Modeling the Isolation System Vibration

The effect of the isolation system vibration can be described using a basic model [1], illustrated in the figure below. It shows a direct drive system on a base with limited mass and stiffness. The following parameters are used:

ML represents the total mass of the load
MB represents the mass of the isolated stationary base
F represents the applied force
XL represents the displacement of the load relative to ground
XB represents the displacement of the base relative to ground
K represents the stiffness of the isolation system
d represents the damping isolation system

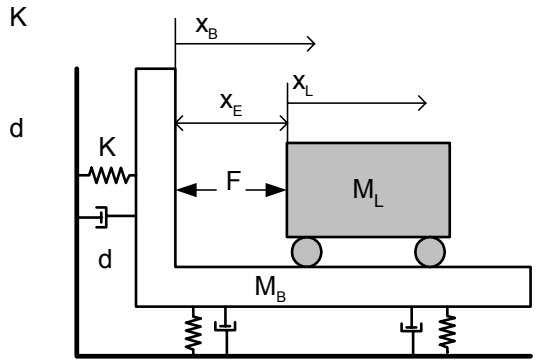

Figure: Simplified model of the isolation system effect

The feedback reading is relative to the base:

$$X_{encoder} = X_L - X_B$$

The Force is applied both on the load at the stationary base.
The transfer function describing the relation between the applied force and the feedback reading is:

$$\frac{X_{encoder}}{F} = \frac{1}{M_L s^2} + \frac{1}{M_B s^2 + ds + K} = \frac{1}{M_L s^2}\left(\frac{(M_B + M_L)s^2 + ds + K}{M_B s^2 + ds + K}\right)$$

The part in the parenthesis represents the isolation system dynamics