PRESS RELEASE

Fraunhofer IPM joins forces with Research Fab Microelectronics Germany

Integrated optical light sources for ion trap quantum computing

Quantum computing and neuromorphic computing are expected to take on computationally intensive tasks in the future. However, the step up from lab to real-world application for this next generation computing is yet to be realized, which is why the Research Fab Microelectronics Germany (FMD) has joined forces with the Fraunhofer Institute for Physical Measurement Techniques IPM in order to harness its expertise in the field of photonics.

Digital computers are increasingly reaching their limits in terms of the processing power required for artificial intelligence or edge computing. However, in recent years, researchers (including those at FMD) have started to develop the basis for new technological approaches such as quantum computing and neuromorphic computing. Having joined forces with several Fraunhofer institutes, among them Fraunhofer IPM, the FMD now plans to take this research one step closer to a real-world application: With its "Module Quantum and Neuromorphic Computing" – an initiative funded by the German Federal Ministry of Education and Research (BMBF) – the FMD aims to establish the technical and structural infrastructure needed to develop the hardware and manufacturing techniques for this next generation of computers.

Targeted optimization of lithium niobate waveguides

One promising approach to quantum computing is ion trap quantum computing, which uses ions as computational building blocks (qubits). These qubits are held, manipulated, and read out using laser beams inside an "ion trap". To date, only costly laboratory lasers have been used for this purpose. However, to take ion trap quantum computing to the next level, researchers need to develop integrated optical light sources with a high integration density, which can be produced cost-effectively on a large scale. Lithium niobate waveguides offer an excellent solution here, because they combine several key optical functions, which make them well suited to ion trap quantum computing. Fraunhofer IPM has conducted significant research in this area and therefore has much expertise to offer around the simulation, manufacture, and characterization of integrated optical lithium niobate waveguides.

Editorial notes
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As part of the research initiative, Fraunhofer IPM also plans to procure a "Focussed Ion Beam" system to enable it to optimize existing waveguide manufacturing processes. The aim is to reduce optical losses within the waveguide and adjust key waveguide components with nanometer accuracy – two vital steps to manufacture highly complex integrated photonic light sources with a high degree of reliability

Further information

FMD-QNC
Research Fab Microelectronics Germany — Module Quantum and Neuromorphic Computing (FMD-QNC)

Cooperating partners
AMO GmbH, Forschungszentrum Jülich GmbH, Fraunhofer EMFT, Fraunhofer ENAS, Ferdinand-Braun-Institut gGmbH, Fraunhofer FHR, Fraunhofer HHI, Fraunhofer IAF, IHP GmbH, Fraunhofer IIS, Fraunhofer IISB, Fraunhofer IMS, Fraunhofer IMWS, Fraunhofer IOF, Fraunhofer IPM, Fraunhofer IPMS, Fraunhofer ILT, Fraunhofer ISIT, Fraunhofer IZM.

About the Research Fab Microelectronics Germany (FMD)

As a coperation of the Fraunhofer Group for Microelectronics with the Leibniz institutes FBH and IHP, the Research Fab Microelectronics Germany (FMD for its acronym in German) is the central contact for all questions concerning micro- and nanoelectronics. As a one-stop shop, FMD has been combining scientific excellence, application-oriented technologies and system solutions of the 13 cooperating institutes from the Fraunhofer-Gesellschaft and Leibniz Association into a customer-specific offering since 2017.

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