

## Project abstract Title: **3D HapticTouch ASIC**

The **3D HapticTouch ASIC** project aims to develop an ASIC, based on results from an ongoing Vinnova project (MEMS-based ultrasonic sensor Fas-2) that will allow for the combination of ultrasound sensors **and haptic touch and audio feedback** to be used in self-driving autonomous vehicles. If successful the project partners, representing the whole value chain will be able to commercialise the world's first sensor transducer platform for haptic feedback on a mm scale, and at a price that makes it commercially viable to integrate it in the cockpit of a vehicle.

The project's focus is to develop the ASIC in order to be able to demonstrate the Analog part for Transmit and Receive (Tx/Rx) of the (Micro Electromechanical System) MEMS ultrasound transducer and re-use the digital part in a FPGA solution developed in the 2017-18 ISU-2 project, with support from ShortLink, a world leading developer of ASICs, and with input from an end user (Autoliv, the world's largest automotive safety supplier), to help verify the compatibility and commercial potential of the system, Autoliv will therefore be an important partner in the development process, with the aim that they will take the final prototypes and test them further in an end-user environment. The work will also be supported by researchers from Linköping University who will offer vital input from their analysis and research during the R&D process, especially identifying more sophisticated and energy effective modulation technologies. In addition, Mycronic AB will join as an important stakeholder to further evaluate additional applications, such as 3D ultrasound imaging for pick and place robotics applications (see LOI) and ABB Robotics has also indicated an interest in studying the technology and its potential use in many other applications.

The project will end with a number of prototypes having been produced, which will be further tested in an operational environment after the project (Q4 2019). If successful, the market potential is substantial. With an indicative market size of ~4 Bp considering the automotive segment alone. Global Automotive Cameras Market is expected to reach \$33 billion by 2024; growing at a CAGR of 17.5% from 2016 to 2024<sup>1</sup>

### Objective

The goal is to develop an ASIC with the following characteristics:

- Possible to mass produce in IC Foundries (for example AMS Austria, X-Fab-Germany, STM-France, TSMC-Taiwan etc.) at cost of less than 5 USD,
- Less than 1 mW / channel in total power consumption thereby making possible its use in mobile units.
- A minimized ASIC form factor of ~50-100 mm<sup>2</sup> (5-7 x 8-12 mm) with a thickness of less than 0.3 mm.
- Allowing both analog and digital Tx/Rx beam forming of 96x96 channels pMUT transducers

### Abstract

4 partners will develop two generations of ASICs for ultrasound-based 3D imaging microsensor system. Technology is unique world-wide and includes the use of MEMS pMUT transmitters. The goal is to energy-efficient and minimize systems to open up new uses, especially in vehicle safety. Two generations of ASICs will be developed in the project, a first analog version of beamforming Tx / Rx control where digital algorithms are implemented in an FPGA solution. Technical development and end-user performance testing are done in 5 work packages combined with WPs for project management and a workpackage of business intelligence survey and alternative applications and spill over technologies.

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**Other project partners:** ShortLink (SME); LiU-ISY (ROT); Autoliv (Large Ind.)

*(ExAudio and Brann sub contractors), Mycronic as advisor and spill-over partner.*

**Total cost of project:** 8 915,400 SEK

**Total grant:** 3 990,000 SEK

<sup>1</sup> [www.variantmarketresearch.com/report-categories/automotive/global-automotive-cameras-market](http://www.variantmarketresearch.com/report-categories/automotive/global-automotive-cameras-market)

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