EMC Test Report

Project Number: 4115134

Report Number: 4115134EMC02 **Revision Level:** 0

Client: Arris Group, Inc.

Equipment Under Test: Telephone Gateway Modem

Model: TG3452

FCC ID: UIDTG3452

IC ID: 6670A-TG3452

Applicable Standards: FCC Part 15 Subpart C, § 15.407
ANSI C63.10: 2013

Report issued on: 17 April 2017

Test Result: Compliant

Tested by: Jeremy O. Pickens, Senior EMC Engineer

Reviewed by: David Schramm, EMC/RF/SAR/HAC Manager

Remarks:
This report details the results of the testing carried out on one sample, the results contained in this test report do not relate to other samples of the same product. The manufacturer should ensure that all products in series production are in conformity with the product sample detailed in this report.

Table of Contents

1 Summary of Test Results

Test Description	Test Specification	Test Result
Emission Bandwidth	15.407(a), 15.407(e)	Compliant
Spectral Density	15.407(a)	Compliant
Peak Power Output	15.407(a)	Compliant
Unwanted Emissions	15.407(b)	Compliant
AC Powerline Conducted Emission	15.107, 15.207	Compliant

1.1 *Modifications Required for Compliance*

None

2 General Information

2.1 *Client Information*

Name:	ARRIS Group, Inc.
Address:	3871 Lakefield Drive, Suite 300
City, State, Zip, Country:	Suwanee, GA 30024, USA

2.2 *Test Laboratory*

Name:	SGS North America, Inc.
Address:	620 Old Peachtree Road NW, Suite 100
City, State, Zip, Country:	Suwanee, GA 30024, USA
Accrediting Body:	A2LA
Type of lab:	Testing Laboratory
Certificate Number:	3212.01

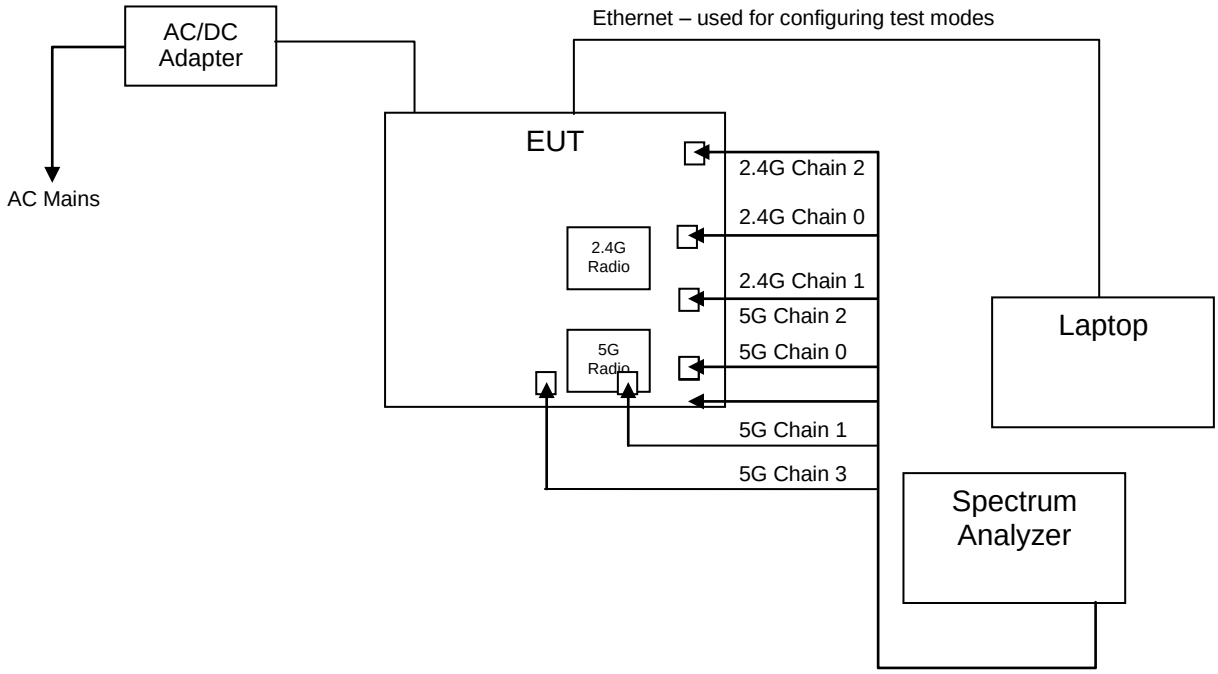
2.3 *General Information of EUT*

Type of Product:	Telephone Gateway Modem
Model Number:	TG3452
Serial Number:	73B2M1333301099 (Conducted) 71G2M1222202391 (Radiated)
Power Supply:	M/N: PA-1500-6AR1, P/N: AREP05678
Frequency Range:	5150 to 5250 MHz and 5725 to 5825MHz
Data Modes:	802.11a, 802.11n (HT20), 802.11n (HT40), 802.11ac (VHT20), 802.11ac (VHT40), 802.11ac (VHT80)
Antenna:	Internal, 4x4 MIMO
Rated Voltage:	100-240Vac, 50/60Hz (AC to 12VDC Adapter)
Test Voltage:	120Vac, 60Hz
Sample Received Date:	08 March 2017
Dates of testing:	08 March - 12 April 2017

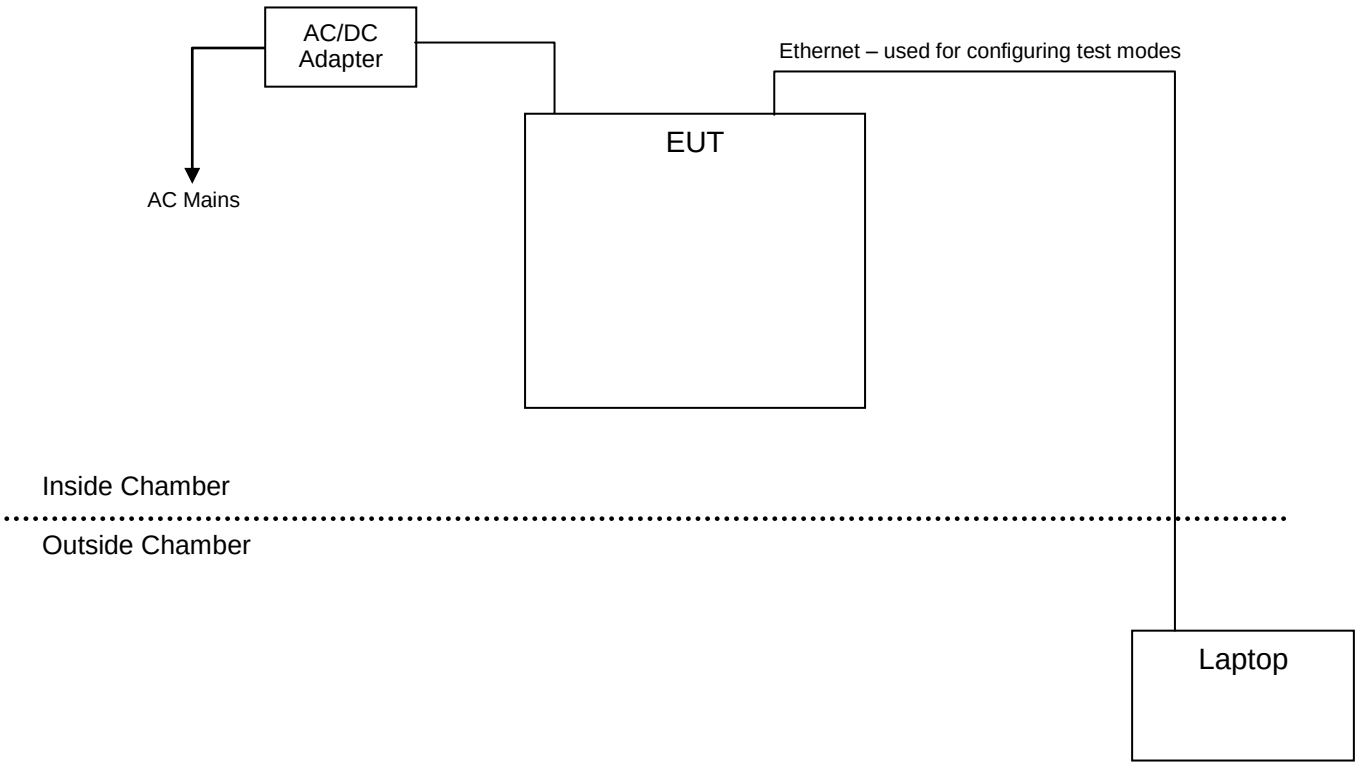
2.4 *Operating Modes and Conditions*

Using test commands, the EUT would transmit continuously on any of the UNII Band 1 or 3 channels at full power. Worst-case power and PSD were achieved at the lowest data rate. For radiated spurious emissions measurements, only the worst-case mode with respect to peak power was investigated.

2.5 *EUT Connection Block Diagram – Conducted Measurements*



2.6 *EUT Connection Block Diagram – Radiated Measurements*



2.7 *System Configurations*

Device reference	Manufacturer	Description	Model Number	Serial Number
A	Arris	Telephone Gateway Modem	TG3452	73B2M1333301099 (Conducted) 71G2M1222202391 (Radiated)
B	LiteOn	AC/DC Supply	PA-1500-6AR1 P/N: AREP05678	Not Labeled

3 Emission Bandwidth and Occupied Bandwidth

3.1 *Test Result*

Test Description	Test Specification	Test Result
Emission bandwidth / 99% OBW	15.407(a), 15.407(e)	Compliant

3.2 *Test Method*

The procedures from ANSI C63.10: 2013 clause 12.4 and KDB document 789033 D02 General UNII Test Procedures New Rules v01r03 were used to determine the 6 dB bandwidth, the 26dB bandwidth, and 99% OBW.

3.3 *Test Site*

SGS EMC Laboratory, Suwanee, GA

Environmental Conditions

Temperature: 23.3 °C
Relative Humidity: 44.3 %

3.4 *Test Equipment*

Test Date: 12-Apr-2017 Tester: JOP

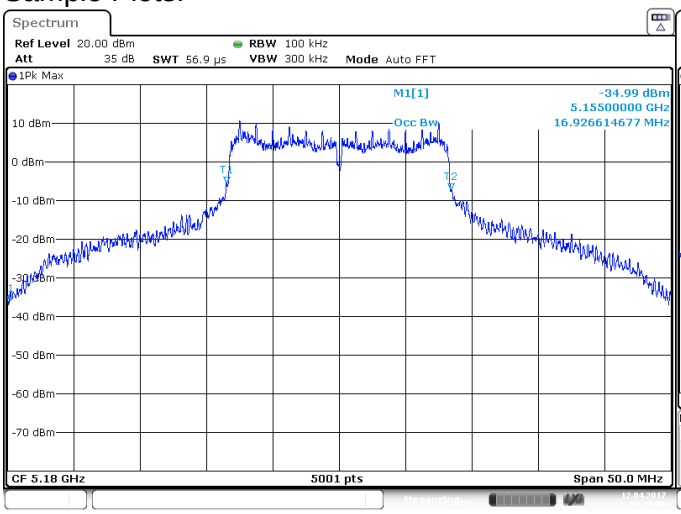
Equipment	Model	Manufacturer	Asset Number	Cal Due Date
SIGNAL ANALYZER	FSV30	ROHDE & SCHWARZ	B085749	8-Oct-2017
RF CABLE	141	HUBER & SUHNER	B095585	26-Jul-2017

Note: The equipment calibration period is 1 year except for the FSV30 which is on a 2-year cycle.

3.5 *Test Data*

Protocol	Channel	26dB Bandwidth (MHz)	6dB Bandwidth (MHz)	OBW (99%) (MHz)
802.11a	36	26.045	16.117	16.927
802.11a	44	28.064	16.28	16.627
802.11a	48	28.094	16.04	16.637
802.11a	149	29.354	16.31	16.487
802.11a	157	27.465	16.29	16.477
802.11a	165	25.515	16.29	16.517
802.11n (HT40)	38	42.292	35.9	36.253
802.11n (HT40)	46	41.952	35.62	36.273
802.11n (HT40)	151	42.452	36.24	36.253
802.11n (HT40)	159	42.392	36.017	36.213
802.11ac (VHT80)	42	81.424	75.16	75.745
802.11ac (VHT80)	155	80.984	76.04	75.705

Sample Plots:



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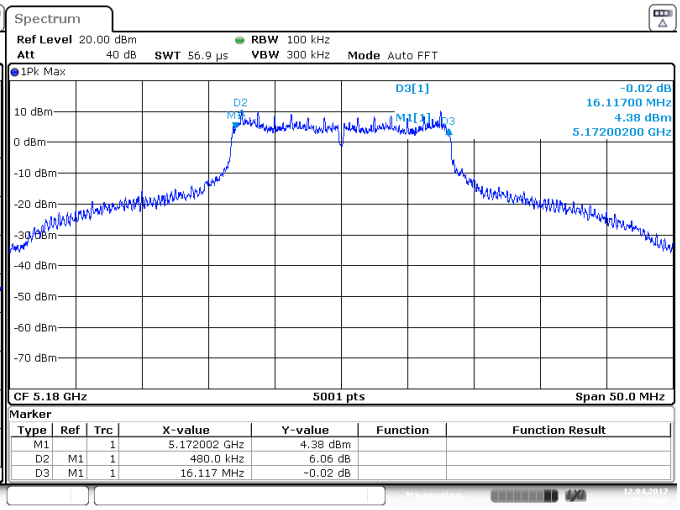

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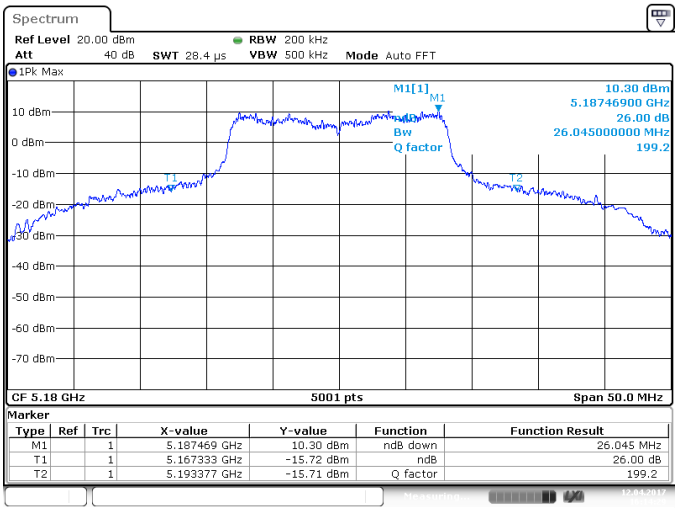

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4 Output Power

4.1 *Test Result*

Test Description	Test Specification	Test Result
Peak Output Power	15.407(a)	Compliant

4.2 *Test Method*

Fundamental power measurements were recorded using the procedures from ANSI C63.10: 2013 clause 12.3 and KDB document 789033 D02 General UNII Test Procedures New Rules v01r03.

Note: Antenna gain values were provided by Arris. The values were maximum measured gains from the EUT. For correlated streams used in legacy 802.11 (a), the gain is higher because it represents the peak composite gain of all four antennas combined, For uncorrelated streams used in MIMO 802.11 (n/ac), the gain shown is the max peak gain when comparing all four antennas.

Limit

For an outdoor access point operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W provided the maximum antenna gain does not exceed 6 dBi.

For the band 5.725-5.85 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W.

For using antennas with greater than 6dBi of gain, the limit is reduced in dB by the amount the gain exceeds 6dBi

4.3 *Test Site*

SGS EMC Laboratory, Suwanee, GA

Environmental Conditions

Temperature: 24.1 °C
Relative Humidity: 41.8 %

4.4 *Test Equipment*

Test End Date: 12-Apr-2017 Tester: JOP

Equipment	Model	Manufacturer	Asset Number	Cal Due Date
SIGNAL ANALYZER	FSV30	ROHDE & SCHWARZ	B085749	8-Oct-2017
RF CABLE	141	HUBER & SUHNER	B095585	26-Jul-2017

Note: The equipment calibration period is 1 year except for the FSV30 which is on a 2-year cycle.

4.5 *Test Data – UNII Band 1*

802.11a									
Frequency (MHz)	Channel (WLAN)	Chain 0 (dBm)	Chain 1 (dBm)	Chain 2 (dBm)	Chain 3 (dBm)	Total Power (dBm)	Antenna Gain (dBi)	Limit (dBm)	Margin (dB)
5180	36	19.1	20.4	22.2	18.4	26.29	9.10	26.9	-0.61
5220	44	19.7	20.3	22.1	19.8	26.61	9.30	26.7	-0.09
5240	48	19.7	19.9	22.1	19.9	26.54	9.40	26.6	-0.06

802.11n HT20									
Frequency (MHz)	Channel (WLAN)	Chain 0 (dBm)	Chain 1 (dBm)	Chain 2 (dBm)	Chain 3 (dBm)	Total Power (dBm)	Antenna Gain (dBi)	Limit (dBm)	Margin (dB)
5180	36	17.8	18.5	20.7	17.6	24.86	4.10	30	-5.14
5220	44	20.7	21.9	22.7	22.1	27.93	4.20	30	-2.07
5240	48	19.5	19.9	20.7	19.7	26.00	4.30	30	-4.00

802.11ac VHT20									
Frequency (MHz)	Channel (WLAN)	Chain 0 (dBm)	Chain 1 (dBm)	Chain 2 (dBm)	Chain 3 (dBm)	Total Power (dBm)	Antenna Gain (dBi)	Limit (dBm)	Margin (dB)
5180	36	16.7	18	20.7	17.5	24.53	4.10	30	-5.47
5220	44	20.9	22.1	22.5	21.4	27.79	4.20	30	-2.21
5240	48	21.2	21.4	22.4	21.4	27.65	4.30	30	-2.35

802.11n HT40									
Frequency (MHz)	Channel (WLAN)	Chain 0 (dBm)	Chain 1 (dBm)	Chain 2 (dBm)	Chain 3 (dBm)	Total Power (dBm)	Antenna Gain (dBi)	Limit (dBm)	Margin (dB)
5190	38	13	14.3	15.2	12.9	19.98	4.10	30	-10.02
5230	46	22.6	23.2	25.4	22.1	29.54	4.20	30	-0.46

802.11ac VHT40									
Frequency (MHz)	Channel (WLAN)	Chain 0 (dBm)	Chain 1 (dBm)	Chain 2 (dBm)	Chain 3 (dBm)	Total Power (dBm)	Antenna Gain (dBi)	Limit (dBm)	Margin (dB)
5190	38	13.7	14.9	15.8	13.7	20.64	4.10	30	-9.36
5230	46	22	22.9	25	22.1	29.20	4.20	30	-0.80

802.11ac VHT80									
Frequency (MHz)	Channel (WLAN)	Chain 0 (dBm)	Chain 1 (dBm)	Chain 2 (dBm)	Chain 3 (dBm)	Total Power (dBm)	Antenna Gain (dBi)	Limit (dBm)	Margin (dB)
5210	36	13.9	14.6	16.9	13.7	21.00	4.10	30	-9.00

4.6 *Test Data – UNII Band 3*

802.11a									
Frequency (MHz)	Channel (WLAN)	Chain 0 (dBm)	Chain 1 (dBm)	Chain 2 (dBm)	Chain 3 (dBm)	Total Power (dBm)	Antenna Gain (dBi)	Limit (dBm)	Margin (dB)
5745	149	15.5	20.9	19.7	20.1	25.49	8.70	27.3	-1.81
5785	157	19.1	20.3	22.8	20.1	26.82	8.70	27.3	-0.48
5825	165	19.1	22.7	22.3	19.8	27.27	8.70	27.3	-0.03

802.11n HT20									
Frequency (MHz)	Channel (WLAN)	Chain 0 (dBm)	Chain 1 (dBm)	Chain 2 (dBm)	Chain 3 (dBm)	Total Power (dBm)	Antenna Gain (dBi)	Limit (dBm)	Margin (dB)
5745	149	19.6	24.2	20.8	20.8	27.74	4.60	30	-2.26
5785	157	18.2	23.4	19.7	20.2	26.84	4.40	30	-3.16
5825	165	17.9	19.6	22.5	19.7	26.27	4.00	30	-3.73

802.11ac VHT20									
Frequency (MHz)	Channel (WLAN)	Chain 0 (dBm)	Chain 1 (dBm)	Chain 2 (dBm)	Chain 3 (dBm)	Total Power (dBm)	Antenna Gain (dBi)	Limit (dBm)	Margin (dB)
5745	149	21	23.5	23.1	21.4	28.40	4.60	30	-1.60
5785	157	19.5	23.8	23.1	20.5	28.10	4.40	30	-1.90
5825	165	18.9	22.2	21.4	19.8	26.79	4.00	30	-3.21

802.11n HT40									
Frequency (MHz)	Channel (WLAN)	Chain 0 (dBm)	Chain 1 (dBm)	Chain 2 (dBm)	Chain 3 (dBm)	Total Power (dBm)	Antenna Gain (dBi)	Limit (dBm)	Margin (dB)
5755	151	19.6	21.8	19.5	19	26.14	4.60	30	-3.86
5795	159	16.8	20.9	22.4	19.7	26.41	4.40	30	-3.59

802.11ac VHT40									
Frequency (MHz)	Channel (WLAN)	Chain 0 (dBm)	Chain 1 (dBm)	Chain 2 (dBm)	Chain 3 (dBm)	Total Power (dBm)	Antenna Gain (dBi)	Limit (dBm)	Margin (dB)
5755	151	18.7	23	22.4	20.2	27.42	4.60	30	-2.58
5795	159	17	19.1	20.8	20.3	25.55	4.40	30	-4.45

802.11ac VHT80									
Frequency (MHz)	Channel (WLAN)	Chain 0 (dBm)	Chain 1 (dBm)	Chain 2 (dBm)	Chain 3 (dBm)	Total Power (dBm)	Antenna Gain (dBi)	Limit (dBm)	Margin (dB)
5775	155	18.9	22.9	22	19.5	27.16	4.50	30	-2.84

5 Power Spectral Density

5.1 *Test Result*

Test Description	Test Specification	Test Result
Power Spectral Density	15.407(a)	Compliant

5.2 *Test Method*

Fundamental power measurements were recorded using the procedures from ANSI C63.10: 2013 clause 12.5 and KDB document 789033 D02 General UNII Test Procedures New Rules v01r03. The lowest data rate for each modulation was determined to be the worst-case.

Limit

The limit is 17dBm in any 1MHz band for channels in the 5.15-5.25GHz band and 30dBm in any 500-kHz band for channels in the 5.725-5.85GHz band.

5.3 *Test Site*

SGS EMC Laboratory, Suwanee, GA

Environmental Conditions

Temperature: 24.0 °C
Relative Humidity: 46.4 %

5.4 *Test Equipment*

Test Date: 28-Mar-2017 Tester: JOP

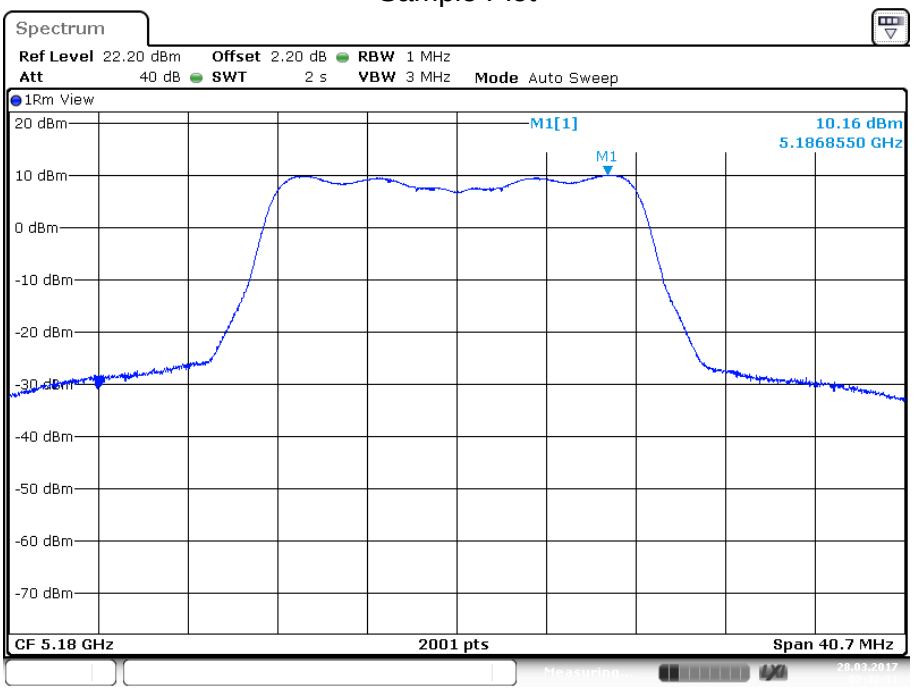
Equipment	Model	Manufacturer	Asset Number	Cal Due Date
SIGNAL ANALYZER	FSV30	ROHDE & SCHWARZ	B085749	8-Oct-2017
RF CABLE	141	HUBER & SUHNER	B095585	26-Jul-2017

Note: The equipment calibration period is 1 year except for the FSV30 which is on a 2-year cycle.

5.5 *Test Data (UNII Band 1)*

Protocol	Channel	Chain 0 (dBm/MHz)	Chain 1 (dBm/MHz)	Chain 2 (dBm/MHz)	Chain 3 (dBm/MHz)	Duty Cycle Correction	Summed (dBm/MHz)	Limit (dBm)	Margin (dB)
802.11a	36	7.1	8.4	10.2	6.4	1.7	15.99	17	-1.01
802.11a	44	7.6	8.2	10	7.7	1.7	16.21	17	-0.79
802.11a	48	7.6	7.8	10	7.8	1.7	16.14	17	-0.86
802.11n (HT20)	36	5	5.7	7.9	4.8	1.8	13.86	17	-3.14
802.11n (HT20)	44	7.9	9.1	9.9	9.3	1.8	16.93	17	-0.07
802.11n (HT20)	48	8.6	9	9.8	8.8	1.8	16.90	17	-0.10
802.11ac (VHT20)	36	4	5.3	8	4.8	1.8	13.63	17	-3.37
802.11ac (VHT20)	44	8.2	9.4	9.8	8.7	1.8	16.89	17	-0.11
802.11ac (VHT20)	48	8.5	8.7	9.7	8.7	1.8	16.75	17	-0.25
802.11n (HT40)	38	-3.4	-2.1	-1.2	-3.5	3.2	6.78	17	-10.22
802.11n (HT40)	46	6.2	6.8	9	5.7	3.2	16.34	17	-0.66
802.11ac (VHT40)	38	-2.5	-1.3	-0.4	-2.5	3.2	7.64	17	-9.36
802.11ac (VHT40)	46	5.8	6.7	8.8	5.9	3.2	16.20	17	-0.80
802.11ac (VHT80)	46	-9	-8.3	-6	-9.2	5.9	4.00	17	-13.00

Sample Plot



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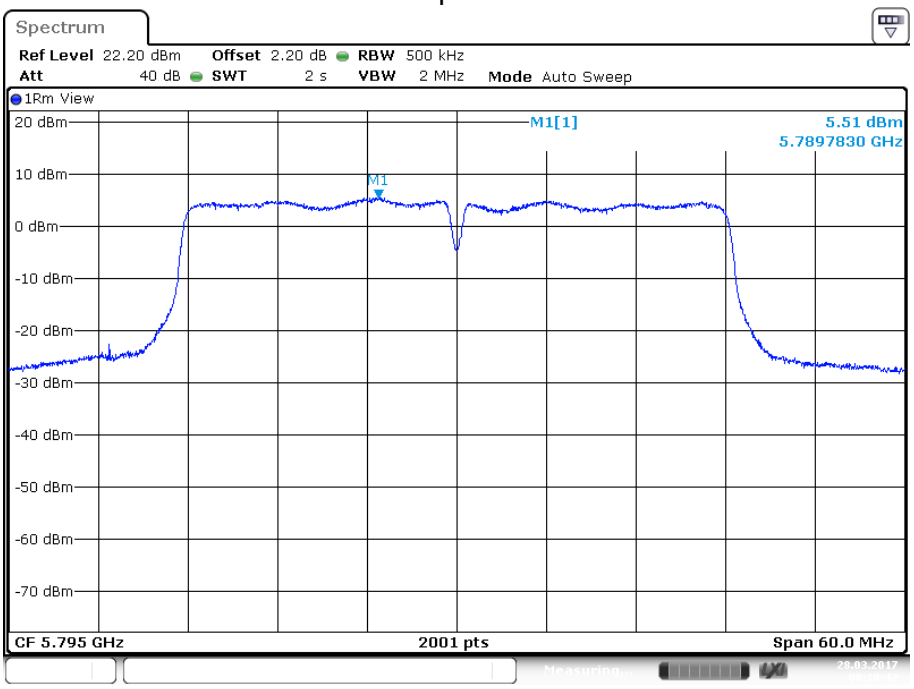
5.6 *Test Data (UNII Band 3)*

Protocol	Channel	Meas PSD Chain 0 (dBm/500kHz)	Meas PSD Chain 1 (dBm/500kHz)	Meas PSD Chain 2 (dBm/500kHz)	Meas PSD Chain 3 (dBm/500kHz)	Duty Cycle Correction	Max PSD (dBm/500kHz)	Limit (dBm)	Margin (dB)
802.11a	149	-0.2	5.2	4	4.4	1.7	11.49	30	-18.51
802.11a	157	5.9	7.1	9.6	6.9	1.7	15.32	30	-14.68
802.11a	165	3.4	7	6.6	4.1	1.7	13.27	30	-16.73
802.11n (HT20)	149	3.8	8.4	5	5	1.8	13.74	30	-16.26
802.11n (HT20)	157	2.4	7.6	3.9	4.4	1.8	12.84	30	-17.16
802.11n (HT20)	165	5	6.7	9.6	6.8	1.8	15.17	30	-14.83
(VHT20)	149	5.2	7.7	7.3	5.6	1.8	14.40	30	-15.6
(VHT20)	157	3.7	8	7.3	4.7	1.8	14.10	30	-15.9
(VHT20)	165	3.1	6.4	5.6	4	1.8	12.79	30	-17.21
802.11n (HT40)	151	2.7	4.9	2.6	2.1	3.2	12.44	30	-17.56
802.11n (HT40)	159	1.4	5.5	7	4.3	3.2	14.21	30	-15.79
(VHT40)	151	1.8	6.1	5.5	3.3	3.2	13.72	30	-16.28
(VHT40)	159	1.8	3.9	5.6	5.1	3.2	13.55	30	-16.45
(VHT80)	155	-7	-3	-3.9	-6.4	5.9	7.16	30	-22.84

Sample Plot



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6 Unwanted Emissions

6.1 *Test Result*

Test Description	Test Specification	Test Result
Spurious Emissions	15.407(b) ANSI C63.10: 2013	Compliant

6.2 *Test Method*

Testing was performed using the radiated and conducted methods defined in ANSI C63.10: 2013 clause 12.7 and KDB 789033 D02 General UNII Test Procedures New Rules v01r03. In lieu of the marker-delta or integration methods, band edge compliance was shown using a peak detector and a 1MHz resolution bandwidth.

Lowest, middle, and highest channels were investigated for each band. Only the modulation providing the worst-case power was reported except at the band edges where all modulations and bandwidths were measured. The frequency range examined was 9kHz to 40GHz. A pre-scan was performed in the 9kHz-30MHz range and no emissions associated with the radio were observed.

Limit:

For transmitters operating in the 5.15-5.25 GHz band: All emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of −27 dBm/MHz.

For transmitters operating in the 5.725-5.85 GHz band: All emissions within the frequency range from the band edge to 10 MHz above or below the band edge shall not exceed an e.i.r.p. of −17 dBm/MHz; for frequencies 10 MHz or greater above or below the band edge, emissions shall not exceed an e.i.r.p. of −27 dBm/MHz.

6.3 *Test Site*

SGS EMC Laboratory, Suwanee, GA

Environmental Conditions

Temperature: 24.0 °C
Relative Humidity: 46.3 %

6.4 *Test Equipment – Conducted Measurements*

Test Date: 12-Apr-2017 Tester: JOP

Equipment	Model	Manufacturer	Asset Number	Cal Due Date
SIGNAL ANALYZER	FSV30	ROHDE & SCHWARZ	B085749	8-Oct-2017
RF CABLE	141	HUBER & SUHNER	B095585	26-Jul-2017

Note: The equipment calibration period is 1 year except for the FSV30 which is on a 2-year cycle.

6.5 *Test Equipment – Radiated Measurements*

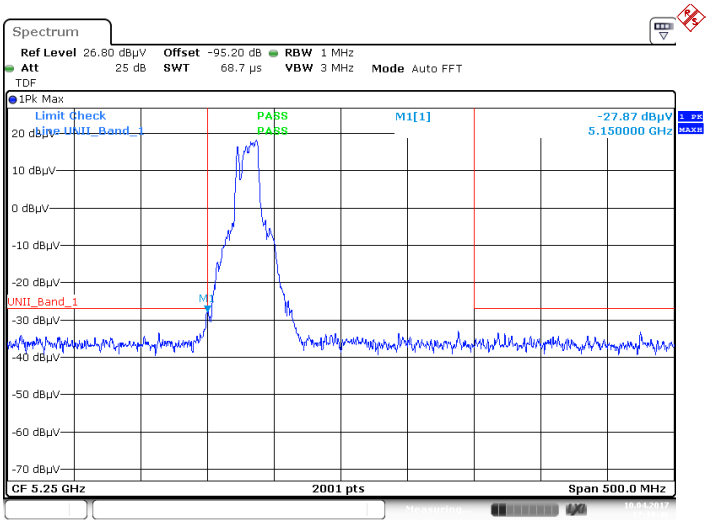
Test End Date: 10-Apr-2017 Tester: JOP/FN

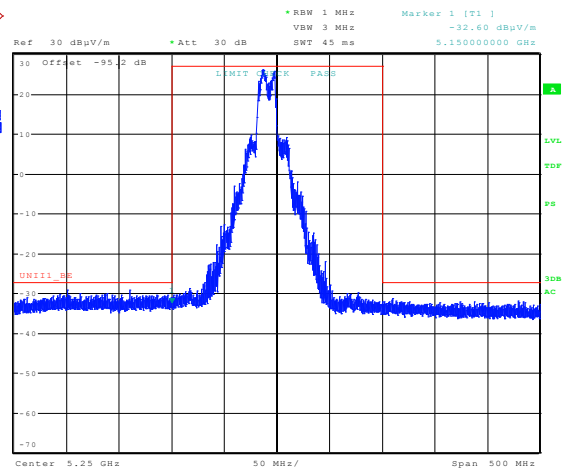
Equipment	Model	Manufacturer	Asset Number	Cal Due Date
EMI TEST RECEIVER	ESU40	ROHDE & SCHWARZ	B079629	20-Jun-2017
SIGNAL ANALYZER	FSV30	ROHDE & SCHWARZ	B085749	8-Oct-2017
ANTENNA, DRG HORN (MEDIUM)	3117	ETS LINDGREN	B079699	26-Apr-2017
RF CABLE	NFS-290-78.7-NFS	FLORIDA RF LABS	B095019	28-Jul-2017
RF CABLE	NMS-290-236.2-NMS	FLORIDA RF LABS	B095020	29-Jul-2017
RF CABLE	SF106	HUBER & SUHNER	B079661	29-Jul-2017
RF CABLE	SUCOFLEX 100	HUBER & SUHNER	B108523	4-Aug-2017
ANTENNA, DRG HORN (SMALL)	3116B	ETS LINDGREN	B079695	15-Jul-2017
RF CABLE	SF102	HUBER & SUHNER	B079822	27-Jul-2017
RF CABLE	SF102	HUBER & SUHNER	B079824	27-Jul-2017
LOW NOISE AMPLIFIER	NSP1840-HG	MITEQ	B087572	29-Jul-2017
ANTENNA, BILOG	JB6	SUNOL	B079690	10-Nov-2017
RF CABLE	CBL-25FT-NMNM	MINI-CIRCUITS	B094941	25-Jul-2017
RF CABLE	SF106	HUBER & SUHNER	B079713	27-Jul-2017
RF CABLE	SF106	HUBER & SUHNER	B085892	27-Jul-2017
RF CABLE	104PE	HUBER & SUHNER	B079793	27-Jul-2017
LOW NOISE AMPLIFIER	TS-PR18	ROHDE & SCHWARZ	B094463	22-Feb-2018

Note: The equipment calibration period is 1 year except for the FSV30 which is on a 2-year cycle.

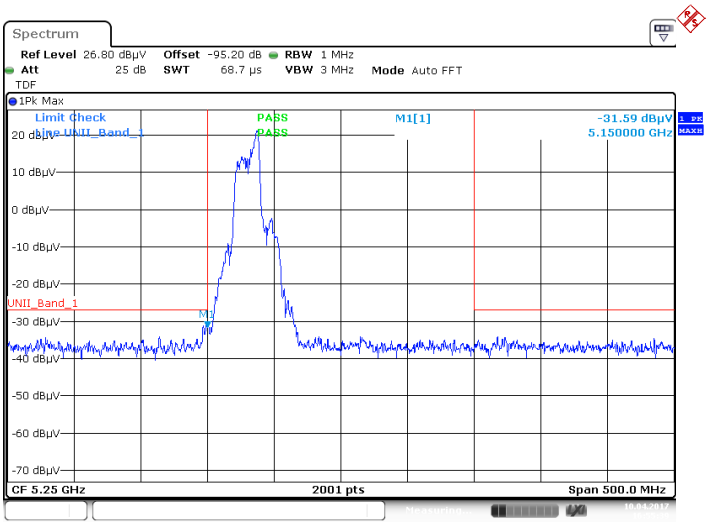
6.6 *Test Data - UNII Band 1 – Radiated Band Edge*

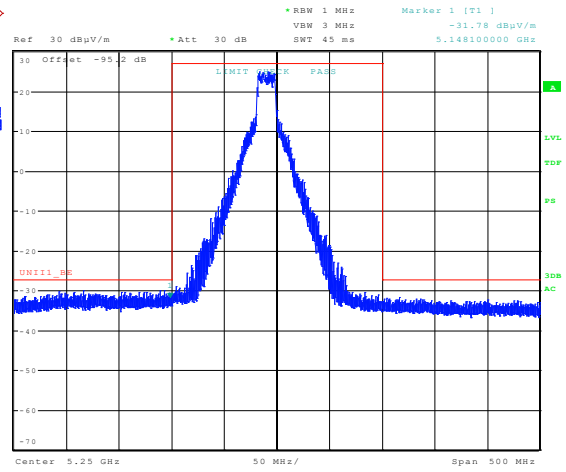
802.11a
Channels 36 and 48



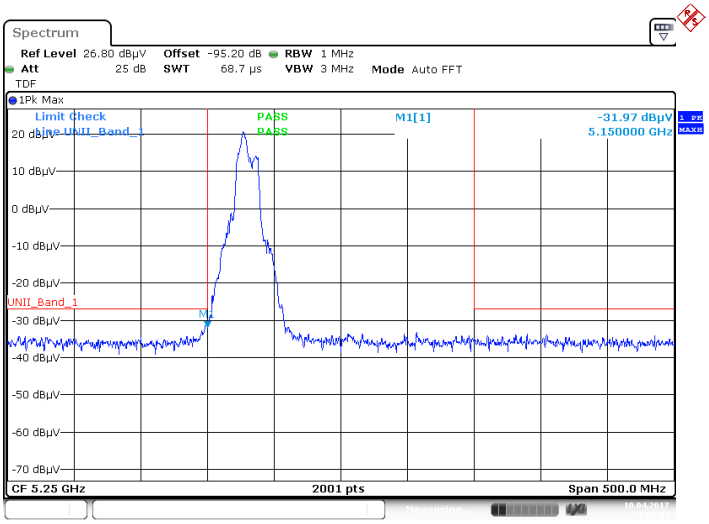


802.11n (HT20)
Channels 36 and 48

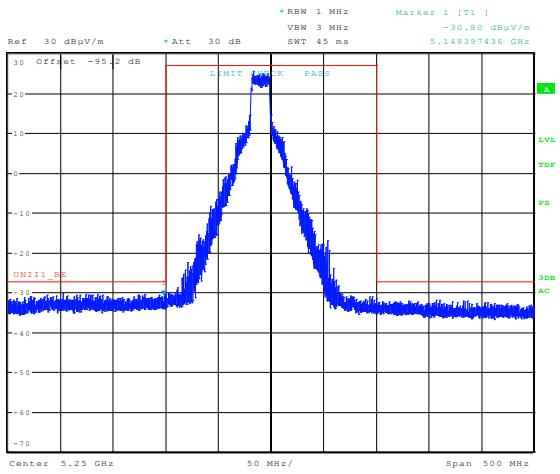




802.11ac (VHT20)
Channels 36 and 48

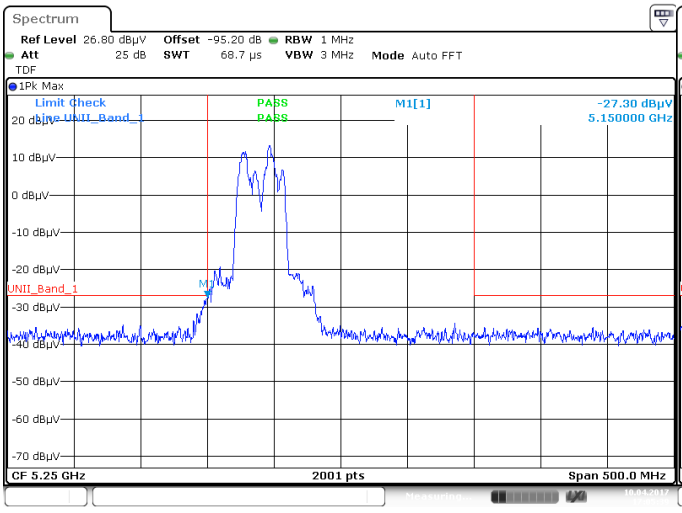


Date: 10.APR.2017 14:57:43

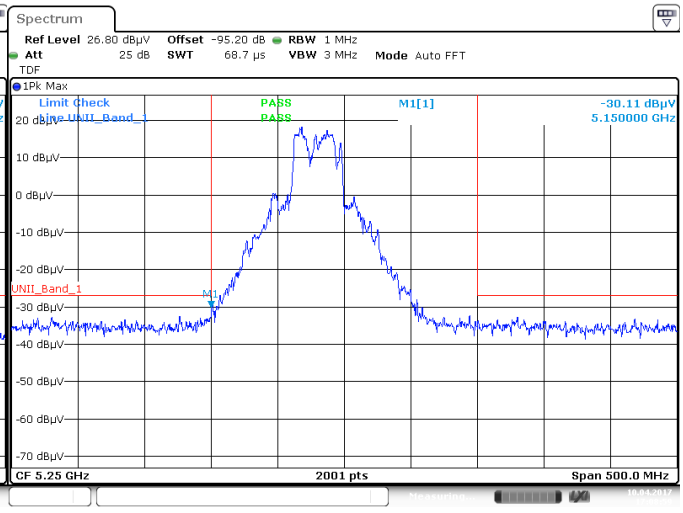


Date: 23.MAR.2017 06:14:35

802.11n (HT40)
Channels 38 and 46

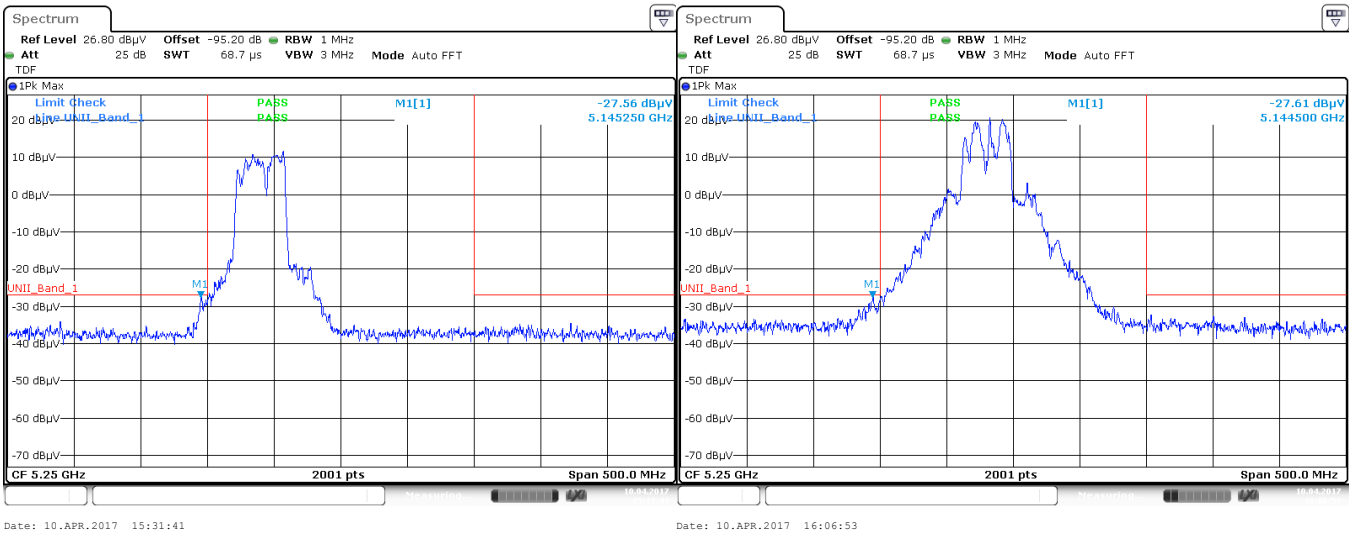


Date: 10.APR.2017 17:05:39

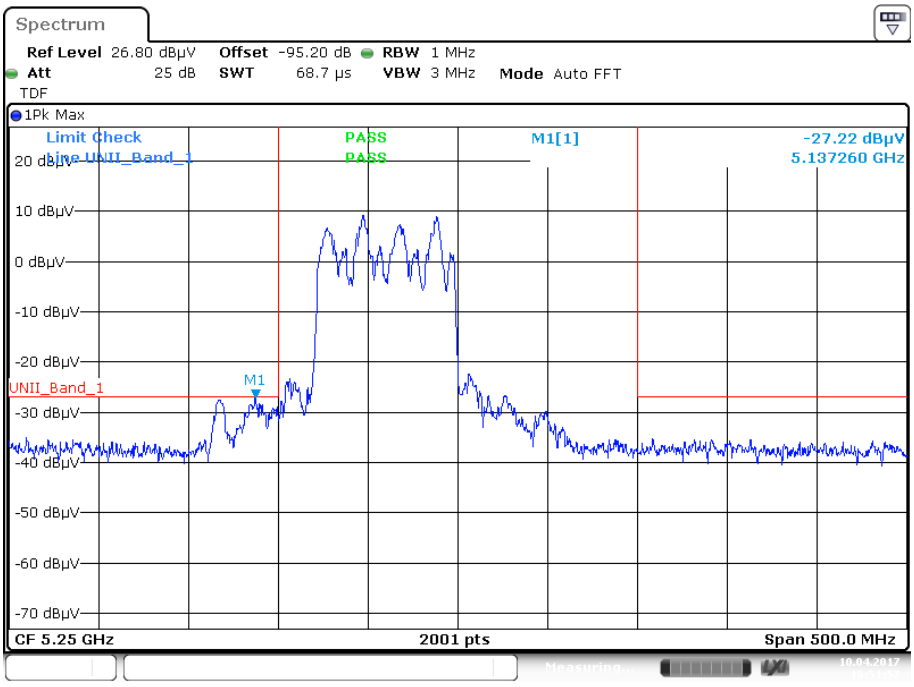


Date: 10.APR.2017 17:08:59

802.11ac (VHT40)
Channels 38 and 46

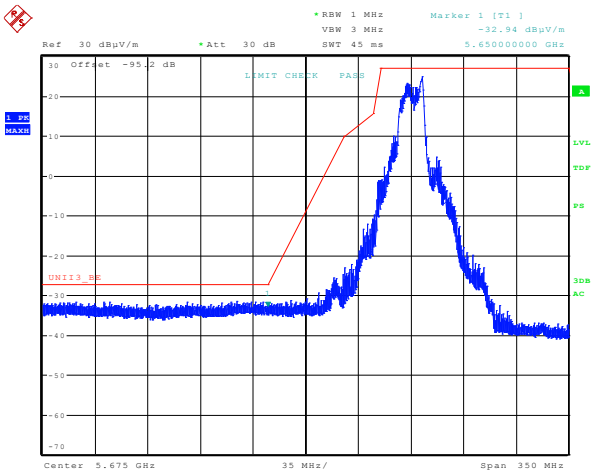


802.11ac (VHT80)
Channel 42

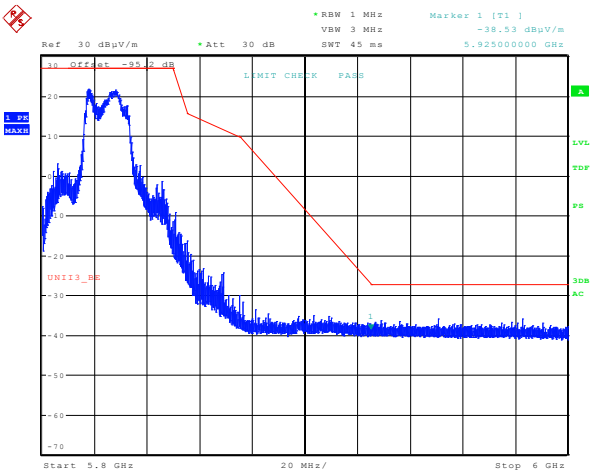


6.7 *Test Data - UNII Band 1 – Radiated Band Edge*

802.11a
Channels 149 and 165

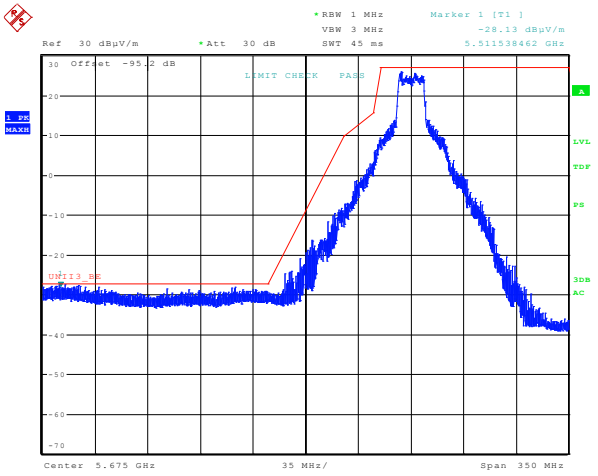


Date: 22.MAR.2017 10:53:25

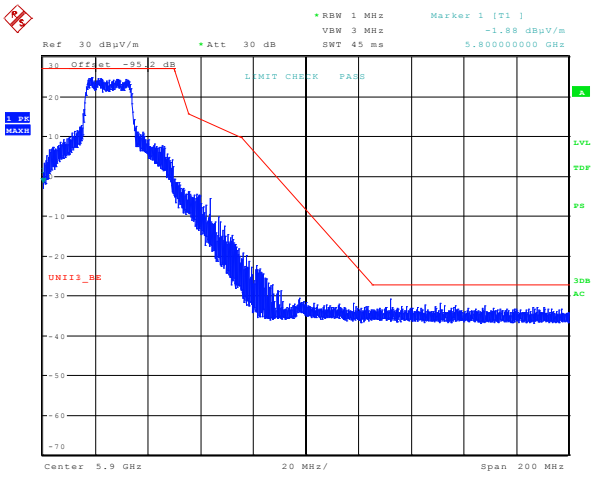


Date: 22.MAR.2017 13:46:59

802.11n (HT20)
Channels 149 and 165

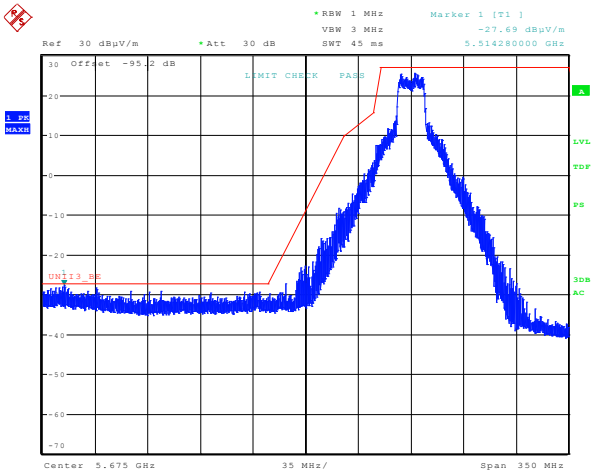


Date: 22.MAR.2017 11:20:39

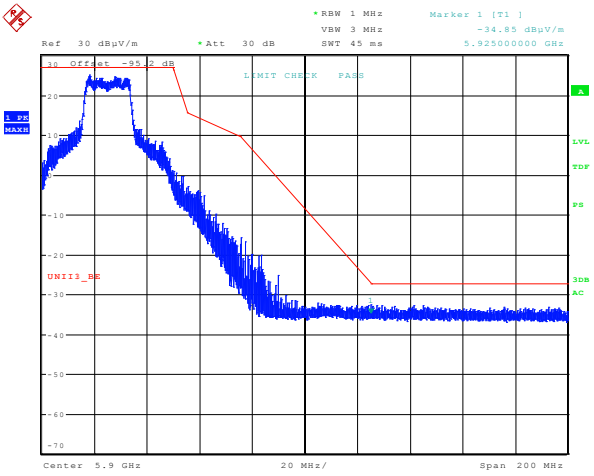


Date: 23.MAR.2017 04:55:40

802.11ac (VHT20)
Channels 149 and 165

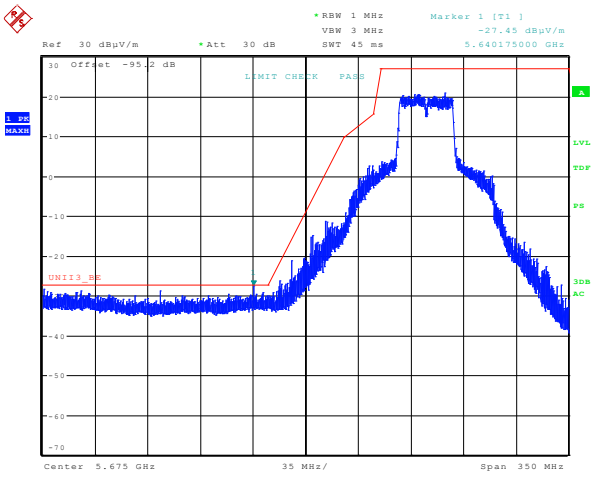


Date: 22.MAR.2017 13:15:33

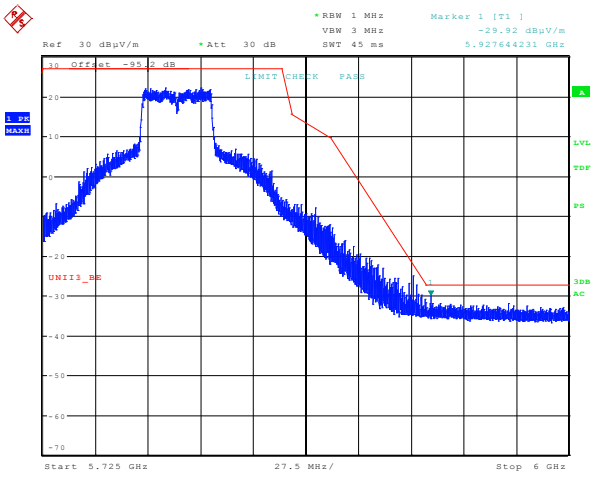


Date: 23.MAR.2017 04:57:53

802.11n (HT40)
Channels 151 and 159

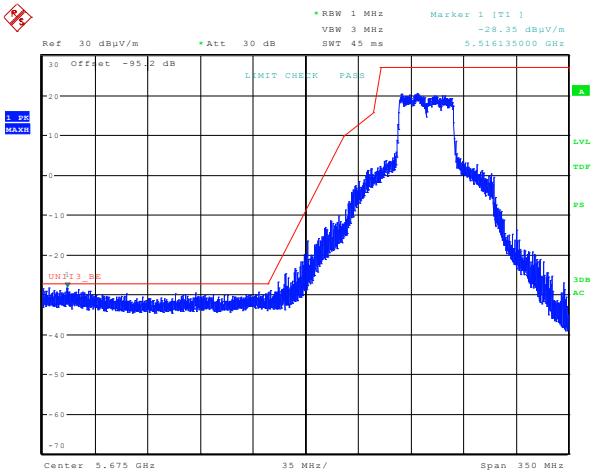


Date: 22.MAR.2017 11:31:59

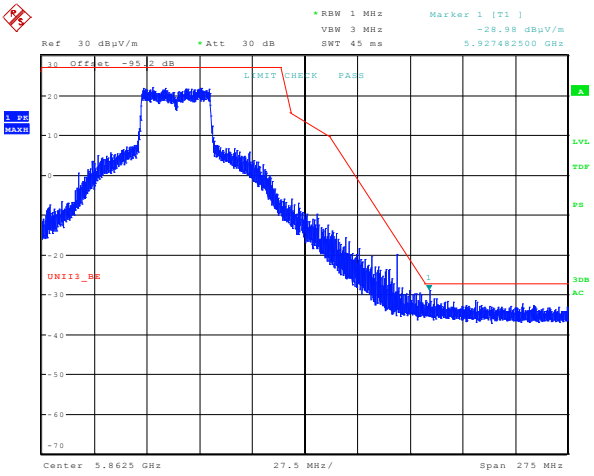


Date: 23.MAR.2017 05:05:23

802.11ac (VHT40)
Channels 151 and 159

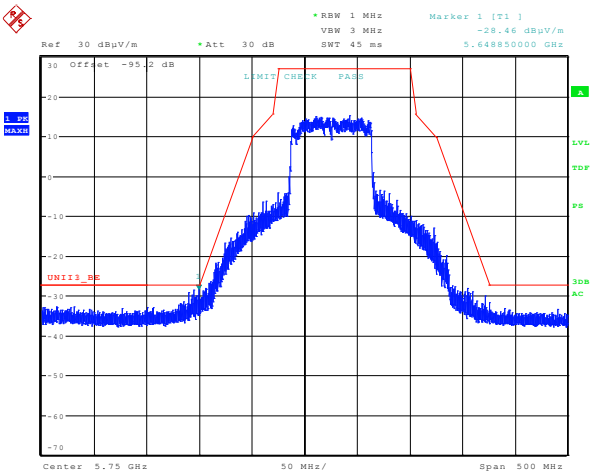


Date: 22.MAR.2017 13:25:37



Date: 23.MAR.2017 05:07:17

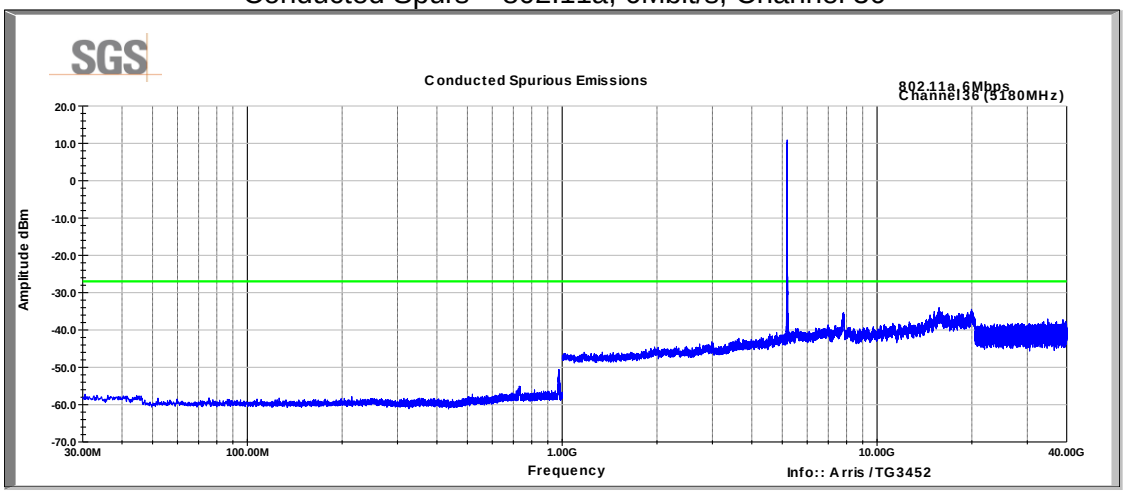
802.11ac (VHT80)
Channel 155



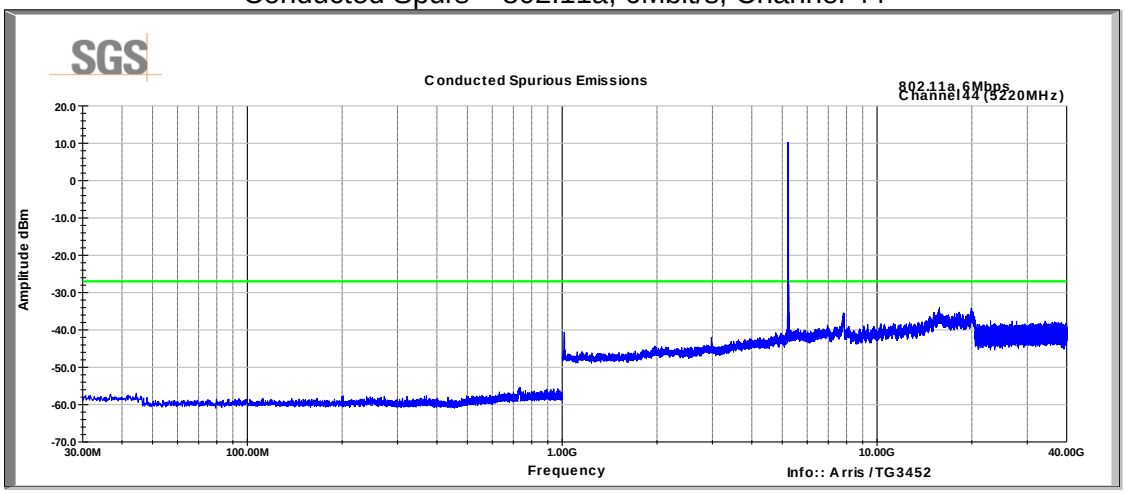
Date: 23.MAR.2017 05:17:00

6.8 *Test Data – Conducted Spurs*

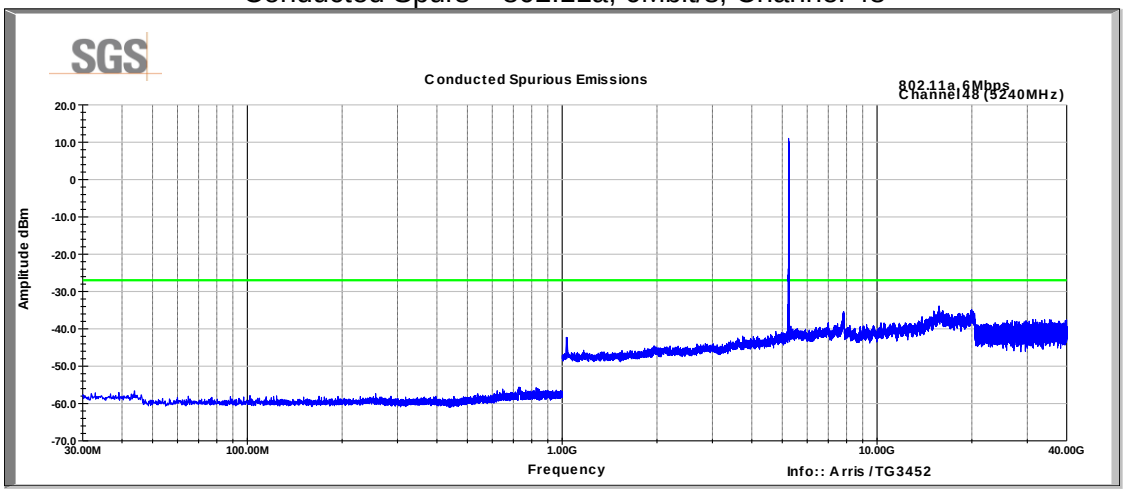
Conducted Spurs – 802.11a, 6Mbit/s, Channel 36



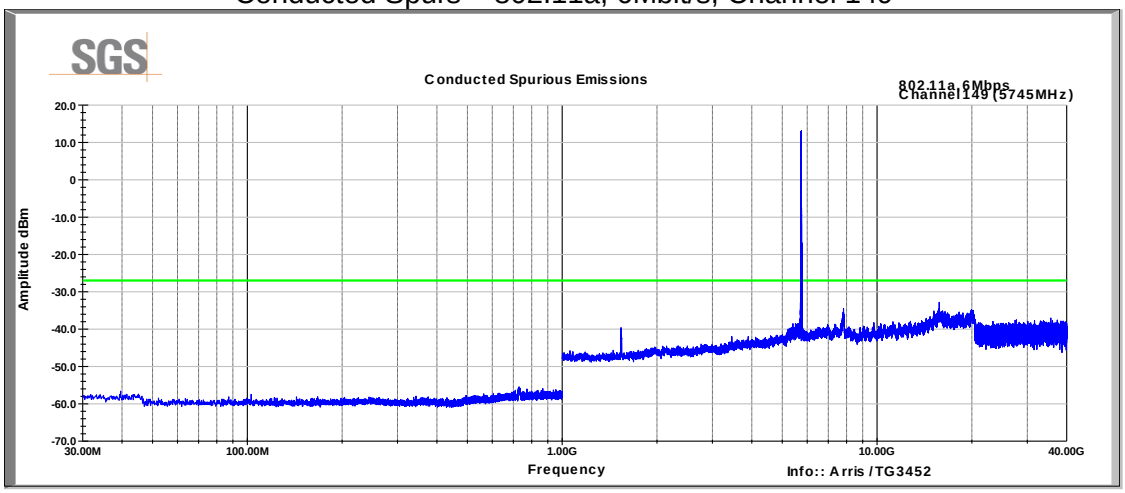
Conducted Spurs – 802.11a, 6Mbit/s, Channel 44



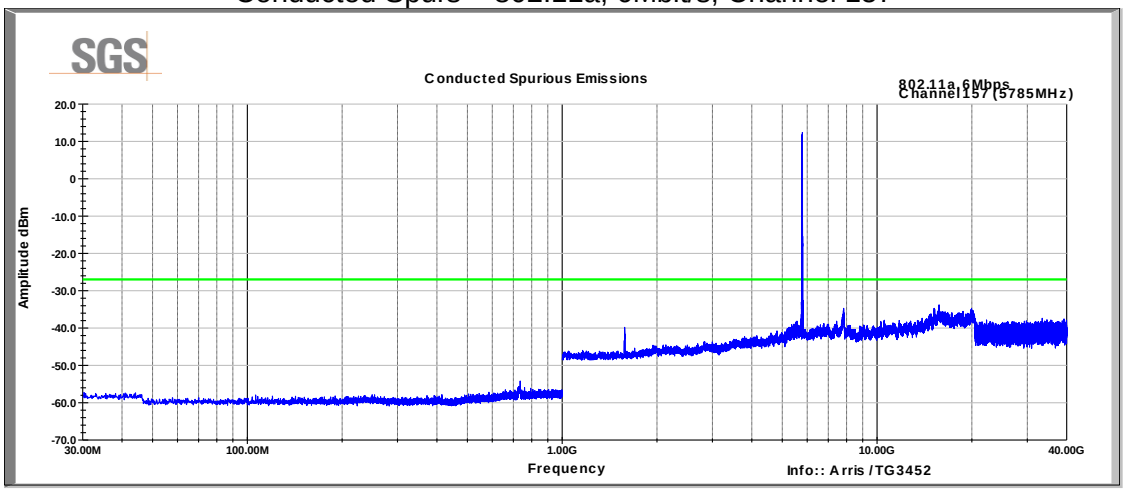
Conducted Spurs – 802.11a, 6Mbit/s, Channel 48



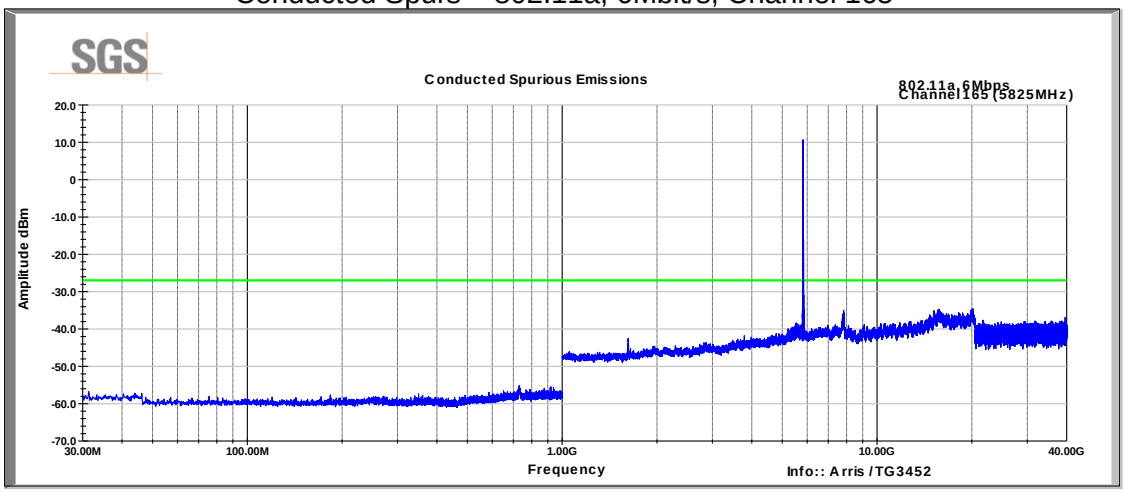
Conducted Spurs – 802.11a, 6Mbit/s, Channel 149



Conducted Spurs – 802.11a, 6Mbit/s, Channel 157

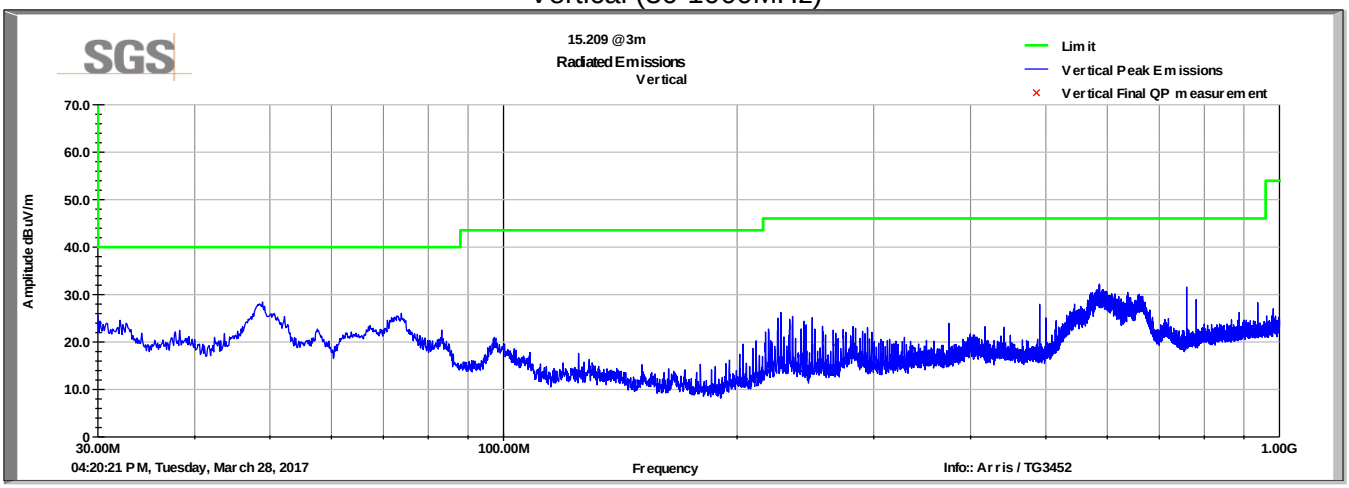


Conducted Spurs – 802.11a, 6Mbit/s, Channel 165

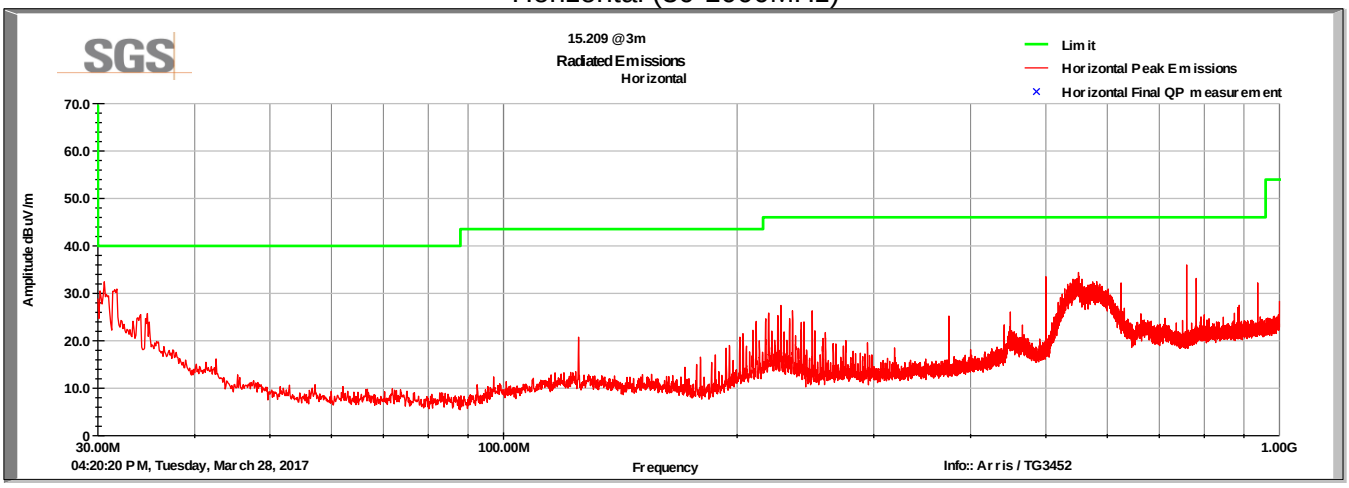


6.9 *Unwanted Emissions – Cabinet Radiation*

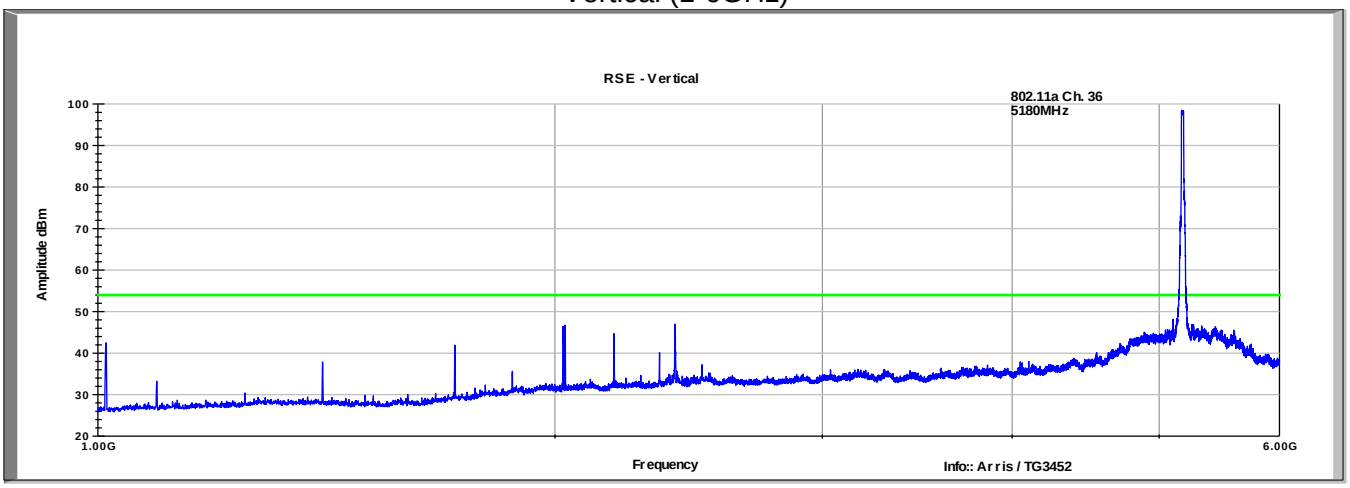
Channel 36
Vertical (30-1000MHz)



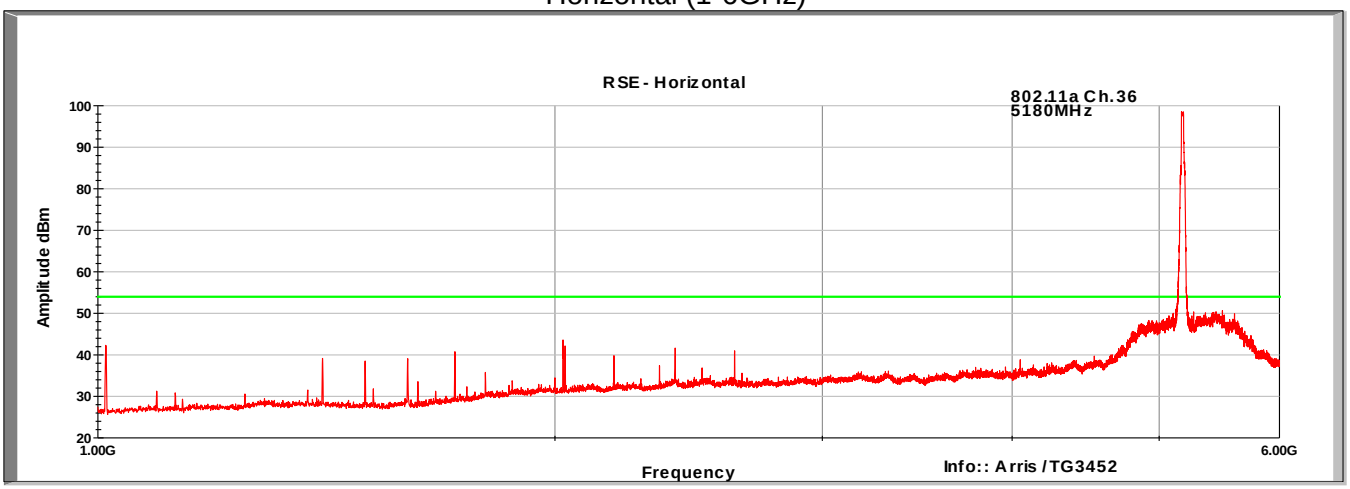
Channel 36
Horizontal (30-1000MHz)



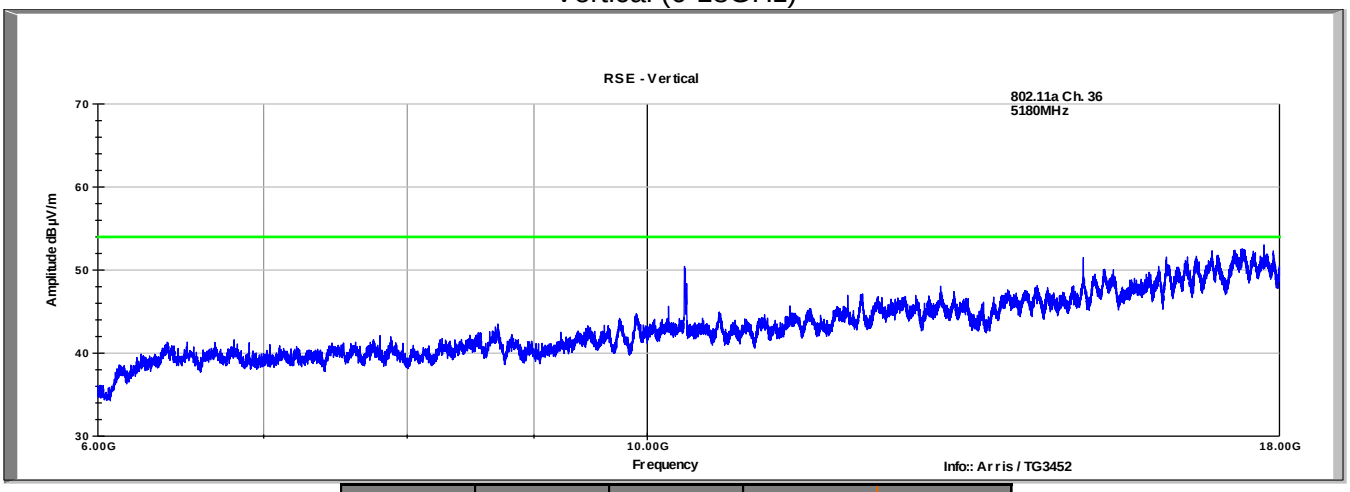
Channel 36
Vertical (1-6GHz)



Channel 36
Horizontal (1-6GHz)

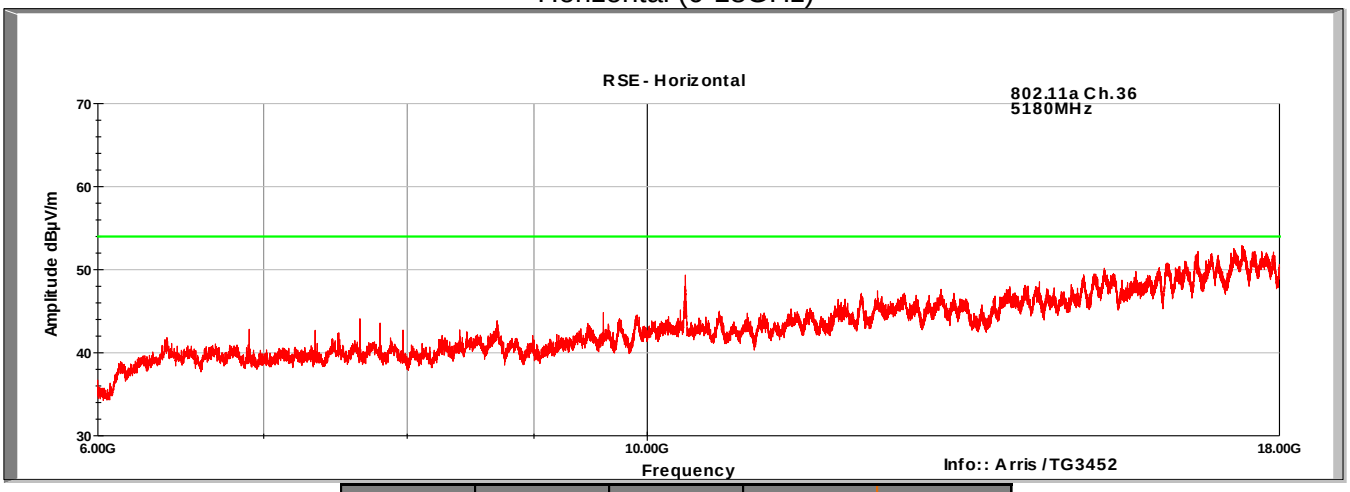


Channel 36
Vertical (6-18GHz)



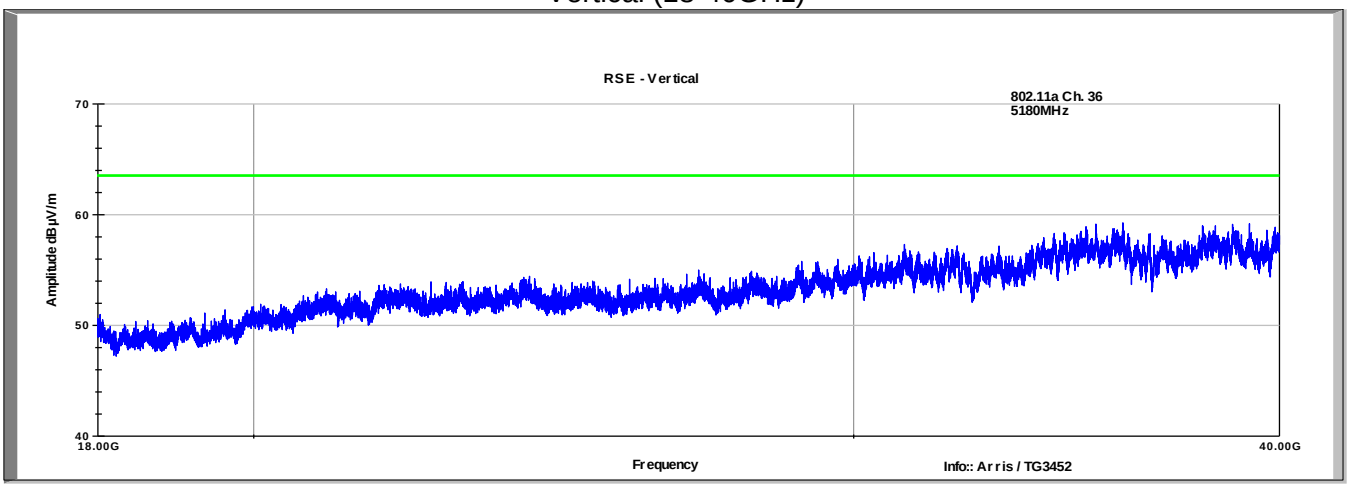
Frequency MHz	Polarity (V/H)	Peak Value (dBuV/m)	AVG Limit (dBuV/m)	Margin (dB)
10360.00	V	50.4	54.0	-3.6

Channel 36
Horizontal (6-18GHz)

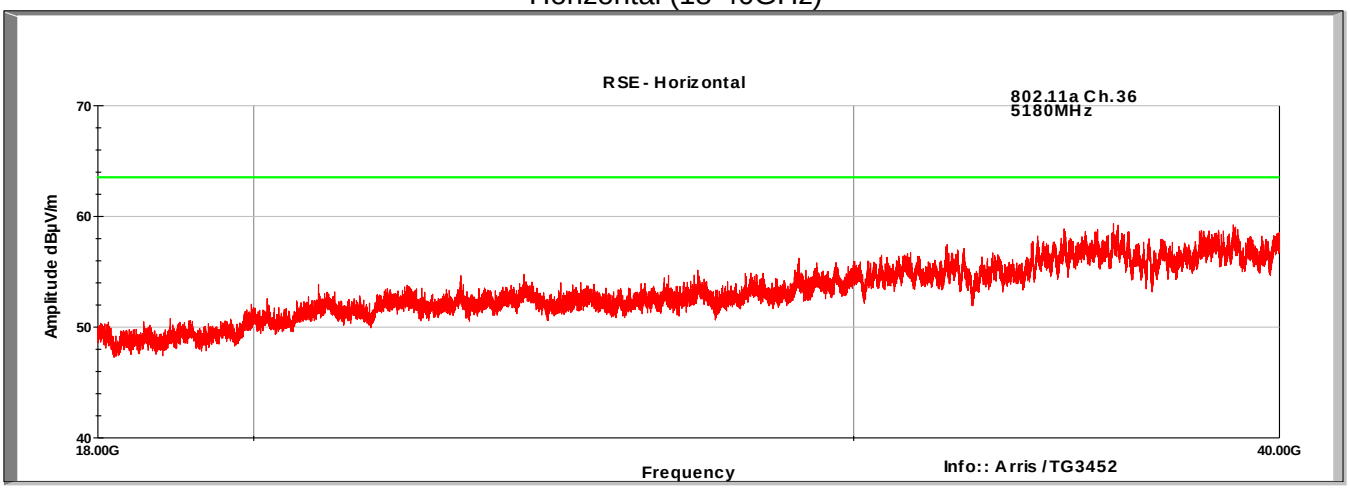


Frequency MHz	Polarity (V/H)	Peak Value (dBuV/m)	AVG Limit (dBuV/m)	Margin (dB)
10360.00	H	49.4	54.0	-4.6

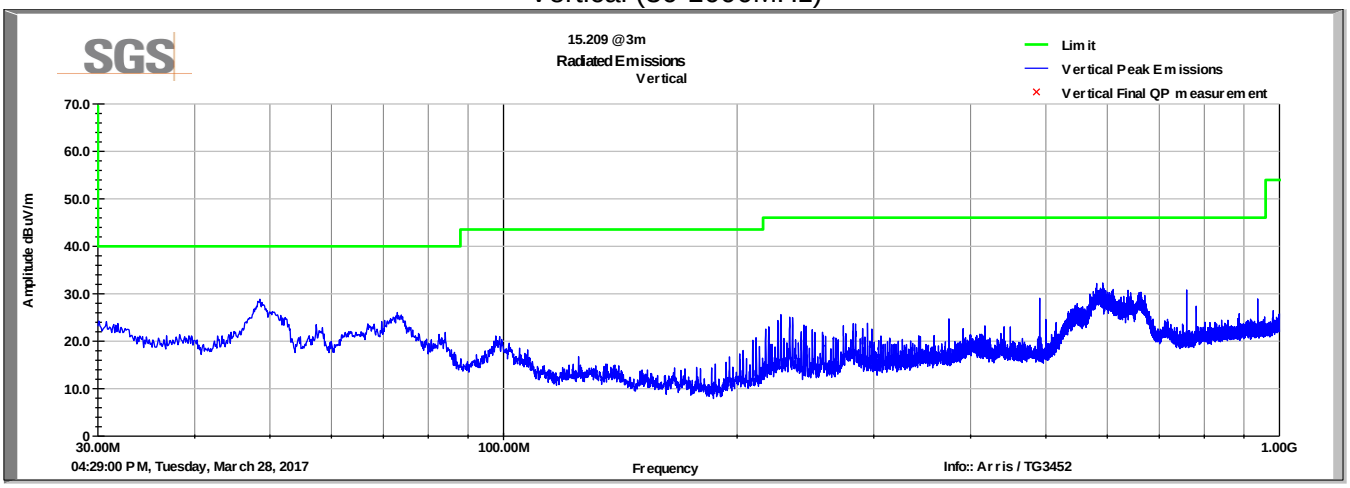
Channel 36
Vertical (18-40GHz)



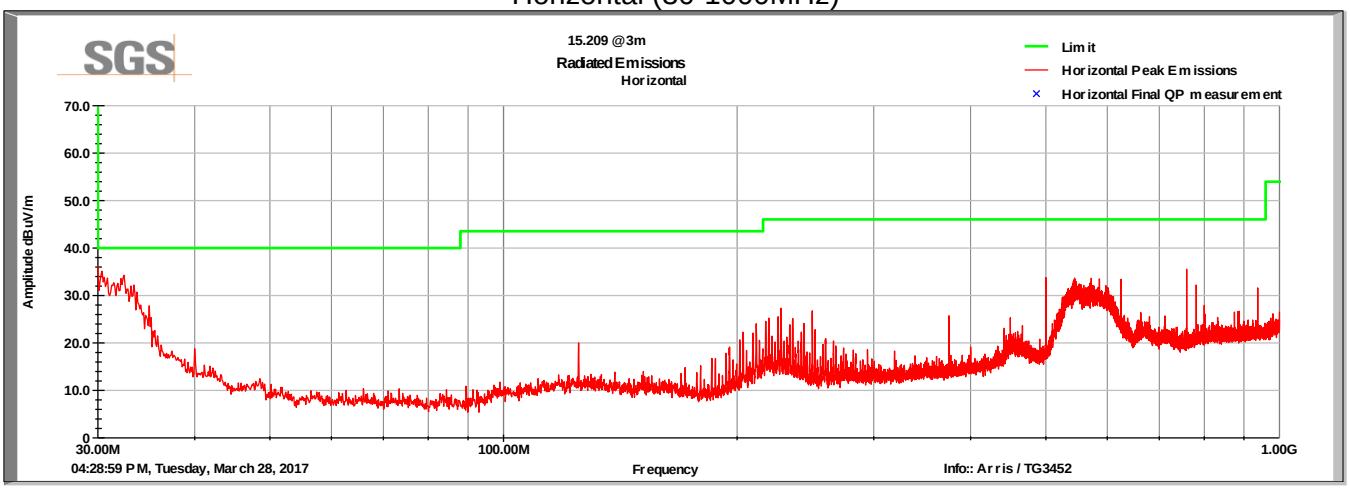
Channel 36
Horizontal (18-40GHz)



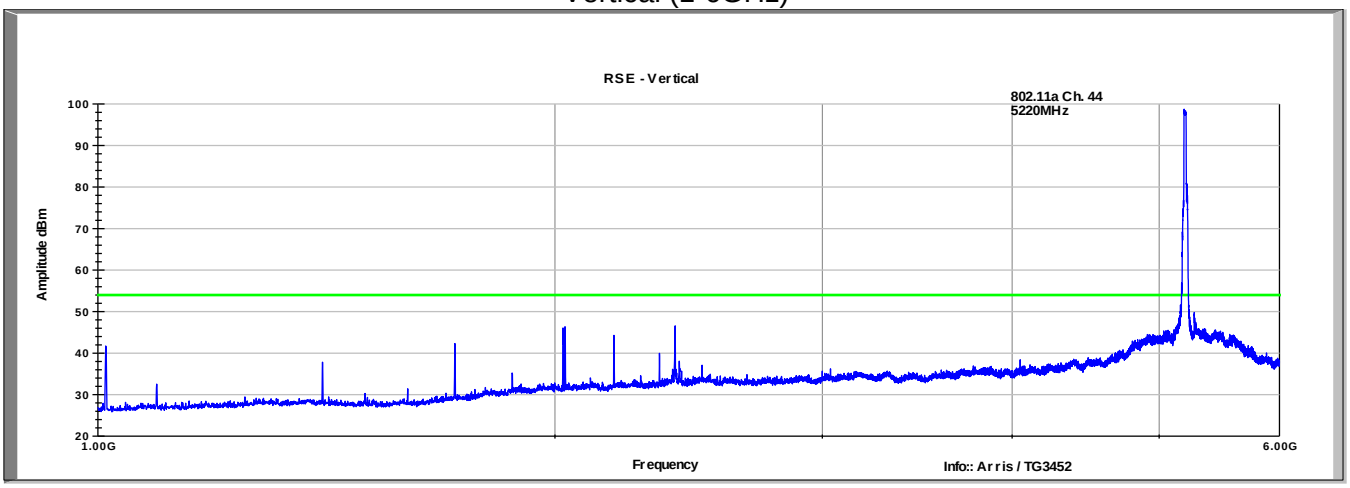
Channel 44
Vertical (30-1000MHz)



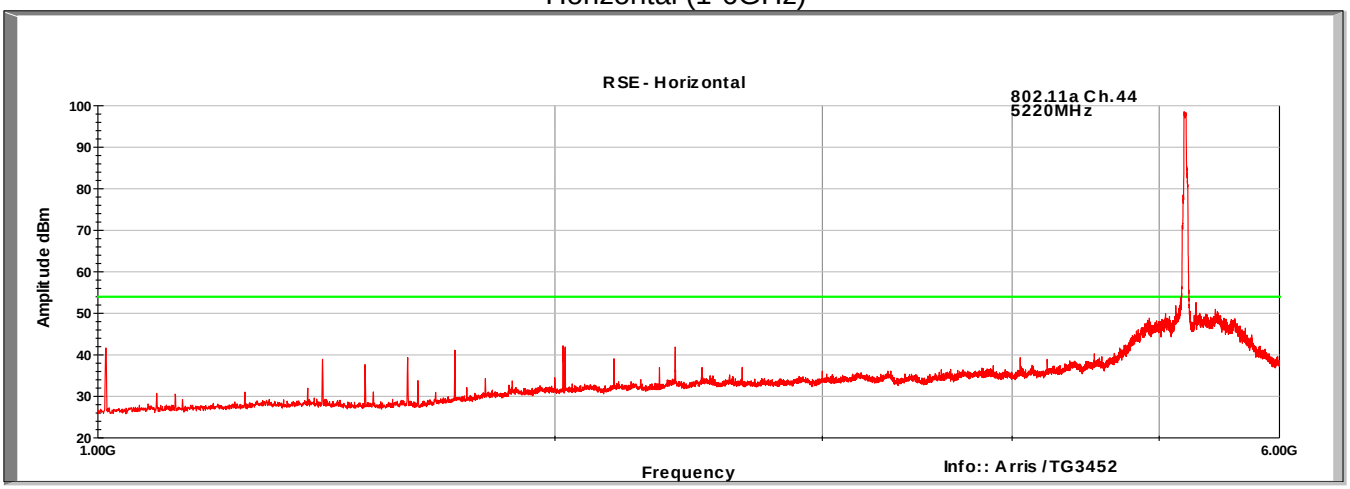
Channel 44
Horizontal (30-1000MHz)



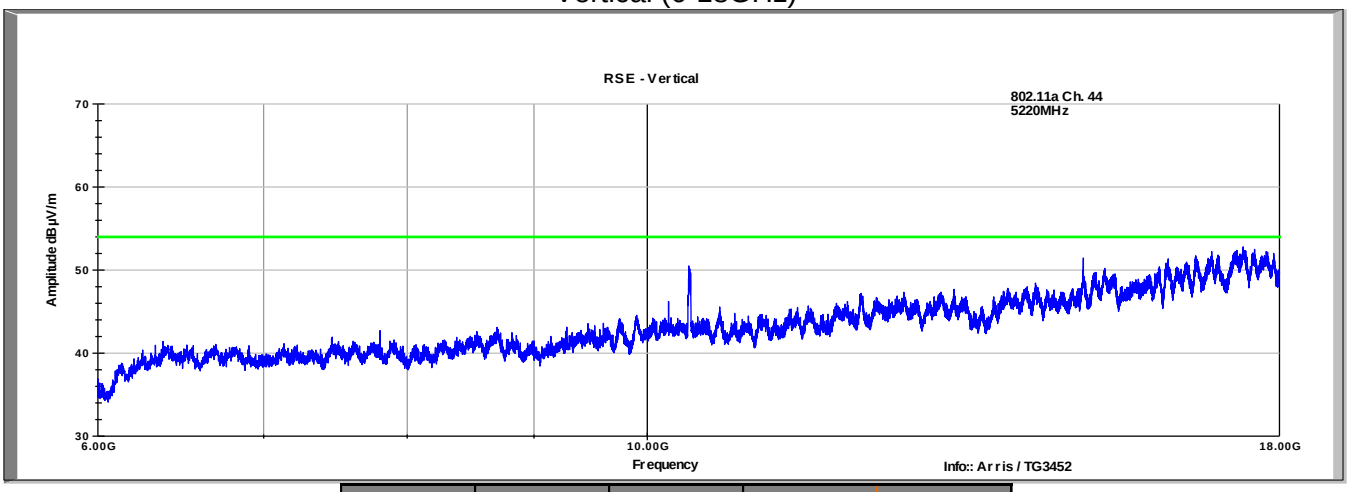
Channel 44
Vertical (1-6GHz)



Channel 44
Horizontal (1-6GHz)

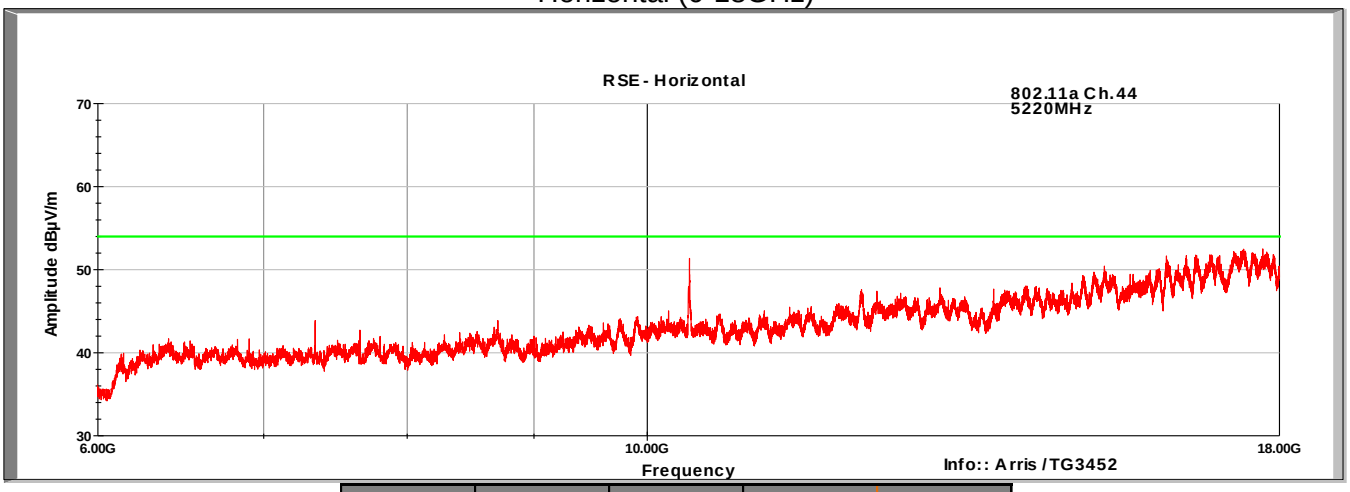


Channel 44
Vertical (6-18GHz)



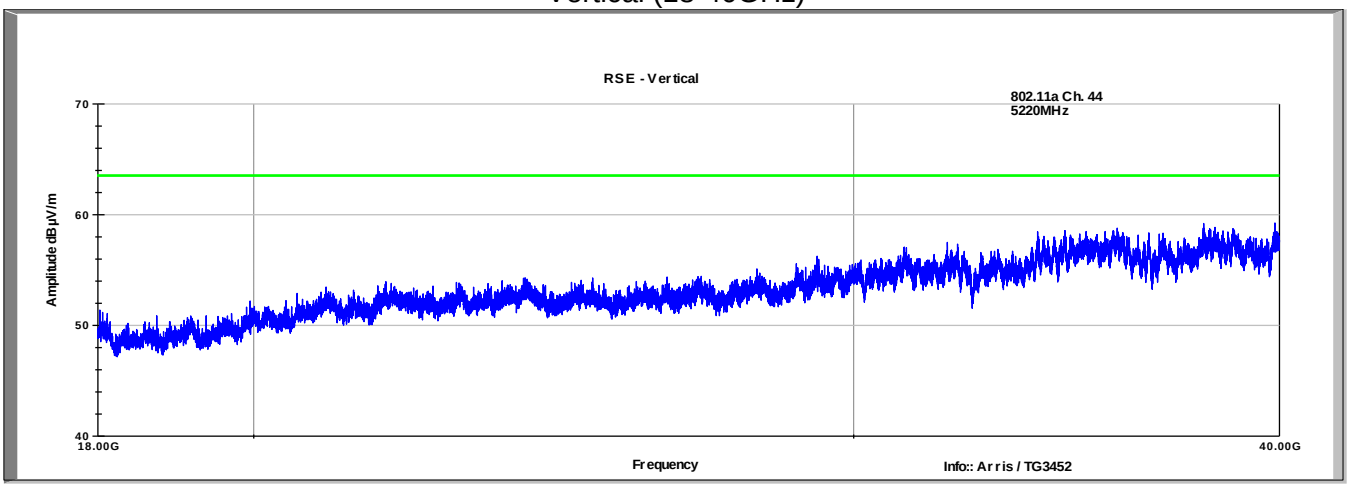
Frequency MHz	Polarity (V/H)	Peak Value (dBuV/m)	AVG Limit (dBuV/m)	Margin (dB)
10440.00	V	50.5	54.0	-3.5

Channel 44
Horizontal (6-18GHz)

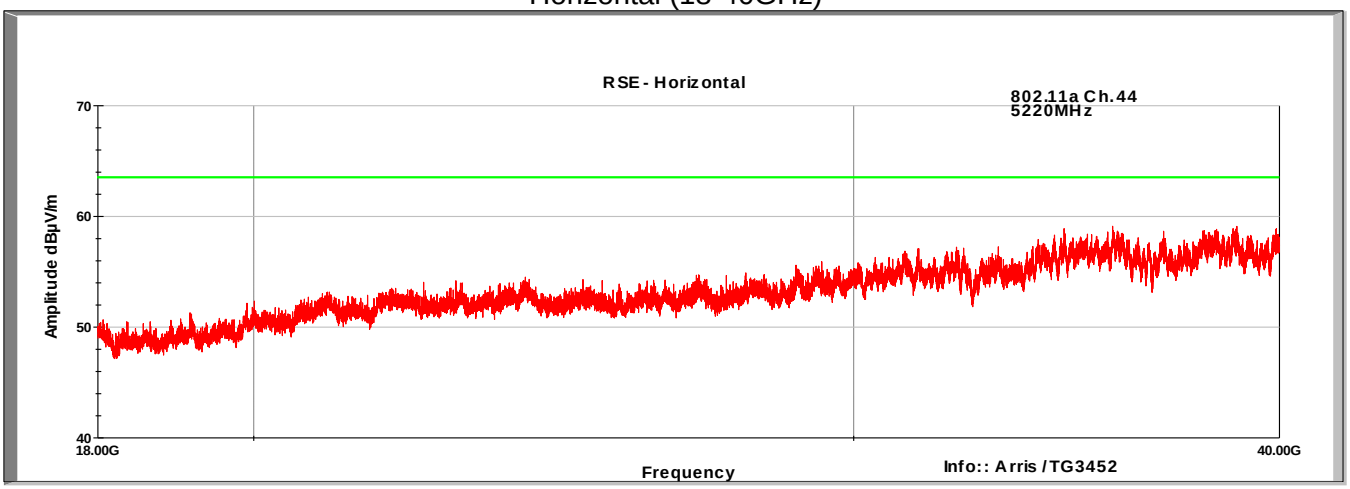


Frequency MHz	Polarity (V/H)	Peak Value (dBuV/m)	AVG Limit (dBuV/m)	Margin (dB)
10440.00	H	51.4	54.0	-2.6

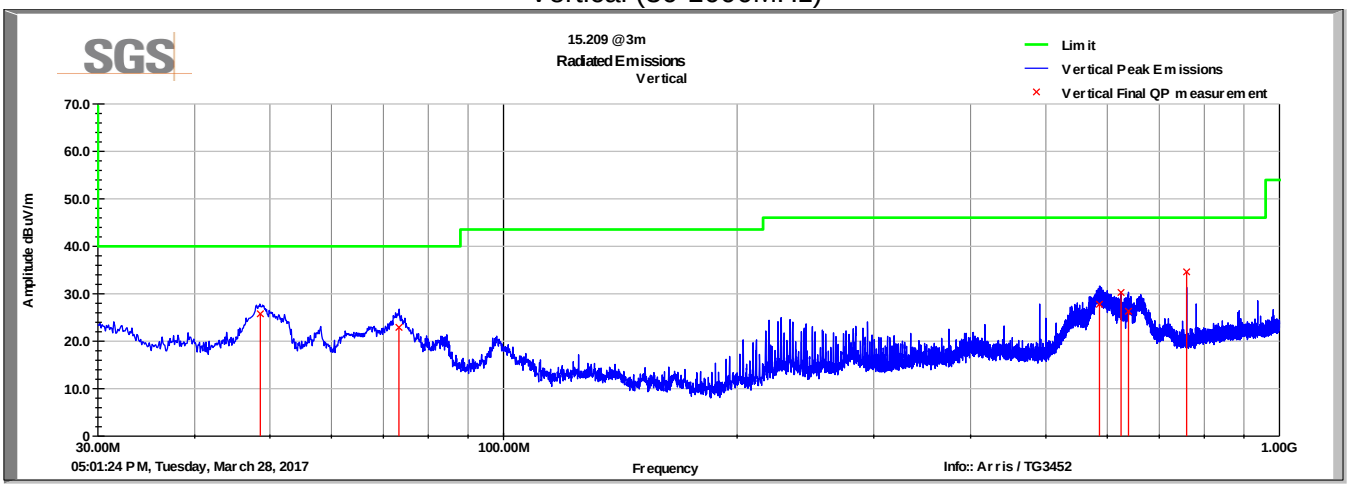
Channel 44
Vertical (18-40GHz)



Channel 44
Horizontal (18-40GHz)

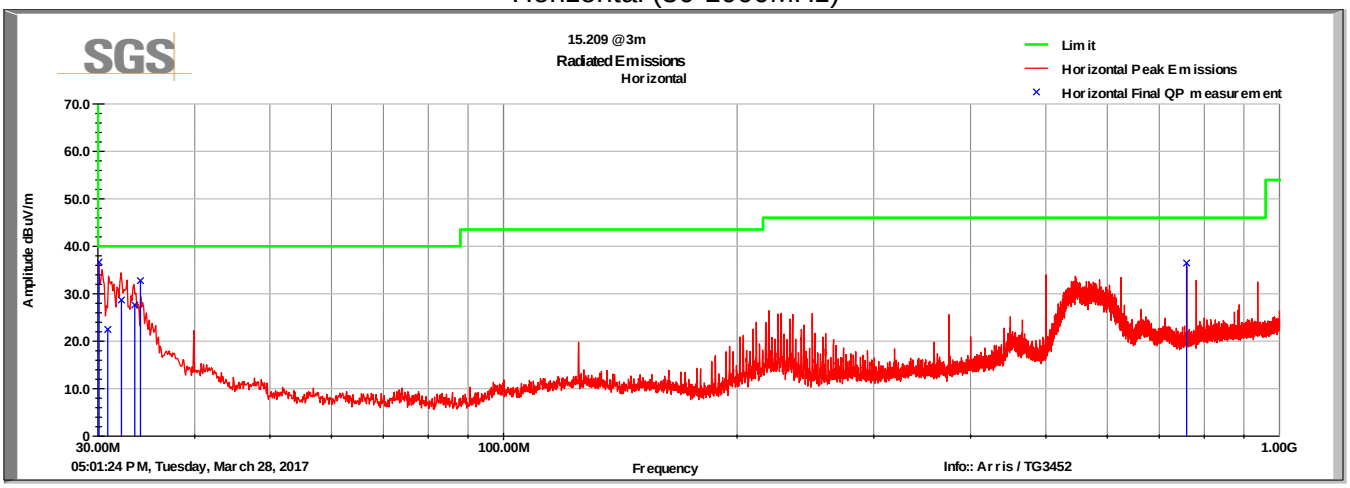


Channel 48
Vertical (30-1000MHz)



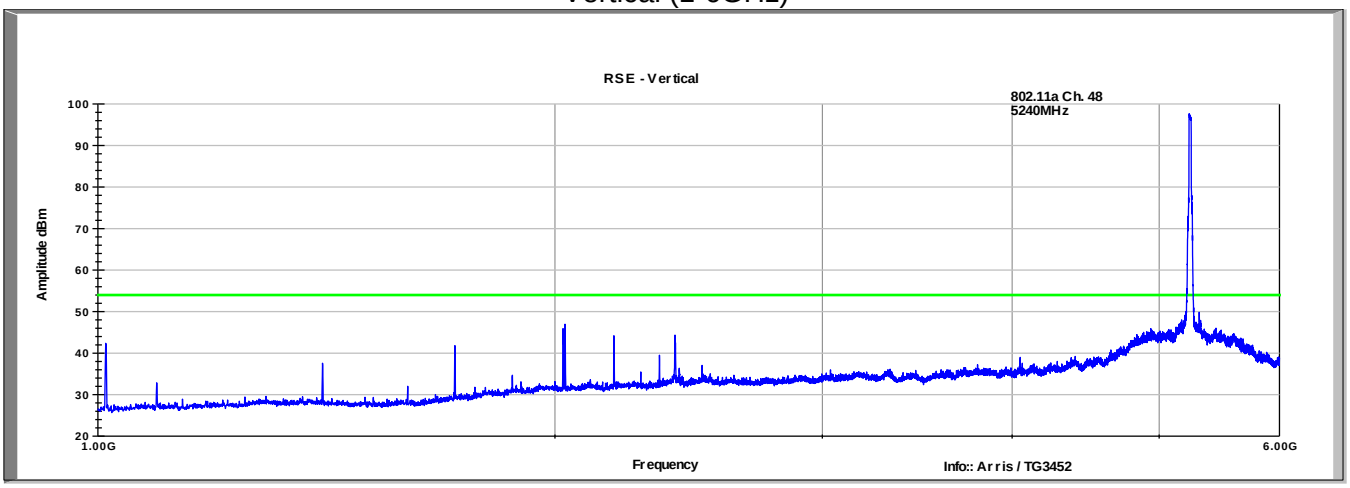
Frequency MHz	Raw QP (dBuV)	Polarity (V/H)	Azimuth (degrees)	Height (cm)	AF (dB/m)	Loss (dB)	Amp (dB)	QP Value (dBuV/m)	Limit (dBuV/m)	Margin (dB)
48.60	48.2	V	262.0	121.0	9.3	1.0	32.7	25.8	40.0	-14.2
73.33	46.7	V	90.0	119.0	8.2	1.2	33.2	22.9	40.0	-17.1
586.20	37.8	V	2.0	100.0	19.5	3.6	33.2	27.8	46.0	-18.3
625.00	39.8	V	30.0	100.0	19.9	3.8	33.2	30.3	46.0	-15.8
638.87	35.5	V	326.0	158.0	20.2	3.8	33.2	26.3	46.0	-19.7
759.37	42.4	V	336.0	150.0	21.2	4.2	33.2	34.6	46.0	-11.4
QP Value = Level + AF + CL - Amp										
Margin = QP Value - Limit										

Channel 48
Horizontal (30-1000MHz)

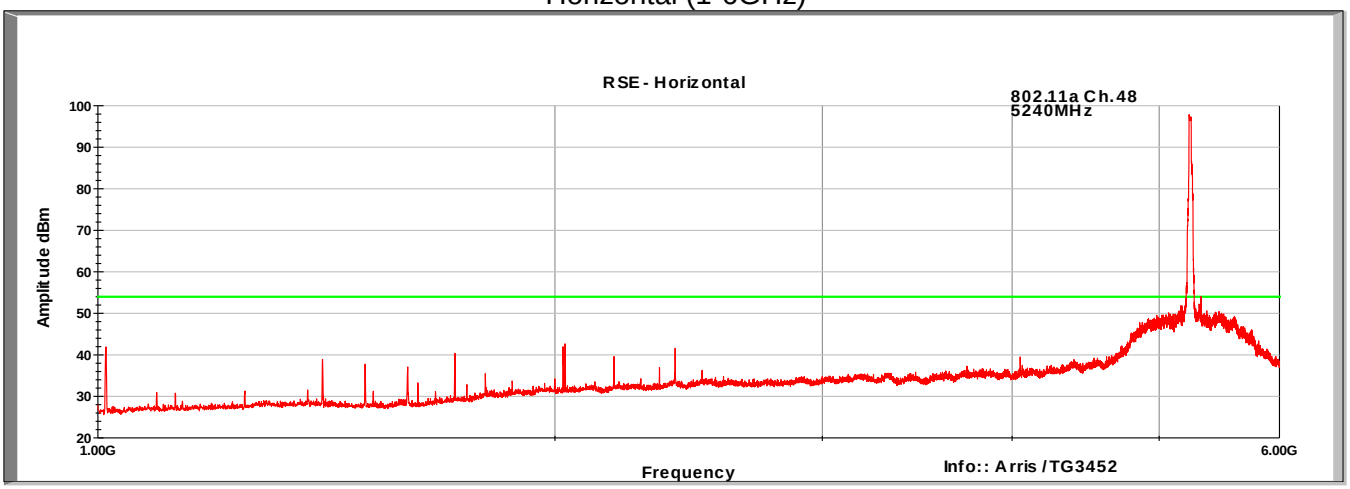


Frequency MHz	Raw QP (dBuV)	Polarity (V/H)	Azimuth (degrees)	Height (cm)	AF (dB/m)	Loss (dB)	Amp (dB)	QP Value (dBuV/m)	Limit (dBuV/m)	Margin (dB)
30.11	45.4	H	319.0	100.0	22.2	0.8	31.7	36.7	40.0	-3.3
30.90	31.8	H	0.0	205.0	21.6	0.8	31.7	22.5	40.0	-17.5
32.17	39.1	H	320.0	166.0	20.7	0.8	31.9	28.7	40.0	-11.3
33.48	39.2	H	324.0	186.0	19.6	0.8	32.0	27.6	40.0	-12.4
34.04	44.8	H	320.0	119.0	19.1	0.8	31.9	32.8	40.0	-7.2
759.38	44.2	H	46.0	110.0	21.2	4.2	33.2	36.5	46.0	-9.5
QP Value = Level + AF + CL - Amp										
Margin = QP Value - Limit										

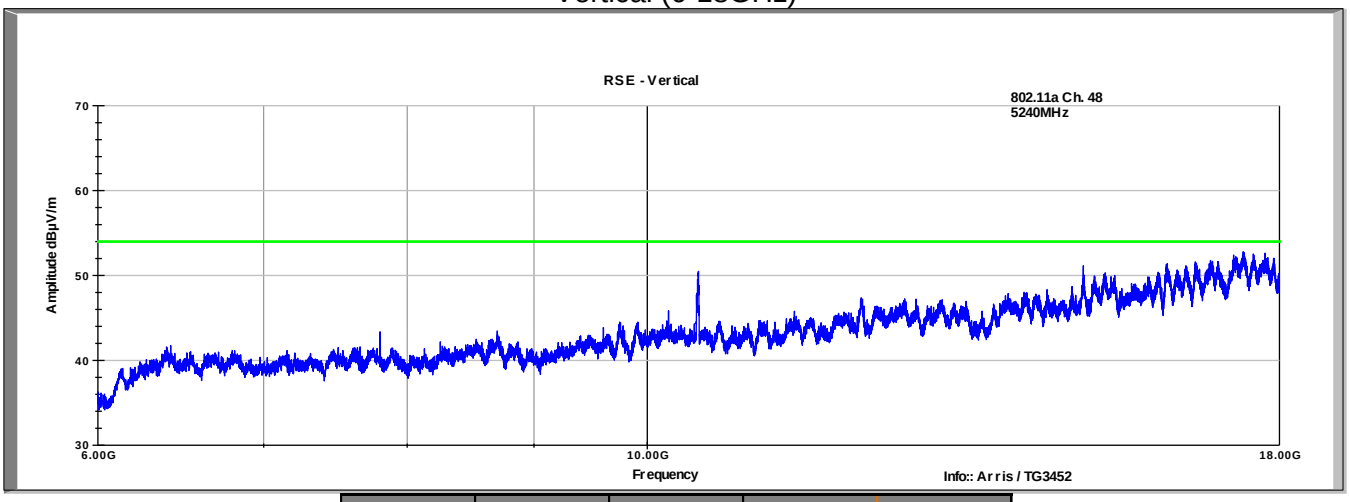
Channel 48
Vertical (1-6GHz)



Channel 48
Horizontal (1-6GHz)

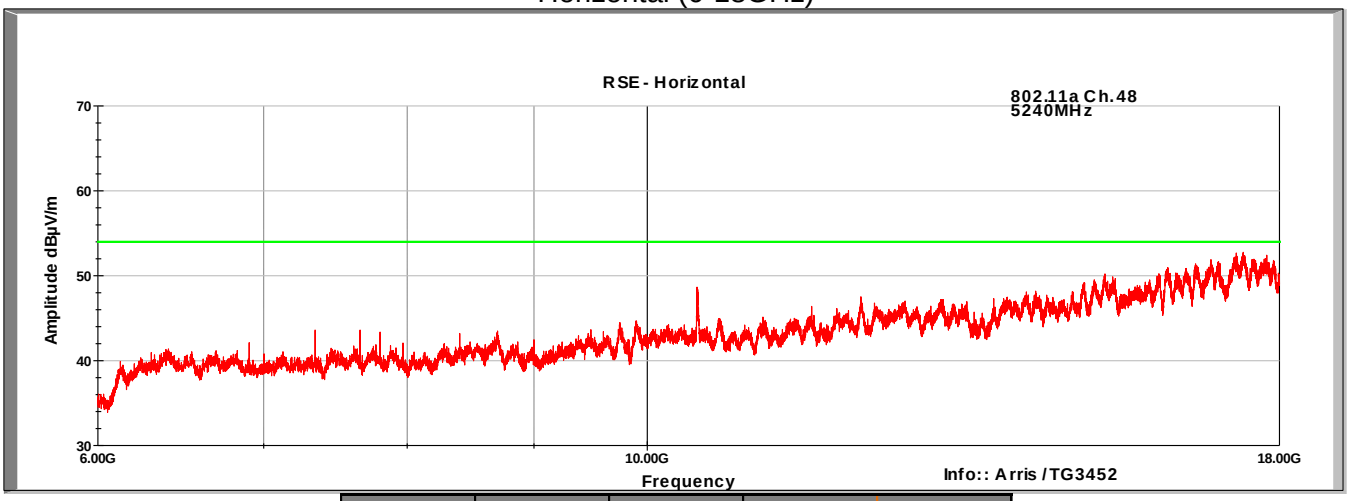


Channel 48
Vertical (6-18GHz)



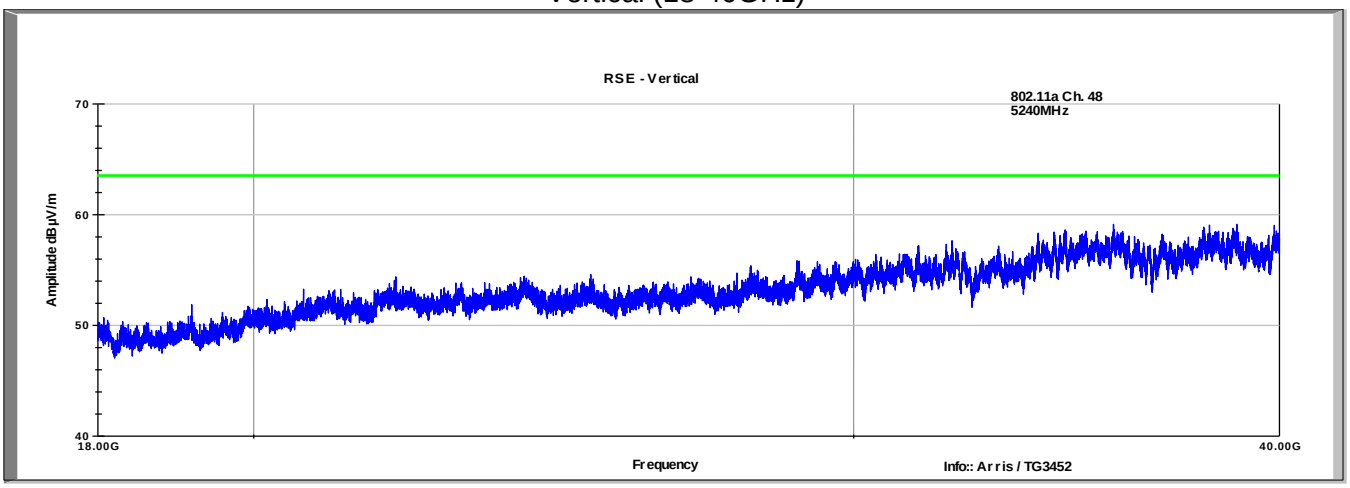
Frequency MHz	Polarity (V/H)	Peak Value (dBuV/m)	AVG Limit (dBuV/m)	Margin (dB)
10480.00	V	50.3	54.0	-3.7

Channel 48
Horizontal (6-18GHz)

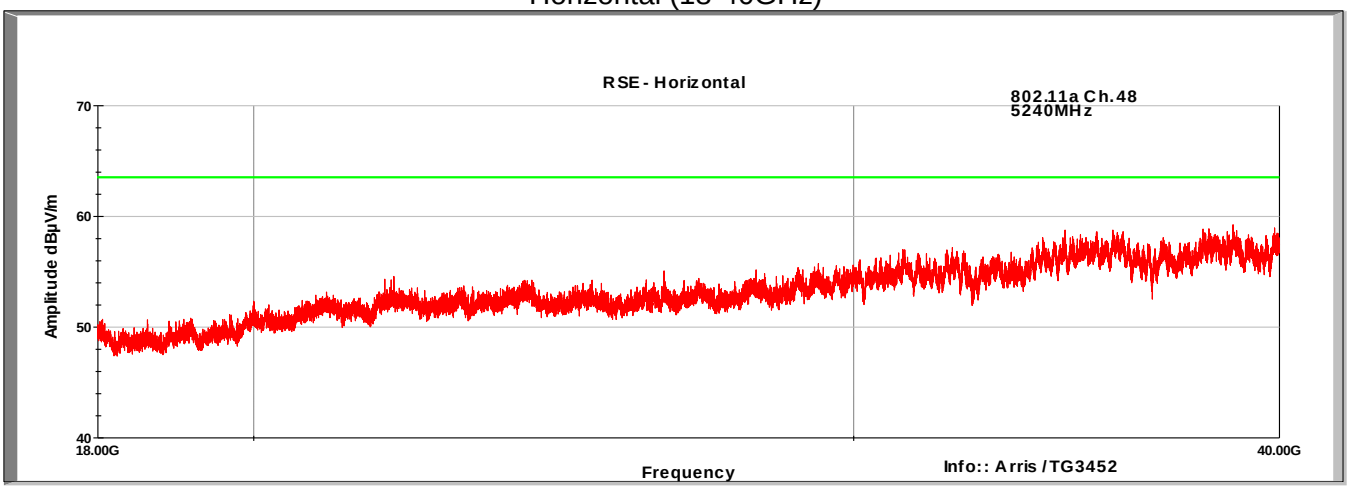


Frequency MHz	Polarity (V/H)	Peak Value (dBuV/m)	AVG Limit (dBuV/m)	Margin (dB)
10480.00	H	48.6	54.0	-5.4

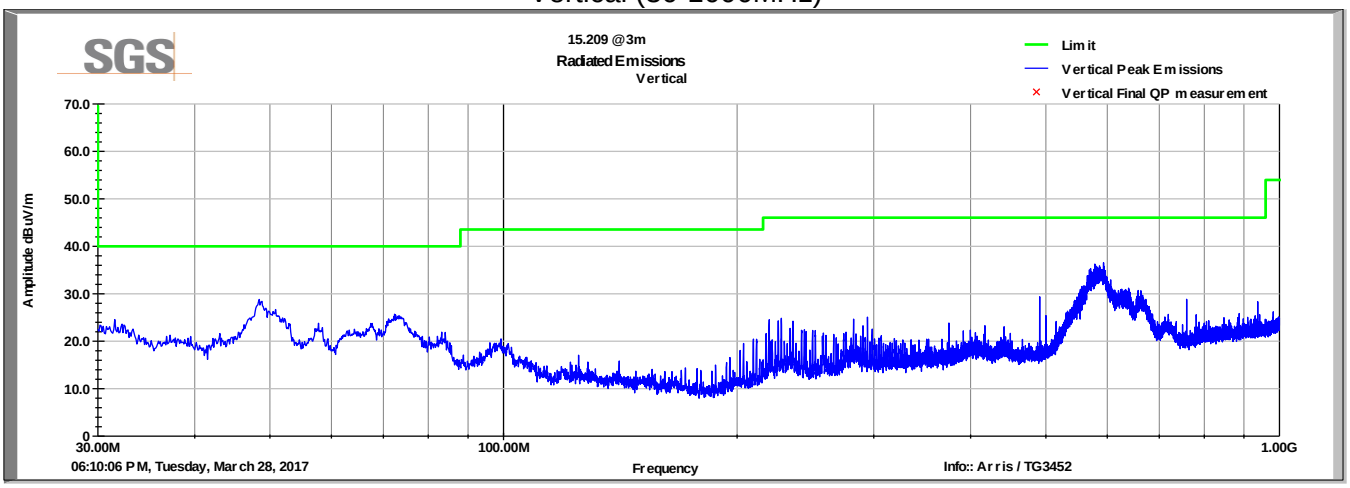
Channel 48
Vertical (18-40GHz)



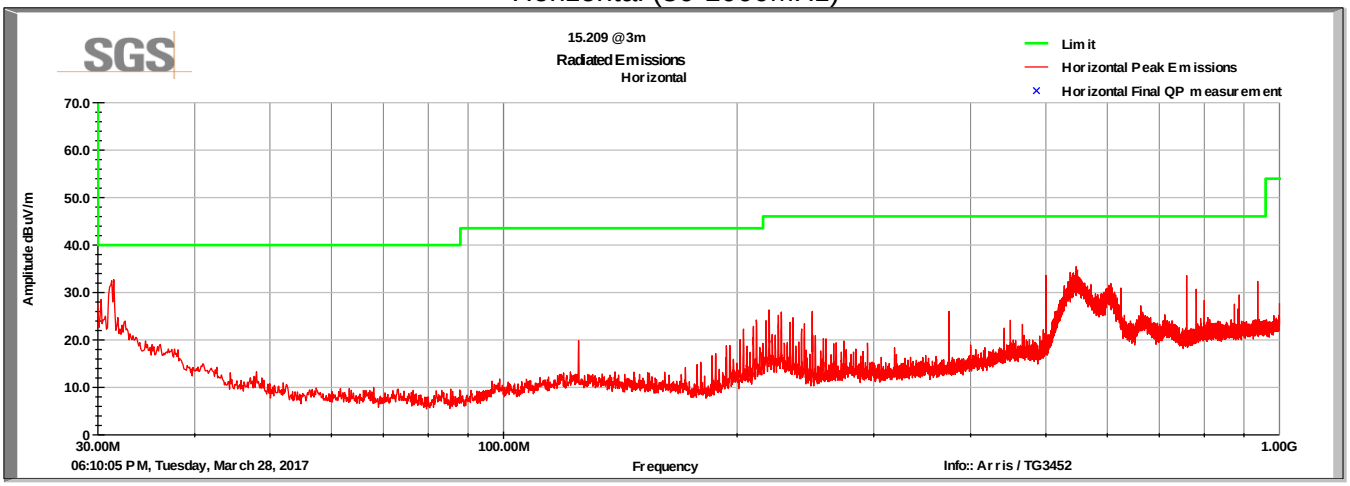
Channel 48
Horizontal (18-40GHz)



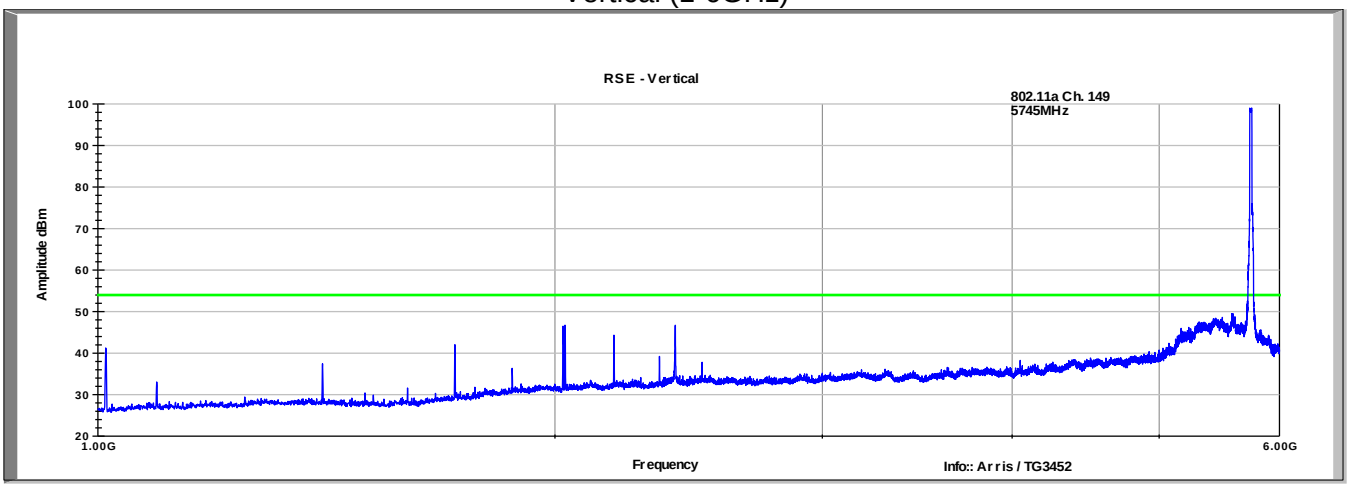
Channel 149
Vertical (30-1000MHz)



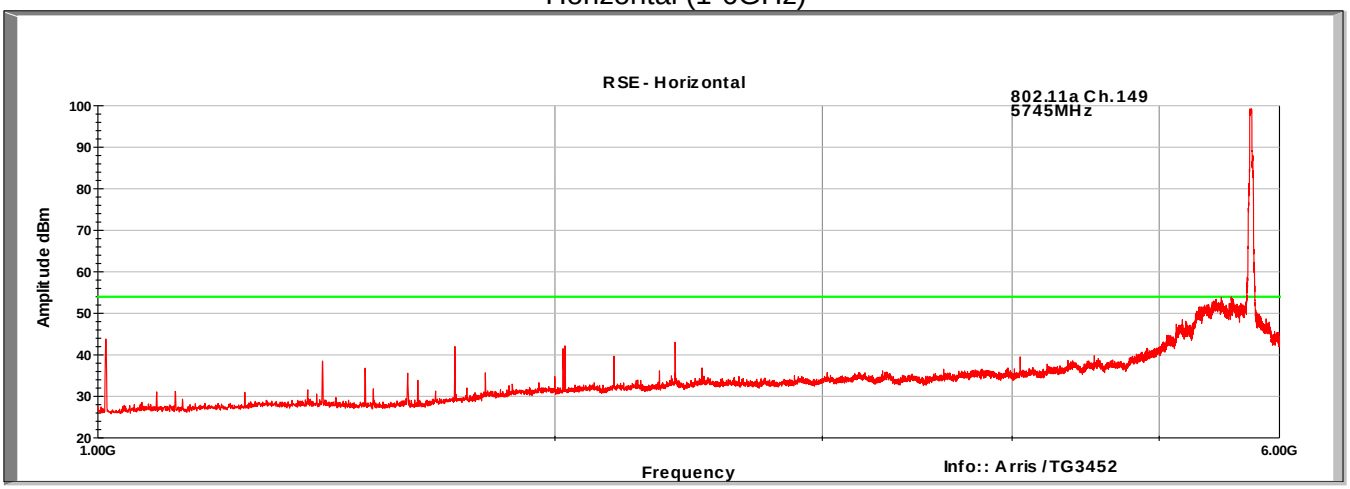
Channel 149
Horizontal (30-1000MHz)



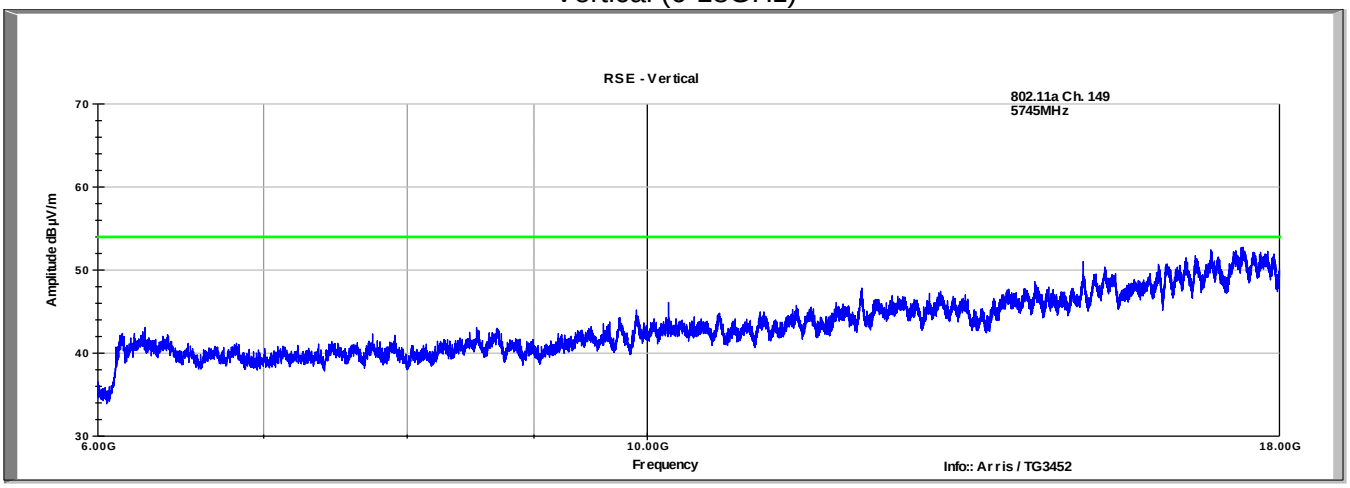
Channel 149
Vertical (1-6GHz)



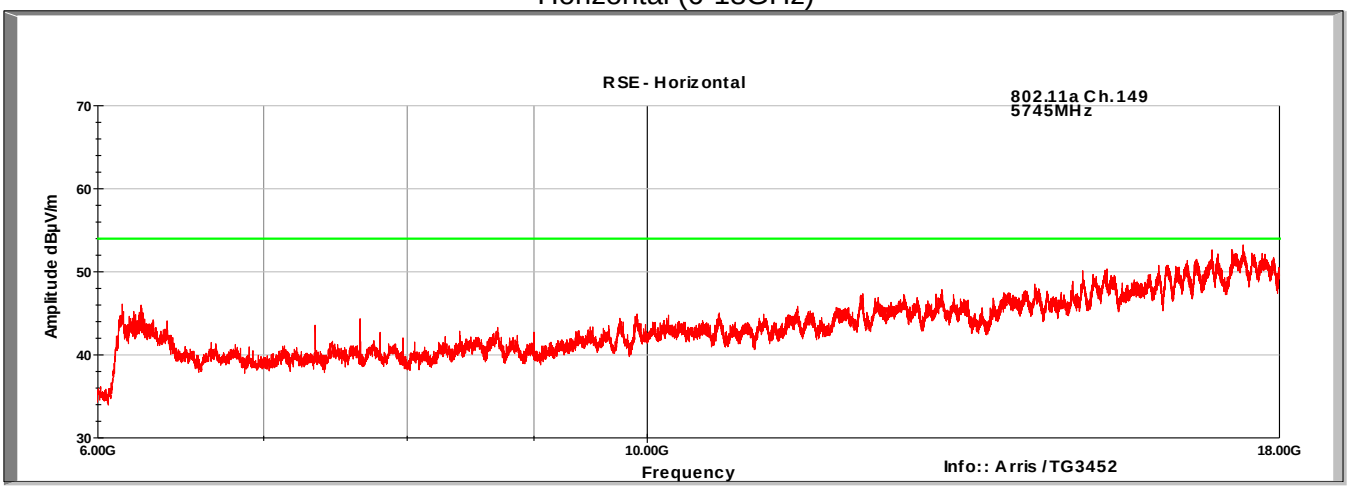
Channel 149
Horizontal (1-6GHz)



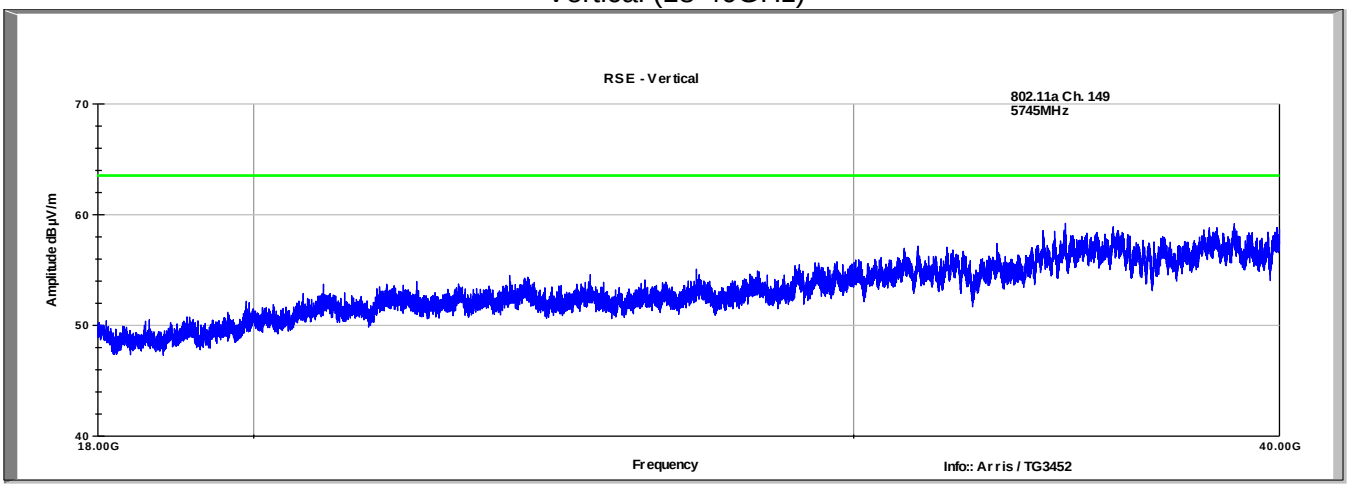
Channel 149
Vertical (6-18GHz)



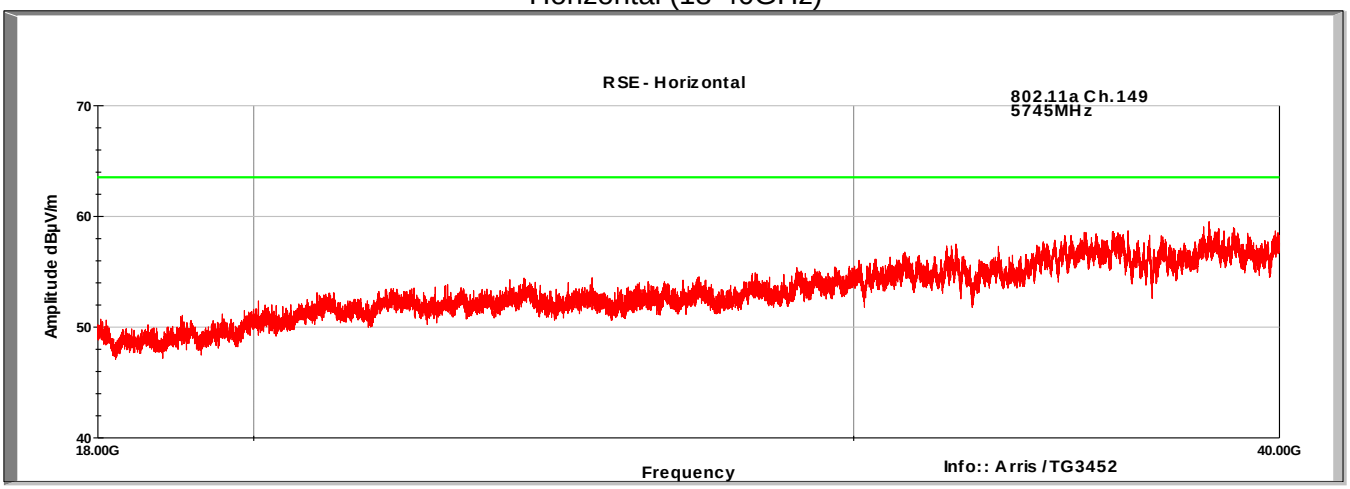
Channel 149
Horizontal (6-18GHz)



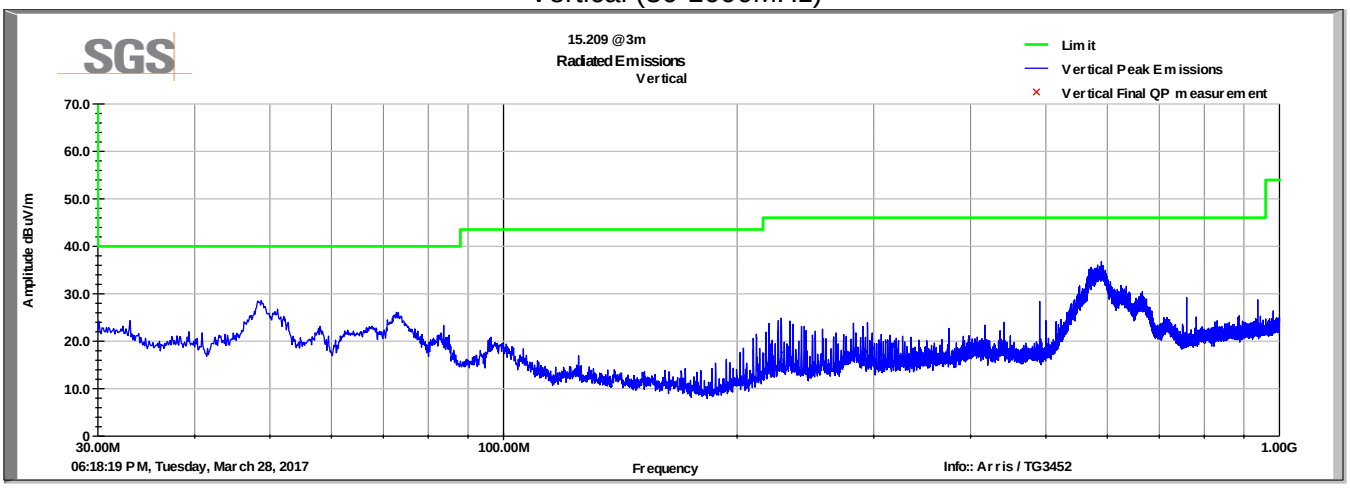
Channel 149
Vertical (18-40GHz)



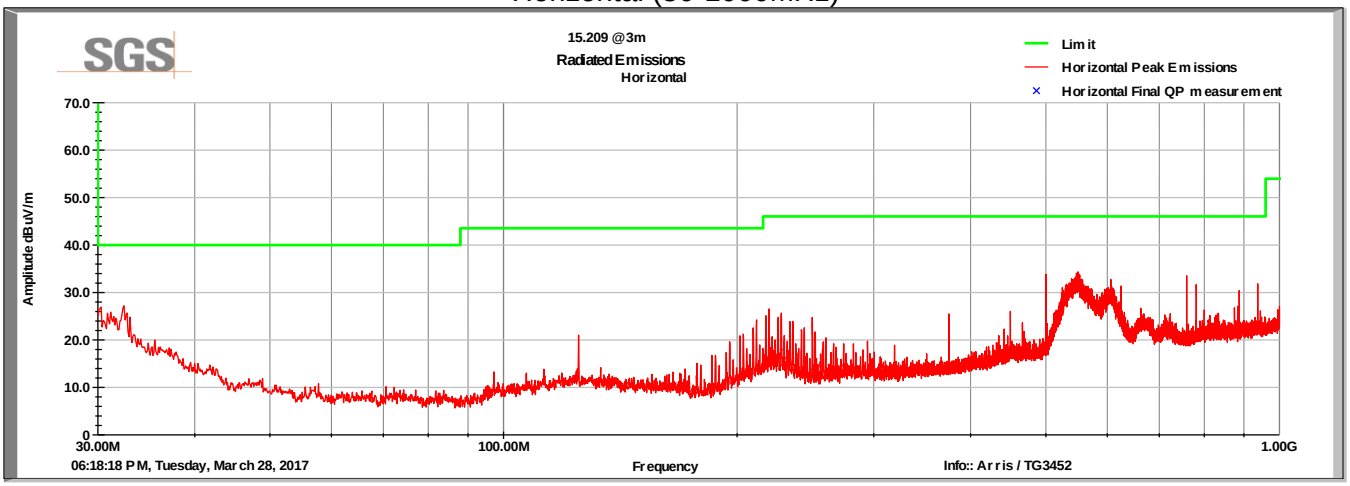
Channel 149
Horizontal (18-40GHz)



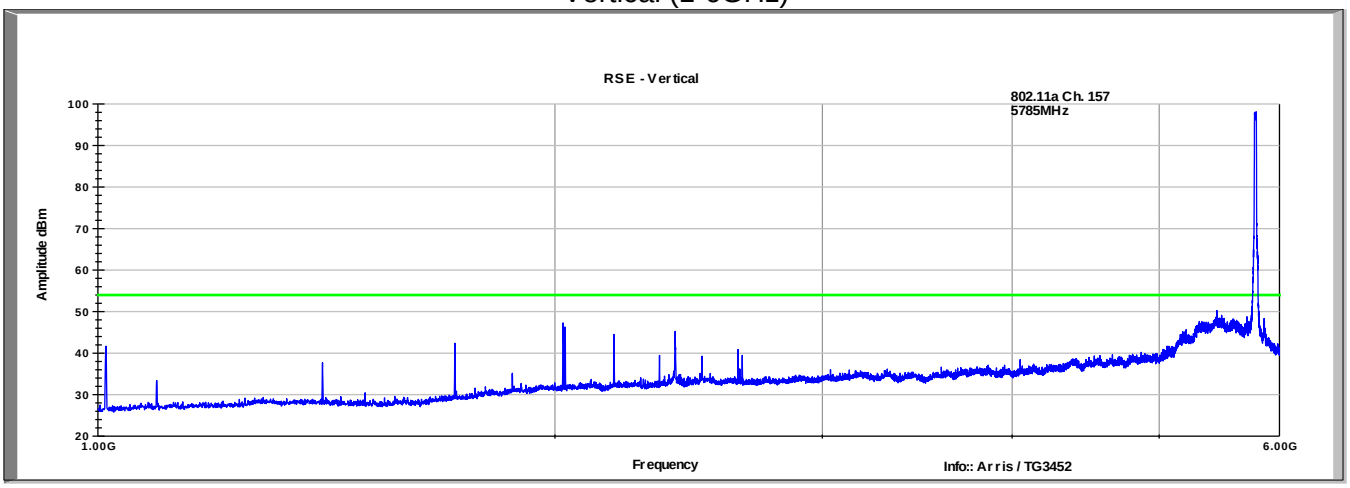
Channel 157
Vertical (30-1000MHz)



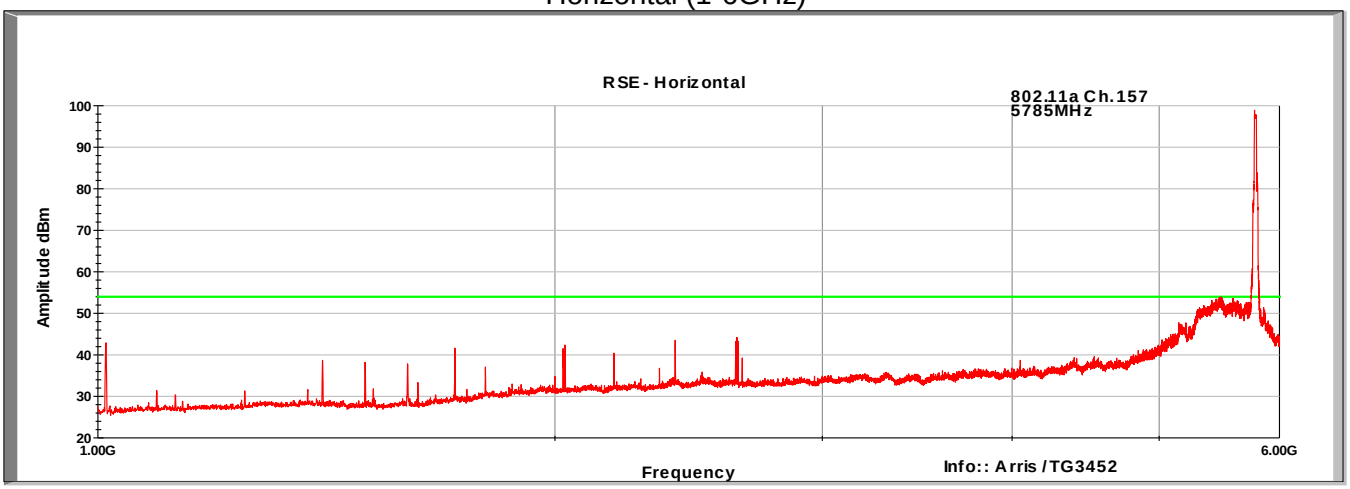
Channel 157
Horizontal (30-1000MHz)



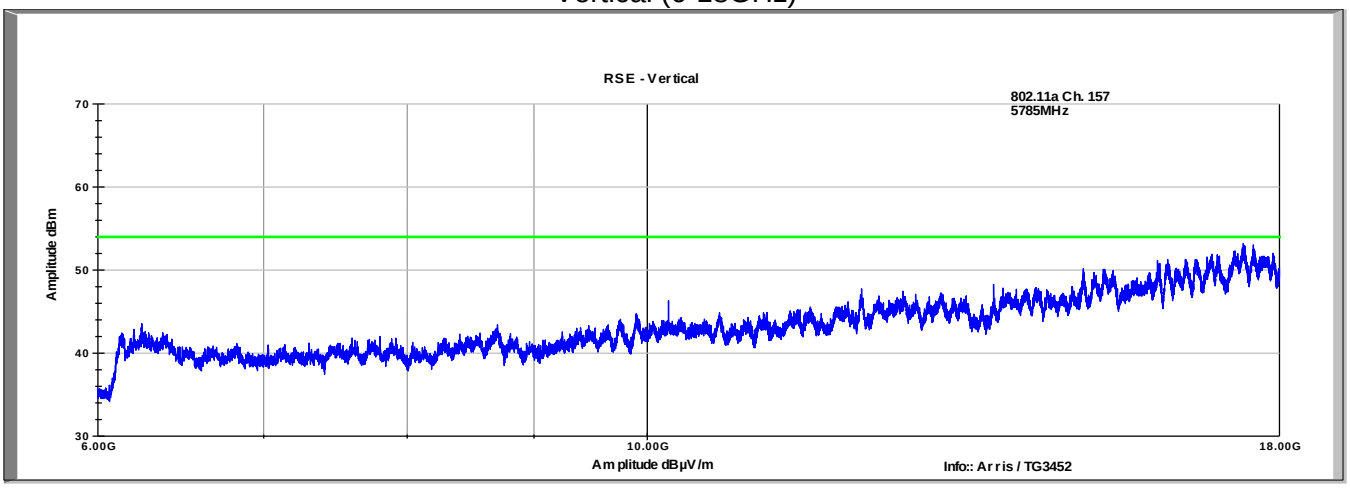
Channel 157
Vertical (1-6GHz)



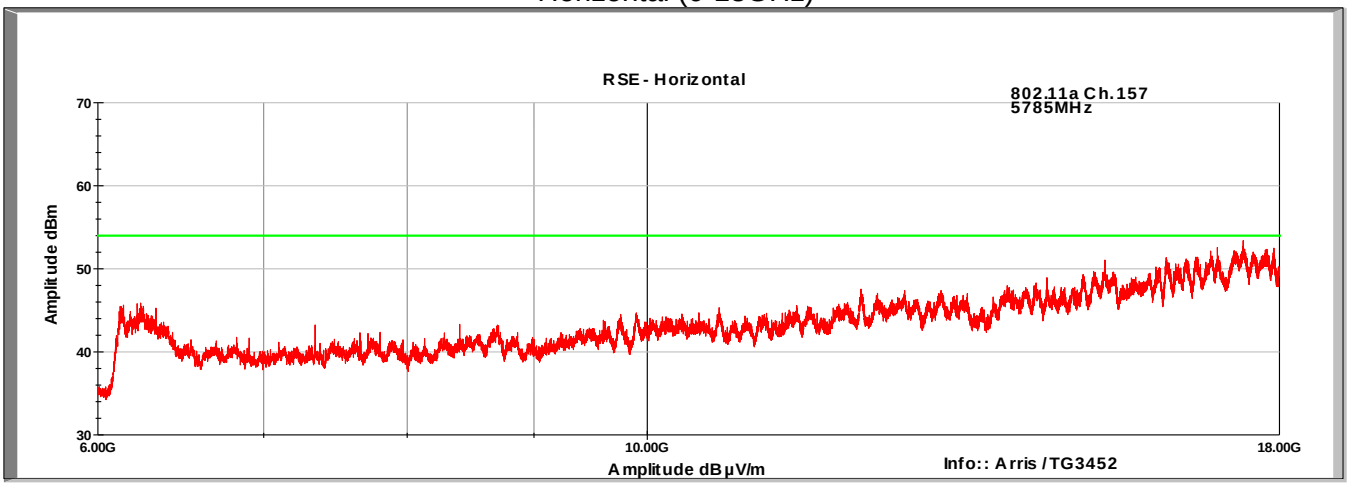
Channel 157
Horizontal (1-6GHz)



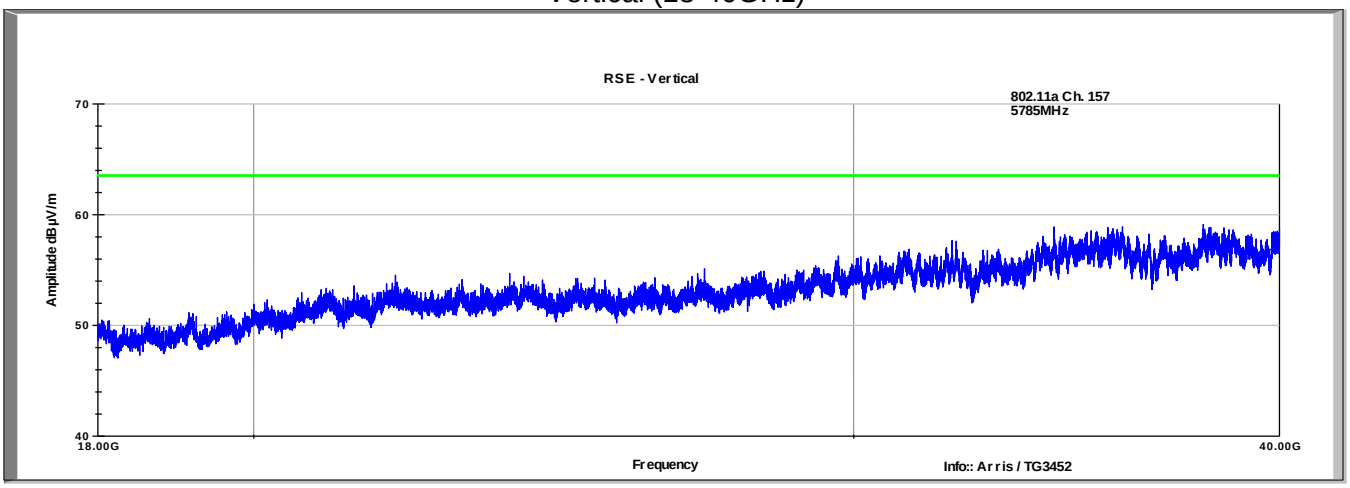
Channel 157
Vertical (6-18GHz)



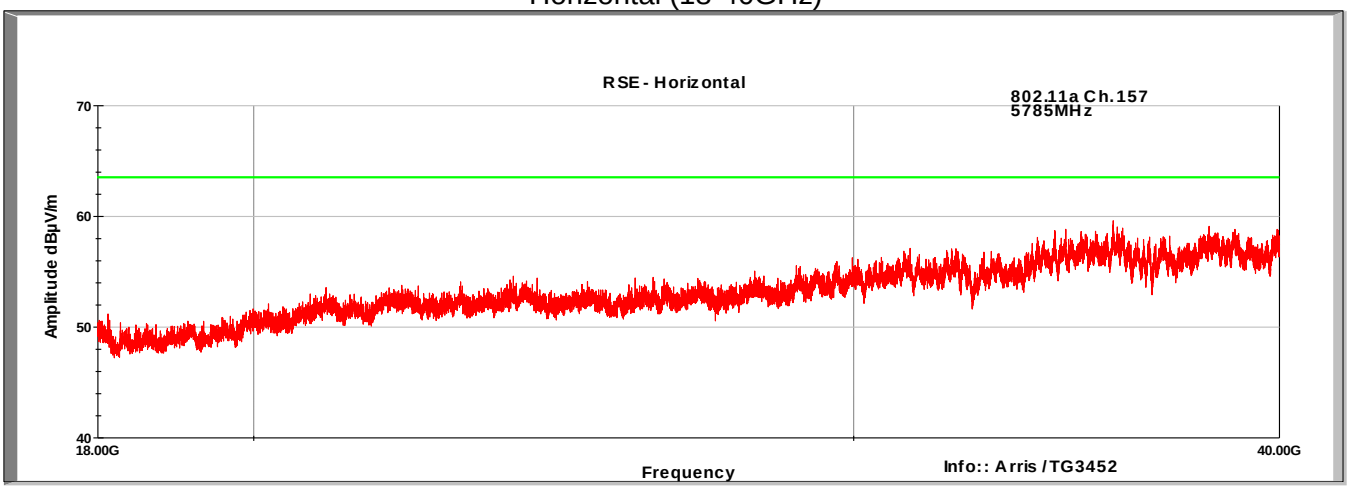
Channel 157
Horizontal (6-18GHz)



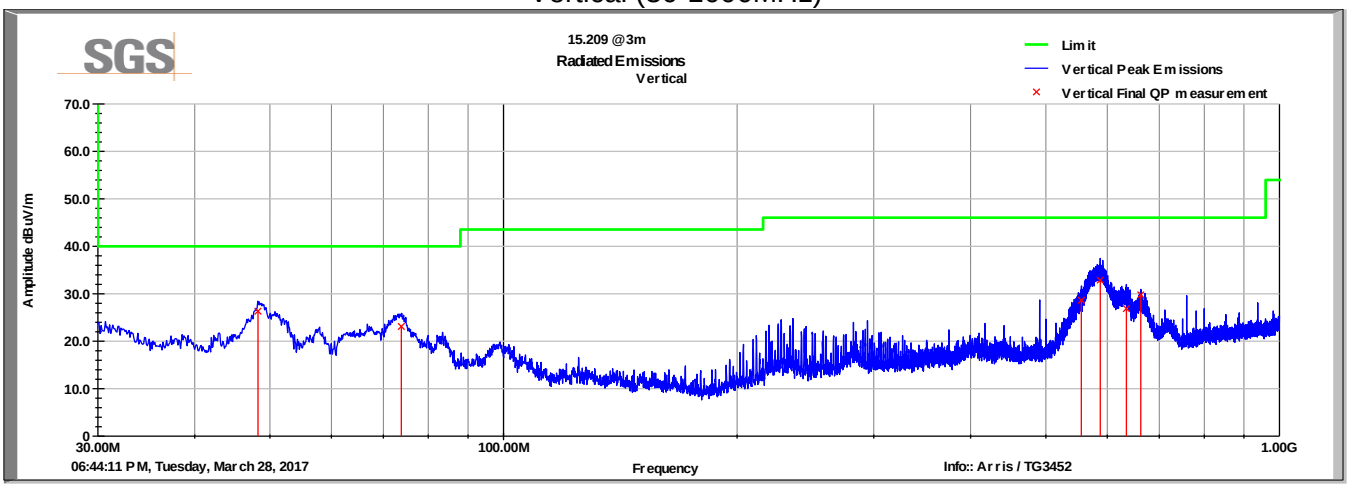
Channel 157
Vertical (18-40GHz)



Channel 157
Horizontal (18-40GHz)

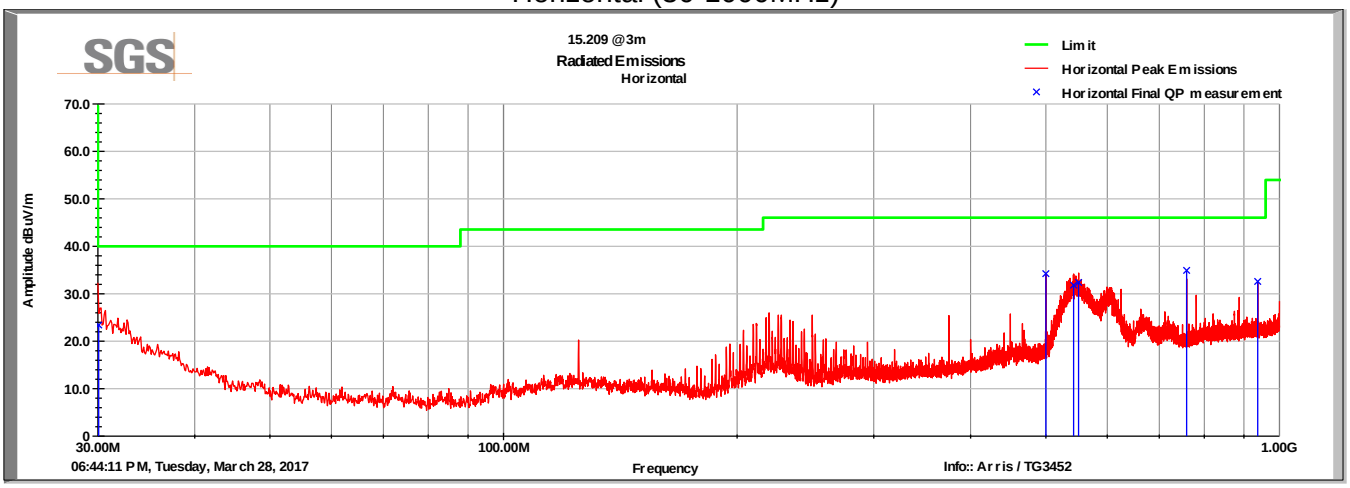


Channel 165
Vertical (30-1000MHz)



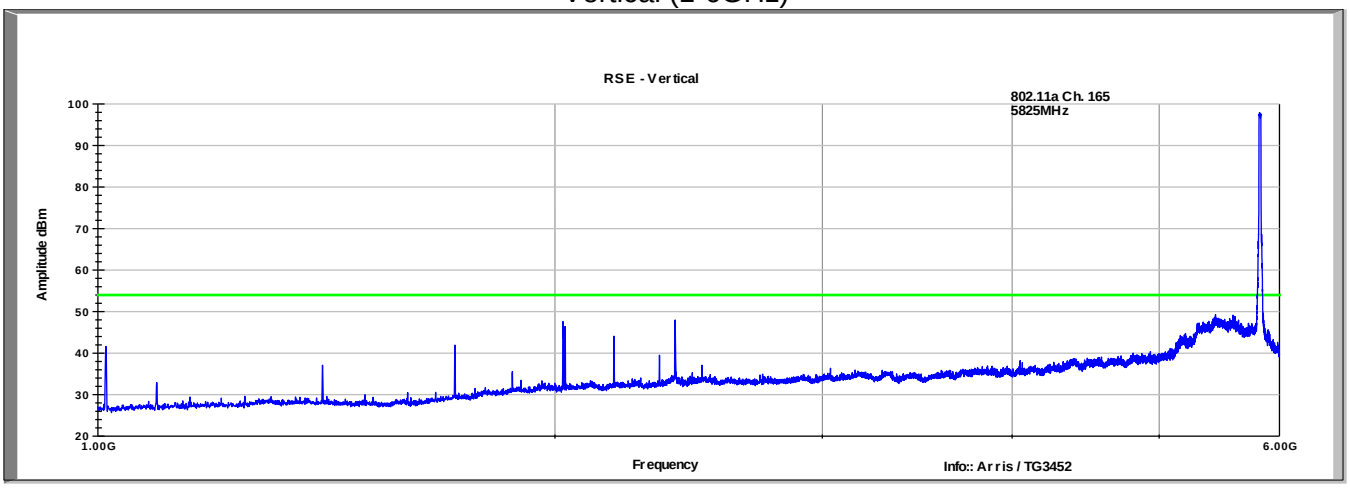
Frequency MHz	Raw QP (dBuV)	Polarity (V/H)	Azimuth (degrees)	Height (cm)	AF (dB/m)	Loss (dB)	Amp (dB)	QP Value (dBuV/m)	Limit (dBuV/m)	Margin (dB)
48.26	48.6	V	82.0	100.0	9.4	1.0	32.7	26.3	40.0	-13.7
73.85	46.8	V	212.0	100.0	8.2	1.2	33.2	23.1	40.0	-16.9
555.64	39.5	V	217.0	100.0	18.8	3.5	33.2	28.6	46.0	-17.4
587.67	42.9	V	186.0	177.0	19.5	3.6	33.2	32.9	46.0	-13.1
635.05	36.2	V	167.0	159.0	20.1	3.8	33.2	26.9	46.0	-19.2
662.73	38.6	V	198.0	166.0	20.5	3.9	33.2	29.8	46.0	-16.2
QP Value = Level + AF + CL - Amp										
Margin = QP Value - Limit										

Channel 165
Horizontal (30-1000MHz)

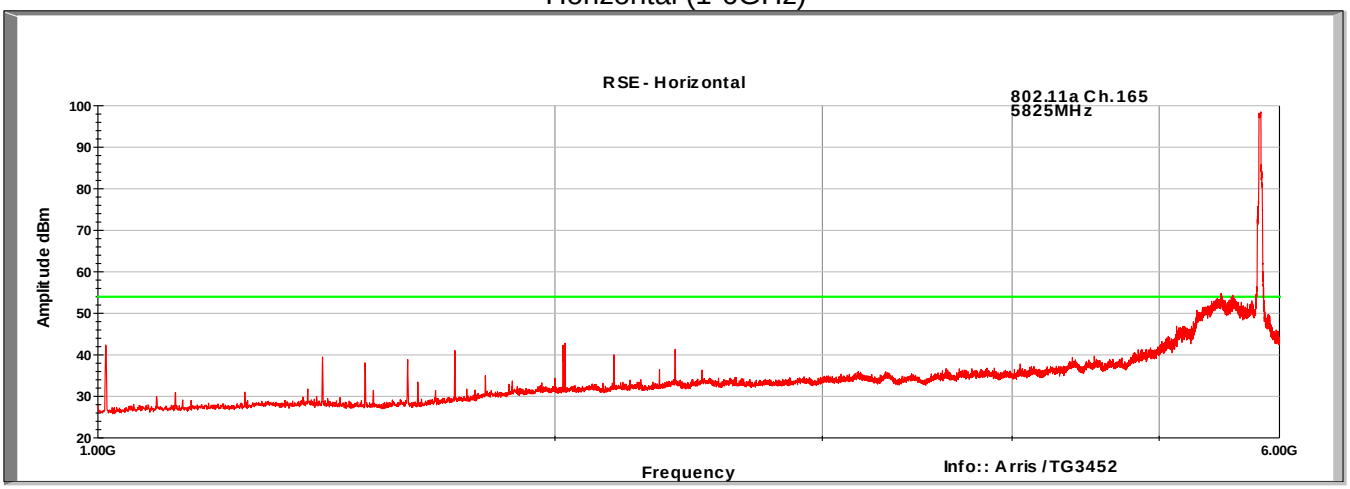


Frequency MHz	Raw QP (dBuV)	Polarity (V/H)	Azimuth (degrees)	Height (cm)	AF (dB/m)	Loss (dB)	Amp (dB)	QP Value (dBuV/m)	Limit (dBuV/m)	Margin (dB)
30.08	32.1	H	303.0	175.0	22.2	0.8	31.7	23.4	40.0	-16.6
500.00	46.0	H	265.0	157.0	18.1	3.3	33.3	34.2	46.0	-11.8
543.01	43.0	H	75.0	157.0	18.6	3.5	33.3	31.8	46.0	-14.2
551.00	43.4	H	90.0	167.0	18.7	3.5	33.3	32.4	46.0	-13.6
759.38	42.7	H	298.0	204.0	21.2	4.2	33.2	34.9	46.0	-11.1
937.50	38.0	H	40.0	335.0	23.2	4.7	33.2	32.6	46.0	-13.4
QP Value = Level + AF + CL - Amp										
Margin = QP Value - Limit										

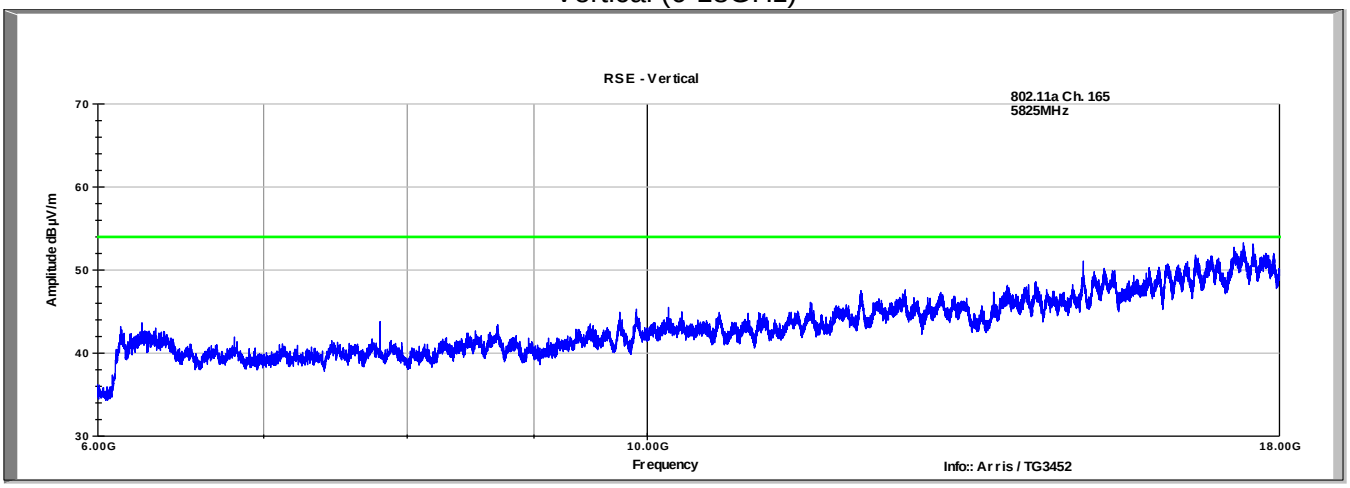
Channel 165
Vertical (1-6GHz)



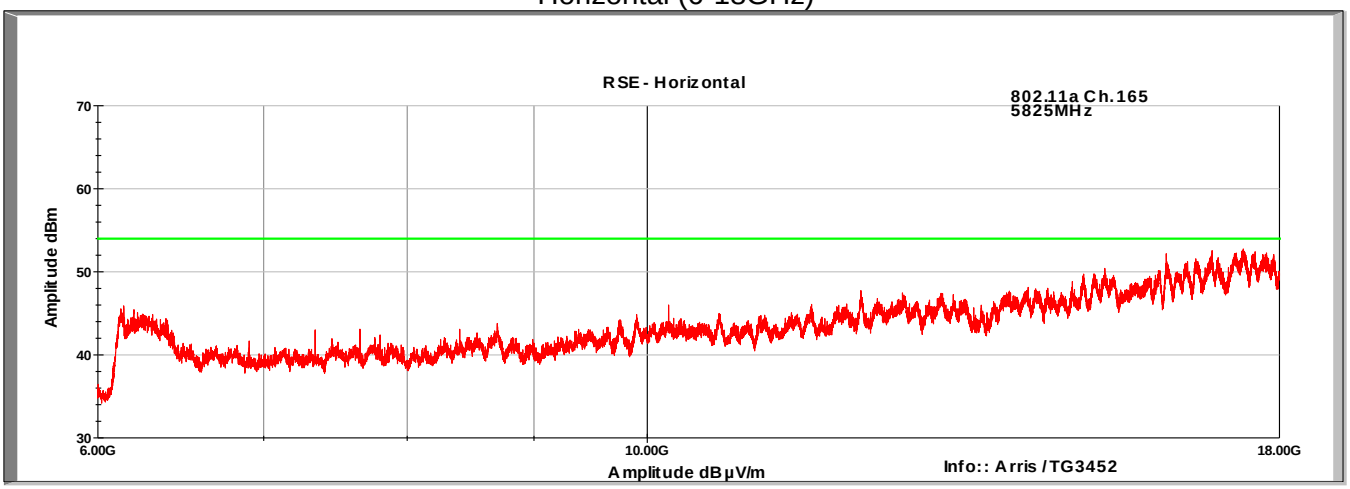
Channel 165
Horizontal (1-6GHz)



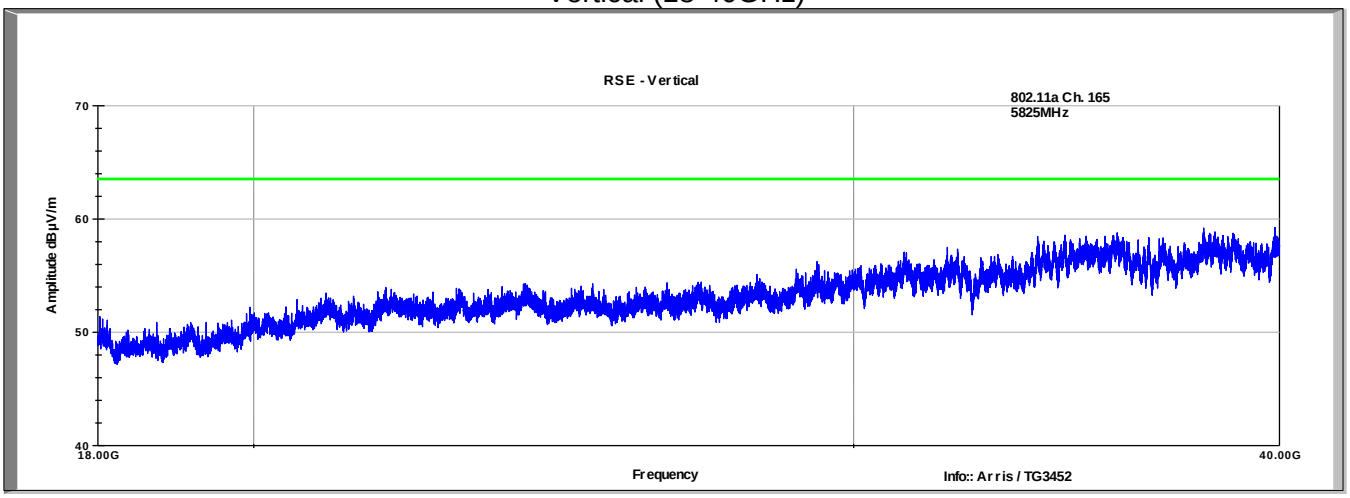
Channel 165
Vertical (6-18GHz)



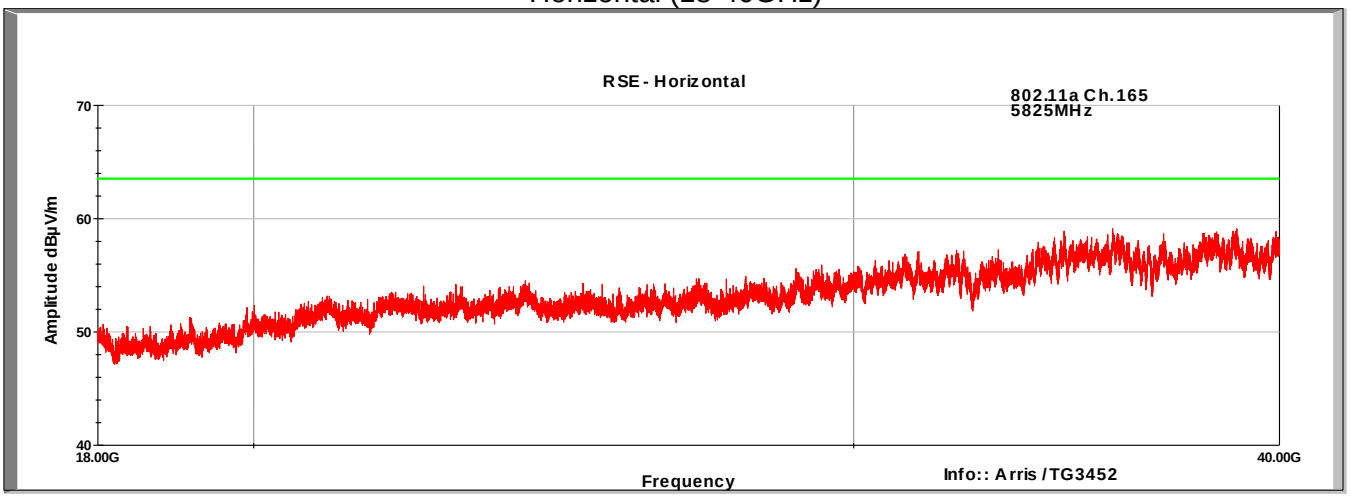
Channel 165
Horizontal (6-18GHz)



Channel 165
Vertical (18-40GHz)



Channel 165
Horizontal (18-40GHz)



7 Conducted Emissions

7.1 *Test Result*

Test Description	Basic Standards	Test Result
Conducted Emissions, Class B	ANSI C63.4:2014	Compliant

7.2 *Test Method*

With the receivers resolution bandwidth was set to 9 kHz the initial preliminary exploratory scans were performed over the measuring frequency range (0.15MHz to 30MHz) using a max hold mode incorporating a Peak detector and Average detector and using the TILE! software. The final test data was measured using a Quasi-Peak detector and Average detector and compared against the limits indicated in the table below.

Frequency Range	Class A Limits (dBuV)	Class B Limits (dBuV) CISPR
0.15 to 0.5 MHz	Avg 66 QP 79	Avg 56 to 46 QP 66 to 56
0.5 to 5 MHz	Avg 60 QP 73	Avg 46 Pk 56
5 to 30 MHz	Avg 60 QP 73	Avg 50 Pk 60

7.3 *Test Site*

SGS EMC Laboratory, Suwanee, GA

Environmental Conditions
Temperature: 23.5°C
Relative Humidity: 42.8%

7.4 *Test Equipment*

Test Date: 13-Apr-2017 Tester: FRN

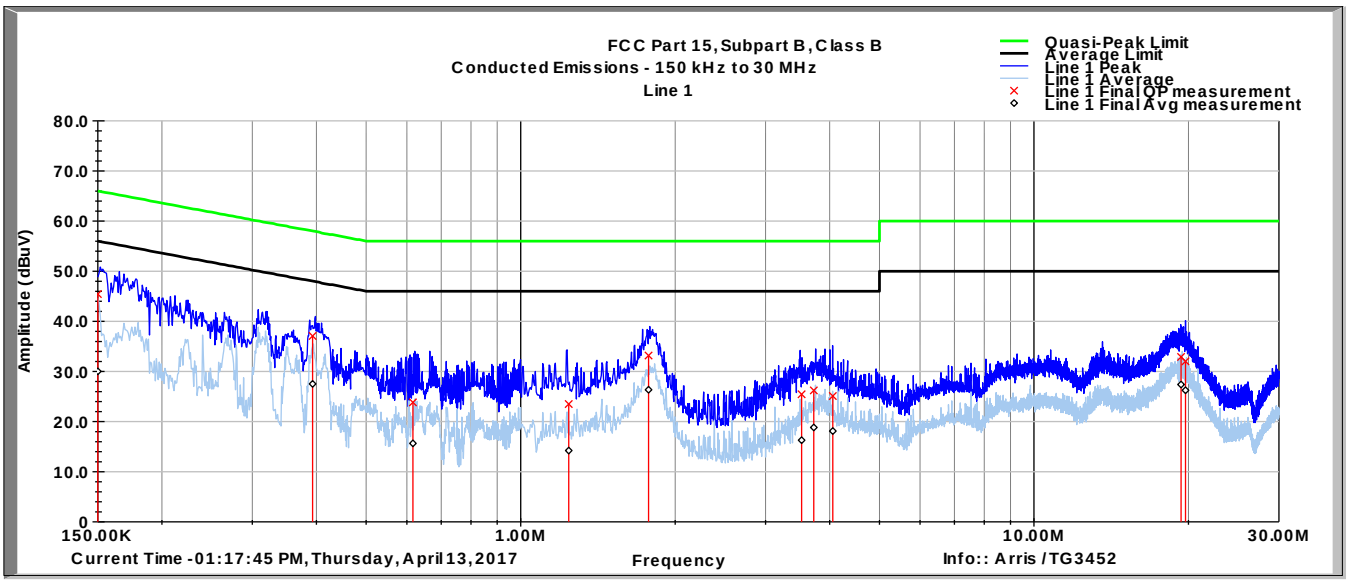
Equipment	Model	Manufacturer	Asset Number	Cal Due Date
EMI TEST RECEIVER	ESU8	ROHDE & SCHWARZ	B085759	21-Jul-2017
LINE IMPEDANCE STABILIZATION NETWORK	NNB 51	TESEQ	B087573	16-Nov-2017
RF CABLE	SF106	HUBER & SUHNER	B079661	29-Jul-2017

Note: The equipment calibration period is 1 year.

Software:
“Conducted Emissions” TILE! profile dated Dec 2015

7.5 *Test Data*

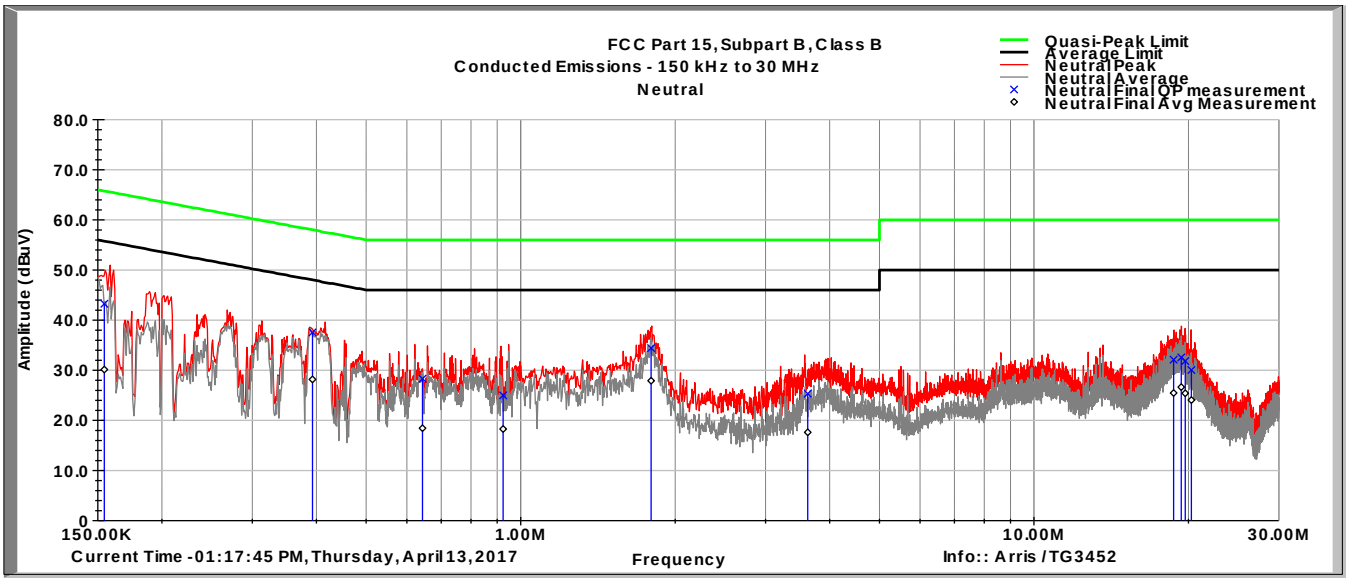
Line 1 Conducted Emissions Plot 150-30MHz



Line 1 Conducted Emissions Data 150-30MHz

Frequency MHz	QP Value dBuV	QP Limit dBuV	QP Margin dB	Avg Value dBuV	Avg Limit dBuV	Avg Margin dB
0.150	45.4	66.0	-20.6	30.0	56.0	-26.0
0.393	37.1	58.0	-21.0	27.5	48.0	-20.5
0.617	23.8	56.0	-32.2	15.6	46.0	-30.4
1.240	23.5	56.0	-32.5	14.2	46.0	-31.8
1.775	33.2	56.0	-22.8	26.3	46.0	-19.7
3.526	25.4	56.0	-30.6	16.3	46.0	-29.7
3.724	26.2	56.0	-29.8	18.8	46.0	-27.2
4.056	25.1	56.0	-30.9	18.1	46.0	-27.9
19.342	32.9	60.0	-27.1	27.4	50.0	-22.6
19.735	32.0	60.0	-28.0	26.2	50.0	-23.8

Neutral Conducted Emissions Plot 150-30MHz



Neutral Conducted Emissions Data 150-30MHz

Frequency MHz	QP Value dBuV	QP Limit dBuV	QP Margin dB	Avg Value dBuV	Avg Limit dBuV	Avg Margin dB
0.155	43.2	65.7	-22.5	30.1	55.7	-25.6
0.393	37.5	58.0	-20.5	28.2	48.0	-19.9
0.644	28.3	56.0	-27.7	18.4	46.0	-27.6
0.924	25.0	56.0	-31.0	18.3	46.0	-27.7
1.795	34.4	56.0	-21.6	27.9	46.0	-18.1
3.625	25.3	56.0	-30.7	17.6	46.0	-28.4
18.712	32.1	60.0	-27.9	25.5	50.0	-24.5
19.366	32.6	60.0	-27.4	26.6	50.0	-23.4
19.715	31.8	60.0	-28.2	25.4	50.0	-24.6
20.258	30.1	60.0	-29.9	24.1	50.0	-25.9

8 Revision History

Revision Level	Description of changes	Revision Date
--	Initial release	17 April 2017