

Status Update of the aLIGO lock acquisition simulation

General Status:

- Set up Linux environment
- Started building Model from scratch
- Finished setting up the interferometer part
- Began checking the open IFO response
- Not yet closed any of the locking loop
- Phone-based simulation support by Hiro

Motivation is to answer the questions such as

Can we lock the full IFO ?

How exactly are we going to lock the IFO ?

We know the big picture e.g. 3f locking for central part and ALS for the arm

How do we hand-off the CARM from the ALS control to infrared ?

ALS guarantees sub-nm stability while CARM line width ~ 10 pm.

How do we offload the CARM offset ?

How are we going to automate the locking progression ?

Guardian script ? Some kind of fast switch ? Beckoff synchronization ?

What was done in the past and what will be done

L. Barsotti (2008 ?) did an E2E simulation:

- Demonstrated usefulness of 3f lock in aLIGO configuration
- Various way of CARM signal extraction when offsetted
Assuming ALS provides a super stable arm motion
- Reflective SRM $T = ??? \%$
- Parallel EOM modulation. No SBs on SBs.

We (2013) will do an E2E simulation :

- Locking with the up-to-date aLIGO parameters.
=> seismic noise, ALS stability, control functionality, signal extraction scheme.
- Transmissive SRM $T = 37 \%$
- Serial EOM modulation. SBs on SBs.

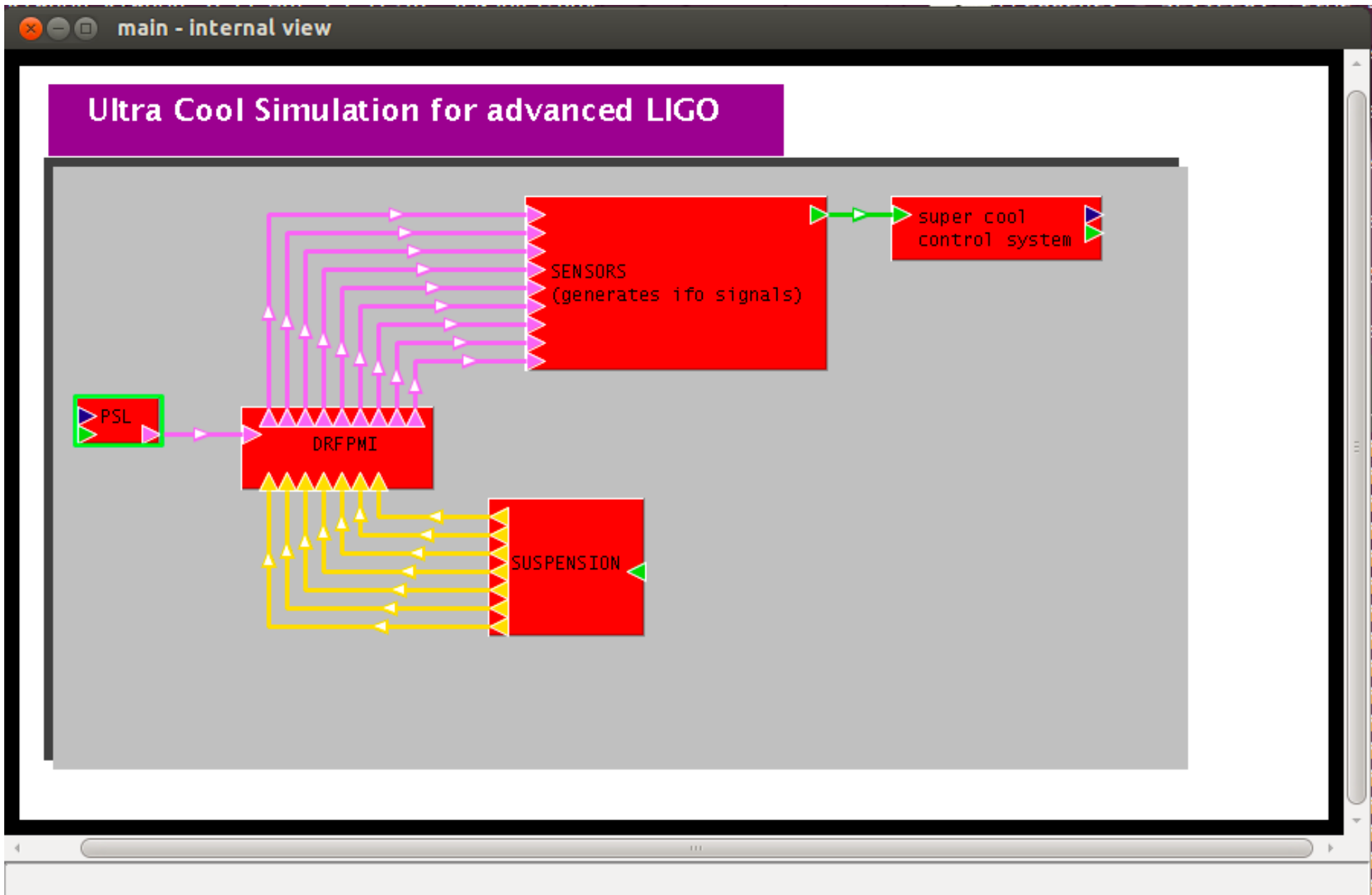
Configuration at the beginning (Proposed)

- * No radiation pressure
- * No sophisticated suspension (instead a digital filter plus white noise)
- * Serial EOM modulation
- * Transmissive SRM
- * no electronics noise
- * Realistic seismic noise and ALS stability

Plan in the upcoming two weeks :

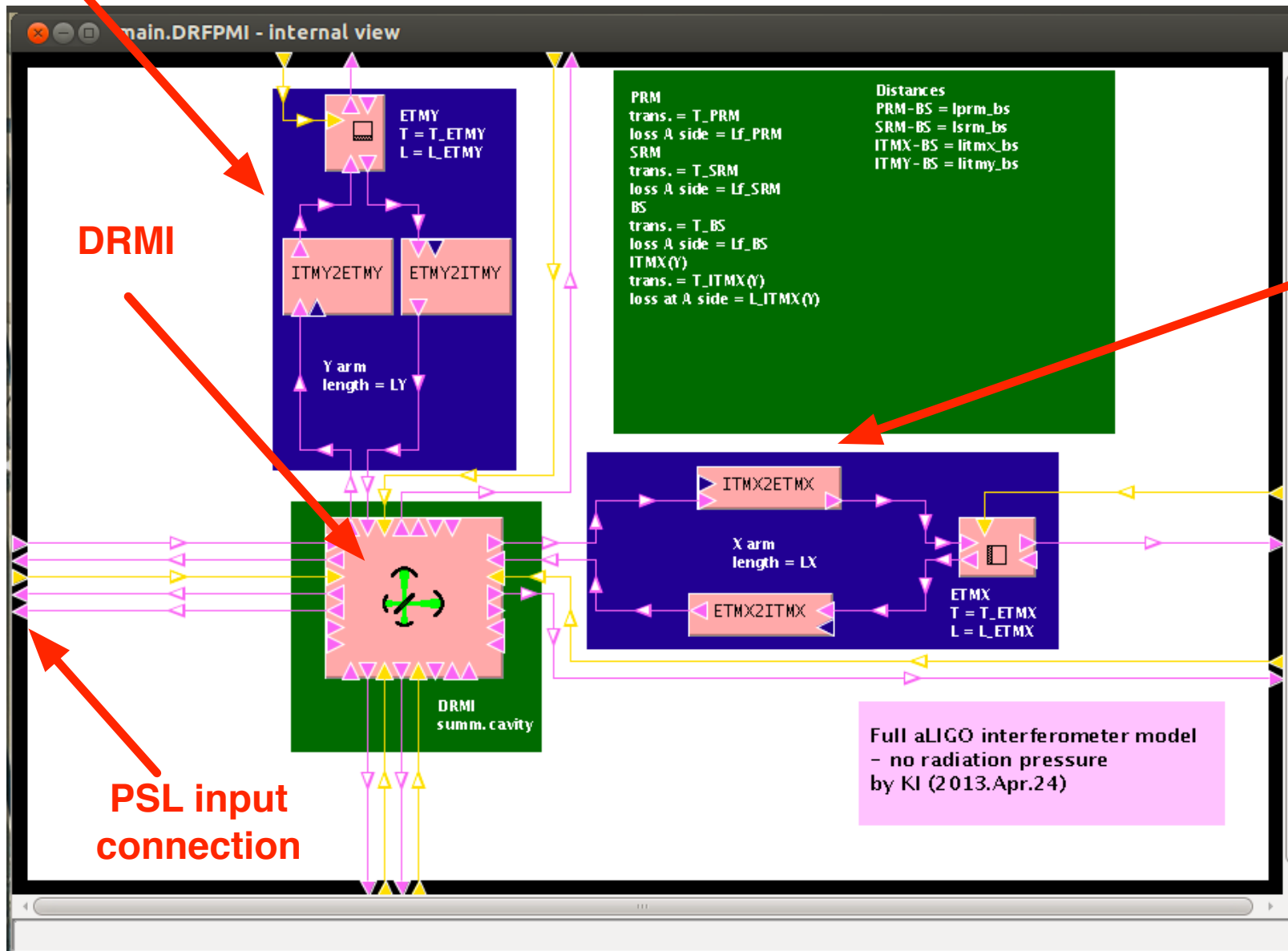
- * Finish verifying the IFO response (comparison with Optickle)
- * Hopefully Start closing the loops

Overview of the current model



Y arm

Interferometer internal view



PSL internal view

