Simulating the Advanced LIGO Interferometer Using the Real Control Code

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Mentor

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What can be done?

Implementing a real-time simulation of the hardware that communicates to the control code will generate a practical troubleshooting technique.

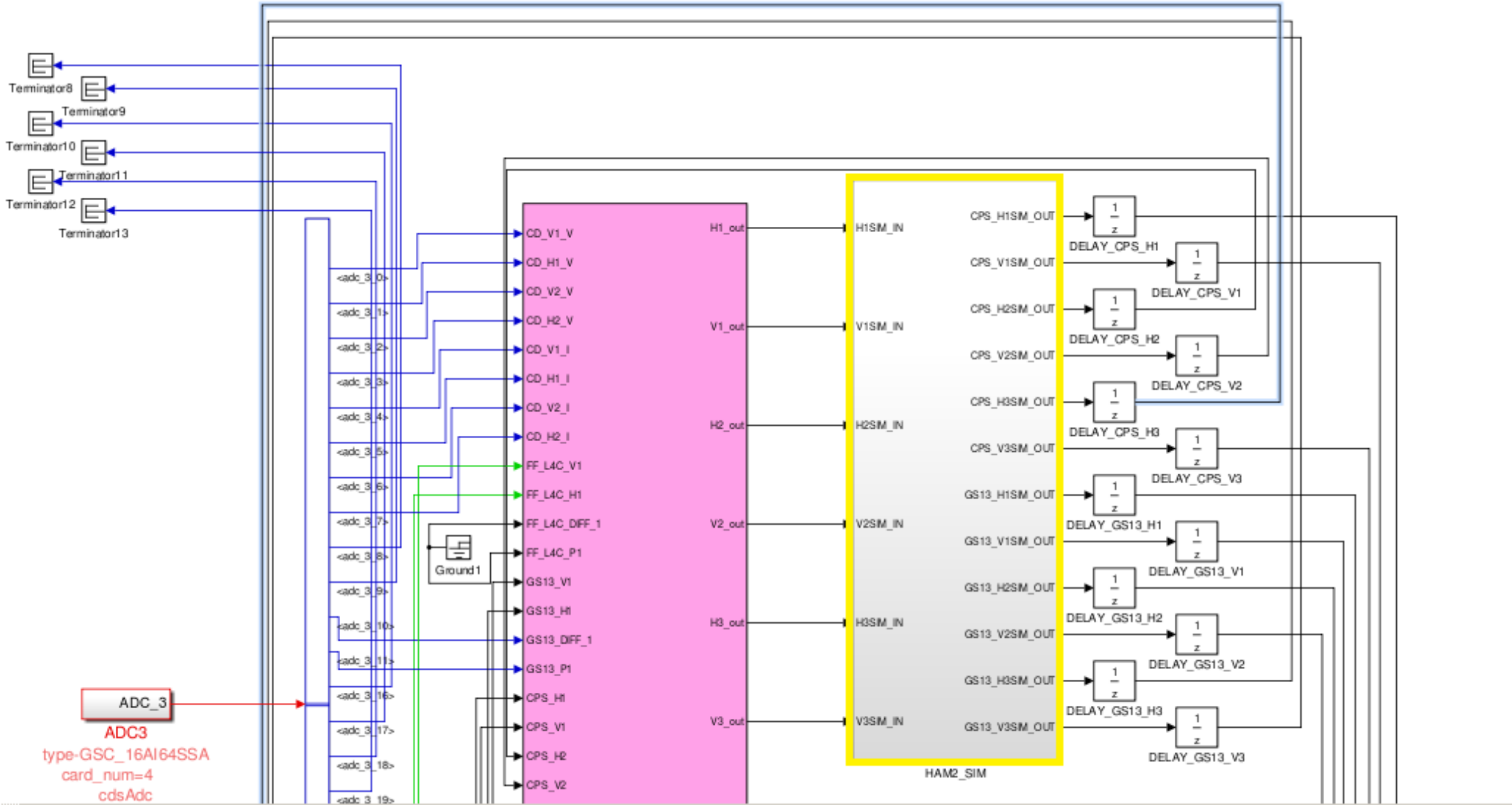
Things to Keep in Mind

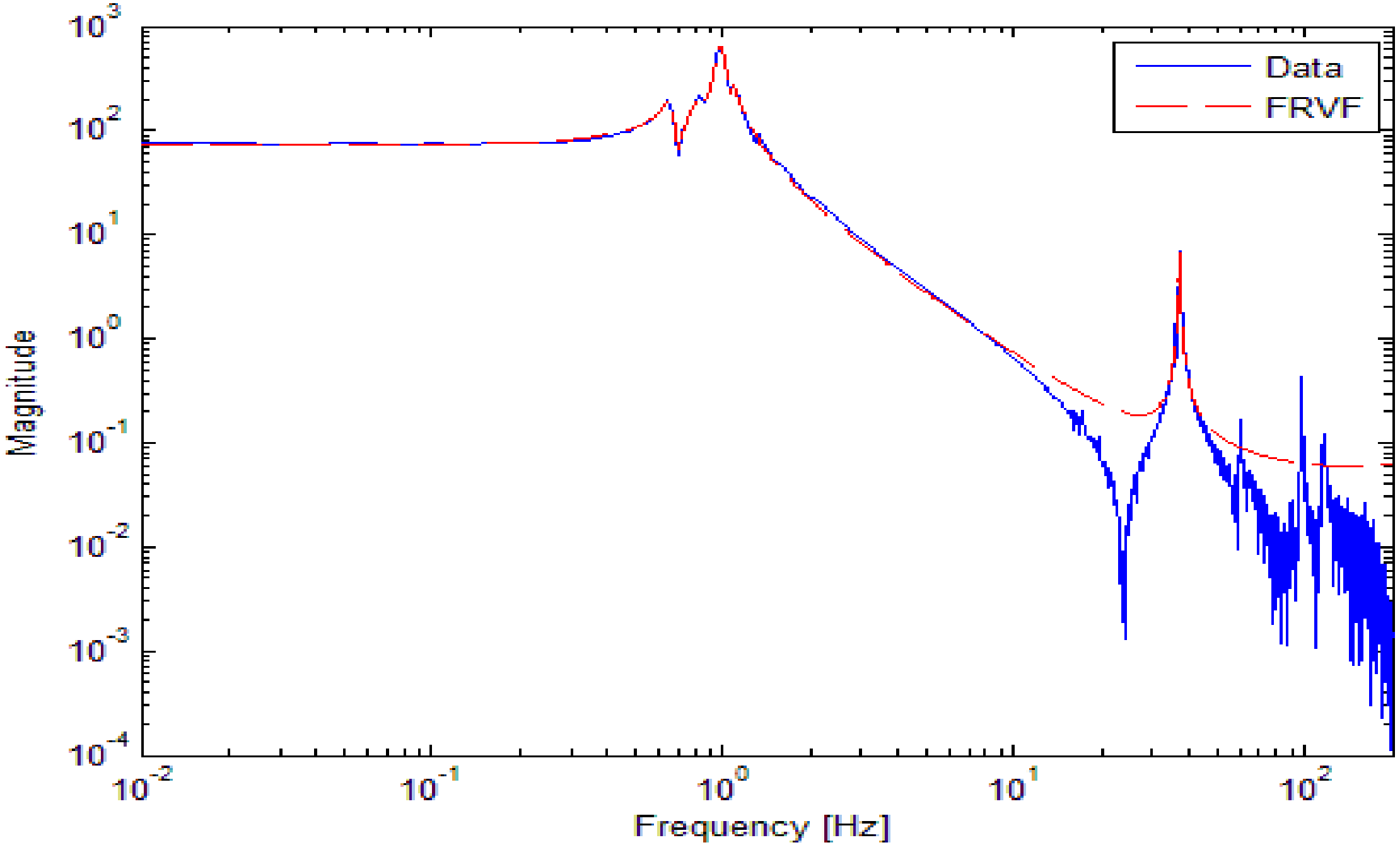
How do we develop a simulation?

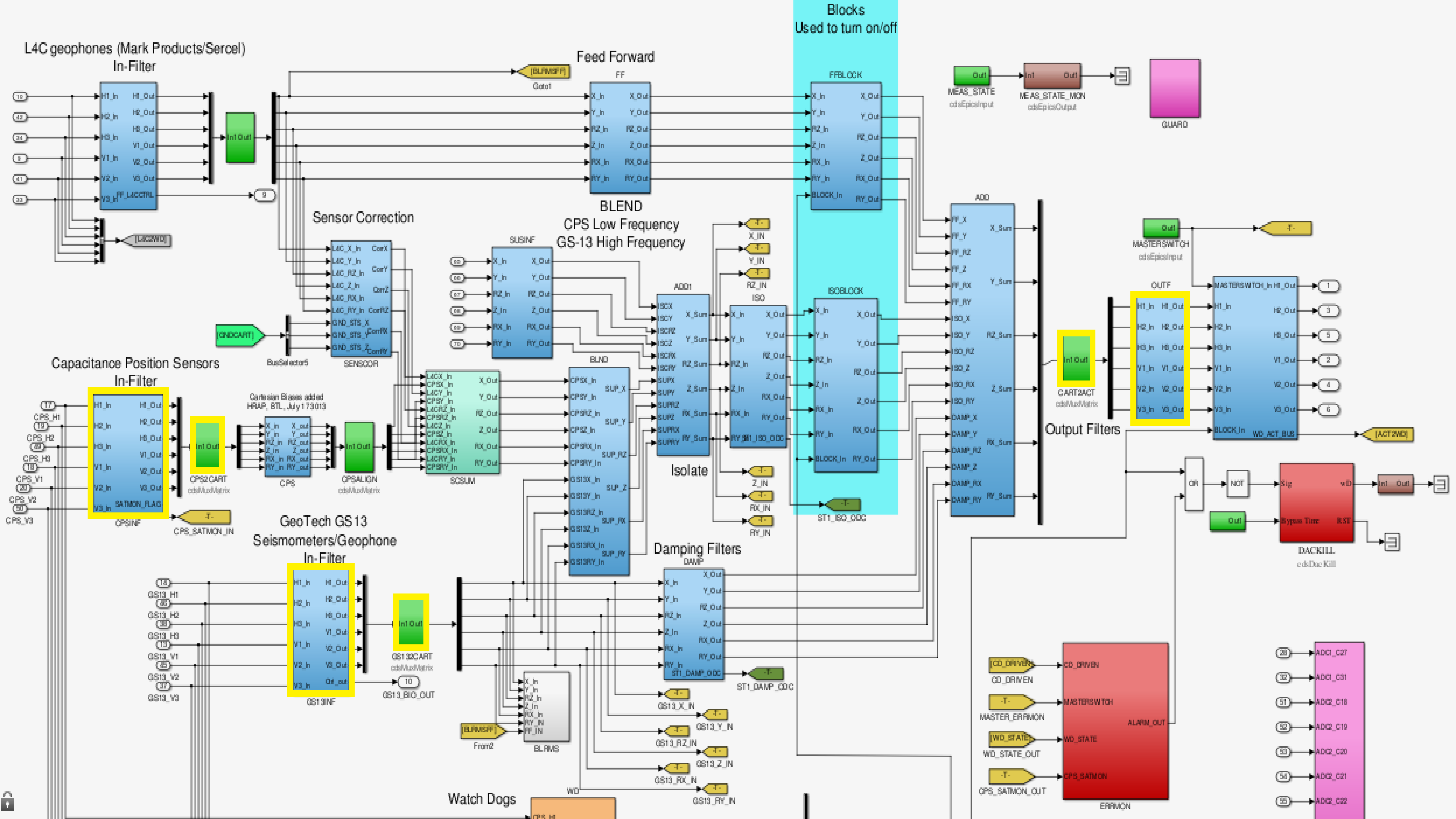
What is noise and how do we simulate it?

What have we learned during this process?

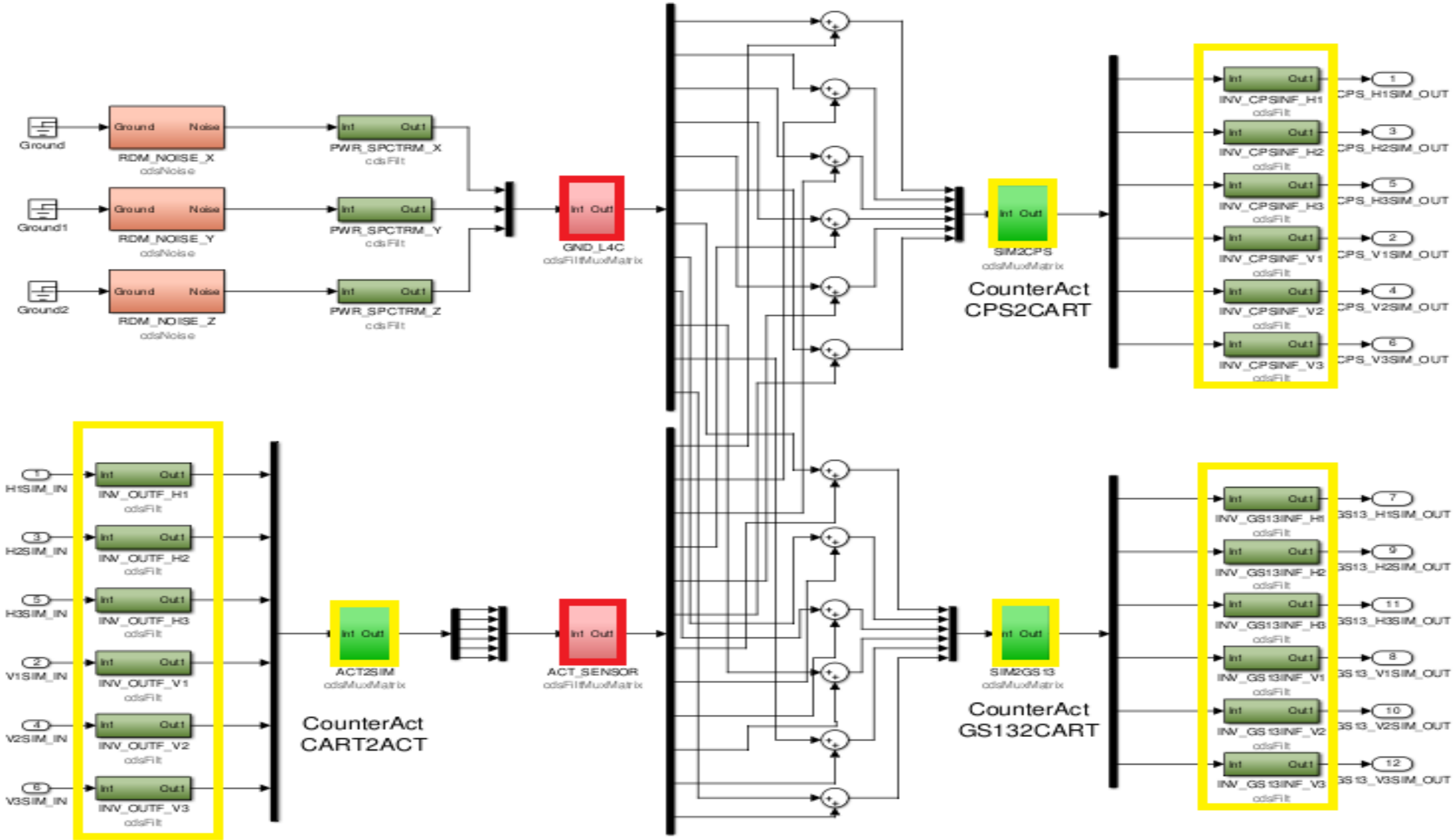
Ham 2&3 ISI/HEPI Wiring Diagram - D1101576



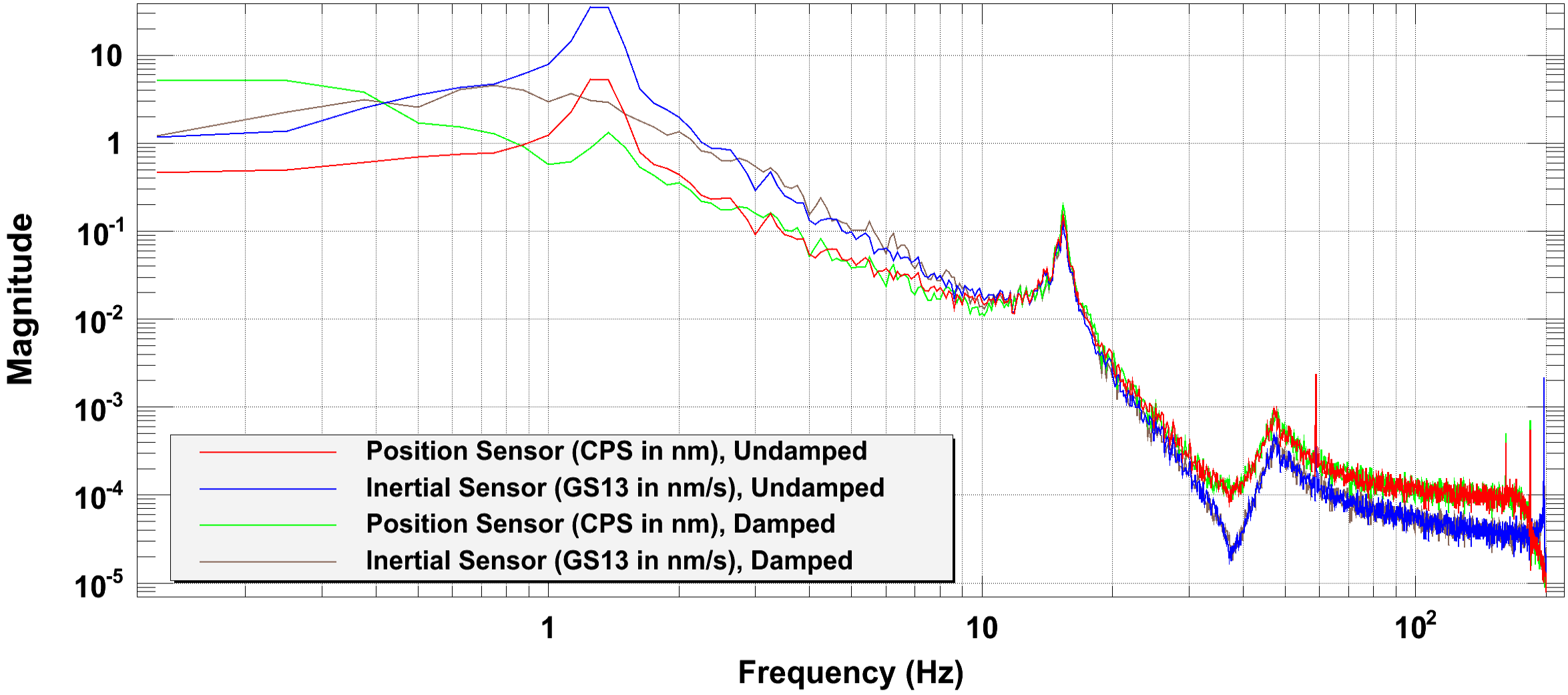

Data
FRVF
Magnitude
Frequency [Hz]
10^{3}
10^{2}
10^{1}
10^{0}
10^{-1}
10^{-2}
10^{-3}
10^{-4}
10^{-2}
10^{-1}
10^{0}
10^{1}
10^{2}



L4C geophones (Mark Products/Sercel)
In-Filter
L4CINF
L4C2WD
Feed Forward
FF
BLRMSFF
Goto1
Blocks
Used to turn on/off
FFBLOCK
MEAS_STATE
cdsEpicsInput
MEAS_STATE_MON
cdsEpicsOutput
GUARD
Sensor Correction
SENSCOR
GNDCART
BusSelector5
BLEND
CPS Low Frequency
GS-13 High Frequency
SUSINF
ADD1
ISO
Isolate
ISOBLOCK
ST1_ISO_ODC
ADD
MASTERSWITCH
cdsEpicsInput
OUTF
Output Filters
CART2ACT
cdsMuxMatrix
WD_ACT_BUS
ACT2WD
Capacitance Position Sensors
In-Filter
CPSINF
CPS_SATMON_IN
CPS2CART
cdsMuxMatrix
Cartesian Biases added
HRAP, BTL, July 17 2013
CPS
CPSALIGN
cdsMuxMatrix
SCSUM
BLND
GeoTech GS13
Seismometers/Geophone
In-Filter
GS13INF
GS132CART
cdsMuxMatrix
GS13_BIO_OUT
Damping Filters
DAMP
ST1_DAMP_ODC
BLRMS
From2
BLRMSFF
Watch Dogs
WD
OR
NOT
DACKILL
cdsDacKill
Bypass Time
CD_DRIVEN
MASTER_ERRMON
WD_STATE_OUT
CPS_SATMON_OUT
ERRMON
ALARM_OUT


Ground
Ground1
Ground2
Ground Noise
RDM_NOISE_X
RDM_NOISE_Y
RDM_NOISE_Z
odsNoise
In1 Out1
PWR_SPCTRM_X
PWR_SPCTRM_Y
PWR_SPCTRM_Z
odsFilt
GND_L4C
odsFiltMuxMatrix
SIM2CPS
odsMuxMatrix
CounterAct
CPS2CART
INV_CPSINF_H1
INV_CPSINF_H2
INV_CPSINF_H3
INV_CPSINF_V1
INV_CPSINF_V2
INV_CPSINF_V3
1
CPS_H1SIM_OUT
3
CPS_H2SIM_OUT
5
CPS_H3SIM_OUT
2
CPS_V1SIM_OUT
4
CPS_V2SIM_OUT
6
CPS_V3SIM_OUT
1
H1SIM_IN
3
H2SIM_IN
5
H3SIM_IN
2
V1SIM_IN
4
V2SIM_IN
6
V3SIM_IN
INV_OUTF_H1
INV_OUTF_H2
INV_OUTF_H3
INV_OUTF_V1
INV_OUTF_V2
INV_OUTF_V3
ACT2SIM
ACT_SENSOR
CounterAct
CART2ACT
SIM2GS13
CounterAct
GS132CART
INV_GS13INF_H1
INV_GS13INF_H2
INV_GS13INF_H3
INV_GS13INF_V1
INV_GS13INF_V2
INV_GS13INF_V3
7
GS13_H1SIM_OUT
9
GS13_H2SIM_OUT
11
GS13_H3SIM_OUT
8
GS13_V1SIM_OUT
10
GS13_V2SIM_OUT
12
GS13_V3SIM_OUT

Power spectrum



*T0=20/08/2013 17:20:38

Avg=11

BW=0.1875

OVERVIEW

Learned about noise and filters

Discussed framework of simulation

Explained how to interpret and expand