

## MEICORD OPAL AUDIOPHILE ETHERNET (PATCH) CABLES

**Unshielded and uncrossed.** The Achilles heel of LAN cables is the plug. A new form of RJ-45 connector is supposed to solve this weakness. Does it really also improve the sound of network cables?

The response to our report in December, 2008 about differences in sound quality between network cables was dramatic: “Idiocy” was the response from the IT branch whereas audiophiles who have experience with digital streaming responded “Absolutely correct”. Our readers included two engineers who are professionals in network technology and decided to find a decisive answer through exact measurements. We sent them the test cables from our comparison and they connected them to a professional measuring device from Fluke in order to determine two critical parameters: crosstalk between the pairs of twisted-pair cables and RL (return loss). Crosstalk should be minimal and RL should be maximal in good cables in order to prevent interactions between the twisted pairs and reflection at the end of the cables.

Box: RJ45 plug: These were originally invented for telephoning. A rounded form of the eight contact strips would be preferable to the quadratic form for high frequencies.

**Monster has the best measurements.** LAN cables are assigned to categories dependent on whether they surpass certain critical levels of crosstalk and RL as well as other parameters. Cat.5 cables need to satisfy these criteria at 100 MHz whereas more stringent criteria at 250 MHz are demanded of Cat.6 cables. However, the measurements by the two engineers yielded unexpected results: Not one of the cables fulfilled the requirements for Cat.6 although most of them were designated as Cat.6. Furthermore, only one cable even satisfied the criteria for Cat.5, and that was the best cable in our audio comparisons, the Advanced High Speed Cat.6 cable marketed by Monster. The crosstalk values for this cable were dramatically better than all other cables. Do crosstalk and RL values of network cables affect the sound quality of digitally streamed audio files?

A more detailed analysis of the results, particularly from the viewpoint of audio quality, suggests that these dramatic measurements might not have an equally dramatic effect on sound quality. After all, the topic is not Gigabit Ethernet, but rather only Fast Ethernet, with bitrates up to 100 Mbits/s, which is all that is required for audio purposes. Fast Ethernet only uses two of the four twisted pairs within an Ethernet cable. And the measurements for those two pairs were well within the requirements for Cat.5 cables, except for the Hama cable (see Table).

**None fulfils Cat.6** What is causing the different measurements for the individual cables. We presume that the cables used by Hama should support the critical requirements. However, that situation might change once they are connected to the plugs. The pairs of twisted pairs are in very close proximity within the plugs, and can be pressed together too

strongly by the plug collar. The problem becomes particularly dramatic when cables cross within the plug because that impairs their characteristic impedance, which is critically important for sounds in the VHF band. Furthermore, mistakes are often made during the automatic attachments of plugs to cables, which can only be performed optimally with specialized machines.

Cable	Crosstalk	RL	shielding
	(Margin over requirements in db)		
Hama Cat.5e	+5.7	+−0.2	S/UTP
Hama Cat.6	+11.3	-1.2	S/FTP
Monster Advanced High Speed Cat.6	+16.6	+7.8	U/UTP
Oehlbach Cat.6	+2.1	+0.9	S/FTP
Oelbach Network pro Cat.7	+4.3	+6.7	S/FTP
Sommercable Mercator pur Cat.5e	+1.3	+4.4	S/FTP
Sommercable Mercator pur Cat.6	+10.9	+0	S/FTP
Meicord Cat.6 Opal (unshielded)	+19.6	+8.9	U/UTP
Meicord Cat.6 shielded	+14.4	+7.4	S/FTP
Values shown are the worst paired values for any twisted pair at 100 MHz.			
Cat.5 are supposed to be suitable for bitrates up to 1 GBit/s and Cat.6 up to 10 GBit/s			
U/UTP: fully unshielded; S/FTP: each pair of wires is wrapped in foil (F) and the entire bundle is wrapped in woven textile (S). Shielded cables have an earthing contact on the outside of the plug.			

Because the plugs are so important, the two engineers, Friedrich Müller and (expunged), invented a plug construction whose core is an integrated “Cable manager”: it conducts the individual pairs of wires with defined distances of separation to the plugs. And each wire end has a different shape, which prevents cables crossing each other (see Foto). Further special features of the plug are that the cables are prevented from bending too sharply, the interlock release is lengthier, and the shape is particularly narrow, which facilitates plugging and unplugging the cables when the router sockets are very tight. In the interim, these engineers have founded a new start-up company, Meicord, that manufactures these new patch cables.

**How do Meicord cables sound?** One can speculate about the construction details and measurement values. But how do they sound, particularly in comparison to the cables we tested previously? We tested one shielded and one unshielded Meicord cable, each 3 m long, against the best cables from our previous test in STEREO 12/2008. We used an Olive server as a musical source, connected by a Mercator Pur Cat.6 cable from Sommercable to

the router which was connected to an Olive network player via the cable being tested. The unshielded, dark blue Meicord cable was much more natural and homogeneous, well balanced and filled the sound stage more than the reference Monster cable. It also had greater presence with male voices. In contrast, the shielded Meicord cable was clearly worse: it flattened the sound stage, had less aura and airiness, and revealed fewer details.

**Does it depend on the shielding?** Is the shielding the crucial aspect? Are unshielded patch cords generally better than shielded ones? After all, the Monster Advanced High Speed cable was the only cable in our previous test that was unshielded. Or is the problem the electrostatic potential, caused by the earthing of components in the shielded cable? In an attempt to clarify this issue, we earthed the router and the network player connected by the unshielded Meicord cable. But the sound was unchanged. Whatever the true explanation is, shielding seems to be important but so is the plug.

**Future directions.** Shielded cables are the current state of the art. However, after our tests, Meicord will only sell the unshielded versions. They satisfy Cat.6 regulations and are sold under the Brand name "Opal". They can be bought from licensed dealers or directly from <http://www.meicord.de> (Tel: 0049 441 925 1787). They are sold in lengths of 1, 2, 3 or 5 m for prices between €72 and €96. Other lengths are available on request. Each cable is accompanied by a protocol of measurements for that cable according to the Cat.6 regulations. The battle of the patch cords is herewith opened – as well as a new tuning area for audiophile streaming.

Ulrich Wienforth