**LTE Interference Theoretical Study**

Assumptions:

LTE Transmitter Downlink Power[[1]](#footnote-1): +46 dBm

LTE Downlink Antenna Gain: 16 dB

LTE Downlink EIRP: +62 dBm (111 dBmV)

LTE Handset Uplink Output Power (max) +23 dBm (72 dBmV)

LTE Handset Uplink Output Power (typical) +15 dBm (64 dBmV)

LTE 750 MHz Loss @ 1 km (~0.6 mi) based upon the Hata model1: 99 dB (downlink)

LTE 750 MHz Line-of-Site Free-Space Loss @ 2.5m: (~8 ft): 38 dB (uplink)

750 MHz Downlink Interferer Level @ 1 km: +12 dBmV

750 MHz Uplink Interferer Level @ 2.5 m: +34 dBmV (max)

750 MHz Uplink Interferer Level @ 2.5 m: +26 dBmV (typical)

Line Amplifier Input Level: +10 dBmV

Line Amplifier Output Level: +45 dBmV

Customer Drop @ Bonding Block +14 dBmV

Customer Drop @ CPE Input: -6 dBmV

Desired MER (256-QAM): 33 dB

To achieve desired downstream MER from a single-point leakage flaw:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **Downlink Interferer** | | | **Uplink Interferer** |
|  | **Line Amp Input** | **Line Amp Output** | **House Drop** | **House Drop** |
| **QAM Signal Level** | +10 dBmV | +45 dBmV | +14 dBmV | -6 dBmV |
| **Desired MER** | 33 dBc | 33 dBc | 33 dBc | 33 dBc |
| **Max Allowable Interferer Level** | -23 dBmV | +12 dBmV | -19 dBmV | -39 dBmV |
| **LTE Interferer Level** | +12 dBmV | +12 dBmV | +12 dBmV | +26 (typical) |
| **Shielding Integrity Enabling LTE Interference** | ≤35 dB | 0 dB | ≤31 dB | ≤65 dB |
| **774 MHz Leakage** | 9 µV/m  @ 10 feet | 28,904 µV/m  @ 10 feet | 23 µV/m  @ 10 feet | >1 µV/m  @ 8.2 feet |

Max Allowable Interferer Level = QAM Signal Level – Desired MER

LTE Interferer Level is computed using the Hata model Open Air formula.

Required Shielding Integrity = LTE Interferer Level – Max Allowable Interferer Level

774 Leakage measured at the stated distance from the actual leak source. Free-space loss @ 10 feet = 39.9 dB; at 8.2 feet = 38.2 dB.

The implications:

The home environment presents the most vulnerable opportunity for LTE ingress interference since the signal level is so strong in this environment. The least likely to exhibit susceptibility to LTE ingress at the selected distance from the LTE site is the output side of a line amplifier.

Producing signal leakage of less than 1 µV/m from internal wiring presenting a shielding integrity of 65 dB, it also is the most difficult to detect using available signal leakage detection methods. A better technology would use the M3 high-level solution to push a dramatically larger signal into the internal wiring while disconnected from the network. The marginally useful signal leakage detector will now respond very well to the higher leakage levels. Where this is not practical, a reversal technology must be implemented where a high level signal is broadcast into the in-home environment. Internal wiring gathers the broadcast signal at points of vulnerability and forwards the residual to a central location for processing.

To be effective, an ingress solution must deliver adequate signal level to

1. Ref.: <https://sites.google.com/site/lteencyclopedia/lte-radio-link-budgeting-and-rf-planning>, [↑](#footnote-ref-1)