SERENA: gan-on-Silicon Efficient mm-wave euRopean systEm iNtegration plAtform

The European cooperative research project SERENA, officially started on 1st January 2018 and is coordinated by the Austrian company TECHNIKON. Under the technical lead of Dr. Kristoffer Andersson (Ericsson AB, Sweden), the project team will develop a beamforming system platform enabling scaling of functional performance beyond what is possible in monolithic integration (i.e. CMOS). Complementary to current integration platforms, a hybrid analogue/digital signal processing architecture for optimizing the power efficiency and cost of mm-wave multi antenna array systems will be realised as a proof-of-concept prototype. The project is planned to run for 36 months and receives funding from the European Union under grant agreement number 779305.

SERENA will extend the limits of mainstream semiconductor technologies by developing a low-cost and high-performance hybrid integration platform for high frequency communication systems. The SERENA architecture and platform is suitable for a wide range of applications such as safety radar, high-speed wireless communication, or imaging sensors. There is a strong industry pull to substantially reduce the cost of mm-wave systems for future key markets such as 5G wireless communications and autonomous vehicles (automotive radar sensors). These systems will increasingly rely on active antenna arrays and electronic beam-steering. A fundamental challenge is to bring into production high performance mm-wave active antenna systems, at a viable price-point and low energy consumption.

To tackle this challenge, **SERENA** will extend the limits of mainstream semiconductor technologies by developing a low-cost and high-performance (high-power and high-efficiency) hybrid integration platform for mm-wave systems. The platform will be based on breakthroughs in Gallium Nitride on Silicon (GaN-on-Si) technology and state-of-the-art volume packaging. Compared with state-of-the-art the **SERENA** architecture and platform will bring the following system level advancements:

energy efficiency increased by a factor of 10	size reduction by a factor of 4	cost reduction by a factor of 10	significantly reduced design time/complexity
transmit output power by a factor of 4 to 10	power consumption reduction by a factor of 2 to 5	wireless area capacity (bit/s/km²) increase by 10 to 100 times	
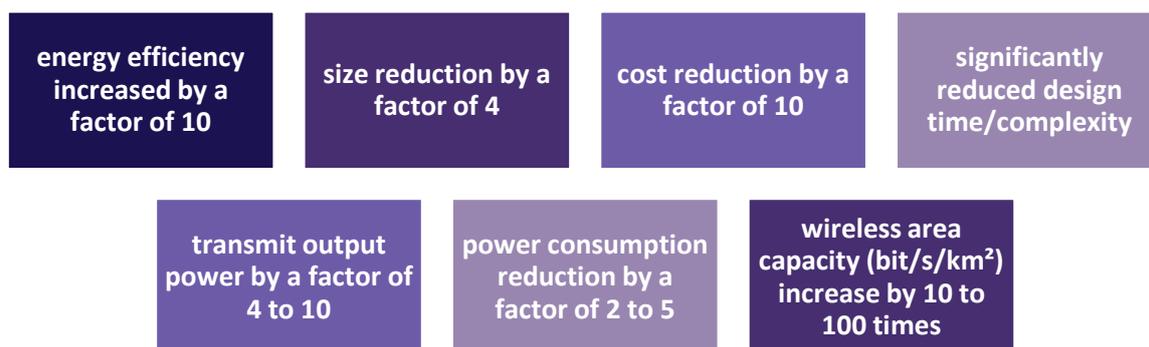
To reach these goals, **SERENA** will provide an optimized hybrid analog/digital mm-wave beam steering system architecture. A proof-of-concept prototype will be built using state-of-the-art GaN-on-Silicon technology, SiGe/CMOS integrated circuits and a novel heterogeneous 3D integration approach to reach low-cost with beyond state-of-the-art performance.

In this project, a GaN-on-Silicon cost- and power efficient mm-wave beam-steering system will be developed as a proof-of-concept for future key markets (mm-wave 5G communication systems and radars for autonomous vehicles) to show the unique capabilities of the **SERENA** technology.

The **SERENA** consortium consists of 10 highly qualified industrial and academic partners from various backgrounds and 6 different countries (Austria, Sweden, Belgium, France, Germany and Greece), making it well-positioned to achieve its objectives.

The SERENA partners are:

- TECHNIKON Forschungs- und Planungsgesellschaft mbH , Austria
- Ericsson AB, Sweden
- Infineon Technologies Austria AG, Austria
- Epigan NV, Belgium
- Ommic SAS, France
- Totalförsvarets Forskningsinstitut, Sweden
- Fraunhofer Gesellschaft zur Förderung der angewandten Forschung E.V., Germany
- Institute of Communication and Computer Systems, Greece
- Chalmers Tekniska Högskola AB, Sweden
- Technische Universität Berlin, Germany

The official Kick-Off meeting took place from 15th-16th January 2018 and was be hosted by Infineon Technologies Austria AG in Villach.

For more information, please visit http://www.serena-h2020.eu [coming soon]

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