[DIY Audio Home]

Tube Microphone Preamp

A while back a friend that does some home recording asked me about a tube microphone preamp. Something I hadn't designed yet... so I designed one.

This particular design is pretty high-end. I started with the best microphone input transformer I could find (at least without having something custom made). So this is *not* an inexpensive preamp... the input transformer alone sells for $135! The total cost for everything including the case and PCB is right around $400.

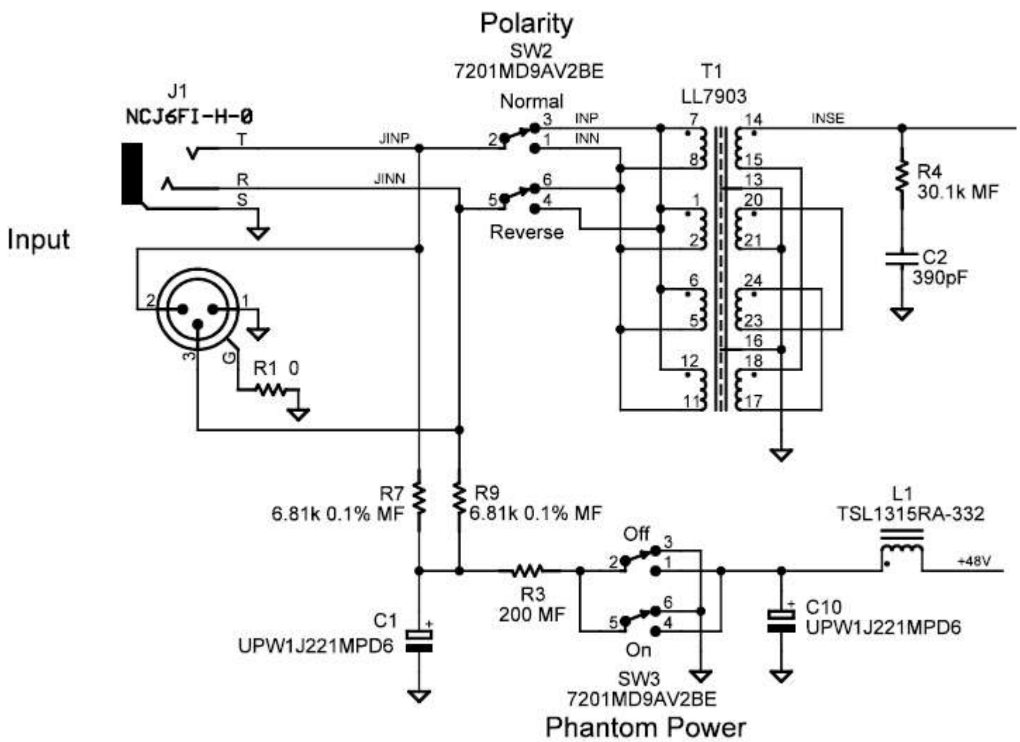
I'm selling the PCBs for $30 each on eBay.

The Circuit

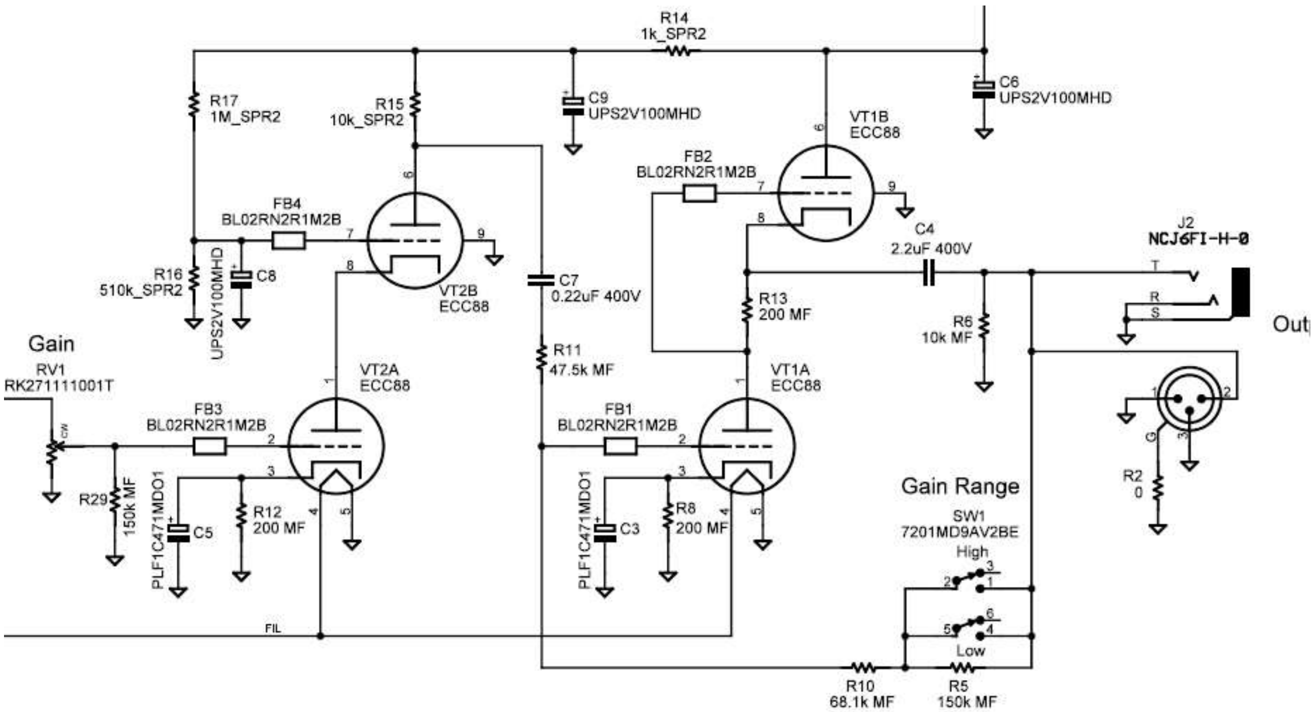
The circuit topology uses an input transformer, followed by a 6922/6DJ8/ECC88 cascode stage. The output uses another ECC88, in SRPP, with some feedback around it. The feedback has two settings, giving two gain selections.

Click here for a full PDF schematic. You can download the BOM either in PDF or XLS format.

Input is via a Neutrik combo 1/4"/XLR jack. The signal passes through a Lundahl LL7903 transformer. Provisions for phantom power as well as a polarity flip switch is included.

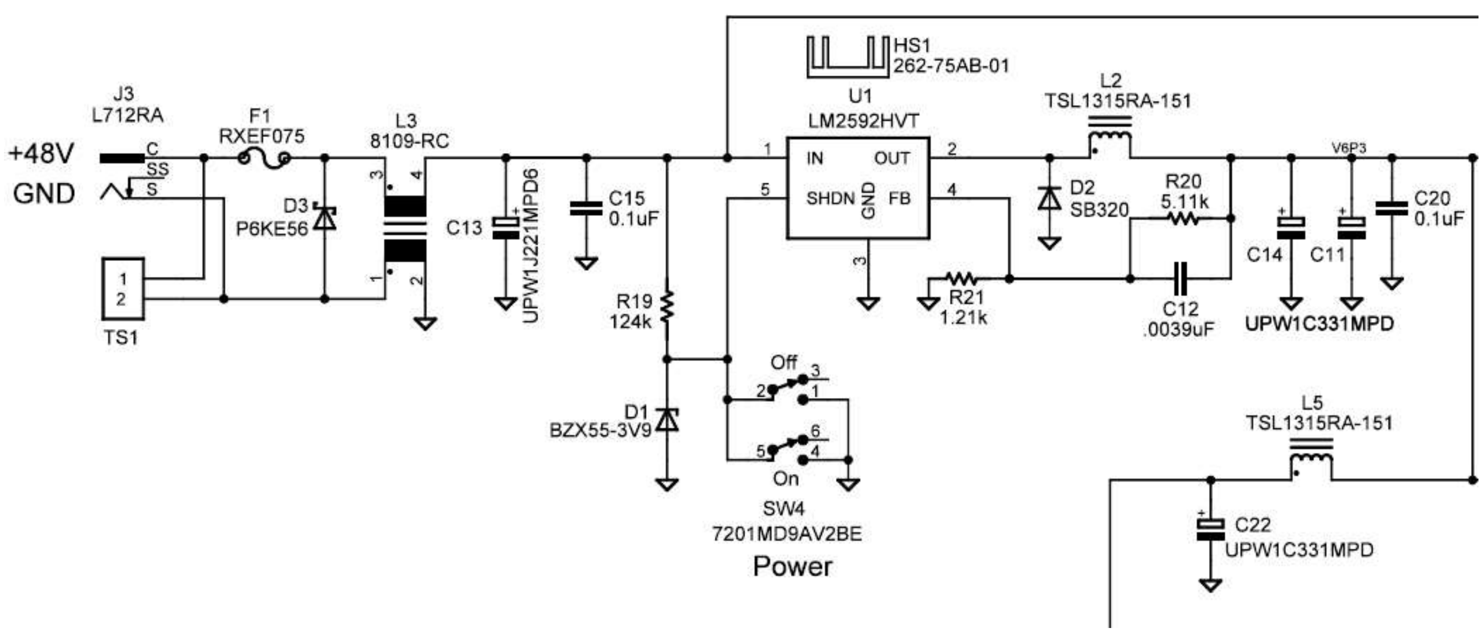


The amp stage proper: Cascode followed by SRPP. I know some people hate SRPP - it's too trendy, I guess. But here is seems to me the best choice, able to drive a 600 ohm load. Note some NFB around the final stage, two different amounts selected by a switch. The output - unbalanced, no output transformer - is supplied via another 1/4"/XLR combo jack. Yes, the XLR is the wrong sex, but you can't get a male combo jack, and front panel space was limited.

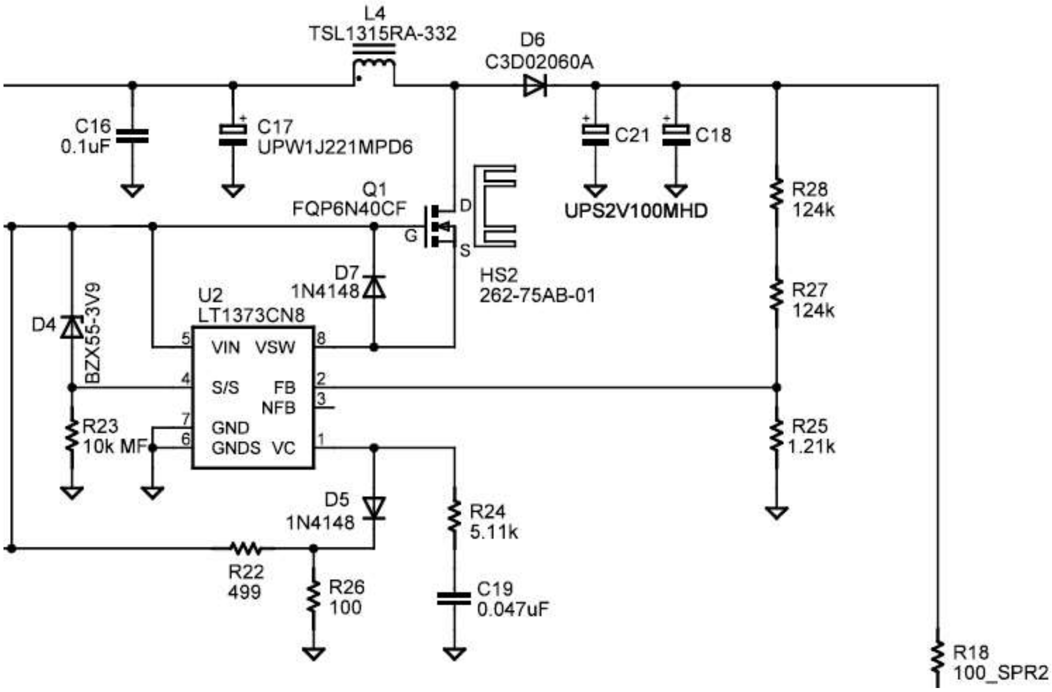


The power supply is, uh, unconventional. What? Who? Me? Yup. A switching supply, generating 6.3V filament voltage and +200V B+ from a 48VDC input. The beauty of switching supplies is that the noise they generate - and yes, they do generate some noise - is at high enough frequency that it's easy to filter, and above the audible range. For a low-level preamp like this I'd rather have a few millivolts of 100kHz than a few millivolts of 60Hz!

Here's the input and filament buck:



...and here's the B+ boost:



I powered this from a desktop-type switching 48V 1A power supply.

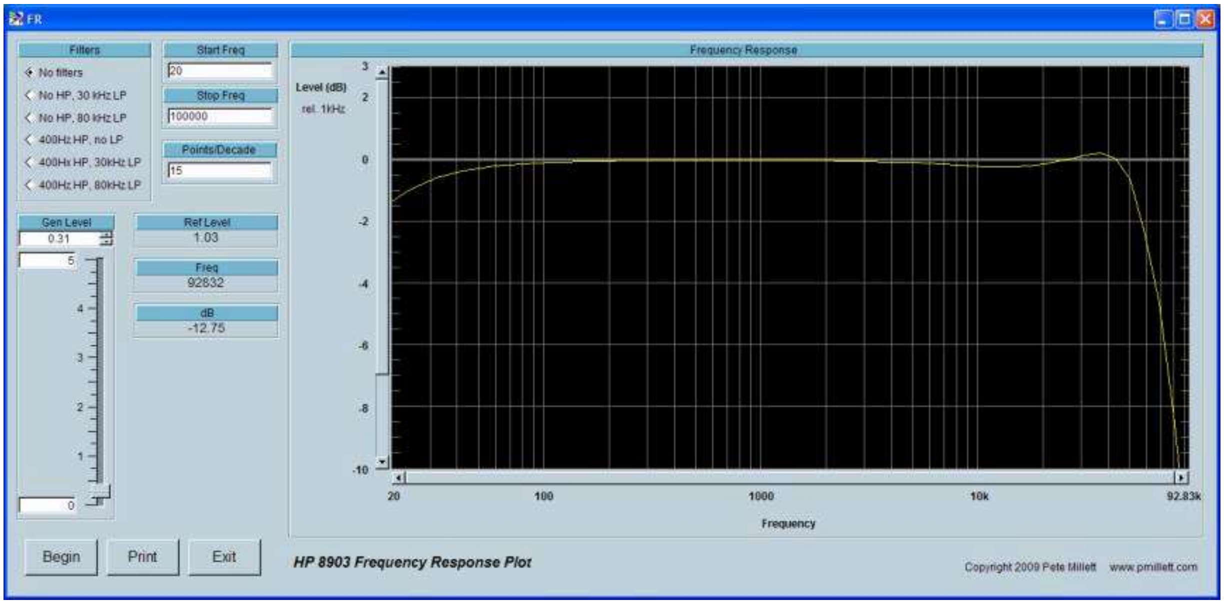
Performance

Some measurements:

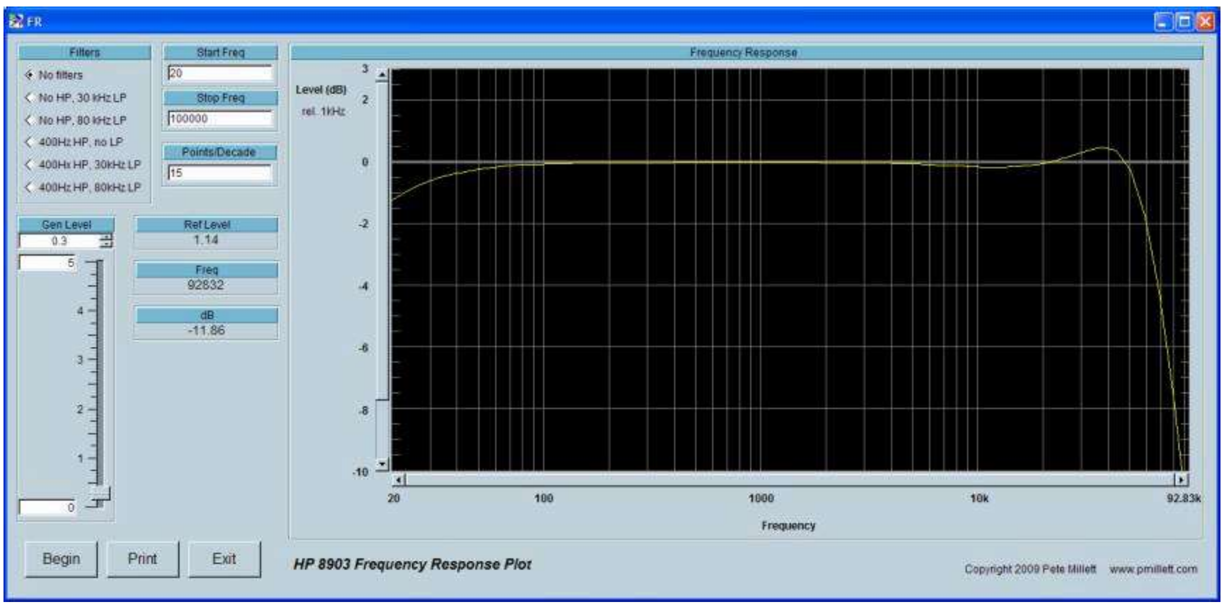
Parameter	*Gain setting*	*HiZ load*	*600 ohm load*
Maximum gain 10mV in 1kHz	Low	48dB	46dB
	High	58dB	55dB
Maximum output voltage 1kHz	Low	20V RMS	9V RMS
	High	42V RMS	9V RMS
THD+N 10mV in max gain	Low	0.6%	0.65%
	High	0.47%	0.5%
THD+N 10mV in 1V out 1kHz no LP filter	Low	0.25%	0.25%
	High	0.15%	0.15%
Freq Response 20Hz - 50kHz 10mV in 1V out	Low	+/-1.5dB	+/-2dB
	High	+/-1.5dB	+/-2.5dB

....and some graphs (all taken with a high-Z load):

Frequency response, low gain setting, 10mV in and 1V out:

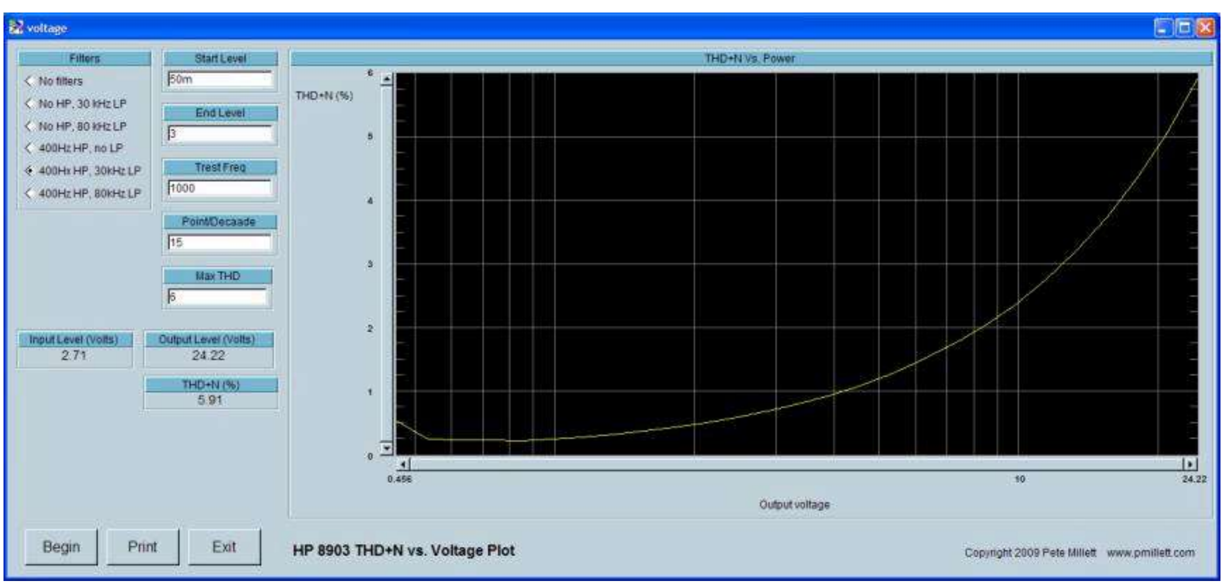


Same at high gain:

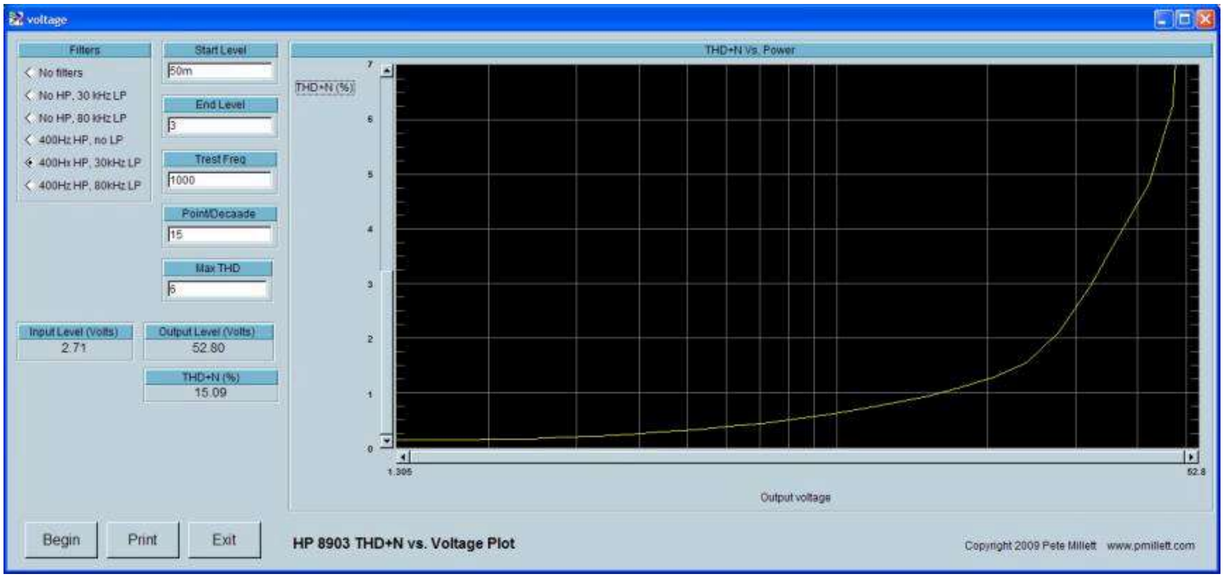


...the peaking at HF can be adjusted by changing the RC loading on the transformer secondary.

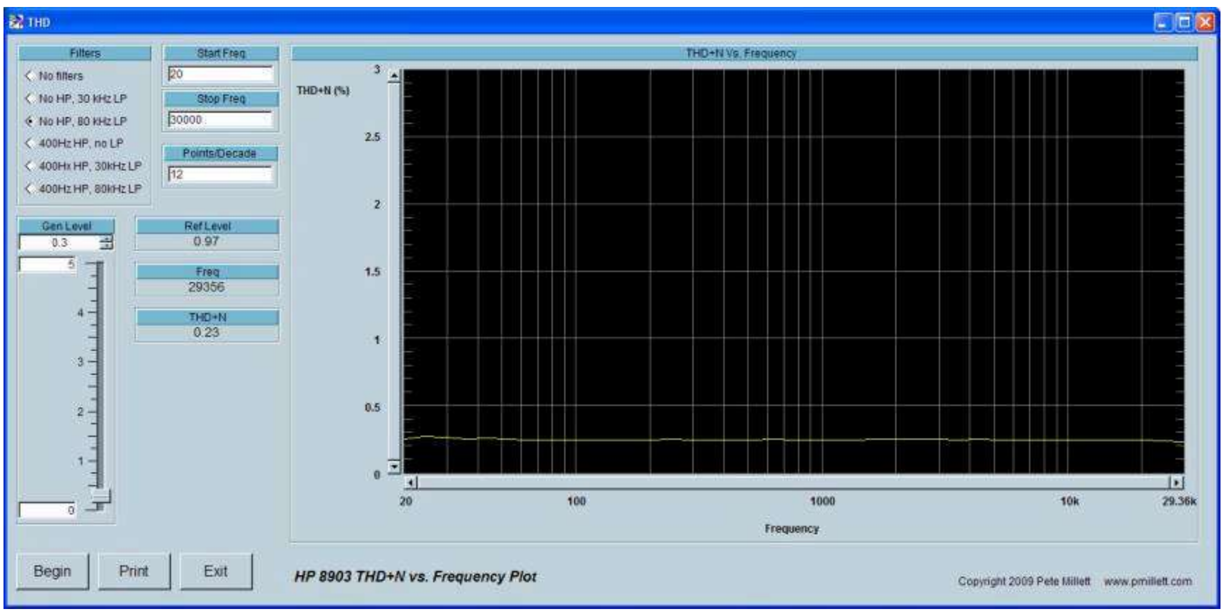
THD+N vs. output voltage, low gain setting:



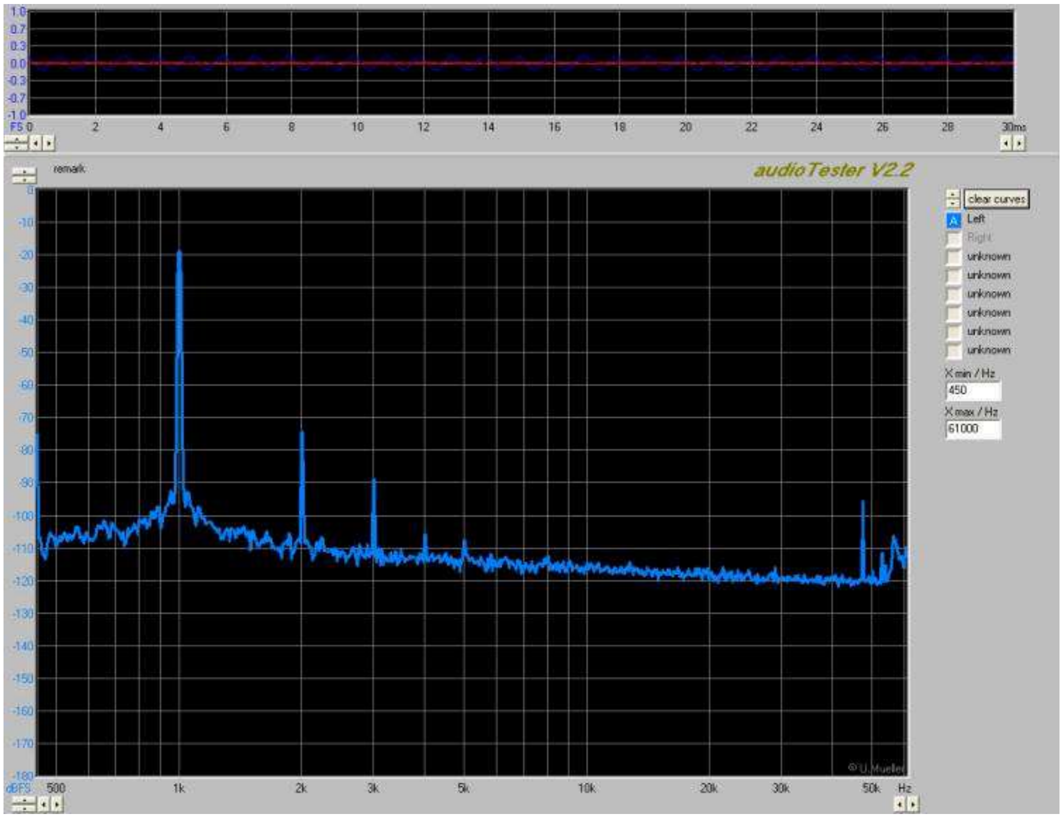
...and high gain:



THD+N vs. frequency, 10mV in 1V out, boring:



...and finally an FFT, 10mV in, 1V out:

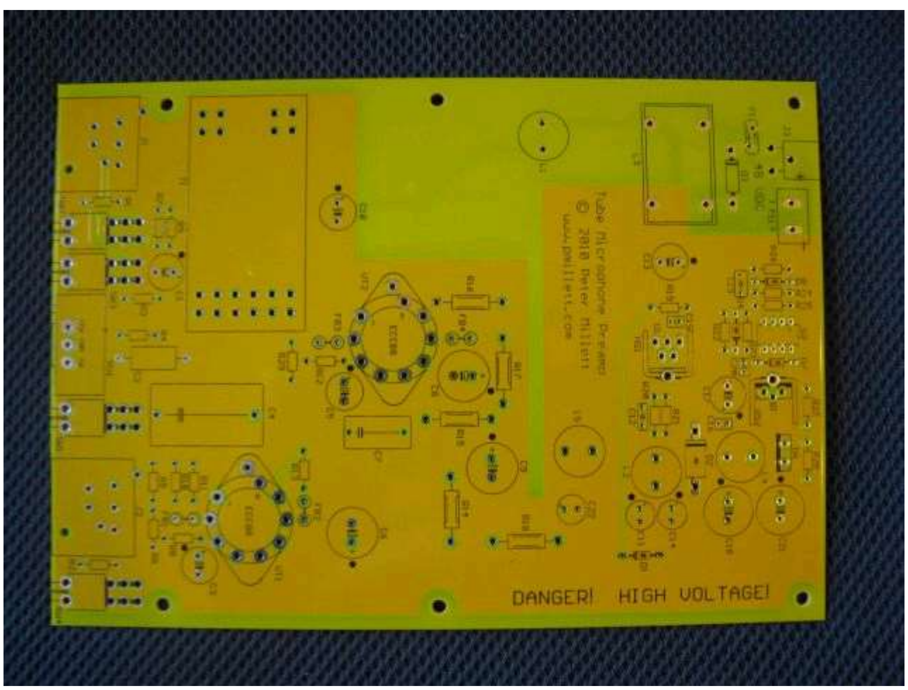


...nicely tubey!

Implementation

I designed a PCB to contain the amp and fit inside an off-the-shelf enclosure.

Here's what the PCB looks like (click for a full-size image):



...and the assembled PCB:

The enclosure I put this in is an LMB-Heeger EAS-500 extruded box. I had front and rear panels made by Front Panel Express to fit the box.

You can download a zip file with my FPE front and rear files here.

I'm waiting to get the front and rear panels back from being laser-engraved. When I get them back I'll post photos of the whole thing put together. But really the guts are more interesting anyway :)