TMC™
VIBRATION CONTROL

Application Note

STACIS® III Quiet Island®

Piezoelectric Active Vibration Cancellation

STACIS III Quiet Island Enables High-Resolution Cryo-EM

Application: 3D Protein and Cellular Imaging

Microscope: Thermo Fisher (formerly FEI) Titan Krios Cryo-Transmission Electron Microscope

Introduction:

In 2014, the Multiscale Microscopy Core of Oregon Health & Science University (OHSU) expanded its Collaborative Life Sciences Building to include the state-of-the-art Thermo Fisher Titan Krios cyro-transmission electron microscope.

Photo courtesy of OHSU

Challenges:

Transmission electron microscopes, such as the Krios, are some of the most vibration-sensitive instruments in the world and are subject to building floor vibration that can jeopardize high-resolution performance.

Discussion:

A major concern regarding the performance of the tool was upcoming construction and opening of a nearby bridge. Construction activity and vehicle traffic can greatly increase building floor vibration levels. The Krios is also sensitive to acoustics, with the TEM column surrounded by an acoustic enclosure. While the acoustic enclosure reduces the influence of acoustics on the TEM, the large cabinet can couple acoustics to the TEM's support platform as floor vibration, so it is important to decouple the enclosure from the column.

Solution – TMC STACIS III Quiet Island:

STACIS III incorporates a unique serial design and proprietary high-force piezoelectric technology with a wide active bandwidth from 0.6 Hz to 150 Hz and inertial active vibration cancellation with 90% reduction starting at 2 Hz. There is no soft suspension and, unlike active air systems, STACIS is inherently compatible with the Titan Krios' internal active air isolation system with both systems fully optimized. TMC has designed a 2-part nested Quiet Island specific to the Krios, consisting of an inner STACIS Quiet Island that supports the column, and an outer Rigid Quiet Island "ring" that decouples and supports the acoustic enclosure. STACIS Quiet Island is a point-of-use solution that allows for greater flexibility and cost savings in the design and planning of lab facilities.

Summary:

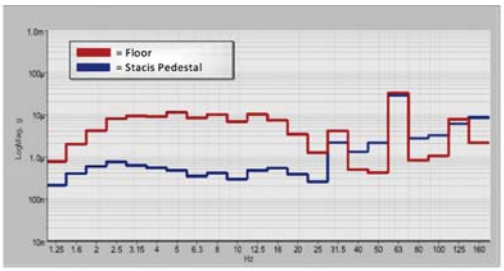
"The [STACIS Quiet Island] seems to be working as expected. A bridge next to us opened…and there are trains, buses, and also street cars passing all day and we haven't experienced any problems. This is fantastic." – Claudia López, PhD, Multi-Scale Microscope Core Manager, OHSU.

- Hard-mount design, no soft suspension, no air
- Digital controller with PC-based GUI or push-button LCD menu
- 2-part platform decouples acoustic enclosure for TEM column

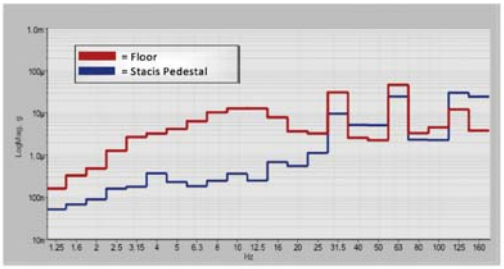
Transmissibility

Measured on-site with Krios installed

Horizontal Vibration



Vertical Vibration



- Low frequency vibration cancellation starting at 0.6 Hz
- 20dB isolation starting at 2-3Hz
- PIB-AVC™ (Payload Independent Broadband Active Vibration Cancellation)

Lambda
www.lambdaphoto.co.uk
T: +44 (0)1582 764334

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