

Press Release

May 21, 2026Page 1 | 3

Fraunhofer Researchers Make Technology Museum Quieter

Silent Science: Setting New Standards for Sound Insulation in Vibrating Systems

At the Phaeno Museum in Wolfsburg, a rotating billiard table impressively demonstrates the Coriolis force but previously caused significant noise. Vibration experts from the Fraunhofer Institute for Structural Durability and System Reliability LBF integrated Acoustic Black Holes beneath the rotating billiard table, achieving a noise reduction of approximately 13 decibels. ABH technology enhances visitors' experience, represents a promising approach to reducing noise in various areas of life, and offers significant potential for other industries, such as mechanical engineering and transportation.

The [Phaeno Museum](#) in Wolfsburg offers its guests a very special billiards table: Visitors can roll a billiard ball across a rotating steel disc. The rotation guides the billiard ball onto a curved path. This allows visitors to visualize the effect of the Coriolis force. If the ball is dropped onto the rotating disc, or if the ball bounces on the disc, this results in significant noise pollution. The rotating disc vibrates like a large gong, disturbing visitors and museum staff.

Conventional approaches for noise reduction, such as damp materials, do not achieve a significant reduction in volume due to the turntable's high mass. The Fraunhofer researchers from Darmstadt were able to solve the problem. They attached so-called Acoustic Black Holes to the underside of the turntable.

In practice: Effective, targeted damping in a concentrated area

Acoustic Black Holes (ABH) are achieved by reducing the wall thickness in a manner that follows a power function. The bending waves within the Acoustic Black Hole are directed into the area of low wall thickness, where they can be effectively damped by a damping layer. Until now, ABH have primarily been demonstrated on simple bending beams (and in some cases plates) in the laboratory. The damping achievable with ABH is extremely high, so there are virtually no reflections of the vibration waves. By analogy with an astronomical black hole, the wave energy can practically no longer escape the acoustic "black hole."

Based on experimental investigations, the project team from Fraunhofer LBF developed a concept for vibration reduction for the entire "turntable" system, designed it numerically, and attached it to the underside of the turntable. This

allows noise levels to be significantly reduced without impairing the exhibit's functionality.

May 21, 2026

Page2 | 3

Maximum vibration damping through Acoustic Black Hole technology

The new concept consists of five circular segments that are mounted on the turntable from below, each with a cross-section designed in the form of an Acoustic Black Hole (ABH). A damping material is applied to the free-vibrating end. This concept, implemented for the first time at the museum, was subjected to structural dynamic and acoustic testing in various configurations. It became clear that the developed measure can significantly reduce radiated sound power across a broad frequency range. A vibration reduction between 40 dB (at 140 Hz) and 20 dB (at 1650 Hz), as well as a reduction in radiated sound power of approximately 13 dB compared to a turntable without the measure, were achieved.

"With ABH, vibration energy can be selectively dissipated in a specific area of the structure," explains Dr. Sebastian Rieß, a researcher at Fraunhofer LBF. Current research projects at Fraunhofer LBF focus on integrating ABH into complex rotating structures. The results could set new standards in noise reduction.

More about Acoustic Black Hole (ABH) technology

The Acoustic Black Hole effect draws on the principles of modern physics. Similar to light particles that are trapped in a black hole, vibrations are "captured" in a specific absorption zone within an Acoustic Black Hole and can no longer escape, resulting in virtually perfect absorption of vibrations. The advantages of this promising technology are immense: It enables effective damping of structure-borne noise in components while reducing material requirements, thereby offering significant weight and cost savings as well as benefits in terms of recyclability. Many industrial applications where vibrations are a nuisance can benefit.



New concept dampens vibrations in rotating systems: Five circular segments mounted from below onto a turntable, each with a cross-section designed in the form of an Acoustic Black Hole (ABH). Photo: Fraunhofer LBF, Ursula Raapke.



More peace and quiet in the museum: A rotating pool table without unwanted vibrations. Photo: Fraunhofer LBF, Ursula Raapke

Contact

Contacts

Anke Zeidler-Finsel

Fraunhofer Institute for Structural
Durability and System Reliability LBF
Press and Public Relations
Tel. +49 6151 705-268
anke.zeidler-finsel@lbf.fraunhofer.de

Scientific Contact

Heiko Atzrodt, M.S.

Dr.-Ing. Sebastian Rieß
Fraunhofer Institute for Structural
Durability and System Reliability LBF
System Dynamics
heiko.atzrodt@lbf.fraunhofer.de
sebastian.riess@lbf.fraunhofer.de

www.lbf.fraunhofer.de

