Test of: VuBIQ Inc, VuLInk VL300

To: FCC CFR 47 Part 15.255 & IC RSS-210

Test Report Serial No.: DVWC02-U1 Rev A

TEST REPORT

FROM

Test of: VuBIQ Inc VuLInk VL300

To: FCC CFR 47 Part 15.255 & RSS-210

Test Report Serial No.: DVWC02-U1 Rev A

This report supersedes: NONE

Applicant: VuBIQ Inc
65 Enterprise
Aliso Viejo, CA 92656
USA

Product Function: Wireless HD Video link

Copy No: pdf **Issue Date:** 6th April 2010

This Test Report is Issued Under the Authority of;

MiCOM Labs, Inc.
440 Boulder Court, Suite 200
Pleasanton, CA 94566 USA
Phone: +1 (925) 462-0304
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www.micomlabs.com

ACCREDITED
CERTIFICATE #2381.01

MiCOM Labs is an ISO 17025 Accredited Testing Laboratory

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1. ACCREDITATION, LISTINGS & RECOGNITION

1.1. ACCREDITATION

MiCOM Labs, Inc. an accredited laboratory complies with the international standard EN ISO/IEC 17025. The company is accredited by the American Association for Laboratory Accreditation (A2LA) www.a2la.org test laboratory number 2381.01. MiCOM Labs test schedule is available at the following URL; http://www.a2la.org/scopepdf/2381-01.pdf

ilac-MRA

A2LA World Class Accreditation

The American Association for Laboratory Accreditation

Accredited Laboratory

A2LA has accredited

MICOM LABS

Pleasanton, CA

for technical competence in the field of

Electrical Testing

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2005 *General Requirements for the Competence of Testing and Calibration Laboratories*. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (*refer to joint ISO-ILAC-IAF Communiqué dated 8 January 2009*).

AMERICAN ASSOCIATION FOR LABORATORY ACCREDITATION CORPORATE SEAL 1978 DISTRICT OF COLUMBIA A2LA

Presented this 26th day of February 2008.

President & CEO
For the Accreditation Council
Certificate Number 2381.01
Valid to April 30, 2010
Revised March 22, 2010

For the tests or types of tests to which this accreditation applies, please refer to the laboratory's Electrical Scope of Accreditation.

1.2. LISTINGS

MiCOM Labs test facilities are listed by the following organizations;

North America

United States of America

Federal Communications Commission (FCC) Listing #: 102167

Canada

Industry Canada (IC) Listing #: 4143A

Japan Registration

VCCI Membership Number: 2959

- Radiated 3 meter site; Registration No. R-2881
- Line Conducted, Registration Nos. C-3181 & T-1470
- Emissions; Registration Nos. C-3180 & T-1469

1.3. RECOGNITION

APEC MRA (Asia-Pacific Economic Community Mutual Recognition Agreement)

Conformity Assessment Body (CAB) – MiCOM Labs

Test data generated by MiCOM Labs is accepted in the following countries under the APEC MRA.

Country	Recognition Body	Phase	CAB Identification No.
Australia	Australian Communications and Media Authority (ACMA)	I	US0159
Hong Kong	Office of the Telecommunication Authority (OFTA)	I	
Korea	Ministry of Information and Communication Radio Research Laboratory (RRL)	I	
Singapore	Infocomm Development Authority (IDA)	I	
Taiwan	National Communications Commission (NCC) Bureau of Standards, Metrology and Inspection (BSMI)	I I	
Vietnam	Ministry of Information and Communication	I	

2. DOCUMENT HISTORY

Document History		
Revision	**Date**	**Comments**
Draft		
Rev A	6th April 2010	Initial Release

3. TEST RESULT CERTIFICATE

Applicant:	VuBIQ Inc 65 Enterprise Aliso Viejo CA , 92656, USA	Tested By:	MiCOM Labs, Inc. 440 Boulder Court Suite 200 Pleasanton California, 94566, USA
Product:	VuLInk	Telephone:	+1 925 462 0304
Model No.:	VL300	Fax:	+1 925 462 0306
S/No's:	1436		
Date(s) Tested:	9-15th March 2010	Website:	www.micomlabs.com

STANDARD(S)	TEST RESULTS
FCC CFR 47 Part 15.255 & IC RSS-210	EQUIPMENT COMPLIES

MiCOM Labs, Inc. tested the equipment mentioned in accordance with the requirements set forth in the above standards. Test results indicate that the equipment tested is capable of demonstrating compliance with the requirements as documented within this report.

Notes:

1. This document reports conditions under which testing was conducted and the results of testing performed.
2. Details of test methods used have been recorded and kept on file by the laboratory.
3. Test results apply only to the item(s) tested.

ACCREDITED
CERTIFICATE #2381.01

Approved & Released for MiCOM Labs, Inc. by:

Graeme Grieve
Quality Manager MiCOM Labs,

Gordon Hurst
President & CEO MiCOM Labs, Inc.

4. REFERENCES AND MEASUREMENT UNCERTAINTY

4.1. Normative References

Ref.	Publication	Year	Title
i.	FCC CFR 47 Part 15 SubPart 15.255	June 2007	Radio Frequency Devices - Intentional Radiators
ii.	Industry Canada RSS-210	Issue 7 June 2007	Low Power License-Exempt Radiocommunication Devices (All Frequency Bands)
iii.	Industry Canada RSS-Gen	Issue 2 June 2007	General Requirements and Information for the Certification of Radiocommunication Equipment.
iv.	ANSI C63.4	2003	American National Standards for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz
v.	CISPR 22/ EN 55022	2005	Limits and Methods of Measurements of Radio Disturbance Characteristics of Information Technology Equipment
vi.	M 3003	Edition 1 Dec. 1997	Expression of Uncertainty and Confidence in Measurements
vii.	LAB34	Edition 1 Aug 2002	The expression of uncertainty in EMC Testing
viii.	ETSI TR 100 028	2001	Parts 1 and 2 Electromagnetic compatibility and Radio Spectrum Matters (ERM); Uncertainties in the measurement of mobile radio equipment characteristics
ix.	A2LA	7th August 2009	Reference to A2LA Accreditation Status – A2LA Advertising Policy

4.2. Test and Uncertainty Procedures

Conducted and radiated emission measurements were conducted in accordance with American National Standards Institute ANSI C63.4, listed in the Normative References section of this report.

Measurement uncertainty figures are calculated in accordance with ETSI TR 100 028 Parts 1 and 2.

Measurement uncertainties stated are based on a standard uncertainty multiplied by a coverage factor k = 2, providing a level of confidence of approximately 95 % in accordance with UKAS document M 3003 listed in the Normative References section of this report.

5. TEST SUMMARY

The following table represents the list of measurements required under the **FCC CFR47 Part 15.255** and **Industry Canada RSS-210, Annex 13.2**, **Industry Canada RSS-Gen**

Section(s)	Test Items	Description	Condition	Result	Test Report Section
15.255 (e)(1) §4.4.1	Bandwidth(s)	26 dB & 99% Bandwidth	Conducted	Complies	7.1.1
15.255 (b)	Power Density	Emission power density	Conducted	Complies	7.1.2
15.255 (e) 13.2.3	Peak Output Power	EUT output power	Conducted	Complies	7.1.3
1.1310 §5.5	Maximum Permissible Exposure	MPE	Calculation	Complies	7.1.4
15.255 (c),(d)	Spurious Emissions	Emissions above 1 GHz	Radiated	Complies	7.1.5
15.205, 15.209 2.2	Radiated Emissions	Emissions below 1 GHz	Radiated	Complies **Class A Limits**	7.1.6
15.255 (f) 2.1 §4.5	Frequency Stability	In-band emission stability	Component Review		7.1.7
15.207 §7.2.2	AC Mains Line Conducted	0.15 – 30 MHz emissions	Conducted	Complies	7.1.8
15.255 (h) 13.2.6	Group Installations	Operation within group installations	Client Declaration		7.1.9
15.255 (i) 13.2.7	Transmitter Self-Identification Transmission	Transmission within buildings	Client Declaration		7.1.10

Note 1: *Test results reported in this document relate only to the items tested*
Note 2: *The required tests demonstrated compliance as per client declaration of test configuration, monitoring methodology and associated pass/fail criteria*
Note 3: *Section 3.7 Equipment Modifications highlights the equipment modifications that were required to bring the product into compliance with the above test matrix*

6. PRODUCT DETAILS AND TEST CONFIGURATIONS

6.1. Test Program Scope

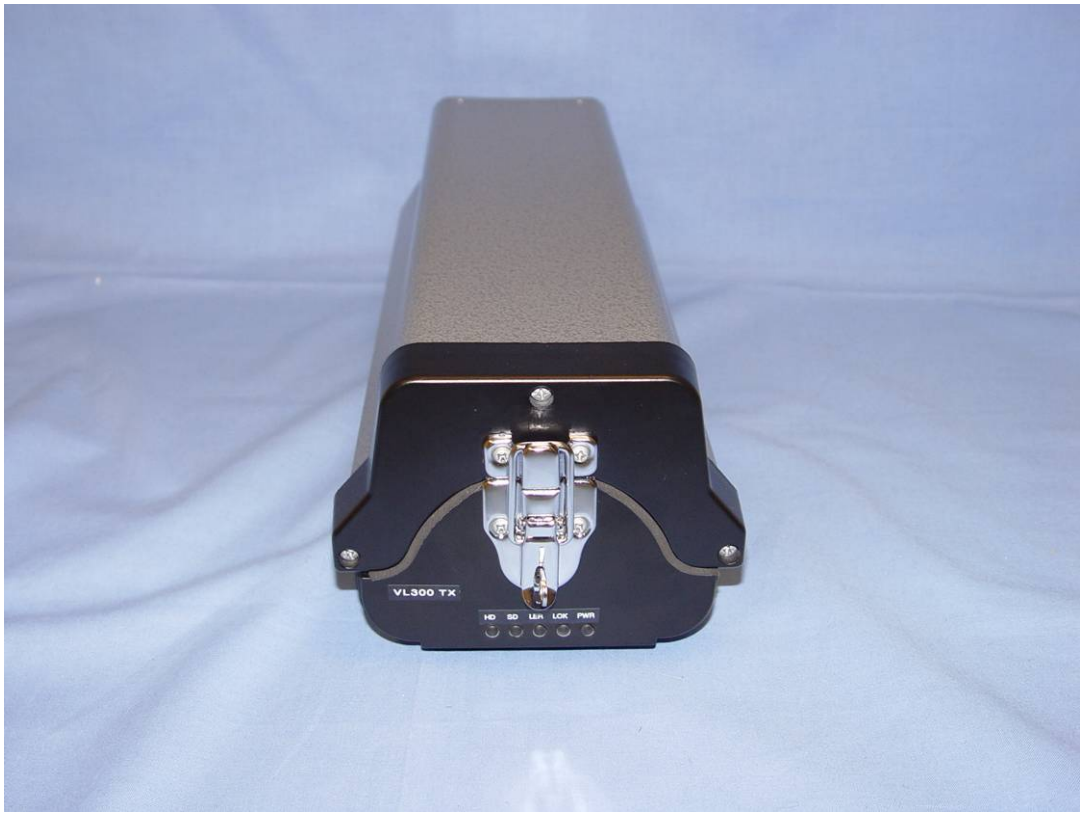
The scope of the test program was to test the VuBIQ Inc VuLInk VL300 Wireless HD Video link for compliance against FCC CFR 47 Part 15 and Industry Canada RSS 210, Annex 13.2.

Testing performed on the VuLink VL300 Video Link was performed per the FCC's KDB Publication 200443.

Applicant: VuBIQ Inc. VuLInk VL300 Wireless HD Video Link

Applicant: VuBIQ Inc. VuLInk VL300 Wireless HD Video Link

Rear



Applicant: VuBIQ Inc. VuLInk VL300 Wireless HD Video Link

Connectors

6.2. EUT Details

Detail	Description
Purpose:	Test of the VuBIQ Inc VuLInk VL300 Wireless HD Video link for compliance against FCC CFR 47 Part 15.255 and Industry Canada RSS 210, Annex 13.2.
Applicant:	VuBIQ Inc 65 Enterprise Aliso Viejo California 92656 USA
Manufacturer:	VuBIQ Inc 65 Enterprise Aliso Viejo California 92656 USA
Test Laboratory:	MiCOM Labs, Inc. 440 Boulder Court, Suite 200 Pleasanton, California 94566 USA
Test report reference number:	DVWC02-U1
Date EUT received:	9th March 2010
Dates of test (from - to):	9th – 15th March
No of Units Tested:	1
Product Name:	VuLInk
Manufacturers Trade Name:	VuLink
Model No.:	VL300
Equipment Primary Function:	Wireless HD Video link
Equipment Secondary Function(s):	WAS / RLAN system
Type of Technology:	Microwave point to point HD video link
Installation type:	Fixed Link
Operating Frequency:	60.48 GHz
Construction/Location for Use:	Indoor only
Software/Firmware Release:	1.1.107
Hardware Release:	V1.2
Test Software Release:	N/A
Transmit/Receive Operation:	Transceiver
Output Power Type (Client Declaration)::	Variable, minimum transmit level -20 dBm
Automatic Transmit Power Control Available:	Not Available
Remote Frequency Control Available:	Not Available
Rated Input Voltage and Current (AC):	Voltage: 120 Vac, Current: 100mA
Rated Input Voltage and Current (DC):	Nominal: 12 Vdc Max: 16 Vdc Min: 11 Vdc Current: 1 (A)
Operating Temperature Range ºC:	Min: 50 Max: -20
ITU Emission Designator(s):	1G25J1FNN
Long Term Frequency Stability:	25 ppm
Equipment Dimensions:	14.7 x 4.5 x 5.5
Weight:	4.4 Lbs

6.3. External A.C/D.C Power Adaptor

Detail	Description
Ac Adapter	Phihong PSAA20R-120-R, 120Vac 60Hz / 12Vdc

6.4. Operational Power Range

Declared O/P Power Range	Mode 1		Mode 2	
	Max	Min	Max	Min
EUT	2.059 mW	0.01 mW	N/A	N/A

6.5. Types of Modulation Supported

Modulation / Mode	BW 1	BW 2	BW 3	BW 4	BW 5
OOK	1.253 GHz	--	--	--	--

6.6. Antenna Details

The following is a description of the EUT antennas.

Antenna Type:	Manufacturer	Model	Gain (dBi)	Frequency Range (GHz)
Horn	Flann Microwave	25810-TA	34.5	51.500-75.00

6.7. Cabling and I/O Ports

The following is a description of the cable and input, output ports available on the EUT.

Type of I/O Ports	Description	Screened (y/n)	Description	Qty	Tested
DC	4 Pin XLR connector	Y	12 Vdc	1	N
Video In	BNC 75 Ohm	Y	Video Input	1	N

6.8. EUT Configurations

Band (GHz)	Mode	Freq Band (MHz)	Freq Range (MHz)	Low ch	Mid ch	High ch	No. of Channels	Channel Spacing (MHz)	Channel BW (MHz)
57 - 64	Tx	57,000 - 64,000	57,000 - 64,000	--	60,480.00	--	1	N/A	1,253.00

The VuLink VL300 was tested for single channel operation

6.9. Equipment Details

The following is a description of EUT and supporting equipment used during the test program.

Type (EUT/Support)	Equipment Description	Manufacturer	Model No.	Serial No(s).
EUT	VuLink HD Video transmitter	VuBiQ	VL300	1436
EUT	ac Adapter 115 Vac, 60 Hz to 12 Vdc	Phihong	PSA15R-120P	N/A
Support	Data generator	Compuvideo	CV-9160SDI	N/A

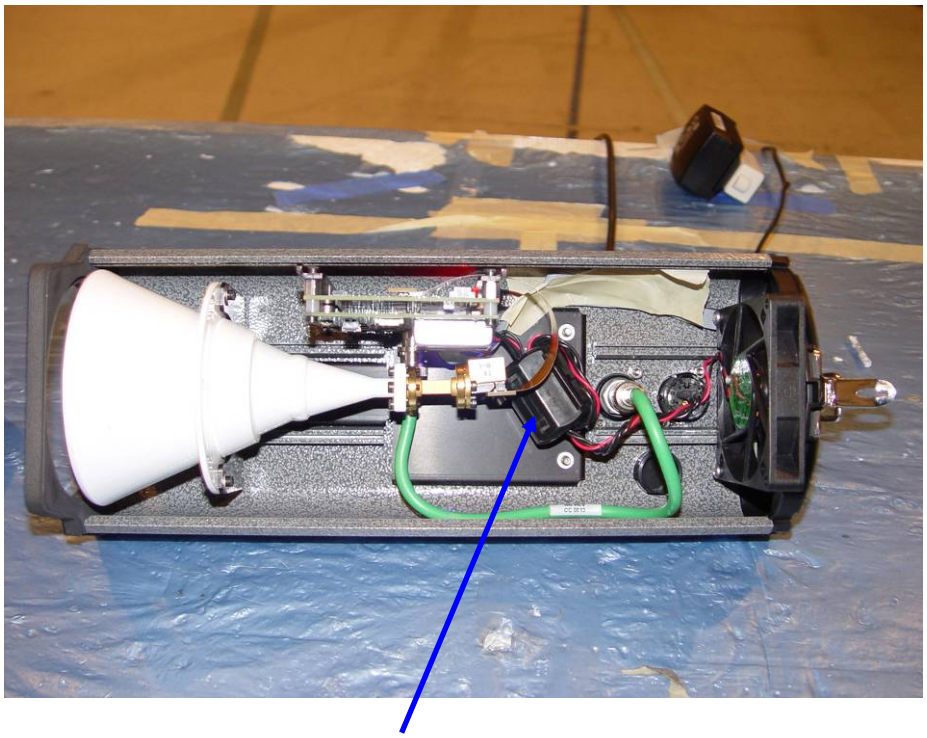
6.10. Test Configurations

Operational Mode(s)	Data Rate Tested	Duty Cycle
HD-SDI Video Transmission	1485 MBit/s	100%

6.11. Equipment Modifications

The following modifications were required to bring the equipment into compliance:

No.	Test	Problem	Modification Required
#1	Radiated Emissions	Non-Compliant Emission(s)	Ferrite placed on dc power supply line(s)



#1 Ferrite place on dc power supply

6.12. Deviations from the Test Standard

The following deviations from the test standard were required in order to complete the test program:

1. NONE

7. TEST RESULTS

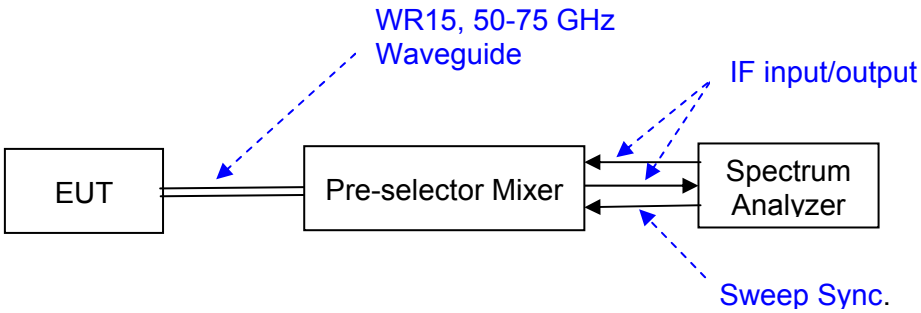
7.1. Device Characteristics

7.1.1. Bandwidth Measurement(s)

FCC, Part 15 Subpart C §15.255
Industry Canada RSS-210

Test Procedure
The bandwidth at 26 dB and 99 % was measured with a spectrum analyzer connected to the antenna terminal, while EUT is operating in transmission mode at the appropriate center frequency. Testing performed on the VuLink VL300 Video Link was performed per the FCC's KDB Publication 200443.

Test Measurement Set up



Measurement set up for 26 dB and 99 % bandwidth

Measurement Results for 26 dB & 99% Bandwidth

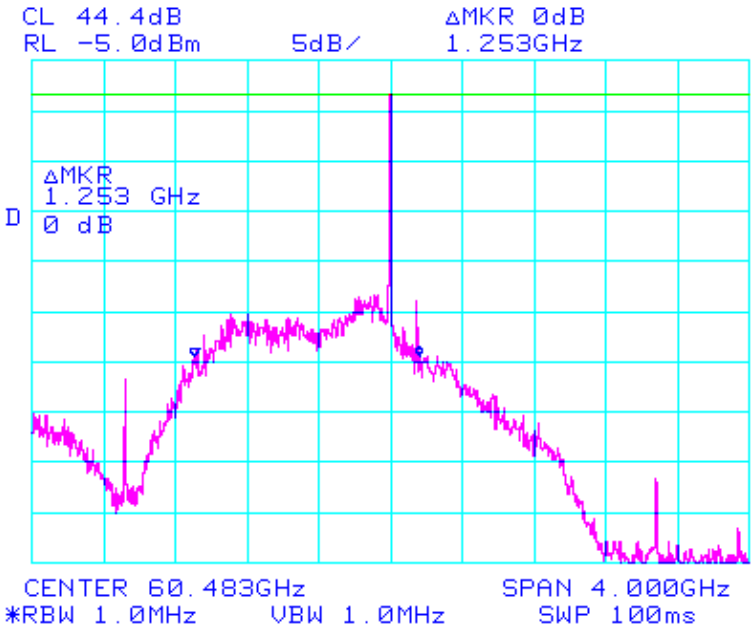
Ambient conditions.
Temperature: 17 - 20 °C Relative humidity: 38 - 42 % Pressure: 998 - 2004 mbar

Radio Parameters
Duty Cycle: 100%
Output: Modulated Carrier
Data Input: HD
Power: Maximum
Test Type: Conducted

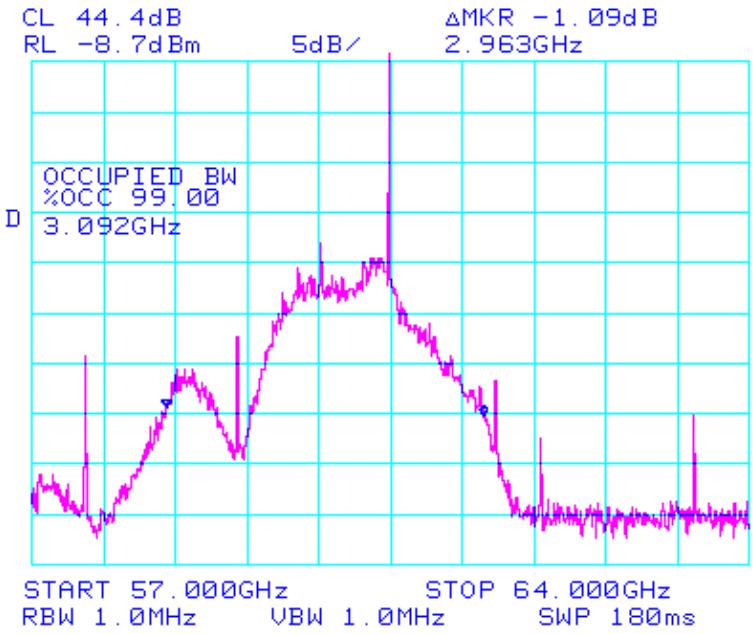
TABLE OF RESULTS

Center Frequency (GHz)	26 dB Bandwidth (GHz)	99% Bandwidth (GHz)
60.48	1,253.0	3,092.0

26 dB Bandwidth



99 % Bandwidth



Specification

Limits

§15.255 (e)(1)
The 26 dB bandwidth shall be at least 100 MHz.

§ IC RSS-Gen 4.4.1 Occupied Bandwidth When an occupied bandwidth value is not specified in the applicable RSS, the transmitted signal bandwidth to be reported is to be its 99% emission bandwidth, as calculated or measured.

Laboratory Measurement Uncertainty for Spectrum Measurement

Measurement uncertainty	±2.81 dB

Traceability

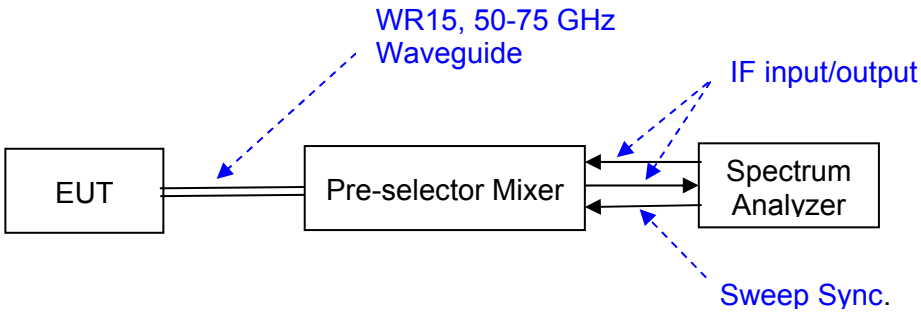
Method	Test Equipment Used
Measurements were made per work instruction WI-03 'Measurement of RF Spectrum Mask'	0088, 0146, 0158, 0227, 0252, 0310, 0312, 0307

7.1.2. Power Density

FCC, Part 15 Subpart C §15.255
Industry Canada RSS-210

Test Procedure
The Power Density was measured conductively with a spectrum analyzer connected to the antenna terminal. The EUT transmitter was modulated operating at the appropriate center frequency. Testing performed on the VuLink VL300 Video Link was performed per the FCC's KDB Publication 200443

Test Measurement Set up



Measurement set up for Power Density

Limit: 18 uW/cm^2 @3m distance

Area = $4\pi r^2$ where r = 300 cm

18 μW/cm^2 = +43.1 dBm
Antenna Gain = 34.5 dBi

$\therefore$ conducted limit = EIRP limit – antenna gain = 43.1 – 34.5 = +8.6 dBm

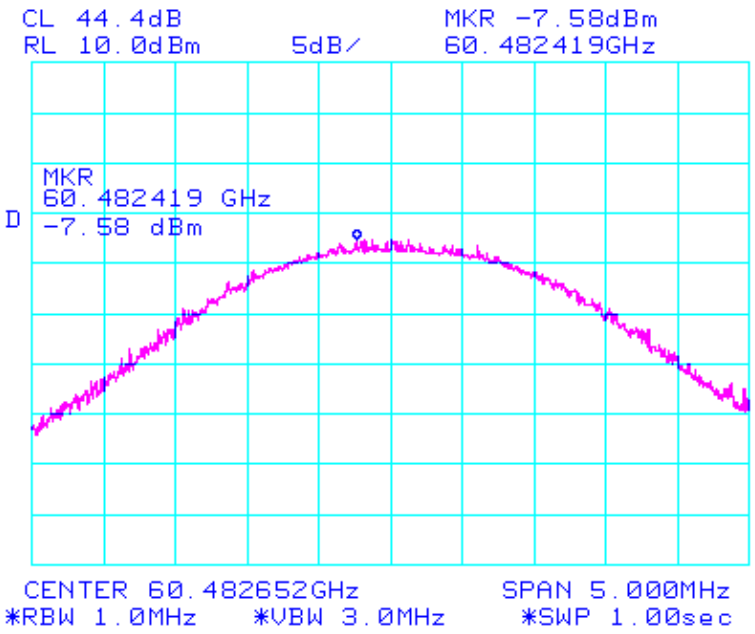
Ambient conditions.
Temperature: 17 - 20 °C Relative humidity: 38 - 42 % Pressure: 998 - 2004 mbar

Radio Parameters
Duty Cycle: 100%
Output: Modulated Carrier
Data Input: HD
Power: Maximum
Test Type: Conducted

TABLE OF RESULTS

Center Frequency (GHz)	Peak Frequency (MHz)	PPSD (dBm)
60.48	60.482419	-7.58

Power Density



Specification

FCC, Part 15
§15.255 (b)(1) The peak power density of any emission shall not exceed 18 uW/cm^2, as measured 3m from the radiating structure.

Industry Canada RSS-210
§ **A13.2.2 (i)** the peak power density of any emission shall not exceed 18 uW/cm^2

Laboratory Measurement Uncertainty for Spectral Density

Measurement uncertainty	±1.33 dB

Traceability

Method	Test Equipment Used
Measurements were made per work instruction WI-01 'Measuring RF Output Power'	0088, 0146, 0158, 0227, 0252, 0310, 0312, 0307

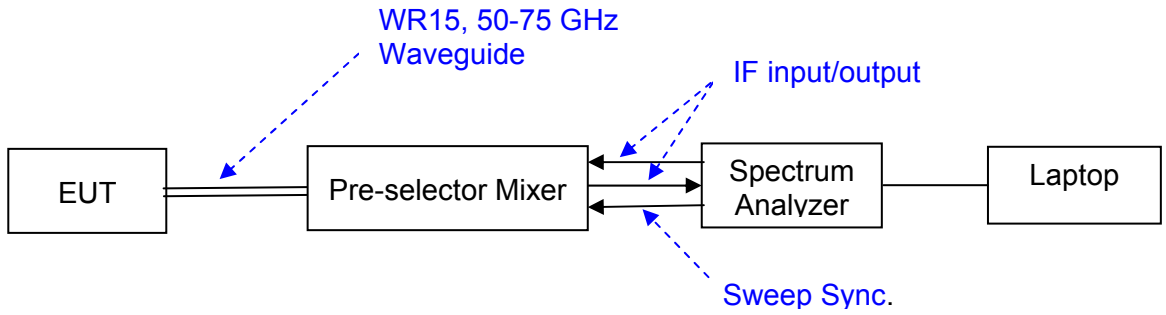
7.1.3. Peak Output Power

FCC, Part 15 Subpart C §15.255
Industry Canada RSS-210

Test Procedure
The Peak Output Power was measured conductively with a spectrum analyzer connected to the antenna terminal. The EUT transmitter was modulated operating at the appropriate center frequency. Testing performed on the VuLink VL300 Video Link was performed per the FCC's KDB Publication 200443.

Equivalent Measurement Method
Per the FCC's Publication 200443 an equivalent method was used to find the Peak Output Power. To find the actual Peak Power of the device the RF spectrum was downloaded to a computer and the spectrum integrated over the 26 dB emission bandwidth to provide the actual peak power.

Test Measurement Set up



Measurement set up for Peak Output Power

Peak Power Limit: 18 uW/cm^2 @3m distance

Area = $4\pi r^2$ where r = 300 cm

18 μW/cm^2 = +43.1 dBm
Antenna Gain = 34.5 dBi

$\therefore$ conducted limit = EIRP limit – antenna gain = 43.1 – 34.5 = +8.6 dBm

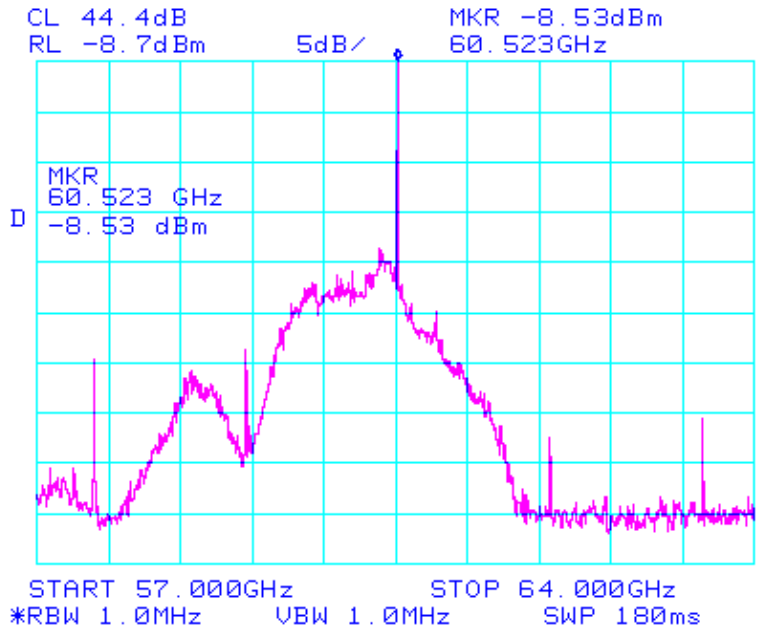
Ambient conditions.
Temperature: 17 - 20 °C Relative humidity: 38 - 42 % Pressure: 998 - 2004 mbar

Radio Parameters
Duty Cycle: 100%
Output: Modulated Carrier
Data Input: HD
Power: Maximum
Test Type: Conducted

TABLE OF RESULTS

Center Frequency	Calculated Integrated Power over 26 dB Bandwidth	
GHz	mW	dBm
60.48	2.059	+3.1

Peak Power



To find the Peak Output Power of the device the RF spectrum was downloaded to a computer and the spectrum integrated over the 26 dB emission bandwidth to provide the actual power.

Specification

Limits

FCC, Part 15

§15.255 (e) Except as specified elsewhere in this paragraph (e), the total peak transmitter output power shall not exceed 500 mW.

15.255 (e)(1) Transmitters with an emission bandwidth of less than 100 MHz must limit their peak transmitter output power to the product of 500 mW times their emission bandwidth divided by 100 MHz. For the purposes of this paragraph (e)(1), emission bandwidth is defined as the instantaneous frequency range occupied by a steady state radiated signal with modulation, outside which the radiated power spectral density never exceeds 6 dB below the maximum radiated power spectral density in the band, as measured with a 100 kHz resolution bandwidth spectrum analyzer. The center frequency must be stationary during the measurement interval, even if not stationary during normal operation (e.g. for frequency hopping devices).

15.255 (e)(2) Peak transmitter output power shall be measured with an RF detector that has a detection bandwidth that encompasses the 57–64 GHz band and that has a video bandwidth of at least 10 MHz, or using an equivalent measurement method.

15.255 (e)(2) For purposes of demonstrating compliance with this paragraph (e), corrections to the transmitter output power may be made due to the antenna and circuit loss.

Industry Canada RSS-210
A13.1.3 Peak Transmitter Output Power There is no limit on peak transmitter output power.

Laboratory Measurement Uncertainty for Power Measurements

Measurement uncertainty	±1.33 dB

Traceability

Method	Test Equipment Used
Measurements were made per work instruction WI-01 'Measuring RF Output Power'	0088, 0146, 0158, 0227, 0252, 0310, 0312, 0307

7.1.4. Maximum Permissible Exposure

FCC, Part 1 Subpart C §1.1310
Industry Canada RSS-Gen §5.5

Calculations for Maximum Permissible Exposure Levels

Power Density = Pd (mW/cm^2) = EIRP/(4πd^2)
P = Peak output power (mW)
G = Antenna numeric gain (numeric)
d = Separation distance (cm)
Numeric Gain = 10 ^ (G (dBi)/10)

The peak power in the table below is calculated by assuming a worst case scenario where the transmitter is operating maximum power.

Because the EUT belongs to the General Population/Uncontrolled Exposure the limit of power density is 1.0 mW/cm^2

Freq. Band (GHz)	Antenna Gain (dBi)	Numeric Gain (numeric)	Peak Output Power (dBm)	Peak Output Power (mW)	Calculated Safe Distance @ 1mW/cm^2 Limit(cm)	Minimum Separation Distance (cm)
60.48	34.5	2818.4	+3.10	2.059	21.5	21.5

***Note:** for mobile or fixed location transmitters the minimum separation distance is 20cm, even if calculations indicate the MPE distance to be less.

Specification

Maximum Permissible Exposure Limits

FCC §1.1310 Limit = 1mW / cm^2 from 1.310 Table 1

RSS-Gen §5.5 Before equipment certification is granted, the application requirements of RSS-102 shall be met.

Laboratory Measurement Uncertainty for Power Measurements

Measurement uncertainty	±1.33 dB

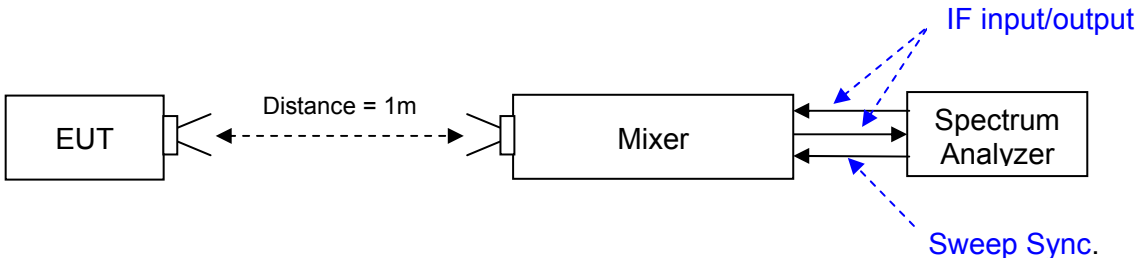
7.1.5. Spurious Emissions (> 1 GHz)

FCC, Part 15 Subpart C §15.255 (e)(2)
Industry Canada RSS-210

Test Procedure
Spurious emissions were measured at a 1m measurement distance. A horn antenna was connected to the pre-selector mixer and the measurement results recorded on the spectrum analyzer. Testing performed on the VuLink VL300 Video Link was performed per the FCC's KDB Publication 200443.

The modulated transmitter was operating at the appropriate center frequency.

Test Measurement Set up



Measurement set up for Spurious Emissions

Spurious Emission Limit: 90 pW/cm^2 @ 3m distance

Area = $4\pi r^2$ where r = 300 cm

90 pW/cm^2 = +101.7μW EIRP = -9.93 dBm EIRP = 85.37 dBμV/m

Radiated limit (3 m) = 85.37 dBμV/m

Radiated Limit (1 m distance) = 3 m limit – conversion to 1 m (-9.54 dB) = 94.9 dBμV/m

As a result of the EUT having a WR-15 waveguide connecting the transmitter to the antenna port spurious emissions 1 - 26 GHz would be below cut-off and therefore not measured.

Radio Parameters
Duty Cycle: 100%
Output: Modulated Carrier
Data Input: HD
Power: Maximum
Centre Frequency: 60.48 GHz
Test Type: Radiated

Spurious Emissions Identified (PEAK)

Emission Frequency (GHz)	Measured Emission (dBμV)	Receive Antenna Gain (dBi)	Corrected Emission (dBμV)	EIRP Limit (1m Limit) (dBμV/m)
37.990	48.68	22.60	26.08	94.9
41.220	48.80	28.33	22.30	
50.607	73.00	34.50	38.50	
70.470	67.17	38.34	28.83	
94.020	55.00	41.65	13.35	

Note: the above peak levels are less than the average limit therefore the system satisfies peak and average limits.

Limits

§15.255 (c)(1) The power of any emission outside of the 57 – 64 GHz band shall consist solely of spurious emissions.

§15.255 (c)(2) Radiated emissions below 40 GHz shall not exceed the general limits in §15.209.

§15.255 (c)(3) Between 40 and 200 GHz the level of the emissions shall not exceed 90 pW/cm^2 at a distance of 3 meters.

§15.255 (c)(4) The level of the spurious emission shall not exceed the level of the fundamental emission

§15.255 (d) Only spurious emissions and transmissions related to a publicly accessible coordination channel, whose purpose is to coordinate operation between diverse transmitters with a view towards reducing the probability of interference throughout the 57 – 64 GHz band are permitted in the 57 – 57.05 GHz band.

RSS-210 §A13.2.2 In-band Emissions: Within the band 57-64 GHz, emission levels measured 3 meters from the radiating source shall not exceed the following:

(i) For products other than fixed field disturbance sensors, the average power density of any emission, measured during the transmit interval, shall not exceed 9 µW/cm2, and the peak power density of any emission shall not exceed 18µW/cm2.

(ii) For fixed field disturbance sensors that occupy 500 MHz or less of bandwidth and that are contained wholly within the frequency band 61.0-61.5 GHz, the average power density of any emission, measured during the transmit interval, shall not exceed 9µW/cm2, and the peak power density of any emission shall not exceed 18 µW/cm2.

In addition, the average power density of any emission outside of the band 61.0-61.5 GHz, measured during the transmit interval, but still within the band 57-64 GHz, shall not exceed 9 nW/cm2, and the peak power density of any emission shall not exceed 18 nW/cm2.

(iii) For fixed field disturbance sensors other than those operating under the provisions of subsection A13.2.2(1)(ii) of this section, the peak transmitter output power shall not exceed 0.1 mW and the peak power density shall not exceed 9 nW/cm2.

(2) **Spurious emissions:** Any emissions outside the band 57-64 GHz shall consist solely of spurious emissions and shall not exceed:

(i) the limits shown in Tables 2 and 3 for emissions below 40 GHz;
(ii) 90 pW/cm^2 at a distance of 3 metres for emissions between 40 GHz and 200 GHz;

Within the band 57.0-57.05 GHz, only spurious emissions related to a publicly-accessible coordination channel are permitted. The band 57-57.05 GHz is reserved exclusively for a publicly-accessible coordination channel

Laboratory Measurement Uncertainty for Radiated Spurious Emissions

Measurement uncertainty	+5.6 / -4.5 dB

Traceability

Method	Test Equipment Used
Measurements were made per work instruction WI-05 'Measurement of Spurious Emissions'	0088, 128, 0145, 0146, 0147, 0148, 0158, 227, 229, 0252, 0310, 0312, 0307

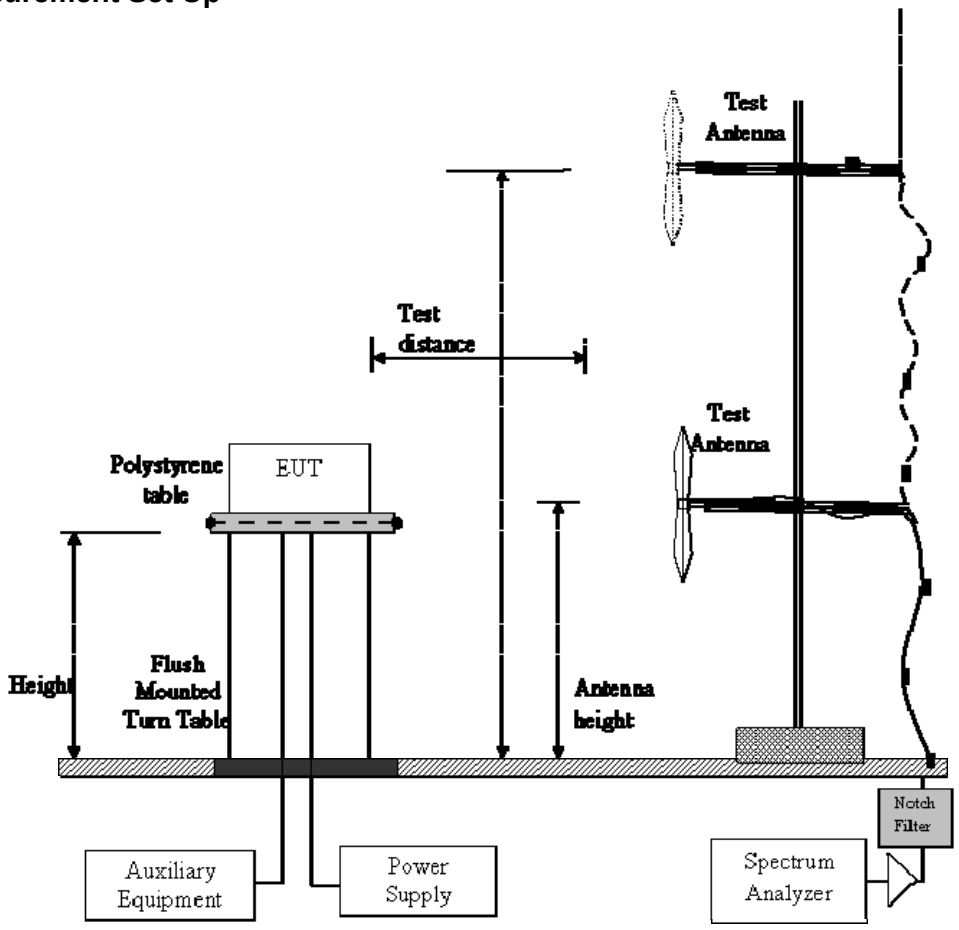
7.1.6. Radiated Emissions (< 1GHz)

Test Procedure

Testing was performed in a 3-meter anechoic chamber. Preliminary radiated emissions were measured on every azimuth and with the receiving antenna in both horizontal and vertical polarizations. Preliminary emissions were recorded with in Spectrum Analyzer mode, using a maximum peak detector while in peak hold mode.

Emissions nearest the limits were chosen for maximization and formal measurement using a CISPR Compliant receiver. Emissions above 1000 MHz are measured utilizing a CISPR compliant average detector with a tuned receiver, using a bandwidth of 1 MHz. Emissions from 30 MHz – 1000 MHz are measured utilizing a CISPR compliant quasi-peak detector with a tuned receiver, using a bandwidth of 120 kHz. Only the highest emissions relative to the limit are listed.

Test Measurement Set Up



Radiated Emission Measurement Setup – Below 1 GHz

Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Loss, and subtracting Amplifier Gain from the measured reading. All factors are included in the reported data.

FS = R + AF + CORR – FO

FS = Field Strength
R = Measured Spectrum analyzer Input Amplitude
AF = Antenna Factor

CORR = Correction Factor = CL – AG + NFL

CL = Cable Loss
AG = Amplifier Gain
FO = Distance Falloff Factor
NFL = Notch Filter Loss or Waveguide Loss

Field Strength Calculation Example:

Given receiver input reading of 51.5 dBμV; Antenna Factor of 8.5 dB; Cable Loss of 1.3 dB; Falloff Factor of 0 dB, an Amplifier Gain of 26 dB and Notch Filter Loss of 1 dB. The Field Strength of the measured emission is:

FS = 51.5 + 8.5 + 1.3 - 26.0 +1 = 36.3 dBμV/m

Conversion between dBμV/m (or dBμV) and μV/m (or μV) are done as:

Level (dBμV/m) = 20 * Log (level (μV/m))

40 dBμV/m = 100 μV/m
48 dBμV/m = 250 μV/m

Specification

Radiated Spurious Emissions

FCC §15.255(c) (1) The power density of any emissions outside the 57-64 GHz band shall consist solely of spurious emissions. (2) Radiated emissions below 40 GHz shall not exceed the general limits in Section 15.209 of this part.

FCC §15.205 (a) Except as shown in paragraph (d) of 15.205 (a), only spurious emissions are permitted in any of the frequency bands listed.

FCC §15.205 (a) Except as shown in paragraphs (d) and (e) of this section, the field strength of emissions appearing within these frequency bands shall not exceed the limits shown in Section §15.209. At frequencies equal to or less than 1000 MHz, compliance with the limits in Section 15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000 MHz, compliance with the emission limits in Section 15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in Section 15.35 apply to these measurements.

FCC §15.209 (a) Except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table.

Table 1: FCC 15.209 Spurious Emissions Limits

Frequency (MHz)	Field Strength (µV/m)	Field Strength (dBµV/m)	Measurement Distance (meters)
30-88	100	40.0	3
88-216	150	43.5	3
216-960	200	46.0	3
Above 960	500	54.0	3

Laboratory Measurement Uncertainty for Spectrum Measurement

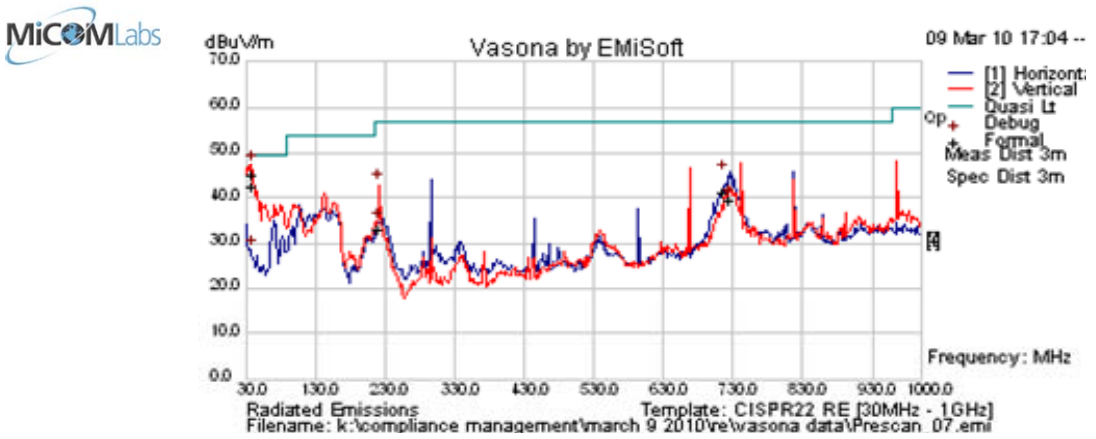
Measurement Uncertainty	+5.6/ -4.5 dB

Traceability:

Method	Test Equipment Used
Work instruction WI-03	0088, 0158, 0134, 0304, 0311, 0315, 0310, 0312

Radiated Emissions Results < 1 GHz

Test Freq.	60 GHz	**Engineer**	GMH
Variant	Transmitter	**Temp (ºC)**	20.5
Freq. Range	30 MHz - 1000 MHz	**Rel. Hum.(%)**	38
Power Setting	Maximum, ac adapter 115Vac 60Hz	**Press. (mBars)**	1012
Antenna	Integral		
Test Notes 1	Type B2 Ferrite wrapped around power supply cable near PCB		
Test Notes 2	Cables routed away from pcb		



Formally measured emission peaks

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
38.761	57.7	3.6	-16.1	45.2	Quasi Max	V	102	0	49.5	-4.3	Pass	
716.948	44.2	6.7	-9.7	41.3	Quasi Max	H	100	227	57	-15.7	Pass	
220.831	47.6	4.9	-19.6	32.9	Quasi Max	H	124	79	57	-24.1	Pass	
725.666	41.9	6.8	-9.2	39.5	Quasi Max	V	100	136	57	-17.6	Pass	
39.057	55.0	3.6	-16.2	42.3	Quasi Max	V	141	8	49.5	-7.2	Pass	
220.782	47.8	4.9	-19.6	33.1	Quasi Max	V	102	3	57	-23.9	Pass	

Legend:	DIG = Digital Device Emission; TX = Transmitter Emission; FUND = Fundamental Frequency
	NRB = Non-Restricted Band, Limit is 20 dB below Fundamental; RB = Restricted Band

CLASS A emissions

7.1.7. Frequency Stability

FCC, Part 15 Subpart C §15.255
Industry Canada RSS-210 A13.1.5

Test Procedure

The manufacturer of the equipment is responsible for ensuring that the frequency stability is such that emissions are always maintained within the band of operation under all conditions.

Manufacturer Declaration

The frequency stability of the reference oscillator sets the frequency stability of the RF transceiver and will always remain within the band of interest as calculated through the component specifications over voltage and temperature.

Frequency Stability

Oscillator characteristics
Reference Crystal Valpy Fisher VF266-A-1
A: stability 25 ppm
-1: temperature range -40 to +85C
Reference Frequency: 285.714 MHz

±25ppm at 60.48 GHz translates to a maximum frequency shift of ±1.5145 MHz. As the edge of the channels is at least two MHz from either of the band edges, ±1.5145 MHz is more than sufficient to guarantee that the intentional emission will remain in the band over the entire operating range of the EUT.

Voltage Regulation

The TEN 8-121x series is a family of high performance 8 W DC/DC converter modules featuring wide 2:1 input voltage ranges in a DIL-24 package with industry standard footprint. A very high efficiency allows an operating temperature range of –40°C to +85°C.

Specification

Limits

§15.255 (f) Fundamental emissions must be contained within the frequency bands specified in this section during all conditions of operation. Equipment is presumed to operate over the temperature range -20 to + 50°C with an input voltage variation of 85% to 115% of the rated input voltage, unless justification is presented to demonstrate otherwise.

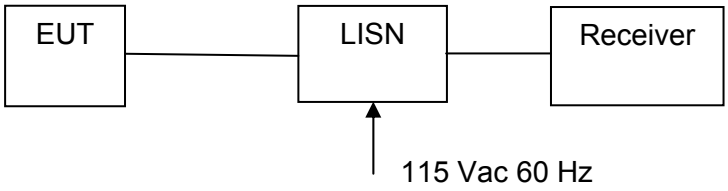
RSS-210 A13.1.5
Fundamental emissions must be contained within the frequency bands specified in this section during all conditions of operation.

7.1.8. AC Mains Line Conducted

FCC, Part 15 Subpart C §15.207
Industry Canada RSS-Gen §7.2.2

Test Procedure
The EUT is configured in accordance with ANSI C63.4. The conducted emissions are measured in a shielded room with a spectrum analyzer in peak hold in the first instance. Emissions closest to the limit are measured in the quasi-peak mode (QP) with the tuned receiver using a bandwidth of 9 kHz. The emissions are maximized further by cable manipulation. The highest emissions relative to the limit are listed.

Test Measurement Set up



Measurement set up for AC Line Conducted Emissions Test

Measurement Results for AC Line Conducted Emissions (150 kHz – 30 MHz)

Specification

Limit

§15.207 (a) Except as shown in paragraphs (b) and (c) of this section, for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table, as measured using a 50 μΩ line impedance stabilization network (LISN), see §15.207 (a) matrix below. Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal.

RSS-Gen §7.2.2
The radio frequency voltage that is conducted back into the AC power lines in the frequency range of 0.15 MHz to 30 MHz shall not exceed the limits shown in the table below. The tighter limit applies at the frequency range boundaries.

§15.207 (a) and **RSS-Gen §7.2.2** Limit Matrix
The lower limit applies at the boundary between frequency ranges

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

* Decreases with the logarithm of the frequency

Laboratory Measurement Uncertainty for Conducted Emissions

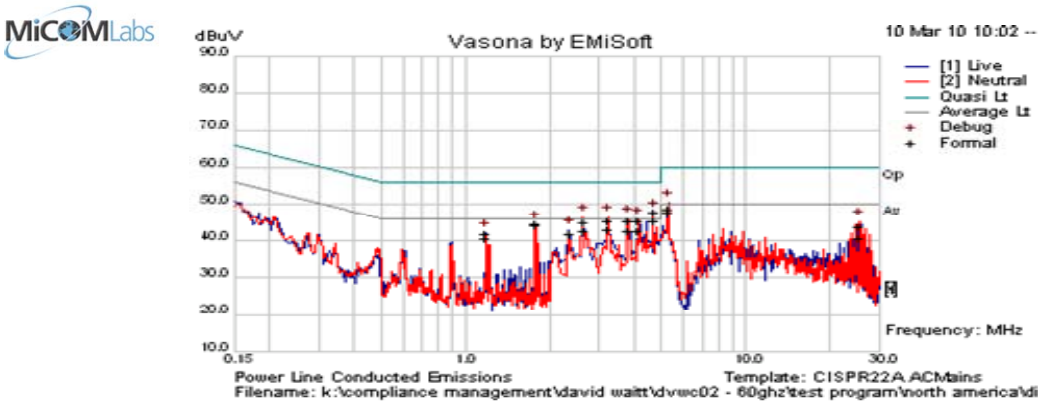
Measurement uncertainty	±2.64 dB

Traceability

Method	Test Equipment Used
WI-EMC-01 'Measurement of Conducted Emissions'	0088, 0158, 0184, 0287, 0190, 0293, 0307

AC Mains Line Conducted Results

Test Freq.	60 GHz		CSB
Variant	Transmitter - AC Line Emissions		18.5
Freq. Range	0.150 MHz - 30 MHz		38
Power Setting	120V AC; 50 Hz		1012
Antenna	Integral		
Test Notes 1	1080i Video presented to Video Input.		
Test Notes 2			



Formally measured emission peaks

Frequency MHz	Raw dBuV	Cable Loss	Factors dB	Level dBuV	Measurement Type	Line	Limit dBuV	Margin dB	Pass /Fail	Comments
1.183	30.7	9.9	0.1	40.7	Average	Live	46.0	-5.3	Pass	
1.183	31.8	9.9	0.1	41.8	Quasi Peak	Live	56.0	-14.2	Pass	
1.775	34.6	10.0	0.1	44.8	Average	Live	46.0	-1.2	Pass	
1.775	34.2	10.0	0.1	44.3	Quasi Peak	Live	56.0	-11.7	Pass	
2.367	31.6	10.1	0.1	41.8	Quasi Peak	Live	56.0	-14.2	Pass	
2.367	31.6	10.1	0.1	41.8	Average	Live	46.0	-4.2	Pass	
2.662	35.0	10.1	0.1	45.2	Quasi Peak	Neutral	56.0	-10.8	Pass	
2.662	32.4	10.1	0.1	42.6	Average	Neutral	46.0	-3.4	Pass	
3.253	35.4	10.1	0.2	45.7	Quasi Peak	Neutral	56.0	-10.3	Pass	
3.253	32.7	10.1	0.2	43.0	Average	Neutral	46.0	-3.0	Pass	
3.844	35.2	10.1	0.2	45.5	Quasi Peak	Neutral	56.0	-10.5	Pass	
3.844	32.7	10.1	0.2	42.9	Average	Neutral	46.0	-3.1	Pass	
4.141	32.5	10.1	0.2	42.8	Average	Live	46.0	-3.3	Pass	
4.141	35.2	10.1	0.2	45.5	Quasi Peak	Live	56.0	-10.5	Pass	
4.732	35.2	10.1	0.2	45.6	Average	Live	46.0	-0.4	Pass	
4.732	37.5	10.1	0.2	47.8	Quasi Peak	Live	56.0	-8.2	Pass	
5.323	37.5	10.2	0.2	47.9	Average	Neutral	50.0	-2.1	Pass	
5.323	38.4	10.2	0.2	48.7	Quasi Peak	Neutral	60.0	-11.3	Pass	

Legend:	DIG = Digital Device Emission; TX = Transmitter Emission; FUND = Fundamental Frequency
	NRB = Non-Restricted Band, Limit is 20 dB below Fundamental; RB = Restricted Band

7.1.9. Group Installation

FCC, Part 15 Subpart C §15.255 (h)
Industry Canada RSS-210 A13.2.6

Client Declaration

The frequency, amplitude and phase of the transmitter are set within the EUT with no external phase-locking inputs or any other means in which to combine two or more units together and realize beam forming arrays.

Limits

§15.207 (h) Any transmitter that has received the necessary FCC equipment authorization under the rules of this chapter may be mounted in a group installation for simultaneous operation with one or more other transmitter(s) that have received the necessary FCC equipment authorization, without any additional equipment authorization. However, no transmitter operating under the provisions of this section may be equipped with external phase-locking inputs that permit beam-forming arrays to be realized.

RSS-210 A13.2.6
Any transmitter that has received the necessary IC certification under this RSS may be mounted in a group installation for simultaneous operation with one or more transmitter(s) that have received the necessary IC authorization, without any additional equipment authorization. However, no transmitter operating under the provisions of this section may be equipped with external phase-locking inputs that permit beam-forming arrays to be realized.

7.1.10. Transmitter Self-Identification Transmission

FCC §15.255 (i)
RSS-210 A13.2.7

Results: Not Applicable

Transmitter Self-Identification Transmission is not applicable for this device as it is for outdoor use only. There will be no internal transmissions from a building.

Limits

§15.255 (i) For all transmissions that emanate from inside of a building, within any one second interval of signal transmission, each transmitter with a peak output power equal to or greater than 0.1 mW or a peak power density equal to or greater than 3 nW/cm^2, as measured 3 meters from the radiating structure, must transmit a transmitter identification at least once. Each application for equipment authorization for equipment that will be used inside of a building must declare that the equipment contains the required transmitter identification feature and must specify a method whereby interested parties can obtain sufficient information, at no cost, to enable them to fully detect and decode this transmitter identification information. Upon the completion of decoding, the transmitter identification data block must provide the following fields:

1).. FCC identifier, which shall be programmed at the factory

2).. Manufacturer's serial number, which shall be programmed at the factory

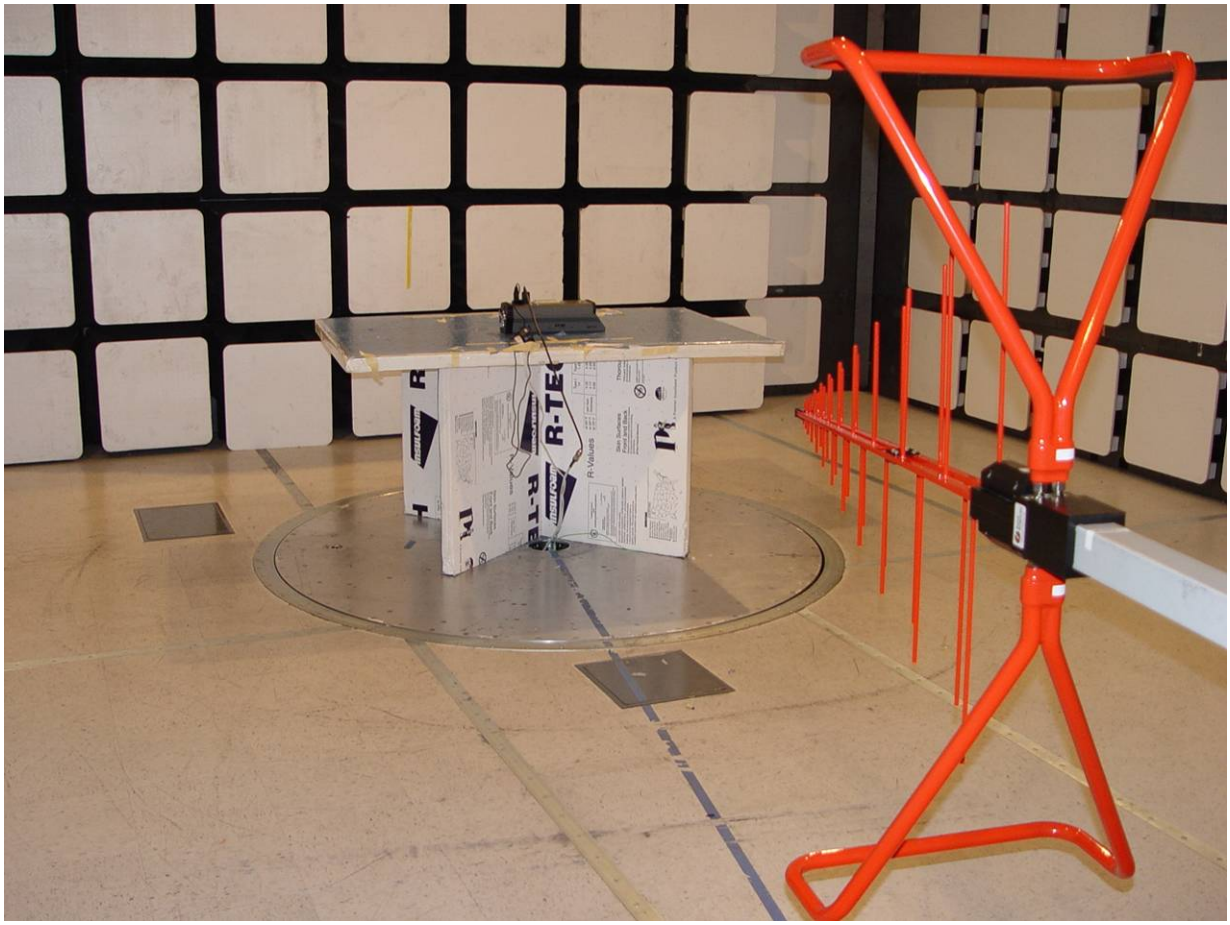
3).. Provision for at least 24 bytes of data relevant to the specific device, which shall be field programmable. The grantee must implement a method that makes it possible for users to specify and update this data. The recommended content of this field is information to assist in contacting the operator.

RSS-210

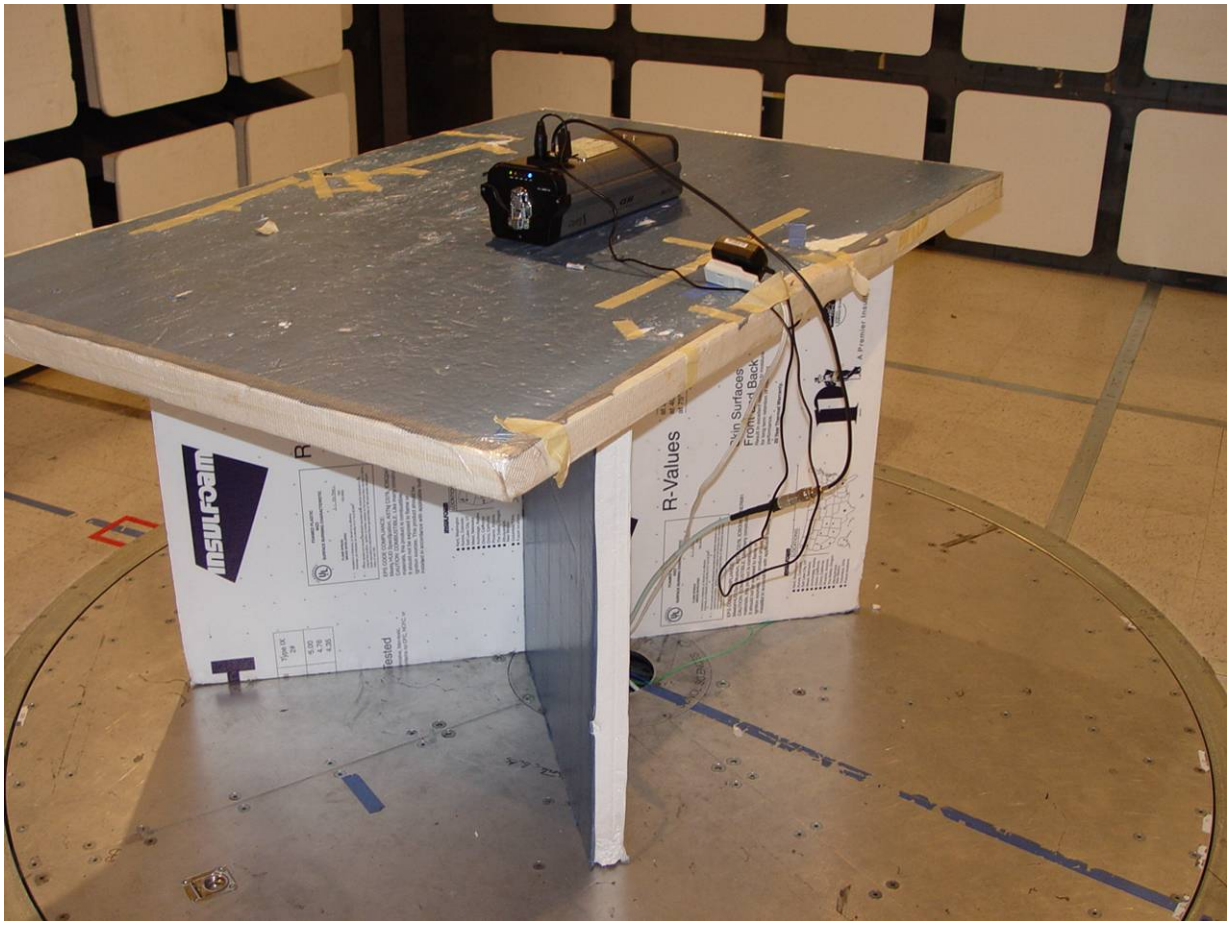
13.2.7 Transmitter Self-identification Transmission For all transmissions that emanate from inside a building, within any 1 second interval of signal transmission, each transmitter with a peak output power equal to or greater than 0.1 mW or a peak power density equal to or greater than 3 nW/cm2, as measured 3 meters from the radiating source, must transmit a transmitter identification at least once. Each application for equipment approval must declare that the equipment that will be used inside a building contains the required transmitter identification feature and must specify a method whereby interested parties can obtain sufficient information, at no cost, to enable them to fully detect and decode this transmitter identification information. Upon the completion of decoding, the transmitter identification data block must provide the following fields: (a) Industry Canada certification number, which shall be programmed at the factory; (b) Manufacturer's serial number, which shall be programmed at the factory; and (c) Provision for at least 24 bytes of data relevant to the specific device, which shall be field programmable. The applicant must implement a method that makes it possible for users to specify and update this data. The recommended content of this field is information to assist in contacting the operator.

8. PHOTOGRAPHS

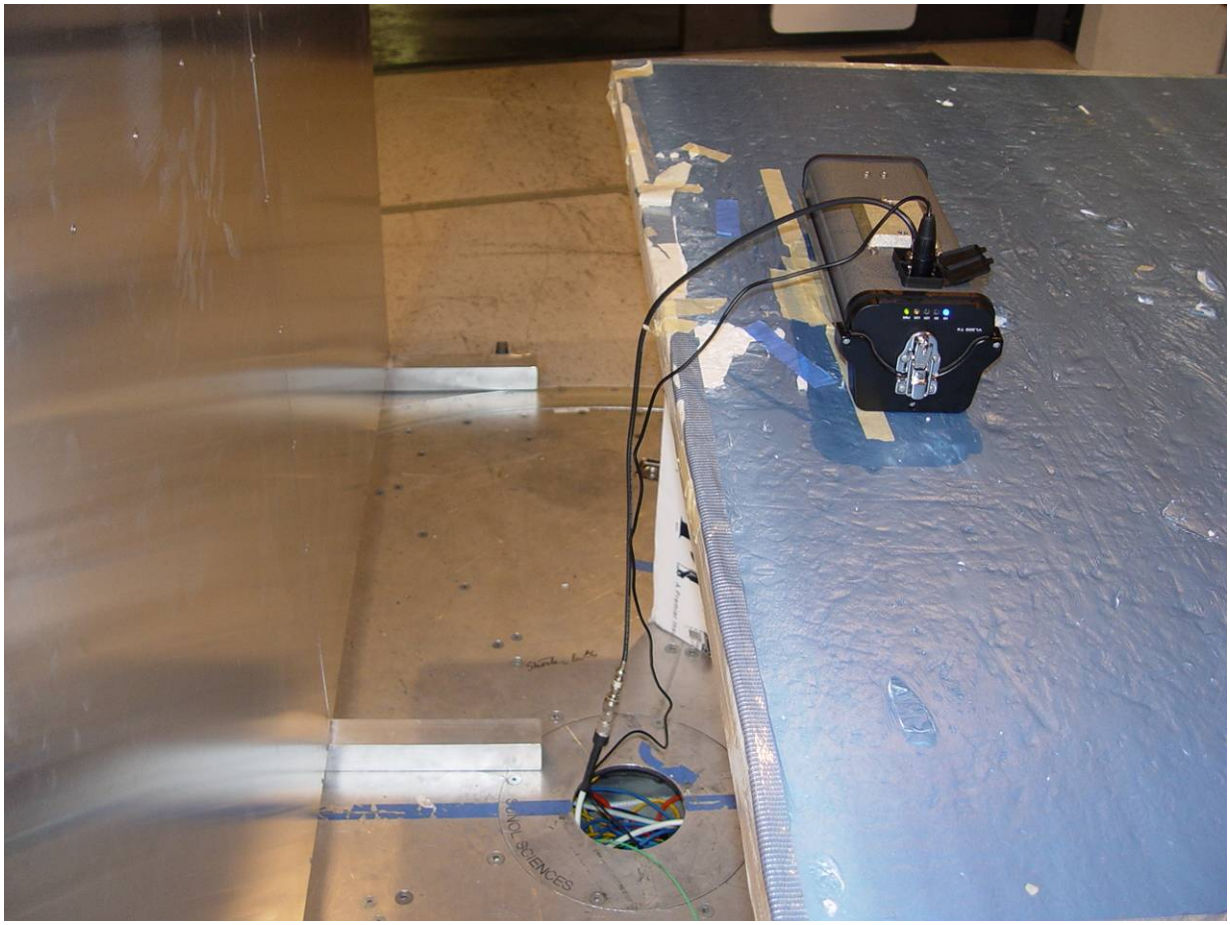
8.1. Spurious Emissions < 1GHz



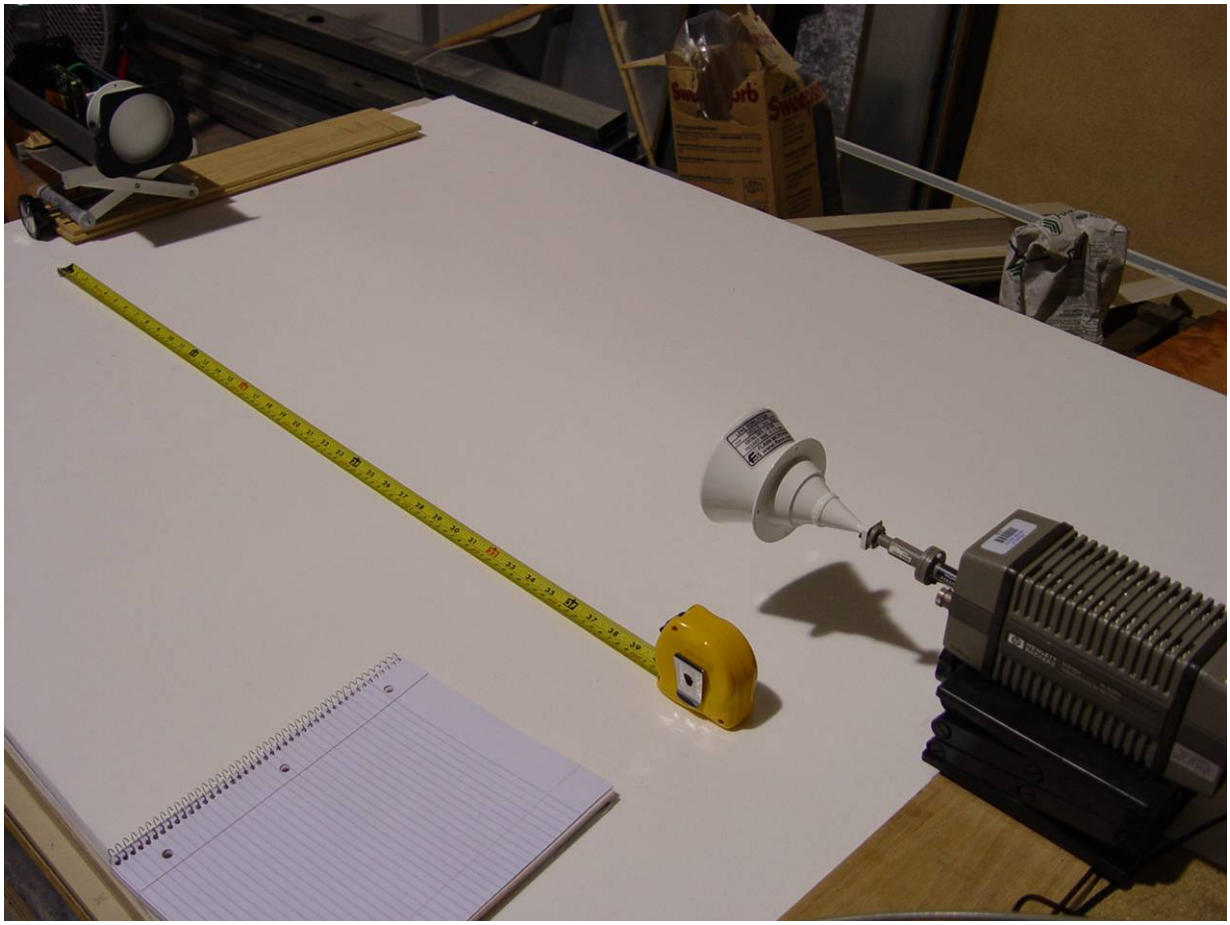
8.2. Spurious Emissions < 1GHz



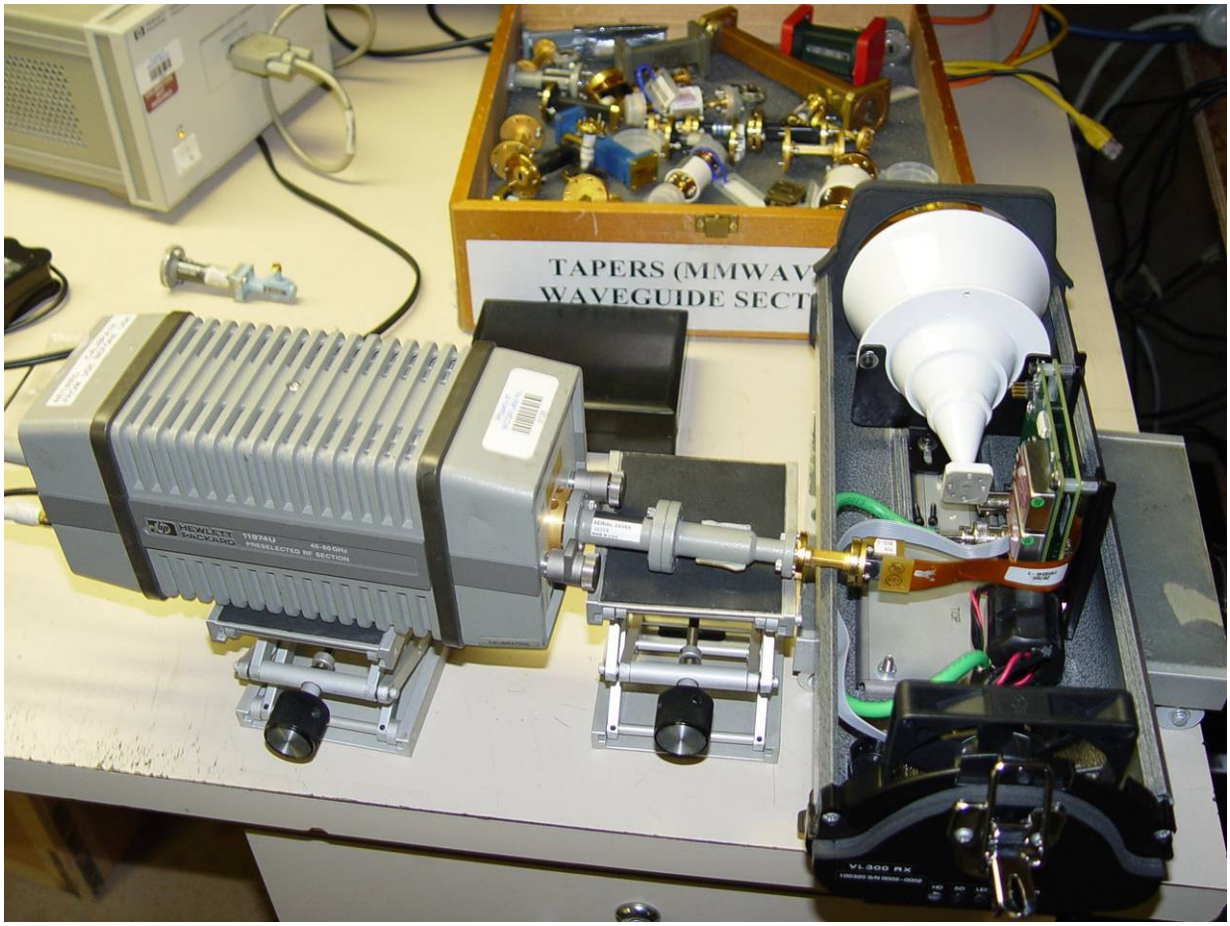
8.3. AC Wireline Emissions



8.4. Spurious Emissions above 1 GHz



8.5. Conducted Test Set-up

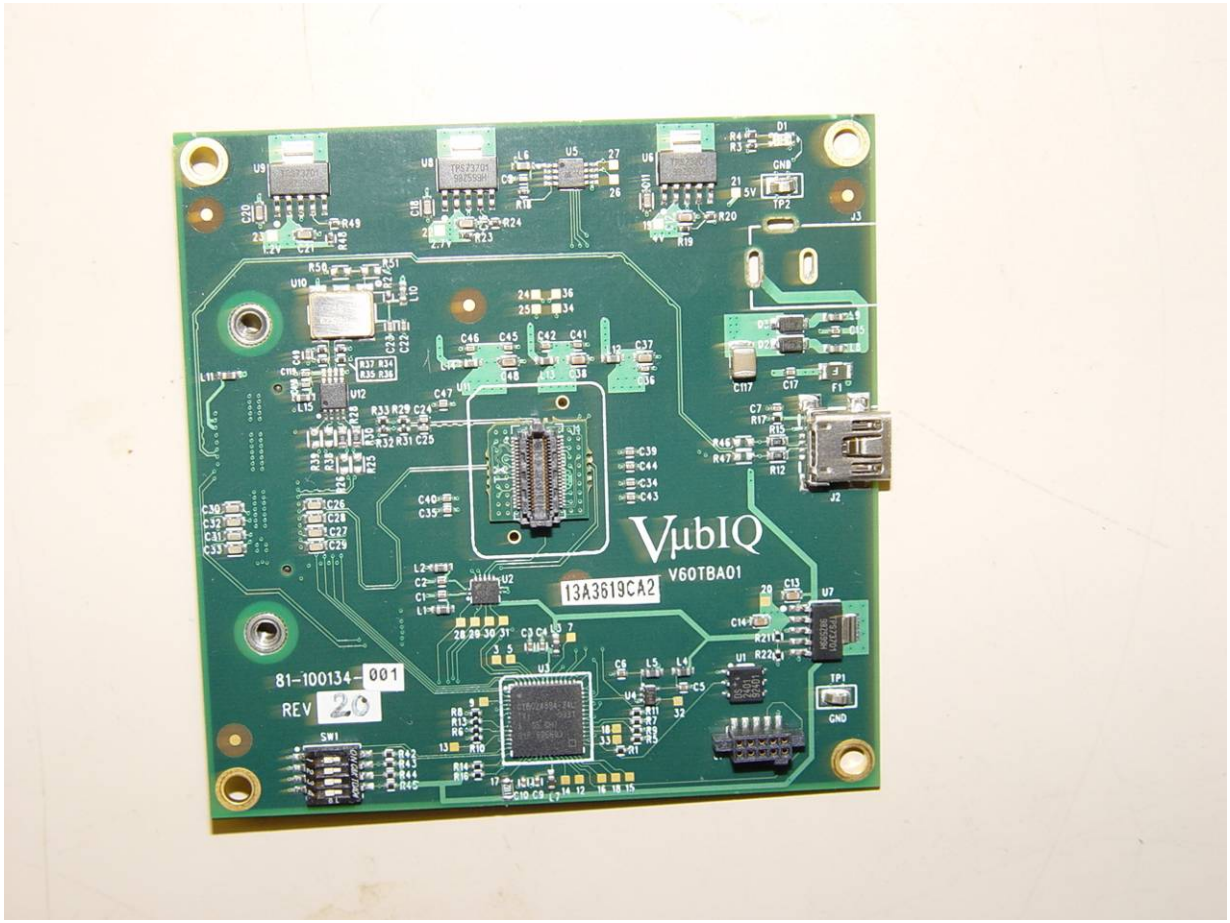


8.6. Internal Photographs

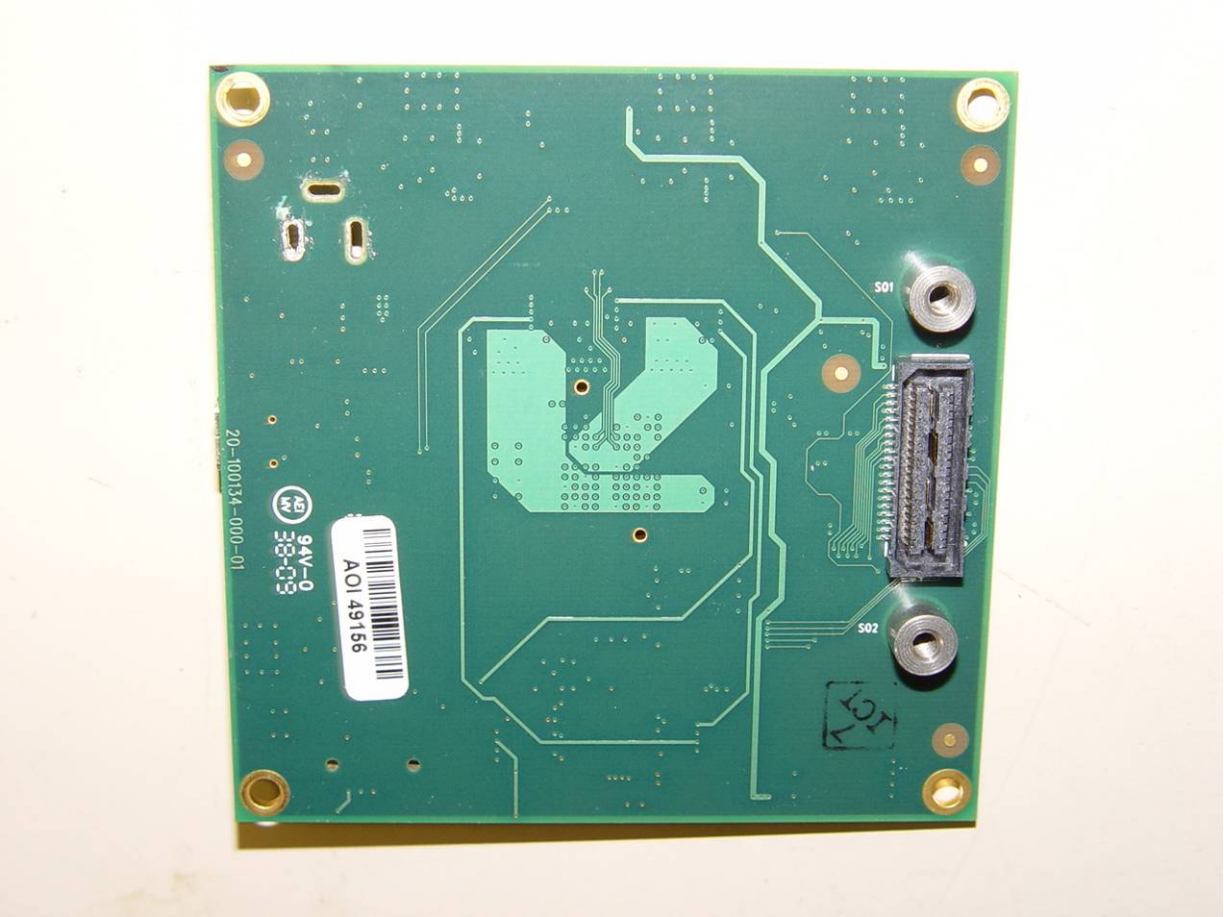
8.6.1. Baseband PCB

8.6.2. Baseband PCB Rear

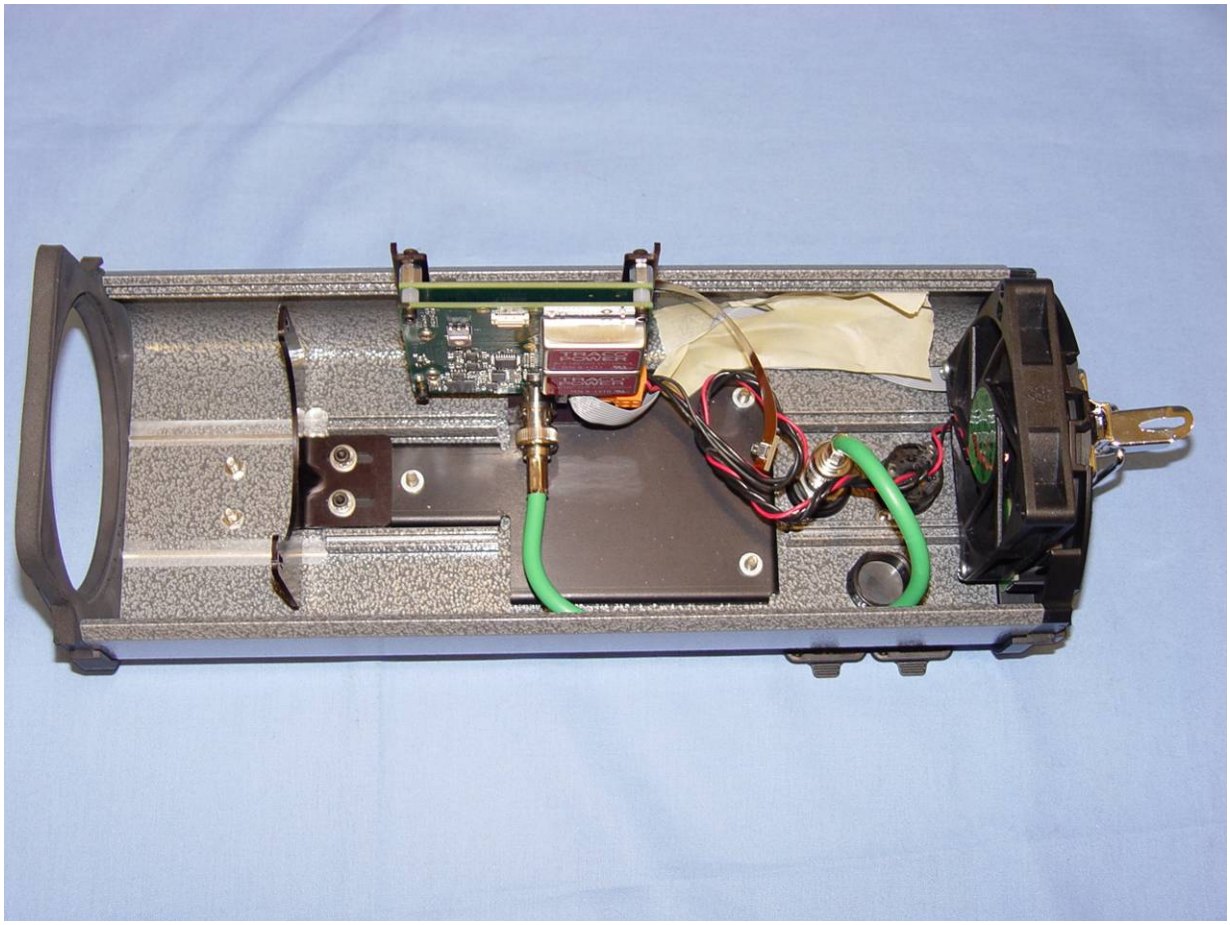
8.6.3. RF PCB



8.6.4. RF PCB Rear

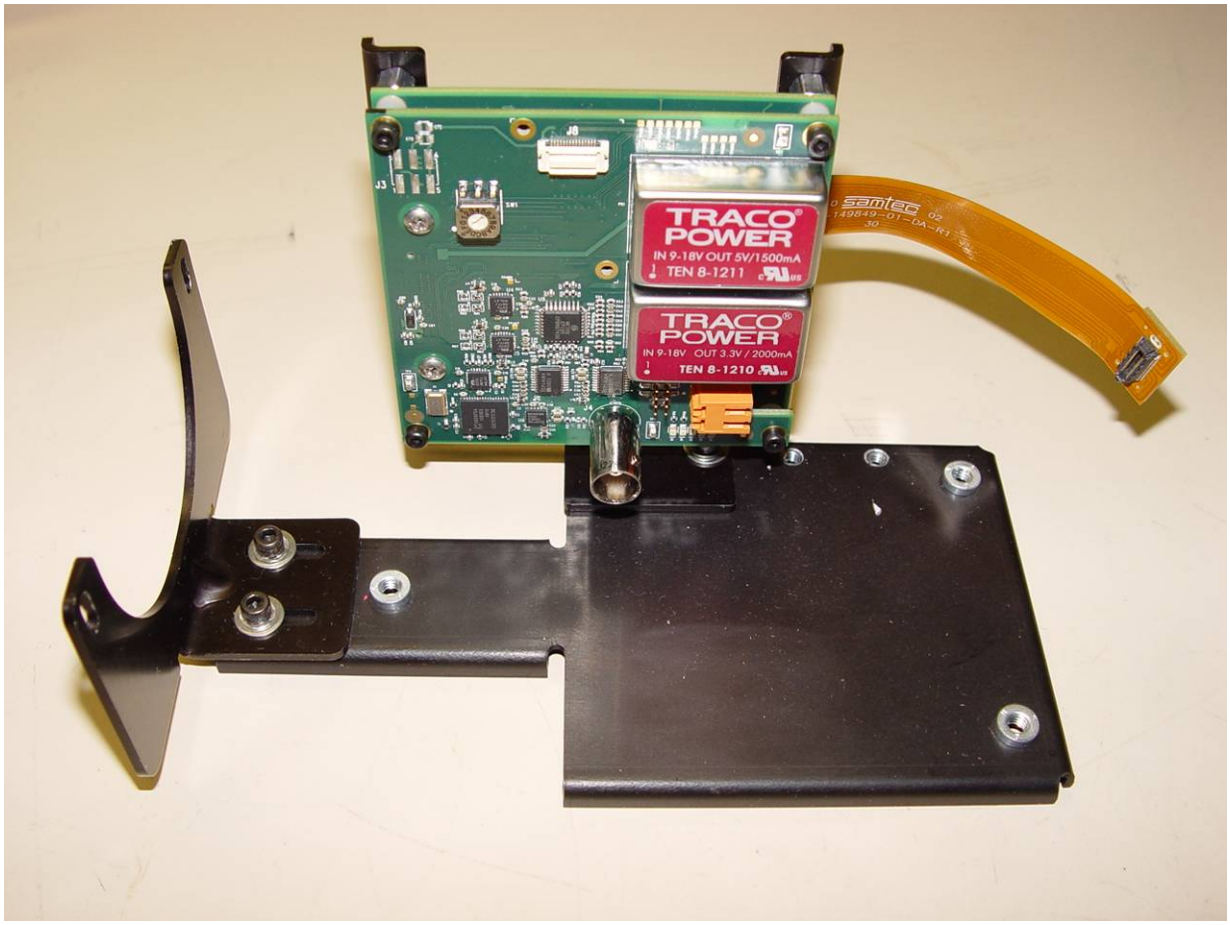


8.6.5. VuLink VL300 Body Shell



8.6.6. RF PCB

8.6.7. Baseband PCB



9. TEST EQUIPMENT DETAILS

Asset #	Instrument	Manufacturer	Model #	Serial #
0088	Spectrum Analyzer	Hewlett Packard	8564E	3410A00141
0128	Pre-selector Mixer	Hewlett Packard	11974U	3001A00107
0134	Pre-Amplifier	COM Power	PA-122	181910
0145	Horn Antenna	Millimeter Products Inc	261K	595
0146	Horn Antenna	Maury Electronics	MPI261U	383
0147	Horn Antenna	Maury Electronics	MPI261E	387
0148	Horn Antenna	Millimeter Products Inc	MPI261A	59
0158	Barometer /Thermometer	Control Co.	4196	E2846
0227	Pre-selector Mixer	Hewlett Packard	11974V	3001A00134
0229	Pre-selector Mixer	Hewlett Packard	11970W	2521A01085
0252	SMA Cable	Megaphase	Sucoflex 104	None
0310	SMA Cable	Micro-Coax	104	77420
0312	SMA Cable	Huber & Suhner	104	77429
0307	BNC Cable	Megaphase	1689 1GVT4	15F50B002

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