F2 Labs
16740 Peters Road
Middlefield, Ohio 44062
United States of America
www.f2labs.com

CERTIFICATION TEST REPORT

Manufacturing Address:	Zhen Jiangqiang Ling Electronic Co. Ltd. 200 Xuefu Road Zhen Jiang Jiangsu 212016 CHINA
Applicant Address:	Shanghai Qiangling Electronic Co., Ltd. 139 Wang Dong RD S, SI Jing Song Jiang, Shanghai, 201601, CHINA
Product Name:	TCP ColorSpree Tunable White
Product Description:	Bluetooth A19 Tunable White
Model:	**A19BT001**
FCC ID:	**NIRA19BT001**
Testing Commenced:	**November 30, 2015**
Testing Ended:	**Dec. 3, 2015**
Summary of Test Results:	**In Compliance** The EUT complies with the EMC requirements when manufactured identically as the unit tested in this report, including any required modifications. Any changes to the design or build of this unit subsequent to this testing may deem it non-compliant.

Standards:

- **FCC Part 15 Subpart C, Section 15.247**
- **FCC15.207 - Conducted Limits**
- **ANSI C63.10:2013**
- **FCC 15.31(e) Voltage Variations**

Evaluation Conducted by:

Joe Knepper, EMC Proj. Eng.

Report Reviewed by:

Ken Littell, Director of EMC & Wireless Operations

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1 ADMINISTRATIVE INFORMATION

1.1 Measurement Location:

F2 Labs in Middlefield, Ohio. Site description and attenuation data are on file with the FCC's Sampling and Measurement Branch at the FCC Laboratory in Columbia, MD**.**

1.2 Measurement Procedure:

All measurements were performed according to the 2013 version of ANSI C63.10 and recommended FCC procedure of measurement of DTS operating under Section 15.247 and in KDB558074. A list of the measurement equipment can be found in Section 6.

1.3 Uncertainty Budget:

The uncertainty in EMC measurements arises from several factors which affect the results, some associated with environmental conditions in the measurement room, the test equipment being used and the measurement techniques adopted.

The measurement uncertainty budgets detailed below are calculated from the test and calibration data, and are expressed with a 95% confidence factor. Note: Only measurements listed below which relate to tests included in this Test Report are applicable to it.

Measurement Range	Expanded Uncertainty	Combined Uncertainly
Radiated Emissions <1 GHz @3m	±5.07dB	±2.54
Radiated Emissions <1 GHz @10m	±5.09dB	±2.55
Radiated Emissions 1 GHz to 2.7GHz	±3.62dB	±1.81
Radiated Emissions 2.7 GHz to 18GHz	±3.10dB	±1.55
AC Power Line Conducted Emissions, 150kHz to 30 MHz	±2.76dB	±1.38

This Uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

1.4 Document History

Document Number	Description	Issue Date	Approved By
F2LQ7271B-02E	First Issue	Dec. 16, 2015	K. Littell

2 SUMMARY OF TEST RESULTS

Test Name	Standard(s)	Results
-6dB Occupied Bandwidth	CFR 47 Part 15.247(a)(2) / KDB558074	Complies
Conducted Output Power	CFR 47 Part 15.247(b)(3) / KDB558074	Complies
Conducted Spurious Emissions	CFR 47 Part 15.247(d) / Part 15.207 / KDB558074	Complies
Radiated Spurious Emission with 2 dBi Integral Antenna	CFR 47 Part 15.247(d) / Part 15.209 / KDB558074	Complies
Peak Power Spectral Density	CFR 47 Part 15.247(e) / KDB558074	Complies
Conducted Emissions	CFR 47 Part 15.207(a)	Complies
Voltage Variation	CFR 47 Part 15.31(e)	Complies

Modifications Made to the Equipment
None

3 TABLE OF MEASURED RESULTS

Test	Low Channel 2.402 GHz	Mid Channel 2.442 GHz	High Channel 2.480 GHz
Conducted Output Power	0.0735mW (-11.34dBm)	0.0853mW (-10.69dBm)	0.0538mW (-12.69dBm)
Conducted Output Power at 100V	0.0432mW (-13.65dBm)	0.0895mW (-10.48dBm)	0.1052mW (-9.78dBm)
Conducted Output Power at 140V	0.0455mW (-13.42dBm)	0.1035mW (-9.85dBm)	0.0849mW (-10.71dBm)
Conducted Output Power Limit	1 Watt (30dBm)	1 Watt (30dBm)	1 Watt (30dBm)
E.I.R.P. with 2 dBi Integral antenna	0.116mW (-9.34dBm)	0.164mW (-7.85dBm)	0.1667mW (-7.78dBm)
E.I.R.P. Limit	4 Watts, (36.02dBm)	4 Watts, (36.02dBm)	4 Watts, (36.02dBm)
Peak Power Spectral Density	-21.96 dBm	-19.75 dBm	-22.23 dBm
Peak Power Spectral Density Limit	8 dBm	8 dBm	8 dBm
-6dB Occupied Bandwidth	0.7335 MHz	0.7296 MHz	0.7295 MHz
-6dB Occupied Bandwidth Limit	≥ 500KHz	≥ 500KHz	≥ 500KHz

4 ENGINEERING STATEMENT

This report has been prepared on behalf of Shanghai Qiangling Electronic Co., Ltd. to provide documentation for the testing described herein. This equipment has been tested and found to comply with Part 15.247 of the FCC Rules using ANSI C63.10 2013 and KDB558074 standards. The test results found in this test report relate only to the items tested.

5 EUT INFORMATION AND DATA

5.1 Equipment Under Test:

Product: TCP ColorSpree Tunable White
Model: A19BT001
Serial No.: 1263-18, 1263-19, 1263-20
FCC ID: NIRA19BT001

5.2 Trade Name:

TCP

5.3 Power Supply:

120V, 60 Hz

5.4 Applicable Rules:

CFR 47, Part 15.247, subpart C

5.5 Equipment Category:

Radio Transmitter-DTS

5.6 Antenna:

Internal Antenna

5.7 Accessories:

N/A

5.8 Test Item Condition:

The equipment to be tested was received in good condition.

5.9 Testing Algorithm:

EUT was set up in a normal testing manner, powered at 120V, 60 Hz. EUT transmitted at High (2.48 GHz), Mid (2.442 GHz) and Low (2.402 GHz) continuously.

6 LIST OF MEASUREMENT INSTRUMENTATION

Equipment Type	Asset Number	Manufacturer	Model	Serial Number	Calibration Due Date
Shielded Chamber	CL166	AlbatrossProjects	B83117-DF435-T261	US140023	Jan. 1, 2016
Temp/Hum. Recorder	CL137	Extech	RH520	CH16992	May 7, 2016
Receiver	CL151	Rohde & Schwarz	ESU40	100319	Nov. 25, 2016
Horn Antenna	CL098	Emco	3115	9809-5580	Dec. 3, 2015
Pre-Amplifier	CL045	Hewlett-Packard	8447D	2944A08445	Nov. 2, 2016
Amplifier w/Monopole & 18" Loop	CL163	A.H. Systems, Inc.	EHA-52B	100	Apr. 20, 2016
Software:	Tile Version 1.0		Software Verified: Nov. 30, 2015		
Software:	EMC 32, Version 5.20.2		Software Verified: Nov. 30,2015		
Antenna, Horn	CL114	A. H. Systems, Inc.	SAS-572	237	Oct. 16, 2016
Spectrum Analyzer	0141	Hewlett Packard	8591E	3520A04145	Jan. 8, 2016
Temp/Hum. Rec.	CL119	Extech	RH520	H005869	Feb. 9, 2016
Transient Limiter	0202	Hewlett Packard	11947A	3107A00729	June 27, 2016
LISN	CL184	Com-Power	LI-125A	191213	June 9, 2016
LISN	CL185	Com-Power	LI-125A	191214	June 9, 2016

7 FCC PART 15.247(a)(2) – OCCUPIED BANDWIDTH

7.1 Requirements:

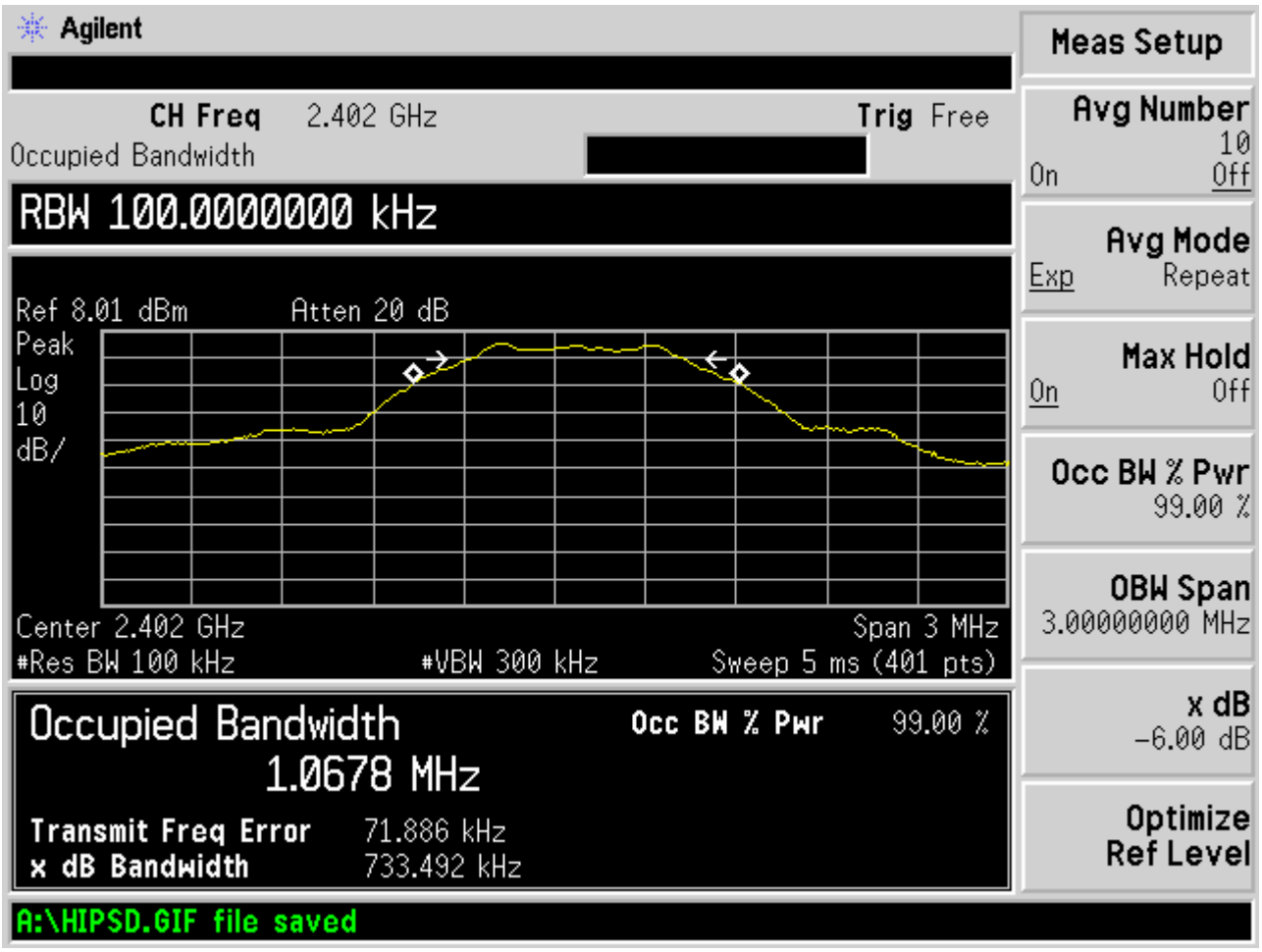
The 6dB bandwidth shall be greater than 500 kHz.

Bandwidth measurements were made at the low (2.402 GHz), mid (2.442 GHz) and upper (2.480 GHz) frequencies. The bandwidth was measured using the analyzer's occupied bandwidth function.

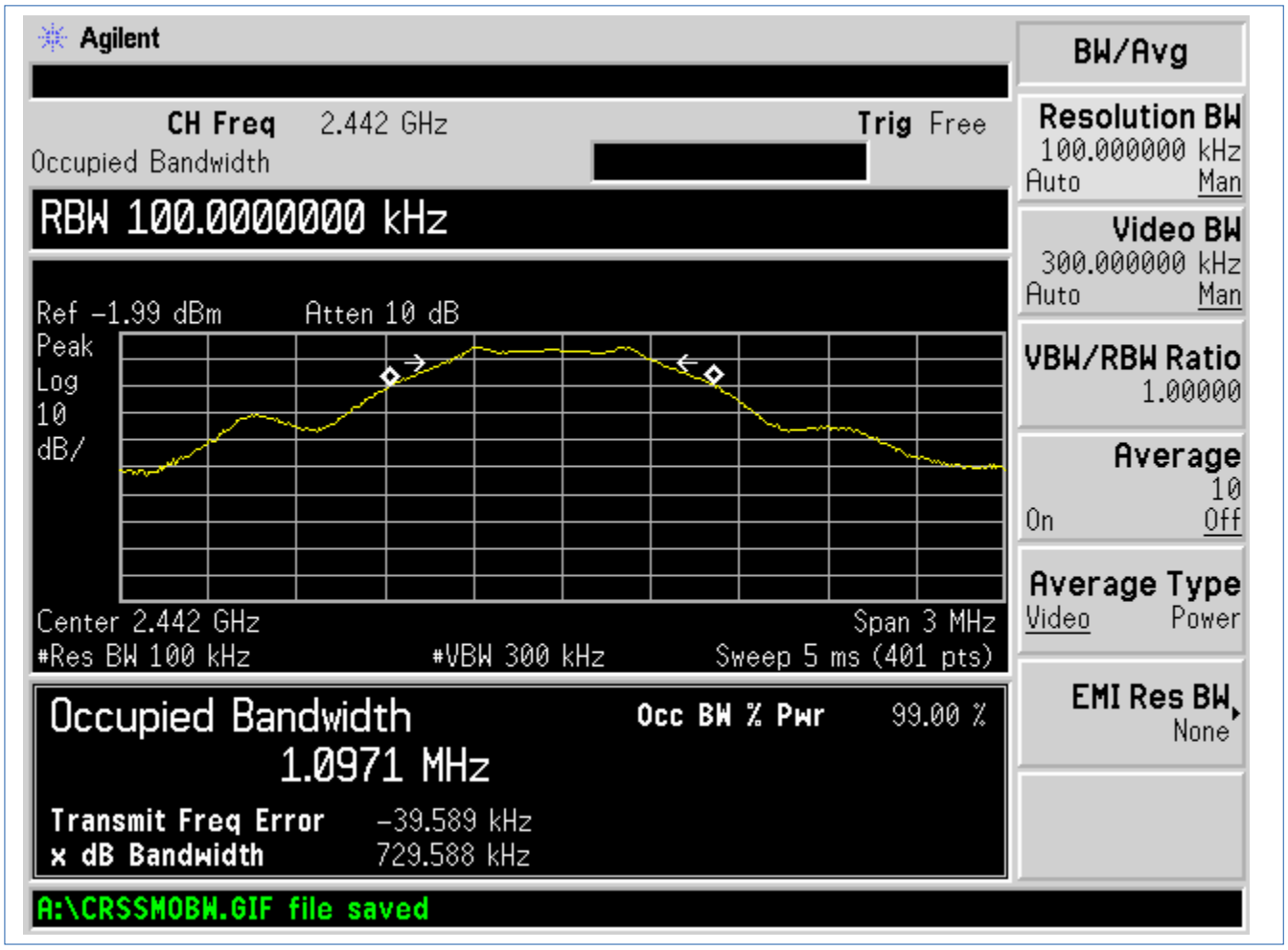
7.2 Occupied Bandwidth Test Data

Test Date:	Nov. 30, 2015	**Test Engineer:**	J. Knepper
Standards:	CFR 47 Part 15.247(a)(2); KDB558074	**Air Temperature:**	20.2ºC
		Relative Humidity:	47%

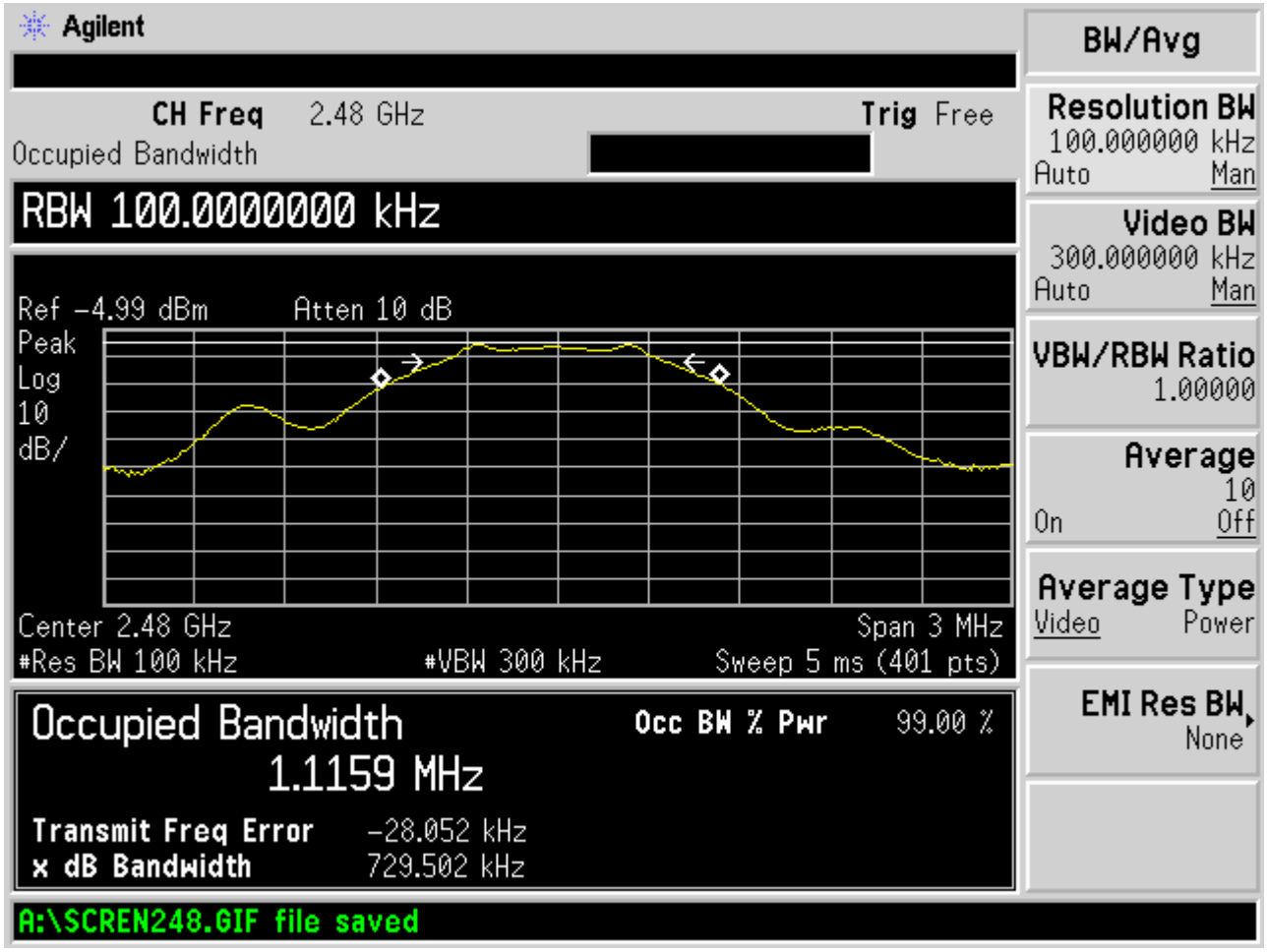
Low Channel



Mid Channel


Agilent
CH Freq 2.442 GHz
Trig Free
Occupied Bandwidth
RBW 100.0000000 kHz
Ref -1.99 dBm
Atten 10 dB
Peak
Log
10
dB/
Center 2.442 GHz
Span 3 MHz
#Res BW 100 kHz
#VBW 300 kHz
Sweep 5 ms (401 pts)
Occupied Bandwidth
1.0971 MHz
Occ BW % Pwr 99.00 %
Transmit Freq Error -39.589 kHz
x dB Bandwidth 729.588 kHz
A:\CRSSMOBW.GIF file saved
BW/Avg
Resolution BW
100.000000 kHz
Auto Man
Video BW
300.000000 kHz
Auto Man
VBW/RBW Ratio
1.00000
Average
10
On Off
Average Type
Video Power
EMI Res BW
None

High Channel



8 FCC PART 15.247(b)(3) – CONDUCTED OUTPUT POWER

The EUT antenna port was fitted with an SMA connector and directly connected to the input of the receiver. The peak power output was measured.

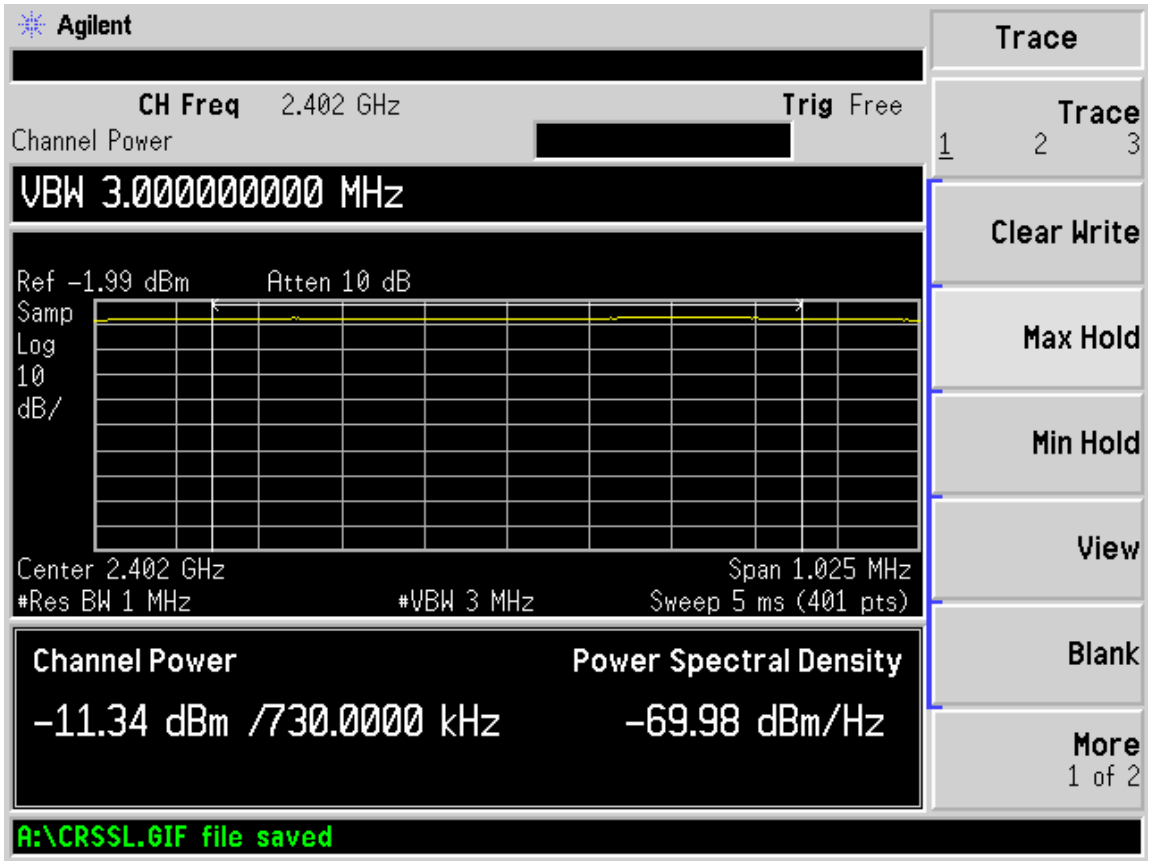
8.1 Requirements:

The peak power output shall be 1 watt (30 dBm) or less when using an antenna with a gain of less than 6dBi. For antennas having a gain of more than 6dBi, the limit is reduced by 1dB for every dB the antenna gain is over 6dBi.

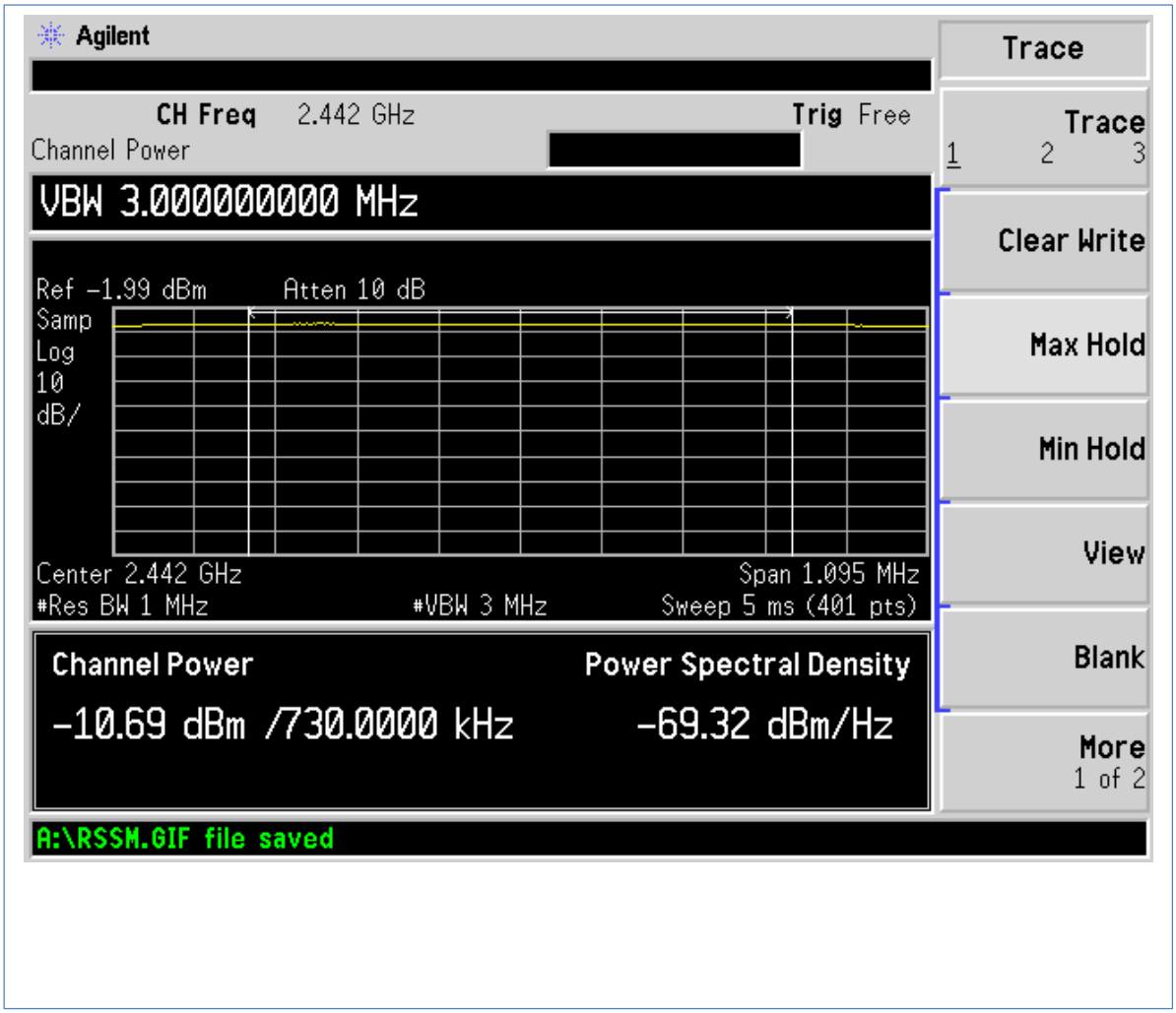
8.2 Conducted Output Power Test Data

Test Date:	Nov. 30, 2015	**Test Engineer:**	J. Knepper
Standards:	CFR 47 Part 15.247(b)(3); KDB558074	**Air Temperature:**	20.1ºC
		Relative Humidity:	47%

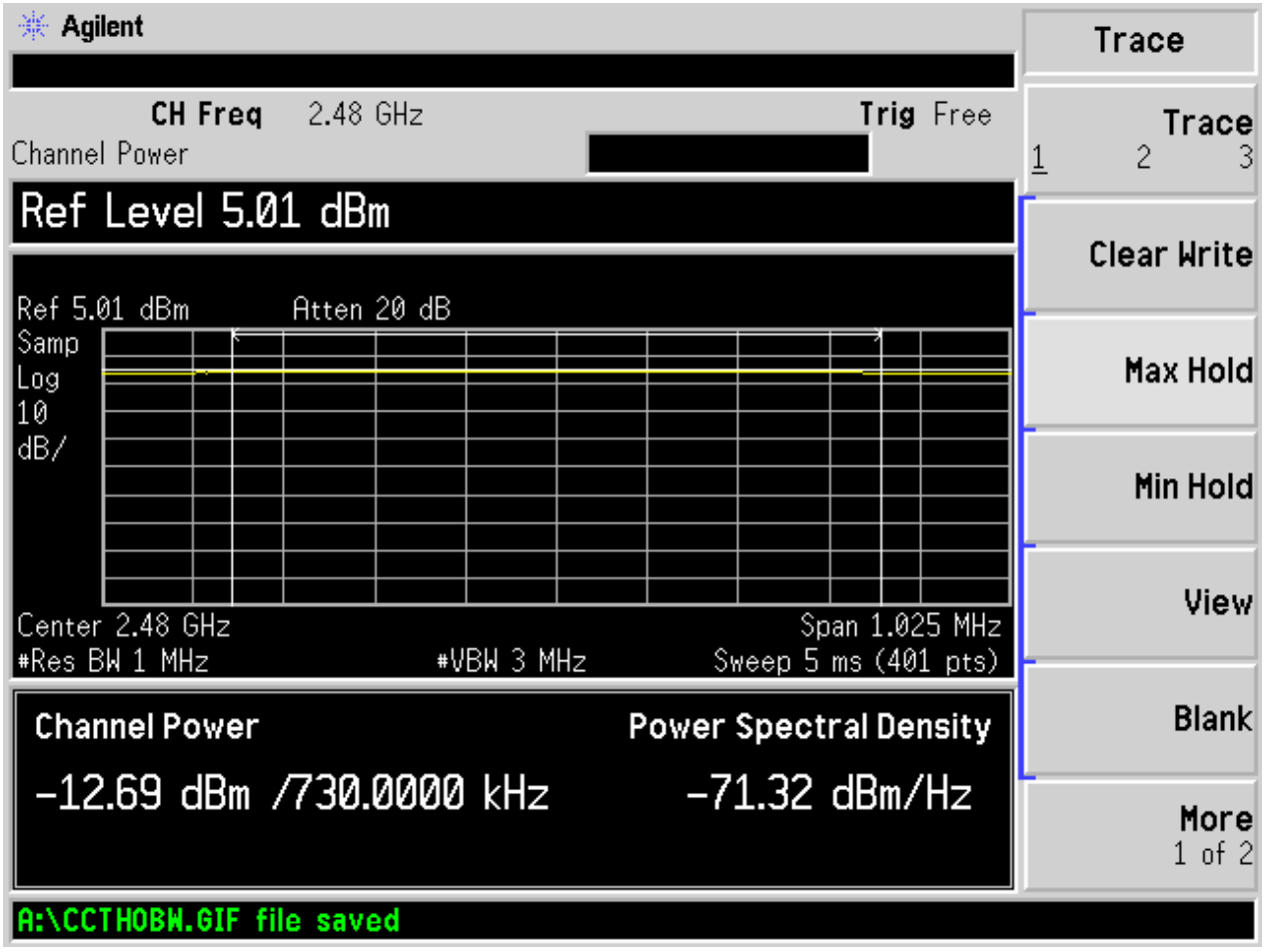
Low Channel



Mid Channel


Agilent
Trace
CH Freq 2.442 GHz
Trig Free
Channel Power
Trace
1 2 3
VBW 3.000000000 MHz
Clear Write
Ref -1.99 dBm
Atten 10 dB
Samp
Log
10
dB/
Max Hold
Min Hold
View
Center 2.442 GHz
Span 1.095 MHz
#Res BW 1 MHz
#VBW 3 MHz
Sweep 5 ms (401 pts)
Blank
Channel Power
-10.69 dBm /730.0000 kHz
Power Spectral Density
-69.32 dBm/Hz
More
1 of 2
A:\RSSM.GIF file saved

High Channel



9 FCC Part 15.247(d) – CONDUCTED SPURIOUS EMISSIONS

The following tests were performed to demonstrate compliance.

RF Antenna Conducted Test

The EUT antenna port was fitted with an SMA connector and directly connected to the input of the spectrum analyzer.

9.1 Requirements:

All Spurious Emissions must be at least 20dB down from the highest emission level measured within the authorized band up through the tenth harmonic.

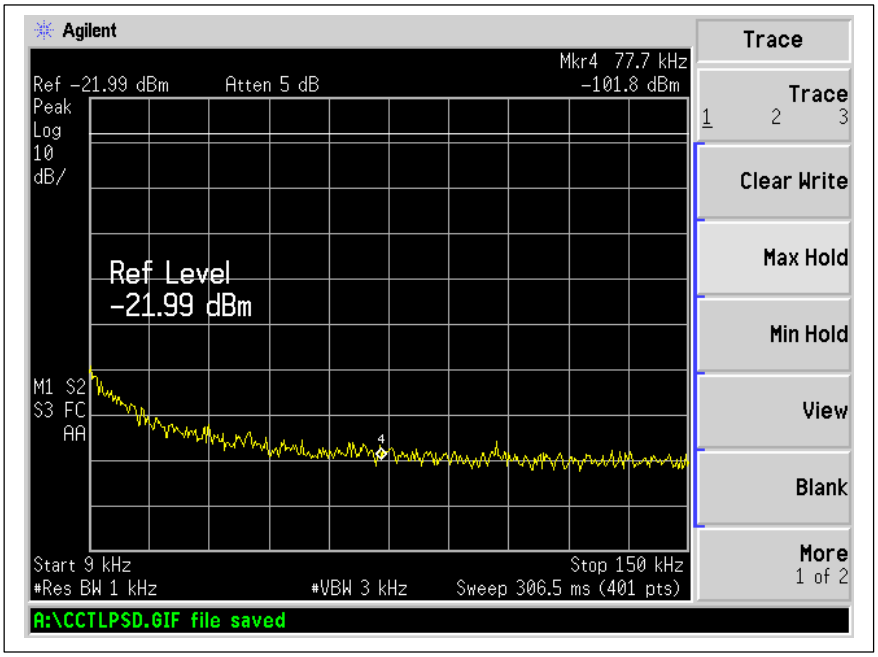
Spurious emissions measurements were made at the low, mid, and upper channels with the appropriate spectrum analyzer impulse bandwidth. Additionally, 6dB down points were measured for the low and high channels to verify band edge compliance.

9.2 Test Data – Conducted Spurious Emissions

Test Date:	Nov. 30, 2015	**Test Engineer:**	J. Knepper
Standards:	CFR 47 Part 15.247(d) / Part 15.209; KDB558074	**Air Temperature:**	20.3ºC
		Relative Humidity:	47%

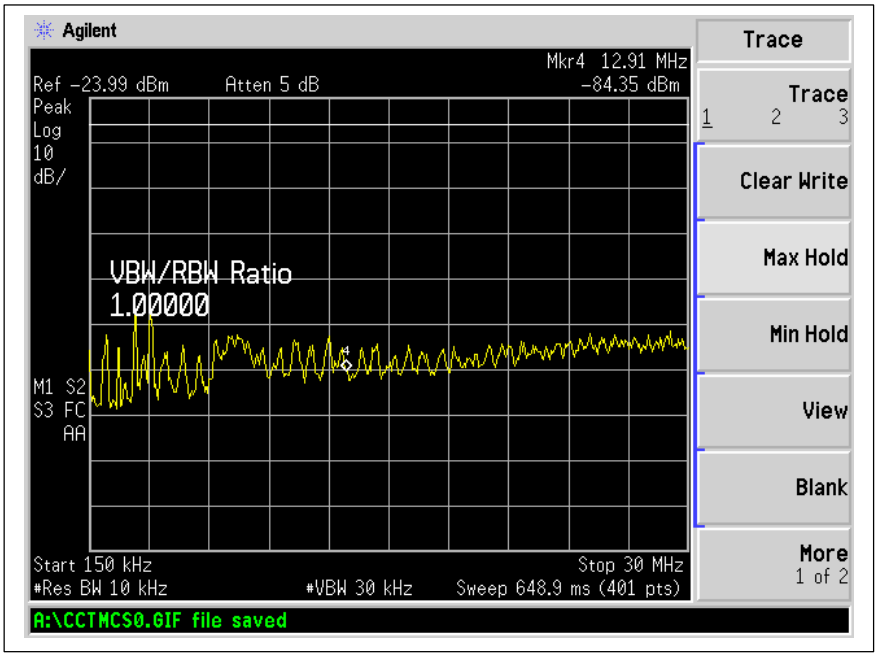
Low Channel: 0.009 MHz to 0.15 MHz

.



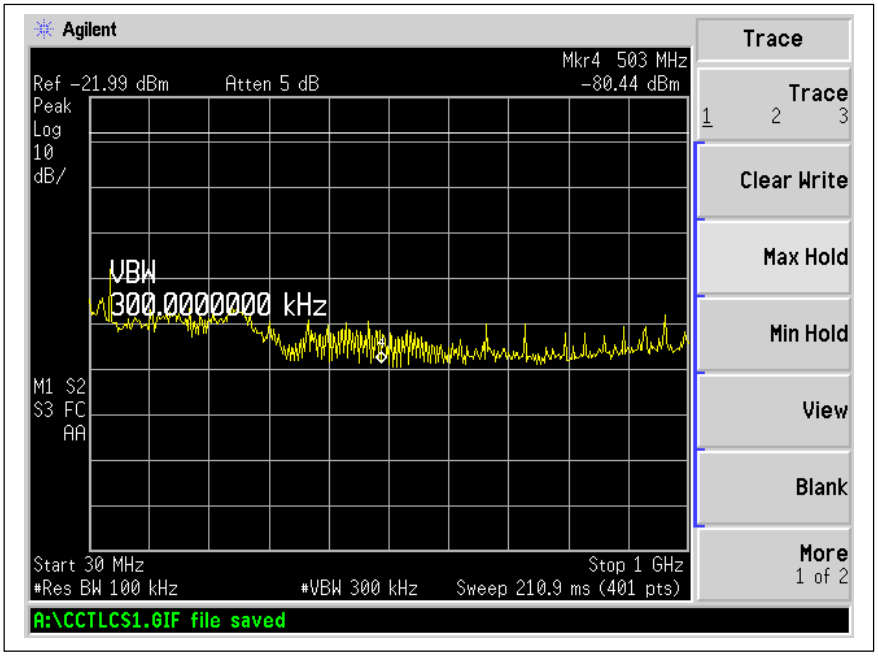
Low Channel: 0.15 MHz to 30 MHz

.



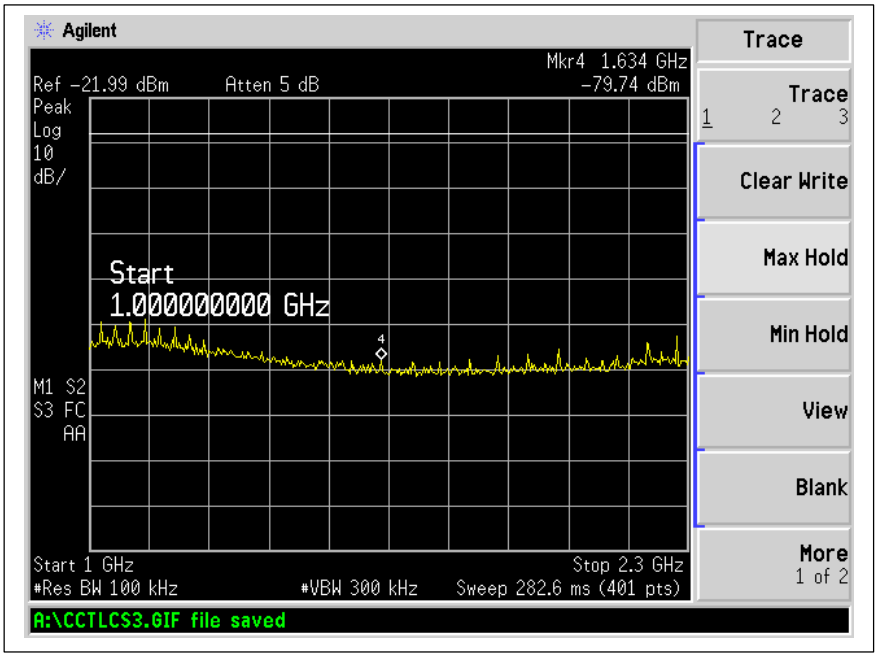
Low Channel: 30 MHz to 1 GHz

.



Low Channel: 1 GHz to 2.3 GHz

.



Low Channel: 2.3 GHz to 2.6 GHz

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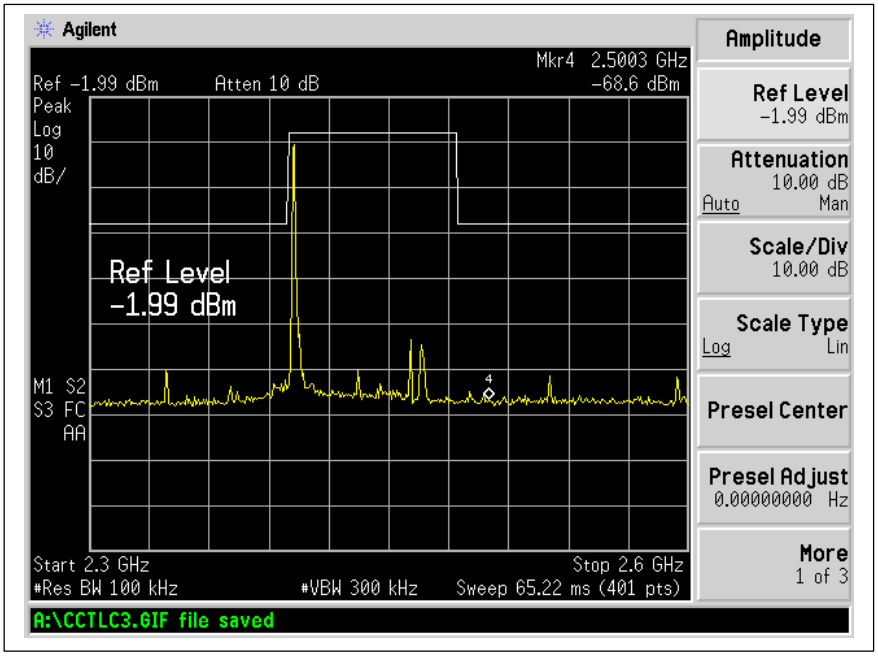
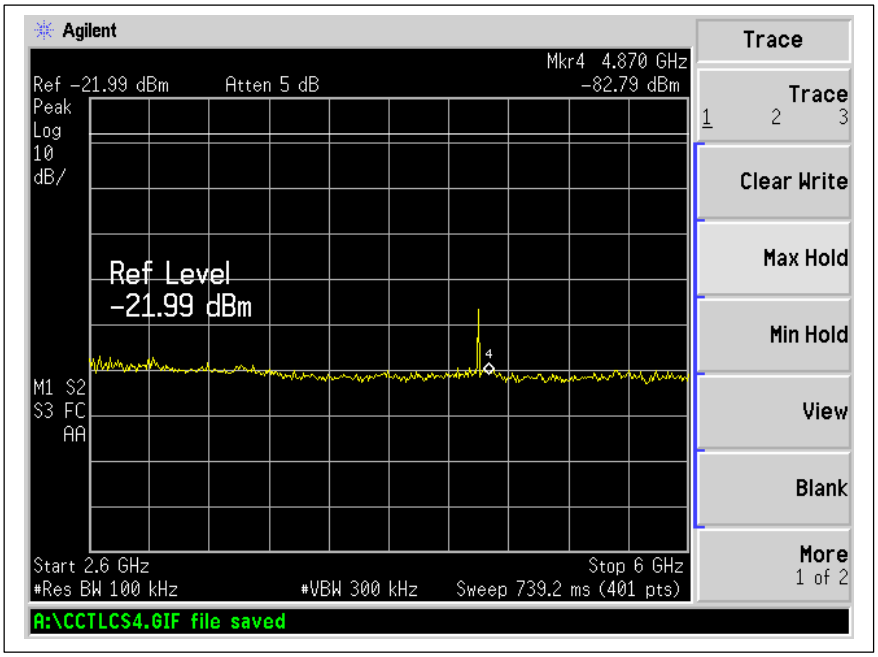


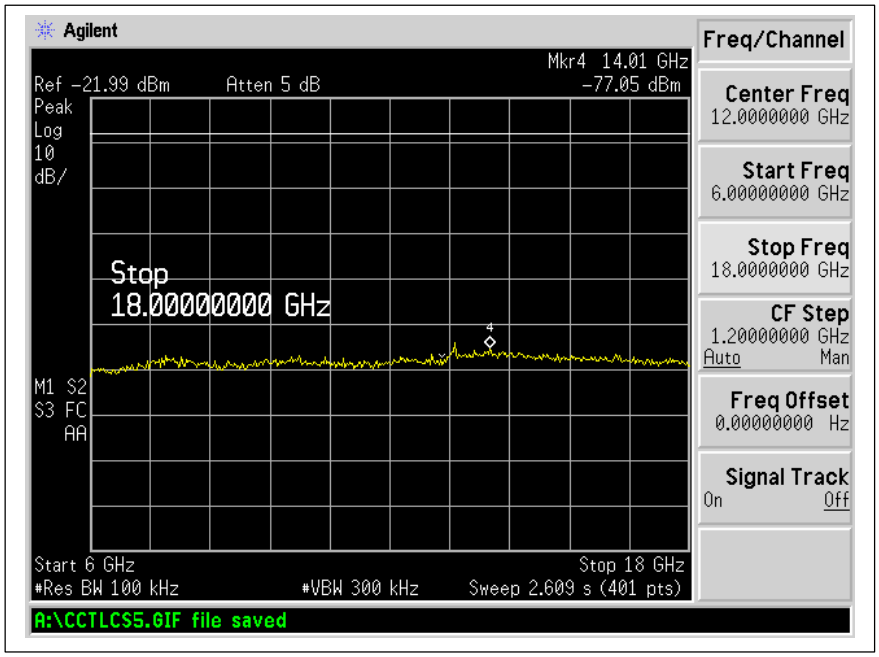
Low Channel: 2.6 GHz to 6 GHz

.



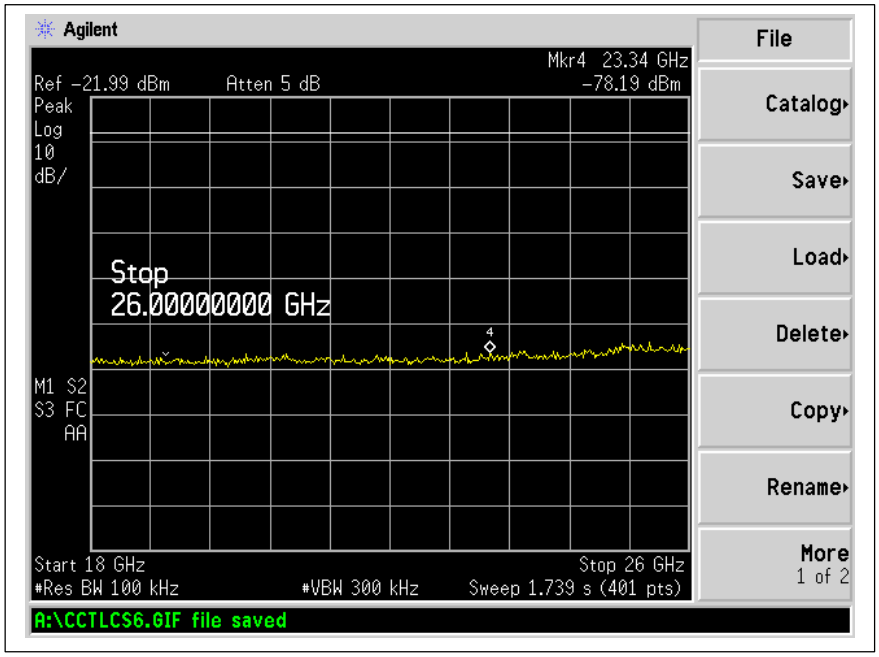
Low Channel: 6 GHz to 18 GHz

.



Low Channel: 18 GHz to 26 GHz

.



Mid Channel: 0.009 MHz to 0.15 MHz

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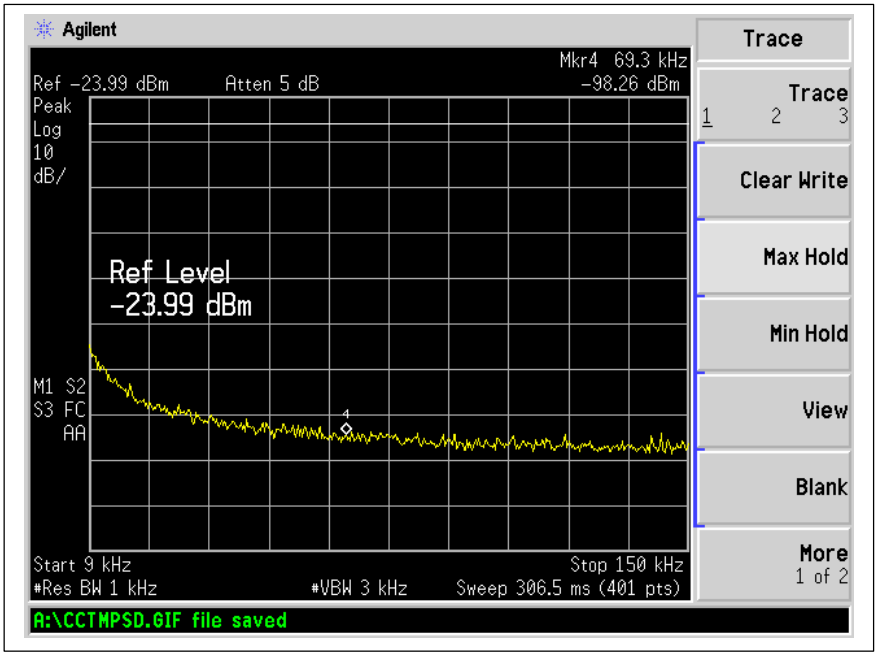

Mid Channel: 0.15 MHz to 30 MHz

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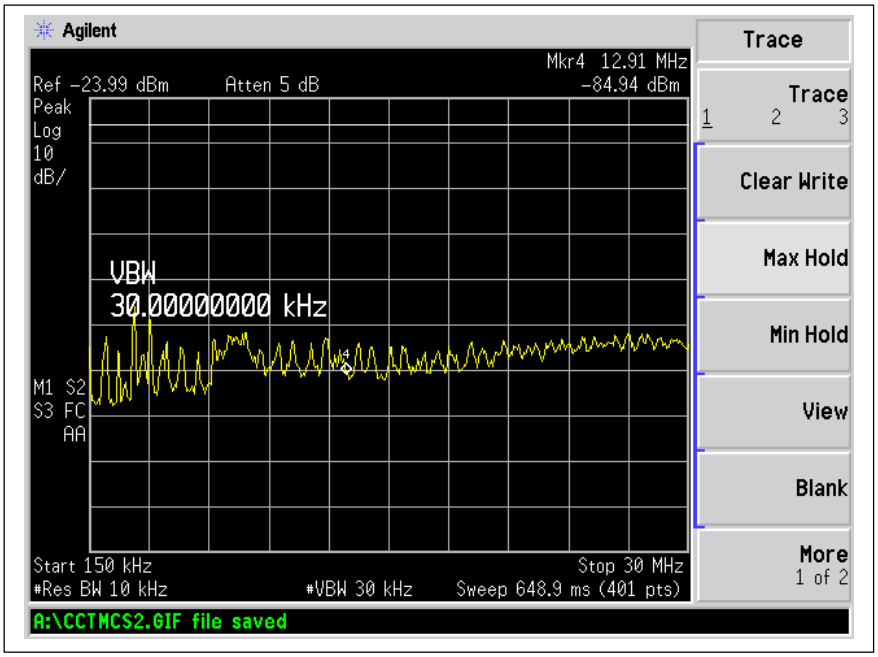
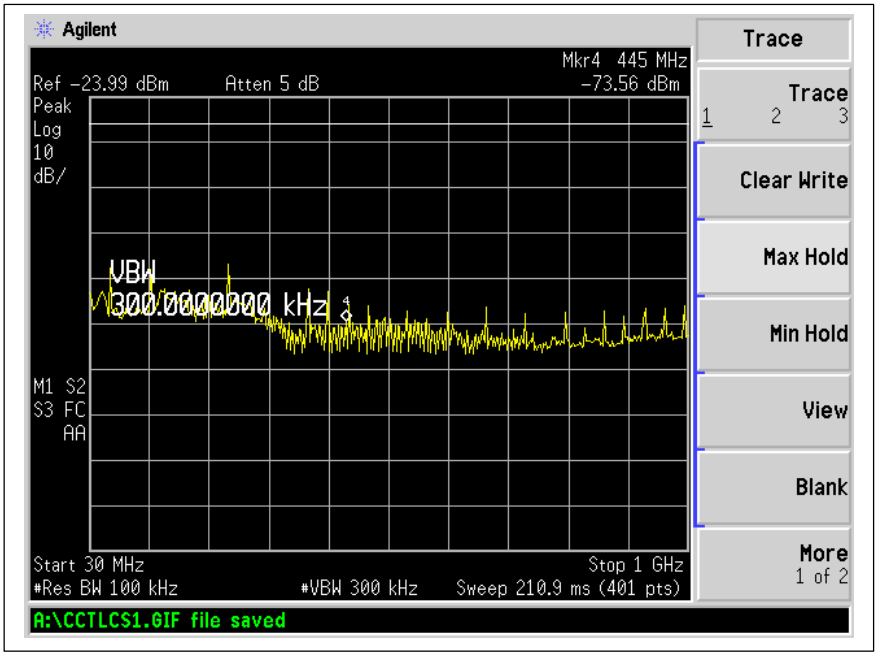


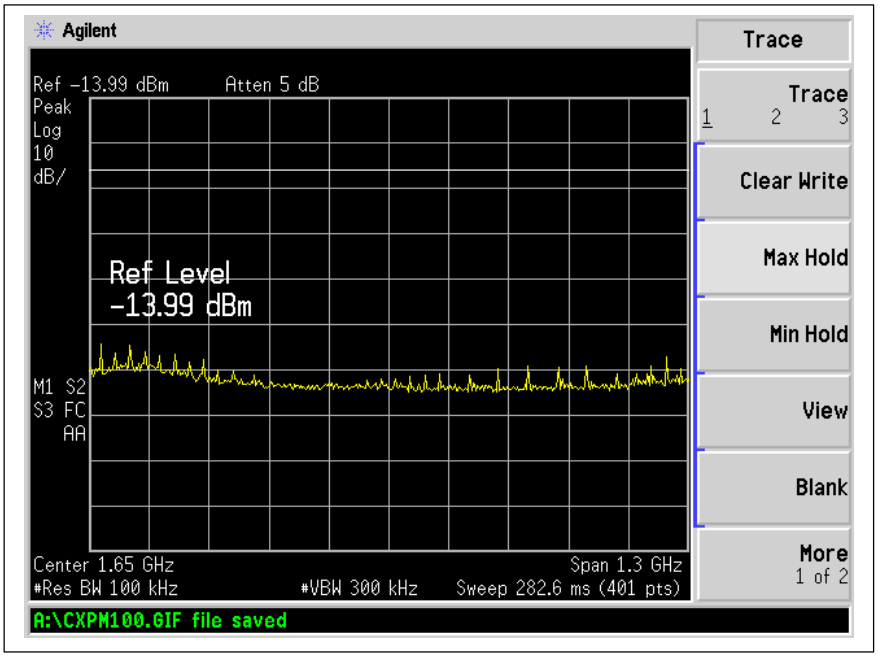
Mid Channel: 30 MHz to 1 GHz

.



Mid Channel: 1 GHz to 2.3 GHz

.



Mid Channel: 2.3 GHz to 2.6 GHz

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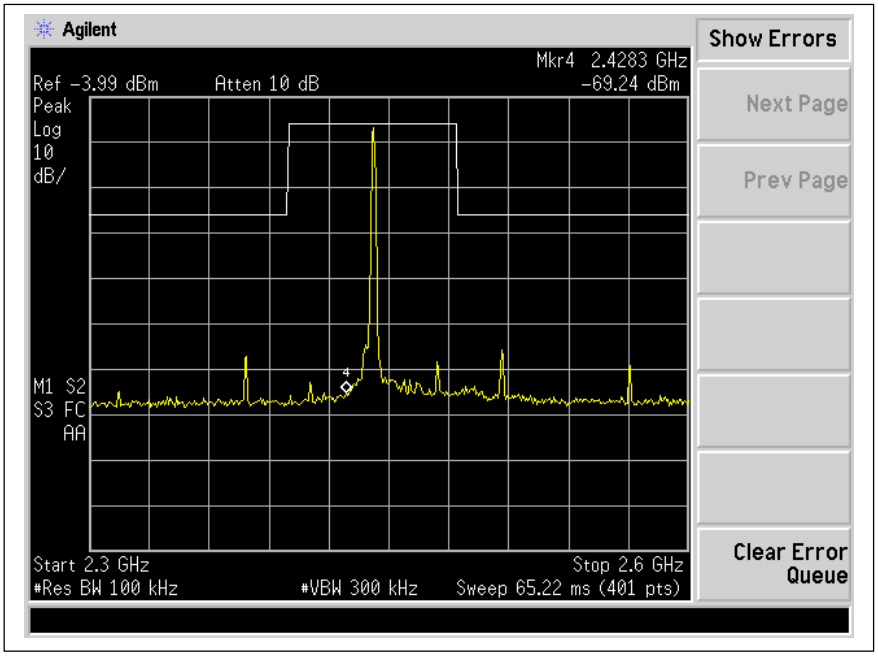

Mid Channel: 2.6 GHz to 6 GHz

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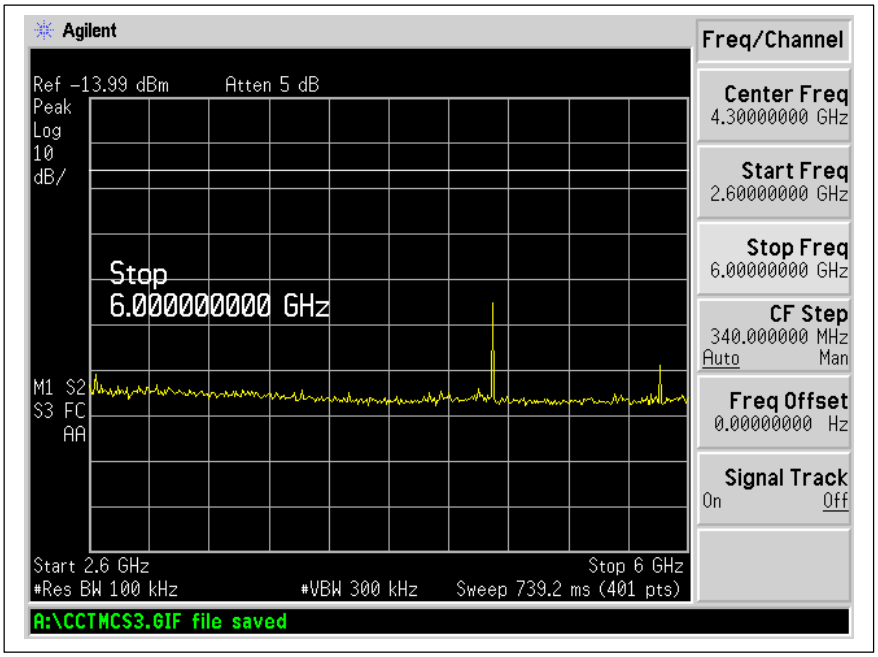

Mid Channel: 6 GHz to 18 GHz

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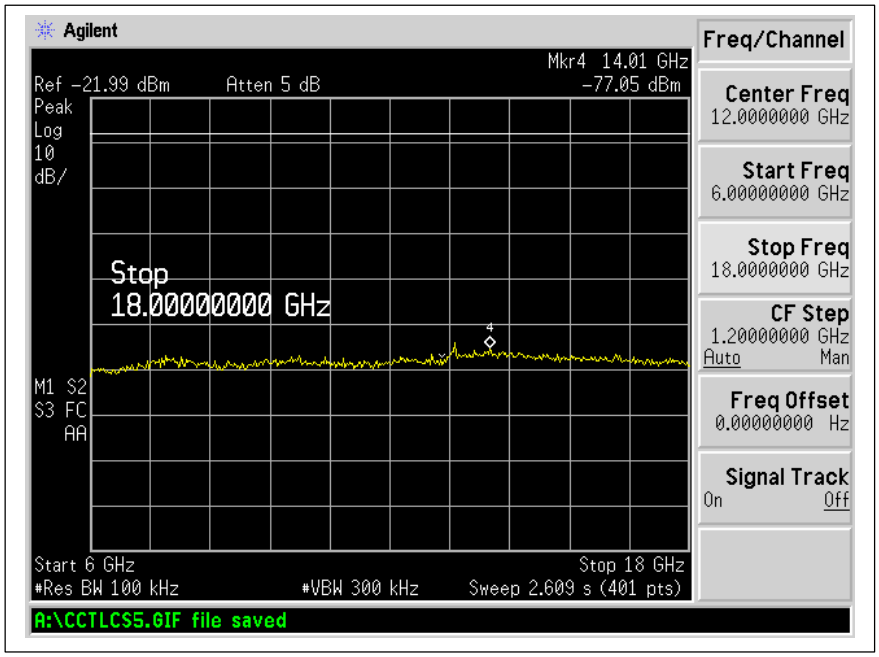

Mid Channel: 18 GHz to 26 GHz

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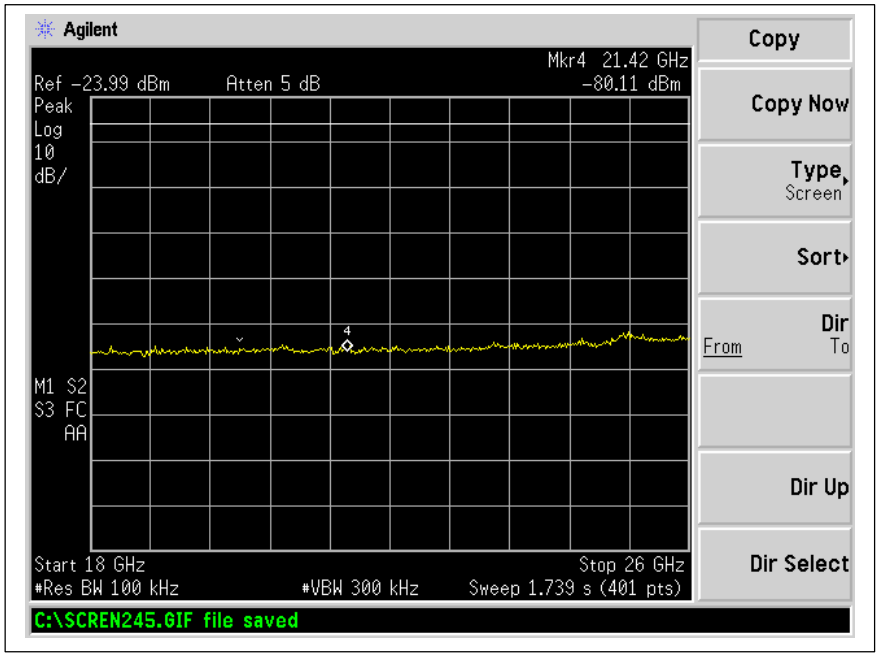

High Channel: 0.009 MHz to 0.15 MHz

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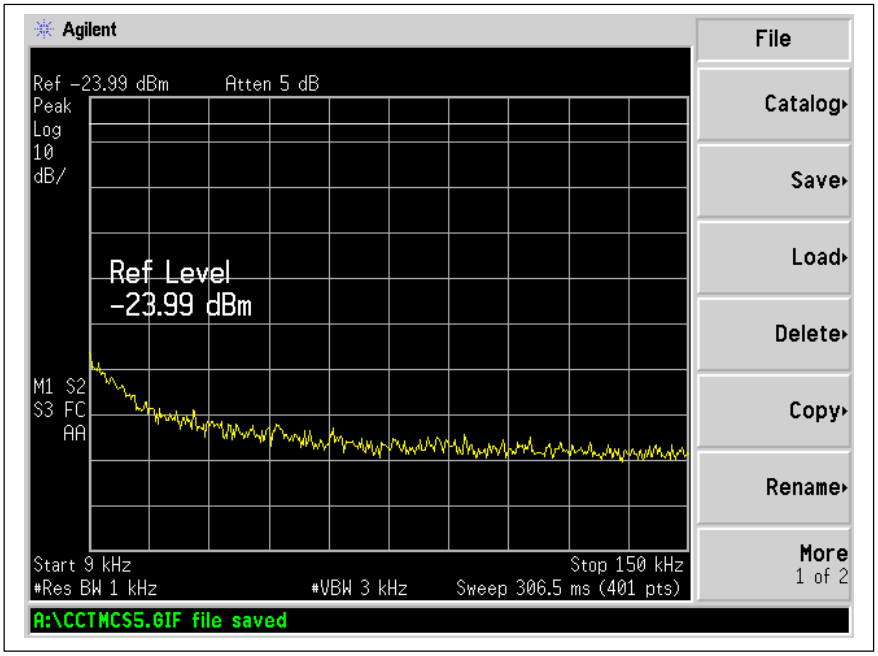

High Channel: 0.15 MHz to 30 MHz

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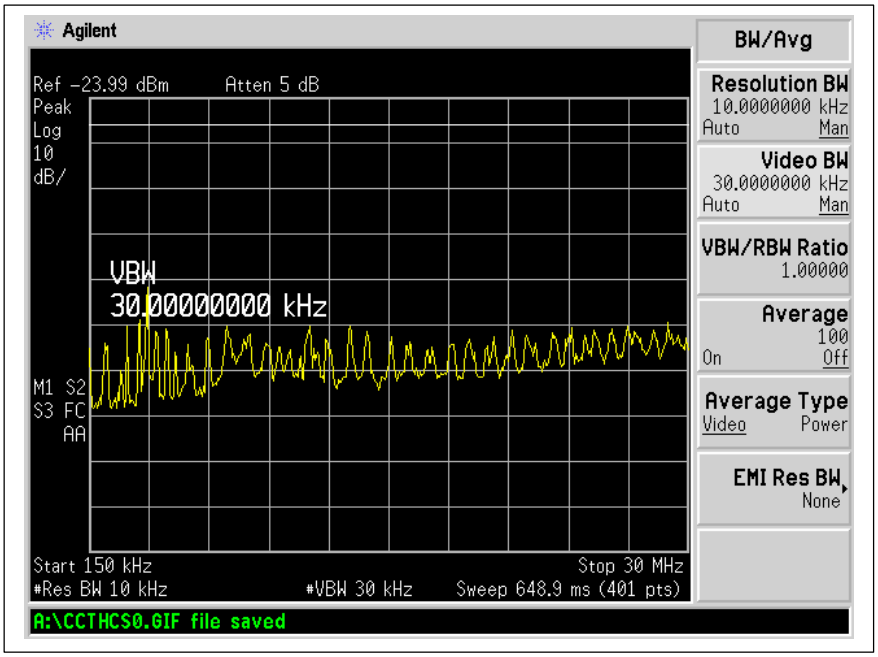

High Channel: 30 MHz to 1 GHz

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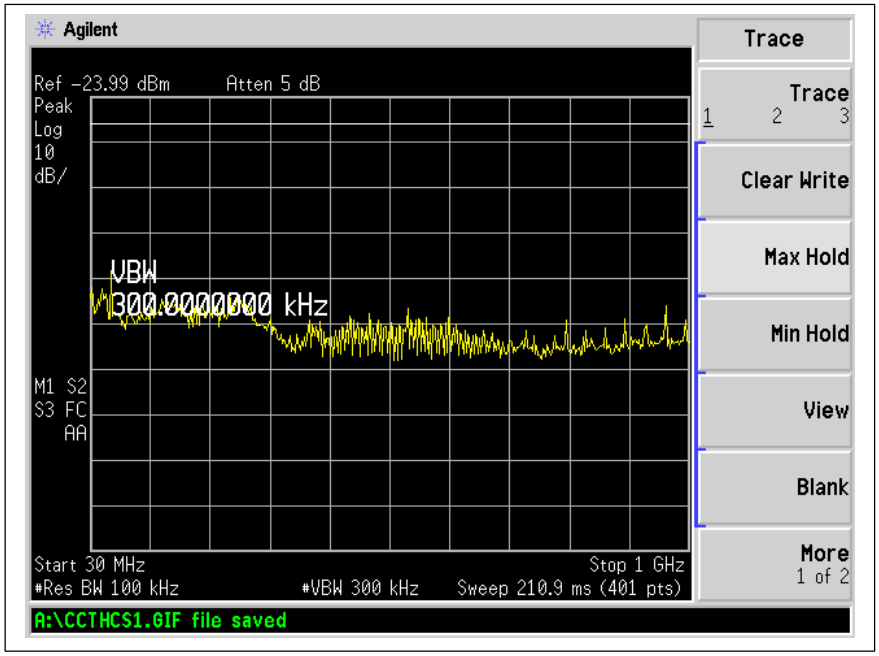

High Channel: 1 GHz to 2.3 GHz

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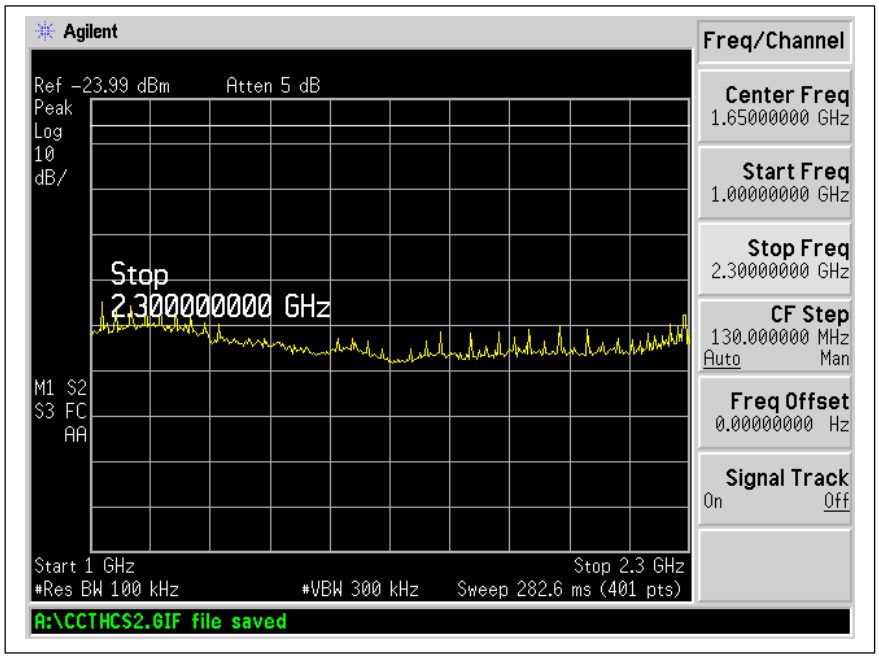

High Channel: 2.3 GHz to 2.6 GHz

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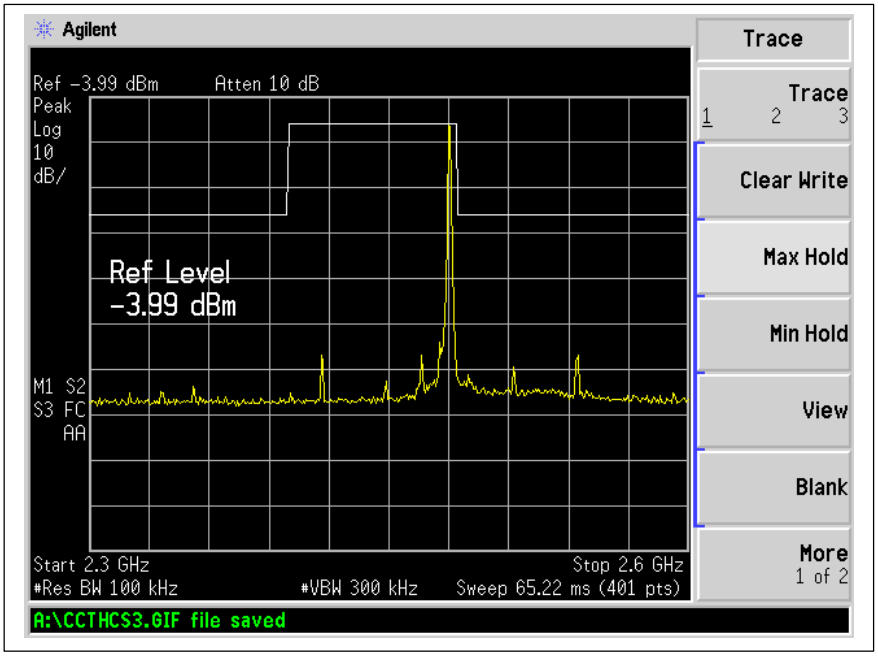

High Channel: 2.6 GHz to 6 GHz

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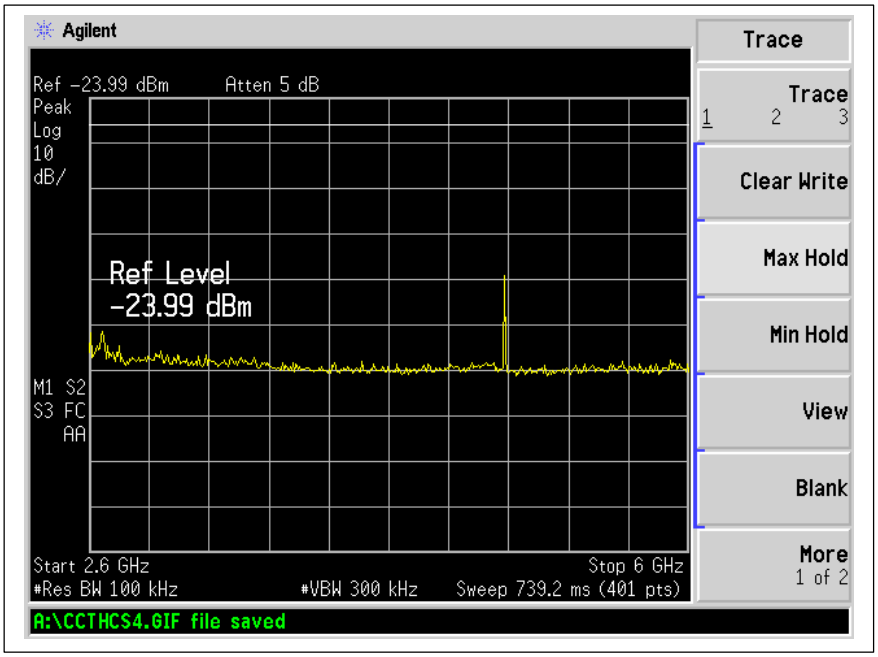

High Channel: 6 GHz to 18 GHz

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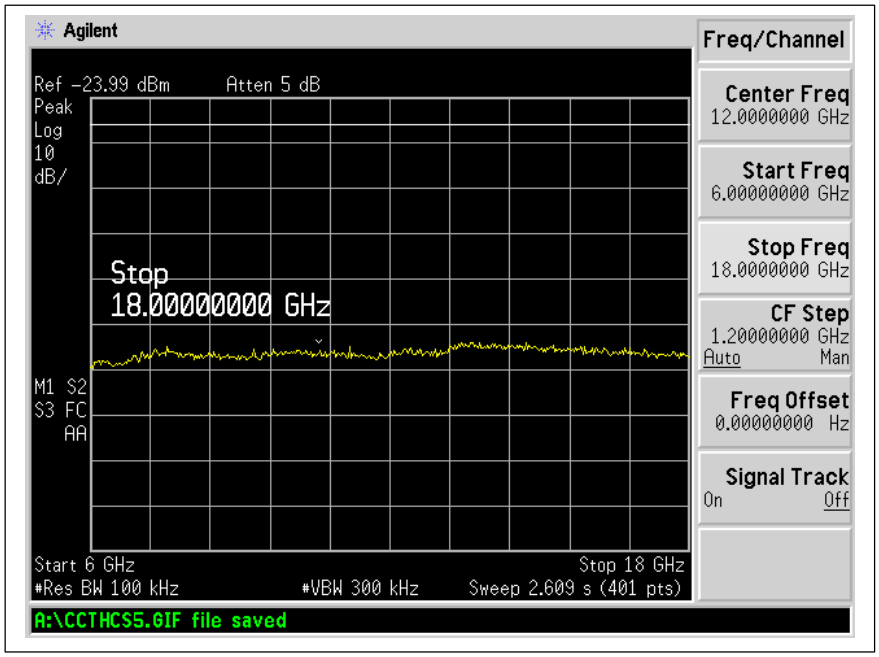

High Channel: 18 GHz to 26 GHz

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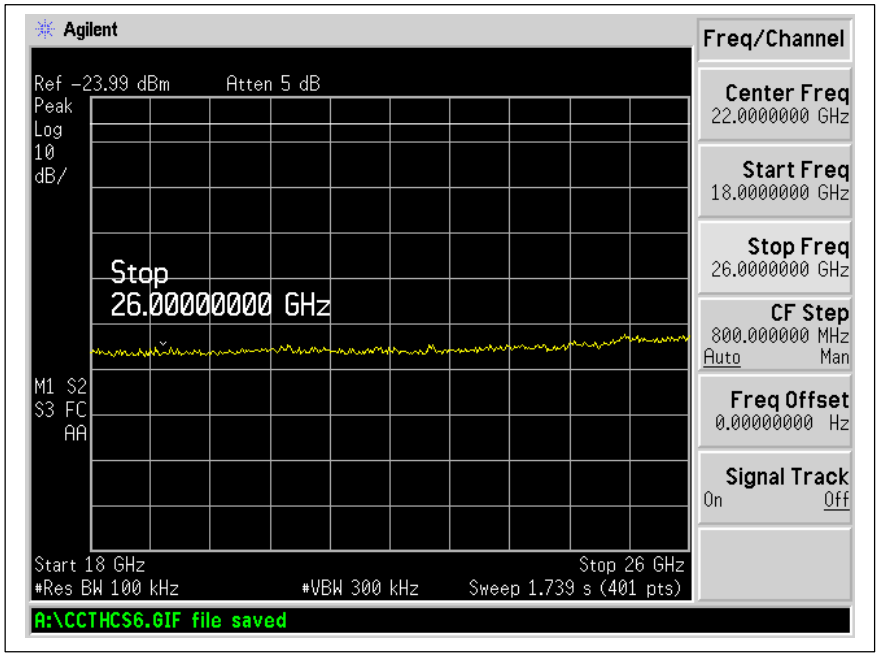


10 RADIATED SPURIOUS EMISSION

The EUT antenna port was fitted with its internal antenna. Radiated emissions were measured in a Semi-Anechoic Chamber. All emissions generated that fall in the restricted bands per FCC Part 15.205 were examined.

10.1 Requirements:

All emissions that fall in the restricted bands defined in FCC Part 15.205 shall not exceed the maximum field strength listed in FCC Part 15.209(a).

10.2 Radiated Spurious Emission Test Data

Test Date(s):	Dec. 1-2, 2015	**Test Engineer:**	J. Knepper
Standards:	CFR 47 Part 15.247(d); Part 15.209 / KDB558074	**Air Temperature:**	19.6ºC
		Relative Humidity:	47%

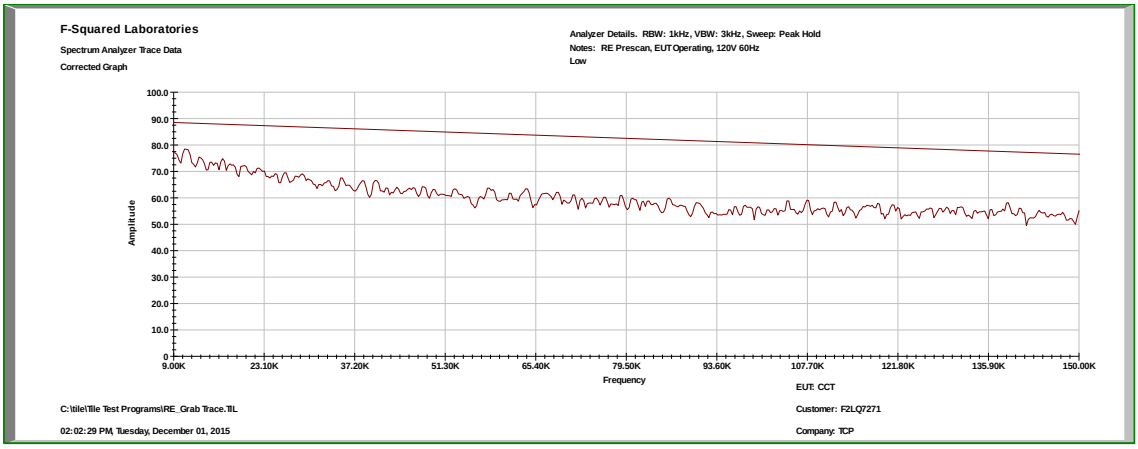
Notes: Plots are peak, max hold prescan data included only to determine what frequencies to investigate and measure. The EUT was initially placed in a semi-anechoic chamber, and rotated in all three orthogonal positions to maximize the emissions. Characterization measurements were then performed to determine at which frequencies significant emissions occurred. These graphs are shown below.

The equipment was fully exercised with all cabling attached to the EUT and was positioned in a semi-anechoic chamber for maximum emissions. While the equipment was energized, the receiving antenna was scanned from 1.0 meter to 4.0 meters in both vertical and horizontal polarities while the turntable was adjusted 360 degrees to determine the maximum field strength. The tables of measured results can be found below.

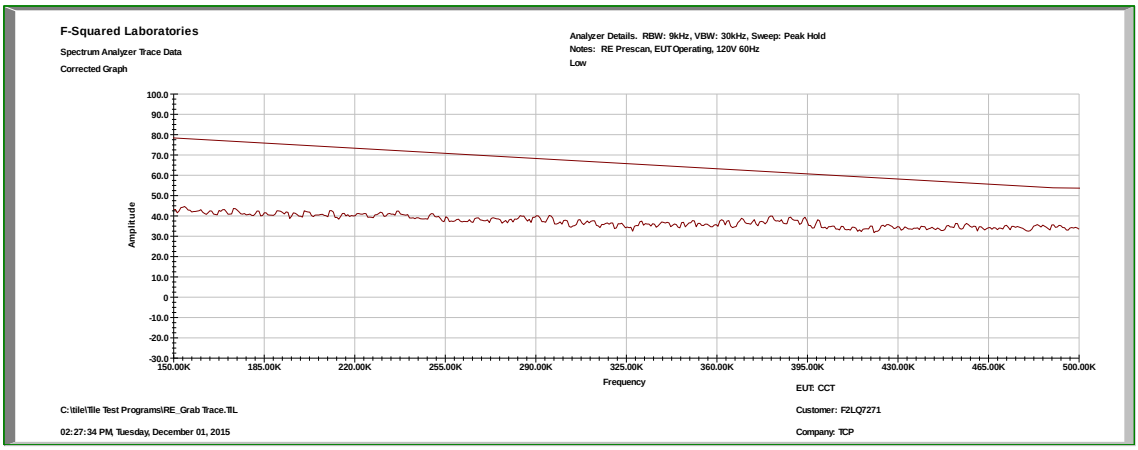
Some of the frequencies did not change with the EUT on or off. At those frequencies, the test distance was shortened to 1 meter and still no emissions from the EUT were visible or over the ambient or limit.

The plots are for reference only and the limit lines are not actual limit lines but merely a guide.

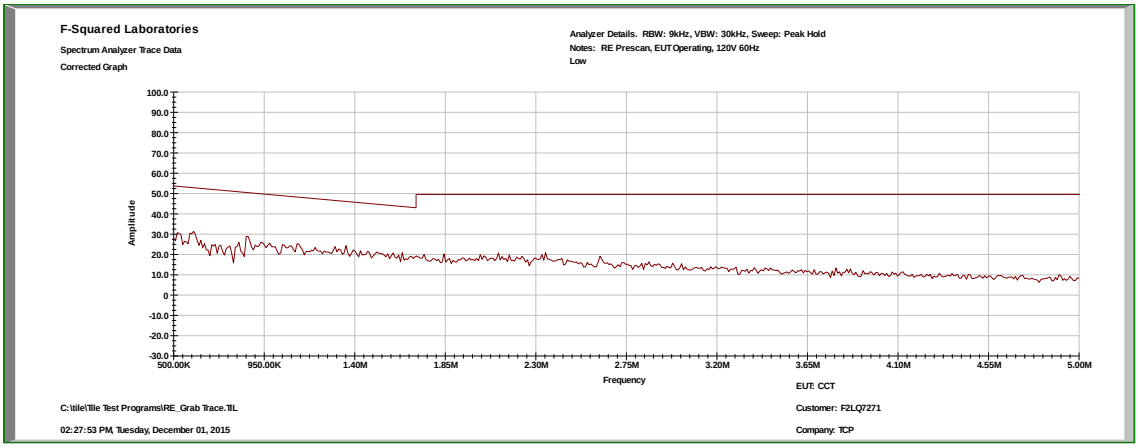
Low Channel: 0.009 MHz to 0.15 MHz



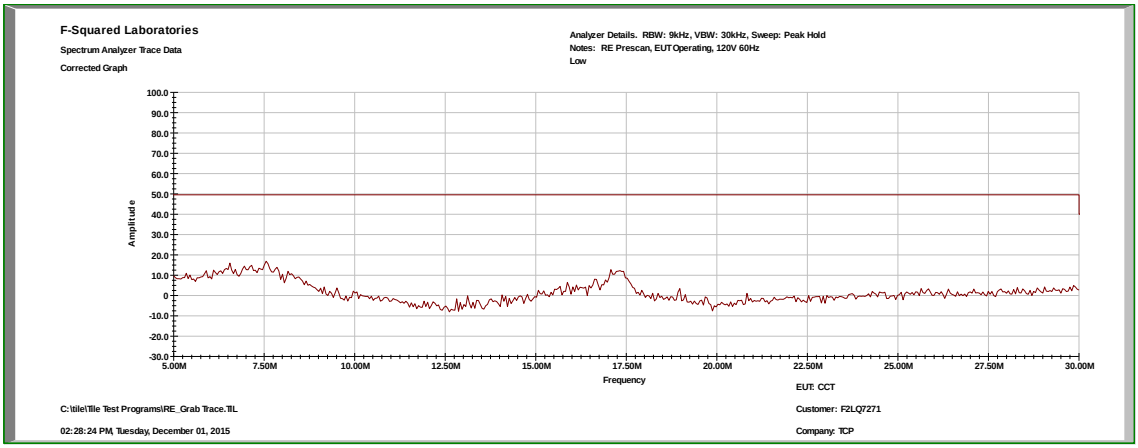
Low Channel: 0.15 MHz to 0.5 MHz



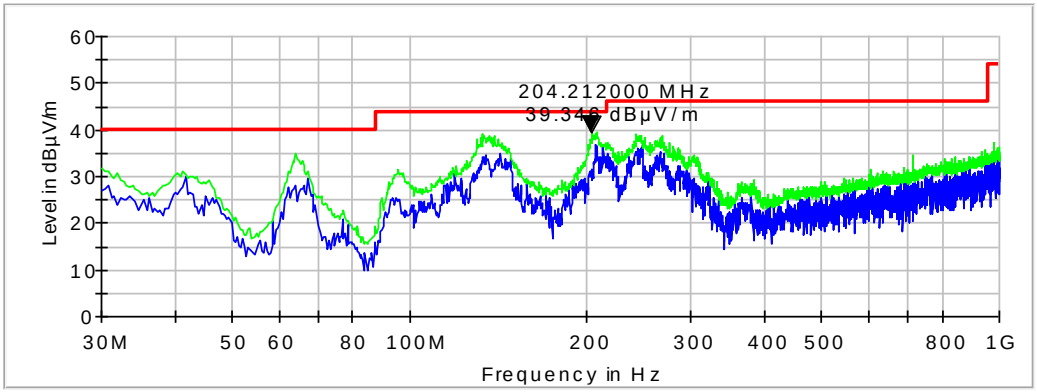
Low Channel: 0.5 MHz to 5 MHz



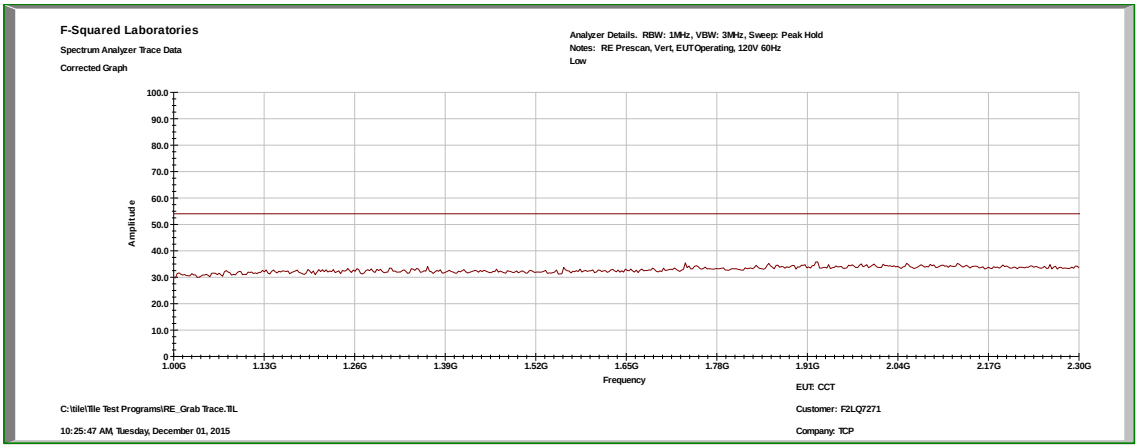
Low Channel: 5 MHz to 30 MHz



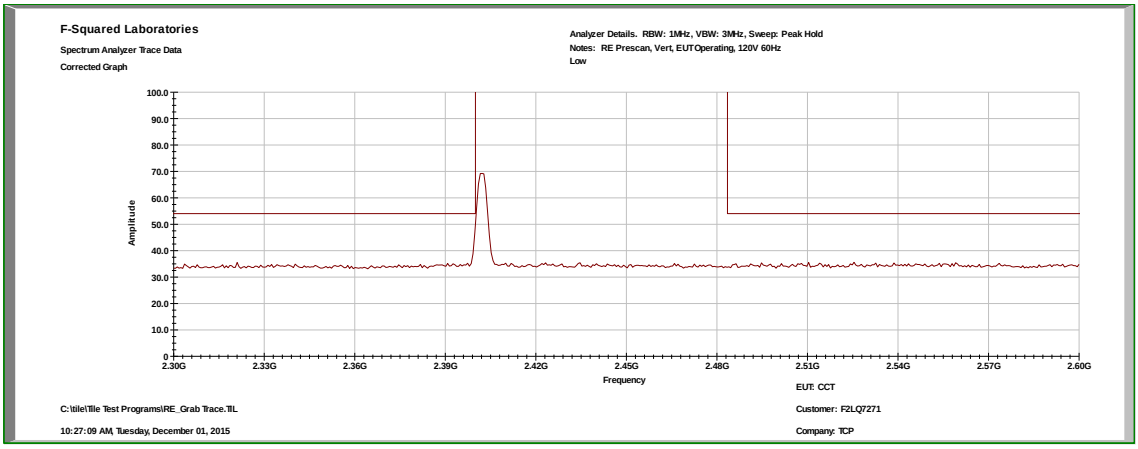
Low Channel: 30 MHz to 1 GHz, Vertical



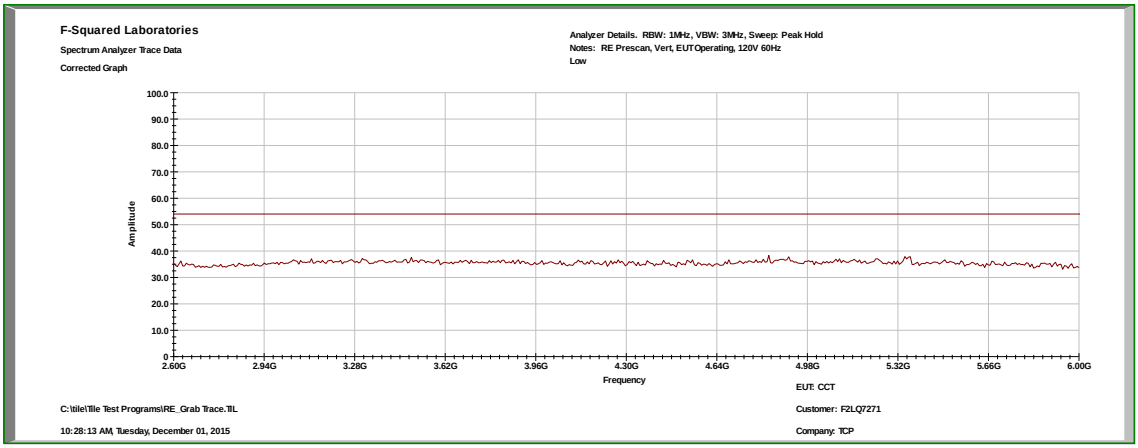
Low Channel: 1 GHz to 2.3 GHz, Vertical



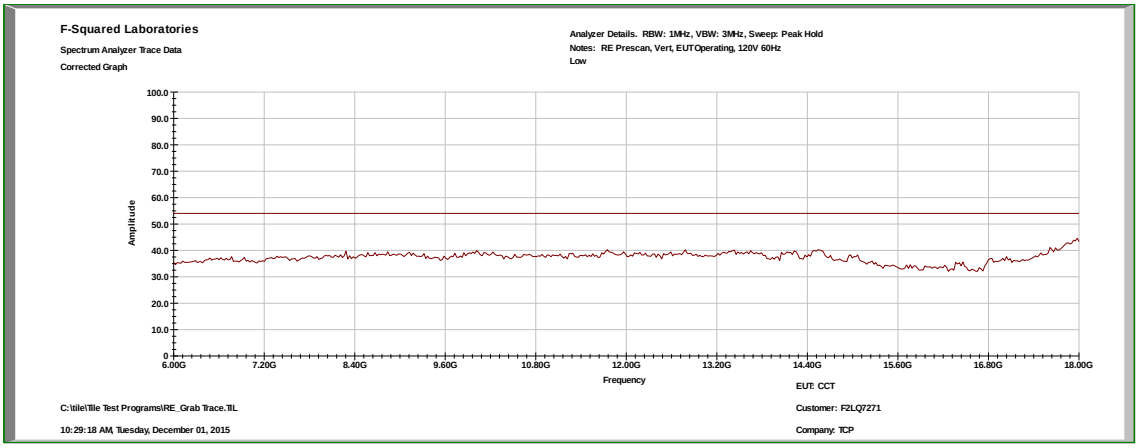
Low Channel: 2.3 GHz to 2.6 GHz, Vertical



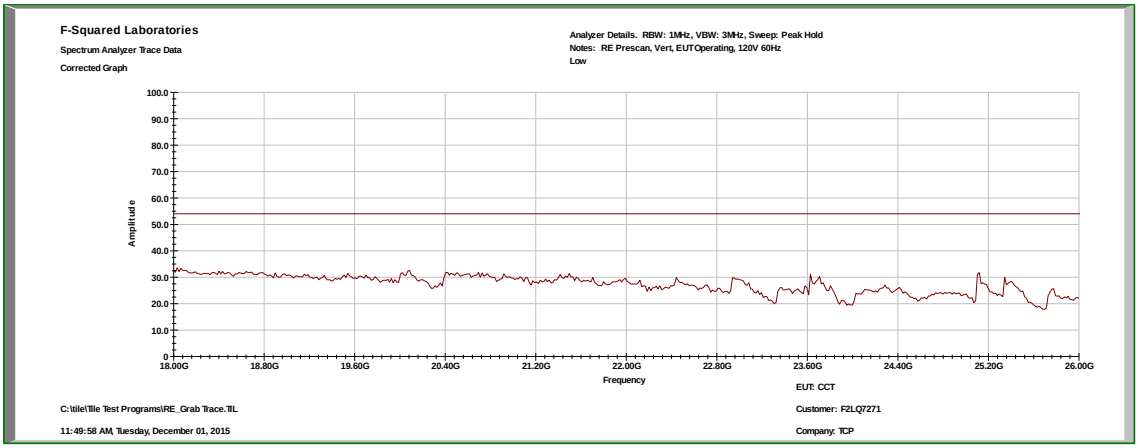
Low Channel: 2.6 GHz to 6 GHz, Vertical



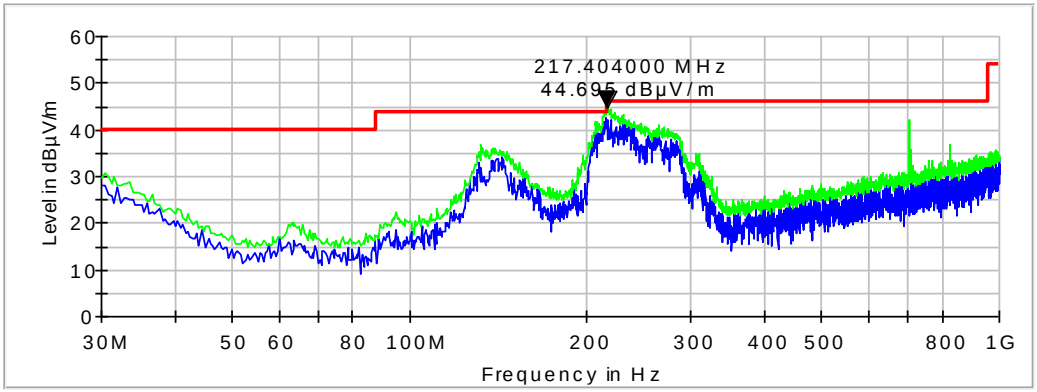
Low Channel: 6 GHz to 18 GHz



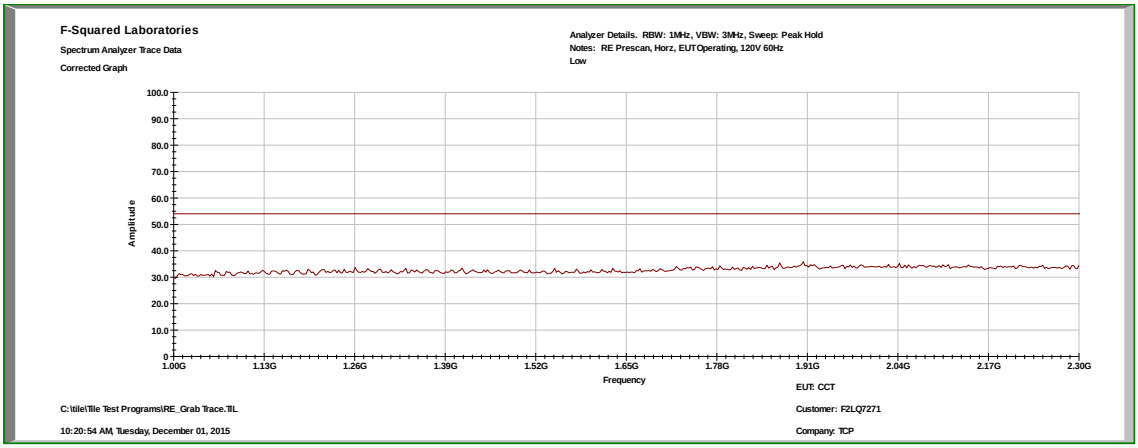
Low Channel: 18 GHz to 26 GHz



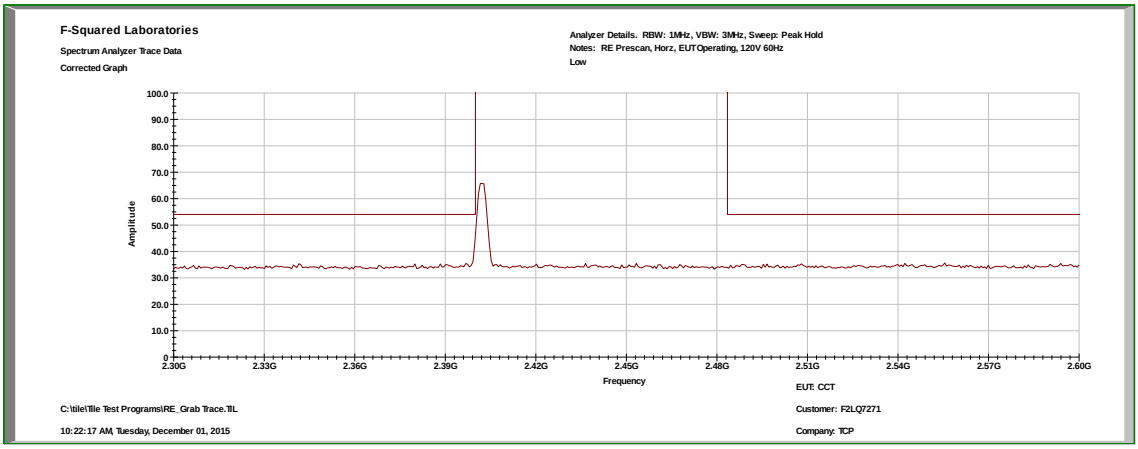
Low Channel: 30 MHz to 1 GHz, Horizontal



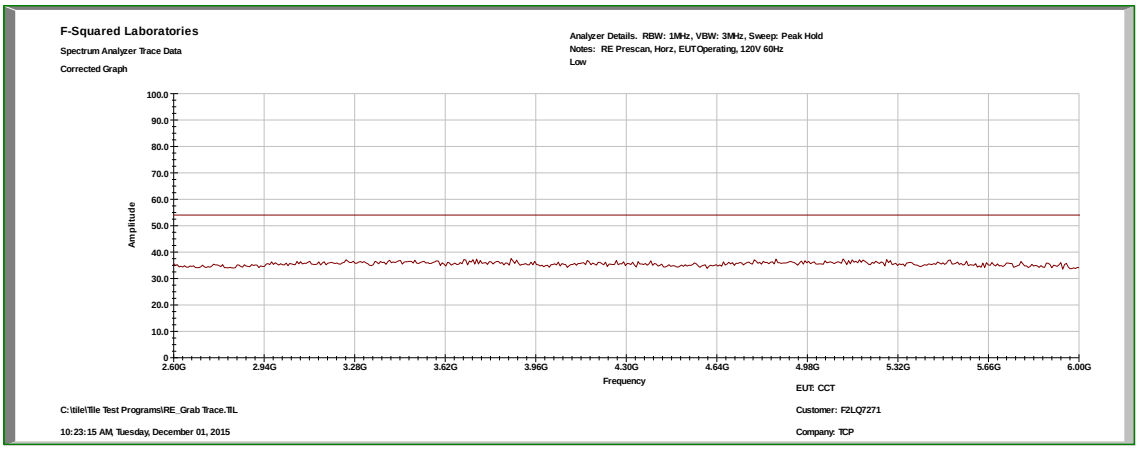
Low Channel: 1 GHz to 2.3 GHz, Horizontal



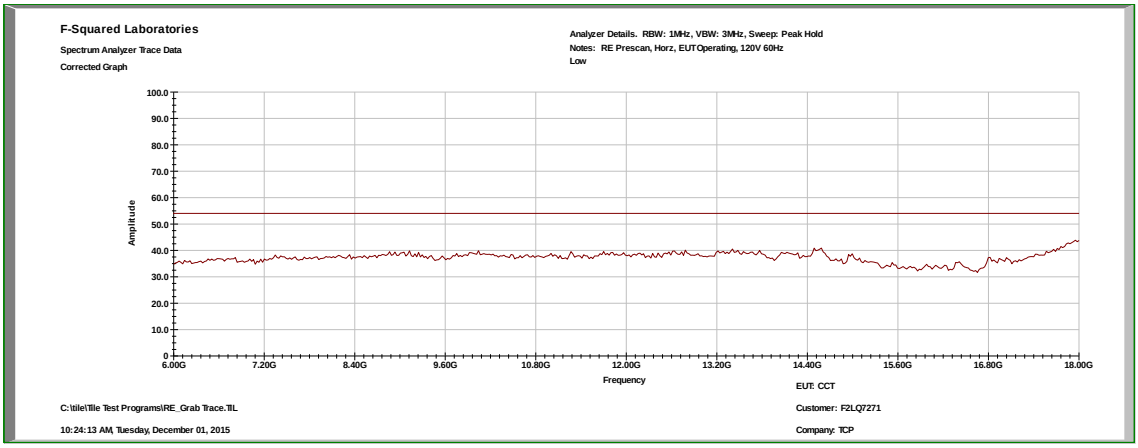
Low Channel: 2.3 GHz to 2.6 GHz, Horizontal



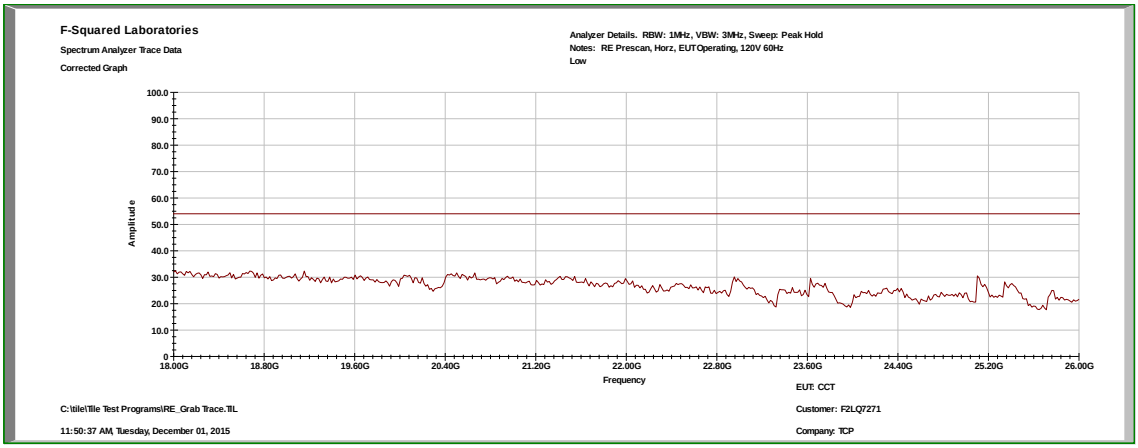
Low Channel: 2.6 GHz to 6 GHz, Horizontal



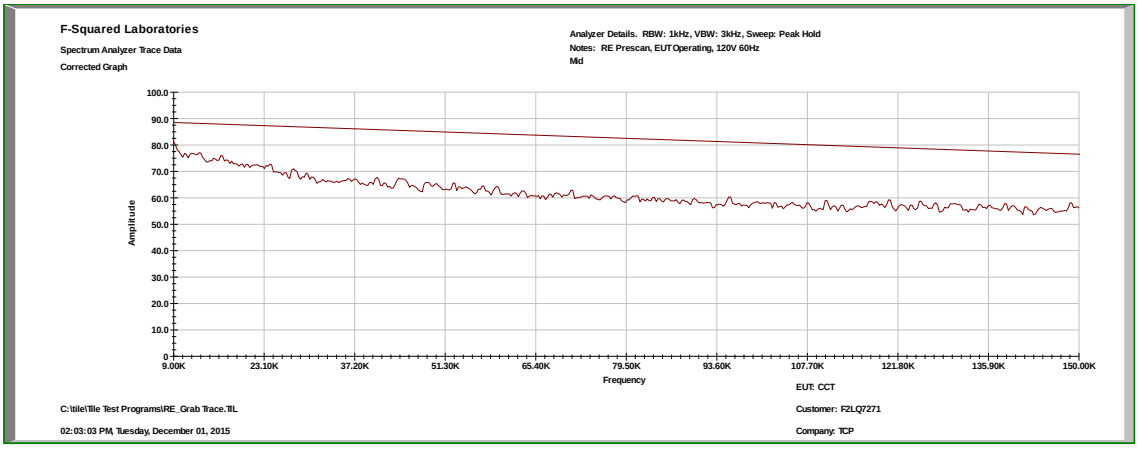
Low Channel: 6 GHz to 18 GHz, Horizontal



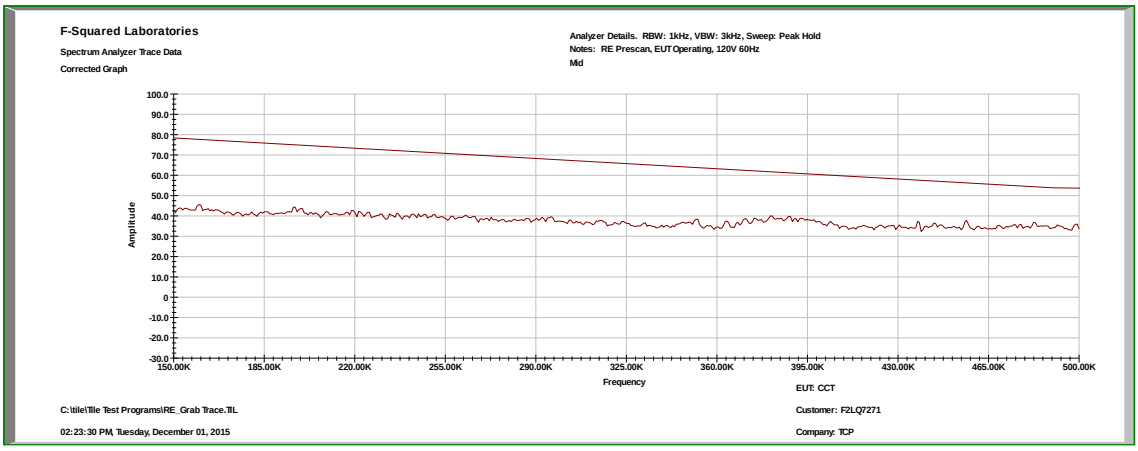
Low Channel: 18 GHz to 26 GHz, Horizontal



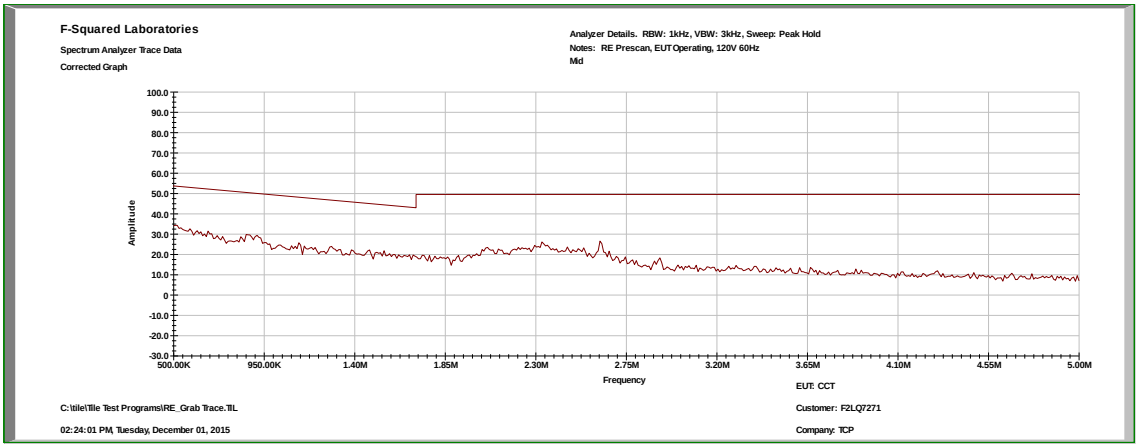
Mid Channel: 0.009 MHz to 0.15 MHz



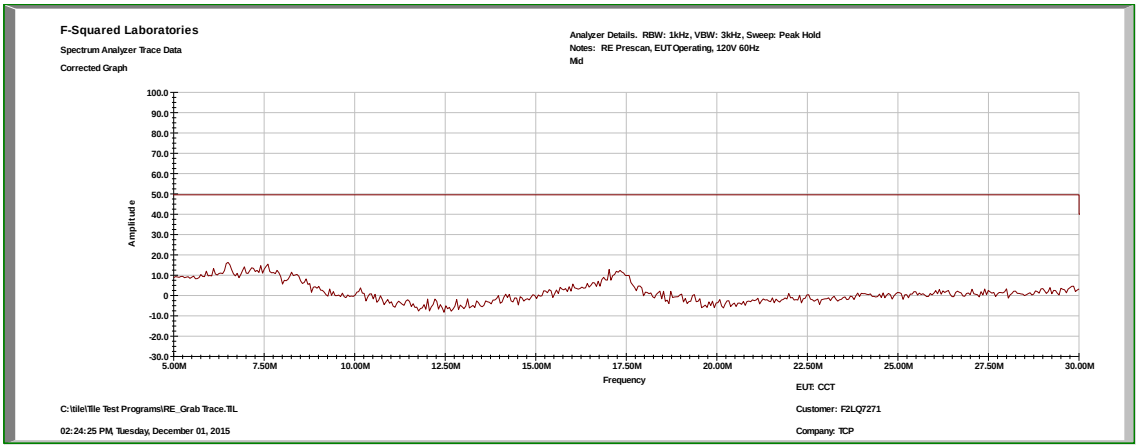
Mid Channel: 0.15 MHz to 0.5 MHz



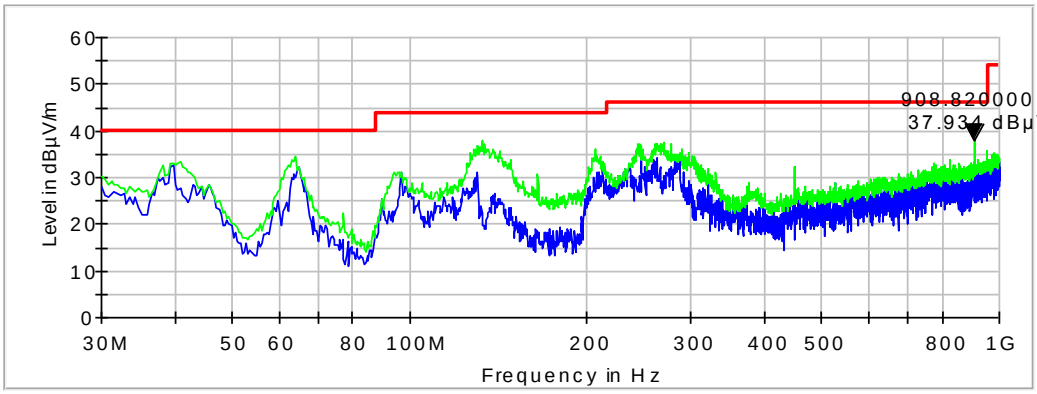
Mid Channel: 0.5 MHz to 5 MHz



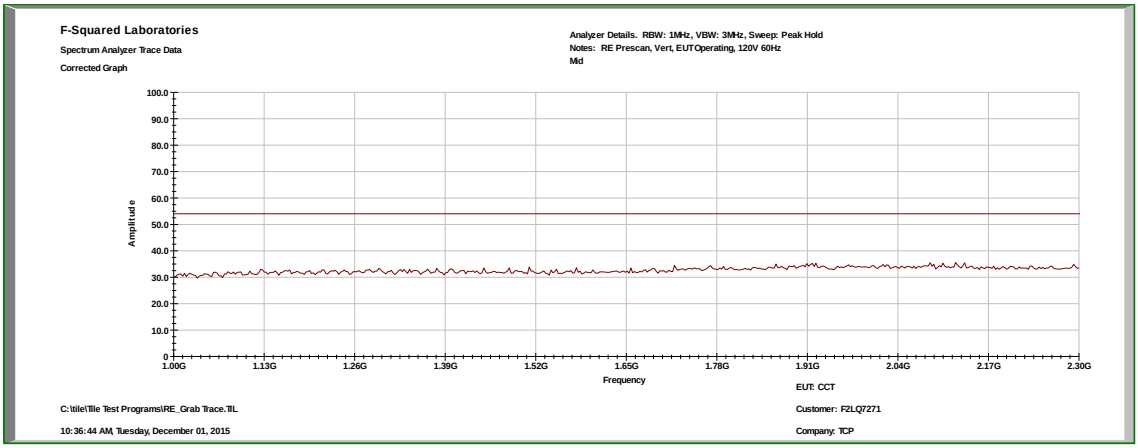
Mid Channel: 5 MHz to 30 MHz



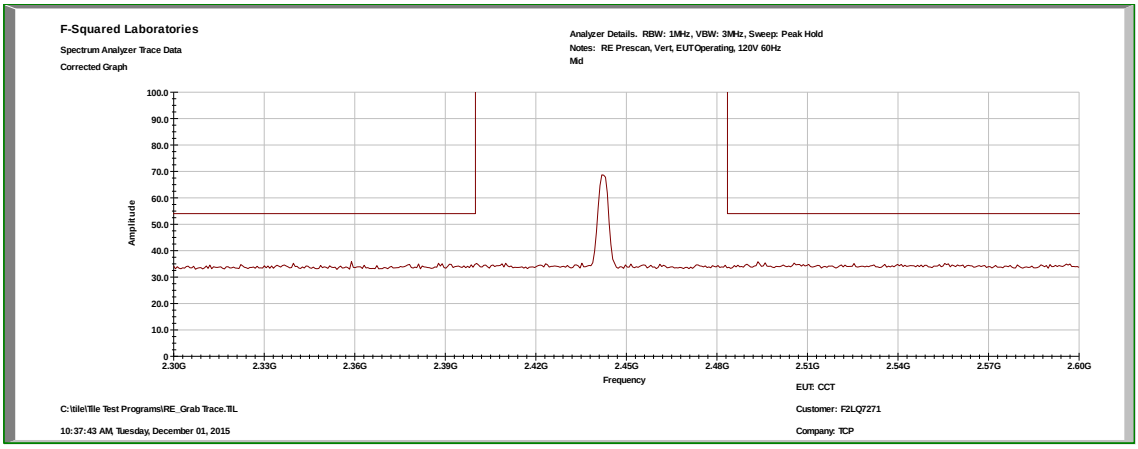
Mid Channel: 30 MHz to 1 GHz, Vertical



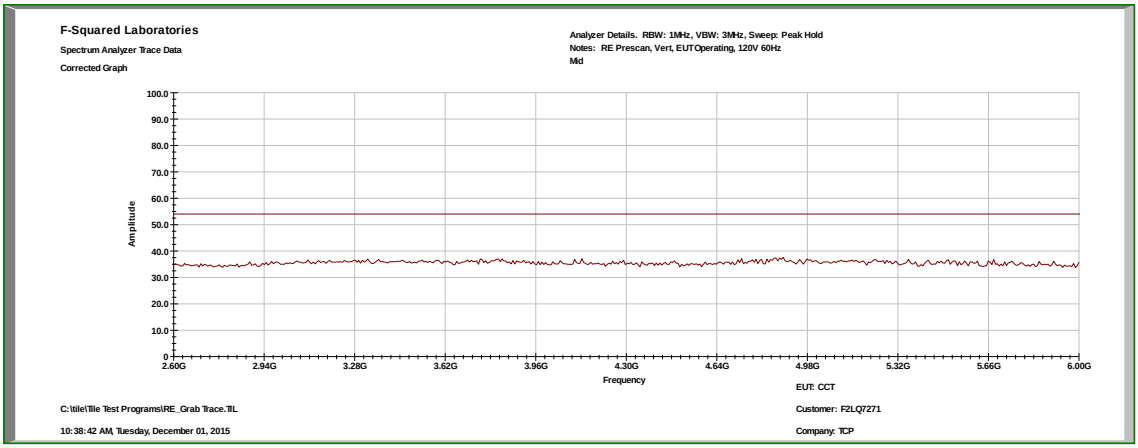
Mid Channel: 1 GHz to 2.3 GHz, Vertical



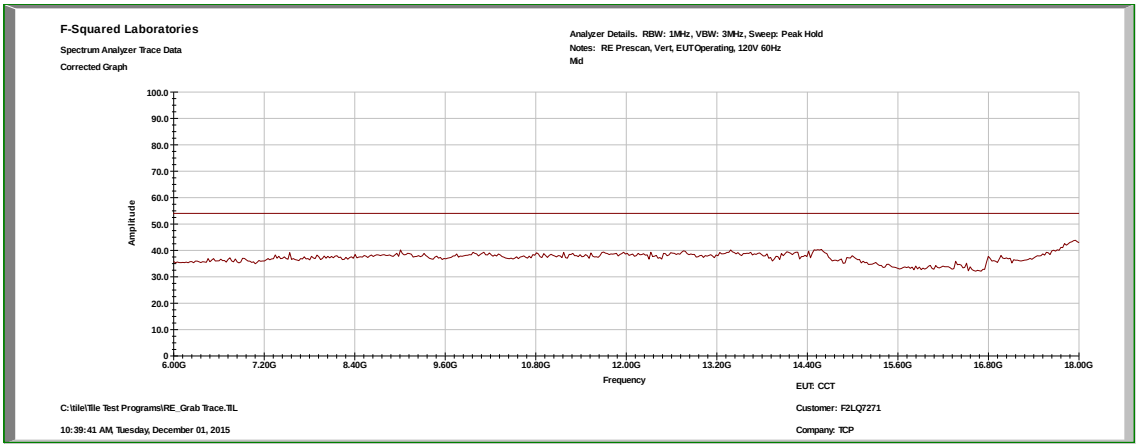
Mid Channel: 2.3 GHz to 2.6 GHz, Vertical



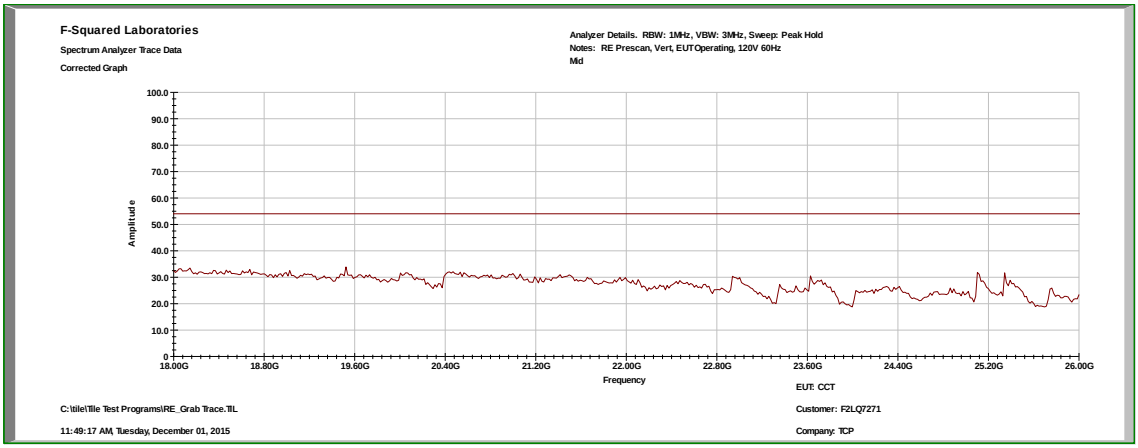
Mid Channel: 2.6 GHz to 6 GHz, Vertical



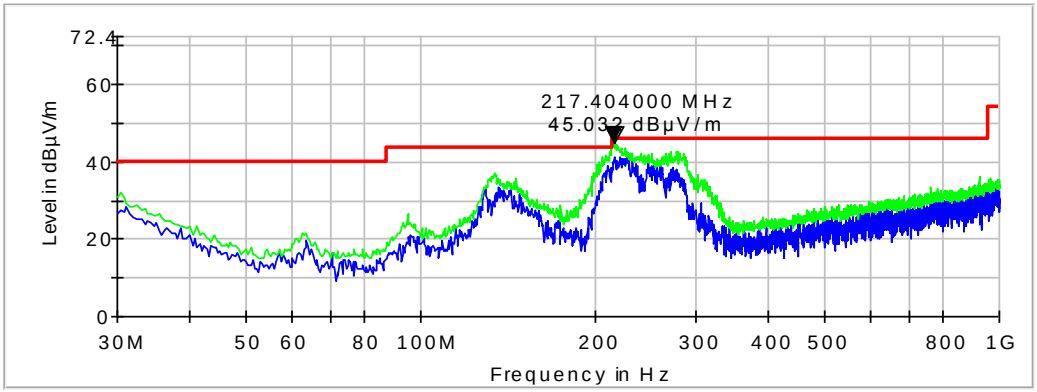
Mid Channel: 6 GHz to 18 GHz



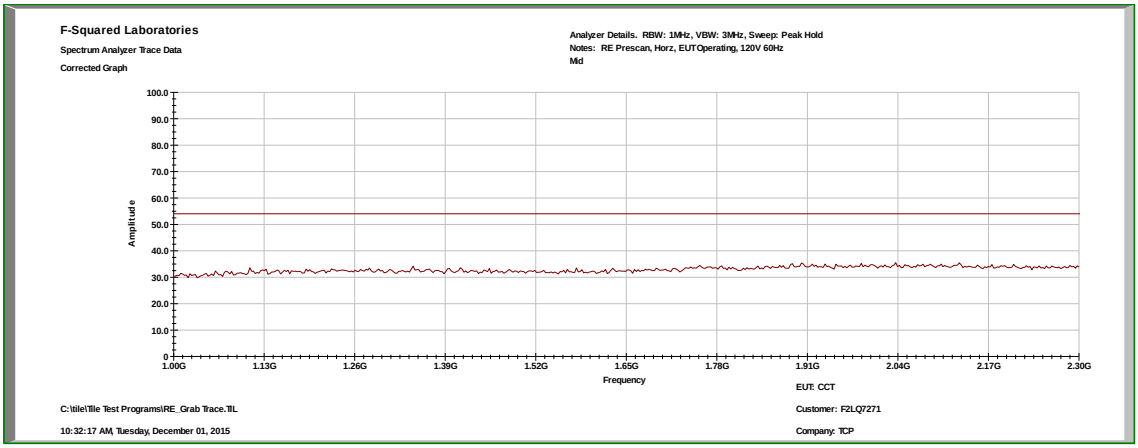
Mid Channel: 18 GHz to 26 GHz



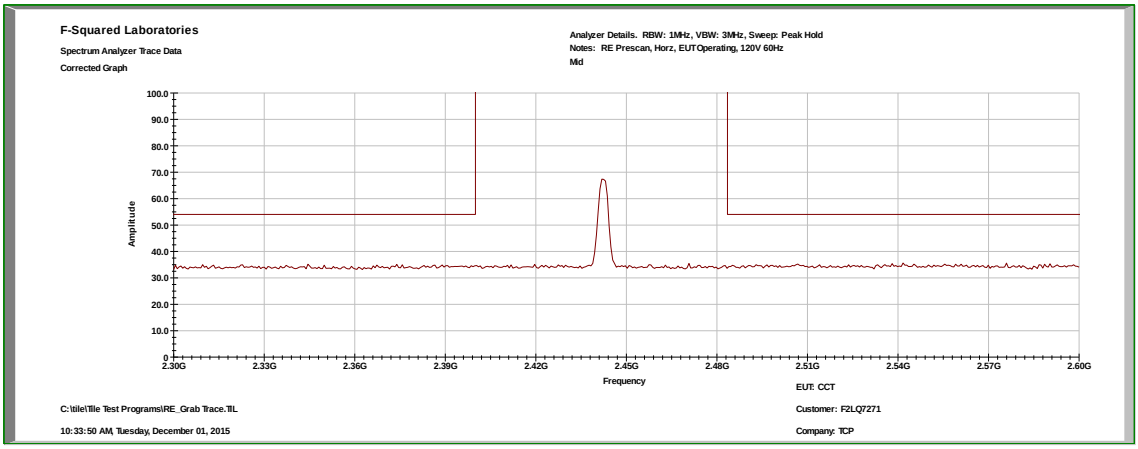
Mid Channel: 30 MHz to 1 GHz, Horizontal



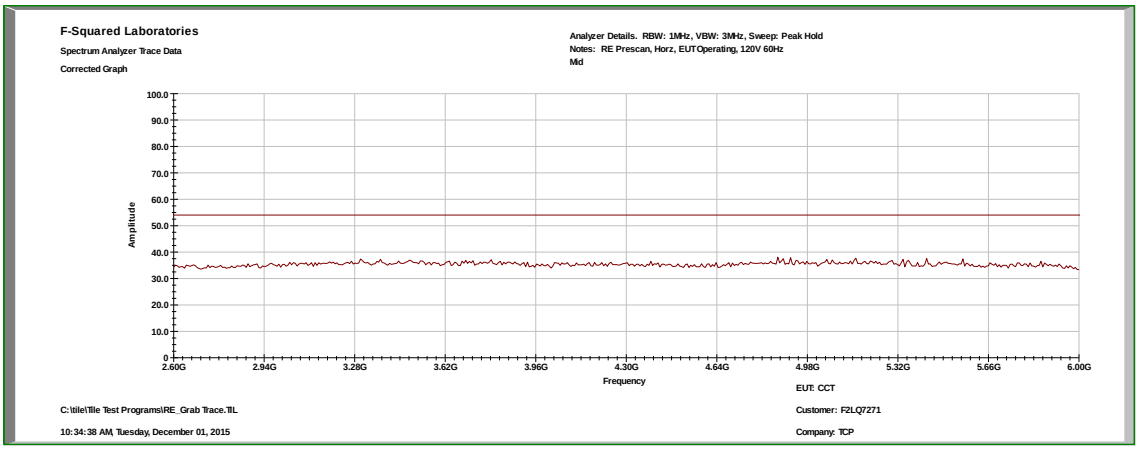
Mid Channel: 1 GHz to 2.3 GHz, Horizontal



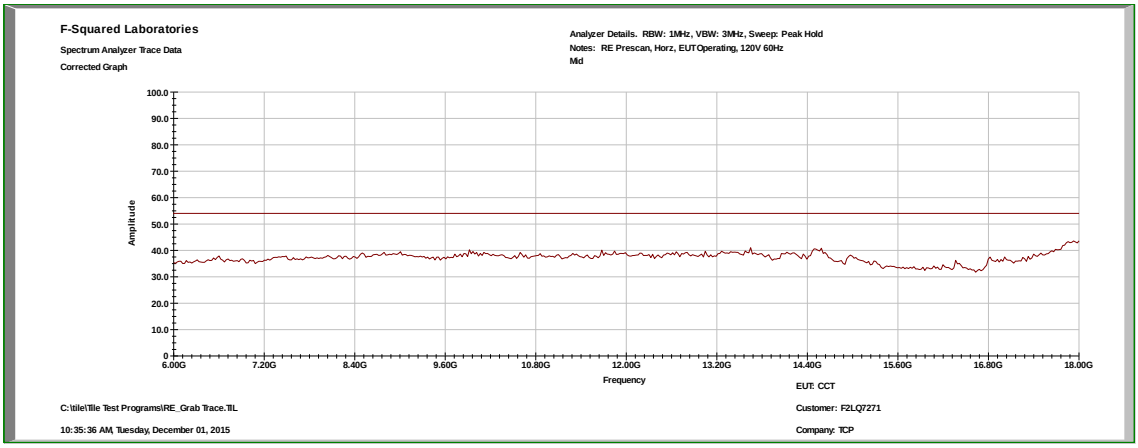
Mid Channel: 2.3 GHz to 2.6 GHz, Horizontal



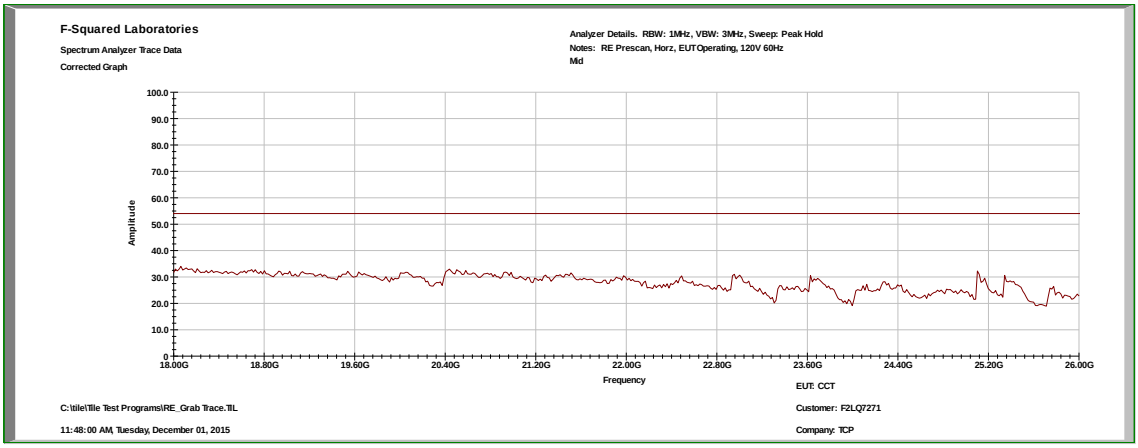
Mid Channel: 2.6 GHz to 6 GHz, Horizontal



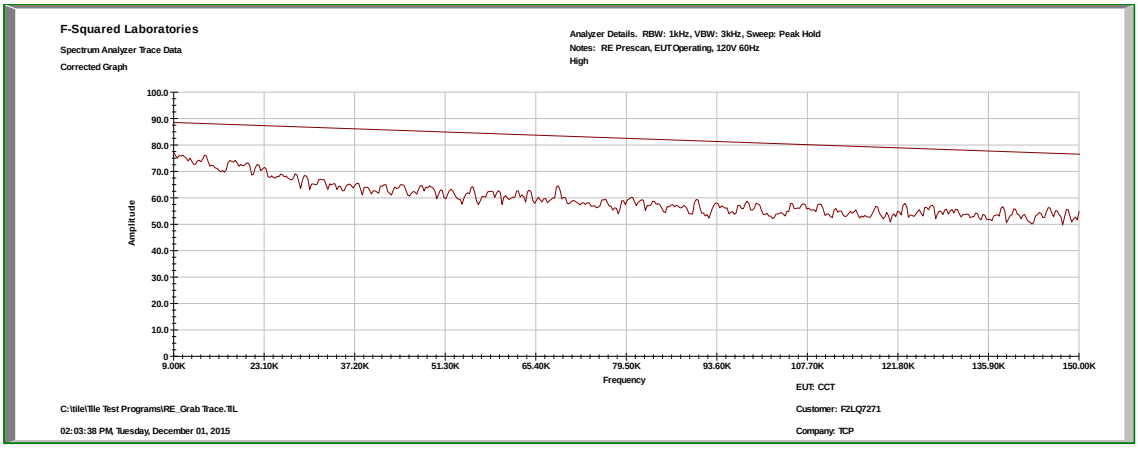
Mid Channel: 6 GHz to 18 GHz, Horizontal



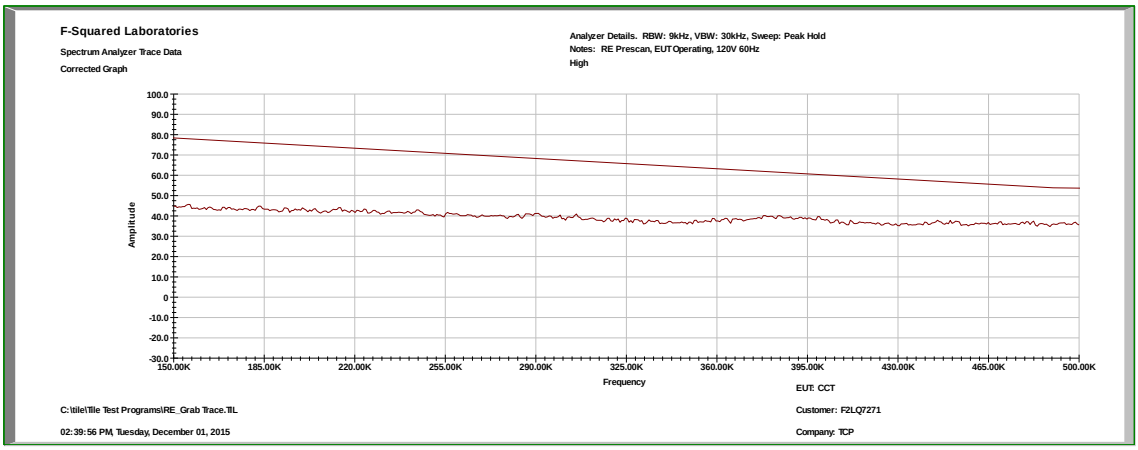
Mid Channel: 18 GHz to 26 GHz, Horizontal



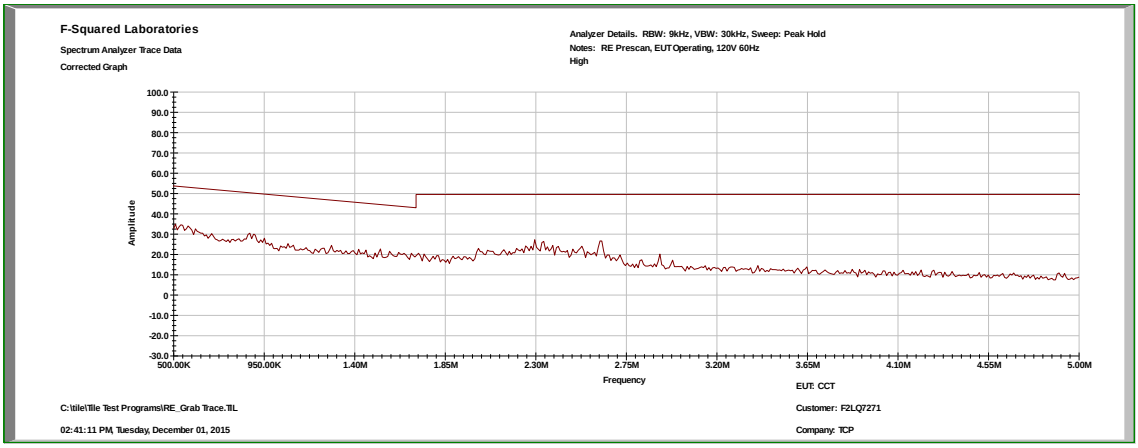
High Channel: 0.009 MHz to 0.15 MHz



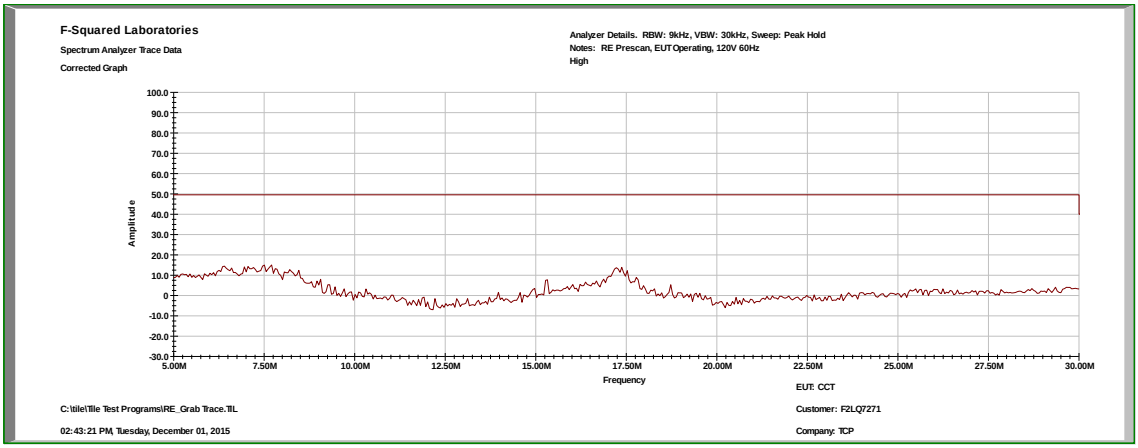
High Channel: 0.15 MHz to 0.5 MHz



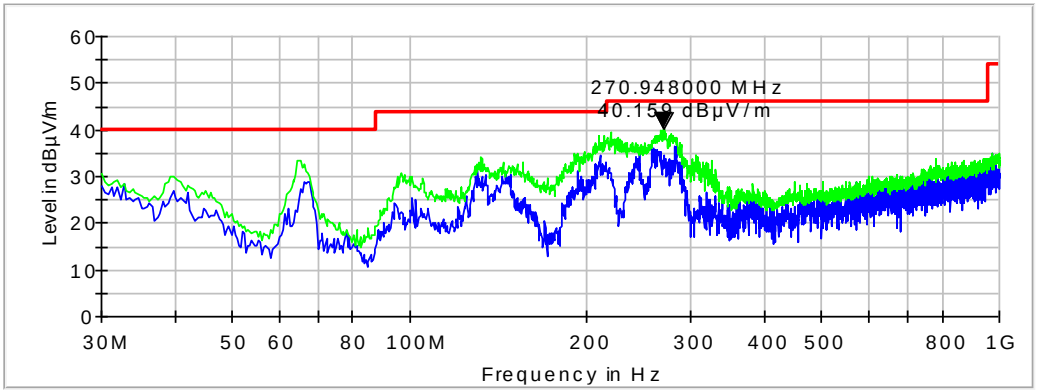
High Channel: 0.5 MHz to 5 MHz



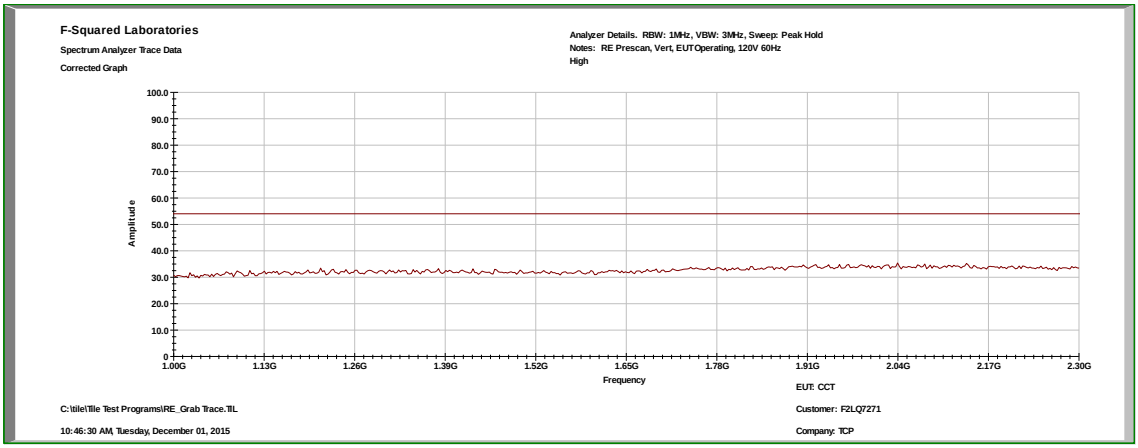
High Channel: 5 MHz to 30 MHz



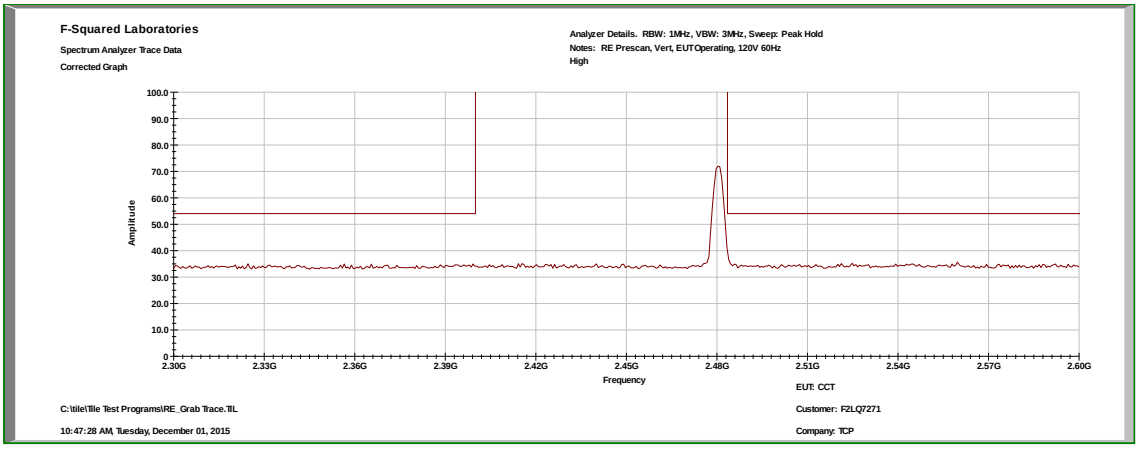
High Channel: 30 MHz to 1 GHz, Vertical



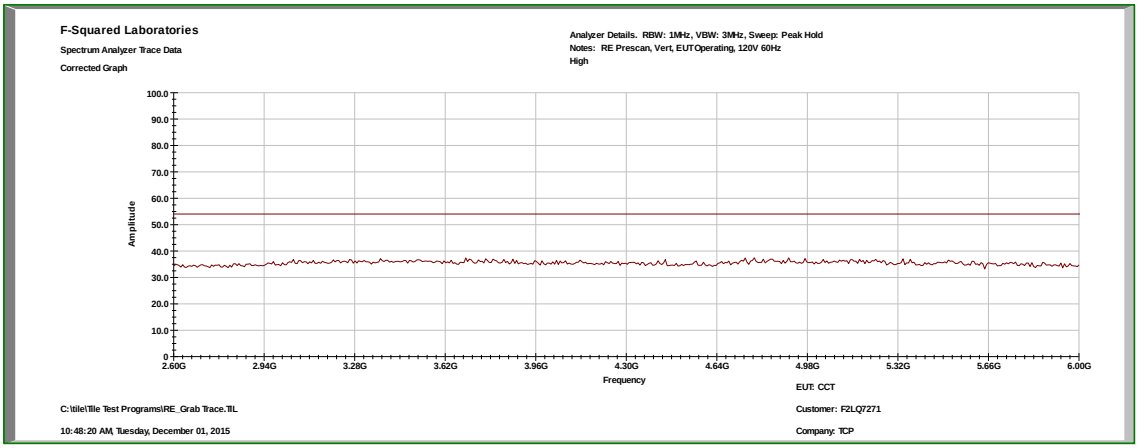
High Channel: 1 GHz to 2.3 GHz, Vertical



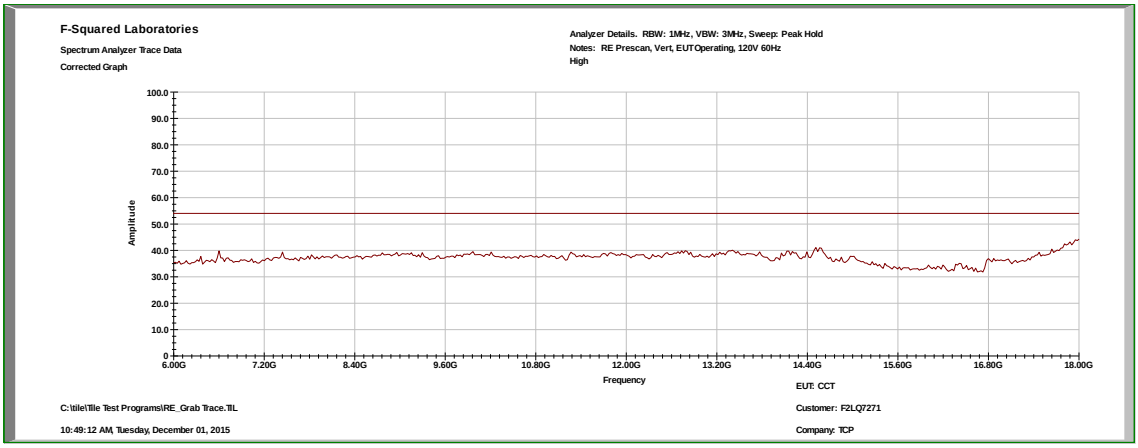
High Channel: 2.3 GHz to 2.6 GHz, Vertical



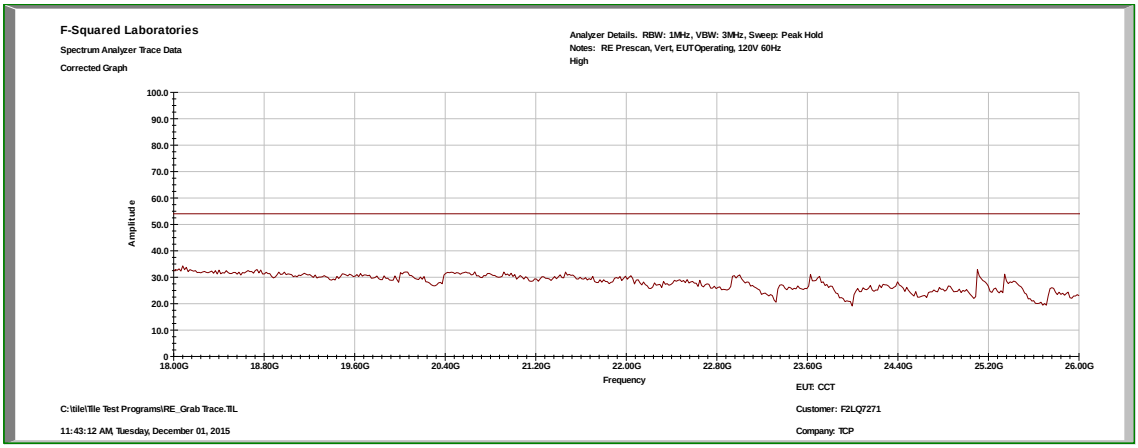
High Channel: 2.6 GHz to 6 GHz, Vertical



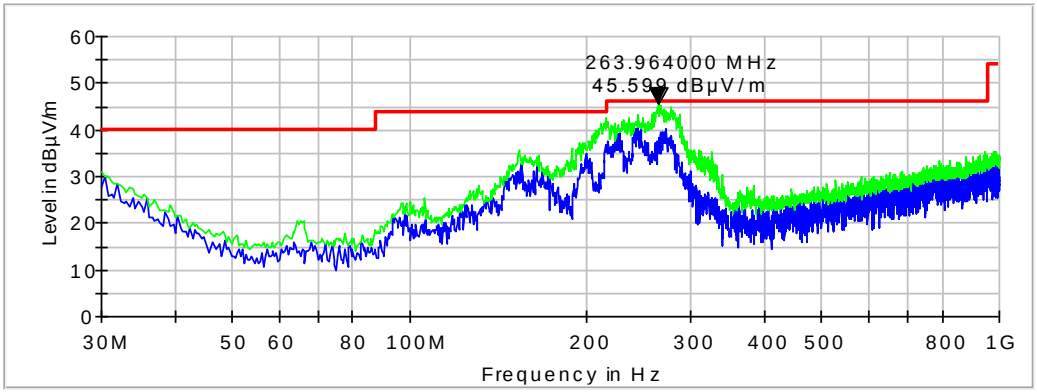
High Channel: 6 GHz to 18 GHz



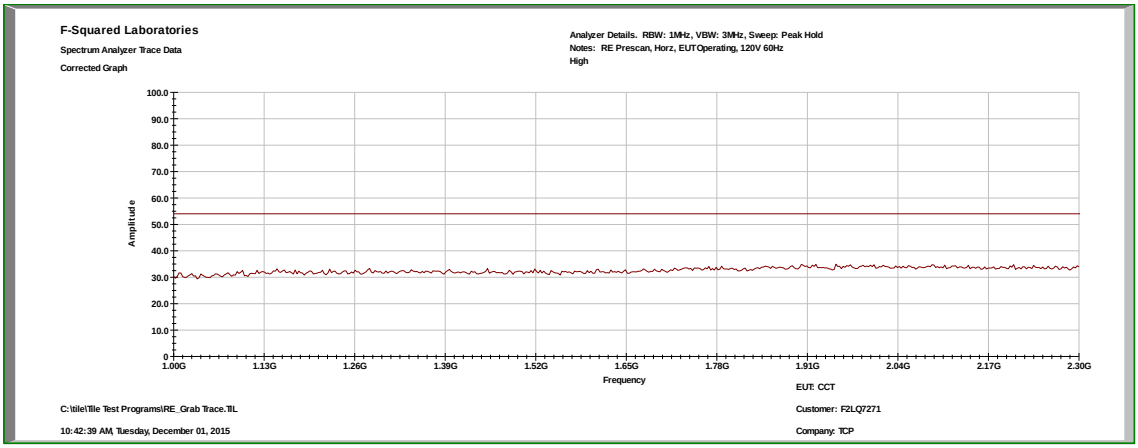
High Channel: 18 GHz to 26 GHz



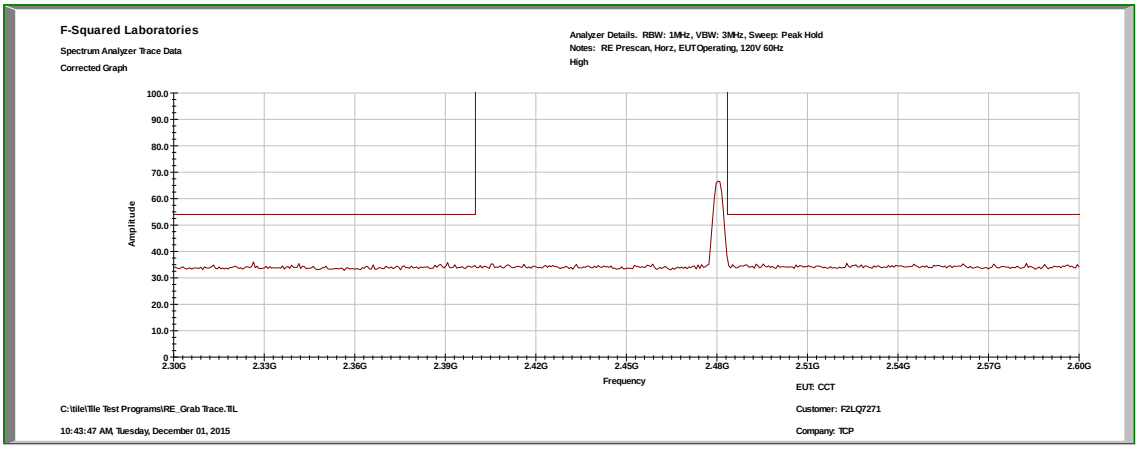
High Channel: 30 MHz to 1 GHz, Horizontal



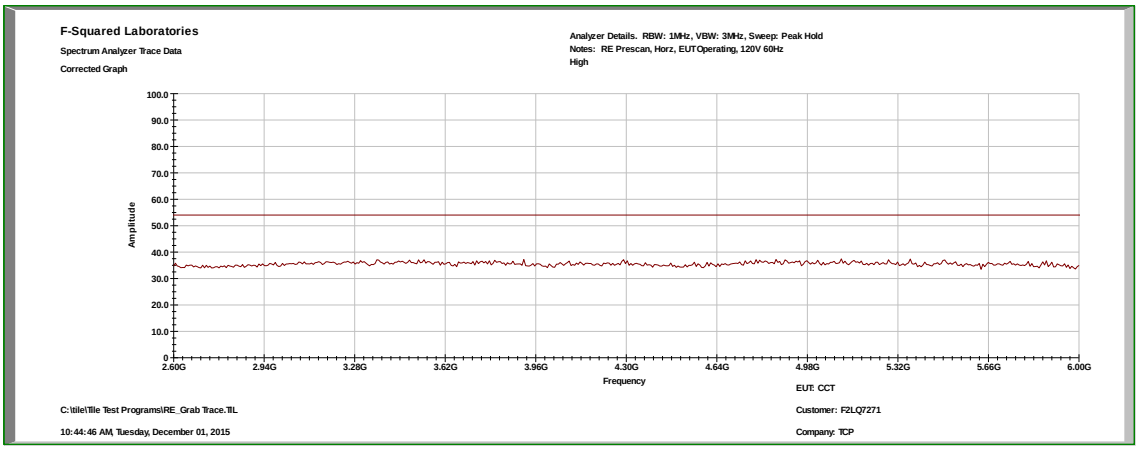
High Channel: 1 GHz to 2.3 GHz, Horizontal



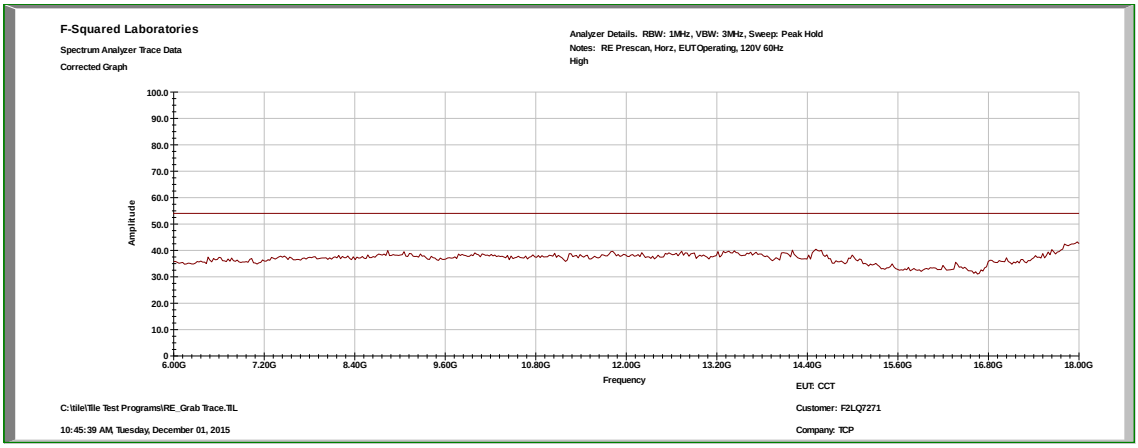
High Channel: 2.3 GHz to 2.6 GHz, Horizontal



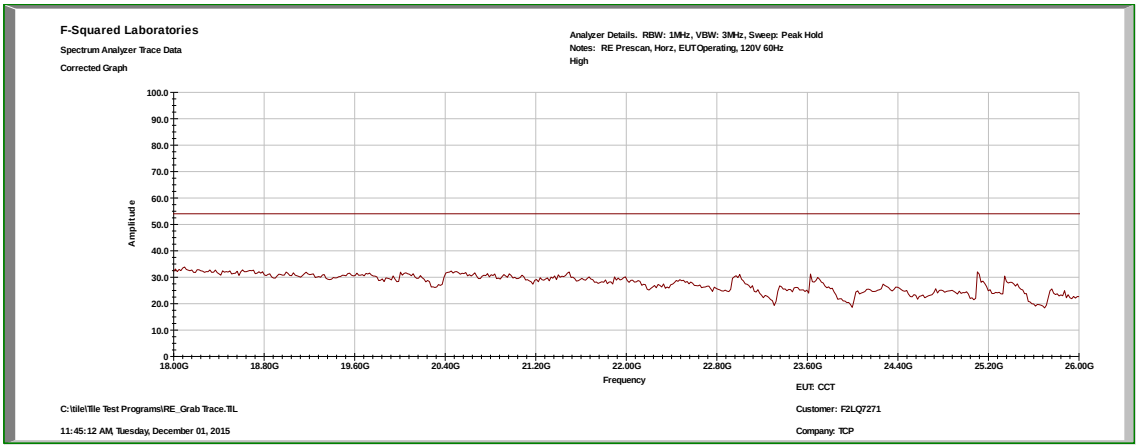
High Channel: 2.6 GHz to 6 GHz, Horizontal



High Channel: 6 GHz to 18 GHz, Horizontal



High Channel: 18 GHz to 26 GHz, Horizontal



Measurements

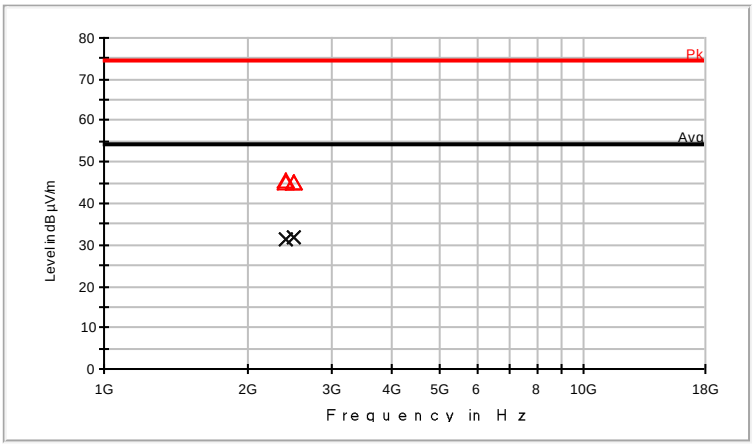
Radiated Spurs, >1 GHz

Low Channel - MaxPeak

Frequency (MHz)	Antenna Polarization	Reading (dBµV)	Cable Loss & Antenna Factor (dB)	Emission (dBµV/m)	Limit (dBµV/m)	Margin (dB)
2390.000000	H	39.1	6.7	45.80	74.0	-28.2
2390.000000	V	38.6	6.7	45.30	74.0	-28.7
2483.500000	H	38.3	6.9	45.20	74.0	-28.8
2483.500000	V	38.5	6.9	45.40	74.0	-28.6

Low Channel - Average

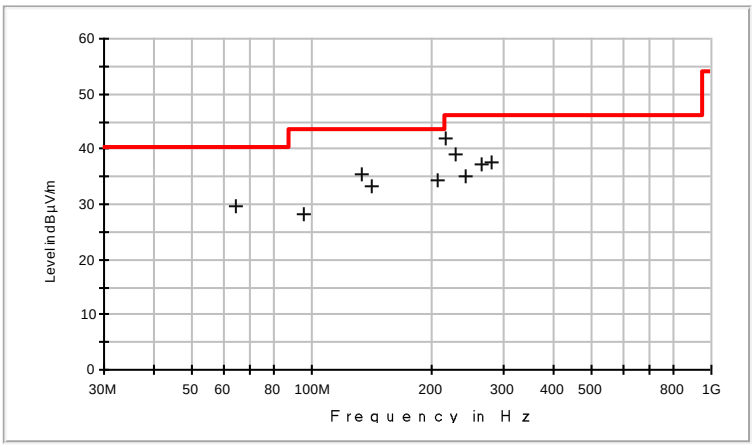
Frequency (MHz)	Antenna Polarization	Reading (dBµV)	Cable Loss & Antenna Factor (dB)	Emission (dBµV/m)	Limit (dBµV/m)	Margin (dB)
2390.000000	H	24.7	6.7	31.40	54.0	-22.6
2390.000000	V	24.8	6.7	31.50	54.0	-22.5
2483.500000	H	24.8	6.9	31.70	54.0	-22.3
2483.500000	V	24.8	6.9	31.70	54.0	-22.3



Radiated Spurs, <1 GHz

Low Channel - QuasiPeak

Frequency (MHz)	Antenna Polarization	Reading (dBµV)	Cable Loss & Antenna Factor (dB)	Emission (dBµV/m)	Limit (dBµV/m)	Margin (dB)
64.144000	V	21.6	8.0	29.60	40.0	-10.4
95.572000	V	19.1	9.0	28.10	43.5	-15.4
132.820000	V	21.3	14.0	35.30	43.5	-8.2
141.356000	V	20.1	13.3	33.40	43.5	-10.1
204.988000	V	22.6	11.7	34.30	43.5	-9.2
215.076000	H	30.5	11.3	41.80	43.5	-1.7
229.044000	H	27.4	11.8	39.20	46.0	-6.8
242.624000	V	22.9	12.3	35.20	46.0	-10.8
264.740000	H	23.8	13.5	37.30	46.0	-8.7
282.588000	H	23.8	13.8	37.60	46.0	-8.4



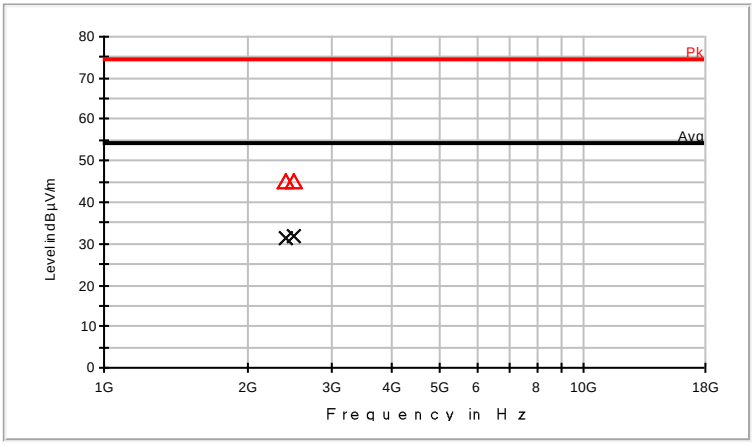
Radiated Spurs, >1 GHz

Mid Channel - MaxPeak

Frequency (MHz)	Antenna Polarization	Reading (dBµV)	Cable Loss & Antenna Factor (dB)	Emission (dBµV/m)	Limit (dBµV/m)	Margin (dB)
2390.000000	V	38.5	6.7	45.20	74.0	-28.8
2390.000000	H	38.5	6.7	45.20	74.0	-28.8
2483.500000	V	38.6	6.9	45.50	74.0	-28.5
2483.500000	H	38.5	6.9	45.40	74.0	-28.6

Low Channel - Average

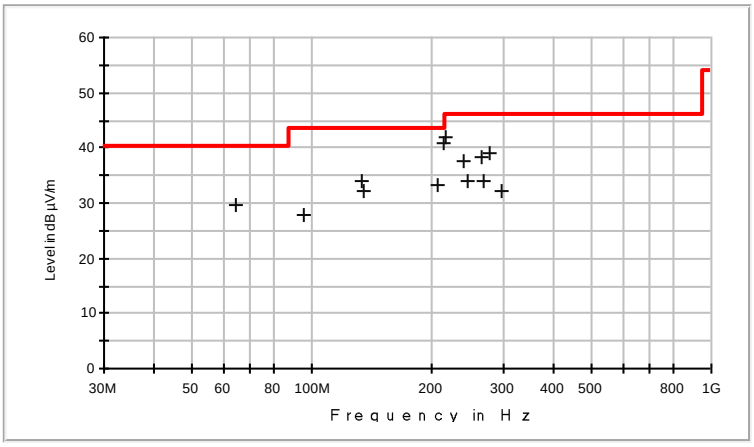
Frequency (MHz)	Antenna Polarization	Reading (dBµV)	Cable Loss & Antenna Factor (dB)	Emission (dBµV/m)	Limit (dBµV/m)	Margin (dB)
2390.000000	V	24.7	6.7	31.40	54.0	-22.6
2390.000000	H	24.7	6.7	31.40	54.0	-22.6
2483.500000	V	24.8	6.9	31.70	54.0	-22.3
2483.500000	H	24.8	6.9	31.70	54.0	-22.3



Radiated Spurs, <1 GHz

Mid Channel - QuasiPeak

Frequency (MHz)	Antenna Polarization	Reading (dBµV)	Cable Loss & Antenna Factor (dB)	Emission (dBµV/m)	Limit (dBµV/m)	Margin (dB)
64.144000	V	21.7	8.0	29.70	40.0	-10.3
95.184000	V	19.0	8.9	27.90	43.5	-15.6
132.432000	V	19.9	14.0	33.90	43.5	-9.6
134.372000	H	18.3	13.9	32.20	43.5	-11.3
206.152000	V	21.5	11.6	33.10	43.5	-10.4
213.524000	H	29.6	11.3	40.90	43.5	-2.6
215.830000	H	30.6	11.3	41.90	43.5	-1.6
240.296000	H	25.4	12.3	37.70	46.0	-8.3
244.176000	V	21.8	12.3	34.10	46.0	-11.9
265.516000	H	24.9	13.5	38.40	46.0	-7.6
269.396000	V	20.2	13.8	34.00	46.0	-12.0
277.156000	H	25.0	13.9	38.90	46.0	-7.1
297.720000	V	18.2	14.0	32.20	46.0	-13.8



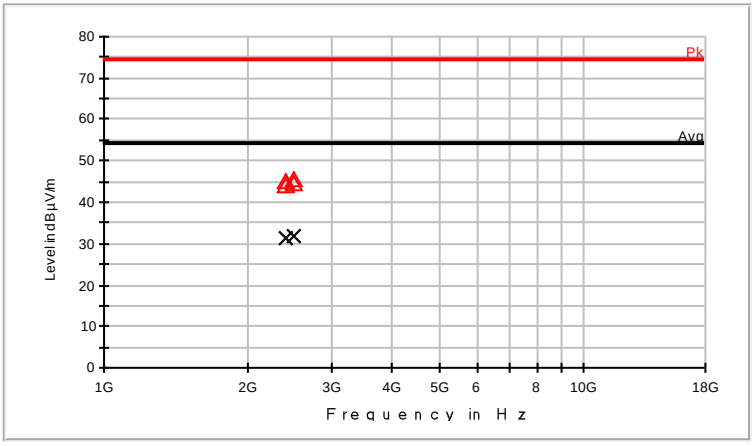
Radiated Spurs, >1 GHz

High Channel - MaxPeak

Frequency (MHz)	Antenna Polarization	Reading (dBµV)	Cable Loss & Antenna Factor (dB)	Emission (dBµV/m)	Limit (dBµV/m)	Margin (dB)
2390.000000	H	38.4	6.7	45.10	74.0	-28.9
2390.000000	V	37.8	6.7	44.50	74.0	-29.5
2483.500000	H	38.9	6.9	45.80	74.0	-28.2
2483.500000	V	38.2	6.9	45.10	74.0	-28.9

High Channel - Average

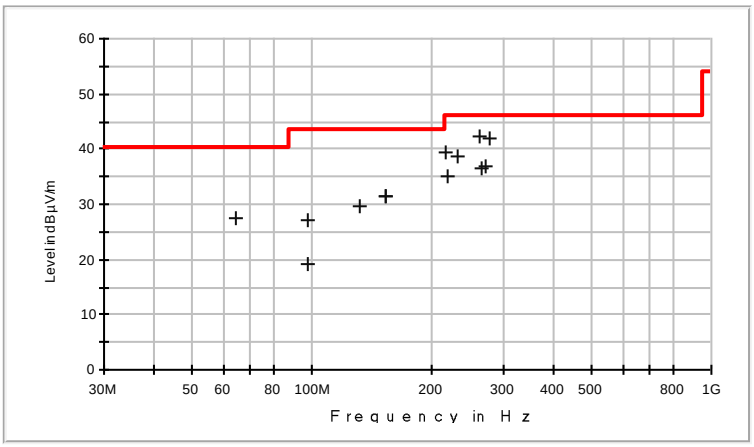
Frequency (MHz)	Antenna Polarization	Reading (dBµV)	Cable Loss & Antenna Factor (dB)	Emission (dBµV/m)	Limit (dBµV/m)	Margin (dB)
2390.000000	H	24.9	6.7	31.60	54.0	-22.4
2390.000000	V	24.7	6.7	31.40	54.0	-22.6
2483.500000	H	24.9	6.9	31.80	54.0	-22.2
2483.500000	V	24.9	6.9	31.80	54.0	-22.2



Radiated Spurs, <1 GHz

High Channel - QuasiPeak

Frequency (MHz)	Antenna Polarization	Reading (dBµV)	Cable Loss & Antenna Factor (dB)	Emission (dBµV/m)	Limit (dBµV/m)	Margin (dB)
64.532000	V	19.4	8.1	27.50	40.0	-12.5
96.736000	V	17.9	9.3	27.20	43.5	-16.3
96.736000	H	9.8	9.3	19.10	43.5	-24.4
132.044000	V	15.6	14.0	29.60	43.5	-13.9
153.384000	H	18.5	12.9	31.40	43.5	-12.1
153.384000	H	18.6	12.9	31.50	43.5	-12.0
215.464000	H	28.1	11.3	39.40	43.5	-4.1
218.956000	V	23.7	11.5	35.20	46.0	-10.8
230.984000	H	26.9	11.9	38.80	46.0	-7.2
262.024000	H	29.2	13.1	42.30	46.0	-3.7
265.516000	V	23.2	13.5	36.70	46.0	-9.3
271.336000	V	22.9	13.8	36.70	46.0	-9.3
277.156000	H	28.2	13.9	42.10	46.0	-3.9



11 FCC PART 15.247(e) – PEAK POWER SPECTRAL DENSITY (PSD)

Peak power spectral density measurements were performed.

11.1 Requirements:

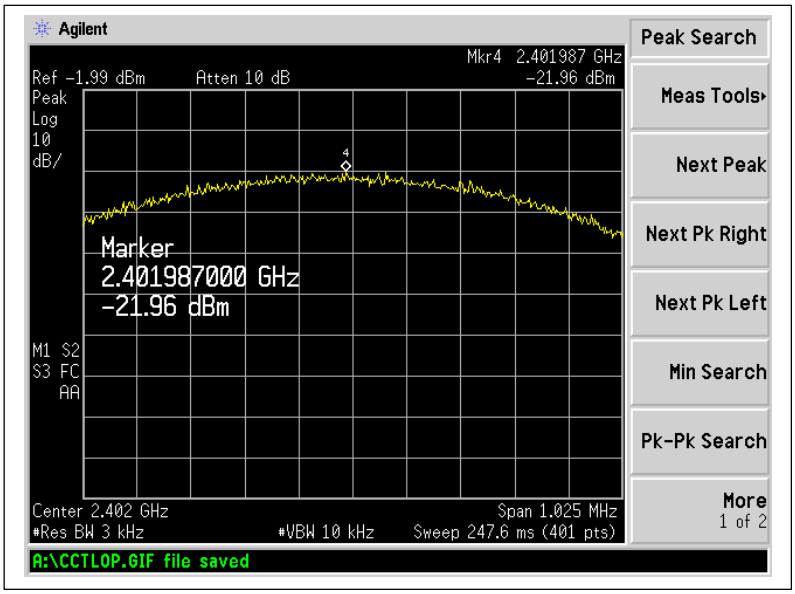
The peak power spectral density shall not exceed +8dBm in any 3 kHz band during any time interval of continuous transmission.

Power spectral density measurements were performed at a resolution bandwidth of 3 kHz (video bandwidth set at 10 KHz). The peak spectral densities were measured at the low, mid, and upper channels.

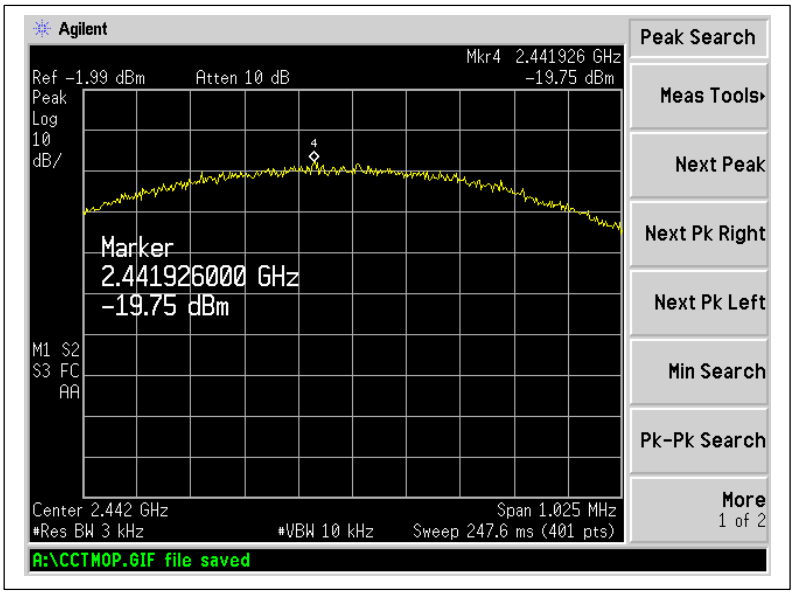
11.2 Peak Power Spectral Density Test Data

Test Date(s):	Nov. 30, 2015	Test Engineer:	J. Knepper
Standards:	CFR 47 Part 15.247(e); KDB558074	Air Temperature:	20.4ºC
		Relative Humidity:	47%

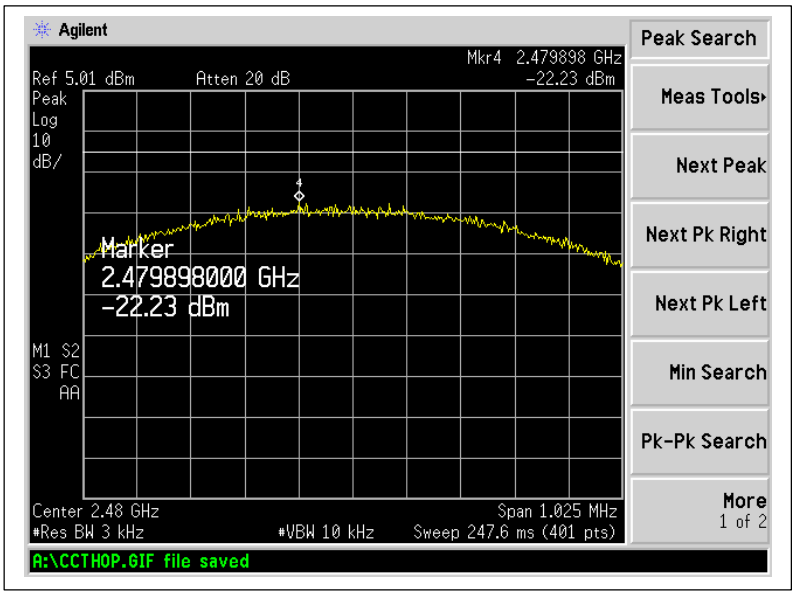
Low Channel



Mid Channel



High Channel



12 CONDUCTED EMISSIONS

12.1 Requirements

In accordance with FCC CFR 47 Part 15.207(a), “Except as shown in paragraphs (b) and (c) of this section, for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the following table, as measured using a 50 μH/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequency ranges.

Frequency of Emission (MHz)	Conducted Limit (dBμV)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

*Decreases with the logarithm of the frequency.

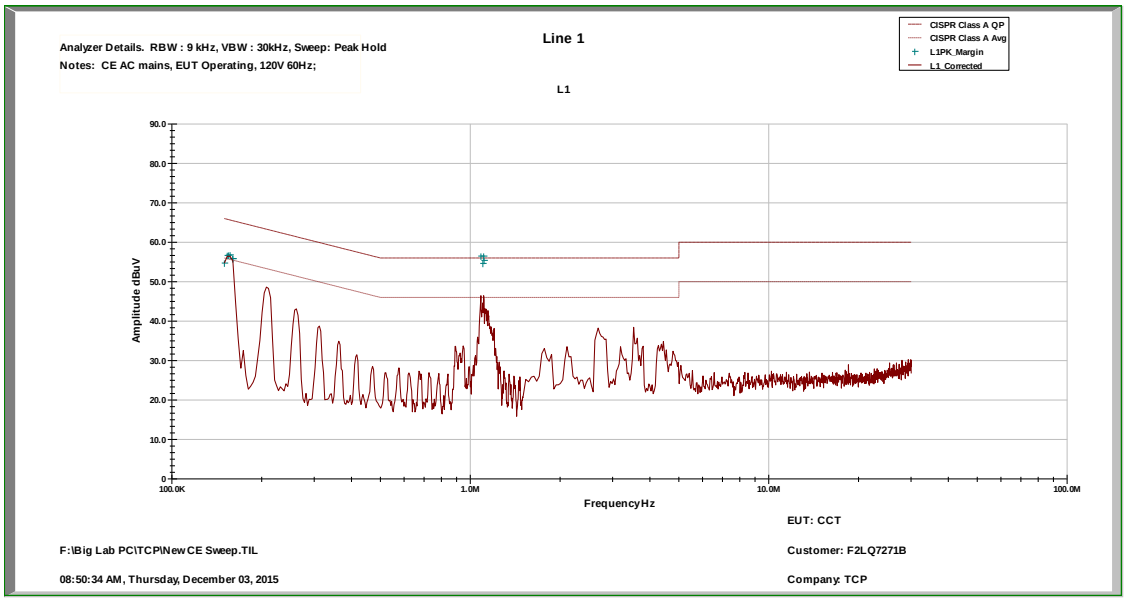
12.2 Procedure

The EUT was placed on a 1.0 x 1.5 meter non-conductive table, 0.8 meter above a horizontal ground plane and 0.4 meter from a vertical ground plane. Power was provided to the EUT through a LISN bonded to a 3 x 2 meter ground plane. The LISN and peripherals were supplied power through a filtered AC power source. The output of the LISN was connected to the input of the receiver via a transient limiter, and emissions in the range 150 kHz to 30 MHz were measured. The measurements were recorded using the quasi-peak and average detectors as directed by the standard, and the resolution bandwidth during testing was 9 kHz. The raw measurements were corrected to allow for attenuation from the LISN, transient limiter and cables.

12.3 Conducted Emissions Test Data

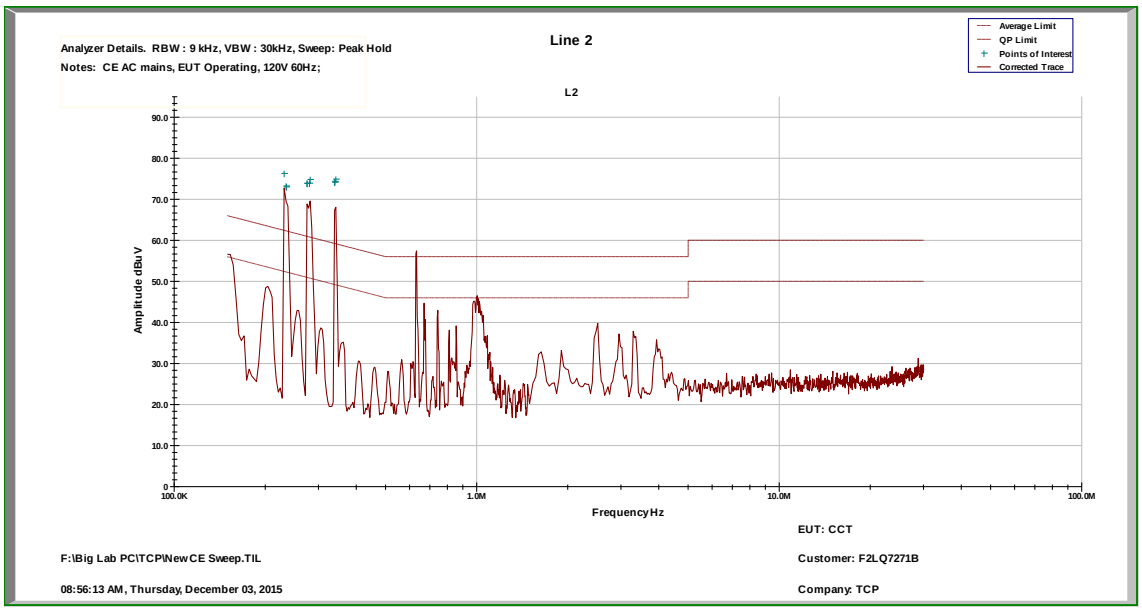
Test Date:	Dec. 3, 2015	**Test Engineer:**	J. Knepper
Rule:	15.207	**Air Temperature:**	19.9º C
Test Results:	Pass	**Relative Humidity:**	46%

Conducted Test – Line 1: 0.15 MHz to 30.0 MHz



Top Discrete Measurements								
No.	**Conductor**	**Frequency (MHz)**	**Detector**	**Level (dBµV)**	**Adjustment (dB)**	**Results (dBµV)**	**Limit (dBµV)**	**Margin (dB)**
1	Line 1	0.15	Quasi-Peak	39.830	11.560	51.390	66	-14.610
		0.15	Average	27.845	11.560	39.405	56	-16.595
2	Line 1	0.153375	Quasi-Peak	43.480	11.506	54.986	65.816	-10.830
		0.153375	Average	34.525	11.506	46.031	55.816	-9.785
3	Line 1	0.155	Quasi-Peak	44.680	11.480	56.160	65.728	-9.568
		0.155	Average	36.140	11.480	47.620	55.728	-8.108
4	Line 1	0.15675	Quasi-Peak	43.200	11.452	54.652	65.636	-10.984
		0.15675	Average	35.132	11.452	46.584	55.636	-9.052
5	Line 1	0.16	Quasi-Peak	38.170	11.400	49.570	65	-15.89
		0.16	Average	28.482	11.400	39.882	55	-15.582
6	Line 1	0.160125	Quasi-Peak	41.830	11.399	53.229	65	-12.229
		0.160125	Average	27.830	11.399	39.229	55	-16.229
7	Line 1	1.08487	Quasi-Peak	27.020	10.257	37.277	56	-18.723
		1.08487	Average	9.113	10.257	19.370	46	-26.630
8	Line 1	1.10175	Quasi-Peak	21.610	10.260	31.870	56	-24.130
		1.10175	Average	6.270	10.260	16.530	46	-29.470
9	Line 1	1.1085	Quasi-Peak	20.390	10.258	30.648	56	-25.352
		1.1085	Average	4.285	10.258	14.543	46	-31.457
10	Line 1	1.11188	Quasi-Peak	19.300	10.258	29.558	56	-26.442
		1.11188	Average	3.492	10.258	13.750	46	-32.250

Conducted Test – Line 2: 0.15 MHz to 30.0 MHz



Top Discrete Measurements								
No.	Conductor	Frequency (MHz)	Detector	Level (dBµV)	Adjustment (dB)	Results (dBµV)	Limit (dBµV)	Margin (dB)
1	Line 2	0.231	Quasi-Peak	49.580	10.826	60.406	62.414	-2.008
		0.231	Average	5.250	10.826	16.076	52.414	-36.338
2	Line 2	0.234375	Quasi-Peak	27.870	10.808	38.678	62.45	-23.772
		0.234375	Average	15.023	10.808	25.831	52.45	-26.619
3	Line 2	0.235	Quasi-Peak	50.020	10.804	60.824	62.271	-1.447
		0.235	Average	8.925	10.804	19.729	52.271	-32.542
4	Line 2	0.274875	Quasi-Peak	47.450	10.650	58.100	60.969	-2.869
		0.274875	Average	1.990	10.650	12.640	50.969	-38.329
5	Line 2	0.275	Quasi-Peak	12.140	10.650	22.790	60.966	-38.18
		0.275	Average	6.760	10.650	17.410	50.966	-33.556
6	Line 2	0.28	Quasi-Peak	12.240	10.636	22.876	60.816	-37.940
		0.28	Average	1.980	10.636	12.616	50.816	-38.200
7	Line 2	0.281625	Quasi-Peak	45.020	10.631	55.651	60.768	-5.117
		0.281625	Average	5.980	10.631	16.611	50.768	-34.157
8	Line 2	0.339	Quasi-Peak	11.230	10.525	21.755	59.228	-37.473
		0.339	Average	2.218	10.525	12.743	49.228	-36.485
9	Line 2	0.34	Quasi-Peak	44.910	10.524	55.434	59.203	-3.769
		0.34	Average	7.320	10.524	17.844	49.203	-31.359
10	Line 2	0.342375	Quasi-Peak	21.130	10.521	31.651	59.146	-27.495
		0.342375	Average	1.202	10.521	11.723	49.146	-37.423

13 FCC 15.31(e) – VOLTAGE VARIATION

13.1 Requirements

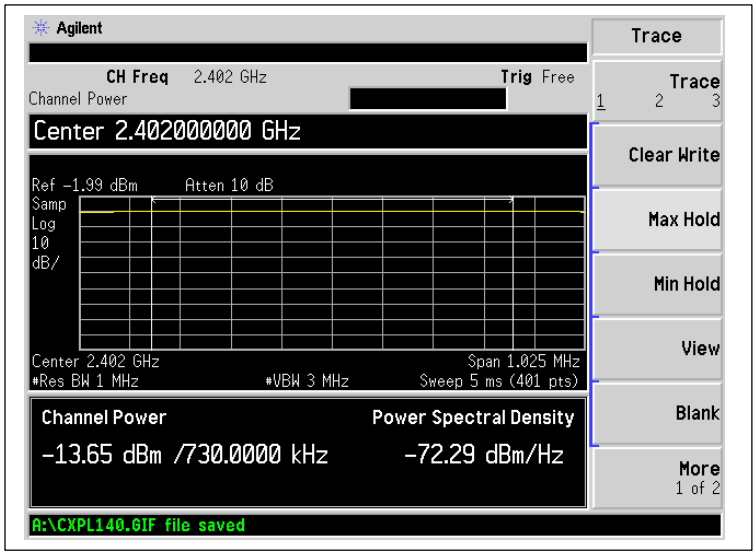
For intentional radiators, measurements of the variation of the input power or the radiated signal level of the fundamental frequency component of the emission, as appropriate, shall be performed with the supply voltage varied between 85% and 115% of the nominal rated supply voltage. For battery-operated equipment, the equipment tests shall be performed using a new battery.

13.3 Extreme Voltages Test Data

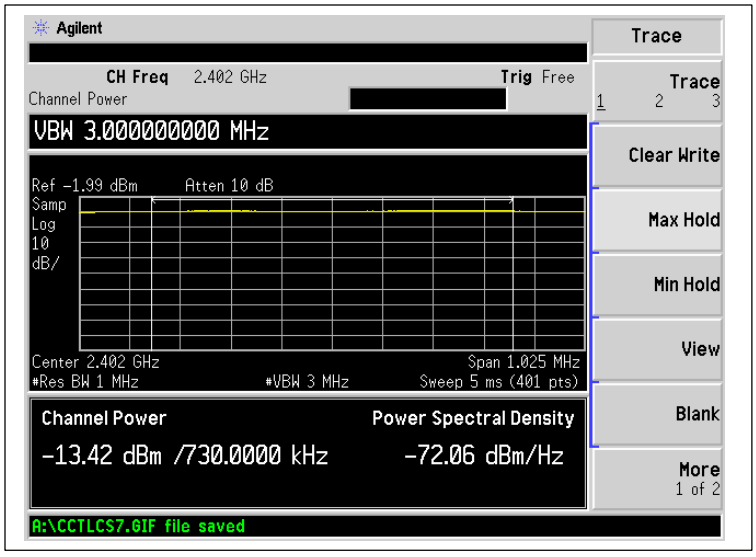
Test Date:	Nov. 30, 2015	**Test Engineer:**	J. Knepper
Rule:	15.31(e)	**Air Temperature:**	19.3º C
Test Results:	Pass	**Relative Humidity:**	46%

Low Channel

100V

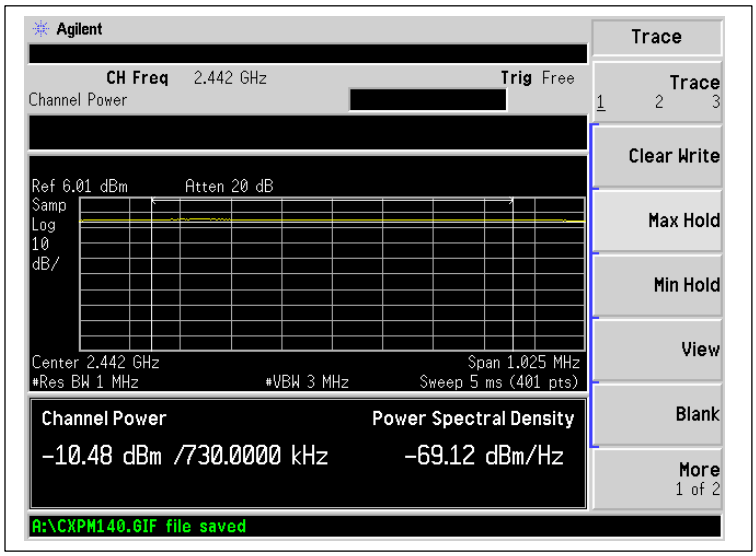


140V

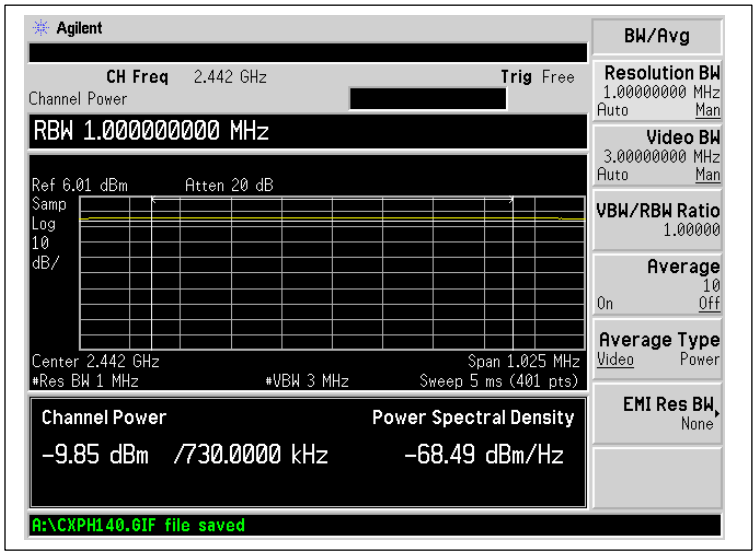


Mid Channel

100V

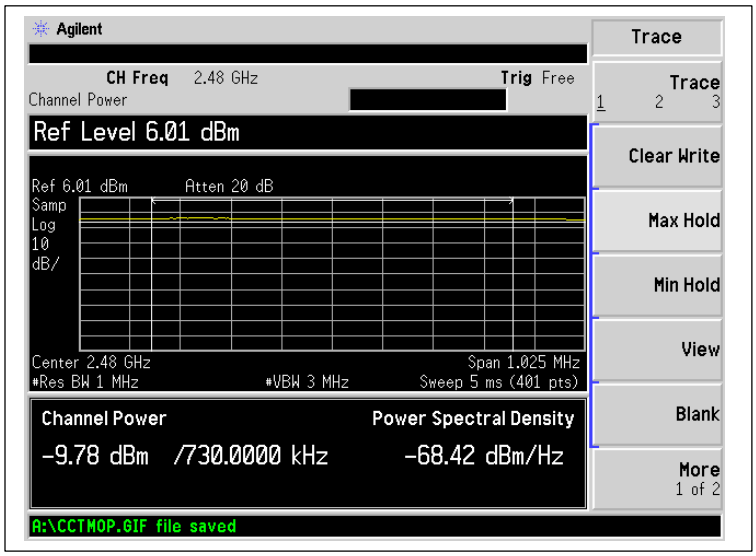


140V

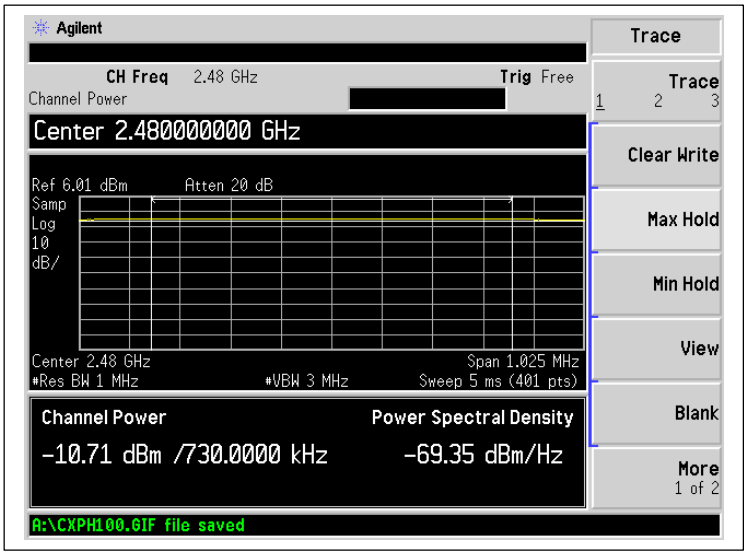


High Channel

100V



140V

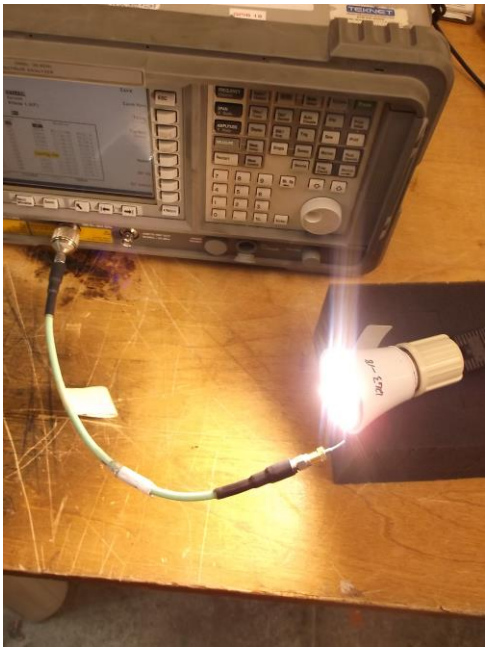


14 PHOTOGRAPHS/EXHIBITS – PRODUCT PHOTOS, TEST SETUPS

Radiated Spurious Emission, <1 GHz

Radiated Spurious Emission, >1 GHz

Conducted Output Power, Peak Power Spectral Density, -6dB Occupied Bandwidth, and Conducted Spurious Emissions



Conducted Emissions