

# Acoustic challenges in a car cabin

The constant evolution of motor vehicles is a never-ending source of new acoustic challenges. The transition from internal combustion engines (ICEs) to electric vehicles (EVs) is a lot more than just swapping power sources.



## New challenges

Added to the vehicle noise itself come the audio and infotainment system assessment challenges. Efforts to increase efficiency and extend the range between charging go beyond the technological improvements in battery and motor efficiency. Lighter materials are being incorporated into the vehicle structures and interiors. This introduces a range of new challenges for assessing the quality of in-cabin audio:

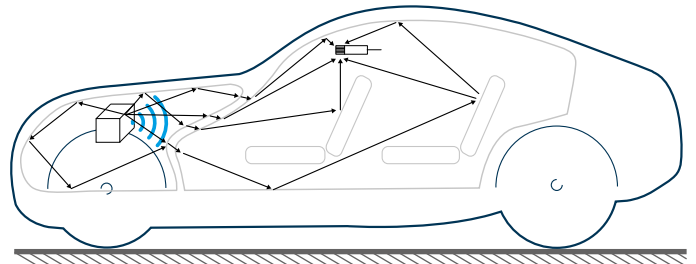
- Lighter materials with their own dampening characteristics
- Highly reflective elements like instrumentation panels, windows, and even panoramic glass that may or may not be exposed on the interior ceiling.
- The combination of the above.

This results in a combination of sound fields where noise can come to the occupants from multiple angles, with a range of dampening effects for different frequencies. If not evaluated properly, occupants could experience muddled audio for some frequencies or reverberant dissonance for other frequencies.



## Beyond the capability of traditional testing

The new challenges have pushed audio testing needs beyond the capabilities of  $\frac{1}{2}$ " microphones.



Angle of incidence has much less effect on  $\frac{1}{4}$ " microphones—perfect for chaotic sound fields

## Can the 46BC match $\frac{1}{2}$ " microphones on the low end?

The noise floor of traditional  $\frac{1}{4}$ " microphones was once a primary limitation for use in automotive NVH testing. However, the 46BC has the lowest noise floor of any  $\frac{1}{4}$ " microphone on the market, making it uniquely suited to replace the  $\frac{1}{2}$ " microphones in current use, enabling improved high-frequency accuracy, while maintaining low noise floors.



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### Valid data in any sound field

The size and design of the 46BC multi-field microphone provides the right data in any measurement scenario and will always comply with IEC 61672, regardless of the sound field.

### The lowest noise floor

GRAS 46BC has the lowest noise floor of any 1/4" microphone, so it matches the sensitivity of 1/2" mics and can therefore measure the low levels found in a car cabin.

### Evolving for EV testing

The high sensitivity and low noise floor coupled with the size advantages of the 46BC provide the ideal solution for acquiring in-cabin data for both audio and NVH testing.

## BENEFITS of 46BC at a glance:

- Only multifield microphone on the market.
- Lowest 1/4" noise floor.
- Reduced influence of the angle of incidence.
- Meets the requirements of the AES Acoustics Measurements recommendation.
- Well-suited for high-frequency measurements.
- Minimal footprint for easy placement.
- Reduced influence on measurement environment due to their small size.

[Get more information >](#)



## Why is a 1/4" microphone better?

The actual physical size of 1/4" microphones provides many benefits for in-cabin acoustic testing. The [size-related properties](#) reduce the pressure build-up effect on the diaphragm and minimizes error when measuring in a non-free-field environment, such as in-cabin. This enables improved accuracy at higher-frequency ranges. And when accounting for real-world conditions and measuring where there are many reflections and disturbances, such as in-cabin, the physical advantages of a 1/4" microphone can greatly increase accuracy and simplify post-processing data.

The cabin is a complex sound field, consisting of multiple source contributions that can change due to factors that depend on velocity, such as road noise, wind noise, braking noise, etc. This environment is a prime example of a multifield environment, and it can only be measured accurately with 1/4" or smaller microphones.

According to the Acoustic Engineer Society (AES) In-car Acoustics Measurements recommendation, microphones that match the characteristics of [46BL-1](#) and the [46BC](#) are ideally suited for these types of measurements.



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### About GRAS Sound & Vibration

GRAS Sound & Vibration is a leading manufacturer of state-of-the-art measurement microphones. We serve R&D, production engineering, QA and production units within aerospace, automotive, audiology and consumer electronics with strict requirements for microphone accuracy and repeatability. GRAS microphones are designed to live up to the high quality, durability and accuracy that our customers have come to expect and trust.

GRAS 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. Read more at [www.grasacoustics.com](http://www.grasacoustics.com)