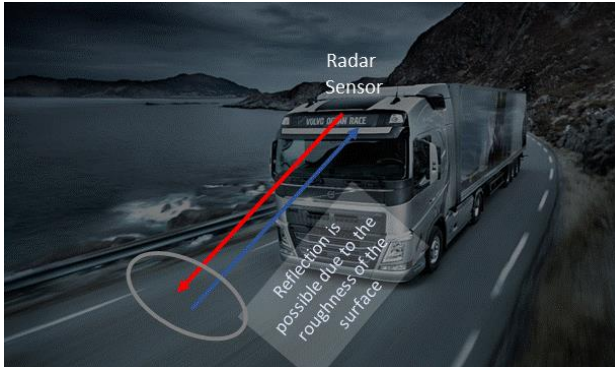


# Road surface recognition at mm-wavelengths using a polarimetric radar

## Background



Thin formations of ice on road surfaces contribute to traffic accidents in winter and cause many casualties all over the world. A radar sensor capable of detecting ice in front of a moving car can deliver warning to the driver or to the control system of the vehicle. Mm-wavelengths are attractive for traffic safety related applications due to their short wavelengths, which allow building compact antennas in combination with availability of

technology and frequency spectrum. However, at mm-wavelengths the road surface appears to be a distributed target with many random scatters contributing to the reflection. Distributed targets are inherently random, and a single measurement is not sufficient to extract reliable information about its surface properties. Therefore, a statistical approach must be adopted. In this project we want to use polarimetric attributes such as target entropy (TE), which is a measure of target disorder and polarimetric pedestal (PP), which is a measure of the degree of depolarization generated by the target, to analyze the surface.

## About the project

In this project we want to build a polarimetric radar at 80 GHz that can be installed on a vehicle and used to evaluate road surface in real traffic conditions. The RF part will have 2 transmitters (Tx) and 2 receivers (Rx): one Tx/Rx pair for horizontal and one Tx/Rx for vertical polarization. To build the radar you will use a mm-wave radar sensor evaluation kits, which are commercially available from, for example, Texas Instruments (TI)<sup>1</sup>.

## Your responsibility

Your work will include hardware design/assembly and interface to a duo polarization antenna. In addition to, data acquisition, signal processing and radar calibration. Finally, the radar-prototype will be installed on a vehicle and tested in real traffic conditions.

## Qualifications

We are looking for 1, or team of 2 students with background in microwaves and/or signal processing. The project will be conducted at Gotmic with supervision from the "microwave electronics laboratory" at MC2/Chalmers.

## About us

Gotmic is a high frequency mm-wave company with the vision and mission to make high frequency MMIC chips (50 - 120 GHz) affordable having high quality and yield. We bring together more than 15 years of knowledge and experience of high frequency circuit design, fabrication and contact with major foundries.

## Contact

Rickard Lövblom: rickard.lovblom@gotmic.se

Vessen Vassilev: vessen.vassilev@chalmers.se

---

<sup>1</sup> AWR1443 single-chip 76-GHz to 81-GHz automotive radar sensor evaluation module