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What's my bandwidth? When calling it "4K" isn't enough…

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Manufacturers often rate their products by the maximum supported resolution: 720p, 1080p, etc. This works well for older products that support lower resolutions, but 4K and its associated technologies present a bit of a challenge. *4K is not 4K*, even though manufacturers often generically label their products as "4K compliant" or "4K ready."

4K comes in a variety of flavors that radically affect the required electronics and cabling, and when you include features like HDR the signal gets pretty beefy fast. Simply calling something "4K" doesn't really do the product or application justice, and it can lead to issues as you start to put generically labeled 4K products together into a system.

To ensure compatibility and satisfactory performance, it's better to understand the *Data Rate* (also known as the *Bandwidth*) of your products and system. This rating is based on all of the components of the signal—color bit depth, frame rate, chroma sub-sampling, etc.—and understanding it will help make sure your electronics and cable will support the best performance possible.

The below chart serves as a basic overview to HDMI signal components, including the Data Rate (or required bandwidth) of the resulting signal.

Generic Name	HDMI Version	Actual Resolution	Frame Rate	Chroma Sub-Sampling	Color Bit Depth	HDR	Wide Color Gamut	Data Rate (Bandwidth)
1080p	1.4	1920x1080	24 fps	4:2:0	8 bit	No	No	2.23 Gbps
1080p	1.4	1920x1080	60 fps	4:2:0	8 bit	No	No	4.45 Gbps
1080p	1.4	1920x1080	60 fps	4:4:4	8 bit	No	No	4.45 Gbps
4K@30	1.4	3840x2160	24 fps	4:2:0	8 bit	No	No	8.91 Gbps
4K@30	1.4	3840x2160	24 fps	4:4:4	8 bit	No	No	8.91 Gbps
4K@30	1.4	4096x2160	24 fps	4:4:4	8 bit	No	No	8.91 Gbps
4K@60	1.4	3840x2160	60 fps	4:2:0	8 bit	No	No	8.91 Gbps
4K@60	2.0	3840x2160	60 fps	4:2:0	8 bit	No	No	8.91 Gbps
4K@30	2.0	3840x2160	24 fps	4:2:2	10 bit	Yes	Yes	8.91 Gbps
▲COPPER BASED SYSTEMS ▲					▼ FIBER BASED SYSTEMS ▼			
4K@30	2.0	3840x2160	24 fps	4:4:4	10 bit	Yes	Yes	11.14 Gbps
4K@60	2.0	3840x2160	60 fps	4:2:0	10 bit	Yes	Yes	11.14 Gbps
4K@30	2.0	3840x2160	24 fps	4:4:4	12 bit	Yes	Yes	13.37 Gbps
4K@60	2.0	3840x2160	60 fps	4:2:0	12 bit	Optional	Yes	13.37 Gbps
4K@60	2.0	3840x2160	60 fps	4:2:2	12 bit	Optional	Yes	17.82 Gbps
4K@60	2.0	3840x2160	60 fps	4:4:4	8 bit	Optional	Yes	17.82 Gbps

A significant takeaway on the chart is the copper versus fiber line. While not a hard rule, most copper technologies max out at 10 Gbps over longer distances and therefore will not support higher bandwidth signals. In these applications fiber-based solutions are not only recommended, but are required.