

CellAdvisor Analysis of LTE/TDD In-Channel Interference

Mobile operators are embracing LTE technology and are aggressively deploying it using two techniques: frequency division duplex (FDD), where cell-site and mobile transmission are separated by frequency, and time division duplex (TDD), where this separation is based on time. LTE is not immune to interference, and its effect deteriorates mobile transmissions. This decreases throughput and interrupts mobile services, seriously degrading customer quality of experience.

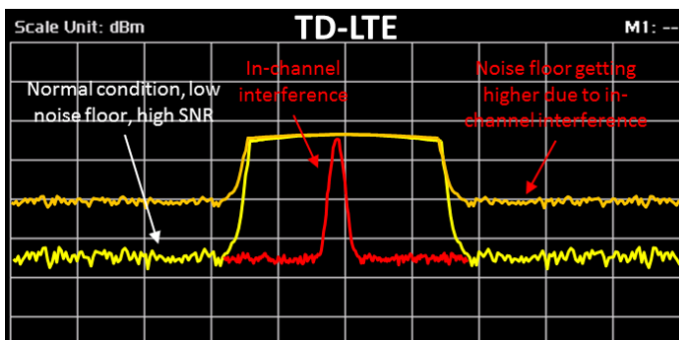


Figure 1. LTE TDD signal with interference

Background

LTE-TDD signals transmit cell-site and mobile data in the same frequency channel by allocating specific timeslots for each transmitter.

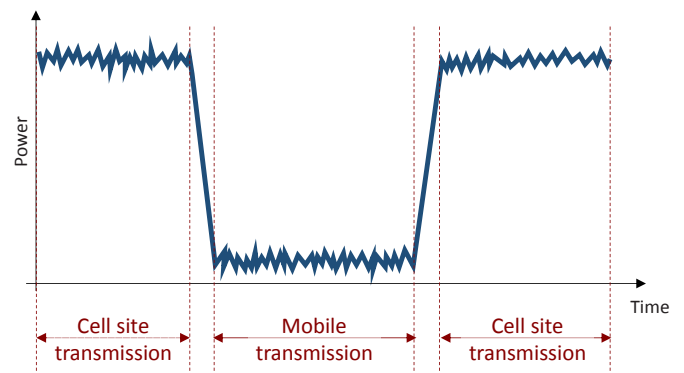


Figure 2. LTE-TDD signal structure in the time domain

Unmet Need

Interference in LTE-TDD signals causes high received signal strength indicator (RSSI) alarms and degrades mobile throughput. The ability to detect this interference in LTE-TDD is challenging. The TDD transmission scheme is based on timing, and the analysis should be made on the carrier's frequency at different time frames to properly analyze mobile transmissions. The analysis is very difficult to analyze with conventional instruments such as spectrum analyzers since they continuously analyze signals in the frequency domain.

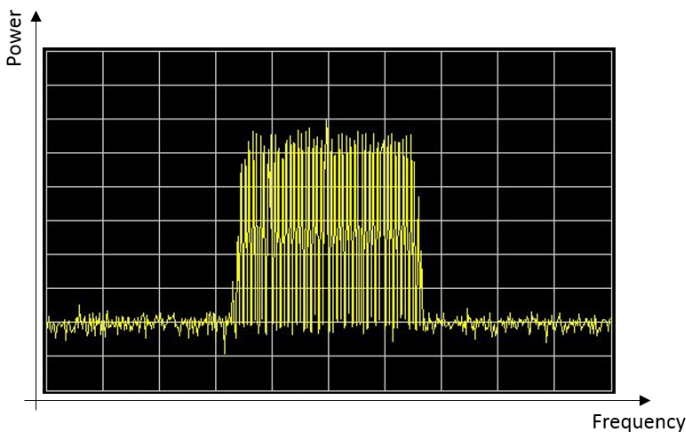


Figure 3. LTE-TDD spectrum analysis in the frequency domain

Solution

Clearly, mobile operators require a portable solution that accurately measures interference across both domains.

VIAVI Solutions™ CellAdvisor™ analyzers support frequency-base and time-base analysis, as well as dedicated LTE-TDD signal analysis, performing power measurements on the allocated timeslots or sub-frames for cell-site and mobile transmissions.

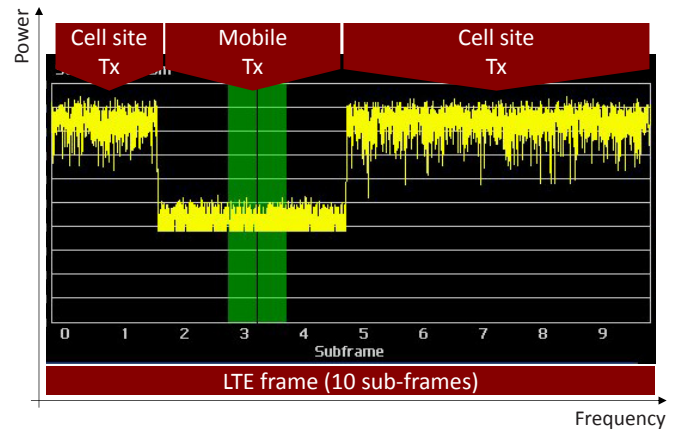


Figure 4. CellAdvisor LTE-TDD power vs. time analysis

Furthermore, CellAdvisor's LTE-TDD analysis can perform spectrum measurements by sub-frames, properly differentiating cell site and mobile transmissions. Figure 5 shows LTE sub-frame 0 allocated for cell-site transmission.

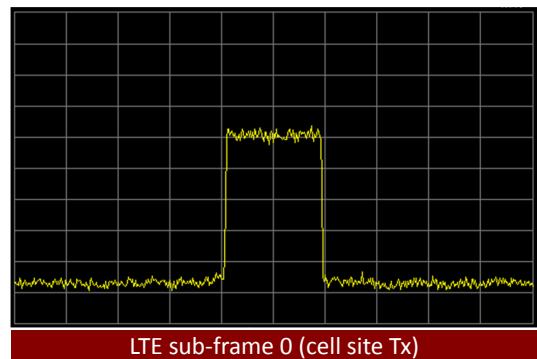


Figure 5. CellAdvisor spectrum analysis of LTE-TDD (cell site)

Figure 6 shows LTE sub-frame 3 allocated for mobile transmission. CellAdvisor clearly detects the presence.

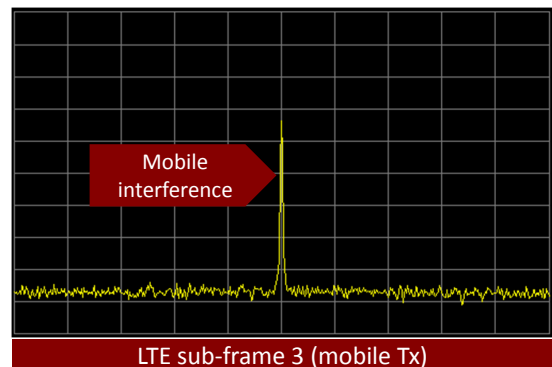


Figure 6. CellAdvisor spectrum analysis of LTE-TDD (mobile Tx)

Summary

LTE-TDD is not immune to the interference that can seriously degrade mobile transmissions. However, conventional instrumentation dedicated for frequency domain analysis cannot detect it adequately.

CellAdvisor analyzes LTE-TDD signals by measuring using both frequency and time domains, properly differentiating and analyzing cell-site and mobile transmissions to effectively detect interference. It is the most advanced and complete portable test solution for installing and maintaining cell sites. It supports all wireless technologies—GSM/GPRS/EDGE, CDMA/EV-DO, WCDMA/HSPDA, LTE-FDD/LTE-TDD—as well as advanced capabilities such as LTE-MBMS, LTE-Advanced, fiber inspection, cloud services, RFoCPRI™, and RFoBSAI.

