



# CABLES FOR 4K

Long HDMI cables struggling with 4K resolution, while the short handles all without problems. We test, compare and while at it also describes the topic HDMI cables.

Which HDMI cable should I purchase? The answer is the one that works. Pffuuuit. The problem is before actually testing no one, not you or I know exactly which one. And, there is a tremendous difference between a 1080P signal and the requirements for 4K, full resolution, color depth, frames per second and high dynamic range (HDR).

Today's cables have become far better and what used to be a hard function for long cables and 1080P signal in 2010, is now a walk in the park. The catch is that the requirements continuously increases.

It is important to understand that the cable is but a link between what we define as the source, e.g. the Blu-ray player with reader and circuitry to create signal, and the sink, usually a monitor or a projector of some sort to display the media to the viewer. It may also be a HDMI switch board, e.g. incorporated in your home cinema receiver. There are in other words complex signal paths where possible interference might emerge.

## FUNTIONALITY IS CASE DEPENDENT

I argue that a HDMI cable function is dependent on the situation if video and audio will work or not. The source should send a signal of a certain minimum quality and the sink must be of a certain standard to be able to receive it. The cable transmit the signal with lowest

possible degradation, while also handling the specific environmental influence where it is located.

The longer the cable, the larger the risk is to pick up noise and interference. Also, the higher the signal bandwidth is (Gbps), the more sensitive the transmission is. In addition, the more unfavorable the cable routing is, e.g. laying among all other cables in a snakepit, the further the signal will degrade.

Cables and connectors are also subject to wear and tear. To bend a cable in a too tight radius, will affect the cable performance. Also the often seen way to hide a too long cable, wind it up sometimes around steel objects, increases the risk of malfunction as discovered in the test (A very good way to make an inductive coil = high bandwidth/frequency filter). The HDMI consortium have found that the 4K signal is more sensitive to RFI, such as WiFi, which is already now planned to be included in future certificates and classifications of HDMI cables. E.g. a Google Cast dongle just beside a HDMI connection, or a WiFi router on top of your home cinema receiver might ruin the 4K dreams, while a 1080P signal is unaffected in exactly the same situation.

## TEST PROCEDURE

Even though the situation make up for the success or failure, the well-designed cable must

meet some basic properties. When the source and sink is known to be well within the specification, the cable must at least succeed according to its specification. This is possible to test. How well does the cable manage to be wound up to a bobbin? Poorly? Does it perform better when straightened out and tested again? The test is performed with equipment from Murideo, the Six-G and Six-A are the names of the generator and analyzer respectively. The test is simple; the generator sends a signal with a certain resolution and frequency through the cable to the analyzer which determines one out of three possible results:

NO SIGNAL – Just as it sounds. The analyzer cannot detect a readable signal.

ERROR – The units communicates and establishes a stable link, but there are transitional faults in the signal. There are discrepancies between the comparable check-sums suggesting bit-incorrect transfer.

PASS – Signal transfer bit-correct, everything works.

The test equipment is not more complex or detailed than above. Either it works, it does not work or there are transitional problems. The testers are not aimed for labs, to determine why things does not work, but rather on the field as an aid to establish if there are sufficient conditions to make transmissions work.

The testers also analyze some other important HDMI related issues; none of the cables displayed any problems, but it is worth mentioning:

5 Volt – That the cable leads the HDMI specific

5V to the sink.

DDC – Display Data Channel is used for handshake protocol where the source and sink exchange metadata presenting themselves for each other. E.g. a display may send info about native resolution and update frequency, a home cinema receiver may tell the source which audio formats it is capable of decoding, if there are 3D compatible devices, among many other properties.

Also the HDCP encryption utilize this channel and it is completely separated from the leads transmitting video and audio. If not in perfect working condition though, neither the source nor the sink get the necessary information about the other.

HPD – Hot plug detect is a constant signal to detect whether there really is any device in the other end. Is the cable very long, of a substandard design or have been damaged, this function may not work resulting in that neither of the devices are even aware of each other's existence.

Personally I have only encountered any of these problems when the cable has been damaged and there is no other option than to replace it.

#### THIS IS HOW HDMI WORKS

HDMI is an entirely digital way of communication and uses a technology called TMDS (Transition Minimized Differential Signaling). The TMDS signal sends in a logic link (single link) and is made up of video, audio and some metadata. The encoding follows a technique called 8b/10b and is in many cases encrypted according to HDCP to protect the producer copyright. Further details is not needed here, Wikipedia cover in-depth HDMI technology for those interested. We do however intend to highlight certain issues, misunderstandings and dodger's tricks common on the HDMI market. Basically: the cable should transfer intended signal between source and sink, keeping signal integrity good enough to receive and decode just as good as transmitted. That is all a cable is capable of. The cable cannot improve video or audio. The cable cannot add greyscales, warmer



**Premium High-Speed** is the latest classification that also incorporates a hard-to-counterfeit label. The reason is that the consumer could not verify, i.e. not be sure if the cable fulfilled alleged speed class or not. The label's holographic QR code allows to track manufacturing and specification. So far there are only short cables that carry this label/certification.

color tones or details. The bass sound cannot become more solid or soul more intimate because of the cable. Either the signal reaches the receiver circuitry intact or it has become degraded or worse, it is not readable at all. Any alleged signal improvements by the cable is just nonsense. Naturally in order to make you pay more than you need.

Did you ever experience that a new HDMI cable improved video and audio? Well, except for the sheer joy of a new part and the consequential imagination, you may experience true improvements. The old cable was perhaps damaged or of a sub-standard design creating interference and the new cable was far better in preserving the original signal integrity.

#### WHAT DOES HDMI CABEL CONTROL AND NOT

The following commonly available functions does not have anything to do with the cable; 3D image  
HDCP encryption  
HDR (High dynamic range)  
HD Sound  
Deep Color  
ARC  
HDMI Versions

All these details generate between the source and sink circuitry, that is your e.g. Blu-ray and TV. The cable that in the most basic versions, consist of copper leads and some sort of plastic insulation cannot by itself decide to turn the above on or off. If you experience anything like that, the fault is somewhere else but not in the cable. Note that cable brand commercials/datasheets often include statements like "3D ready". The reason is that customers often asks if the cable supports 3D video, but now we can leave it as a non-cable issue.

Certainly there are stories about ARC not working. They derives from older cables that was not correctly designed and in fact skipped the specific channels in the HDMI specification that was designated "for future purposes" in order to save a penny.

ARC have a tendency to be troublesome anyway, but with a modern cable it should not be an issue.

The only function that put demands on how the cables are connected are Ethernet. Ironically so! Because no product use Ethernet over HDMI!

#### CABLE CONTROL IS DECISIVE

Everything is about the signal coming through bit-correct. The higher the bandwidth, the larger the risk for corrupt signal integrity. Therefore one could argue for that the cable quality in fact matters. There are better and there are not so good cables. The longer the cable and the higher the bandwidth, the higher the demands are on the cable. And, the cable quality



Murideo test equipment give very specific classification information for each cable, allowing us to determine if a cable will meet required standard. It will show if the cable is able to transmit desired standard and if 18Gbps is needed or if the lower speed class is sufficient for desired media transmission.





does not necessarily correspond to the price. Do you hear anyone state that "all HDMI cables are equally good, because the signal is digital", that is also rubbish. If that would be the case you could have used "steel wires" between source and sink. A good HDMI cable works in all of the appliances it is used in. A not so good can work in some cases and will not work in all. The reason is simply, it cannot keep signal integrity for the chosen length, bandwidth, routing and adjacent equipment/conditions, leaving signal so corrupt it cannot be decoded. Today it is rarely problems with 1080P signals. Even with an eBay cable. But increase length and/or bandwidth, as we can see in our 4K test at longer lengths, the cheap alternatives will most probably disqualify.

#### HDMI CABLES DOES NOT COME IN HDMI VERSIONS

Off course the industry know all this and have been trying to keep the confusion under control. There is nothing called HDMI 2.0 cables. Furthermore it is a violation against the HDMI license regulations. Instead there are classifications similar to data network cables, telling how fast data transfer the cable supports. There are currently three classes:

**STANDARD** – supports up to 2.2 Gbps, i.e. 1080i and 720P signals. A today already outdated cable for e.g. 1080P, i.e. Full HD support.

**HIGH-SPEED** – supports up to 18 Gbps and consequently today's 4K resolution in 60 fps. Sometimes referred to as 10.2 Gbps, which is the former speed limit for this class. Not translatable speeds!

**PREMIUM HIGH-SPEED** – Same as above, but cable origin and manufacturing is traceable using a QR-code label. The reason is that the High-Speed marking was easy to falsify and consumers could not be 100% sure of marking genuineness.

#### HOW MANY GIGABITS PER SECOND IS REQUIRED?

The answer on above question vary a lot, since the consumer/user is quite free to adapt/modify the output signals frequency and color bit

depth. Below is the most common shown:

- 18Gbps supports 2160P (4K) @ 60 fps and color space RGB/YCbCr 4:4:4 with color depth 8 bit (per channel). This will normally give the best picture from a computer when using the TV set as display/monitor. Future video sources will require this speed limit.

- 13.3 Gbps is sufficient for 2160P (4K) with today's refreshing rate of 24/25/30 fps, colorspace RGB/YCbCr 4:4:4 including color depth up to 12 bit (per channel). Examples of use is HDR and Ultra HD Blu-ray where today's refresh rate does not exceed 30 fps. This class of cable bandwidth is sufficient also for 4K @ 50/60 fps with somewhat reduced color space, YCbCr 4:2:0, bit still up to color depths at 12 bit. Appliances are some computer games in 3K, HDR and e.g. Netflix.

- 9 Gbps is also sufficient for some 4K settings such as; 2160P @ 30 fps, RGB/YCbCr 4:4:4 and 8 bit color depth; 2160P @ 24 fps, 24 bit color depth and finally; 2160P @ 50/60 fps reduced color space to YCbCr 4:2:0 and maximally 8 bit color depth. Still it is not impossible for Ultra HD Blu-ray, but all properties affecting the result must be optimal, since bandwidth class is on the brink.

- 6.7 Gbps is the bandwidth covering all 1080P (FullHD) variants including 3D from FullHD Blu-ray, refresh rates up to 60 fps and 12 bit color depth. It is more than sufficient for 1080P @ 24 fps (normal FullHD movie) and all forms of 1080i and 720P (so called HD Ready).

The specific data refers to the TMDS-speed test reported from the Murideo analyzer. Sound formats such as DTS Master Audio does not add more than 0.03 Gbps, why they normally do not have any impact.

#### MAYBE 13.3 GIGABITS PER SECOND IS ENOUGH?

4K media @ 60 fps, full color space and bit depth is challenging. In the test, Supra long

cables are the only how manages this signal, while all short lengths made it, even though we had to repeat the test for some cables before passing. This might do the trick if there is some hassle, simply disconnect and reconnect cable and try again.

The 13.3 Gbps speed qualifying most cables in the test is sufficient for most users. The average cable consumer might think they run full speed 4K with all settings at max (18 Gbps), but in practice most home cinema appliances do not run faster than 13.3 from HD-Blu-ray, 4K, HDR, @24 fps. Most 60 fps, 12 bit color depth and YCbCr 4:2:0 runs too. The future requirements will increase and already today's advanced PC user is recommended to go for 18 Gbps for gaming at maximal settings and refresh rates.

#### CONCLUSION

Swedish Jenving and their ice blue Supra Cables are the only longer cables that qualifies to the test requirements in all categories.

All their cable lengths manages 18Gbps! The other brands vary and not even the active cables including electronic amplifiers to uphold signal strength succeed. But, as mentioned, 13.3 Gbps is sufficient for today's home cinema but without advanced PC usage. All shorter lengths cover 18 Gbps speed which is also our editorials office experience.

Whenever a short lengths does not support 18Gbps it usually because a worn and damaged cable. If you just need a short length cable, do not waste your money when available cable stretches from just Euro 10:- up to and beyond 100:-.

Well does this mean that all cables in this test always going to work? No ... It still up to the system appliance. As an example, a 10 meter Supra cable could not deliver a stable 4K @ 60 fps signal between an Oppo UDP-203 and a Sony KD-55A1-TV, because I was too stupid and lazy to route the cable from noise sources and straighten it instead of keeping it rolled as a coil. It is not so easy to always do as I preach, maybe?





## JENVING

Swedish Jenving is a renowned manufacturer and the stiffer, ice blue Supra HD5 cable is common (in Sweden). Myself I've ran in to this cable in numerous installations and have already had many opportunities to test it. In the picture above, the 15 meter cable display full speed even though Jenving themselves does not vouch maximum speed for longer than 10 meters. Further Jenving offers a way to remove the connector housing in order to install in regular conduits.

**1 – 15 m: 18 Gbps**

## NONAME-KABLAR

Dessa kablar är av typiskt noname-snitt (noname är inte en japansk tillverkare utan engelska för "inget namn") och alltså inte märkta av någon. Testkablarna kommer från en nordisk distributör och dyker upp under många namn och olika priser. 20-meterskabeln kostar kring 500-800 kronor beroende på butik och det finns många som säljer snarlika, anonyma kablar. De långa kablarna fungerar sämre när de är ihoprullade.

**20 m: 9 Gbps**  
**10 m: 13,3 Gbps**  
**2 m: 18 Gbps**



## DELTACO

Generalagenten Deltaco skickar in två korta kablar, en premium High Speed och en slimmad High Speed. Premium-kabeln (HDMI-1020-K, ca 100 kr) är robust och fungerade som väntat. Den slimmade kabeln (HDMI-1042-K, ca 140 kr) testade vi att böja ordentligt vid fästet och det var heller inga bekymmer. Deltaco skickade också in en aktiv och riktningkänslig kabel, Prime (ca 650 kronor) Den lyckades nästan, dock med Error-meddelande vid 18 Gbps.

**10 m: 13,3 Gbps**  
**2 m: 18 Gbps**

## BLACK CONNECT

Stapelvaran hos Hembiotbutiken är kabeln Black Connect. En 1-meters High Speed-klassad kabel (159 kronor) gör precis vad den ska. Spännande nog skickar de med en 10 meterskabel (1 000 kr) som är Standard-klassad. Nu blev vi nyfikna för ingen vid friskt sinne köper en sådan kabel år 2017. Det roliga är att denna sämst specade kabeln i testet faktiskt fungerar lika bra (eller dåligt) som merparten andra långa kablarna. På sätt och vis är därför den här kabeln en av de få långa kablarna som håller under den lovar. Minst 2,2 Gbps men inte 18 Gbps.

**10 m: 13,3 Gbps**  
**1 m: 18 Gbps**



## OHLBACH

Agenten MACAudio tar in tyska Oehlbachs kablar. Stora kontakter där den 1,2 meter korta kabeln har en grov strumpa (XXL Carb Connect, ca 1 400 kronor) och är flexibel i själva kabeln men styv i kontakten. De skickar också med en 10 meter härligt vit kabel med namnet Shape Magic 1000 (ca 2 000 kronor; finns även som svart) HDMI-kontakterna på denna är något vinklade.

**10 m: 13,3 Gbps**  
**1,2 m: 18 Gbps**

## LJUDTEMA ATLAS

Från agenten Ljudtema kom eleganta kabeln Atlas. En mjukare kabel, Element på 2 meter (ca 500 kr) som kan böjas ordentligt. Också här passerade 18 Gbps utan problem trots belastning på kabeln. De har även en 12-meters aktiv kabel, Equator (ca 2 600 kr) som då är riktad. Den nådde inte upp till 18 Gbps.

**12 m: 13,3 Gbps**  
**2 m: 18 Gbps**