

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, DTS/UNII a/b/g/n/ac, ANT+ and NFC.
This test report addresses the WWAN receiver mode. (GSM850/WCDMA B5/LTE B5)

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)

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	R37KCHE3W01SE3	N/A
Data Cable	SAMSUNG	EP-D140AWE	N/A	N/A
Earphone	SAMSUNG	EHS61ASFWE	N/A	N/A

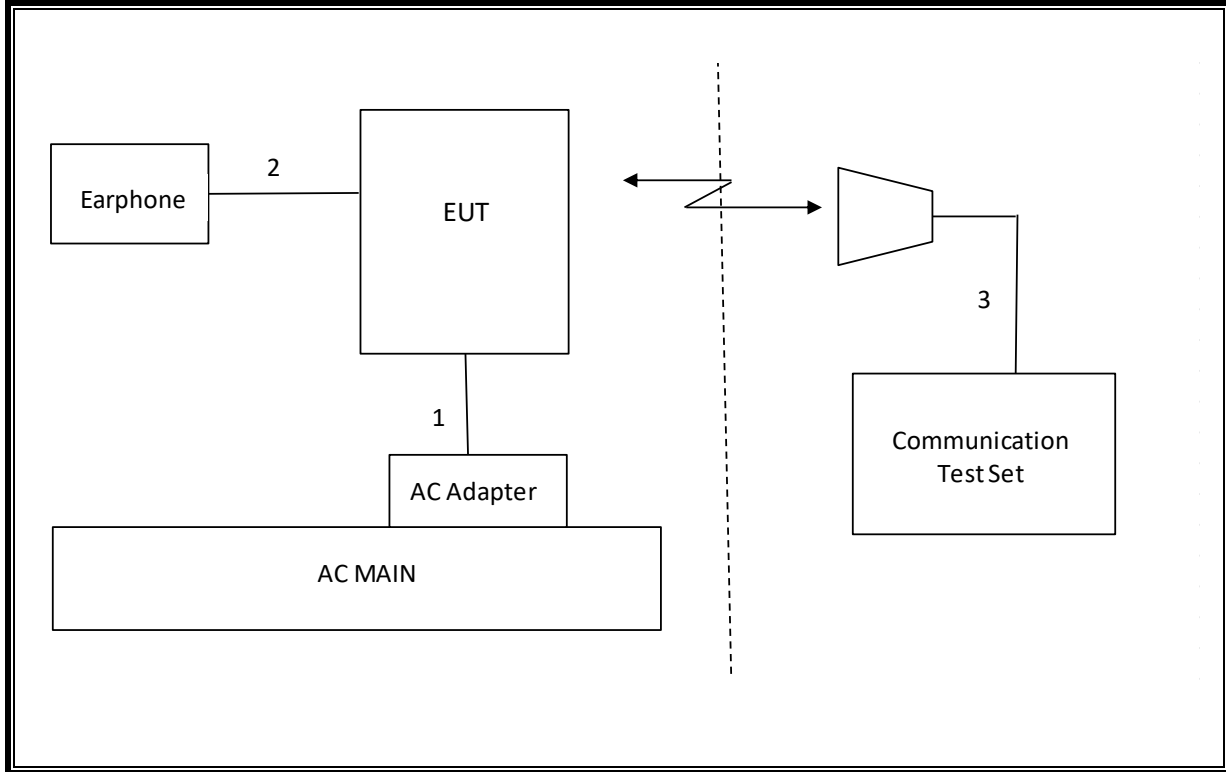
I/O CABLE

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

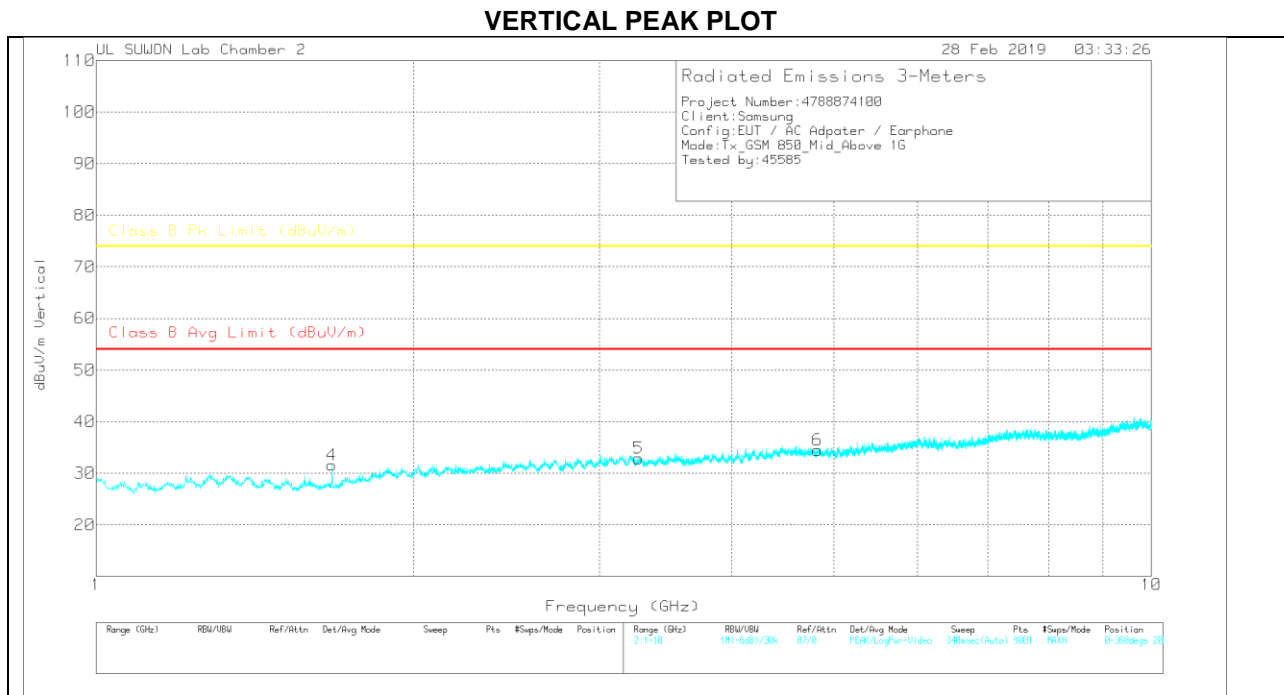
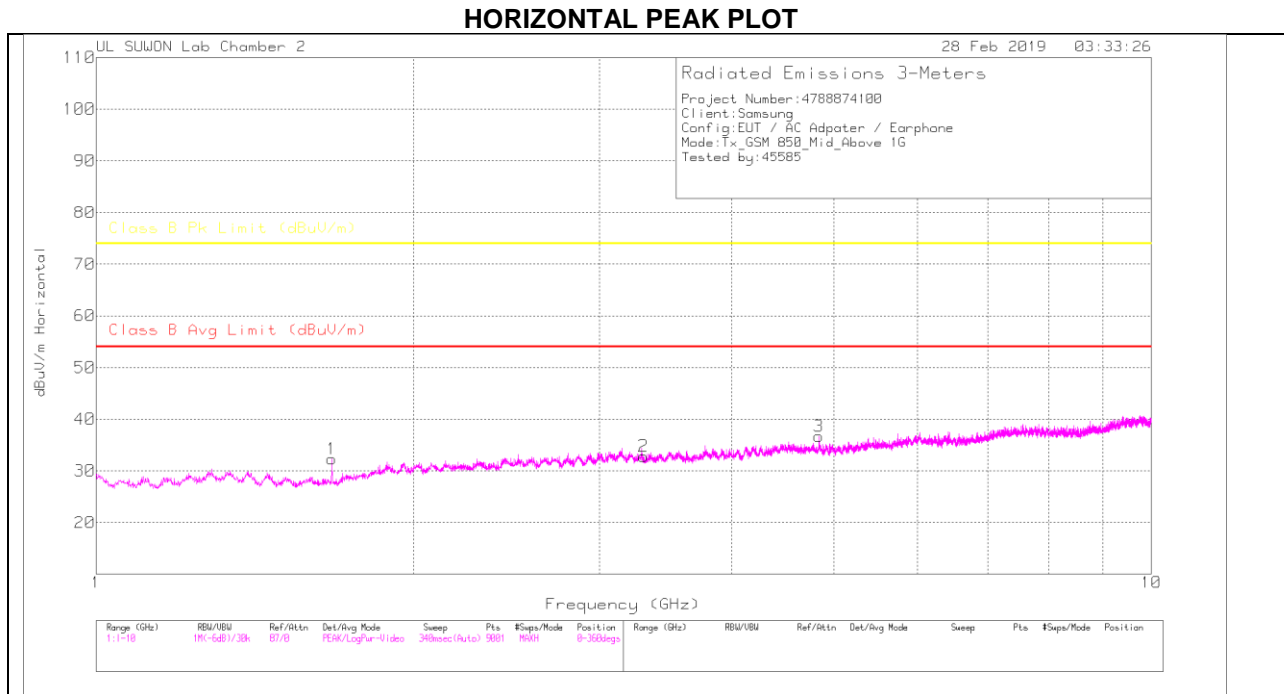
§15.109 (a) Except for Class A digital devices, the field strength of radiated emissions from unintentional radiators at a distance of 3 meters shall not exceed the following values:

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)



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(CSFR)Margin (dB)	Class B Pk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	1.673	34.62	PK	28.5	-31.3	.5	32.32	-	-	74	-41.68	0-360	100	H
2	3.302	29.53	PK	32.6	-29.9	.6	32.83	-	-	74	-41.17	0-360	100	H
3	4.843	30.27	PK	34	-28	.4	36.67	-	-	74	-37.33	0-360	100	H
4	1.673	33.88	PK	28.5	-31.3	.5	31.58	-	-	74	-42.42	0-360	200	V
5	3.266	29.09	PK	32.8	-29.8	.8	32.89	-	-	74	-41.11	0-360	200	V
6	4.829	27.97	PK	34	-27.9	.4	34.47	-	-	74	-39.53	0-360	200	V

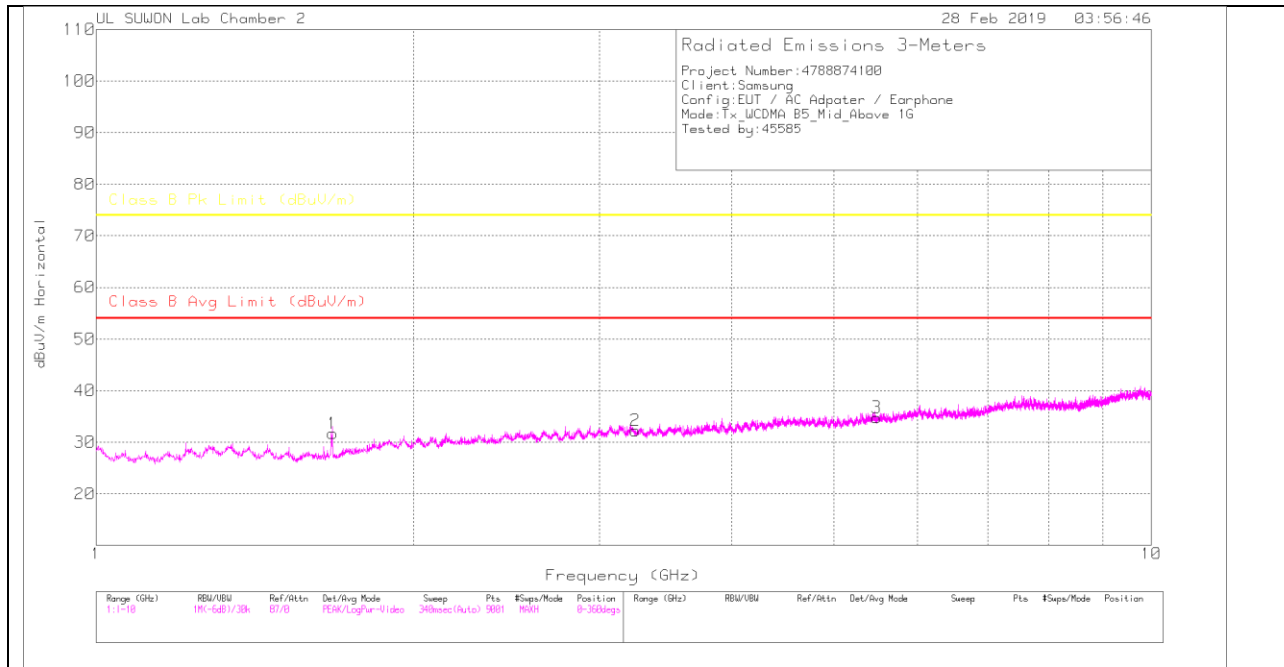
PK – Peak Detector

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

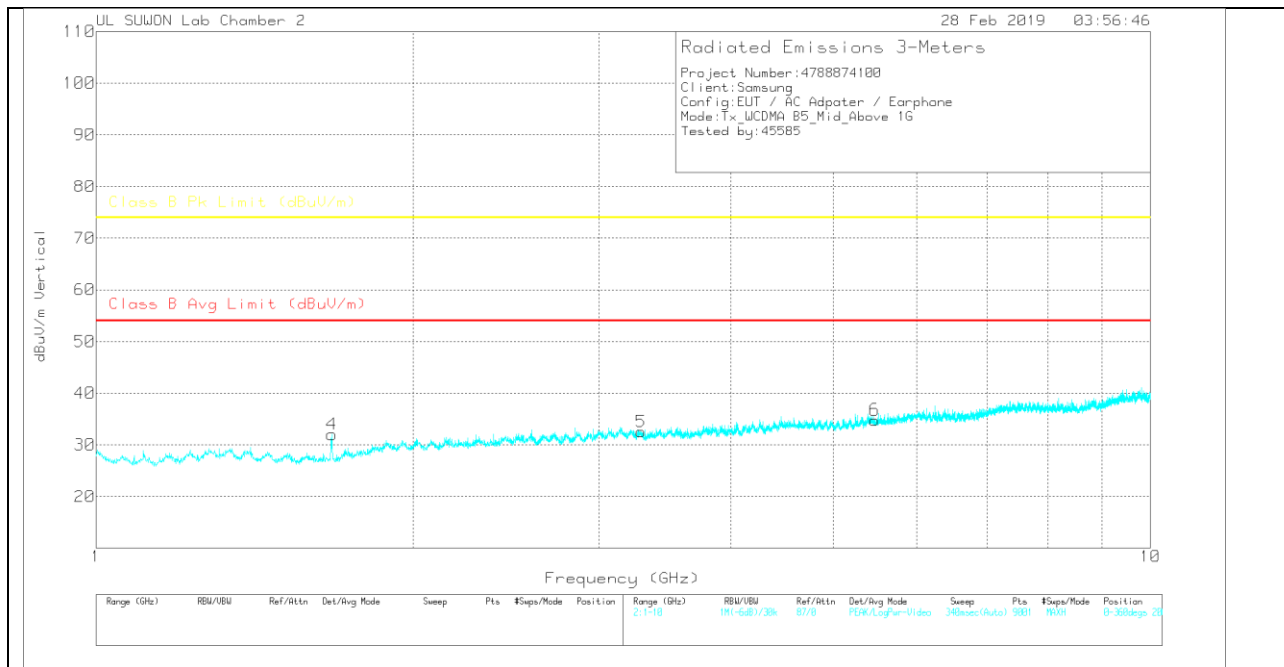
4.2. Above 1 GHz in the WCDMA Band 5

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	1.676	33.98	PK	28.5	-31.3	.5	31.68	-	-	74	-42.32	0-360	100	H
2	3.243	28.37	PK	32.9	-29.7	.7	32.27	-	-	74	-41.73	0-360	100	H
3	5.491	27.58	PK	34.6	-27.8	.4	34.78	-	-	74	-39.22	0-360	200	H
4	1.674	34.43	PK	28.5	-31.4	.5	32.03	-	-	74	-41.97	0-360	200	V
5	3.287	29.04	PK	32.7	-29.9	.7	32.54	-	-	74	-41.46	0-360	100	V
6	5.479	27.6	PK	34.6	-27.8	.4	34.8	-	-	74	-39.2	0-360	100	V

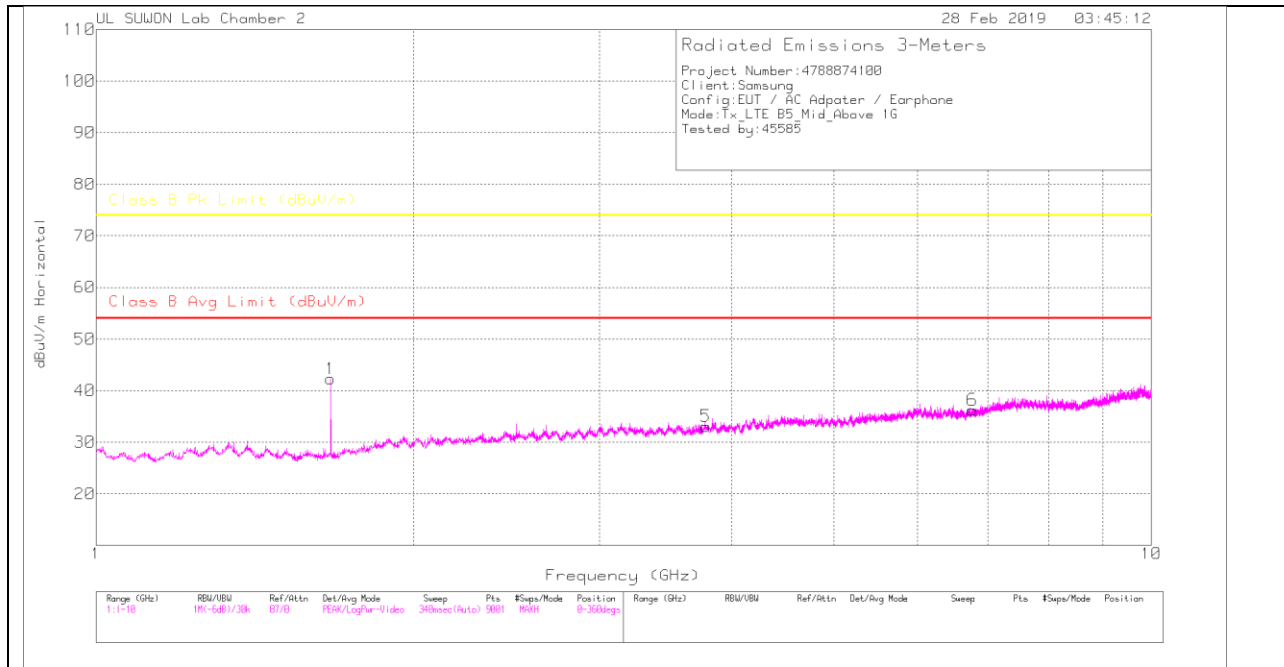
PK – Peak Detector

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

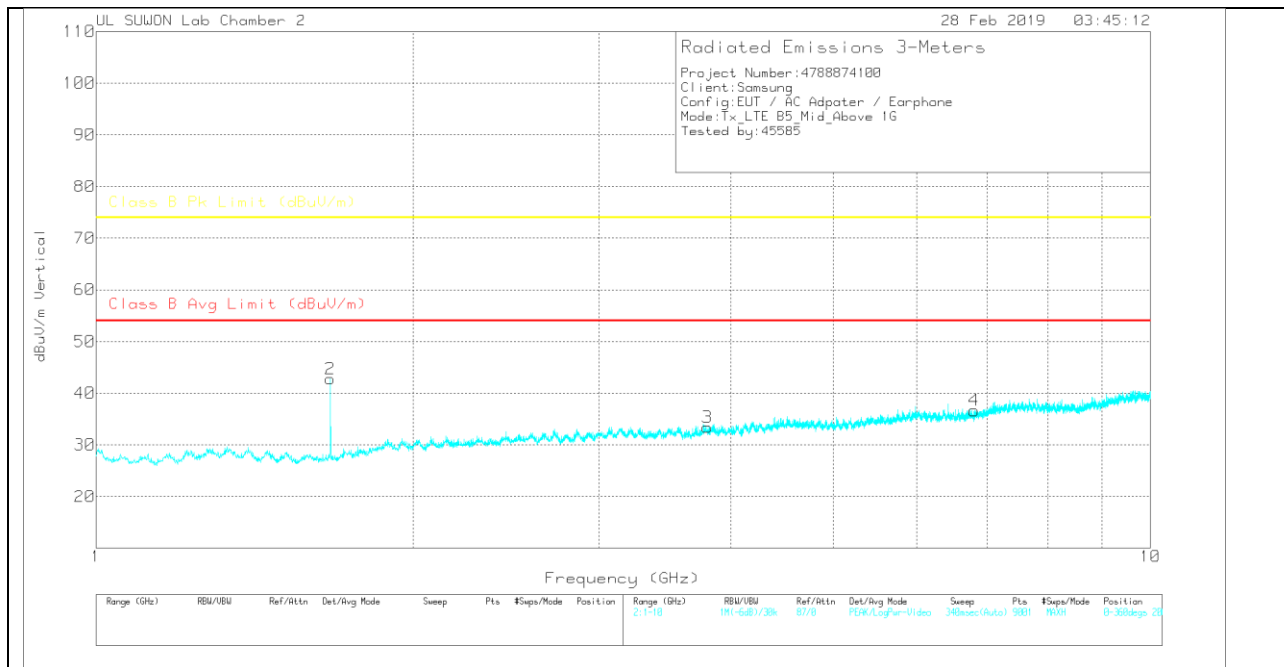
4.3. Above 1 GHz in the LTE Band 5

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	1.668	44.71	PK	28.4	-31.3	.5	42.31	-	-	74	-31.69	0-360	100	H
5	3.783	28.58	PK	33.2	-29.2	.5	33.08	-	-	74	-40.92	0-360	200	H
6	6.769	26.04	PK	35.5	-25.8	.5	36.24	-	-	74	-37.76	0-360	100	H
2	1.668	45.17	PK	28.4	-31.3	.5	42.77	-	-	74	-31.23	0-360	200	V
3	3.8	28.81	PK	33.2	-29.1	.5	33.41	-	-	74	-40.59	0-360	100	V
4	6.806	26.55	PK	35.5	-25.8	.4	36.65	-	-	74	-37.35	0-360	200	V

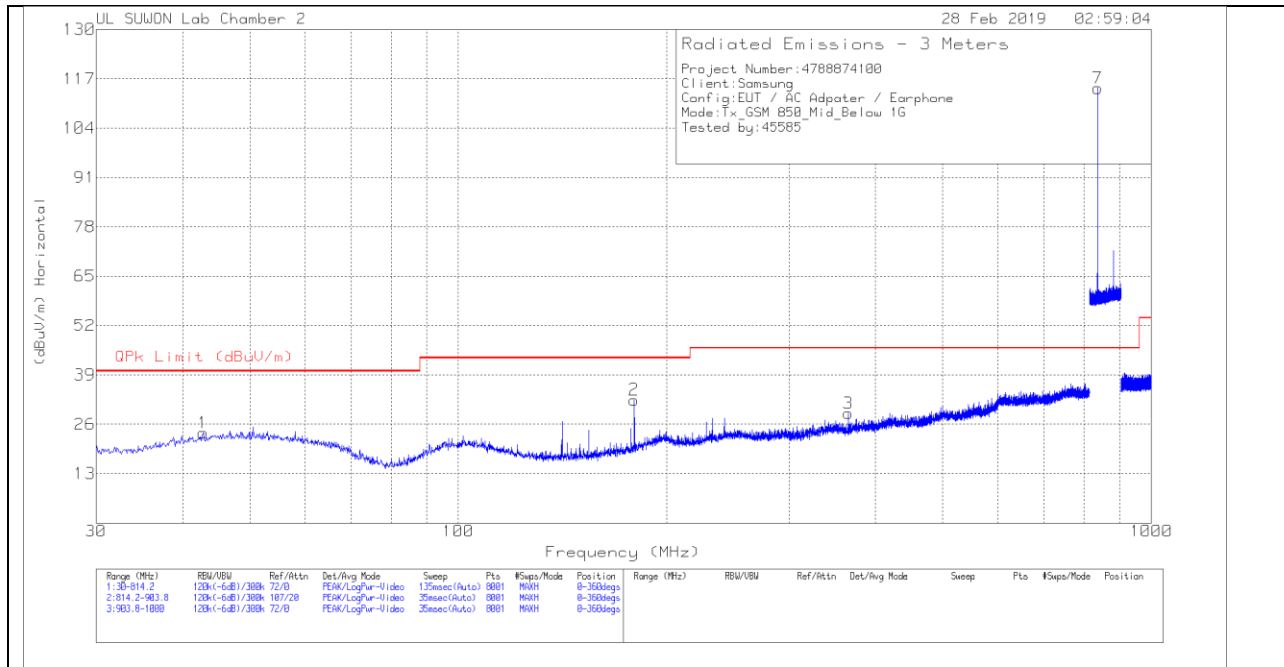
PK – Peak Detector

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

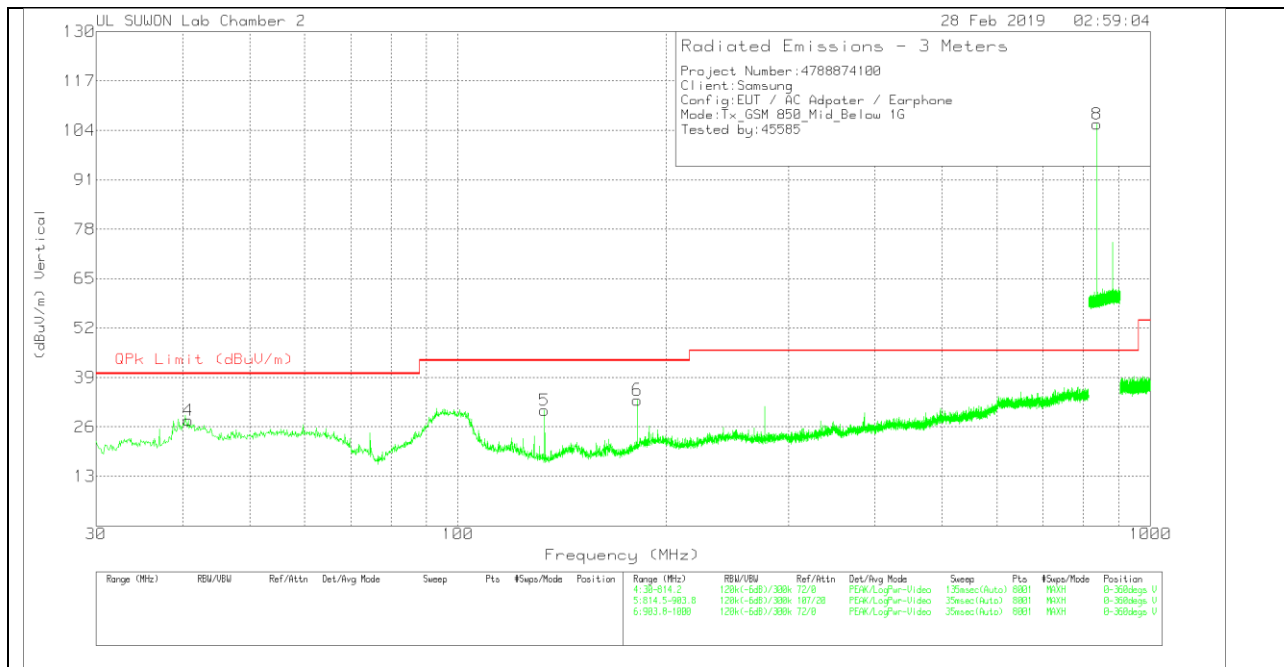
4.4. Below 1 GHz in the GSM850

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	42.8413	3.65	Pk	19.4	.7	23.75	40	-16.25	0-360	400	H
2	179.3901	15.32	Pk	15.7	1.4	32.42	43.52	-11.1	0-360	200	H
3	365.3435	6.35	Pk	20.4	2.1	28.85	46.02	-17.17	0-360	100	H
7	836.656	84.33	Pk	27.1	3.1	114.53	46.02	68.51	0-360	100	H
4	40.7828	8.12	Pk	18.9	.7	27.72	40	-12.28	0-360	100	V
5	133.3184	15.03	Pk	14.1	1.2	30.33	43.52	-13.19	0-360	100	V
6	181.4486	15.64	Pk	15.9	1.5	33.04	43.52	-10.48	0-360	400	V
8	836.6586	75.43	Pk	27.1	3.1	105.63	46.02	59.61	0-360	200	V

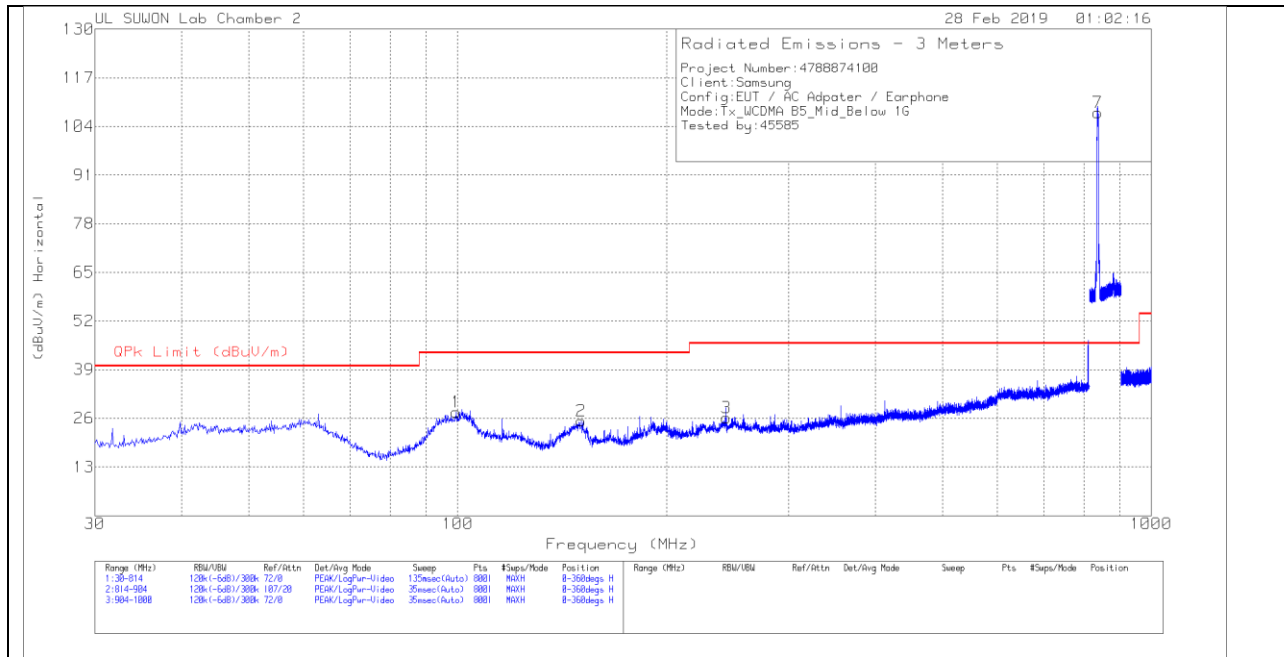
Pk - Peak detector

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

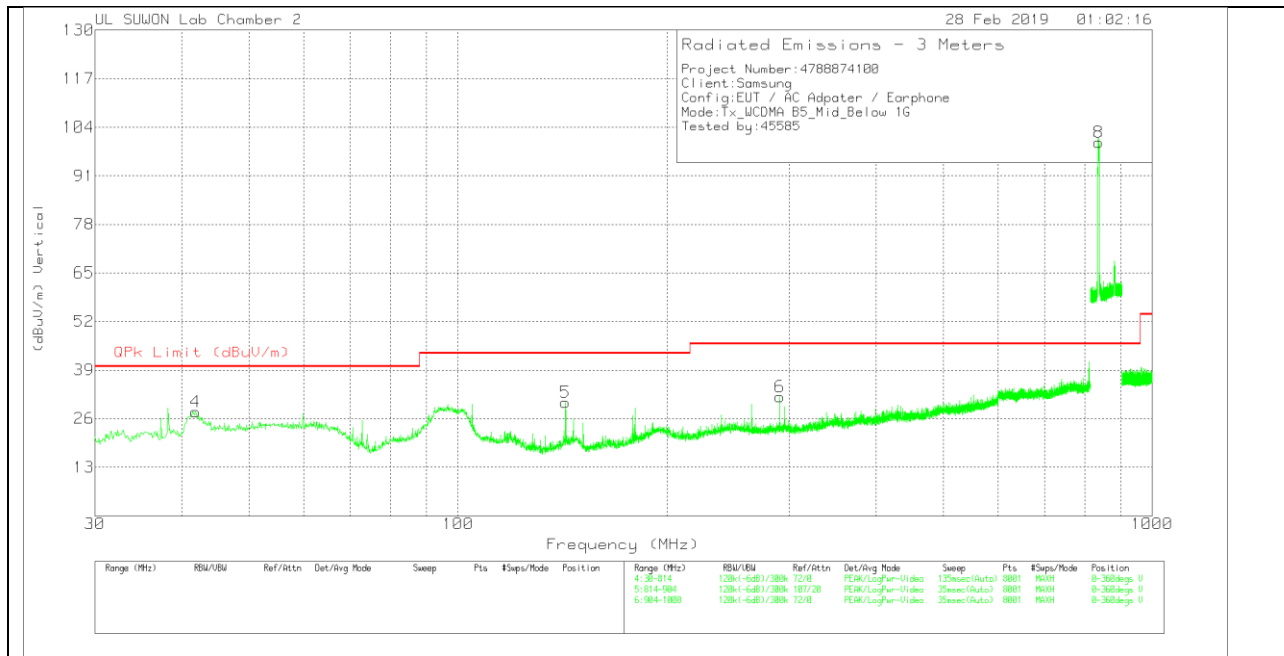
4.5. Below 1 GHz in the WCDMA Band 5

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	99.58	8.83	Pk	17.7	1.1	27.63	43.52	-15.89	0-360	200	H
2	150.736	9.89	Pk	14.1	1.3	25.29	43.52	-18.23	0-360	200	H
3	244.228	5.69	Pk	18.8	1.7	26.19	46.02	-19.83	0-360	200	H
7	836.6463	77.47	Pk	27.1	3.1	107.67	46.02	61.65	0-360	100	H
4	41.858	7.96	Pk	19.2	.7	27.86	40	-12.14	0-360	100	V
5	142.896	14.94	Pk	14.1	1.3	30.34	43.52	-13.18	0-360	100	V
6	290.68	10.94	Pk	19.1	1.8	31.84	46.02	-14.18	0-360	200	V
8	836.77	69.71	Pk	27.1	3.1	99.91	46.02	53.89	0-360	200	V

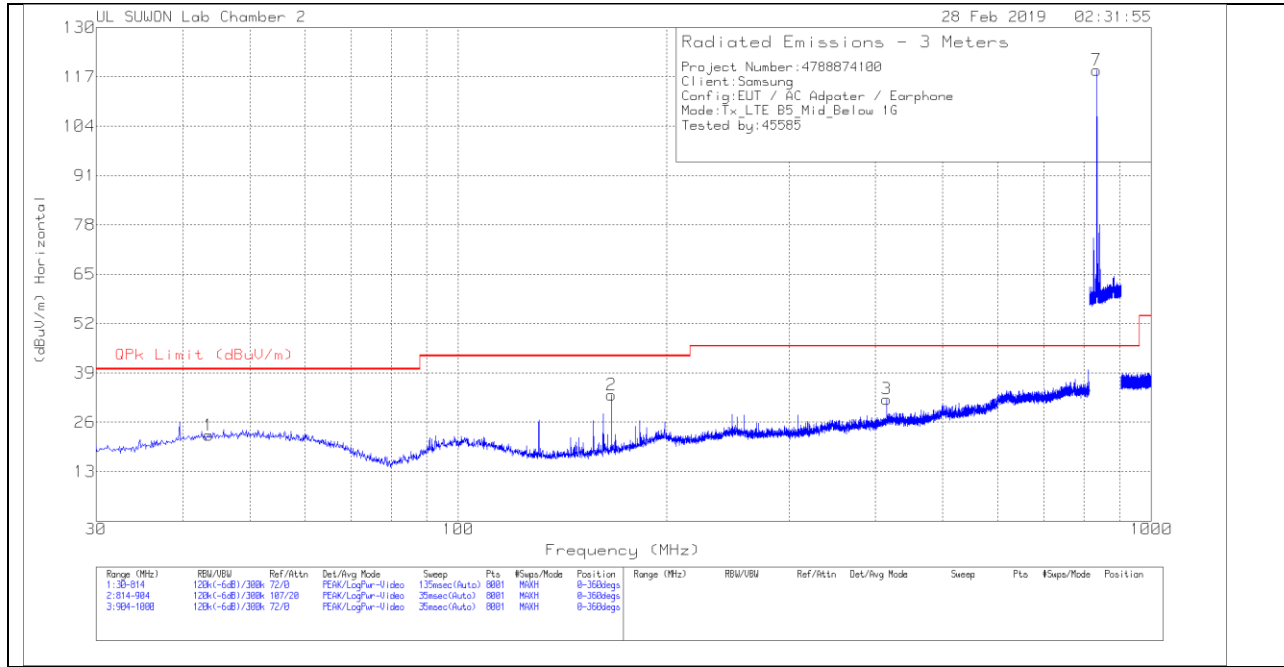
Pk - Peak detector

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

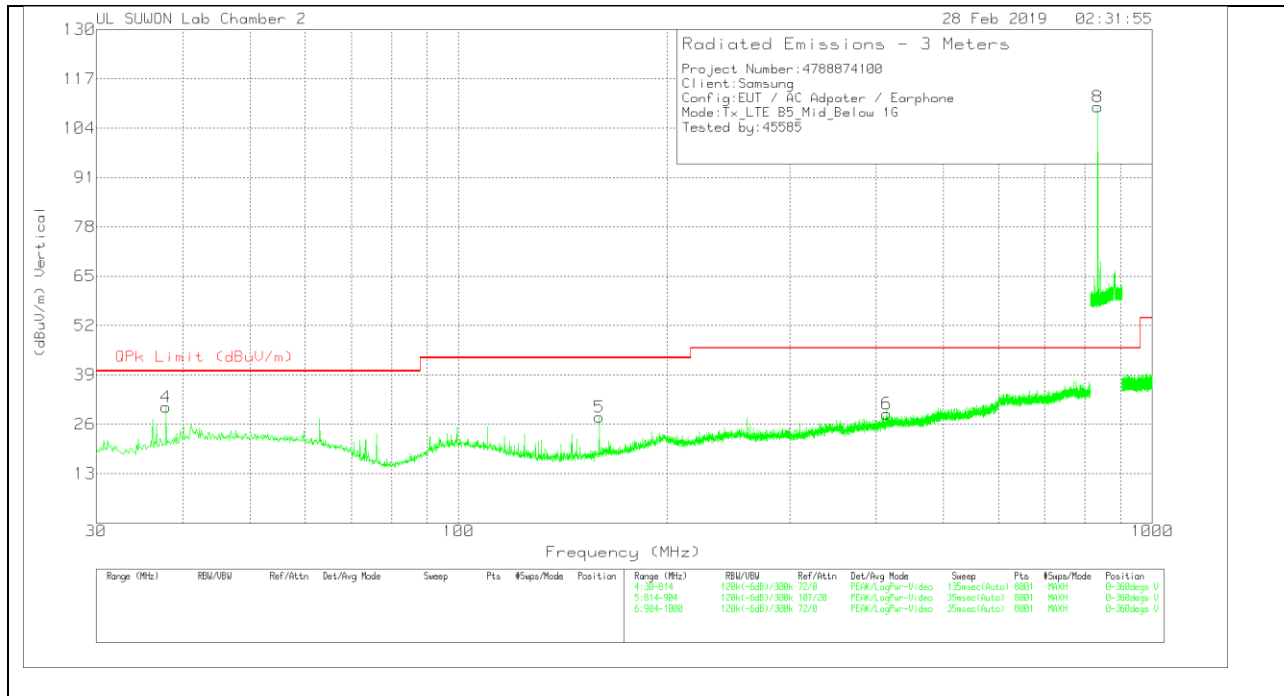
4.6. Below 1 GHz in the LTE Band 5

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	43.622	2.28	Pk	19.6	.7	22.58	40	-17.42	0-360	200	H
2	166.318	16.9	Pk	14.9	1.4	33.2	43.52	-10.32	0-360	200	H
3	415.336	8.01	Pk	21.9	2.2	32.11	46.02	-13.91	0-360	100	H
7	834.3625	88.54	Pk	27.1	3.1	118.74	46.02	72.72	0-360	100	H
4	37.84	12.03	Pk	17.8	.7	30.53	40	-9.47	0-360	100	V
5	159.556	11.89	Pk	14.6	1.4	27.89	43.52	-15.63	0-360	300	V
6	414.356	4.66	Pk	21.9	2.2	28.76	46.02	-17.26	0-360	400	V
8	834.4075	79.4	Pk	27.1	3.1	109.6	46.02	63.58	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.