AEROSPACE
ENVIRONMENTAL

# Open your Ears

## TU Delft Builds a Sounder Future Through Open Science — Powered by KEMAR

✓ **CUSTOMER**
**TU Delft**

✓ **PRODUCT**
**GRAS 45BB**

✓ ***"IT'S A SERIOUS HEALTH RISK"***
***By Dr. R. (Roberto) Merino Martinez***
*Assistant Professor*

### ADDRESSING NOISE POLLUTION

Noise pollution isn't just an urban annoyance—it's a serious health risk. "The World Health Organization has considered noise pollution as the second biggest environmental threat in Europe after air pollution," says Merino Martinez, TU Delft. "Over 30% of Europeans are exposed to harmful transport noise levels. Chronic exposure to noise contributed to 66,000 premature deaths annually in Europe. That's a big part of the motivation for ***The Open Your Ears project***."

### THE CHALLENGE:
### Making the Invisible World of Acoustics Audible

When engineers, architects, and researchers design new spaces — from lecture halls to urban environments — they face a paradox: **sound is one of the most influential design factors, yet one of the hardest to predict and communicate.**

Traditional simulations can show acoustic energy, reverberation times, and reflections, but they rarely answer the most important question:

***"What will it actually sound like for a human being?"***

(Fotograaf Den Haag, professionele bedrijfsfotografie Den Haag)

GRAS
An Axiometrix Solutions Brand

At TU Delft, a team of acoustic researchers wanted to change that.
Their ambition was bold:

- Turn complex acoustic simulations into real, listenable audio
- Create a shared, open-science platform where researchers can compare, refine, and build on each other's models
- Make acoustics as tangible and intuitive as architectural renderings
- Improve communication between engineers, designers, and the public by letting them hear the impact of design decisions

But to achieve this, they needed a reliable, standardized reference for **human hearing** — something that could translate physics into perception.

They needed **KEMAR**.

## THE SOLUTION:
## Auralisation Driven by KEMAR's Human-like Hearing

TU Delft adopted an open-science approach to acoustics.
This included building tools that turn acoustic simulations into realistic 3D sound experiences — a process known as **auralisation**.

For auralisation to be credible, it must account for:

- How sound interacts with the shape of the human head
- How ears filter and color sound (HRTF – Head Related Transfer Function)
- How humans perceive distance, direction, and elevation

This is where **GRAS KEMAR** became central.

### KEMAR's Role in the Solution

KEMAR provided TU Delft with:

- **A human-accurate reference point** for measuring sound exactly as a person would hear it
- **Consistent, repeatable data** for comparing simulation results
- **High-resolution HRTFs** that make virtual acoustic environments feel lifelike
- A neutral, research-grade platform trusted in universities worldwide

By integrating measurement data from KEMAR into their auralisation models, TU Delft's team could transform raw simulation outputs into immersive, accurate soundscapes.

**The result:**
Designers and stakeholders can **listen** to future environments — before construction begins.

## THE OUTCOME:
## Better Decisions, Sharper Models, and a More Human Future

TU Delft's open-science acoustic platform has already produced several tangible benefits:

**1.** **More Accurate Acoustic Predictions**
By grounding their models in human-perceived sound rather than abstract metrics, researchers can better assess whether a design "sounds good."

**2.** **Stronger Collaboration Across Disciplines**
Architects, engineers, sound designers, and urban planners can now share a common language: **hearing a space instead of interpreting graphs.**

**3.** **Faster and More Informed Decision-Making**
Listening to the acoustics of a design allows stakeholders to choose materials, shapes, or layouts with far greater confidence.

**4.** **A Truly Open Science Platform**
Tools and data are openly available, allowing global researchers to contribute improvements — accelerating innovation.

**5.** **Human-Centric Acoustic Design**
Thanks to KEMAR-powered auralisation, acoustics becomes not just a technical field, but an experiential one aligned with human perception.
KEMAR helps TU Delft turn sound from a calculation into an experience — supporting a more inclusive, understandable, and sound-focused built environment.

(Fotograaf Den Haag, professionele bedrijfsfotografie Den Haag)

## ABOUT THE CUSTOMER:
## TU Delft Faculty of Aerospace Engineering faculty

**TU Delft** is one of Europe's leading research universities, globally recognized for engineering, architecture, and technology innovation. The acoustics research group is known for:

- Pioneering open-science infrastructure
- Bridging computational acoustics with real-world perception
- Developing tools that democratize acoustic design
- Working across industries — from construction to mobility to environmental sound

This particular initiative reflects TU Delft's belief that acoustics should be **transparent, collaborative, and centered around human experience.**

PALILA

https://www.tudelft.nl/lr/palila >

SQAT

https://github.com/ggrecow/SQAT >

**GRAS 45BB-14 KEMAR**
**for High-Frequency Test of Ear- and Headphones, 2-Ch CCP**

Scan the QR for the full story

**Read more: >**

## ABOUT KEMAR:
## The World's Most Trusted Acoustic Manikin

For more than 30 years, GRAS KEMAR has been the global reference for acoustic measurements involving human perception.

KEMAR is used in:

- University research laboratories
- Telecom and audio engineering
- Automotive and aerospace noise studies
- Consumer electronics testing
- Hearing aid and audiology research

### Why KEMAR Was Essential for This Project

- Human-like ear and head geometry
- Accurate and standardized HRTFs
- Reliable, repeatable measurement results
- A large existing reference library for scientific comparison
- Trusted methodology recognized by researchers worldwide

KEMAR bridges the gap between **objective measurement** and **subjective hearing**, making it ideal for projects where human perception is the goal — like TU Delft's auralisation platform.

## Read the full story here:

Open Your Ears: Building a sounder future through open science >

### About GRAS Sound & Vibration

GRAS is a worldwide leader in the sound and vibration industry. We develop and manufacture state-of-the-art measurement microphones to industries where acoustic measuring accuracy and repeatability is of the utmost importance in R&D, QA and production. This includes applications and solutions for customers within the fields of aerospace, automotive, audiology, and consumer electronics. GRAS microphones are designed to live up to the high quality, durability and accuracy that our customers have come to expect and trust.
GRAS Sound & Vibration is represented through subsidiaries and distributors in more than 40 countries and is part of Axiometrix Solutions, a leading test solutions provider comprised of globally recognized measurement brands.

GRAS Sound & Vibration
Skovlytoften 33, 2840 Holte, Denmark, +45 4566 4046, www.GRASacoustics.com

GRAS
An Axiometrix Solutions Brand