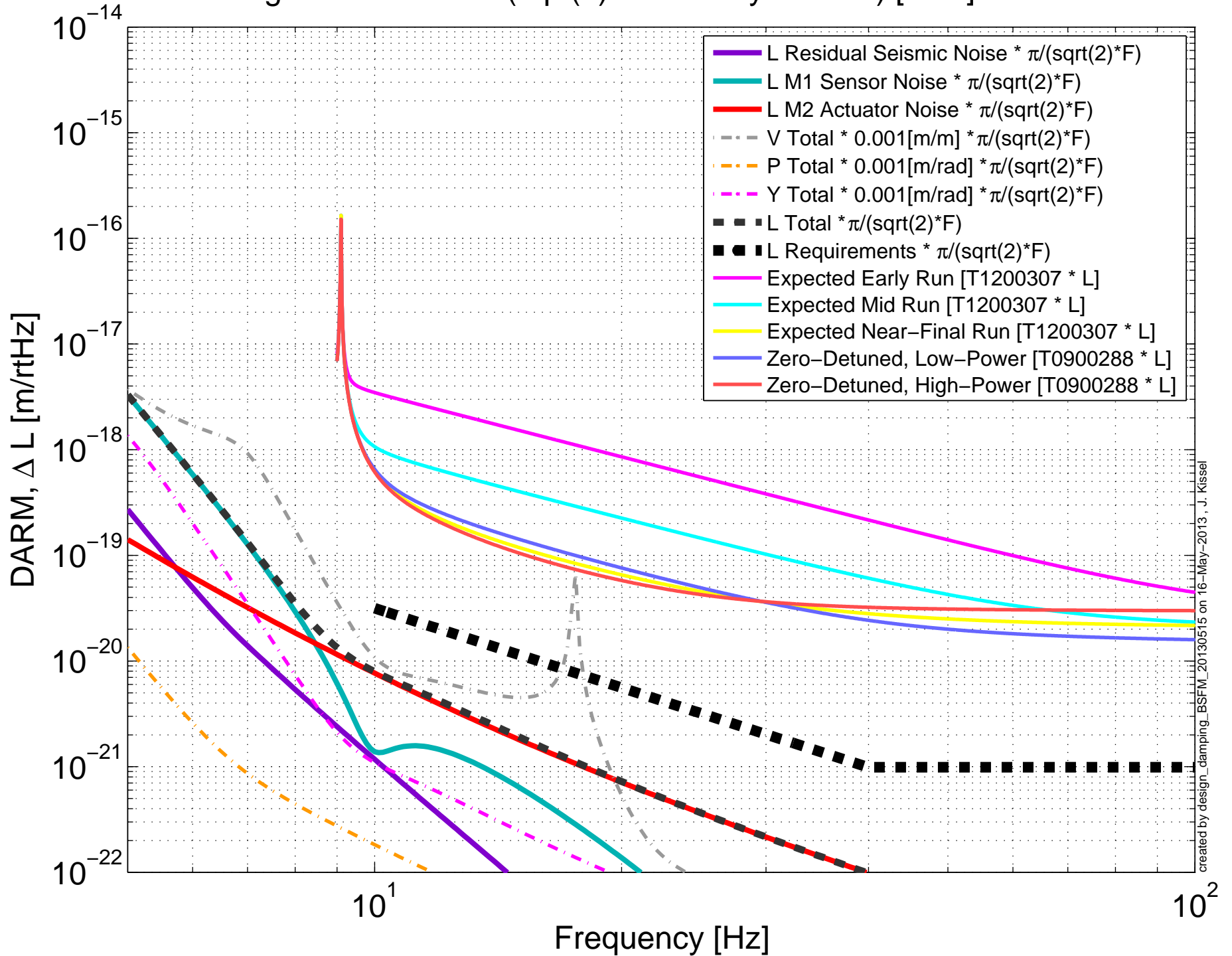


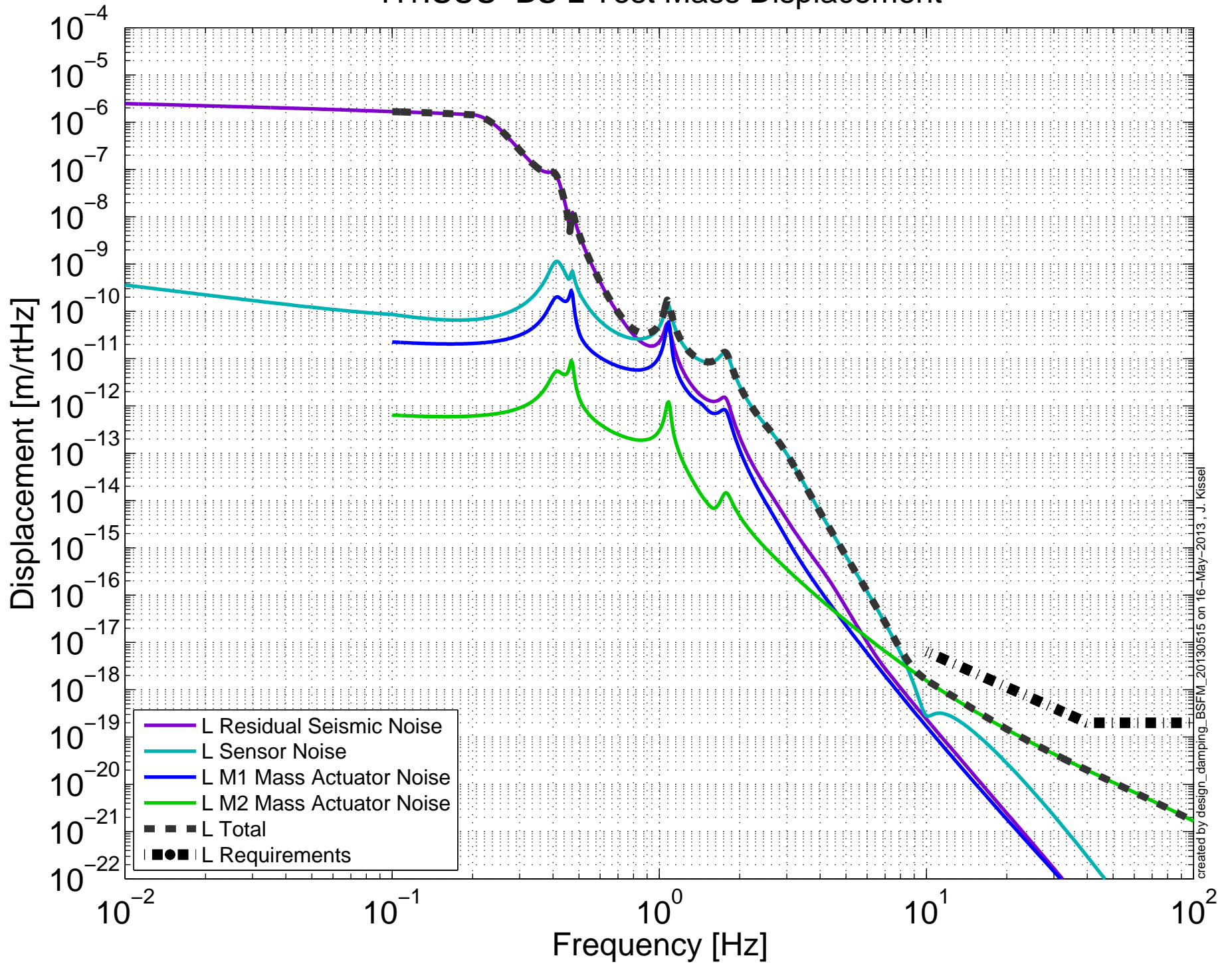
# Damping Loop Performance, Differential Arm Displacement

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

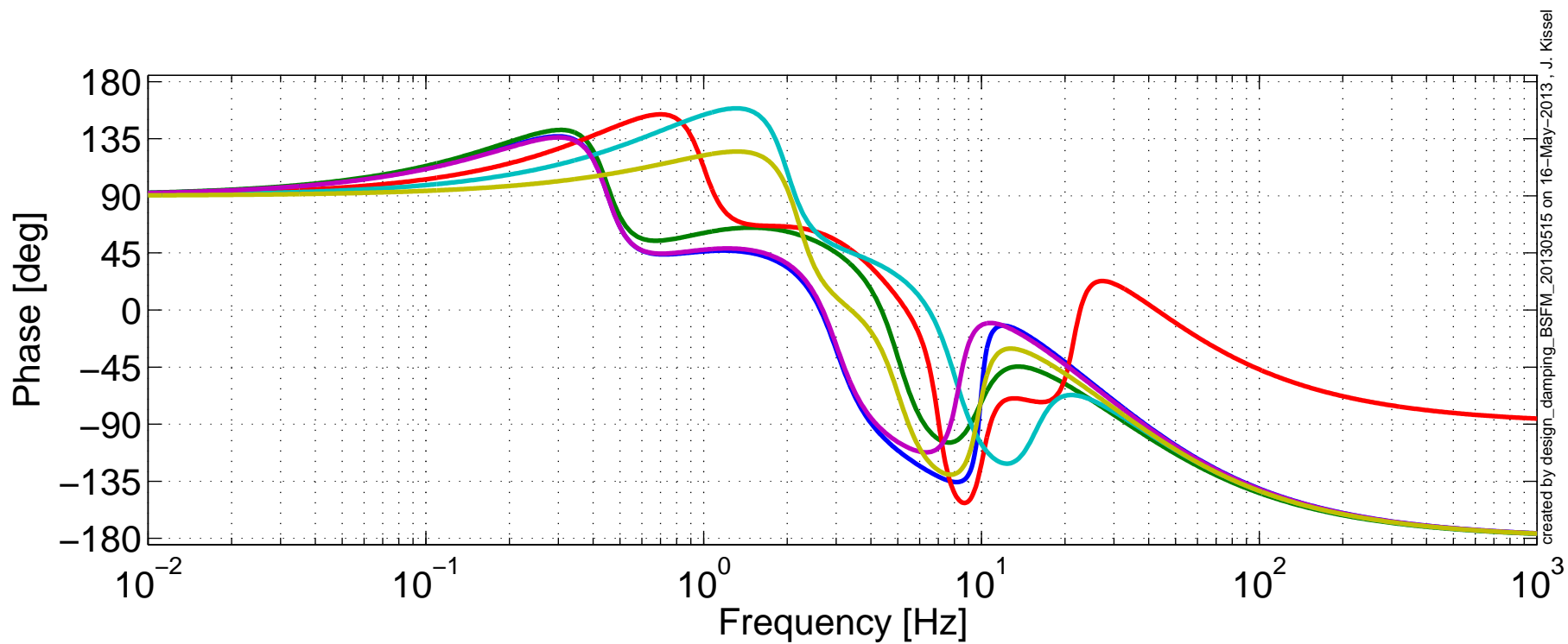
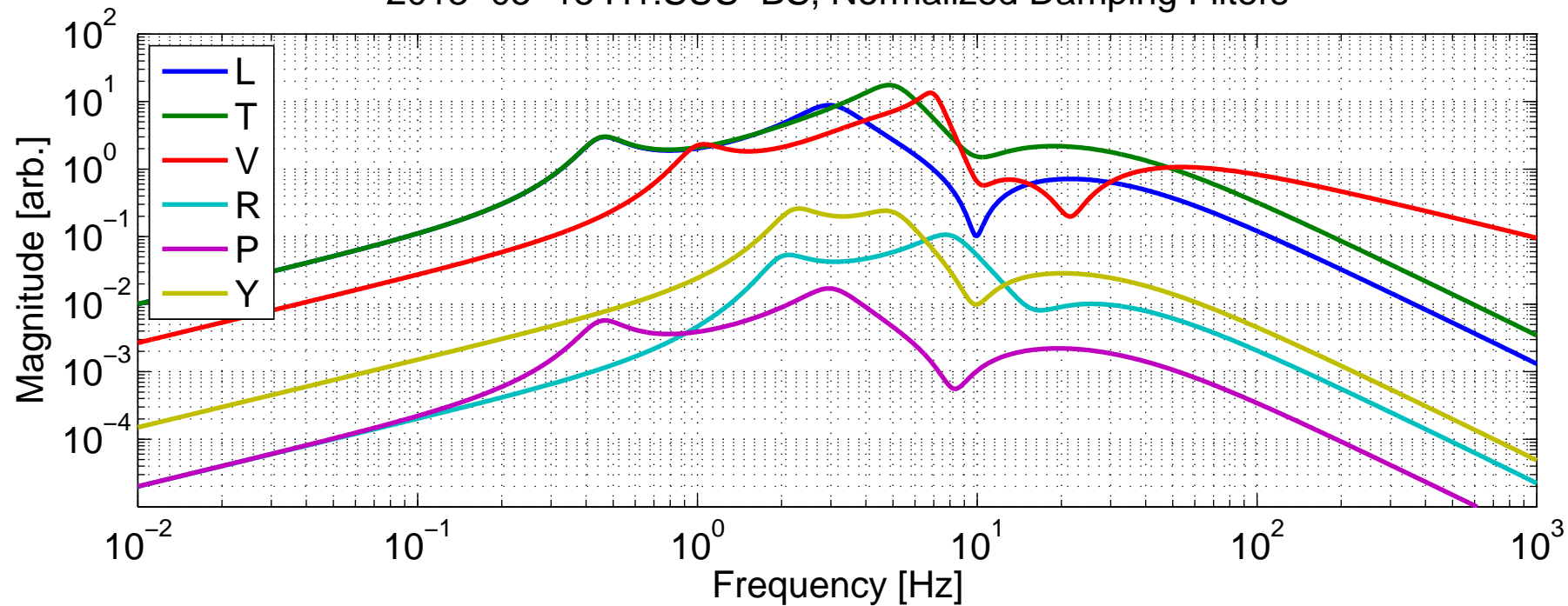


# Damping Loop Performance

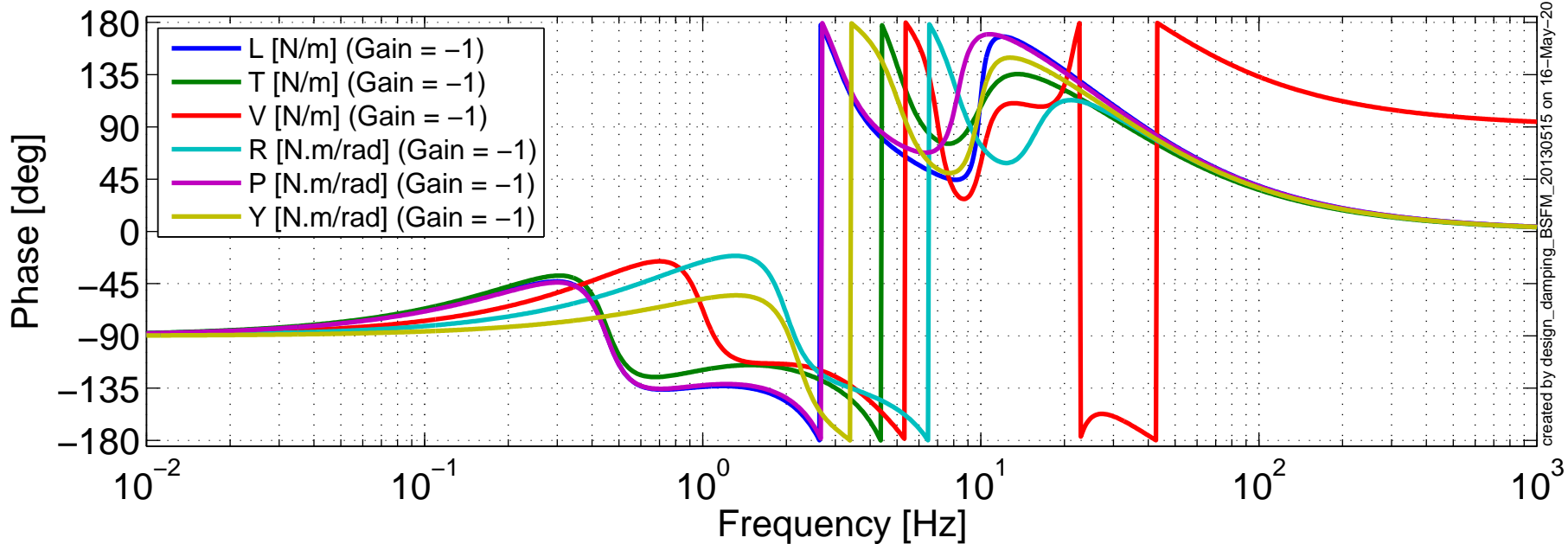
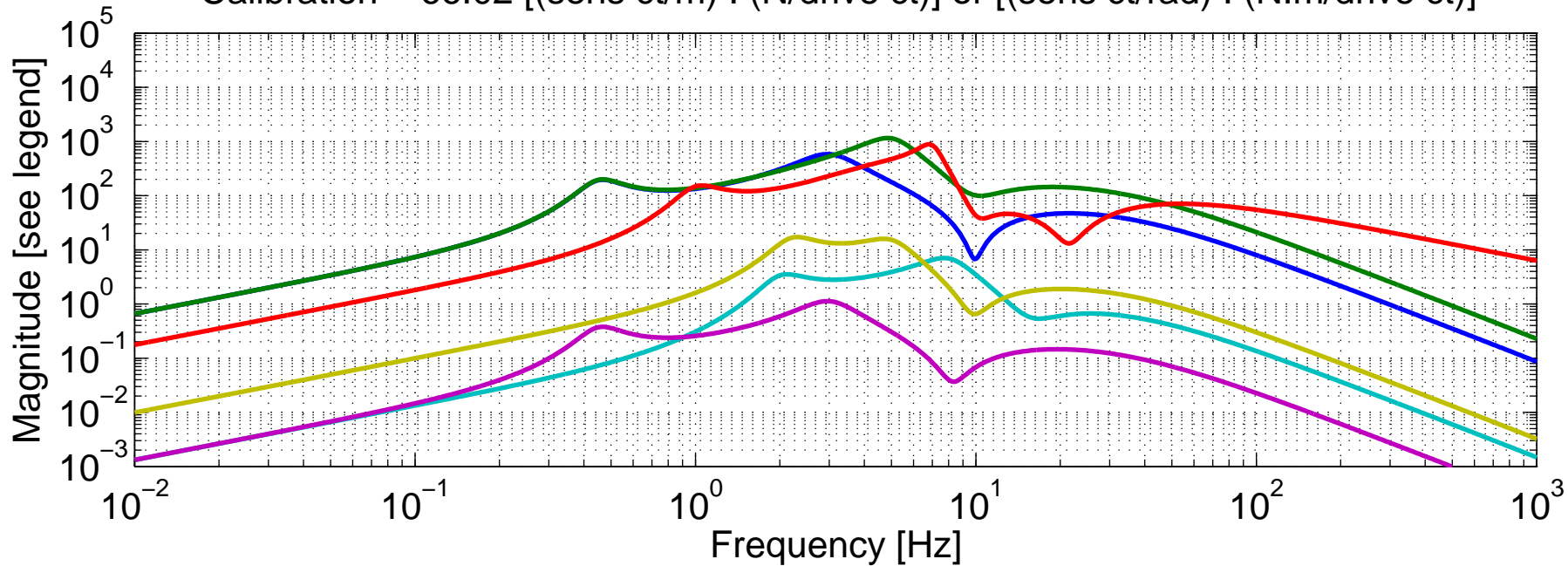
## H1:SUS-BS L Test Mass Displacement



# 2013-05-15 H1:SUS-BS, Normalized Damping Filters

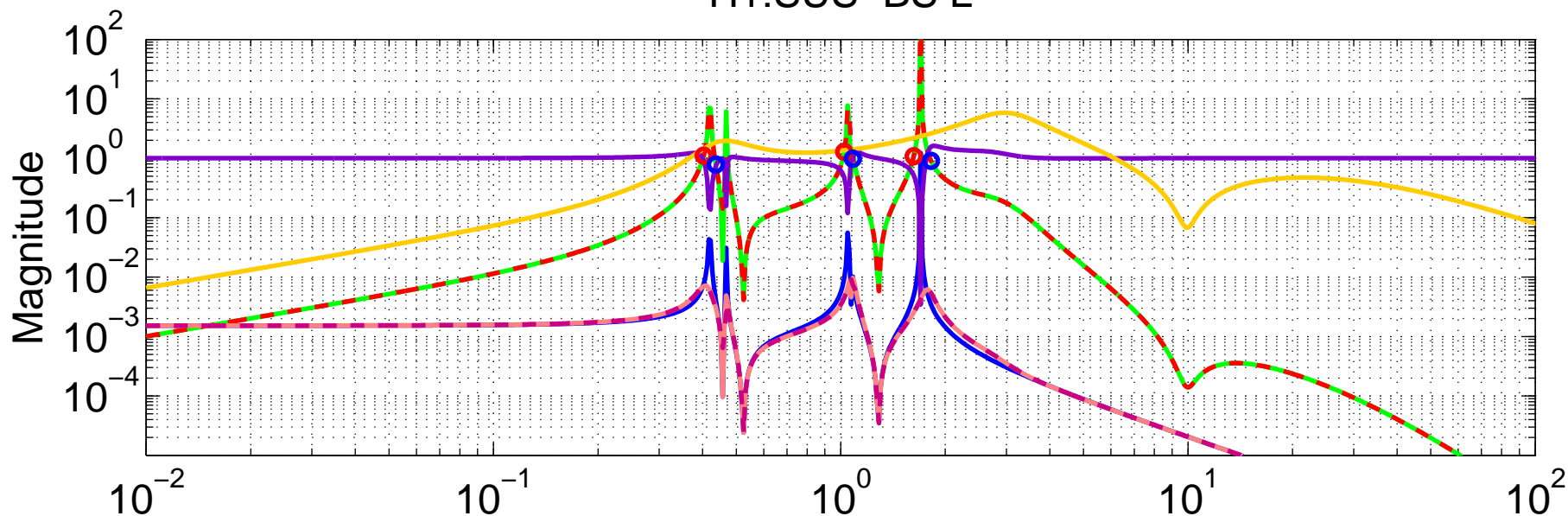


2013-05-15 H1:SUS-BS, Calibrated Damping Filters  
 Calibration = 66.02 [(sens ct/m) . (N/drive ct)] or [(sens ct/rad) . (N.m/drive ct)]

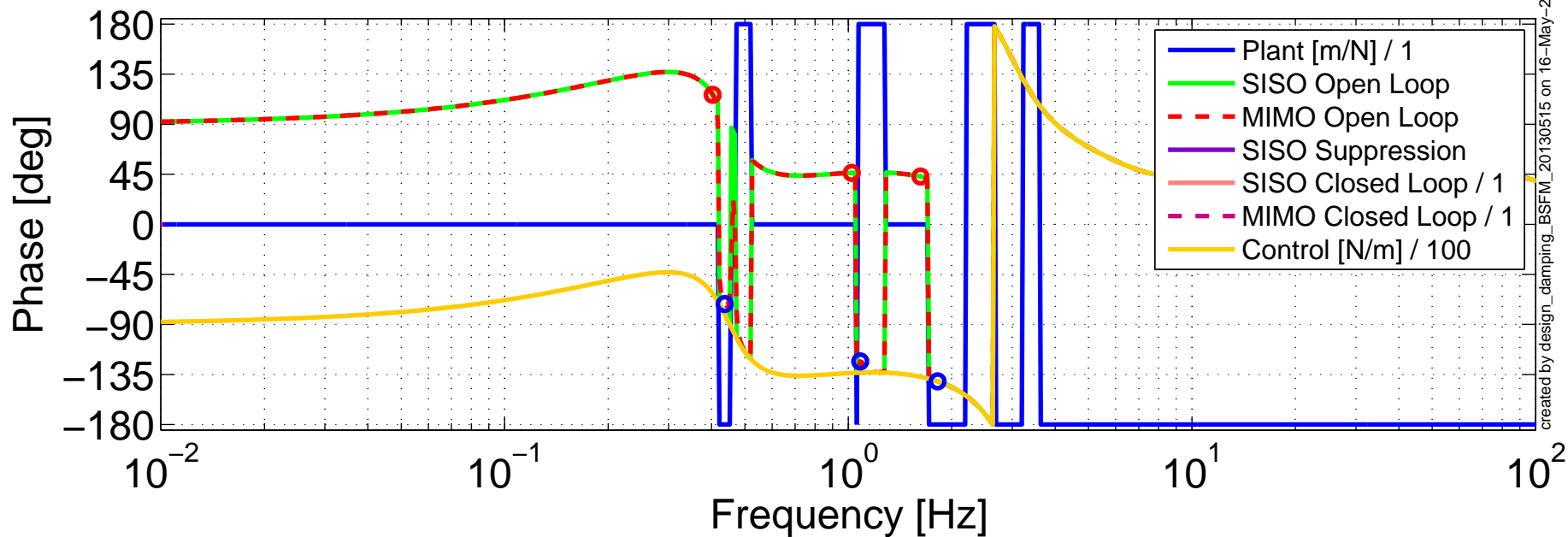


# Damping Loop Design

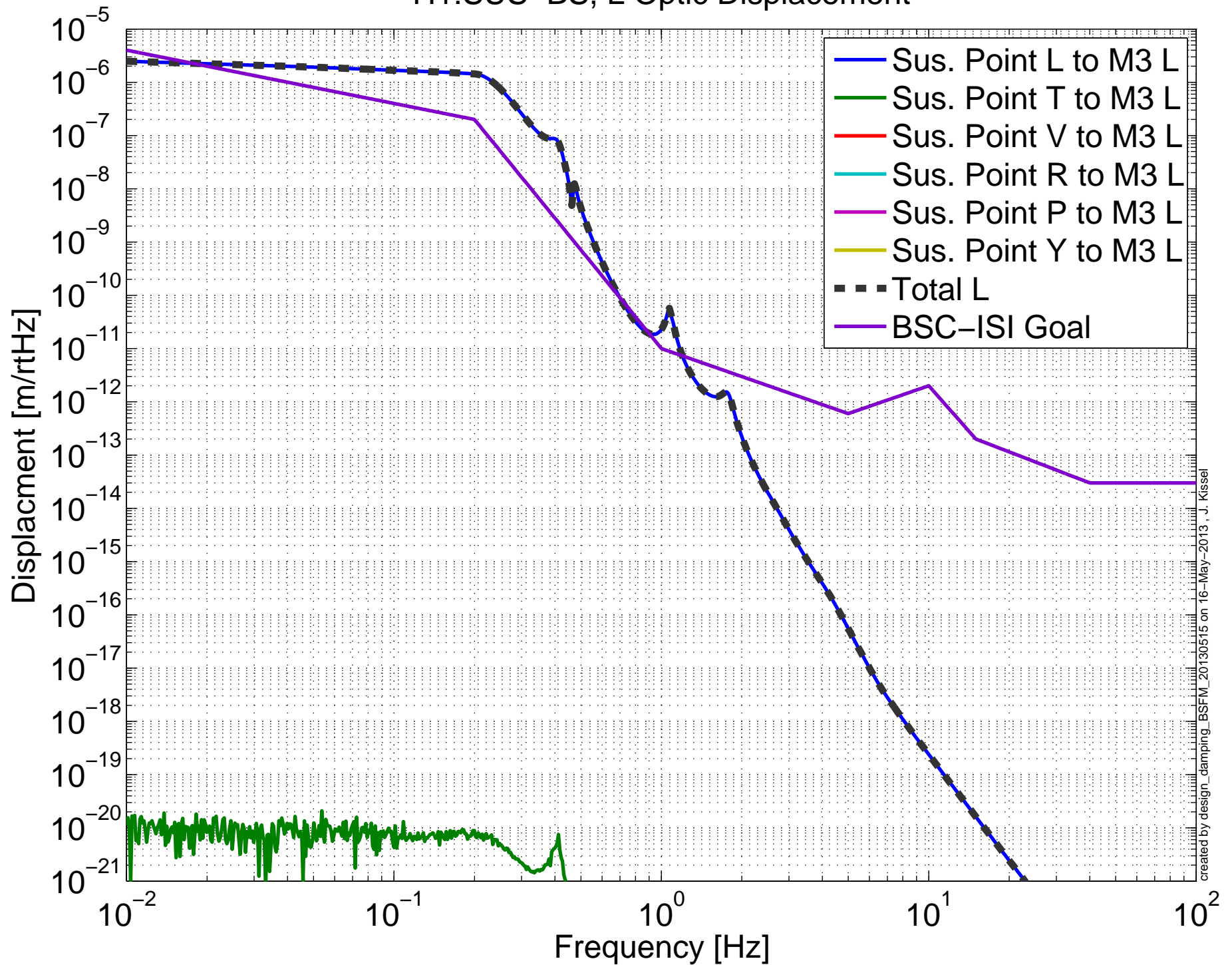
## H1:SUS-BS L



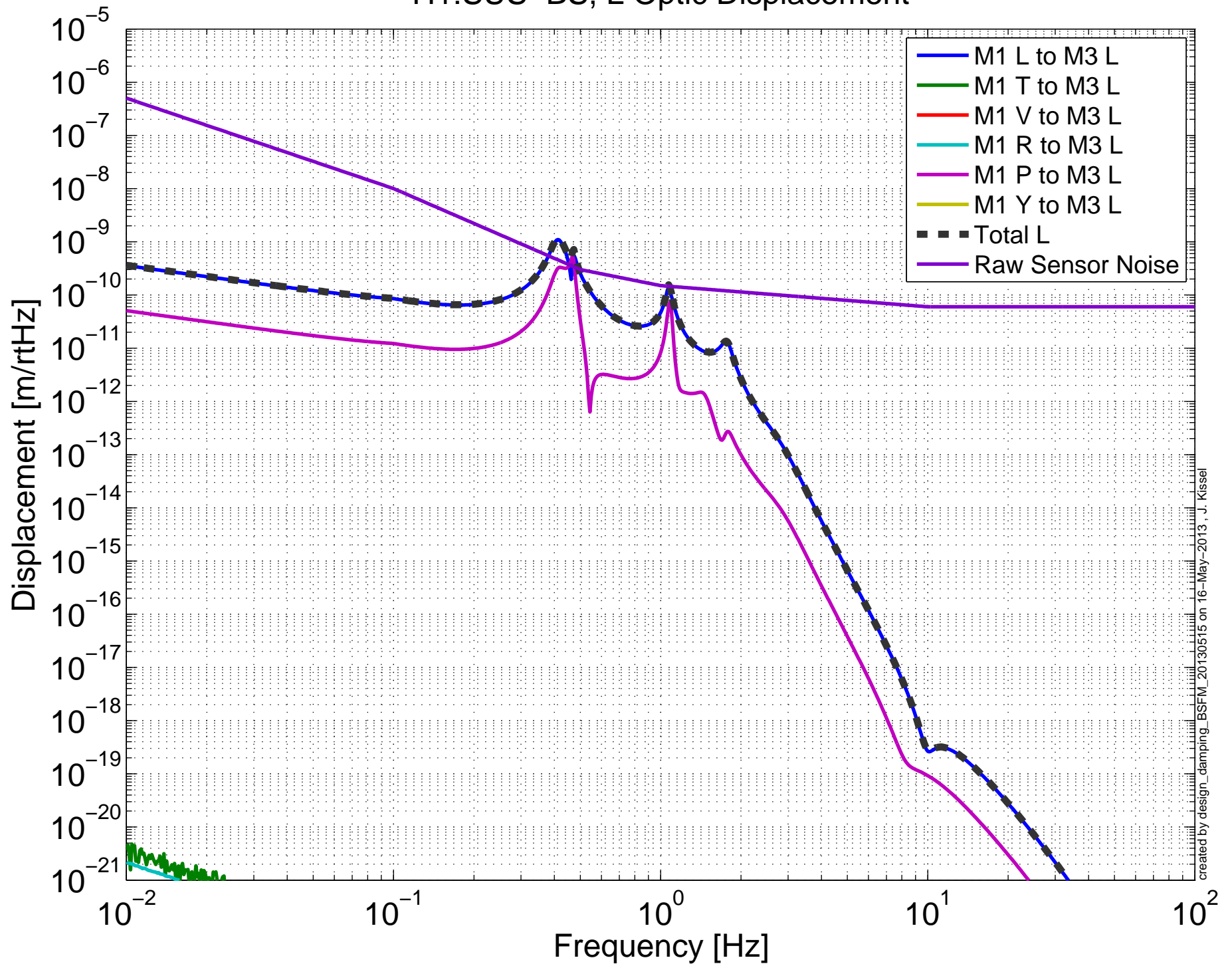
MIMO LUGF Phase Margins (red): [63.6    134    137] [deg]  
MIMO UUGF Phase Margins (blue): [108    56.7    38.8] [deg]



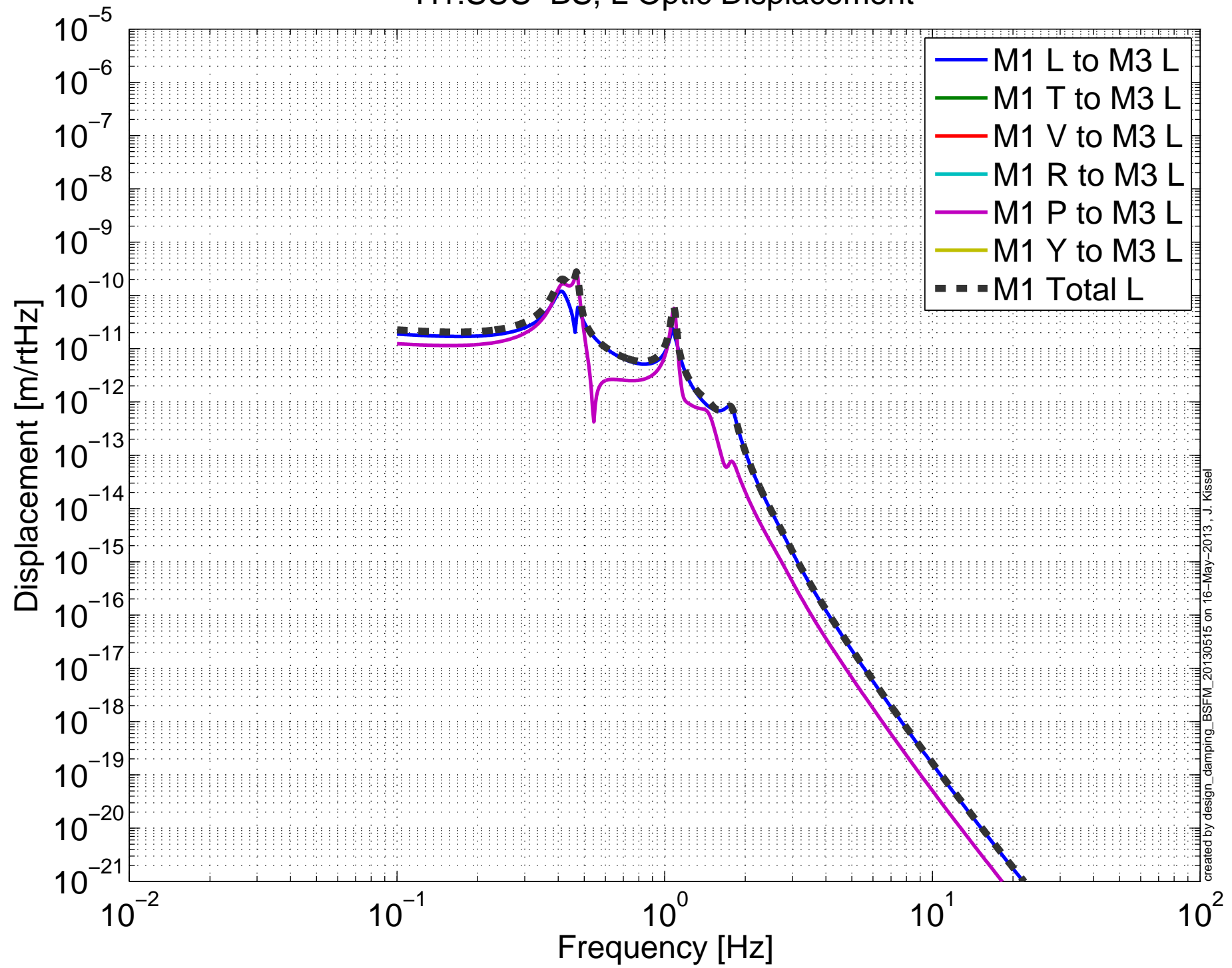
Projected Sus. Point > Optic Seismic Noise Budget  
H1:SUS-BS, L Optic Displacement



# Projected Top Mass Sensor > Optic Noise Budget H1:SUS-BS, L Optic Displacement



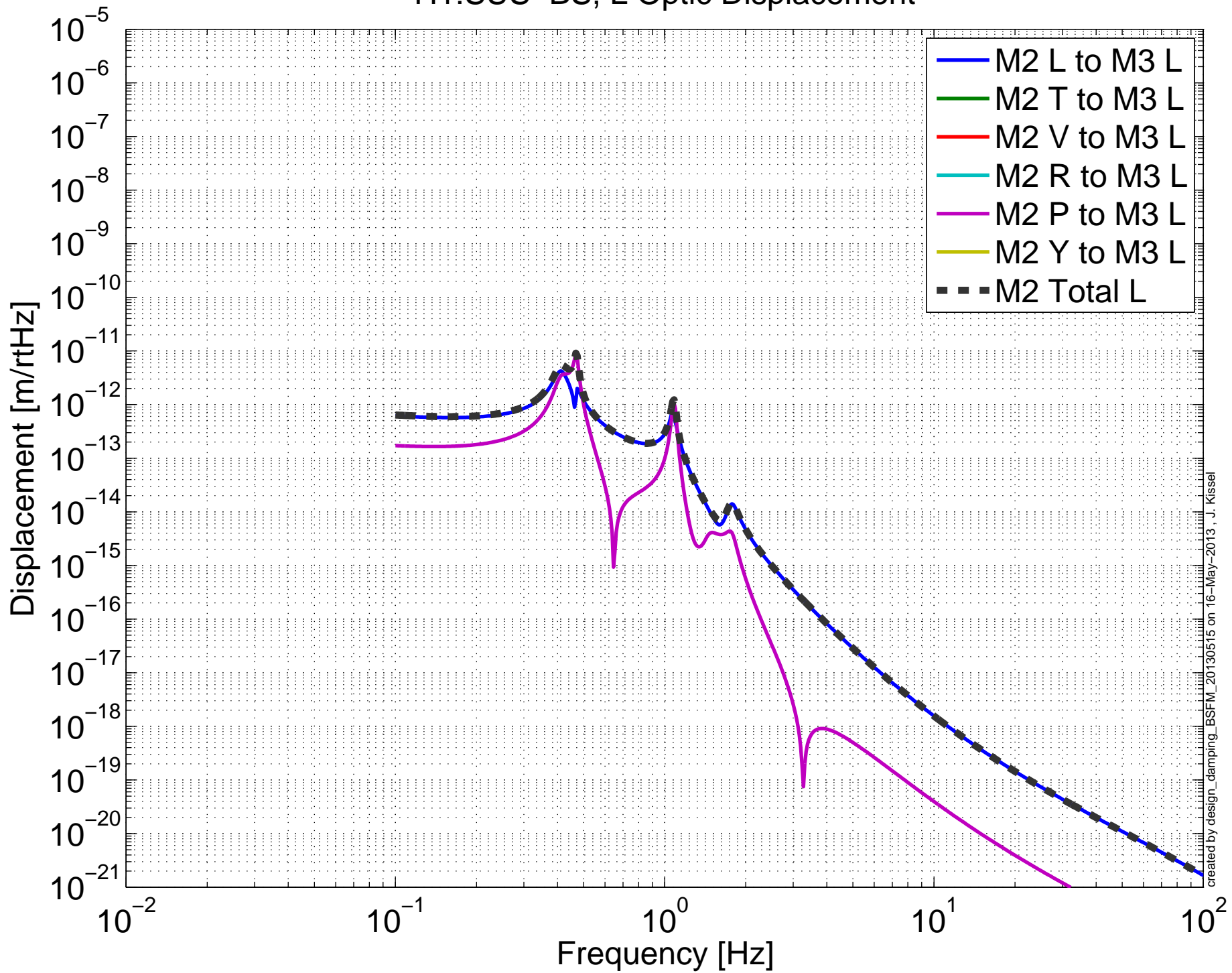
# Projected M1 Mass Actuator > Optic Noise Budget H1:SUS-BS, L Optic Displacement



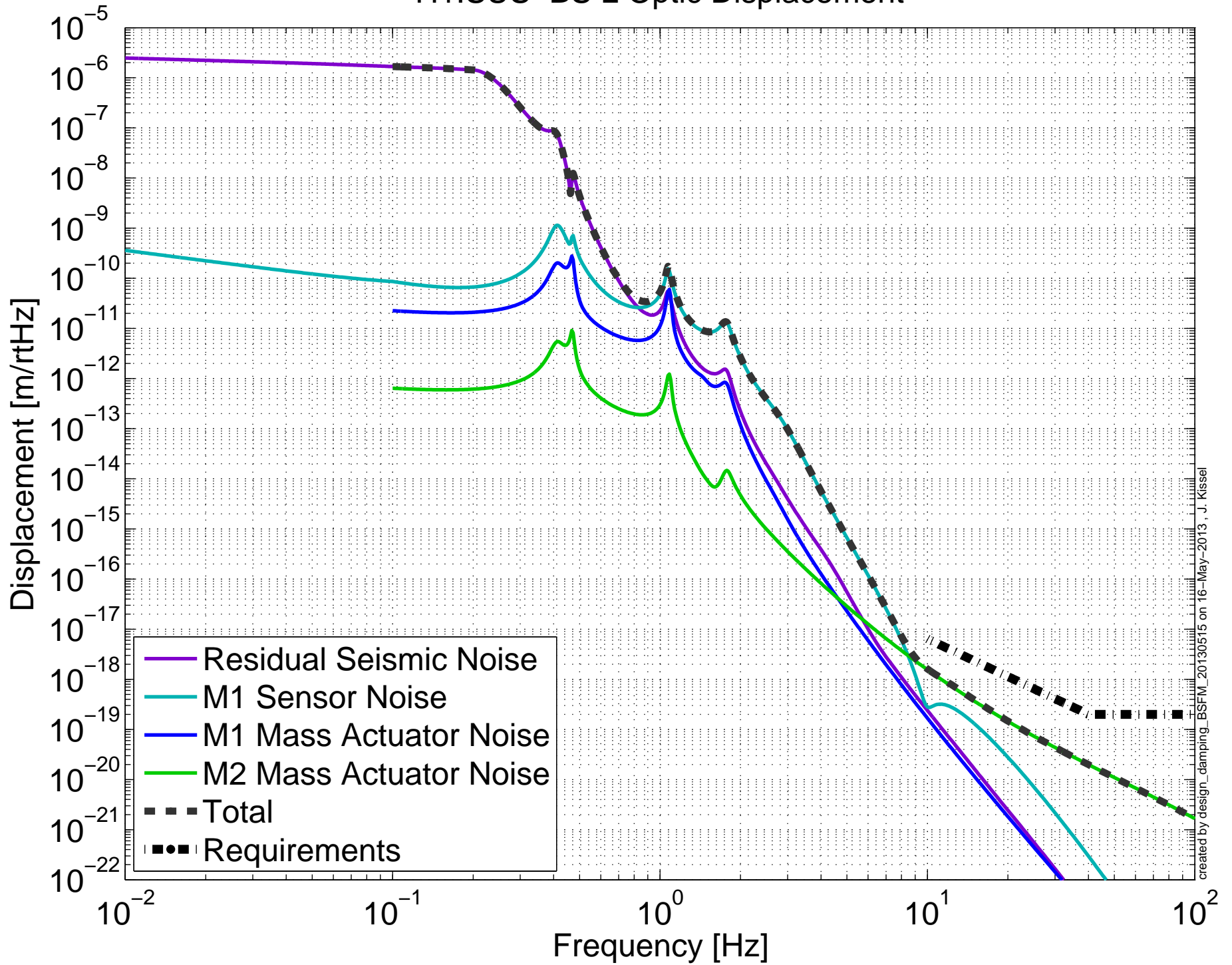
created by design\_damping\_BSFW\_20130515 on 16-May-2013, J. Kissel



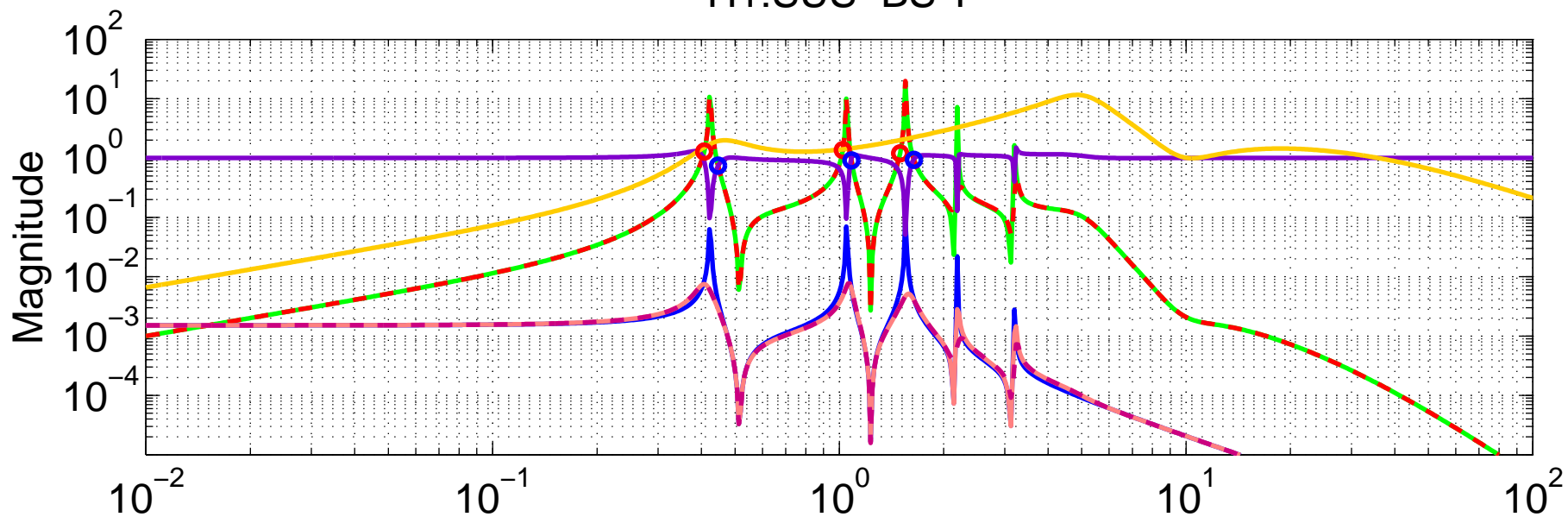
# Projected M2 Mass Actuator > Optic Noise Budget H1:SUS-BS, L Optic Displacement



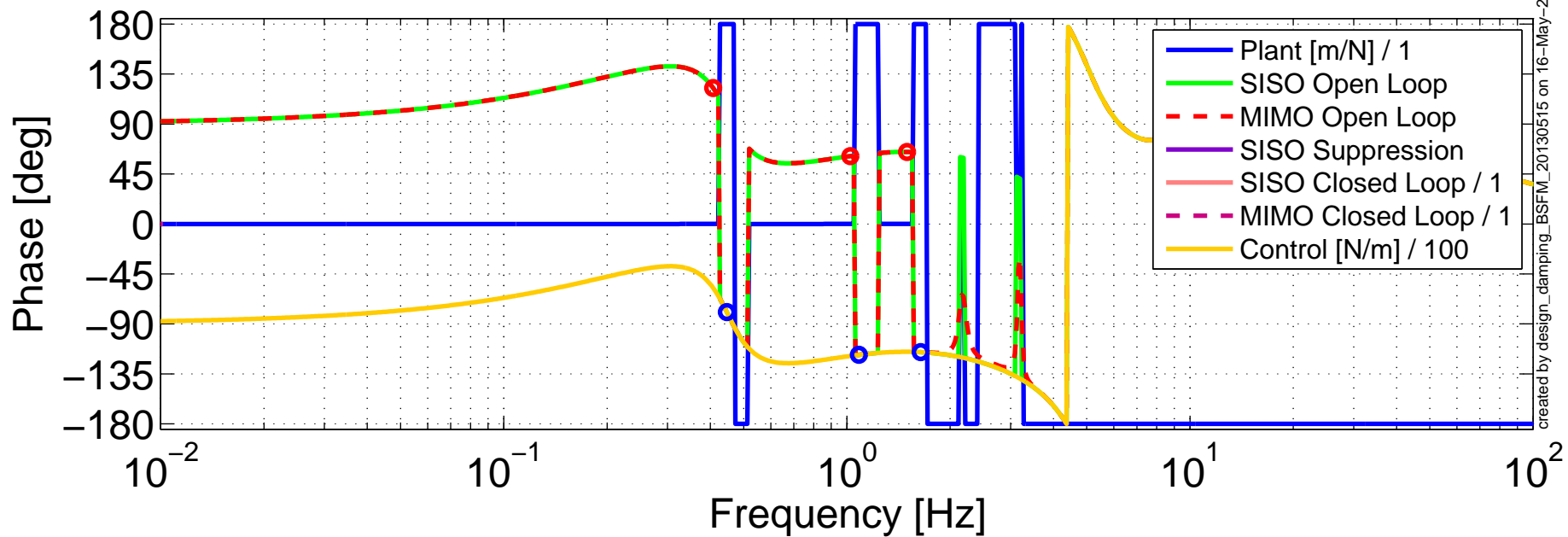
# Damping Loop Performance H1:SUS-BS L Optic Displacement



# Damping Loop Design H1:SUS-BS T

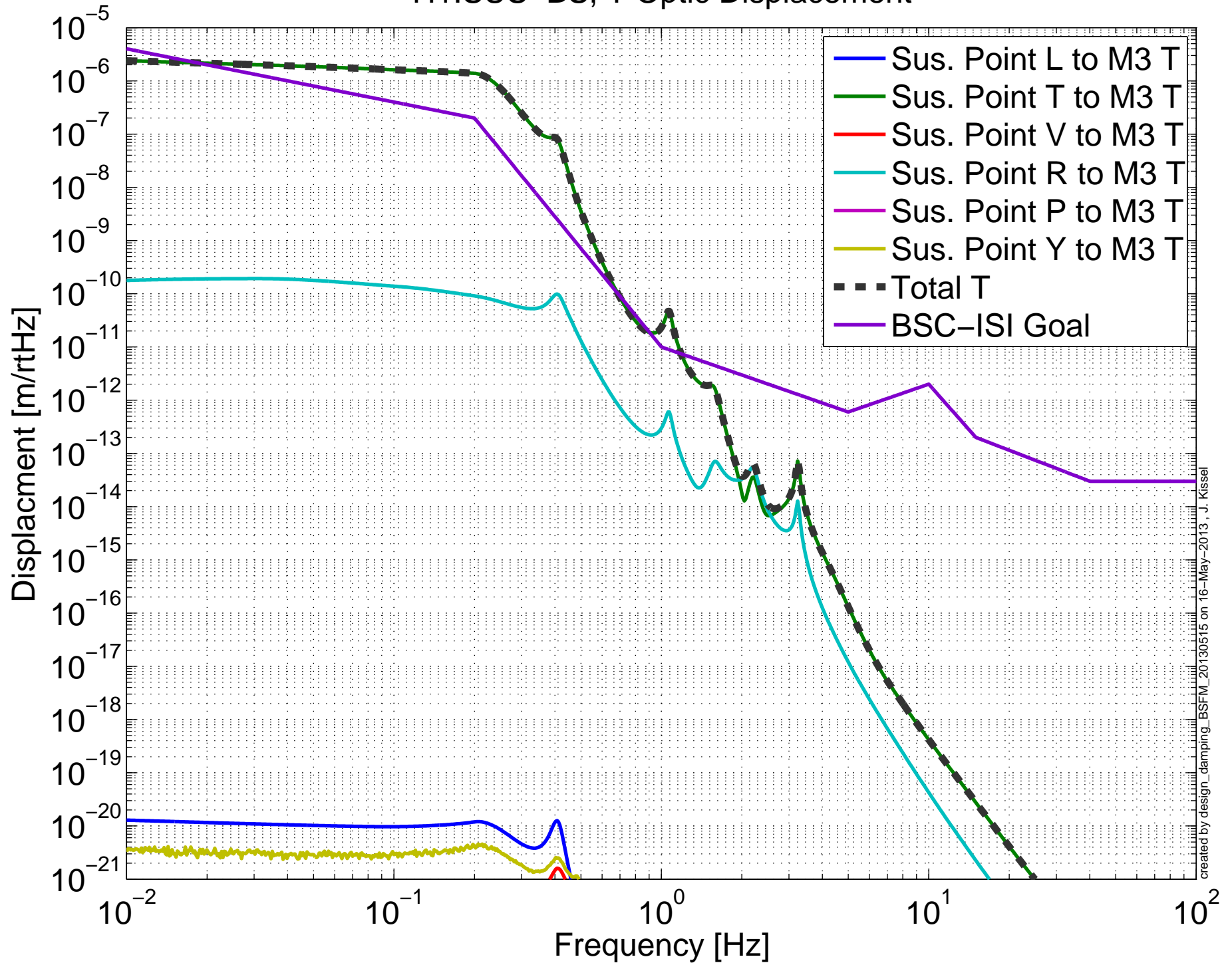


MIMO LUGF Phase Margins (red): [57.6    119    115] [deg]  
MIMO UUGF Phase Margins (blue): [101    62.2    64.7] [deg]

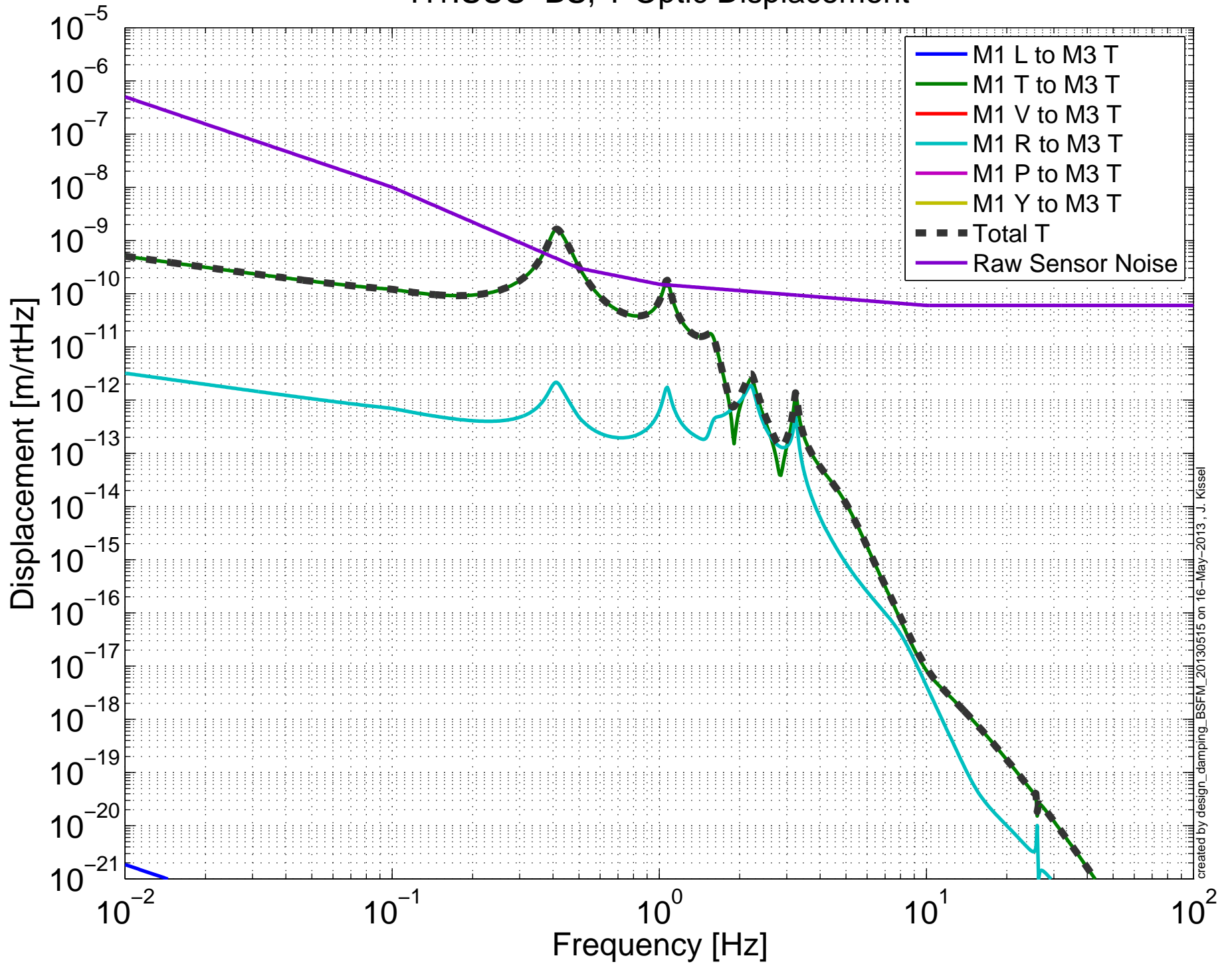


- Plant [m/N] / 1
- SISO Open Loop
- - - MIMO Open Loop
- SISO Suppression
- SISO Closed Loop / 1
- - - MIMO Closed Loop / 1
- Control [N/m] / 100

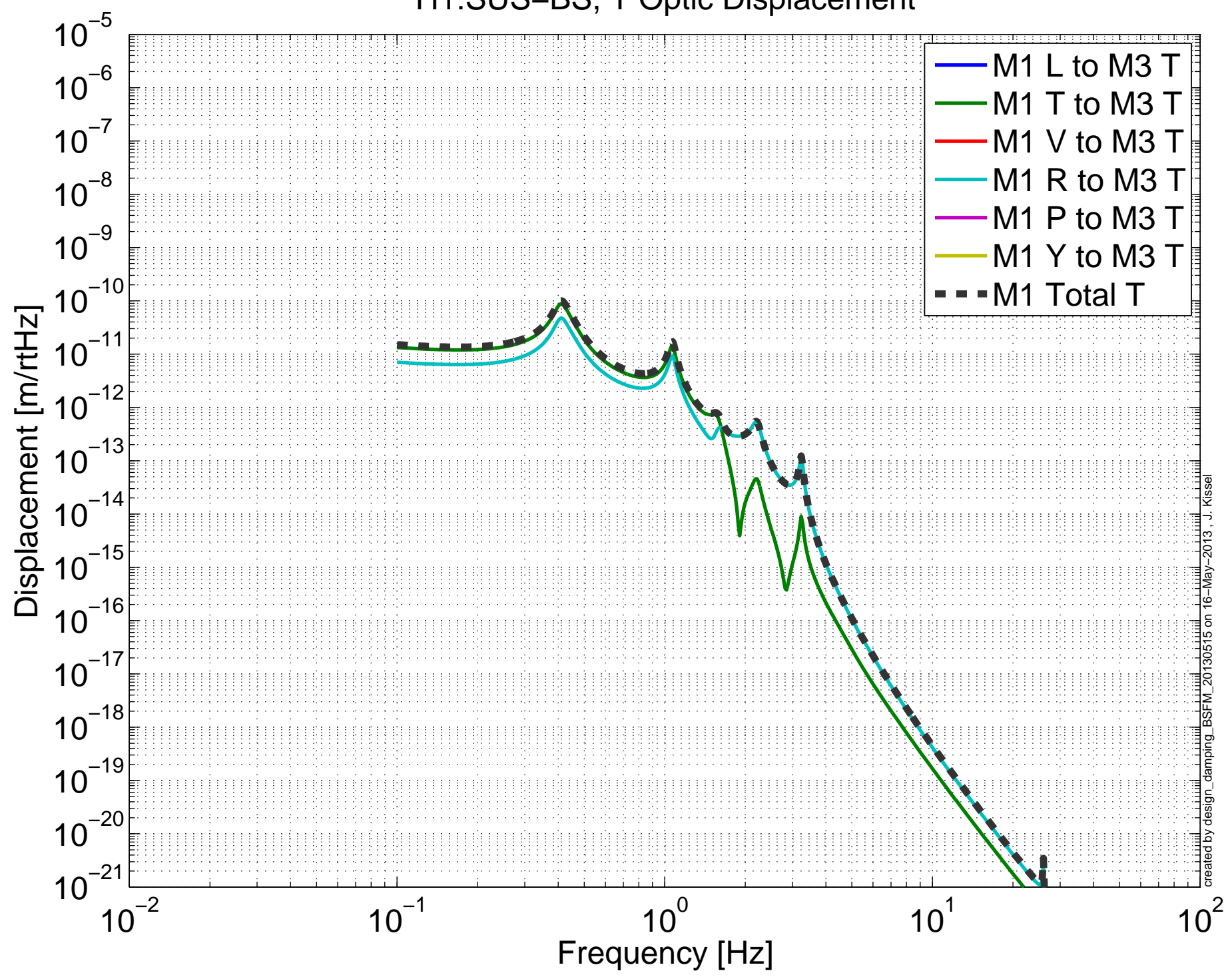
# Projected Sus. Point > Optic Seismic Noise Budget H1:SUS-BS, T Optic Displacement



# Projected Top Mass Sensor > Optic Noise Budget H1:SUS-BS, T Optic Displacement

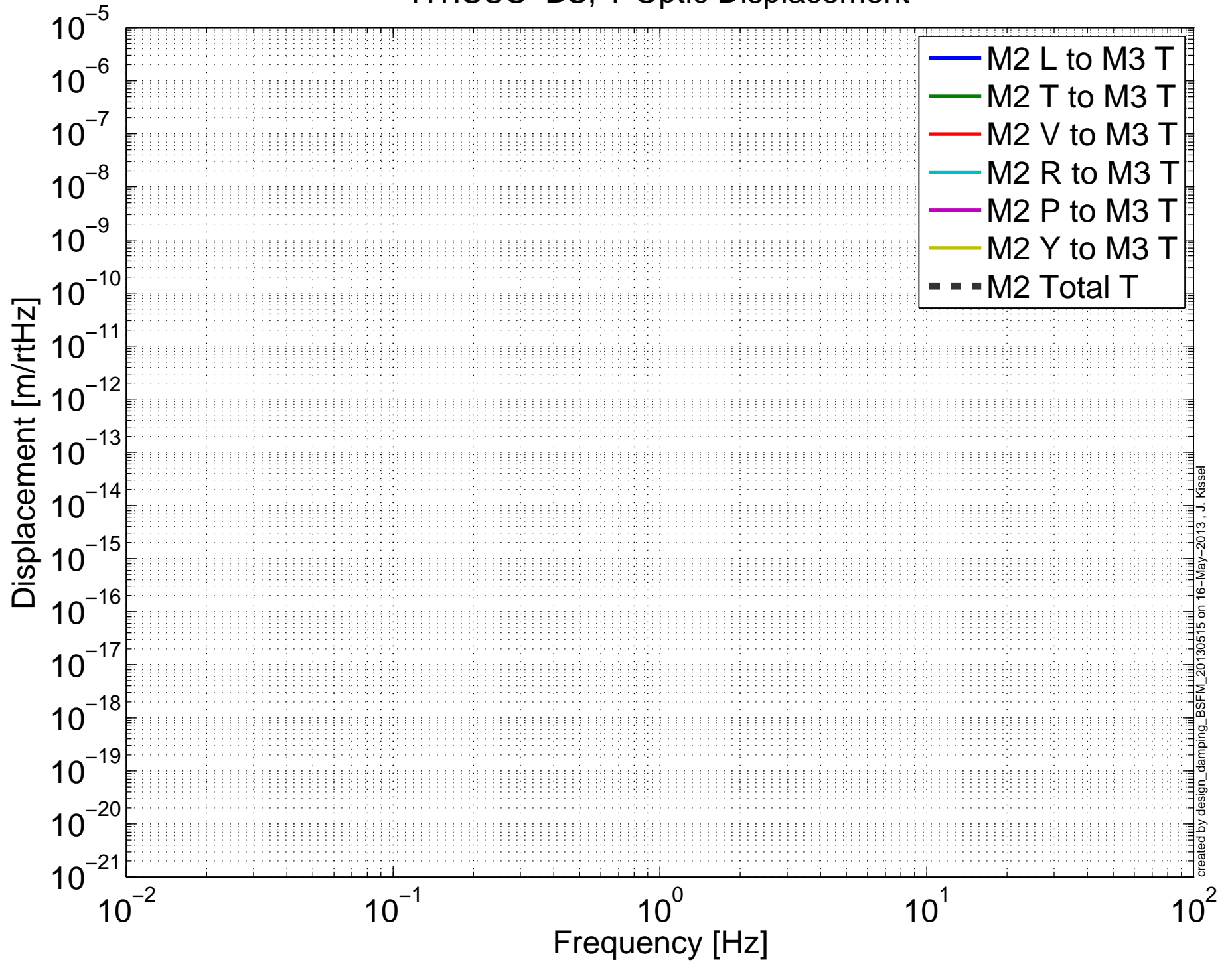


# Projected M1 Mass Actuator > Optic Noise Budget H1:SUS-BS, T Optic Displacement



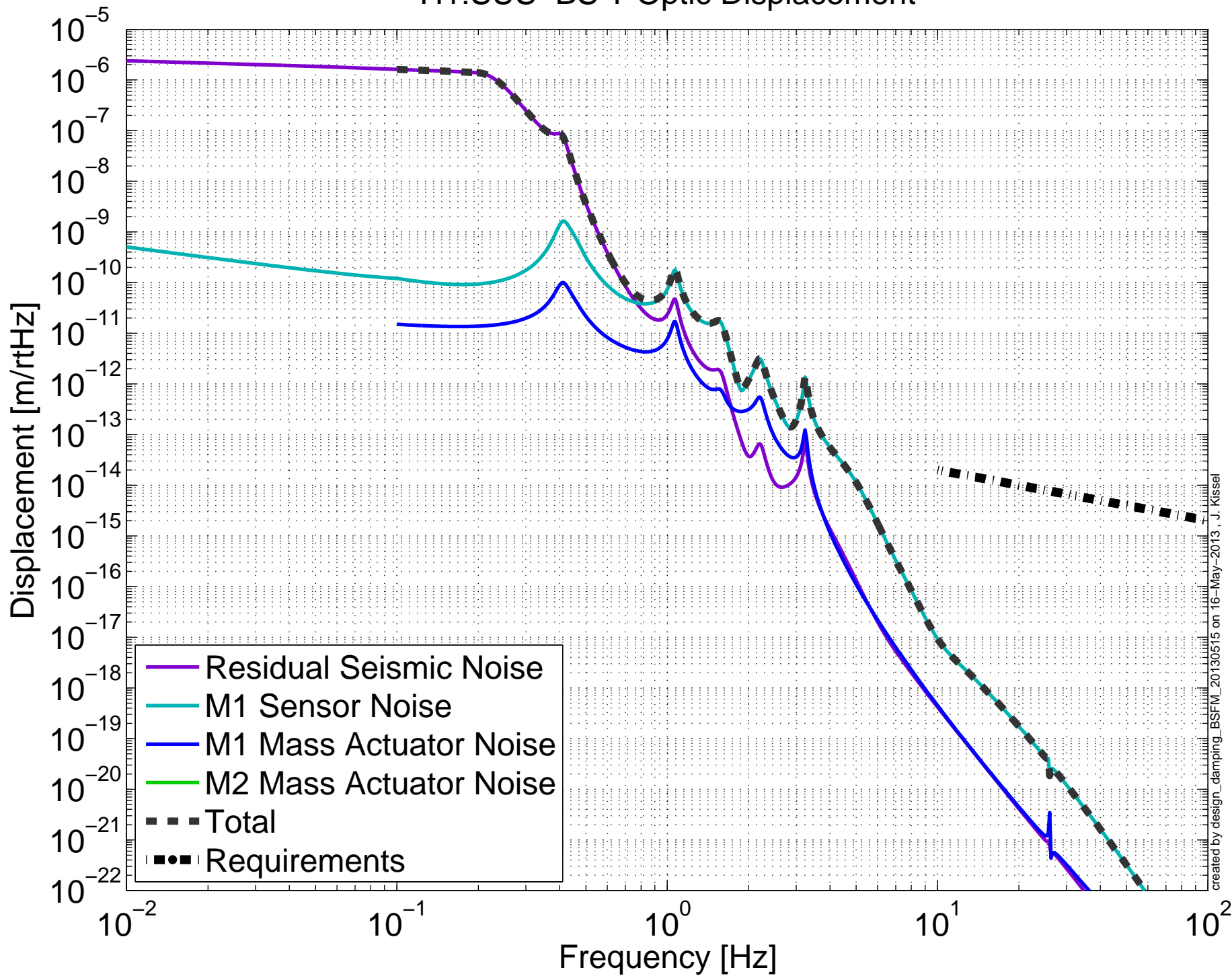
created by design\_damping\_BSFW\_20130515 on 16-May-2013, J. Kissel

# Projected M2 Mass Actuator > Optic Noise Budget H1:SUS-BS, T Optic Displacement



# Damping Loop Performance

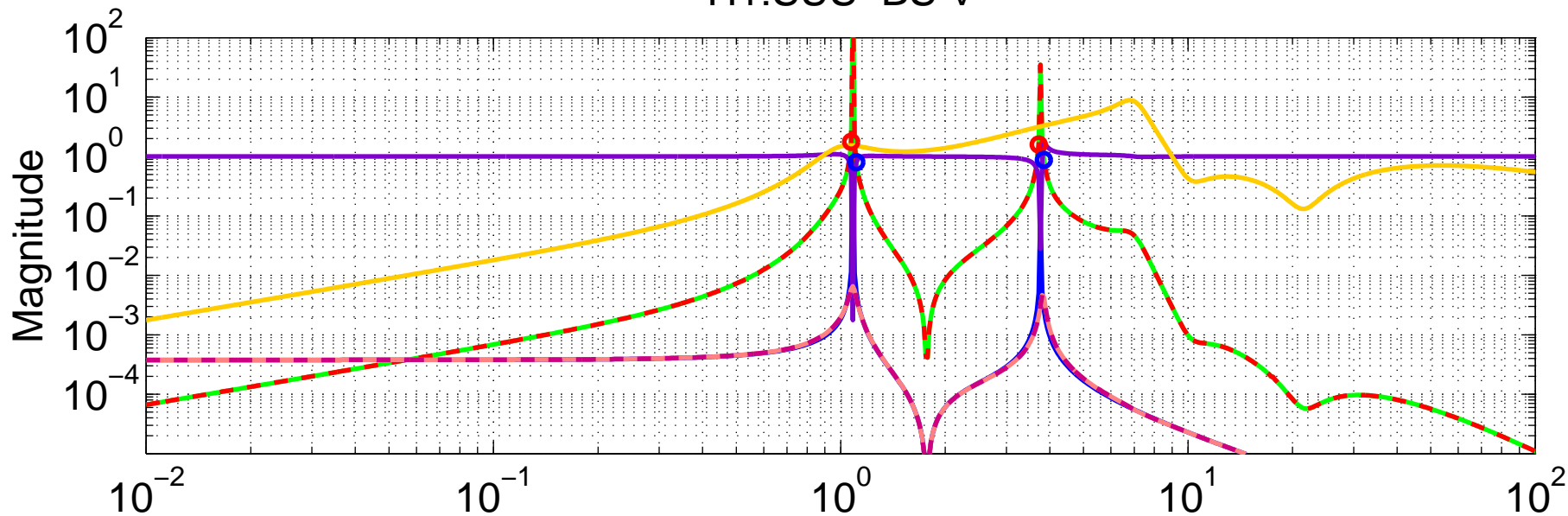
## H1:SUS-BS T Optic Displacement





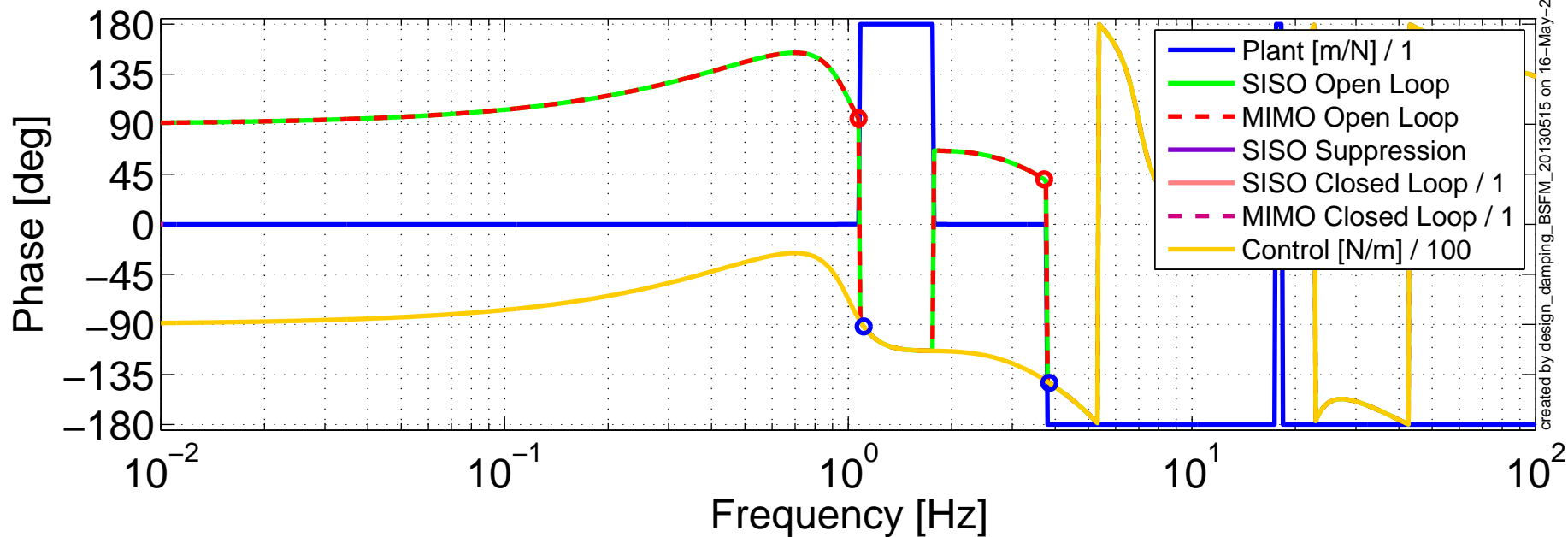
# Damping Loop Design

## H1:SUS-BS V

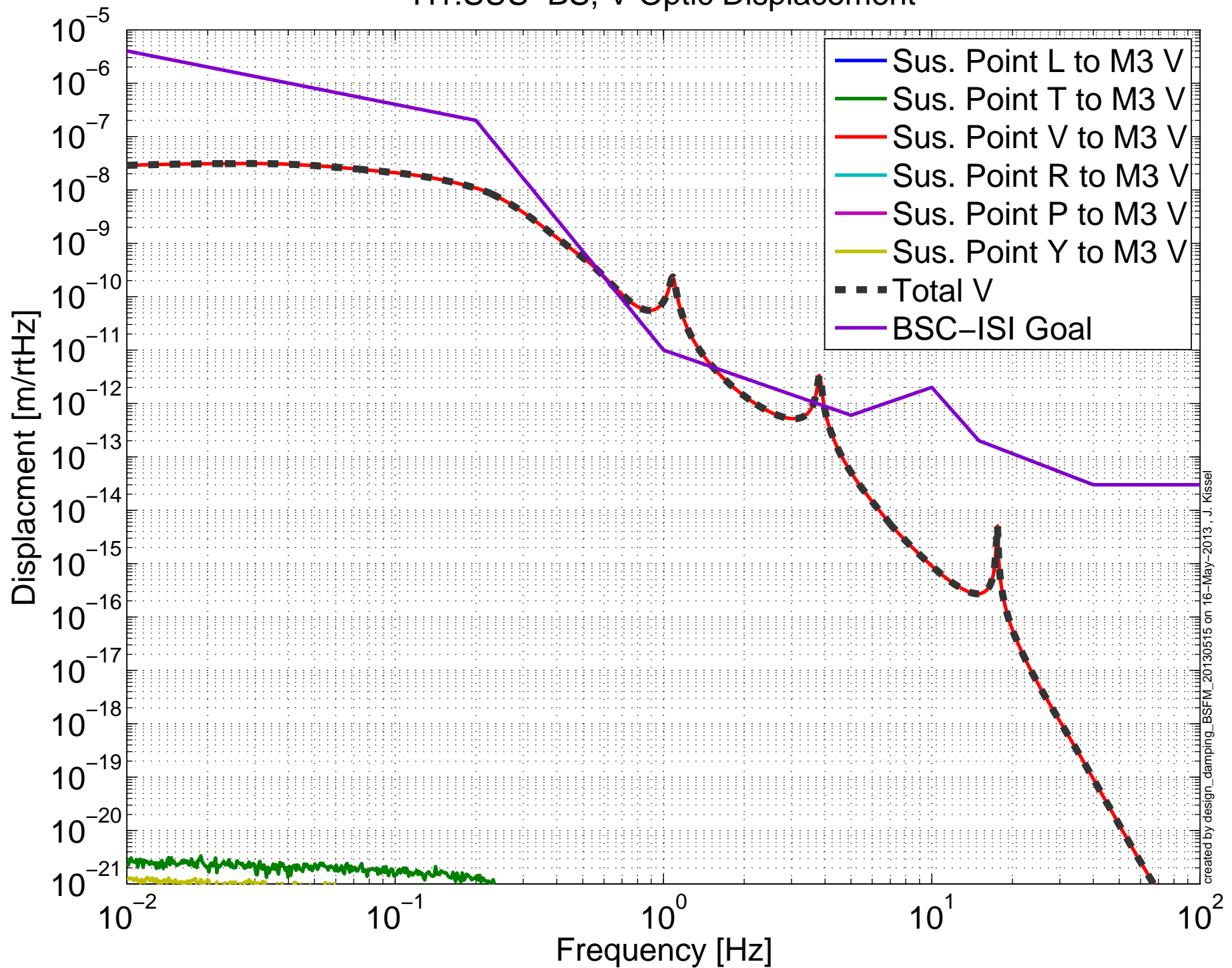


MIMO LUGF Phase Margins (red): [84.8 140] [deg]  
 MIMO UUGF Phase Margins (blue): [88.1 37.4] [deg]

140] [deg]  
 37.4] [deg]

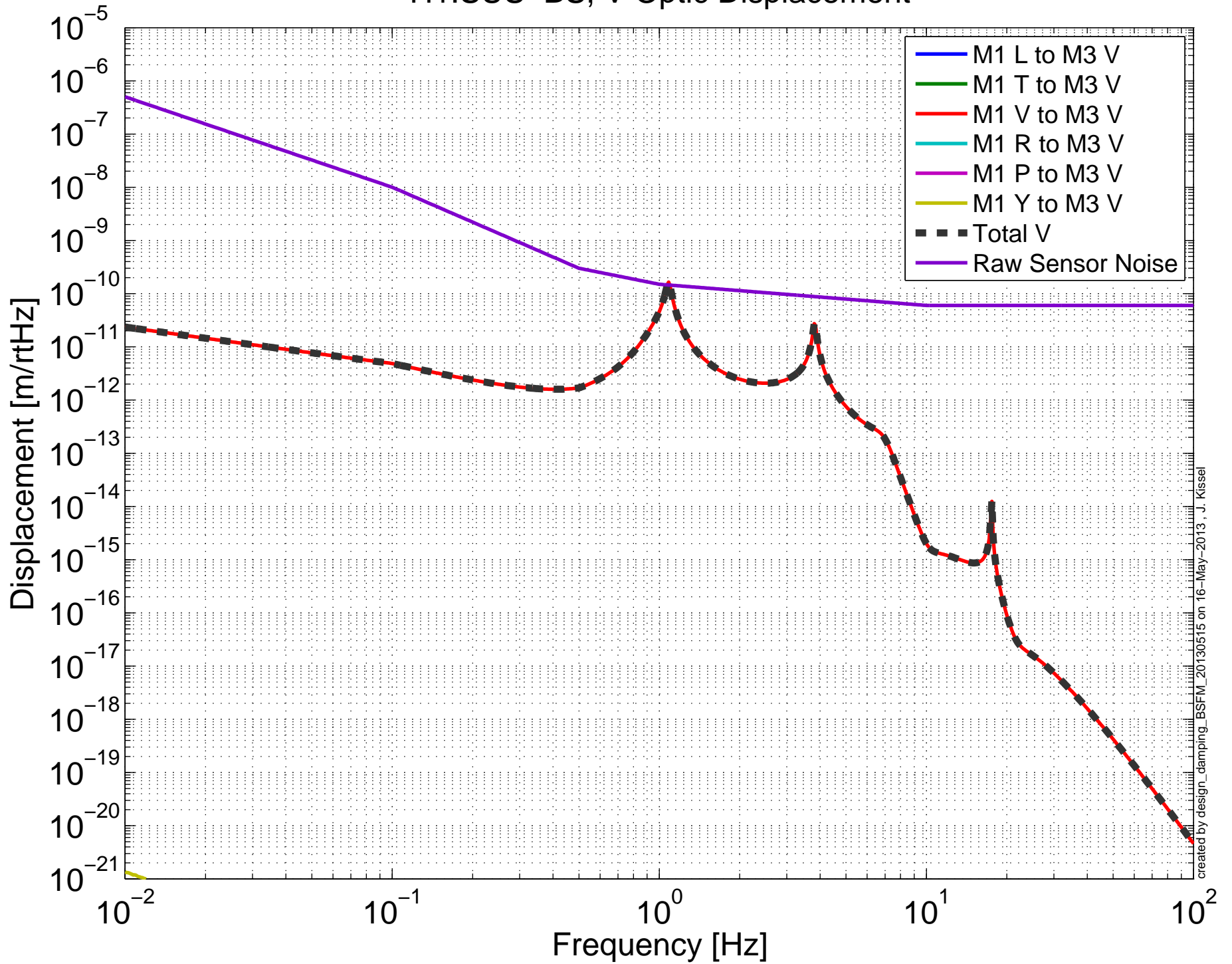


# Projected Sus. Point > Optic Seismic Noise Budget H1:SUS-BS, V Optic Displacement

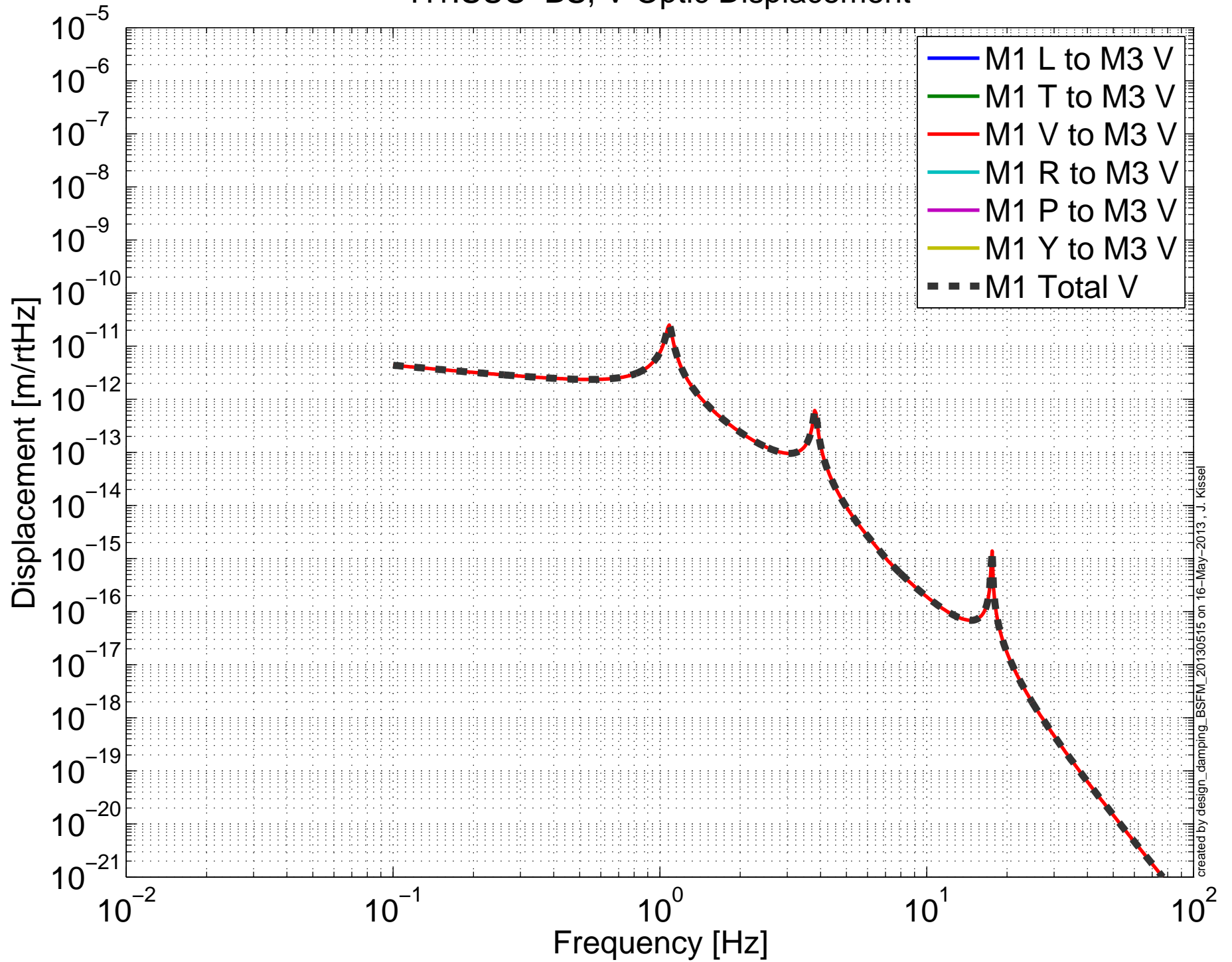


created by design\_damping\_BSFW\_20130515 on 16-May-2013, J. Kissel

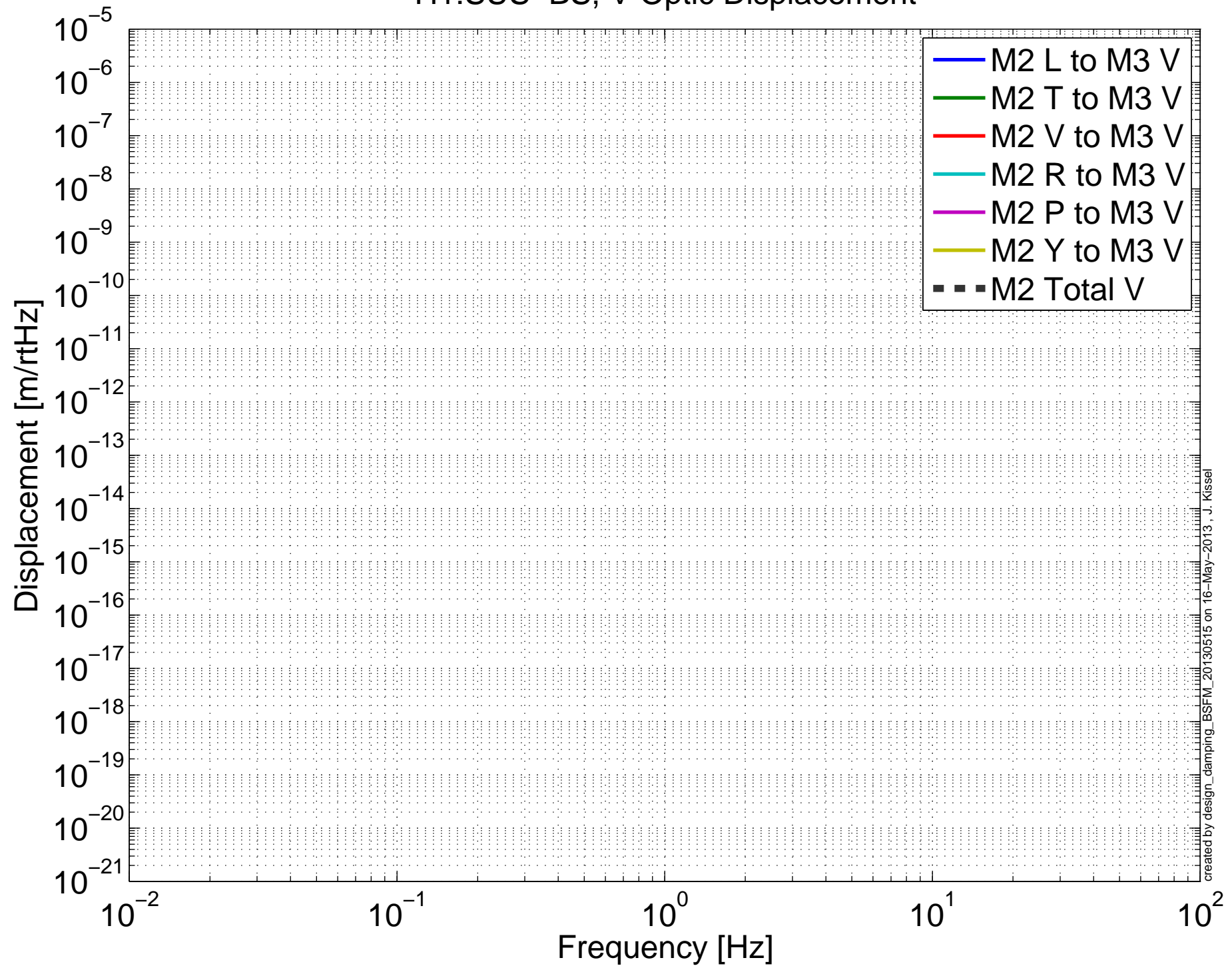
# Projected Top Mass Sensor > Optic Noise Budget H1:SUS-BS, V Optic Displacement



# Projected M1 Mass Actuator > Optic Noise Budget H1:SUS-BS, V Optic Displacement



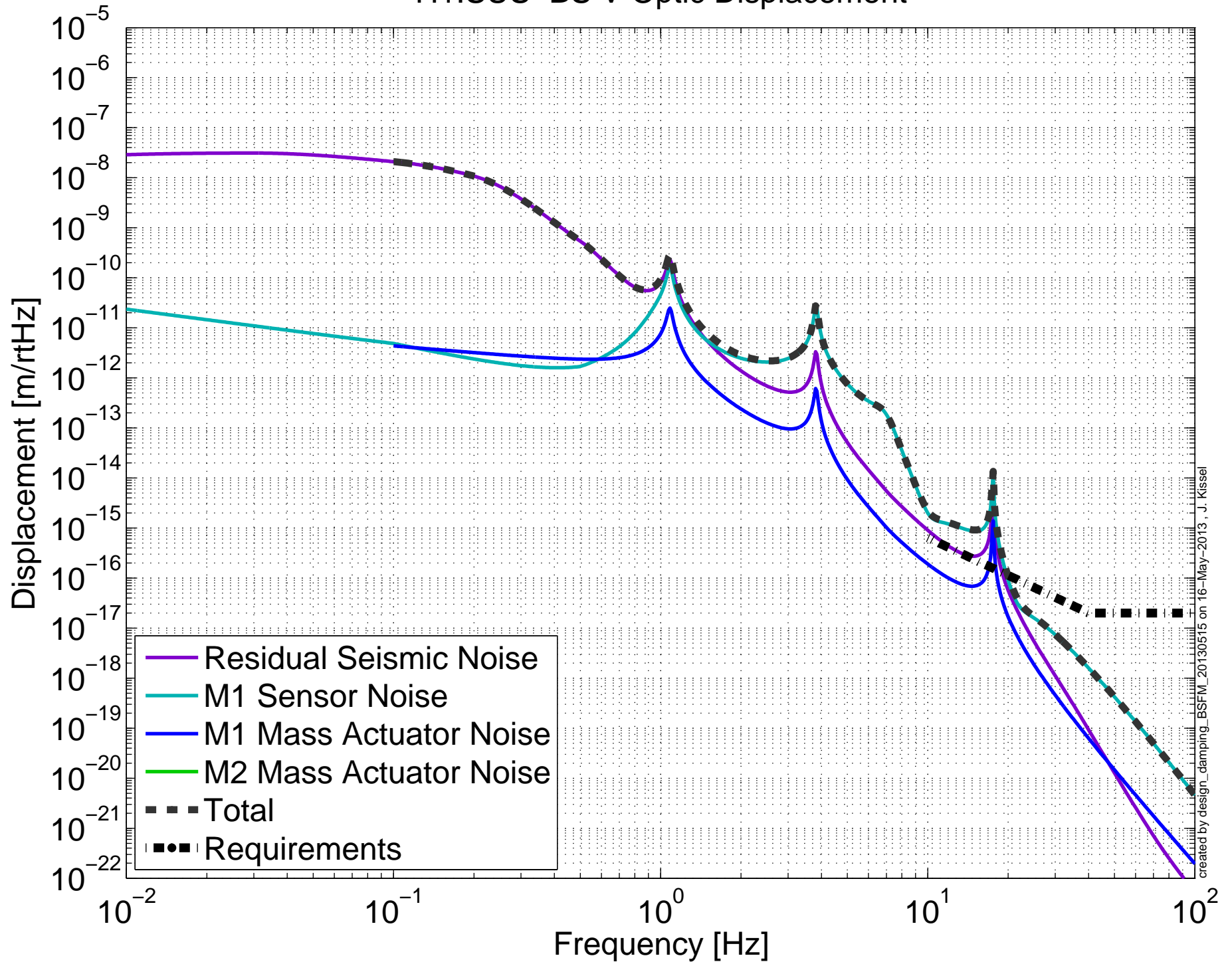
# Projected M2 Mass Actuator > Optic Noise Budget H1:SUS-BS, V Optic Displacement



created by design\_damping\_BSFV\_20130515 on 16-May-2013, J. Kiesel

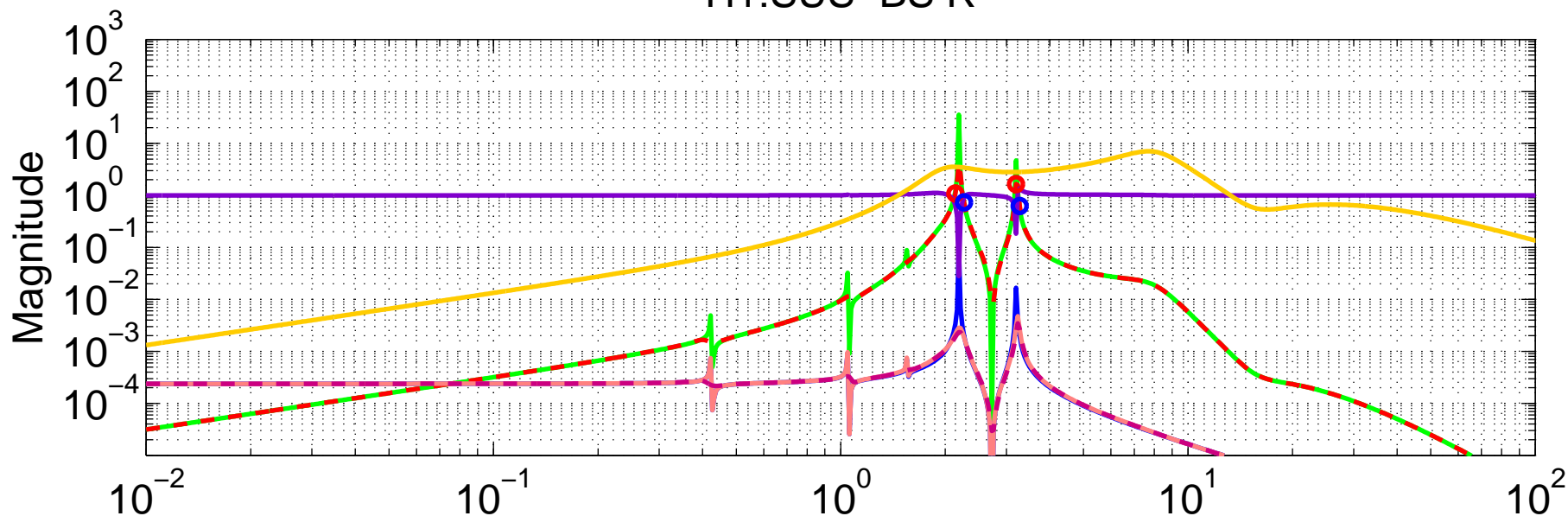
# Damping Loop Performance

## H1:SUS-BS V Optic Displacement

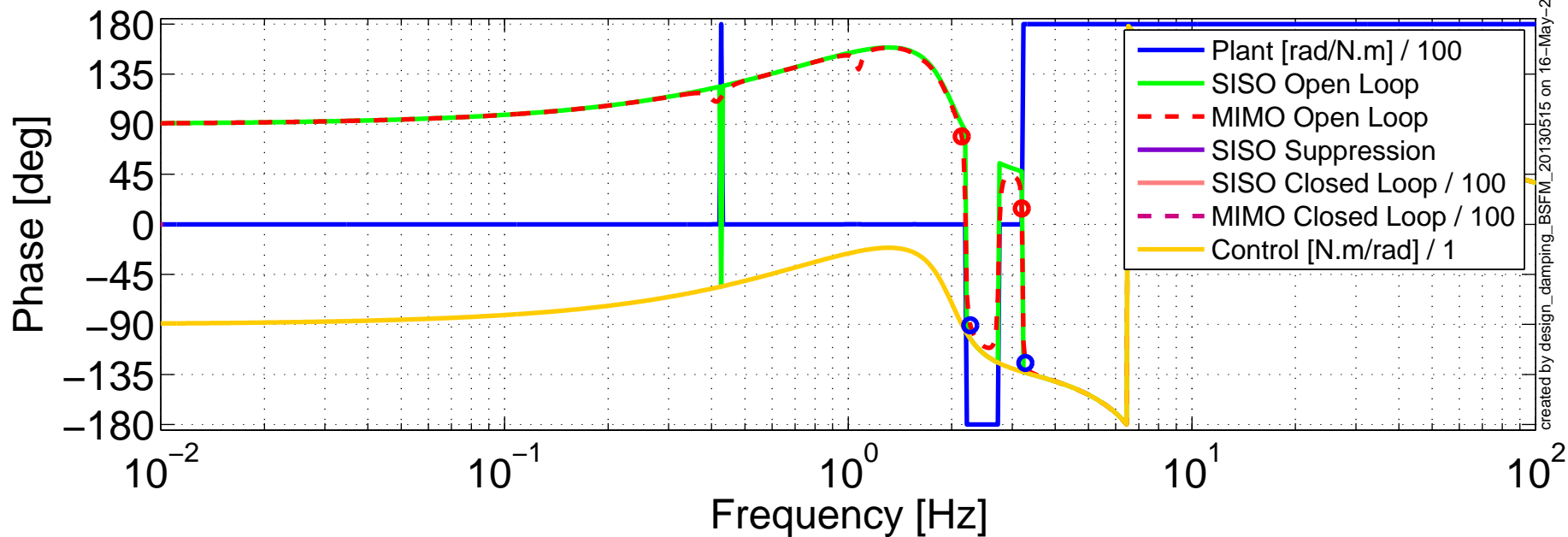


# Damping Loop Design

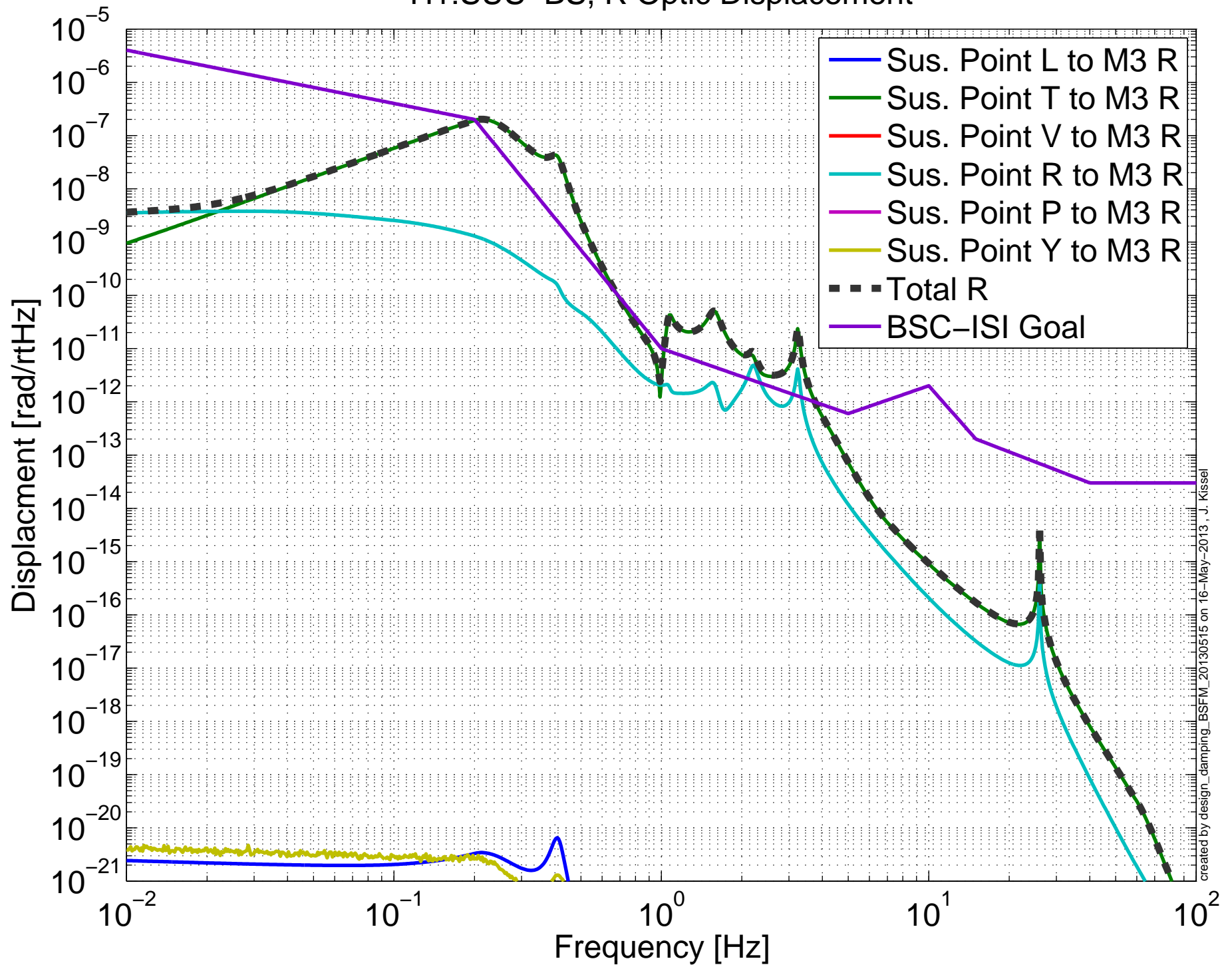
## H1:SUS-BS R



MIMO LUGF Phase Margins (red): [101 166] [deg]  
MIMO UUGF Phase Margins (blue): [89.2 55.4] [deg]

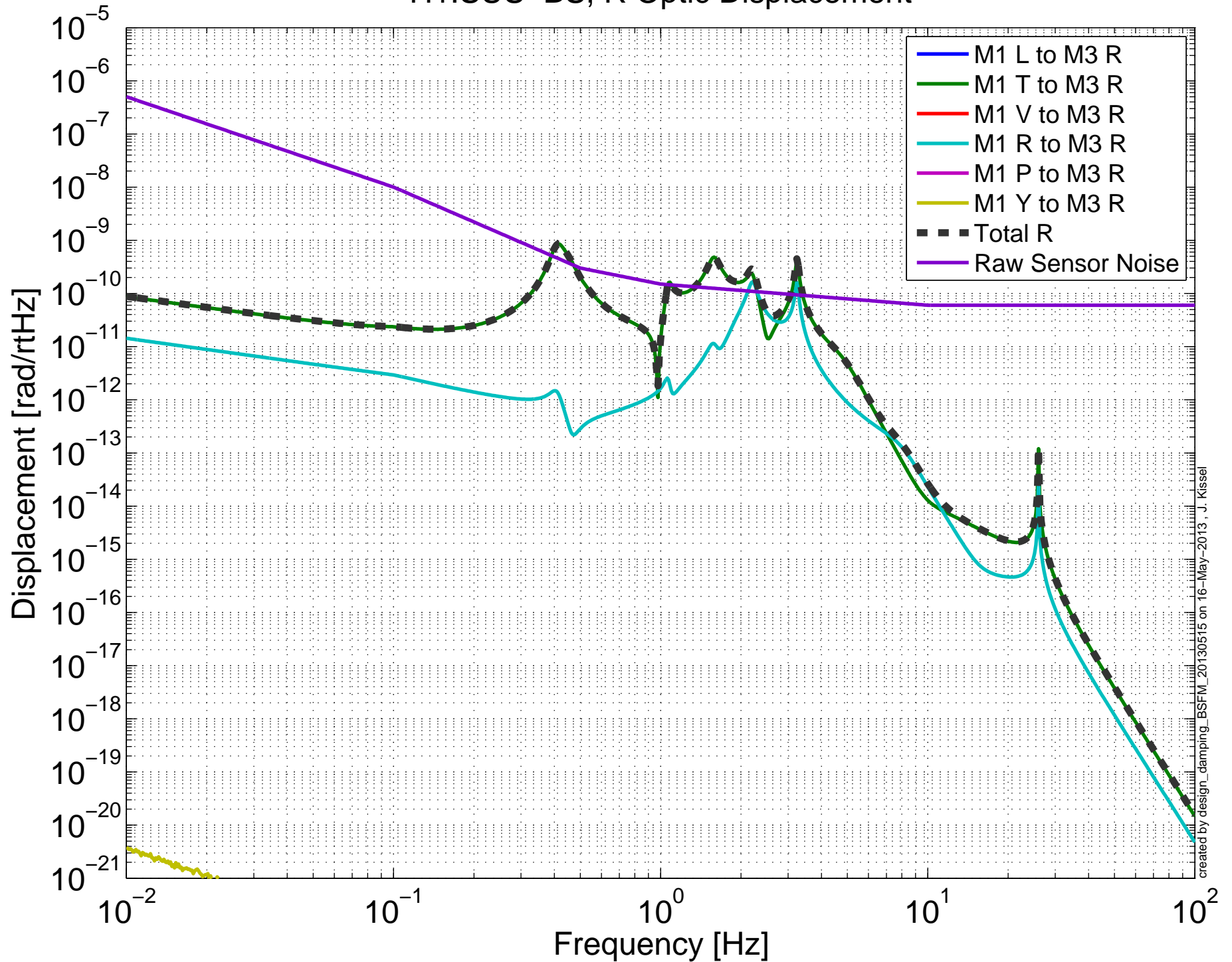


# Projected Sus. Point > Optic Seismic Noise Budget H1:SUS-BS, R Optic Displacement

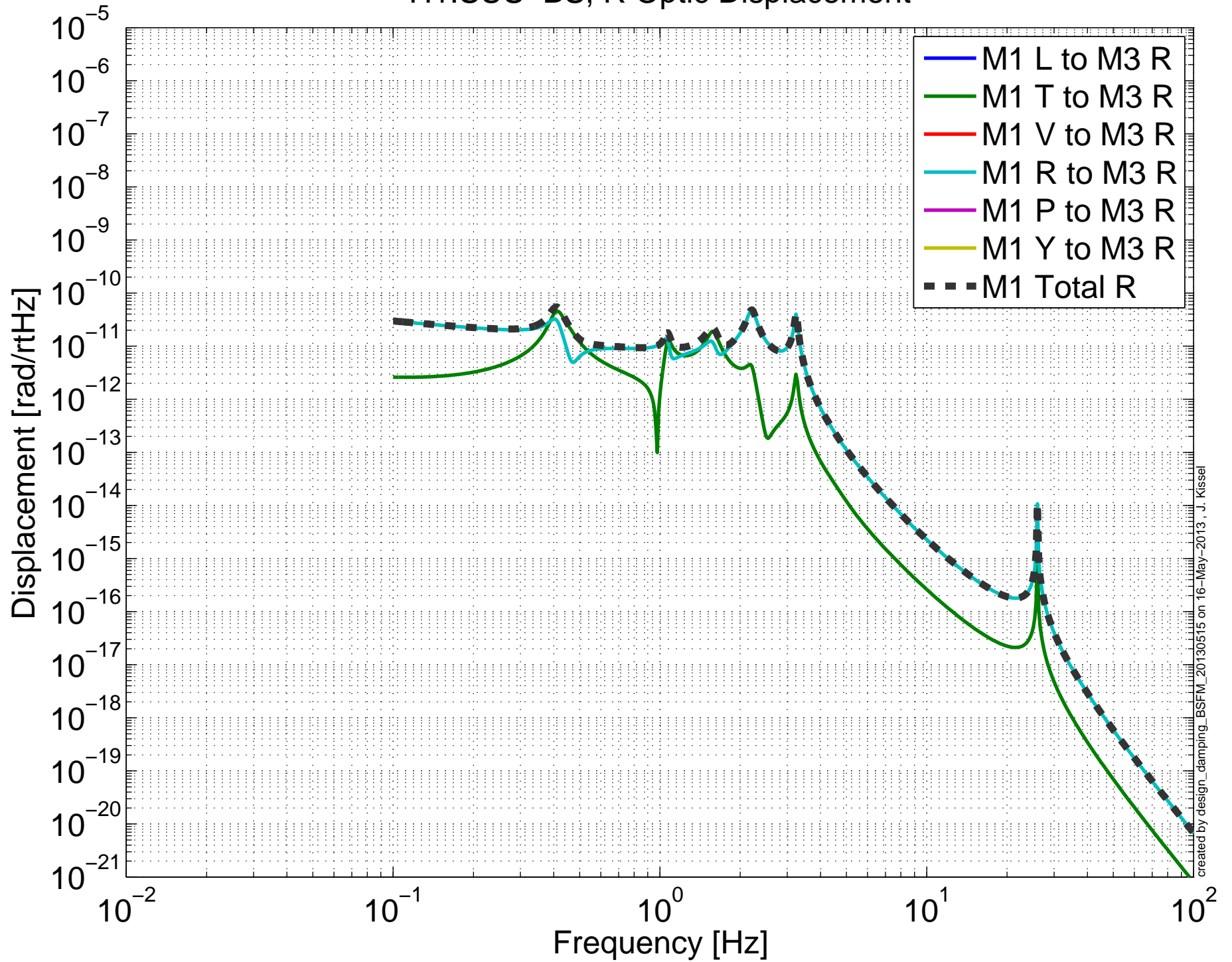




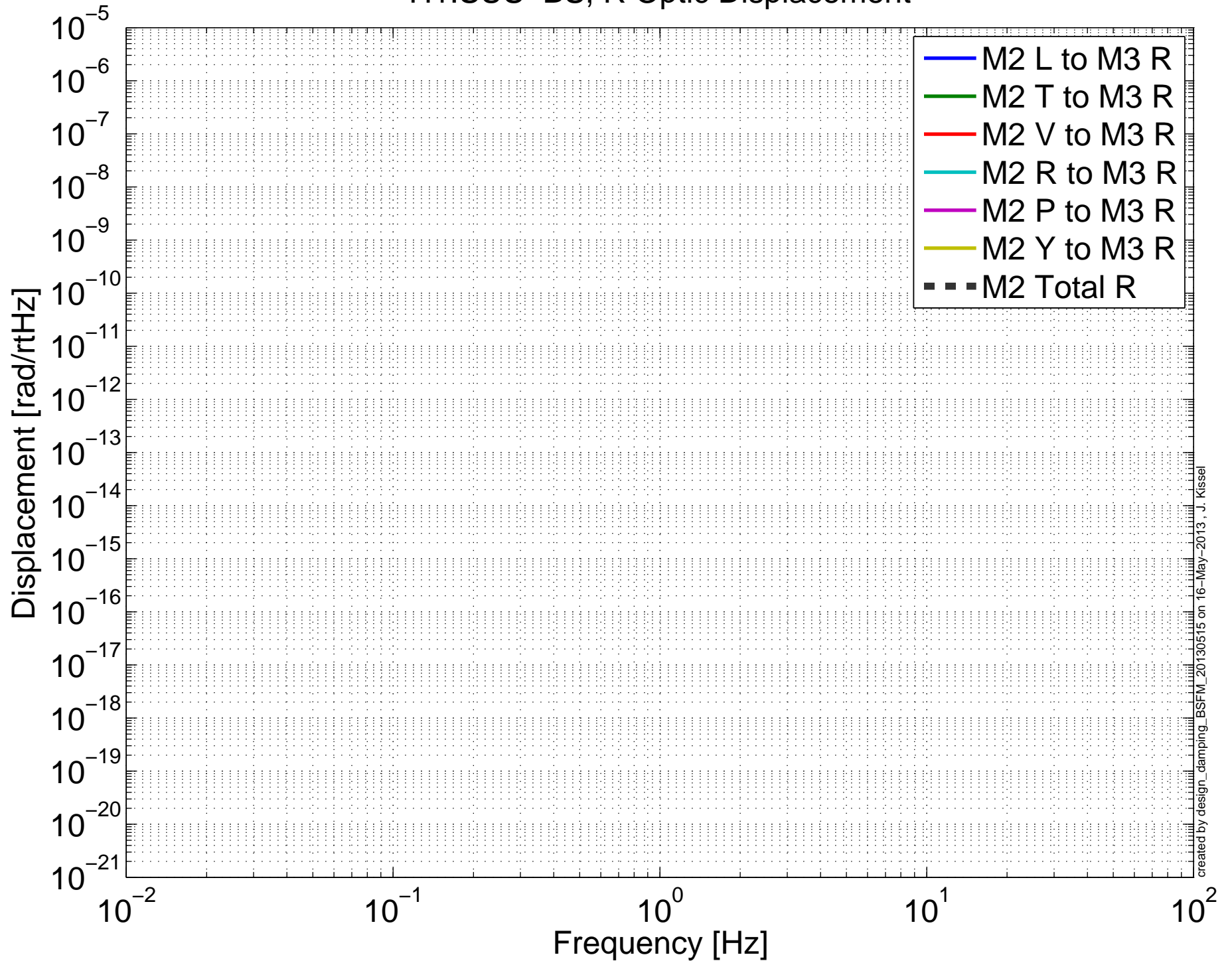
# Projected Top Mass Sensor > Optic Noise Budget H1:SUS-BS, R Optic Displacement



# Projected M1 Mass Actuator > Optic Noise Budget H1:SUS-BS, R Optic Displacement

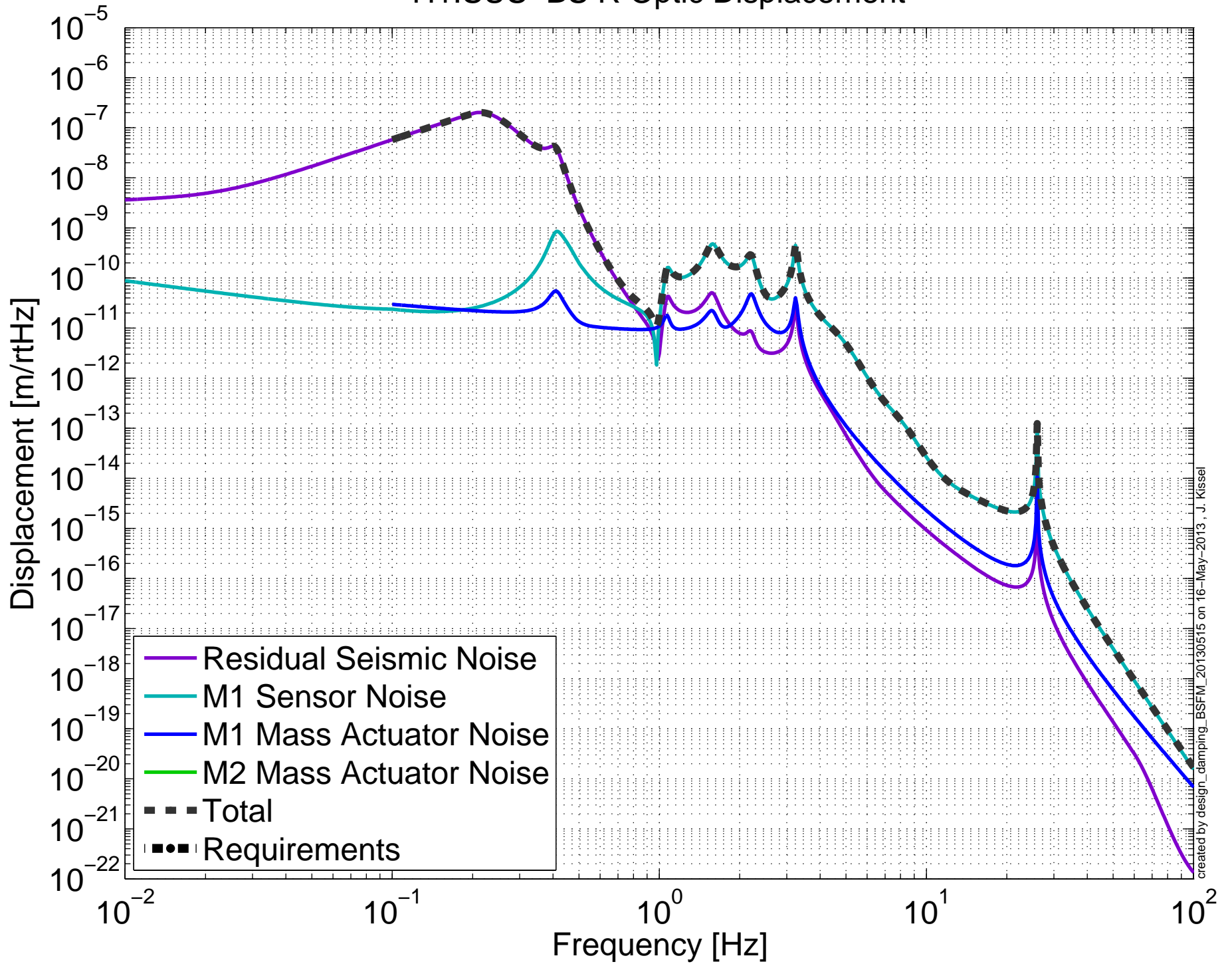


# Projected M2 Mass Actuator > Optic Noise Budget H1:SUS-BS, R Optic Displacement



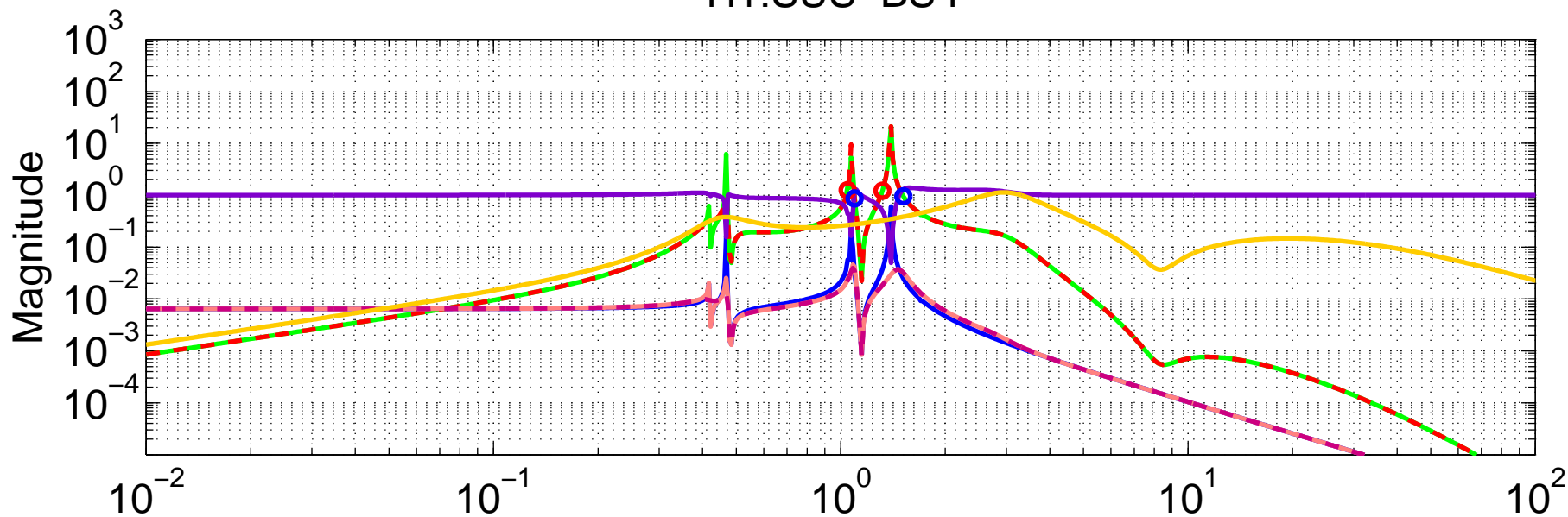
# Damping Loop Performance

## H1:SUS-BS R Optic Displacement

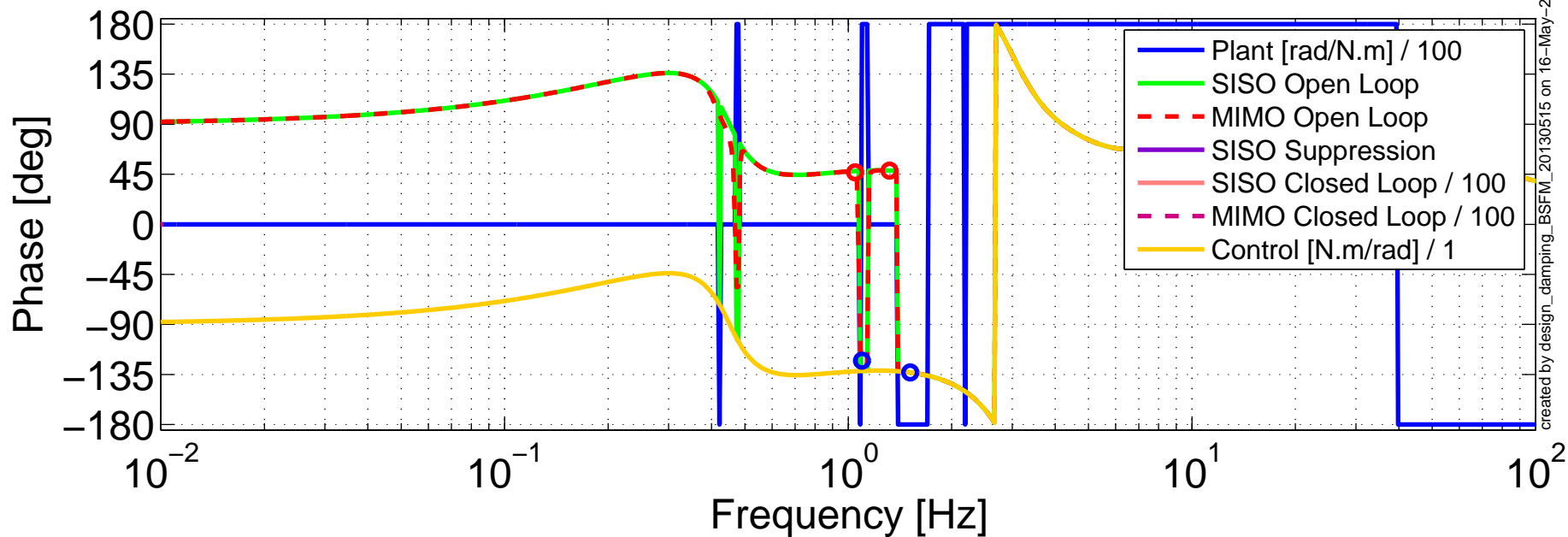


# Damping Loop Design

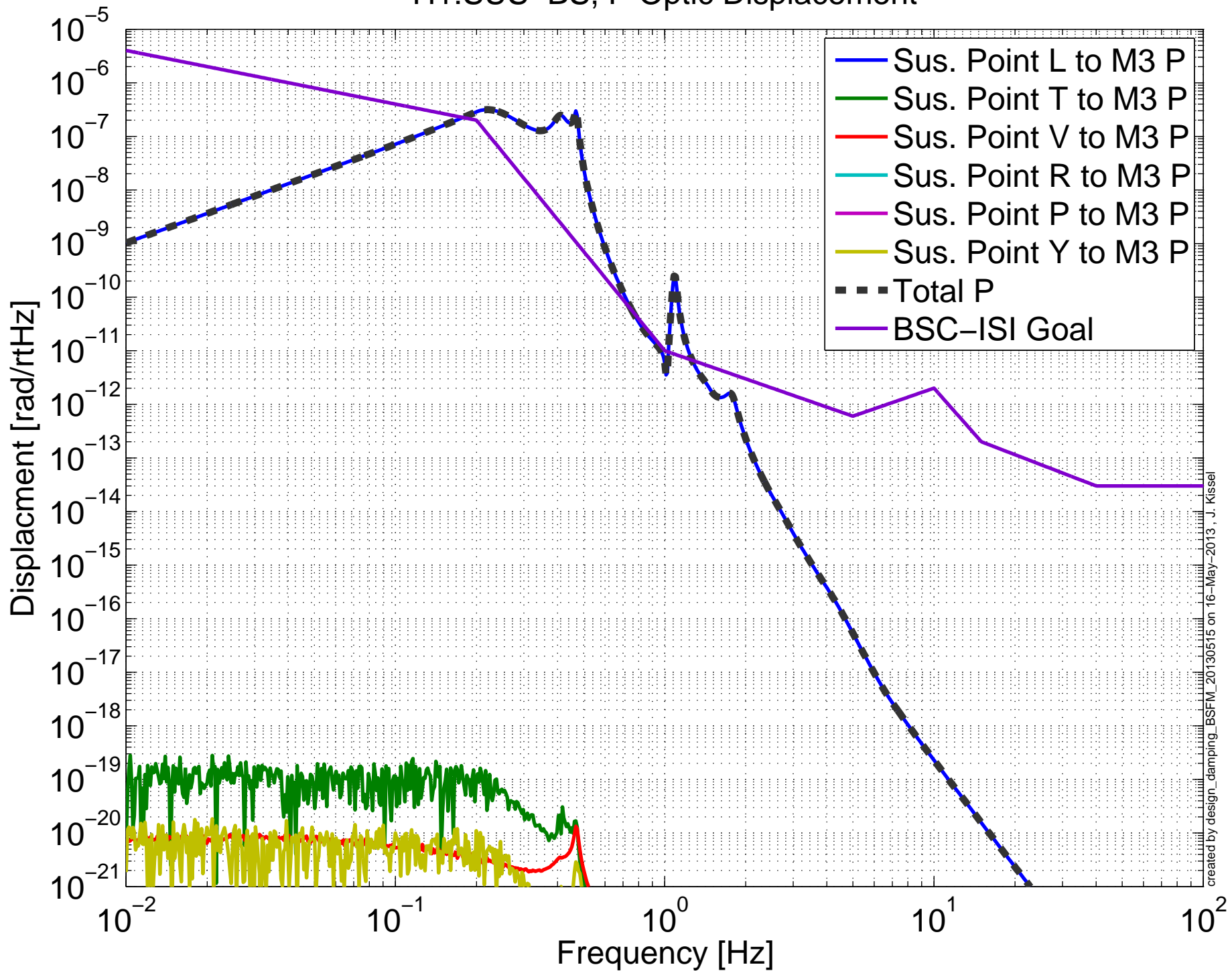
## H1:SUS-BS P



MIMO LUGF Phase Margins (red): [133 132] [deg]  
MIMO UUGF Phase Margins (blue): [57.4 46.8] [deg]

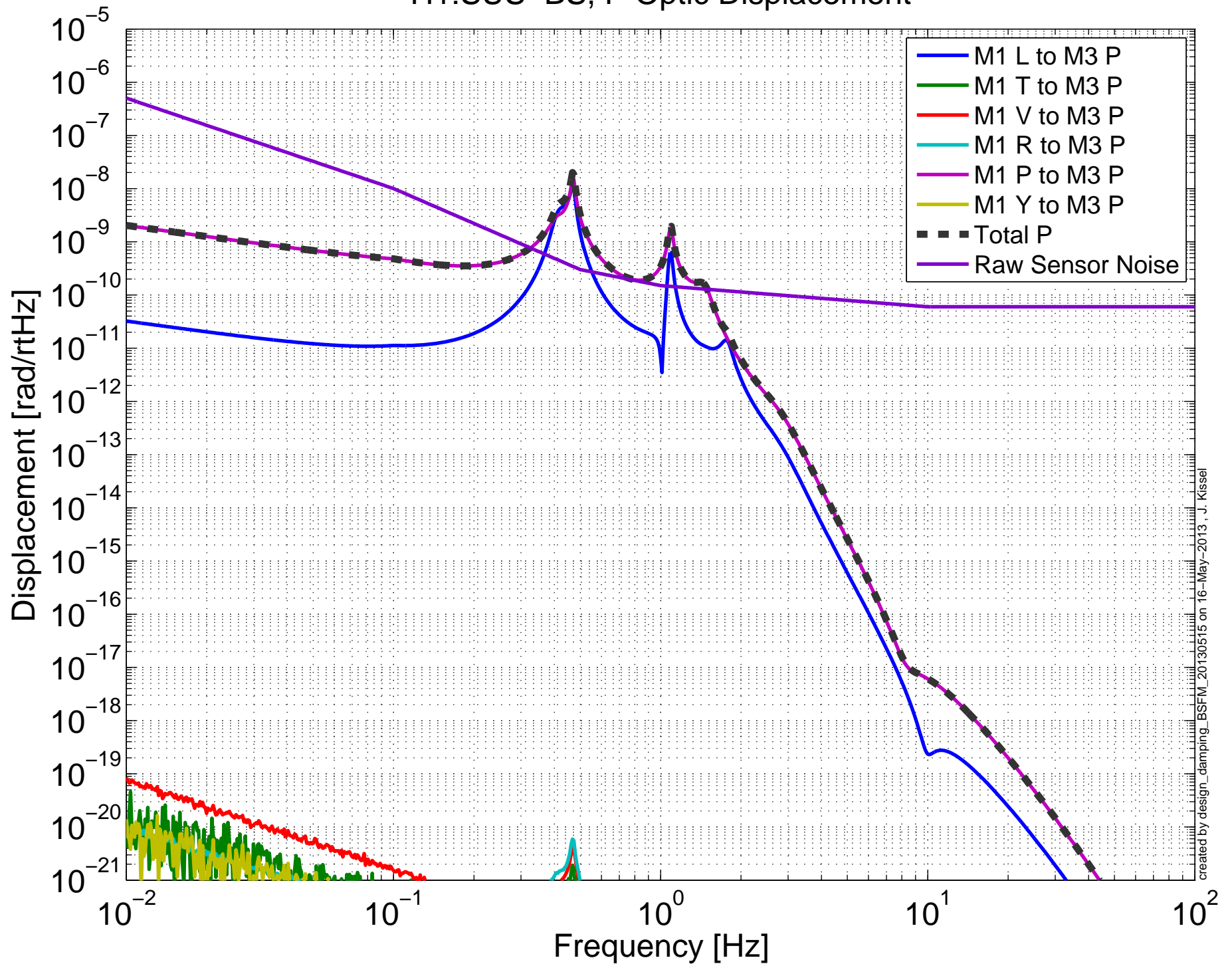


# Projected Sus. Point > Optic Seismic Noise Budget H1:SUS-BS, P Optic Displacement

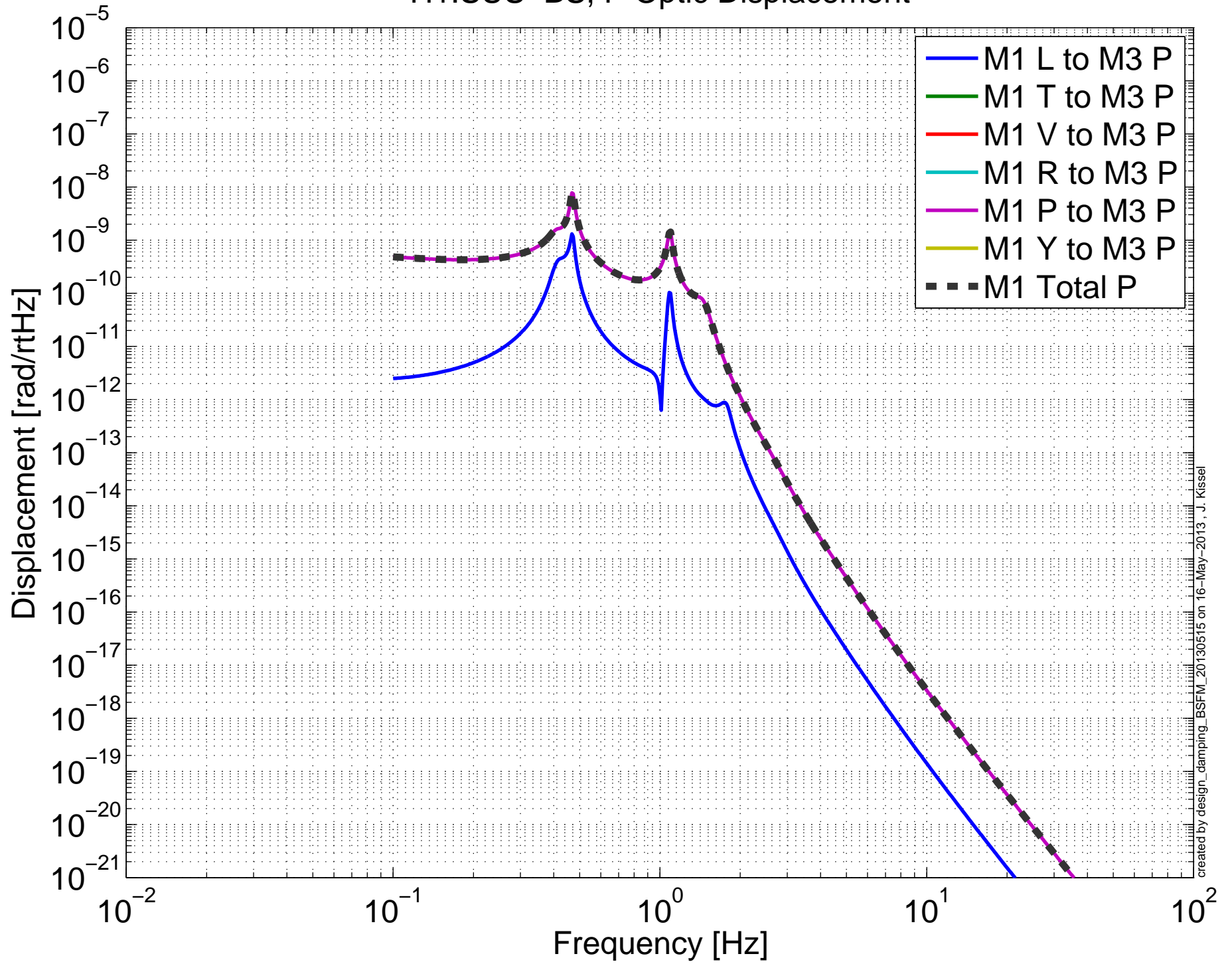


created by design\_damping\_BSFW\_20130515 on 16-May-2013, J. Kissel

# Projected Top Mass Sensor > Optic Noise Budget H1:SUS-BS, P Optic Displacement

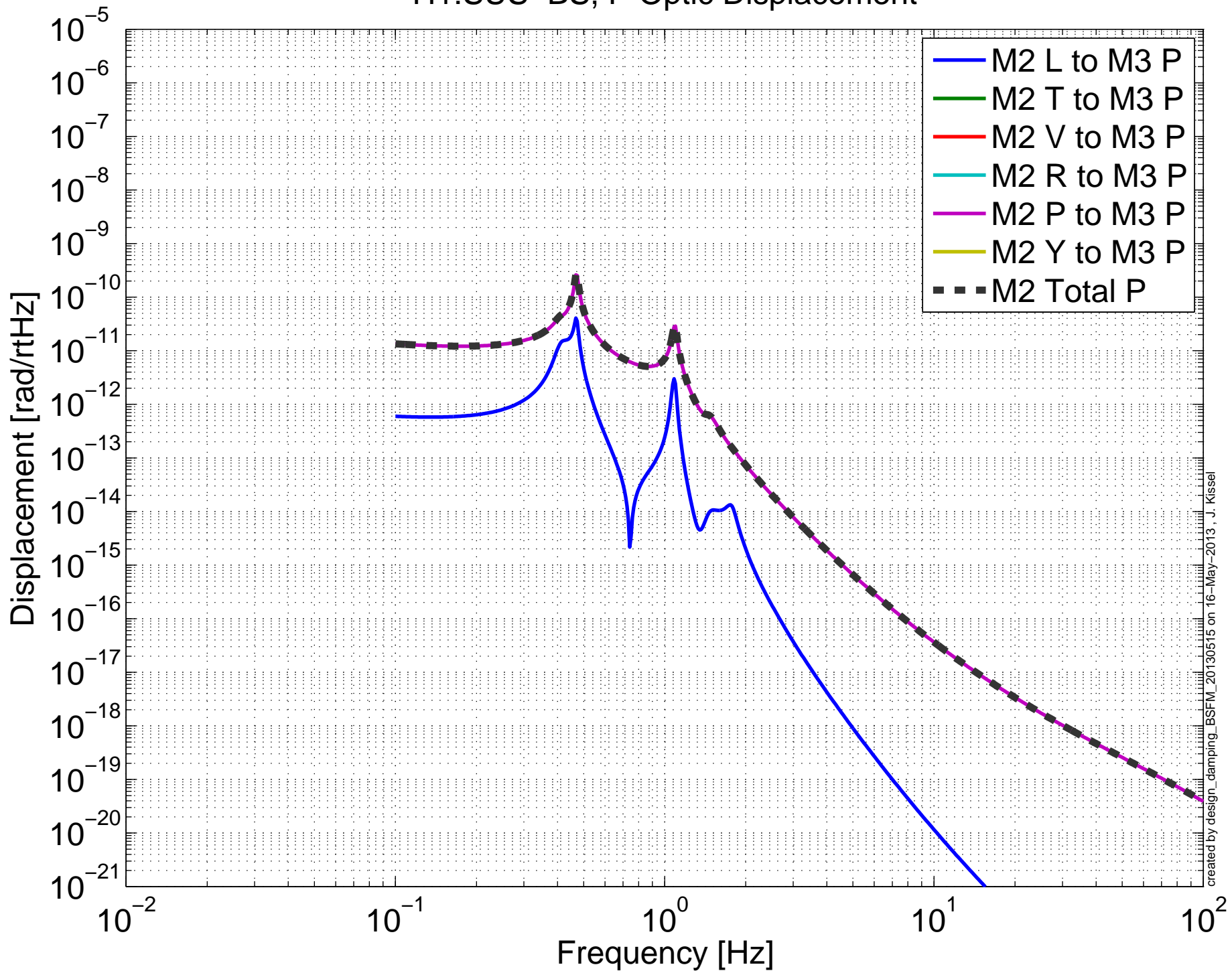


# Projected M1 Mass Actuator > Optic Noise Budget H1:SUS-BS, P Optic Displacement



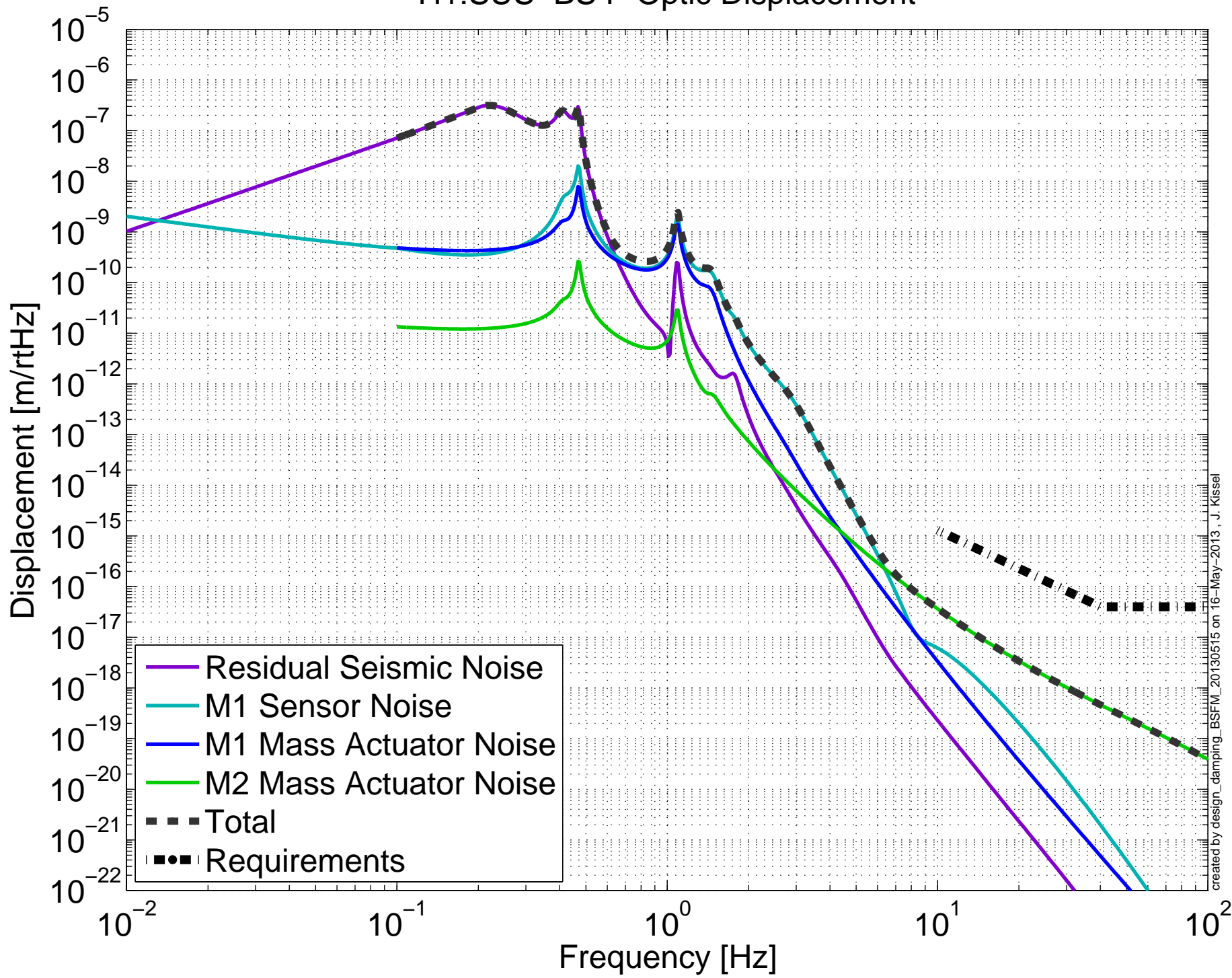


# Projected M2 Mass Actuator > Optic Noise Budget H1:SUS-BS, P Optic Displacement



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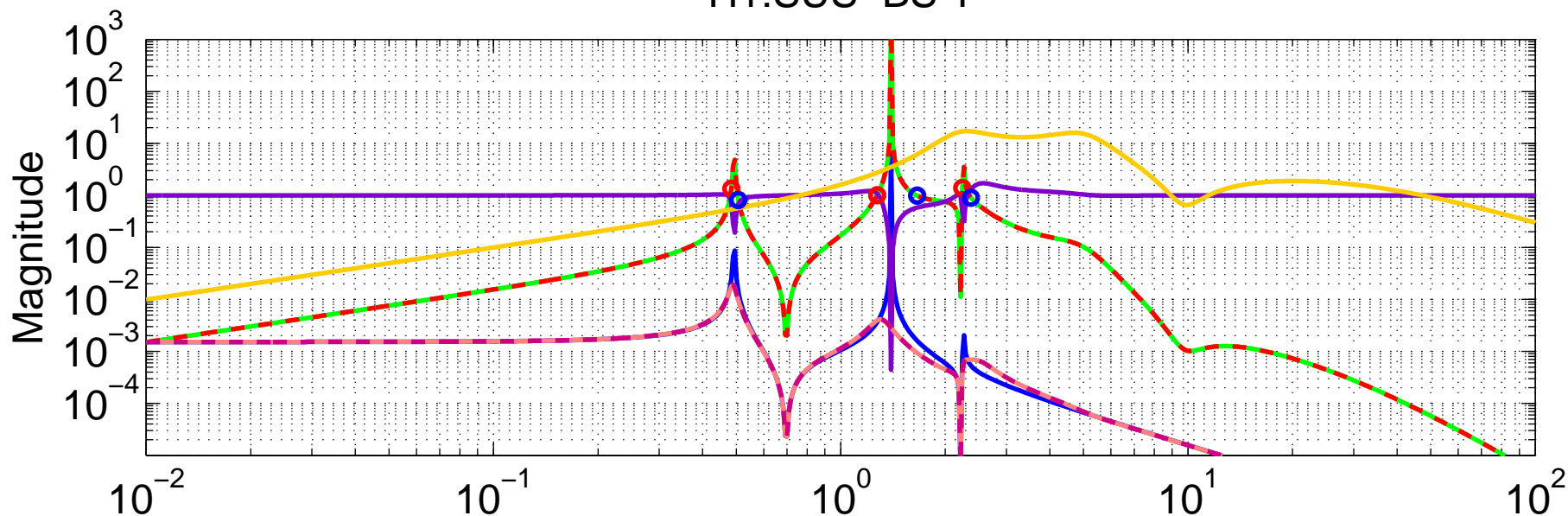
# Damping Loop Performance H1:SUS-BS P Optic Displacement



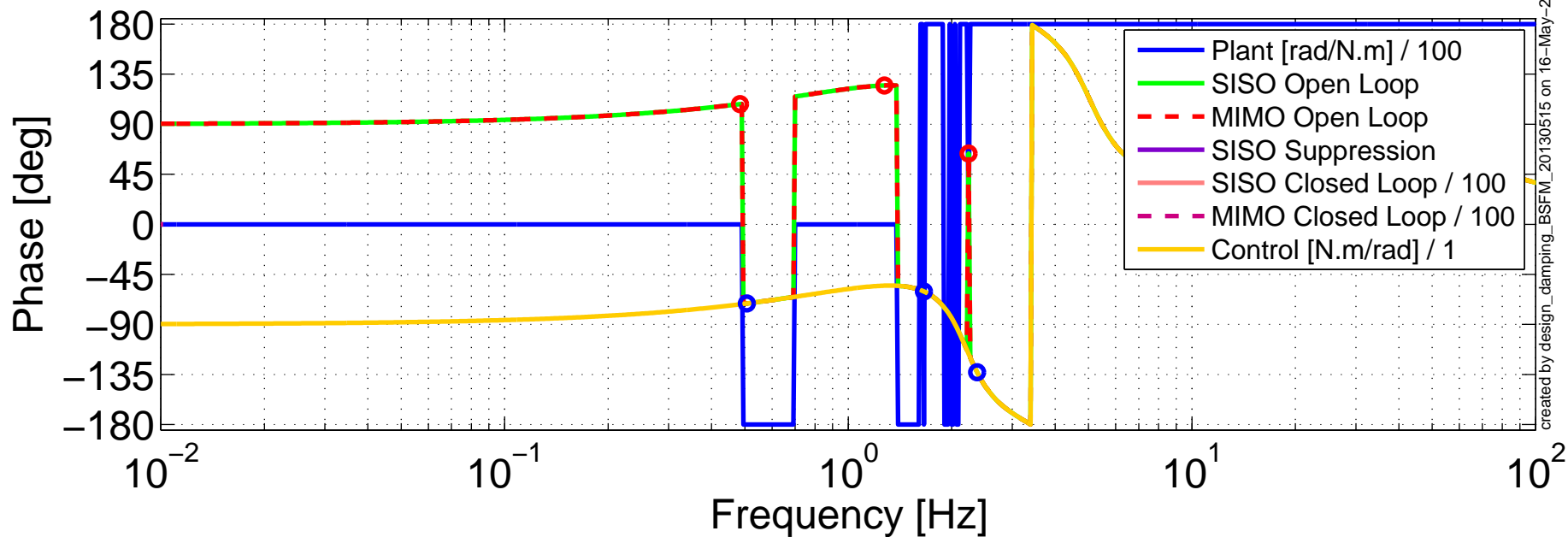
created by design\_damping\_BSFM\_20130515 on 16-May-2013, J. Kissel

# Damping Loop Design

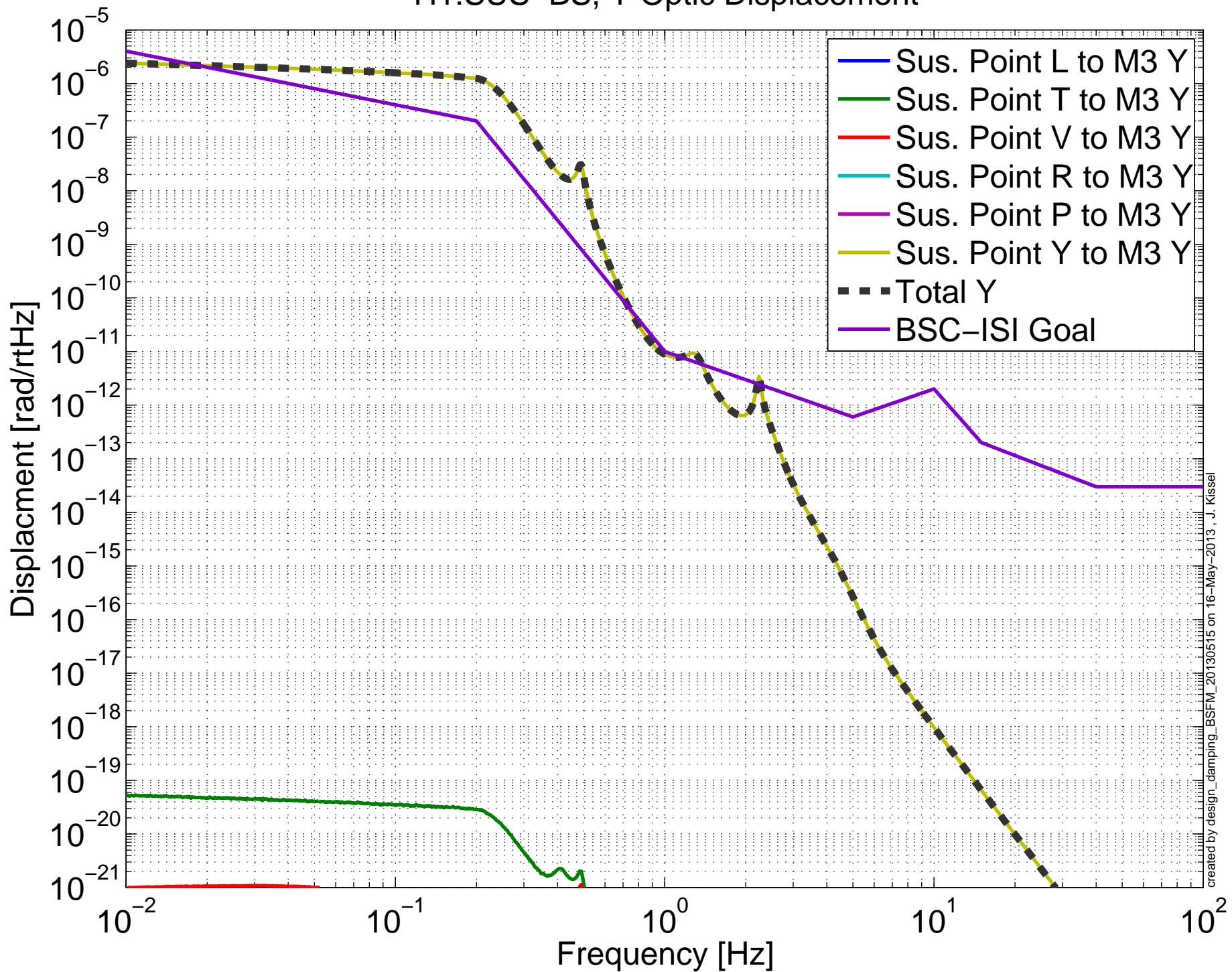
## H1:SUS-BS Y



MIMO LUGF Phase Margins (red): [71.9    55.2    116] [deg]  
MIMO UUGF Phase Margins (blue): [109    120    47] [deg]

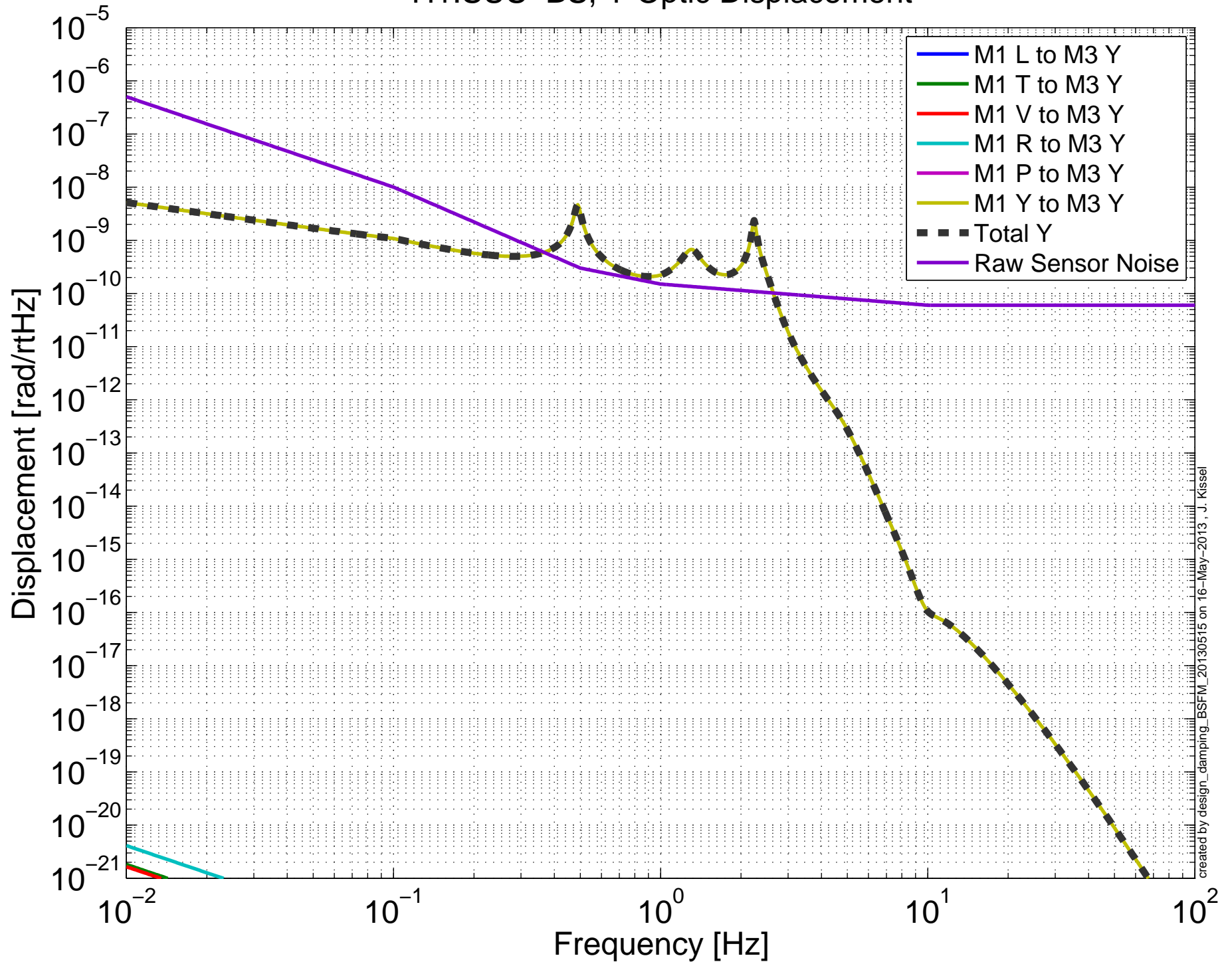


# Projected Sus. Point > Optic Seismic Noise Budget H1:SUS-BS, Y Optic Displacement

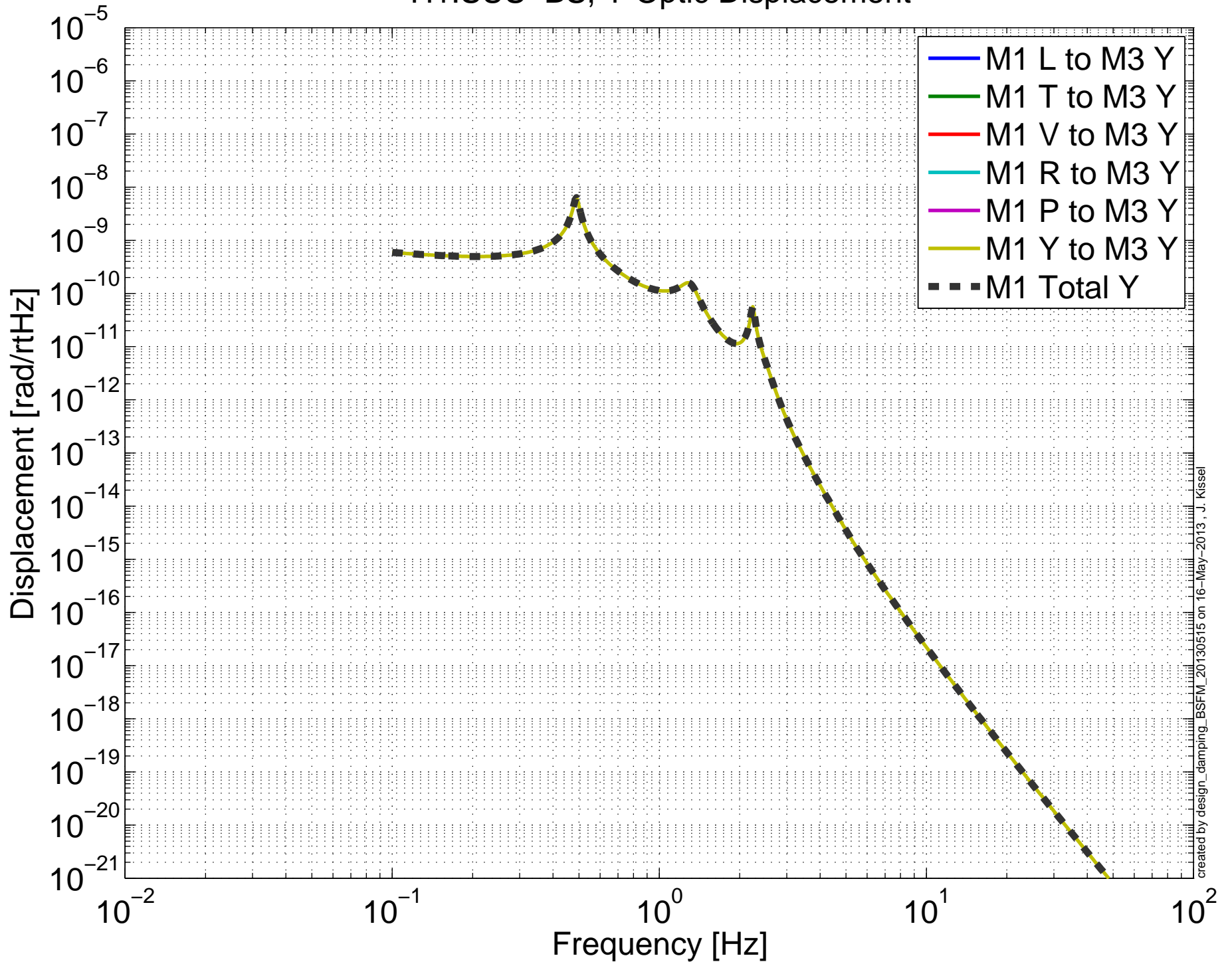


created by design\_damping\_BSFW\_20130515 on 16-May-2013, J. Kissel

# Projected Top Mass Sensor > Optic Noise Budget H1:SUS-BS, Y Optic Displacement

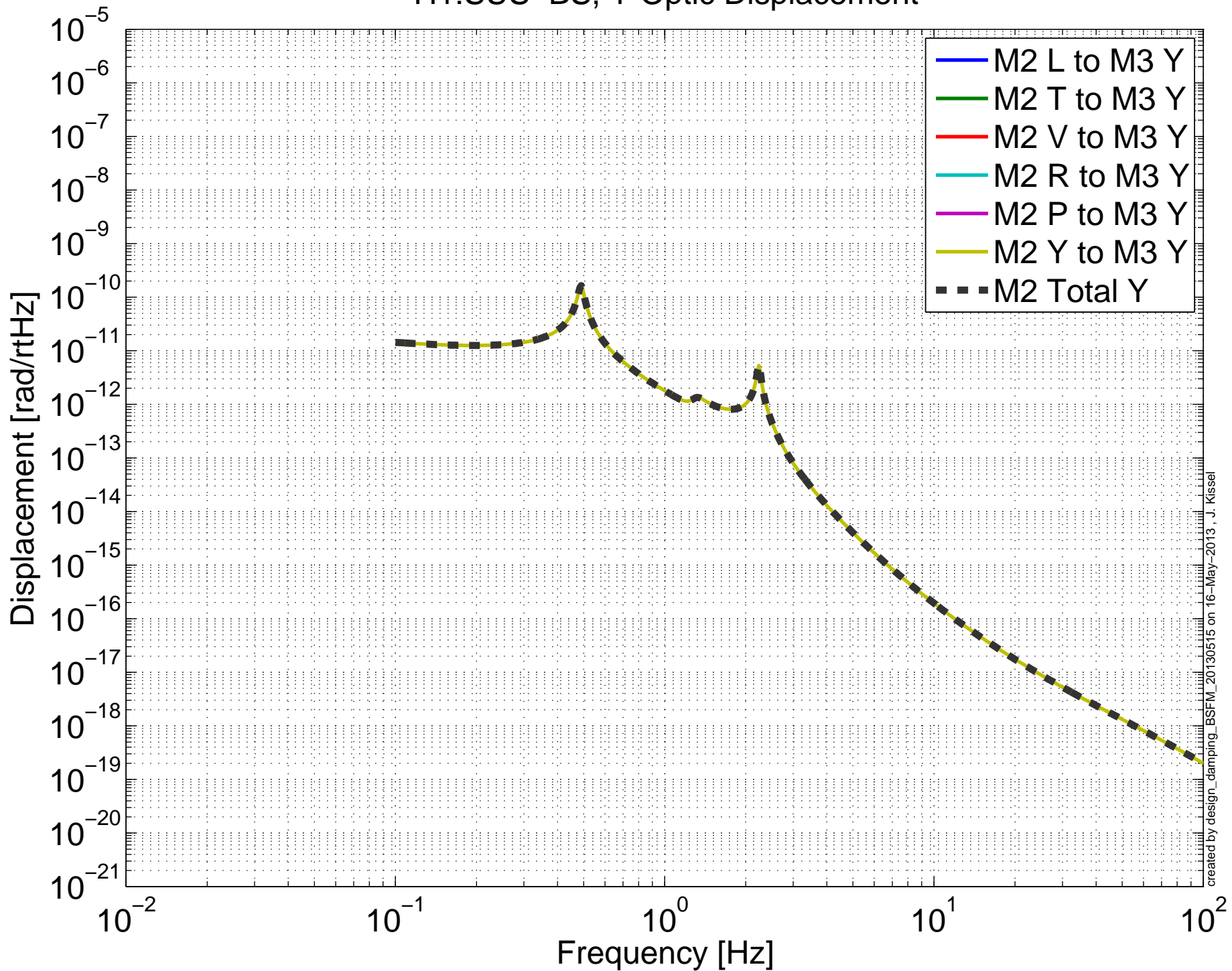


# Projected M1 Mass Actuator > Optic Noise Budget H1:SUS-BS, Y Optic Displacement



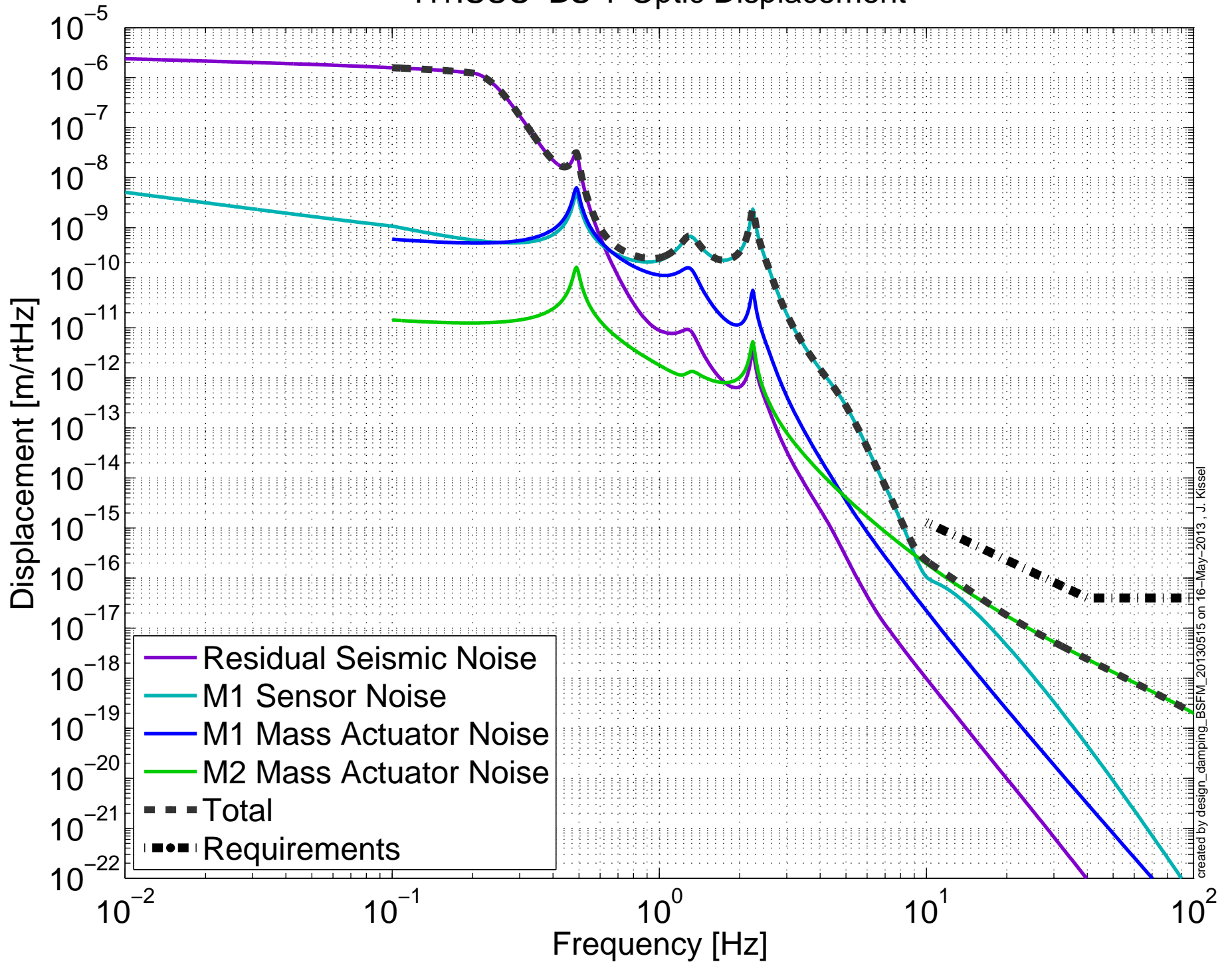
created by design\_damping\_BSFW\_20130515 on 16-May-2013, J. Kiesel

# Projected M2 Mass Actuator > Optic Noise Budget H1:SUS-BS, Y Optic Displacement



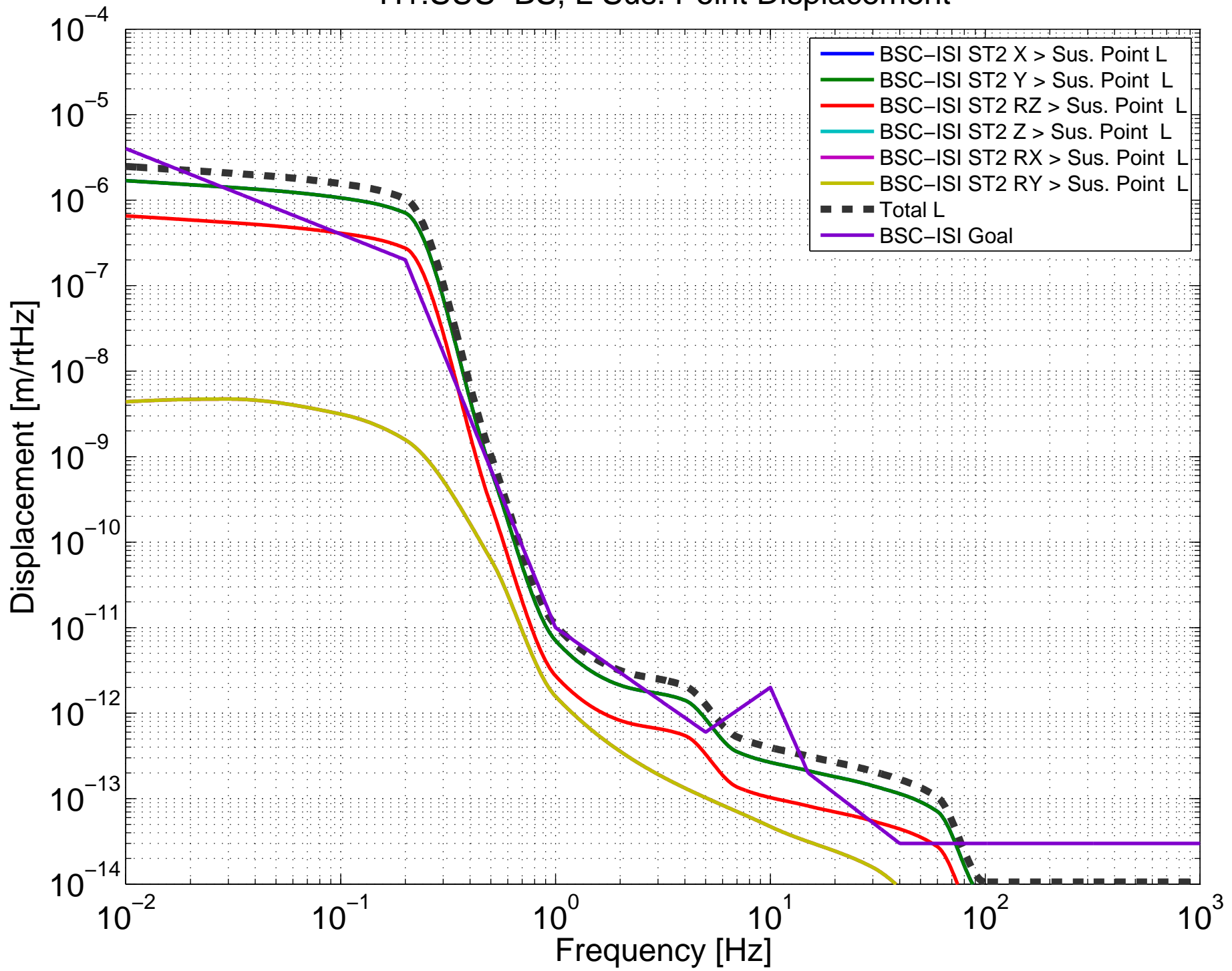
# Damping Loop Performance

## H1:SUS-BS Y Optic Displacement





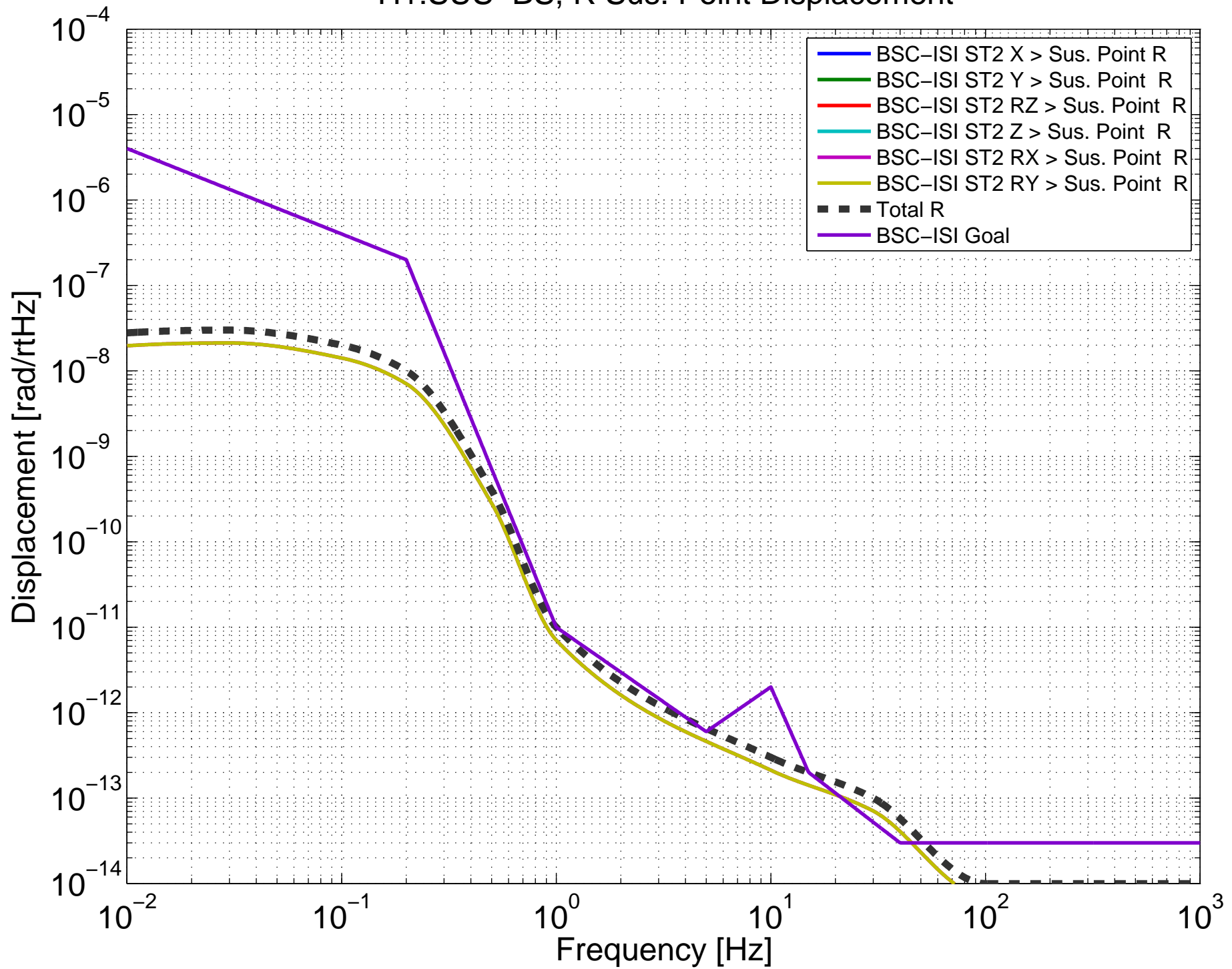
# Projected ISI Seismic Noise Budget H1:SUS-BS, L Sus. Point Displacement







# Projected ISI Seismic Noise Budget H1:SUS-BS, R Sus. Point Displacement



# Projected ISI Seismic Noise Budget H1:SUS-BS, P Sus. Point Displacement

