



Compliance Testing, LLC

Previously Flom Test Lab

EMI, EMC, RF Testing Experts Since 1963

toll-free: (866) 311-3268

fax: (480) 926-3598

<http://www.ComplianceTesting.com>
info@ComplianceTesting.com

Test Report

Prepared for: EMS Technologies Honeywell Satcom

Model: KRFU, Conduction Cooled

Description: KA Band Aviation Radio

Serial Number: 000000109

FCC ID: K6KJETWAVE2

To

FCC Part 25

Date of Issue: August 15, 2017

On the behalf of the applicant:

**EMS Technologies Honeywell Satcom
400 Maple Grove Rd
Ottawa, Ontario K2V 1B8**

Attention of:

**Steven Mills
Ph: (613)591-6040
E-Mail: Steven.Mills2@Honeywell.com**

**Prepared By
Compliance Testing, LLC
1724 S. Nevada Way
Mesa, AZ 85204
(480) 926-3100 phone / (480) 926-3598 fax
www.compliancetesting.com
Project No: p1730017**

**Greg Corbin
Project Test Engineer**

This report may not be reproduced, except in full, without written permission from Compliance Testing.
All results contained herein relate only to the sample tested



Test Report Revision History

Revision	Date	Revised By	Reason for Revision
1.0	6/15/2017	Greg Corbin	Original Document
2.0	6/27/2017	Greg Corbin	Added FMA antenna information to page 6
3.0	6/29/2017	Greg Corbin	Updated block diagram on page 10, removed 4.77 dB correction factor and corrected reported frequency below 1 GHz from radiated emission tables pages 11 - 18
4.0	7/5/2017	Greg Corbin	Added KRFU P/N to page 5
5.0	7/7/2017	Amanda Reed	Updated model name and description
6.0	8/1/2017	Greg Corbin	Added spurious search note to test procedure on page 9. Removed Authorized BW column from table on page 21.
7.0	8/14/2017	Greg Corbin	Added EIRP formula on page 10 and updated EIRP calculations in tables on pages 11 - 18



Table of Contents

<u>Description</u>	<u>Page</u>
Standard Test Conditions and Engineering Practices	5
Test Result Summary	7
Conducted Output Power	8
Conducted Emissions Limitations (Mask).....	9
Radiated Spurious Emissions.....	10
Frequency Tolerance (Temperature Variation)	19
Frequency Tolerance (Voltage Variation)	20
Necessary Bandwidth Calculations (Occupied Bandwidth).....	21
Test Equipment Utilized	22

ILAC / A2LA

Compliance Testing, LLC, has been accredited in accordance with the recognized International Standard ISO/IEC 17025:2005. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (refer joint ISO-ILAC-IAF Communiqué dated January 2009).

The tests results contained within this test report all fall within our scope of accreditation, unless noted in the table below.

Please refer to <http://www.compliancetesting.com/labscope.html> for current scope of accreditation.

Testing Certificate Number: **2152.01**



FCC Site Reg. #349717

IC Site Reg. #2044A-2

Non-accredited tests contained in this report:

N/A

Standard Test Conditions and Engineering Practices

All tests and measurement data shown were performed in accordance with FCC Rules and Regulations, Volume II; Part 2 and the following individual Parts: FCC Part 25 Satellite Communications.

Unless otherwise indicated, the procedures contained in ANSI C63.4-2014 were observed during testing.

Prior to testing, the EUT was tuned up in accordance with the manufacturer's alignment procedures. All external gain controls were maintained at the position of maximum and/or optimum gain throughout the testing.

Measurement results, unless otherwise noted, are worst case measurement.

Unless otherwise indicated in the specific measurement results, the ambient temperature was maintained within the range of 10° to 40°C (50° to 104°F) and the relative humidity levels were in the range of 10% to 90%.

Environmental Conditions		
Temperature (°C)	Humidity (%)	Pressure (mbar)
16.4 – 22.5	17.1 – 34.7	951.2 – 984.0

EUT Description

Model: KRFU, Conduction Cooled

Description: KA Band Aviation Radio

P/N: 90401203

Serial Number: 000000109

Additional Information:

The EUT is an aircraft earth station installed on the fuselage of the airplane and used to provide Inmarsat Global Xpress Aviation data services.

EUT Operation during Tests

The EUT (KRFU, KA Band Radio Frequency Unit) operates from 29 – 30 GHz using 3 types of modulation; QPSK, BPSK and 8PSK.

The EUT was controlled by the manufacturer using a PC and sending commands thru a terminal window.

The EUT output is WR 28 waveguide. The manufacturer provided a 20 dB waveguide coupler and a 40 dB waveguide attenuator for a load.

The conducted measurements were measured at the coupled port of the coupler.

The EUT is connected to a FMA antenna (Fuselage Mount Antenna) in normal operation

Radiated measurements were measured in an anechoic chamber with the transmitter connected to the FMA antenna and into a termination.

The KRFU receives DC power from the MODMAN (Modem Manager).



Accessories:

Qty	Description	Manufacturer	Model	S/N
1	Modman (Modem Manager)	Honeywell	90400012-0002	000000004
1	APM (Aeronautical Personality Module)	Honeywell	90401121	000000421
1	KANDU (KA Band Network Data Unit)	Honeywell	90404518	000000100
1	FMA (Fuselage Mount Antenna)	Honeywell	90000380-1	00025
1	Waveguide Attenuator, 26.5 – 40 GHz, 40 dB	ATM	28-630HPA-40-6-6	Q392606-05
1	Waveguide Coupler, 26.5 – 40 GHz, 20 dB coupling	RF-Lambda	RWGCP28SB	14081803#
1	Waveguide to Coax Adapter WR28 to 2.92 mm coax	Pasternack	PE9826	N/A

Cables:

Qty	Description	Length (M)	Shielding Y/N	Part Number	Manufacturer
1	GXA Jetwave SSSTR Internal Harness	25	N	90404098 rev D	Honeywell
1	TMA/FMA LRU Cable	25	N	90404099 rev C	Honeywell
1	Jetwave KRFU LRU Cable	25	N	90404338 rev C	Honeywell
1	SMA Male to TNC Male Cable	25	Y	PE3C0122- 2500CM	PASTERNAK

Modifications: None



Test Result Summary

Specification	Test Name	Pass, Fail, N/A	Comments
25.204	Carrier Output Power (Conducted)	Pass	
25.202f	Unwanted Emissions (Transmitter Conducted)	Pass	
2.1053	Field Strength of Spurious Radiation	Pass	
25.202f	Emission Masks (Occupied Bandwidth)	Pass	
25.202d	Frequency Stability (Temperature Variation)	Pass	
25.202d	Frequency Stability (Voltage Variation)	Pass	

Conducted Output Power

Engineer: Greg Corbin

Test Date: 5/16/2017

Test Procedure

The EUT was connected to a Spectrum Analyzer via a 20 dB coupler. The spectrum analyzer channel power measurement tool was used to record the output power.

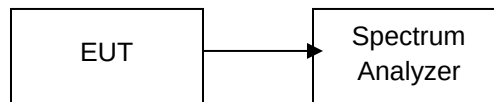
Output Power was recorded for 3 types of modulation and 2 symbol rates.

Per §25.204(c), there is no EIRP limit for earth stations with elevation angles > 5 degrees above the horizon.

Per the manufacturer, the EUT does not transmit at elevation angles < 5 degrees above the horizon.

EIRP is based on the antenna used and is addressed at the time of installation.

Test Setup



Transmitter Peak Output Power

Tuned Frequency (GHz)	Modulation	Symbol Rate (Msym)	Recorded Measurement (dBm)	Specification Limit	Result
29.0	QPSK	1	41.8	No limit for Aircraft Earth	Pass
29.5	QPSK	1	36.9	No limit for Aircraft Earth	Pass
30.0	QPSK	1	36.2	No limit for Aircraft Earth	Pass
29.0	BPSK	1	41.7	No limit for Aircraft Earth	Pass
29.5	BPSK	1	36.9	No limit for Aircraft Earth	Pass
30.0	BPSK	1	36.1	No limit for Aircraft Earth	Pass
29.0	8PSK	1	41.6	No limit for Aircraft Earth	Pass
29.5	8PSK	1	36.5	No limit for Aircraft Earth	Pass
30.0	8PSK	1	35.7	No limit for Aircraft Earth	Pass
29.0	QPSK	5	41.9	No limit for Aircraft Earth	Pass
29.5	QPSK	5	38.3	No limit for Aircraft Earth	Pass
30.0	QPSK	5	36.5	No limit for Aircraft Earth	Pass
29.0	BPSK	5	41.7	No limit for Aircraft Earth	Pass
29.5	BPSK	5	38.4	No limit for Aircraft Earth	Pass
30.0	BPSK	5	36.6	No limit for Aircraft Earth	Pass
29.0	8PSK	5	41.7	No limit for Aircraft Earth	Pass
29.5	8PSK	5	38.1	No limit for Aircraft Earth	Pass
30.0	8PSK	5	36.3	No limit for Aircraft Earth	Pass

Conducted Emissions Limitations (Mask)

Engineer: Greg Corbin

Test Date: 5/16/2017

Test Procedure

The EUT was connected directly to a spectrum analyzer using the waveguide coupling port that was connected to the EUT output.

The output cable and coupler insertion loss were input to the spectrum analyzer before recording spurious emission data.

Since the EUT output is WR 28 waveguide, the conducted emission limitations measurements were limited to the masks within the passband.

A spurious search was performed from 20 – 50 GHz. No signals were found and the spectrum analyzer noise floor was greater than 20 dB below the -13 dBm limit.

All other emission limitations were measured radiated, in an anechoic chamber with the transmitter connected to the FMA antenna and into a termination.

Test Setup



Refer to Annex A for Conducted Emission Mask test data

Radiated Spurious Emissions

Engineer: Greg Corbin

Test Date: 6/1/2017

Test Procedure

Since the EUT output is WR 28 waveguide, the conducted emission limitations measurements were limited to the masks within the passband.

All other emission limitations were measured radiated, in an anechoic chamber with the transmitter connected to the FMA antenna and into a termination.

Measurements were performed from 30 MHz to 150 GHz.

Harmonic mixers were utilized above 40 GHz.

The spurious emissions measurements were performed using all 3 modulations (QPSK, BPSK, 8PSK) at 1 Msymbol data rate. Measurements were also performed at 29.5 GHz at all 3 modulations and a 5 Msymbol data rate.

All measurements are field strength measured at the distance shown in the following tables.

Field Strength (calculated) = Measured Data + BW Corr Factor + Rcv Mixer Corr Factor + Rcv Ant Corr Factor + Distance Corr Factor - Ext Amp Gain

Convert field strength (dBuV/m) to EIRP (dBm).

$EIRP(dBm) = dBuV/m + 20\log D - 104.77$

Compared the result to -13 dBm conducted limit.

BW Correction Factor = $10 \cdot \log(B1/B2)$

Antenna Gain to Antenna Factor, $ACF(dB) = 20 \cdot \log(freq, MHz) - Antenna\ gain\ (dBi) - 29.79$

Distance Correction Factor, $DCF\ (dB) = 20 \cdot \log(D1/D2)$

For the Horn antennas used with the external mixers above 40 GHz, the data supplied from mfr is transmit gain data. The TX gain was converted to Antenna factor data.

For measurements above 50 GHz, it was necessary to move the RX antenna in closer than 1 meter and apply a distance correction factor in order to get the spectrum analyzer noise floor below the limit

Radiated spurious measurements were recorded for low, middle, high frequencies, QPSK, BPSK, 8PSK modulations and 1 Msymbol data rate.

Radiated spurious measurements were also recorded at 29.5 GHz at a 5 Msymbol data rate for all 3 modulations.

For 1 - 18 GHz, Horn Antenna asset i00271 ACF was measured at 3 meter, test was performed at 1m, used distance correction factor of -9.54 dB to compensate for the difference.

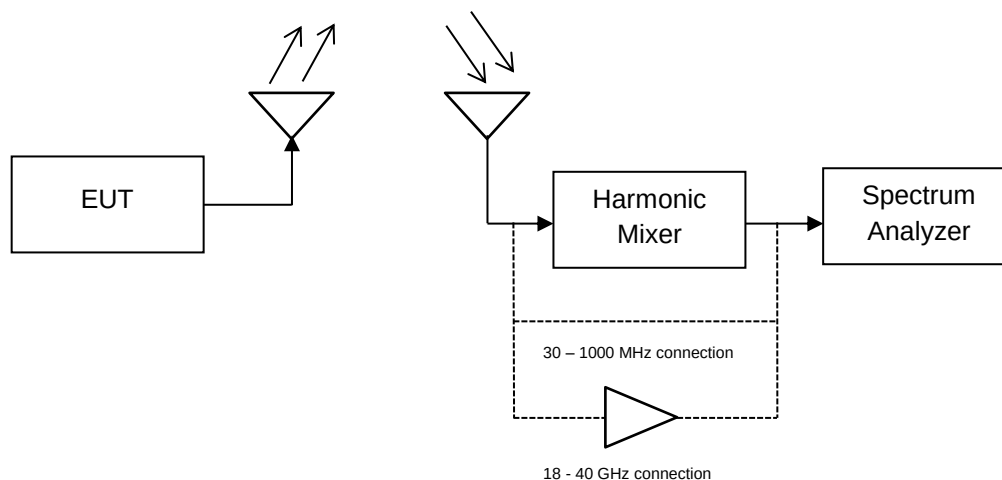
Freq at 1.92 and 9.131 GHz are ambient signals, not part of EUT leaking into the chamber on the manufacturer control cable harness.

Notes for 30 - 1000 MHz

For 30 - 1000 MHz, all correction factors were input to the spectrum analyzer before recording data.

From 30 - 120 MHz, ambient signals were getting into the chamber due to the control cables not being shielded, the ambients were recorded with the system off, system on carrier muted and system on carrier on with the system tuned to 29.5 GHz, there was no change in the ambient signal levels and no other signals were observed with the carrier on.

All peak signals including the ambients were below the limit.



Radiated Spurious Emissions Test Data

Tuned Frequency = 29.0 GHz, QPSK at 1 Msymbol
Transmitter on, output connected to 50 ohm termination

Frequency Range	Raw Data		Measurement Distance		Distance Corr Factor	RBW	BW Corr Factor	Exlt. Amp Gain	RX Mixer Corr Factor	RX Ant Corr Factor	Field Strength Calculated	Convert Field Strength to EIRP	Limit	Margin
	Freq	Level	Required	Used										
GHz	GHz	dBuV/m	meter	meter	dB	kHz	dB	dB	dB	dB	dBuV/m	dBm	dBm	dB
0.03 -1	0.0349	42.30	3	3	0.00	120	0	0	0.00	0.00	42.30	-62.47	-13	-49.47
1 - 18	16.64	45.20	1	1	-9.54	1000	0	0	0.00	39.60	75.26	-29.51	-13	-16.51
18 - 40	37.678	57.10	1	1	0.00	1000	0	35.7	0.00	45.30	66.70	-38.07	-13	-25.07
40 - 50	44.717	5.30	1	1	0.00	100	10	0	22.90	39.92	78.12	-26.65	-13	-13.65
50 - 75	73.662	6.30	1	0.5	-6.02	100	10	0	36.30	44.35	90.93	-13.84	-13	-0.84
75 - 110	99.917	5.30	1	0.1	-20.00	100	10	0	42.50	47.10	84.90	-19.87	-13	-6.87
110 - 150	112.281	-4.89	1	0.1	-20.00	30	15.2	0	51.60	48.92	90.85	-13.92	-13	-0.92

Tuned Frequency = 29.0 GHz, BPSK at 1 Msymbol
Transmitter on, output connected to 50 ohm termination

Frequency Range	Raw Data		Measurement Distance		Distance Corr Factor	RBW	BW Corr Factor	Exlt. Amp Gain	RX Mixer Corr Factor	RX Ant Corr Factor	Field Strength Calculated	Convert Field Strength to EIRP	Limit	Margin
	Freq	Level	Required	Used										
GHz	GHz	dBuV/m	meter	meter	dB	kHz	dB	dB	dB	dB	dBuV/m	dBm	dBm	dB
0.03 -1	0.1044	41.80	3	3	0.00	120	0	0	0.00	0.00	41.80	-62.97	-13	-49.97
1 - 18	17.915	46.20	1	1	-9.54	1000	0	0	0.00	42.80	79.46	-25.31	-13	-12.31
18 - 40	37.326	57.20	1	1	0.00	1000	0	36.2	0.00	45.30	66.30	-38.47	-13	-25.47
40 - 50	40.6	5.10	1	1	0.00	100	10	0	23.60	39.08	77.78	-26.99	-13	-13.99
50 - 75	61.418	4.90	1	0.5	-6.02	100	10	0	34.20	42.78	85.86	-18.91	-13	-5.91
75 - 110	106.568	6.20	1	0.1	-20.00	100	10	0	43.40	47.66	87.26	-17.51	-13	-4.51
110 - 150	112.301	-5.21	1	0.1	-20.00	30	15.2	0	51.50	48.92	90.44	-14.33	-13	-1.33

Tuned Frequency = 29.0 GHz, 8PSK at 1 Msymbol
Transmitter on, output connected to 50 ohm termination

Frequency Range	Raw Data		Measurement Distance		Distance Corr Factor	RBW	BW Corr Factor	Exlt. Amp Gain	RX Mixer Corr Factor	RX Ant Corr Factor	Field Strength Calculated	Convert Field Strength to EIRP	Limit	Margin
	Freq	Level	Required	Used										
GHz	GHz	dBuV/m	meter	meter	dB	kHz	dB	dB	dB	dB	dBuV/m	dBm	dBm	dB
0.03 -1	0.0332	41.80	3	3	0.00	120	0	0	0.00	0.00	41.80	-62.97	-13	-49.97
1 - 18	17.443	45.30	1	1	-9.54	1000	0	0	0.00	43.00	78.76	-26.01	-13	-13.01
18 - 40	37.304	58.10	1	1	0.00	1000	0	36.2	0.00	45.30	67.20	-37.57	-13	-24.57
40 - 50	44.15	4.40	1	1	0.00	100	10	0	23.40	39.81	77.61	-27.16	-13	-14.16
50 - 75	70.56	5.50	1	0.5	-6.02	100	10	0	34.60	43.98	88.06	-16.71	-13	-3.71
75 - 110	93.332	5.40	1	0.1	-20.00	100	10	0	42.30	46.51	84.21	-20.56	-13	-7.56
110 - 150	112.241	-4.90	1	0.1	-20.00	30	15.2	0	51.50	48.91	90.74	-14.03	-13	-1.03

Tuned Frequency = 29.5 GHz, QPSK at 1 Msymbol
Transmitter on, output connected to 50 ohm termination

Frequency Range	Raw Data		Measurement Distance		Distance Corr Factor	RBW	BW Corr Factor	Exlt. Amp Gain	RX Mixer Corr Factor	RX Ant Corr Factor	Field Strength Calculated	Convert Field Strength to EIRP	Limit	Margin
	Freq	Level	Required	Used										
GHz	GHz	dBuV/m	meter	meter	dB	kHz	dB	dB	dB	dB	dBuV/m	dBm	dBm	dB
0.03 –1	0.1044	40.60	3	3	0.00	120	0	0	0.00	0.00	40.60	-64.17	-13	-51.17
1 - 18	16.838	44.00	1	1	-9.54	1000	0	0	0.00	40.80	75.26	-29.51	-13	-16.51
18 - 40	37.304	57.29	1	1	0.00	1000	0	36.1	0.00	45.30	66.49	-38.28	-13	-25.28
40 - 50	45.967	4.90	1	1	0.00	100	10	0	22.70	40.16	77.76	-27.01	-13	-14.01
50 - 75	70.998	5.40	1	0.5	-6.02	100	10	0	35.10	43.93	88.41	-16.36	-13	-3.36
75 - 110	86.451	5.30	1	0.1	-20.00	100	10	0	42.00	45.55	82.85	-21.92	-13	-8.92
110 - 150	112.301	-4.82	1	0.1	-20.00	30	15.2	0	51.60	48.92	90.93	-13.84	-13	-0.84

Tuned Frequency = 29.5 GHz, BPSK at 1 Msymbol
Transmitter on, output connected to 50 ohm termination

Frequency Range	Raw Data		Measurement Distance		Distance Corr Factor	RBW	BW Corr Factor	Exlt. Amp Gain	RX Mixer Corr Factor	RX Ant Corr Factor	Field Strength Calculated	Convert Field Strength to EIRP	Limit	Margin
	Freq	Level	Required	Used										
GHz	GHz	dBuV/m	meter	meter	dB	kHz	dB	dB	dB	dB	dBuV/m	dBm	dBm	dB
0.03 –1	0.106	40.70	3	3	0.00	120	0	0	0.00	0.00	40.70	-64.07	-13	-51.07
1 - 18	16.838	45.80	1	1	-9.54	1000	0	0	0.00	40.80	77.06	-27.71	-13	-14.71
18 - 40	37.238	57.70	1	1	0.00	1000	0	36.2	0.00	45.30	66.80	-37.97	-13	-24.97
40 - 50	41.3	5.10	1	1	0.00	100	10	0	23.30	39.23	77.63	-27.14	-13	-14.14
50 - 75	52.251	5.10	1	0.5	-6.02	100	10	0	34.50	41.27	84.85	-19.92	-13	-6.92
75 - 110	81.881	6.90	1	0.1	-20.00	100	10	0	42.60	45.07	84.57	-20.20	-13	-7.20
110 - 150	112.261	-5.02	1	0.1	-20.00	30	15.2	0	51.70	48.91	90.82	-13.95	-13	-0.95

Tuned Frequency = 29.5 GHz, 8PSK at 1 Msymbol
Transmitter on, output connected to 50 ohm termination

Frequency Range	Raw Data		Measurement Distance		Distance Corr Factor	RBW	BW Corr Factor	Exlt. Amp Gain	RX Mixer Corr Factor	RX Ant Corr Factor	Field Strength Calculated	Convert Field Strength to EIRP	Limit	Margin
	Freq	Level	Required	Used										
GHz	GHz	dBuV/m	meter	meter	dB	kHz	dB	dB	dB	dB	dBuV/m	dBm	dBm	dB
0.03 –1	0.03	41.00	3	3	0.00	120	0	0	0.00	0.00	41.00	-63.77	-13	-50.77
1 - 18	16.697	45.10	1	1	-9.54	1000	0	0	0.00	40.00	75.56	-29.21	-13	-16.21
18 - 40	37.579	57.80	1	1	0.00	1000	0	36	0.00	45.30	67.10	-37.67	-13	-24.67
40 - 50	42.583	5.10	1	1	0.00	100	10	0	22.90	39.49	77.49	-27.28	-13	-14.28
50 - 75	59.405	5.50	1	0.5	-6.02	100	10	0	34.10	42.39	85.97	-18.80	-13	-5.80
75 - 110	95.223	5.50	1	0.1	-20.00	100	10	0	42.30	46.38	84.18	-20.59	-13	-7.59
110 - 150	112.321	-4.84	1	0.1	-20.00	30	15.2	0	51.50	48.92	90.81	-13.96	-13	-0.96

Tuned Frequency = 29.5 GHz, QPSK at 5 Msymbol
Transmitter on, output connected to 50 ohm termination

Frequency Range	Raw Data		Measurement Distance		Distance Corr Factor	RBW	BW Corr Factor	Exlt. Amp Gain	RX Mixer Corr Factor	RX Ant Corr Factor	Field Strength Calculated	Convert Field Strength to EIRP	Limit	Margin
	Freq	Level	Required	Used										
GHz	GHz	dBuV/m	meter	meter	dB	kHz	dB	dB	dB	dB	dBuV/m	dBm	dBm	dB
0.03 –1	0.03	40.80	3	3	0.00	120	0	0	0.00	0.00	40.80	-63.97	-13	-50.97
1 - 18	16.187	45.50	1	1	-9.54	1000	0	0	0.00	38.70	74.66	-30.11	-13	-17.11
18 - 40	37.359	56.80	1	1	0.00	1000	0	36.2	0.00	45.30	65.90	-38.87	-13	-25.87
40 - 50	40	5.40	1	1	0.00	100	10	0	24.10	38.95	78.45	-26.32	-13	-13.32
50 - 75	63.782	5.70	1	0.5	-6.02	100	10	0	33.90	43.00	86.58	-18.19	-13	-5.19
75 - 110	101.316	5.90	1	0.1	-20.00	100	10	0	42.60	46.92	85.42	-19.35	-13	-6.35
110 - 150	112.341	-5.24	1	0.1	-20.00	30	15.2	0	51.50	48.92	90.41	-14.36	-13	-1.36

Tuned Frequency = 29.5 GHz, BPSK at 5 Msymbol
Transmitter on, output connected to 50 ohm termination

Frequency Range	Raw Data		Measurement Distance		Distance Corr Factor	RBW	BW Corr Factor	Exlt. Amp Gain	RX Mixer Corr Factor	RX Ant Corr Factor	Field Strength Calculated	Convert Field Strength to EIRP	Limit	Margin
	Freq	Level	Required	Used										
GHz	GHz	dBuV/m	meter	meter	dB	kHz	dB	dB	dB	dB	dBuV/m	dBm	dBm	dB
0.03 –1	0.0995	41.10	3	3	0.00	120	0	0	0.00	0.00	41.10	-63.67	-13	-50.67
1 - 18	17.065	44.80	1	1	-9.54	1000	0	0	0.00	41.60	76.86	-27.91	-13	-14.91
18 - 40	38.228	58.65	1	1	0.00	1000	0	35.5	0.00	45.20	68.35	-36.42	-13	-23.42
40 - 50	41.117	4.90	1	1	0.00	100	10	0	23.40	39.19	77.49	-27.28	-13	-14.28
50 - 75	59.33	5.70	1	0.5	-6.02	100	10	0	34.10	42.38	86.15	-18.62	-13	-5.62
75 - 110	76.786	5.70	1	0.1	-20.00	100	10	0	43.30	44.52	83.52	-21.25	-13	-8.25
110 - 150	112.221	-4.98	1	0.1	-20.00	30	15.2	0	51.70	48.91	90.86	-13.91	-13	-0.91

Tuned Frequency = 29.5 GHz, 8PSK at 5 Msymbol
Transmitter on, output connected to 50 ohm termination

Frequency Range	Raw Data		Measurement Distance		Distance Corr Factor	RBW	BW Corr Factor	Exlt. Amp Gain	RX Mixer Corr Factor	RX Ant Corr Factor	Field Strength Calculated	Convert Field Strength to EIRP	Limit	Margin
	Freq	Level	Required	Used										
GHz	GHz	dBuV/m	meter	meter	dB	kHz	dB	dB	dB	dB	dBuV/m	dBm	dBm	dB
0.03 –1	0.106	41.20	3	3	0.00	120	0	0	0.00	0.00	41.20	-63.57	-13	-50.57
1 - 18	15.393	46.40	1	1	-9.54	1000	0	0	0.00	38.30	75.16	-29.61	-13	-16.61
18 - 40	37.315	57.70	1	1	0.00	1000	0	36.2	0.00	45.30	66.80	-37.97	-13	-24.97
40 - 50	42.633	5.50	1	1	0.00	100	10	0	22.90	39.50	77.90	-26.87	-13	-13.87
50 - 75	72.811	5.10	1	0.5	-6.02	100	10	0	36.30	44.15	89.53	-15.24	-13	-2.24
75 - 110	87.711	5.30	1	0.1	-20.00	100	10	0	42.10	45.67	83.07	-21.70	-13	-8.70
110 - 150	112.301	-4.76	1	0.1	-20.00	30	15.2	0	51.50	48.92	90.89	-13.88	-13	-0.88

Tuned Frequency = 30.0 GHz, QPSK at 1 Msymbol
Transmitter on, output connected to 50 ohm termination

Frequency Range	Raw Data		Measurement Distance		Distance Corr Factor	RBW	BW Corr Factor	Exlt. Amp Gain	RX Mixer Corr Factor	RX Ant Corr Factor	Field Strength Calculated	Convert Field Strength to EIRP	Limit	Margin
	Freq	Level	Required	Used										
GHz	GHz	dBuV/m	meter	meter	dB	kHz	dB	dB	dB	dB	dBuV/m	dBm	dBm	dB
0.03 –1	0.1044	41.70	3	3	0.00	120	0	0	0.00	0.00	41.70	-63.07	-13	-50.07
1 - 18	16.555	45.40	1	1	-9.54	1000	0	0	0.00	39.40	75.26	-29.51	-13	-16.51
18 - 40	37.106	57.40	1	1	0.00	1000	0	36.3	0.00	45.40	66.50	-38.27	-13	-25.27
40 - 50	41.95	6.00	1	1	0.00	100	10	0	23.20	39.26	78.46	-26.31	-13	-13.31
50 - 75	70.523	5.00	1	0.5	-6.02	100	10	0	34.60	44.08	87.66	-17.11	-13	-4.11
75 - 110	77.521	5.30	1	0.1	-20.00	100	10	0	43.10	44.70	83.10	-21.67	-13	-8.67
110 - 150	112.281	-5.23	1	0.1	-20.00	30	15.2	0	51.60	48.92	90.51	-14.26	-13	-1.26

Tuned Frequency = 30.0 GHz, BPSK at 1 Msymbol
Transmitter on, output connected to 50 ohm termination

Frequency Range	Raw Data		Measurement Distance		Distance Corr Factor	RBW	BW Corr Factor	Exlt. Amp Gain	RX Mixer Corr Factor	RX Ant Corr Factor	Field Strength Calculated	Convert Field Strength to EIRP	Limit	Margin
	Freq	Level	Required	Used										
GHz	GHz	dBuV/m	meter	meter	dB	kHz	dB	dB	dB	dB	dBuV/m	dBm	dBm	dB
0.03 –1	0.03	40.10	3	3	0.00	120	0	0	0.00	0.00	40.10	-64.67	-13	-51.67
1 - 18	17.54	45.70	1	1	-9.54	1000	0	0	0.00	43.60	79.76	-25.01	-13	-12.01
18 - 40	37.304	58.30	1	1	0.00	1000	0	36.2	0.00	45.30	67.40	-37.37	-13	-24.37
40 - 50	45.283	4.80	1	1	0.00	100	10	0	22.90	39.93	77.63	-27.14	-13	-14.14
50 - 75	71.223	6.20	1	0.5	-6.02	100	10	0	35.30	44.16	89.64	-15.13	-13	-2.13
75 - 110	91.791	5.20	1	0.1	-20.00	100	10	0	42.00	46.17	83.37	-21.40	-13	-8.40
110 - 150	112.241	-4.96	1	0.1	-20.00	30	15.2	0	51.70	48.91	90.88	-13.89	-13	-0.89

Tuned Frequency = 30.0 GHz, 8PSK at 1 Msymbol
Transmitter on, output connected to 50 ohm termination

Frequency Range	Raw Data		Measurement Distance		Distance Corr Factor	RBW	BW Corr Factor	Exlt. Amp Gain	RX Mixer Corr Factor	RX Ant Corr Factor	Field Strength Calculated	Convert Field Strength to EIRP	Limit	Margin
	Freq	Level	Required	Used										
GHz	GHz	dBuV/m	meter	meter	dB	kHz	dB	dB	dB	dB	dBuV/m	dBm	dBm	dB
0.03 –1	0.0995	40.20	3	3	0.00	120	0	0	0.00	0.00	40.20	-64.57	-13	-51.57
1 - 18	16.13	32.40	1	1	-9.54	1000	0	0	0.00	38.60	61.46	-43.31	-13	-30.31
18 - 40	37.282	57.50	1	1	0.00	1000	0	36.2	0.00	45.30	66.60	-38.17	-13	-25.17
40 - 50	40.467	4.90	1	1	0.00	100	10	0	23.70	38.95	77.55	-27.22	-13	-14.22
50 - 75	53.214	5.00	1	0.5	-6.02	100	10	0	34.40	41.63	85.01	-19.76	-13	-6.76
75 - 110	109.072	5.20	1	0.1	-20.00	100	10	0	44.20	47.66	87.06	-17.71	-13	-4.71
110 - 150	112.281	-5.02	1	0.1	-20.00	30	15.2	0	51.50	48.92	90.62	-14.15	-13	-1.15

Tuned Frequency = 29.0 GHz, QPSK at 1 Msymbol
Transmitter off, output connected to FMA Antenna

Frequency Range	Raw Data		Measurement Distance		Distance Corr Factor	RBW	BW Corr Factor	Exlt. Amp Gain	RX Mixer Corr Factor	RX Ant Corr Factor	Field Strength Calculated	Convert Field Strength to EIRP	Limit	Margin
	Freq	Level	Required	Used										
GHz	GHz	dBuV/m	meter	meter	dB	kHz	dB	dB	dB	dB	dBuV/m	dBm	dBm	dB
0.03 –1	0.0332	43.70	3	3	0.00	120	0	0	0.00	0.00	43.70	-61.07	-13	-48.07
1 - 18	16.838	45.70	1	1	-9.54	1000	0	0	0.00	40.80	76.96	-27.81	-13	-14.81
18 - 40	37.524	60.20	1	1	0.00	1000	0	36.1	0.00	45.20	69.30	-35.47	-13	-22.47
40 - 50	46.673	5.80	1	1	0.00	1000	0	0	23.00	40.29	69.09	-35.68	-13	-22.68
50 - 75	58.767	4.80	1	0.5	-6.02	100	10	0	33.80	42.39	84.97	-19.80	-13	-6.80
75 - 110	99.005	5.30	1	0.1	-20.00	100	10	0	42.50	47.02	84.82	-19.95	-13	-6.95
110 - 150	112.341	-4.89	1	0.1	-20.00	30	15.2	0	51.60	48.92	90.86	-13.91	-13	-0.91

Tuned Frequency = 29.0 GHz, BPSK at 1 Msymbol
Transmitter off, output connected to FMA Antenna

Frequency Range	Raw Data		Measurement Distance		Distance Corr Factor	RBW	BW Corr Factor	Exlt. Amp Gain	RX Mixer Corr Factor	RX Ant Corr Factor	Field Strength Calculated	Convert Field Strength to EIRP	Limit	Margin
	Freq	Level	Required	Used										
GHz	GHz	dBuV/m	meter	meter	dB	kHz	dB	dB	dB	dB	dBuV/m	dBm	dBm	dB
0.03 –1	0.0995	42.20	3	3	0.00	120	0	0	0.00	0.00	42.20	-62.57	-13	-49.57
1 - 18	17.717	46.30	1	1	-9.54	1000	0	0	0.00	43.10	79.86	-24.91	-13	-11.91
18 - 40	37.568	57.90	1	1	0.00	1000	0	36.1	0.00	45.20	67.00	-37.77	-13	-24.77
40 - 50	41.3	4.80	1	1	0.00	1000	0	0	23.60	39.23	67.63	-37.14	-13	-24.14
50 - 75	56.766	6.30	1	0.5	-6.02	100	10	0	33.30	42.09	85.67	-19.10	-13	-6.10
75 - 110	88.814	4.90	1	0.1	-20.00	100	10	0	41.90	46.08	82.88	-21.89	-13	-8.89
110 - 150	112.301	-5.21	1	0.1	-20.00	30	15.2	0	51.60	48.92	90.54	-14.23	-13	-1.23

Tuned Frequency = 29.0 GHz, 8PSK at 1 Msymbol
Transmitter off, output connected to FMA Antenna

Frequency Range	Raw Data		Measurement Distance		Distance Corr Factor	RBW	BW Corr Factor	Exlt. Amp Gain	RX Mixer Corr Factor	RX Ant Corr Factor	Field Strength Calculated	Convert Field Strength to EIRP	Limit	Margin
	Freq	Level	Required	Used										
GHz	GHz	dBuV/m	meter	meter	dB	kHz	dB	dB	dB	dB	dBuV/m	dBm	dBm	dB
0.03 –1	0.0332	43.10	3	3	0.00	120	0	0	0.00	0.00	43.10	-61.67	-13	-48.67
1 - 18	15.932	45.10	1	1	-9.54	1000	0	0	0.00	38.20	73.76	-31.01	-13	-18.01
18 - 40	37.095	58.40	1	1	0.00	1000	0	36.4	0.00	45.40	67.40	-37.37	-13	-24.37
40 - 50	47.617	4.80	1	1	0.00	1000	0	0	22.20	40.47	67.47	-37.30	-13	-24.30
50 - 75	52.001	5.50	1	0.5	-6.02	100	10	0	34.50	41.33	85.31	-19.46	-13	-6.46
75 - 110	88.814	4.90	1	0.1	-20.00	100	10	0	42.00	46.08	82.98	-21.79	-13	-8.79
110 - 150	112.221	-4.90	1	0.1	-20.00	30	15.2	0	51.60	48.91	90.84	-13.93	-13	-0.93

Tuned Frequency = 29.5 GHz, QPSK at 1 Msymbol
Transmitter off, output connected to FMA Antenna

Frequency Range	Raw Data		Measurement Distance		Distance Corr Factor	RBW	BW Corr Factor	Exlt. Amp Gain	RX Mixer Corr Factor	RX Ant Corr Factor	Field Strength Calculated	Convert Field Strength to EIRP	Limit	Margin
	Freq	Level	Required	Used										
GHz	GHz	dBuV/m	meter	meter	dB	kHz	dB	dB	dB	dB	dBuV/m	dBm	dBm	dB
0.03 –1	0.1011	42.90	3	3	0.00	120	0	0	0.00	0.00	42.90	-61.87	-13	-48.87
1 - 18	15.988	46.3	1	1	-9.54	1000	0	0	0.00	38.40	75.16	-29.61	-13	-16.61
18 - 40	37.469	57.90	1	1	0.00	1000	0	36.2	0.00	45.20	66.90	-37.87	-13	-24.87
40 - 50	45.517	5.10	1	1	0.00	1000	0	0	22.80	40.07	67.97	-36.80	-13	-23.80
50 - 75	66.321	5.40	1	0.5	-6.02	100	10	0	34.20	43.34	86.92	-17.85	-13	-4.85
75 - 110	83.737	5.80	1	0.1	-20.00	100	10	0	42.40	45.27	83.47	-21.30	-13	-8.30
110 - 150	112.281	-4.82	1	0.1	-20.00	30	15.2	0	51.60	48.92	90.92	-13.85	-13	-0.85

Tuned Frequency = 29.5 GHz, BPSK at 1 Msymbol
Transmitter off, output connected to FMA Antenna

Frequency Range	Raw Data		Measurement Distance		Distance Corr Factor	RBW	BW Corr Factor	Exlt. Amp Gain	RX Mixer Corr Factor	RX Ant Corr Factor	Field Strength Calculated	Convert Field Strength to EIRP	Limit	Margin
	Freq	Level	Required	Used										
GHz	GHz	dBuV/m	meter	meter	dB	kHz	dB	dB	dB	dB	dBuV/m	dBm	dBm	dB
0.03 –1	0.1011	45.90	3	3	0.00	120	0	0	0.00	0.00	45.90	-58.87	-13	-45.87
1 - 18	16.243	45.80	1	1	-9.54	1000	0	0	0.00	38.80	75.06	-29.71	-13	-16.71
18 - 40	37.953	57.80	1	1	0.00	1000	0	35.8	0.00	45.20	67.20	-37.57	-13	-24.57
40 - 50	42.967	5.20	1	1	0.00	1000	0	0	22.80	39.57	67.57	-37.20	-13	-24.20
50 - 75	55.065	6.20	1	0.5	-6.02	100	10	0	33.70	41.73	85.61	-19.16	-13	-6.16
75 - 110	79.237	5.30	1	0.1	-20.00	100	10	0	42.90	44.79	82.99	-21.78	-13	-8.78
110 - 150	112.241	-5.02	1	0.1	-20.00	30	15.2	0	51.60	48.91	90.72	-14.05	-13	-1.05

Tuned Frequency = 29.5 GHz, 8PSK at 1 Msymbol
Transmitter off, output connected to FMA Antenna

Frequency Range	Raw Data		Measurement Distance		Distance Corr Factor	RBW	BW Corr Factor	Exlt. Amp Gain	RX Mixer Corr Factor	RX Ant Corr Factor	Field Strength Calculated	Convert Field Strength to EIRP	Limit	Margin
	Freq	Level	Required	Used										
GHz	GHz	dBuV/m	meter	meter	dB	kHz	dB	dB	dB	dB	dBuV/m	dBm	dBm	dB
0.03 –1	0.1011	46.30	3	3	0.00	120	0	0	0.00	0.00	46.30	-58.47	-13	-45.47
1 - 18	16.527	45.50	1	1	-9.54	1000	0	0	0.00	39.30	75.26	-29.51	-13	-16.51
18 - 40	37.755	59.00	1	1	0.00	1000	0	35.7	0.00	45.30	68.60	-36.17	-13	-23.17
40 - 50	43.567	4.70	1	1	0.00	1000	0	0	23.40	39.69	67.79	-36.98	-13	-23.98
50 - 75	66.421	5.10	1	0.5	-6.02	100	10	0	34.20	43.36	86.64	-18.13	-13	-5.13
75 - 110	79.237	5.30	1	0.1	-20.00	100	10	0	42.90	44.79	82.99	-21.78	-13	-8.78
110 - 150	112.321	-4.84	1	0.1	-20.00	30	15.2	0	51.60	48.92	90.91	-13.86	-13	-0.86

**Tuned Frequency = 29.5 GHz, QPSK at 5 Msymbol
 Transmitter off, output connected to FMA Antenna**

Frequency Range	Raw Data		Measurement Distance		Distance Corr Factor	RBW	BW Corr Factor	Exlt. Amp Gain	RX Mixer Corr Factor	RX Ant Corr Factor	Field Strength Calculated	Convert Field Strength to EIRP	Limit	Margin
	Freq	Level	Required	Used										
GHz	GHz	dBuV/m	meter	meter	dB	kHz	dB	dB	dB	dB	dBuV/m	dBm	dBm	dB
0.03 –1	0.1011	44.30	3	3	0.00	120	0	0	0.00	0.00	44.30	-60.47	-13	-47.47
1 - 18	16.612	46.20	1	1	-9.54	1000	0	0	0.00	39.60	76.26	-28.51	-13	-15.51
18 - 40	37.678	58.00	1	1	0.00	1000	0	35.7	0.00	45.30	67.60	-37.17	-13	-24.17
40 - 50	44.183	4.70	1	1	0.00	1000	0	0	23.60	39.82	68.12	-36.65	-13	-23.65
50 - 75	60.655	5.40	1	0.5	-6.02	100	10	0	34.40	42.57	86.35	-18.42	-13	-5.42
75 - 110	82.931	5.40	1	0.1	-20.00	100	10	0	42.70	45.18	83.28	-21.49	-13	-8.49
110 - 150	112.201	-5.25	1	0.1	-20.00	30	15.2	0	51.60	48.91	90.49	-14.28	-13	-1.28

**Tuned Frequency = 29.5 GHz, BPSK at 5 Msymbol
 Transmitter off, output connected to FMA Antenna**

Frequency Range	Raw Data		Measurement Distance		Distance Corr Factor	RBW	BW Corr Factor	Exlt. Amp Gain	RX Mixer Corr Factor	RX Ant Corr Factor	Field Strength Calculated	Convert Field Strength to EIRP	Limit	Margin
	Freq	Level	Required	Used										
GHz	GHz	dBuV/m	meter	meter	dB	kHz	dB	dB	dB	dB	dBuV/m	dBm	dBm	dB
0.03 –1	0.1011	43.80	3	3	0.00	120	0	0	0.00	0.00	43.80	-60.97	-13	-47.97
1 - 18	16.47	45.67	1	1	-9.54	1000	0	0	0.00	39.30	75.43	-29.34	-13	-16.34
18 - 40	37.733	58.10	1	1	0.00	1000	0	35.7	0.00	45.30	67.70	-37.07	-13	-24.07
40 - 50	43.967	6.00	1	1	0.00	1000	0	0	22.90	39.77	68.67	-36.10	-13	-23.10
50 - 75	55.603	5.80	1	0.5	-6.02	100	10	0	33.50	41.81	85.09	-19.68	-13	-6.68
75 - 110	92.281	5.40	1	0.1	-20.00	100	10	0	42.10	46.11	83.61	-21.16	-13	-8.16
110 - 150	112.261	-4.98	1	0.1	-20.00	30	15.2	0	51.60	48.91	90.76	-14.01	-13	-1.01

**Tuned Frequency = 29.5 GHz, 8PSK at 5 Msymbol
 Transmitter off, output connected to FMA Antenna**

Frequency Range	Raw Data		Measurement Distance		Distance Corr Factor	RBW	BW Corr Factor	Exlt. Amp Gain	RX Mixer Corr Factor	RX Ant Corr Factor	Field Strength Calculated	Convert Field Strength to EIRP	Limit	Margin
	Freq	Level	Required	Used										
GHz	GHz	dBuV/m	meter	meter	dB	kHz	dB	dB	dB	dB	dBuV/m	dBm	dBm	dB
0.03 –1	0.1011	45.10	3	3	0.00	120	0	0	0.00	0.00	45.10	-59.67	-13	-46.67
1 - 18	16.64	46.20	1	1	-9.54	1000	0	0	0.00	39.60	76.26	-28.51	-13	-15.51
18 - 40	37.458	57.90	1	1	0.00	1000	0	36.2	0.00	45.20	66.90	-37.87	-13	-24.87
40 - 50	41.2	5.20	1	1	0.00	1000	0	0	23.30	39.21	67.71	-37.06	-13	-24.06
50 - 75	52.726	4.90	1	0.5	-6.02	100	10	0	34.50	41.35	84.73	-20.04	-13	-7.04
75 - 110	92.281	5.40	1	0.1	-20.00	100	10	0	42.10	46.11	83.61	-21.16	-13	-8.16
110 - 150	112.261	-4.76	1	0.1	-20.00	30	15.2	0	51.60	48.91	90.98	-13.79	-13	-0.79

**Tuned Frequency = 30.0 GHz, QPSK at 1 Msymbol
Transmitter off, output connected to FMA Antenna**

Frequency Range	Raw Data		Measurement Distance		Distance Corr Factor	RBW	BW Corr Factor	Exlt. Amp Gain	RX Mixer Corr Factor	RX Ant Corr Factor	Field Strength Calculated	Convert Field Strength to EIRP	Limit	Margin
	Freq	Level	Required	Used										
GHz	GHz	dBuV/m	meter	meter	dB	kHz	dB	dB	dB	dB	dBuV/m	dBm	dBm	dB
0.03 –1	0.1011	45.30	3	3	0.00	120	0	0	0.00	0.00	45.30	-59.47	-13	-46.47
1 - 18	16.498	45.80	1	1	-9.54	1000	0	0	0.00	39.30	75.56	-29.21	-13	-16.21
18 - 40	37.458	57.60	1	1	0.00	1000	0	36.2	0.00	45.20	66.60	-38.17	-13	-25.17
40 - 50	46.683	5.00	1	1	0.00	1000	0	0	22.80	40.19	67.99	-36.78	-13	-23.78
50 - 75	55.678	5.60	1	0.5	-6.02	100	10	0	33.50	42.02	85.10	-19.67	-13	-6.67
75 - 110	85.663	5.50	1	0.1	-20.00	100	10	0	42.10	45.57	83.17	-21.60	-13	-8.60
110 - 150	112.241	-5.23	1	0.1	-20.00	30	15.2	0	51.60	48.91	90.51	-14.26	-13	-1.26

**Tuned Frequency = 30.0 GHz, BPSK at 1 Msymbol
Transmitter off, output connected to FMA Antenna**

Frequency Range	Raw Data		Measurement Distance		Distance Corr Factor	RBW	BW Corr Factor	Exlt. Amp Gain	RX Mixer Corr Factor	RX Ant Corr Factor	Field Strength Calculated	Convert Field Strength to EIRP	Limit	Margin
	Freq	Level	Required	Used										
GHz	GHz	dBuV/m	meter	meter	dB	kHz	dB	dB	dB	dB	dBuV/m	dBm	dBm	dB
0.03 –1	0.1011	43.00	3	3	0.00	120	0	0	0.00	0.00	43.00	-61.77	-13	-48.77
1 - 18	17.943	45.60	1	1	-9.54	1000	0	0	0.00	43.10	79.16	-25.61	-13	-12.61
18 - 40	37.315	58.40	1	1	0.00	1000	0	36.2	0.00	45.40	67.60	-37.17	-13	-24.17
40 - 50	41.367	5.70	1	1	0.00	1000	0	0	23.40	39.14	68.24	-36.53	-13	-23.53
50 - 75	52.251	5.10	1	0.5	-6.02	100	10	0	34.50	41.47	85.05	-19.72	-13	-6.72
75 - 110	90.285	5.50	1	0.1	-20.00	100	10	0	42.10	46.02	83.62	-21.15	-13	-8.15
110 - 150	112.241	-4.96	1	0.1	-20.00	30	15.2	0	51.60	48.91	90.78	-13.99	-13	-0.99

**Tuned Frequency = 30.0 GHz, 8PSK at 1 Msymbol
Transmitter off, output connected to FMA Antenna**

Frequency Range	Raw Data		Measurement Distance		Distance Corr Factor	RBW	BW Corr Factor	Exlt. Amp Gain	RX Mixer Corr Factor	RX Ant Corr Factor	Field Strength Calculated	Convert Field Strength to EIRP	Limit	Margin
	Freq	Level	Required	Used										
GHz	GHz	dBuV/m	meter	meter	dB	kHz	dB	dB	dB	dB	dBuV/m	dBm	dBm	dB
0.03 –1	0.1011	44.70	3	3	0.00	120	0	0	0.00	0.00	44.70	-60.07	-13	-47.07
1 - 18	17.773	46.00	1	1	-9.54	1000	0	0	0.00	42.70	79.16	-25.61	-13	-12.61
18 - 40	37.271	57.60	1	1	0.00	1000	0	36.2	0.00	45.50	66.90	-37.87	-13	-24.87
40 - 50	41.567	4.50	1	1	0.00	1000	0	0	23.20	39.18	66.88	-37.89	-13	-24.89
50 - 75	64.595	5.20	1	0.5	-6.02	100	10	0	33.60	43.31	86.09	-18.68	-13	-5.68
75 - 110	90.285	5.50	1	0.1	-20.00	100	10	0	42.10	46.02	83.62	-21.15	-13	-8.15
110 - 150	112.281	-5.02	1	0.1	-20.00	30	15.2	0	51.60	48.92	90.72	-14.05	-13	-1.05

Frequency Tolerance (Temperature Variation)

Test Engineer: Greg Corbin

Test Date: 6/16/2017

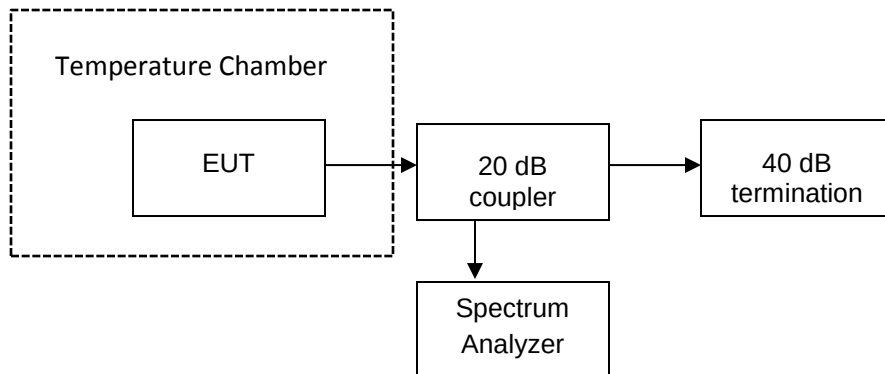
Limit: 0.001%

Test Procedure

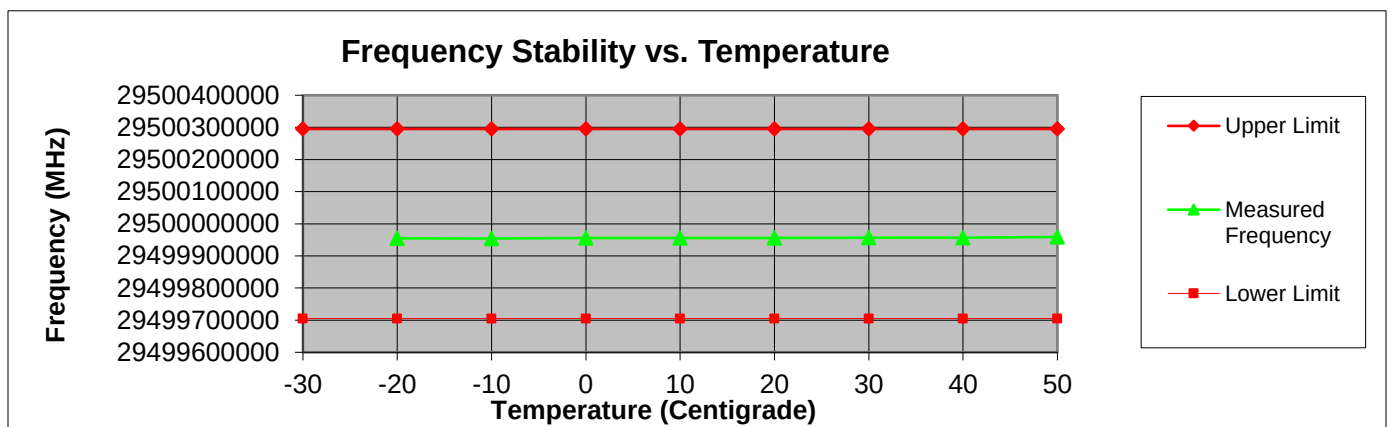
The EUT was placed in an environmental test chamber and the temperature was raised from -20°C to 50°C in 10°C increments.

The EUT receives its DC power from the MODMAN. The MODMAN receives AC power from an AC power supply. The 50 MHz reference signal for the EUT also comes from the MODMAN. The MODMAN was located inside the chamber for the temperature test.

The EUT RF output was connected to the spectrum analyzer via a 20 dB coupler. At each 10°C increment the frequency was measured.



Test Plot



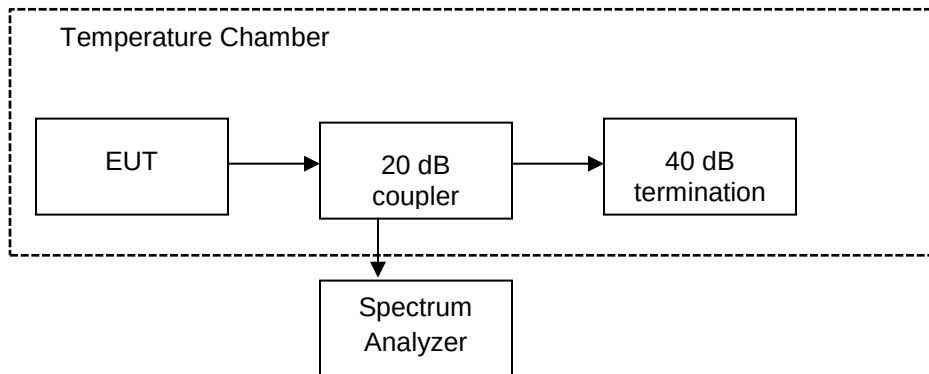
Frequency Tolerance (Voltage Variation)

Engineer: Greg Corbin

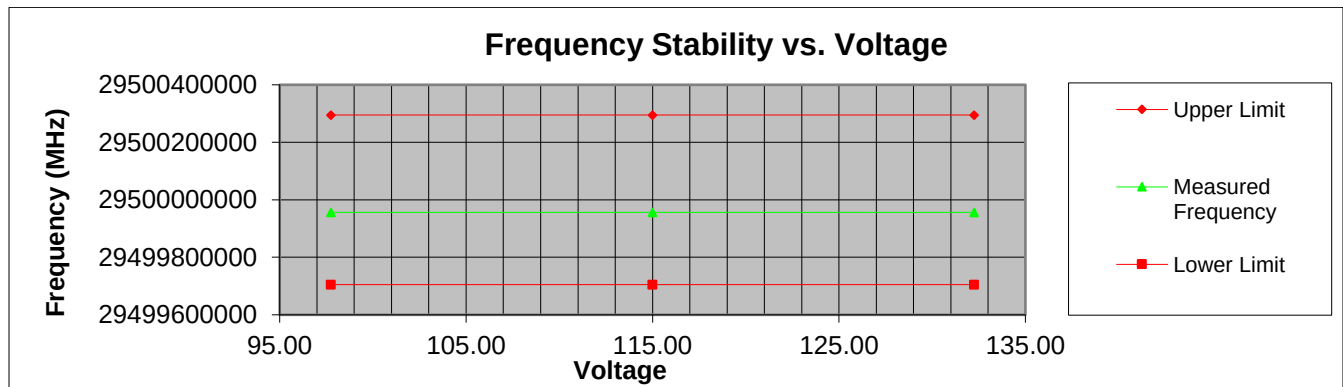
Test Date: 6/16/2017

Test Procedure

The EUT receives its DC power from the MODMAN. The MODMAN receives AC power from an AC power supply. The voltage was varied at the MODMAN input. The 50 MHz reference signal for the EUT comes from the MODMAN. The MODMAN was located inside the chamber for the temperature test. The EUT RF output was connected to the spectrum analyzer via a 20 dB coupler. At 20°C, the EUT output frequency was measured at the nominal voltage and at the $\pm 15\%$ voltage levels for the EUT.



Test Plot





Necessary Bandwidth Calculations (Occupied Bandwidth)

Engineer: Greg Corbin

Test Date: 6/16/2017

The table below contains the necessary bandwidth calculations for the EUT.
The necessary bandwidth calculations were provided by the manufacturer.

Data Rate (kbps)	Symbol Rate (ksym/s)	Modulation Type	Signal States (S)	Performance Factor (K)	Necessary Bandwidth (kHz)	FCC Designator
47000	5875	8PSK	8	0.25	7833	7M83G7W
20000	5000	QPSK	4	0.25	5000	5M00G1W
936	468	BPSK	2	0.25	468	468kG7W

Test Equipment Utilized

Description	MFG	Model Number	CT Asset Number	Last Cal Date	Cal Due Date
Horn Antenna	EMCO	3116	i00085	2/6/17	2/6/19
Horn Antenna, Amplified	ARA	DRG-118/A	i00271	6/16/2016	6/16/2018
Humidity / Temp Meter	Newport	IBTHX-W-5	i00282	6/9/17	6/9/18
Bi-Log Antenna	Schaffner	CBL 6111D	i00349	8/3/2016	8/3/2018
EMI Analyzer	Agilent	E7405A	i00379	2/22/17	2/22/18
Harmonic Mixer	HP	11970V	00463	6/04/15	6/04/17
Harmonic Mixer	HP	11970W	00464	6/20/15	6/20/17
Harmonic Mixer	HP	11970Q	00465	6/04/15	6/04/17
Horn Antenna, standard gain	CMI	H06R	00475	NR	NR
Horn Antenna, standard gain	CMI	H010R	00476	NR	NR
Horn Antenna, standard gain	CMI	H015R	00477	NR	NR
Harmonic Mixer	OML	M06HWD	00480	7/27/15	7/27/17
Horn Antenna, standard gain	CMI	H022R	00484	NR	NR
Spectrum Analyzer	Agilent	E4448A (rental)	S/N:US42070207	8/15/16	8/5/18
AC Power Supply	California Instruments	801RP	05438 (Honeywell asset)	3/8/2017	3/8/2018

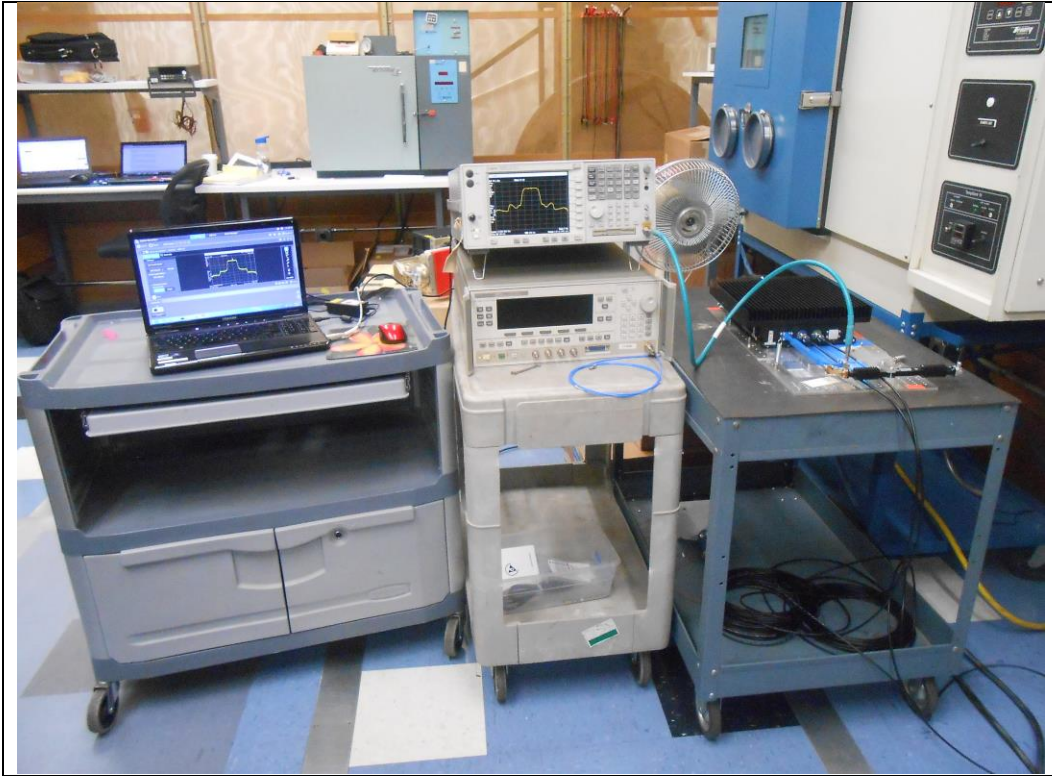
In addition to the above listed equipment standard RF connectors and cables were utilized in the testing of the described equipment. Prior to testing these components were tested to verify proper operation.

END OF TEST REPORT



Test Setup Photos
FCC ID: K6KJETWAVE2

RF Conducted #1



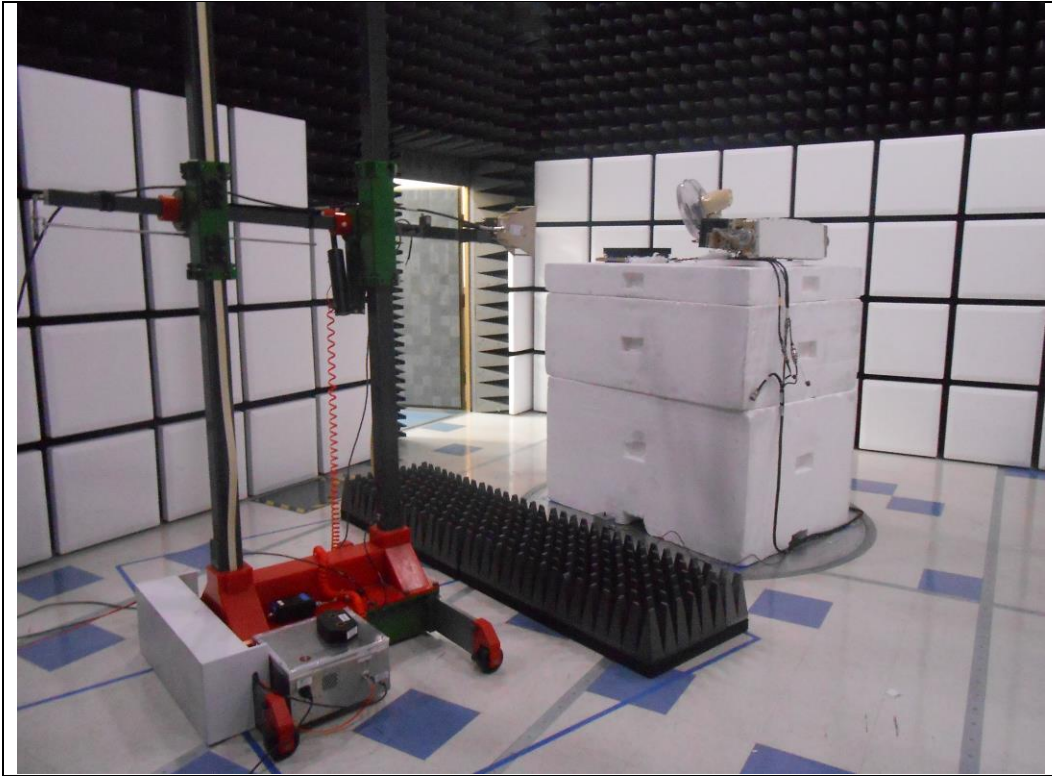
RF Conducted Temp Test #2





Test Setup Photos
FCC ID: K6KJETWAVE2

RF Radiated #1



RF Radiated #2





Test Setup Photos
FCC ID: K6KJETWAVE2

RF Radiated #3



RF Radiated #4

