

WHY FIBER OPTICS IS FEEDING ON INDUSTRY MOMENTUM

With increasing data rates, the need for ‘fully featured’ 4K, the impending push for 8K and more, fiber presents on increasingly attractive signal transmission option. *by Kjersti Martino*

YIKES! FIBER! We hear this often from integrators when they first look at fiber. In this new column, we’re going to try to demystify fiber solutions and provide useful information from leading experts in the field.

The AV industry has spent decades using copper cables. From coax to s-video to HDMI, fixed length copper cables have been cheap and easy. You just plug them in and they work. So why complicate things with fiber?

Technically, fiber optic technology has the following advantages over copper transmission:

- **Performance** (data rate over distance): As data rates increase, physics imposes a limit on the distance that copper cables can transmit high-speed signals without being overwhelmed by errors. Using a baseline distance of 100 feet, optical technologies can transmit more than 100 times the data that copper cabling can transmit.

As the market matures, we may find opportunities to do things that were simply unthinkable when we were limited to copper cables.

- **Aesthetics** (thin, light, unobtrusive cabling): Optical cables are typically 50% the width and a fraction of the weight of high-end copper cables. With some types of fiber, the width can be 10% of a copper cable and the jacket can be translucent which means the fiber is nearly invisible.
- **Immunity to Electromagnetic Interference** (EMI): Electrical signals over copper can be disrupted by other electronic systems or even other channels within the same cable. Light waves over fiber are immune to this type of interference.

SIGNAL DISTRIBUTION COMPARISON

Video Signal	Video Distribution Method	Bandwidth Limit	Distance Limit	Lossy Compression?
HD - 1080p	Copper	9 Gbps	~50 ft	No
	HDBaseT with Cat5	9 Gbps	330 ft	No
	Video over IP with Cat5	1 or 10 Gbps	330 ft	No
UHD 4K	Copper	18 Gbps	~20 ft	No
	HDBaseT with Cat6	10.2 Gbps	330 ft	Yes
	Video over IP with Cat6	1 or 10 Gbps	330 ft	Yes
	Hybrid Optical Cables	18 Gbps	~100 ft	No
	Optical Adapters	18 Gbps	> 3000 ft	No
8K Video	Copper	48 Gbps	~6 ft	No
	HDBaseT with Cat6	10.2 Gbps	330 ft	Yes
	Video over IP with Cat6	1 or 10 Gbps	330 ft	Yes
	Hybrid Optical Cables	48 Gbps	~100 ft	No
	Optical Adapters	48 Gbps	> 1300 ft	No

- **Security:** Information moved over fiber is very difficult to “snoop” vs. data moved over copper.

The primary driver for transitioning from copper to optical technology has been performance, but keep an eye on these other advantages. As the market matures, we may find opportunities to do things that were simply unthinkable when we were limited to copper cables.

Why Now?

Fiber optic technology has been around for 50+ years, so what’s changed? When 4K was first introduced it included only the higher resolution, not all the other features that make up the complete standard. This is similar to when we used to call 480p “High Definition” video. Just as HD eventually became 1080p, the term 4K is coming to mean “fully featured” 4K. Fully featured 4K required 18 Gbps and this has caused considerable angst in our industry because it forces hard changes upon us.

The Datacom industry went through a similar transition from copper to optical 20 years ago when data centers first began demanding 10 Gbps links over unsustainable distances. It took years to invent new technologies, drive standards, and build new supply chains and now those changes have just accelerated. Data centers

are now deploying 400 Gbps optical solutions with an eye towards 800 Gbps.

The AV industry is also at a point of no return. If 4K looks like a hard transition, imagine how difficult 8K video will be with its 48 Gbps of required bandwidth.

So what’s next?

In the months to come, *The Fiber Connection* will delve into the different types of fiber, cable technologies, connectors, electrical to optical (E-O) conversion systems, Video over IP over fiber, and case studies to help you understand fiber and provide your customers with the very best AV experience.

Welcome to the Optical Revolution!



KJERSTI MARTINO has a PhD in Electrical Engineering with a focus on electro-optical devices. She worked from 2008 to 2017 at Zephyr Photonics, a supplier of lasers, photodetectors and optical solutions to the aerospace industry. She is currently a Product Manager at Inneos.