

## Why tube buffered digital output

*ayon*  
audio

We have read hundreds of international reviews of CD-T transports/Players in the last 10 years, some of them costly toys for boys. None of them, I repeat not a single article if memory serves me showed the scope trace. The most basic fundamental test - see on the scope if square looks like square. Nobody did. We analyzed over 50 schematics and we reached the conclusion that all these player's digital trace and all schematics of outputs look bad. Some of them better than others, some just so-so, and some just quite bad. What particularly annoyed us is that the signal trace is so sensitive to small changes of the load - resistance, capacitance and inductance. That's why digital cables sound different from one another - because the transmitter is not optimized, it is weak. Its output impedance is 10 times too high or evens more. No any so called "golden" cables or whatever can make wrong S/PDIF signal on the way to the DAC good again.

Chips producing a distort signal on the way to the DAC which is created mostly by weak generator etc. The Chip will be happy working into virtually no loads at all; just feed the tube grid and then the square will be perfect. Then the tube will have infinitely better output impedance (single hundreds of Ohms) and it will send the signal nice, pure, sharp, stiff and indifferent to cable and plugs.

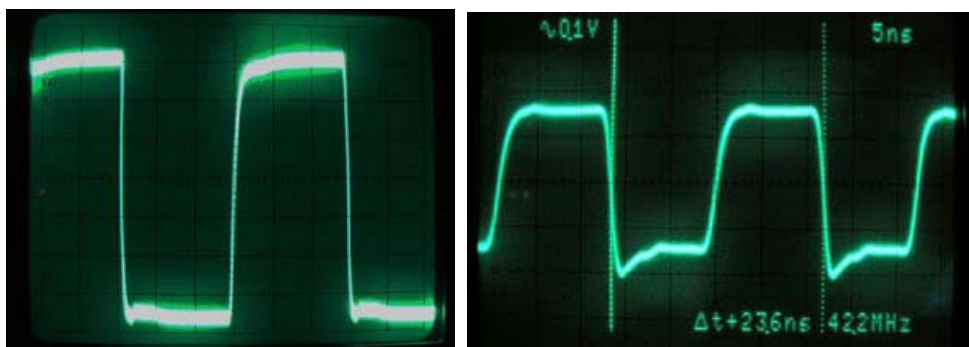
We took the tube which is really good for high frequencies - the superfast radar type 6N14P from the old soviet military program, which has a frequency response good till 200 MHz. Our signal needs circa 20 MHz bandwidth so the tube is ten times "too good" for the job. (Audio tubes of course are no good enough because the frequency range is too low).

### How it works – simple explanation:

We created a simple mono triode amplifier in cathode follower. The anode supply is circa 90 V. The cathode is a 75+75 Ohm resistor divider. Output is a 1,5 V DC square from 75 Ohm resistor. Fully aligned to 75 Ohm characteristic impedance of the S/PDIF format.

The tube grid is connected to one of outputs of the I2S/SPDIF Chip.

The square wave is perfect; there is no ringing and no roll off:



### Why tube digital output sounds better?

There are two simple main factors involved. The chip that produces SPDIF square wave is not loaded - it can relax because infinite impedance and zero capacitance.

The tube can "drive" the output cables and DAC input circuitry better because it has low impedance output, high speed and high power. So the transport is much less dependent on the digital cable quality etc.

*Notice:* The DataStream is mono, carrying left and right information alternating in the data packets L and R, the timing to send them both to stereo DAC is critical. When the timing is really perfect, the sound of L and R becomes better synchronized. Our brain is fooled better - it can detect time differences between L and R as small as single milliseconds. Left and right ear detect differences in timing of sound arrival to our ears. With precise/squared digital signal - time alignment of L and R is much improved. The pleasure of listening increases by a factor that is easy to detect in few seconds after press the "Play" button.