Status Update of aLIGO Lock Acquisition Simulation

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Overview

- Started getting some preliminary results.

- It still uses low ALS noise
  (i.e. HIFO-Y noise ~ 8 Hz rms)

- Self-locking is tested.
  It works although people may not like it.

- Standard multiple-steps look reasonable.

DARM control

- Depending on how close to the resonance, one has to surf between appropriate signals.
- **When far far away:**

DARM errr = ALS diff   (not included in simulation)
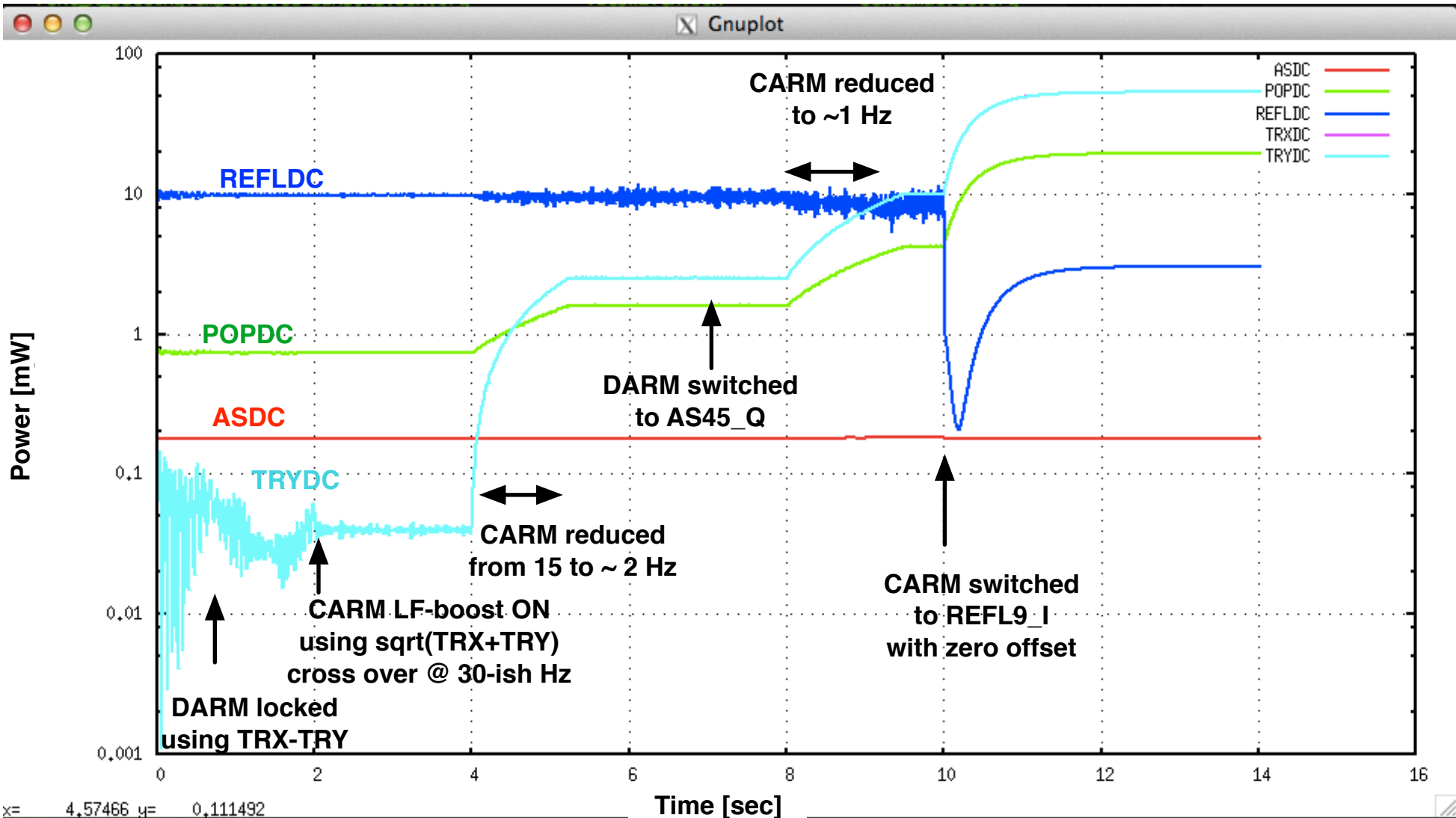
- **When far away:**

DARM errr = (TRX - TRY) / (TRX + TRY)^3/2

- **When close:**

DARM errr = AS45_Q / (TRX + TRY)
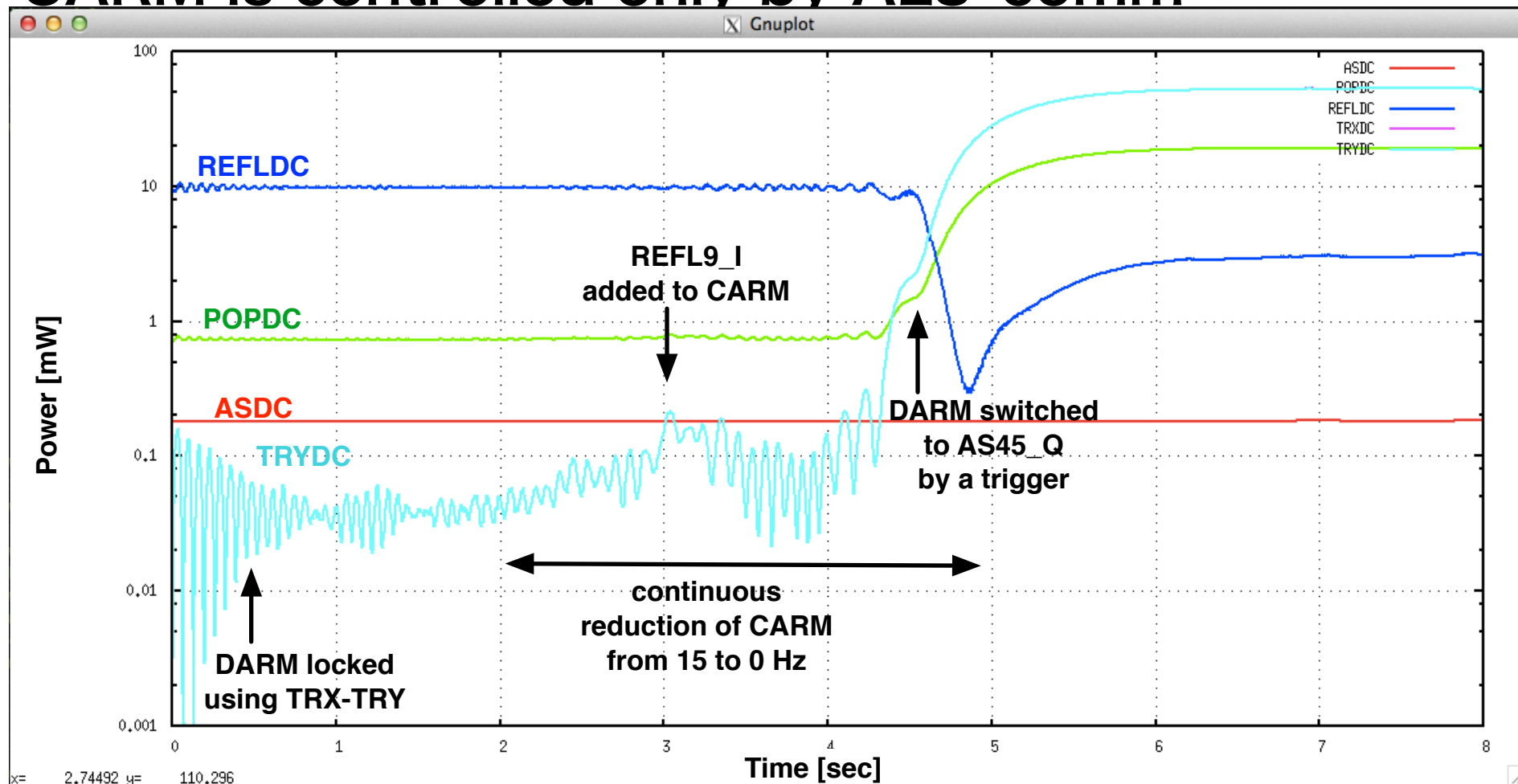
The simulation

- CARM starts with an offset of 15 Hz.
  => gives small TRX and TRY signals.

- DARM is then locked to the zero offset point.

- Reduce the CARM offset.

- DRMI is held by the 3fs all the time.

Multiple Steps

And self-locking ...

- Non-stop version of the multiple-steps.
- Doable but highly acrobatic ...
- CARM is controlled only by ALS comm

Many small tasks to be done

- Realistic TRX(Y) PD noise

  => consideration of High-Low switching ?
- Include ALS_diff to study the initial DARM hand-off
- Do a worst case study with high ALS noise
- Study impacts of SRC detuning on DARM err signal
- Study why DARM signal needs to be normalized by

  (TRX+TRY)^3/2
- Quad suspension occasionally explodes probably due to a

  numerical precision issue => getting help from Hiro
- Consider application of the SRM misalignment technique

  => Bas @ VIRGO already made a code which simulates

   the misalignment in e2e.

Appendix

Appendix. SRCL saturation

- SRCL 3f (REFL135_I) is the weakest signal
  => contaminated by CARM at HFs (> 10 Hz)
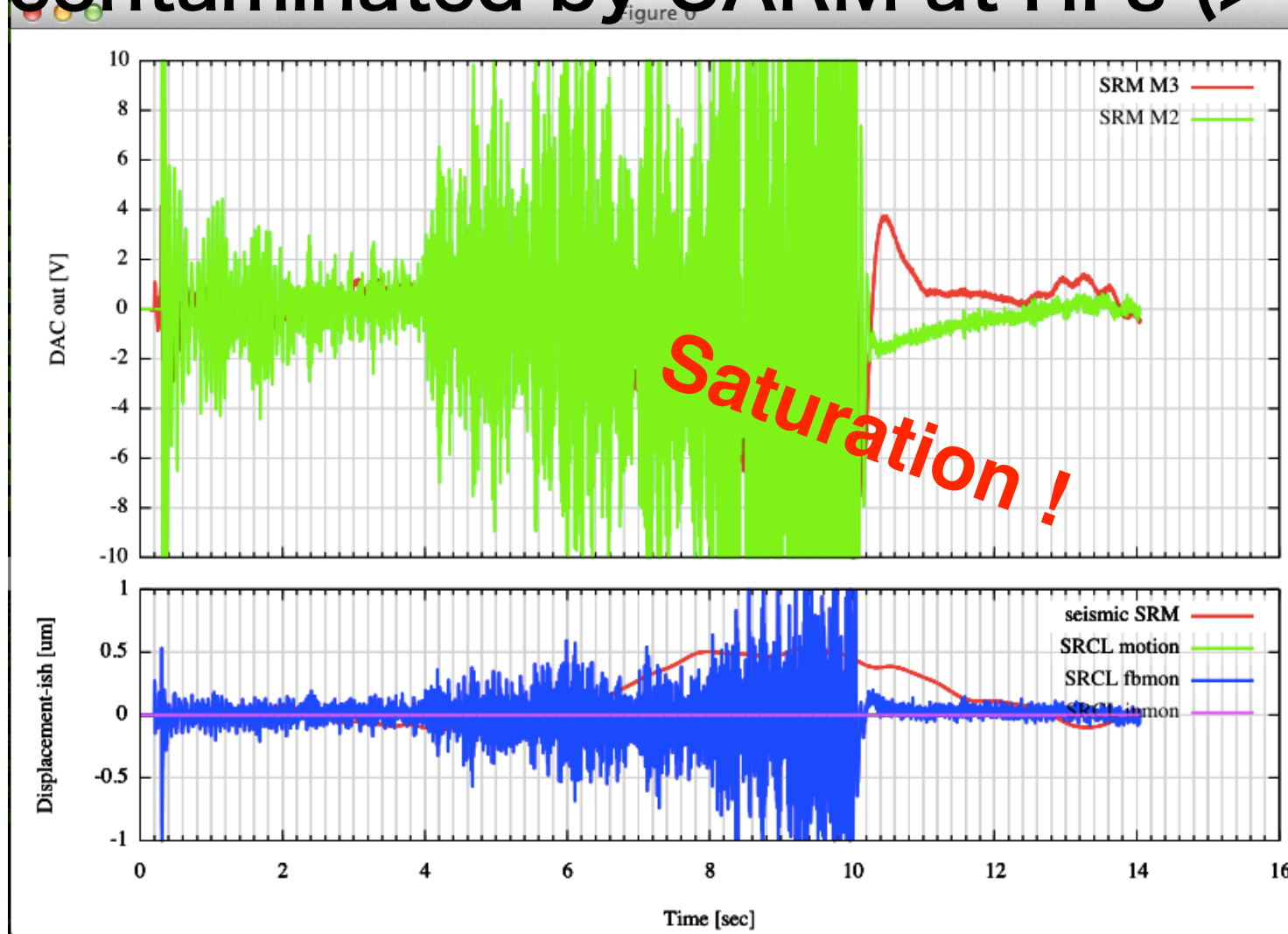
Appendix. SRCL solutions

■ **There are several solutions.**

 Not so worrisome.

   ✓ Stop using ALS_comm at HF.
      => REFL_DC for suppressing HF part of CARM
      => Or use only sqrt(TRX+TRY)
   ✓ Decrease SRCL UGF as low as possible.
   ✓ Do the self-locking
     => suppresses CARM before the carrier builds high
         enough to kick SRCL.
   ✓ Decrease SRCL UGF as low as possible.
   ✓ Misalign SRM and bring it in afterward.