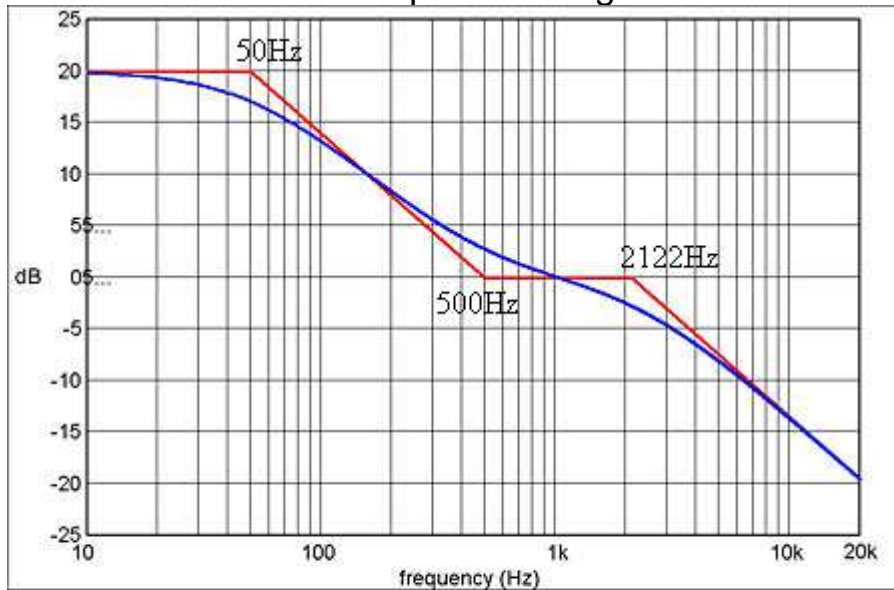


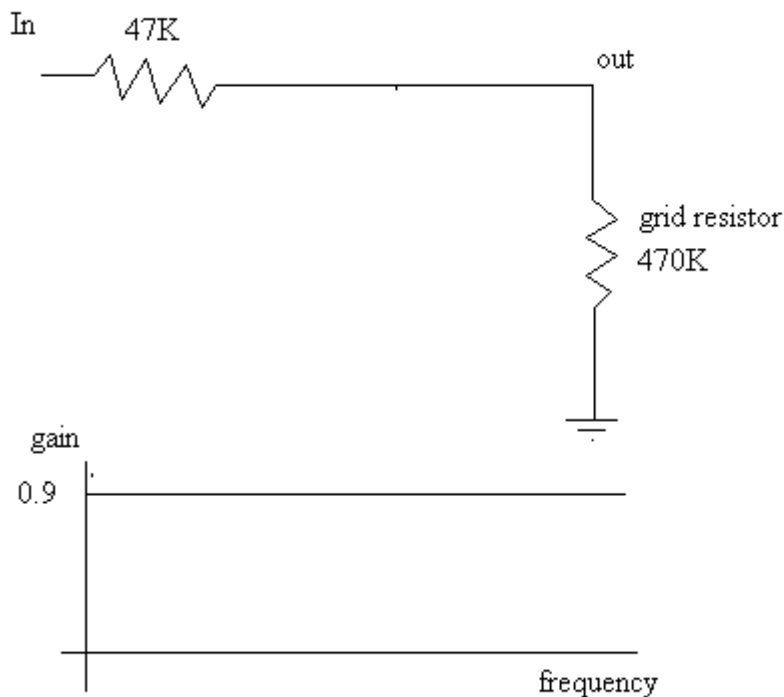
RIAA equalizer design



$$\begin{aligned}
 3180\mu\text{S} &= 50\text{Hz} \\
 318\mu\text{S} &= 500\text{Hz} \\
 75\mu\text{S} &= 2122\text{Hz}
 \end{aligned}$$

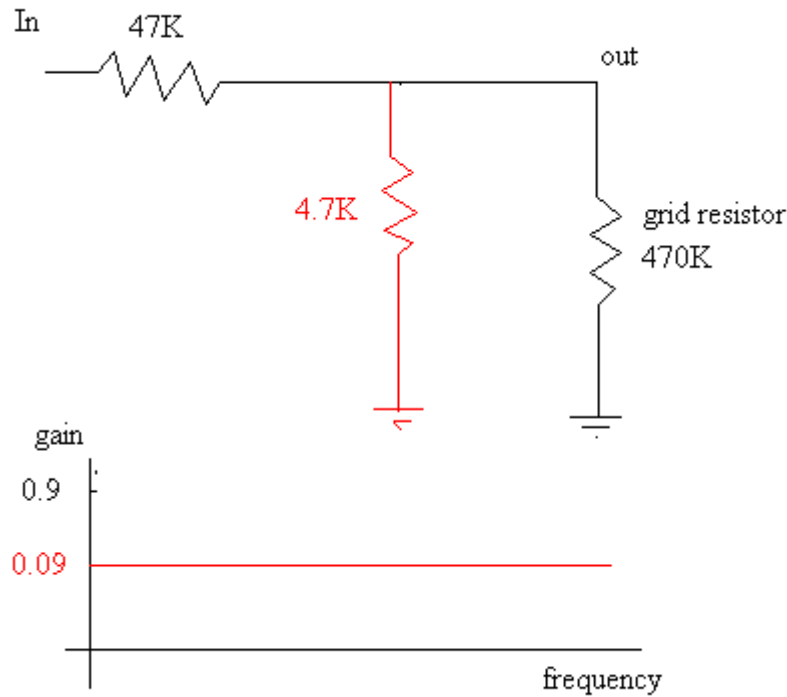
$$\text{freq} = \frac{1}{2 \cdot \pi \cdot 75\mu\text{S}} = 2122\text{Hz}$$

RIAA consist of 3 frequency corner which is 50Hz or time constant 3180uS , 500Hz 318uS , 2122Hz 75uS . the gain in 50hz and below is +20db which is 10 times gain, and below 20Khz is -20db which is attenuate 10 times. So the total different is 100 times from 50Hz below to 20Khz above.

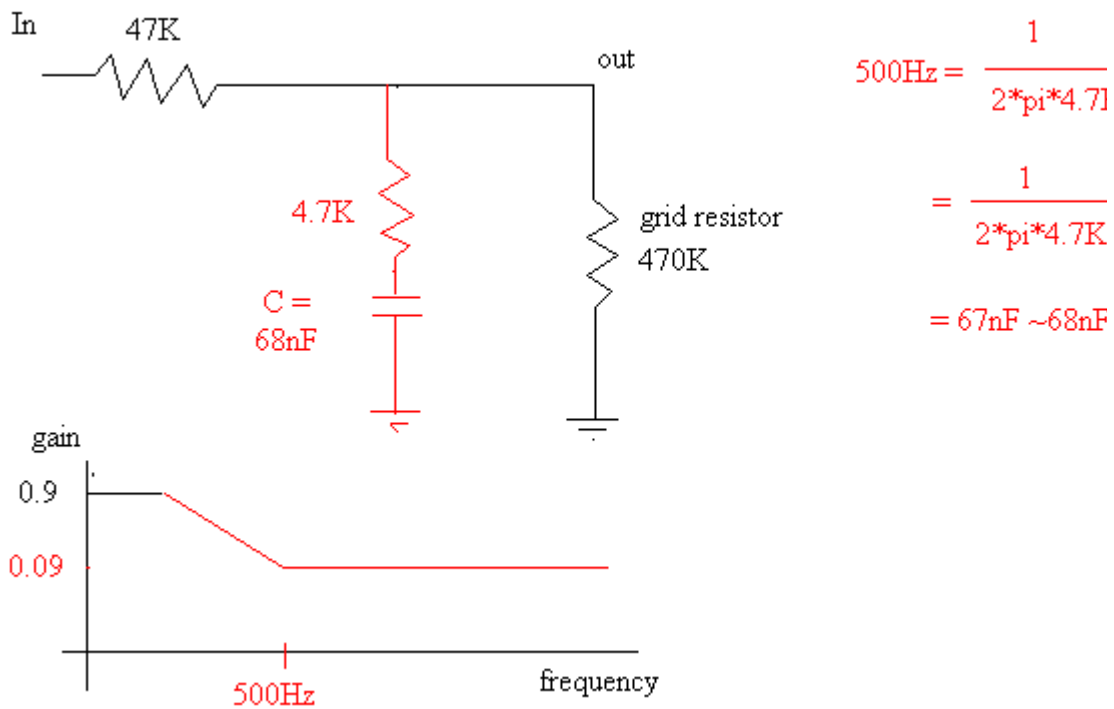


The grid resistor is the Rg1 for next tube , the 47K is just a beginning resistor , we cant choice too high it will have more attenuation versus 470K , if we choice too low since the tube having output impedance will series up with it and cause the frequency more depending on tube then 47K. So for starting i assume the tube output impedance is much much more smaller then

47K so , the majority is 47k without any capacitor by right the input and output gain approximately 0.9

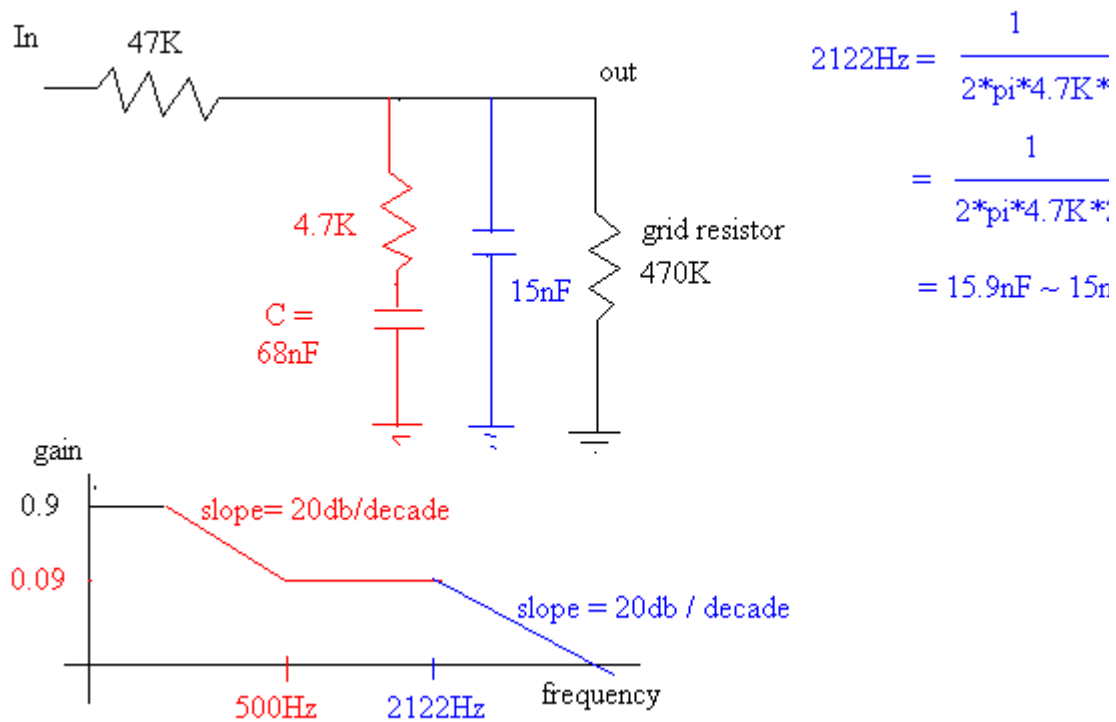


Since the RIAA at middle portion is 0db or and 50Hz below is +20db, because here all is passive component so there is not gain in here, so we offset +0db at 50Hz below , and 500Hz above is -20db , so which is attenuate 10times, so 0.9 to 0.09 gain , by adding 4.7K ohm resistor there.



By adding a Capacitor when 500Hz have equal XC of 4.7K so when above 500Hz is go into below 4.7K or close to 0, so meaning that before 500Hz the capacitor having higher value then XC , so this will cause the slope from 50Hz to 500Hz slowly attenuate the gain until it

reach 500hz , and above the gain will become flat



In order to complete another 75uS or 2122Hz corner , we need to add another capacitor , which is 15nF , which after 2122Hz the capacitor having XC as 4.7Khz and when above 2122Hz it start to go below 4.7K to cause further more attenuation until 20Khz and above it continue attenuate... since RIAA are only care up to 20Khz to make it simple we let it continue attenuate..

In order to make it useful , the MM output usually about 10mV below, and Power amplifier require about 1V to amplifier , since this circuit attenuate 10 times at 1Khz , so we need to have $1\text{V} / 10\text{mV} = 100\text{times} \times 10\text{times}$ attenuation in this circuit, total gain of 1000 times!! , So we can add phono stage input boost up about 100times, before go into this RIAA and after RIAA we can boost again for 10 times. or another way round.

Since tube output contain of DC so before go into this circuit there need to add a capacitor to filter out the DC to let only AC signal go in, So the suggestion capacitor can be 0.47uF in order no to attenuate the 50Hz.