Electromagnetic Compatibility Test Report

Tests Performed on an RF IDeas, Inc.

125 kHz Card Reader/pcProx Nano, Model RDR-6011AKU-V2

Radiometrics Document RP-9047A

ACCREDITED
TESTING CERT #1495.01

Product Detail:	
FCC ID: M9MLC6X11U2 IC: 6571A-LC6X11U2 Equipment type: 125 kHz Card Reader	
Test Standards:	
US CFR Title 47, Chapter I, FCC Part 15 Subpart C FCC Part 15 CFR Title 47: 2019 Canada ISED; RSS-210, Issue 9: 2016 as required for Category I Equipment This report concerns: Original Equipment FCC Part 15.209	
Tests Performed For:	*Test Facility:*
RF IDeas, Inc. 4020 Winnetka Ave Rolling Meadows, IL 60008	**Radiometrics Midwest Corporation** 12 East Devonwood Avenue Romeoville, IL 60446
Test Date(s): (Month-Day-Year)	
May 2 to 16, 2019	

Document RP-9047A Revisions:

Rev.	Issue Date	Affected Sections	Revised By
0	May 22, 2019		
1	May 29, 2019	Cover, 2.0, 10.0, Figure 1, 11.3.1	Joseph Strzelecki

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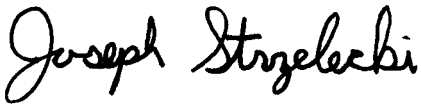
1.0 ADMINISTRATIVE DATA

Equipment Under Test: An RF IDeas, Inc., 125 kHz Card Reader Model: RDR-6011AKU-V2 This will be referred to as the EUT in this Report	
Date EUT Received at Radiometrics: (Month-Day-Year) May 2, 2019	*Test Date(s): (Month-Day-Year)* May 2, 2019
Test Report Written and Authorized By: Joseph Strzelecki Senior EMC Engineer	*Test Witnessed By:* Shiung Lo RF IDeas, Inc.
Radiometrics' Personnel Responsible for Test:  05/22/2019 Date Joseph Strzelecki Senior EMC Engineer NARTE EMC-000877-NE Chris Dalessio EMC Technician Dave Jarvis EMC Technician	*EUT Checked By:* Joseph Strzelecki Chris Dalessio Dave Jarvis Radiometrics The above personnel certifies: (1) The EUT had no loss of performance beyond the manufacture's performance level during the immunity tests. (2) A functional test was performed on the EUT after the immunity tests and no damage was sustained.

2.0 TEST SUMMARY AND RESULTS

The EUT (Equipment Under Test) is a 125 kHz Card Reader, Model RDR-6011AKU-V2, manufactured by RF IDeas, Inc. 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	30-1000 MHz	RSS-210 & FCC Part 15	Pass
Conducted Emissions, AC Mains	0.15 - 30 MHz	RSS-210 & FCC Part 15	Pass
RF Radiated Emissions H-Field	0.009 – 30 MHz	RSS-210 & FCC Part 15	Pass
Occupied Bandwidth	125 kHz	RSS-210 & FCC Part 15	Pass

Note: The RSS-210 specification is not currently covered in Radiometrics' Scope of Accreditation. This is technically very similar to FCC, CFR 47 Part 15 which is on Radiometrics scope.

2.1 RF Exposure Compliance Requirements

Since the effective power output is less than 1 mW, the EUT meets the FCC requirement for RF exposure and is exempt from RSS-102. There are no power level adjustments and 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 125 kHz Card Reader, Model RDR-6011AKU-V2, manufactured by RF IDeas, Inc. The EUT was in good working condition during the tests, with no known defects.

3.1.1 FCC Section 15.203 & RSS-GEN Antenna Requirements

The antenna is permanently attached to the PCB. The antenna is internal to the EUT and it is not readily available to be modified by the end user.

3.2 Related Submittals

RF IDeas, Inc. 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 high, nonconductive test stand. The testing was performed in conditions as close as possible to installed conditions. Wiring was consistent with manufacturer's recommendations. Power was supplied at 115 VAC, 60 Hz single-phase to the host computer. The EUT was powered from either the USB or PS/2 port.

4.2 Product Family

The following is the product family list of the readers that use the same electronics and PCB as the ones tested in this report:

Model Number	Family Part Number Description	Differences
RDR-6011AKU-V2	pcProx Enroll Vertical Nano - HID	HID format Keystroke Firmware
RDR-6211AKU-V2	pcProx Enroll Vertical Nano - Casi Rusco	Casi Rusco format Keystroke Firmware
RDR-6311AKU-V2	pcProx Enroll Vertical Nano - Indala	Indala format Keystroke Firmware
RDR-6911AKU-V2	pcProx Enroll Vertical Nano - AWID	AWID format Keystroke Firmware
RDR-6E11AKU-V2	pcProx Enroll Vertical Nano - EM	EM format Keystroke Firmware

The identification for all equipment, plus descriptions of all cables used in the tested system, are:

Tested System Configuration List

Item	Description	Type*	Manufacturer	Model Number	Serial Number
1	Card Reader: USB version	E	RF IDeas	RDR-6011AKU-V2	SN01
2	XPS Laptop Computer	H	Dell	PP25L	CN-0N6705-70166-7A4-01-1
3	Laptop AC-DC power supply	H	Dell	DA65NS4-00	CN-0XK850-48661-78C-289Z

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

List of Cables

QTY	Length (m)	Cable Description	Connected to (Item #)	Shielded?
1	1.1	USB Cable to Card Reader	#1 and #2	Yes
1	1.8	AC Cord to AC-DC power supply	#3 Power input	No
1	1.3	DC Cord to Computer	#3 to #2	No

See previous table for Item #'s.

4.3 Special Accessories

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

4.4 Equipment Modifications

No modifications were made at Radiometrics in order to meet the requirements listed in this report.

5.0 TEST SPECIFICATIONS

Document	Date	Title
FCC CFR Title 47	2019	Code of Federal Regulations Title 47, Chapter 1, Federal Communications Commission, Part 15 - Radio Frequency Devices
IC RSS-210 Issue 9	2016	Low Power Licence-Exempt Radiocommunication Devices (All Frequency Bands) Category I Equipment
IC RSS-Gen Issue 5	2019	General Requirements and Information for the Certification of Radiocommunication Equipment (RSS-Gen)

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.

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 IC8727A-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. The results relate only to the EUT listed herein. Any modifications made to the EUT subsequent to the indicated test date will invalidate the data and void this certification.

10.0 TEST EQUIPMENT TABLE

RMC ID	Manufacturer	Description	Model No.	Serial No.	Frequency Range	Cal Period	Cal Date
ANT-53	EMCO	Loop Antenna	6507	1453	1 kHz-30 MHz	24 Mo	12/28/17
ANT-68	EMCO	Log-Periodic Ant.	93146	9604-4456	200-1000MHz	24 Mo.	12/05/17
ANT-80	AH Systems	Bicon Antenna	SAS-540	294	20-330MHz	24 Mo.	12/14/18
CAB-106A	Teledyne	Coaxial Cable	N/A	1090	DC-2 GHz	24 Mo.	05/07/18
CAB-1090	Teledyne	Coaxial Cable	N/A	1090	DC-18 GHz	24 Mo.	05/16/18
CAB-160B	Teledyne	Coaxial Cable	N/A	1090	DC-18 GHz	24 Mo.	05/09/18
HPF-01	Solar	High Pass Filter	7930-100	HPF-1	0.15-30MHz	24 Mo.	03/04/18
LSN-03	Farnell	50 uH LISN	1EXLSN30B	000314	0.01-30MHz	24 Mo.	03/27/18
LSN-17	EMCO	LISN	3810/2NM	9602-1356	0.15 - 30MHz	24 Mo.	03/04/19

RMC ID	Manufacturer	Description	Model No.	Serial No.	Frequency Range	Cal Period	Cal Date
REC-20	HP / Agilent	Spectrum Analyzer	85460A/84562A	33330A00135 3410A00178	30Hz-6GHz	24 Mo.	08/03/17
REC-21	Agilent	Spectrum Analyzer	E7405A	MY45118341	9kHz-26.5GHz	24 Mo.	01/06/18
REC-22	Rohde & Schwarz	Spectrum Analyzer	ESIB 26	100145	26.5 GHz	24 Mo	08/29/17
THM-02	Fluke	Temp/Humid Meter	971	93490471	N/A	24 Mo.	10/17/17

Note: All calibrated equipment is subject to periodic checks.

Software Company	Test Software Name	Version	Applicable Tests
Radiometrics	EN550XX0	02.28.17	RF Conducted Emissions (FCC Part 15 & EN 55011/22)
Radiometrics	REREC11D	06.18.18	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 AC Conducted Emissions

The tests and limits are in accordance with FCC section 15.207 and RSS Gen section 8.8.

A computer-controlled analyzer was used to perform the conducted emissions measurements. The frequency range was divided into 500 subranges equally spaced on a logarithmic scale. The computer recorded the peak of each subrange. This data was then plotted on a semi-log graph generated by the computer. Adjusting the positions of the cables and orientation of the test system then maximizes the highest emissions.

Mains Conducted emission measurements were performed using a 50 Ohm/50 uH Line Impedance Stabilization Network (LISN) as the pick-up device. Measurements were repeated on both leads within the power cord. If the EUT power cord exceeded 80 cm in length, the excess length of the power cord was made into a 30 to 40 cm bundle near the center of the cord. The LISN was placed on the floor at the base of the test platform and electrically bonded to the ground plane.

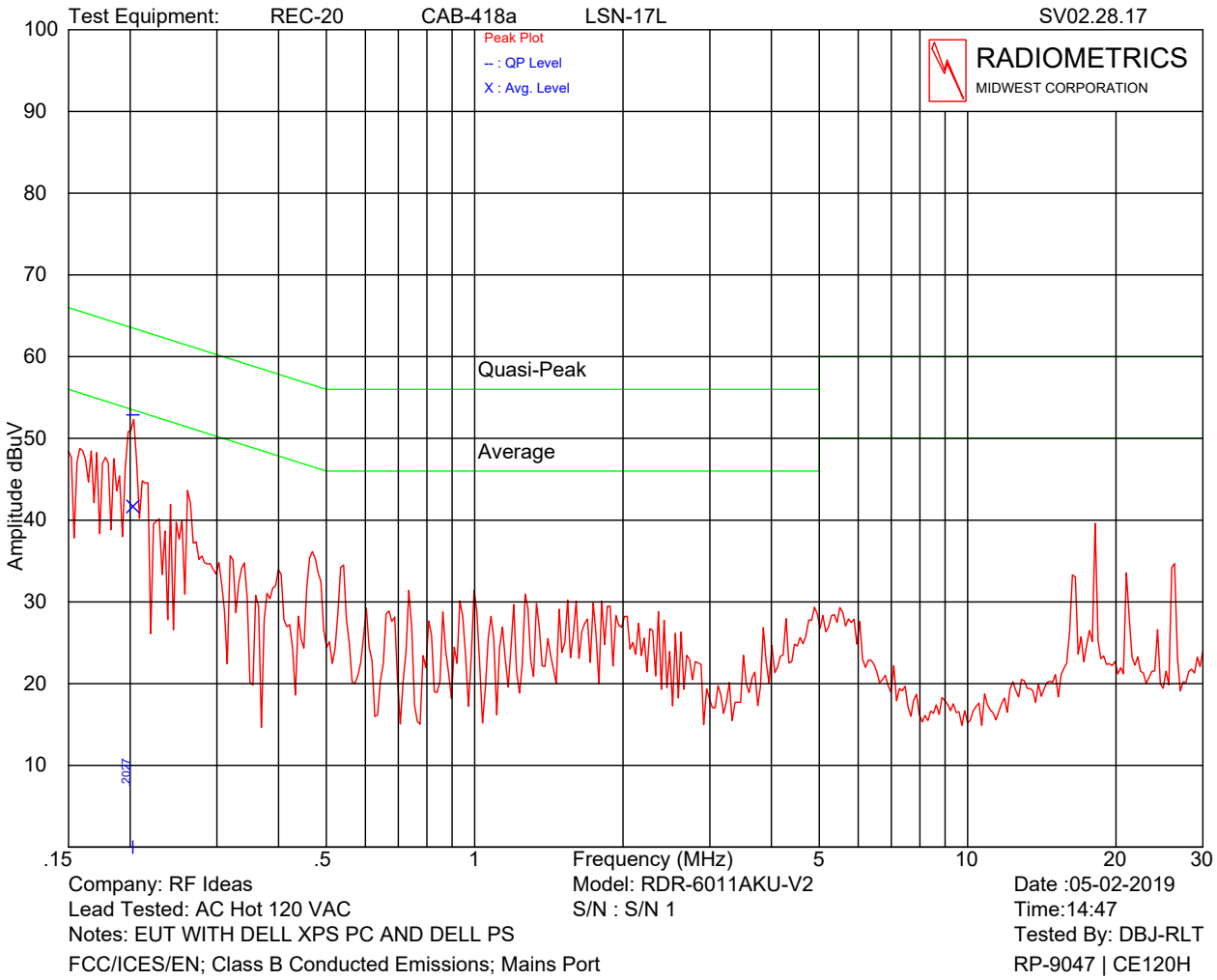
FCC/IC Limits of Conducted Emissions at the AC Mains Ports

Frequency Range (MHz)	Class B Limits (dBuV)	
	Quasi-Peak	Average
0.150 - 0.50*	66 - 56	56 - 46
0.5 – 5.0	56	46
5.0 - 30	60	50
* The limit decreases linearly with the logarithm of the frequency in this range.		

The Limit shown above is RSS-GEN Table 3.

The initial step in collecting conducted data is a peak detector scan and the plotting of the measurement range. Significant peaks are then marked as shown on the following table, and these signals are then measured with the quasi-peak detector. The following represents the worst case emissions from the host computer (with the EUT connected) power cord, after testing all modes of operation.

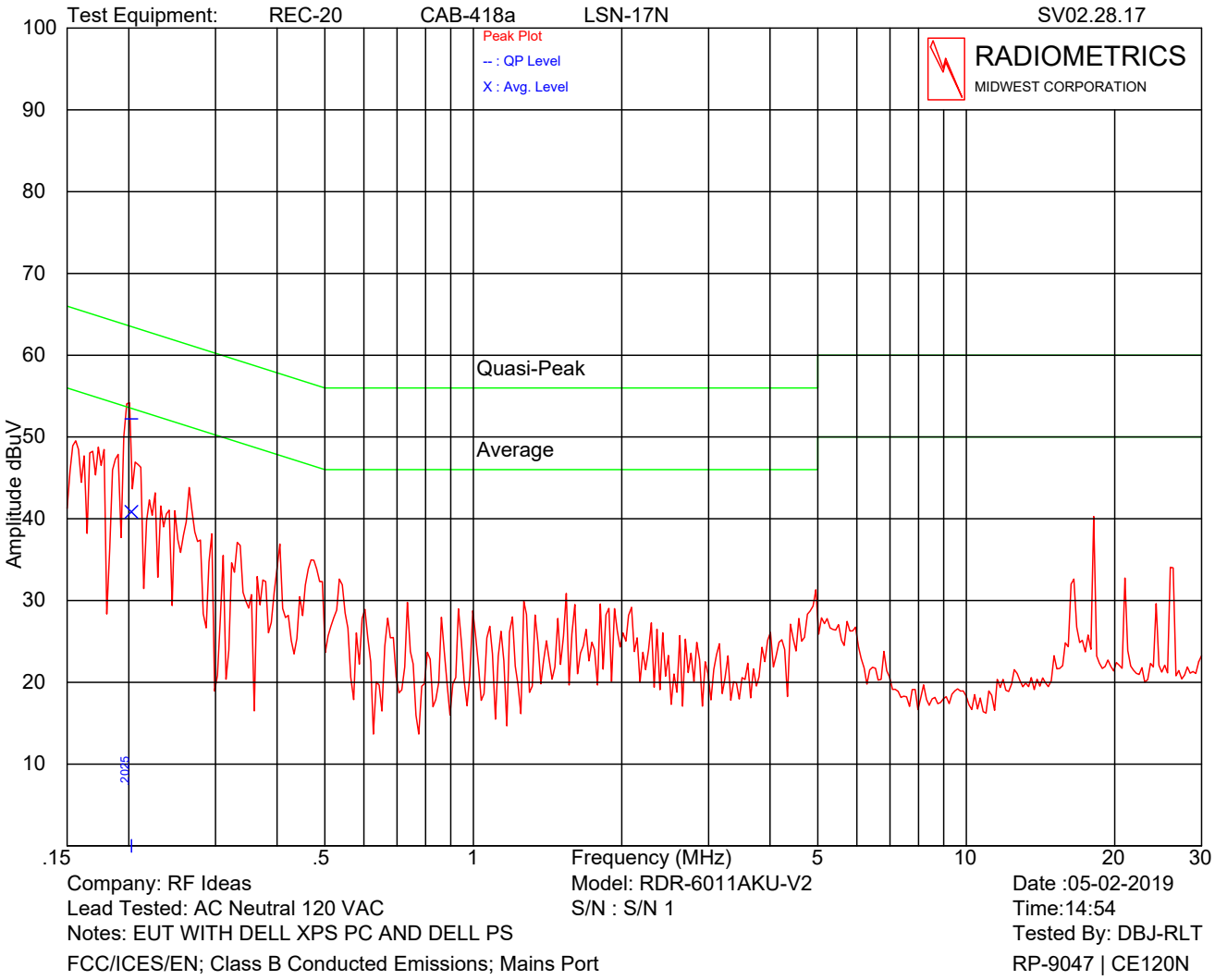
Test Date : May 2, 2019
QP readings are quasi-peak with a 9 kHz bandwidth and no video filter.



Frequency MHz	QP Amplitude	QP Limit	Average Amplitude	Average Limit	Margin Under Limit
0.203	52.9	63.5	41.7	53.5	10.6

Lead under test	Freq. MHz	Peak dBuV	Average Limit dBuV	Margin dB
AC Hot 120 VAC	0.152	49.5	55.9	6.4
AC Hot 120 VAC	0.158	49.2	55.6	6.4
AC Hot 120 VAC	0.167	48.7	55.1	6.4
AC Hot 120 VAC	0.171	48.9	54.9	6.0
AC Hot 120 VAC	0.178	48.3	54.6	6.3
AC Hot 120 VAC	0.185	48.6	54.2	5.6
AC Hot 120 VAC	0.195	46.3	53.8	7.5
AC Hot 120 VAC	0.206	47.4	53.4	6.0
AC Hot 120 VAC	0.212	44.8	53.1	8.3
AC Hot 120 VAC	0.217	44.6	52.9	8.3
AC Hot 120 VAC	0.242	41.9	52.0	10.1
AC Hot 120 VAC	0.262	43.6	51.4	7.7
AC Hot 120 VAC	18.135	39.6	50.0	10.4

The above are the highest readings relative to the limit. The peak readings met the average limit.



Company: RF Ideas
Lead Tested: AC Neutral 120 VAC
Notes: EUT WITH DELL XPS PC AND DELL PS
FCC/ICES/EN; Class B Conducted Emissions; Mains Port

Model: RDR-6011AKU-V2
S/N : S/N 1

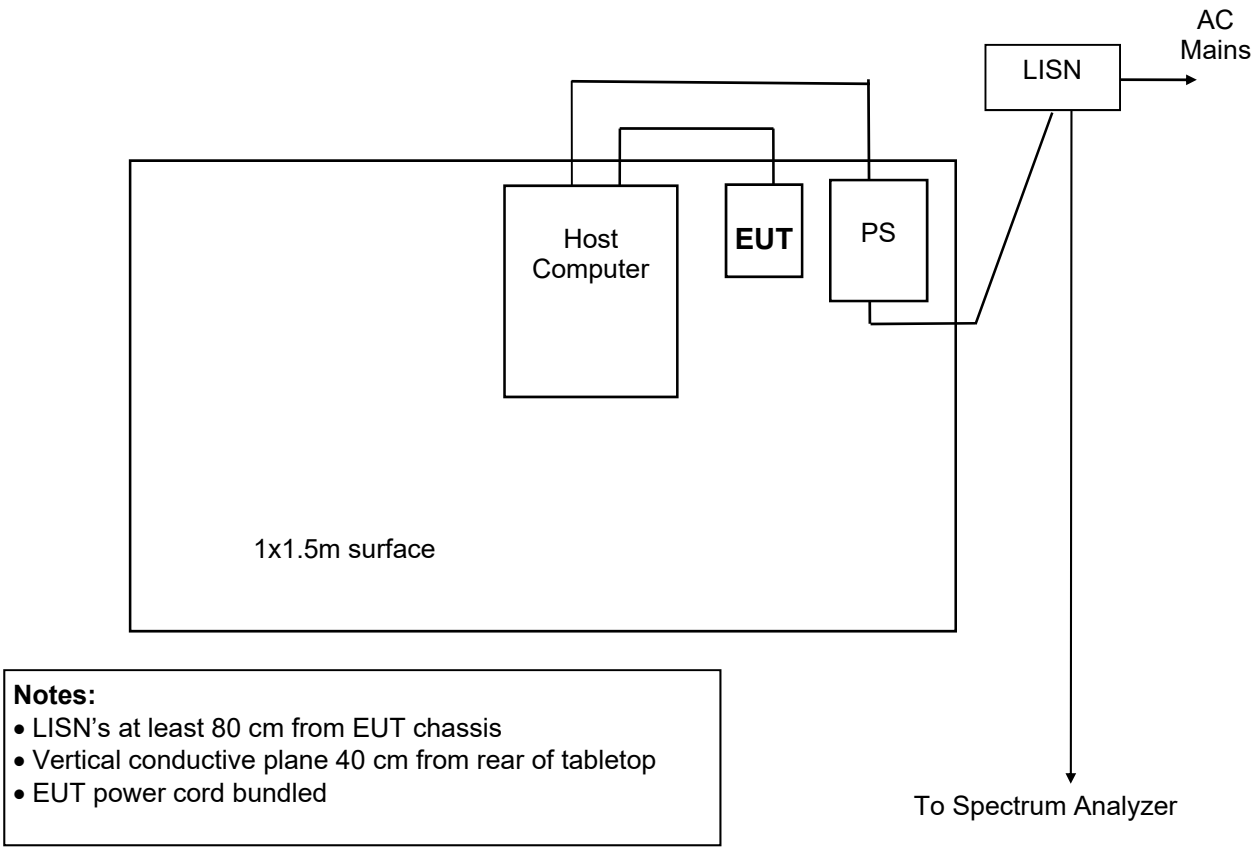
Date :05-02-2019
Time:14:54
Tested By: DBJ-RLT
RP-9047 | CE120N

Frequency MHz	QP Amplitude	QP Limit	Average Amplitude	Average Limit	Margin Under Limit
0.203	52.2	63.5	40.8	53.5	11.3

Lead under test	Freq. MHz	Peak dBuV	Average Limit dBuV	Margin dB
AC Neutral 120 VAC	0.156	49.6	55.7	6.1
AC Neutral 120 VAC	0.167	49.2	55.1	5.9
AC Neutral 120 VAC	0.178	49.0	54.6	5.6
AC Neutral 120 VAC	0.190	47.9	54.0	6.1
AC Neutral 120 VAC	0.209	46.6	53.2	6.6
AC Neutral 120 VAC	0.212	46.3	53.1	6.8
AC Neutral 120 VAC	0.226	43.2	52.6	9.4
AC Neutral 120 VAC	0.265	43.8	51.3	7.5
AC Neutral 120 VAC	0.405	36.9	47.7	10.8
AC Neutral 120 VAC	18.135	40.3	50.0	9.7

The above are the highest readings relative to the limit. The peak readings met the average limit.
Judgment: Passed by at least 5.6 dB.

Figure 1. Conducted Emissions Test Setup (USB Reader)



11.2 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. Figure 4 herein lists the details of the test equipment used during radiated emissions 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 1000 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.

Radiated Emissions Field Strength Limits

Frequency Range (MHz)	Test Distance (meters)	Class B Limits	
		uV/m	dB(uV/m)
0.009-0.490	300	2400/F(kHz)	20*LOG(2400/kHz)
0.490-1.705	30	24000/F(kHz)	20*LOG(24000/kHz)
1.705-30.0	30	30	29.5
30 - 88	3	100	40.0
88 - 216	3	150	43.5
216 - 960	3	200	46.0
Above 960	3	500	54.0

The emission limits shown in the above table are based on measurements using a CISPR quasi-peak detector except for the frequency bands 9-90 kHz, 110-490 kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector.

11.2.1 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

Where: FS = Field Strength
RA = Receiver Amplitude
AF = Antenna Factor
CF = Cable Attenuation Factor
AG = Amplifier Gain

11.2.2 Radiated Emissions Test Results

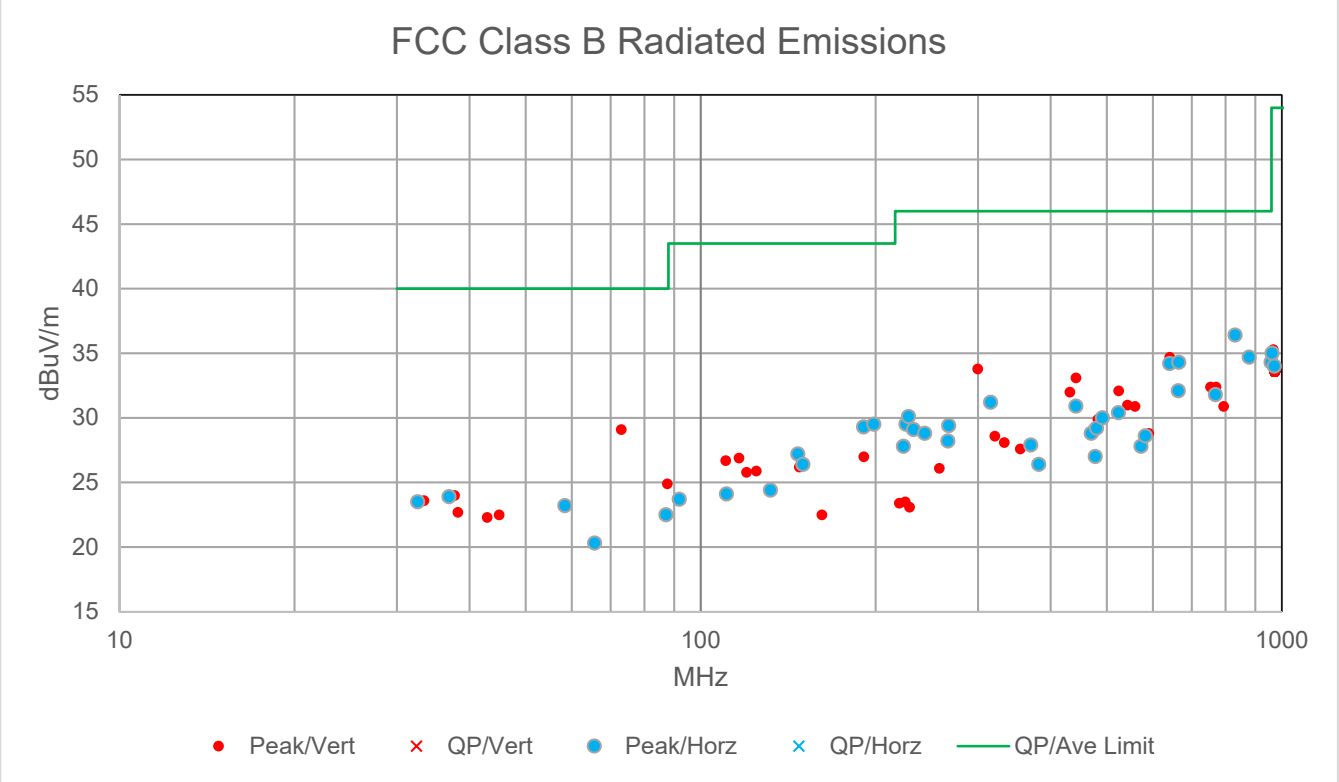
Test Date	05/02/2019
Test Distance	3 Meters
Specification	FCC Part 15 Subpart C & RSS-210
Notes	The actual FCC limits are in uV/m. The data in the table below coverted the limit to dBuV/m
Abbreviations	P = peak; Q = QP Pol = Antenna Polarization; V = Vertical; H = Horizontal
EUT	RDR-6011AKU-V2

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
32.6	10.1	P	H	13.0	0.4	0.0	23.5	40.0	16.5
36.9	11.7	P	H	11.8	0.4	0.0	23.9	40.0	16.1
58.4	13.5	P	H	9.2	0.5	0.0	23.2	40.0	16.8
65.7	10.5	P	H	9.2	0.6	0.0	20.3	40.0	19.7
87.2	12.1	P	H	9.7	0.7	0.0	22.5	40.0	17.5
91.9	13.2	P	H	9.8	0.7	0.0	23.7	43.5	19.8
110.8	12.3	P	H	11.0	0.8	0.0	24.1	43.5	19.4
131.9	11.3	P	H	12.2	0.9	0.0	24.4	43.5	19.1
147.0	13.6	P	H	12.7	0.9	0.0	27.2	43.5	16.3

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
150.0	12.7	P	H	12.8	0.9	0.0	26.4	43.5	17.1
190.8	14.3	P	H	13.9	1.1	0.0	29.3	43.5	14.2
198.6	14.2	P	H	14.2	1.1	0.0	29.5	43.5	14.0
223.4	16.1	P	H	10.6	1.1	0.0	27.8	46.0	18.2
225.7	17.9	P	H	10.5	1.1	0.0	29.5	46.0	16.5
227.9	13.8	P	H	15.1	1.2	0.0	30.1	46.0	15.9
232.5	17.3	P	H	10.6	1.2	0.0	29.1	46.0	16.9
243.0	16.2	P	H	11.4	1.2	0.0	28.8	46.0	17.2
266.4	14.7	P	H	12.2	1.3	0.0	28.2	46.0	17.8
267.2	15.8	P	H	12.3	1.3	0.0	29.4	46.0	16.6
315.5	15.2	P	H	14.6	1.4	0.0	31.2	46.0	14.8
369.9	11.8	P	H	14.6	1.5	0.0	27.9	46.0	18.1
382.0	10.4	P	H	14.5	1.5	0.0	26.4	46.0	19.6
442.4	13.2	P	H	16.0	1.7	0.0	30.9	46.0	15.1
470.3	10.2	P	H	16.9	1.7	0.0	28.8	46.0	17.2
477.8	11.0	P	H	14.2	1.8	0.0	27.0	46.0	19.0
480.1	10.6	P	H	16.8	1.8	0.0	29.2	46.0	16.8
491.4	10.6	P	H	17.6	1.8	0.0	30.0	46.0	16.0
523.8	10.6	P	H	17.9	1.9	0.0	30.4	46.0	15.6
572.5	7.6	P	H	18.3	1.9	0.0	27.8	46.0	18.2
582.5	8.5	P	H	18.2	1.9	0.0	28.6	46.0	17.4
641.3	12.6	P	H	19.5	2.1	0.0	34.2	46.0	11.8
663.8	10.4	P	H	19.6	2.1	0.0	32.1	46.0	13.9
665.0	12.5	P	H	19.7	2.1	0.0	34.3	46.0	11.7
768.8	7.9	P	H	21.6	2.3	0.0	31.8	46.0	14.2
831.3	12.1	P	H	21.9	2.4	0.0	36.4	46.0	9.6
878.8	9.9	P	H	22.3	2.5	0.0	34.7	46.0	11.3
958.8	7.9	P	H	23.8	2.6	0.0	34.3	46.0	11.7
962.5	8.6	P	H	23.8	2.6	0.0	35.0	54.0	19.0
971.3	8.4	P	H	23.0	2.6	0.0	34.0	54.0	20.0
33.4	10.5	P	V	12.7	0.4	0.0	23.6	40.0	16.4
37.7	12.0	P	V	11.6	0.4	0.0	24.0	40.0	16.0
38.2	10.8	P	V	11.5	0.4	0.0	22.7	40.0	17.3
42.9	11.4	P	V	10.4	0.5	0.0	22.3	40.0	17.7
45.0	11.8	P	V	10.2	0.5	0.0	22.5	40.0	17.5
73.0	19.2	P	V	9.3	0.6	0.0	29.1	40.0	10.9
87.6	14.5	P	V	9.7	0.7	0.0	24.9	40.0	15.1
110.4	15.0	P	V	10.9	0.8	0.0	26.7	43.5	16.8
116.4	14.8	P	V	11.3	0.8	0.0	26.9	43.5	16.6
119.9	13.4	P	V	11.6	0.8	0.0	25.8	43.5	17.7
124.6	13.2	P	V	11.9	0.8	0.0	25.9	43.5	17.6
147.8	12.6	P	V	12.7	0.9	0.0	26.2	43.5	17.3
161.6	8.6	P	V	12.9	1.0	0.0	22.5	43.5	21.0
190.8	12.0	P	V	13.9	1.1	0.0	27.0	43.5	16.5
219.6	11.6	P	V	10.7	1.1	0.0	23.4	46.0	22.6
224.9	11.8	P	V	10.6	1.1	0.0	23.5	46.0	22.5
228.7	11.4	P	V	10.5	1.2	0.0	23.1	46.0	22.9
257.4	12.8	P	V	12.1	1.2	0.0	26.1	46.0	19.9
299.7	18.4	P	V	14.0	1.4	0.0	33.8	46.0	12.2
320.8	12.9	P	V	14.3	1.4	0.0	28.6	46.0	17.4
332.9	12.8	P	V	13.9	1.4	0.0	28.1	46.0	17.9
354.8	11.3	P	V	14.8	1.5	0.0	27.6	46.0	18.4
431.8	14.0	P	V	16.3	1.7	0.0	32.0	46.0	14.0

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
442.4	15.4	P	V	16.0	1.7	0.0	33.1	46.0	12.9
473.3	10.6	P	V	16.8	1.7	0.0	29.1	46.0	16.9
482.4	11.2	P	V	16.9	1.8	0.0	29.9	46.0	16.1
523.8	12.3	P	V	17.9	1.9	0.0	32.1	46.0	13.9
542.5	11.8	P	V	17.3	1.9	0.0	31.0	46.0	15.0
558.8	10.4	P	V	18.6	1.9	0.0	30.9	46.0	15.1
575.0	7.8	P	V	18.3	1.9	0.0	28.0	46.0	18.0
590.0	8.2	P	V	18.6	2.0	0.0	28.8	46.0	17.2
641.3	13.1	P	V	19.5	2.1	0.0	34.7	46.0	11.3
666.3	12.4	P	V	19.8	2.1	0.0	34.3	46.0	11.7
753.8	8.6	P	V	21.6	2.2	0.0	32.4	46.0	13.6
770.0	8.4	P	V	21.7	2.3	0.0	32.4	46.0	13.6
793.8	8.1	P	V	20.5	2.3	0.0	30.9	46.0	15.1
966.3	9.1	P	V	23.6	2.6	0.0	35.3	54.0	18.7
970.0	8.5	P	V	23.1	2.6	0.0	34.2	54.0	19.8
972.5	8.2	P	V	22.8	2.6	0.0	33.6	54.0	20.4

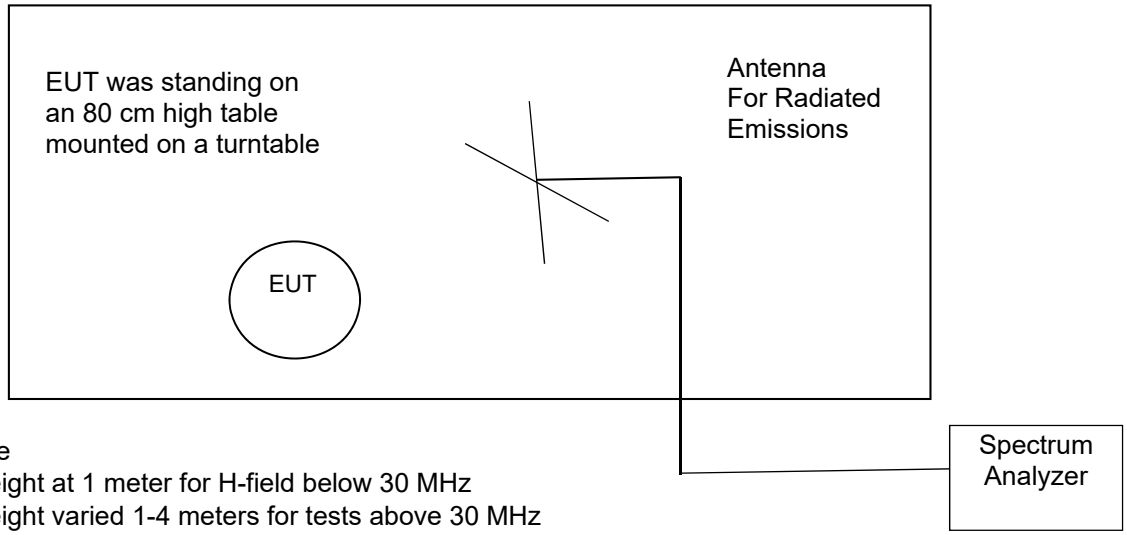
Judgment: Passed by 9.6 dB



Radiated emissions in a graphical format. The above chart has the same data as the previous tables.

Figure 2. Drawing of Radiated Emissions Test Setup

Chamber E, anechoic



Notes:
- Not to Scale
- Antenna height at 1 meter for H-field below 30 MHz
- Antenna height varied 1-4 meters for tests above 30 MHz
- 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
0.01 to 30 MHz	ANT-53	None; Active ANT	REC-21
30 to 200 MHz	ANT-80	Internal	REC-21
200 to 1000 MHz	ANT-68	Internal	REC-21

11.3 Magnetic Field Measurements and Decay Factor Calculations

Radiated emission measurements are performed with an EMCO shielded loop antenna. The antenna and the EUT were rotated in order to find the maximize readings.

The distance correction factor is calculated as follows:
The distance factor in (dB) = DE*20*Log(TD/SD)
Where: DE = Decay Exponent (2.0 is used for this)
TD = Test distance in meters. This is 3 meters
SD = Specifciation Distance in meters

From 9 kHz to 490 kHz, the Specifcation Distance is 300m therefore the distance factor is 2*20*LOG(300/3) = 80 dB.
From 490 kHz to 30 MHz, the Specifcation Distance is 30m therefore the distance factor is 2*20*LOG(30/3) = 40 dB.

11.3.1 Magnetic Field Radiated Emissions Results (0.009 to 30 MHz)

Test Date	05/02/2019
Test Distance	3 Meters
Specification	FCC 15 & RSS-GEN
Notes	A shielded Loop Antenna was used for this test.
Configuration	RDR-6011AKU-V2 (USB)

Freq (kHz)	meter reading dBuV	Loop Ant Factor	Dist. (m)	Decay exp	Cable Loss dB	Distance factor dB	Field Strength dBuV/m	FCC & RSS-GEN Limit dBuV/m	Margin under limit	Notes
125.0	56.4	19.1	3.0	2.0	0.1	-80.0	-4.4	25.7	30.1	
250.0	46.8	18.9	3.0	2.0	0.1	-80.0	-14.2	19.6	33.8	
375.0	42.9	18.9	3.0	2.0	0.1	-80.0	-18.1	16.1	34.2	
500.0	38.1	18.8	3.0	2.0	0.1	-40.0	17.0	33.6	16.6	
625.0	34.2	18.7	3.0	2.0	0.1	-40.0	13.0	31.7	18.7	
Column #										
1	2	3	4	5	6	7	8	9	10	

Notes on Columns:
Column #1. Frequency of Tested Emission.
Column #2. Uncorrected readings from the spectrum analyzer (Peak)
Column #3. Antenna factor converts dBuV to dBuV/m
Column #4. Test Distance in meters
Column #5. Decay Exponent
Column #6. Cable Loss
Column #7. Distance factor (dB) = (Decay Exponent)*20*Log(Test Distance/Specification Distance)
Column #8. Total field strength. This = Columns 2 + 3 + 6 + 7
Column #9. FCC and Canada Limit in dBuV/m
Column #10. This is the margin under the limit for that row.

All limits are general limits of FCC 15.209 or the RSS-Gen.

The emissions were scanned from 10 kHz to 30 MHz. No other emissions were detected from 10 kHz to 30 MHz within 10 dB of the 15.209 or the RSS-GEN limits.

Judgement: Passed by 16.6 dB.

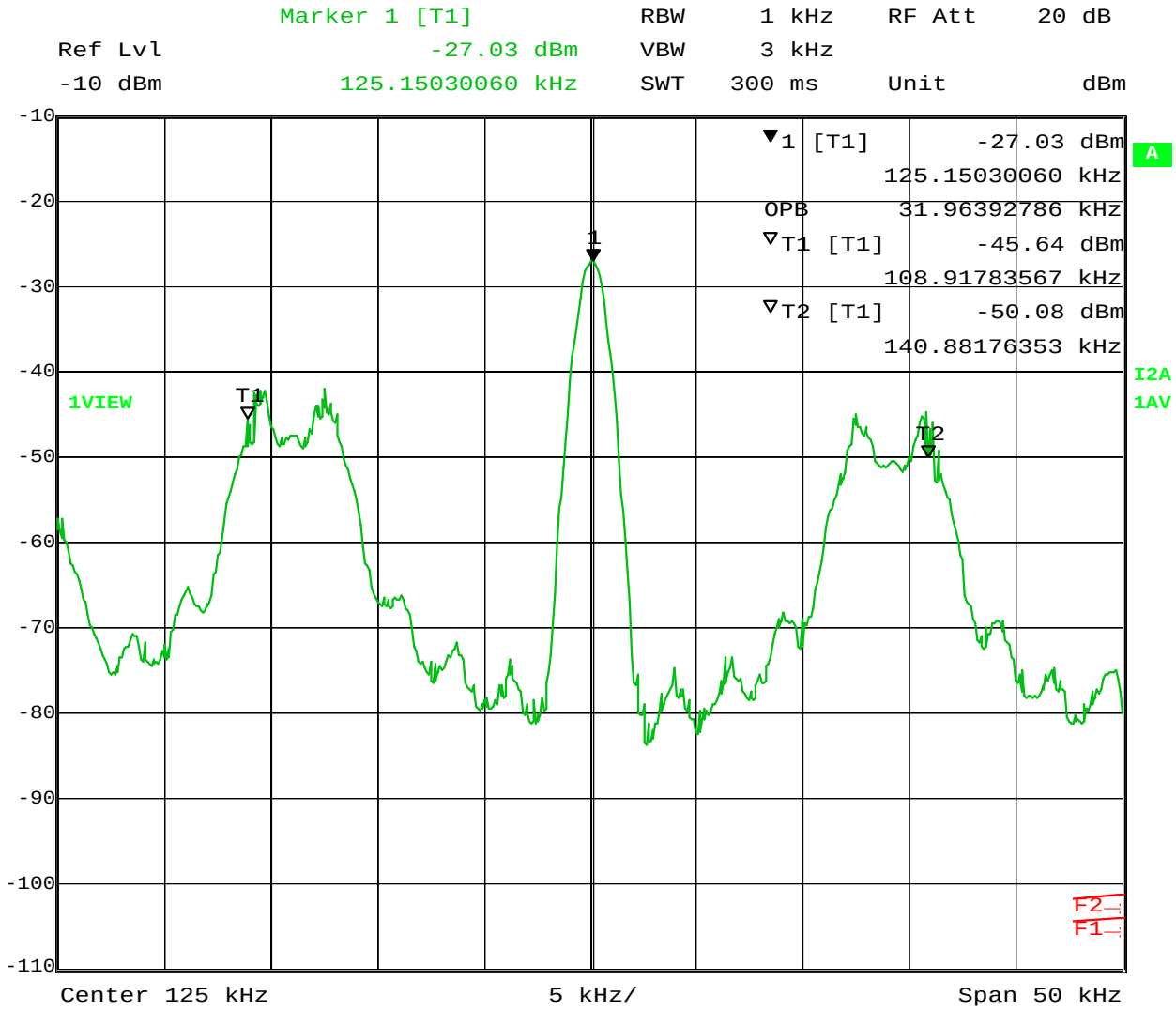
11.4 Occupied Bandwidth Data

The occupied bandwidth of the RF output was measured using a spectrum analyzer. 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. The plots of the occupied bandwidth for the EUT are supplied on the following page.

Product	99% OBW
	125 kHz signal
USB	32 kHz

Judgement: Pass

Figure 3. Occupied Bandwidth Plots 125 kHz



Comment A: 99% Occupied Bandwidth with card
Date: 16.MAY.2019 12:53:00

Bandwidth = 32.0 kHz

12.0 MEASUREMENT INSTRUMENTATION UNCERTAINTY

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.

Measurement	Uncertainty
Conducted Emissions, LISN method, 150 kHz to 30 MHz	2.7 dB
Radiated Emissions, H-field, 3 meters, 9 kHz to 30 MHz	2.7 dB
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
99% Occupied Bandwidth	1% of frequency span
Temperature THM-03	0.6 Deg C