

Helping Terma measure insertion loss

Terma – a leading contractor within the Aerospace and Defense Industry – is collaborating with BAE Systems on helmet audio advances and integrating their 3D-Audio/Active Noise Reduction (ANR) technology with BAE Systems' Striker® II Helmet Mounted Display (HMD).

In order to develop these helmet audio advances Terma needs a human-like Acoustic Test Fixture to measure insertion loss and hereby produce communication headsets and prevent hearing impairment and noise-induced hearing injuries.

Developing communication headsets with adequate hearing protection and noise cancellation for use in high-noise environments is very challenging. To measure the insertion loss of such a communication headset integrated in a helmet requires the use of a test head especially designed to perform well at high sound pressure levels. The test head needs to be built in a way which ensures preferable fit even though you cannot inspect the fit of the ear cups below the helmet. To make the task even more difficult, very noisy environments are also often further "polluted" with high impulse noise which is notoriously difficult to measure.

The vast majority of test platforms will not be able to function properly in such environments as the measurements will be contaminated with noise coming from the test fixture being agitated into resonating, which means that its self-insertion loss will not be sufficiently high to allow investigation of what is really of interest: the insertion loss properties of the communication/hearing protector system being tested.

✓ CUSTOMER

Terma

✓ HIGHLIGHTS

- ANSI-ANSA S12.42 Standard
- MIRE-like insertion loss measurements
- Human-like Acoustic Test Fixture with heating system

✓ KEY LEARNINGS

Developing communication headsets with adequate hearing protection and noise cancellation for use in high-noise environments is very challenging. With the GRAS 45CB Terma can perform MIRE-like insertion loss measurement. Hereby Terma can develop communication headsets which will prevent future hearing impairment and noise induced hearing injuries.



The GRAS 45CB, also called the ANSI-head because it meets the American ANSI-ANSA S12.42 Standard.

GRAS

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The 45CB is the most human-like Acoustic Test Fixture available on the market for measuring insertion loss. With this test fixture we can test all types of hearing-protectors in the most realistic way - both in the acoustic lab and in the field.

Acoustic Engineer at Terma
Bjarne Bjerre

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Area Manager from GRAS, Michael Trolle adjusting the fit of the helmet and placing the cables correct in order to turn on the build-in heating system.



Performing MIRE-like insertion loss measurements on an acoustic test fixture

For Terma the ear cup in the helmet design is to protect the pilot against noise and therefore insertion loss is a key design parameter. The most optimal way to carry out insertion loss measurements would be to measure the damping directly on humans with Microphones In Real Ear (MIRE) measurements. Since that approach is utterly time consuming, requires available test subjects and planning, Terma has chosen to use the GRAS 45CB Acoustic Test Fixture. The 45CB Acoustic Test Fixture (ATF) consists of a sturdy platform that has a very high self-insertion loss, at the same time it can accommodate ear simulators that can handle very high sound pressures and measure at high levels. The ATF is temperature adjustable and with the integrated heating system of the pinna area influences the cushion in a more realistic way. Simulating the factors and matching the dimensions of the human head, the 45CB - besides the sturdy platform - consists of two pinnae with an anthropometric concha and ear canal and high resolution ear simulators to measure at high frequencies.



A human-like acoustic test fixture

With, realistic flesh-simulation and human-like proportions it provides realistic test results. Acoustic Engineer at Terma Bjarne Bjerre reasons the choice of GRAS: *“The 45CB is the most human-like Acoustic Test Fixture available on the market for measuring insertion loss. With this test fixture we can test all types of hearing-protectors in the most realistic way - both in the acoustic lab and in the field. When having conducted our measurements on the 45CB, we validate our data on a number of people”*. Furthermore Bjarne Bjerre mentions the heating system as a key

parameter: *"The heating system of the pinna area influences the cushion surface / stiffness in a realistic way"*. The 45CB allows a relatively well reproducible measurements on helmets configurations and the high self-insertion loss is able to indicate "over engineering". Overall the human-like ATF provides Terma with repeatable results and this measurement method is quicker too.

Meeting the American ANSI-ANSA S12.42 Standard

At GRAS we have been working with high-quality measurement testing since the day we began. Our expertise in Manikin based measurements is proven with the KEMAR manikin and the 45CA hearing protector test fixture. It was because of this expertise that ANSI's American National Standards on Acoustics S12 committee invited us to participate in the development of a new standard for measuring the insertion loss of hearing protection devices in continuous and impulsive noise. GRAS has developed an acoustic test fixture to fulfill the requirements specified in the American ANSI-ANSA S12.42 Standard: *"Methods for the Measurement of Insertion Loss of Hearing Protection Devices in continuous or Impulsive Noise Using Microphone-in-Real-Ear or Acoustic Test Fixture Procedures"*.



The human-like Acoustic Test Fixture
GRAS 45CB

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ABOUT GRAS SOUND & VIBRATION A/S

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 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 is represented through subsidiaries and distributors in more than 40 countries. Read more at www.gras.dk