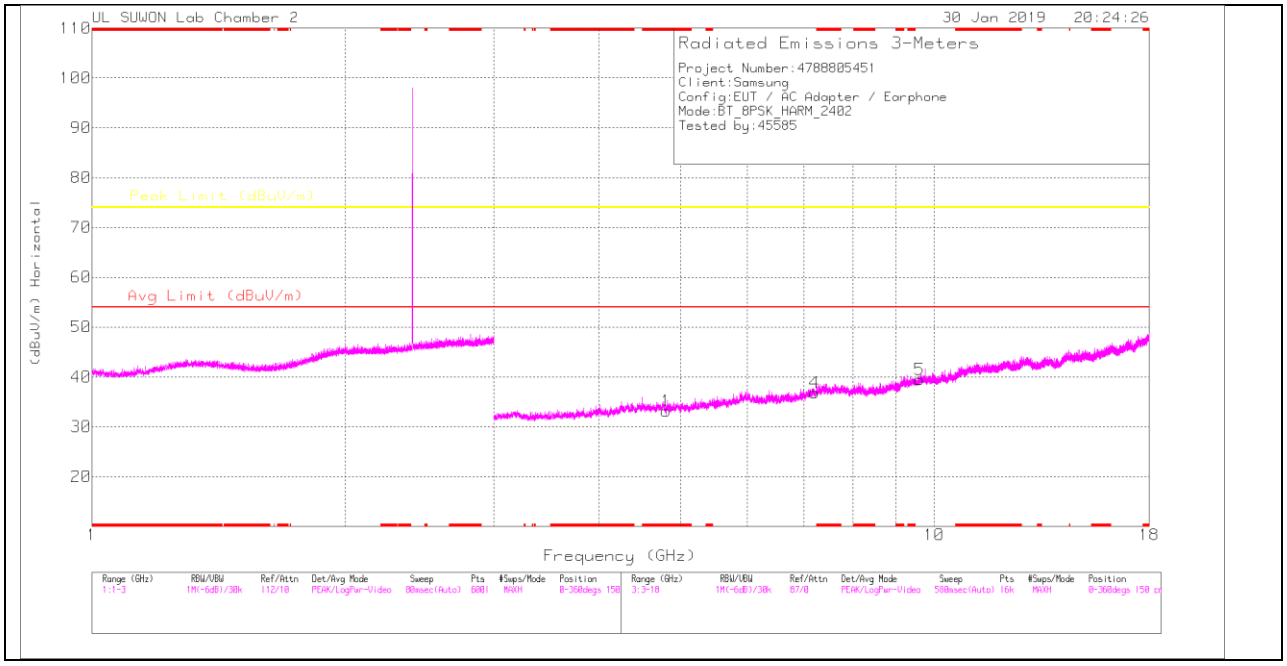
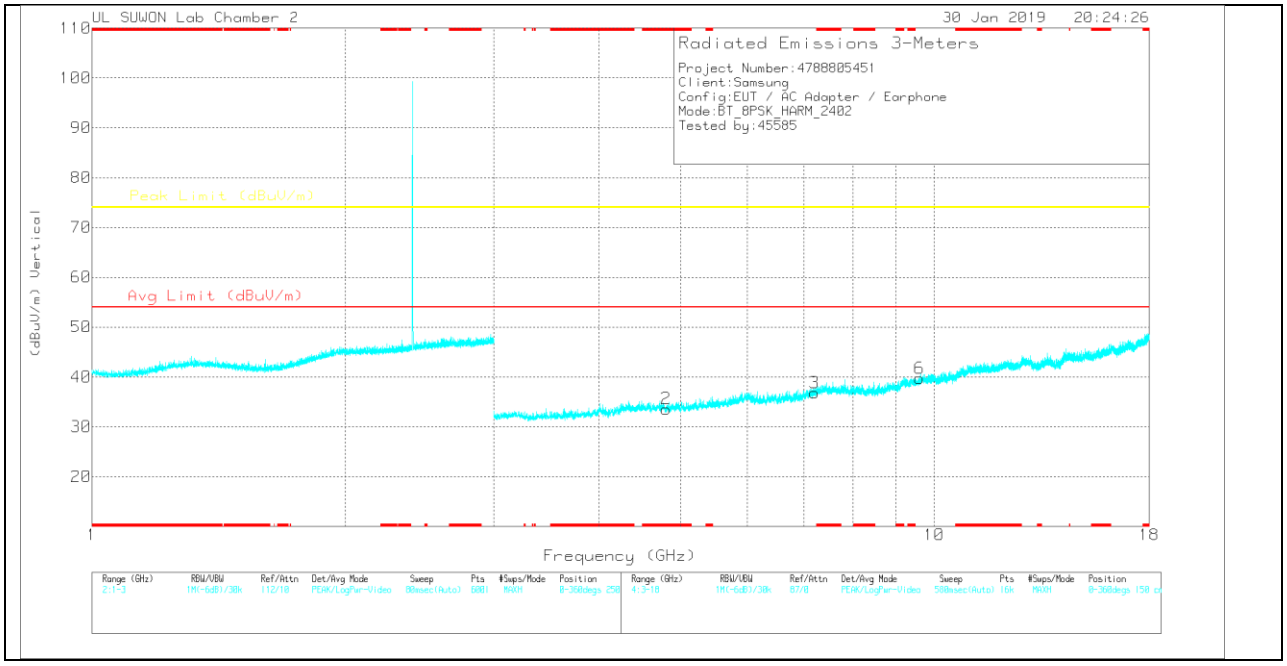
# HARMONICS AND SPURIOUS EMISSIONS

## LOW CHANNEL HORIZONTAL




## LOW CHANNEL VERTICAL




Note: Emission was scanned up to 26GHz; No emissions were detected above the noise floor which was at least 20dB below the specification limit.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## LOW CHANNEL DATA

Trace Markers

| Marker | Frequency (GHz) | Meter Reading (dBuV) | Det | 3117_00168724 | 3GHz_HP[dB] | Corrected Reading (dBuV/m) | Avg Limit (dBuV/m) | Margin (dB) | Peak Limit (dBuV/m) | Margin (dB) | Azimuth (Degs) | Height (cm) | Polarity |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | * 4.805 | 27.24 | PK | 34 | -28.1 | 33.14 | - | - | 74 | -40.86 | 0-360 | 250 | H |
| 4 | 7.208 | 25.97 | PK | 36.1 | -25.3 | 36.77 | - | - | 74 | -37.23 | 0-360 | 250 | H |
| 5 | 9.609 | 24.35 | PK | 37 | -21.9 | 39.45 | - | - | 74 | -34.55 | 0-360 | 150 | H |
| 2 | * 4.805 | 27.7 | PK | 34 | -28.1 | 33.6 | - | - | 74 | -40.4 | 0-360 | 150 | V |
| 3 | 7.208 | 26.08 | PK | 36.1 | -25.3 | 36.88 | - | - | 74 | -37.12 | 0-360 | 250 | V |
| 6 | 9.606 | 24.6 | PK | 37 | -21.9 | 39.7 | - | - | 74 | -34.3 | 0-360 | 250 | V |

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
PK – Peak Detector

Note: Only peak measurement was performed. Because peak measurement result of unwanted emission is less than average limit (54dBuV/m).


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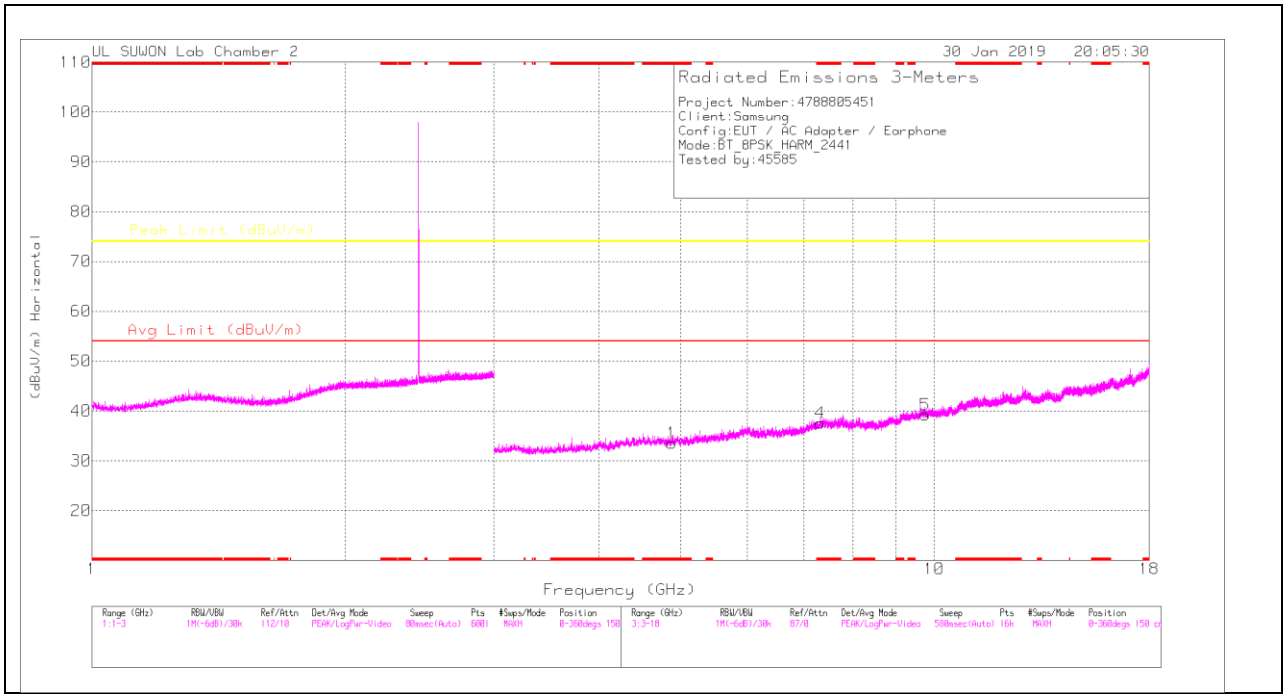
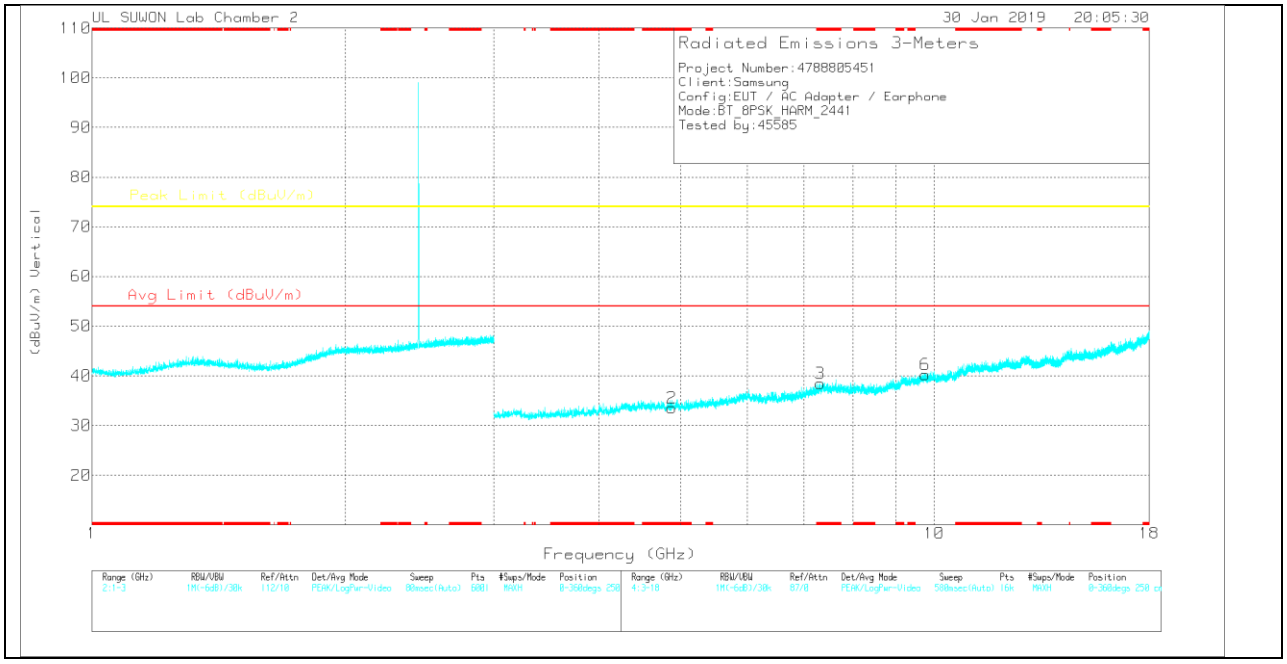
**MID CHANNEL HORIZONTAL**




**MID CHANNEL VERTICAL**




Note: Emission was scanned up to 26GHz; No emissions were detected above the noise floor which was at least 20dB below the specification limit.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**MID CHANNEL DATA**

Trace Markers

| Marker | Frequency (GHz) | Meter Reading (dBuV) | Det | 3117_00168724 | 3GHz_HP[dB] | Corrected Reading (dBuV/m) | Avg Limit (dBuV/m) | Margin (dB) | Peak Limit (dBuV/m) | Margin (dB) | Azimuth (Degs) | Height (cm) | Polarity |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | * 4.882 | 27.47 | PK | 34 | -27.9 | 33.57 | - | - | 74 | -40.43 | 0-360 | 150 | H |
| 4 | * 7.323 | 26.28 | PK | 36.2 | -24.9 | 37.58 | - | - | 74 | -36.42 | 0-360 | 150 | H |
| 5 | 9.765 | 23.52 | PK | 37.2 | -21.5 | 39.22 | - | - | 74 | -34.78 | 0-360 | 250 | H |
| 2 | * 4.882 | 27.4 | PK | 34 | -27.9 | 33.5 | - | - | 74 | -40.5 | 0-360 | 250 | V |
| 3 | * 7.323 | 27.18 | PK | 36.2 | -24.9 | 38.48 | - | - | 74 | -35.52 | 0-360 | 150 | V |
| 6 | 9.764 | 24.48 | PK | 37.2 | -21.5 | 40.18 | - | - | 74 | -33.82 | 0-360 | 150 | V |

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
PK – Peak Detector

Note: Only peak measurement was performed. Because peak measurement result of unwanted emission is less than average limit (54dBuV/m).


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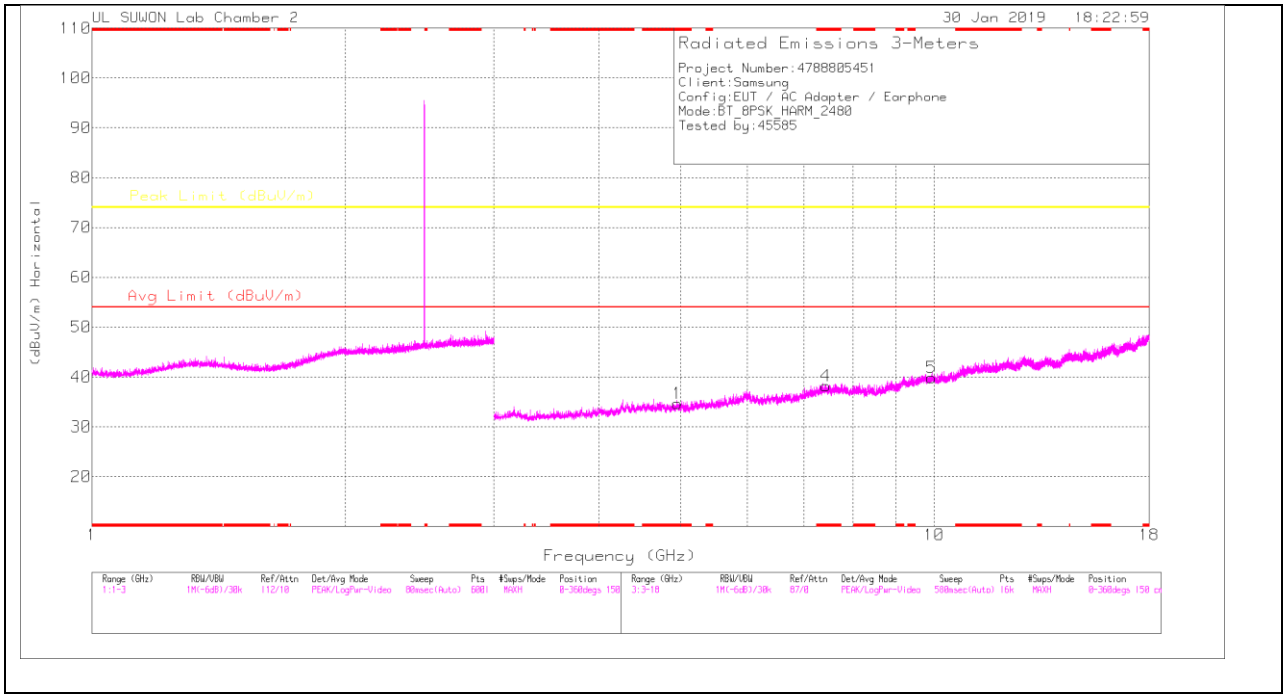
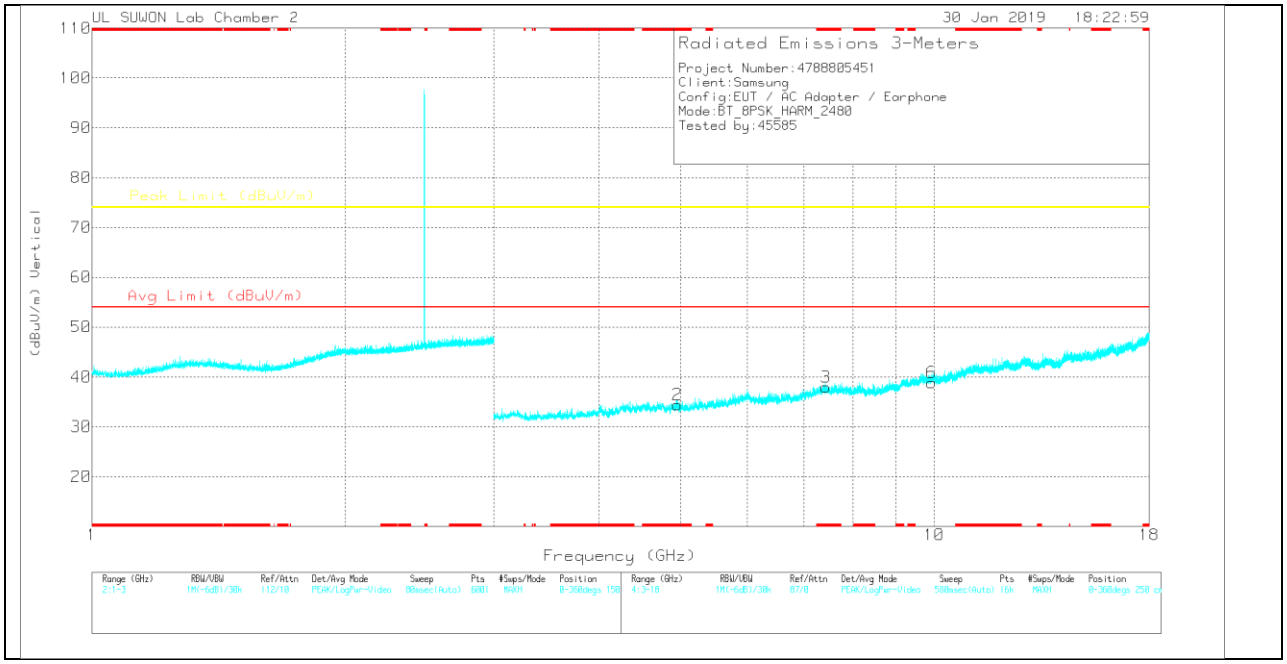
**HIGH CHANNEL HORIZONTAL**




**HIGH CHANNEL VERTICAL**

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## HIGH CHANNEL DATA

Trace Markers

| Marker | Frequency (GHz) | Meter Reading (dBuV) | Det | 3117_00168724 | 3GHz_HP[dB] | Corrected Reading (dBuV/m) | Avg Limit (dBuV/m) | Margin (dB) | Peak Limit (dBuV/m) | Margin (dB) | Azimuth (Degs) | Height (cm) | Polarity |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | * 4.959 | 27.73 | PK | 34.1 | -27.1 | 34.73 | - | - | 74 | -39.27 | 0-360 | 250 | H |
| 4 | * 7.442 | 26.14 | PK | 36.2 | -24.1 | 38.24 | - | - | 74 | -35.76 | 0-360 | 150 | H |
| 5 | 9.921 | 23.51 | PK | 37.4 | -21 | 39.91 | - | - | 74 | -34.09 | 0-360 | 150 | H |
| 2 | * 4.959 | 27.4 | PK | 34.1 | -27.1 | 34.4 | - | - | 74 | -39.6 | 0-360 | 250 | V |
| 3 | * 7.44 | 25.74 | PK | 36.2 | -24 | 37.94 | - | - | 74 | -36.06 | 0-360 | 250 | V |
| 6 | 9.921 | 22.45 | PK | 37.4 | -21 | 38.85 | - | - | 74 | -35.15 | 0-360 | 150 | V |

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
PK – Peak Detector

Note: Only peak measurement was performed. Because peak measurement result of unwanted emission is less than average limit (54dBuV/m).


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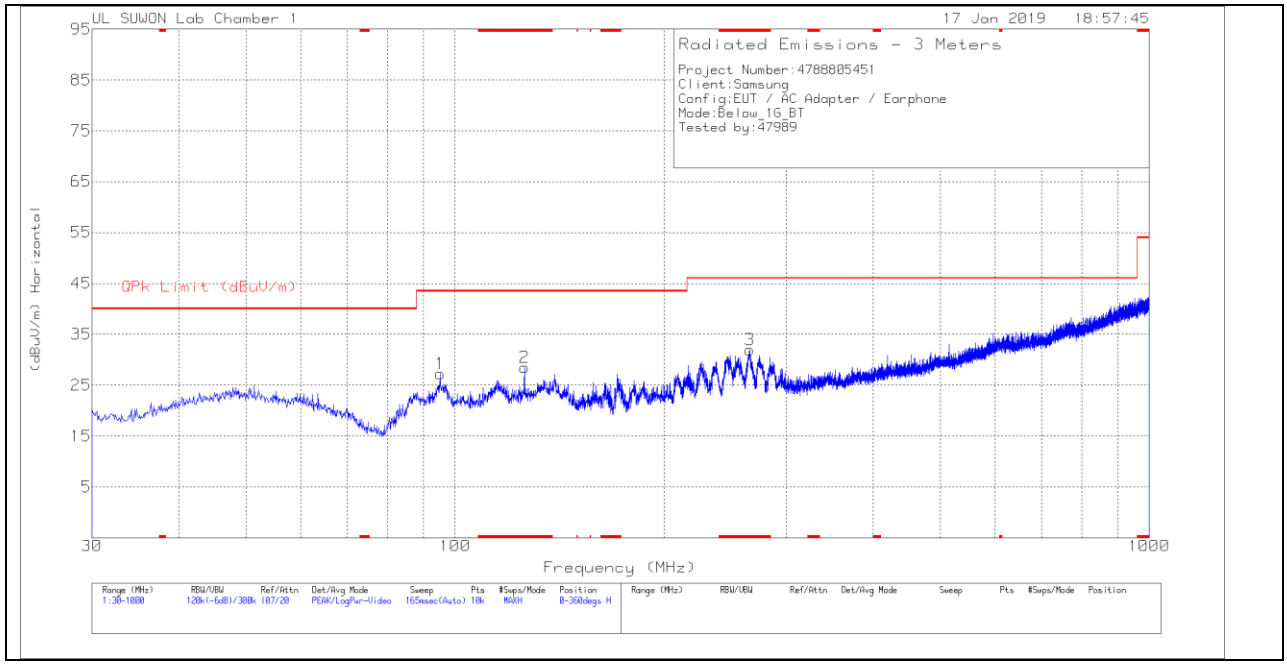
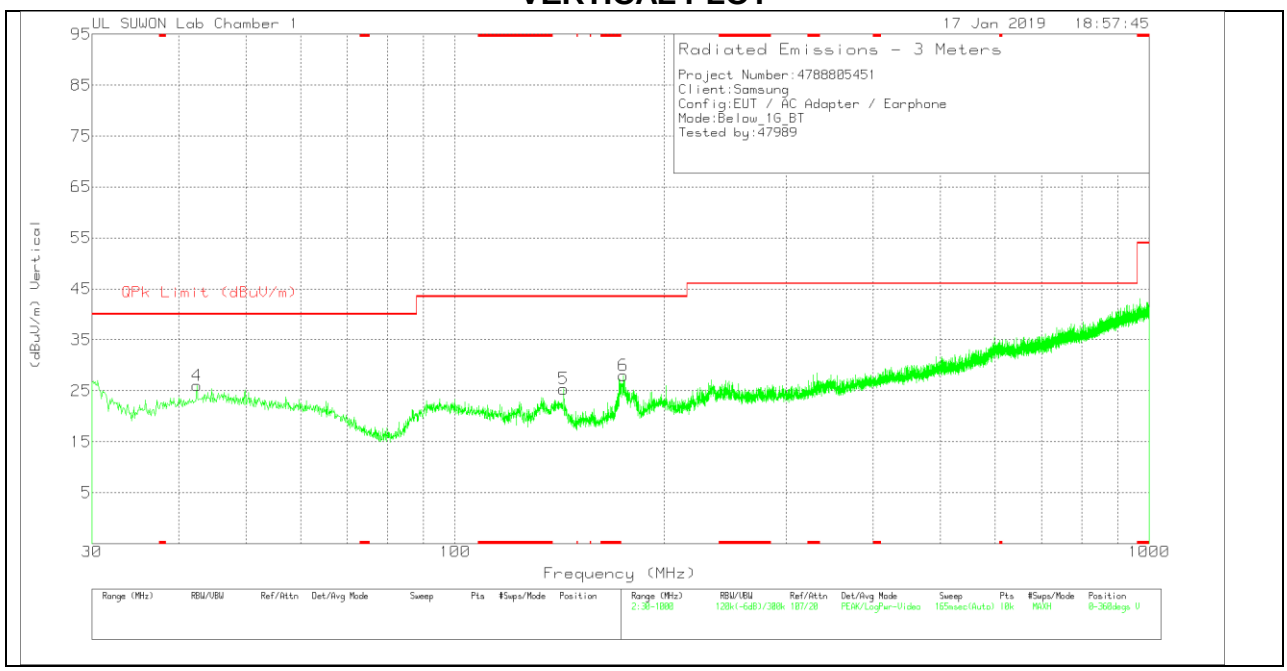
## 11.2. WORST-CASE BELOW 1 GHz

**GFSK SPURIOUS EMISSIONS 30 TO 1000 MHz**

### HORIZONTAL PLOT




### VERTICAL PLOT





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# BELOW 1 GHz TABLE

Trace Markers

| Marker | Frequency (MHz) | Meter Reading (dBuV) | Det | VULB9163_750 | Below_1G[dB] | Corrected Reading (dBuV/m) | QPk Limit (dBuV/m) | Margin (dB) | Azimuth (Degs) | Height (cm) | Polarity |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 95.184 | 39.69 | Pk | 17.3 | -29.7 | 27.29 | 43.52 | -16.23 | 0-360 | 300 | H |
| 2 | * 125.933 | 43.04 | Pk | 14.7 | -29.3 | 28.44 | 43.52 | -15.08 | 0-360 | 400 | H |
| 3 | * 265.613 | 41.2 | Pk | 18.6 | -27.9 | 31.9 | 46.02 | -14.12 | 0-360 | 100 | H |
| 4 | 42.513 | 37.47 | Pk | 19.2 | -30.7 | 25.97 | 40 | -14.03 | 0-360 | 100 | V |
| 5 | 143.4415 | 40.34 | Pk | 14.1 | -29.1 | 25.34 | 43.52 | -18.18 | 0-360 | 200 | V |
| 6 | 174.918 | 41.68 | Pk | 15.1 | -28.8 | 27.98 | 43.52 | -15.54 | 0-360 | 100 | V |

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
Pk - Peak detector


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# 12. AC POWER LINE CONDUCTED EMISSIONS

**LIMITS**

FCC §15.207 (a)

| 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.

**TEST PROCEDURE**

The EUT is placed on a non-conducting table 40 cm from the vertical ground plane and 80 cm above the horizontal ground plane. The EUT is configured in accordance with ANSI C63.10.

The receiver is set to a resolution bandwidth of 9 kHz. Peak detection is used unless otherwise noted as quasi-peak or average.

Line conducted data is recorded for both NEUTRAL and HOT lines.


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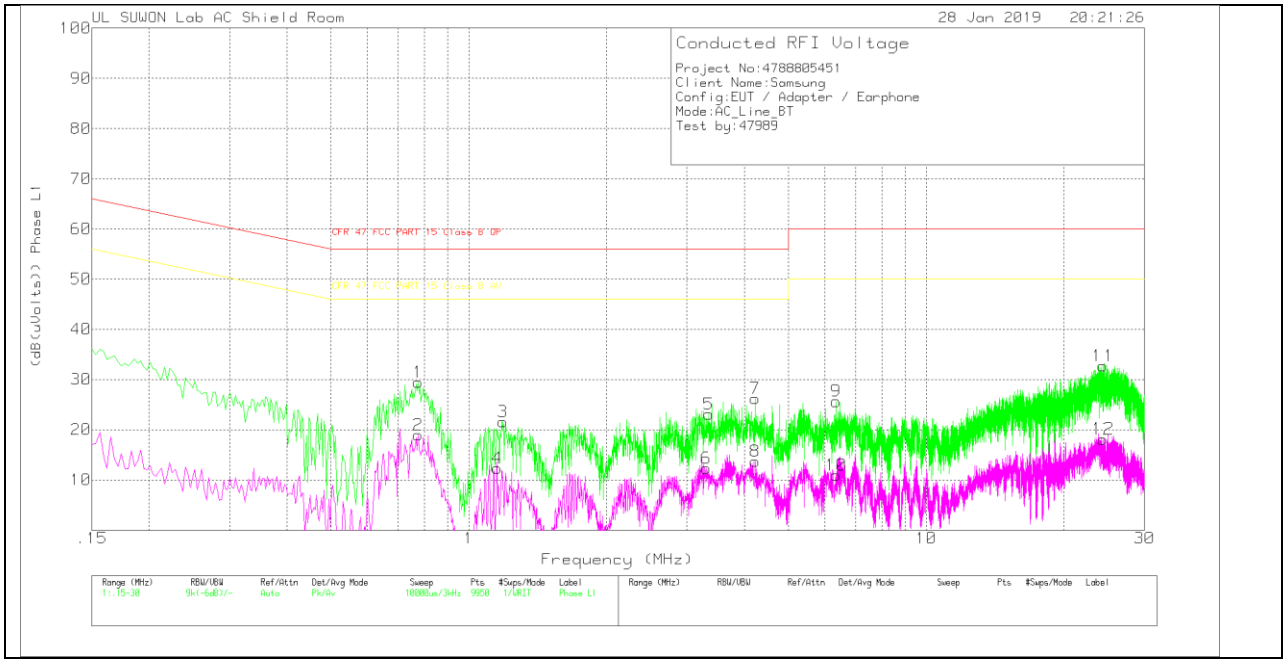
**RESULTS**

**WORST EMISSIONS**

## LINE 1 PLOT





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# LINE 1 RESULTS

## Trace Markers

Range 1: Phase L1 .15 - 30MHz

| Marker | Frequency (MHz) | Meter Reading (dBuV) | Det | ENV216_101836_With ex-cord_L1 | CABLELOSS(dB) | Corrected Reading (dB(uVolts)) | CFR 47 FCC PART 15 Class B QP | Margin (dB) | CFR 47 FCC PART 15 Class B AV | Margin (dB) |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | .774 | 19.32 | Pk | 9.9 | .2 | 29.42 | 56 | -26.58 | - | - |
| 2 | .774 | 8.91 | Av | 9.9 | .2 | 19.01 | - | - | 46 | -26.99 |
| 3 | 1.188 | 11.53 | Pk | 9.8 | .3 | 21.63 | 56 | -34.37 | - | - |
| 4 | 1.155 | 2.22 | Av | 9.8 | .3 | 12.32 | - | - | 46 | -33.68 |
| 5 | 3.348 | 12.89 | Pk | 9.9 | .3 | 23.09 | 56 | -32.91 | - | - |
| 6 | 3.3 | 2.1 | Av | 9.9 | .3 | 12.3 | - | - | 46 | -33.7 |
| 7 | 4.227 | 16.12 | Pk | 9.8 | .3 | 26.22 | 56 | -29.78 | - | - |
| 8 | 4.227 | 3.62 | Av | 9.8 | .3 | 13.72 | - | - | 46 | -32.28 |
| 9 | 6.348 | 15.46 | Pk | 9.9 | .3 | 25.66 | 60 | -34.34 | - | - |
| 10 | 6.357 | .76 | Av | 9.9 | .3 | 10.96 | - | - | 50 | -39.04 |
| 11 | 24.36 | 21.74 | Pk | 10.6 | .4 | 32.74 | 60 | -27.26 | - | - |
| 12 | 24.36 | 7.15 | Av | 10.6 | .4 | 18.15 | - | - | 50 | -31.85 |

Pk - Peak detector
Av - Average detection


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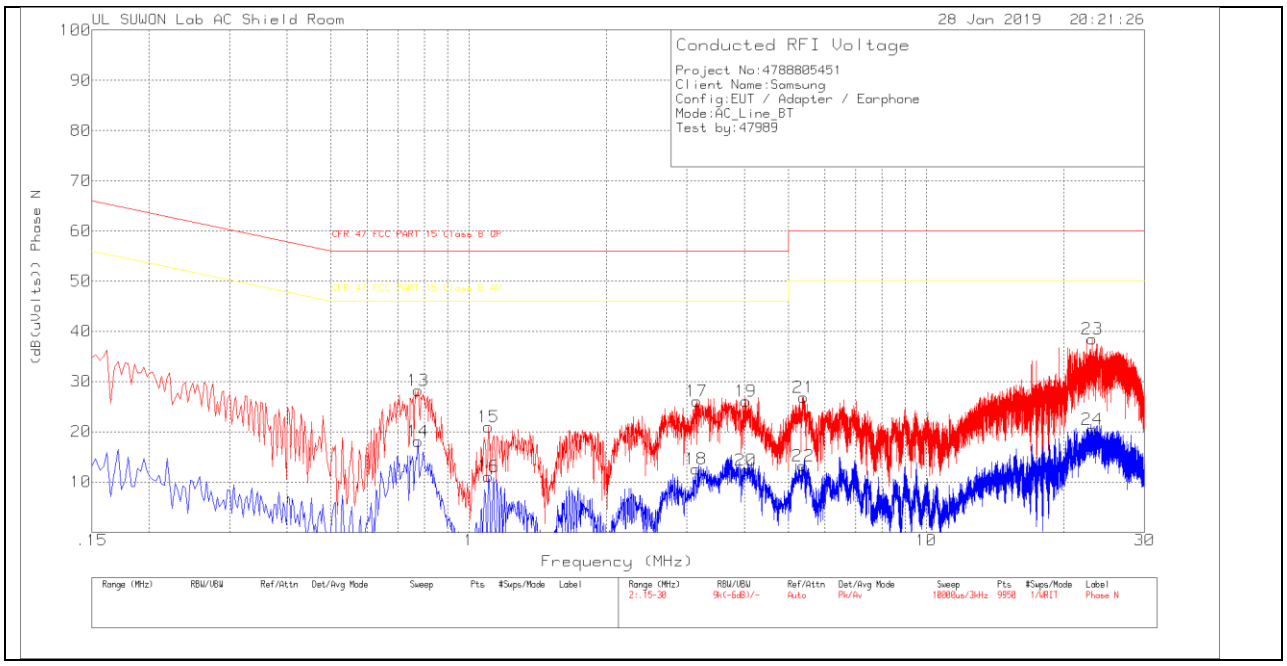
## LINE 2 PLOT





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## LINE 2 RESULTS

### Trace Markers

Range 2: Phase N .15 - 30MHz

| Marker | Frequency (MHz) | Meter Reading (dBuV) | Det | ENV216_101836_With ex-cord_N | CABLELOSS(dB) | Corrected Reading (dB(uVolts)) | CFR 47 FCC PART 15 Class B QP | Margin (dB) | CFR 47 FCC PART 15 Class B AV | Margin (dB) |
|---|---|---|---|---|---|---|---|---|---|---|
| 13 | .774 | 18.26 | Pk | 9.8 | .2 | 28.26 | 56 | -27.74 | - | - |
| 14 | .774 | 8.04 | Av | 9.8 | .2 | 18.04 | - | - | 46 | -27.96 |
| 15 | 1.104 | 10.89 | Pk | 9.8 | .3 | 20.99 | 56 | -35.01 | - | - |
| 16 | 1.104 | .95 | Av | 9.8 | .3 | 11.05 | - | - | 46 | -34.95 |
| 17 | 3.15 | 16.07 | Pk | 9.7 | .3 | 26.07 | 56 | -29.93 | - | - |
| 18 | 3.141 | 2.57 | Av | 9.7 | .3 | 12.57 | - | - | 46 | -33.43 |
| 19 | 4.035 | 16.03 | Pk | 9.8 | .3 | 26.13 | 56 | -29.87 | - | - |
| 20 | 4.035 | 2.24 | Av | 9.8 | .3 | 12.34 | - | - | 46 | -33.66 |
| 21 | 5.388 | 16.8 | Pk | 9.8 | .3 | 26.9 | 60 | -33.1 | - | - |
| 22 | 5.382 | 3.11 | Av | 9.8 | .3 | 13.21 | - | - | 50 | -36.79 |
| 23 | 23.028 | 27.46 | Pk | 10.6 | .4 | 38.46 | 60 | -21.54 | - | - |
| 24 | 23.052 | 9.51 | Av | 10.6 | .4 | 20.51 | - | - | 50 | -29.49 |

Pk - Peak detector


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