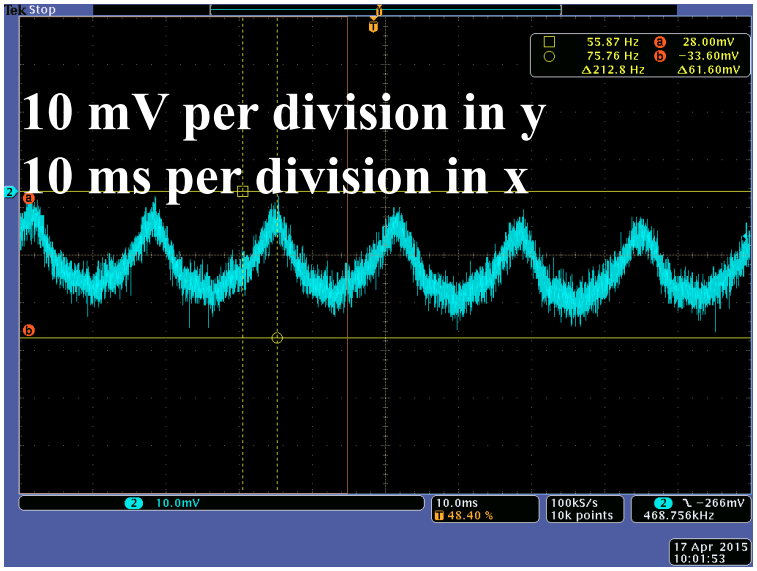
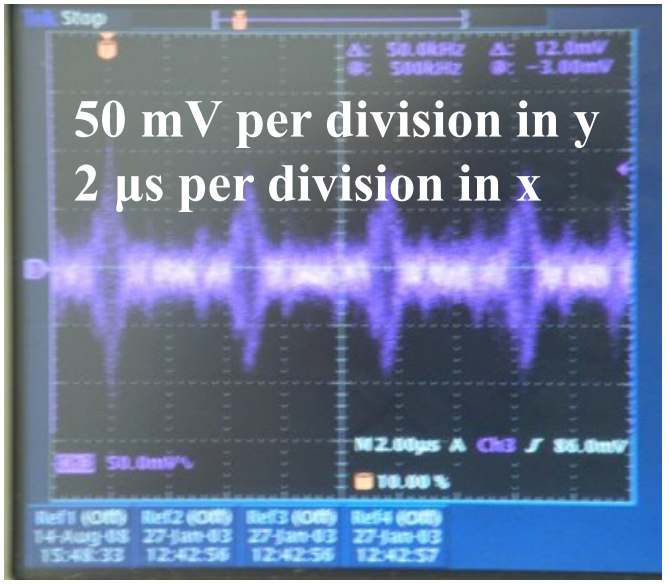
# Polarimeter update

Mike, Nathan, Ross and Robert

# Problems



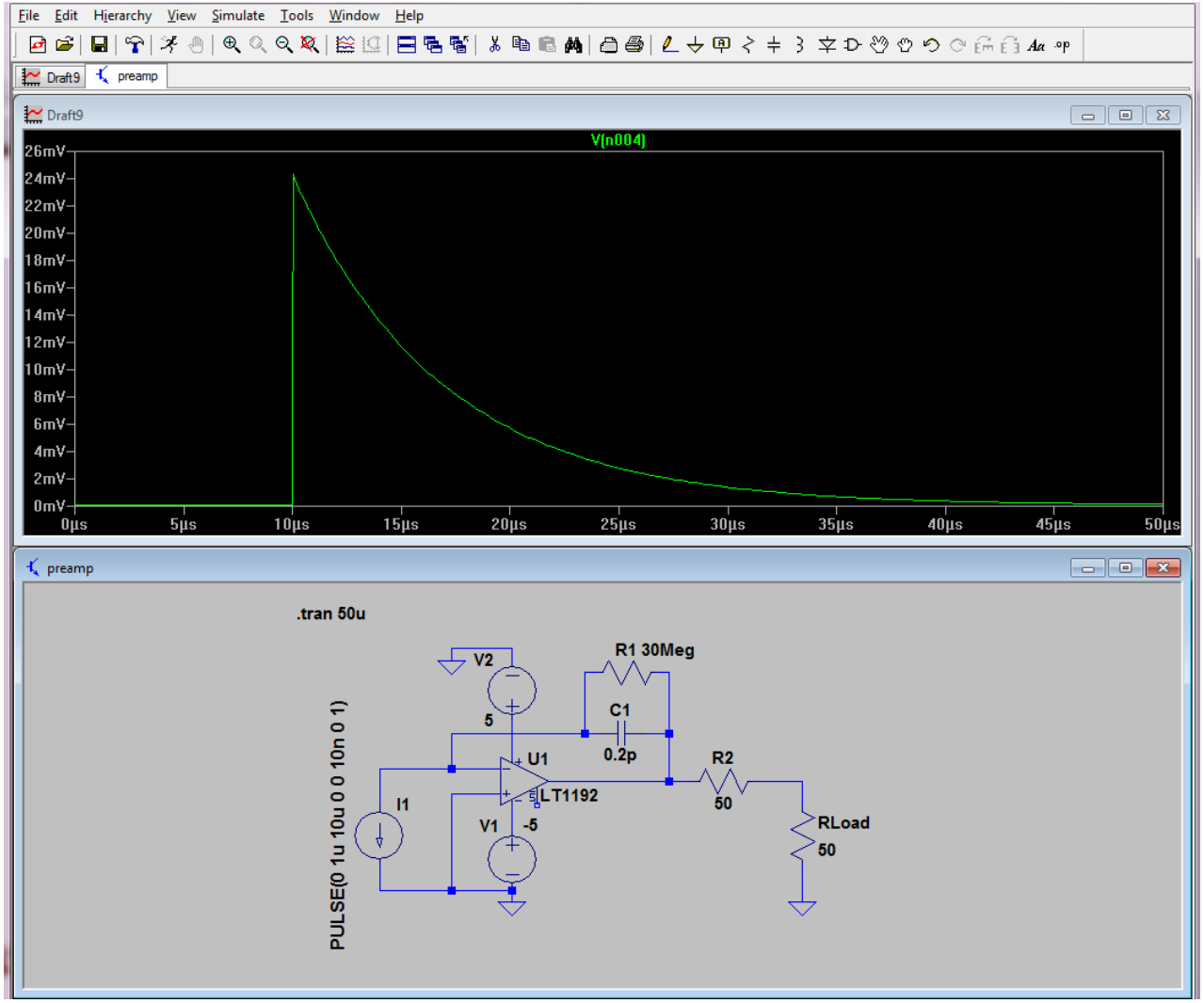

Baseline problem



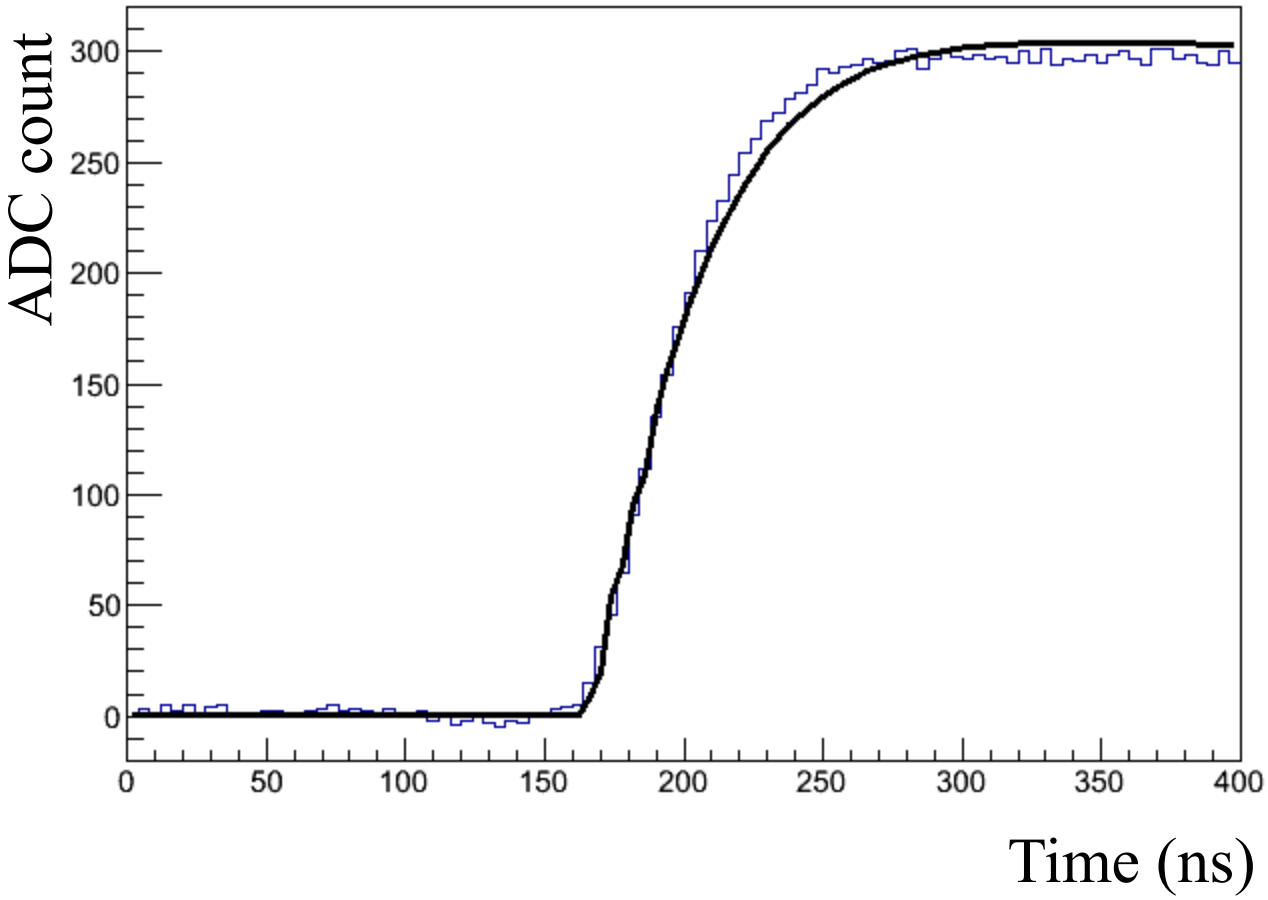

Chirping problem

- Rate problem: Rates were too low for the beam current used in Spring 2015

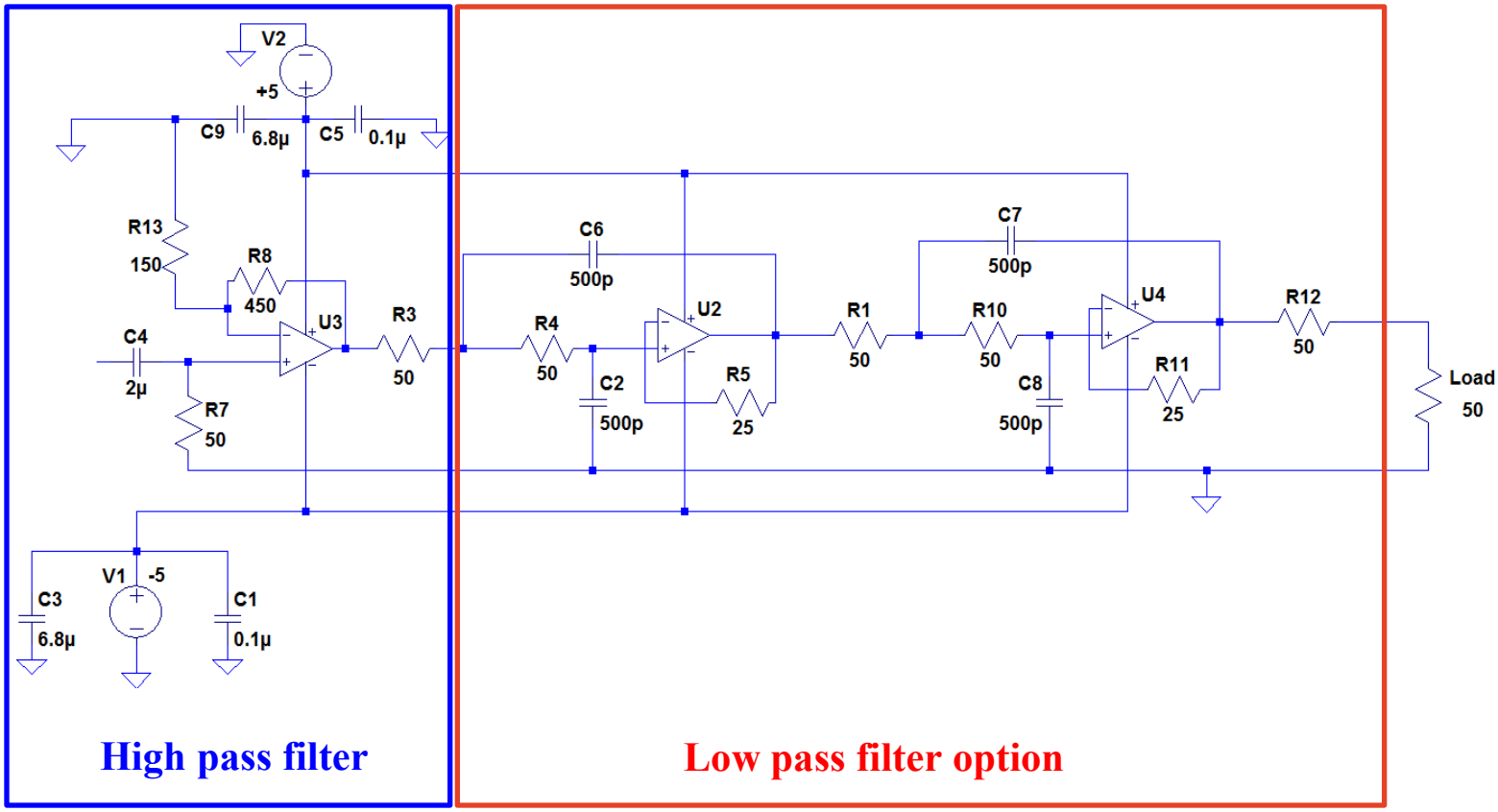
# LTSpice of preamp with current-pulse input



# Comparison of LTSpice output to Spring 2015 TPOL event



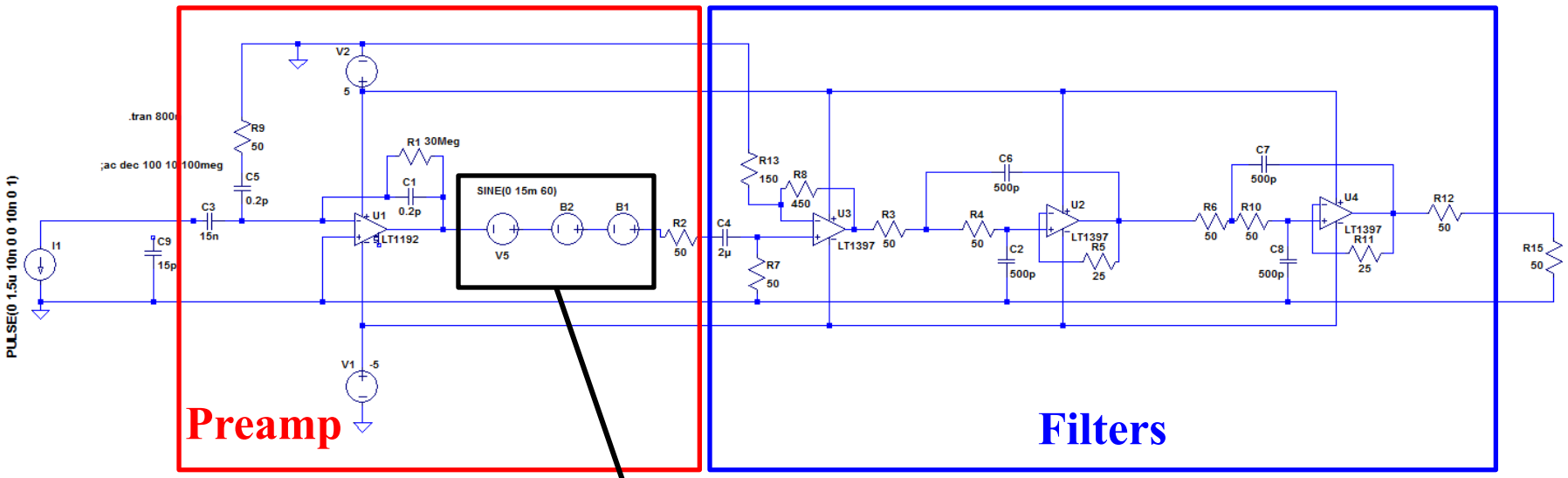
# Band pass filter schematic




- Jumpers (not shown) will allow for bypass of Low pass filter
- Fernando helped us to choose the type of op-amps (OPA690 series)
- All three op-amps come in a single package


ASU

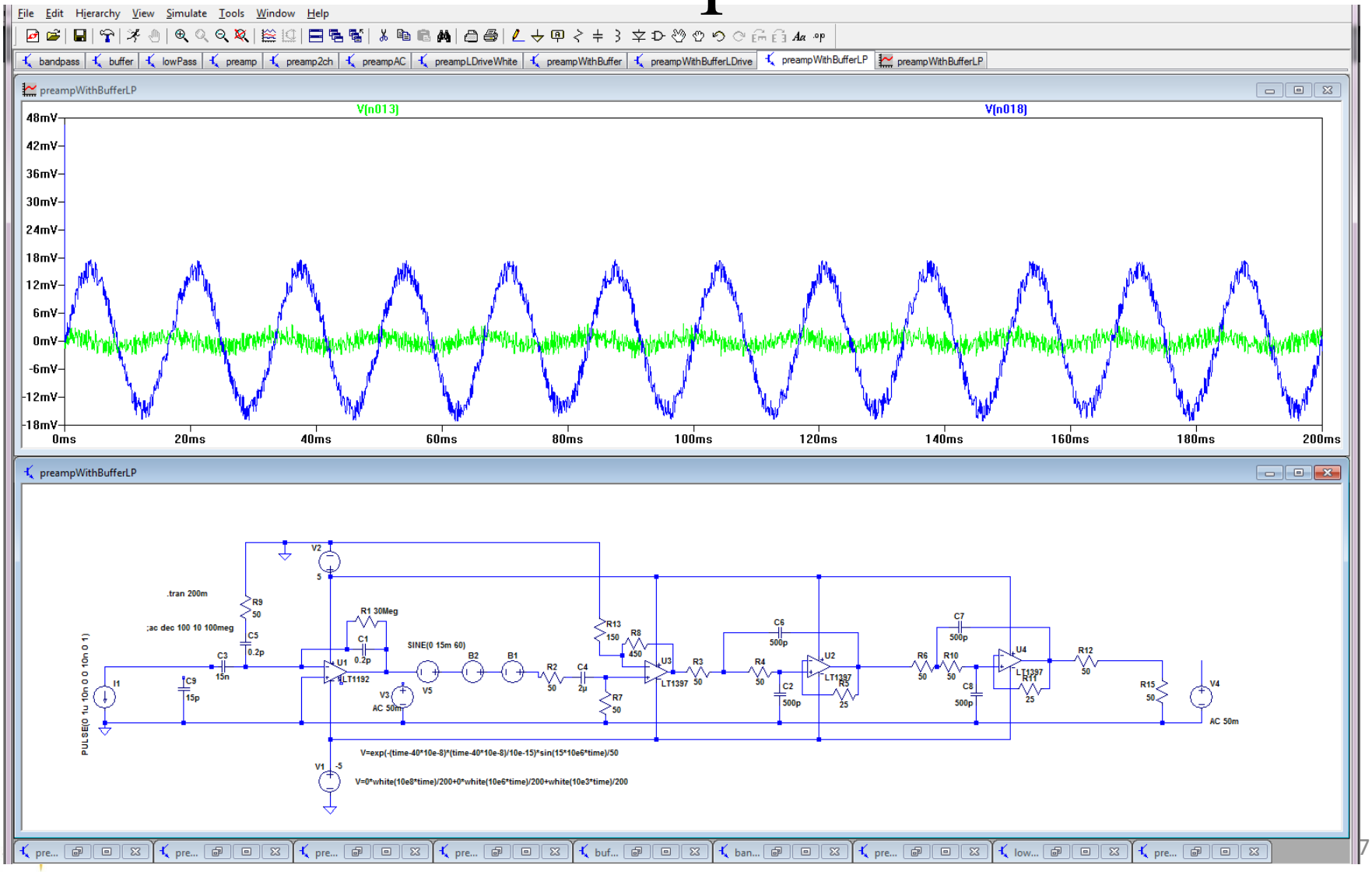
# Noise model



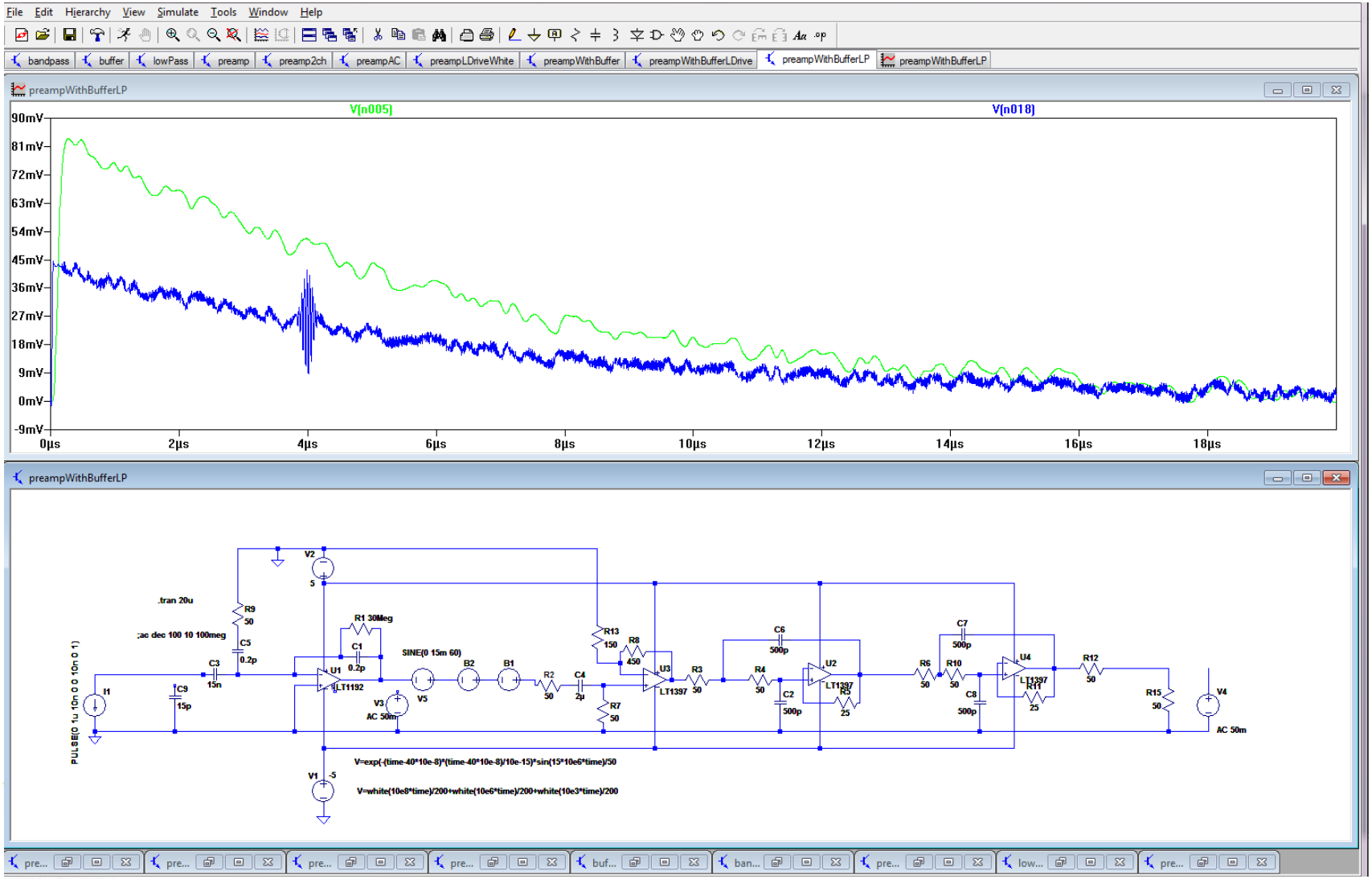

Noise injection:

- 60 Hz sine wave
- White noise
- Gaussian packet of 15 MHz

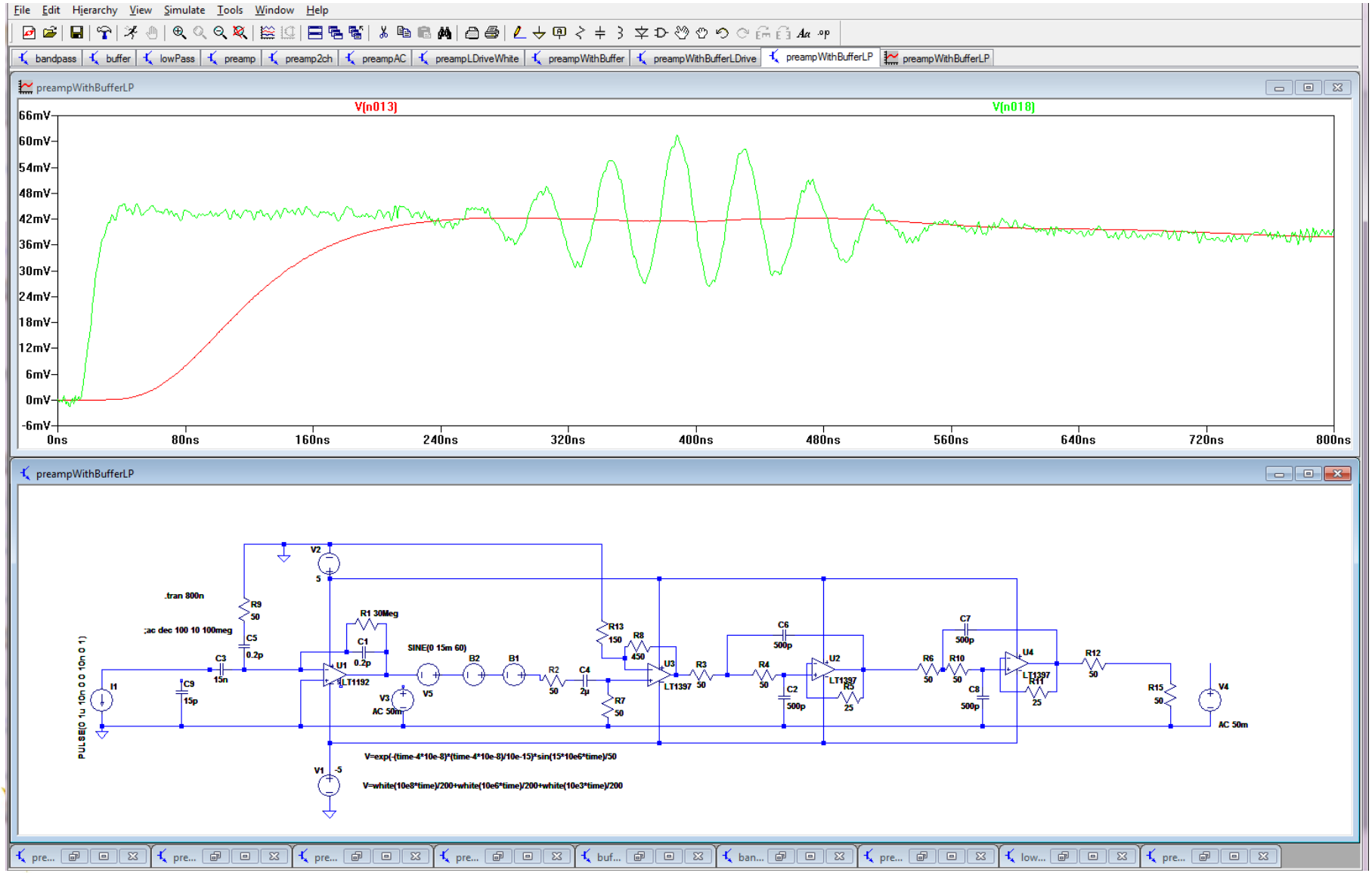
# Large time scale without 15MHz noise packet



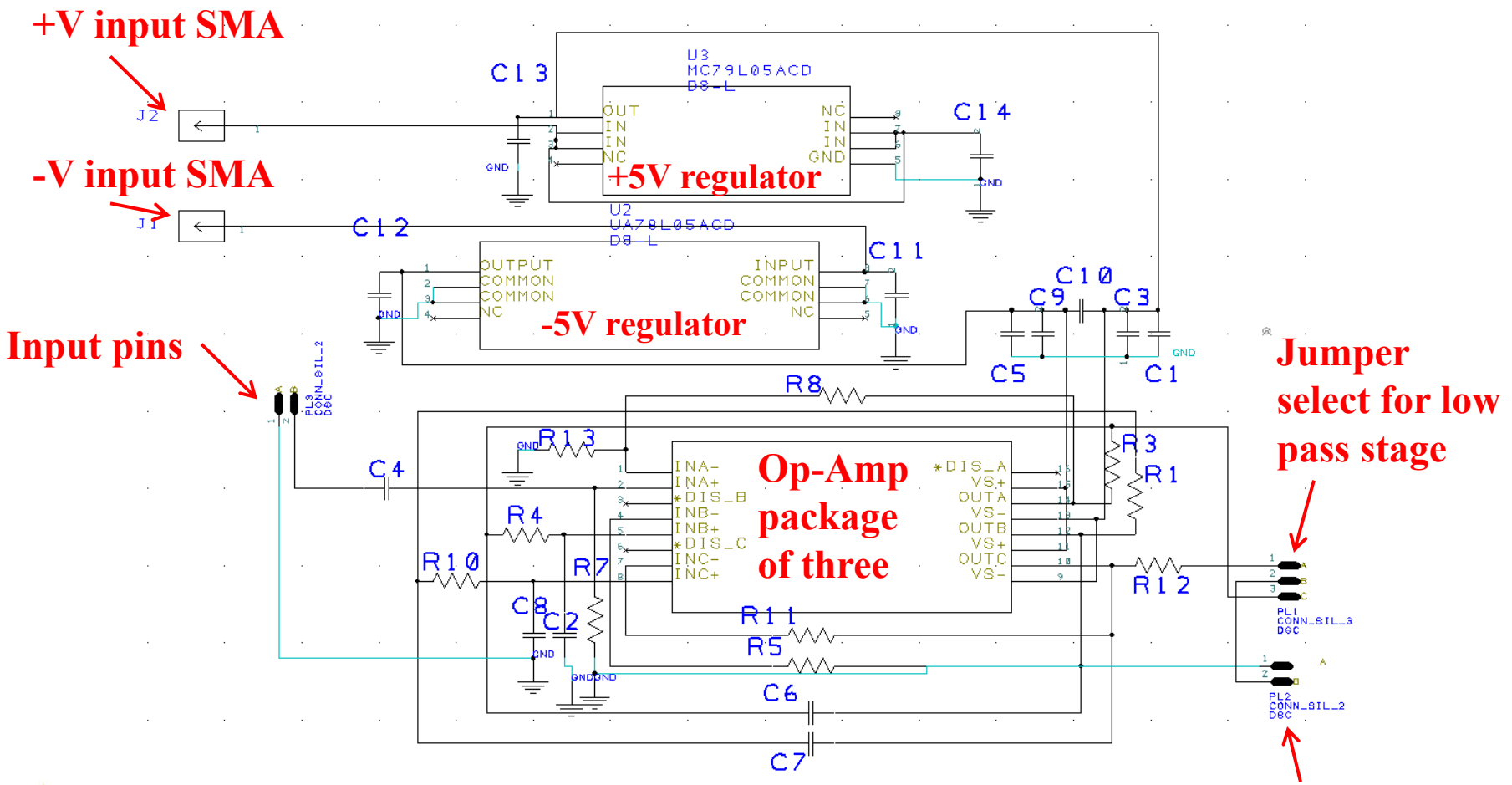
# Medium time scale including 15 MHz noise packet



# Small time scale



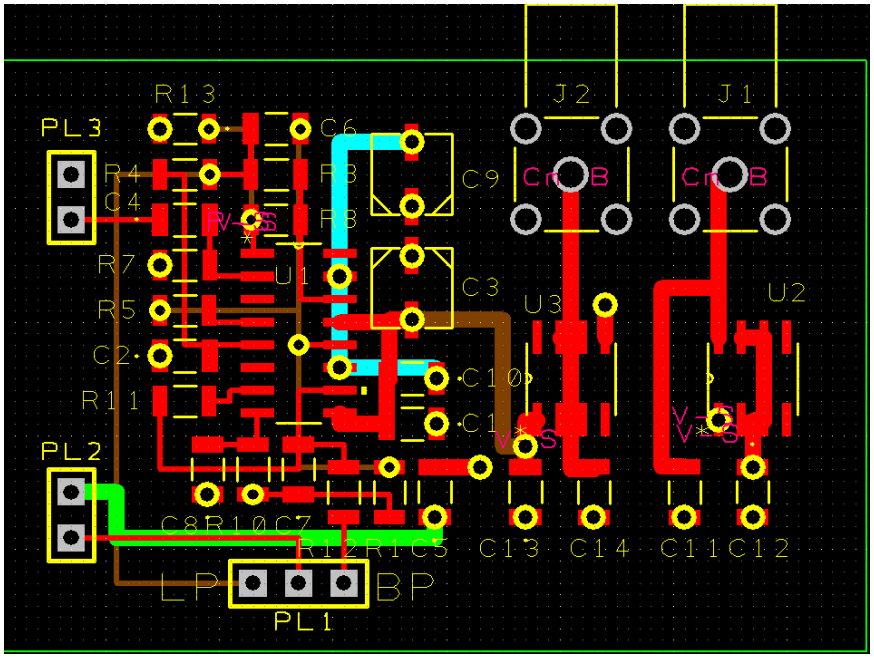
# 1-channel-filter circuit diagram in component form using DesignSpark PCB



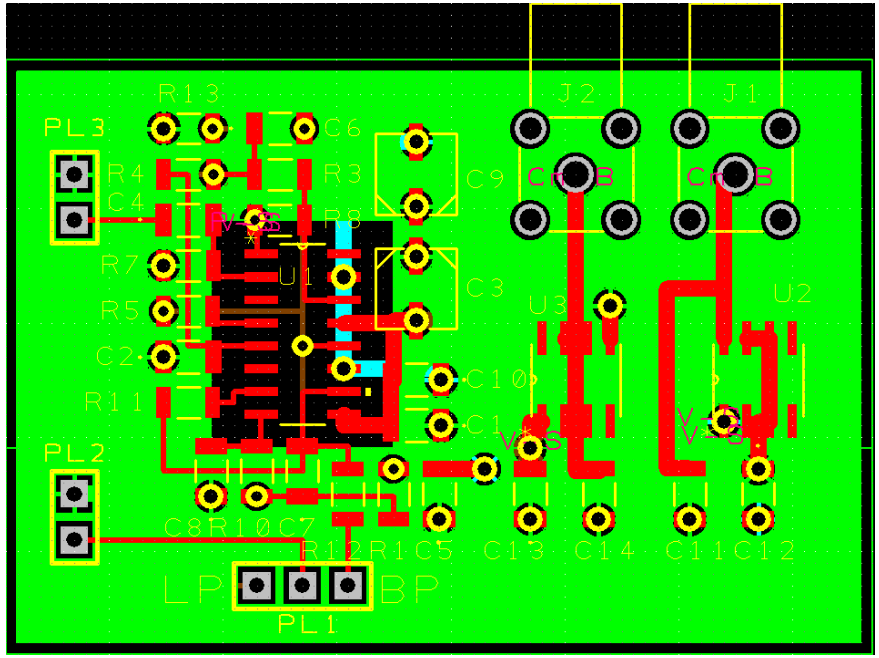

- Ross did single channel PCB design

# PCB design of 1-channel filter (all layers)

Without copper pour

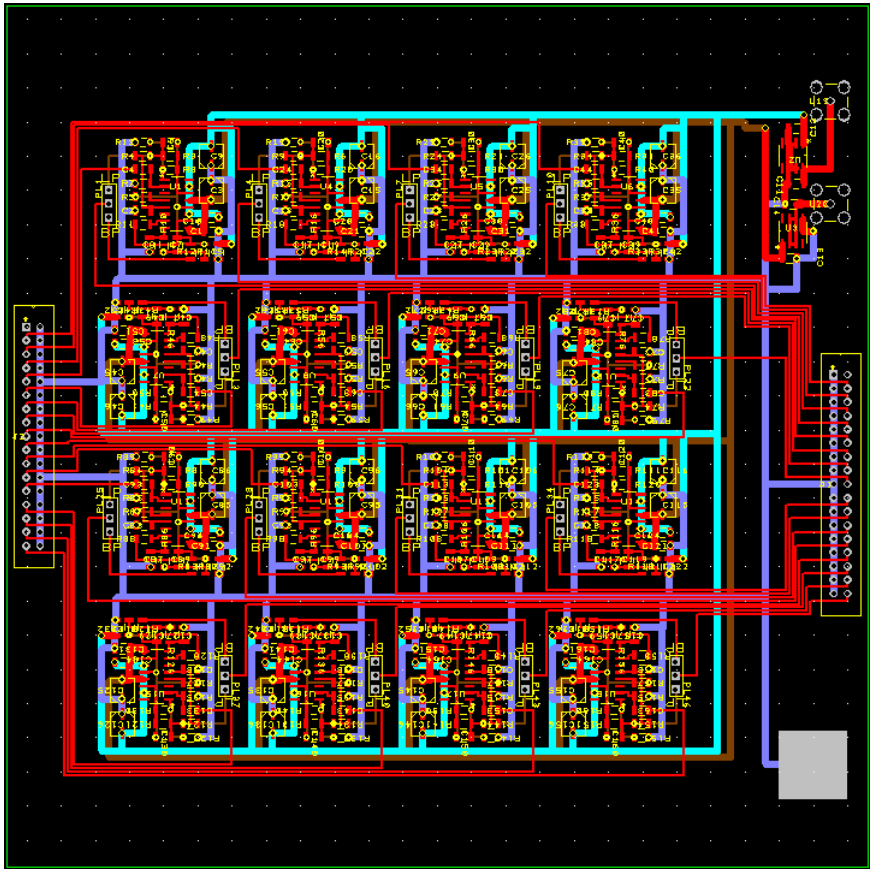



With copper pour

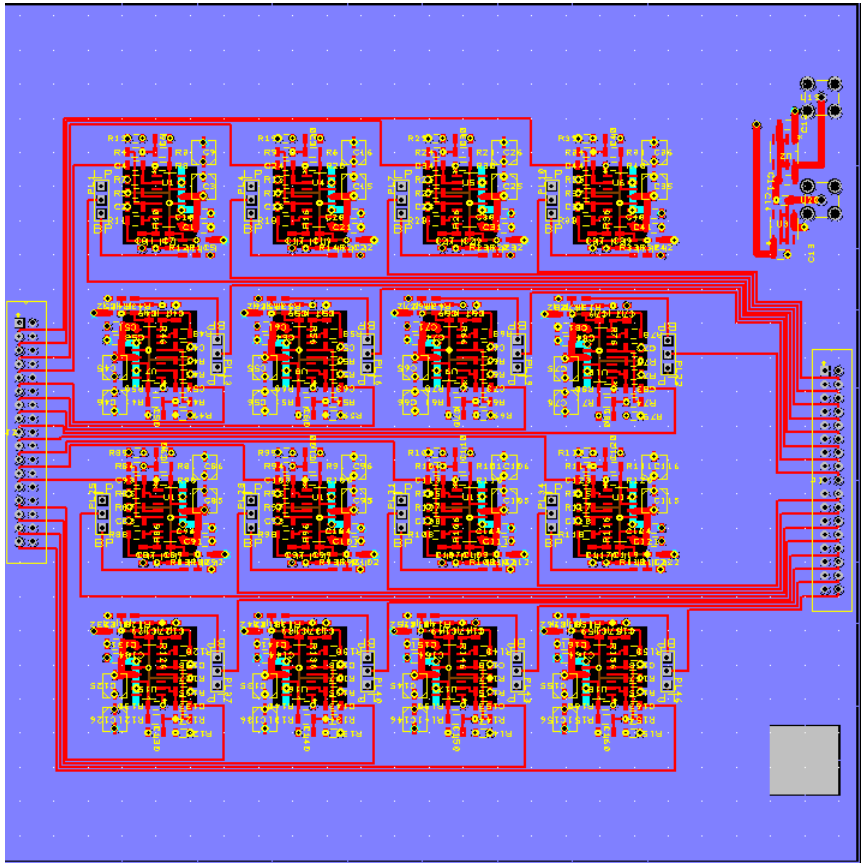


# 16-channel filter (all layers)

Without copper pour



With copper pour



- Used single-channel layout as template

# Soldering

- Ross found a way to do reflow soldering at a low cost ☺

Proctor Silex
31118Y 4-Slice
Toaster Oven ($25)

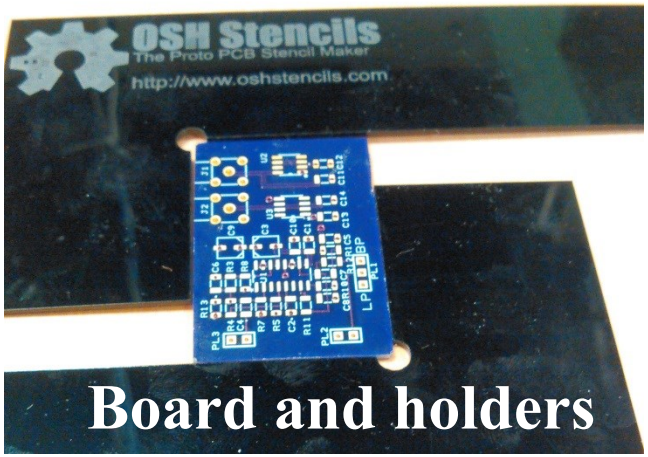
+

Reflowster ($135)

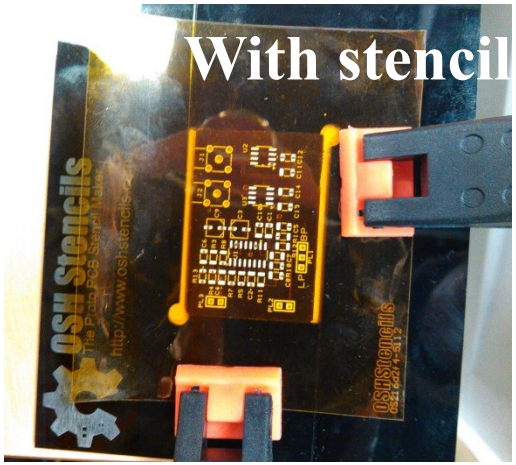

=

**Reflow soldering device**

# Making single channel board



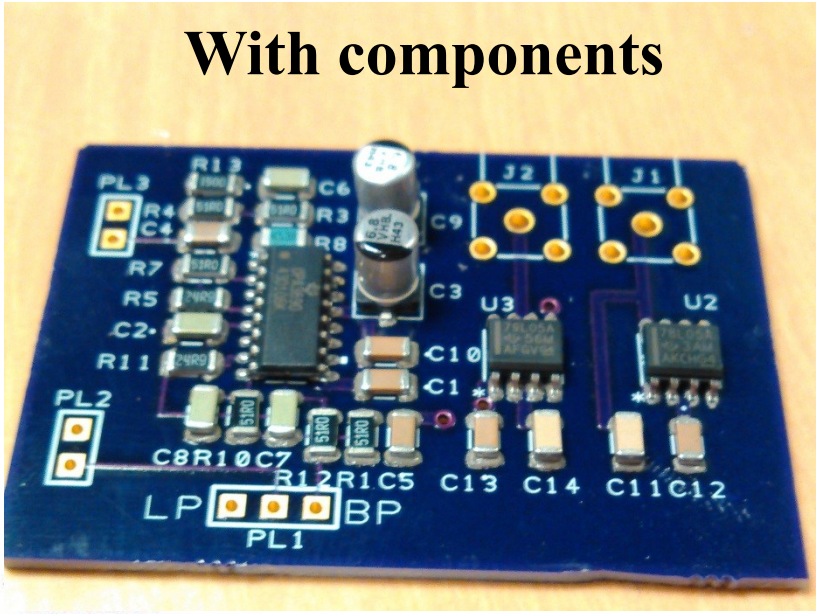

Board and holders

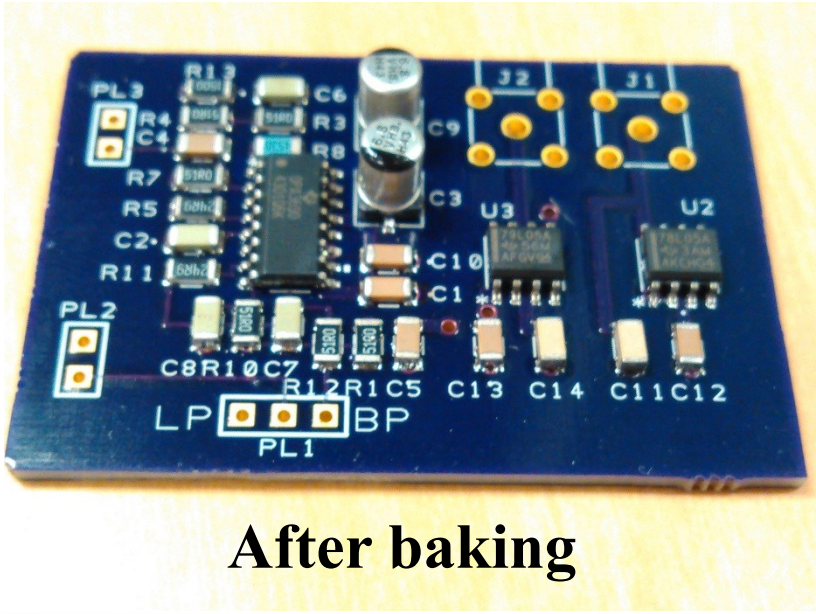



With stencil


Solder paste application

With components

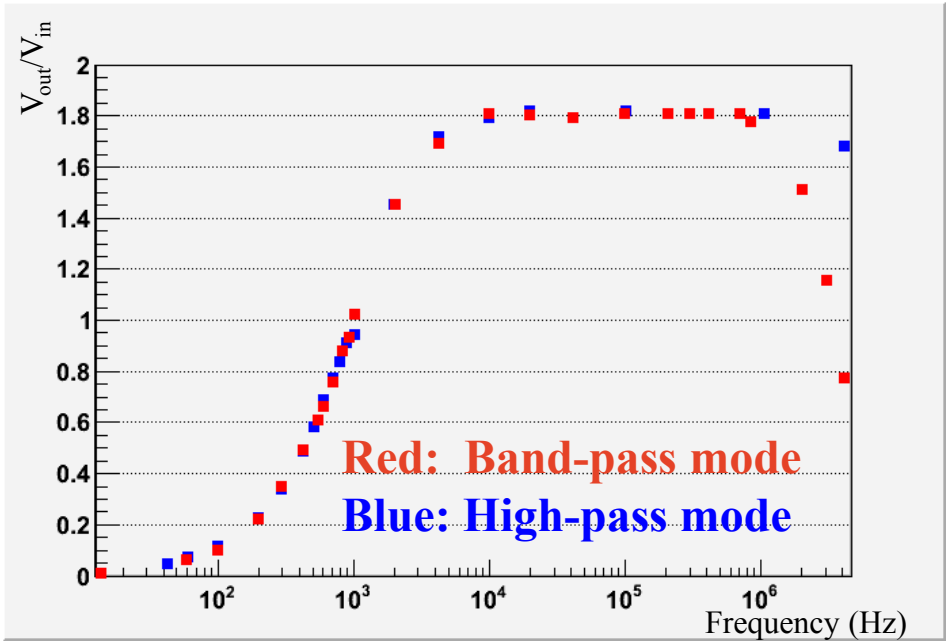


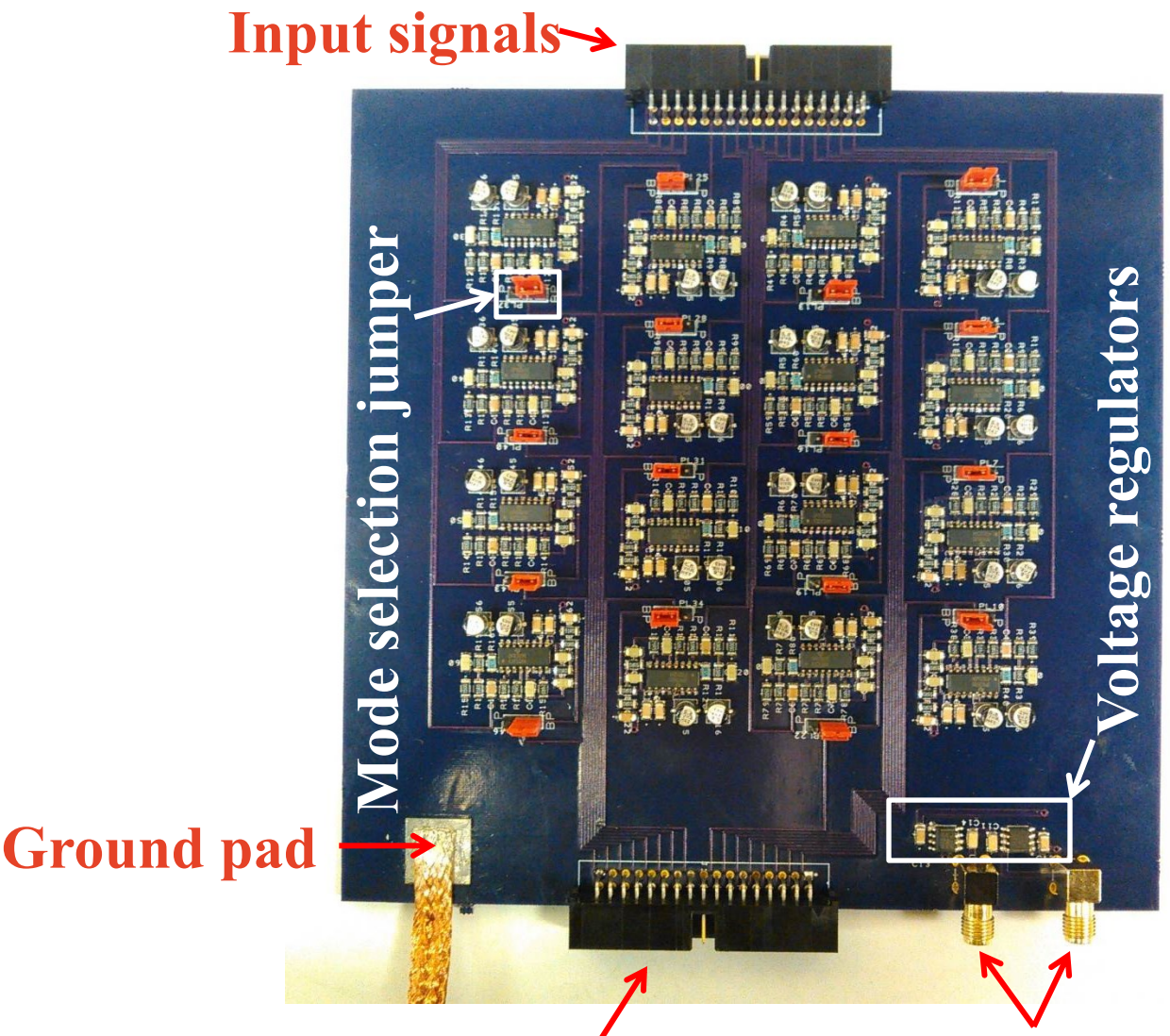

After baking

# Test results for single channel board

- Our frequency generator only goes up to 4 MHz



# 16-channel board



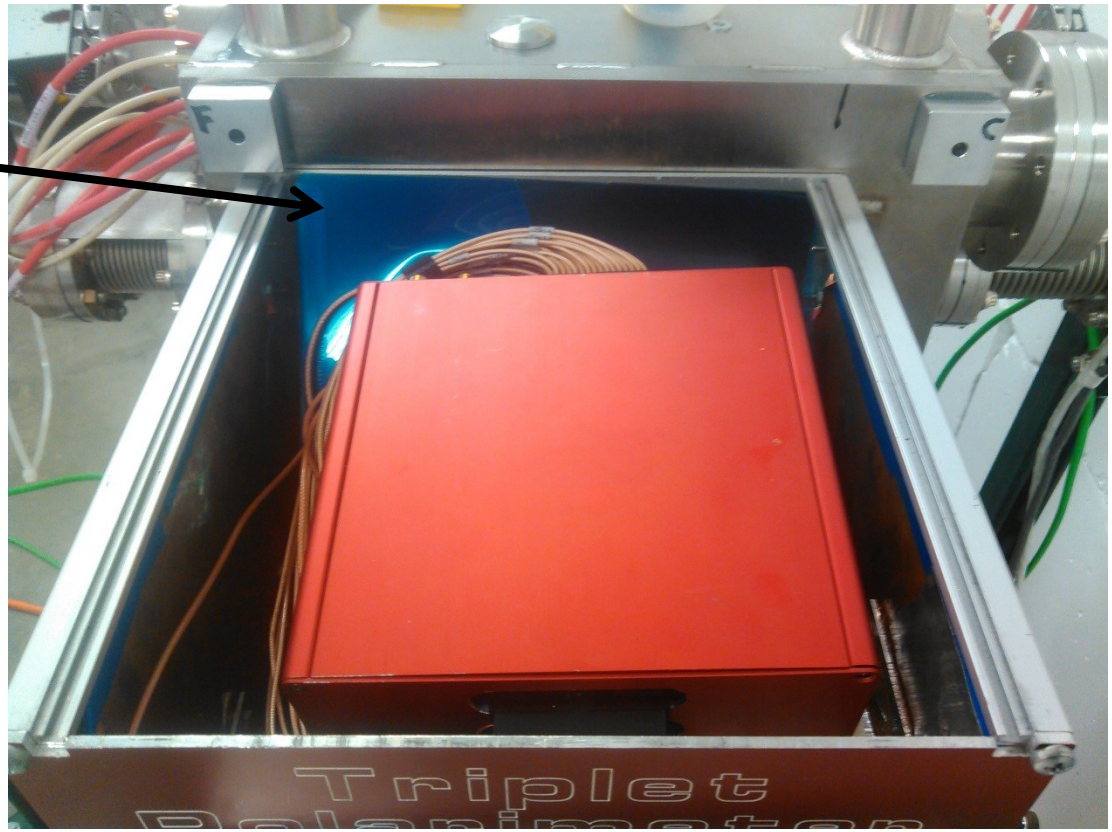
# Enclosure and LV inputs

- Robert Lee (ASU undergrad) helped machine the front and back panels of the enclosure

- Nick Sandoval modified the polarimeter distribution box to supply the LV needed to power the filter

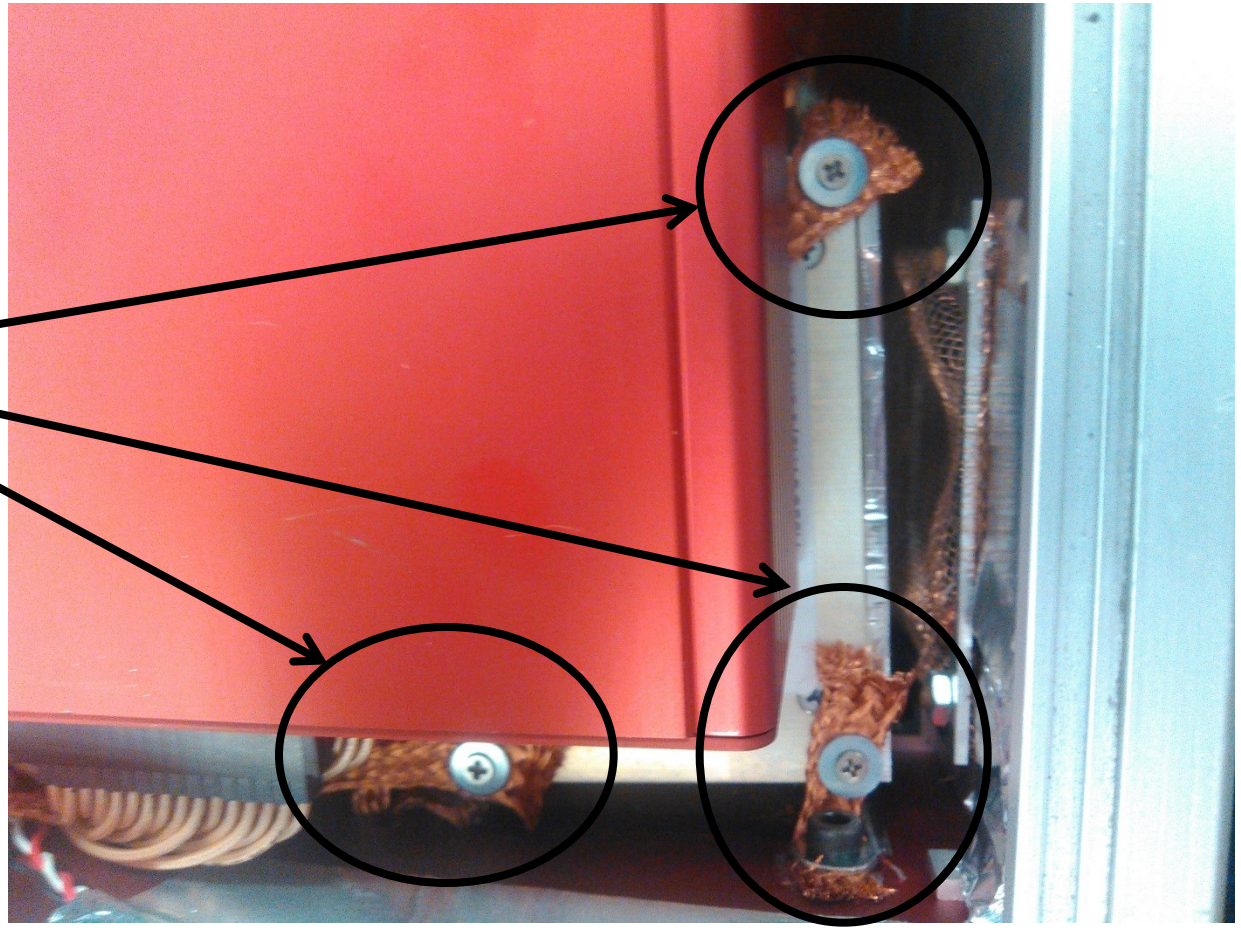
# Filter box installed in the preamp enclosure

- Important: plastic separator between filter box and electrical feedthrough flange
- Could not fit filter box inside the distribution box, had to put it in the preamp enclosure
- Filter box sits on top of the preamp boxes

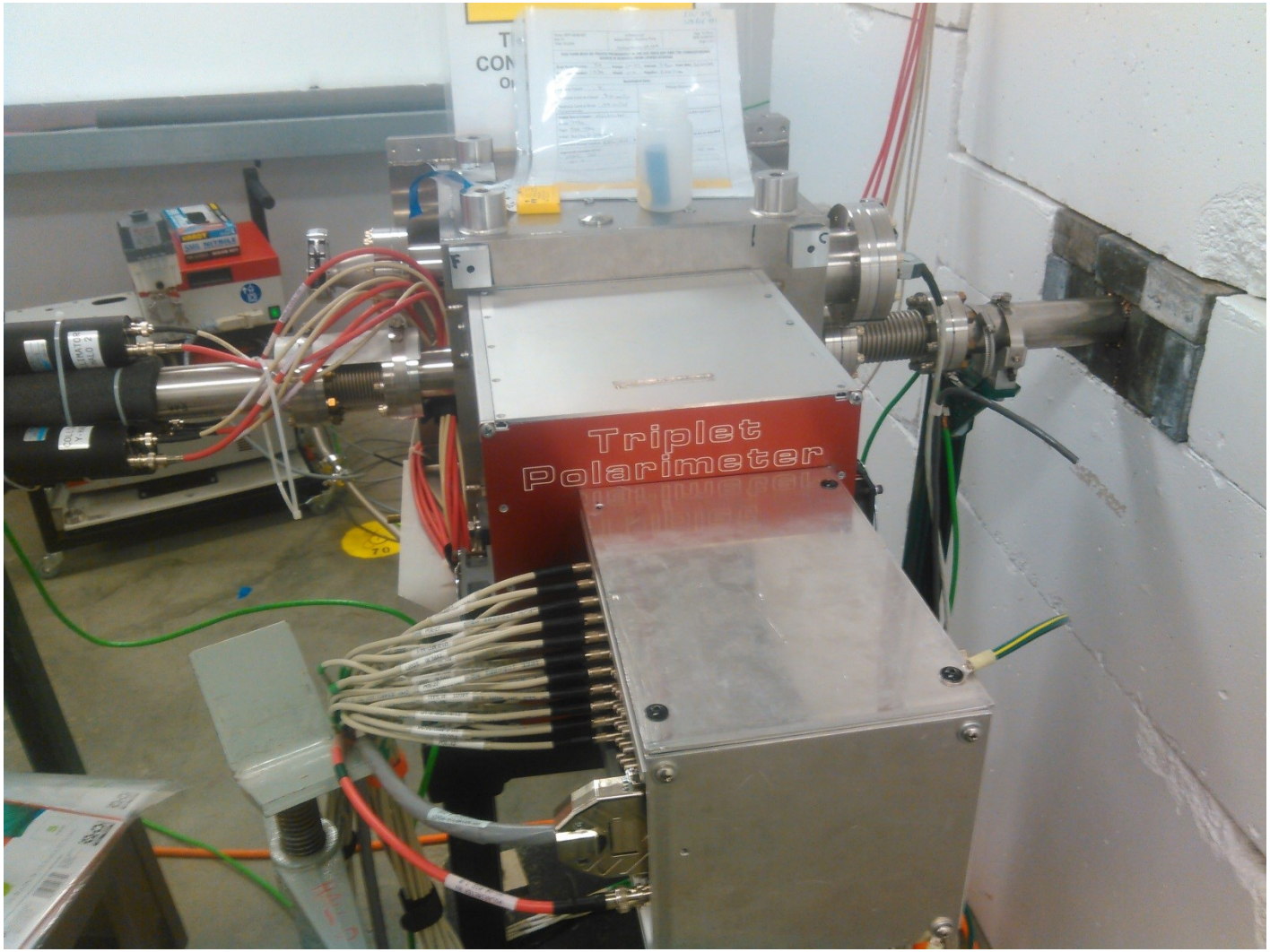


# Grounding the preamp box

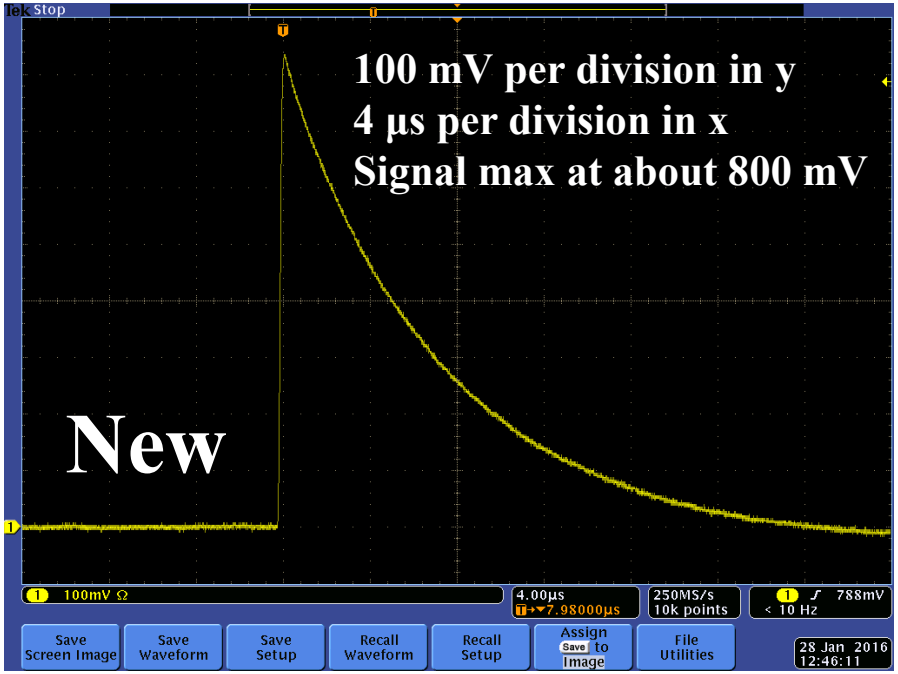
- Important: ½ inch copper braids from preamp box to front panel of enclosure



# Polarimeter all buttoned up



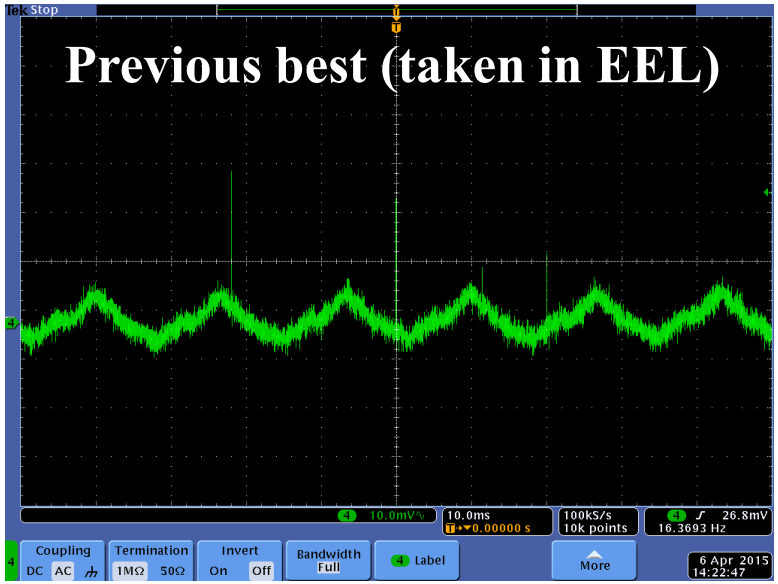
# Americium 241 alpha signal

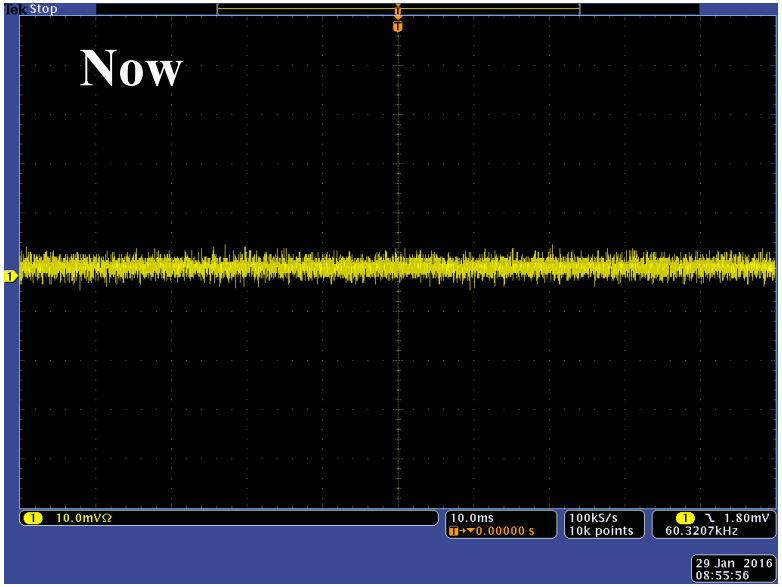




- Note: No chirping was seen when we were in the EEL
- Sensitivity has increased by a factor ~2

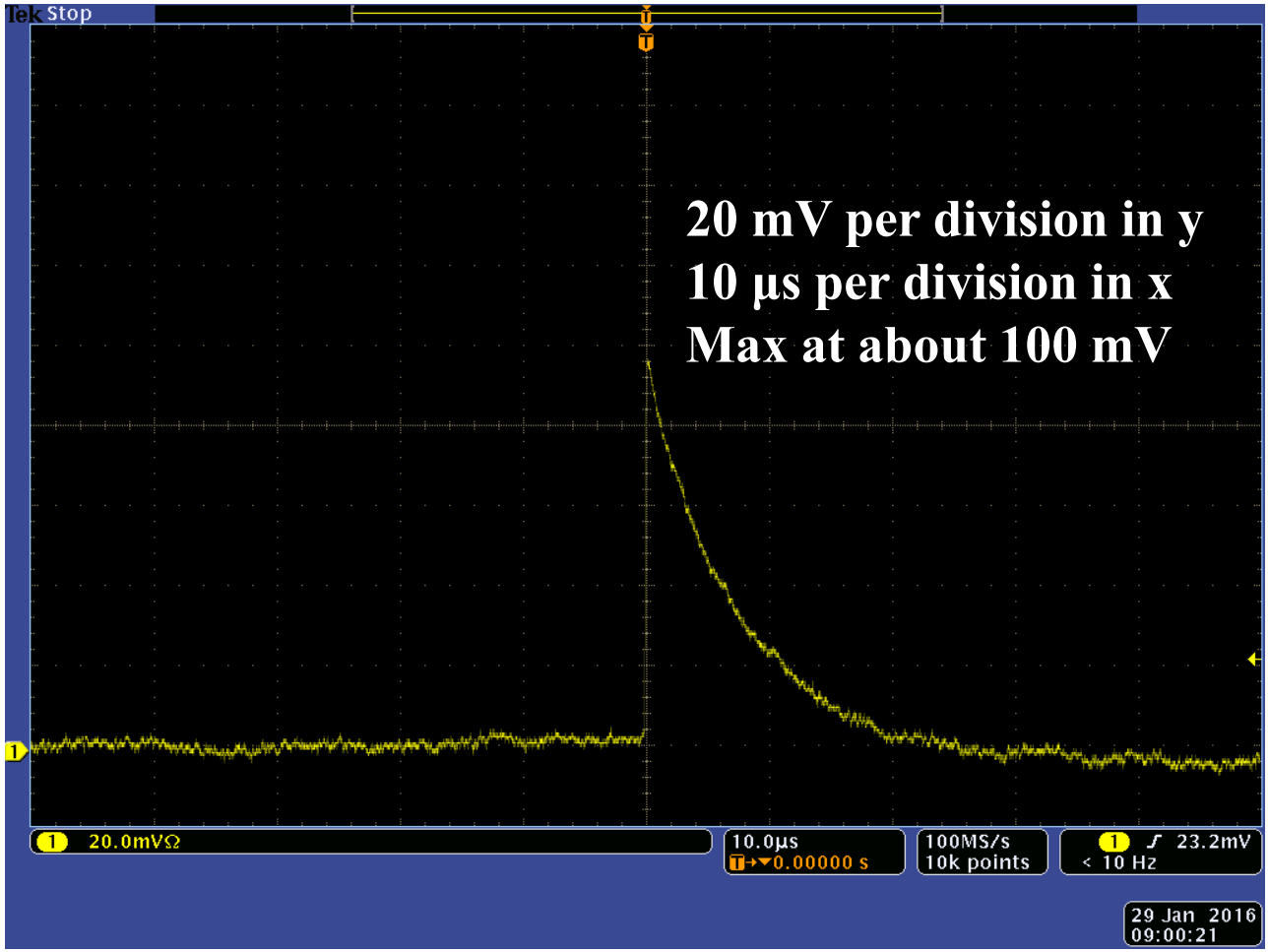
# Baseline



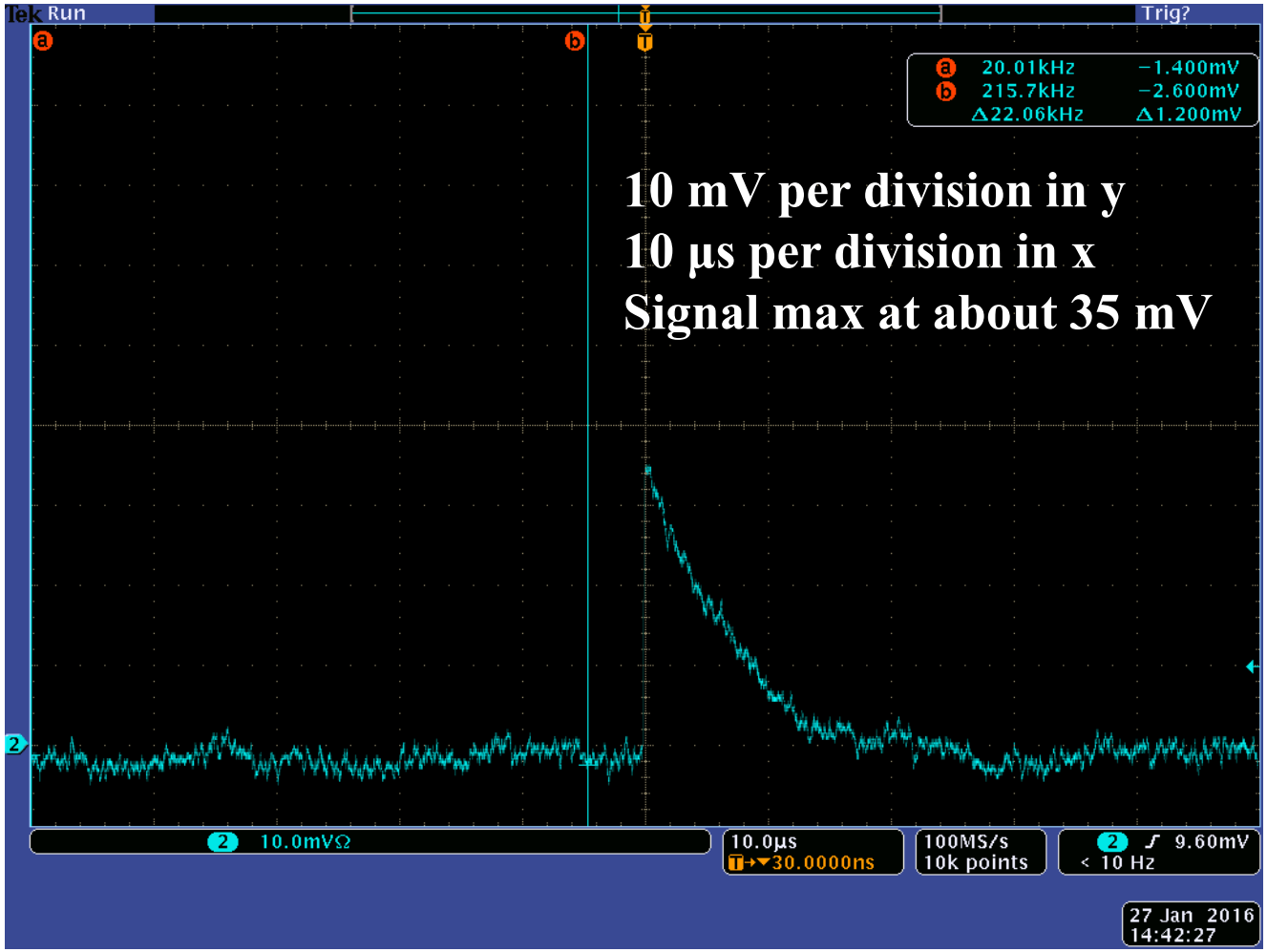




- 10 mV per division in *y*
- 10 ms per division in *x*

# Cosmic


Tek Stop
20 mV per division in y
10 µs per division in x
Max at about 100 mV
1 20.0mVΩ
10.0µs
0.00000 s
100MS/s
10k points
1 23.2mV
< 10 Hz
29 Jan 2016
09:00:21

# Cesium 137 beta signal



# Survey of detector and new converter tray

- The new converter tray is centered in the *y*-direction to within 350 microns
- Detector is 670 microns above center and 180 microns left of center
- Detector has moved 70 microns upstream from previous survey
- Distance from downstream part of converter tray to upstream part of detector is 31.8 mm
- The new *x*-positions of the converters have been put into the slow controls by Havones

# Foils

- Foils have been installed
  - position 1: 50 micron berylium ($1.42 \times 10^{-4}$ rad lengths)
  - position 2: 75 micron berylium ($2.13 \times 10^{-4}$ rad lengths)
  - position 3: 750 micron berylium ($2.13 \times 10^{-3}$ rad lengths)

**New converter that is 10 times as thick as used in Spring 2015**

# Title

# Title

# Title

# Title

# Title