Note: The following is a mailing list posting by John Dunlavy, a well known audio designer. I stashed a copy of this posting because I wanted to cite it in my stereo equipment page, and at the time there were no good repository of the mailing list or usenet articles that was accessible via a stable URL. I would suggest you check out audio postings by dunlavy for even more information.

Date: Tue, 5 Nov 1996 13:08:50 -0500
From: 102365.2026@compuserve.com (Dunlavy Audio Labs)
To: bass@mcfeeley.cc.utexas.edu (bass group)
Subject: Cable Nonsense (Long)

Having read some of the recent comments on several of the Internet audio groups, concerning audible differences between interconnect and loudspeaker cables, I could not resist adding some thoughts about the subject as a concerned engineer possessing credible credentials.

To begin, several companies design and manufacture loudspeaker and interconnect cables which they proudly claim possess optimized electrical properties for the *audiophile* applications intended. However, accurate measurements of several popularly selling cables reveal significant differences that call into question the technical goals of their designer. These differences also question the capability of the companies to perform accurate measurements of important cable performance properties. For example, any company not possessing a precision C-L-R bridge, a Vector Impedance Meter, a Network Analyzer, a precision waveform and impulse generator, wideband precision oscilloscopes, etc., probably needs to purchase them if they are truly serious about designing audio cables that provide premium performance.

The measurable properties of loudspeaker cables that are important to their performance include characteristic impedance (series inductance and parallel capacitance per unit length), loss resistance (including additional resistance due to skin-effect losses versus frequency), dielectric losses versus frequency (loss tangent, etc.), velocity-of-propagation factor, overall loss versus frequency into different impedance loads, etc.

Measurable properties of interconnect cables include all of the above, with the addition of those properties of the dielectric material that contribute to *microphonic noise* in the presence of ambient vibration, noise, etc. (in combination with a *D.C. off-set* created by a pre-amp output circuit, etc.).

While competent cable manufacturers should be aware of these measurements and the need to make them during the design of their cables, the raw truth is that most do not! Proof of this can be found in the absurd buzzard-salve, snake-oil and meaningless advertising claims found in almost all magazine ads and product literature for audiophile cables. Perhaps worse, very few of the expensive, high-tech appearing cables we have measured appear to have been designed in accordance with the well-known laws and principles taught by proper physics and engineering disciplines. (Where are the costly Government Consumer Protection people who are supposed to protect innocent members of the public by identifying and policing questionable performance claims, misleading specifications, etc.?) --- Caveat Emptor!

For example, claiming that copper wire is *directional*, that slow-moving electrons create distortion as they haphazardly carry the signal along a wire, that cables store and release energy as signals propagate along them, that a *final energy component* (improperly labeled as *Joules*) is the measure of the tonality of cables, ad nauseum, are but a few of the non-entities used in advertisements to describe *cable performance*.

Another pet peeve of mine is the concept of a *special configuration* included with a loudspeaker cable which is advertised as being able to *terminate the cable* in a matter intended to deliver more accurate tonality, better imaging, lower *noise*, etc. The real truth is that this *special configuration* contains nothing more than a simple, inexpensive network intended to prevent poorly-designed amplifiers, with a too-high slew-rate (obtained at the expense of instability caused by too much inverse-feedback) from oscillating when connected to a loudspeaker through a low-loss, low-impedance cable. When this *box* appears at the loudspeaker-end of a cable, it seldom contains nothing more than a *Zobel network*, which is usually a *series resistor-capacitor* network, connector in parallel with the wires of the cable. If it is at the amplifier-end of the cable, it is probably either a *parallel resistor-inductor* network, connected in series with the cable conductors (or a simple cylindrical ferrite sleeve covering both conductors). But the proper place for such a network, if it is needed to *insure amplifier stability and prevent high-frequency oscillations*, is within the amplifier - not along the loudspeaker cable. Hmmm!

Having said all this, are there really any significant *audible* differences between most cables that can be consistently identified by experienced listeners? The answer is simple: very seldom! Those who claim otherwise do not fully grasp the power of the old *Placebo-Effect* - which is very alive and well among even the most well-intentioned listeners. The placebo-effect renders *audible signatures* easy to detect and describe - if the listener knows which cable is being heard. But, take away this knowledge during blind or double-blind listening comparisons and the differences either disappear completely or hover close to the level of

random guessing. Speaking as a competent professional engineer, designer and manufacturer, nothing would please me and my company's staff more than being able to design a cable which consistently yielded a positive score during blind listening comparisons against other cables. But it only rarely happens - if we wish to be honest!

Oh yes, we have heard of golden-eared audiophiles who claim to be able to consistently identify *huge, audible differences* between cables. But when these experts have visited our facility and were put to the test under carefully-controlled conditions, they invariably failed to yield a score any better than *chance*. For example, when led to believe that three popular cables were being compared, varying in size from a high-quality 12 AWG ZIP-CORD to a *high-tech looking* cable with a diameter exceeding an inch, the largest and sexiest looking cable always scored best - even though the CABLES WERE NEVER CHANGED and they listened to the ZIP Cord the entire time.

Sorry, but I do not buy the claims of those who say they can always audibly identify differences between cables, even when the comparisons are properly controlled to ensure that the identity of the cable being heard is not known by the listener. We have accomplished too many *true blind comparisons* with listeners possessing the right credentials, including impeccable hearing attributes, to know that *real, audible differences* seldom exist - if the comparisons are properly implemented to eliminate other causes such as system interactions with cables, etc.

Indeed, during these *comparisons* (without changing cables), some listeners were able to describe in great detail the *big differences* they thought they heard in bass, high-end detail, etc. (Of course, the participants were never told the *NAUGHTY TRUTH*, lest they become an enemy for life!)

So why does a reputable company like DAL engage in the design and manufacture of audiophile cables? The answer is simple: since significant measurable differences do exist and because well-known and understood transmission line theory defines optimum relationships between such parameters as cable impedance and the impedance of the load (loudspeaker), the capacitance of an interconnect and the input impedance of the following stage, why not design cables that at least satisfy what theory has to teach? And, since transmission line theory is universally applied, quite successfully, in the design of cables intended for TV, microwave, telephone, and other critical applications requiring peak performance, etc., why not use it in designing cables intended for critical audiophile applications? Hmmm! To say, as some do, that there are factors involved that competent engineers and scientists have yet to identify is utter nonsense and a cover-up for what should be called *pure snake oil and buzzard salve* - in short, pure *fraud*. If any cable manufacturer, writer, technician, etc. can identify such an audible design parameter that cannot be measured using available lab equipment or be described by known theory, I can guarantee a nomination for a *Nobel Prize*.

Anyway, I just had to share some of my favorite Hmmm's, regarding cable myths and seemingly fraudulent claims, with audiophiles on the net who may lack the technical expertise to separate fact from fiction with regard to cable performance. I also welcome comments from those who may have other opinions or who may know of something I might have missed or misunderstood regarding cable design, theory or secret criteria used by competitors to achieve performance that cannot be measured or identified by conventional means. Lets all try to get to the bottom of this mess by open, informed and objective inquiry.

I sincerely believe the time has come for concerned audiophiles, true engineers, competent physicists, academics, mag editors, etc. to take a firm stand regarding much of this disturbing new trend in the blatantly false claims frequently found in cable advertising. If we fail to do so, reputable designers, engineers, manufacturers, magazine editors and product reviewers may find their reputation tarnished beyond repair among those of the audiophile community we are supposed to serve.

Best regards,
John Dunlavy