Electromagnetic Compatibility Test Report

Tests Performed on a Landauer

Digital Dosimeter Transciever, Model Verifii

Radiometrics Document RP-8494

Product Detail:
FCC ID: 2ALO9V0100 Equipment type: DXX Low power transmitter 15.249
Test Standards:
US CFR Title 47, Chapter I, FCC Part 15 Subpart C FCC Part 15 CFR Title 47: 2016 This report concerns: Original Grant for Certification FCC Part 15; Class B

Tests Performed For:	*Test Facility:*
Landauer 2 Science Rd. Glenwood, IL 60425	**Radiometrics Midwest Corporation** 12 Devonwood Avenue Romeoville, IL 60446-1349 (815) 293-0772

Test Date(s): (Month-Day-Year)
December 5 thru 13, 2016

Document RP-8494 Revisions:

Rev.	Issue Date	Affected Sections	Revised By
0	August 14, 2017		
1	August 16, 2017	4.1, 10.0, 11.1.2, 11.1.3	Joseph Strzelecki
2	September 25, 2017	2.0, 11.1.2	Joseph Strzelecki

Table of Contents

1.0 ADMINISTRATIVE DATA

Equipment Under Test:	
A Landauer, Digital Dosimeter Model: Verifii Serial Number: none This will be referred to as the EUT in this Report	
Date EUT Received at Radiometrics: (Month-Day-Year)	*Test Date(s): (Month-Day-Year)*
December 5, 2016	December 5 thru 13, 2016
Test Report Written By:	*Test Witnessed By:*
Joseph Strzelecki Senior EMC Engineer	The tests were not witnessed by Landauer Landauer
Radiometrics' Personnel Responsible for Test:	*Test Report Approved By*
Joseph Strzelecki 08/14/2017 Joseph Strzelecki Senior EMC Engineer NARTE EMC-000877-NE	Chris W. Carlson Chris W. Carlson Director of Engineering NARTE EMC-000921-NE

2.0 TEST SUMMARY AND RESULTS

The EUT (Equipment Under Test) is a Digital Dosimeter, Model Verifii, manufactured by Landauer. The detailed test results are presented in a separate section. The following is a summary of the test results.

Emissions Tests Results

Environmental Phenomena	Frequency Range	Basic Standard	Test Result
RF Radiated Emissions	30-25,000 MHz	FCC Part 15.249	Pass
Occupied Bandwidth Test	Fundamental Freq.	FCC Part 15	Pass

The EUT uses 2426 MHz as an advertising channel, so it used much more often than other frequencies, so it was chosen as the middle frequency tested.

2.1 RF Exposure Compliance Requirements

Since the power output is less than 10 mW, the EUT meets the FCC requirement for RF exposure and it is exempt from RF exposure evaluations. There are no power level adjustments available to the end user. The antenna is permanently attached. The detailed calculations for RF Exposure are presented in a separate document.

3.0 EQUIPMENT UNDER TEST (EUT) DETAILS

3.1 EUT Description

The EUT is a Digital Dosimeter, Model Verifii, manufactured by Landauer. The EUT was in good working condition during the tests, with no known defects.

The EUT is an electronic dosimeter that measures the amount of radiation exposure that the wearer has encountered. It takes measurements periodically and sends the data to a base station via BLE.

3.1.1 FCC Section 15.203 & RSS-GEN Antenna Requirements

The antenna is permanently attached to the printed circuit board. The antenna is internal to the EUT and it is not readily available to be modified by the end user. Therefore, it meets the 15.203 Requirements.

3.2 Related Submittals

Landauer is not submitting any other products simultaneously for equipment authorization related to the EUT.

4.0 TESTED SYSTEM DETAILS

4.1 Tested System Configuration

The system was configured for testing in a typical fashion. The EUT was placed on an 80-cm or 150cm high, nonconductive test stand. The testing was performed in conditions as close as possible to installed conditions. Wiring was consistent with manufacturer's recommendations.

The EUT was tested as a stand-alone device. Power was supplied with a new battery.

The identification for all equipment used in the tested system, are:

Tested System Configuration List

Item	Description	Type*	Manufacturer	Model Number	Serial Number
1	Digital Dosimeter	E	Landauer	Verifii	none

* Type: E = EUT, P = Peripheral, S = Support Equipment; H = Host Computer

4.2 Special Accessories

No special accessories were used during the tests in order to achieve compliance.

4.3 Equipment Modifications

No modifications were made to the EUT at Radiometrics' test facility in order to comply with the standards listed in this report.

5.0 TEST SPECIFICATIONS

Document	Date	Title
FCC CFR Title 47	2016	Code of Federal Regulations Title 47, Chapter 1, Federal Communications Commission, Part 15 - Radio Frequency Devices

6.0 TEST PROCEDURE DOCUMENTS

The tests were performed using the procedures from the following specifications:

Document	Date	Title
ANSI C63.4-2014	2014	Methods of Measurement of Radio Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz
ANSI C63.10-2013	2013	American National Standard for Testing Unlicensed Wireless Devices

7.0 RADIOMETRICS' TEST FACILITIES

The results of these tests were obtained at Radiometrics Midwest Corp. in Romeoville, Illinois, USA. Radiometrics is accredited by A2LA (American Association for Laboratory Accreditation) to conform to ISO/IEC 17025: 2005 "General Requirements for the Competence of Calibration and Testing Laboratories". Radiometrics' Lab Code is 121191 and Certification Number is 1495.01. Radiometrics' scope of accreditation includes all of the test methods listed herein. A copy of the accreditation can be accessed on our web site (www.radiomet.com). Radiometrics accreditation status can be verified at A2LA's web site (www.a2la2.org).

The following is a list of shielded enclosures located in Romeoville, Illinois used during the tests:

Chamber E: Is a custom made anechoic chamber that measures 52' L X 30' W X 18' H. The walls and ceiling are fully lined with RF absorber. Pro-shield of Collinsville, Oklahoma manufactured the chamber. The floor has a 9' x 9' section of microwave absorber for testing above 1 GHz.

Test Station F: Is an area that measures 10' D X 12' W X 10' H. The floor and back wall are metal shielded. This area is used for conducted emissions measurements.

A separate ten-foot long, brass plated, steel ground rod attached via a 6-inch copper braid grounds each of the above chambers. Each enclosure is also equipped with low-pass power line filters.

The FCC has accepted these sites as test site number US1065. The FCC test site Registration Number is 732175. Details of the site characteristics are on file with the Industry Canada as site number IC 3124A-1.

A complete list of the test equipment is provided herein. The calibration due dates are indicated on the equipment list. The equipment is calibrated in accordance to ANSI/NCSL Z540-1 with traceability to the National Institute of Standards and Technology (NIST).

8.0 DEVIATIONS AND EXCLUSIONS FROM THE TEST SPECIFICATIONS

There were no deviations or exclusions from the test specifications.

9.0 CERTIFICATION

Radiometrics Midwest Corporation certifies that the data contained herein was taken under conditions that meet or exceed the requirements of the test specification and the data contained herein was taken with calibrated test equipment. The results relate only to the EUT listed herein.

10.0 TEST EQUIPMENT TABLE

RMC ID	Manufacturer	Description	Model No.	Serial No.	Frequency Range	Cal Period	Cal Date
AMP-05	RMC/Celeritek	Pre-amplifier	MW110G	1001	1.0-12GHz	24 Mo.	10/06/15
AMP-20	Avantek	Pre-amplifier	SF8-0652	15221	8-18GHz	12 Mo	01/05/16
AMP-22	Anritsu	Pre-amplifier	MH648A	M23969	0.1-1200MHz	12 Mo.	01/05/16
ANT-04	Tensor	Biconical Antenna	4104	2246	20-250MHz	24 Mo.	05/16/16
ANT-06	EMCO	Log-Periodic Ant.	3146	1248	200-1000MHz	24 Mo.	11/25/15
ANT-36	EMCO	Horn Antenna	3115	2502	1.0-18GHz	24 Mo.	11/02/16
ANT-48	RMC	Std. Gain Horn	HW2020	1001	18-26.5 GHz	24 Mo.	12/15/15
MXR-02	HP / Agilent	Harmonic Mixer	11970K	2332A00489	18-26.5GHz	12 Mo.	01/08/16
REC-08	Hewlett Packard	Spectrum Analyzer	8566B	2648A13481 2209A01436	30Hz-22GHz	24 Mo.	12/21/15
REC-11	HP / Agilent	Spectrum Analyzer	E7405A	US39110103	9Hz-26.5GHz	12 Mo	03/23/16
REC-21	Agilent	Spectrum Analyzer	E7405A	MY45118341	9Hz-26.5 GHz	24 Mo.	12/22/15
THM-03	Fluke	Temp/Humid Meter	971	95850465	N/A	12 Mo.	01/11/16

Note: All calibrated equipment is subject to periodic checks.

Software Company	Test Software Name	Version	Applicable Tests
Radiometrics	REREC11D	01.05.16	RF Radiated Emissions (FCC Part 15 & EN 55011/22)
Agilent	PSA/ESA-E/L/EMC	2.4.0.42	Bandwidth and screen shots

11.0 TEST SECTIONS

11.1 Radiated RF Emissions

Radiated emission measurements were performed with linearly polarized broadband antennas. The results obtained with these antennas can be correlated with results obtained with a tuned dipole antenna. The radiated emission measurements were performed with a spectrum analyzer. The bandwidth used from 150 kHz to 30 MHz is 9 or 10 kHz and the bandwidth from 30 MHz to 1000 MHz is 100 or 120 kHz. Above 1 GHz, a 1 MHz bandwidth is used. A 10 dB linearity check is performed prior to start of testing in order to determine if an overload condition exists. A harmonic mixer was used from 18 to 25 GHz. Figure 4 herein lists the details of the test equipment used during radiated emissions tests.

The EUT was rotated through three orthogonal axis as per 5.10.1 of ANSI C63.10 during the radiated tests.

Final radiated emissions measurements were performed inside of an anechoic chamber at a test distance of 3 meters. The anechoic chamber is designated as Chamber E. This Chamber meets the Site Attenuation requirements of ANSI C63.4 and CISPR 16-1. Chamber E is located at 12 East Devonwood Ave. Romeoville, Illinois EMI test lab.

The entire frequency range from 30 to 25,000 MHz was slowly scanned with particular attention paid to those frequency ranges which appeared high. Measurements were performed using two antenna polarizations, (vertical and horizontal). The worst case emissions were recorded. All measurements may be performed using either the peak, average or quasi-peak detector functions. If the peak detector data exceeds or is marginally close to the limits, the measurements are repeated using a quasi-peak detector or average function as required by the specification for final determination of compliance.

The detected emission levels were maximized by rotating the EUT, adjusting the positions of all cables, and by scanning the measurement antenna from 1 to 4 meters above the ground.

11.1.1 Field Strength Calculation

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

FS = RA + AF + CF - AG + HPF + PKA

Where: FS = Field Strength
RA = Receiver Amplitude
AF = Antenna Factor
CF = Cable Attenuation Factor
AG = Amplifier Gain
PKA = Peak to Average Factor (This is only used for average measurements above 1 GHz)

The Peak to average factor is used when average measurements are required. It is calculated by the highest duty cycle in percent over any 100mS transmission. The factor in dB is 20*Log(Duty cycle mS/100 mS).

Note: The actual FCC limits are in uV/m. The data in the results table coverted the limits to dBuV/m.
100 uV/m = 40.0 dBuV/m
150 uV/m = 43.5 dBuV/m
200 uV/m = 46.0 dBuV/m
500 uV/m = 54.0 dBuV/m

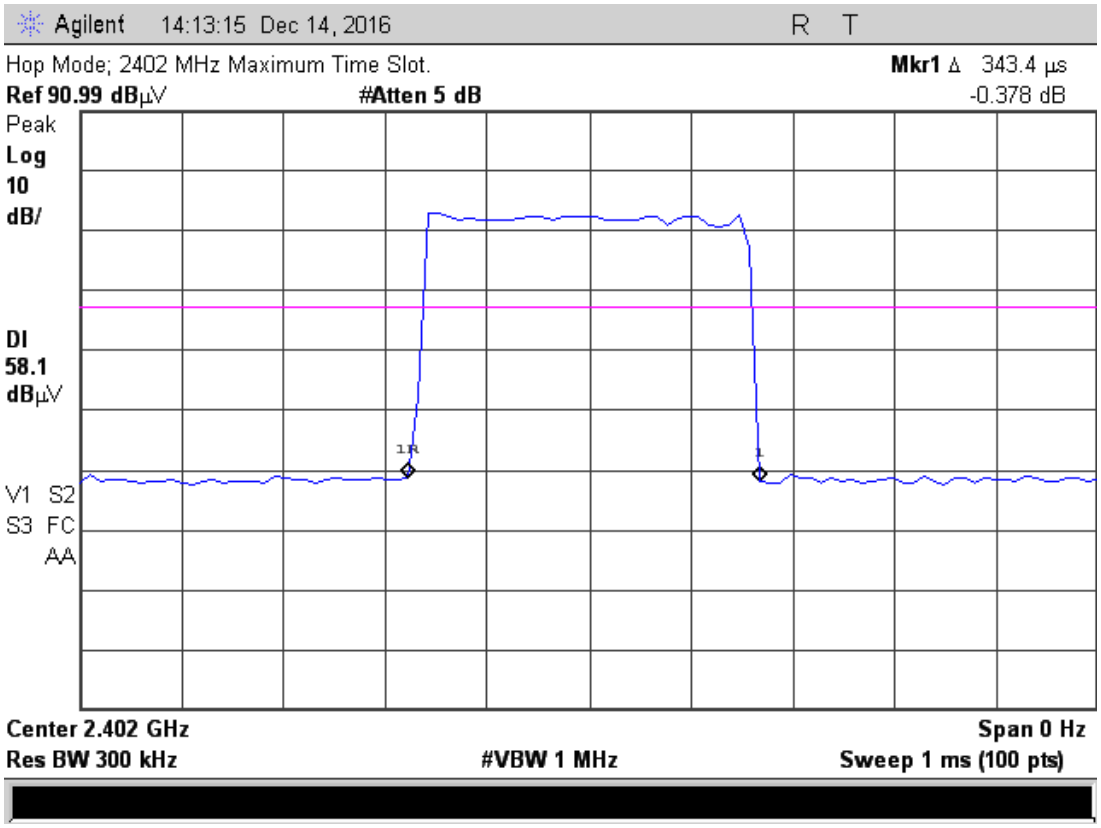
11.1.2 Duty Cycle

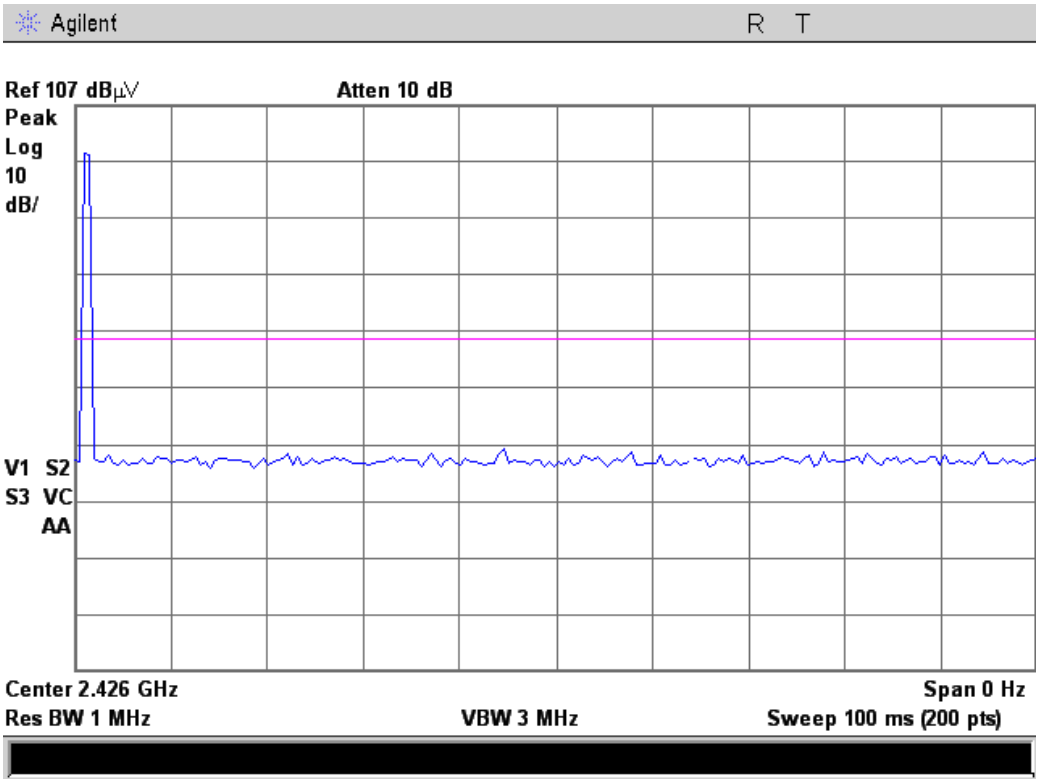
The averave value of the pulsed emissions were measured as per section 7.5, formula (10) of of ANSI C63.10-2013.

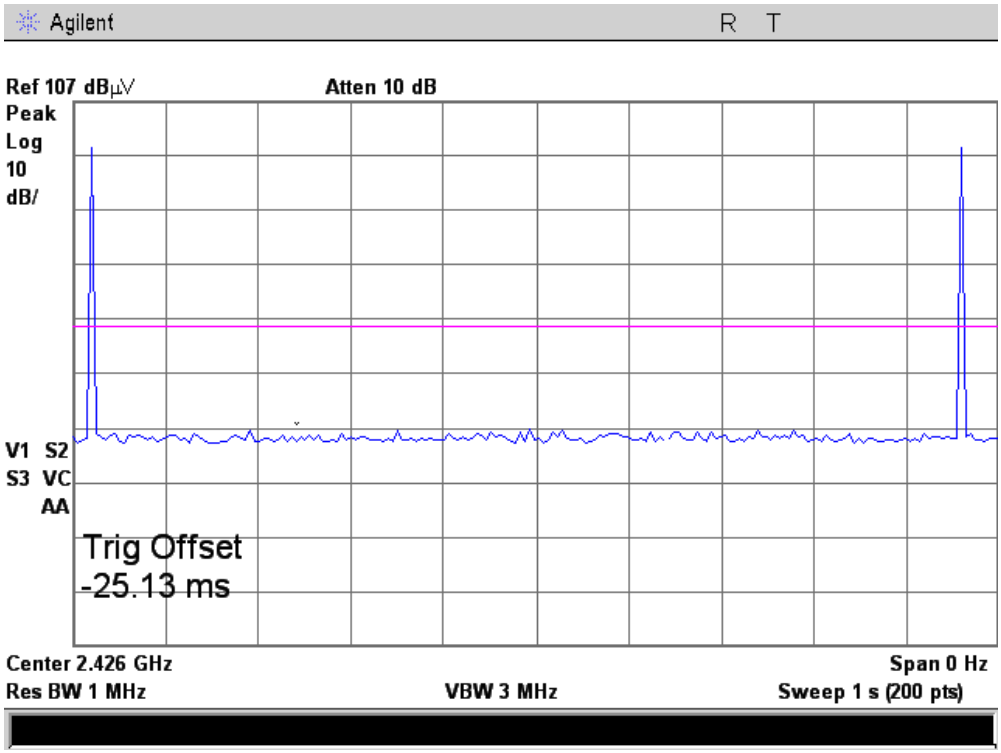
The Peak to average factor is calculated by the highest duty cycle in percent over any 100mS transmission. The factor in dB is 20 * Log(Duty cycle/100). The transmitter operates for a maximum duration of 1.1 ms in any 100 ms interval for a 1.1% maximum duty cycle. 20 Log*(mSec/100mSec) = -39.2 dB Peak to average Correction factor.

Since the difference between the peak and the average limits are 20 dB, there is no need to use a correction factor more than 20 dB. Therefore a 20 dB factor was used.

There will be, at most, 1 transmissions of 1 packet each, with a maximum duration of 343 usec per 100 msec and an effective duty cycle of no more than 1%. The 3 transmissions per 100 mSec is set by firmware in the product.


Agilent 14:13:15 Dec 14, 2016
R T
Hop Mode; 2402 MHz Maximum Time Slot.
Mkr1 Δ 343.4 µs
Ref 90.99 dBµV
#Atten 5 dB
-0.378 dB
Peak
Log
10
dB/
DI
58.1
dBµV
V1 S2
S3 FC
AA
Center 2.402 GHz
Span 0 Hz
Res BW 300 kHz
#VBW 1 MHz
Sweep 1 ms (100 pts)


Agilent
R T
Ref 107 dBµV
Atten 10 dB
Peak
Log
10
dB/
V1 S2
S3 VC
AA
Center 2.426 GHz
Span 0 Hz
Res BW 1 MHz
VBW 3 MHz
Sweep 100 ms (200 pts)



In accordance to 7.5 of ANSI C63.10 the following procedures were used.

a) The EUT was set to the “worst-case” pulse ON time.
b) The RF output was Coupled to the input of a spectrum analyzer by a “near-field” coupling method. The signal received shall be of sufficient level to trigger adequately the spectrum analyzer sweep display.
c) The center frequency of the spectrum analyzer was set to the center of the RF signal.
d) The spectrum analyzer was set for ZERO SPAN.
e) The sweep time was of the analyzer was set to 100 ms and other times to show the duty cycle.
f) Since the pulse train has a period that exceeds 100 ms, or as an alternative to step f), then:
    1) The trigger on the spectrum analyzer was set to capture the greatest amount of pulse “ON time” over 100 ms.
    2) The 100 ms period that contains the maximum “on time” was found.
    3) The duty cycle was determined by dividing the total maximum “ON time” by 100 ms (tON/100 ms).
h) The duty cycle correction factor was used applying Equation (10) of ANSI C63.10 to the duty cycle determined in the preceding steps.

11.1.3 Radiated Emissions Test Results

Emissions Below 1 GHz

Test Date	December 6 and 7, 2016
Test Distance	3 Meters
Specification	FCC Part 15 Subpart C
Abbreviations	Pol = Antenna Polarization; V = Vertical; H = Horizontal; P = peak; Q = QP

All emissions except Fundamental and harmonics

Freq. MHz	Meter Reading dBuV	Dect.	Ant. Pol.	Ant Factor	Cable & Amp Factors	Dist Fact dB	EUT dBuV/m	Limit dBuV/m	Margin Under Limit dB	Note

Freq. MHz	Meter Reading dBuV	Dect.	Ant. Pol.	Ant Factor	Cable & Amp Factors	Dist Fact dB	EUT dBuV/m	Limit dBuV/m	Margin Under Limit dB	Note
64.7	31.5	P	V	7.9	-28.1	0.0	11.3	40.0	28.7	
162.6	33.9	P	V	15.3	-27.6	0.0	21.6	43.5	21.9	
237.9	31.5	P	V	15.4	-27.4	0.0	19.5	46.0	26.5	
65.8	31.4	P	H	7.6	-28.1	0.0	10.9	40.0	29.1	
144.4	30.6	P	H	12.2	-27.7	0.0	15.1	43.5	28.4	
238.4	31.5	P	H	15.5	-27.4	0.0	19.6	46.0	26.4	
274.4	31.2	P	V	13.0	-27.3	0.0	16.9	46.0	29.1	
358.8	31.4	P	V	14.3	-27.1	0.0	18.6	46.0	27.4	
486.9	31.6	P	V	17.5	-26.8	0.0	22.3	46.0	23.7	
572.5	30.1	P	V	18.3	-26.7	0.0	21.7	46.0	24.3	
760.0	30.5	P	V	20.2	-26.1	0.0	24.6	46.0	21.4	
978.8	29.5	P	V	22.9	-24.4	0.0	28.0	54.0	26.0	
289.4	30.1	P	H	13.7	-27.3	0.0	16.5	46.0	29.5	
383.1	32.3	P	H	15.2	-27.2	0.0	20.3	46.0	25.7	
484.4	30.3	P	H	17.6	-26.7	0.0	21.2	46.0	24.8	
553.8	31.2	P	H	18.9	-26.5	0.0	23.6	46.0	22.4	
761.3	31.1	P	H	20.4	-26.0	0.0	25.5	46.0	20.5	
975.0	29.8	P	H	22.7	-24.4	0.0	28.1	54.0	25.9	
1007.5	47.9	P	H	23.7	-34.5	0.0	37.1	74.0	36.9	1
1165.0	47.2	P	H	25.1	-34.8	0.0	37.5	74.0	36.5	1
1322.5	46.4	P	H	25.6	-34.9	0.0	37.1	74.0	36.9	1
1715.0	47.0	P	H	26.3	-34.7	0.0	38.6	74.0	35.4	1
1895.0	45.0	P	H	27.5	-34.6	0.0	37.9	74.0	36.1	1
2352.5	46.4	P	H	28.1	-34.2	0.0	40.3	74.0	33.7	1
2392.5	47.0	P	H	28.3	-34.2	0.0	41.1	74.0	32.9	1
2552.5	45.7	P	H	28.8	-34.0	0.0	40.5	74.0	33.5	1
2712.5	44.9	P	H	28.9	-33.9	0.0	39.9	74.0	34.1	1
2927.5	42.1	P	H	29.5	-33.6	0.0	38.0	74.0	36.0	1
3227.5	41.6	P	H	30.9	-33.1	0.0	39.4	74.0	34.6	1
4537.5	41.7	P	H	33.2	-31.7	0.0	43.2	74.0	30.8	1
4897.5	40.0	P	H	33.3	-31.2	0.0	42.1	74.0	31.9	1
5132.5	42.0	P	H	33.7	-30.8	0.0	44.9	74.0	29.1	1
5490.0	40.0	P	H	34.4	-30.5	0.0	43.9	74.0	30.1	1
6287.5	40.9	P	H	34.8	-30.2	0.0	45.5	74.0	28.5	1
6600.0	40.8	P	H	34.7	-29.8	0.0	45.7	74.0	28.3	1
7295.0	39.2	P	H	36.4	-29.6	0.0	46.0	74.0	28.0	1
1007.5	41.6	P	V	23.7	-34.5	0.0	30.8	74.0	43.2	1
1185.0	42.9	P	V	25.3	-34.8	0.0	33.4	74.0	40.6	1
1497.5	43.0	P	V	25.5	-34.7	0.0	33.8	74.0	40.2	1
1540.0	42.6	P	V	25.6	-34.7	0.0	33.5	74.0	40.5	1
1932.5	42.0	P	V	27.6	-34.6	0.0	35.0	74.0	39.0	1
1987.5	42.7	P	V	27.6	-34.6	0.0	35.7	74.0	38.3	1
2130.0	42.4	P	V	27.5	-34.3	0.0	35.6	74.0	38.4	1
2392.5	49.6	P	V	28.3	-34.2	0.0	43.7	74.0	30.3	1
2545.0	52.0	P	V	28.8	-34.0	0.0	46.8	74.0	27.2	1
2567.5	51.3	P	V	28.8	-33.9	0.0	46.2	74.0	27.8	1
2980.0	43.6	P	V	29.9	-33.4	0.0	40.1	74.0	33.9	1
3172.5	42.3	P	V	30.7	-33.2	0.0	39.8	74.0	34.2	1
3200.0	41.8	P	V	30.8	-33.1	0.0	39.5	74.0	34.5	1
3567.5	40.3	P	V	31.4	-33.0	0.0	38.7	74.0	35.3	1
3980.0	40.5	P	V	32.8	-32.5	0.0	40.8	74.0	33.2	1
4167.5	41.7	P	V	32.4	-32.3	0.0	41.8	74.0	32.2	1
4852.5	43.3	P	V	33.3	-31.3	0.0	45.3	74.0	28.7	1

Freq. MHz	Meter Reading dBuV	Dect.	Ant. Pol.	Ant Factor	Cable & Amp Factors	Dist Fact dB	EUT dBuV/m	Limit dBuV/m	Margin Under Limit dB	Note
5090.0	40.4	P	V	33.6	-31.0	0.0	43.0	74.0	31.0	1
5537.5	41.3	P	V	34.3	-30.6	0.0	45.0	74.0	29.0	1
5940.0	40.2	P	V	34.4	-30.1	0.0	44.5	74.0	29.5	1
6125.0	40.9	P	V	34.8	-29.9	0.0	45.8	74.0	28.2	1
6472.5	40.8	P	V	34.6	-29.8	0.0	45.6	74.0	28.4	1
6872.5	42.1	P	V	35.3	-29.8	0.0	47.6	74.0	26.4	1

Note 1: Peak Reading under the Average limit

Judgment: Passed by at least 6 dB
No other emissions were detected within 10 dB of the limits.

Fundammental and Harmonic Emissions FCC 15.249; Three axis tested

		Spectrum Analyzer Readings									EUT	Peak	Ave	Peak	Ave	Margin
hrm	Tx	Peak			Ave	Peak			Ave	Corr.	Emission	Tot. FS		Limit		Under
		Vertical Polarization				Horizontal Polarization					Freq					
#	Freq	X	Y	Z	Max	X	Y	Z	Max	Fact.	MHz	dBuV/m		dBuV/m		Limit
1	2402	89.4	99.7	94.9	79.7	98.6	93.7	92.9	78.6	-5.9	2402.0	93.8	73.8	114	94	20.2
BE	2402	44.6	54.9	50.1	34.9	53.8	48.9	48.1	33.8	-5.9	2400.0	49.0	29.0	74	54	25.0
2	2402	53.9	55.3	56.5	36.5	59.5	51.7	56.7	39.5	1.8	4804.0	61.3	41.3	74	54	12.7
3	2402	54.7	52.5	51.3	34.7	49.2	53.9	49.6	33.9	6.4	7206.0	61.1	41.1	74	54	12.9
4	2402	39.2	39.1	38.2	19.2	39.9	38.9	39.3	19.9	10.6	9608.0	50.5	30.5	74	54	23.5
5	2402	36.3	36.8	37.4	17.4	37.0	36.8	36.4	17.0	12.7	12010.0	50.1	30.1	74	54	23.9
1	2426	90.2	100.1	95.0	80.1	94.3	91.2	94.8	74.8	-5.6	2426.0	94.5	74.5	114	94	19.5
2	2426	52.0	55.6	55.7	35.7	59.3	51.0	55.8	39.3	2.0	4852.0	61.3	41.3	74	54	12.7
3	2426	55.6	52.8	52.9	35.6	50.7	54.5	52.9	34.5	6.7	7278.0	62.3	42.3	74	54	11.7
4	2426	38.0	39.3	39.4	19.4	38.7	38.9	39.8	19.8	11.1	9704.0	50.9	30.9	74	54	23.1
5	2426	37.1	35.6	36.8	17.1	36.0	36.1	35.2	16.1	12.3	12130.0	49.4	29.4	74	54	24.6
1	2480	92.2	99.8	97.1	79.8	99.3	93.6	97.1	79.3	-5.6	2480.0	94.2	74.2	114	94	19.8
BE	2480	45.3	52.9	50.2	32.9	52.4	46.7	50.2	32.4	-5.6	2483.5	47.3	27.3	74	54	26.7
2	2480	51.1	57.2	56.1	37.2	58.1	49.1	55.6	38.1	2.0	4960.0	60.1	40.1	74	54	13.9
3	2480	56.2	55.0	54.0	36.2	51.8	56.3	53.1	36.3	7.0	7440.0	63.3	43.3	74	54	10.7
4	2480	37.8	38.0	38.5	18.5	38.0	38.2	38.1	18.2	11.6	9920.0	50.1	30.1	74	54	23.9
5	2480	36.2	37.2	36.8	17.2	36.5	35.9	37.0	17.0	11.3	12400.0	48.5	28.5	74	54	25.5
Column numbers (see below for explanations)																
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17

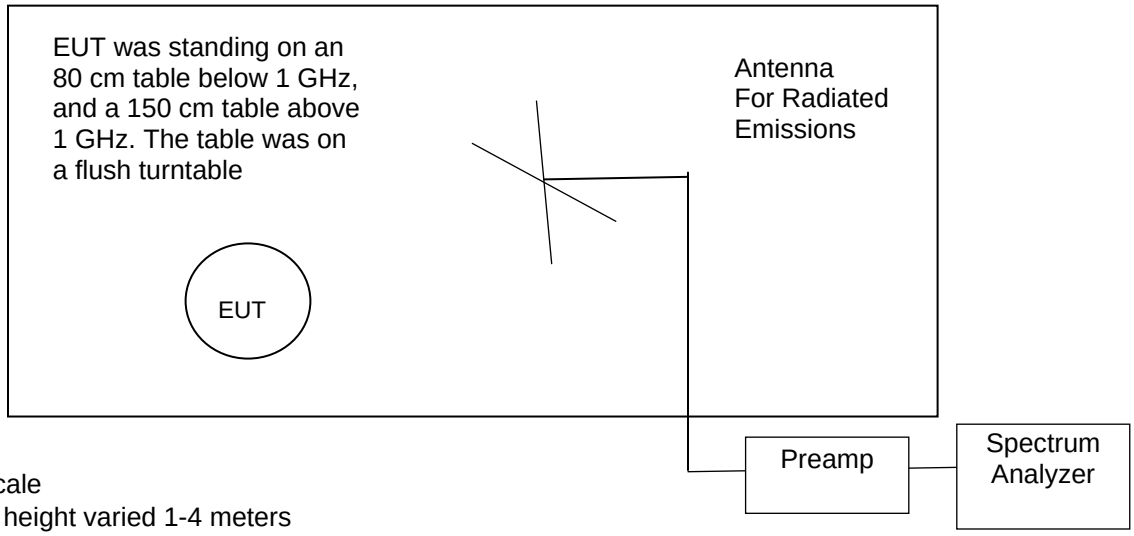
Column #1. hrm = Harmonic; BE = Band Edge emissions
Column #2. Frequency of Transmitter.
Column #3. Uncorrected readings from the spectrum analyzer with First Axis Rotation.
Column #4. Uncorrected readings from the spectrum analyzer with Second Axis Rotation.
Column #5. Uncorrected readings from the spectrum analyzer with Third Axis Rotation.
Column #6. Average Reading based on peak reading reduced by the Duty cycle correction
Column #7. Uncorrected readings from the spectrum analyzer with First Axis Rotation.
Column #8. Uncorrected readings from the spectrum analyzer with Second Axis Rotation.
Column #9. Uncorrected readings from the spectrum analyzer with Third Axis Rotation.
Column #10. Average Reading based on peak reading reduced by the Duty cycle correction
Column #11. Corr. Factors = Cable Loss – Preamp Gain + Antenna Factor
Column #12. Frequency of Tested Emission
Column #13. Highest peak field strength at listed frequency.
Column #14. Highest Average field strength at listed frequency.
Column #15. Peak Limit. (Fundamental limit is 15.249, Harmonics are 15.209)
Column #16. Average Limit. (Fundamental limit is 15.249, Harmonics are 15.209)
Column #17. The margin (last column) is the worst case margin under the peak or average limits for that row.

Overall Judgment: Passed by at least 9.1 dB

No other Emissions were detected from 30 to 25,000 MHz within 10 dB of the limits.

Figure 1. Drawing of Radiated Emissions Setup

Chamber E, anechoic



Notes:
- Not to Scale
- Antenna height varied 1-4 meters
- Distance from antenna to tested system is 3 meters
- AC cords not shown. They are connected to AC outlet with low-pass filter on turntable

Frequency Range	Receive Antenna	Pre-Amplifier	Spectrum Analyzer
30 to 200 MHz	ANT-04	AMP-22	REC-11
200 to 1000 MHz	ANT-06	AMP-22	REC-11
1 to 10 GHz	ANT-36	AMP-05	REC-11
10 to 18 GHz	ANT-36	AMP-20	REC-11
18 to 25 GHz	ANT-48	AMP-29	REC-08; MXR-01

11.2 Occupied Bandwidth Data

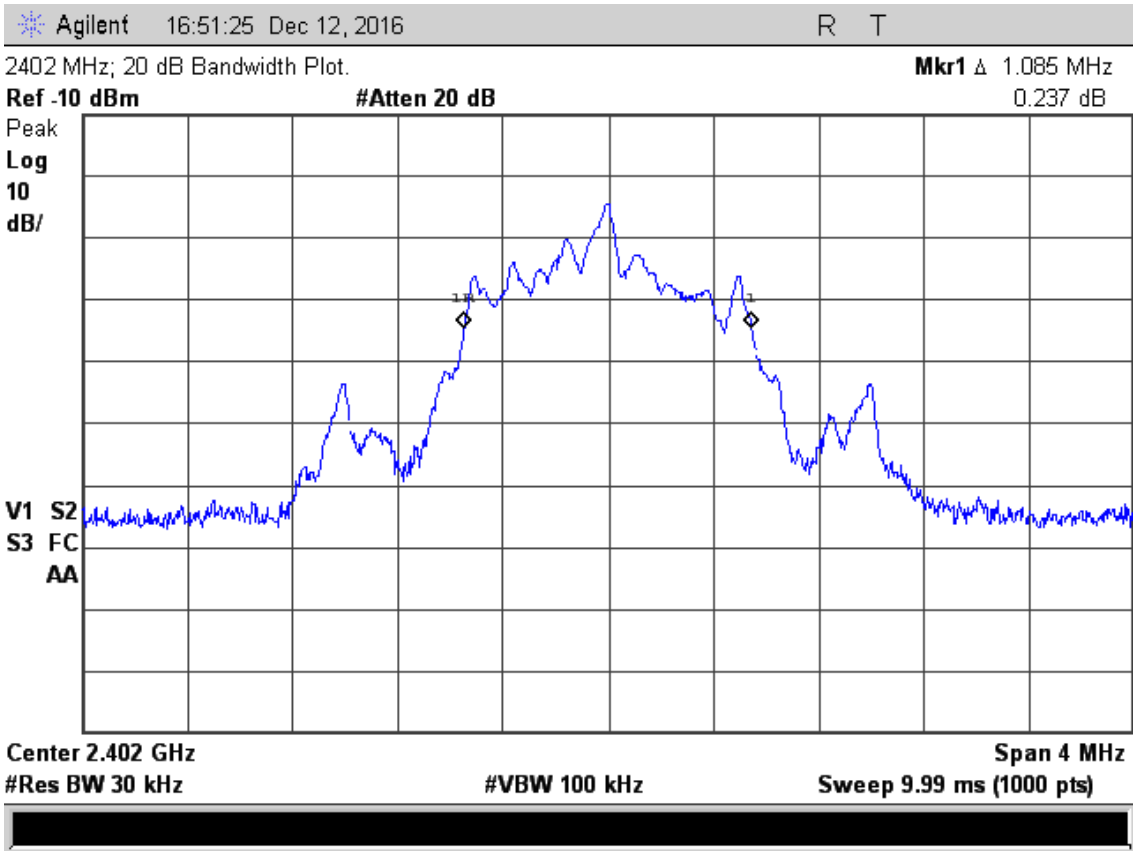
The occupied bandwidth of the RF output was measured using a spectrum analyzer. The bandwidth was measured using the peak detector function and a narrow resolution bandwidth.

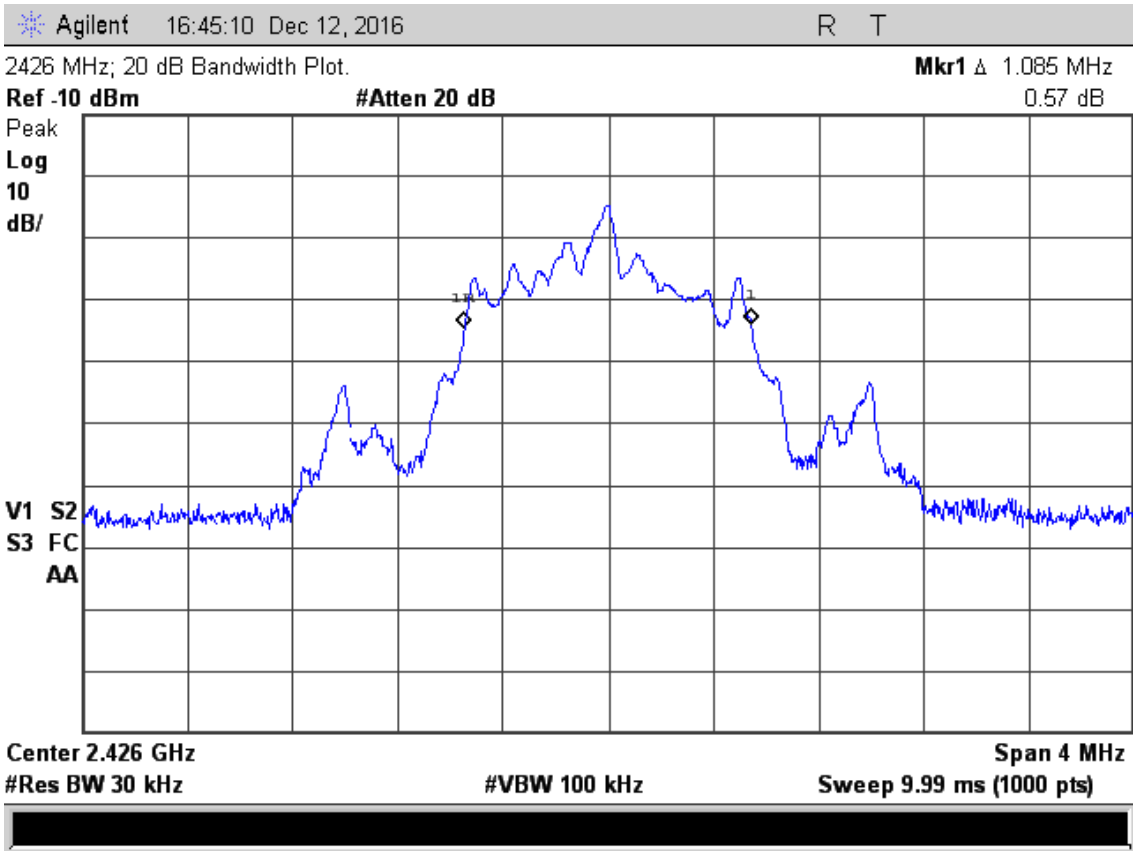
A broadband antenna was used to receive the modulated signal. The spectrum analyzer was set to the MAX HOLD mode to record the worst case of the modulation. The spectrum analyzer display was digitized and plotted. A limit was drawn on the plots based on the level of the modulated carrier. The plots of the occupied bandwidth for the EUT are supplied on the following page.

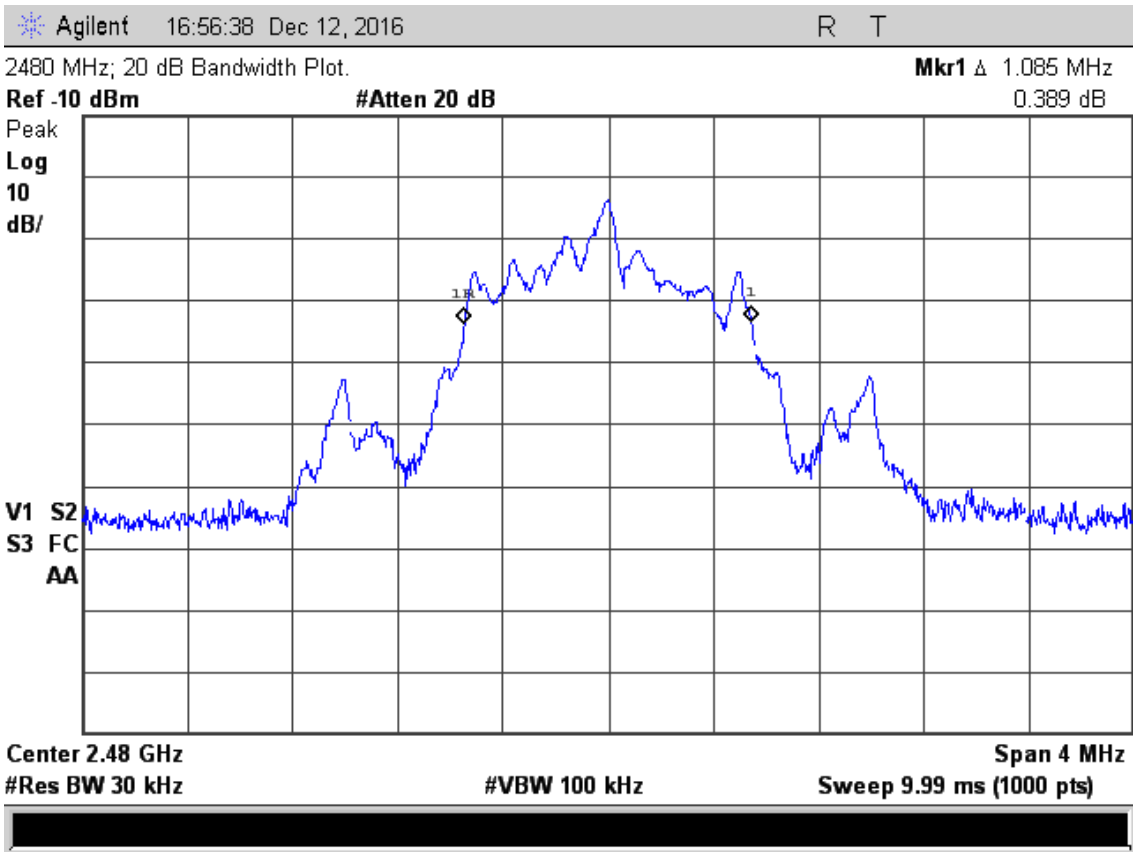
Channel MHz	20 dB EBW MHz
2402	1.085
2426	1.085
2480	1.085

Judgement: Pass

Figure 2. Occupied Bandwidth Plots




Agilent 16:45:10 Dec 12, 2016
R T
2426 MHz; 20 dB Bandwidth Plot.
Mkr1 Δ 1.085 MHz
0.57 dB
Ref -10 dBm
#Atten 20 dB
Peak
Log
10
dB/
V1 S2
S3 FC
AA
Center 2.426 GHz
Span 4 MHz
#Res BW 30 kHz
#VBW 100 kHz
Sweep 9.99 ms (1000 pts)


Agilent 16:56:38 Dec 12, 2016
R T
2480 MHz; 20 dB Bandwidth Plot.
Mkr1 Δ 1.085 MHz
0.389 dB
Ref -10 dBm
#Atten 20 dB
Peak
Log
10
dB/
V1 S2
S3 FC
AA
Center 2.48 GHz
Span 4 MHz
#Res BW 30 kHz
#VBW 100 kHz
Sweep 9.99 ms (1000 pts)

11.2.1 Measurement Instrumentation Uncertainty

Measurement	Uncertainty
Radiated Emissions, E-field, 3 meters, 30 to 200 MHz	3.3 dB
Radiated Emissions, E-field, 3 meters, 200 to 1000 MHz	4.9 dB
Radiated Emissions, E-field, 3 meters, 1 to 18 GHz	4.8 dB
Radiated Emissions, E-field, 3 meters, 18 to 26 GHz	5.3 dB
Bandwidth using marker delta method at a span of 4 MHz	4 kHz
Temperature THM-02	0.6 Deg C

The uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of k=2 in accordance with CISPR 16-4-2.