

Appendix B : Cellular receiver Part15B test results

1. TEST METHODOLOGY

The tests documented in this report were performed in accordance with following methods.

1. FCC CFR 47 Part 2.
2. FCC CFR 47 Part 15.
3. ANSI C63.4 : 2014

2. EQUIPMENT UNDER TEST

2.1. DESCRIPTION OF EUT

The EUT is a GSM/WCDMA/LTE Phone + BT/BLE and DTS b/g/n.
This test report addresses the WWAN receiver mode.
(GSM850/WCDMA B5/LTE B5/LTE B12/LTE B13)

2.2. TEST MODE

Mode	Description
GSM850	Communicating with Call simulator(CMW500)
WCDMA BAND 5	Communicating with Call simulator(CMW500)
LTE BAND 5	Communicating with Call simulator(CMW500)
LTE BAND 12	Communicating with Call simulator(CMW500)
LTE BAND 13	Communicating with Call simulator(CMW500)

Note: The spurious emissions were pre-tested and found to be similar in low / mid / high.
Therefore, the mid channel is only described in this report.

2.3. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Support Equipment List				
Description	Manufacturer	Model	Serial Number	FCC ID
Charger	SAMSUNG	EP-TA200	R37KC3B01GORC3	N/A
Data Cable	SAMSUNG	EP-D140AWE	N/A	N/A
Earphone	SAMSUNG	EHS61ASFWE	N/A	N/A

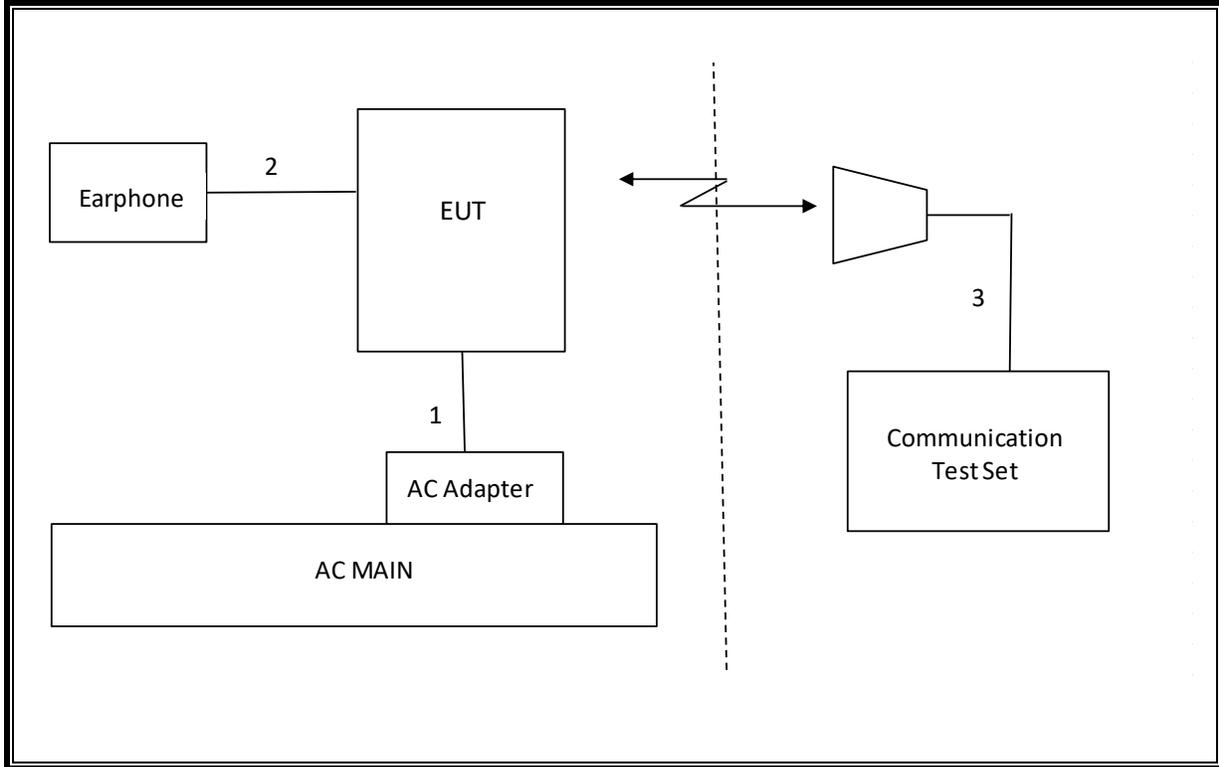
I/O CABLE

I/O Cable List						
Cable No	Port	# of identical ports	Connector Type	Cable Type	Cable Length (m)	Remarks
1	DC Power	1	C Type	Shielded	1.1m	N/A
2	Audio	2	Mini-Jack	Unshielded	1.2m	N/A

TEST SETUP

The EUT is continuously communicated to the call box during the tests.

SETUP DIAGRAM FOR TESTS (RADIATED TEST SETUP)



3. TEST AND MEASUREMENT EQUIPMENT

The following test and measurement equipment was utilized for the tests documented in this report:

Test Equipment List				
Description	Manufacturer	Model	S/N	Cal Due
Antenna, Tuned Dipole 400-1000 MHz	ETS	3121D DB4	00164753	06-30-19
Antenna, Horn, 40 GHz	ETS	3116C	00166155	12-04-19
Preamplifier	ETS	3116C-PA	00168841	08-09-19
Antenna, Horn, 40 GHz	ETS	3116C	00168645	12-04-19
Antenna, Bilog, 30MHz-1GHz	SCHWARZBECK	VULB9163	750	08-04-20
Antenna, Bilog, 30MHz-1GHz	SCHWARZBECK	VULB9163	845	08-04-20
Antenna, Bilog, 30MHz-1GHz	SCHWARZBECK	VULB9163	749	08-04-20
Antenna, Horn, 18 GHz	ETS	3115	00167211	08-04-20
Antenna, Horn, 18 GHz	ETS	3115	00161451	08-04-20
Antenna, Horn, 18 GHz	ETS	3117	00168724	08-04-20
Antenna, Horn, 18 GHz	ETS	3117	00205959	08-04-20
Antenna, Horn, 18 GHz	ETS	3117	00168717	08-04-20
Combiner	WEINSCHTEL	1575	2152	08-08-19
Communications Test Set	R&S	CMW500	115331	08-07-19
DC Power Supply	Agilent / HP	E3640A	MY54226395	08-06-19
Preamplifier, 1000 MHz	Sonoma	310N	341282	08-07-19
Preamplifier, 1000 MHz	Sonoma	310N	370599	08-06-19
Preamplifier, 1000 MHz	Sonoma	310N	351741	08-07-19
Preamplifier, 18 GHz	Miteq	AFS42-00101800-25-S-42	1876511	08-07-19
Preamplifier, 18 GHz	Miteq	AFS42-00101800-25-S-42	2029169	08-07-19
Preamplifier, 18 GHz	Miteq	AFS42-00101800-25-S-42	1896138	08-07-19
Spectrum Analyzer, 44 GHz	Agilent / HP	N9030A	MY54490312	08-06-19
EMI Test Receive, 40 GHz	R&S	ESU40	100439	08-06-19
EMI Test Receive, 40 GHz	R&S	ESU40	100457	08-06-19
EMI Test Receive, 44 GHz	R&S	ESW40	101590	08-06-19
High Pass Filter 1.2GHz	Micro-Tronics	HPM50108-02	G005	08-08-19
High Pass Filter 1.2GHz	Micro-Tronics	HPM50108-02	G006	08-08-19
High Pass Filter 2.8GHz	Micro-Tronics	HPM50111-02	010	08-08-19
High Pass Filter 2.8GHz	Micro-Tronics	HPM50111-02	011	08-08-19
High Pass Filter 4GHz	Micro-Tronics	HPM50118-02	G001	08-08-19
High Pass Filter 4GHz	Micro-Tronics	HPM50118-02	G002	08-08-19
Attenuator	PASTERNAK	PE7087-10	A009	08-08-19
Attenuator	PASTERNAK	PE7087-10	A001	08-08-19
Attenuator	PASTERNAK	PE7087-10	A008	08-08-19
Attenuator	PASTERNAK	PE7087-10	2	08-07-19
Attenuator	PASTERNAK	PE7395-10	A011	08-08-19
Antenna, Loop, 9kHz-30MHz	R&S	HFH2-Z2	100418	10-26-19
Temperature Chamber	ESPEC	SH-642	93001109	08-06-19
UL Software				
Description	Manufacturer	Model	Version	
Antenna port test software	UL	CLT	Ver 2.5	

4. APPLICABLE LIMITS AND TEST RESULTS

TEST PROCEDURE

ANSI C63.4: 2014

LIMIT

§15.109 (a) Except for Class A digital devices, the field strength of radiated emissions from unintentional radiators at a distance of 3 meters shall not exceed the following values:

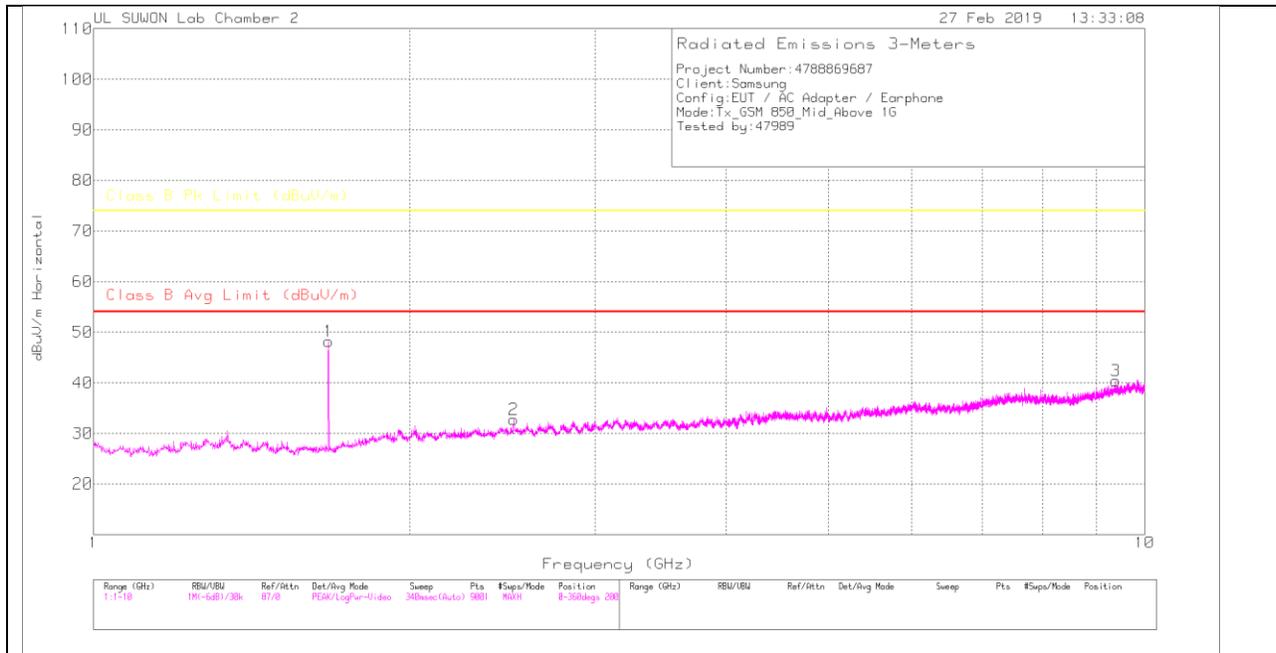
Limits for radiated disturbance of Class B ITE at measuring distance of 3 m	
Frequency range (MHz)	Quasi-peak limits (dB μ V/m)
30 to 88	40
88 to 216	43.5
216 to 960	46
Above 960 MHz	54

Note: The lower limit shall apply at the transition frequency.

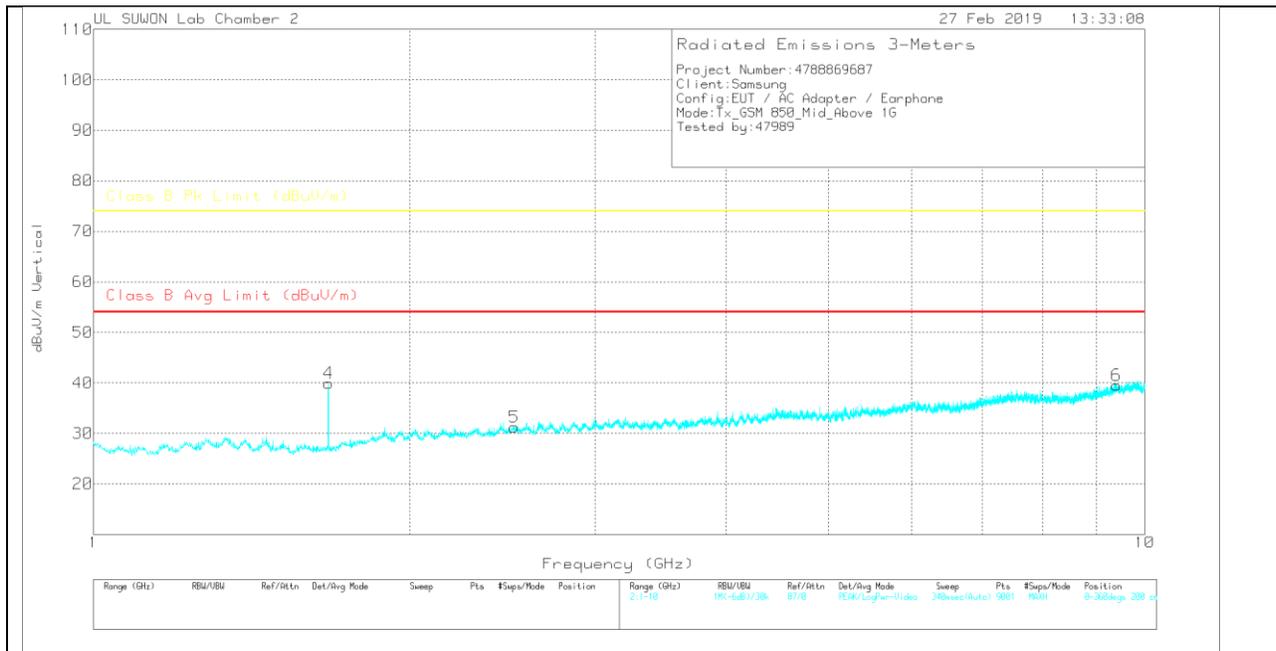
4.1. Above 1 GHz in the GSM850

MID CHANNEL(881.6MHz)

HORIZONTAL PEAK PLOT



VERTICAL PEAK PLOT



DATA

Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	3117_00168724	1-18GHz(dB)	1GHz_HPF	Corrected Reading dBuV/m	Class B Avg Limit (dBuV/m)	Av(CSPP)/Margin (dB)	Class B PK Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	1.673	50.5	PK	28.5	-31.3	.5	48.2	-	-	74	-25.8	0-360	200	H
2	2.509	30.66	PK	31.9	-30.3	.5	32.76	-	-	74	-41.24	0-360	100	H
3	9.392	25.68	PK	36.7	-22.6	.6	40.38	-	-	74	-33.62	0-360	100	H
4	1.673	42.26	PK	28.5	-31.3	.5	39.96	-	-	74	-34.04	0-360	200	V
5	2.512	29.03	PK	31.9	-30.2	.5	31.23	-	-	74	-42.77	0-360	200	V
6	9.398	24.74	PK	36.7	-22.5	.6	39.54	-	-	74	-34.46	0-360	200	V

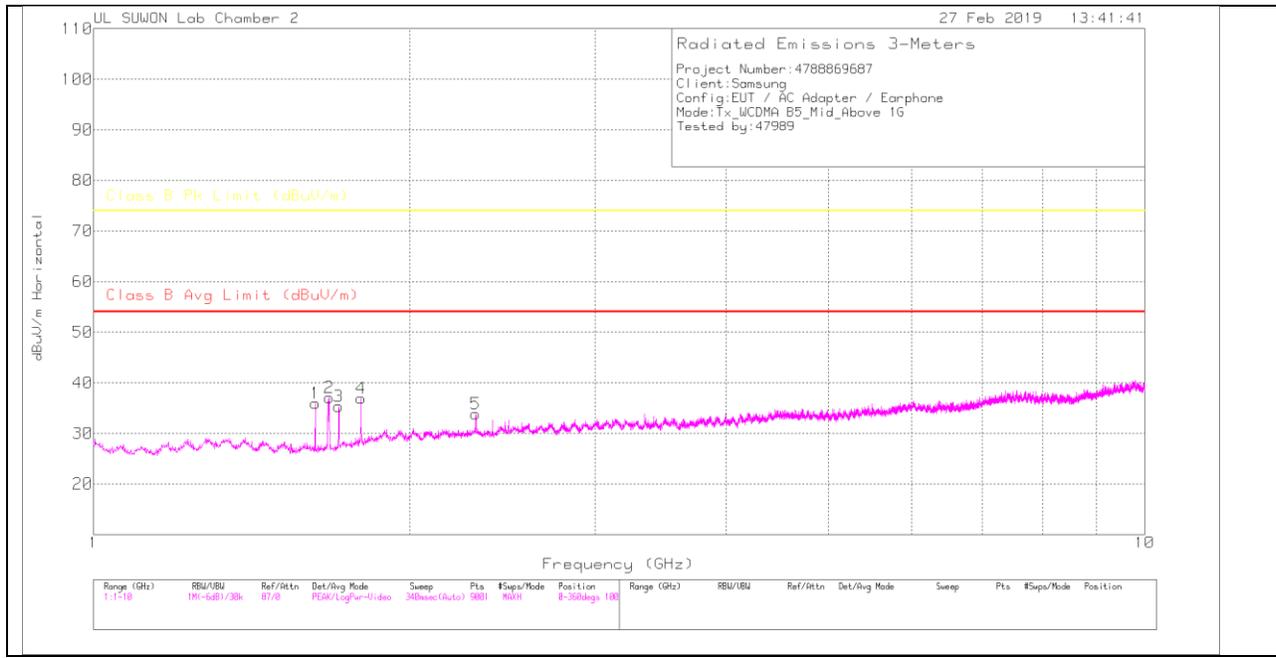
PK – Peak detector

Note: Unwanted emissions on the harmonic frequency and marker pointed were generated from the call-simulator with the TX and RX signals.

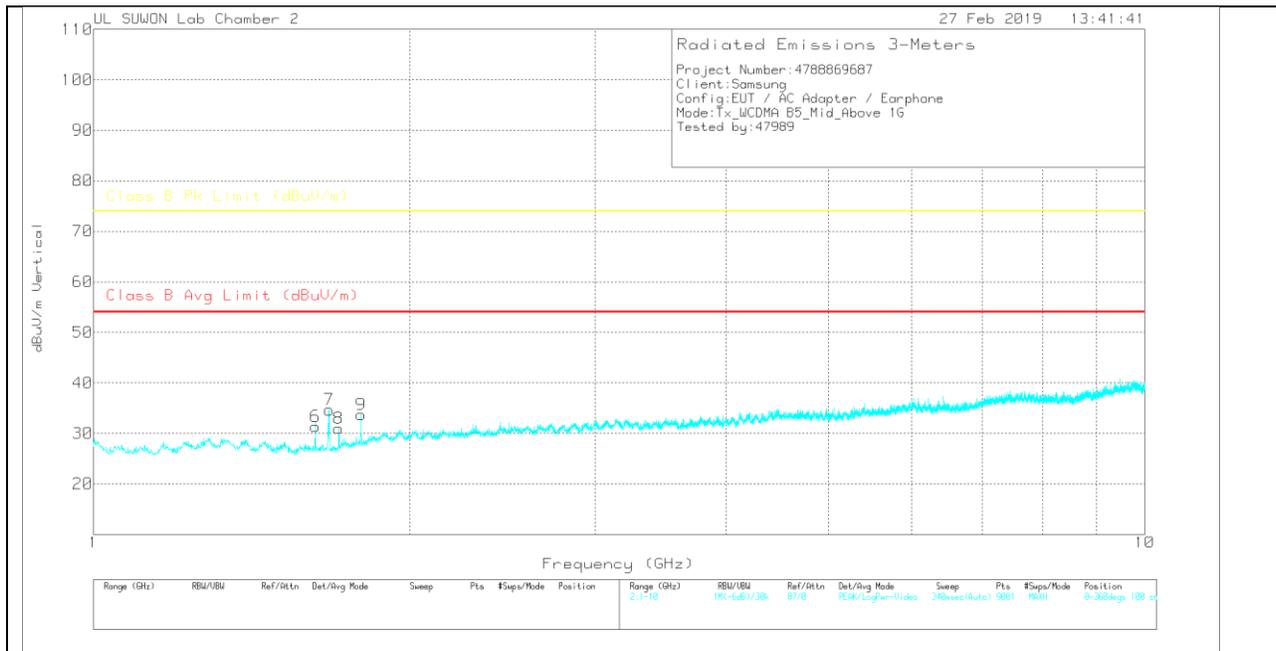
4.2. Above 1 GHz in the WCDMA Band 5

MID CHANNEL(881.6MHz)

HORIZONTAL PEAK PLOT



VERTICAL PEAK PLOT



DATA

Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	3117_00168724	1-18GHz(dB)	1GHz_HPF	Corrected Reading dBuV/m	Class B Avg Limit (dBuV/m)	Av(CSPK)Margin (dB)	Class B PK Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	1.626	38.28	PK	28.3	-31.4	.8	35.98	-	-	74	-38.02	0-360	100	H
2	1.675	39.41	PK	28.5	-31.3	.5	37.11	-	-	74	-36.89	0-360	200	H
3	1.711	37.12	PK	28.8	-31.3	.7	35.32	-	-	74	-38.68	0-360	100	H
4	1.797	37.97	PK	29.8	-31.2	.4	36.97	-	-	74	-37.03	0-360	100	H
5	2.31	32.23	PK	31.5	-30.8	.9	33.83	-	-	74	-40.17	0-360	100	H
6	1.625	33.67	PK	28.3	-31.4	.8	31.37	-	-	74	-42.63	0-360	200	V
7	1.675	36.95	PK	28.5	-31.3	.5	34.65	-	-	74	-39.35	0-360	200	V
8	1.711	32.76	PK	28.8	-31.3	.7	30.96	-	-	74	-43.04	0-360	200	V
9	1.797	34.7	PK	29.8	-31.2	.4	33.7	-	-	74	-40.3	0-360	200	V

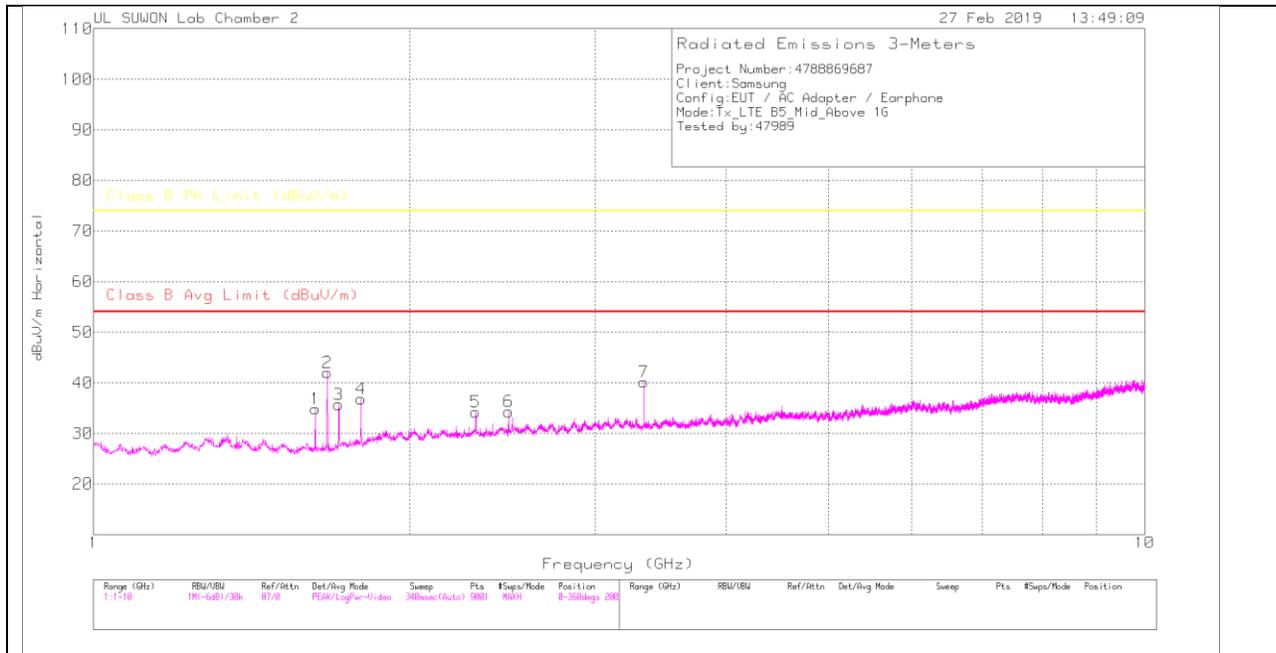
PK – Peak detector

Note: Unwanted emissions on the harmonic frequency and marker pointed were generated from the call-simulator with the TX and RX signals.

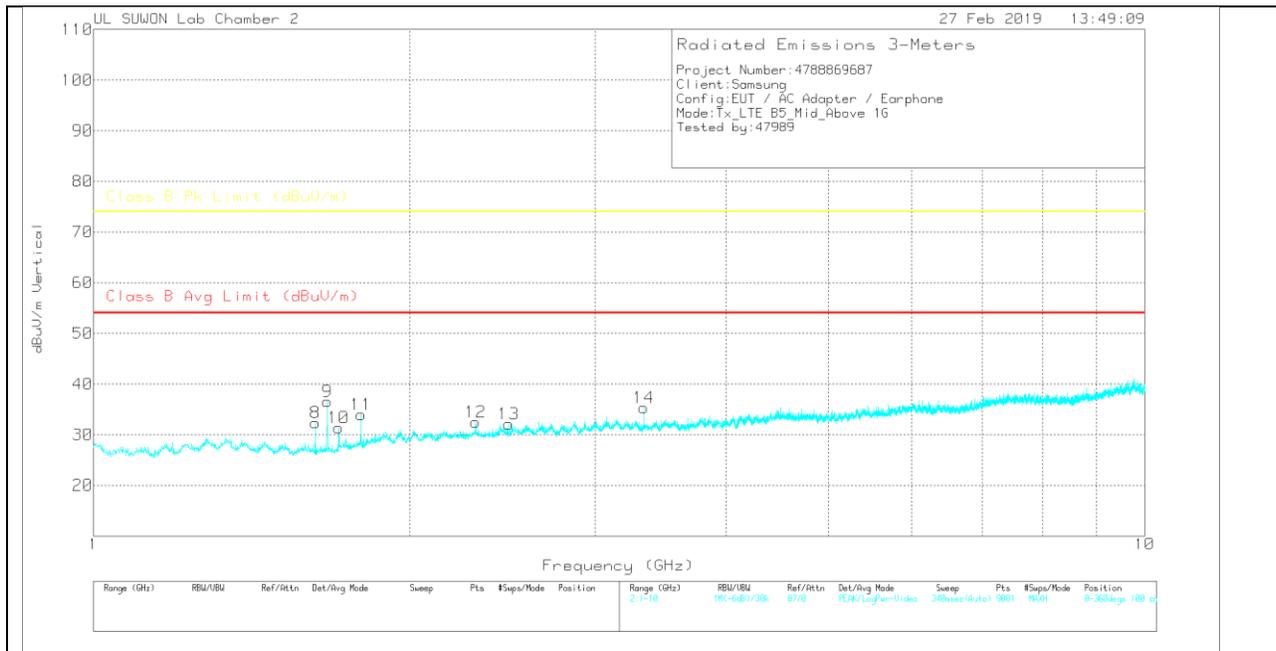
4.3. Above 1 GHz in the LTE Band 5

MID CHANNEL(881.5MHz)

HORIZONTAL PEAK PLOT



VERTICAL PEAK PLOT



DATA

Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	3117_00168724	1-18GHz(dB)	1GHz_HPF	Corrected Reading dBuV/m	Class B Avg Limit (dBuV/m)	Av(CSPK)Margin (dB)	Class B Pk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	1.626	37.18	PK	28.3	-31.4	.8	34.88	-	-	74	-39.12	0-360	200	H
2	1.668	44.35	PK	28.4	-31.3	.5	41.95	-	-	74	-32.05	0-360	100	H
3	1.711	37.53	PK	28.8	-31.3	.7	35.73	-	-	74	-38.27	0-360	100	H
4	1.797	37.78	PK	29.8	-31.2	.4	36.78	-	-	74	-37.22	0-360	200	H
5	2.31	32.56	PK	31.5	-30.8	.9	34.16	-	-	74	-39.84	0-360	100	H
6	2.482	31.98	PK	31.9	-30.2	.6	34.28	-	-	74	-39.72	0-360	100	H
7	3.337	36.92	PK	32.6	-29.9	.5	40.12	-	-	74	-33.88	0-360	100	H
8	1.626	34.61	PK	28.3	-31.4	.8	32.31	-	-	74	-41.69	0-360	200	V
9	1.668	38.91	PK	28.4	-31.3	.5	36.51	-	-	74	-37.49	0-360	200	V
10	1.711	33.21	PK	28.8	-31.3	.7	31.41	-	-	74	-42.59	0-360	100	V
11	1.797	34.92	PK	29.8	-31.2	.4	33.92	-	-	74	-40.08	0-360	200	V
12	2.31	30.86	PK	31.5	-30.8	.9	32.46	-	-	74	-41.54	0-360	100	V
13	2.482	29.78	PK	31.9	-30.2	.6	32.08	-	-	74	-41.92	0-360	200	V
14	3.337	32.09	PK	32.6	-29.9	.5	35.29	-	-	74	-38.71	0-360	200	V

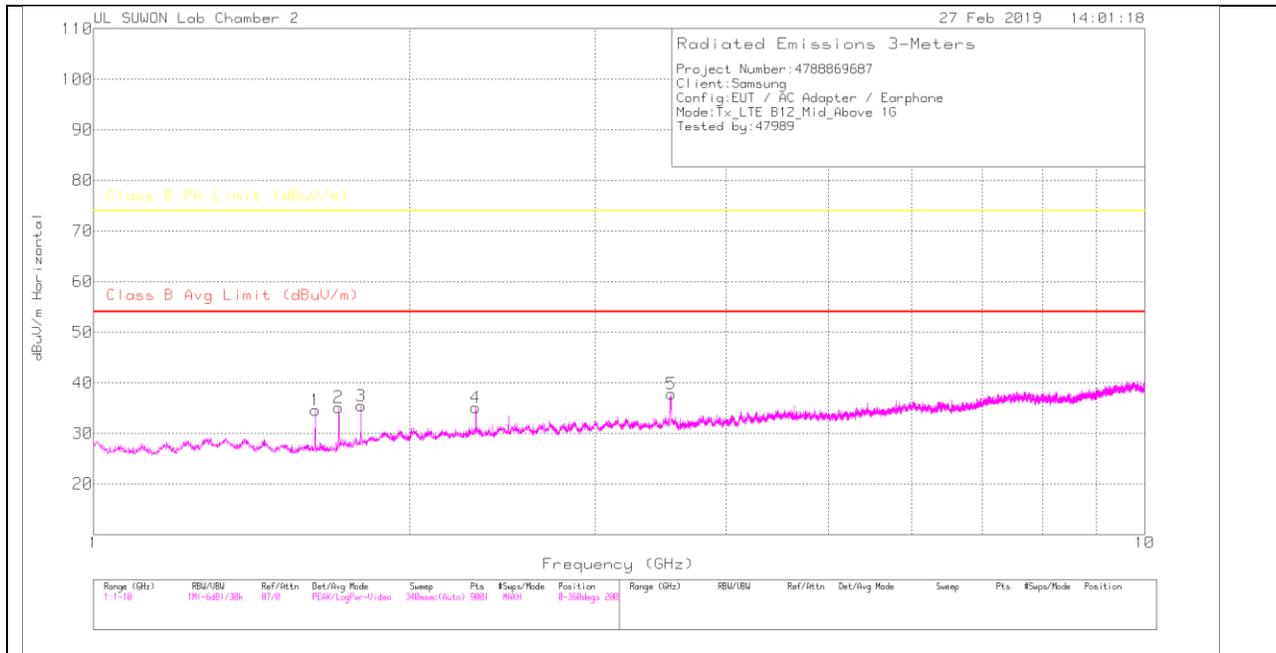
PK – Peak detector

Note: Unwanted emissions on the harmonic frequency and marker pointed were generated from the call-simulator with the TX and RX signals.

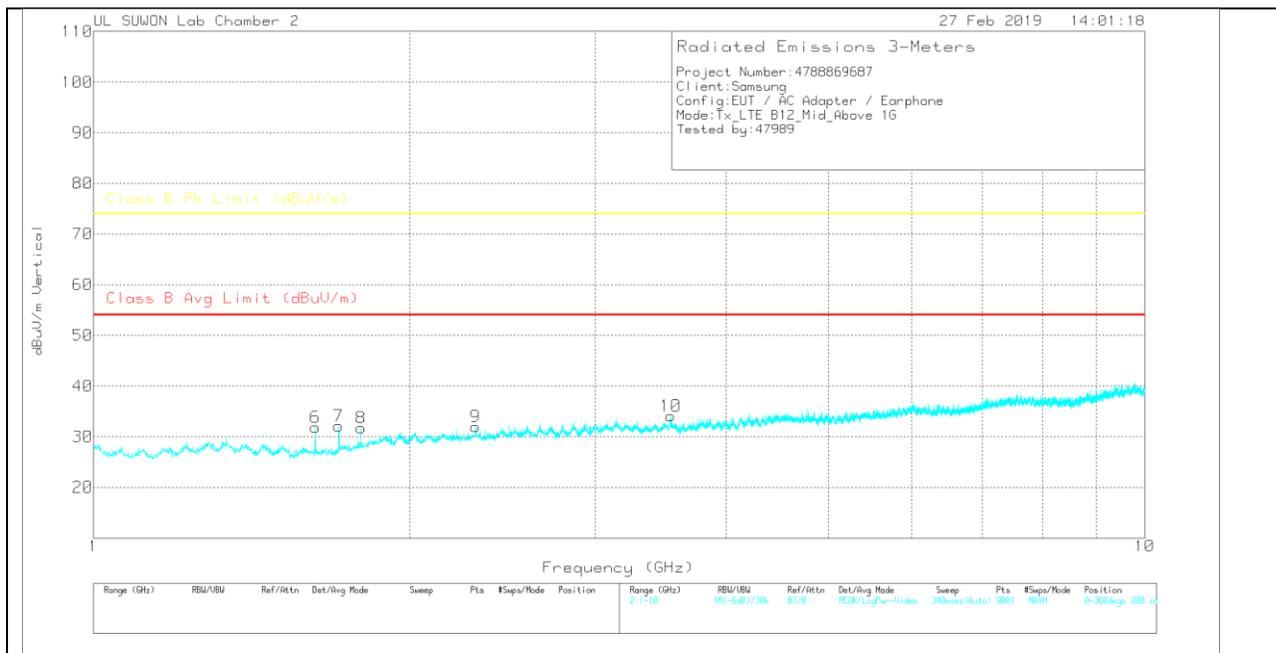
4.4. Above 1 GHz in the LTE Band 12

MID CHANNEL(737.5MHz)

HORIZONTAL PEAK PLOT



VERTICAL PEAK PLOT



DATA

Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	3117_00168724	1-18GHz(dB)	1GHz_HPF	Corrected Reading dBuV/m	Class B Avg Limit (dBuV/m)	Av(CSPK)Margin (dB)	Class B Pk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	1.625	36.86	PK	28.3	-31.4	.8	34.56	-	-	74	-39.44	0-360	100	H
2	1.711	36.94	PK	28.8	-31.3	.7	35.14	-	-	74	-38.86	0-360	100	H
3	1.797	36.45	PK	29.8	-31.2	.4	35.45	-	-	74	-38.55	0-360	100	H
4	2.31	33.44	PK	31.5	-30.8	.9	35.04	-	-	74	-38.96	0-360	200	H
5	3.544	33.47	PK	32.7	-29	.6	37.77	-	-	74	-36.23	0-360	200	H
6	1.625	34.16	PK	28.3	-31.4	.8	31.86	-	-	74	-42.14	0-360	200	V
7	1.711	33.86	PK	28.8	-31.3	.7	32.06	-	-	74	-41.94	0-360	200	V
8	1.797	32.69	PK	29.8	-31.2	.4	31.69	-	-	74	-42.31	0-360	200	V
9	2.31	30.34	PK	31.5	-30.8	.9	31.94	-	-	74	-42.06	0-360	200	V
10	3.538	29.81	PK	32.7	-29	.6	34.11	-	-	74	-39.89	0-360	200	V

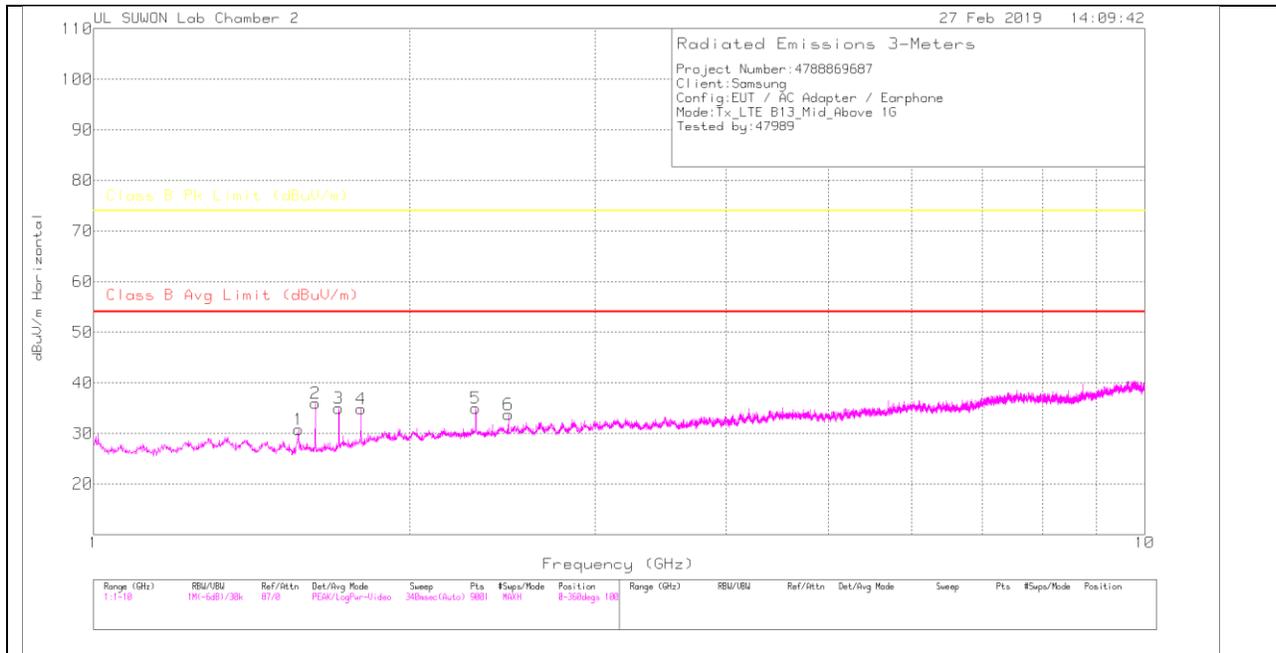
PK – Peak detector

Note: Unwanted emissions on the harmonic frequency and marker pointed were generated from the call-simulator with the TX and RX signals.

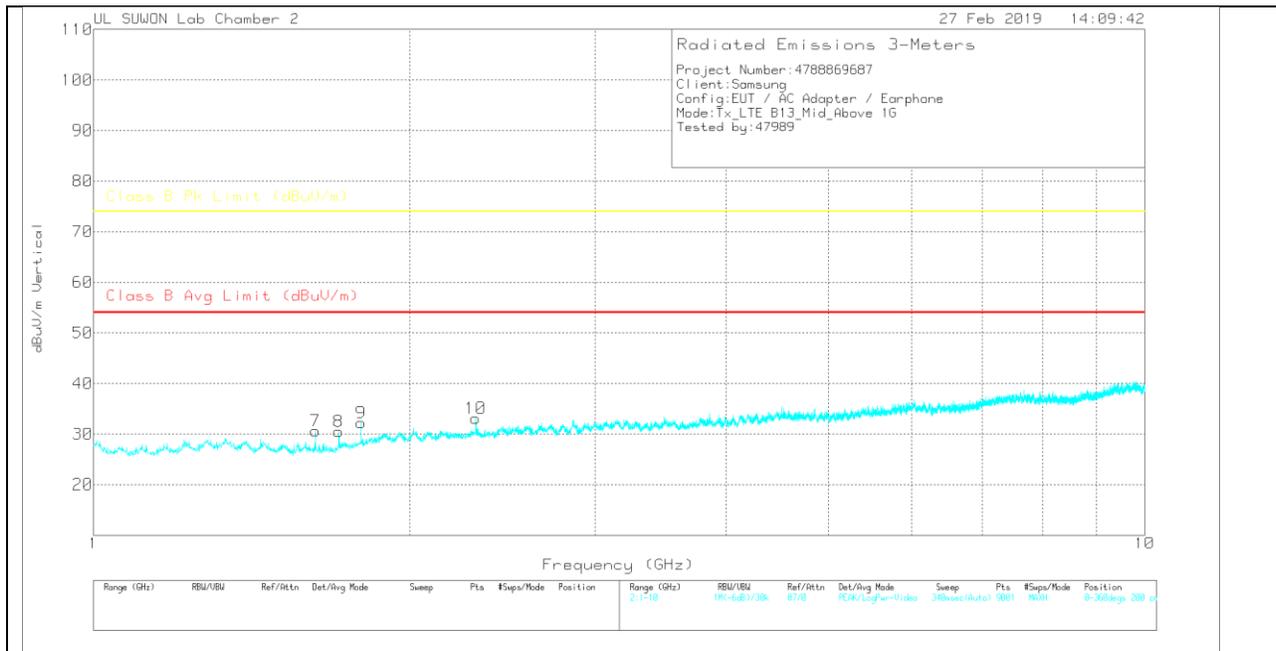
4.5. Above 1 GHz in the LTE Band 13

MID CHANNEL(751.0MHz)

HORIZONTAL PEAK PLOT



VERTICAL PEAK PLOT



DATA

Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	3117_00168724	1-18GHz(dB)	1GHz_HPF	Corrected Reading dBuV/m	Class B Avg Limit (dBuV/m)	Av(CSPK)Margin (dB)	Class B Pk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	1.566	33.31	PK	28.3	-31.5	.6	30.71	-	-	74	-43.29	0-360	200	H
2	1.626	38.21	PK	28.3	-31.4	.8	35.91	-	-	74	-38.09	0-360	100	H
3	1.711	36.81	PK	28.8	-31.3	.7	35.01	-	-	74	-38.99	0-360	100	H
4	1.797	35.78	PK	29.8	-31.2	.4	34.78	-	-	74	-39.22	0-360	100	H
5	2.31	33.31	PK	31.5	-30.8	.9	34.91	-	-	74	-39.09	0-360	200	H
6	2.481	31.49	PK	31.9	-30.3	.6	33.69	-	-	74	-40.31	0-360	100	H
7	1.626	32.93	PK	28.3	-31.4	.8	30.63	-	-	74	-43.37	0-360	200	V
8	1.711	32.27	PK	28.8	-31.3	.7	30.47	-	-	74	-43.53	0-360	200	V
9	1.797	33.27	PK	29.8	-31.2	.4	32.27	-	-	74	-41.73	0-360	200	V
10	2.31	31.5	PK	31.5	-30.8	.9	33.1	-	-	74	-40.9	0-360	200	V

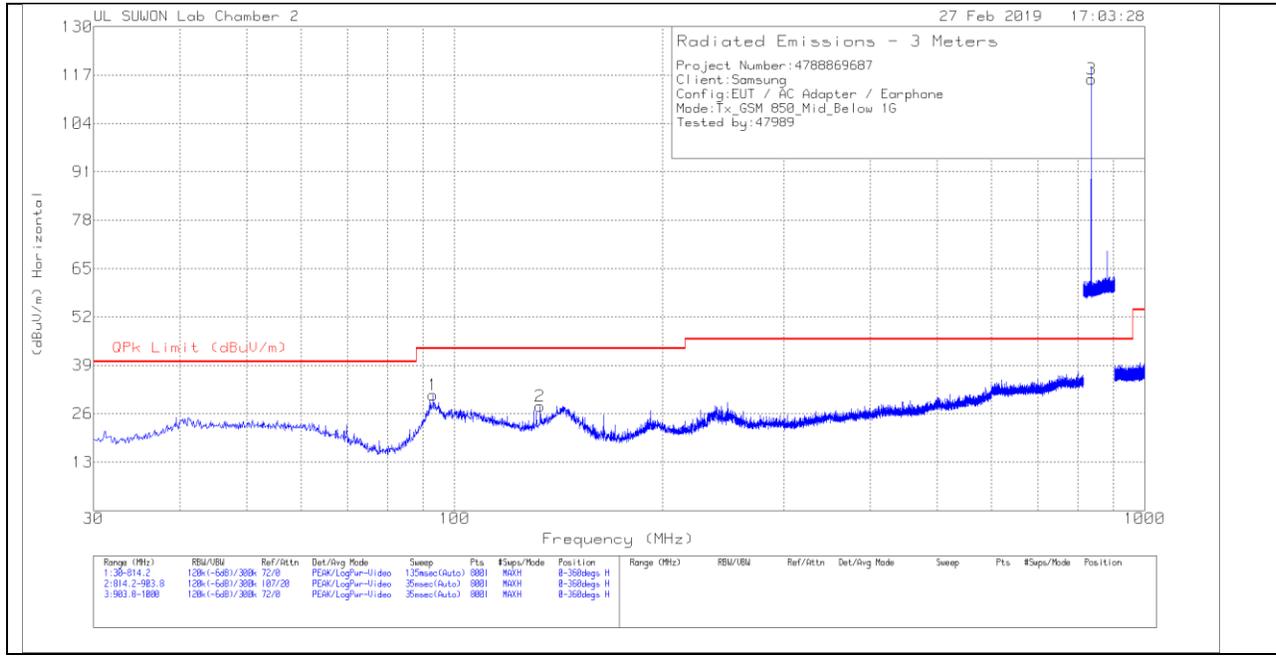
PK – Peak detector

Note: Unwanted emissions on the harmonic frequency and marker pointed were generated from the call-simulator with the TX and RX signals.

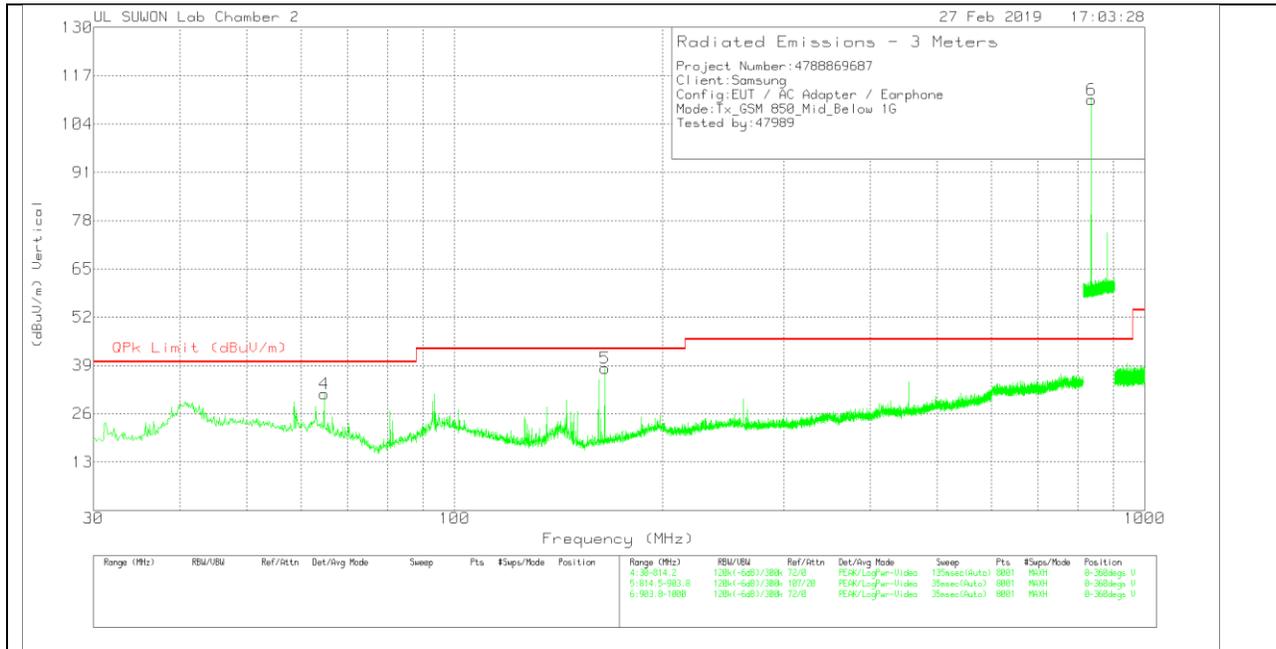
4.6. Below 1 GHz in the GSM850

MID CHANNEL(881.6MHz)

HORIZONTAL PEAK PLOT



VERTICAL PEAK PLOT



DATA

Trace Markers

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	VULB9163_749	Bypass_Below_1G[dB]	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	93.1281	13.36	Pk	16.7	1	31.06	43.52	-12.46	0-360	300	H
2	133.1223	12.61	Pk	14.1	1.3	28.01	43.52	-15.51	0-360	300	H
3	836.6896	85.7	Pk	27.1	3.1	115.9	46.02	69.88	0-360	100	H
4	64.7009	13.13	Pk	17.3	.9	31.33	40	-8.67	0-360	200	V
5	165.0785	21.98	Pk	14.8	1.4	38.18	43.52	-5.34	0-360	100	V
6	836.6251	80.3	Pk	27.1	3.1	110.5	46.02	64.48	0-360	200	V

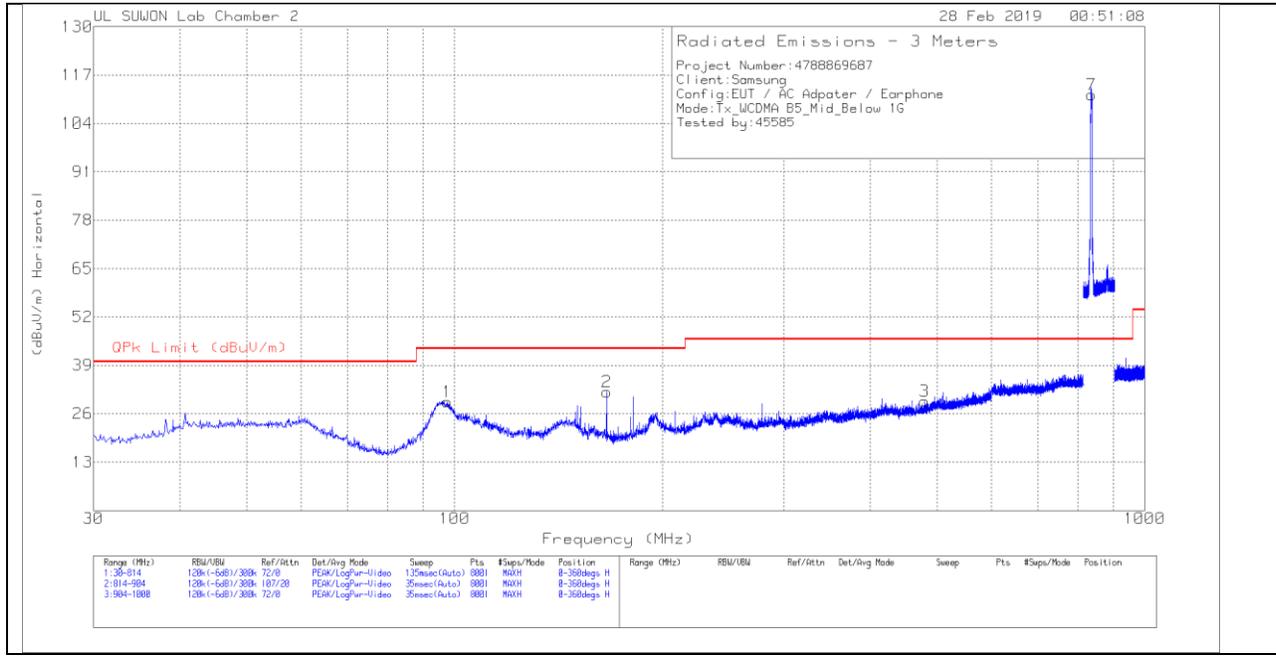
Pk - Peak detector

Note: Unwanted emissions captured from 824MHz to 849MHz and from 869MHz to 894MHz were the TX and RX signals generated from the call-simulator.

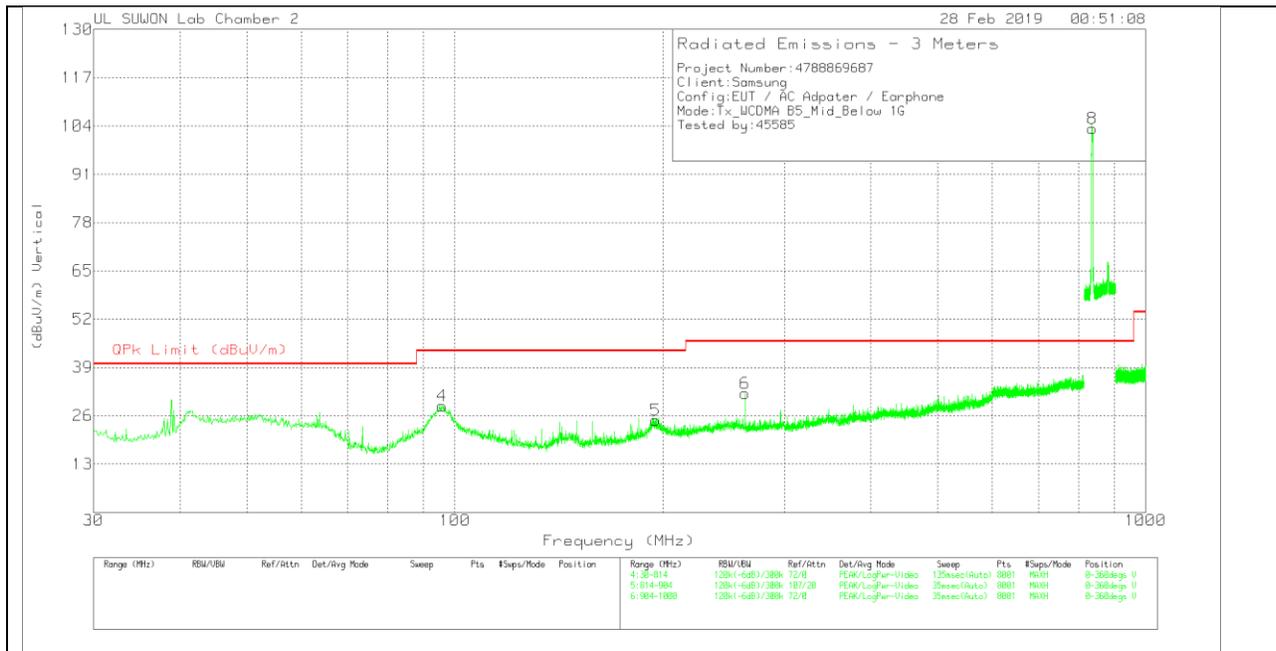
4.7. Below 1 GHz in the WCDMA Band 5

MID CHANNEL(881.6MHz)

HORIZONTAL PEAK PLOT



VERTICAL PEAK PLOT



DATA

Trace Markers

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	VULB9163_749	Bypass_Below_1G[dB]	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	97.62	10.54	Pk	17.5	1.1	29.14	43.52	-14.38	0-360	300	H
2	166.122	15.6	Pk	14.9	1.4	31.9	43.52	-11.62	0-360	400	H
3	480.114	4.37	Pk	22.6	2.4	29.37	46.02	-16.65	0-360	300	H
7	836.8263	81.41	Pk	27.1	3.2	111.71	46.02	65.69	0-360	100	H
4	95.856	10.43	Pk	17.3	1	28.73	43.52	-14.79	0-360	100	V
5	195.032	5.23	Pk	18	1.5	24.73	43.52	-18.79	0-360	100	V
6	263.142	11.68	Pk	18.7	1.7	32.08	46.02	-13.94	0-360	100	V
8	836.59	73.06	Pk	27.1	3.1	103.26	46.02	57.24	0-360	200	V

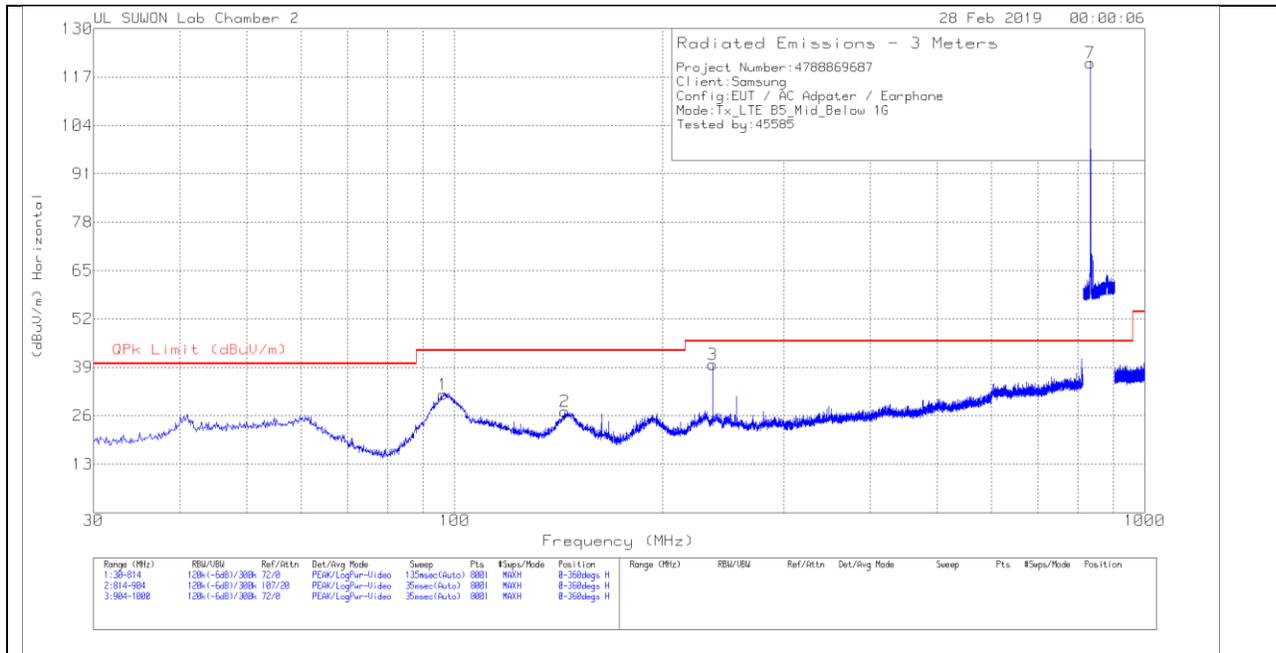
Pk - Peak detector

Note: Unwanted emissions captured from 824MHz to 849MHz and from 869MHz to 894MHz were the TX and RX signals generated from the call-simulator.

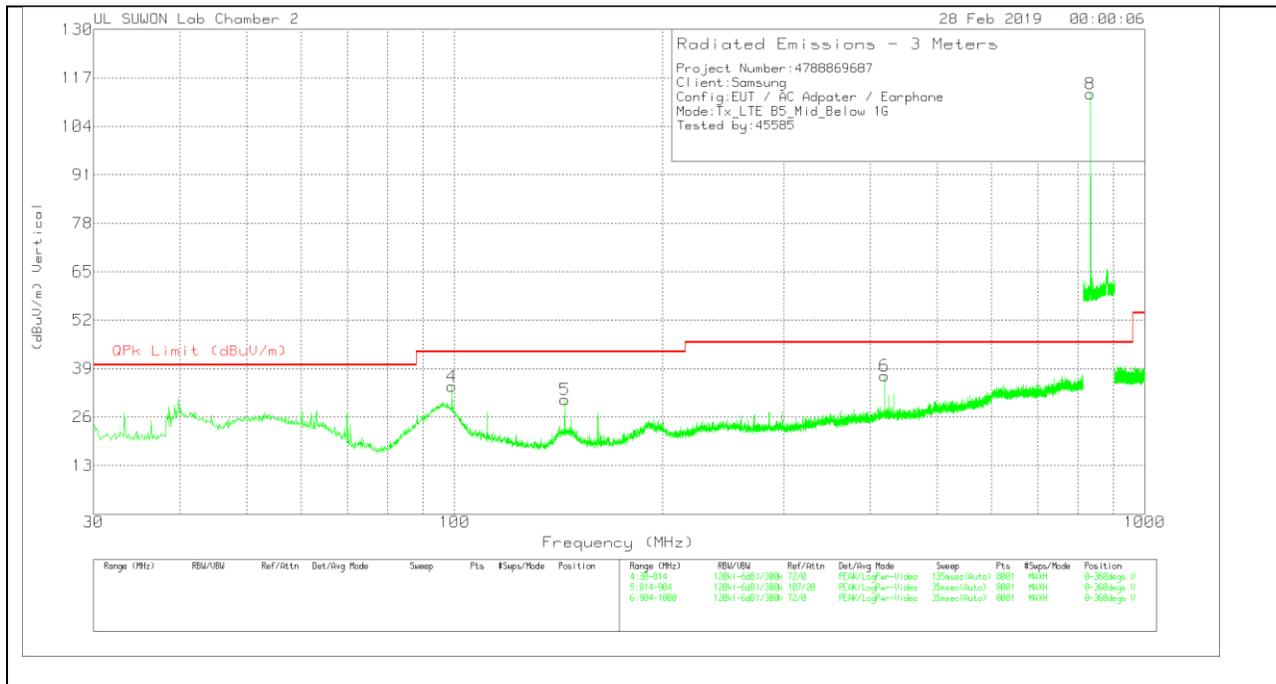
4.8. Below 1 GHz in the LTE Band 5

MID CHANNEL(881.5MHz)

HORIZONTAL PEAK PLOT



VERTICAL PEAK PLOT



DATA

Trace Markers

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	VULB9163_749	Bypass_Below_1G[dB]	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	96.346	13.26	Pk	17.4	1	31.66	43.52	-11.86	0-360	300	H
2	144.66	11.82	Pk	14.1	1.3	27.22	43.52	-16.3	0-360	200	H
3	236.584	19.74	Pk	18.3	1.7	39.74	46.02	-6.28	0-360	100	H
7	834.34	90.56	Pk	27.1	3.1	120.76	46.02	74.74	0-360	100	H
4	99.188	15.43	Pk	17.7	1.1	34.23	43.52	-9.29	0-360	100	V
5	144.464	15.35	Pk	14.1	1.3	30.75	43.52	-12.77	0-360	100	V
6	419.844	12.73	Pk	22.1	2.2	37.03	46.02	-8.99	0-360	100	V
8	834.3231	82.54	Pk	27.1	3.1	112.74	46.02	66.72	0-360	200	V

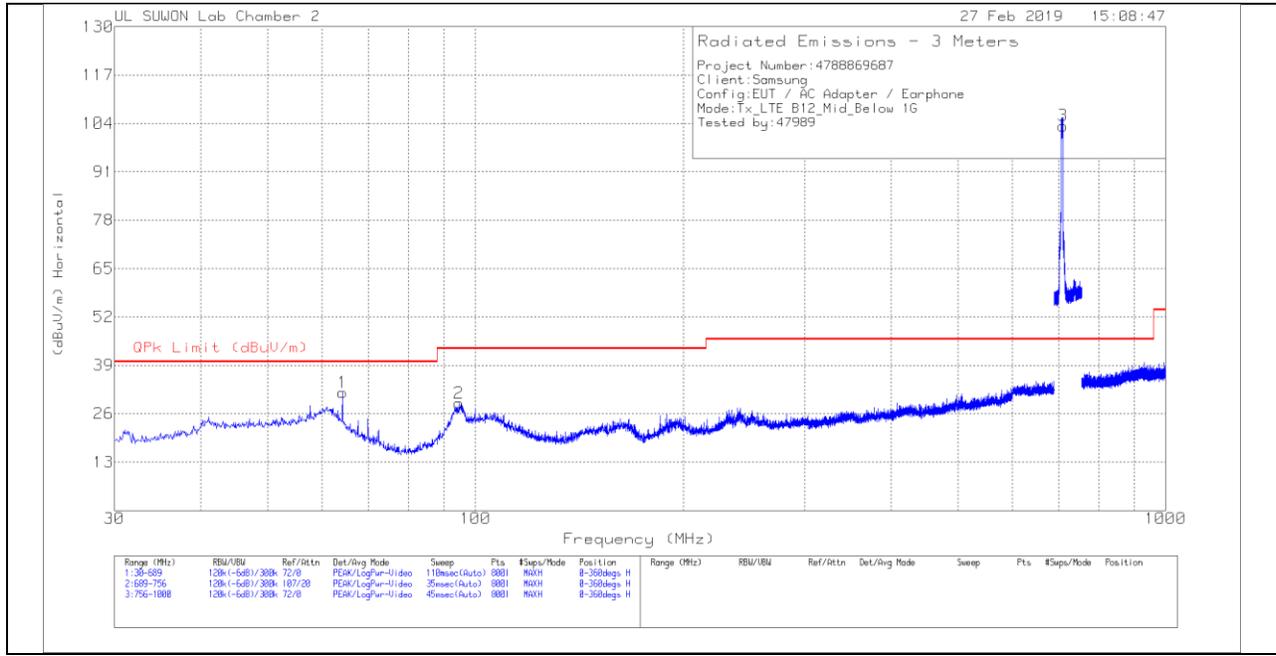
Pk - Peak detector

Note: Unwanted emissions captured from 824MHz to 849MHz and from 869MHz to 894MHz were the TX and RX signals generated from the call-simulator.

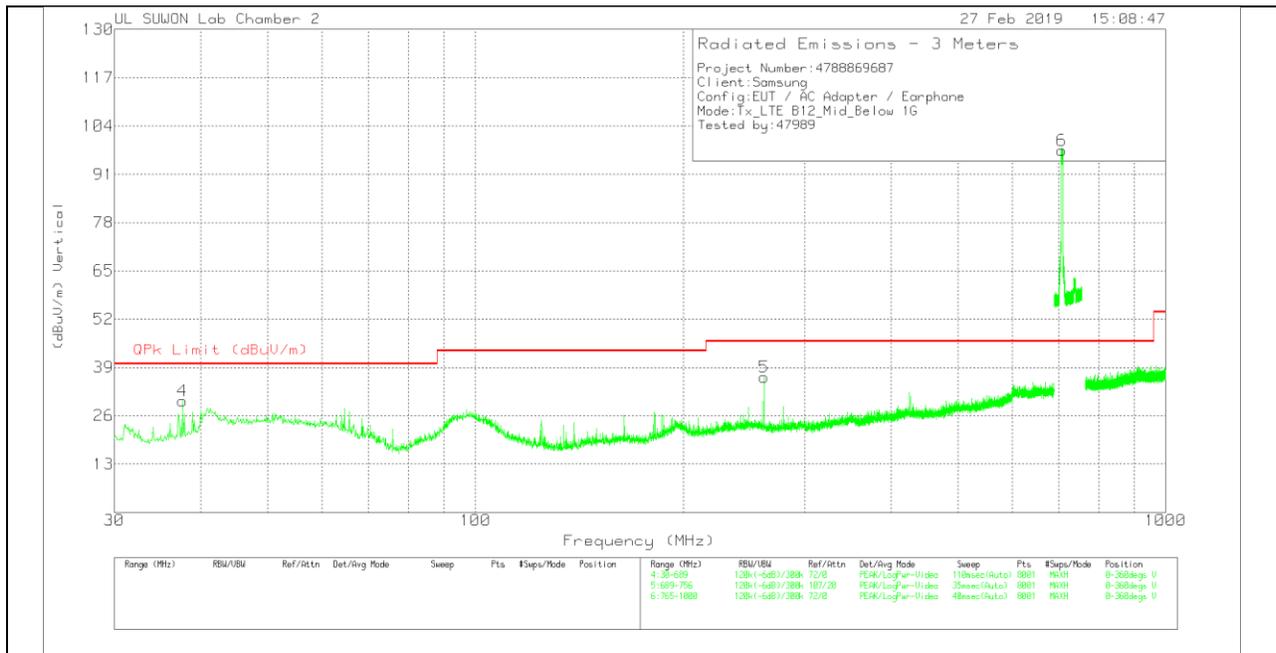
4.9. Below 1 GHz in the LTE Band 12

MID CHANNEL(737.5MHz)

HORIZONTAL PEAK PLOT



VERTICAL PEAK PLOT



DATA

Trace Markers

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	VULB9163_749	Bypass_Below_1G[dB]	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	64.1856	13.32	Pk	17.5	.9	31.72	40	-8.28	0-360	300	H
2	94.6644	10.58	Pk	17.1	1.1	28.78	43.52	-14.74	0-360	200	H
3	709.6528	75	Pk	25.5	2.9	103.4	46.02	57.38	0-360	100	H
4	37.6609	11.62	Pk	17.7	.7	30.02	40	-9.98	0-360	200	V
5	261.968	16.02	Pk	18.7	1.7	36.42	46.02	-9.6	0-360	200	V
6	706.8136	69.04	Pk	25.5	2.9	97.44	46.02	51.42	0-360	100	V

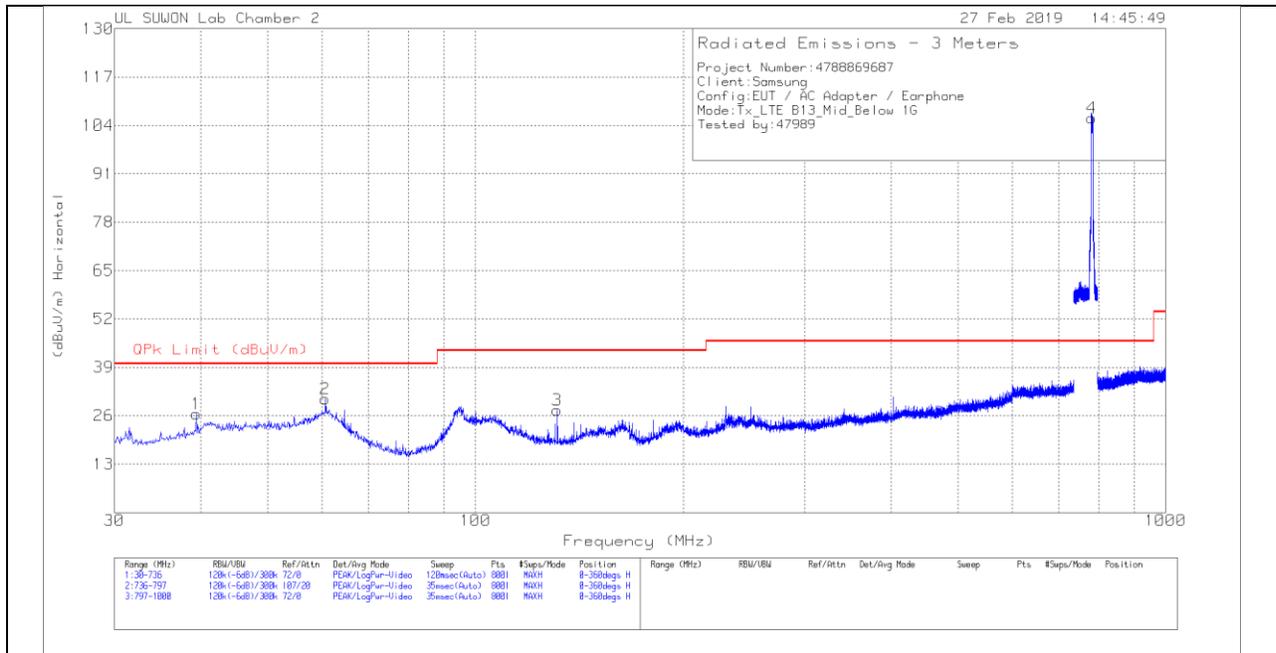
Pk - Peak detector

Note: Unwanted emissions captured from 699MHz to 716MHz and from 729MHz to 746MHz were the TX and RX signals generated from the call-simulator.

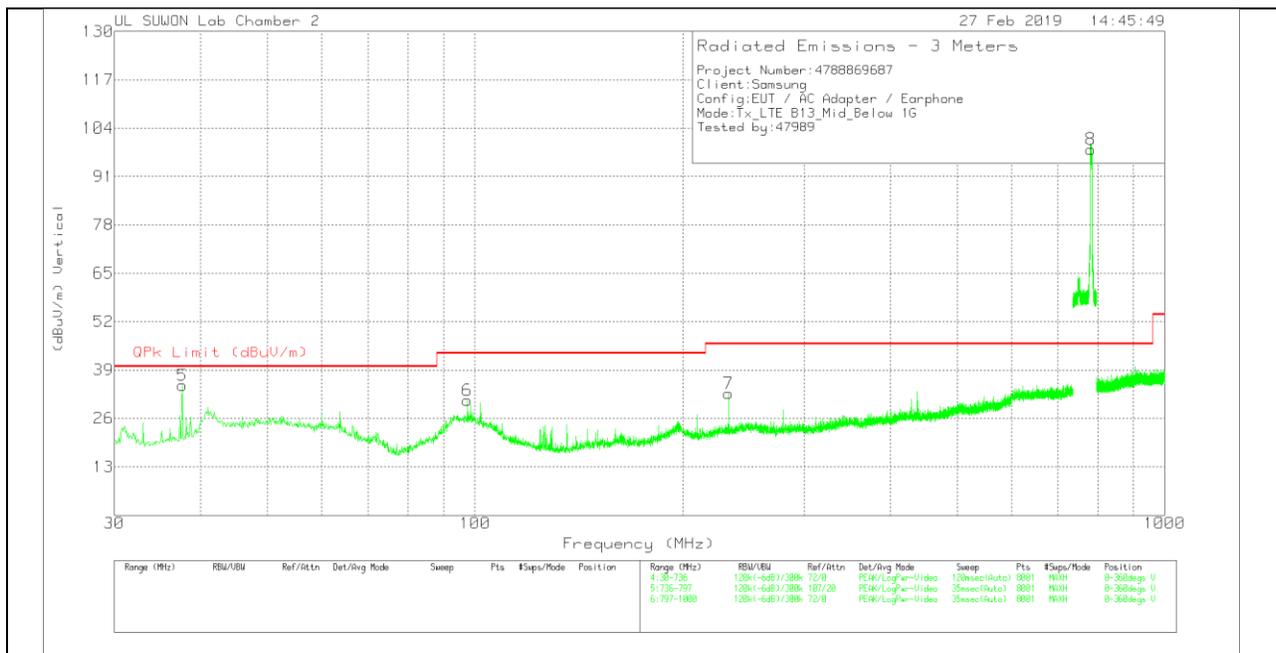
4.10. Below 1 GHz in the LTE Band 13

MID CHANNEL(751.0MHz)

HORIZONTAL PEAK PLOT



VERTICAL PEAK PLOT



DATA

Trace Markers

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	VULB9163_749	Bypass_Below_1G[dB]	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	39.4428	7.27	Pk	18.5	.7	26.47	40	-13.53	0-360	200	H
2	60.6228	11.38	Pk	18.4	.8	30.58	40	-9.42	0-360	100	H
3	131.3993	12.15	Pk	14.2	1.2	27.55	43.52	-15.97	0-360	400	H
4	780.8045	76.38	Pk	26.7	3	106.08	46.02	60.06	0-360	100	H
5	37.6778	16.51	Pk	17.7	.7	34.91	40	-5.09	0-360	100	V
6	97.5113	12.37	Pk	17.5	1	30.87	43.52	-12.65	0-360	100	V
7	232.975	12.87	Pk	18.3	1.6	32.77	46.02	-13.25	0-360	100	V
8	781.0409	68.65	Pk	26.7	3	98.35	46.02	52.33	0-360	200	V

Pk - Peak detector

Note: Unwanted emissions captured from 777MHz to 787MHz and from 746MHz to 756MHz were the TX and RX signals generated from the call-simulator.