Compliance Test Report
for
FCC Title 47

Trade Name	Maxiva Compact Class TV Transmitter/Transposer/Gap Filler	
Models	**UAX-80AT-C, UAX-50AT-C, UAX-25AT-C, UAX-5AT-C, UAX-80R6, UAX-50R6, UAX-25R6, UAX10R6, UAX5R6**	
Name and address of manufacturer or responsible party	Harris Corporation 3200 Wismann Lane Quincy, Il. 62305	
FCC Identifier	**BOIUAXCC**	
Serial Number	Prototype	
Type (AM, FM, TV, etc)	TV, (ATSC)	
RF Frequency Range	Any single UHF channel from 14 to Ch. 69	
RF Power Rating	Power ratings vary by model from 5W to 100W	
Date(s) on which testing was performed	August 23 – September 10, 2011	
Address of test locations	Harris Corporation 3200 Wismann Lane Quincy, Il. 62305	Harris Corporation 5300 Kings Island Dr. Ste. 101 Mason Ohio 45040

PERSON PRIMARILY RESPONSIBLE FOR TESTING	
Name	Paul Mizwicki
Title	Project Manager
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Name(s) of others who performed testing if applicable	John Harmon, Engineering Dept. Mason OH. Terry Hollenberg, Quincy, IL
Signature	
Date Signed	

Official of Responsible Party	
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Title	Systems Engineer
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Email	cwilli05@harris.com
Signature	Carl B Williams
Date Signed	09-14-2011

FCC Verification Test Plan Purpose and Scope

This test plan prescribes tests applicable to demonstrate compliance with the requirements of US 47CFR2 and 47CFR74 for digital operation of the Maxiva Compact Class transmitter. Analog compliance will not be demonstrated for FCC purposes as analog television broadcast ceased on February 17, 2009.

Table of Contents

1. References

47CFR Part 2	PART 2--FREQUENCY ALLOCATIONS AND RADIO TREATY MATTERS; GENERAL RULES AND REGULATIONS	October 2008 Revision
47 CFR Part 74	PART 74—EXPERIMENTAL RADIO, AUXILIARY, SPECIAL BROADCAST AND OTHER PROGRAM DISTRIBUTIONAL SERVICES	October 2008 Revision
ANSI/TIA-603-C-2004	Land Mobile FM or PM - Communications Equipment - Measurement and Performance Standards	2004
ATSC A/64B, 26 May 2008	**ATSC Recommended Practice: Transmission Measurement and Compliance for Digital Television**	26 May 2008

2. Administrative Requirements

2.1. Reference: 47CFR 2.955

Item Description	Information or reference to information	Comment
Location of original design drawings and specifications and all changes that have been made that may affect compliance with the requirements of § 2.953.	All design and build documentation located at Harris BCD	
Procedures used for production inspection and testing (if tests were performed) to insure the conformance required by § 2.953. (Statistical production line emission testing is not required)	Refer to Sections 4-8	
Record of the measurements made on an appropriate test site that demonstrates compliance with the applicable Regulations	Refer to results in this document	
Date(s) on which testing was performed.	Refer to page 1	
Name of test laboratory and individual(s) who performed testing.	Harris	
Descriptions of how testing was performed	Refer to Sections 4-8	
EUT name and model	See page 1	
Types and lengths of cables and cable arrangement during test	See Section 6.10	
Drawings or photographs showing test set-up	See Section 4-8	
Modifications implemented to achieve compliance	None	
Compliance data	Refer to Sections 4-8	
Name and signature of person responsible for testing.	Refer to Page 2	
Name and signature of official of responsible party per 2.909.	Refer to Page 2	

3. Evaluation Requirements Summary

	47CFR2	47CFR73	ANSI/TIA-603-C-2004	Comment
Measurements Required	2.1041	NA	NA	
RF power output.	2.1046	74.735(b)	2.2.1	
Modulation characteristics.	2.1047	74.736	NA	ATSC A-64B
Occupied bandwidth.	2.1049	74.794	NA	ATSC A-64B
Spurious emissions at antenna terminals.	2.1051	74.794	NA	ATSC A-64B
Field strength of spurious radiation.	2.1053	NA	2.2.12	
Frequency stability.	2.1055	74.761	2.2.2	ATSC A-64B
Frequency spectrum to be investigated.	2.1057	NA		
TV transmission standards: Digital	NA	73.682(d)		

4. RF power output.

4.1. Reference(s)

4.1.1. 47CFR2.1046

4.1.2. 47CFR74.735(b)

4.2. Criteria

Minimum and maximum powers are dependent on the geographical location and channel. Refer to 74.735. Since the effective Radiated Power (ERP) is dependent on the antenna RF system at each site, the transmitter power (TPO) is measured for reporting purposes only.

4.3. Measurement Procedure

Measurement of average power using a directly connected power meter or analyzer with attention to the following conditions of 2.1046

a) For transmitters other than single sideband, independent sideband and controlled carrier radiotelephone, power output shall be measured at the RF output terminals when the transmitter is adjusted in accordance with the tune-up procedure to give the values of current and voltage on the circuit elements specified in Sec. 2.1033(c)(8). The electrical characteristics of the radio frequency load attached to the output terminals when this test is made shall be stated.

(c) For measurements conducted pursuant to paragraphs (a) and (b) of this section, all calculations and methods used by the applicant for determining carrier power or peak envelope power, as appropriate, on the basis of measured power in the radio frequency load attached to the transmitter output terminals shall be shown. Under the test conditions specified, no components of the emission spectrum shall exceed the limits specified in the applicable rule parts as necessary for meeting occupied bandwidth or emission limitations.

4.4. Evaluation Results:

The transmitter model tested was the Maxiva Compact Class . This transmitter nominal power output is 100W at the unit. The channel selected for the measurements was 683 MHz.

Average DTV Power was measured via a precision directional coupler connected at the output of the EUT. The transmitter power was adjusted for 100W. The equipment used was,

Equipment List	Model#	Harris Asset#	Cal Date/Due Date
Agilent Pwr Mtr	E4419B	11170	06/24/2010 - 12/31/2011
Agilent Pwr Sensor	8481H	03123	03/17/2011 - 09/30/2012

5. Modulation characteristics.

5.1. Reference(s)

5.1.1.2.1047

5.1.2.See Section 8 of this document

5.2. Criteria

5.2.1.See Section 8 of this document

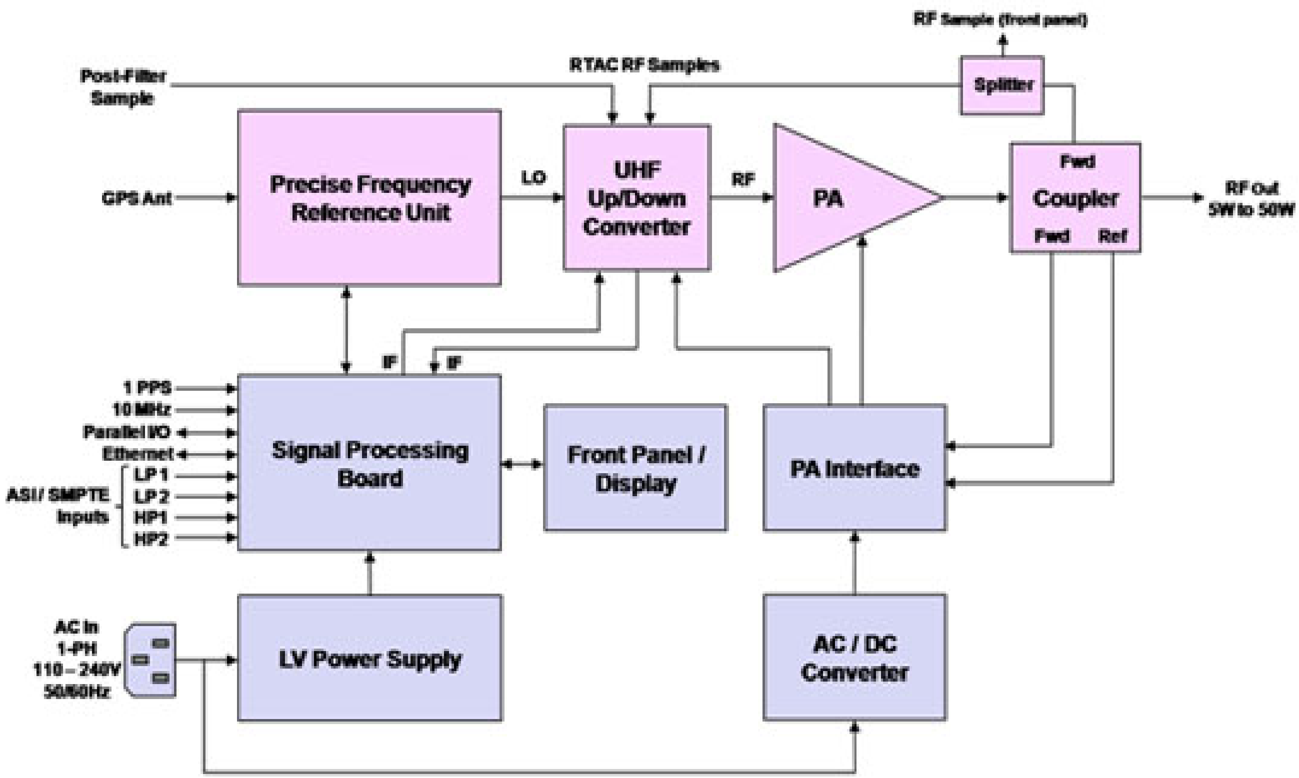
5.3. Measurement Procedure

5.3.1.See Section 8 of this document

5.4. Evaluation Results:

Brief technical description of the modulation scheme employed and emission designator
Emission designator is 6M00C7W for 8-VSB.
The transmitter accepts either SMPTE-310 or ASI formats with ATSC modulated RF output.

The modulation is done in the Apex M2X Exciter. The signal is then amplified by two stages of amplification. The transmitter block diagram is shown in the next figure.



Occupied bandwidth.

6. Reference(s)

6.1.1.47CFR2.1049

6.1. Criteria

Must be within emission mask in Section 6.10 of this document

6.2. Measurement Procedure

The occupied bandwidth, that is the **frequency** bandwidth such that, below its lower and above its upper **frequency** limits, the mean powers radiated are each equal to 0.5 percent of the total mean power radiated by a given emission shall be measured under the following conditions as applicable:

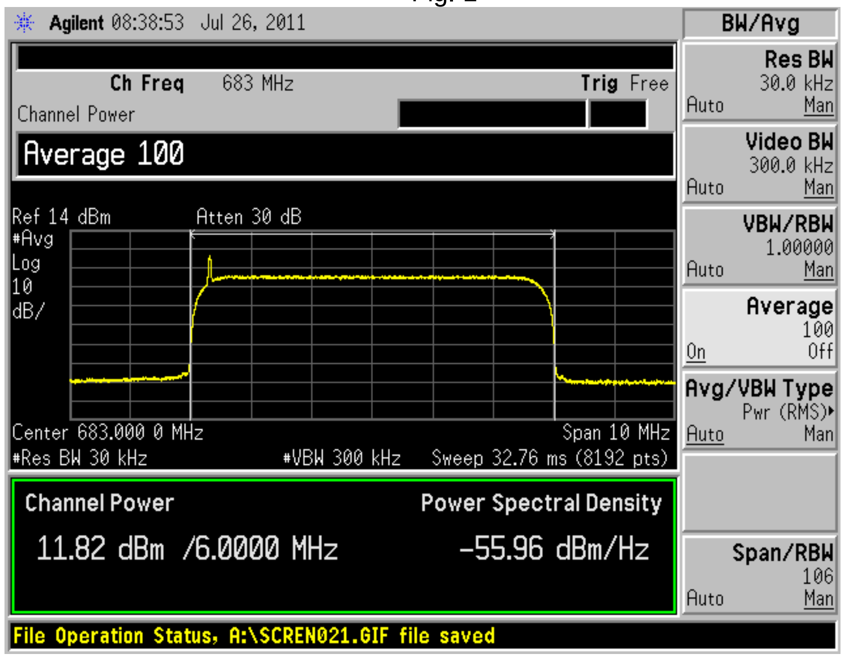
. . .

(h) Transmitters employing digital modulation techniques--when modulated by an input signal such that its amplitude and symbol rate represent the maximum rated conditions under which the equipment will be operated. The signal shall be applied through any filter networks, pseudo-random generators or other devices required in normal service. Additionally, the occupied bandwidth shall be shown for operation with any devices used for modifying the spectrum when such devices are optional at the discretion of the user.

6.3. Evaluation Results:

Spectrum analyzer plot showing the channel bandwidth. The measured occupied bandwidth was 5.5393Mhz. (See section 6.6 for Table of Allotments)

Fig. 1


Agilent 08:38:53 Jul 26, 2011
BW/Avg
Ch Freq 683 MHz
Trig Free
Channel Power
Average 100
Ref 14 dBm
Atten 30 dB
#Avg
Log
10
dB/
Center 683.000 0 MHz
Span 10 MHz
#Res BW 30 kHz
#VBW 300 kHz
Sweep 32.76 ms (8192 pts)
Channel Power
Power Spectral Density
11.82 dBm /6.0000 MHz
-55.96 dBm/Hz
Res BW
30.0 kHz
Auto Man
Video BW
300.0 kHz
Auto Man
VBW/RBW
1.00000
Auto Man
Average
100
On Off
Avg/VBW Type
Pwr (RMS)
Auto Man
Span/RBW
106
Auto Man
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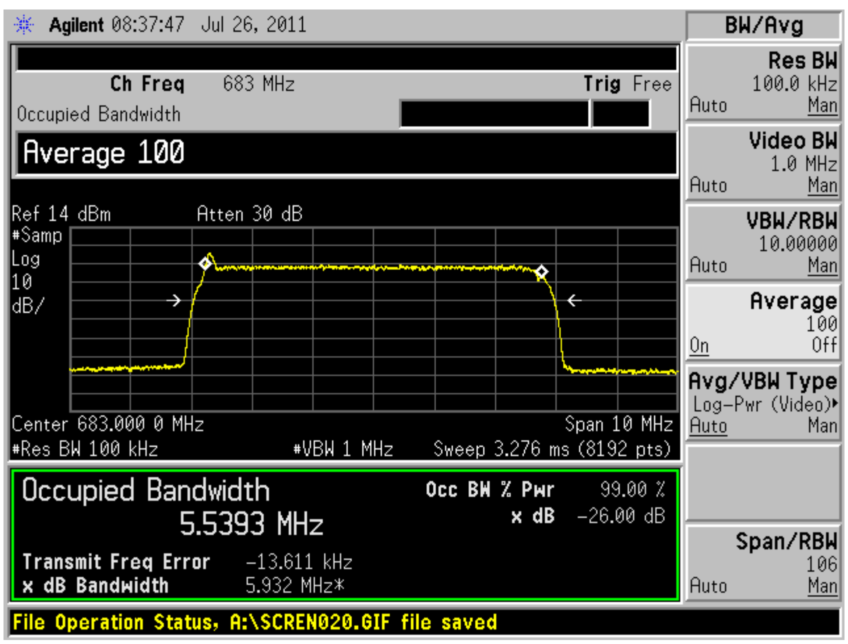

Agilent 08:37:47 Jul 26, 2011
BW/Avg
Ch Freq 683 MHz
Trig Free
Occupied Bandwidth
Average 100
Ref 14 dBm
Atten 30 dB
#Samp
Log
10
dB/
Center 683.000 0 MHz
Span 10 MHz
#Res BW 100 kHz
#VBW 1 MHz
Sweep 3.276 ms (8192 pts)
Occupied Bandwidth
5.5393 MHz
Occ BW % Pwr 99.00 %
x dB -26.00 dB
Transmit Freq Error -13.611 kHz
x dB Bandwidth 5.932 MHz*
Res BW
100.0 kHz
Auto Man
Video BW
1.0 MHz
Auto Man
VBW/RBW
10.00000
Auto Man
Average
100
On Off
Avg/VBW Type
Log-Pwr (Video)
Auto Man
Span/RBW
106
Auto Man
File Operation Status, A:\SCREN020.GIF file saved

Spurious emissions at antenna terminals.

6.4. Reference(s)

6.4.1.47CFR2.1051

6.4.2.47CFR74.794

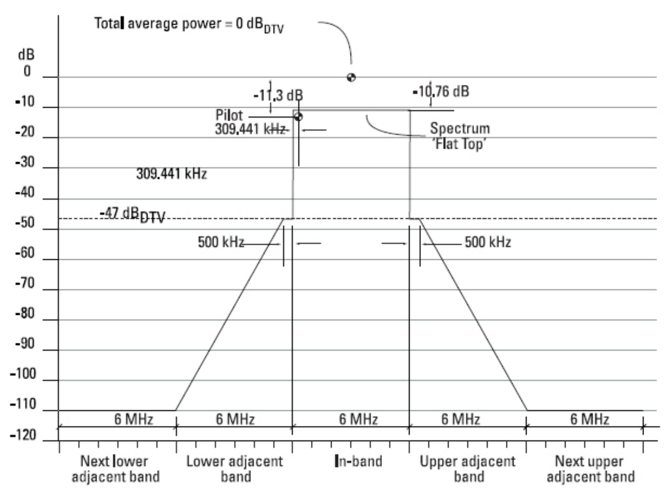
6.4.3.ATSC A/64B

6.5. Criteria

Full service mask: (a)(iii) The power level of emissions on frequencies outside the authorized channel of operation must be attenuated no less than the following amounts below the average transmitted power within the authorized channel. In the first 500 kHz from the channel edge the emissions must be attenuated no less than 47 dB. More than 6 MHz from the channel edge, emissions must be attenuated no less than 110 dB. At any frequency between 0.5 and 6 MHz from the channel edge, emissions must be attenuated no less than the value determined by the following formula::

Attenuation in dB = -11.5(Df + 3.6);
Where: Df = frequency difference in MHz from the edge of the channel.

(2) This attenuation is based on a measurement bandwidth of 500 kHz. Other measurement bandwidths may be used as long as appropriate correction factors are applied. Measurements need not be made any closer to the band edge than one half of the resolution bandwidth of the measuring instrument. Emissions include sidebands, spurious emissions and radio frequency harmonics. Attenuation is to be measured at the output terminals of the transmitter (including any filters that may be employed). In the event of interference caused to any service, greater attenuation may be required.



6.6. Measurement Procedure

The radio frequency voltage or powers generated within the equipment and appearing on a spurious frequency shall be checked at the equipment output terminals when properly loaded with a suitable artificial antenna. Curves or equivalent data shall show the magnitude of each harmonic and other spurious emission that can be detected when the equipment is operated under the conditions specified in Sec. 2.1049 as appropriate. The magnitude of spurious emissions which are attenuated more than 20 dB below the permissible value need not be specified.

6.7. Evaluation Results:

6.7.1. Total Integrated Power in Adjacent 500 KHz Bands (Upper and Lower) Relative to Channel Power.

The transmitter was connected to a dummy load and operated at rated power. A sample of the transmitter was connected to an Agilent Spectrum Analyzer. The analyzer was used to measure the total integrated power in the 6MHz channel. This power was used as the reference for out of channel power measurements. The spectrum analyzer was then used to measure the total integrated power in the adjacent 500kHz bandwidth.

The plots below show the measurement results:

Fig. 2

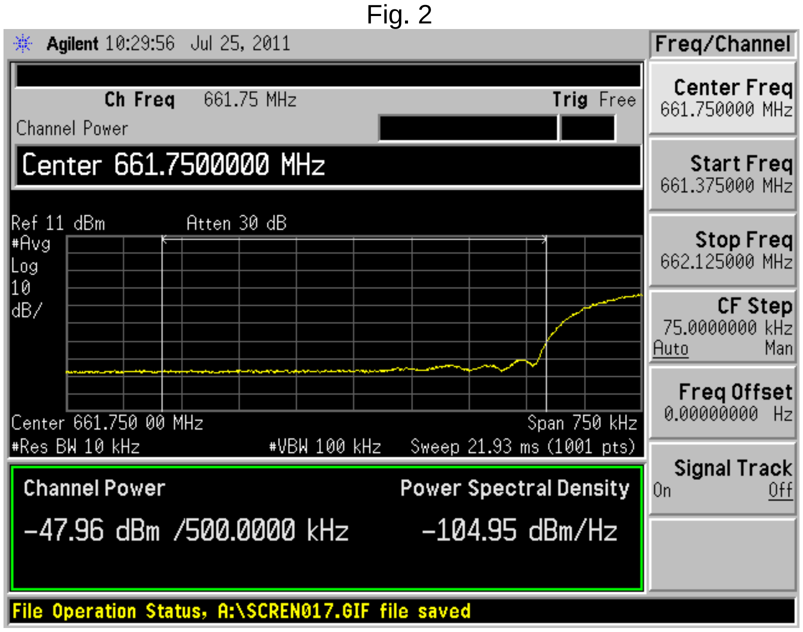
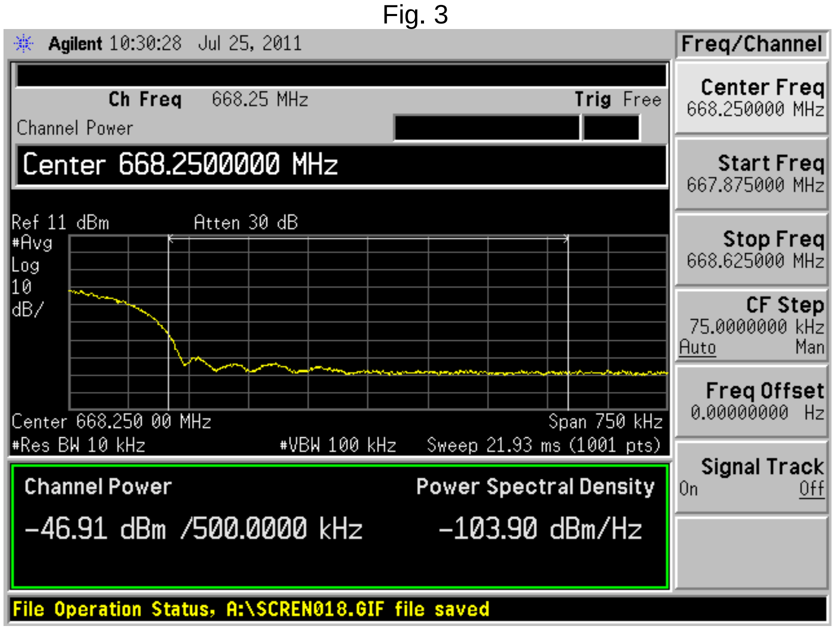


Fig. 3



The following table summarizes the results:

Description	Measured (dBm)	ACP Referenced to Total Channel Power (dBc)	Specification (dBc)	Pass Margin (dB)
Total Channel Power	11.82	-	-	-
Upper Adjacent 500 kHz	-46.91	58.63	47	11.82
Lower Adjacent 500 kHz	-47.96	59.78	47	11.82

Equipment List	Model#	Harris Asset#	Cal Date/Due Date
Agilent Spectrum Analyzer	E44443A	00011777	11/29/2010 – 5/31/2012
Agilent Pwr Mtr	E4419B	11170	06/24/2010 – 12/31/2011
Agilent Pwr Sensor	8481H	03123	03/17/2011 – 09/30/2012

The tabulated results are shown below: Channel Center Frequency in MHz= 683

Frequency Offset - Fc = 683 (MHz)	Transmitter Output Relative to Full Power (dB)	Filter Response (dB)	Caluculated Spurious Level w Mask Filter (dB)	Spec Per 73.622 (dB)	Pass Margin (dB)
-6	-51.82	-60	-111.82	-110.4	-1.42
-5	-53	-50	-103	-98.9	-4.1
-4	-54.55	-34	-88.55	-87.4	-1.15
-3	-54.43	-25	-79.43	-75.9	-3.53
-2	-56.1	-11	-66.1	-64.4	-1.7
-1	-52.25	-5.5	-57.75	-52.9	-4.85
-0.5	-52.1	0	-52.1	-47	-5.1
0.5	-53.3	0	-53.3	-47	-6.3
1	-53.83	-5.5	-59.33	-52.9	-6.43
2	-55.5	-11	-66.5	-64.4	-2.1
3	-54.55	-25	-79.55	-75.9	-3.65
4	-54.55	-34	-88.55	-87.4	-1.15
5	-53.74	-50	-103.74	-98.9	-4.84
6	-54.19	-60	-114.19	-110.4	-3.79

Equipment List	Model#	Harris Asset#	Cal Date/Due Date
Agilent Spectrum Analyzer	E44443A	00011777	11/29/2010 – 5/31/2012
Agilent Pwr Mtr	E4419B	11170	06/24/2010 – 12/31/2011
Agilent Pwr Sensor	8481H	03123	03/17/2011 – 09/30/2012

6.7.2. Spurious Emissions at Antenna Terminals

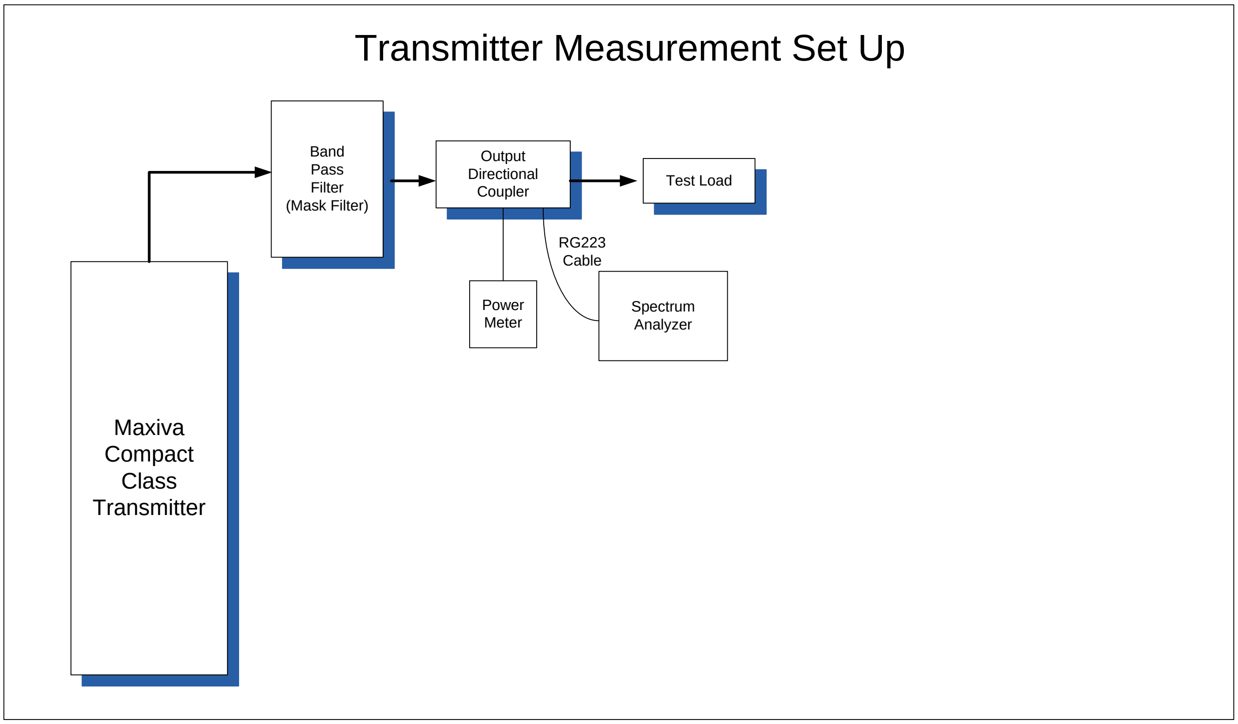
The Maxiva Compact Class transmitter system is equipped with one directional coupler located at the final output.

The coupler was characterized to a frequency of 6 GHz using a network analyzer.

The transmitter was operated into a dummy load. The transmitter sample from the coupler was observed on a spectrum analyzer.

The measured levels of the carrier, all harmonics and spurious were recorded. The measured data was corrected for the coupling values, filter loss, as well as the measurement cable loss to derive the actual levels in the transmission line.

The measurement setup is shown in the figure below,



All spurious emissions on the RF line must be lower than -110 dB from the total channel power. The results are tabulated below:

Frequency (MHz)	Harmonic	Tx Ouput Before Filters (dBm)	Input Directional Coupler Response and RG223 Cable Loss (dB)	Adjusted Tx Ouput Power Before Filters (dBm)	Attenuation of BPF+LPF (dB)	Calculated Transmitter Spurious Signal Power (dBm)	Spurious Emission Power Referenced to Total Power (dBc)
683	Fundamental	-10.75	-36.18	46.93	0	0	0
1366	2nd	-71.35	-41.65	-29.7	-80	-109.7	-156.63
2049	3rd	-68.89	-35.45	-33.44	-82	-115.44	-162.37
2732	4th	-86	-36.43	-49.57	-81	-130.57	-177.5
3415	5th	-78.26	-35.45	-42.81	-64	-106.81	-153.74
4098	6th	-89.5	-34.55	-54.95	-75	-129.95	-176.88
4781	7th	-89.5	-36.25	-53.25	-30.76	-84.01	-130.94
5464	8th	-90.5	-34.5	-56	-65	-121	-167.93
6147	9th	-88.6	-40.65	-47.95	-86	-133.95	-180.88
6830	10th	-89	-36.15	-52.85	-52	-104.85	-151.78

Note that the fundamental power before filters of 46.93 dBm is lower than the actual rated power of 50 dBm or 100W. This is due to the 30 kHz resolution bandwidth used for the measurements above.

TECHNICAL REPORT

Author:	Terry Hollenberg	**Dates:**	8/30/11 thru 9/2/11
Subject:	Orion 100W Radiated Emissions	**Location**	Harris Building 5, Quincy, IL

Signed: ______________________________

6.8. Introduction

This report is just the radiated emissions portion of compliance testing. The information herein ultimately can be combined with other compliance test results.

Presently the FCC rule on television cabinet radiation is unclear, except that (from 2.1053): "Information submitted shall include the relative radiated power of each spurious emission with reference to the rated power output of the transmitter, assuming all emissions are radiated from half wave dipole antennas."

Historically the required limit was 60 dB below the peak of sync. This was the same as the harmonic and spurious requirements. With the conversion to digital television there no longer is a peak of sync to reference, plus we now have a highly restrictive emission mask that requires the signals outside of the channel to be 110 dB down. This requires a sharp filter in line with the transmitter output. A filter of course does nothing for cabinet radiation.

Thus far the FCC does not distinguish cabinet emissions from conducted emissions. However it is doubtful that the FCC intended to impose these emission requirements on cabinetry. Indeed, they have recognized that -110 dBc can even be below the Part 15 class A or B limits.

Also historically the European rules on radiated emissions have been tougher to meet than the FCC rules for both Radio and TV. Therefore, it is my opinion that compliance with the applicable European standard (ETSI EN 302 296 in this case) will demonstrate that the intended spectrum management is being met for both CE and FCC purposes.

This report supplements the previous radiated emissions testing that was done at 50 watts output. In this case the testing was done at 100 watts output.

6.9. Test Methodology

A unit was setup to operate at 100W with DVB-T modulation into a dummy load. The Orion unit is small enough to be placed on a 1 meter high wooden table, and then rotated as needed, while keeping the antenna stationary. The area used for test in Building 5 and was reasonably free of reflective objects.

The emissions from 30 MHz to the tenth harmonic were examined using an Agilent E4445A EMI receiver and two antennas to cover this frequency range. The EMI receiver provides a direct field strength reading by taking into account the cable loss and antenna factor for each frequency:

dBuV/m = dBuV reading + Cable Loss + Antenna Factor

The E4445A also provides the required Quasi-Peak detection.

Measurements were performed at 3 meters.

The unit was tested at three frequencies (474 MHz, 666 MHz, and 858 MHz) per EN 302 296.

At frequencies above 1 GHz, the noise floor of the EMI receiver can become an issue. This issue exists at the low emission levels required of the exciter, after the cable loss and antenna factor are applied. For this reason the Resolution Bandwidth of the receiver was reduced in order to lower the noise floor. If any spurious was found a correction factor was applied to the resulting signal level.

From experience and power amplifier knowledge we know that the dominant radiated emissions will be the operating frequency (which is excluded) and its harmonics. For this reason these frequencies were examined first, followed by looking at segments of the spectrum while turning the exciter off and on to observe whether it contributed to the spectrum.

6.10. Equipment Under Test

Figure 1, Orion Front

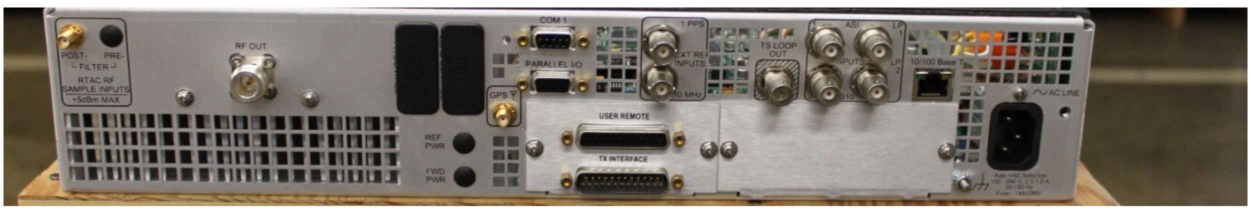


Figure 2, Orion Rear

7. Test Setup

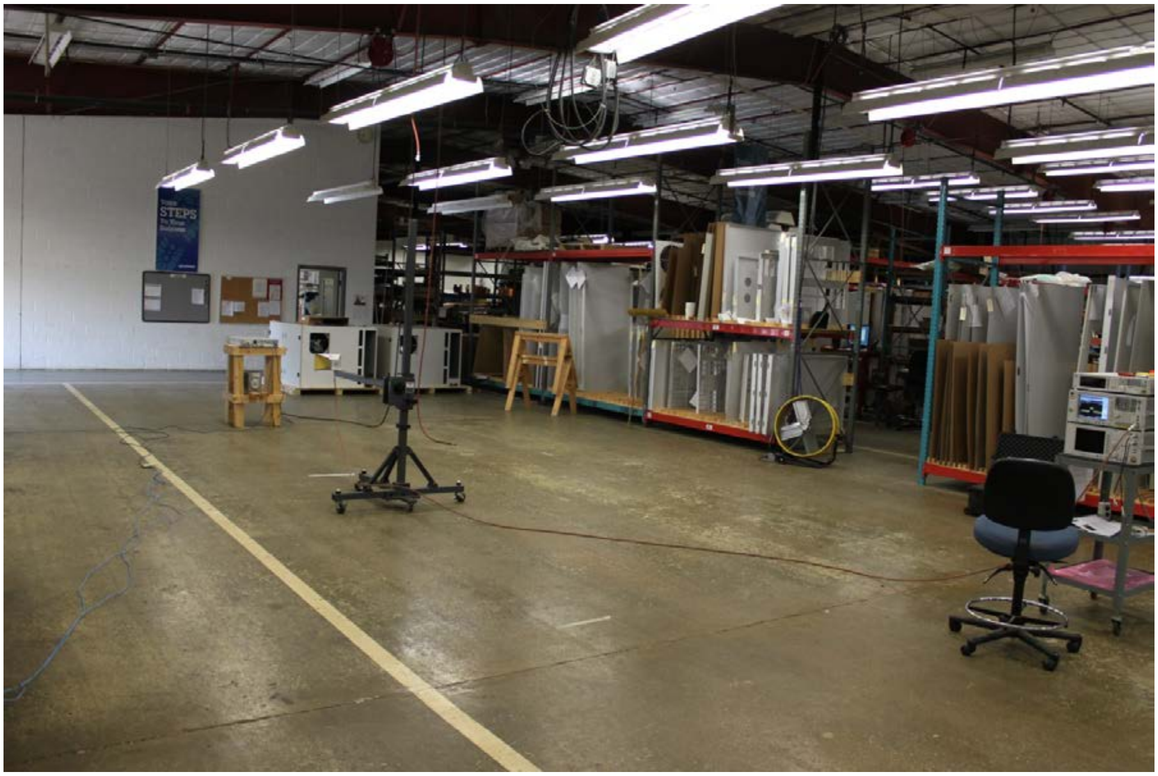


Figure 3, Antenna Setup for 1 GHz and Up

Figure 4, Antenna for 30 MHz to 1 GHz

7.1. Limits

From EN 302 296:

Quasi-Peak Limits (dBuV/m) at 10m (See notes 1 and 2)	Frequency Range
$30dBuV/m \leq 60+10\log(P_o/2000) \leq 70dBuV/m$	30 MHz to 230 MHz
$37dBuV/m \leq 67+10\log(P_o/2000) \leq 77dBuV/m$	230 MHz to 1 GHz*
1. P_o is power output in watts. 2. There is an exclusion band for the carrier.	

For 100W, this figures to be 47 dBuV from 30 MHz to 230 MHz, and 54 dBuV from 230 MHz to 4.5 GHz.

Since the measurements were made at 3 meters instead of 10 meters, the limit is adjusted by the formula:

$$L(x) = L(10m) + 20 \log (10/x)$$

The difference between 10m and 3m is 10.45 dB, therefore the 3 meter limits are:

3m Limit	Range
57.4 dBuV/m	30 MHz to 230 MHz
64.4 dBuV/m	230 MHz to 4.5 GHz

7.2. Reference Bandwidth

Based on the following excerpt from ETSI EN 302 296, the measurements above 1 GHz will be referenced to a 100 kHz measurement bandwidth:

> The following reference bandwidths are to be used:
> For spurious emissions:
> - 100 kHz between 9 kHz and 174 MHz;
> - 4 kHz between 174 MHz and 400 MHz;
> - 100 kHz between 400 MHz and 790 MHz;
> - 4 kHz between 790 MHz and 862 MHz;
> - 100 kHz between 862 MHz and 1000 MHz;
> - 100 kHz above 1000 MHz.

7.3. Test Equipment

Equipment	Model	Asset	Cal Date	Cal Due
Agilent EMI receiver	E4445A	12694	6/29/11	6/29/12
Electro-Metrics BiconicLog Antenna	EM6917-2	8843		09/15/2011
ETS Lindgren Horn Antenna	3115	11500	3/31/11	3/31/13
Coax RGS393, Teflon	“Brown 2”			

7.4. Radiated Emission Results

In the tables below, the first column of data represents measurements from the Front. Above 1 GHz the RBW was reduced to 10 kHz in order to expose possible spurious signals. None were found, so this column represents the noise level with 10 kHz RBW. In subsequent columns a highlighted level signifies that something was found. For these signals a correction factor of 10 dB needs to be applied, based on the formula:

$$10 \times \log(100\text{kHz}/10\text{kHz}) = 10 \text{ dB}$$

Thus, 23.7 dBuV/m becomes 33.7 dBuV/m.

HARRIS Communications

Cabinet Radiation
FCC

CP_W	=	100	Watts
R	=	3	meters
$FL_{dBuV/m}$	=	147.38	dBuV/m

FCC Standard: -63.0 $Spur_{dBc}$-RA

Tabulated Measurements and results - Horizontal Polarization

Front						Front-Right				
Frequency (MHz)	$Meas_{dBuV}$	AF dB	Cable dB	$Spur_{dBc}$-RA		Frequency (MHz)	$Meas_{dBuV}$	AF dB	Cable dB	$Spur_{dBc}$-RA
666.0	78.3	0.0	0	-69.08		666.0	87.9	0.0	0	-59.48
1332.0	26.68	0.0	0	-120.70		1332.0	26.25	0.0	0	-121.13
1998.0	26.72	0.0	0	-120.66		1998.0	26.46	0.0	0	-120.92
2664.0	26.83	0.0	0	-120.55		2664.0	26.09	0.0	0	-121.29
3330.0	28.98	0.0	0	-118.40		3330.0	26.85	0.0	0	-120.53
3996.0	28.03	0.0	0	-119.35		3996.0	26.8	0.0	0	-120.58
4662.0	27.02	0.0	0	-120.36		4662.0	26.44	0.0	0	-120.94
5328.0	27.17	0.0	0	-120.21		5328.0	28.44	0.0	0	-118.94
5994.0	26.72	0.0	0	-120.66		5994.0	27.1	0.0	0	-120.28
6660.0	25.1	0.0	0	-122.28		6660.0	26.5	0.0	0	-120.88
Right						Right-Rear				
Frequency (MHz)	$Meas_{dBuV}$	AF dB	Cable dB	$Spur_{dBc}$-RA		Frequency (MHz)	$Meas_{dBuV}$	AF dB	Cable dB	$Spur_{dBc}$-RA
666.0	87.8	0.0	0	-59.58		666.0	84.7	0.0	0	-62.68
1332.0	26.31	0.0	0	-121.07		1332.0	22.1	0.0	0	-125.28
1998.0	26.77	0.0	0	-120.61		1998.0	26.92	0.0	0	-120.46
2664.0	27.48	0.0	0	-119.90		2664.0	27.7	0.0	0	-119.68
3330.0	26.89	0.0	0	-120.49		3330.0	27	0.0	0	-120.38
3996.0	26.36	0.0	0	-121.02		3996.0	26.85	0.0	0	-120.53
4662.0	27.03	0.0	0	-120.35		4662.0	27	0.0	0	-120.38
5328.0	26.9	0.0	0	-120.48		5328.0	27.05	0.0	0	-120.33
5994.0	27.38	0.0	0	-120.00		5994.0	26	0.0	0	-121.38
6660.0	27	0.0	0	-120.38		6660.0	26.3	0.0	0	-121.08

Tabulated Measurements and results - Horizontal Polarization

Rear						Left-Rear				
Frequency (MHz)	$Meas_{dBuV}$	AF dB	Cable dB	$Spur_{dBc}$-RA		Frequency (MHz)	$Meas_{dBuV}$	AF dB	Cable dB	$Spur_{dBc}$-RA
666.0	74	0.0	0.0	-73.38		666.0	79.4	0.0	0	-67.98
1332.0	40.19	0.0	0.0	-107.19		1332.0	29.95	0.0	0	-117.43
1998.0	27.05	0.0	0.0	-120.33		1998.0	36.93	0.0	0	-110.45
2664.0	28.39	0.0	0.0	-118.99		2664.0	28.6	0.0	0	-118.78
3330.0	27.03	0.0	0.0	-120.35		3330.0	26.92	0.0	0	-120.46
3996.0	26.9	0.0	0.0	-120.48		3996.0	27.7	0.0	0	-119.68
4662.0	27.38	0.0	0.0	-120.00		4662.0	27	0.0	0	-120.38
5328.0	27.48	0.0	0.0	-119.90		5328.0	26.85	0.0	0	-120.53
5994.0	26.89	0.0	0.0	-120.49		5994.0	27	0.0	0	-120.38
6660.0	26.36	0.0	0.0	-121.02		6660.0	26.85	0.0	0	-120.53
Left						Front-Left				
Frequency (MHz)	$Meas_{dBuV}$	AF dB	Cable dB	$Spur_{dBc}$-RA		Frequency (MHz)	$Meas_{dBuV}$	AF dB	Cable dB	$Spur_{dBc}$-RA
666.0	79.3	0.0	0	-68.08		666.0	84.7	0.0	0	-62.68
1332.0	26.37	0.0	0	-121.01		1332.0	34.38	0.0	0	-113.00
1998.0	26.68	0.0	0	-120.70		1998.0	27.03	0.0	0	-120.35
2664.0	26.72	0.0	0	-120.66		2664.0	27.02	0.0	0	-120.36
3330.0	26.83	0.0	0	-120.55		3330.0	26.9	0.0	0	-120.48
3996.0	26.85	0.0	0	-120.53		3996.0	25.92	0.0	0	-121.46
4662.0	26.8	0.0	0	-120.58		4662.0	26.02	0.0	0	-121.36
5328.0	26.44	0.0	0	-120.94		5328.0	26.6	0.0	0	-120.78
5994.0	28.44	0.0	0	-118.94		5994.0	28.95	0.0	0	-118.43
6660.0	27.1	0.0	0	-120.28		6660.0	26.17	0.0	0	-121.21

Tabulated Measurements and results - Vertical Polarization										
Front						Front-Right				
Frequency (MHz)	Meas$_{dBuV}$	AF dB	Cable dB	Spur$_{dBc}$-RA		Frequency (MHz)	Meas$_{dBuV}$	AF dB	Cable dB	Spur$_{dBc}$-RA
666.0	74	0.0	0.0	-73.38		666.0	79.4	0.0	0	-67.98
1332.0	31.8	0.0	0.0	-115.58		1332.0	39.73	0.0	0	-107.65
1998.0	35.33	0.0	0.0	-112.05		1998.0	29.1	0.0	0	-118.28
2664.0	38.54	0.0	0.0	-108.84		2664.0	30.93	0.0	0	-116.45
3330.0	26.02	0.0	0.0	-121.36		3330.0	26.61	0.0	0	-120.77
3996.0	26.6	0.0	0.0	-120.78		3996.0	26.91	0.0	0	-120.47
4662.0	28.95	0.0	0.0	-118.43		4662.0	27.41	0.0	0	-119.97
5328.0	26.17	0.0	0.0	-121.21		5328.0	27.33	0.0	0	-120.05
5994.0	26.9	0.0	0.0	-120.48		5994.0	26.39	0.0	0	-120.99
6660.0	25.92	0.0	0.0	-121.46		6660.0	27.19	0.0	0	-120.19
Right						Right-Rear				
Frequency (MHz)	Meas$_{dBuV}$	AF dB	Cable dB	Spur$_{dBc}$-RA		Frequency (MHz)	Meas$_{dBuV}$	AF dB	Cable dB	Spur$_{dBc}$-RA
666.0	84.4	0.0	0	-62.98		666.0	85.3	0.0	0	-62.08
1332.0	41.78	0.0	0	-105.60		1332.0	22.5	0.0	0	-124.88
1998.0	30.5	0.0	0	-116.88		1998.0	34.33	0.0	0	-113.05
2664.0	26.8	0.0	0	-120.58		2664.0	37.25	0.0	0	-110.13
3330.0	26.96	0.0	0	-120.42		3330.0	27.67	0.0	0	-119.71
3996.0	27.43	0.0	0	-119.95		3996.0	27.01	0.0	0	-120.37
4662.0	26.51	0.0	0	-120.87		4662.0	28.26	0.0	0	-119.12
5328.0	25.62	0.0	0	-121.76		5328.0	26.67	0.0	0	-120.71
5994.0	27.64	0.0	0	-119.74		5994.0	28.26	0.0	0	-119.12
6660.0	26.68	0.0	0	-120.70		6660.0	26.67	0.0	0	-120.71
Rear						Left-Rear				
Frequency (MHz)	Meas$_{dBuV}$	AF dB	Cable dB	Spur$_{dBc}$-RA		Frequency (MHz)	Meas$_{dBuV}$	AF dB	Cable dB	Spur$_{dBc}$-RA
666.0	81.7	0.0	0	-65.68		666.0	75.9	0.0	0	-71.48
1332.0	33.28	0.0	0	-114.10		1332.0	32.02	0.0	0	-115.36
1998.0	27.63	0.0	0	-119.75		1998.0	36	0.0	0	-111.38
2664.0	27.34	0.0	0	-120.04		2664.0	27.39	0.0	0	-119.99
3330.0	27	0.0	0	-120.38		3330.0	29.32	0.0	0	-118.06
3996.0	27.2	0.0	0	-120.18		3996.0	26.89	0.0	0	-120.49
4662.0	30.93	0.0	0	-116.45		4662.0	26.29	0.0	0	-121.09
5328.0	26.61	0.0	0	-120.77		5328.0	27.67	0.0	0	-119.71
5994.0	26.91	0.0	0	-120.47		5994.0	26.39	0.0	0	-120.99
6660.0	27.41	0.0	0	-119.97		6660.0	27.19	0.0	0	-120.19

Left						Left-Front				
Frequency (MHz)	Meas$_{dBuV}$	AF dB	Cable dB	Spur$_{dBc}$-RA		Frequency (MHz)	Meas$_{dBuV}$	AF dB	Cable dB	Spur$_{dBc}$-RA
666.0	79.3	0.0	0	-68.08		666.0	76.8	0.0	0	-70.58
1332.0	47.91	0.0	0	-99.47		1332.0	36	0.0	0	-111.38
1998.0	33.28	0.0	0	-114.10		1998.0	27.39	0.0	0	-119.99
2664.0	27.63	0.0	0	-119.75		2664.0	29.32	0.0	0	-118.06
3330.0	27.34	0.0	0	-120.04		3330.0	26.89	0.0	0	-120.49
3996.0	27	0.0	0	-120.38		3996.0	26.29	0.0	0	-121.09
4662.0	27.2	0.0	0	-120.18		4662.0	27.67	0.0	0	-119.71
5328.0	26.61	0.0	0	-120.77		5328.0	27.34	0.0	0	-120.04
5994.0	26.91	0.0	0	-120.47		5994.0	27	0.0	0	-120.38
6660.0	27.41	0.0	0	-119.97		6660.0	27.2	0.0	0	-120.18

7.1. Emission Spectrum Plots

This section is a series of plots showing a breakdown of the spectrum of emissions.

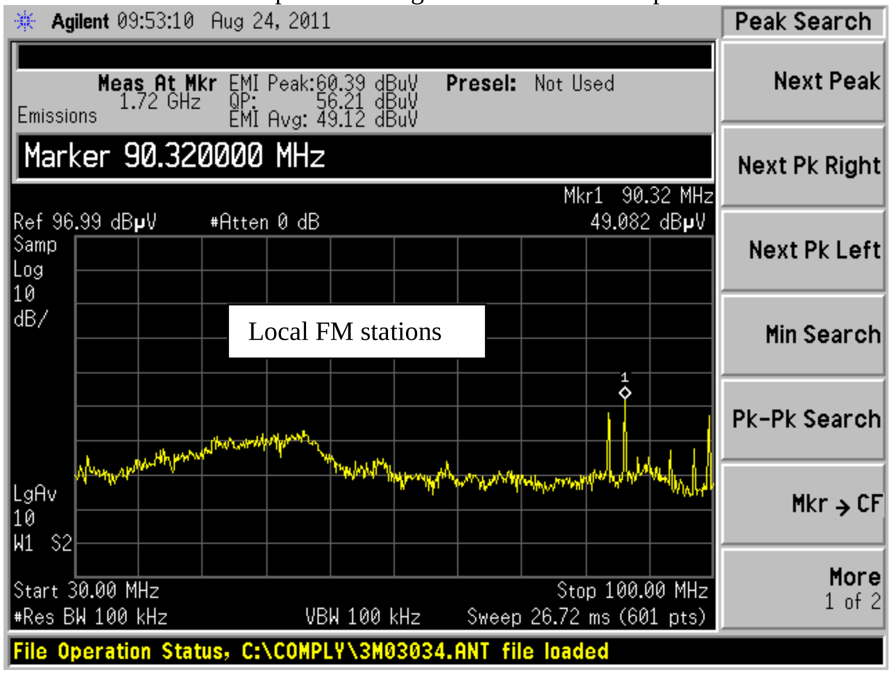


Figure 5, Rear, Vertical, 30 MHz to 100 MHz

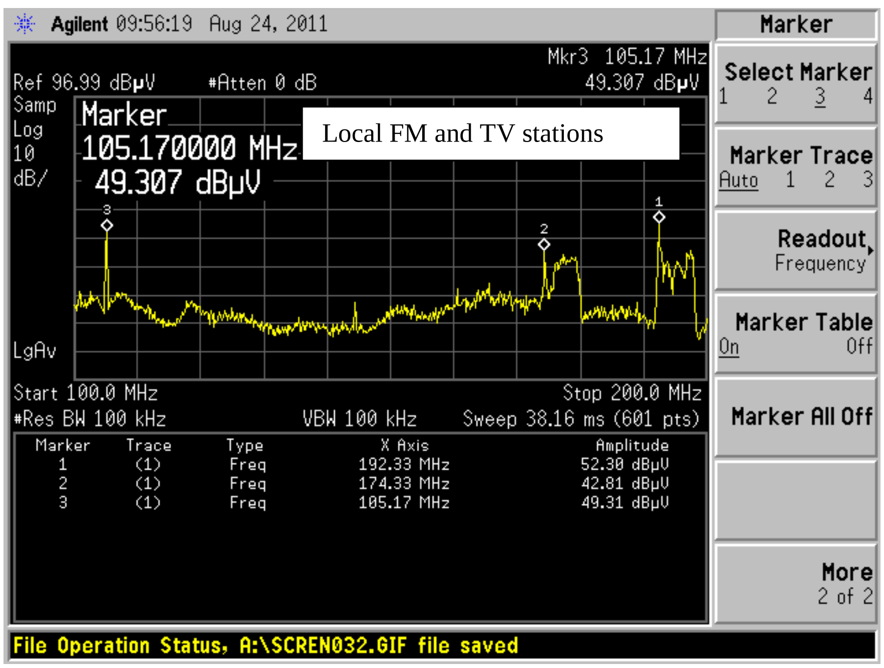


Figure 6, Rear, Vertical, 100 MHz to 200 MHz

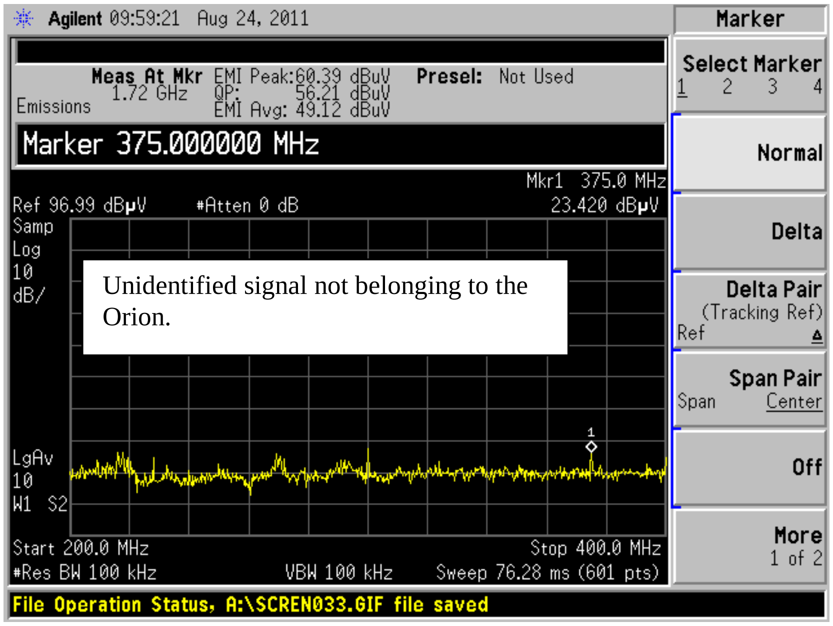


Figure 7, Rear, Vertical, 200 MHz to 400 MHz

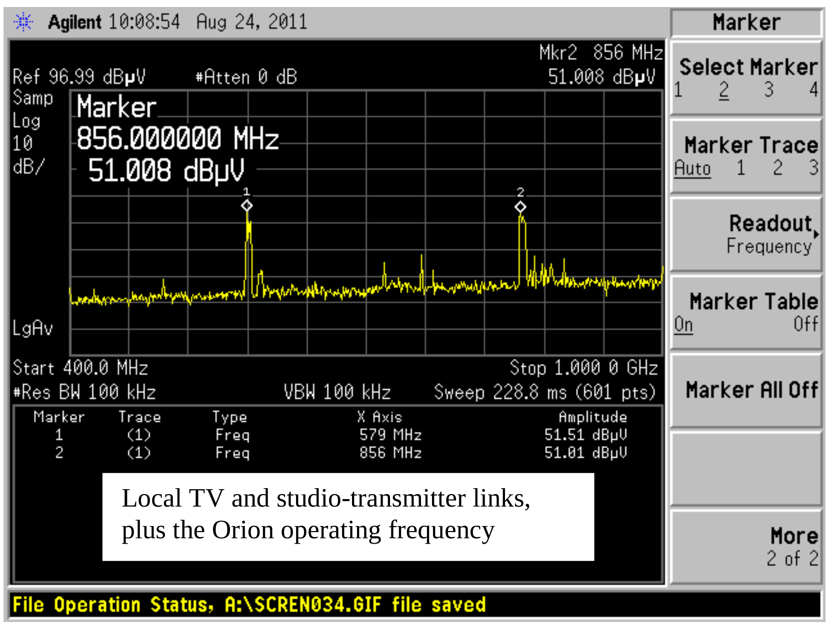


Figure 8, Rear, Vertical, 400 MHz to 1 GHz

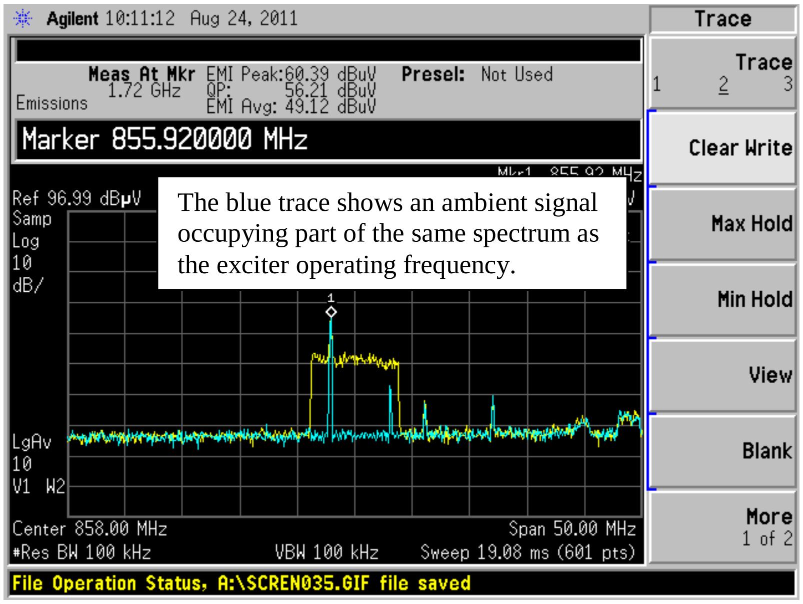


Figure 9, Ambient Plus Orion ON

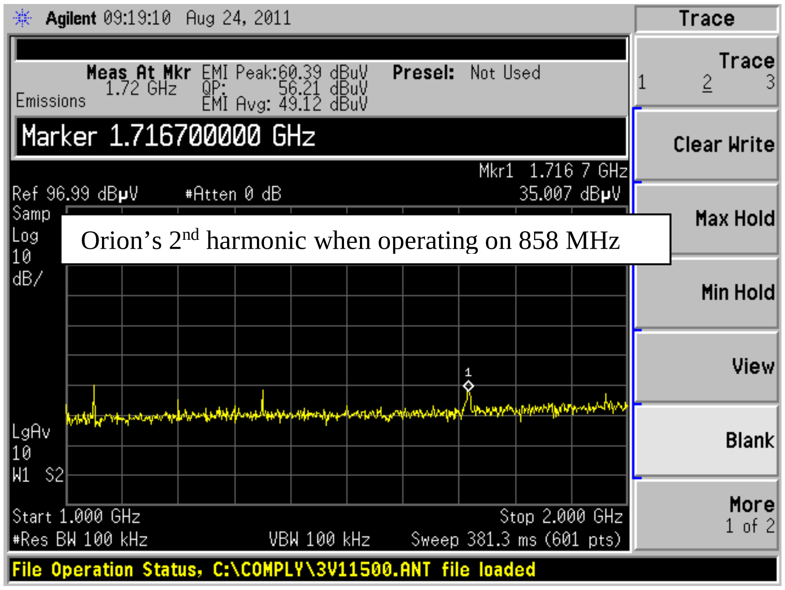


Figure 10, Rear Vertical, 1 GHz to 2 GHz

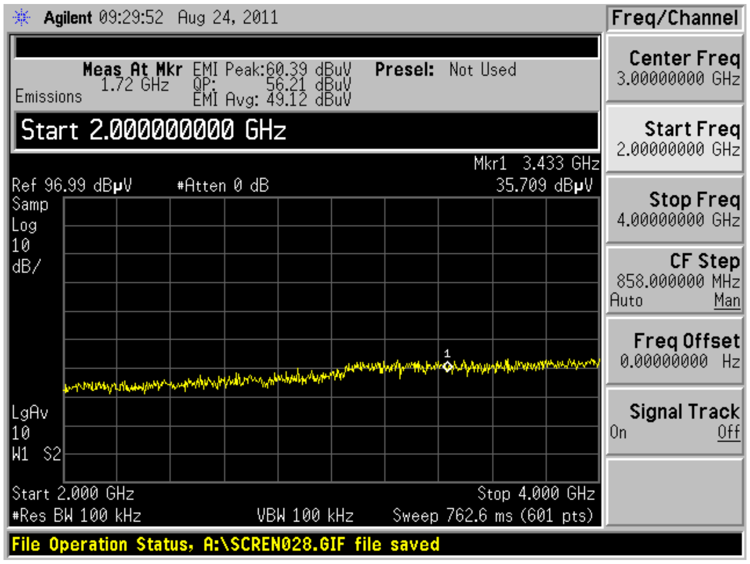


Figure 11, Rear, Vertical, 2 GHz to 4 GHz

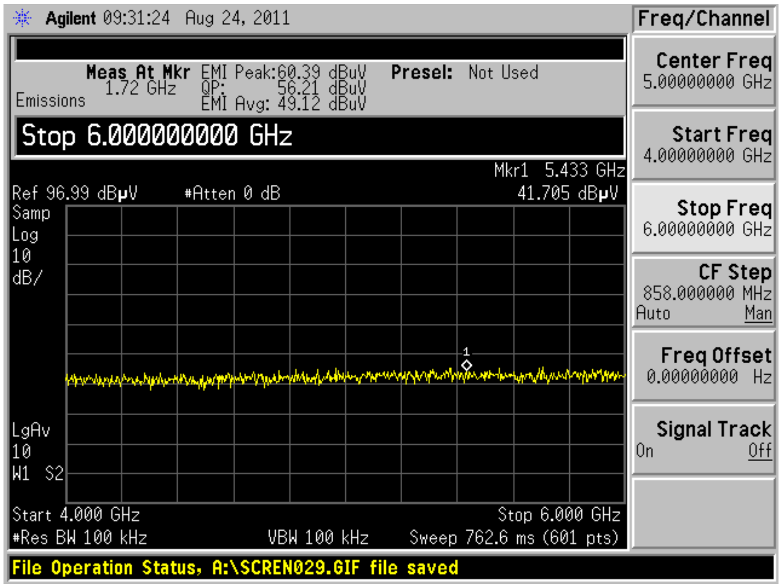


Figure 12, Rear, Vertical, 4 GHz to 6 GHz

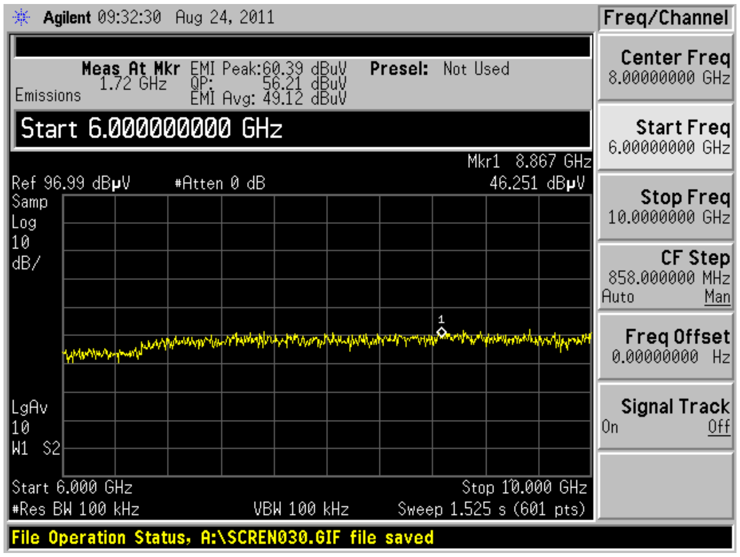


Figure 13, Rear, Vertical, 6 GHz to 10 GHz

Frequency stability.

8. Reference(s)

47CFR2.1055

8.1. Criteria

73.1545 requires the pilot frequency be held within a tolerance of ±1000 Hz.

8.2. Measurement Procedure

(a) The frequency stability shall be measured with variation of
ambient temperature as follows:

. . . .

(3) From 0 deg. to +50 deg. centigrade for equipment to be licensed
for use in the Radio Broadcast Services under part 74 of this chapter.

(b) Frequency measurements shall be made at the extremes of the specified temperature range and at intervals of not more than 10 deg. centigrade through the range. A period of time sufficient to stabilize all of the components of the oscillator circuit at each temperature level shall be allowed prior to frequency measurement. The short term transient effects on the frequency of the transmitter due to keying (except for broadcast transmitters) and any heating element cycling normally occurring at each ambient temperature level also shall be shown. Only the portion or portions of the transmitter containing the frequency determining and stabilizing circuitry need be subjected to the temperature variation test.

(d) The frequency stability shall be measured with variation of
primary supply voltage as follows:

(1) Vary primary supply voltage from 85 to 115 percent of the
nominal value for other than hand carried battery equipment.

(3) The supply voltage shall be measured at the input to the cable
normally provided with the equipment, or at the power supply terminals if cables are not normally provided. Effects on frequency of transmitter keying (except for broadcast transmitters) and any
heating element cycling at the nominal supply voltage and at each
extreme also shall be shown.

8.3. Evaluation Results:

The Maxiva transmitter frequency stability is determined solely by the exciter. A separate report on the FCC Verification for the exciter is available from Harris under document number: BD-REG-09-009.

The following paragraphs on the frequency stability of the exciter were taken from that report:

The exciter was placed in the environmental chamber. The AC line connected to a variac. The exciter was locked to an external SMPTE source, and the internal frequency reference was used to control the exciter frequency. Internal to the exciter the data at the Nyquist filter was turned off, thus allowing the exciter to produce a pilot only. The exciter was connected to a frequency counter and the frequency of the pilot measured. The exciter was allowed to soak at the ambient temperature until the frequency had settled. The line voltage was then varied and the frequency of the pilot recorded.

Temp	93.5VAC	110VAC	126.5VAC
0	670999986.3	670999986.5	670999986.5
10	670999986.3	670999986.2	670999986.4
20	670999991.6	670999990.7	670999991.2
30	670999988.2	670999988.7	670999986.7
40	670999988.4	670999988.2	670999986.8
50	670999987.7	670999987.7	670999987.1

Equipment used. Data taken on 08/31/08

Item	Manufacturer	Model	Serial Number	Calibration Due:
Exciter Tested	Harris	APEX M2X	Eng Unit 1	Not Required
Frequency Counter	HP	53132A	3710A04170	May 27 2009
Variac	Staco	3PN1010V	----	Not Required
Thermometer	Electro-Therm	SH66A	356747	May 31 2010
Temperature Chamber	Tenney	T30RC	12437-5	Not Required
SMPTE Source	Harris	HRX200	----	Not Required

Initial Frequency after stabilization:	670999988.7	Measured at Nominal (°C)	30C.

Initial Frequency	Lowest Frequency Measured (MHz)	Highest Frequency Measured (MHz)	Maximum Deviation(Hz)	Maximum Deviation(ppm)
670999988.7	670999986.3	670999991.6	5.3Hz	0.008

Frequency spectrum to be investigated.

8.4. Reference(s)

47CFR2.1057

8.5. Criteria

None

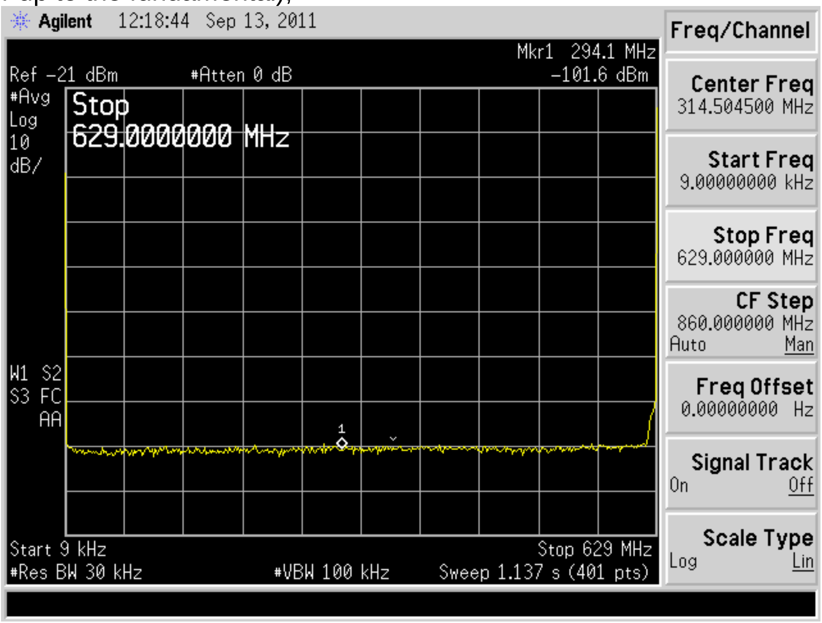
8.6. Measurement Procedure

(a) In all of the measurements set forth in Sections. 2.1051 and 2.1053, the spectrum shall be investigated from the lowest radio frequency signal generated in the equipment, without going below 9 kHz, up to at least the frequency shown below: (1) If the equipment operates below 10 GHz: to the tenth harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower.

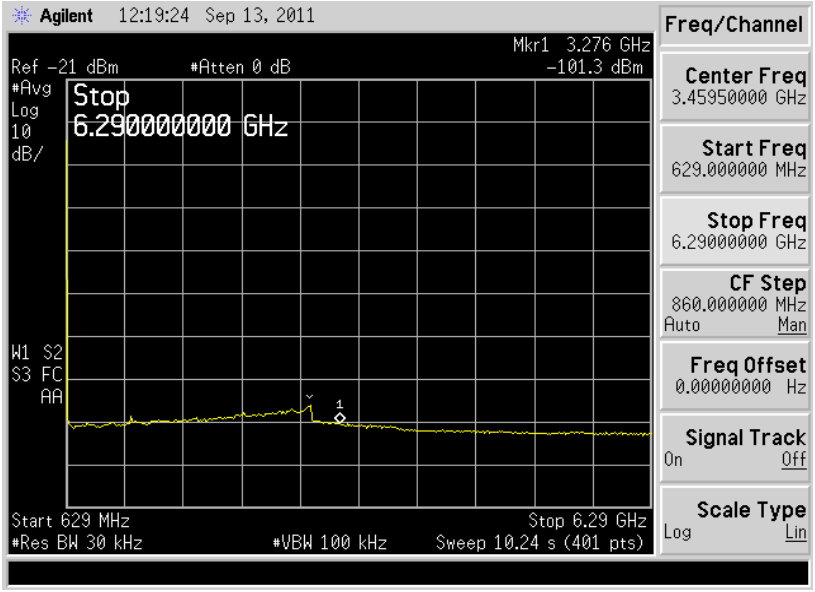
8.7. Evaluation Results:

Frequencies in the range of 9 kHz to the 10th harmonic of the fundamental (6.83 GHz) were investigated. Most of the previous data focused on the harmonics above 1 GHz.

For the low range of 9kHz to the fundamental, no spurious emissions were detected or measureable (neither conducted nor radiated). Conducted emissions are shown in the spectrum plots below (essentially measuring the instrument's noise floor up to the fundamental),



Spectral Plot: 9 kHz to Fundamental



Spectral Plot: Fundamental to 1 Ghz

9. TV transmission standards: Digital

9.1. Reference(s)

9.1.1. 47CFR73.682(d)

9.1.2. ATSC A/64B

9.2. Web Link(s)

http://edocket.access.gpo.gov/cfr_2007/octqtr/pdf/47cfr73.682.pdf

http://www.atsc.org/standards/a_64b.pdf

9.3. Criteria

73.682(d) Digital broadcast television transmission standard. Effective February 1, 2005, transmission of digital broadcast television (DTV) signals shall comply with the standards for such transmissions set forth in ATSC A/52: ''ATSC Standard Digital Audio Compression (AC–3)'' (incorporated by reference, *see* § 73.8000), ATSC Doc. A/53B, Revision B with Amendment 1 and Amendment 2: ''ATSC Digital Television Standard,'' except for Section 5.1.2 (''Compression format constraints'') of Annex A ''Video Systems Characteristics'') and the phrase ''*see* Table 3'' in Section 5.1.1. Table 2 and Section 5.1.2 Table 4 (incorporated by reference, *see* § 73.8000), and ATSC A/ 65B: ''ATSC Program and System Information Protocol for Terrestrial Broadcast and Cable,'' (Revision B) 2003 (incorporated by reference, *see* § 73.8000). Although not incorporated by reference, licensees may also consult ATSC Doc. A/54, Guide to Use of the ATSC Digital Television Standard, (October 4, 1995), and ATSC Doc. A/69, recommended Practice PSIP Implementation Guidelines for Broadcasters (June 25, 2002)

9.4. Measurement Procedure

None

9.5. Evaluation Results:

The Transmitter accepts a SMPTE 310 input from an external source and as such does not create or modify the audio or video standards as outlined in the ATSC specifications. Refer to ATCS compliance data, symbol rate tolerance, for more information.

10. Indicating Instruments

10.1. Reference(s)

10.1.1. 47CFR73.1215

10.2. Criteria

§ 73.1215 Specifications for indicating instruments.

The following requirements and specifications shall apply to indicating instruments used by broadcast stations:

(a) Linear scale instruments:
(1) Length of scale shall not be less than 2.3 inches (5.8 cm).
(2) Accuracy shall be at least 2 percent of the full scale reading.

(3) The maximum rating of the meter shall be such that it does not read off scale during modulation or normal operation.

(4) Scale shall have at least 40 divisions.

(5) Full scale reading shall not be greater than five times the minimum normal indication.

(b) Instruments having square-law scales:
(1) Meet the requirements of paragraphs(a) (1), (2), and (3) of this section for linear scale instruments.
(2) Full scale reading shall not be greater than three times the minimum normal indication.
(3) No scale division above one-third full scale reading shall be greater than one-thirtieth of the full scale reading. (Example: An ammeter meeting requirement (1) having full scale reading of 6 amperes is acceptable for reading currents from 2 to 6 amperes, provided no scale division between 2 and 6 amperes is greater than one-thirtieth of 6 amperes, 0.2 ampere.)

(c) Instruments having logarithmic scales:
(1) Meet the requirements of paragraphs (a) (1), (2), and (3) of this section for linear scale instruments.
(2) Full scale reading shall not be greater than five times the minimum normal indication.
(3) No scale division above one-fifth full scale reading (in watts) shall be greater than one-thirtieth of the full scale reading. Example: A wattmeter meeting requirement (3) having full scale reading of 1,500 watts is acceptable for reading power from 300 to 1,500 watts, provided no scale division between 300 and 1,500 watts is greater than one-thirtieth of 1,500 watts or 50 watts.)

(d) Instruments having expanded scales:
(1) Shall meet the requirements of paragraphs (a) (1), (2), and (3) of this section for linear scale instruments.
(2) Full scale reading shall not be greater than five times the minimum normal indication.
(3) No scale division above one-fifth full scale reading shall be greater than one-fiftieth of the full scale reading. (Example: An ammeter meeting the requirement (1) is acceptable for indicating current from 1 to 5 amperes, provided no division between 1 and 5 amperes is greater than one-fiftieth of 5 amperes, 0.1 ampere.)

(e) Digital meters, printers, or other numerical readout devices may be used in addition to or in lieu of indicating instruments meeting the specifications of paragraphs (a), (b), (c), and (d) of this section. The readout of the device must include at least three digits and must indicate the value of the parameter being read to an accuracy of 2%. The multiplier, if any, to be applied to the reading of each parameter must be indicated at the operating position.

(f) No instrument which has been broken or appears to be damaged or defective, or the accuracy of which is questionable shall be used, until it has been checked, and if necessary repaired and recalibrated by the manufacturer or qualified instrument repair service.

Repaired instruments shall not be used unless a certificate of calibration has been provided showing that the instrument conforms to the manufacturer's specifications for accuracy.

10.3. Measurement Procedure

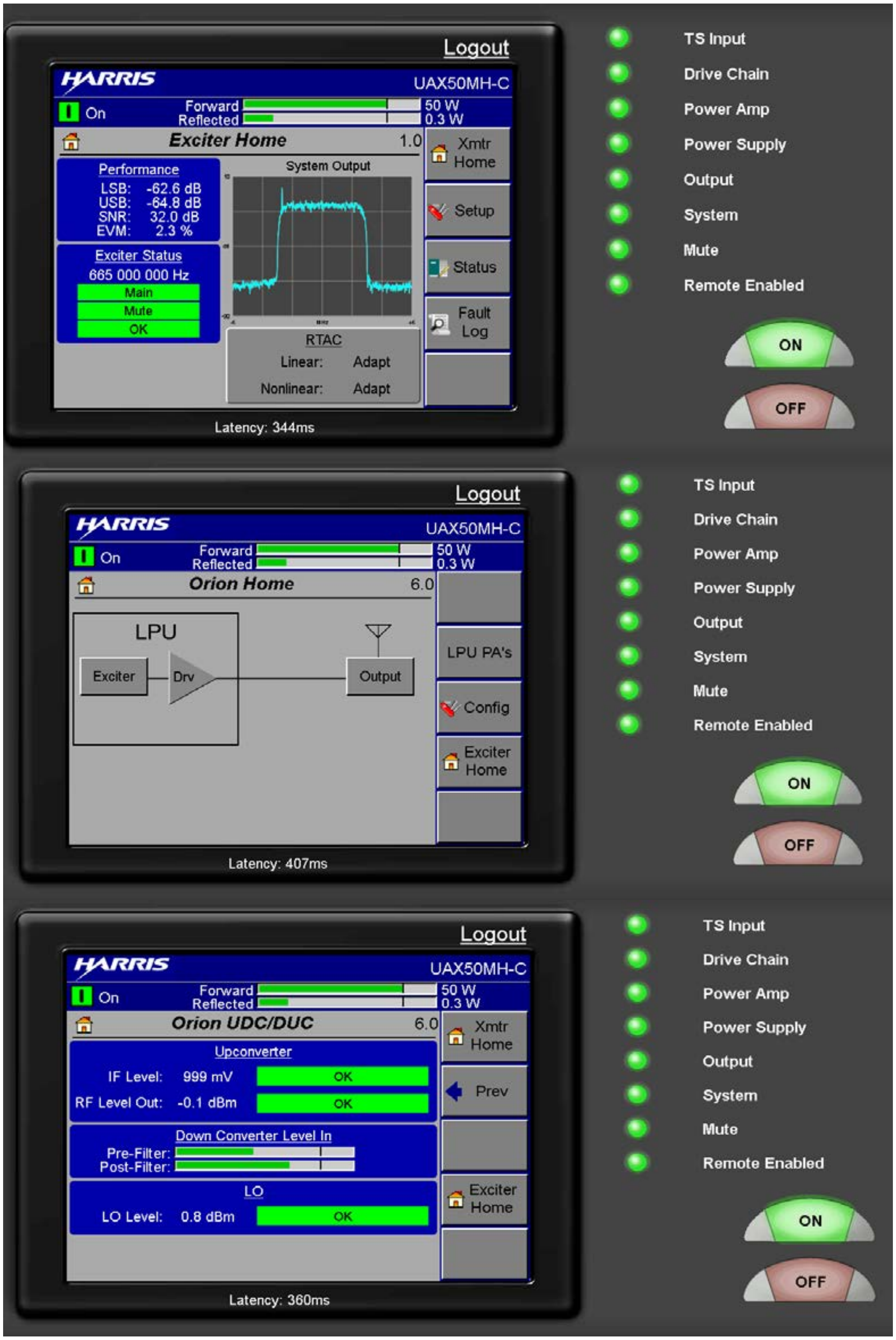
NA

10.4. Evaluation Results:

All meter scales are digital in the Maxiva ULX transmitter. The main power readings are displayed on the LCD screen using a bar graph display. In addition, the absolute numeric value of the power reading is displayed to a 10 watt resolution. At the lowest power level in the transmitter family, this is equivalent to 0.6% resolution.

Meter accuracy is 2% or better. No meter reads off scale during normal operation.

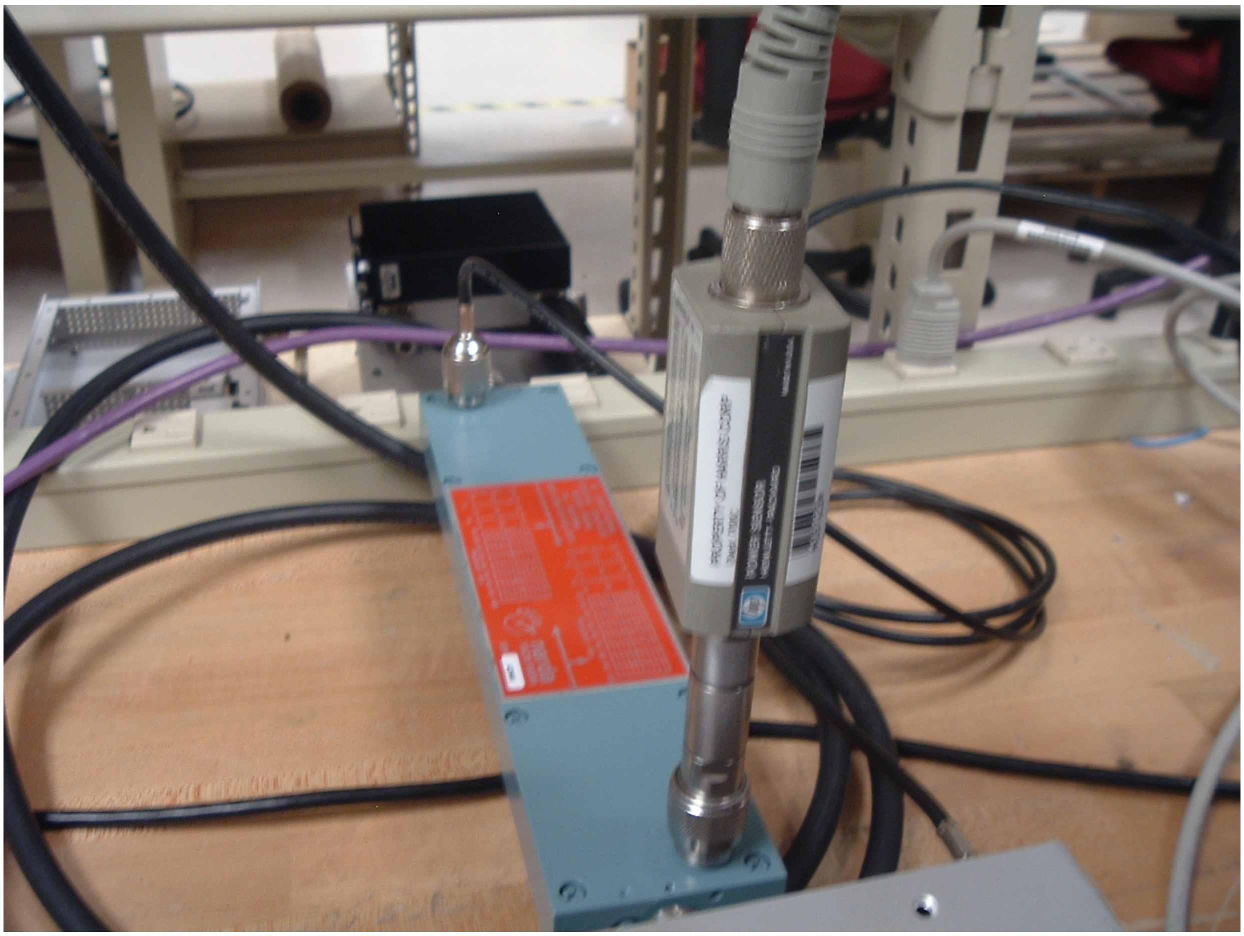
The main transmitter GUI screen displays are shown below,

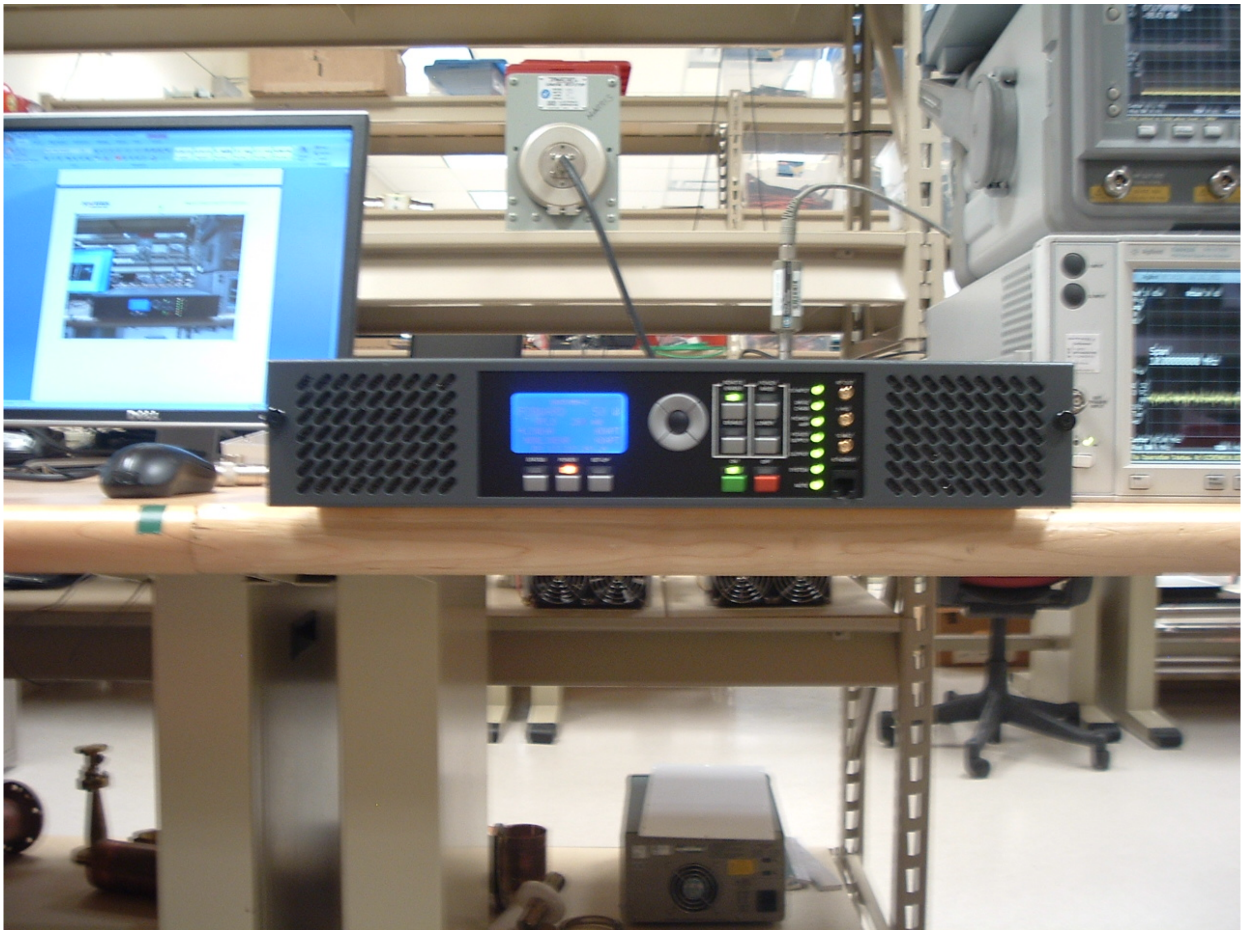

Logout
HARRIS
UAX50MH-C
On
Forward
Reflected
50 W
0.3 W
Exciter Home
1.0
Xmtr Home
Performance
LSB: -62.6 dB
USB: -64.8 dB
SNR: 32.0 dB
EVM: 2.3 %
System Output
Setup
Exciter Status
665 000 000 Hz
Main
Mute
OK
Status
Fault Log
RTAC
Linear: Adapt
Nonlinear: Adapt
Latency: 344ms
TS Input
Drive Chain
Power Amp
Power Supply
Output
System
Mute
Remote Enabled
ON
OFF
Logout
HARRIS
UAX50MH-C
On
Forward
Reflected
50 W
0.3 W
Orion Home
6.0
LPU
Exciter
Drv
Output
LPU PA's
Config
Exciter Home
Latency: 407ms
TS Input
Drive Chain
Power Amp
Power Supply
Output
System
Mute
Remote Enabled
ON
OFF
Logout
HARRIS
UAX50MH-C
On
Forward
Reflected
50 W
0.3 W
Orion UDC/DUC
6.0
Xmtr Home
Upconverter
IF Level: 999 mV OK
RF Level Out: -0.1 dBm OK
Prev
Down Converter Level In
Pre-Filter:
Post-Filter:
LO
LO Level: 0.8 dBm OK
Exciter Home
Latency: 360ms
TS Input
Drive Chain
Power Amp
Power Supply
Output
System
Mute
Remote Enabled
ON
OFF

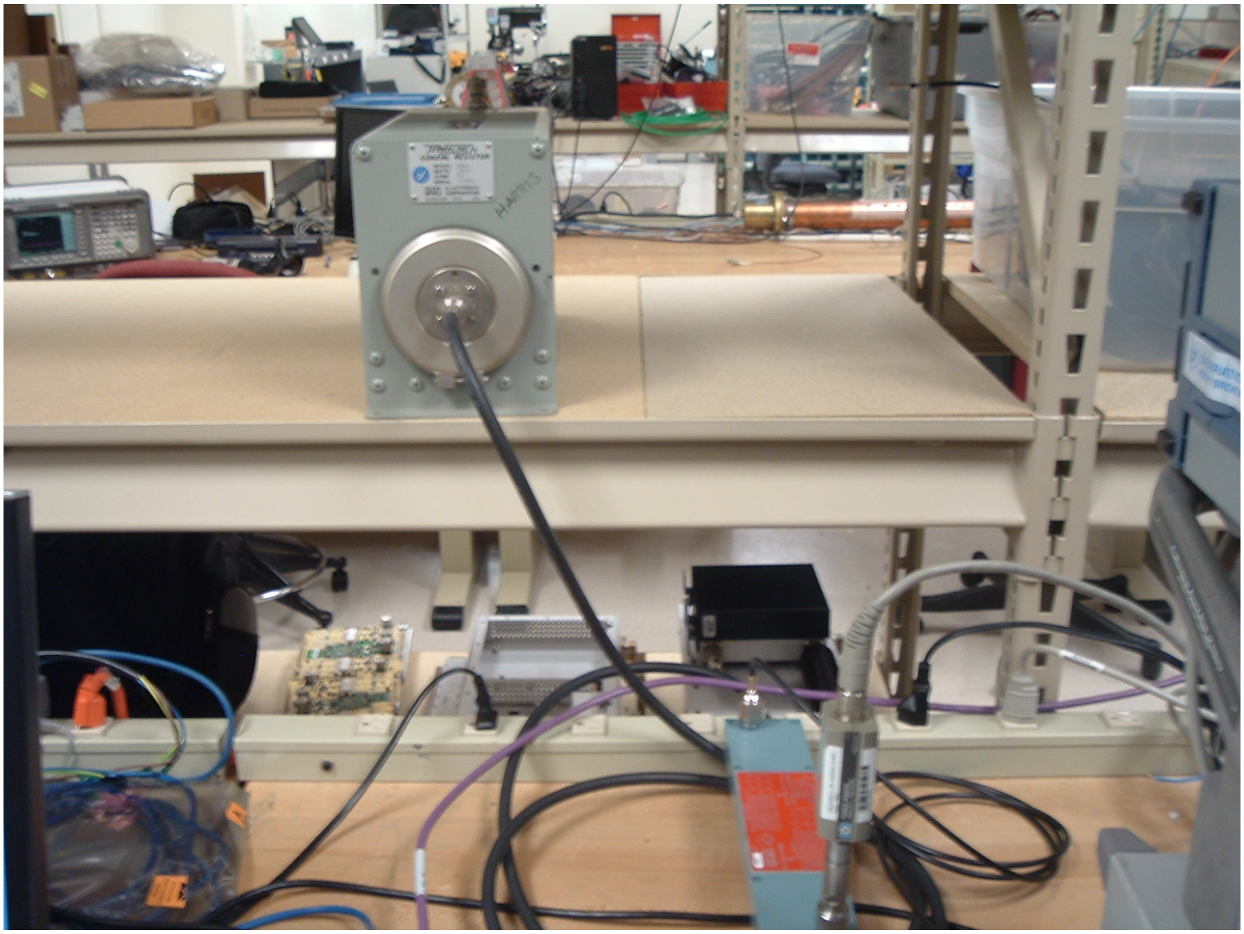
Description of Modifications Performed to Achieve Compliance

No modifications required

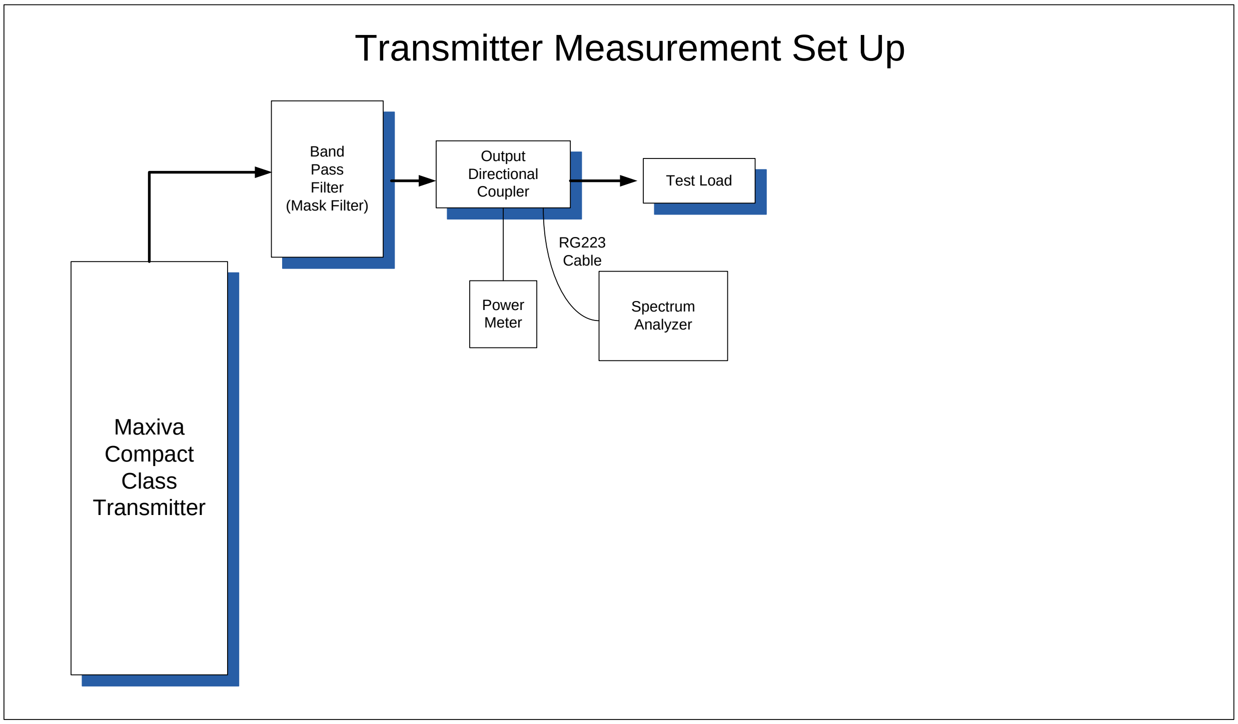
11. Photos of Test Setup







12. Block Diagram of Test Setup



13. List of Measuring Equipment Used

Equipment List	Model#	Harris Asset#	Cal Date/Due Date
Agilent Spectrum Analyzer	E44443A	00011777	11/29/2010 – 5/31/2012
Agilent Pwr Mtr	E4419B	11170	06/24/2010 – 12/31/2011
Agilent Pwr Sensor	8481H	03123	03/17/2011 – 09/30/2012
Tektronix MPEG Recorder/Player	MTX100B	00014167	Cal not Required