## Power Line Conducted Emissions

### Purpose

The purpose of this test is to ensure that the RF energy unintentionally emitted from the EUT's power line does not exceed the limits listed below as defined in the applicable test standard and measured from a LISN. This helps protect lower frequency radio services such as AM radio, shortwave radio, amateur radio, maritime radio, CB radio, and so on, from unwanted interference.

### Limits & Method

The method is as defined in ANSI C63.4. The limits are as defined in FCC Part 15 Section 15.107 and ICES-003 Issue 6 Section 6.1:

CLASS A

|  |  |  |  |
| --- | --- | --- | --- |
| **Average Limits** | | **Quasi-Peak Limits** | |
| 150 kHz – 500 kHz | 66 dBµV | 150 kHz – 500 kHz | 79 dBµV |
| 500 kHz – 30 MHz | 60 dBµV | 500 kHz – 30 MHz | 73 dBµV |

CLASS B

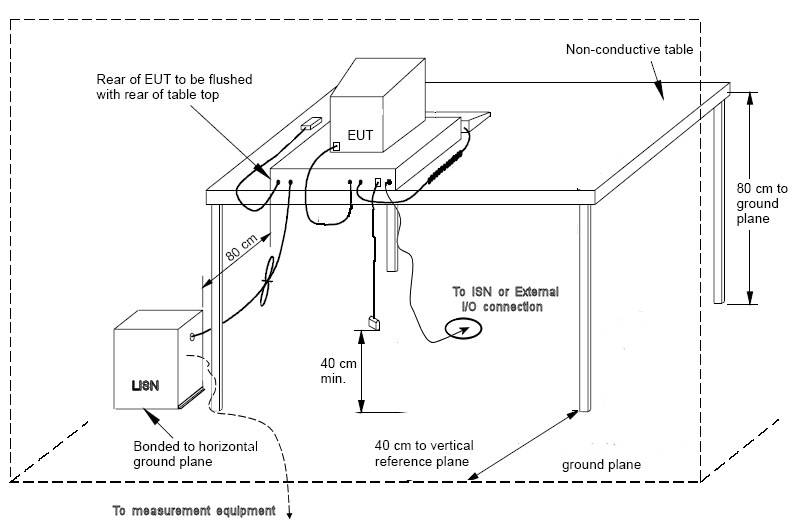
|  |  |  |  |
| --- | --- | --- | --- |
| **Average Limits** | | **Quasi-Peak Limits** | |
| 150 kHz – 500 kHz | 56 to 46\* dBµV | 150 kHz – 500 kHz | 66 to 56\* dBµV |
| 500 kHz – 5 MHz | 46 dBµV | 500 kHz – 5 MHz | 56 dBµV |
| 5 MHz – 30 MHz | 50 dBµV | 5 MHz – 30 MHz | 60 dBµV |

\* Decreases linearly with the logarithm of the frequency

Both Quasi-Peak and Average limits are applicable and each is specified as being measured with a resolution bandwidth of 9 kHz. For Quasi-Peak, a video bandwidth at least three times greater than the resolution bandwidth is used.

Based on ANSI C63.4 Section 4.2, if the Peak or Quasi-Peak detector measurements do not exceed the Average limits, then the EUT is deemed to have passed the requirements.

Typical Setup Diagram



### Measurement Uncertainty

The expanded measurement uncertainty is calculated in accordance with CISPR 16-4-2 and is ±2.73dB with a 'k=2' coverage factor and a 95% confidence level.

### Preliminary Graphs

The graphs shown below are maximized peak measurement graphs measured with a resolution bandwidth greater than or equal to the final required detector. This peaking process is done as a worst case measurement and enables the detection of frequencies of concern for final measurement. For final measurements with the appropriate detector, where applicable, please refer to the tables under Final Measurements.

Insert PLCE Photos Here

### Final Measurements

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Product Category | | | Class A | | | | | | | | |
| EUT | | |  | | | | | | | | |
| Supply | | | **120Vac 60Hz** | | | | | | | | |
| **Frequency (MHz)** | **Detector** | **Received Signal (dBµV)** | **Atten Factor (dB)** | **Cable Factor (dB)** | **LISN Factor (dB)** | **Level (dBµV)** | **QP Limit (dBµV)** | **AVG Limit (dBµV)** | **QP Margin (dB)** | **AVG Margin (dB)** | **Pass/ Fail** |
| Line 1 | | | | | | | | | | | |
| 0.000 | PEAK | 0.0 | 0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | Pass0 |
| 0.000 | PEAK | 0.0 | 0 | 0.0 | 0.0 | 0.0 | 0.0 | -- | 0.0 | -- | Pass1 |
| 0.000 | PEAK | 0.0 | 0 | 0.0 | 0.0 | 0.0 | 0.0 | -- | 0.0 | -- | Pass2 |
| 0.000 | PEAK | 0.0 | 0 | 0.0 | 0.0 | 0.0 | 0.0 | -- | 0.0 | -- | Pass3 |
| 0.000 | PEAK | 0.0 | 0 | 0.0 | 0.0 | 0.0 | 0.0 | -- | 0.0 | -- | Pass4 |
| 0.000 | PEAK | 0.0 | 0 | 0.0 | 0.0 | 0.0 | 0.0 | -- | 0.0 | -- | Pass5 |
| 0.000 | PEAK | 0.0 | 0 | 0.0 | 0.0 | 0.0 | 0.0 | -- | 0.0 | -- | Pass6 |
| 0.000 | PEAK | 0.0 | 0 | 0.0 | 0.0 | 0.0 | 0.0 | -- | 0.0 | -- | Pass7 |
| 0.000 | PEAK | 0.0 | 0 | 0.0 | 0.0 | 0.0 | 0.0 | -- | 0.0 | -- | Pass8 |
| 0.000 | PEAK | 0.0 | 0 | 0.0 | 0.0 | 0.0 | 0.0 | -- | 0.0 | -- | Pass9 |
| 0.000 | PEAK | 0.0 | 0 | 0.0 | 0.0 | 0.0 | 0.0 | -- | 0.0 | -- | Pass10 |
| 0.000 | PEAK | 0.0 | 0 | 0.0 | 0.0 | 0.0 | 0.0 | -- | 0.0 | -- | Pass11 |
| 0.000 | PEAK | 0.0 | 0 | 0.0 | 0.0 | 0.0 | 0.0 | -- | 0.0 | -- | Pass12 |
| 0.000 | PEAK | 0.0 | 0 | 0.0 | 0.0 | 0.0 | 0.0 | -- | 0.0 | -- | Pass13 |
| 0.000 | PEAK | 0.0 | 0 | 0.0 | 0.0 | 0.0 | 0.0 | -- | 0.0 | -- | Pass14 |
| Line 2 | | | | | | | | | | | |
| 0.000 | PEAK | 0.0 | 0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | Pass15 |
| 0.000 | PEAK | 0.0 | 0 | 0.0 | 0.0 | 0.0 | 0.0 | -- | 0.0 | -- | Pass16 |
| 0.000 | PEAK | 0.0 | 0 | 0.0 | 0.0 | 0.0 | 0.0 | -- | 0.0 | -- | Pass17 |
| 0.000 | PEAK | 0.0 | 0 | 0.0 | 0.0 | 0.0 | 0.0 | -- | 0.0 | -- | Pass18 |
| 0.000 | PEAK | 0.0 | 0 | 0.0 | 0.0 | 0.0 | 0.0 | -- | 0.0 | -- | Pass19 |
| 0.000 | PEAK | 0.0 | 0 | 0.0 | 0.0 | 0.0 | 0.0 | -- | 0.0 | -- | Pass20 |
| 0.000 | PEAK | 0.0 | 0 | 0.0 | 0.0 | 0.0 | 0.0 | -- | 0.0 | -- | Pass21 |
| 0.000 | PEAK | 0.0 | 0 | 0.0 | 0.0 | 0.0 | 0.0 | -- | 0.0 | -- | Pass22 |
| 0.000 | PEAK | 0.0 | 0 | 0.0 | 0.0 | 0.0 | 0.0 | -- | 0.0 | -- | Pass23 |
| 0.000 | PEAK | 0.0 | 0 | 0.0 | 0.0 | 0.0 | 0.0 | -- | 0.0 | -- | Pass24 |
| 0.000 | PEAK | 0.0 | 0 | 0.0 | 0.0 | 0.0 | 0.0 | -- | 0.0 | -- | Pass25 |
| 0.000 | PEAK | 0.0 | 0 | 0.0 | 0.0 | 0.0 | 0.0 | -- | 0.0 | -- | Pass26 |
| 0.000 | PEAK | 0.0 | 0 | 0.0 | 0.0 | 0.0 | 0.0 | -- | 0.0 | -- | Pass27 |
| 0.000 | PEAK | 0.0 | 0 | 0.0 | 0.0 | 0.0 | 0.0 | -- | 0.0 | -- | Pass28 |
| 0.000 | PEAK | 0.0 | 0 | 0.0 | 0.0 | 0.0 | 0.0 | -- | 0.0 | -- | Pass29 |
| Line 3 | | | | | | | | | | | |
| 0.000 | PEAK | 0.0 | 0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | Pass30 |
| 0.000 | PEAK | 0.0 | 0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | Pass31 |
| 0.000 | PEAK | 0.0 | 0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | Pass32 |
| 0.000 | PEAK | 0.0 | 0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | Pass33 |
| 0.000 | PEAK | 0.0 | 0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | Pass34 |
| 0.000 | PEAK | 0.0 | 0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | Pass35 |
| 0.000 | PEAK | 0.0 | 0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | Pass36 |
| 0.000 | PEAK | 0.0 | 0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | Pass37 |
| 0.000 | PEAK | 0.0 | 0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | Pass38 |
| 0.000 | PEAK | 0.0 | 0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | Pass39 |
| 0.000 | PEAK | 0.0 | 0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | Pass40 |
| 0.000 | PEAK | 0.0 | 0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | Pass41 |
| 0.000 | PEAK | 0.0 | 0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | Pass42 |
| 0.000 | PEAK | 0.0 | 0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | Pass43 |
| 0.000 | PEAK | 0.0 | 0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | Pass44 |
| Neutral | | | | | | | | | | | |
| 0.000 | PEAK | 0.0 | 0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | Pass45 |
| 0.000 | PEAK | 0.0 | 0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | Pass46 |
| 0.000 | PEAK | 0.0 | 0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | Pass47 |
| 0.000 | PEAK | 0.0 | 0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | Pass48 |
| 0.000 | PEAK | 0.0 | 0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | Pass49 |
| 0.000 | PEAK | 0.0 | 0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | Pass50 |
| 0.000 | PEAK | 0.0 | 0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | Pass51 |
| 0.000 | PEAK | 0.0 | 0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | Pass52 |
| 0.000 | PEAK | 0.0 | 0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | Pass53 |
| 0.000 | PEAK | 0.0 | 0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | Pass54 |
| 0.000 | PEAK | 0.0 | 0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | Pass55 |
| 0.000 | PEAK | 0.0 | 0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | Pass56 |
| 0.000 | PEAK | 0.0 | 0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | Pass57 |
| 0.000 | PEAK | 0.0 | 0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | Pass58 |
| 0.000 | PEAK | 0.0 | 0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | Pass59 |

Insert Emissions Data Here

Average and Quasi-Peak Emissions Table

Note:

Peak = Peak measurement

AVG = Average measurement

QP = Quasi-Peak measurement

See 'Appendix B – EUT, Peripherals and Test Setup Photos' for photos showing the test set-up for the highest line conducted emission

### Test Equipment List

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Equipment** | **Model No.** | **Manufacturer** | **Last Calibration Date** | **Next Calibration Date** | **Asset #** |
| Spectrum Analyzer | ESL 6 | Rohde & Schwarz | Dec. 27, 2017 | Dec. 27, 2019 | GEMC 160 |
| Spectrum Analyzer | FSU 3 | Rohde & Schwarz | Feb. 7, 2017 | Feb. 7, 2019 | GEMC 198 |
| LISN | FCC-LISN-50/250-  16-2-01 | FCC | Jan. 10, 2018 | Jan. 10, 2020 | GEMC 302 |
| LISN | FCC-LISN-50-100-1-02-MS461F | FCC | Feb. 20, 2018 | Feb. 20, 2020 | GEMC 121, GEMC 123 |
| RF Cable 3m | LMR-400-3M-50Ω-MN-MN | LexTec | NCR | NCR | GEMC 276 |
| Attenuator 10 dB | 612-10-1 | Meca Electronics, Inc | NCR | NCR | GEMC 223 |
| 150kHz High Pass Filter | EZ-25 | Rohde & Schwarz | NCR | NCR | GEMC 120 |
| Emissions Software | 0.1.97 | TUV SUD Canada, Inc | NCR | NCR | GEMC 58 |
| BAT-EMC Emission | 3.17.0.25 | Nexio, Inc. | NCR | NCR | GEMC 311 |

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