# Active Cable Technology

## Expanding the Limits of HDMI Transmission

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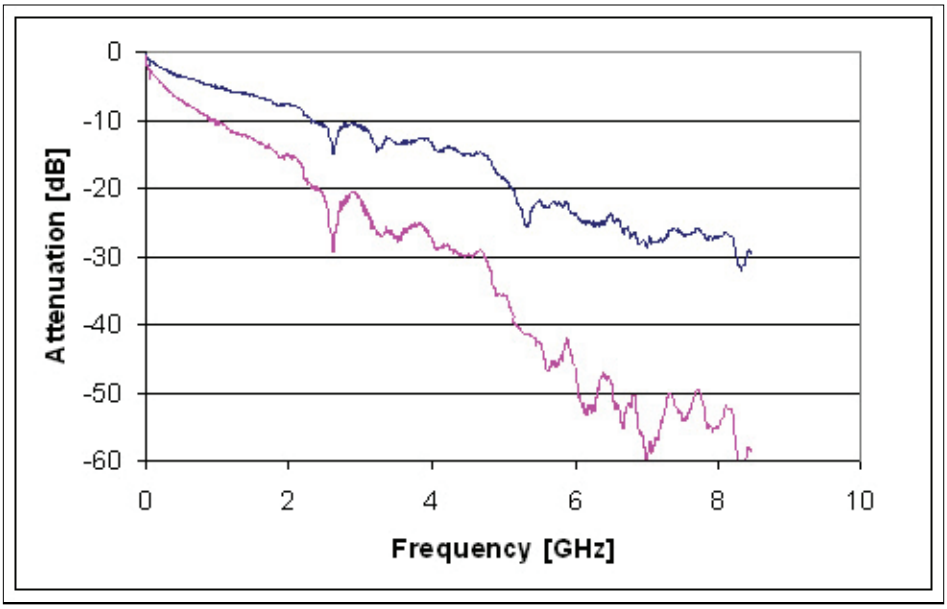



As more and more features are built into the HDMI standard we're forced to use cables that support greater bandwidth than ever before, which has led to design challenges with newer cables. As cable distance and bandwidth are increased we start to see changes to our signal.

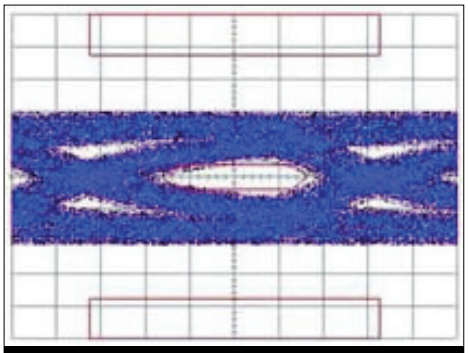
With copper cable, as distance increases bandwidth is reduced, and while the low frequencies will pass untouched, the higher frequencies will be affected. This happens when a lot of data is being transferred between digital devices at high rates. Depending on the quality of the cable being used, at 15 feet we start to see severe attenuation at the higher frequency range. This variance can be as much as 17db which would severely compromise our signal. Even on extremely high quality cables we can see between 8 and 9db attenuation at 15 feet. For a cleaner signal attenuation must be minimized.

To put this in perspective, imagine driving a candy apple red sports car through a long tunnel, and as we go deeper the bright color of our car starts to fade. By the time we exit the tunnel our red car is now pink. This is the reality of unamplified HDMI cables today. It has become increasingly difficult, outside of active amplification technology, to extend these signals reliably.

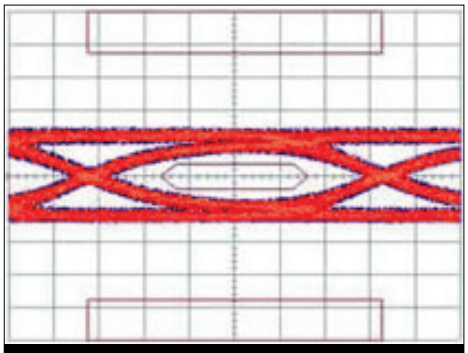
It's become more difficult to use HDMI cables for longer distance runs. For commercial, residential, or digital signage installations, distance is the number one challenge to overcome. Distance constrains design, products, and end user experience. Integrators face these challenges every day and a viable solution is in high demand.

A past solution was to increase the copper size used in the cable but this made the cable bulkier and heavier, and increased the manufacturing cost of the cable. There is also no guarantee that manufacturing multiple cables at the same length from the same spool of copper achieves equal results. Between twist rates and strand length differences, data in specific signals, like clocking or transition minimized differential signaling (TMDS), can get lost.

Another solution is to add equalization or an active booster to the same AWG wiring or smaller, and to boost the signal on the receive end to fix attenuation and cross-talk in the signal. There are quite a few reasons to use active rather than passive technology inside the cable. A passive method of boosting the signal



**POOR SIGNAL** – Without active amplification in the cable there's significant image loss



**GOOD SIGNAL** – A programmable chip in the HDMI cable fixes flaws and errors in the signal

has limitations: it doesn't regulate the amplification if there are performance or strand length differences in the cable.

Atlona's active cable technology is the solution for long cable runs. With a chip programmed at the factory, we can set different attributes to different channels to accommodate for signal attenuation. This resolves variations in signal that we see across multiple cables from the same batch or spool. Using a programmable chip on a cable-by-cable basis, Atlona has resolved variance in HDMI cabling.

Since active cables require 5mA to work properly across different lengths, speeds and performance, the source can be a challenge since the source itself needs to have a true 5V signal to activate the handshake process. To offset this we can take 5mA from the sink device (projector, display, or computer monitor) to power up the circuitry of the active cable technology. This lets the cable stay clean with no external power devices needed.

Active cable technology features thinner-gauge cables, which are lighter, easier, and more cost-effective to manufacture. They have a better bend radius and are more flexible, which keeps the installation environment neater and cleaner. When a category cable-based HDMI extender won't work, Atlona's active cable technology achieves a reliable and consistent signal.