AVIAT NETWORKS

USE OF CLASS 4 ANTENNAS

WHAT IS A CLASS 4 ANTENNA?

Until recently, most antenna manufacturers based their compliance standards on the European Telecommunications Standards Institute (ETSI) class 3 requirement (similar to FCC Category A). ETSI classifies antennas into four groups based on their radio pattern envelopes. This grouping categorizes class 1 as the least stringent and class 4 as the most stringent. The thinking goes that Class 3 antennas are for use in networks where there is a “very high interference potential.” Class 4 antennas are a cut above and designed for “extremely high interference potential.” This translates to a reduction of side lobes resulting in a cleaner, narrower radiation pattern as shown in Figure 1. Because interference issues increase over time as networks densify, antenna manufacturers have started to move their compliance requirements to ETSI class 4.

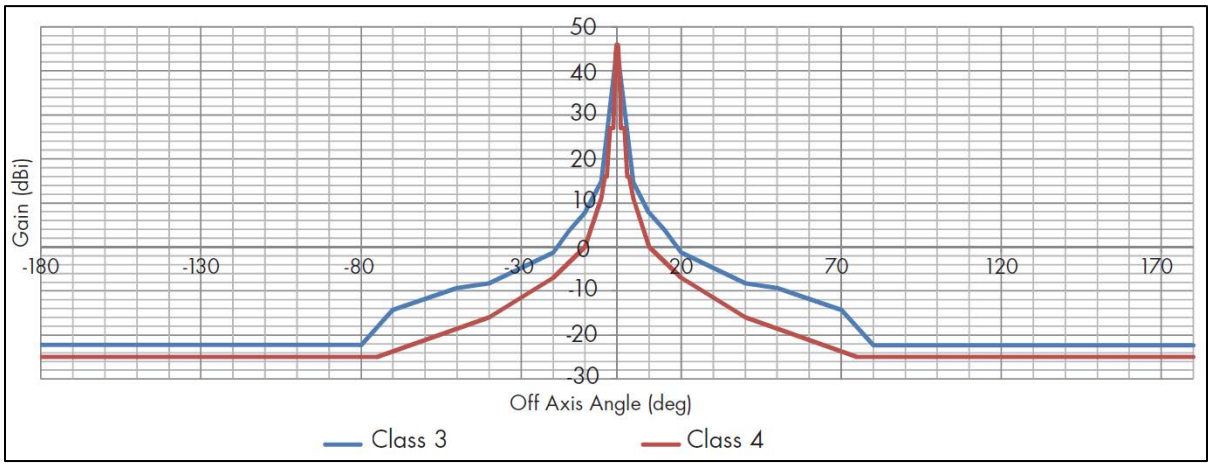

Figure 1.

BENEFITS

EASIER COORDINATION FOR DIFICCULT SITES

Class 4 antennas can make coordination easier on sites with interference issues. Figure 2 shows the interference analysis of a link deployed in Rio de Janeiro, Brazil by Aviat Networks. It compares class 3 and class 4 antenna interference analyses for the sites Sra. Pena and Mendanha. From the columns highlighted in red, threshold degradation is high with high levels of interference at the Mendanha site. In this link, the use of the class 3 antenna is not an option because interference levels at the Mendanha site are too high and are degrading the link to the point of making it unusable. If the class 3 antenna is replaced with a class 4 antenna the threshold degradation level will be reduced. Reduced interference now enables one channel (channel 24) making this link usable.

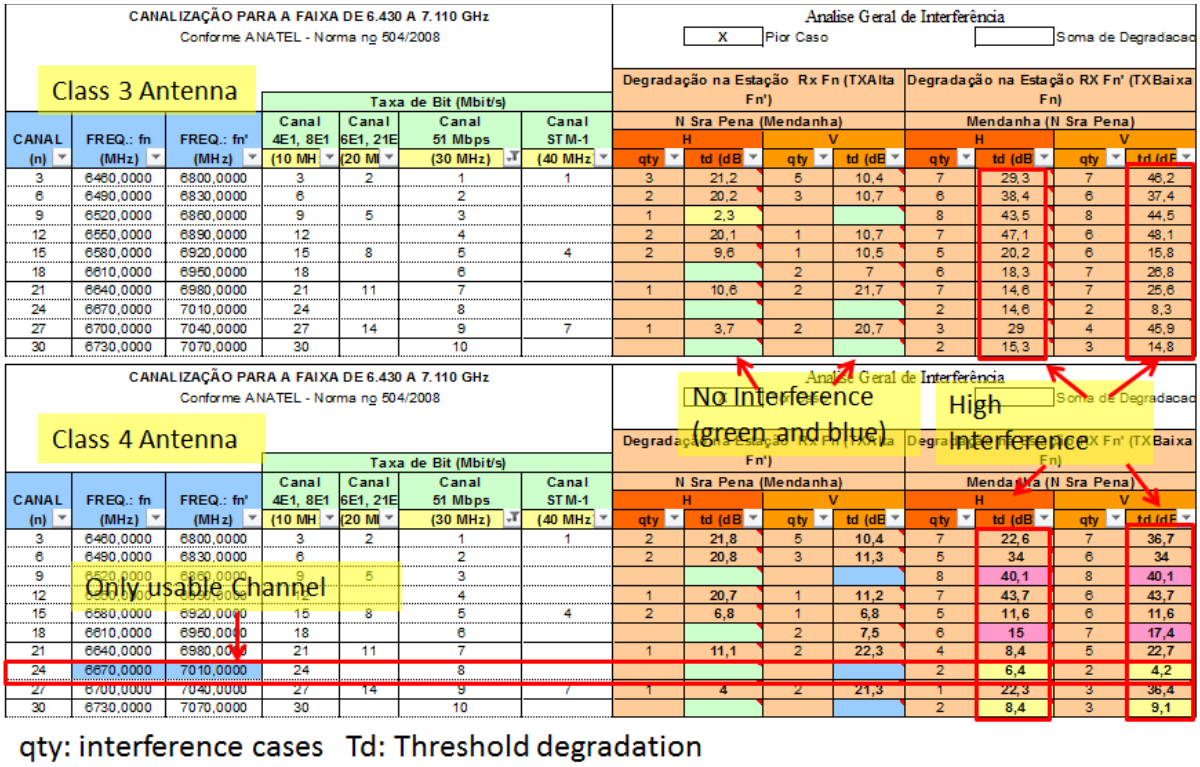

Figure 1. Interference analysis for link in Rio de Janeiro, Brazil

HIGHER CAPACITY

The easiest way to increase capacity is to increase channel size, but due to interference at congested sites this is difficult in many cases. Because links that use class 4 antennas are more immune to interference, this provides a better chance to coordinate larger channels that use class 3 antennas. If larger channels are not possible, using class 4 antennas will increase the signal-to-noise ratio allowing microwave radios to work at higher modulations and letting network operators obtain higher capacity than if they used standard class 3 antennas.

SMALLER ANTENNAS

Traditionally, one strategy used by operators to reduce interference is to deploy nominally larger-than-necessary antennas that benefit from improved signal-to-noise ratio, albeit at the cost of increased tower space and initial purchase price. Class 4 antennas allow use of smaller antennas without exposing the link to added interference. By using class 4 antennas it may be possible to use the next-smaller dish antenna compared to the existing antenna size on microwave backhaul links and still meet the availability target.

DRAWBACKS

The major disadvantage of using class 4 antennas is the additional cost. As passive mechanical devices antennas require high precision tooling and detailed manufacturing quality control to achieve superior performance, which drives up costs. This is the case for class 4 antennas. Although higher performance antennas have been available for some time in the lower frequency bands (below 11 GHz) it is only recently that antenna manufacturers launched class 4 products for the higher frequency bands (13,15,18 and 23 GHz). For example, Commscope launched the Sentinel antenna line that has 1 to 3 ft. products in the 13 to 23 GHz frequency bands. And RFS has manifested the desire to launch its own class 4 antenna line.

WHEN TO USE

Although CAPEX costs are higher for class 4 antennas their use is increasing as network operators are becoming more aware of the Total Cost of Ownership (TCO) of network assets. The deployment of class 4 antennas also helps to reduce congestion problems, which allows networks to achieve higher capacities, and under certain circumstances smaller dish sizes. They are also the right tool for customers who are not open to Adaptive Modulation and Coding (ACM) such as utilities. In this case, the use of class 4 antennas in congested environments allows links to operate at higher signal-to-noise ratios running at higher modulations. In the short term, the use of class 4 antennas can be seen as a valuable asset in the network engineer's tool box, especially for difficult-to-coordinate sites. In the medium to longer term, class 4 antennas could eventually become compulsory for congested environments because networks are becoming denser and sites with coordination issues more common.