

Monitoring Adjacent Channel Interference

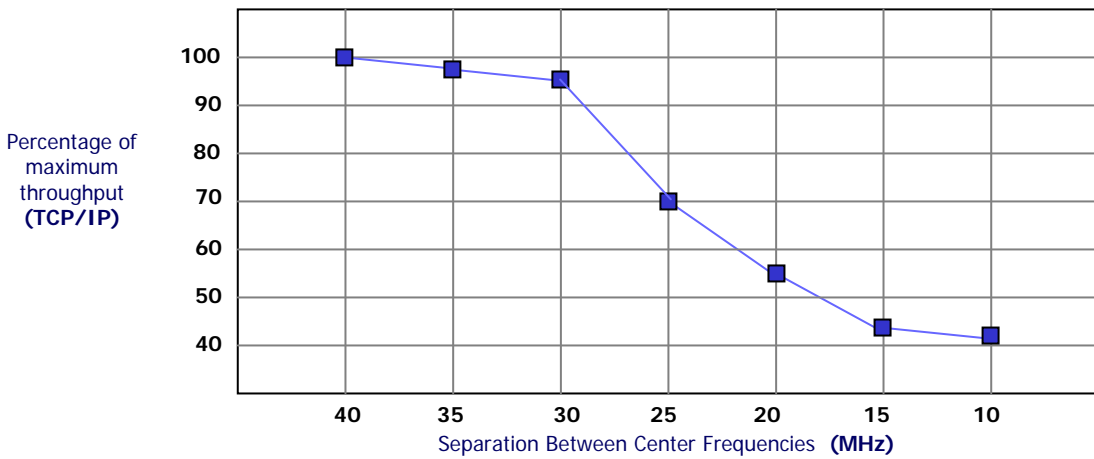
A core limitation of all wireless networks is RF channel interference. The worst case is co-channel interference - where all mesh backhaul radios are on the same channel. This is the case with dual radio systems, where one radio serves clients while the other (solitary) radio forms the mesh backhaul path.

Adjacent channel interference is significantly less damaging but also causes throughput losses. It occurs when two or more radios operate on different channels but the center frequencies are sufficiently close to cause interference.

Field tests with 802.11 compliant 5GHz radios indicate minimal adjacent channel interference with proper antenna placement and at least 40 MHz separation between the center frequencies of the 5GHz radios. Decreasing the channel separation between these center frequencies beyond a minimum of 40 MHz results in decreased throughput/performance. Throughput rapidly deteriorates below 30 MHz channel separation between uplink and downlink backhaul radios.

Dynamic channel management software residing in each MeshDynamics node monitors the RF environment and minimizes adjacent channel interference by ensuring sufficient channel separation between all up link and down link radios that “hear” each other.

MeshDynamics patented and patent pending technology in each node maintains the correct level of channel separation specific to a radio type, protocol and external RF conditions. This is key to ensuring reliable high performance in dynamic wireless mesh networks.



5G Spectrum Usage (40 MHz Separation)

The 5G spectrum is broken up into three sections shown below. With 20 MHz Channel Widths and 40 MHz separation between the channels, there are a total of $4+8+3=15$ channels available:

- . 5180-5320 = four 20 MHz non overlapping 5180, 5220, 5260, 5300
- . 5400-5700 = eight 20 MHz non overlapping 5400, 5440, 5480, 5520, 5560, 5600, 5640, 5680
- . 5745-5845 = three 20 MHz non overlapping 5745, 5785, 5825

Based on country based regulatory restrictions not all these channels may be available for unlicensed use. Nevertheless 5G remains the preferred choice for wireless backhaul radio uplink and downlinks with 2.4G serving the service radios (AP) for client access.

2.4GHz Spectrum Usage (20 MHz separation)

Three channels in the 2.4GHz ISM band are referred to as “non-overlapping”. These are channels 1, 6, and 11, and are the default 2.4GHz channels used by MeshDynamics. In the illustration below, it can be seen how the “tails” of the OFDM channel masks overlap, while the “plateaus” do not. Note that the separation between the center frequencies is less than 40 MHz. 2.4G is not a preferred backhaul spectrum due to its limited spectrum and adjacent channel interference resulting from the channel mask overlaps.

