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Test Report

Prepared for: EMS Technologies of Canada, Ltd., now part of Honeywell

Model: A350 Part number 1458-A-1100

Description: A350 Satellite Data Unit

To

FCC Part 87

Date of Issue: October 18, 2012

On the behalf of the applicant:	**EMS Technologies of Canada, Ltd., now part of Honeywell** **400 Maple Grove Rd.** **Ottawa, ON K2V 1B8** **Canada**
Attention of:	**Ron Halka, Manager Sr. Product Mfg. Eng.** **Phone: (613) 591-9040** **E-Mail: Ron.Halka@Honeywell.com**

Prepared by

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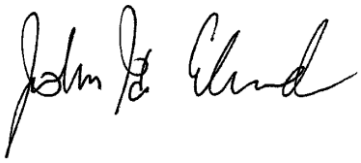

John Erhard
Project Test Engineer

Test Report Revision History

Revision	Date	Revised By	Reason for Revision
1.0	October 18, 2012	John Erhard	Original Document
2.0	April 3, 2013	Karen Springer	Corrected Emission Designator

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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**

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FCC OATS Reg, #933597

IC Reg. #2044A-1

Non-accredited tests contained in this report:

N/A

Standard Test Conditions Engineering Practices

All tests and measurement data shown were performed in accordance with FCC Rules and Regulations, Volume II; Part 2, Sub-part J, Sections 2.947, 2.1033(c), 2.1041, 2.1046, 2.1047, 2.1051, 2.1053, 2.1055, 2.1057 and the following individual Parts: 87.

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

In accordance with ANSI C63.10-2009 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 specify testing over a different temperature range. Also, unless otherwise indicated, the humidity levels were in the range of 10% to 90% relative humidity.

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

Environmental Conditions		
Temperature (º C)	**Humidity (%)**	**Pressure (mbar)**
26.20	36.10	966.900

EUT Description

Model: A350 Part number 1458-A-1100
Description: A350 Satellite Data Unit
Firmware: N/A
Software: N/A

Additional Information

The EUT is an aviation earth station.

EUT Operation during Tests

The EUT was in a normal hardware configuration with a rack mount PC running test software allowing manual control of the radio functions. .

Test Results Summary

Specification	Test Name	Pass, Fail, N/A	Comments
2.1046, 87.131	Carrier Output Power (Conducted)	Pass	
2.1051, 87.139(i)(1)	Unwanted Emissions (Transmitter Conducted)	Pass	
2.1053	Field Strength of Spurious Radiation	Pass	
2.1049, 87.139(i)(3)	Emission Masks (Occupied Bandwidth)	Pass	See FCC waiver for allowable variance
2.1047	Audio Low Pass Filter (Voice Input)	N/A	The EUT does not contain an audio input
2.1047	Audio Frequency Response	N/A	The EUT does not contain an audio input
2.1047	Modulation Limiting	N/A	The EUT does not contain an audio input
2.1055, 87.133(a)	Frequency Stability (Temperature Variation)	Pass	
2.1055, 87.133(a)	Frequency Stability (Voltage Variation)	Pass	

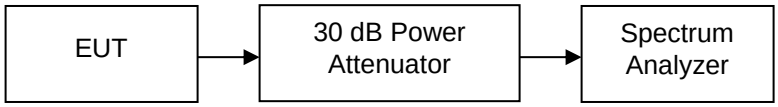
Carrier Output Power (Conducted)

Name of Test: Carrier Output Power (Conducted) **Engineer:** John Erhard
Test Equipment Utilized: i00331 **Test Date:** 10/15/2012

Test Procedure

The Equipment Under Test (EUT) was connected directly to a spectrum analyzer with the RBW set to 1 MHz and the VBW set to 3 X RBW. This guaranteed that the RBW was greater than the transmit signal occupied bandwidth ensuring there was no signal suppression. The peak readings were taken for each modulation type and the result was then compared to the limit.

Test Setup



BPSK Transmitter Peak Output Power

Tuned Frequency (MHz)	Measured Power (dBm)	Measured Power (W)	Limit (W)	Result
1626.5	46.99	50.0	60	Pass
1643.5	46.92	49.2	60	Pass
1660.5	47.00	50.1	60	Pass

QPSK Transmitter Peak Output Power

Tuned Frequency (MHz)	Measured Power (dBm)	Measured Power (W)	Limit (W)	Result
1626.5	44.21	26.4	60	Pass
1643.5	44.27	26.7	60	Pass
1660.5	44.14	25.9	60	Pass

QAM Transmitter Peak Output Power

Tuned Frequency (MHz)	Measured Power (dBm)	Measured Power (W)	Limit (W)	Result
1626.5	44.18	26.2	60	Pass
1643.5	44.20	26.3	60	Pass
1660.5	44.15	26.0	60	Pass

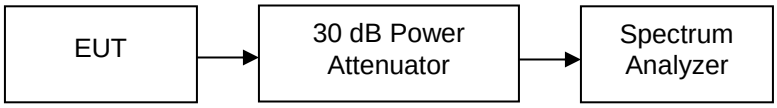
Conducted Spurious Emissions

Name of Test: Conducted Spurious Emissions **Engineer:** John Erhard
Test Equipment Utilized: i00331 **Test Date:** 10/16/2012

Test Procedure

The EUT was connected directly to a spectrum analyzer to verify that the UUT met the requirements for spurious emissions. The RBW was set according to the requirements of 87139 (i)(1). The power was corrected for the measurement RBW bandwidth. The dBc limit, the DLNA rejection, and corrected power were summed together to determine the necessary dBm value of the EUT to provide a system rejection greater than the FCC limit. This necessary value was compared to the measured value to ensure compliance to the specification, which is expressed as the margin. A negative value indicates a passing result.

Test Setup



BPSK 1626.5 MHz Conducted Spurious Emissions

Freq (MHz)	Limit (dBc)	RBW (MHz)	Modified A Type DLNA Rejection (dB)	Measured Power (dBm)	Corrected Power (dBm)	Necessary Level (dBm)	Measured Level (dBm)	Margin (dB)
.010 to 1525	-135	0.004	80	46.62	47.87	-7.13	-35.69	-28.56
1525 to 1559	-203	0.004	120	46.62	47.87	-35.13	-42.04	-6.91
1559 to 1585	-155	1	100	46.99	46.99	-8.01	-20.37	-12.36
1585 to 1605	-143	1	88	46.99	46.99	-8.01	-20.54	-12.53
1605 to1610	-117	1	62	46.99	46.99	-8.01	-20.78	-12.77
1610 to 1610.6	-95	1	40	46.99	46.99	-8.01	-18.47	-10.46
1610.6 to 1613.8	-80	1	40	46.99	46.99	6.99	-19.56	-26.55
1613.8 to 1614	-95	1	40	46.99	46.99	-8.01	-18.03	-10.02
1614 to 1620	-70	0.004	2.3	46.62	47.87	-19.83	-29.54	-9.71
1620 to 1626.5	-70	0.004	2.3	46.62	47.87	-19.83	-34.04	-14.21
1626.5 to 1660	-70	0.004	0.8	46.62	47.87	-21.33	-32.32	-10.99
1660 to 1670	-49.5	0.02	0.8	46.9	45.14	-3.56	-20.7	-17.14
1670 to 1735	-60	0.004	0.8	46.62	47.87	-11.33	-38.06	-26.73
1735 to 12000	-105	0.004	50	46.62	47.87	-7.13	-37.8	-30.67
12000 to 18000	-70	0.004	15	46.62	47.87	-7.13	-36.01	-28.88

BPSK 1643.5 MHz Conducted Spurious Emissions

Freq (MHz)	Limit (dBc)	RBW (MHz)	Modified A Type DLNA Rejection (dB)	Measured Power (dBm)	Corrected Power (dBm)	Necessary Level (dBm)	Measured Level (dBm)	Margin (dB)
.010 to 1525	-135	0.004	80	46.51	47.76	-7.24	-39.75	-32.51
1525 to 1559	-203	0.004	120	46.51	47.76	-35.24	-41.31	-6.07
1559 to 1585	-155	1	100	46.92	46.92	-8.08	-20.15	-12.07
1585 to 1605	-143	1	88	46.92	46.92	-8.08	-20.45	-12.37
1605 to1610	-117	1	62	46.92	46.92	-8.08	-20.64	-12.56
1610 to 1610.6	-95	1	40	46.92	46.92	-8.08	-20.53	-12.45
1610.6 to 1613.8	-80	1	40	46.92	46.92	6.92	-20.84	-27.76
1613.8 to 1614	-95	1	40	46.92	46.92	-8.08	-19.74	-11.66
1614 to 1620	-70	0.004	2.3	46.51	47.76	-19.94	-29.43	-9.49
1620 to 1626.5	-70	0.004	2.3	46.51	47.76	-19.94	-31.27	-11.33
1626.5 to 1660	-70	0.004	0.8	46.51	47.76	-21.44	-34.39	-12.95
1660 to 1670	-49.5	0.02	0.8	46.87	45.11	-3.59	-28.81	-25.22
1670 to 1735	-60	0.004	0.8	46.51	47.76	-11.44	-32.8	-21.36
1735 to 12000	-105	0.004	50	46.51	47.76	-7.24	-37.36	-30.12
12000 to 18000	-70	0.004	15	46.51	47.76	-7.24	-36.21	-28.97

BPSK 1660.5 MHz Conducted Spurious Emissions

Freq (MHz)	Limit (dBc)	RBW (MHz)	Modified A Type DLNA Rejection (dB)	Measured Power (dBm)	Corrected Power (dBm)	Necessary Level (dBm)	Measured Level (dBm)	Margin (dB)
.010 to 1525	-135	0.004	80	46.6	47.85	-7.15	-39.64	-32.49
1525 to 1559	-203	0.004	120	46.6	47.85	-35.15	-41.78	-6.63
1559 to 1585	-155	1	100	47	47.00	-8.00	-20.39	-12.39
1585 to 1605	-143	1	88	47	47.00	-8.00	-20.59	-12.59
1605 to1610	-117	1	62	47	47.00	-8.00	-20.09	-12.09
1610 to 1610.6	-95	1	40	47	47.00	-8.00	-20.27	-12.27
1610.6 to 1613.8	-80	1	40	47	47.00	7.00	-19.71	-26.71
1613.8 to 1614	-95	1	40	47	47.00	-8.00	-19.21	-11.21
1614 to 1620	-70	0.004	2.3	46.6	47.85	-19.85	-28.98	-9.13
1620 to 1626.5	-70	0.004	2.3	46.6	47.85	-19.85	-42.25	-22.40
1626.5 to 1660	-70	0.004	0.8	46.6	47.85	-21.35	-27.87	-6.52
1660 to 1670	-49.5	0.02	0.8	46.83	45.07	-3.63	-25.15	-21.52
1670 to 1735	-60	0.004	0.8	46.6	47.85	-11.35	-31.4	-20.05
1735 to 12000	-105	0.004	50	46.6	47.85	-7.15	-37.34	-30.19
12000 to 18000	-70	0.004	15	46.6	47.85	-7.15	-35.39	-28.24

QPSK 1626.5 MHz Conducted Spurious Emissions

Freq (MHz)	Limit (dBc)	RBW (MHz)	Modified A Type DLNA Rejection (dB)	Measured Power (dBm)	Corrected Power (dBm)	Necessary Level (dBm)	Measured Level (dBm)	Margin (dB)
.010 to 1525	-135	0.004	80	33.75	35.00	-20.00	-38.32	-18.32
1525 to 1559	-203	0.004	120	33.75	35.00	-48.00	-55.07	-7.07
1559 to 1585	-155	1	100	44.21	44.21	-10.79	-20.23	-9.44
1585 to 1605	-143	1	88	44.21	44.21	-10.79	-20.02	-9.23
1605 to1610	-117	1	62	44.21	44.21	-10.79	-20.26	-9.47
1610 to 1610.6	-95	1	40	44.21	44.21	-10.79	-19.28	-8.49
1610.6 to 1613.8	-80	1	40	44.21	44.21	4.21	-20.01	-24.22
1613.8 to 1614	-95	1	40	44.21	44.21	-10.79	-19.90	-9.11
1614 to 1620	-70	0.004	2.3	33.75	35.00	-32.70	-41.37	-8.67
1620 to 1626.5	-70	0.004	2.3	33.75	35.00	-32.70	-36.57	-3.87
1626.5 to 1660	-70	0.004	0.8	33.75	35.00	-34.20	-36.13	-1.93
1660 to 1670	-49.5	0.02	0.8	40.12	38.36	-10.34	-35.08	-24.74
1670 to 1735	-60	0.004	0.8	33.75	35.00	-24.20	-30.16	-5.96
1735 to 12000	-105	0.004	50	33.75	35.00	-20.00	-37.26	-17.26
12000 to 18000	-70	0.004	15	33.75	35.00	-20.00	-35.63	-15.63

QPSK 1643.5 MHz Conducted Spurious Emissions

Freq (MHz)	Limit (dBc)	RBW (MHz)	Modified A Type DLNA Rejection (dB)	Measured Power (dBm)	Corrected Power (dBm)	Necessary Level (dBm)	Measured Level (dBm)	Margin (dB)
.010 to 1525	-135	0.004	80	34.38	35.63	-19.37	-38.96	-19.59
1525 to 1559	-203	0.004	120	34.38	35.63	-47.37	-55.63	-8.26
1559 to 1585	-155	1	100	44.27	44.27	-10.73	-19.47	-8.74
1585 to 1605	-143	1	88	44.27	44.27	-10.73	-20.72	-9.99
1605 to1610	-117	1	62	44.27	44.27	-10.73	-19.67	-8.94
1610 to 1610.6	-95	1	40	44.27	44.27	-10.73	-18.80	-8.07
1610.6 to 1613.8	-80	1	40	44.27	44.27	4.27	-19.53	-23.80
1613.8 to 1614	-95	1	40	44.27	44.27	-10.73	-19.28	-8.55
1614 to 1620	-70	0.004	2.3	34.38	35.63	-32.07	-42.85	-10.78
1620 to 1626.5	-70	0.004	2.3	34.38	35.63	-32.07	-44.57	-12.50
1626.5 to 1660	-70	0.004	0.8	34.38	35.63	-33.57	-33.99	-0.42
1660 to 1670	-49.5	0.02	0.8	40.07	38.31	-10.39	-35.47	-25.08
1670 to 1735	-60	0.004	0.8	34.38	35.63	-23.57	-30.93	-7.36
1735 to 12000	-105	0.004	50	34.38	35.63	-19.37	-37.70	-18.33
12000 to 18000	-70	0.004	15	34.38	35.63	-19.37	-35.33	-15.96

QPSK 1660.5 MHz Conducted Spurious Emissions

Freq (MHz)	Limit (dBc)	RBW (MHz)	Modified A Type DLNA Rejection (dB)	Measured Power (dBm)	Corrected Power (dBm)	Necessary Level (dBm)	Measured Level (dBm)	Margin (dB)
.010 to 1525	-135	0.004	80	33.32	34.57	-20.43	-39.25	-18.82
1525 to 1559	-203	0.004	120	33.32	34.57	-48.43	-55.25	-6.82
1559 to 1585	-155	1	100	44.14	44.14	-10.86	-20.06	-9.20
1585 to 1605	-143	1	88	44.27	44.27	-10.73	-20.63	-9.90
1605 to1610	-117	1	62	44.27	44.27	-10.73	-19.82	-9.09
1610 to 1610.6	-95	1	40	44.27	44.27	-10.73	-19.94	-9.21
1610.6 to 1613.8	-80	1	40	44.27	44.27	4.27	-19.62	-23.89
1613.8 to 1614	-95	1	40	44.27	44.27	-10.73	-21.19	-10.46
1614 to 1620	-70	0.004	2.3	33.32	34.57	-33.13	-46.52	-13.39
1620 to 1626.5	-70	0.004	2.3	33.32	34.57	-33.13	-42.70	-9.57
1626.5 to 1660	-70	0.004	0.8	33.32	34.57	-34.63	-35.73	-1.10
1660 to 1670	-49.5	0.02	0.8	40.39	38.63	-10.07	-24.24	-14.17
1670 to 1735	-60	0.004	0.8	33.32	34.57	-24.63	-38.99	-14.36
1735 to 12000	-105	0.004	50	33.32	34.57	-20.43	-37.07	-16.64
12000 to 18000	-70	0.004	15	33.32	34.57	-20.43	-34.80	-14.37

QAM 1626.5 MHz Conducted Spurious Emissions

Freq (MHz)	Limit (dBc)	RBW (MHz)	Modified A Type DLNA Rejection (dB)	Measured Power (dBm)	Corrected Power (dBm)	Necessary Level (dBm)	Measured Level (dBm)	Margin (dB)
.010 to 1525	-135	0.004	80	32.08	33.33	-21.67	-39.05	-17.38
1525 to 1559	-203	0.004	120	32.08	33.33	-49.67	-53.80	-4.13
1559 to 1585	-155	1	100	44.18	44.18	-10.82	-20.55	-9.73
1585 to 1605	-143	1	88	44.18	44.18	-10.82	-20.42	-9.60
1605 to1610	-117	1	62	44.18	44.18	-10.82	-19.41	-8.59
1610 to 1610.6	-95	1	40	44.18	44.18	-10.82	-20.06	-9.24
1610.6 to 1613.8	-80	1	40	44.18	44.18	4.18	-18.19	-22.37
1613.8 to 1614	-95	1	40	44.18	44.18	-10.82	-18.19	-7.37
1614 to 1620	-70	0.004	2.3	32.08	33.33	-34.37	-41.12	-6.75
1620 to 1626.5	-70	0.004	2.3	32.08	33.33	-34.37	-36.47	-2.10
1626.5 to 1660	-70	0.004	0.8	32.08	33.33	-35.87	-36.93	-1.06
1660 to 1670	-49.5	0.02	0.8	39.52	37.76	-10.94	-35.03	-24.09
1670 to 1735	-60	0.004	0.8	32.08	33.33	-25.87	-46.35	-20.48
1735 to 12000	-105	0.004	50	32.08	33.33	-21.67	-37.27	-15.60
12000 to 18000	-70	0.004	15	32.08	33.33	-21.67	-35.11	-13.44

QAM 1643.5 MHz Conducted Spurious Emissions

Freq (MHz)	Limit (dBc)	RBW (MHz)	Modified A Type DLNA Rejection (dB)	Measured Power (dBm)	Corrected Power (dBm)	Necessary Level (dBm)	Measured Level (dBm)	Margin (dB)
.010 to 1525	-135	0.004	80	31.55	32.80	-22.20	-39.51	-17.31
1525 to 1559	-203	0.004	120	31.55	32.80	-50.20	-55.72	-5.52
1559 to 1585	-155	1	100	44.2	44.2	-10.80	-19.78	-8.98
1585 to 1605	-143	1	88	44.2	44.2	-10.80	-20.65	-9.85
1605 to1610	-117	1	62	44.2	44.2	-10.80	-19.54	-8.74
1610 to 1610.6	-95	1	40	44.2	44.2	-10.80	-19.08	-8.28
1610.6 to 1613.8	-80	1	40	44.2	44.2	4.20	-20.31	-24.51
1613.8 to 1614	-95	1	40	44.2	44.2	-10.80	-18.78	-7.98
1614 to 1620	-70	0.004	2.3	31.55	32.80	-34.90	-43.15	-8.25
1620 to 1626.5	-70	0.004	2.3	31.55	32.80	-34.90	-45.55	-10.65
1626.5 to 1660	-70	0.004	0.8	31.55	32.80	-36.40	-37.03	-0.63
1660 to 1670	-49.5	0.02	0.8	39.74	37.98	-10.72	-36.89	-26.17
1670 to 1735	-60	0.004	0.8	31.55	32.80	-26.40	-40.59	-14.19
1735 to 12000	-105	0.004	50	31.55	32.80	-22.20	-37.74	-15.54
12000 to 18000	-70	0.004	15	31.55	32.80	-22.20	-35.53	-13.33

QAM 1660.5 MHz Conducted Spurious Emissions

Freq (MHz)	Limit (dBc)	RBW (MHz)	Modified A Type DLNA Rejection (dB)	Measured Power (dBm)	Corrected Power (dBm)	Necessary Level (dBm)	Measured Level (dBm)	Margin (dB)
.010 to 1525	-135	0.004	80	32.66	33.91	-21.09	-39.08	-17.99
1525 to 1559	-203	0.004	120	32.66	33.91	-49.09	-55.44	-6.35
1559 to 1585	-155	1	100	44.15	44.15	-10.85	-20.71	-9.86
1585 to 1605	-143	1	88	44.15	44.15	-10.85	-20.68	-9.83
1605 to1610	-117	1	62	44.15	44.15	-10.85	-20.77	-9.92
1610 to 1610.6	-95	1	40	44.15	44.15	-10.85	-20.09	-9.24
1610.6 to 1613.8	-80	1	40	44.15	44.15	4.15	-19.35	-23.50
1613.8 to 1614	-95	1	40	44.15	44.15	-10.85	-19.66	-8.81
1614 to 1620	-70	0.004	2.3	32.66	33.91	-33.79	-46.01	-12.22
1620 to 1626.5	-70	0.004	2.3	32.66	33.91	-33.79	-43.07	-9.28
1626.5 to 1660	-70	0.004	0.8	32.66	33.91	-35.29	-37.48	-2.19
1660 to 1670	-49.5	0.02	0.8	39.91	38.15	-10.55	-26.39	-15.84
1670 to 1735	-60	0.004	0.8	32.66	33.91	-25.29	-31.37	-6.08
1735 to 12000	-105	0.004	50	32.66	33.91	-21.09	-37.72	-16.63
12000 to 18000	-70	0.004	15	32.66	33.91	-21.09	-35.29	-14.20

Field Strength of Spurious Radiation

Name of Test:	Field Strength of Spurious Radiation	**Engineer:**	John Erhard
Test Equipment Utilized:	i00103, i00331	**Test Date:**	10/18/2012

Test Procedure

A) Connect the equipment as illustrated

B) Adjust the spectrum analyzer for the following settings:
1) Resolution Bandwidth 100 kHz (<1 GHZ), 1 MHZ (> 1GHz).
2) Video Bandwidth ≥ 3 times Resolution Bandwidth, or 30 kHz
3) Sweep Speed ≤2000 Hz/second
4) Detector Mode = Mean or Average Power

C) Place the transmitter to be tested on the turntable in the standard test site. The transmitter is transmitting into a non-radiating load that is placed on the turntable. The RF cable to this load should be of minimum length.

D) For each spurious measurement the test antenna should be adjusted to the correct length for the frequency involved. This length may be determined from a calibration ruler supplied with the equipment. Measurements shall be made from the lowest radio frequency generated in the equipment to the tenth harmonic of the carrier, except for the region close to the carrier equal to ± the test bandwidth (see section 1.3.4.4).

E) For each spurious frequency, raise and lower the test antenna from 1 m to 4 m to obtain a maximum reading on the spectrum analyzer with the test antenna at horizontal polarity. Repeat this procedure to obtain the highest possible reading. Record this maximum reading.

F) Repeat step E) for each spurious frequency with the test antenna polarized vertically.

G) Reconnect the equipment as illustrated.

H) Keep the spectrum analyzer adjusted as in step B).

I) Remove the transmitter and replace it with a substitution antenna (the antenna should be half-wavelength for each frequency involved). The center of the substitution antenna should be approximately at the same location as the center of the transmitter. At lower frequencies, where the substitution antenna is very long, this will be impossible to achieve when the antenna is polarized vertically. In such case the lower end of the antenna should be 0.3 m above the ground.

J) Feed the substitution antenna at the transmitter end with a signal generator connected to the antenna by means of a non-radiating cable. With the antennas at both ends horizontally polarized and with the signal generator tuned to a particular spurious frequency, raise and lower the test antenna to obtain a maximum reading at the spectrum analyzer. Adjust the level of the signal generator output until the previously recorded maximum reading for this set of conditions is obtained. This should be done carefully repeating the adjustment of the test antenna and generator output.

K) Repeat step J) with both antennas vertically polarized for each spurious frequency.

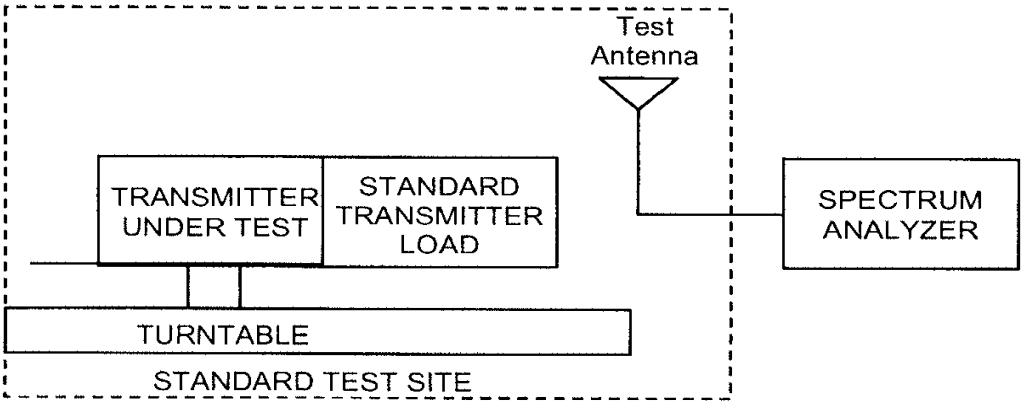
L) Calculate power in dBm into a reference ideal half-wave dipole antenna by reducing the readings obtained in steps J) and K) by the power loss in the cable between the generator and the antenna and further corrected for the gain of the substitution antenna used relative to an ideal half-wave dipole antenna.

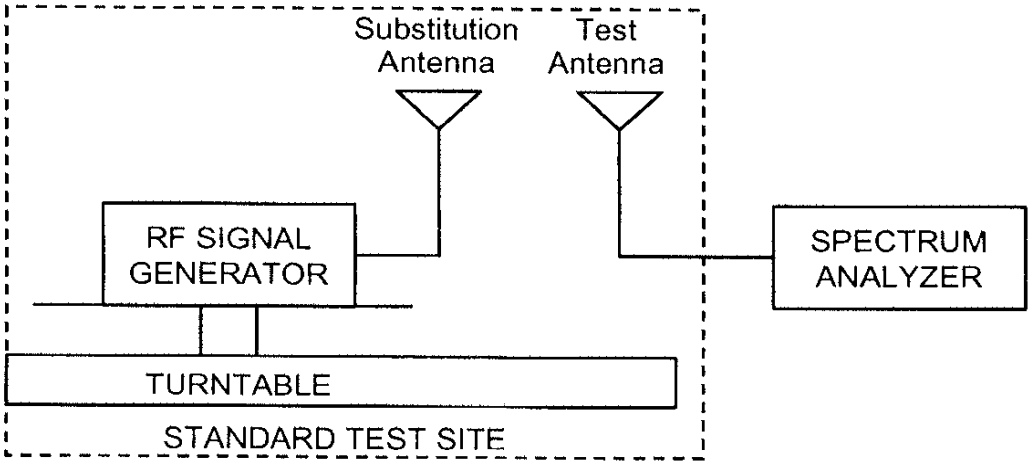
M) The levels recorded in step L) are absolute levels of radiated spurious emissions in dBm. The radiated spurious emissions in dB can be calculated by the following:

Radiated spurious emissions dB = **$10\log_{10}$(TX power in watts/0.001) – the levels in step l)**

NOTE: It is permissible that other antennas provided can be referenced to a dipole.

Test Setup


Test
Antenna
TRANSMITTER
UNDER TEST
STANDARD
TRANSMITTER
LOAD
SPECTRUM
ANALYZER
TURNTABLE
STANDARD TEST SITE


Substitution
Antenna
Test
Antenna
RF SIGNAL
GENERATOR
SPECTRUM
ANALYZER
TURNTABLE
STANDARD TEST SITE

BPSK 1626.5 MHz

Emission Frequency (MHz)	Measured Level (dBm)	Limit (dBm)	Result
3253.0	-68.78	-13	Pass
4879.5	-74.46	-13	Pass
6506.0	-74.35	-13	Pass

BPSK 1643.5 MHz

Emission Frequency (MHz)	Measured Level (dBm)	Limit (dBm)	Result
3287.0	-61.17	-13	Pass
4930.5	-70.89	-13	Pass
6574.0	-72.49	-13	Pass

BPSK 1660.5 MHz

Emission Frequency (MHz)	Measured Level (dBm)	Limit (dBm)	Result
3321.0	-51.98	-13	Pass
4981.5	-65.69	-13	Pass
6642.0	-70.21	-13	Pass

QPSK 1626.5 MHz

Emission Frequency (MHz)	Measured Level (dBm)	Limit (dBm)	Result
3253.0	-68.59	-13	Pass
4879.5	-75.17	-13	Pass
6506.0	-71.90	-13	Pass

QPSK 1643.5 MHz

Emission Frequency (MHz)	Measured Level (dBm)	Limit (dBm)	Result
3287.0	-62.57	-13	Pass
4930.5	-74.14	-13	Pass
6574.0	-69.29	-13	Pass

QPSK 1660.5 MHz

Emission Frequency (MHz)	Measured Level (dBm)	Limit (dBm)	Result
3321.0	-60.41	-13	Pass
4981.5	-71.85	-13	Pass
6642.0	-72.15	-13	Pass

QAM 1626.5 MHz

Emission Frequency (MHz)	Measured Level (dBm)	Limit (dBm)	Result
3253.0	-73.84	-13	Pass
4879.5	-75.64	-13	Pass
6506.0	-69.65	-13	Pass

QAM 1643.5 MHz

Emission Frequency (MHz)	Measured Level (dBm)	Limit (dBm)	Result
3287.0	-63.56	-13	Pass
4930.5	-74.10	-13	Pass
6574.0	-72.5	-13	Pass

QAM 1660.5 MHz

Emission Frequency (MHz)	Measured Level (dBm)	Limit (dBm)	Result
3321.0	-61.46	-13	Pass
4981.5	-72.74	-13	Pass
6642.0	-68.88	-13	Pass

No other emissions were detected.

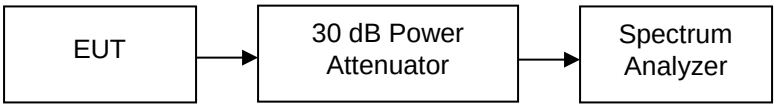
Emission Masks (Occupied Bandwidth)

Name of Test: Emission Masks (Occupied Bandwidth) **Engineer:** John Erhard
Test Equipment Utilized: i00331 **Test Date:** 10/16/2012

Test Procedure

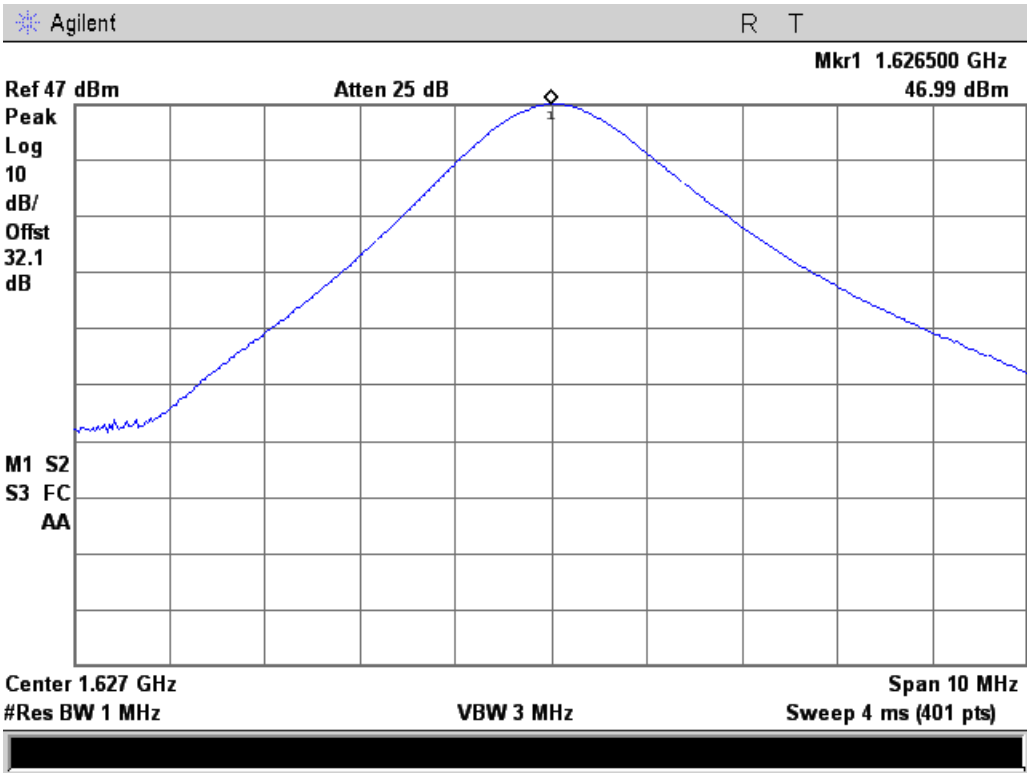
The EUT was connected directly to a spectrum analyzer to verify that the EUT meets the required emissions mask. A reference level plot is provided to verify that the peak power was established prior to testing the mask. The transmitter is digital modulation therefore no data input is required to measure the emission mask. The RBW was set as close as possible to 1% of the occupied bandwidth to ensure accurate readings.

Test Setup

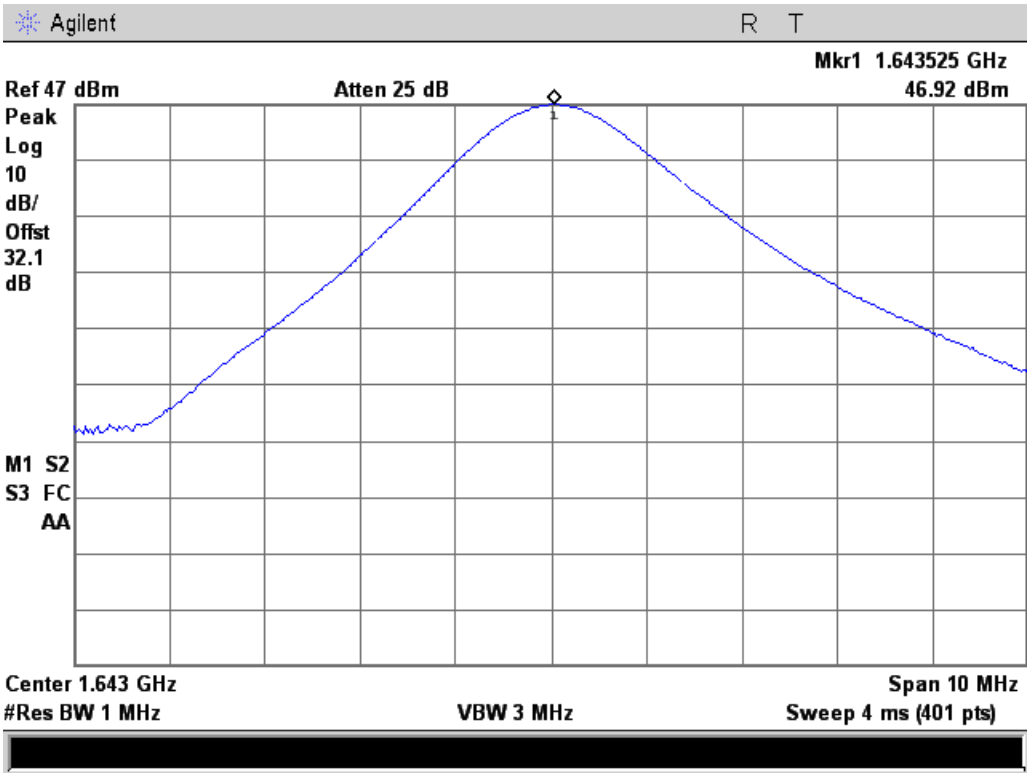


BPSK Emissions Mask

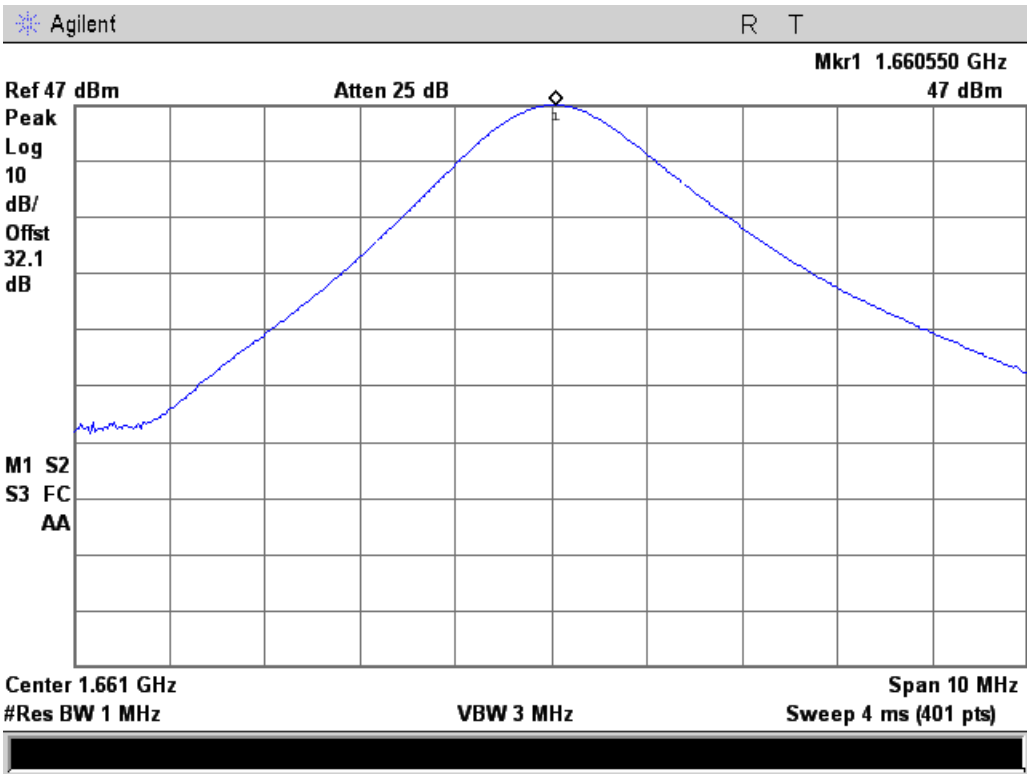
BPSK 1626.5 MHz Reference



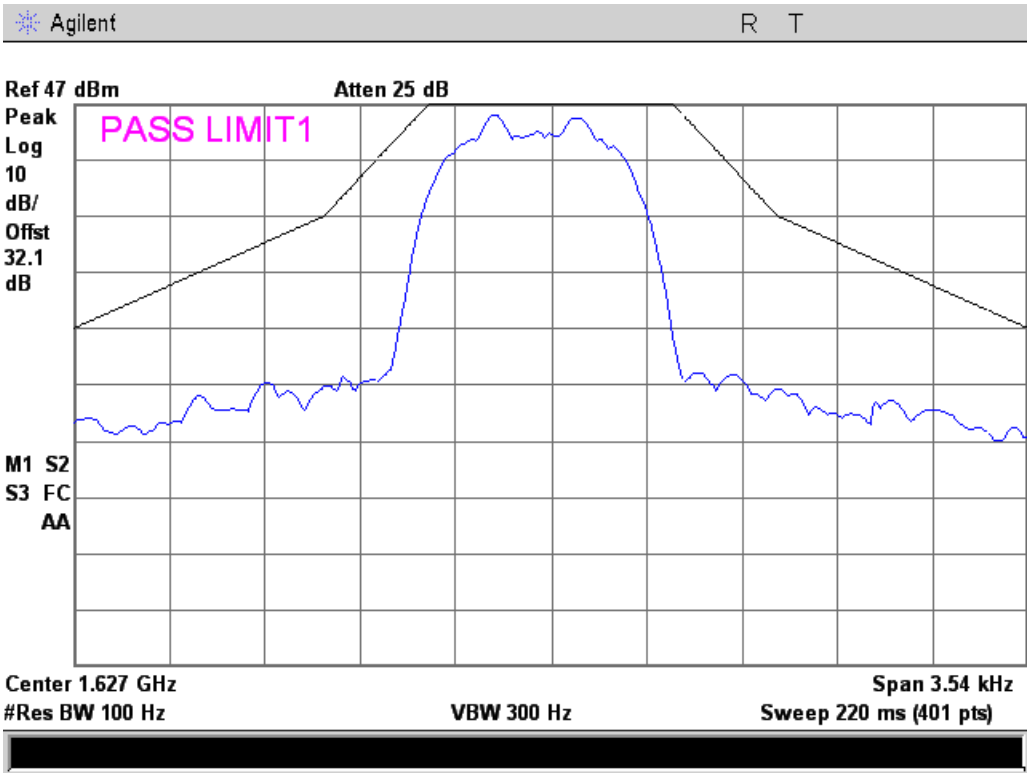
BPSK 1643.5 MHz Reference



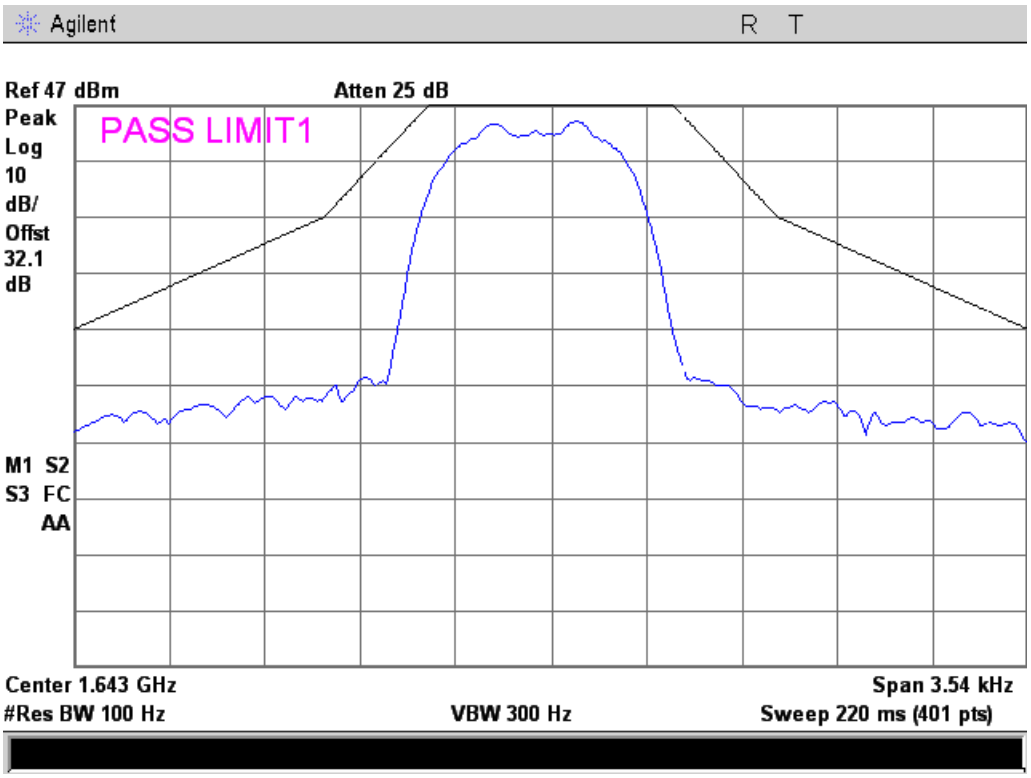
BPSK 1660.5 MHz Reference



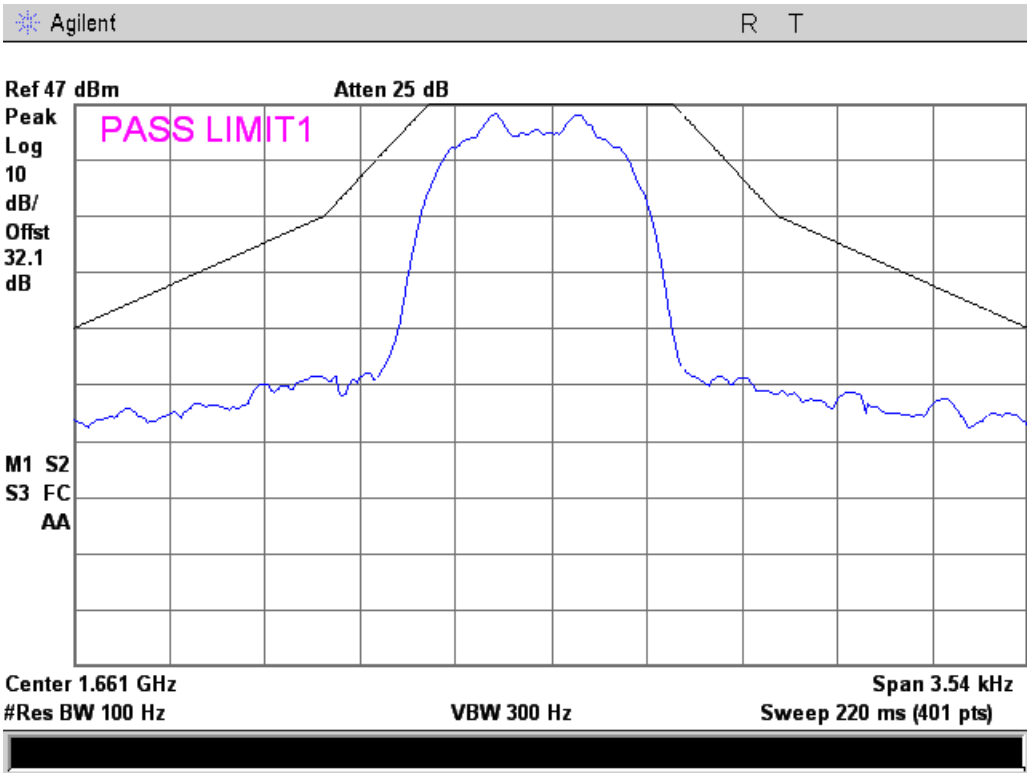
BPSK 1626.5 MHz 840HG1D



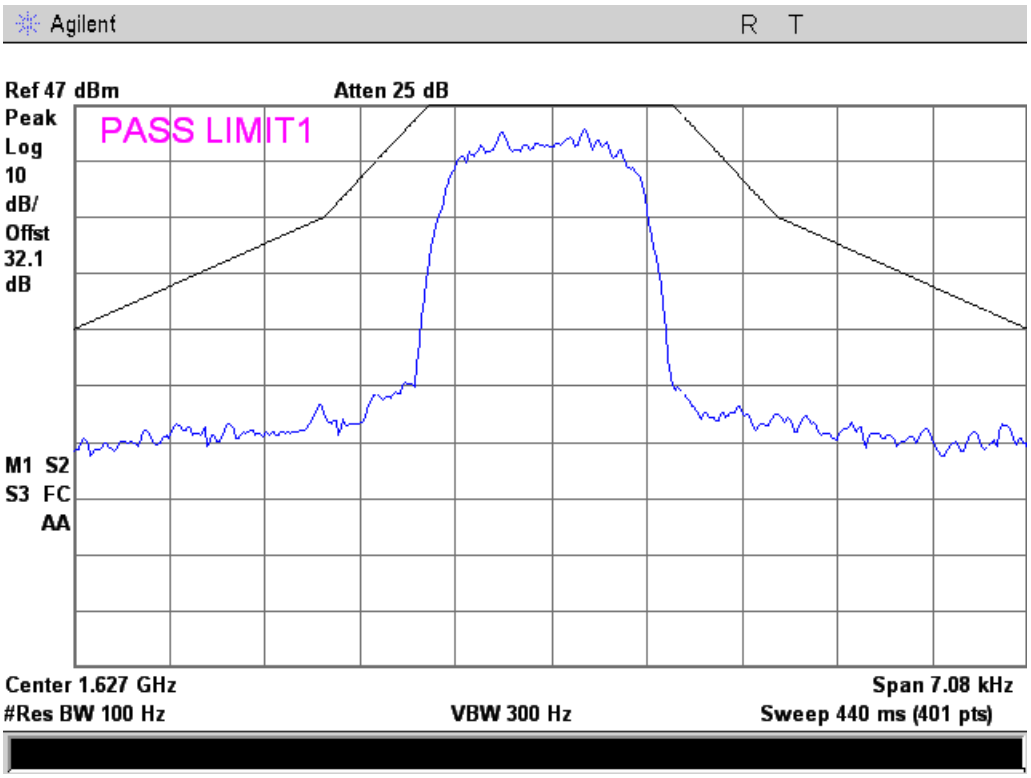
BPSK 1643.5 MHz 840HG1D



BPSK 1660.5 MHz 840HG1D



BPSK 1626.5 MHz 1K68G1D



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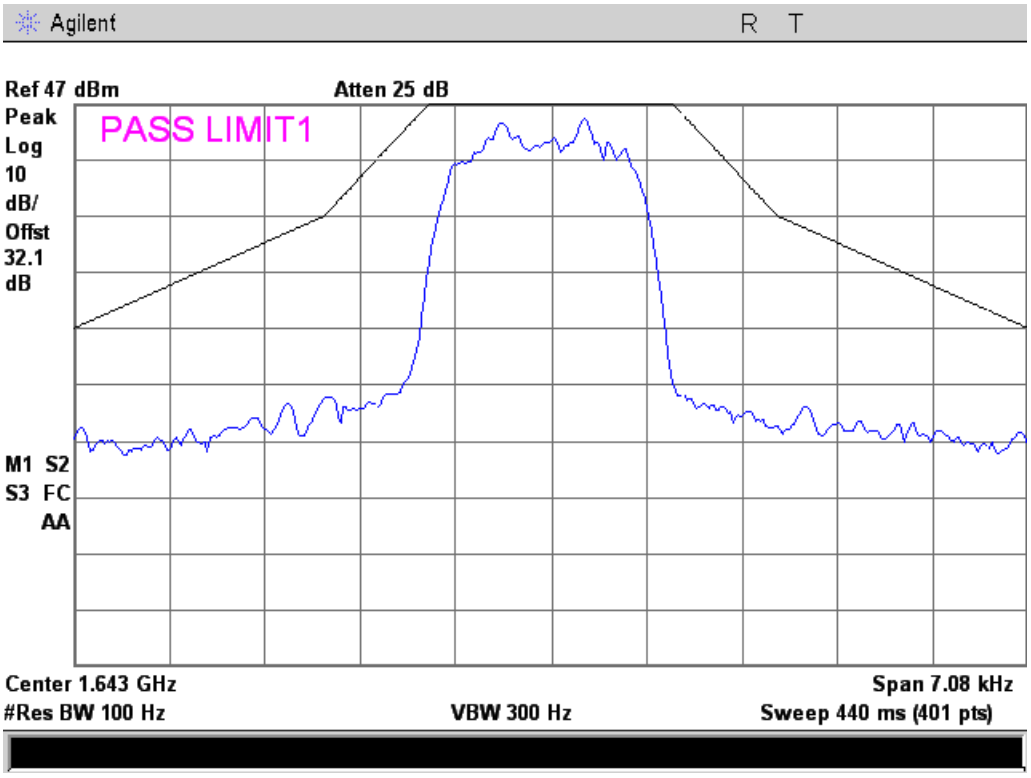

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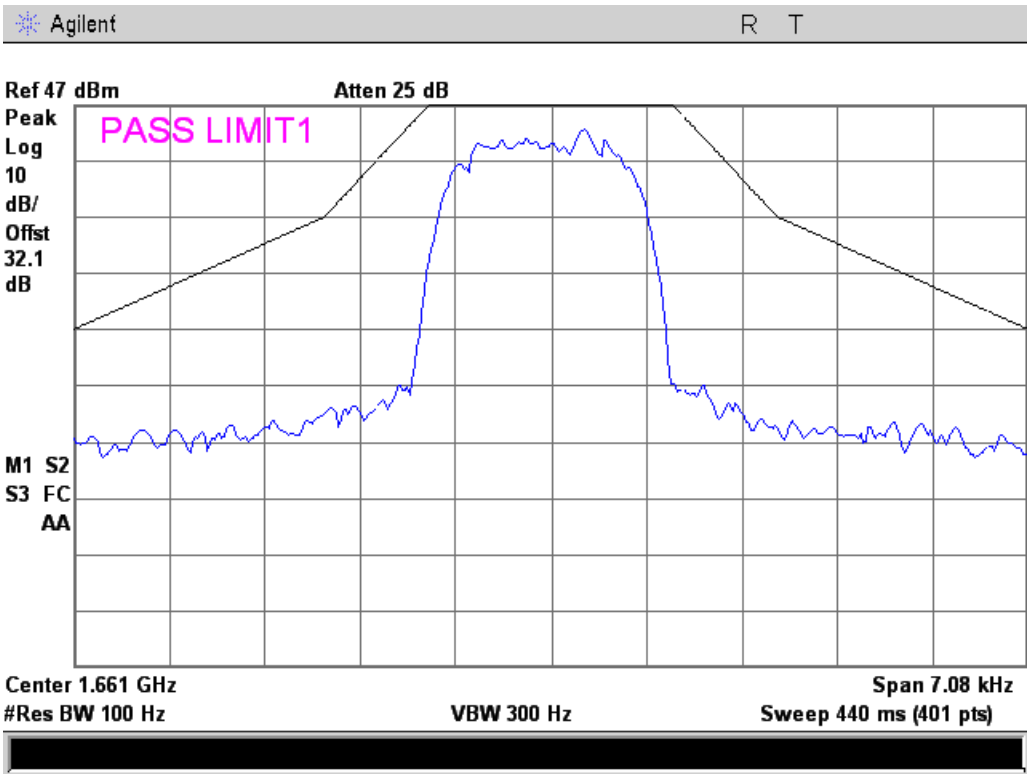
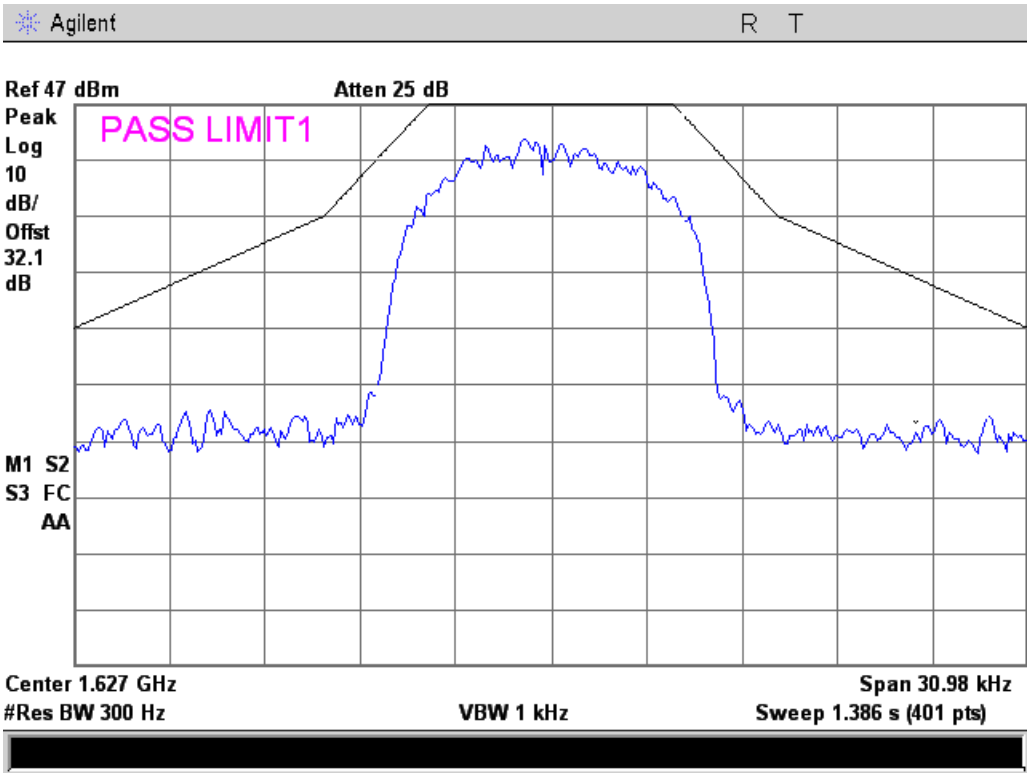


BPSK 1626.5 MHz 10K5G1D



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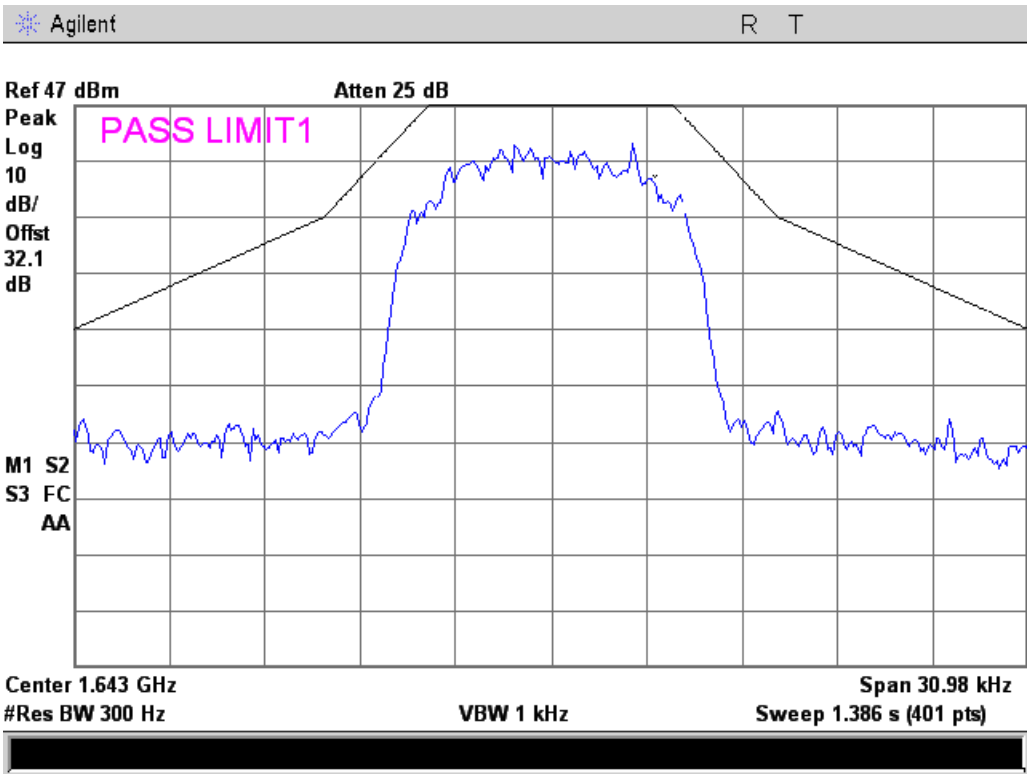

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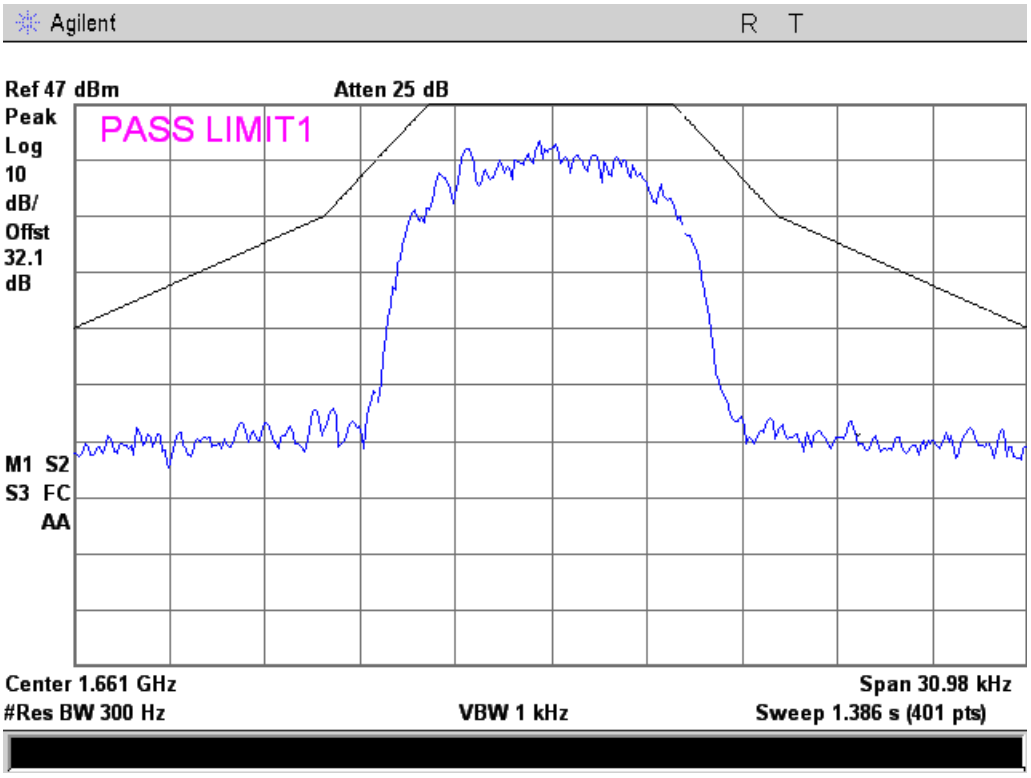
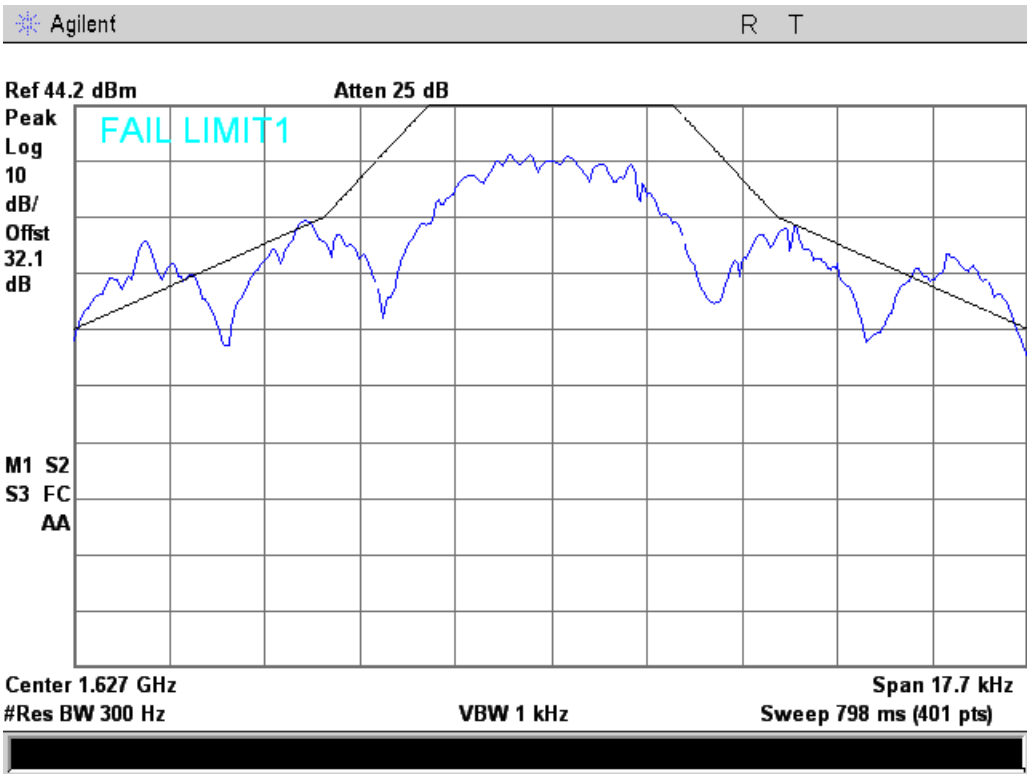
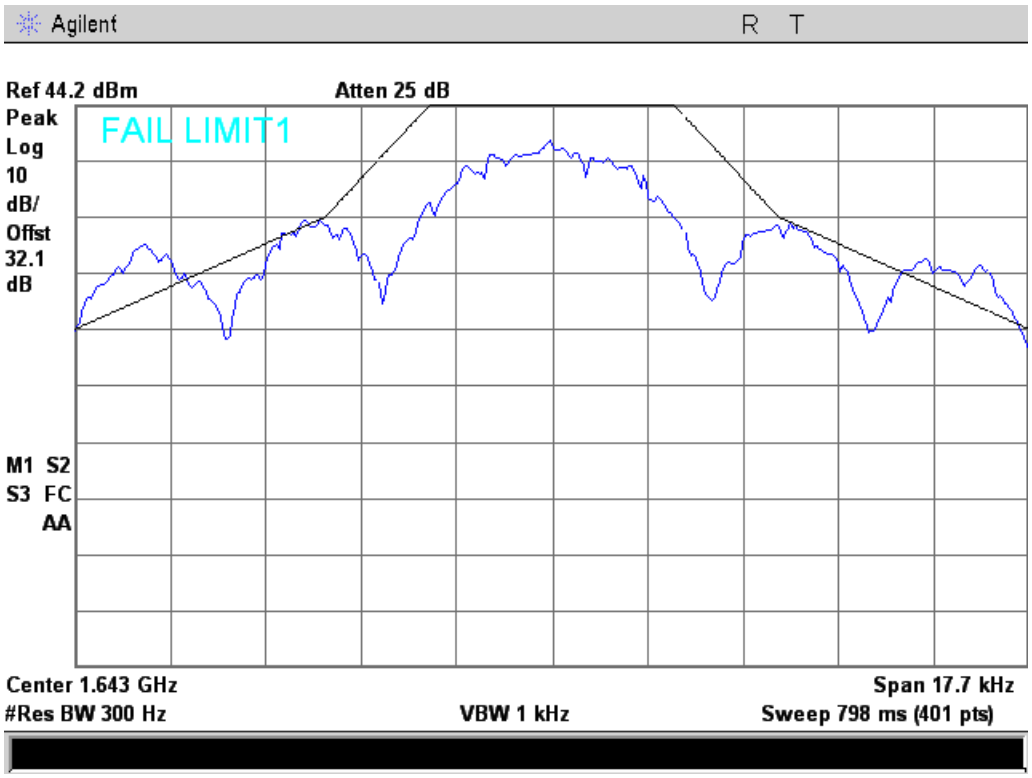


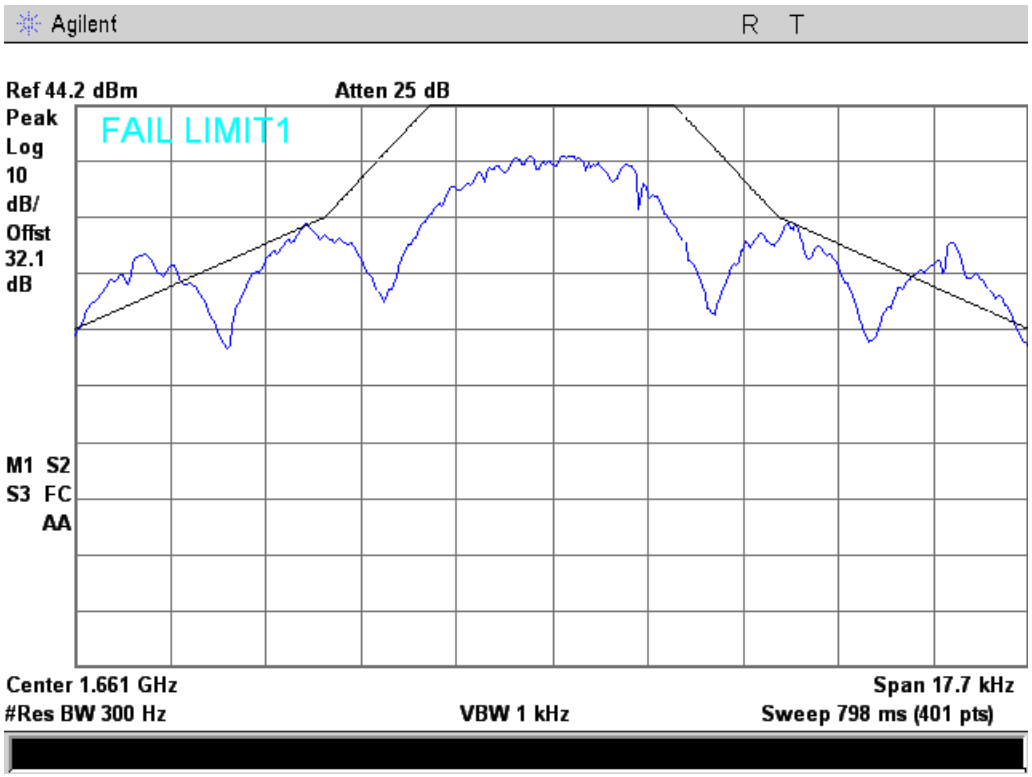
BPSK 1626.5 MHz 21K0G1D



BPSK 1643.5 MHz 21K0G1D



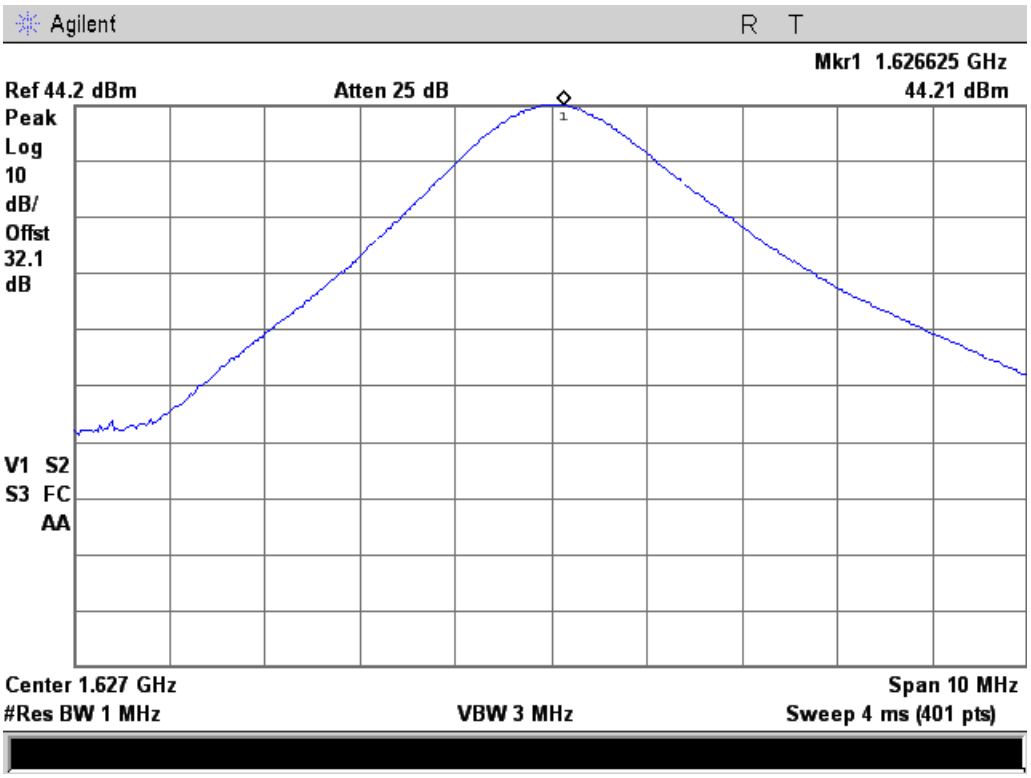
BPSK 1660.5 MHz 21K0G1D



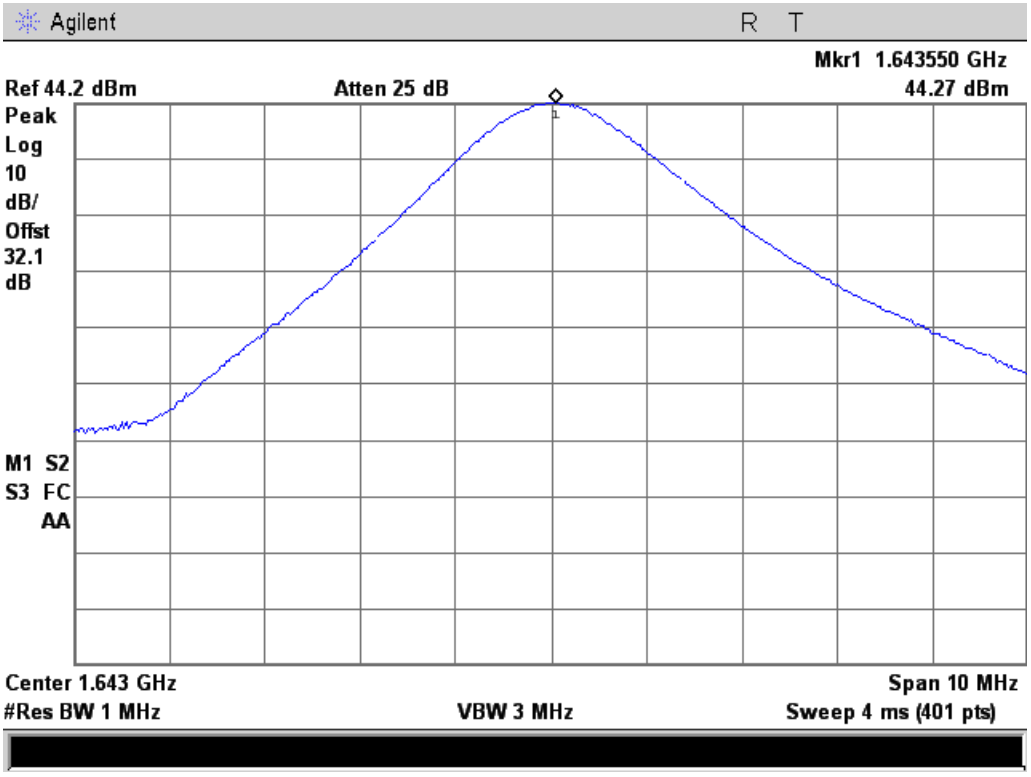
A waiver has been granted for this modulation type and bandwidth.

QPSK Emissions Mask

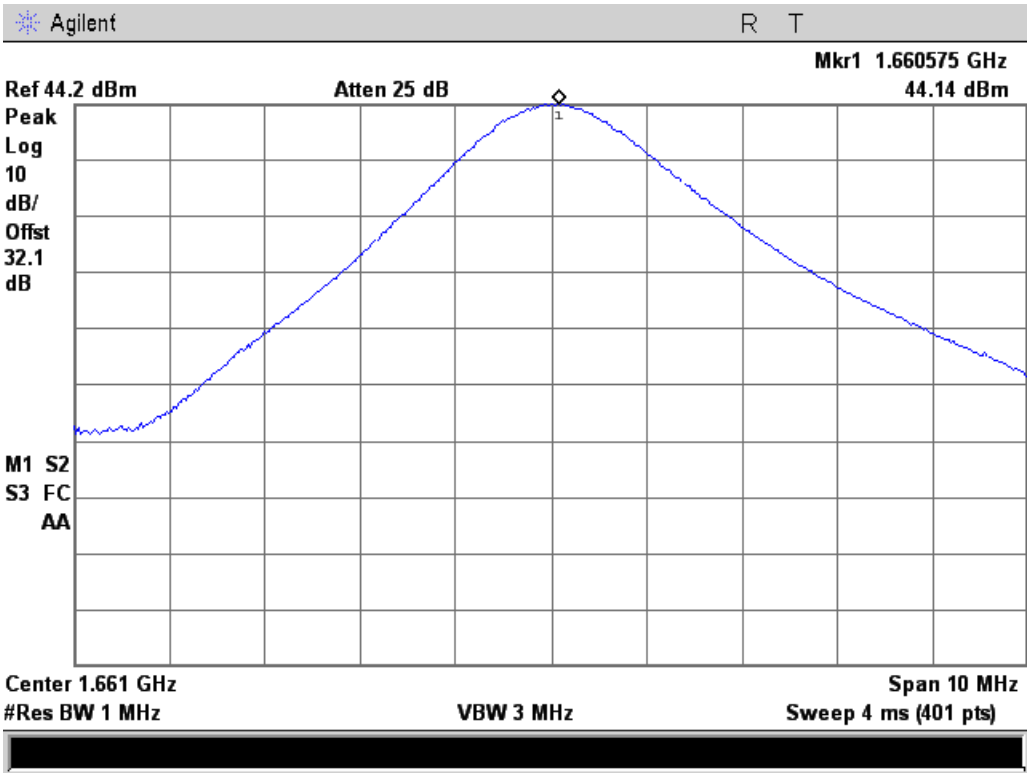
QPSK 1626.5 MHz Reference



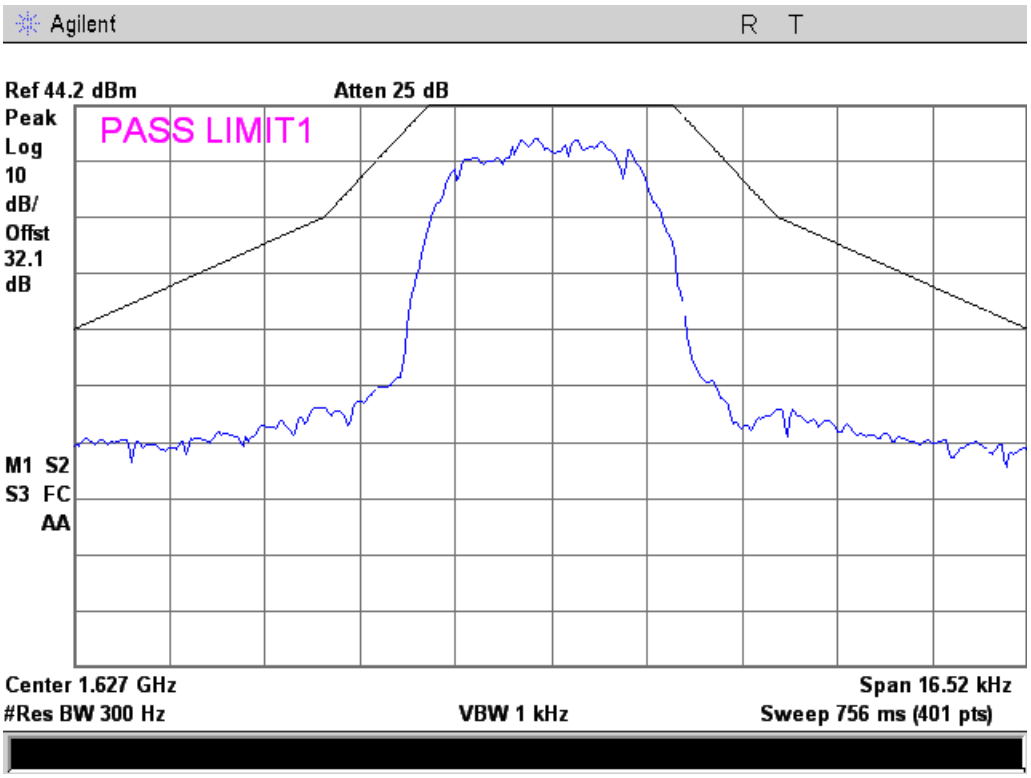
QPSK 1643.5 MHz Reference



QPSK 1660.5 MHz Reference



QPSK 1626.5 MHz 7K20G1E



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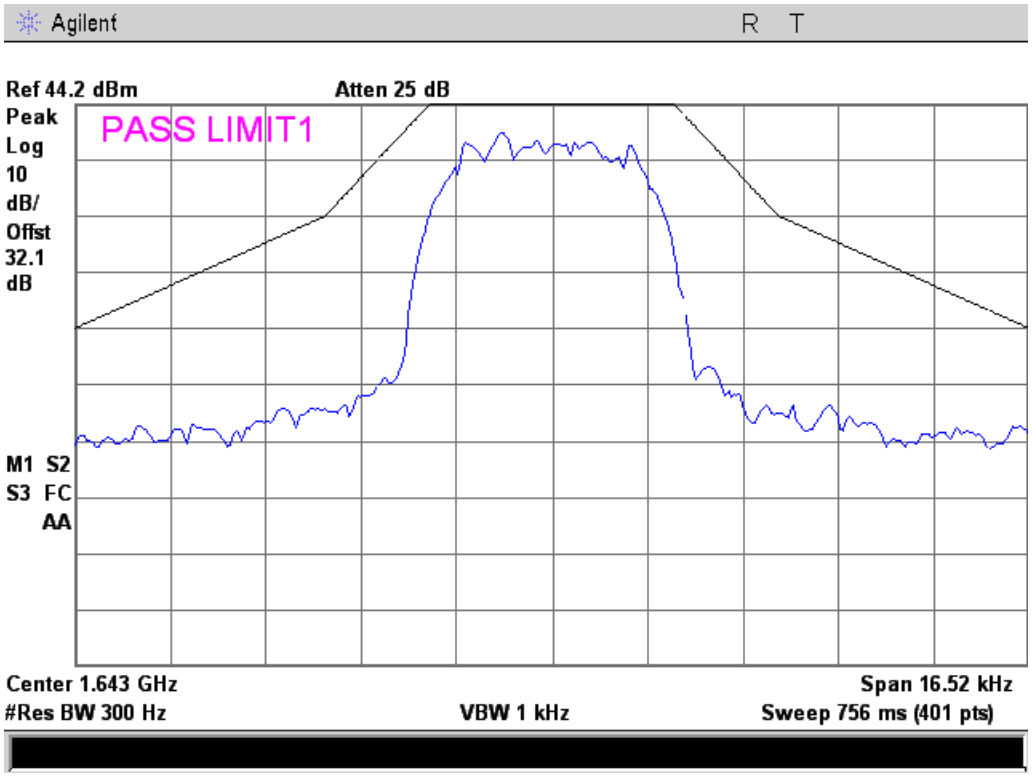

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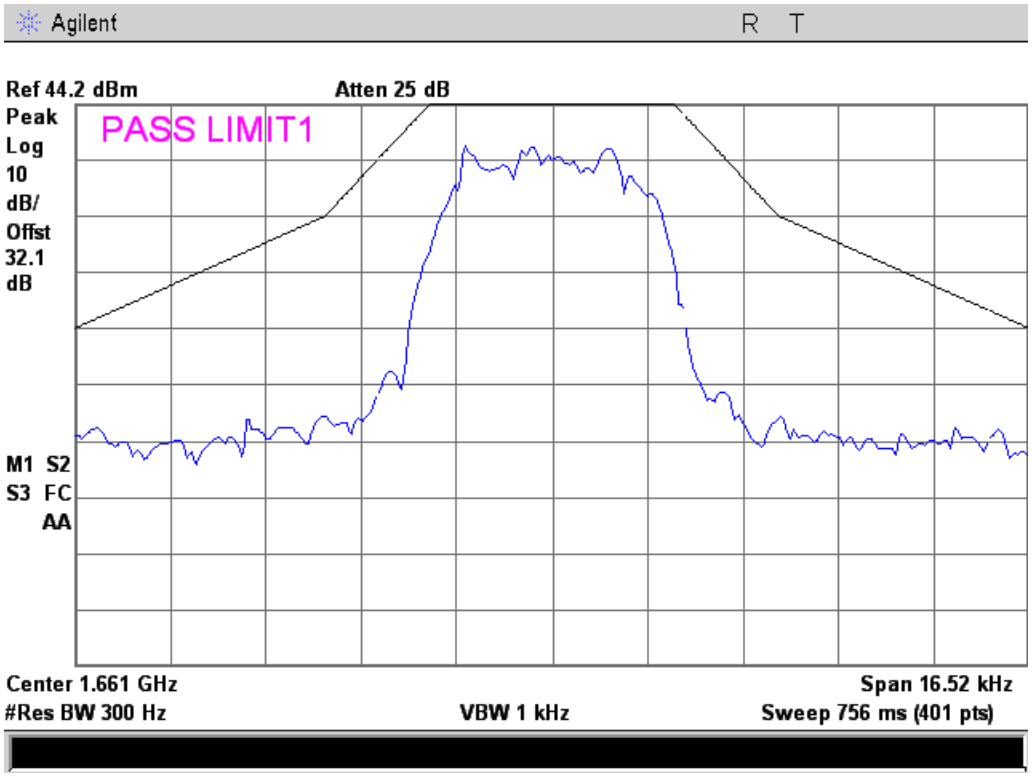
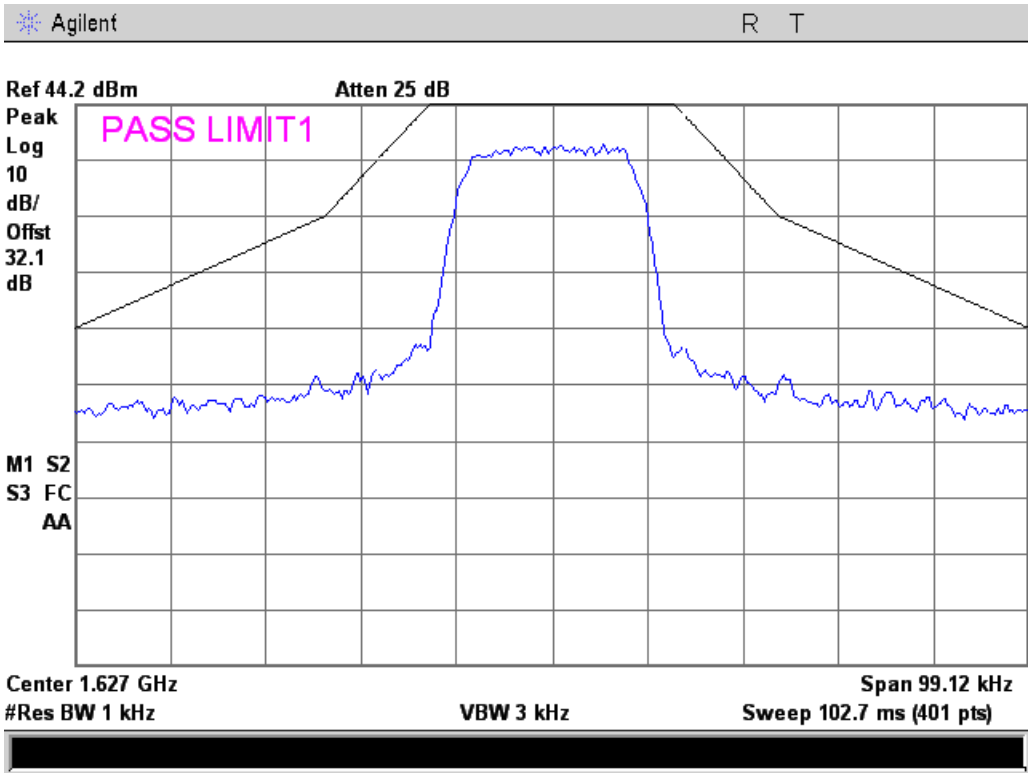


QPSK 1626.5 MHz 25K0G7W



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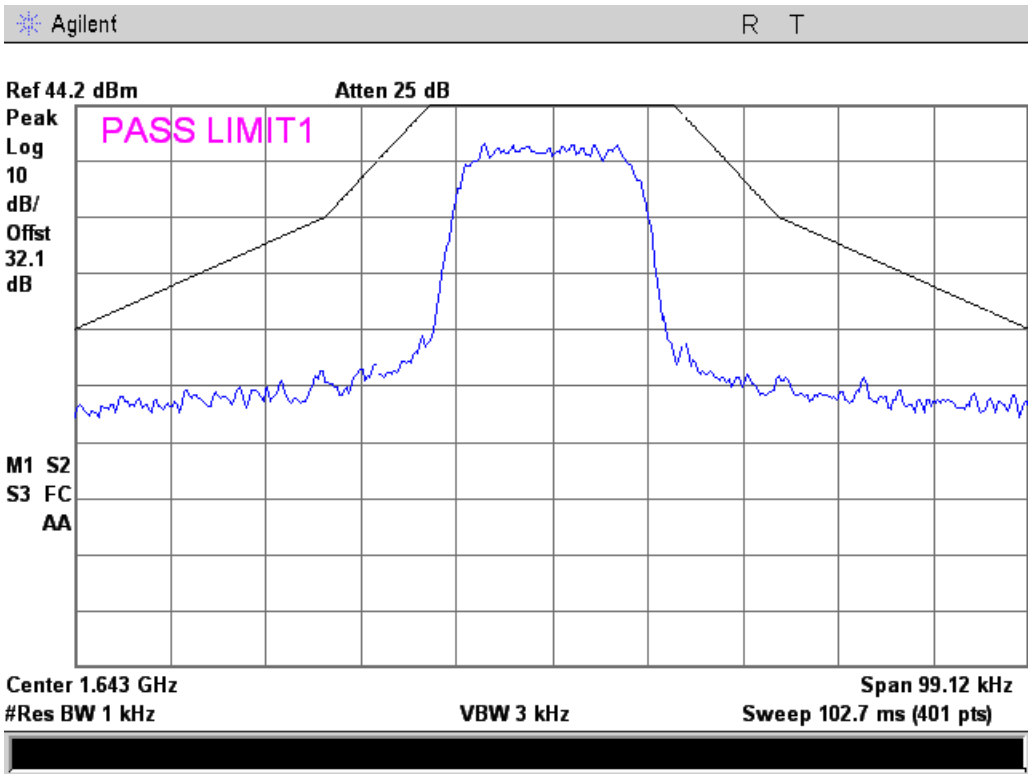
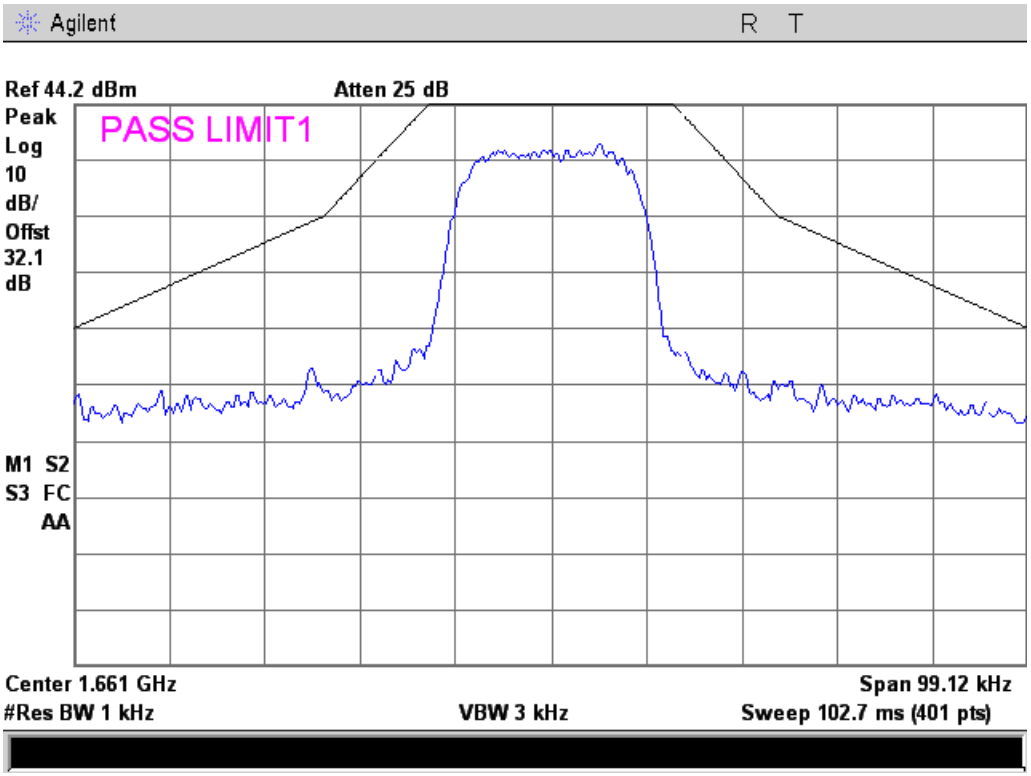
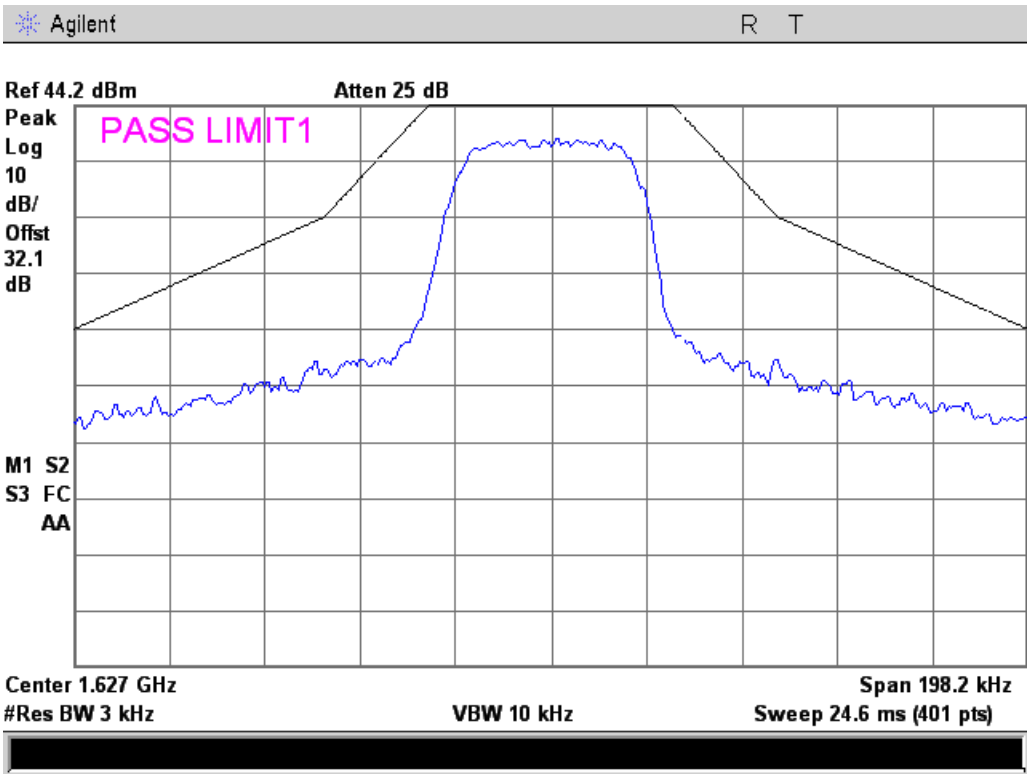


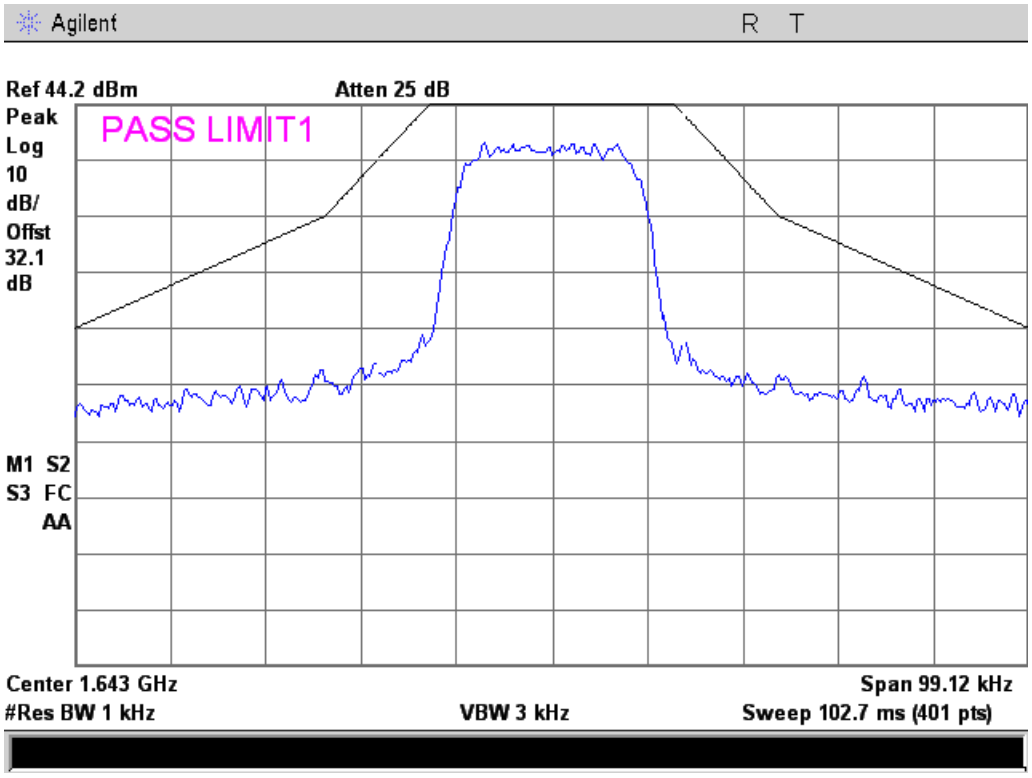
QPSK 1660.5 MHz 25K0G7W



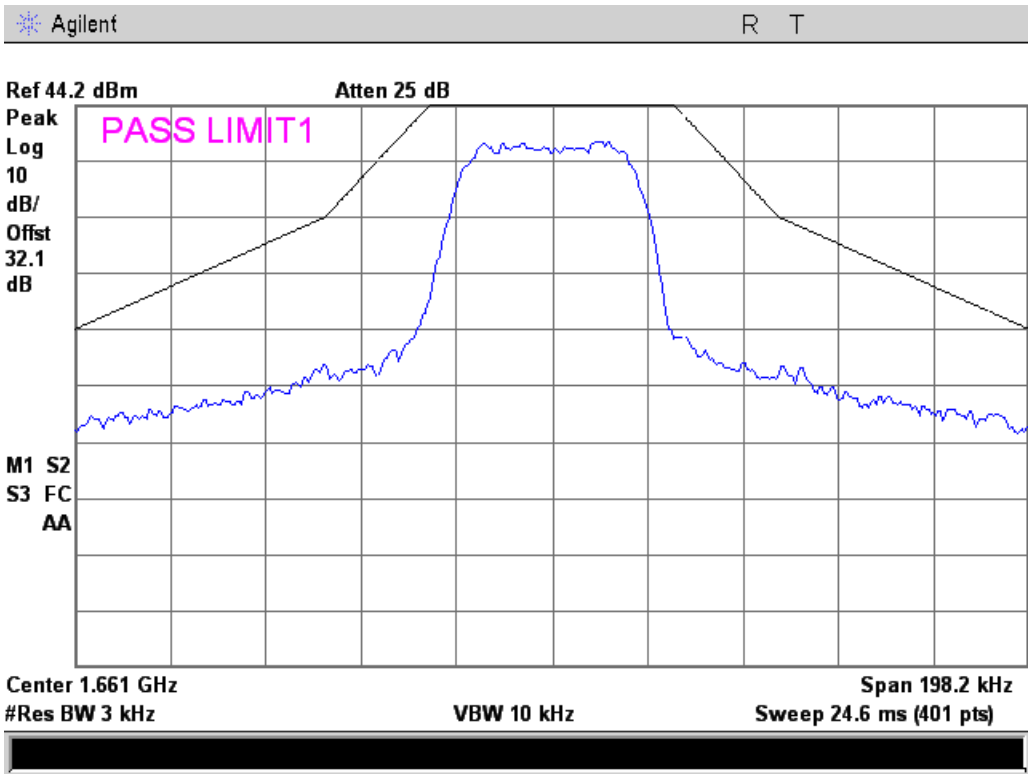
QPSK 1626.5 MHz 50K0G7W



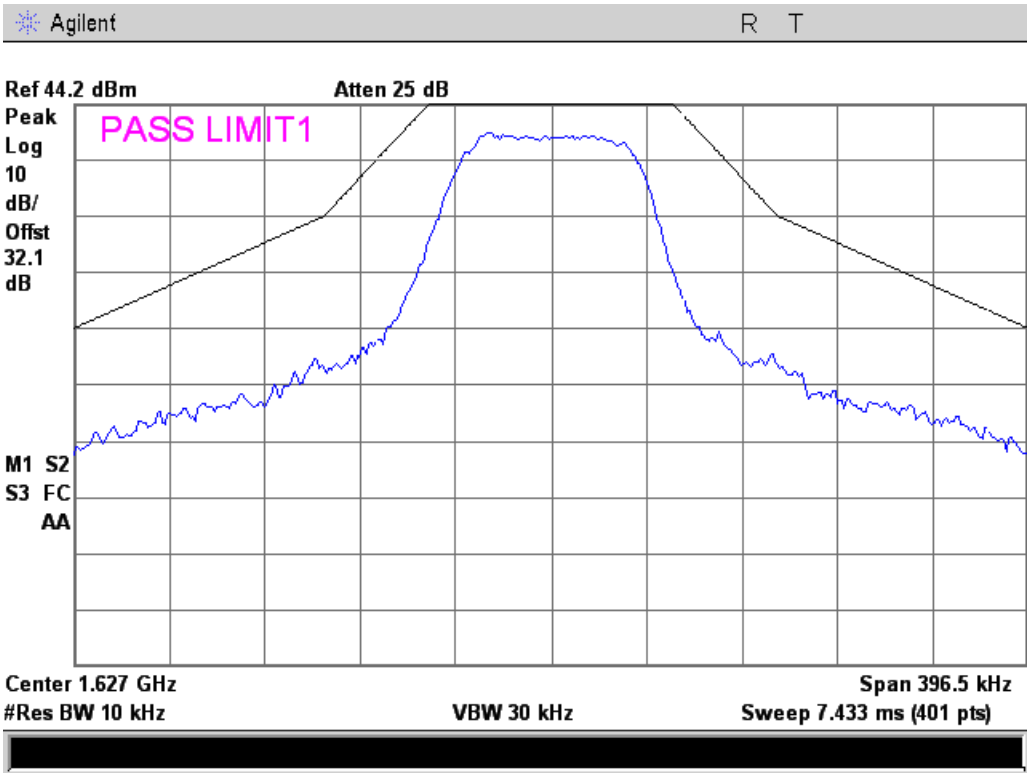
QPSK 1643.5 MHz 50K0G7W



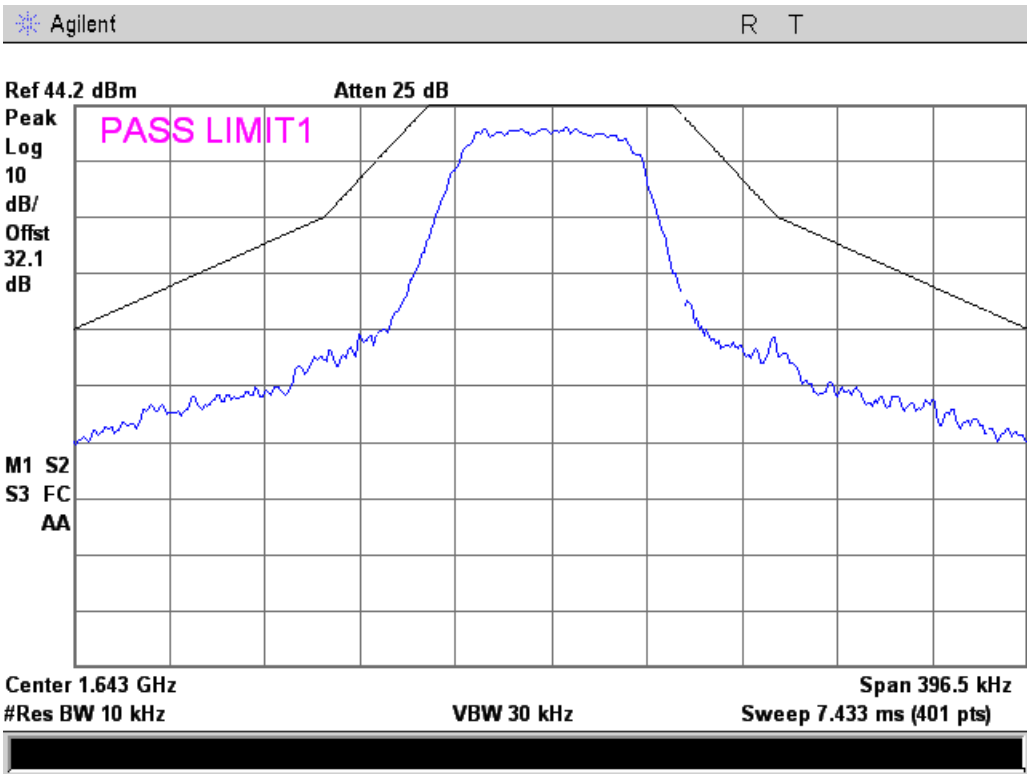
QPSK 1660.5 MHz 50K0G7W



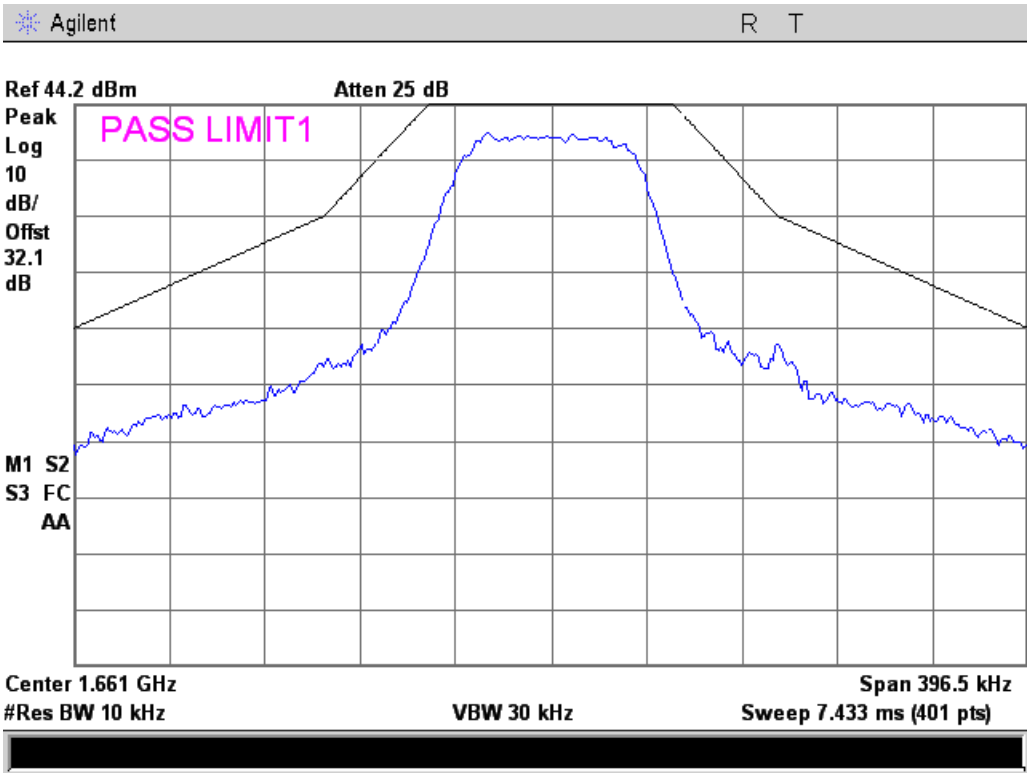
QPSK 1626.5 MHz 100KG7W



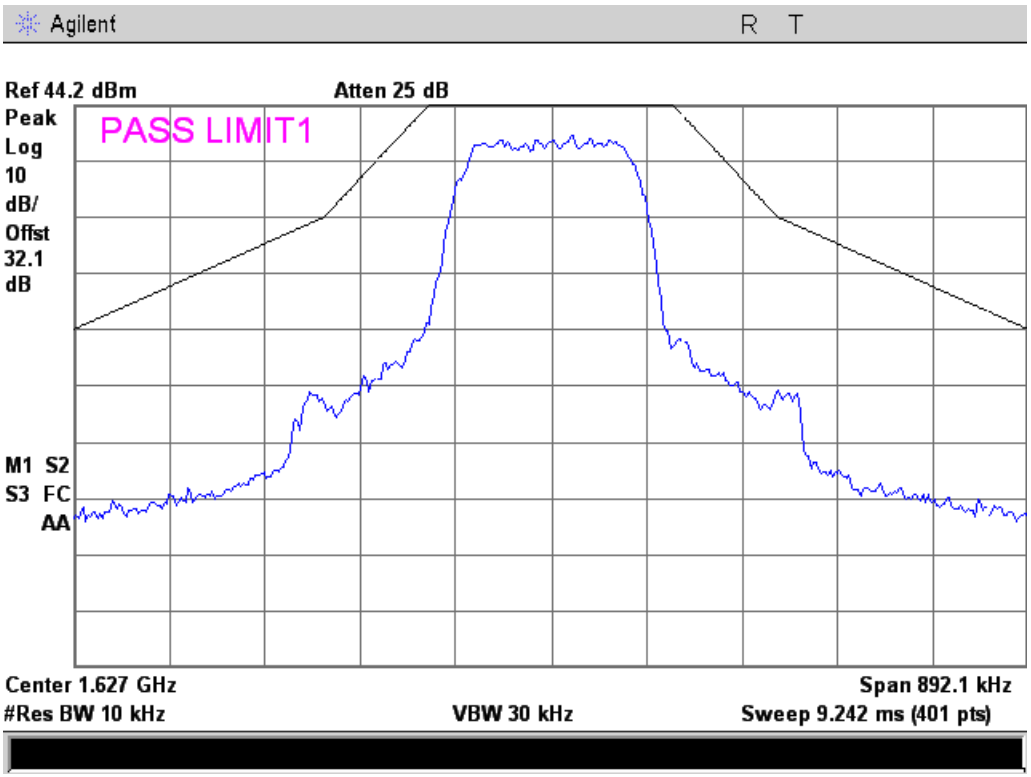
QPSK 1643.5 MHz 100KG7W



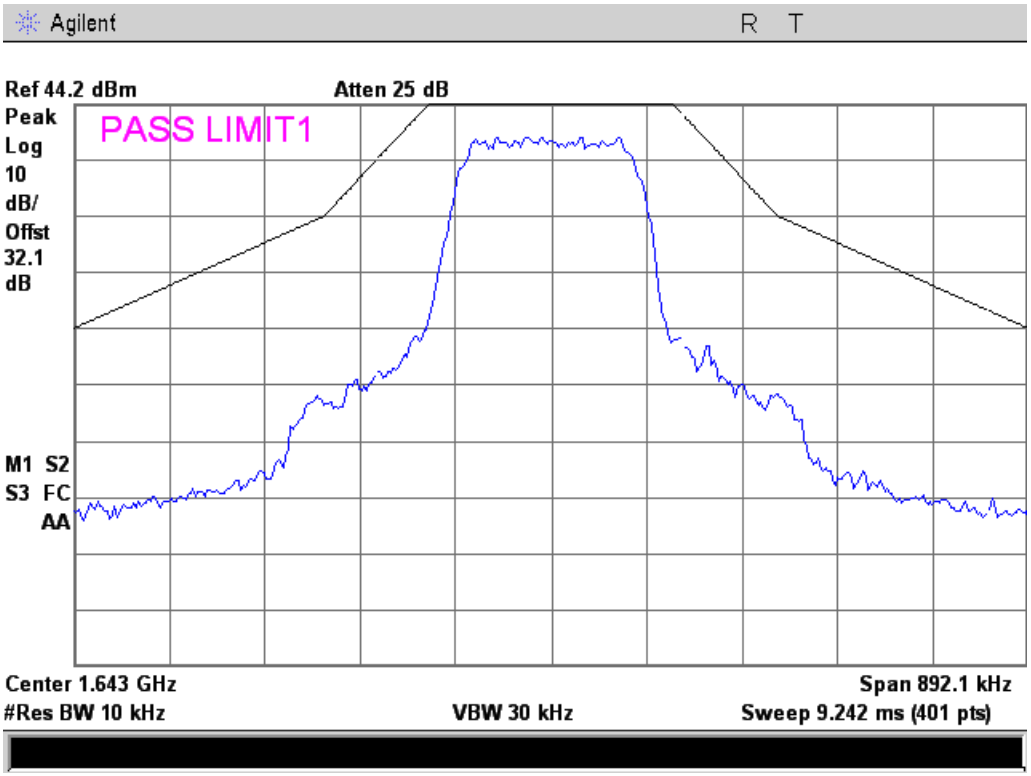
QPSK 1660.5 MHz 100KG7W



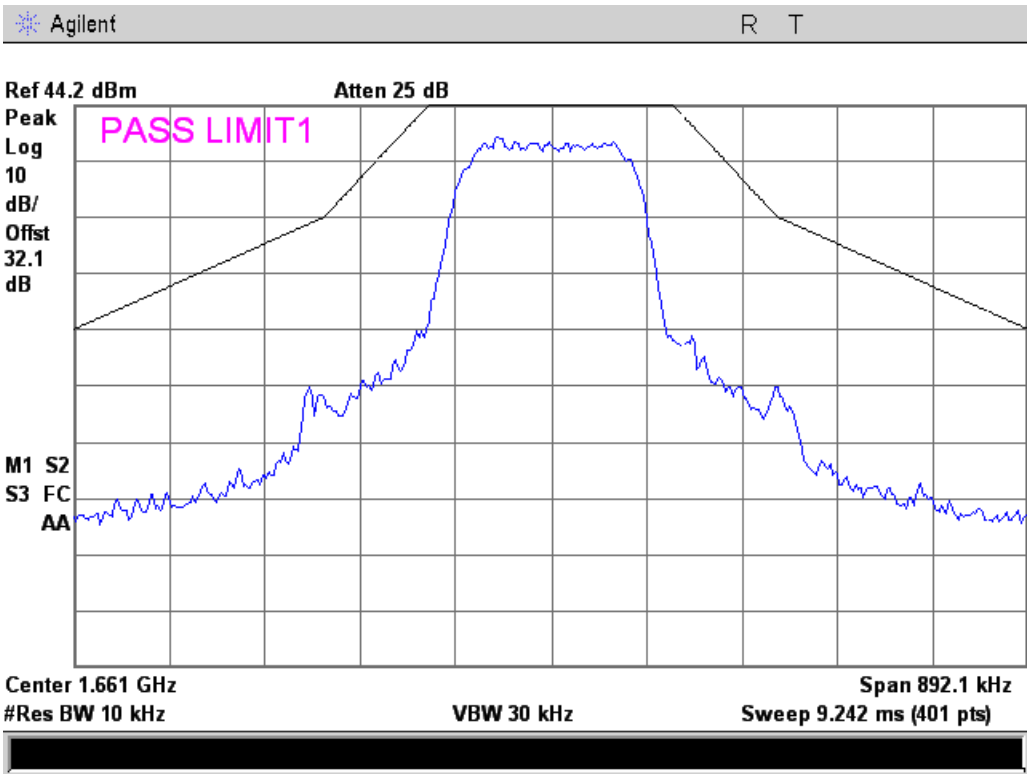
QPSK 1626.5 MHz 200KG7W



QPSK 1643.5 MHz 200KG7W

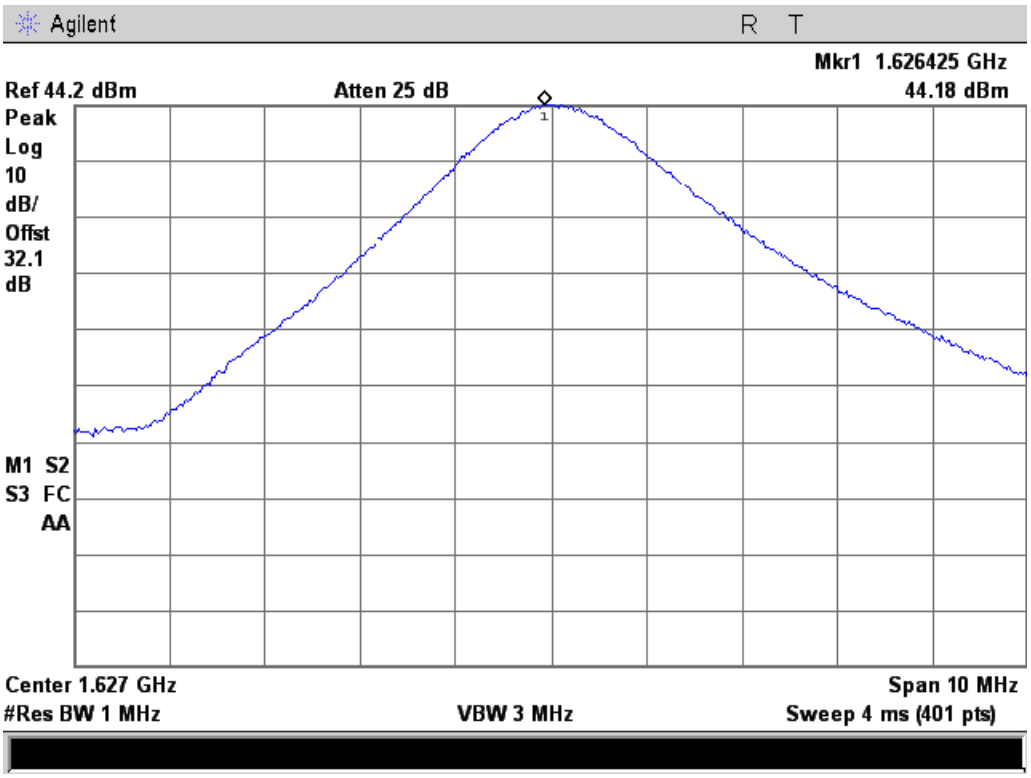


QPSK 1660.5 MHz 200KG7W

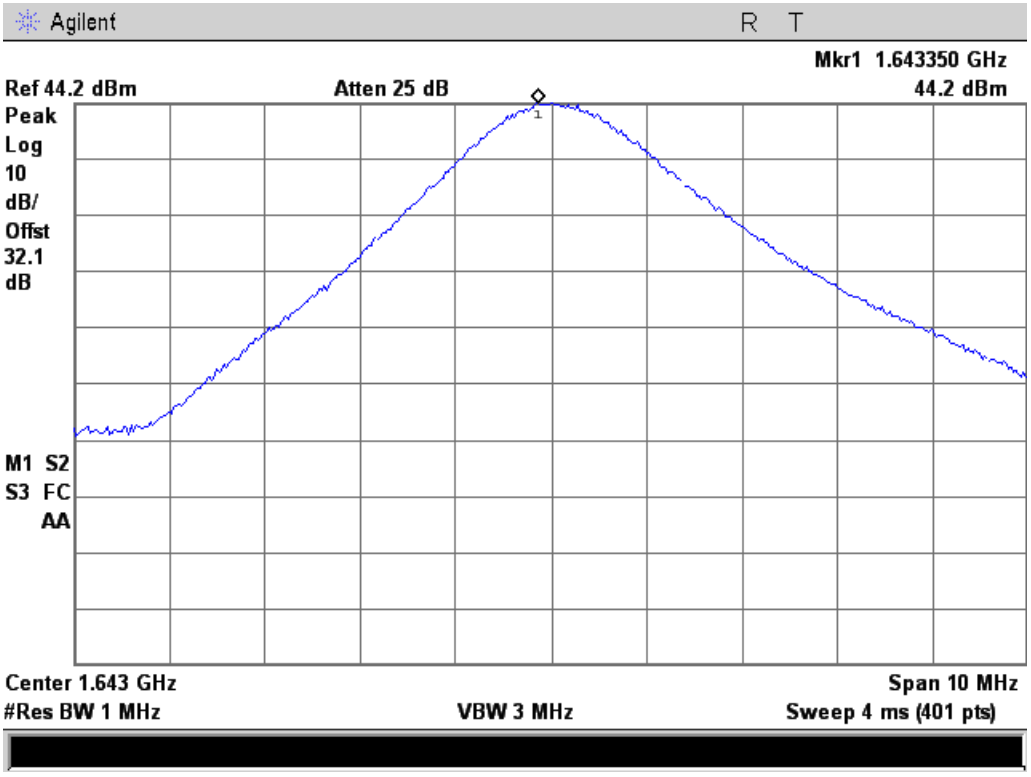


QAM Emissions Mask

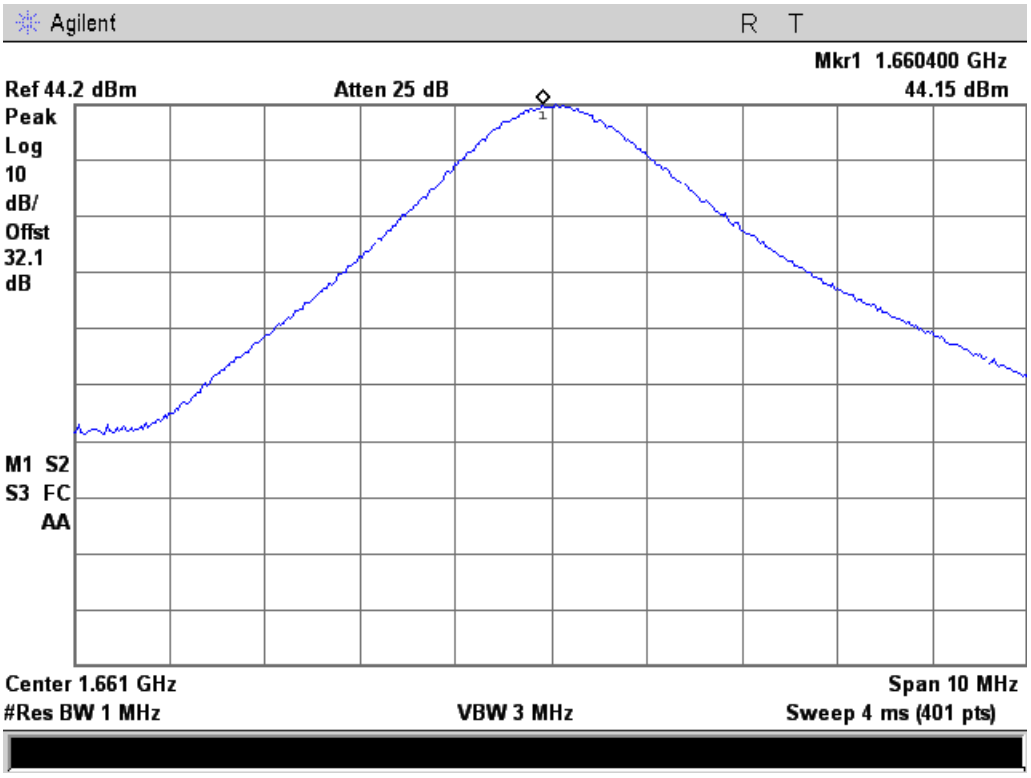
QAM 1626.5 MHz Reference



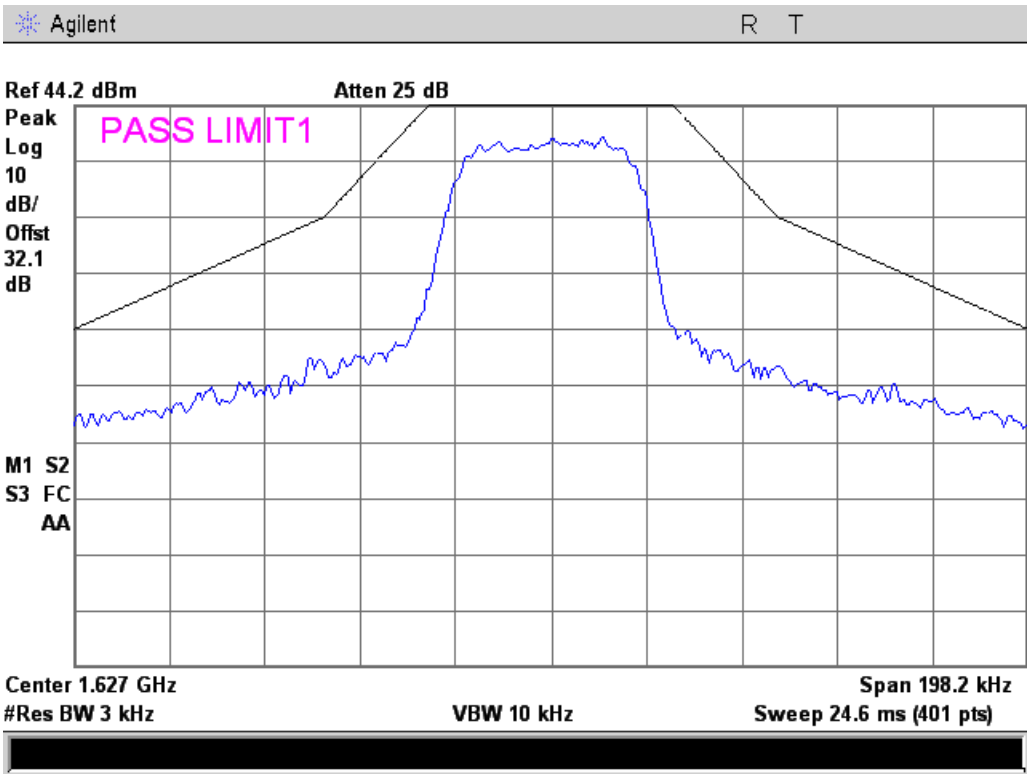
QAM 1643.5 MHz Reference



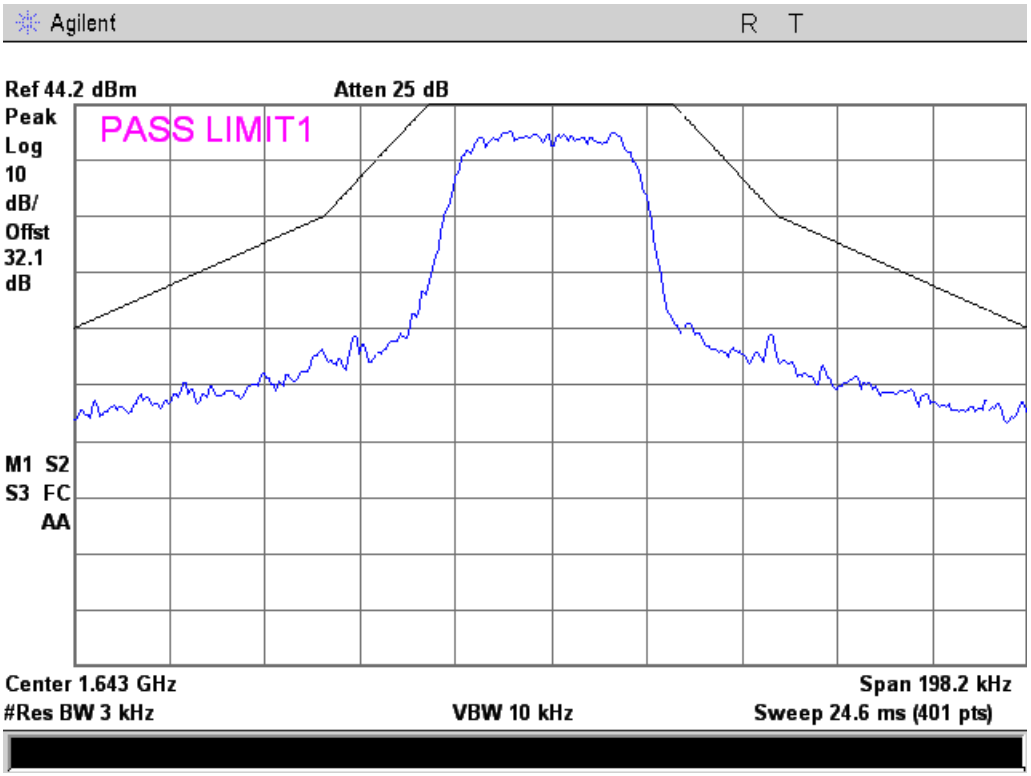
QAM 1660.5 MHz Reference



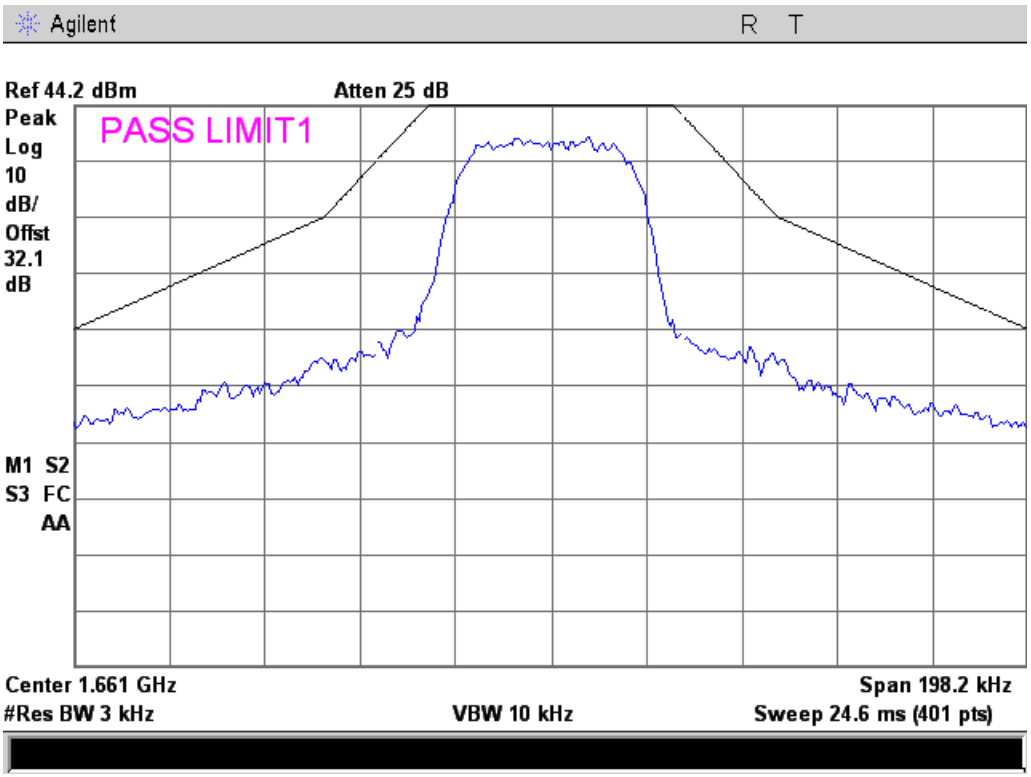
QAM 1626.5 MHz 50K0D7W



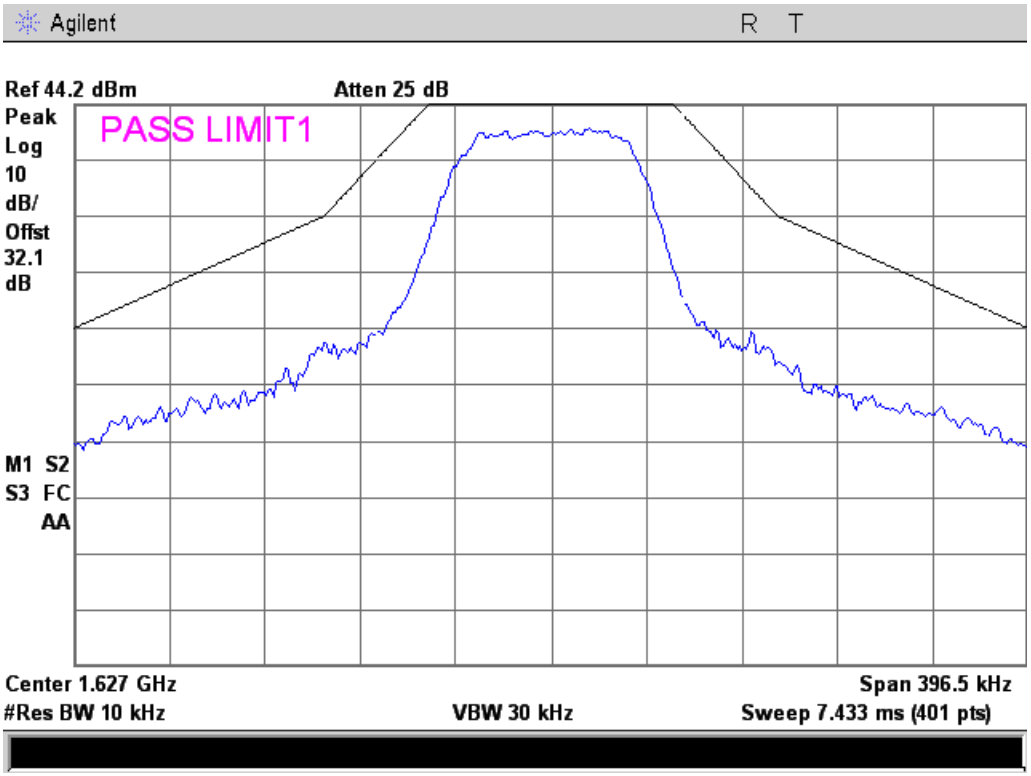
QAM 1643.5 MHz 50K0G7W



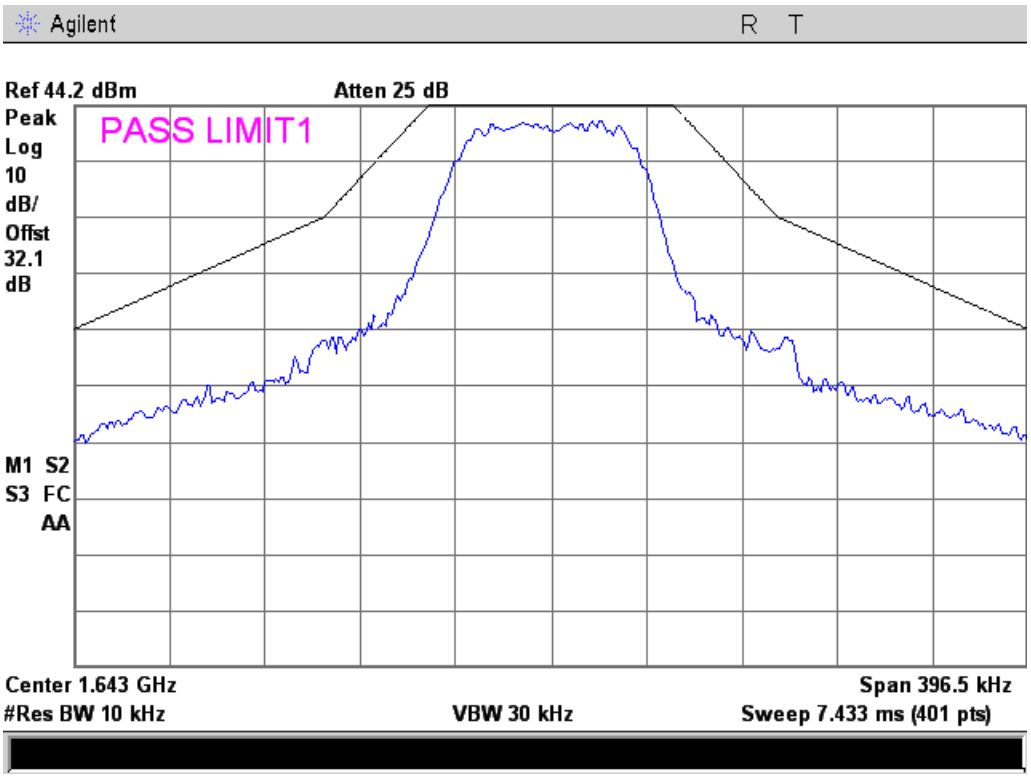
QAM 1660.5 MHz 50K0D7W



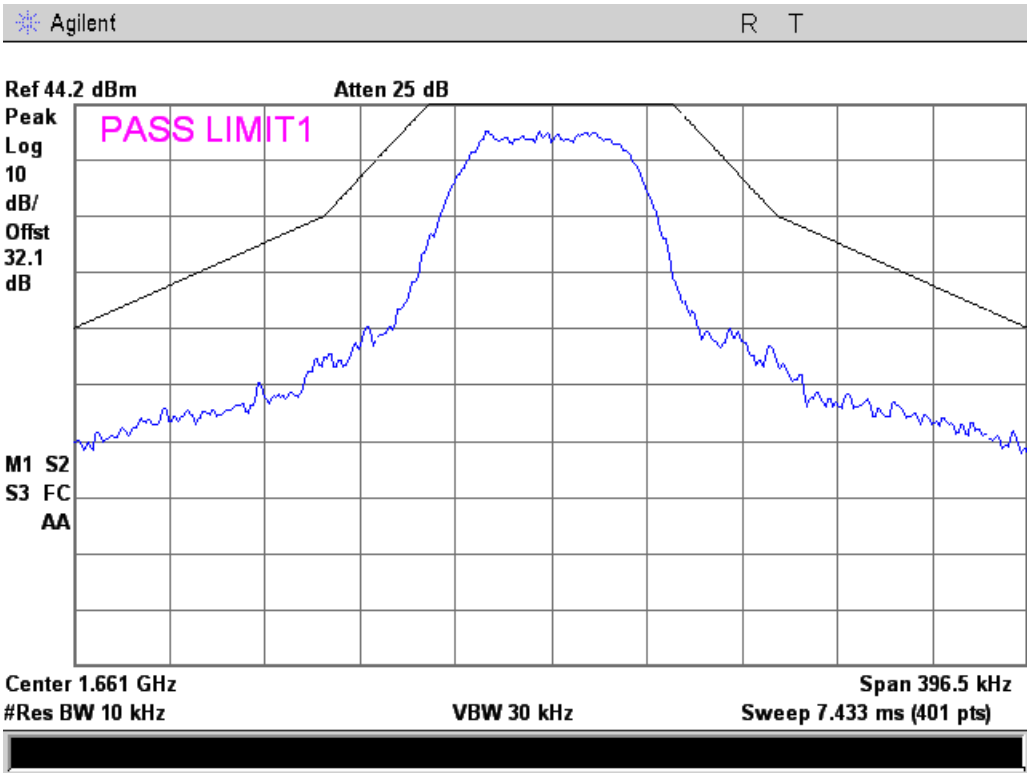
QAM 1626.5 MHz 100KD7W



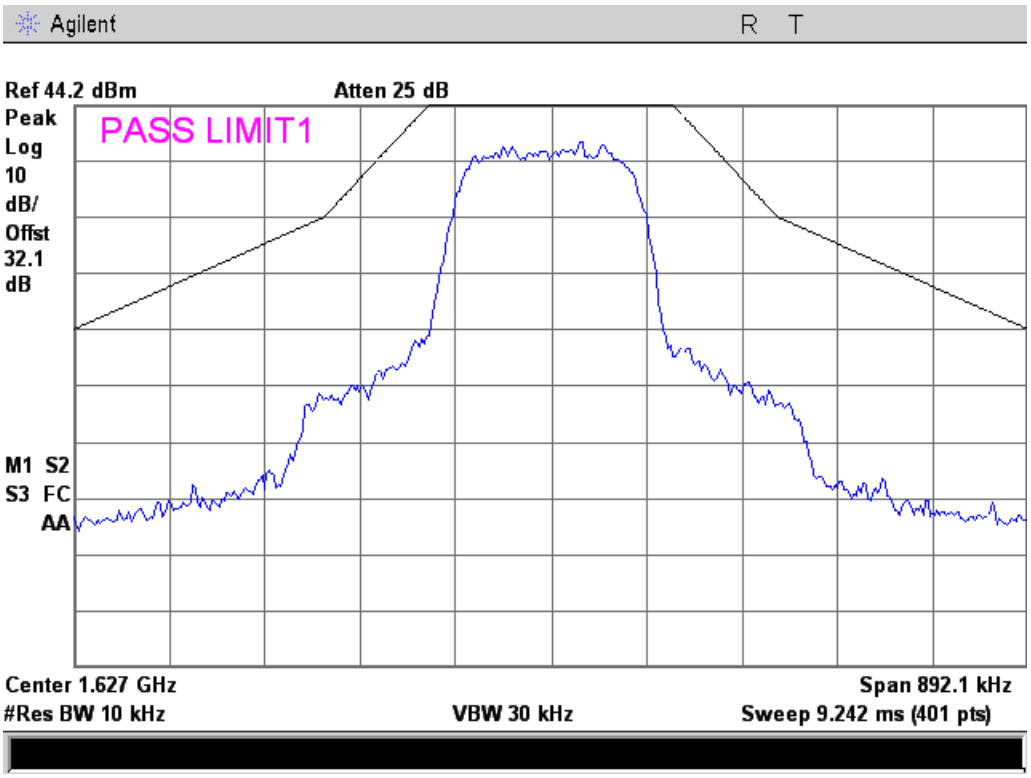
QAM 1643.5 MHz 100KD7W



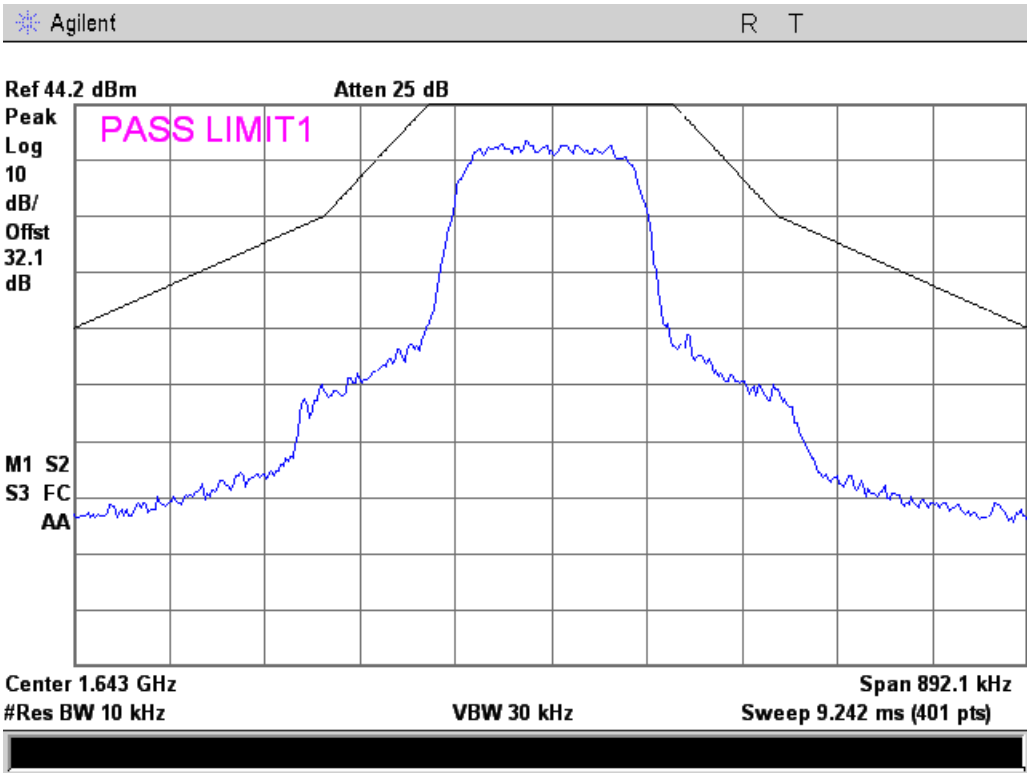
QAM 1660.5 MHz 100KD7W



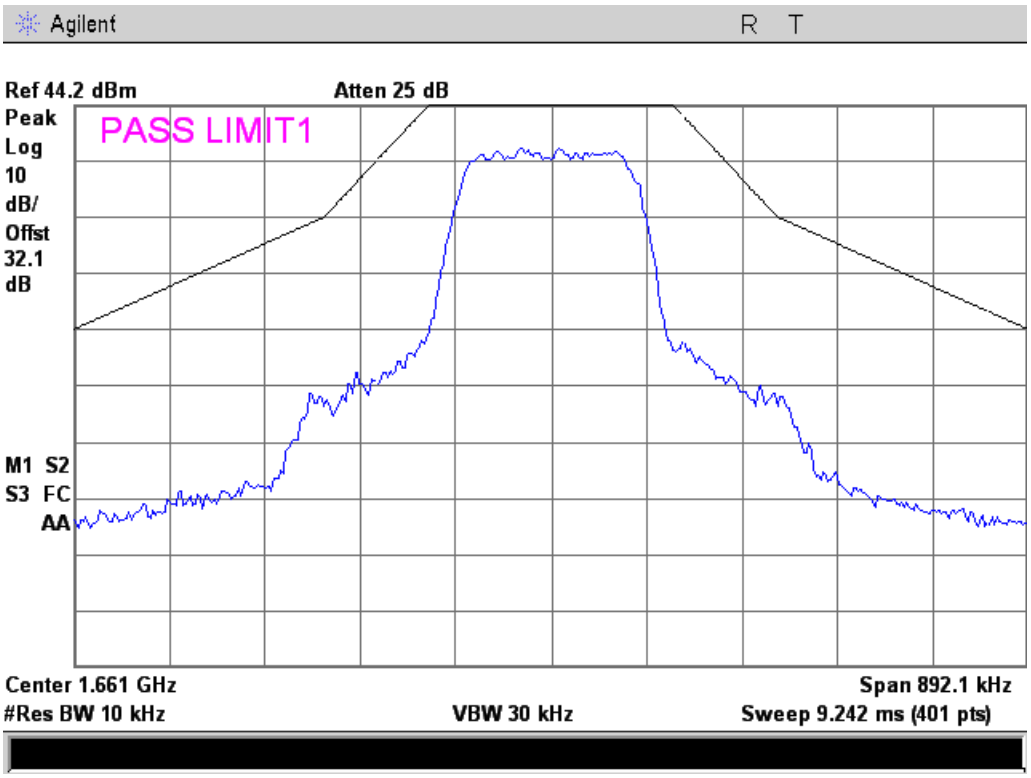
QAM 1626.5 MHz 200KD7W



QAM 1643.5 MHz 200KD7W



QAM 1660.5 MHz 200KD7W



A waiver has been granted for this modulation type.

Frequency Stability (Temperature Variation)

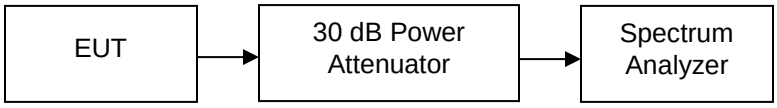
Name of Test: Frequency Stability (Temperature Variation) **Engineer:** John Erhard
Test Equipment Utilized: i00027, i00029, i00343 **Test Date:** 10/17/2012

Test Procedure

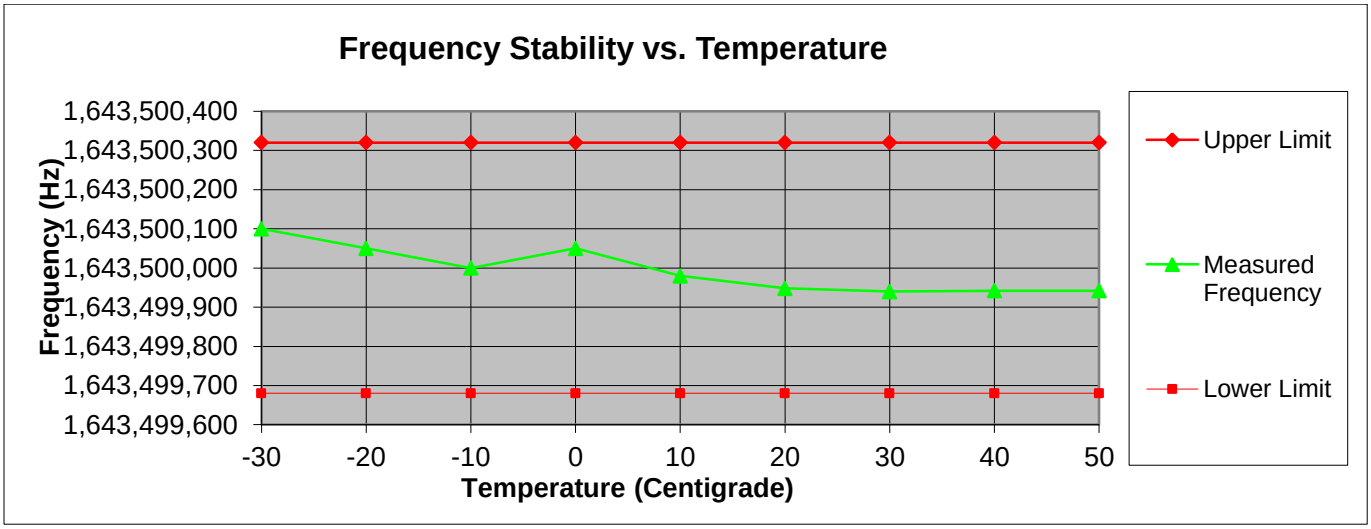
The EUT was placed in an environmental test chamber and the RF output was connected directly to a frequency counter. The temperature was varied from -30ºC to 50ºC in 10ºC increments. After a sufficient time for temperature stabilization the RF output frequency was measured.

The frequency stability limit is 320 Hz.

Test Setup



Measurement Results



Frequency Stability (Voltage Variation)

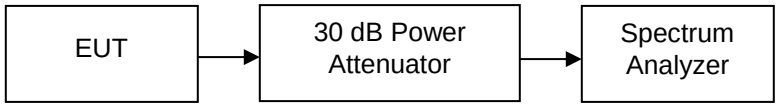
Name of Test: Frequency Stability (Voltage Variation) **Engineer:** John Erhard
Test Equipment Utilized: i00027, i00029, i00343 **Test Date:** 10/17/2012

Test Procedure

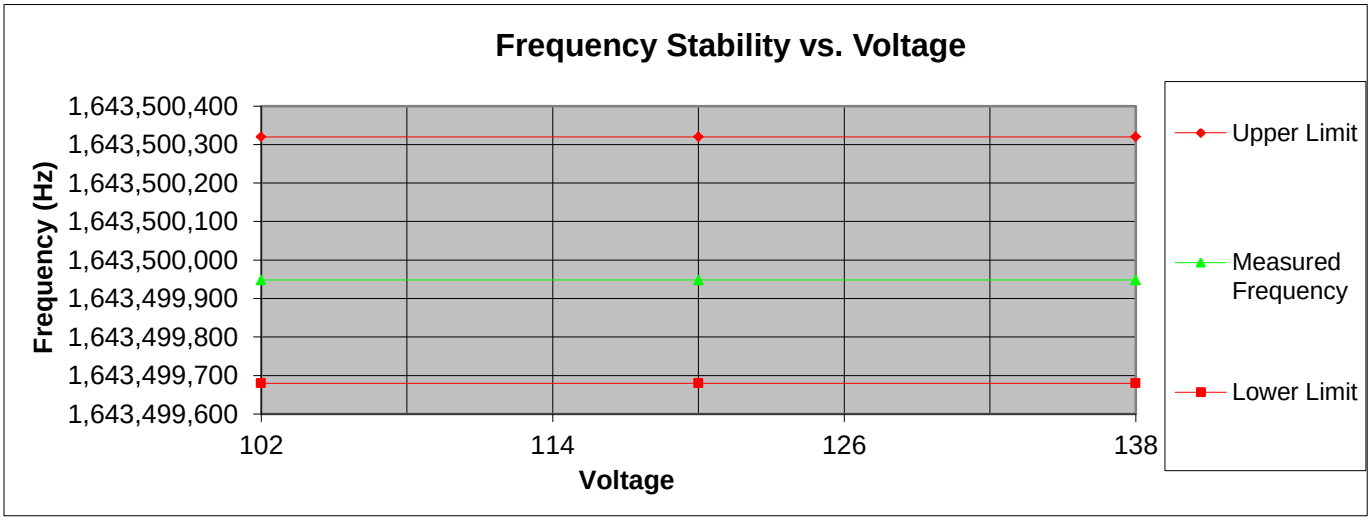
The EUT was placed in a temperature chamber at 20±5°C and connected directly to a spectrum analyzer. The power supply voltage to the EUT was varied from 85% to 115% of the nominal value and the RF output was measured. This was measured with both a 400 Hz 120 VAC supply and a variable DC voltage source.

The frequency stability limit is 320 Hz.

Test Setup



Test Results



Necessary Bandwidth and Emission Bandwidth

Name of Test: Necessary Bandwidth and Emission Bandwidth **Engineer:** John Erhard

BPSK

Modulation = 840HG1D

Necessary Bandwidth Calculation:

Signal States (S)	=	2
Data Rate (D)	=	0.6
Constant Factor (K)	=	0.7
Necessary Bandwidth (B_N), kHz	=	$2*D*K / LOG_2(S)$

Modulation = 1K68G1D

Necessary Bandwidth Calculation:

Signal States (S)	=	2
Data Rate (D)	=	1.2
Constant Factor (K)	=	0.7
Necessary Bandwidth (B_N), kHz	=	$2*D*K / LOG_2(S)$

Modulation = 21K0G1D

Necessary Bandwidth Calculation:

Signal States (S)	=	2
Data Rate (D)	=	3
Constant Factor (K)	=	3.5
Necessary Bandwidth (B_N), kHz	=	$2*D*K / LOG_2(S)$

QPSK

Modulation = 6K80G1E

Necessary Bandwidth Calculation:

Signal States (S)	=	4
Data Rate (D)	=	8.4
Constant Factor (K)	=	0.81
Necessary Bandwidth (B_N), kHz	=	$2*D*K / LOG_2(S)$

Modulation = 7K20G1E

Necessary Bandwidth Calculation:

Signal States (S)	=	4
Data Rate (D)	=	5.6
Constant Factor (K)	=	1.29
Necessary Bandwidth (B_N), kHz	=	$2*D*K / LOG_2(S)$

Modulation = 10K5G1D

Necessary Bandwidth Calculation:

Signal States (S)	=	4
Data Rate (D)	=	10.5
Constant Factor (K)	=	1
Necessary Bandwidth (B_N), kHz	=	$2*D*K / LOG_2(S)$

Modulation = 25K0G7W

Necessary Bandwidth Calculation:

Signal States (S)	=	4
Data Rate (D)	=	33.6
Constant Factor (K)	=	0.74
Necessary Bandwidth (B_N), kHz	=	$2*D*K / LOG_2(S)$

Modulation = 50K0G7W

Necessary Bandwidth Calculation:

Signal States (S)	=	4
Data Rate (D)	=	67.2
Constant Factor (K)	=	0.74
Necessary Bandwidth (B_N), kHz	=	$2*D*K / LOG_2(S)$

Modulation = 100KG7W

Necessary Bandwidth Calculation:

Signal States (S)	=	4
Data Rate (D)	=	134.4
Constant Factor (K)	=	0.74
Necessary Bandwidth (B_N), kHz	=	$2*D*K / LOG_2(S)$

Modulation = 200KG7W

Necessary Bandwidth Calculation:

Signal States (S)	=	4
Data Rate (D)	=	302.4
Constant Factor (K)	=	0.66
Necessary Bandwidth (B_N), kHz	=	$2*D*K / LOG_2(S)$

QAM

Modulation = 40K0G1D

Necessary Bandwidth Calculation:

Signal States (S)	=	16
Data Rate (D)	=	134.4
Constant Factor (K)	=	0.6
Necessary Bandwidth (B_N), kHz	=	2*D*K / LOG_2(S)

Modulation = 40K0G1E

Necessary Bandwidth Calculation:

Signal States (S)	=	16
Data Rate (D)	=	134.4
Constant Factor (K)	=	0.6
Necessary Bandwidth (B_N), kHz	=	2*D*K / LOG_2(S)

Modulation = 50K0D7W

Necessary Bandwidth Calculation:

Signal States (S)	=	16
Data Rate (D)	=	134.4
Constant Factor (K)	=	0.74
Necessary Bandwidth (BN), kHz	=	2*D*K / LOG2(S)

Modulation = 100KD7W

Necessary Bandwidth Calculation:

Signal States (S)	=	16
Data Rate (D)	=	268.8
Constant Factor (K)	=	0.74
Necessary Bandwidth (B_N), kHz	=	2*D*K / LOG_2(S)

Modulation = 200KD7W

Necessary Bandwidth Calculation:

Signal States (S)	=	16
Data Rate (D)	=	604.8
Constant Factor (K)	=	0.66
Necessary Bandwidth (B_N), kHz	=	2*D*K / LOG_2(S)

Test Equipment Utilized

Manufacturer	Model	Description	Asset#	Last Calibration	Calibration Due
Tenney	Tenney Jr	Temperature Test Chamber	i00027	Verified on:10/17/12	
Fluke	Hydra	Data Bucket	i00343	12/15/11	12/15/12
HP	8563E	Spectrum Analyzer	i00029	9/13/12	9/13/13
EMCO	3115	Horn Antenna	i00103	11/5/10	11/5/12
Agilent	E4407B	Spectrum Analyzer	i00331	4/20/12	4/20/13

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