

# **Electromagnetic Compatibility Test Report**

*Prepared in accordance with*

**FCC Part 15C, ANSI C63.10:2009**

On

**RFID Module with Passive Tag**

**HS1RN4**

JADAK LLC

7279 William Barry Blvd.

North Syracuse, NY 13212

Prepared by:

**TUV Rheinland of North America, Inc.**

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## Manufacturer's statement - attestation

The manufacturer; JADAK LLC, 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.

**Mark Macko**

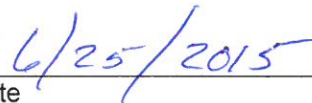
Printed name of official



Signature of official

**7279 William Barry Blvd.  
North Syracuse, New York 13212**

Address







Date

**315-218-1304**

Telephone number

**mmacko@jadaktech.com**

Email address of official

<b>Client:</b>	JADAK LLC 7279 William Barry Blvd. North Syracuse, NY 13212	Contact: Mark Macko Tel: 315-218-1304 Fax: 315-701-0679 e-mail mmacko@jadaktech.com		
<b>Identification:</b>	RFID Module with Passive Tag	<b>Serial No.:</b>	TS-1	
<b>Test item:</b>	Model HS1RN4	<b>Date Test Completed:</b>		6/23/2015
<b>Testing location:</b>	TUV Rheinland of North America 710 Resende Road Webster, NY 14580 U.S.A.	Tel: (585) 645-0125		
<b>Test specification:</b>	Emissions: FCC Part 15.225 Radiated Emissions Std FCC Part 15.209, FCC Part 15.225(b), FCC Part 15.203			
<b>Test Result:</b>	The above product was found to be Compliant to the above test standard(s)			
<b>tested by:</b> Randall Masline		<b>reviewed by:</b> Cecil Gittens		
23 September 2015 Date Name Signature		 23 September 2015 Date Name Signature		
<b>Other Aspects:</b>	None			
Abbreviations: OK, Pass, Compliant, Complies = passed Fail, Not Compliant, Does Not Comply = failed N/A = not applicable				
  <b>US5253</b>	 	<b>Industry Canada</b>	<b>VCCI</b>	<b>BSMI</b>
	<b>Testing Cert.# 3331.08</b>	<b>482B-1</b>	<b>A-0203</b>	<b>SL2-IN-E-050R</b>

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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, ANSI C63.10:2009 based on the results of testing performed on 6/23/2015 on the RFID Module with Passive Tag, Model Number. HS1RN4, manufactured by JADAK LLC. 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.

The 13.56 MHz Tag is passive.

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### 1.3 Summary of Test Results

<b>Applicant</b>	JADAK LLC 7279 William Barry Blvd. North Syracuse, NY 13212	<b>Tel</b>	315-218-1304	<b>Contact</b>	Mark Macko
		<b>Fax</b>	315-701-0679	<b>e-mail</b>	mmacko@jadaktech.com
<b>Description</b>	RFID Module with Passive Tag	<b>Model Number</b>	HS1RN4		
<b>Serial Number</b>	TS-1	<b>Test Voltage/Freq.</b>	Powered Via USB		
<b>Test Date Completed:</b>	6/23/2015	<b>Test Engineer</b>	Randall Masline		
<b>Standards</b>	<b>Description</b>	<b>Severity Level or Limit</b>	<b>Measured</b>	<b>Test Result</b>	
FCC Part 15 subpart C Standard	Radio Frequency Devices - Subpart C: Intentional Radiators	See called out parts below	See Below	Complies	
FCC Part 15.225	Operation in the band 13.110 - 14.010 MHz	See Basic Standards Below	See Below	Complies	
FCC Part 15.209	Radiated Emissions	Class B, 9kHz - 1000 MHz	Limit	Complies	
FCC Part 15.225(b)	Field Strength of Fundamental and Spurious Emissions	15.225 Limit is 83.9 dBuV at 13.565 MHz at 30m	Limit	Complies	
FCC Part 15.207	Conducted Emissions	Transmitter, 150 kHz - 30 MHz	Limit	Not Applicable	
FCC Part 15.225(c)	Frequency Tolerance test.	Frequency contained with +/- 0.01% of operating Frequency -20° to +50° C Voltage Variations from 85% to 115%		Complies	
FCC Part 15.203	Antenna Requirement	The Antenna is placed inside a housing that will not allow substitution.		Complies	

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## 2 Laboratory Information

### 2.1 Accreditations & Endorsements

#### 2.1.1 US Federal Communications Commission

TUV Rheinland of North America located at, 710 Resende Road, Webster, NY 14580 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 90575). The laboratory scope of accreditation includes: Title 47 CFR Part 15, and 18. The accreditation is updated every 3 years.

#### 2.1.2 A2LA

This is a 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: 3331.08). 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 A-0203

#### 2.1.4 Industry Canada

(Registration No.: 482B-1) The 10m Semi-Anechoic Chamber has been accepted by Industry Canada to perform testing to 3 and to 10m, based on the test procedures described in ANSI C63.4-2013.

#### 2.1.5 BSMI

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

#### 2.1.6 Korea

Recognized by Radio Research Agency as an accredited Conformity Assessment Body (CAB) under the terms of Phase I of the APEC TEL.

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### 2.1.7 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 $\mu$ 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

	U <sub>lab</sub>	U <sub>cispr</sub>
<b>Radiated Disturbance @ 10m</b>		
30 MHz – 1,000 MHz	4.57 dB	5.2 dB
<b>Conducted Disturbance @ Mains Terminals</b>		
150 kHz – 30 MHz	2.62 dB	3.6 dB
<b>Disturbance Power</b>		
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.

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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
Radiated Emissions							
Analyzer w RF Filter Section 85460A	HP	8546A		3325A00134	12-Aug-14	12-Aug-15	RE
Multimeter	Fluke	83	C437	48162892	12-Aug-14	12-Aug-15	RE
BiLog	Chase	CBL6111	C017	1169	22 Aug 13	22 Aug 15	RE
Receiver (20Hz-40GHz)	Rohde & Schwarz	ESI(B) 40		100274	15-Aug-14	15-Aug-15	RE
Loop Antenna	EMCO	6502		8901-2302	10-Mar-15	10-Mar-17	RE
General Laboratory Equipment							
Multimeter	Fluke	87	C405	49050672	12-Aug-14	12-Aug-15	
Multimeter	Fluke	8062A	C452	4715199	12-Aug-14	12-Aug-15	
Pressure/Temperature/RH	Extech	SD700	C480	Q668876	12-Aug-14	12-Aug-15	

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### **3 Product Information**

#### **3.1 Equipment Modifications**

No modifications were needed to bring product into compliance.

#### **3.2 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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## 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	6/18/2015	
Standard	FCC Part 15.209							
Product Model	HS1RN4				Serial#	TS-1		
Configuration	Tested in 10m Semi-Anechoic Chamber							
Test Set-up	Tested in 10m Semi-Anechoic Chamber, placed on turn-table at 3 meters, see test plans for details							
EUT Powered By	Powered Via USB	Temp	24°C	Humidity	52%	Pressure	1013mbar	
Frequency Range	9kHz - 1000 MHz @ 3m							
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 FCC emissions tests were performed using the procedures of ANSI C63.10:2013 including methods for signal maximizations and EUT configuration. The photos included with the report show the EUT in its maximized configuration. Further radiated emission tests were performed per the procedures stated in the other emissions standards listed in this report.

The frequency range from 9kHz - 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, at a distance of 3 meters.

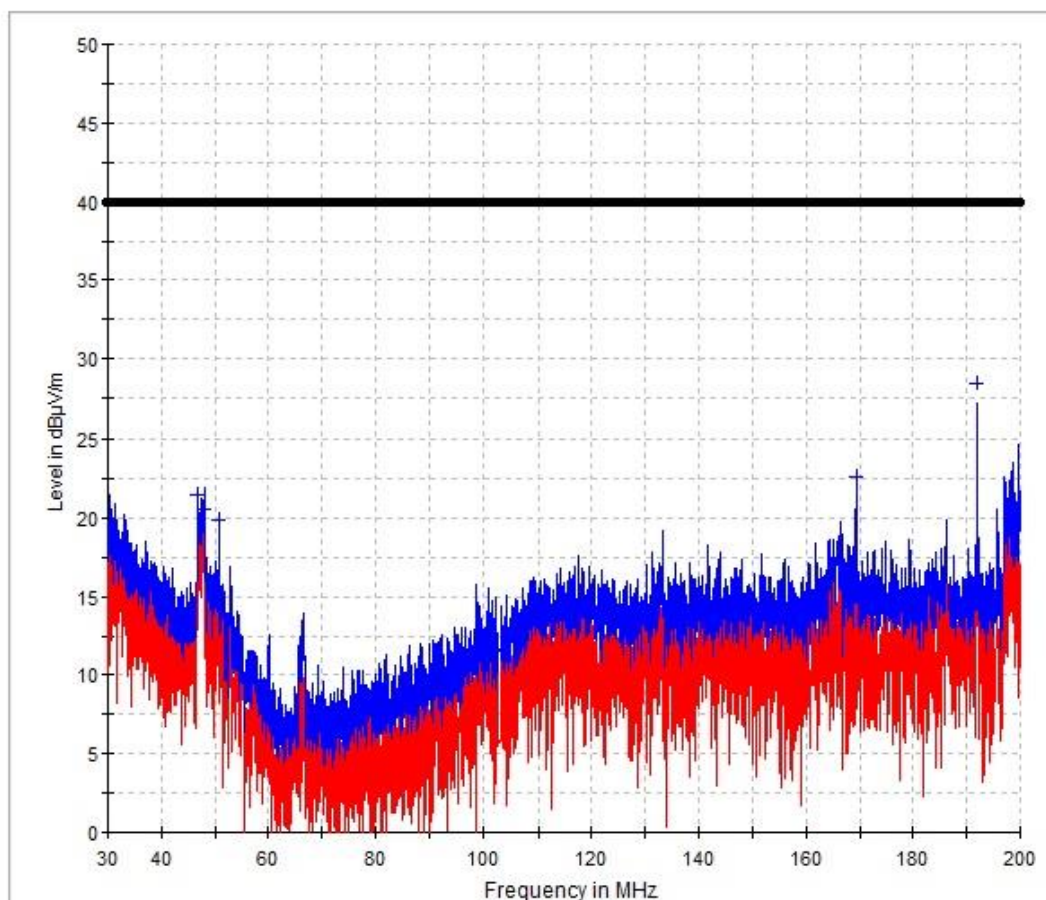
#### 4.1.3 Deviations

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

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## 4.1.1 Final Graphs

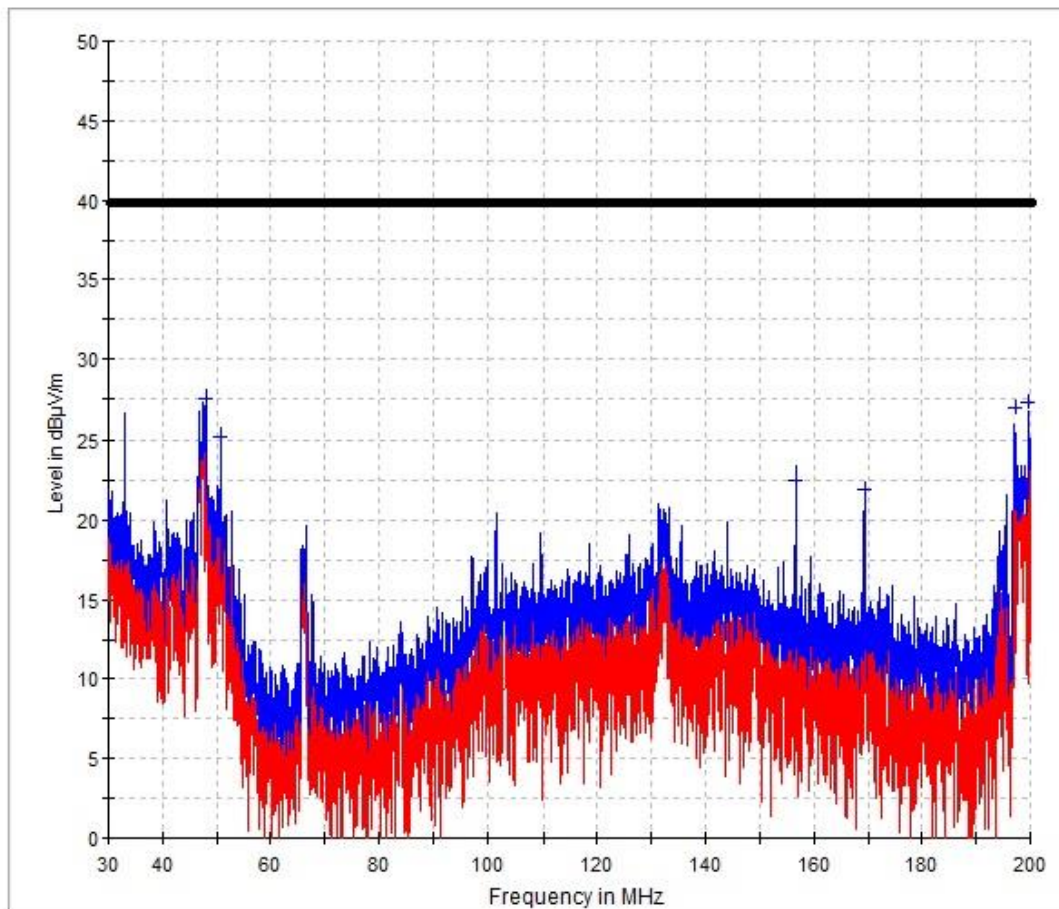
## NOTES:

**Radiated Emissions Prescan**  
**Horizontal**


Frequency MHz	QuasiPeak dBµV/m	Meas. Time ms	Bandwidth kHz	Height cm	Polarization	Azimuth deg	Corr. dB	Comment
---	---	---	---	---	---	---	---	---
46.720000	21.4	150.0	120.000	100.0	H	349.0	-7.8	
48.040000	20.6	150.0	120.000	100.0	H	349.0	-8.5	
50.760000	19.8	150.0	120.000	100.0	H	349.0	-9.7	
169.320000	22.6	150.0	120.000	100.0	H	349.0	-5.5	
192.000000	28.4	150.0	120.000	100.0	H	349.0	-5.9	

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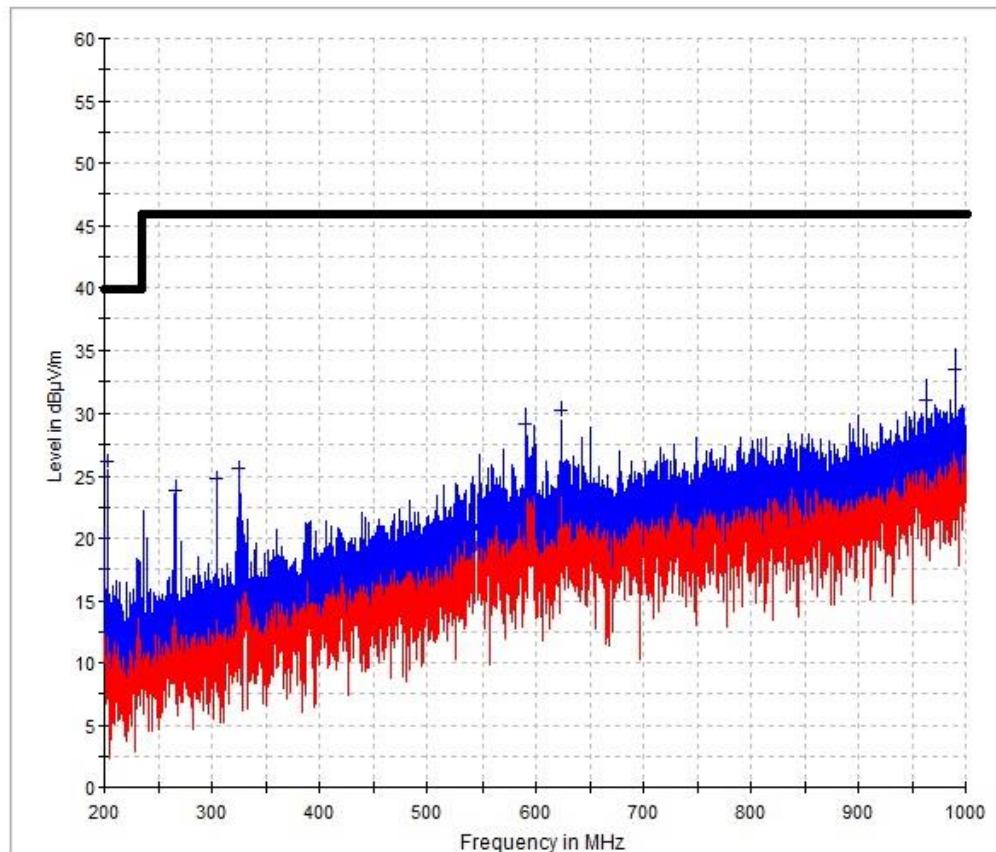
## NOTES:

**Radiated Emissions Prescan**  
**Vertical**


Frequency MHz	QuasiPeak dBµV/m	Meas. Time ms	Bandwidth kHz	Height cm	Polarization	Azimuth deg	Corr. dB	Comment
32.880000	19.1	150.0	120.000	100.0	V	349.0	-0.9	
48.000000	27.5	150.0	120.000	100.0	V	349.0	-8.5	
50.760000	25.2	150.0	120.000	100.0	V	349.0	-9.7	
156.720000	22.5	150.0	120.000	100.0	V	349.0	-5.1	
169.320000	22.0	150.0	120.000	100.0	V	349.0	-5.5	
197.160000	27.0	150.0	120.000	100.0	V	349.0	-5.5	
199.800000	27.3	150.0	120.000	100.0	V	349.0	-5.4	

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## NOTES:

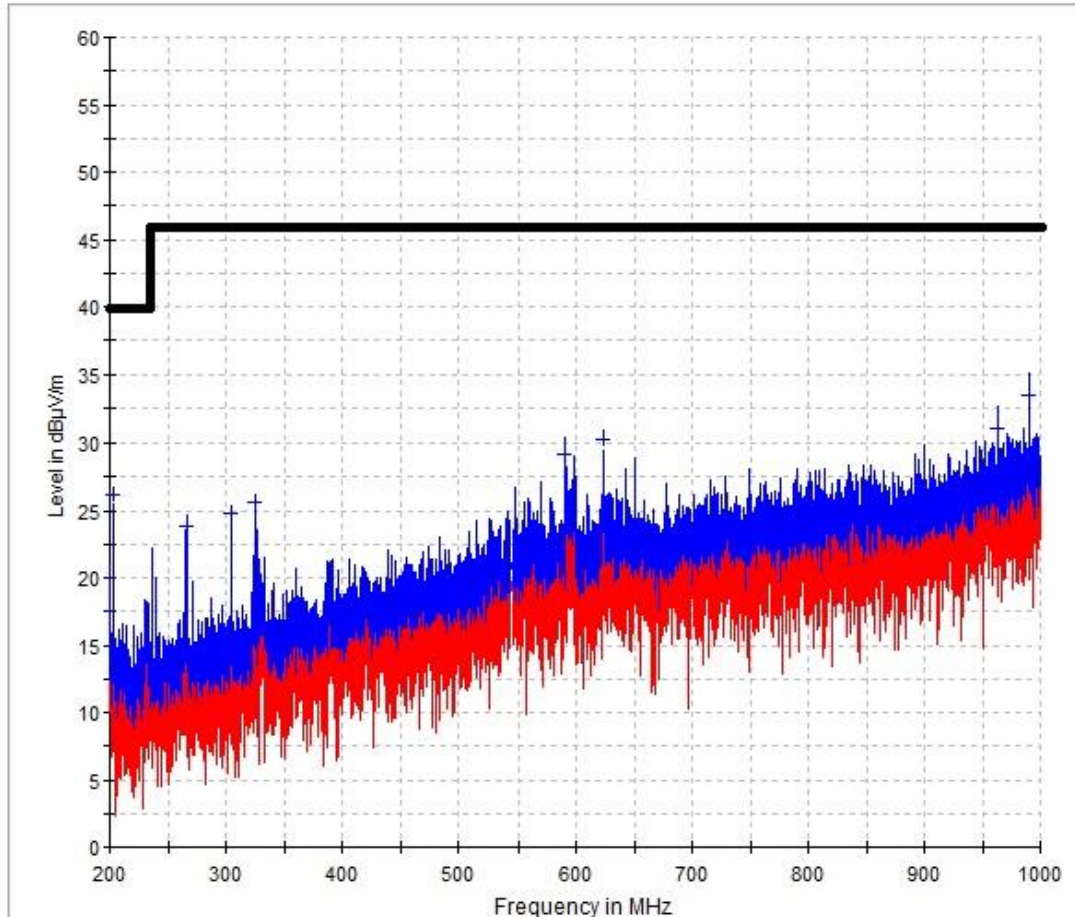
**Radiated Emissions Prescan**  
**Horizontal**


Frequency MHz	QuasiPeak dBµV/m	Meas. Time ms	Bandwidth kHz	Height cm	Polarization	Azimuth deg	Corr. dB	Comment
203.200000	26.2	100.0	120.000	150.0	H	349.0	-5.2	
266.240000	23.9	100.0	120.000	150.0	H	349.0	-1.3	
304.800000	24.8	100.0	120.000	150.0	H	349.0	0.0	
326.080000	25.7	100.0	120.000	150.0	H	349.0	0.8	
591.120000	29.2	100.0	120.000	150.0	H	349.0	7.9	
623.840000	30.2	100.0	120.000	150.0	H	349.0	8.8	
962.960000	30.9	100.0	120.000	150.0	H	349.0	17.0	
990.080000	33.4	100.0	120.000	150.0	H	349.0	18.1	

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## NOTES:

**Radiated Emissions Prescan**  
**Vertical**


Frequency MHz	QuasiPeak dBµV/m	Meas. Time ms	Bandwidth kHz	Height cm	Polarization	Azimuth deg	Corr. dB	Comment
203.200000	26.2	100.0	120.000	150.0	V		349.0	-5.2
266.240000	23.9	100.0	120.000	150.0	V		349.0	-1.3
304.800000	24.8	100.0	120.000	150.0	V		349.0	0.0
326.080000	25.7	100.0	120.000	150.0	V		349.0	0.8
591.120000	29.2	100.0	120.000	150.0	V		349.0	7.9
623.840000	30.2	100.0	120.000	150.0	V		349.0	8.8
962.960000	30.9	100.0	120.000	150.0	V		349.0	17.0
990.080000	33.4	100.0	120.000	150.0	V		349.0	18.1

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## 4.2 Fundamental Field Strength and Harmonic Emissions

This test evaluates the field strength of the fundamental and field strength of the spurious emissions.

### 4.2.1 Test Over View

Results	Complies (as tested per this report)					Date	3/20/2015	
Standard	FCC Part 15.225(b)							
Product Model	HS1RN4				Serial#	TS-1		
Configuration	Tested in 10m Semi-Anechoic Chamber							
Test Set-up	Tested in 10m Semi-Anechoic chamber    EUT placed on table    Tested in 10m Semi-Anechoic Chamber							
EUT Powered By	Powered Via USB	Temp	21° C	Humidity	48%	Pressure	1021mbar	
Perf. Criteria	15.225 (Below Limit)			Perf. Verification		Readings under Limit		
Mod to EUT	None			Test Performed By		Randall Masline		

### 4.2.2 Test Procedure

The EUT was placed on a table 3 meters from the antenna and all 3 orthogonal positions were investigated for highest field strength and highest spurious emissions. The fundamental frequency of the EUT is 433 MHz, therefore in addition to the requirements of 15.205 the EUT was tested to meet the following requirements in 15.231(b)

Fundamental frequency (MHz)	Field strength of fundamental (microvolts/meter)	Field strength of spurious emissions (microvolts/meter)
40.66– 40.70.....	2,250.....	225
70–130.....	1,250.....	125
130–174.....	\1\ 1,250 to 3,750	\1\ 125 to 375
174–260.....	3,750.....	375
260–470.....	\1\ 3,750 to 12,500.	\1\ 375 to 1,250
Above 470.....	12,500.....	1,250

### 4.2.3 Deviations

There were no deviations from the test methodology listed in the test plan for the harmonic current emissions test.

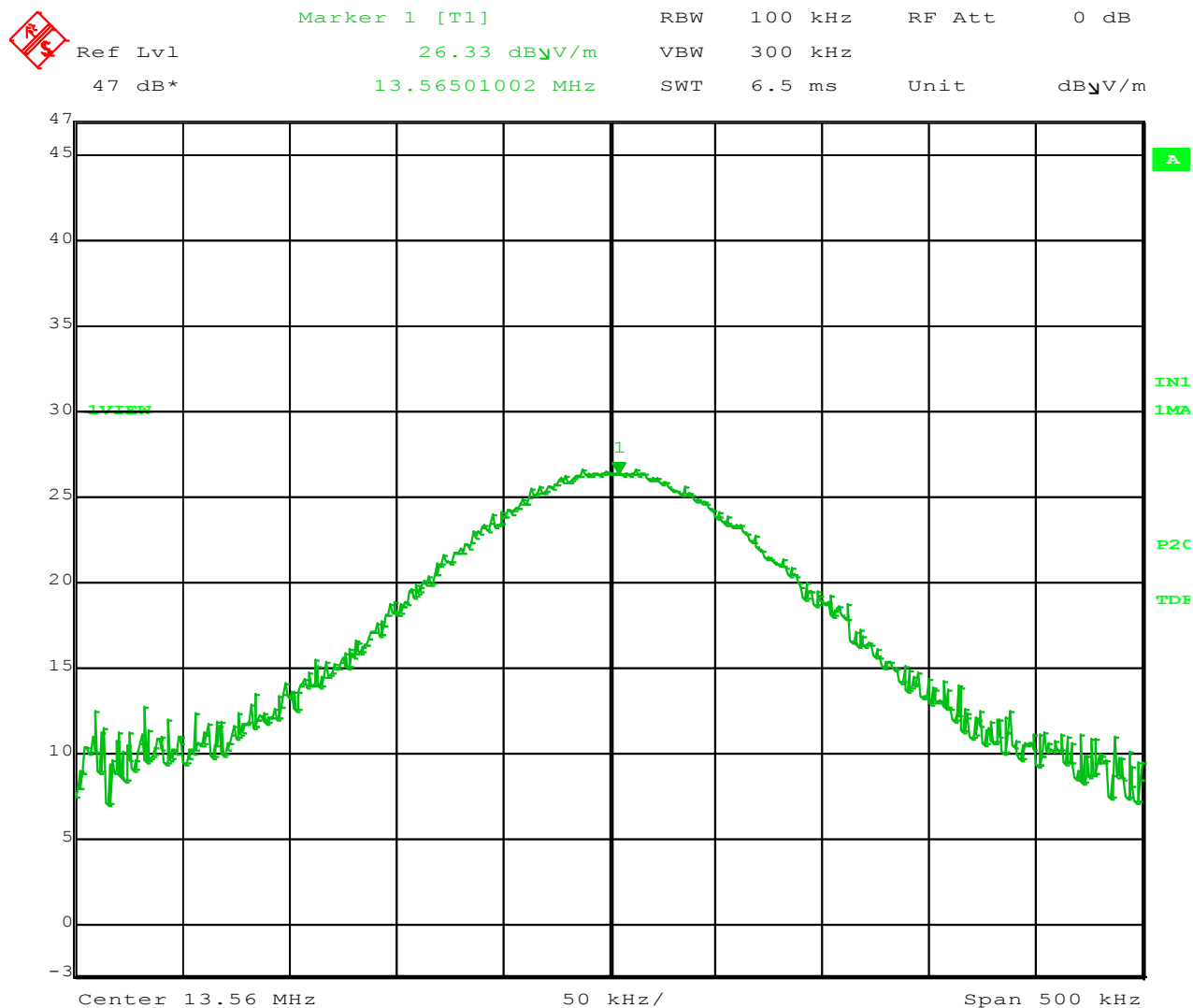
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#### 4.2.4 Final Test

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

#### 4.2.5 Final Data



Date: 18.JUN.2015 10:47:09

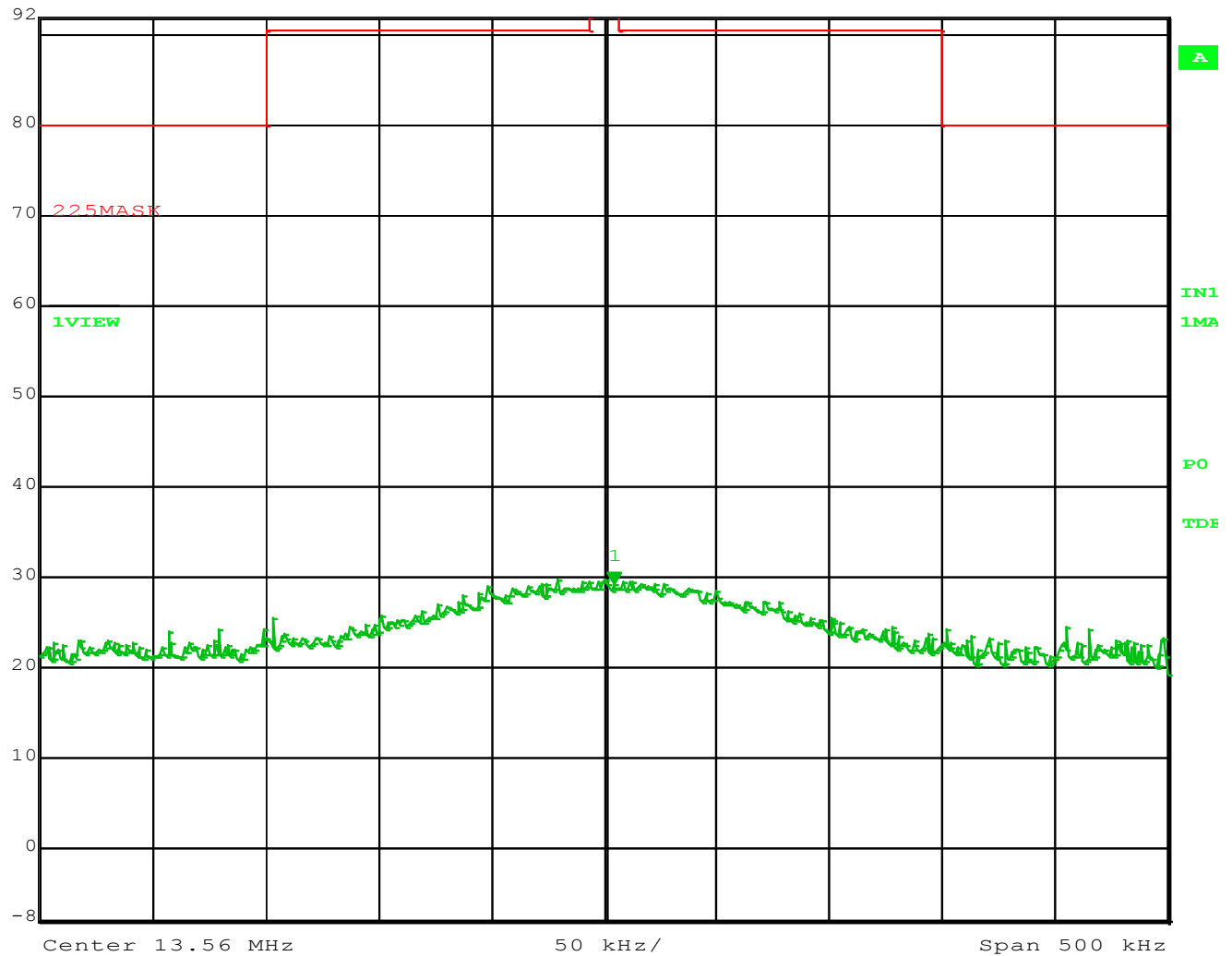
Figure 1 – Peak Field Strength Parallel Polarity is 26.33 dBuV at 1m

NOTE: The limit for 15.225 (b) 13.553 – 13.567 MHz band is 90.4 dBuV at 3m

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Marker 1 [T1] RBW 100 kHz RF Att 0 dB  
29.20 dBV/m VBW 300 kHz  
Ref Lvl 92 dB\* 13.56501002 MHz SWT 6.5 ms Unit dBV/m



Date: 18.JUN.2015 10:52:39

Figure 2 – Mask measured at 1m distance

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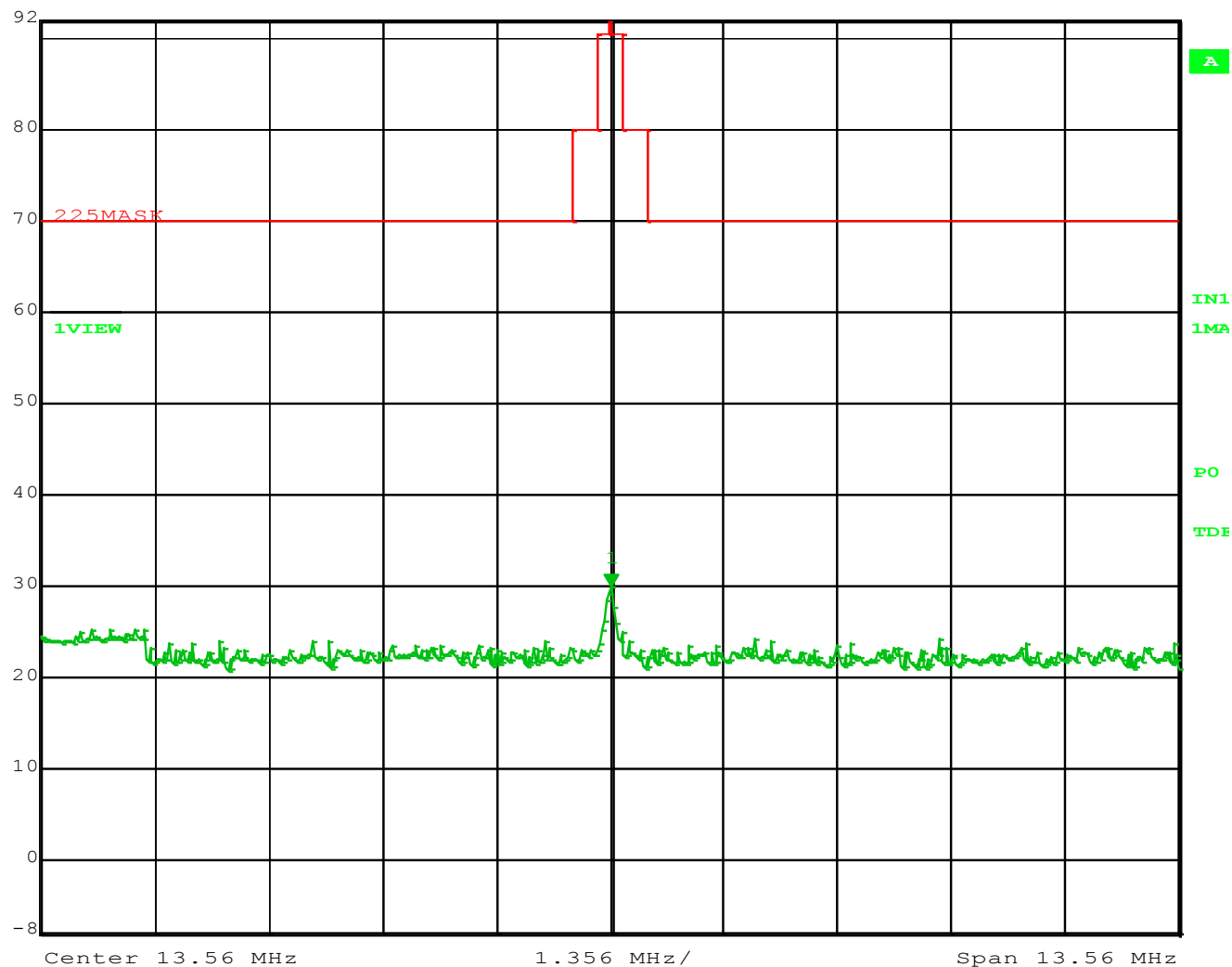
Report No.:

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Marker 1 [T1]	RBW	100 kHz	RF Att	0 dB
Ref Lvl	29.88 dBμV/m	VBW	300 kHz	
92 dB*	13.56501002 MHz	SWT	145 ms	Unit dBμV/m



Date: 18.JUN.2015 10:54:04

Figure 3 – Mask measured at 1m distance

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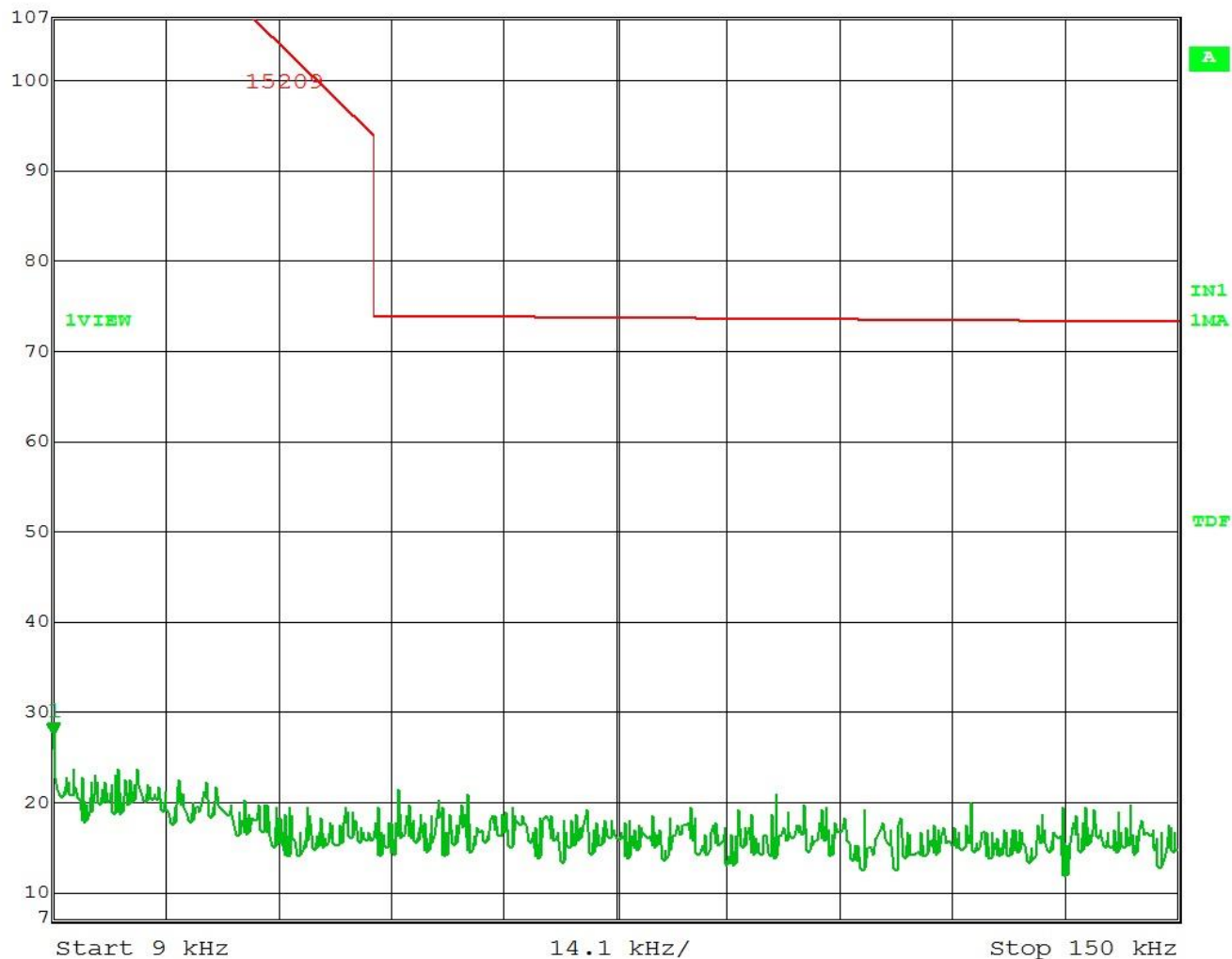
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Marker 1 [T1] RBW 200 Hz RF Att 10 dB  
Ref Lvl 27.49 dBμV VBW 200 Hz  
107 dBμV 9.00000000 kHz SWT 18 s Unit dBμV



Date: 18. June. 2015 23:17:53

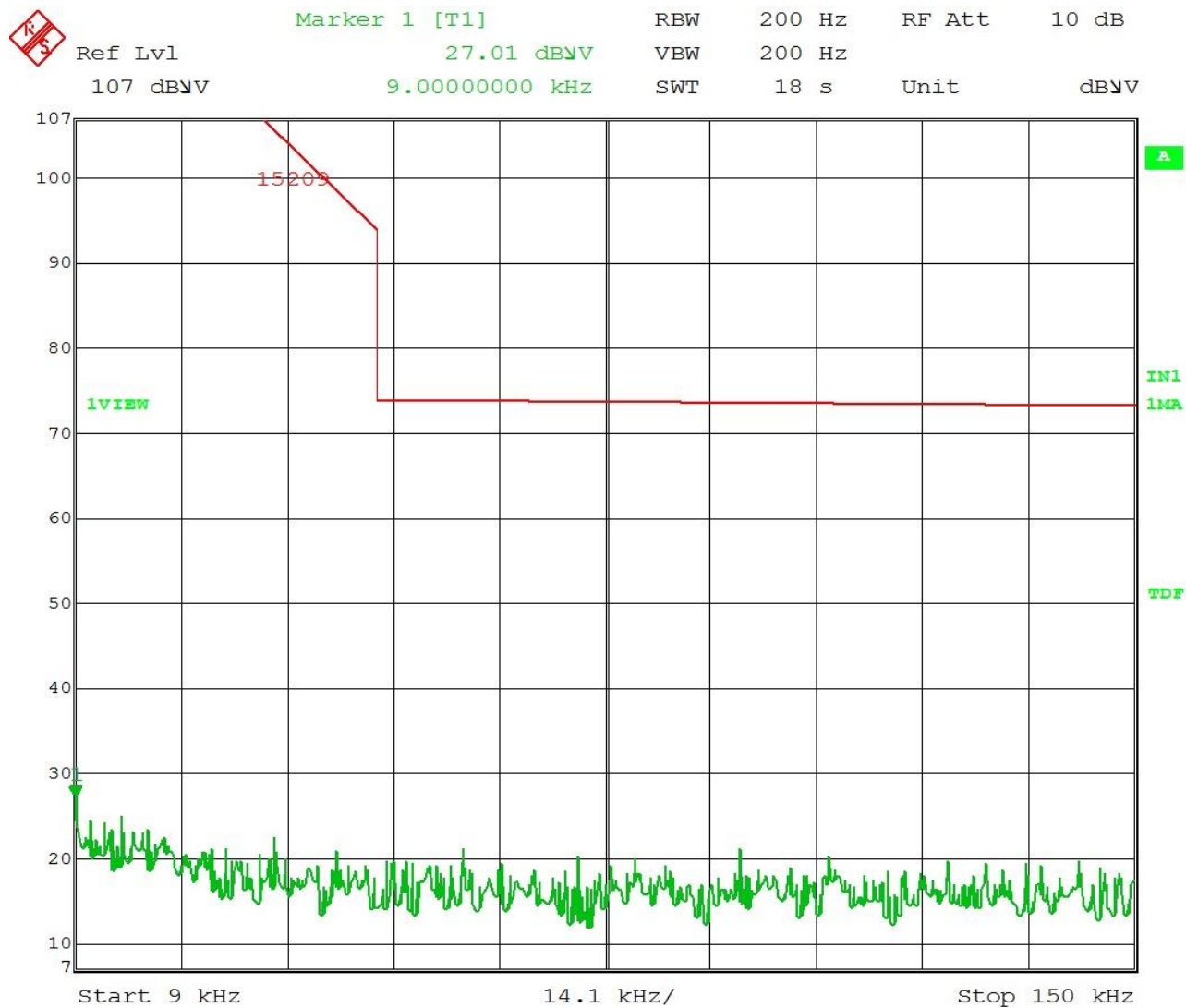
Figure 4 – Spurious Emissions (Parallel) 9 kHz to 150 kHz Measured at 1m distance

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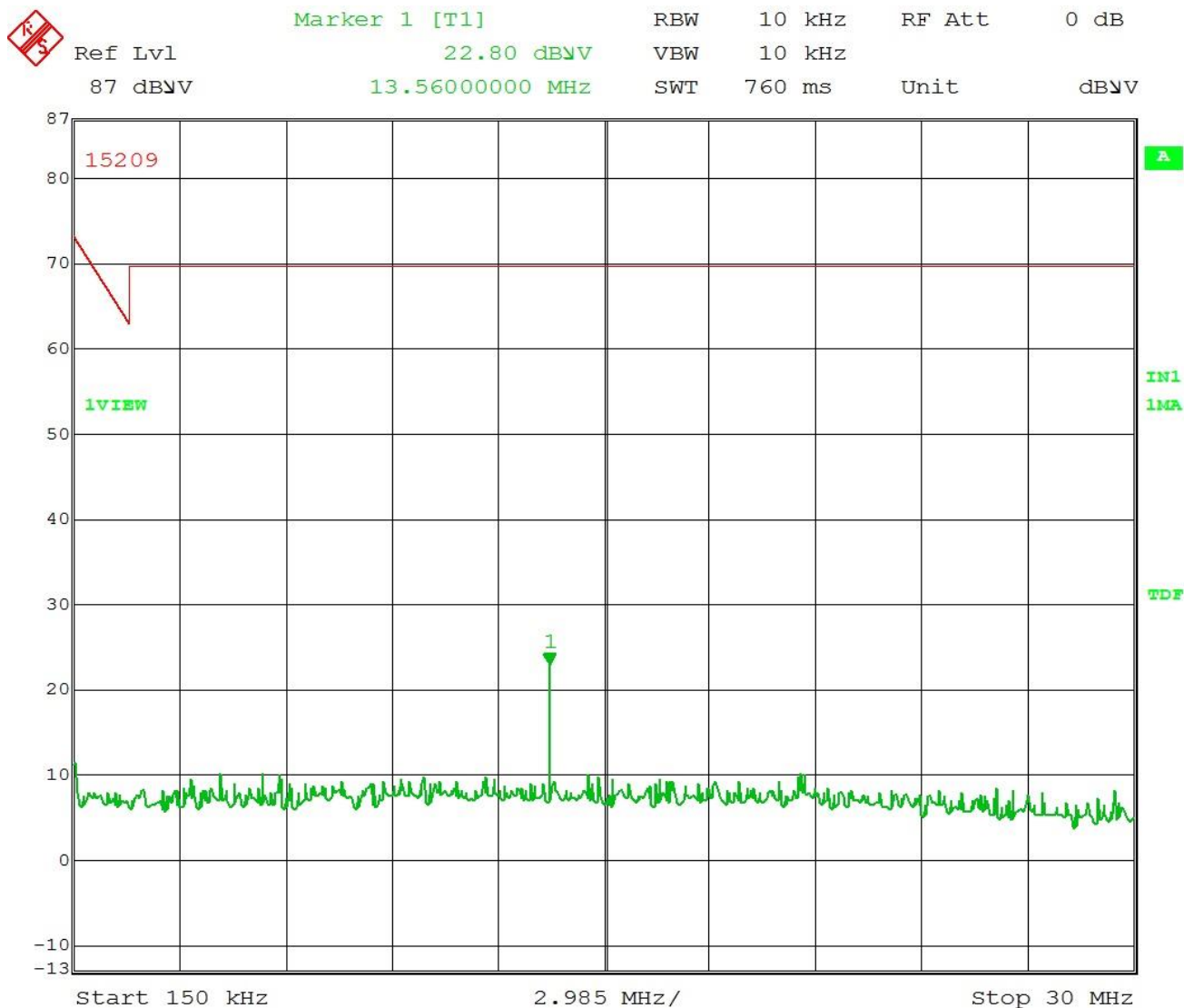
Date: 18. June. 2015 23:19:49

Figure 5 – Spurious Emissions (Perpendicular) 9 kHz to 150 kHz Measured at 1m distance

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Date: 18. June. 2015 23:22:36

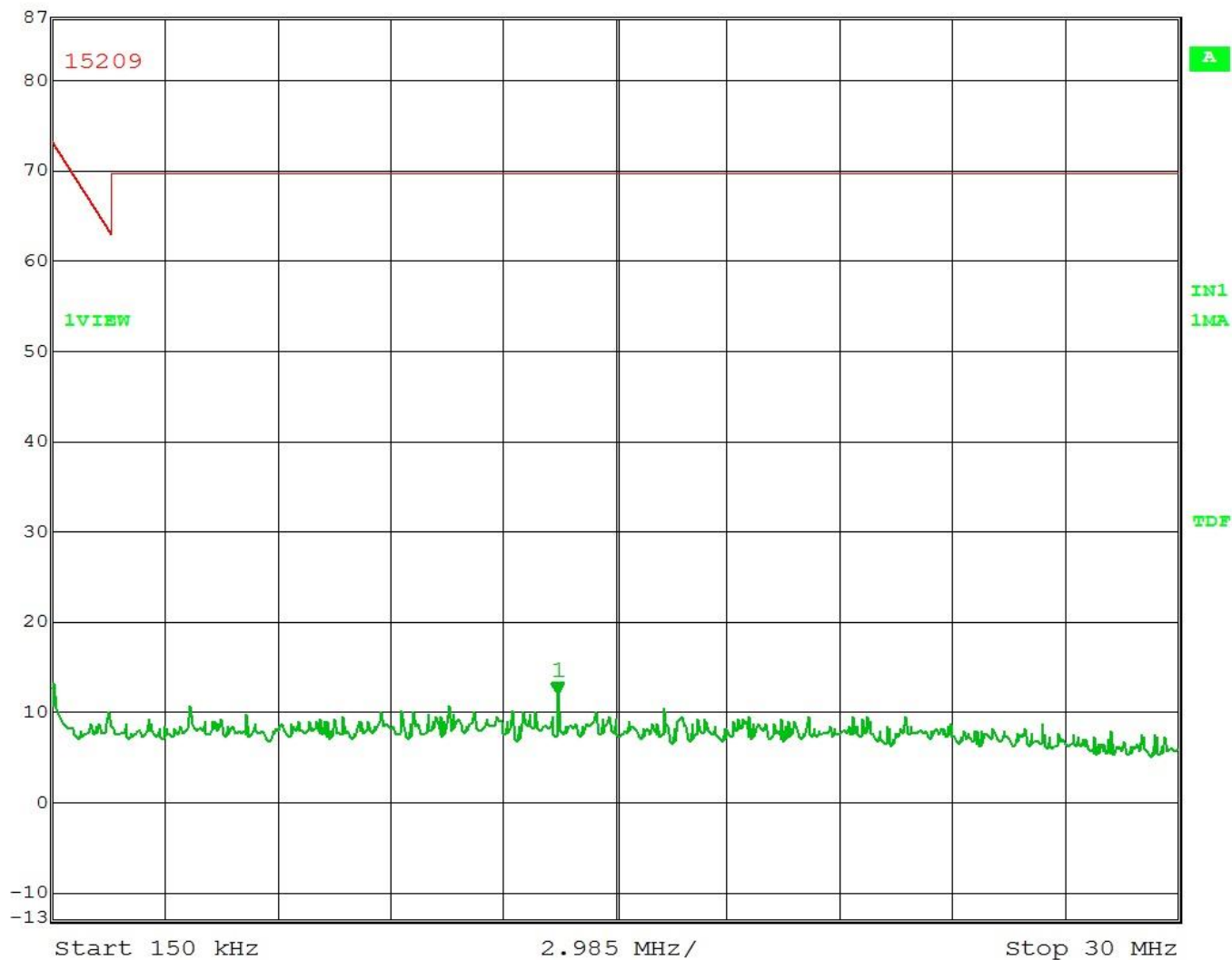
Figure 6 – Spurious Emissions (Parallel) 150 kHz to 30 MHz Measured at 1m distance

Frequency (MHz)	Peak	QP	Result
13.560	22.80	FUNDAMENTAL	Complies

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Marker 1 [T1] RBW 10 kHz RF Att 0 dB  
 Ref Lvl 11.75 dBμV VBW 10 kHz  
 87 dBμV 13.56000000 MHz SWT 760 ms Unit dBμV



Date: 18. June. 2015 23:21:50

Figure 7 – Spurious Emissions (Perpendicular) 150 kHz to 30 MHz Measured at 1m distance

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## 4.1 Frequency Tolerance

This test is to evaluate the performance of the EUT when subjected to Variations in voltage and temperature.

### 4.1.1 Over View of Test

Results	Complies (as tested per this report)					Date	6/18/2015	
Standard	FCC Part 15.225(c)							
Product Model	HS1RN4				Serial#	TS-1		
Configuration	See test plan for details							
Test Set-up	Tested in open area on ground plane . See test plans for details							
EUT Powered By	Powered Via USB	Temp	22° C	Humidity	22%	Pressure	1008mbar	
Mod to EUT	None		Test Performed By		Randall Masline			

### 4.1.2 Test Procedure

The frequency tolerance of the carrier signal shall be maintained within +/- 0.01% 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 supply voltage from 85% to 115% of the rated supply voltage at a temperature of 20 degrees C. For battery operated equipment, the equipment tests shall be performed using a new battery.

### 4.1.3 Acceptable Climatic Conditions

Unless otherwise specified by the committee responsible for the generic or product standard, the climatic conditions in the laboratory shall be within any limits specified for the operation of the EUT and the test equipment by their respective manufacturers.

Tests shall not be performed if the relative humidity is so high as to cause condensation on the EUT or the test equipment.

### 4.1.4 Deviations

There were no deviations from the test methodology listed in the test plan for the Frequency Tolerance test.

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Tolerance of carrier signal at +/- 0.01% in the 15.225(b) band for 13.567 - 13.710 MHz =  
13.565643 MHz to 13.711371 MHz

Temperature	Frequency (MHz)	Result
-20° C	13.5668722	Complies
Nom 22° C	13.56501002	Complies
+55° C	13.56002512	Complies

Voltage Variation	Frequency (MHz)	Result
85% - 102VAC	13.56998725	Complies
Nom 120VAC	13.56501002	Complies
115% - 138VAC	13.56003012	Complies

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## 5 RF Exposure - FCC

### 5.1 Exposure Requirements – FCC KDB # 447498 DO1

FCC KDB # 447498 DO1 V05r02 - Mobile and Portable Device RF Exposure and Procedures and Equipment, Appendix A shows that the SAR Text Exclusion Threshold for a device with a separation distance of 5 mm at 2450 MHz is 10 mW

#### 5.1.1 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.

#### 5.1.2 Evaluation

The EUT will be used as a portable device where the antenna will be located less than 20cm from the user, therefore SAR evaluation is required.

##### 5.1.2.1 Evaluation for FCC

FCC 447498 DO1 Mobile Portable RF Exposure V05r02, Appendix C shows that the SAR Text Exclusion Threshold for a device with a worst-case separation distance of < 50 mm and < 50 MHz is 308 mW.

The minimum power that requires SAR testing with a separation distance of 50 mm at < 50 MHz is 308 mW.

The maximum EiRP peak power output of the EUT is: < 0.1 mW

The 0.1 mW EiRP of the EUT is well below the 308 mW power level that requires SAR Testing.

#### 5.1.3 Conclusion

##### SAR data is not required for FCC

Note: The < 0.1 mW power level includes the 100% Duty Cycle factor.  
This is considered to be the absolute worst case.

#### 5.1.4 Calculated EiRP Level

Notes: The EUT does not have a means to make direct measurements.

This EiRP calculation was made using the maximum Peak Field value of 26.33 dBμV/m at 3m.

The Duty Cycle was at 100%

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**5.1.5 Antenna Gain:**

The antenna used in the EUT is a Loop antenna which is etched onto a flexible PCB.

According to the manufacturer, the antenna has a theoretical gain of 0 dBi or numeric gain of 1 (unity gain).

The stated Maximum EIRP power of the EUT is < 0.1 mW (100% Duty Cycle)

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## Appendix A

### 6 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.

#### 6.1 General Information

<b>Client</b>	JADAK LLC
<b>Address 1</b>	27279 William Barry Blvd.
<b>Address 2</b>	North Syracuse, NY 13212
<b>Contact Person</b>	Mark Macko
<b>Telephone</b>	315-218-1304
<b>Fax</b>	315-701-0679
<b>e-mail</b>	mmacko@jadaktech.com

#### 6.2 Model(s) Name

HS1RN4

#### 6.3 Type of Product

RFID Module with Passive Tag

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#### 6.4 Equipment Under Test (EUT) Description

The Model number HS1RN4 is a RFID Module with Passive Tag that operates at 13.56 MHz

#### 6.5 Modifications

No modifications were necessary to meet the requirements.

#### 6.6 Product Environment

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

\*Check all that apply

#### 6.7 Countries

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

\*Check all that apply

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## 6.8 General Product Information

Size	H	35.5cm	W	8cm	L	10cm
Weight	<1kg		Fork-Lift Needed		No	
Notes						

## 6.9 EUT Electrical Powered Information

### 6.9.1 Electrical Power Type

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

Name	Type	Voltage		Frequency	Current	Notes
		min	max			
USB	DC	5	5	DC	0.5A	
<b>Notes</b>						

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