LIGO

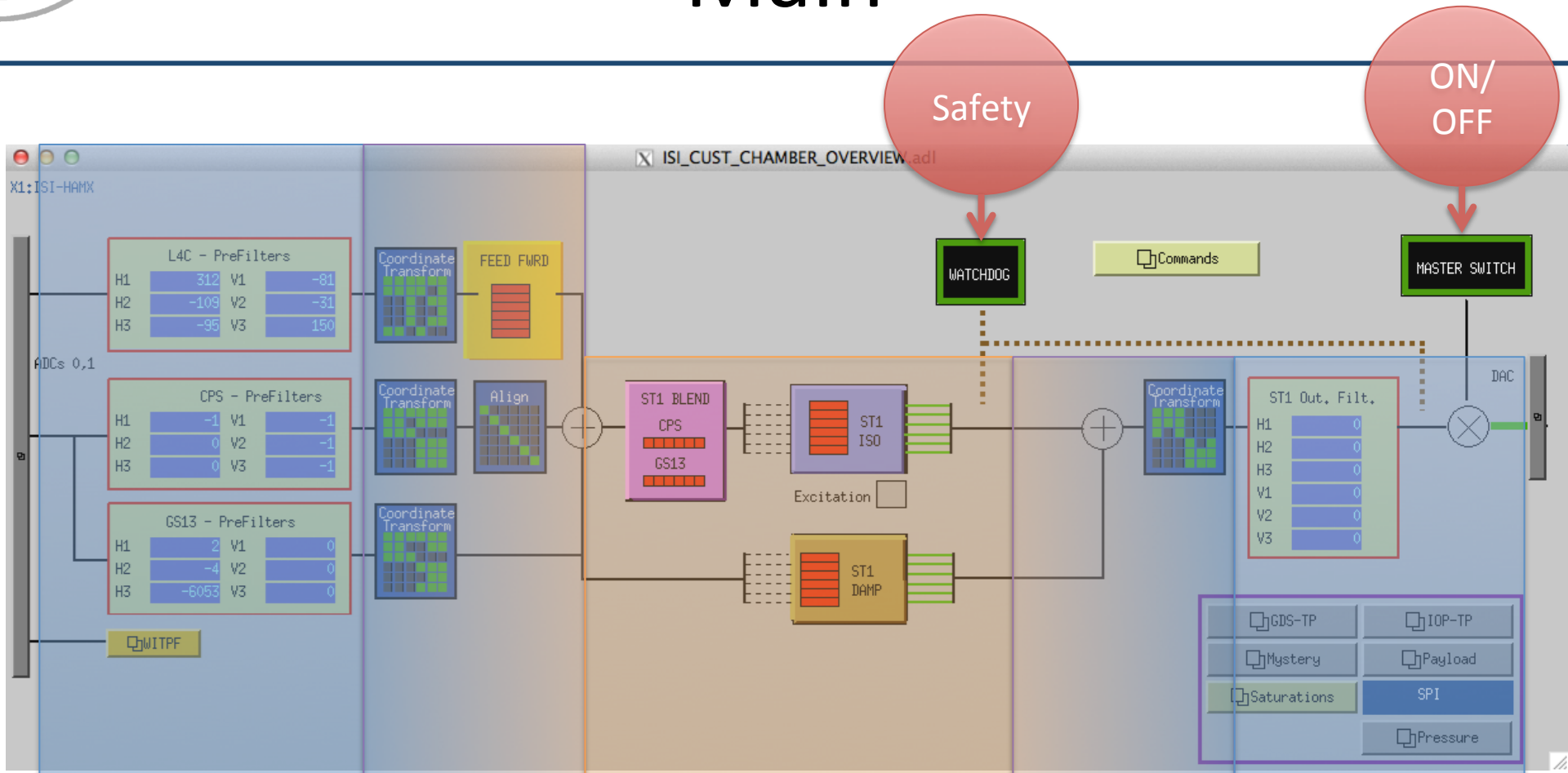
HAM-ISI
Medm Screens and Troubleshooting (introduction)

Hugo Paris for the SEI team

LIGO

MEDM Screens

Main



Sensors
- L4C
- CPS
- GS13

Basis change
Local => Cartesian

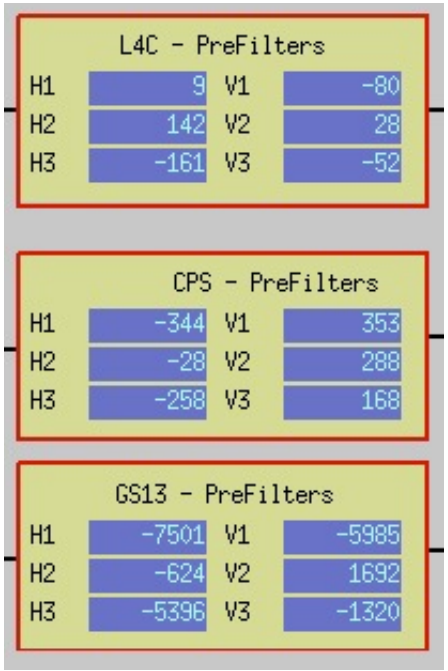
Processing
Sensor blend
Damping
Isolation

Basis change
Cartesian => Local

Actuators

Sensors

Calm environment:

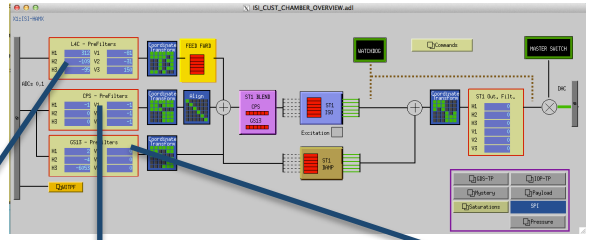


L4C 0 +/- 400cts

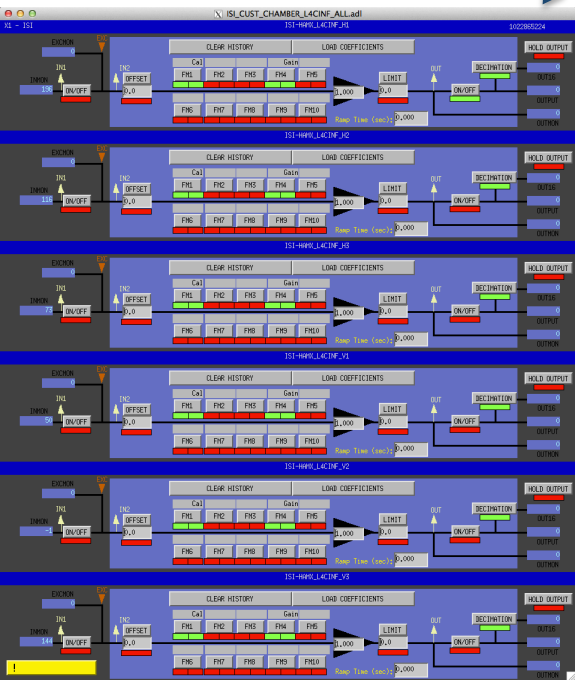
CPS 0 +/- 400cts

GS13 +/- 12000

Input Filters (INF)

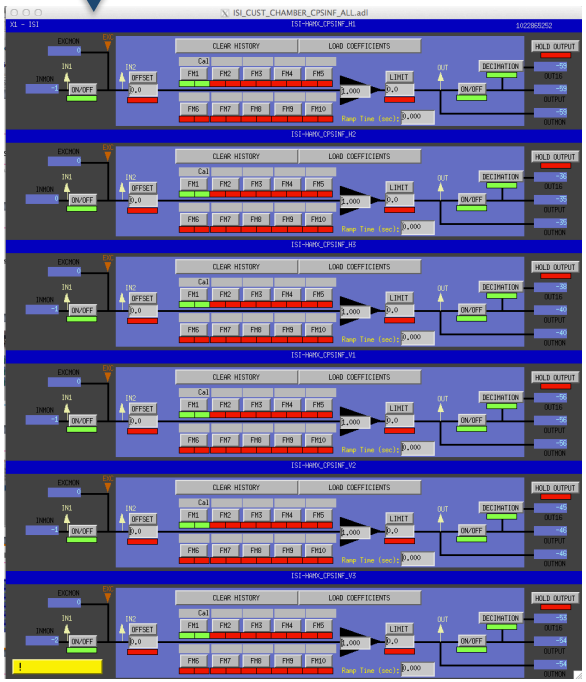


L4C



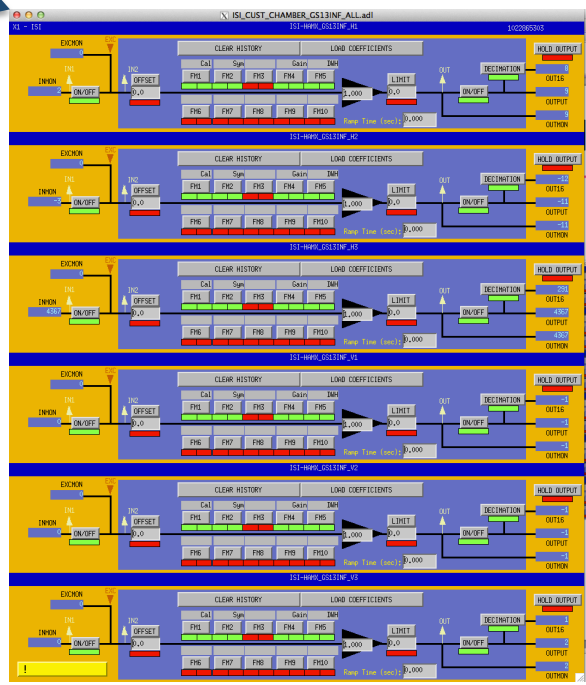
- Calibration
- Gain

CPS



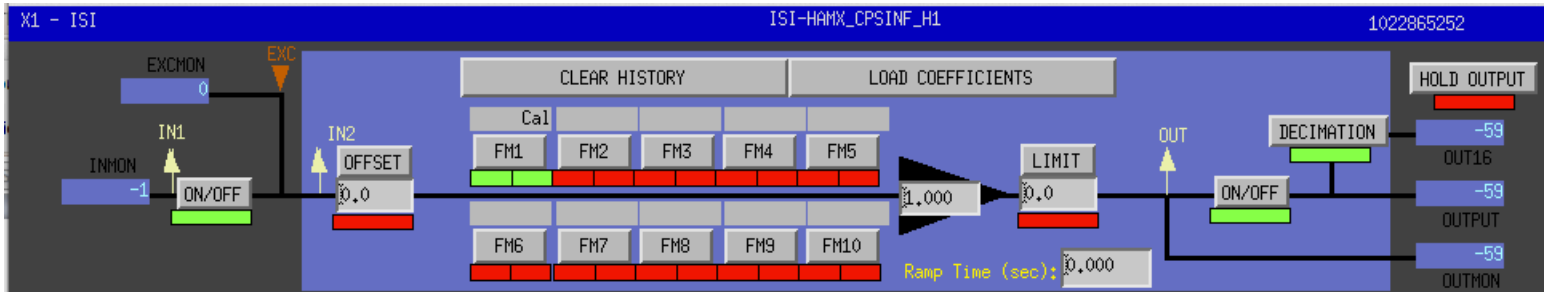
- Calibration

GS13



- Calibration
- Symmetrization
- Gain
- Dewhitening

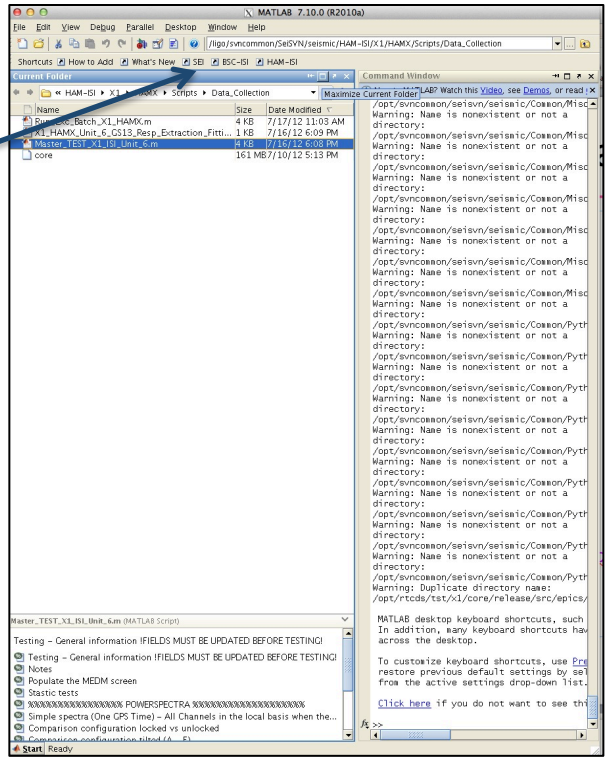
Input Filters (INF)



Coordinate Transform Matrices

① Open Matlab®

② Load Paths:
HAM-ISI
SEI

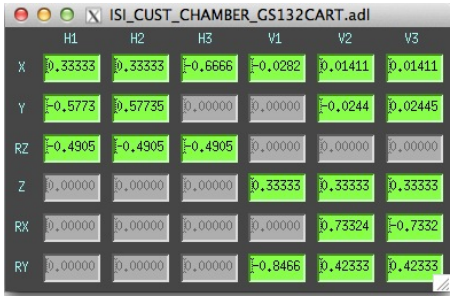


③ Set Variables:

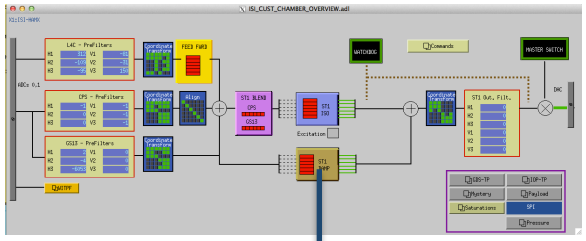
```
IFO          = 'X1';
Chamber      = 'HAMX';
Direction    = 'X';
Set_Gains    = 1;
```

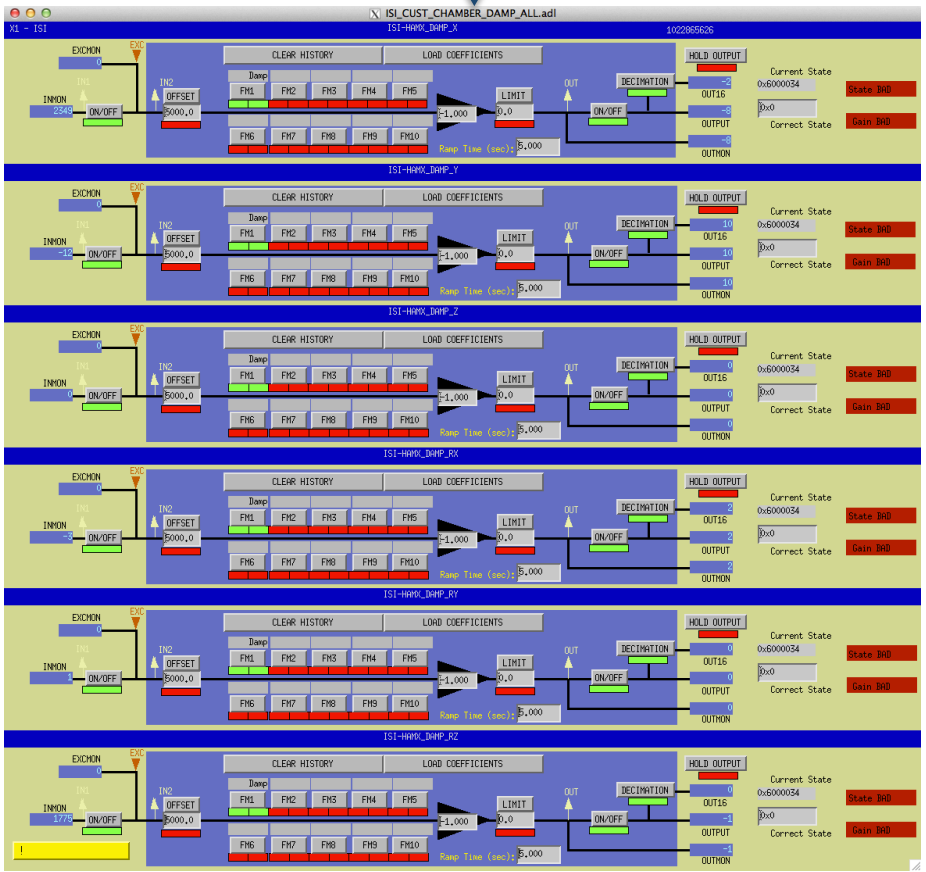
④ Run:

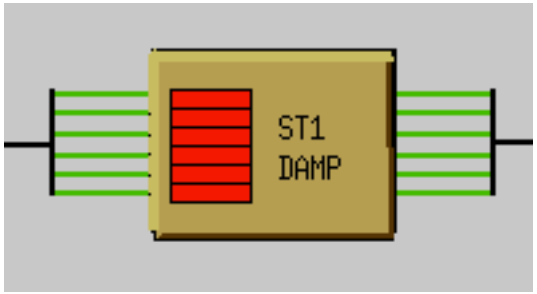
Populate_MEDM_Screen_HAM_ISI(IFO,Chamber,Direction,Set_Gains)



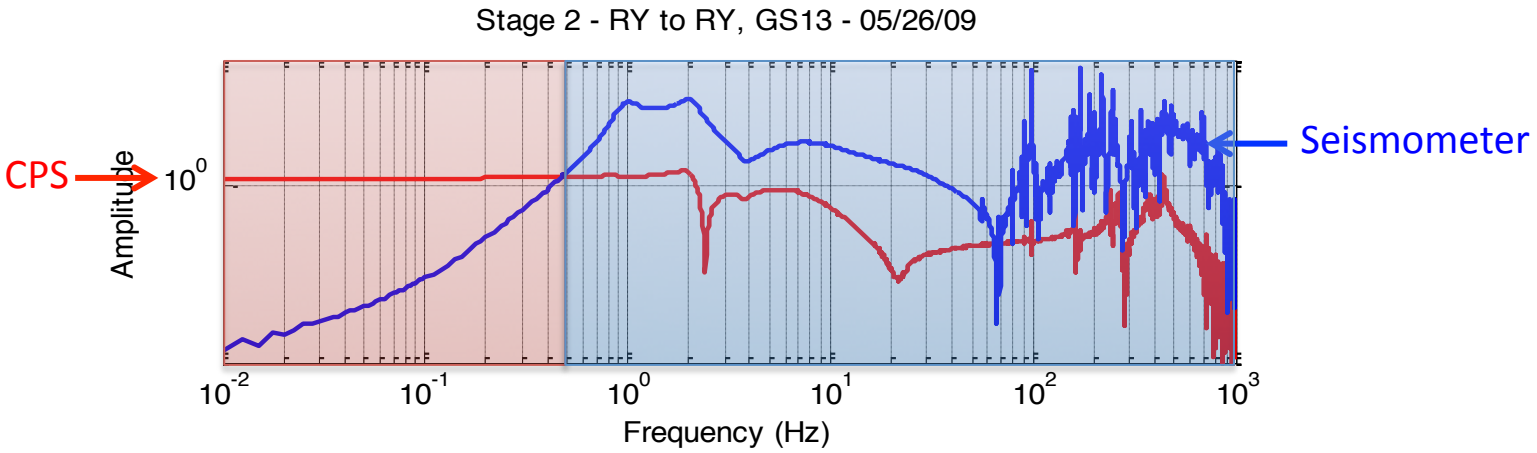
Damping



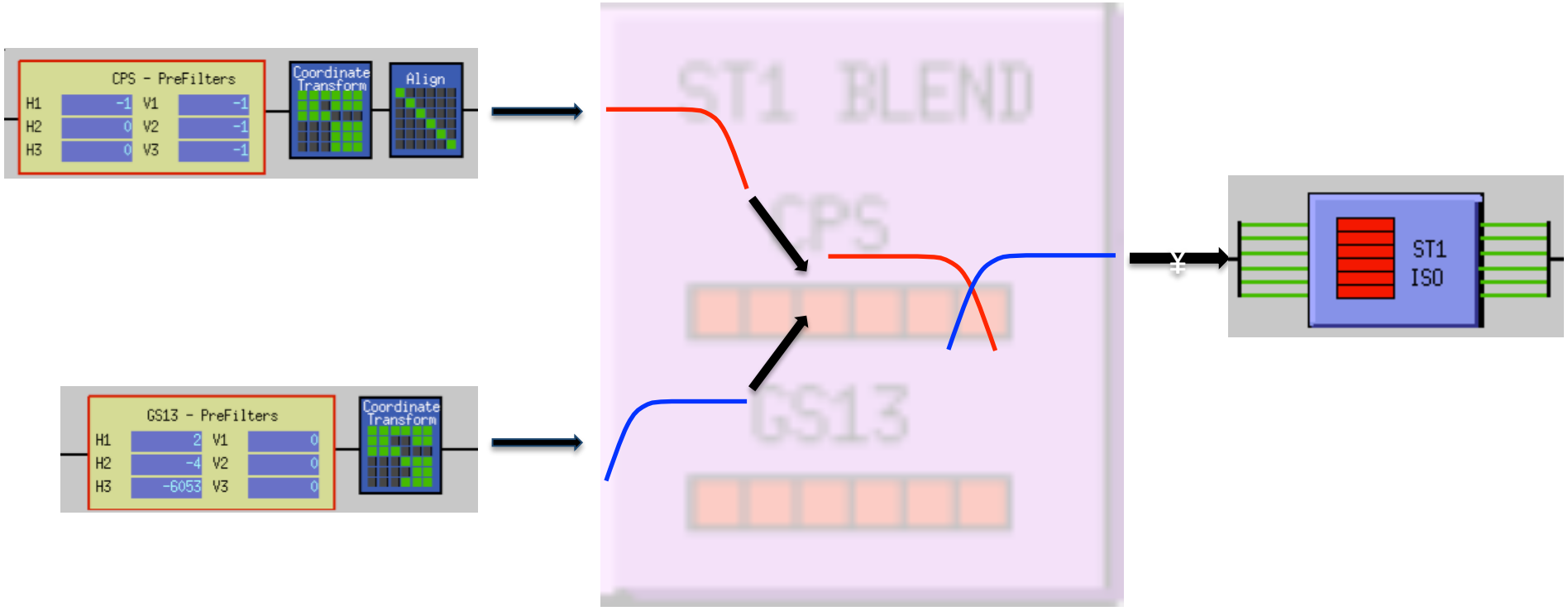

ISI_CUST_CHAMBER_DAMP_ALL.adl
ISI-HAM6_DAMP_X
ISI-HAM6_DAMP_Y
ISI-HAM6_DAMP_Z
ISI-HAM6_DAMP_RX
ISI-HAM6_DAMP_RY
ISI-HAM6_DAMP_RZ
CLEAR HISTORY
LOAD COEFFICIENTS
HOLD OUTPUT
DECIMATION
LIMIT
OFFSET
ON/OFF


ST1
DAMP

Blend

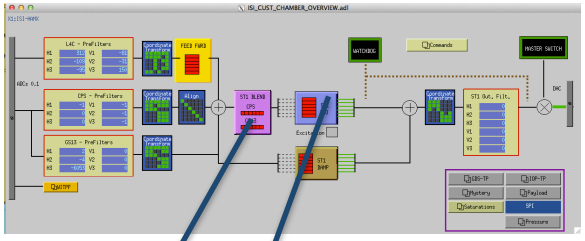

Stage 2 - RY to RY, GS13 - 05/26/09
CPS
Seismometer
Amplitude
10^0
10^{-2}
10^{-1}
10^0
10^1
10^2
10^3
Frequency (Hz)

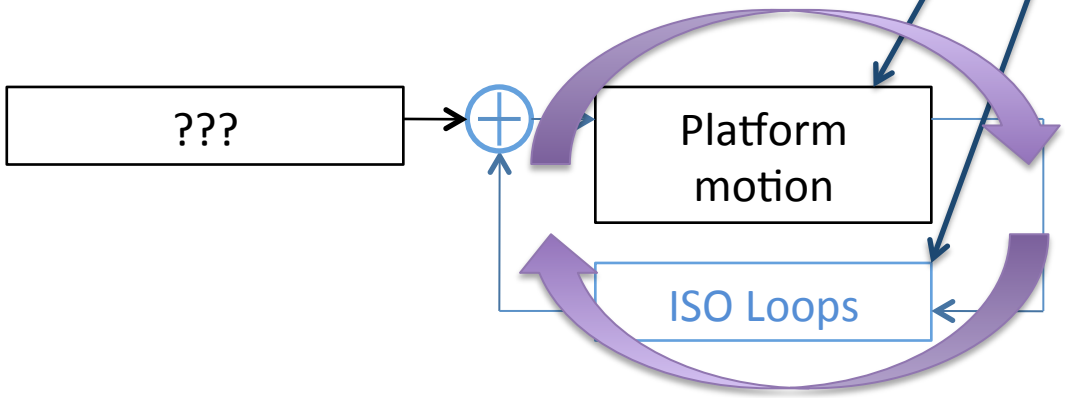
Blend


CPS - PreFilters
H1 -1 V1 -1
H2 0 V2 -1
H3 0 V3 -1
Coordinate Transform
Align
GS13 - PreFilters
H1 2 V1 0
H2 -4 V2 0
H3 -6053 V3 0
Coordinate Transform
ST1 BLEND
CPS
GS13
ST1 ISO

ISO Loops

- We don't know the perturbation:***???***
- Measure the motion of the platform: ***Blend***
- Counteract with actuators: ***ISO Loops***

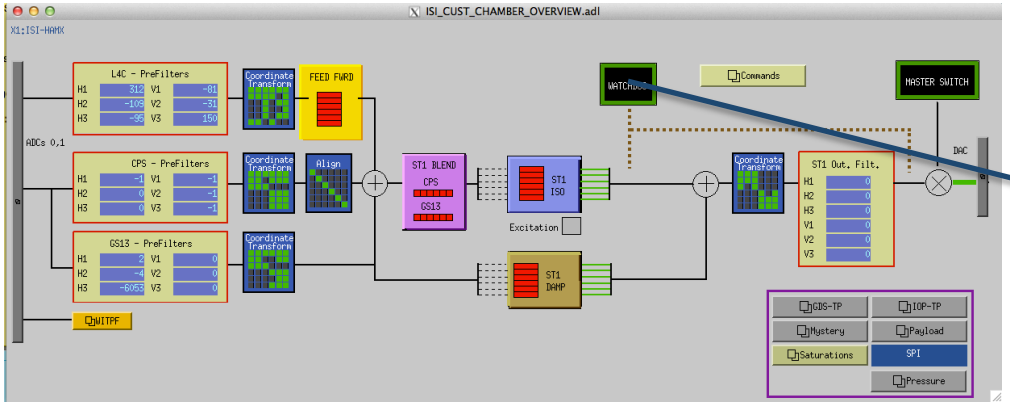


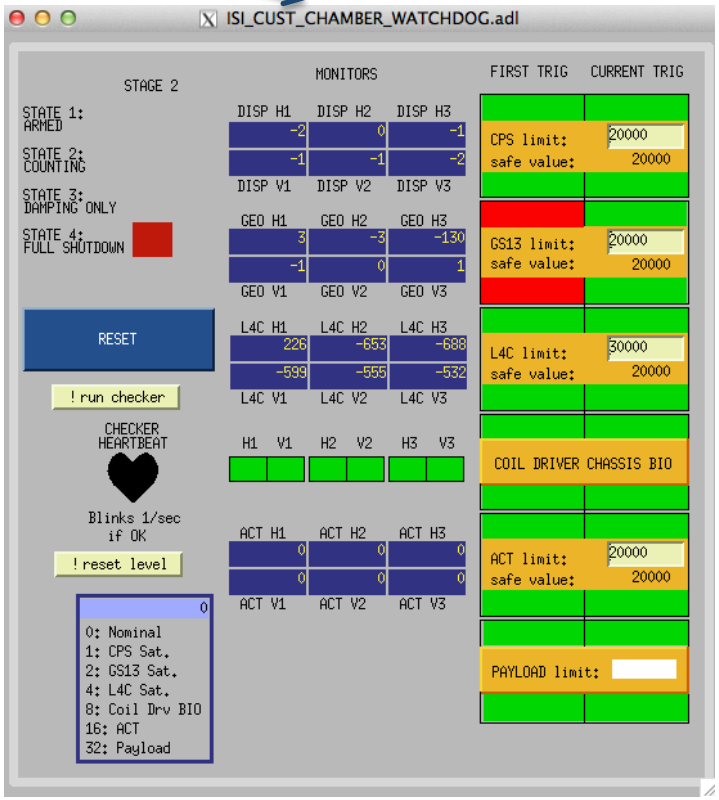


+ High performances

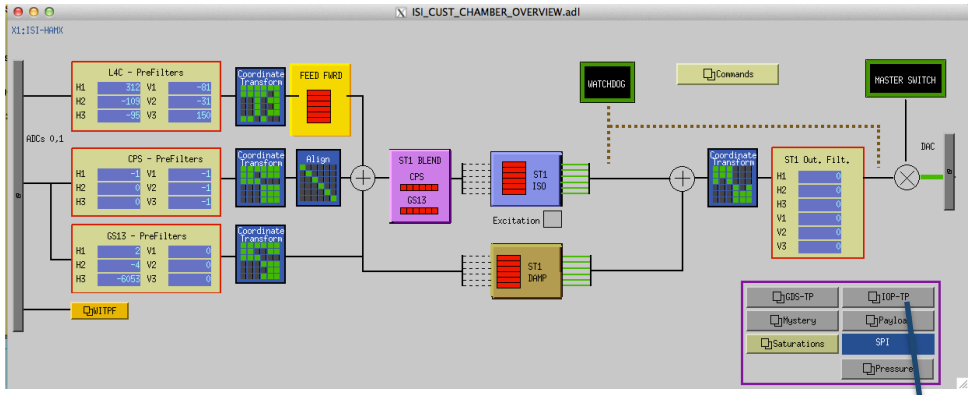
- Risks of Instability

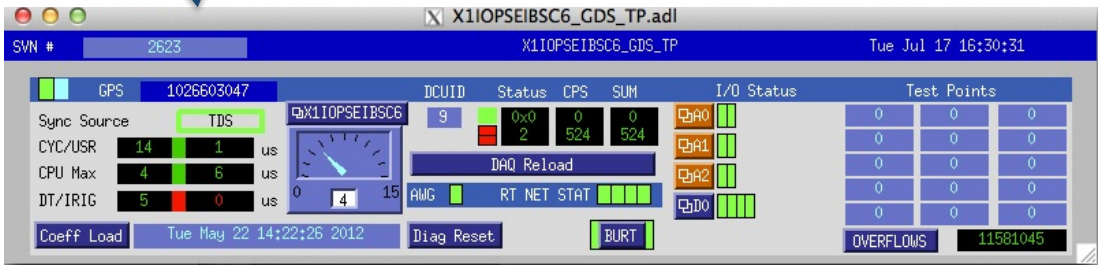
Watchdogs


ISI_CUST_CHAMBER_OVERVIEW.adl
X1:ISI-HAMX
L4C - PreFilters
CPS - PreFilters
GS13 - PreFilters
ADCs 0,1
FEED FWD
Coordinate Transform
Align
ST1 BLEND
CPS
GS13
ST1 ISO
Excitation
ST1 DAMP
WATCHDOG
Commands
MASTER SWITCH
DAC
ST1 Out. Filt.
WITPF
GDS-TP
IOP-TP
Mystery
Payload
Saturations
SPI
Pressure


ISI_CUST_CHAMBER_WATCHDOG.adl
STAGE 2
MONITORS
FIRST TRIG
CURRENT TRIG
STATE 1: ARMED
STATE 2: COUNTING
STATE 3: DAMPING ONLY
STATE 4: FULL SHUTDOWN
DISP H1
DISP H2
DISP H3
DISP V1
DISP V2
DISP V3
GEO H1
GEO H2
GEO H3
GEO V1
GEO V2
GEO V3
L4C H1
L4C H2
L4C H3
L4C V1
L4C V2
L4C V3
ACT H1
ACT H2
ACT H3
ACT V1
ACT V2
ACT V3
CPS limit:
safe value:
GS13 limit:
L4C limit:
ACT limit:
PAYLOAD limit:
RESET
! run checker
CHECKER HEARTBEAT
Blinks 1/sec if OK
! reset level
COIL DRIVER CHASSIS BIO
0: Nominal
1: CPS Sat.
2: GS13 Sat.
4: L4C Sat.
8: Coil Drv BIO
16: ACT
32: Payload

CPU check


ISI_CUST_CHAMBER_OVERVIEW.adl
X1:ISI-HAM6
L4C - PreFilters
CPS - PreFilters
GS13 - PreFilters
Coordinate Transform
FEED FWD
Align
ST1 BLEND
CPS
GS13
ST1 ISO
Excitation
ST1 DAMP
WATCHDOG
Commands
MASTER SWITCH
DAC
ST1 Out. Filt.
ADCs 0,1
WITPF
GDS-TP
IOP-TP
Mystery
Saturations
SPI
Pressure


X1IOPSEIBSC6_GDS_TP.adl
SVN #
2623
X1IOPSEIBSC6_GDS_TP
Tue Jul 17 16:30:31
GPS
1026603047
Sync Source
TDS
CYC/USR
CPU Max
DT/IRIG
us
X1IOPSEIBSC6
DCUID
Status
CPS
SUM
9
0x0
2
0
524
0
524
I/O Status
A0
A1
A2
DO
Test Points
DAQ Reload
AWG
RT NET STAT
Coeff Load
Tue May 22 14:22:26 2012
Diag Reset
BURT
OVERFLOWS
11581045

Conclusion

We want:

• Input filters	-	ON
• Coordinate Transform Matrices	-	Loaded
• Damping loops	-	ON
• Isolation filters	-	ON
• WD	-	Safe
• CPU	-	OK state

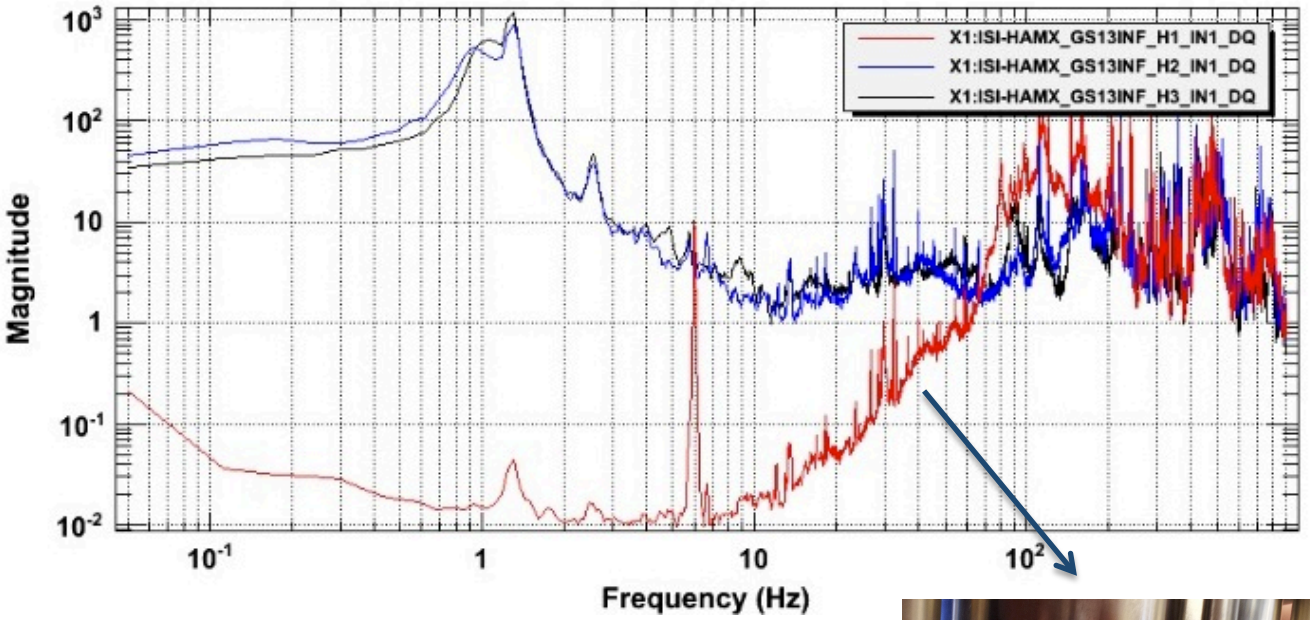
Guardian will help

LIGO

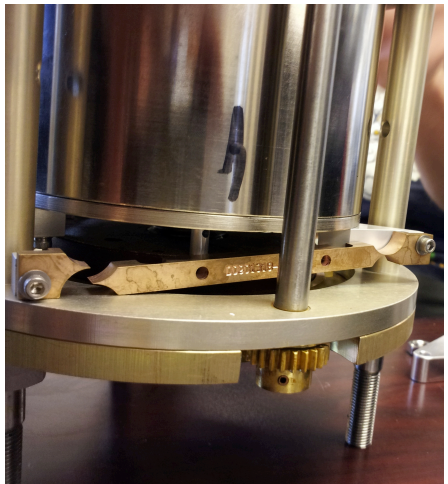
Troubleshooting

Power Spectra

DTT or Matlab®



Broken Flexure…



Transfer Functions

Measured/processed via Matlab®

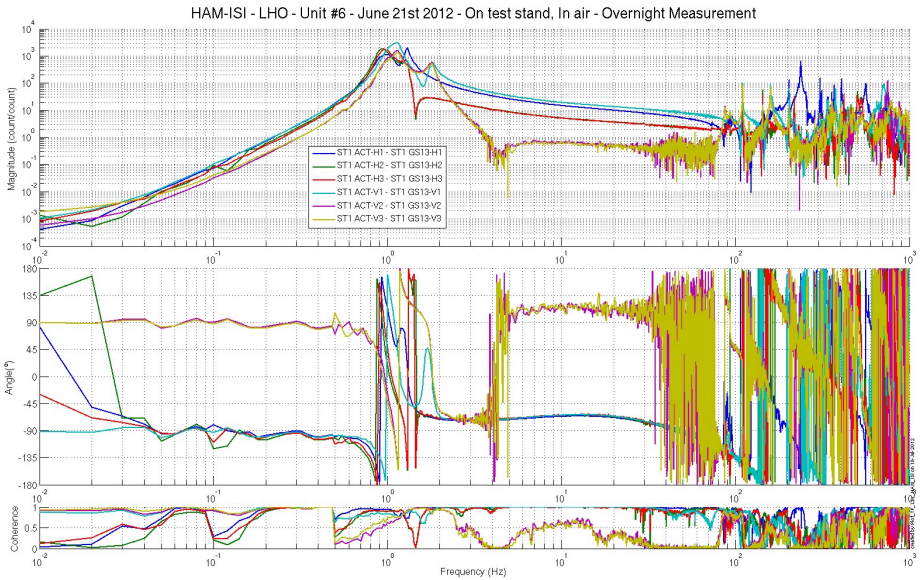
More details in E1000309

① Run/Save excitation: Run_Exc_Batch_X1_HAMX.m.
② Retrieve time series + Process/Save TF data: Run_Get_Batch.m
③ Concatenate/display/save TFS: Step_1_Plot_TF_Loc_to_Loc_X1_ISI_HAMX.m

We want

Symmetry
Low noise
Results comparable to reference

Example #1

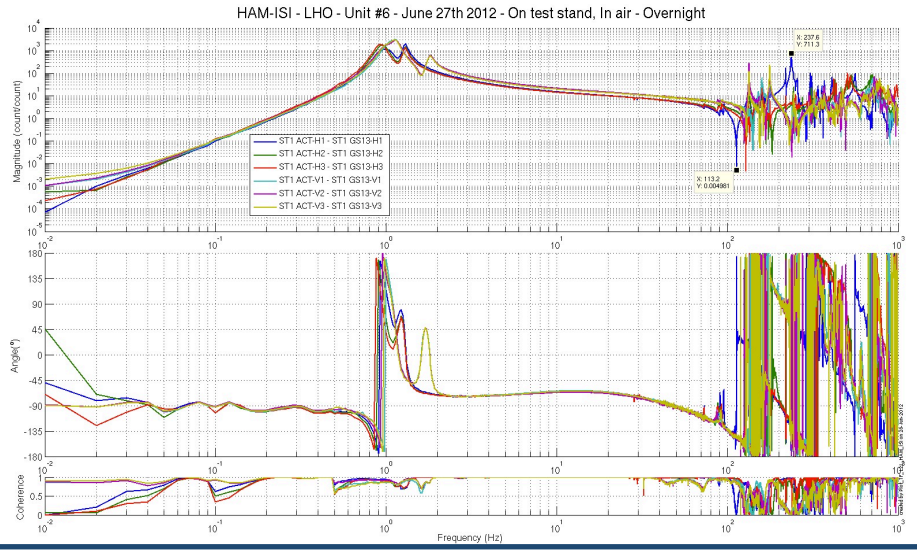


IN-Field cables misconnected

Bad connection on GS13 cables => Gain of $^1/_2$

GS13 connections mismatched => reading cross-coupling

Example #2



Mechanical issue

GS13 not torqued against the ISI

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Thank you