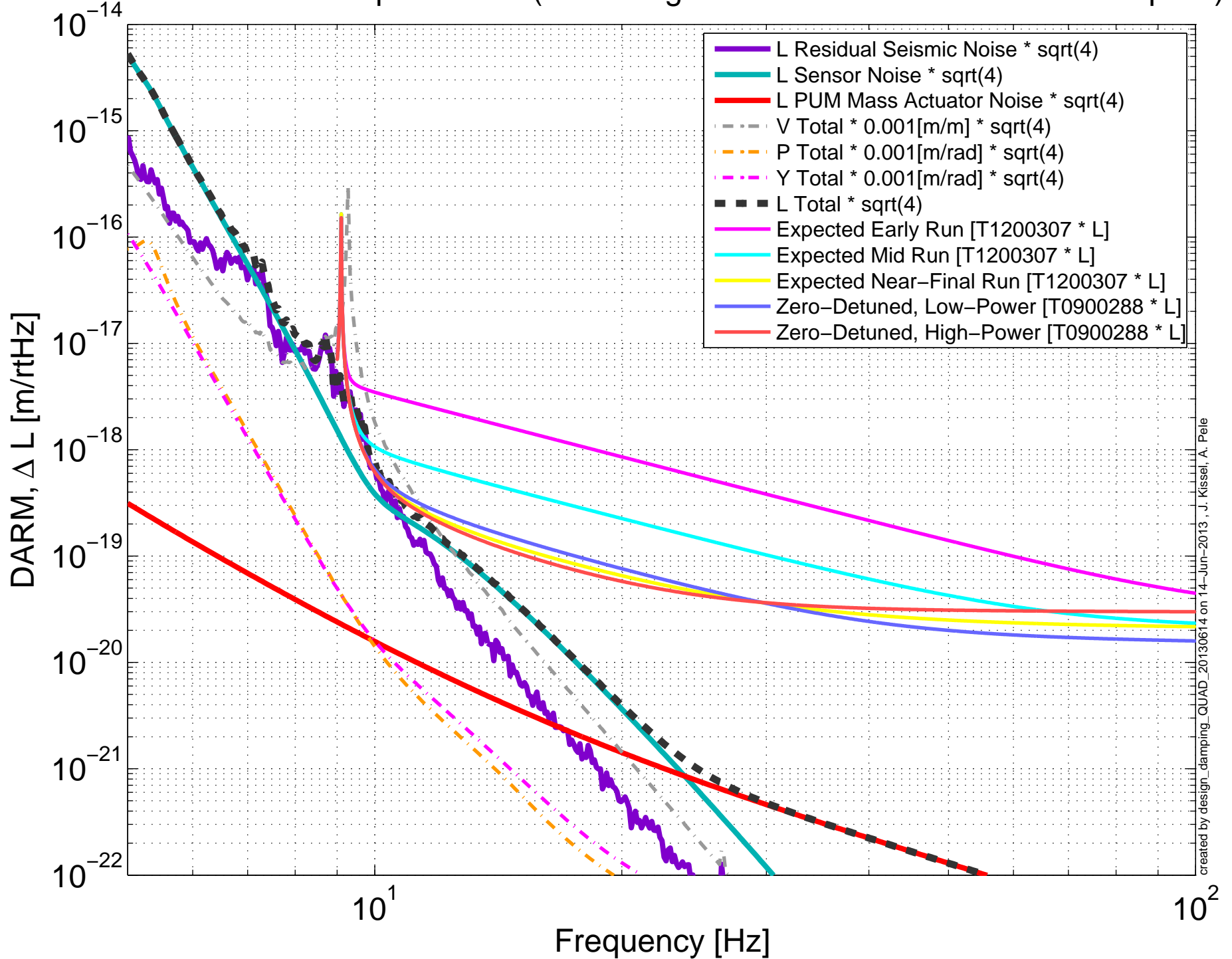


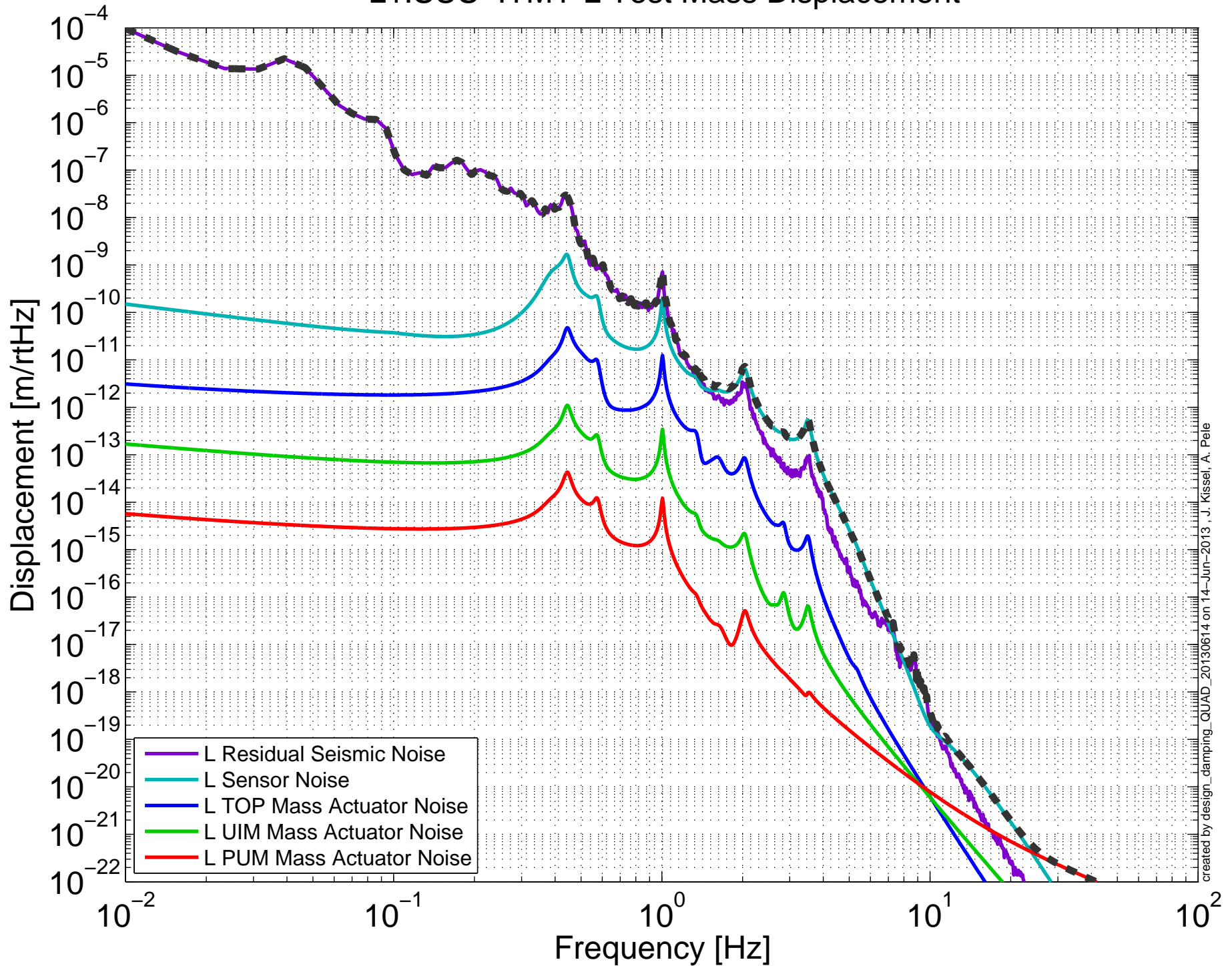
Damping Loop Performance

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

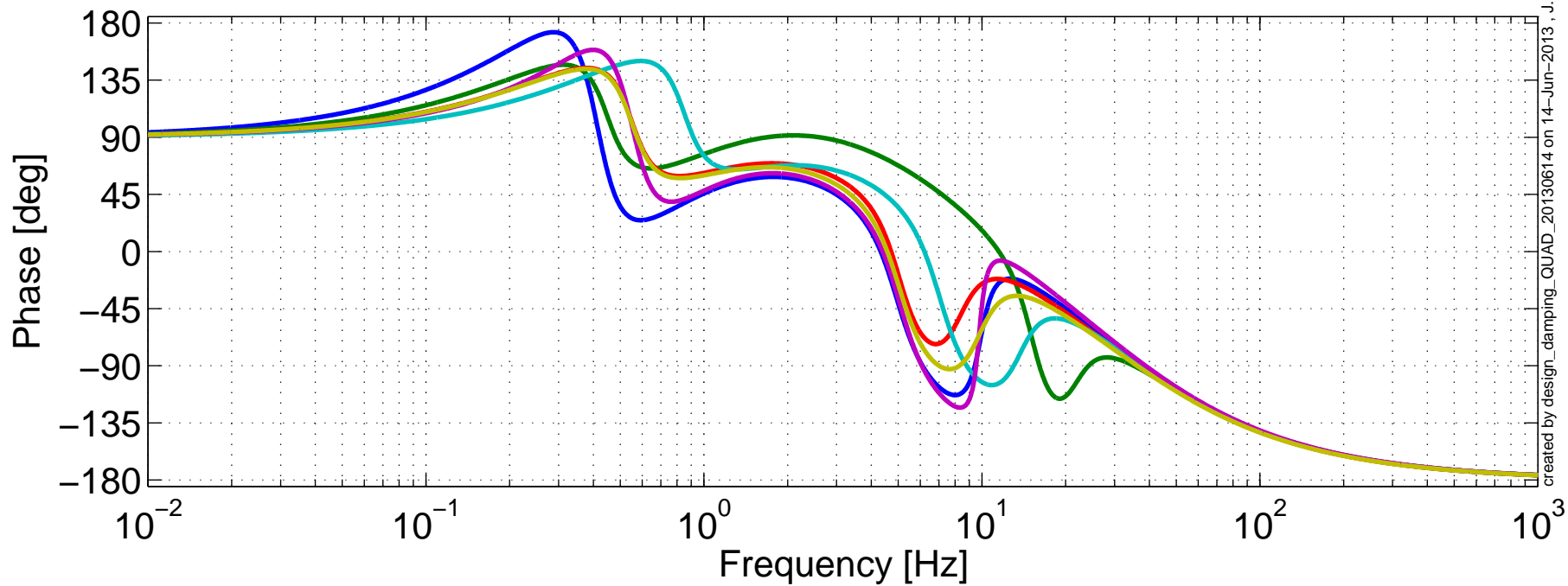
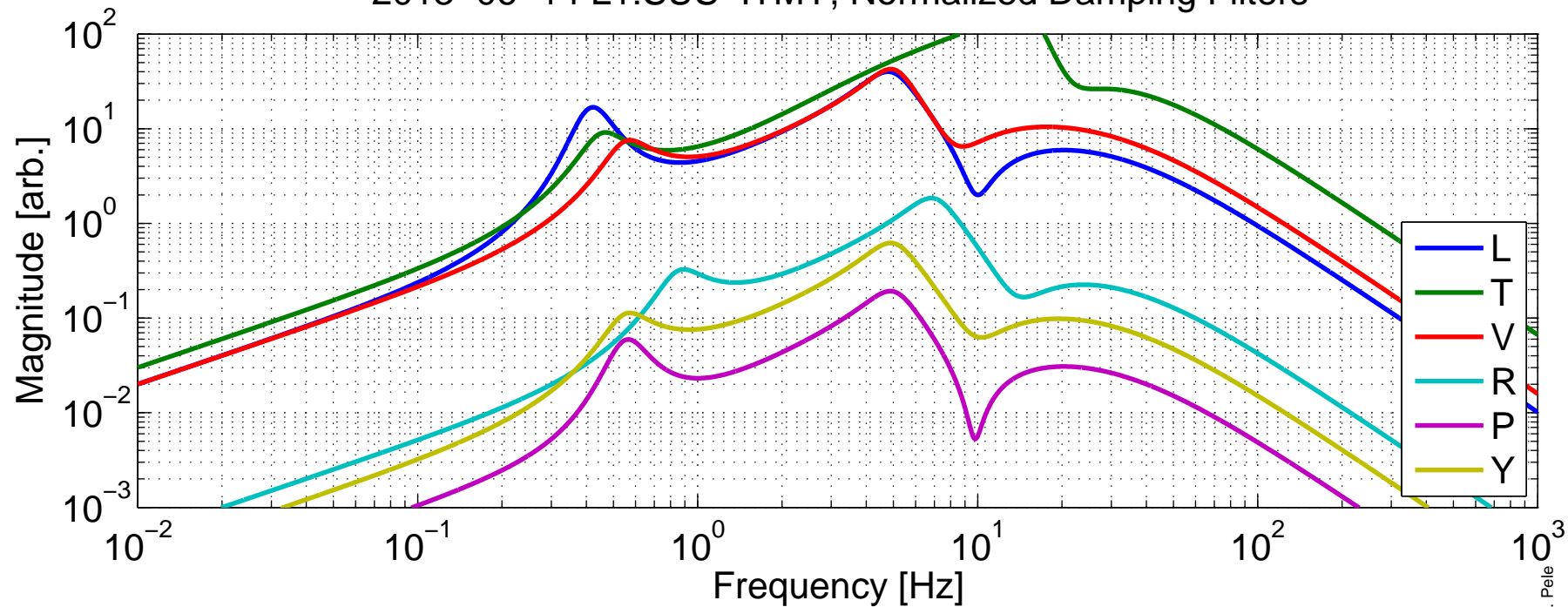


Damping Loop Performance

L1:SUS-ITMY L Test Mass Displacement

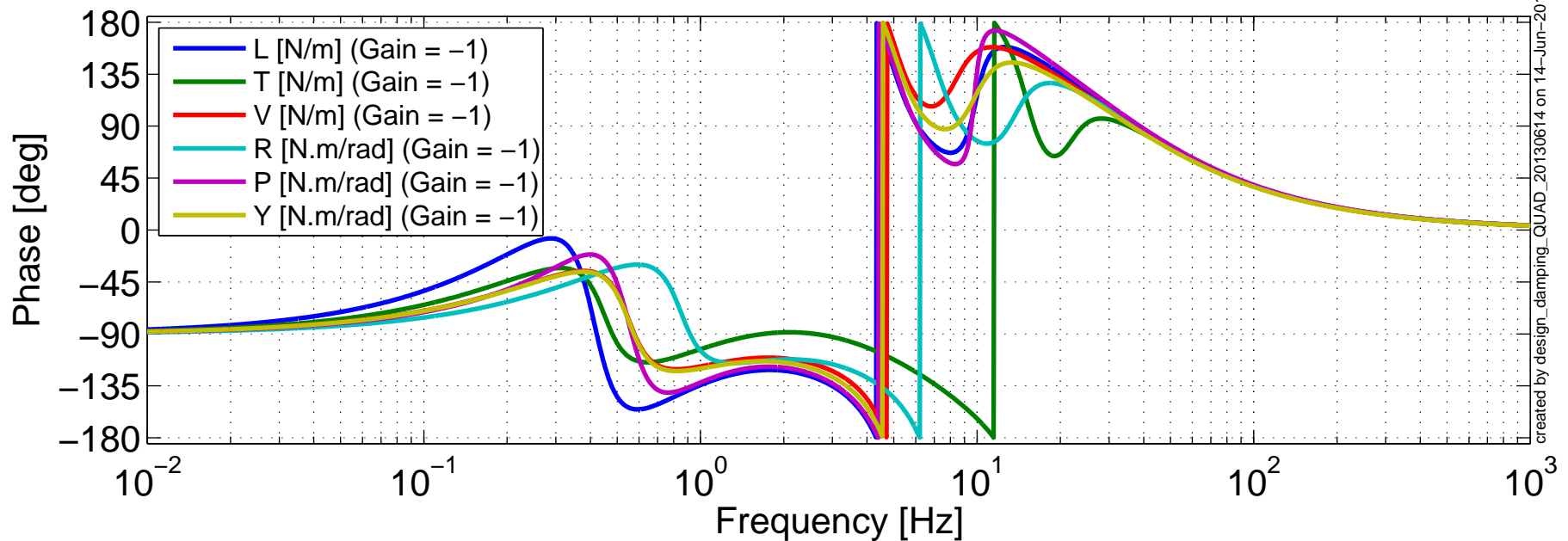
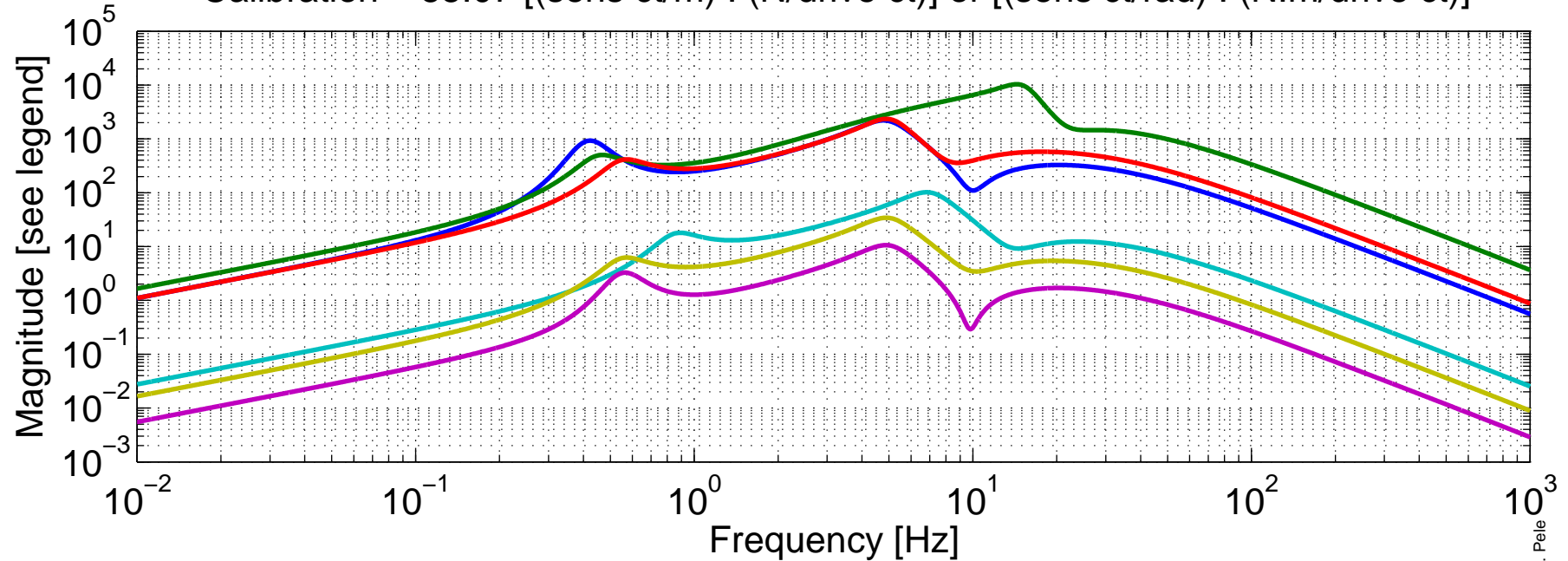


2013-06-14 L1:SUS-ITMY, Normalized Damping Filters



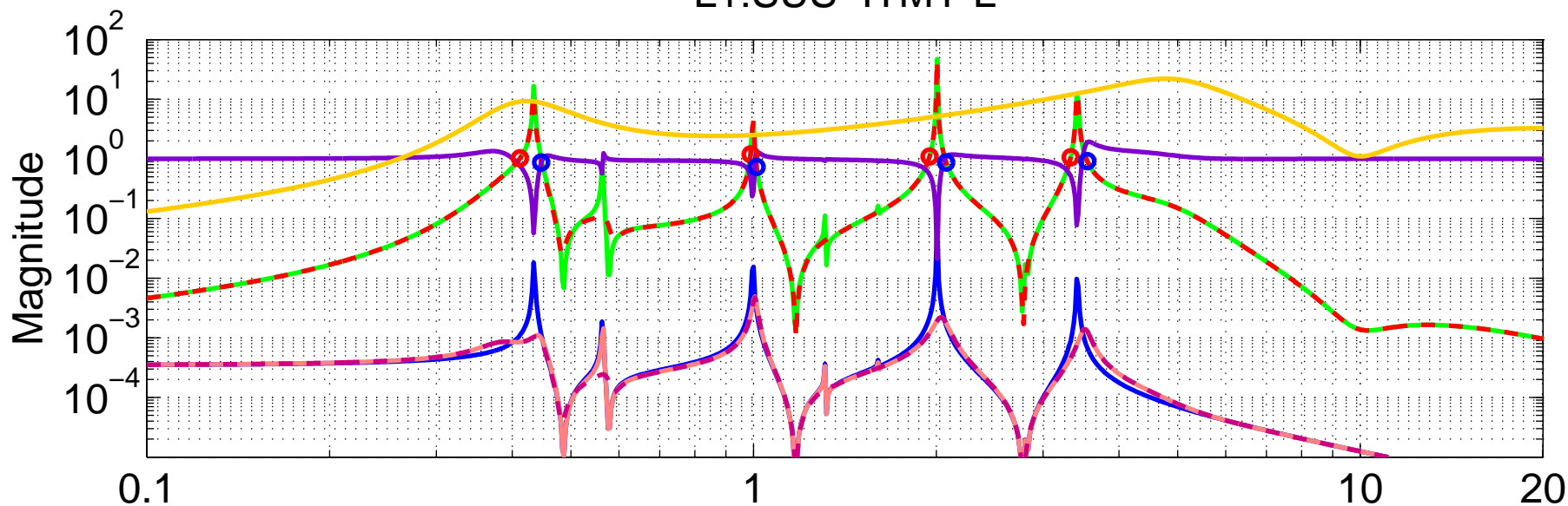
created by design_damping_QUAD_20130614 on 14-Jun-2013, J. Kissel, A. Pele

2013-06-14 L1:SUS-ITMY, Calibrated Damping Filters
 Calibration = 55.07 [(sens ct/m) . (N/drive ct)] or [(sens ct/rad) . (N.m/drive ct)]

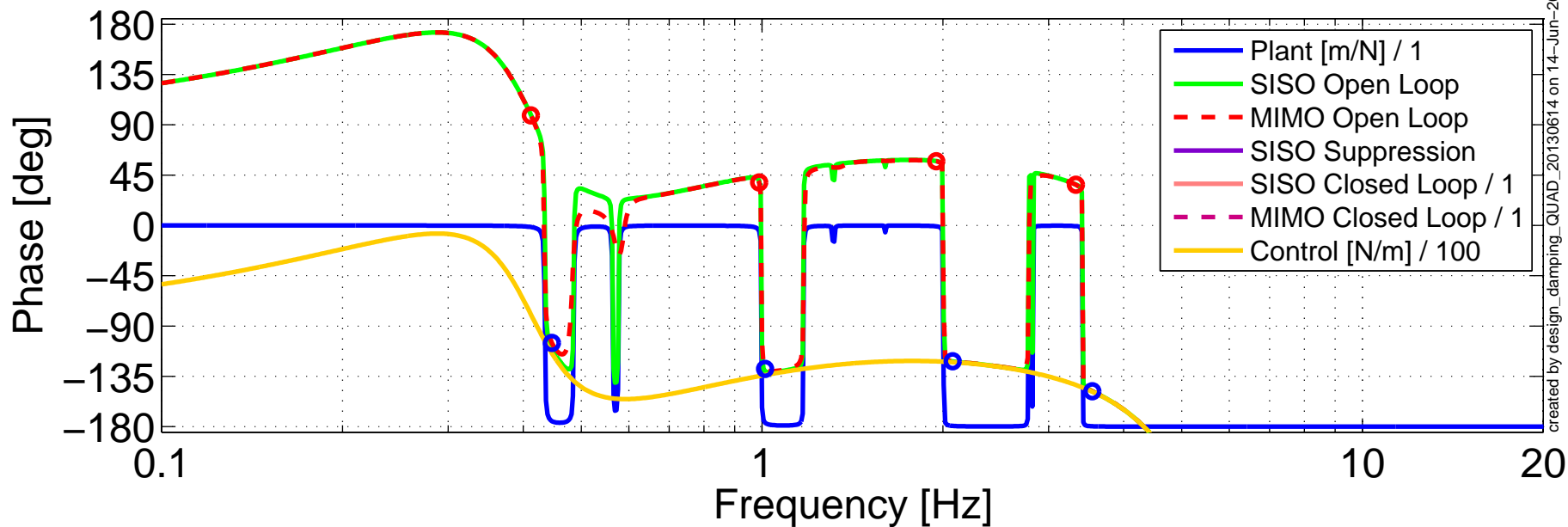


Damping Loop Design

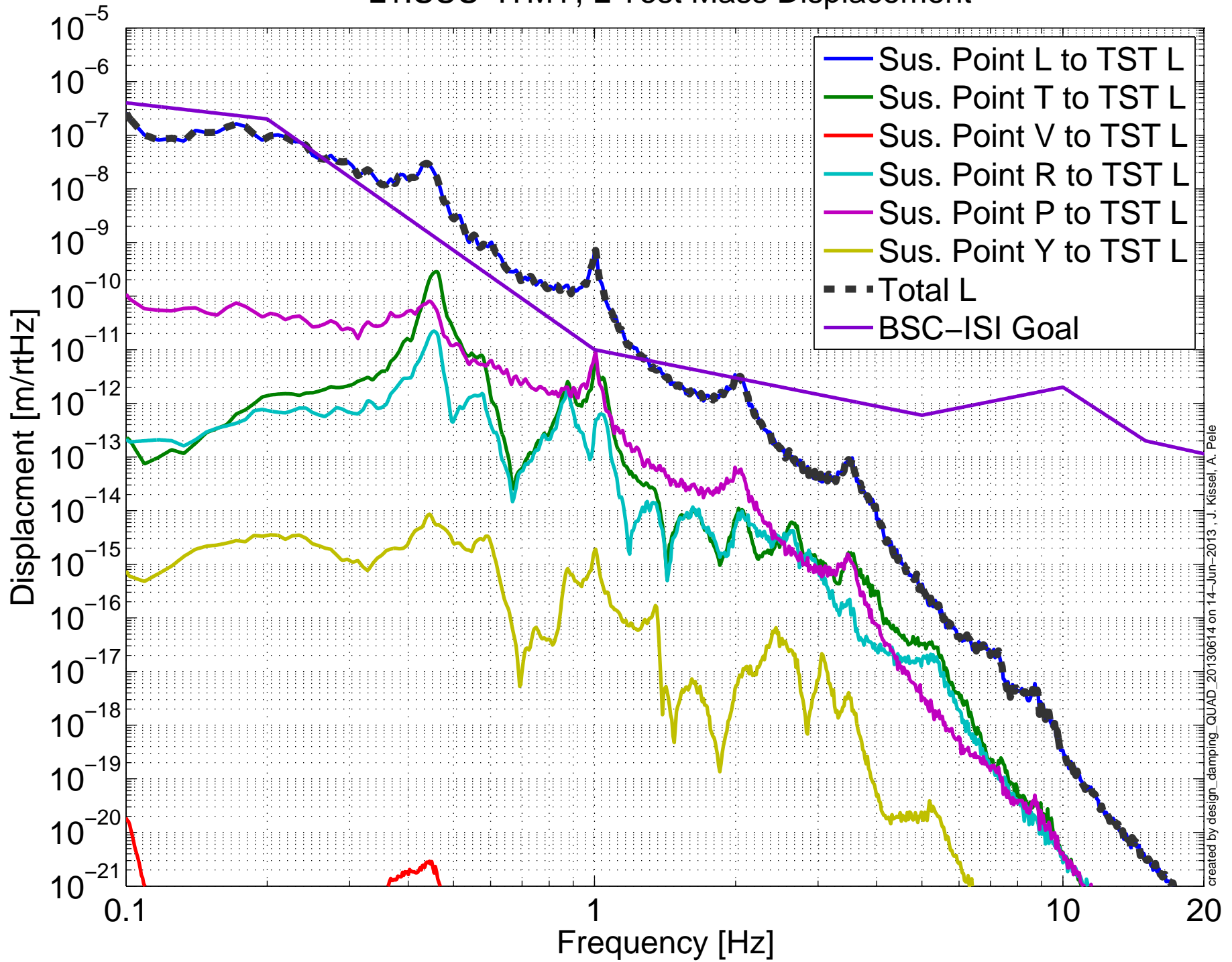
L1:SUS-ITMY L



MIMO LUGF Phase Margins (red): [81.6 142 123 144] [deg]
MIMO UUGF Phase Margins (blue): [74.9 51.6 58.5 31.7] [deg]

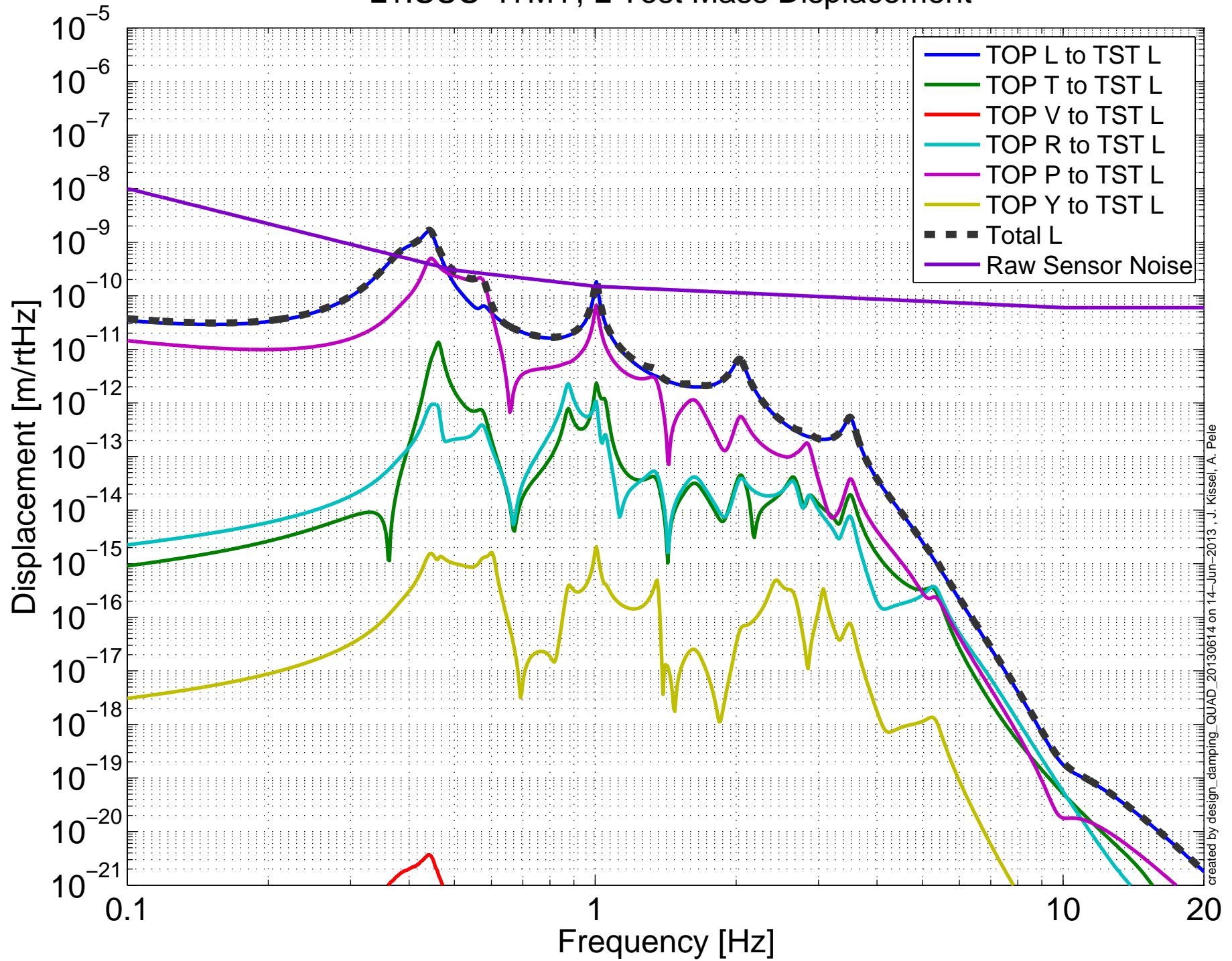


Projected Sus. Point > Test Mass Seismic Noise Budget L1:SUS-ITMY, L Test Mass Displacement

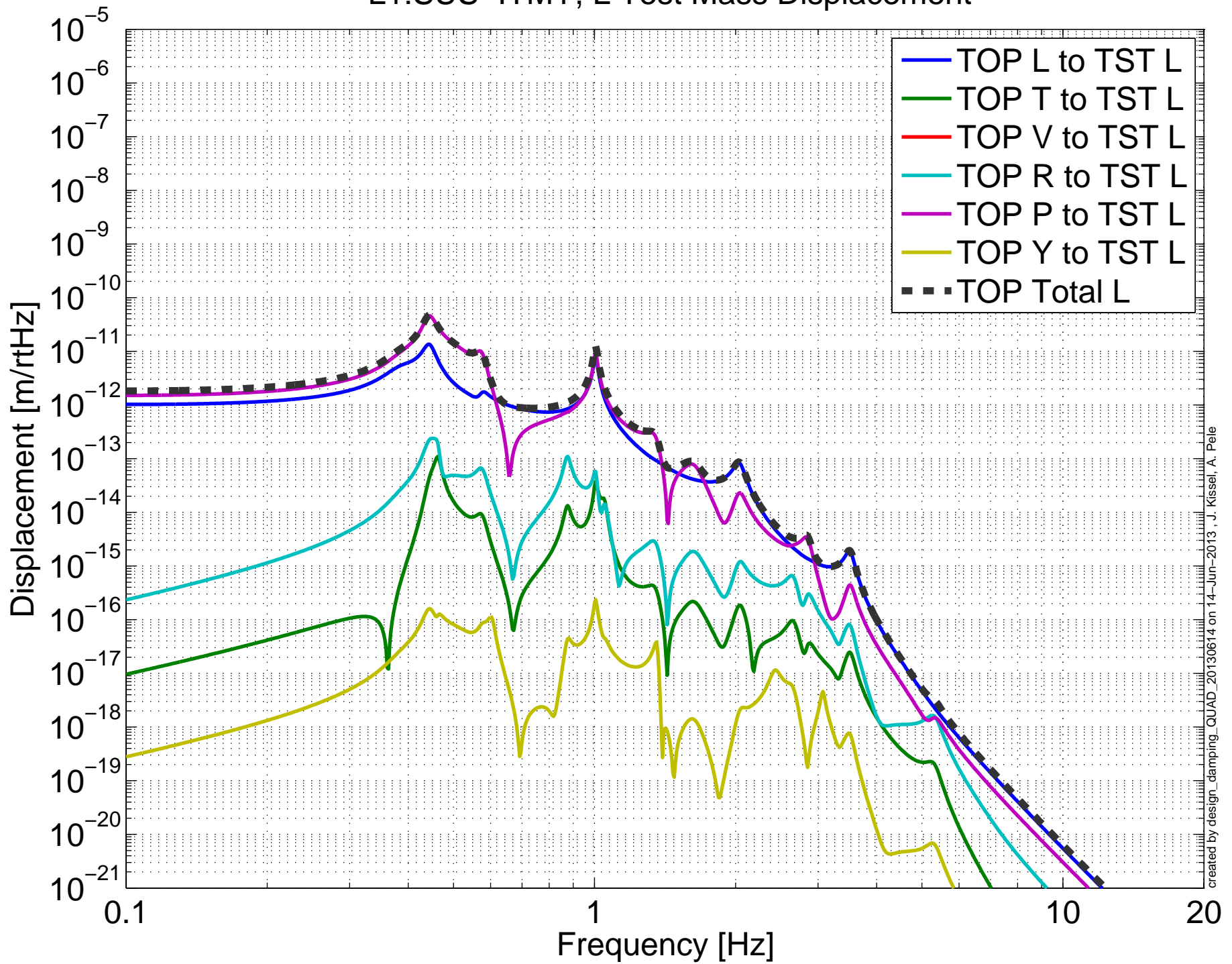


created by design_damping_QUAD_20130614 on 14-Jun-2013, J. Kissel, A. Pele

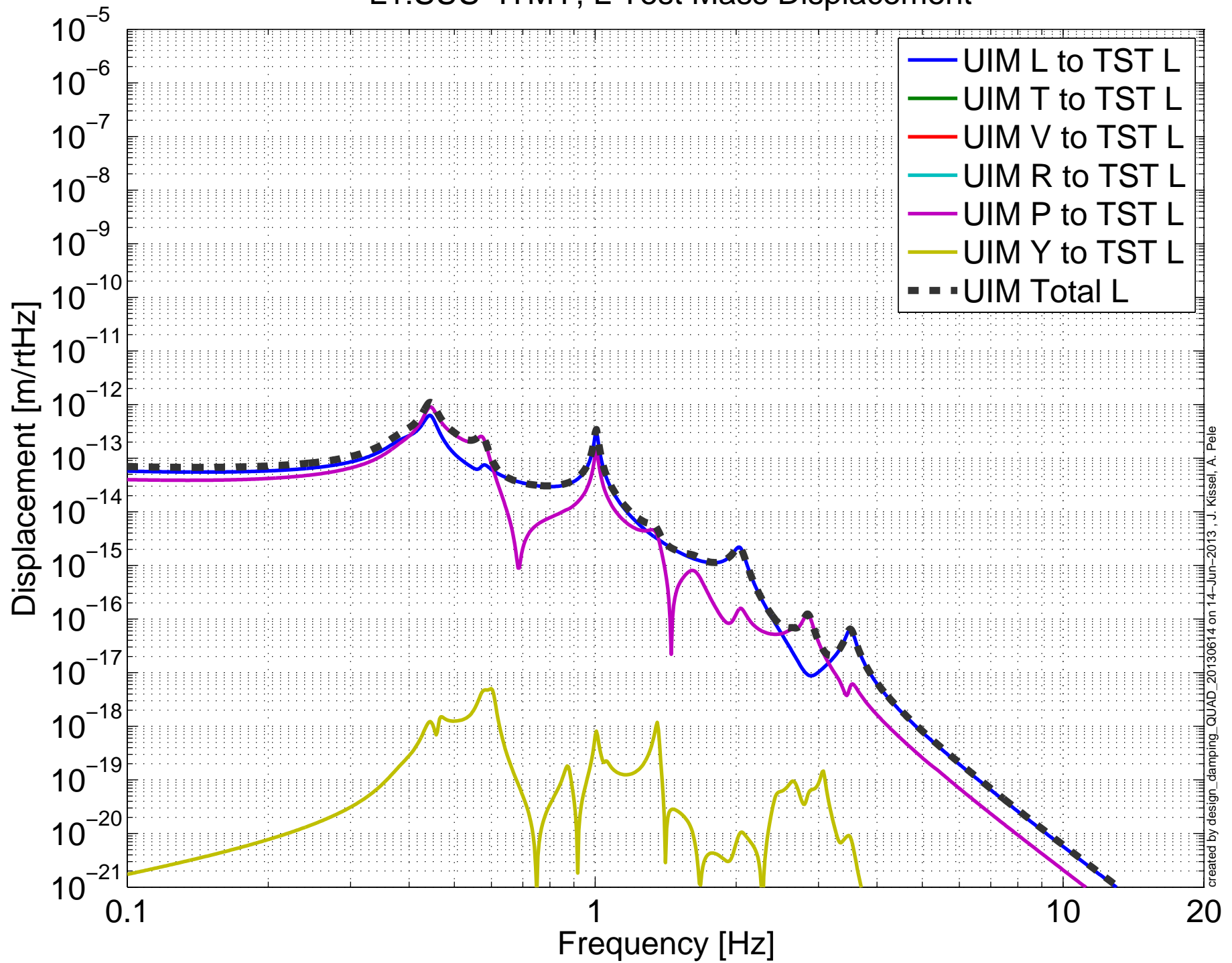
Projected Top Mass Sensor > Test Mass Noise Budget L1:SUS-ITMY, L Test Mass Displacement



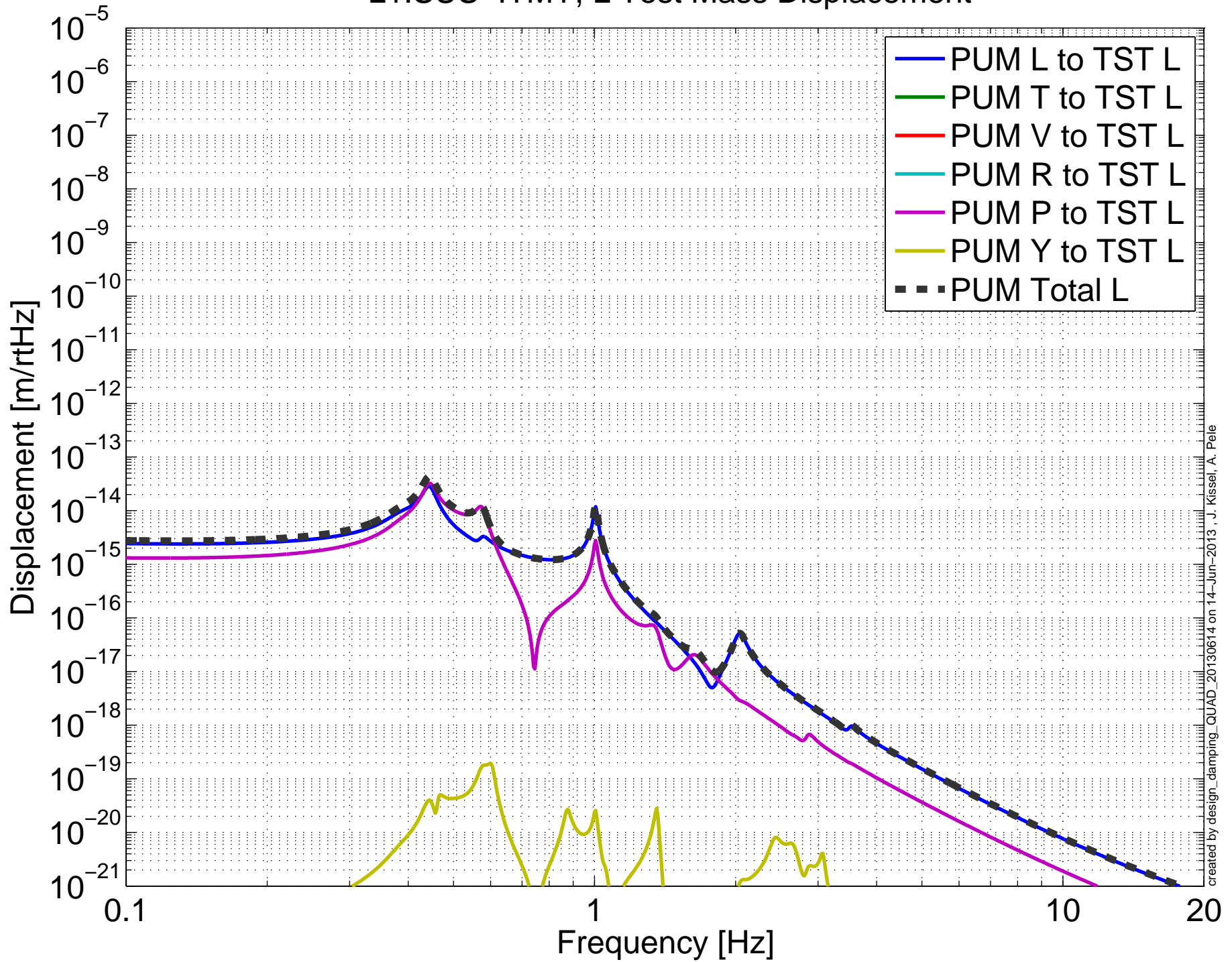
Projected Top Mass Actuator > Test Mass Noise Budget L1:SUS-ITMY, L Test Mass Displacement



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

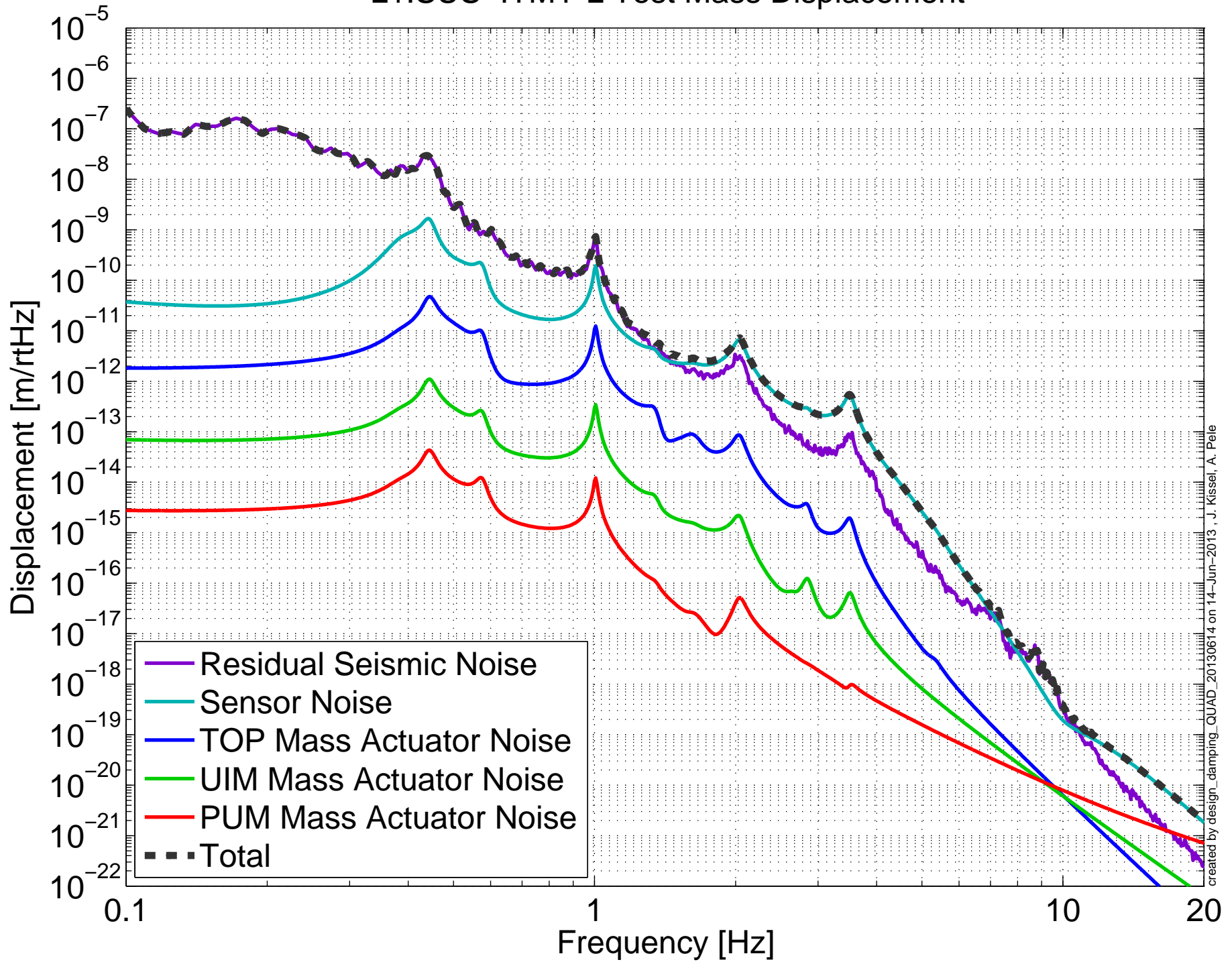


Projected PUM Mass Actuator > Test Mass Noise Budget L1:SUS-ITMY, L Test Mass Displacement

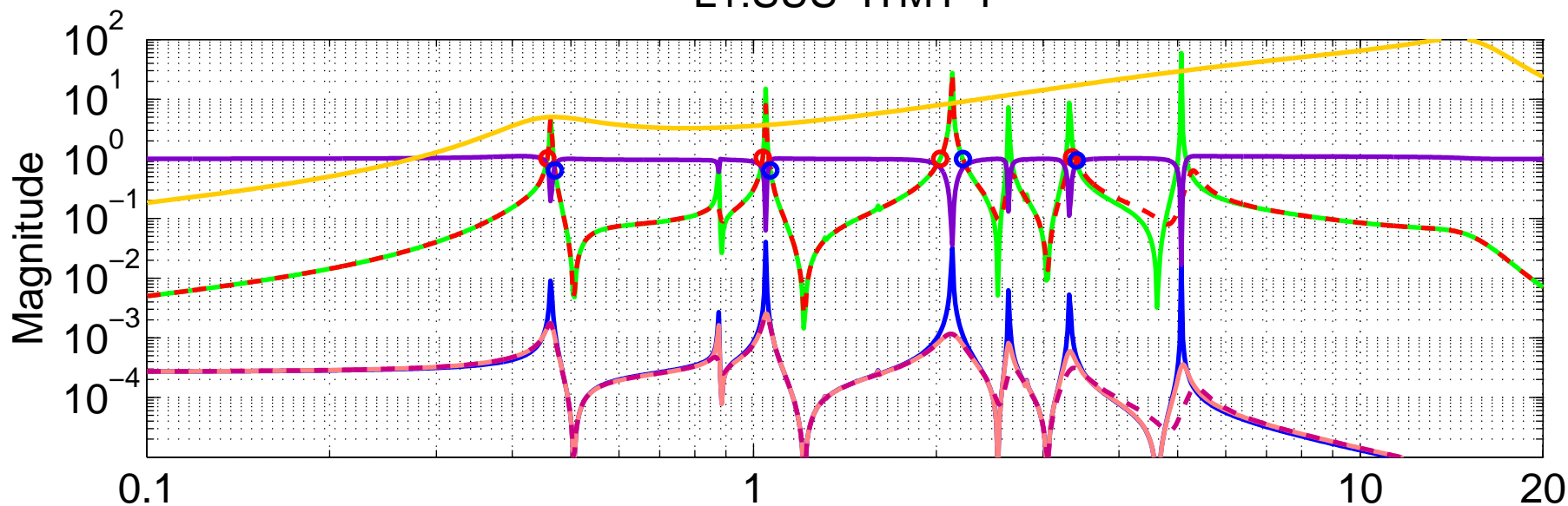


Damping Loop Performance

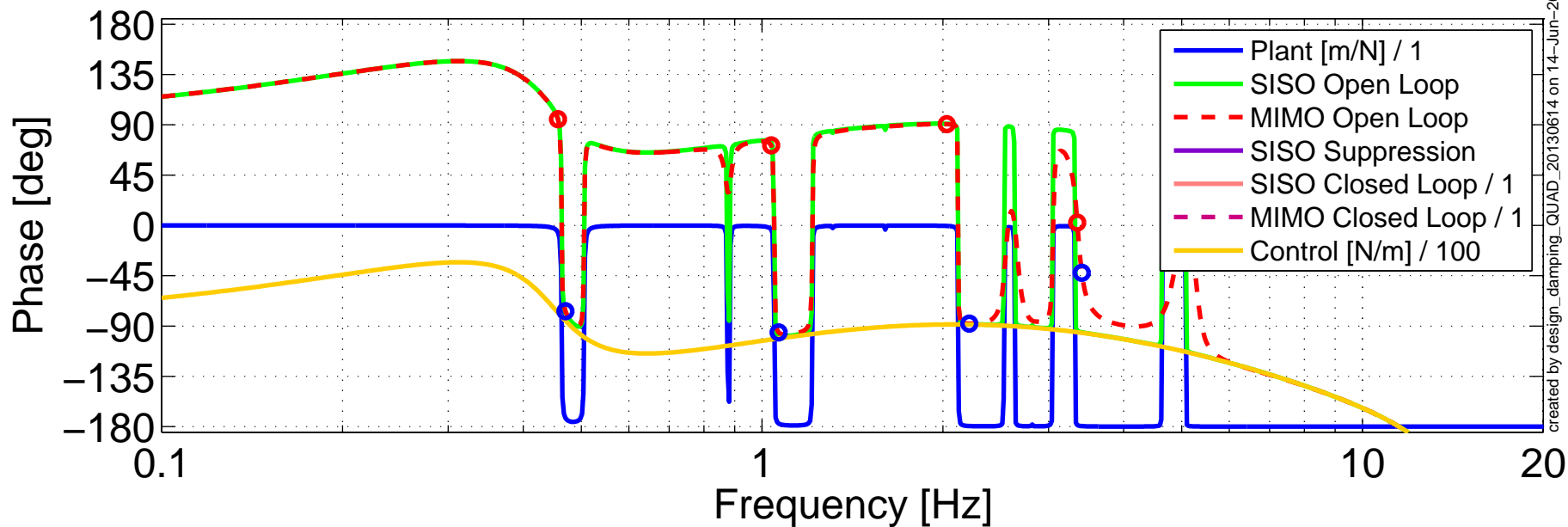
L1:SUS-ITMY L Test Mass Displacement



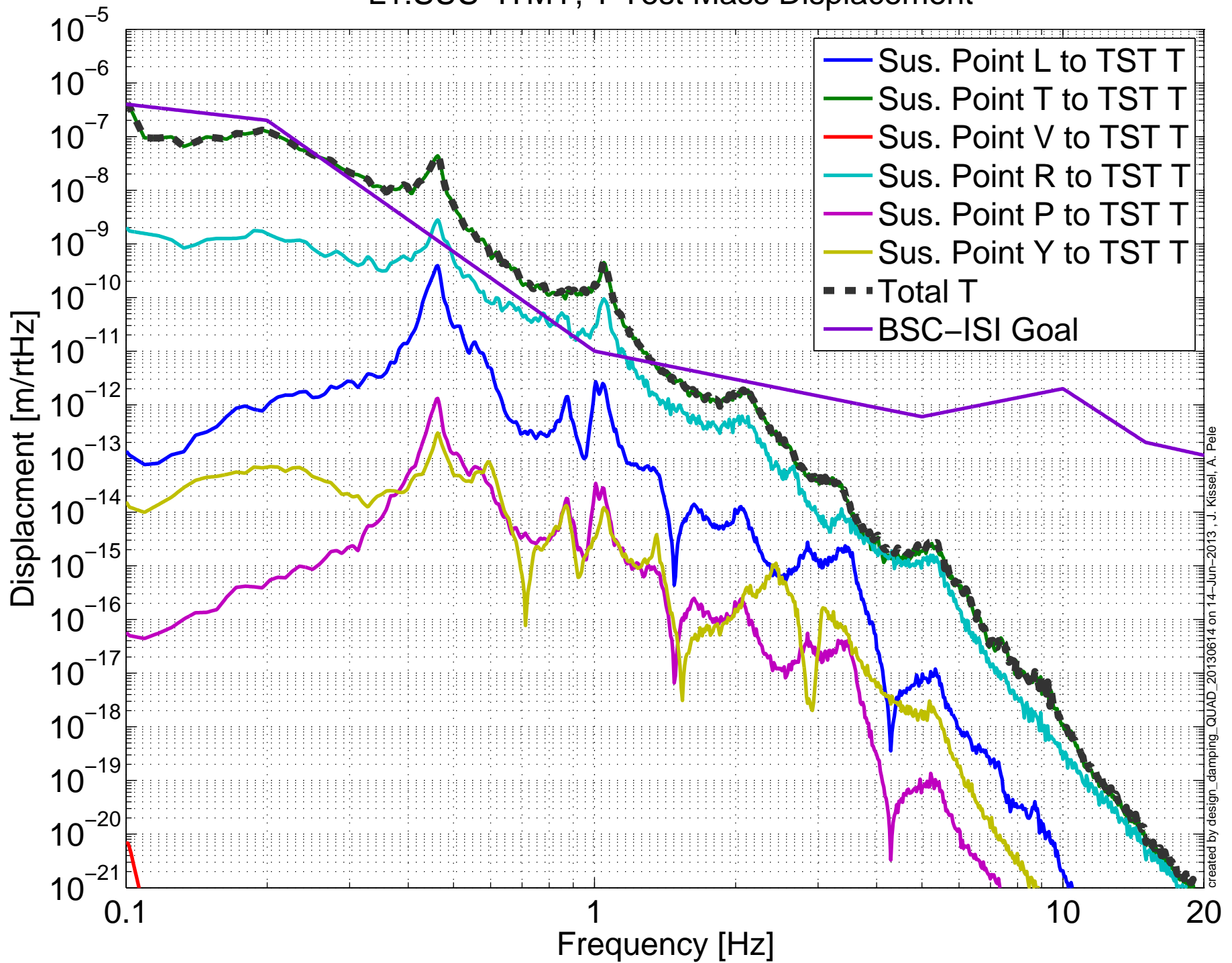
Damping Loop Design L1:SUS-ITMY T



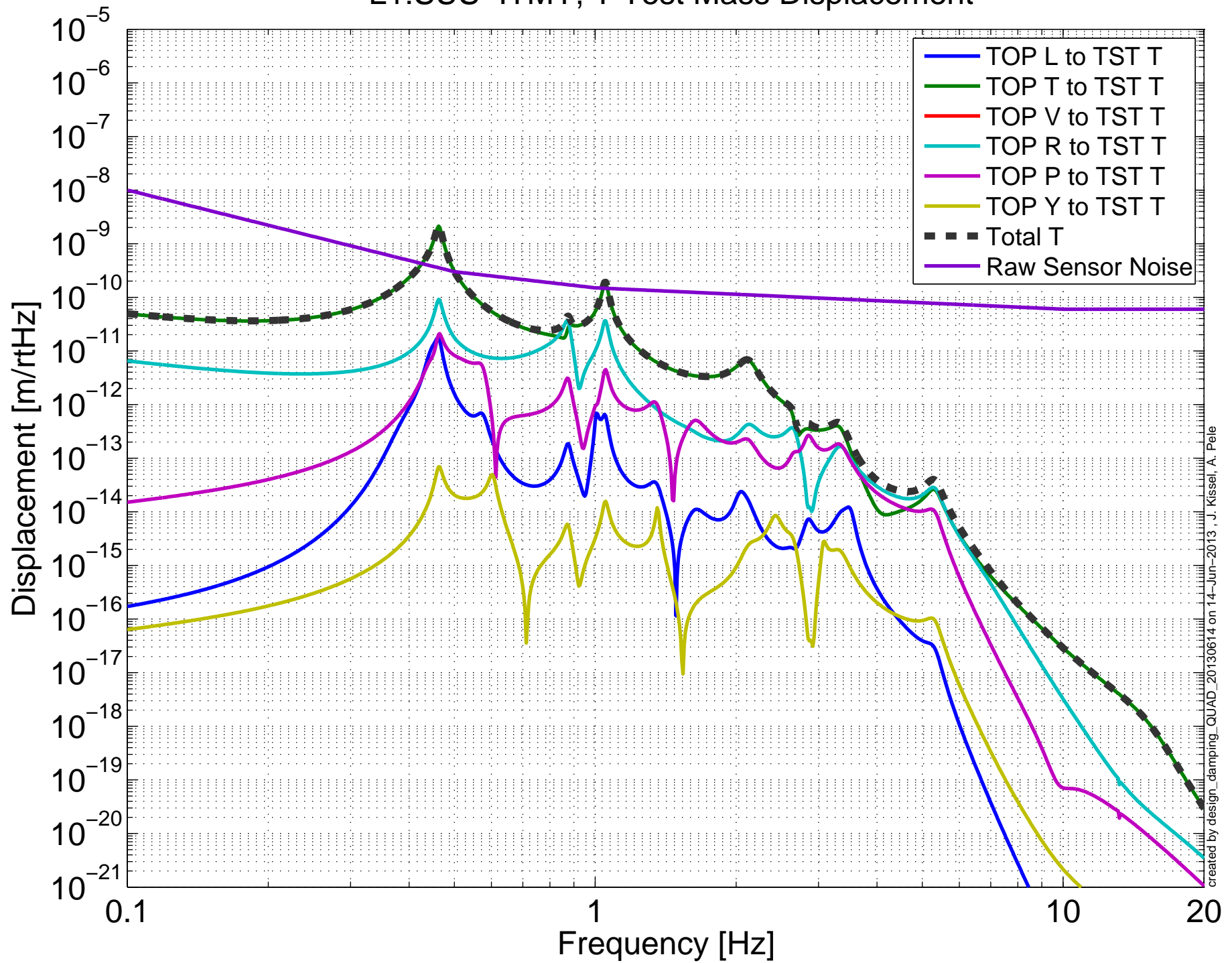
MIMO LUGF Phase Margins (red): [85 108 89.4 177] [deg]
 MIMO UUGF Phase Margins (blue): [103 84.2 92.2 138] [deg]



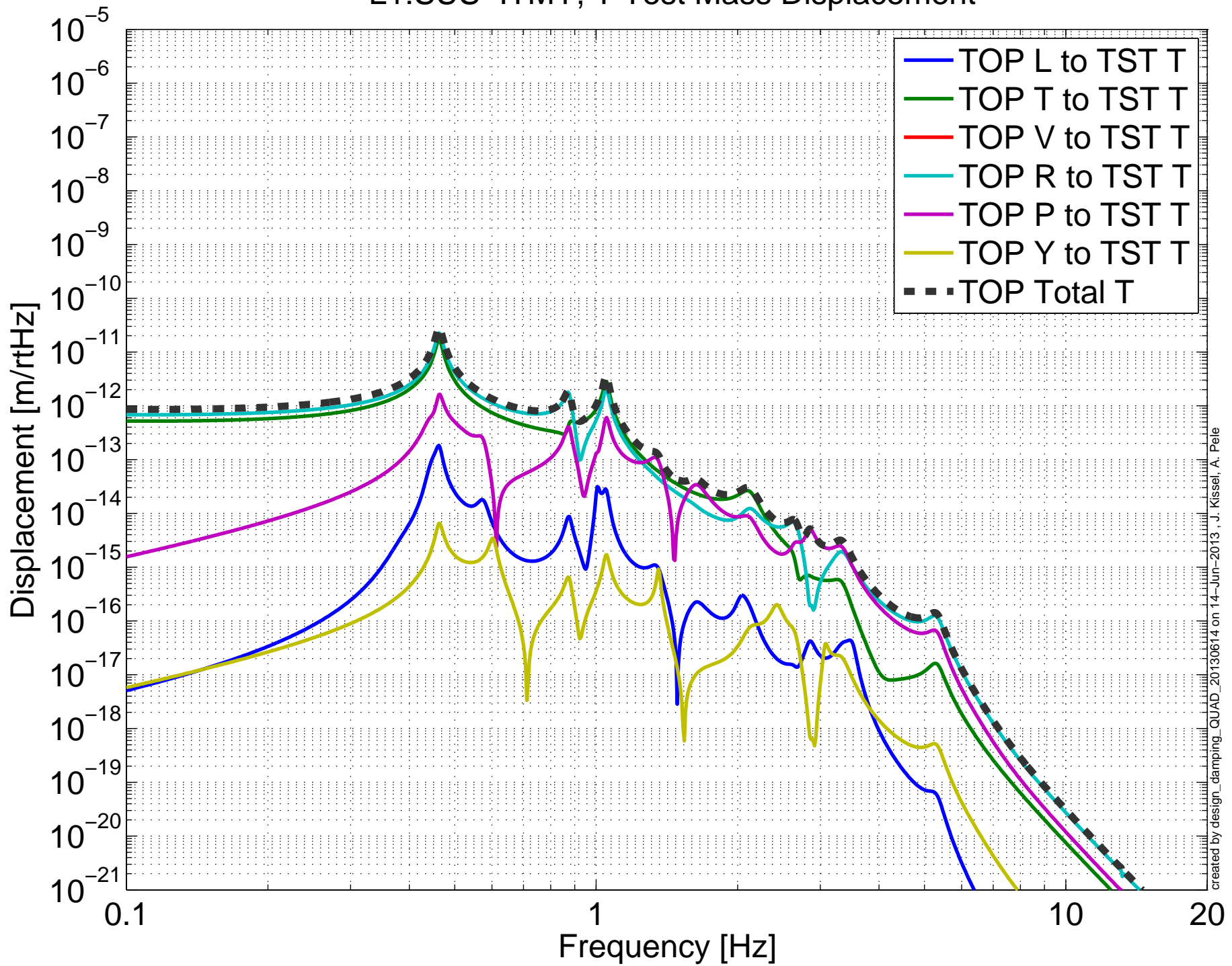
Projected Sus. Point > Test Mass Seismic Noise Budget L1:SUS-ITMY, T Test Mass Displacement



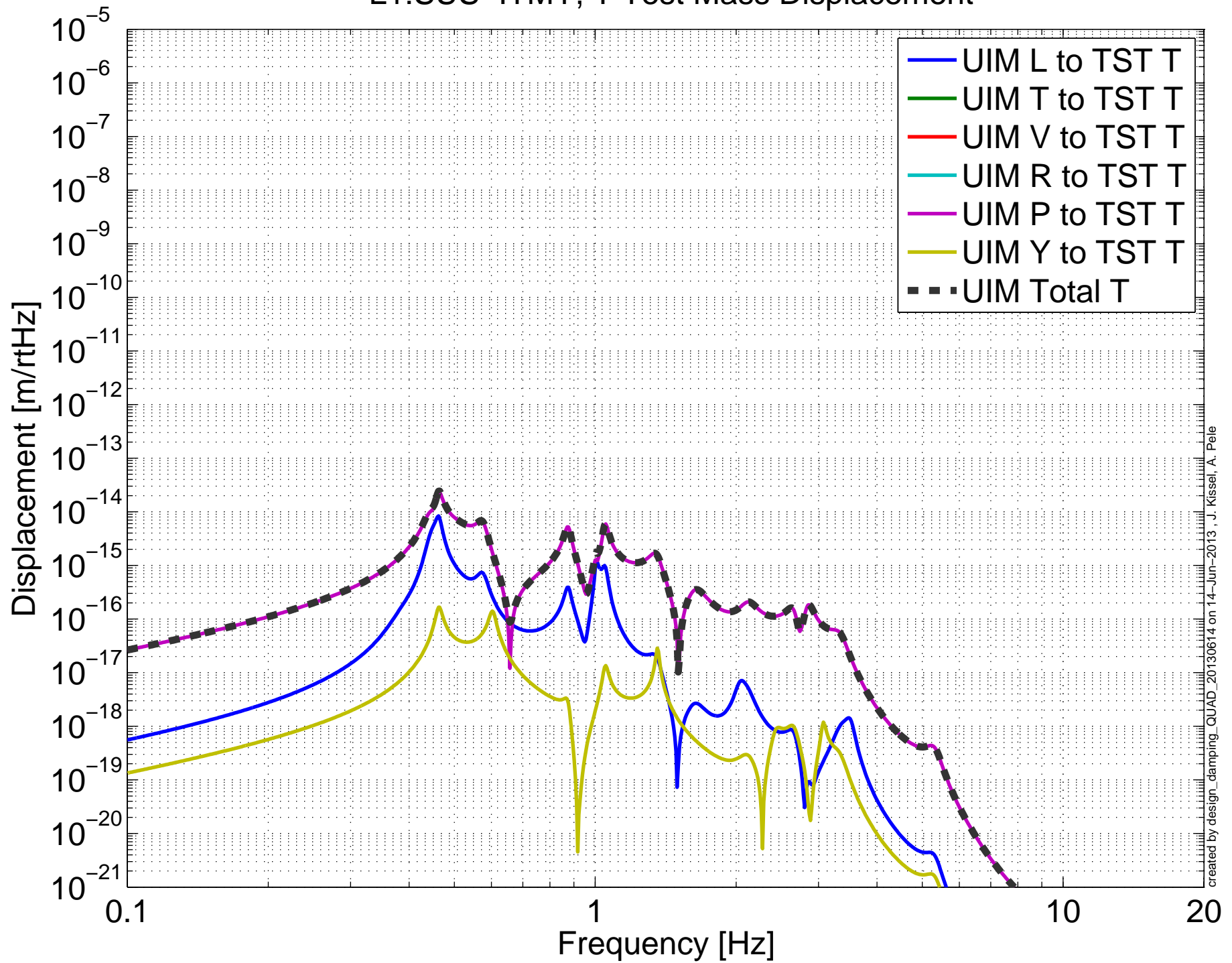
Projected Top Mass Sensor > Test Mass Noise Budget L1:SUS-ITMY, T Test Mass Displacement



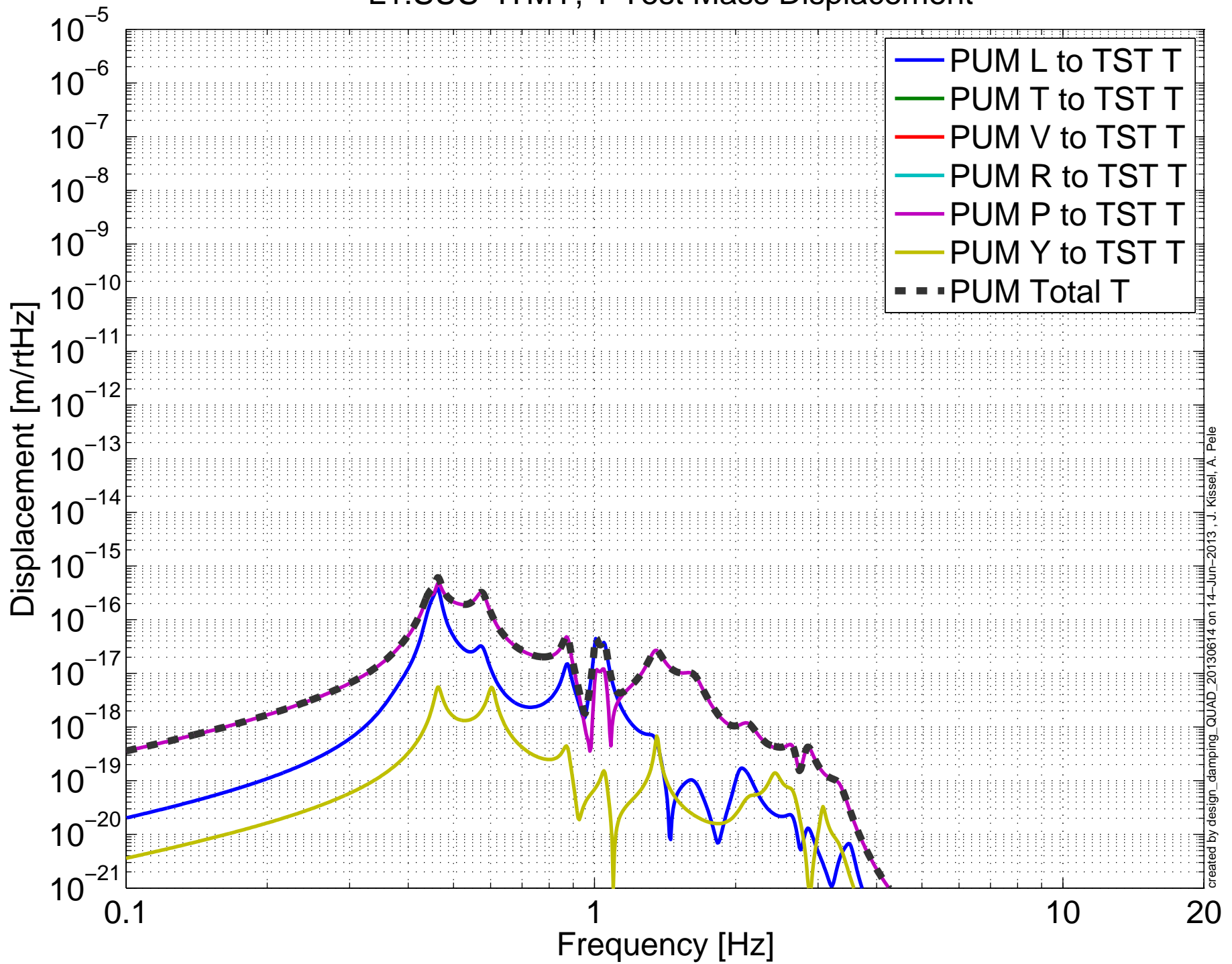
Projected Top Mass Actuator > Test Mass Noise Budget L1:SUS-ITMY, T Test Mass Displacement



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



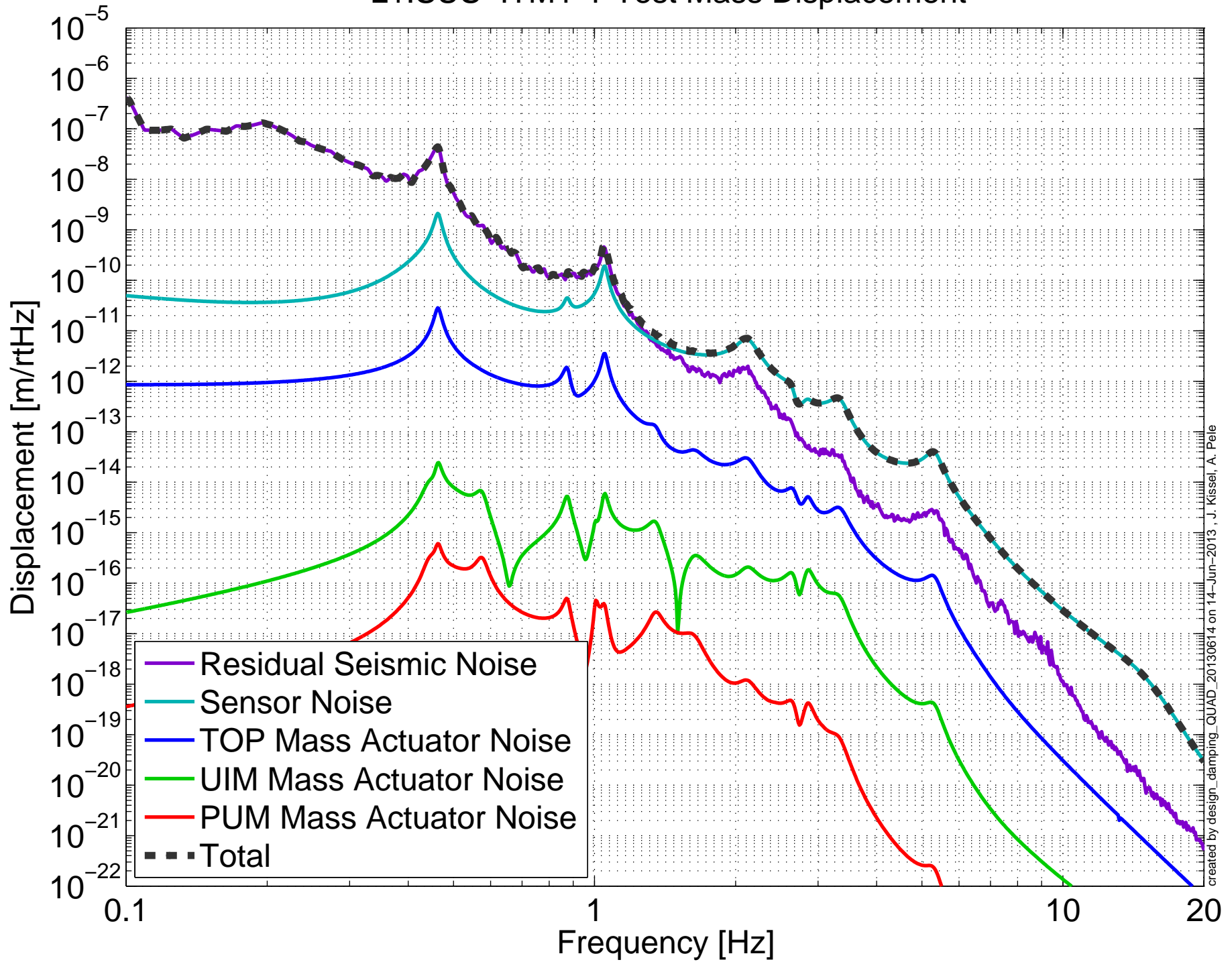
Projected PUM Mass Actuator > Test Mass Noise Budget L1:SUS-ITMY, T Test Mass Displacement



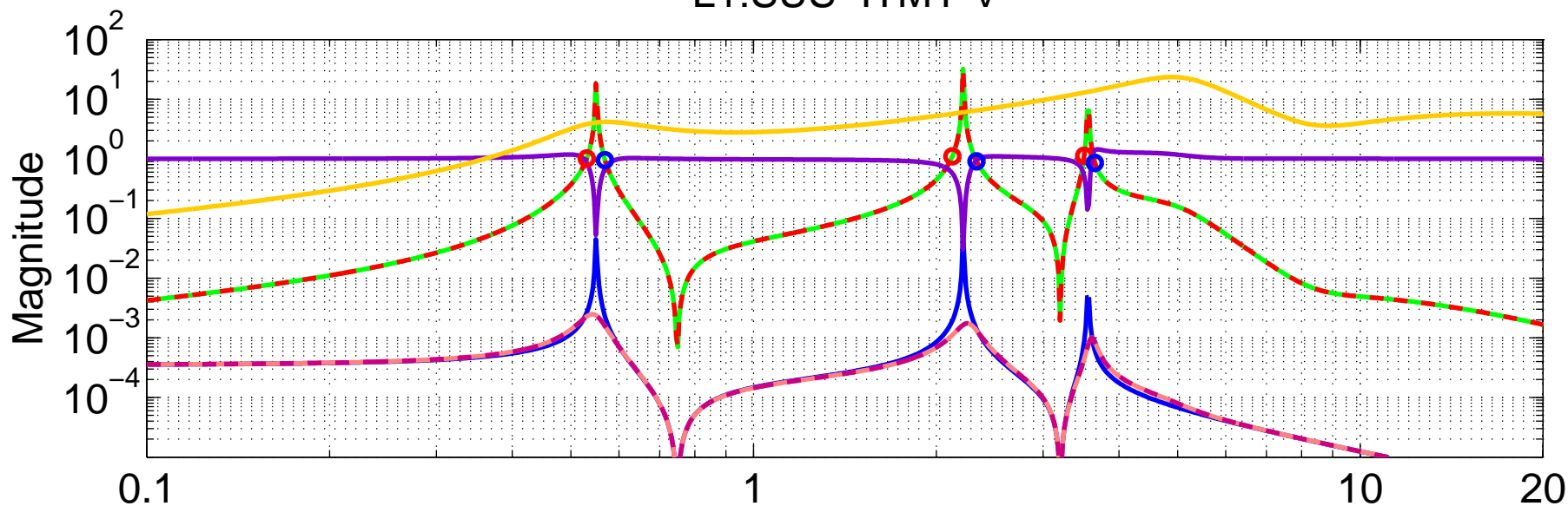
created by design_damping_QUAD_20130614 on 14-Jun-2013, J. Kissel, A. Pele

Damping Loop Performance

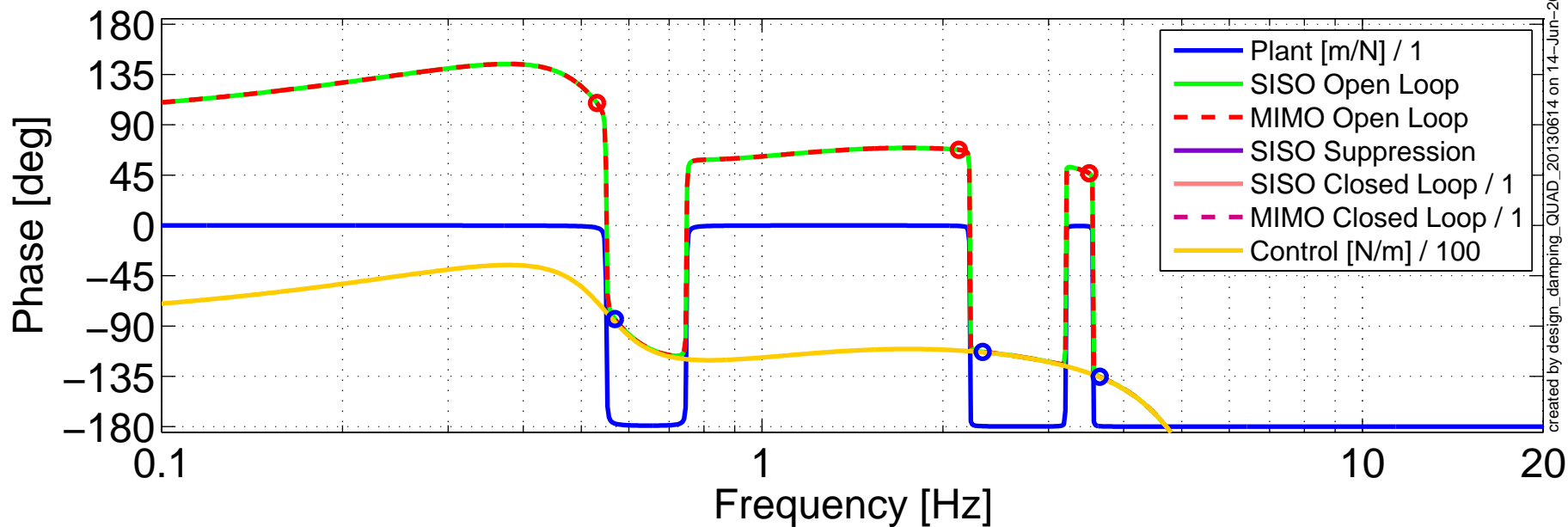
L1:SUS-ITMY T Test Mass Displacement



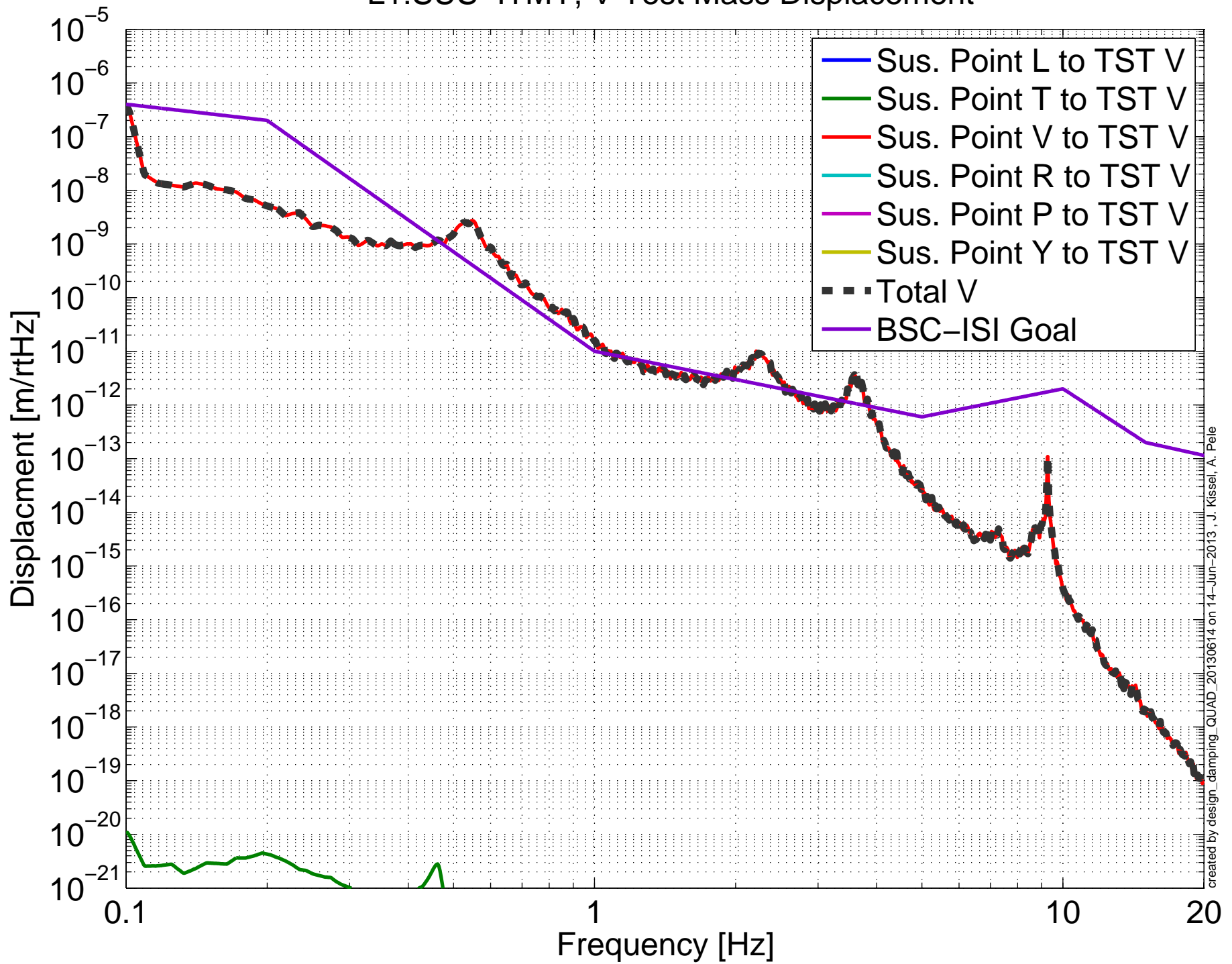
Damping Loop Design L1:SUS-ITMY V



MIMO LUGF Phase Margins (red): [70.5 112 133] [deg]
 MIMO UUGF Phase Margins (blue): [96.2 66.9 44.6] [deg]

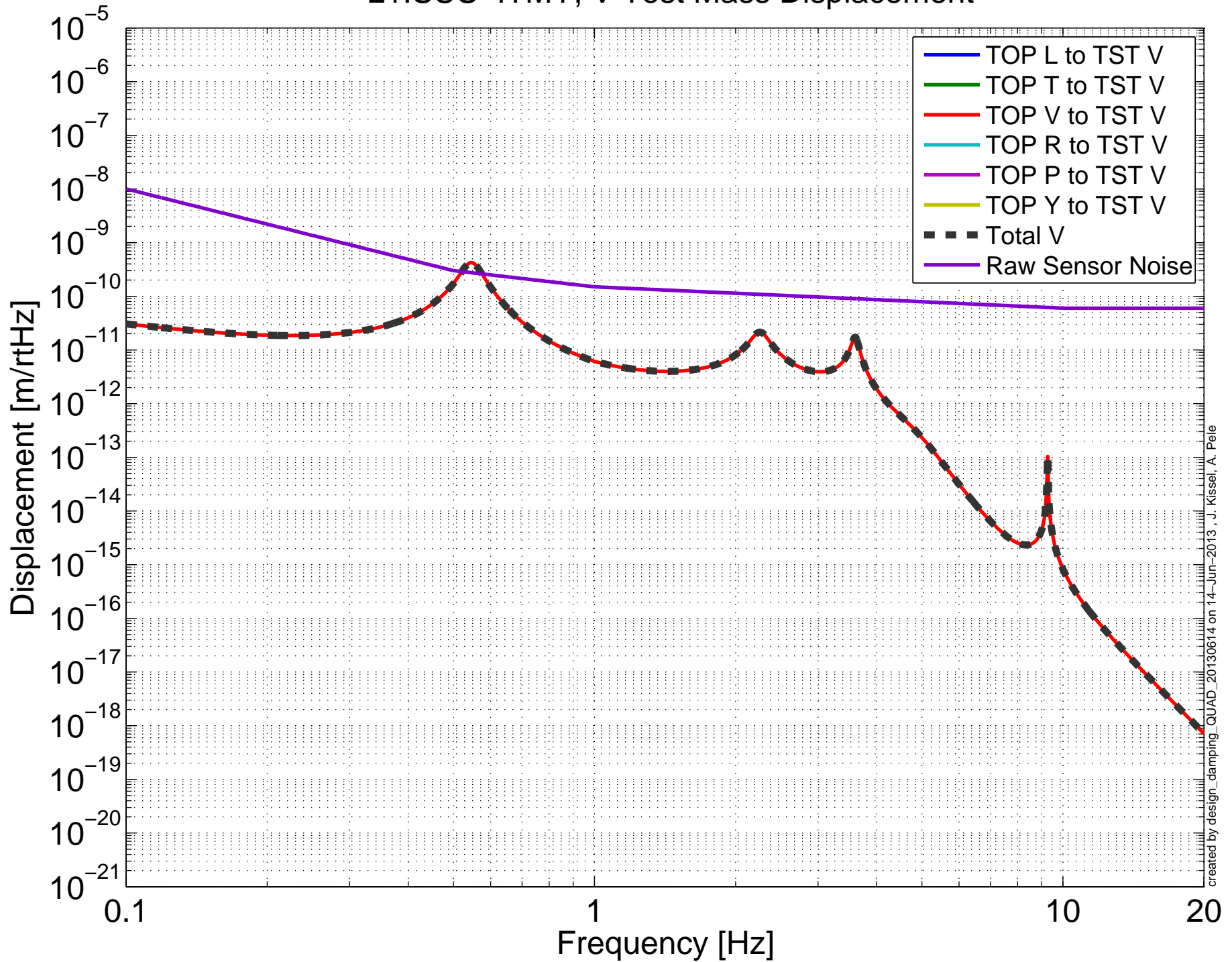


Projected Sus. Point > Test Mass Seismic Noise Budget L1:SUS-ITMY, V Test Mass Displacement

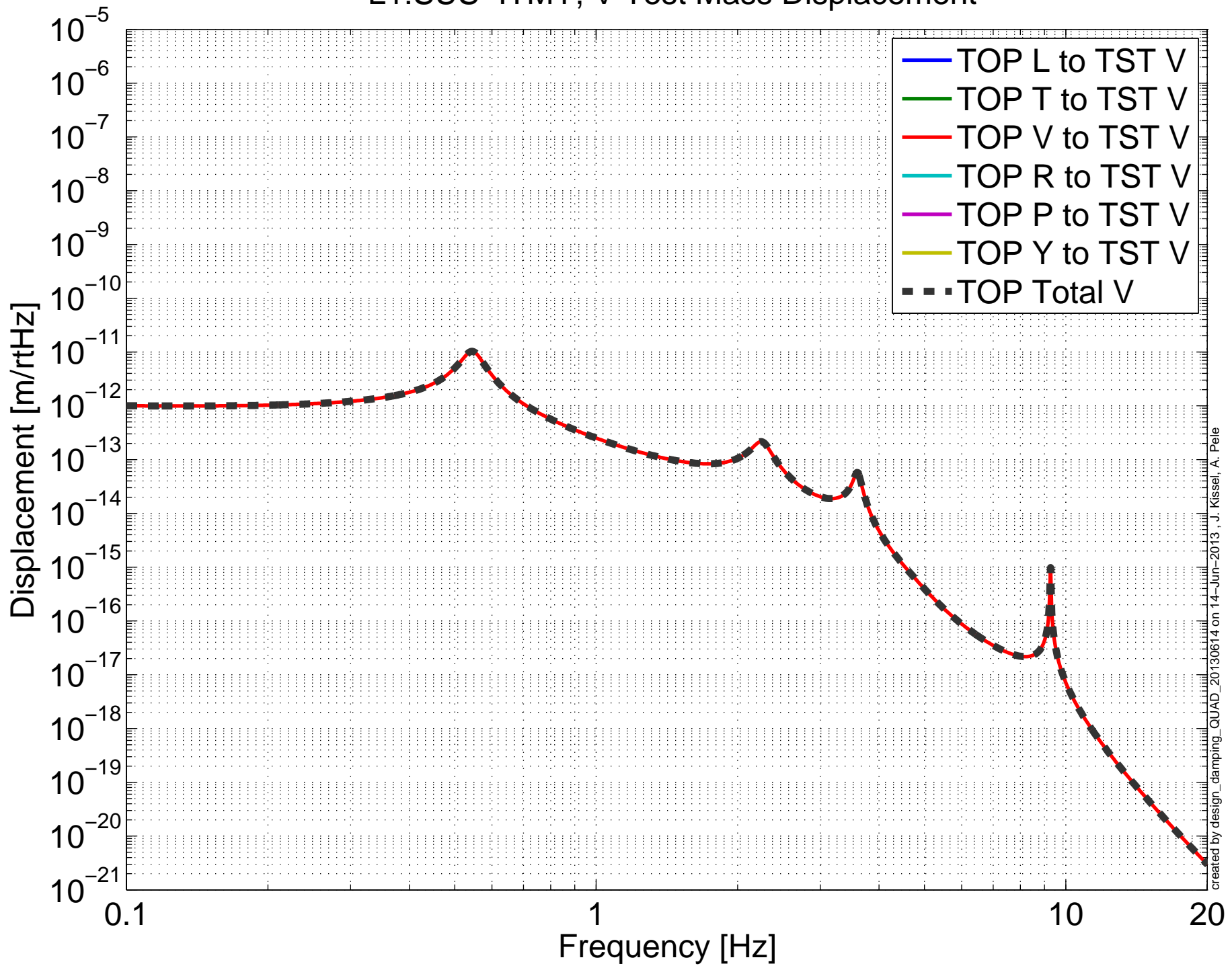


created by design_clamping_QUAD_20130614 on 14-Jun-2013, J. Kissel, A. Pele

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

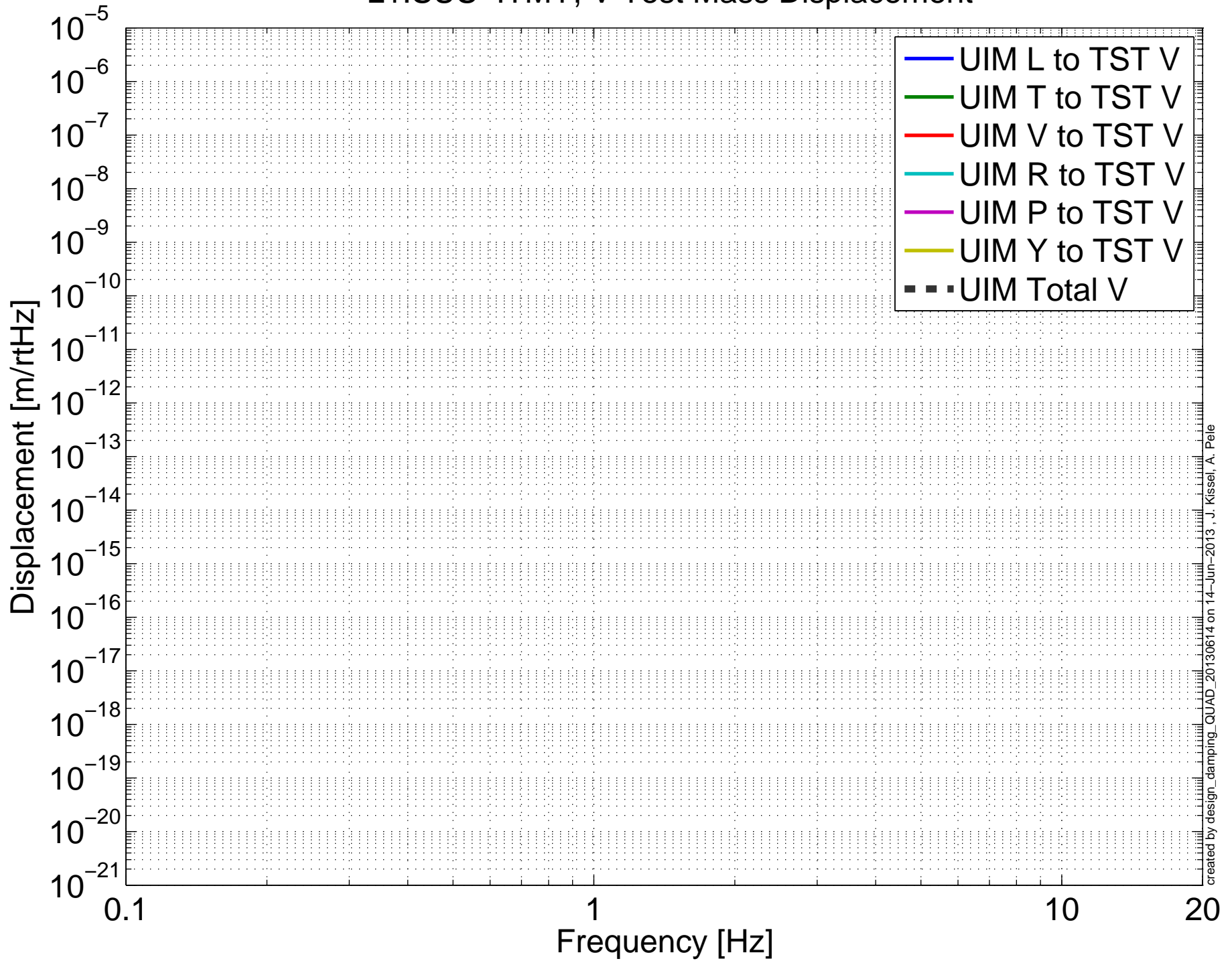


Projected Top Mass Actuator > Test Mass Noise Budget L1:SUS-ITMY, V Test Mass Displacement



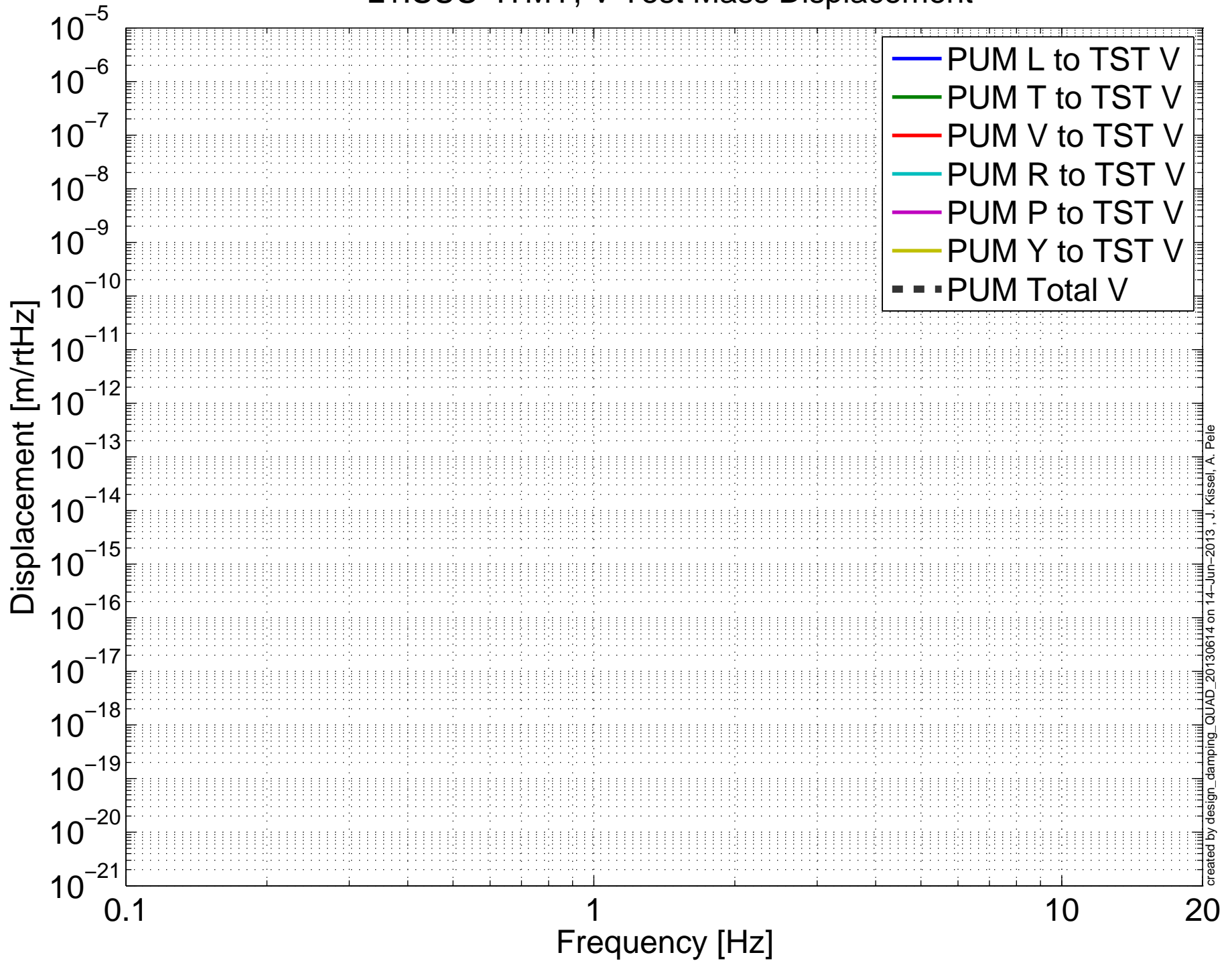
created by design_damping_QUAD_20130614 on 14-Jun-2013, J. Kissel, A. Pele

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



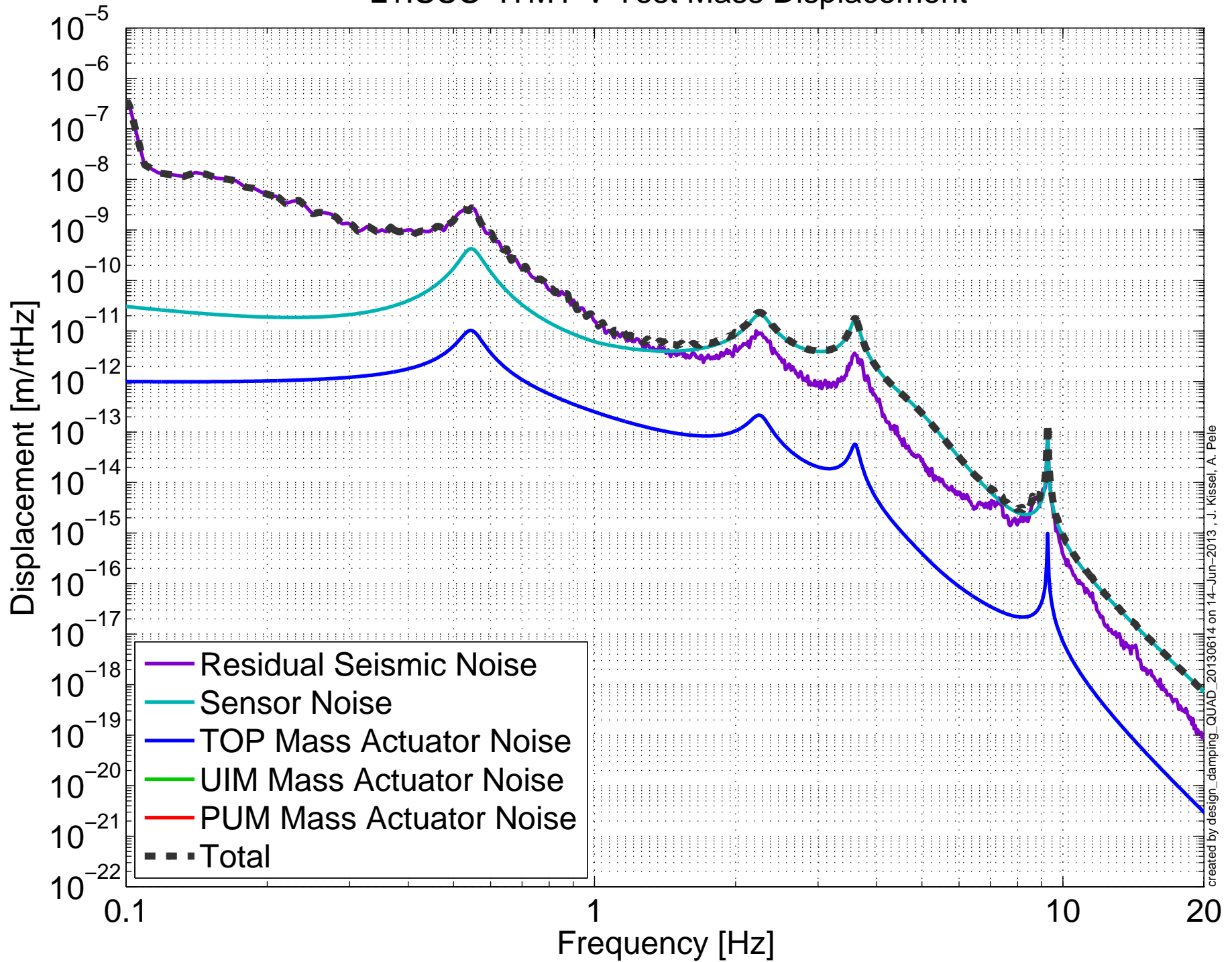
created by design_damping_QUAD_20130614 on 14-Jun-2013, J. Kissel, A. Pele

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



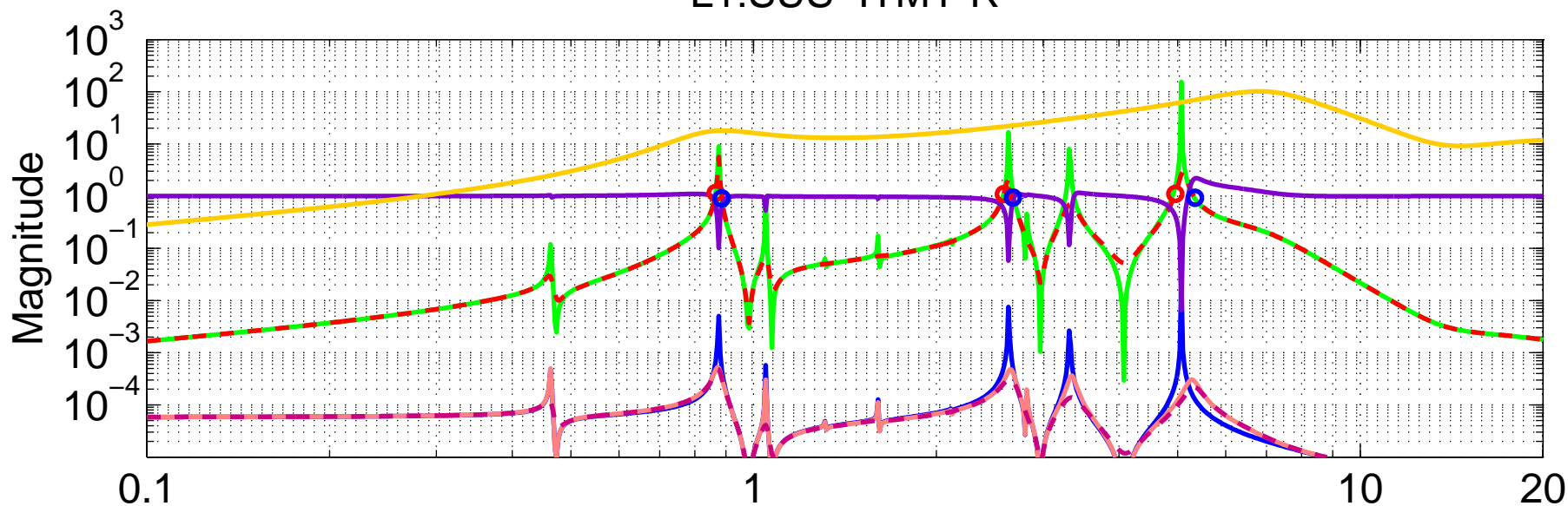
Damping Loop Performance

L1:SUS-ITMY V Test Mass Displacement

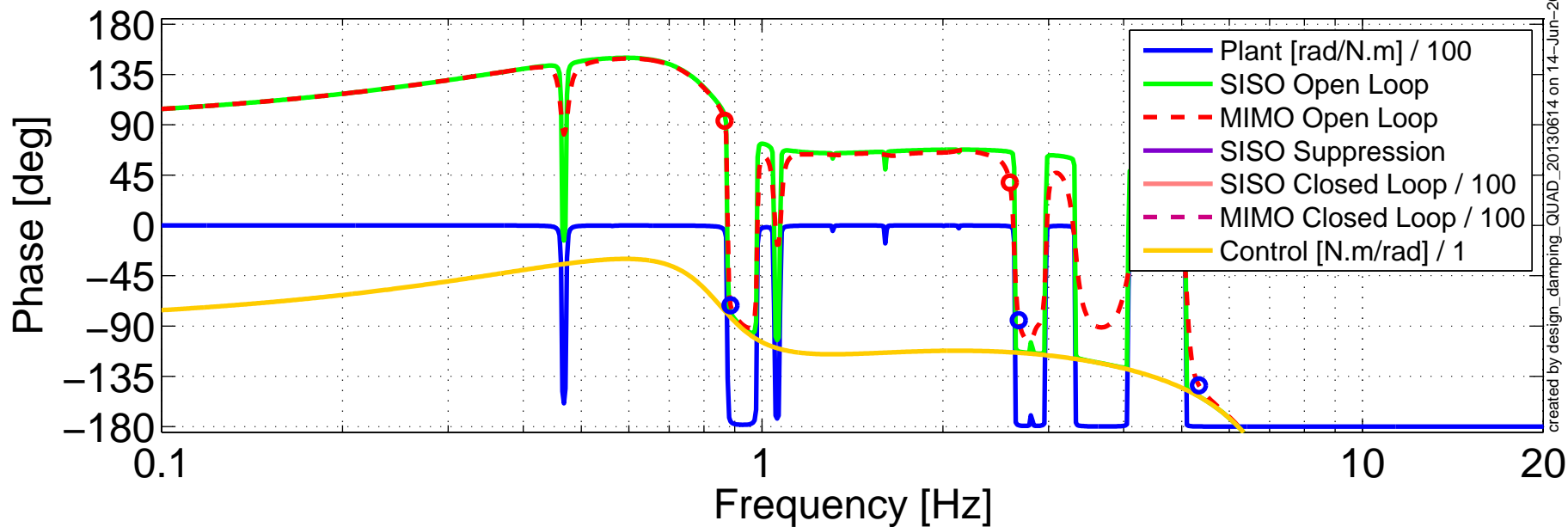


Damping Loop Design

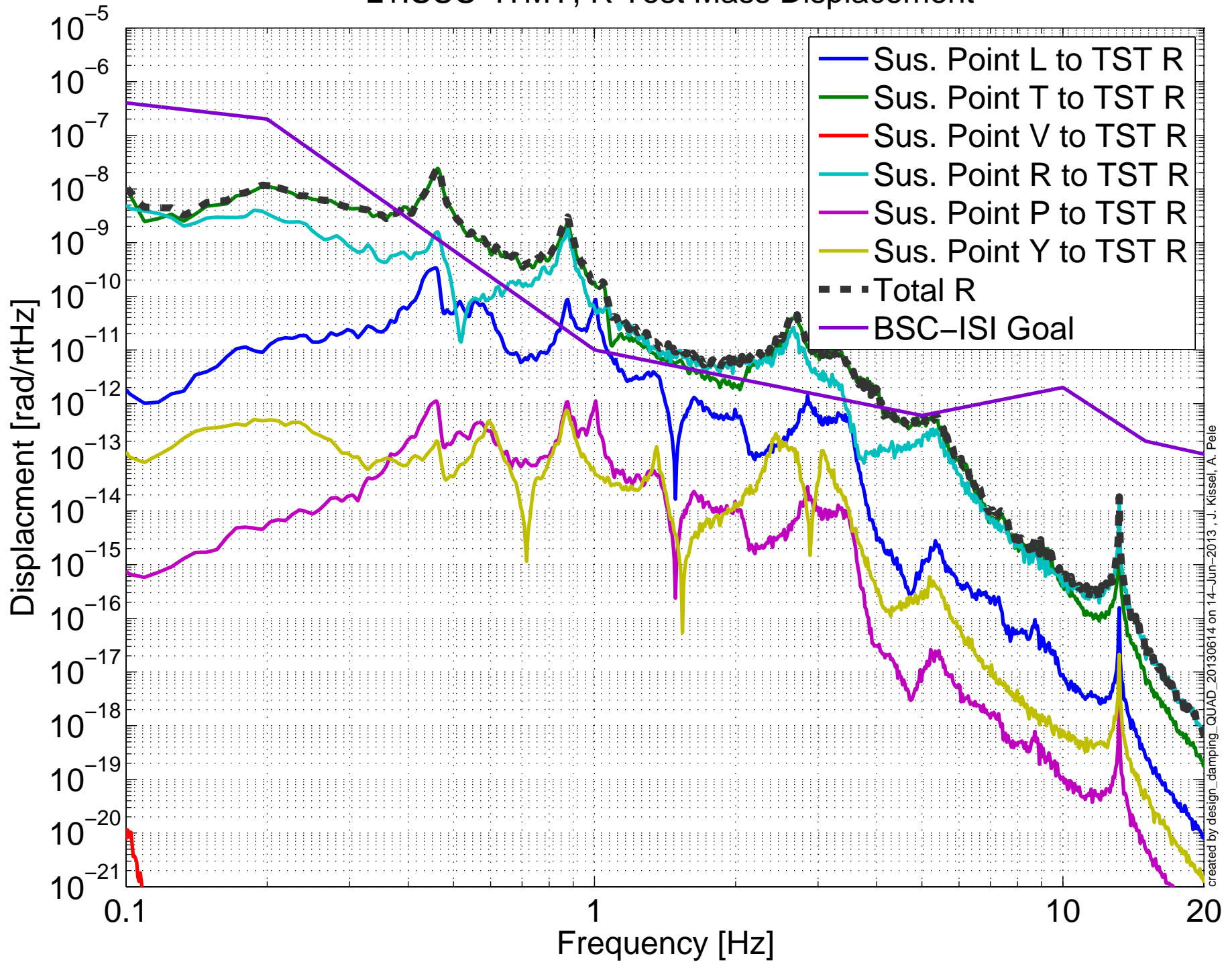
L1:SUS-ITMY R



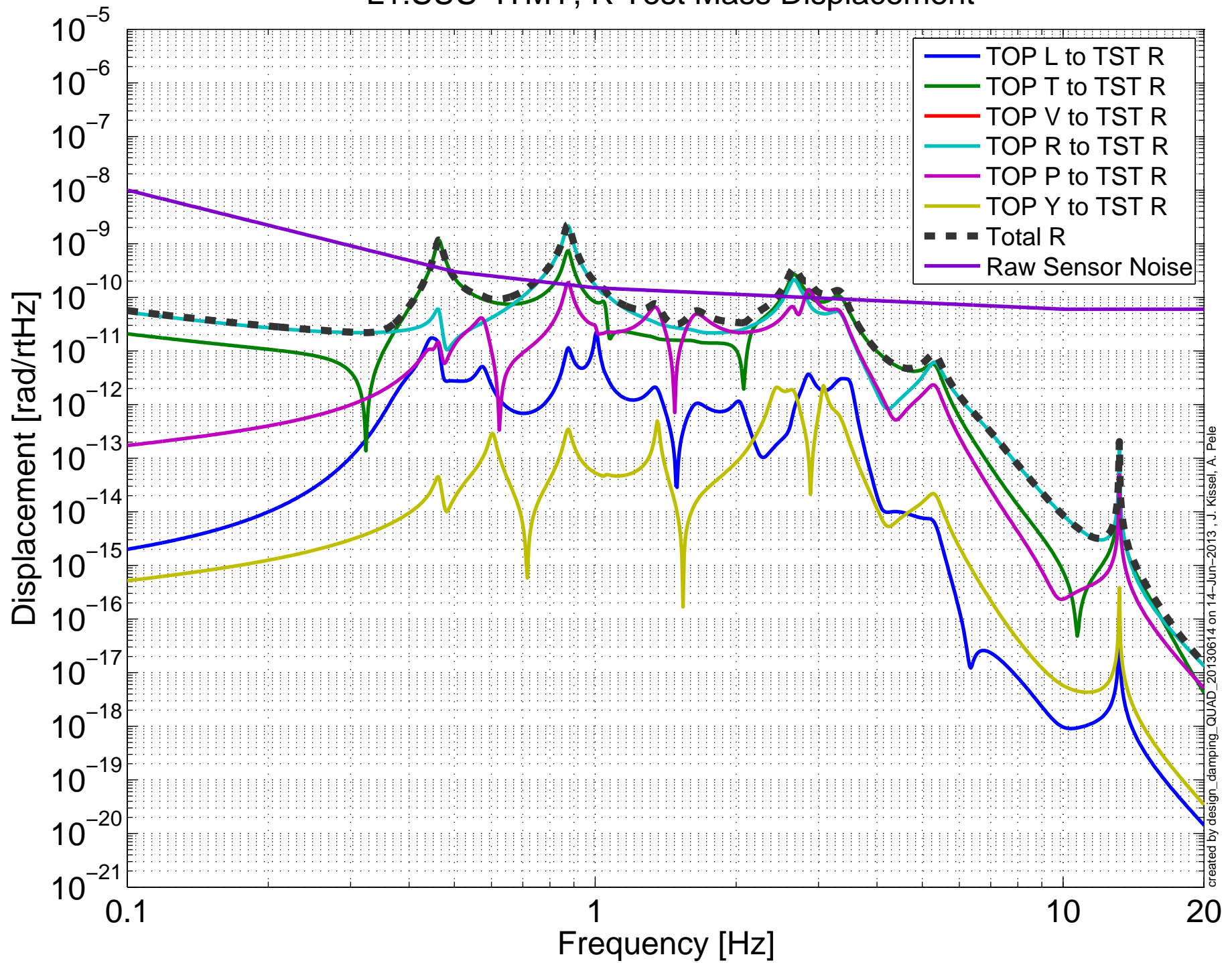
MIMO LUGF Phase Margins (red): [86.3 142 178] [deg]
MIMO UUGF Phase Margins (blue): [109 95.3 37] [deg]



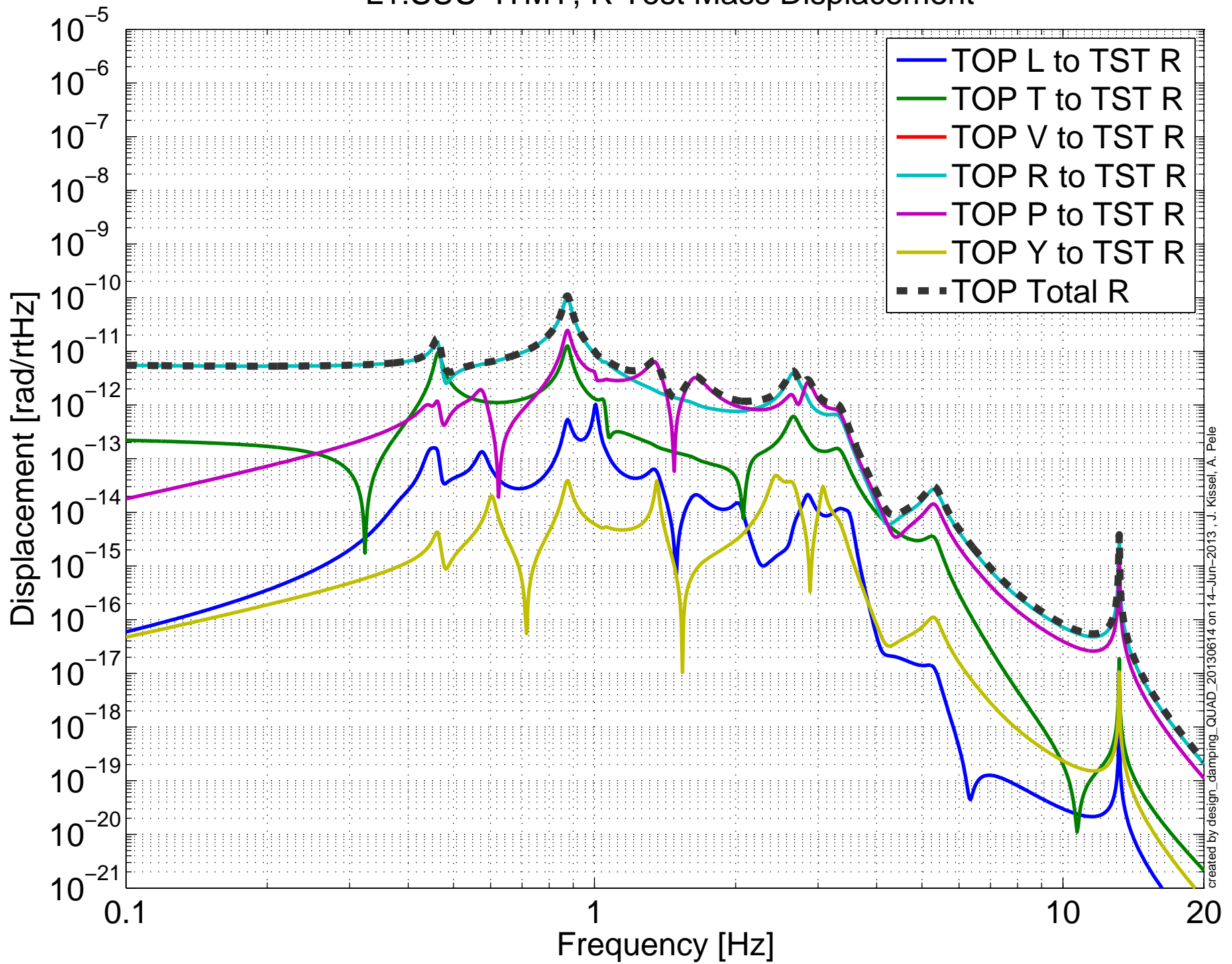
Projected Sus. Point > Test Mass Seismic Noise Budget L1:SUS-ITMY, R Test Mass Displacement



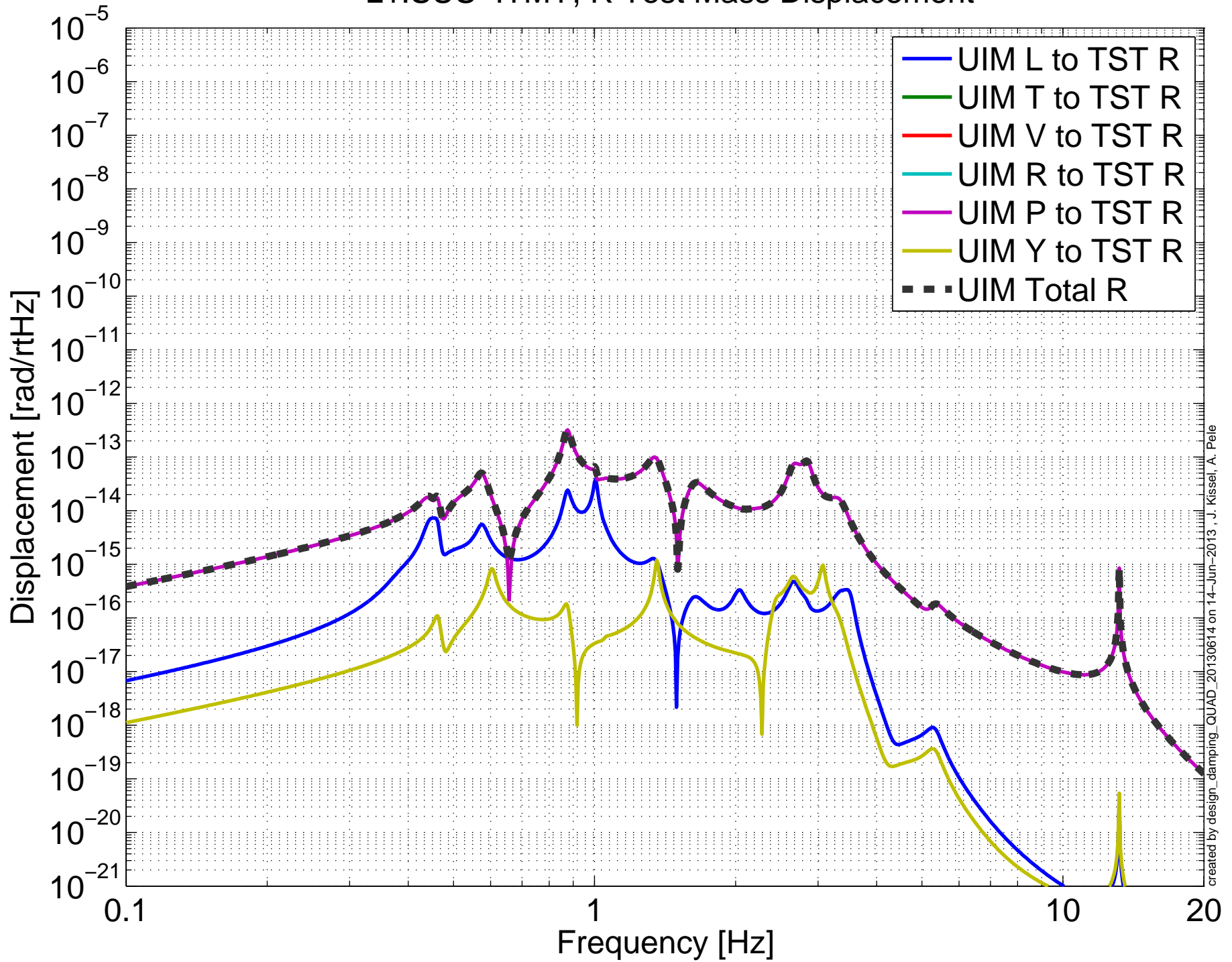
Projected Top Mass Sensor > Test Mass Noise Budget L1:SUS-ITMY, R Test Mass Displacement



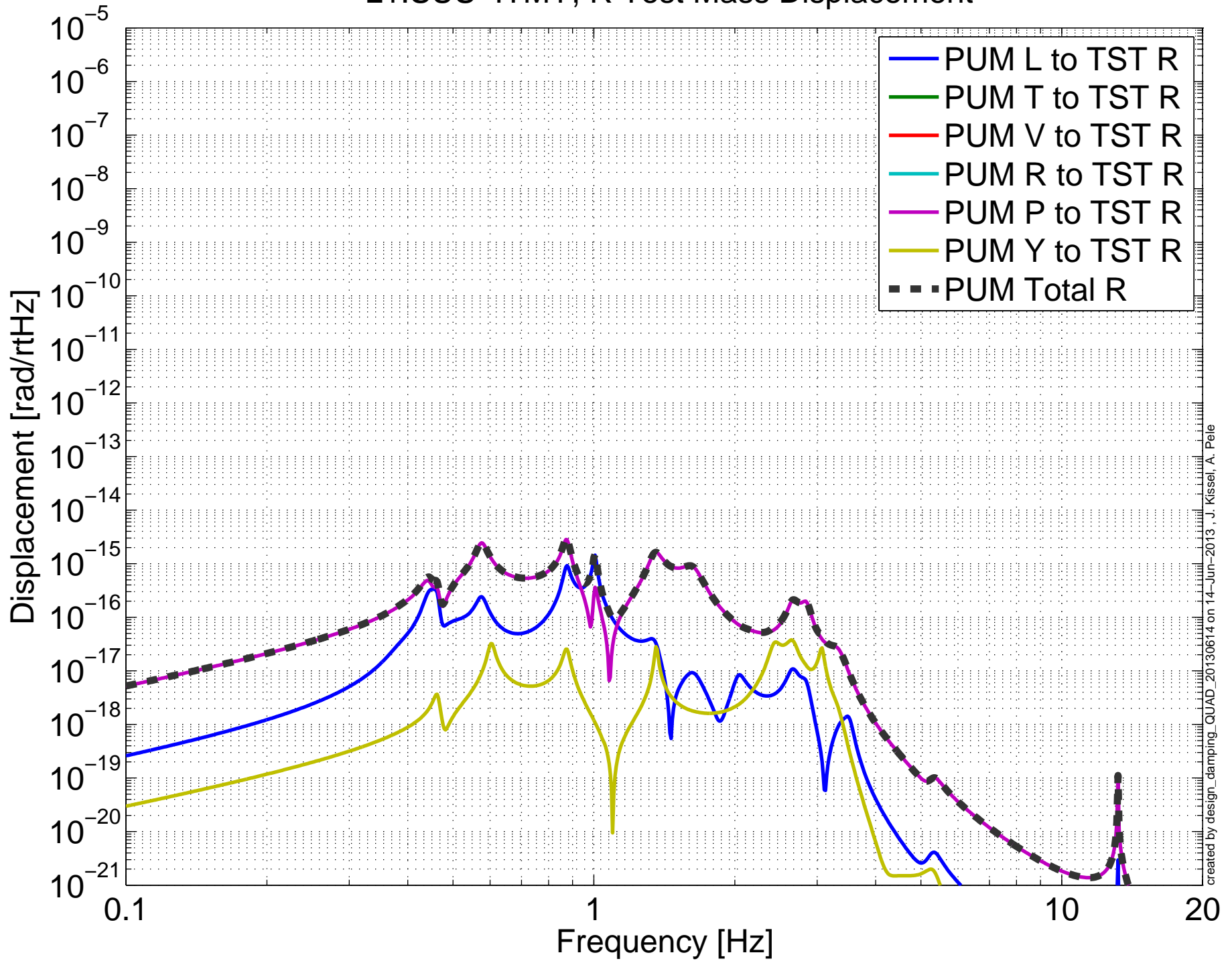
Projected Top Mass Actuator > Test Mass Noise Budget L1:SUS-ITMY, R Test Mass Displacement



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

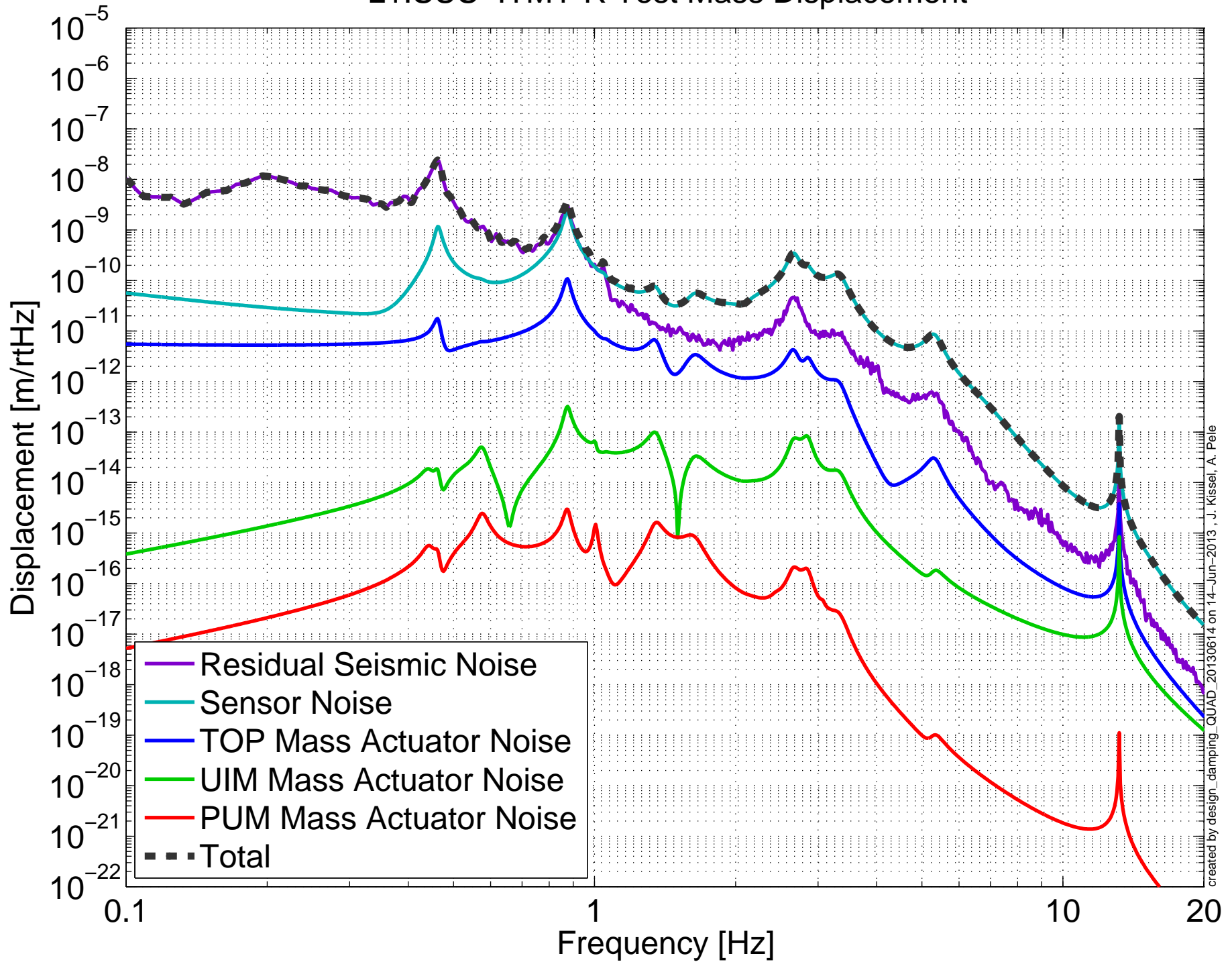


Projected PUM Mass Actuator > Test Mass Noise Budget L1:SUS-ITMY, R Test Mass Displacement



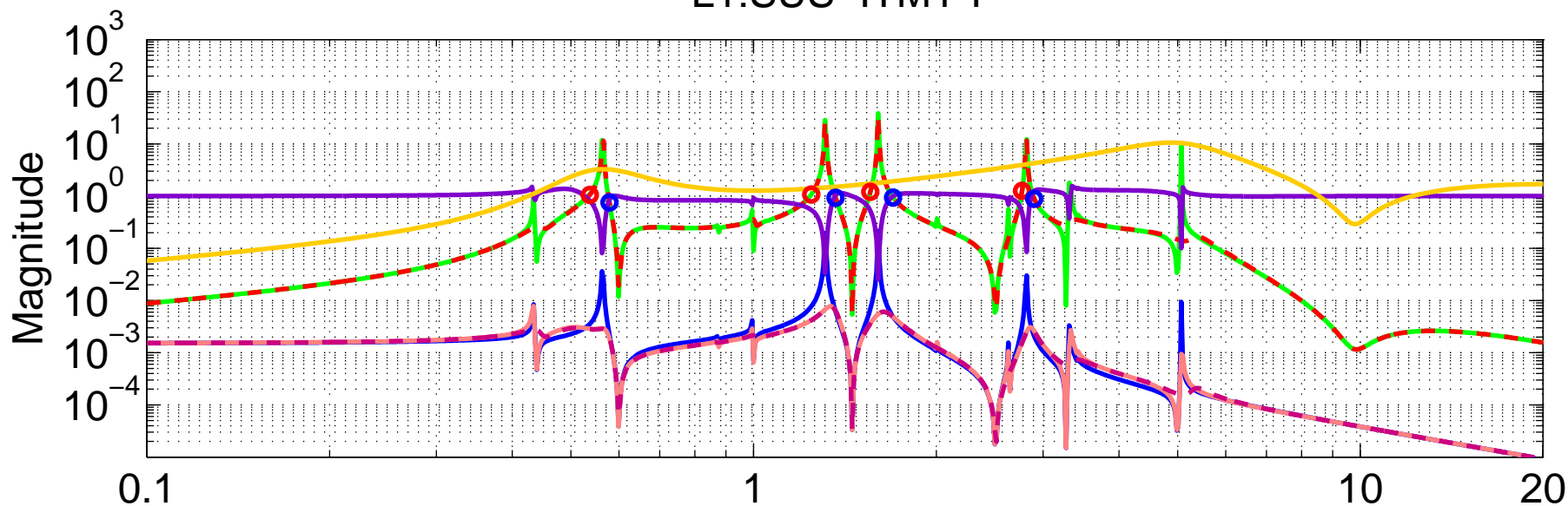
Damping Loop Performance

L1:SUS-ITMY R Test Mass Displacement

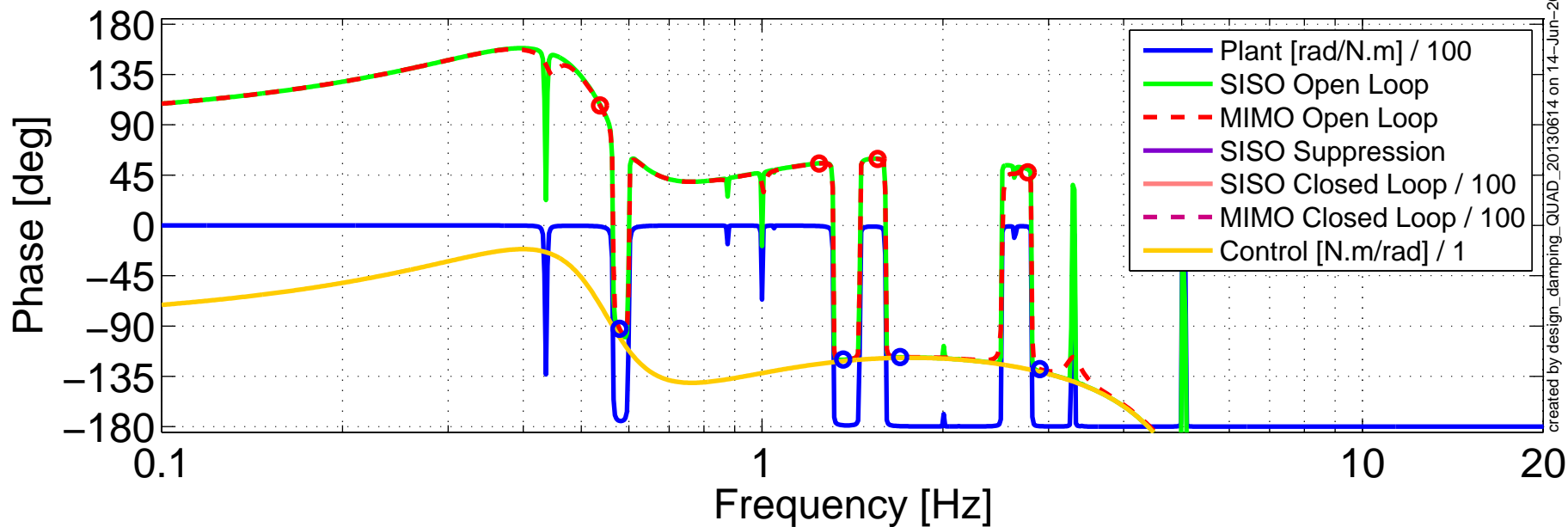


Damping Loop Design

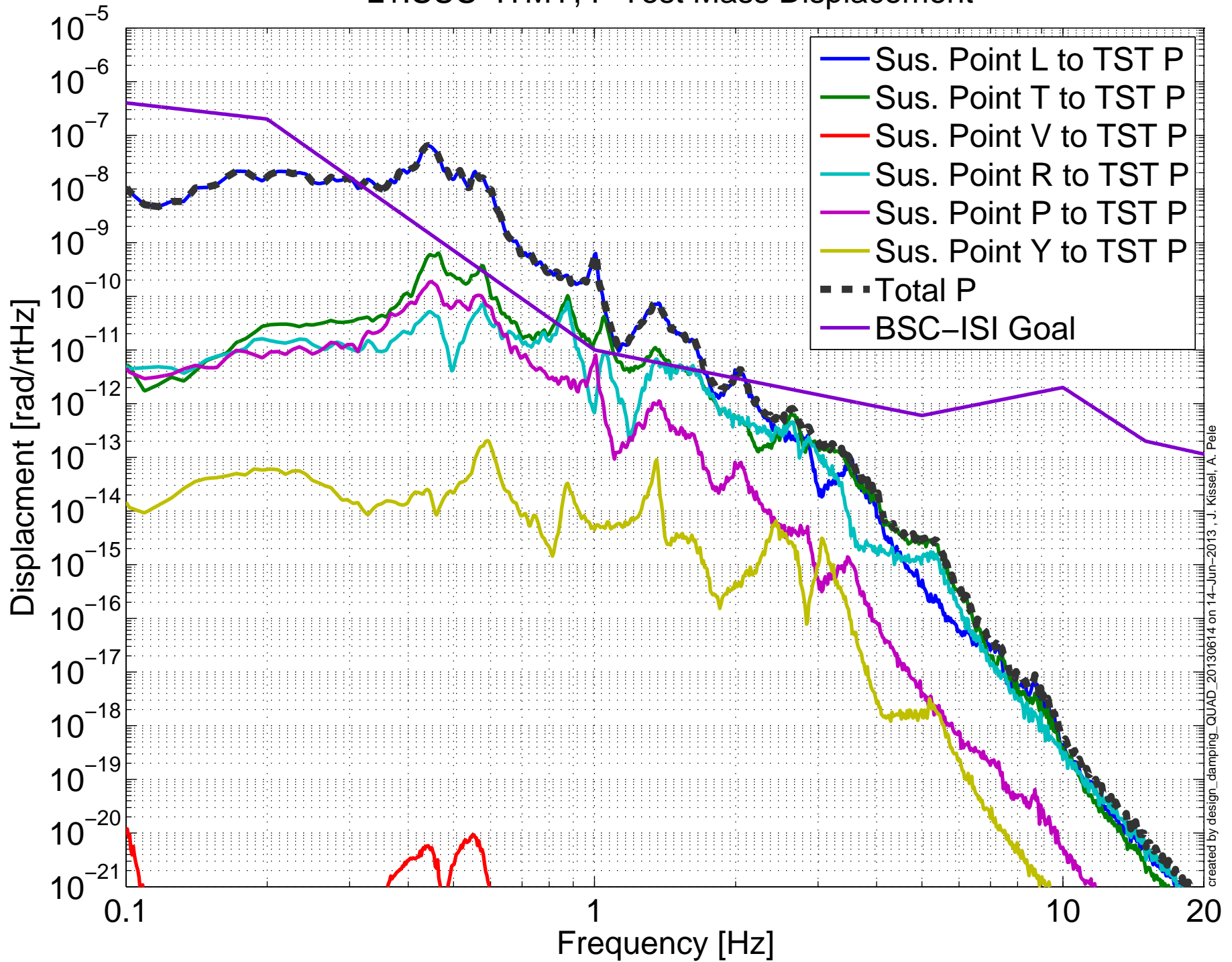
L1:SUS-ITMY P



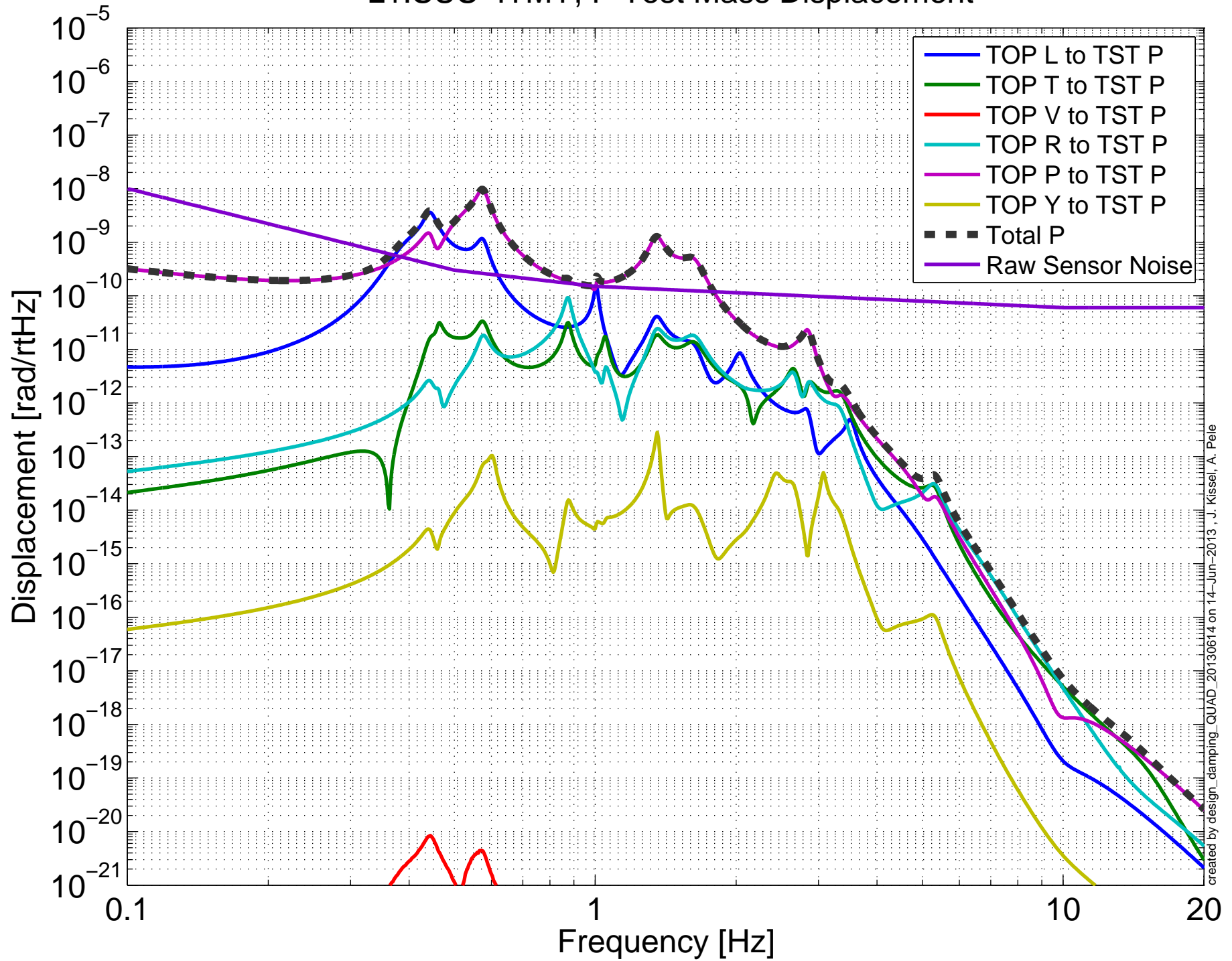
MIMO LUGF Phase Margins (red): [72.8 125 120 133] [deg]
 MIMO UUGF Phase Margins (blue): [87.5 60 62.3 51.4] [deg]



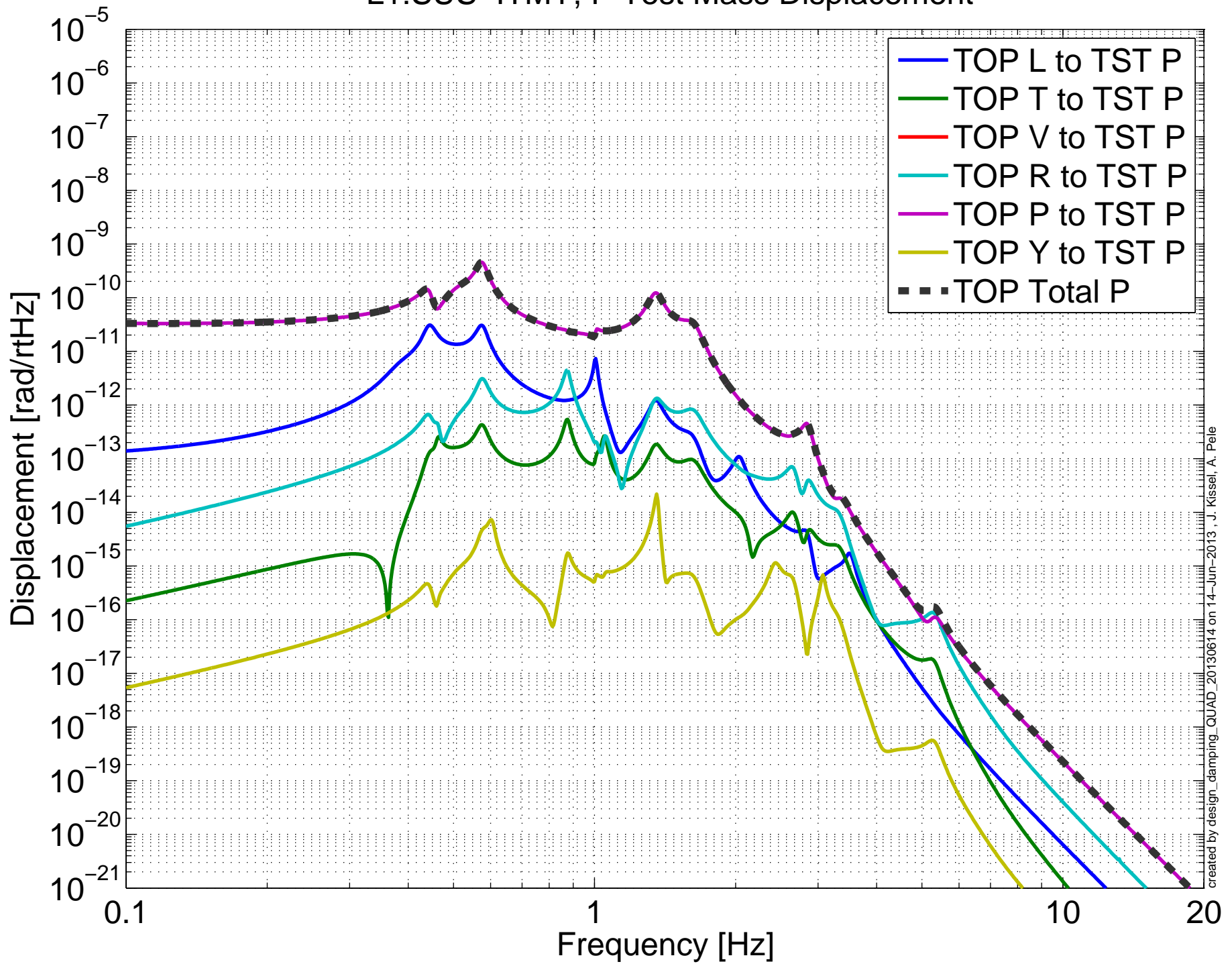
Projected Sus. Point > Test Mass Seismic Noise Budget L1:SUS-ITMY, P Test Mass Displacement



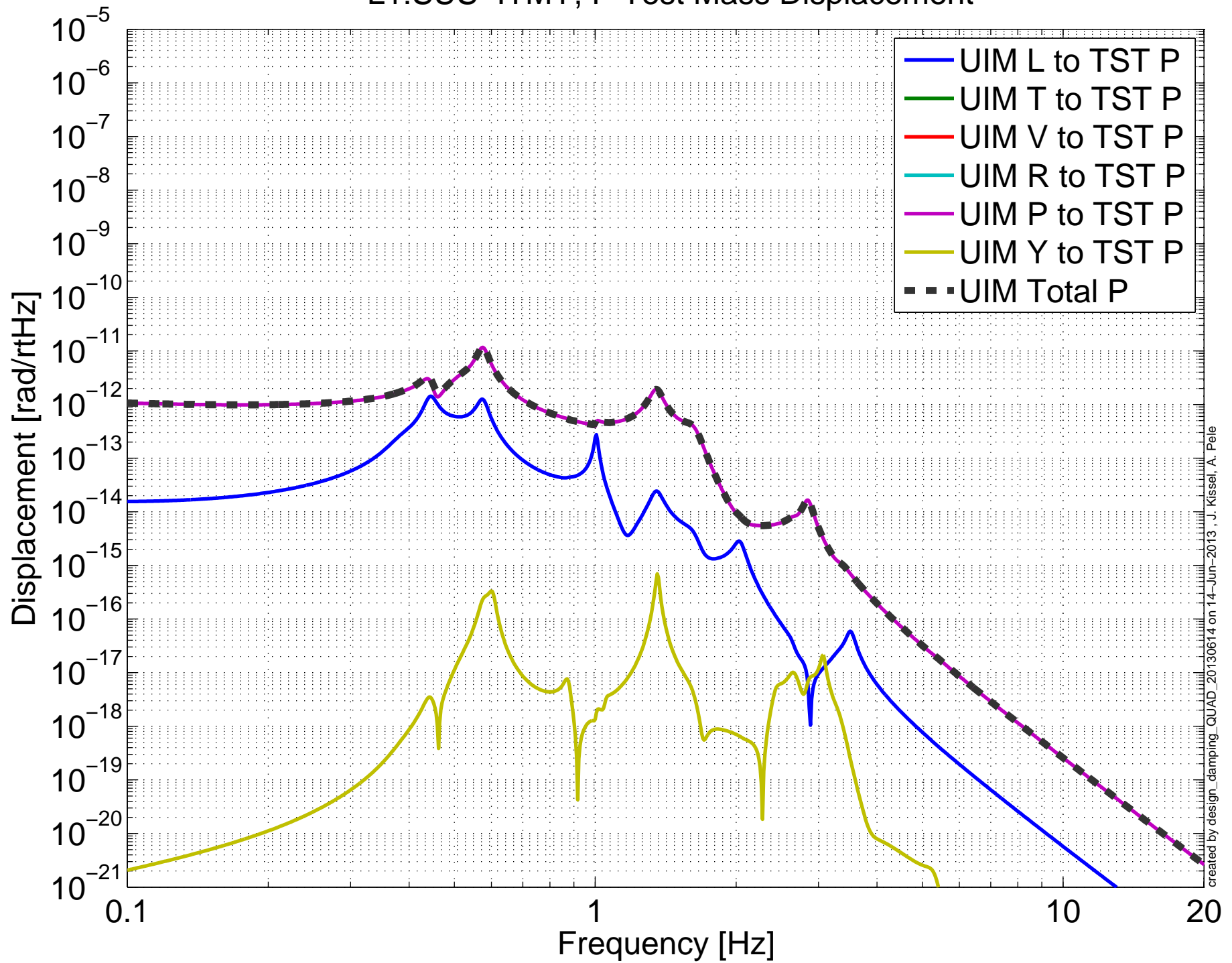
Projected Top Mass Sensor > Test Mass Noise Budget L1:SUS-ITMY, P Test Mass Displacement



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

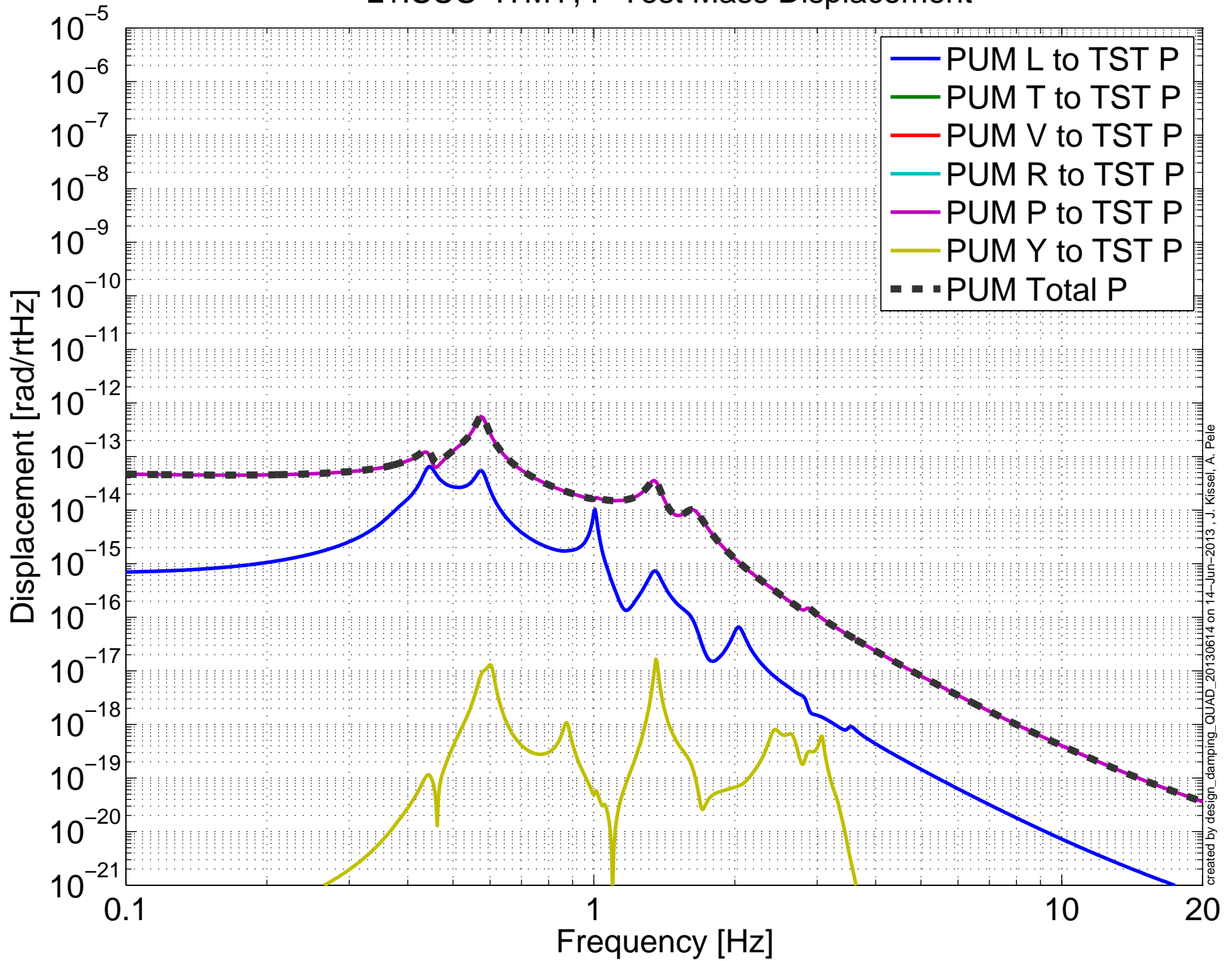


Projected UIM Mass Actuator > Test Mass Noise Budget L1:SUS-ITMY, P Test Mass Displacement



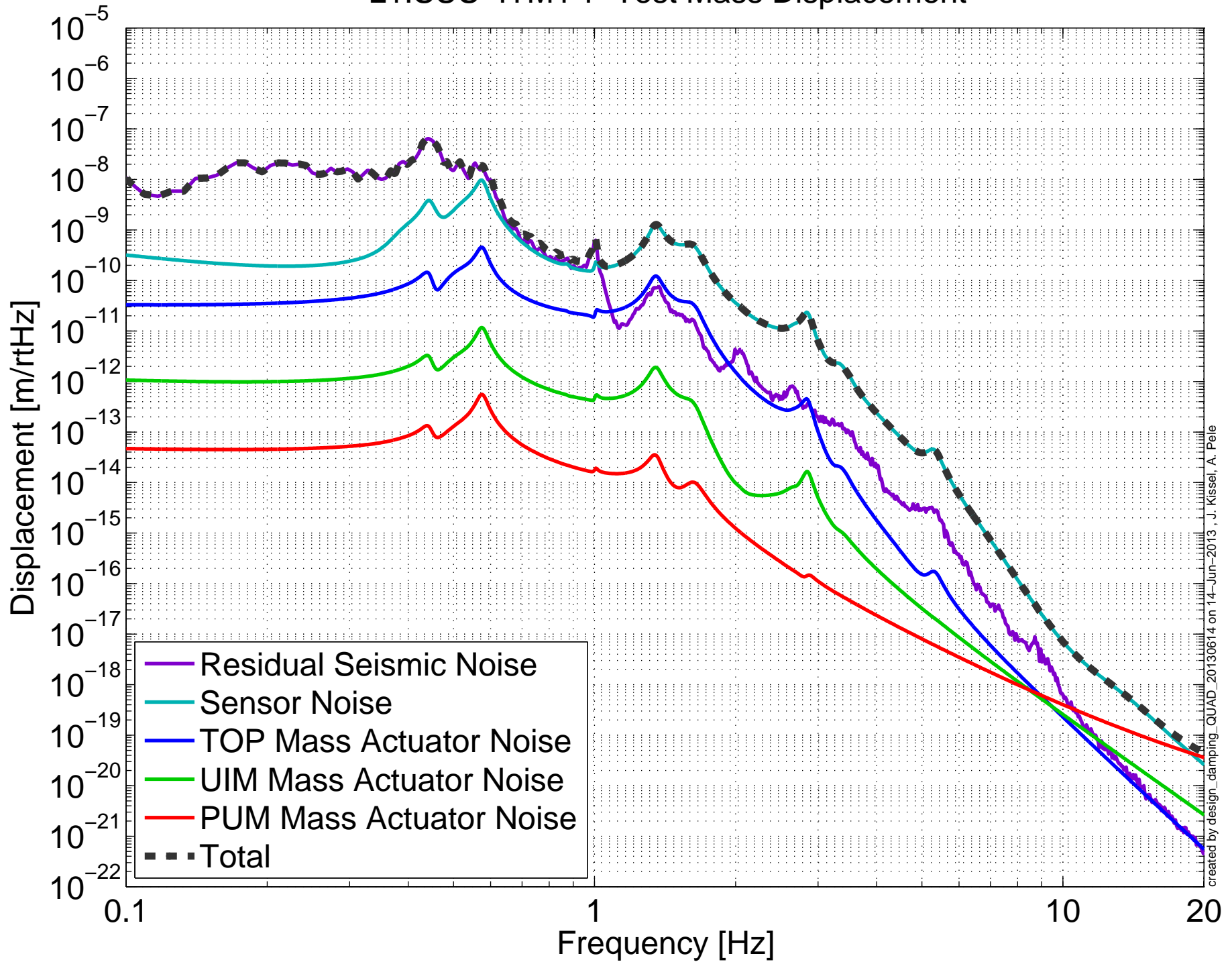
created by design_damping_QUAD_20130614 on 14-Jun-2013, J. Kissel, A. Pele

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

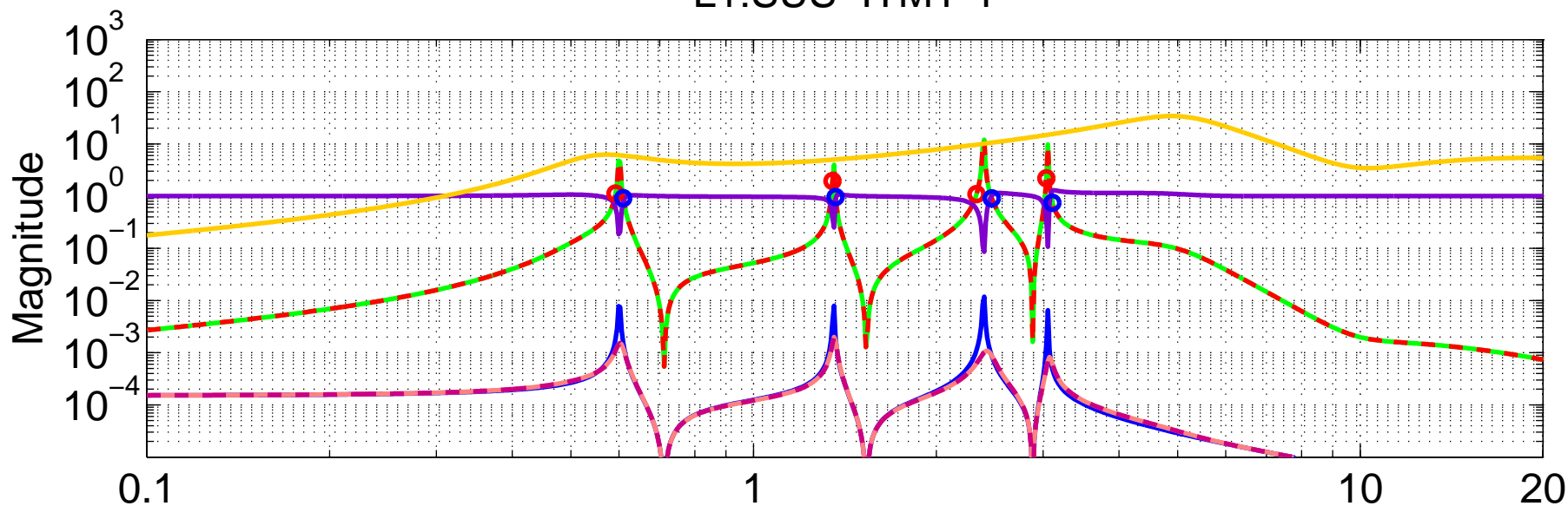


Damping Loop Performance

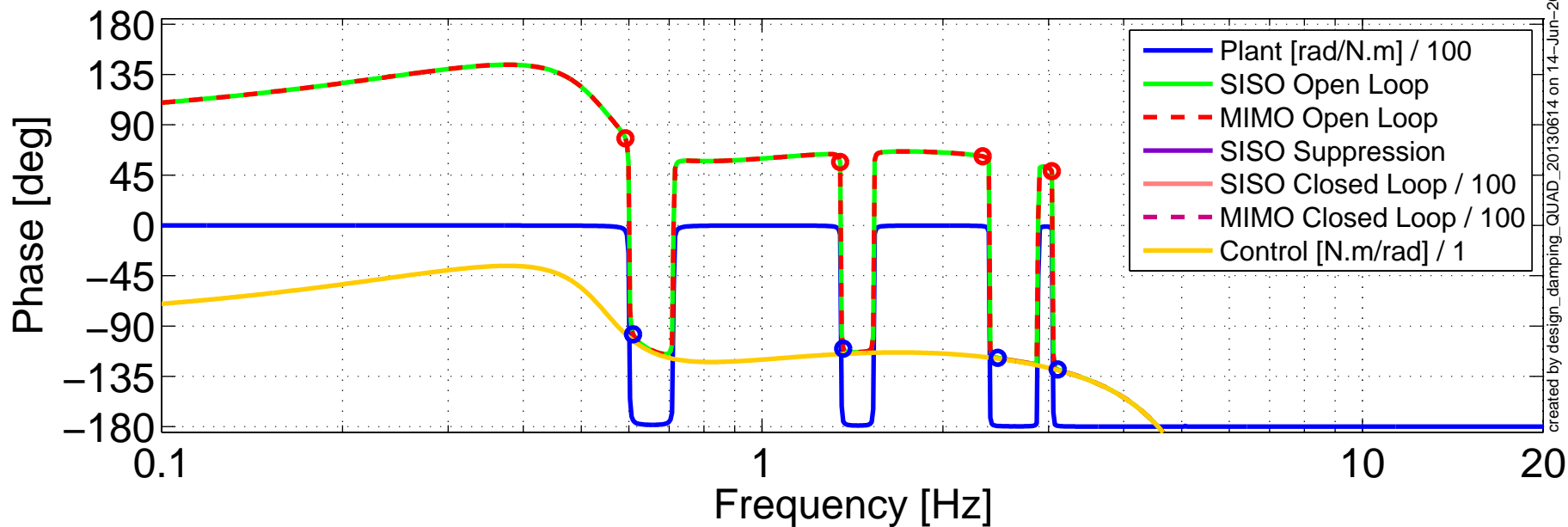
L1:SUS-ITMY P Test Mass Displacement



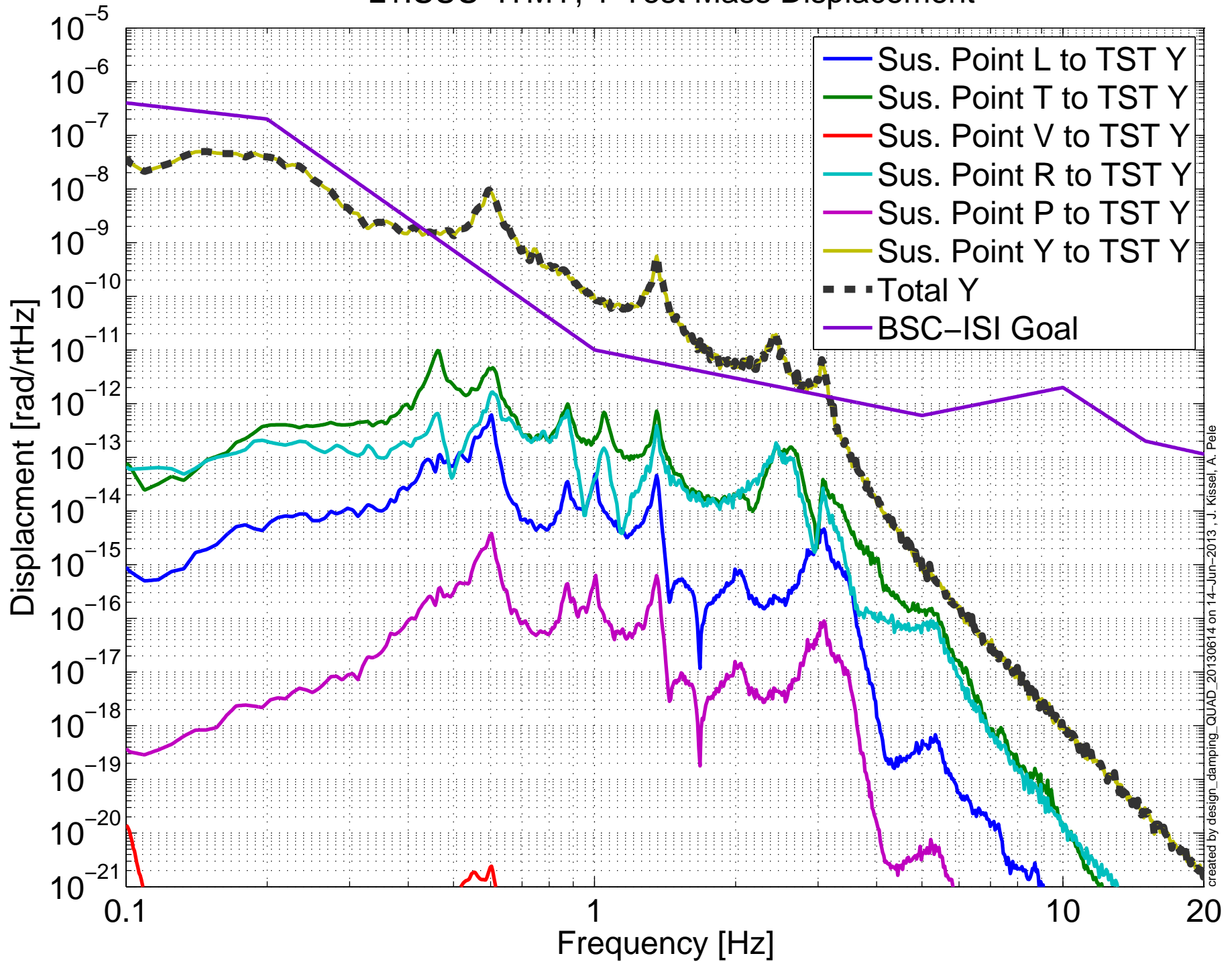
Damping Loop Design L1:SUS-ITMY Y



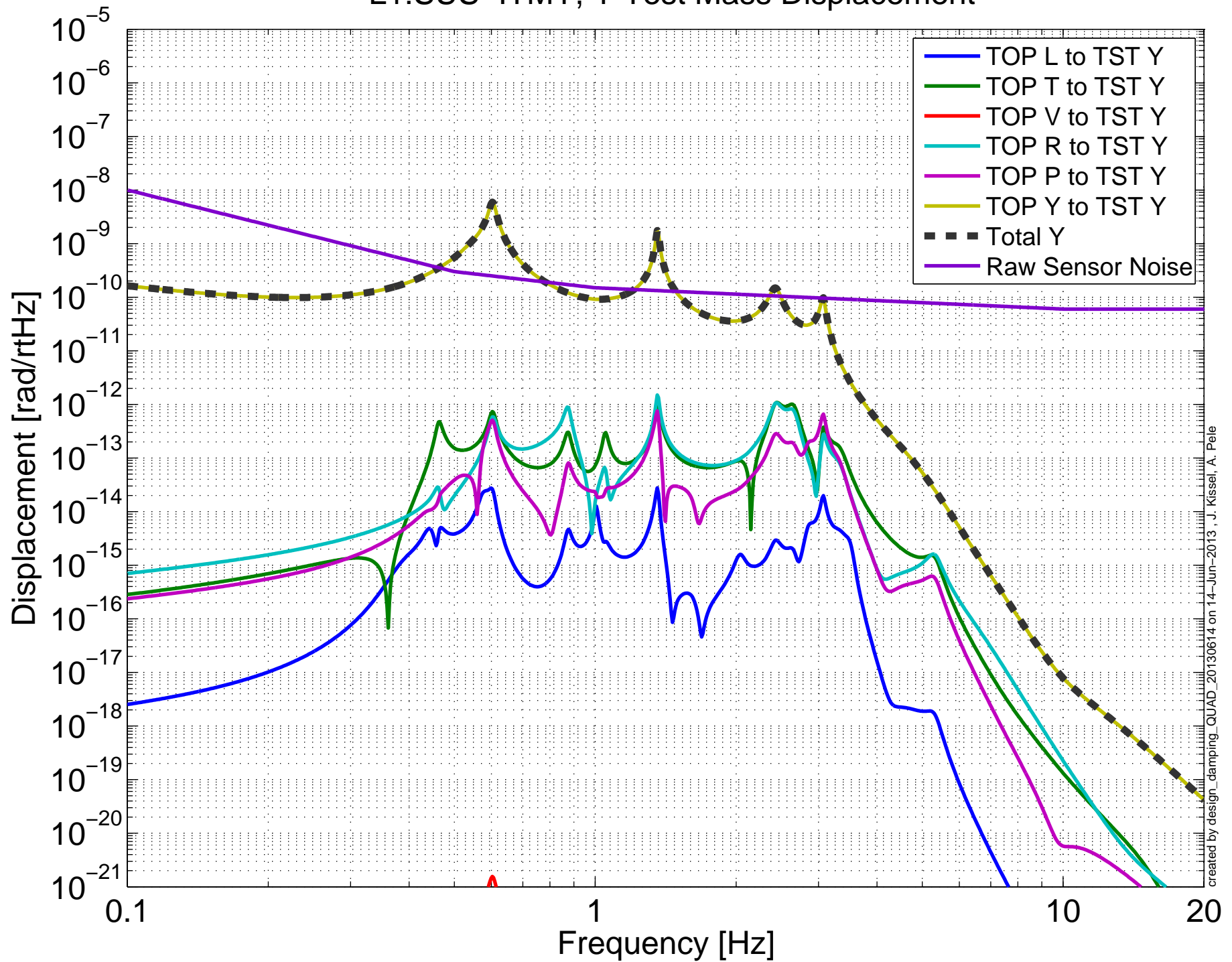
MIMO LUGF Phase Margins (red): [102 123 118 132] [deg]
 MIMO UUGF Phase Margins (blue): [82.6 69.7 61.5 51.2] [deg]



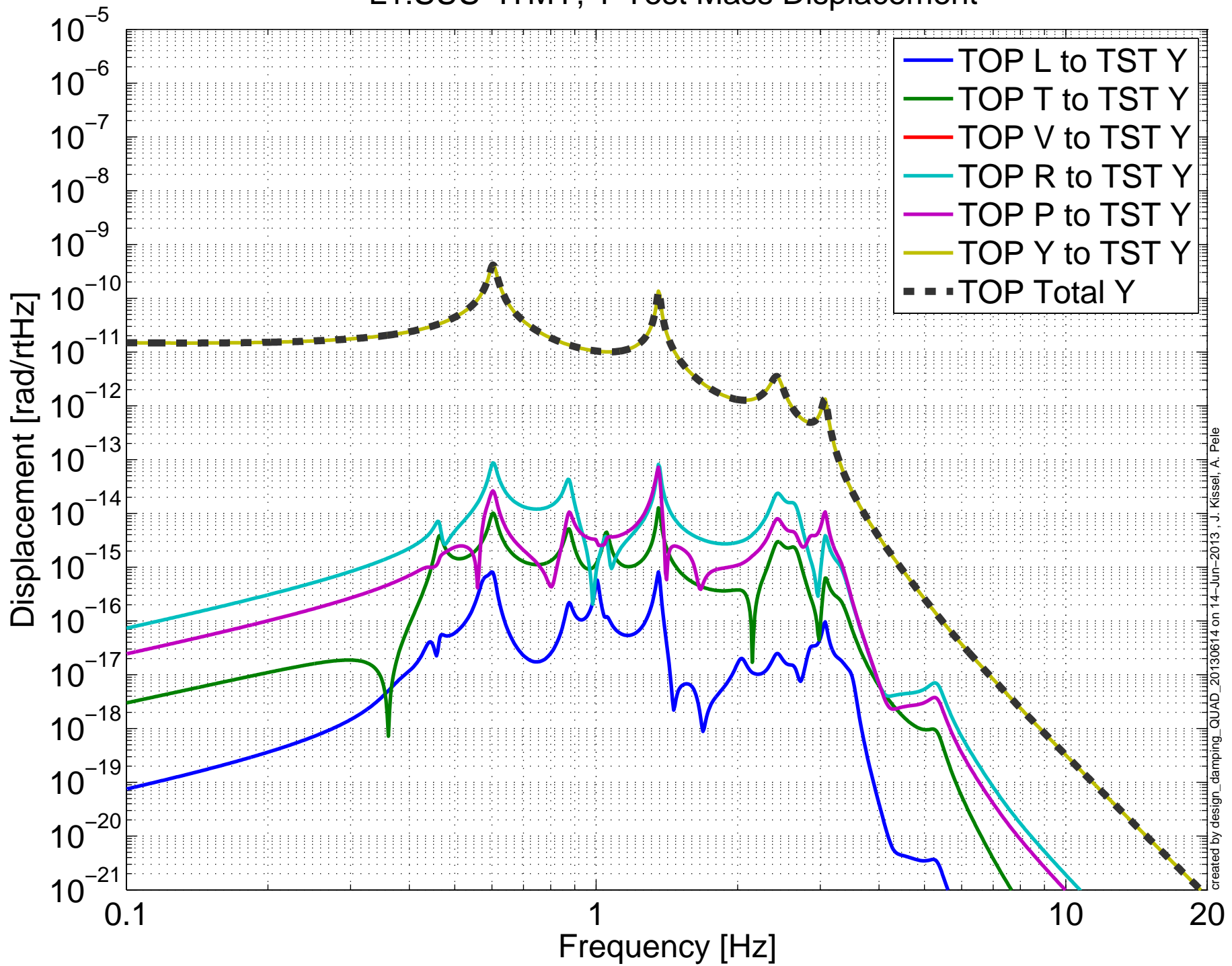
Projected Sus. Point > Test Mass Seismic Noise Budget L1:SUS-ITMY, Y Test Mass Displacement



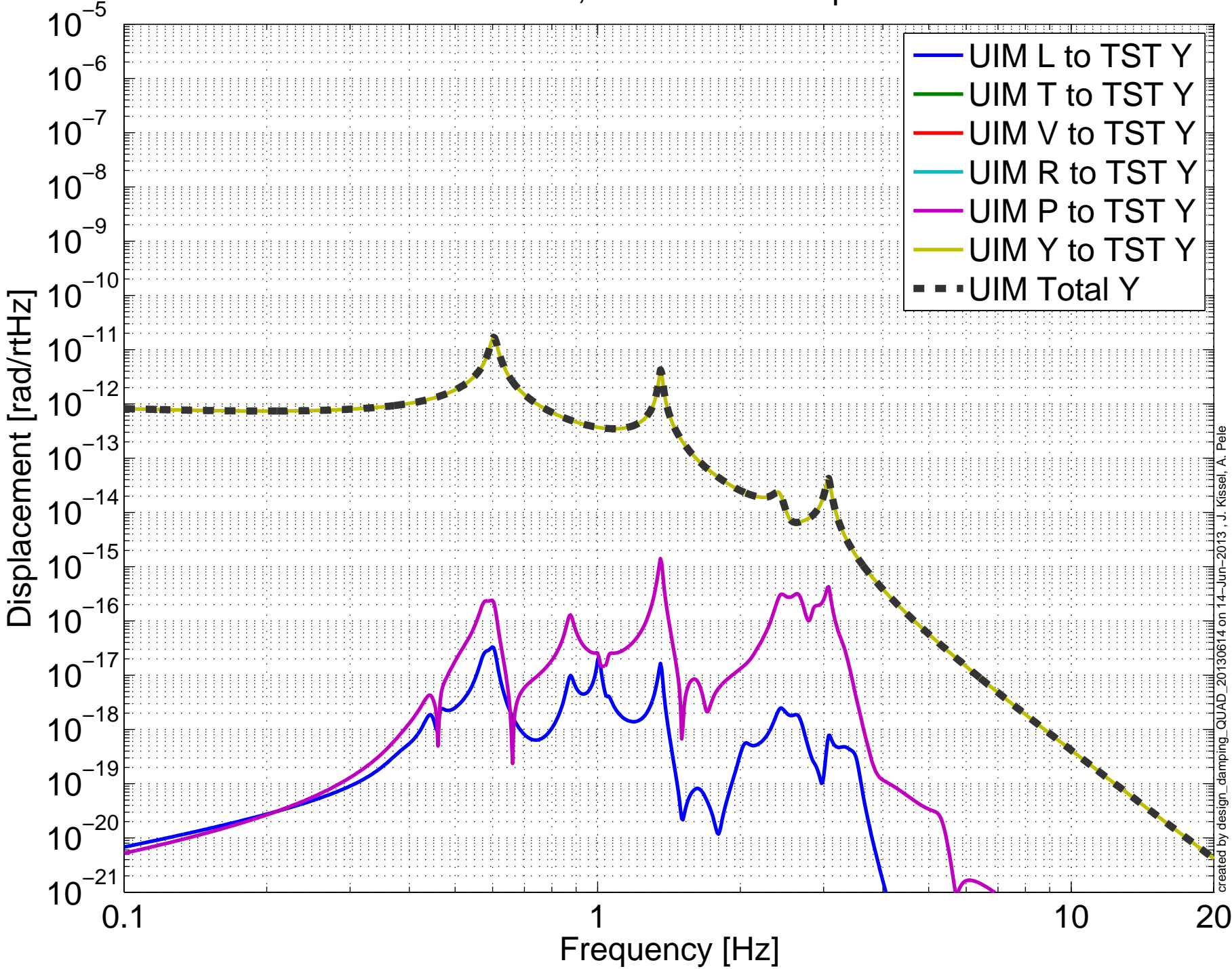
Projected Top Mass Sensor > Test Mass Noise Budget L1:SUS-ITMY, Y Test Mass Displacement



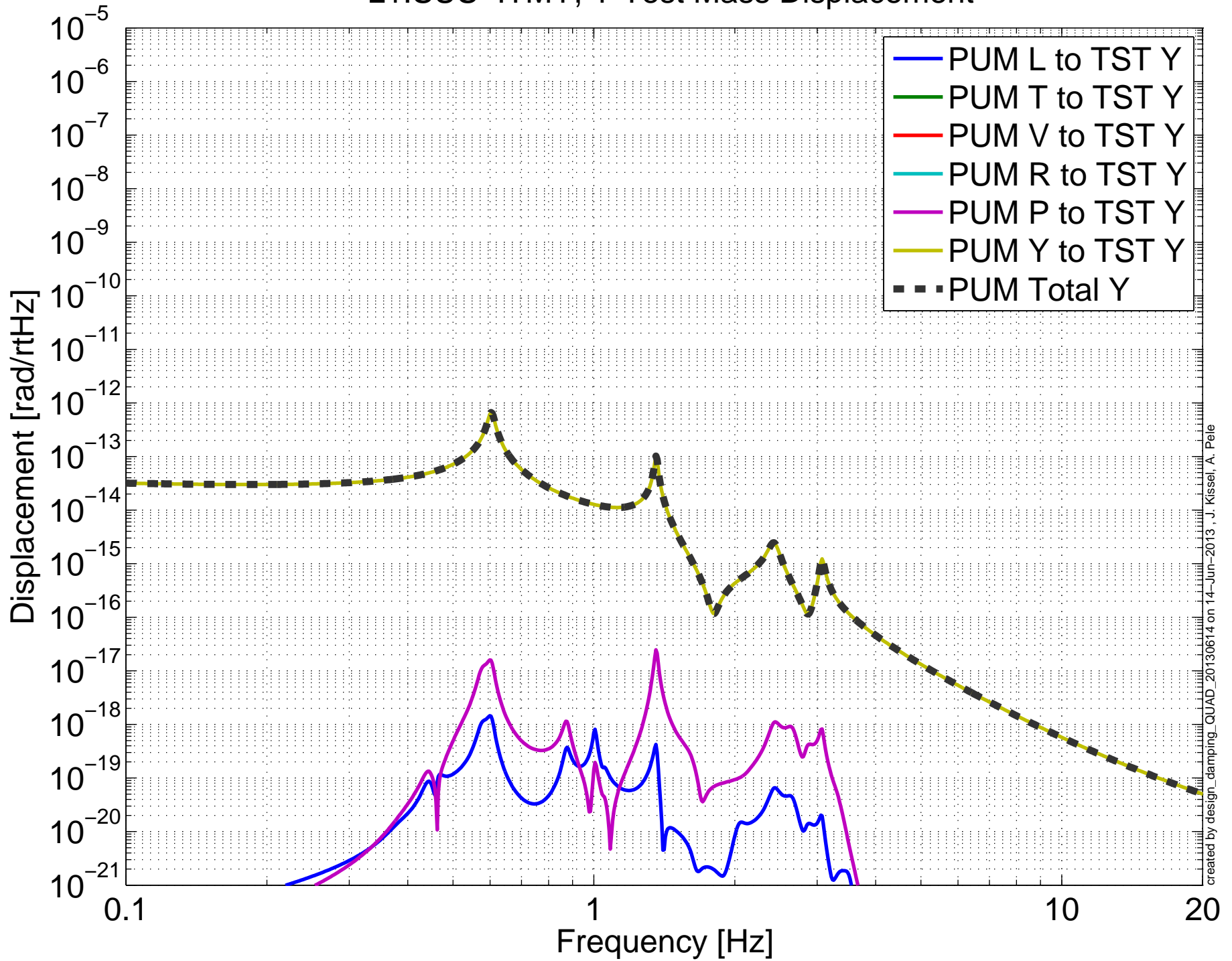
Projected Top Mass Actuator > Test Mass Noise Budget L1:SUS-ITMY, Y Test Mass Displacement



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



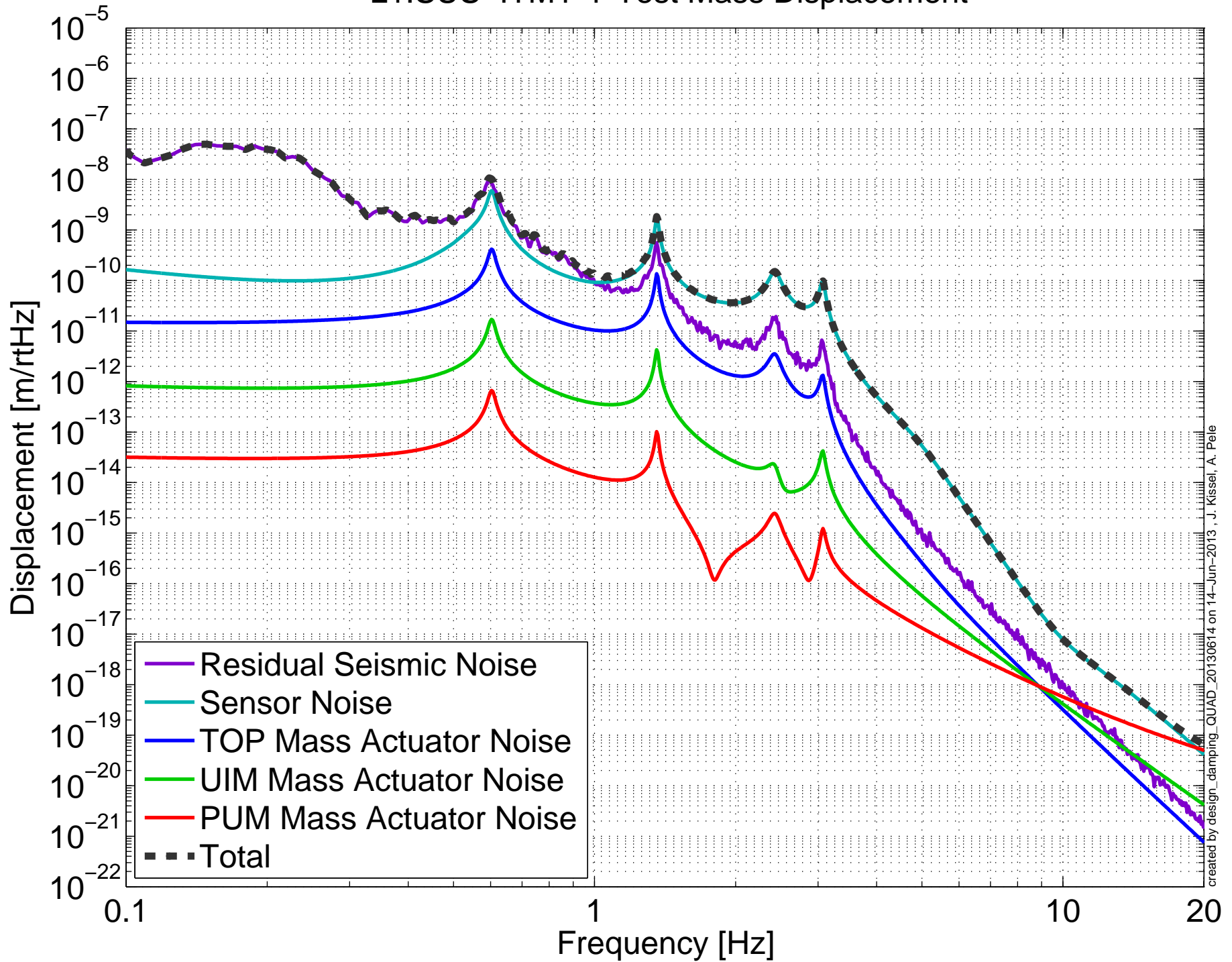
Projected PUM Mass Actuator > Test Mass Noise Budget L1:SUS-ITMY, Y Test Mass Displacement



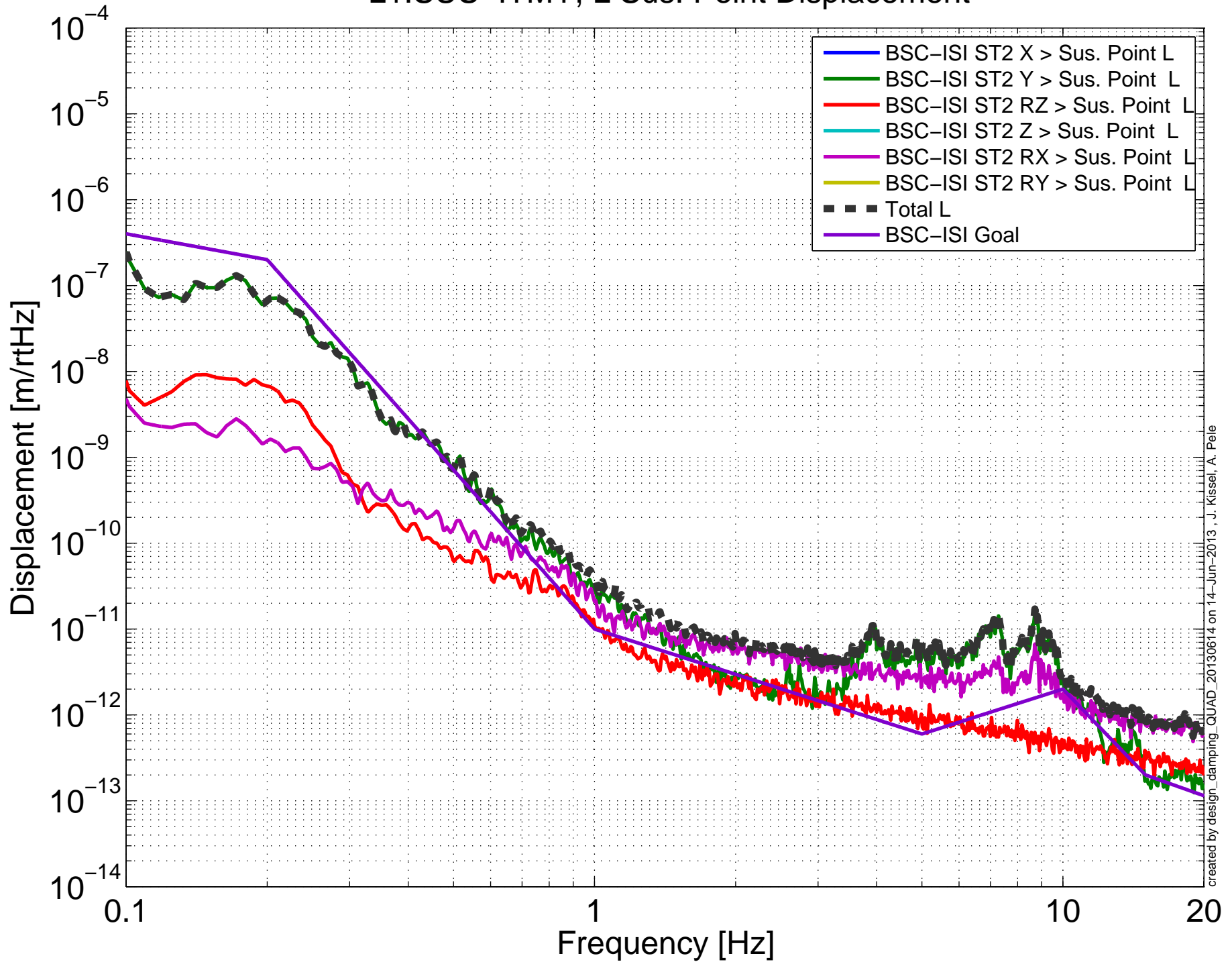
created by design_damping_QUAD_20130614 on 14-Jun-2013, J. Kissel, A. Pele

Damping Loop Performance

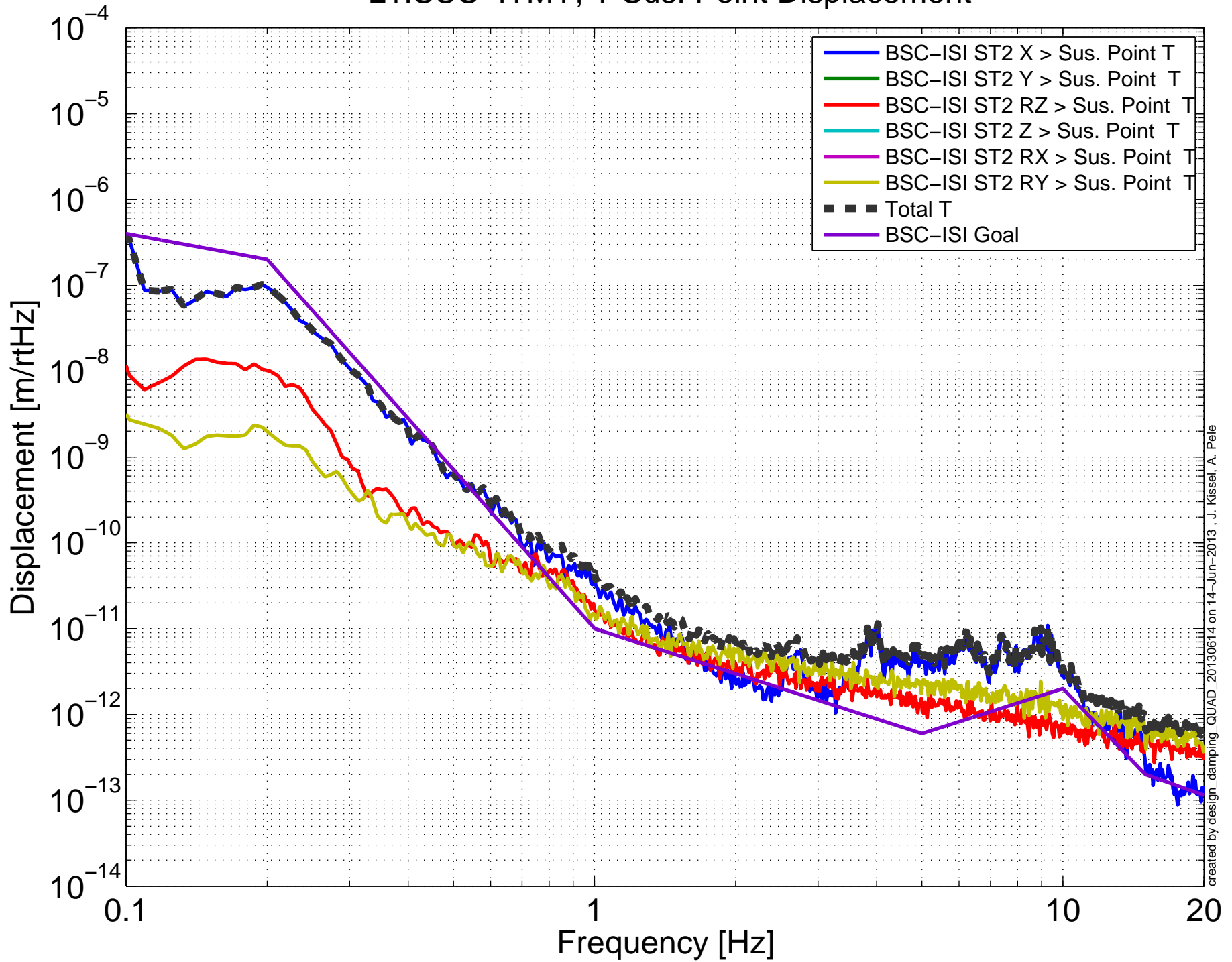
L1:SUS-ITMY Y Test Mass Displacement



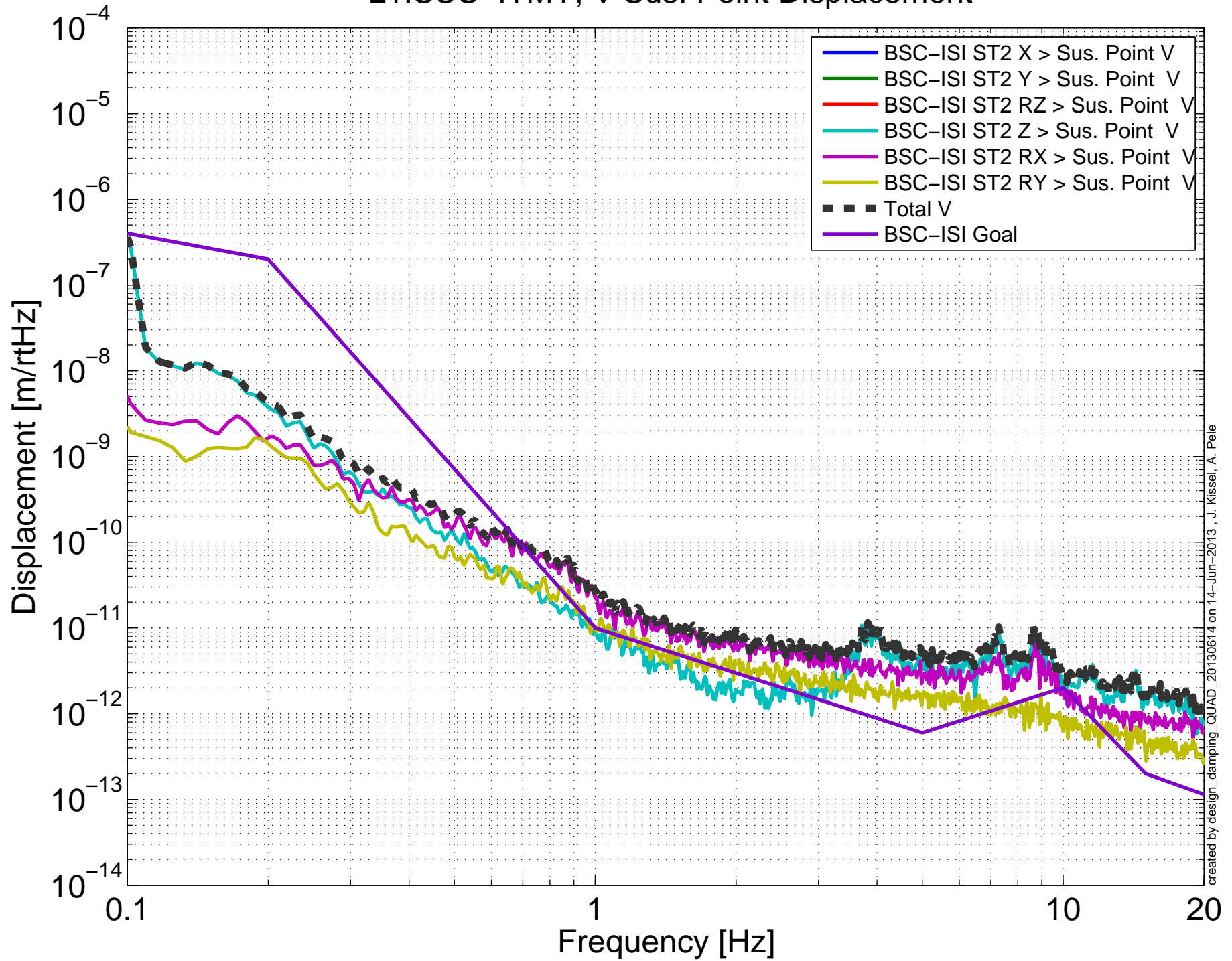
Projected ISI Seismic Noise Budget L1:SUS-ITMY, L Sus. Point Displacement



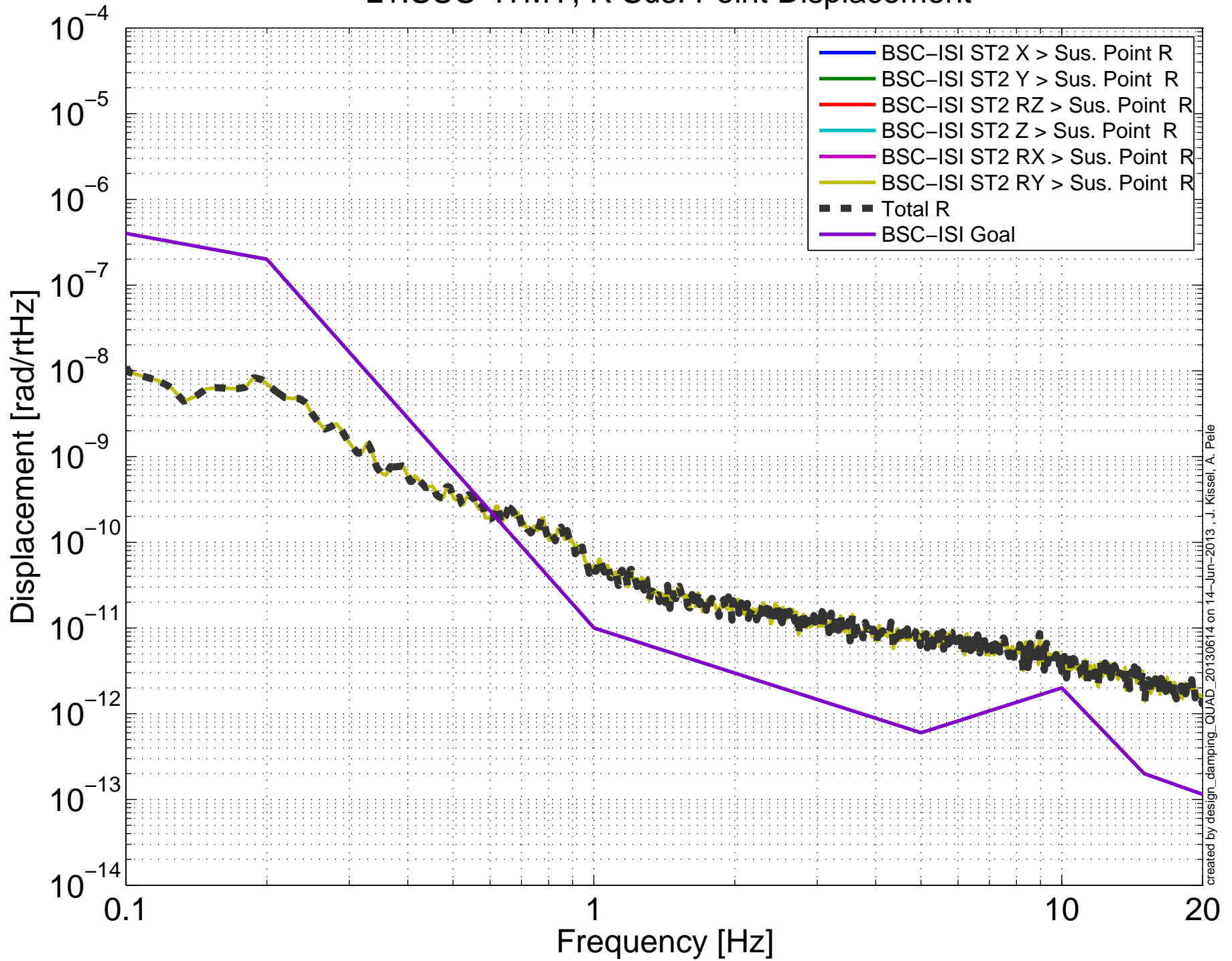
Projected ISI Seismic Noise Budget L1:SUS-ITMY, T Sus. Point Displacement



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

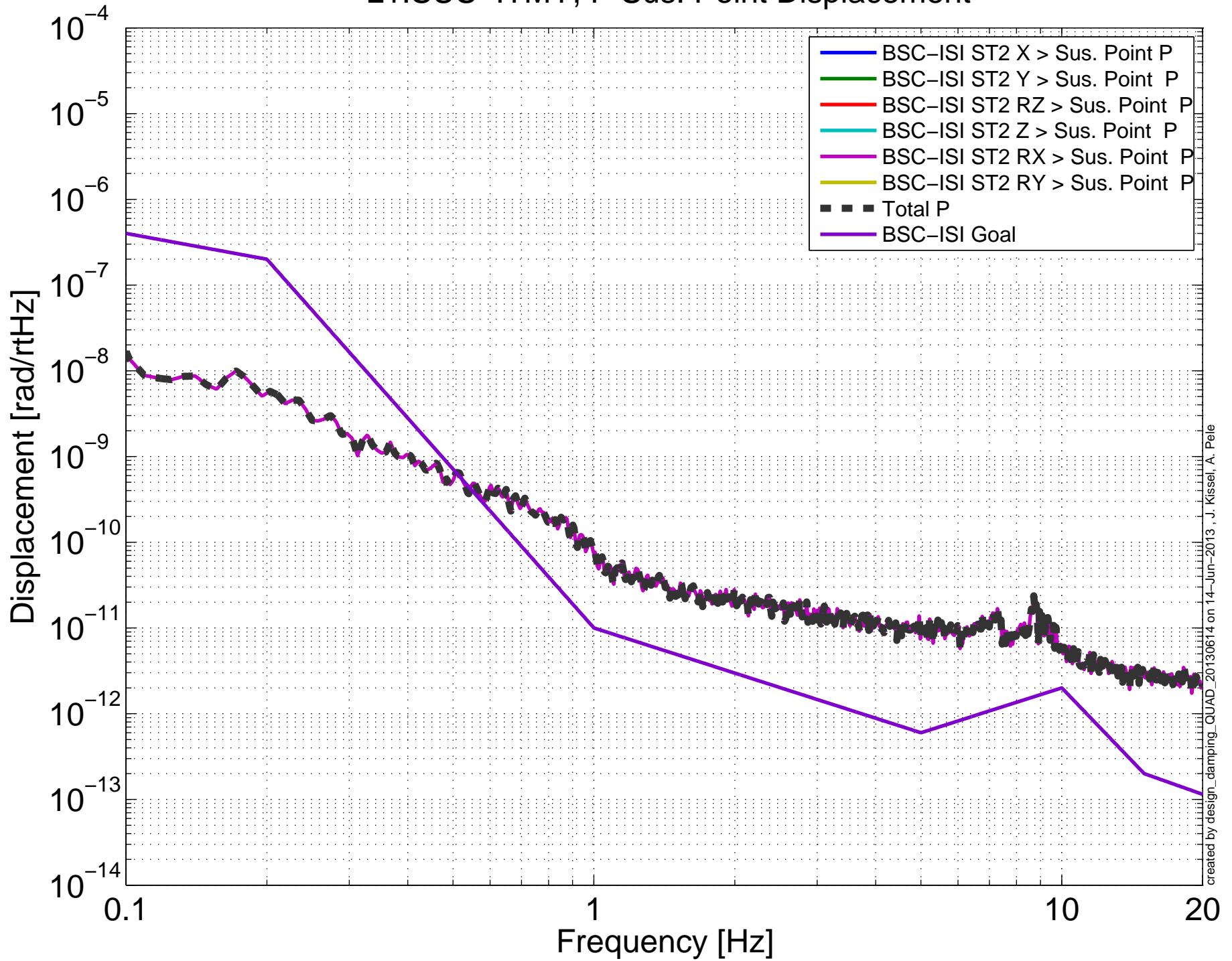


Projected ISI Seismic Noise Budget L1:SUS-ITMY, R Sus. Point Displacement



created by design_damping_QUAD_20130614 on 14-Jun-2013, J. Kissel, A. Pele

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



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

