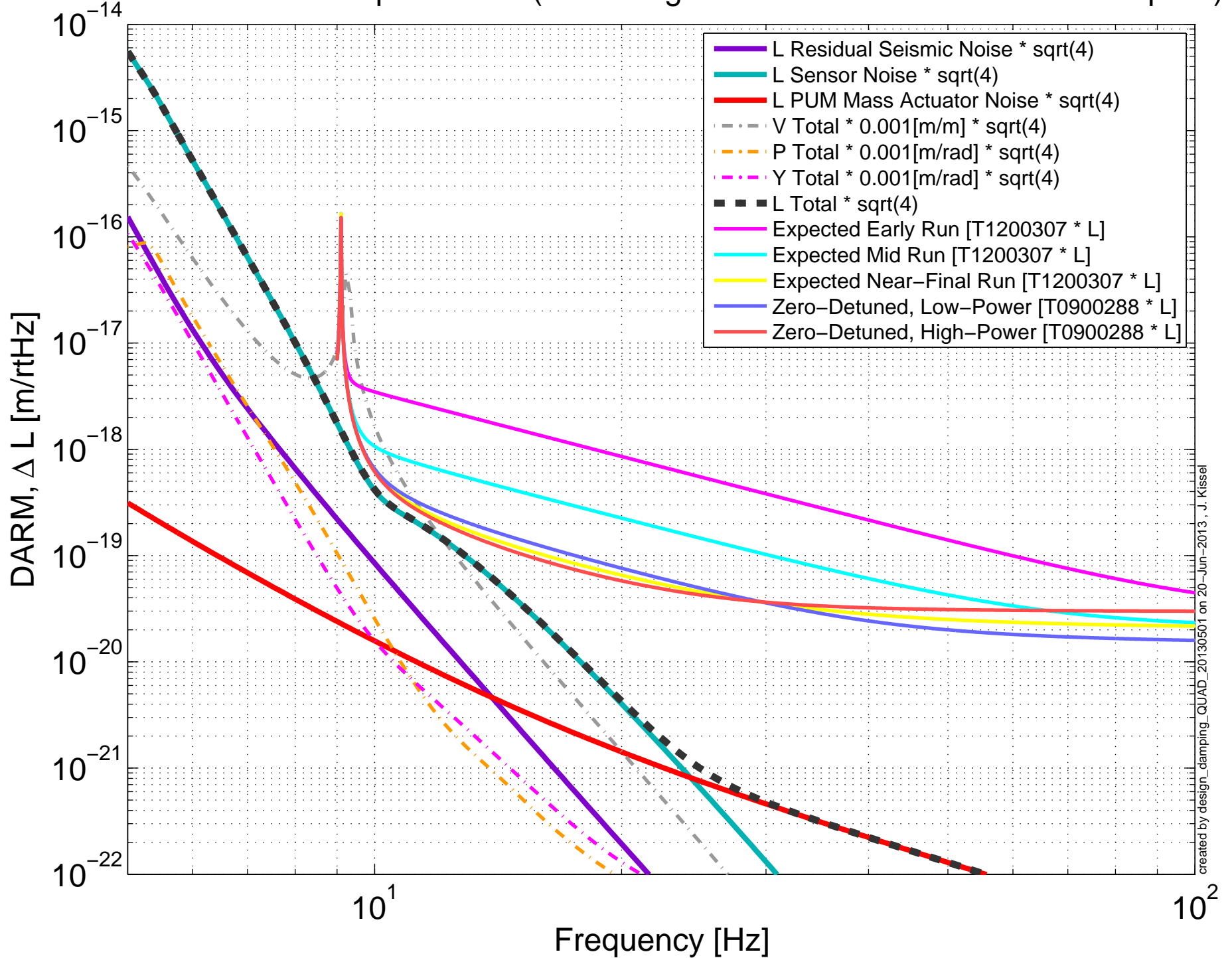


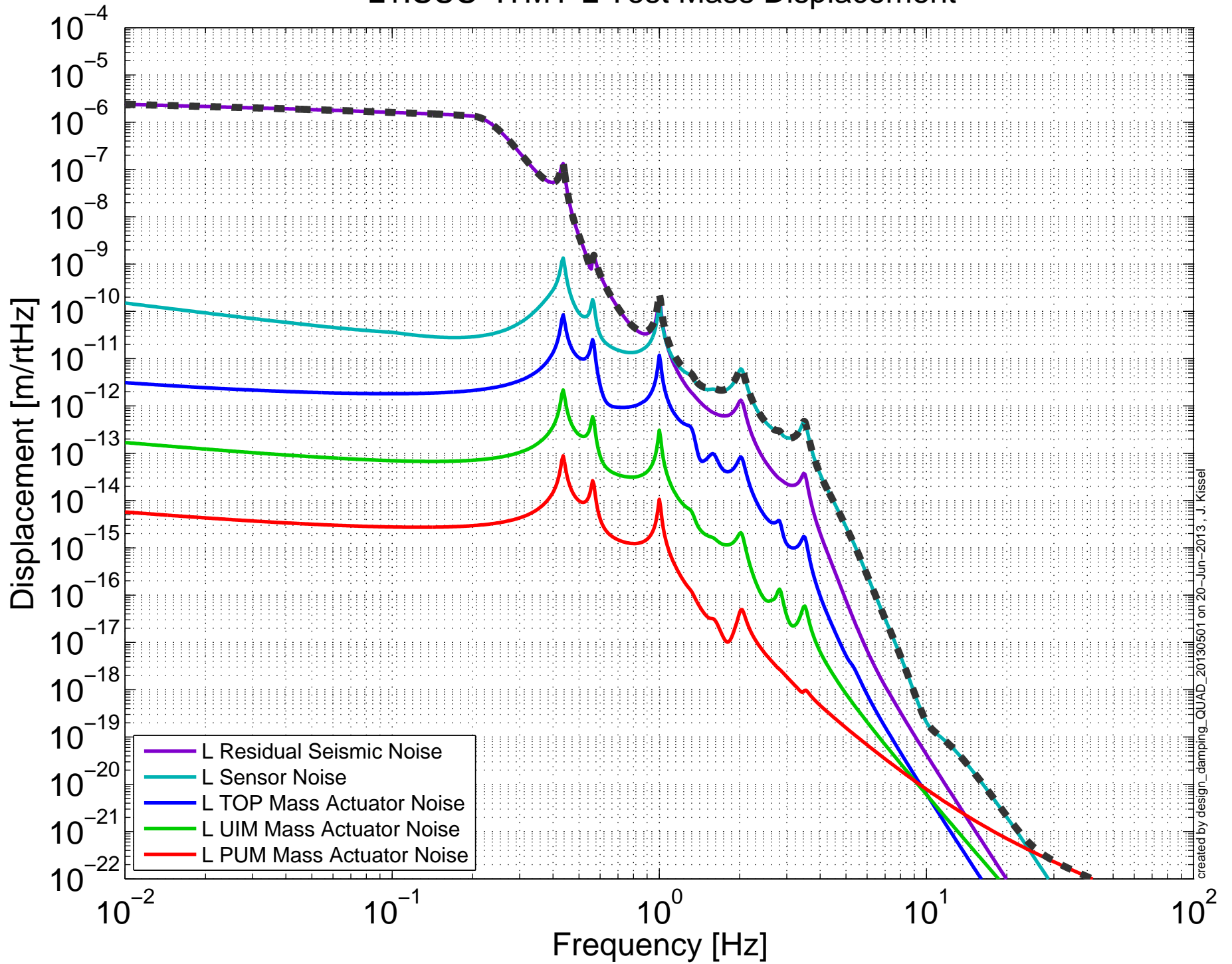
Damping Loop Performance

Differential Arm Displacement (Assuming Identical Performance for all 4 Optics)

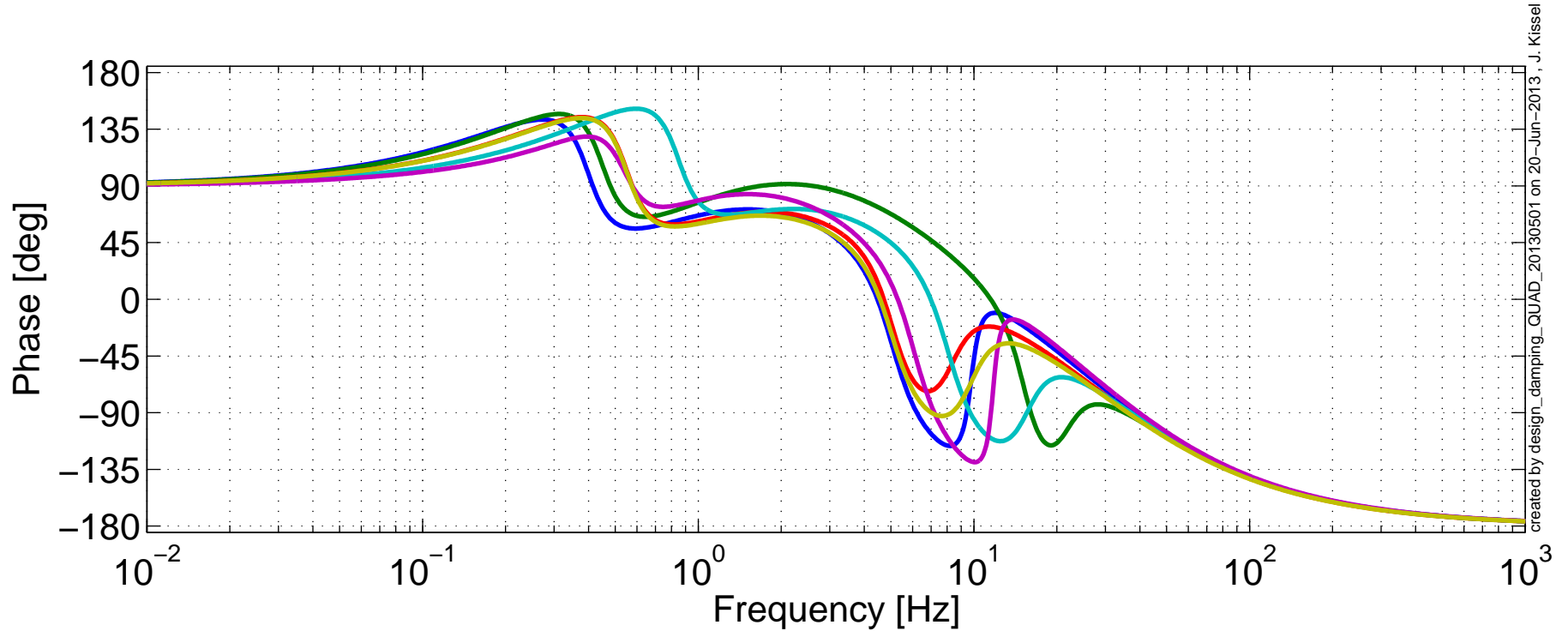
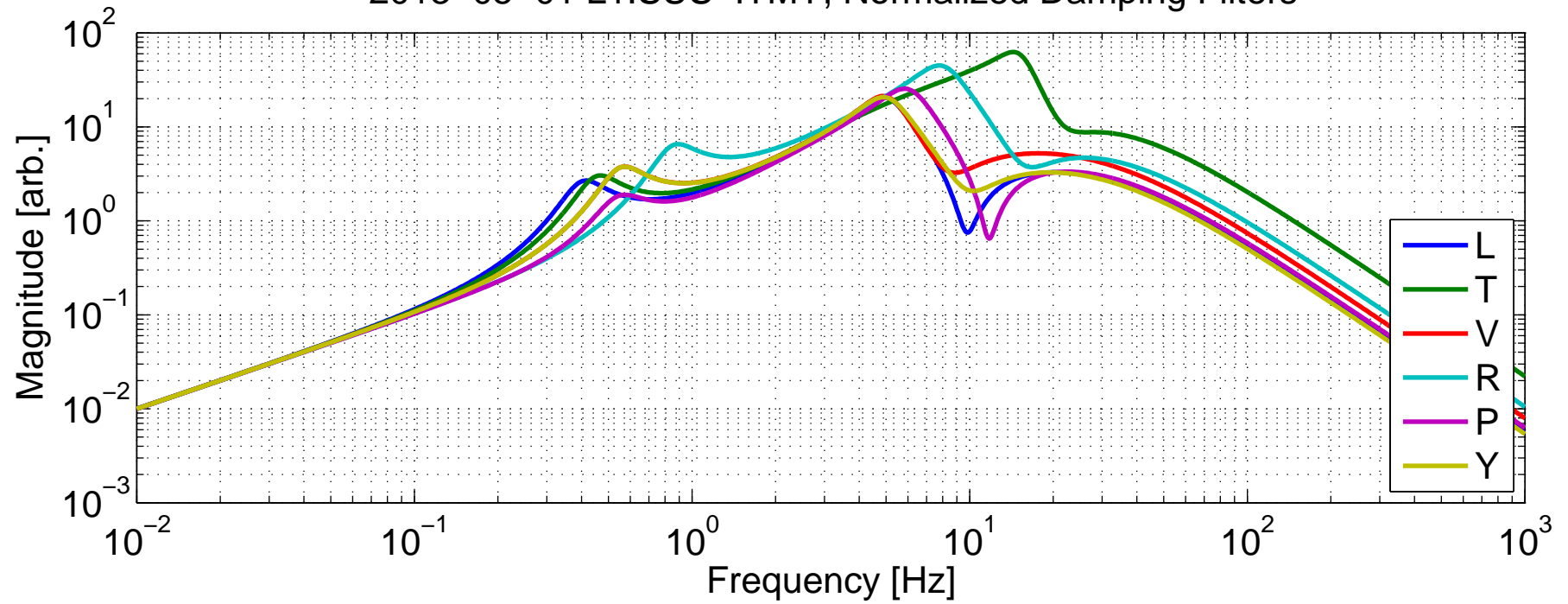


Damping Loop Performance

L1:SUS-ITMY L Test Mass Displacement

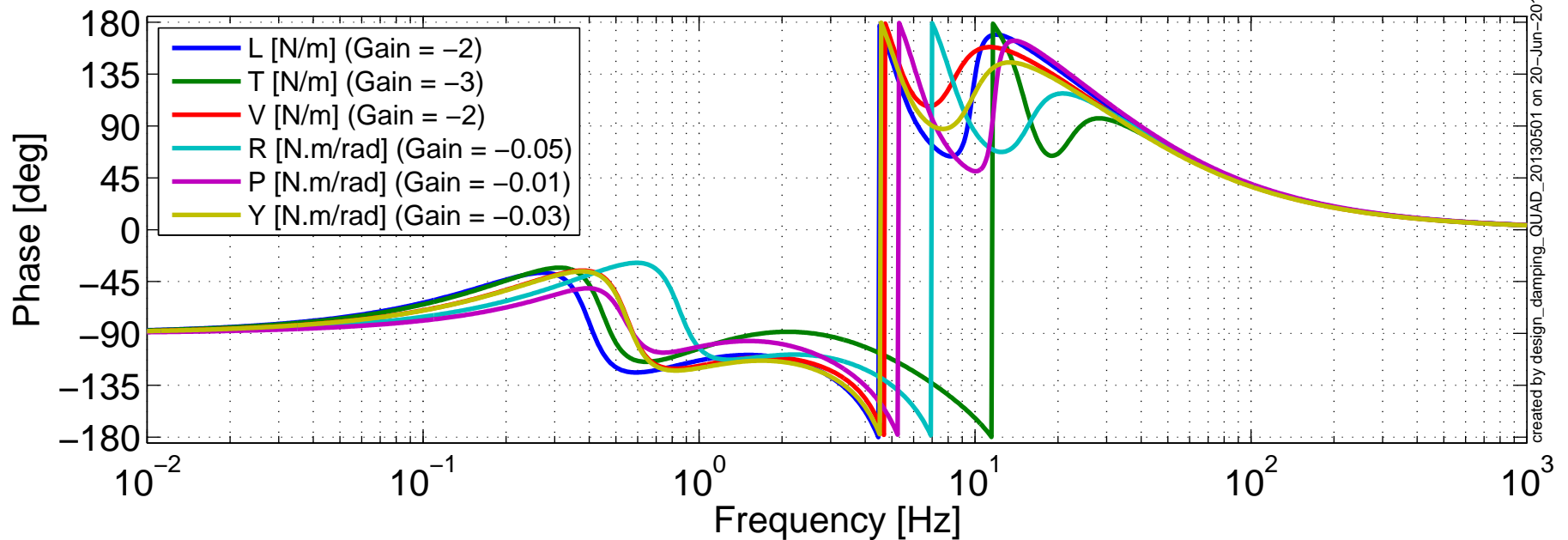
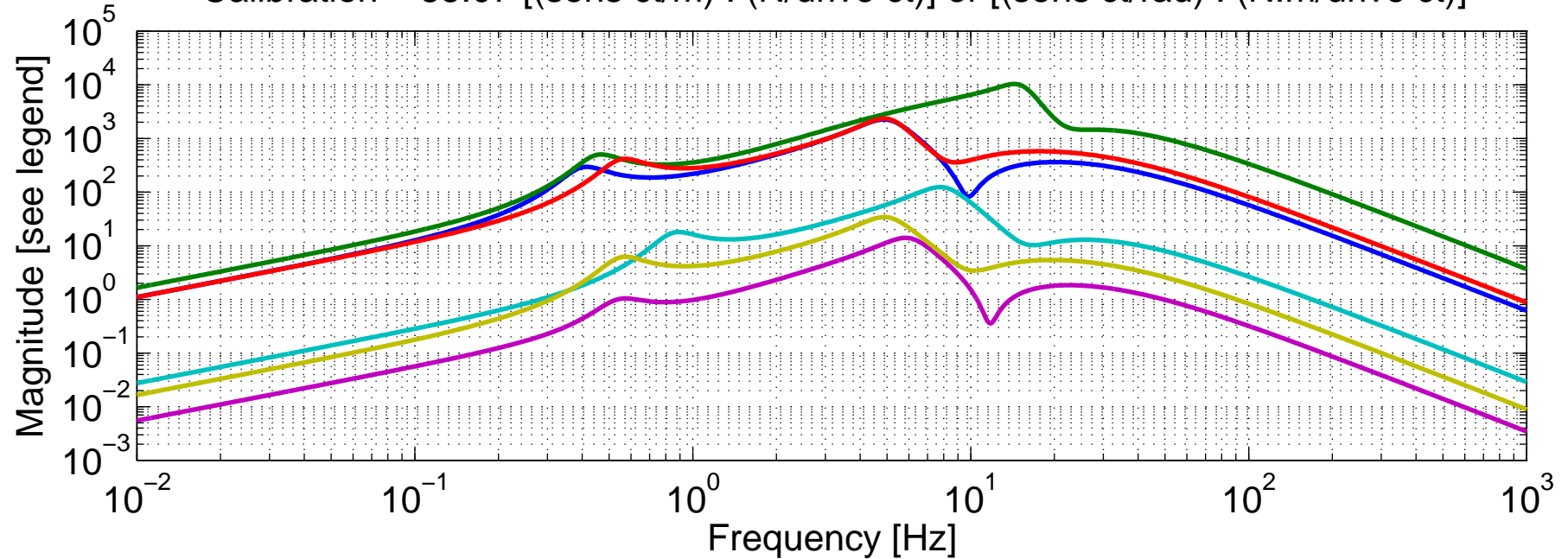


2013-05-01 L1:SUS-ITMY, Normalized Damping Filters



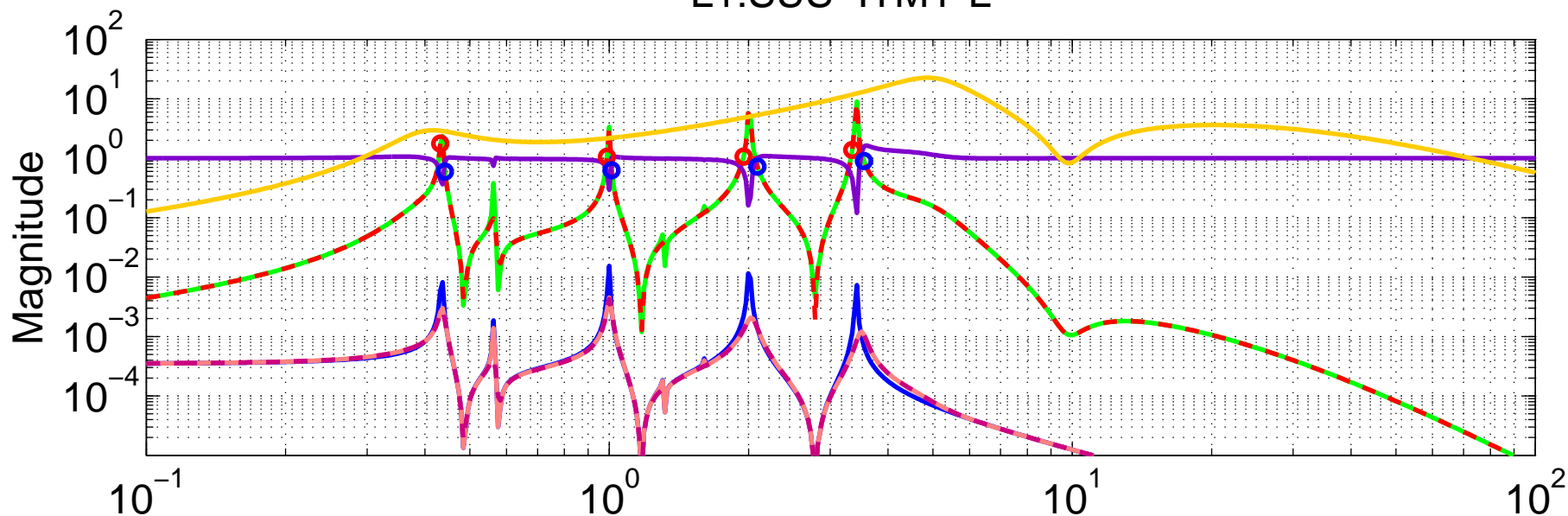
created by design_damping_QUAD_20130501 on 20-Jun-2013 - J. Kissel

2013-05-01 L1:SUS-ITMY, Calibrated Damping Filters
Calibration = 55.07 [(sens ct/m) . (N/drive ct)] or [(sens ct/rad) . (N.m/drive ct)]

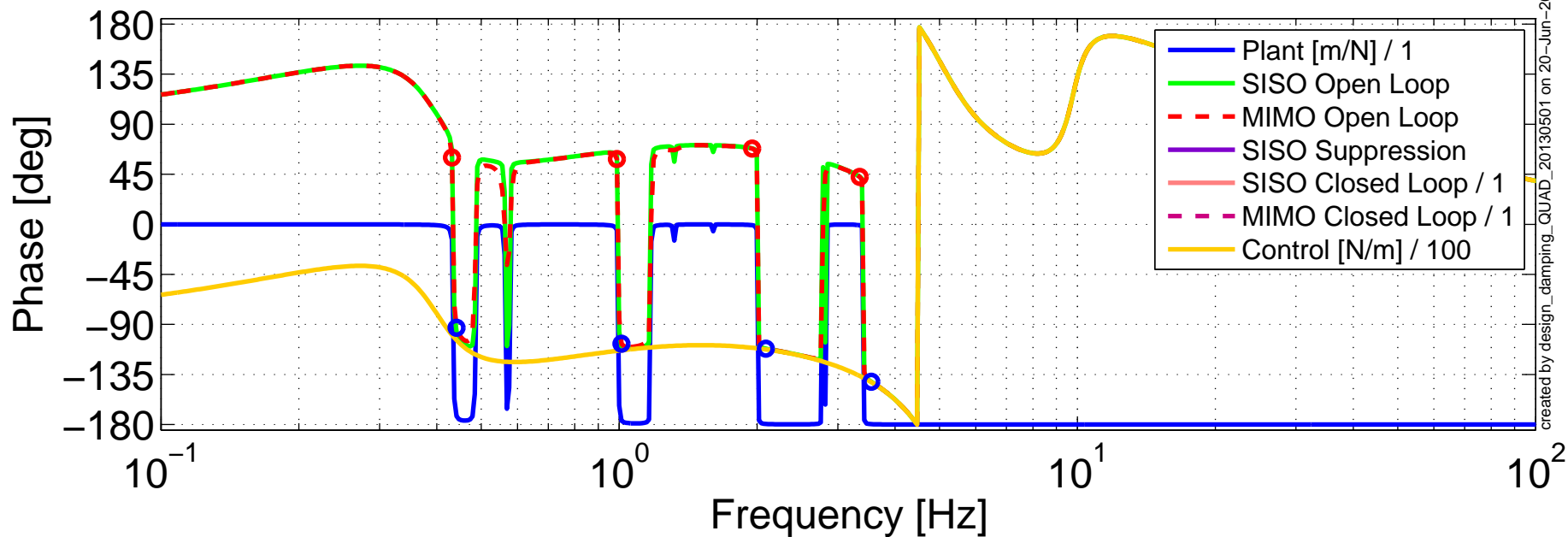


Damping Loop Design

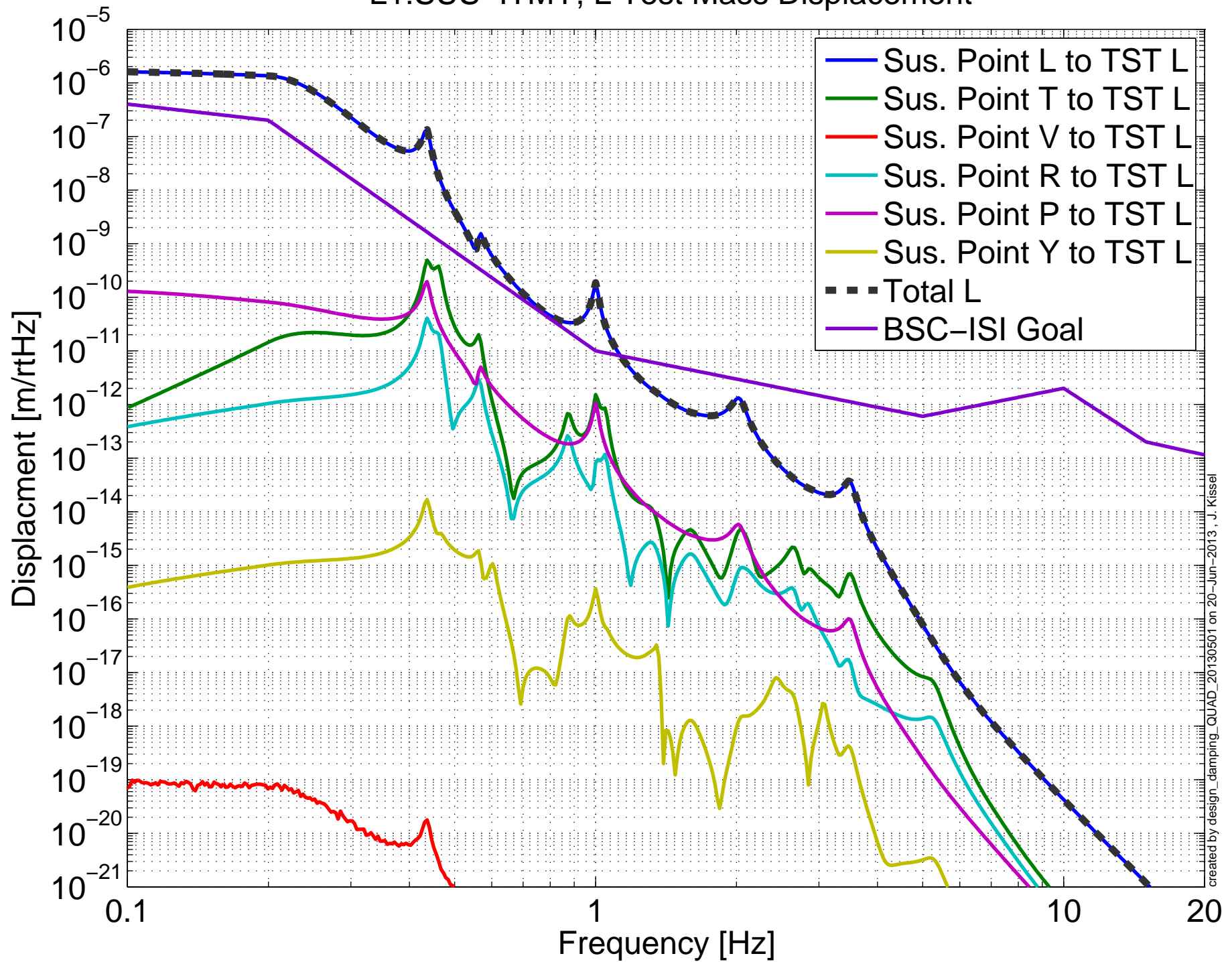
L1:SUS-ITMY L



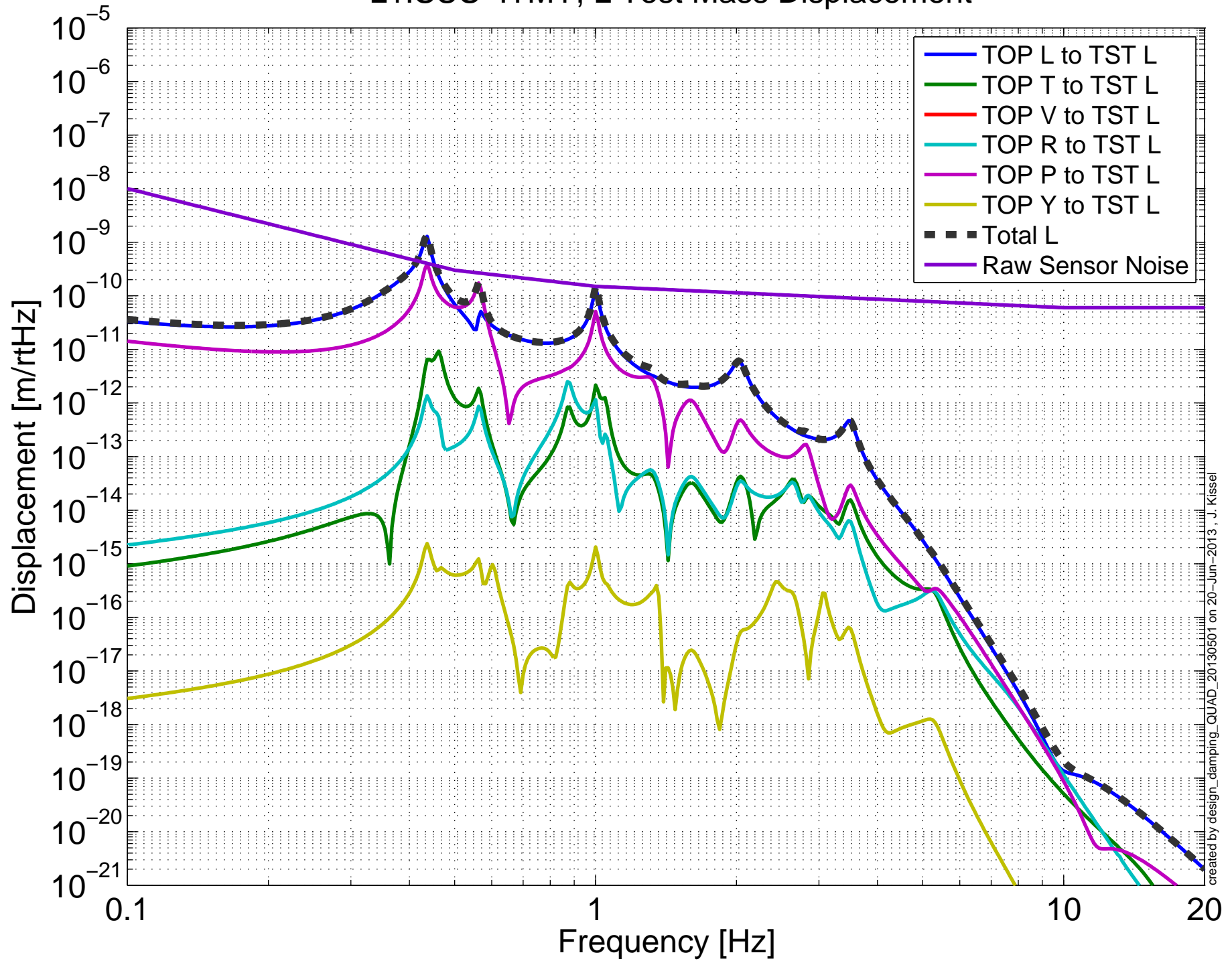
MIMO LUGF Phase Margins (red): [120 121 112 137] [deg]
MIMO UUGF Phase Margins (blue): [87 72.6 68.2 38.5] [deg]



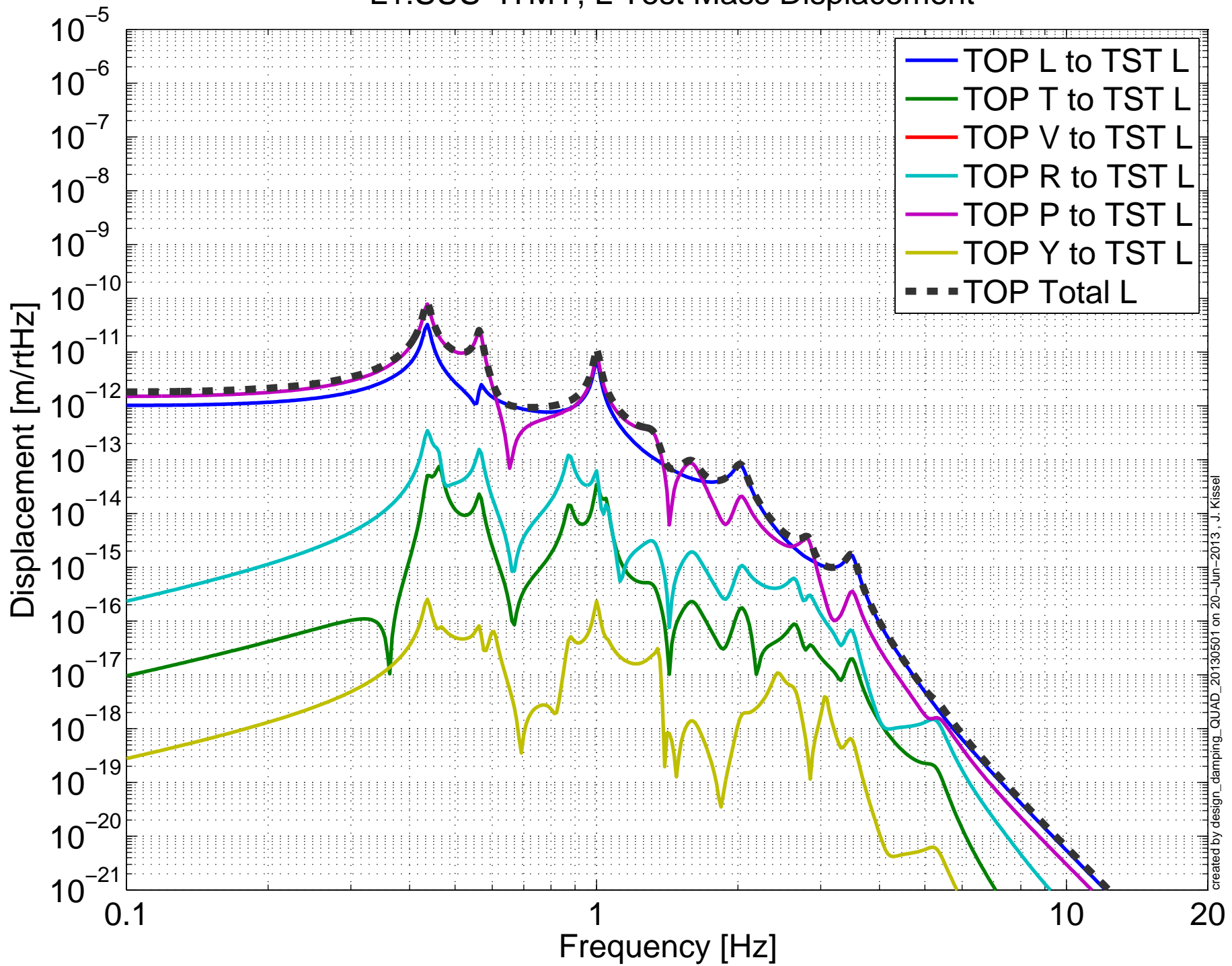
Projected Sus. Point > Test Mass Seismic Noise Budget L1:SUS-ITMY, L Test Mass Displacement



Projected Top Mass Sensor > Test Mass Noise Budget L1:SUS-ITMY, L Test Mass Displacement

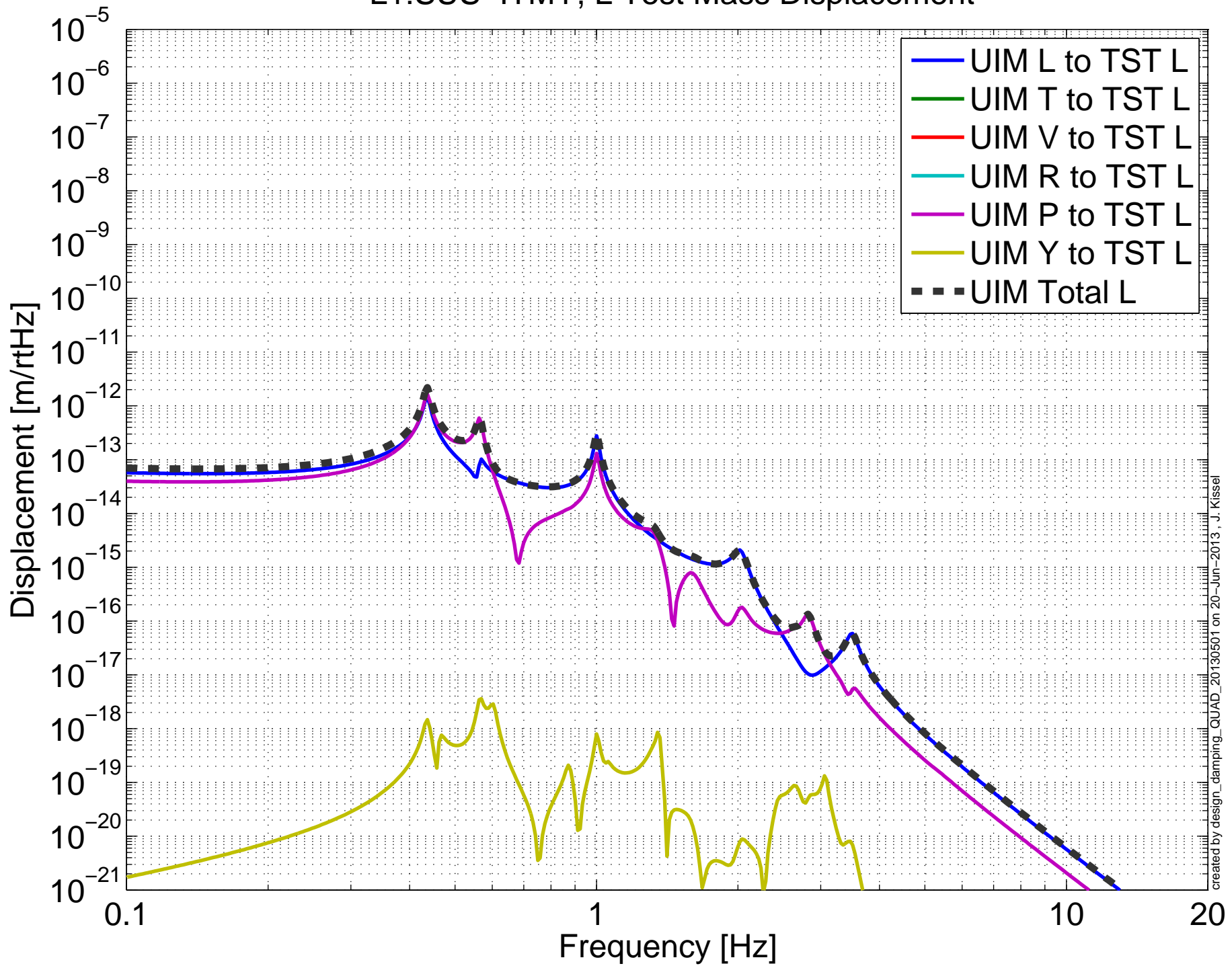


Projected Top Mass Actuator > Test Mass Noise Budget L1:SUS-ITMY, L Test Mass Displacement



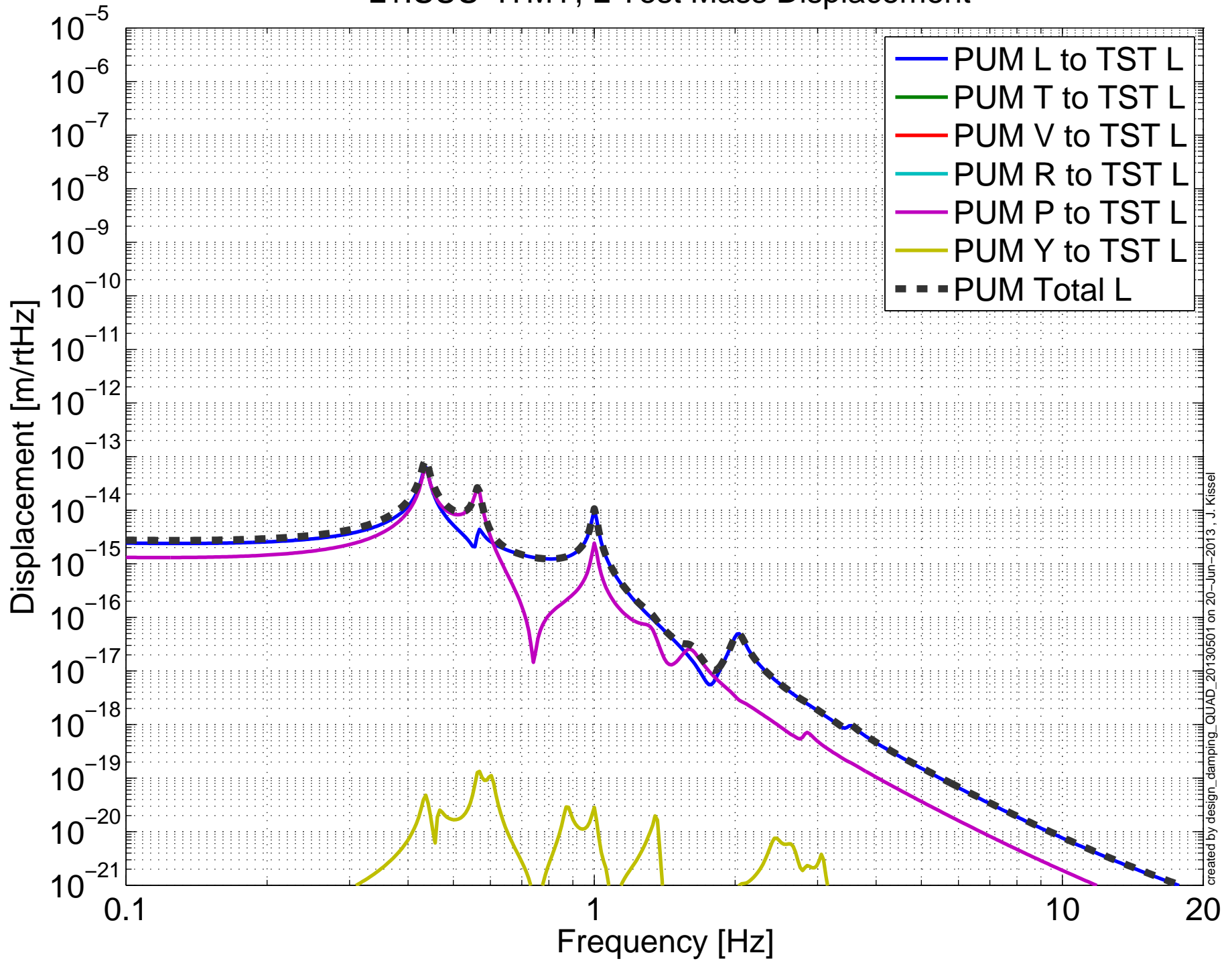
created by design_damping_QUAD_20130501 on 20-Jun-2013, J. Kissel

Projected UIM Mass Actuator > Test Mass Noise Budget L1:SUS-ITMY, L Test Mass Displacement



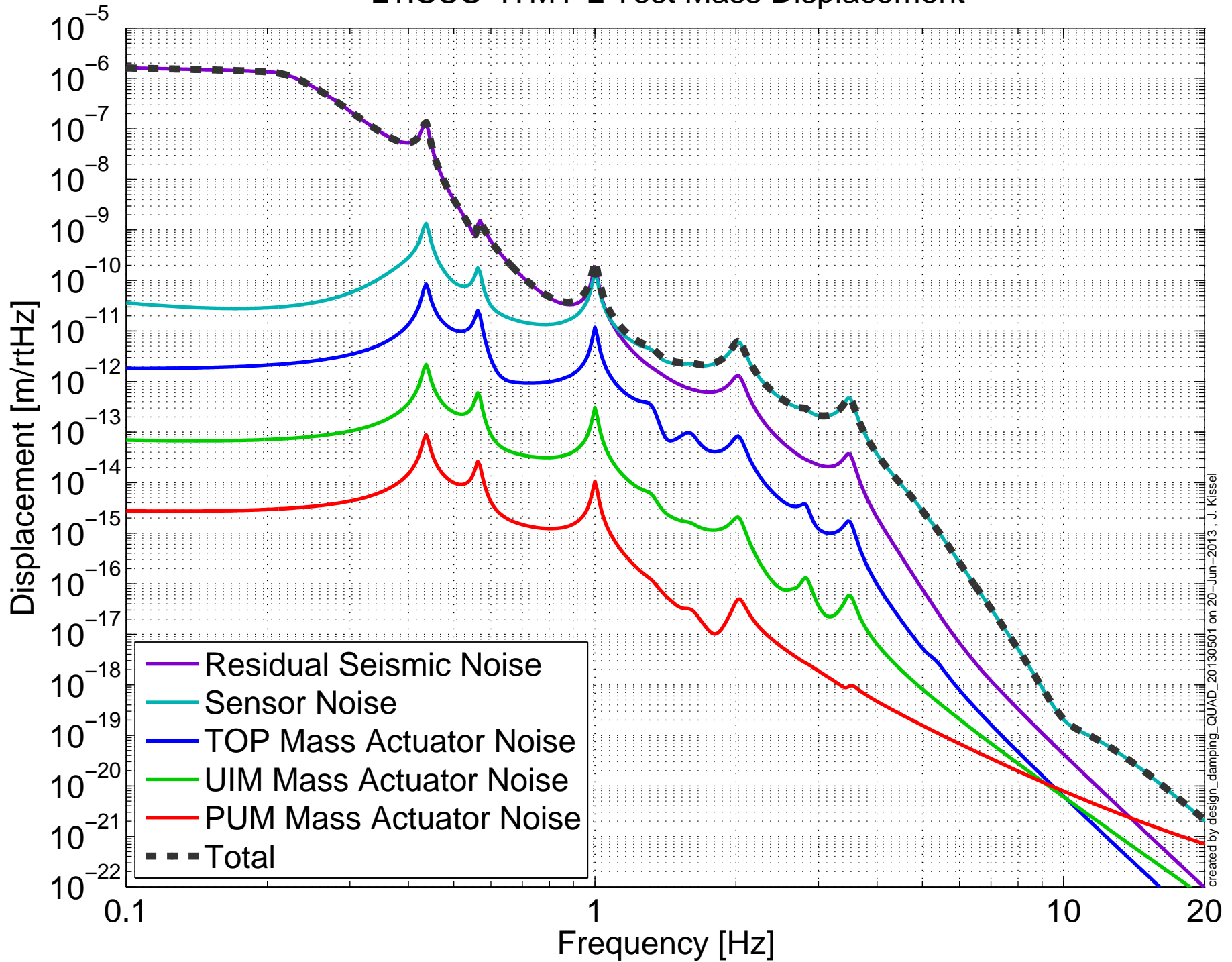
created by design_damping_QUAD_20130501 on 20-Jun-2013 - J. Kissel

Projected PUM Mass Actuator > Test Mass Noise Budget L1:SUS-ITMY, L Test Mass Displacement



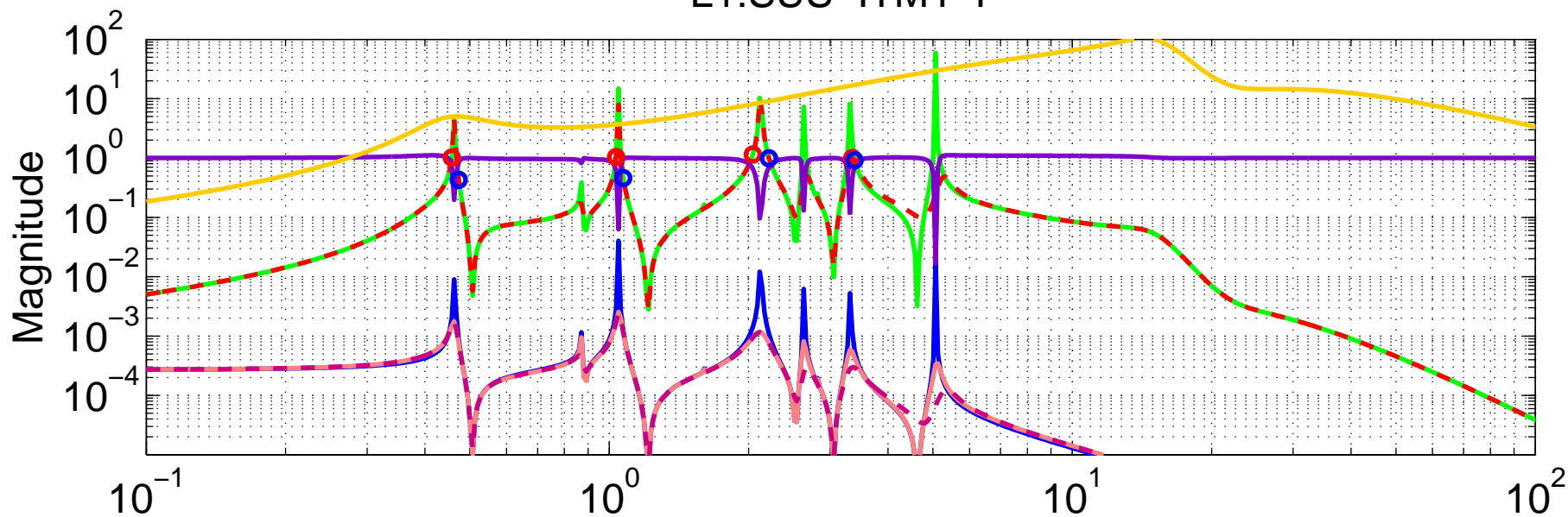
Damping Loop Performance

L1:SUS-ITMY L Test Mass Displacement

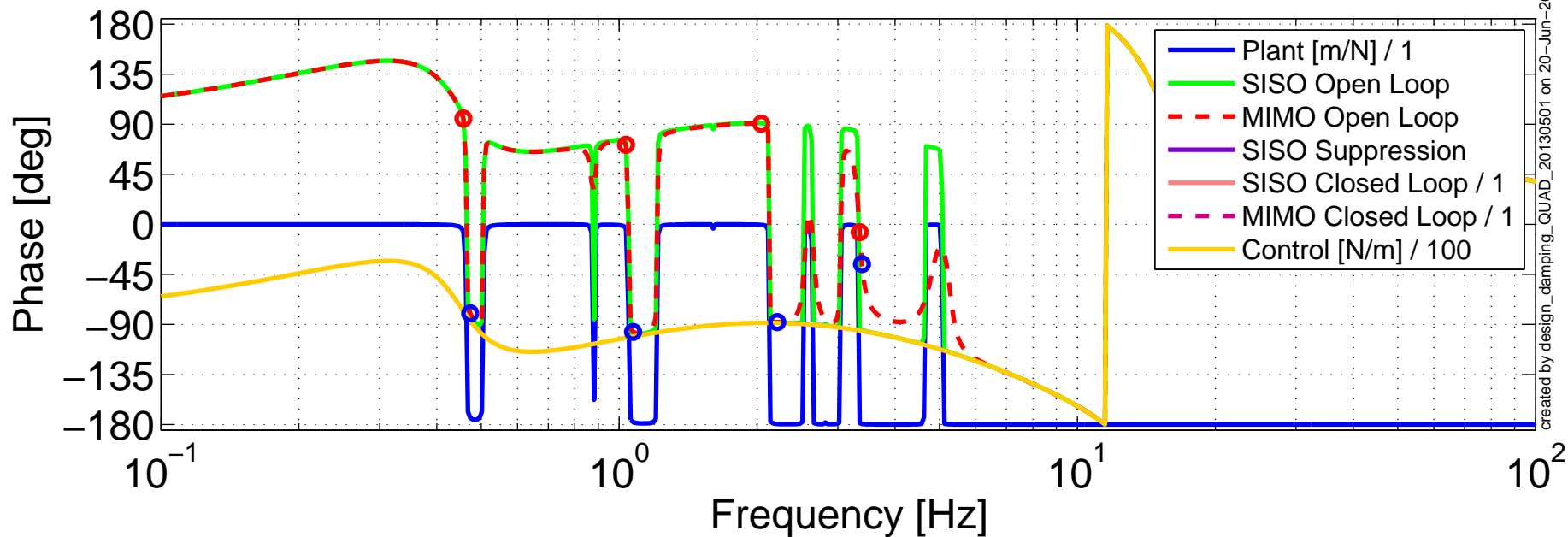


created by design_damping_QUAD_20130501 on 20-Jun-2013 - J. Kissel

Damping Loop Design L1:SUS-ITMY T

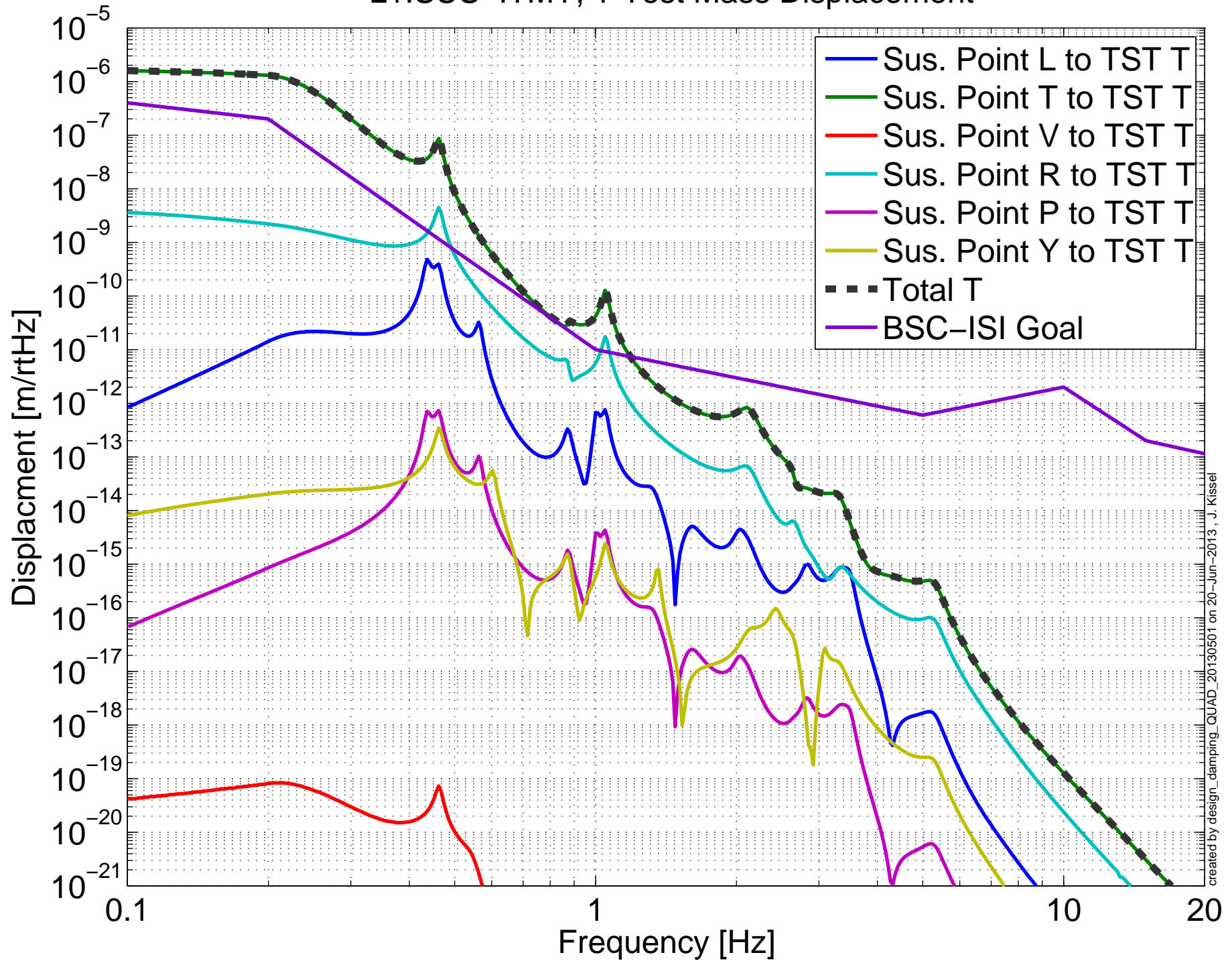


MIMO LUGF Phase Margins (red): [85 109 89.5 187] [deg]
MIMO UUGF Phase Margins (blue): [100 83.3 92.2 144] [deg]

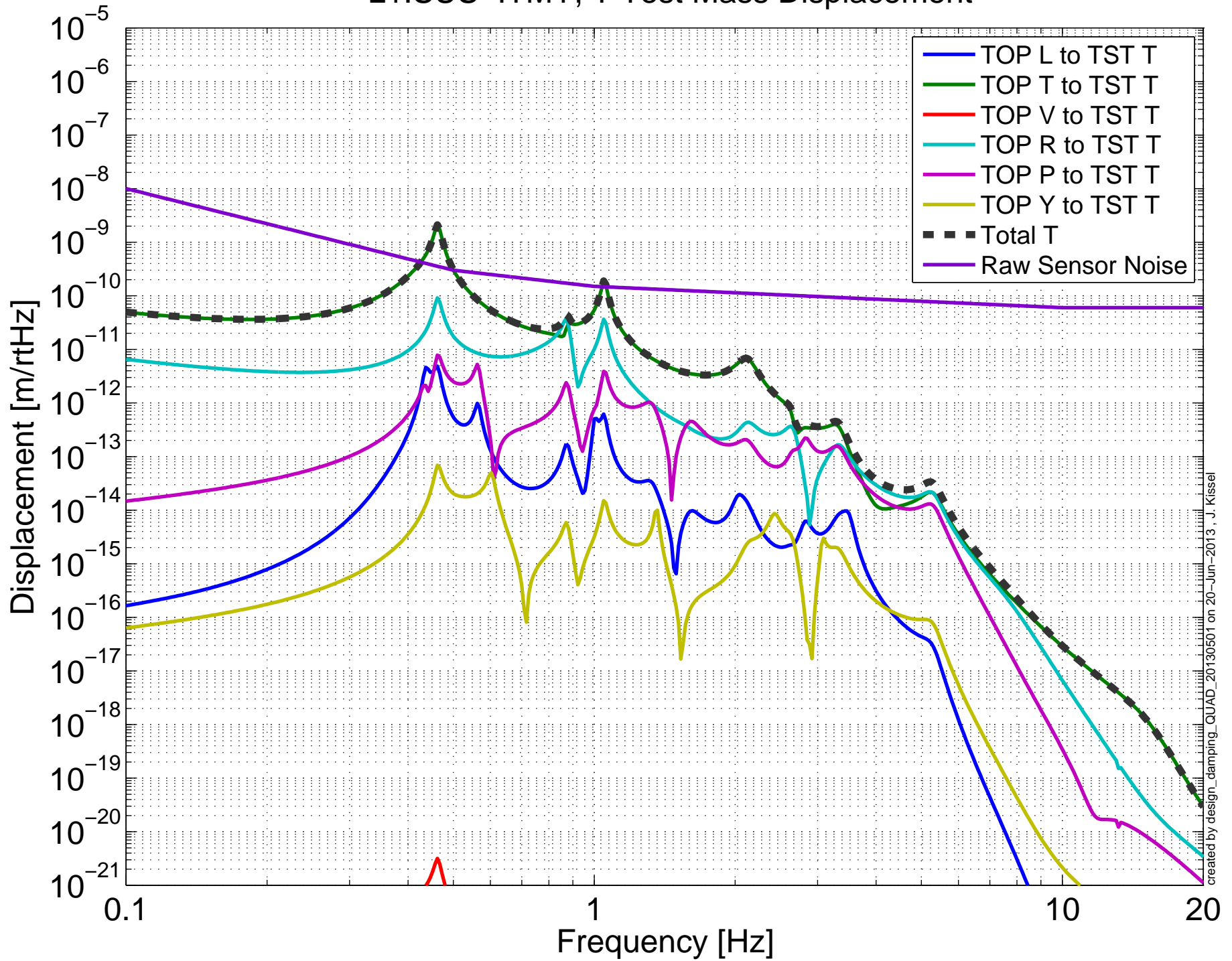


created by design_damping_QUAD_20130501 on 20-Jun-2013, J. Kissel

Projected Sus. Point > Test Mass Seismic Noise Budget L1:SUS-ITMY, T Test Mass Displacement

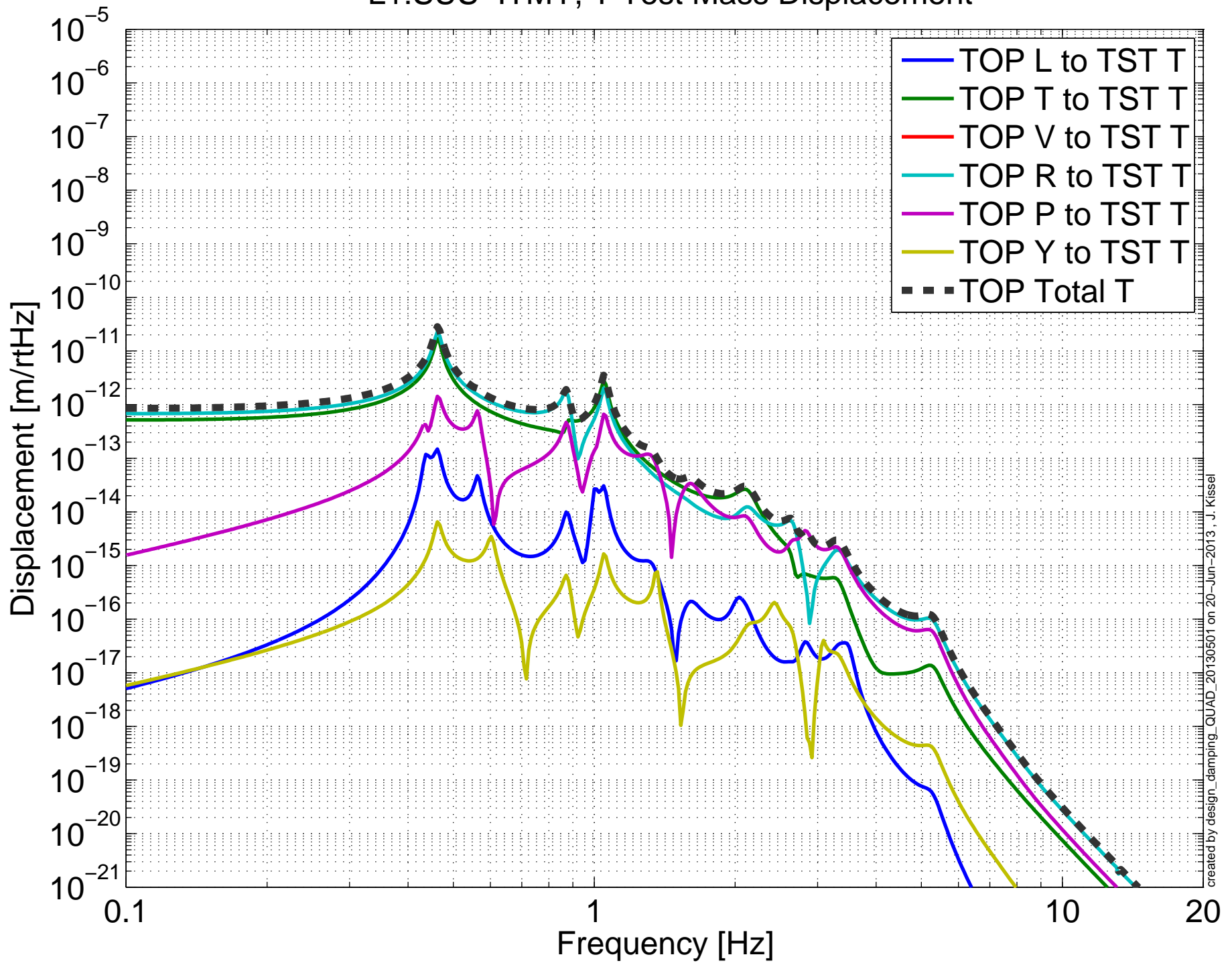


Projected Top Mass Sensor > Test Mass Noise Budget L1:SUS-ITMY, T Test Mass Displacement

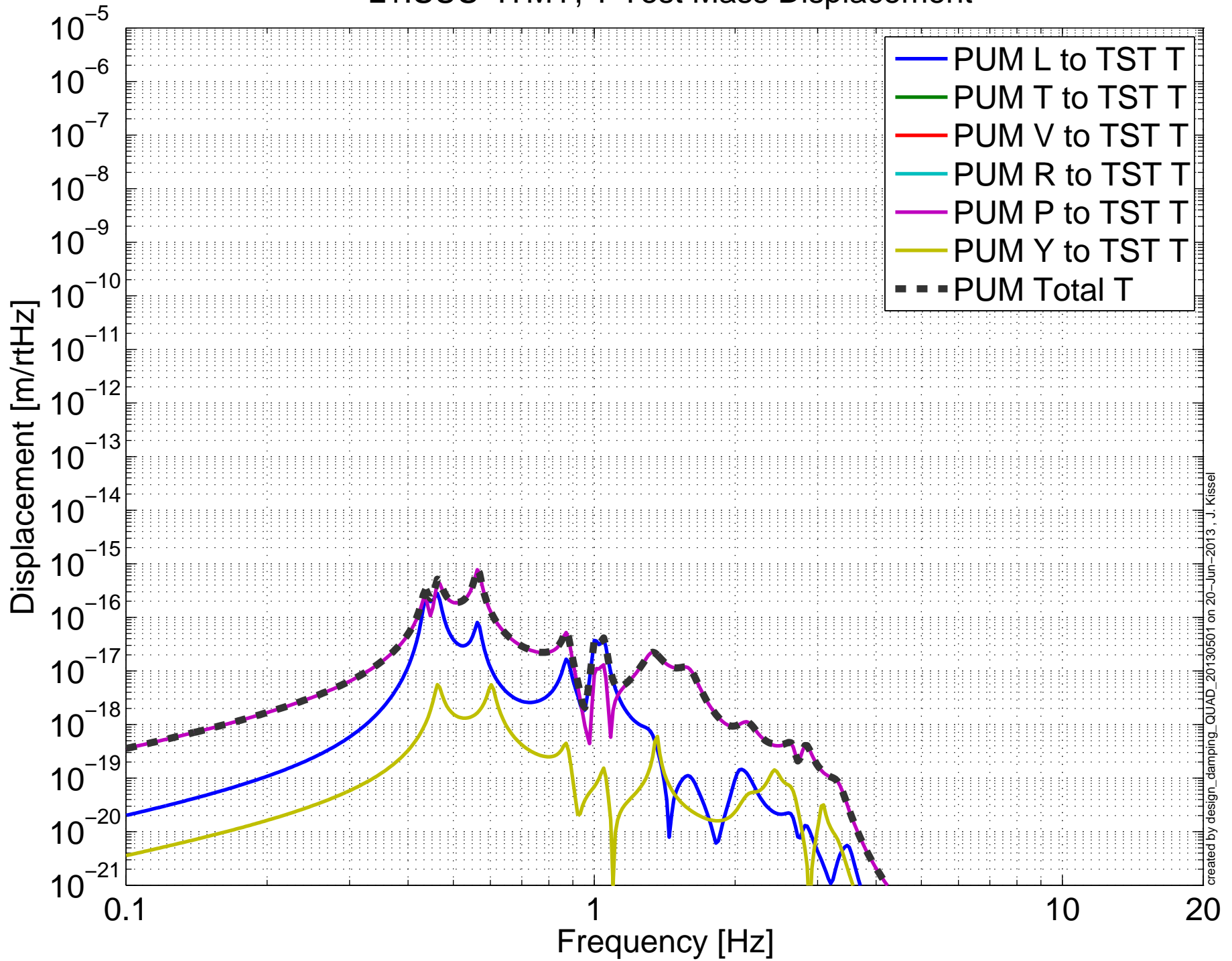


created by design_damping_QUAD_20130501 on 20-Jun-2013 - J. Kissel

Projected Top Mass Actuator > Test Mass Noise Budget L1:SUS-ITMY, T Test Mass Displacement

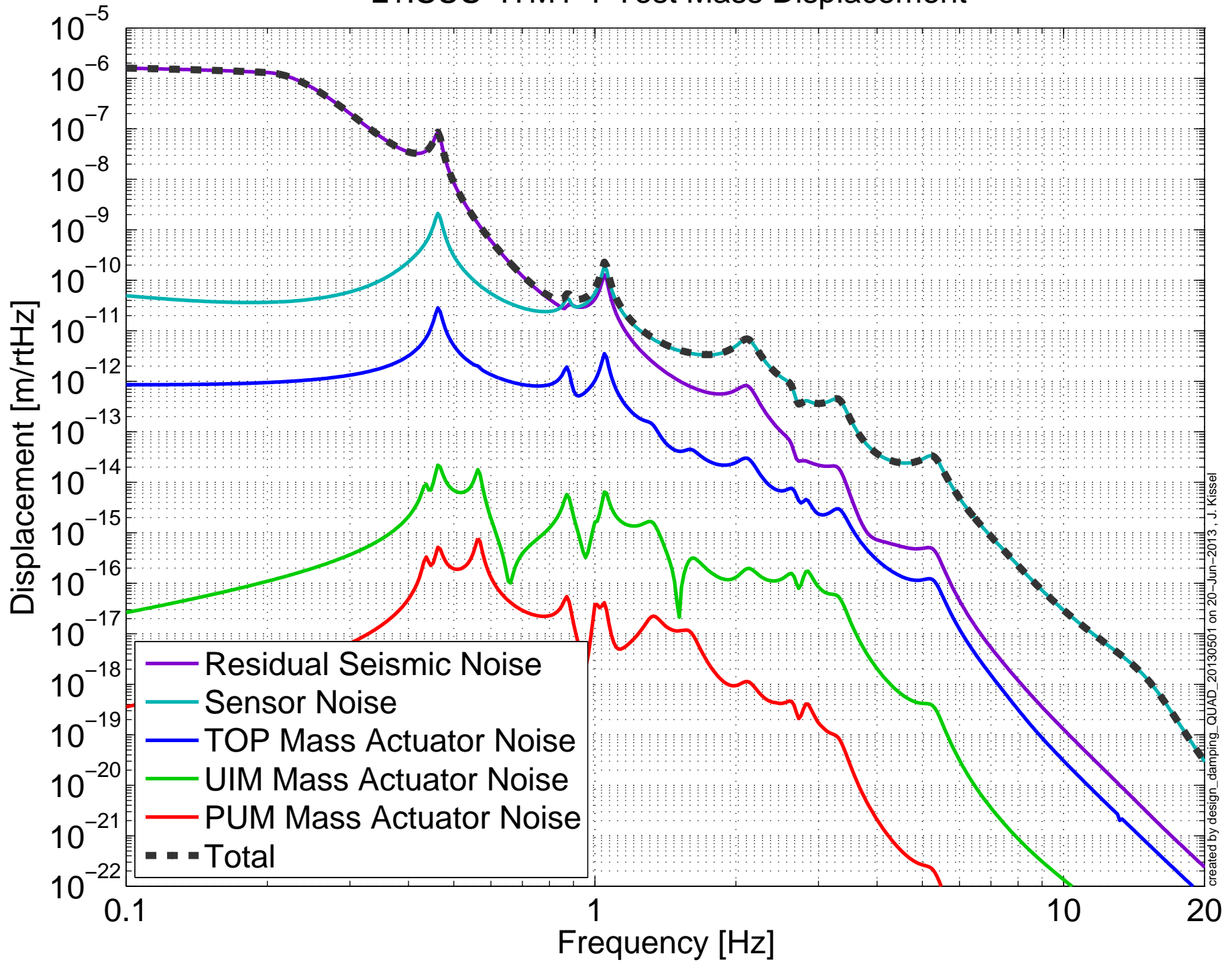


Projected PUM Mass Actuator > Test Mass Noise Budget L1:SUS-ITMY, T Test Mass Displacement

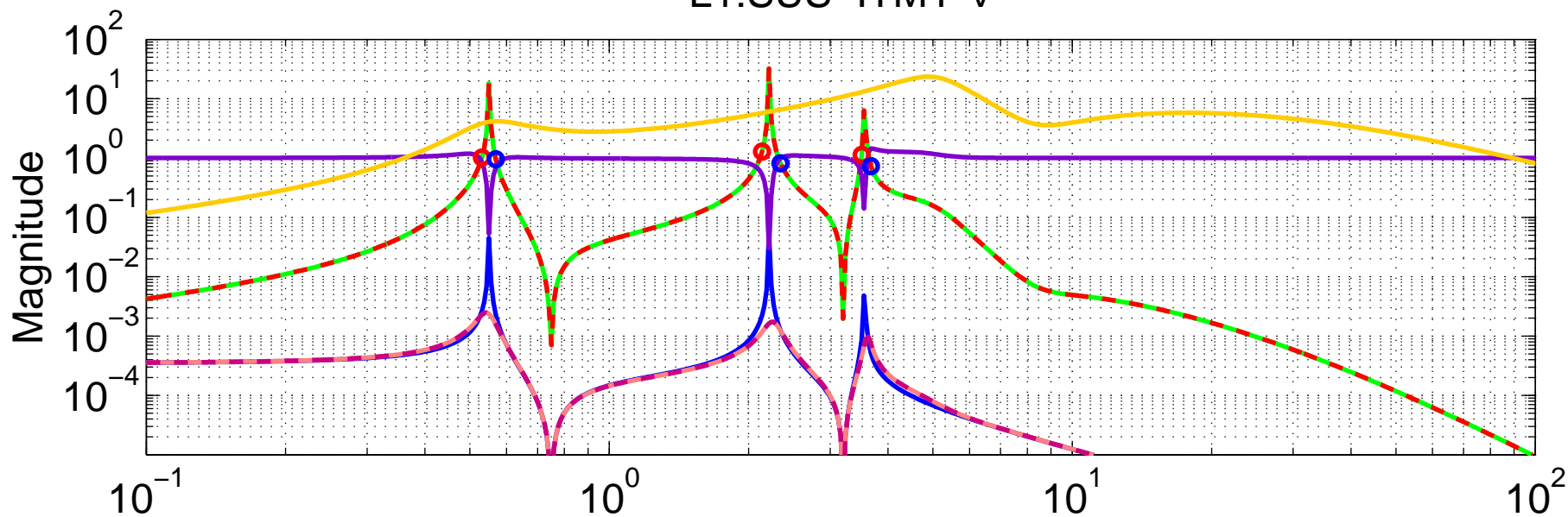


Damping Loop Performance

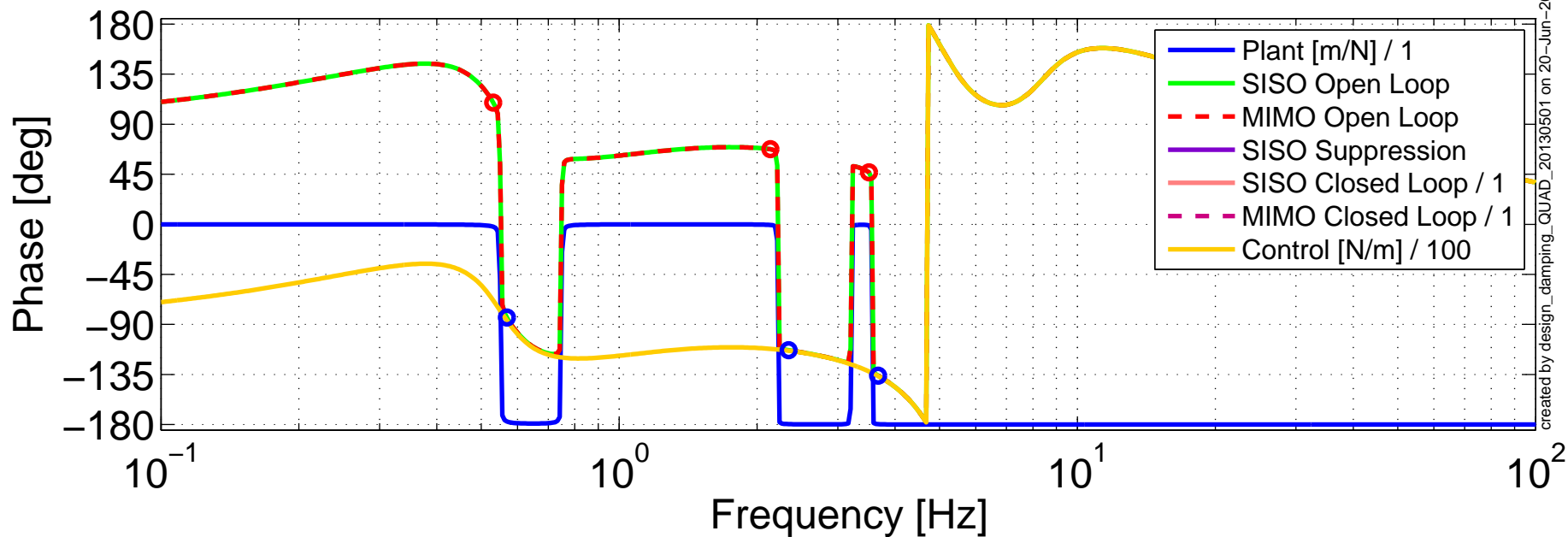
L1:SUS-ITMY T Test Mass Displacement



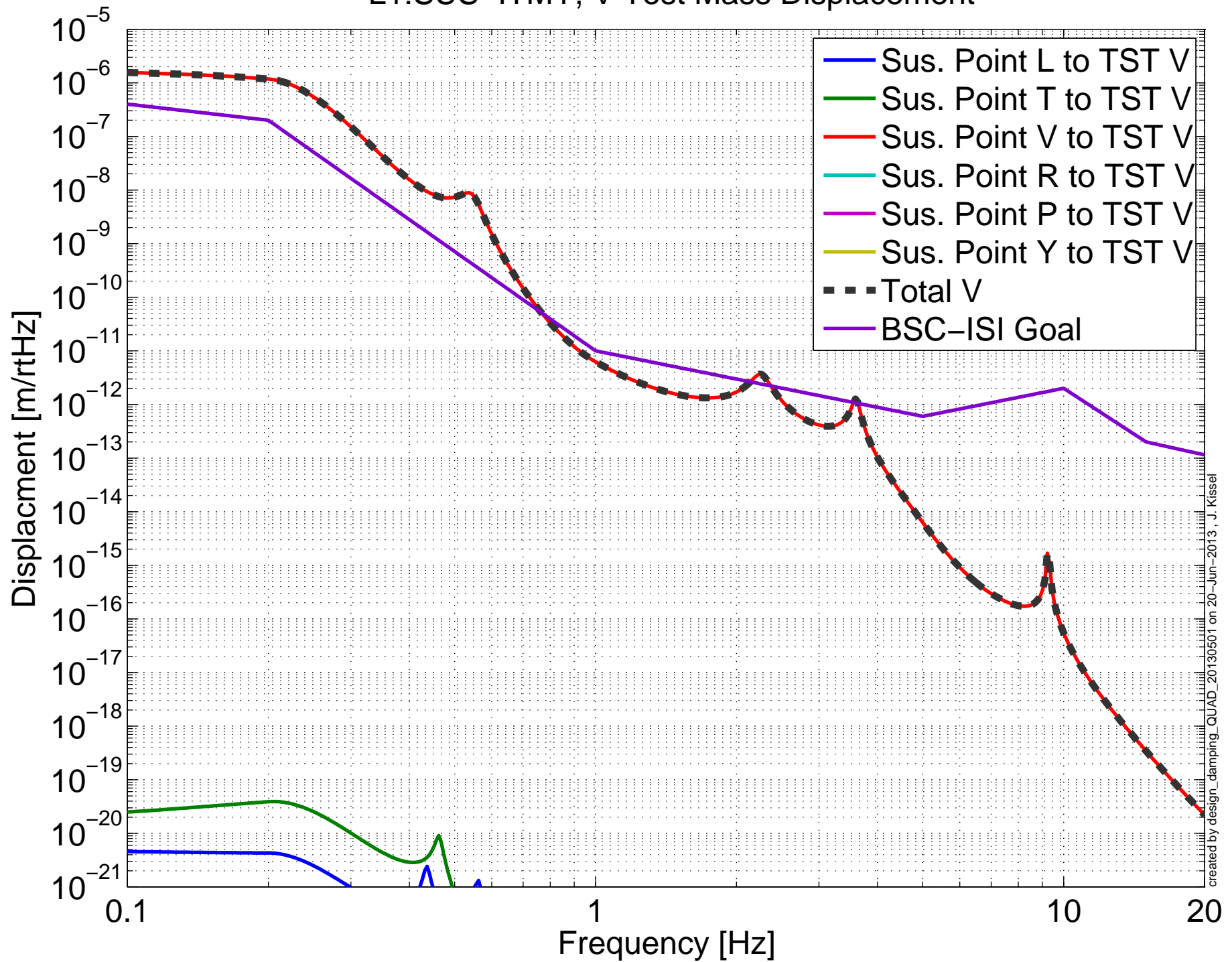
Damping Loop Design L1:SUS-ITMY V



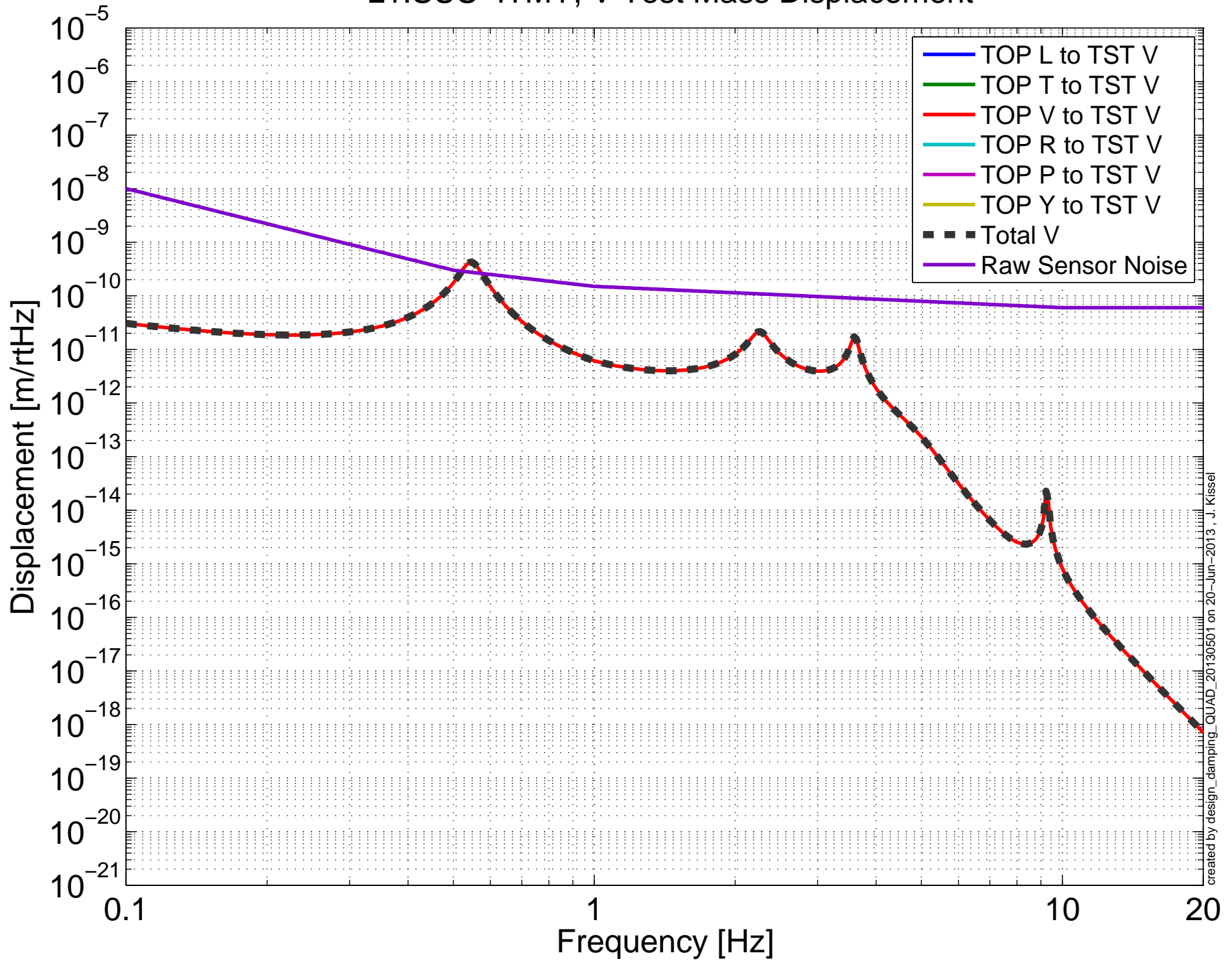
MIMO LUGF Phase Margins (red): [70.5 113 133] [deg]
MIMO UUGF Phase Margins (blue): [96.2 66.8 44] [deg]



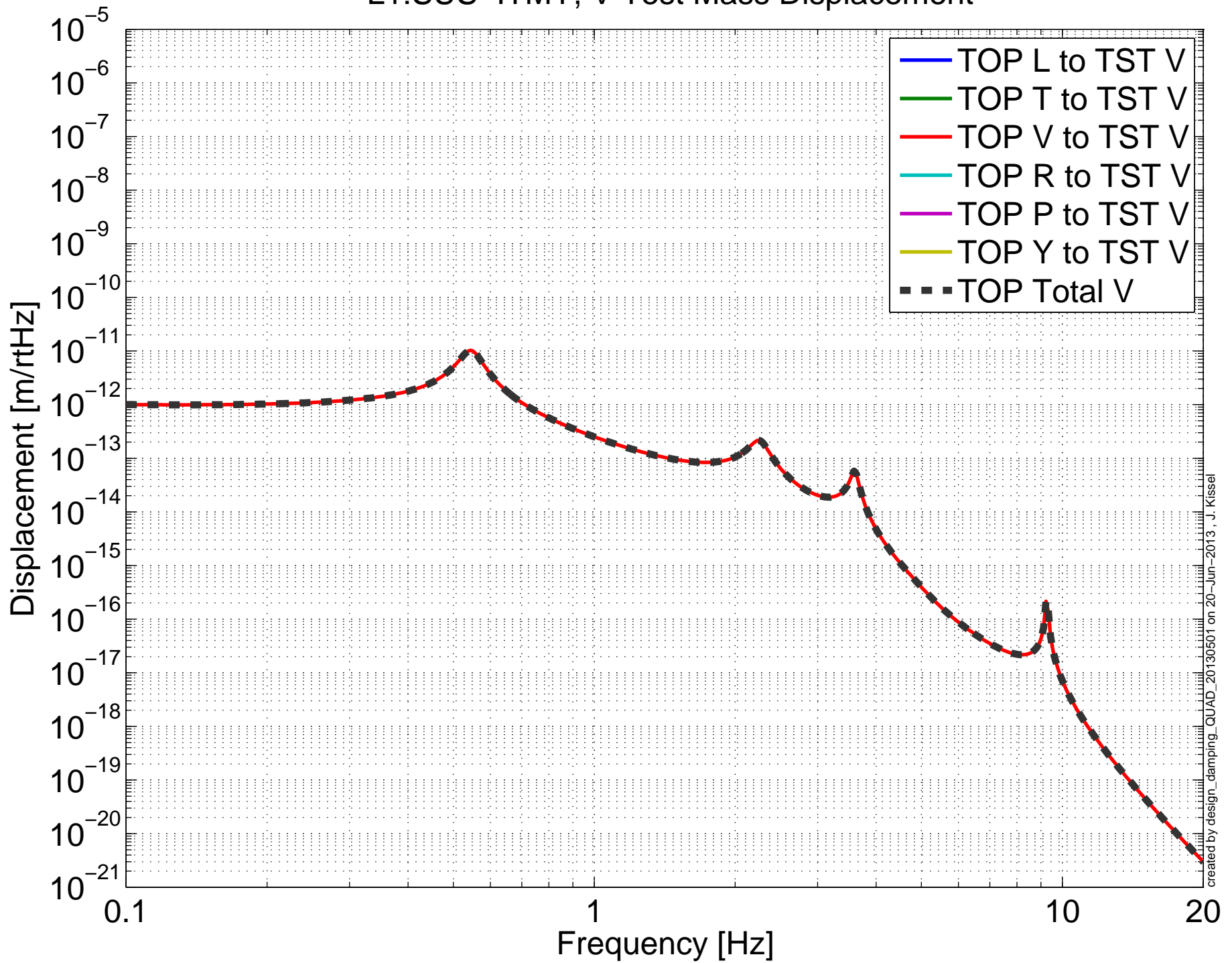
Projected Sus. Point > Test Mass Seismic Noise Budget L1:SUS-ITMY, V Test Mass Displacement



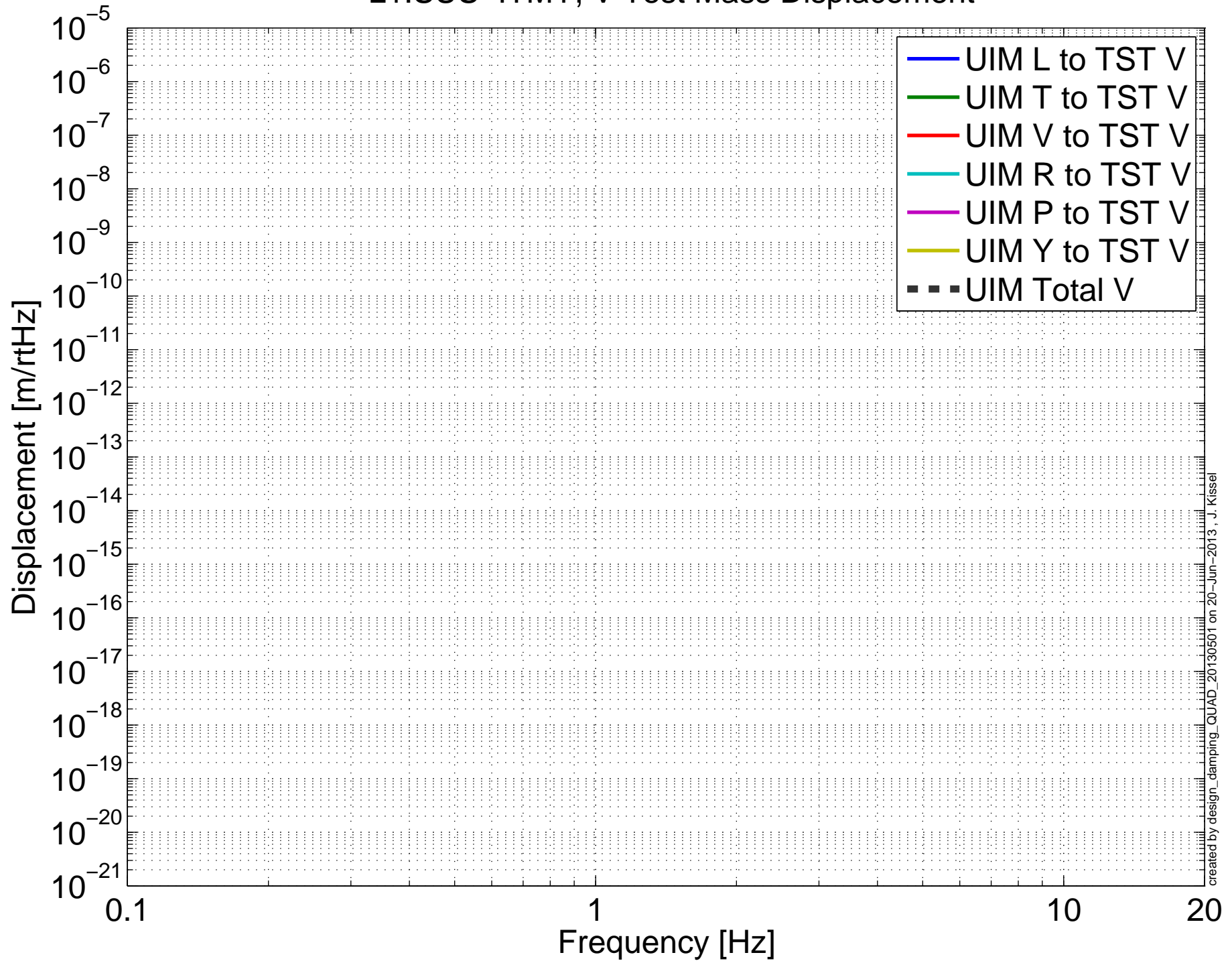
Projected Top Mass Sensor > Test Mass Noise Budget L1:SUS-ITMY, V Test Mass Displacement



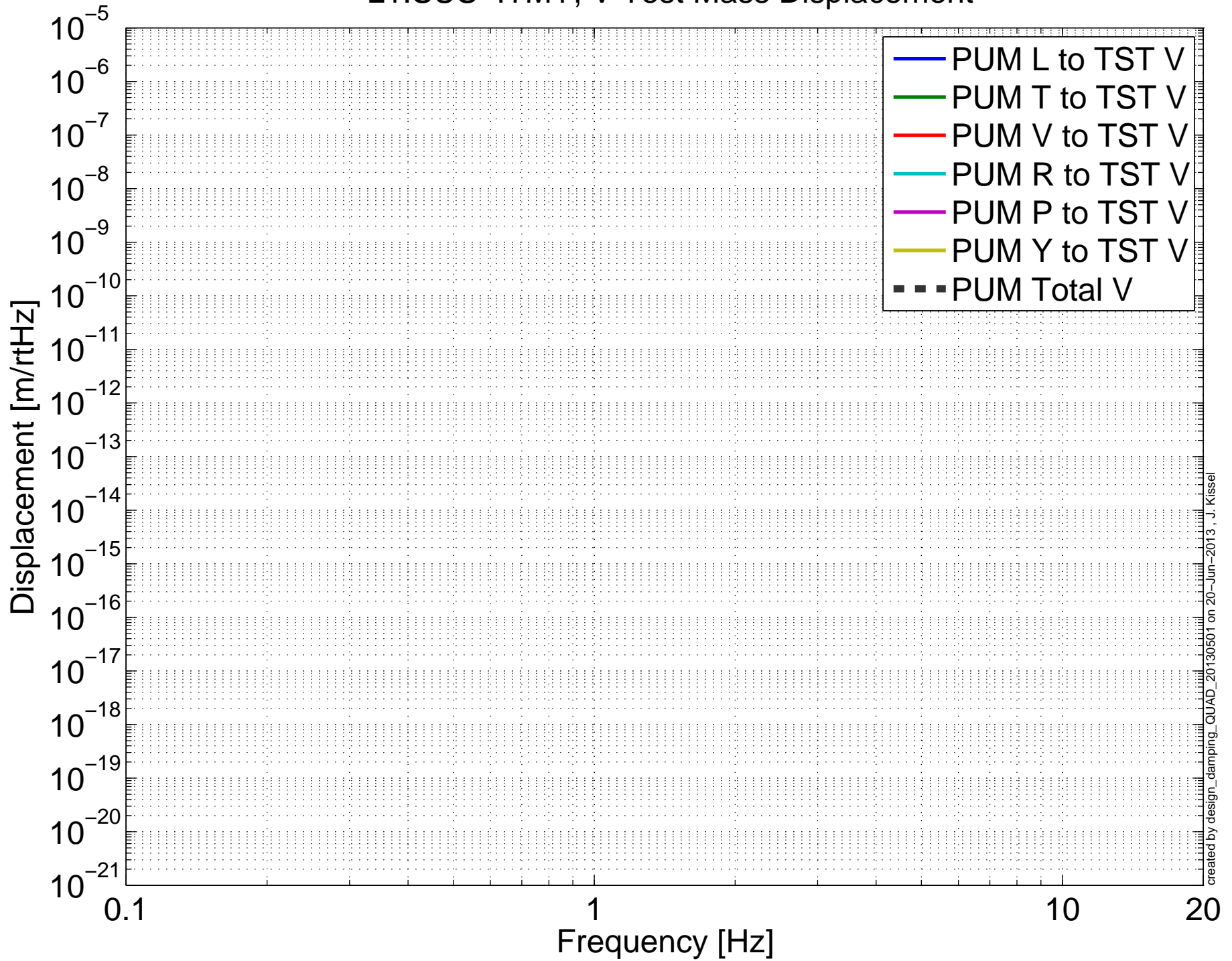
Projected Top Mass Actuator > Test Mass Noise Budget L1:SUS-ITMY, V Test Mass Displacement



Projected UIM Mass Actuator > Test Mass Noise Budget L1:SUS-ITMY, V Test Mass Displacement



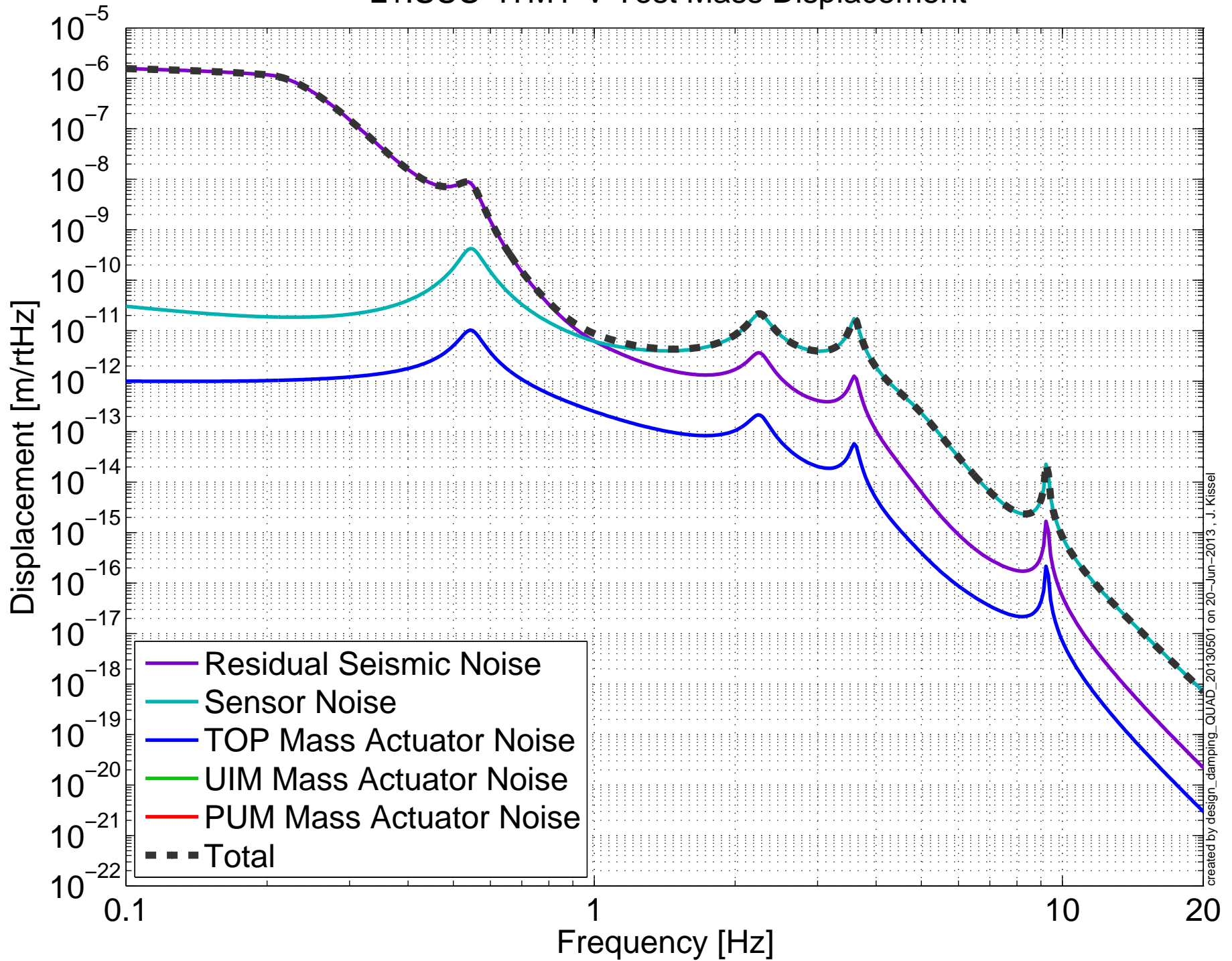
Projected PUM Mass Actuator > Test Mass Noise Budget L1:SUS-ITMY, V Test Mass Displacement



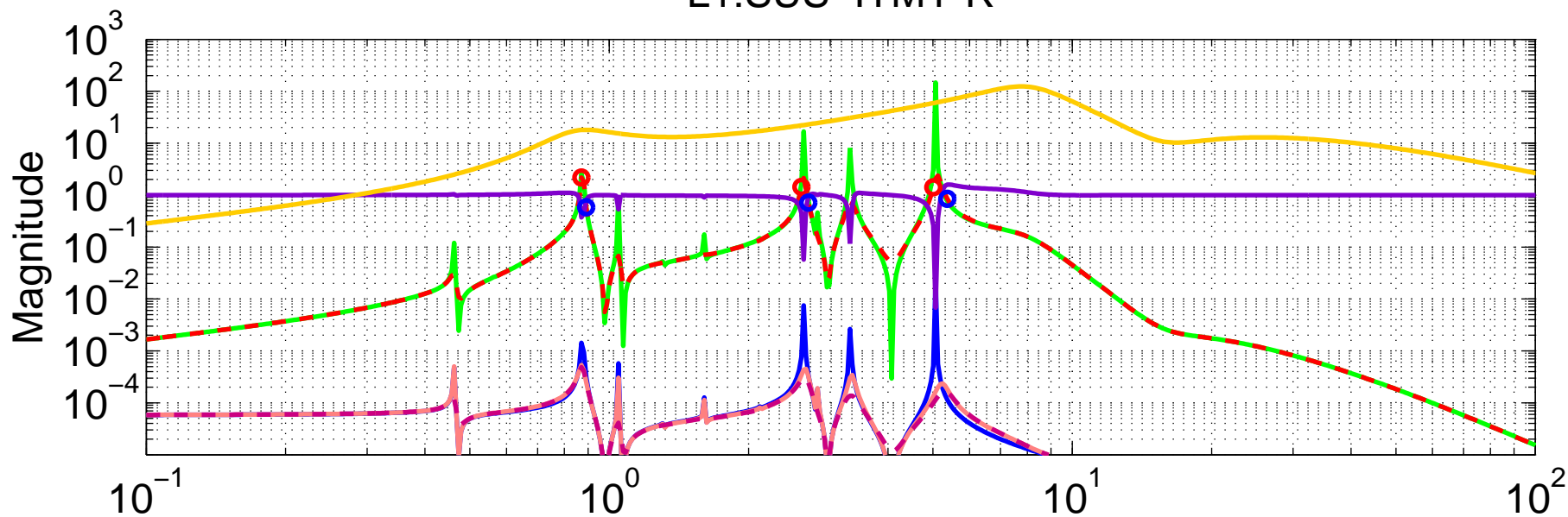
created by design_damping_QUAD_20130501 on 20-Jun-2013, J. Kissel

Damping Loop Performance

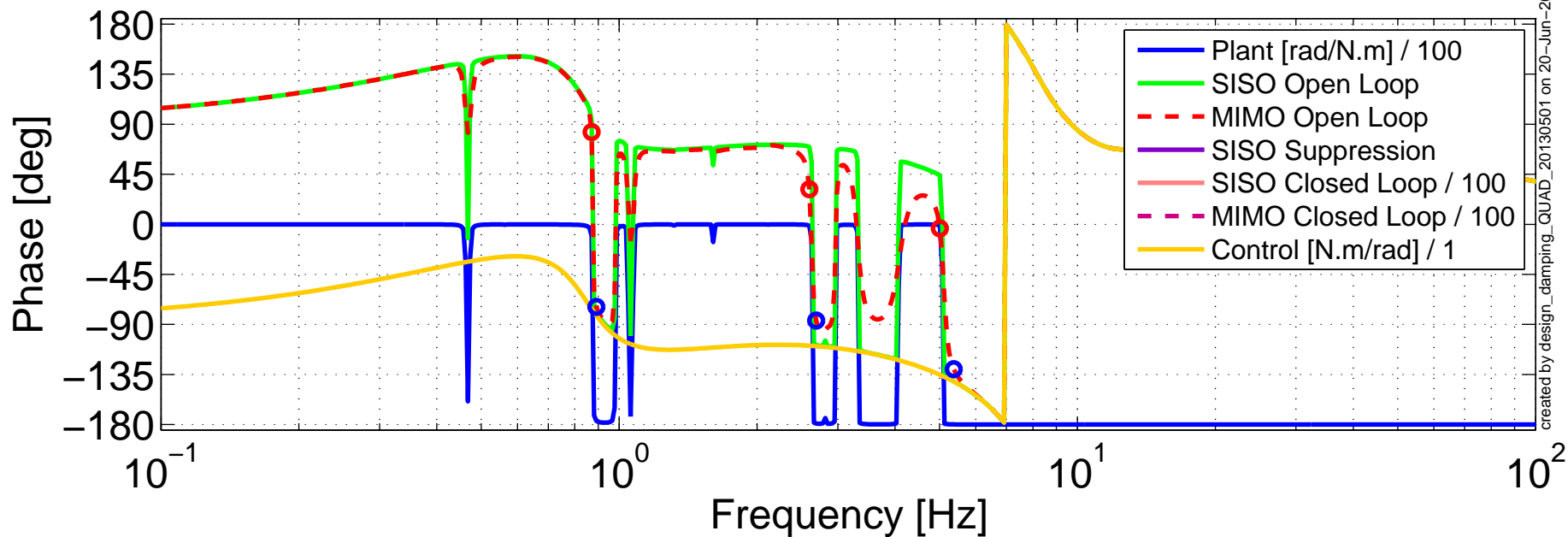
L1:SUS-ITMY V Test Mass Displacement



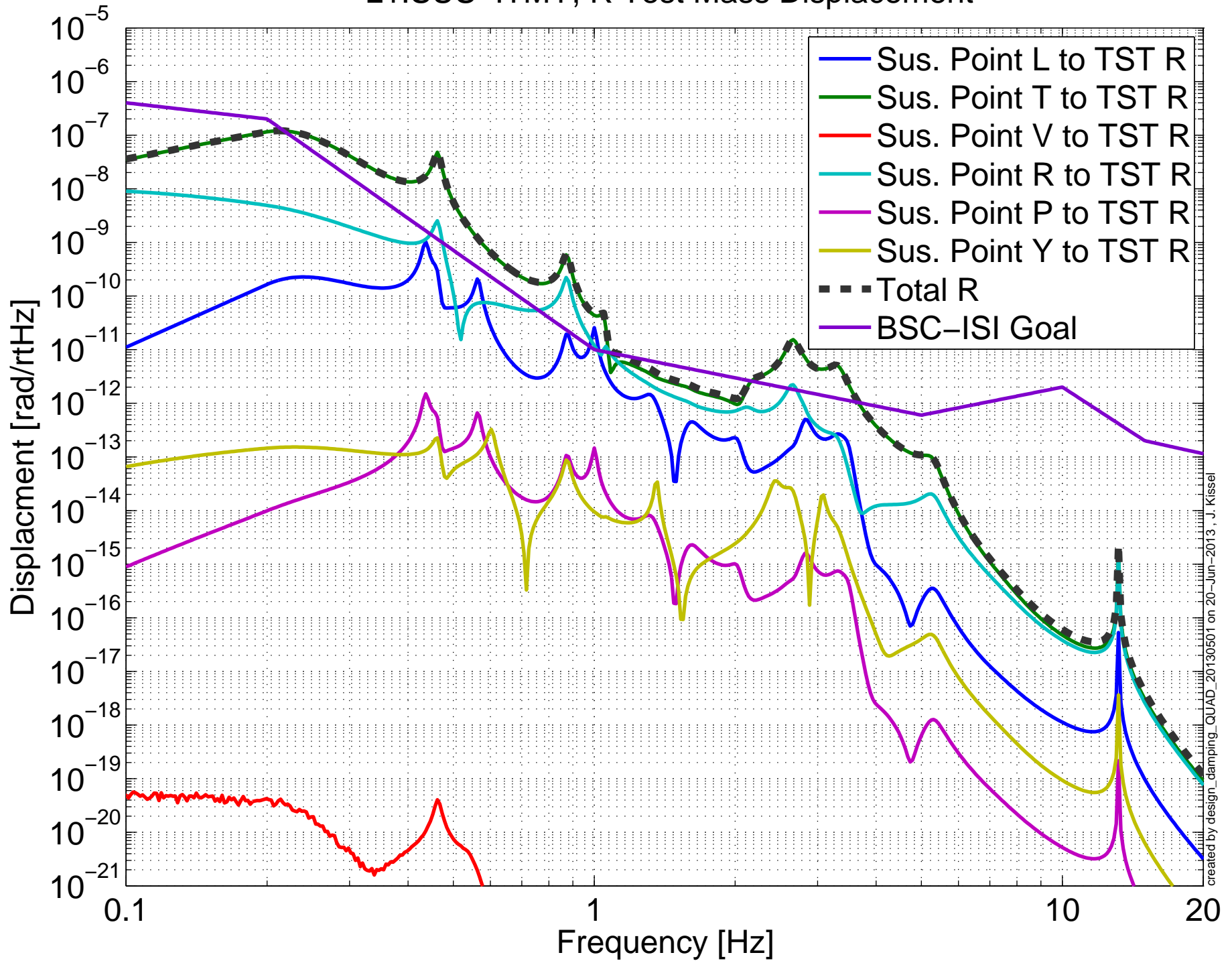
Damping Loop Design L1:SUS-ITMY R



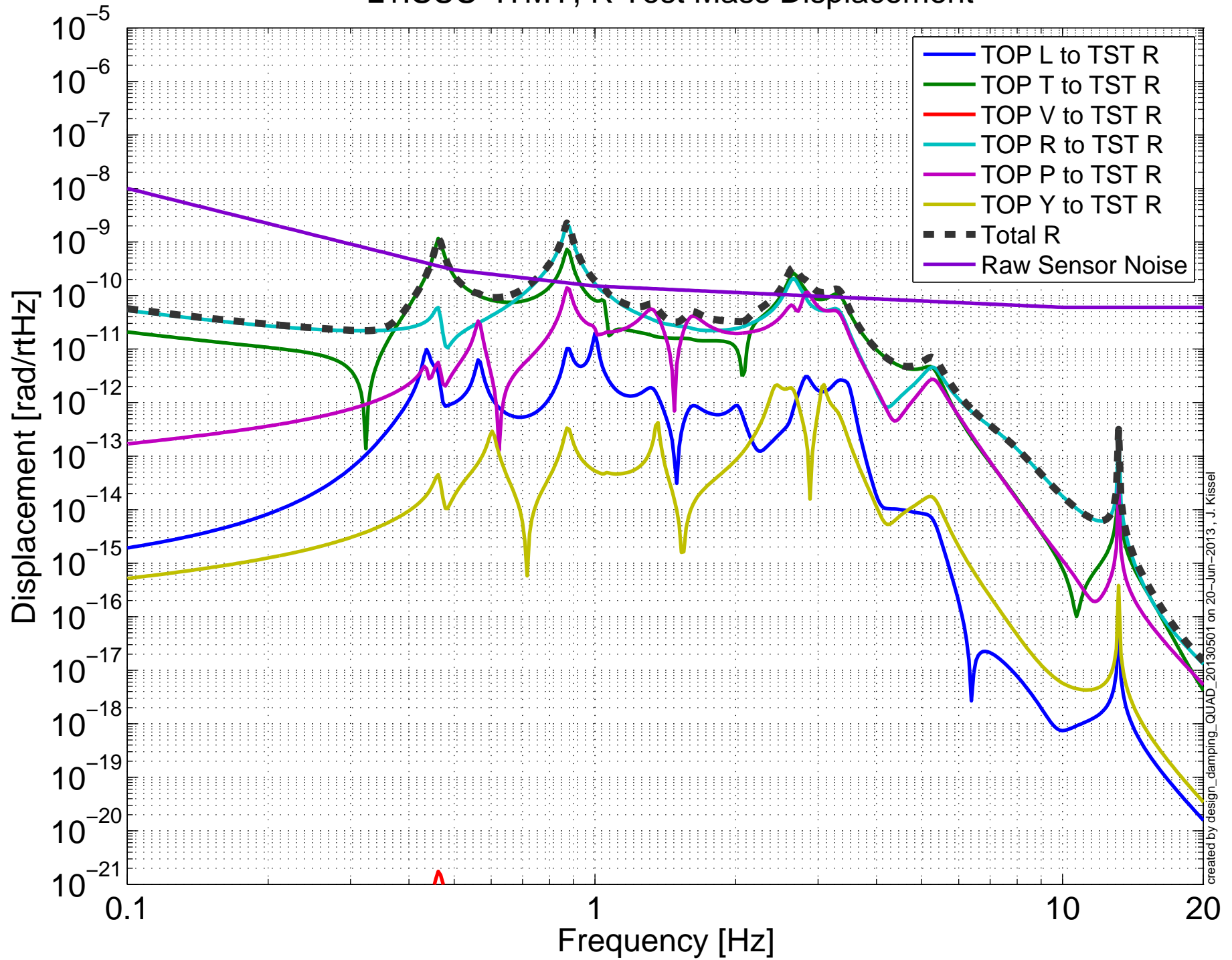
MIMO LUGF Phase Margins (red): [97 148 184] [deg]
MIMO UUGF Phase Margins (blue): [106 93.5 49.7] [deg]



Projected Sus. Point > Test Mass Seismic Noise Budget
L1:SUS-ITMY, R Test Mass Displacement

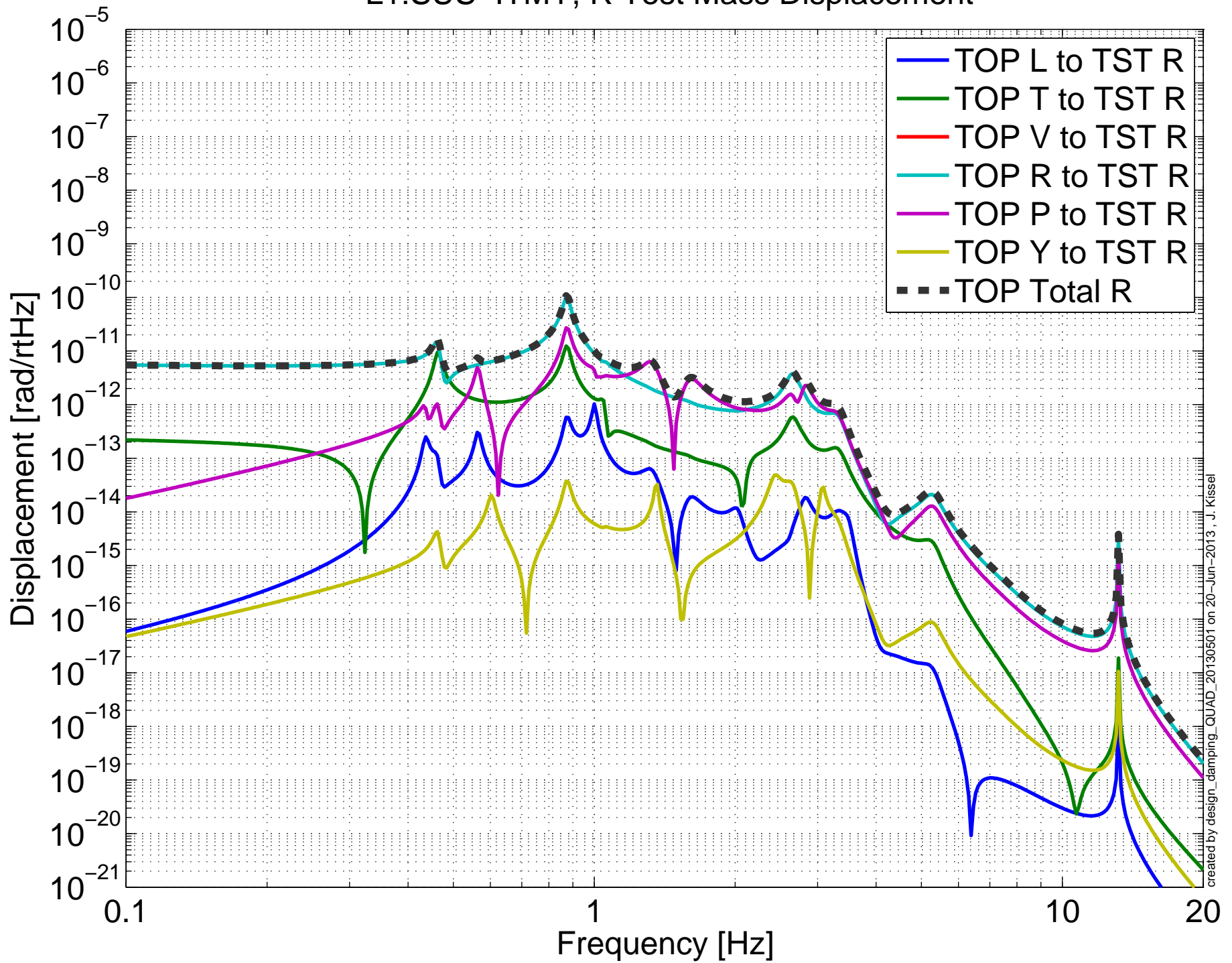


Projected Top Mass Sensor > Test Mass Noise Budget L1:SUS-ITMY, R Test Mass Displacement



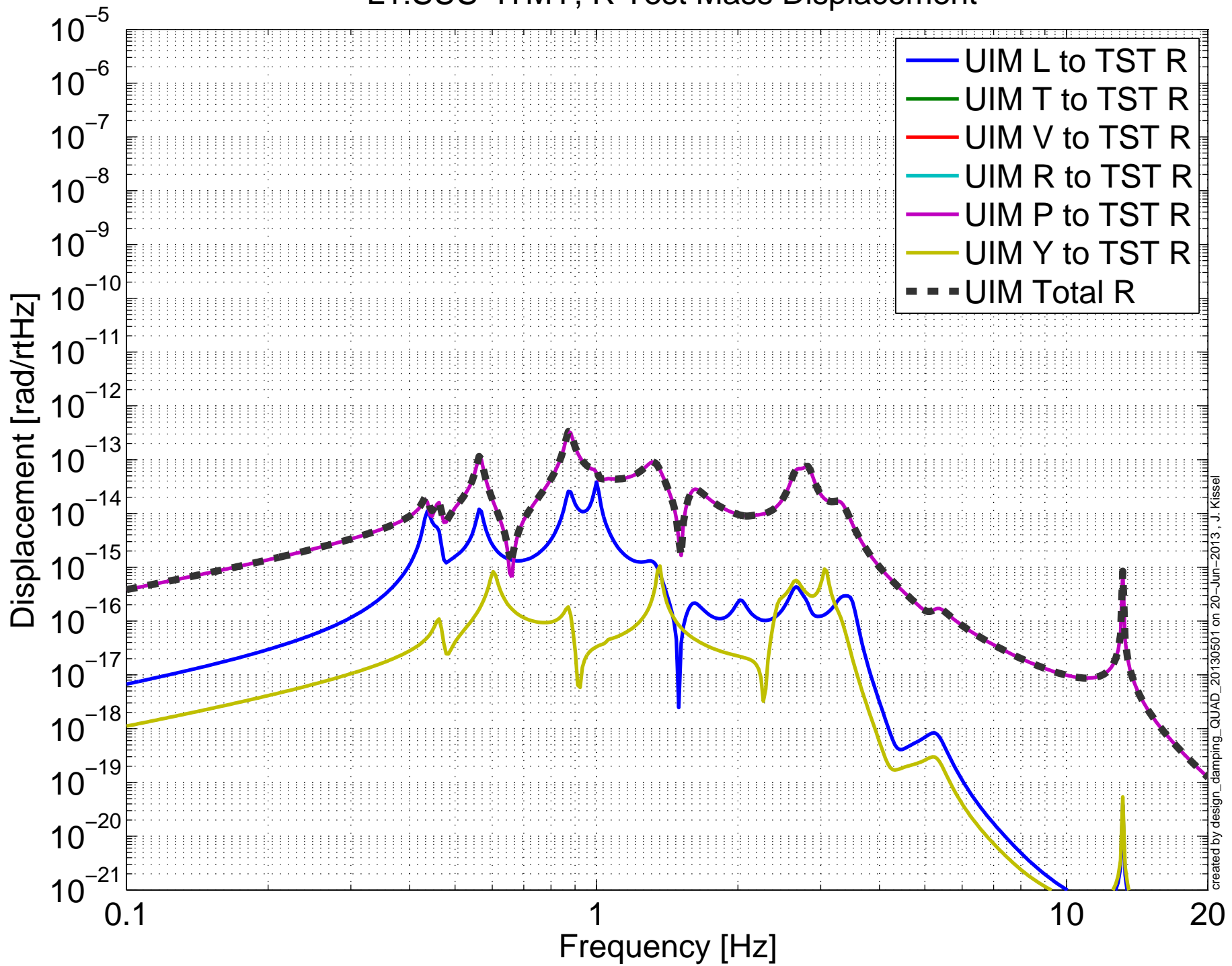
created by design_damping_QUAD_20130501 on 20-Jun-2013 - J. Kissel

Projected Top Mass Actuator > Test Mass Noise Budget L1:SUS-ITMY, R Test Mass Displacement



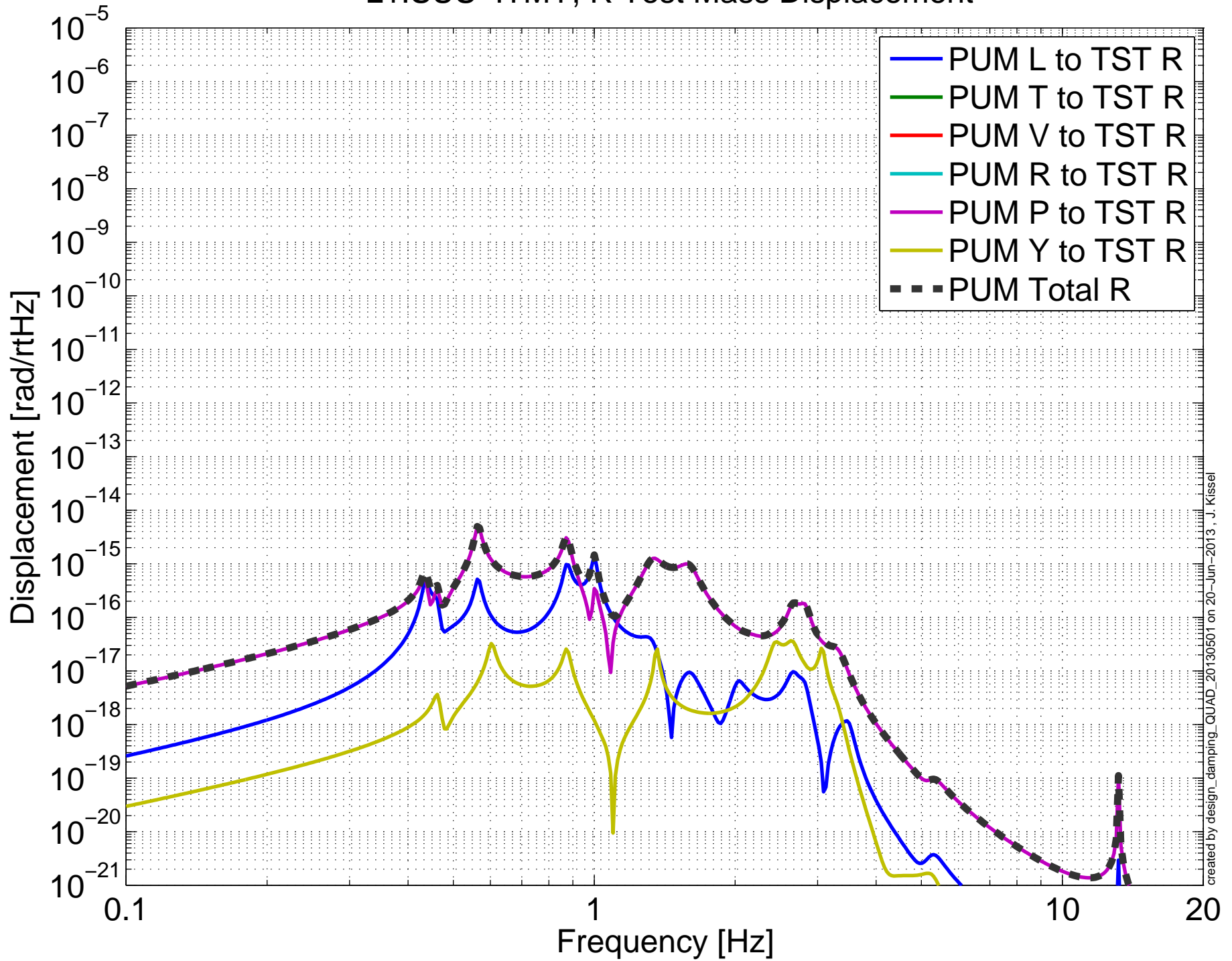
created by design_damping_QUAD_20130501 on 20-Jun-2013 - J. Kissel

Projected UIM Mass Actuator > Test Mass Noise Budget L1:SUS-ITMY, R Test Mass Displacement



created by design_damping_QUAD_20130501 on 20-Jun-2013 - J. Kissel

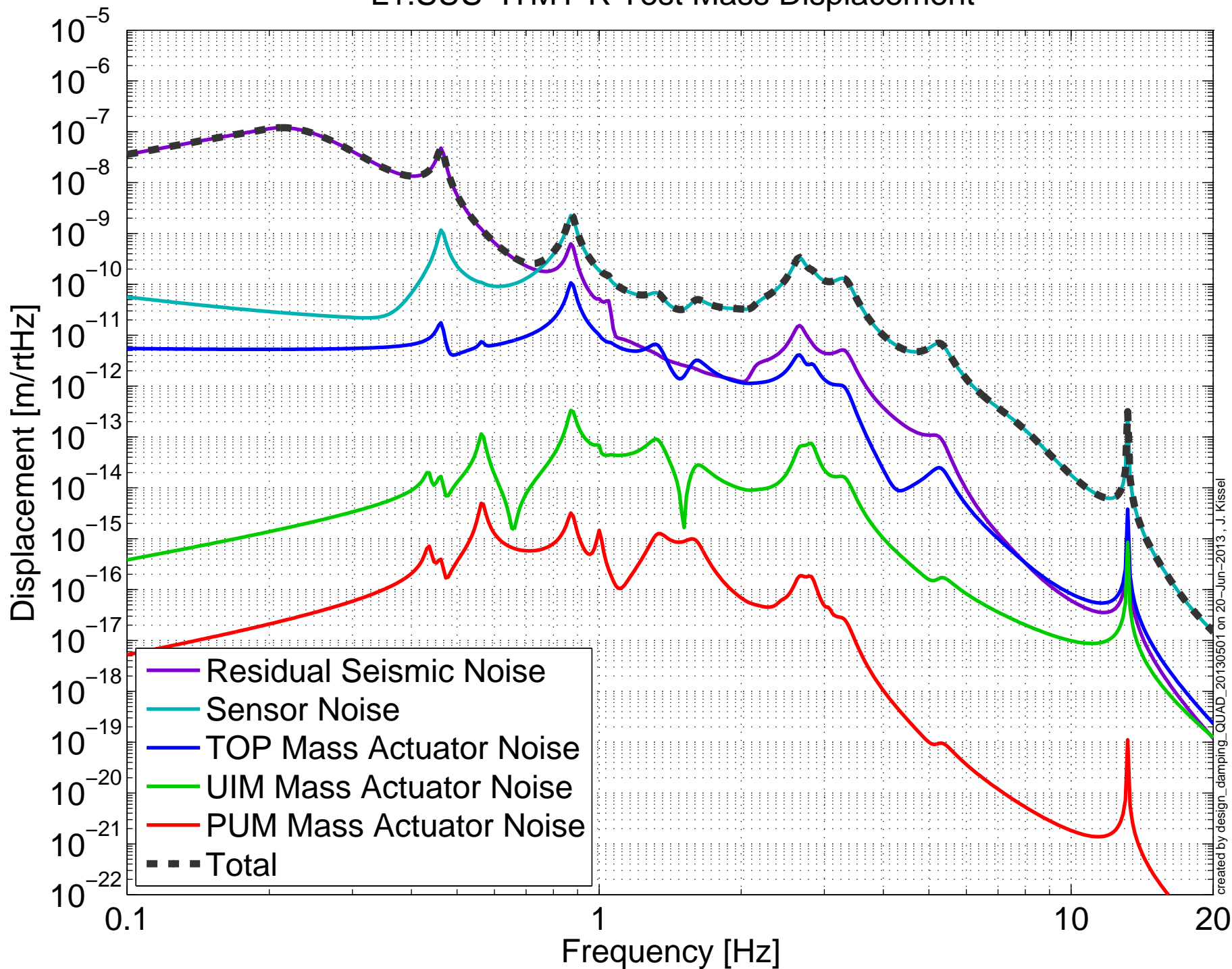
Projected PUM Mass Actuator > Test Mass Noise Budget L1:SUS-ITMY, R Test Mass Displacement



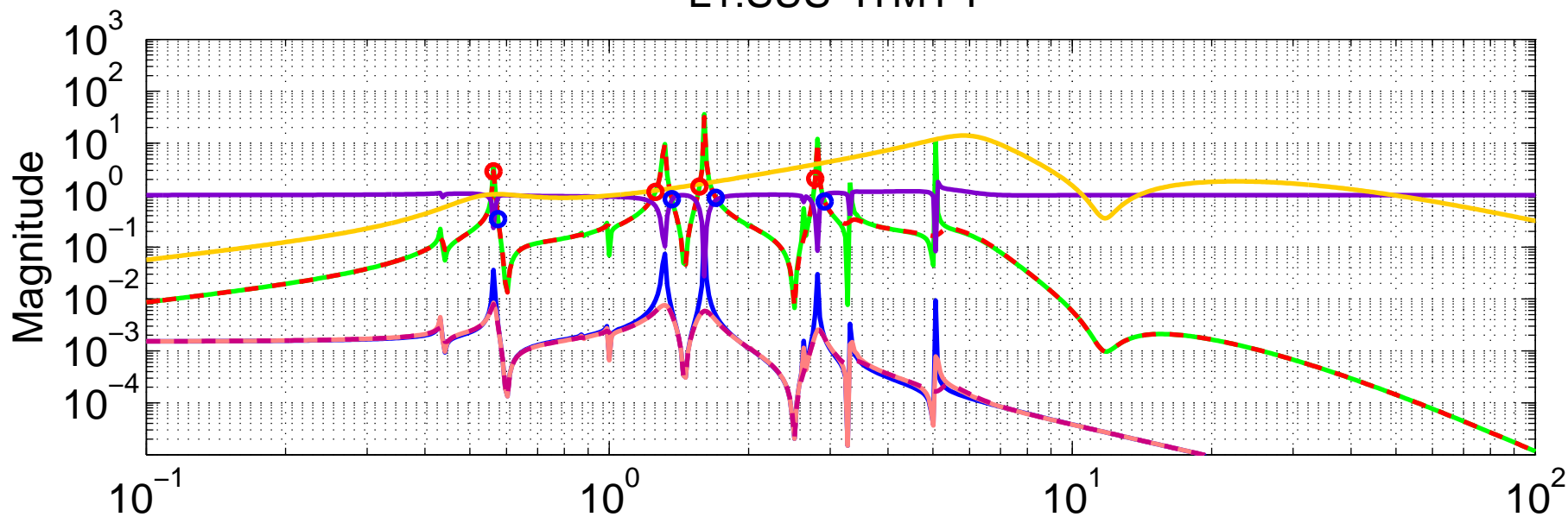
created by design_damping_QUAD_20130501 on 20-Jun-2013, J. Kissel

Damping Loop Performance

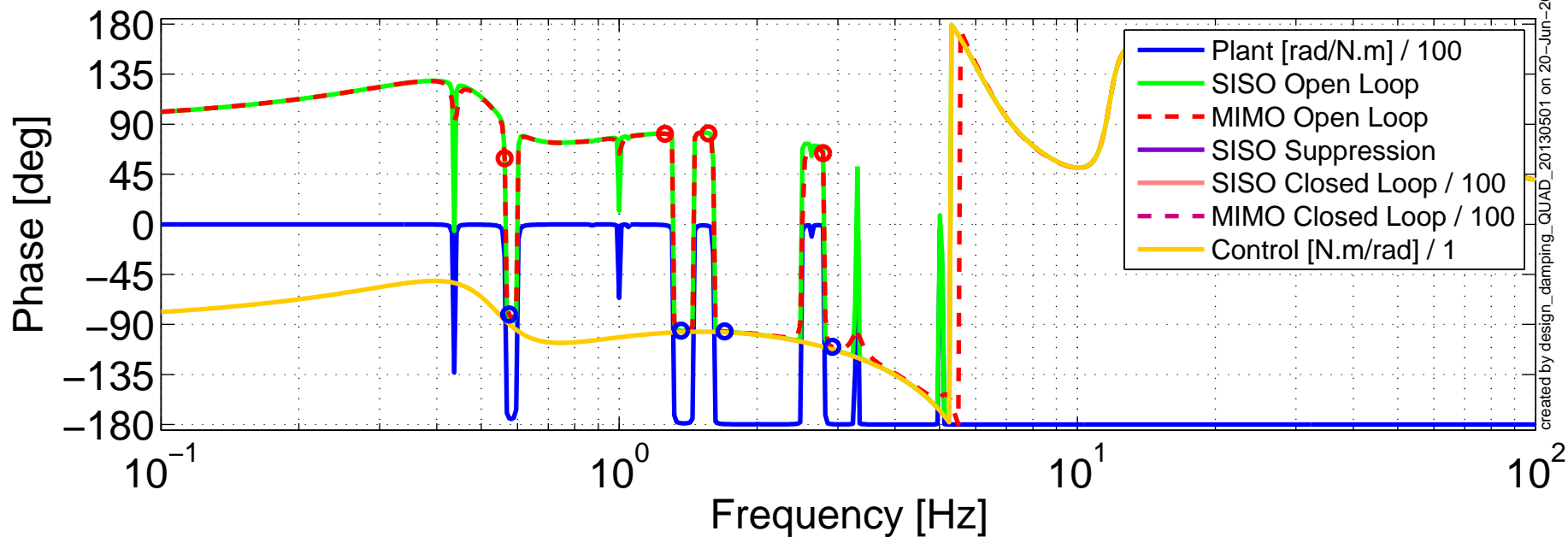
L1:SUS-ITMY R Test Mass Displacement



Damping Loop Design L1:SUS-ITMY P

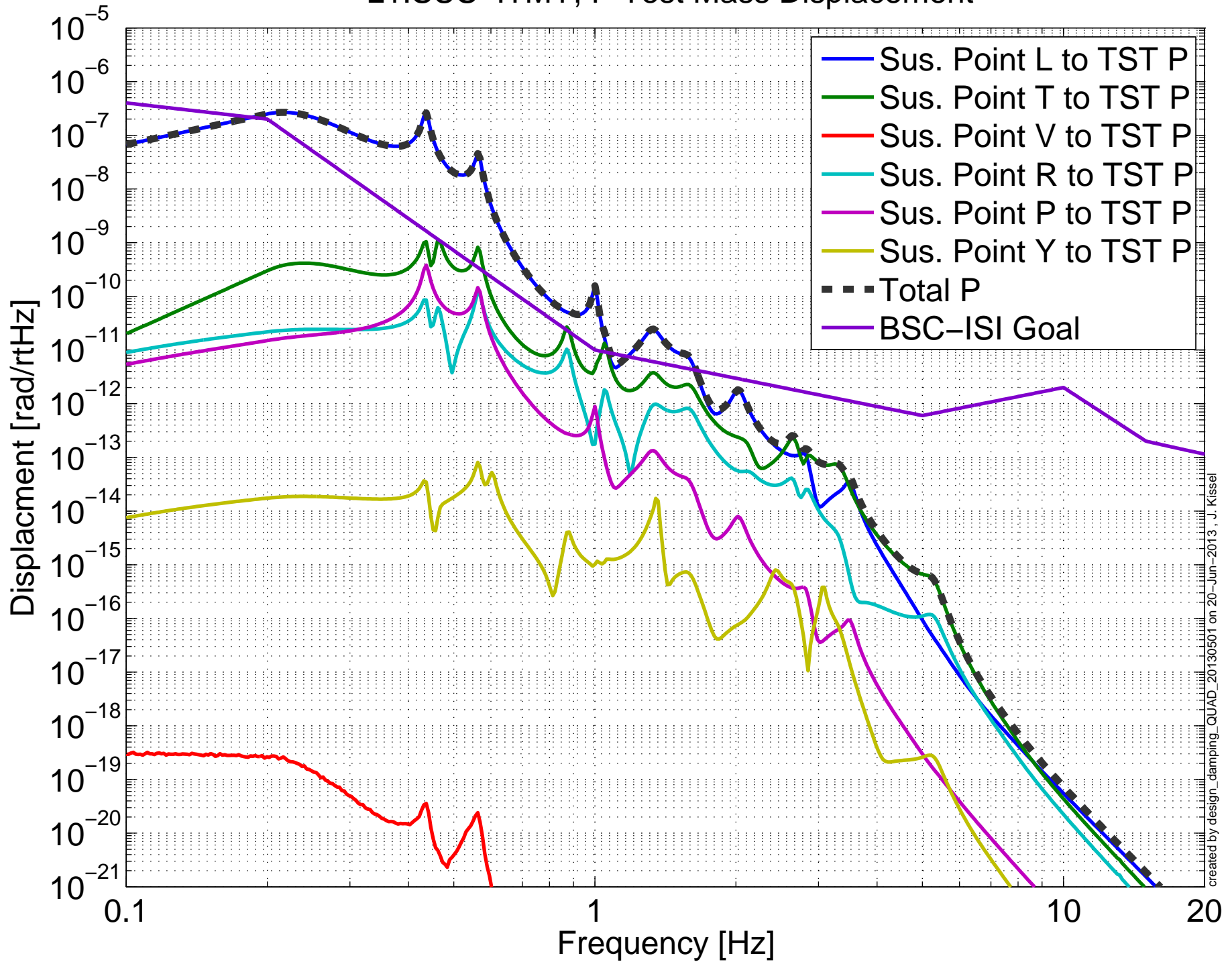


MIMO LUGF Phase Margins (red): [121 98.6 98.3 116] [deg]
 MIMO UUGF Phase Margins (blue): [98.9 84.5 83.7 69.8] [deg]

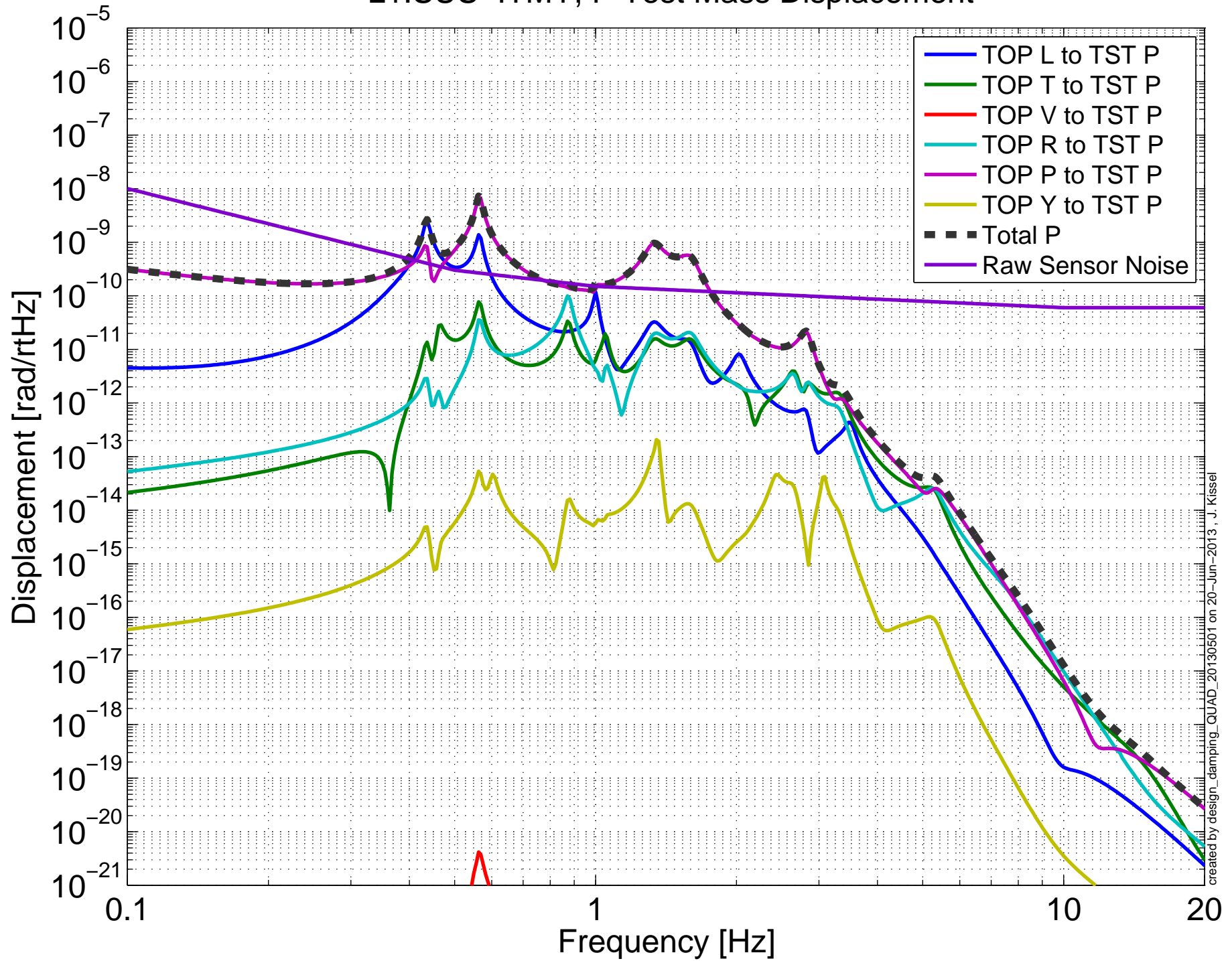


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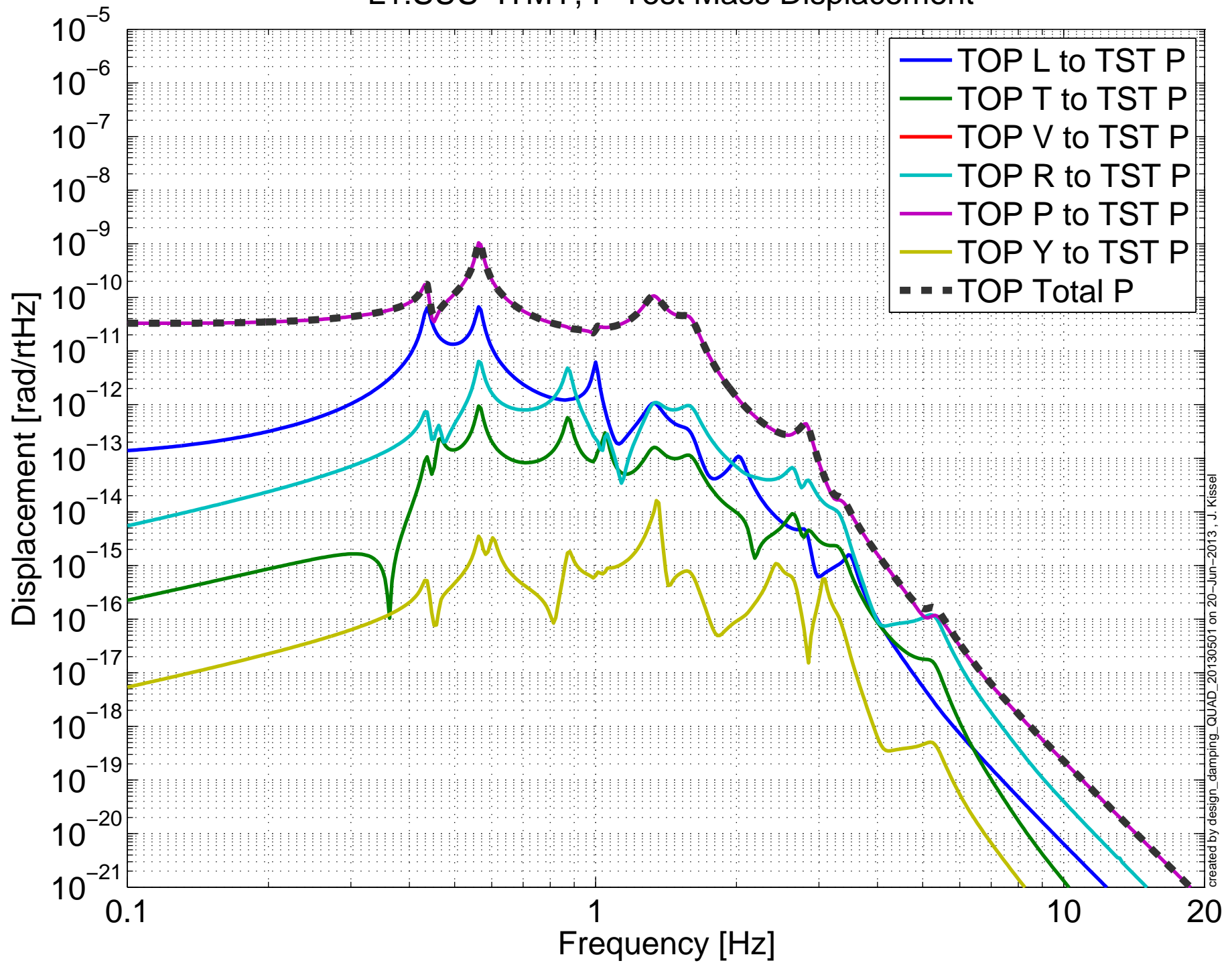
Projected Sus. Point > Test Mass Seismic Noise Budget L1:SUS-ITMY, P Test Mass Displacement



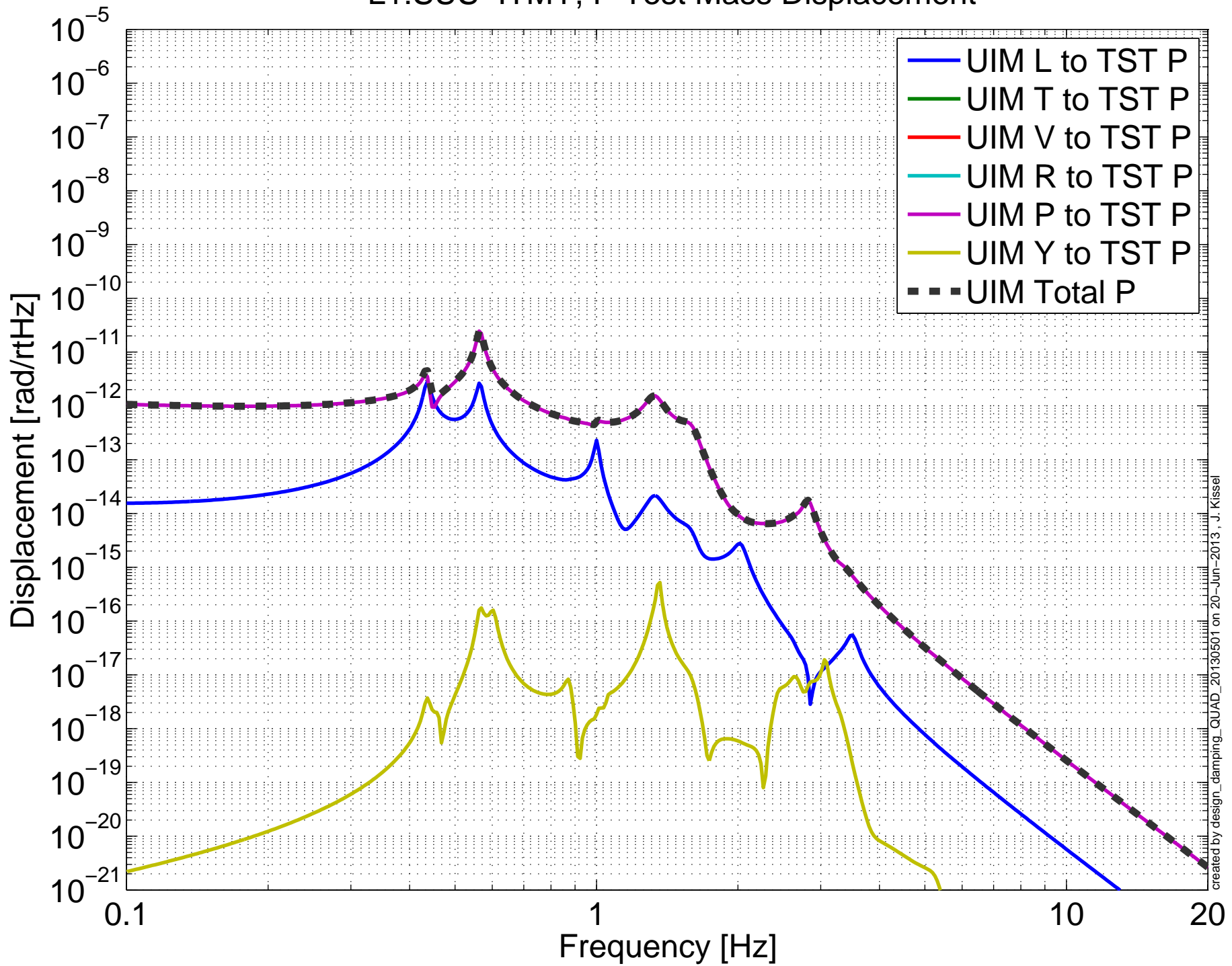
Projected Top Mass Sensor > Test Mass Noise Budget L1:SUS-ITMY, P Test Mass Displacement



Projected Top Mass Actuator > Test Mass Noise Budget L1:SUS-ITMY, P Test Mass Displacement

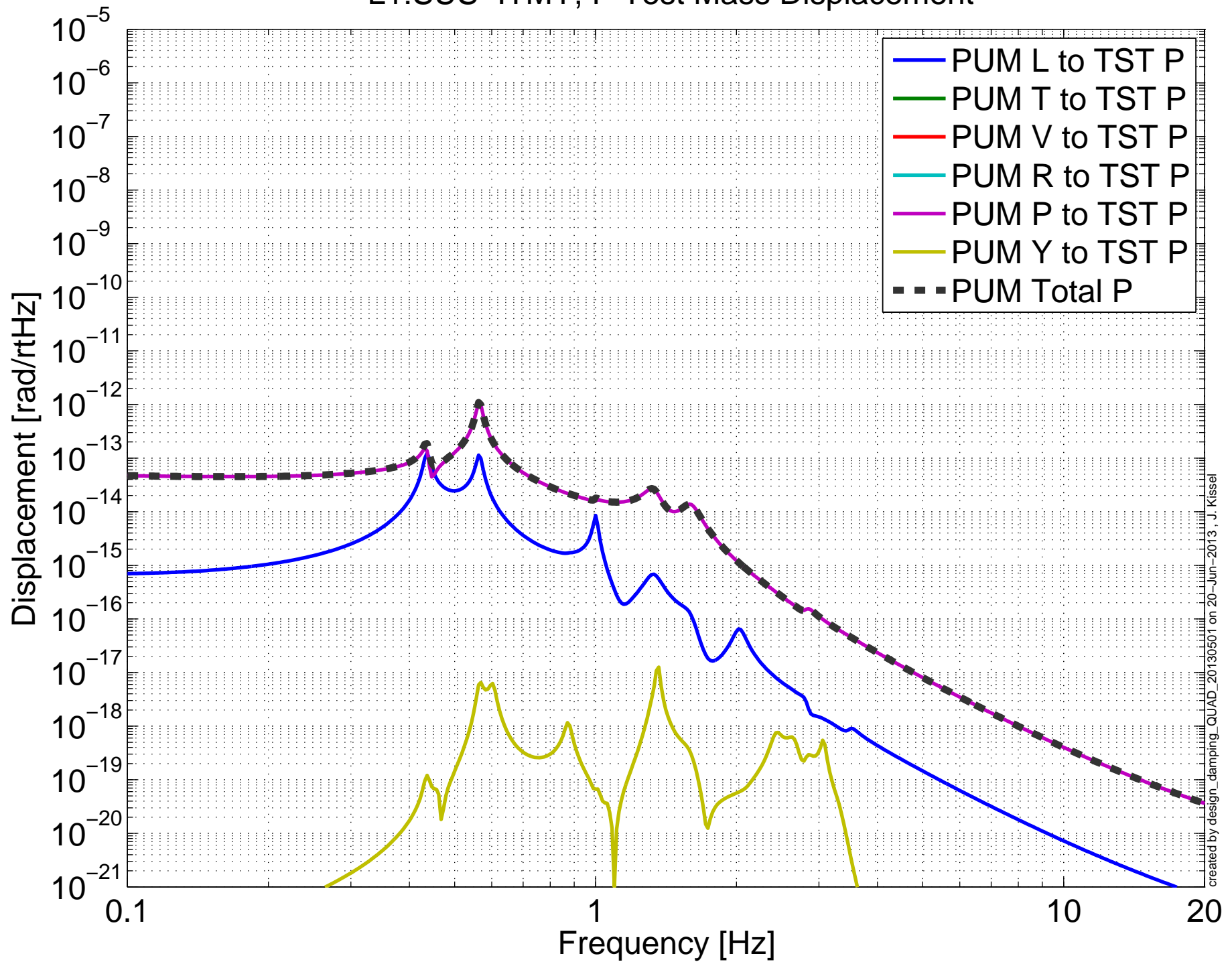


Projected UIM Mass Actuator > Test Mass Noise Budget L1:SUS-ITMY, P Test Mass Displacement



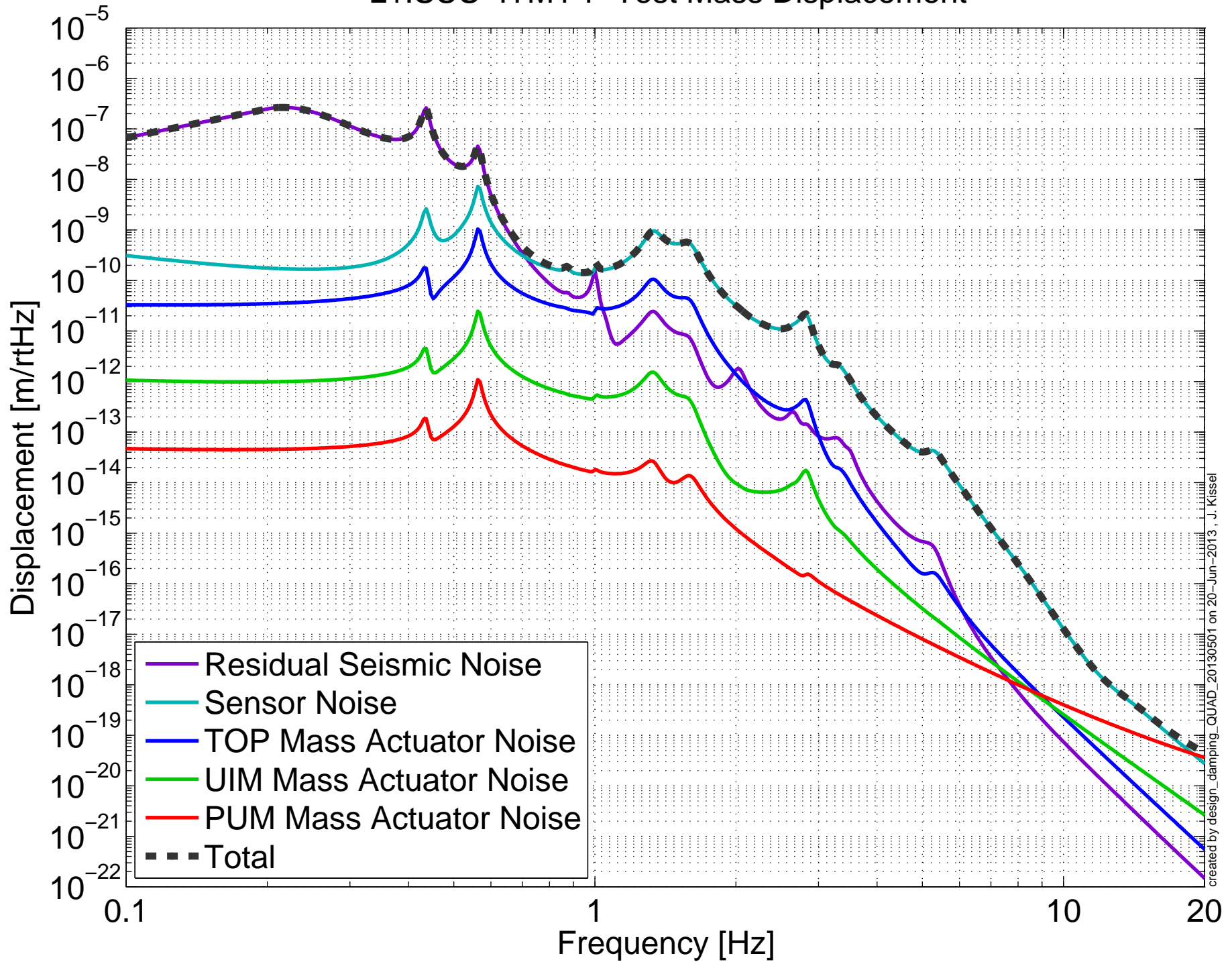
created by design_damping_QUAD_20130501 on 20-Jun-2013, J. Kissel

Projected PUM Mass Actuator > Test Mass Noise Budget L1:SUS-ITMY, P Test Mass Displacement

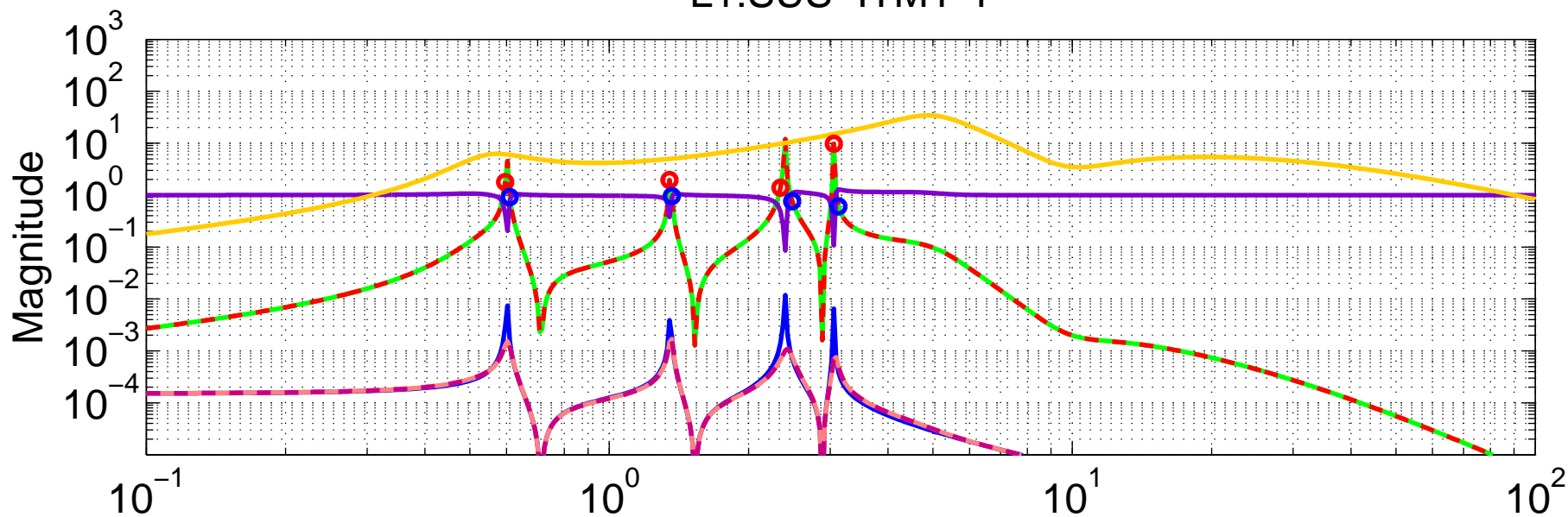


Damping Loop Performance

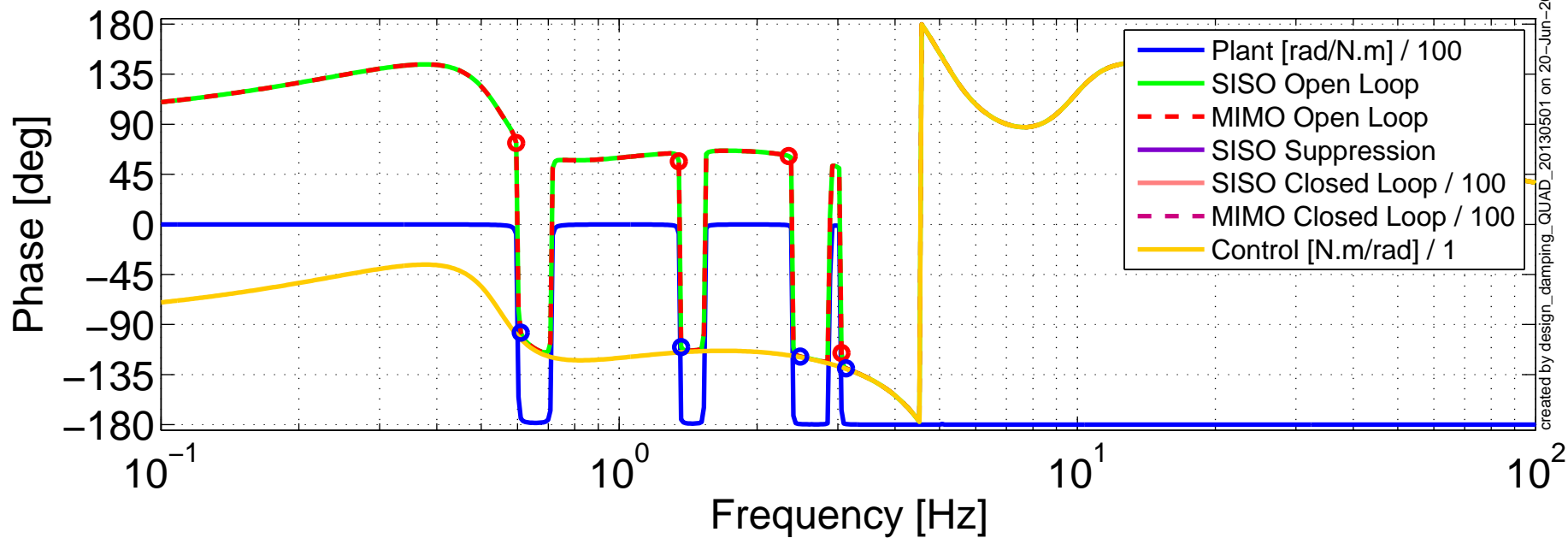
L1:SUS-ITMY P Test Mass Displacement



Damping Loop Design L1:SUS-ITMY Y

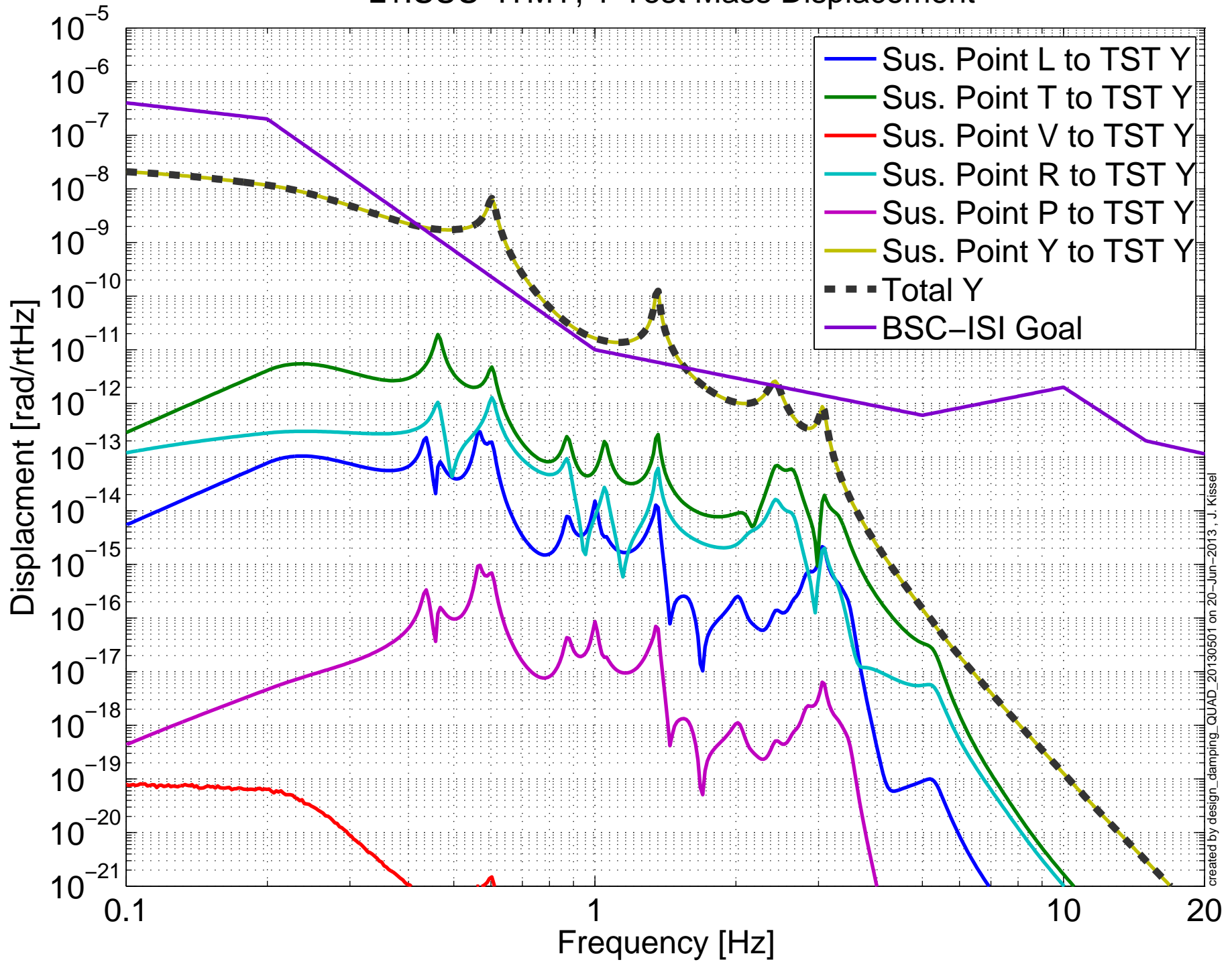


MIMO LUGF Phase Margins (red): [107 123 119 295] [deg]
 MIMO UUGF Phase Margins (blue): [82.6 69.7 61.2 50.7] [deg]

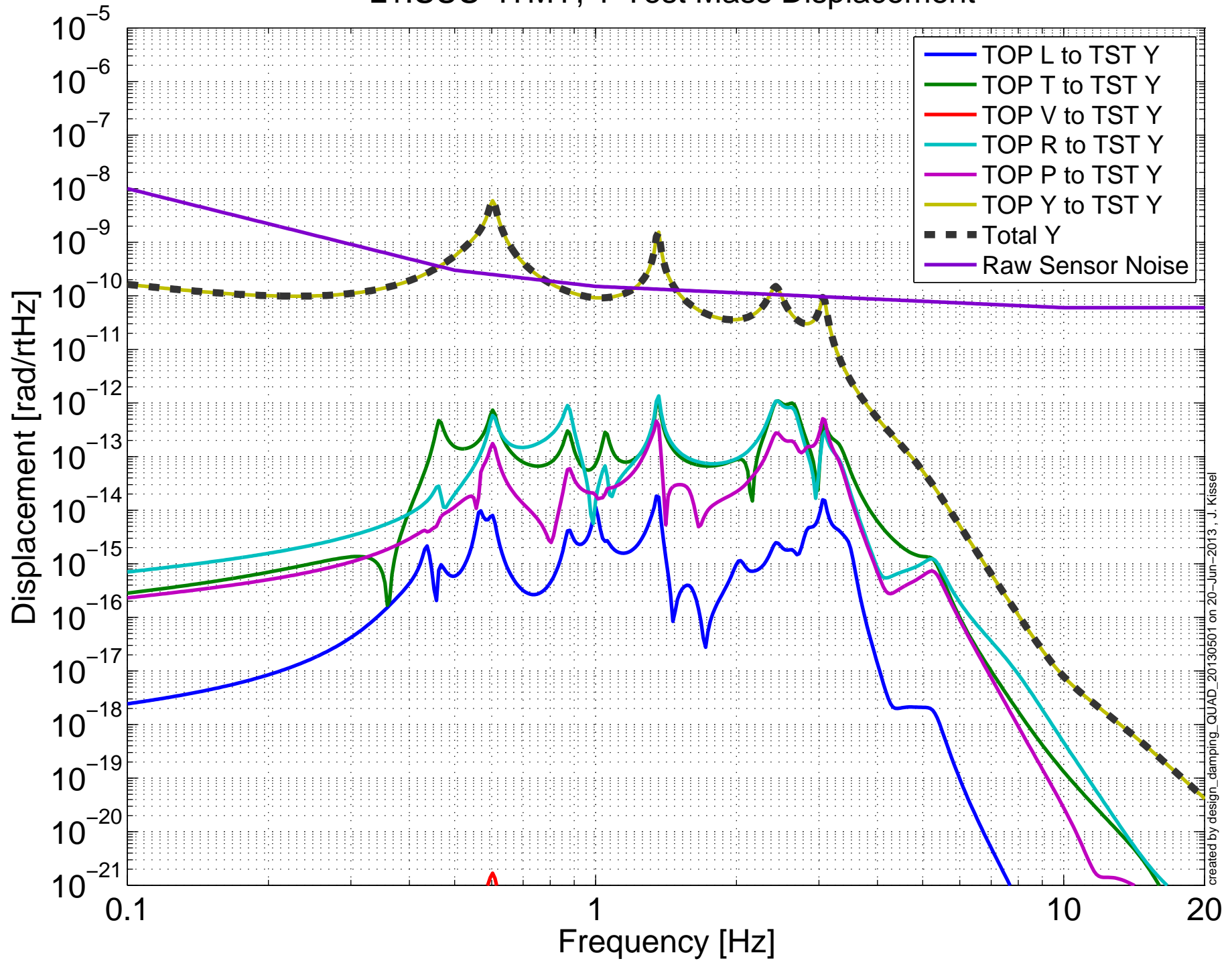


created by design_damping_QUAD_20130501 on 20-Jun-2013, J. Kissel

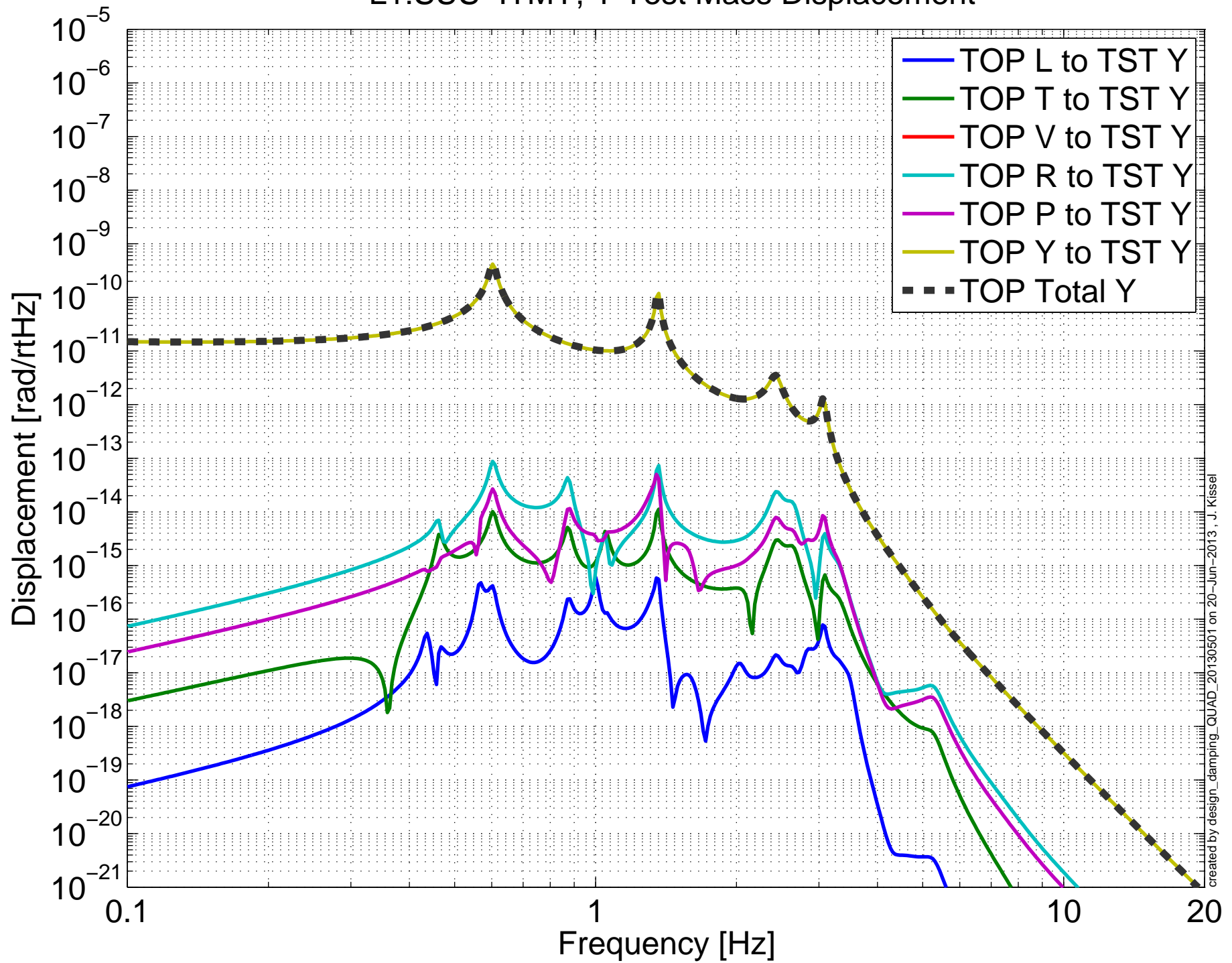
Projected Sus. Point > Test Mass Seismic Noise Budget L1:SUS-ITMY, Y Test Mass Displacement



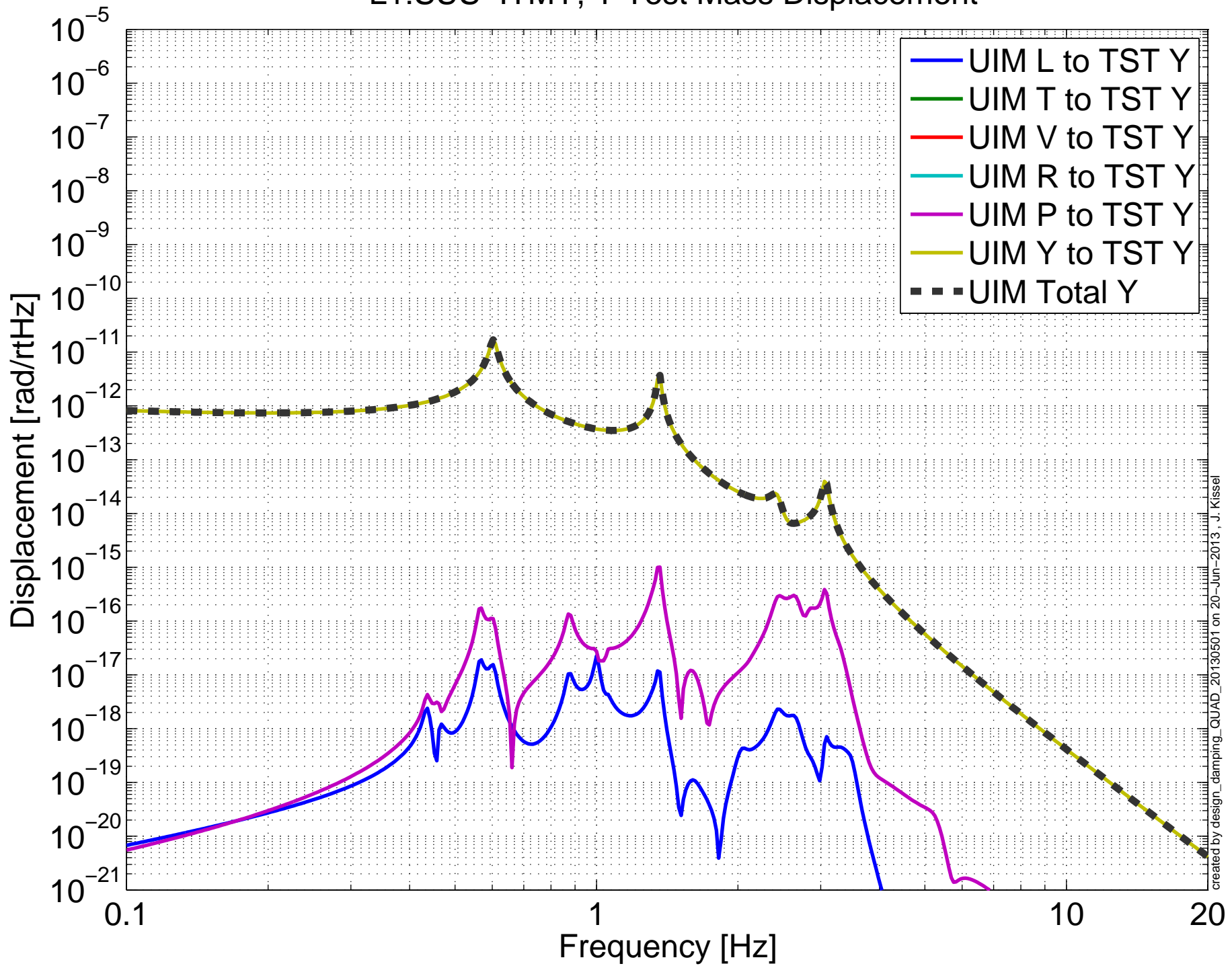
Projected Top Mass Sensor > Test Mass Noise Budget L1:SUS-ITMY, Y Test Mass Displacement



Projected Top Mass Actuator > Test Mass Noise Budget L1:SUS-ITMY, Y Test Mass Displacement

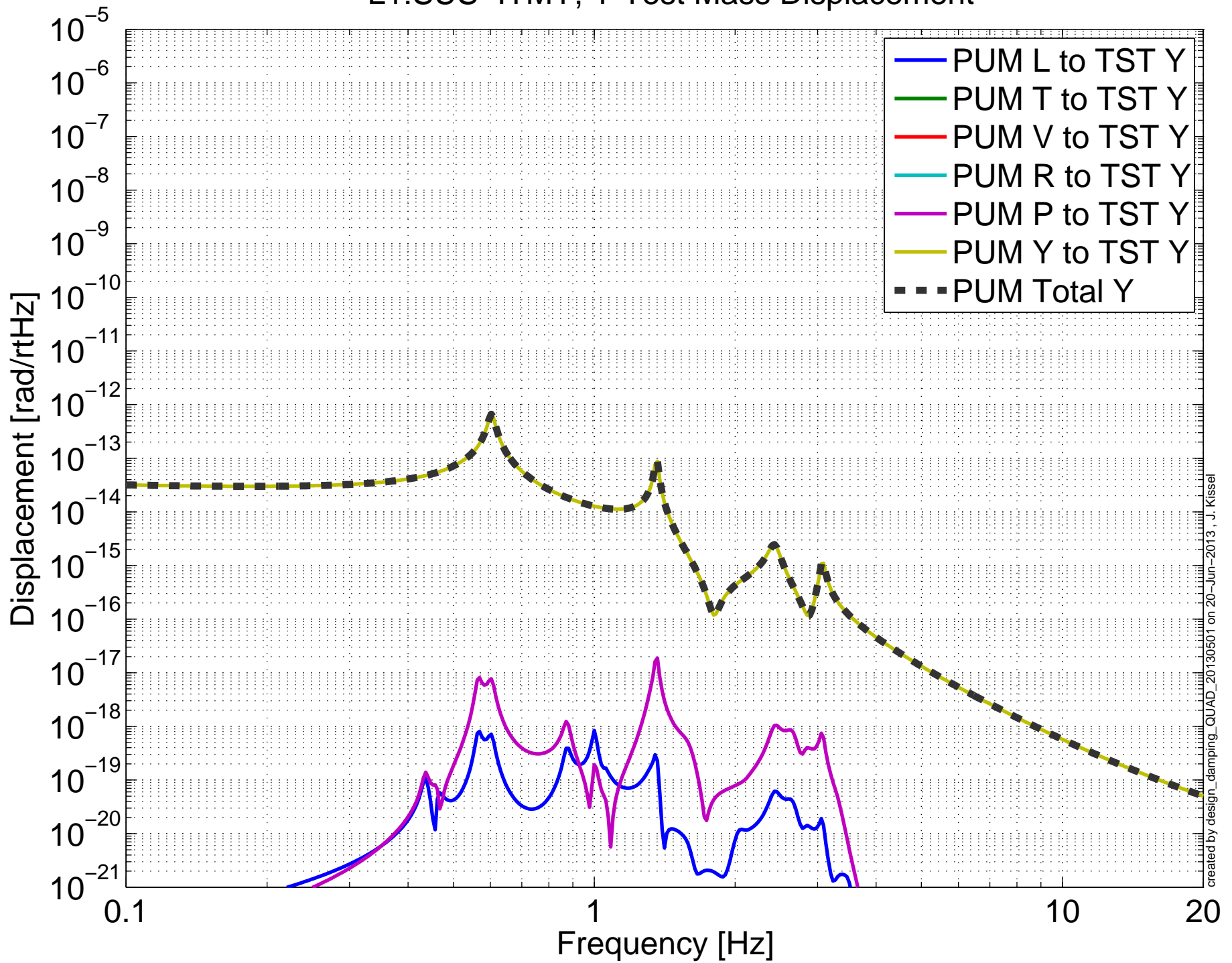


Projected UIM Mass Actuator > Test Mass Noise Budget L1:SUS-ITMY, Y Test Mass Displacement



created by design_damping_QUAD_20130501 on 20-Jun-2013, J. Kissel

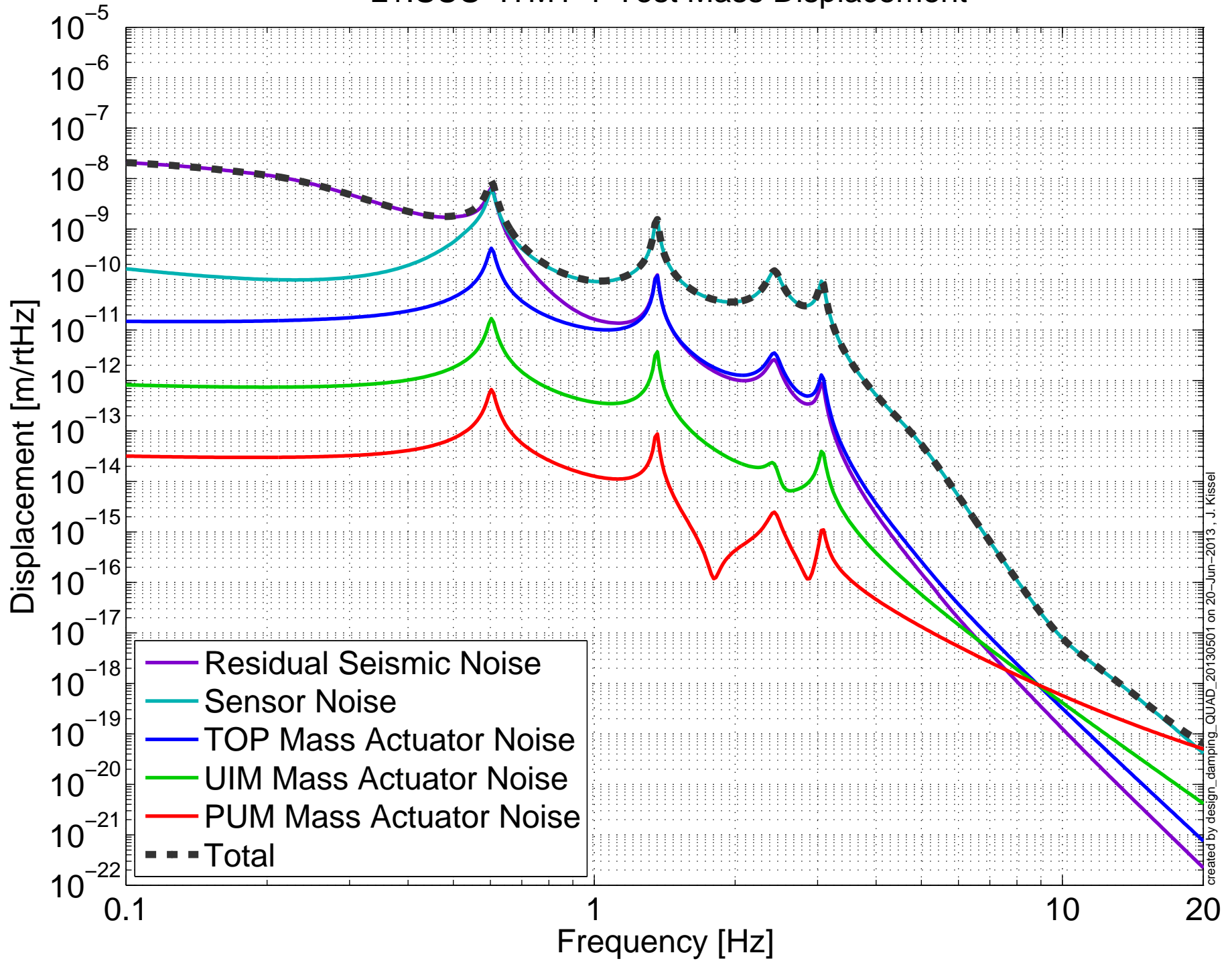
Projected PUM Mass Actuator > Test Mass Noise Budget L1:SUS-ITMY, Y Test Mass Displacement



created by design_damping_QUAD_20130501 on 20-Jun-2013, J. Kissel

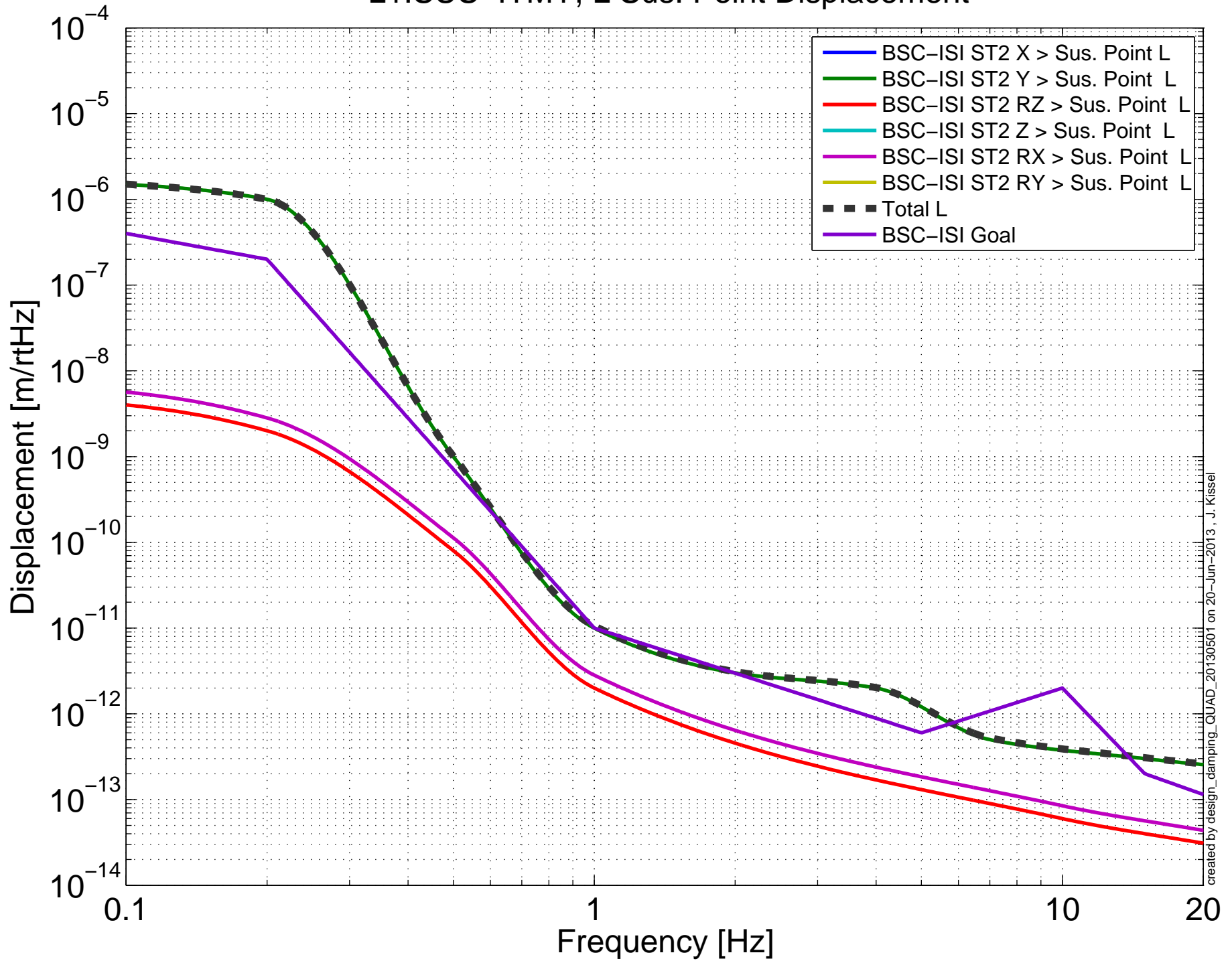
Damping Loop Performance

L1:SUS-ITMY Y Test Mass Displacement



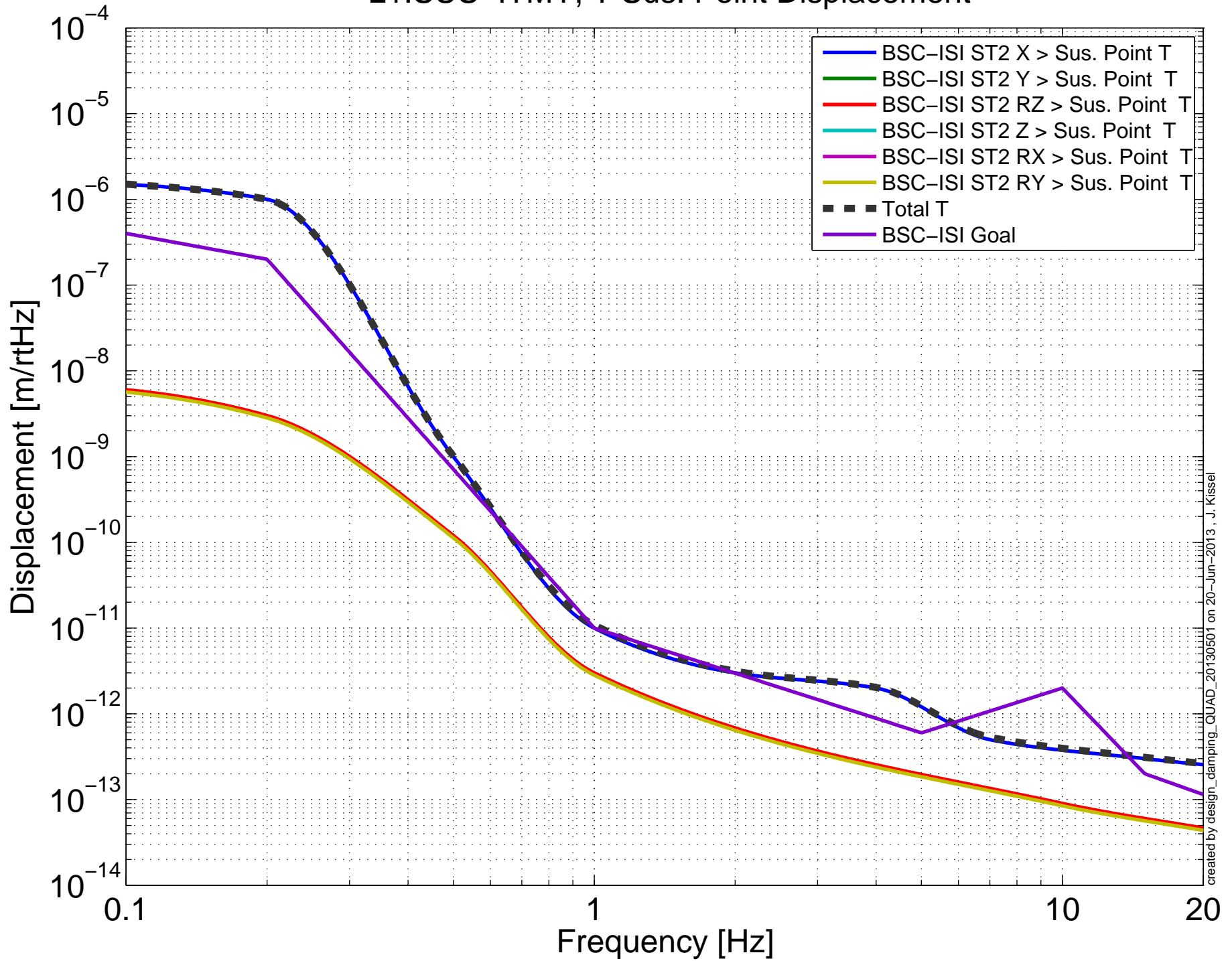
created by design_damping_QUAD_20130501 on 20-Jun-2013 - J. Kissel

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



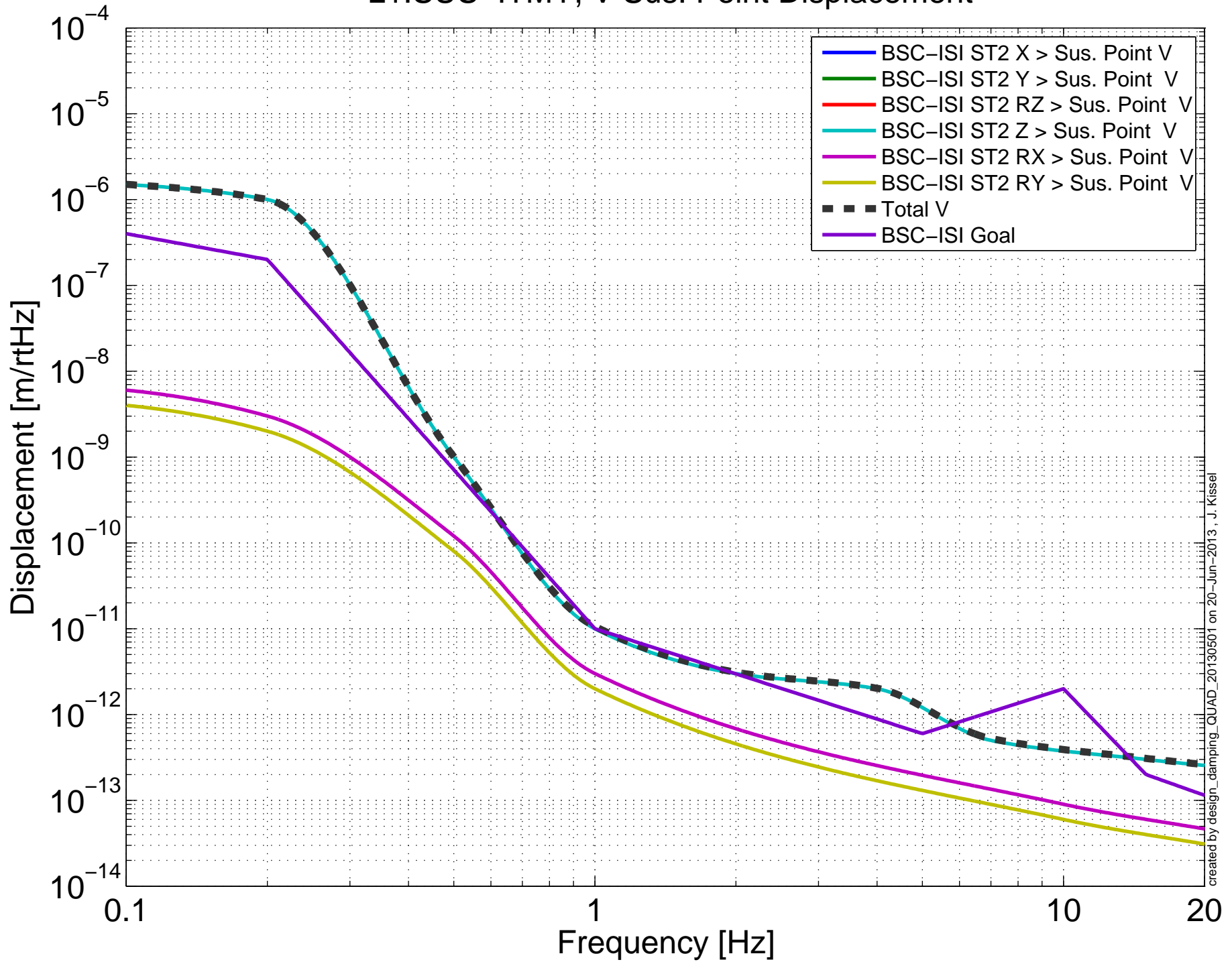
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Projected ISI Seismic Noise Budget L1:SUS-ITMY, T Sus. Point Displacement

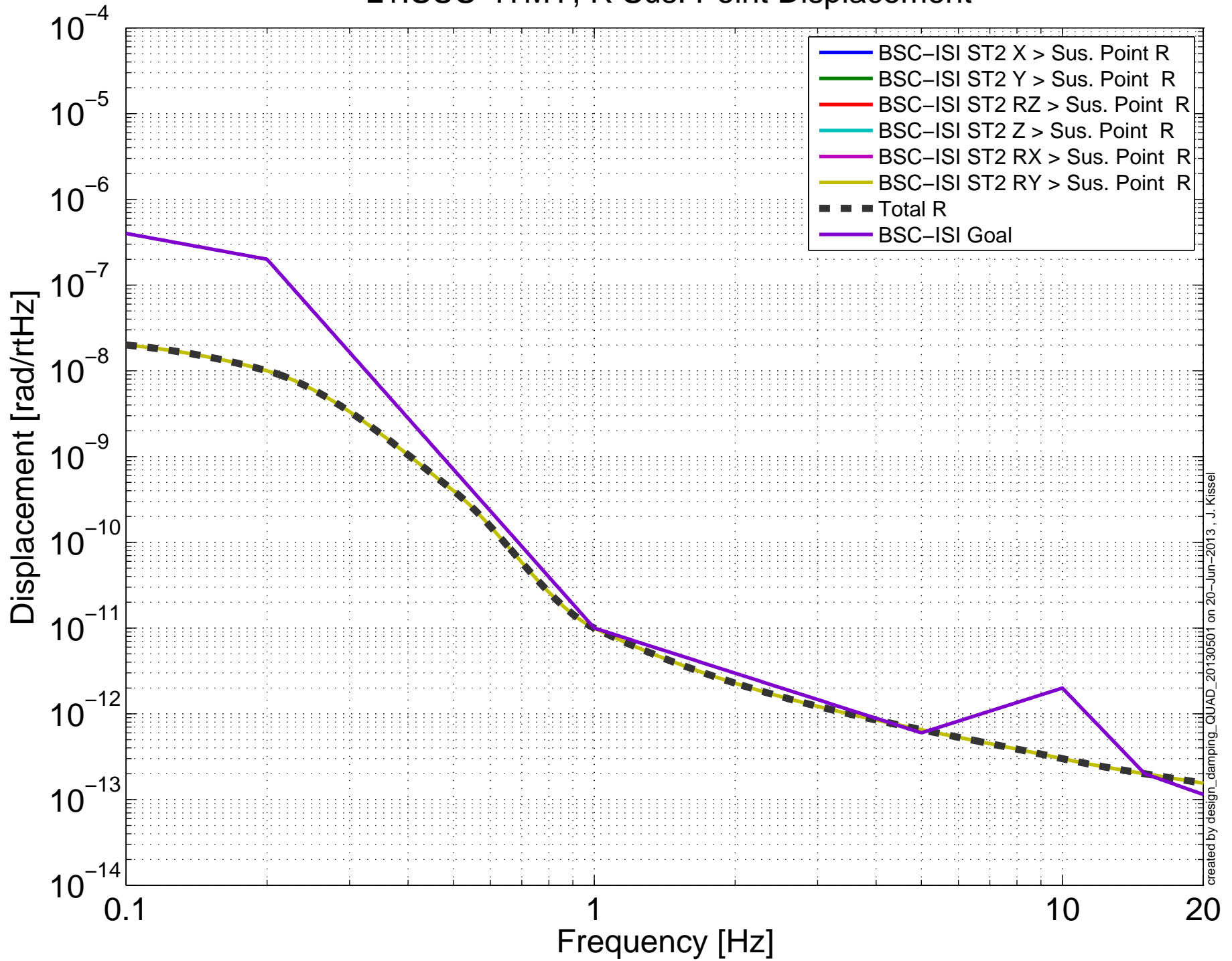


created by design_damping_QUAD_20130501 on 20-Jun-2013, J. Kissel

Projected ISI Seismic Noise Budget L1:SUS-ITMY, V Sus. Point Displacement

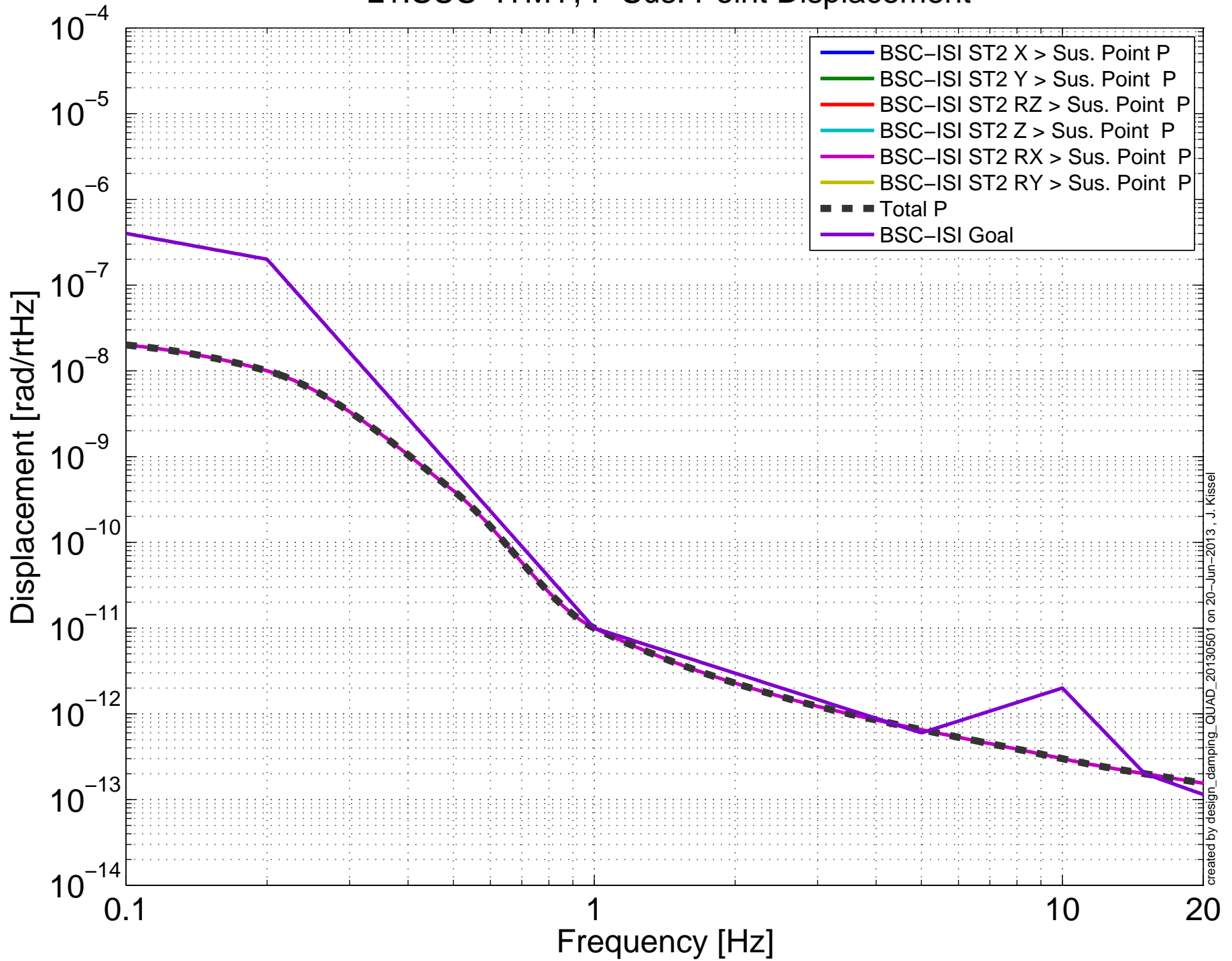


Projected ISI Seismic Noise Budget L1:SUS-ITMY, R Sus. Point Displacement



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



created by design_damping_QUAD_20130501 on 20-Jun-2013, J. Kissel

Projected ISI Seismic Noise Budget L1:SUS-ITMY, Y Sus. Point Displacement

