UNDERSTANDING FRL (Fixed Rate Link)

MURIDEO®

HDMI®
HIGH-DEFINITION MULTIMEDIA INTERFACE

Fixed Rate Link Data Chart

FRL Rate	Resolution	Frame Rate	Subsampling	Bit Depth	Bandwidth
FRL1	1080P	120Hz	4:4:4	8 Bit	9Gbps
	1080P	120Hz	4:2:2	8-12 Bit	9Gbps
	4K	30Hz	4:4:4	8 Bit	9Gbps
	4K	30Hz	4:2:2	8-12 Bit	9Gbps
	4K	60Hz	4:2:0	8 Bit	9Gbps
FRL2	1080P	120Hz	4:4:4	10-12 Bit	18Gbps
	4K	30Hz	4:4:4	10-12 Bit	18Gbps
	4K	60Hz	4:4:4	8-12 Bit	18Gbps
	4K	60Hz	4:2:2	8-12 Bit	18Gbps
	4K	60Hz	4:2:0	10-12 Bit	18Gbps
	4K	120Hz	4:2:0	8 Bit	18Gbps
	5K	30Hz	4:4:4	8-12 Bit	18Gbps
	5K	30Hz	4:2:2	8-12 Bit	18Gbps
	5K	60Hz	4:2:0	8-12 Bit	18Gbps
	8K	30Hz	4:2:0	8 Bit	18Gbps
FRL3	4K	120Hz	4:2:0	10-12 Bit	24Gbps
	4K	120Hz	4:2:0	10-12 Bit	24Gbps*
	5K	60Hz	4:4:4	8 Bit	24Gbps
	5K	60Hz	4:2:2	8-12 Bit	24Gbps
	5K	120Hz	4:2:0	8 Bit	24Gbps
	8K	30Hz	4:2:0	10-12 Bit	24Gbps
	10K	30Hz	4:2:0	8 Bit	24Gbps
FRL4	4K	120Hz	4:2:2	8-12 Bit	32Gbps
	4K	120Hz	4:4:4	8 Bit	32Gbps
	5K	60Hz	4:4:4	10-12 Bit	32Gbps
	5K	120Hz	4:2:0	10-12 Bit	32Gbps
	8K	30Hz	4:4:4	8 Bit	32Gbps
	8K	30Hz	4:2:2	8-12 Bit	32Gbps
	8K	60Hz	4:2:0	8 Bit	32Gbps
	10K	30Hz	4:2:0	10-12 Bit	32Gbps
FRL5	4K	120Hz	4:4:4	10 Bit	40Gbps
	5K	120Hz	4:4:4	8 Bit	40Gbps
	5K	120Hz	4:2:2	8-12 Bit	40Gbps
	8K	30Hz	4:4:4	10 Bit	40Gbps
	8K	60Hz	4:2:0	10 Bit	40Gbps*
	10K	30Hz	4:4:4	8 Bit	40Gbps
	10K	30Hz	4:2:2	8-12 Bit	40Gbps
	10K	60Hz	4:2:0	8 Bit	40Gbps
FRL6	4K	120Hz	4:4:4	12 Bit	48Gbps
	8K	30Hz	4:4:4	12 Bit	48Gbps
	8K	60Hz	4:2:0	12 Bit	48Gbps

*Rows must be supported to be considered HDMI 2.1

HDMI 2.1 features some new tricks that allow for the better transport of audio-video signals. One of those tricks is FRL or Fixed Rate Link.

FRL differs from the traditional TMDS signaling of previous HDMI versions (HDMI 2.0 and below). It defines signals by the number of lanes and their combined lane rates and has six possible FRL rates consisting of three to four lanes with a lane rate of 3-12Gbps (see table below). Notably, FRL will always attempt to maximize throughput based on the sink capabilities and, ultimately, the link (cable) maximum capacity using link training and each lane maintains a fixed data rate rather than the previous HDMI versions varying data rate TMDS Channels. Also, FRL embeds the TMDS Clock Channel directly into the HDMI Signal, allowing for features such as Variable Refresh Rate, Dynamic HDR, and more.

However, HDMI 2.1 is not entirely different because FRL is backward compatible with lower data rates and will fall back to traditional TMDS if FRL is not supported. When in fall back, TMDS is capable of all signals up to FRL2. Although a device may support a particular FRL rate, it might not support all possible video signals.

FRL Rate	Number of Lanes	Lane Rate	Total Bandwidth
FRL1	3	3Gbps	9Gbps
FRL2	3	6Gbps	18Gbps
FRL3	4	6Gbps	24Gbps
FRL4	4	8Gbps	32Gbps
FRL5	4	10Gbps	40Gbps
FRL6	4	12Gbps	48Gbps
FRL Rate/Total Bandwidth equals the Number of Lanes times Lane Rate			

Use Murideo 8K SIX-G and SIX-A to be sure you're using HDMI 2.1 compatible devices.