

6. Publishable Summary

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Real economy and society in near future will be dominated by much more intelligent and connected equipment and devices than today. This is part of the concept described by the Internet of Things (IoT) - transforming the real economy into the digital economy. Micro- and nanoelectronic components and systems are the key enablers for that transformation process. While the semiconductor ecosystem itself employs approximately 250,000 people across Europe directly and 2,500,000 in the complete components value chain the leverage effect on the future digitalized economy becomes increasingly important. The European Union has set the stage to empower semiconductor manufacturing in Europe being one of the key drivers for innovation, employment and creator for answers to the challenges of a modern society. IoSense is designed as an Innovation Action (IA) to boost the European competitiveness of ECS industries, by establishing three fully connected semiconductor pilot lines in Europe to enable the production of innovative sensor system components.

IoSense will increase the manufacturing capacity of sensor/MEMS components in the three involved Pilot Lines by factor of 10 while improving manufacturing cost and manufacturing time.

The new pilot lines will follow a real modular approach, being connected to world leading specific and highly specialized associated manufacturing lines in Europe (AMS, APC, BTE, Fraunhofer IPMS and IMEC), acting as value-chain based network for fast new product introduction (From idea to market).



Figure 1: Structure of IoSense Fully Connected Pilot Lines

Key innovations in the IoSense pilot line project focus especially on frontend technologies, sensor packaging and system integration technologies and systems for:

- MEMS (Pressure, etc.)
- Optical (photo-acoustic, monochromatic, LiDAR, 3D imager)

- Radar
- Magnetic (Hall, xMR)
- Gas (metal-oxide-based, photo-acoustic)
- Temperature
- Environmental (fine dust)

Focus will be on the availability of top innovative, competitive sensors and sensor systems “Made in Europe” for key application in the domains of Mobility, Society, Health, Energy, and Production – IoSense builds solutions that connect the real analogue world with the global digital networks.

IoSense will demonstrate the project achievements with the following demonstrators:

- Mobility: Active perception sensor system focused on urban efficiency enhancement
- Society: Smart lighting
- Energy: Energy-efficient building demonstrator incorporating multiple diverse IoT sensor systems
- Health: Indoor and outdoor air quality and dust pollution monitoring for urban environments
- Production: (1) Sensor functions for process technologies and (2) Advanced smart industrial technology universal sensor

Further demonstrators will show innovative key aspects for future IoT systems, e.g.

- Self-configuration and self-healing mechanisms and
- Concepts for power-aware and security-aware configurations

Today many competitors are already involved in the development of sensor systems for applications in the emerging Internet of Things. But there is a significant gap between those forces and the capabilities to bring ideas into the high volume market fast enough. IoSense will close this gap by providing modular flexible pilot lines with a close connection between technology and application ready to manufacture each kind of prototypes.

IoSense is designed to enable focused development work on technological as well as application oriented tasks combined with market orientation. “Design to Market Needs” will be accomplished by partner and customer involvement, embedding all required functionality besides sensors: microprocessors, data storage and elaboration, data transceiving on state-of-the-art connectivity standards and security solutions in hard- and software. Finally, the time for idea-to-market for new sensor systems is intended to be brought down to less than one year.

The intended close connection between technology (sensor systems) and application (IoT) requires the setting up of an adequate value creating network and eco system. Through this consortium competitive IoT sensor system architectures build on innovative and producible sensor semiconductor components will be specified, drafted, designed, manufactured and validated within IoSense. The development of sensor systems asks for multi physics and multi domain engineering capabilities – simulation topics will be carried out intensively. Models as well as simulation tools will be covered.

Results from IoSense will be available in different domains:

- Requirement collections for new sensor systems and IoT aspects of sensor systems
- New integrated and discrete sensor / MEMS devices for multiple applications in all key domains
- New sensor related FE and BE technology modules and technologies
- ASIC’s for the interface between sensor and signal processing system and modules for analogue and digital signal processing
- IoT-oriented software concepts and code

IoSense pilot lines will be empowered to manufacture those sensor system variants, which are efficiently and effectively fulfilling the main requirements of the IoT-sensor-systems market which is intended to get a size of \$400B in 2024. As a result, semiconductor manufacturing will get a new boost in Europe enabling the industry with competitive solutions, securing employment and providing answers to the upcoming challenges in the IoT era.