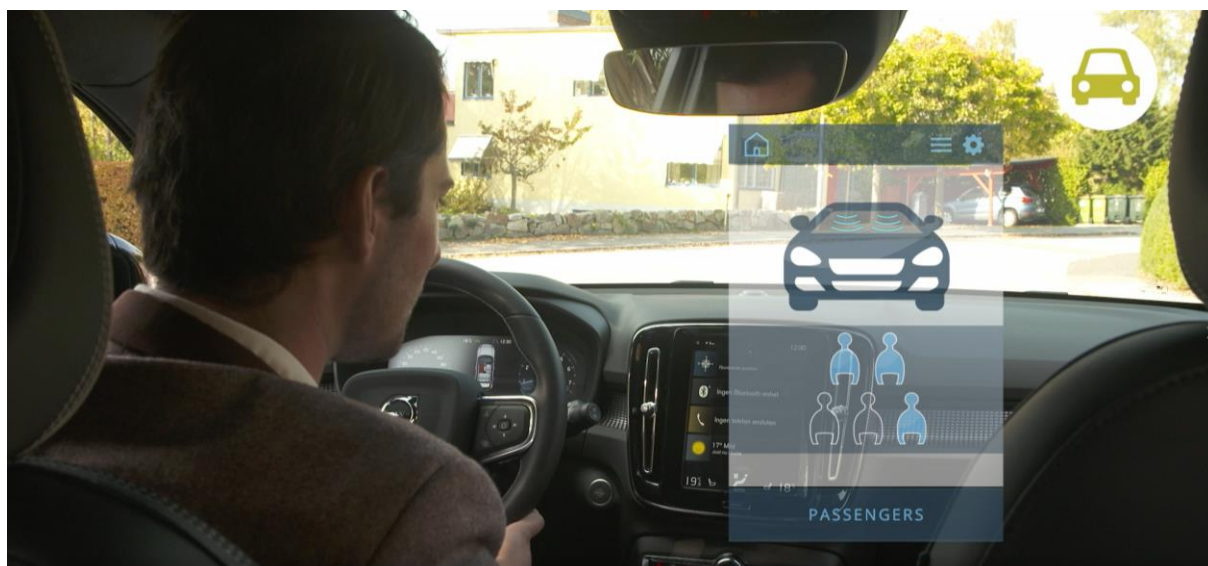


# Radars för ökad säkerhet i gränssnitt mot människa

Publik rapport



Författare: Acconeer AB  
Datum: 2020-12-21  
Projekt inom Elektronik, mjukvara och kommunikation

**FFI** Fordonsstrategisk  
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## Kort om FFI

FFI är ett samarbete mellan staten och fordonsindustrin om att gemensamt finansiera forsknings- och innovationsaktiviteter med fokus på områdena Klimat & Miljö samt Trafiksäkerhet. Satsningen innebär verksamhet för ca 1 miljard kr per år varav de offentliga medlen utgör drygt 400 Mkr.

För närvarande finns fem delprogram; Energi & Miljö, Trafiksäkerhet och automatiserade fordon, Elektronik, mjukvara och kommunikation, Hållbar produktion och Effektiva och uppkopplade transportsystem. Läs mer på [www.vinnova.se/ffi](http://www.vinnova.se/ffi).

# 1 Sammanfattning

Acconeer have together with its customers studied the benefit of the pulsed coherent radar technology in two applications where there exist safety hazards today, namely passenger detection and gesture control. Emphasis have been on establishing a road map within these use cases and challenges related to autonomous driving level 4 and 5, to be able to define future sensor products and solutions that would benefit users and the Swedish Automotive industry.

For passenger detection we have demonstrated a proof-of-concept (PoC) solution, integrated in the ceiling of a car, that can detect tiny movements from a baby's chest only from the beating of a heart, and through clothing and blankets. This feature is critical to be able to offer a 100% detection rate system to avoid that children are forgotten in hot cars.

For gesture control we have demonstrated a PoC solution integrated in the arm rest of a car seat, which allows for control of car functionality in a user defined interaction volume. The interaction volume allows for easy, intuitive, and robust interaction between human and car to minimize distractions. The solution is designed to avoid distraction while performing common tasks such as answering a call, adjusting volume, or toggling functions, as the user does not need to precisely interact with a touch display or physical button.

The project has worked to establish use case and feature road maps within these two domains and demonstrated PoCs have helped to get interest and feedback from customers on the road maps to the level where we have been able to collect requirements on a future sensor product that can support the road maps. The prestudy has worked with these requirements and established a first version of a system requirement specification and corresponding system model, to accurately simulate the performance of the future sensor product in the respective use cases. This system model makes it possible to investigate system performance parameters such as accuracy, resolution, latency, cost, and power consumption, to find the best trade-off between these. Based on this system requirement specification we have developed a project plan and budget for the sensor development project and subsequent vehicle development program milestones in order to get the product to market.

One specific subject that has been studied in detail is industry safety requirements and ISO 26262 safety development process. Based on discussions with customers we have found that the passenger detection use case will require ASIL classification and this has been accounted for in the project plan and budget.

Both passenger detection and gesture control have been studied in the context of future vehicle platforms offering autonomous driving and flexible interior. We have used this knowledge to attract interest from OEMs for a continued vehicle development program for which Acconeer, together with partners, will apply funding for from FFI during 2021.

## 2 Executive summary in English

The prestudy has helped Acconeer and its customers to understand the benefit of the pulsed coherent radar technology in two applications where there exist safety hazards today, namely passenger detection and gesture control. Emphasis has been on challenges related to autonomous driving level 4 and 5 and flexible interior, to be able to define future sensor products and solutions. The project has worked to establish use case and feature road maps within these two domains and demonstrated PoCs have helped to get interest and feedback from customers on the road maps to the level where we have been able to collect requirements on a future sensor product that can support the road maps.

## 3 Syfte, forskningsfrågor och metod

Understand the benefits of pulsed coherent radar technology in two applications where there exist safety hazards today, namely passenger detection and gesture control. This was done through market analysis, customer requirement collection, system simulations and experimental proof of concepts.

## **4 Mål**

The objective of the prestudy was to allow Acconeer and its customers to understand the benefit of the pulsed coherent radar technology in two applications where there exist safety hazards today, namely passenger detection and gesture control. Emphasis was on challenges related to autonomous driving level 4 and 5 and flexible interior, to be able to define future sensor products and solutions.

## **5 Resultat och måluppfyllelse**

The project has worked to establish use case and feature road maps within these two domains and demonstrated PoCs have helped to get interest and feedback from customers on the road maps to the level where we have been able to collect requirements on a future sensor product that can support the road maps. We have used this knowledge to attract interest from OEMs for a continued vehicle development program.

## 6 Spridning och publicering

### 6.1 Kunskaps- och resultatspridning

Hur har/planeras projektresultatet att användas och spridas?	Markera med X	Kommentar
Öka kunskapen inom området		
Föras vidare till andra avancerade tekniska utvecklingsprojekt	x	
Föras vidare till produktutvecklingsprojekt	x	
Introduceras på marknaden		
Användas i utredningar/regelverk/tillståndsärenden/ politiska beslut		

### 6.2 Publikationer

No publications

## 7 Slutsatser och fortsatt forskning

Acconeer has together with customers concluded on a sensor product requirement specification to support developed road maps for gesture control and passenger detection. This has been formalized into a sensor development project and vehicle development program milestones to allow several innovative features to be added to future autonomous driving level 4 and 5 vehicles. To enable these features extensive research and development is needed in terms of radar sensor, but also on sensor fusion, vehicle integration, and functional safety. Based on obtained results Acconeer will together with partners apply for a continued vehicle development program from FFI during 2021.

## 8 Deltagande parter och kontaktpersoner

Acconeer AB, Mikael Egard