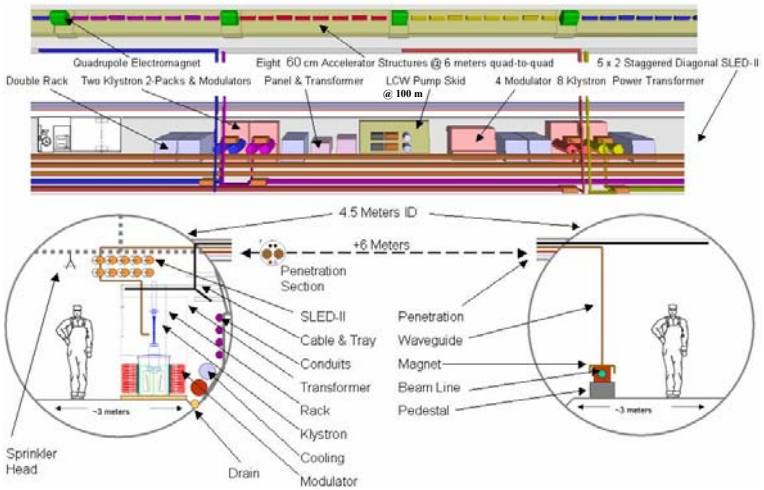
Keeping the Beam Tunnel Quiet

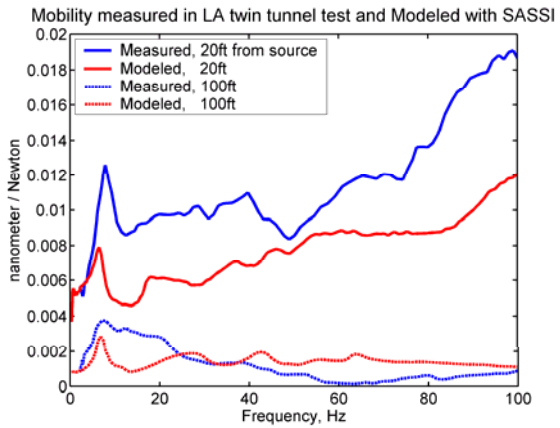
Support to Beam tunnel transmission measured in LA metro twin tunnels and being verified with 3D modeling.

At 60Hz the mobility across tunnels is ~1 nm/100 Newtons permitting moderate vibration in Support tunnel.

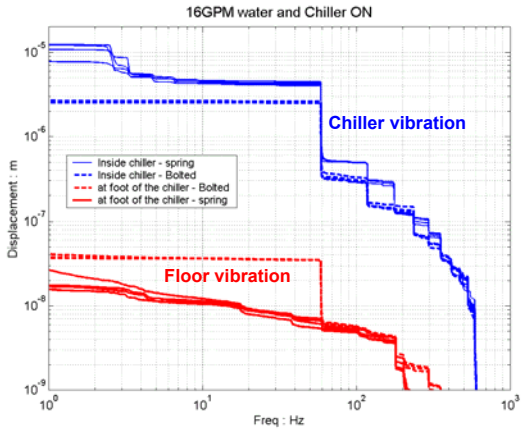
If required, vibration due to equipment can be eliminated with standard inexpensive means, e.g. 3Hz springs.



Los Angeles metro twin tunnels were chosen for vibration transmissibility tests, because their size, separation and geology are very similar to CA-NLC configuration



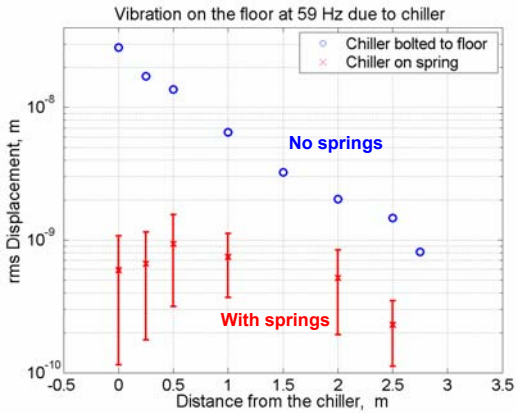
Mobility (response / driving force) measured in LA metro twin tunnel test and modeled with 3D code SASSI.



The chiller (~700 lb) shown above vibrates by 2-3micron at 59Hz. If mounted rigidly, it transmits ~30nm to the floor near the support. Same chiller mounted on soft spring transmits considerably less vibration to the floor (<nm).

Such chiller mounted on soft springs (~ 3Hz) in the NLC Support tunnel would produce <0.002nm of vibration in the NLC Beam tunnel.

All major rotating equipment in NLC is provided with soft springs to reduce vibration transmission to beam tunnel.



Vibration on the floor vs distance. For chiller on springs, its vibration effects are indistinguishable on the floor.