Manufacturer's statement - attestation

The manufacturer; Food Automation – Service Techniques, Inc., as the responsible party for the equipment tested, hereby affirms:

a) That he has reviewed and concurs that the test shown in this report are reflective of the operational characteristics of the device for which certification is sought;

b) That the device in this test report will be representative of production units;

c) That all changes (in hardware and software/firmware) to the subject device will be reviewed.

d) That any changes impacting the attributes, functionality or operational characteristics documented in this report will be communicated to the body responsible for approving (certifying) the subject equipment.

Stanley Vreeland Printed name of official	 Signature of official
905 Honeyspot Rd. **Stratford, CT 06615** Address	08/03/11 Date
203-380-3510 Telephone number	svreeland@fastinc.com Email address of official

Electromagnetic Compatibility Test Report

Prepared in accordance with

FCC Part 15C and ANSI C63.10

On

Wireless Kitchen Management System

Sensor

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

Prepared by:

TUV Rheinland of North America, Inc.

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.:***	0NT08212037
Test item:	Sensor	***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
Randall E Masline 2 February 2011 ***Date*** ***Name*** ***Signature***	Cecil Gittens 2 February 2011 ***Date*** ***Name*** ***Signature***
Other Aspects:	**None**

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

FC	NVLAP **NVLAP Lab Code (200313-0)**	**Industry Canada**	**BSMI**
US5253		**34661C-1**	**SL2-IN-E-050R**

TABLE OF CONTENTS

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. Sensor, 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.

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	Wireless Kitchen Management System	**Model Number**	Sensor
Serial Number	0NT08212037	**Test Voltage/Freq.**	6VDC
Test Date Completed:	12/2/2010	**Test Engineer**	Randall Masline

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**
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	**Complies**
FCC Part 15.207(a)	Conducted Emissions	DC Powered	Limit	**Complies**
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	**Complies**
FCC Part 15.215(c)	Band Edge Requirements	Per Section 15.215(c) of the standard	Limit	**Complies**
FCC Part 15.249(3)	Frequency Tolerance	Carrier Maintained to 0.001% of frequency at -20ºC to +50ºC	Limit	**Complies**
FCC Part 2.1093	RF Exposure	MPE or SAR Requirements (Mobile)	Limit	**Complies**

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.

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:

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

Measurement	*Ulab*	*Ucispr*
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

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 ± 1.2dB.

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.

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

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

Figure 1 – External Photo of EUT

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	Sensor			**Serial#**	0NT08212037		
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	6VDC	**Temp**	21ºC	**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

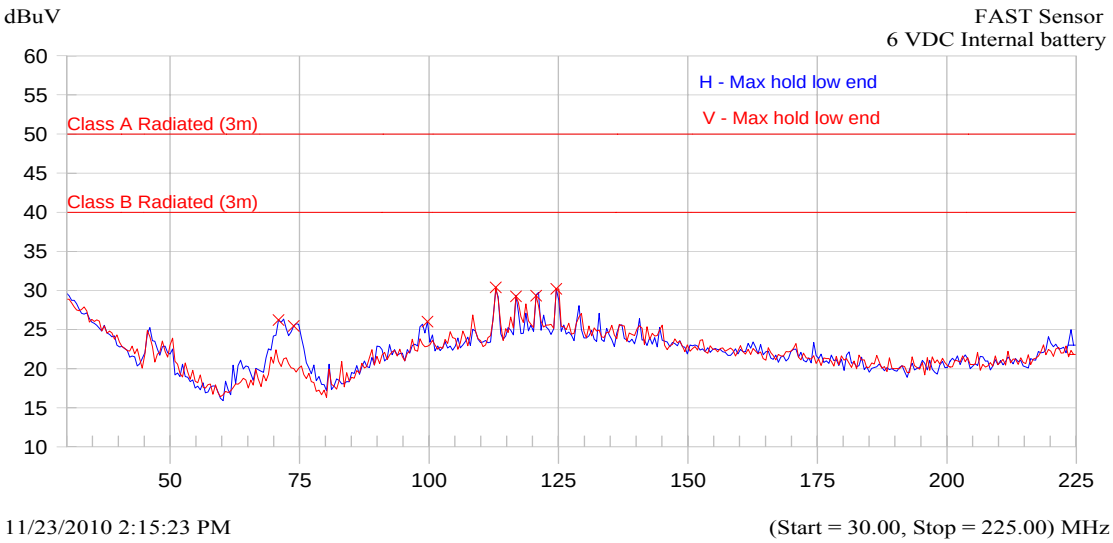
All final radiated emissions measurements were below (in compliance) the limits.

4.1.5 Final Graphs

NOTES:

Radiated Emissions Prescan
Vertical / Horizontal

Sensor low end



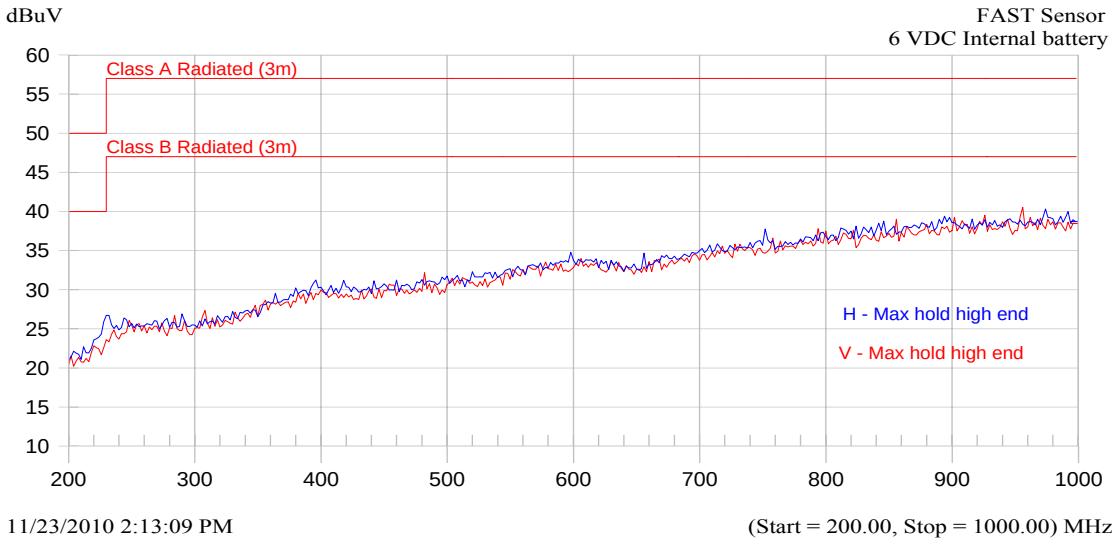
Frequency MHz	Peak dBuV	QP dBuV	Class B-QP dB	Class A-QP dB	Trace Name
112.875	30.4				V - Max hold low end
116.775	29.3				V - Max hold low end
120.675	29.3				V - Max hold low end
124.575	30.2				V - Max hold low end
70.950	26.2				H - Max hold low end
73.875	25.4				H - Max hold low end
99.713	26.0				H - Max hold low end

NOTES:

Radiated Emissions Prescan

Vertical / Horizontal

Sensor high end



Frequency	Peak	QP	Class B-QP	Class A-QP	Trace Name
MHz	dBuV	dBuV	dB	dB	

4.1.6 Final Tabulated Data

Radiated Emissions Measurements									
Standard:	Class B/FCC Part 15.209(a)				Final	Date:	11/23/2010		
Device Tested:	FAST XWIRE-SENSOR				3m	File .xls:			
	Measured Level								
Meas #	Freq (MHz)	Quasi-Peak	Quasi-Peak Limit	Quasi-Peak Δ	Result	Antenna Polarization	Angle (degrees)	Antenna Height (meters)	Comment
1	70.9500	21.60	40.00	-18.40	Complied	Horizontal	0	1.00	
2	73.8750	20.80	40.00	-19.20	Complied	Horizontal	0	1.00	
3	99.7130	21.20	40.00	-18.80	Complied	Horizontal	0	1.00	
4	**112.8750**	**28.90**	**40.00**	**-11.10**	**Complied**	**Vertical**	**0**	**1.00**	**Maximum Emissions**
5	116.7750	27.50	40.00	-12.50	Complied	Vertical	0	1.00	
6	120.6750	27.30	40.00	-12.70	Complied	Vertical	0	1.00	

4.2 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.

4.2.1 Test Over View

Results	**Complies** (as tested per this report)				**Date**	12/2/2010	
Standard	FCC Part 15.249(a)						
Product Model	Sensor			**Serial#**	0NT08212037		
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	6VDC	**Temp**	22º 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		

4.2.2 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.

4.2.3 Deviations

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

4.2.4 Final Test

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

The highest average measurement was made on channel 1 in the vertical polarization at 87.17 dBuV at 2405.09018 MHz. The limit is 94dBuV

4.2.5 Final Data

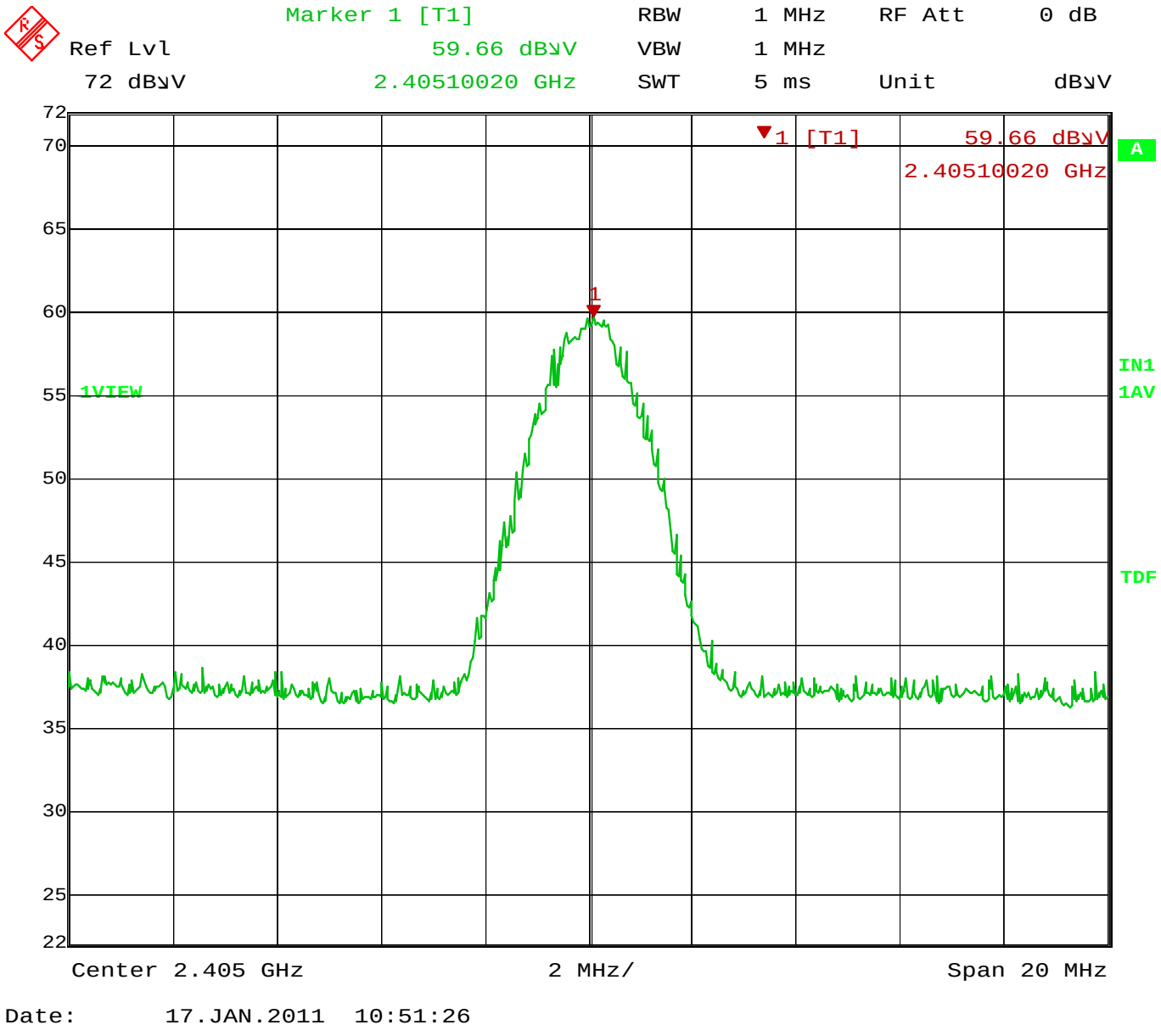


Figure 2 – Channel 1 Horizontal

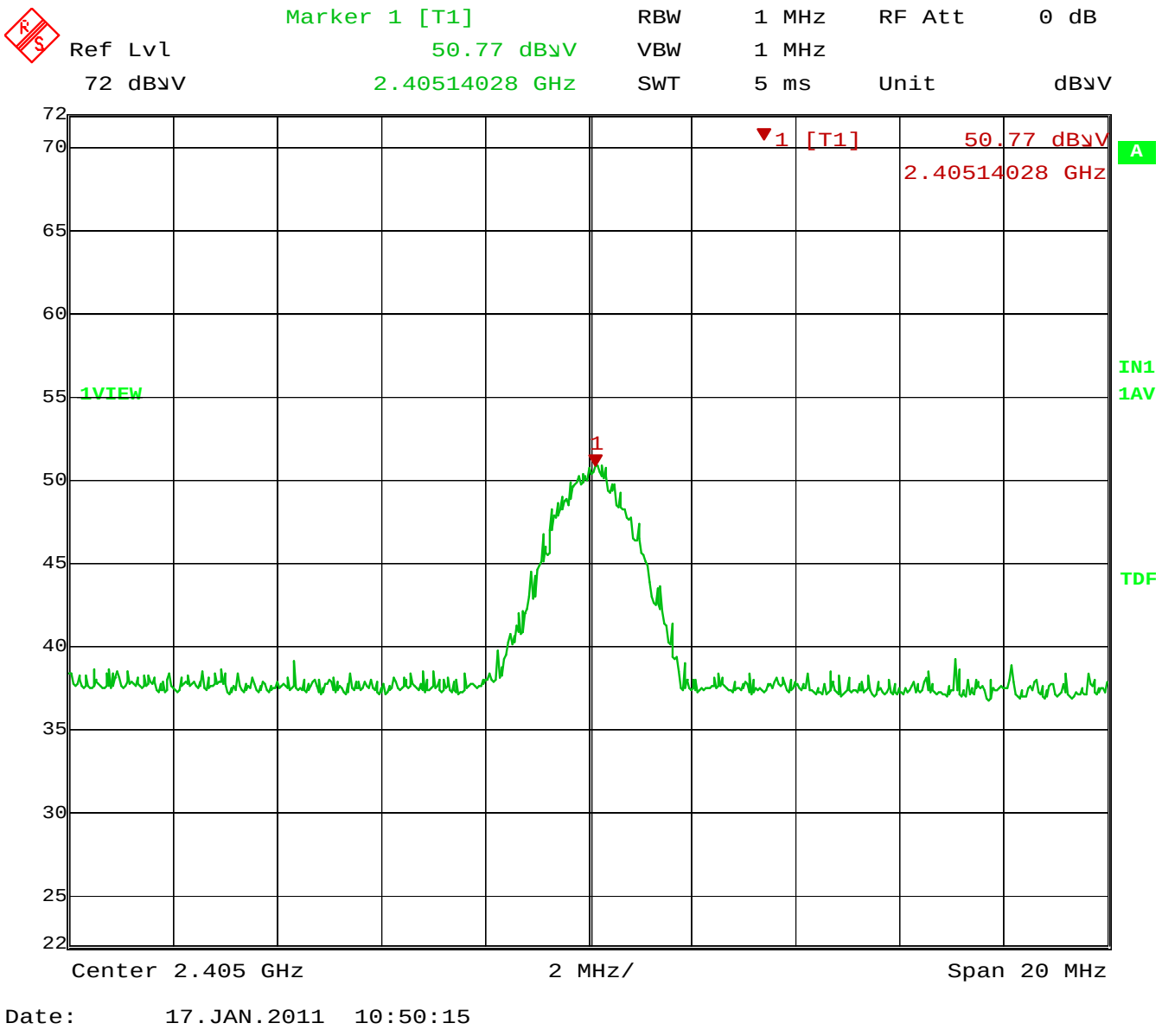


Figure 3 – Channel 1 Vertical

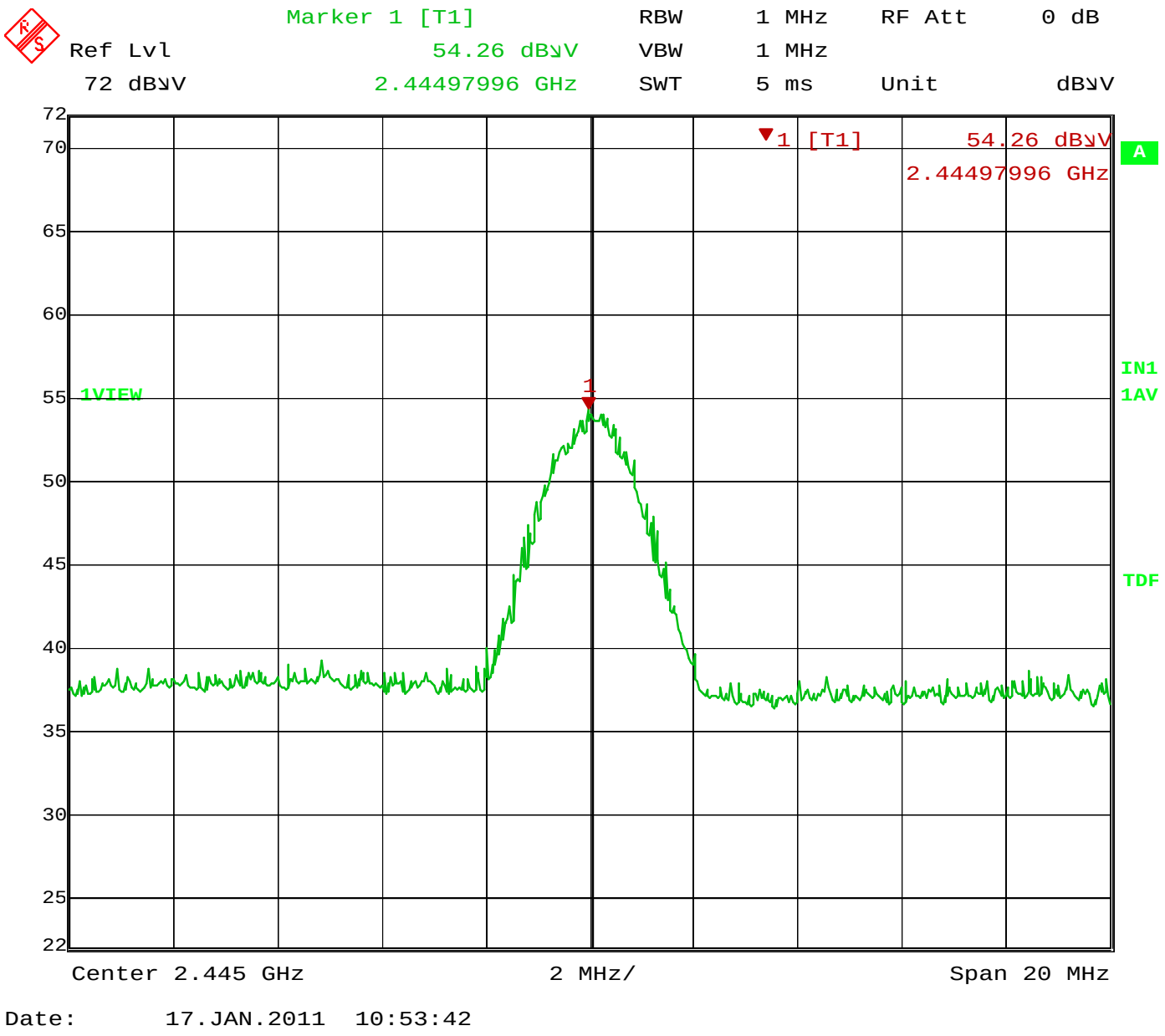


Figure 4 – Channel 2 Horizontal

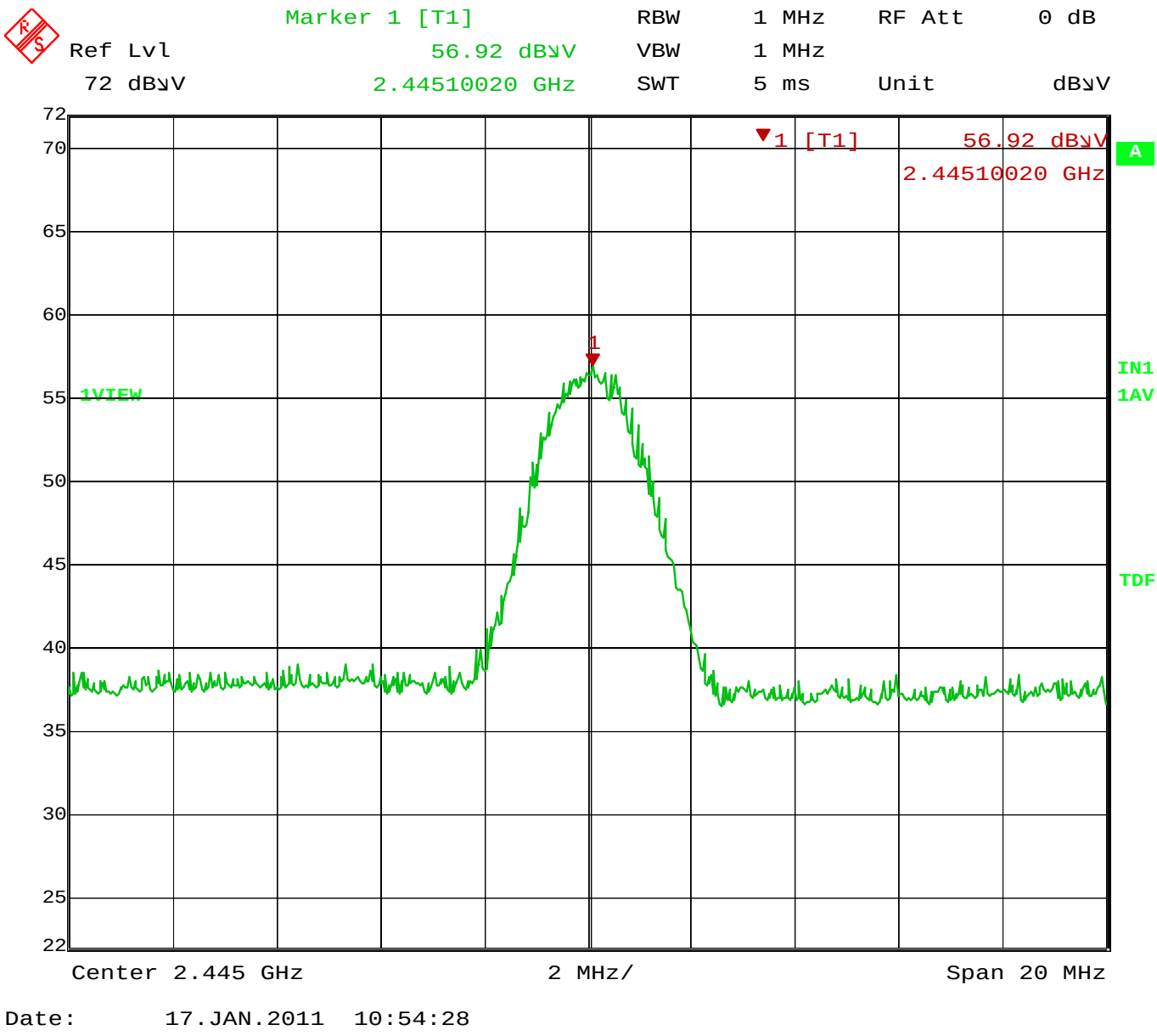


Figure 5 – Channel 2 Vertical

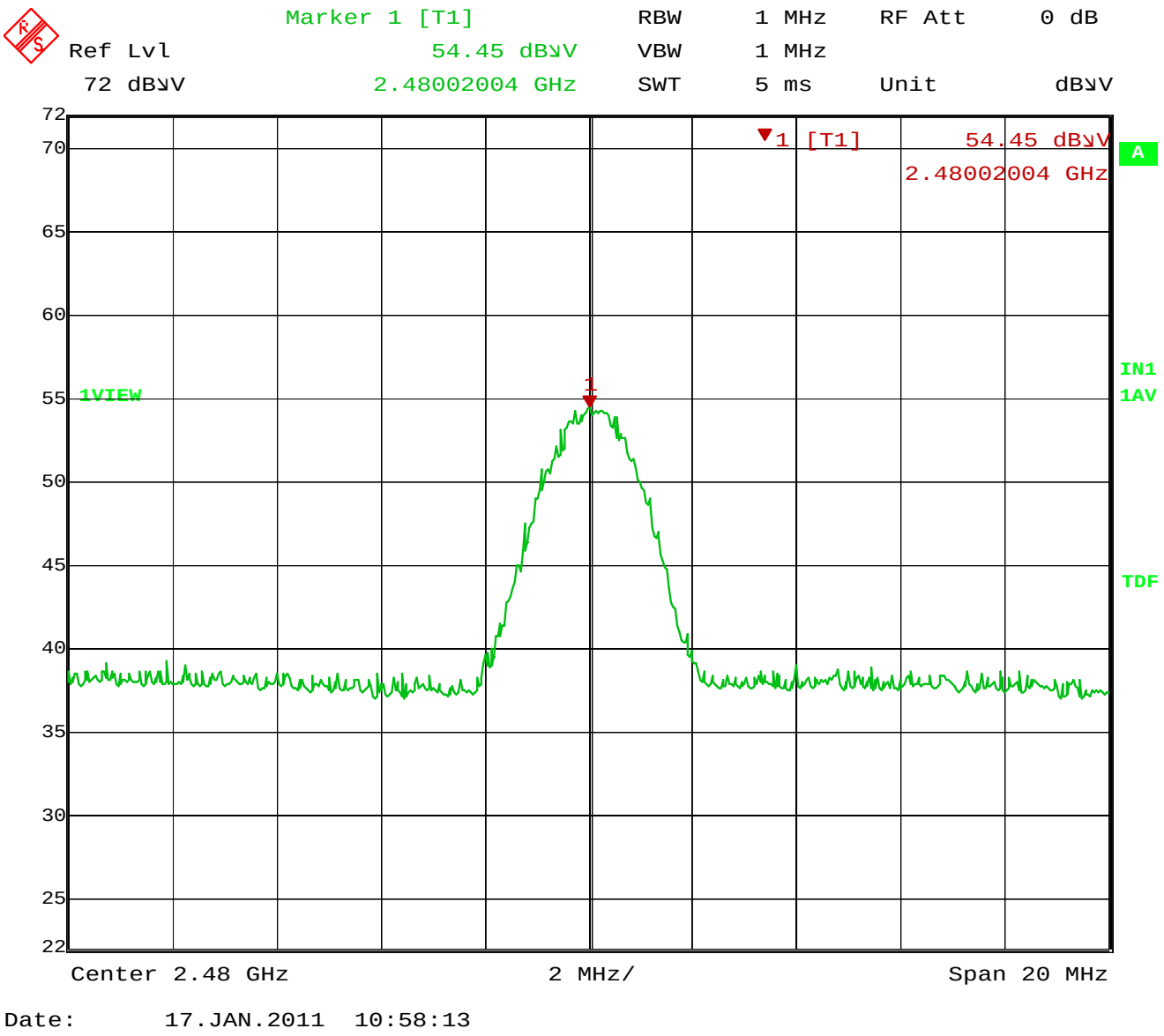


Figure 6 – Channel 3 Horizontal

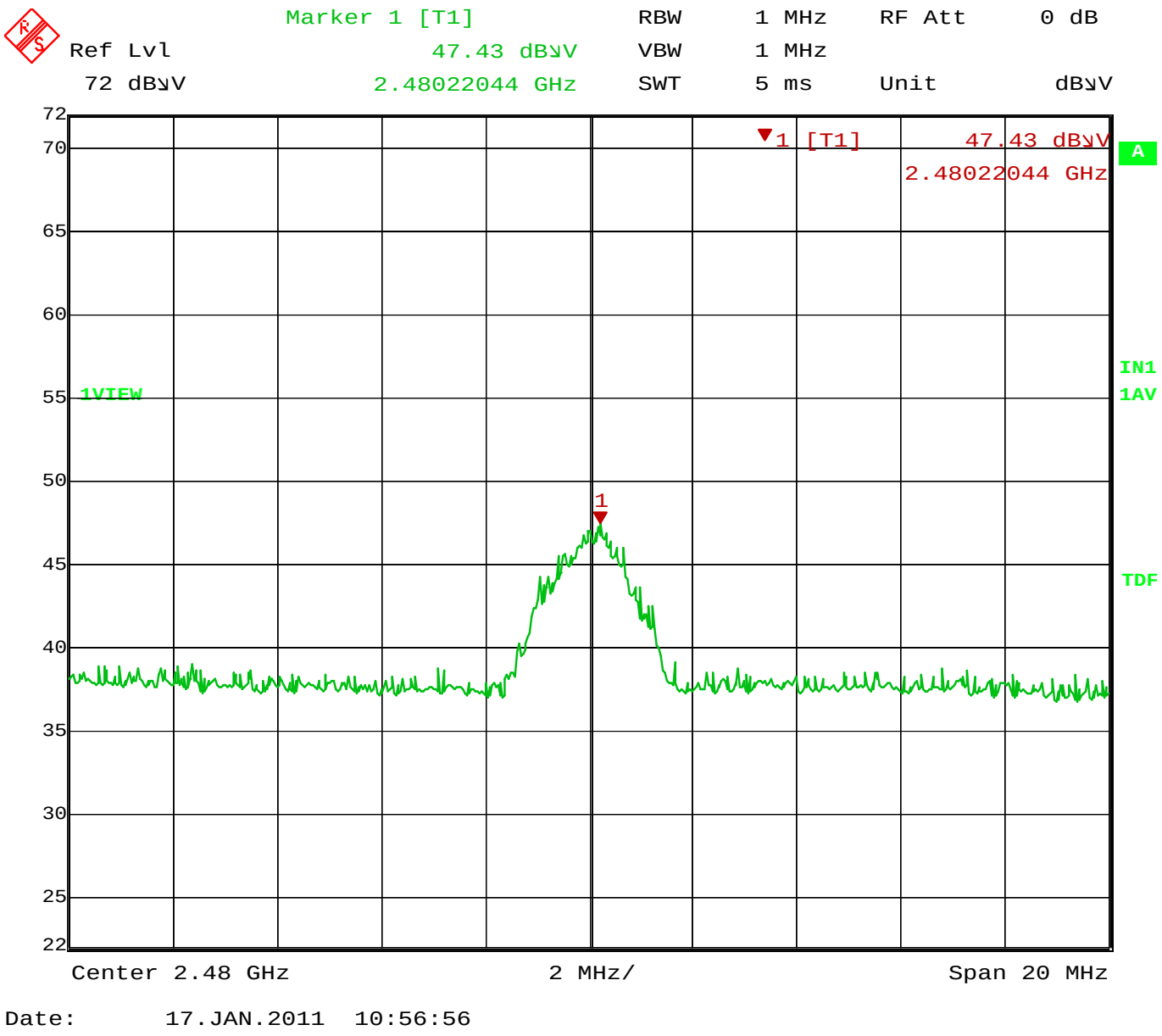


Figure 7 – Channel 3 Vertical

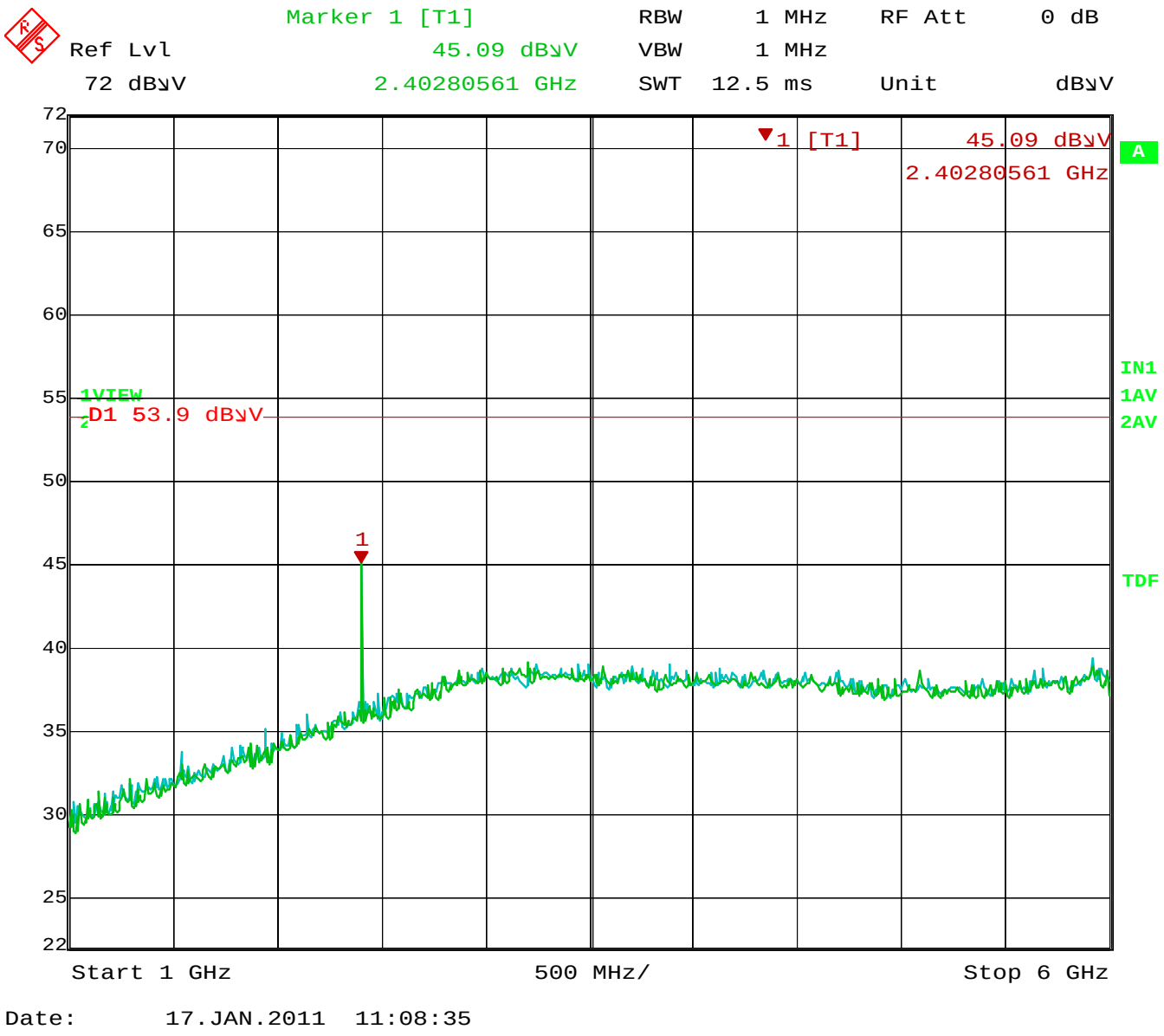


Figure 8 – 1 to 6 GHz

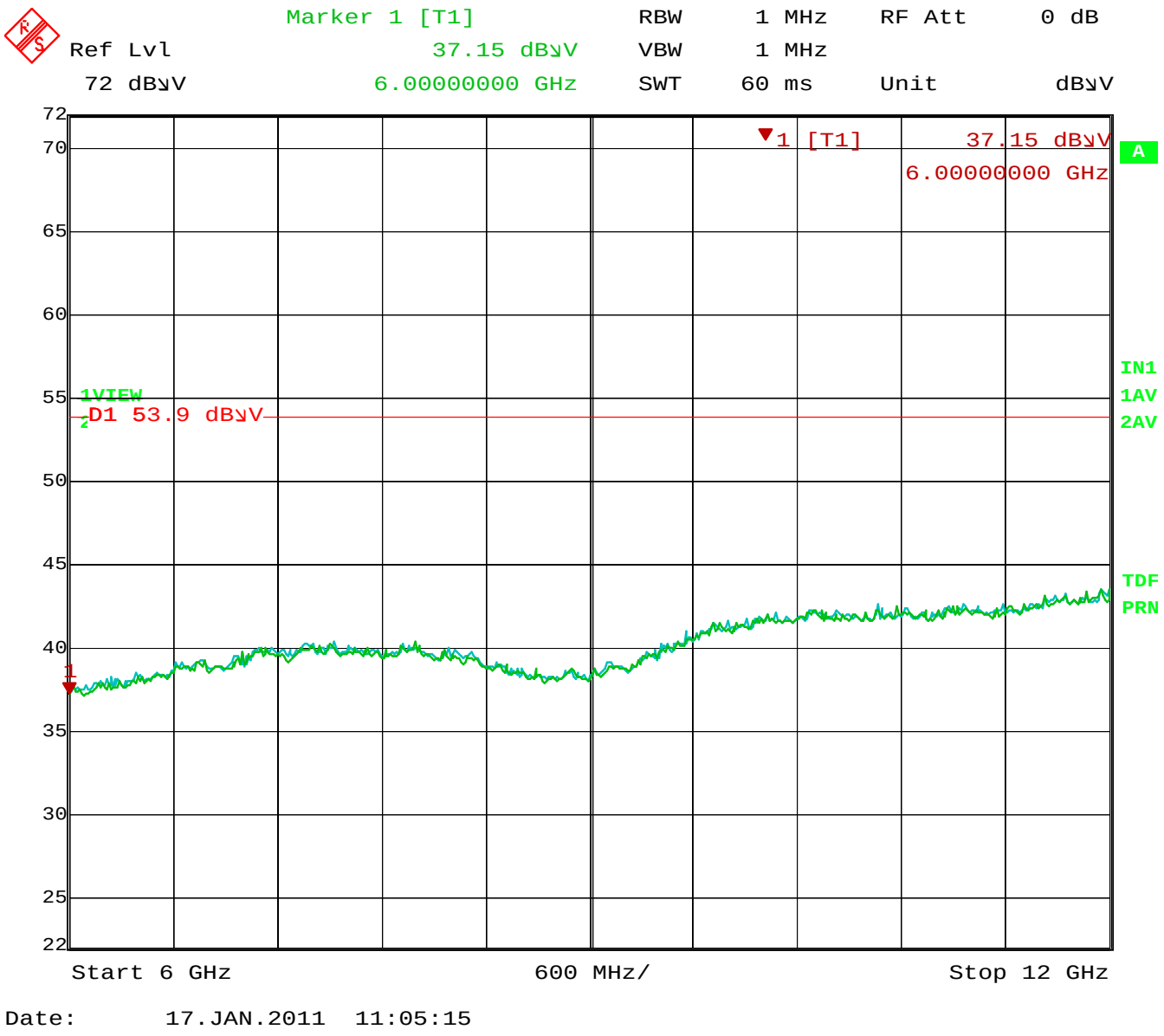


Figure 9 – 6 to 12 GHz

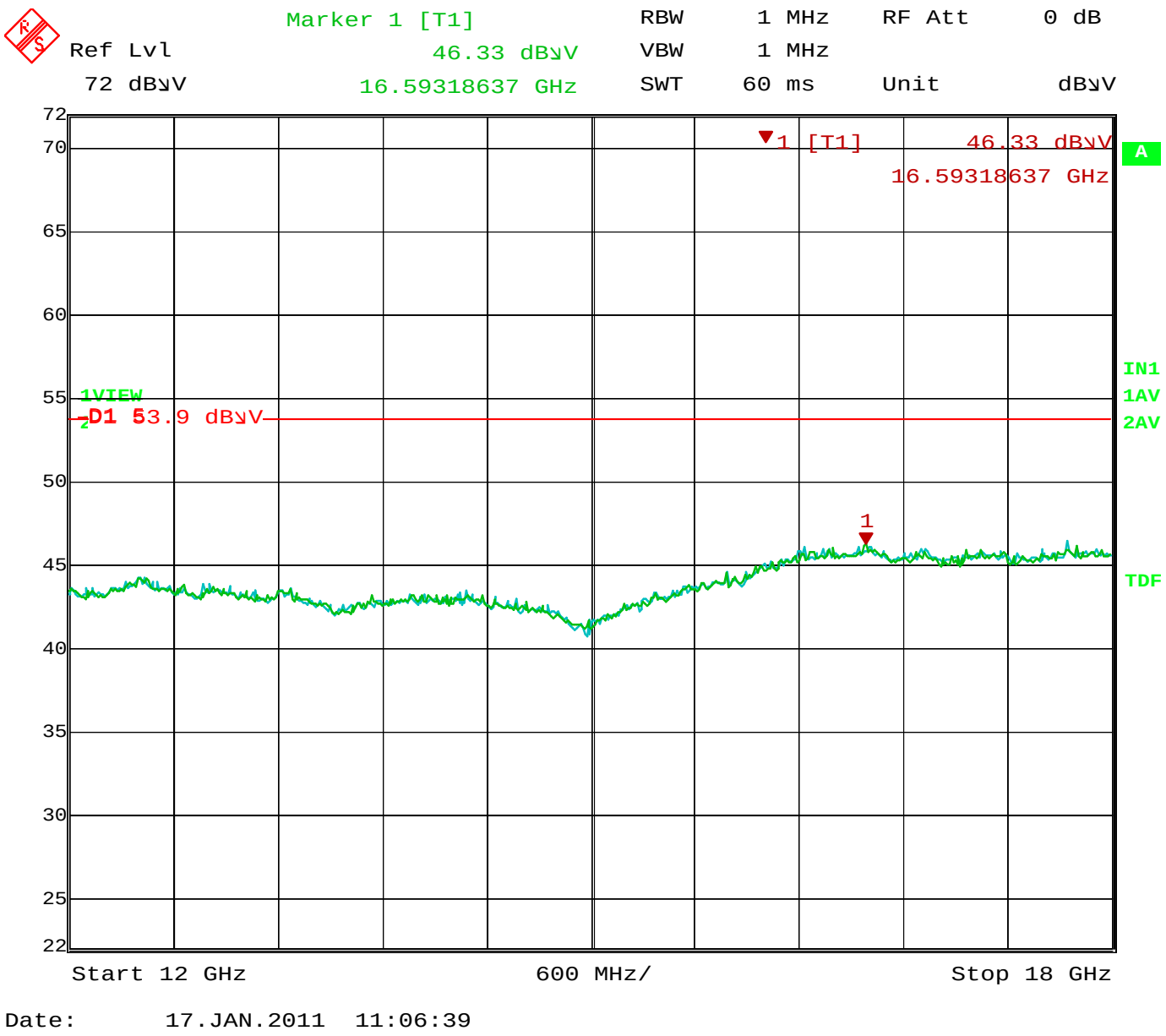


Figure 10 – 12 to 18 GHz

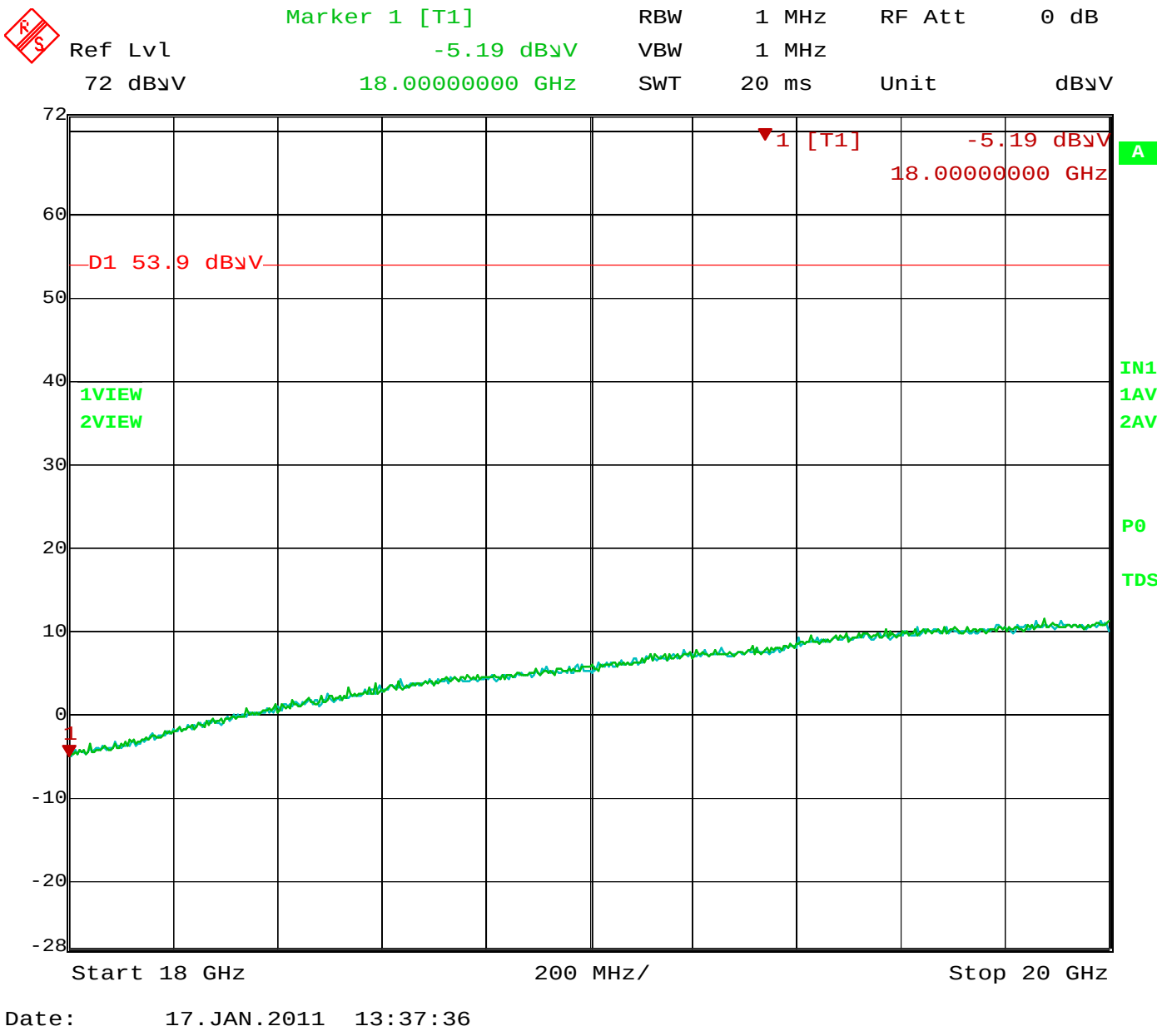


Figure 11 – 18 to 20 GHz

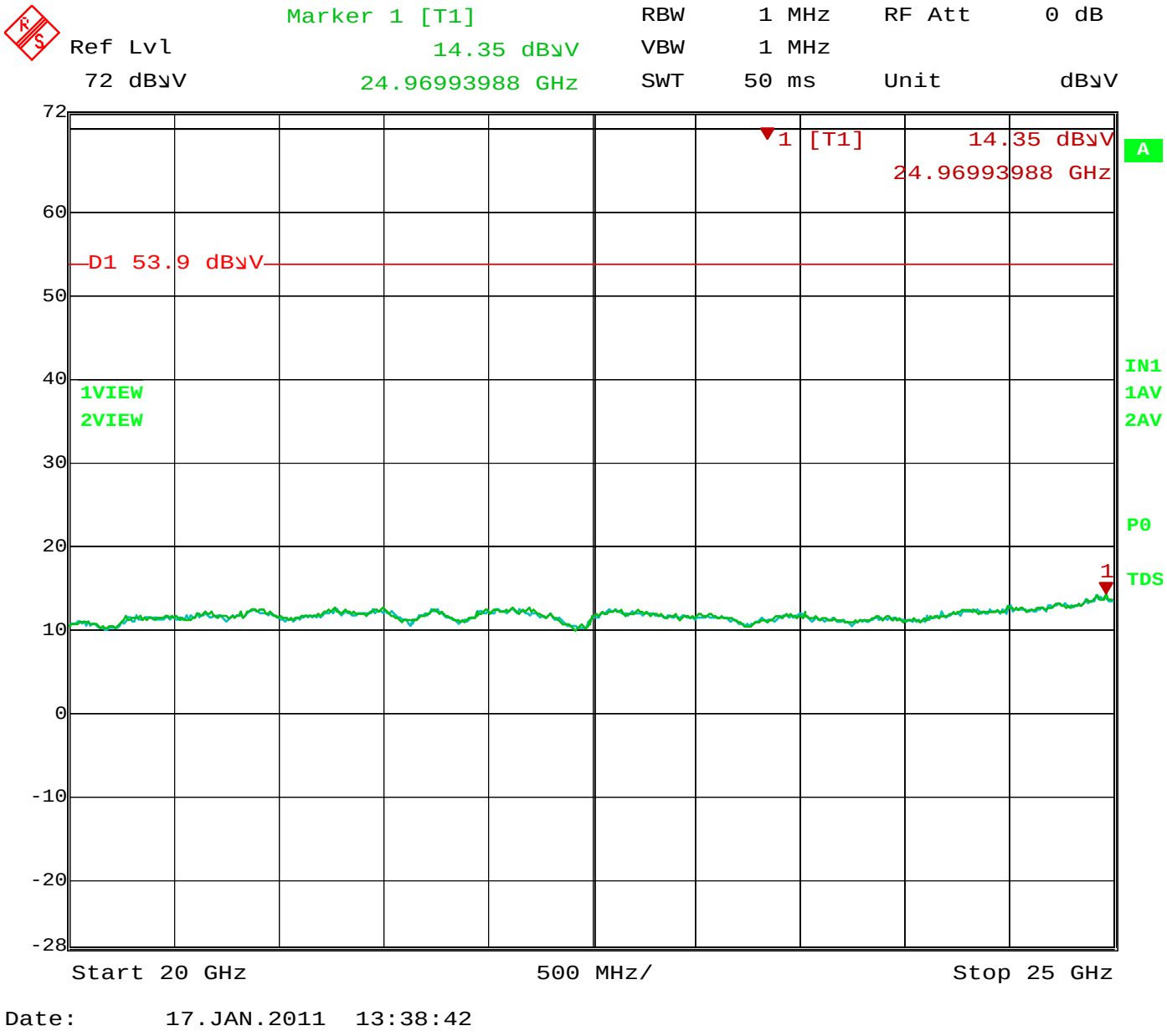


Figure 12 – 20 to 25 GHz

4.3 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.

4.3.1 Test Over View

Results	**Complies** (as tested per this report)				**Date**	12/2/2010	
Standard	FCC Part 15.215(c)						
Product Model	Sensor			**Serial#**	0NT08212037		
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	6VDC	**Temp**	22º 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		

4.3.2 Test Procedure

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

4.3.3 Deviations

There were no deviations from the test methodology.

4.3.4 Final Test

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

4.3.5 Band Edge Requirement Data

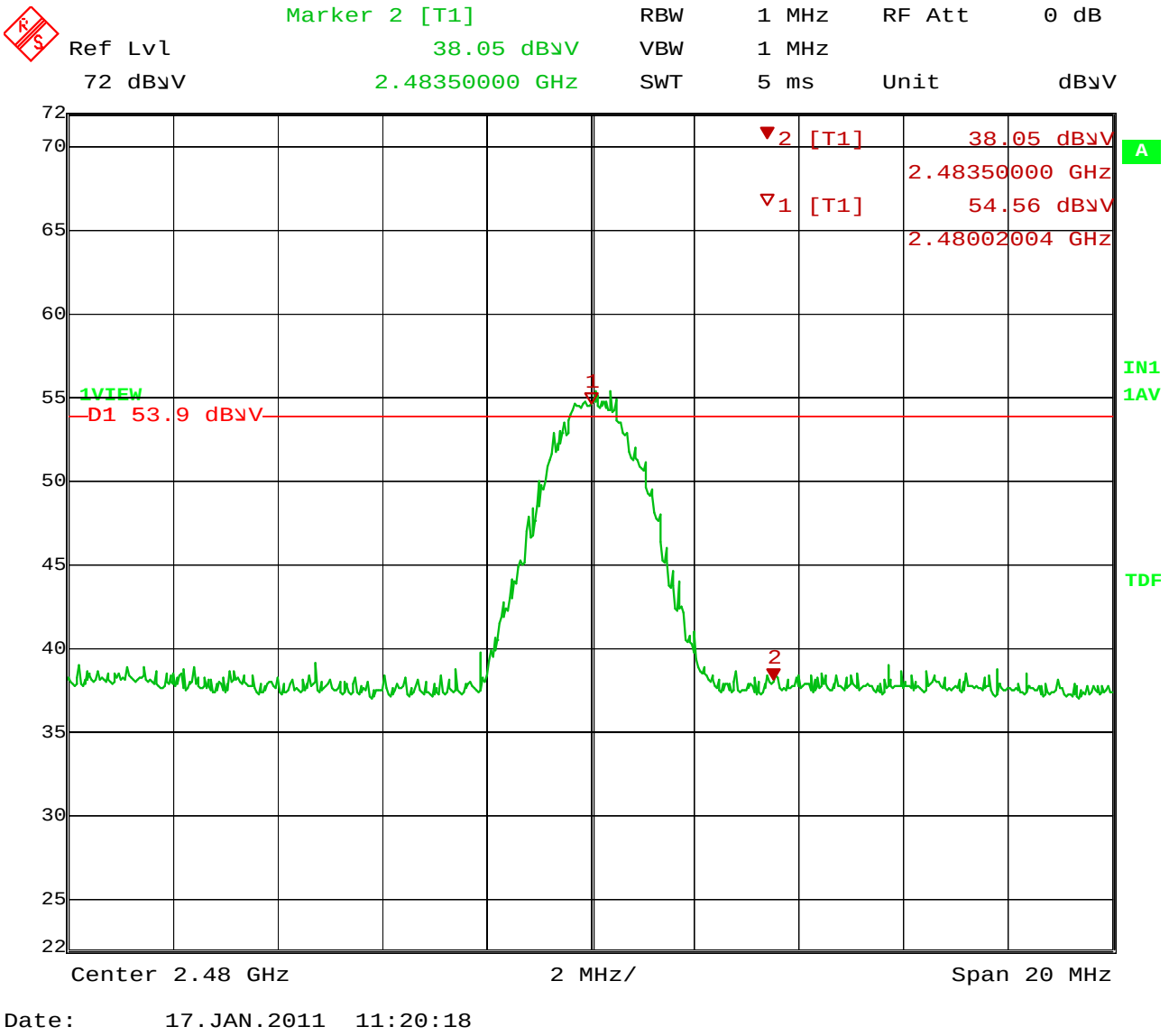


Figure 13 – Upper Band Edge

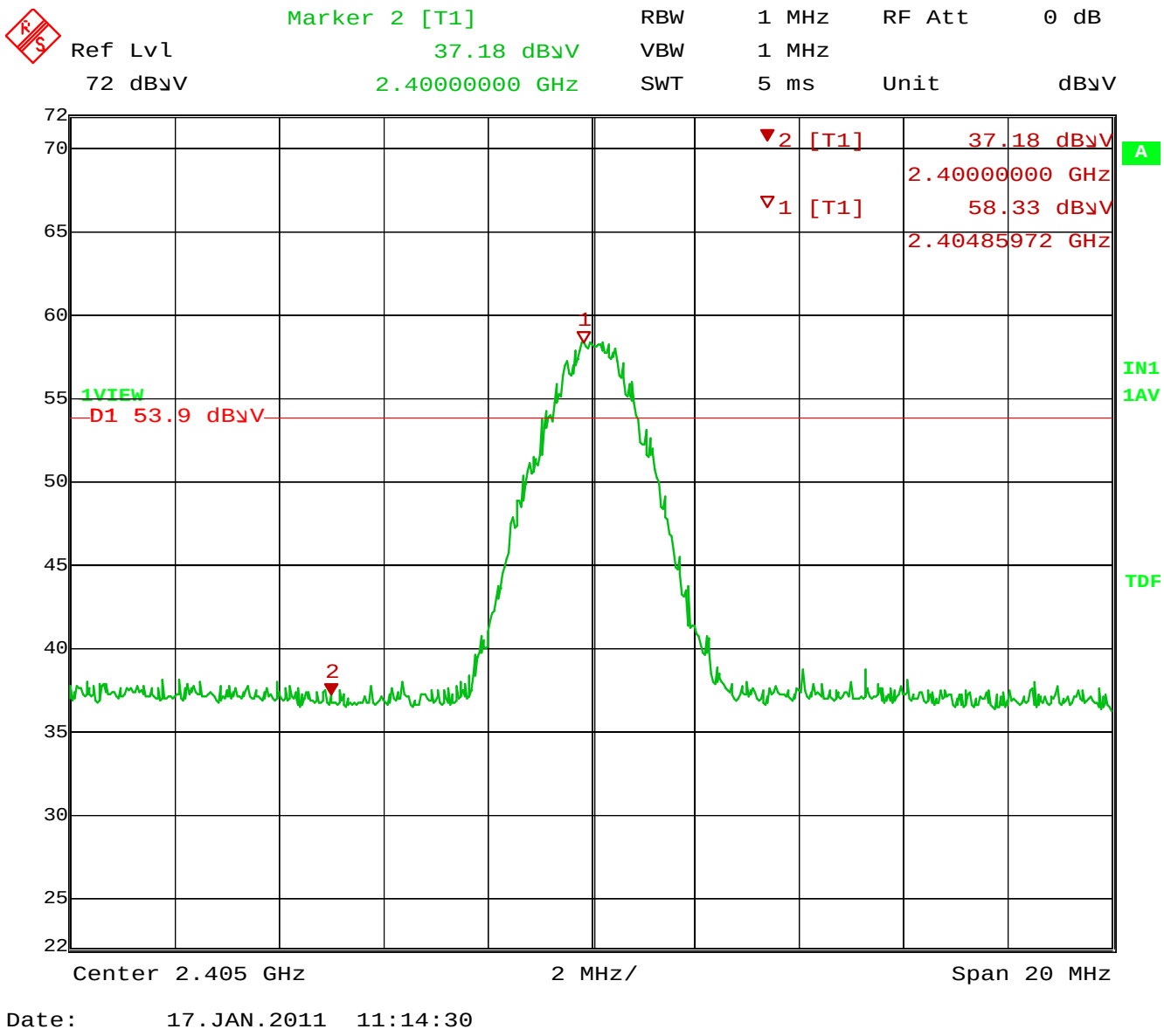


Figure 14 – Lower Band Edge

4.4 Frequency Tolerance

4.4.1 Test Over View

Results	**Complies** (as tested per this report)				**Date**	12/2/2010	
Standard	FCC Part 15.249(3)						
Product Model	Sensor			**Serial#**	0NT08212037		
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	6VDC	**Temp**	22º C	**Humidity**	47%	**Pressure**	996mbar
Mod to EUT	None		**Test Performed By**		Randall Masline		

4.4.2 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.

4.4.3 Deviations

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

4.4.4 Final Test

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

4.4.5 Final Data

Test	Frequency (GHz)	Allowable Deviation (MHz)	Result
-20 Degrees C at nominal	2.40512020	2.400	**Complies**
+50 Degrees C at nominal	2.40514020	2.400	**Complies**
Nominal 6 VDC Voltage	2.40510020	2.400	**Complies**
85% - 5.1 VDC	2.40510500	2.400	**Complies**
115% - 6.9 VDC	2.40510620	2.400	**Complies**

Table 1 – Frequency Tolerance

4.5 RF Exposure Measurement (Mobile Device)

4.5.1 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.

4.5.2 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

4.5.3 EUT Operating condition

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

4.5.4 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**.

4.5.5 Test Results

4.5.6 Antenna Gain

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

4.5.7 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/cm^2

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

Pd = (0.000018*1.0) / (1600π) = **0.0001 mW/cm^2**, which is 0.619 mW/cm^2 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).

4.5.8 Sample Calculation

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

Where;

Pd = power density in mW/cm^2
Pout = output power to antenna in mW
G = gain of antenna in linear scale
π ≈ 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).

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

Sensor

5.3 Type of Product

Wireless Kitchen Management System

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

☐	**Residential**	☐	**Hospital**
☒	**Light Industrial**	☐	**Small Clinic**
☒	**Industrial**	☐	**Doctor's office**
☐	**Other**		

*Check all that apply

5.7 Countries

☒	**USA**
☐	**Canada**

*Check all that apply

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 15.249(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

5.9 General Product Information

Size	**H**	4.5cm	**W**	3cm	**L**	11cm	
Weight	1kg		**Fork-Lift Needed**		No		
Notes							

5.10 EUT Electrical Powered Information

5.10.1 Electrical Power Type

☒	**AC**	☐	**DC**	☐	**Batteries**	☐	**Host -**

5.10.2 Electrical Power Information

Name	Type	Voltage		Frequency	Current	Notes
		min	max			
Battery	6 VDC	3.5	7.5	DC		
Notes						

5.11 EUT Modes of Operation

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

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
None					