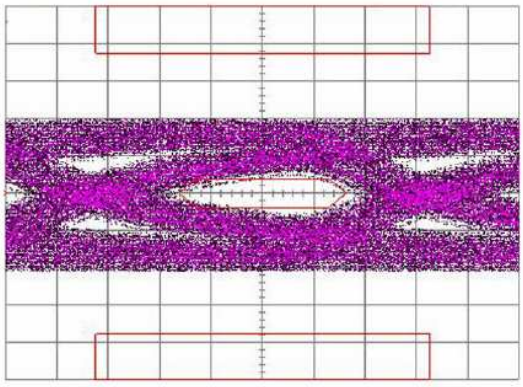
GOMAX FORUM

How HDMI sources affect the CAT5 transmission range

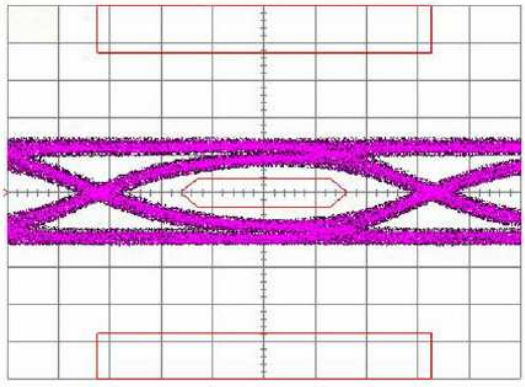
When people are talking about HDMI applications such as extenders, splitters, switchers or matrices, usually the number of ports, transmission range, and HDMI versions etc. are evaluated and even tested over and over again! There is actually nothing wrong with this attitude or manner. The points we would like to express in this article is to open a discussion regarding how HDMI sources will affect the capability of reception of the receiver! This essay is also to demonstrate not only the transmission media or mechanism but also the source itself plays an important role in HDMI signal extension, duplication, and switching!

The first concept we need to briefly introduce is regarding eye patterns. What are the eye patterns? What kind of information can we get from measuring eye patterns? As digital signals get its leading position over traditional analog ones more and more clearly and the bandwidth demands increase crazily, how to send high quality and high speed digital signals from site A to site B is no longer a simple task, especially no compression techniques involved! The most popular technique is regarding differential signaling. Differential signaling brings a lot of advantages over many others, such as high noise immunity, lower energy emission, and fewer wires etc. However, when we condense 24 bits or even 48 bits into one pair of lines based on differential signaling technique, the very coming issue is the high bandwidth requirement over wires. In telecommunication, an eye pattern is an oscilloscope display in which a pseudorandom binary sequence signal from a receiver is repetitively sampled and applied to the vertical input, while the data rate is used to trigger the horizontal sweep. It is so called because, when the signal is in NRZ code, the pattern looks like a series of eyes between a pair of rails. In other words, eye pattern is what the digital signal looks like on an oscilloscope. The traces of many 1s and 0s overlap together on the oscilloscope to form a pattern that resembles an eye shape.

Below are examples.



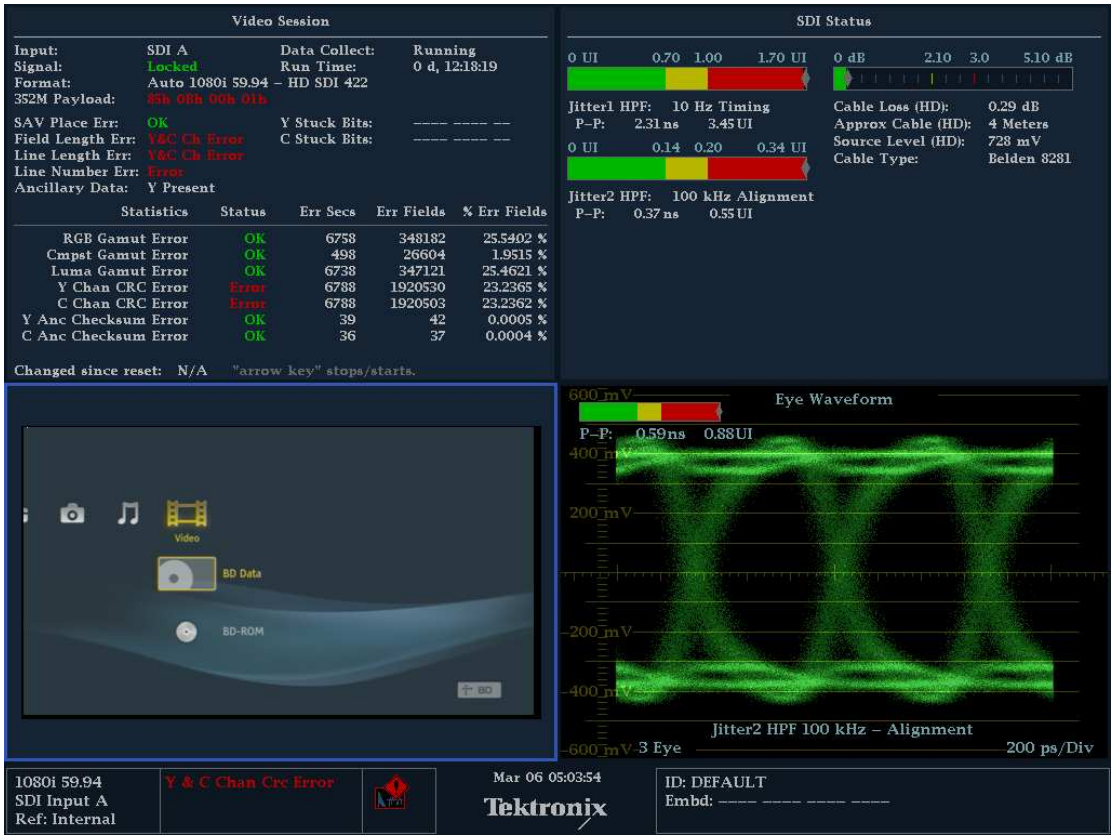
Poor Signal



Good Signal

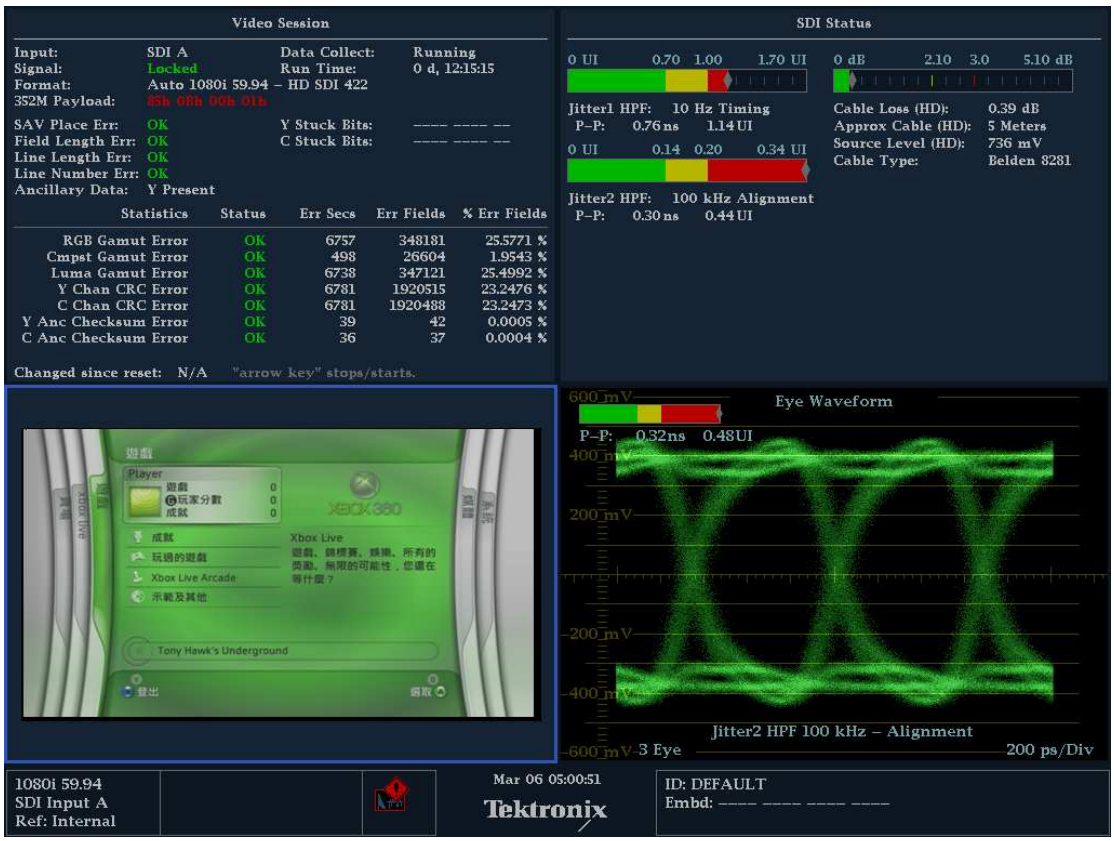
Why do we bring the eye pattern issue here? Fundamentally, the quality of eye patterns in any HDMI transmission, which inherits the characteristics of differential signaling naturally, indicates how well or successfully this communication will be. Let us look at 3 examples! In the following pictures, we demonstrate how different HDMI sources thru the same HDMI cable and receiver behave while transmission is taking place! From the receiver's point of view, the better the eye pattern shape, the lower the error rate! For the listed examples, PS3 outperforms the other two sources! It results from more stable clock, smaller power noise, and more considerate circuit design on the source side!

Sony Blu-ray player: BDP-BX1



Sony PS3

XBOX360



There is a key measurable factor to define the quality of transmitted differential signal, which is so called jitter. **Jitter** is an unwanted variation of one or more characteristics of a periodic signal in electronics and telecommunications. Jitter may be seen in characteristics such as the interval between successive pulses, or the amplitude, frequency, or phase of successive cycles. Jitter is a significant factor in the design of almost all communications links (e.g. USB, PCI-e, SDI, DVI, HDMI, PC-48). In clock recovery applications it is also called **timing jitter**. The bigger the jitter, the inferior the communication channel quality will be.

Therefore, unless HDMI applications offer Clock and Data Recovery (CDR) capability to the received signals, the jitter residing the input HDMI signal may cause the shorter transmission distance or high bit error rate even although the viewer or listener may not perceive those defects! Even worse, if the HDMI splitter, extender or switcher in the HDMI transmission path is not well designed, more jitters resulting from low frequency power noise, mismatched impedance or poor grounding of the HDMI equipment will lead to a complete shutdown! This also explains some combinations of sources and receivers can work under 1080p deep color cases over 15 meter long HDMI cables, but some simply don’t with the same cable and TV set!

In a summary, we use 3 examples to demonstrate how the HDMI source plays its role in the system, and consider this as a reminder! To always guarantee the best digital video and audio experiences you will have, pick up your HDMI source more carefully at the first place!