

### Vibration Isolation for High-Resolution Microscopy and Nanotechnology

A “passive” vibration isolation system invented at the TU Wien offers performance comparable to or better than active vibration control without the disadvantages of active systems. The system also provides exact levelling of the payload.

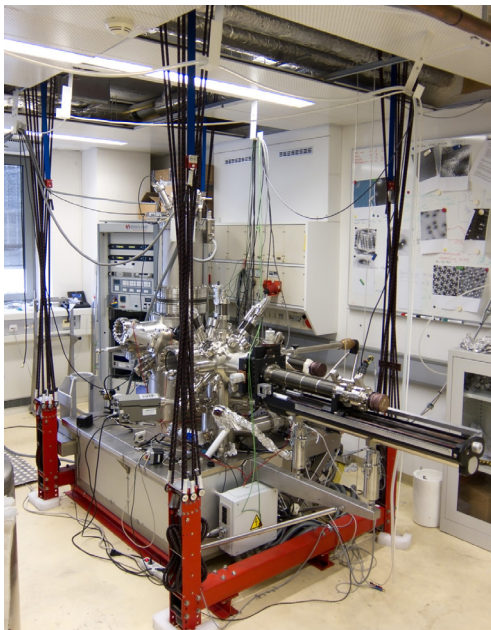
#### BACKGROUND

High-resolution microscopes and nanotechnology devices are sensitive to environmental vibrations. Pneumatic vibration isolation systems are limited in performance, while active vibration control is complex, expensive, requires difficult fine-tuning, and is limited by the performance of the vibration sensors.

#### TECHNOLOGY

The invented vibration isolation is a passive system where the payload is suspended from a frame or the ceiling. It features autolevelling for exact horizontal placement of the payload without any detectable vibrations by the readjustments, even in case of changing load distribution.

A prototype was developed for a high-resolution scanning tunneling microscope/non-contact atomic-force microscope (STM/nc-AFM). (Fig. 1). It



is in a highly frequented building, surrounded by heavy street traffic and railroads. The STM/nc-AFM system is equipped with internal vibration isolation, but due to low-frequency vibrations of the building it was impossible to obtain high-resolution data. Now, the resolution of the STM/nc-AFM is unaffected by the vibrations from the surrounding; even sub-picometer resolution is easily achieved. The resonance peaks induced by the vibration isolation are much lower than for spring-suspended systems and do not compromise the resolution of the instrument.

Fig 1: Vibration isolation of a high-resolution non-contact AFM/STM system at the TU Wien by suspension from the ceiling. The resonance frequencies of the prototype are  $\approx 0.4$  Hz (x, y) and  $\approx 0.8$  Hz in z direction.

#### ADVANTAGES

- Superior vibration isolation
- No tuning required
- Easy scalability from below 100 kg up to loads of several tons
- Exact levelling of the payload
- Low power consumption
- No compressed air required

**REFERENCE:**  
M002/2016

#### APPLICATIONS:

- scanning-probe microscopes
- scanning tunneling microscope
- non-contact atomic-force microscope (STM/nc-AFM)
- electron microscopes
- nanotechnology devices

**DEVELOPMENT STATUS:**  
Prototype

#### KEYWORDS:

Vibration isolation  
Microscopy  
Electron Microscopy  
AFM  
STM  
Nanotechnology

#### IPR:

Austrian (AT) Patent  
filed

#### OPTIONS:

- R&D - Cooperation
- License Agreement
- Patent sale

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**VIDEO:** <https://youtu.be/S3xAwYo7Dqg>

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