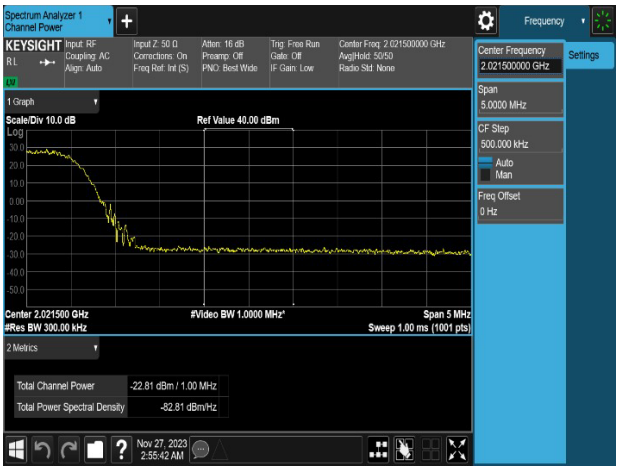
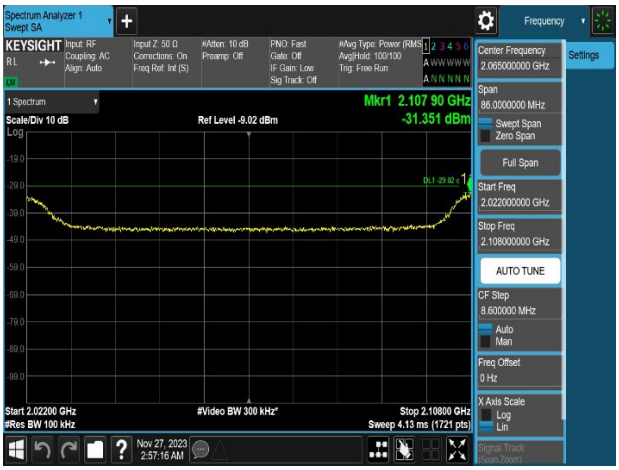
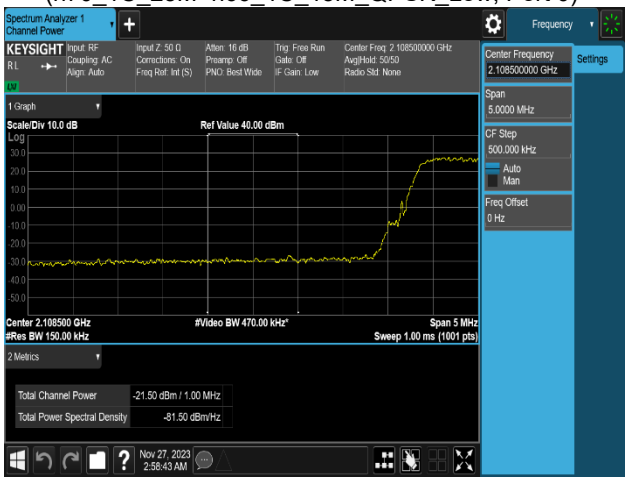


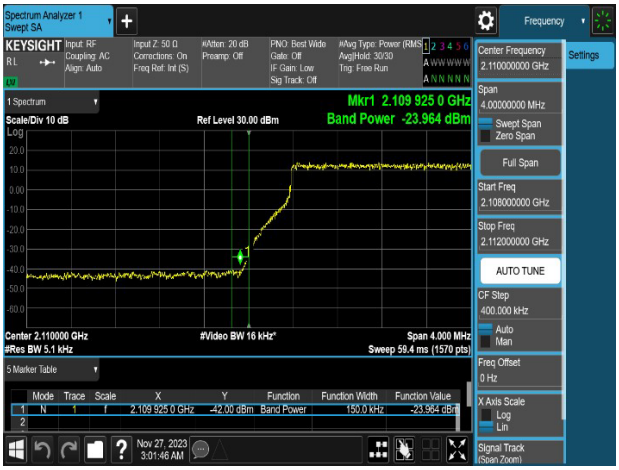
Plot 8-109. Conducted Spurious Emission Plot
2.021 GHz to 2.022 GHz
(n70_1C_25M+n66_1C_15M_QPSK_Low, Port 0)



Plot 8-110. Conducted Spurious Emission Plot
2.022 GHz to 2.108 GHz
(n70_1C_25M+n66_1C_15M_QPSK_Low, Port 0)

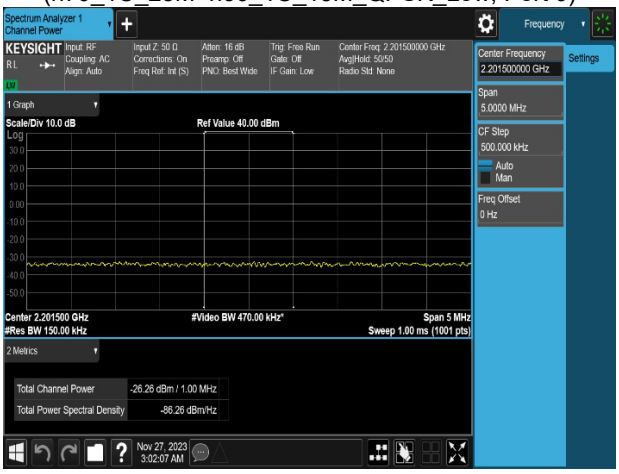


Plot 8-111. Conducted Spurious Emission Plot
2.108 GHz to 2.109 GHz
(n70_1C_25M+n66_1C_15M_QPSK_Low, Port 0)



Plot 8-112. Conducted Spurious Emission Plot
2.109 GHz to 2.110 GHz
(n70_1C_25M+n66_1C_15M_QPSK_Low, Port 0)

Plot 8-113. Conducted Spurious Emission Plot
2.200 GHz to 2.201 GHz
(n70_1C_25M+n66_1C_15M_QPSK_Low, Port 0)



Plot 8-114. Conducted Spurious Emission Plot
2.201 GHz to 2.202 GHz
(n70_1C_25M+n66_1C_15M_QPSK_Low, Port 0)

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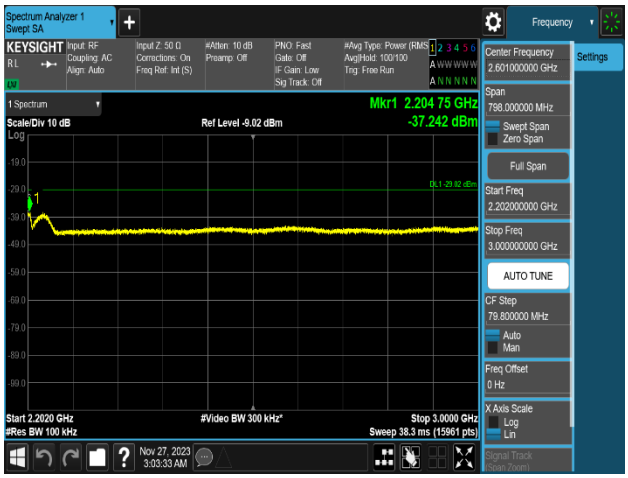
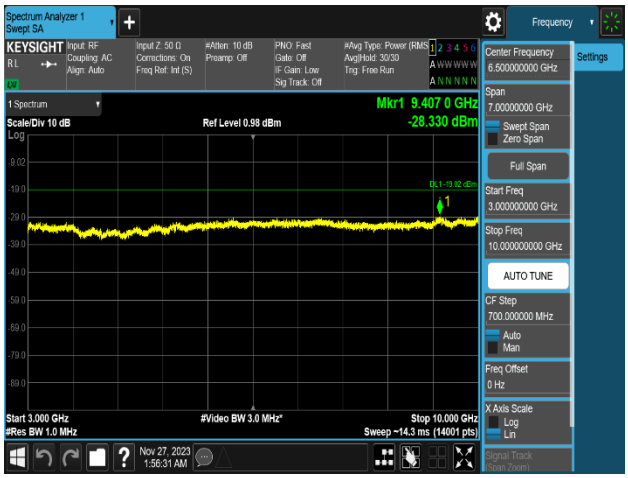
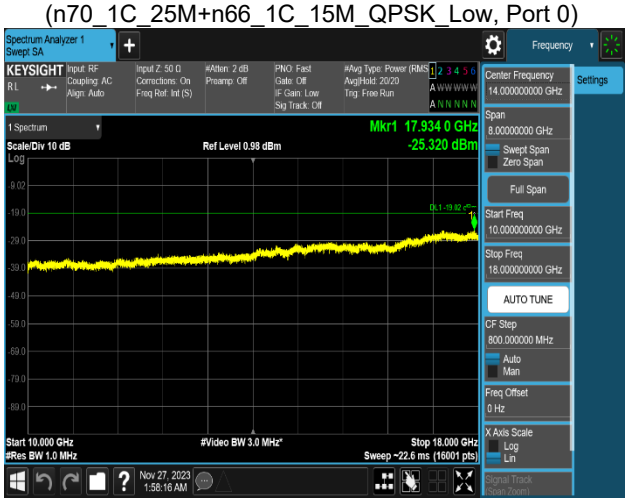


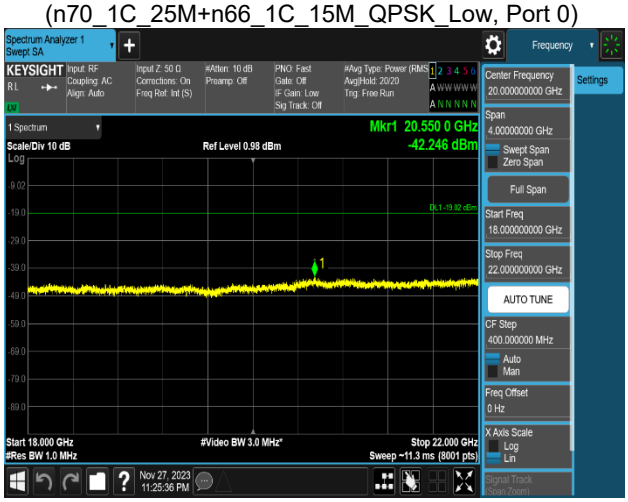
Plot 8-115. Conducted Spurious Emission Plot
2.202 GHz to 3 GHz
(n70_1C_25M+n66_1C_15M_QPSK_Low, Port 0)



Plot 8-116. Conducted Spurious Emission Plot
3 GHz to 10 GHz
(n70_1C_25M+n66_1C_15M_QPSK_Low, Port 0)



Plot 8-117. Conducted Spurious Emission Plot
10 GHz to 18 GHz
(n70_1C_25M+n66_1C_15M_QPSK_Low, Port 0)



Plot 8-118. Conducted Spurious Emission Plot
18 GHz to 22 GHz
(n70_1C_25M+n66_1C_15M_QPSK_Low, Port 0)

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8.7 Radiated spurious emission

Test Overview

Radiated spurious emissions measurements are performed using the field strength method described in ANSI C63.26-2015 with the EUT transmitting into an integral antenna. Measurements on signals operating below 1GHz are performed using vertically and horizontally polarized broadband tri-log antennas. Measurements on signals operating above 1GHz are performed using vertically and horizontally polarized broadband horn antennas.

Test Procedure Used

ANSI C63.26 - Section 5.5.3.2

Test Setting

1. Start frequency was set to 30 MHz and stop frequency was set to at least 10 * the fundamental frequency
2. RBW = 100 kHz for emissions below 1 GHz and 1 MHz for emissions above 1GHz
3. VBW ≥ 3 x RBW
4. No. of sweep points ≥ 2 x span / RBW
5. Detector = Peak for the pre-scan, (In cases where the level is within 2 dB of the limit, the final measurement is taken using RMS detector.)
6. Trace mode = Max Hold (In cases where the level is within 2 dB of the limit, the final measurement is taken using triggering/gating and trace averaging.)
7. The trace was allowed to stabilize.

Limit

§ 27.53(h)

(h) AWS emission limits—(1) General protection levels. Except as otherwise specified below, for operations in the 1695–1710 MHz, 1710–1755 MHz, 1755–1780 MHz, 1915–1920 MHz, 1995–2000 MHz, 2000–2020 MHz, 2110–2155 MHz, 2155–2180 MHz, and 2180–2200 bands, the power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) in watts by at least 43 + 10 log10 (P) dB.

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Test Setup

The EUT and measurement equipment were set up as shown in the diagram below.

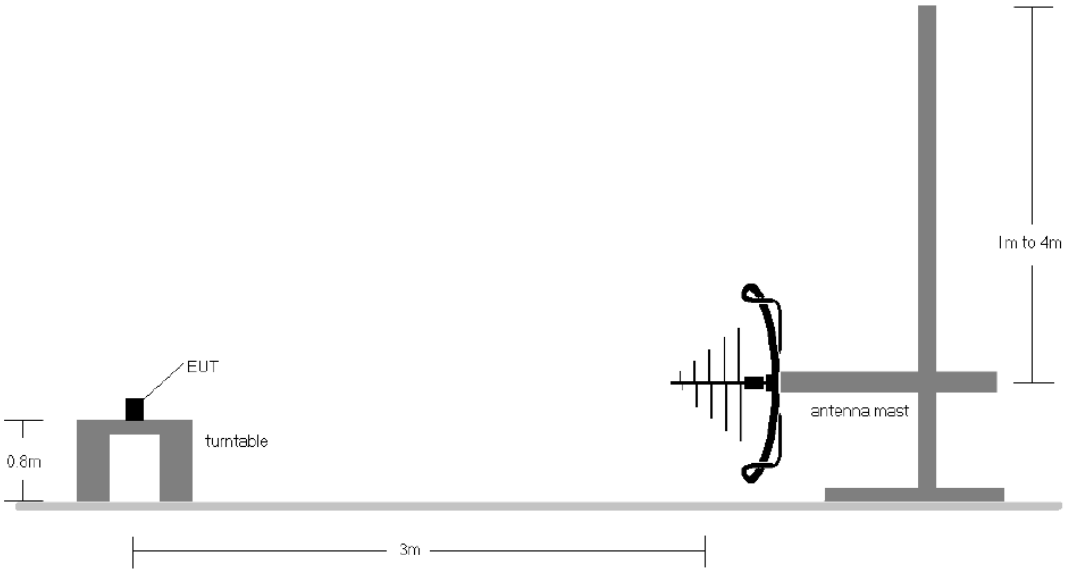

Figure 8-6. Test Instrument & Measurement Setup < 1 GHz

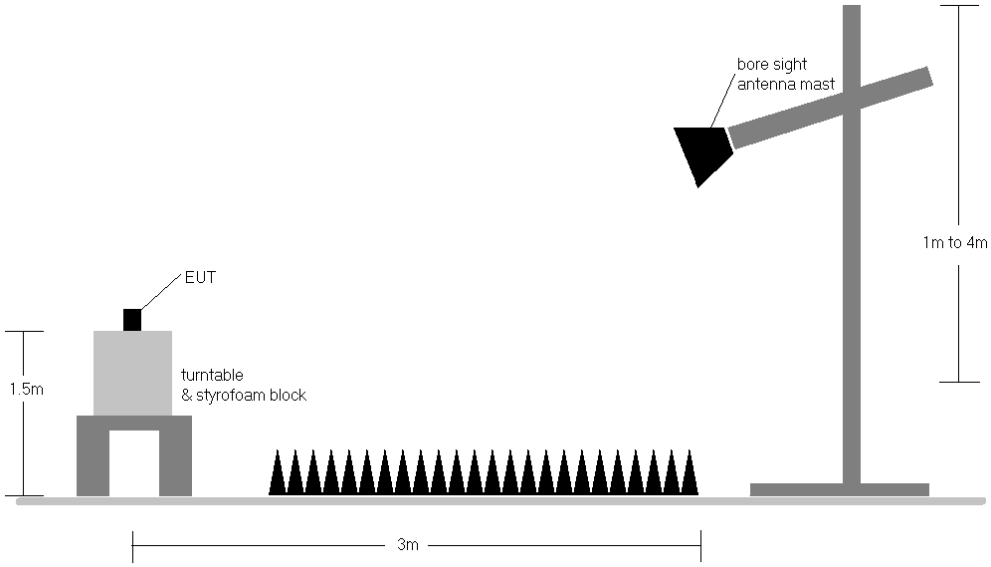

Figure 8-7. Test Instrument & Measurement Setup > 1 GHz

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Test Notes

1. The average EIRP reported below is calculated per 5.2.7 of ANSI C63.26-2015 which states:

   The measured e.i.r.p is converted to E-field in V/m. Then the distance correction is applied before converted back to calculated e.i.r.p.as explained in KDB 971168 D01 D01 v03r01.

Effective Isotropic Radiated Power Sample Calculation

Field Strength [dBµV/m] = Measured Value [dBm] + 107 + AFCL [dB/m]

= -51.28 [dBm] + 107 + -0.99 [dB/m] = 54.73 dBµV/m

e.i.r.p. [dBm] = E[dB μV/m] + 20 $\log_{10}$(d[m]) - 104.8

= 54.73 dB[μV/m] + (20*log (3)) - 104.8

= -40.53 dBm

*AFCL (dB/m) contains measurement antenna factor(dB/m) and cable loss(dB) as below:

Frequency [MHz]	Antenna Factor (dB/m)	Chamber measurement cable loss + amplifier [dB]	AFCL (dB/m)
4385.0	32.15	-33.14	-0.99
6577.5	35.08	-32.14	2.93

Table 8-27. Adopted AFCL value in the calculation

2. The EUT was tested in both horizontal and vertical antenna polarizations and in all possible test configurations and positioning. The worst case emissions are reported with the EUT positioning, modulations, channel bandwidth configurations shown in the tables below.

3. The spectrum is measured from 30 MHz to the 10th harmonic of the fundamental frequency of the transmitter. The worst-case emissions are reported.

4. All emissions were measured at a 3-meter test distance.

5. Spurious emissions were measured with all EUT antennas transmitting simultaneously and all antenna ports terminated.

6. The "-" shown in the following RSE tables are used to denote a noise floor measurement.

7. All modes of operation were investigated and the worst case configuration results are reported in this section.

8. For below 1 GHz, the result of spurious emissions are attenuated more than 20 dB below the permissible value. So all value does not be reported.

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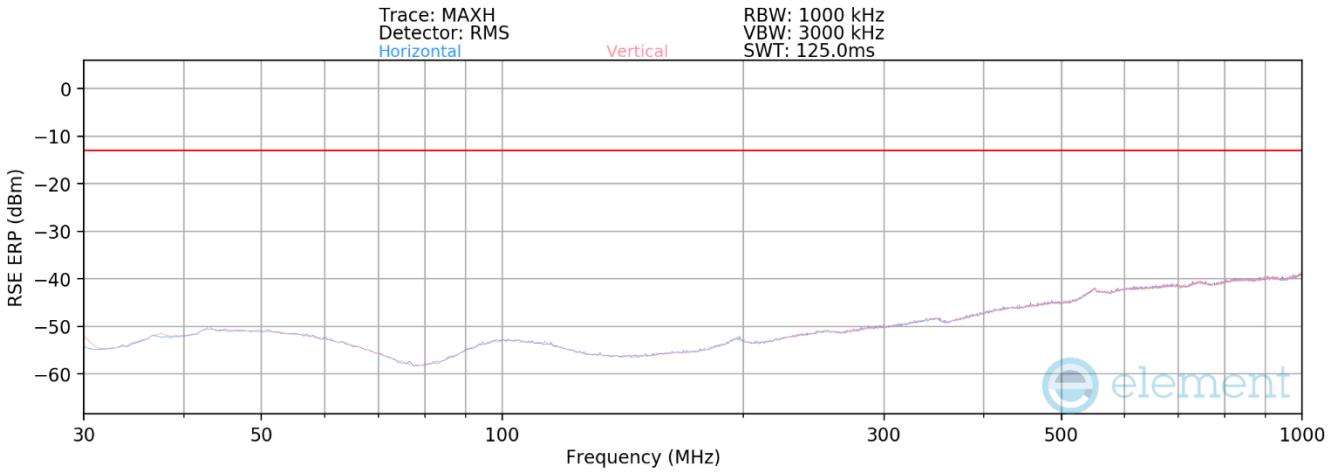
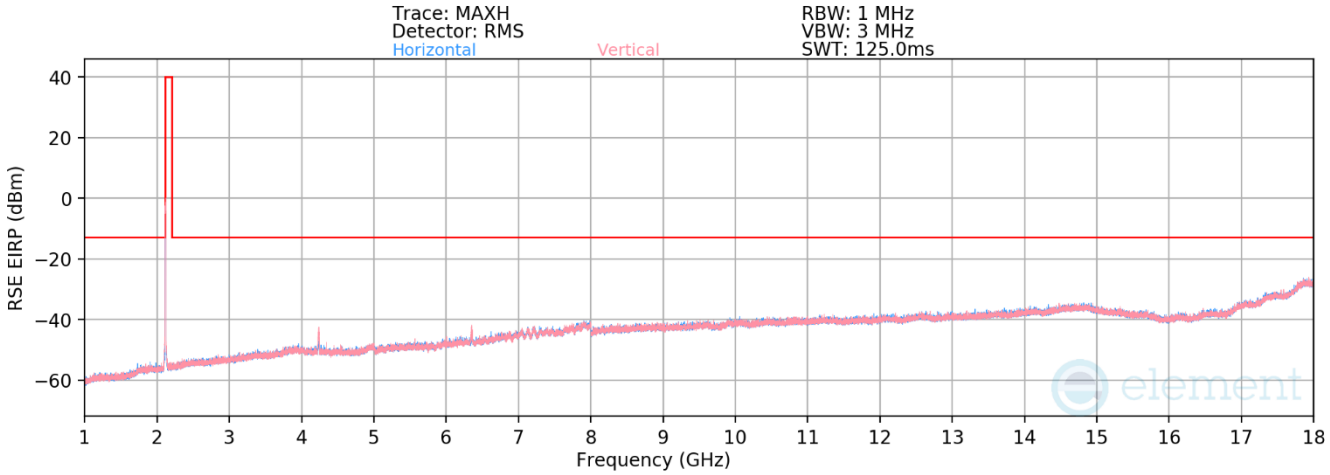
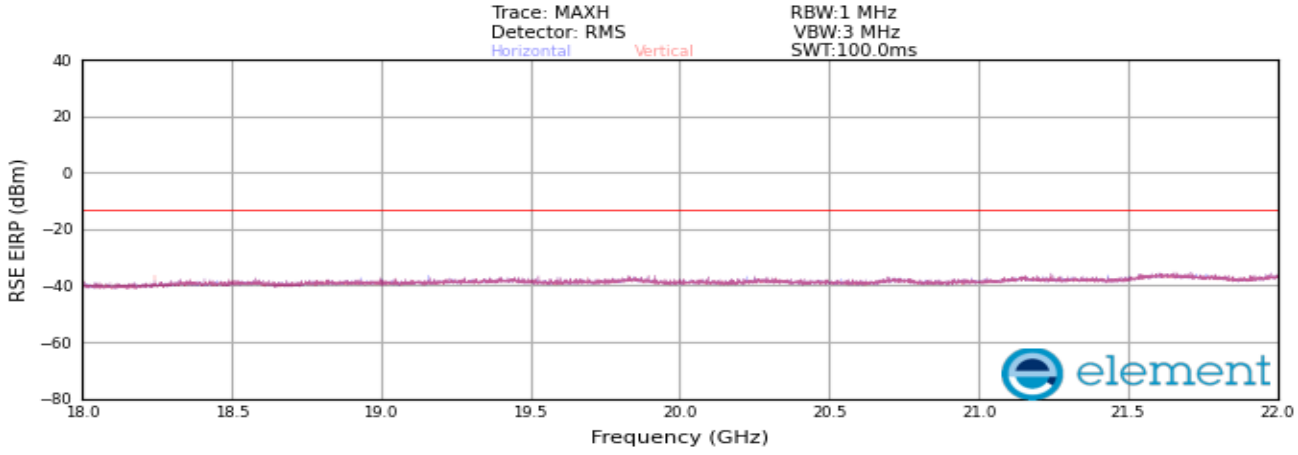


Plot 8-119. Radiated spurious emission_30 MHz to 1000 MHz (n66_1C_15M_Low Channel)



Plot 8-120. Radiated spurious emission_1 GHz to 18 GHz (n66_1C_15M_Low Channel)



Plot 8-121. Radiated spurious emission_18 GHz to 22 GHz (n66_1C_15M_Low Channel)

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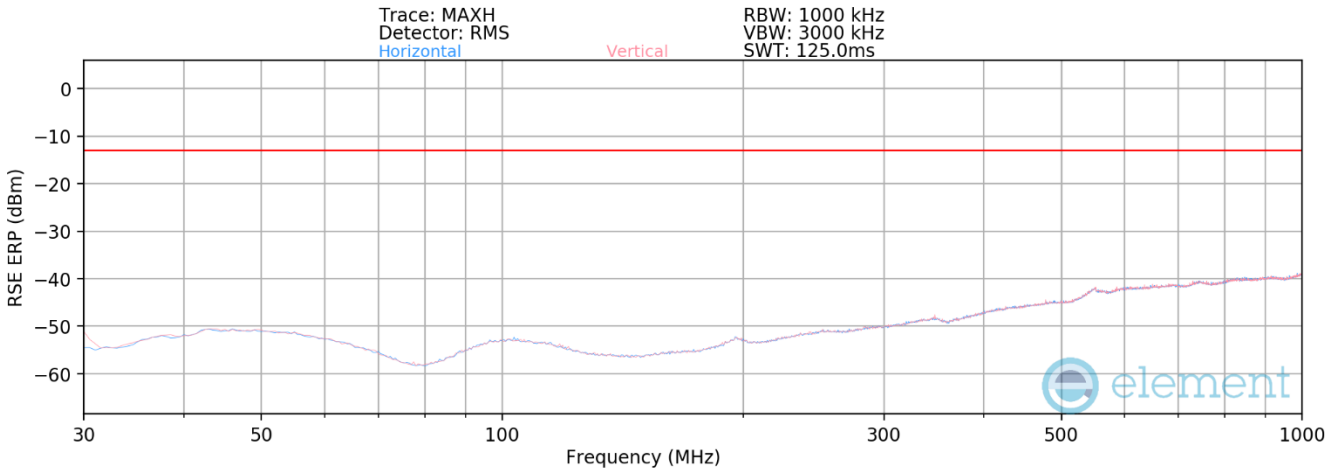
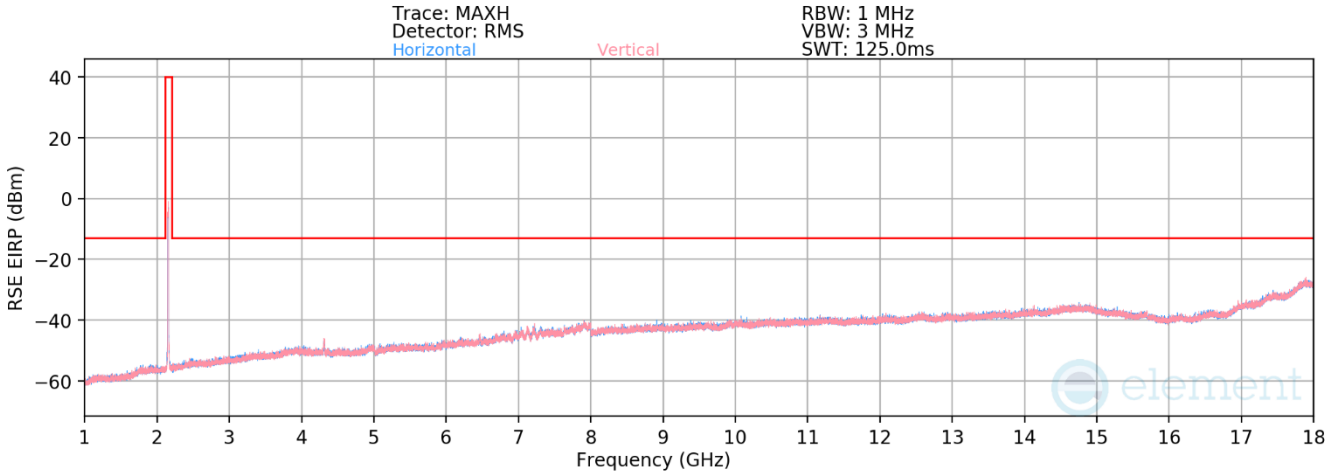
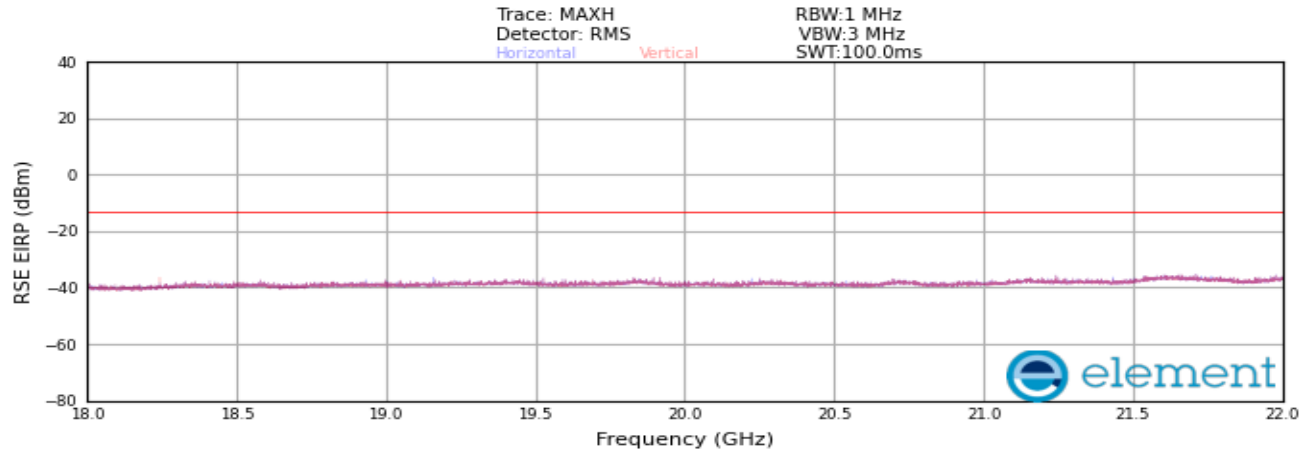


Plot 8-122. Radiated spurious emission_30 MHz to 1000 MHz (n66_1C_15M_Mid Channel)



Plot 8-123. Radiated spurious emission_1 GHz to 18 GHz (n66_1C_15M_Mid Channel)



Plot 8-124. Radiated spurious emission_18 GHz to 22 GHz (n66_1C_15M_Mid Channel)

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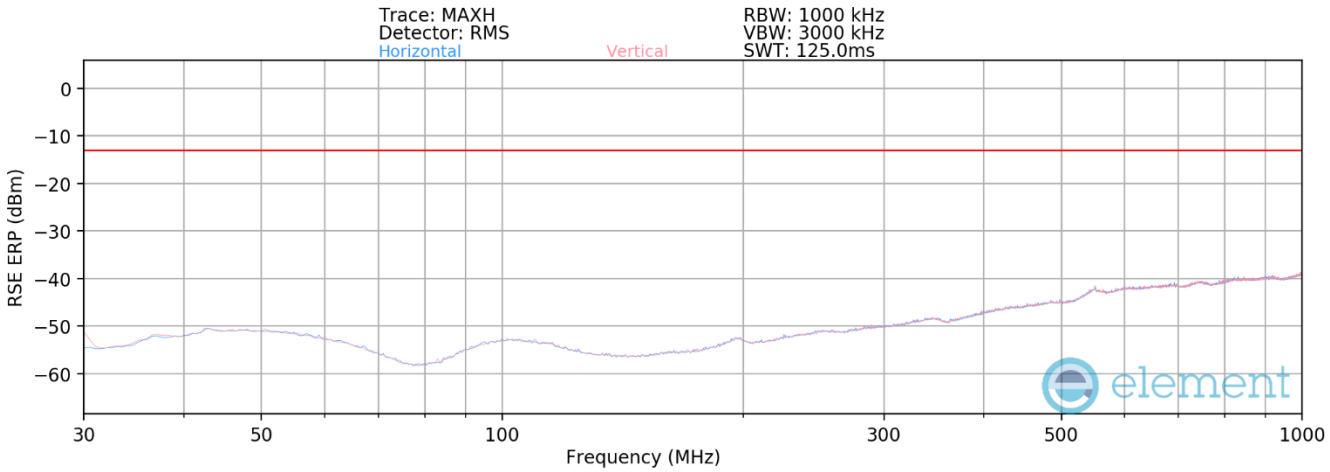
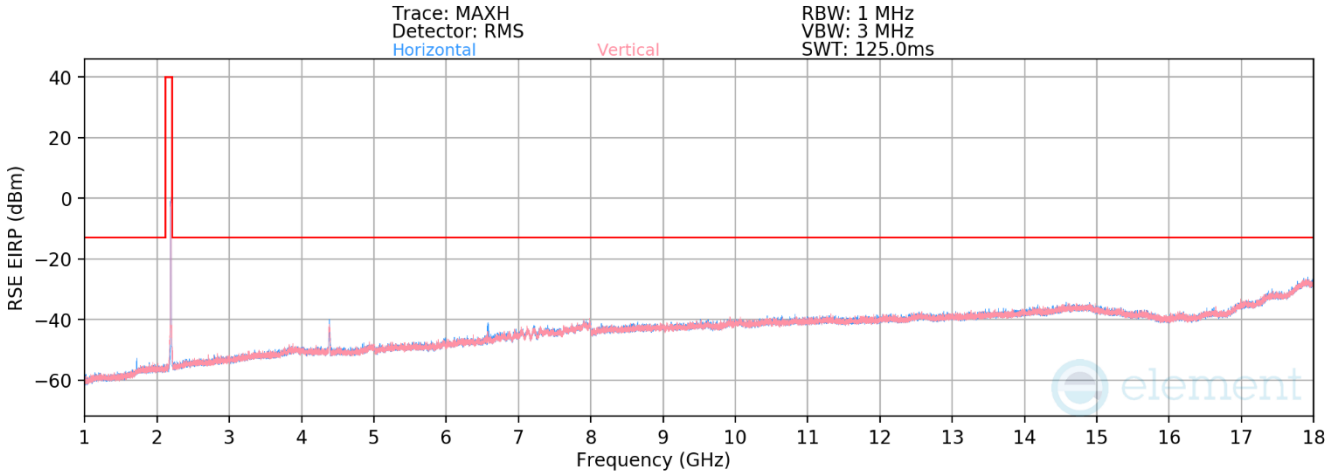
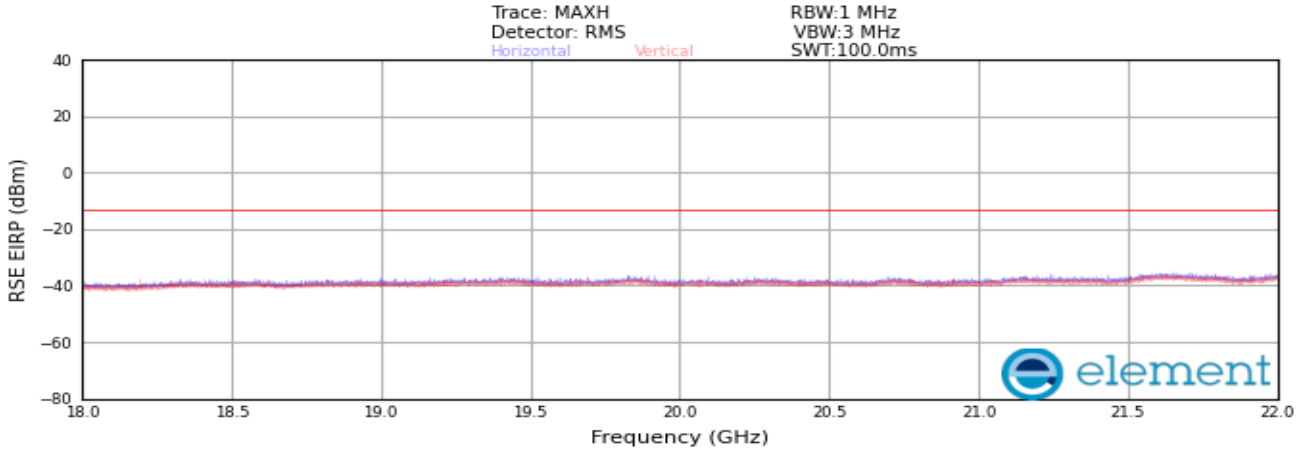


Plot 8-125. Radiated spurious emission_30 MHz to 1000 MHz (n66_1C_15M_High Channel)



Plot 8-126. Radiated spurious emission_1 GHz to 18 GHz (n66_1C_15M_High Channel)



Plot 8-127. Radiated spurious emission_18 GHz to 22 GHz (n66_1C_15M_High Channel)

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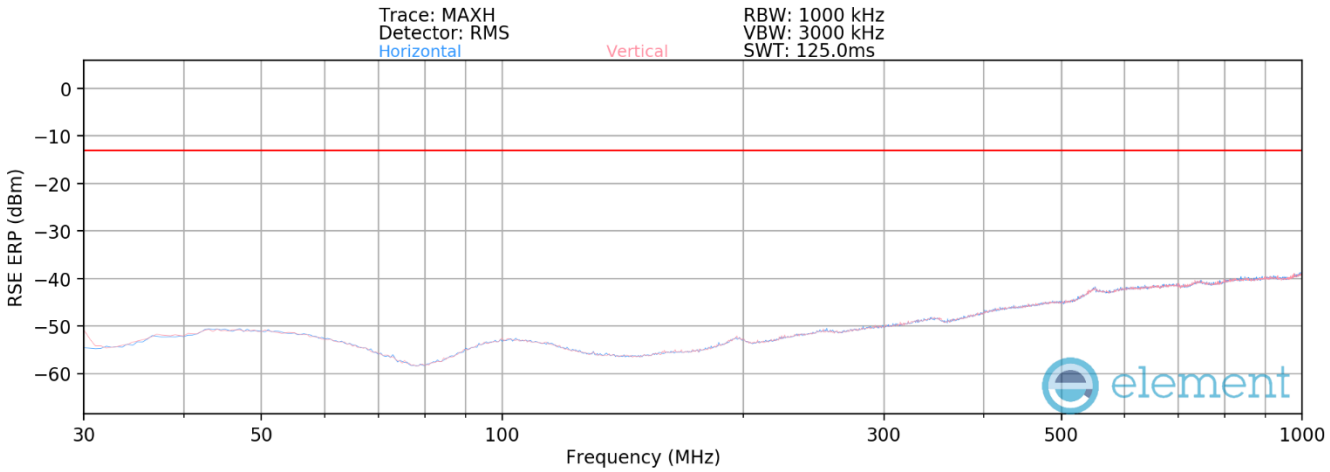
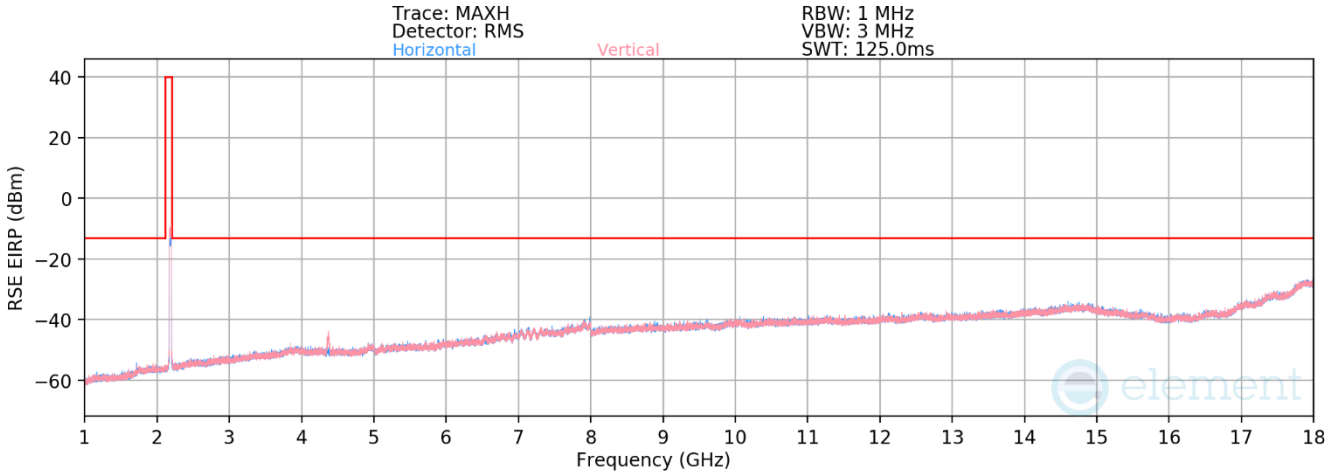
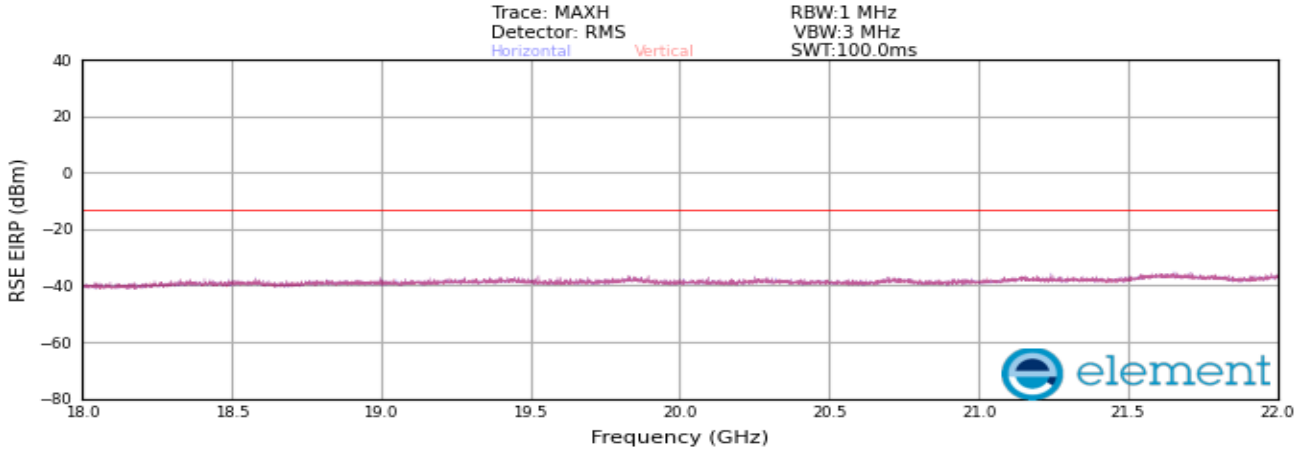


Plot 8-128. Radiated spurious emission_30 MHz to 1000 MHz (n66_1C_30M_High Channel)



Plot 8-129. Radiated spurious emission_1 GHz to 18 GHz (n66_1C_30M_High Channel)



Plot 8-130. Radiated spurious emission_18 GHz to 22 GHz (n66_1C_30M_High Channel)

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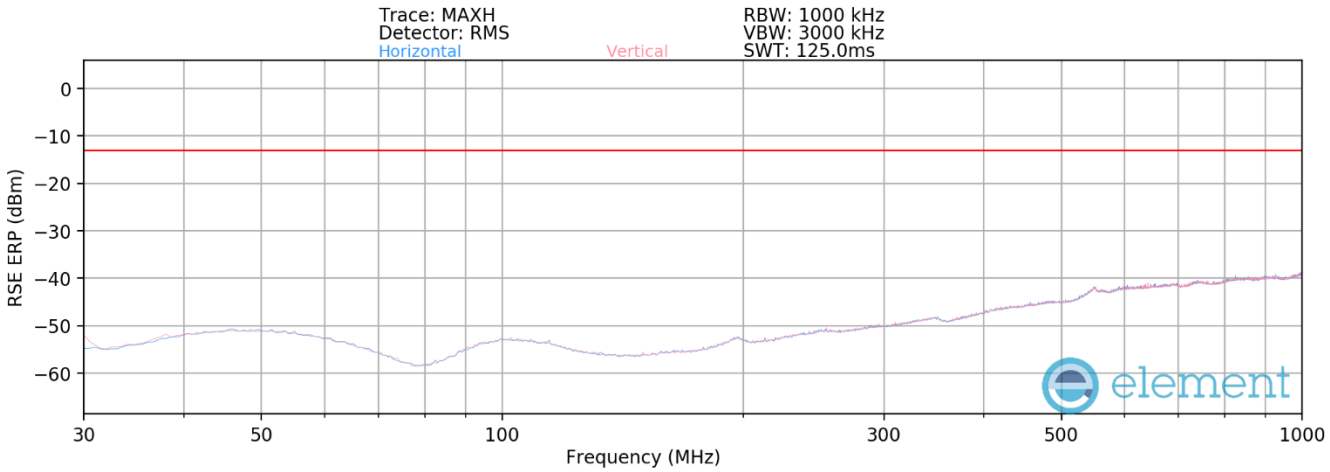
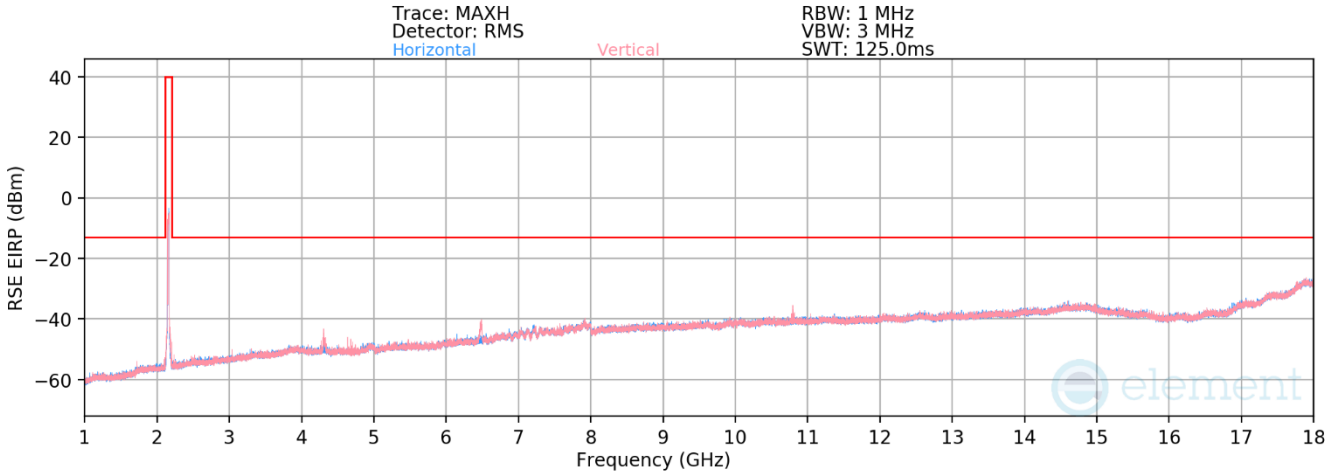
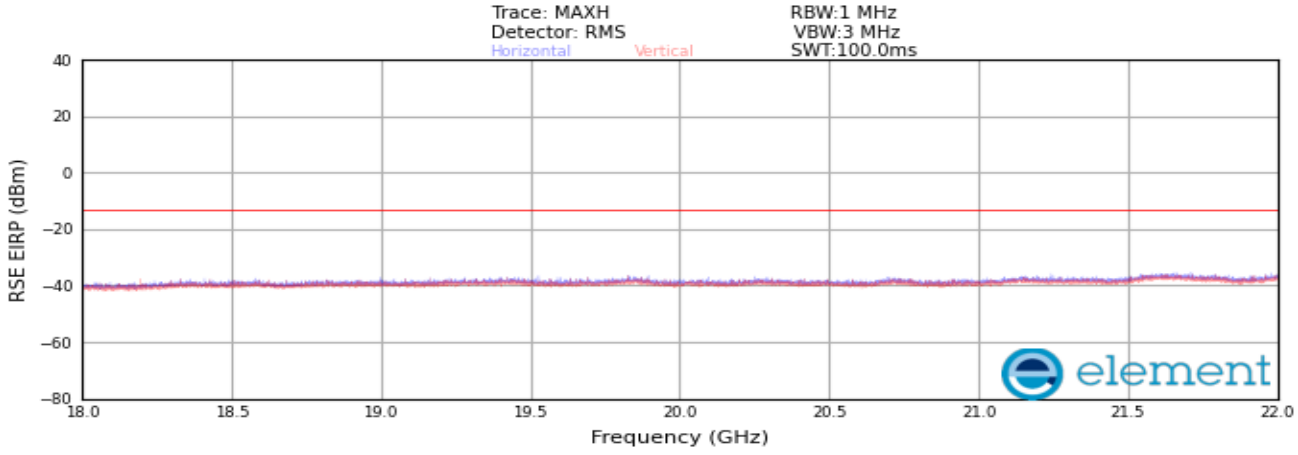


Plot 8-131. Radiated spurious emission_30 MHz to 1000 MHz (n66_3C_5M+5M+15M_Mid Channel)



Plot 8-132. Radiated spurious emission Plot_1 GHz to 18 GHz (n66_3C_5M+5M+15M_Mid Channel)



Plot 8-133. Radiated spurious emission Plot_18 GHz to 22 GHz (n66_3C_5M+5M+15M_Mid Channel)

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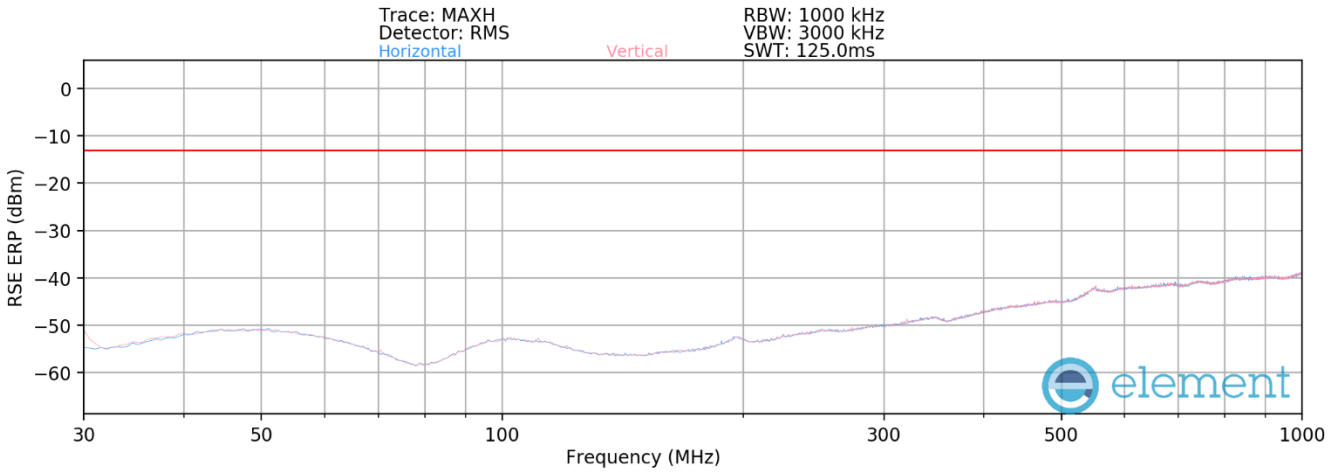
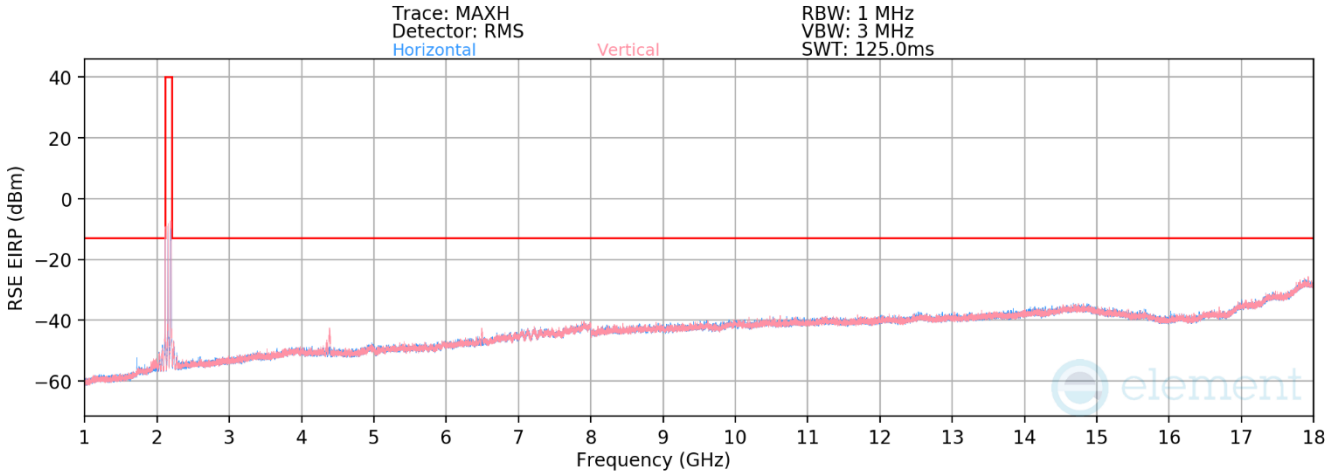
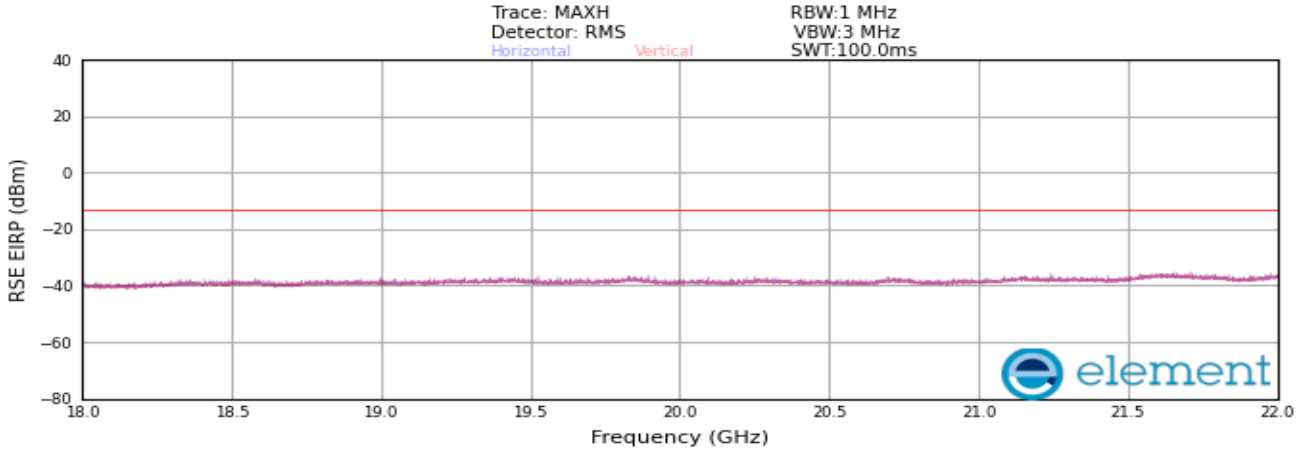


Plot 8-134. Radiated spurious emission_30 MHz to 1000 MHz (n66_3NC_5M+5M+15M)



Plot 8-135. Radiated spurious emission Plot_1 GHz to 18 GHz (n66_3NC_5M+5M+15M)



Plot 8-136. Radiated spurious emission Plot_18 GHz to 22 GHz (n66_3NC_5M+5M+15M)

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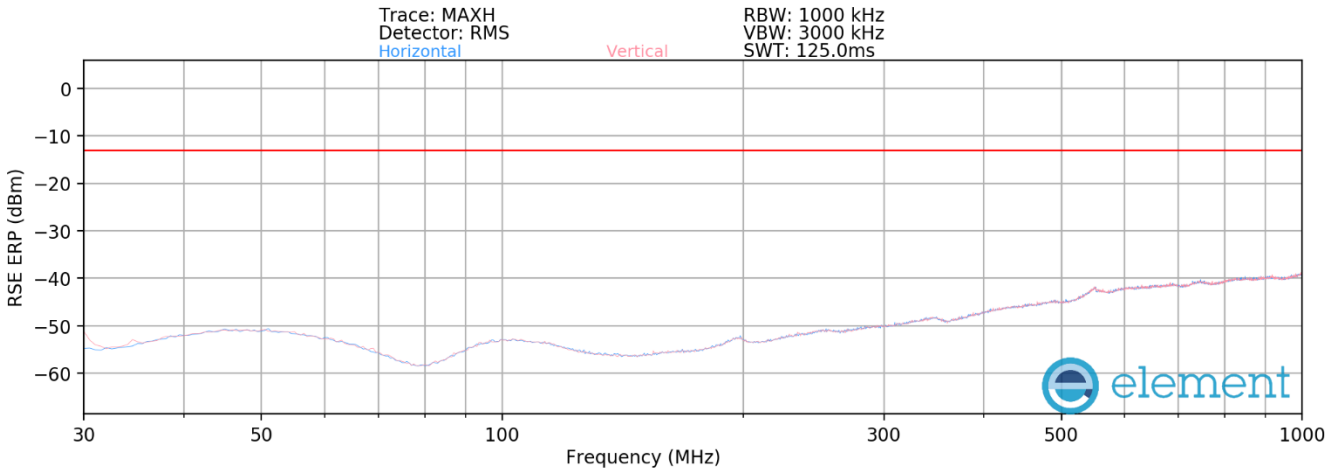
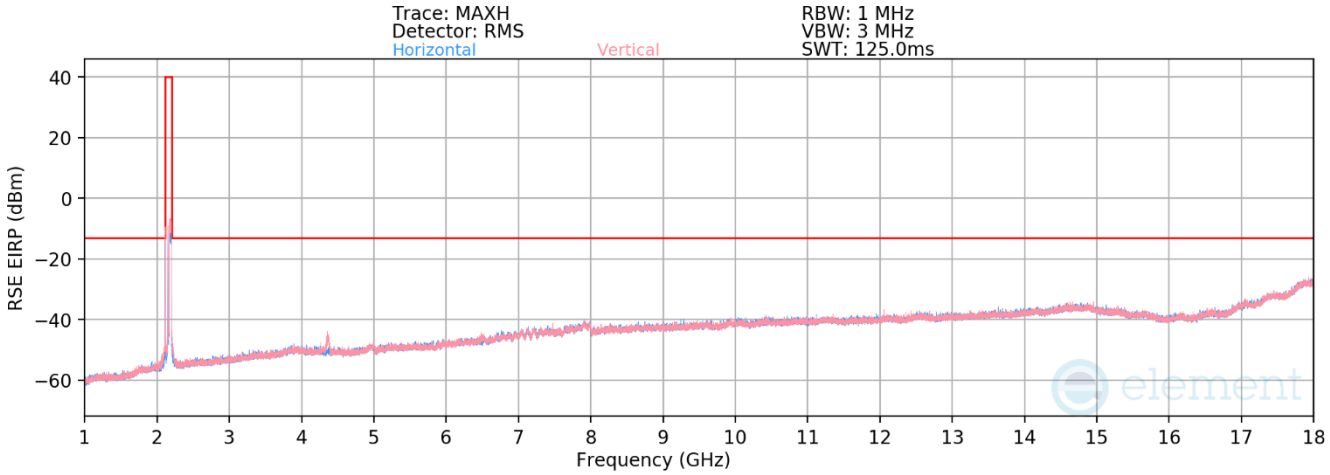
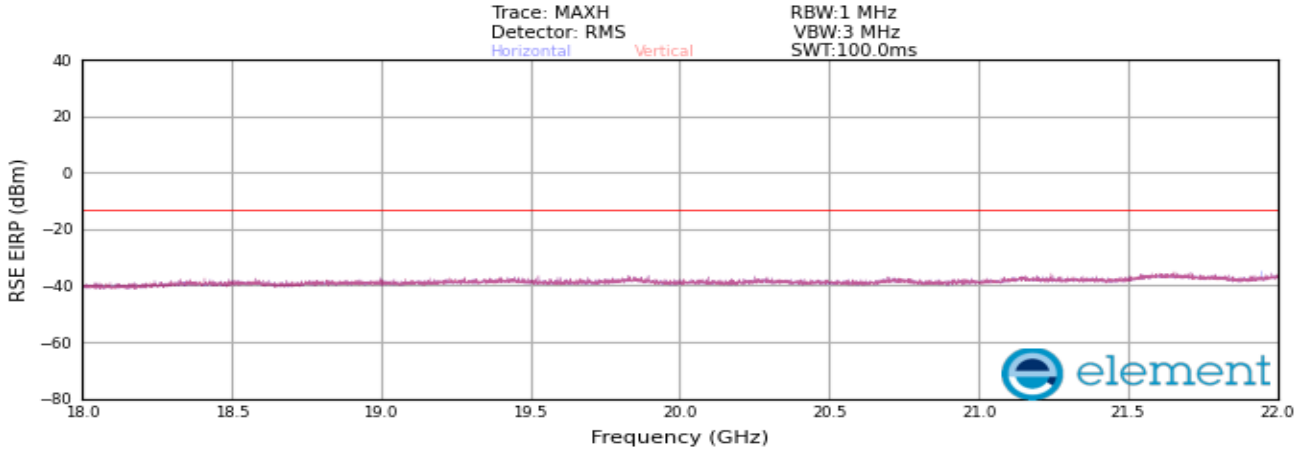


Plot 8-137. Radiated spurious emission_30 MHz to 1000 MHz (n66_3NC_5M+5M+30M_Mid Channel)



Plot 8-138. Radiated spurious emission Plot_1 GHz to 18 GHz (n66_3NC_5M+5M+30M_Mid Channel)



Plot 8-139. Radiated spurious emission Plot_18 GHz to 22 GHz (n66_3NC_5M+5M+30M_Mid Channel)

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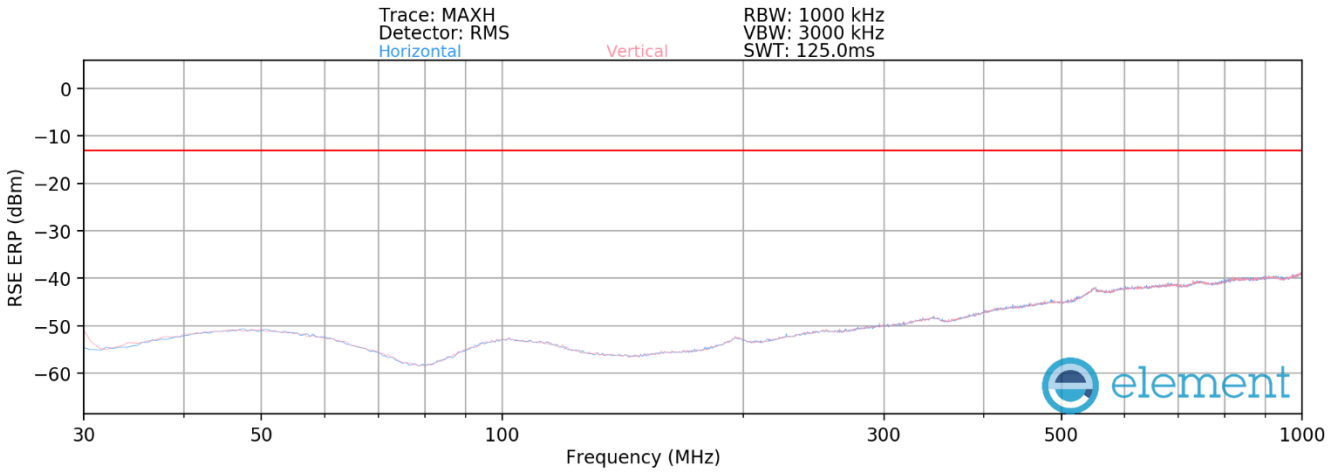
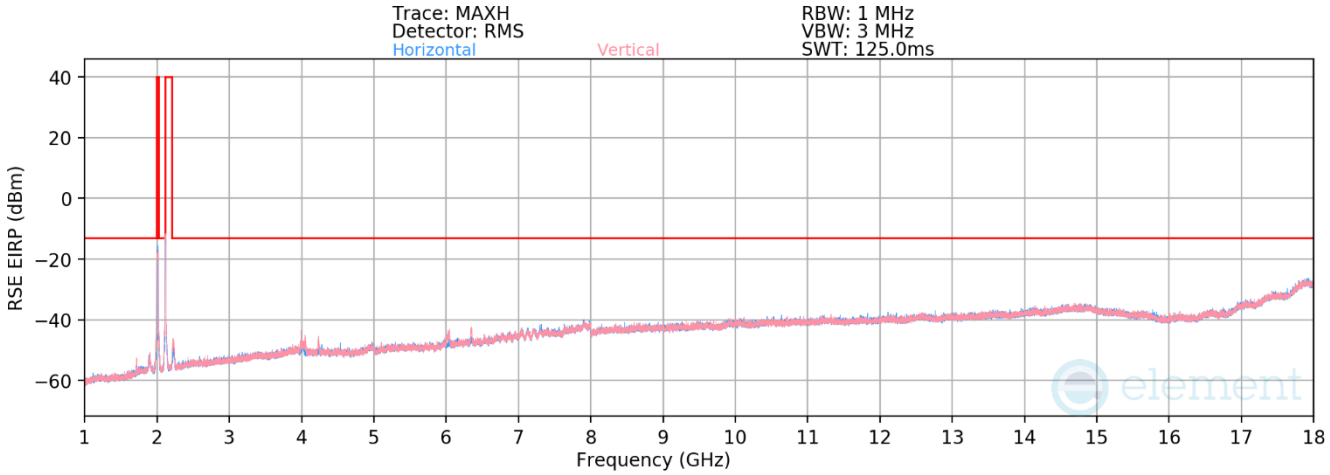
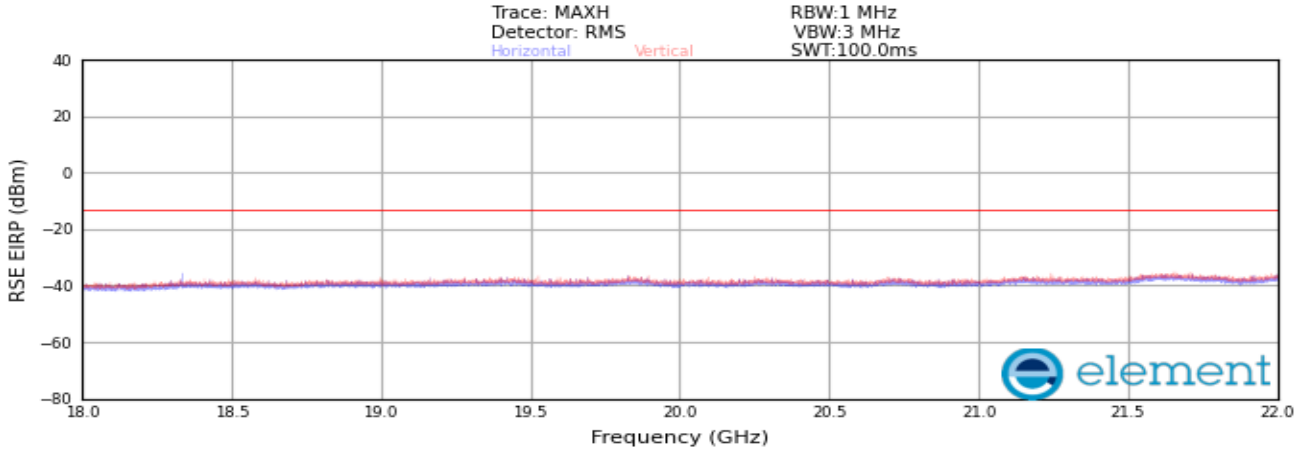


Plot 8-140. Radiated spurious emission_30 MHz to 1000 MHz (n70_1C_25M + n66_1C_15M_Multi-Band operation)



Plot 8-141. Radiated spurious emission Plot_1 GHz to 18 GHz (n70_1C_25M + n66_1C_15M_Multi-Band operation)



Plot 8-142. Radiated spurious emission Plot_18 GHz to 22 GHz (n70_1C_25M + n66_1C_15M_Multi-Band operation)

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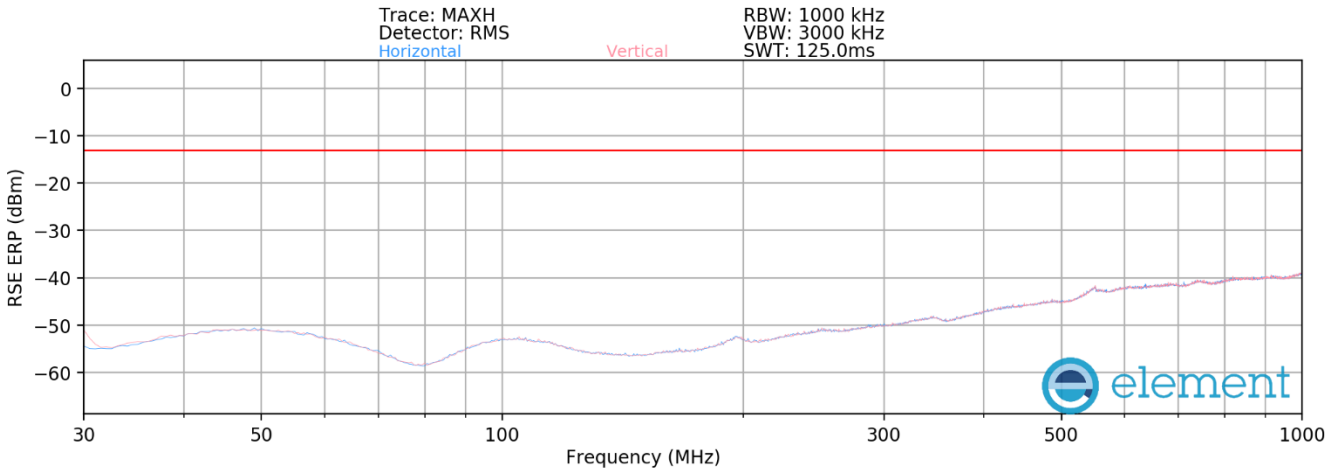
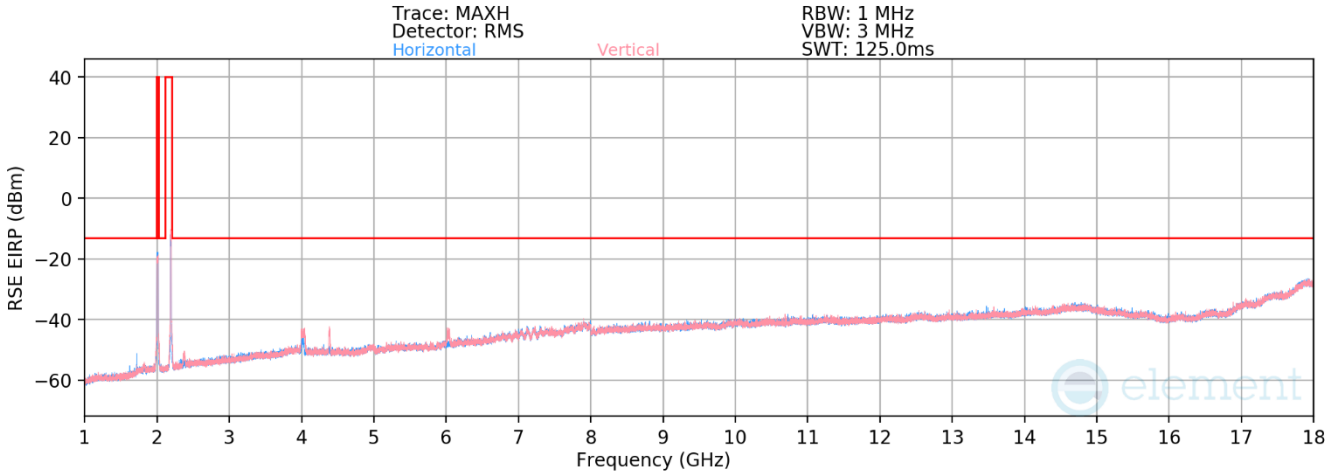
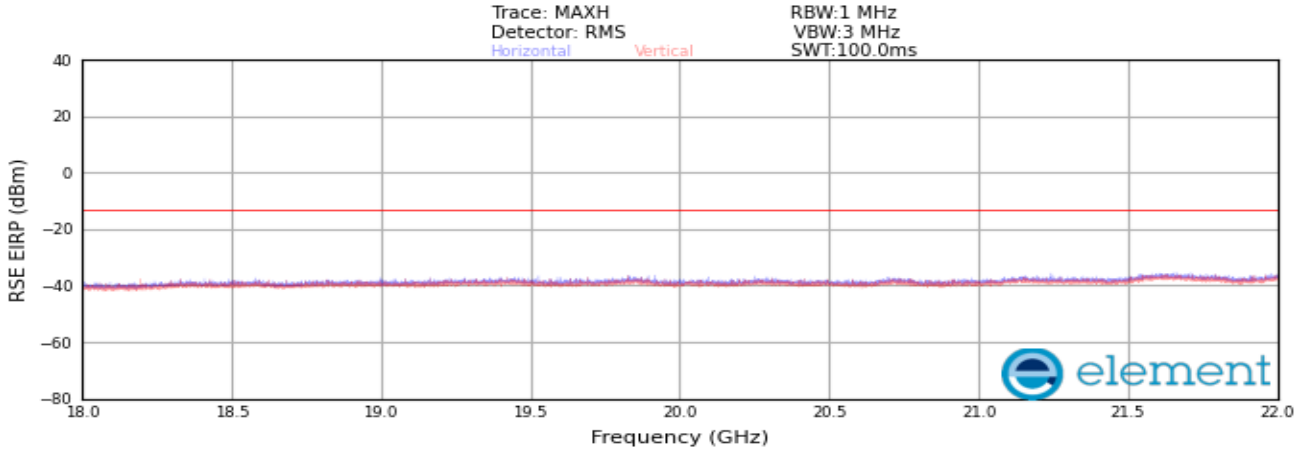


Plot 8-143. Radiated spurious emission_30 MHz to 1000 MHz (n70_1C_25M + n66_3C_5M+5M+30M_Multi-Band operation)



Plot 8-144. Radiated spurious emission Plot_1 GHz to 18 GHz (n70_1C_25M + n66_3C_5M+5M+30M_Multi-Band operation)



Plot 8-145. Radiated spurious emission Plot_18 GHz to 22 GHz (n70_1C_25M + n66_3C_5M+5M+30M_Multi-Band operation)

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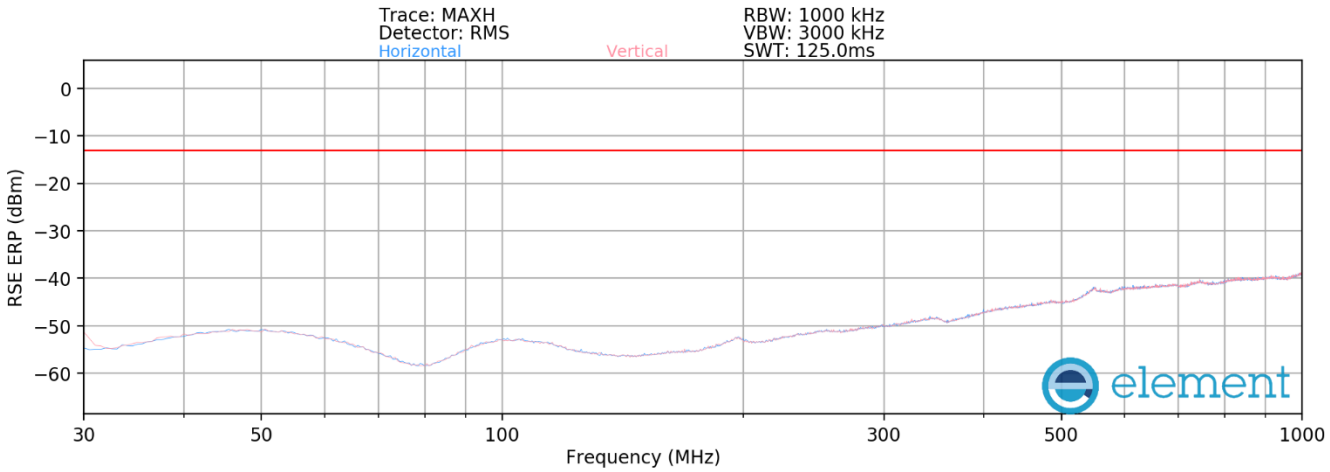
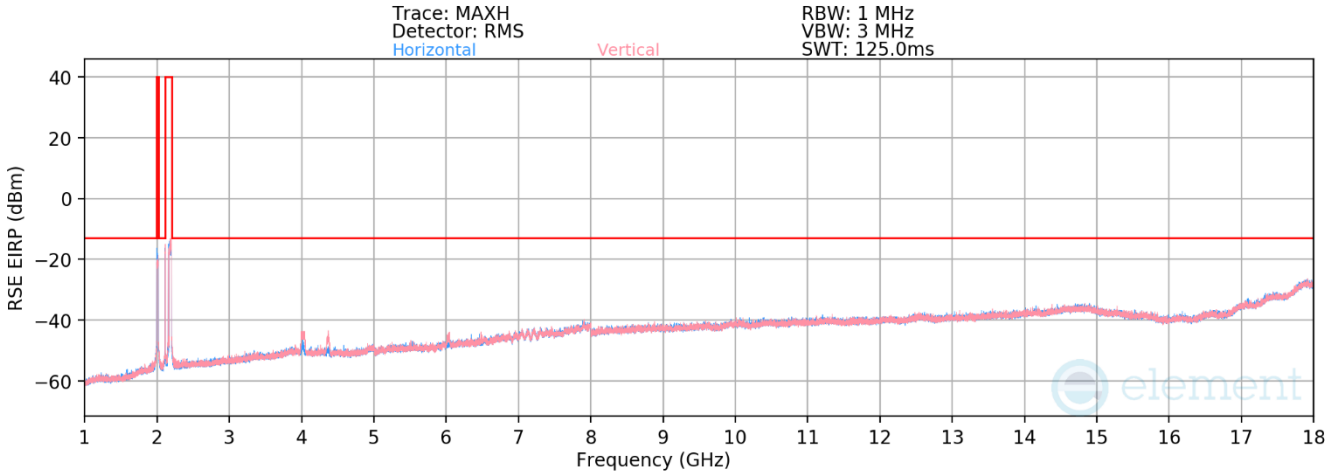
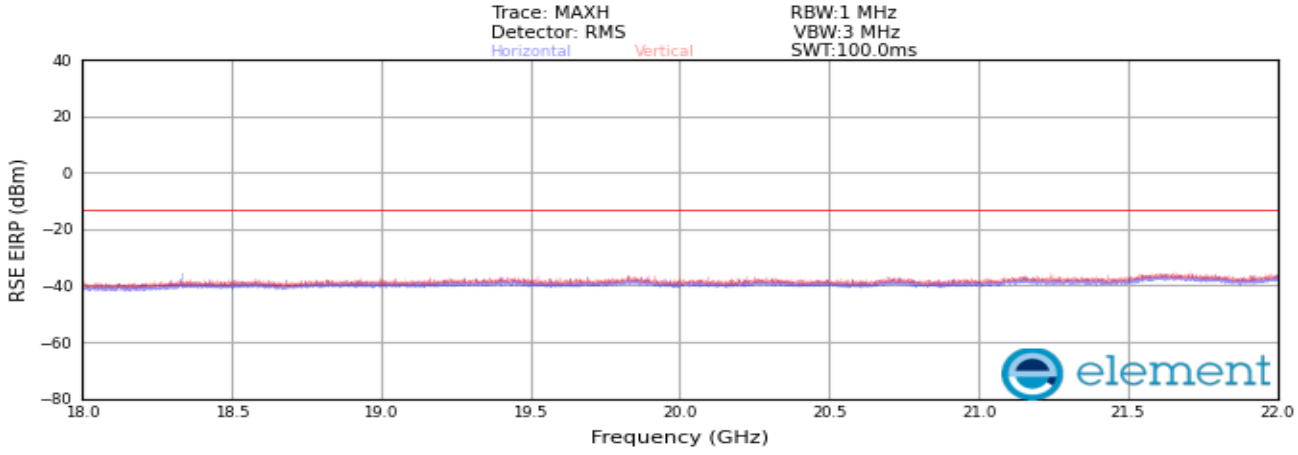


Plot 8-146. Radiated spurious emission_30 MHz to 1000 MHz (n70_1C_25M + n66_3NC_5M+5M+30M_Multi-Band operation)



Plot 8-147. Radiated spurious emission Plot_1 GHz to 18 GHz (n70_1C_25M + n66_3NC_5M+5M+30M_Multi-Band operation)



Plot 8-148. Radiated spurious emission Plot_18 GHz to 22 GHz (n70_1C_25M + n66_3NC_5M+5M+30M_Multi-Band operation)

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Bandwidth (MHz):	n66_1C_15M_High Channel
Center Frequency (MHz):	2192.5 MHz
Modulation Signal:	QPSK

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Heigh [cm]	Turntable azimuth [degree]	Analyzer Level [dBm/MHz]	AFCL [dBm]	Field Strength [dBμV/m]	RSE EIRP [dBm/MHz]	Limit [dBm/MHz]	Margin [dB]
4385.0	H	140	57	-51.28	-0.99	54.73	-40.53	-13.00	-27.53
4385.0	V	144	65	-52.15	-0.99	53.86	-41.40	-13.00	-28.40
6577.5	V	158	111	-60.38	2.93	49.55	-45.70	-13.00	-32.70
6577.5	H	162	122	-57.35	2.93	52.58	-42.67	-13.00	-29.67

Table 8-28. Radiated spurious emission Worst case Summary Data

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9.0 CONCLUSION

The data collected relate only to the item(s) tested and show that the **Samsung RRU(RF4451d) FCC ID: A3LRF4451D-70A** complies with all of the requirements of Part 27 FCC Rules.

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10.0 APPENDIX. A

10.1 Conducted Average Output Power

Test Overview

A transmitter port of EUT is connected to the input of a signal analyzer. All measurements are performed as RMS average measurements while the EUT is operating at its maximum duty cycle, at maximum power, and at the appropriate frequencies.

Test Description

KDB 971168 D01 v03r01 – Section 5
KDB 662911 D01 v02r01 – Section E)1) In-Band Power Measurements
ANSI C63.26-2015 – Section 5.2.4.4.1

The measurement was made using a direct connection between the RF output of the EUT and the spectrum analyzer. The spectrum analyzer settings were as follows:

1. Conducted power measurements are performed using the signal analyzer's "channel power" measurement capability for signals with continuous operation.
2. RBW = 1 ~ 5% of the expected OBW
3. VBW ≥ 3 x RBW
4. Span = 2 ~ 3 x OBW
5. No. of sweep points ≥ 2 x span / RBW
6. Detector = RMS
7. Trigger Settings is set to "RF Power" for signals with non-continuous operation with the sweep times set to "auto". Refer test note 3 for details.
8. Trace mode = Trace-Averaging (RMS) set to average over 100 sweeps
9. The trace was allowed to stabilize

Test Setup

The EUT and measurement equipment were set up as shown in the diagram below.

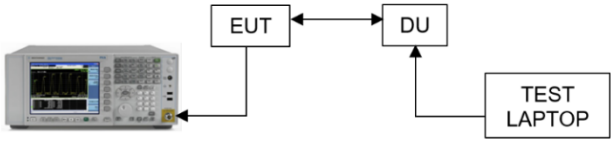

Figure 10-1. Test Instrument & Measurement Setup

Limit

N/A

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Note

1. Result for reference maximum output power of Grant of Authorization is under section 10.1.

2. MIMO Calculations are done considering output channel power for all ports and respective margins are calculated according to procedures in section 6.4 of ANSI C63.26 and section D of KDB 971168 D01 v03r01.

3. Consider the following factors for MIMO Power:
   Conducted power for each port is measured in dBm.
   Powers are summed up in linear using the measure-and-sum technique defined in KDB 971168 D01 v03r01-Section D.
   Conducted power per port (dBm) is converted to a linear value (mW). A summation of linear powers for all ports gives us the total MIMO conducted power in milliWatts (mW).

4. Sample Calculation:
   Let us assume the following numbers:
   a) Total MIMO Conducted Power as 183424.35 mW
   b)

Factors		Value	Unit
Summed MIMO Conducted Power (linear sum)		183424.35	mW
Summed MIMO Conducted Power (dBm)	= 10 * log (183424.35) =	52.63	dBm

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Channel	Port	QPSK	16QAM	64QAM	256QAM
Low	0	46.62	46.84	46.92	46.71
	1	46.48	46.69	46.83	46.72
	2	46.10	46.41	46.41	46.37
	3	46.16	46.42	46.41	46.28
	Total Conducted Power (mW)	172425.71	182577.10	184903.15	179683.79
	Total Conducted Power(dBm)	52.37	52.61	52.67	52.55
Mid	0	**46.87**	46.91	**46.95**	46.83
	1	**46.70**	46.71	**46.72**	46.72
	2	**46.42**	46.48	**46.57**	46.41
	3	**46.45**	46.53	**46.47**	46.37
	Total Conducted Power (mW)	**183424.35**	185413.24	**186289.46**	182287.49
	Total Conducted Power(dBm)	**52.63**	52.68	**52.70**	52.61
High	0	46.76	46.80	46.81	46.31
	1	46.66	46.81	46.78	46.29
	2	46.47	46.49	46.57	46.40
	3	46.36	46.43	46.44	46.45
	Total Conducted Power (mW)	181381.14	184356.14	185066.09	173124.76
	Total Conducted Power(dBm)	52.59	52.66	52.67	52.38

Table 10-1. Conducted Average Output Power Table (n66_1C_15M)

Channel	Port	QPSK	16QAM	64QAM	256QAM
High	0	**45.97**	46.46	**46.58**	46.52
	1	**45.98**	46.36	**46.39**	46.45
	2	**46.18**	46.50	**46.53**	46.47
	3	**46.14**	46.58	**46.49**	46.56
	Total Conducted Power (mW)	**161774.84**	177677.39	**178593.60**	178682.21
	Total Conducted Power(dBm)	**52.09**	52.50	**52.52**	52.52

Table 10-2. Conducted Average Output Power Table (n66_1C_30M)

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Channel	Port	QPSK	16QAM
Low	0	47.92	47.84
	1	48.05	47.93
	2	47.93	47.80
	3	48.13	47.91
	Total Conducted Power (mW)	252870.33	244958.00
	Total Conducted Power(dBm)	54.03	53.89
Mid	0	**48.09**	**48.06**
	1	**47.99**	**47.99**
	2	**48.13**	**48.14**
	3	**48.24**	**48.13**
	Total Conducted Power (mW)	**259061.19**	**257099.91**
	Total Conducted Power(dBm)	**54.13**	**54.10**
High	0	47.98	48.02
	1	47.91	47.93
	2	48.05	48.07
	3	48.21	48.19
	Total Conducted Power (mW)	254655.47	255512.22
	Total Conducted Power(dBm)	54.06	54.07

Table 10-3. Conducted Average Output Power Table (n66_3C_5M+5M+15M)

Channel	Port	QPSK	16QAM
High	0	**48.09**	**48.20**
	1	**48.03**	**48.11**
	2	**48.22**	**48.26**
	3	**48.23**	**48.20**
	Total Conducted Power (mW)	**260851.64**	**263841.41**
	Total Conducted Power(dBm)	**54.16**	**54.21**

Table 10-4. Conducted Average Output Power Table (n66_3C_5M+5M+30M)

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