FCC Part 90
For Compliance Testing internal use only **Please keep this page with the report in our internal files**

NOTES

1) **ITEMS IN RED THROUGOUT THE REPORT ARE ITEMS THAT NEED TO BE ADDRESSED BY THE ENG AT THE TIME OF COMPLETION.**

Template Revision History

Revision	Date	Revised By	Authorized by: QM<initials>, Date	Reason for Revision
1.0		SMS		Retype into MS2010 and inserted GM links
2.0	3/9/12	AR		Correct GM links, fix grammar errors throughout document, add missing tests to Test Summary Table
3.0	8/1/13	AR		Corrected Measurement Procedure for Carrier Output Power, typographical errors,
4.0	12/19/13	MSE		Added section for test setup photos, changed address for new building, changed FCC & IC site registration #
5.0	7/22/14	MSE		Added column to Template Revision History for QM's initials. Added Goldmine fields for serial number and FCC ID. Added directory path of template to the footer.
6.0	5/22	AR		Corrected typographical errors throughout report
7.0	5/1/18	SC		Added 750 form reminder.
8.0	9/7/18	AReed		Corrected GM fields & general formatting

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: Fortem Technologies

Model: R20, R20 DAN-C

Description: Navigation Radar

Serial Number: R20s-C00325

FCC ID: 2APIM-FTR20SKYD

To

FCC Part 90

Date of Issue: October 11, 2019

On the behalf of the applicant:	**Fortem Technologies** **2015 West Grove Pkwy** **Pleasant Grove, UT 8406284062**
Attention of:	**Jeff Davis, Compliance Officer** **Ph: (801)822-8043** **E-Mail: jeffery.davis@fortemtech.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: p19a0001

Greg Corbin
Project Test Engineer

Test Report Revision History

Revision	Date	Revised By	Reason for Revision
1.0	October 11, 2019	Greg Corbin	Original Document
2.0	October 25, 2019	Greg Corbin	Added 2nd model to report on page 1 and 6.
3.0	October 29, 2019	Greg Corbin	Corrected heading on page 9 Revised output power table on page 9 Revised formulas on page 10 Revised radiated spurious tables on pages 11 - 13

Table of Contents

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 to the 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 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

The Applicant has been cautioned as to the following:

15.21: **Information to the User**

The user's manual or instruction manual for an intentional radiator shall caution the user that changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

15.27(a): **Special Accessories**

Equipment marketed to a consumer must be capable of complying with the necessary regulations in the configuration in which the equipment is marketed. Where special accessories, such as shielded cables and/or special connectors are required to enable an unintentional or intentional radiator to comply with the emission limits in this part, the equipment must be marketed with, i.e. shipped and sold with, those special accessories. However, in lieu of shipping or packaging the special accessories with the unintentional or intentional radiator, the responsible party may employ other methods of ensuring that the special accessories are provided to the consumer, without an additional charge.

Information detailing any alternative method used to supply the special accessories for a grant of equipment authorization or retained in the verification records, as appropriate. The party responsible for the equipment, as detailed in § 2.909 of this chapter, shall ensure that these special accessories are provided with the equipment. The instruction manual for such devices shall include appropriate instructions on the first page of text concerned with the installation of the device that these special accessories must be used with the device. It is the responsibility of the user to use the needed special accessories supplied with the equipment.

Test and Measurement Data

All tests and measurement data shown were performed in accordance with FCC Rules and Regulations, Volume II, Part 2, Subpart J, Sections 2.947, 2.1033(c), 2.1041, 2.1046, 2.1047, 2.1049, 2.1051, 2.1053, 2.1055, 2.1057, and the following individual Parts: FCC Part 90.

Standard Test Conditions and Engineering Practices

Except as noted herein, the following conditions and procedures were observed during the testing.

In accordance with ANSI/TIA 603C, and unless otherwise indicated in the specific measurement results, the ambient temperature of the actual EUT was maintained within the range of 10° to 40°C (50° to 104°F) unless the particular equipment requirements specified testing over a different temperature range. Also, unless otherwise indicated, the humidity levels were in the range of 10% to 90% relative humidity.

Environmental Conditions		
Temp (ºC)	**Humidity (%)**	**Pressure (mbar)**
24.9 – 26.4	33.6 – 37.7	962.5 – 970.4

Measurement results, unless otherwise noted, are worst-case measurements.

EUT Description
Model: R20, R20 DAN-C
Description: Navigation Radar
Firmware: N/A
Software: 2.6.2_1909231216_Radar_2.6.2
Serial Number: R20s-C00325
Additional Information:
The R20 True View Radar is a navigational radiolocation radar operating from 16.2 – 16.5 GHz at 45 dBm nominal output power.
The input voltage operating range is 18 – 36 vdc.
Power was supplied by a DIN mount power supply provided by the manufacturer.
The input to the power supply was 120 vac. The output voltage was 24 vdc.
The EUT uses FMCW modulation.
The EUT was previously certified for Part 87 from 15.4 – 15.7 GHz.
This test report is to support a C2PC to add Part 90 to the existing FCC ID: 2APIM-FTR20SKYD.
The Internal antenna gain is 12 dBi.

There are 2 variances of the navigational radar. The R20 (Which is the model that was used for certification tests and the R20 DAN-C. THe manufacturer has stated, “The difference between the two products is very much just a minor software regarding difference regarding the UI. This UI difference does not affect the actual RF operation at all.”

EUT Operation during Tests
The EUT is integrated with the antenna and there is no option for a conducted port.
All tests were performed radiated in a 3m anechoic chamber.
The manufacturer was present during the test and controlled the EUT via an Ethernet connection connected to a laptop for setting the frequency and output power.
For the previous Part 87 certification, KDB 192438 provided guidance from the FCC on measuring FMCW and referred to KDB 890966 to use for the purpose the calculating the average value of the peak measurement.
For testing purposes the sweeping function is stopped and device is put on Low, Mid and High channels.
Peak measurements of the signal were recorded and the average value was calculated for FMCW based on procedures on KDB 890966.

Accessories:

Qty	Description	Manufacturer	Model	S/N
1	AC to DC Power Supply	Traco Power	TIB 480-124	N/A

Cables:

Qty	Description	Length (M)	Shielding Y/N	Shielded Hood Y/N	Termination
1	Ethernet, shielded	7	Y	N	None

Modifications: None

Test Result Summary

Specification	Test Name	Pass, Fail, N/A	Comments
2.1046	Carrier Output Power (conducted)	Pass	Conducted power was calculated from the EIRP measurement
2.1051	Unwanted Emissions (Transmitter Conducted)	N/A	No conducted port
2.1053	Field Strength of Spurious Radiation	Pass	
90.210 (n) 2.1049	Emission Masks (Occupied Bandwidth)	Pass	
2.1047	Audio Low Pass Filter (Voice Input)	N/A	No audio port
2.1047	Audio Frequency Response	N/A	No audio port
2.1047(a)	Modulation Limiting	N/A	No audio port
90.213	Frequency Stability (Temperature Variation)	Pass	
90.213	Frequency Stability (Voltage Variation)	Pass	
2.202	Necessary Bandwidth Calculation	Pass	

Carrier Output Power (Radiated)
Engineer: Greg Corbin
Test Date: 10/8/19

Measurement Procedure

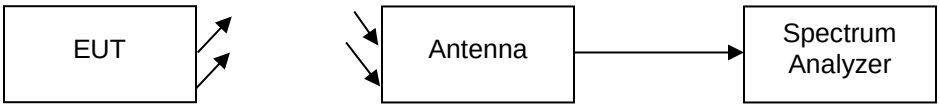
The EUT was placed in an anechoic chamber at a height of 1.5meters.
The EUT was placed in CW mode and the peak power was recorded. For the fundamental signal, the power was measured at 3 meters.
The emissions were recorded without any correction factors in the measuring receiver.
All correction factors were added to the measurement in the table below.

Measured E (corrected, dBuV/m) = Measured power (uncorrected, dBuV) + cable loss (dB)+antenna correction factor (dB)
EIRP (dBm) = Measured E (corrected, dBuV/m) +20 LOG (distance) – 104.77

E= Electric field (dBuV/m)
d=3 meter
$W=10^{((dBm-30)/10)}$

The RBW was set to 100 kHz below 1 GHz and 1 MHz above 1 GHz. The VBW was set to 3 x RBW.

Test Setup



Tuned Frequency	Measured level Uncorrected	Cable Loss	Antenna Correction Factor	Measured level corrected	Measured Power EIRP		Limit (Note 1 – 4)	Result
(MHz)	(dBuV)	(dB)	(dB)	(dBuV/m)	(dBm)	(W)	(W)	
16200	87.56	13.2	39.5	140.26	45.032	31.860	37.946	Pass
16350	85.20	13.4	39.5	138.10	42.872	19.375	37.946	Pass
16500	85.52	13.9	39.5	138.92	43.692	23.401	37.946	Pass

Notes:

1. Per FCC section 90.205 (S) The output power shall not exceed by more than 20 percent either the output power shown in the Radio Equipment List [available in accordance with §90.203(a)(1)] for transmitters included in this list or when not so listed, the manufacturer's rated output power for the particular transmitter specifically listed on the authorization.
2. MFR rated power is 45 dBm EIRP or 31.622 watts
3. 20% of 31.622 = 6.324 w
4. Limit = 31.622 + 6.324 = 37.946 w

Field Strength of Spurious Radiation

Engineer: Greg Corbin

Test Date: 10/8/2019

Measurement Procedure

The EUT was placed in an anechoic chamber for measuring radiated spurious emissions.
From 30 MHz – 18 GHz the radiated spurious was measured at a 3 meter distance
Above 18 GHz the radiated spurious was measured at 1 meter distance.
The RBW was set to 100 kHz below 1 GHz and 1 MHz above 1 GHz. The VBW was set to 3 x RBW.
The frequency range from 30 MHz to the 5th harmonic was investigated.

All correction factors were added to the raw data recorded in the table below
Formulas used:

E (dBuV/m) = Measured value (dBuV) + cable loss (dB) + HPF loss(dB) – amplifier gain(dB)+ receive mixer correction factor +receive antenna correction factor (dB)
EIRP (dBm) = E (dBuV/m) + 20*LOG (distance) – 104.77

dBm to watts conversion: $W=10^{((dBm-30)/10)}$
watts to dBm conversion: dBm=10*LOG (watts)+30

Average Factor is calculated as below:
The manufacturer provided the following information:

- RF cycle time = 250000 ns
- Rise time = 229260 ns
- Idle time (top) = 279 ns
- Fall time = 15000 ns
- Idle time (bottom) = 5461 ns

The transmitter is on during the rise time and idle time (top).
The transmitter is off during the fall time and idle time (bottom).
The mfr declared BW -= 150 MHz
On Time (sec) = 0.000229260 + 0.000000279= 0.000229539
Off Time (sec) = 0.000015000 + 0.0000005461 = 0.0000155461

Per KDB 890966 D01, the Average Factor is calculated using the following formulas:

Average factor = (T_D) / cycle time
Dwell Time (T_D) = TS/ΔF

TS is the signal sweep frequency time in seconds
ΔF is the signal sweep frequency span in MHz
cycle time is the total time for a complete cycle of the signal including retrace and any other latency times.

T_D= 0.000229539/150 = 0.00000153026
Average Factor = 0.00000153026/0.000250 = 006121040 = 0.006

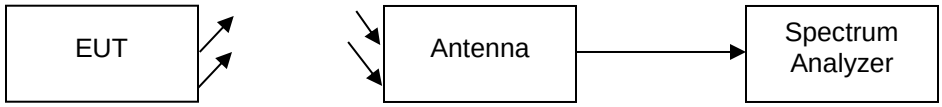
Distance correction factor = 20*LOG(D1/D2)

The duty cycle correction factor (Average Factor) was calculated per KDB and added to the radiated spurious measurement after all the correction factors have been applied.

Peak measurements of the signal were recorded and the average value was calculated for FMCW based on procedures on KDB 890966.

For frequency ranges which utilize external mixers, 1 plot was recorded with the signal ident function in the spectrum analyzer turned on and 2 plots with the signal ident function turned off, 1 with RBW set to 30 or 100 kHz to clearly identify the wanted signal and the final measurement with the RBW set to 1 MHz.

Test Setup



Radiated Spurious Emissions _Tuned Frequency = 16.2 GHz

Frequency Range	Measured Frequency	Measured Level	Distance	Cable Loss	Highpass Filter loss	External Amplifier Gain	Receive Mixer Correction Factor	Receive Antenna Correction Factor
(GHz)	(GHz)	(dBuV)	(meter)	(dB)	(dB)	(dB)	(dB)	(dB)
0.030 - 1	93.1	61	3	0.94	0	27	0	13.90
1 - 18	17.504	42.16	3	14.1	4.7	39.51	0	42.30
18 – 26.5	25.969	46.81	1	6.6	0	36.9	0	46
26.5 - 40	32.4	19.73	1	1	0.6	0	22.2	48.2
40 - 50	48.6	17.90	1	1	0	0	22.6	40.5
50 - 75	54.562	14.00	1	1	0	0	34.1	42.2
75 - 85	84.85	14.38	0.2	1	0	0	40.40	45.8

Frequency Range	Peak Measured Level Corrected	EIRP		Average Factor	Average Measured Level EIRP		Limit	Margin
(MHz)	(dBuV/m)	(dBm)	watt	N/A	(watts)	(dBm)	(dBm)	(dB)
0.030 - 1	48.84	-46.39	0.0000000230	0.0061	1.40143E-10	-68.5343	-13	-55.53
1 - 18	73.29	- 31.48	0.0000007116	0.0061	4.34083E-09	-53.6243	-13	-40.62
18 – 26.5	62.51	-42.26	0.0000000594	0.0061	3.62518E-10	-64.4067	-13	-51.41
26.5 - 40	91.73	-13.04	0.0000496592	0.0061	3.02921E-07	-35.1867	-13	-22.19
40 - 50	82.00	-22.77	0.0000052845	0.0061	3.22352E-08	-44.9167	-13	-31.92
50 - 75	91.30	-13.47	0.0000449780	0.0061	2.74366E-07	-35.6167	-13	-22.62
75 - 85	87.60	-31.15	0.0000007676	0.0061	4.68E-09	-53.30	-13	-40.30

Radiated Spurious Emissions _Tuned Frequency = 16.35 GHz

Frequency Range	Measured Frequency	Measured Level	Measurement Distance used	Distance Correction Factor	Cable Loss	Highpass Filter loss	External Amplifier Gain	Receive Mixer Correction Factor
(GHz)	(GHz)	(dBuV)	(meter)	(dB)	(dB)	(dB)	(dB)	(dB)
0.030 - 1	0.0931	62.70	3	0.00	0.94	0	27	0.00
1 - 18	16.867	36.60	3	9.54	13.9	17.1	43.7	0.00
18 – 26.5	26.054	46.98	1	0.00	6.6	0	36.9	0.00
26.5 - 40	32.7	20.00	1	0.00	1	0.6	0	23.00
40 - 50	49.05	19.50	1	0.00	1	0	0	22.20
50 - 75	51	14.26	1	0.00	1	0	0	34.80
75 - 85	82.57	13.67	0.2	-13.98	1	0	0	40.50

Frequency Range	Receive Antenna Correction Factor	Peak Measured Level Corrected	EIRP		Average Factor	Average Measured Level EIRP		Limit	Margin
(MHz)	(dB)	(dBuV/m)	(dBm)	watt	N/A	(watts)	(dBm)	(dBm)	(dB)
0.030 - 1	13.90	50.54	-44.69	0.0000000340	0.0061	2.07287E-10	-66.8343	-13	-53.83
1 - 18	41.90	75.34	-29.43	0.0000011409	0.0061	6.95941E-09	-51.5743	-13	-38.57
18 – 26.5	46.00	62.68	-42.09	0.0000000618	0.0061	3.7699E-10	-64.2367	-13	-51.24
26.5 - 40	48.70	93.30	-11.47	0.0000712853	0.0061	4.3484E-07	-33.6167	-13	-20.62
40 - 50	40.60	83.30	-21.47	0.0000071285	0.0061	4.3484E-08	-43.6167	-13	-30.62
50 - 75	41.90	91.96	-12.81	0.0000523600	0.0061	3.19396E-07	-34.9567	-13	-21.96
75 - 85	45.70	86.89	-31.86	0.0000006518	0.0061	3.98E-09	-54.01	-13	-41.01

Radiated Spurious Emissions _Tuned Frequency = 16.50 GHz

Frequency Range	Measured Frequency	Measured Level	Measurement Distance used	Distance Correction Factor	Cable Loss	Highpass Filter loss	External Amplifier Gain	Receive Mixer Correction Factor
(GHz)	(GHz)	(dBuV)	(meter)	(dB)	(dB)	(dB)	(dB)	(dB)
0.030 - 1	93.1	63.00	3	0.00	0.94	0	27	0.00
1 - 18	16.51	42.49	1	9.54	13.6	16.92	42	0.00
18 – 26.5	25.374	45.62	1	0.00	6.6	0	36.9	0.00
26.5 - 40	33	14.30	1	0.00	1	0.5	0	22.80
40 - 50	49.5	16.80	1	0.00	1	0	0	22.40
50 - 75	54.81	14.90	1	0.00	1	0	0	33.90
75 - 85	77.2	14.30	0.2	-13.98	1	0	0	40.60

Frequency Range	Receive Antenna Correction Factor	Peak Measured Level Corrected	EIRP		Average Factor	Average Measured Level EIRP		Limit	Margin
(MHz)	(dB)	(dBuV/m)	(dBm)	watt	N/A	(watts)	(dBm)	(dBm)	(dB)
0.030 - 1	13.90	50.84	-44.39	0.0000000364	0.0061	2.22112E-10	-66.5343	-13	-53.53
1 - 18	40.20	80.75	-24.02	0.0000039650	0.0061	2.41865E-08	-46.1643	-13	-33.16
18 – 26.5	46.00	61.32	-43.45	0.0000000452	0.0061	2.75632E-10	-65.5967	-13	-52.60
26.5 - 40	48.90	87.50	-17.27	0.0000187499	0.0061	1.14375E-07	-39.4167	-13	-26.42
40 - 50	40.70	80.90	-23.87	0.0000041020	0.0061	2.50225E-08	-46.0167	-13	-33.02
50 - 75	42.20	92.00	-12.77	0.0000528445	0.0061	3.22352E-07	-34.9167	-13	-21.92
75 - 85	45.40	87.32	-31.43	0.0000007196	0.0061	4.39E-09	-53.58	-13.00	-40.58

Refer to Annex A for Radiated Emission plots.

Emission Masks (Occupied Bandwidth)

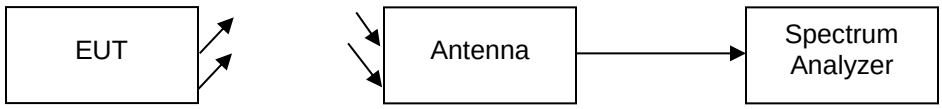
Engineer: Greg Corbin

Test Date: 10/9/19

Measurement Procedure

The EUT was placed in a 3m anechoic chamber for measuring the emission mask.
The spectrum analyzer reference level was set to the unmodulated output power.
The EUT was put into FMCW mode and the emissions were plotted against the emission mask B per FCC section 90.210(n).

Test Setup



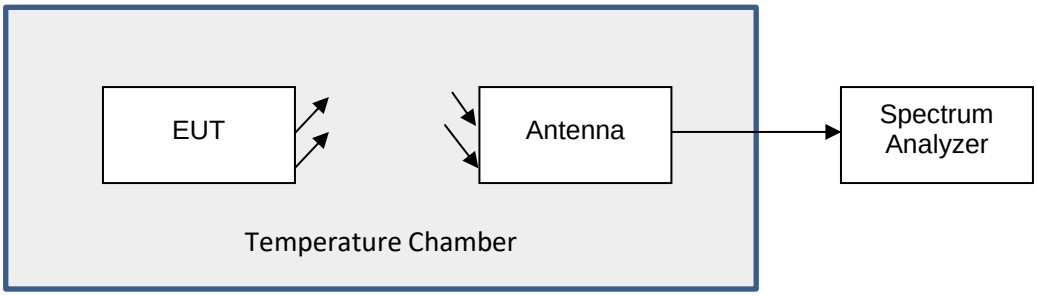
Refer to Annex B for Emission Mask plots

Frequency Stability
Engineer: Greg Corbin
Test Date: 10/10/2019

Measurement Procedure

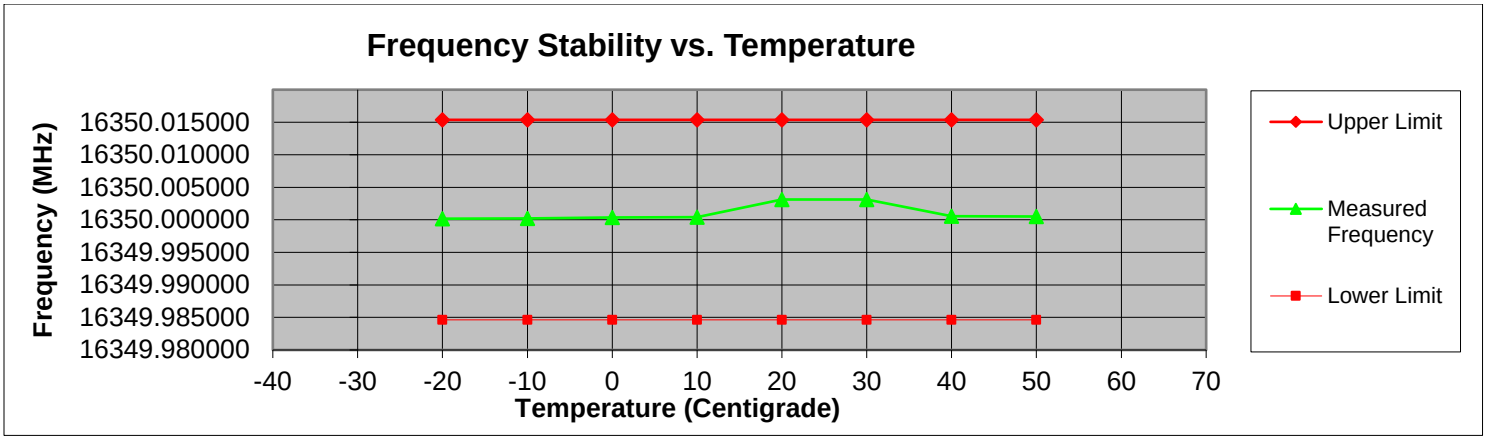
The EUT was placed in an environmental test chamber and the RF output was monitored with a horn antenna located inside the temperature chamber connected to a spectrum analyzer.
The temperature was varied from -20°C to 50°C in 10°C increments. After a sufficient time for temperature stabilization the RF output frequency was measured.
At 20°C the power supply voltage to the EUT was varied from 85% to 115% of the nominal value and the RF output was measured.
The EUT is has an input voltage range of 18 – 28 VDC. This is normally supplied by a AC to DC power supply. For the voltage variation at 20 Deg C both the AC input voltage to the AC to DC power supply and the DC input voltage were varied and the frequency stability results were recorded

Test Setup



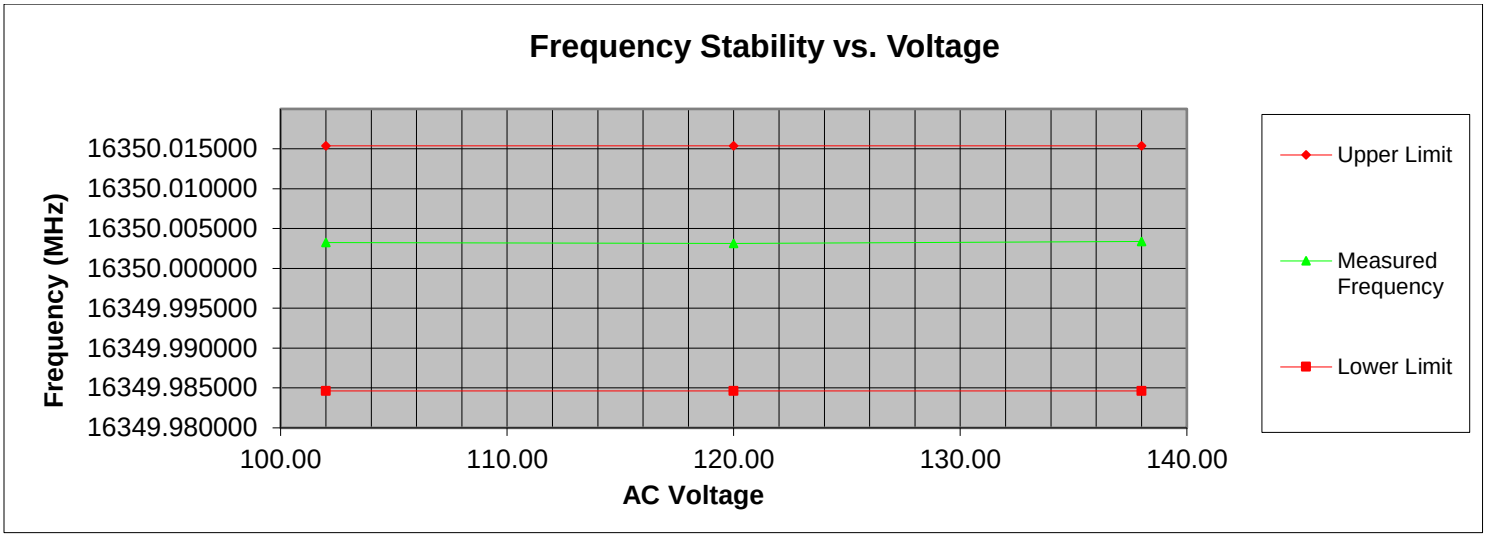
Frequency Stability Temperature Variation Measurement Results

Tuned Frequency	Temperature	Tolerance	Measured Frequency	Upper Limit	Lower Limit	Upper Margin	Lower Margin
(MHz)	(deg C)	(PPM)	(MHz)	(MHz)	(MHz)	(MHz)	(MHz)
16350.000	-20	0.94	16350.0001750	-0.015194	0.015544	16350.015369	16349.984631
16350.000	-10	0.94	16350.0002250	-0.015144	0.015594	16350.015369	16349.984631
16350.000	0	0.94	16350.0003750	-0.014994	0.015744	16350.015369	16349.984631
16350.000	10	0.94	16350.0004125	-0.014957	0.015782	16350.015369	16349.984631
16350.000	20	0.94	16350.0031250	-0.012244	0.018494	16350.015369	16349.984631
16350.000	30	0.94	16350.0031250	-0.012244	0.018494	16350.015369	16349.984631
16350.000	40	0.94	16350.0005500	-0.014819	0.015919	16350.015369	16349.984631
16350.000	50	0.94	16350.0005125	-0.014856	0.015882	16350.015369	16349.984631



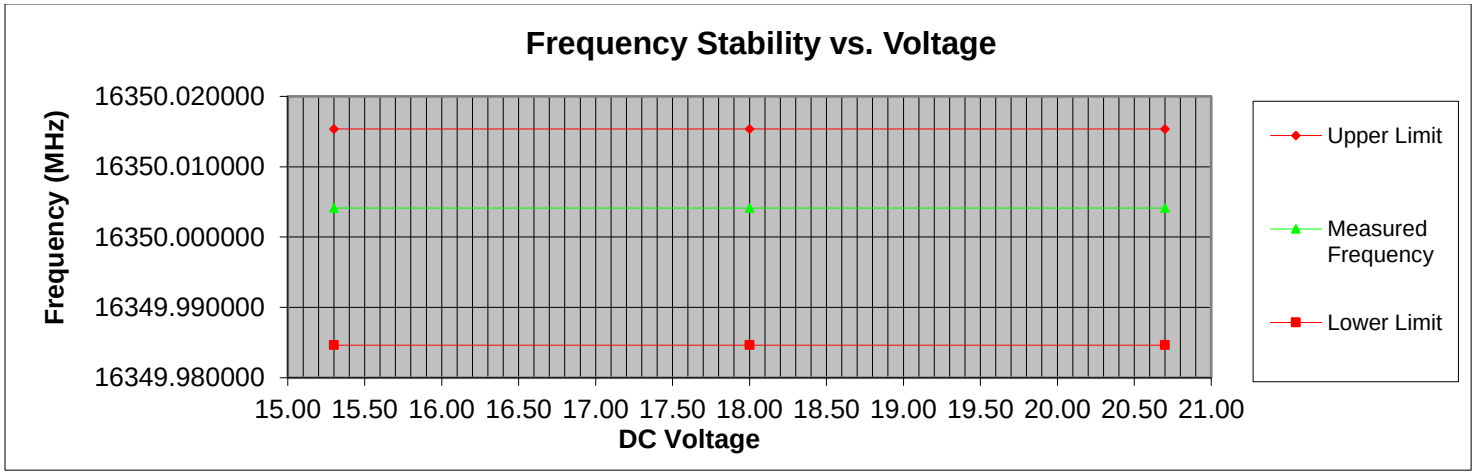
Frequency Stability Voltage Variation Measurement Results
AC Voltage

Tuned Frequency	Tolerance	AC Voltage	Measured Frequency	Upper Limit	Lower Limit	Upper Margin	Lower Margin
(MHz)	(PPM)	(PPM)	(MHz)	(MHz)	(MHz)	(MHz)	(MHz)
16350.000	0.94	102.00	16350.003250	-0.012119	0.018619	16350.015369	16349.984631
16350.000	0.94	120.00	16350.003125	-0.012244	0.018494	16350.015369	16349.984631
16350.000	0.94	138.00	16350.003375	-0.011994	0.018744	16350.015369	16349.984631



Frequency Stability Voltage Variation Measurement Results
DC Voltage

Tuned Frequency	Tolerance	DC Voltage	Measured Frequency	Upper Limit	Lower Limit	Upper Margin	Lower Margin
(MHz)	(PPM)	(PPM)	(MHz)	(MHz)	(MHz)	(MHz)	(MHz)
16350.000	0.94	15.30	16350.004125	-0.011244	0.019494	16350.015369	16349.984631
16350.000	0.94	18.00	16350.004125	-0.011244	0.019494	16350.015369	16349.984631
16350.000	0.94	20.70	16350.004125	-0.011244	0.019494	16350.015369	16349.984631



Necessary Bandwidth Calculations

Engineer: Greg Corbin

Test Date: 10/8/2019

FCC part 2.202(c)(4) was followed for determining necessary bandwidth.

(c) The necessary bandwidth may be determined by one of the following methods:

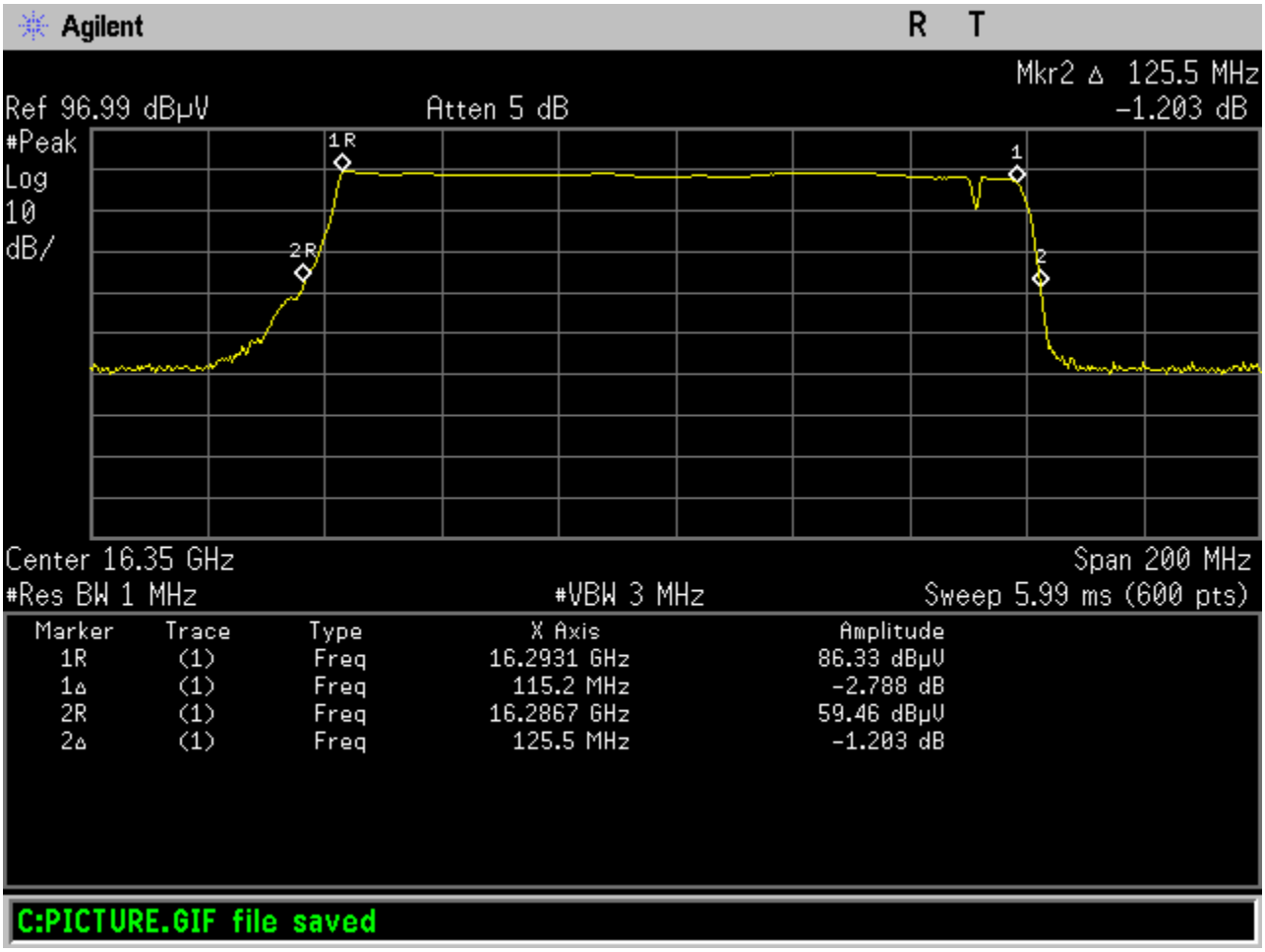
1) Use of the formulas included in the table, in paragraph (g) of this section, which also gives examples of necessary bandwidths and designation of corresponding emissions;

(2) For frequency modulated radio systems which have a substantially linear relationship between the value of input voltage to the modulator and the resulting frequency deviation of the carrier and which carry either single sideband suppressed carrier frequency division multiplex speech channels or television, computation in accordance with provisions of paragraph (f) of this section and formulas and methods indicated in the table, in paragraph (g) of this section;

(3) Computation in accordance with Recommendations of the International Radio Consultative Committee (C.C.I.R.);

(4) Measurement in cases not covered by paragraph (c) (1), (2), or (3) of this section.

EUT was tuned to the center of the band and the necessary bandwidth was measured.
Tuned Frequency = 16.35 GHz
Measured Bandwidth = 125.5 MHz



Measurement Uncertainty

Measurement Uncertainty for Compliance Testing is listed in the table below.

The reported expanded uncertainty has been estimated at a 95% confidence level (k=2)

Measurement Type	Expanded Uncertainty
Conducted Emissions, AC Powerline	± 3.28 dB
Radiated Emissions_30 – 1000 MHz	± 4.82 dB
Radiated Emissions_1 – 18 GHz	± 5.73 dB
Frequency Error	± 22 Hz
Conducted RF Power	± 0.98 dB
Conducted Spurious Emission	± 2.49 dB
AC Voltage	± 2.3 %
DC Voltage	± 0.12 %
Temperature	± 1.0 deg C
Humidity	± 4.32 %

Test Equipment Utilized

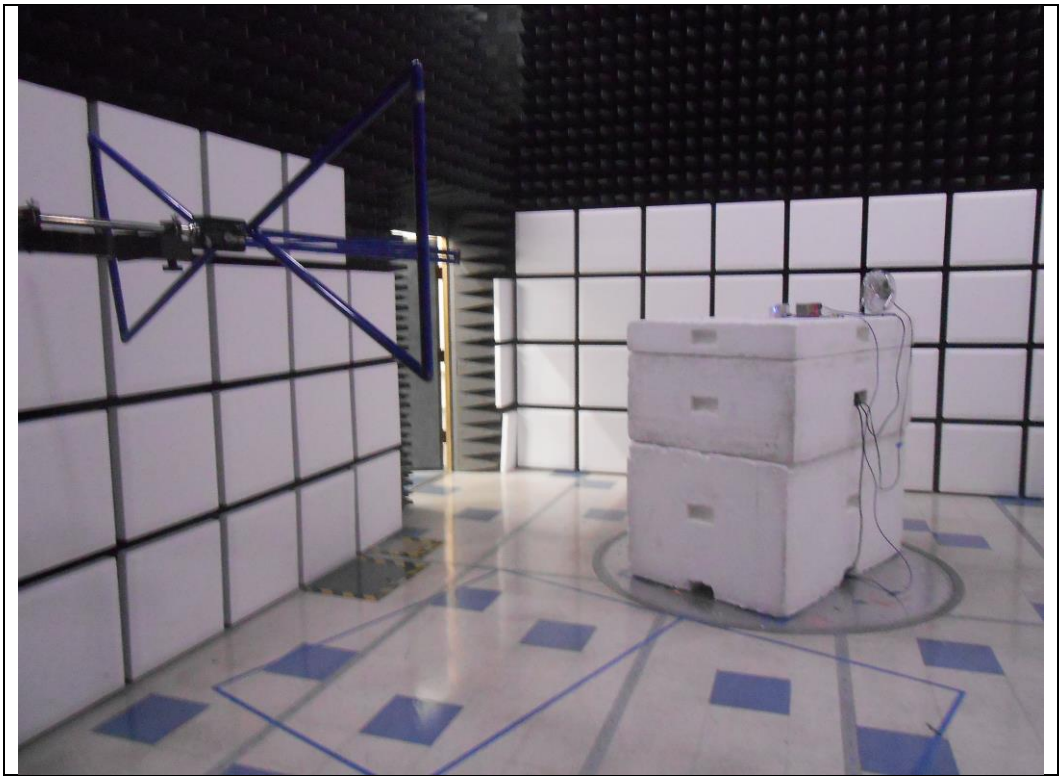
Description	MFG	Model Number	CT Asset #	Last Cal Date	Cal Due Date
Spectrum Analyzer	Agilent	4407B	i00331	12/4/18	12/4/19
Harmonic mixer 26.5-40 GHz	HP	11970 A	i00193	6/28/18	6/28/21
Harmonic mixer 33-50 GHz	HP	11970 Q	i00465	6/28/18	6/28/21
Harmonic mixer 50-75 GHz	HP	11970 V	i00463	6/28/18	6/28/21
Harmonic mixer 75-110 GHz	HP	11970 W	i00464	6/28/18	6/28/21
High gain WR22 waveguide Horn Antenna (33-50 GHz)	cmi	HO22R	i00484	NA	NA
High gain WR22 waveguide Horn Antenna (50-75 GHz)	cmi	HO15R	i00477	NA	NA
High gain WR22 waveguide Horn Antenna (75-110 GHz)	cmi	HO10R	i00476	NA	NA
Horn Antenna (18-40 GHz)	EMCO	3116	i00085	2/28/19	2/28/21
Preamp 18-40 GHz	MITEQ	AMF-18004000-29-8P	i00461	Verified on: 10/8/19	
Horn Antenna (1-18GHz)	ARA	DRG-118/A	i00271	6/16/18	6/16/20
BiLog Antenna	Chase	CBL6111C	i00267	3/8/18	3/8/20
Preamplifier	HP	8447D	i00055	Verified on: 10/8/19	

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.

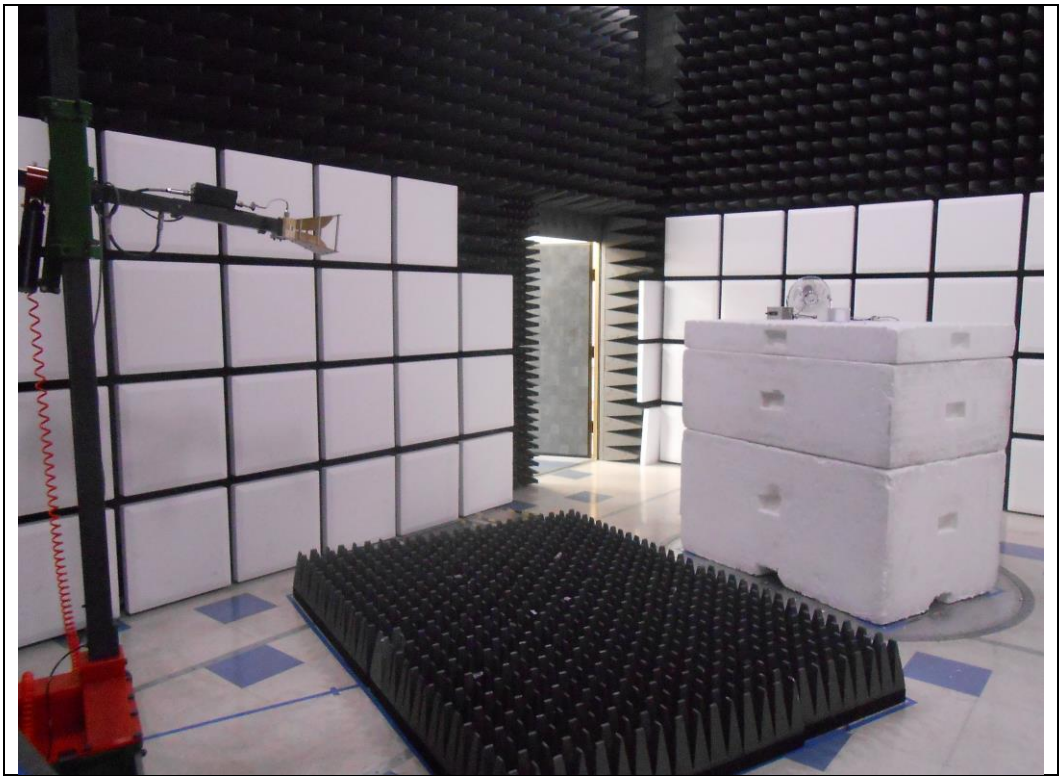
END OF TEST REPORT

Test Setup Photos
FCC ID: 2APIM-FTR20SKYD

RF Radiated 30 - 1000 MHz



RF Radiated 1 – 18 GHz

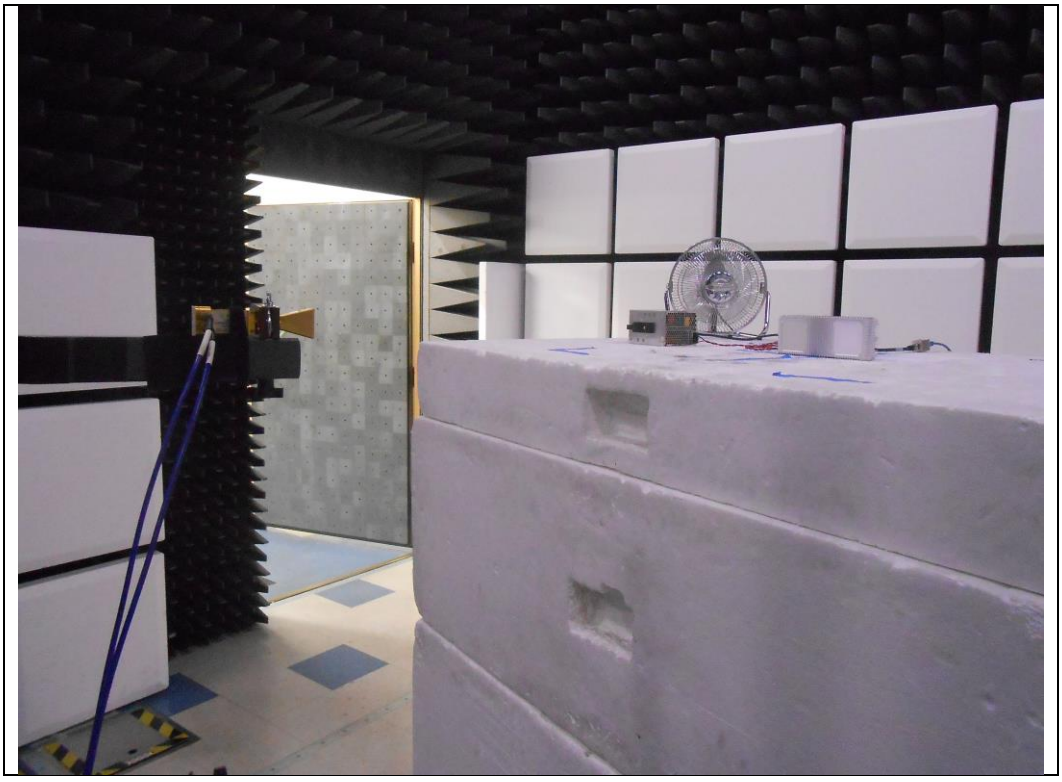


RF Radiated_18 – 26.5 GHz

RF Radiated_26.5 – 40 GHz

RF Radiated_40 – 50 GHz

RF Radiated_50 - 75 GHz



RF Radiated_75 – 85 GHz

Temperature Stability