



ČVUT

ČESKÉ VYSOKÉ
UČENÍ TECHNICKÉ
V PRAZE

Subharmonic generator B2M34IAS

Petr Polášek

3.1.2018





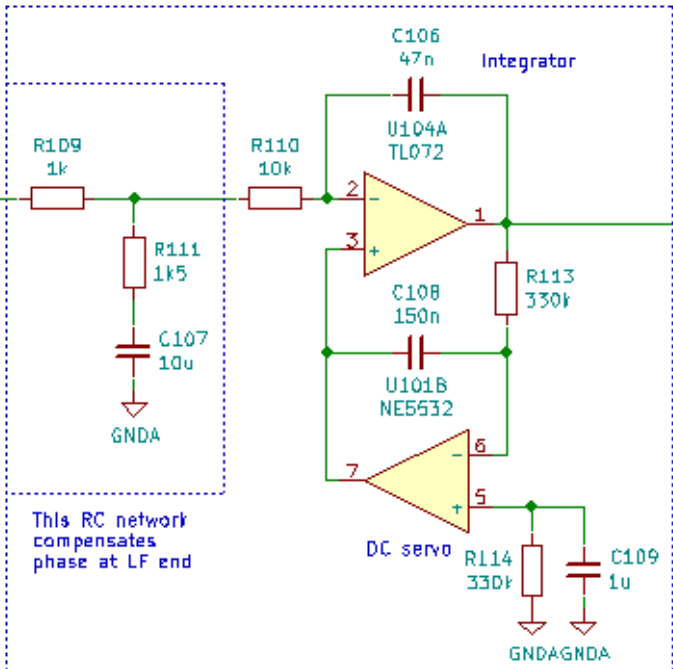
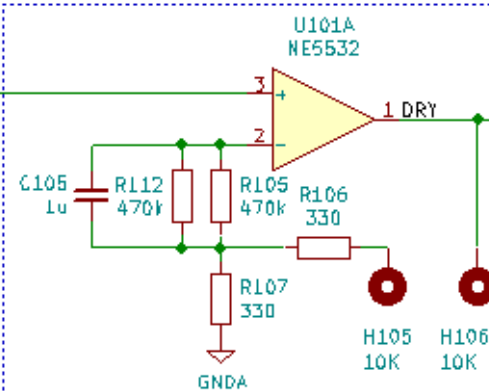
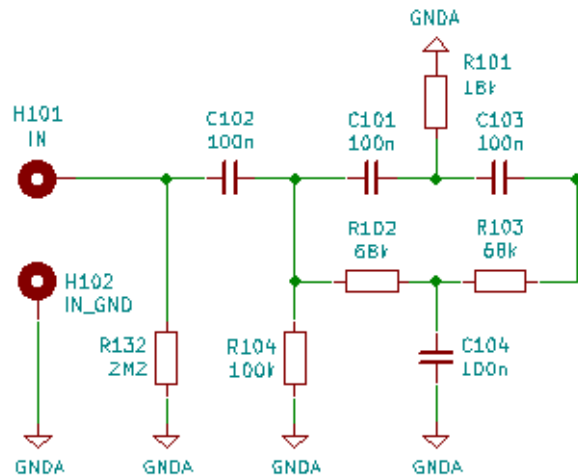
90° phasing circuit - schematic

Input HPF and 32 Hz notch filter to prevent saturation of phasing circuit. All capacitors should be linear.

Input amplifier

The 2 470k resistors are matched with the DC Impedance of the Input filter and help reduce DC offset. When changing the Input filter, change this input current compensation as well. The 1u capacitor can be of any bipolar type.

90 degrees phasing circuit (Integrator with DC servo and phase compensation at LF end)
Maintains +90deg phase (+/- 0.25deg) from 67 Hz and higher.
It has a "resonance" at 32 Hz which is the reason for notch filter on Input.
The 47n and 10u capacitors should be linear, the rest is not so critical.



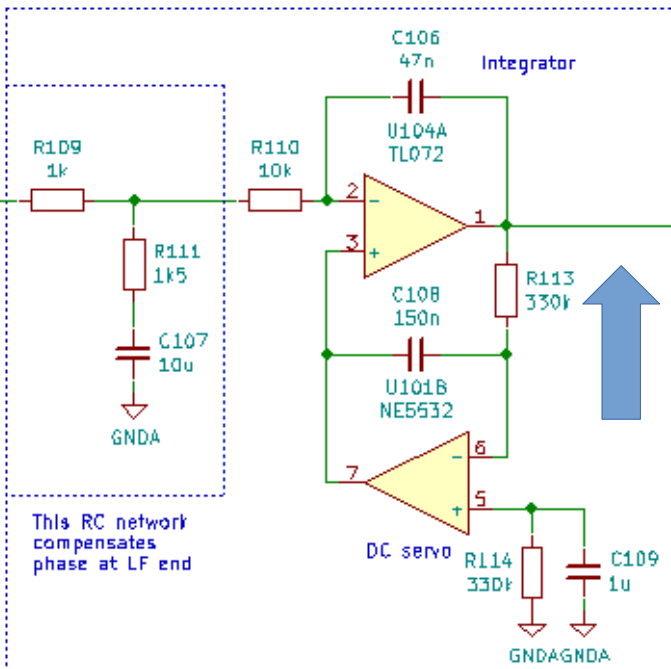
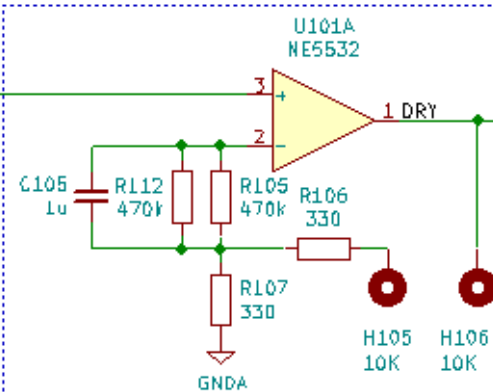
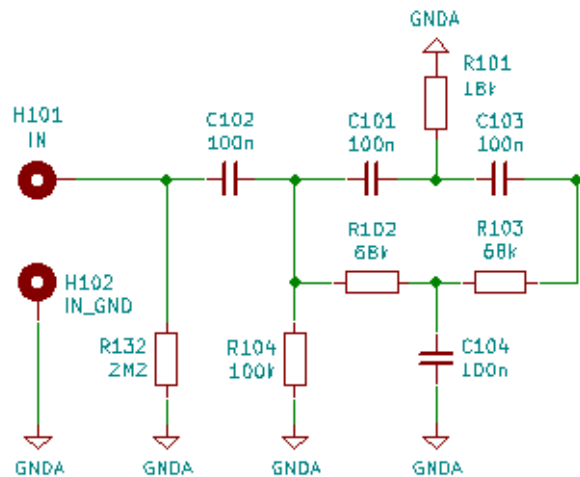
This RC network compensates phase at LF end

90° phasing circuit - schematic

Input HPF and 32 Hz notch filter to prevent saturation of phasing circuit. All capacitors should be linear.

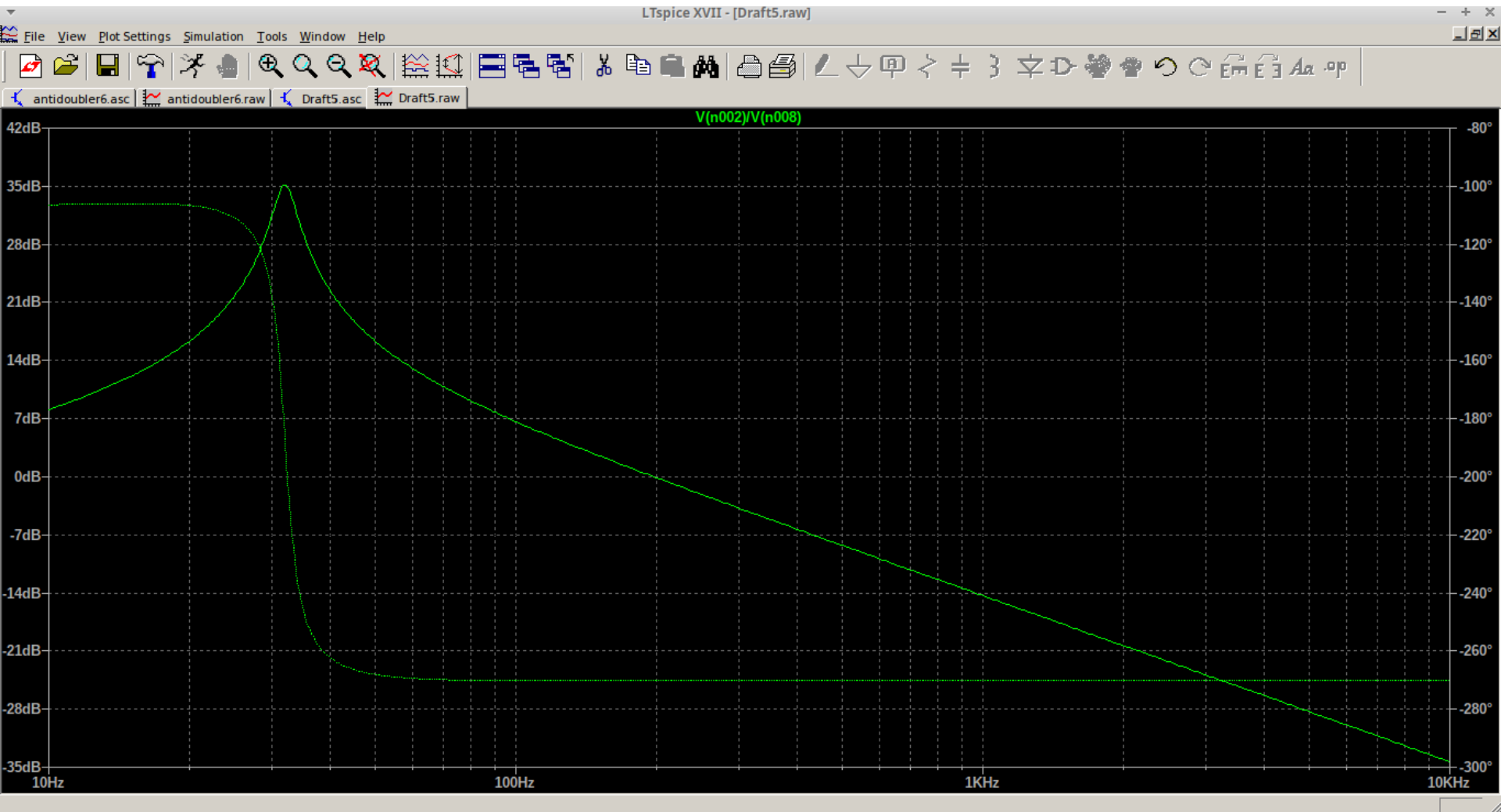
Input amplifier
The 2 470k resistors are matched with the DC Impedance of the Input filter and help reduce DC offset. When changing the Input filter, change this input current compensation as well. The 1u capacitor can be of any bipolar type.

90 degrees phasing circuit (Integrator with DC servo and phase compensation at LF end)
Maintains +90deg phase ($\pm 0.25\text{deg}$) from 67 Hz and higher.
It has a "resonance" at 32 Hz which is the reason for notch filter on Input.
The 47n and 10u capacitors should be linear, the rest is not so critical.



This RC network compensates phase at LF end

90° phasing circuit - characteristics





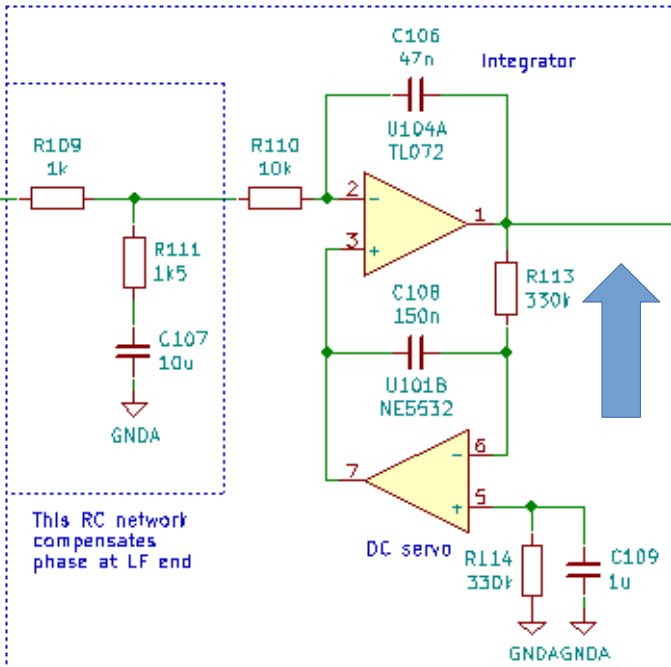
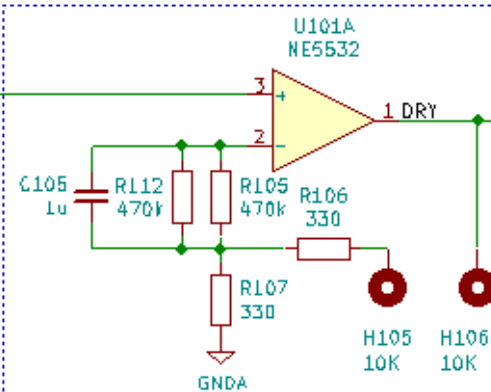
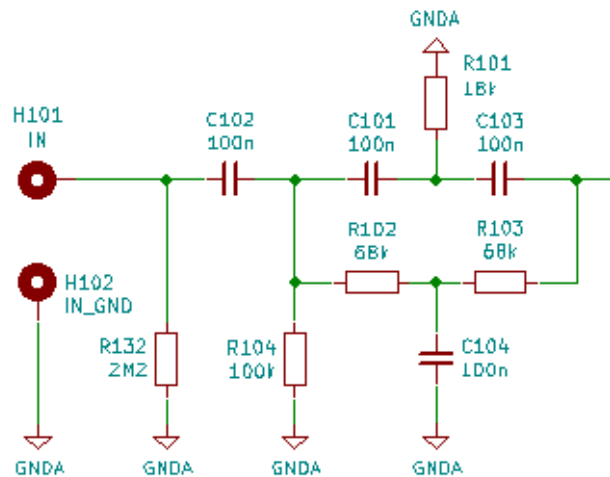
90° phasing circuit - schematic

Input HPF and 32 Hz notch filter to prevent saturation of phasing circuit. All capacitors should be linear.

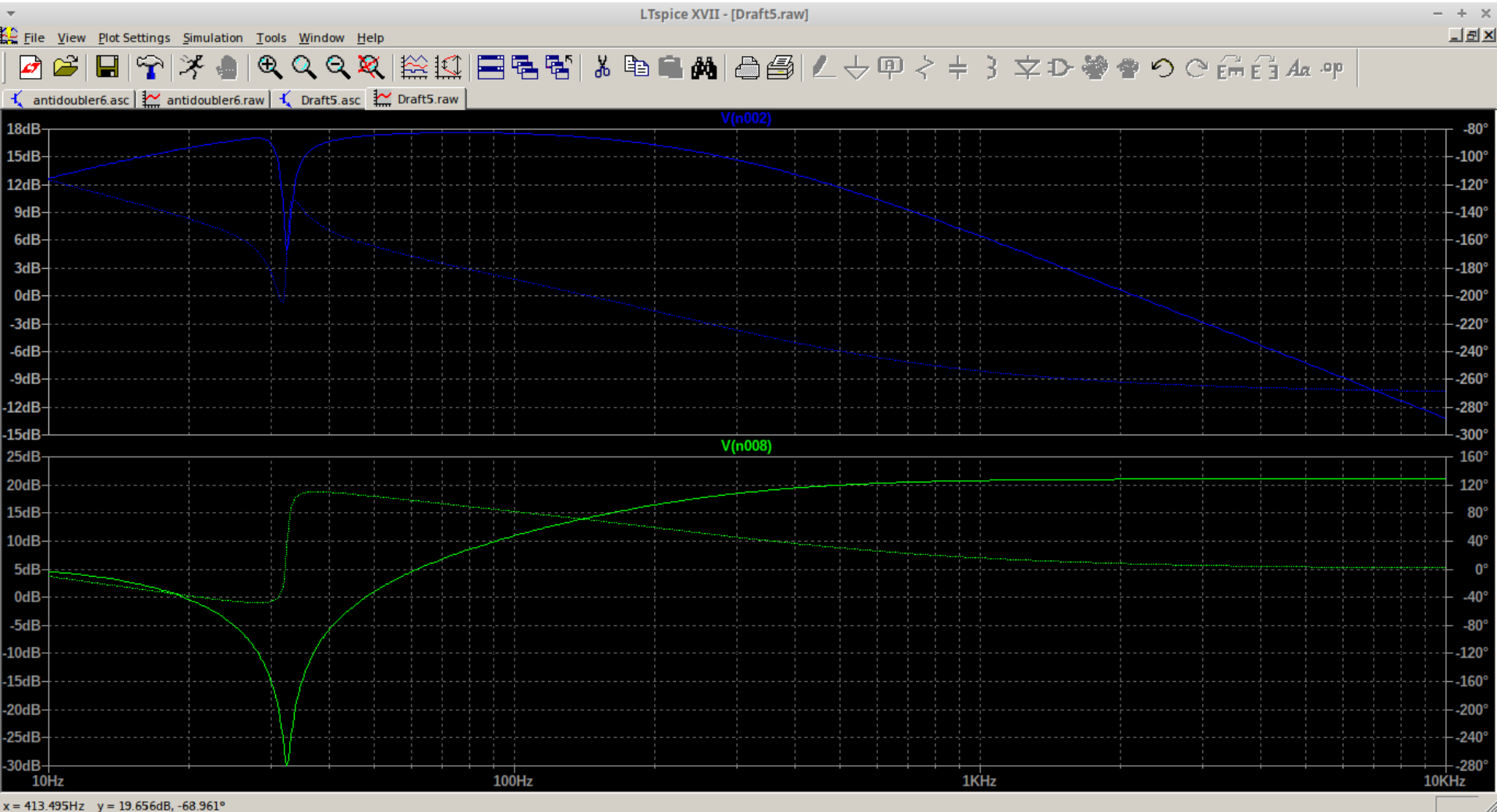
Input amplifier

The 2 470k resistors are matched with the DC Impedance of the Input filter and help reduce DC offset. When changing the Input filter, change this input current compensation as well. The 1u capacitor can be of any bipolar type.

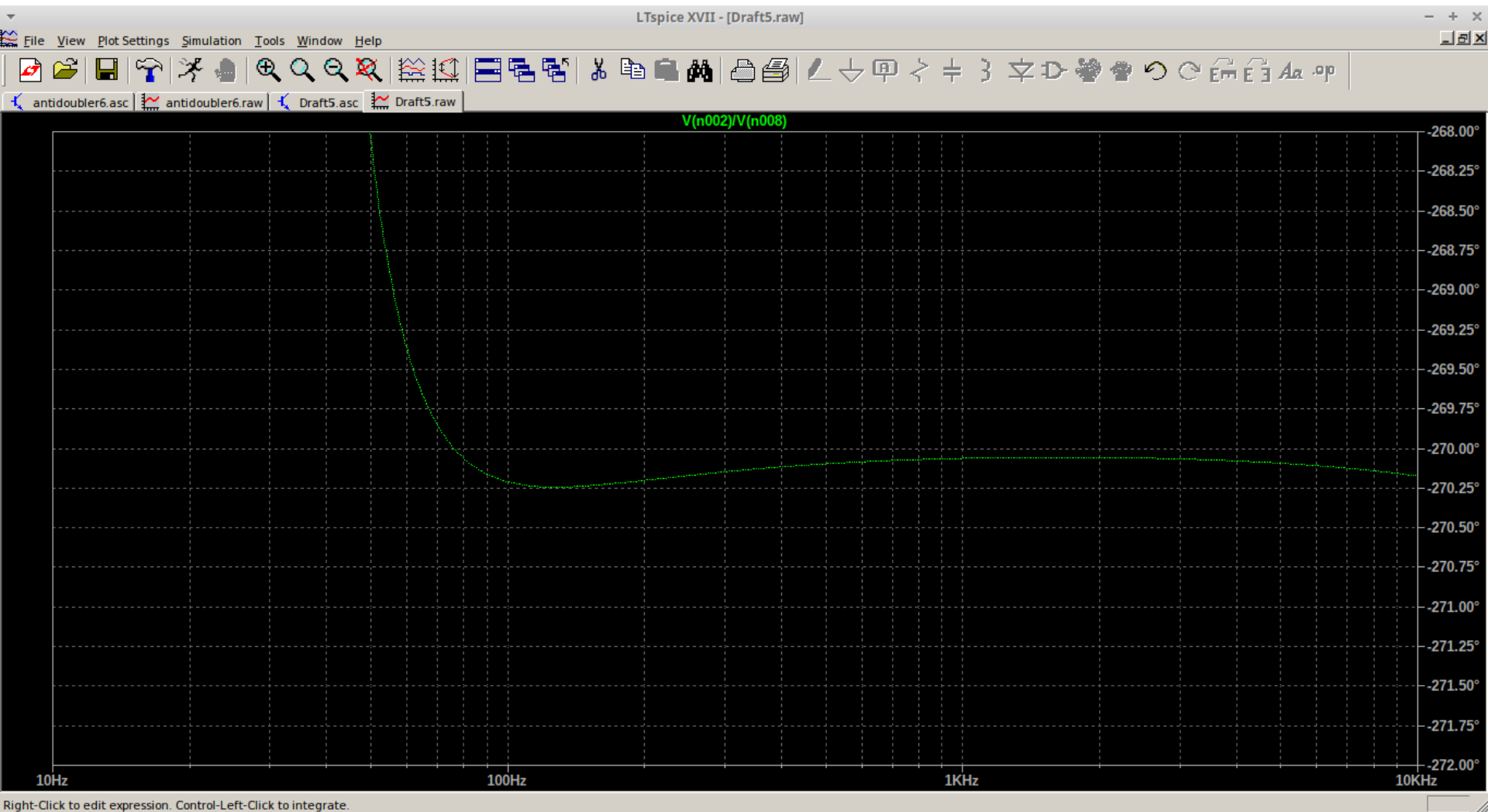
90 degrees phasing circuit (Integrator with DC servo and phase compensation at LF end)
Maintains +90deg phase ($\pm 0.25\text{deg}$) from 67 Hz and higher.
It has a "resonance" at 32 Hz which is the reason for notch filter on Input.
The 47n and 10u capacitors should be linear, the rest is not so critical.



90° phasing circuit – notch filter

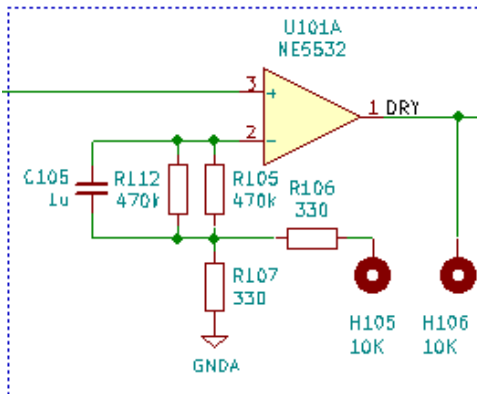


90° phasing circuit – phase accuracy

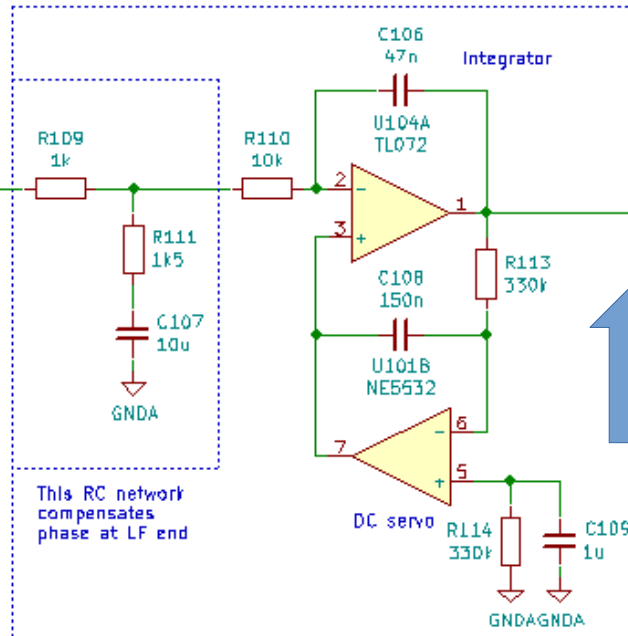


Extreme detector - schematic

Input amplifier
The 2 470k resistors are matched with the DC impedance of the input filter and help reduce DC offset. When changing the input filter, change this input current compensation as well. The 1u capacitor can be of any bipolar type.

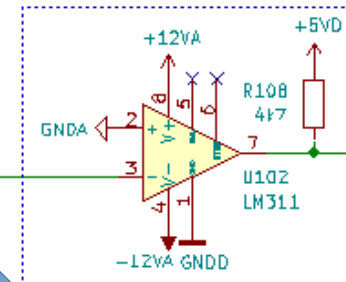


90 degrees phasing circuit (Integrator with DC servo and phase compensation at LF end)
Maintains +90deg phase ($\pm 0.25\text{deg}$) from 67 Hz and higher.
It has a "resonance" at 32 Hz which is the reason for notch filter on input.
The 47n and 10u capacitors should be linear, the rest is not so critical.

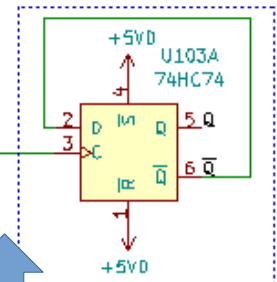


This RC network compensates phase at LF end

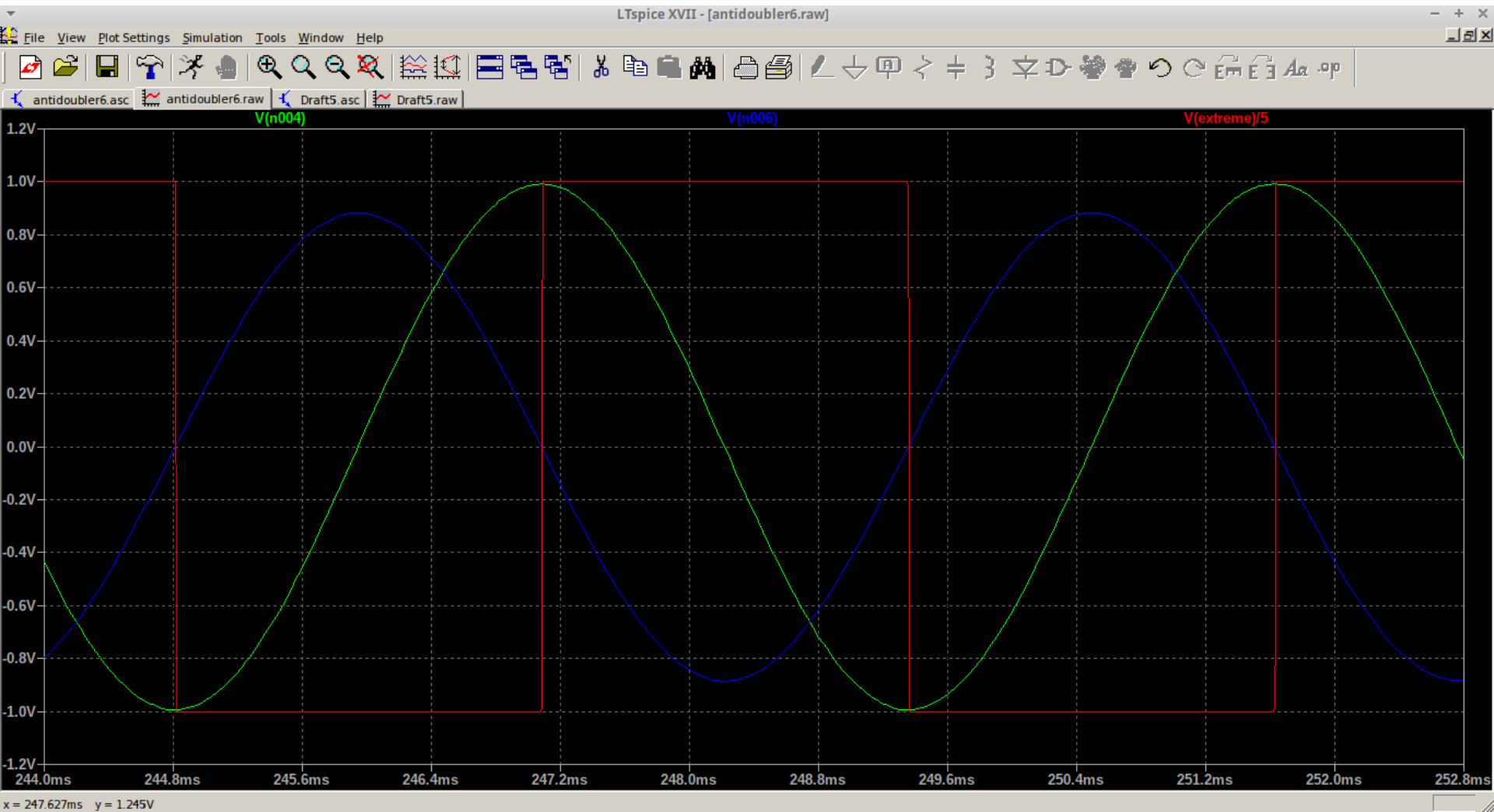
Detector of zero derivation
Detects the maximum or minimum of smooth periodic wave

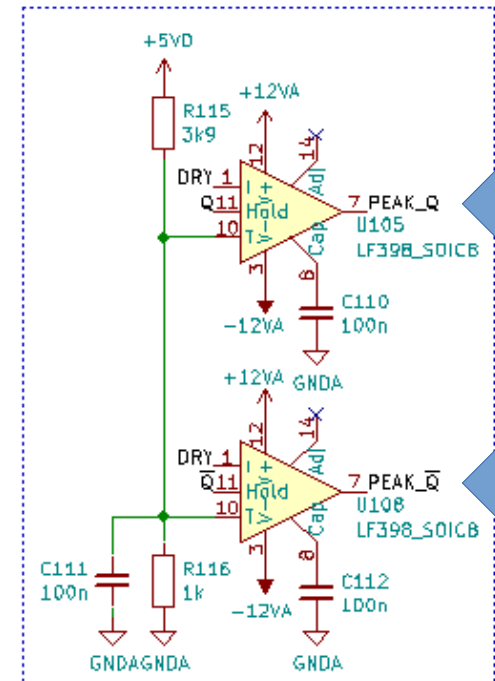


Clock generator detecting zero crossing of the phasing circuit

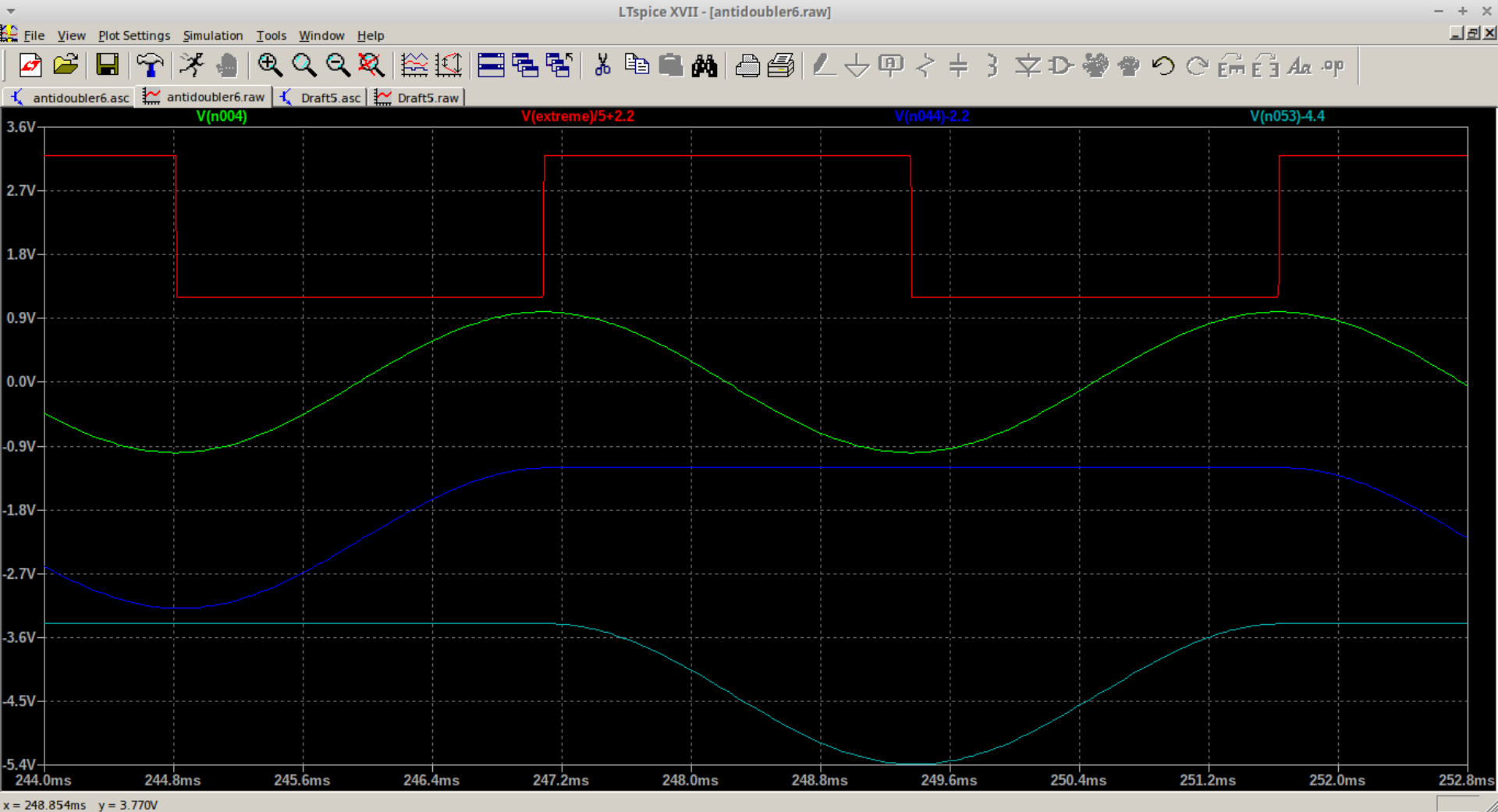


Extreme detector - waveforms



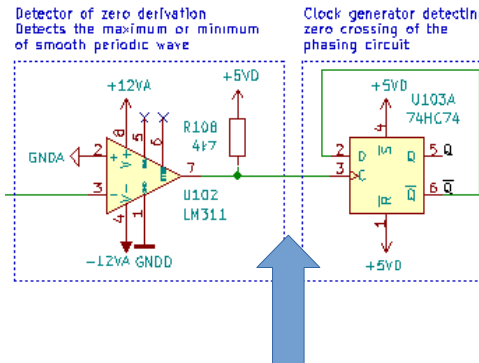


Synchronous extreme detectors

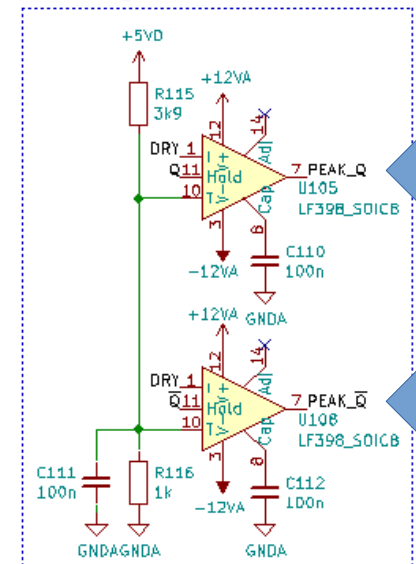




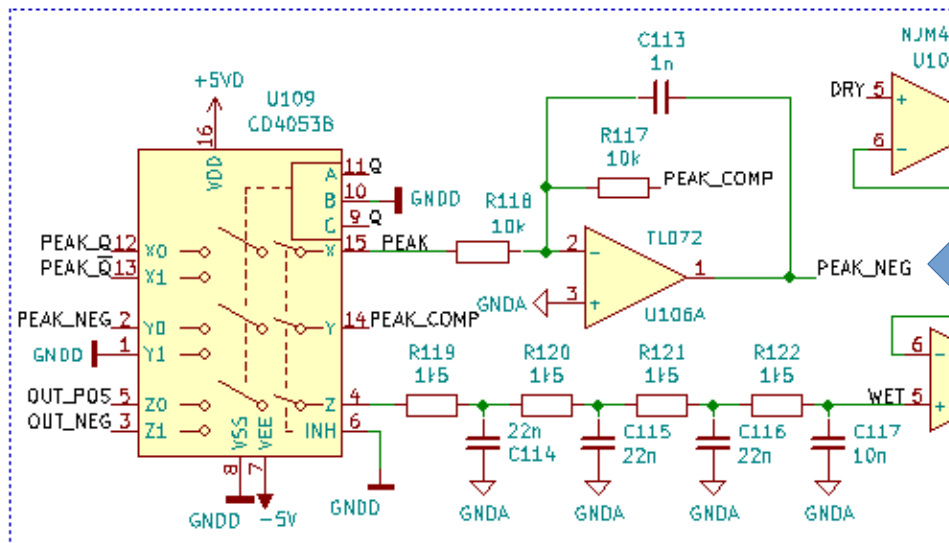
Synchronous extreme detectors



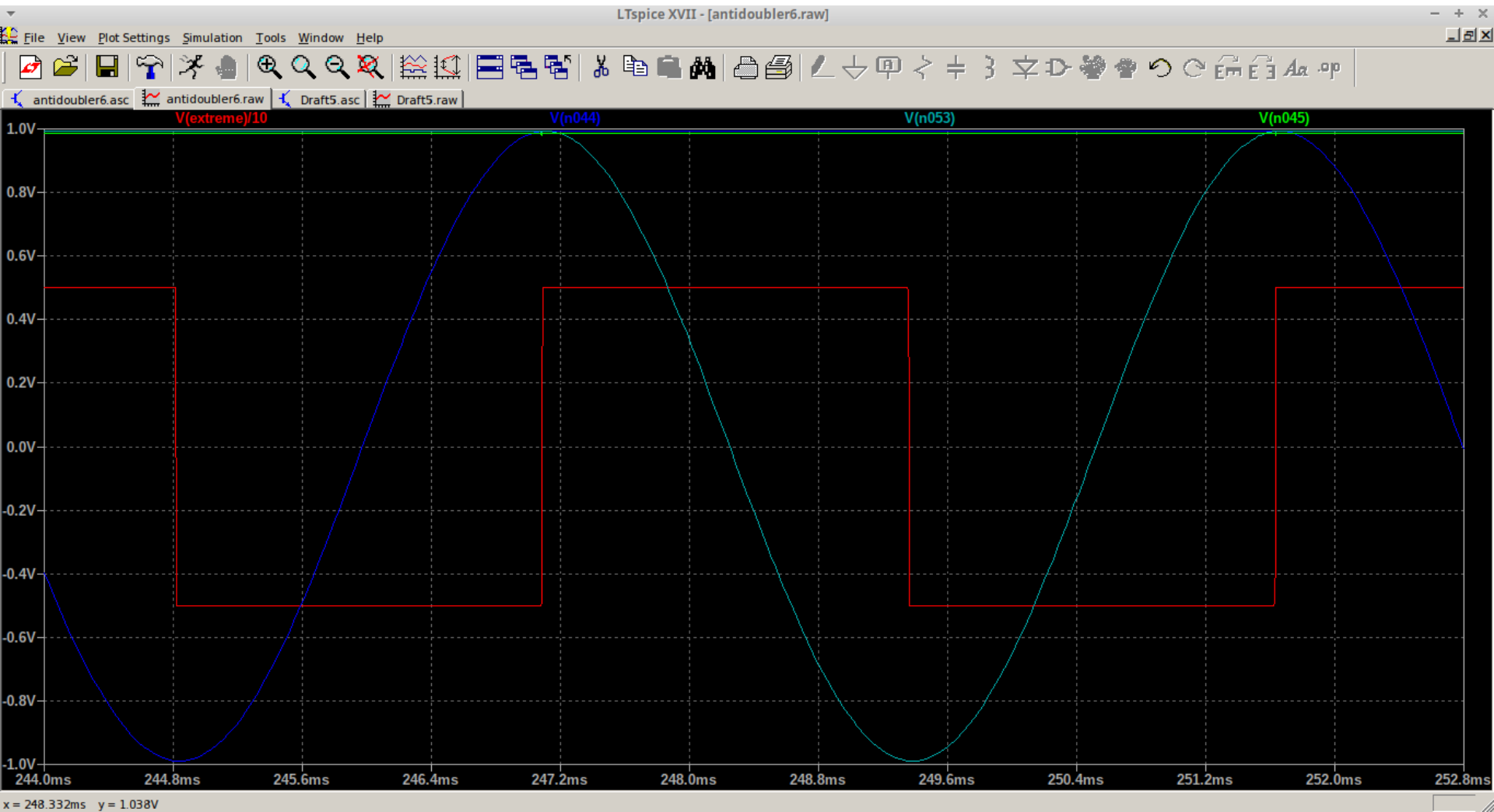
Peak detector, detects peaks synchronously by
detecting zero crossing of the phasing circuit
Capacitors can be of any type with low
self-discharge.



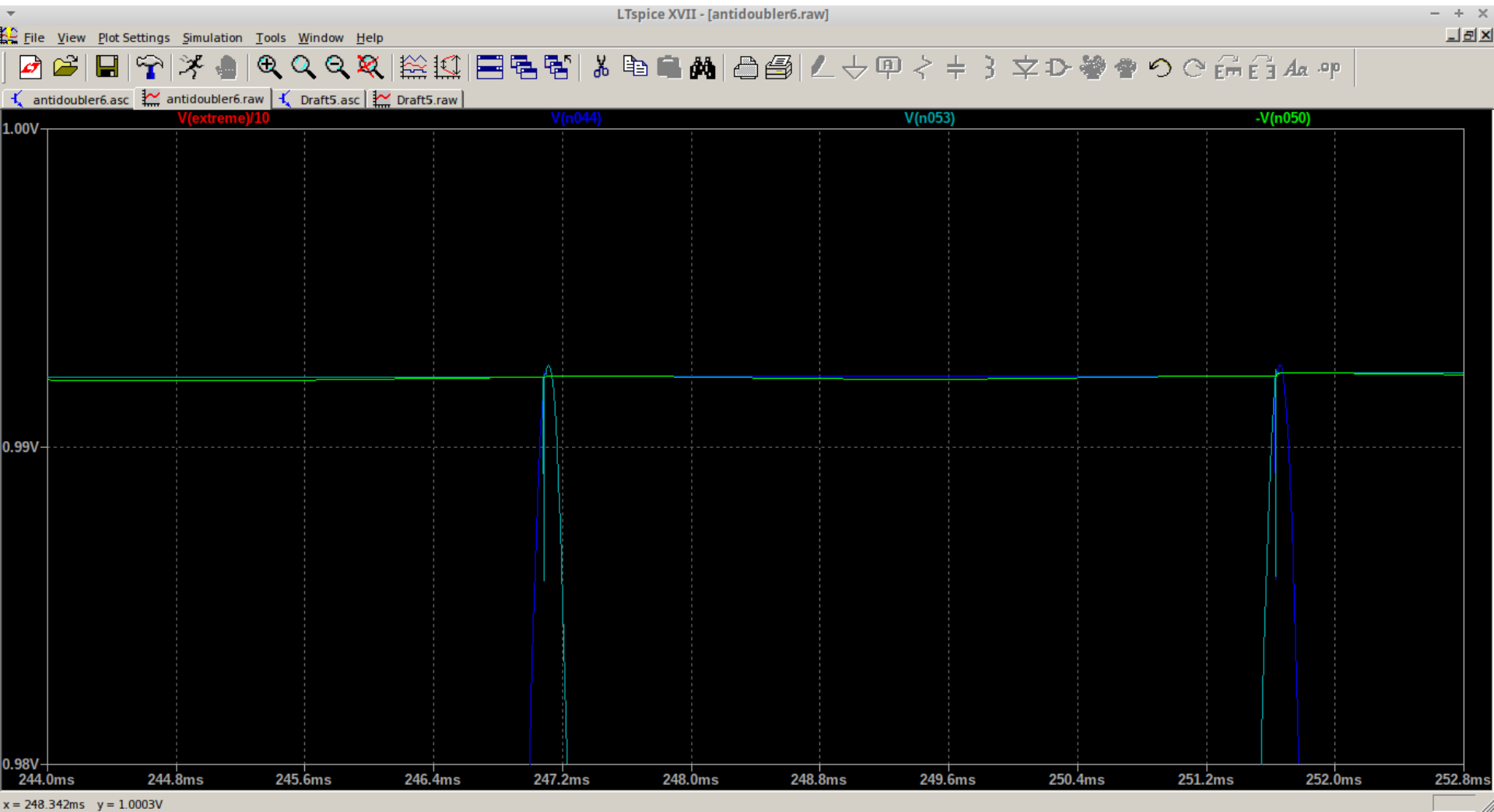
Analog switches which do most of the magic. Switch A switches between the two peak detectors
Switch B serves as a "compensating" switch which reduces the effect of switch resistance on the
Switch C switches polarity of the output waveform – required part of the transformation to half
All capacitors should be linear.



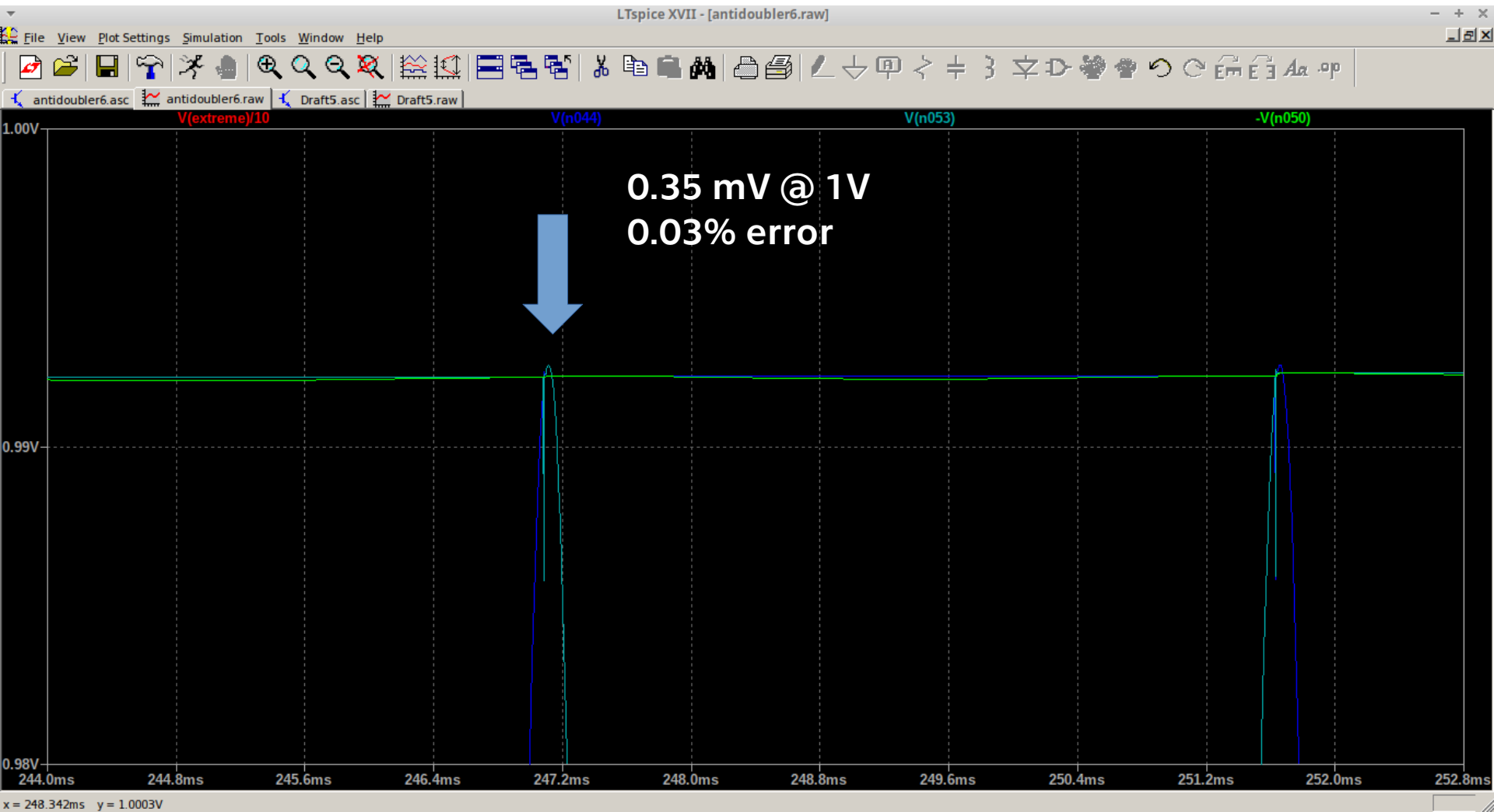
Synchronous extreme detectors



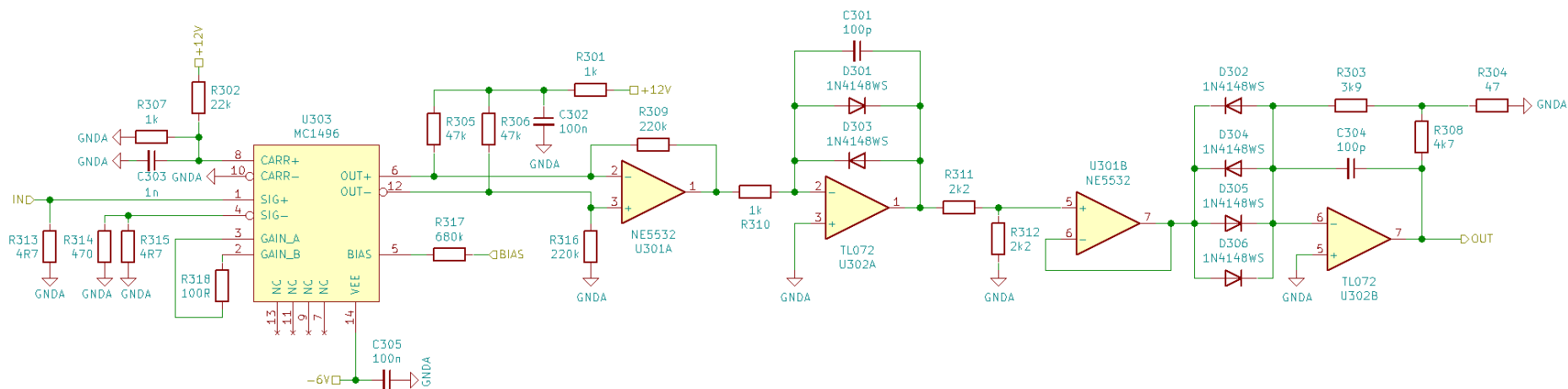
Synchronous extreme detector accuracy



Synchronous extreme detectors

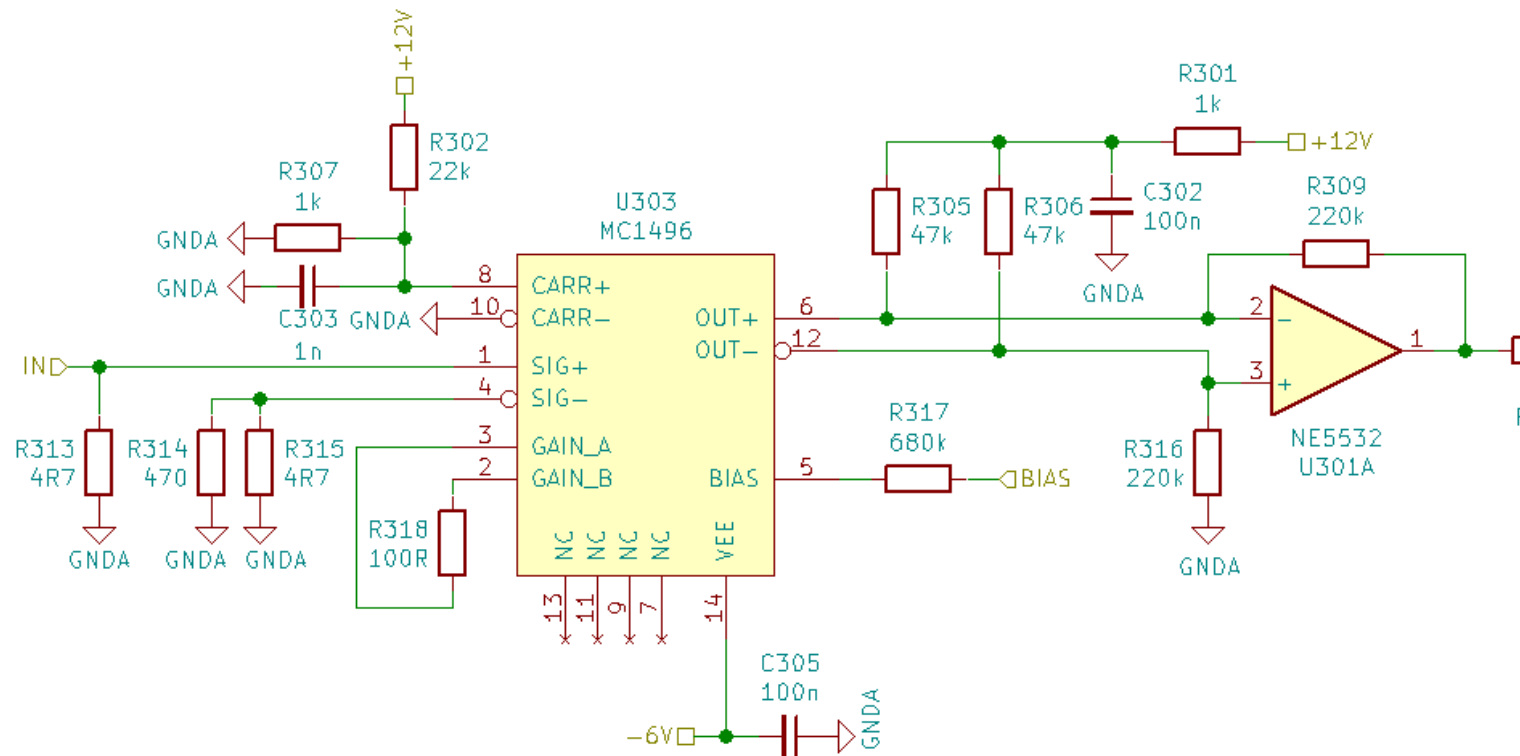


Square root finder - schematic

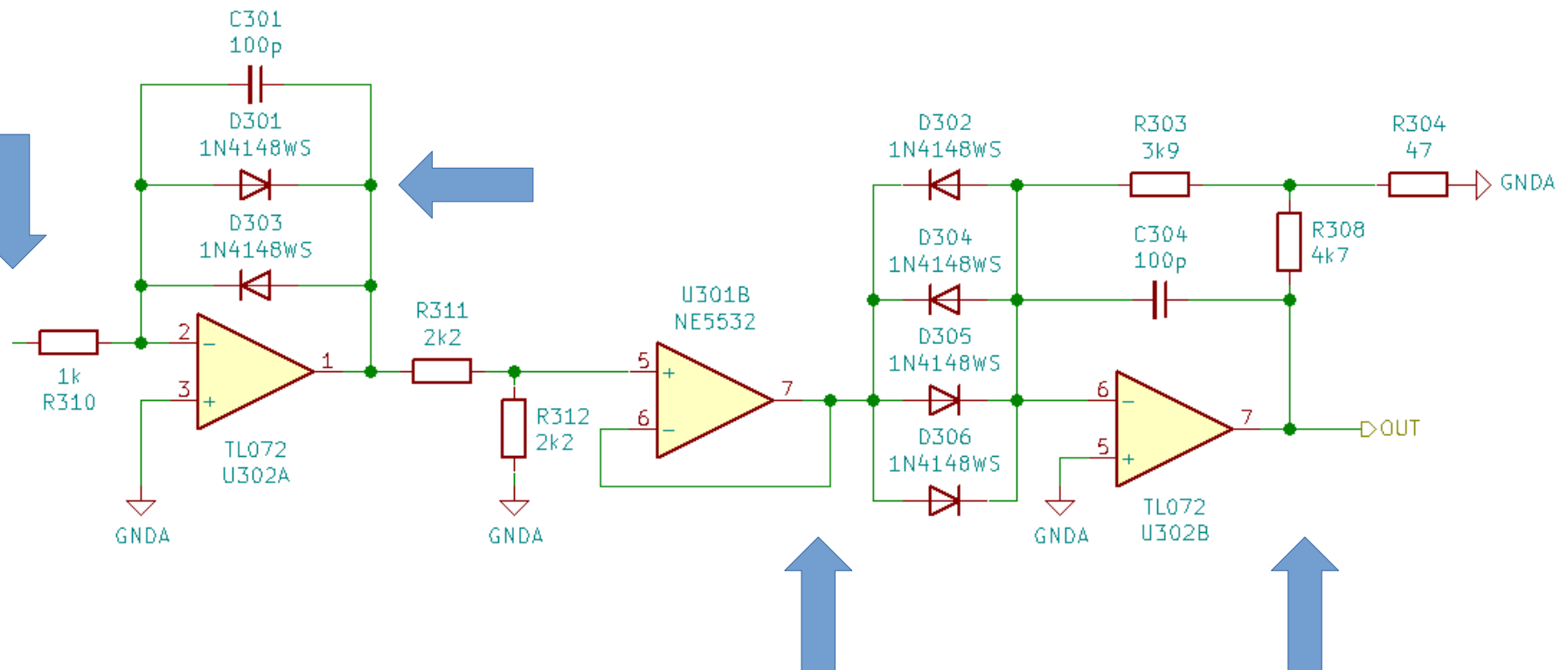




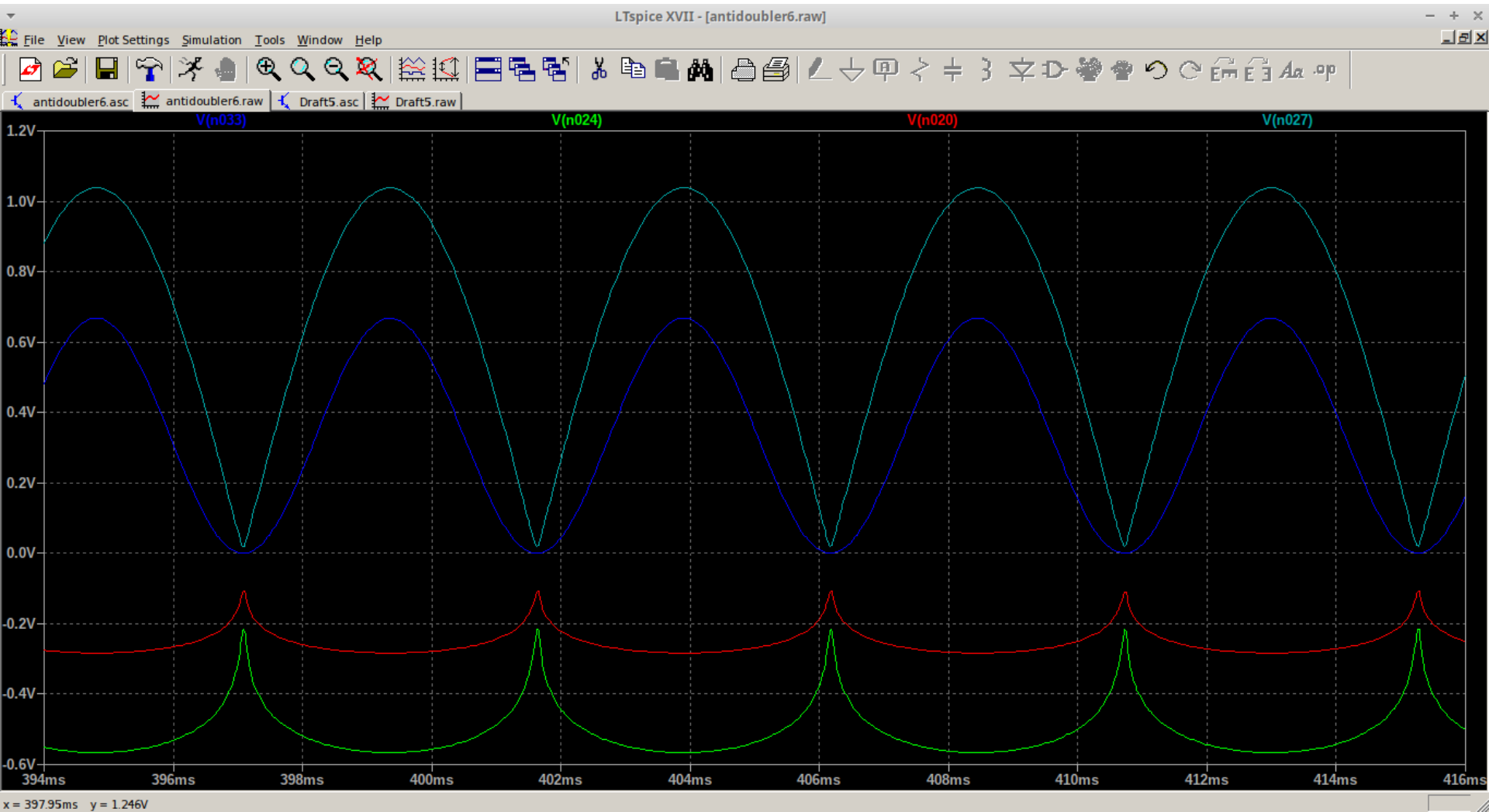
Square root finder – gain control



Square root finder – square root cell



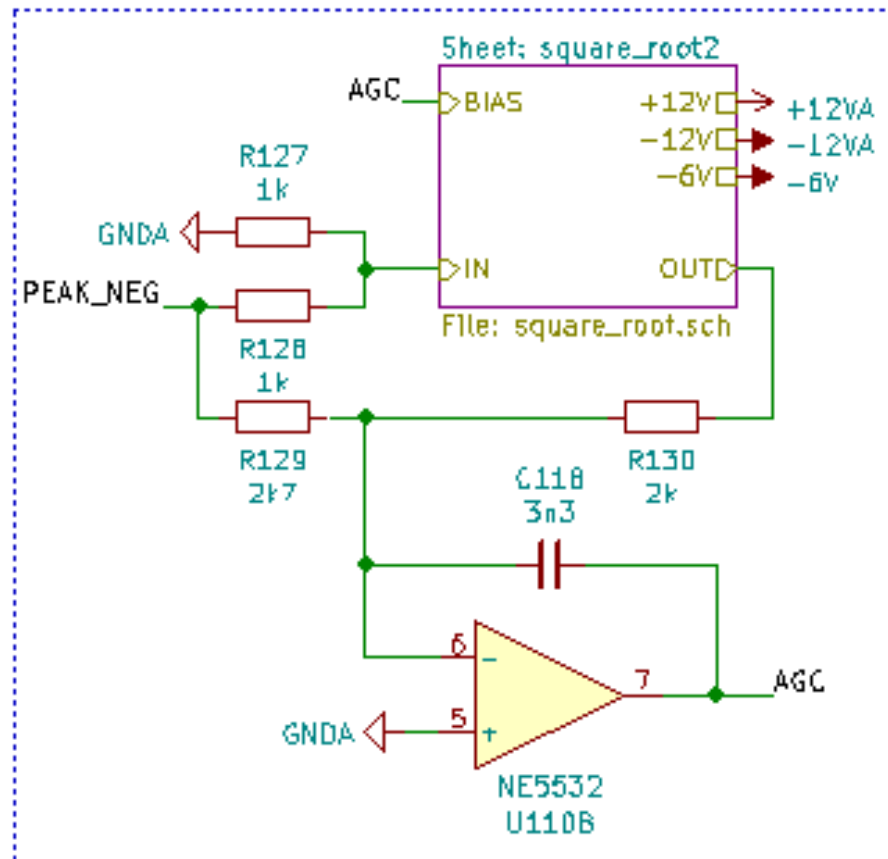
Square root finder - waveforms

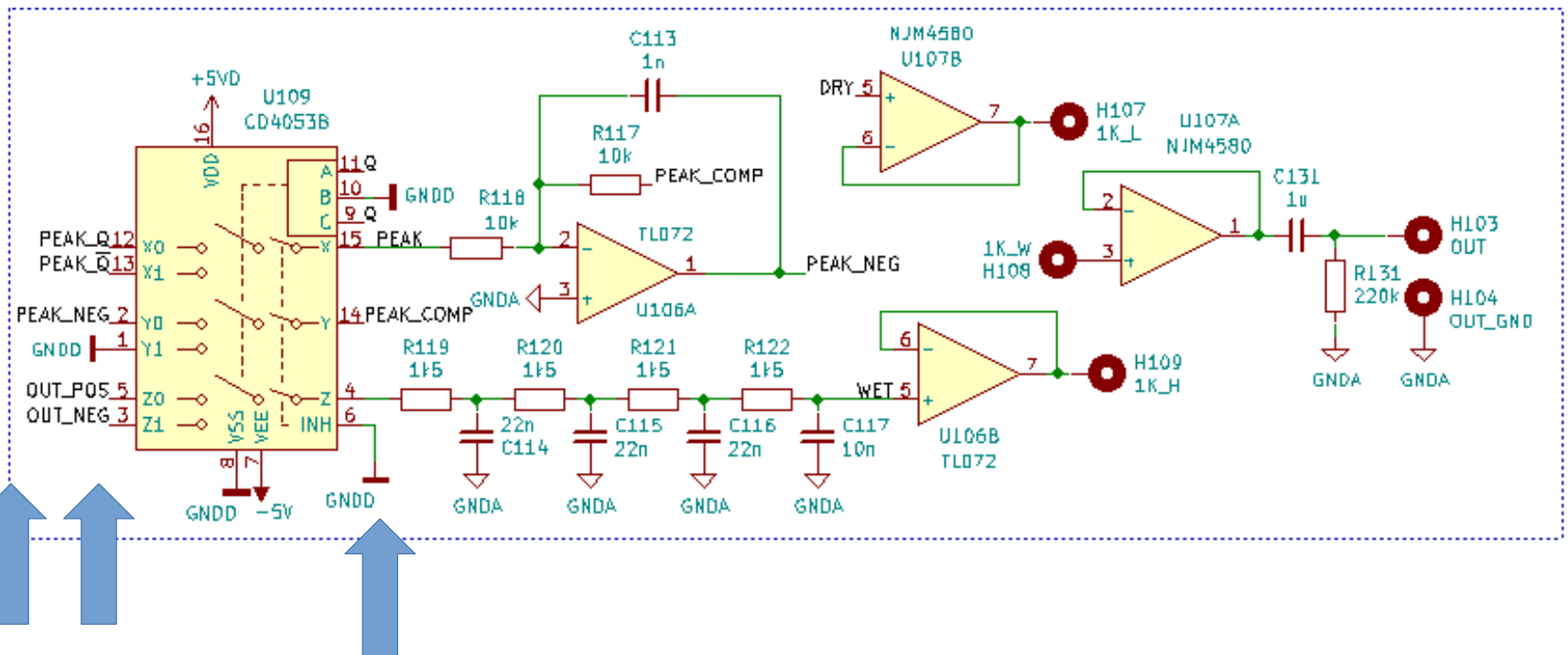




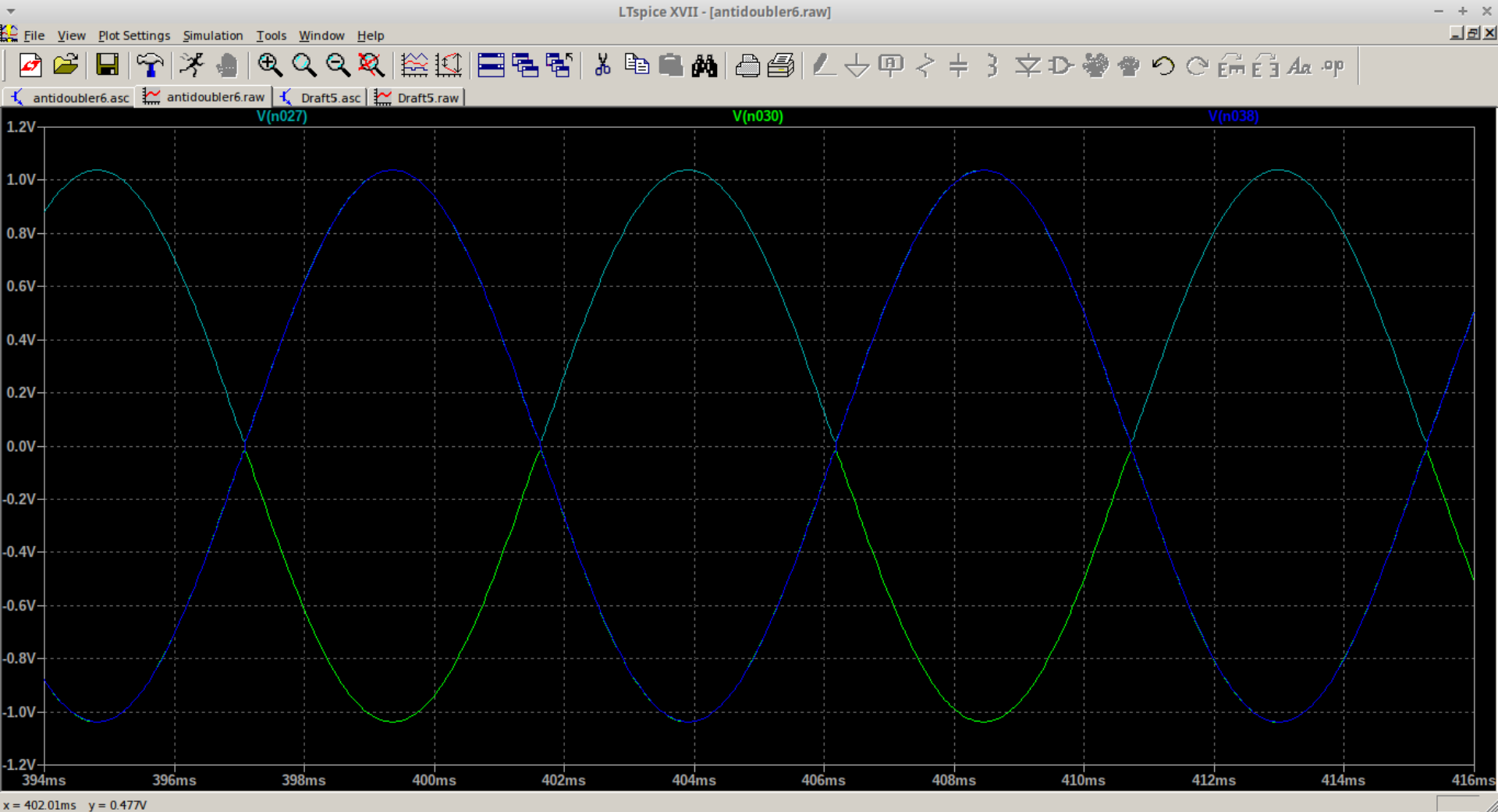
Square root finder – AGC feedback

AGC circuit which computes gain for the main square root circuit. The capacitor is noncritical.





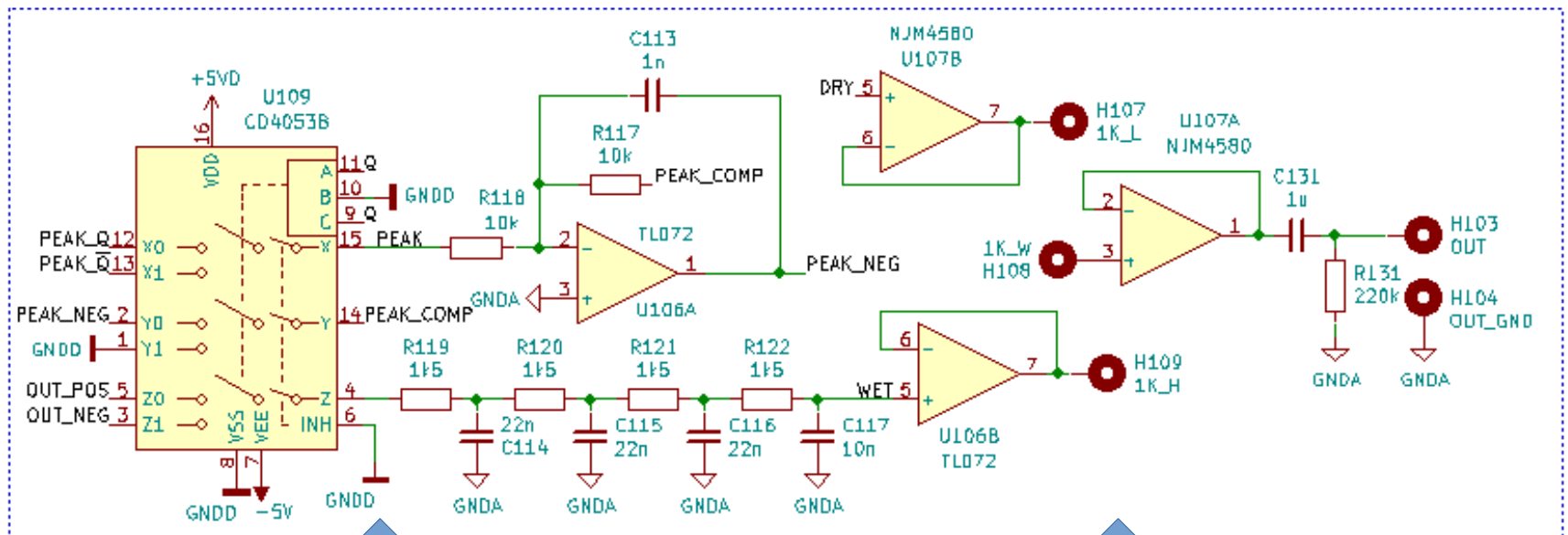
Polarity inverter - waveforms



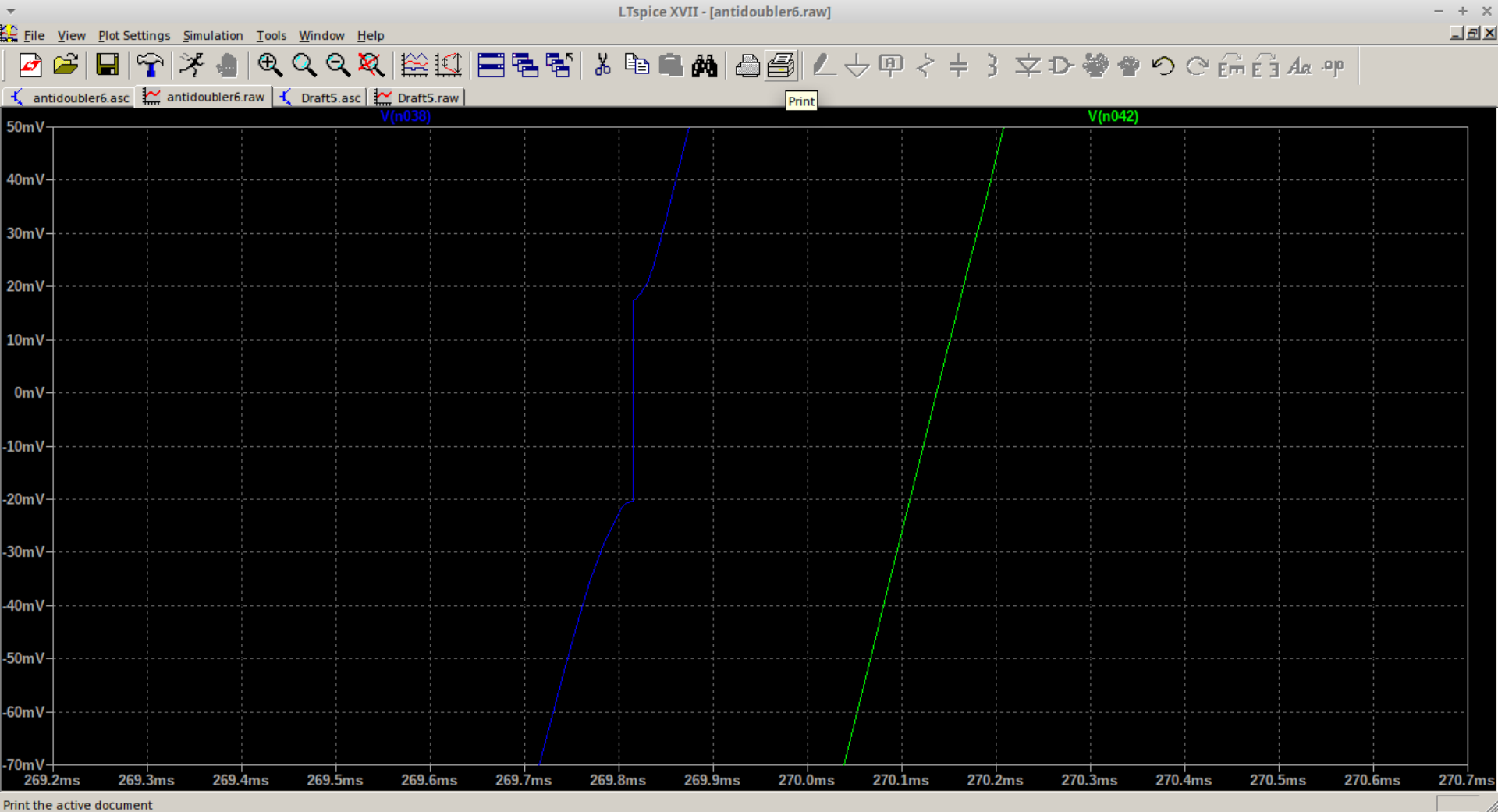


Polarity inverter - schematics

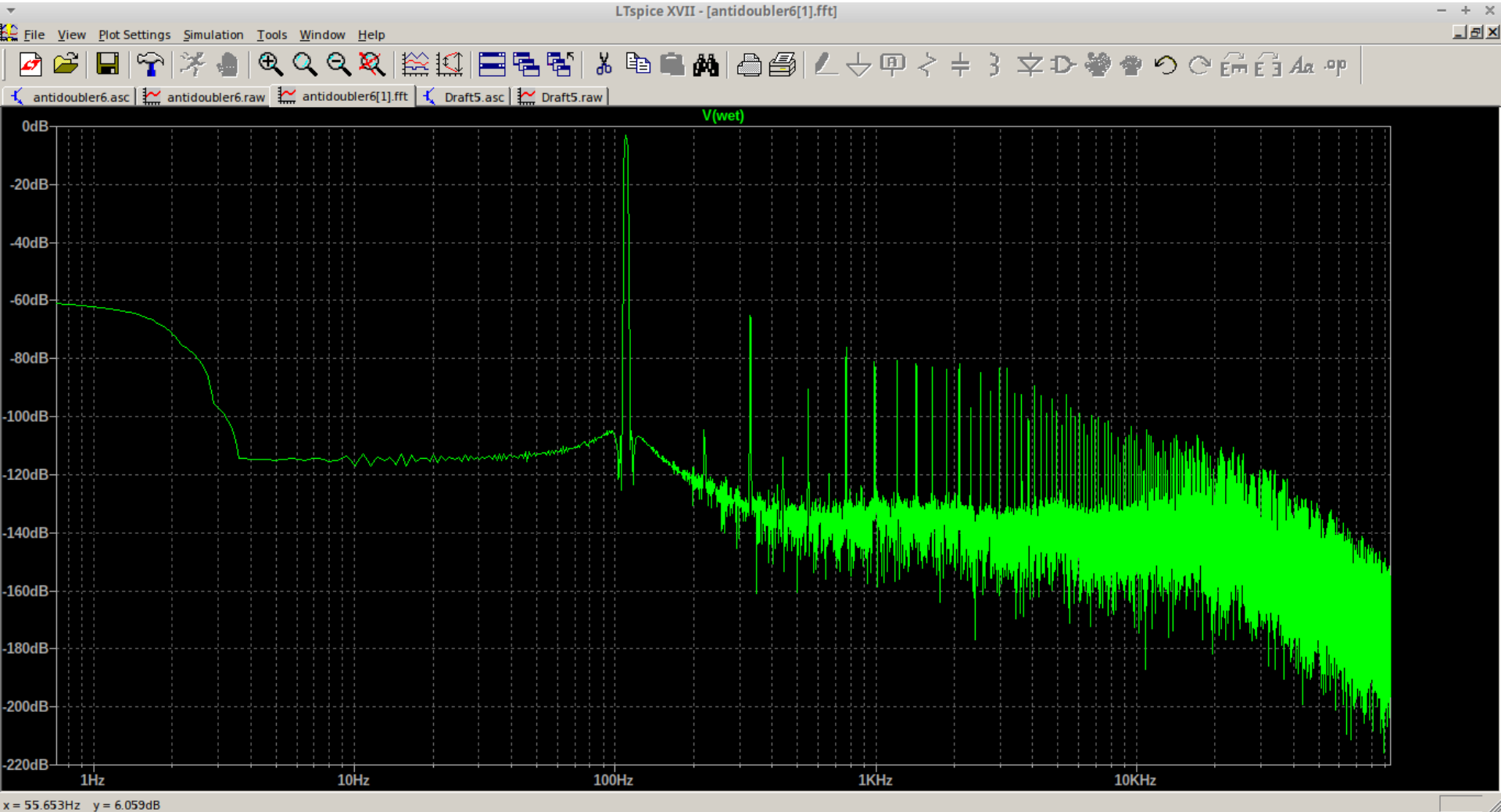
Analog switches which do most of the magic. Switch A switches between the two peak detectors.
Switch B serves as a "compensating" switch which reduces the effect of switch resistance on the performance of the inverting amplifier.
Switch C switches polarity of the output waveform – required part of the transformation to half frequency
All capacitors should be linear.



Polarity inverter – crossover distortion



Output signal FFT



Output signal FFT - magnified

