7.2 Radiated Spurious Emission

7.2.1 TEST OVERVIEW

Radiated spurious emissions measurements are performed using the substitution method described in ANSI/TIA-603-C-2004 with the EUT transmitting into an integral antenna. Measurements on signals operating below 1GHz are performed using vertically and vertically polarized tuned dipole antennas. Measurements on signals operating above 1GHz are performed using vertically and horizontally polarized broadband horn antennas. All measurements are performed as peak measurements while the EUT is operating at its maximum duty cycle, at maximum power, and at the appropriate frequencies.

Test Procedures Used

KDB 971168 v02r01 – Section 5.8
ANSI/TIA-603-C-2004 – Section 2.2.12

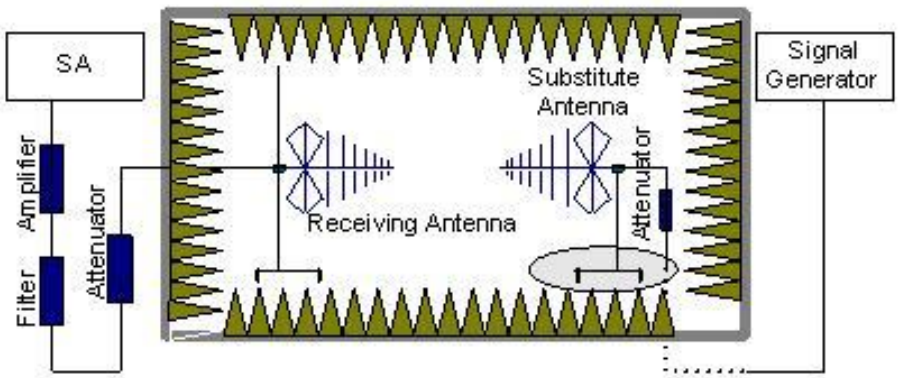
Test Settings

1. RBW = 100kHz for emissions below 1GHz and 1MHz for emissions above 1GHz
2. VBW ≥ 3 x RBW
3. Span = 1.5 times the OBW
4. No. of sweep points > 2 x span / RBW
5. Detector = Peak
6. Trace mode = max hold
7. The trace was allowed to stabilize

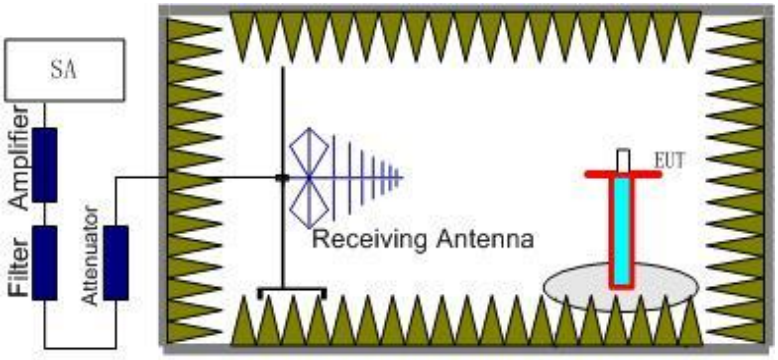
Test Setup

The procedure of radiated spurious emissions is as follows:

a) Pre-calibration With pre-calibration method, the Radiated Spurious Emissions(RSE) is calculated as, RSE=Rx（dBuV）+CL（dB）+SA（dB）+Gain（dBi）-107（dBuV to dBm）The SA is calibrated using following setup.



b) EUT was placed on a 0.8 meter high non-conductive stand at a 3 meter test distance from the receive antenna. A receiving antenna was placed on the antenna mast 3 meters from the test item for emission measurements. The height of receiving antenna is 0.8m. The test setup refers to figure below. Detected emissions were maximized at each frequency by rotating the test item and adjusting the receiving antenna polarization. The radiated emission measurements of all non-harmonic and harmonics of the transmit frequency through the 10th harmonic were measured with peak detector and 1MHz bandwidth.



Radiated emissions measurements were made only at the upper, middle, and lower carrier frequencies of the LTE band 2, the LTE band 4 and LTE band 17. It was decided that measurements at these three carrier frequencies would be sufficient to demonstrate compliance with emissions limits because it was seen that all the significant spurs occur well outside the band and no radiation was seen from a carrier in one block of any band into any of the other blocks.

The substitution method is used. Substitution values at each frequency are measured before and saved to the test software. A "reference path loss" is established and the A_{Rpl} is the attenuation of “reference path loss”, and including the gain of receive antenna, the gain of the preamplifier, the cable loss and the air loss. The measurement results are obtained as described below: $Power=P_{Mea}+A_{Rpl}$

7.2.2 PROVISIONS APPLICABLE

(a) On any frequency outside a licensee’s frequency block (e.g. A, D, B, etc.) within the USPCS spectrum, the power of any emission shall be attenuated below the transmitter power (P, in Watts) by at least 43+10Log(P) dB. The specification that emissions shall be attenuated below the transmitter power (P) by at least 43 + 10 log (P) dB, translates in the relevant power range (1 to 0.001 W) to -13 dBm. At 1 W the specified minimum attenuation becomes 43 dB and relative to a 30 dBm (1 W) carrier becomes a limit of -13 dBm. At 0.001 W (0 dBm) the minimum attenuation is 13 dB, which again yields a limit of -13 dBm. In this way a translation of the specification from relative to absolute terms is carried out.

Note: Only record the worst condition of each test mode:

7.2.3 MEASUREMENT RESULT

LTE Band 2

Low channel

Frequency (MHz)	Substituted level (dBm)	Polarity (H/V)	Antenna Gain Correction (dB)	Cable Loss (dB)	Corrected Reading (dBm)	Limit (dBm)	Margin (dB)
3720	-46.09	V	10.06	2.52	-38.55	-13	-25.55
3720	-46.76	H	10.06	2.52	-39.22	-13	-26.22
257.2	-51.94	V	6.7	0.24	-45.48	-13	-32.48
640.2	-48.57	H	6.5	0.39	-42.46	-13	-29.46

Middle channel

Frequency (MHz)	Substituted level (dBm)	Polarity (H/V)	Antenna Gain Correction (dB)	Cable Loss (dB)	Corrected Reading (dBm)	Limit (dBm)	Margin (dB)
3760	-47.20	V	10.06	2.52	-39.66	-13	-26.66
3760	-46.65	H	10.06	2.52	-39.11	-13	-26.11
256.9	-56.21	V	6.7	0.24	-49.75	-13	-36.75
639.8	-48.74	H	6.5	0.39	-42.63	-13	-29.63

High channel

Frequency (MHz)	Substituted level (dBm)	Polarity (H/V)	Antenna Gain Correction (dB)	Cable Loss (dB)	Corrected Reading (dBm)	Limit (dBm)	Margin (dB)
3800	-48.86	V	10.06	2.52	-41.32	-13	-28.32
3800	-48.82	H	10.06	2.52	-41.28	-13	-28.28
254.6	-55.31	V	6.7	0.24	-48.85	-13	-35.85
639.4	-48.32	H	6.5	0.39	-42.21	-13	-29.21

LTE Band 4

Low channel

Frequency (MHz)	Substituted level (dBm)	Polarity (H/V)	Antenna Gain Correction (dB)	Cable Loss (dB)	Corrected Reading (dBm)	Limit (dBm)	Margin (dB)
3440	-48.75	V	10.06	2.52	-41.21	-13	-28.21
3440	-47.41	H	10.06	2.52	-39.87	-13	-26.87
257.4	-55.09	V	6.7	0.24	-48.63	-13	-35.63
640.2	-51.84	H	6.5	0.39	-45.73	-13	-32.73

Middle channel

Frequency (MHz)	Substituted level (dBm)	Polarity (H/V)	Antenna Gain Correction (dB)	Cable Loss (dB)	Corrected Reading (dBm)	Limit (dBm)	Margin (dB)
3465	-48.61	V	10.06	2.52	-41.07	-13	-28.07
3465	-47.81	H	10.06	2.52	-40.27	-13	-27.27
256.9	-55.18	V	6.7	0.24	-48.72	-13	-35.72
639.8	-49.82	H	6.5	0.39	-43.71	-13	-30.71

High channel

Frequency (MHz)	Substituted level (dBm)	Polarity (H/V)	Antenna Gain Correction (dB)	Cable Loss (dB)	Corrected Reading (dBm)	Limit (dBm)	Margin (dB)
3490	-48.63	V	10.06	2.52	-41.09	-13	-28.09
3490	-45.74	H	10.06	2.52	-38.20	-13	-25.20
254.6	-54.10	V	6.7	0.24	-47.64	-13	-34.64
639.4	-48.18	H	6.5	0.39	-42.07	-13	-29.07

LTE Band 12

Low channel

Frequency (MHz)	Substituted level (dBm)	Polarity (H/V)	Antenna Gain Correction (dB)	Cable Loss (dB)	Corrected Reading (dBm)	Limit (dBm)	Margin (dB)
1408	-49.44	V	10.72	1.65	-40.37	-13	-27.37
1408	-44.36	H	10.72	1.65	-35.29	-13	-22.29
255.2	-51.86	V	6.7	0.24	-45.40	-13	-32.40
641.1	-48.67	H	6.5	0.39	-42.56	-13	-29.56

Middle channel

Frequency (MHz)	Substituted level (dBm)	Polarity (H/V)	Antenna Gain Correction (dB)	Cable Loss (dB)	Corrected Reading (dBm)	Limit (dBm)	Margin (dB)
1415	-48.22	V	10.72	1.65	-39.15	-13	-26.15
1415	-47.50	H	10.72	1.65	-38.43	-13	-25.43
254.5	-55.92	V	6.7	0.24	-49.46	-13	-36.46
640.2	-50.28	H	6.5	0.39	-44.17	-13	-31.17

High channel

Frequency (MHz)	Substituted level (dBm)	Polarity (H/V)	Antenna Gain Correction (dB)	Cable Loss (dB)	Corrected Reading (dBm)	Limit (dBm)	Margin (dB)
1422	-46.59	V	10.72	1.65	-37.52	-13	-24.52
1422	-46.78	H	10.72	1.65	-37.71	-13	-24.71
254.2	-53.49	V	6.7	0.24	-47.03	-13	-34.03
640.8	-50.53	H	6.5	0.39	-44.42	-13	-31.42

LTE Band 17

Low channel

Frequency (MHz)	Substituted level (dBm)	Polarity (H/V)	Antenna Gain Correction (dB)	Cable Loss (dB)	Corrected Reading (dBm)	Limit (dBm)	Margin (dB)
1418	-49.04	V	10.72	1.65	-41.50	-13	-28.50
1418	-46.57	H	10.72	1.65	-39.03	-13	-26.03
253.8	-53.70	V	6.7	0.24	-47.24	-13	-34.24
640.5	-54.30	H	6.5	0.39	-48.19	-13	-35.19

Middle channel

Frequency (MHz)	Substituted level (dBm)	Polarity (H/V)	Antenna Gain Correction (dB)	Cable Loss (dB)	Corrected Reading (dBm)	Limit (dBm)	Margin (dB)
1420	-47.81	V	10.72	1.65	-38.74	-13	-25.74
1420	-48.31	H	10.72	1.65	-39.24	-13	-26.24
253.8	-54.10	V	6.7	0.24	-47.64	-13	-34.64
639.7	-50.59	H	6.5	0.39	-44.48	-13	-31.48

High channel

Frequency (MHz)	Substituted level (dBm)	Polarity (H/V)	Antenna Gain Correction (dB)	Cable Loss (dB)	Corrected Reading (dBm)	Limit (dBm)	Margin (dB)
1422	-49.98	V	10.72	1.65	-40.91	-13	-27.91
1422	-46.80	H	10.72	1.65	-37.73	-13	-24.73
254.5	-51.40	V	6.7	0.24	-44.94	-13	-31.94
639.4	-49.74	H	6.5	0.39	-43.63	-13	-30.63

Note: 1. EUT Field Strength (dBm) = Reading (Signal generator) + Antenna Gain (substitution antenna) - Cable loss (From Signal Generator to substitution antenna).

2. Below 30MHZ no Spurious found and the QPSK modes is the worst condition.

8. FREQUENCY STABILITY

8.1 MEASUREMENT METHOD

In order to measure the carrier frequency under the condition of AFC lock, it is necessary to make measurements with the EUT in a “call mode”. This is accomplished with the use of R&S CMW500 DIGITAL RADIO COMMUNICATION TESTER.

1 , Measure the carrier frequency at room temperature.

2 , Subject the EUT to overnight soak at -10℃.

, With the EUT, powered via nominal voltage, connected to the CMW500 and in a simulated call on channel 20175 for LTE band 4 measure the carrier frequency. These measurements should be made within 2 minutes of Powering up the EUT, to prevent significant self-warming.

3 , Repeat the above measurements at 10℃ increments from -10℃ to +50℃. Allow at least 1 1/2 hours at each temperature, unpowered, before making measurements.

4 , Re-measure carrier frequency at room temperature with nominal voltage. Vary supply voltage from minimum voltage to maximum voltage, in 0.1Volt increments re-measuring carrier frequency at each voltage. Pause at nominal voltage for 1 1/2 hours unpowered, to allow any self-heating to stabilize, before continuing.

5 , Subject the EUT to overnight soak at +50℃.

6 , With the EUT, powered via nominal voltage, connected to the CMW500 and in a simulated call on the centre channel, measure the carrier frequency. These measurements should be made within 2 minutes of Powering up the EUT, to prevent significant self-warming.

7 , Repeat the above measurements at 10℃ increments from +50℃ to -10℃. Allow at least 1 1/2 hours at each temperature, unpowered, before making measurements.

8 , At all temperature levels hold the temperature to +/- 0.5℃ during the measurement procedure.

8.2 PROVISIONS APPLICABLE

8.2.1 For Hand carried battery powered equipment

Frequency stability testing is performed in accordance with the guidelines of ANSI/TIA-603-C-2004. The frequency stability of the transmitter is measured by:

a.) Temperature: The temperature is varied from -30°C to +50°C in 10°C increments using an environmental chamber.

b.) Primary Supply Voltage: The primary supply voltage is varied from 85% to 115% of the nominal value for non hand-carried battery and AC powered equipment. For hand-carried, battery-powered equipment, primary supply voltage is reduced to the battery operating end point which shall be specified by the manufacturer.

For Part 22, the frequency stability of the transmitter shall be maintained within ±0.00025% (±2.5 ppm) of the center frequency. For Part 24 and Part 27, the frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.

8.2.2 For equipment powered by primary supply voltage

1. The carrier frequency of the transmitter is measured at room temperature (20°C to provide a reference).
2. The equipment is turned on in a “standby” condition for fifteen minutes before applying power to the transmitter. Measurement of the carrier frequency of the transmitter is made within one minute after applying power to the transmitter.
3. Frequency measurements are made at 10°C intervals ranging from -30°C to +50°C. A period of at least one half-hour is provided to allow stabilization of the equipment at each temperature level.

8.3 MEASUREMENT RESULT (WORST)

LTE Band 2

Middle Channel, f_O = 1880 MHz				
Temperature (℃)	**Power Supplied**	**Frequency Error (Hz)**	**Frequency Error (ppm)**	**Limit (ppm)**
-10	3.7	-3.35	-0.001781	±2.5
0		-4.03	-0.002146	±2.5
10		-4.28	-0.002275	±2.5
20		-4.09	-0.002176	±2.5
30		-4.02	-0.002138	±2.5
40		-3.98	-0.002115	±2.5
50		-3.52	-0.001872	±2.5
55		-2.49	-0.001324	±2.5
- 25	4.2	-2.59	-0.001377	±2.5
	3.5	-3.83	-0.002039	±2.5

LTE Band 4

Middle Channel, f_O = 1732.5 MHz				
Temperature (℃)	**Power Supplied**	**Frequency Error (Hz)**	**Frequency Error (ppm)**	**Limit (ppm)**
-10	3.7	-0.14	-0.000083	±2.5
0		-0.33	-0.000190	±2.5
10		0.27	0.000157	±2.5
20		-0.34	-0.000198	±2.5
30		0.27	0.000157	±2.5
40		-0.34	-0.000198	±2.5
50		-0.76	-0.000438	±2.5
55		-1.00	-0.000578	±2.5

- 25	4.2	-0.43	-0.000248	±2.5
	3.5	-0.92	-0.000528	±2.5

LTE Band 12

Middle Channel, f_O = 707.5 MHz				
Temperature (℃)	**Power Supplied**	**Frequency Error (Hz)**	**Frequency Error (ppm)**	**Limit (ppm)**
-10	3.7	-0.59	-0.000829	±2.5
0		-0.83	-0.001173	±2.5
10		-0.37	-0.000526	±2.5
20		-0.13	-0.000182	±2.5
30		-0.59	-0.000829	±2.5
40		-0.84	-0.001193	±2.5
50		-1.39	-0.001961	±2.5
55		-0.87	-0.001233	±2.5
- 25	4.2	0.01	0.000020	±2.5
	3.5	-0.86	-0.001213	±2.5

LTE Band 17

Middle Channel, f_O = 710 MHz				
Temperature (℃)	**Power Supplied**	**Frequency Error (Hz)**	**Frequency Error (ppm)**	**Limit (ppm)**
-10	3.7	-1.56	-0.002196	±2.5
0		0.16	0.000222	±2.5
10		-0.13	-0.000181	±2.5
20		-0.06	-0.000081	±2.5
30		0.41	0.000584	±2.5
40		0.03	0.000040	±2.5
50		-0.64	-0.000907	±2.5
55		-0.57	-0.000806	±2.5
25	4.2	-0.64	-0.000907	±2.5
	3.5	-0.31	-0.000443	±2.5

Note: The EUT doesn't work below -10℃

9. OCCUPIED BANDWIDTH

9.1 MEASUREMENT METHOD

The test set up and general procedure is similar to conducted peak output power test. Only different for setting the measurement configuration of the measuring instrument of Spectrum Analyzer.

9.2 PROVISIONS APPLICABLE

The emission bandwidth is defined as two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26dB below the transmitter power

9.3 MEASUREMENT RESULT

The occupied bandwidth, that is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5 percent of the total mean power radiated by a given emission shall be measured. All modes of operation were investigated and the worst case configuration results are reported in this section.

LTE Band 2

Channel Bandwidth: 1.4 MHz

Channel Bandwidth: 1.4 MHz					
Modulation	Channel	RB Configuration		Occupied Bandwidth(MHz)	Verdict
		Size	Offset		
QPSK	LCH	6	0	1.0782	PASS
	MCH	6	0	1.0787	PASS
	HCH	6	0	1.0777	PASS
16QAM	LCH	6	0	1.0823	PASS
	MCH	6	0	1.0825	PASS
	HCH	6	0	1.0818	PASS

Channel Bandwidth: 3 MHz

Channel Bandwidth: 3 MHz					
Modulation	Channel	RB Configuration		Occupied Bandwidth(MHz)	Verdict
		Size	Offset		
QPSK	LCH	15	0	2.6861	PASS
	MCH	15	0	2.6858	PASS
	HCH	15	0	2.6857	PASS
16QAM	LCH	15	0	2.6852	PASS
	MCH	15	0	2.6842	PASS
	HCH	15	0	2.6840	PASS

Channel Bandwidth: 5 MHz

Channel Bandwidth: 5 MHz					
Modulation	Channel	RB Configuration		Occupied Bandwidth(MHz)	Verdict
		Size	Offset		

QPSK	LCH	25	0	4.4802	PASS
	MCH	25	0	4.4752	PASS
	HCH	25	0	4.4835	PASS
16QAM	LCH	25	0	4.4833	PASS
	MCH	25	0	4.4825	PASS
	HCH	25	0	4.4792	PASS

Channel Bandwidth: 10 MHz

Channel Bandwidth: 10 MHz					
Modulation	Channel	RB Configuration		Occupied Bandwidth (MHz)	Verdict
		Size	Offset		
QPSK	LCH	50	0	8.9463	PASS
	MCH	50	0	8.9378	PASS
	HCH	50	0	8.9484	PASS
16QAM	LCH	50	0	8.9529	PASS
	MCH	50	0	8.9459	PASS
	HCH	50	0	8.9342	PASS

Channel Bandwidth: 15 MHz

Channel Bandwidth: 15 MHz					
Modulation	Channel	RB Configuration		Occupied Bandwidth (MHz)	Verdict
		Size	Offset		
QPSK	LCH	75	0	13.424	PASS
	MCH	75	0	13.417	PASS
	HCH	75	0	13.411	PASS
16QAM	LCH	75	0	13.404	PASS
	MCH	75	0	13.406	PASS
	HCH	75	0	13.391	PASS

Channel Bandwidth: 20 MHz

Channel Bandwidth: 20 MHz					
Modulation	Channel	RB Configuration		Occupied Bandwidth (MHz)	Verdict
		Size	Offset		
QPSK	LCH	100	0	17.852	PASS
	MCH	100	0	17.856	PASS
	HCH	100	0	17.831	PASS
16QAM	LCH	100	0	17.872	PASS
	MCH	100	0	17.867	PASS
	HCH	100	0	17.845	PASS

LTE Band 4

Channel Bandwidth: 1.4 MHz

Channel Bandwidth: 1.4 MHz					
Modulation	Channel	RB Configuration		Occupied Bandwidth(MHz)	Verdict
		Size	Offset		
QPSK	LCH	6	0	1.0782	PASS
	MCH	6	0	1.0752	PASS
	HCH	6	0	1.0797	PASS
16QAM	LCH	6	0	1.0785	PASS
	MCH	6	0	1.0776	PASS
	HCH	6	0	1.0761	PASS

Channel Bandwidth: 3 MHz

Channel Bandwidth: 3 MHz					
Modulation	Channel	RB Configuration		Occupied Bandwidth(MHz)	Verdict
		Size	Offset		
QPSK	LCH	15	0	2.6790	PASS
	MCH	15	0	2.6843	PASS
	HCH	15	0	2.6844	PASS
16QAM	LCH	15	0	2.6852	PASS
	MCH	15	0	2.6844	PASS
	HCH	15	0	2.6866	PASS

Channel Bandwidth: 5 MHz

Channel Bandwidth: 5 MHz					
Modulation	Channel	RB Configuration		Occupied Bandwidth(MHz)	Verdict
		Size	Offset		
QPSK	LCH	25	0	4.4822	PASS
	MCH	25	0	4.4824	PASS
	HCH	25	0	4.4748	PASS
16QAM	LCH	25	0	4.4728	PASS
	MCH	25	0	4.4819	PASS
	HCH	25	0	4.4826	PASS

Channel Bandwidth: 10 MHz

Channel Bandwidth: 10 MHz					
Modulation	Channel	RB Configuration		Occupied Bandwidth (MHz)	Verdict
		Size	Offset		
QPSK	LCH	50	0	8.9397	PASS

	MCH	50	0	8.9524	PASS
	HCH	50	0	8.9477	PASS
16QAM	LCH	50	0	8.9344	PASS
	MCH	50	0	8.9532	PASS
	HCH	50	0	8.9589	PASS

Channel Bandwidth: 15 MHz

Channel Bandwidth: 15 MHz					
Modulation	Channel	RB Configuration		Occupied Bandwidth (MHz)	Verdict
		Size	Offset		
QPSK	LCH	75	0	13.383	PASS
	MCH	75	0	13.415	PASS
	HCH	75	0	13.396	PASS
16QAM	LCH	75	0	13.380	PASS
	MCH	75	0	13.406	PASS
	HCH	75	0	13.408	PASS

Channel Bandwidth: 20 MHz

Channel Bandwidth: 20 MHz					
Modulation	Channel	RB Configuration		Occupied Bandwidth (MHz)	Verdict
		Size	Offset		
QPSK	LCH	100	0	17.849	PASS
	MCH	100	0	17.866	PASS
	HCH	100	0	17.813	PASS
16QAM	LCH	100	0	17.846	PASS
	MCH	100	0	17.869	PASS
	HCH	100	0	17.804	PASS

LTE Band 12

Channel Bandwidth: 1.4 MHz

Channel Bandwidth: 1.4 MHz					
Modulation	Channel	RB Configuration		Occupied Bandwidth(MHz)	Verdict
		Size	Offset		
QPSK	LCH	6	0	1.0783	PASS
	MCH	6	0	1.0782	PASS
	HCH	6	0	1.0772	PASS
16QAM	LCH	6	0	1.0811	PASS
	MCH	6	0	1.0812	PASS
	HCH	6	0	1.0796	PASS

Channel Bandwidth: 3 MHz

Channel Bandwidth: 3 MHz					
Modulation	Channel	RB Configuration		Occupied Bandwidth(MHz)	Verdict
		Size	Offset		
QPSK	LCH	15	0	2.6860	PASS
	MCH	15	0	2.6855	PASS
	HCH	15	0	2.6868	PASS
16QAM	LCH	15	0	2.6862	PASS
	MCH	15	0	2.6842	PASS
	HCH	15	0	2.6842	PASS

Channel Bandwidth: 5 MHz

Channel Bandwidth: 5 MHz					
Modulation	Channel	RB Configuration		Occupied Bandwidth(MHz)	Verdict
		Size	Offset		
QPSK	LCH	25	0	4.4744	PASS
	MCH	25	0	4.4793	PASS
	HCH	25	0	4.4752	PASS
16QAM	LCH	25	0	4.4677	PASS
	MCH	25	0	4.4790	PASS
	HCH	25	0	4.4673	PASS

Channel Bandwidth: 10 MHz

Channel Bandwidth: 10 MHz					
Modulation	Channel	RB Configuration		Occupied Bandwidth (MHz)	Verdict
		Size	Offset		
QPSK	LCH	50	0	8.9334	PASS
	MCH	50	0	8.9728	PASS
	HCH	50	0	8.9634	PASS
16QAM	LCH	50	0	8.9145	PASS
	MCH	50	0	8.9569	PASS
	HCH	50	0	8.9475	PASS

LTE Band 17

Channel Bandwidth: 5 MHz

Channel Bandwidth: 5 MHz					
Modulation	Channel	RB Configuration		Occupied Bandwidth (MHz)	Verdict
		Size	Offset		
QPSK	LCH	25	0	4.4844	PASS
	MCH	25	0	4.4898	PASS
	HCH	25	0	4.4770	PASS
16QAM	LCH	25	0	4.4800	PASS
	MCH	25	0	4.4797	PASS
	HCH	25	0	4.4707	PASS

Channel Bandwidth: 10 MHz

Channel Bandwidth: 10 MHz					
Modulation	Channel	RB Configuration		Occupied Bandwidth (MHz)	Verdict
		Size	Offset		
QPSK	LCH	50	0	8.9719	PASS
	MCH	50	0	8.9725	PASS
	HCH	50	0	8.9510	PASS
16QAM	LCH	50	0	8.9671	PASS
	MCH	50	0	8.9477	PASS
	HCH	50	0	8.9473	PASS

Note: Please refers to Appendix B for compliance test plots for Occupied Bandwidth (99%)

10. EMISSION BANDWIDTH

10.1 MEASUREMENT METHOD

The test set up and general procedure is similar to conducted peak output power test. Only different for setting the measurement configuration of the measuring instrument of Spectrum Analyzer.

10.2 PROVISIONS APPLICABLE

The emission bandwidth is defined as two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26dB below the transmitter power

10.3 MEASUREMENT RESULT

The occupied bandwidth, that is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5 percent of the total mean power radiated by a given emission shall be measured. All modes of operation were investigated and the worst case configuration results are reported in this section.

LTE Band 2

Channel Bandwidth: 1.4 MHz

Channel Bandwidth: 1.4 MHz					
Modulation	Channel	RB Configuration		26dB Bandwidth (MHz)	Verdict
		Size	Offset		
QPSK	LCH	6	0	1.254	PASS
	MCH	6	0	1.258	PASS
	HCH	6	0	1.260	PASS
16QAM	LCH	6	0	1.258	PASS
	MCH	6	0	1.219	PASS
	HCH	6	0	1.290	PASS

Channel Bandwidth: 3 MHz

Channel Bandwidth: 3 MHz					
Modulation	Channel	RB Configuration		26dB Bandwidth (MHz)	Verdict
		Size	Offset		
QPSK	LCH	15	0	2.911	PASS
	MCH	15	0	2.892	PASS
	HCH	15	0	2.913	PASS
16QAM	LCH	15	0	2.900	PASS
	MCH	15	0	2.893	PASS
	HCH	15	0	2.903	PASS

Channel Bandwidth: 5 MHz

Channel Bandwidth: 5 MHz					
Modulation	Channel	RB Configuration		26dB Bandwidth (MHz)	Verdict
		Size	Offset		

QPSK	LCH	25	0	4.790	PASS
	MCH	25	0	4.819	PASS
	HCH	25	0	4.799	PASS
16QAM	LCH	25	0	4.816	PASS
	MCH	25	0	4.799	PASS
	HCH	25	0	4.816	PASS

Channel Bandwidth: 10 MHz

Channel Bandwidth: 10 MHz					
Modulation	Channel	RB Configuration		26dB Bandwidth (MHz)	Verdict
		Size	Offset		
QPSK	LCH	50	0	9.598	PASS
	MCH	50	0	9.552	PASS
	HCH	50	0	9.430	PASS
16QAM	LCH	50	0	9.610	PASS
	MCH	50	0	9.515	PASS
	HCH	50	0	9.511	PASS

Channel Bandwidth: 15 MHz

Channel Bandwidth: 15 MHz					
Modulation	Channel	RB Configuration		26dB Bandwidth (MHz)	Verdict
		Size	Offset		
QPSK	LCH	75	0	14.36	PASS
	MCH	75	0	14.15	PASS
	HCH	75	0	14.06	PASS
16QAM	LCH	75	0	14.15	PASS
	MCH	75	0	14.13	PASS
	HCH	75	0	13.97	PASS

Channel Bandwidth: 20 MHz

Channel Bandwidth: 20 MHz					
Modulation	Channel	RB Configuration		26dB Bandwidth (MHz)	Verdict
		Size	Offset		
QPSK	LCH	100	0	18.67	PASS
	MCH	100	0	18.65	PASS
	HCH	100	0	18.62	PASS
16QAM	LCH	100	0	18.71	PASS
	MCH	100	0	18.69	PASS
	HCH	100	0	18.58	PASS

LTE Band 4

Channel Bandwidth: 1.4 MHz

Channel Bandwidth: 1.4 MHz					
Modulation	Channel	RB Configuration		26dB Bandwidth (MHz)	Verdict
		Size	Offset		
QPSK	LCH	6	0	1.215	PASS
	MCH	6	0	1.233	PASS
	HCH	6	0	1.213	PASS
16QAM	LCH	6	0	1.235	PASS
	MCH	6	0	1.233	PASS
	HCH	6	0	1.231	PASS

Channel Bandwidth: 3 MHz

Channel Bandwidth: 3 MHz					
Modulation	Channel	RB Configuration		26dB Bandwidth (MHz)	Verdict
		Size	Offset		
QPSK	LCH	15	0	2.881	PASS
	MCH	15	0	2.895	PASS
	HCH	15	0	2.905	PASS
16QAM	LCH	15	0	2.894	PASS
	MCH	15	0	2.882	PASS
	HCH	15	0	2.909	PASS

Channel Bandwidth: 5 MHz

Channel Bandwidth: 5 MHz					
Modulation	Channel	RB Configuration		26dB Bandwidth (MHz)	Verdict
		Size	Offset		
QPSK	LCH	25	0	4.775	PASS
	MCH	25	0	4.835	PASS
	HCH	25	0	4.791	PASS
16QAM	LCH	25	0	4.830	PASS
	MCH	25	0	4.820	PASS
	HCH	25	0	4.870	PASS

Channel Bandwidth: 10 MHz

Channel Bandwidth: 10 MHz					
Modulation	Channel	RB Configuration		26dB Bandwidth (MHz)	Verdict
		Size	Offset		
QPSK	LCH	50	0	9.532	PASS
	MCH	50	0	9.481	PASS

	HCH	50	0	9.468	PASS
16QAM	LCH	50	0	9.558	PASS
	MCH	50	0	9.484	PASS
	HCH	50	0	9.430	PASS

Channel Bandwidth: 15 MHz

Channel Bandwidth: 15 MHz					
Modulation	Channel	RB Configuration		26dB Bandwidth (MHz)	Verdict
		Size	Offset		
QPSK	LCH	75	0	14.07	PASS
	MCH	75	0	14.09	PASS
	HCH	75	0	14.08	PASS
16QAM	LCH	75	0	13.99	PASS
	MCH	75	0	13.99	PASS
	HCH	75	0	13.98	PASS

Channel Bandwidth: 20 MHz

Channel Bandwidth: 20 MHz					
Modulation	Channel	RB Configuration		26dB Bandwidth (MHz)	Verdict
		Size	Offset		
QPSK	LCH	100	0	18.60	PASS
	MCH	100	0	18.59	PASS
	HCH	100	0	18.53	PASS
16QAM	LCH	100	0	18.59	PASS
	MCH	100	0	18.62	PASS
	HCH	100	0	18.52	PASS

LTE Band 12

Channel Bandwidth: 1.4 MHz

Channel Bandwidth: 1.4 MHz					
Modulation	Channel	RB Configuration		26dB Bandwidth (MHz)	Verdict
		Size	Offset		
- QPSK	LCH	6	0	1.234	PASS
	MCH	6	0	1.226	PASS
	HCH	6	0	1.235	PASS
16QAM	LCH	6	0	1.240	PASS
	MCH	6	0	1.239	PASS
	HCH	6	0	1.245	PASS

Channel Bandwidth: 3 MHz

Channel Bandwidth: 3 MHz

Modulation	Channel	RB Configuration		26dB Bandwidth (MHz)	Verdict
		Size	Offset		
QPSK	LCH	15	0	2.893	PASS
	MCH	15	0	2.902	PASS
	HCH	15	0	2.886	PASS
16QAM	LCH	15	0	2.893	PASS
	MCH	15	0	2.893	PASS
	HCH	15	0	2.897	PASS

Channel Bandwidth: 5 MHz

Channel Bandwidth: 5 MHz					
Modulation	Channel	RB Configuration		26dB Bandwidth (MHz)	Verdict
		Size	Offset		
QPSK	LCH	25	0	4.771	PASS
	MCH	25	0	4.826	PASS
	HCH	25	0	4.791	PASS
16QAM	LCH	25	0	4.810	PASS
	MCH	25	0	4.826	PASS
	HCH	25	0	4.830	PASS

Channel Bandwidth: 10 MHz

Channel Bandwidth: 10 MHz					
Modulation	Channel	RB Configuration		26dB Bandwidth (MHz)	Verdict
		Size	Offset		
QPSK	LCH	50	0	9.480	PASS
	MCH	50	0	9.573	PASS
	HCH	50	0	9.456	PASS
16QAM	LCH	50	0	9.422	PASS
	MCH	50	0	9.524	PASS
	HCH	50	0	9.454	PASS

LTE Band 17

Channel Bandwidth: 5 MHz

Channel Bandwidth: 5 MHz					
Modulation	Channel	RB Configuration		26dB Bandwidth(MHz)	Verdict
		Size	Offset		
QPSK	LCH	25	0	4.782	PASS
	MCH	25	0	4.810	PASS
	HCH	25	0	4.810	PASS
16QAM	LCH	25	0	4.829	PASS

	MCH	25	0	4.824	PASS
	HCH	25	0	4.836	PASS

Channel Bandwidth: 10 MHz

Channel Bandwidth: 10 MHz					
Modulation	Channel	RB Configuration		26dB Bandwidth (MHz)	Verdict
		Size	Offset		
QPSK	LCH	50	0	9.588	PASS
	MCH	50	0	9.523	PASS
	HCH	50	0	9.556	PASS
16QAM	LCH	50	0	9.467	PASS
	MCH	50	0	9.482	PASS
	HCH	50	0	9.482	PASS

Note: Please refers to Appendix B for compliance test plots for emission bandwidth (-26dBc)

11. BAND EDGE

11.1 MEASUREMENT METHOD

The test set up and general procedure is similar to conducted peak output power test. Only different for setting the measurement configuration of the measuring instrument of Spectrum Analyzer.

11.2 PROVISIONS APPLICABLE

As Specified in FCC rules of §2.1051 §24.238(a) §27.53(e) §27.53(g)
KDB 971168 v02r01 – Section 6.0

11.3 MEASUREMENT RESULT

All out of band emissions are measured with a spectrum analyzer connected to the antenna terminal of the EUT while the EUT is operating at its maximum duty cycle, at maximum power, and at the appropriate frequency. All data rates were investigated to determine the worst case configuration. All modes of operation were investigated and the worst case configuration results are reported in this section.
The minimum permissible attenuation level of any spurious emission is 43 + log10(P[Watts]), where P is the transmitter power in Watts.
Please refers to Appendix III for compliance test plots for band edge

12. MAINS CONDUCTED EMISSION

12.1 MEASUREMENT METHOD

The measurement procedure specified in ANSI/TIA-603-D-2010 was used for testing. Conducted Emission was measured with travel charger.

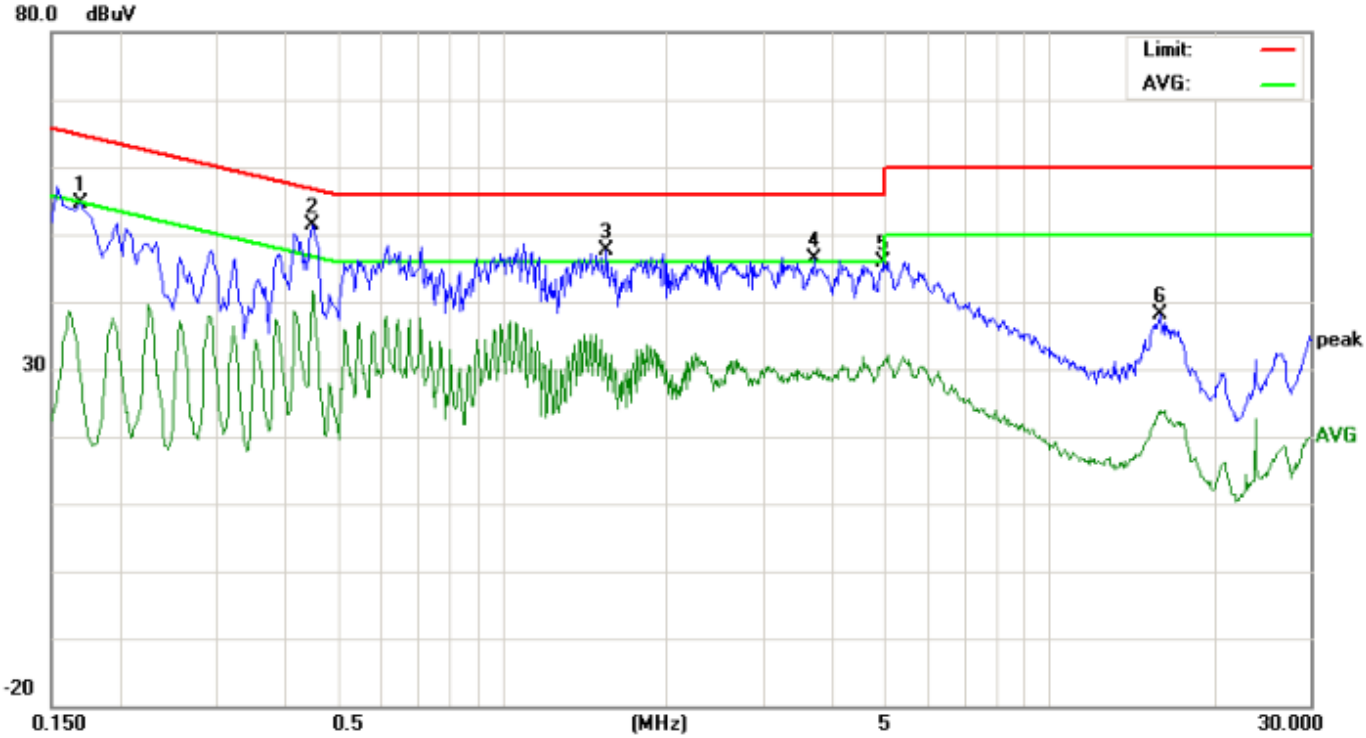
12.2 PROVISIONS APPLICABLE

Frequency of Emission (MHz)	Conducted Limit(dBuV)	
	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. *The lower limit shall apply at the transition frequency.		

Note: The FDD Band 2 mode is the worst condition and the test result as following:

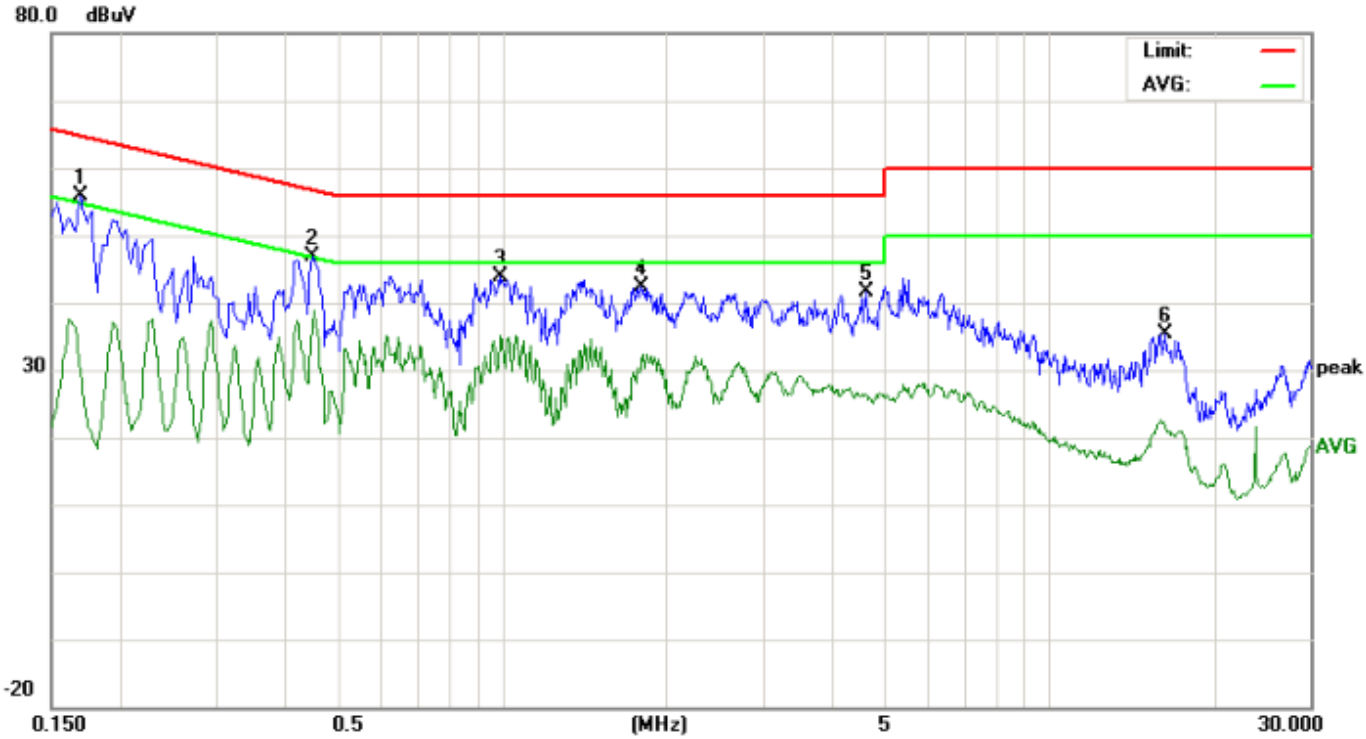
12.3 MEASUREMENT RESULT

LINE CONDUCTED EMISSION – L



No.	Freq. (MHz)	Reading_Level (dBuV)			Correct Factor	Measurement (dBuV)			Limit (dBuV)		Margin (dB)		P/F	Comment
		Peak	QP	AVG	dB	Peak	QP	AVG	QP	AVG	QP	AVG		
1	0.1700	44.40		18.27	10.18	54.58		28.45	64.96	54.96	-10.38	-26.51	P	
2	0.4500	41.08		31.20	10.37	51.45		41.57	56.87	46.87	-5.42	-5.30	P	
3	1.5540	37.18		20.91	10.36	47.54		31.27	56.00	46.00	-8.46	-14.73	P	
4	3.7260	35.83		18.78	10.47	46.30		29.25	56.00	46.00	-9.70	-16.75	P	
5	4.9860	35.72		20.72	10.24	45.96		30.96	56.00	46.00	-10.04	-15.04	P	
6	16.0300	28.02		13.29	10.11	38.13		23.40	60.00	50.00	-21.87	-26.60	P	

LINE CONDUCTED EMISSION – N



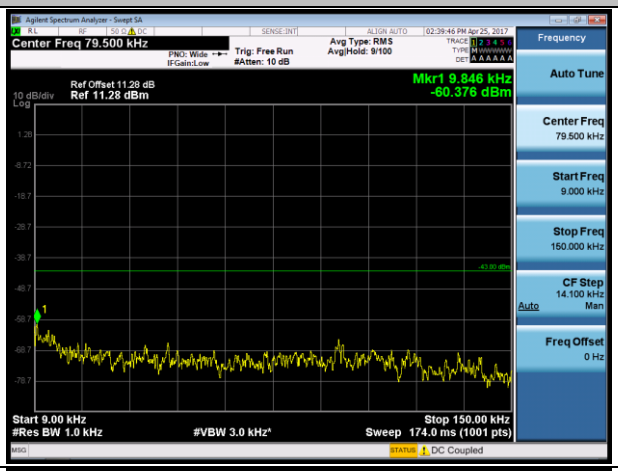
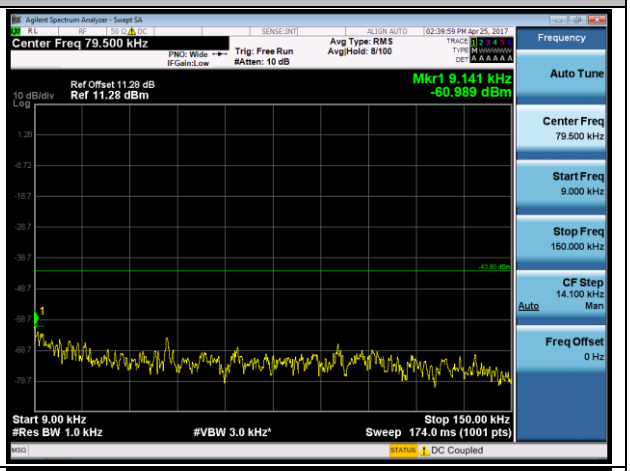
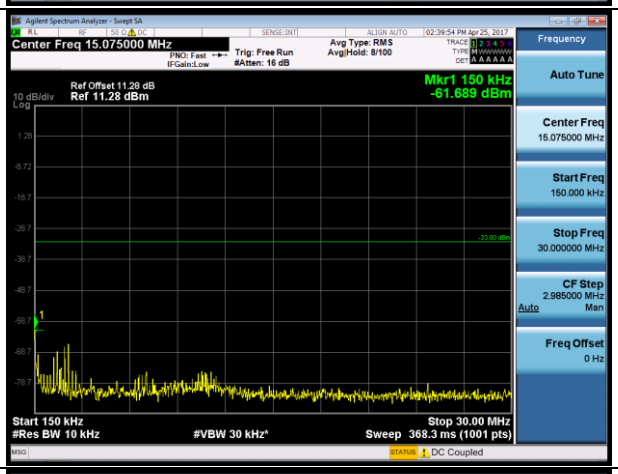
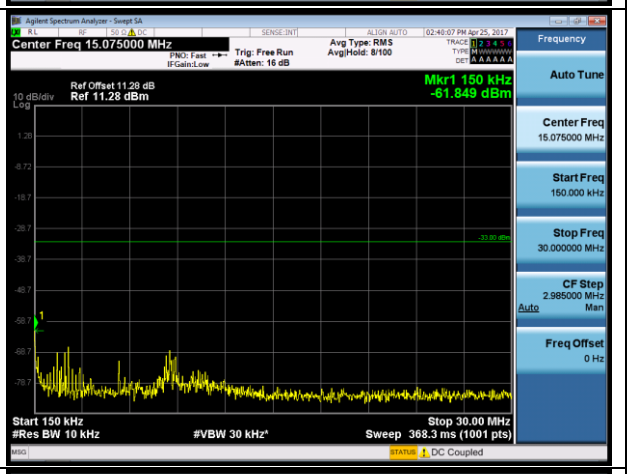
No.	Freq. (MHz)	Reading_Level (dBuV)			Correct Factor	Measurement (dBuV)			Limit (dBuV)		Margin (dB)		P/F	Comment
		Peak	QP	AVG	dB	Peak	QP	AVG	QP	AVG	QP	AVG		
1	0.1700	45.61		19.09	10.18	55.79		29.27	64.96	54.96	-9.17	-25.69	P	
2	0.4500	36.60		27.04	10.37	46.97		37.41	56.87	46.87	-9.90	-9.46	P	
3	0.9940	33.44		24.66	10.37	43.81		35.03	56.00	46.00	-12.19	-10.97	P	
4	1.7980	32.22		20.15	10.28	42.50		30.43	56.00	46.00	-13.50	-15.57	P	
5	4.6380	31.51		16.24	10.22	41.73		26.46	56.00	46.00	-14.27	-19.54	P	
6	16.3500	25.32		11.55	10.12	35.44		21.67	60.00	50.00	-24.56	-28.33	P	

Note: The FDD Band 2 mode is the worst condition.

APPENDIX A

TEST PLOTS FOR CONDUCTED SPURIOUS EMISSION

LTE BAND 2

LCH_QPSK_1RB#0	LCH_QPSK_1RB#24
	
	

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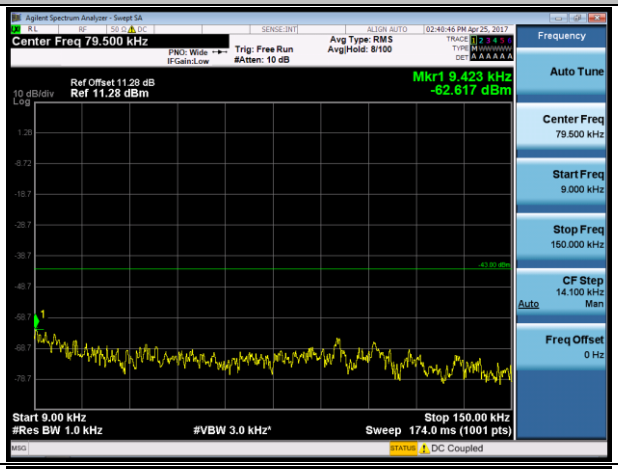
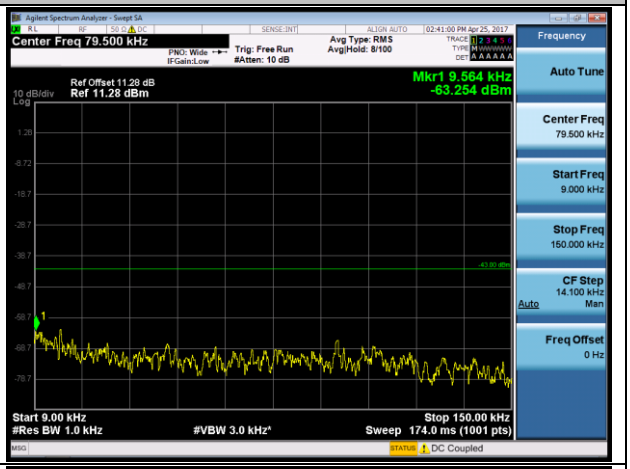
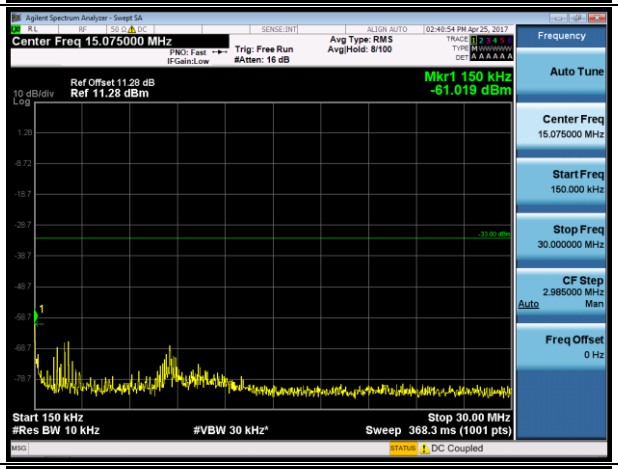
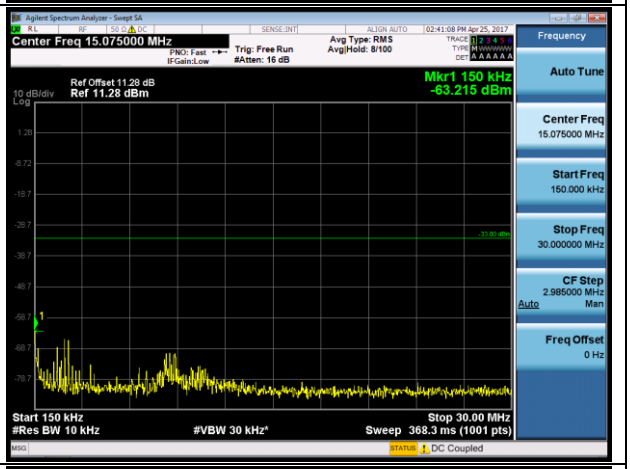
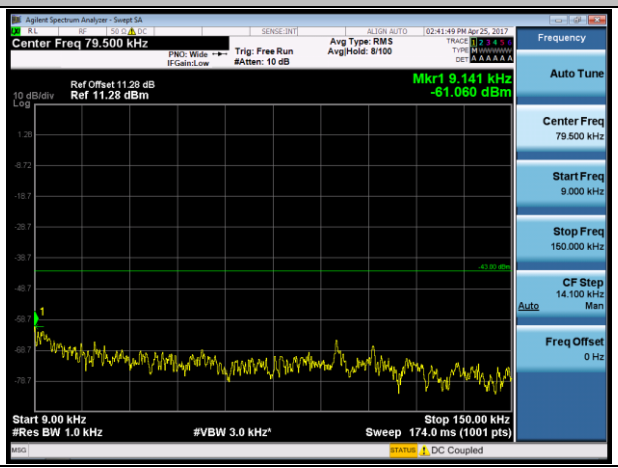
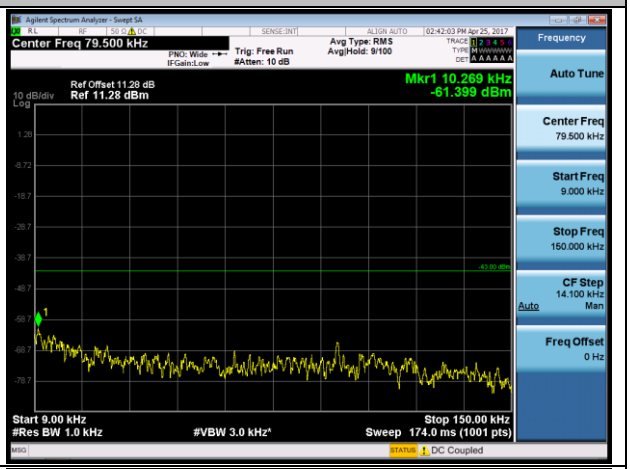
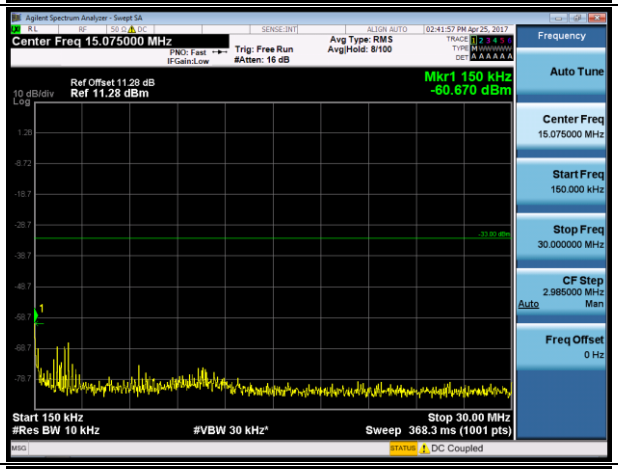
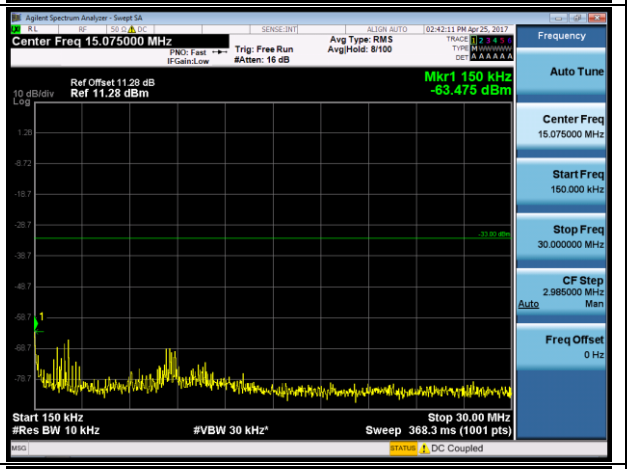
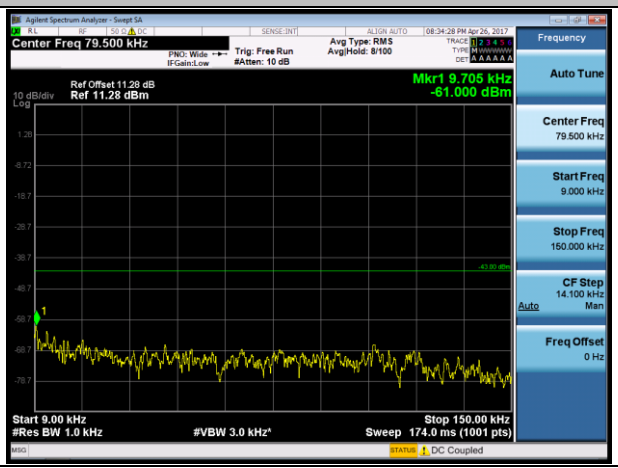
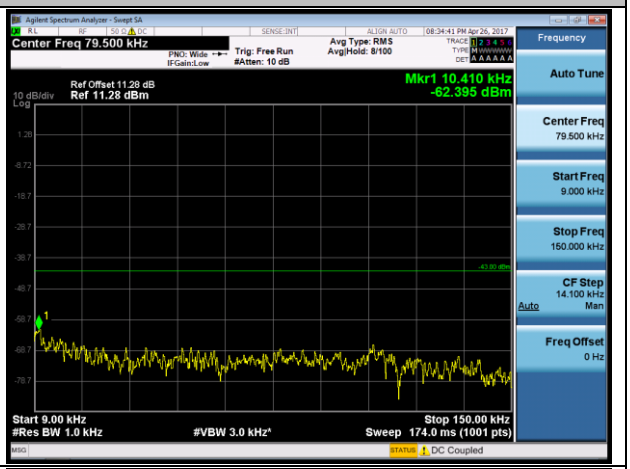
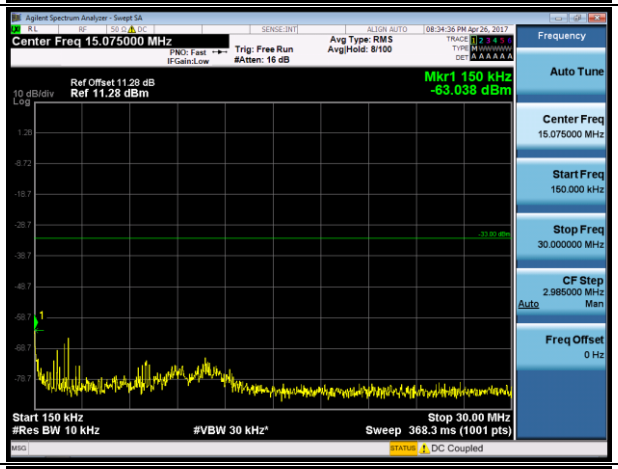
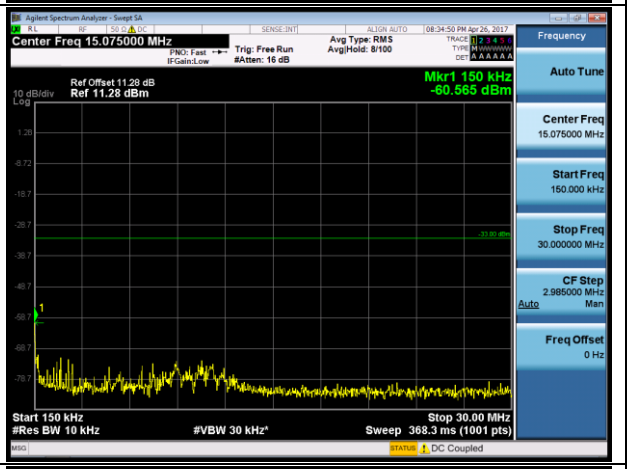
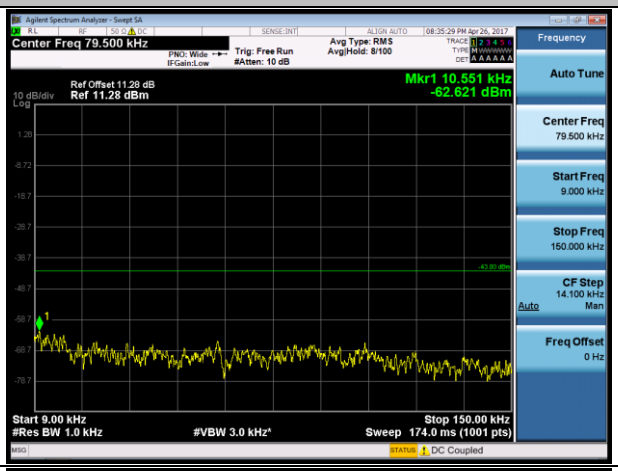
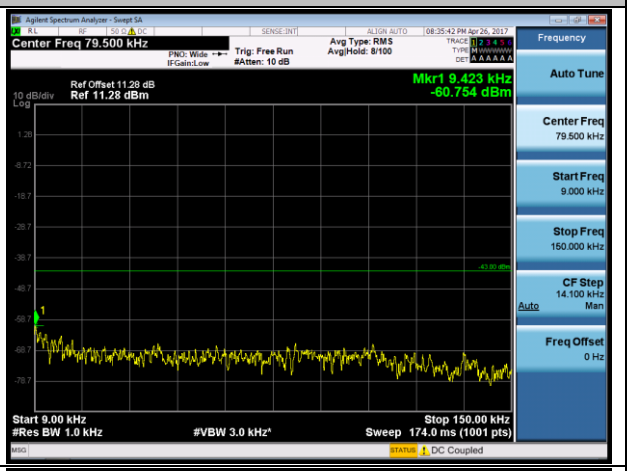
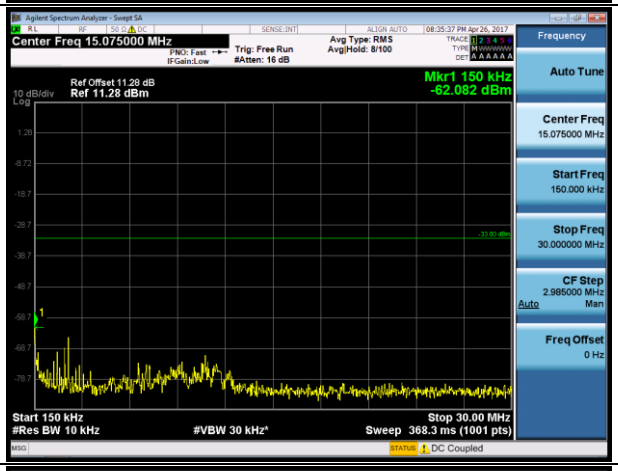
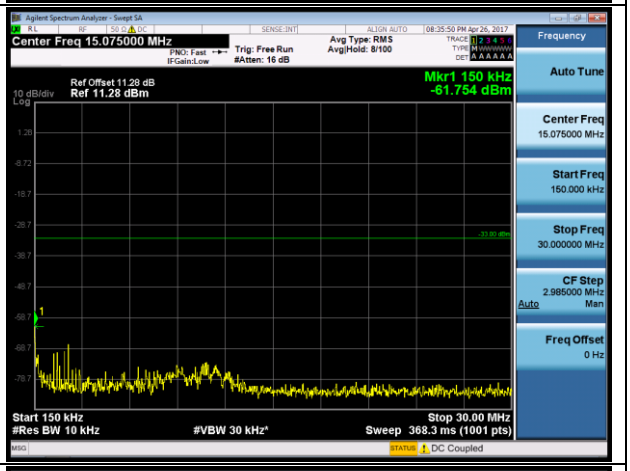
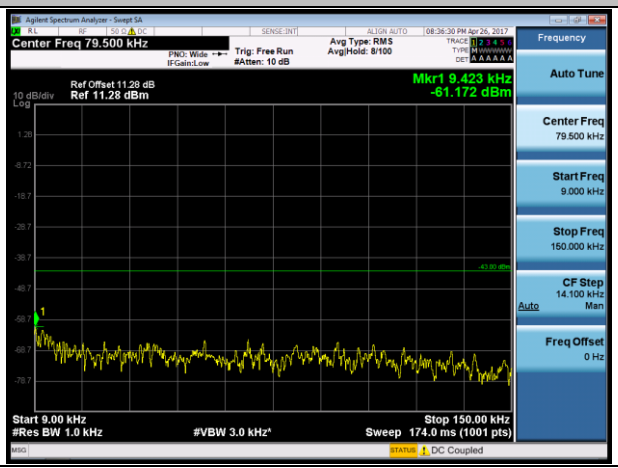
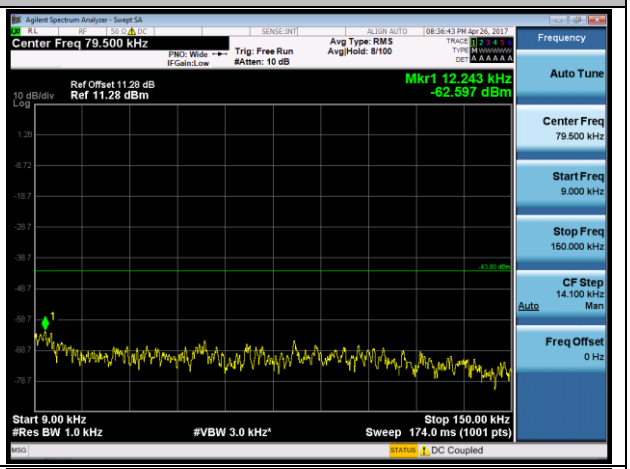
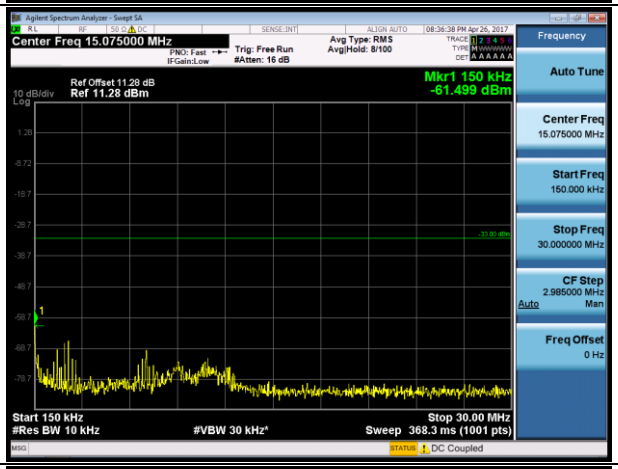
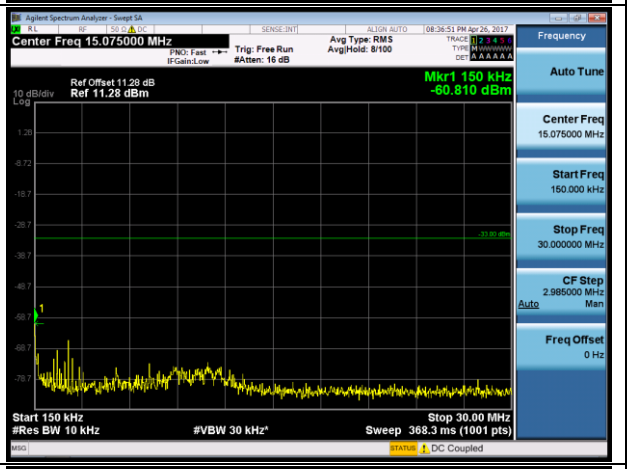
	
	

HCH_QPSK_1RB#0	HCH_QPSK_1RB#24
	
	

LTE BAND 4

LCH_QPSK_1RB#0	LCH_QPSK_1RB#24
	
	

MCH_QPSK_1RB#0	MCH_QPSK_1RB#24
	
	

HCH_QPSK_1RB#0	HCH_QPSK_1RB#24
	
	

LTE BAND 12

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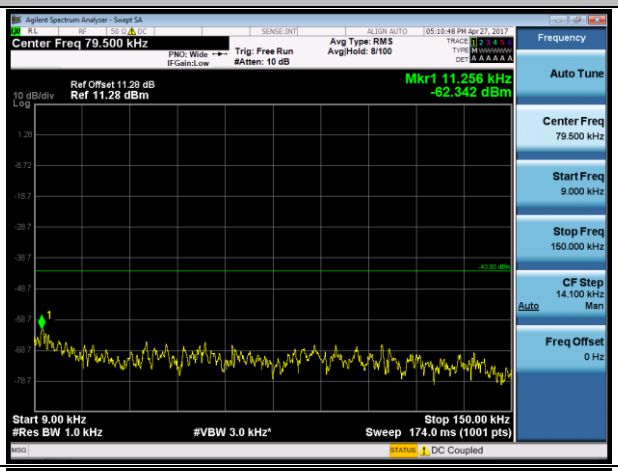	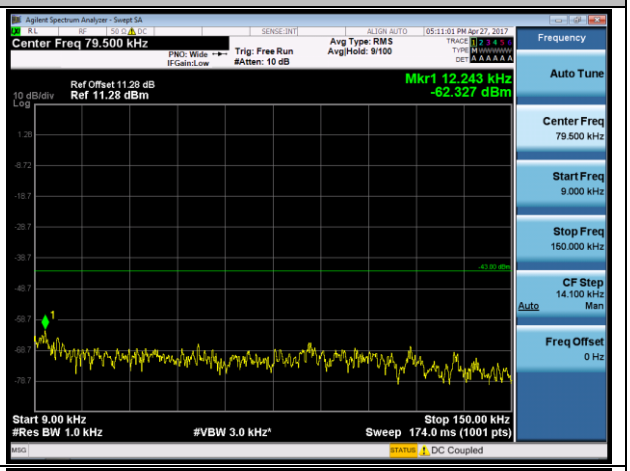
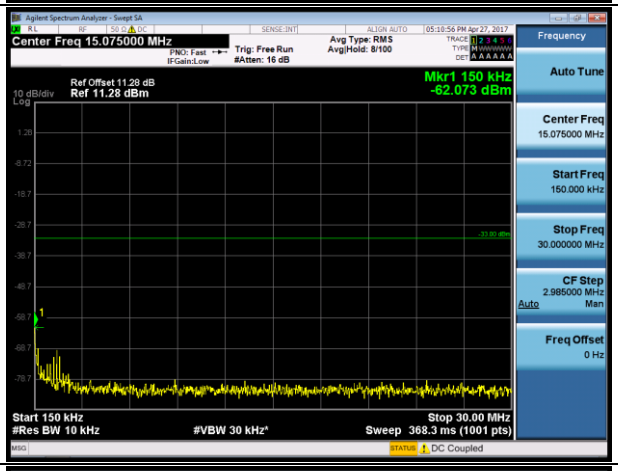	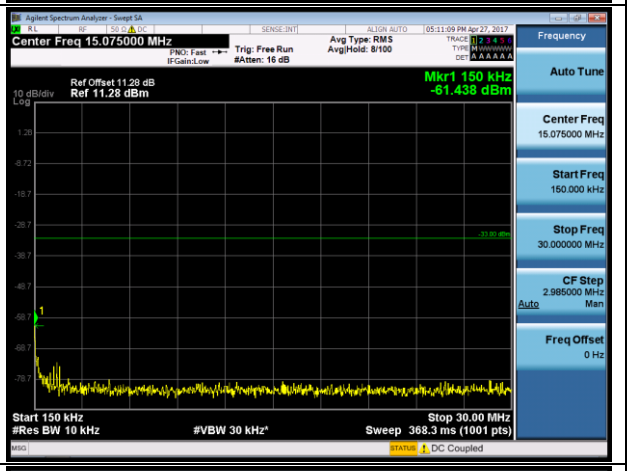

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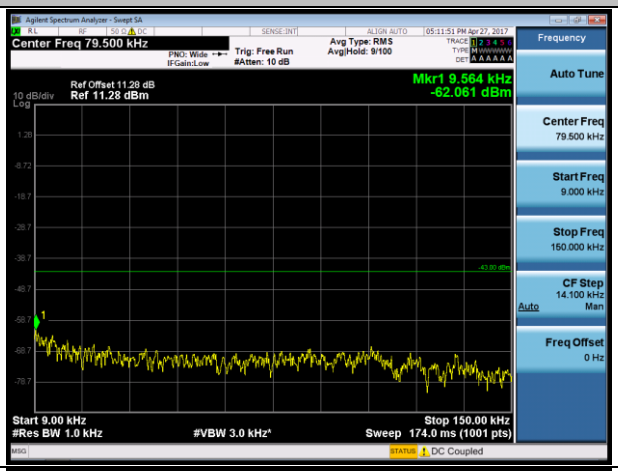	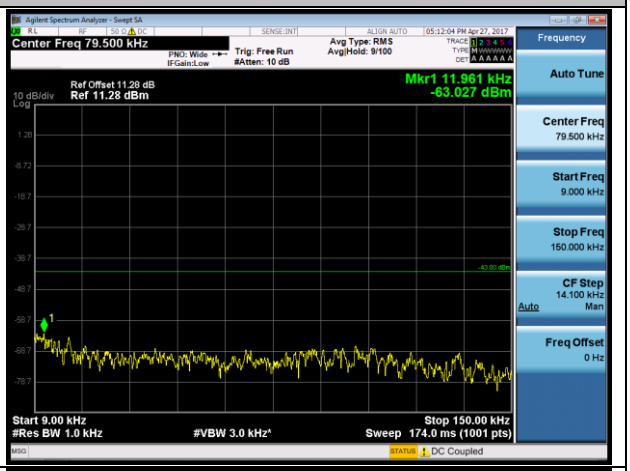
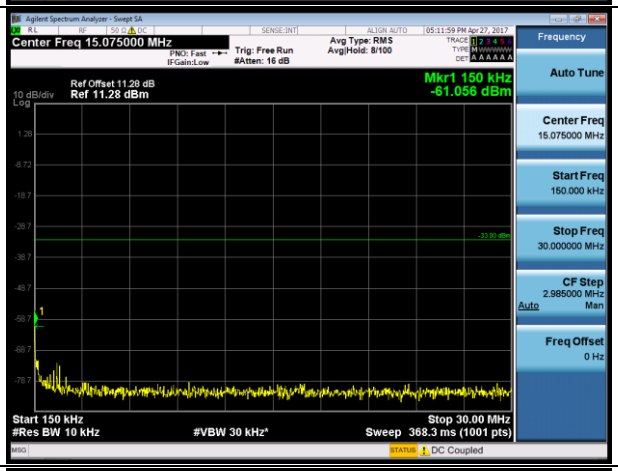	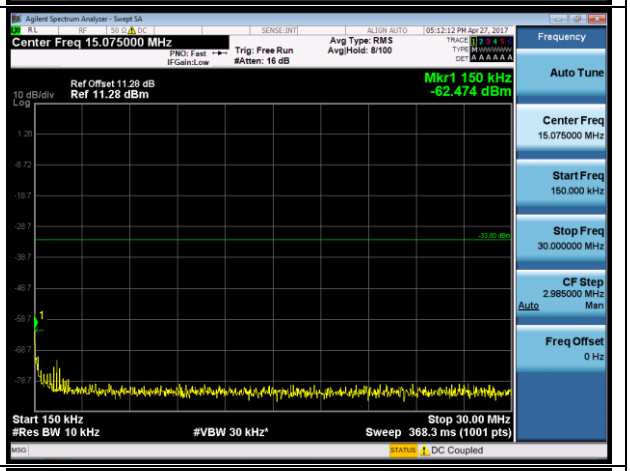
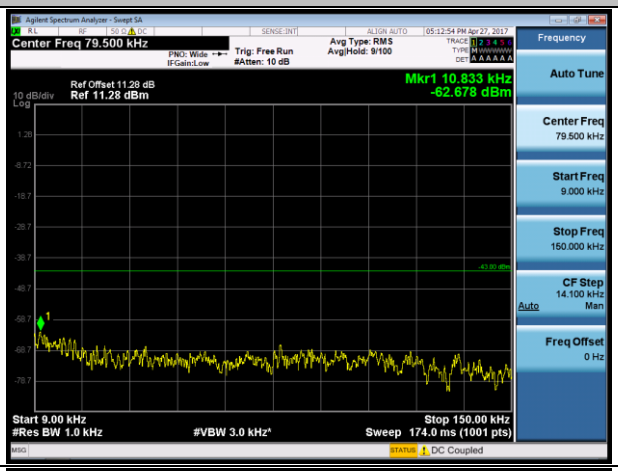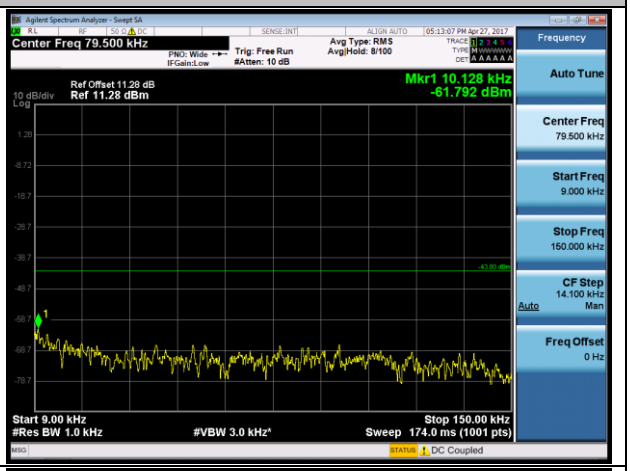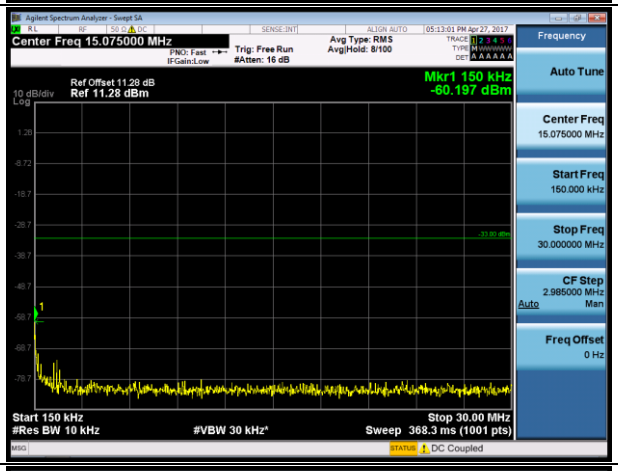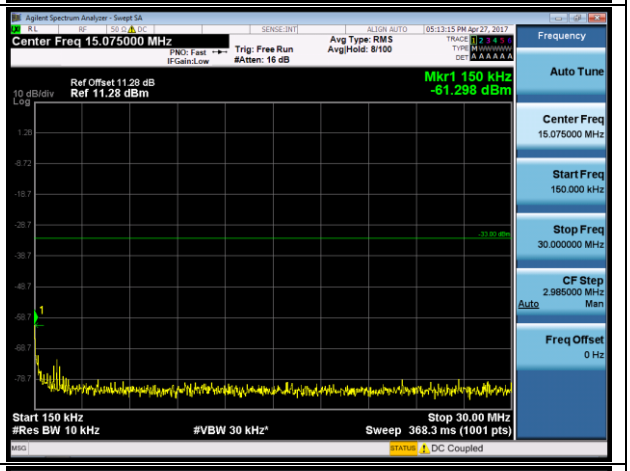
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