

# Triode Dick's Page

## Attila

Single ended 300BXLs amplifier

An audiophile barbarian...

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## Attila?

What's the f\*\*\* is 'Attila'? Very simple put: the best single ended amplifier I build so far... It began, as it's always does, with an idea but somewhere on that track I've got the pace. About half a year ago. I wanted to see what's possible with this big XLS triodes, based on my experience with the Goliath which sounded better and better after several tweaks with beautiful components.

I had my 'Big C' selected as study object and it had to endure all my new ideas with patience, what turned out a to be a pretty thing. It made the results of the changes and new designs very predictable and valuable for building my new amplifier... The Big C amplifier is playing now several years at my home and all the positive experiences I picked up building the Goliath 211 amplifier, were

often first applied in the Big C and later the Attila. Even the little guy 'Little Caesar', leaves his tracks in this new heavy weight, with the exterior already visible part.

On photo: on the left the Little C and on the right his big brother Attila. The family resemblance is obvious, despite the differences. The analogy is that they are both pleasant and very musical amplifiers.

Help....

'I want to help you with such an extremely redesigned amplifier' said Wil Blaauw of AE, the transformer manufacturer who delivered me one beautiful



transformer after the other for my amplifiers the last years. 'But the output transformers have to be completely winded with silver wire'. That I can not afford, I have to admit, but the deal is, that I build some Attila amplifiers for him when the project is successful. That was the deal. But then the first problem came up: Where do you find the fine transformer silver without being forced to buy 10 kilometer? The project is expensive enough and exaggeration is an art too. Wil started a search. He has contacts all over the world and that gives enough hope for a good result.

For making the primary windings of a transformer, you need hundreds of meters silver wire. So, a relative small purchase to a firm like Siltech where you pay tens of dollars a meter, is not attractive when you need an enormous wire spool for a set transformers. As always, patience is a nice thing and the search to this exclusive stuff was rewarded after a few months, so the task could begin. First there were test with copper wire, what's electrical somewhat differs from silver, but not enough to prevent usable outcomes. But most of the pre-design is already done, by making the numerous amorphous core output transformers the last years.

Winding silver on the secondary side of the transformers gave so much positive experiences, that the next logical step is to make them completely of silver. (technical and listening wise, less logical money wise....) The work had to be done very cautious. A mishap coil will cost a small fortune. When I've got the first ones home, it turned out to be that Wil made them on a core that one and a half times as big as the old one. 'To make the low reproduction without any compromise' he told me. That it already was more than acceptable, didn't bother him at all.... What did Clint E. as 'Dirty Harry' said about that? 'A man has to know his limitations....', or something like that...



The only problem I had, was the need for an even bigger chassis. Building and finishing the Little C a short time ago, I knew that that Black Gate WKZ not only are beautiful capacitors, but also very compact and space saving in respect to the PIO's I've got used to. An other issue was that the transformers were still naked and not molded in. The fragile silver wiring didn't encouraged me to experiment. After the datasheets were made they had to be molded as soon as possible to minimize the possibility of damage. In normal conditions the transformers are not in this naked state, but molded in a nice box. We had to be sure if the air slot, mandatory on single ended Output

transformers to overcome core saturation by single direction, was 100% okay. With a transformers as this one, where so much money, time and labor is invested, you check, double check and triple check, I can tell you that...

## Music...

When the transformers were in their boxes and were much easier to handle, we made some last measurements. Everything was ok and then... I couldn't resist it



any longer and I made some extension wiring on my Big C. It looked like sh\*t but it was an ideal way to listen to a well known amplifier instead of a brand new amplifier. My wife was thrilled by the way it looked on my rack. Two big and ugly things coming over the edge of the shelf in the front and back And all of this for the good cause ! ...haha....

But it went very smooth! And after a several weeks all the sorrow was behind us and the transformers got their definite space on the new cabinets. By then, the Output transformers were played in fine. Compare the 'old' champagne colored boxes with the new transformers behind the end tube against the wall... Then you know the physical size of the Attila will be bigger than the Big C. But it all fits on the rack.



## More help from friends....

AN audiophile friend from the south of the country made me some steel boxes for the Output transformers with the speed of light. A fine specialist in metal handling... Robert thanks! The beautiful woodwork was already done (again) by my Flemish audio friend Guido and brought to my home. A prestigious amplifier as the Attila becomes superb with such a cabinet. I'm very pleased with it.

Small and compact is something else, but it could still be handled. We had to put some time in putting the amps in the audio rack, but we succeeded. And it looks nice and tidy.

## I have to swallow....

When I had to test the Output transformers and put them on my workbench to torture them I've got sweat pearls on my head, I have never seen anything like

this before. On full power, 125mA biasthru the KR300BXLs Kanthal triode, which acts as current dispatcher, there's at 20 Hz no sign of core saturation. We are close to 20 Watt output power. That's very special for a single ended amplifier. I did see it before, but in that case it caused a penalty on the higher frequencies, that already dropped before the 20 Kc was reached. In addition to that it also triggered a lot of resonances close to 20Kc.

But not on the Attila Output transformer, who finds its -3dB point above the 100Kc. The -1dB point can be found at 49Kc. And the first small transformer resonance will enter at 216Kc. So far away, that the block display is a straight line without any overshoot. Really superb results.

The output transformer already was not the limiting factor in a tube amplifier, even though I still hear (solid state) guys stating the opposite, the suckers... The Big C output transformer is very good, the affordable output transformer of the Little Ceasar is unexpectedly beautiful, but the one of the Attila is superb. I'm proud to have them on my amplifier first....what an adventure.

## The Power Supply...

That the used electronic components shouldn't be the main issue may be clear. Otherwise there's no sense in putting a lot of effort in an Output transformer.



The Power Supply gets its Black Gate WKZ. A big investment for sure. In all you need 4 of them! You can count on 85 euro a piece and bingo, another assault on your moneybag... But on the other hand, an Armada of oil Caps in your amplifier is also far from cheap. Old worn down stuff deserves no place in this amplifier so you have to depend on for instance ASC oil caps or NOS PIO's. Even then it will cost you a lot of money. The BeeGee WKZ has a big benefit for me: its compactness. There are two 47uF capacitors in a single compact container. A hole in your chassis is all it takes to save a lot of space. A second benefit is the larger capacity. That will give the amplifier more power to drive even the more difficult types of loudspeakers. The output is about 20 Watt per channel, what gives you more possibilities in this area in comparison with a classic 7-Watt 300B Amp. De last mentioned is more than enough in my home situation, but there are plenty speaker types which need something more than that.

Of course, I do know that the pricing of these Caps is ridiculous; watch the big differences in pricing of the suppliers. How much would they really costs, coming

out of the factory? But there is no real (cheaper) alternative for this capacitor. The vanishing of the Elna Cerafine didn't really helped in that respect.

The use of this model Capacitor made it possible to apply short wiring in the Little Ceasar. The Black Gates were also tested in detail in the PS of the Big C. The results are so beautiful that I left them there. The lager capacity gives the amplifier more body, looseness and dynamics in less easy speaker systems. (Read: speakers that require more current because of f.i a 4-Ohm impedance).

The power amplifier is a story in itself. Quite big for a 20 Watt amplifier... What is the benefit of this huge physic appearance?

In the first place: absence of every kind of resonance. In the second place: it is a very cool guy, with a continuous operating temperature that won't exceed the environment temperature. And not in the last pace: the transformer is winded in a manner that is specific for use in a medical environment. High frequent parasitic garbage from the power grid is blocked as good as possible by using a special winding method in combination with the appliance of several static screens. The leaking current from primary to secondary is very low. The inrush current from switching on the device is even so very low. You will hear nothing, no 'clunk', completely nada, nothing. The first time on the workbench I really



had some doubts if the power was actually on. That's not an average thing for a normal audio amp.

To get the wiring as short as possible and to hold a good overview, I put the transformer flat on the chassis. A positive experience I had with once again the Little C project. The cross pollination is at its best here.

You good say, that the Attila is an amplifier where all positive developments from earlier projects come together. But that we went one step further with the quality of components and especially in respect to the output transformers.

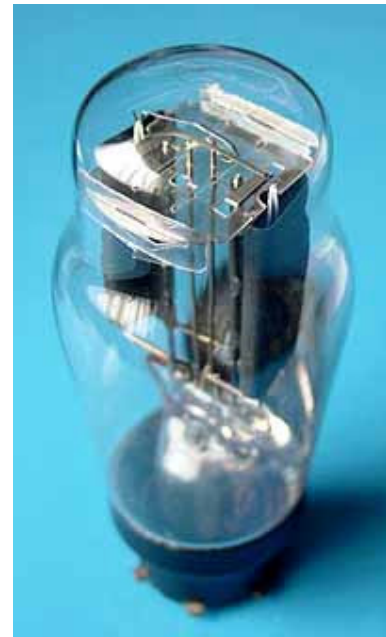


## Lets walk along the components ...

The PS for the driver and end tube will get their own circuit as in the Big C. The supply of the end tube starts with the '83' gas filled rectifier. A mighty fine tube, I find

myself, but it is a child to be worried about. The '83' is not an ultra-solid tube as the CV378/GZ37 and must be treated with care. It first has to warm up good and only than the high voltage can be applied. An 83, which will be handled with care, has a long life. But being careless is the way to ruin this tube. The very solid GZ37, the only tube I had never problems with, is also usable here. A few extra taps on the power transformer makes that possible. The higher voltage drop in respect to the 'low drop 83' will be compensated by that. A 5Z3 can be used without problems, a GZ37 or 5U4 needs another socket, Octal instead of UX4.

The AZ1 in the driver channel is an old friend. A RGN1064 or AZ11 with exception of the socket identical. I find the mesh version the most beautiful, but it's becoming scarcer and scarcer. Merchants embraced that tube a long time ago as a sort of money generator. There is nothing else left tan to use the normal AZ1, what's really no punishment. There is no problem finding these because they were produced by the millions and made decades long in our own country. The capacitor occupation is giving a nice overview using 2 double Black Gate WKZ's. Direct behind the '83' you should be tempering the capacity what's done here by using a 6uF oil cap. The AZ1 is also getting a nice oil cap as buffer. Both circuits will get a double pi-filter right behind that. Two chokes and both BG's. The capacitor bank takes distinct less space as for instance the Big C, with its large amount of oil Caps, whereby the chokes could be mounted now below the chassis plate, what's no luxury looking at the physical size of the PSU and output transformer.



## Chokes..

The chokes are very luxurious this time and the number we use is larger than before, because of the double pi-filter for the pre-stage as well as for the end stage. The Chokes have to be something special. A little bit over dimensioned, to get a nice low Ohm resistance. I want a fast and tight supply for the end tube.

This is of less importance in a classic 300B circuit, but the tuned-up end tubes can deliver much more current if its needed, the catch is that the PSU most come up with this current. It's become an issue in the lower frequency ranges. Four amorphous core chokes per channel take some space. The other components

are not much less, that's why I use here the best material I know of. I've got the taste of the amorphous core chokes when I used them in my Goliath 22 amplifier and however there is no difference like night and day in respect to the ligament cores, it is worthwhile in a prestigious project as this. It's in the little thing, as always in our hobby. You have to make a big investment for an improvement that's worthwhile. If it's better to spend this money on music, is a question that crosses my mind often....

## A very beautiful discovery...

The resistors are from a type I discovered not so long ago. I applied them more and more and find the quality elevating. They are on the level of 'accepted' well known audiophile resistors (read: high priced) They are carbon types that comes in 1 and 3 Watt types.

'Very pricy of course..... Hey, you have to be honest....'

No, without any jokes. I found them in a box of the local electronic store. The man behind the counter couldn't tell me much about it (mind this: it is still an old fashion intimate electronic store, no audio store where they won't tell you a thing), except that it is current production and there is a demand by local D.I.Y audio hobbyists... The pricing is really un-audio. About 20 cents for the 1-watt type and twice that for the 3-watt type. When this quality would be sold under a funny name in an audio components store, you would probably pay 1, 2 or even 3 euros a piece. 'mmm, it really sounds as a 3 euro resistor...'

## Fixed or Auto...

A big change in respect to the Big C is the fixed **negative grid voltage** (ngv) for the end tube instead of an auto bias with a fat resistor and capacitor for decoupling. In the past I wasn't very fond of this 'NGV' method. I had some bad experiences with it and it took me years to overcome that.

The (that time often Chinese) end tubes were, in the beginning of the nineties, low on reliability and stability and as a result of that, the anode current keeps wobbling and there could easily be a leakage between grid and cathode. That goes on till the big climax: a bright shining anode plate. I've seen them light up as a light bulb. After that I was a long time anti Chinese (only in the tube department, the food is always good..) and used if it's was possible tubes from the old stock (NOS: New Old Stock, as in: new tubes that are no longer produced, but recline on a storage shelf..) The last years however, there are



more and more reliable tubes (also from China) so there is no obstacle anymore to use the NGV.

I admit I was still a long time paranoid about this issue, but in the Goliath 211 amplifier the NGV was simply the only reasonable option. To make the already high voltage unnecessary higher just for an auto bias, was just stupid. I have to tell you that the old 211 triode **the** example is of a stabile tube. Those things are made for the broadcast world and had to operate under worse conditions, but they keep doing their job. When used in an audio application, the 211 will feel itself in a comfortable situation.....

The other often-used method is the use of a fat cathode resistor, where enough voltage drops tot configure the tube. The control grid will be connected by a grid leak resistor to a mass potential that's lower, negative in respect to the cathode. Is there suddenly running more current thru the tube (and cathode resistor) than will the voltage drop over the cathode resistor much higher and the cathode more positive in respect to mass. (Put in an other way and maybe more clear: the grid will be more negative in respect to the cathode), by which the current will be automatically squeezed. That's the so called: 'auto bias'. A disadvantage is the voltage loss over the cathode resistor, that's 70 volts for a 300B, who must be compensated with a higher voltage supply and the necessary decoupling with a capacitor, by which the dampening of the speaker at the lower frequencies decreases, unless you choose a high capacitance. The capacitor is hardwired in the signal path and is of great importance for the quality of the sound. When using a NGV configuration, the cathode is wired directly to mass and the grid will be negative by a separate negative voltage source.

In a normal 300B amplifier there is not much heat emitting in the cathode resistor, but on a tuned up amplifiers with a XLS end tube, the emitted energy cannot be neglected anymore, not even with an applied 50-watt resistor. The thing gets really hot.

After building the Goliath 211 my fears for "fixed negative" is slowly went away. The amplifiers stands as a rock. And remember, last year there where a lot of complaints about shortcutting exploding Black Gate 100volt types, that where be used as cathode decoupling, with all the sorrow afterwards. The Big C got also a NGV circuit in the preliminary stages to the Attila, and I must say, I'm very happy with it. The low reproduction benefits on tightness and the fired capacitor from the cathode circuit is not really a disadvantage. I couldn't find any disadvantages till now.

The NGC circuit is connected in a way that if the runner of the pot loses his contact, the voltage becomes maximum negative. Every advantage has its disadvantage and that is a very tight control range. I wanted to have some more. The question is if the use of a solid Bourns or Vishay, in the Attila and Goliath, is save enough.... Everybody has to decide for him/her self. De Big C amplifier plays with the NGV and Black Gates easier, more loose and wins in transparency. The Attila gets his ngv configuration from the start.

## Heavy metal...

To 'loose' the chokes is even a bigger challenge. Placing four of those things in a single amplifier is a big task. On top of the amplifier is no place left, but beneath the surface is more than enough space, thanks to the compact capacitors.

Watch the mounting positions in respect to the power transformer in respect to each other. Do not place chokes core to core. The change of influencing each other is large. One choke I mounted semi-permanent to make later service, upgrades or something else possible. The choke is removable by unscrewing two screws. On the backside it is mounted with a special clamp.



## Further details...



The central mass connection point is just situated before the power transformer. The separate amplifier stages have got their own sub-mass connection points. From there goes the one and only connection to the chassis, the so-called star-mass point. If you should bring all the mass connections to this point, you have to use a lot more wiring than is really necessary and the signal path will be a lot longer. I work already several years with sub-star mass networks and it makes a very quiet

amplifier possible. The shorter signal path has, no doubt, also a positive influence.

## Silence please...

Speaking about quiet amplifiers, the filaments of the end tubes are connected to a DC supply. I began to appreciate the black silent background more and more and the littlest hum irritates me. I love it when the music stops, the echo slowly dies and the deep silence leaves. The place where the music is played in is hearable and touchable. Especially with high-resolution sources as the SACD en DVD-A. It give me an enormous kick when I can hear the acoustic of the room where the music was recorded in, much longer than normal, And you bet that this low threshold plays its part in regular music passages. This Atilla let me experience things I didn't noticed before. Very special..... Of course I tried this DC supply also on my Big C, and I leave it there to stay. The most sensitive speakers are no issue anymore. Once in a while I hear voices that tell me that AC is sounding better than DC for direct heated tubes. I have to tell you that I can't hear the difference. The silent amplifier is for me the big benefit!

It's wonderful that all the preliminary designing gave a great result as this. When all the parts got their place in the box and I switched on the power, I had immediately a good feeling about this amp.