

# PRESS RELEASE

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**PRESS RELEASE**November 13, 2023 || page 1 | 3

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## Taking the road to the lab: Users deliberate upon biaxial fatigue strength tests for passenger car and truck wheels and hubs

**In recent years there have been major changes in the life cycle testing of vehicles or individual components: Thanks to state-of-the-art testing technology today a few hours in the laboratory are sufficient for life cycle testing whereas previously test drives on the road taking a couple of weeks were necessary for this purpose. This development continues as the UC 16 - Users Conference on Biaxial Wheel/Hub Fatigue Testing on November 8th, 2023, in Darmstadt showed. More than 50 scientists and users from Europe and all around the world met at the Fraunhofer Institute for Structural Durability and System Reliability LBF in Darmstadt. Thanks to a wide range of development and testing activities in the field of wheel testing and approval, the institute was able to establish itself as a technology leader. Today the testing technology is known and accepted on a worldwide basis. It has been established as the international standard for more safety in vehicle wheels construction. Besides it shortens the development times for new reliable and safety relevant products.**

The 16th Users Conference on Biaxial Fatigue Testing with scientists, manufacturers of passenger cars and commercial vehicles as well as suppliers was dedicated to various anniversaries. The biennial user conference itself has been in existence for 30 years now. Furthermore, the organizing Fraunhofer LBF celebrated its 85th anniversary in 2023, and the ZWARP technology has been around for over 40 years.

### **New findings of multiple impact factors for BiAx wheel testing**

The international meeting, organized by the Fraunhofer-scientists, is known as a forum to discuss new developments in the market for testing and validation technologies with industry experts. Due to the different anniversaries and the missed conference two years ago due to Corona, this year's conference was a good occasion to meet by a face-to-face meeting for exchange of ideas concerning several questions: In which direction will the technology and the conference develop, what are the future requirements of this technology and why is it beneficial to further develop the biaxial fatigue tests after so many years of application? An active discussion among the participants, guest contributions from partners who had only recently begun to use the

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ZWARP technology and from partners who have been using it since its introduction provided the required answers. A contribution on the impact factors of load files such as wheel size, wheel design, tires, vehicle application and vehicle usage arouse particular interest. The discussion of the general development of the conference gave fruitful feedback and other forms like workshops and online forum were suggested. A community wide committee is planned to prepare the next conference.

**PRESS RELEASE**

November 13, 2023 || page 2 | 3

**ZWARP technology: efficient wheel development for more than 40 years**

The Fraunhofer LBF is considered as the pioneer in the multi-axial life cycle testing of vehicle wheels and wheel hubs. In 1982, scientists at the institute put the biaxial wheel/hub test rig (ZWARP) into operation for the first time. At that time, it was a novel device for examining vehicle wheels under biaxial load. In 1982 a patent for road vehicles and in 1987 a patent for rail vehicles were filed and these technologies were subsequently sold under license to customers. At [www.zwarp.fraunhofer.de/en.html](http://www.zwarp.fraunhofer.de/en.html) Fraunhofer LBF created a website with in-depth information about biaxial wheel/hub testing (ZWARP). Today, wheel road simulators of this type are used on a worldwide basis to shorten development times in the automotive industry and to test safety components such as wheels and wheel hubs.



Dr. Christoph Bleicher, Division Director Structural Durability at Fraunhofer LBF, welcomed the participants of UC 16 - Users Conference on Biaxial Fatigue Testing, the 16th user conference for biaxial fatigue testing of wheels, wheel hubs and wheel bearings. Photo: Fraunhofer LBF/Döberl

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**Fraunhofer LBF** in Darmstadt has stood for the **safety and reliability of lightweight structures** for more than 80 years. Today, with its expertise in the areas of structural durability, system reliability, vibration technology and polymer technology, the Institute provides solutions for three of the most important cross-cutting issues of the future: lightweight design, functional integration and cyberphysical mechanical engineering systems. The focus here is on solutions to social challenges such as resource efficiency and emission reduction as well as future mobility, like e-mobility and autonomous, networked driving. Comprehensive skills ranging from data acquisition in real operational field use to data analysis and data interpretation, in addition to deriving specific measures to design and improve material, component and system properties form the basis for this. Customers come from automotive and commercial vehicle construction, railway transport engineering, shipbuilding, aviation, machine and plant construction, power engineering, electrical engineering, medical engineering, and the chemical industry. They benefit from the proven expertise of 400 employees and cutting-edge technology accommodated in more than 17,900 square meters of laboratory and experimental space.

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