

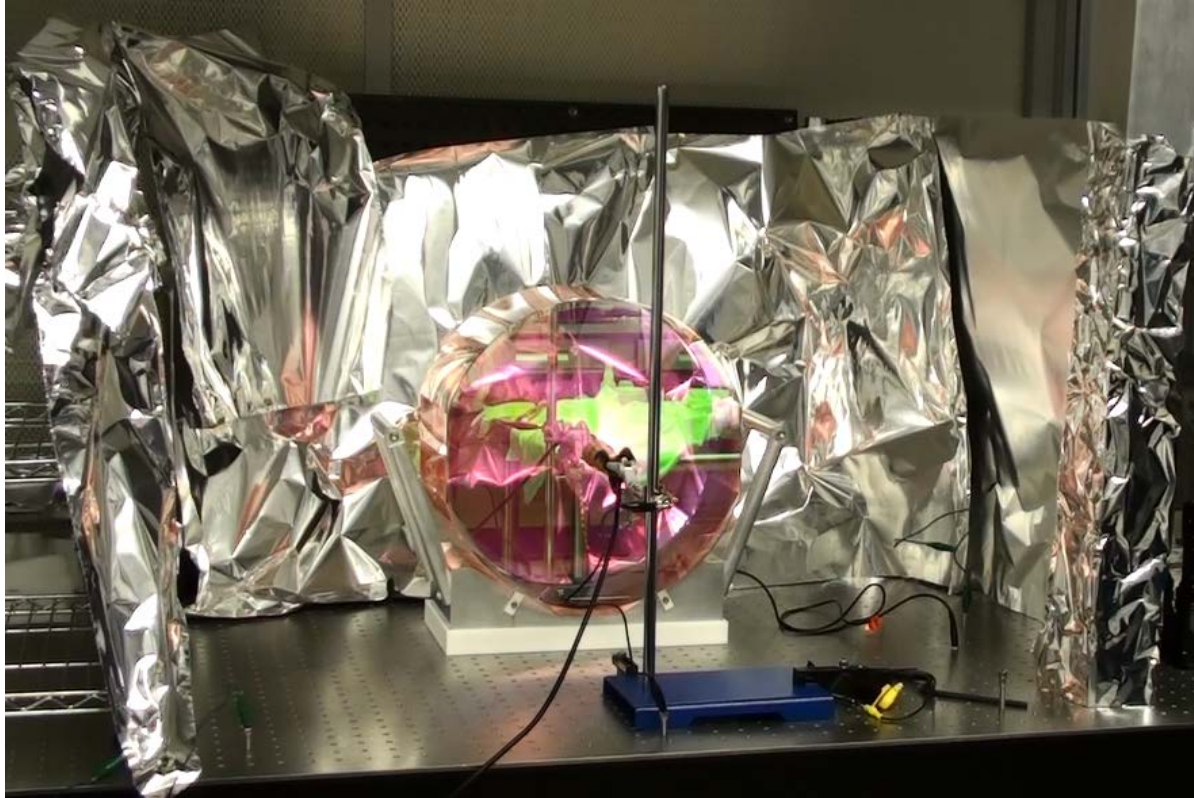
“You can look but you can't touch”

- I. First Contact wrt Charge
- II. Experiments to back up ETM / ERM Discharge procedure
- III. Experiments associated with Static Residue

Systems meeting 22nd April 2015

Kate Gushwa, Calum Torrie and Kyle Baric
(with Travis Sadecki and Betsy Weaver at LHO and previously with
GariLynn Billingsley and Norna Robertson at CIT and input from
Danny Sellars and Gary Traylor)

I. First Contact wrt Charge

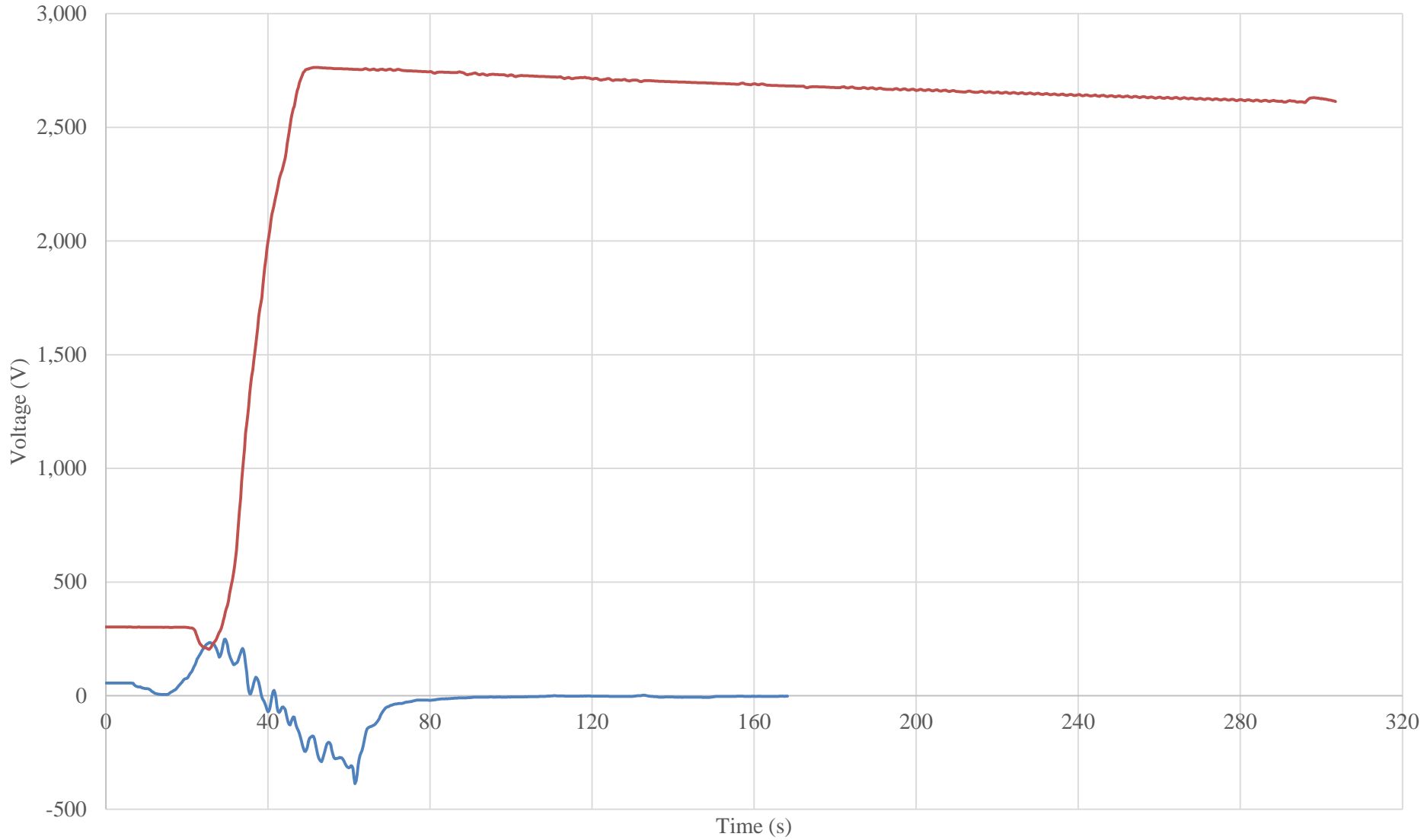


Refer to LIGO-T1500170:
[Charge Experiments at LHO -
March 2015](#)

I. Experimental Setup

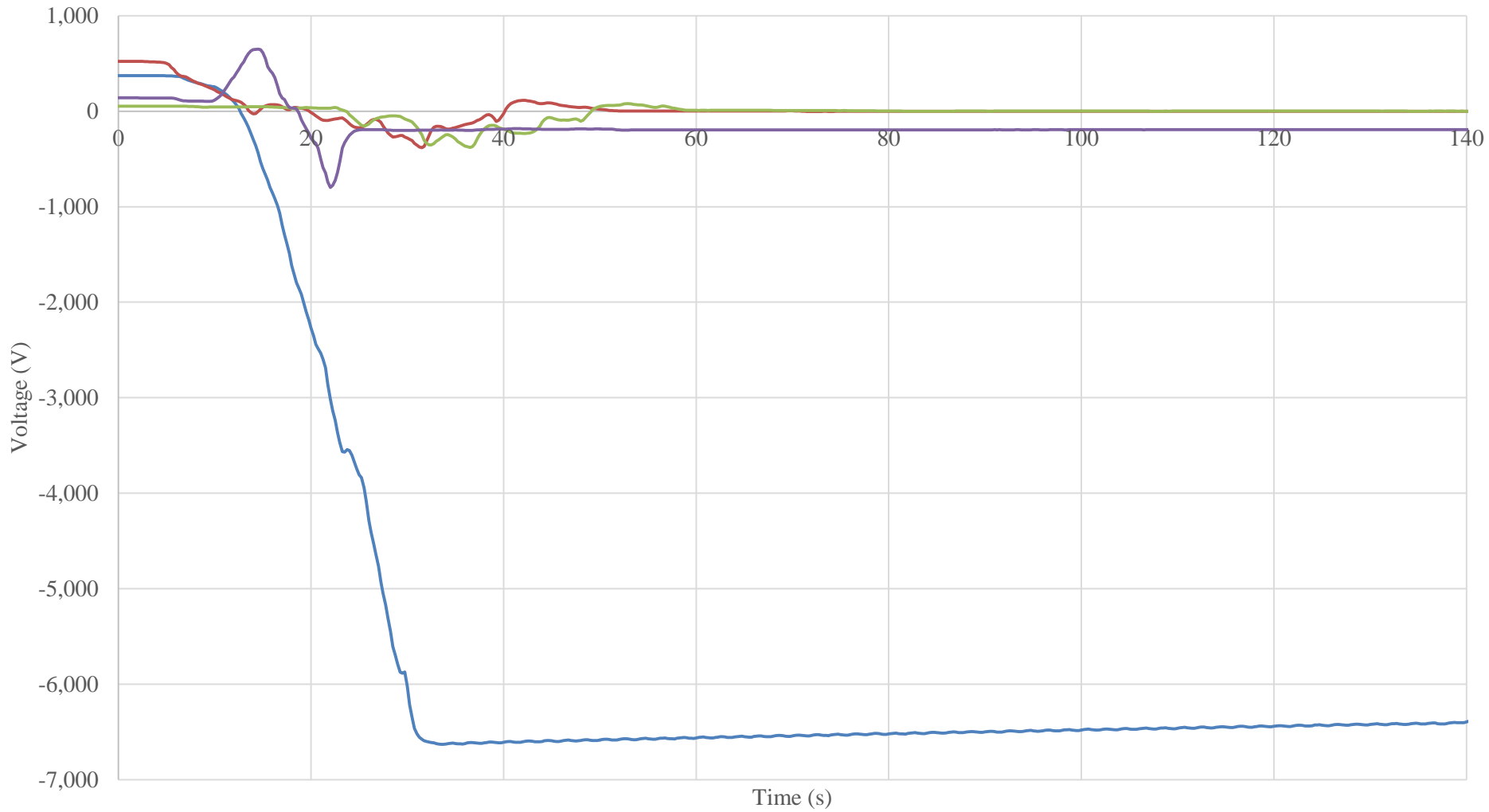
- ETM (single optic on V-block)
- On a flow bench in clean-room at LHO
- Grounded metal box
- All other items also grounded including table, stand etc ...
- Electrometer positioned 1" from surface being measured.
- Always peeled FC from AR side
- Measured on both HR and AR side.
- Zeroed electrometer with cap

Top Gun vs No Top Gun During Peel of First Contact (Measured from HR Side)



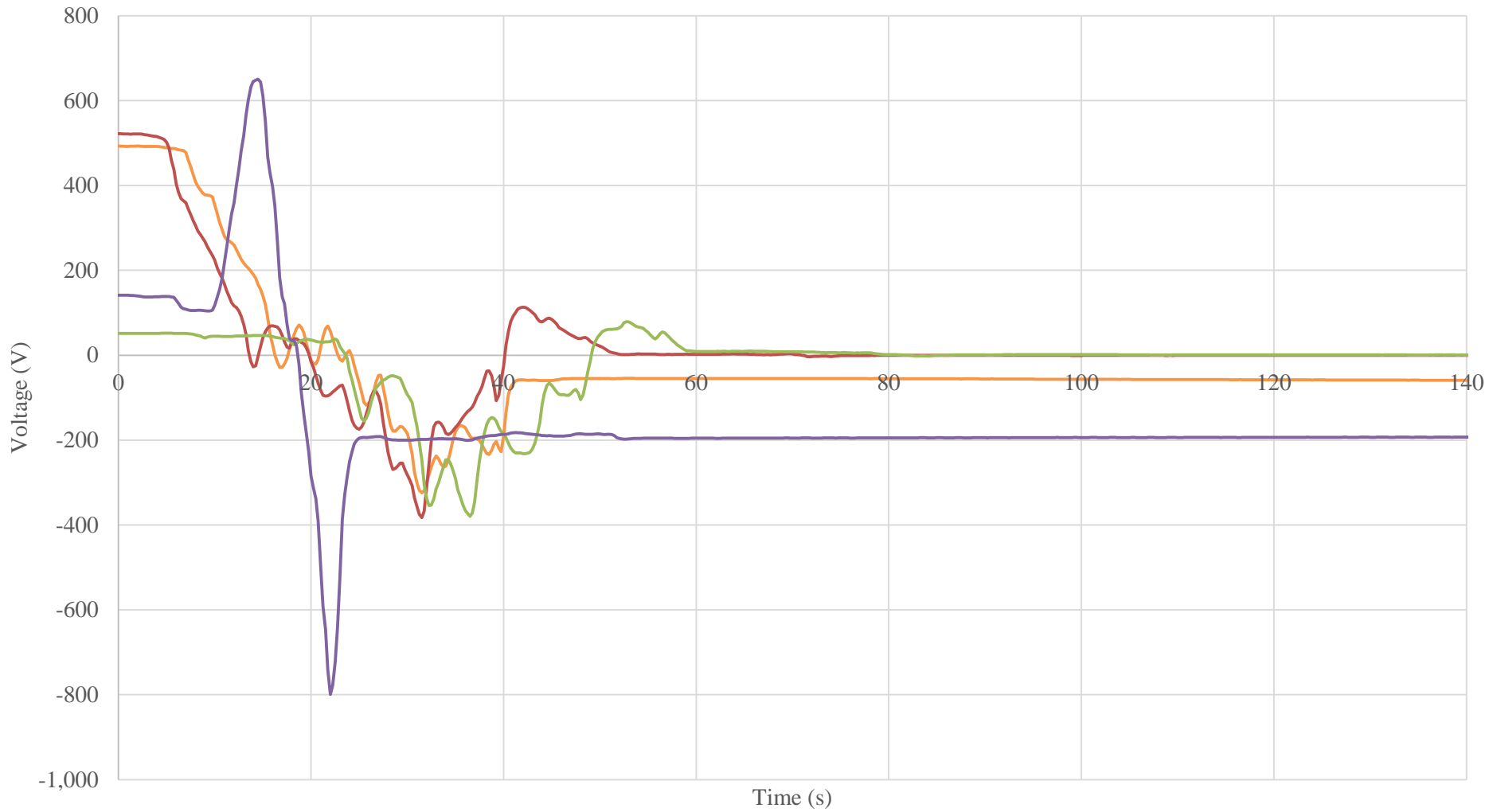
— 1.1 - Top Gun during peel + 71s — 1.2 - No Top Gun

Test #3 (Measured from HR Side)



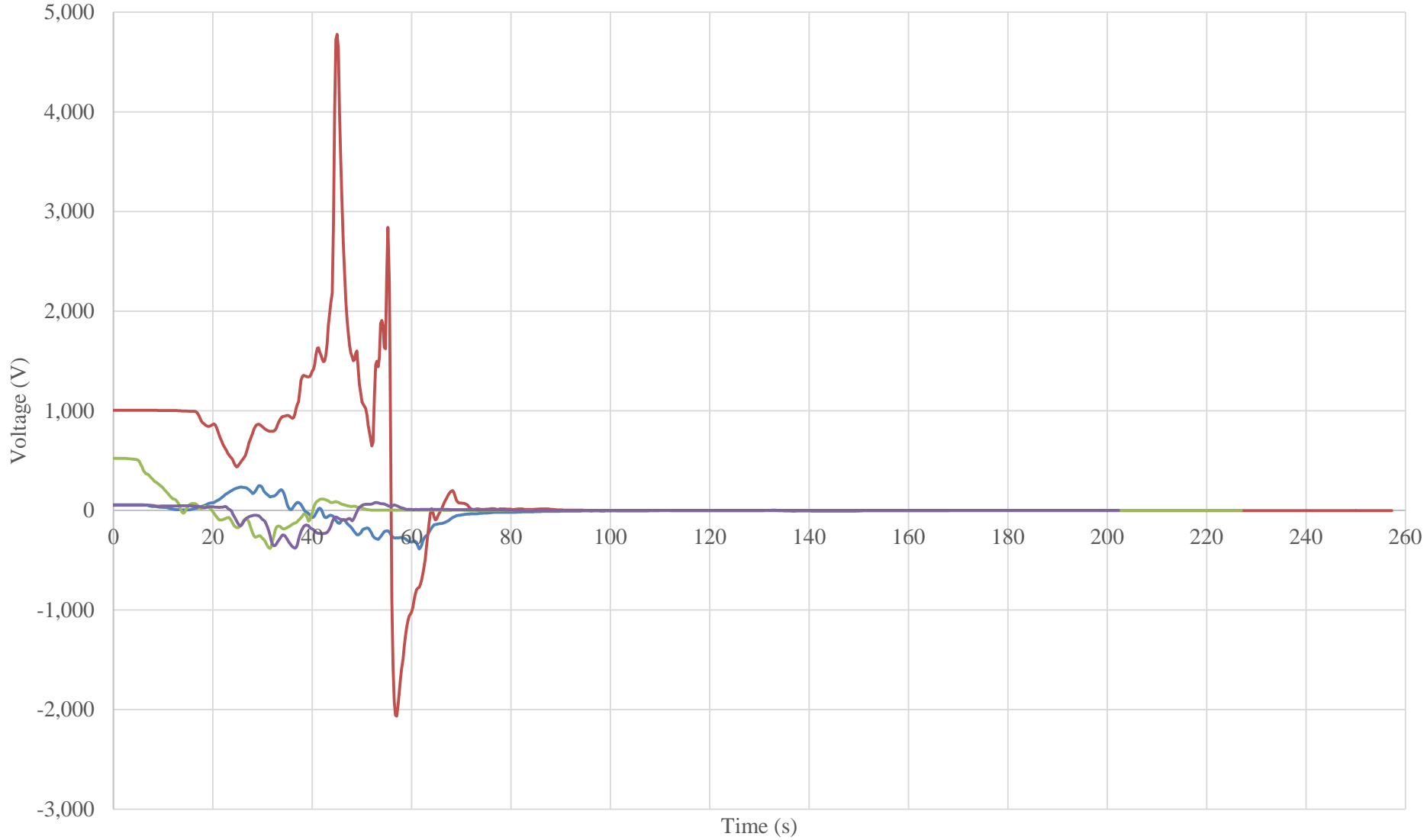
- 3.1 - No Top Gun during peel, ~30s "clean up" 3x
- 3.3 - Top Gun during peel +30s
- 3.4 - Top Gun during peel +30s, Glove #3 & ground strap
- 3.5 - Top Gun during peel + 12s, post peel inspection (BAD EXAMPLE)

Test #3 (Measured from HR Side)



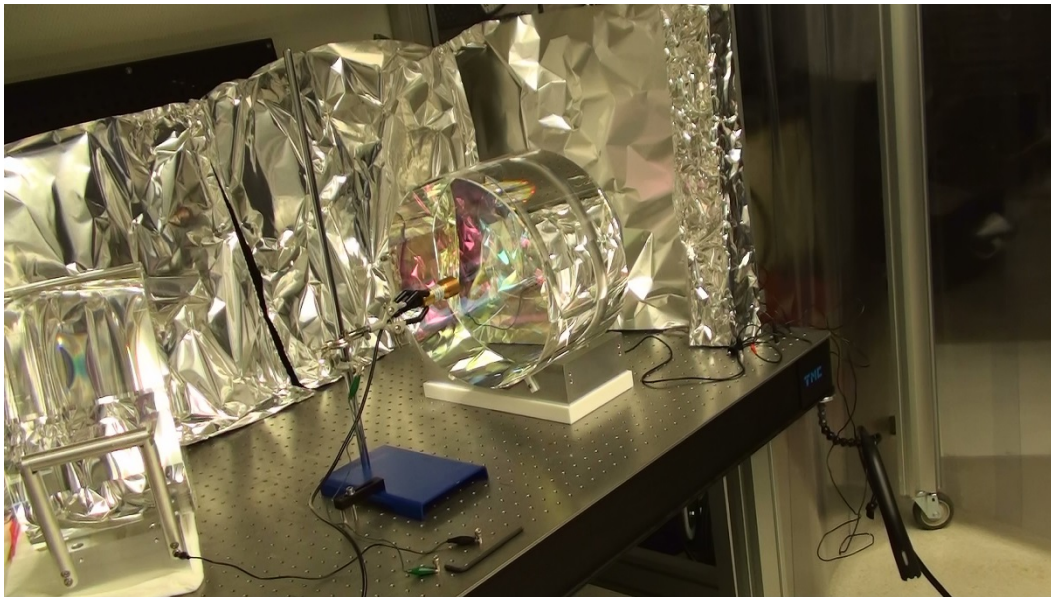
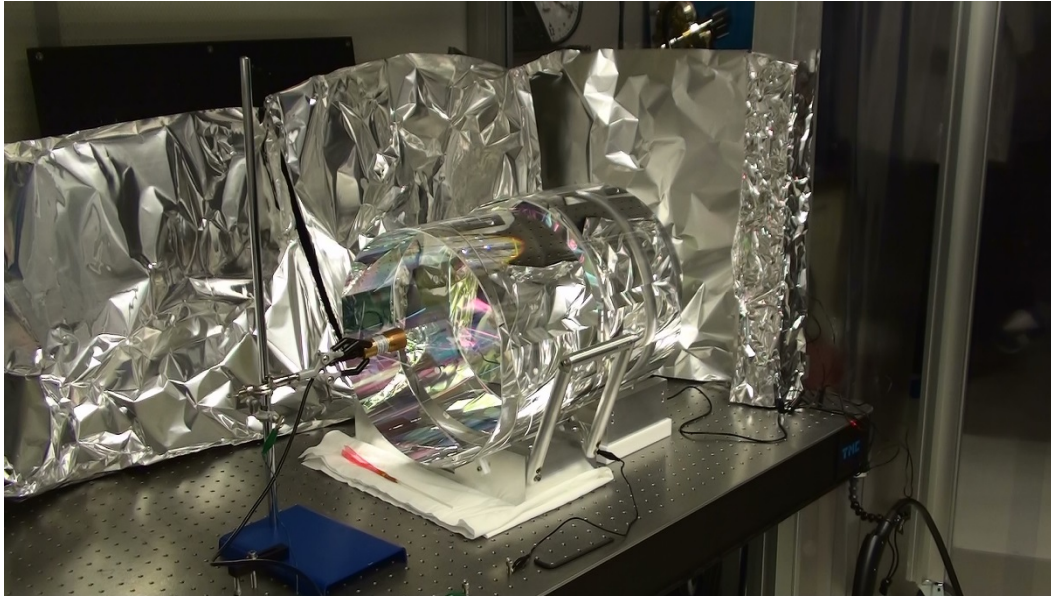
- 3.2 - Top Gun during peel
- 3.3 - Top Gun during peel +30s
- 3.4 - Top Gun during peel +30s, Glove #3 & ground strap
- 3.5 - Top Gun during peel + 12s, post peel inspection (BAD EXAMPLE)

Top Gun During & After Peel (Measured from Both HR & AR)



— 1.1 - 71s post peel (HR) — 2.3 - 30s post peel (AR) — 3.3 - 30s post peel (HR) — 3.4 - 30s post peel, glove #3 & ground strap (HR)

II. Experiments to back up ETM / ERM Discharge procedure

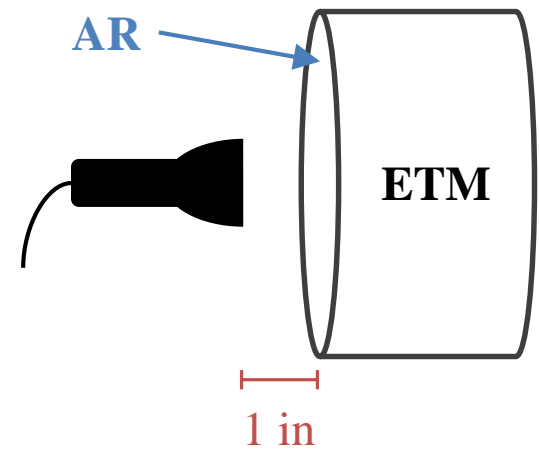
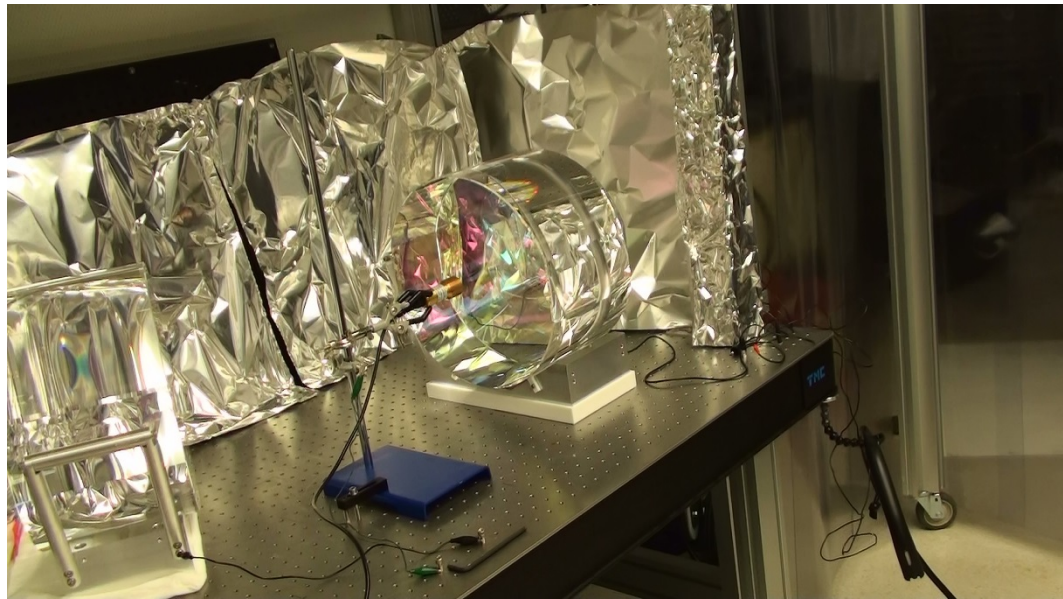
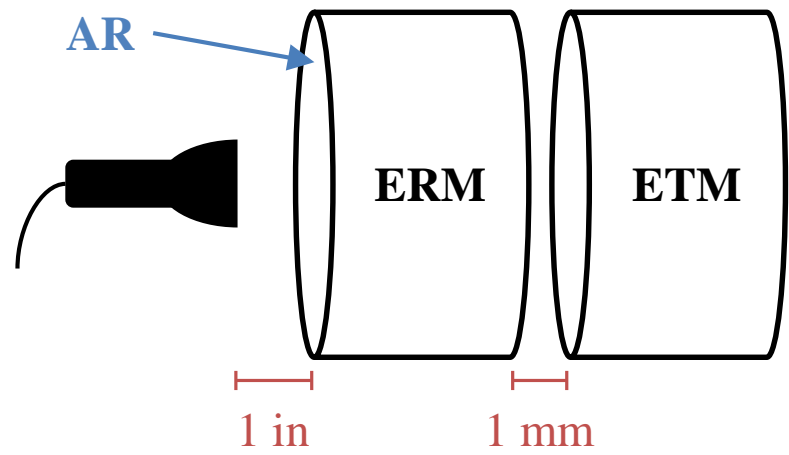
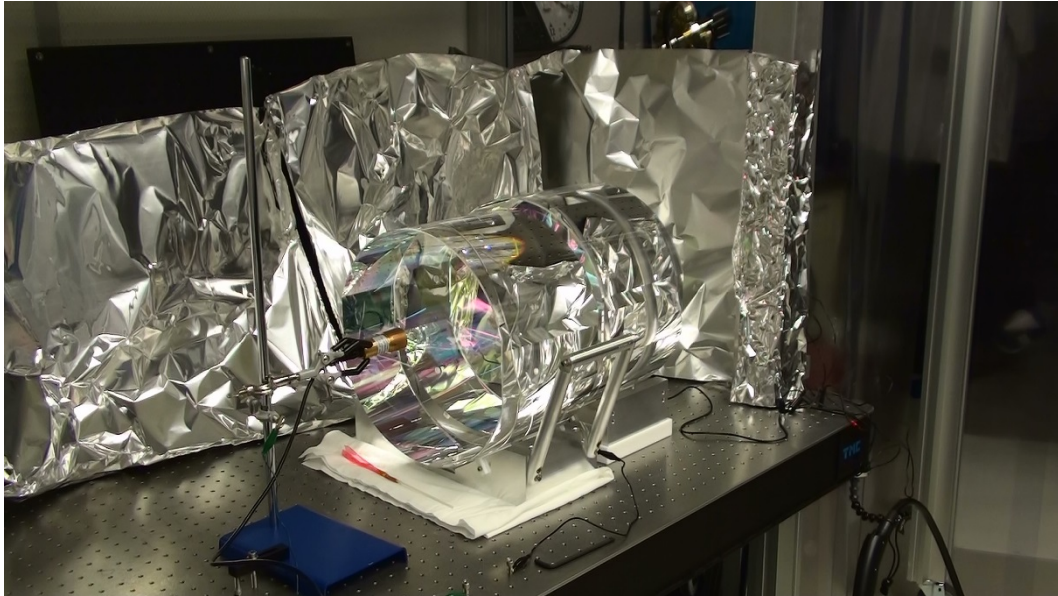


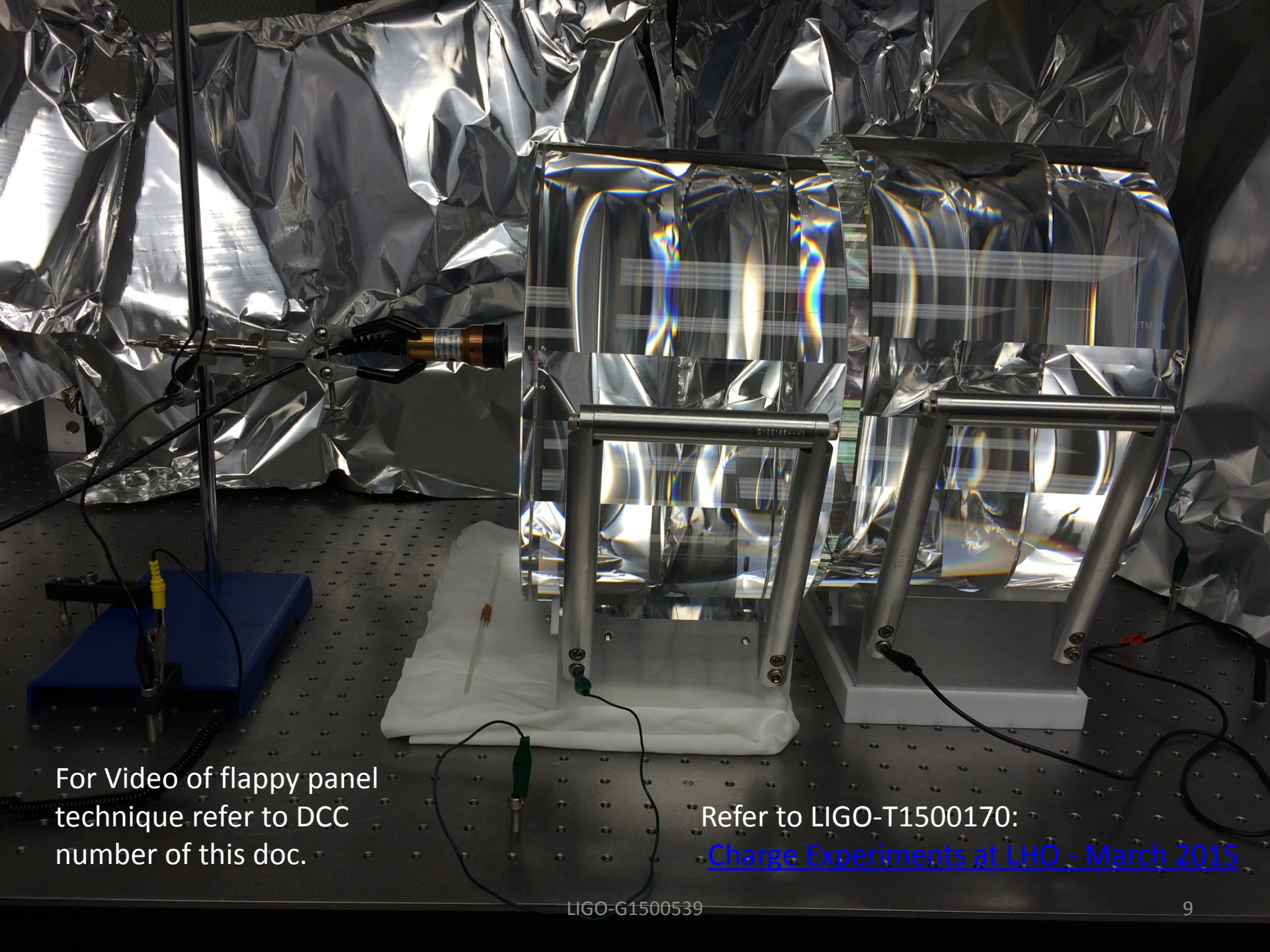
II. Experimental Setup

- ETM and PUM [ERM] each on a V-block
- On a flow bench in clean-room at LHO
- Grounded metal box
- All other items also grounded including table, stand etc ...
- Electrometer positioned 1" from surface being measured.
- 10mm gap
- Applied charge in gap
- Measurements made from both behind PUM [ERM] and also in gap at ETM (after separated optics).

Refer to LIGO-T1500101: [ETM / ERM Gap discharge procedure](#)

II. Experiments to back up ETM / ERM Discharge procedure

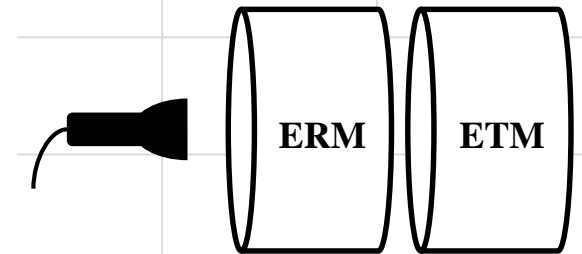
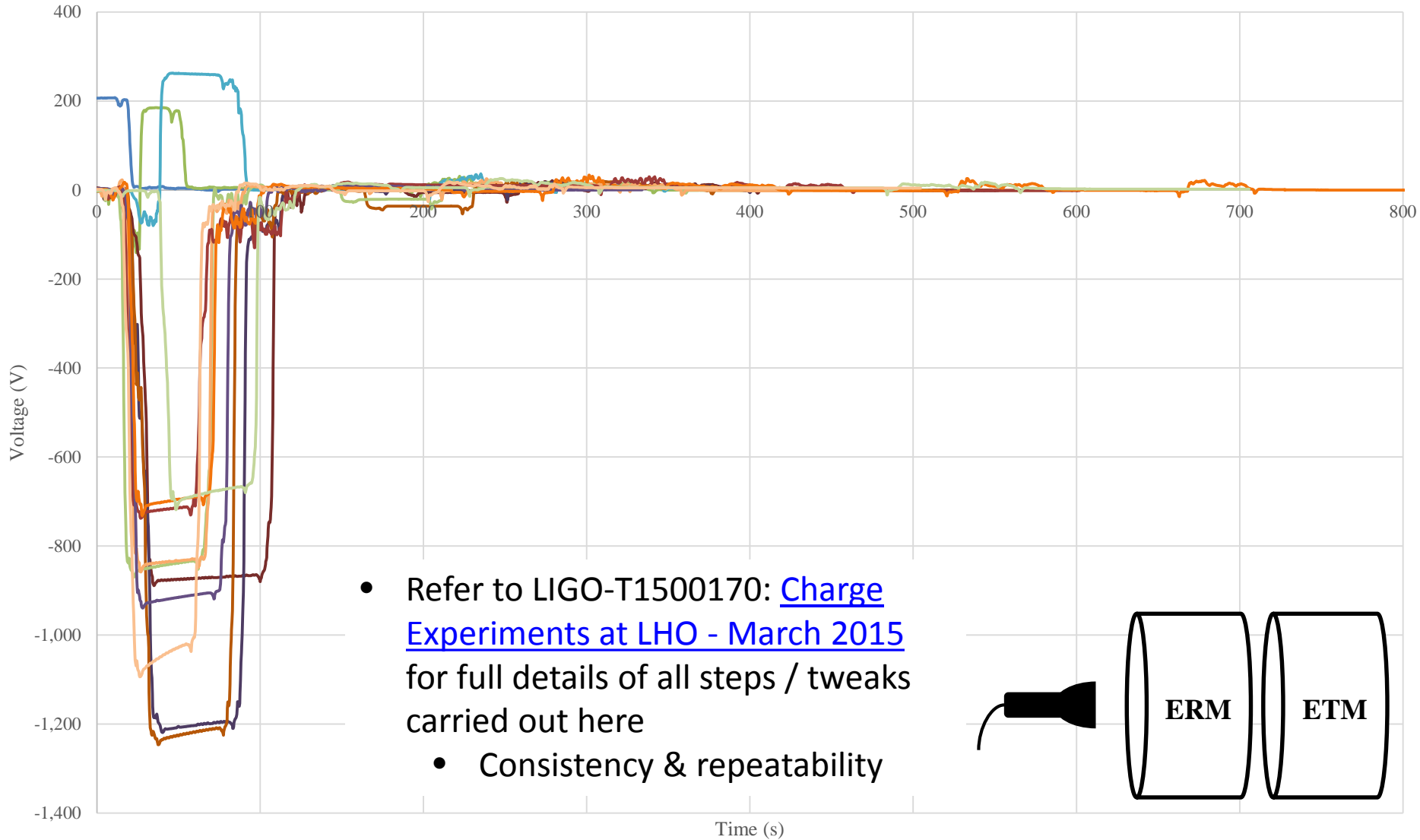




For Video of flappy panel
technique refer to DCC
number of this doc.

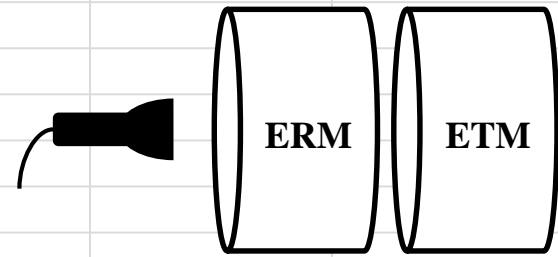
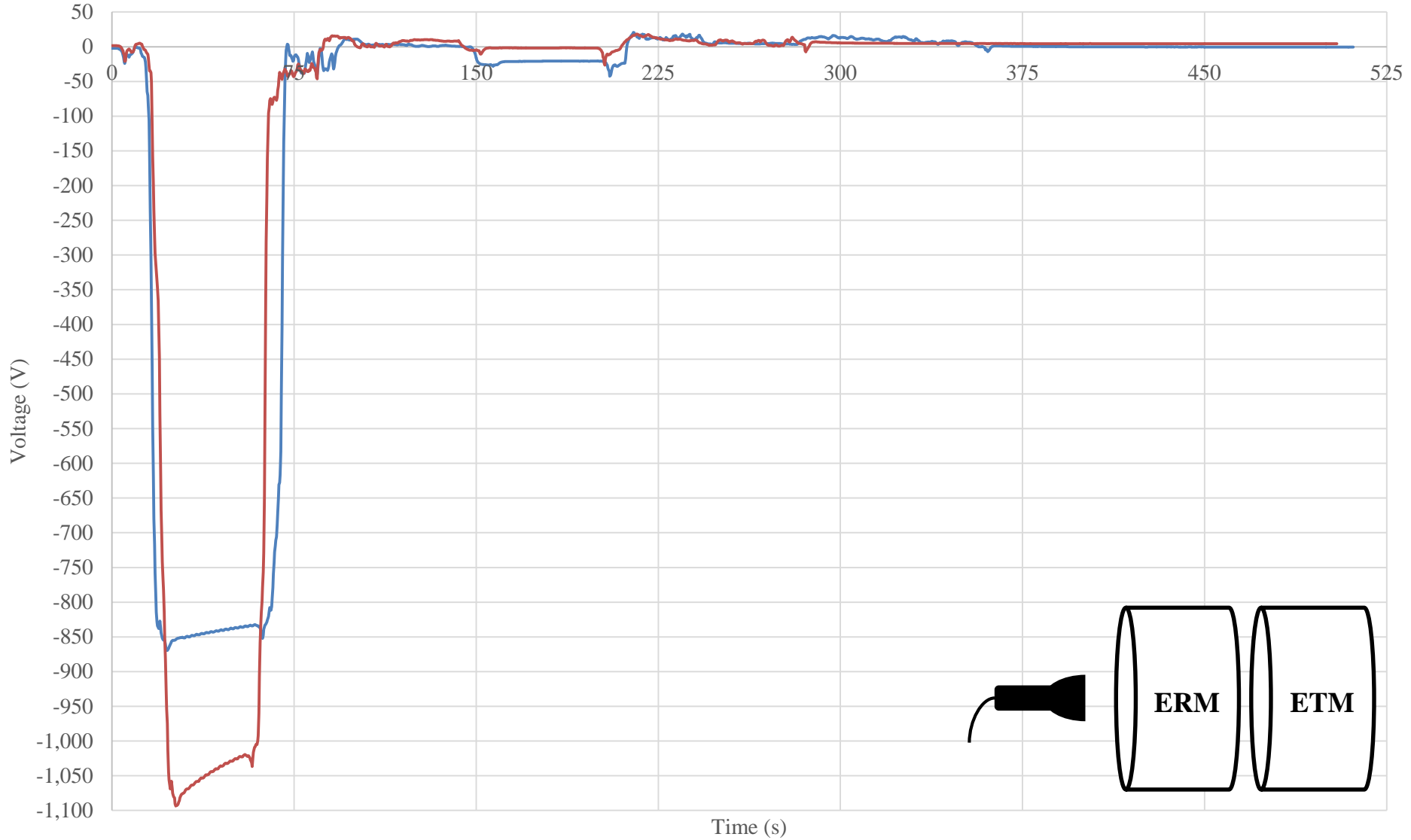
Refer to LIGO-T1500170:
[Charge Experiments at LHO - March 2015](#)

Charging with First Contact & Discharging with Flappy Panel (Days 4 & 5 Part A, Measured from ERM AR)



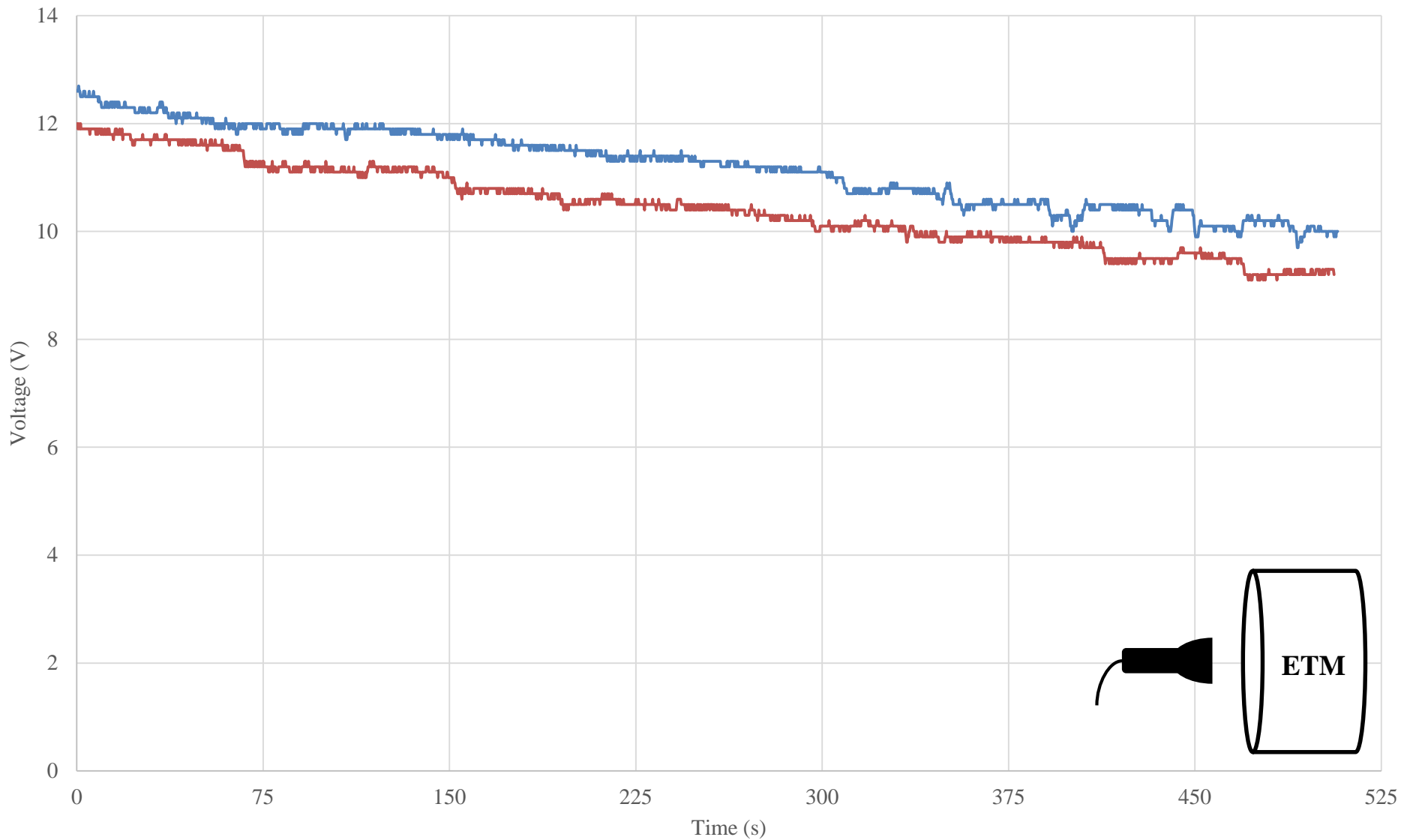
4.1 A 4.2 A 4.3 A 4.4 A 4.5 A 4.6 A 4.7 A 5.1 A 5.2 A 5.3 A 5.4 A 5.6 A 5.8 A

Long Duration Experiments (Days 4 & 5 Part A Measured from ERM AR)



— 4.7 Part A - Standard flappy pannel procedure — 5.8 A - Flappy pannel procedure w/ modified TG "clean up" (gap & barrel only)

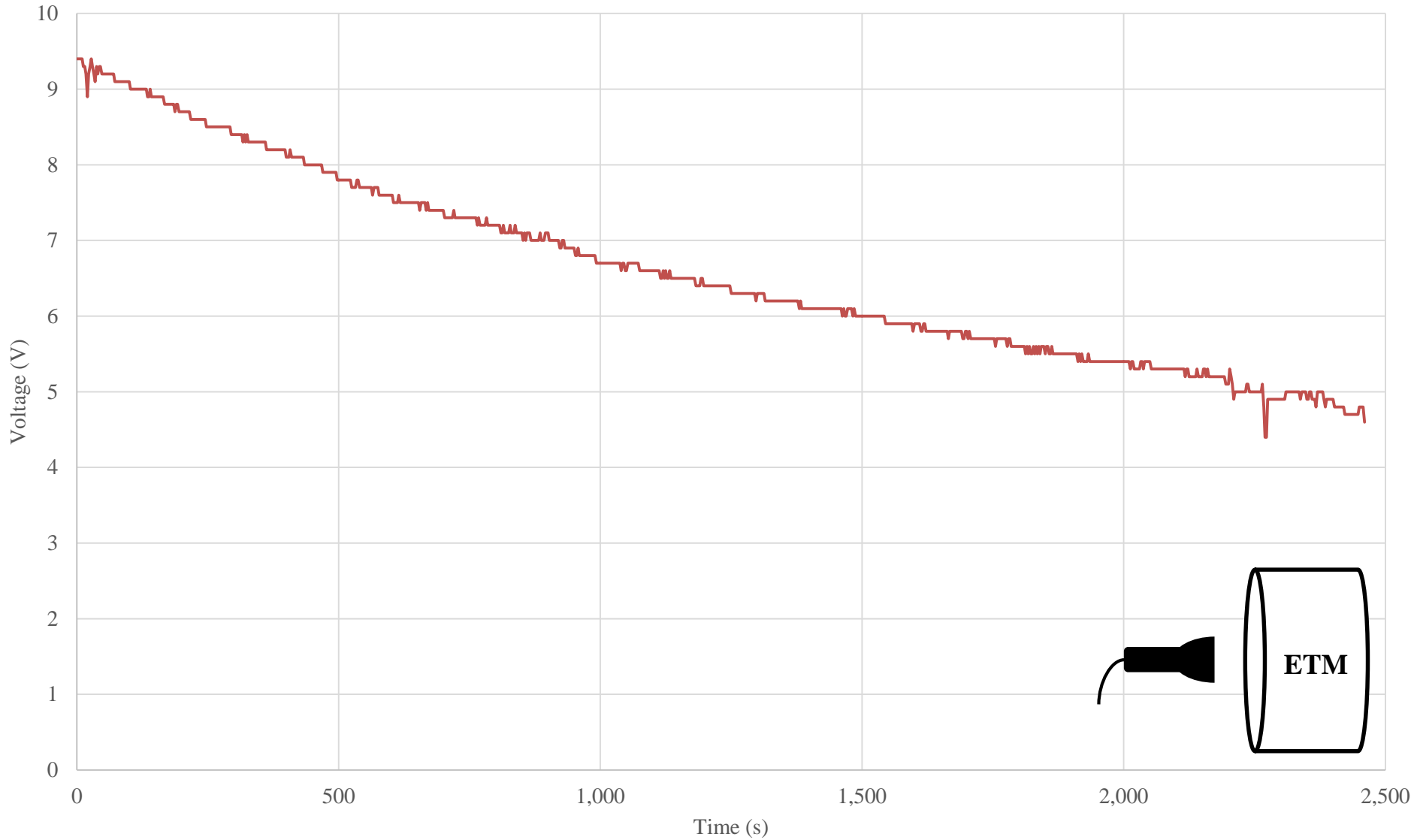
Long Duration Experiments (Days 4 & 5 Part B, Measured from ETM AR)



— 4.7 Part B - Standard flappy panel procedure

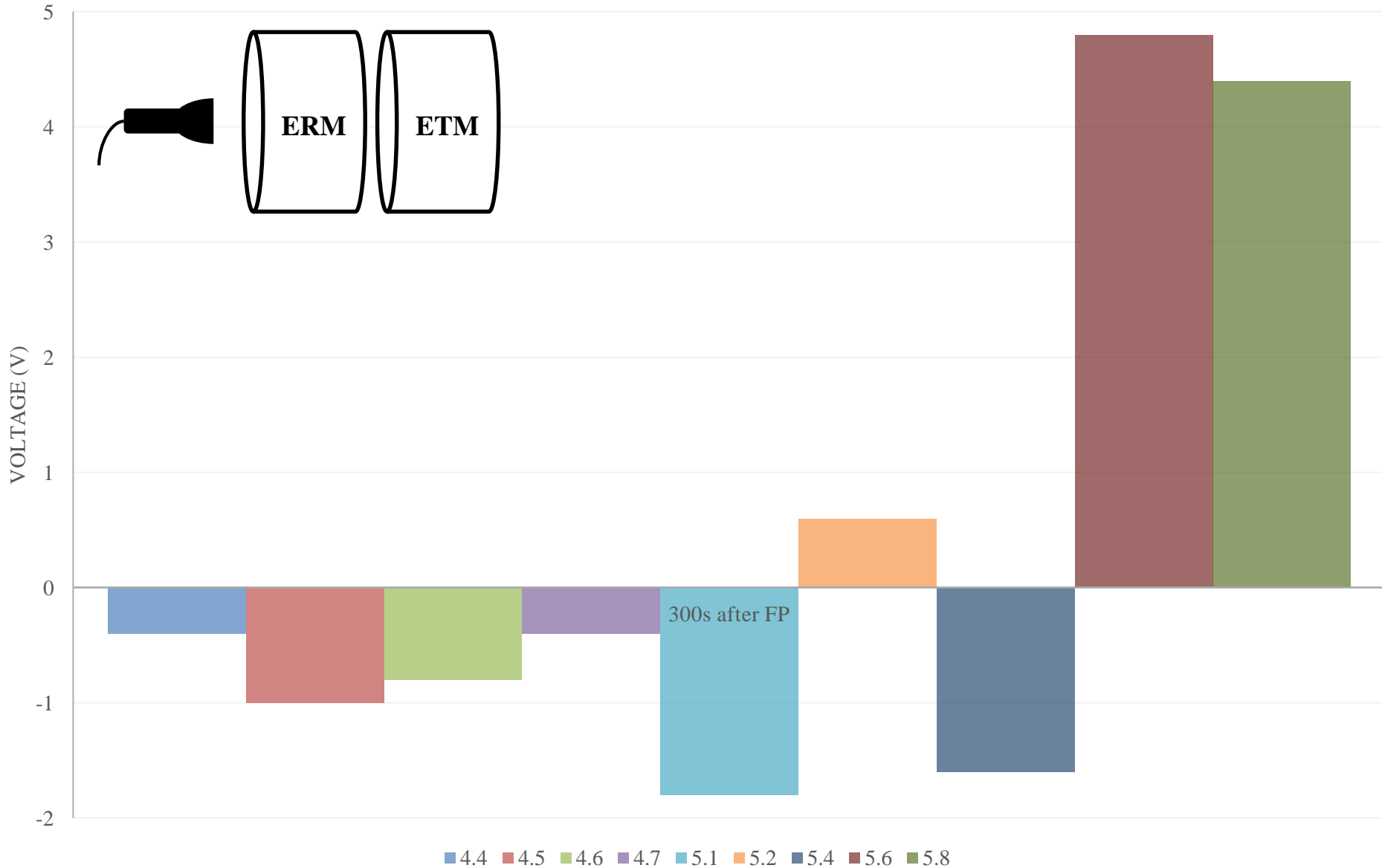
— 5.8 B - Flappy panel procedure w/ modified TG "clean up" (gap & barrel only)

Long Duration Experiments (Days 4 & 5 Part C, Measured from ETM AR)

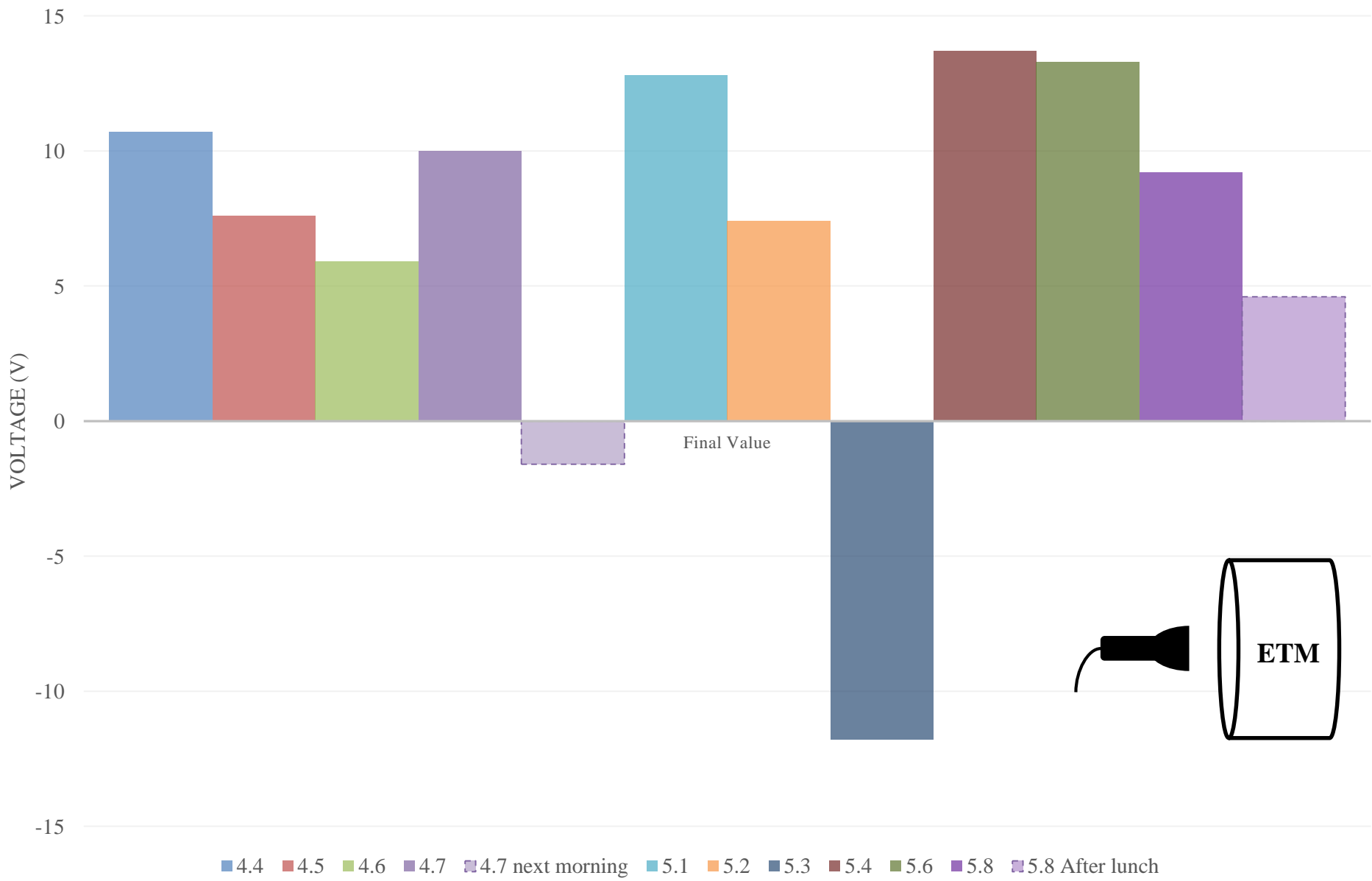


— 5.8 C - Flappy pannel procedure w/ modified TG "clean up" (after lunch)

300 Seconds After Flappy Panel Removed (Days 4 & 5 Part A, Measured from ERM AR)



800 Seconds After Flappy Panel Removed (Days 4 & 5 Part B, Measured from ETM AR)



III. Experiments associated with Static Residue

III. Experimental setup

- 1" thick x 34cm diameter glass plate (one with gold pattern, as shown).
- All experiments carried out in a grounded box.
- Electrometer (USSVM II) used for measurements.
- Electrometer position 1" from front face of plate.
- Electrometer positioned at 2 o'clock position.
- Various items used to charge optic!
 - Touching or wiping in the general vicinity of the electrometer
- Top Gun used at 10-20 PSI to discharge
 - *CONC: Can always recover with TG!*

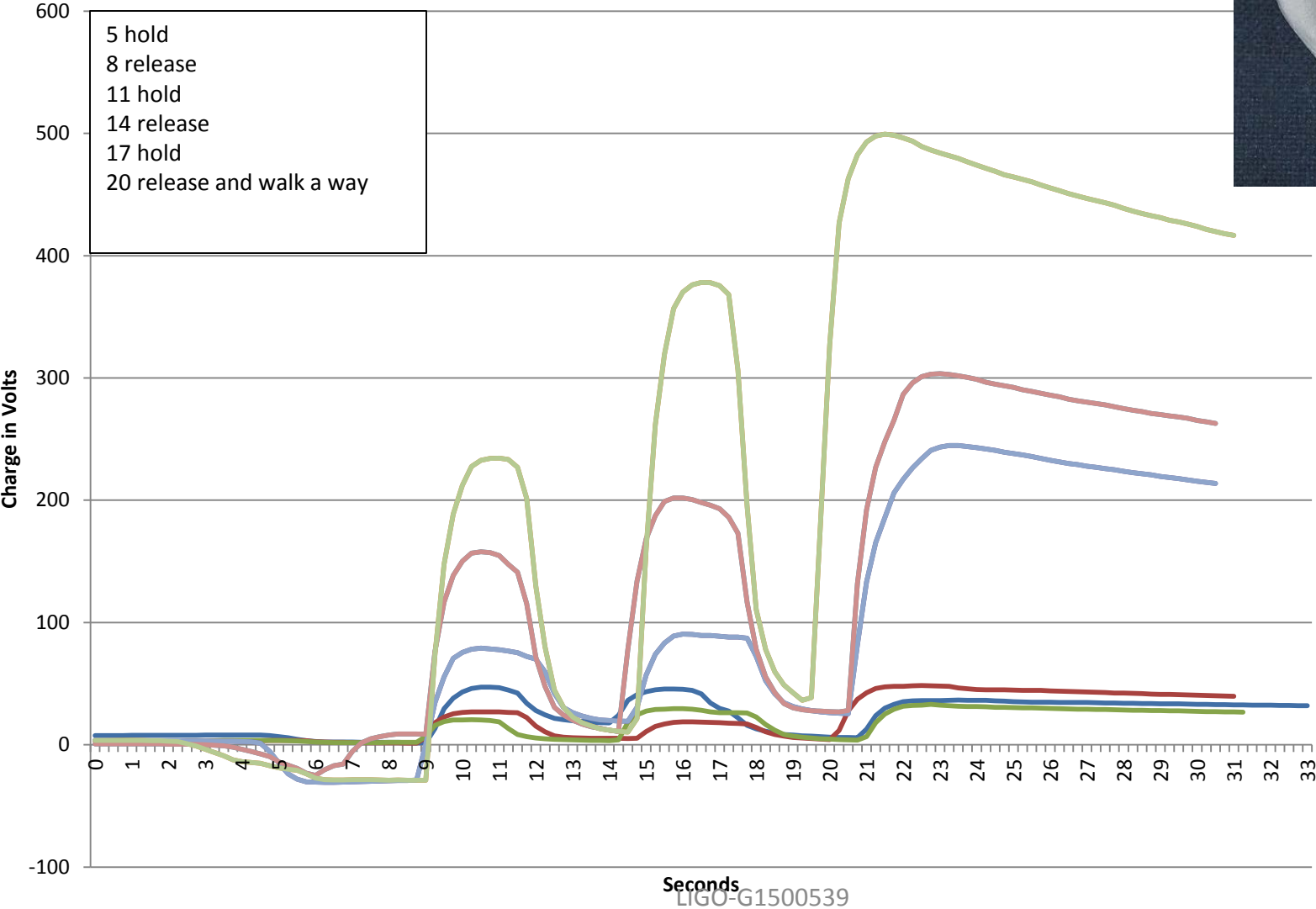


LIGO-T1500157: [Static residue tests Gloves and plastics](#)

Qualakate Vs. Latex (current gloves we use in chamber)

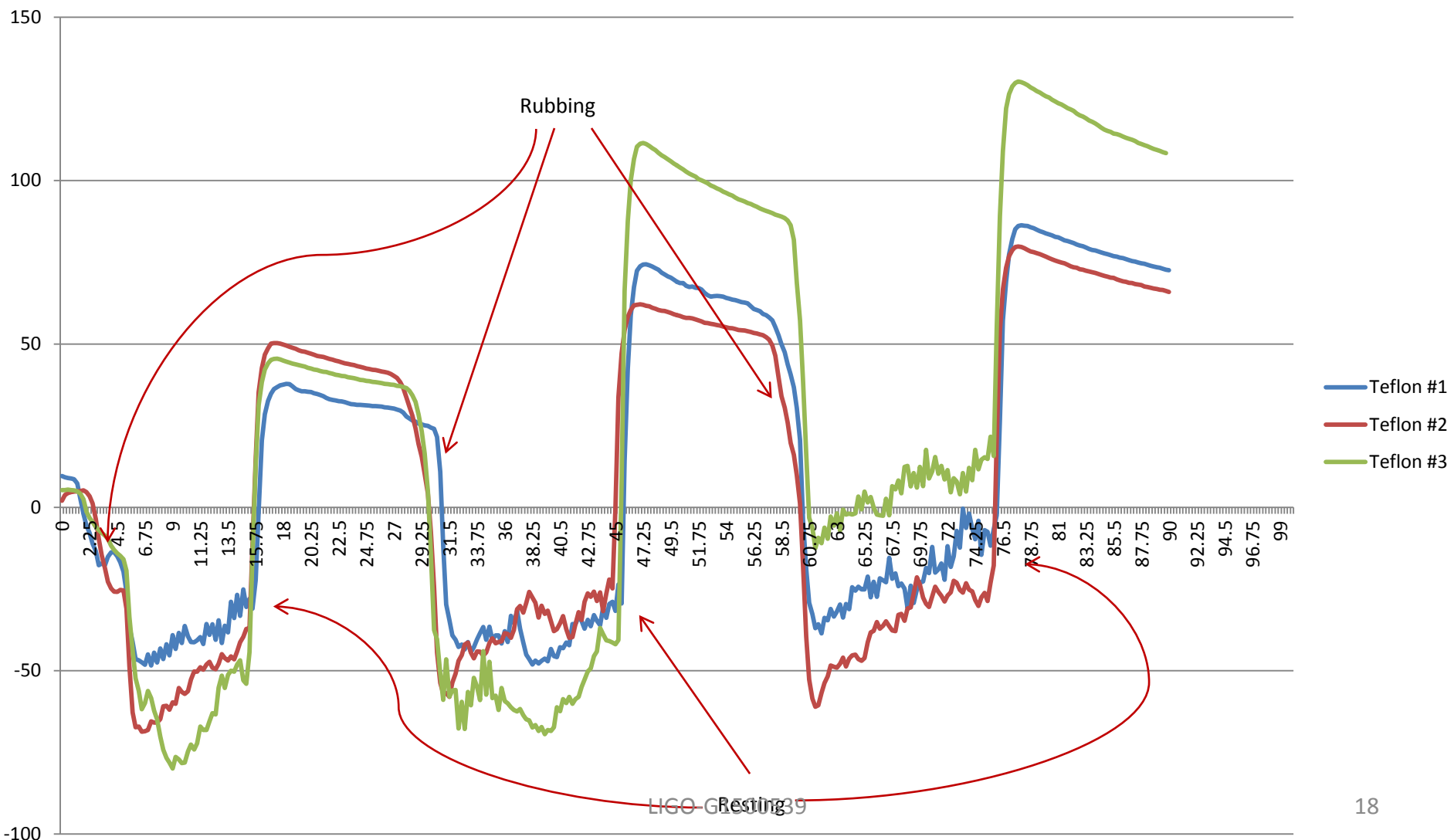


Qualakate glove



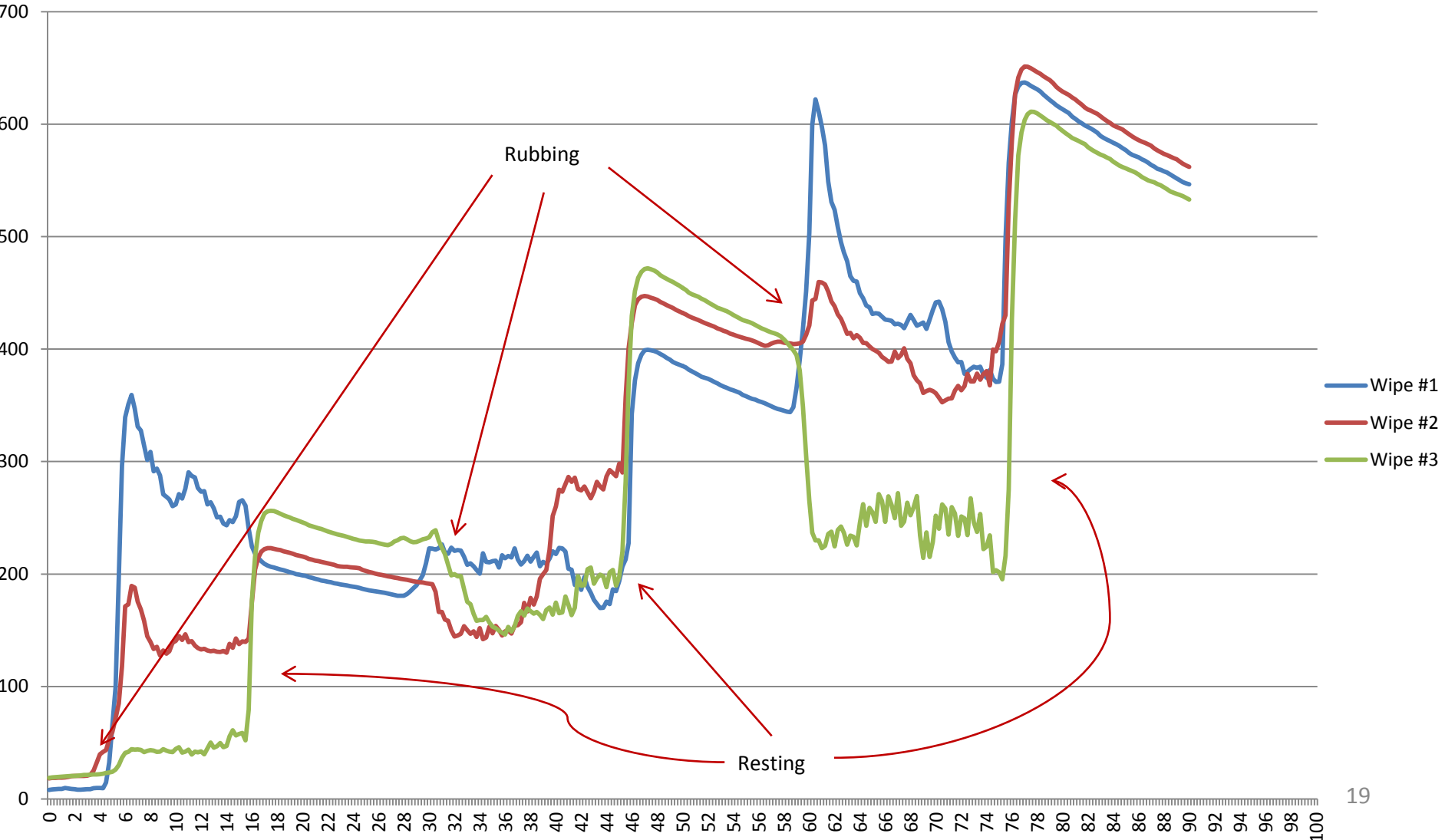
Teflon- similar to that used in ETM /ITM

5s-15s rub with Teflon
30s-45s "
60s-75s "
90s End



Wipe (believe Contec wipe, similar to ones used at site)

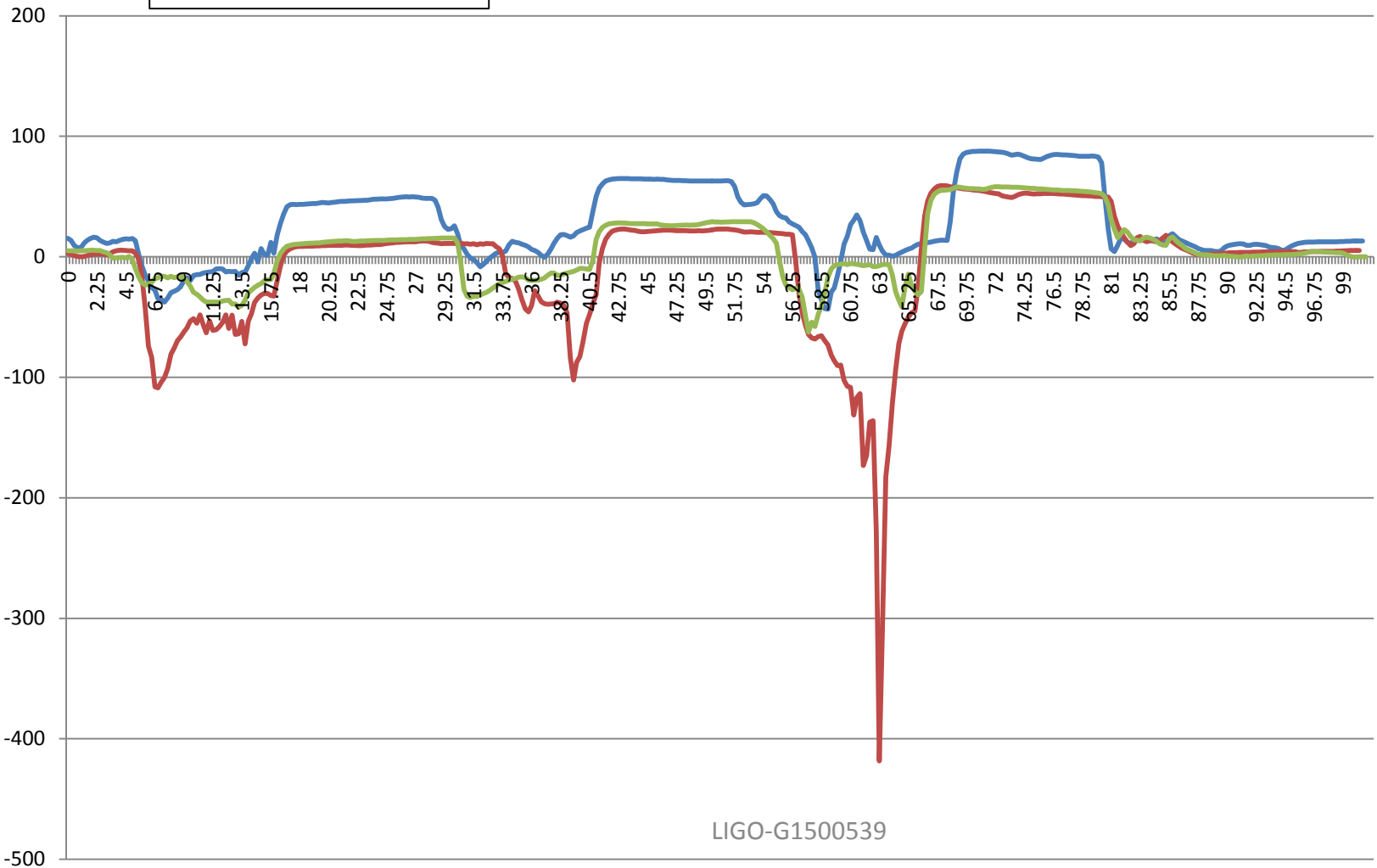
5s-15s rub with wipe
30s-45s "
60s-75s "
90s End



Alpha Swab (with stabilization)

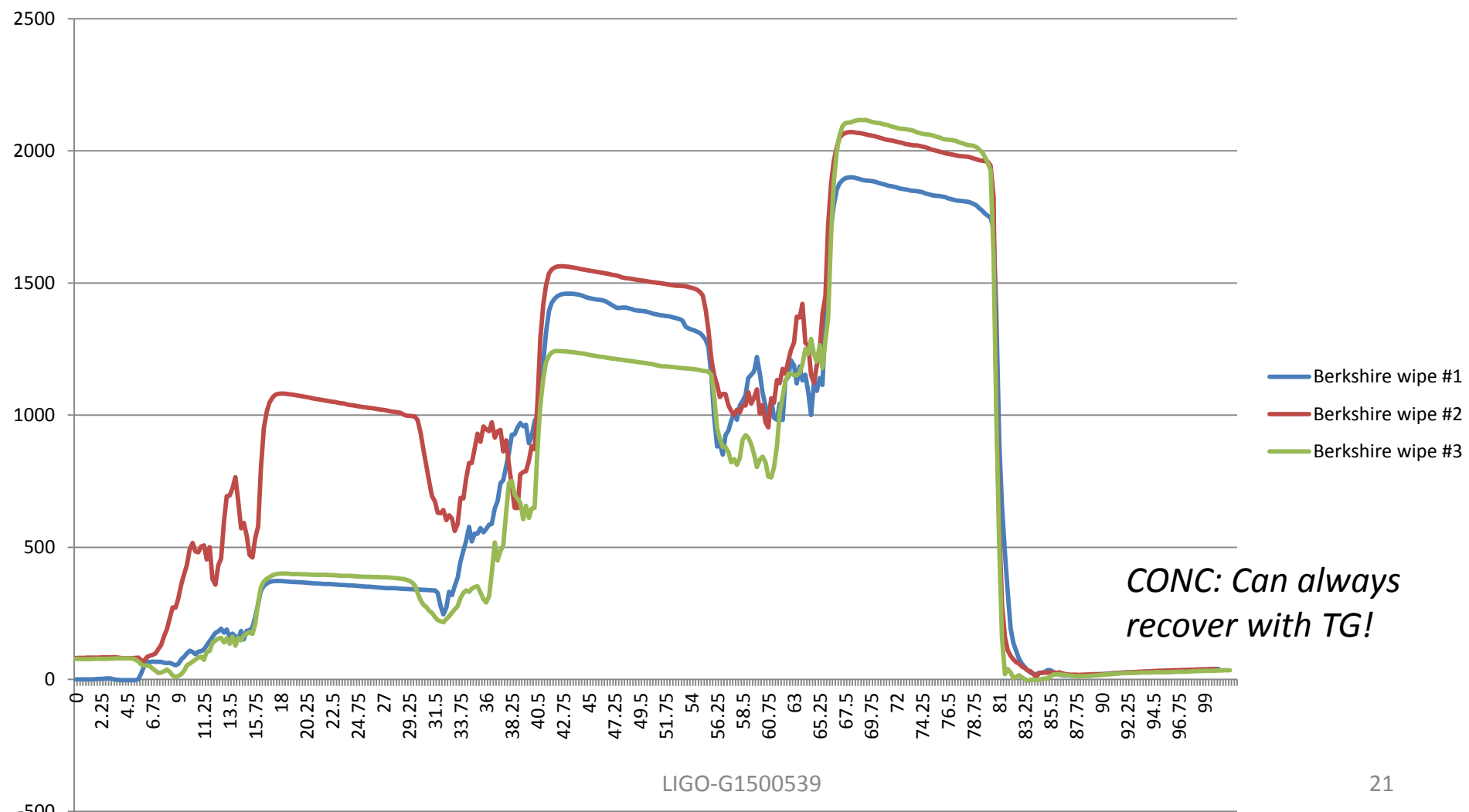
5s-15s wipe with cloth
30s-40s "
55s-65s "
80s-85s Blow with Top Gun
100s End

*CONC: Can
always
recover
with TG!*



Berkshire wipes (with stabilization)

5s-15s wipe with cloth
30s-40s “
55s-65s “
80s-85s Blow with Top Gun
100s End



Summary / Actions / Conclusions

- Discharge procedure updated, LIGO-T1500101: [ETM / ERM Gap discharge procedure.](#) (version 2)
- This work has taken us back to the 30s post peel recommendation with top gun.
- Also recommending use of electrometer to check for charge & use top gun to “clean up”.
- As a result we have a large number of documents updated
 - LIGO-E1300142: [DCN Associated with a collection of documents related to in chamber work in particular cleaning of optics](#) (Unapproved)
- Top Gun is our friend
 - So far shown can always (so far) recover with Top Gun
- ACTIONS
 - Deliver TMDS to LLO, LHO and MIT (high priority)
 - Go over docs including updated discharge procedure with Detector Engineering and Operator teams
 - Work on whether Discharge procedure can be used on ITM (low priority)