TMC VIBRATION CONTROL / AMETEK®

CASE STUDY | WPI

# The Ultrafast THz and Optical Spectroscopy Lab at Worcester Polytechnic Institute makes vibration concerns irrelevant with TMC's custom product.

**INDUSTRY**
Physics Research

**TECHNOLOGY**
Spectroscopy

**AFFILIATION**
Worcester Polytechnic Institute

## SITUATION

Professor Lyubov Titova's Ultrafast THz and Optical Spectroscopy Lab at Worcester Polytechnic Institute (WPI) is part of the WPI Energy Research Group. The lab conducts cutting-edge experiments in ultrafast optical spectroscopy and terahertz spectroscopy to probe the dynamics of photo-excited charge carriers in nanomaterials with applications in photovoltaics, optoelectronics, and THz photonics.

Previously, the lab was located in the basement of one of the university's research buildings, which was ideal for controlling floor vibration. Unfortunately, the lab's experiments are very sensitive to temperature and humidity, which weren't well-controlled in the basement. The lab moved its experimental equipment to the fourth floor of a newly constructed building. Though this location had excellent temperature and humidity control, it had much worse floor vibration than the basement location. In fact, the floor vibration was so bad that the lab was unable to run any experiments.

**"In terms of just how clean the data looks and the signal to noise, we are able to do the same kind of measurements that we used to do on the ground floor. We're now able to do it on the fourth floor with two highways and a train track nearby. This is awesome. This is great data."**

**LYUBOV TITOVA**
Associate Professor, Department of Physics
**WORCESTER POLYTECHNIC INSTITUTE**

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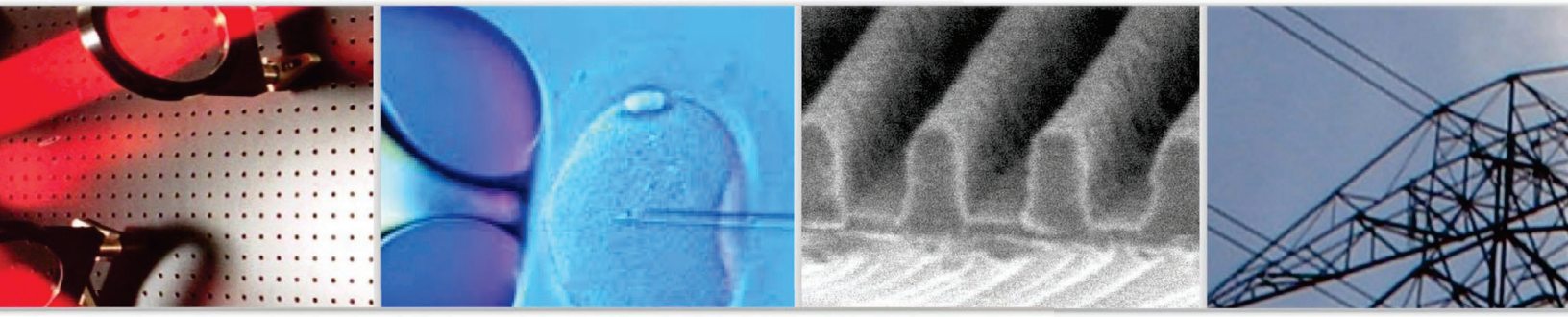

## SOLUTION

TMC worked with Dr. Titova and her group to develop a customized vibration control system to support the optical equipment used for the lab's experiments. The chosen solution was TMC's LaserTable-Base™ with a novel L-shaped design, which combines two stages of vibration control, allowing them to work in conjunction for Dr. Titova's lab-specific experimental setup.

The LaserTable-Base is a two-stage vibration control solution. Typically, optical tables are supported by pneumatic vibration isolation systems. Though very effective at isolating high frequencies, these passive systems will amplify vibration in the critical 1 to 3 Hz range.

TMC's STACIS® technology overcomes these limitations through proprietary technology that incorporates piezoelectric actuators and inertial vibration sensors to cancel—not amplify—very low-frequency vibration. When LaserTable-Base combines air and STACIS into one integrated cancellation system, the result is vibration cancellation at very low frequencies and unprecedented levels of high-frequency isolation due to the combined effect of two isolation systems in series.

## BENEFITS

The vibration on the fourth floor of the university research building was such that Dr. Titova's group could not run their experiments, particularly with a commuter train and highway traffic just outside the building. Some of the lab's measurements take a long time, so it wasn't practical to try to time them based on the train schedule.

The LaserTable-Base base made these vibration concerns irrelevant. In addition to enjoying temperature and humidity control suitable for its experiments, the lab is now able to replicate the same vibration isolation it used to achieve from the solid floor in the basement of the former building. The lab group can now run experiments whenever they choose and be sure they are protected from external vibration.


Shown is the LaserTable-Base with the L-shaped design that's used by the Ultrafast THz and Optical Spectroscopy Lab at WPI.