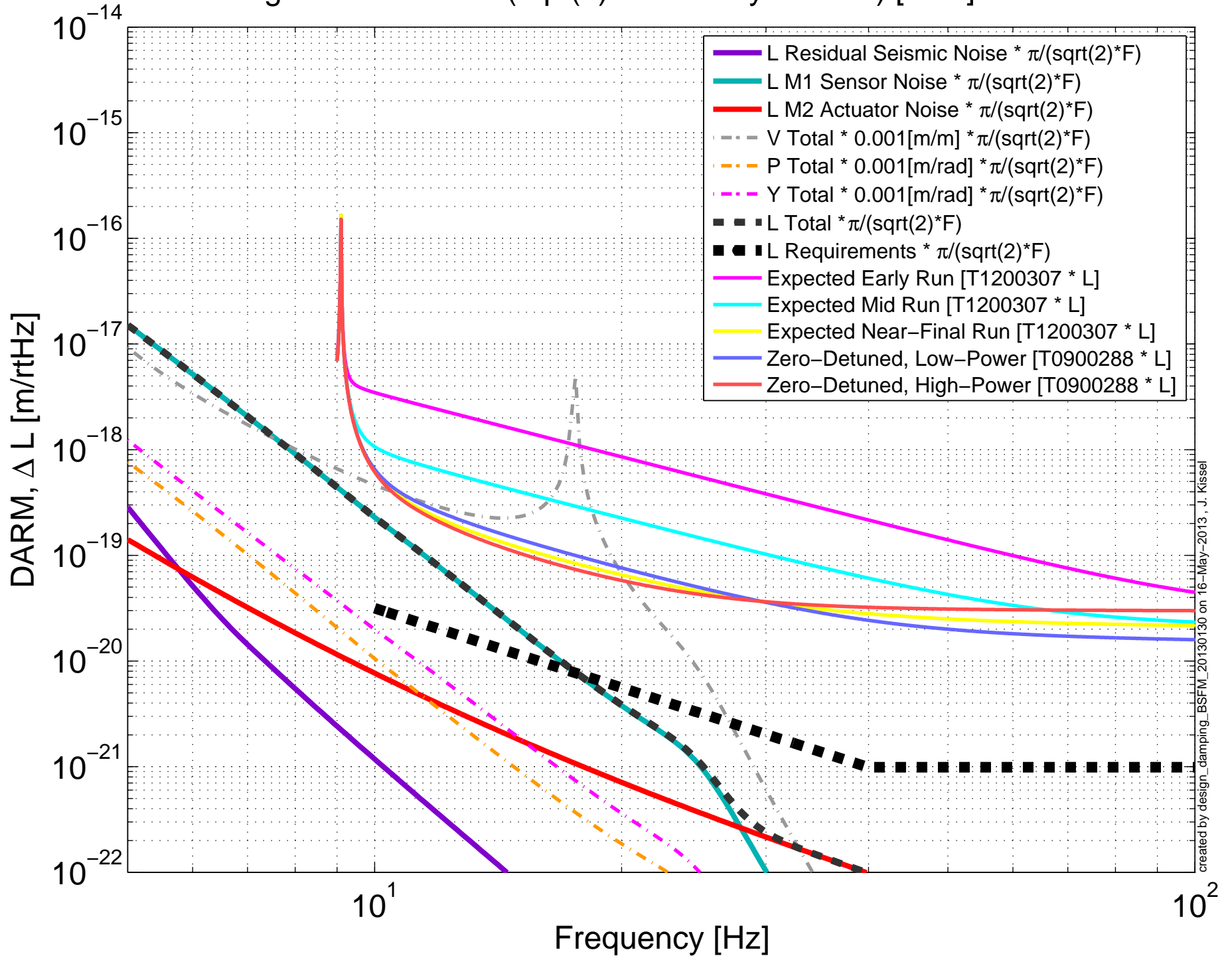


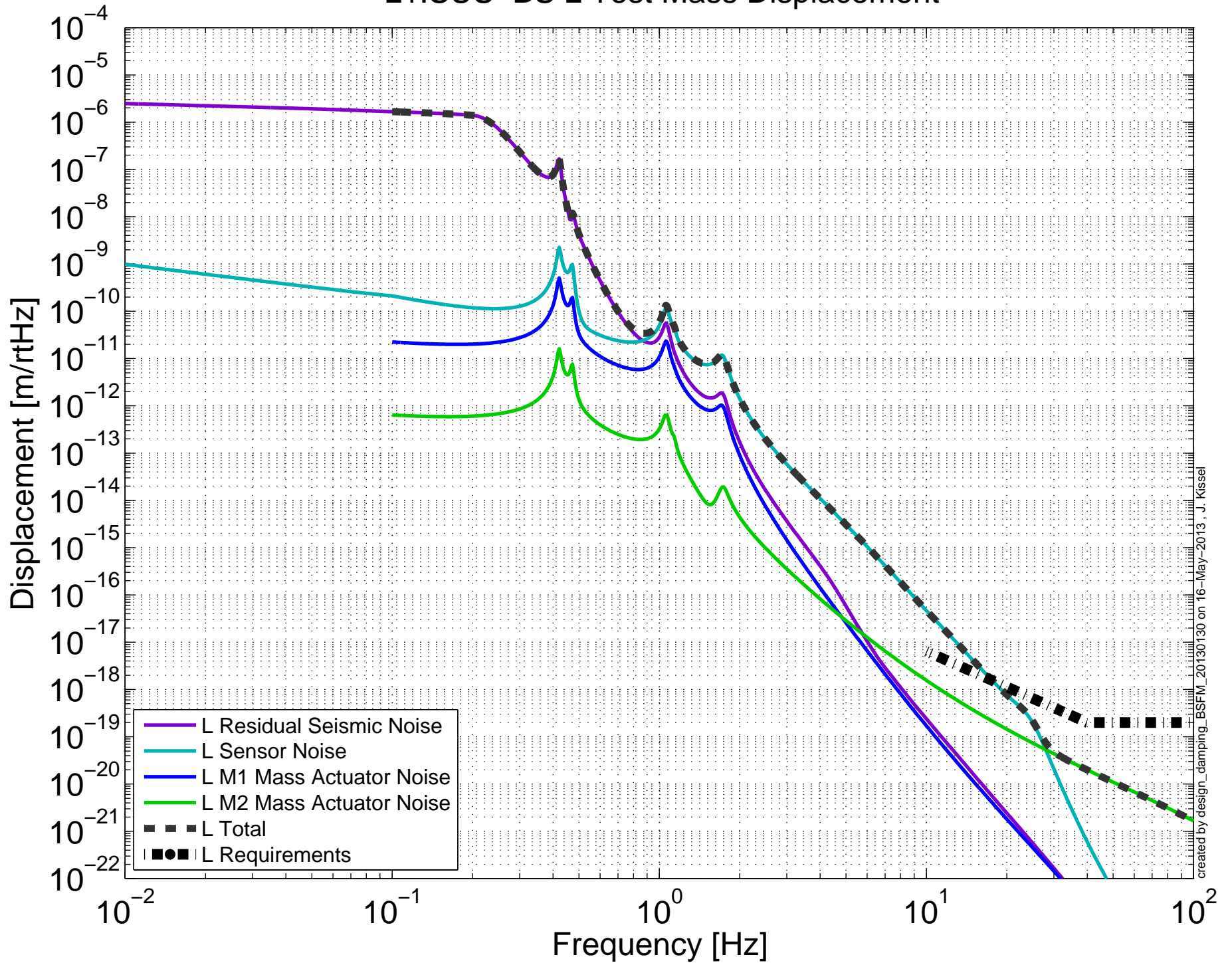
# Damping Loop Performance, Differential Arm Displacement

Assuming  $BS2DARM = \pi/(\sqrt{2}) \cdot \text{armCavityFinesse}$  [m/m] from T080192

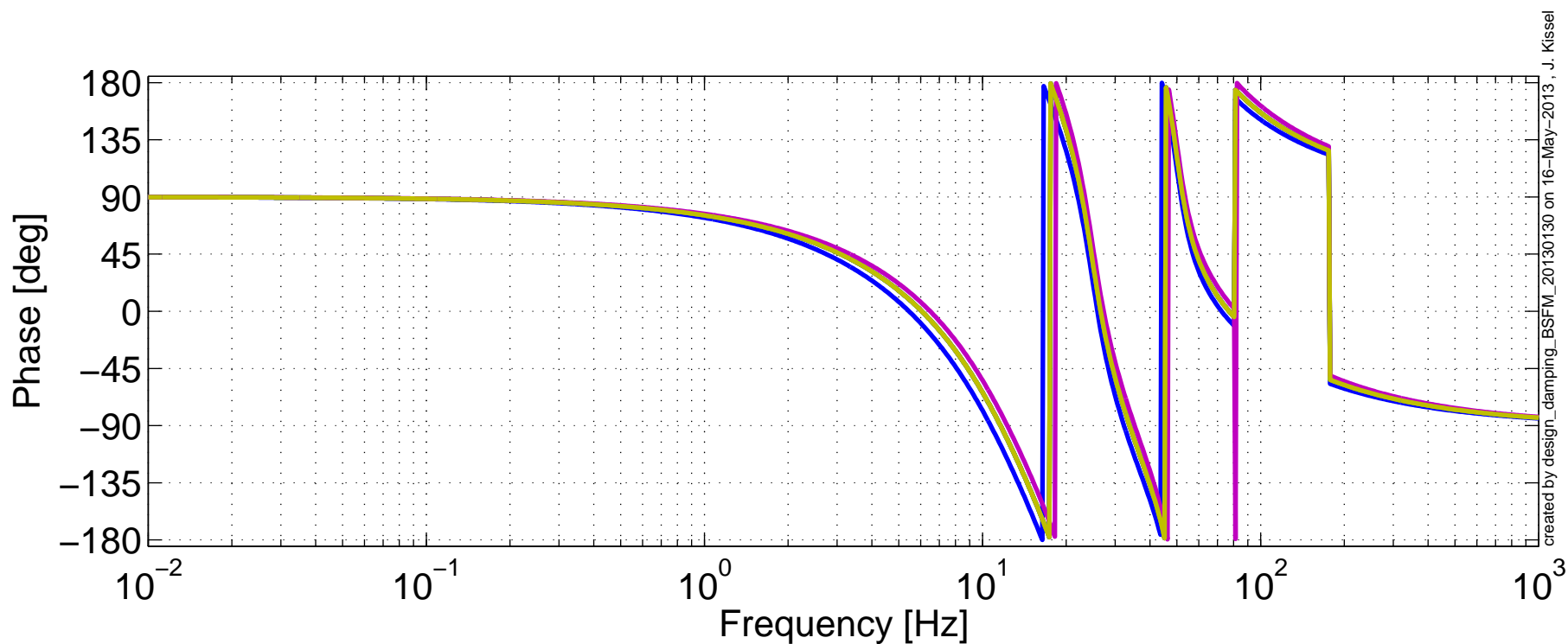
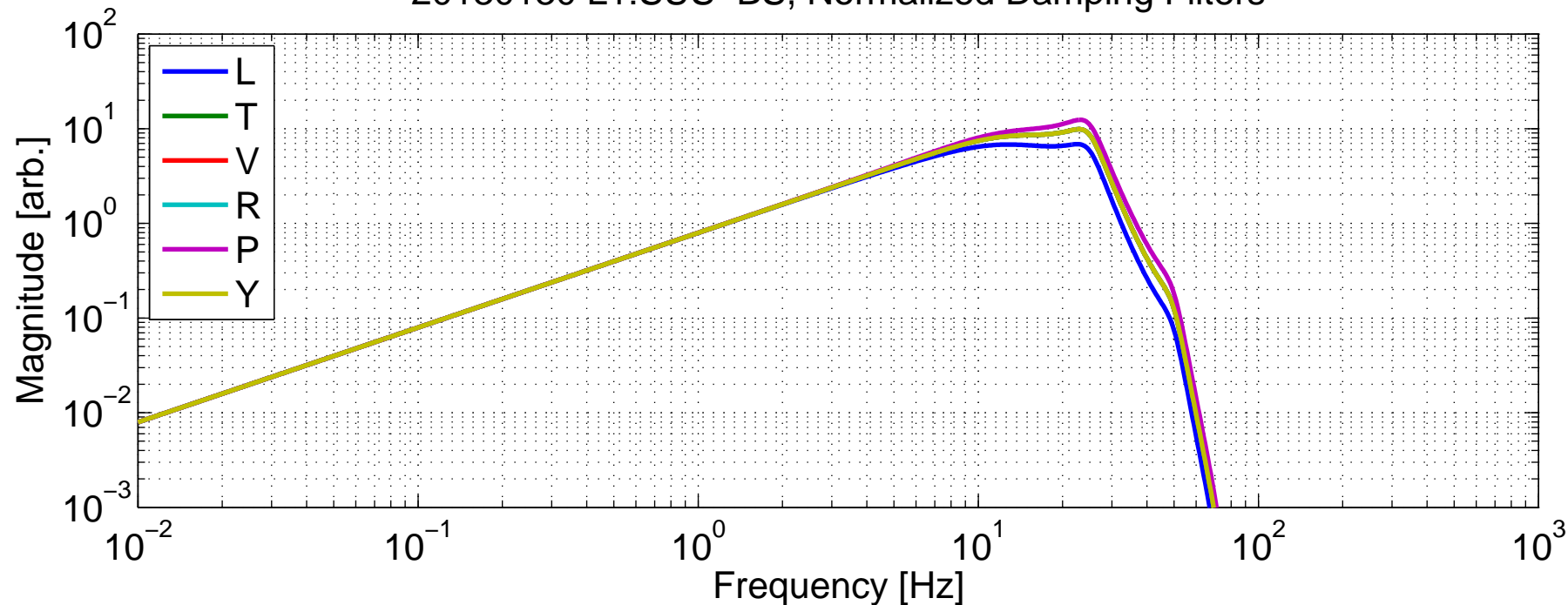


# Damping Loop Performance

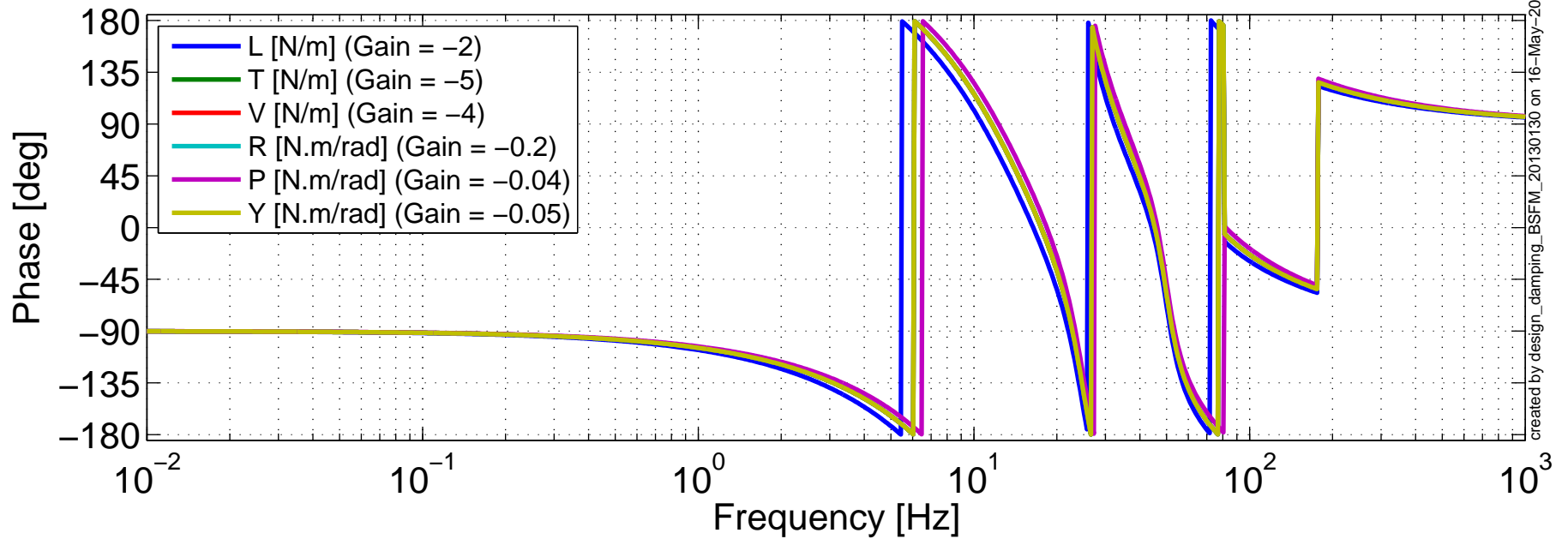
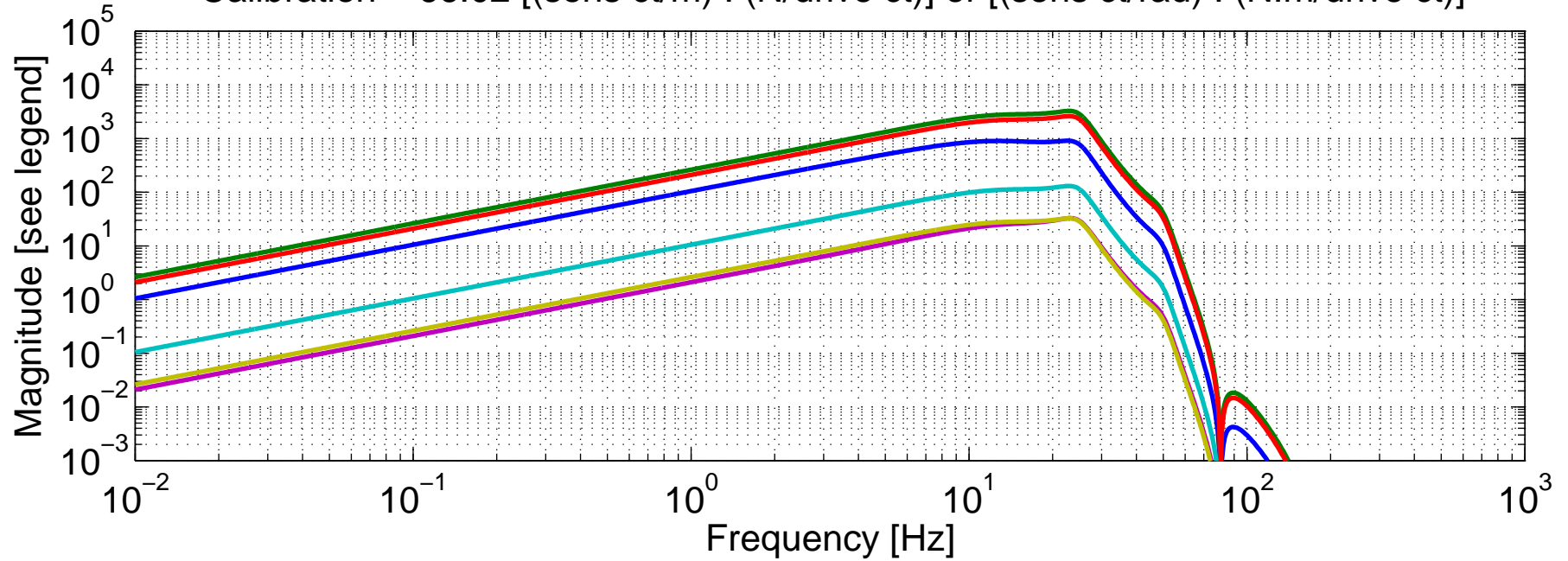
## L1:SUS-BS L Test Mass Displacement



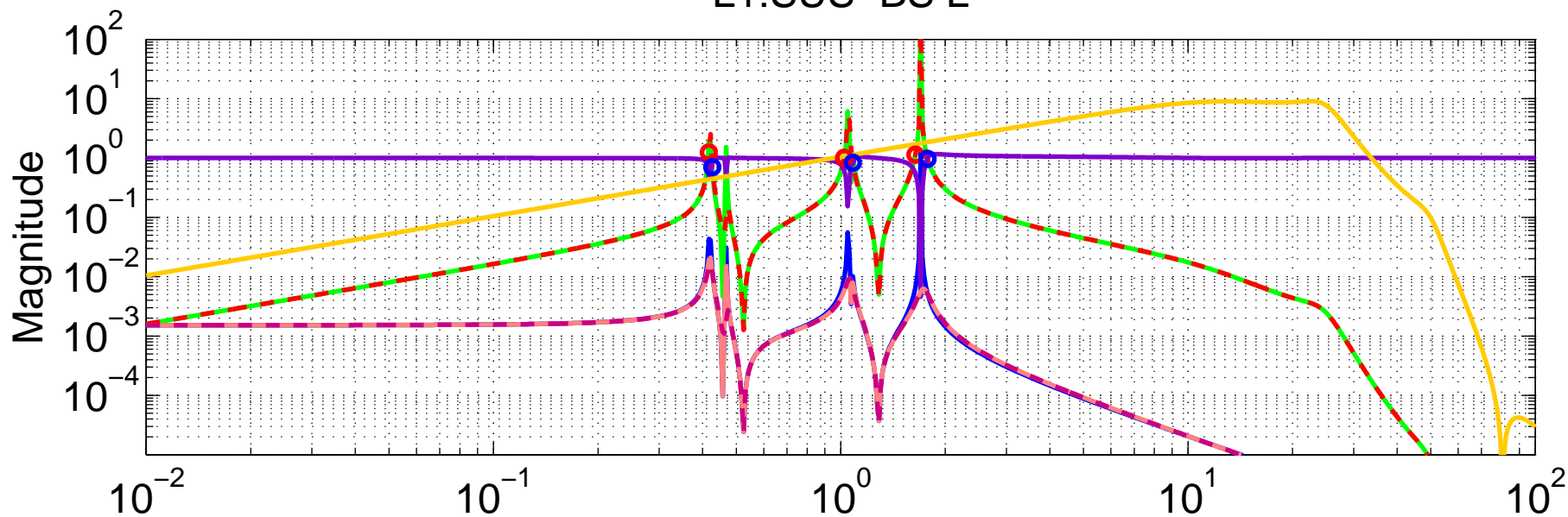
# 20130130 L1:SUS-BS, Normalized Damping Filters



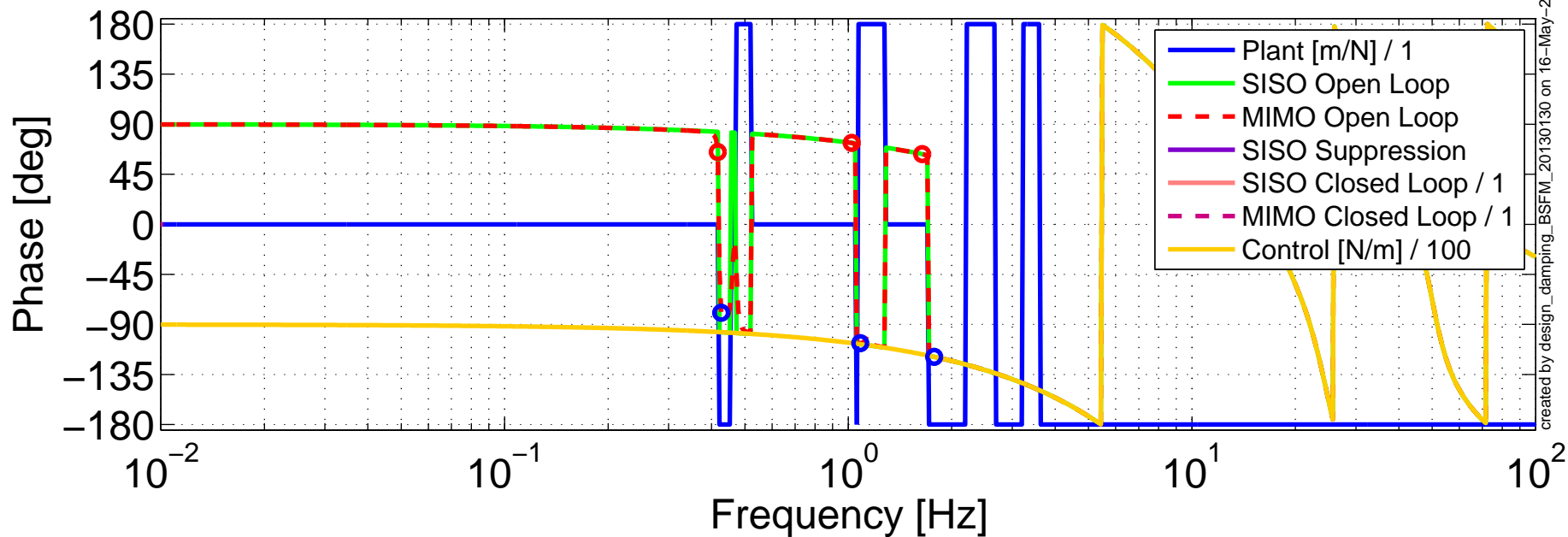
20130130 L1:SUS-BS, Calibrated Damping Filters  
Calibration = 66.02 [(sens ct/m) . (N/drive ct)] or [(sens ct/rad) . (N.m/drive ct)]



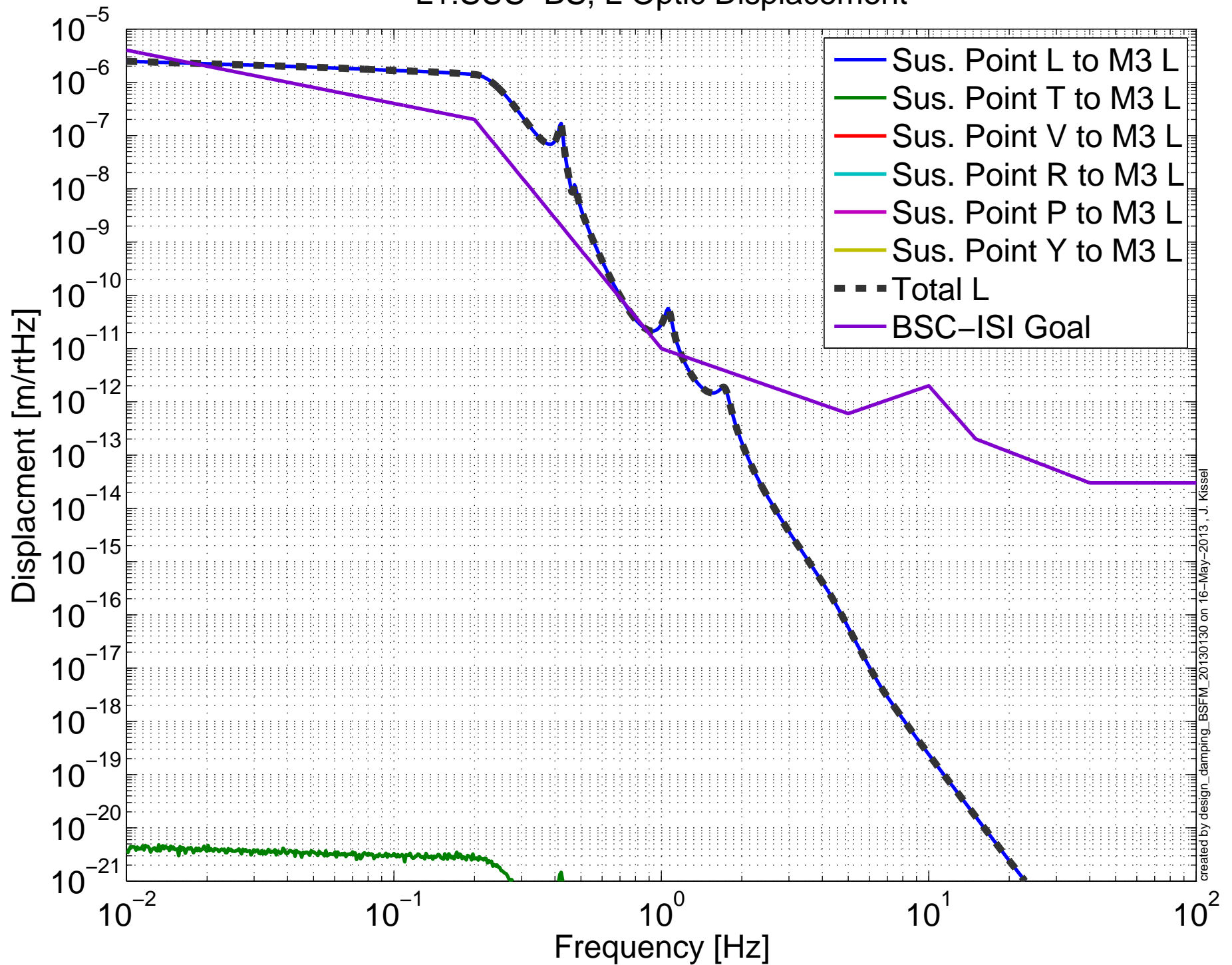
# Damping Loop Design L1:SUS-BS L



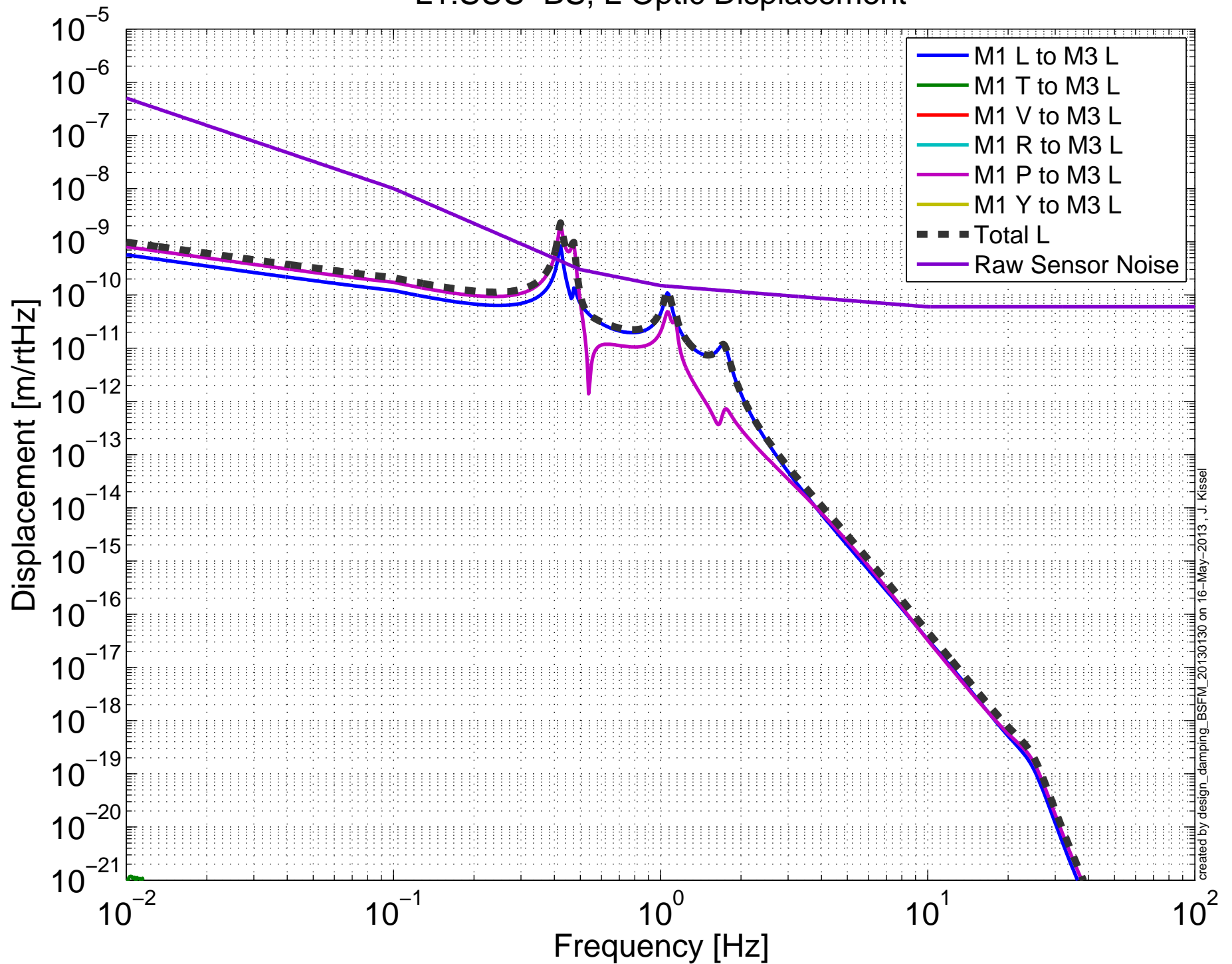
MIMO LUGF Phase Margins (red): [115    107    117] [deg]  
 MIMO UUGF Phase Margins (blue): [100    73.2    60.9] [deg]



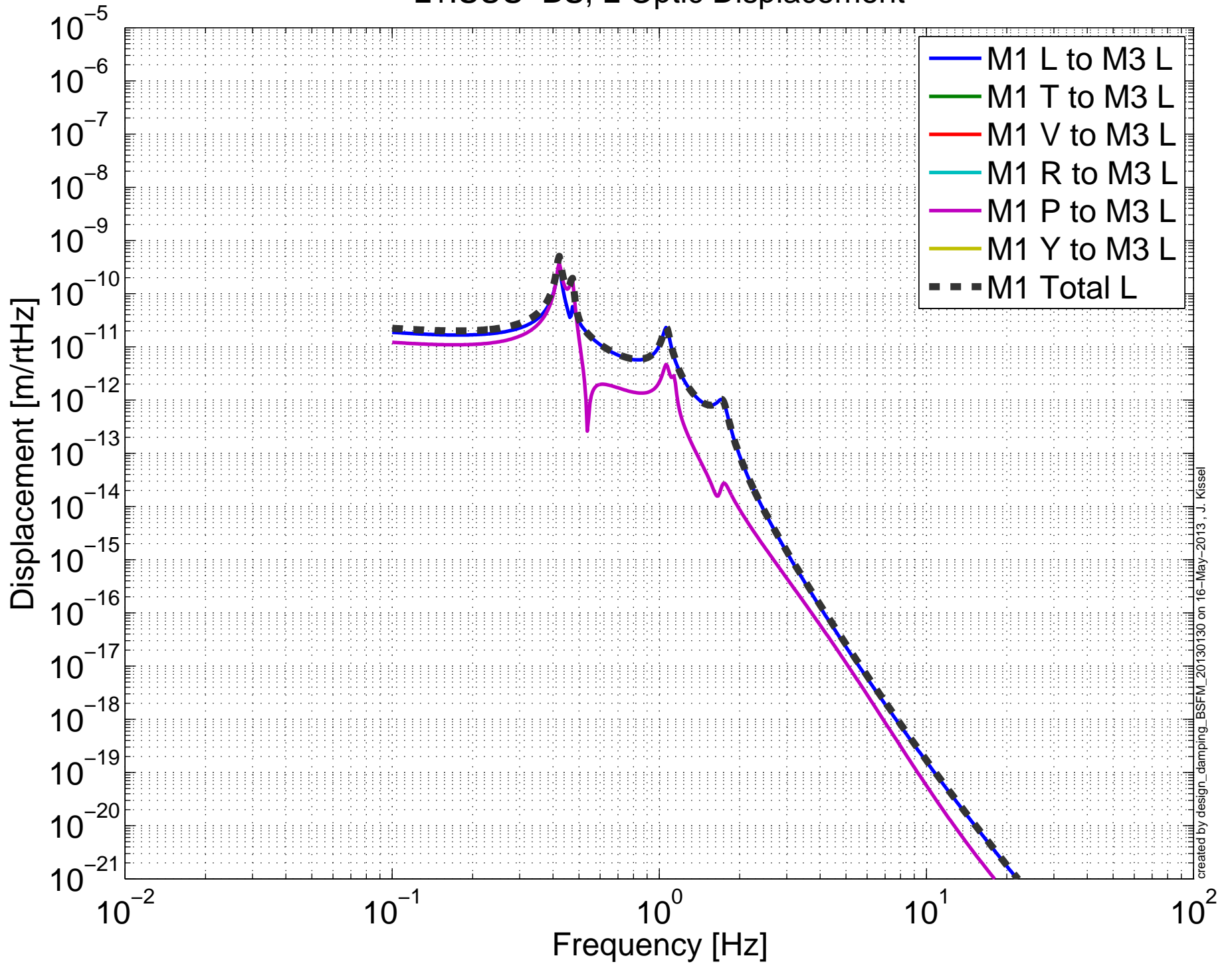
# Projected Sus. Point > Optic Seismic Noise Budget L1:SUS-BS, L Optic Displacement



# Projected Top Mass Sensor > Optic Noise Budget L1:SUS-BS, L Optic Displacement

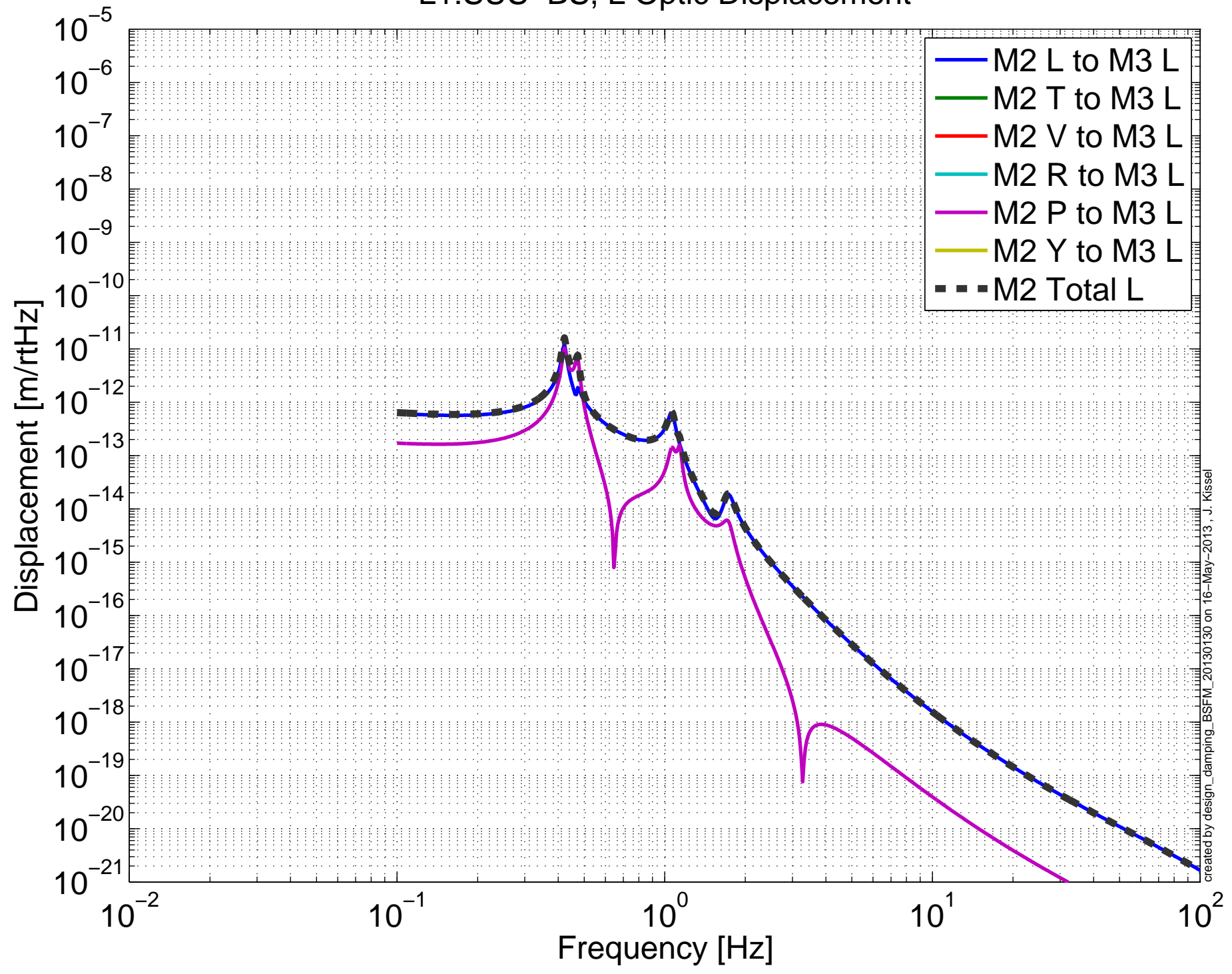


# Projected M1 Mass Actuator > Optic Noise Budget L1:SUS-BS, L Optic Displacement



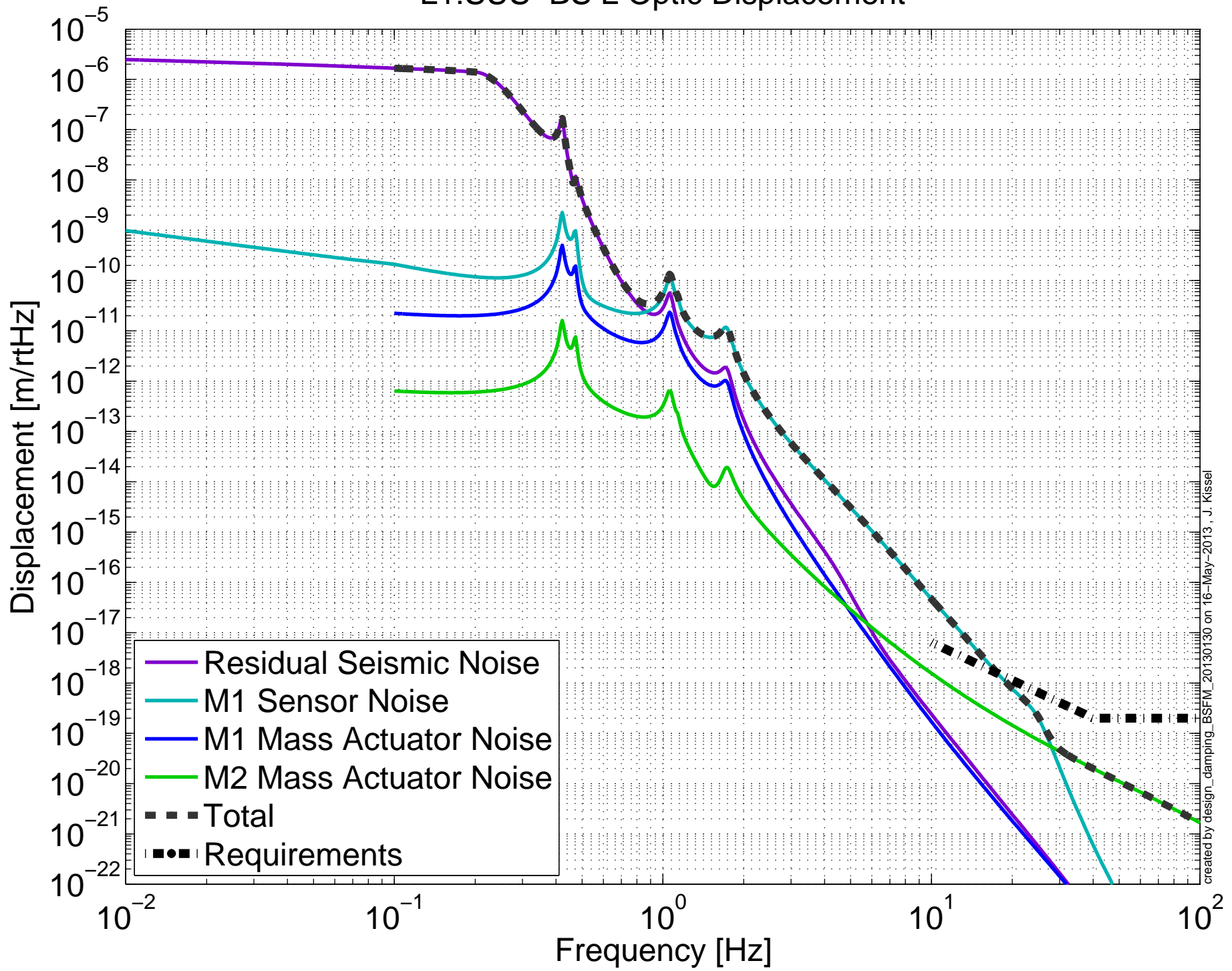


# Projected M2 Mass Actuator > Optic Noise Budget L1:SUS-BS, L Optic Displacement



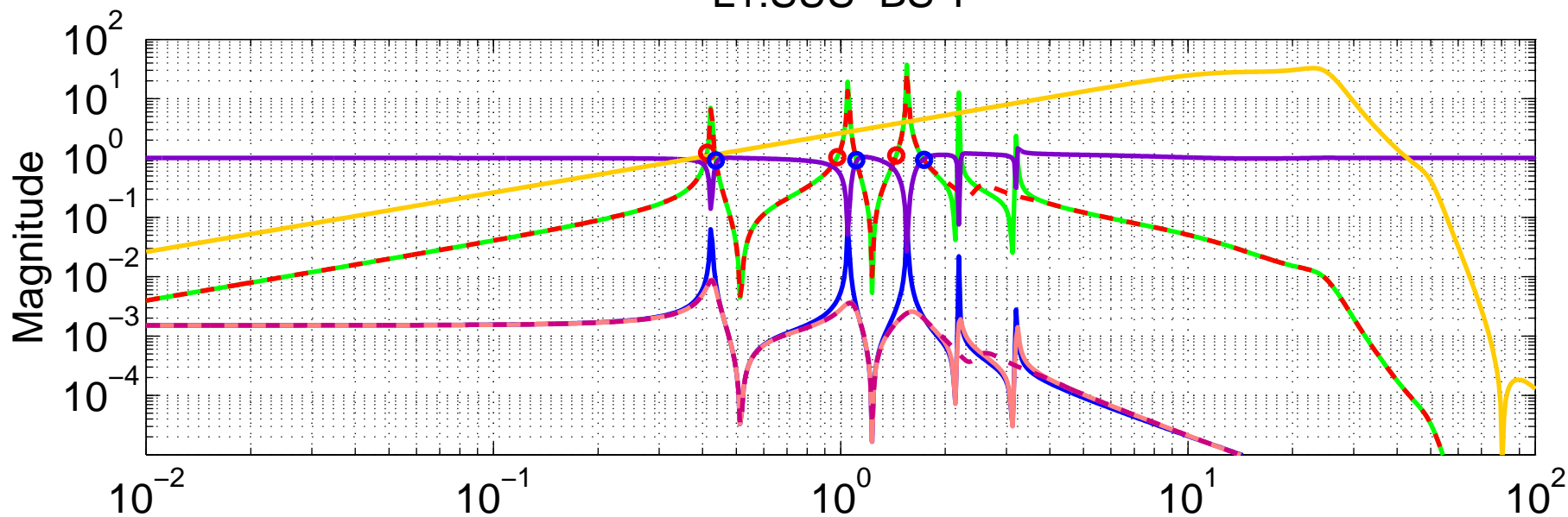
created by design\_damping\_BSFW\_20130130 on 16-May-2013, J. Kiesel

# Damping Loop Performance L1:SUS-BS L Optic Displacement

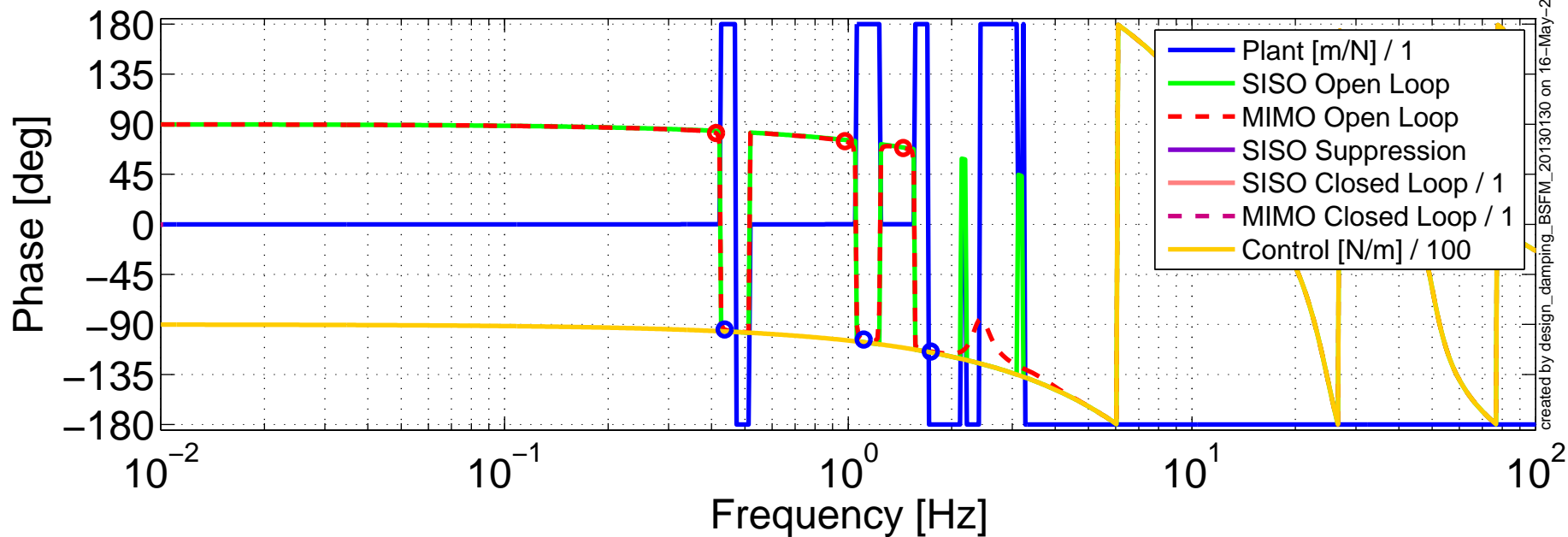


# Damping Loop Design

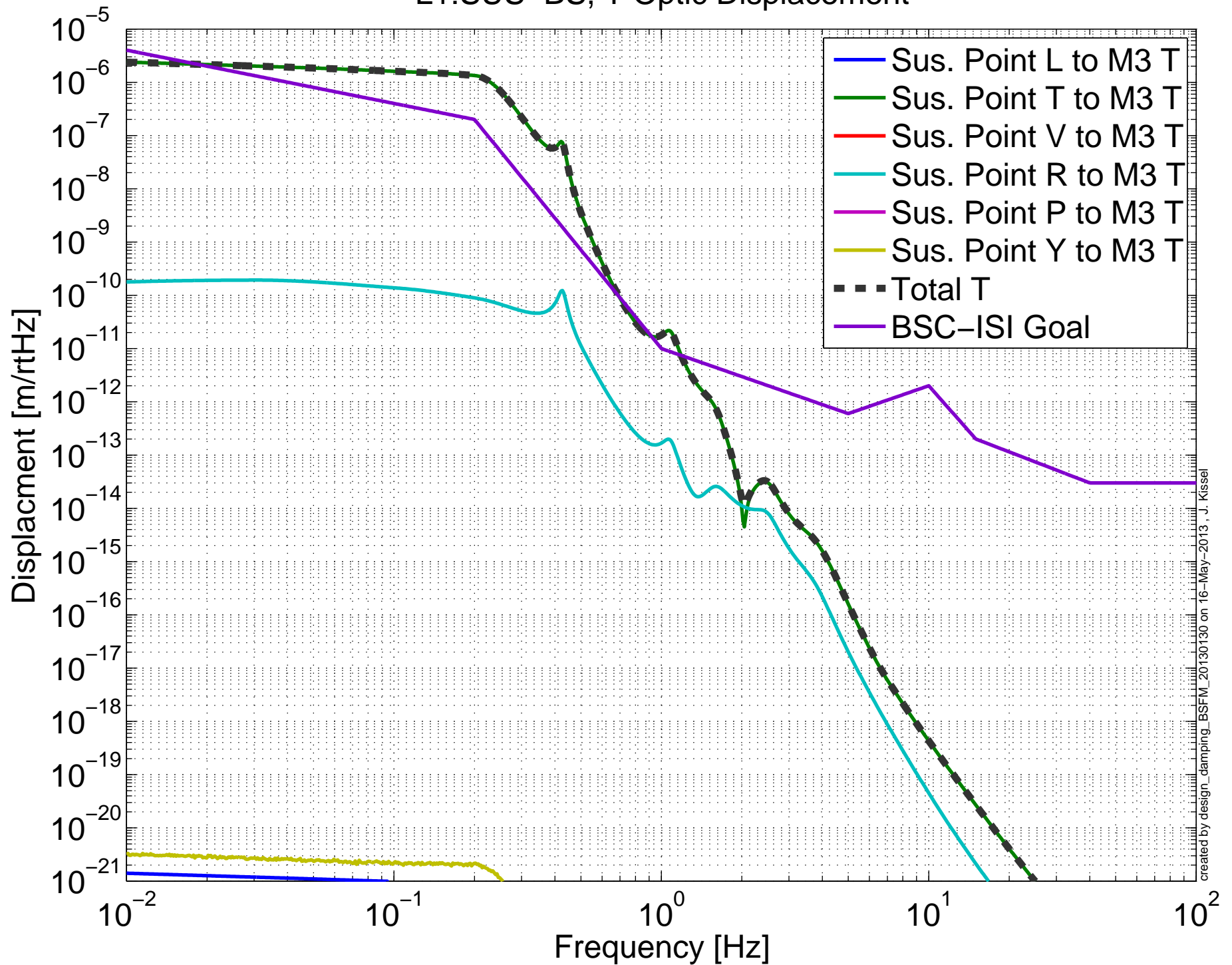
## L1:SUS-BS T



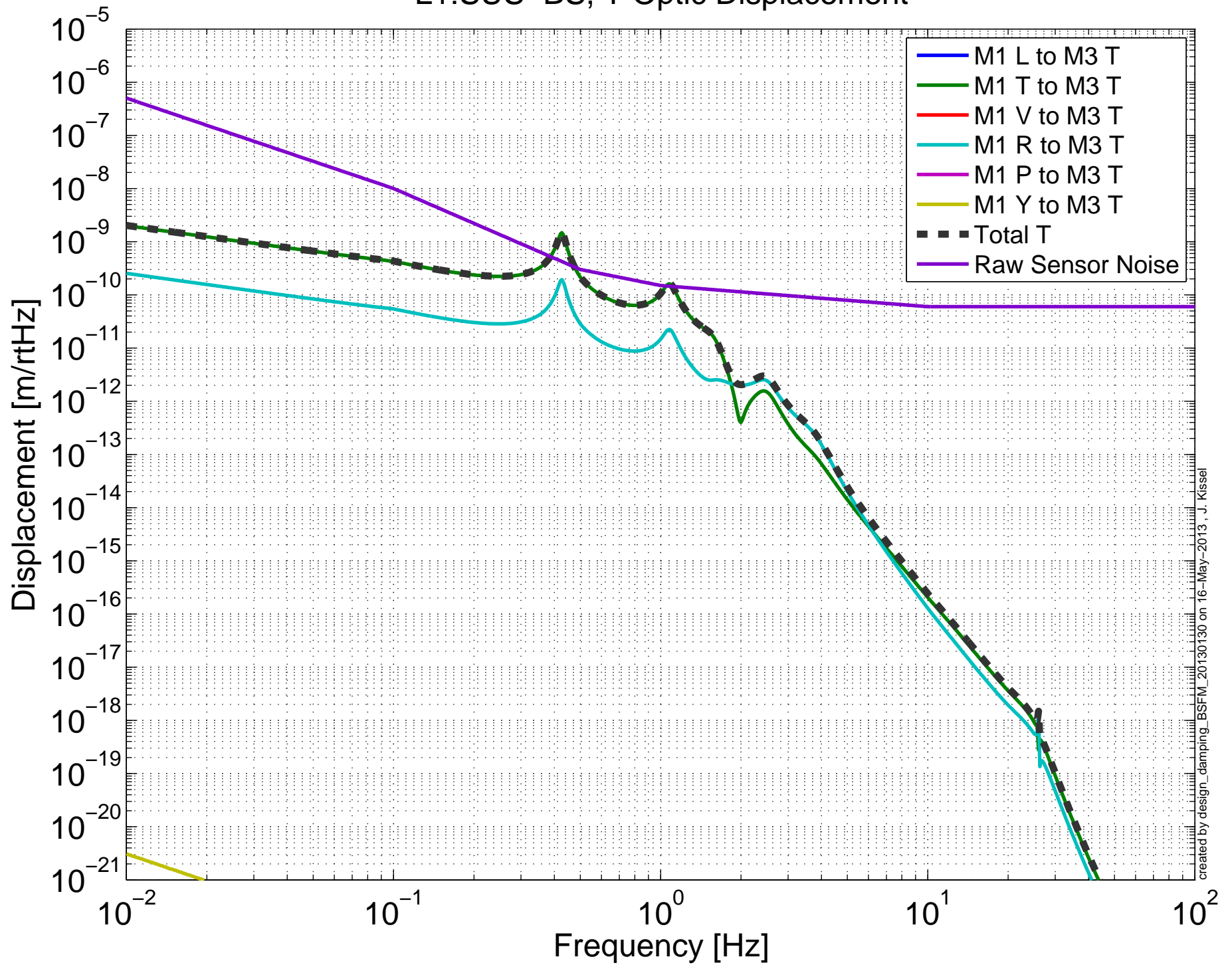
MIMO LUGF Phase Margins (red): [98    105    111] [deg]  
MIMO UUGF Phase Margins (blue): [85.4    76.4    65.7] [deg]



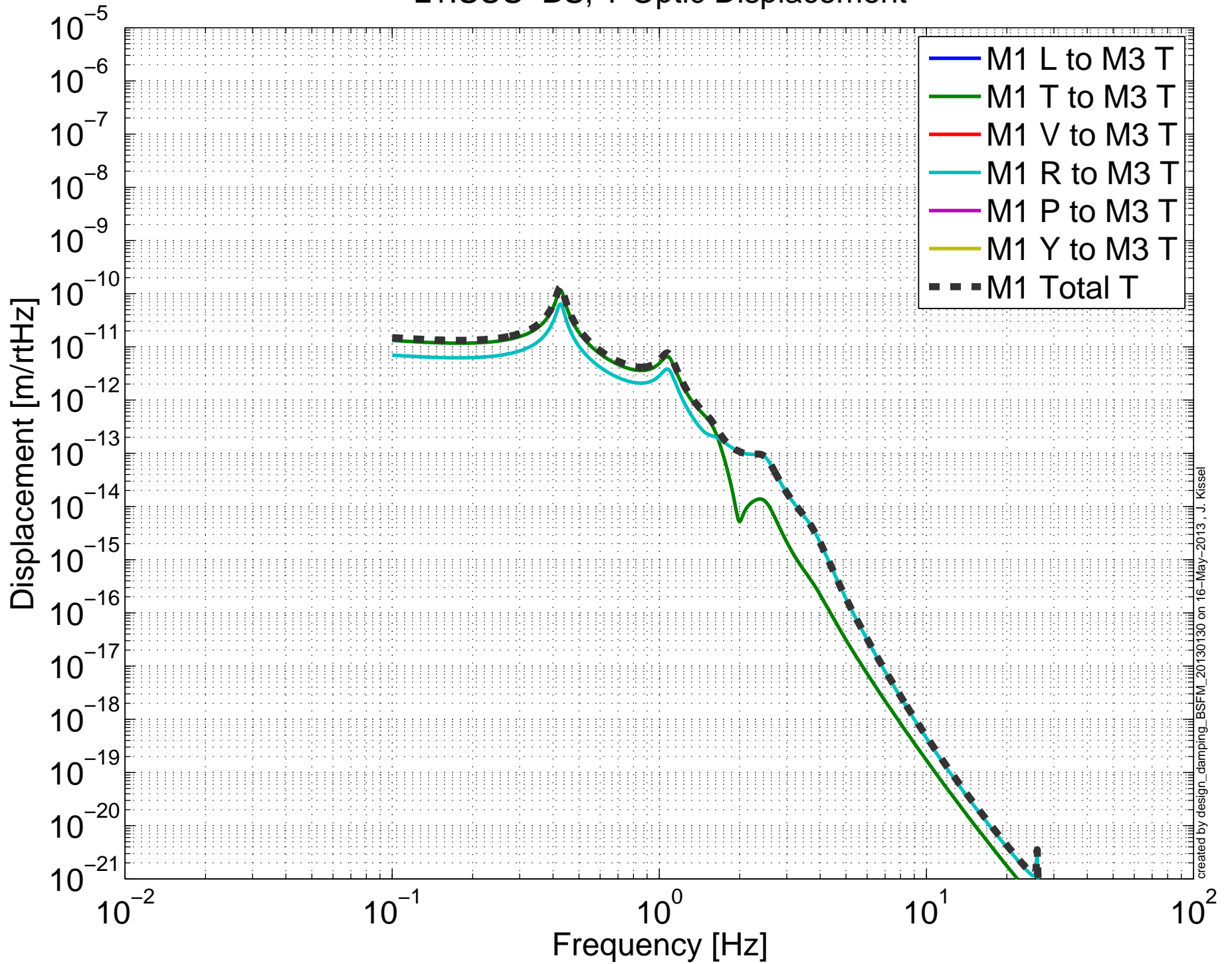
# Projected Sus. Point > Optic Seismic Noise Budget L1:SUS-BS, T Optic Displacement



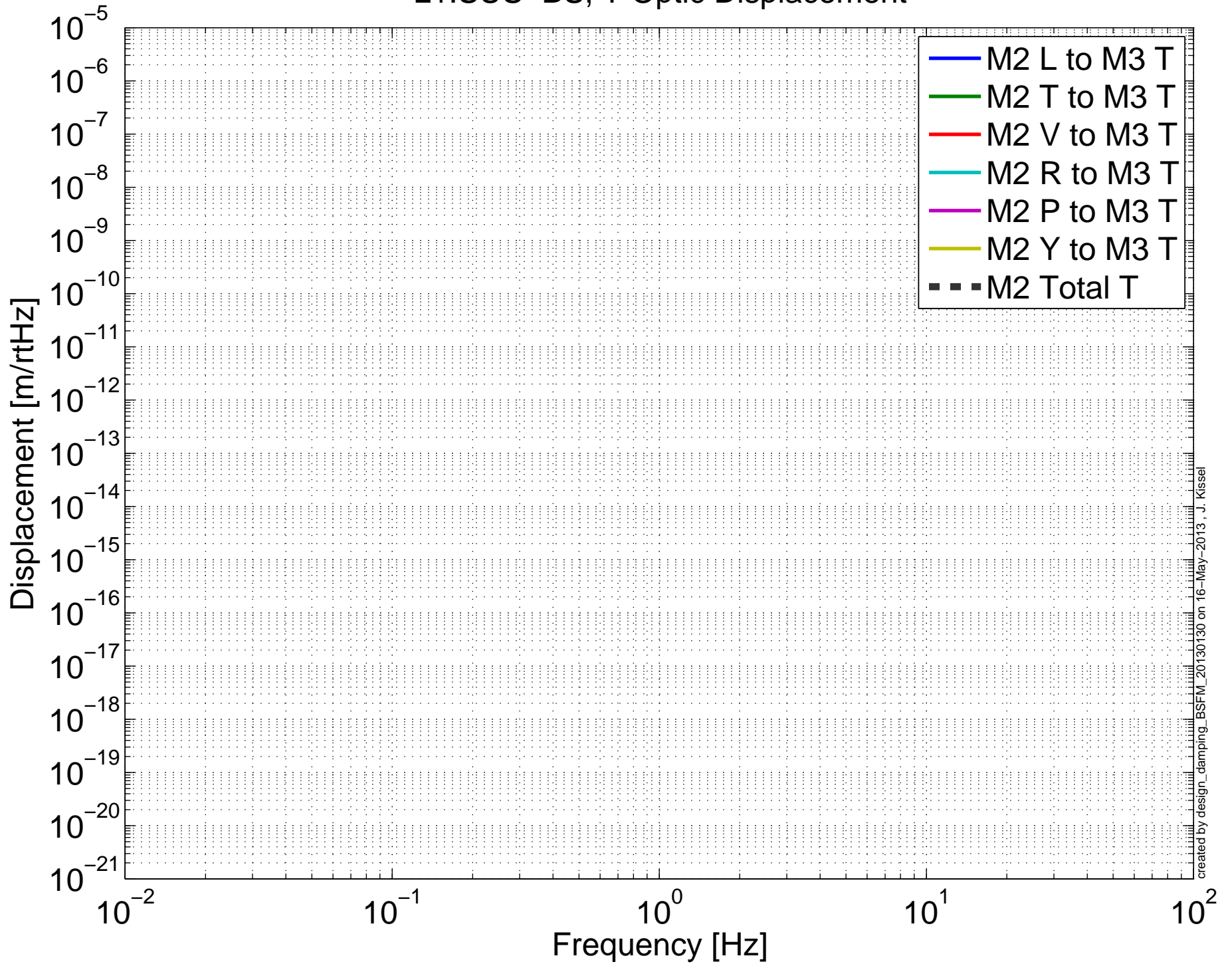
# Projected Top Mass Sensor > Optic Noise Budget L1:SUS-BS, T Optic Displacement



# Projected M1 Mass Actuator > Optic Noise Budget L1:SUS-BS, T Optic Displacement

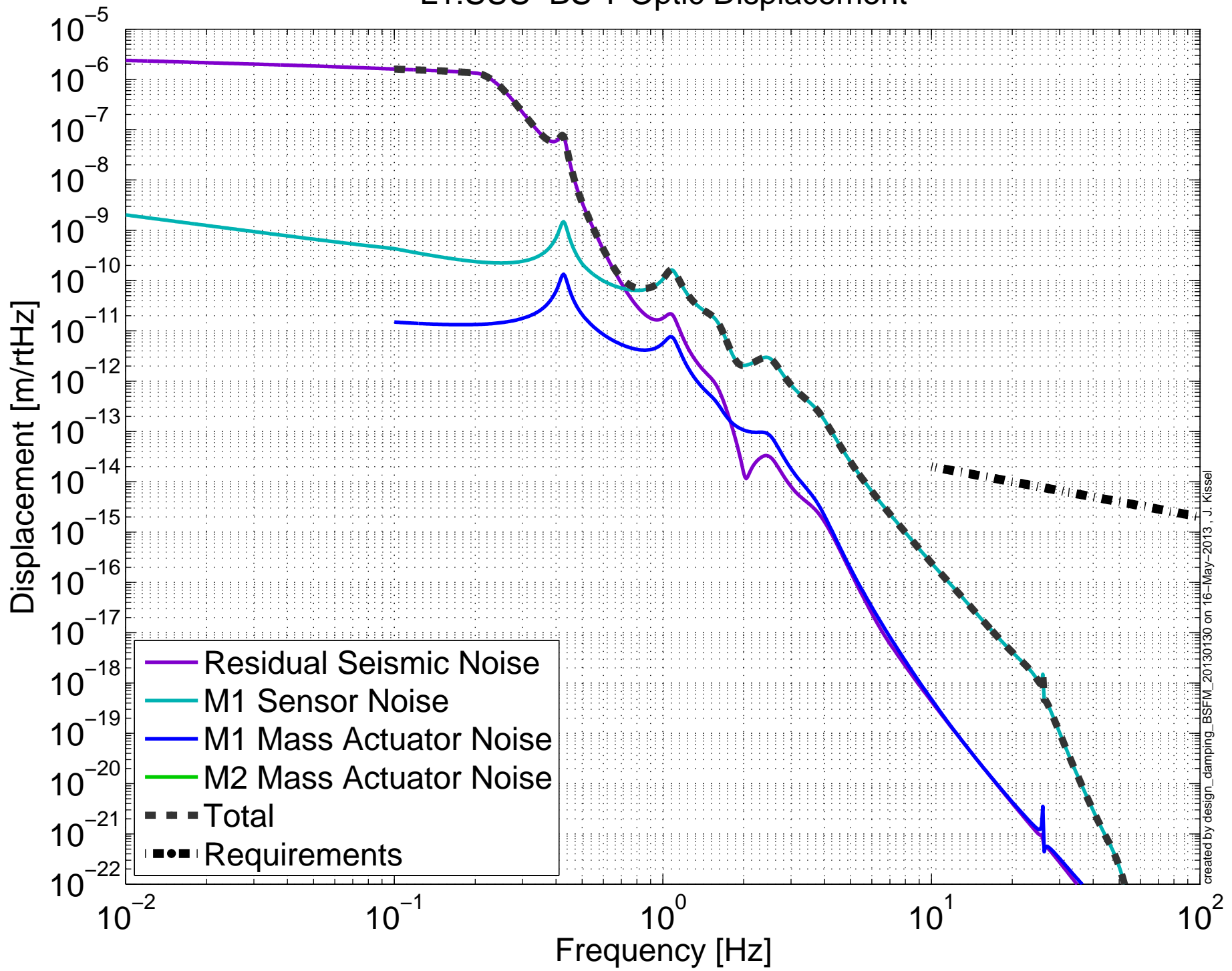


# Projected M2 Mass Actuator > Optic Noise Budget L1:SUS-BS, T Optic Displacement



# Damping Loop Performance

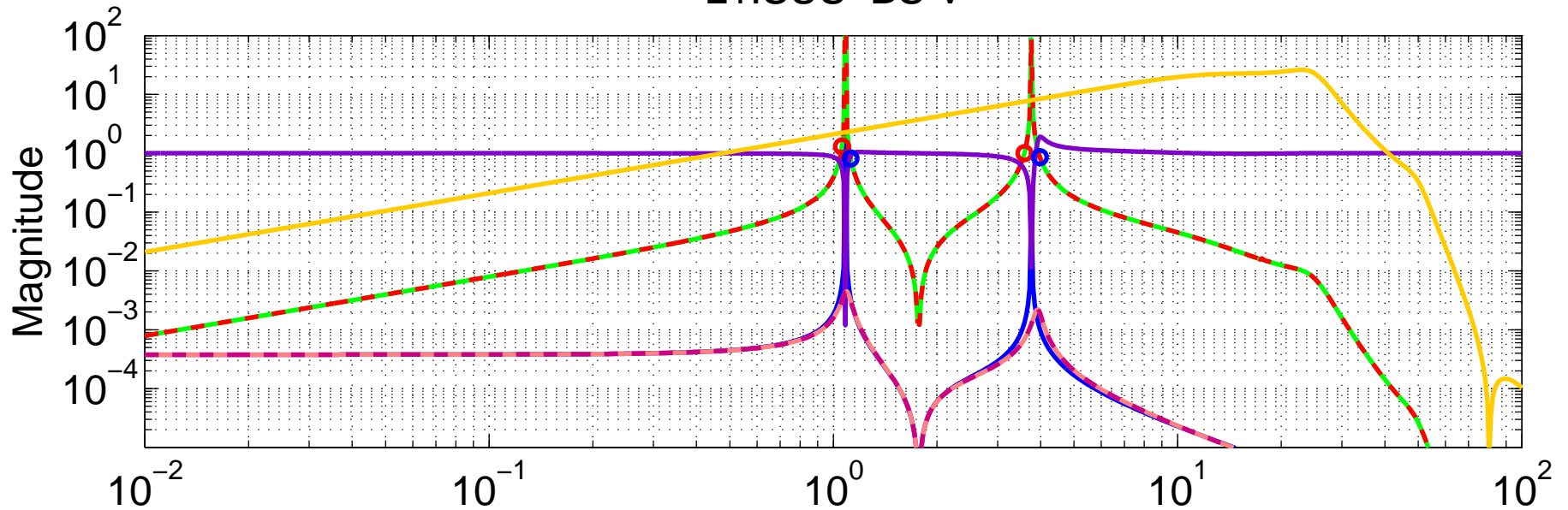
## L1:SUS-BS T Optic Displacement



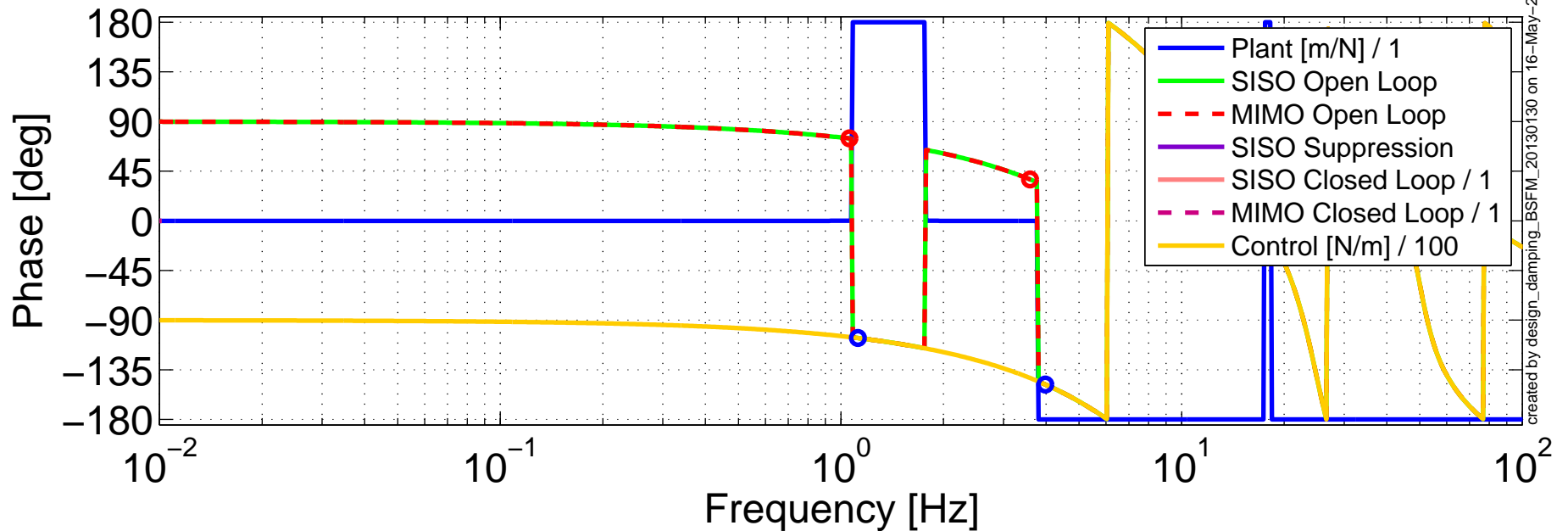
created by design\_damping\_BSFM\_20130130 on 16-May-2013, J. Kissel



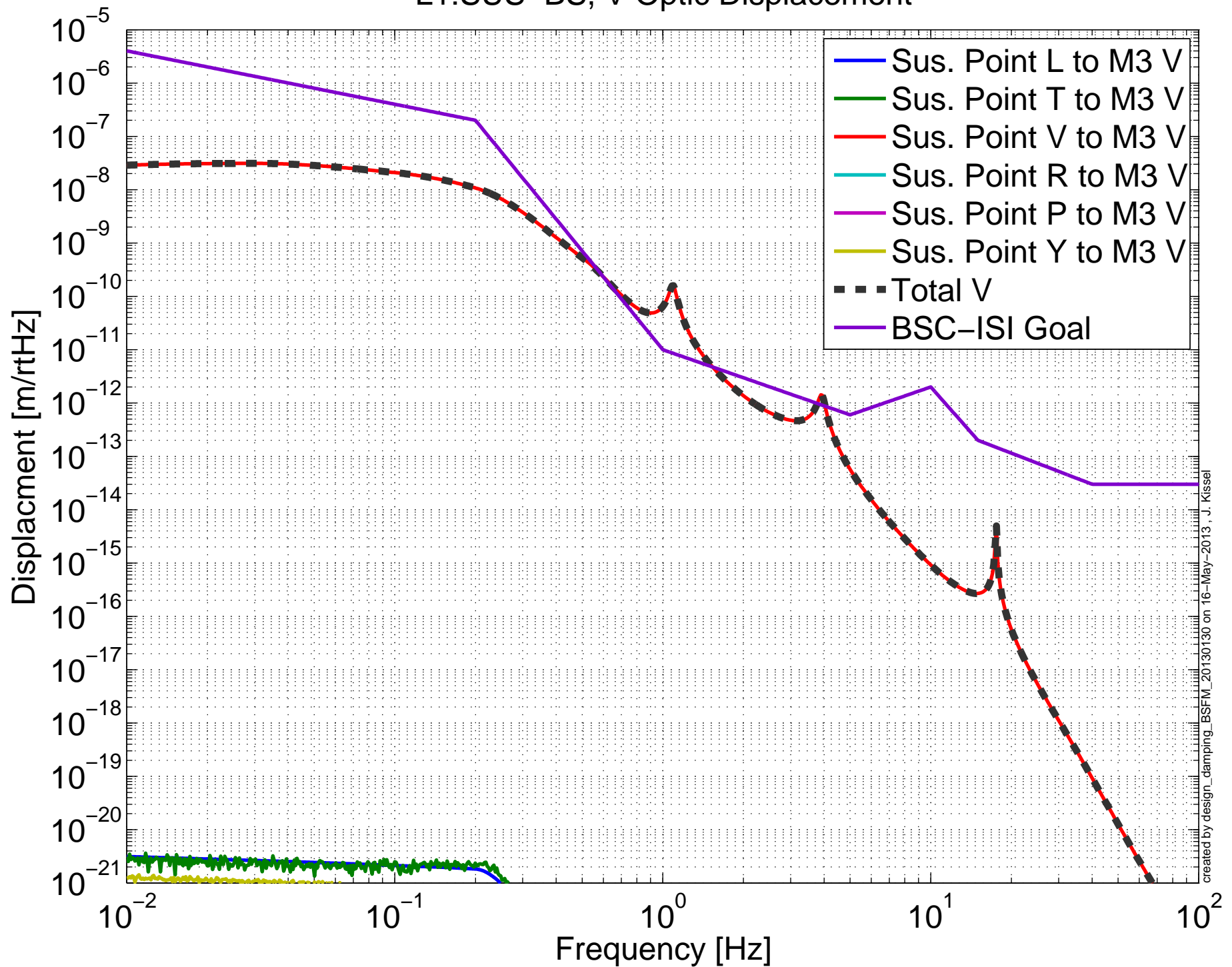
# Damping Loop Design L1:SUS-BS V



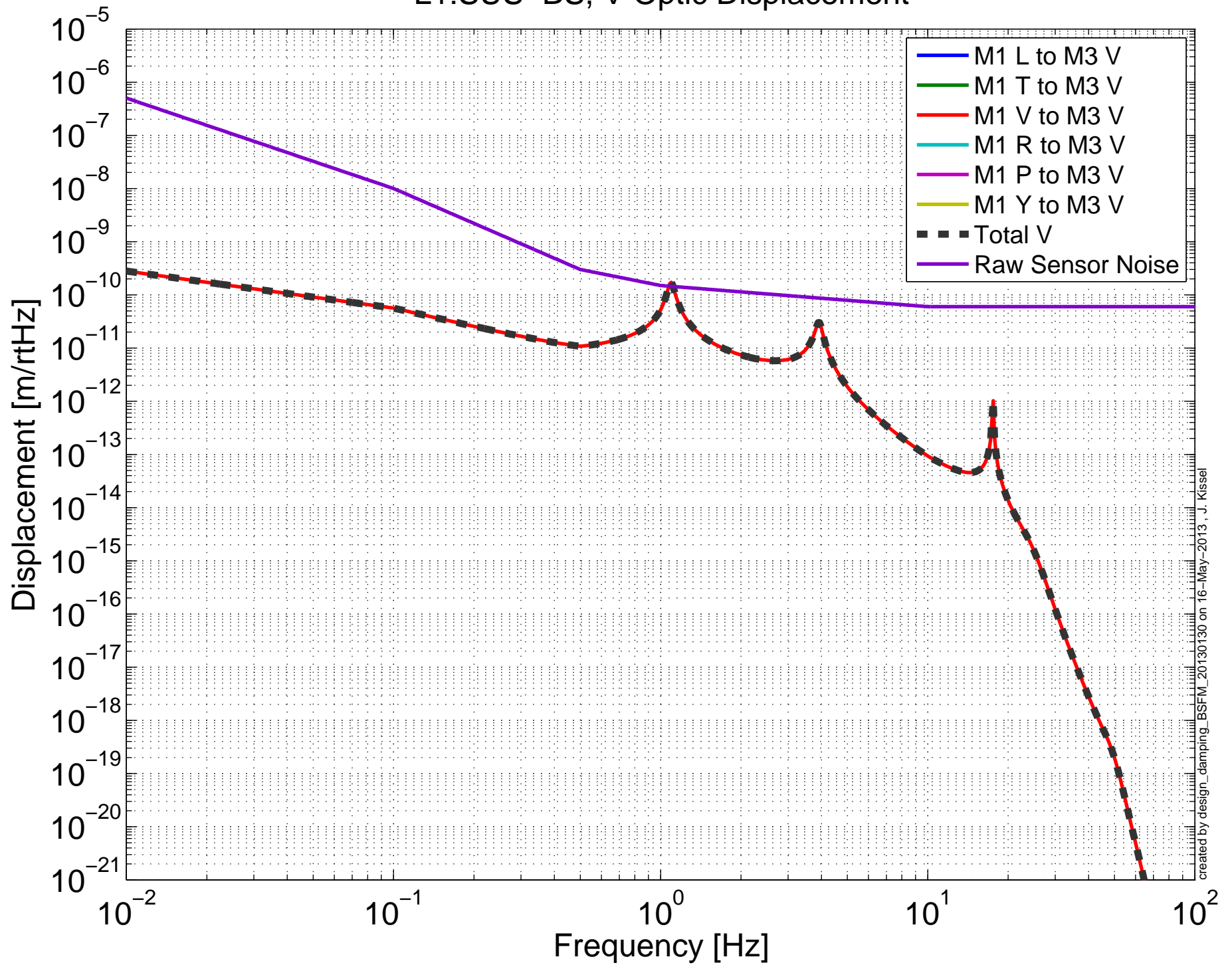
MIMO LUGF Phase Margins (red): [105    142] [deg]  
 MIMO UUGF Phase Margins (blue): [73.8    31.7] [deg]



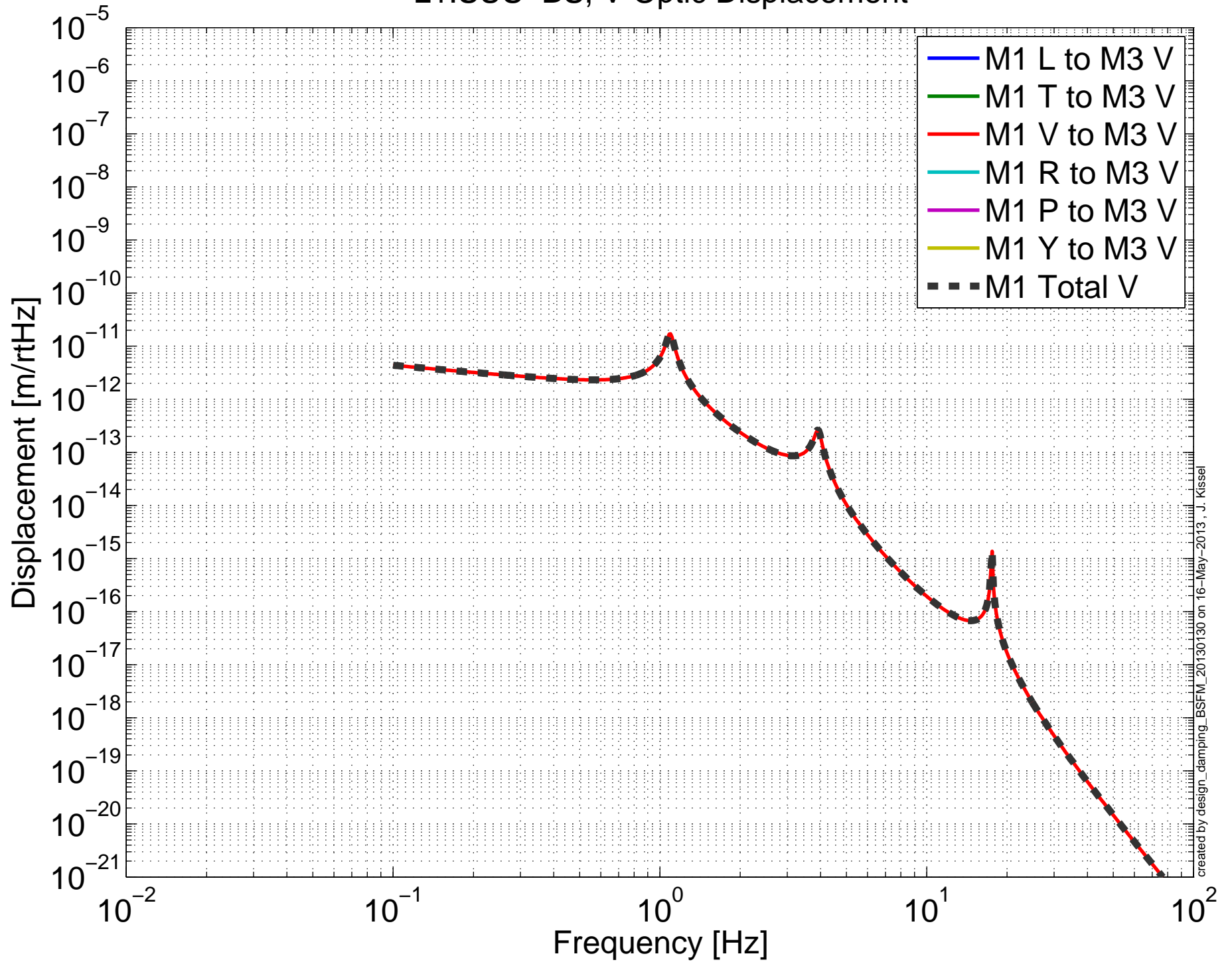
# Projected Sus. Point > Optic Seismic Noise Budget L1:SUS-BS, V Optic Displacement



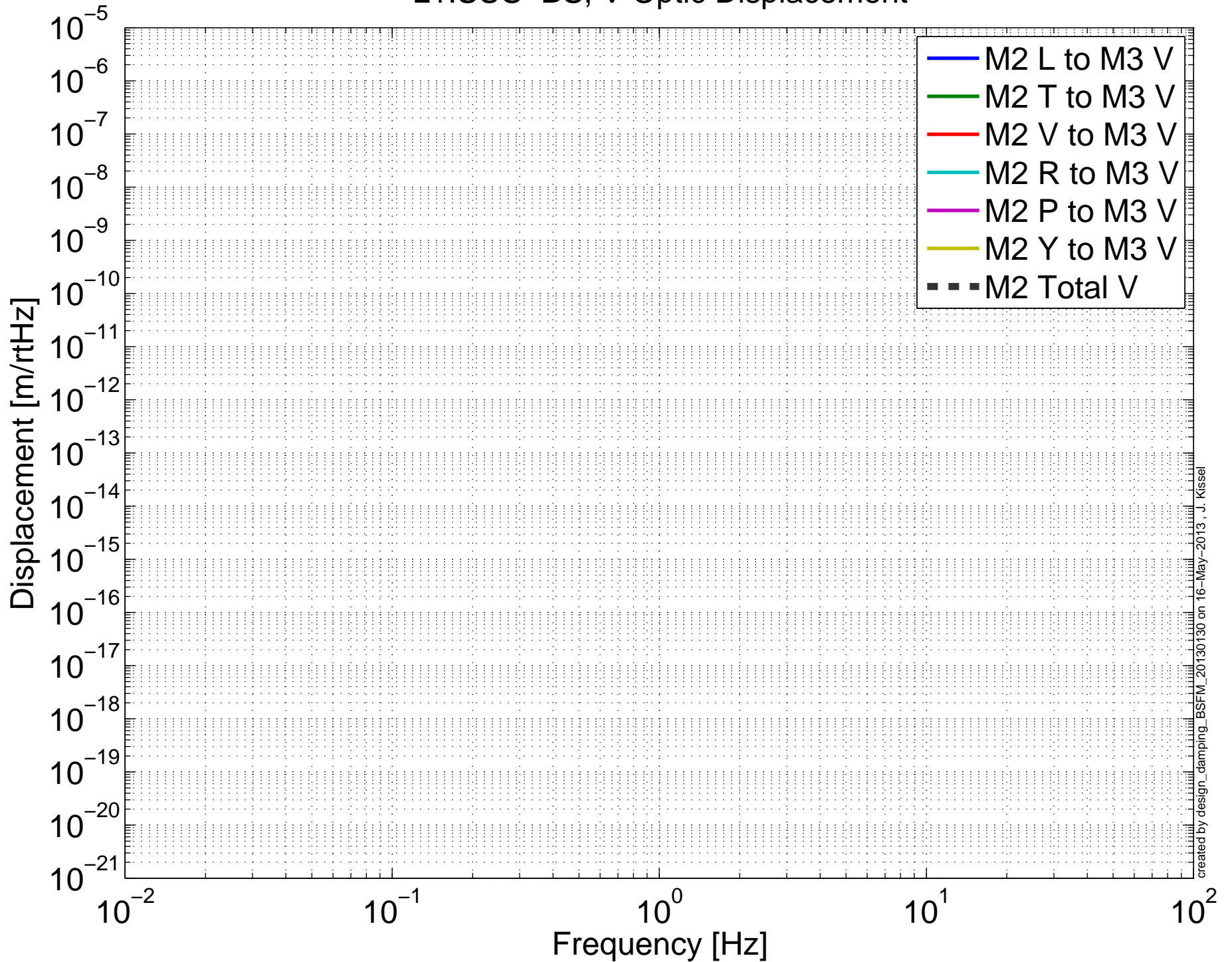
# Projected Top Mass Sensor > Optic Noise Budget L1:SUS-BS, V Optic Displacement



# Projected M1 Mass Actuator > Optic Noise Budget L1:SUS-BS, V Optic Displacement

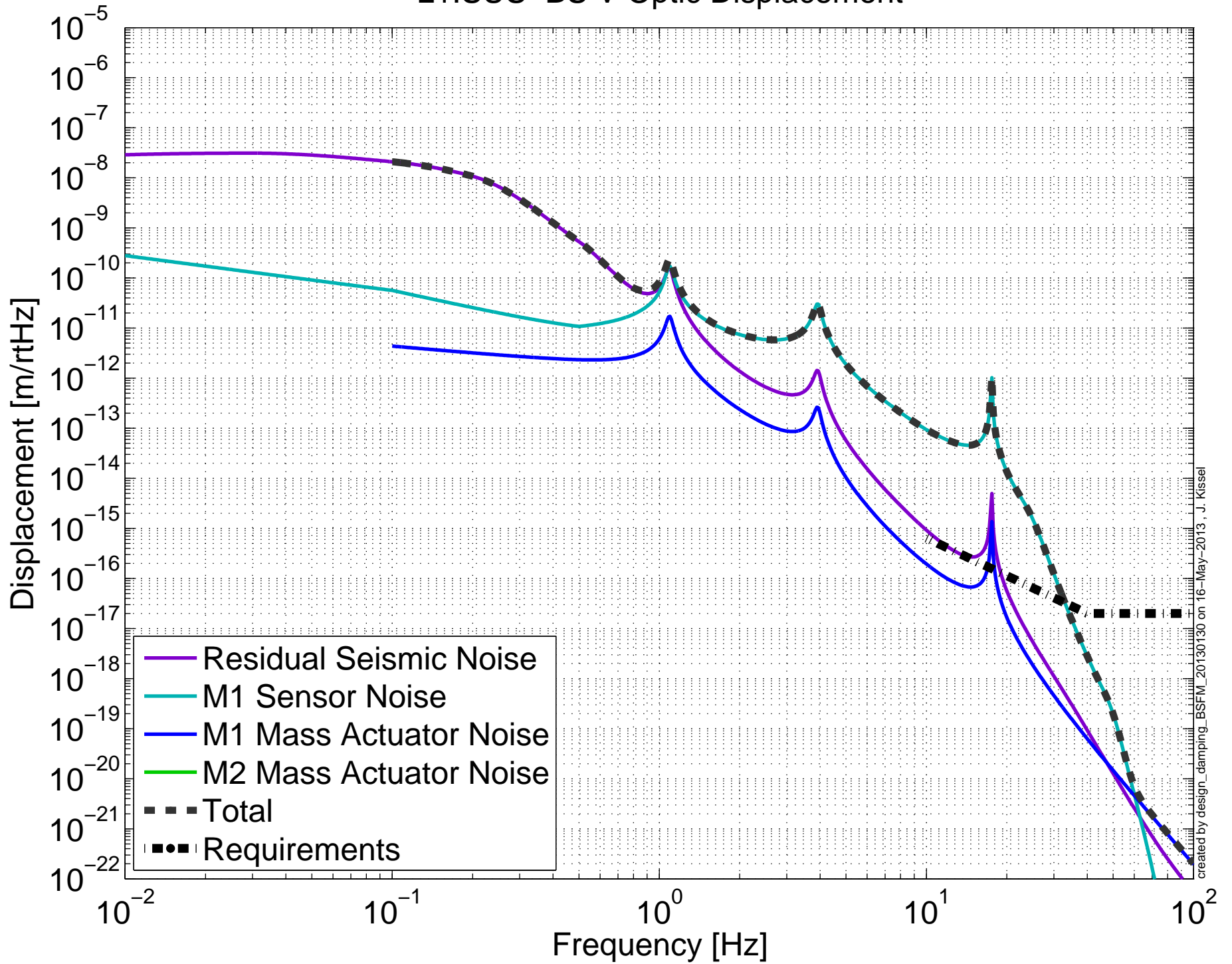


# Projected M2 Mass Actuator > Optic Noise Budget L1:SUS-BS, V Optic Displacement



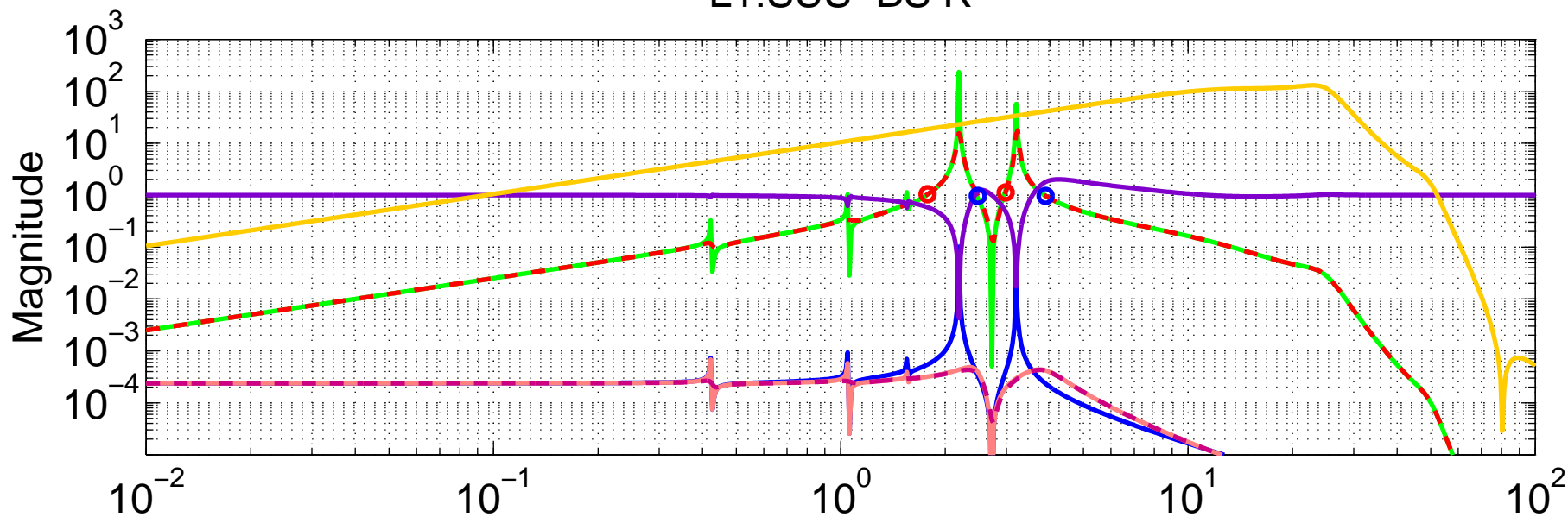
# Damping Loop Performance

## L1:SUS-BS V Optic Displacement

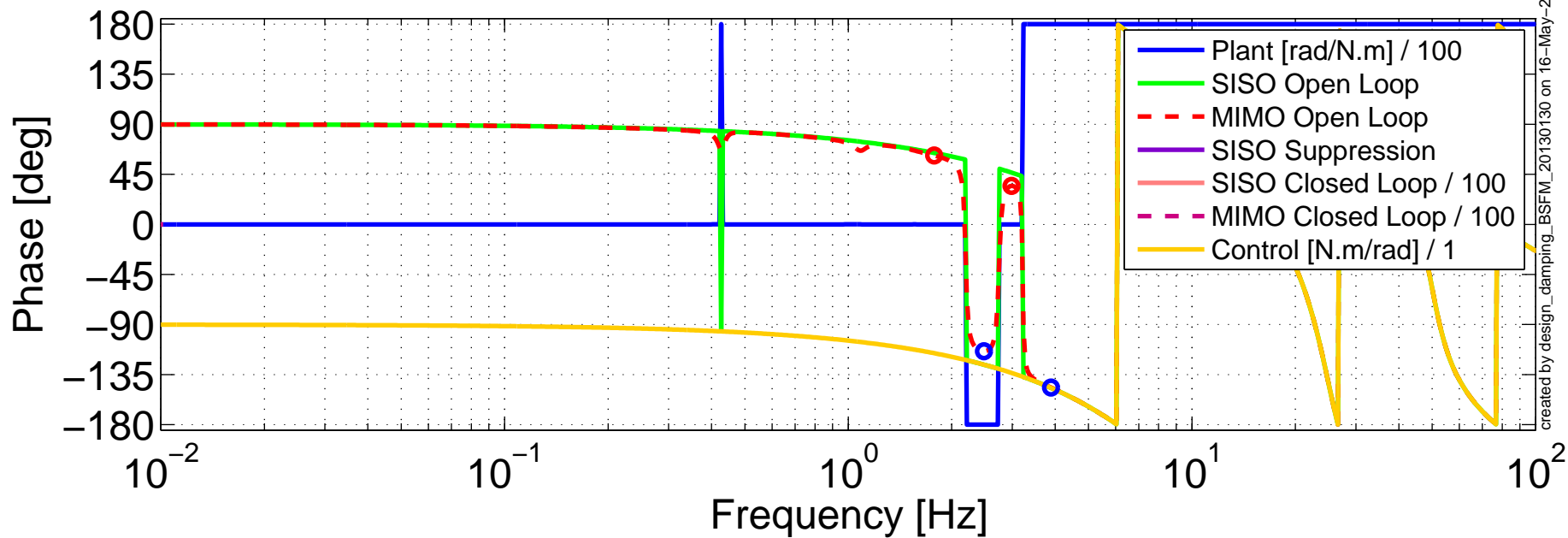


# Damping Loop Design

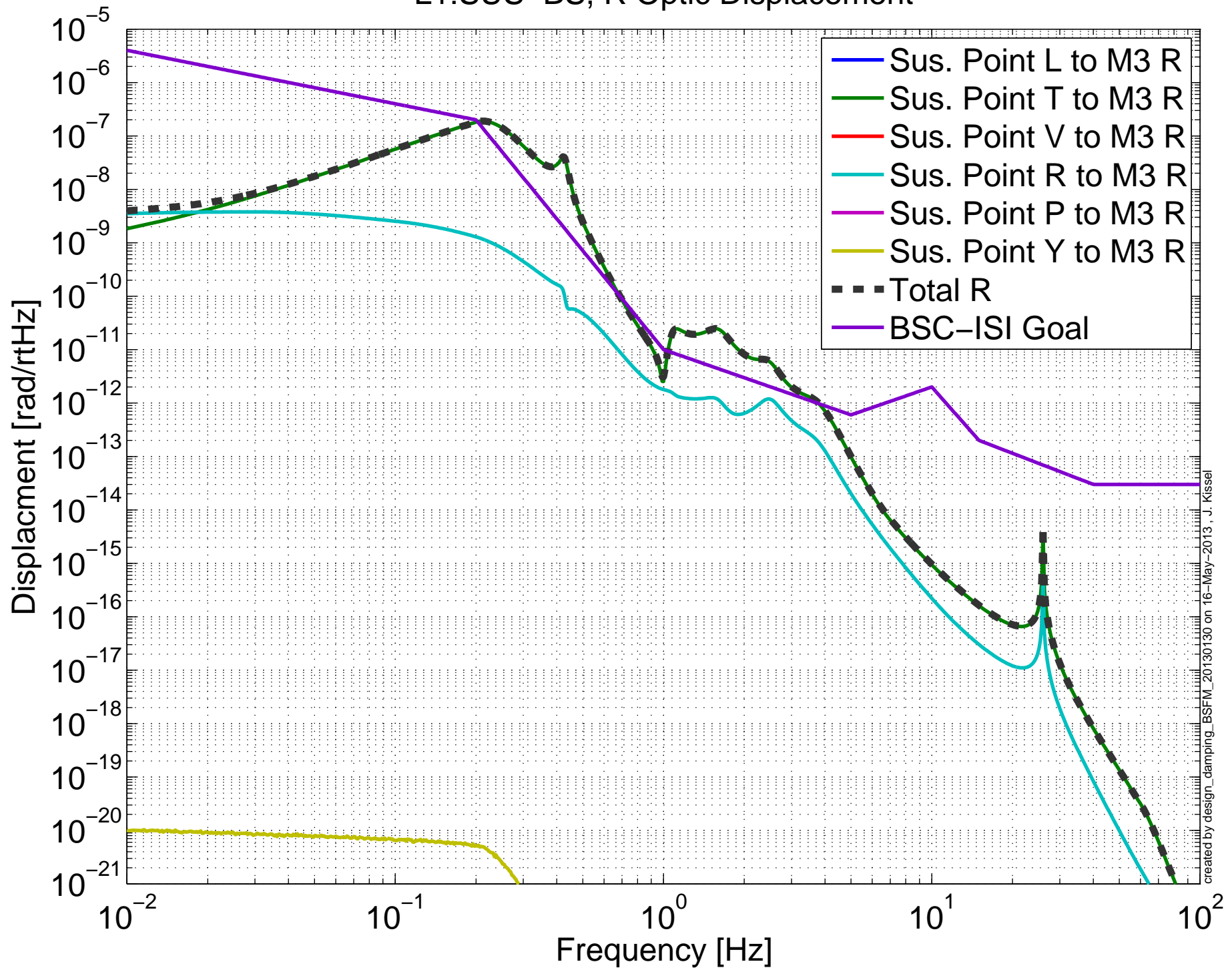
## L1:SUS-BS R



MIMO LUGF Phase Margins (red): [118 145] [deg]  
MIMO UUGF Phase Margins (blue): [66 33.3] [deg]



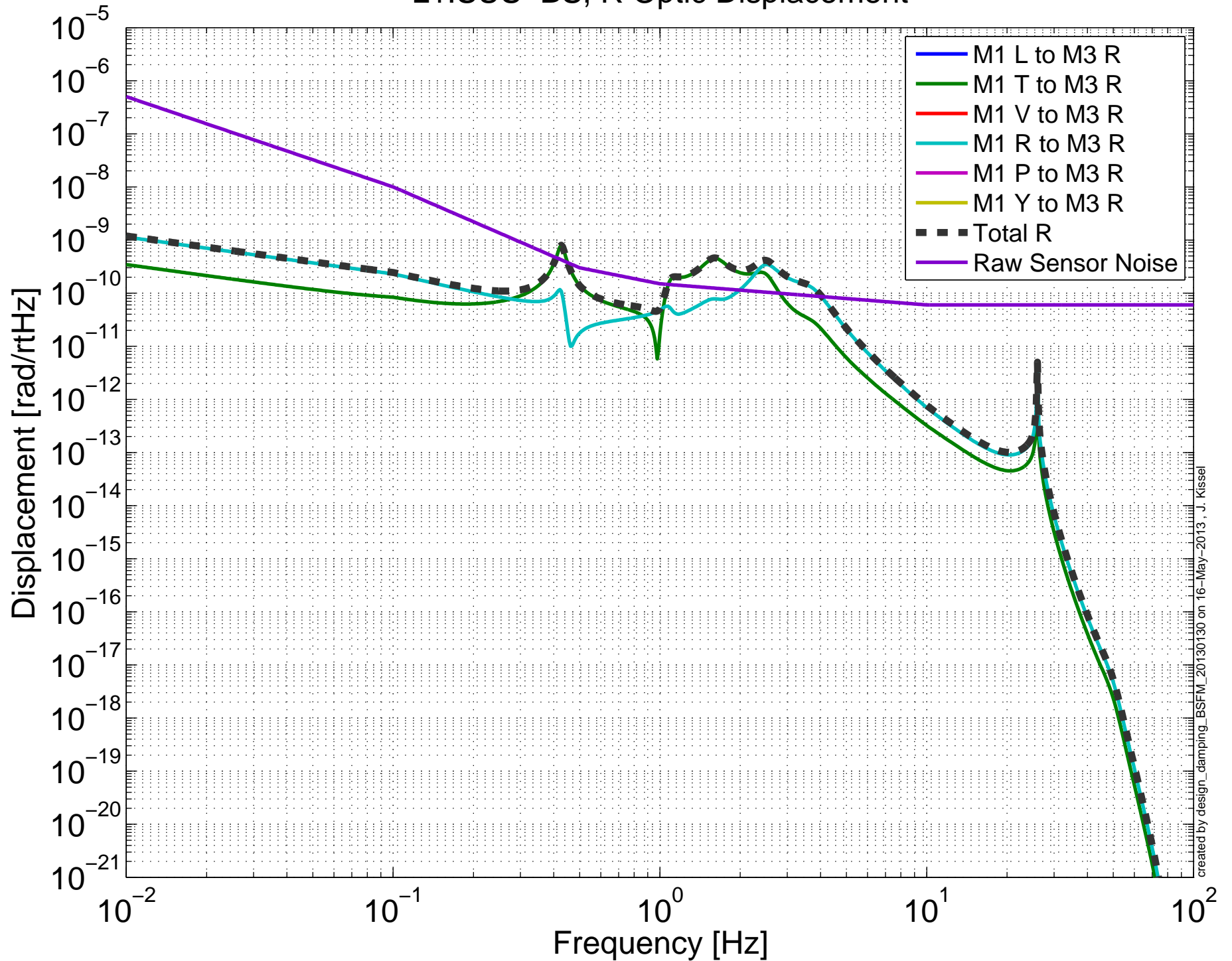
Projected Sus. Point > Optic Seismic Noise Budget  
L1:SUS-BS, R Optic Displacement



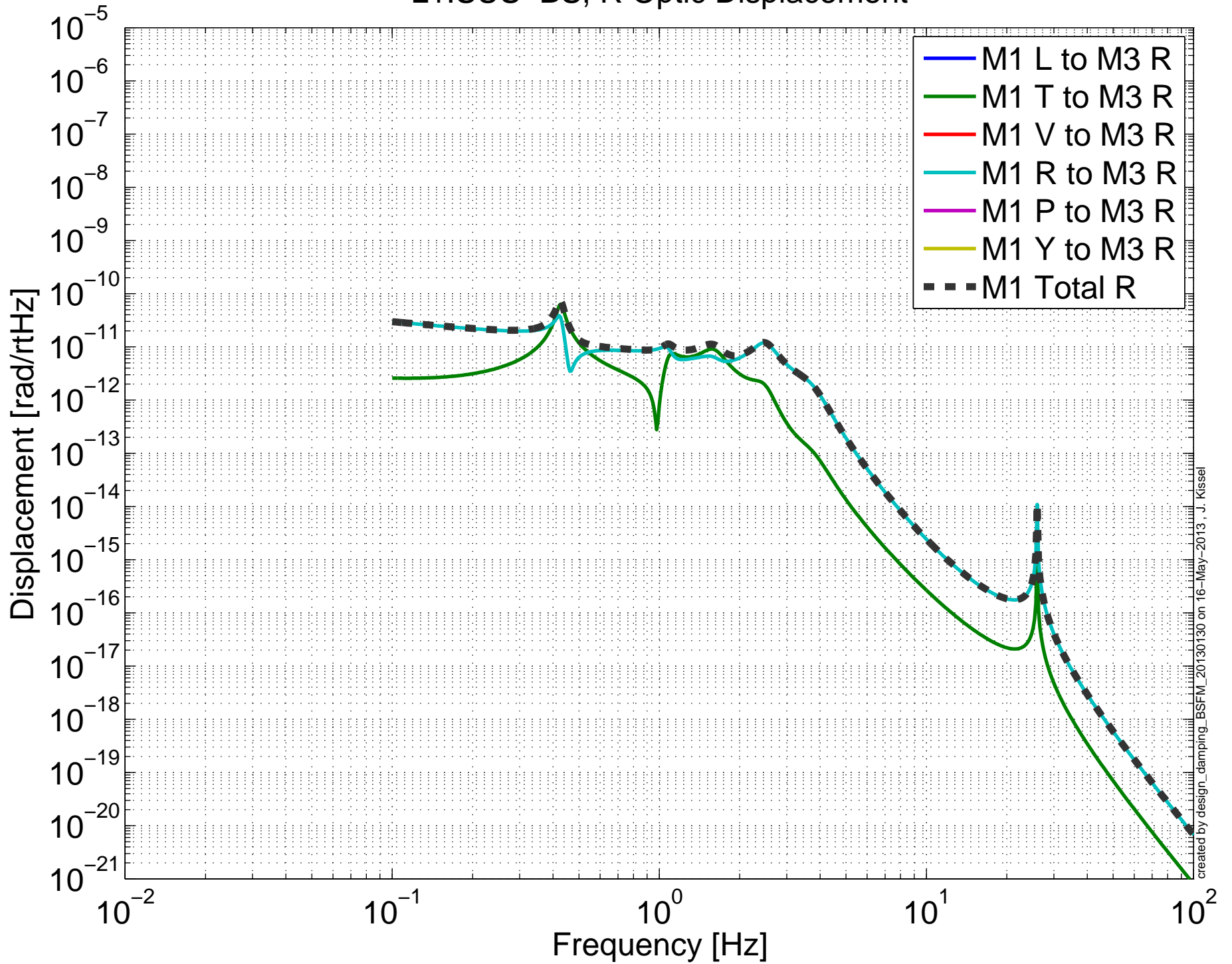
created by design\_damping\_BSFW\_20130130 on 16-May-2013, J. Kissel



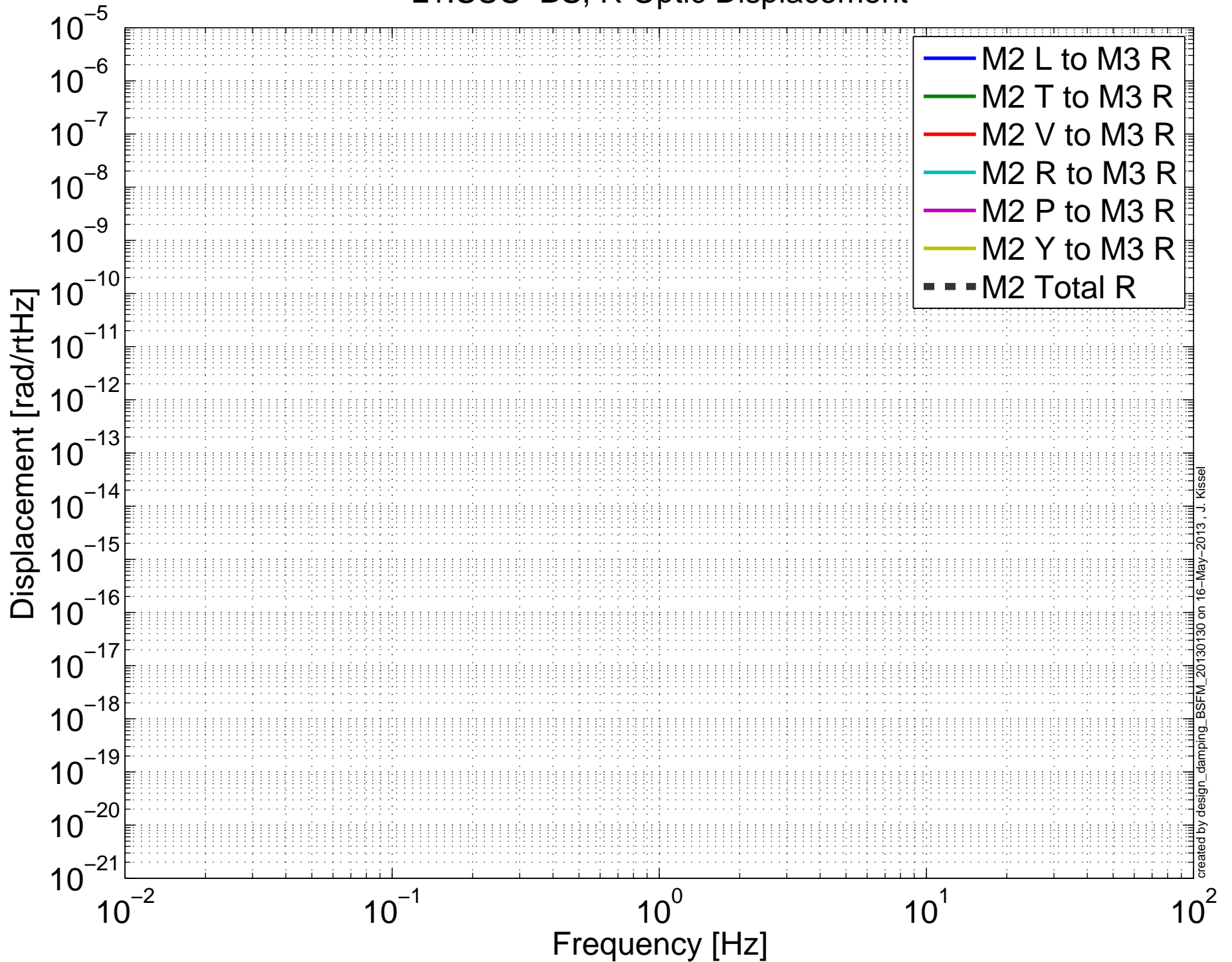
# Projected Top Mass Sensor > Optic Noise Budget L1:SUS-BS, R Optic Displacement



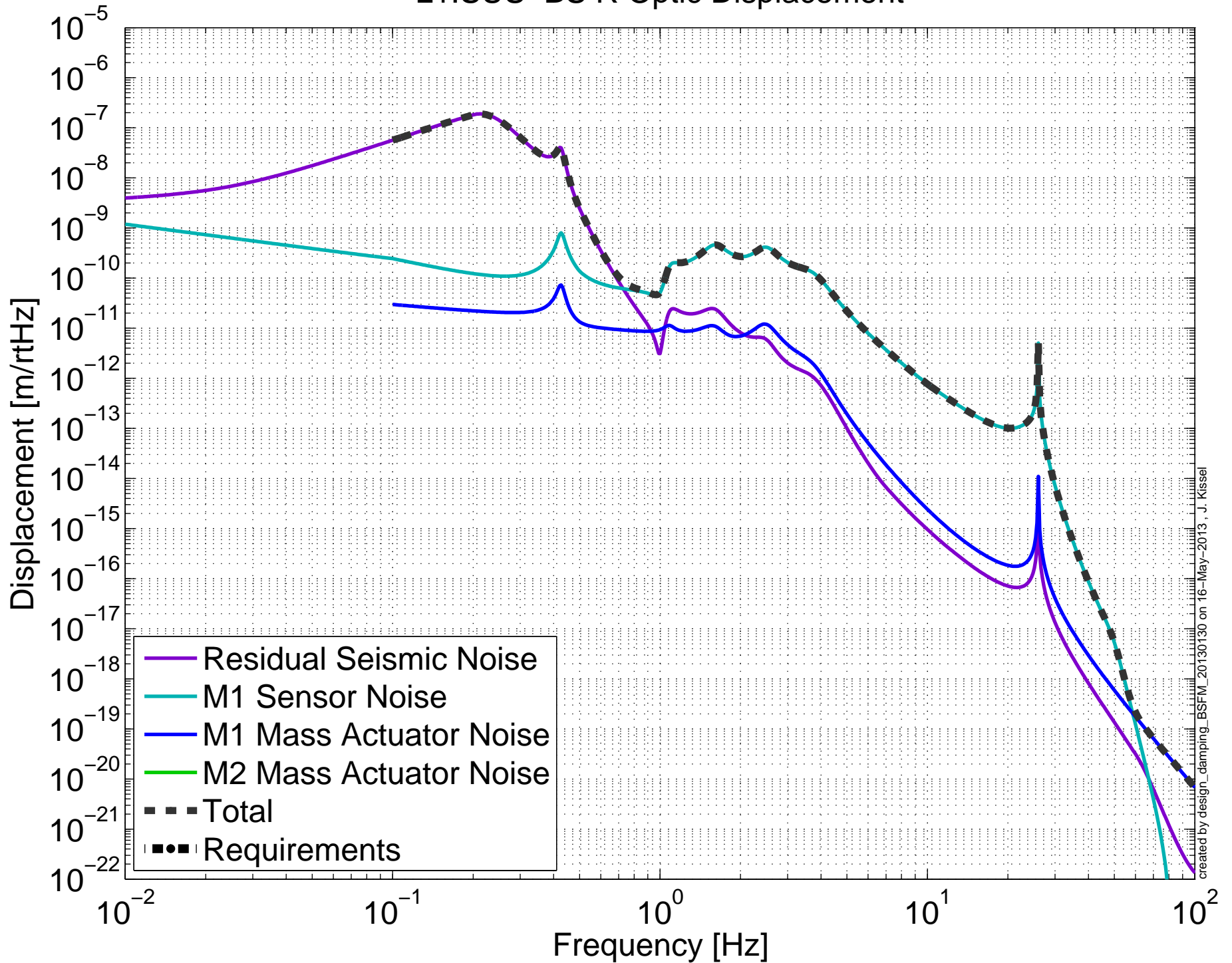
# Projected M1 Mass Actuator > Optic Noise Budget L1:SUS-BS, R Optic Displacement



# Projected M2 Mass Actuator > Optic Noise Budget L1:SUS-BS, R Optic Displacement

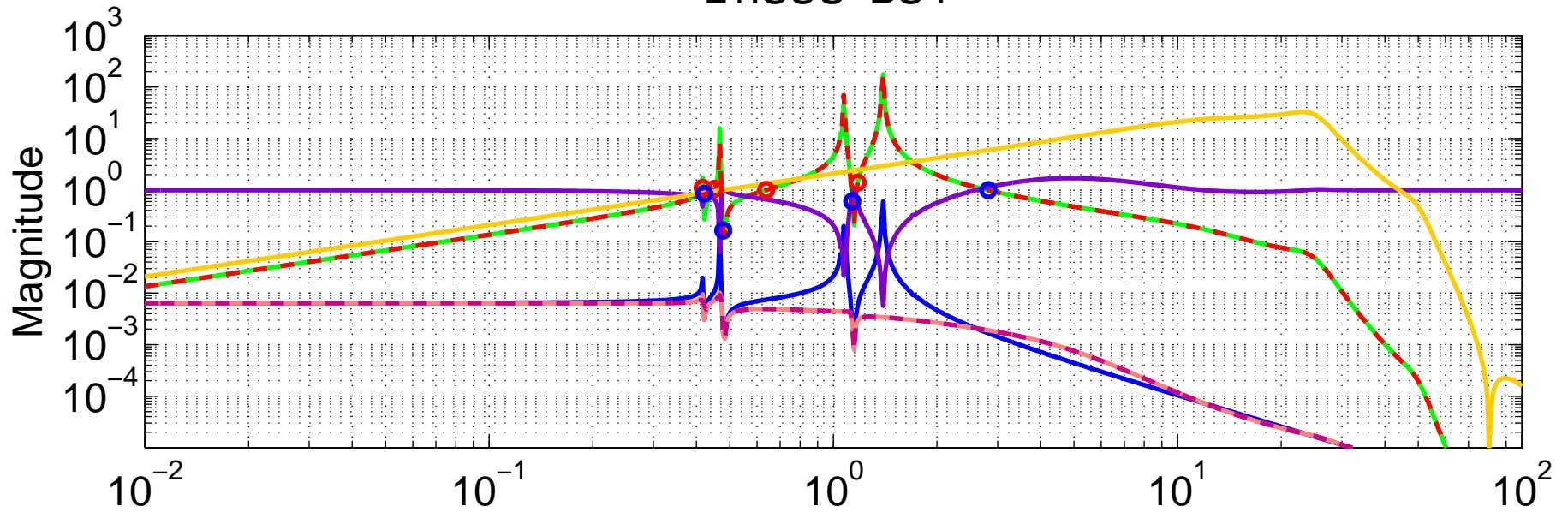


# Damping Loop Performance L1:SUS-BS R Optic Displacement

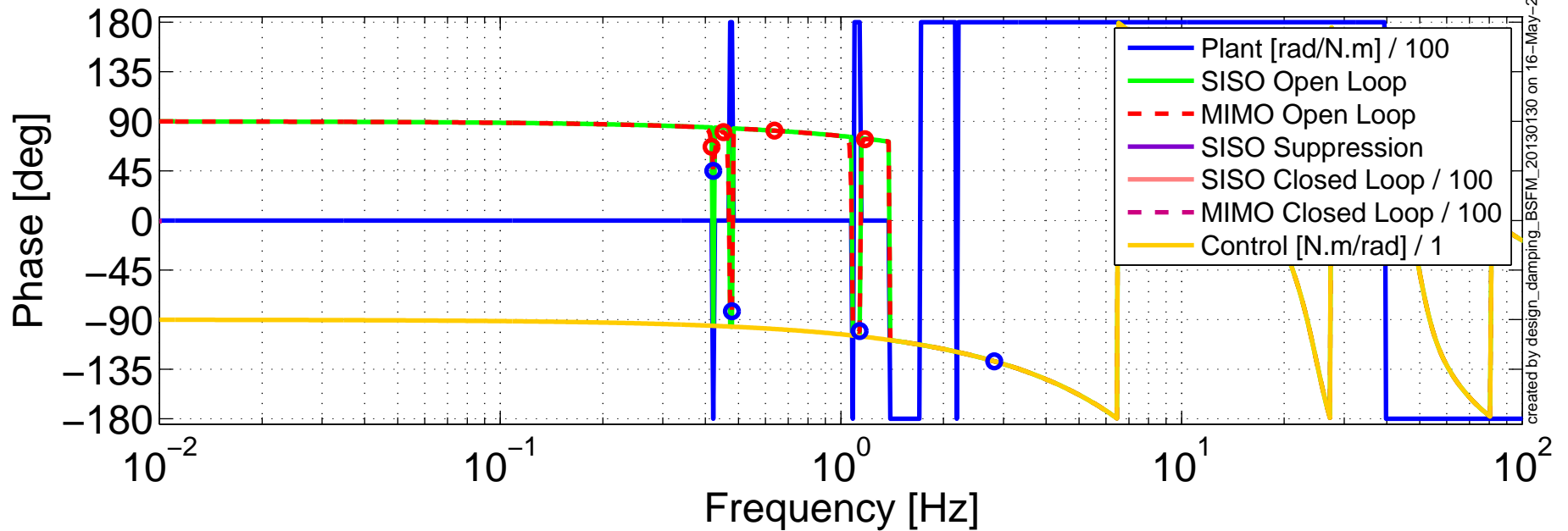


# Damping Loop Design

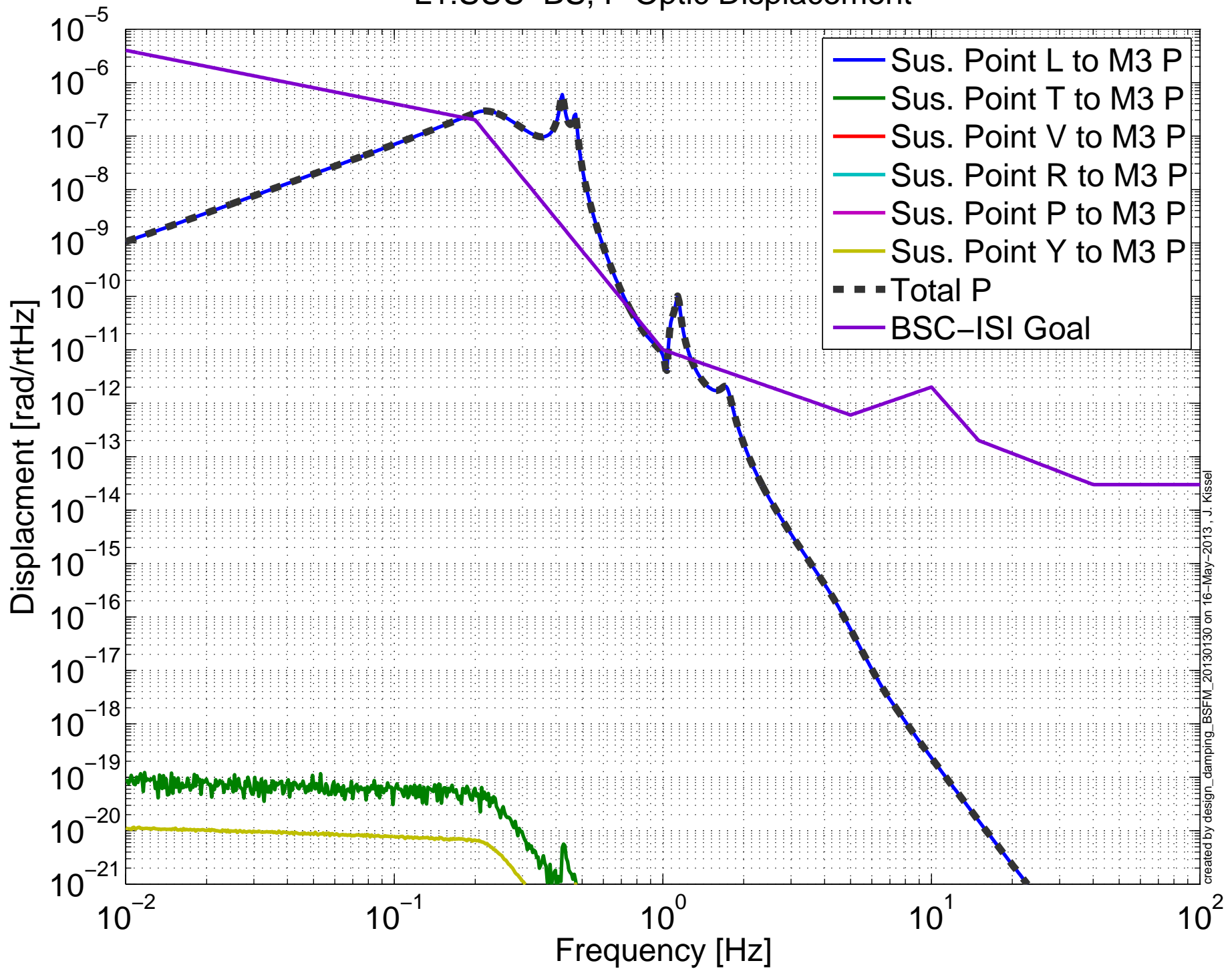
## L1:SUS-BS P



MIMO LUGF Phase Margins (red): [113    99.9    98.5    106] [deg]  
MIMO UUGF Phase Margins (blue): [225    97.5    79.6    52.2] [deg]

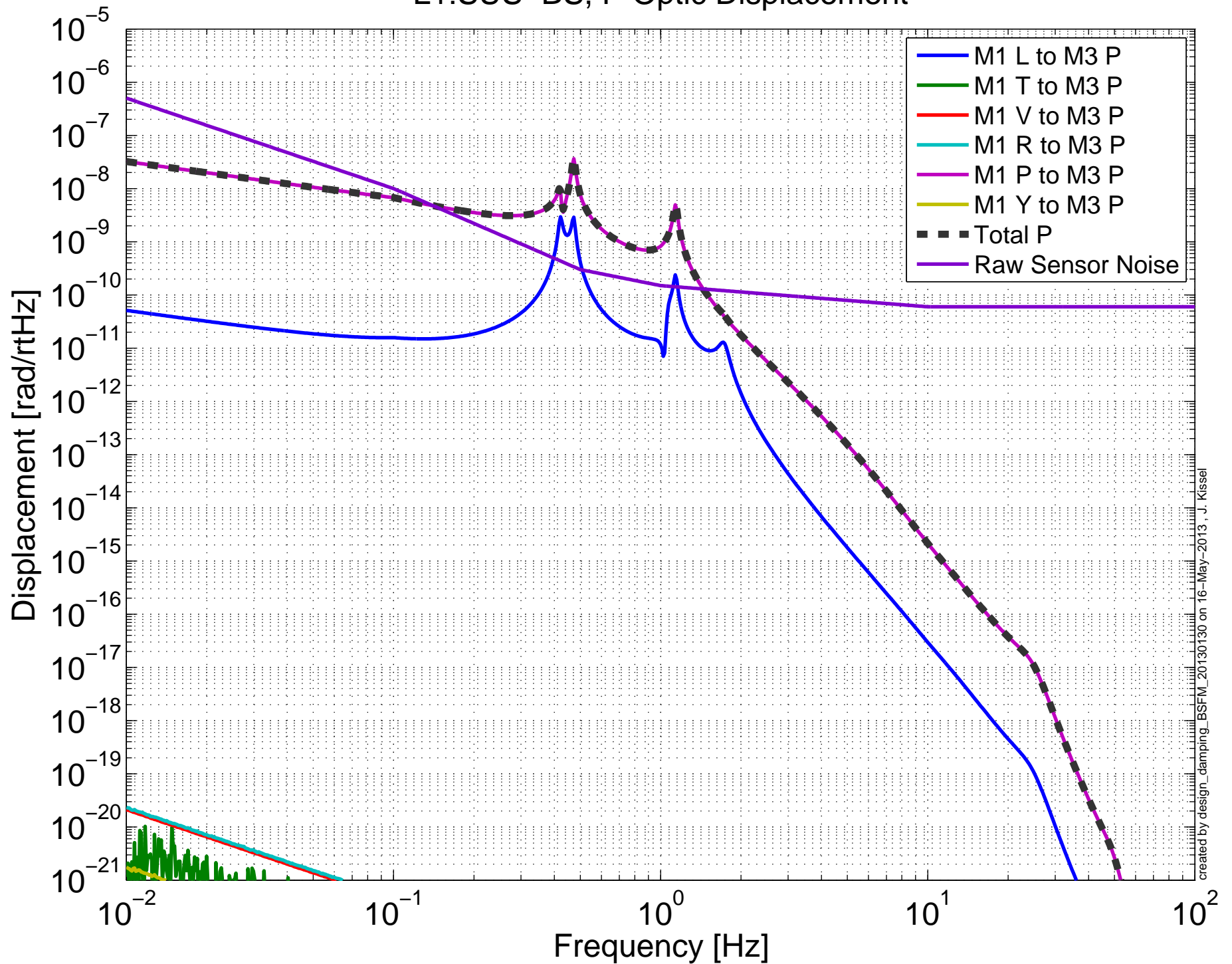


Projected Sus. Point > Optic Seismic Noise Budget  
L1:SUS-BS, P Optic Displacement

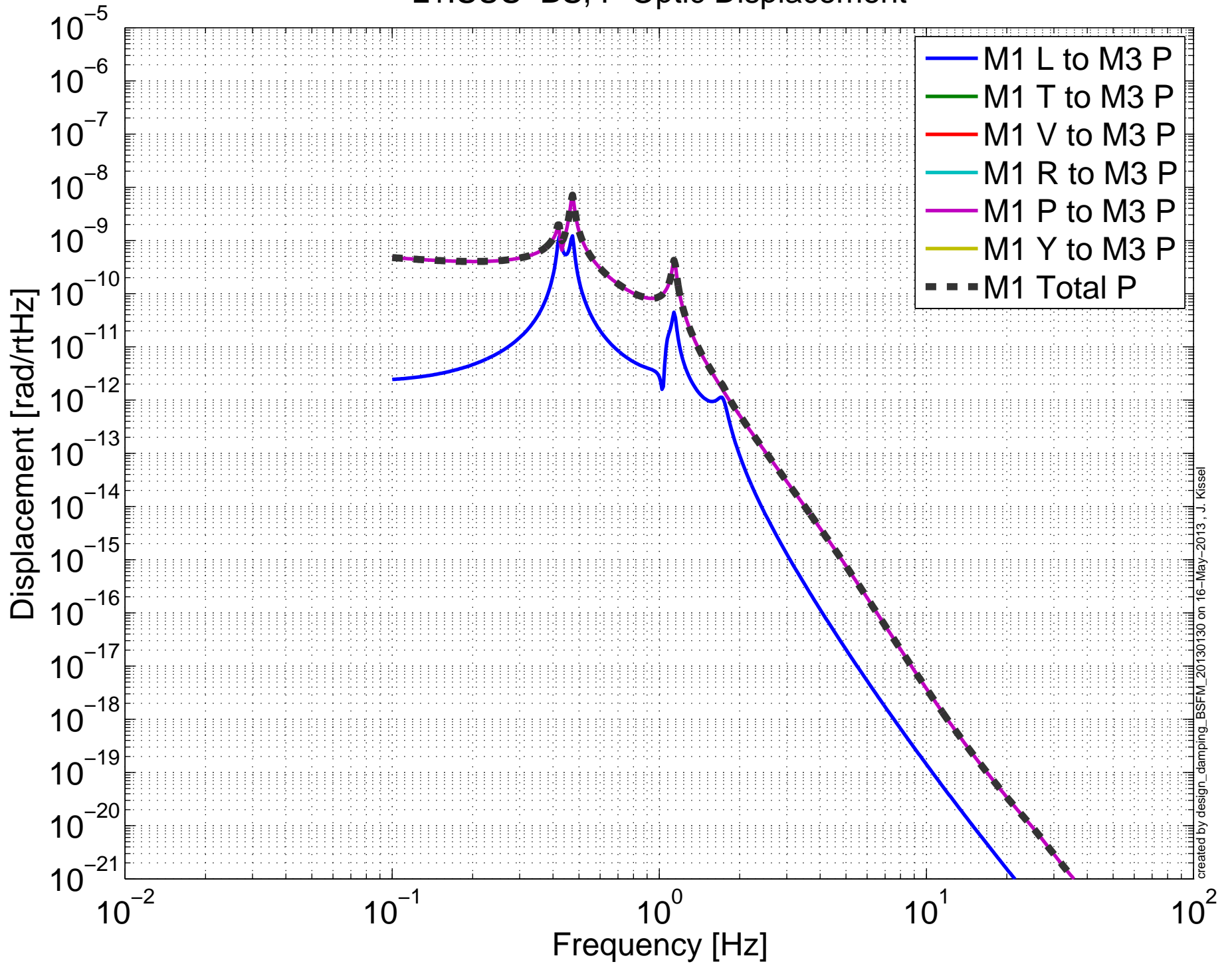


created by design\_damping\_BSFW\_20130130 on 16-May-2013, J. Kiesel

# Projected Top Mass Sensor > Optic Noise Budget L1:SUS-BS, P Optic Displacement

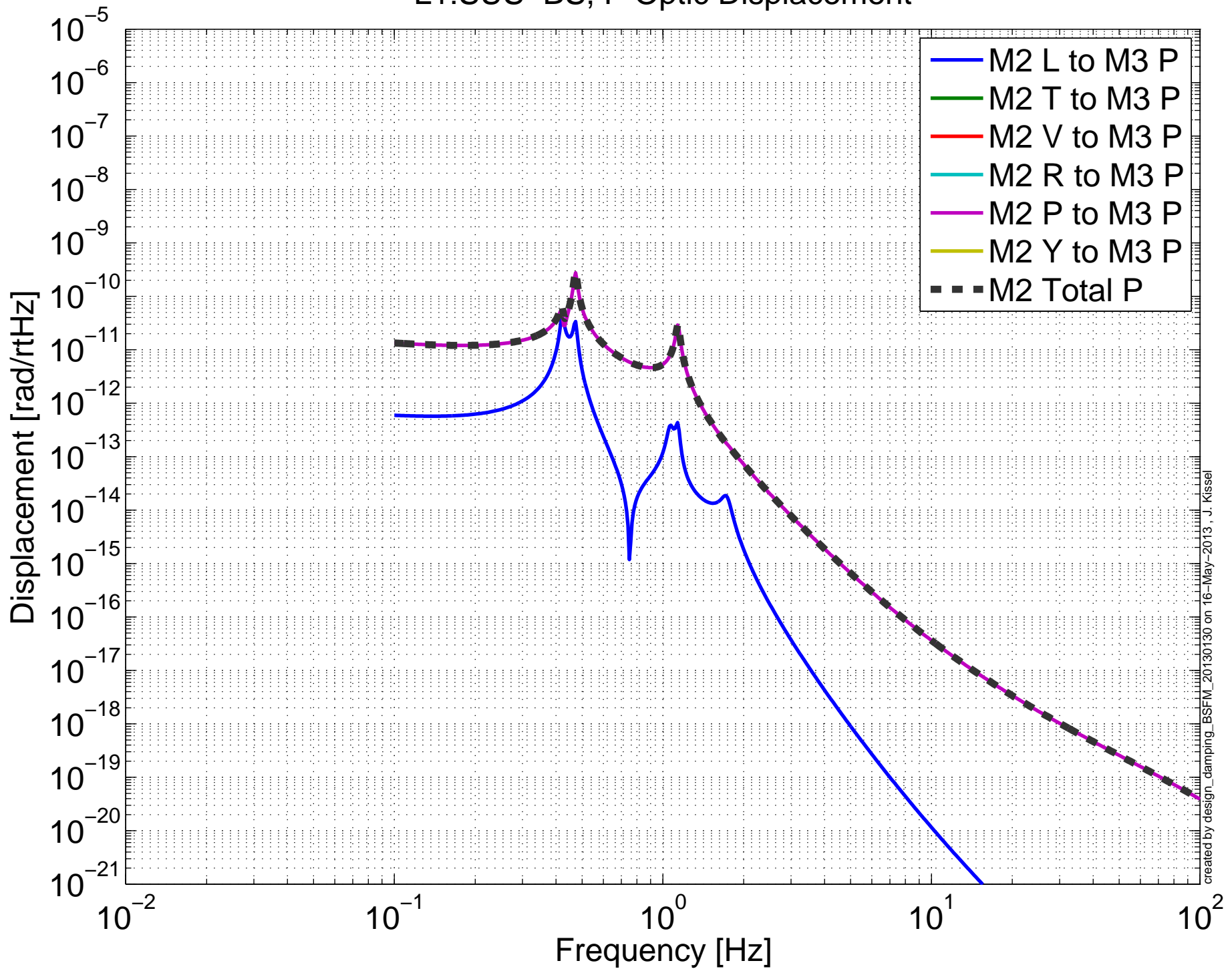


# Projected M1 Mass Actuator > Optic Noise Budget L1:SUS-BS, P Optic Displacement



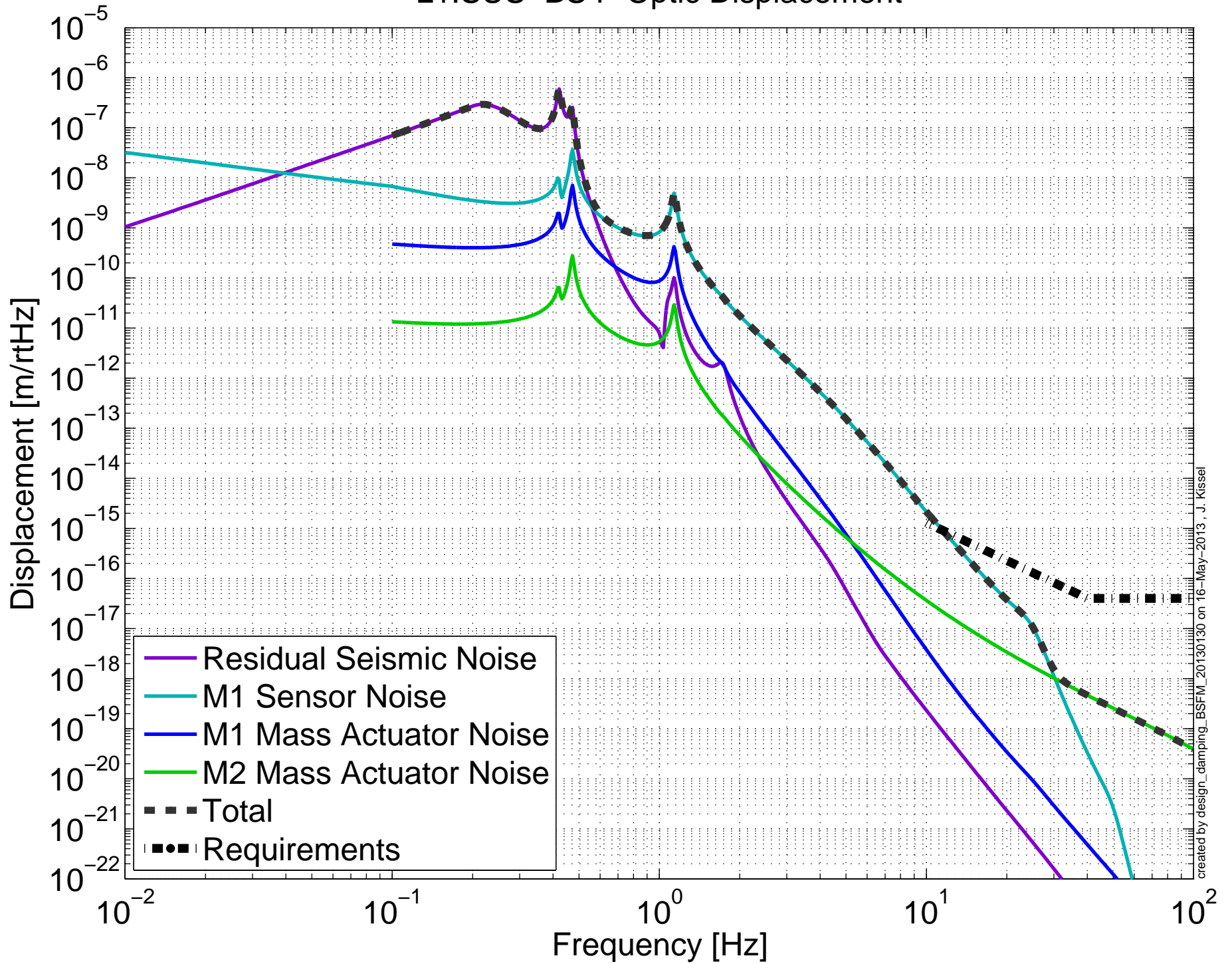


# Projected M2 Mass Actuator > Optic Noise Budget L1:SUS-BS, P Optic Displacement



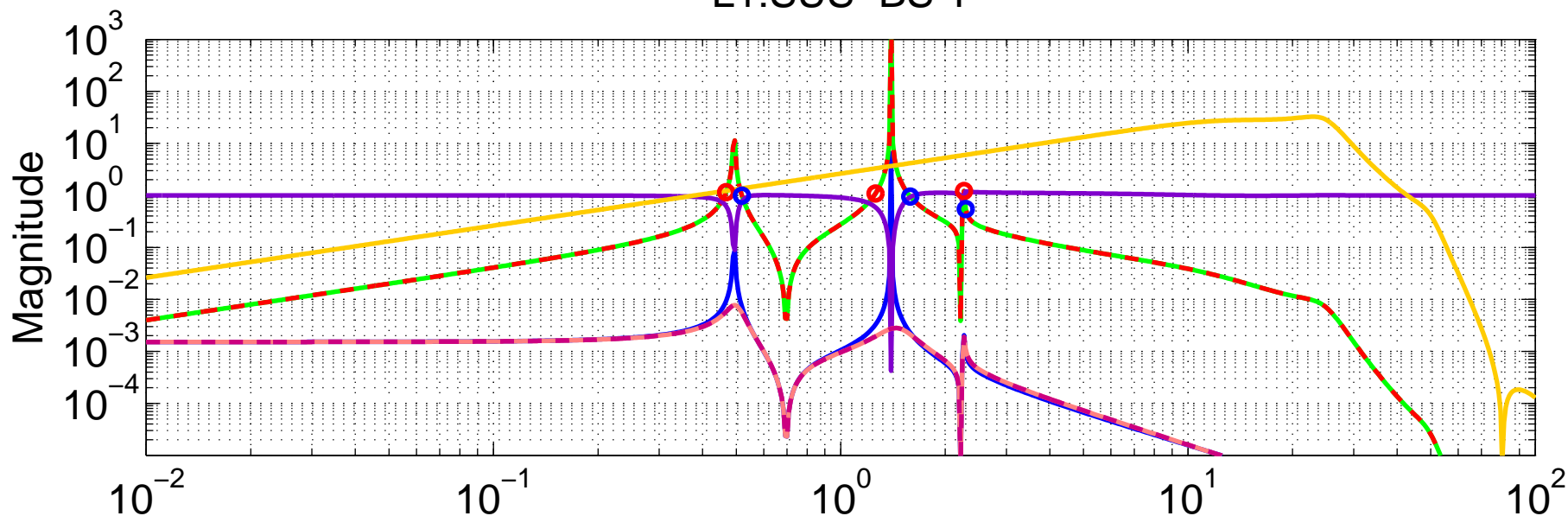
created by design\_damping\_BSFW\_20130130 on 16-May-2013, J. Kiesel

# Damping Loop Performance L1:SUS-BS P Optic Displacement

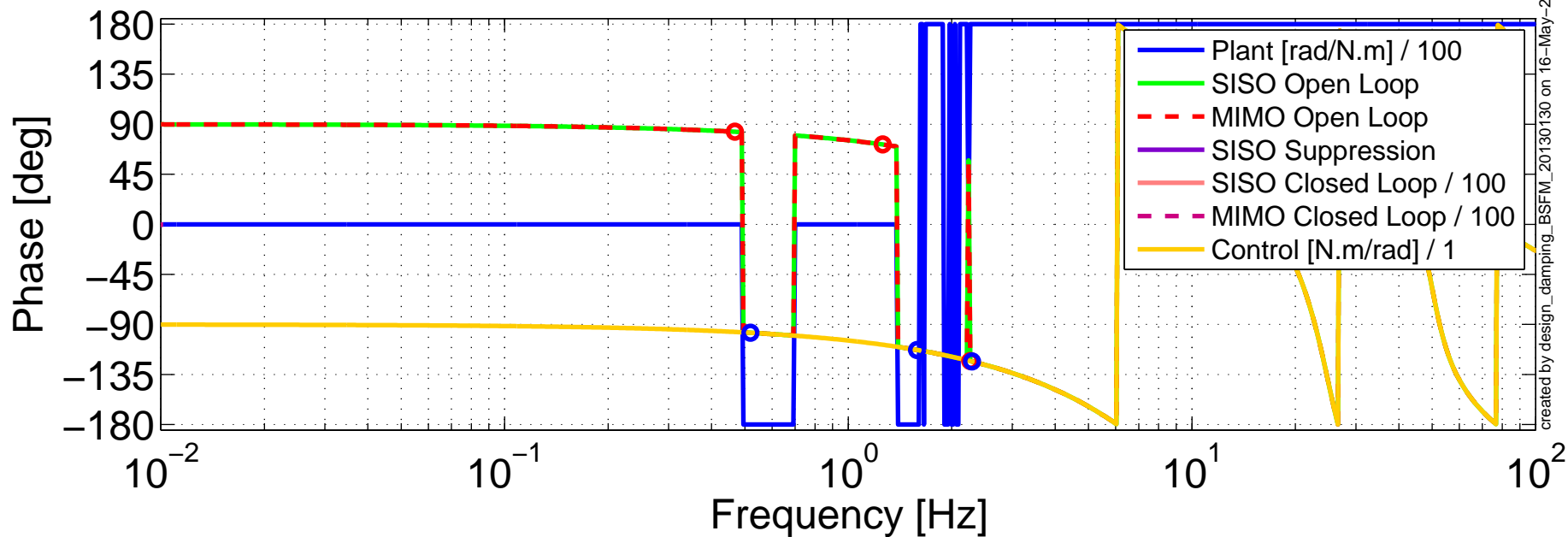


# Damping Loop Design

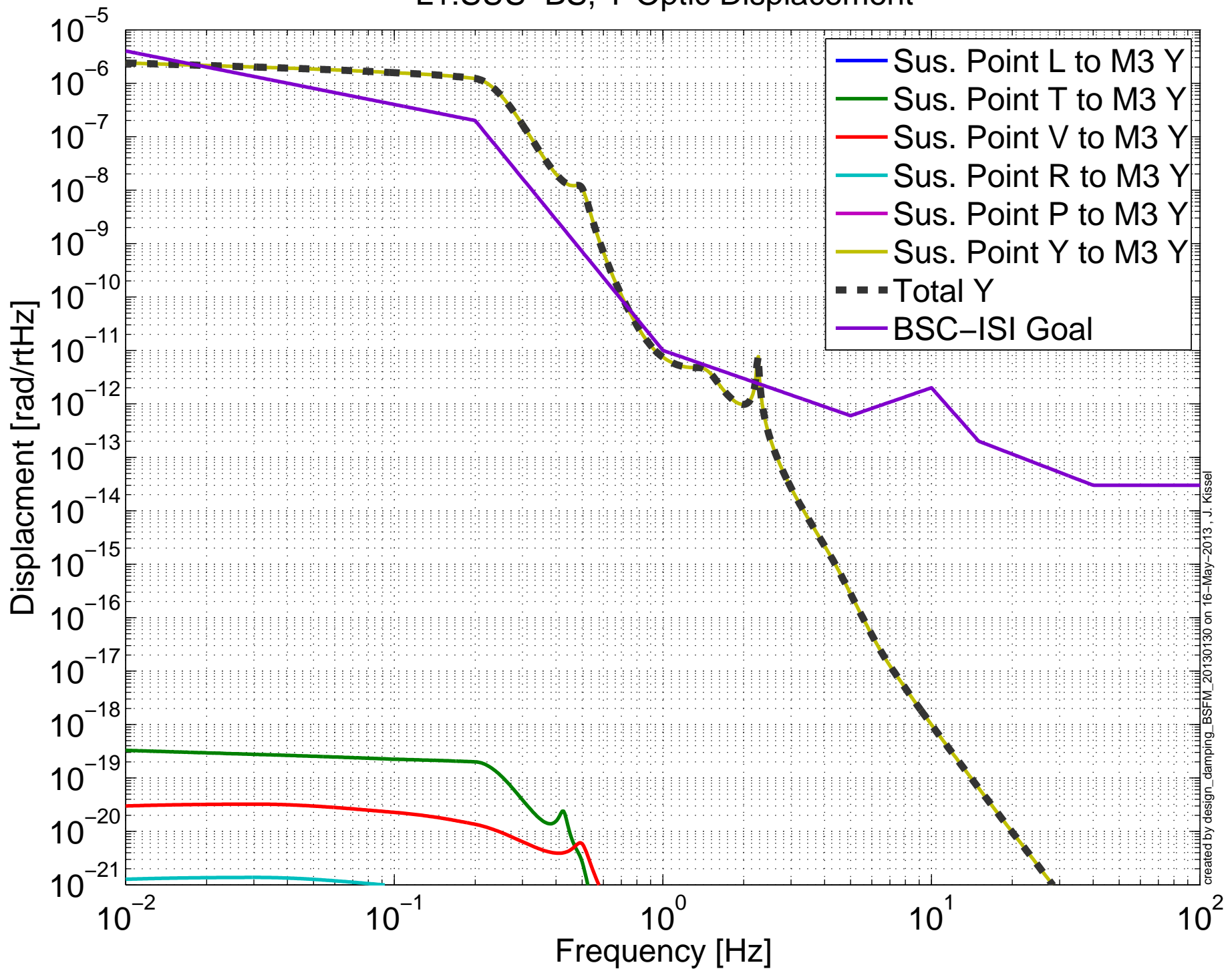
## L1:SUS-BS Y



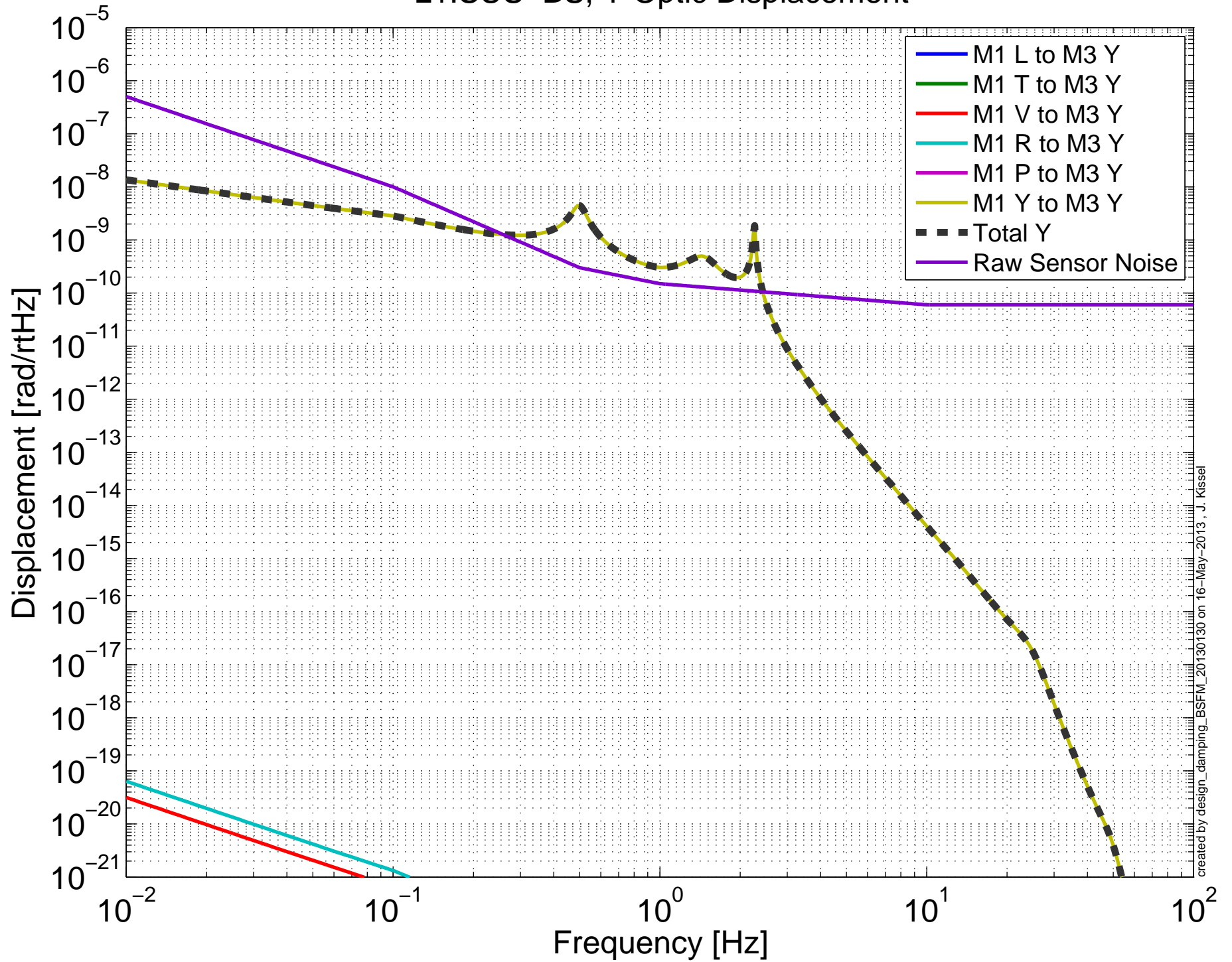
MIMO LUGF Phase Margins (red): [96.8    108    303] [deg]  
MIMO UUGF Phase Margins (blue): [82.5    67    56.7] [deg]



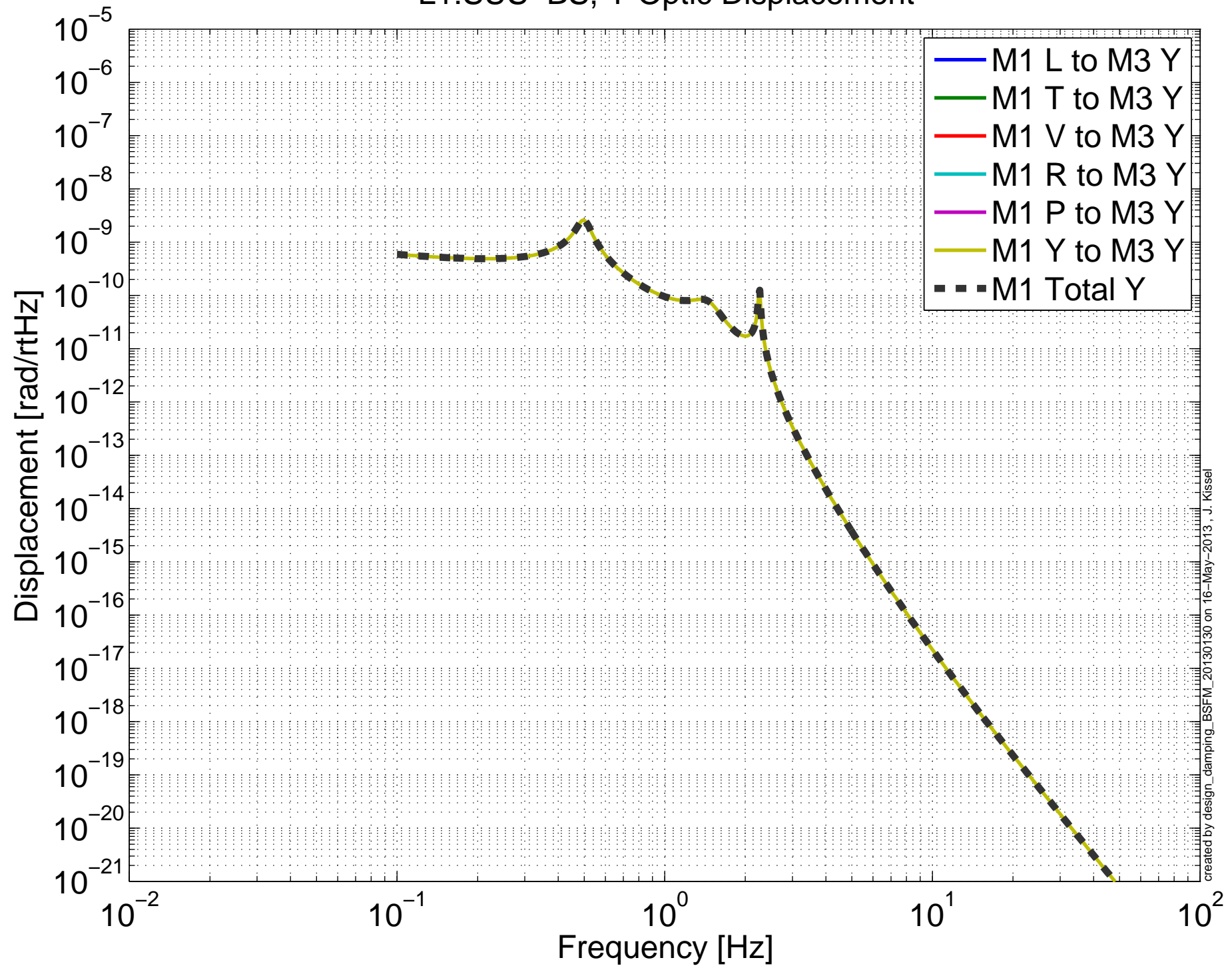
# Projected Sus. Point > Optic Seismic Noise Budget L1:SUS-BS, Y Optic Displacement



# Projected Top Mass Sensor > Optic Noise Budget L1:SUS-BS, Y Optic Displacement

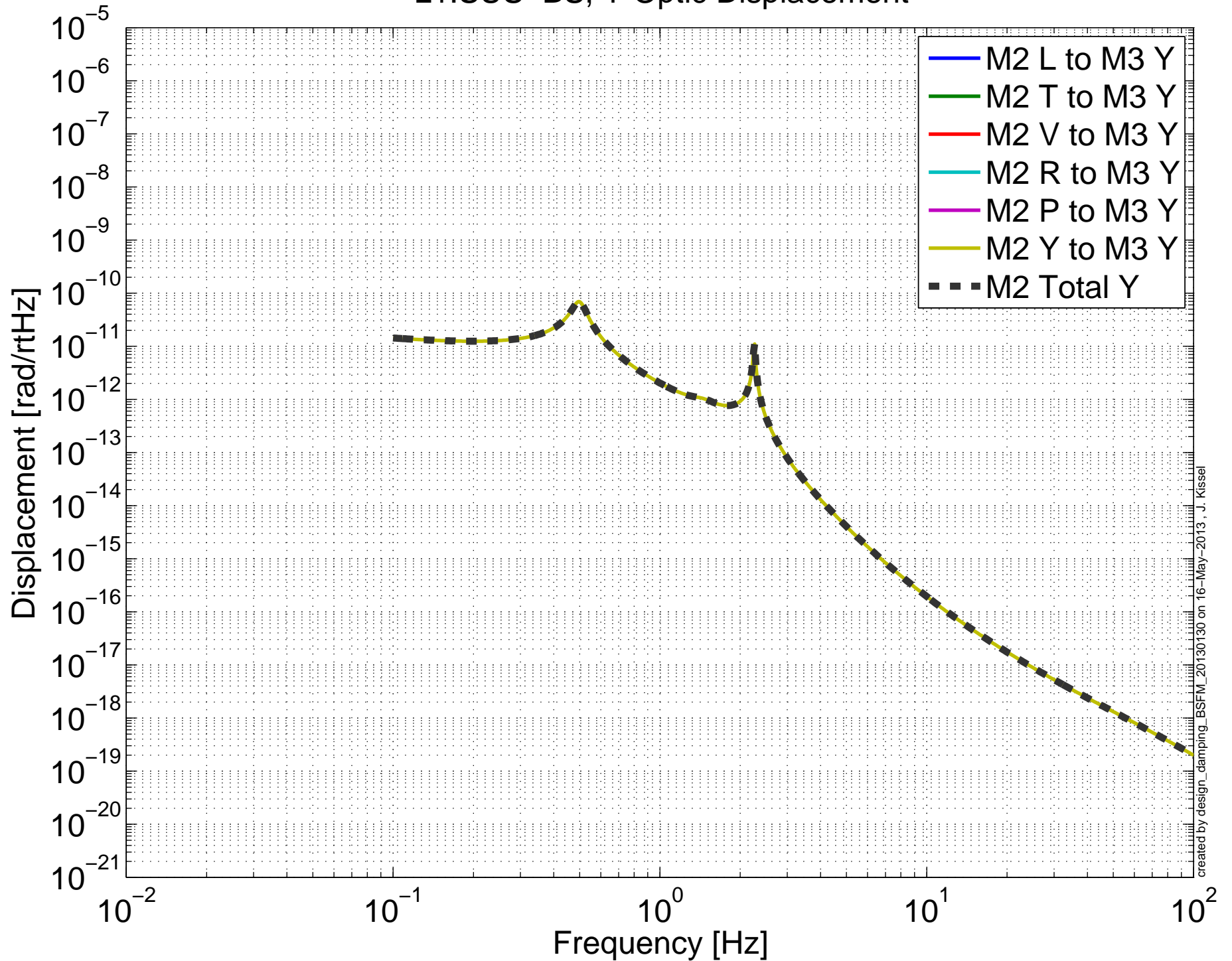


# Projected M1 Mass Actuator > Optic Noise Budget L1:SUS-BS, Y Optic Displacement



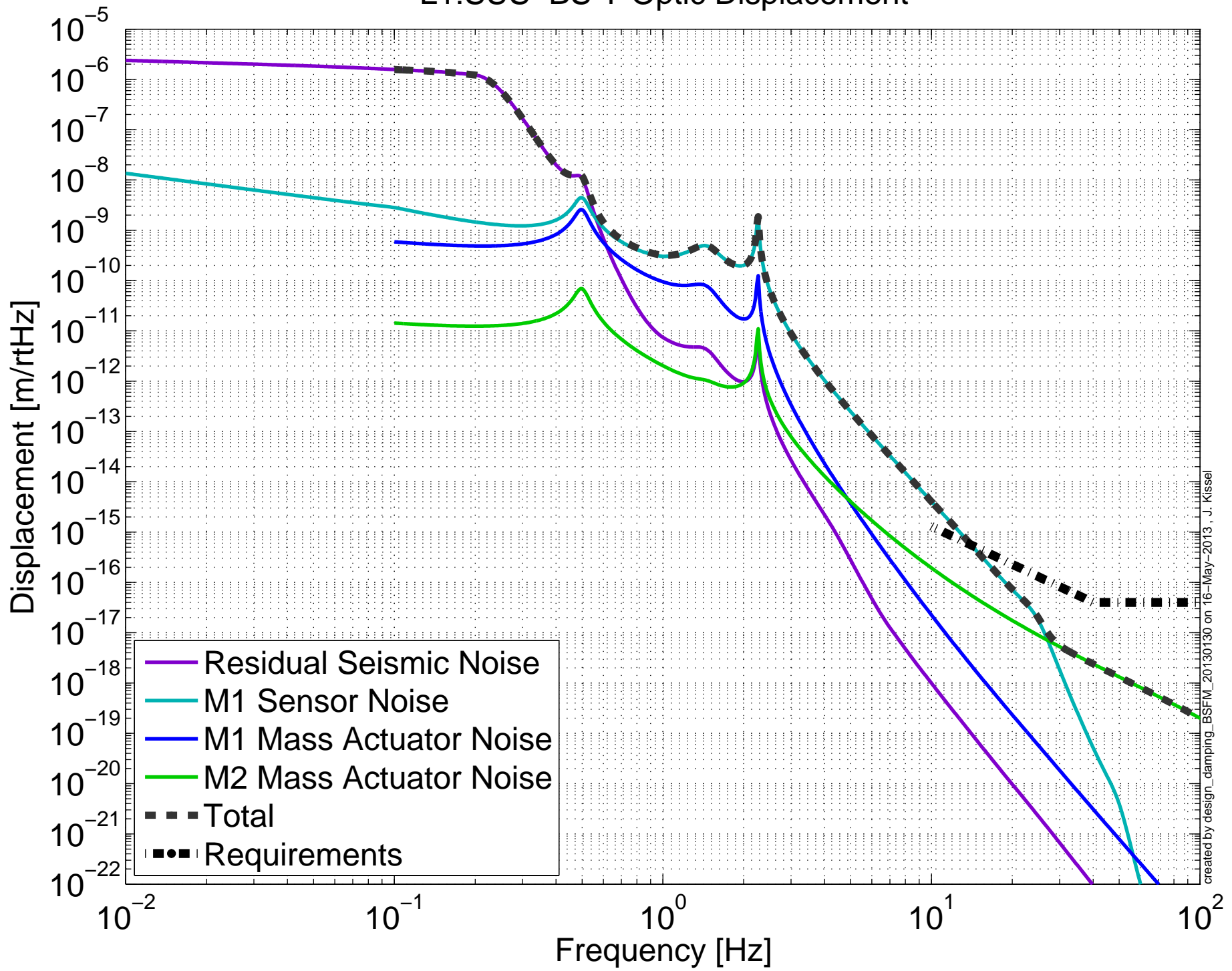
created by design\_damping\_BSFW\_20130130 on 16-May-2013, J. Kiesel

# Projected M2 Mass Actuator > Optic Noise Budget L1:SUS-BS, Y Optic Displacement



created by design\_damping\_BSFW\_20130130 on 16-May-2013, J. Kiesel

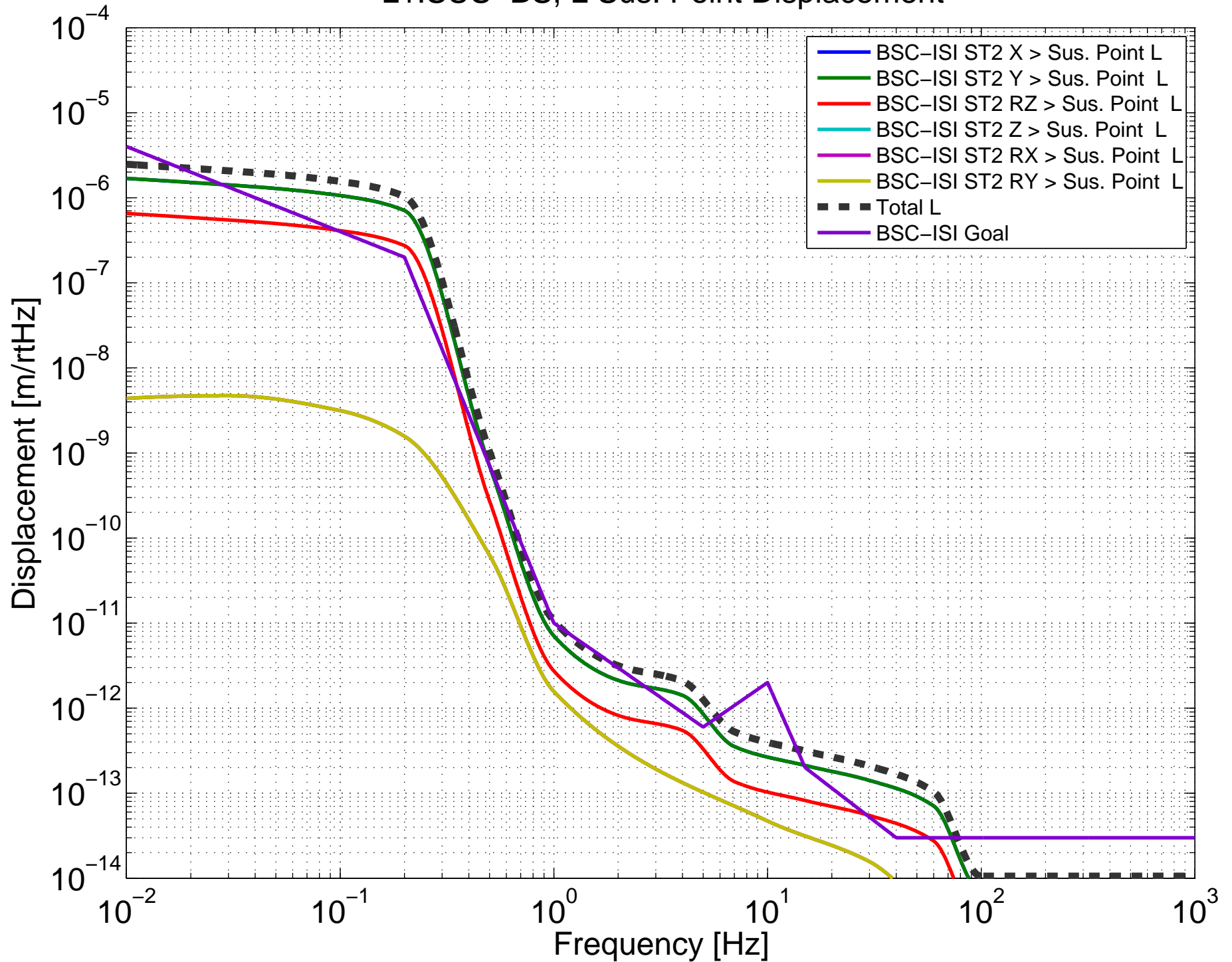
# Damping Loop Performance L1:SUS-BS Y Optic Displacement



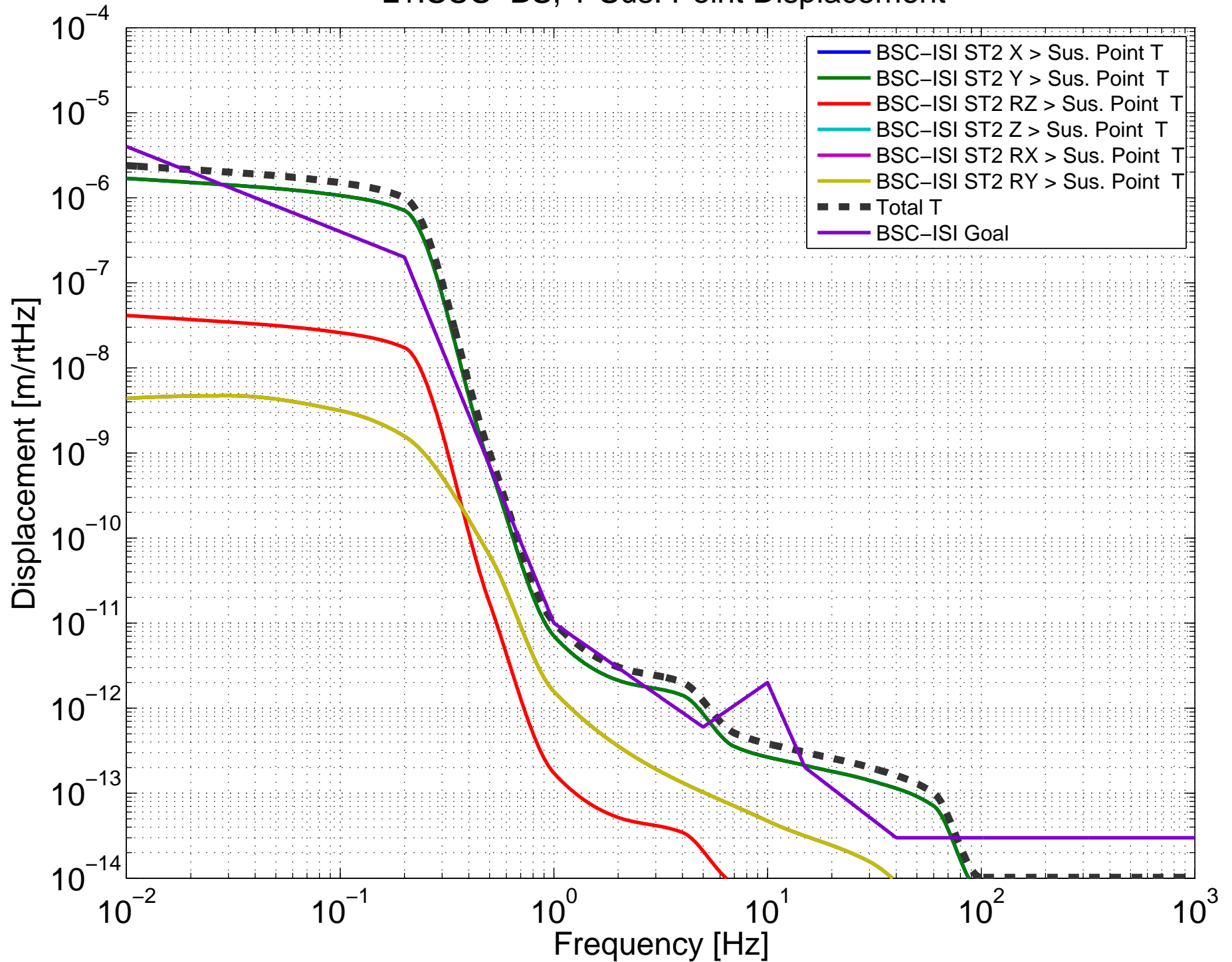
created by design\_damping\_BSFM\_20130130 on 16-May-2013, J. Kissel



# Projected ISI Seismic Noise Budget L1:SUS-BS, L Sus. Point Displacement

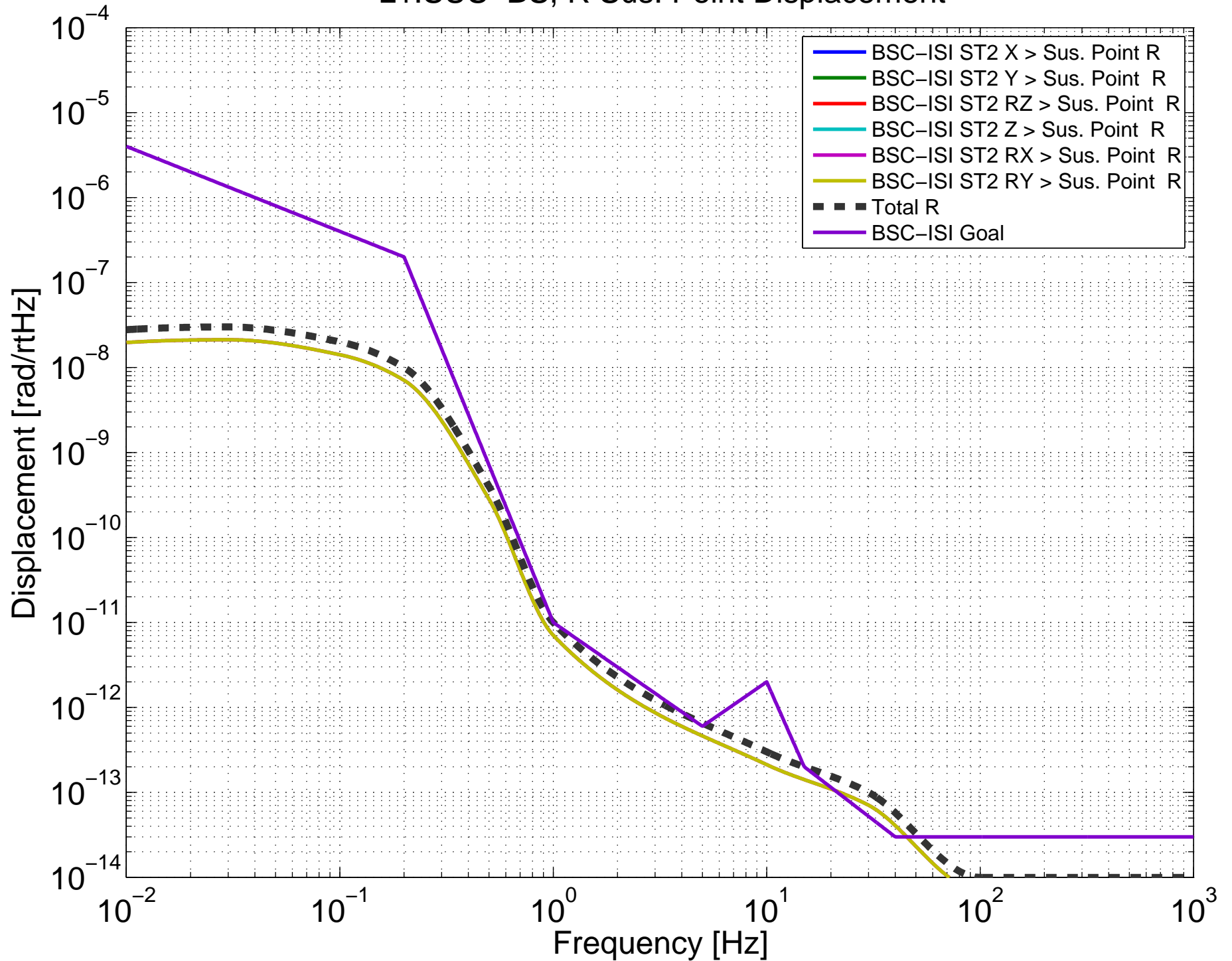


# Projected ISI Seismic Noise Budget L1:SUS-BS, T Sus. Point Displacement





# Projected ISI Seismic Noise Budget L1:SUS-BS, R Sus. Point Displacement



# Projected ISI Seismic Noise Budget L1:SUS-BS, P Sus. Point Displacement

