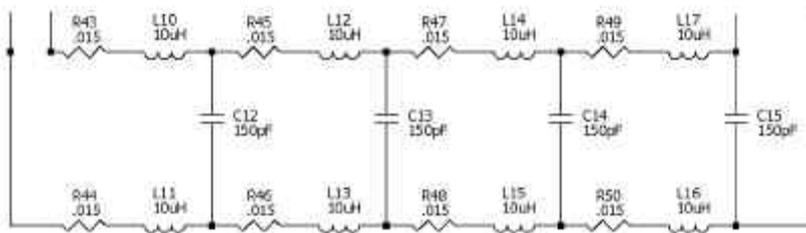


An Introduction to the Atlas Cables “HighV” design philosophy

When we design an audio, video or a digital cable we start by considering three main elements. The conductor material and its construction; the insulating material (also known as the dielectric) and the overall construction of the cable – is it co-axial; a twisted pair; etc. The conductor material normally used is a single drawn crystal (OHNO) of very pure copper or silver which has no discontinuities in the signal path. Depending upon the application the conductor can be a single wire or a bunch of wires of the same diameter or a mixture of diameters. In theory an excellent cable will simply comprise of a pair of pure conductors in free air, although in practice the conductors need to be covered by an insulating material, normally a plastic, to stop the two wires from shorting together and to protect the conductors from corrosion; copper & silver being particularly vulnerable in this respect. But now instead of free air between the conductors there are the two insulating “tubes” forming a dielectric. Now the cable has become a capacitor or a distributed capacitor whose equivalent electrical circuit is shown below. If the cable is a co-axial interconnect then the capacitance is between the inner conductor and the shield or braid and as the inductance is very small so the cable becomes a series of small low-pass networks; attenuating the higher frequencies.

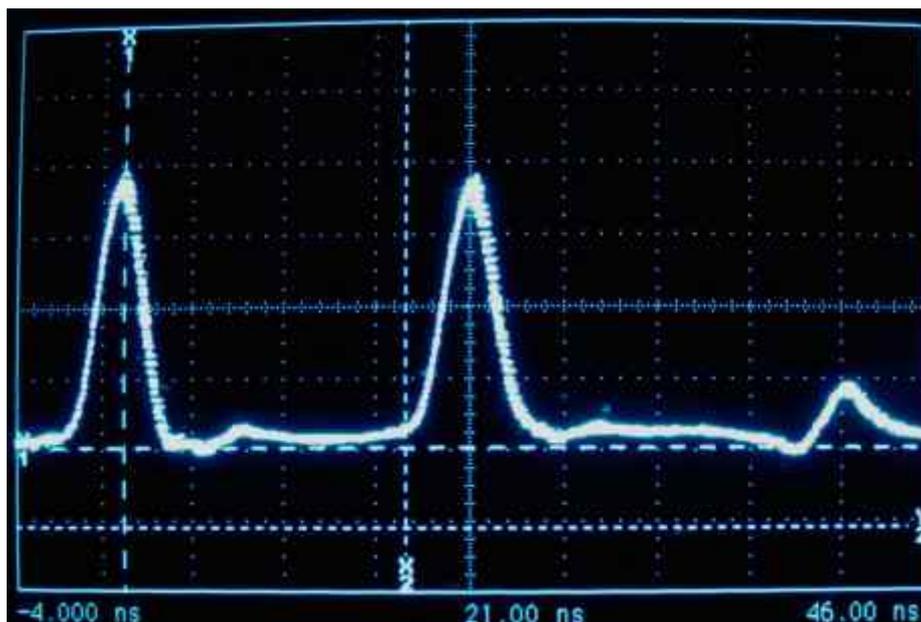


As a rule of thumb the higher the capacitance the longer it takes for the signal to pass through the cable; so the “slower” the cable. What do we mean by the “speed” of a cable? Well the most common term in use is the Velocity of Propagation (VOP); the speed at which the signal travels down the conductor. The VOP is defined as a figure relative to the speed of light in a vacuum ($C=299\,792\,458$ metres per second). We can say that light travels about 3 metres in 10 nano-seconds so if we measure how long it takes for a pulse to travel down a wire we can define the speed or VOP as a fraction of the time light would take; with light being defined as 1.00. This measurement is made using a technique called Time Domain Reflectometry. The TDR technique is based upon the fact that if you fire a pulse down an open ended cable the pulse will be reflected back by the open end and return back to the beginning. Looking at the figure below you can see that time T (nSecs) represents the time taken for the pulse to travel along the cable and then back again over a total length of L metres.

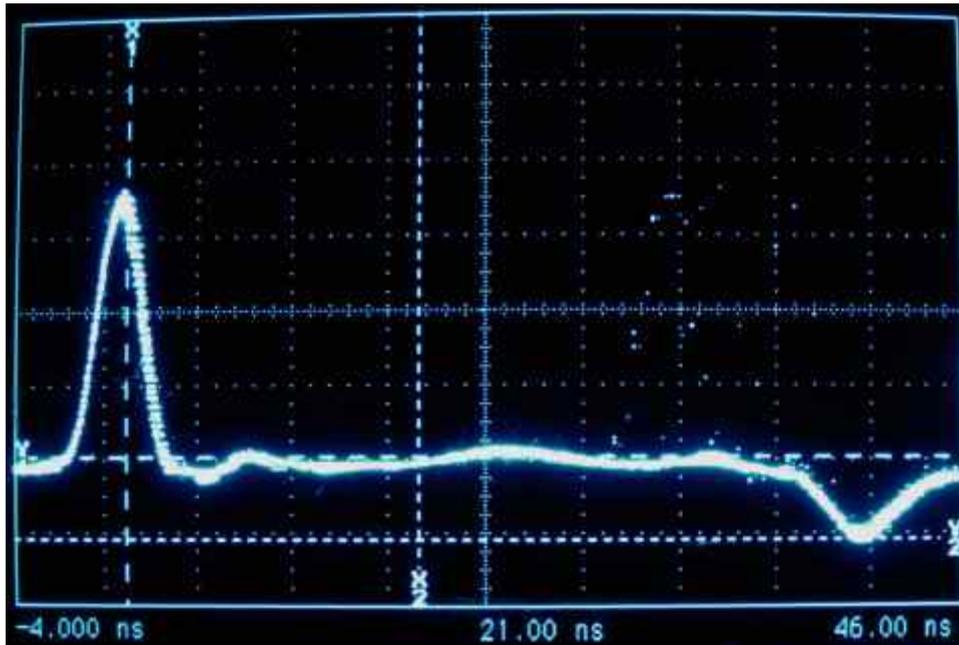
So then the VOP = $(L/T) / C$



This measurement is difficult to make with good accuracy because the test pulse really needs to have a width of 6 nSecs or less; any wider and it would mask the start of the reflected pulse. And to measure such a narrow pulse requires the use of a high speed oscilloscope; one with a bandwidth of 1 GHz or more. Such high speed oscilloscopes and fast pulse generators are rarely seen in audio laboratories yet they are the minimum that are needed as can be seen from the waveform photograph below which shows that the rectangular input pulse is actually seen as a triangular pulse because of the small but finite rise and fall times of the test equipment. In the measurement shown the time delay is 15.4 nSecs and the cable length was measured at 2.14 metres. So this particular cable has a measured VOP of 0.92 which is very high for an audio cable; in fact this particular measured cable is one of the fastest yet measured.



This measurement technique can also reveal other vital information. If, for example, the open end of the cable is loaded with a resistor whose value equals the Characteristic Impedance of the cable there will be no return pulse. This measurement is particularly important in the case of digital and video cables where the impedance has a major influence upon how accurately the signal is transmitted from one piece of equipment to another. The picture below shows a cable being tested in this way with the X2 marker in the position where the reflected pulse would be positioned.



Reducing the capacitance to the low level necessary for high VOP cables is very difficult and in the case of Atlas Cables it has been the result of extensive development work which led to the use of a new dielectric material, Microporous PTFE Foam which has a dielectric constant figure of about 1.5. By comparison the previously highest performance insulator, solid PTFE, has dielectric constant of around 2.1 so the new material allows a 30% greater signal velocity. This radical new material has been used in all of the Atlas “**HighV**” series of cables.

And how does the use of Atlas “**HighV**” cables benefit the listener? Obviously a very fast (high VOP) cable will have a wide bandwidth so it will transmit all the signal frequencies of interest without any loss. And although we have no need to conduct the higher radio frequencies this same wide bandwidth means that all the audio frequencies are carried without any measurable amplitude or phase errors; the audio signal is preserved perfectly. We can also look at the benefits in a different but equally valid way because as described at the start of this piece we know that the theoretically perfect cable would just have two pure conductors with no resistance; inductance or capacitance. In truth it is only the last two parameters which are problematic

because any resistance will simply attenuate all signals by an equal amount whereas the effects of inductance and capacitance are frequency dependent. As a consequence of our research work the “**HighV**” family of Atlas interconnects and loudspeaker cables all have very low figures of inductance and capacitance and hence high VOP figures. These cables have consequently moved one step closer to matching the theoretically perfect cable. As a result the many audible benefits of these new cables, particularly the outstanding Mavros and Asimi ranges, are there to be heard when you take the opportunity to audition their performance.