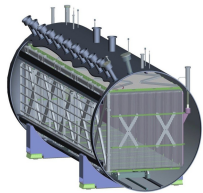


Recent Drift HV Fluctuations

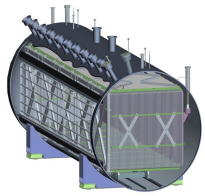
Michael Mooney
BNL

November 1st, 2015

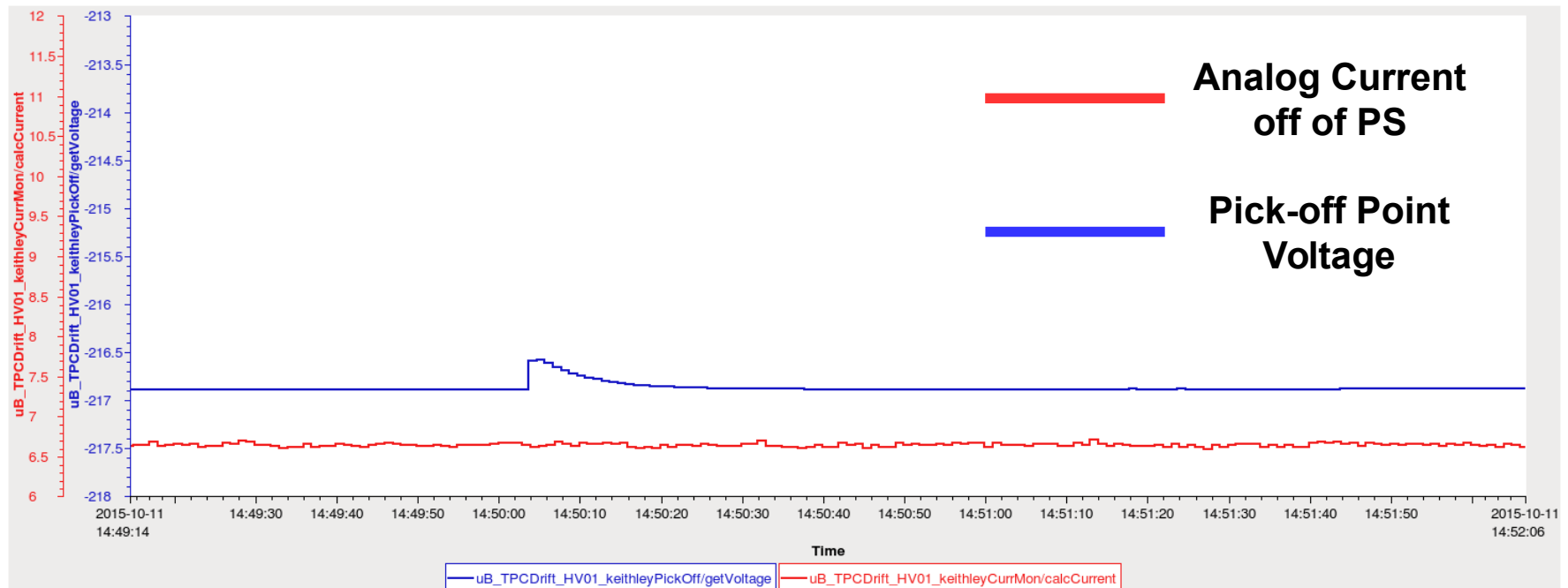


Introduction

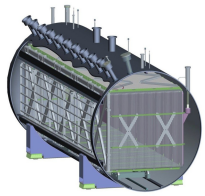
- ◆ Recently (Saturday, October 31st) a shifter (Mary Bishai) observed strange fluctuations of the cathode HV value
 - Fluctuation was previous to shift (Thursday, October 29th)
 - Promptly reported Run Coordinator
 - This is exactly what I'd like to see shifters doing on their shifts... stay curious!
- ◆ Fluctuation observed on both pick-off point (Keithley in source mode) and power supply (analog current readback Keithley)
- ◆ Took a deeper look over the past ~3 weeks (back to October 11th) to see if there were any more features in drift HV
 - See two cases of large deviations (including one reported by Mary)
 - Also noticed six more cases of smaller deviations
 - Easily could have missed especially small deviations



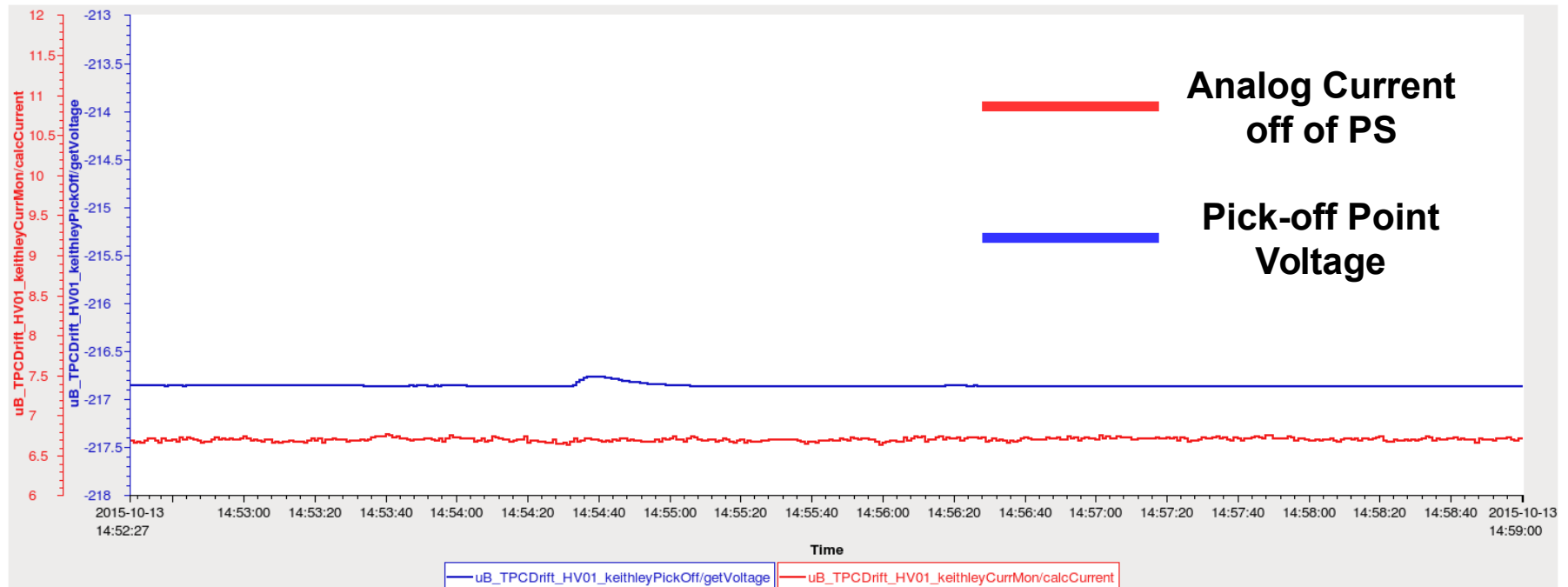
Small Deviation: Oct. 11th



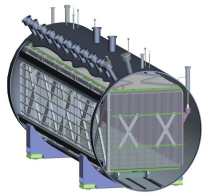
- ◆ Relatively small deviation on pick-off point
- ◆ Seems cut off at beginning (leading edge is not smooth)
- ◆ No significant activity seen on PS



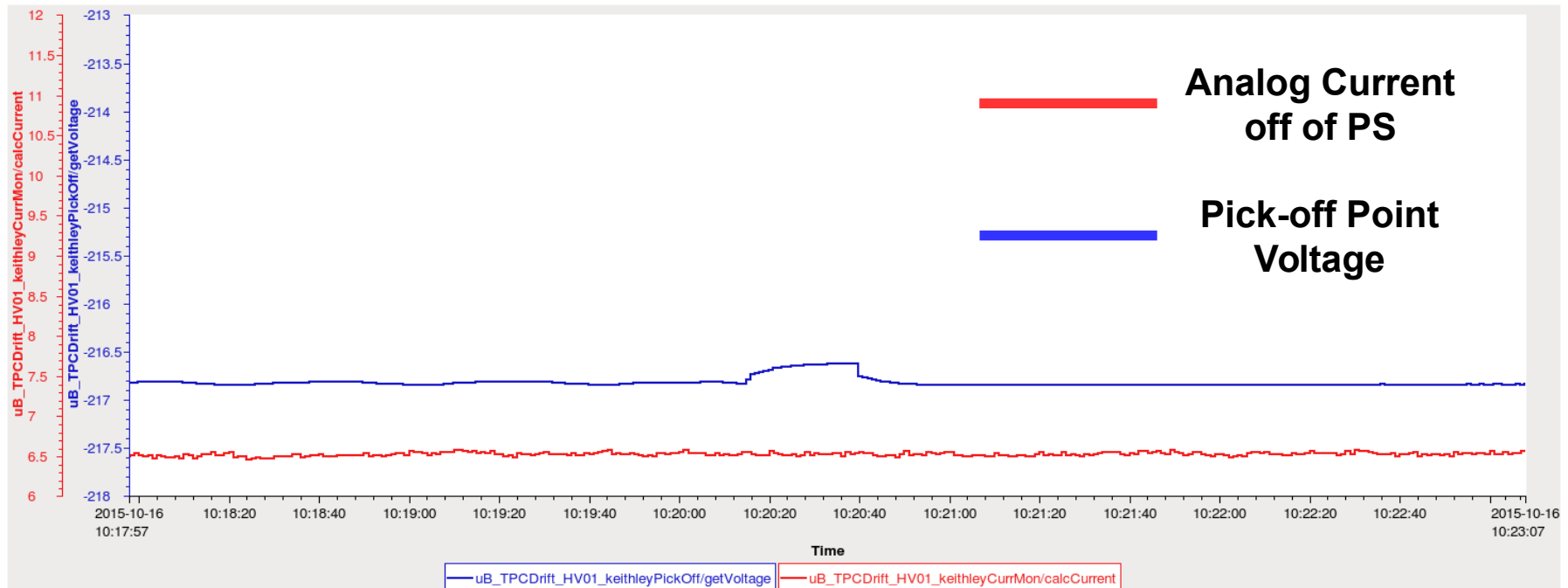
Small Deviation: Oct. 13th



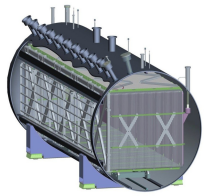
- ◆ Another small deviation on pick-off point
- ◆ Again, no significant activity seen on PS



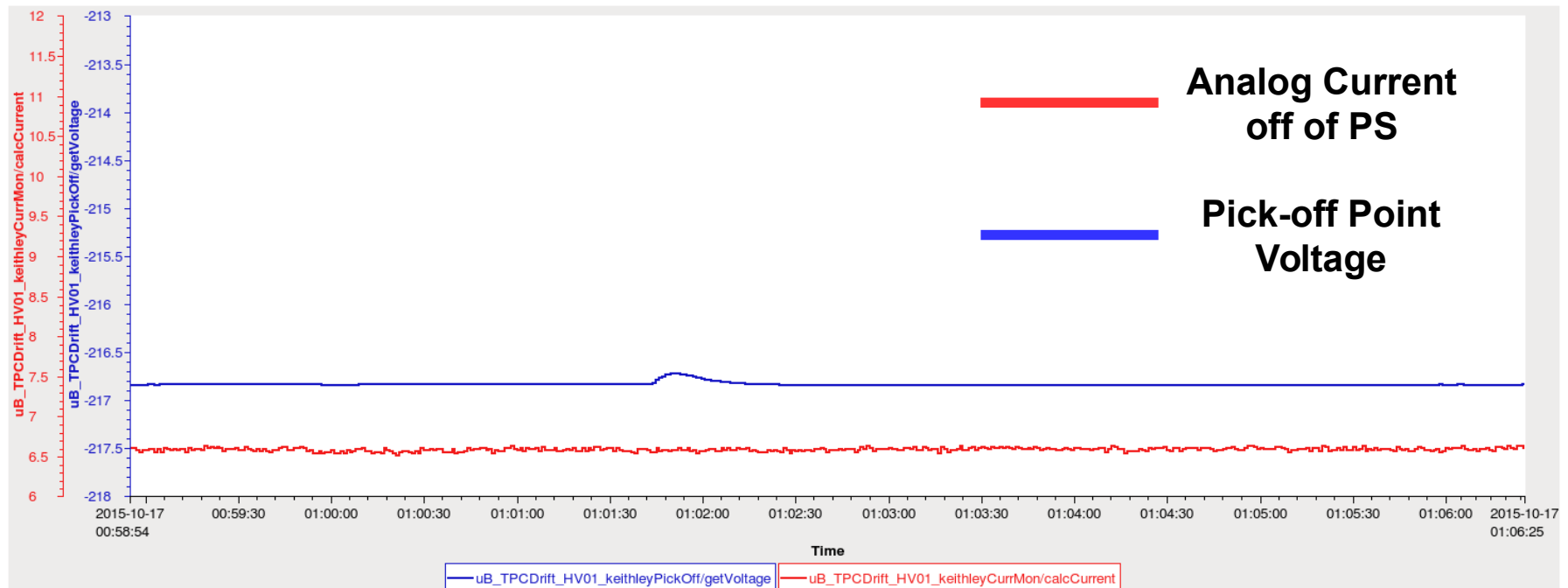
Small Deviation: Oct. 16th



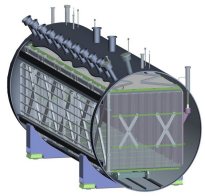
- ◆ Small deviation on pick-off point with unusual shape
- ◆ Seems cut off at end (trailing edge is not smooth)
- ◆ No significant activity seen on PS



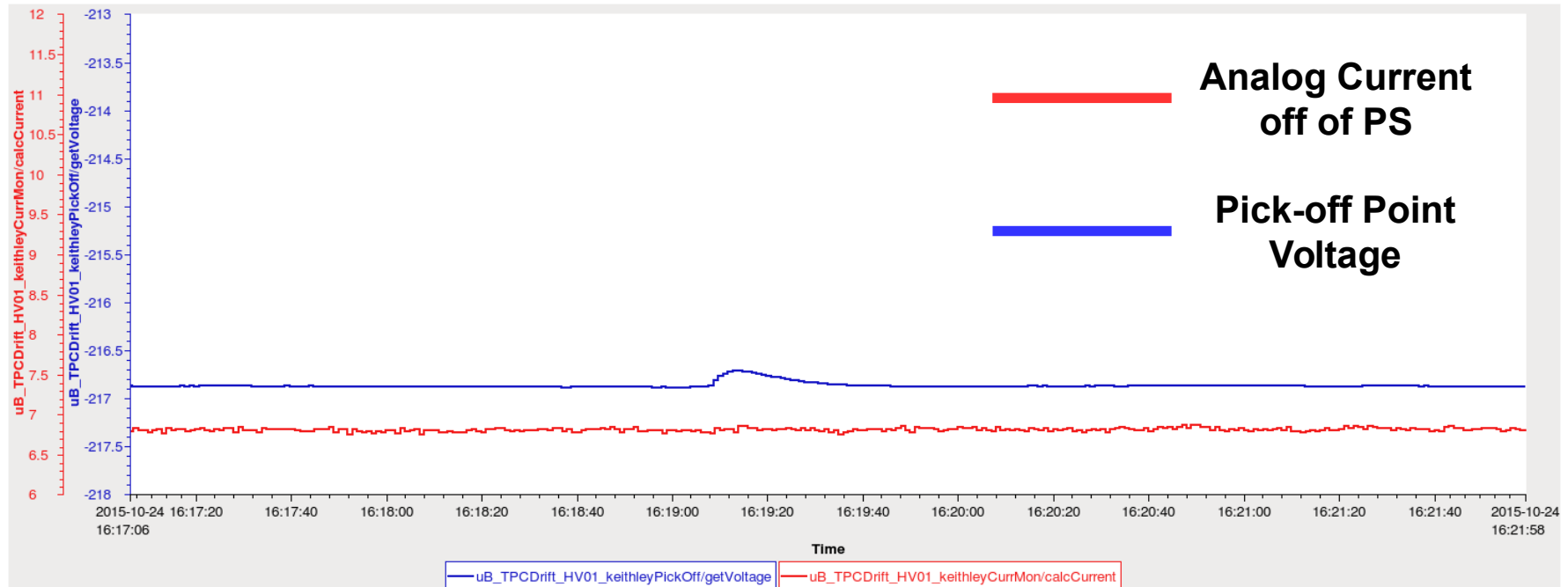
Small Deviation: Oct. 17th



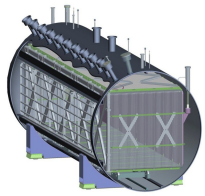
- ◆ Another small deviation on pick-off point
- ◆ Similar to pulse seen on October 13th
- ◆ No significant activity seen on PS



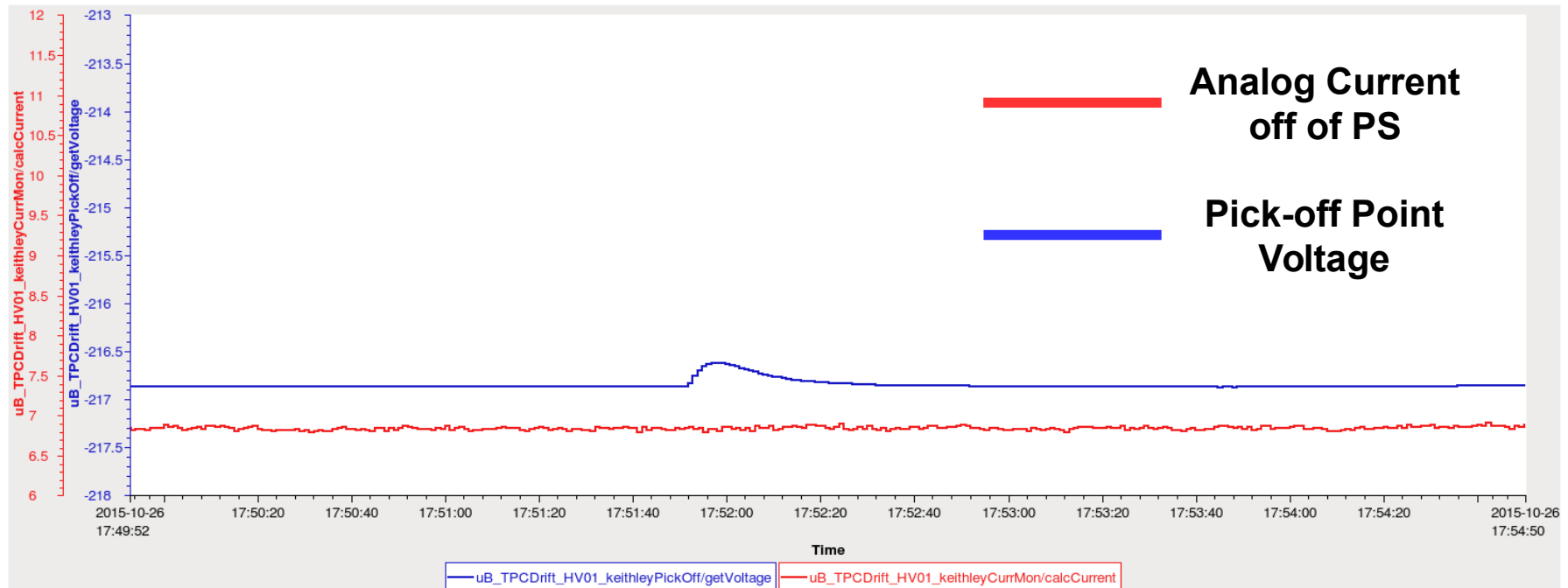
Small Deviation: Oct. 24th



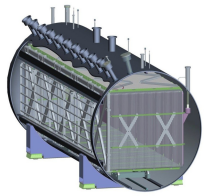
- ◆ Yet another small deviation on pick-off point
- ◆ Very similar to features observed on October 13th, October 17th
- ◆ Once again, no significant activity seen on PS



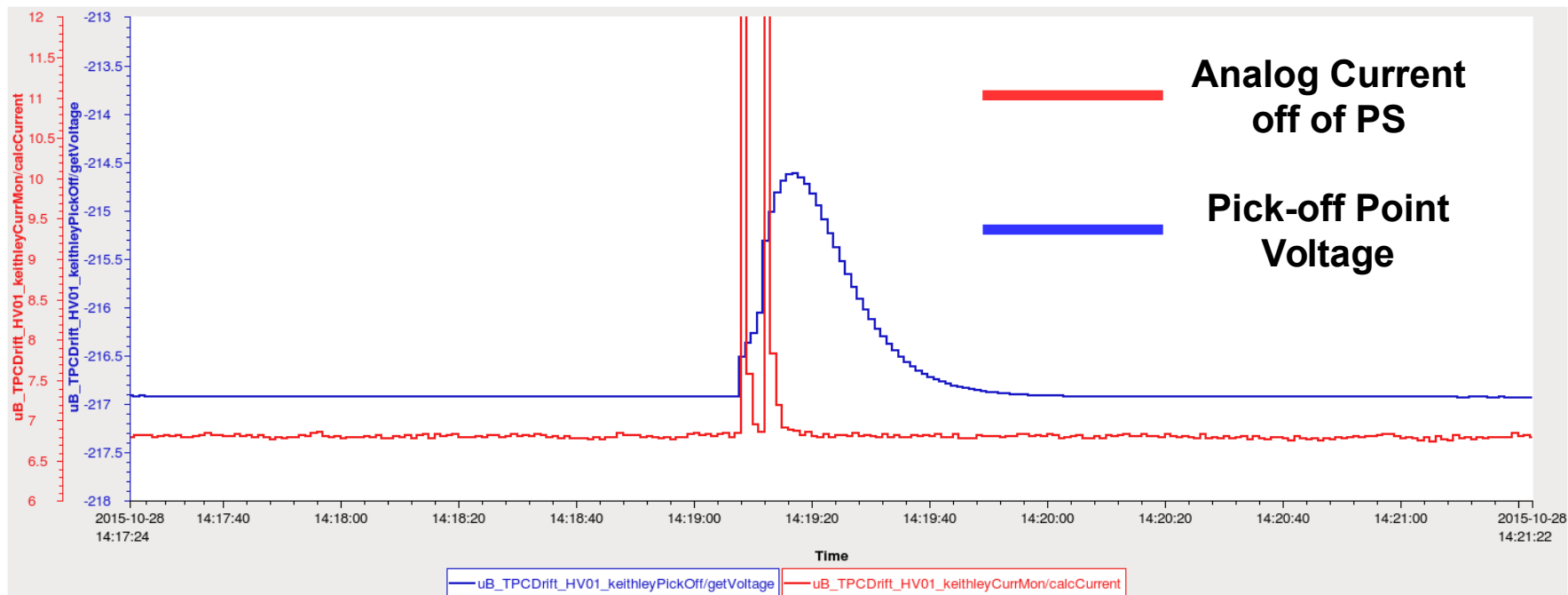
Small Deviation: Oct. 26th



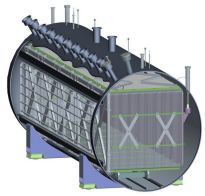
- ◆ Another small deviation on pick-off point (slightly higher in magnitude compared to before)
- ◆ No significant activity seen on PS like all other pick-off point pulses of similar magnitude



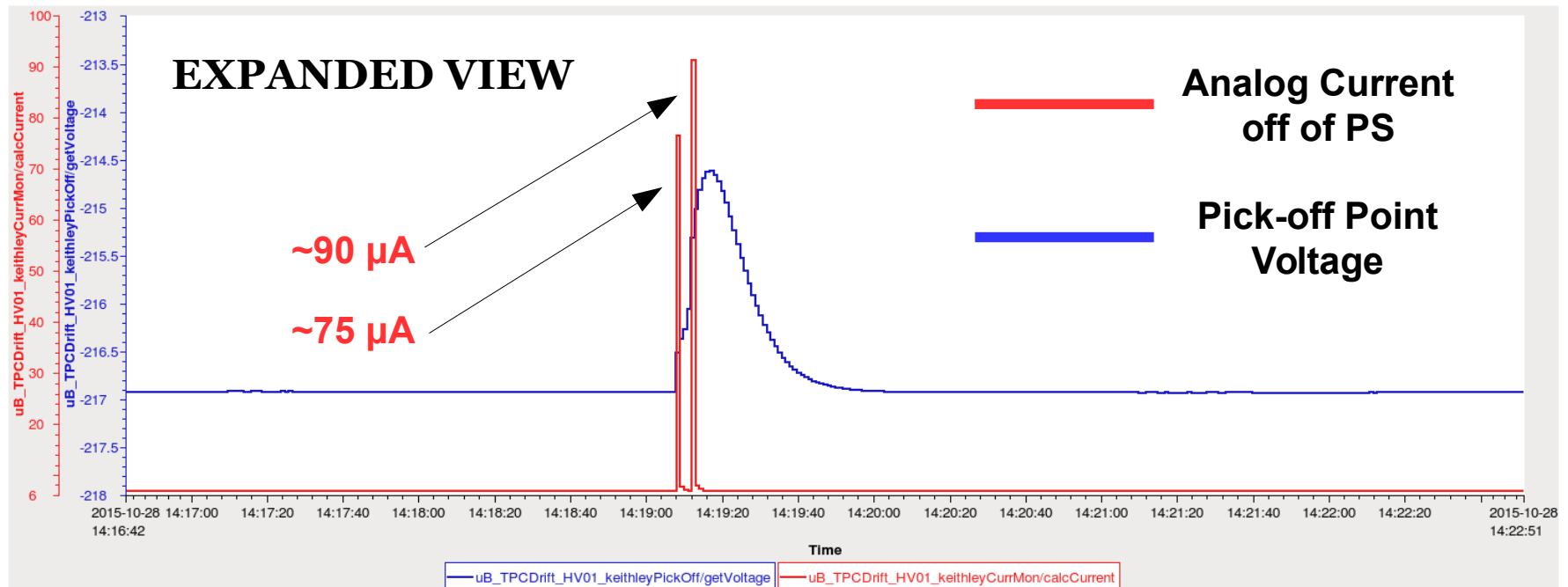
Large Deviation: Oct. 28th



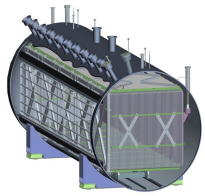
- ◆ A much larger deviation is seen for the first time (since October 11th) on the pick-off point – roughly **1%** deviation
- ◆ Also for the first time, significant activity on the PS (two current spikes) is seen



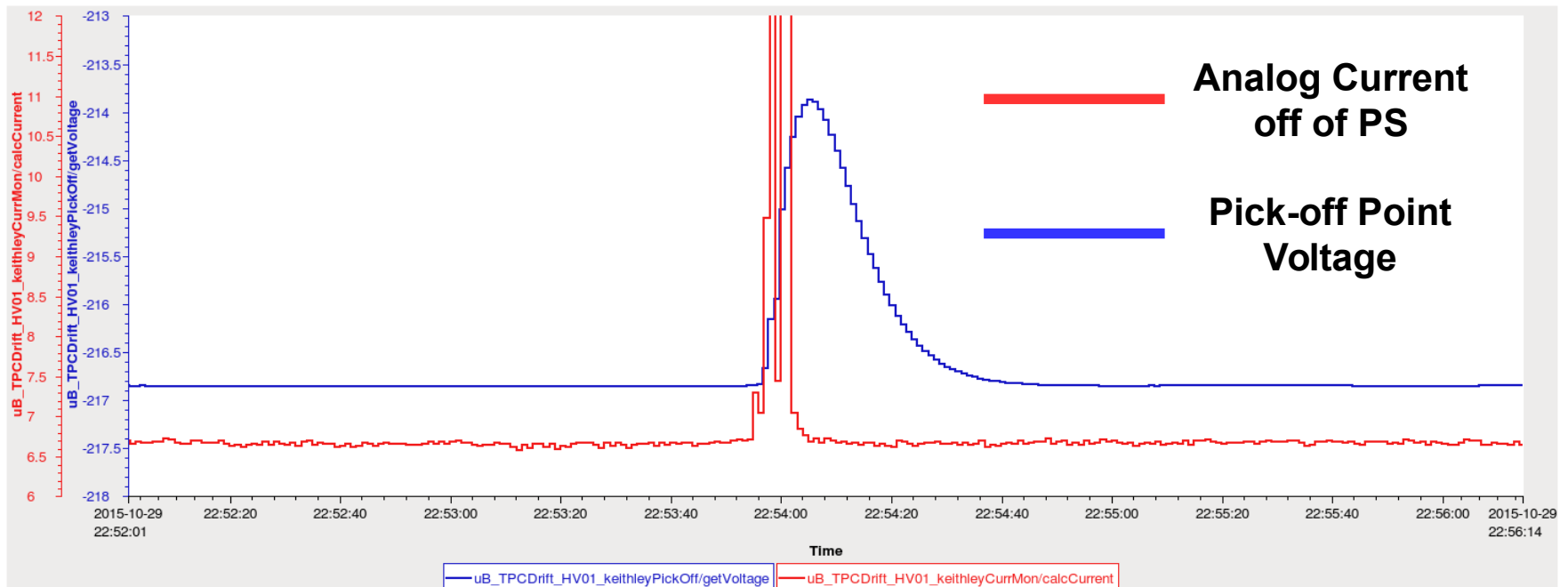
Large Deviation: Oct. 28th



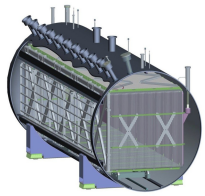
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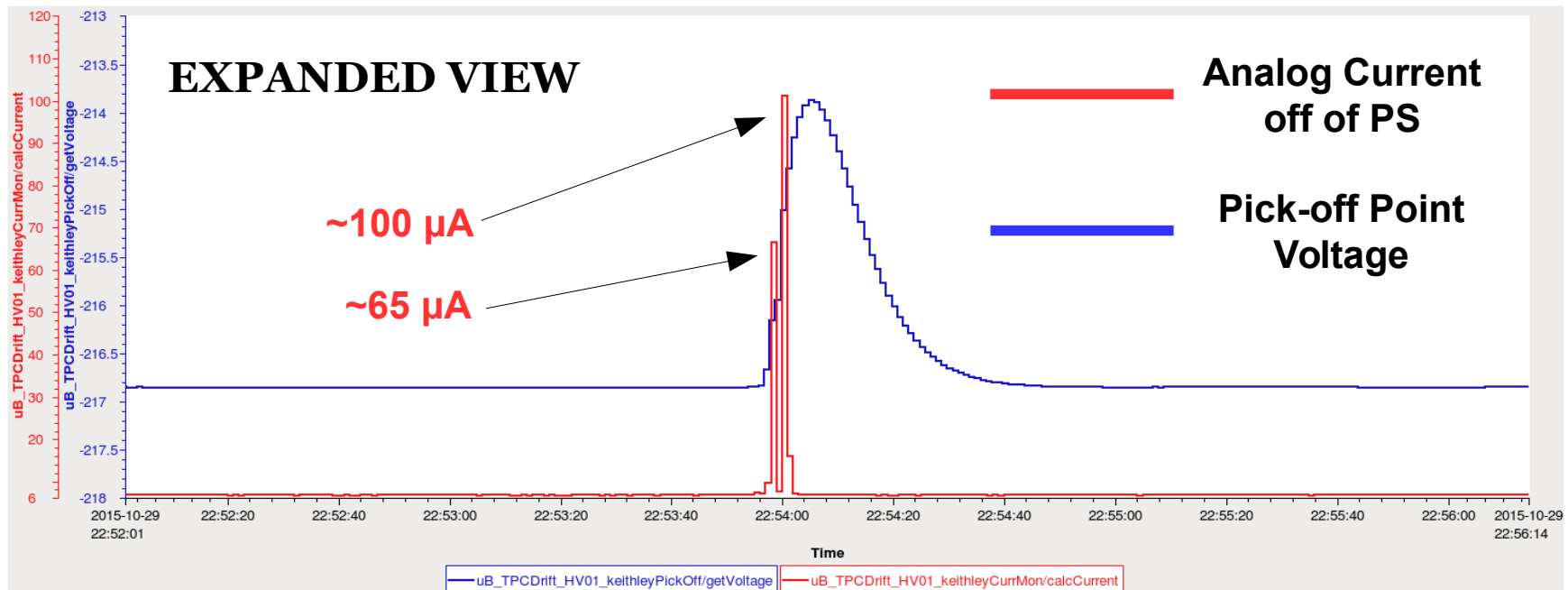
Large Deviation: Oct. 29th



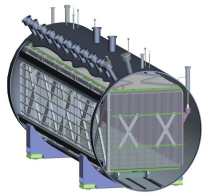
- ◆ Another large deviation is seen on the pick-off point – roughly **1.5%** deviation (larger than the last one)
- ◆ Again, significant activity on the PS (two current spikes) is seen, much like deviation seen on October 28th



Large Deviation: Oct. 29th



- ◆ Another large deviation is seen on the pick-off point – roughly **1.5%** deviation (larger than the last one)
- ◆ Again, significant activity on the PS (two current spikes) is seen, much like deviation seen on October 28th



Summary

Date	Approx. Time	Pick-Off Point: ΔV [V]	Analog Current off of PS: Current Spikes [μA]
Oct. 11 th	14:50	0.3 (0.15%)	—
Oct. 13 th	15:00	0.1 (0.05%)	—
Oct. 16 th	10:20	0.3 (0.10%)	—
Oct. 17 th	01:00	0.1 (0.05%)	—
Oct. 24 th	16:20	0.2 (0.10%)	—
Oct. 26 th	17:50	0.3 (0.15%)	—
Oct. 28 th	14:20	2.3 (1.05%)	75, 90
Oct. 29 th	22:50	3.0 (1.40%)	65, 100

- ◆ Time constant of pick-off point relaxation approximately **15 seconds**
- ◆ Most of small and both large deviations should have triggered alarms
 - Recently addressed by Sowjanya, shouldn't be an issue moving forward
- ◆ Shifters being advised to monitor cathode HV in detail for now