

**Unsettled Topics  
Concerning Coating  
Detection by LiDAR in  
Autonomous Vehicles**

**Cristina Porcel Magnusson**

# Unsettled Topics Concerning Coating Detection by LiDAR in Autonomous Vehicles

**Cristina Porcel Magnusson**  
*Skansense CLU*

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**EDGE DEVELOPMENT TEAM**

---

Christopher Seubert, PhD, *Ford Motor Company*

Donald H. Campbell, *BAE Systems Corporation*

Hanno Holzhueter, *Ibeo Automotive Systems GmbH*

Niels de Boer, *Centre of Excellence for Testing and Research of Autonomous Vehicles—NTU Singapore*

Raymond Schulz, *Ibeo Automotive Systems GmbH*

Serge Lambermont, *Autobotik Pte. Ltd.*

Yu Pan, PhD, *Motional Singapore Pte. Ltd.*





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## About the Editor



**Cristina Porcel Magnusson** has more than 19 years of experience in senior international positions, mainly in the areas of research and development (R&D), quality, and testing in automotive tier-one suppliers like Valeo, Faurecia, and Bosch. She has a strong technical background in the fields of optics, powertrain, and car body. She enjoys innovation, testing, and standard compliance.

Cristina started her career as a quality systems consultant and has worked in the automotive industry for more than 15 years. She led the design validation of the first Advanced Front-lighting System (AFS)—or bending light headlights—in Valeo Lighting Systems for Volkswagen headquarters in Wolfsburg, Germany (Touareg and Phaeton models).

She joined Faurecia in 2004 as Engineering and Lean Manufacturing manager for the Interior Systems division, entering the international talent program in Nanterre-Paris. Later, she joined Bosch as an International R&D Project Manager for fuel filter development, for customers including Opel/Russelheim and GM Detroit.

In her role as Global Director of Project Quality at Gestamp Automotive, she was responsible for more than 100 sites globally on new product launches, and standards compliance. She worked with senior customers like Volkswagen and

Toyota in the U.S., Europe, Mexico, Brazil, India, and China in the areas of car body and chassis.

In 2016, she founded SkanSense out of the European Space Agency (ESA) incubation program. SkanSense specializes in autonomous vehicle consultancy and light detection and ranging (LiDAR) testing. Currently, the company is working in the digital transformation of coatings and materials and their interaction with perception systems for New Mobility.

Awarded female entrepreneur of the year (Madrid, 2017) and innovator leader by the Spanish MIT Economic Forum 2018, she has also served as a professor at Comillas Pontifical University of Madrid and as a speaker in seminars at the Polytechnic University of Guangzhou in China, the Centre of Excellence for Testing and Research of Autonomous Vehicles at Nanyang Technological University (CETRAN) in Singapore, and the Car Body Painting conference by Automotive Circle in Detroit.

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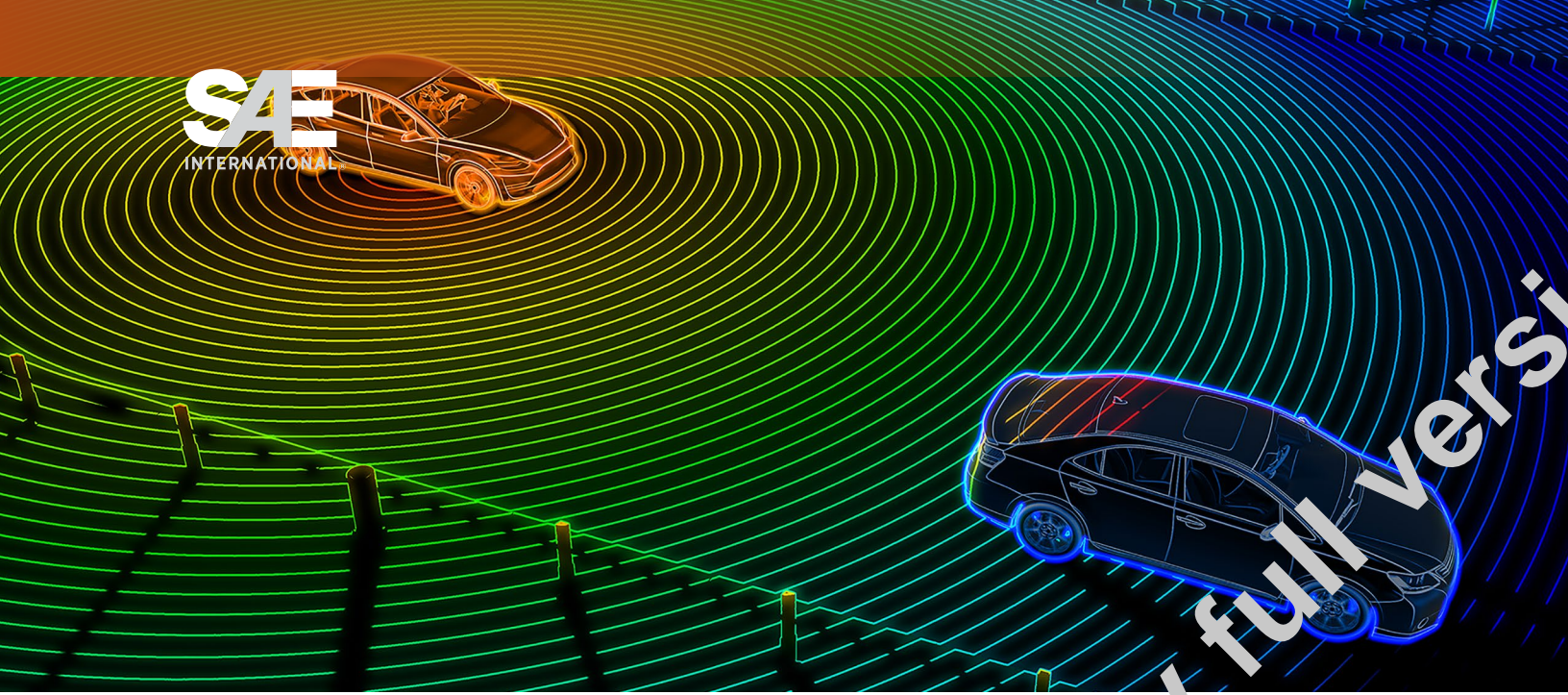
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# Unsettled Topics Concerning Coating Detection by LiDAR in Autonomous Vehicles

## Abstract

Autonomous vehicles (AVs) utilize multiple devices, like high-resolution cameras and radar sensors, to interpret the driving environment and achieve full autonomy. One of these instruments—the light detection and ranging (LiDAR) sensor—functions like radar, but utilizes pulsed infrared (IR) light, typically at wavelengths of 905 nm or 1,550 nm. The LiDAR sensor receives the reflected light from objects and calculates each object's distance and position.

In current vehicles, the exterior automotive paint system covers an area larger than any other exterior material. Therefore, understanding how LiDAR wavelengths interact with other vehicles' coatings is extremely important to the safety of future automated driving technologies.

Some coatings are more easily detected by LiDAR than others. In general, dark colors can absorb as much as 95% of the incident LiDAR intensity, reducing the amount of signal reflected toward the sensor. White cars are more easily detected as they exhibit high IR reflectivity. Many other factors like gloss level, effect pigments, and refinishes can affect reflectivity and even blind LiDAR sensors.

On the other hand, several variables define overall LiDAR and perception system performance, including IR reflectivity of paint but also the target object's geometry, the type of LiDAR technology employed, angle of the target surface, environmental conditions, and sensor fusion software architecture.

Sensing technologies and Materials are two different industries that have not directly interacted in the perception and system sense. With the new applications in the AV industry, approaches need to be taken in a multidisciplinary way to ensure a reliable and safe technology for the future.

This report provides a transversal view of the different industry segments from pigment and coating manufacturers to LiDAR component and vehicle system development and integration, and a structured decomposition of the different variables and technologies involved.

NOTE: SAE EDGE Research Reports are intended to identify and illuminate key issues in emerging, but still unsettled, technologies of interest to the mobility industry. The goal of SAE EDGE Research Reports is to stimulate discussion and work in the hope of promoting and speeding resolution of identified issues. These reports are not intended to resolve the challenges they identify or close any topic to further scrutiny.

**CRISTINA PORCEL MAGNUSSON**  
*SkanSense SLU*

### Edge Development Team

Christopher Seubert, PhD, *Ford Motor Company*  
Donald H. Campbell, *BASF Corporation*  
Hanno Holzhüter, *Ibeo Automotive Systems GmbH*  
Niels de Boer, *Centre of Excellence for Testing and Research of Autonomous Vehicles—NTU Singapore*  
Raymond Schulz, *Ibeo Automotive Systems GmbH*  
Serge Lambermont, *Autobotik Pte. Ltd.*  
Yu Pan, PhD, *Motional Singapore Pte. Ltd.*

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