

**ELECTRO MAGNETIC TEST, INC.**1547 Plymouth Street, Mountain View, CA 94043 Tel: (650) 965-4000 Fax: (650) 965-3000

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*FCC PART 15.247, SUBPART C  
IC RSS-247  
TEST REPORT*

*for**the*

DOSIMETER

MODEL:NM001937

Prepared for

Dosime, Inc.  
3000 Executive Pkwy #222  
San Ramon, CA 94583

Prepared by:   
GEORGE HSU

Approved by:   
KEVIN BOTHMANN

ELECTRO MAGNETIC TEST, INC.  
1547 PLYMOUTH STREET  
MOUNTAIN VIEW, CALIFORNIA 94043  
(650) 965-4000

DATE: January 5, 2017

	REPORT BODY	APPENDICES				TOTAL
		<i>A</i>	<i>B</i>	<i>C</i>	<i>D</i>	
PAGES	24	22	3	2	2	53

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## **TABLE OF CONTENTS**

<b>GENERAL REPORT SUMMARY .....</b>	<b>4</b>
<b>SUMMARY OF TEST RESULTS.....</b>	<b>5</b>
<b>TECHNICAL DESCRIPTION OF THE EUT .....</b>	<b>6</b>
<b>1. PURPOSE .....</b>	<b>7</b>
<b>2. ADMINISTRATIVE DATA.....</b>	<b>7</b>
2.1 LOCATION OF TESTING .....	7
2.2 TRACEABILITY STATEMENT.....	7
2.3 COGNIZANT PERSONNEL.....	7
2.4 DATE TEST SAMPLE WAS RECEIVED.....	7
2.5 DISPOSITION OF THE TEST SAMPLE.....	7
2.6 ABBREVIATIONS AND ACRONYMS .....	8
<b>3. APPLICABLE DOCUMENTS.....</b>	<b>9</b>
<b>4. DESCRIPTION OF TEST CONFIGURATION</b>	
4.1 DESCRIPTION OF TEST CONFIGURATION - EMI.....	10
4.1.1 Cable Construction and Termination.....	11
<b>5. LISTS OF EUT, ACCESSORIES AND TEST EQUIPMENT.....</b>	<b>12</b>
5.1 EUT AND ACCESSORY LIST.....	12
5.2 EMI TEST EQUIPMENT .....	13
<b>6. TEST SITE DESCRIPTION .....</b>	<b>14</b>
6.1 TEST FACILITY DESCRIPTION .....	14
6.2 EUT MOUNTING, BONDING AND GROUNDING.....	14
6.3 FACILITY ENVIRONMENTAL CHARACTERISTICS .....	14
<b>7. TEST PROCEDURES .....</b>	<b>15</b>
7.1 EMISSIONS IN RESTRICTED AND NON-RESTRICTED BANDS.....	16
7.1.1 General Requirements Limit (FCC PART 15 Section 15.209(a)(1), IC-RSS-GEN Issue 4, [8.9]).....	16
7.1.2 Emissions in Restricted and Non-Restricted Bands Limit (FCC PART 15 Section 15.247(d), IC-RSS-GEN Issue 4, [8.10], IC-RSS 247 Issue 1, [5.5] ).....	16
7.1.3 Test Procedure (Radiated) .....	17
7.1.4 Test Procedure (Conducted) .....	18
7.2 CONDUCTED EMISSIONS (AC POWERLINE) .....	19
7.2.1 Limit (FCC PART 15 Section 15.207(a), IC RSS-GEN Issue 4 [8.8]) .....	19
7.2.2 Test Procedure .....	19
7.3 OCCUPIED BANDWIDTH.....	20
7.3.1 Limit (FCC PART 15 Section 15.247(a)(2), IC-RSS 247 Issue 1, [5.2.1]).....	20
7.3.2 Test Procedure .....	20
7.4 MAXIMUM PEAK OUTPUT POWER .....	21
7.4.1 Limit (FCC PART 15 Section 15.247(b)(3), IC-RSS 247 Issue 1, [5.4.4]).....	21
7.4.2 Test Procedure .....	21
7.5 MAXIMUM PEAK POWER SPECTRAL DENSITY.....	22
7.5.1 Limit (FCC PART 15 Section 15.247(e), IC-RSS 247 Issue 1, [5.2.2]) .....	22
7.5.2 Test Procedure .....	22
7.6 ANTENNA REQUIREMENT.....	23
7.6.1 Requirement (FCC PART 15 SECTION 15.203, 15.247(c)(i)) .....	23
<b>8. CONCLUSIONS / COMPLIANCE STATEMENT .....</b>	<b>24</b>

**ELECTRO MAGNETIC TEST, INC.**

1547 Plymouth Street, Mountain View, CA 94043 Tel: (650) 965-4000 Fax: (650) 965-3000

## LIST OF APPENDICES

APPENDIX	TITLE
A	Radiated and Conducted Data Sheets <ul style="list-style-type: none"><li>• Radiated Emissions Test Data (General Requirements, and Restricted Bands)</li><li>• Emissions in Non-Restricted Frequency Bands Test Data</li><li>• Occupied Bandwidth Test Data</li><li>• Maximum Peak Output Power Test Data</li><li>• Maximum Peak Power Spectral Density Test Data</li><li>• Band Edge Test Data</li></ul>
B	Test Setup Diagrams
C	Modifications To The EUT
D	Additional Models Covered Under This Report

## LIST OF FIGURES

FIGURE	TITLE
1	Conducted Emissions Test Setup
2	Plot Map And Layout of Test Site
3	Layout of 5 Meter Semi-Anechoic Chamber


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1547 Plymouth Street, Mountain View, CA 94043 Tel: (650) 965-4000 Fax: (650) 965-3000

### GENERAL REPORT SUMMARY

This electromagnetic emission test report is generated by Electro Magnetic Test, Inc., which is an independent testing and consulting firm. The test report is based on testing performed Electro Magnetic Test, Inc. personnel according to the measurement procedure described in the test specification given below and in the "Test Procedures" section of this report.

The measurement data and conclusions appearing herein relate only to the sample tested and this report may not be reproduced in any form unless done so in full.

This report must not be used to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the U.S. Federal Government.

The measurement data and conclusions contained in this test report are deemed satisfactory evidence of compliance with Industry Canada Interference-Causing Equipment Standard ICES-003, Issue 5, August 2012.

Electro Magnetic Test, Inc. is recognized by the following agencies for performing EMI/EMC testing:

COUNTRY	AGENCY	IDENTIFYING #
USA	Federal Communications Commission (FCC) (EMT's test site is recognized by the FCC)	Registration Number: 90576
USA, Canada, Taiwan, Australia/New Zealand, European Community	National Voluntary Lab Accreditation Program (NVLAP) (EMT is accredited by NVLAP. A copy of the NVLAP Scope Of Accreditation is available upon request.)	Lab Code: 200147-0
Canada	Industry Canada	File No.: IC 2804
Japan	Voluntary Control Council For Interference (VCCI)	A-0118
	Open Field Test Site "A"	-
	Mains Conducted Emissions Test Site "D"	-
	Telecom Conducted Emissions Test Site "D"	-
	3 Meter Semi-Anechoic Chamber Site "E"	-
	3 Meter Semi-Anechoic Chamber Site "E" (1GHz – 6GHz)	-
	Mains Conducted Emissions Test Site "E"	-
	Telecom Conducted Emissions Test Site "E"	-
Korea	Ministry of Information and Communication's Radio Research Laboratory (RRL) under the Asia Pacific Economic Cooperation (APEC) Mutual Recognition Arrangement (A copy of the Scope Of Accreditation is available upon request)	US0036
Taiwan	Bureau Of Standards, Metrology and Inspection (BSMI)	Reference Number: SL2-IN-E-1024
Australia / New Zealand	Australian Communications Authority (AUSTEL)	*

\*These agencies do not issue an identifying number to test labs.


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1547 Plymouth Street, Mountain View, CA 94043 Tel: (650) 965-4000 Fax: (650) 965-3000

**GENERAL REPORT SUMMARY (CONTINUED)**

Device Tested: DOSIMETER  
Model: NM001937  
S/N: N/A

Product Description: The EUT is a BLE dosimeter that also accepts wireless recharging

Modifications: The EUT was not modified during the testing.

Manufacturer: Dosime, Inc.  
3000 Executive Pkwy #222  
San Ramon, CA 94583

Test Date(s): November 25, and December 12, 2016

Test Specifications: EMI requirements  
Limits: FCC Title 47, Part 15 Subpart C  
Test Procedure: ANSI C63.10.2013

Test Deviations: The test procedure was not deviated from during the testing.

**SUMMARY OF TEST RESULTS**

TEST	DESCRIPTION	FCC STANDARD	IC STANDARD	REMARKS	RESULTS
7.1	Emissions in Restricted and Non-Restricted Bands	15.209, 15.247, 15.247(d)	RSS-GEN Issue 4, [8.9] RSS 247 Issue 1, [5.5]:	Radiated	<b>PASS</b>
7.2	Conducted Emissions	15.207(a)	RSS-GEN Issue 4 [8.8]	Conducted	<b>N/A***</b>
7.3	Occupied Bandwidth	15.247(a)(2)	RSS 247 Issue 1, [5.2.1, 6.2.4.1]	Conducted	<b>PASS</b>
7.4	Maximum Peak Output Power	15.247 (b)	RSS 247 Issue 1, [5.4.4]	Conducted	<b>PASS</b>
7.5	Maximum Peak Power Spectral Density	15.247(e)	RSS 247 Issue 1, [5.2.2]	Conducted	<b>PASS</b>
7.6	Antenna Requirement	15.203, 15.247(b)(4))	N/A	N/A	<b>PASS</b>

\*\*\*The device is battery powered and does not have any physical cable connections


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### TECHNICAL DESCRIPTION OF THE EUT

<b>Manufacturer:</b>		Dosime, Inc					
<b>Manufacturer Address:</b>		3000 Executive Pkwy #222, San Ramon, CA 94583					
<b>EUT Name:</b>		DOSIMETER					
<b>Model No:</b>		NM001937					
<b>Operation frequency:</b>		2402 MHz to 2480 MHz					
<b>Channel Number:</b>		40					
<b>Modulation Technology:</b>		DSSS					
<b>Antenna Type:</b>		PCB Antenna					
<b>Antenna Gain:</b>		-10.05 dBi					
<b>Maximum Output Power:</b>		0.907 dBm					
<b>Description of Channel:</b>							
<b>Bluetooth LE</b>							
<b>Channel</b>	<b>Frequency (MHz)</b>	<b>Channel</b>	<b>Frequency (MHz)</b>	<b>Channel</b>	<b>Frequency (MHz)</b>	<b>Channel</b>	<b>Frequency (MHz)</b>
0	2402	10	2422	20	2442	30	2462
1	2404	11	2424	21	2444	31	2464
2	2406	12	2426	22	2446	32	2466
3	2408	13	2428	23	2448	33	2468
4	2410	14	2430	24	2450	34	2470
5	2412	15	2432	25	2452	35	2472
6	2414	16	2434	26	2454	36	2474
7	2416	17	2436	27	2456	37	2476
8	2418	18	2438	28	2458	38	2478
9	2420	19	2440	29	2460	39	2480

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## **1. PURPOSE**

This document is a qualification test report based on the Electromagnetic Interference (EMI) tests performed on the DOSIMETER Model: NM001937. The EMI measurements were performed according to the measurement procedure described in ANSI C63.10.2013. The tests were performed in order to determine whether the electromagnetic emissions from the equipment under test, referred to as EUT hereafter, are within the specification limits defined in FCC Title 47, Part 15, Subpart C.

## **2. ADMINISTRATIVE DATA**

### **2.1 Location of Testing**

The EMI tests described herein were performed at the test facility of Electro Magnetic Test, Inc., 1547 Plymouth Street, Mountain View, California, 94043.

### **2.2 Traceability Statement**

The calibration certificates of all test equipment used during the test are on file at the location of the test. The measurement results in this report and the calibration of the test equipment are traceable to the National Institute of Standards and Technology (NIST).

### **2.3 Cognizant Personnel**

#### Dosime, Inc.

Cindy Meyrath                      Vice President

#### Electro Magnetic Test, Inc.

David Vivanco                      Test Technician  
George Hsu                          Test Technician  
Kevin Bothmann                      Lab Manager

### **2.4 Date Test Sample was Received**

The test sample was received on November 25, 2016.

### **2.5 Disposition of the Test Sample**

The test sample has not yet been returned to Dosime, Inc..

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## **2.6 Abbreviations and Acronyms**

The following abbreviations and acronyms may be used in this document.

RF	Radio Frequency
EMI	Electromagnetic Interference
EUT	Equipment Under Test
P/N	Part Number
S/N	Serial Number
HP	Hewlett Packard
ITE	Information Technology Equipment
CML	Corrected Meter Limit
LISN	Line Impedance Stabilization Network
CISPR	International Special Committee On Radio Interference
FCC	Federal Communications Commission



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1547 Plymouth Street, Mountain View, CA 94043 Tel: (650) 965-4000 Fax: (650) 965-3000

### 3. APPLICABLE DOCUMENTS

The following documents are referenced or used in the preparation of this EMI Test Report.

SPEC	TITLE
RSS-Gen Issue 4, November 2014	General Requirements and Information for the Certification of Radio Apparatus
RSS 247, Issue 1, May 2015	Digital Transmission Systems (DTSS), Frequency Hopping Systems (FHSs) and Licence-Exempt Local Area Network (LE-LAN) Devices
FCC Title 47, Part 15, Subpart C	FCC Rules - Radio frequency devices (including digital devices).
FCC Publication KDB558074	Guidance for Performing Compliance Measurements on Digital Transmissions Systems (DTS) Operating Under 15.247, April 8, 2016
ANSI C63.10-2013	American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices.

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#### **4. DESCRIPTION OF TEST CONFIGURATION**

##### **4.1 Description of Test Configuration – EMI**

During testing the Bluetooth LE radio was continuously transmitting.

It was determined that the emissions were at their highest level when the EUT was operating in the above configuration. The cables were moved to maximize the emissions. The final conducted as well as radiated data was taken in this mode of operation. All initial investigations were performed with the EMI receiver in manual mode scanning the frequency range continuously. The cables were bundled and routed as shown in the photographs in Appendix B.



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#### **4.1.1 Cable Construction and Termination**

The EUT does not have any cables


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## 5. LISTS OF EUT, ACCESSORIES AND TEST EQUIPMENT

### 5.1 EUT and Accessory List

EQUIPMENT TYPE	MANUFACTURER	MODEL	SERIAL NUMBER	FCC ID
DOSIMETER(EUT)	DOSIME, INC.	NM001937	N/A	2AKMV-DOSIME
THE FOLLOWING WERE LOCATED OUTSIDE THE TEST SITE:				
REMOTE LAPTOP	DELL	LATTITUDE D630	FZFDLJ1	N/A
REMOTE LAPTOP POWER SUPPLY	DELL	PA-1900-02D	CN-09T215-71615-42I-6608	DoC


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**5.2 EMI Test Equipment**

EQUIPMENT TYPE	MANUFACTURER	MODEL NUMBER	SERIAL NUMBER	CAL. DATE	CAL. CYCLE
EMI Receiver	Rohde & Schwarz	ESU40	100127	March 11, 2016	1 Year
EMI Test Software	Rohde & Schwarz	EMC32	V8.40.0	N/A	N/A
Biconical Antenna	Com Power	AB-100	01557	June 17, 2016	1 Year
Log Periodic Antenna	Com Power	AL-100	16001	June 17, 2016	1 Year
Passive Loop Antenna (9 KHz – 30 MHz)	ETS-Lindgren	6512	00128210	April 23, 2015	2 Years
BiConiLog Antenna (30 MHz – 1 GHz)	ETS-Lindgren	3142D	00109337	July 8, 2016	1 Year
Antenna Mast	ETS-Lindgren	2175	00095727	N/A	N/A
Turntable	ETS-Lindgren	2187-3.0	00118231	N/A	N/A
Computer	Dell, Inc.	OPTIPLEX 745	4T50WC1	N/A	N/A
Multi-Function Controller	ETS-Lindgren	2090	00102270	N/A	N/A
Spectrum Analyzer	Hewlett Packard	8566B	3024A20115	September 30, 2016	1 Year
RF Preselector	Hewlett Packard	85685A	3010A01157	September 30, 2016	1 Year
Quasi-Peak Adapter	Hewlett Packard	85650A	2430A00451	September 30, 2016	1 Year
Conducted EMI Software	ETS-Lindgren	Tile!	Rev. 7.0.12.697	N/A	N/A
RF Attenuator	Com Power	LIT-153A	531175	March 17, 2016	1 Year
LISN	Solar Electronics	Type 21107-50-TS-50-N	21107150701	August 3, 2016	1 Year
LISN	Solar Electronics	Type 21107-50-TS-50-N	21107150702	August 3, 2016	1 Year
LISN	Solar Electronics	Type 21107-50-TS-50-N	21107150703	August 3, 2016	1 Year
LISN	Solar Electronics	Type 21107-50-TS-50-N	21107150704	August 3, 2016	1 Year

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## **6. TEST SITE DESCRIPTION**

### **6.1 Test Facility Description**

Please refer to the table below and section 7 of this report for the details of which sites were used for testing. All sites are located at 1547 Plymouth Street, Mountain View, California 94043.

<b>Site Used For Test</b>	<b>Site Description</b>
	Open Field Test Site "A"
	Mains Conducted Emissions Test Site "D"
	Telecom Conducted Emissions Test Site "D"
X	3 Meter Semi-Anechoic Chamber Site "E"
	Mains Conducted Emissions Test Site "E"
	Telecom Conducted Emissions Test Site "E"

### **6.2 EUT Mounting, Bonding and Grounding**

The EUT was mounted on a 1.0 by 1.5 meter non-conductive table 0.8 meters above the ground plane.

The EUT was not grounded.

### **6.3 Facility Environmental Characteristics**

All tests were performed in a climate controlled building. The temperature was 22° C, humidity 45%, and barometric pressure 102.6 kPa.


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## 7. TEST PROCEDURES

### 7.1 Emissions in Restricted and Non-Restricted Bands

#### 7.1.1 General Requirements Limit (FCC PART 15 Section 15.209(a)(1), IC-RSS-GEN Issue 4, [8.9])

Frequency of Emission (MHz)	Field Strength		Measurement Distance (Meters)
	$\mu\text{V/m}$	$\text{dB}\mu\text{V/m}$	
0.009-0.49	2400/F(kHz)		300
0.49-1.705	24000/F(kHz)		30
1.705-30	30		30
30-88	100	40	3
88-216	150	43.5	3
216-960	200	46	3
Above 960	500	54	3

#### 7.1.2 Emissions in Restricted and Non-Restricted Bands Limit (FCC PART 15 Section 15.247(d), IC-RSS-GEN Issue 4, [8.10], IC-RSS 247 Issue 1, [5.5] )

##### Emissions in Restricted and Non-Restricted Bands FCC PART 15 Section 15.247(d):

In any 100 kHz 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 the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).


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**7.1.2**
**Emissions in Restricted and Non-Restricted Bands Limit (FCC PART 15 Section 15.247(d), IC-RSS-GEN Issue 4, [8.10], IC-RSS 247 Issue 1, [5.5] ) (Continued)**
**Emissions in Restricted Bands IC-RSS-GEN Issue 4, [8.10]:**

Restricted bands, identified in Table 6, are designated primarily for safety-of-life services (distress calling and certain aeronautical bands), certain satellite downlinks, radio astronomy and some government uses. Except where otherwise indicated, the following restrictions apply:

- (a) Fundamental components of modulation of licence-exempt radio apparatus shall not fall within the restricted bands of Table 6 except for apparatus complying under RSS-287
- (b) Unwanted emissions that fall into restricted bands of Table 6 shall comply with the limits specified in RSS-Gen; and
- (c) Unwanted emissions that do not fall within the restricted frequency bands of Table 6 shall comply either with the limits specified in the applicable RSS or with those specified in this RSS-Gen.

<b>Limit (For Restricted Bands)</b>
See General Limits Requirement In Above Chart (Section 7.1.1)

**Emissions in Non-Restricted Bands IC-RSS 247 Issue 1, [5.5]:**

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the RF power that is produced shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided that the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits, based on the use of root-mean-square averaging over a time interval, as permitted under Section 5.4(4), the attenuation required shall be 30 dB instead of 20 dB. Attenuation below the general field strength limits specified in RSS-Gen is not required.

<b>Limit (For Non Restricted Bands)</b>
20db Below Peak Power Spectral Density
30db Below Average Power Spectral Density



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### 7.1.3 Test Procedure (Radiated)

The Rohde & Schwarz ESU40 EMI receiver was used as a measuring meter while under software control by the Rohde & Schwarz EMC32 software. To increase the sensitivity of the instrument, the built in preamplifier was used from 9 KHz to 1 GHz and an external preamplifier was used from 1 GHz to 26.5 GHz. The EMI receiver was used in the peak detect mode with the "Max Hold" feature activated. In this mode, the EMI receiver records the highest measured reading over all the sweeps. The built in quasi-peak or average detector was used only for those readings which are marked accordingly on the data sheets. The effective measurement bandwidth used for the radiated emissions test was 100 kHz from 9 kHz to 26.5 GHz.

The Loop Antenna, Broadband BiConiLog and horn antennas were used as transducers during the measurement. The Loop antenna was used from 9 KHz to 30 MHz, the BiConiLog antenna was used from 30 MHz to 1000 MHz and horn antennas were used from 1GHz – 26.5 GHz. The frequency spans were wide (9 kHz to 150 kHz, 150 kHz to 30 MHz, 30 MHz to 88 MHz, 88 MHz to 216 MHz, 216 to 300 MHz, 300 MHz to 1 GHz, 1 GHz to 18 GHz and 18 GHz to 26.5 GHz) during preliminary investigations. The final data was taken with a frequency span of 1 MHz. Furthermore, the frequency span was reduced during the preliminary investigations as deemed necessary.

The 5 meter semi-anechoic chamber of Electro Magnetic Test, Inc. was used for radiated emission testing. This test site is set up according to ANSI C63.10.2013. Please see section 6.2 of this report for mounting, bonding and grounding of the EUT. The turntable supporting the EUT is remote controlled using a motor. The turntable permits EUT rotation of 360 degrees in order to maximize emissions. Also, the antenna mast allows height variation of the antenna from 1 meter to 4 meters. Data was collected in the worst case (highest emission) configuration of the EUT. The EUT was rotated 360 degrees and the antenna height was varied from 1 to 4 meters (for E field radiated field strength).

The presence of non EUT signals was verified by turning the EUT off. In case a non EUT signal was detected, the measurement bandwidth was reduced temporarily and verification was made that an additional adjacent peak did not exist. This ensures that the other signal does not hide any emissions from the EUT. The EUT was tested at a 3 meter test distance from 9 kHz to 26.5 GHz. to obtain final test data.

Calculation Of Radiated Emission Test Data:

Amplitude - Gain + Antenna Factor + Cable Loss = Corrected Amplitude

Corrected Amplitude - Limit = Margin

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#### **7.1.4 Test Procedure (Conducted)**

(1) Connect the antenna port of the EUT to the spectrum analyzer via an Attenuator, set the Spectrum Analyzer as below:

RBW: 100 KHz

VBW:  $\geq 3 \times$  RBW

Detector: Peak

Trace Mode: Max Hold

Span  $\geq 1.5$  DTS Bandwidth

(2) Set Frequency Span to DTS Channel Center Frequency

(1) Use Peak Marker Function, This is your reference PSD

RBW: 100 KHz

VBW:  $\geq 3 \times$  RBW

Detector: Peak

Trace Mode: Max Hold

(4) Set Span to encompass frequency range

(5) Report highest emissions


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## 7.2 Conducted Emissions Test – Mains Ports

### 7.2.1 Limit (FCC PART 15 Section 15.207(a), IC RSS-GEN Issue 4 [8.8])

Frequency of Emission (MHz)	Conducted Limit (dBμV)	
	Quasi-peak	Average
0.15-0.5	66 to 56 *	56 to 46 *
0.5-5	56	46
5-30	60	50

\*Note: Decreases with the logarithm of the frequency

### 7.2.2 Test Procedure

The HP 8566B spectrum analyzer was used as a measuring meter along with the HP 85650A quasi-peak adapter. The data was collected with the spectrum analyzer in the peak detect mode with the "Max Hold" feature activated. The quasi-peak detector was used only where indicated in the data sheets. A 10 dB attenuation pad was used for the protection of the spectrum analyzer input stage, and the spectrum analyzer offset was adjusted accordingly to read the actual data measured. The LISN output was read by the HP 8566B spectrum analyzer. The output of the second LISN was terminated by a 50 ohm termination. The effective measurement bandwidth used for the conducted emissions test was 9 kHz.

Please see section 6.2 of this report for mounting, bonding and grounding of the EUT. The EUT was powered through the LISN, which was bonded to the ground plane. The LISN power was filtered and the filter was bonded to the ground plane. The EUT was set up with the minimum distances from any conductive surfaces as specified in ANSI C63.10.2013. The excess power cord was wrapped in a figure eight pattern to form a bundle not exceeding 0.4 meters in length.

The initial test data was taken in manual mode while scanning the frequency ranges of 0.15 MHz to 1.6 MHz, 1.6 MHz to 5 MHz and 5 MHz to 30 MHz. The conducted emissions from the EUT were maximized for operating mode as well as cable and peripheral placement. Once a predominant frequency (within 12 dB of the limit) was found, it was more closely examined with the spectrum analyzer span adjusted to 1 MHz.

The final data was collected under program control by the HP 85869PC software in several overlapping sweeps by running the spectrum analyzer at a minimum scan rate of 10 seconds per octave.

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### 7.3 Occupied Bandwidth

#### 7.3.1 Limit (FCC PART 15 Section 15.247(a)(2), IC-RSS 247 Issue 1, [5.2.1])

##### FCC PART 15 Section 15.247(a)(2)

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

##### IC-RSS 247 Issue 1 [5.2.1]

DTSS include systems that employ digital modulation techniques resulting in spectral characteristics similar to direct sequence systems. The following applies to the bands 902-928 MHz and 2400-2483.5 MHz

Limit
6 dB Bandwidth $\geq$ 500 kHz

#### 7.3.2 Test Procedure

Connect the antenna port of the EUT to the spectrum analyzer via an Attenuator, set the Spectrum Analyzer as below:

RBW: 100 kHz

VBW:  $\geq 3 \times$  RBW

Detector: Peak

Trace Mode: Max Hold

(2) Set analyzer center frequency to center of signal

(3) Turn on occupied bandwidth measurement mode

(4) Set measurement to 6db bandwidth

#### 7.3.3 Test Result

The EUT meets the requirements. Please see the datasheets in Appendix A for the measurement results.

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## **7.4 Maximum Peak Output Power**

### **7.4.1 Limit (FCC PART 15 Section 15.247(b)(3), IC-RSS 247 Issue 1, [5.4.4])**

#### **FCC PART 15 Section 15.247(b)(3)**

For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 Watt.

#### **IC-RSS 247 Issue 1, [5.4.4]**

For DTSSs employing digital modulation techniques operating in the bands 902-928 MHz and 2400-2483.5 MHz, the maximum peak conducted output power shall not exceed 1W. Except provided in Section 5.4(5), the e.i.r.p. shall not exceed 4 W.

<b>Limit</b>
Maximum Peak Output Power (Digital Modulation) $\leq$ 1Watt or 30 dBm

### **7.4.2 Test Procedure**

Connect the antenna port of the EUT to the spectrum analyzer via an Attenuator and set the Spectrum Analyzer as below:

RBW > DTS Bandwidth

VBW  $\geq$  3 x RBW

Span  $\geq$  3 \* RBW

Detector: Peak

Trace Mode: Max Hold

- (1) When the trace is completed, mark the peak value

### **7.4.3 Test Result**

The EUT meets the requirements. Please see the datasheets in Appendix A for the measurement results.

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**7.5 Maximum Peak Power Spectral Density****7.5.1 Limit (FCC PART 15 Section 15.247(e), IC-RSS 247 Issue 1, [5.2.2])****FCC PART 15 Section 15.247(e)**

For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission. This power spectral density shall be determined in accordance with the provisions of paragraph (b) of this section. The same method of determining the conducted output power shall be used to determine the power spectral density

**IC-RSS 247 Issue 1, [5.2.2]**

The transmitter power spectral density conducted from the transmitter to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission. This power spectral density shall be determined in accordance with the provisions of Section 5.4(4), (i.e. the power spectral density shall be determined using the same method as is used to determine the conducted output power)

Limit
8 dBm/3 KHz

**7.5.2 Test Procedure**

Connect the antenna port of the EUT to the spectrum analyzer via an Attenuator and set the Spectrum Analyzer as below:

$3 \text{ kHz} \leq \text{RBW} \leq 100 \text{ kHz}$

$\text{VBW} \geq 3 \times \text{RBW}$

$\text{Span} \geq 1.5 \times \text{DTS Bandwidth}$

Detector: Peak

Sweep Time auto

(1) Use Peak Marker Function

(2) If value Exceeds limit, reduce RBW ( no less than 3 kHz)

**7.5.3 Test Result**

The EUT meets the requirements. Please see the datasheets in Appendix A for the measurement results.

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## **7.6 Antenna Requirement**

### **7.6.1 Requirement (FCC PART 15 SECTION 15.203,15.247(b)(4))**

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this Section.

(4) The conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

### **7.6.2 Test Result**

The antenna is integrated on the main PCB with no consideration for replacement on the NM001937.

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**8. CONCLUSIONS / COMPLIANCE STATEMENT**

Based upon the results contained in this report, Electro Magnetic Test, Inc. has determined that the DOSIMETER, Model:NM001937 meets all of the specification limits defined in FCC Title 47, Part 15, Subpart C.





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## **APPENDIX A**

# ***RADIATED AND CONDUCTED DATA SHEETS***

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**Radiated Emissions (Emissions in Restricted and Non-Restricted Bands)**

EUT:	DOSIMETER	Model Name:	NM001937
Test Mode:	BLE	Test Date:	11/25/2016
Test Engineer:	George Hsu	Measurement:	9 KHz to 30 MHz

The amplitude of spurious emissions from intentional radiators and emissions from unintentional radiators were attenuated more than 20 dB below the permissible value


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**Radiated Emissions (Emissions in Restricted and Non-Restricted Bands)**

EUT:	DOSIMETER	Model Name:	NM001937
Test Mode:	BLE Chanel 0	Test Date:	11/25/2016
Test Engineer:	George Hsu	Measurement:	30 MHz to 1 GHz

**Quasipeak Measurement:**

Frequency (MHz)	QuasiPeak (dB $\mu$ V/m)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dB $\mu$ V/m)
37.380000	23.1	100.0	V	44.0	12.1	16.90	40.00
43.260000	20.8	100.0	V	323.0	9.6	19.20	40.00
55.680000	33.5	100.0	V	355.0	7.4	6.50	40.00
55.860000	34.4	126.0	V	16.0	7.4	5.60	40.00
56.100000	32.1	100.0	V	0.0	7.4	7.90	40.00
56.640000	33.1	100.0	V	16.0	7.4	6.90	40.00
57.090000	34.6	120.0	V	325.0	7.4	5.40	40.00
57.240000	34.0	114.0	V	322.0	7.4	6.00	40.00
57.570000	34.3	119.0	V	314.0	7.4	5.70	40.00
57.780000	31.7	195.0	V	0.0	7.4	8.30	40.00
60.120000	28.0	142.0	V	354.0	7.3	12.00	40.00
132.510000	24.8	150.0	H	256.0	9.0	18.70	43.50
272.730000	23.6	120.0	H	113.0	14.4	22.40	46.00
952.380000	27.5	100.0	H	0.0	27.7	18.50	46.00


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**Radiated Emissions (Emissions in Restricted and Non-Restricted Bands)**

EUT:	DOSIMETER	Model Name:	NM001937
Test Mode:	BLE Channel 0	Test Date:	11/25/2016
Test Engineer:	George Hsu	Measurement:	1 GHz to 18 GHz

**Peak Measurement**

Frequency (MHz)	Peak (dB $\mu$ V/m)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dB $\mu$ V/m)
4803.866667	52.1	216.0	V	0.0	6.4	21.90	74.00
4804.000000	50.3	248.0	H	63.0	6.4	23.70	74.00
7206.000000	55.2	214.0	H	92.0	10.5	18.80	74.00
7206.000000	57.7	207.0	V	346.0	10.5	16.30	74.00

**Quasipeak Measurement:**

Frequency (MHz)	QuasiPeak (dB $\mu$ V/m)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dB $\mu$ V/m)
4803.866667	39.8	216.0	V	0.0	6.4	14.20	54.00
4804.000000	38.7	248.0	H	63.0	6.4	15.30	54.00
7206.000000	51.4	214.0	H	92.0	10.5	2.60	54.00
7206.000000	53.0	207.0	V	346.0	10.5	1.00	54.00

All other spurious emissions from intentional radiators and emissions from unintentional radiators were attenuated more than 20 dB below the permissible value


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**Radiated Emissions (Emissions in Restricted and Non-Restricted Bands)**

EUT:	DOSIMETER	Model Name:	NM001937
Test Mode:	BLE Channel 19	Test Date:	11/25/2016
Test Engineer:	George Hsu	Measurement:	1 GHz to 18 GHz

**Peak Measurement:**

Frequency (MHz)	Peak (dB $\mu$ V/m)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dB $\mu$ V/m)
4879.400000	44.7	212.0	H	220.0	6.2	29.30	74.00
4879.966667	48.1	248.0	V	0.0	6.2	25.90	74.00
7320.033333	54.0	195.0	H	86.0	10.5	20.00	74.00
7320.033333	55.8	219.0	V	0.0	10.5	18.20	74.00
17673.033333	58.5	248.0	V	58.0	25.7	15.50	74.00

**Quasipeak Measurement:**

Frequency (MHz)	QuasiPeak (dB $\mu$ V/m)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dB $\mu$ V/m)
4879.400000	34.5	212.0	H	220.0	6.2	19.50	54.00
4879.966667	42.7	248.0	V	0.0	6.2	11.30	54.00
7320.033333	50.1	195.0	H	86.0	10.5	3.90	54.00
7320.033333	52.8	219.0	V	0.0	10.5	1.20	54.00
17673.033333	45.4	248.0	V	58.0	25.7	8.60	54.00

All other spurious emissions from intentional radiators and emissions from unintentional radiators were attenuated more than 20 dB below the permissible value


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**Radiated Emissions (Emissions in Restricted and Non-Restricted Bands)**

EUT:	DOSIMETER	Model Name:	NM001937
Test Mode:	BLE Channel 39	Test Date:	11/25/2016
Test Engineer:	George Hsu	Measurement:	1 GHz to 18 GHz

**Peak Measurement**

Frequency (MHz)	Peak (dB $\mu$ V/m)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dB $\mu$ V/m)
4959.400	54.0	219.0	V	201.0	6.3	20.0	74.00
4959.200	52.1	222.0	H	56.0	6.3	21.9	74.00
7439.913	43.7	201.1	H	360.0	10.5	30.3	74.00
7439.915	52.5	212.4	V	357.5	10.5	21.5	74.00

**Quasipeak Measurement:**

Frequency (MHz)	QuasiPeak (dB $\mu$ V/m)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dB $\mu$ V/m)
4959.400	45.2	219.0	V	201.0	6.3	8.8	54.00
4959.200	46.5	222.0	H	56.0	6.3	7.5	54.00
7439.913	41.3	201.1	H	360.0	10.5	12.7	54.00
7439.915	51.7	212.4	V	357.5	10.5	2.3	54.00

All other spurious emissions from intentional radiators and emissions from unintentional radiators were attenuated more than 20 dB below the permissible value

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**Radiated Emissions (Emissions in Restricted and Non-Restricted Bands)**

EUT:	DOSIMETER	Model Name:	NM001937
Test Mode:	BLE	Test Date:	11/25/2016
Test Engineer:	George Hsu	Measurement:	18 GHz to 26.5 GHz

The amplitude of spurious emissions from intentional radiators and emissions from unintentional radiators were attenuated more than 20 dB below the permissible value


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**6dB Bandwidth and Occupied Bandwidth Test (Conducted)**

<b>Company:</b>	DOSIME, INC.		<b>Test Date:</b>	12/12/2016		
<b>EUT Name:</b>	DOSIMETER		<b>Test Engineer:</b>	George Hsu		
<b>Model:</b>	NM001937		<b>Test Result:</b>	PASS		
<b>Operating Mode:</b>	TX Mode					
<b>Mode</b>	<b>Test CH</b>	<b>Frequency (MHz)</b>	<b>6 dB Bandwidth (KHz)</b>	<b>99% Occupied Bandwidth (MHz)</b>	<b>6 dB Bandwidth Limit (KHz)</b>	<b>Conclusion</b>
<b>Bluetooth LE</b>	0	2402	705.4	1.0738	$\geq 500$	PASS
	19	2440	715.6	1.0723	$\geq 500$	PASS
	39	2480	725.1	1.0822	$\geq 500$	PASS
Test Equipment: Please refer to section 5.2						



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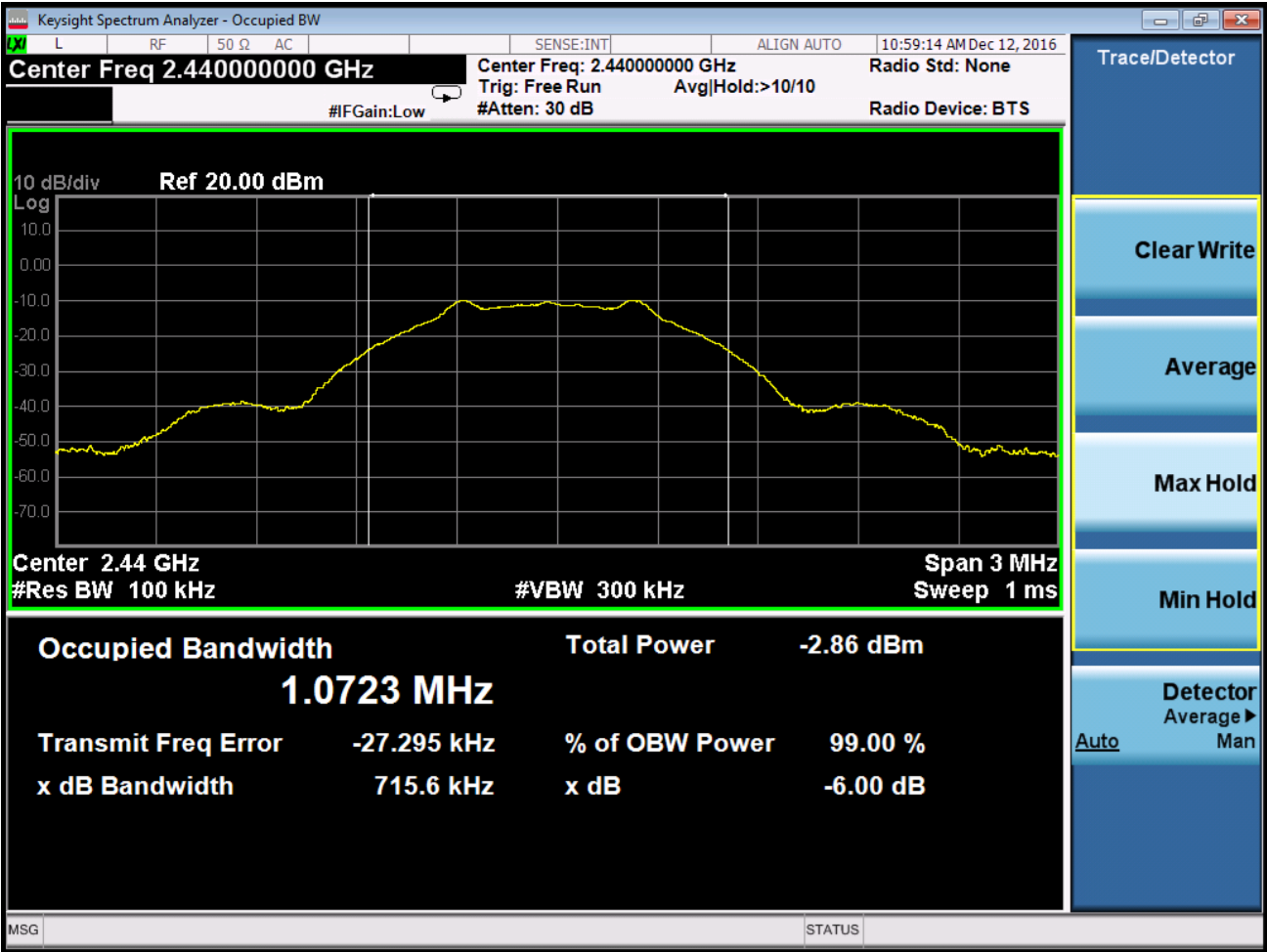
**6dB Bandwidth and Occupied Bandwidth Test (Conducted)****Channel 0**



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**6dB Bandwidth and Occupied Bandwidth Test (Conducted)**



**Channel 19**



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**6dB Bandwidth and Occupied Bandwidth Test (Conducted)**



**Channel 39**


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**Maximum Peak Output Power Test Data (Conducted)**

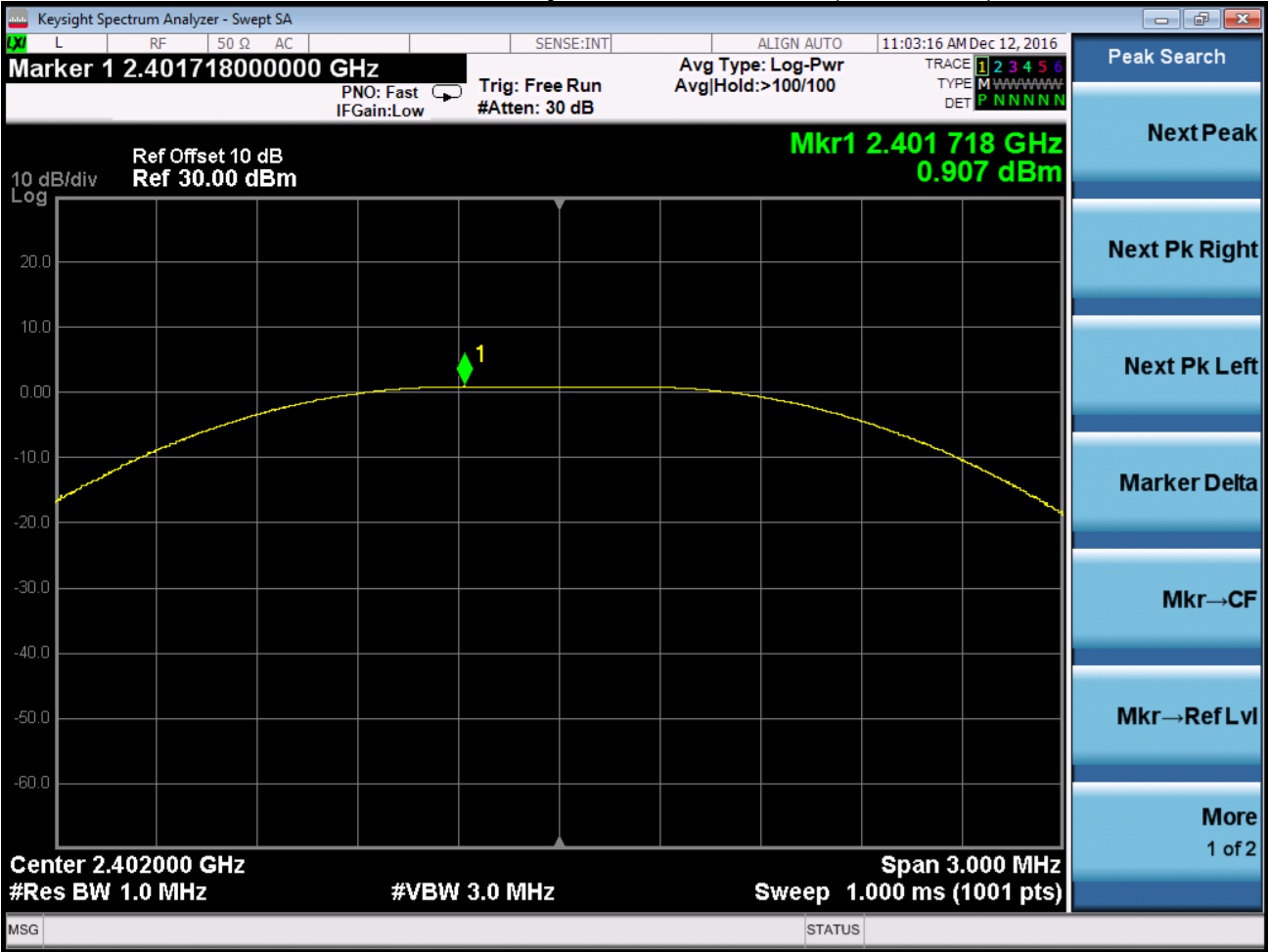
Company:	DOSIME, INC.		Test Date		12/12/2016	
EUT Name	DOSIMETER		Test Engineer		George Hsu	
Model:	NM001937		Test Result		PASS	
Operating Mode	TX Mode					
Mode		Test CH	Frequency (MHz)	Peak Output Power (dBm)	Limit (dBm)	Conclusion
Bluetooth LE		0	2402	0.907	≤ 30	Pass
		19	2440	0.259	≤ 30	Pass
		39	2480	0.110	≤ 30	Pass
Test Equipment: Please refer to section 5.2						



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Maximum Peak Output Power Test Data (Conducted)



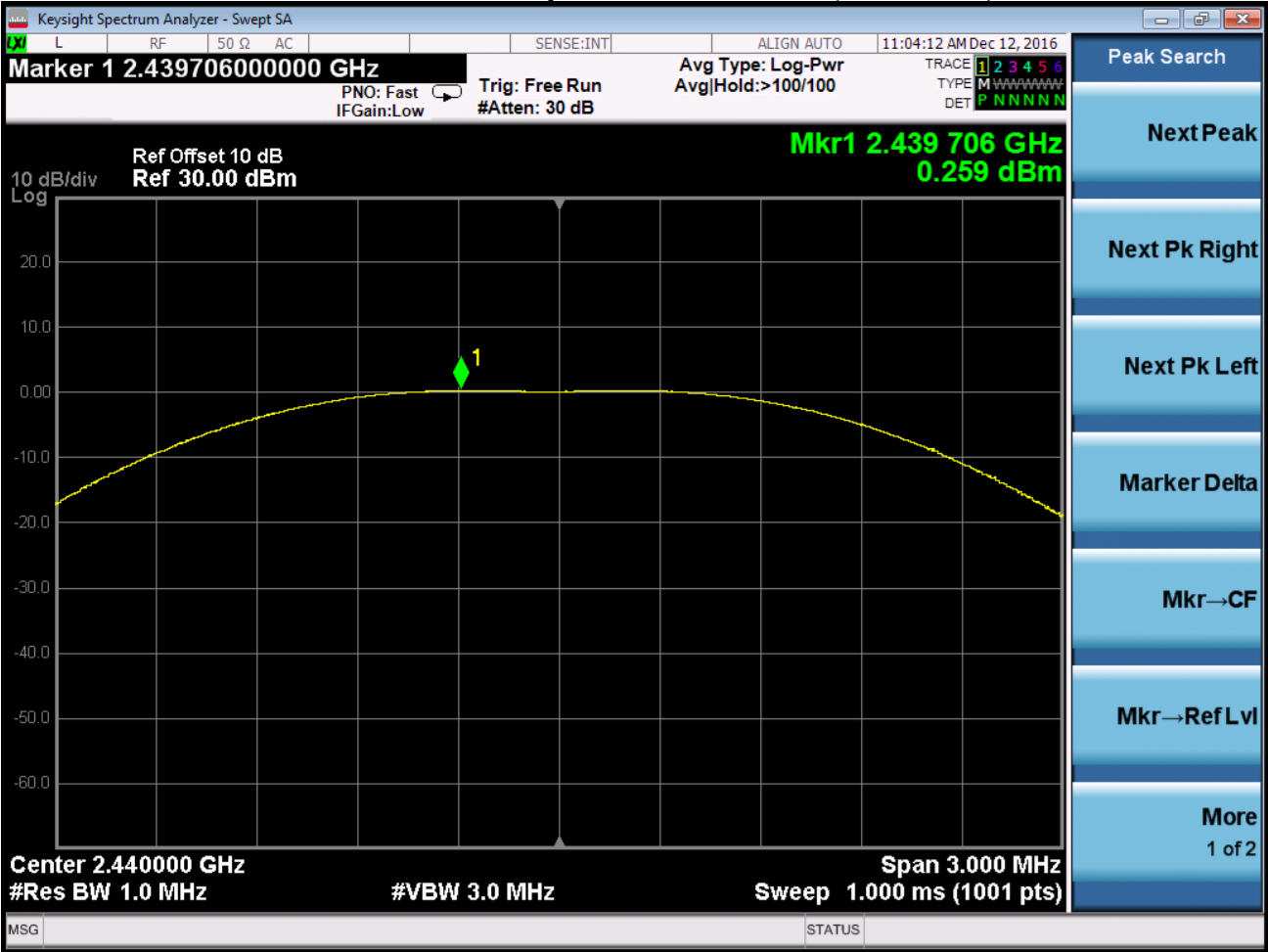
Channel 0



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**Maximum Peak Output Power Test Data (Conducted)**



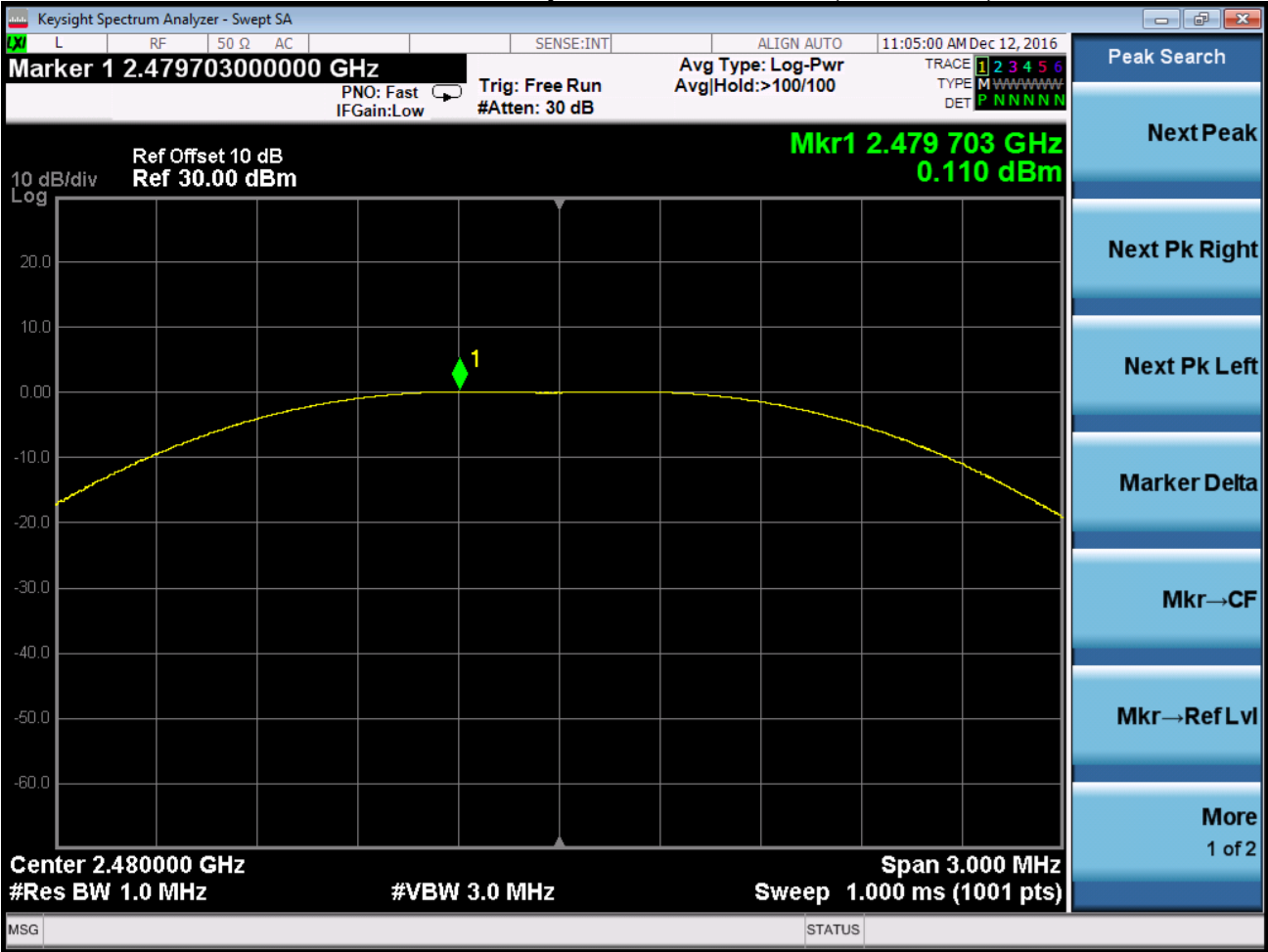
**Channel 19**



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**Maximum Peak Output Power Test Data (Conducted)**



Channel 39


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**Maximum Power Spectral Density Test Data (Conducted)**

Company:	DOSIME, INC.		Test Date	12/12/2016		
EUT Name	DOSIMETER		Test Engineer	George Hsu		
Model:	NM001937		Test Result	PASS		
Operating Mode	TX Mode					
Mode	Test CH	Frequency (MHz)	Peak (dBm)		Limit (dBm)	Conclusion
Bluetooth LE	0	2402	0.979		≤ 8	Pass
	19	2440	0.479		≤ 8	Pass
	39	2480	-0.107		≤ 8	Pass
Test Equipment: Please refer to 5.2						





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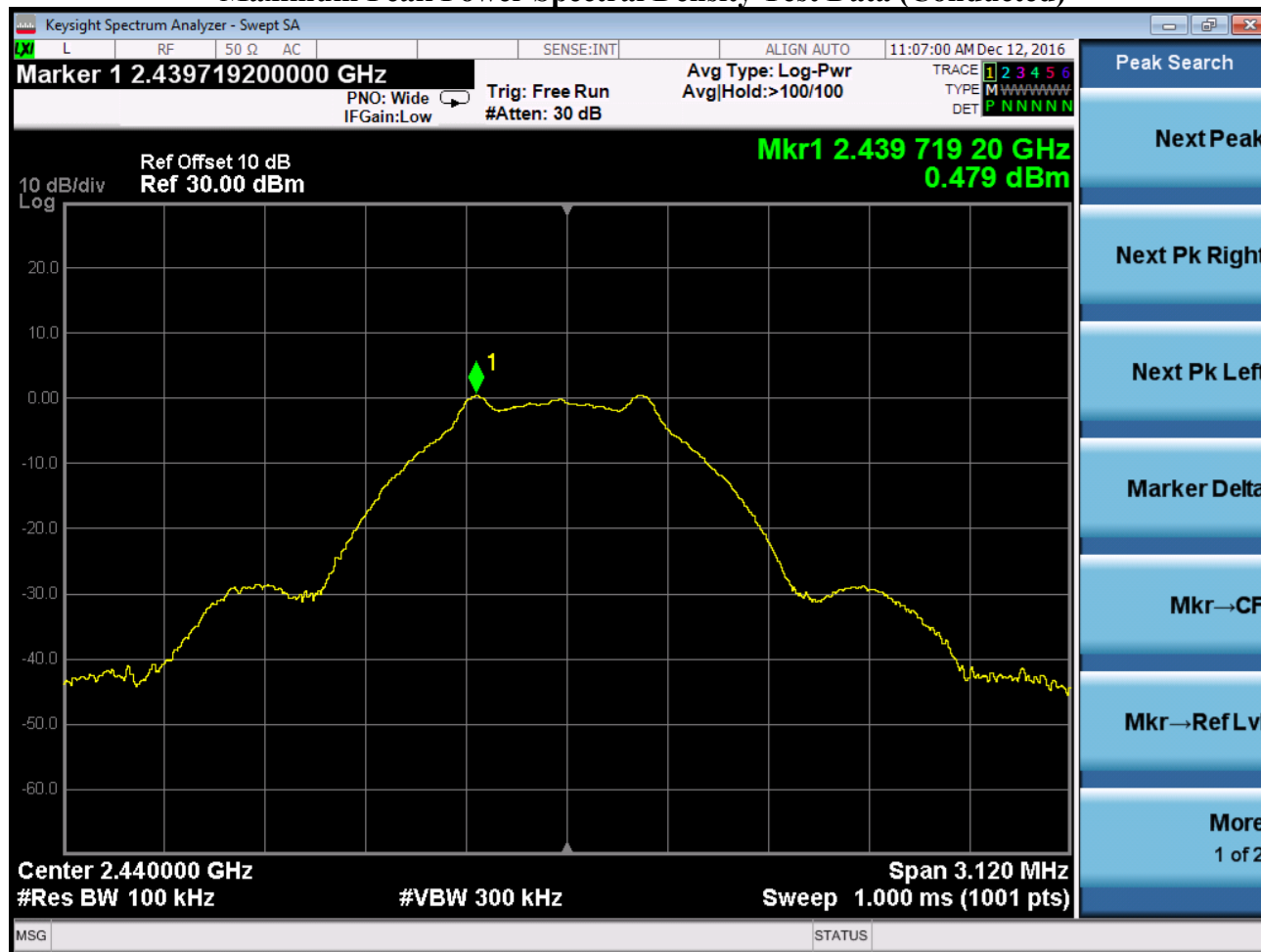
### Maximum Peak Power Spectral Density Test Data (Conducted)



### Low Channel, Channel 0

**ELECTRO MAGNETIC TEST, INC.**

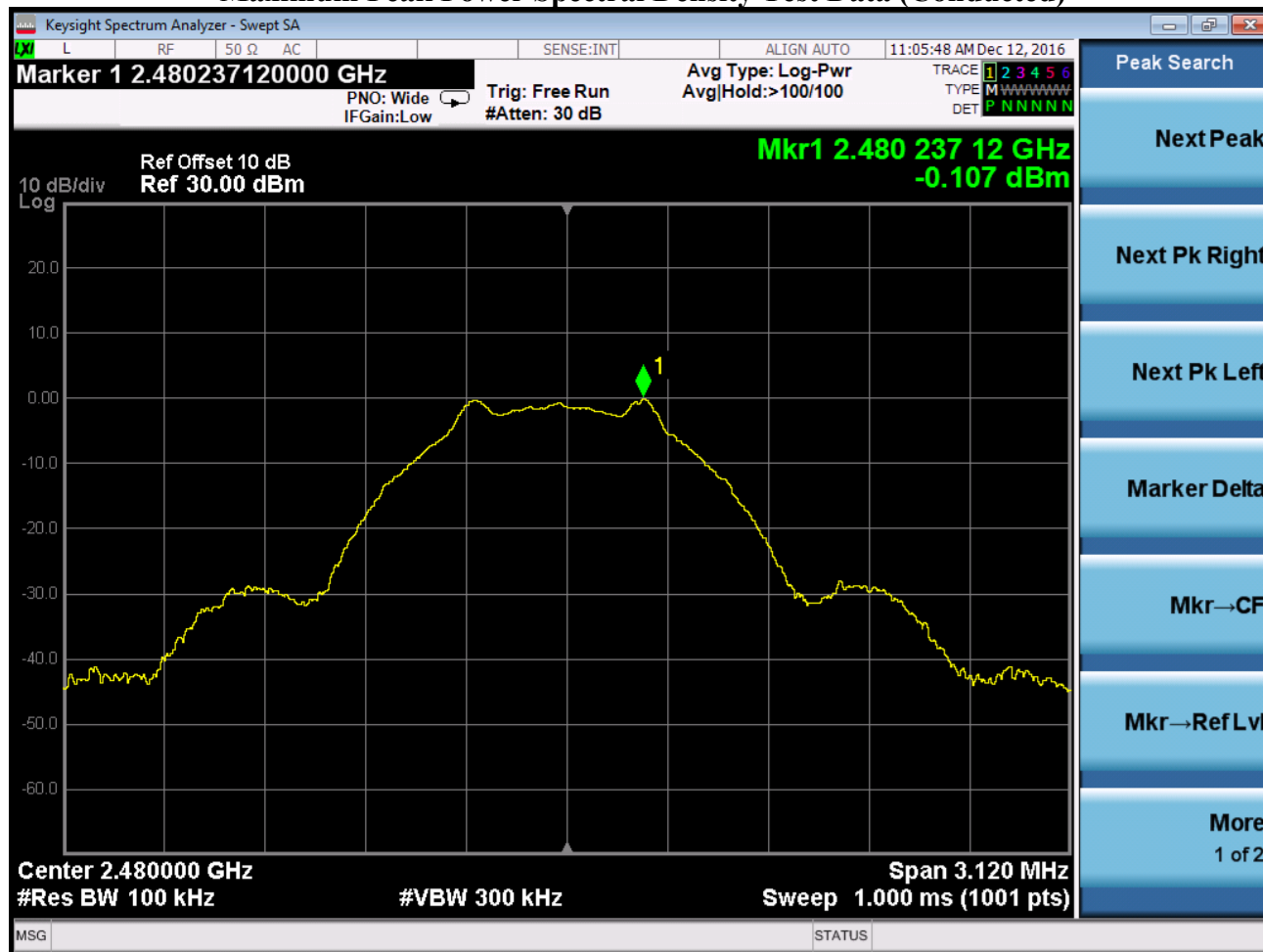
1547 Plymouth Street, Mountain View, CA 94043 Tel: (650) 965-4000 Fax: (650) 965-3000

**Maximum Peak Power Spectral Density Test Data (Conducted)**

Middle Channel, Channel 19

**ELECTRO MAGNETIC TEST, INC.**

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**Maximum Peak Power Spectral Density Test Data (Conducted)****High Channel, Channel 39**


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**Bandedge Test Data (Conducted)**

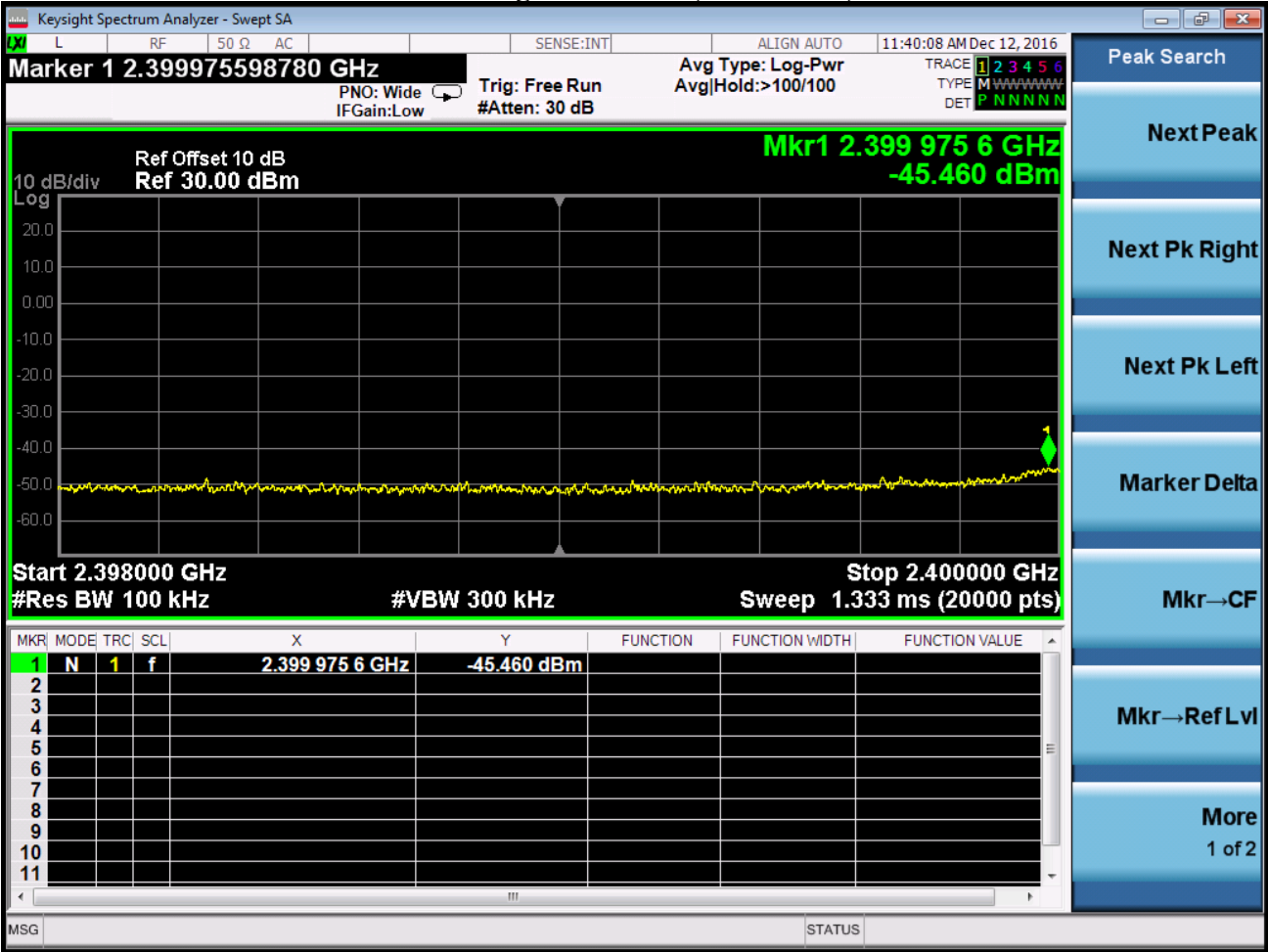
Company:	DOSIME, INC.		Test Date	12/12/2016	
EUT Name	DOSIMETER		Test Engineer	George Hsu	
Model:	NM001937		Test Result	PASS	
Operating Mode	TX Mode				
Mode	Test CH	Frequency (MHz)	Peak (dBm)	Limit (dBm)	Conclusion
Bluetooth LE	0	2399.9756	-45.460	≤ -19.02	Pass
	39	2483.500012886	-48.707	≤ -20.11	Pass
Test Equipment: Please refer to 5.2					



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**Bandedge Test Data (Conducted)**



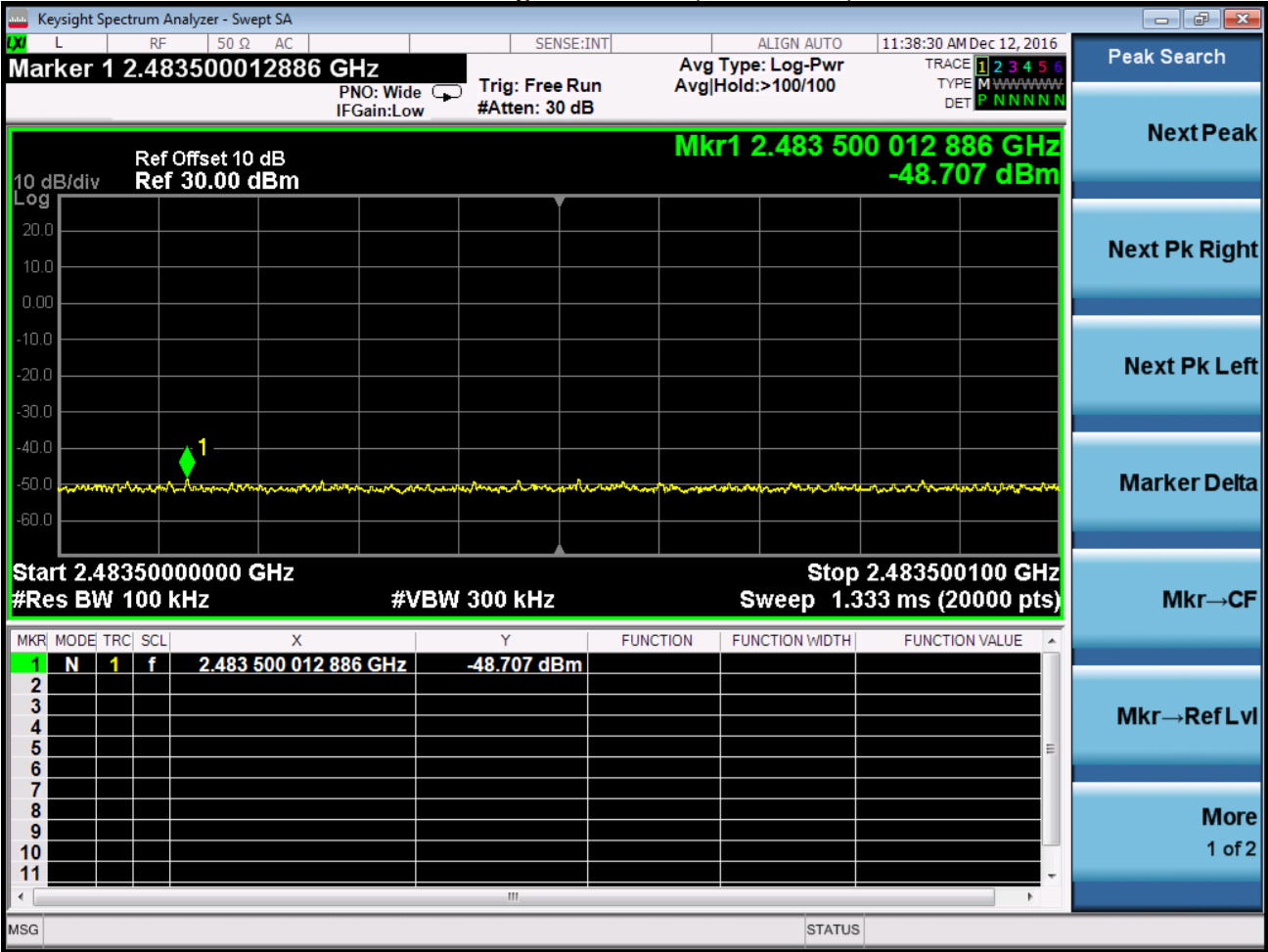
Low Channel, Channel 0



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**Bandedge Test Data (Conducted)**



**High Channel, Channel 39**



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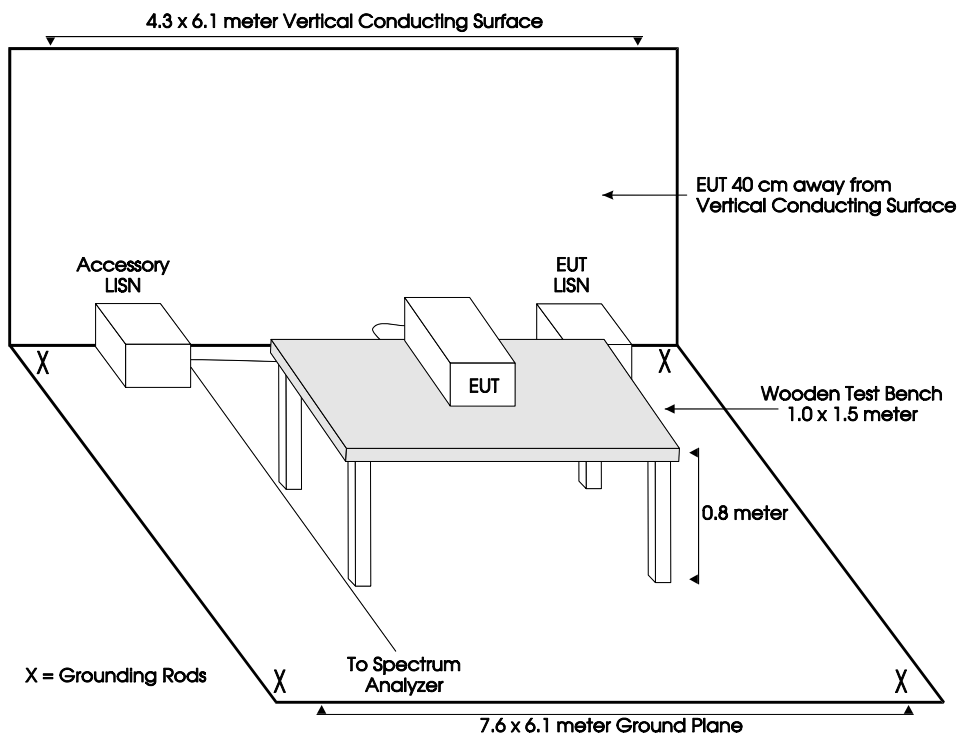
## **APPENDIX B**

### ***TEST SETUP DIAGRAMS***

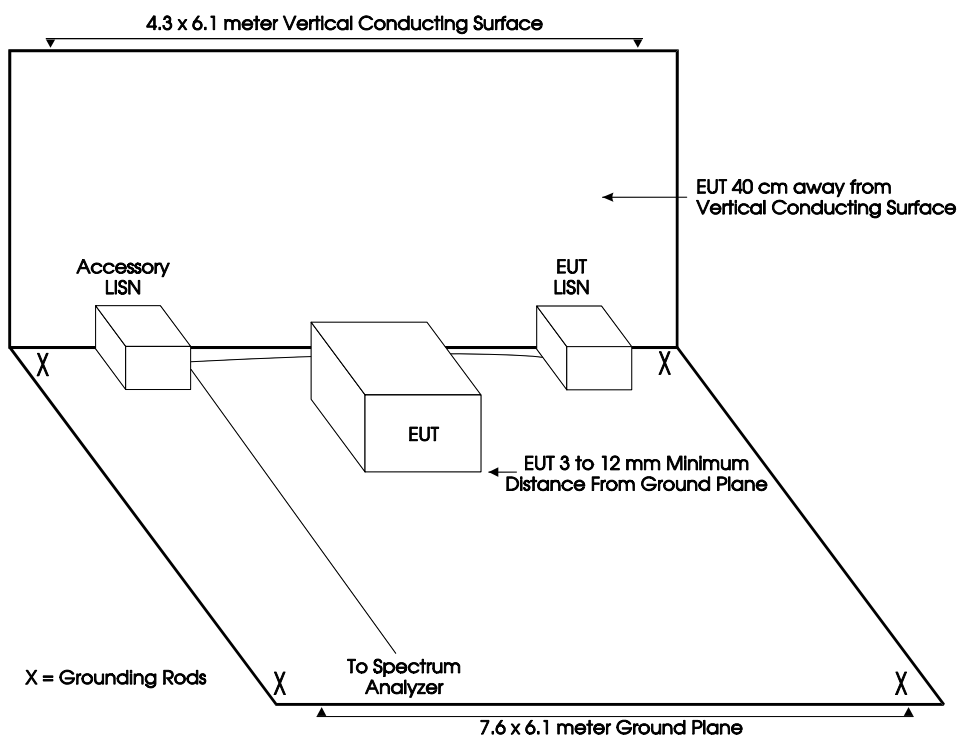


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**FIGURE 1 – TABLETOP CONDUCTED EMISSIONS TEST SETUP – SITE “A”**

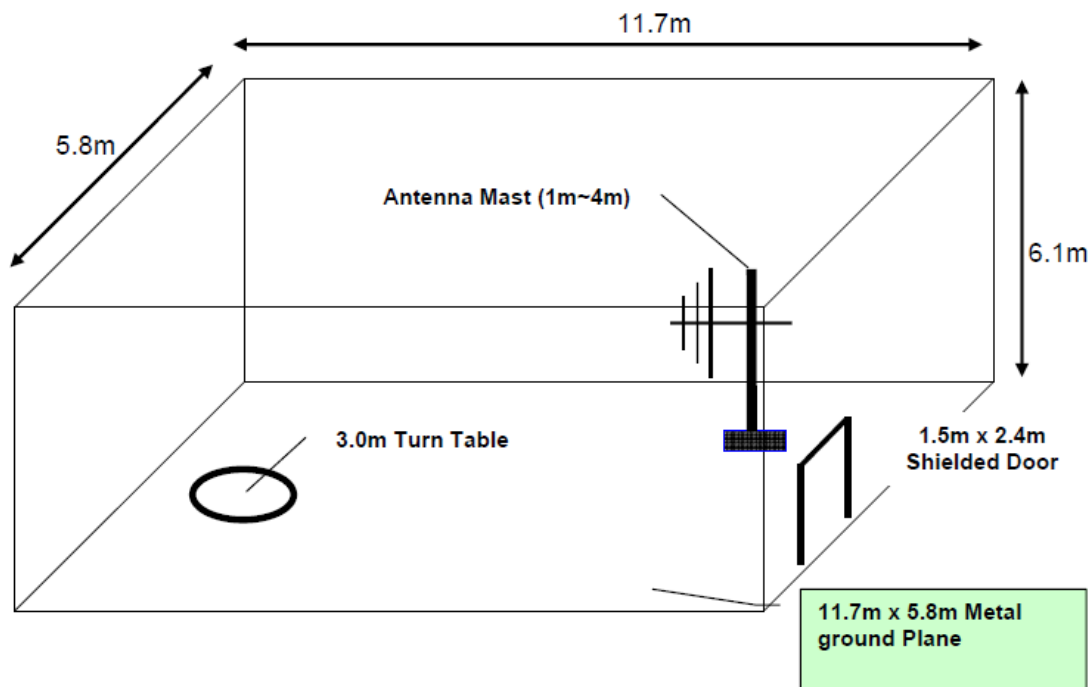


**FIGURE 1a – FLOORSTANDING CONDUCTED EMISSIONS TEST SETUP – SITE “A”**



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**FIGURE 3 - LAYOUT OF 5 METER SEMI-ANECHOIC CHAMBER**



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## **APPENDIX C**

### ***MODIFICATIONS TO THE EUT***



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## **MODIFICATIONS TO THE EUT**

No modifications were made to the EUT by Electro Magnetic Test, Inc. personnel during the testing.



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## **APPENDIX D**

### ***ADDITIONAL MODELS COVERED UNDER THIS REPORT***



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## **ADDITIONAL MODELS COVERED UNDER THIS REPORT**

There are no additional models to be covered under this report.