



Compliance Testing, LLC

Previously Flom Test Lab

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toll-free: (866) 311-3268

fax: (480) 926-3598

<http://www.ComplianceTesting.com>

info@ComplianceTesting.com

Test Report

Prepared for: Ubiquiti Networks, Inc

Model: LBE-M5-23, LBE-M5-OMNI

Description: LiteBeam M5

Serial Number: N/A

FCC ID: SWX-LBE5M

To

FCC Part 15.407

Date of Issue: December 21, 2015

On the behalf of the applicant:

Ubiquiti Networks, Inc
2580 Orchard Parkway
San Jose, CA 95131

Attention of:

Michael Taylor, Compliance Manager
Ph: (408) 942-3085
E-mail: compliance@ubnt.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: p14a0032

Kenneth Lee
Project Test Engineer

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All results contained herein relate only to the sample tested.



Test Report Revision History

Revision	Date	Revised By	Reason for Revision
1.0	October 16, 2015	Kenneth Lee	Original Document
2.0	November 2, 2015	Kenneth Lee	Updated frequency ranges throughout report
3.0	December 21, 2015	Diana Williams	Updated Model Names



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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 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 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 marked 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.



Standard Test Conditions Engineering Practices

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

In accordance with ANSI C63.10-2013 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.

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

Environmental Conditions		
Temperature (°C)	Humidity (%)	Pressure (mbar)
23.0 – 26.5	22.7 – 36.5	962.9 – 972.7

EUT Description

Model: LBE-M5-23, LBE-M5-OMNI

Description: LiteBeam M5

Firmware: N/A

Software: N/A

Serial Number: N/A

Additional Information:

The EUT was tested conducted mode with RF connectors mounted on the EUT at the antenna input.

When the test cable is plugged into the RF connector mounted to the EUT it disables the antenna connection.

The EUT is powered by POE (Power Over Ethernet).

The different data rates were evaluated and the worst case data rate was chosen for all the testing.



EUT Specifications

Equipment Code	NII
Model(s) Tested	LBE-M5-23, LBE-M5-OMNI
Model(s) covered	LBE-M5-23, LBE-M5-OMNI
Frequency Range	5250 – 5350 MHz
Bandwidths	10/20/30/40 MHz
EUT temperature range	-40°C to 80°C
Data Rates	6, 9, 12, 18, 24, 36, 48, 54, MCS0, MCS1, MCS2, MCS3, MCS4, MCS5, MCS6, MCS7, MCS8, MCS9
Modulations	BPSK, QPSK, 16-QAM, 64-QAM, 256-QAM

Antenna List

No.	Manufacturer	Part #	Antenna Type	Peak Gain
1	Ubiquiti	LBE-M5-Omni	OMNI	6
2	Ubiquiti	LBE-M5-23	Dish	23

15.203: Antenna Requirement:

- ☐ The antenna is permanently attached to the EUT
- ☐ The antenna uses a unique coupling
- ☒ The EUT must be professionally installed
- ☐ The antenna requirement does not apply



Accessories:

Qty	Description	Manufacturer	Model	S/N
1	Switching Gigabit Power Supply/POE	Ubiquiti	GP-A240-050G	N/A

Cables: None

Modifications: None



Test Results Summary

Specification	Test Name	Pass, Fail, N/A	Comments
§15.203	Antenna Requirements	Pass	
§15.207 §15.407(b)(6)	Line Conducted Emissions	Pass	
§15.407(a)(1)	Conducted Output Power	Pass	
§15.407(a)(1),(5)	Power Spectral Density	Pass	
§15.403(i) §15.407(a)(5)	26dB Occupied Bandwidth	Pass	
	99% Occupied Bandwidth		
§15.407(b)(1)	Undesirable Emissions	Pass	
§15.205 §15.407(b)(1),(5),(6)(7)	General Field Strength Limits (Restricted Bands and Radiated Emission limits)	Pass	
§15.407(g)	Frequency Stability	Pass	

References	Description
CFR47, Part 15, Subpart B	Unintentional Radiators
CFR47, Part 15, Subpart C	Intentional Radiators
CFR47, Part 15, Subpart E	Unlicensed Nation Information Infrastructure Devices (U-NII)
ANSI C63.10-2009	American National standard for testing Unlicensed Wireless Devices
ANSI C63.4-2009	Method and Measurements of Radio-Noise Emissions from low-Voltage Electrical and Electronic Equipment in the range 9kHz to 40GHz.
ISO/IEC 17025:2005	General requirements for the Competence of Testing and Calibrations Laboratories
KDB 644545 D03	Guidance for IEEE 802 11ac New Rules
KDB 789033 D02	General U-NII Test Procedures New Rules V01
KDB 926956 D01	U-NII Transition Plan



Peak Output Power

Engineer: Alex Macon

Test Date: 10/2/2015

Test Requirements

(2) For the 5.25-5.35 GHz band, the maximum conducted output power over the frequency bands of operation shall not exceed the lesser of 250 mW or $11 \text{ dBm} + 10 \log B$, where B is the 26 dB emission bandwidth in megahertz. If transmitting antennas of directional gain greater than 6 dBi are used, the maximum conducted output power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

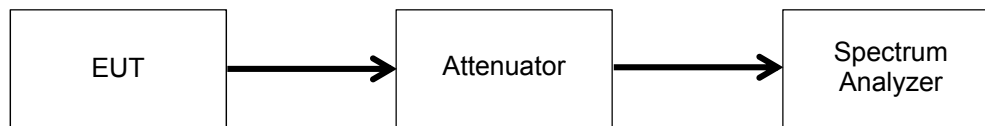
Test Procedure

The RF power was calculated using the spectrum analyzers' band power function per Method SA-1 from KDB 789033 D02 General U-NII Test Procedures New Rules v01. Measurements were made at the low, mid, and high channels of the band.

The Spectrum Analyzer was set to the following:

- a. RBW = 1 MHz
- b. VBW $\geq$ 3 MHz
- c. Sweep time = auto
- d. Detector = RMS
- e. 100 traces in power averaging mode

Test Setup





Test Results

6dbi Antenna

Bandwidth	Test Frequency	Data Rate	TP	F37 Level	F37 Level	Limit	Margin
MHz	MHz			dBm	mW	dBm	dB
10	5255	6	20	18.5	70.8	24	-5.5
10	5300	6	20	19.2	83.9	24	-4.8
10	5340	6	13	15.7	37.5	24	-8.3
20	5260	6	20	21.0	125.3	24	-3.0
20	5300	6	20	20.9	121.9	24	-3.1
20	5335	6	10	12.4	17.3	24	-11.6
30	5265	6	20	21.4	138.7	24	-2.6
30	5300	6	18	19.6	91.4	24	-4.4
30	5330	6	7	9.3	8.5	24	-14.7
40	5270	f0	20	20.9	122.2	24	-3.1
40	5300	f0	18	19.6	90.2	24	-4.5
40	5325	f0	11	13.1	20.5	24	-10.9

23 dbi Antenna

Bandwidth	Test Frequency	Data Rate	F37 Level	F37 Level	Limit	Margin
MHz	MHz		dBm	mW	dBm	dB
10	5255	6	1.5	1.4	7	-5.5
10	5300	6	2.2	1.7	7	-4.8
10	5340	6	-1.3	0.7	7	-8.3
20	5260	6	4.0	2.5	7	-3.0
20	5300	6	3.9	2.5	7	-3.1
20	5335	6	-4.6	0.3	7	-11.6
30	5265	6	4.4	2.8	7	-2.6
30	5300	6	2.6	1.8	7	-4.4
30	5330	6	-7.7	0.2	7	-14.7
40	5270	f0	3.9	2.5	7	-3.1
40	5300	f0	2.6	1.8	7	-4.4
40	5325	f0	-3.9	0.4	7	-10.9



Transmitter Power Spectral Density

Engineer: Alex Macon

Test Date: 10/2/2015

Test Requirements

(2) For the 5.25-5.35 GHz band, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

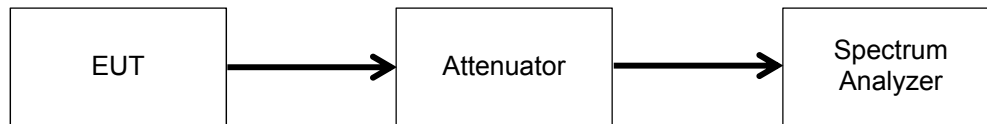
Test Procedure

The Power Spectral Density was measured using the method per SA-1 from KDB 789033 D02 General U-NII Test Procedures New Rules v01. Measurements were made at the low, mid, and high channels of the band. The maximum PSD was determine by finding the peak value across the carrier bandwidth.

The Spectrum Analyzer was set to the following:

- a. RBW = 1 MHz
- b. VBW $\geq$ 3 MHz
- c. Span $1.5 * BW$
- d. Sweep time = auto
- e. Detector = RMS
- f. 100 traces in power averaging mode

Test Setup





Test Results

Bandwidth	Test Frequency	Data Rate	TP	F37 Level	F37 Level	Limit	Margin
MHz	MHz			dBm	mW	dBm	dB
10	5255	6	20	8.9	7.8	11	-2.1
10	5300	6	20	9.9	9.7	11	-1.2
10	5340	6	13	6.4	4.4	11	-4.6
20	5260	6	20	8.8	7.6	11	-2.2
20	5300	6	20	8.9	7.8	11	-2.1
20	5335	6	10	0.1	1.0	11	-10.9
30	5265	6	20	7.3	5.3	11	-3.7
30	5300	6	18	5.7	3.7	11	-5.3
30	5330	6	7	-4.6	0.3	11	-15.6
40	5270	f0	20	5.7	3.7	11	-5.3
40	5300	f0	18	4.4	2.8	11	-6.6
40	5325	f0	11	-2.0	0.6	11	-13.0



Undesirable Emissions Conducted

Engineer: Alex Macon

Test Date: 10/1/2015

Test Requirements

Unwanted Emissions that fall Outside Restricted Bands

For transmitters operating in the 5.25-5.35 GHz band: All emissions outside of the 5.25-5.35 GHz band shall not exceed an e.i.r.p. of -27 dBm/MHz.

As specified in § 15.407(b), emissions above 1000 MHz that are outside of the restricted bands are subject to a maximum emission limit of -27 dBm/MHz. However, an out-of-band emission that complies with both the peak and average limits of § 15.209 is not required to satisfy the -27 dBm/MHz maximum emission limit.

The emission measurements shall be performed using a minimum resolution bandwidth of 1 MHz. A lower resolution bandwidth may be employed near the band edge, when necessary, provided the measured energy is integrated to show the total power over 1 MHz

The provisions of §15.205 apply to intentional radiators operating under this section

Unwanted emissions below 1 GHz must comply with the general field strength limits set forth in §15.209.

For Conducted Unwanted Emissions in the Restricted Bands

For conducted measurements above 1000 MHz, EIRP was determined and then the field strength computed by the following:

$E[\text{dB}\mu\text{V/m}] = \text{EIRP}[\text{dBm}] - 20 \log(d[\text{meters}]) + 104.77$, where E = field strength and $d = 3\text{m}$

$E[\text{dB}\mu\text{V/m}] = \text{EIRP}[\text{dBm}] + 95.2$, for $d = 3\text{ meters}$.

Test Procedure

Per KDB 789033 D02 General U-NII Test Procedures New Rules v01 conducted RF port measurements were made in lieu of radiated. In addition, Cabinet Emissions measurements were performed in a semi-anechoic chamber with the antenna port terminated by a matching load. See additional section for Radiated Emissions.

The following criteria were addressed:

The Spectrum Analyzer was set to the following for emissions > 1000MHz:

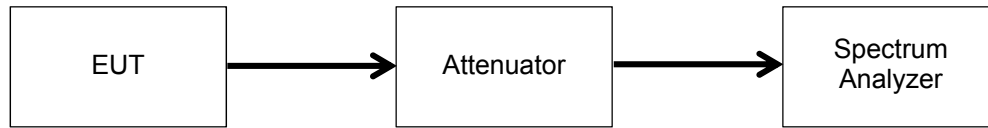
- a. RBW = 1 MHz
- b. VBW $\geq$ 3 MHz
- c. Detector = Peak.
- d. Sweep time = auto
- e. Trace mode = max hold
 - 1. Note: For emissions where the peak exceeded that of the average 15.209 emission limit the following was performed.
- f. RBW = 1 MHz
- g. VBW $\leq$ RBW/100 (i.e., 10 kHz) but not less than 10 Hz

For emissions below 1000MHz the Spectrum Analyzer settings were as follows:

- a. RBW = 100 kHz
- b. VBW $\geq$ 300 kHz
- c. Detector = Peak
- d. Sweep time = auto
- e. Trace mode = max hold



Test Setup



Test Results:

See Annex A: Undesirable Emissions Conducted



Undesirable Emissions Radiated

Engineer: Kenneth Lee

Test Date: 10/15/2015

Test Requirements

The provision of §15.209 were applied. In addition the requirements of §15.205 were also applied.

FCC Part 15 Subpart C Paragraph 15.209(a) Limits

Frequency (MHz)	Frequency (microvolts/meter)	Frequency (meter)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

Remarks: E field strength (dBμV/m) = 20 log E field strength (uV/m)

Test Procedure

The EUT was setup in accordance with ANSI C63.10. 2013 and tested per KDB 789033. The antenna was replaced with non-radiating matched load. The EUT is placed on non-conductive platform at a height of 0.8 meters above the ground plane of the semi-anechoic chambers. The EUT was rotated 360 degrees and the receive antenna raised and lowered to find the maximum emissions from 30MHz to the 10th harmonic of the fundamental. The EUT was set to the maximum power level allowed and the low, mid, and high channels were investigated for emissions.

The Spectrum Analyzer was set to the following for emissions > 1000MHz:

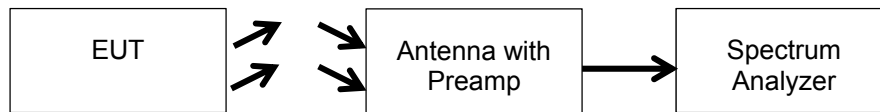
- a. (RBW = 1 MHz
- b. VBW ≥ 3 MHz
- c. Detector = Peak
- d. Sweep time = auto
- e. Trace mode = max hold
 - 1. Note: For emissions where the peak exceeded that of the average 15.209 emission limit the following was performed.
- f. RBW = 1 MHz
- g. VBW ≤ RBW/100 (i.e., 10 kHz) but not less than 10Hz

For emissions below 1000MHz the Spectrum Analyzer settings were as follows:

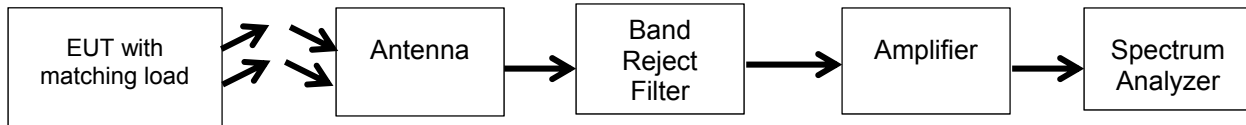
- a. RBW = 100 kHz
- b. VBW ≥ 300 kHz
- c. Detector = Peak
- d. Sweep time = auto
- e. Trace mode = max hold
 - 1. Note: A quasi peak detector was used for emissions where the peak exceeded that of the average 15.209 emission limits



Test Setup below 1000MHz



Test Setup above 1000MHz



Test Results: **See Annex B: Undesirable Emission Radiated**



Occupied Bandwidth

Engineer: Alex Macon

Test Date: 10/2/2015

Test Requirement

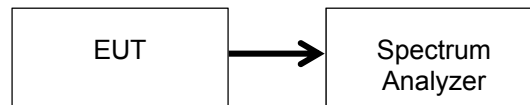
The emission bandwidth shall be determined by measuring the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, that are 26 dB down relative to the maximum level of the modulated carrier. Determination of the emissions bandwidth is based on the use of measurement instrumentation employing a peak detector function with an instrument resolution bandwidth approximately equal to 1.0 percent of the emission bandwidth of the device under measurement

Test Procedure

The Spectrum Analyzer was set to the following parameters:

- a. RBW = approximately 1% of the emission bandwidth.
- b. VBW > RBW.
- c. Detector = Peak.
- d. Trace mode = max hold.

Test Setup



Test Results: **See Annex C: Occupied Bandwidth**



Frequency Stability

Engineer: Alex Macon

Test Date: 7/16/2015

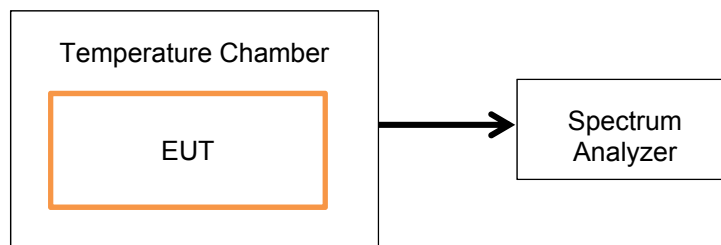
Test Requirement

Manufacturers of U-NII devices are responsible for ensuring frequency stability such that an emission is maintained within the band of operation under all conditions of normal operation as specified in the user's manual.

Test Procedure

- The EUT was placed into a temperature chamber and the temperature ranges were set to the manufacturers' specifications.
- The RF output of the EUT was connected to a spectrum analyzer
- The lowest and highest channels of the band were set to transmit
- The carrier plots were measured to insure that the 26dB band width remained within the band over the prescribed temperature extremes.

Test Setup



Test Results: See Annex D: Frequency Stability



A/C Powerline Conducted Emission

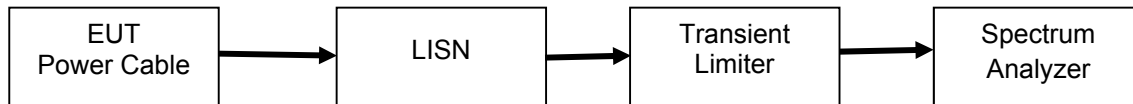
Engineer: Alex Macon

Test Date: 7/10/2015

Test Procedure

The EUT power cable was connected to a LISN and the monitored output of the LISN was connected to a transient limiter, which then connected directly to a spectrum analyzer. The conducted emissions from 150 kHz to 30 MHz were measured and compared to the specification limits.

Test Setup



Test Results: **See Annex E: A/C Powerline Conducted Emission**



Test Equipment Utilized

Description	Manufacturer	Model #	CT Asset #	Last Cal Date	Cal Due Date
Temperature Chamber	Tenney	Tenney Jr	i00027	NCR	NCR
Temperature Chamber	Tenney	Tenney II Benchmaster	i00287	NCR	NCR
EMI Receiver	HP	8546A	i00033	2/26/15	2/26/16
Preamplifier	HP	8447D	i00055	NCR	NCR
Horn Antenna	EMCO	3116	i00085	1/29/15	1/29/17
Bi-Log Antenna	Schaffner	CBL611C	i00267	2/24/14	2/24/16
Horn Antenna, Amplified	ARA	DRG-118/A	i00271	5/8/14	5/8/16
Horn Antenna, Amplified	ARA	MWH-1826/B	i00273	4/22/15	4/22/18
Humidity / Temp Meter	Newport	IBTHX-W-5	i00282	4/1/15	4/1/16
Spectrum Analyzer	Agilent	E4407B	i00331	9/18/15	9/18/16
Data Logger	Fluke	Hydra Data Bucket	i00343	3/24/15	3/24/16
EMI Analyzer	Agilent	E7405A	i00379	2/5/15	2/5/16
3 Meter Semi-Anechoic Chamber	Panashield	3 Meter Semi-Anechoic Chamber	i00428	11/26/13	3/12/16
PSA Spectrum Analyzer	Agilent	E4445A	i00471	8/26/15	8/26/16

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.

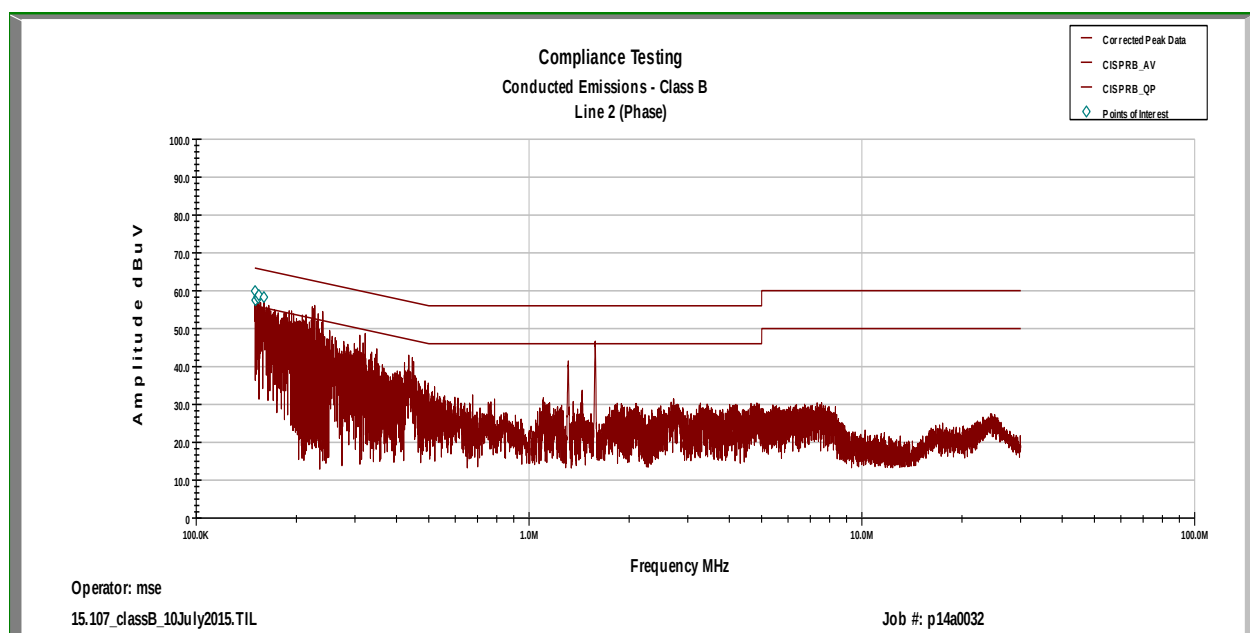
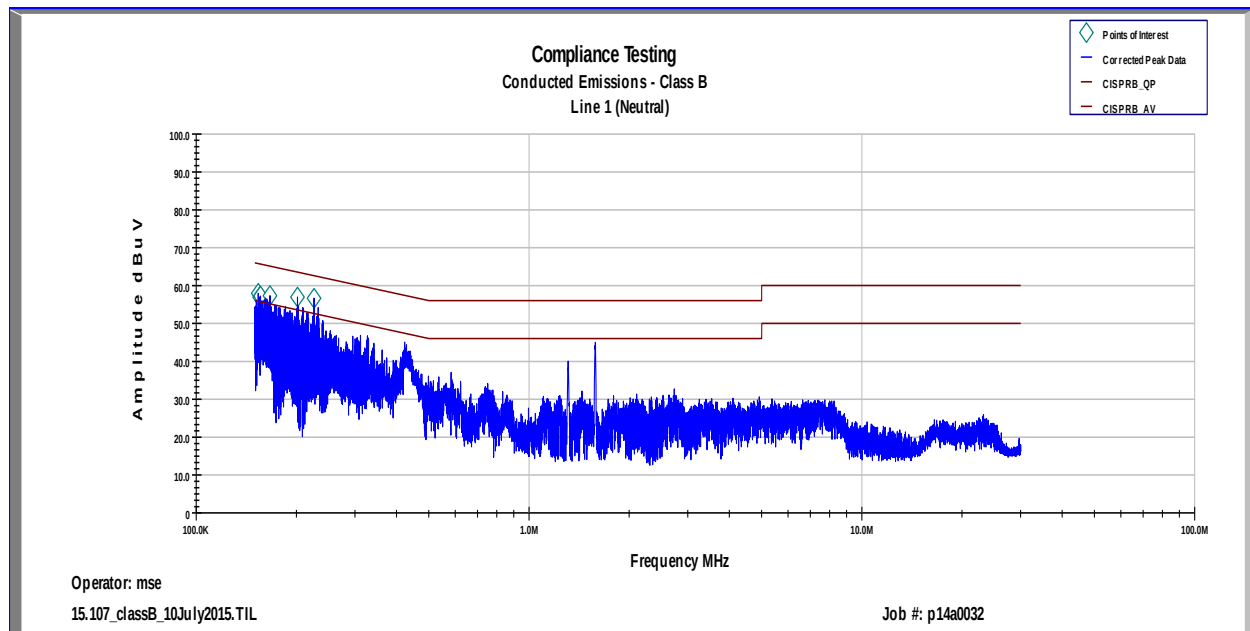
END OF TEST REPORT

Annex E

15.207

A/C Powerline

Conducted Emission



L1 AVG

Frequency	Measured Data	LISN Correction Factor	Cable Correction Factor	Attenuator	Corrected Data	Limit	Margin
220.53 KHz	16.51	0.19	0.021	10.1	26.821	53.985	-27.164
189.99 KHz	17.63	0.2	0.02	10.1	27.953	54.857	-26.904
160.86 KHz	23.5	0.2	0.02	10.191	33.915	55.69	-21.775
159.47 KHz	23.17	0.21	0.02	10.2	33.599	55.729	-22.131
157.01 KHz	23.44	0.23	0.02	10.2	33.887	55.8	-21.913
150.1 KHz	16.49	0.3	0.02	10.2	27.006	55.997	-28.991

L2 AVG

Frequency	Measured Data	LISN Correction Factor	Cable Correction Factor	Attenuator	Corrected Data	Limit	Margin
157.63 KHz	21.8	0.22	0.02	10.2	32.24	55.782	-23.542
155.22 KHz	20.32	0.25	0.02	10.2	30.788	55.851	-25.063
153.07 KHz	18.74	0.27	0.02	10.2	29.226	55.912	-26.686
152.65 KHz	17.92	0.27	0.02	10.2	28.417	55.924	-27.507
151.55 KHz	17.52	0.28	0.02	10.2	28.025	55.956	-27.931
150.95 KHz	16.43	0.29	0.02	10.2	26.937	55.973	-29.036

L1 QP

Frequency	Measured Data	LISN Correction Factor	Cable Correction Factor	Attenuator	Corrected Data	Limit	Margin
157.63 KHz	21.8	0.22	0.02	10.2	32.24	55.782	-23.542
155.22 KHz	20.32	0.25	0.02	10.2	30.788	55.851	-25.063
153.07 KHz	18.74	0.27	0.02	10.2	29.226	55.912	-26.686
152.65 KHz	17.92	0.27	0.02	10.2	28.417	55.924	-27.507
151.55 KHz	17.52	0.28	0.02	10.2	28.025	55.956	-27.931
150.95 KHz	16.43	0.29	0.02	10.2	26.937	55.973	-29.036

L2 QP

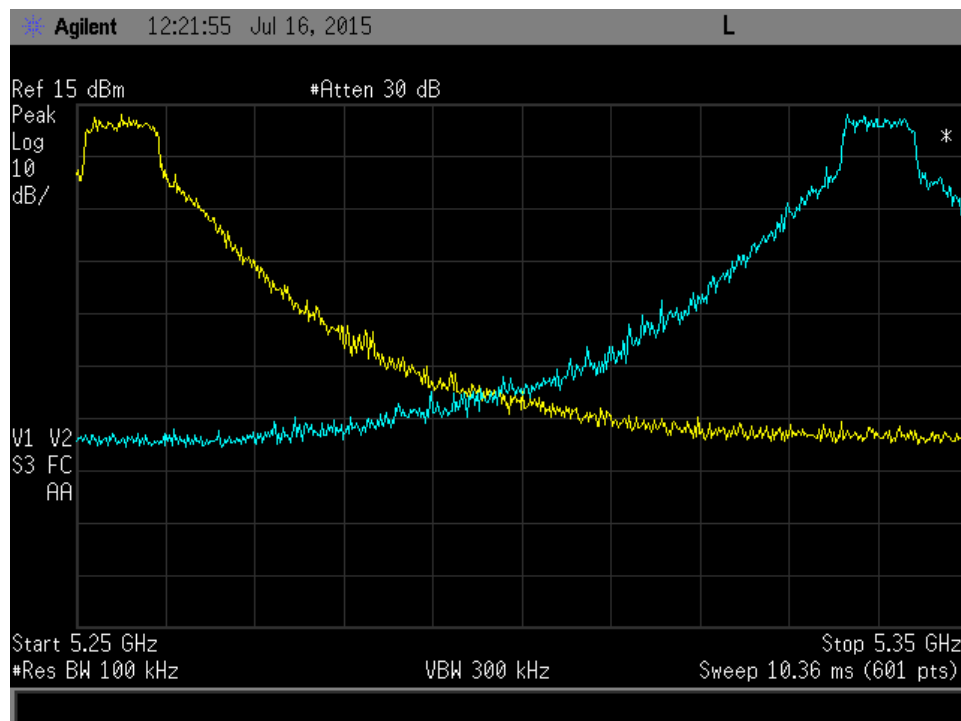
Frequency	Measured Data	LISN Correction Factor	Cable Correction Factor	Attenuator	Corrected Data	Limit	Margin
157.63 KHz	40.63	0.22	0.02	10.2	51.074	65.782	-14.708
155.22 KHz	40.46	0.25	0.02	10.2	50.928	65.851	-14.923
153.07 KHz	39.5	0.27	0.02	10.2	49.989	65.912	-15.923
152.65 KHz	39.32	0.27	0.02	10.2	49.813	65.924	-16.111
151.55 KHz	39.06	0.28	0.02	10.2	49.565	65.956	-16.391
150.95 KHz	38.99	0.29	0.02	10.2	49.5	65.973	-16.472

Annex D

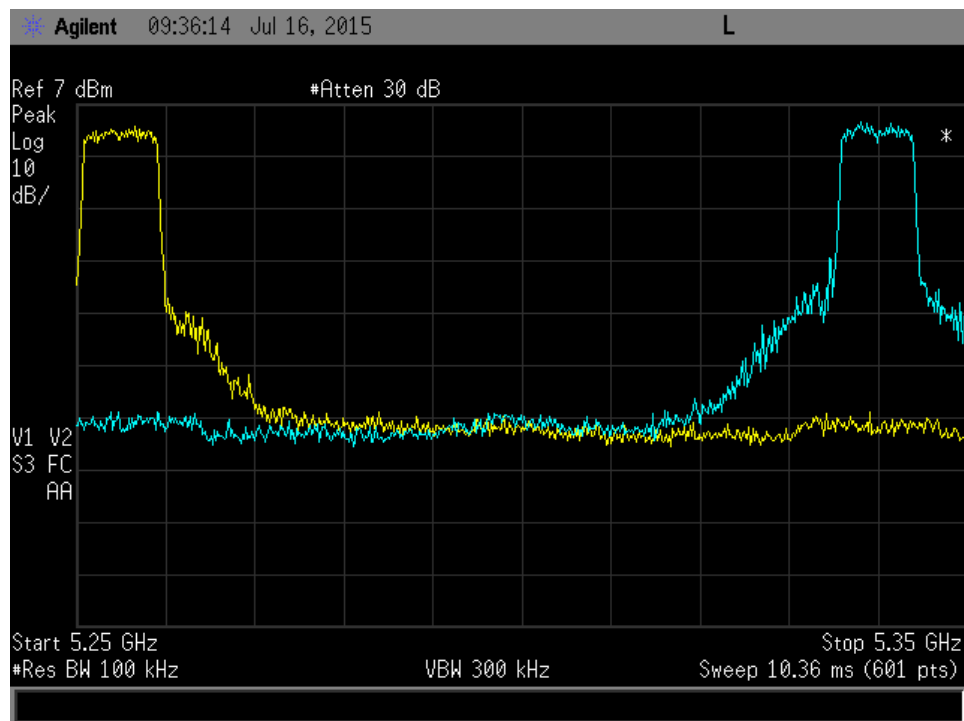
Frequency Stability



UNI-2A -40C

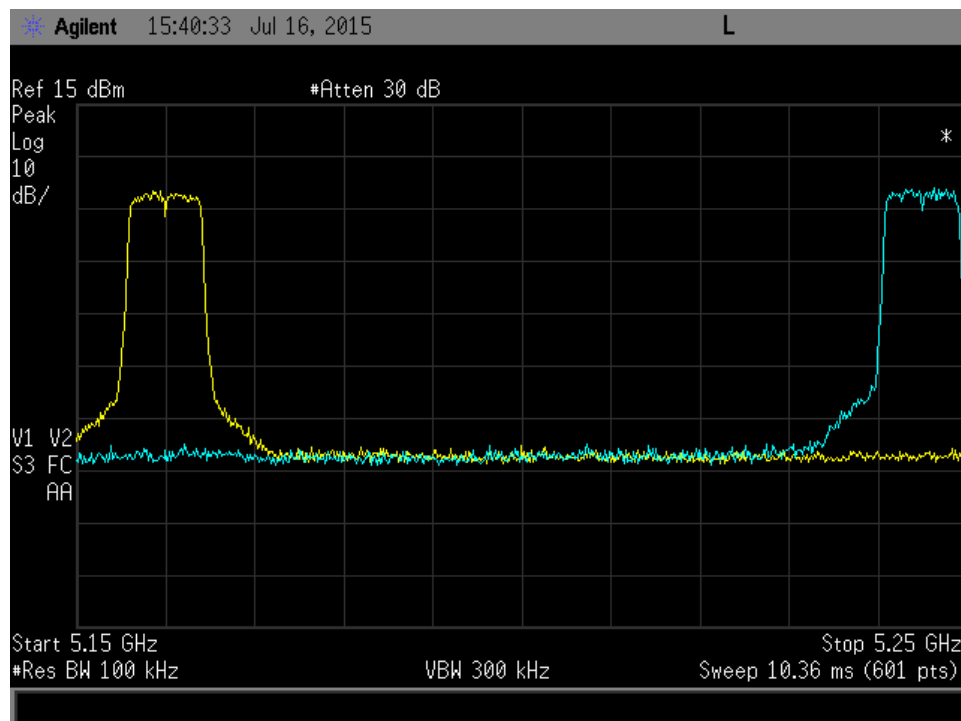


UNI-2A 25C





UNI-2A 80C



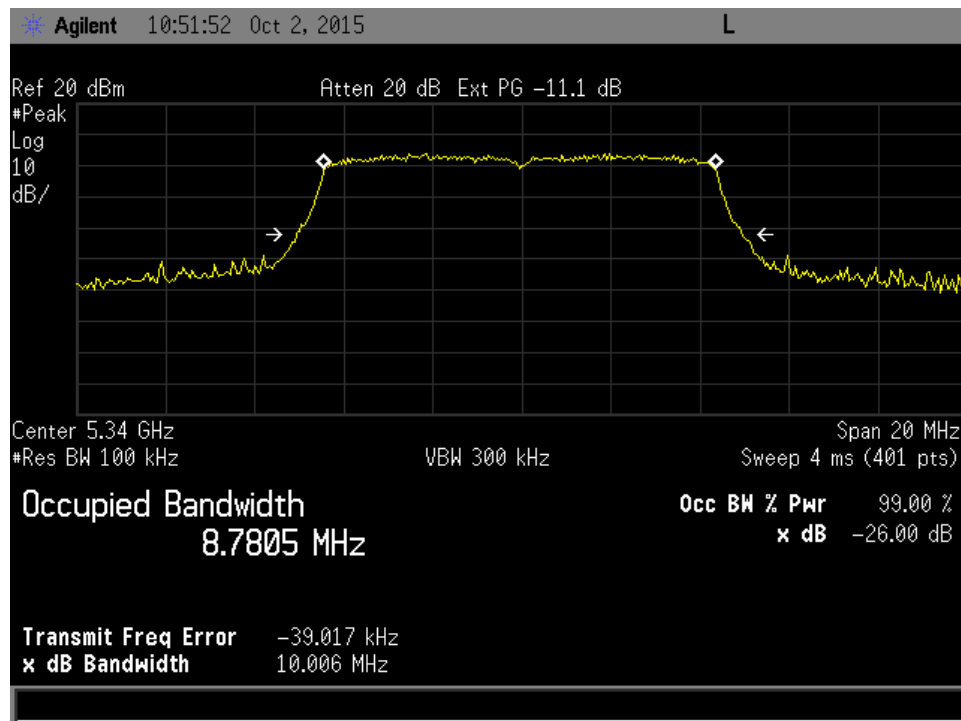
Annex C

Occupied Bandwidth

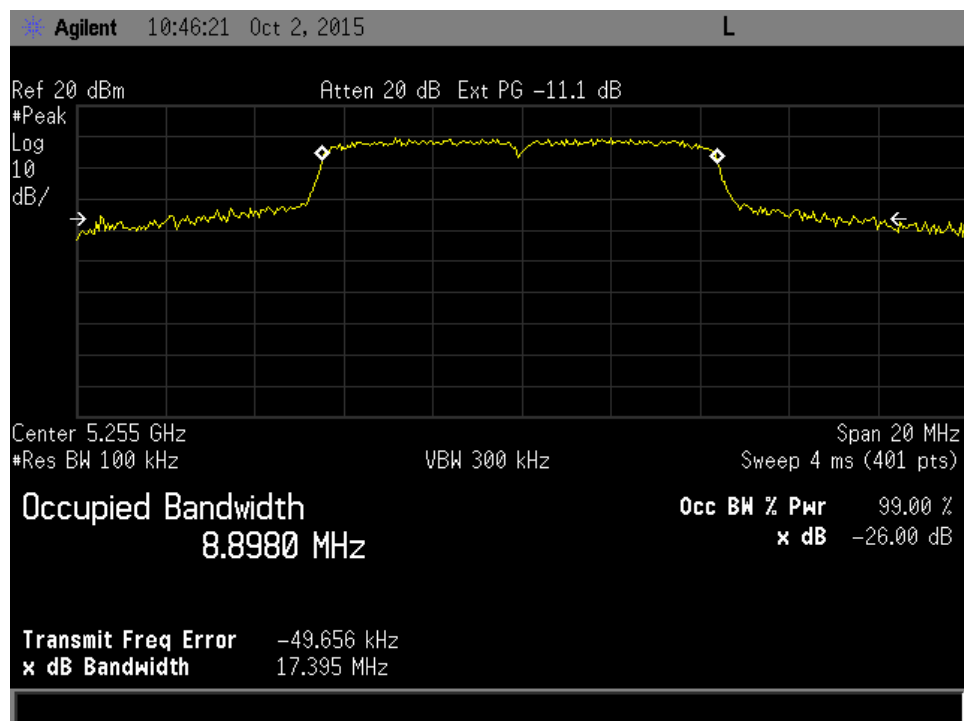
Port F37



10 MHz high ch

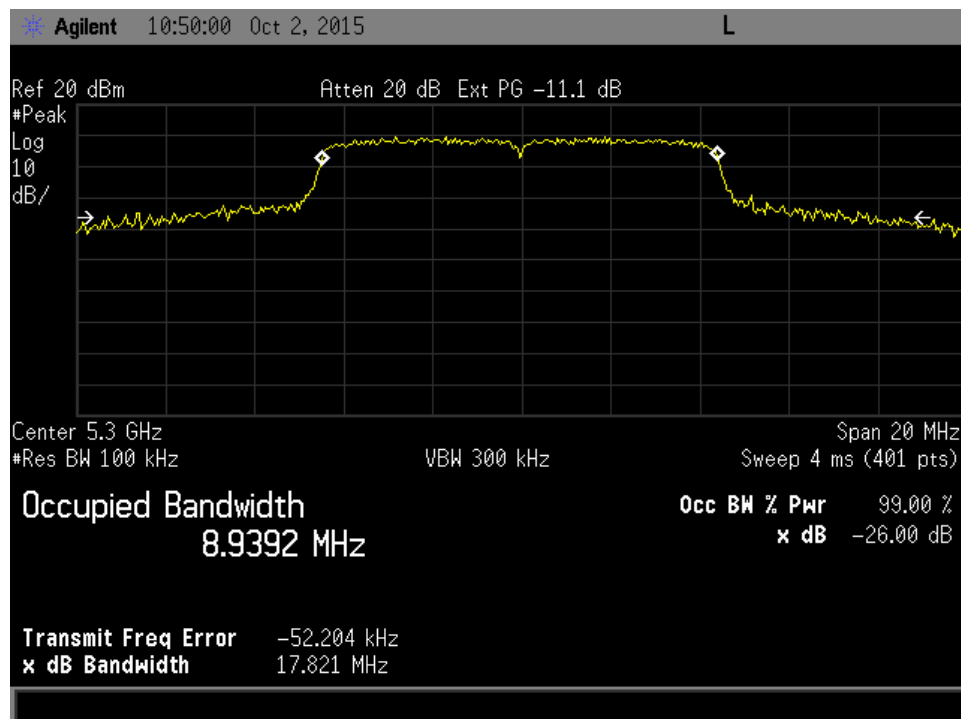


10 MHz low ch

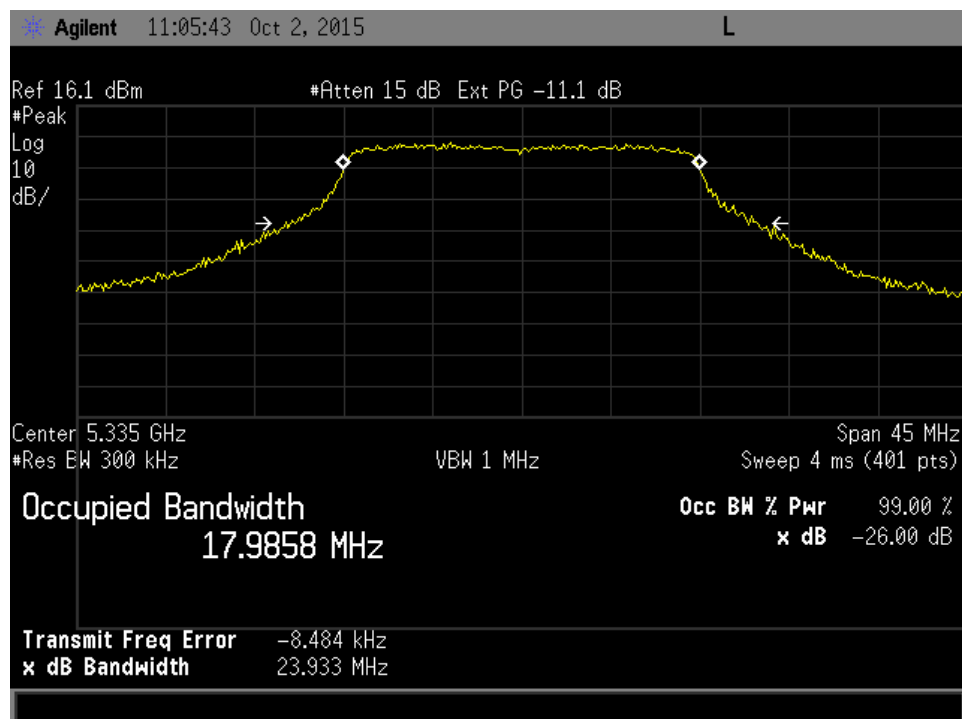




10 MHz mid ch

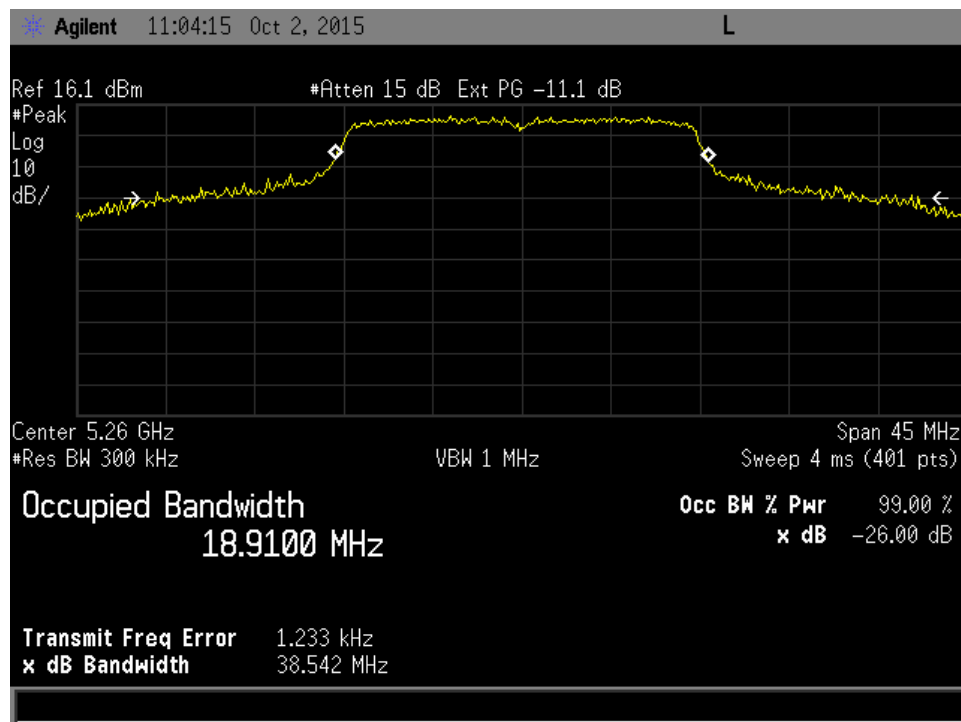


20 MHz high ch

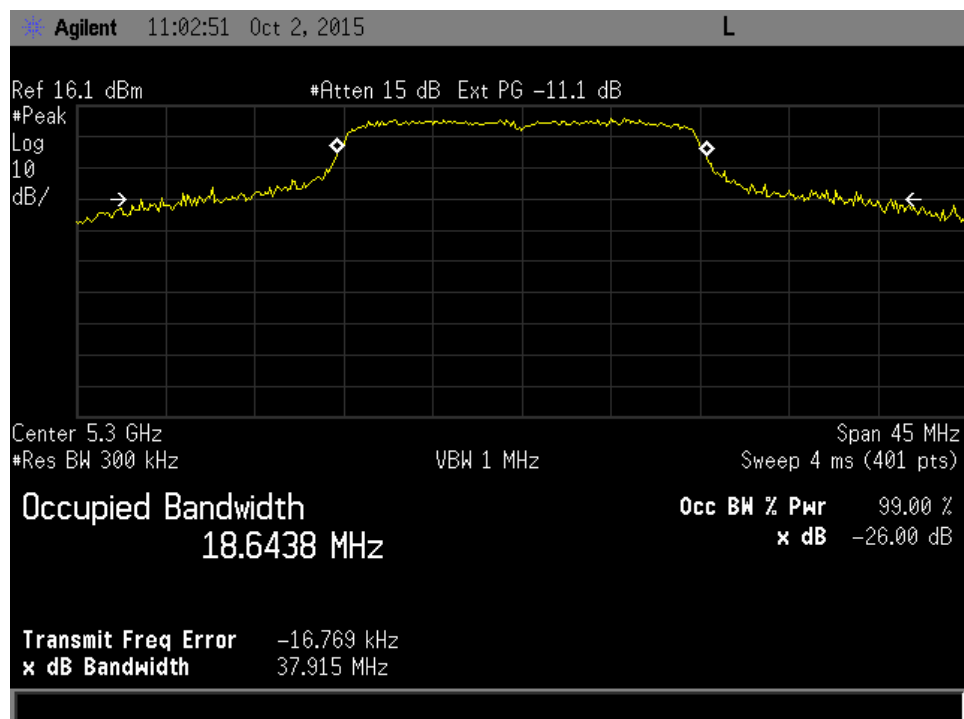




20 MHz low ch

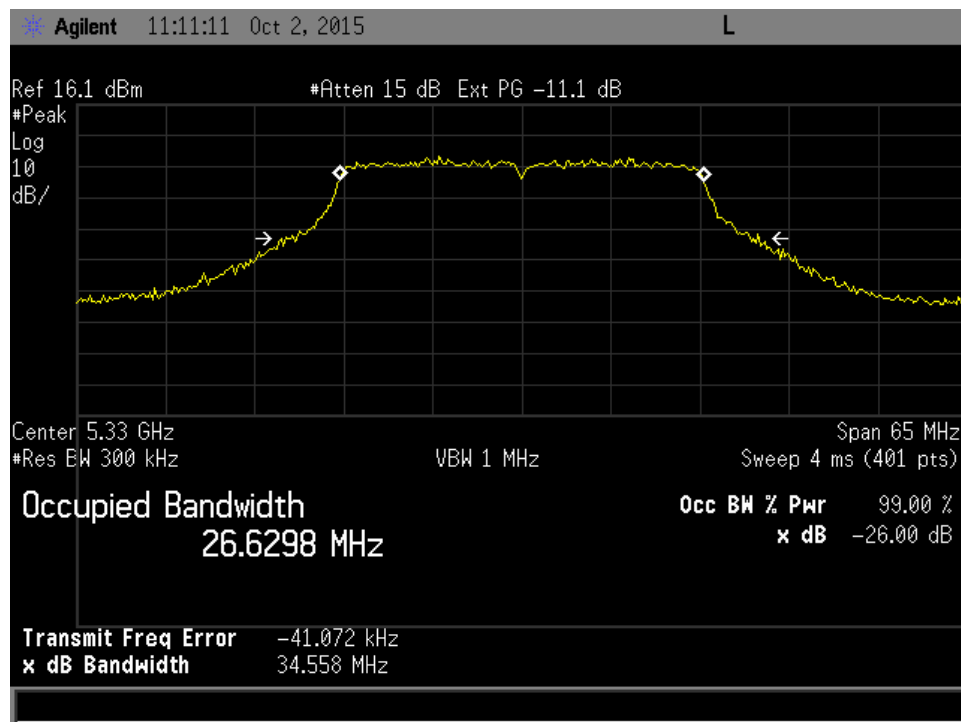


20 MHz mid ch

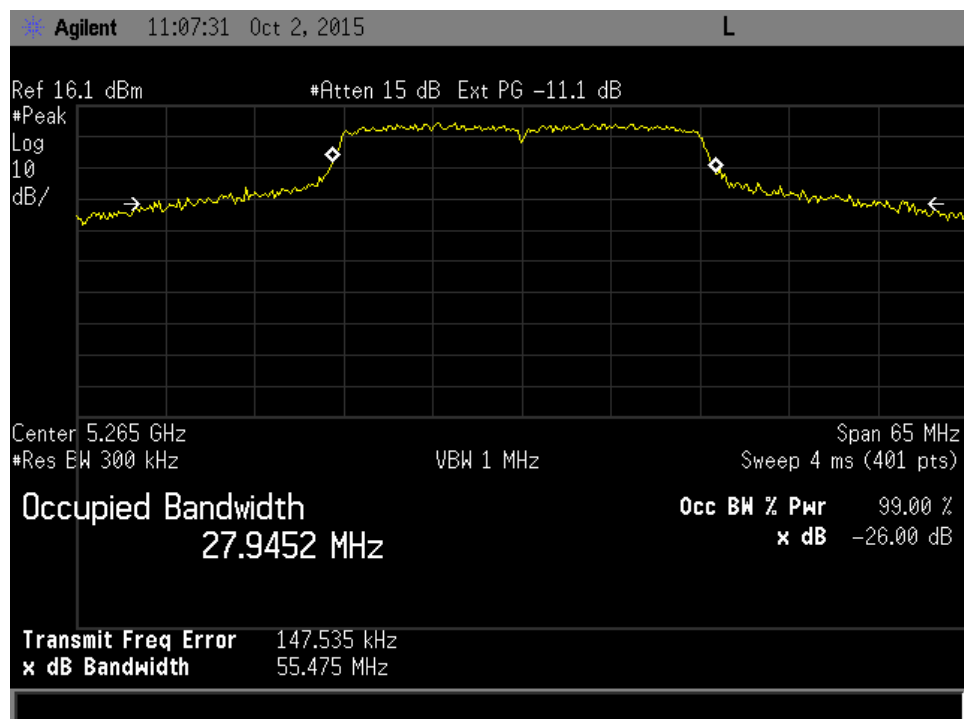




30 MHz high ch

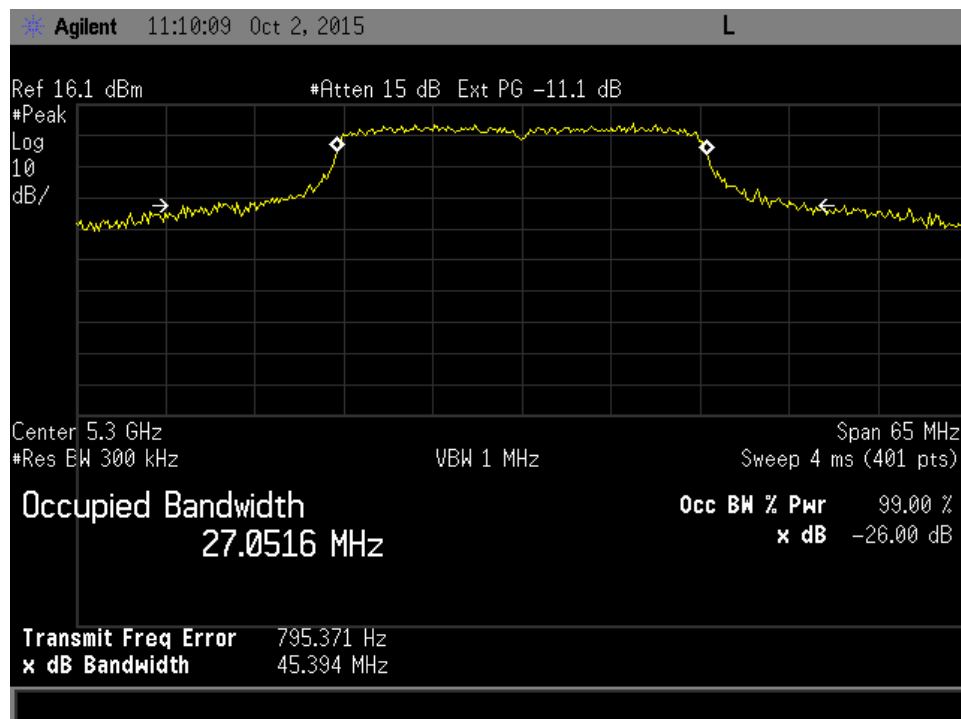


30 MHz low ch

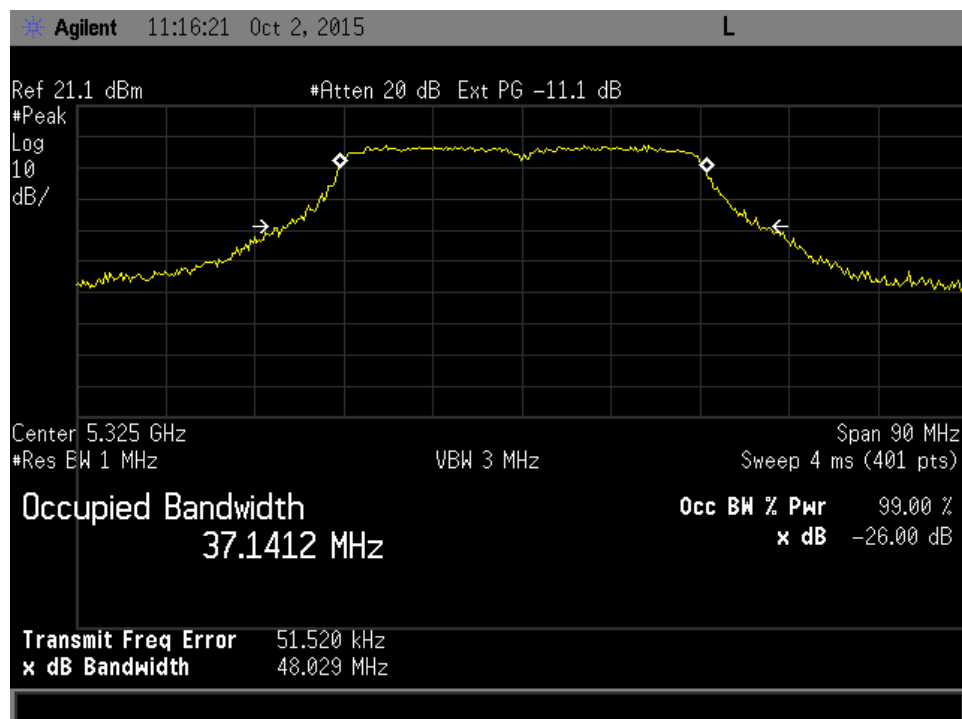




30 MHz mid ch

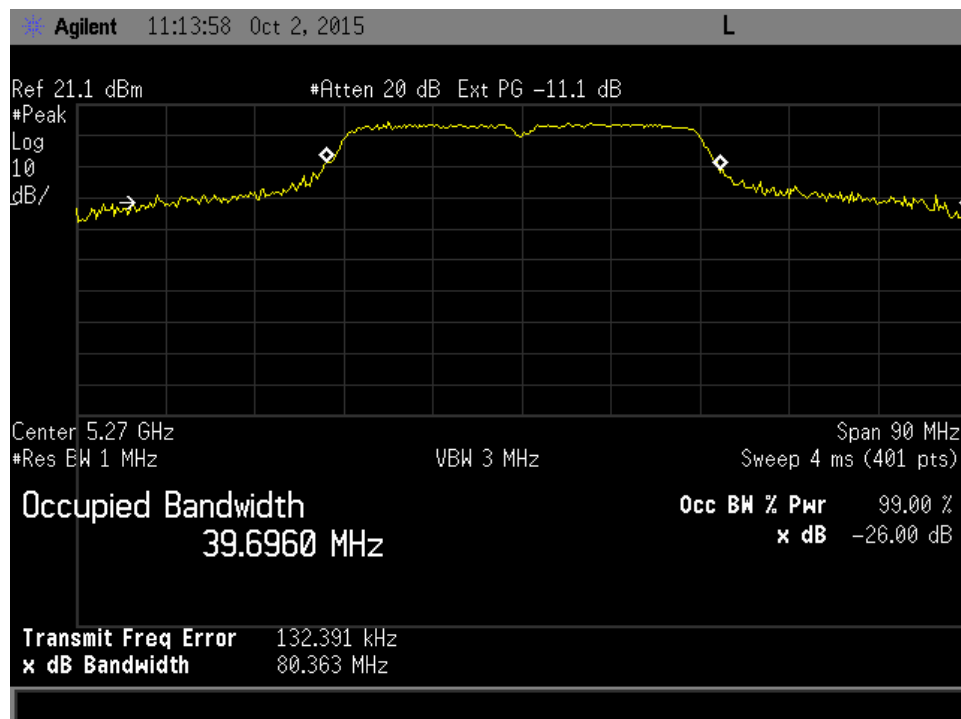


40 MHz high ch

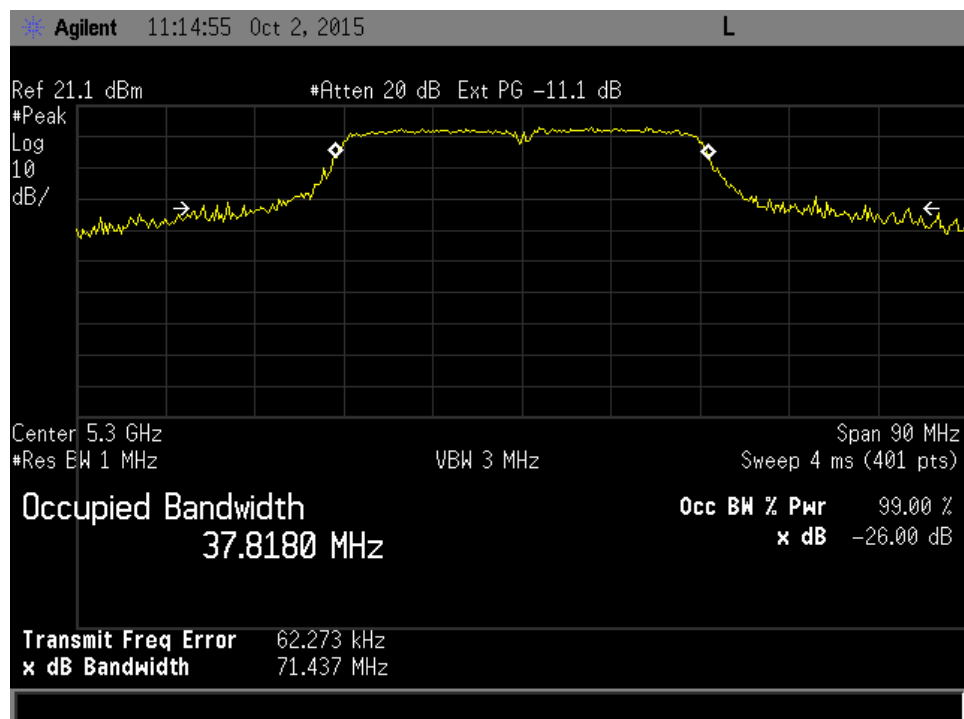




40 MHz low ch



40 MHz mid ch



Annex B

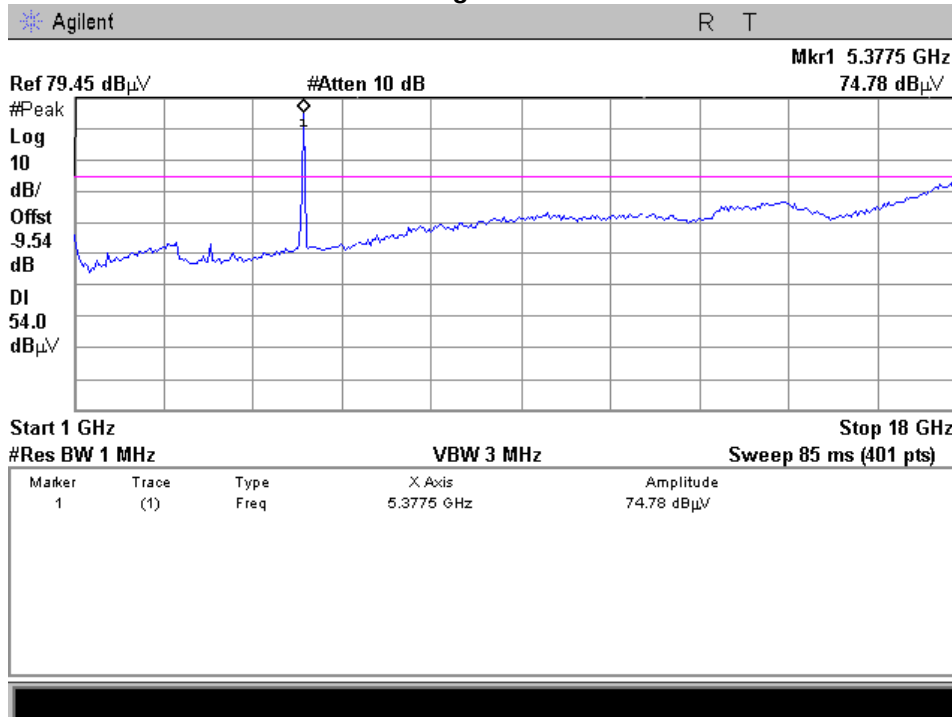
Undesireable Emissions

Radiated

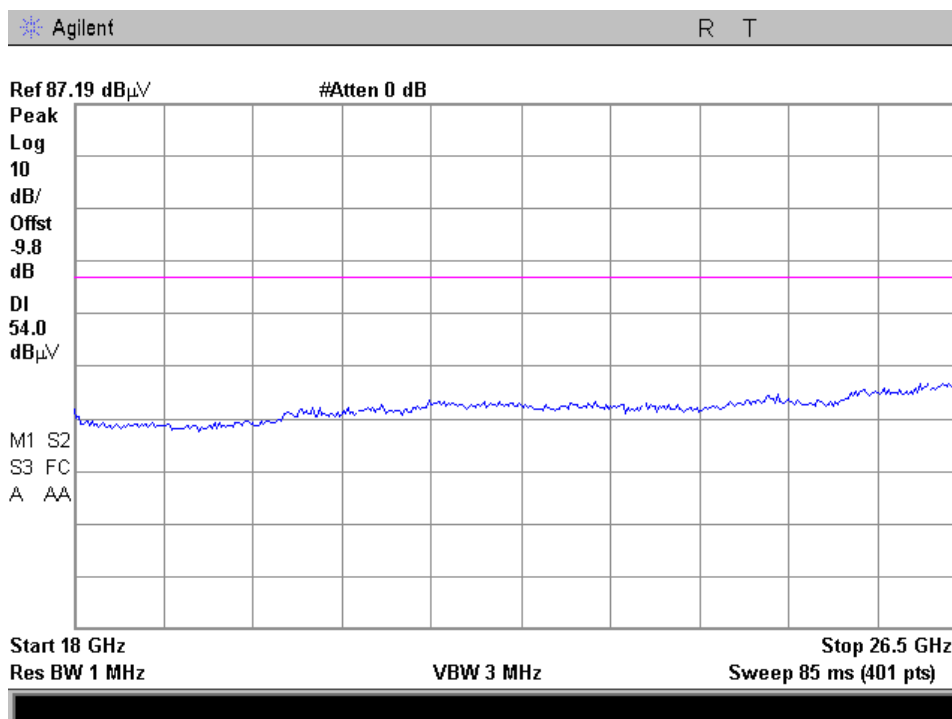
Annex B Notes: The emissions that are over the limit in the 30 – 1000 MHz plots are from digital circuitry and not the transmitter, therefor these emissions only need to meet the -27 dBm/MHz general emission requirements. Emissions were investigated up to 40 GHz but only noise floor was measured.



10 MHz high ch 1-18 GHz

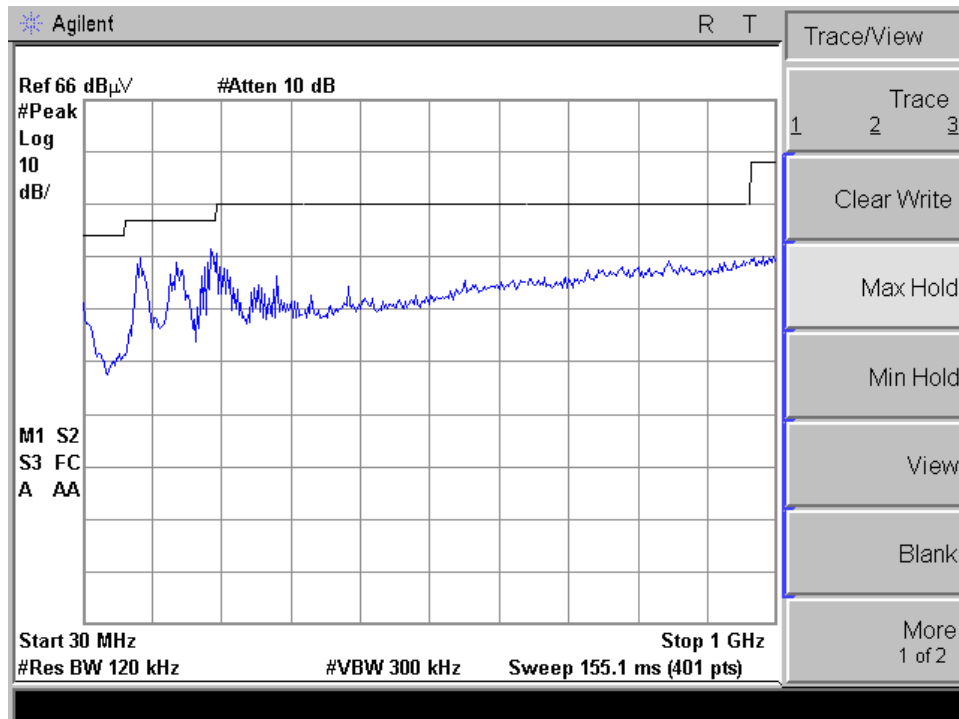


10 MHz high ch 18-26.5 GHz

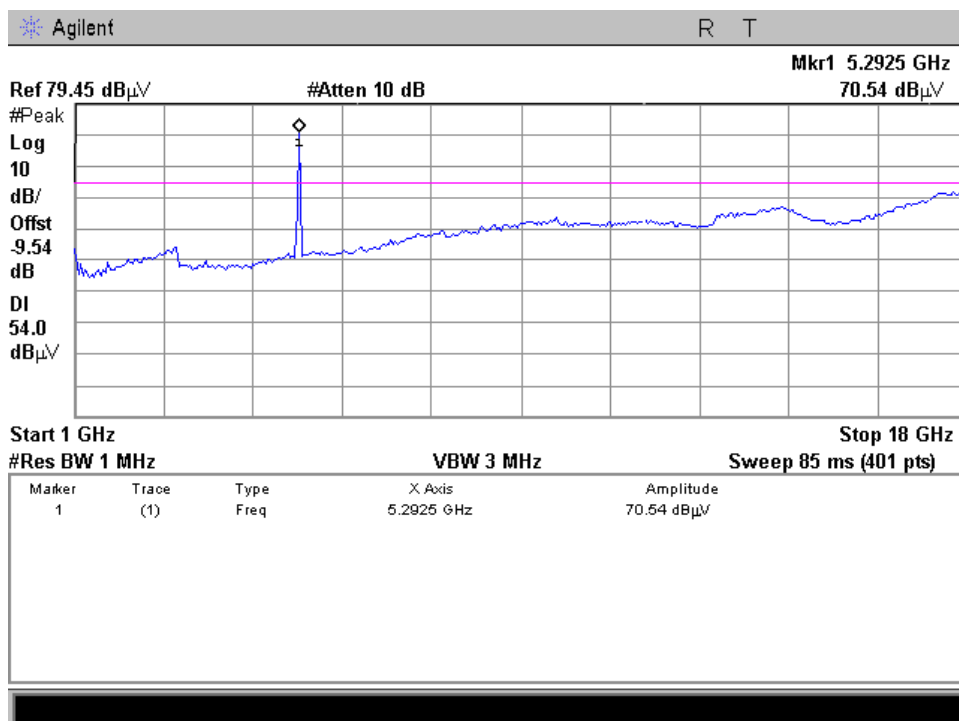




10 MHz high ch 30-1000 MHz

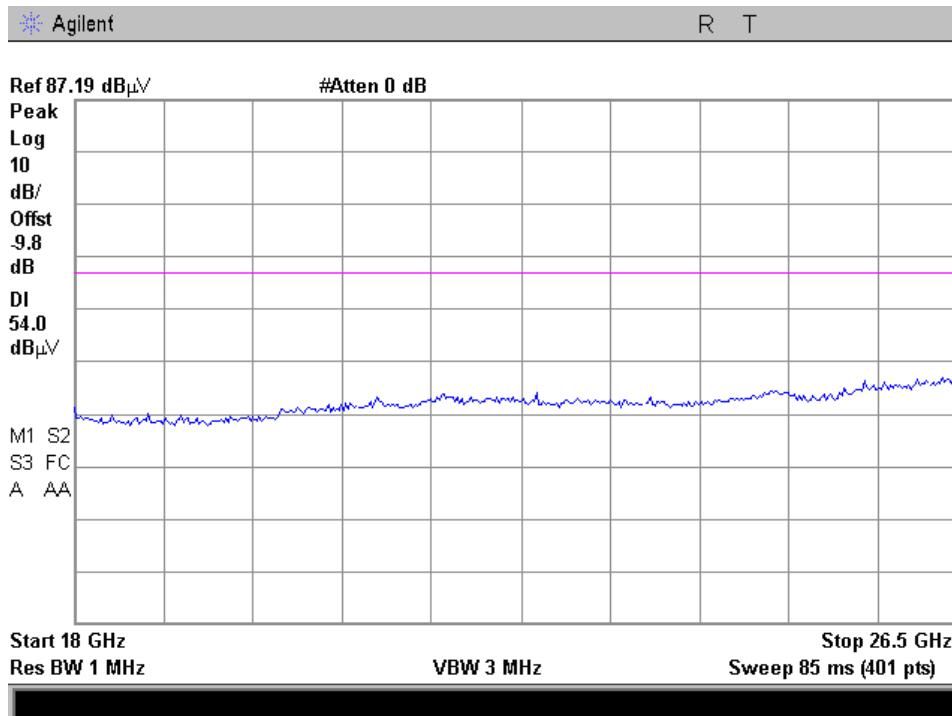


10 MHz low ch 1-18 GHz

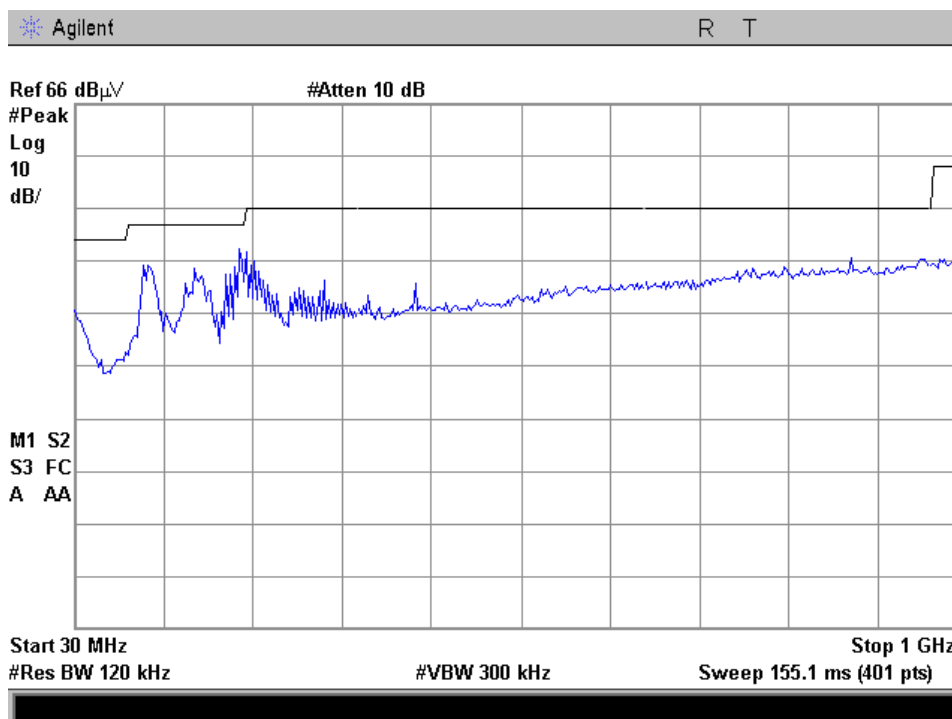




10 MHz low ch 18-26.5 GHz

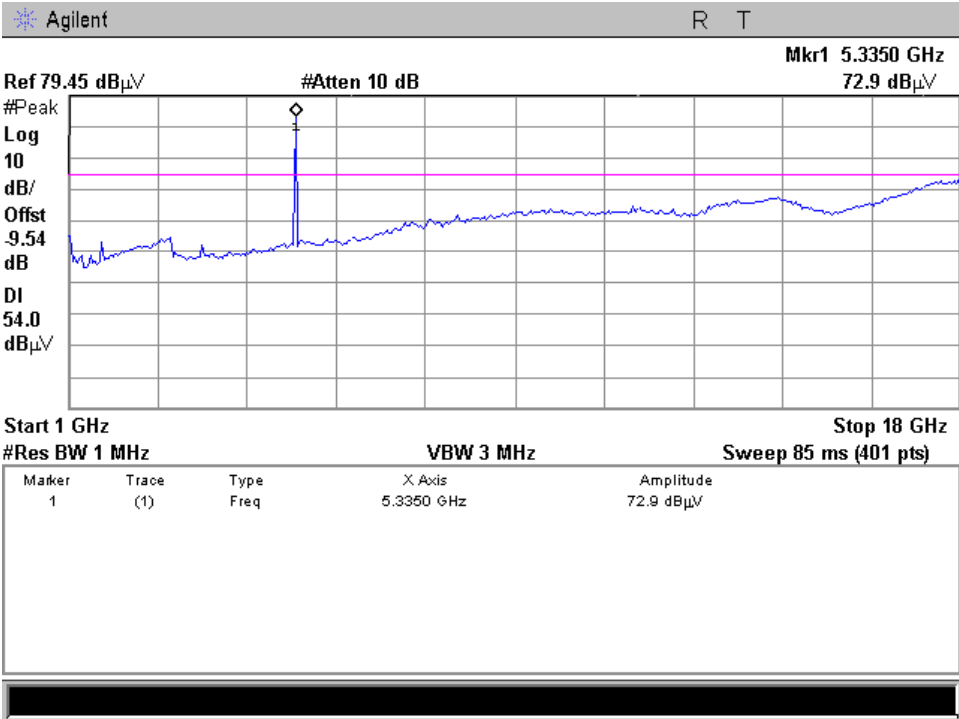


10 MHz low ch 30-1000 MHz

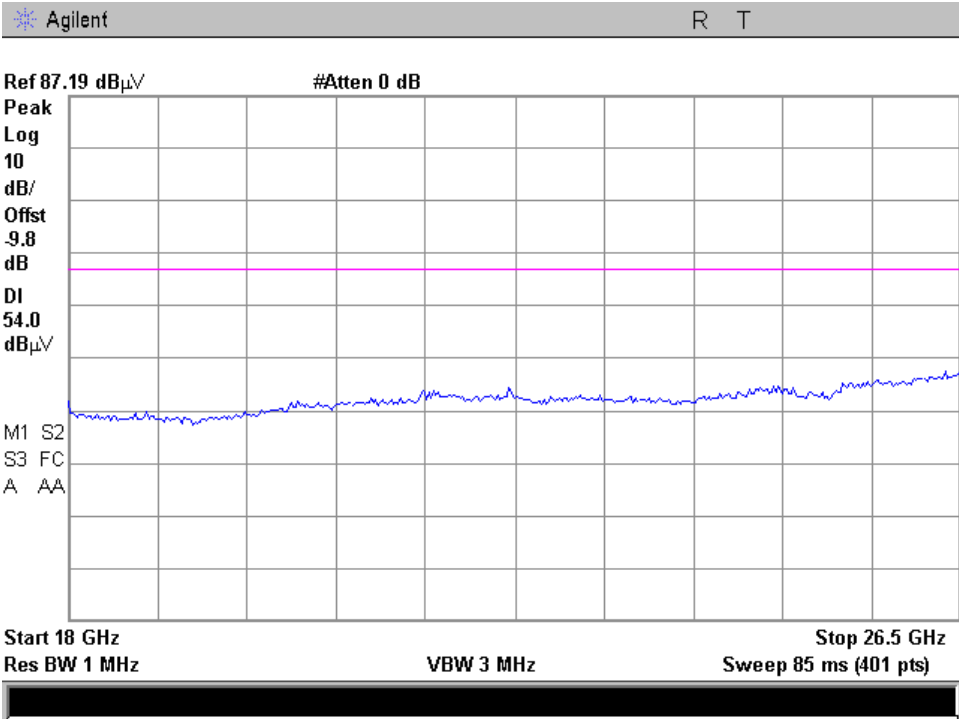




10 MHz mid ch 1-18 GHz

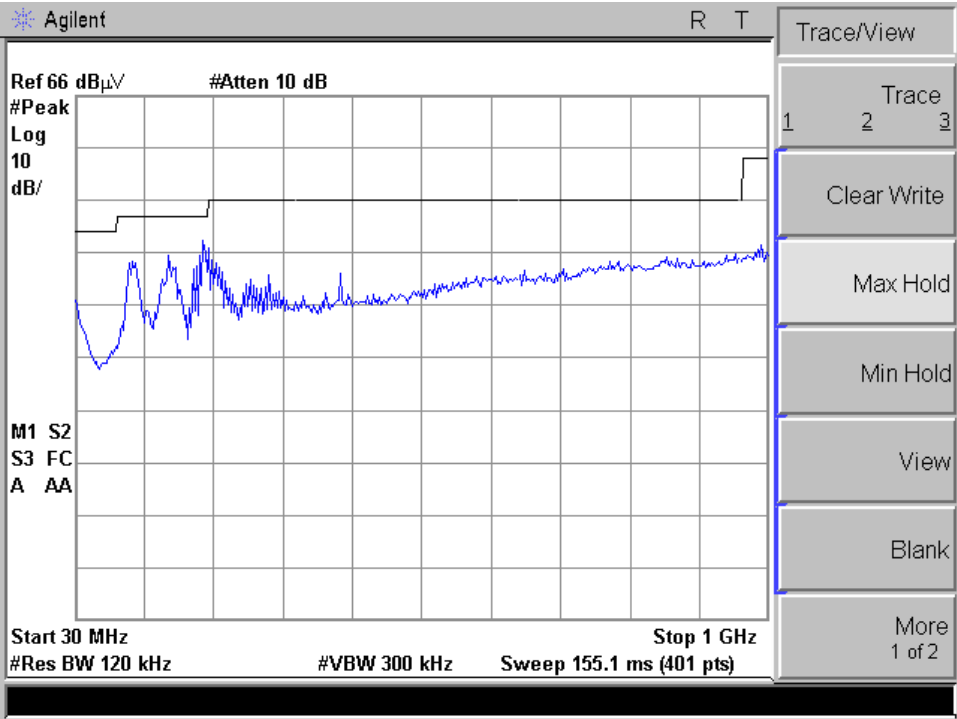


10 MHz mid ch 18-26.5 GHz





10 MHz mid ch 30-1000 MHz



Annex A

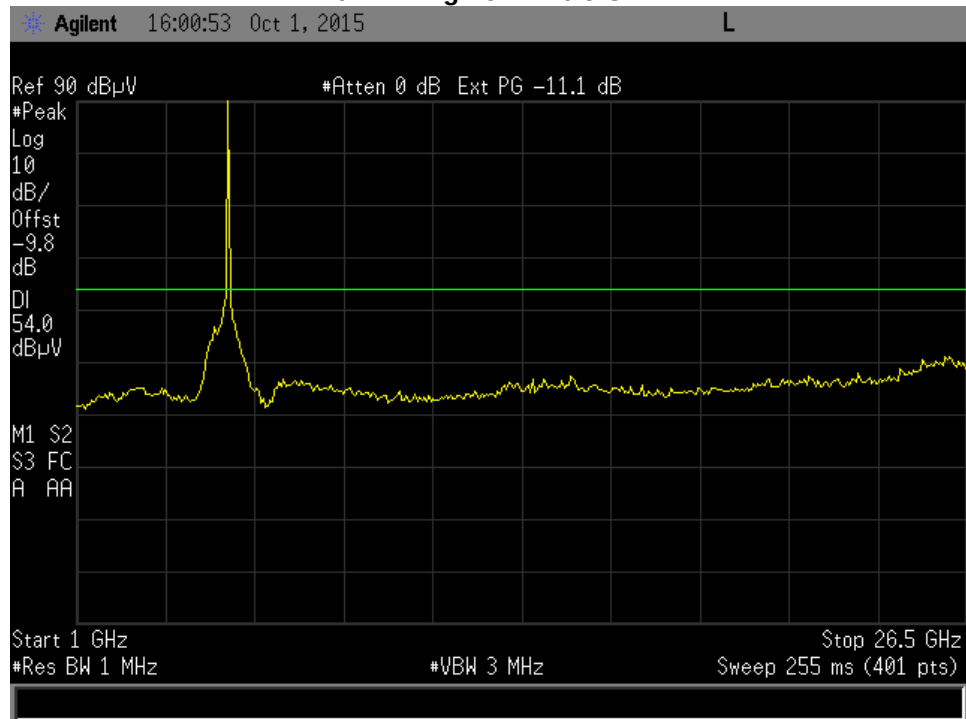
Undesirable Emissions Conducted

30-40000MHz

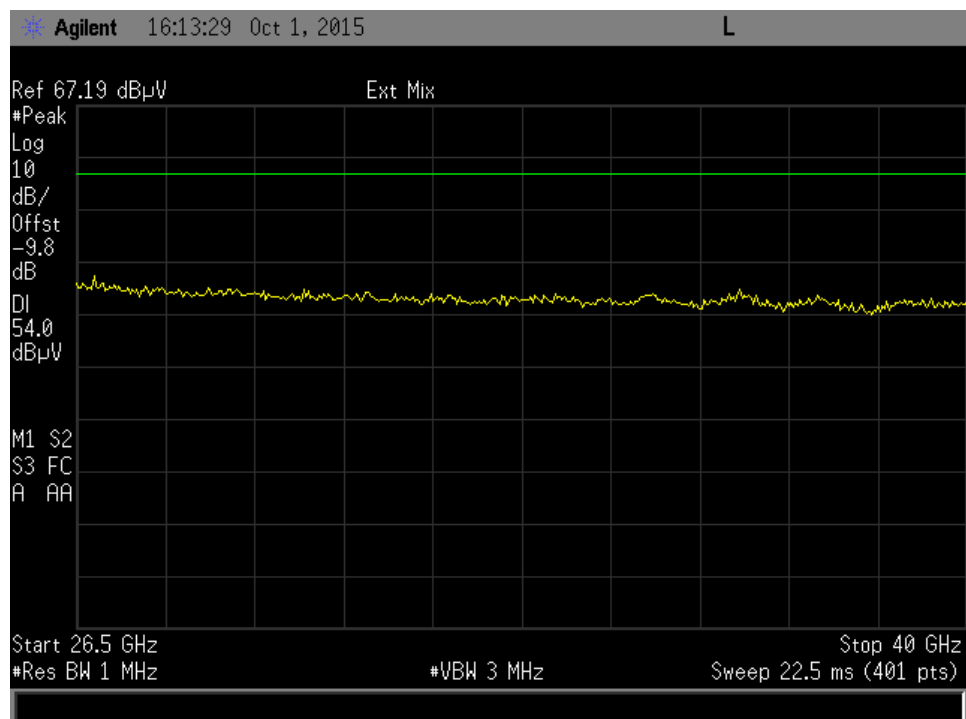
Port F37



10 MHz high ch 1-26.5 GHz

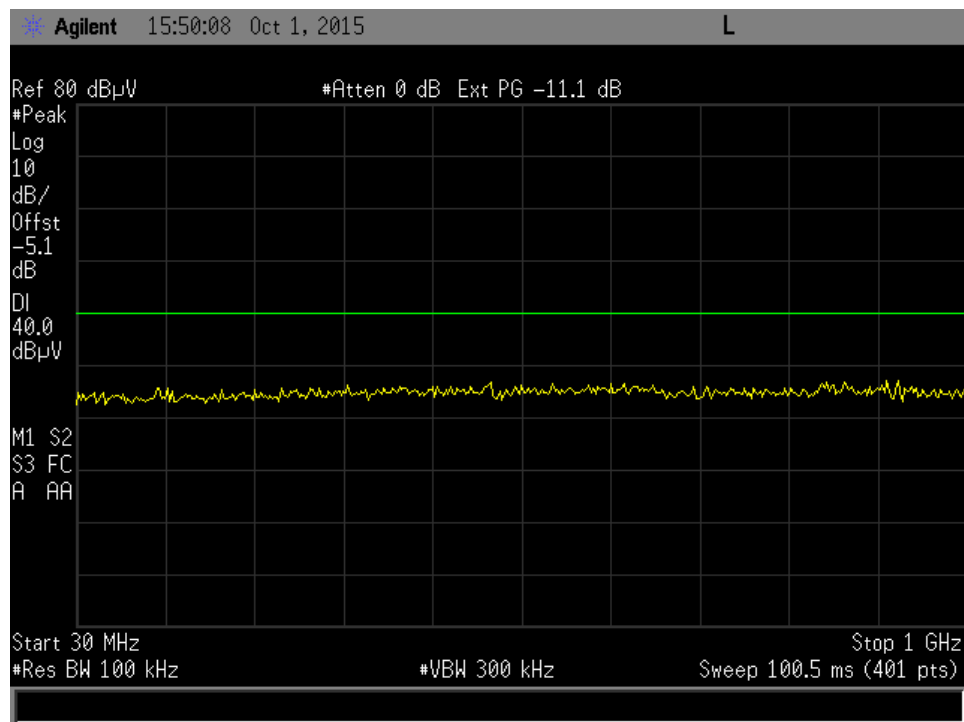


10 MHz high ch 26.5-40 GHz

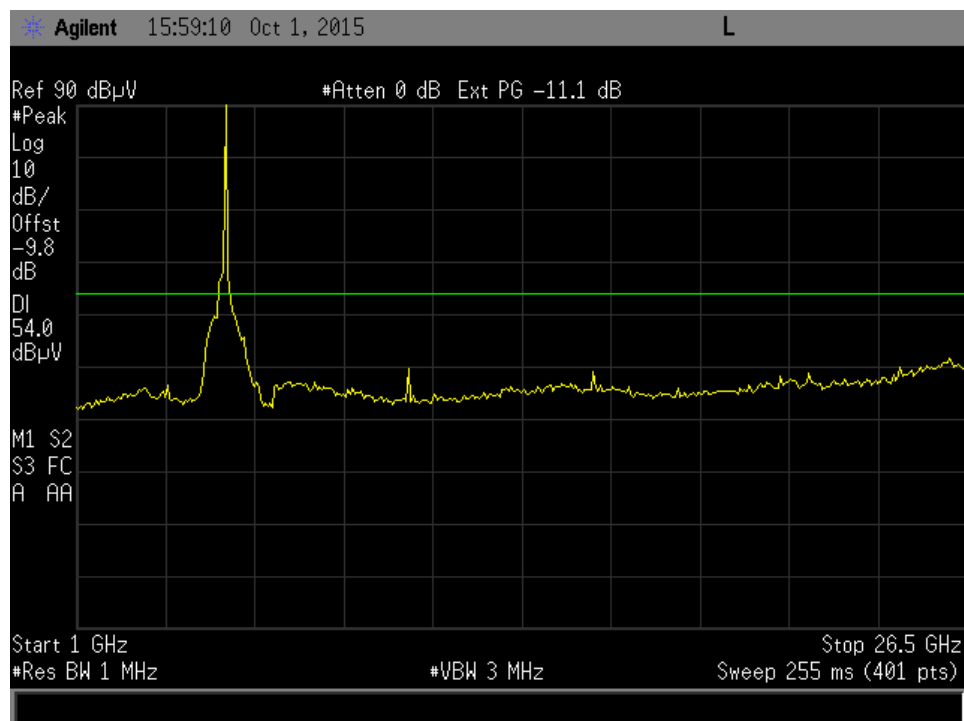




10 MHz high ch 30-1000 MHz

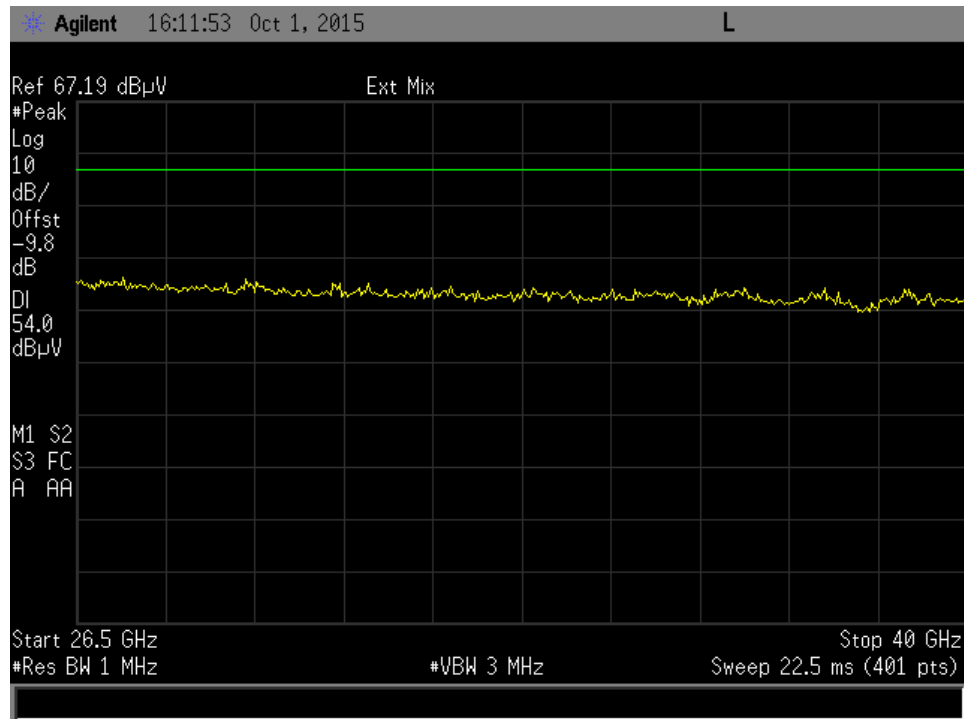


10 MHz low ch 1-26.5 GHz

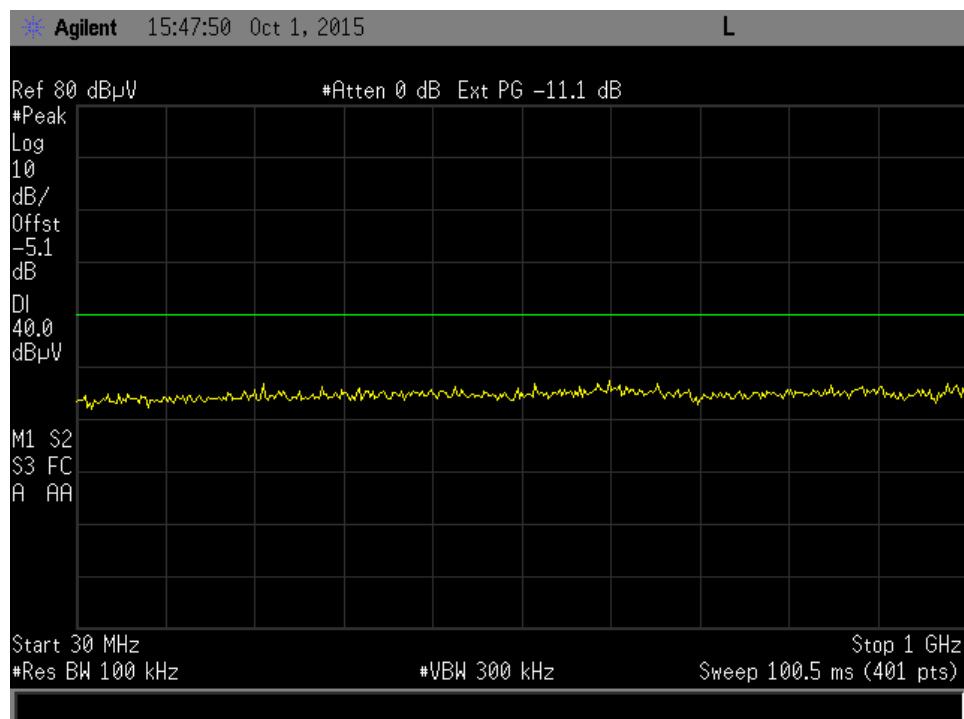




10 MHz low ch 26.5-40 GHz

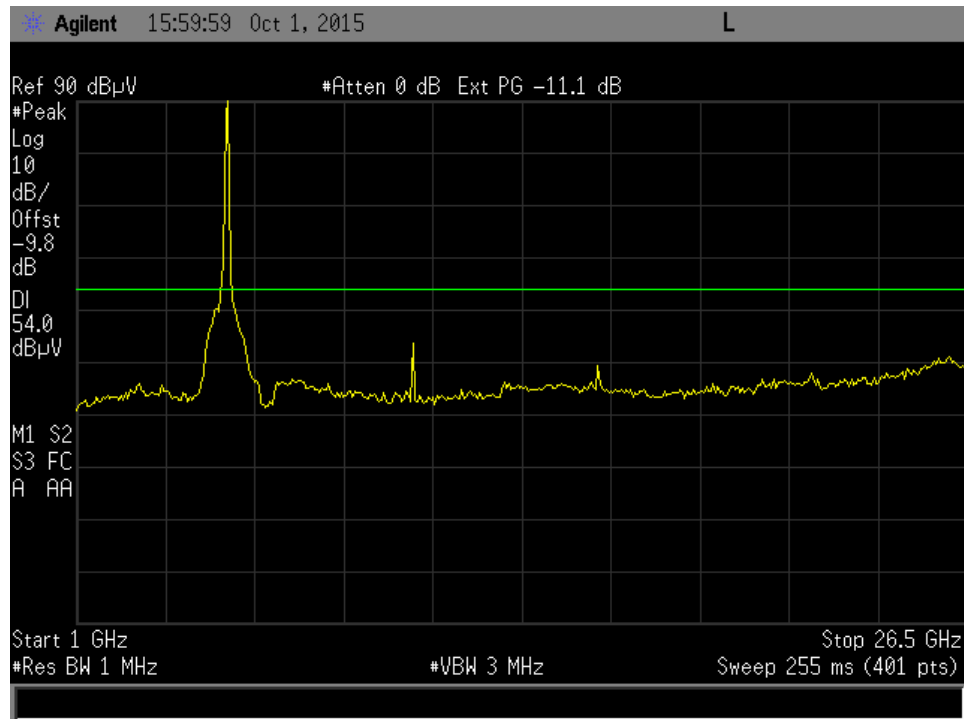


10 MHz low ch 30-1000 MHz

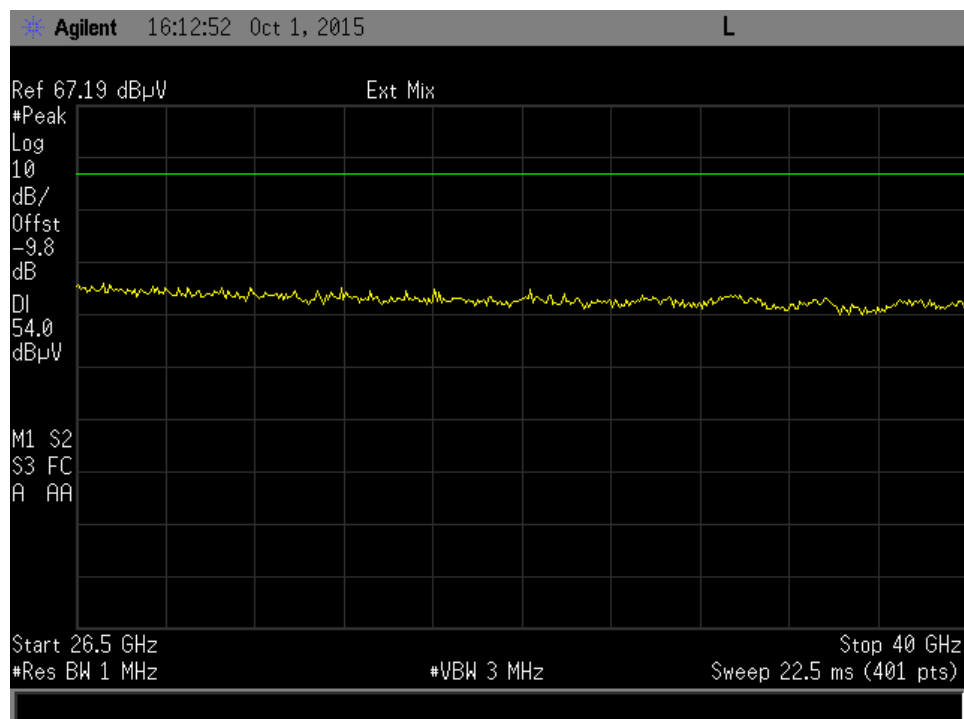




10 MHz mid ch 1-26.5 GHz

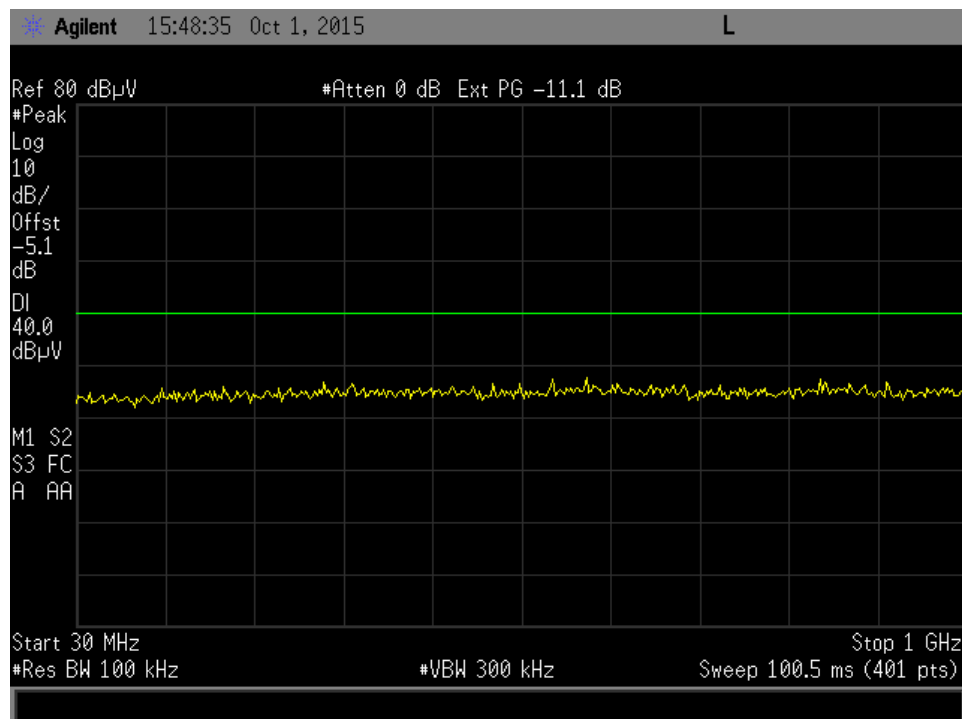


10 MHz mid ch 26.5-40 GHz

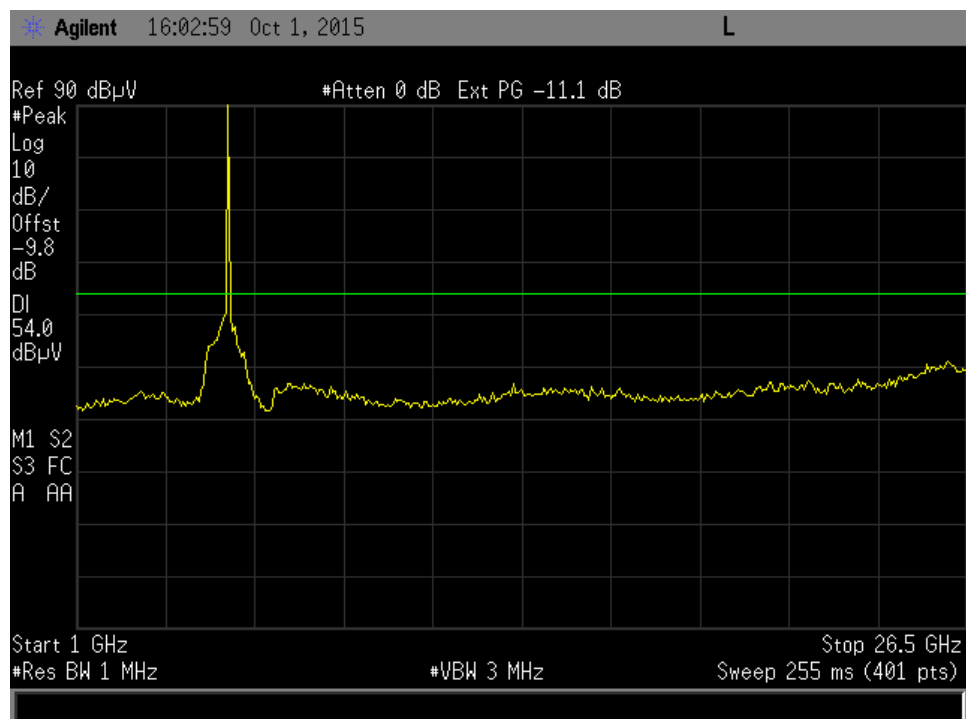




10 MHz mid ch 30-1000 MHz

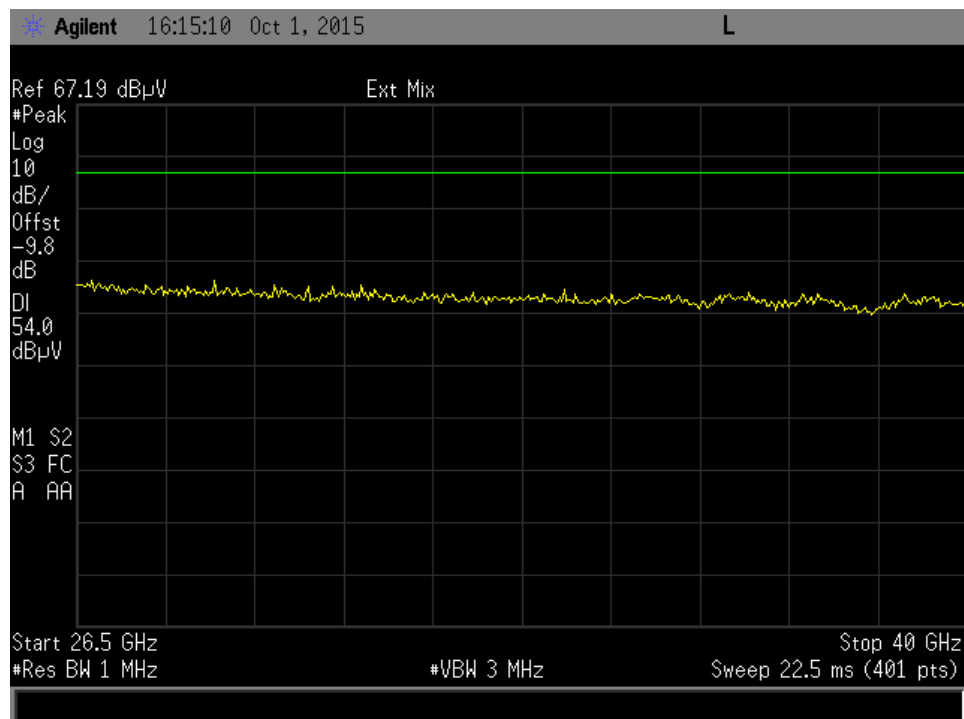


20 MHz high ch 1-26.5 GHz

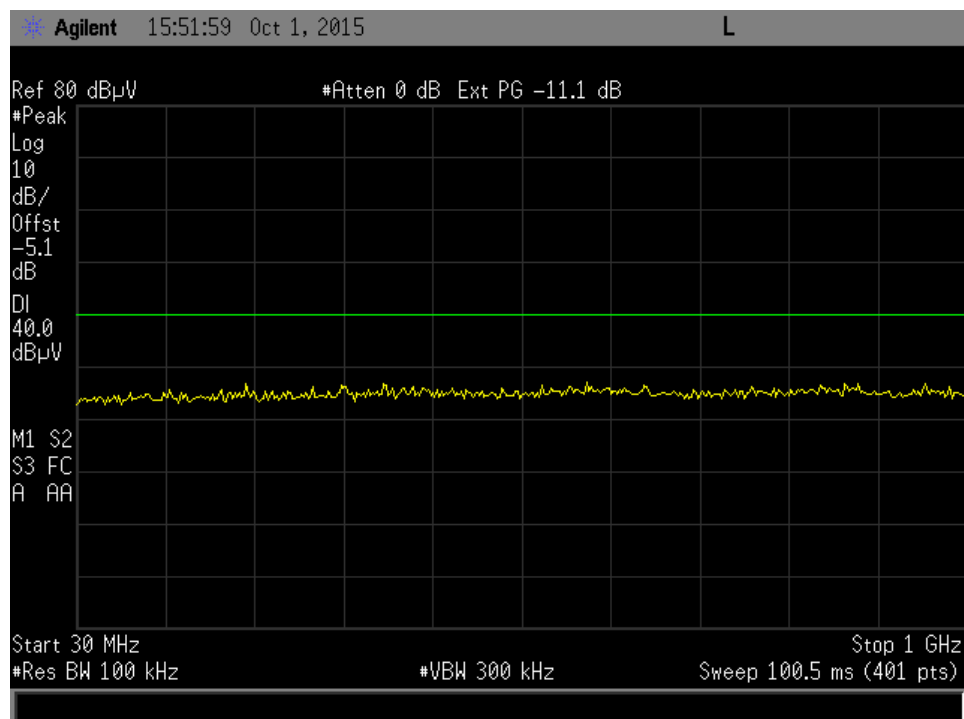




20 MHz high ch 26.5-40 GHz

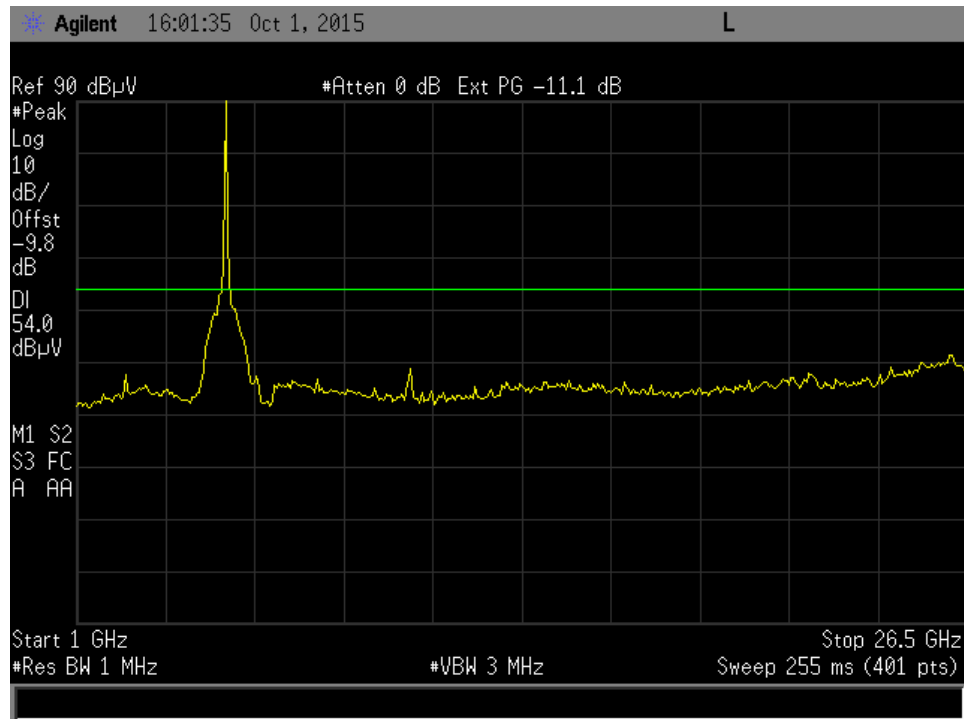


20 MHz high ch 30-1000 MHz

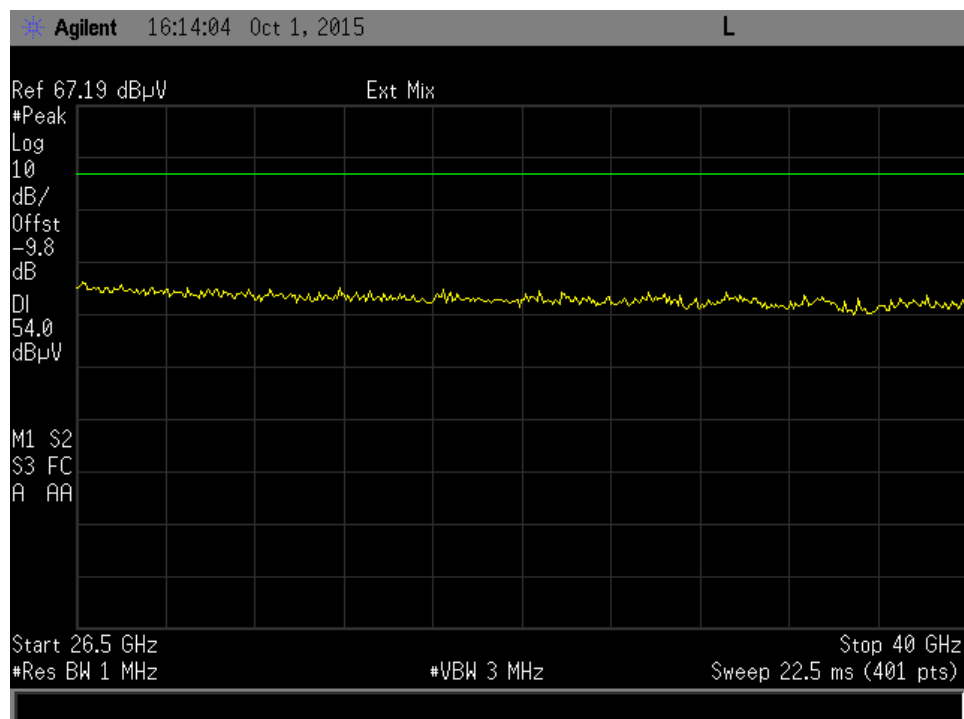




20 MHz low ch 1-26.5 GHz

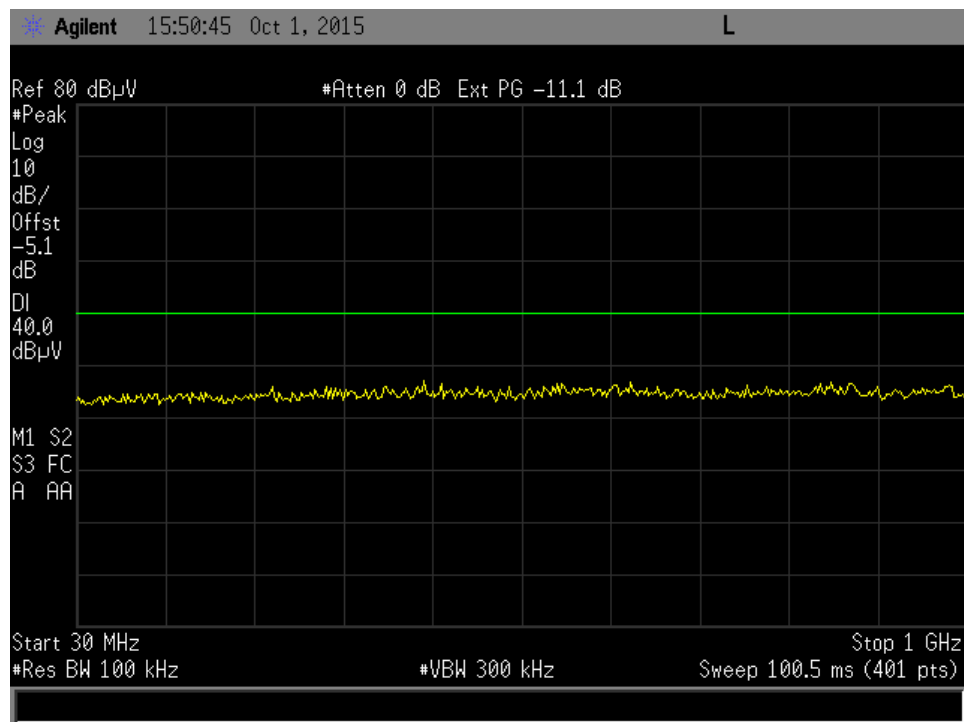


20 MHz low ch 26.5-40 GHz

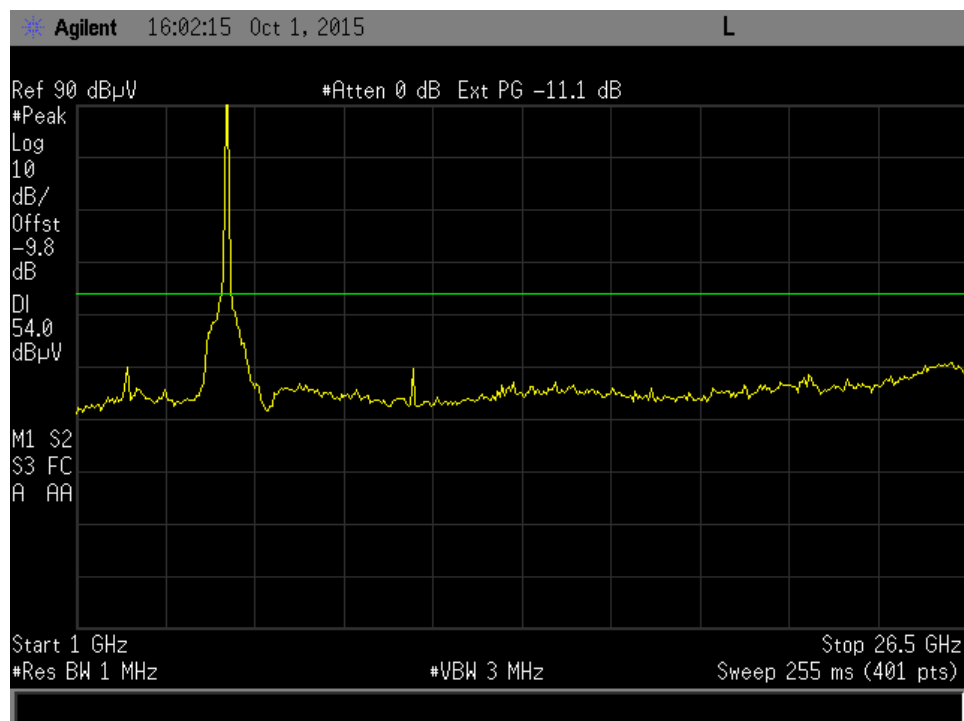




20 MHz low ch 30-1000 MHz

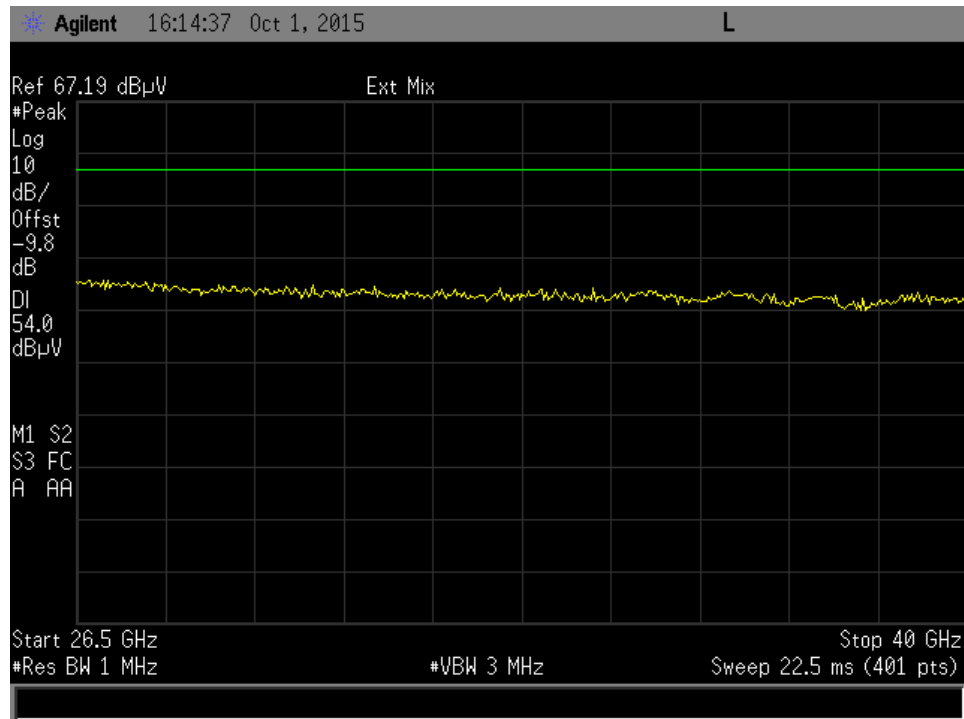


20 MHz mid ch 1-26.5 GHz

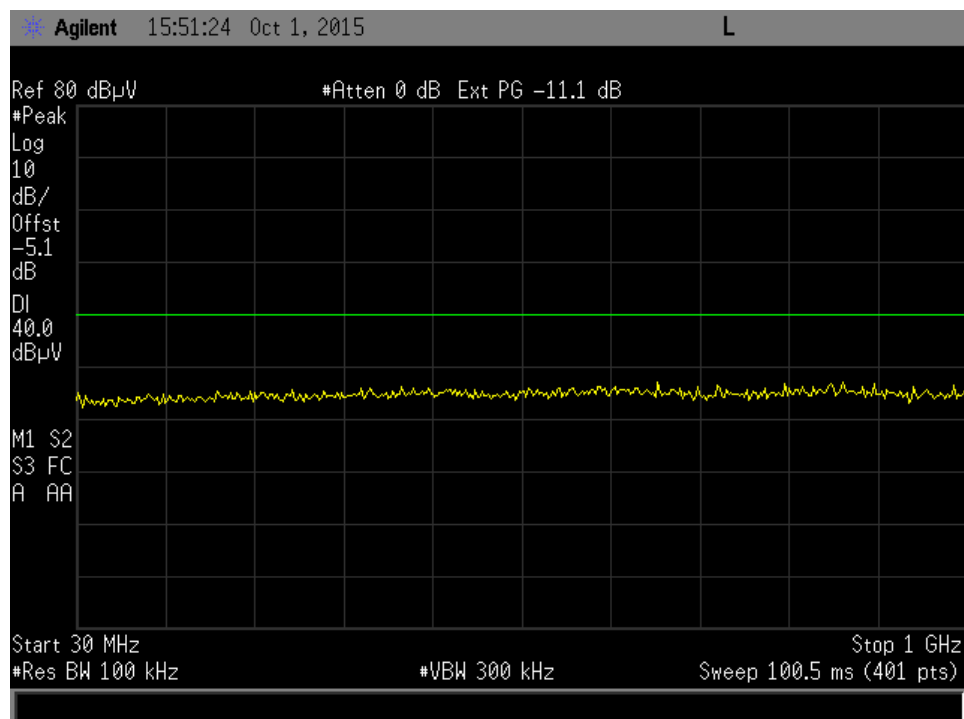




20 MHz mid ch 26.5-40 GHz

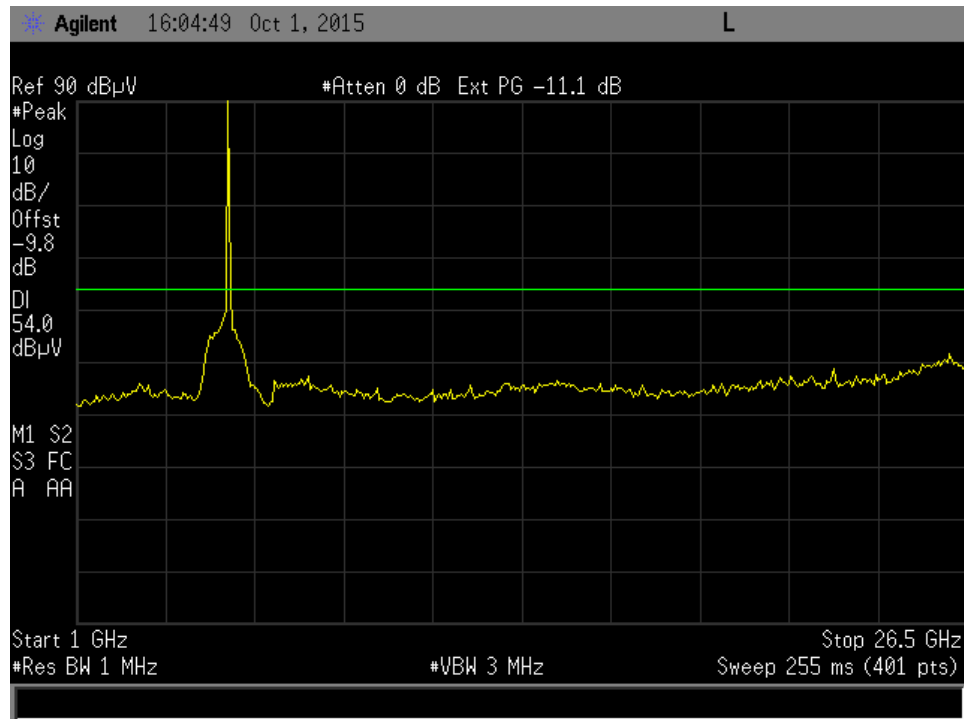


20 MHz mid ch 30-1000 MHz

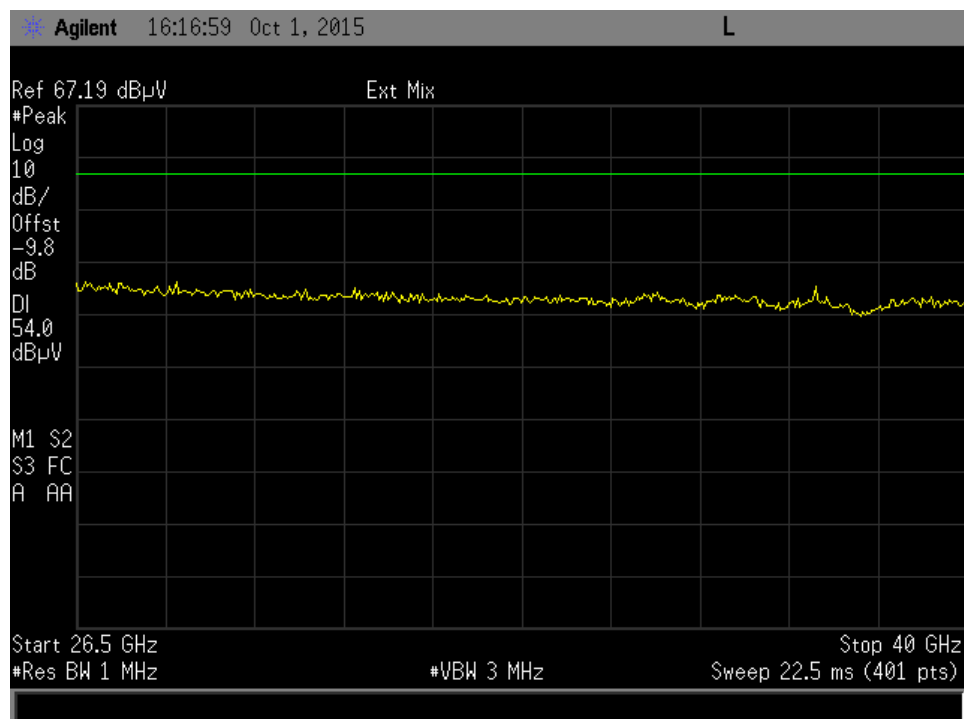




30 MHz high ch 1-26.5 GHz

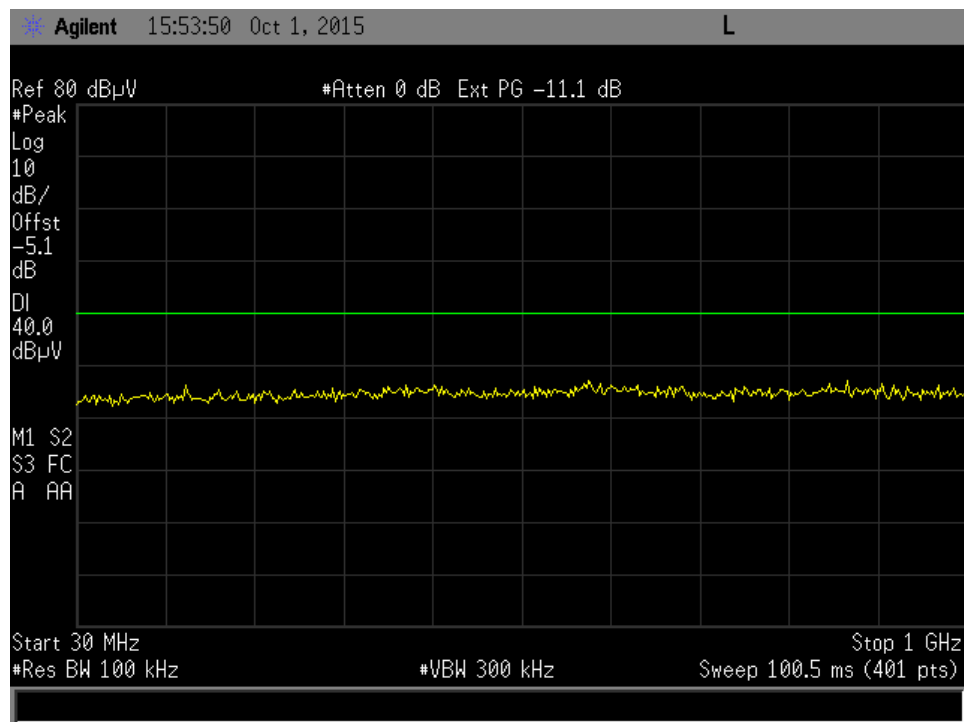


30 MHz high ch 26.5-40 GHz

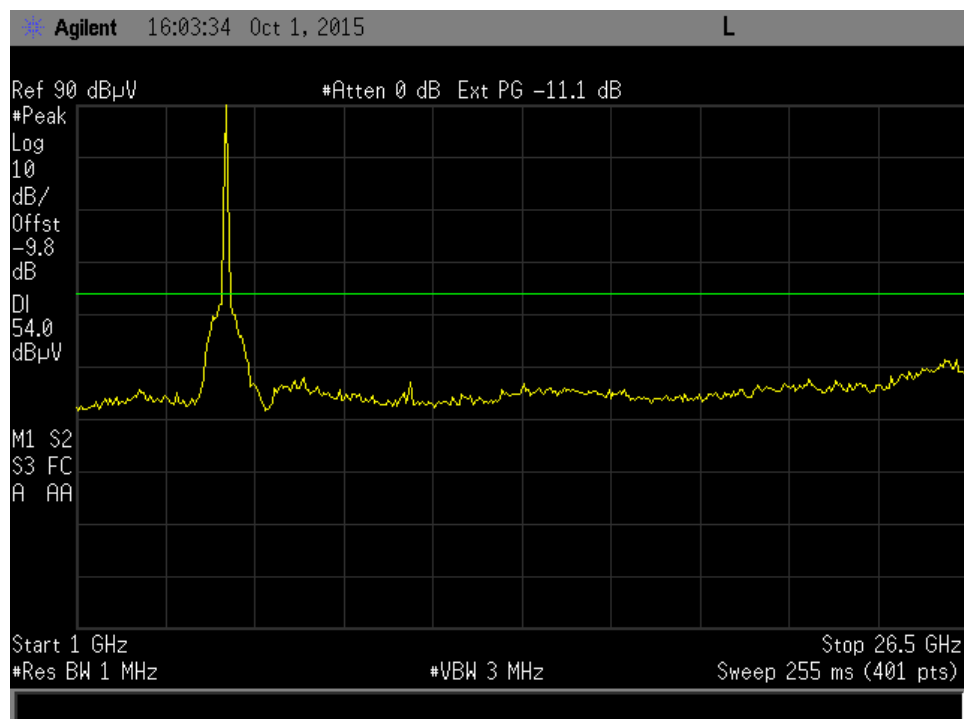




30 MHz high ch 30-1000 MHz

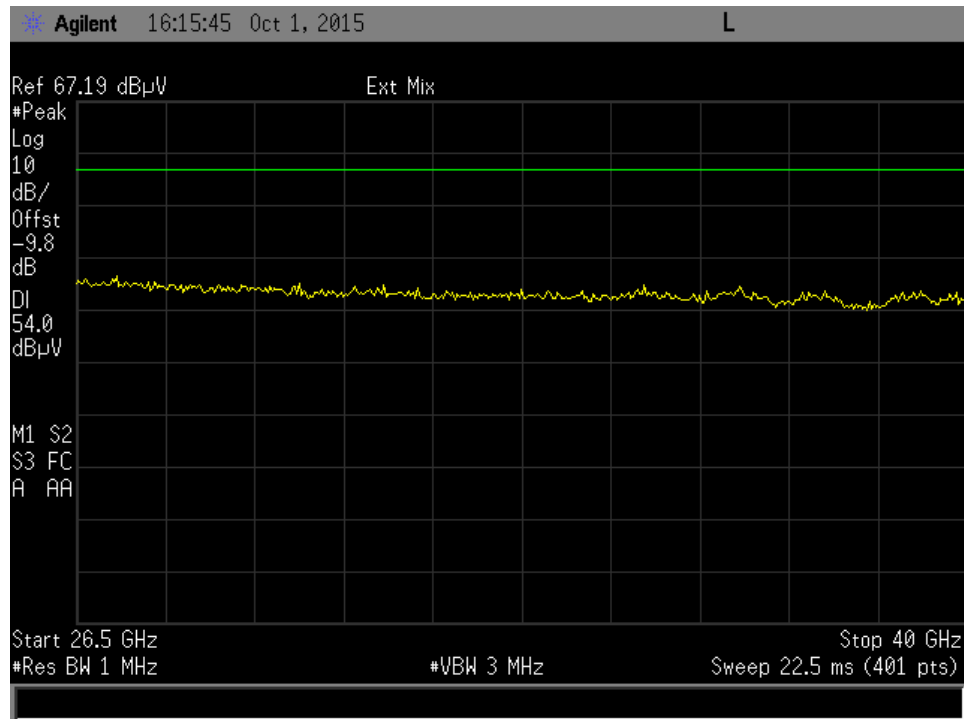


30 MHz low ch 1-26.5 GHz

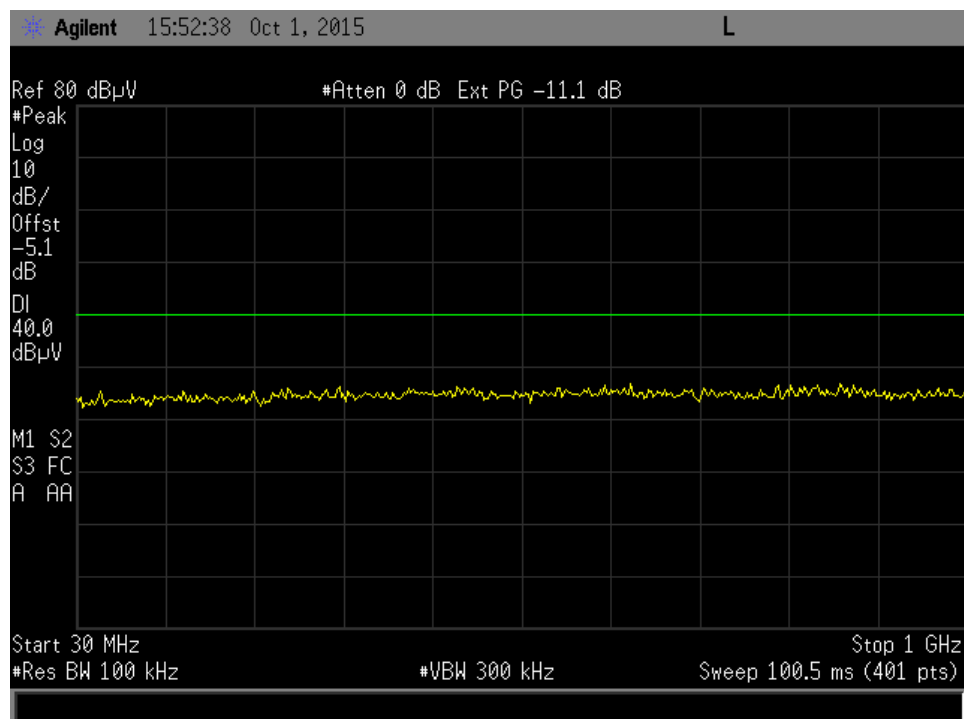




30 MHz low ch 26.5-40 GHz

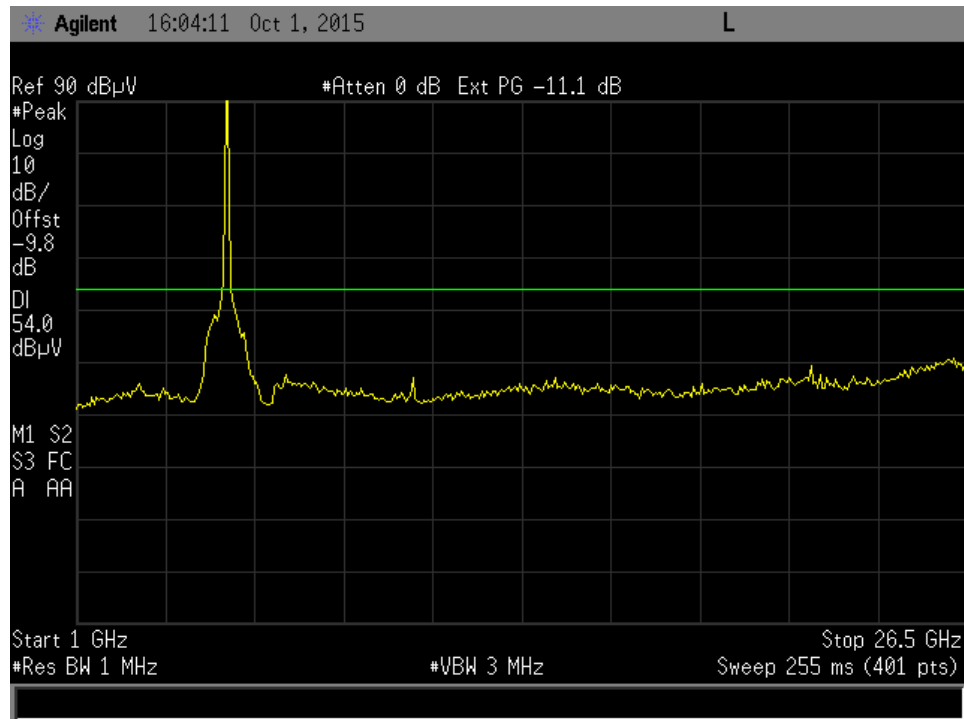


30 MHz low ch 30-1000 MHz

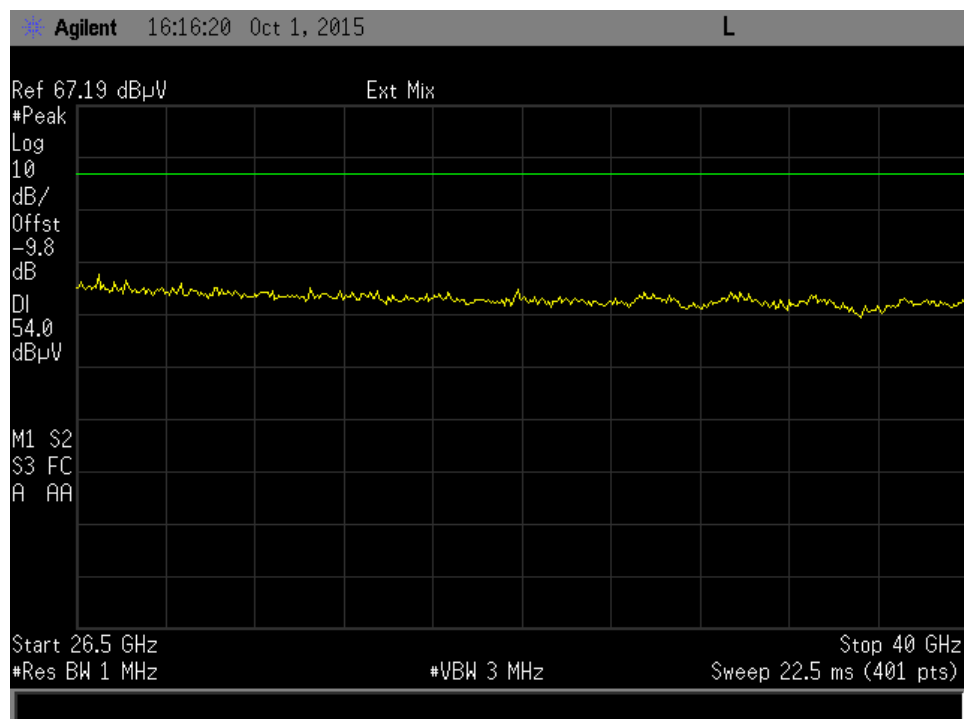




30 MHz mid ch 1-26.5 GHz

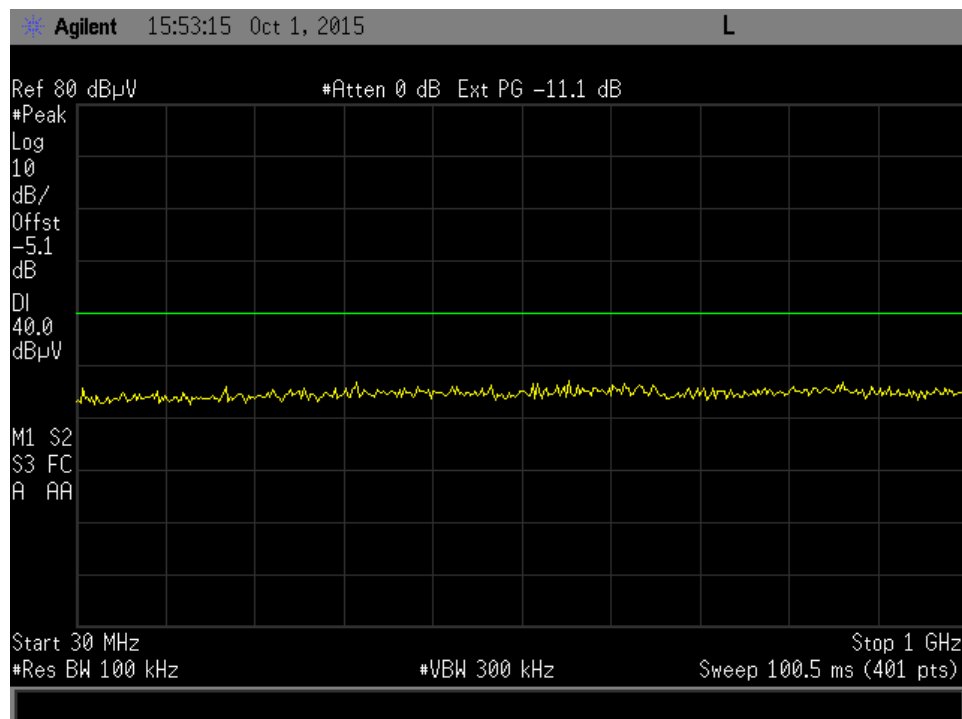


30 MHz mid ch 26.5-40 GHz

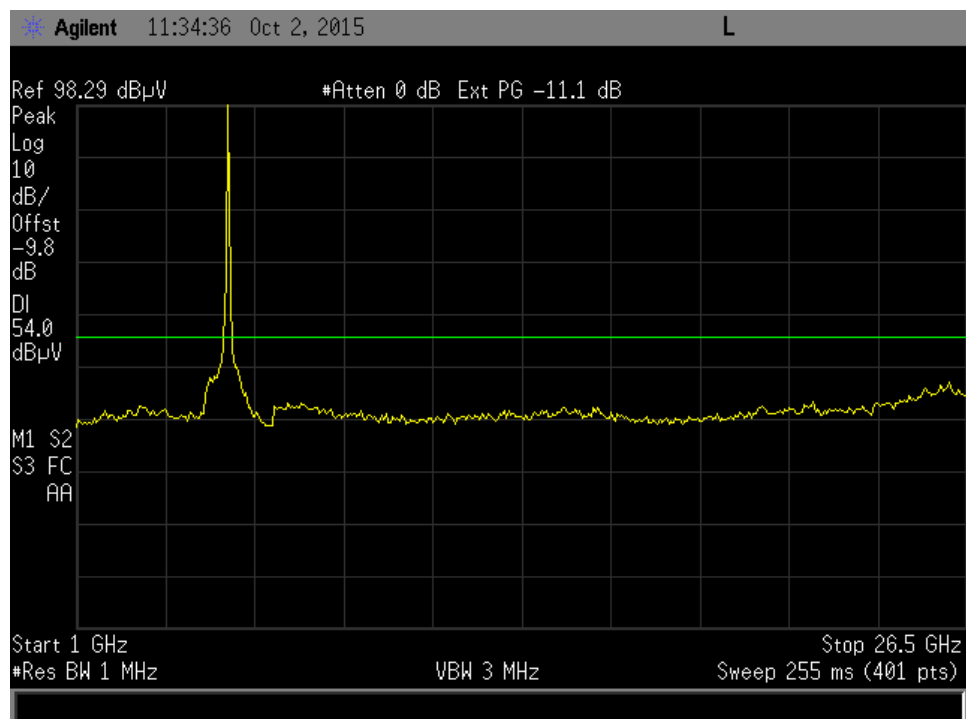




30 MHz mid ch 30-1000 MHz

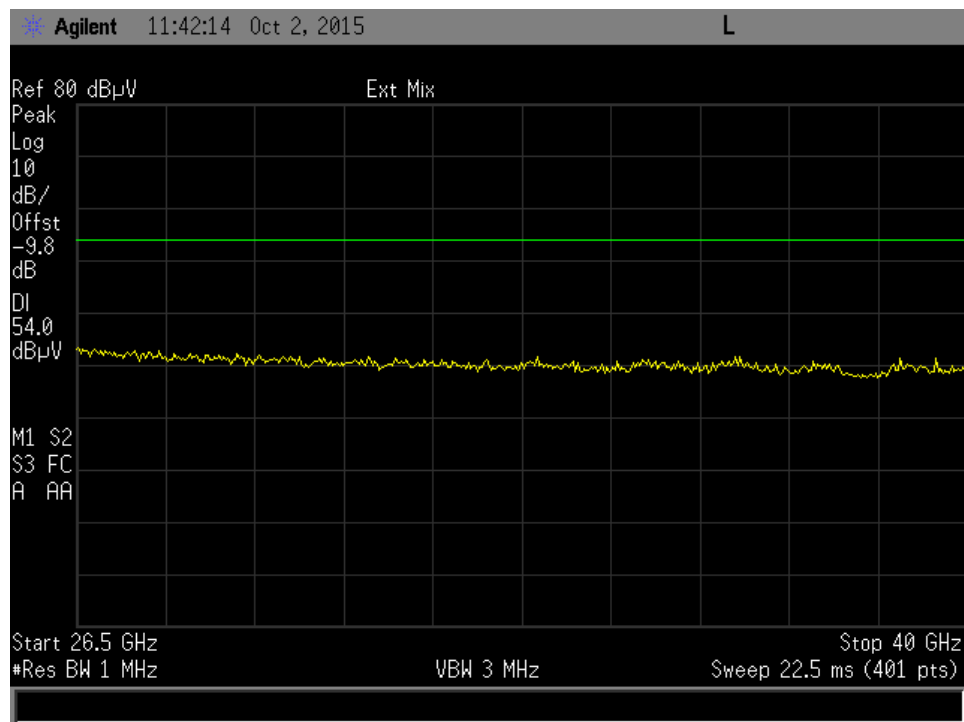


40 MHz high ch 1-26.5 GHz

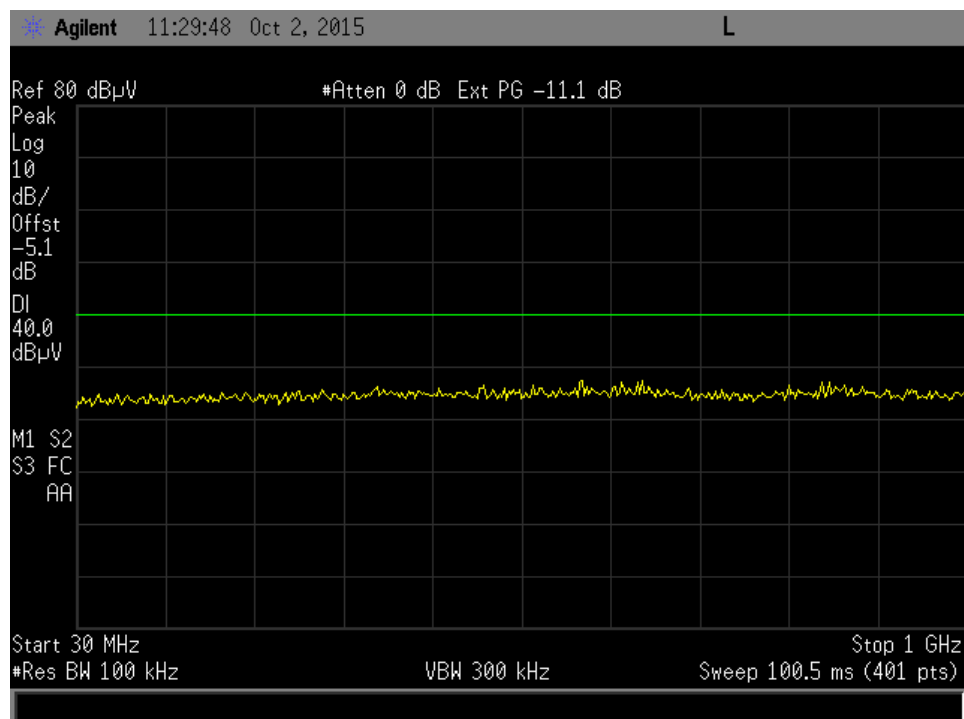




40 MHz high ch 26.5-40 GHz

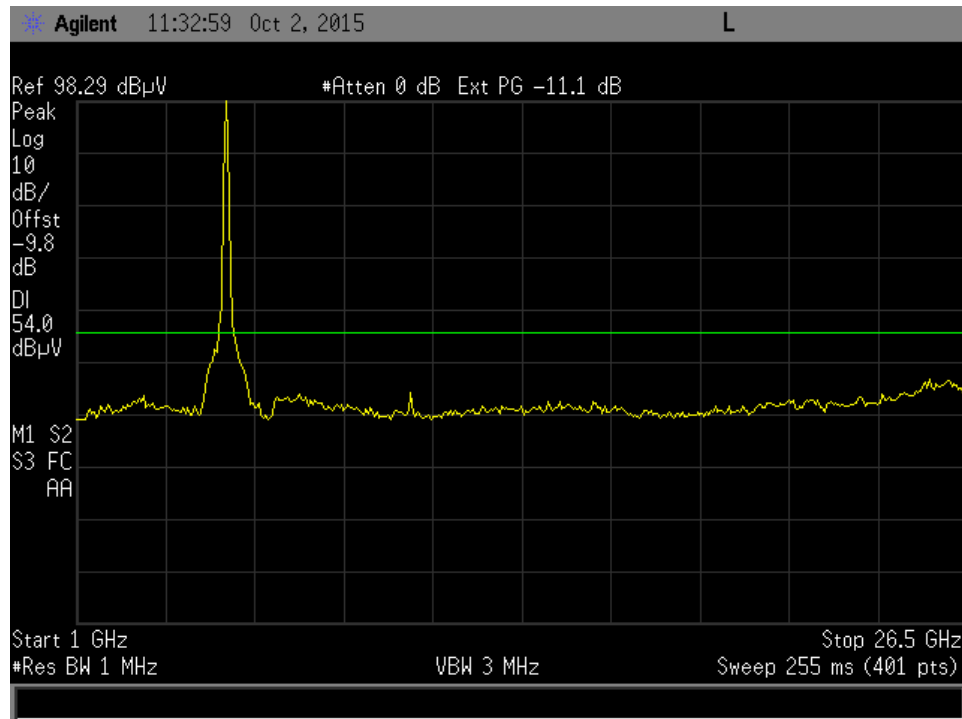


40 MHz high ch 30-1000 MHz

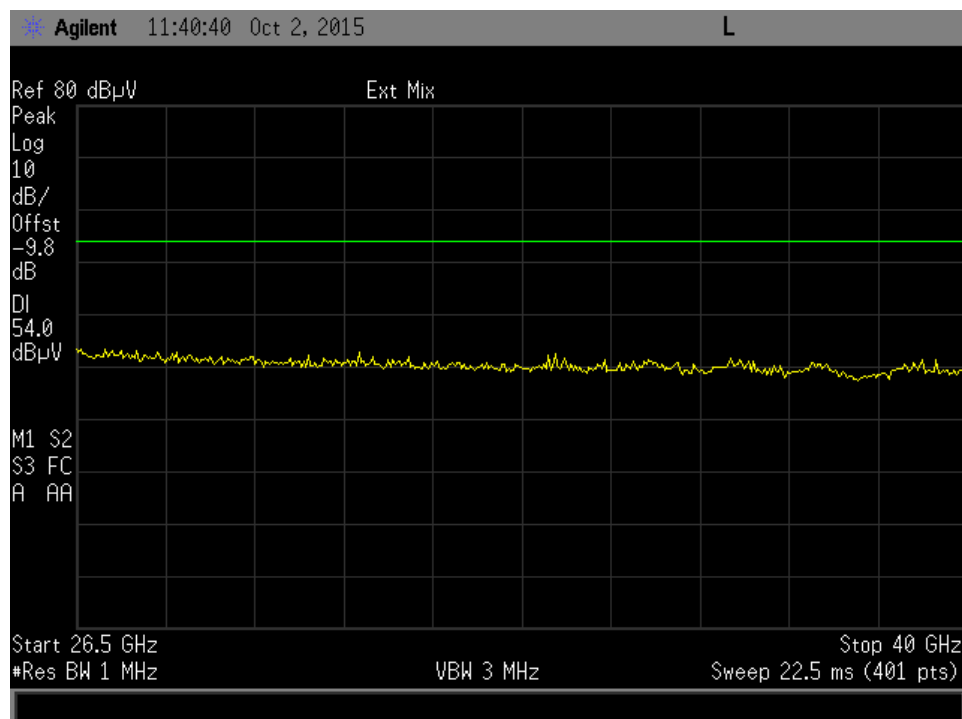




40 MHz low ch 1-26.5 GHz

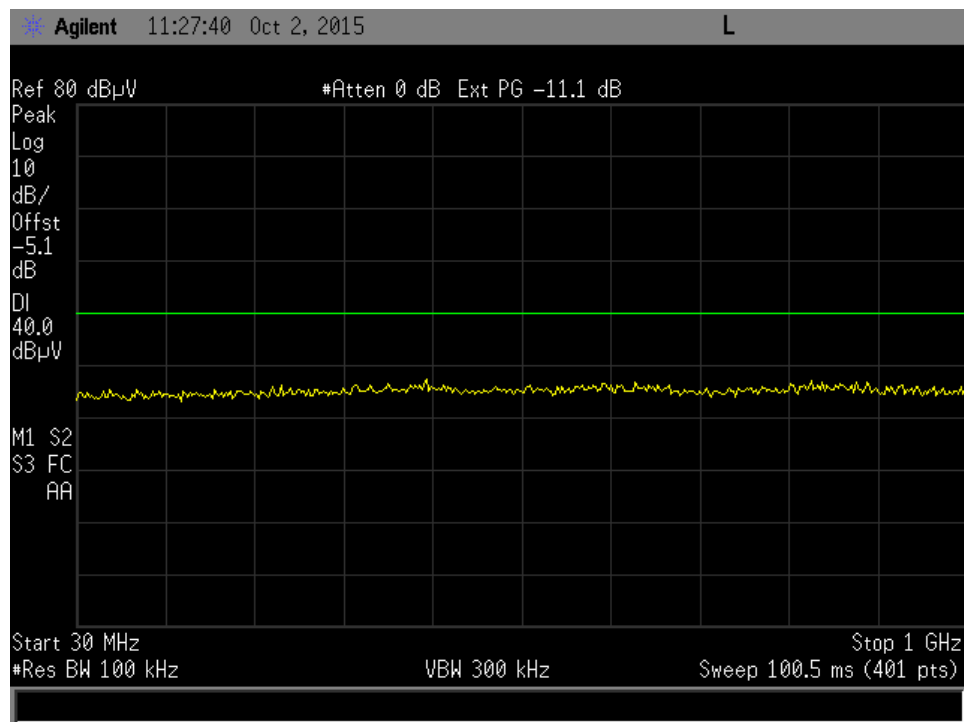


40 MHz low ch 26.5-40 GHz

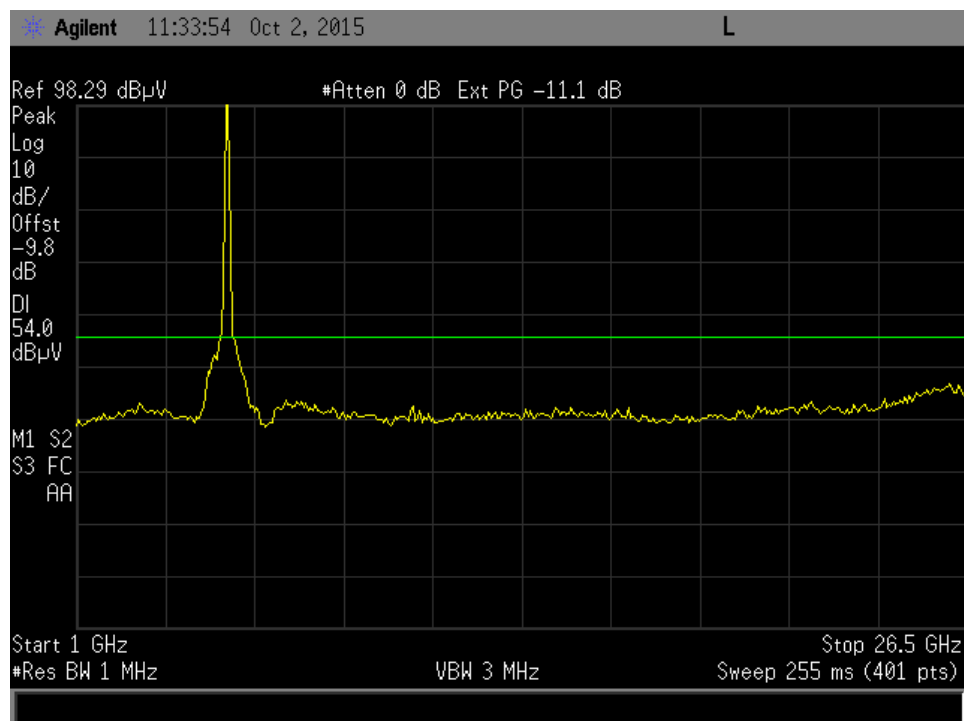




40 MHz low ch 30-1000 MHz

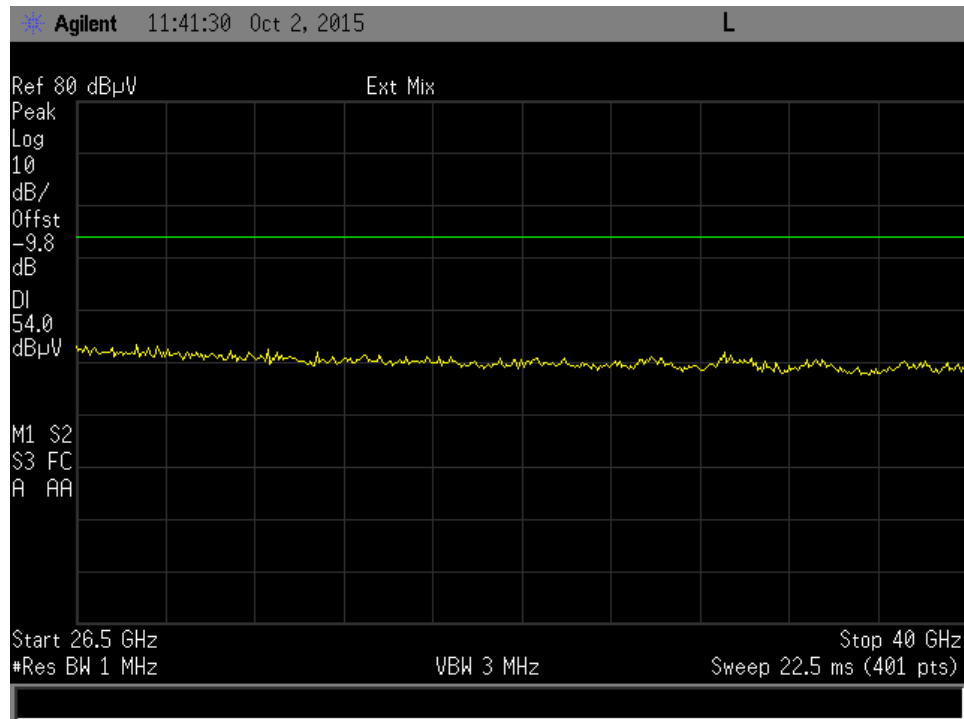


40 MHz mid ch 1-26.5 GHz





40 MHz mid ch 26.5-40 GHz



40 MHz mid ch 30-1000 MHz

