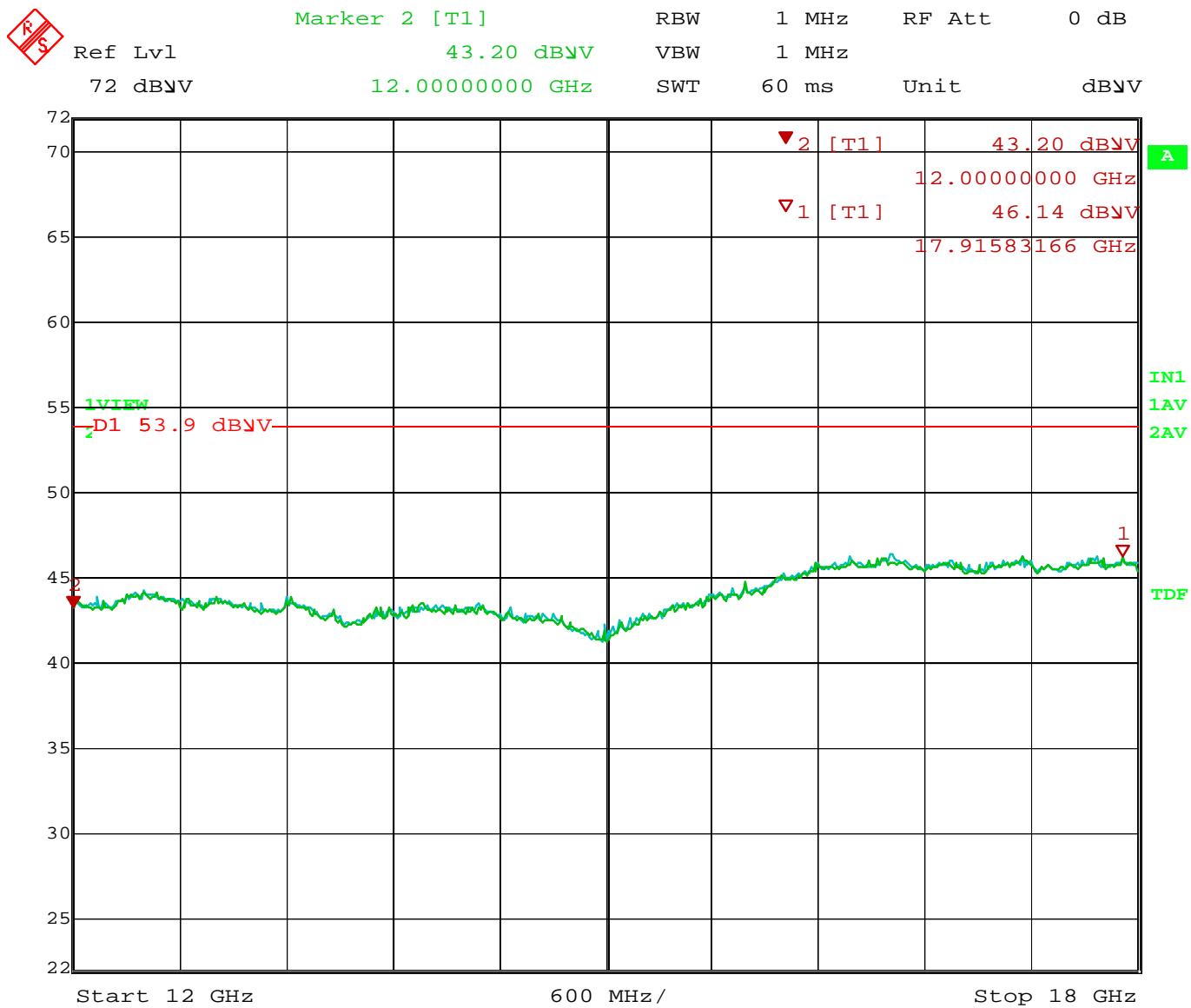
Page 27 of 43



Date: 17.JAN.2011 11:29:46

Figure 9 – 6 to 12 GHz

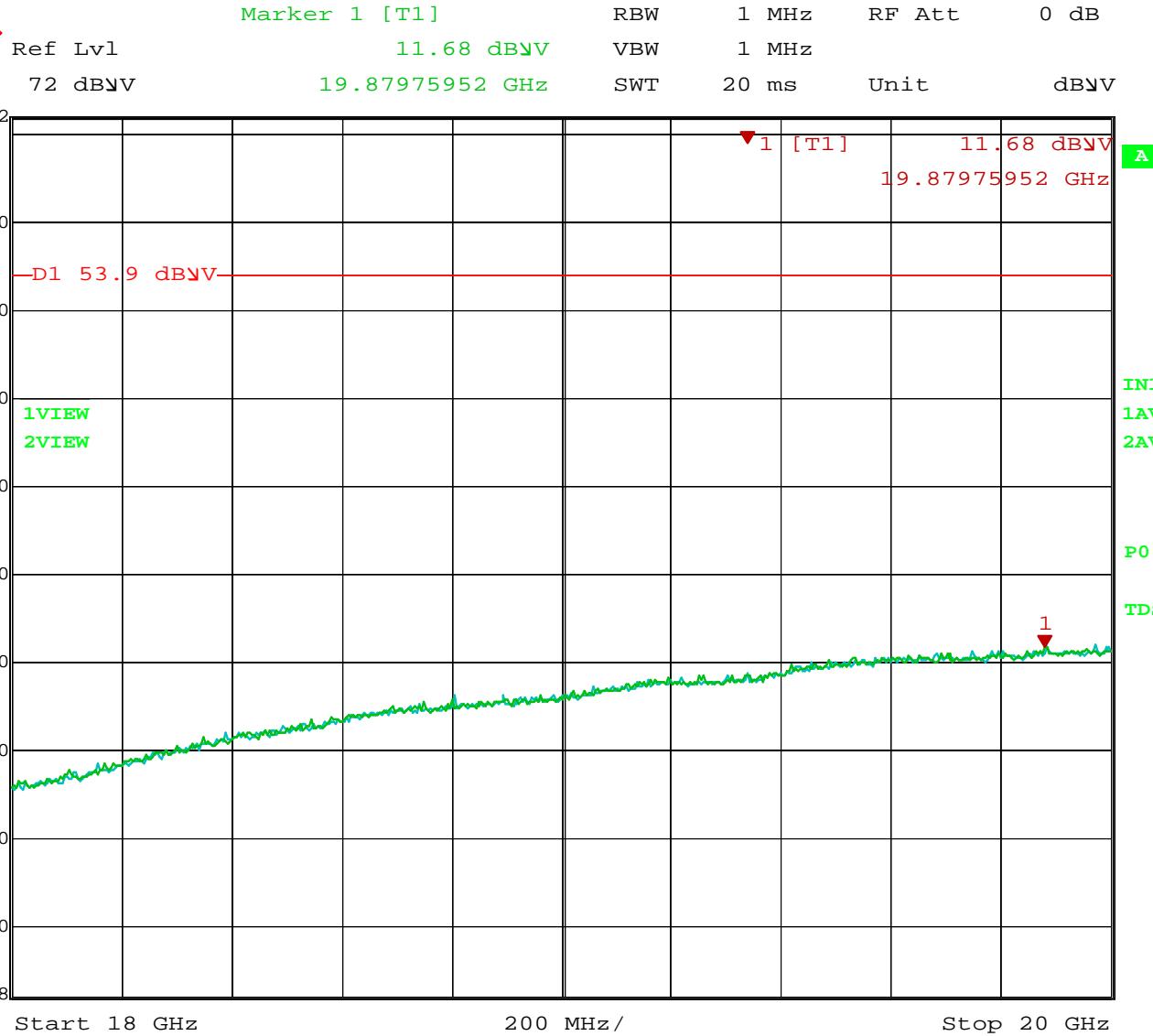
The test results contained in this report refer exclusively to the product(s) presented for testing. No liability may be assumed for models or products not referred to herein. This test report may not be published or duplicated in part without permission of the testing body. This test report by itself does not constitute authorization for the use of any TUV Rheinland test mark. The report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the Federal Government.



Date: 17.JAN.2011 11:30:55

Figure 10 – 12 to 18 GHz

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Date: 17.JAN.2011 13:50:41

Figure 11 – 18 to 20 GHz

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Ref Lvl
72 dB_{UV}

Marker 1 [T1]

13.66 dB_{UV}

RBW

1 MHz

RF Att

0 dB

24.98997996 GHz

VBW

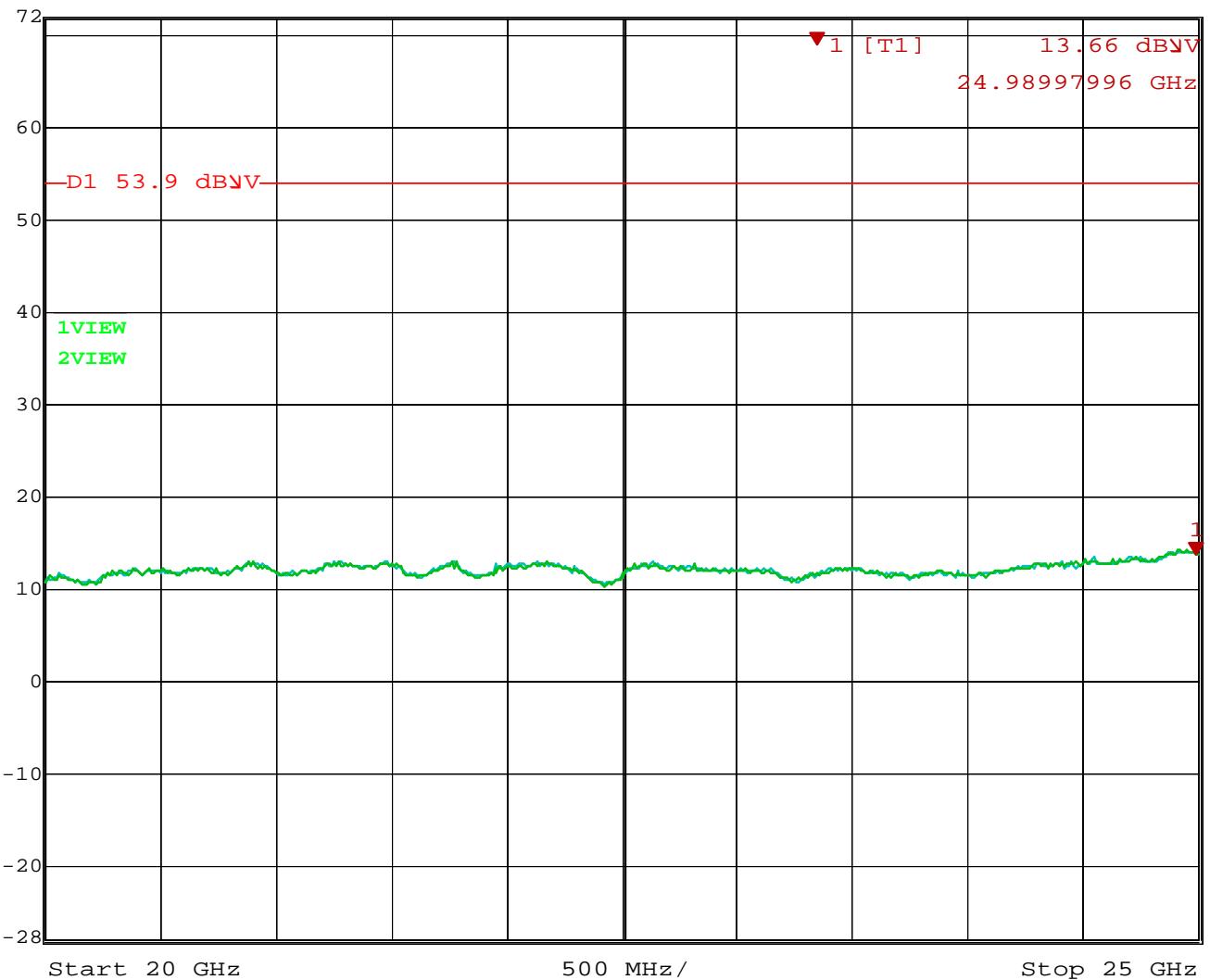
1 MHz

SWT

50 ms

Unit

dB_{UV}



Date: 17.JAN.2011 13:49:40

Figure 12 – 20 to 25 GHz

The test results contained in this report refer exclusively to the product(s) presented for testing. No liability may be assumed for models or products not referred to herein. This test report may not be published or duplicated in part without permission of the testing body. This test report by itself does not constitute authorization for the use of any TUV Rheinland test mark. The report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the Federal Government.

4.4 Band Edge Requirements

The requirement is to ensure the 20dB bandwidth of the emission, or whatever bandwidth may otherwise be specified, is contained within the frequency band designated in the rule section under which the equipment is operated. 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 temperatures and supply voltage.

4.4.1 Test Over View

Results	Complies (as tested per this report)			Date	12/2/2010					
Standard	FCC Part 15.215(c)									
Product Model	SCK Direct II			Serial#	00V08916008					
Configuration	See test plan for details									
Test Set-up	Tested in shielded room EUT placed on table See test plan for details									
EUT Powered By	100-240 VAC 50/60Hz	Temp	22° C	Humidity	47%	Pressure	996mbar			
Perf. Criteria	Per Section 15.215(c) of the standard		Perf. Verification	Readings within the permitted band						
Mod to EUT	None		Test Performed By	Randall Masline						

4.4.2 Test Procedure

The measurement will be made using guidance from ANSI C63.10.

4.4.3 Deviations

There were no deviations from the test methodology.

4.4.4 Final Test

The band edge requirements of the EUT were within the limits specified in the standard.

4.4.5 Band Edge Requirement Data

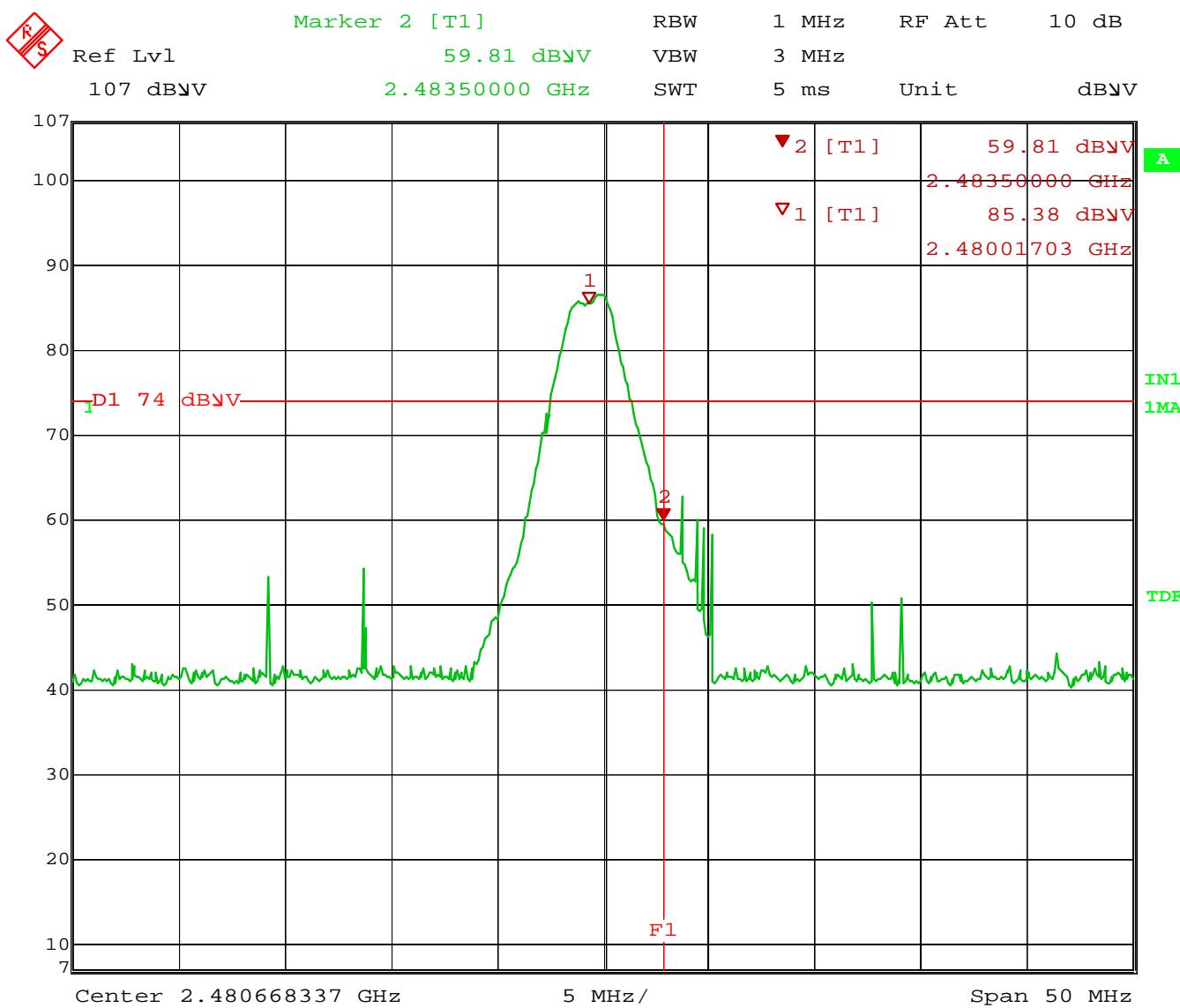
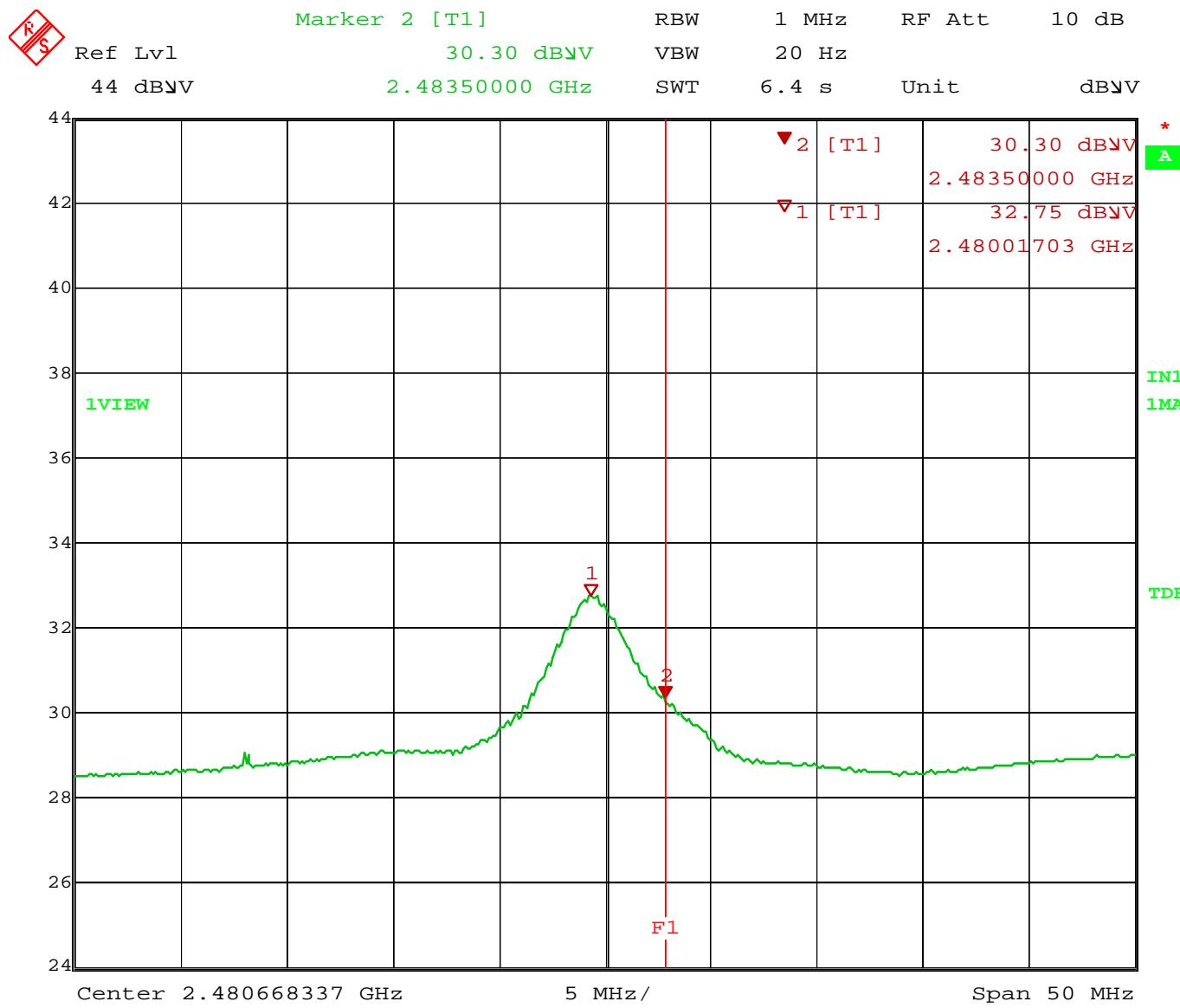


Figure 13 – Upper Band Edge Peak Measurement

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Date: 16.NOV.2011 14:58:49

Figure 14 – Upper Band Edge Peak Measurement

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Ref Lvl
94 dB_VV

Marker 2 [T1]

42.28 dB_VV

RBW

1 MHz

RF Att

30 dB

2.40000000 GHz

VBW

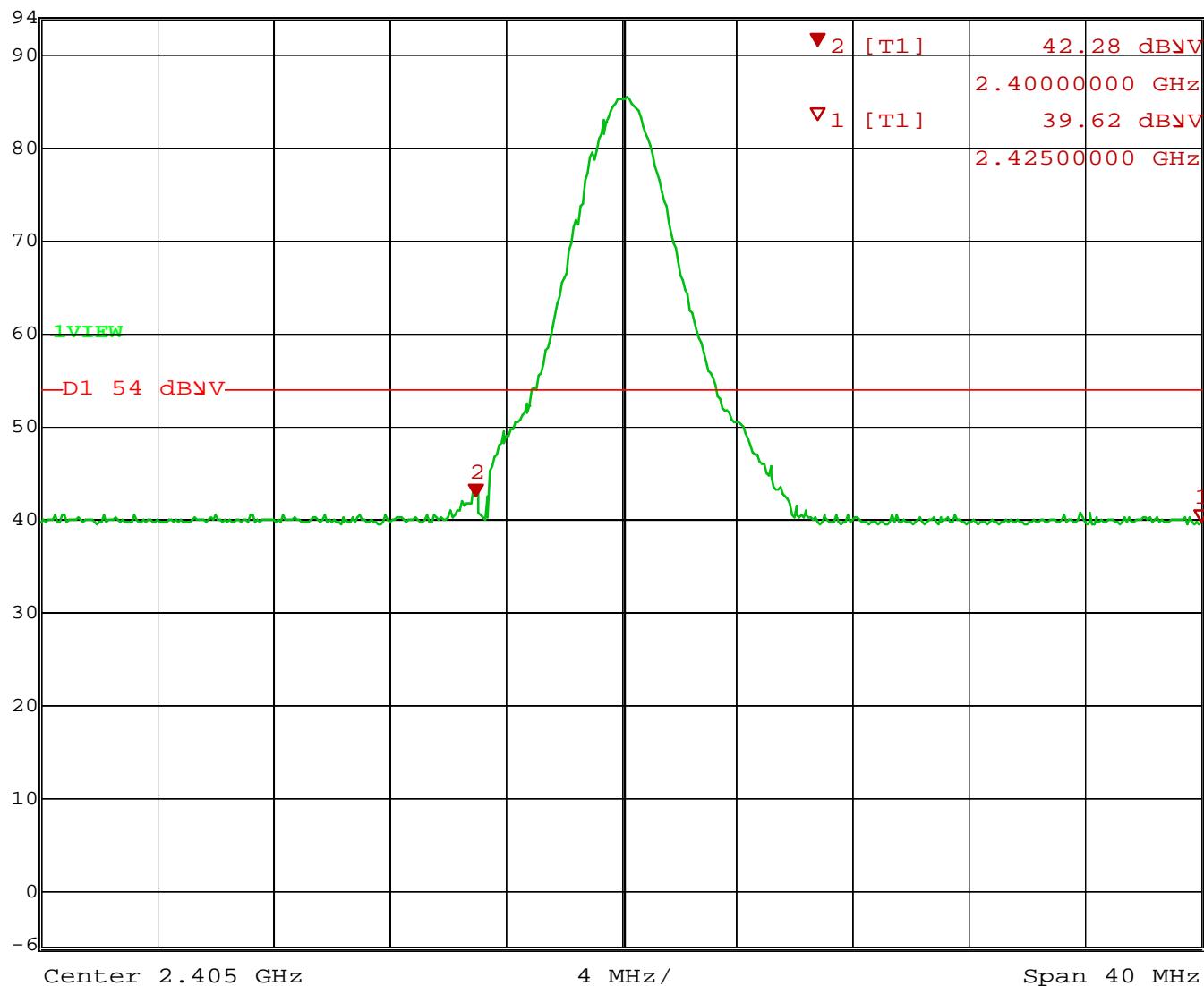
1 MHz

SWT

5 ms

Unit

dB_VV



Date: 2. DEC. 2010 16:31:39

Figure 15 – Lower Band Edge

The test results contained in this report refer exclusively to the product(s) presented for testing. No liability may be assumed for models or products not referred to herein. This test report may not be published or duplicated in part without permission of the testing body. This test report by itself does not constitute authorization for the use of any TUV Rheinland test mark. The report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the Federal Government.

4.5 Frequency Tolerance

4.5.1 Test Over View

Results	Complies (as tested per this report)			Date	12/2/2010			
Standard	FCC Part 15.249(3)							
Product Model	SCK Direct II			Serial#	00V08916008			
Configuration	See test plan for details							
Test Set-up	Tested in 3m chamber EUT placed on table See test plan for details							
EUT Powered By	100-240 VAC 50/60Hz	Temp	22° C	Humidity	47%	Pressure	996mbar	
Mod to EUT	None		Test Performed By	Randall Masline				

4.5.2 Test Procedure

The frequency tolerance of the carrier signal shall be maintained within +/- 0.001% of the operating frequency over a temperature variation of -20 degrees to +50 degrees C at normal supply voltage, and for a variation in the primary voltage from 85% to 115% of the rated supply voltage at a temperature of 20 degrees C. For battery operated equipment, the equipment test shall be performed using a new battery.

4.5.3 Deviations

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

4.5.4 Final Test

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

4.5.5 Final Data

The test results contained in this report refer exclusively to the product(s) presented for testing. No liability may be assumed for models or products not referred to herein. This test report may not be published or duplicated in part without permission of the testing body. This test report by itself does not constitute authorization for the use of any TUV Rheinland test mark. The report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the Federal Government.

Test	Frequency (GHz)	Allowable Deviation (MHz)	Result
-20 Degrees C at nominal	2.44506012	2.400	Complies
+50 Degrees C at nominal	2.44510060	2.400	Complies
Nominal Voltage 120VAC/60Hz	2.44510020	2.400	Complies
85% - 102 VAC	2.44510020	2.400	Complies
115% - 138 VAC	2.44510020	2.400	Complies

Table 1 – Frequency Tolerance

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4.6 RF Exposure Measurement (Mobile Device) 15.247(i)

4.6.1 Test Methodology

In this document, we try to prove the safety of radiation harmfulness to the human body for our product. The limit for Maximum Permissible Exposure (MPE) specified in FCC 1.1310 is followed. The Gain of the antenna used in this product is measured in a Semi-Anechoic Chamber, and also the maximum total power input to the antenna is measured. Through the Friis transmission formula (see section 4.9.6) and the maximum gain of the antenna, we can calculate the distance, away from the product, where the limit of MPE is reached.

Although the Friis transmission formula is a far field assumption, the calculated result of that is an over-prediction for near field power density. We will take that as the worst case to specify the safety range.

4.6.2 RF Exposure Limit

According to FCC 1.1310 table 1: The criteria listed in the following table shall be used to evaluate the environmental impact of human exposure to radio-frequency (RF) radiation as specified in 1.1307(b)

LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm ²)	Average Time (minutes)
(A)Limits For Occupational / Control Exposures				
300-1500	F/300	6
1500-100,000	5	6
(B)Limits For General Population / Uncontrolled Exposure				
300-1500	$f / 1500$	6
1500-100,000	1.0	30

f = Frequency in MHz

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4.6.3 EUT Operating condition

The software provided by Manufacturer enabled the EUT to transmit data at lowest, middle and highest channel individually.

4.6.4 Classification

The antenna of the product, under normal use condition, is at least 20cm away from the body of the user. Warning statement to the user for keeping at least 20cm or more separation distance with the antenna should be included in users manual. Therefore, this device is classified as a **Mobile Device**.

4.6.5 Test Results

4.6.6 Antenna Gain

The maximum Gain measured in Semi-Anechoic Chamber is 0.0 dBi or 1.0 (numeric).

4.6.7 Output Power into Antenna & RF Exposure value at distance 20cm:

Calculations for this report are based on highest power measurement and the highest gain of the antenna. Limit for MPE (from FCC part 1.1310 table 1) is f (MHz) / 1500 = 927.6 / 1500 = 0.62 mW/cm²

Highest Pout is 0.04mW, highest antenna gain (in linear scale) is 1.0, R is 20cm, and f = 2400 MHz

$Pd = (0.04 * 1.0) / (1600\pi) = \underline{0.007 \text{ mW/cm}^2}$, which is 0.613 mW/cm² below to the limit.

Note: This calculation is assuming 100% duty cycle, which would not be the case in normal operation.

As originally tested, the EUT was found to be compliant to the requirements of the test standard(s).

4.6.8 Sample Calculation

The Friis transmission formula: $Pd = (Pout * G) / (4 * \pi * R^2)$

Where;

Pd = power density in mW/cm²

$Pout$ = output power to antenna in mW

G = gain of antenna in linear scale

$\pi \approx 3.1416$

R = distance between observation point and center of the radiator in cm

Ref. : David K. Cheng, *Field and Wave Electromagnetics*, Second Edition, Page 640, Eq. (11-133).

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Appendix A

5 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.

5.1 General Information

Client	Food Automation – Service Techniques, Inc. (FAST)
Address 1	905 Honeyspot Rd
Address 2	Stratford, CT 06615
Contact Person	Stan Vreeland
Telephone	203-380-3510
Fax	203-377-8187
e-mail	svreeland@fastinc.com

5.2 Model(s) Name

SCK Direct II

5.3 Type of Product

Wireless Kitchen Management System

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5.4 Equipment Under Test (EUT) Description

Food quality and supply chain monitor equipment.

5.5 Modifications

No modifications were necessary to meet compliance with regulations.

5.6 Product Environment

<input type="checkbox"/>	Residential	<input type="checkbox"/>	Hospital
<input checked="" type="checkbox"/>	Light Industrial	<input type="checkbox"/>	Small Clinic
<input checked="" type="checkbox"/>	Industrial	<input type="checkbox"/>	Doctor's office
<input type="checkbox"/>	Other		

*Check all that apply

5.7 Countries

<input checked="" type="checkbox"/>	USA
<input type="checkbox"/>	Canada

*Check all that apply

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5.8 Applicable Documents

Standards	Description
FCC Part 15 subpart C Standard	Radio Frequency Devices - Subpart C: Intentional Radiators
FCC Part 15.249(a) FCC Part 15.205(a) FCC Part 15.215(a)	Radiated Emissions
FCC Part 15.207(a)	Conducted Emissions
FCC Part 15.249(a)	Operation within the bands 902-928 MHz, 2400-2483.5 MHz, 5725-5875 MHz and 24.0-24.25 GHz
FCC Part 15.215(c)	Band Edge Requirements
FCC Part 15.249(3)	Frequency Tolerance
FCC Part 2.1093	RF Exposure

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5.9 General Product Information

Size	H	19cm	W	6cm	L	19.6cm
Weight	1kg		Fork-Lift Needed	No		
Notes						

5.10 EUT Electrical Powered Information

5.10.1 Electrical Power Type

<input checked="" type="checkbox"/>	AC	<input type="checkbox"/>	DC	<input type="checkbox"/>	Batteries	<input type="checkbox"/>	Host -
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5.10.2 Electrical Power Information

Name	Type	Voltage		Frequency	Current	Notes
		min	max			
Mains	AC	100	240	50/60		
Notes						

5.11 EUT Modes of Operation

Transmitting at highest, lowest and middle channel at highest output power.

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5.12 Electrical Support Equipment

Type	Manufacture	Model	Connected To
None			

5.13 Non - Electrical Support Equipment

Item	Notes
Gas	None
Water	None

5.14 EUT Equipment/Cabling Information

EUT Port	Connected To	Location	Cable Type		
			Length	Shielded	Bead
Power	AC Mains	Bottom		No	No

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