

PRESS RELEASE

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Fraunhofer launches lighthouse project to develop technologies for 6G

At the beginning of 2021, the Fraunhofer-Gesellschaft launched 6G SENTINEL, a lighthouse project to develop key technologies for the future 6G mobile communications standard. Under the project leadership of the Fraunhofer Institute for Integrated Circuits IIS, five participating Fraunhofer Institutes are pooling their expertise in order to collectively attain a position at the technological vanguard of 6G research. The focus of their work will be on terahertz technologies and solutions for flexible networks.

5G may be garnering all the attention right now, but Fraunhofer laboratories are already busy working on the next generation of mobile communications: 6G will bring about another stride forward in the performance capability of mobile communications as regards peak throughput, user data rate, reliability, latency, energy efficiency and positioning accuracy. Overall, this increase in performance with 6G will be accompanied by much higher connection density.

“In the 6G SENTINEL lighthouse project, the Fraunhofer team is developing novel technologies that will be required for the future 6G mobile communications standard. With these basic technologies for 6G, we want to help strengthen the competitiveness of German industry in a key market for digitalization,” says Prof. Albert Heuberger, Executive Director of Fraunhofer IIS.

The participating institutes are Fraunhofer IIS, the Fraunhofer Institute for Telecommunications HHI, the Fraunhofer Institute for Open Communication Systems FOKUS, the Fraunhofer Institute for Applied Solid State Physics IAF and the Fraunhofer Institute for Reliability and Microintegration IZM.

Terahertz technology and flexible networks

6G will be built on the systematic further development of existing mobile communication technologies while also opening up brand new possibilities. The use of terahertz frequencies above 100 GHz is particularly promising, because they facilitate the extremely high data throughputs that are required for applications such as virtual reality, digital twins, teleoperation and autonomous driving.

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So that mobile communications in the THz range can become a reality, the researchers involved in 6G SENTINEL are working on the development of radio channel models and link-level simulators for the frequency range between 100 and 300 GHz. Building on this work, they plan to develop the prototype of a highly integrated terahertz transmission module and a suitable transmission method for demonstrating mobile THz connections.

The second cornerstone of the project will be the development of software solutions that facilitate the flexible design of networks to align with the application and the current operating conditions. In turn, this requires a modular and software-based core network that will be supplemented by secure and trustworthy components for dynamic control, will allow the integration of new kinds of access and backhaul networks, and will support AI-based network automation. The goal is to develop and demonstrate an adaptable architecture for heterogeneous 6G networks in which satellites and airborne platforms will play a role alongside THz technologies.

Localization and 6G architecture as overarching cross-domain topics

“The twin technological pillars of terahertz communication and flexible networks are at the heart of the 6G SENTINEL lighthouse project. In addition, we want to create a 6G network architecture and develop technologies for even more precise positioning in 6G networks,” explains Bernhard Niemann, project manager of 6G SENTINEL.

Precise localization will be of overarching importance in 6G because new localization approaches will use information about the radio channel to an increasingly systematic extent in order to improve the accuracy of positioning. To this end, the 6G SENTINEL project team will test concepts and algorithms, integrate them functionally into the core network and further develop them into fully integrated localization solutions for the THz range.

The project consortium is planning to merge the technologies developed in the project into a coherent architecture that can serve as the foundation for the flexible implementation of a comprehensive 6G system. To achieve higher transmission rates, the 6G system will generally be characterized by very small cells, the use of THz frequencies and the deployment of antennas with integrated beamforming systems (massive MIMO). At the same time, there is a need for extensive coverage, and so 6G SENTINEL places a special emphasis on the development of solutions for the integration of satellites and other non-terrestrial base stations.

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The Fraunhofer-Gesellschaft, headquartered in Germany, is the world's leading applied research organization. Its research activities are conducted by 74 institutes and research units at locations throughout Germany. The Fraunhofer-Gesellschaft employs a staff of 28,000, who work with an annual research budget totaling more than 2.8 billion euros.

The **Fraunhofer Institute for Integrated Circuits IIS**, headquartered in Erlangen, Germany, conducts world-class research on microelectronic and IT system solutions and services. Today, it is the largest institute of the Fraunhofer-Gesellschaft. Research at Fraunhofer IIS revolves around two guiding topics:

In the area of **"Audio and Media Technologies"**, the institute has been shaping the digitalization of media for more than 30 years now.

Fraunhofer IIS was instrumental in the development of mp3 and AAC and played a significant role in the digitalization of the cinema. Current developments are opening up whole new sound worlds and are being used in virtual reality, automotive sound systems, mobile telephony, streaming and broadcasting.

In the context of **"cognitive sensor technologies"**, the institute researches technologies for sensor technology, data transmission technology, data analysis methods and the exploitation of data as part of data-driven services and their accompanying business models. This adds a cognitive component to the function of the conventional "smart" sensor.

More than 1100 employees conduct contract research for industry, the service sector and public authorities. Founded in 1985 in Erlangen, Fraunhofer IIS has now 14 locations in 11 cities: Erlangen (headquarters), Nuremberg, Fürth, Dresden, further in Bamberg, Waischenfeld, Coburg, Würzburg, Ilmenau, Deggendorf and Passau. The budget of 169.9 million euros is mainly financed by projects. 26 percent of the budget is subsidized by federal and state funds.

Detailed information on: www.iis.fraunhofer.de/en