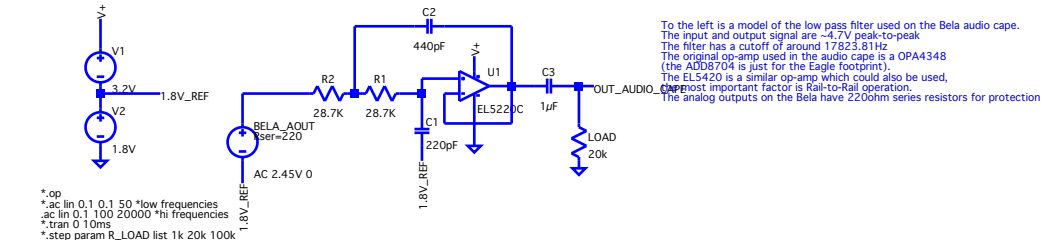
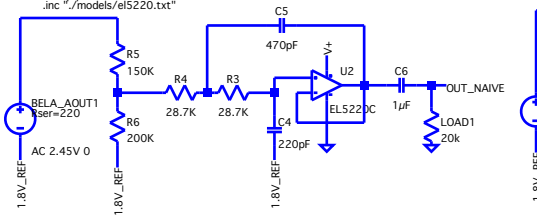
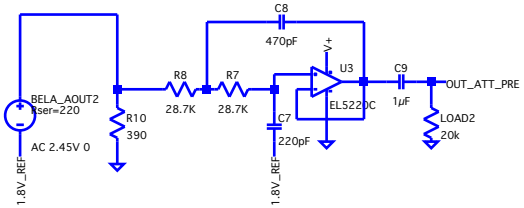


To the left is a model of the low pass filter used on the Bela audio cape.
The input and output signal are ~4.7V peak-to-peak
The filter has a cutoff of around 17823.81Hz
The original op-amp used in the audio cape is a OPA4348
(the ADD8704 is just for the Eagle footprint).
The EL5420 is a similar op-amp which could also be used,
the most important factor is Rail-to-Rail operation.
The analog outputs on the Bela have 220ohm series resistors for protection

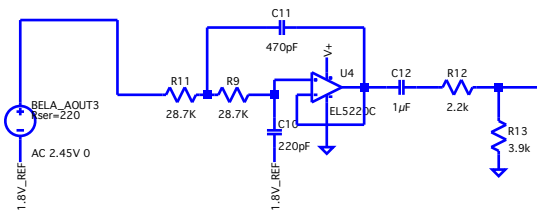
```
*.op
*.ac lin 0.1 0.1 50 *low frequencies
.ac lin 0.1 100 20000 *hi frequencies
*.tran 0 10ms
*.step param R_LOAD list 1k 20k 100k
.inc "./models/el5220.txt"
```



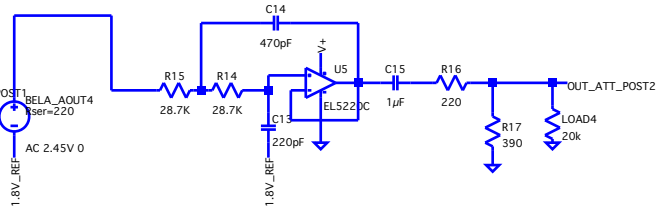
1st try - make a filter that also attenuates the 0-4.7V signal to 3V peak-2-peak.
I've swapped the 440pF cap for a more easily sourced 470pF cap.
The attenuation is ok, but compare the frequency response to the Audio capelet filter
The cutoff is somewhere around 2khz now! And it looks like I've added an extra zero into the curve.



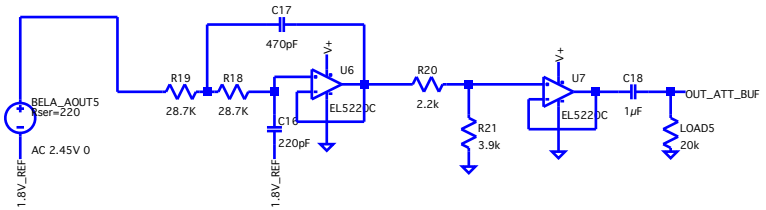
2nd try - Andrew's suggestion to simply add a 390ohm resistor to the analog output.
Now the attenuation is ok and the frequency response is what we want (cutoff ~17khz)
The problem here is the power wasted via that small resistor to ground, which could
draw up to 8mA of current from the DAC per channel



3rd try - Andrew's suggestion to attenuate after the filter.
The frequency response is good. But now the attenuation is highly dependent on the
input impedence of the load. The Adafruit amp (from what I can tell) has input impedance of 20k.
This creates an additional 6% attenuation of the output signal



4th try - Using lower value resistors on the output attenuator
the attenuation is now more exactly, and less dependent on load impedance.
But now we're back to the problem of worst case up to 8mA being drawn by
each op-amp per channel. The MCP6004 op-amps that we ended up using
can deliver up to 20mA, so shouldn't be a problem.



5th try - This design attenuates post filter and uses the larger value
resistors to keep power consumption low. Dependence on the load impedance
is eliminated using a buffer.
This version has low power consumption, good filter behavior, at the expense
of another op-amp.