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EXECUTIVE BRIEF

Easing the operational challenges of 85mhz deployments

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Changing an HFC network from a 42MHz split to an 85MHz split presents significant challenges in the home and local access network. These challenges result from the dramatic change in RF level experienced in the home and network as the frequency band shifts from downstream to upstream usage. However, new strategies are emerging to allow the shift to an 85MHz split without requiring a wholesale upgrade of in-home equipment.

Why is there an issue?

Ideally, the change of the HFC frequency split would not cause any issues. But, the tuners within set-top boxes, cable modems and cable-ready televisions are not perfect. The presence of significant energy in their originally designed reception band even outside of the nominal tuned channel can cause distortions due to automatic gain control (AGC) circuitry.

An AGC circuit exists to protect a device's internal tuner from too much energy in the incoming signal and to boost the signal when it is too low. Many AGC circuits integrate the power received over a wide bandwidth, not just the narrow channel currently desired, and adjust the level into the tuner accordingly. When the AGC circuit detects that the incoming signal power is too high, it will attenuate the signal to protect the tuner. Harmonic distortion or similar issues caused by a powerful upstream signal above 54MHz in the tuner may also contribute to the problem.

The upstream transmit signal from an 85MHz cable modem (CM) is potentially quite powerful. Therefore, the transmitted signal will generate reflections within each splitter that it crosses. That reflected energy travels back through the rest of the home network and can cause a device's AGC circuit to attenuate the entire down-stream signal and create video problems.

The problem of unexpected reflected energy in the downstream tuner's receive band is not limited to the home where a new 85MHz CM is deployed. When a signal is sent from one home into a

port on a tap, reflections are generated in the splitter circuitry within the tap. Therefore, another home that shares a tap's internal splitter can receive a high level of reflected energy. In testing, reflections with as little as 24dB of loss were seen.

Diagnosing 85MHz Related Issues in the Field

Problems caused by AGC overload due to upstream transmissions below 85MHz tend to be intermittent, showing up only when the new CM is transmitting. A report of occasional video break ups can have many possible causes, and 85MHz reflections add yet another.

Further complicating the diagnosis, subscribers are likely to be watching television at the same time that others in their home or neighborhood are using high-speed data services. If a reflected signal issue exists, it may be seen in the evening, but may disappear the following morning. A technician who arrives at the home may not see any video degradation and, unless trained to also look for 85MHz modem issues, may dismiss the problem as a temporary interruption in the plant.

Preventing 85MHz Related Issues

Several alternatives exist to remediate a home where a new 85MHz modem has been installed; the sensitive home equipment can be protected individually or addressed by remediating the home overall.

One approach to preventing in-home issues is to use a two-port cable modem for 85MHz deployments, where one port addresses the hybrid fiber coax (HFC) network and the other port addresses the home network. Using this device eliminates the possibility of interference in the home by directing all 85MHz upstream transmissions directly onto the HFC network.

Alternatively, if a traditional single port CM configuration is used, then filters that block signals between 42MHz and 85MHz should be added to each set-top box or other cable receiving device or alternatively to a splitter port leg to protect multiple devices. The additional filtering helps prevent reflections in the 42-85MHz band from reaching the other ports used for the home.

Advance Deployment of 85MHz Modems before Plant Upgrades

Some MSOs are considering deploying 85MHz modems ahead of planned 85MHz plant upgrades while continuing to use the 54-85MHz frequency band for

downstream services. Unfortunately, problems can be caused by an 85MHz modem even when it operates below 42MHz if it does not have a built-in switchable filter. Testing has shown that at least some DACs used for CM transmitters have a noise floor that pops up during transmissions. The levels seen were fairly low, but may cause distortion to analog video signals in the 54-85MHz band. To avoid this problem, service providers can deploy a device with a built-in switchable filter.

Conclusion

Consumer demand for upstream bandwidth is increasing, causing service providers to evaluate new methods of delivering it. The latest DOCSIS standards provide support for upstream operation above the current operating 5 to 42MHz or 5 to 65MHz bands. Successful expansion of the upstream band requires that actions be taken to prevent problems with legacy equipment already deployed in the field.

A two-port cable modem or gateway provides the most operationally friendly option, but other options can also provide acceptable performance. Improving the port-to-port loss in splitters in the home as well as within taps supporting homes with new 85MHz modems can prevent problems from showing up after the new modems are deployed.