Cambium Networks™

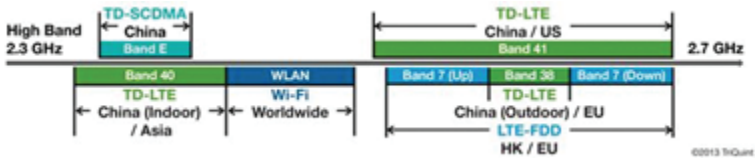
Living next door to a loud and noisy neighbor!

The humble workhorse, unlicensed 2.4 GHz band, has had LTE operating at 2.5 GHz for many years. But that band, often unused in the past, is now quickly becoming hot, as carriers around the world deploy small cell LTE (Long Term Evolution), often on real estate that is adjacent to Outdoor WLAN (Wi-Fi) equipment and this can result in poor performance of 2.4 GHz Wi-Fi Access Points (AP).

As consumers demand "always-on" internet, carriers, city governments, schools colleges, hotels, and resorts are looking for reliable outdoor internet service. While Wi-Fi remains to date the most cost effective way to deliver and fulfil this need, it is not the only solution available.

To meet the high data demand, carriers around the world are accelerating their 4G LTE[1] rollouts often locating small cell LTE radios on real estate that is adjacent or nearby to street furniture used to mount WLAN (Wi-Fi) equipment. Adding to this, to reduce site rollout costs, macro LTE base stations transmit at high power as well. Given that the effective radiated signal levels from mobile network base stations may be very high (1000's of Watts) compared signal levels used in Wi-Fi (typically below 0.1 Watts), all of this can result in interference on 2.4 GHz that adversely affects the operation of Wi-Fi equipment. The global nature of this is illustrated in the picture below – it's everywhere.

The accelerating worldwide adoption of LTE is governed by bands of operations that can operate in both FDD and TDD modes[2]. In particular, FDD band 7 and TDD LTE bands 38, 40 and 41 are located right next to the 2.4 GHz band as shown[3] in Figure 1 below



This interference is not just limited to public outdoor WLAN deployments but can affect private enterprise outdoor deployments as Macro LTE base station transmissions can overlap the outdoor coverage area of schools, colleges, or hotels. It can affect indoor transmissions also, but to a lesser extent due to the presence of walls that serve as natural damper of signals.

SO HOW PREVALENT IS TDD LTE? IT'S GLOBAL!

LTE TDD has been commercial since 2011. As of 2015, 62 LTE TDD (TD-LTE) systems have been commercially launched in 37 countries[4]. The initial bands include 2.3 GHz (Band 40) used in India and 2.6 GHz (Band 38) used in Europe, with variations (Band 41) in the U.S and in Japan. China has allocated LTE TDD in multiple global bands (Band 40). In the US, Sprint owns LTE TDD band 41.

As various studies have shown[5], TDD LTE is liable to cause interference to WLAN equipment operating in the nearby 2.4 GHz band. This problem is further compounded by the fact that most WLAN radios do not have any or have only very limited RF filtering preventing out-of-Wi-Fi-band signals entering Wi-Fi receiver RF parts[6] (Reference).

BAND	DUPLEX MODE	MHz
7	FDD	2600
38	TDD	2600
40	TDD	2300
41	TDD	2500

FIGURE 2: LTE BANDS ADJACENT TO 2.4 GHZ

SO WHAT CAN BE DONE?

There are only three choices for Outdoor WLAN equipment that are affected by LTE. The choices are:

a. Move the WLAN equipment or work with the carrier to move the LTE base station – not a task for the time constrained or faint of heart WLAN operator

b. Switch operations to 5 GHz

c. Ensure the WLAN equipment incorporates specialized LTE filtering.

Given the prevalence of cell phones, and laptops all operating in the 2.4 GHz band, and the nature of 2.4 GHz in providing broad coverage for hard to reach places, switching to 5 GHz may not be the answer. It can result in lost client connections and smaller Wi-Fi cell sizes due to the nature of 5 GHz rapid signal degradation. However, it is indeed possible for WLAN equipment to guard against such LTE interference.

Cambium's IP67-rated cnPilot™ E500 is among those access points that incorporate an LTE coexistence filter that protects the 2.4 GHz band receiver from spurious interference from adjacent band LTE transmissions. In incorporating an LTE filter, the cnPilot E500 Outdoor Access points are specifically designed with an eye on the future, while yet keeping the price of the access point affordable. Given the dynamic nature of changing RF characteristics often seen in outdoor deployment, having an LTE coexistence filtering in your radio ensures that your outdoor Wi-Fi deployments stands the best chance of delivering continued high performance, even as noise and sources of other interference change all around.

That's Peace of mind. Hello Neighbor. Hello LTE.

[1] *4G LTE – LTE is a 4G wireless communications standard developed by the 3rd Generation Partnership Project (3GPP) that's designed to provide up to 10x the speeds of 3G networks for mobile devices such as smartphones, tablets, netbooks, notebooks and wireless hotspots.*

[2] *TDD and FDD LTE: FDD refers to Frequency Division Duplex and involves separate frequency bands for uplink and downlink communication. TDD refers to Time domain duplex and involves a single band which is shared by both uplink and downlink transmissions, taking turns in time*

[3] *http://www.digitimes.com/supply_chain_window/story.asp?datepublish=2014/01/08&pages=PR&seq=205*

[4] *GSA_Evolution_to_LTE_report, 2015. http://gsacom.com/*

[5] *Ofcom, Technical coexistence issues for the 2.3 and 3.4 GHz award, ANNEXES 7-13, https://www.ofcom.org.uk/*

[6] *https://www.ofcom.org.uk/__data/assets/pdf_file/0028/56980/ofcom_and_sky_final_exec_summary.pdf*

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