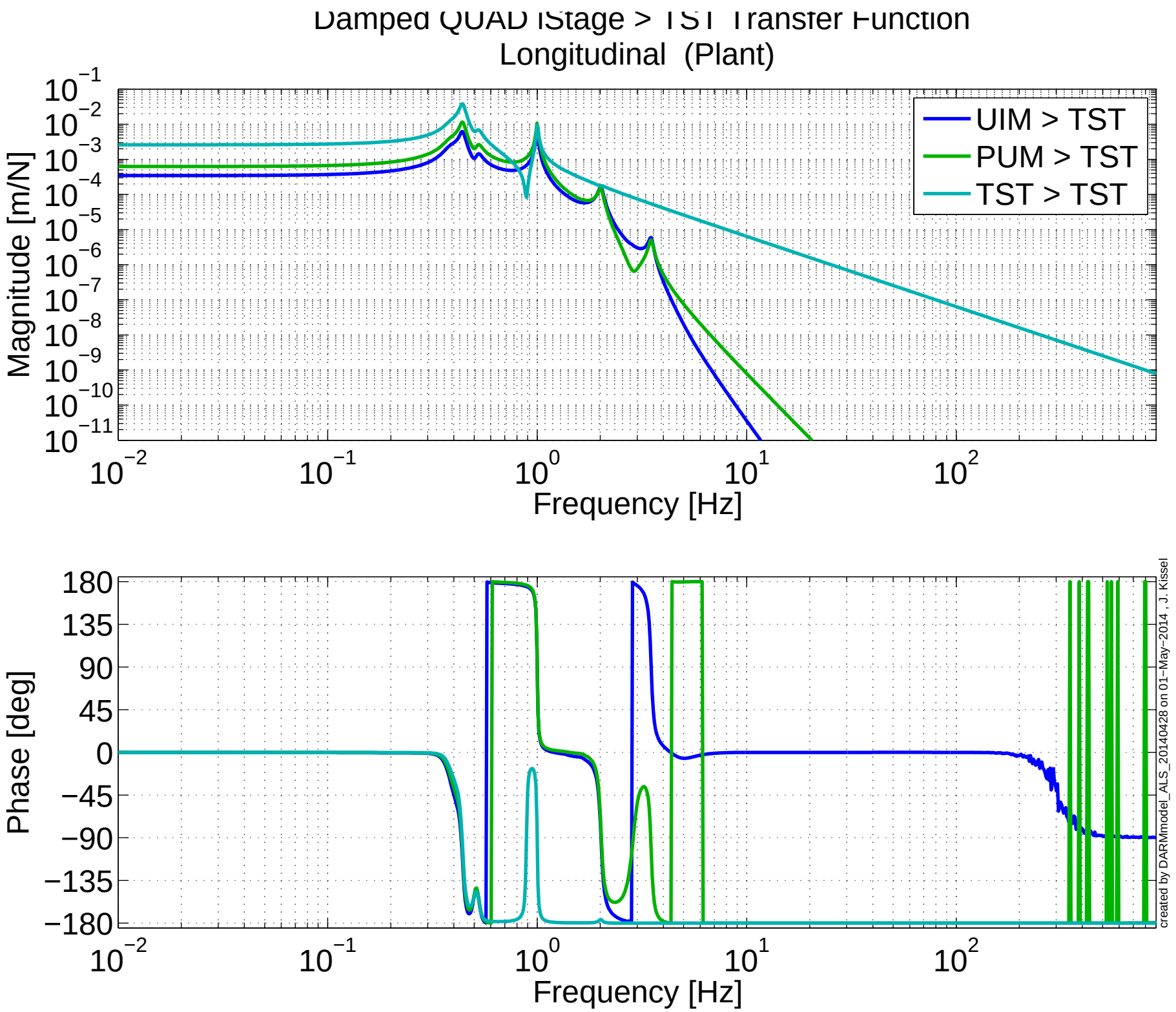
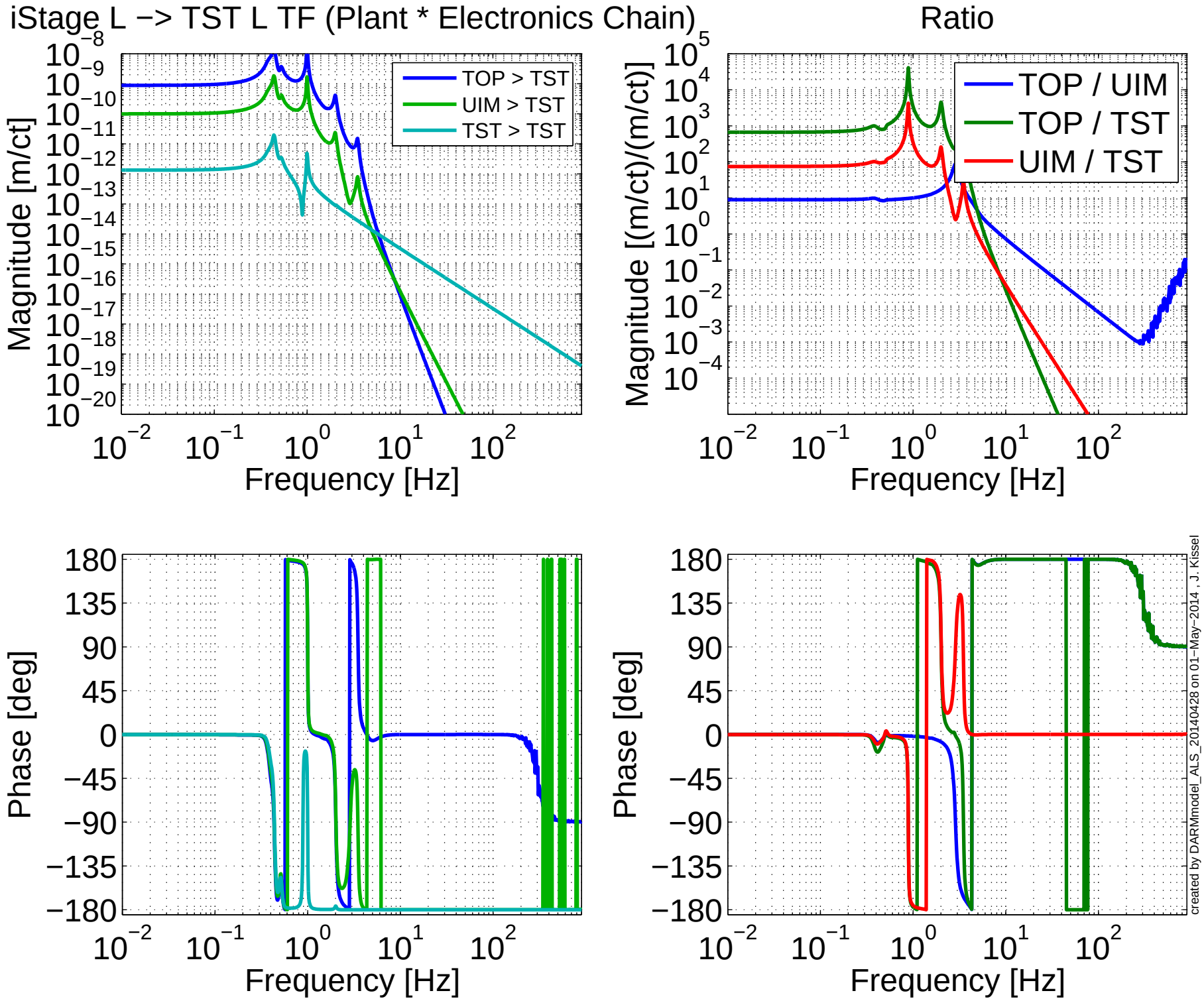
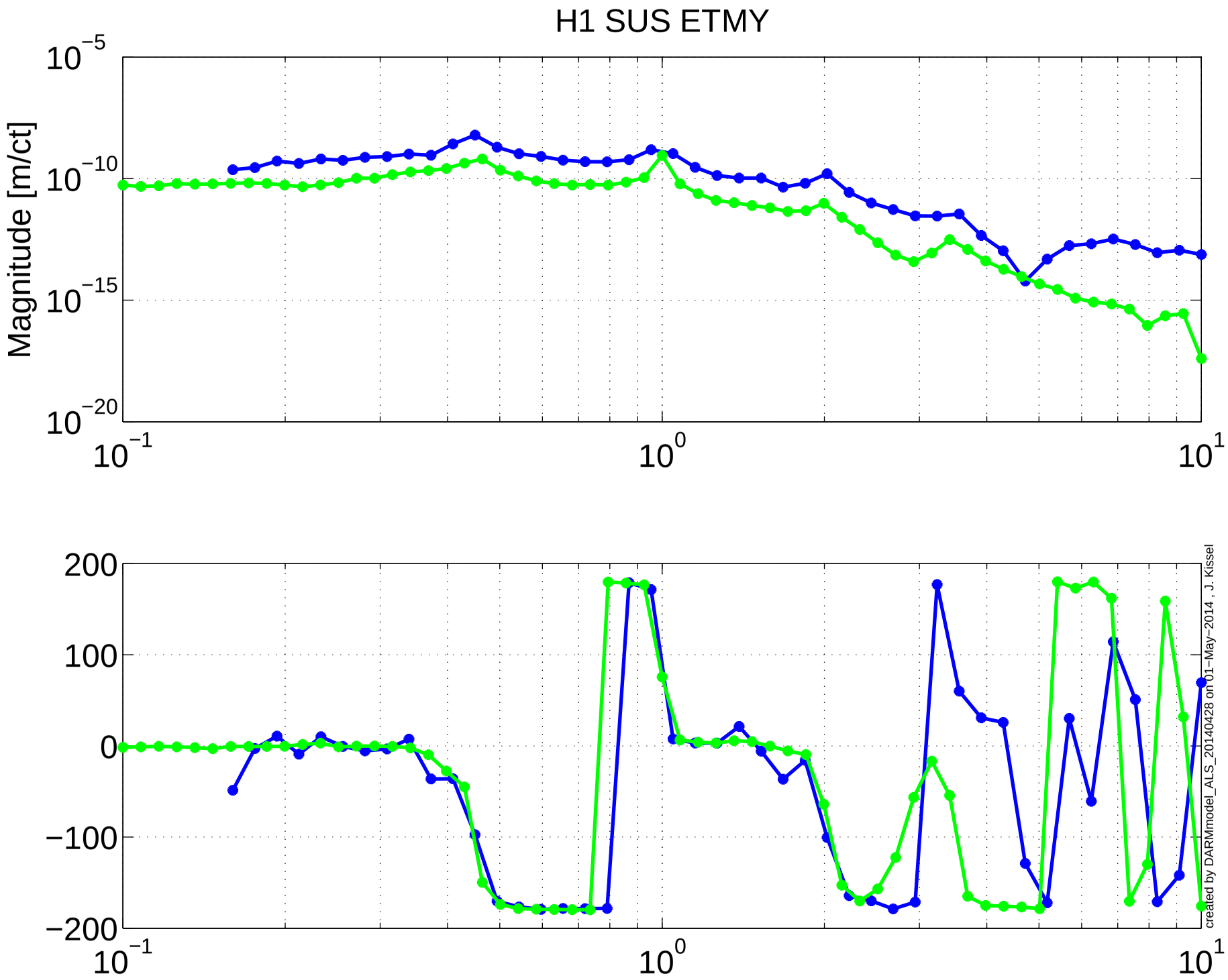
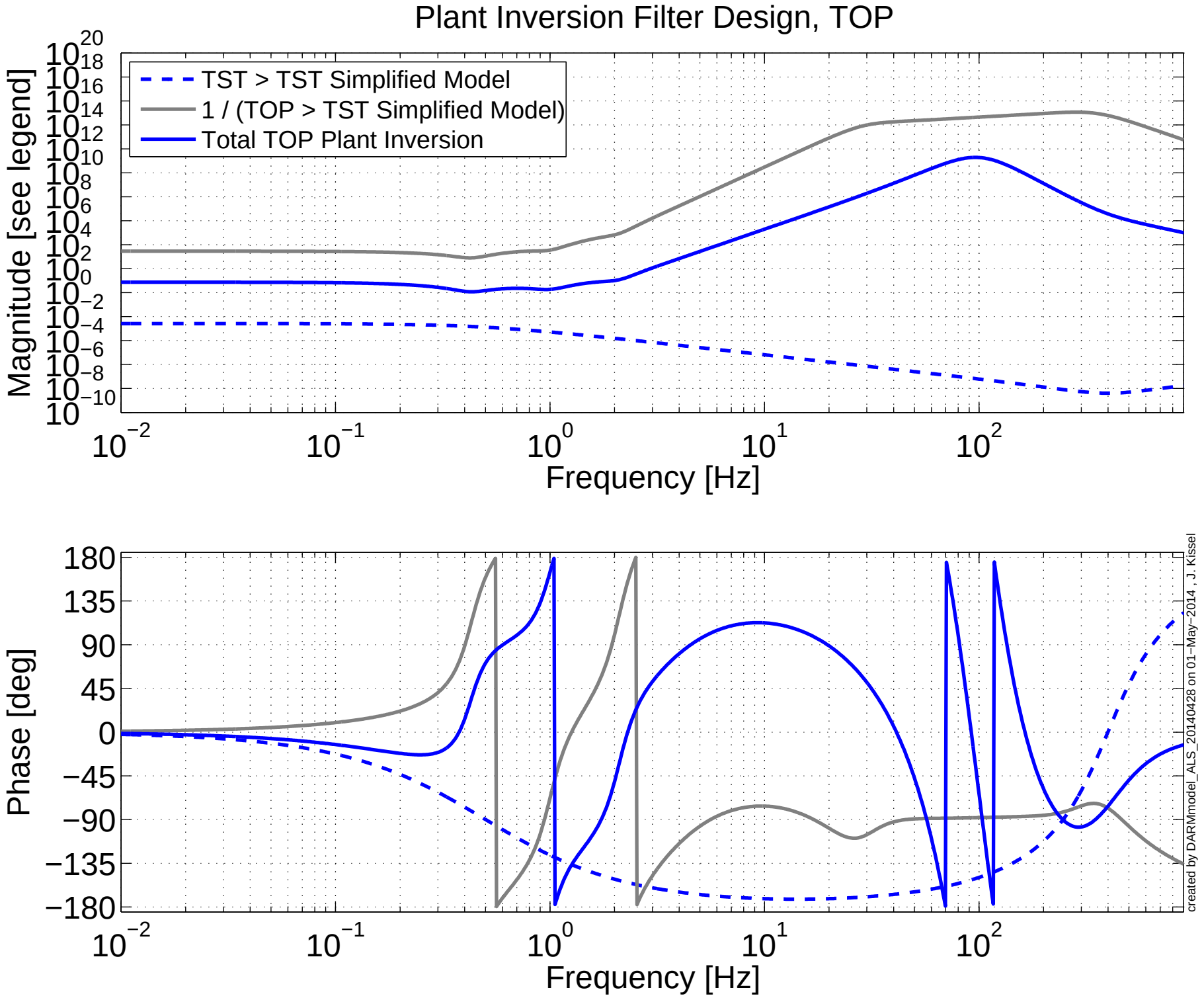
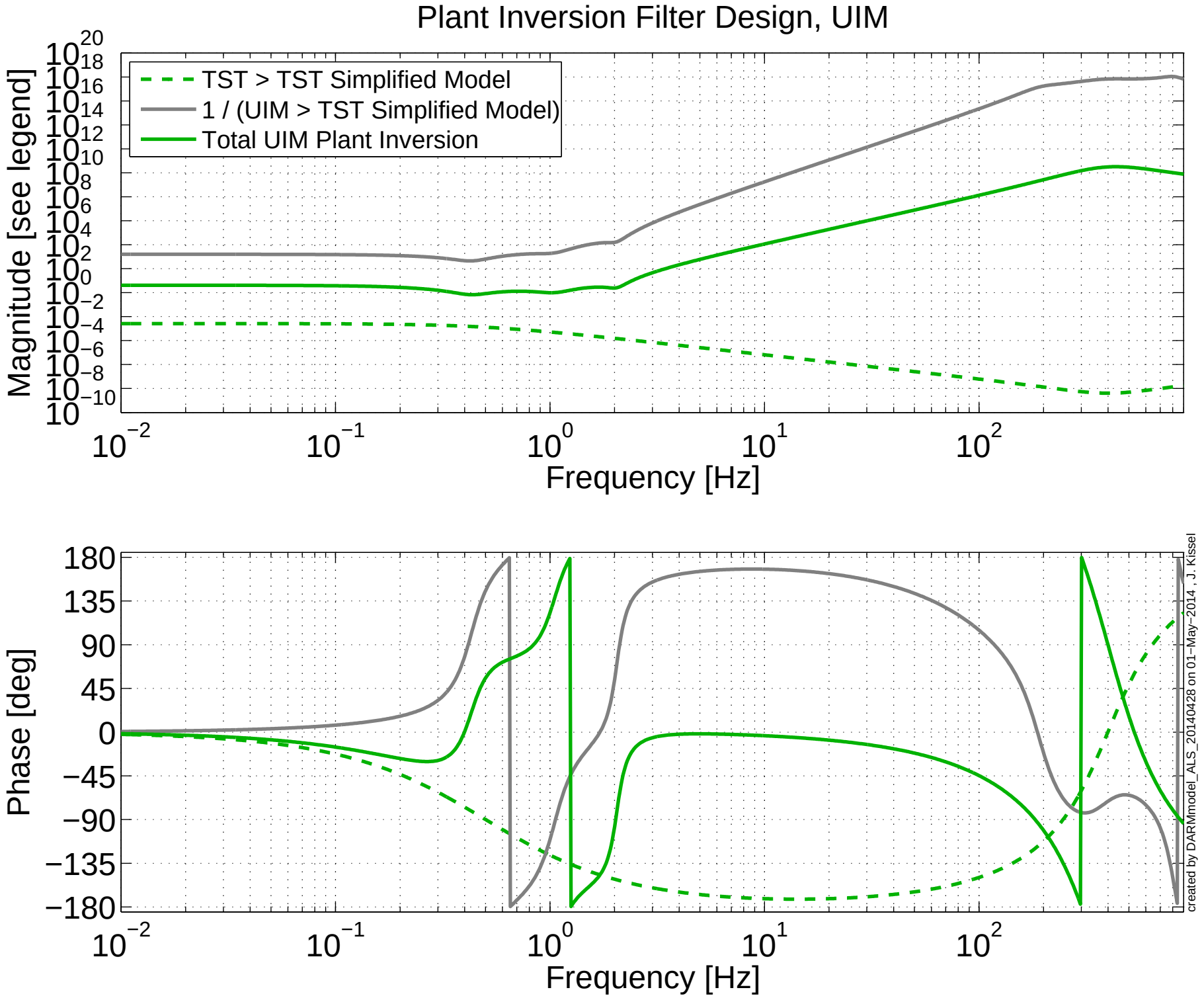
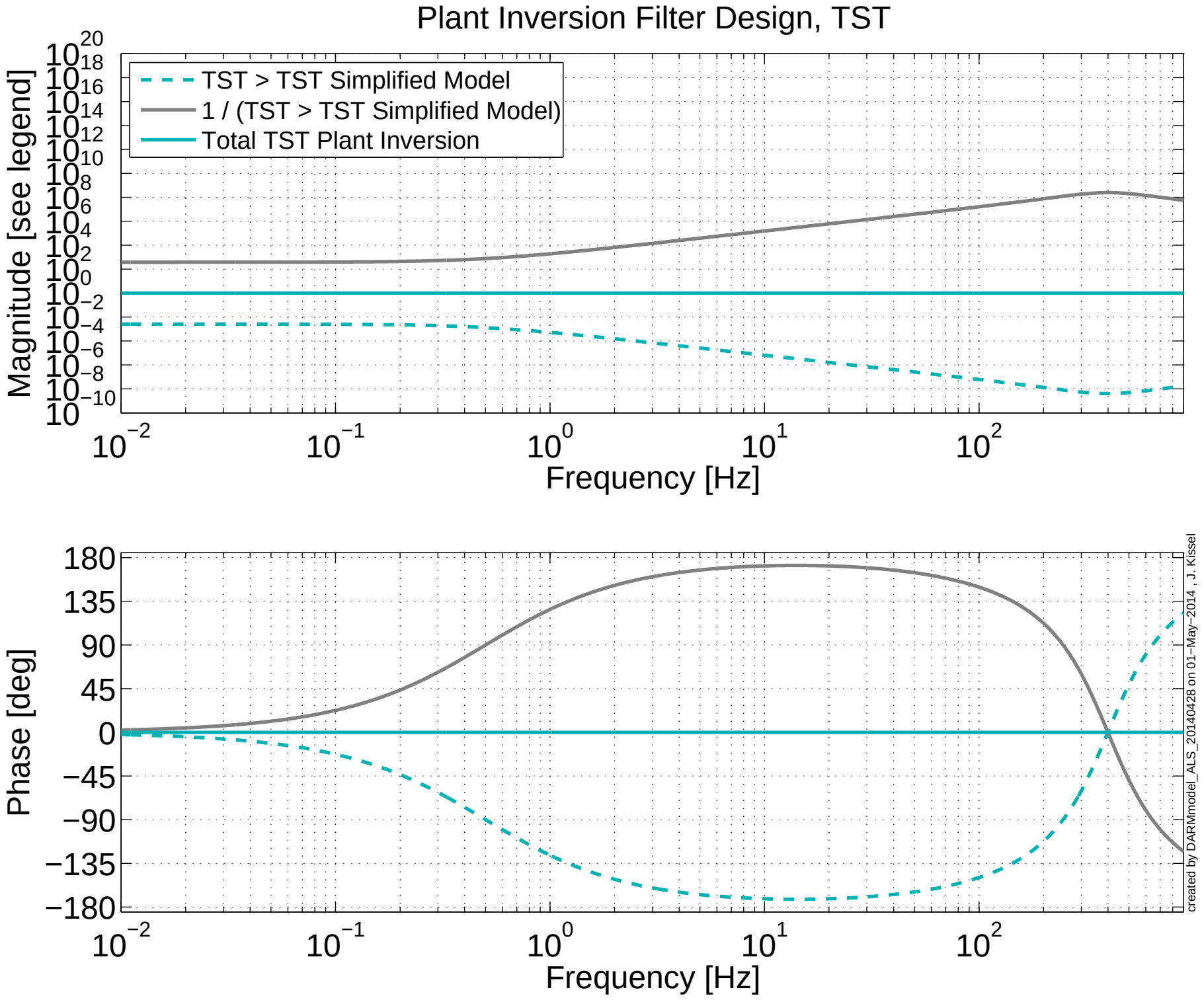

Damped QUAD tStage > TST Transfer Function
Longitudinal (Plant)
Magnitude [m/N]
Frequency [Hz]
UIM > TST
PUM > TST
TST > TST
Phase [deg]
Frequency [Hz]
created by DARMmodel_ALS_20140428 on 01−May−2014 , J. Kissel


iStage L −> TST L TF (Plant * Electronics Chain)
Ratio
Magnitude [m/ct]
Magnitude [(m/ct)/(m/ct)]
Phase [deg]
Frequency [Hz]
TOP > TST
UIM > TST
TST > TST
TOP / UIM
TOP / TST
UIM / TST
created by DARMmodel_ALS_20140428 on 01−May−2014 , J. Kissel

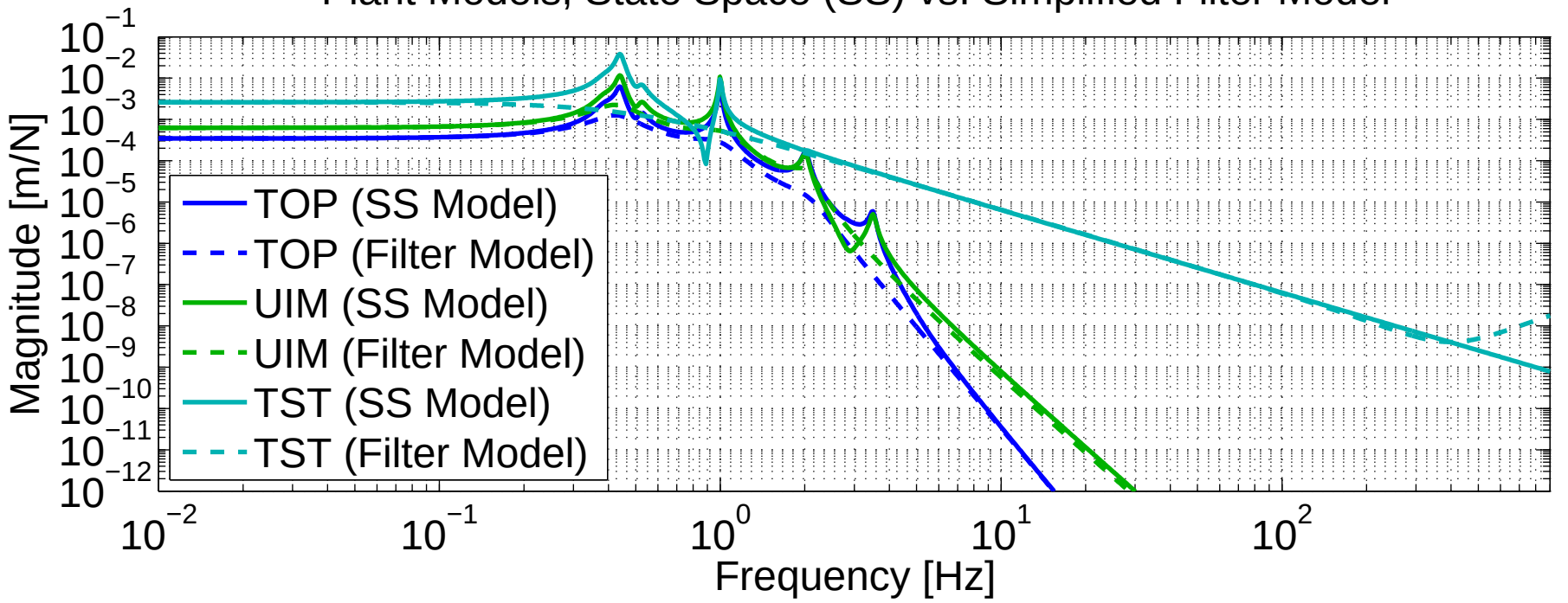

H1 SUS ETMY
Magnitude [m/ct]
10^{-5}
10^{-10}
10^{-15}
10^{-20}
10^{-1}
10^{0}
10^{1}
200
100
0
−100
−200
created by DARMmodel_ALS_20140428 on 01−May−2014 , J. Kissel

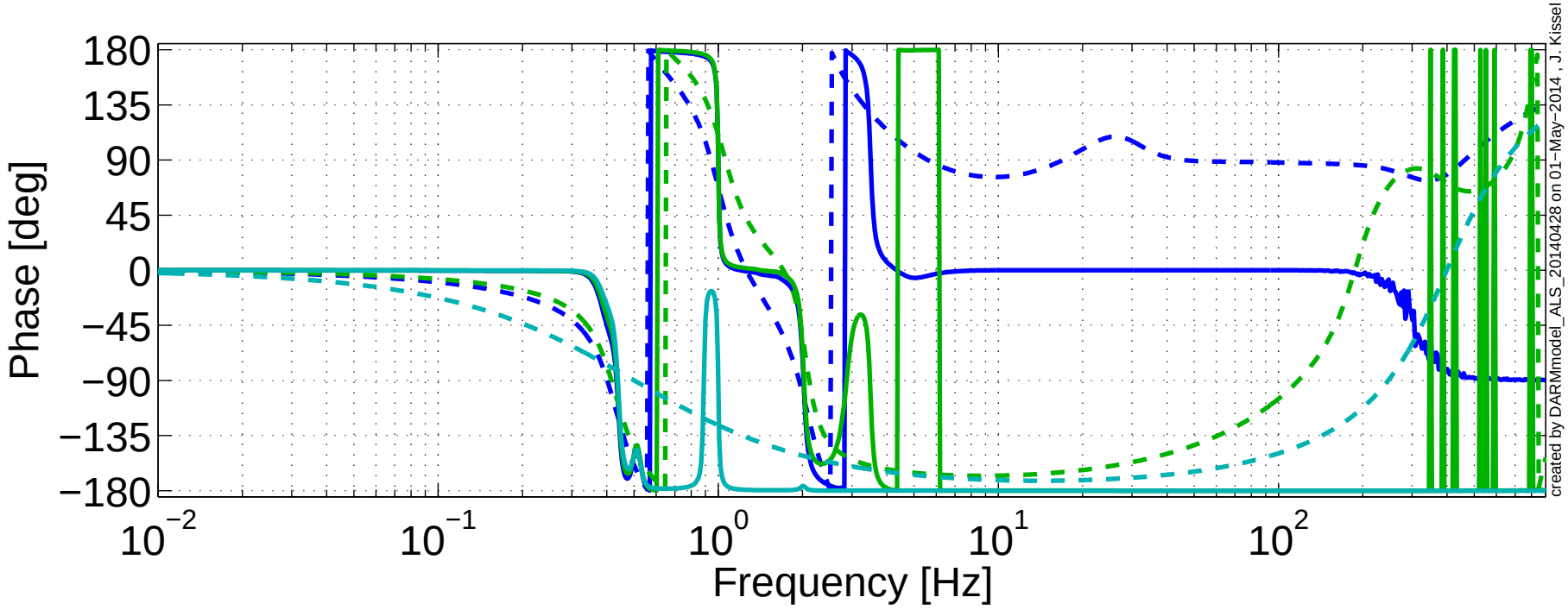

Plant Inversion Filter Design, TOP
TST > TST Simplified Model
1 / (TOP > TST Simplified Model)
Total TOP Plant Inversion
Magnitude [see legend]
Frequency [Hz]
Phase [deg]
Frequency [Hz]
created by DARMmodel_ALS_20140428 on 01−May−2014 , J. Kissel

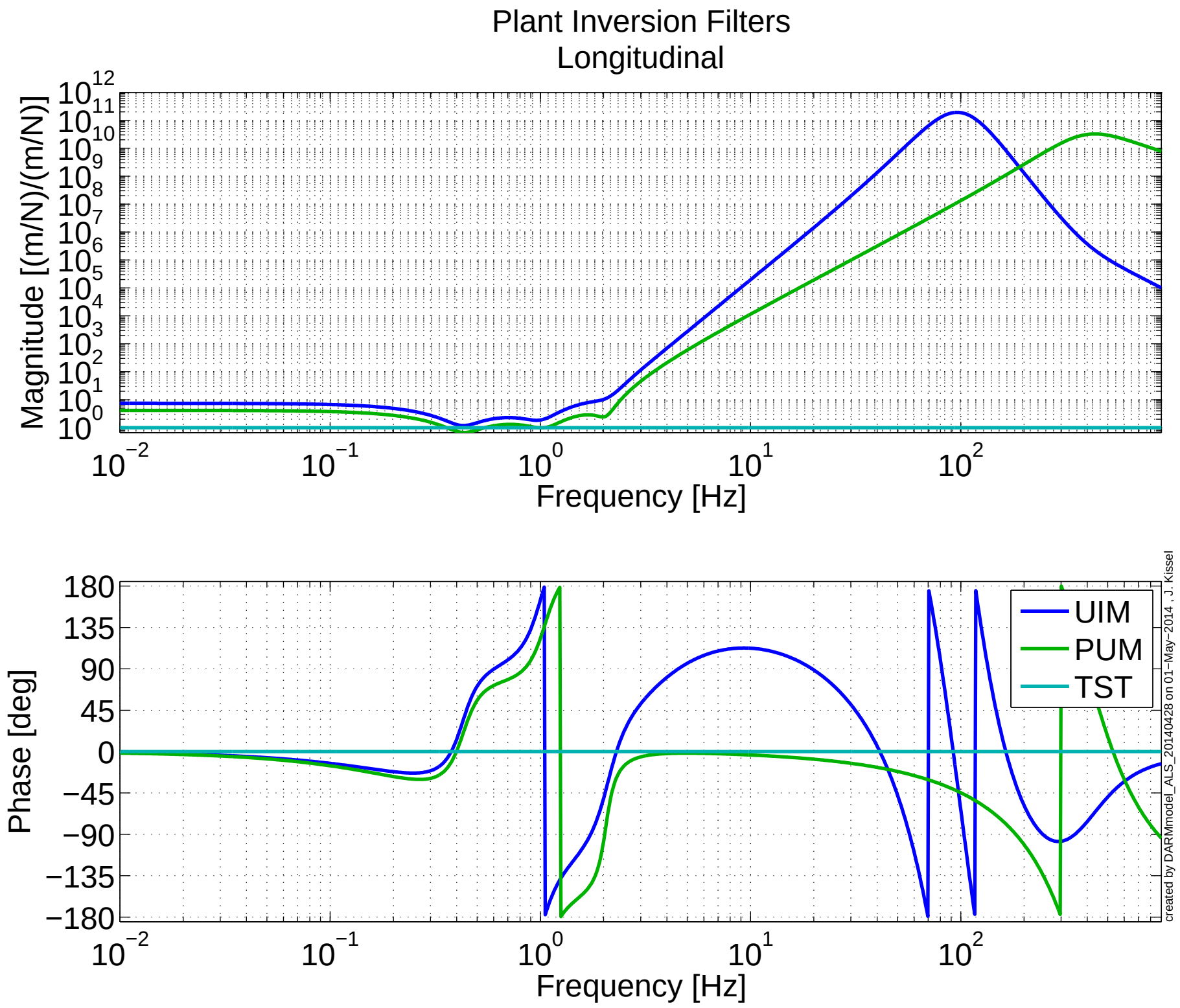

Plant Inversion Filter Design, UIM
TST > TST Simplified Model
1 / (UIM > TST Simplified Model)
Total UIM Plant Inversion
Magnitude [see legend]
Frequency [Hz]
Phase [deg]
Frequency [Hz]
created by DARMmodel_ALS_20140428 on 01−May−2014 , J. Kissel

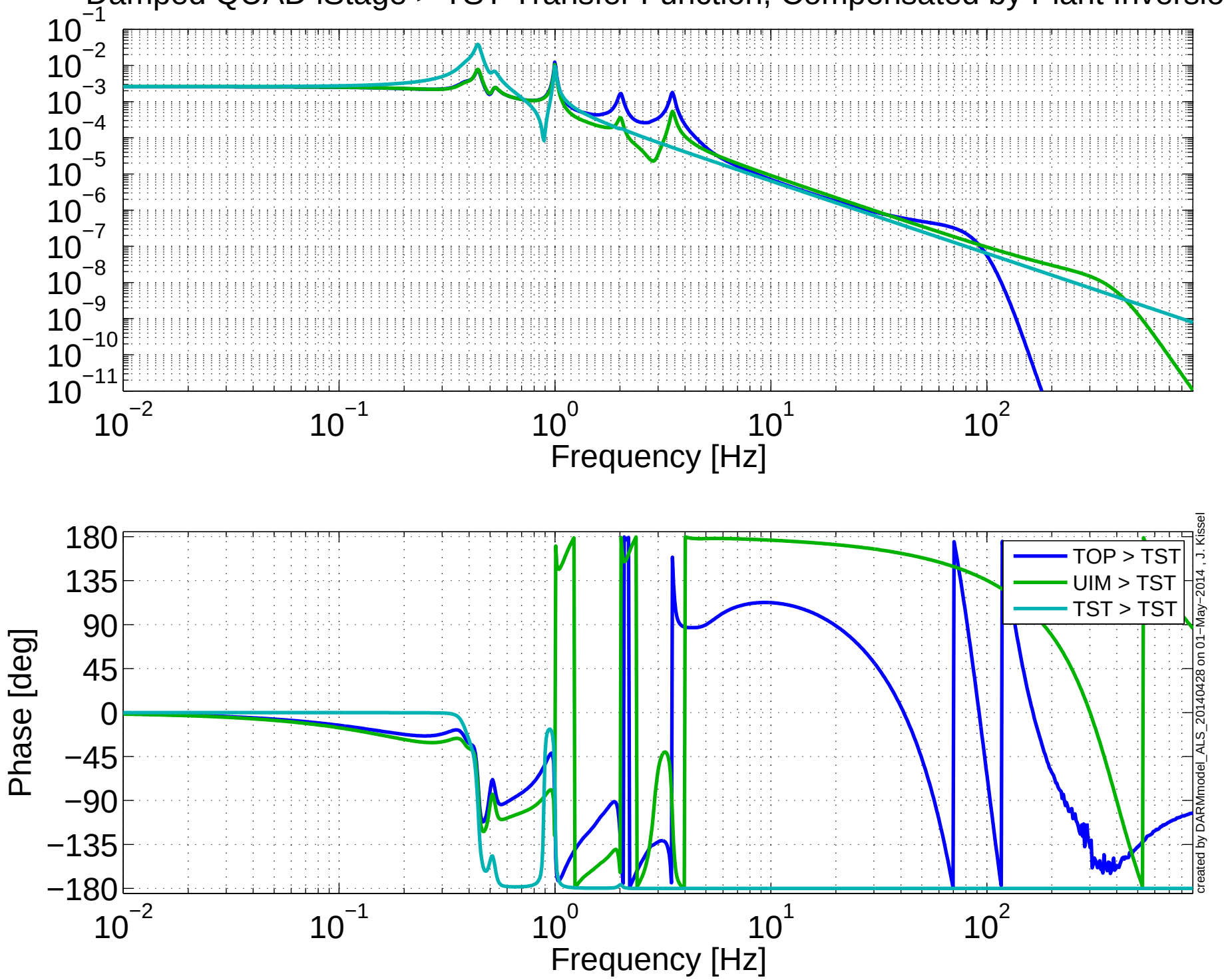

Plant Inversion Filter Design, TST
TST > TST Simplified Model
1 / (TST > TST Simplified Model)
Total TST Plant Inversion
Magnitude [see legend]
Frequency [Hz]
Phase [deg]
Frequency [Hz]
created by DARMmodel_ALS_20140428 on 01−May−2014 , J. Kissel

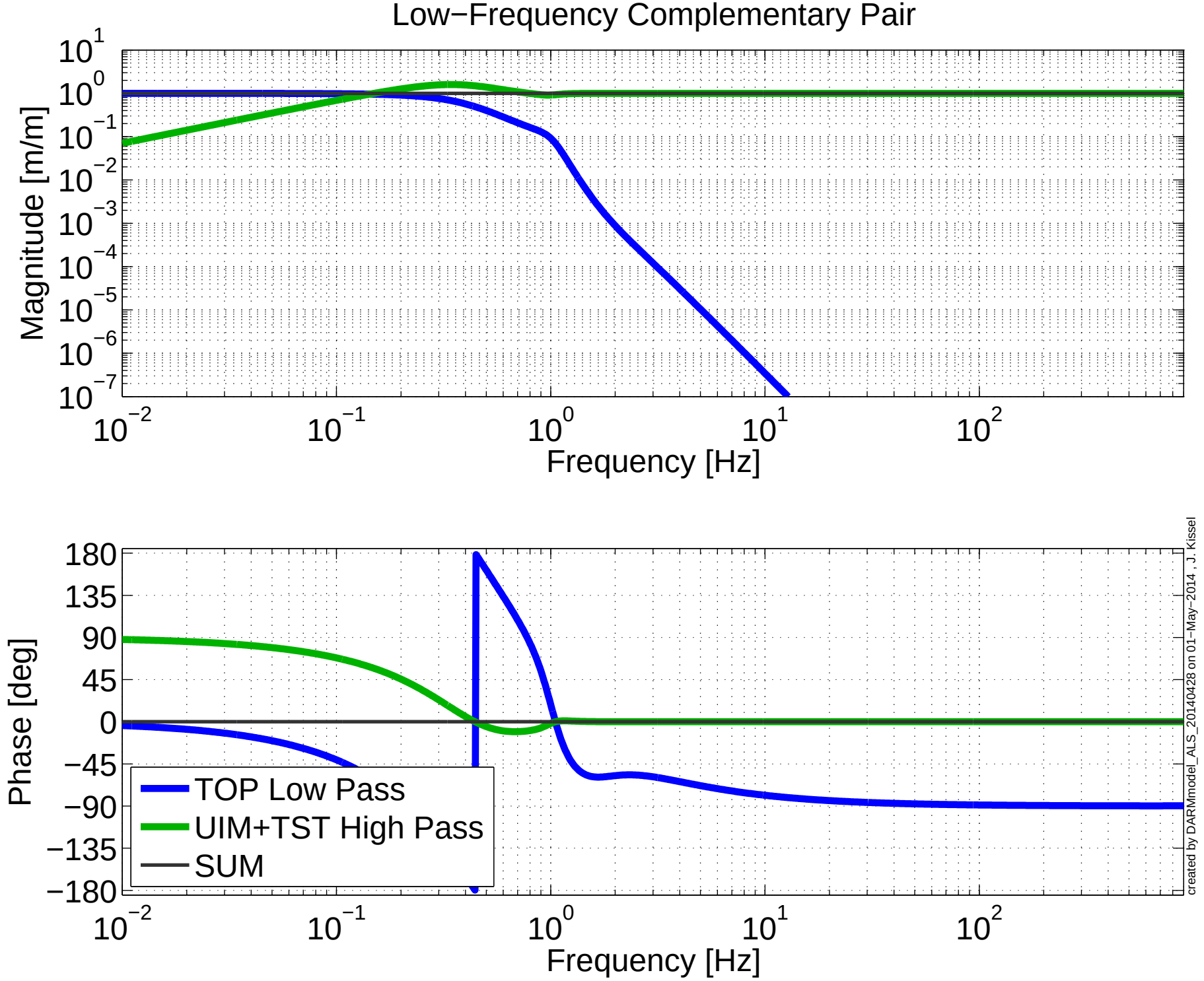
Plant Inversion Filter Design
Plant Models, State Space (SS) vs. Simplified Filter Model

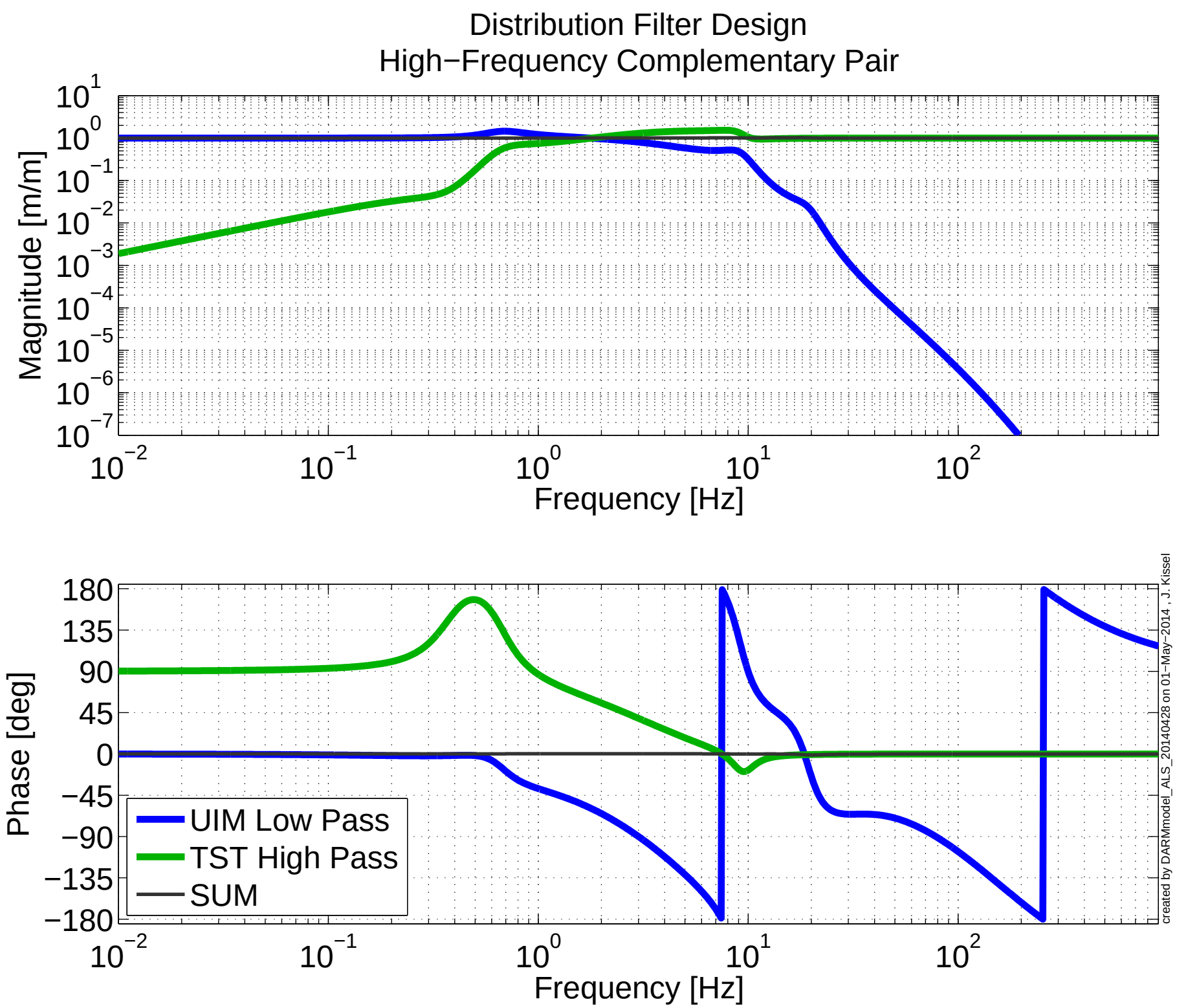


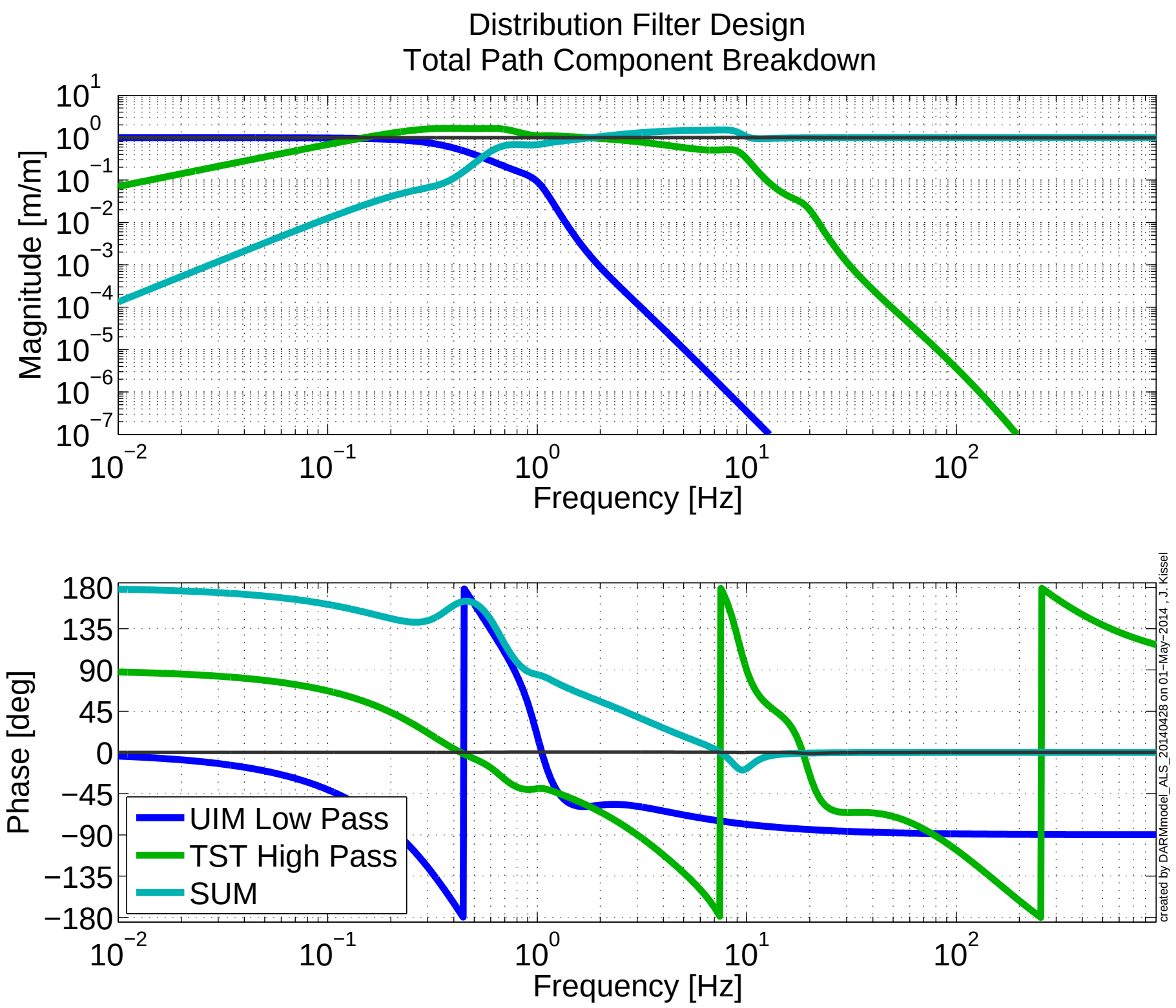


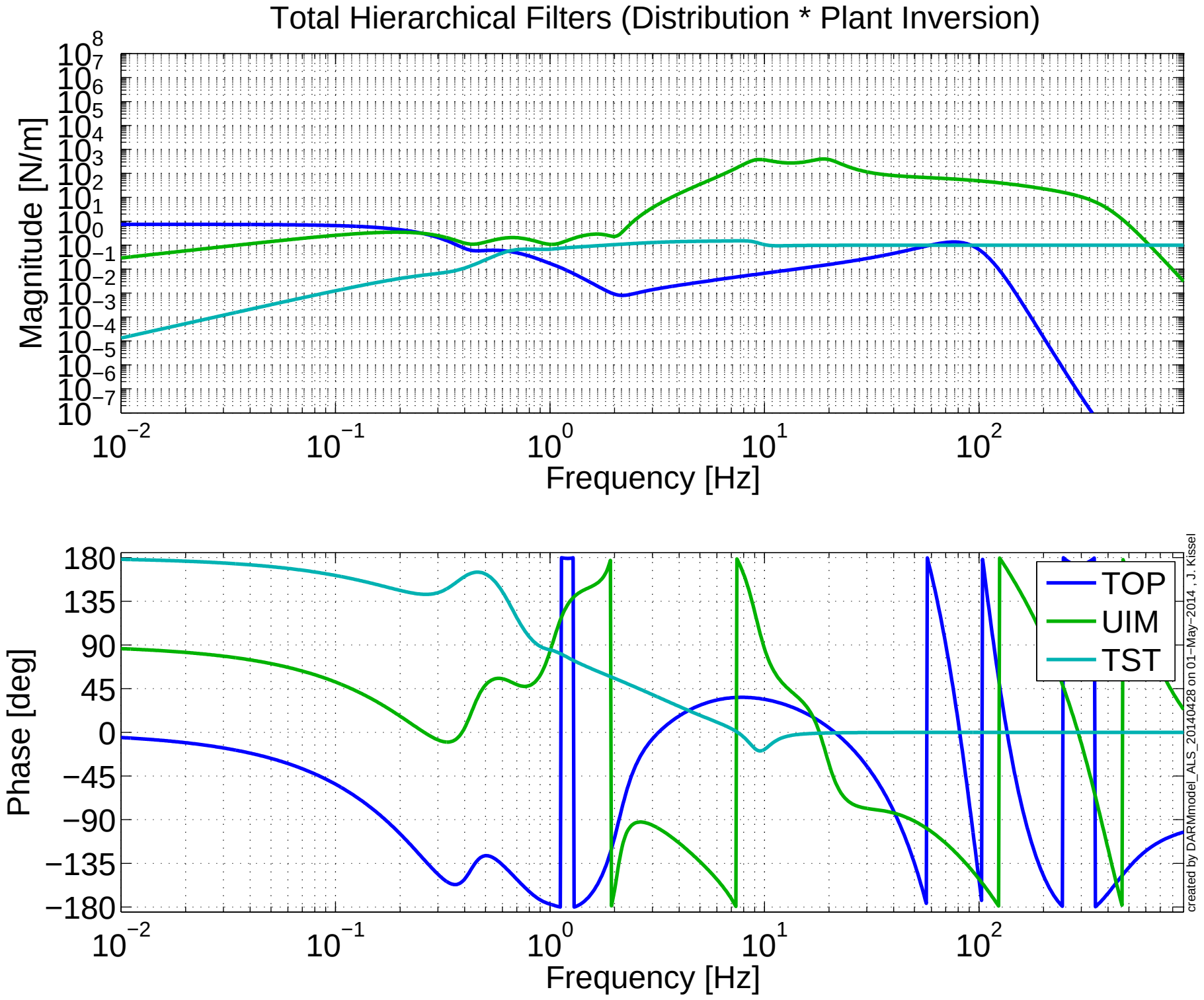

Plant Inversion Filters
Longitudinal
Magnitude [(m/N)/(m/N)]
Frequency [Hz]
Phase [deg]
Frequency [Hz]
UIM
PUM
TST
created by DARMmodel_ALS_20140428 on 01−May−2014 , J. Kissel

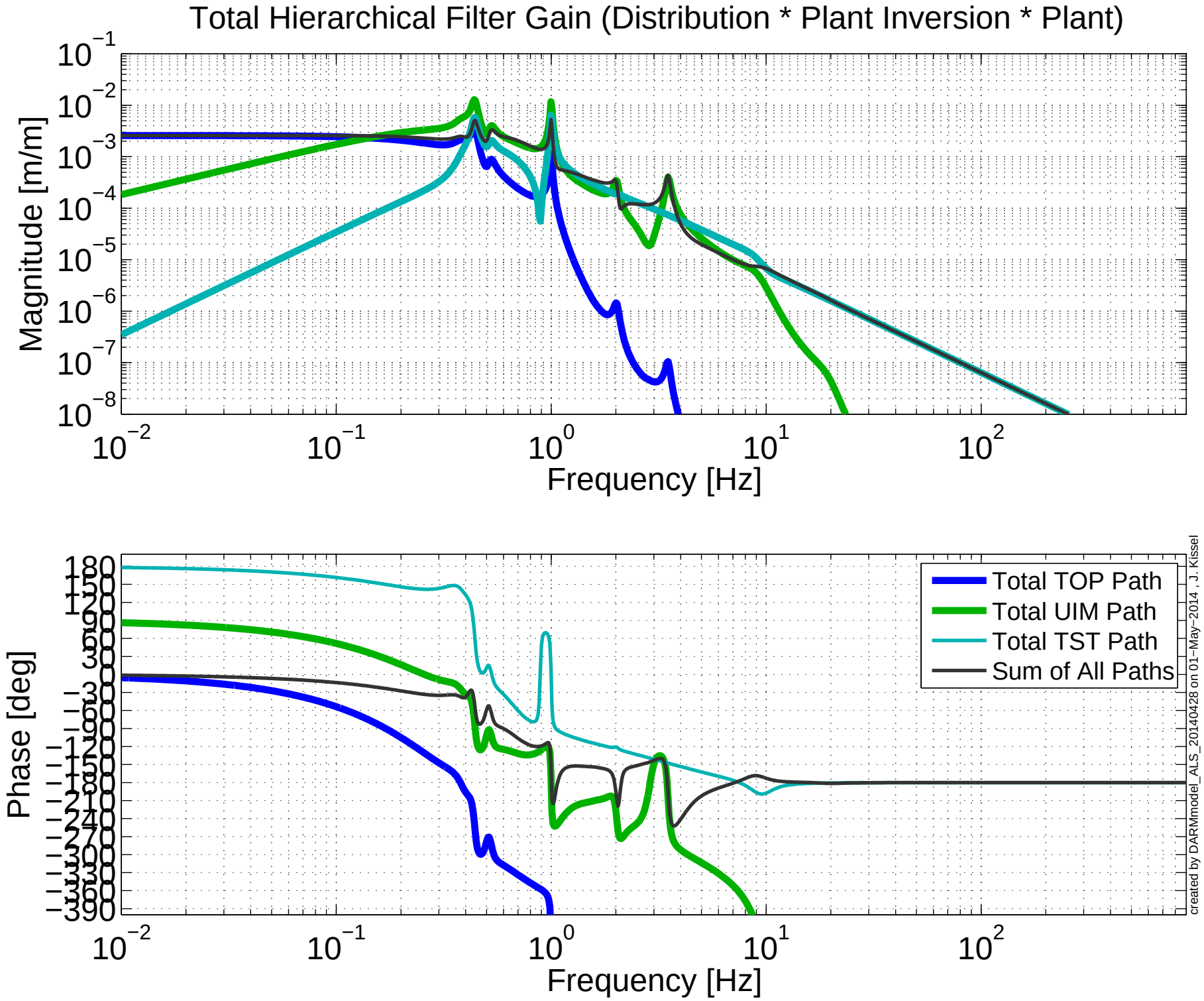

Damped QUAD iStage > TST Transfer Function, Compensated by Plant Inversion
Frequency [Hz]
Phase [deg]
Frequency [Hz]
TOP > TST
UIM > TST
TST > TST
created by DARMmodel_ALS_20140428 on 01−May−2014 , J. Kissel

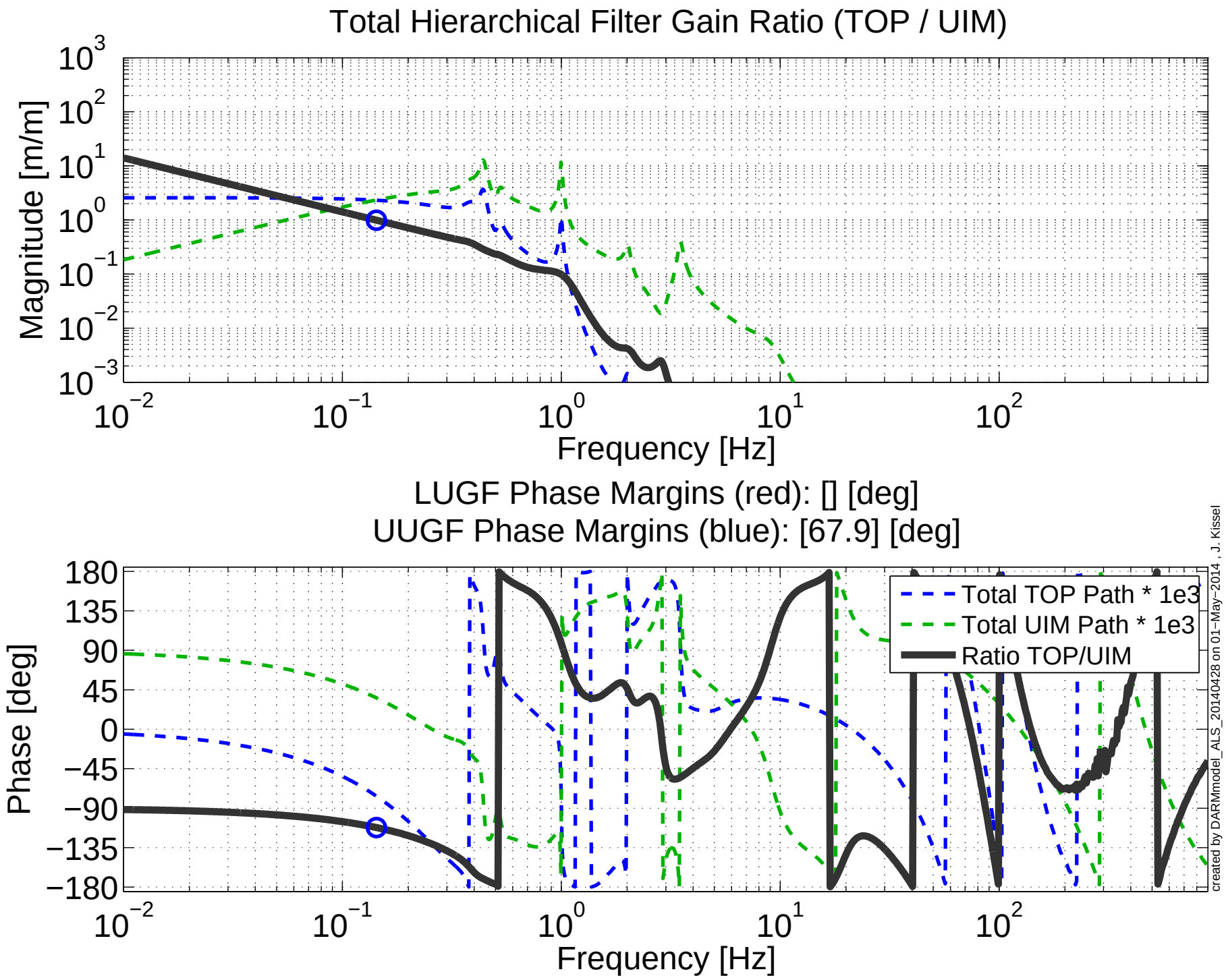

Distribution Filter Design
Low−Frequency Complementary Pair
Magnitude [m/m]
Frequency [Hz]
Phase [deg]
Frequency [Hz]
TOP Low Pass
UIM+TST High Pass
SUM
created by DARMmodel_ALS_20140428 on 01−May−2014 , J. Kissel

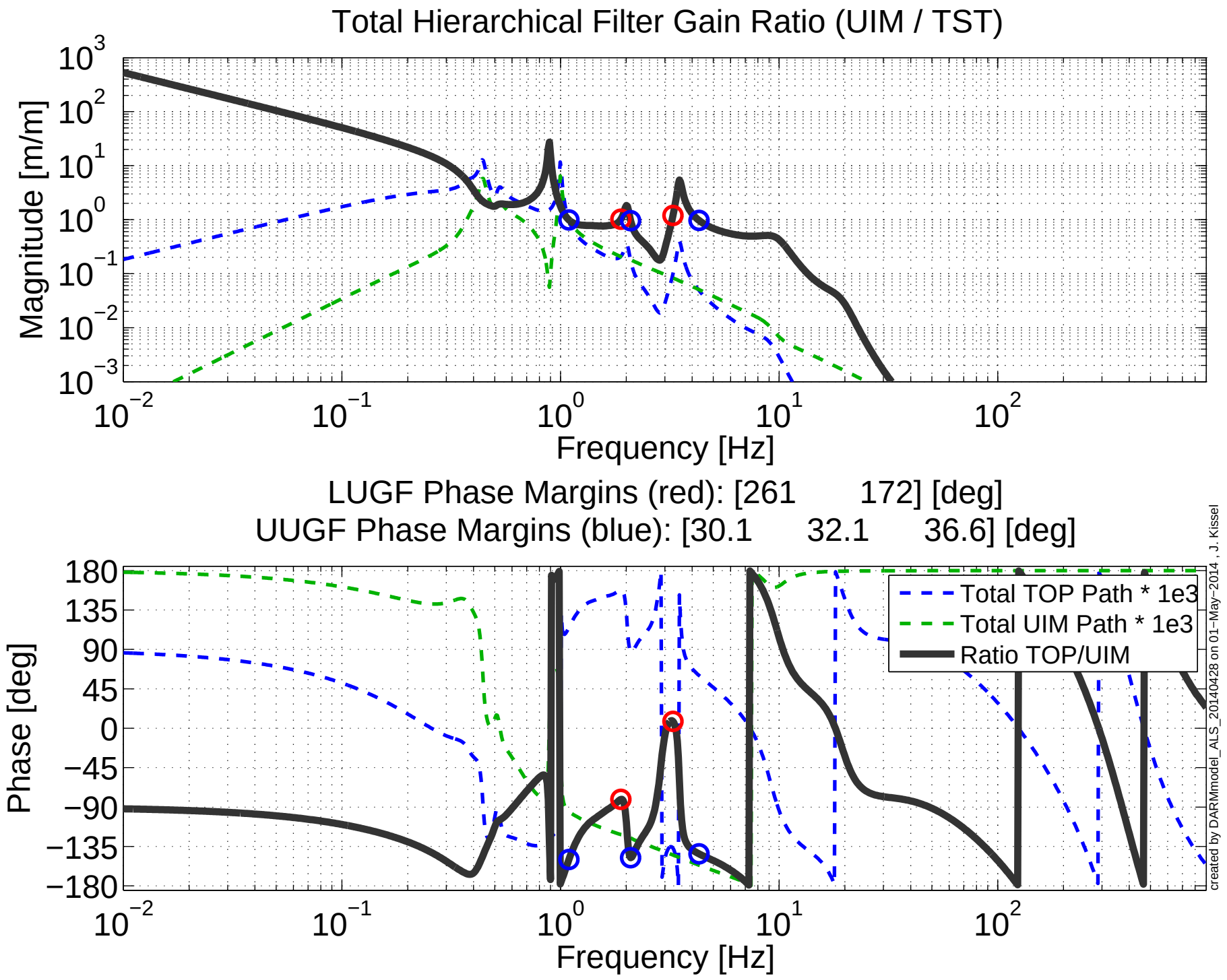

Distribution Filter Design
High−Frequency Complementary Pair
Magnitude [m/m]
Frequency [Hz]
Phase [deg]
Frequency [Hz]
UIM Low Pass
TST High Pass
SUM
created by DARMmodel_ALS_20140428 on 01−May−2014 , J. Kissel

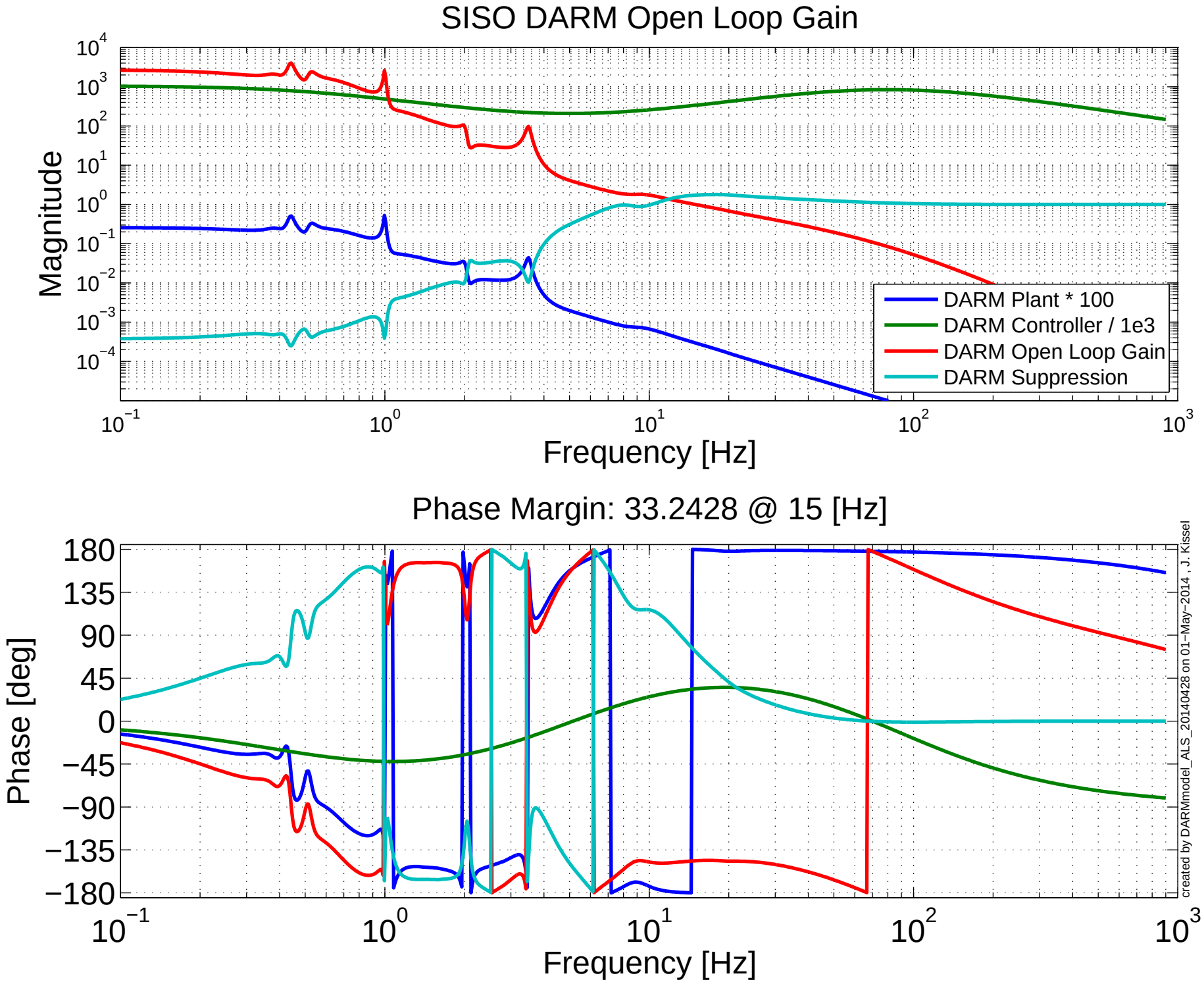

Distribution Filter Design
Total Path Component Breakdown
Magnitude [m/m]
Frequency [Hz]
Phase [deg]
Frequency [Hz]
UIM Low Pass
TST High Pass
SUM
created by DARMmodel_ALS_20140428 on 01−May−2014 , J. Kissel

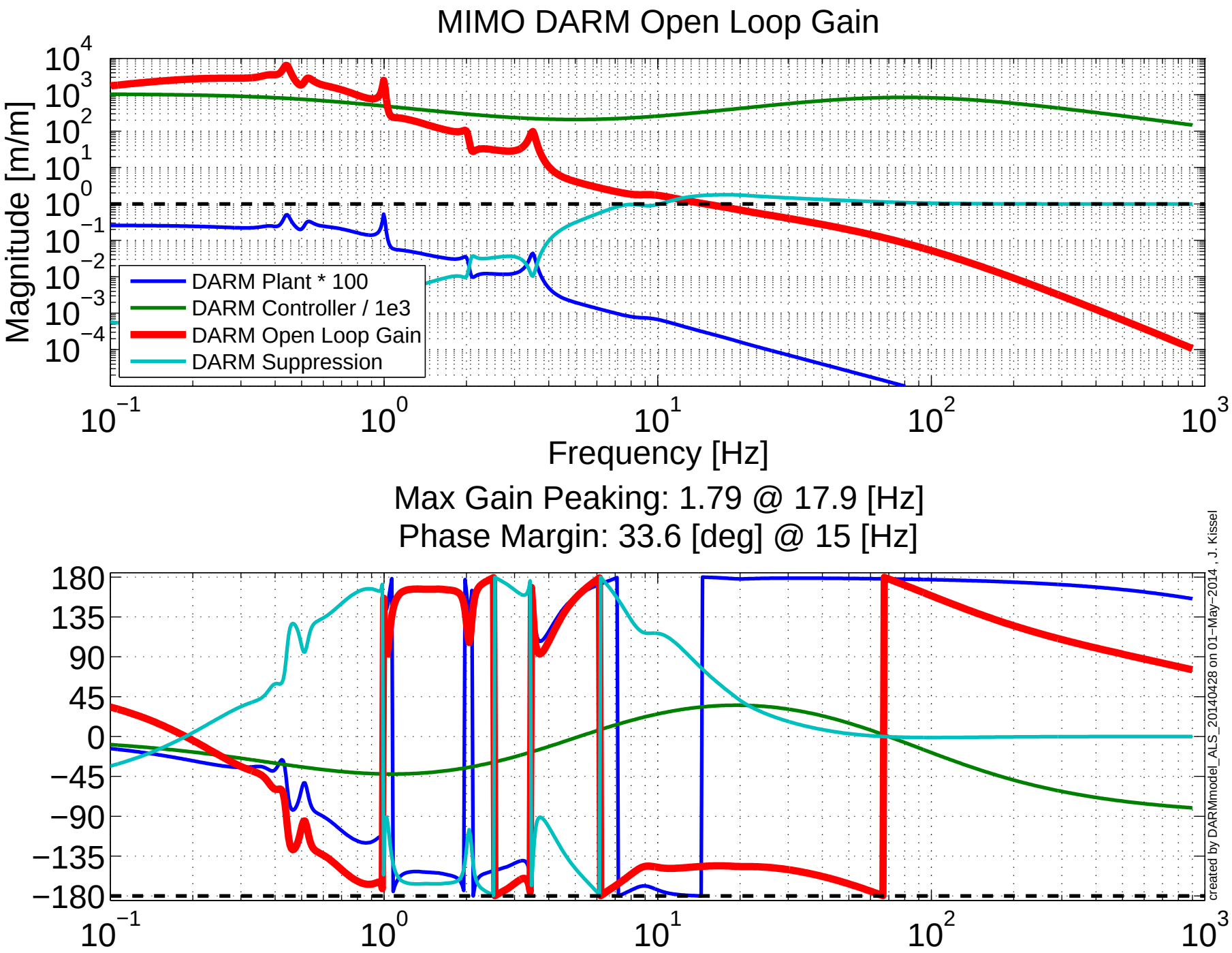

Total Hierarchical Filters (Distribution * Plant Inversion)
Magnitude [N/m]
Frequency [Hz]
Phase [deg]
Frequency [Hz]
TOP
UIM
TST
created by DARMmodel_ALS_20140428 on 01−May−2014 , J. Kissel

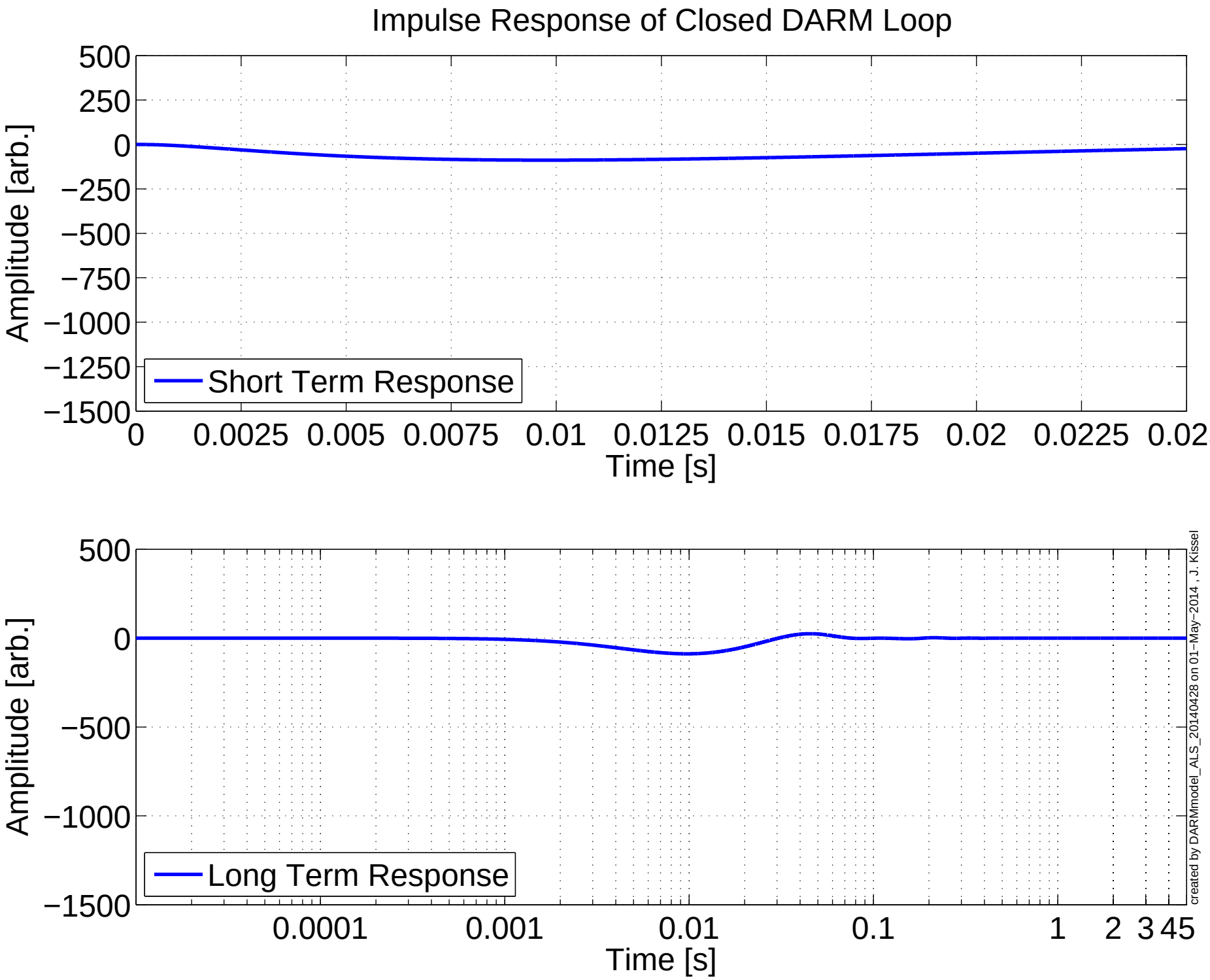

Total Hierarchical Filter Gain (Distribution * Plant Inversion * Plant)
Magnitude [m/m]
Frequency [Hz]
Phase [deg]
Frequency [Hz]
Total TOP Path
Total UIM Path
Total TST Path
Sum of All Paths
created by DARMmodel_ALS_20140428 on 01−May−2014 , J. Kissel

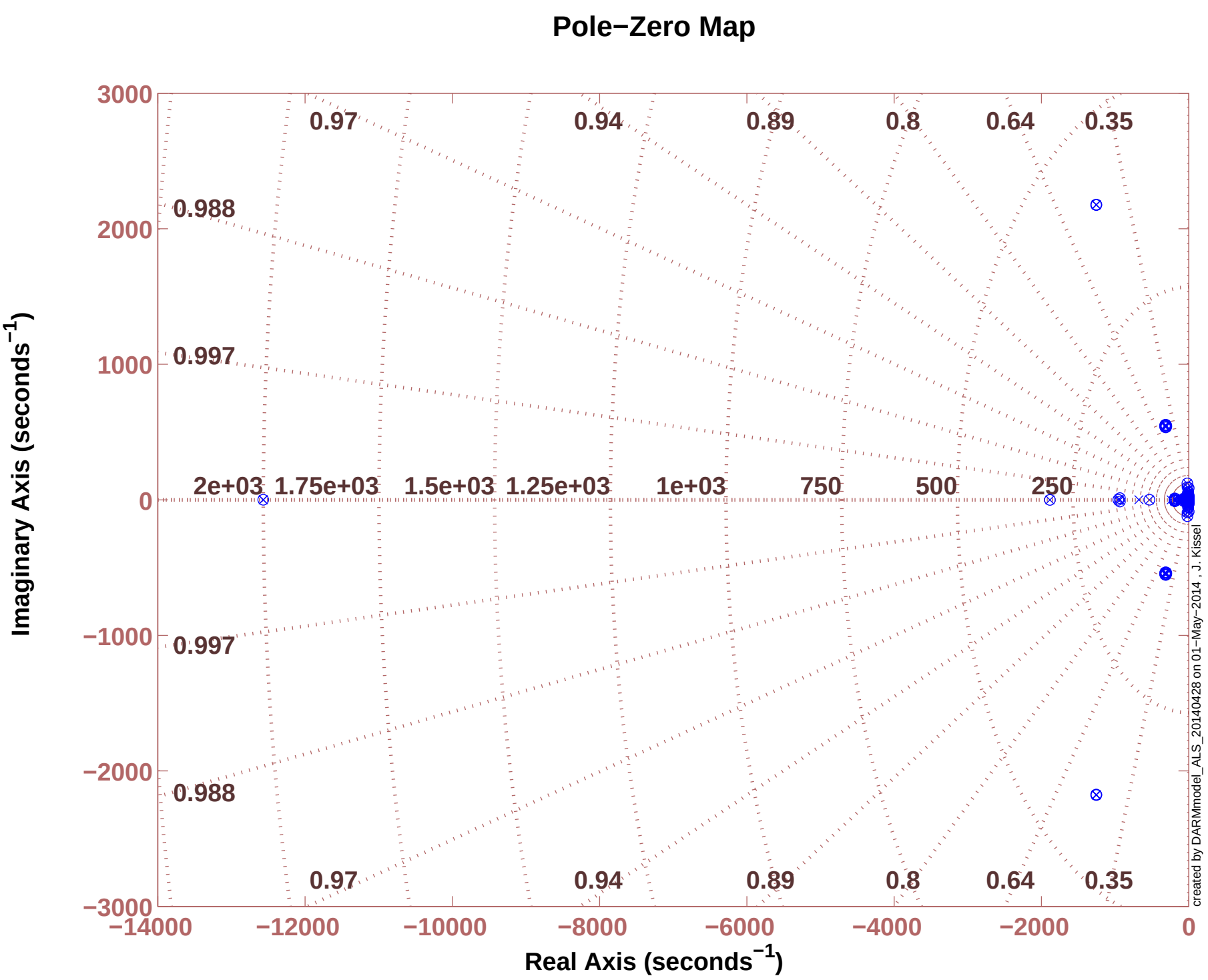

Total Hierarchical Filter Gain Ratio (TOP / UIM)
Magnitude [m/m]
Frequency [Hz]
LUGF Phase Margins (red): [] [deg]
UUGF Phase Margins (blue): [67.9] [deg]
Phase [deg]
Frequency [Hz]
Total TOP Path * 1e3
Total UIM Path * 1e3
Ratio TOP/UIM
created by DARMmodel_ALS_20140428 on 01−May−2014 , J. Kissel

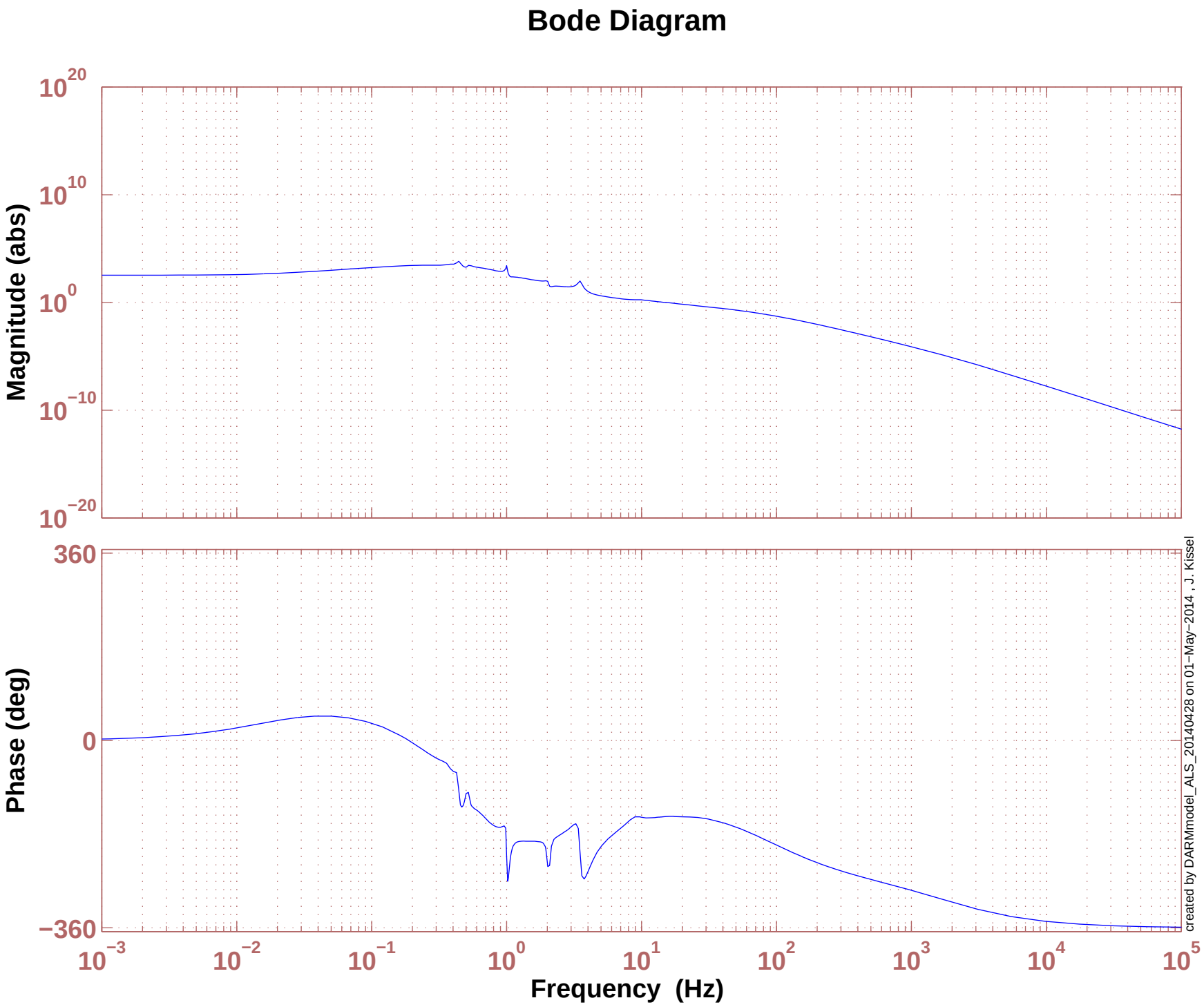

Total Hierarchical Filter Gain Ratio (UIM / TST)
Magnitude [m/m]
Frequency [Hz]
LUGF Phase Margins (red): [261 172] [deg]
UUGF Phase Margins (blue): [30.1 32.1 36.6] [deg]
Phase [deg]
Frequency [Hz]
Total TOP Path * 1e3
Total UIM Path * 1e3
Ratio TOP/UIM
created by DARMmodel_ALS_20140428 on 01−May−2014 , J. Kissel

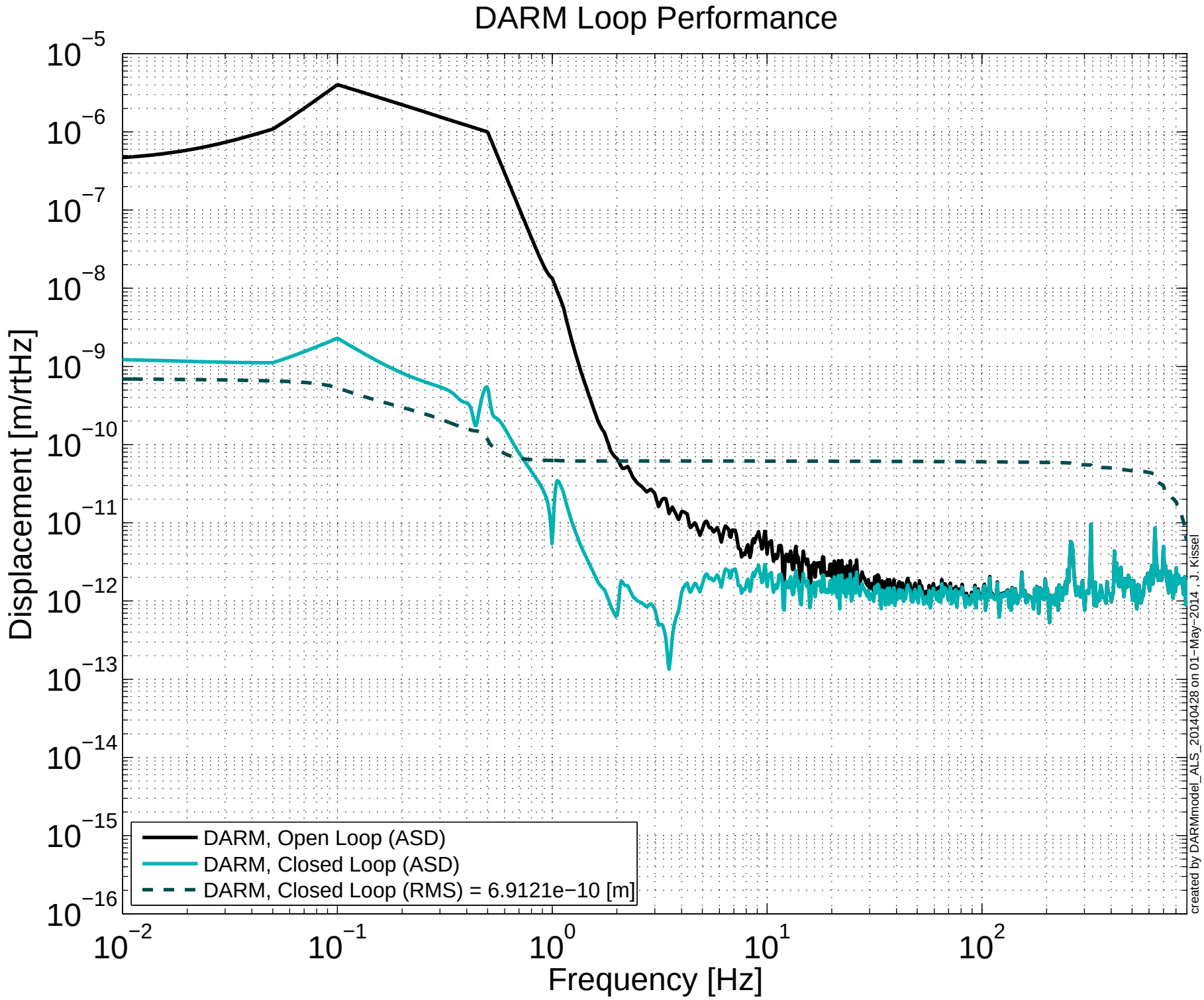

SISO DARM Open Loop Gain
Magnitude
Frequency [Hz]
DARM Plant * 100
DARM Controller / 1e3
DARM Open Loop Gain
DARM Suppression
Phase Margin: 33.2428 @ 15 [Hz]
Phase [deg]
Frequency [Hz]
created by DARMmodel_ALS_20140428 on 01−May−2014 , J. Kissel

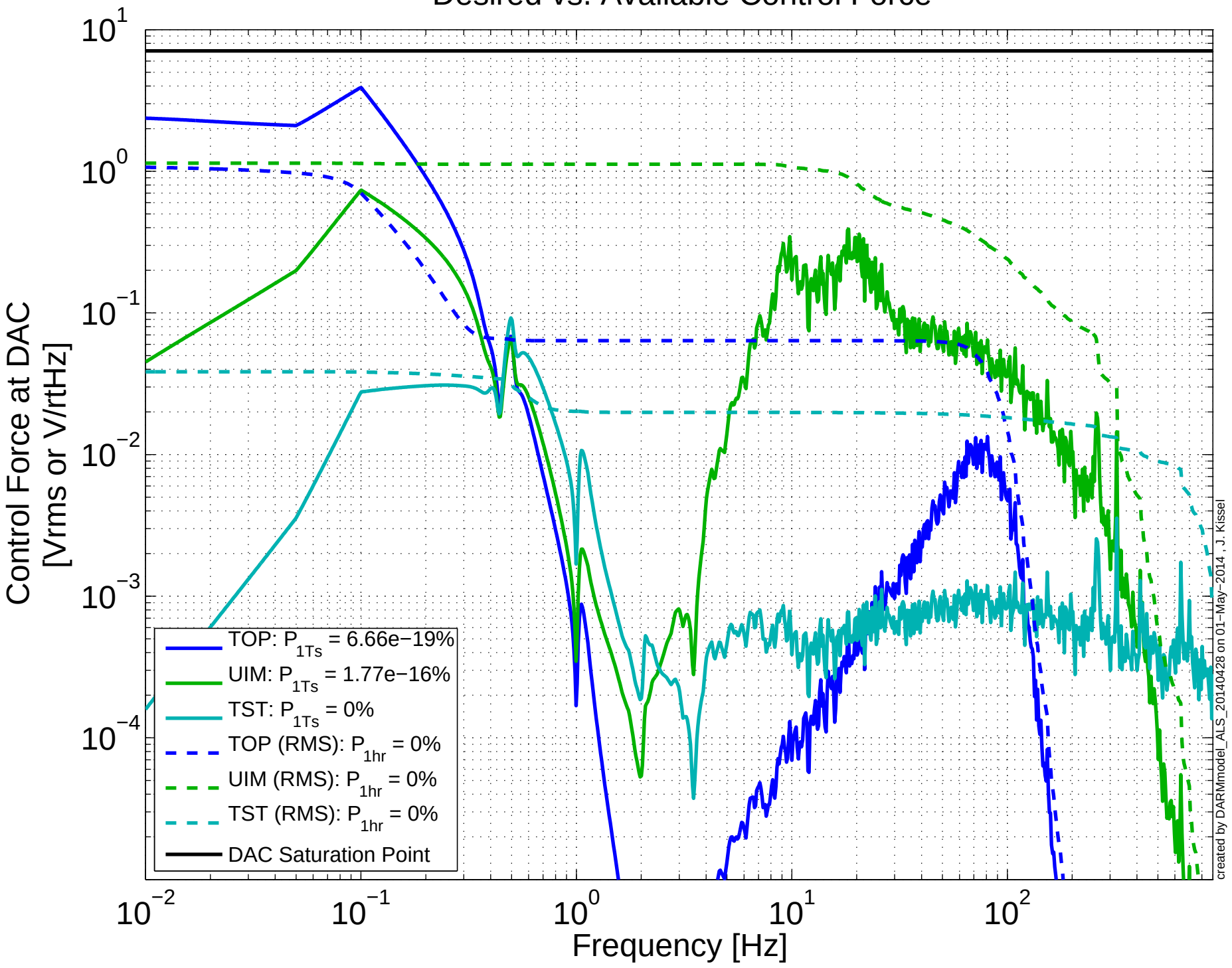

MIMO DARM Open Loop Gain
Magnitude [m/m]
DARM Plant * 100
DARM Controller / 1e3
DARM Open Loop Gain
DARM Suppression
Frequency [Hz]
Max Gain Peaking: 1.79 @ 17.9 [Hz]
Phase Margin: 33.6 [deg] @ 15 [Hz]
created by DARMmodel_ALS_20140428 on 01−May−2014 , J. Kissel


Impulse Response of Closed DARM Loop
Amplitude [arb.]
500
250
0
−250
−500
−750
−1000
−1250
−1500
Short Term Response
0
0.0025
0.005
0.0075
0.01
0.0125
0.015
0.0175
0.02
0.0225
0.025
Time [s]
Amplitude [arb.]
500
0
−500
−1000
−1500
Long Term Response
0.0001
0.001
0.01
0.1
1
2
3
4
5
Time [s]
created by DARMmodel_ALS_20140428 on 01−May−2014 , J. Kissel


Pole−Zero Map
Imaginary Axis (seconds^{-1})
Real Axis (seconds^{-1})
3000
2000
1000
0
−1000
−2000
−3000
−14000
−12000
−10000
−8000
−6000
−4000
−2000
0
0.97
0.94
0.89
0.8
0.64
0.35
0.988
0.997
2e+03
1.75e+03
1.5e+03
1.25e+03
1e+03
750
500
250
created by DARMmodel_ALS_20140428 on 01−May−2014 , J. Kissel


Bode Diagram
Magnitude (abs)
10^{20}
10^{10}
10^{0}
10^{-10}
10^{-20}
Phase (deg)
360
0
−360
10^{-3}
10^{-2}
10^{-1}
10^{0}
10^{1}
10^{2}
10^{3}
10^{4}
10^{5}
Frequency (Hz)
created by DARMmodel_ALS_20140428 on 01−May−2014 , J. Kissel


DARM Loop Performance
Displacement [m/rtHz]
Frequency [Hz]
DARM, Open Loop (ASD)
DARM, Closed Loop (ASD)
DARM, Closed Loop (RMS) = 6.9121e−10 [m]
created by DARMmodel_ALS_20140428 on 01−May−2014 , J. Kissel


Modeled DAC Voltage
Desired vs. Available Control Force
Control Force at DAC
[Vrms or V/rtHz]
Frequency [Hz]
TOP: P1Ts = 6.66e−19%
UIM: P1Ts = 1.77e−16%
TST: P1Ts = 0%
TOP (RMS): P1hr = 0%
UIM (RMS): P1hr = 0%
TST (RMS): P1hr = 0%
DAC Saturation Point
created by DARMmodel_ALS_20140428 on 01−May−2014 , J. Kissel