

XARION LASER ACOUSTICS – HEAR WITH LIGHT, SEE WITH SOUND

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XARION Laser Acoustics was founded in 2012. The invention of the Membrane-free Optical Microphone dates back to 2006. Its technology was subsequently developed together with Philips, NXP Sound Solutions, and the Knowles Corporation, as well as the Vienna University of Technology and ultimately led to the founding of XARION.

Interview with Dr. Jan Berger, Application Engineer at XARION.

Easy Engineering: A brief description of the company and its activities.

Jan Berger: *Who we are?* XARION is a team of young physicists and engineers who are passionate about challenging the conventional method of ultrasonic testing with our core product, the Optical Microphone (see fig. 1). With this innovative sensor, we have developed contact-free inspection solutions for non-destructive material testing and real-time process monitoring. We have set new standards when it comes to detecting material defects and production errors. Customers from the automotive, aerospace, and semiconductor industries are seeking our applications.

What do the automotive, aerospace, and semiconductor industries have in common? They follow the highest standards of quality assurance. They need to know if their products are perfect and their equipment is working flawlessly. That's where XARION comes in.

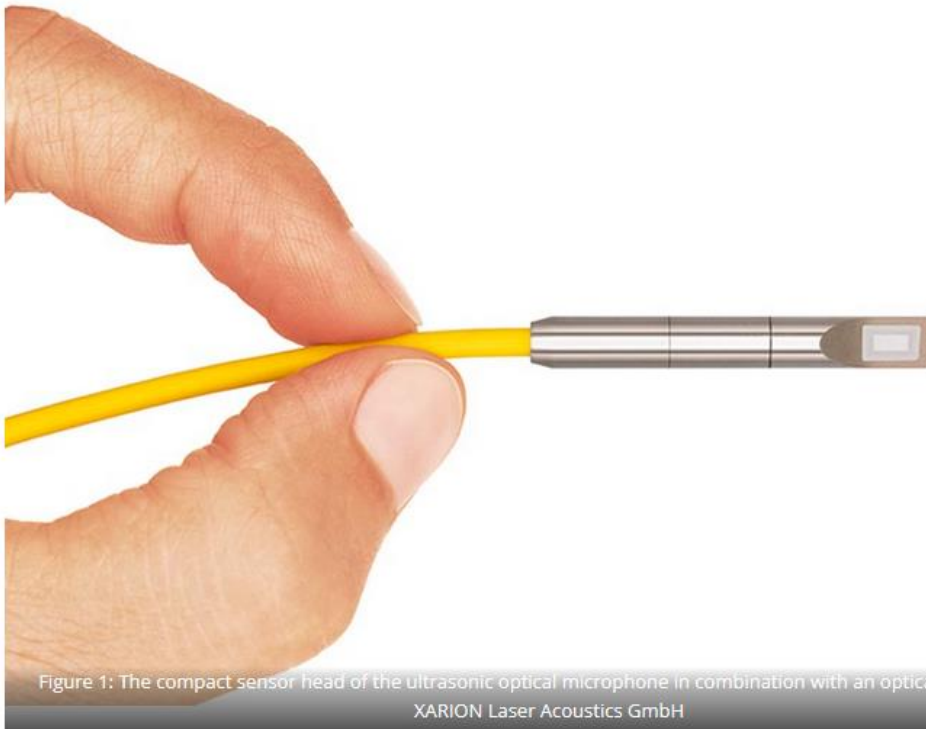


Figure 1: The compact sensor head of the ultrasonic optical microphone in combination with an optical fiber. Source: XARION Laser Acoustics GmbH

How we do that? The major difference and the unique selling point of our testing method compared to existing, conventional ultrasonic testing methods is that XARION's method is completely contact-free. The standard in many markets is still coupled ultrasound, where the use of coupling gel or water is necessary. The ability to test the specimen without contact offers the opportunity to automate the testing process and that is the real benefit to our customers. Automation means increased test throughput in a shorter time and thus reduced costs, which makes a strong argument for the XARION non-contact test method.

E.E: What are the main areas of activity of the company?

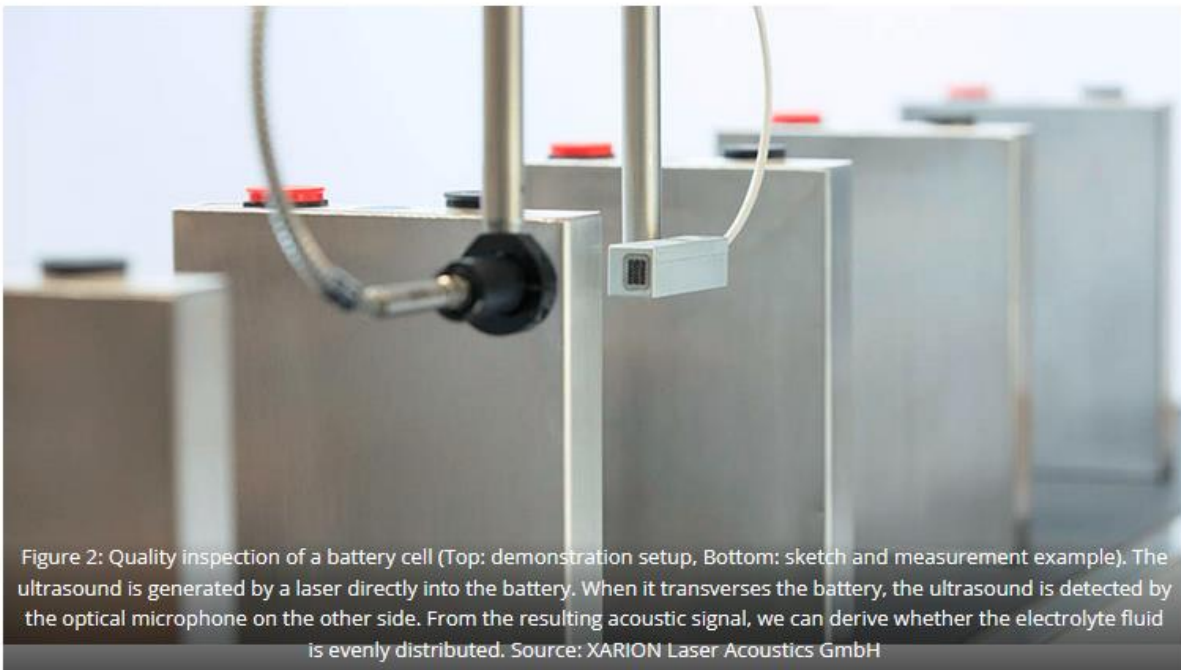
J.B: In their quest to ensure the highest product integrity, we support our customers with a new beneficial approach of non-contact ultrasonic measurement. We can do that during the manufacturing process or — in the area of non-destructive material testing — we do the testing downstream, on the already manufactured product. You may be wondering how we generate the ultrasound information in the test specimen: our proven solution is an excitation laser beam that generates an ultrasonic wave in the test specimen.

In NDT XARION's ultrasonic testing technology is highly relevant for evaluation of (carbon fiber) composites, semiconductor elements, welded joints and batteries. Defects that cannot be seen from the outside, such as delamination, voids, or cracks, can be detected.

The highest level of quality control is particularly critical for components in the aviation and aerospace industry, and safety requirements are also constantly increasing in the automotive and battery sector. In-process monitoring, broadband measurement of airborne ultrasound emission offers new insights into the process quality of innovative manufacturing techniques such as laser welding, ultrasonic welding, or additive manufacturing.

E.E: What's the news about new products?

J.B: An emerging market for XARION's technology comes with the trend towards e-mobility. Incredible investments are currently being made in the production of e-car batteries. And where manufacturing takes place, testing must also take place, and that's where XARION's expertise comes in.



A recently realized testing system allows automated, contact-free measurement of the electrolyte distribution in a battery cell (see fig. 2). This is important because the quality and lifetime of the battery depend crucially on the uniform wetting of the electrodes and separators with electrolyte liquid. For this type of analysis, XARION uses a laser beam to generate an ultrasonic wave in the battery, while the optical microphone on the opposite side of the battery detects how well the sound is conducted by the battery. Dry areas of the battery cell reflect the sound, while areas wetted with electrolyte fluid conduct the sound. The significantly higher resolution and measurement speed of the technology compared to conventional air couplers allow for fast, high-quality, 100% in-line testing during battery production. XARION's ultrasonic testing technology is also suited to monitoring the degree of drying of coated electrodes, the welding of layered electrodes, the testing of laser welds between cells or modules, and the contact of thermal conductive pastes with housings and modules.

E.E: What is the range of products?

J.B: As you can imagine, there is a significant difference between testing the spot welds on a car body and testing computer chips. Our customers have very different requirements, which we address in a customized manner. In addition to such customer-specific systems, a range of standardized testing and monitoring systems are available, which can be quickly and easily deployed in, for example, research departments or testing laboratories (see figs. 3 and 4). XARION relies on a modular system of customer-selectable positioning systems combined with XARION excitation lasers, optical microphones and probes optimized for transmission or one-sided measurements.



Figure 3: A LEAsys laboratory instrument. A wide range of testing tasks can be performed with this versatile and user-friendly station. Often, these laboratory devices also represent the preliminary stage before the leap into fully automated equipment on the production line. Source: XARION Laser Acoustics GmbH

E.E: At what stage is your market currently active?

J.B: What makes us really proud, and justifiably so, is that as a young company, now just 11 years old, we can already count large, renowned companies among our customers. The big players from the aerospace sector and the automotive market have recognized the potential of our technology and are relying on it. The fact that we were able to win them as customers is a great honor for us. Just to mention a few, XARION Laser Acoustics works with NASA, Audi, Porsche, Honeywell, Osram, APG, Schunk, Manz, Fill, and more.

In the aerospace industry, XARION has made a name for itself testing composite structures. In the automotive industry, the technology is used for the automated inspection of spot welds, and is finding the tell-tale echoes at a phenomenal rate. (see fig. 5).

E.E: What can you tell us about market trends?

J.B: From today's perspective, we have plenty to do in the future. If we think about the areas in which existing ultrasonic inspection processes are used, we create a compelling alternative with our advantages of non-contact and automation.



Figure 5: Robot-integrated system for spot-weld inspection. The compact and fiber-coupled probe head for non-contact ultrasonic testing enables straightforward integration. Source: XARION Laser Acoustics GmbH

Our technology particularly appeals to companies with a high degree of quality awareness, because when safety, reliability, and sustainability are paramount, our sensor platform provides an easy solution to verify excellent quality.

In this context, we have seen a very high level of interest in our testing technology in the battery sector, as new technical challenges are constantly emerging in this rapidly growing and diverse market. The inherent battery production design heavily focuses on contact-free, easy-to-integrate solutions for 100% product inspection.

E.E: What are XARION's most innovative products marketed?

J.B: "Hear with light — see with sound", this is our slogan because it is the shortest way to describe our distinctive inspection method. XARION's ultrasonic testing and monitoring solutions are based on our patented membrane-less all-optical microphones. This first-in-class technology is broadband, contact-free, and compact. It sounds simple, but it makes the incredible difference. The combination of these properties makes the optical microphone unique worldwide in ultrasonic measurement technology. It provides significant advantages over conventional ultrasound sensors especially in detection bandwidth, integration, and automation and is used in a variety of application scenarios.

The versatility of XARION's ultrasonic testing is exemplary across many fields, highlighted by its possible use in battery inspection, assessing electrolyte distribution, pouch-cell sealing, foil-to-tab weld quality, thermal paste spread, and bus bar weld quality.

E.E: What estimations do you have for 2023?

J.B: In the long term, our clear vision is to replace conventional, manually processed ultrasonic testing. With XARION's optical microphone technology used in ultrasonic testing and monitoring solutions, we create a captivating alternative to existing ultrasonic inspection processes with the distinct advantages of a non-contact process that can be easily integrated into any automation system. In 2023, we will increasingly push into these markets.

On top of this, XARION's testing technology is revolutionizing non-destructive testing. We can now test objects that could not be fully tested before. In addition, we can allow full in-production inspection where previously only single items could be tested. We see increasing demand for both scenarios and look forward to the growth in the busy and exciting years ahead.