Assembly and packaging technologies for combined electronics, optics and photonics enable the success of a product in terms of performance, reliability, and cost. With the recent developments in optical sensors, Micro-Opto-Electro-Mechanical Systems (MOEMS), which integrate photonics and electronic components, the packaging of systems is getting more complex than ever, increasing the need for advanced assembly and specialized manufacturing processes. APPLAUSE will build on the
European leadership and expertise in advanced packaging and assembly to develop new tools, methods, and processes for high volume mass manufacturing, and to create the necessary environment for keeping the manufacturing and packaging value chain in Europe.

The project will focus on the following key technologies:
• Ultra-thin wafer and die handling and packaging solutions
• High precision photonic packaging
• New bonding technologies for sensitive optics components
• Medical and biocompatible photonic packaging
• Moulding & 3D integration for optical component manufacturing
• New metrology / inspection methods

Work performed from the beginning of the project to the end of the period covered by the report and main results achieved so far

TECHNICAL ACTIVITIES:
During the first period the six use cases (UCs) were defined in terms of functionality, requirements, and technologies to be used. All partners have been strongly involved in the iterative discussions in providing the requirements and specifications for each use case:
1. Substantially smaller 3D integrated ambient light sensor for mobile and wearable applications (ams AG)
2. High performance, low cost, uncooled thermal IR image sensor for automotive and surveillance applications (IDEAS)
3. High speed datacom transceivers with reduced manufacturing costs (DustPhotonics)
4. Flexible patch for cardiac monitoring (Precordior)
5. Miniaturized invasive cardiac sensors (Cardiaccs)
6. Optical humidity measurement modules with cost-effective packaging of components (Vaisala)

In WP3 partners compiled the simulation requirements and specifications in the context of UC specifications from WP2. Modelling and simulation objectives and approaches were discussed, the design developments of the use cases were started and progressed. The packaging concept, thin wafer investigations, the development of test structures, reliability considerations were on focus. First modelling activities of the use case components have also been started. In WP4 the focus was on aligning technology developments with the separate use cases and the specifications defined in WP2. WP6 will develop test strategies for each use case and analyse specimens accordingly. Good progress has been made in feeding the specifications into the test strategies. Characterisation of electro-optical properties have mainly started with early materials from two use cases and metrology development for electro-optical wafer tests on ultra-thin wafers has started.

NON-TECHNICAL ACTIVITIES:
The APPLAUSE grant agreement was signed by both parties and the project started officially on May 1st, 2019. The kick-off meeting was successfully held in Leuven, Belgium, in May 2019. A second consortium meeting was held in Helsinki, Finland in November 2019. The unforeseen changes brought on by covid-19 saw many of the events and meetings planned for spring 2020 changed to
online events. APPLAUSE partners have been engaged in several dissemination activities and events to increase the visibility of the project and raise awareness of the project among external stakeholders. Several means have been deployed for both internal and external communication, including the APPLAUSE project website, LinkedIn account, and CircaBC for internal file sharing.

Progress beyond the state of the art and expected potential impact (including the socio-economic impact and the wider societal implications of the project so far)

Through the APPLAUSE project, European industry will build on the European expertise in advanced packaging and assembly to develop new simulation and test methods, processes and related process equipment, as well as process control equipment for high volume manufacturing of advanced packages combining semiconductors, optics and photonics. Work towards these objectives has started in finalizing the use case pilots’ specifications and requirements to guide the future work towards these targets. The development of novel equipment, processes and software components has also begun.

Last update: 5 October 2020