

***Notes on
DRMI locking at LLO***

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LSC settings Overview

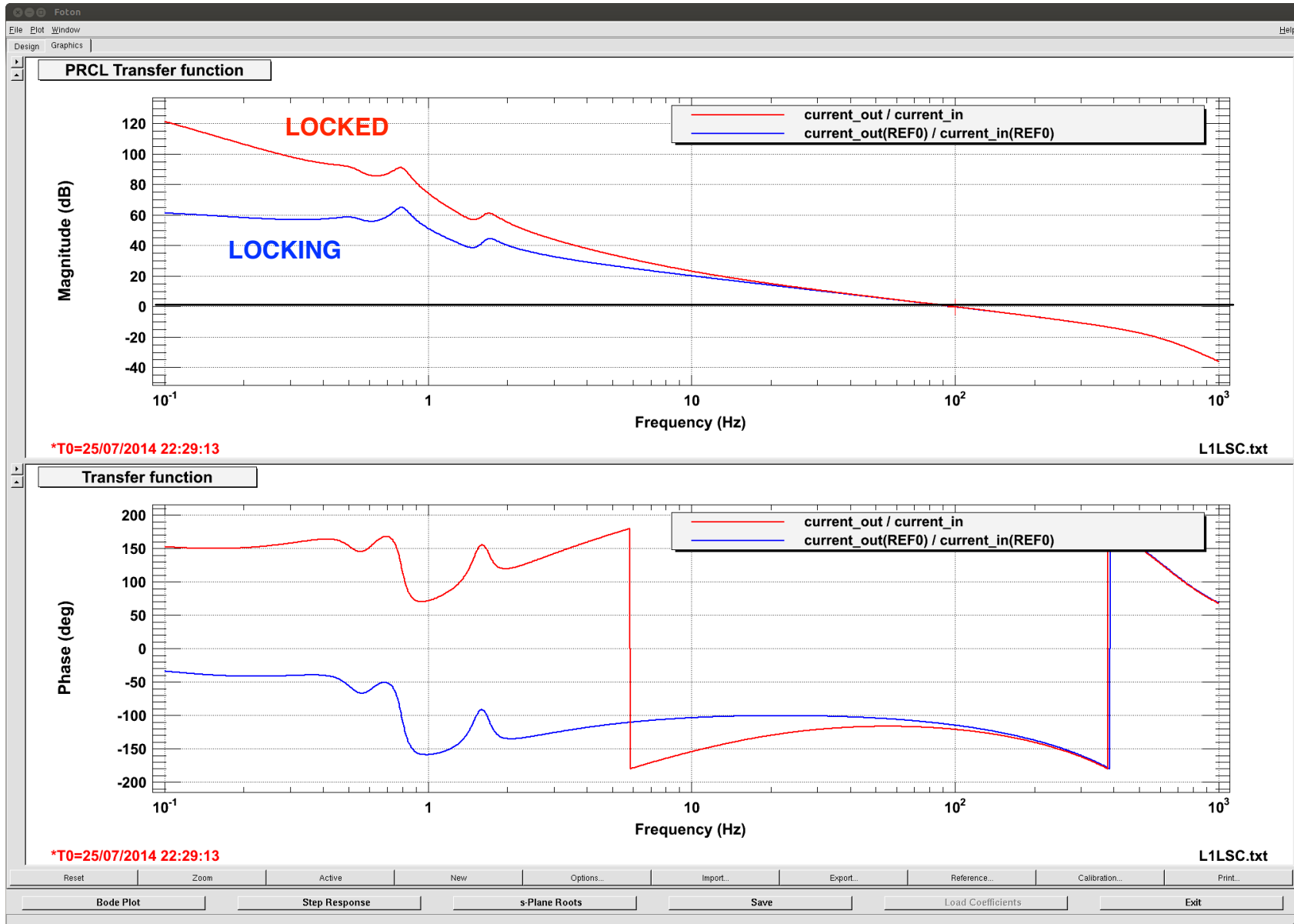
- Guardian-based (a part of the full lock sequence)
- No separate DRMI guardian (AM is working on)
- Several realtime triggers
- Non-diagonalized output matrix (AE is working on)

■ REFL9I -> PRCL (UGF = 100Hz)

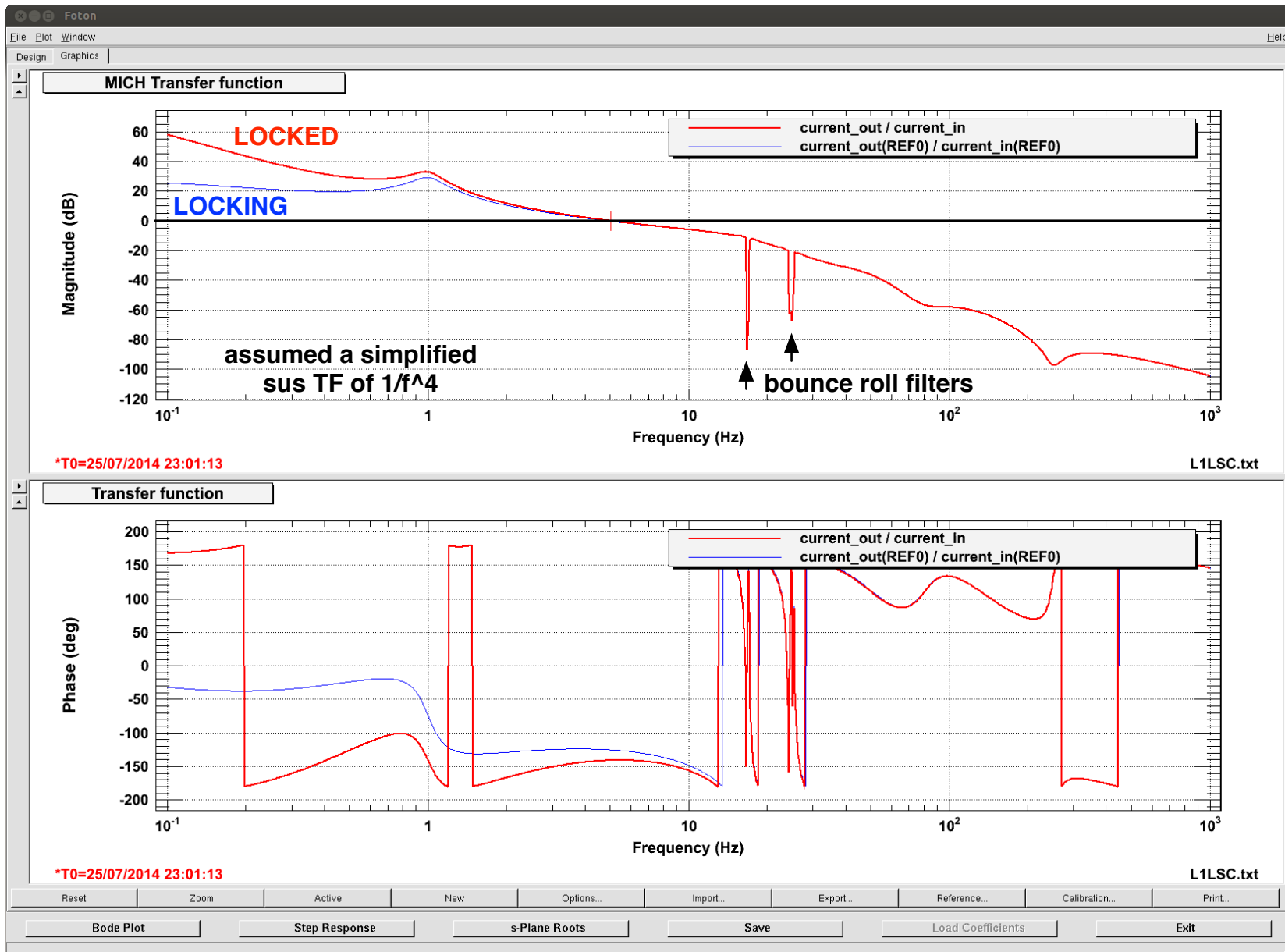
■ REFL45Q -> MICH (UGF = 5Hz)

■ REFL45I + REFL9I -> SRCL (UGF = 50Hz)

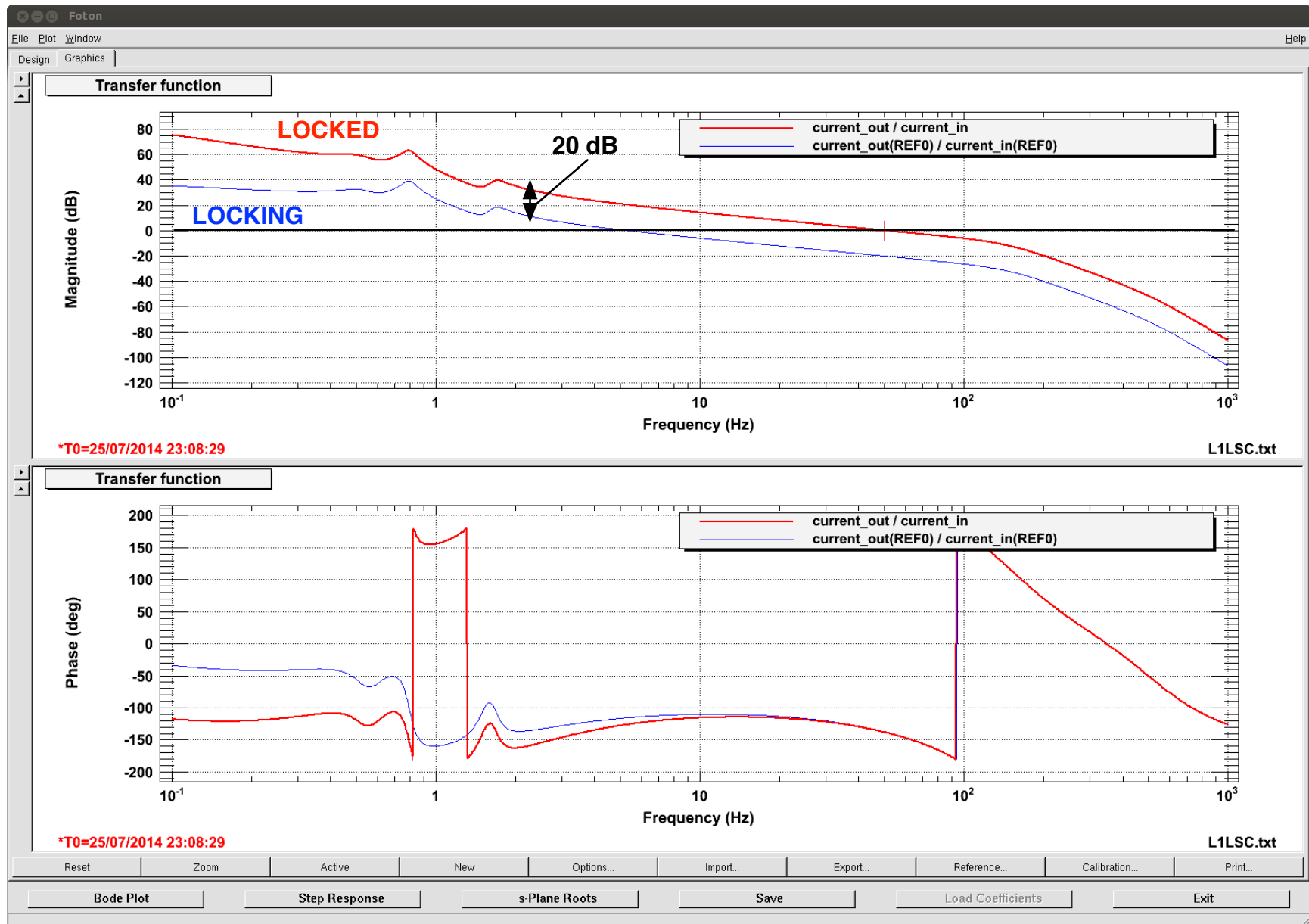
PRCL open loop



MICH open loop



SRCL open loop

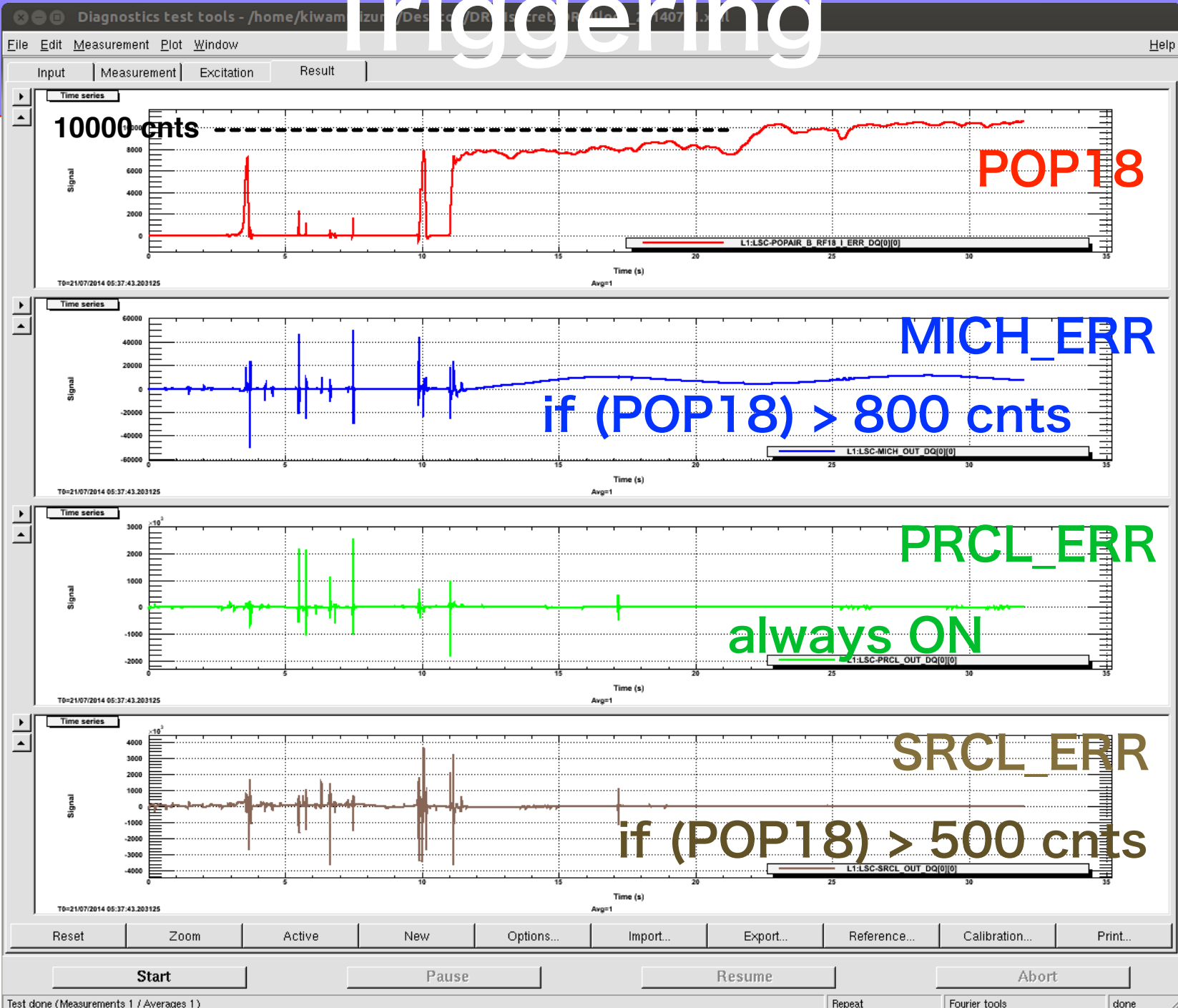


OUTPUT matrix

L1 LSC OUTPUT MATRIX Mon Jul 21 01:03:54 21

DARM	MICH	PRCL	SRCL	CARM	XARM	YARM	OSC1	OSC2	OSC3	
1.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	▶ ETMX
-1.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	▶ ETMY
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.493	0.000	0.000	▶ ITMX
0.000	0.000	0.000	0.000	0.000	0.000	0.000	-0.50	0.000	0.000	▶ ITMY
0.000	0.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	▶ PRM (hierarchical)
0.000	0.000	0.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000	▶ SRM (hierarchical)
0.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	▶ BS (middle stage)
0.000	0.000	1.000	0.000	0.000	0.000	0.000	0.000	0.500	0.000	▶ PR2(bottom stage)
0.000	0.000	0.000	1.000	0.000	0.000	0.000	0.000	0.000	0.500	▶ SR2(bottom stage)
0.000	0.000	0.000	0.000	1.000	0.000	1.000	0.000	0.000	0.000	▶ MC2

Triggering



Length actuation on SUS

- ▣ Guardian-based triggering for the hierarchical longitudinal control
- ▣ PRM M2 stage turns on when DRMI is locked
- ▣ SRM M2 stage turns on when DRMI is locked

- ▣ L2P(Y) and P(Y)2L filters are not used although once they have tried.
- ▣ crossover frequencies ?

ASC overview

- ▣ Crucial for locking and long term lock
- ▣ Initial alignment is critical for locking
- ▣ Misalignment easily elongates the locking down time from 10 sec to several minutes.
- ▣ WFS are used for in-lock control
- ▣ Multiple-steps for initial alignment

ASC Loops

- ▣ 3 main loops
- ▣ 4 auxiliary DC WFS centering, actuating on RM1/RM2/OM1/OM2
- ▣ BS oplev is tuend off when ASC is engaged

* in locking sequence

REFL9 -> PRM + PR2

AS36 -> BS

REFL45 -> SRM

* in full lock

REFL9 -> PRM + PR2

AS36 -> BS

AS36 -> SRM

control bandwidth ~ below 1 Hz

Initial Alignment

- ▣ Initial alignment is broken into three steps
- ▣ REFL and AS WFSs are used

(0) Assume that PR2/IM4 input pointing to X arm and ITMs' angle are already good

(1) Lock PRX to determine PRM angle
(REFL_WFS)

(2) Lock MICH to determine BS angle
(AS_WFS, currently not functional)

(3) Lock SRY to determine SRM angle
(REFL_WFS)

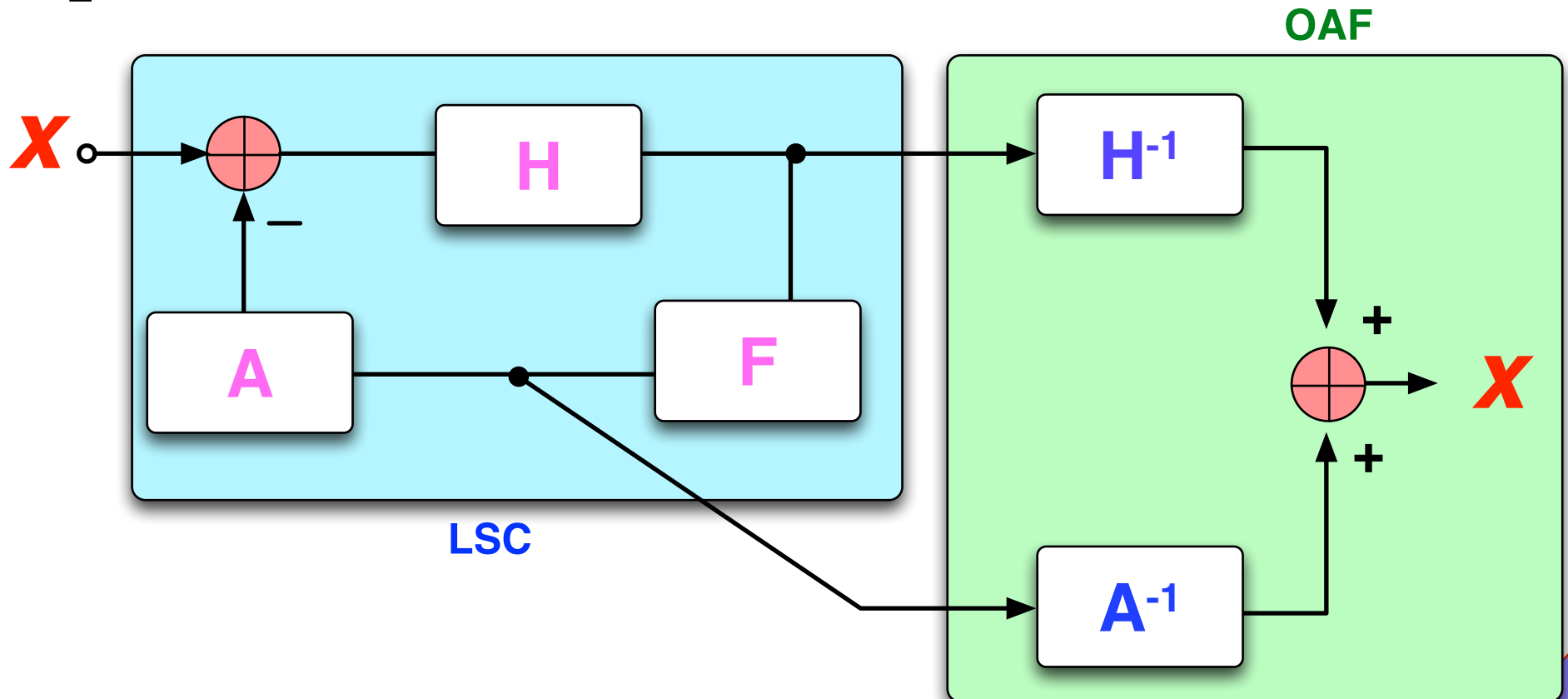
This usually gives a smooth DRMI lock (~10sec)

Seismic

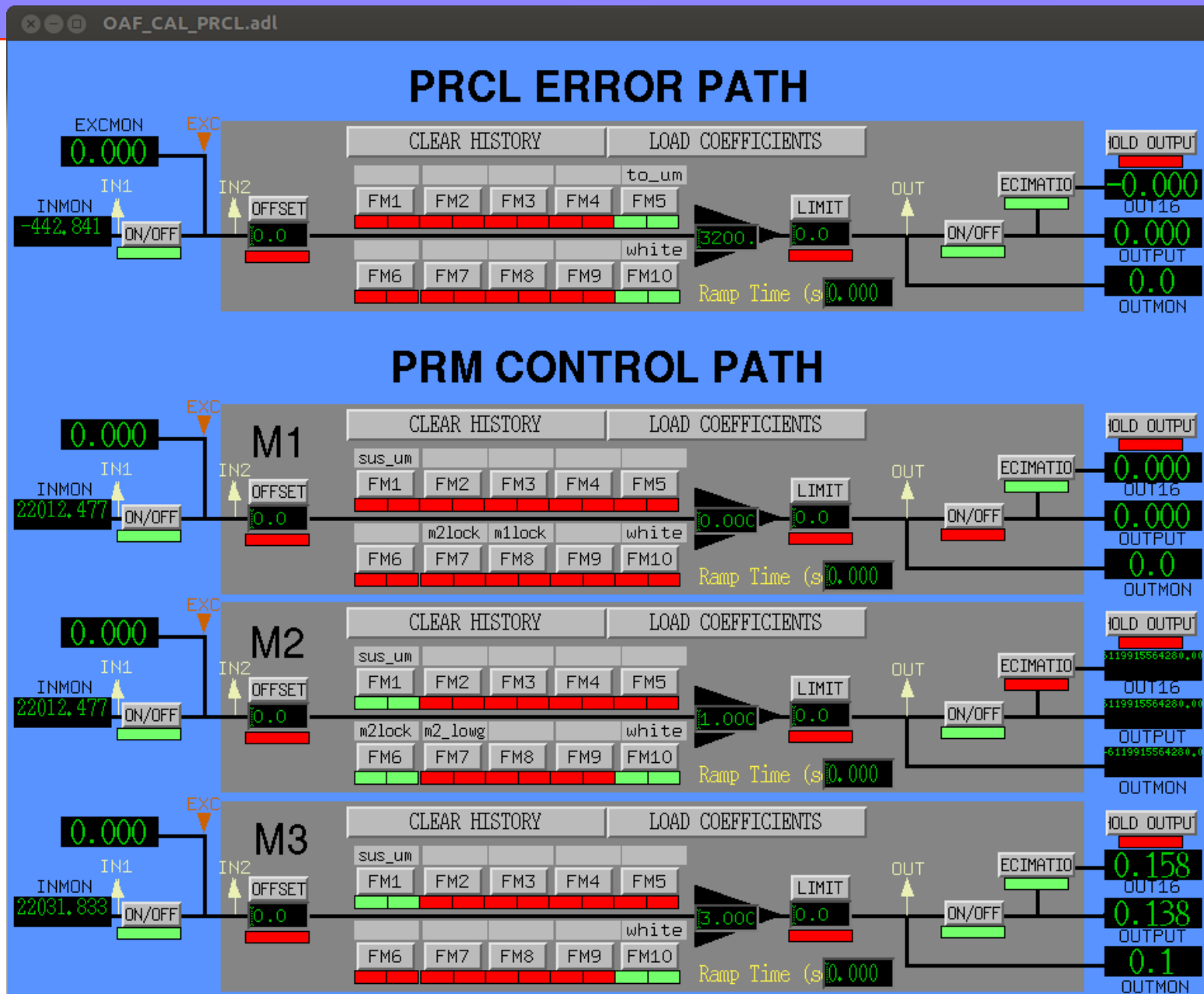
TBD

Calibration

- ▣ Online calibration to obtain open-loop equivalent noise (i.e. unsuppressed) in displacement
- ▣ Model runs in L1OAF



Calibration screen



Misc.

- ▣ Some noise budget code in SVN...
- ▣ Modulation depths ?
- ▣ Power on 3f BBPD ?

Some considerations

▣ Decoupling of MICH actuator ?

a combination of PR2, SR2 and BS seems easier than using PRM, PR2, SRM, SR2 and BS.

What do we want ?

▣ How do we measure the SRC length ?

▣ PR3, SR2 and SR3 angles were left untouched.

Don't we want to control them in the initial alignment ?

▣ Is the chosen ASC loops optimum ? Is there a better solution ?