

News 3.23

Dear readers,

In our current newsletter we have two articles on the topic of autonomy in the maritime industry. What are the advantages of an autonomous navigation system in which ships do not require any human control? To this end, the CML completed the B ZERO project and presented the research results at the National Maritime Conference.

Our VTS laboratory - VTS stands for Vessel Traffic Service - is also about autonomy, among other things: for example, the LEAS project, which revolves around land-based decision support for autonomous ships. And in another laboratory in our new research building, products as well as software and hardware can be tested for cybersecurity.

We hope you enjoy reading.

Yours, **Prof. Carlos Jahn**
Head of Fraunhofer CML



Ship without a helmsman – Development of the watch-free bridge

For almost four years, CML researchers and project partners have been developing the watch-free bridge in the [B ZERO project](#) – in mid-September 2023, the results were presented at the National Maritime Conference in Bremen. The project idea was triggered by the increasing requirements for safety in maritime shipping in the face of growing traffic, decreasing availability of qualified nautical personnel, and improving transport efficiency in the global competitive environment. In addition to the development of a ship's bridge that can navigate for up to 8 hours without the need for intervention by nautical personnel, a digital automated logbook was developed during the project as well as new systems for the provision of data information. All solutions were tested and validated in real test runs. To enable the test ship to operate without human control at times, an autonomous navigation system

(ANS) developed at the CML was installed on board. This system accesses data already available on board a ship, such as AIS data and radar images. In addition, it uses further information from cameras and near-field radars, which were additionally installed for the observation of the direct environment. From all this data, the ANS creates a picture of the situation that makes safe autonomous control possible and, in accordance with the Collision Avoidance Regulations, ensures the safety of the ship.

As soon as the watch-free period ends, e.g. when entering an area with heavy traffic or a port call, the officer takes over the watch via a newly created man-machine interface that clearly provides all important information. If an unclear situation arises during the watch-free period, the ANS requests assistance from the nautical officer to evaluate the system. With the successful implementation, the partners in the B ZERO project - Wärtsilä SAM, Hoppe Bordmesstechnik, NautilusLog, Schulte Group, the Federal Maritime and Hydrographic Agency, Fraunhofer FKIE and CML - have developed innovative and proven products that will be valuable applications for shipping companies.

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Sensors around the autonomously operating ship

IHATEC conference

In Karlsruhe on October 5 and 6, the CML will present the project „Automation of pin handling in container carrying wagons by mobile robotics“ in short „[Pin-Handling-mR](#)“, as well as the project „[FLEXIKING](#)“, in which truck handling time windows are optimized by flexible artificial intelligence.

EUROPORT 2023

The CML will be part of the German Pavilion in Rotterdam from November 7-10. We will present technologies for autonomous systems and nautical assistance systems there.

Cyber Resilience Forum

At this year's Digital Ship Forum on December 7 in Hamburg, our team leader Dr.-Ing. Anisa Rizvanolli will present the CML's cyber security activities in a talk.

Testing cybersecurity safely in the research lab

Cyber risk in shipping has increased dramatically in recent years. In addition to the security of individual components on board, the network topology also has a significant impact on a ship's cybersecurity. Due to limited resources, it is a major challenge for both system integrators and shipping companies to perform cybersecurity tests for different scenarios and components.

Fraunhofer CML's new research building in Harburg's inland port is also referred to as a „stone ship“ due to its external appearance. In fact, it has characteristics of a real ship due to its unique technical features: The [radio and bridge laboratory](#) consists of components, such as those found on board most ocean-going vessels. It is connected to an antenna platform on the roof that provides real-time data for technology such as radar, GPS, AIS and VHF radio.

Equipment manufacturers and software developers, as well as shipping companies, can use the equipment in this lab to have their products or devices tested for cybersecurity. Depending on the requirements, additional components can be added to the bridge and different configurations can be investigated. Furthermore, strategies for dealing with a security incident can also be



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A look into the CML radio laboratory

developed and trained. The aim is also to meet the latest regulatory requirements.

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The CML's Vessel Traffic Service (VTS) laboratory

Captain AI on shore

Maritime transport routes are characterized by increasing digitization and automation of ships: Researchers worldwide are working to further develop highly automated as well as autonomous ships and to test prototypes.

The integration of autonomous ships in existing transport schemes is referred to as mixed shipping traffic and poses new challenges for shore-based traffic control. Especially in places with high traffic density, such as coastal waters or port approaches, decisions in critical situations must be made quickly to maintain safe and smooth traffic.

The consideration of these ships in existing shipping traffic is known as mixed traffic and poses new challenges for shore-based traffic monitoring. Especially in regions of high traffic density, such as coastal waters or port approaches, decisions must be made quickly to maintain safe and efficient traffic.

At Fraunhofer CML, researchers are working on the [LEAS](#) project, which aims to develop a first

demonstrator for a shore-based decision support system using artificial intelligence for mixed vessel traffic:

LEAS stands for „Shore-based Decision Recommendations for Traffic Situations with Highly Automated or Autonomous Ships“ and maps maritime traffic scenarios for which no practical experience on technical and operational requirements and procedures is available yet. Project implementation is possible in the company's own Vessel Traffic Service (VTS) laboratory, where ship traffic and monitoring are realistically simulated.

The LEAS project is of great interest to authorities performing VTS tasks and manufacturers working on technologies for highly automated or autonomous ships.

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Fresh MIU in the 3rd quarter

Our online presentations on new research topics and results „[Maritime Innovation Updates](#)“ (MIU) takes off after the summer break:

Look forward to the classic MIU as well as new episodes „MIU on the spot“, where we present our research labs and workshops. Topics and registration options can be found on our homepage.



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