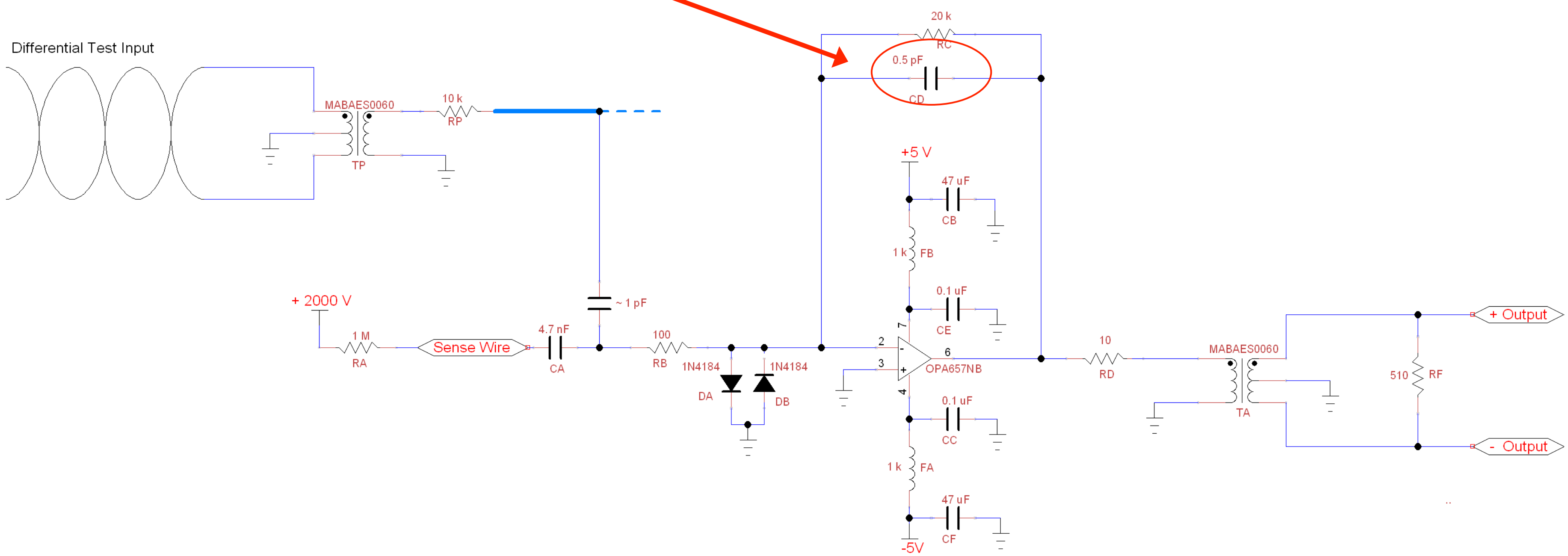
Project sequence	Project	Number needed	Number completed	Project finished
1	Epoxy G10 slats to wire plates	8	8	✔
2	Epoxy G10 slats to spacer plates	8	8	✔
3	Cut preamp cards to correct size	48	8	
4	Cut HV cards to correct size	48	8	
5	Attach HV capacitors to preamp card, test preamp card	48	1	
6	Epoxy preamp and HV bias cards to wire plates	8	0	
7	(a) Bolt together wire and spacer plates, (b) attach wheels, (c) move to Physical Science Building (PSB)	8	0	
8	In PSB clean-room: (a) string carbon-tube wires and in-between field wires, (b) HV test and fix problems, (c) string remainder of sense and field wires, (d) close detector, flow gas, bias HV and LV, test, (f) fix problems	8	0	
9	Prepare MWPCs for shipment to JLab	8	0	

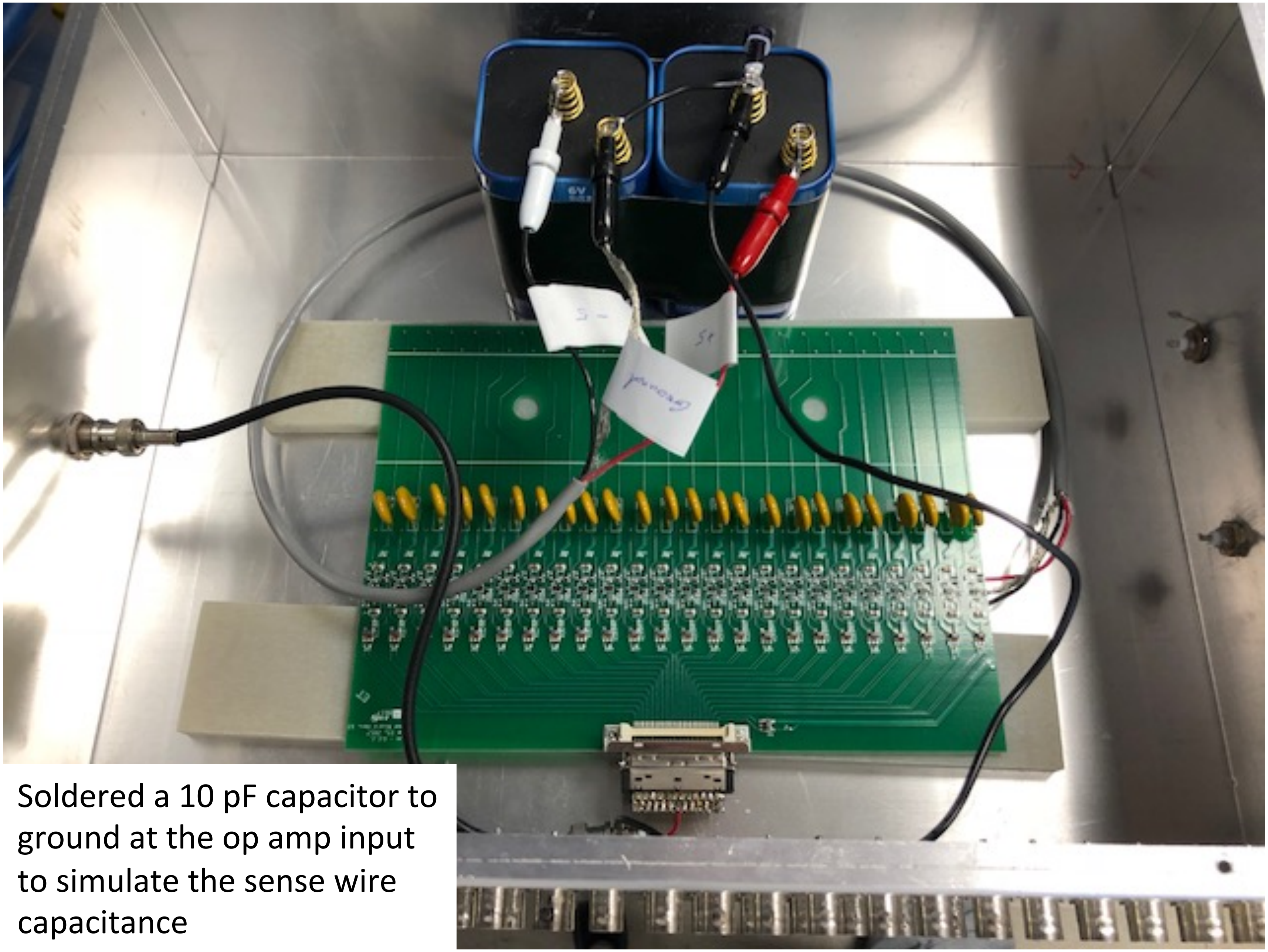
$$1/(2\pi R_F C_F) = \sqrt{(GBP/(4\pi R_F C_D))}$$ from T.I. application note

The equation predicts C_F = 0.3 pF

We used 0.5 pF



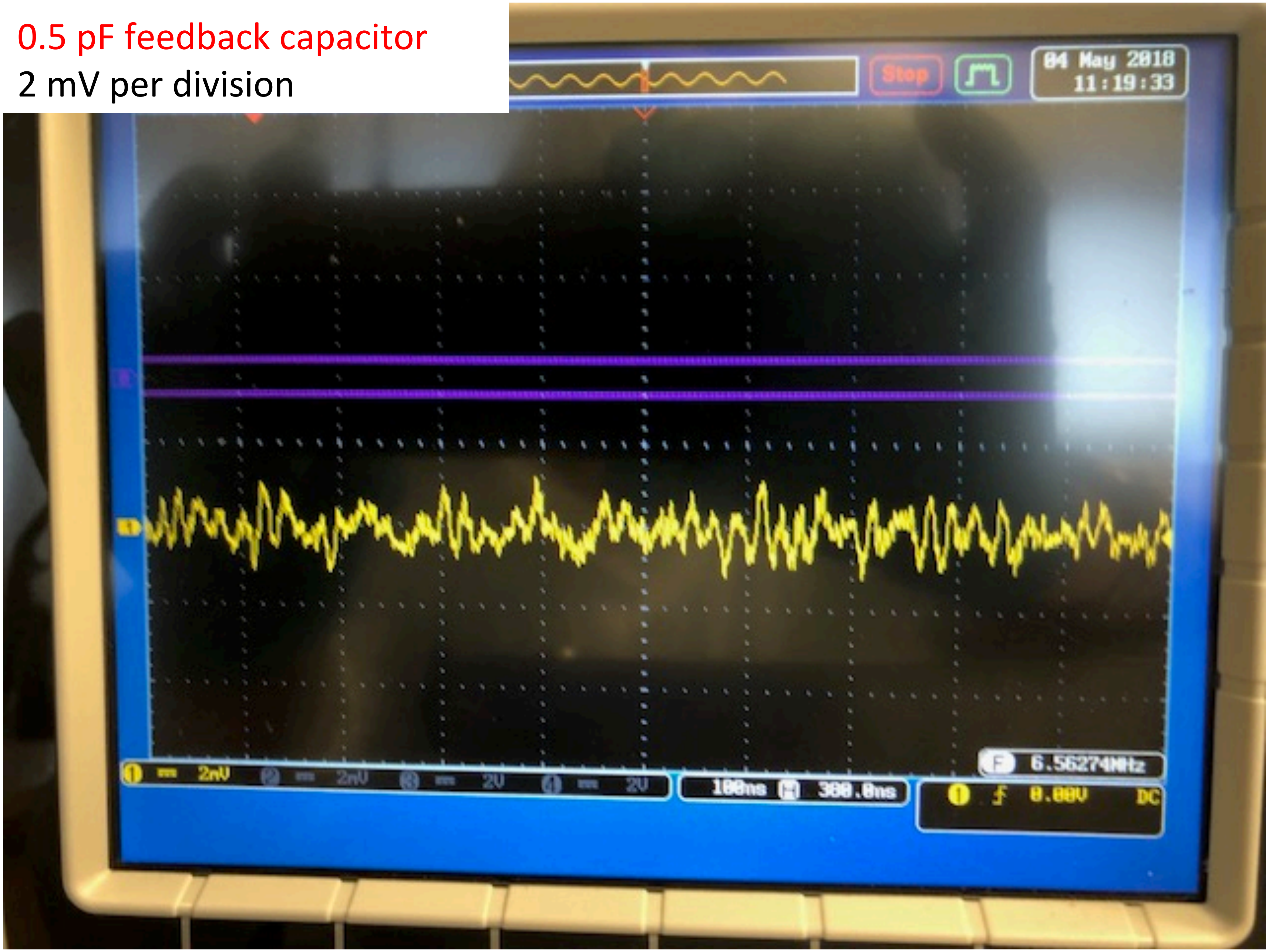
Title		
Sense Channel Circuit		
Author Bobby Johnston UMass MENP		
File C:\Users\Bobby\Desktop\Sense_Schematic		Document
Revision 12	Date June 19, 2017	Sheets 1 of 1



Soldered a 10 pF capacitor to ground at the op amp input to simulate the sense wire capacitance

0.5 pF feedback capacitor

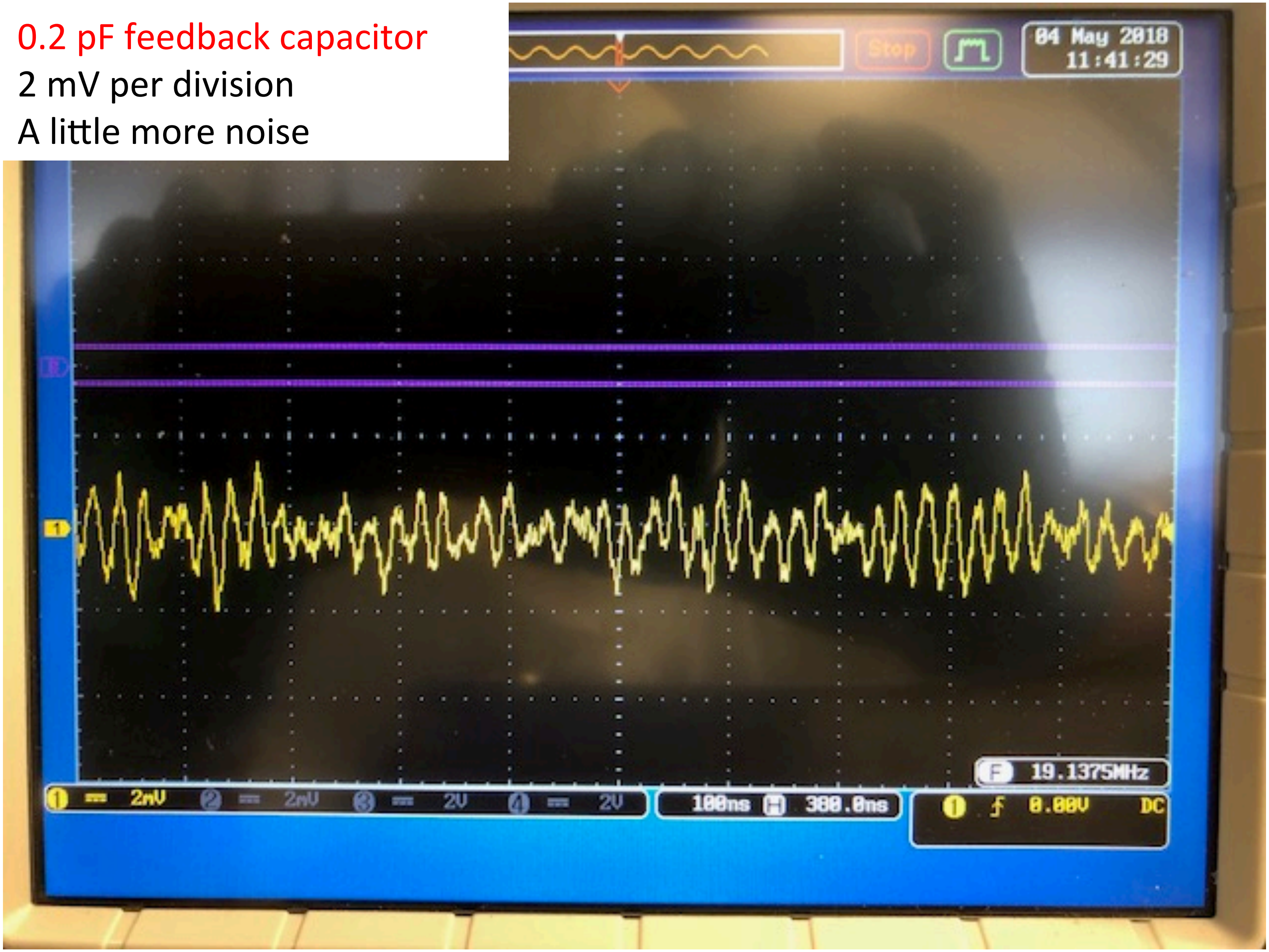
2 mV per division



0.2 pF feedback capacitor

2 mV per division

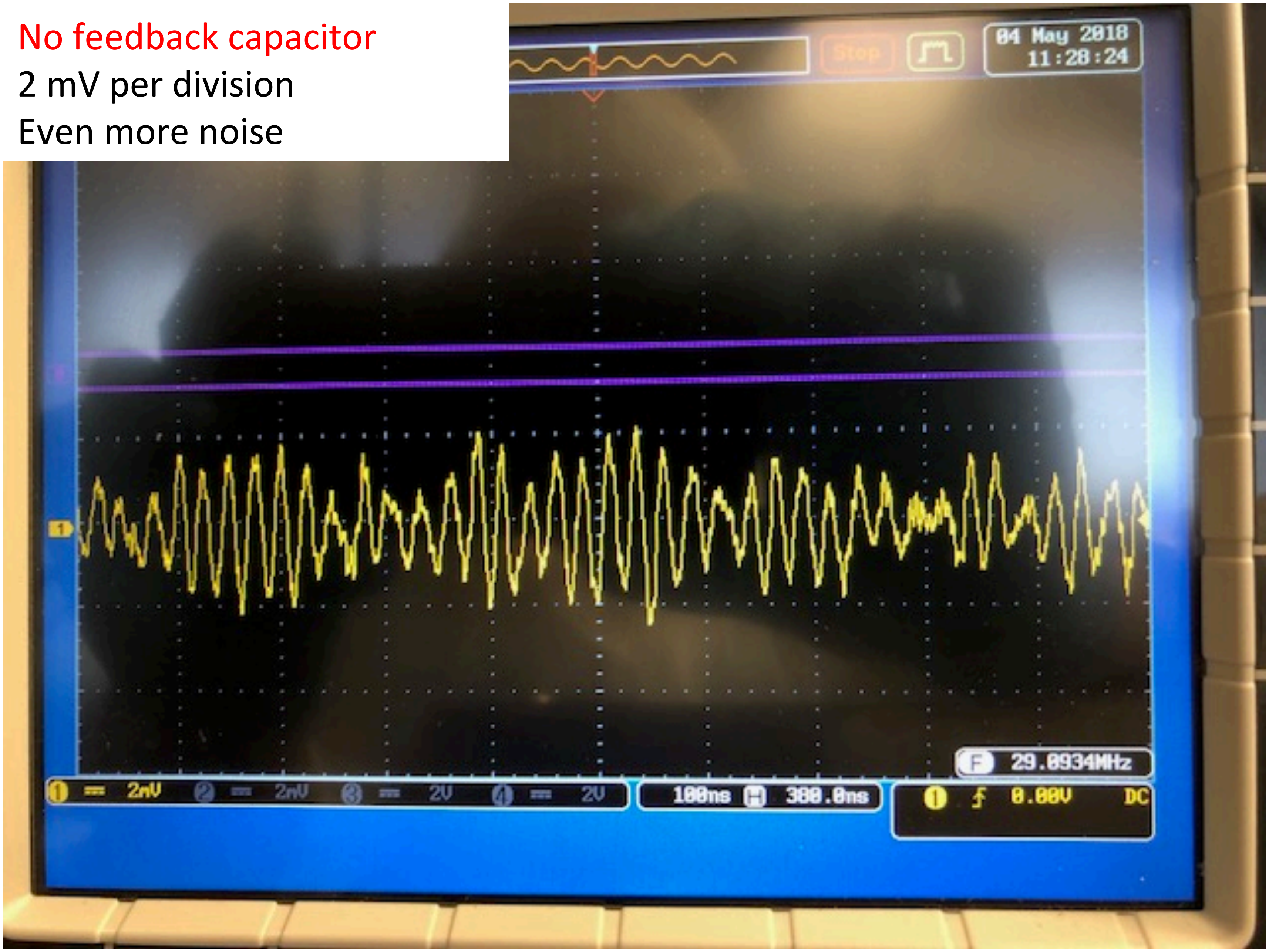
A little more noise



No feedback capacitor

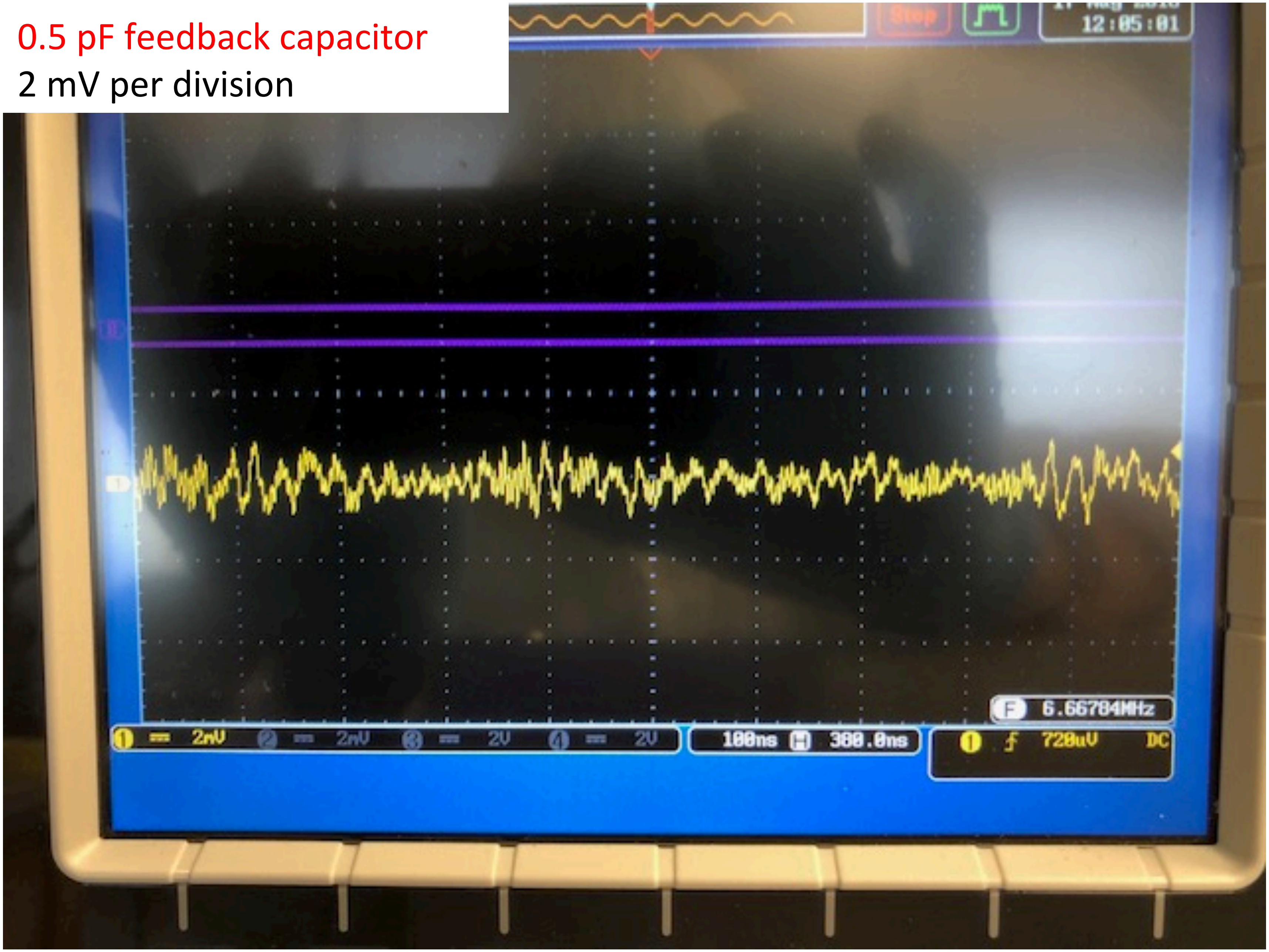
2 mV per division

Even more noise

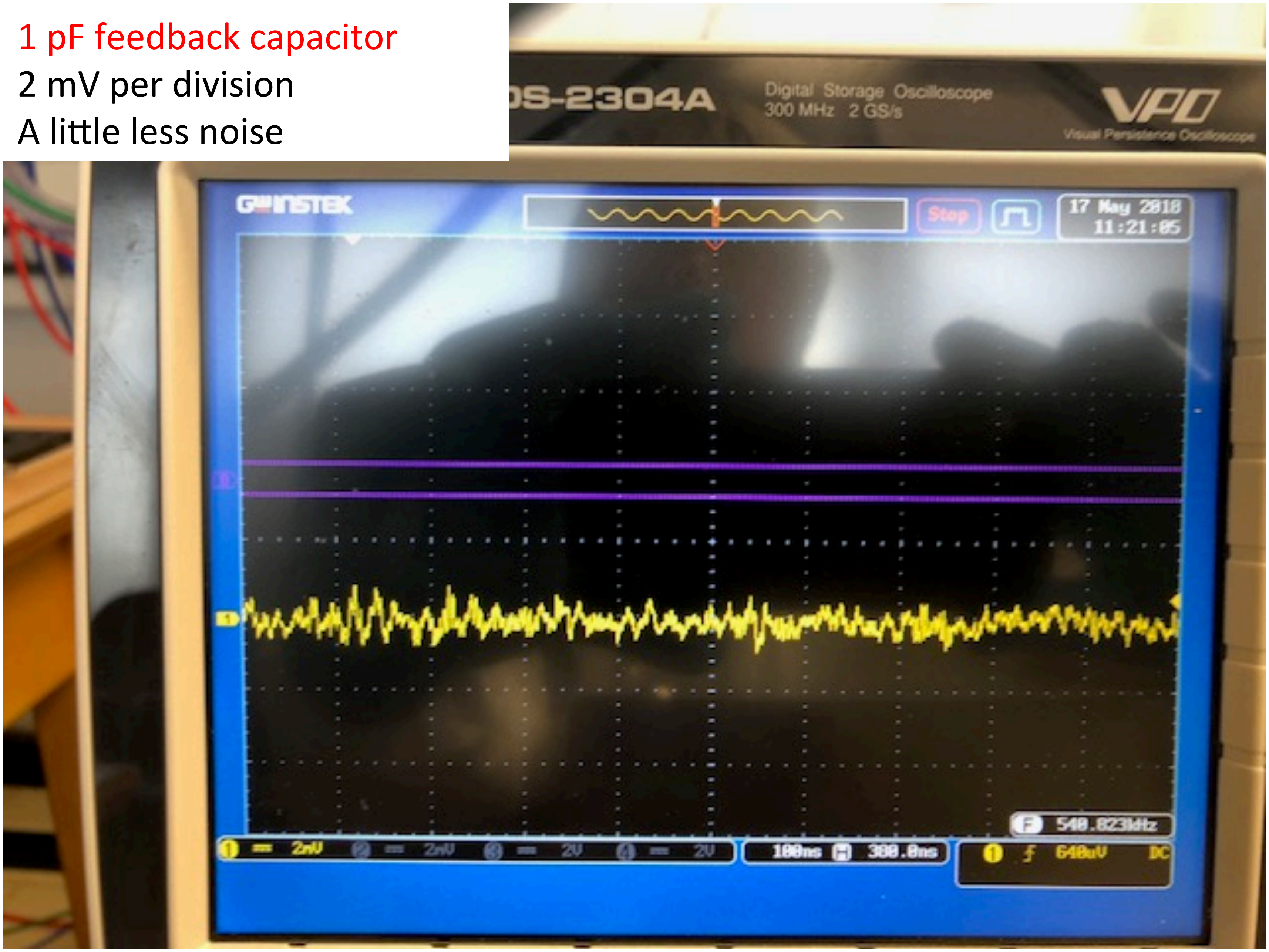


0.5 pF feedback capacitor

2 mV per division



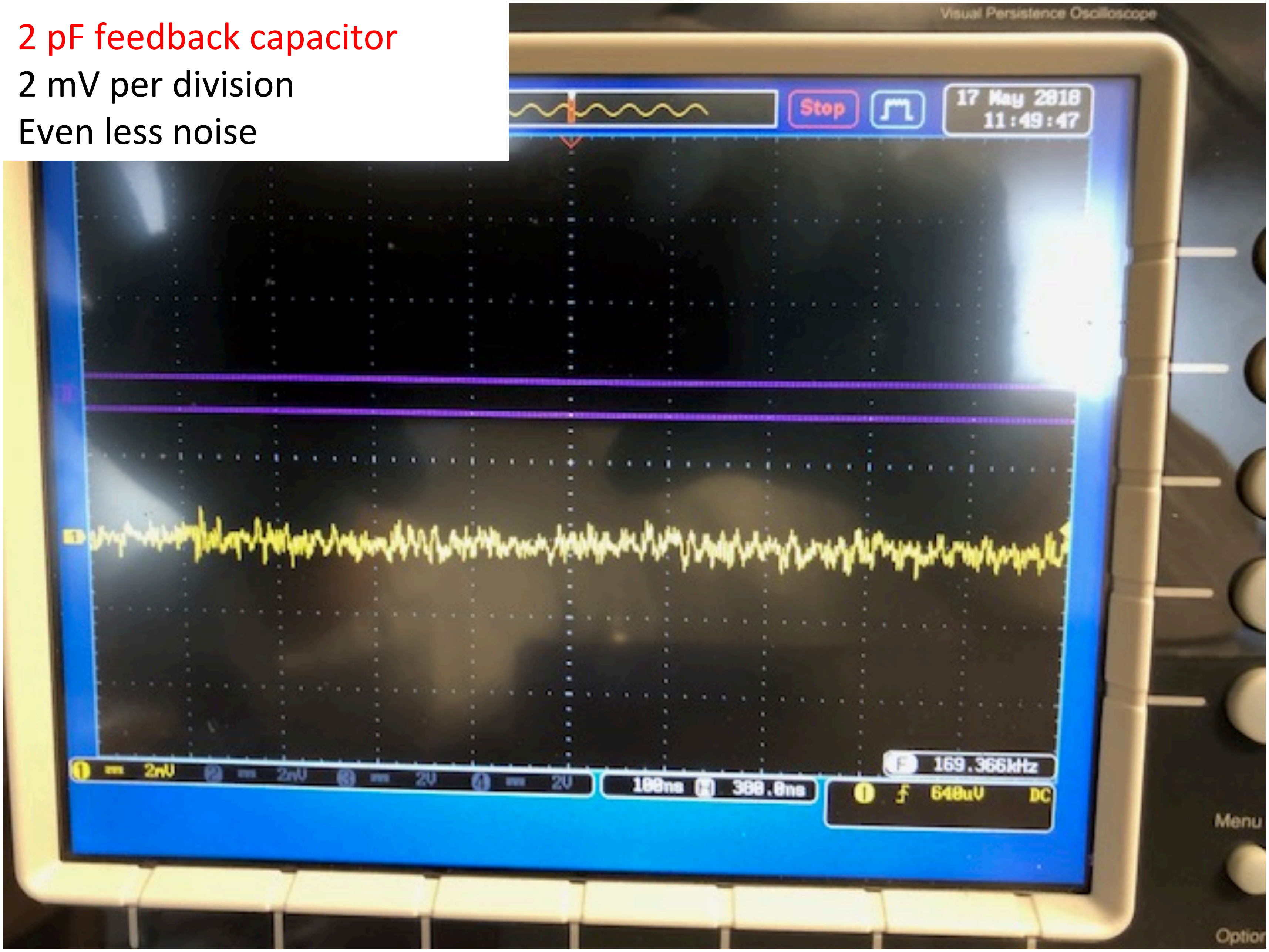
1 pF feedback capacitor
2 mV per division
A little less noise



2 pF feedback capacitor

2 mV per division

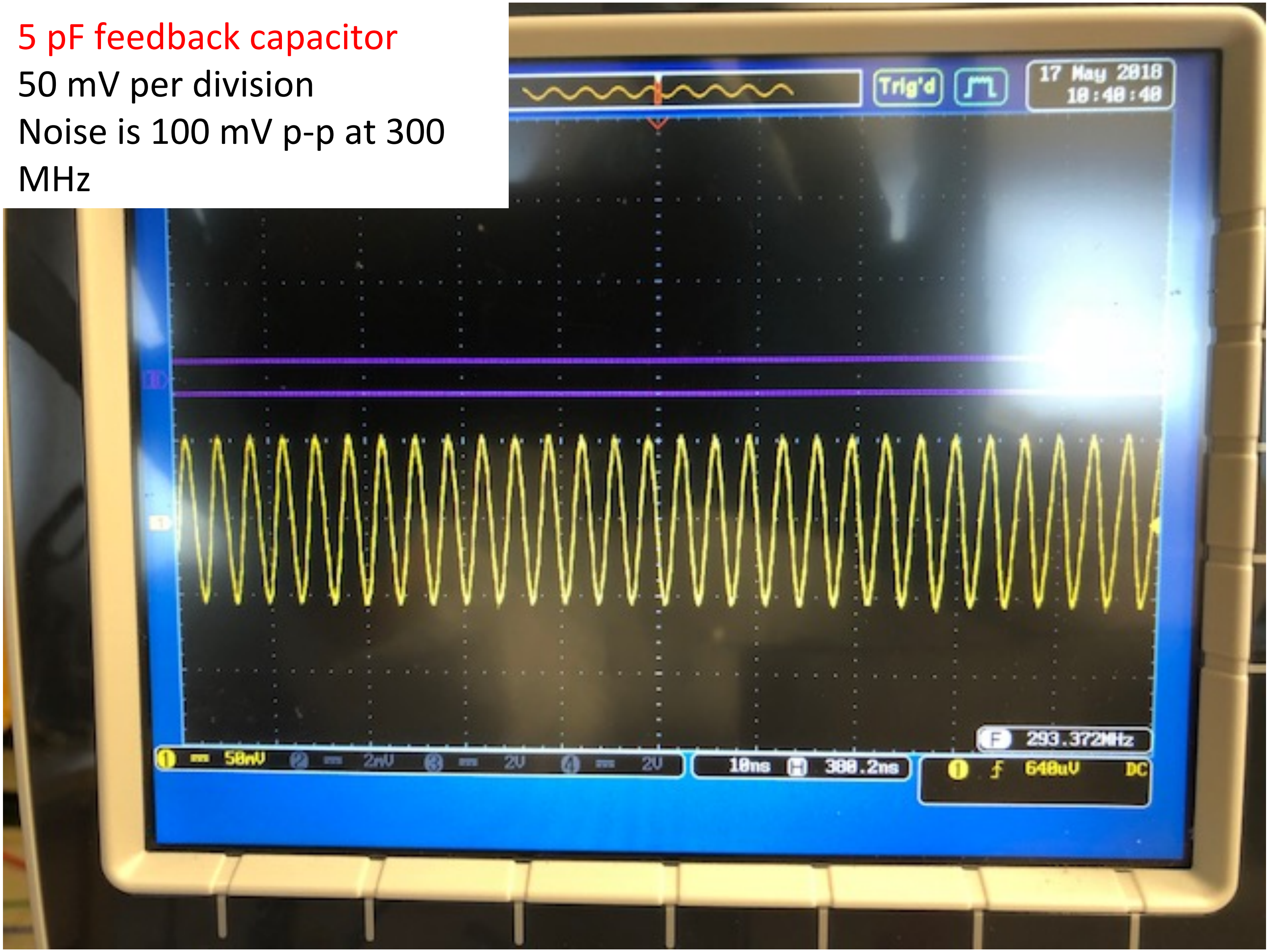
Even less noise



5 pF feedback capacitor

50 mV per division

Noise is 100 mV p-p at 300 MHz



Conclusion:

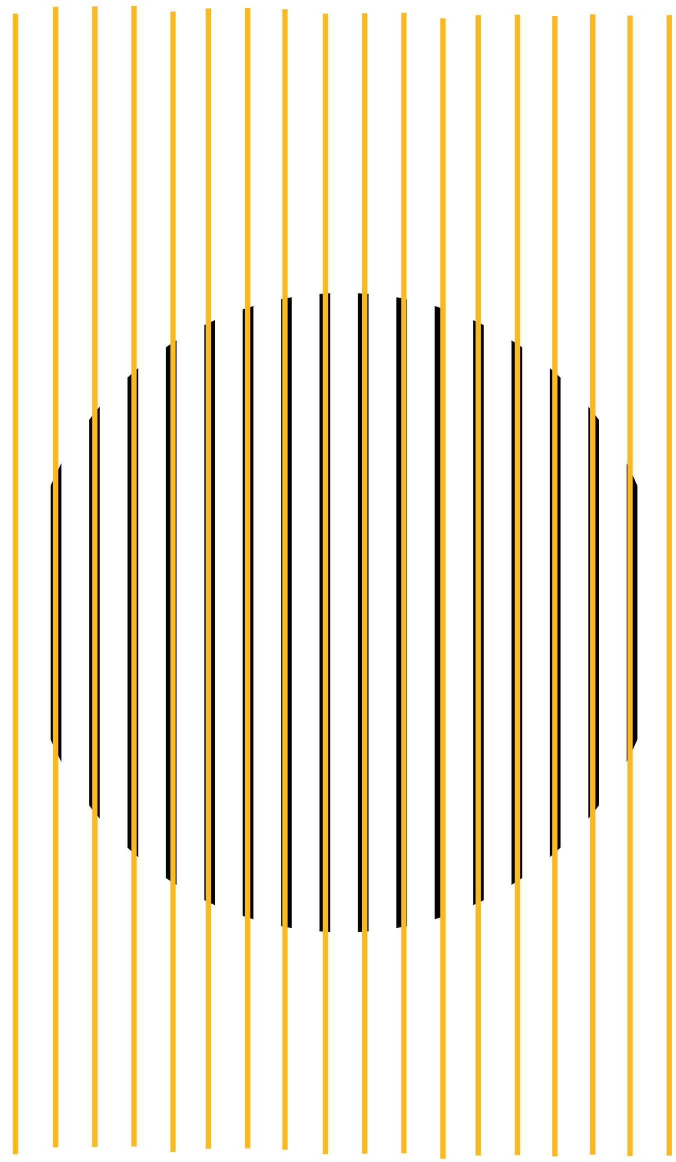
- Unfortunately I didn’t have 3 or 4 pF capacitors on hand when doing these tests.   Nevertheless, can conclude that 2 pF is nearly optimal, with 0.5 pF giving similar noise levels.
- Little to be gained in noise reduction by switching from 0.5 to 2 pF capacitors
- I would like to repeat these studies on the big MWPC prototype

From Ilya's simulation report summer of 2017:

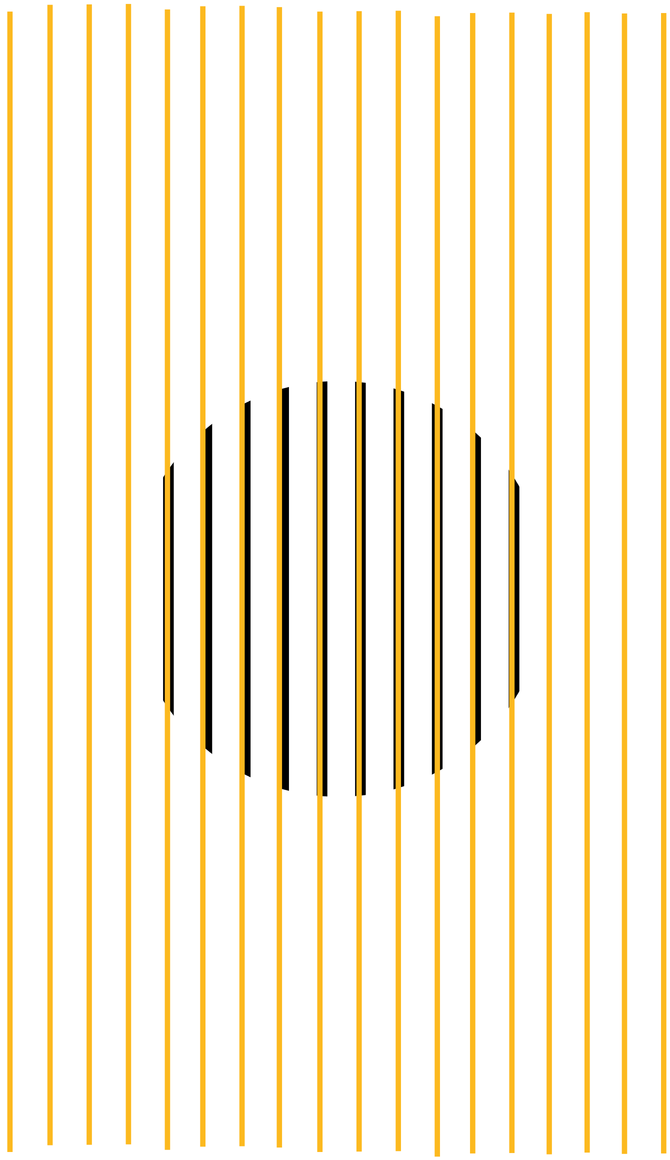
Short summary

- Dead zone sizes less than absorber size probably allows too much beam background. Too high dead zone size value reduces MWPC ability for certain angular range.
- Best values are obtained with dead zone size equals iron absorber hole size plus some offset. Offset value ~ 1cm for 3…4 cm hole radius and even smaller for larger hole. For increased x10 background offset values ~2cm
- Square and round shapes give very close values. At larger dead zone sizes, round shape gives better values
- Absorber serves as a filter for beam interaction background. These calculations have been done for 20cm thick iron. Thinner absorber layers (like 5cm) may give slightly different results. Will be double checked after iron thickness optimization.
- Best values obtained for Iron absorber hole R=3cm and dead zone R=4cm. Hole radius 4cm and dead zone R=5cm looks safer and gives close value.

Prototype MWPC at JLab:
16 carbon tubes
Dead-zone diameter
6.8” = 17.3 cm

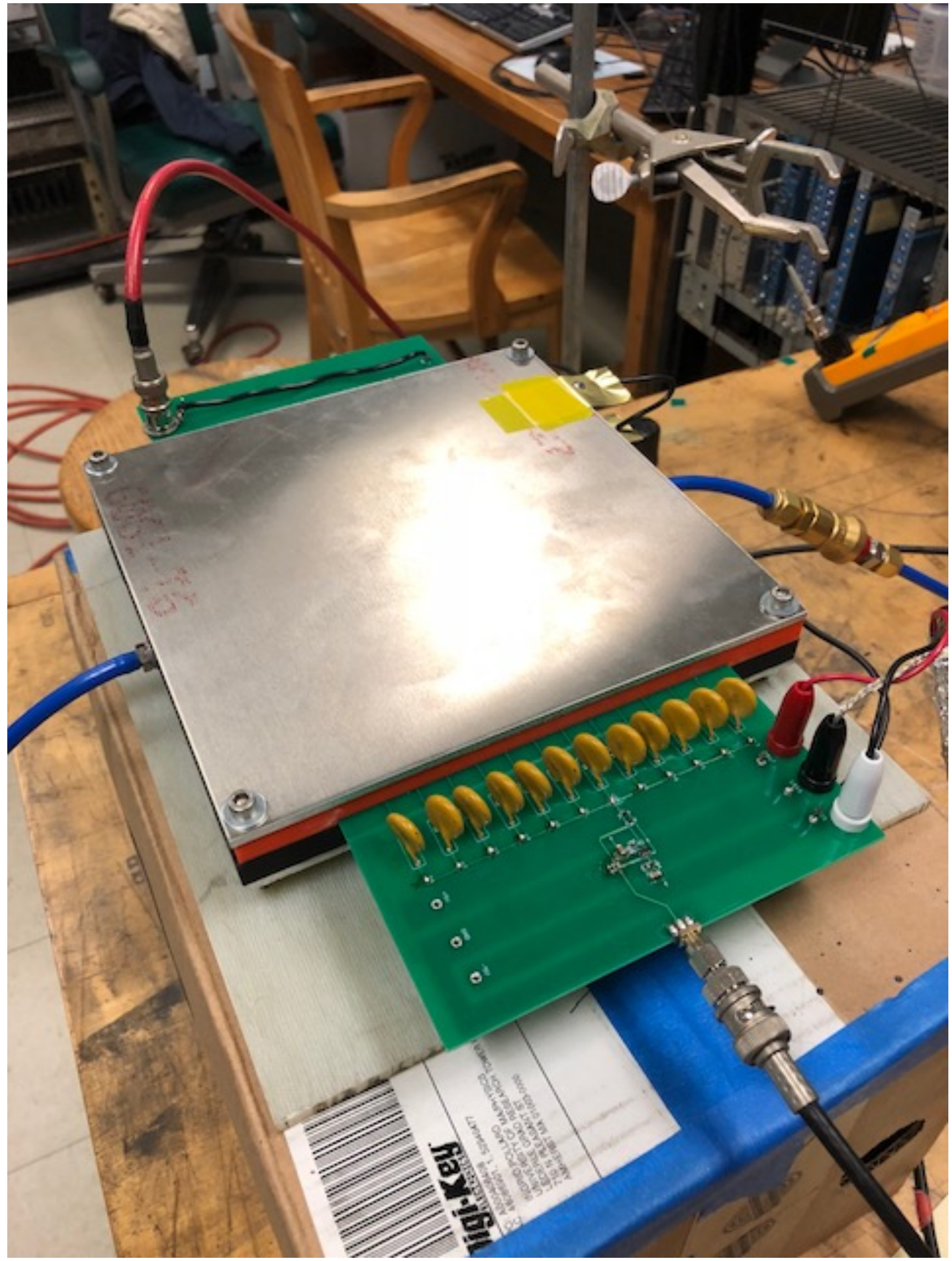


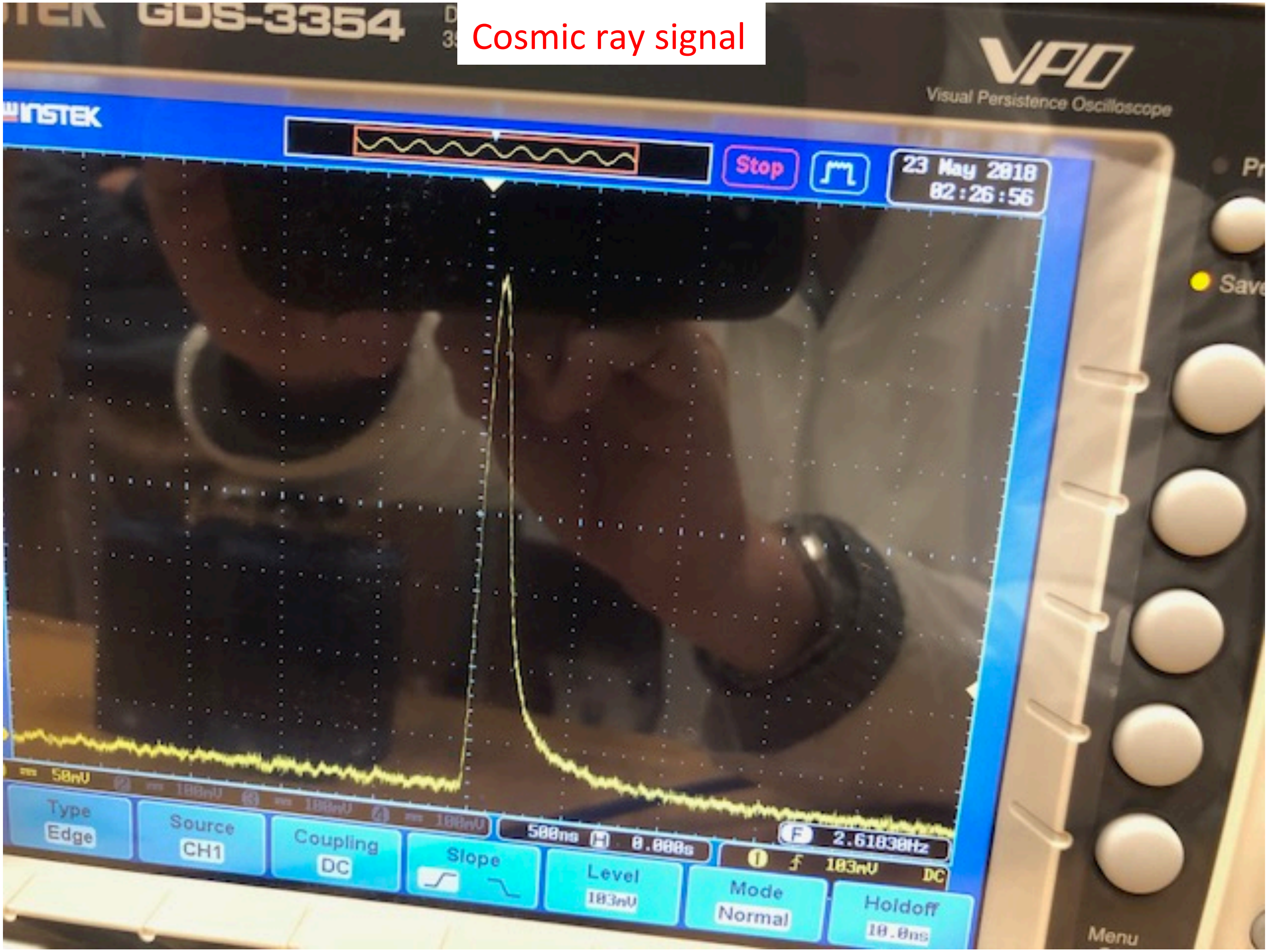
Proposed design
10 carbon tubes
Dead-zone diameter
4.4” = 11.2 cm



Development of a single-channel MWPC with 12 wires and identical wire geometry to our large muon chambers

Alexander Moschella and RM





Cosmic ray signal

- It probably won’t be difficult to build 8 of these mini-MWPCs, and definitely not expensive, less than $100 per detector.
- Could put several of the mini-MWPCs into a frame, and insert different thicknesses of iron absorber between them.
- Put the detector array closer to FCAL than we were before?
- Need 1 ADC channel per mini-MWPC, connection via BNC or SMA connector. Need trigger scintillators in front and back?