



Electromagnetic Compatibility Test Report

Tests Performed on an RF Ideas, Inc.

Dual Frequency Card Reader

Models RDR-80081AK6, RDR-80081AK9, RDR-80581AK6, & RDR-80581AK9

Radiometrics Document RP-8675A




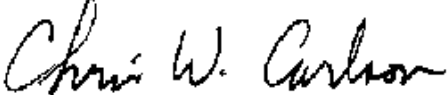
<i>Product Detail:</i>			
FCC ID: M9MLC80XW6R			
IC: 6571A-LC80XW6R			
Equipment type: Dual Frequency Card Reader			
<i>Test Standards:</i>			
US CFR Title 47, Chapter I, FCC Part 15 Subpart C			
FCC Part 15 CFR Title 47: 2017			
Canada ISED; RSS-210, Issue 9: 2016 as required for Category I Equipment			
FCC Part 15.209 and 15.225			
<i>Tests Performed For:</i>		<i>Test Facility:</i>	
RF Ideas, Inc. 4020 Winnetka Av. Rolling Meadows, IL 60008		Radiometrics Midwest Corporation 12 East Devonwood Romeoville, IL 60446	
<i>Test Date(s): (Month-Day-Year)</i>			
June 7 thru August 29, 2017			
Document RP-7382 Revisions:			
Rev.	Issue Date	Affected Sections	Revised By
0	August 31, 2017		
1	September 13, 2017	2, 11.1, 11.2.2, 11.4	Joseph Strzelecki

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1 ADMINISTRATIVE DATA

<i>Equipment Under Test:</i> A RF IDEas, Inc., Dual Frequency Card Reader Models: RDR-80081AK6, RDR-80081AK9, RDR-80581AK6, & RDR-80581AK9 Serial Numbers: L0I530062, L0IS50051, L05S800160, and L05S50051 This will be referred to as the EUT in this Report	
<i>Date EUT Received at Radiometrics: (Month-Day-Year)</i> June 7, 2017	<i>Test Date(s): (Month-Day-Year)</i> June 7 thru August 29, 2017
<i>Test Report Written By:</i> Joseph Strzelecki Senior EMC Engineer	<i>Test Witnessed By:</i> The tests were not witnessed by RF IDEas, Inc.
<i>Radiometrics' Personnel Responsible for Test:</i>  Joseph Strzelecki Senior EMC Engineer NARTE EMC-000877-NE	<i>Test Report Approved By:</i>  Chris W. Carlson Director of Engineering NARTE EMC-000921-NE

2 TEST SUMMARY AND RESULTS

The EUT (Equipment Under Test) is a Dual Frequency Card Reader, Models RDR-80081AK6, RDR-80081AK9, RDR-80581AK6, and RDR-80581AK9, 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 and 13.56 MHz	RSS-210 & FCC Part 15	
Frequency Stability	13.56 MHz	RSS-210 & FCC Part 15	

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 EQUIPMENT UNDER TEST (EUT) DETAILS

3.1 EUT Description

The EUT is a dual frequency card reader, Models RDR-80081AK6, RDR-80081AK9, RDR-80581AK6, and RDR-80581AK9, manufactured by RF IDEas, Inc. The difference between the four model numbers being that the RDR-80081AK6 and RDR-80081AK9 have an SE Logic IC at location U2 that can be used in decoding an HID iCLASS 13.56 MHz credential whereas the models RDR-80581AK6 and RDR-80581AK9 will not have the SE Logic IC. Both products have the same PCB. The EUT was in good working condition during the tests, with no known defects.

3.1.1 Product Family

The following is the product family list of the readers that use the RF sections.

Model Number	Model Number
RDR-80081AK9	RDR-80581AK9
RDR-80081AK6	RDR-80581AK6

3.1.2 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 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. 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	Dual Frequency Reader	E	RF IDEas	RDR-80081AK6	L0I530062
2	Dual Frequency Reader	E	RF IDEas	RDR-80081AK9	L0IS50051
3	Dual Frequency Reader	E	RF IDEas	RDR-80581AK6	L05S800160
4	Dual Frequency Reader	E	RF IDEas	RDR-80581AK9	L05S50051
5	Desktop PC	H	Dell	DCNE	53FMFC1
6	Monitor	P	Dell	E156FPf	CN-0Y9998-72872-5BN-1KET
7	Keyboard	P	Dell	L100	CN-0RH659-73571-14C-0926

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

List of EUT Cables

QTY	Length (m)	Cable Description	Shielded?
1	1.8	Serial Cable to Card Reader	Yes
1	1.8	AC Cord to Computer	No
1	1.5	VGA cable to Monitor	Yes
1	1.9	Power cord to Monitor	No
1	1.5	Integral Mouse cable	Yes
1	1.2	Integral Keyboard cable	Yes

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 at Radiometrics in order to meet the requirements listed in this report.

5 TEST SPECIFICATIONS

Document	Date	Title
FCC CFR Title 47	2017	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 4	2014	General Requirements and Information for the Certification of Radiocommunication Equipment (RSS-Gen)

6 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 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 DEVIATIONS AND EXCLUSIONS FROM THE TEST SPECIFICATIONS

There were no deviations or exclusions from the test specifications.

9 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.

RADIOMETRICS MIDWEST CORPORATION - EMC Test Report

RF IDEas, Models RDR-80081AK6, RDR-80081AK9, RDR-80581AK6, & RDR-80581AK9

10 TEST EQUIPMENT TABLE

RMC ID	Manufacturer	Description	Model No.	Serial No.	Frequency Range	Cal Period	Cal Date
AMP-22	Anritsu	Pre-amplifier	MH648A	M23969	0.1-1200MHz	12 Mo.	01/09/17
ANT-03	Tensor	Biconical Antenna	4104	2231	20-250MHz	24 Mo.	12/07/15
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-08	RMC	Log-Periodic Ant.	LP1000	1002	200-1000MHz	24 Mo.	10/06/16
ANT-53	EMCO	Loop Antenna	6507	1453	1 kHz-30 MHz	24 Mo.	12/17/15
CAB-106A	Teledyne	Coaxial Cable	N/A	1090	DC-2 GHz	24 Mo.	04/21/16
CAB-1090	Teledyne	Coaxial Cable	N/A	1090	DC-18 GHz	24 Mo.	04/19/16
CAB-160B	Teledyne	Coaxial Cable	N/A	1090	DC-18 GHz	24 Mo.	04/21/16
LSN-01	Electrometrics	50 uH LISN	FCC/VDE 50/2	1001	0.01-30MHz	24 Mo.	06/30/17
LSN-03	Farnell	50 uH LISN	1EXLSN30B	000314	0.15-30MHz	24 Mo.	02/08/16
REC-11	Agilent	Spectrum Analyzer	E7405A	US39110103	9Hz-26.5GHz	24 Mo.	03/23/16
REC-21	Agilent	Spectrum Analyzer	E7405A	MY45118341	9kHz-26.5 GHz	24 Mo.	12/22/15
REC-43	Adventest	Spectrum Analyzer	U3772	150800305	9kHz-43GHz	24 Mo.	04/19/17
THM-03	Fluke	Temp/Humid Meter	971	95850465	N/A	12 Mo.	02/20/17

Note: All calibrated equipment is subject to periodic checks.

Software Company	Test Software Name	Version	Applicable Tests
Radiometrics	EN550XX0	06.10.16	RF Conducted Emissions (FCC Part 15 & EN 55011/22)
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 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.		

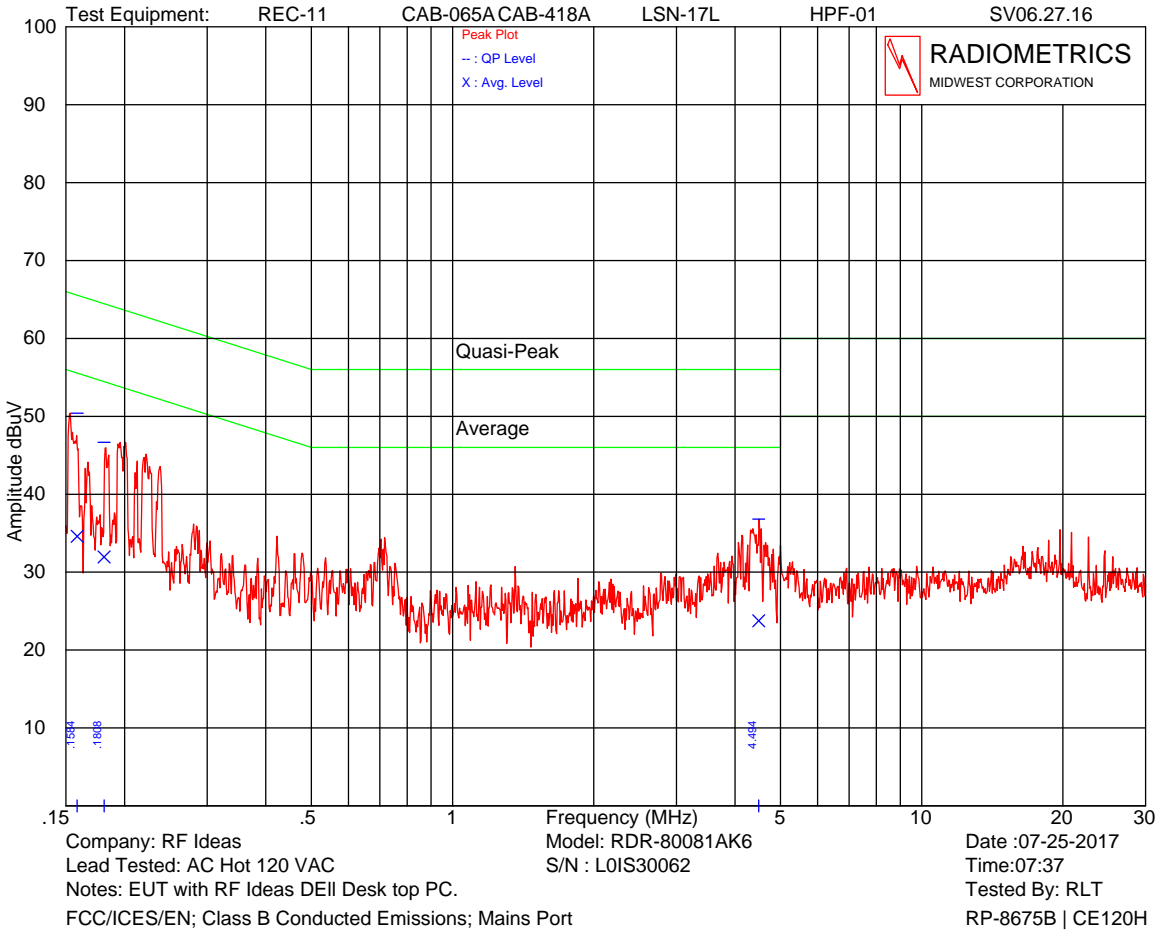
The initial step in collecting conducted data is a peak detector scan and the plotting of the measurement range. Significant peaks are then marked as shown on the following table, and these signals are then measured with the quasi-peak detector. The following represents the worst case emissions from the host computer (with the EUT connected) power cord, after testing all modes of operation. QP readings are quasi-peak with a 9 kHz bandwidth and no video filter.

Test Date : July 25, 2017

The 125 kHz and the 13.56 MHz transmitters were both on during the following tests. The following shows the results while reading the 125 kHz card during the tests. There was no difference seen with the 13.56 MHz or the 125 card type.

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RF IDEas, Models RDR-80081AK6, RDR-80081AK9, RDR-80581AK6, & RDR-80581AK9

Model: RDR-80081AK6;

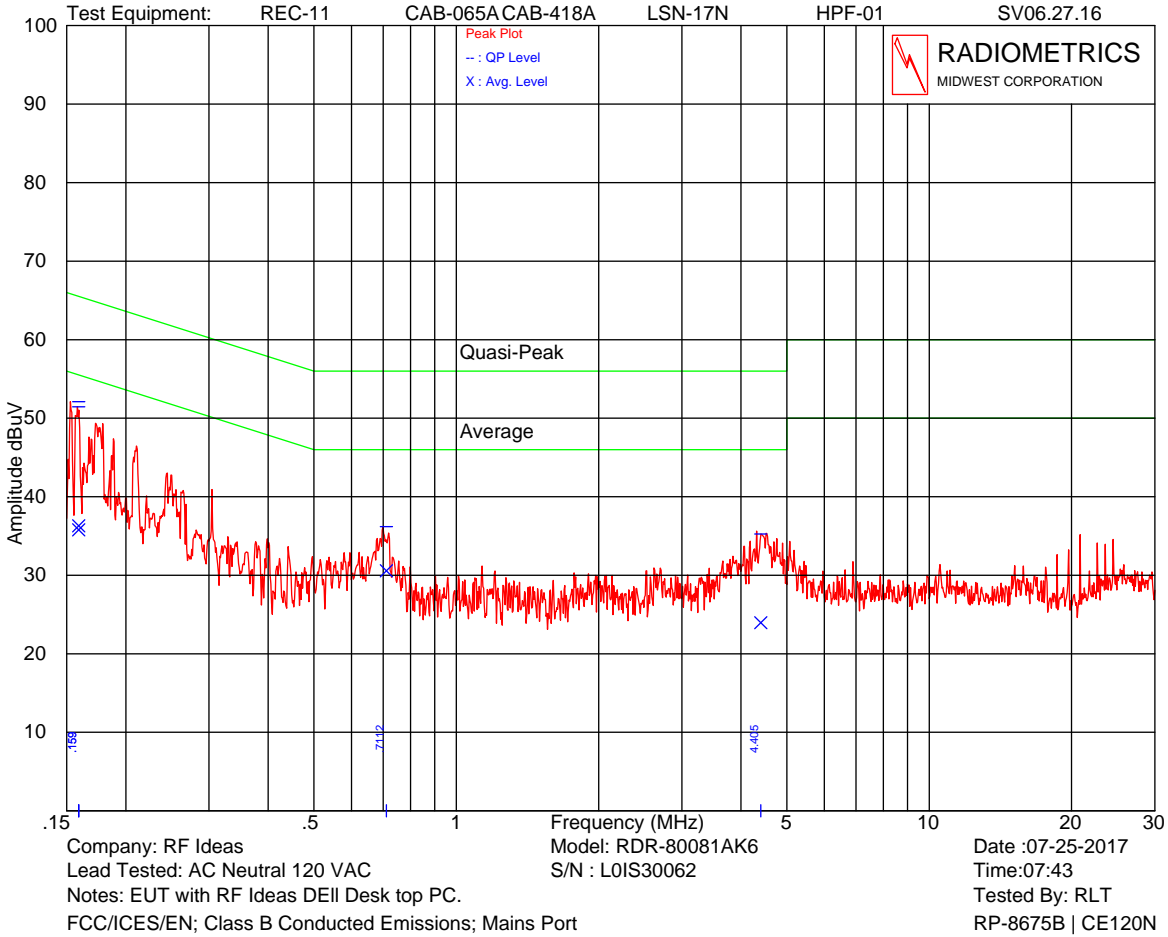


Frequency (MHz)	QP Amplitude (dBuV)	QP Limit (dBuV)	Average Amplitude (dBuV)	Average Limit (dBuV)	Margin (dB)
0.158	50.4	65.5	34.6	55.5	15.1
0.181	46.7	64.4	31.9	54.4	17.8
4.495	36.8	56.0	23.7	46.0	19.2

The Limit shown above is RSS-GEN Table 3.

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RF IDEas, Models RDR-80081AK6, RDR-80081AK9, RDR-80581AK6, & RDR-80581AK9

Model: RDR-80081AK6

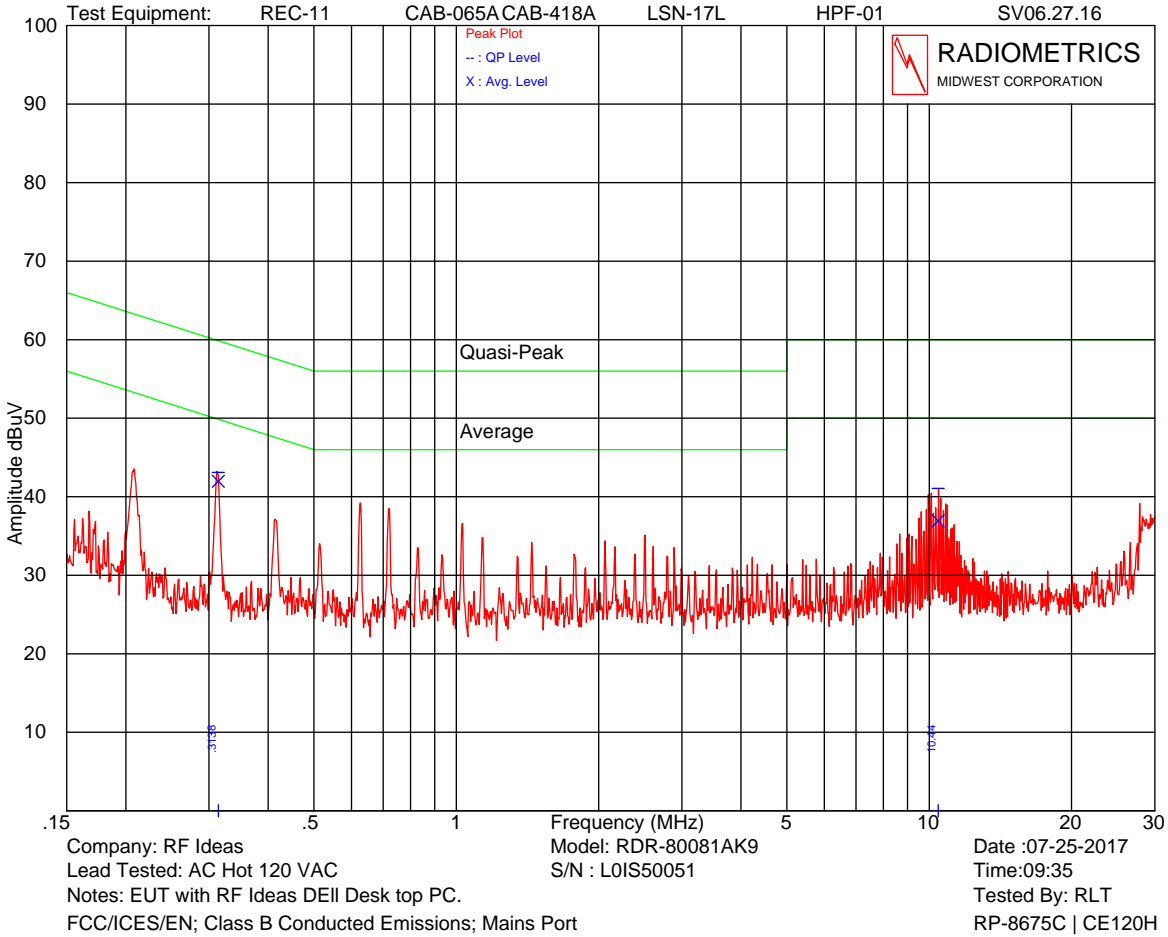


Frequency (MHz)	QP Amplitude (dBuV)	QP Limit (dBuV)	Average Amplitude (dBuV)	Average Limit (dBuV)	Margin (dB)
0.159	52.1	65.5	35.8	55.5	13.4
0.159	51.4	65.5	36.3	55.5	14.1
0.711	36.2	56.0	30.6	46.0	15.4
4.405	35.3	56.0	24.0	46.0	20.7

The Limit shown above is RSS-GEN Table 3.

RADIOMETRICS MIDWEST CORPORATION - EMC Test Report
RF IDEas, Models RDR-80081AK6, RDR-80081AK9, RDR-80581AK6, & RDR-80581AK9

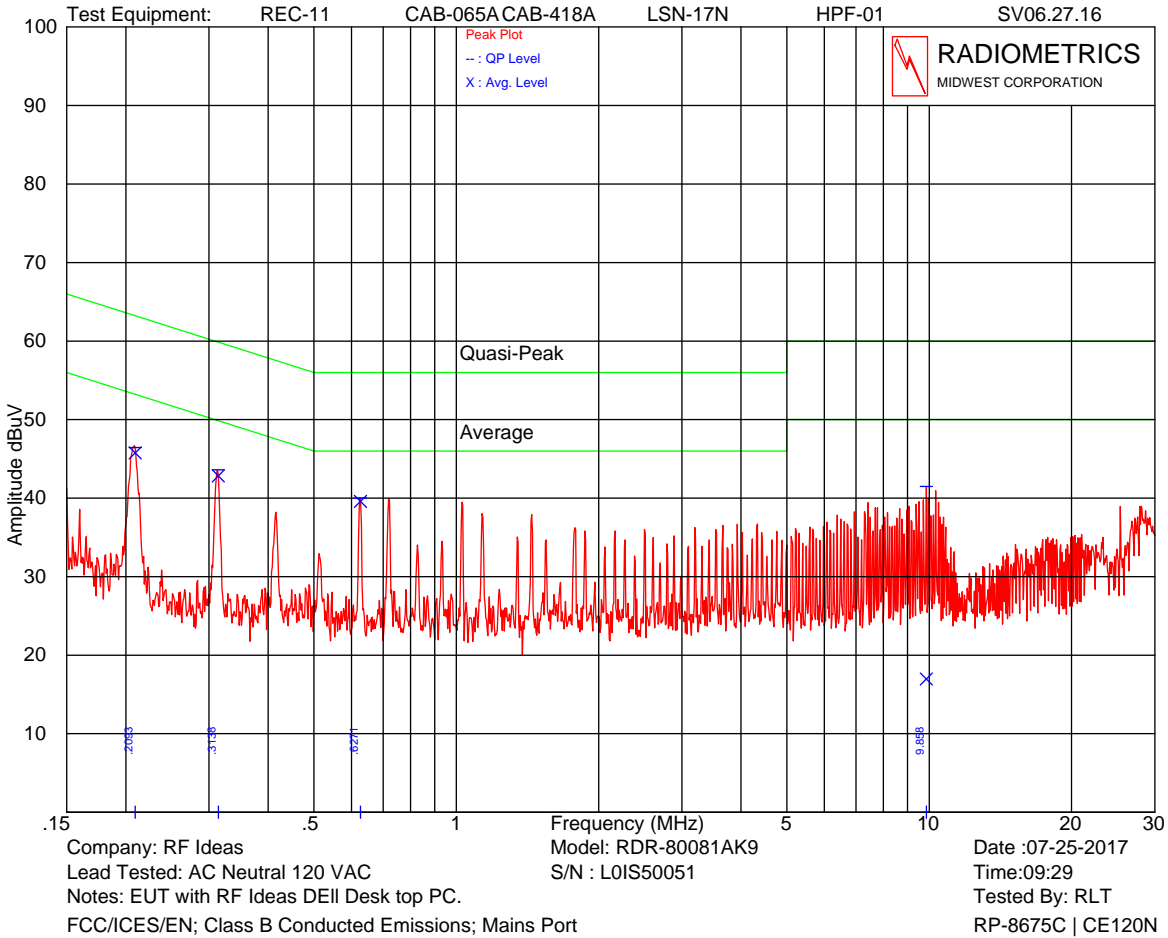
Model: RDR-80081AK9



Frequency (MHz)	QP Amplitude (dBuV)	QP Limit (dBuV)	Average Amplitude (dBuV)	Average Limit (dBuV)	Margin (dB)
0.314	43.1	59.9	42.0	49.9	7.9
10.448	41.1	60.0	36.9	50.0	13.1

RADIOMETRICS MIDWEST CORPORATION - EMC Test Report
RF IDEas, Models RDR-80081AK6, RDR-80081AK9, RDR-80581AK6, & RDR-80581AK9

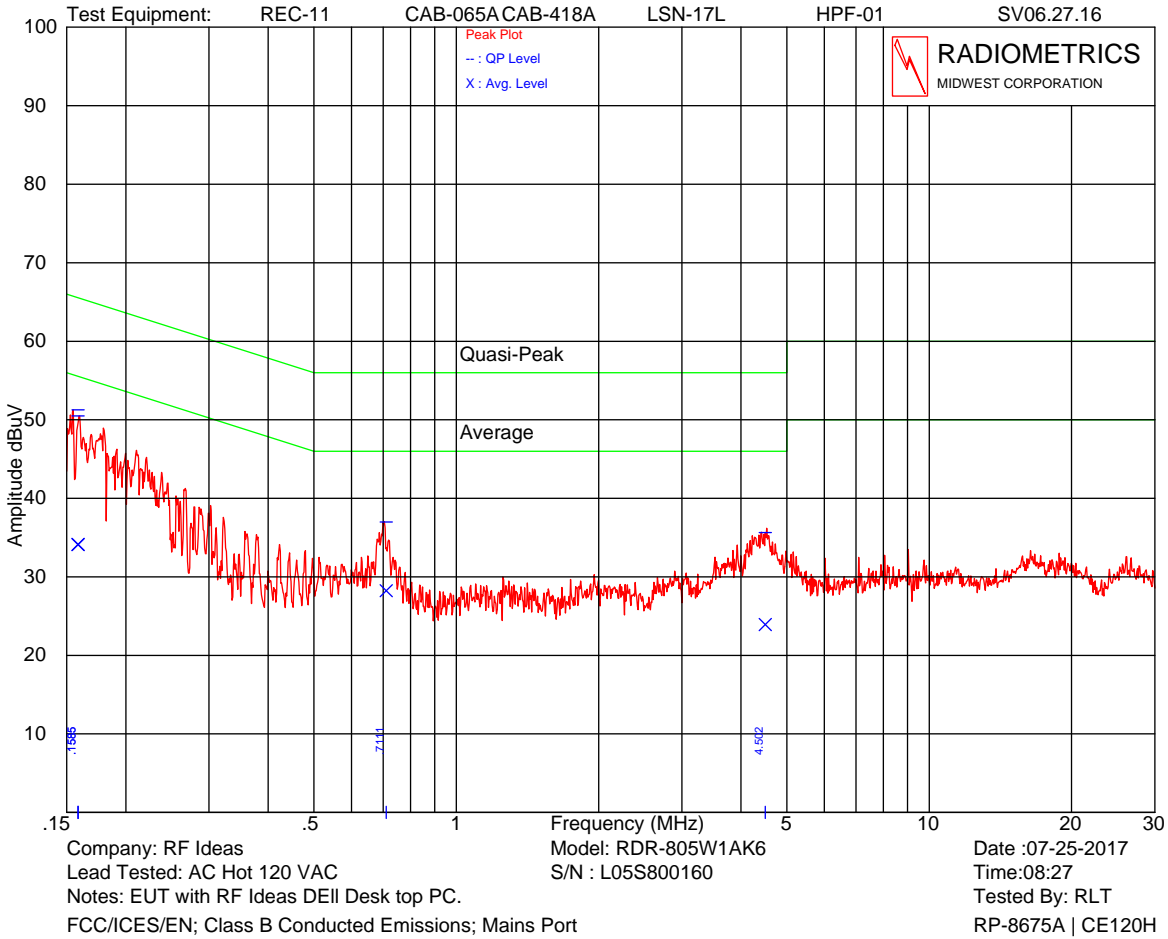
Model: RDR-80081AK9



Frequency (MHz)	QP Amplitude (dBuV)	QP Limit (dBuV)	Average Amplitude (dBuV)	Average Limit (dBuV)	Margin (dB)
0.209	46.4	63.2	45.8	53.2	7.5
0.314	43.6	59.9	42.8	49.9	7.0
0.627	40.0	56.0	39.6	46.0	6.4
9.858	41.5	60.0	17.0	50.0	18.5

The Limit shown above is RSS-GEN Table 3.

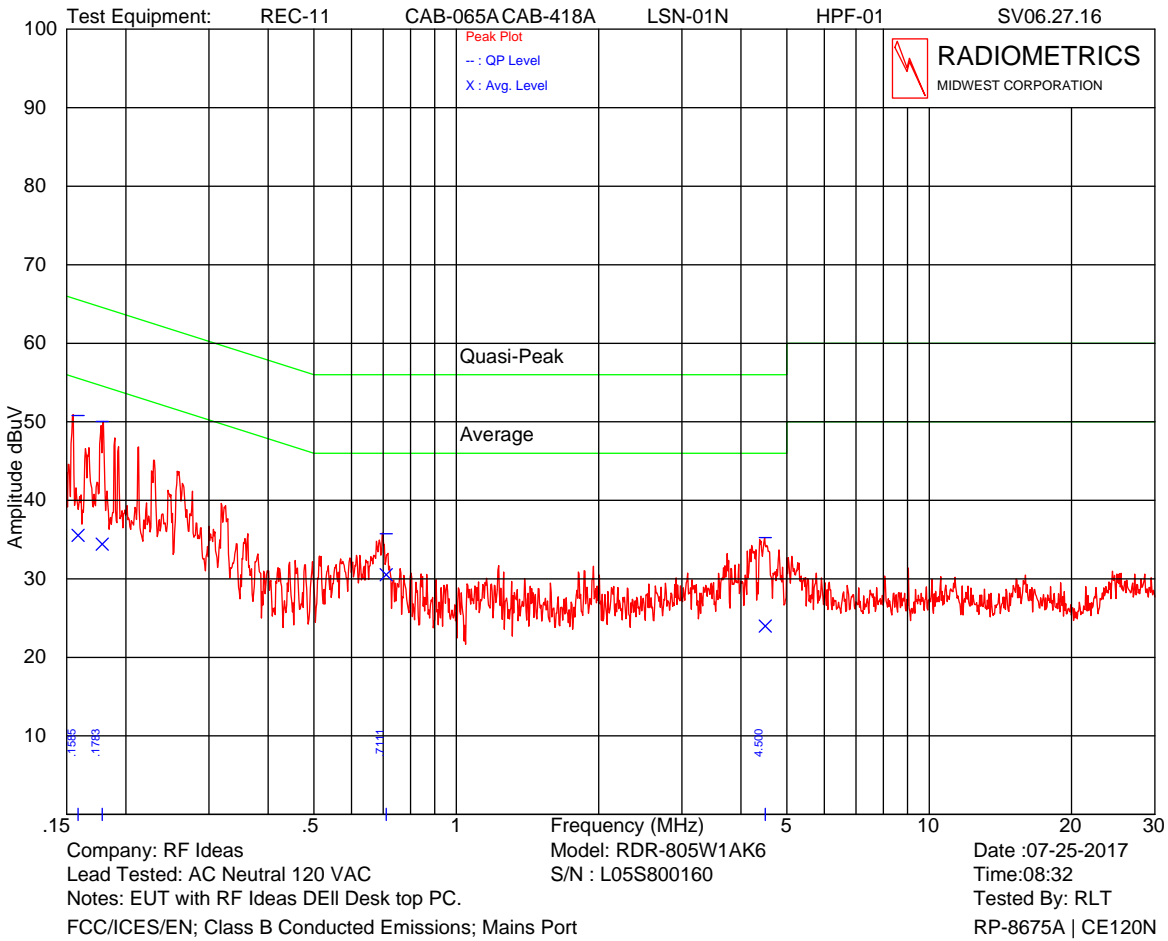
Model: RDR-80581AK6



Frequency (MHz)	QP Amplitude (dBuV)	QP Limit (dBuV)	Average Amplitude (dBuV)	Average Limit (dBuV)	Margin (dB)
0.159	51.3	65.5	34.1	55.5	14.3
0.159	50.5	65.5	34.1	55.5	15.0
0.711	37.0	56.0	28.2	46.0	17.8
4.502	35.6	56.0	23.9	46.0	20.4

The Limit shown above is RSS-GEN Table 3.

Model: RDR-80581AK6



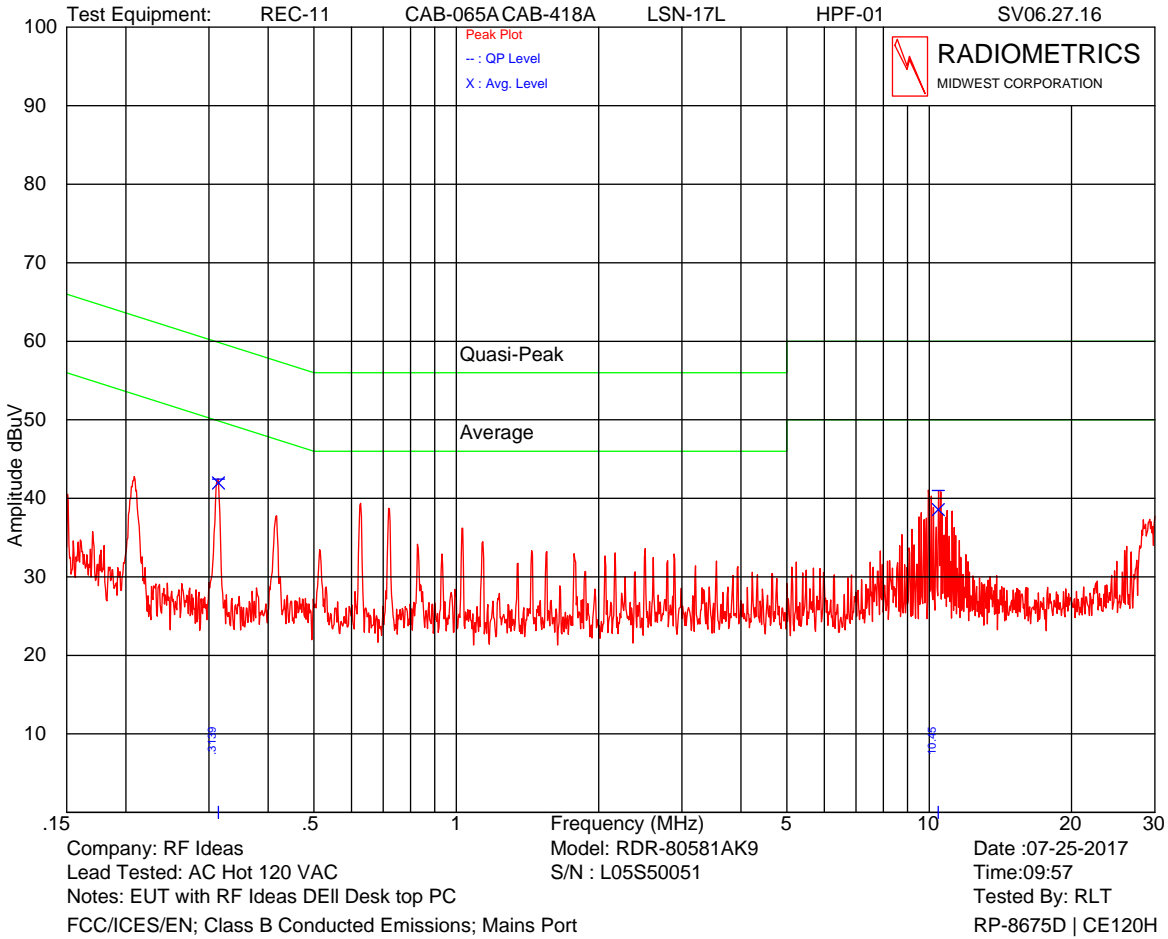
Frequency (MHz)	QP Amplitude (dBuV)	QP Limit (dBuV)	Average Amplitude (dBuV)	Average Limit (dBuV)	Margin (dB)
0.159	50.8	65.5	35.5	55.5	14.7
0.178	50.0	64.6	34.4	54.6	14.5
0.711	35.7	56.0	30.5	46.0	15.5
4.501	35.2	56.0	24.0	46.0	20.8

The Limit shown above is RSS-GEN Table 3.

Judgement: Passed by at least 6 dB at all frequencies with standard Loop antenna installed.

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RF IDEas, Models RDR-80081AK6, RDR-80081AK9, RDR-80581AK6, & RDR-80581AK9

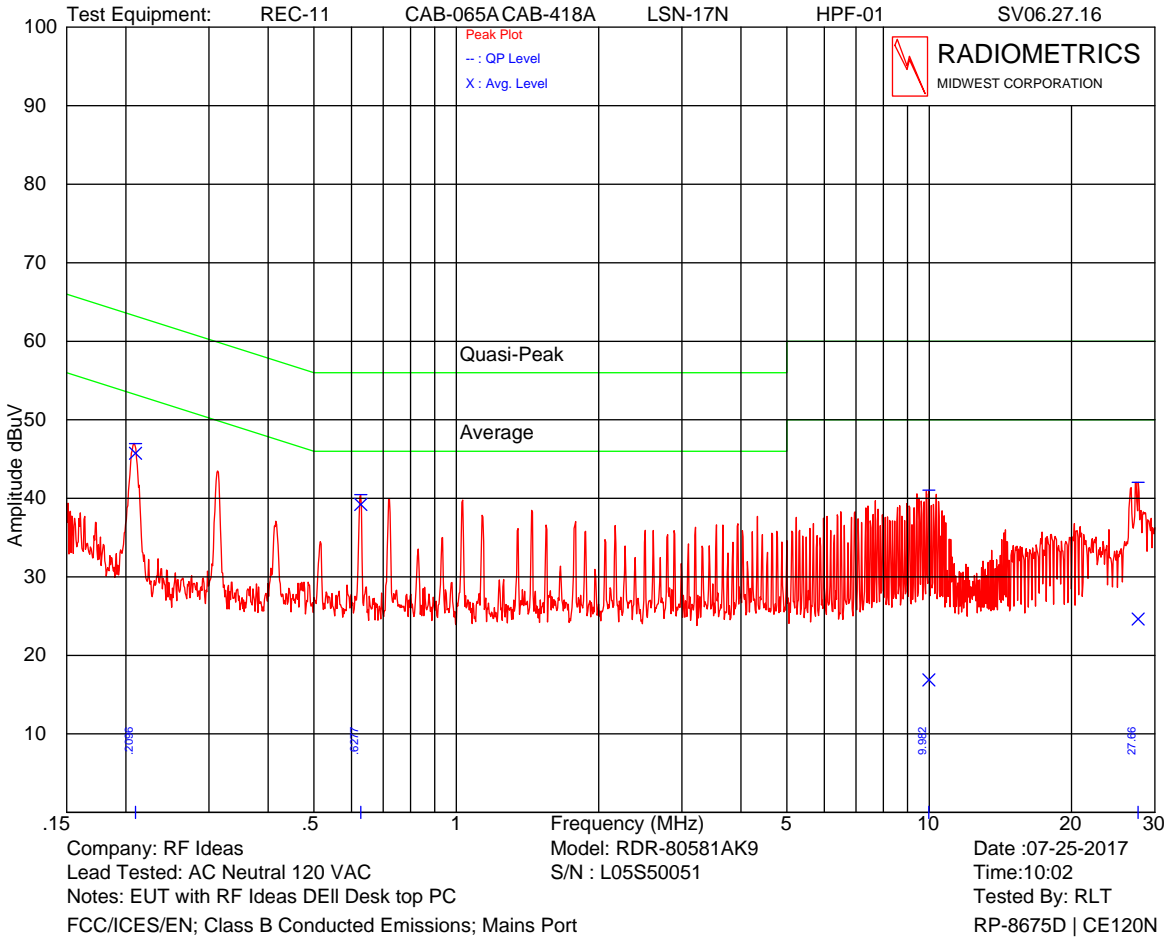
Model: RDR-80581AK9



Frequency (MHz)	QP Amplitude (dBuV)	QP Limit (dBuV)	Average Amplitude (dBuV)	Average Limit (dBuV)	Margin (dB)
0.314	42.4	59.9	42.0	49.9	7.9
10.454	41.0	60.0	38.6	50.0	11.4

The Limit shown above is RSS-GEN Table 3.

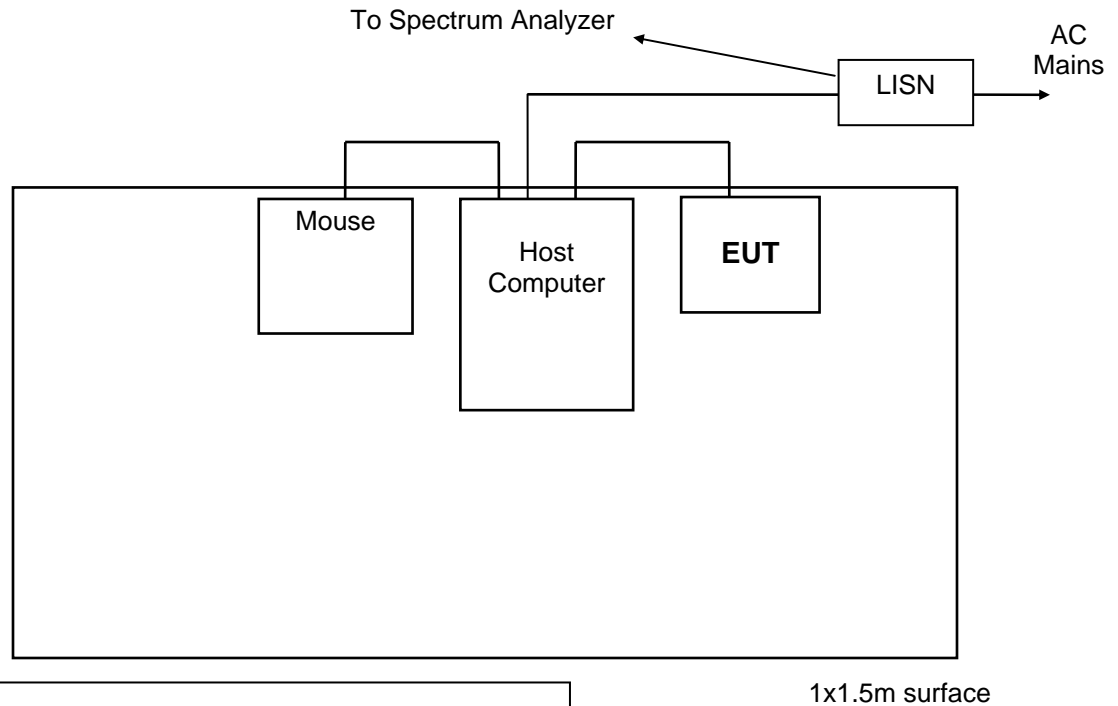
Model: RDR-80581AK9



Frequency (MHz)	QP Amplitude (dBuV)	QP Limit (dBuV)	Average Amplitude (dBuV)	Average Limit (dBuV)	Margin (dB)
0.210	47.0	63.2	45.7	53.2	7.5
0.628	40.5	56.0	39.2	46.0	6.8
9.983	41.0	60.0	16.9	50.0	19.0
27.667	42.0	60.0	24.6	50.0	18.0

The Limit shown above is RSS-GEN Table 3.

Passed by at least 8 dB.

Figure 1. Conducted Emissions Test Setup**Notes:**

- LISN's at least 80 cm from EUT chassis
- Vertical conductive plane 40 cm from rear of table top
- EUT power cord bundled

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.

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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 (dBuV/m)		
		QP	Average	Peak
0.009-0.490	300	2400/F(kHz)	N/A	N/A
0.490-1.705	30	24000/F(kHz)	N/A	N/A
1.705-30.0	30	30	N/A	N/A
30 - 88	3	40.0	N/A	N/A
88 - 216	3	43.5	N/A	N/A
216 - 960	3	46.0	N/A	N/A
960 - 1000	3	54	N/A	N/A

An Average detector can be used for 9-90 kHz and 110-490 kHz.

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 Dates	07/07/2017 & 07/16/2017
Test Distance	3 Meters
Specification	FCC Part 15 Subpart C & RSS-210
Notes	Corr. Factors = cable loss distance factor.
Abbreviations	P = peak; Q = QP Pol = Antenna Polarization; V = Vertical; H = Horizontal

Note: The actual FCC limits are in uV/m. The data in the table below covered the limit 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

The 125 kHz and the 13.56 MHz transmitters were both on during the following tests.

The following shows the highest emissions with the 13.56 MHz or the 125 kHz card during the tests.

RADIOMETRICS MIDWEST CORPORATION - EMC Test Report

RF IDEas, Models RDR-80081AK6, RDR-80081AK9, RDR-80581AK6, & RDR-80581AK9

EUT : RDR-80081AK6; SN: LOIS30062

Freq. MHz	Meter Reading dBuV	Dect. Type	Antenna		Corr. Factors dB	Field Strength dBuV/m		Margin Under Limit dB
			Polarity	Factor dB		EUT	Limit	
33.3	17.3	P	H	11.4	0.5	29.2	40.0	10.8
34.4	17.1	P	H	11.5	0.5	29.1	40.0	10.9
61.3	17.9	P	H	8.7	0.6	27.2	40.0	12.8
67.4	23.5	P	H	7.3	0.7	31.5	40.0	8.5
92.7	18.0	P	H	10.4	0.8	29.2	43.5	14.3
109.2	16.5	P	H	12.4	0.8	29.7	43.5	13.8
120.2	15.0	P	H	12.4	0.9	28.3	43.5	15.2
138.4	19.4	P	H	11.7	1.0	32.1	43.5	11.4
150.4	20.3	P	H	13.3	1.0	34.6	43.5	8.9
174.6	13.8	P	H	16.6	1.1	31.5	43.5	12.0
181.3	12.9	P	H	17.0	1.1	31.0	43.5	12.5
209.9	17.1	P	H	15.3	1.2	33.6	43.5	9.9
257.4	26.1	P	H	11.6	1.3	39.0	46.0	7.0
271.0	24.3	P	H	12.7	1.4	38.4	46.0	7.6
284.6	24.9	P	H	13.6	1.4	39.9	46.0	6.1
302.2	17.5	P	H	14.6	1.5	33.6	46.0	12.4
325.6	19.8	P	H	13.6	1.5	34.9	46.0	11.1
336.0	17.2	P	H	13.8	1.6	32.6	46.0	13.4
362.6	18.9	P	H	14.3	1.6	34.8	46.0	11.2
434.1	18.5	P	H	15.6	1.8	35.9	46.0	10.1
460.8	15.5	P	H	16.2	1.9	33.6	46.0	12.4
487.5	15.5	P	H	17.5	1.9	34.9	46.0	11.1
499.8	20.2	P	H	17.8	2.0	40.0	46.0	6.0
512.5	19.1	P	H	18.0	2.0	39.1	46.0	6.9
516.3	16.9	P	H	17.8	2.0	36.7	46.0	9.3
525.0	17.4	P	H	16.9	2.0	36.3	46.0	9.7
543.8	15.5	P	H	18.0	2.1	35.6	46.0	10.4
605.0	16.0	P	H	18.2	2.2	36.4	46.0	9.6
625.0	20.4	P	H	18.8	2.2	41.4	46.0	4.6
665.0	15.5	P	H	19.6	2.3	37.4	46.0	8.6
678.8	13.1	P	H	21.2	2.3	36.6	46.0	9.4
721.3	12.8	P	H	20.9	2.4	36.1	46.0	9.9
785.0	14.0	P	H	20.9	2.5	37.4	46.0	8.6
786.3	15.6	P	H	20.8	2.5	38.9	46.0	7.1
846.3	14.5	P	H	21.8	2.6	38.9	46.0	7.1
906.3	12.6	P	H	22.1	2.7	37.4	46.0	8.6
36.0	21.6	P	V	11.6	0.5	33.7	40.0	6.3
40.5	20.2	P	V	12.0	0.5	32.7	40.0	7.3
42.1	20.3	P	V	12.0	0.5	32.8	40.0	7.2
43.2	19.8	P	V	12.0	0.5	32.3	40.0	7.7
68.5	22.3	P	V	7.0	0.7	30.0	40.0	10.0
72.3	22.7	P	V	6.5	0.7	29.9	40.0	10.1
92.7	22.9	P	V	10.4	0.8	34.1	43.5	9.4
99.3	21.8	P	V	11.6	0.8	34.2	43.5	9.3
114.2	21.1	Q	V	12.5	0.9	34.5	43.5	9.0
120.2	21.0	Q	V	12.4	0.9	34.3	43.5	9.2
126.3	21.9	Q	V	12.0	0.9	34.8	43.5	8.7
128.4	18.4	Q	V	11.9	0.9	31.2	43.5	12.3
129.0	23.0	P	V	11.9	0.9	35.8	43.5	7.7
138.4	22.6	Q	V	11.7	1.0	35.3	43.5	8.2

RADIOMETRICS MIDWEST CORPORATION - EMC Test Report

RF IDEas, Models RDR-80081AK6, RDR-80081AK9, RDR-80581AK6, & RDR-80581AK9

EUT : RDR-80081AK6; SN: L0IS30062								
Freq. MHz	Meter Reading dBuV	Dect. Type	Antenna		Corr. Factors dB	Field Strength dBuV/m		Margin Under Limit dB
			Polarity	Factor dB		EUT	Limit	
150.4	22.0	Q	V	13.3	1.0	36.3	43.5	7.2
162.6	17.8	Q	V	15.3	1.1	34.2	43.5	9.3
174.6	17.1	P	V	16.6	1.1	34.8	43.5	8.7
200.5	15.7	P	V	16.3	1.2	33.2	43.5	10.3
209.9	16.5	P	V	15.3	1.2	33.0	43.5	10.5
224.7	14.0	P	V	14.4	1.2	29.6	46.0	16.4
225.8	15.2	P	V	14.4	1.2	30.8	46.0	15.2
240.1	14.7	P	V	15.7	1.3	31.7	46.0	14.3
257.4	28.9	P	V	11.6	1.3	41.8	46.0	4.2
266.5	17.2	P	V	12.3	1.4	30.9	46.0	15.1
271.0	22.1	P	V	12.7	1.4	36.2	46.0	9.8
284.6	18.1	P	V	13.6	1.4	33.1	46.0	12.9
299.0	13.9	P	V	14.3	1.5	29.7	46.0	16.3
349.6	18.8	P	V	14.0	1.6	34.4	46.0	11.6
352.9	19.0	P	V	14.1	1.6	34.7	46.0	11.3
362.6	17.9	P	V	14.3	1.6	33.8	46.0	12.2
406.9	16.7	P	V	14.9	1.7	33.3	46.0	12.7
432.2	19.5	P	V	15.7	1.8	37.0	46.0	9.0
466.0	14.1	P	V	16.7	1.9	32.7	46.0	13.3
487.5	14.6	P	V	17.5	1.9	34.0	46.0	12.0
488.1	16.9	P	V	17.4	1.9	36.2	46.0	9.8
499.8	16.5	P	V	17.8	2.0	36.3	46.0	9.7
516.3	14.7	P	V	17.8	2.0	34.5	46.0	11.5
543.8	15.3	P	V	18.0	2.1	35.4	46.0	10.6
625.0	17.7	P	V	18.8	2.2	38.7	46.0	7.3
665.0	11.6	P	V	19.6	2.3	33.5	46.0	12.5
833.8	14.9	P	V	22.0	2.6	39.5	46.0	6.5
846.3	12.8	P	V	21.8	2.6	37.2	46.0	8.8
966.3	13.3	P	V	22.4	2.8	38.5	54.0	15.5

Model Number : RDR-80581AK9; SN: L05S50051								
Freq. MHz	Meter Reading dBuV	Dect. Type	Antenna		Corr. Factors dB	Field Strength dBuV/m		Margin Under Limit dB
			Polarity	Factor dB		EUT	Limit	
34.4	16.9	P	H	11.5	0.5	28.9	40.0	11.1
61.9	17.9	P	H	8.6	0.6	27.1	40.0	12.9
72.9	16.5	P	H	6.4	0.7	23.6	40.0	16.4
100.4	14.3	P	H	11.7	0.8	26.8	43.5	16.7
138.4	21.9	P	H	11.7	1.0	34.6	43.5	8.9
209.9	15.1	P	H	15.3	1.2	31.6	43.5	11.9
241.8	15.1	P	H	15.9	1.3	32.3	46.0	13.7
257.4	26.2	P	H	11.6	1.3	39.1	46.0	6.9
271.0	16.4	P	H	12.7	1.4	30.5	46.0	15.5
302.2	18.0	P	H	14.6	1.5	34.1	46.0	11.9
325.6	17.2	P	H	13.6	1.5	32.3	46.0	13.7
348.4	18.8	P	H	14.0	1.6	34.4	46.0	11.6
362.0	18.8	P	H	14.4	1.6	34.8	46.0	11.2
432.2	19.1	P	H	15.7	1.8	36.6	46.0	9.4

RADIOMETRICS MIDWEST CORPORATION - EMC Test Report

RF IDEas, Models RDR-80081AK6, RDR-80081AK9, RDR-80581AK6, & RDR-80581AK9

Model Number : RDR-80581AK9; SN: L05S50051

Freq. MHz	Meter Reading dBuV	Dect. Type	Antenna		Corr. Factors dB	Field Strength dBuV/m		Margin Under Limit dB
			Polarity	Factor dB		EUT	Limit	
499.8	17.0	P	H	17.8	2.0	36.8	46.0	9.2
528.8	15.5	P	H	16.8	2.0	34.3	46.0	11.7
548.8	15.8	P	H	18.6	2.1	36.5	46.0	9.5
605.0	15.6	P	H	18.2	2.2	36.0	46.0	10.0
625.0	17.3	P	H	18.8	2.2	38.3	46.0	7.7
665.0	15.5	P	H	19.6	2.3	37.4	46.0	8.6
786.3	13.2	P	H	20.8	2.5	36.5	46.0	9.5
846.3	14.4	P	H	21.8	2.6	38.8	46.0	7.2
963.8	10.4	P	H	22.4	2.8	35.6	54.0	18.4
35.0	20.0	P	V	11.5	0.5	32.0	40.0	8.0
39.9	18.8	P	V	12.0	0.5	31.3	40.0	8.7
60.8	18.5	P	V	8.9	0.6	28.0	40.0	12.0
72.3	19.8	P	V	6.5	0.7	27.0	40.0	13.0
92.7	22.9	P	V	10.4	0.8	34.1	43.5	9.4
114.7	21.4	P	V	12.5	0.9	34.8	43.5	8.7
138.4	21.6	Q	V	11.7	1.0	34.3	43.5	9.2
150.4	16.4	P	V	13.3	1.0	30.7	43.5	12.8
209.9	18.1	P	V	15.3	1.2	34.6	43.5	8.9
257.4	22.1	P	V	11.6	1.3	35.0	46.0	11.0
266.5	15.9	P	V	12.3	1.4	29.6	46.0	16.4
349.6	18.6	P	V	14.0	1.6	34.2	46.0	11.8
362.0	17.8	P	V	14.4	1.6	33.8	46.0	12.2
434.1	18.3	P	V	15.6	1.8	35.7	46.0	10.3
490.0	15.3	P	V	17.3	1.9	34.5	46.0	11.5
499.8	14.7	P	V	17.8	2.0	34.5	46.0	11.5
548.8	15.0	P	V	18.6	2.1	35.7	46.0	10.3
625.0	16.9	P	V	18.8	2.2	37.9	46.0	8.1
706.3	11.8	P	V	20.2	2.4	34.4	46.0	11.6
833.8	13.9	P	V	22.0	2.6	38.5	46.0	7.5
966.3	11.5	P	V	22.4	2.8	36.7	54.0	17.3

Model Number : RDR-80081AK9, Serial Number L0IS50051

Freq. MHz	Meter Reading dBuV	Dect. Type	Antenna		Corr. Factors dB	Field Strength dBuV/m		Margin Under Limit dB
			Polarity	Factor dB		EUT	Limit	
33.8	17.2	P	H	11.4	0.5	29.1	40.0	10.9
59.7	13.3	P	H	9.2	0.6	23.1	40.0	16.9
63.5	13.4	P	H	8.2	0.6	22.2	40.0	17.8
92.2	13.0	P	H	10.3	0.8	24.1	43.5	19.4
121.8	13.9	P	H	12.3	0.9	27.1	43.5	16.4
138.9	19.7	P	H	11.7	1.0	32.4	43.5	11.1
209.3	15.1	P	H	15.4	1.2	31.7	43.5	11.8
223.1	12.1	P	H	14.4	1.2	27.7	46.0	18.3
230.8	13.2	P	H	14.7	1.3	29.2	46.0	16.8
241.8	15.8	P	H	15.9	1.3	33.0	46.0	13.0
259.3	12.6	P	H	11.8	1.4	25.8	46.0	20.2
271.0	16.2	P	H	12.7	1.4	30.3	46.0	15.7
284.6	16.8	P	H	13.6	1.4	31.8	46.0	14.2

RADIOMETRICS MIDWEST CORPORATION - EMC Test Report

RF IDEas, Models RDR-80081AK6, RDR-80081AK9, RDR-80581AK6, & RDR-80581AK9

Model Number : RDR-80081AK9, Serial Number L0IS50051

Freq. MHz	Meter Reading dBuV	Dect. Type	Antenna		Corr. Factors dB	Field Strength dBuV/m		Margin Under Limit dB
			Polarity	Factor dB		EUT	Limit	
302.2	16.6	P	H	14.6	1.5	32.7	46.0	13.3
319.1	11.7	P	H	13.8	1.5	27.0	46.0	19.0
325.6	13.6	P	H	13.6	1.5	28.7	46.0	17.3
348.4	18.3	P	H	14.0	1.6	33.9	46.0	12.1
362.6	16.2	P	H	14.3	1.6	32.1	46.0	13.9
379.5	13.0	P	H	15.0	1.7	29.7	46.0	16.3
406.9	14.6	P	H	14.9	1.7	31.2	46.0	14.8
422.5	14.5	P	H	15.7	1.8	32.0	46.0	14.0
432.2	14.6	P	H	15.7	1.8	32.1	46.0	13.9
460.8	15.0	P	H	16.2	1.9	33.1	46.0	12.9
488.1	14.3	P	H	17.4	1.9	33.6	46.0	12.4
500.5	14.7	P	H	17.8	2.0	34.5	46.0	11.5
512.5	14.5	P	H	18.0	2.0	34.5	46.0	11.5
525.0	14.4	P	H	16.9	2.0	33.3	46.0	12.7
566.3	14.3	P	H	18.3	2.1	34.7	46.0	11.3
573.8	13.4	P	H	18.4	2.1	33.9	46.0	12.1
602.5	16.2	P	H	18.2	2.2	36.6	46.0	9.4
631.3	14.8	P	H	19.0	2.2	36.0	46.0	10.0
658.8	13.1	P	H	20.1	2.3	35.5	46.0	10.5
698.8	11.5	P	H	20.7	2.4	34.6	46.0	11.4
786.3	12.7	P	H	20.8	2.5	36.0	46.0	10.0
833.8	11.5	P	H	22.0	2.6	36.1	46.0	9.9
846.3	12.1	P	H	21.8	2.6	36.5	46.0	9.5
966.3	13.4	P	H	22.4	2.8	38.6	54.0	15.4
35.5	18.1	P	V	11.6	0.5	30.2	40.0	9.8
39.9	19.3	P	V	12.0	0.5	31.8	40.0	8.2
61.9	18.3	P	V	8.6	0.6	27.5	40.0	12.5
92.7	19.1	P	V	10.4	0.8	30.3	43.5	13.2
102.6	18.4	P	V	12.0	0.8	31.2	43.5	12.3
107.0	18.9	P	V	12.3	0.8	32.0	43.5	11.5
138.9	19.3	P	V	11.7	1.0	32.0	43.5	11.5
150.4	16.7	P	V	13.3	1.0	31.0	43.5	12.5
200.5	14.2	P	V	16.3	1.2	31.7	43.5	11.8
208.8	15.7	P	V	15.4	1.2	32.3	43.5	11.2
241.8	12.7	P	V	15.9	1.3	29.9	46.0	16.1
250.9	11.7	P	V	11.2	1.3	24.2	46.0	21.8
284.6	12.8	P	V	13.6	1.4	27.8	46.0	18.2
302.2	14.3	P	V	14.6	1.5	30.4	46.0	15.6
349.6	16.9	P	V	14.0	1.6	32.5	46.0	13.5
362.6	11.9	P	V	14.3	1.6	27.8	46.0	18.2
379.5	13.3	P	V	15.0	1.7	30.0	46.0	16.0
434.1	14.8	P	V	15.6	1.8	32.2	46.0	13.8
464.7	17.9	P	V	16.6	1.9	36.4	46.0	9.6
499.8	15.4	P	V	17.8	2.0	35.2	46.0	10.8
525.0	15.7	P	V	16.9	2.0	34.6	46.0	11.4
565.0	12.7	P	V	18.3	2.1	33.1	46.0	12.9
608.8	15.2	P	V	18.4	2.2	35.8	46.0	10.2
625.0	16.7	P	V	18.8	2.2	37.7	46.0	8.3
651.3	14.3	P	V	20.4	2.3	37.0	46.0	9.0
665.0	12.7	P	V	19.6	2.3	34.6	46.0	11.4

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RF IDEas, Models RDR-80081AK6, RDR-80081AK9, RDR-80581AK6, & RDR-80581AK9

Model Number : RDR-80081AK9, Serial Number L0IS50051

Freq. MHz	Meter Reading dBuV	Dect. Type	Antenna		Corr. Factors dB	Field Strength dBuV/m		Margin Under Limit dB
			Polarity	Factor dB		EUT	Limit	
698.8	11.3	P	V	20.7	2.4	34.4	46.0	11.6
797.5	11.1	P	V	20.3	2.5	33.9	46.0	12.1
846.3	11.5	P	V	21.8	2.6	35.9	46.0	10.1
906.3	11.8	P	V	22.1	2.7	36.6	46.0	9.4
966.3	11.6	P	V	22.4	2.8	36.8	54.0	17.2

Model Number : P/N 80081AK6; S/N L0IS30062

Freq. MHz	Meter Reading dBuV	Dect. Type	Antenna		Corr. Factors dB	Field Strength dBuV/m		Margin Under Limit dB
			Polarity	Factor dB		EUT	Limit	
35.0	14.1	P	H	11.5	0.5	26.1	40.0	13.9
54.2	15.5	P	H	10.6	0.6	26.7	40.0	13.3
62.5	15.3	P	H	8.5	0.6	24.4	40.0	15.6
72.3	16.9	P	H	6.5	0.7	24.1	40.0	15.9
99.3	18.1	P	H	11.6	0.8	30.5	43.5	13.0
115.3	16.9	P	H	12.5	0.9	30.3	43.5	13.2
148.3	19.0	P	H	12.9	1.0	32.9	43.5	10.6
150.4	19.5	P	H	13.3	1.0	33.8	43.5	9.7
158.1	15.0	P	H	14.7	1.0	30.7	43.5	12.8
209.3	17.5	P	H	15.4	1.2	34.1	43.5	9.4
241.8	13.8	P	H	15.9	1.3	31.0	46.0	15.0
257.4	26.6	Q	H	11.7	1.3	39.6	46.0	6.4
302.2	15.8	P	H	14.6	1.5	31.9	46.0	14.1
325.6	15.3	P	H	13.6	1.5	30.4	46.0	15.6
362.6	17.2	P	H	14.3	1.6	33.1	46.0	12.9
422.5	12.8	P	H	15.7	1.8	30.3	46.0	15.7
460.8	17.0	P	H	16.2	1.9	35.1	46.0	10.9
487.5	16.5	P	H	17.5	1.9	35.9	46.0	10.1
499.8	15.2	P	H	17.8	2.0	35.0	46.0	11.0
512.5	13.6	P	H	18.0	2.0	33.6	46.0	12.4
525.0	13.1	P	H	16.9	2.0	32.0	46.0	14.0
605.0	12.0	P	H	18.2	2.2	32.4	46.0	13.6
625.0	14.5	P	H	18.8	2.2	35.5	46.0	10.5
846.3	12.8	P	H	21.8	2.6	37.2	46.0	8.8
906.3	13.3	P	H	22.1	2.7	38.1	46.0	7.9
966.3	12.1	P	H	22.4	2.8	37.3	54.0	16.7
37.7	18.4	P	V	11.8	0.5	30.7	40.0	9.3
54.2	23.1	P	V	10.6	0.6	34.3	40.0	5.7
61.3	18.6	P	V	8.7	0.6	27.9	40.0	12.1
71.8	20.3	P	V	6.5	0.7	27.5	40.0	12.5
93.3	21.8	Q	V	10.5	0.8	33.1	43.5	10.4
113.6	25.5	P	V	12.5	0.9	38.9	43.5	4.6
114.2	22.3	Q	V	12.5	0.9	35.7	43.5	7.8
128.4	21.7	Q	V	11.8	0.9	34.4	43.5	9.1
129.6	25.4	P	V	11.8	0.9	38.1	43.5	5.4
150.4	20.7	Q	V	13.3	1.0	35.0	43.5	8.5
177.9	14.6	P	V	16.8	1.1	32.5	43.5	11.0
202.1	4.0	Q	V	16.1	1.2	21.3	43.5	22.2

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RF IDEas, Models RDR-80081AK6, RDR-80081AK9, RDR-80581AK6, & RDR-80581AK9

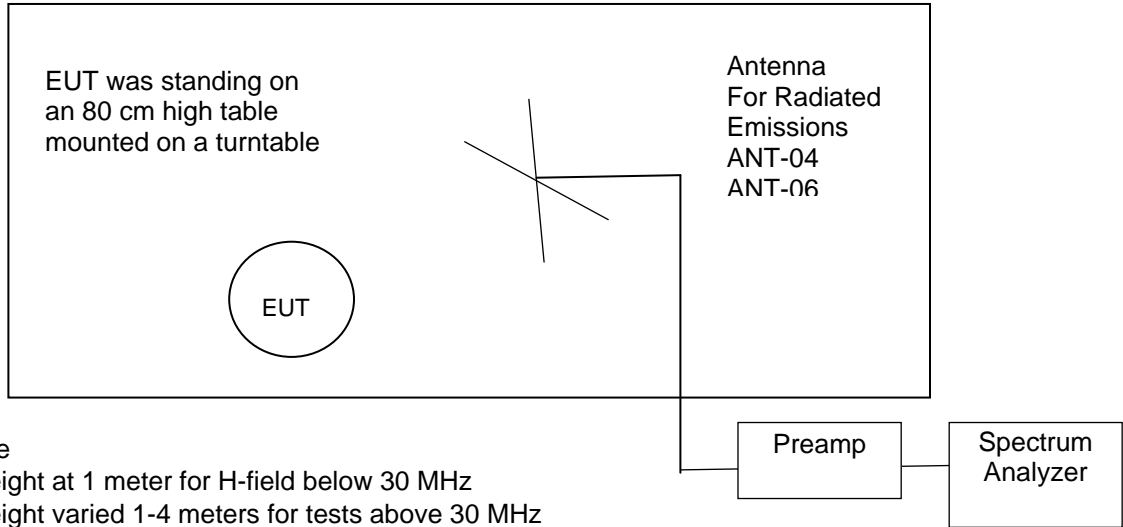
Model Number : P/N 80081AK6; S/N L0IS30062

Freq. MHz	Meter Reading dBuV	Dect. Type	Antenna		Corr. Factors dB	Field Strength dBuV/m		Margin Under Limit dB
			Polarity	Factor dB		EUT	Limit	
218.6	15.6	P	V	14.4	1.2	31.2	46.0	14.8
257.4	25.1	P	V	11.6	1.3	38.0	46.0	8.0
271.0	17.7	P	V	12.7	1.4	31.8	46.0	14.2
284.6	15.5	P	V	13.6	1.4	30.5	46.0	15.5
302.2	11.2	P	V	14.6	1.5	27.3	46.0	18.7
325.6	14.3	P	V	13.6	1.5	29.4	46.0	16.6
352.9	14.9	P	V	14.1	1.6	30.6	46.0	15.4
362.0	12.3	P	V	14.4	1.6	28.3	46.0	17.7
434.1	12.8	P	V	15.6	1.8	30.2	46.0	15.8
468.0	15.1	P	V	17.0	1.9	34.0	46.0	12.0
487.5	15.9	P	V	17.5	1.9	35.3	46.0	10.7
499.8	14.8	P	V	17.8	2.0	34.6	46.0	11.4
512.5	13.2	P	V	18.0	2.0	33.2	46.0	12.8
605.0	13.4	P	V	18.2	2.2	33.8	46.0	12.2
665.0	13.7	P	V	19.6	2.3	35.6	46.0	10.4
786.3	12.2	P	V	20.8	2.5	35.5	46.0	10.5
837.5	12.0	P	V	21.9	2.6	36.5	46.0	9.5
966.3	11.5	P	V	22.4	2.8	36.7	54.0	17.3

Judgment: Passed by 4.2 dB

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 an AC outlet with low-pass filter on turntable

Frequency Range	Receive Antenna	Pre-Amplifier	Spectrum Analyzer
0.01 to 30 MHz	ANT-53	None	REC-21
30 to 200 MHz	ANT-03	AMP-22	REC-21
200 to 1000 MHz	ANT-06	AMP-22	REC-21

11.3 Magnetic Field Measurements and Decay Factor Calculations

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

The distance correction factor is calculated as follows:

The distance factor in (dB) = $DE \cdot 20 \cdot \log(TD/SD)$

Where: DE = Decay Exponent (2.0 is used for this)

TD = Test distance in meters. This is 3 meters

SD = Specifcation Distance in meters

From 9 kHz to 490 kHz, the Specifcation Distance is 300m therefore the distance factor is $2 \cdot 20 \cdot \log(300/3) = 80$ dB.

From 490 kHz to 30 MHz, the Specifcation Distance is 30m therefore the distance factor is $2 \cdot 20 \cdot \log(30/3) = 40$ dB.

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

Test Date	07/07/2017
Test Distance	3 Meters
Specification	FCC 15 & RSS-GEN
Notes	A shielded Loop Antenna was used for this test.

125 kHz Frequencies

Freq (kHz)	meter reading dBuV	Loop Ant Factor	Dist (m)	Decay exp	Cable Loss dB	FCC Distance factor dB	Field Strength dBuV/m	RSS-GEN Limit dBuV/m	Margin under limit	Model
125.0	62.1	19.1	3.0	2.0	0.0	-80.0	1.2	25.7	24.5	80081AK6
250.0	39.5	18.9	3.0	2.0	0.0	-80.0	-21.6	19.6	41.2	80081AK6
375.0	45.7	18.9	3.0	2.0	0.0	-80.0	-15.4	16.1	31.5	80081AK6
125.0	63.8	19.1	3.0	2.0	0.0	-80.0	2.9	25.7	22.8	80081AK9
250.0	48.7	18.9	3.0	2.0	0.0	-80.0	-12.4	19.6	32.1	80081AK9
375.0	45.3	18.9	3.0	2.0	0.0	-80.0	-15.9	16.1	32.0	80081AK9
125.0	62.3	19.1	3.0	2.0	0.0	-80.0	1.4	25.7	24.3	80581AK6
250.0	48.8	18.9	3.0	2.0	0.0	-80.0	-12.3	19.6	31.9	80581AK6
375.0	45.4	18.9	3.0	2.0	0.0	-80.0	-15.7	16.1	31.8	80581AK6
125.0	63.1	19.1	3.0	2.0	0.0	-80.0	2.2	25.7	23.5	80581AK9
250.0	39.8	18.9	3.0	2.0	0.0	-80.0	-21.3	19.6	41.0	80581AK9
375.0	37.5	18.9	3.0	2.0	0.0	-80.0	-23.6	16.1	39.8	80581AK9
500.0	34.7	18.8	3.0	2.0	0.0	-40.0	13.5	33.6	20.2	80581AK9

13.56 MHz Frequencies

Freq (kHz)	meter reading dBuV	Loop Ant Factor	Dist (m)	Decay exp	Cable Loss dB	FCC Distance factor dB	Field Strength dBuV/m	RSS-GEN Limit dBuV/m	Margin under limit	Model
13560	54.2	16.8	3.0	2.0	0.4	-40.0	31.4	40.5	9.1	80081AK6
27120	29.5	16.0	3.0	2.0	0.5	-40.0	6.0	29.5	23.5	80081AK6
13560	52.6	16.8	3.0	2.0	0.4	-40.0	29.8	40.5	10.7	80081AK9
27120	27.1	16.0	3.0	2.0	0.5	-40.0	3.6	29.5	25.9	80081AK9
13560	53.8	16.8	3.0	2.0	0.4	-40.0	31.0	40.5	9.5	80581AK6
27120	30.4	16.0	3.0	2.0	0.5	-40.0	6.9	29.5	22.6	80581AK6
13560	52.7	16.8	3.0	2.0	0.4	-40.0	29.9	40.5	10.6	80581AK9
27120	30.8	16.0	3.0	2.0	0.5	-40.0	7.3	29.5	22.2	80581AK9

The limit shown at 13.56 MHz in the above table is the lowest limit from 15.225 sections (a), (b) and (c).

The limit from 13.553-13.567 MHz at 30 meters is 15,848 uV/m which = 84 dBuV/m in accordance with FCC 15.225 (c) and RSS-210 section A2.6 (c).

The limit drops to 334uV/m from 13.410-13.553 MHz and 13.567-13.710 MHz, and 106uV/m = 40.5 dBuV/m from the bands 13.110-13.410 MHz and 13.710-14.010 MHz.

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

The emissions were scanned from 10 kHz to 30 MHz, including 13.11 and 14.01 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 9.1 dB.

11.4 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.

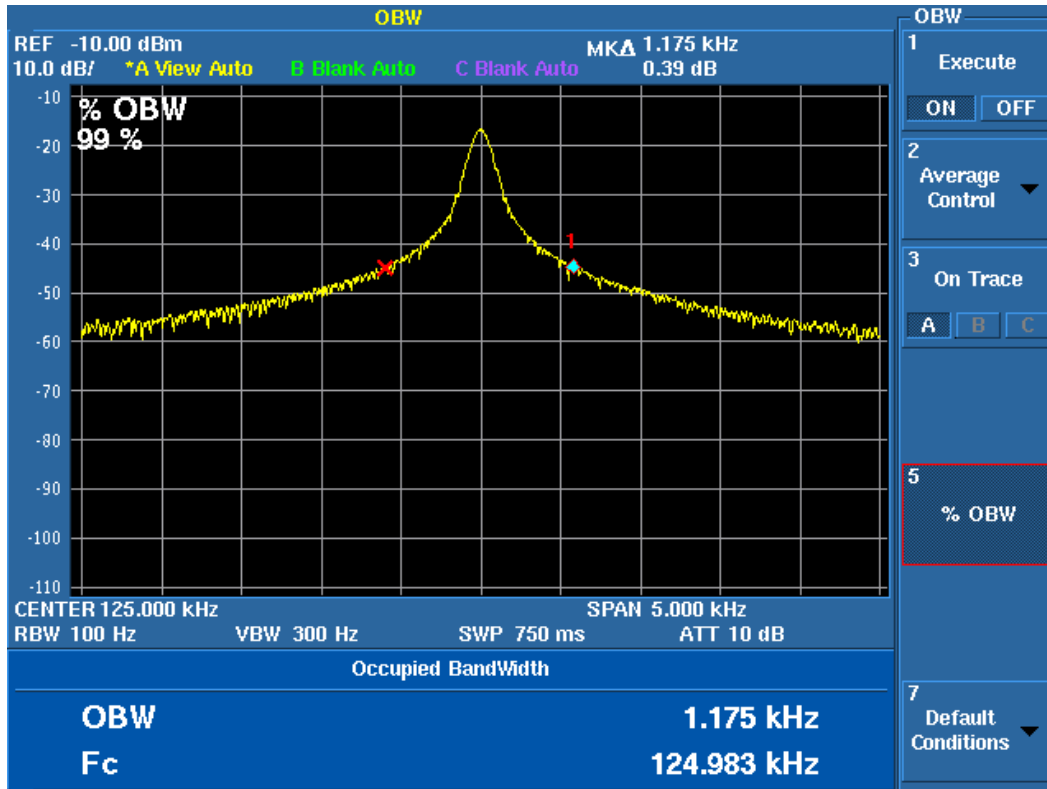
A broadband antenna was used to receive the modulated signal. The spectrum analyzer was set to the MAX HOLD mode to record the worst case of the modulation. The spectrum analyzer display was digitized and plotted. A limit was drawn on the plots based on the level of the modulated carrier. The plots of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

Product	99% EBW	
	125 kHz signal	13.56 MHz Signal
RDR-80081AK6	1.175 kHz	1.620 kHz
RDR-80081AK9	1.200 kHz	1.565 kHz

Judgement: Pass

Figure 3. Occupied Bandwidth Plots 125 kHz

Model: RDR-80081AK6



Model: RDR-80081AK9

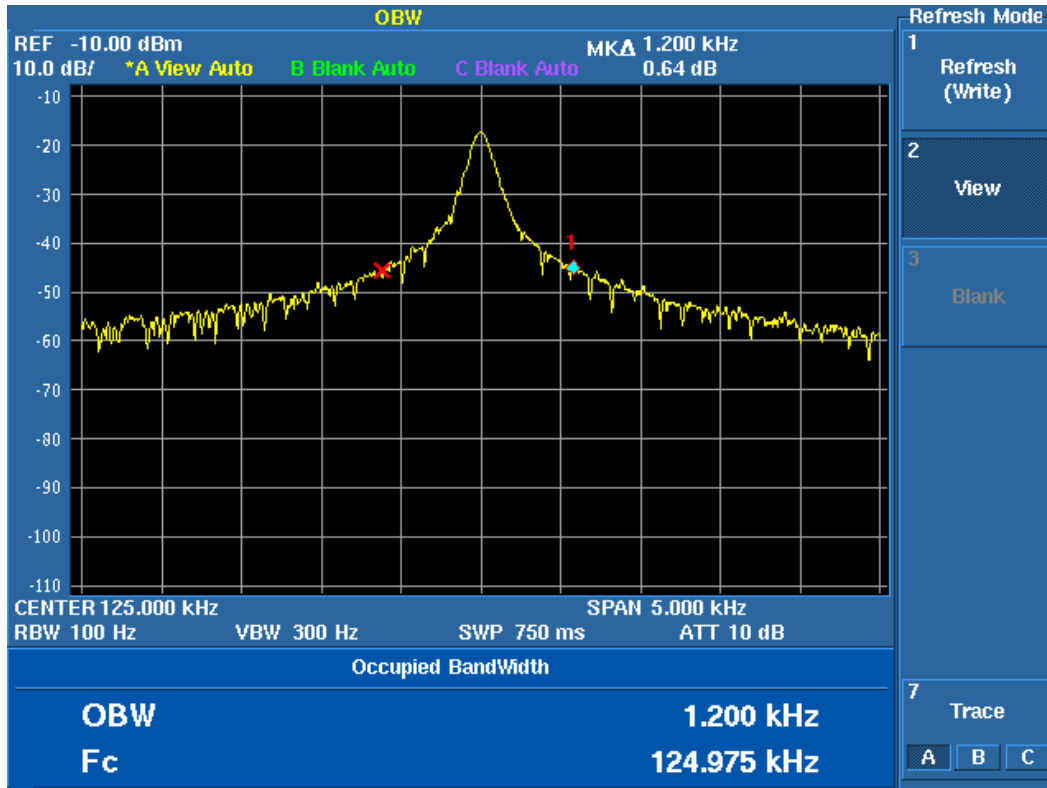
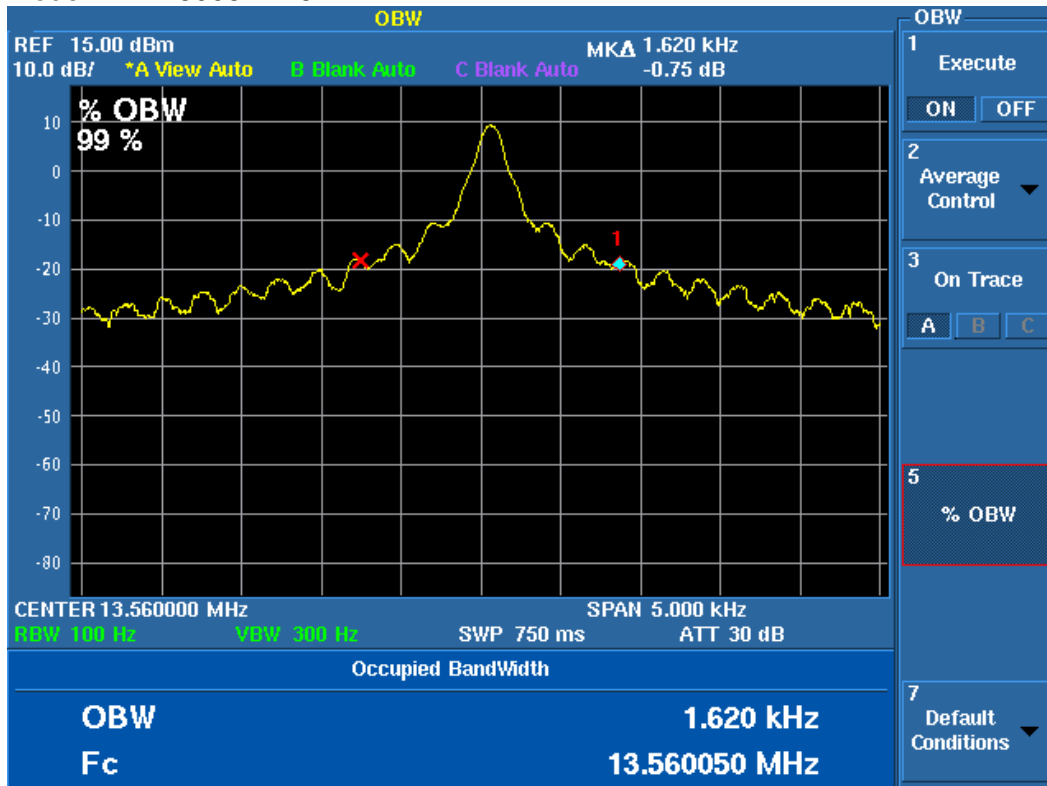
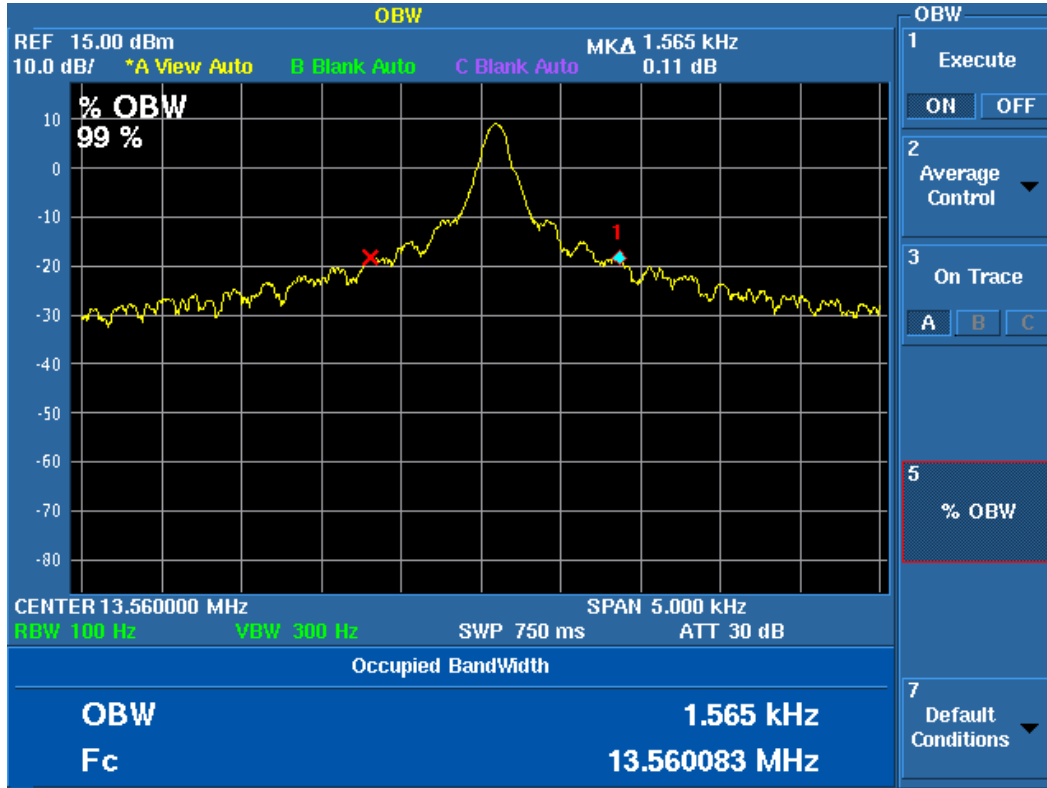


Figure 4. Occupied Bandwidth Plots 13.56 MHz

Model: RDR-80081AK6



Model: RDR-80081AK9



11.5 Frequency Stability

The tests were in accordance to FCC 15.225 and RSS-210 Section A2.6. Since the product is USB powered, a Desktop PC was used to power the device. The input power to the desktop PC was varied by 15%, using a variable AC supply.

11.5.1 Test Results for Frequency Stability

Specification	FCC Part 15.225 RSS-210 Section A2.6	Test Personnel	Richard Tichelaar
Test Date	08/29/2017	Nominal Frequency	13.560 MHz
Test Equipment	Spectrum Analyzer (REC-21); Temperature Chamber TC-01 Power Supply (PSA-02)		
Notes	10 minutes at each Temperature; 1 min at each voltage		

RDR-80081AK6

Temp. Deg C	Start Time	Freq@ start MHz	Freq @2min (MHz)	Freq @5min (MHz)	Freq @10min (MHz)	Max error %
50	8:46	13.560046	13.560015	13.560014	13.560009	0.00034
40	9:04	13.560017	13.560019	13.560016	13.560017	0.00014
30	9:20	13.560044	13.560048	13.560050	13.560042	0.00037
20	9:36	13.560087	13.560088	13.560088	13.560084	0.00065
10	9:54	13.560126	13.560133	13.560131	13.560140	0.00103
0	10:15	13.560173	13.560151	13.560167	13.560142	0.00128

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Temp.	Start	Freq@ start	Freq @2min	Freq @5min	Freq @10min	Max error
Deg C	Time	MHz	(MHz)	(MHz)	(MHz)	%
-10	10:35	13.560174	13.560173	13.560179	13.560169	0.00132
-20	10:52	13.560160	13.560166	13.560159	13.560156	0.00122
20	11:10	13.560161	13.560159	13.560106	13.560087	0.00119
RDR-80081AK9						
50	8:46	13.560083	13.560078	13.560064	13.560058	0.00061
40	9:04	13.560068	13.560053	13.560069	13.560064	0.00051
30	9:20	13.560064	13.560066	13.560066	13.560066	0.00049
20	9:36	13.560091	13.560089	13.560091	13.560094	0.00069
10	9:54	13.560122	13.560126	13.560126	13.560119	0.00093
0	10:15	13.560131	13.560132	13.560128	13.560131	0.00097
-10	10:35	13.560119	13.560122	13.560119	13.560119	0.00090
-20	10:52	13.560106	13.560101	13.560088	13.560092	0.00078
20	11:10	13.560121	13.560124	13.560098	13.560092	0.00091

Volts	Freq.	Change from Nominal	
DC	(MHz)	%	EUT
7.7	13.560061	0.00045	RDR-80081AK6
9.0	13.560060	0.00044	RDR-80081AK6
10.4	13.560059	0.00043	RDR-80081AK6
4.3	13.560092	0.00068	RDR-80081AK9
5.0	13.560079	0.00058	RDR-80081AK9
5.8	13.560080	0.00059	RDR-80081AK9

Test Requirements: Limit is 100 ppm or 0.01% deviation.
Judgement: Pass

12 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
Frequency counter at 13.56 MHz; REC-21	136 Hz
99% Occupied Bandwidth using REC-43	1% of frequency span
Temperature THM-03	0.6 Deg C