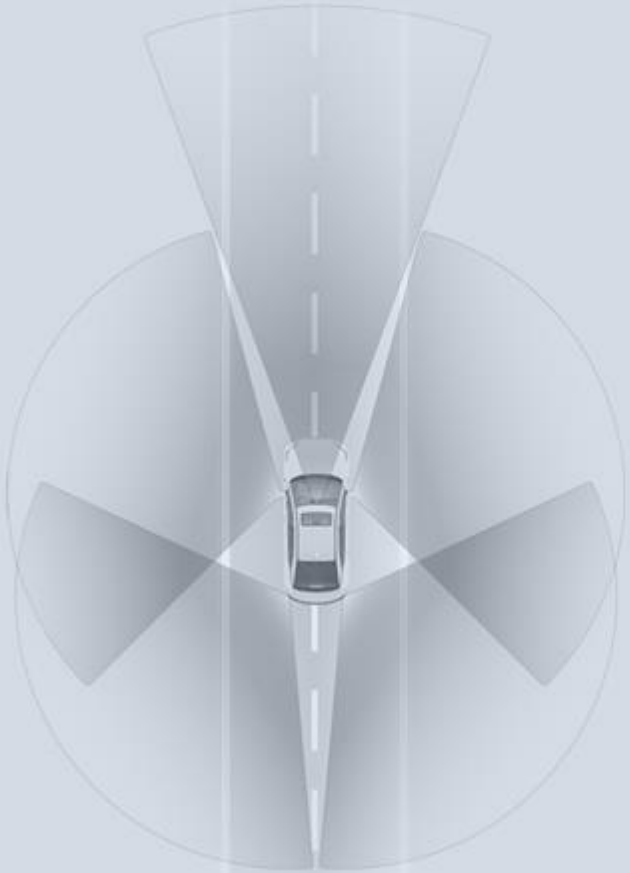
HYBRID LIDAR SYSTEMS AG

Breakthrough for Autonomous Driving

Lidar Sensors for Level 3-5 Autonomy



AZO Space of Innovation

1/40 BEST HIGHTECH VENTURE DAYS 2019

PLUGANDPLAY

European Commission
Horizon 2020
European Union funding for Research & Innovation
SEAL OF EXCELLENCE

ZIM Zentrales Innovationsprogramm Mittelstand

Supported by:
Federal Ministry for Economic Affairs and Energy
on the basis of a decision by the German Bundestag

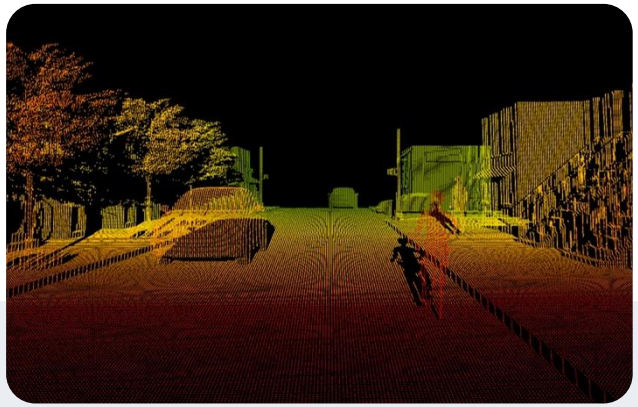
pwc

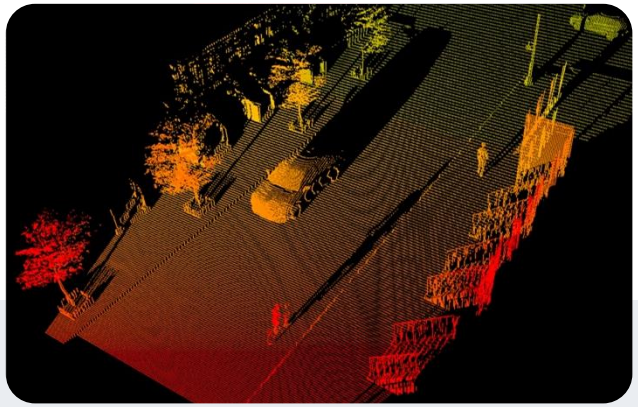
DEKRA AWARD

Lidar & Camera Comparison: Distance Instead of Colour



Regular Camera Image





Lidar Image

Instead of colour, each pixel knows the distance to the object (represented by colour)

Lidar images allow to create a 3D scene

Knowing the exact distance to the objects allows a car to drive safely

Strictly private and confidential

Autonomous Driving Is a Safety Feature and Requires Redundancy



> Lidar technology is (…) the only way to offer redundant perception to the 360 camera systems which are a must. Safety is really crucial in autonomous driving. For level 3 driving you need redundant perception.

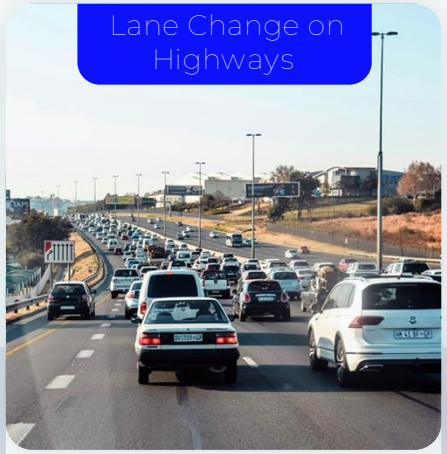
Herbert Diess

Former CEO Volkswagen

Strictly private and confidential

Autonomous Driving Use Cases That Need to Be Solved

Lane Change on Highways



Challenge:

Approaching motorcycle on adjacent lane from the back

Rear Corner Sensors required with Medium Measurement Range

Intersection Crossings

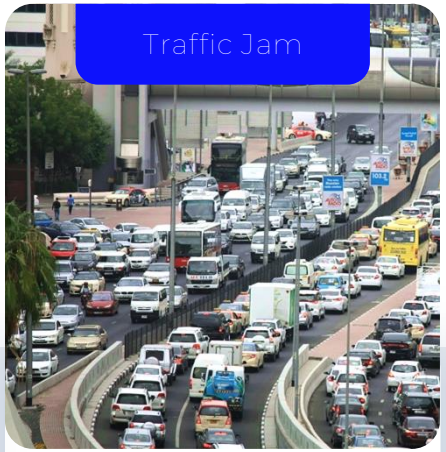


Challenge:

Approaching motorcycle on crossing road at 45 deg line of sight

Front Corner Sensors required with Medium Angular Resolution

Traffic Jam



Challenge:

Near field cut-in

Front Corner Sensors required with Large Horizontal Field of View OR Roof Top Sensor

Overhanging Load



Challenge:

Small object at front window height

Front Corner Sensors required with Large Vertical Field of View OR Roof Top Sensor

Small Obstacles



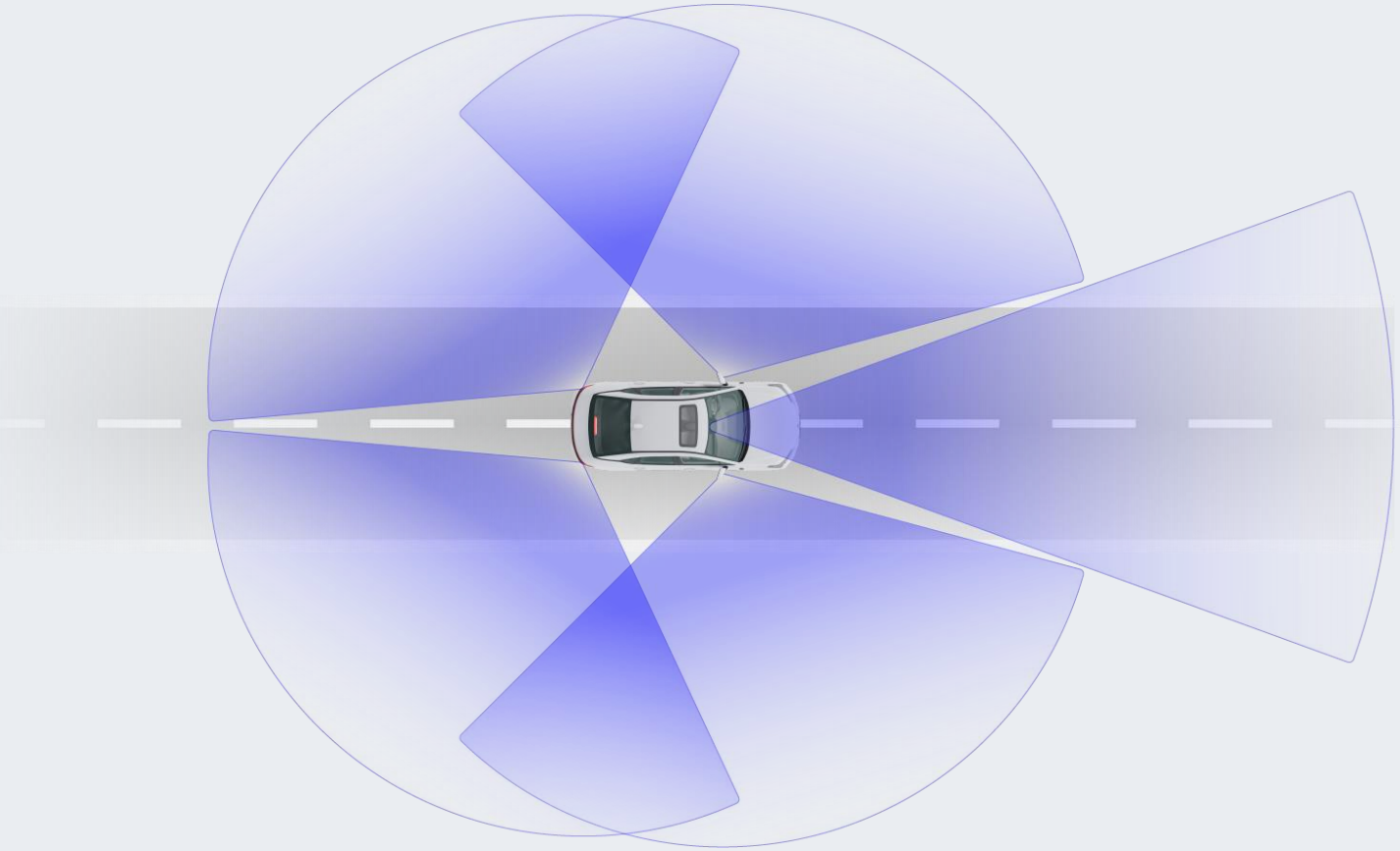
Challenge:

Black tyre laying on empty highway at night time

Roof Top Sensor with Long Measurement Range and High Angular Resolution and Medium Vertical & Horizontal Field of View

Strictly private and confidential

Therefore a High Resolution, Inexpensive View Around the Car Is Required

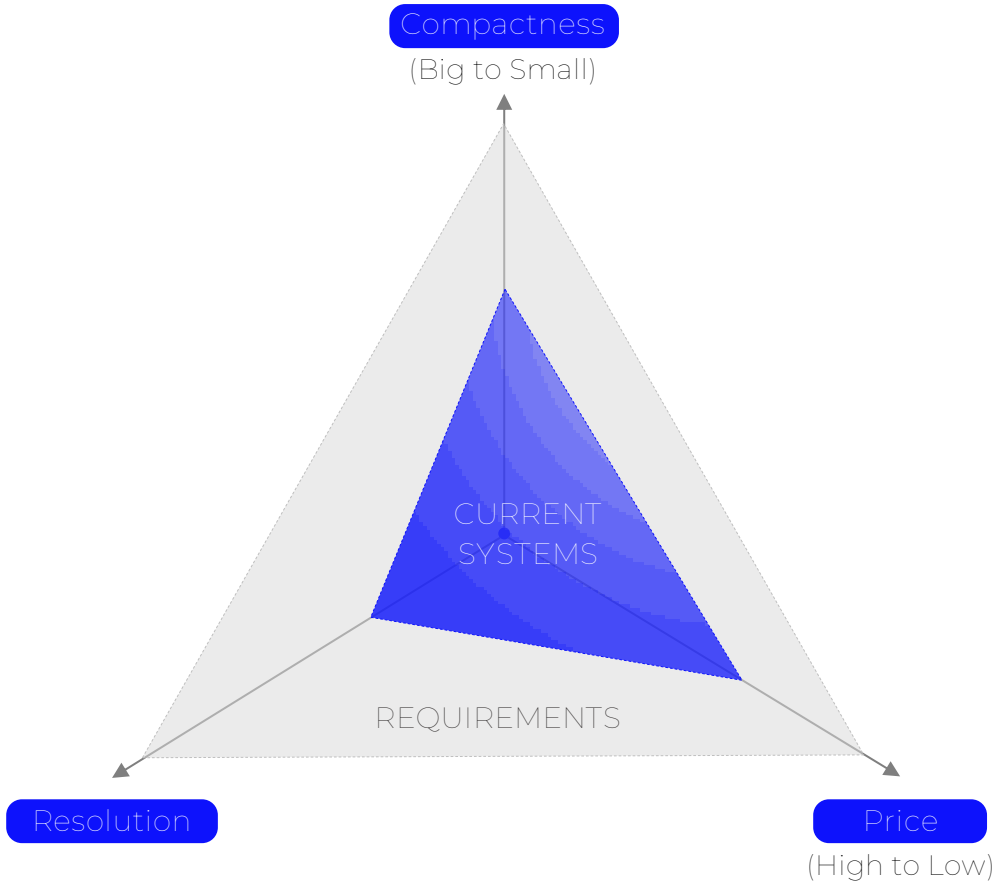


Required Lidar Setup:

- Round view to detect and classify all obstacles
- 1x Long Range Lidar and 4x Corner Lidars
- Lidar must be small enough to fit into car design
- Sensor costs less than 350€ for long range and 250€ for short-range

Strictly private and confidential

Current Systems Are Not Suitable for a Round View



01 **Compactness:**
Design Requirements
Sensor must fit into car design
⊗ Current sensor are too bulky

02 **Resolution:**
Object Classification Requirements
Sensor must detect and classify 10cm objects in 200m distance
⊗ Current sensors can only detect but not classify the object

03 **Price Requirements**
Sensor must cost below 350€
⊗ Current sensors 800€ and above

Strictly private and confidential

Current Lidars Too Bulky for Attractive Car Designs

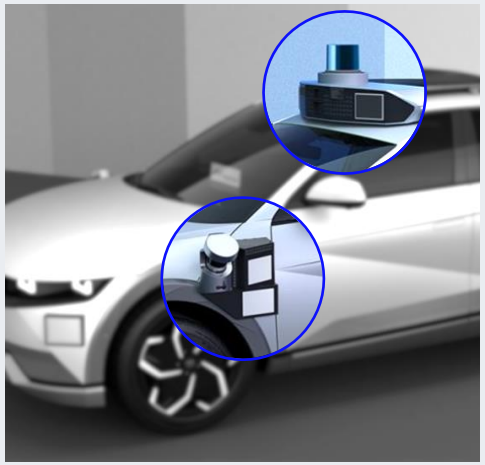
Design is the most important aspect of car sales. Current systems are not acceptable for designers.

Making them smaller means developing completely new technological approaches.

Examples of Current Systems

Long Range:

Sensors too bulky for radiator grille and must be built onto the roof







Corners:

No compact lidars exist. Bulky long range lidar used for corners

Strictly private and confidential

Current Lidars Cannot Classify Objects in 200m Distance

Current Technology

Low Resolution
(up to 30k pixels)

Resolution not enough to classify object. This is necessary to make an informed brake-or-drive decision.

Resolution is enough for detecting objects only.

Strictly private and confidential

Current Lidars Are Based on Technology that Is Expensive in Manufacturing

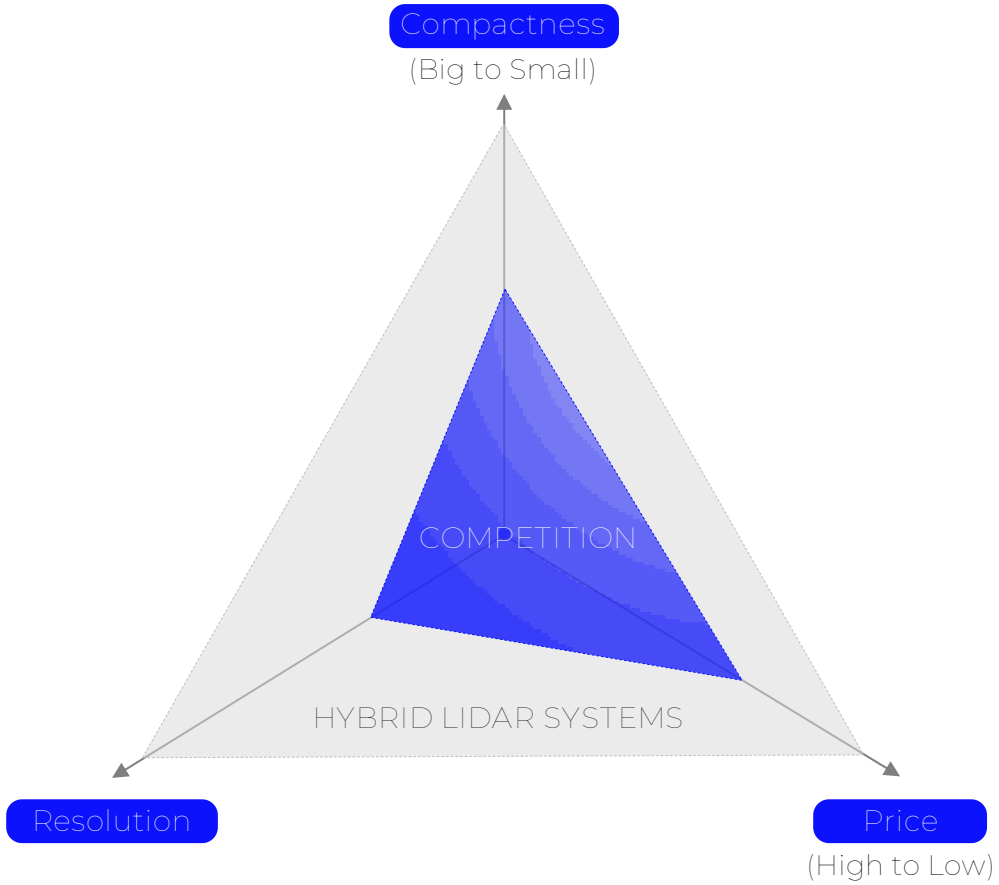
Selling Price to Automotive

* Source Yole Development Lidar Research 2022



Strictly private and confidential

Hybrid Lidar Systems Has Solved the Impossible Trinity



- Lidar technology that is compact enough
- Can classify objects in 200m distance
- Is cheap in manufacturing

Strictly private and confidential

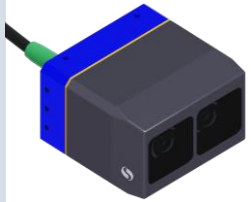
Two Hybrid Lidar Systems Sensors that Fulfil All Automotive Requirements

Long Range Lidar

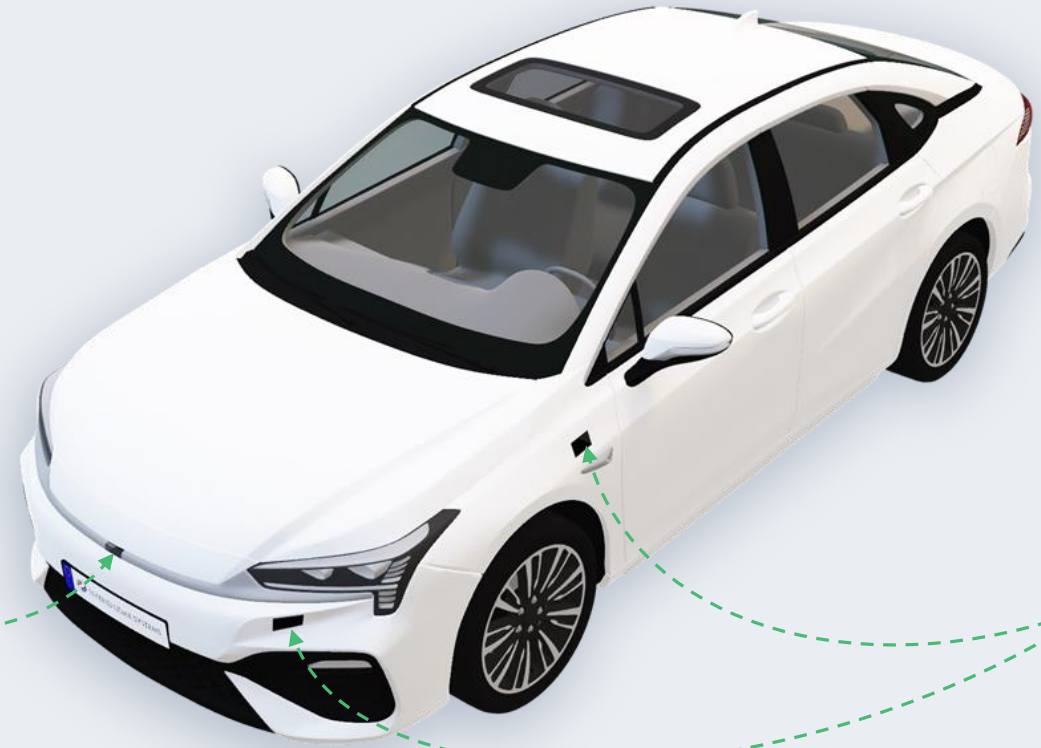
Sensor for classifying objects in 200+ meters

Compact enough to be built into the radiator grille

Resolution: 120k pixels



340€



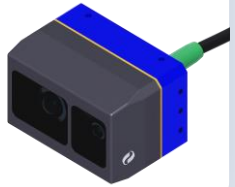
Corner Lidar

Compact sensor with wide field of view

Fits into cars' corner installation space and design

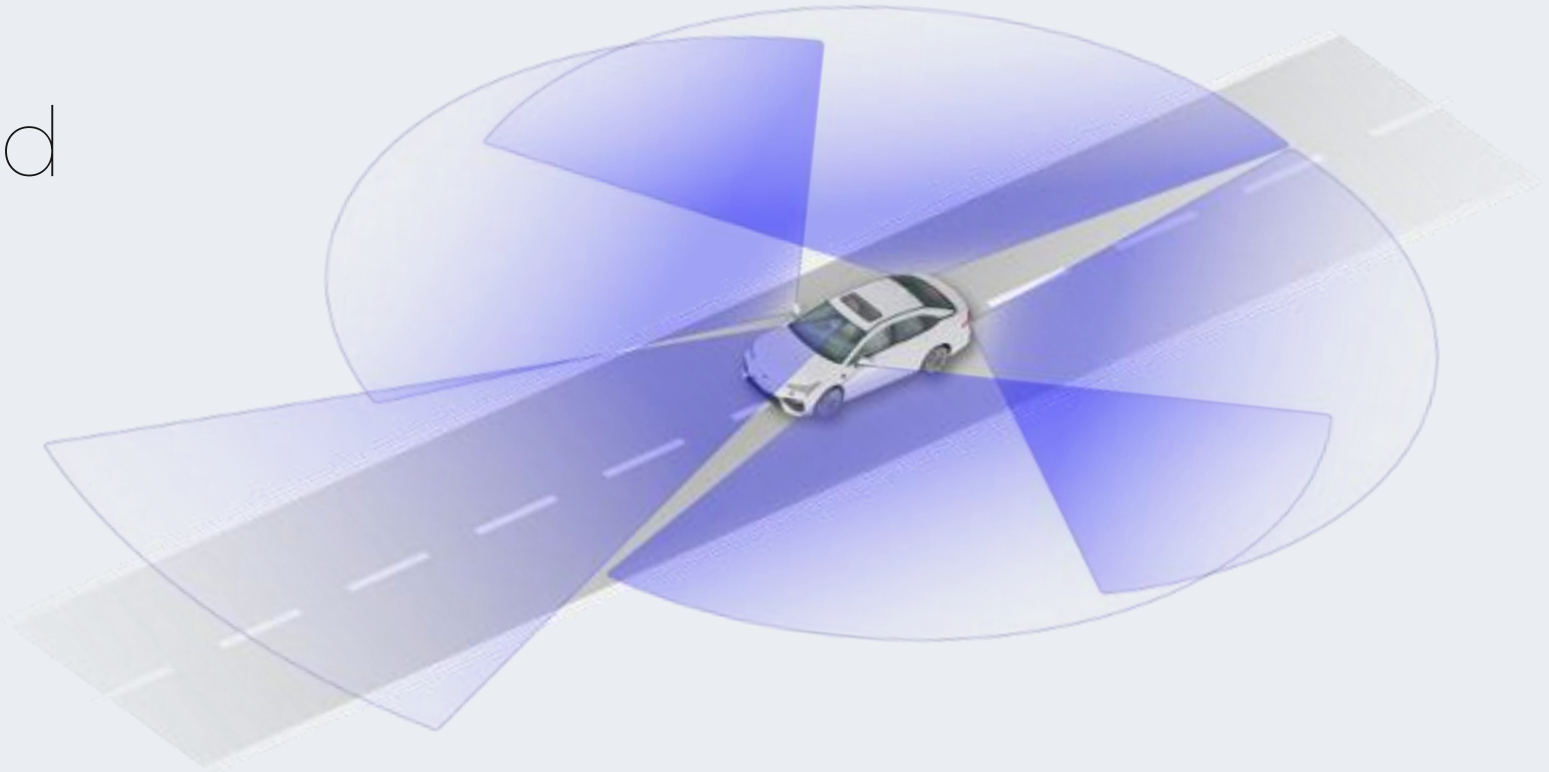
Resolution: 240k pixels

200€



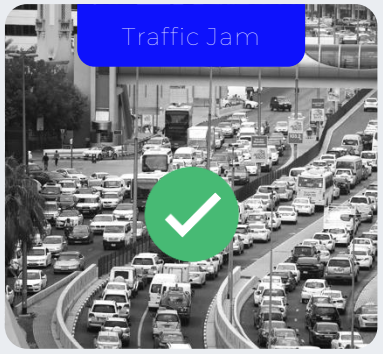
Strictly private and confidential

Our Sensors Achieve a Round View and Solve All Use Cases











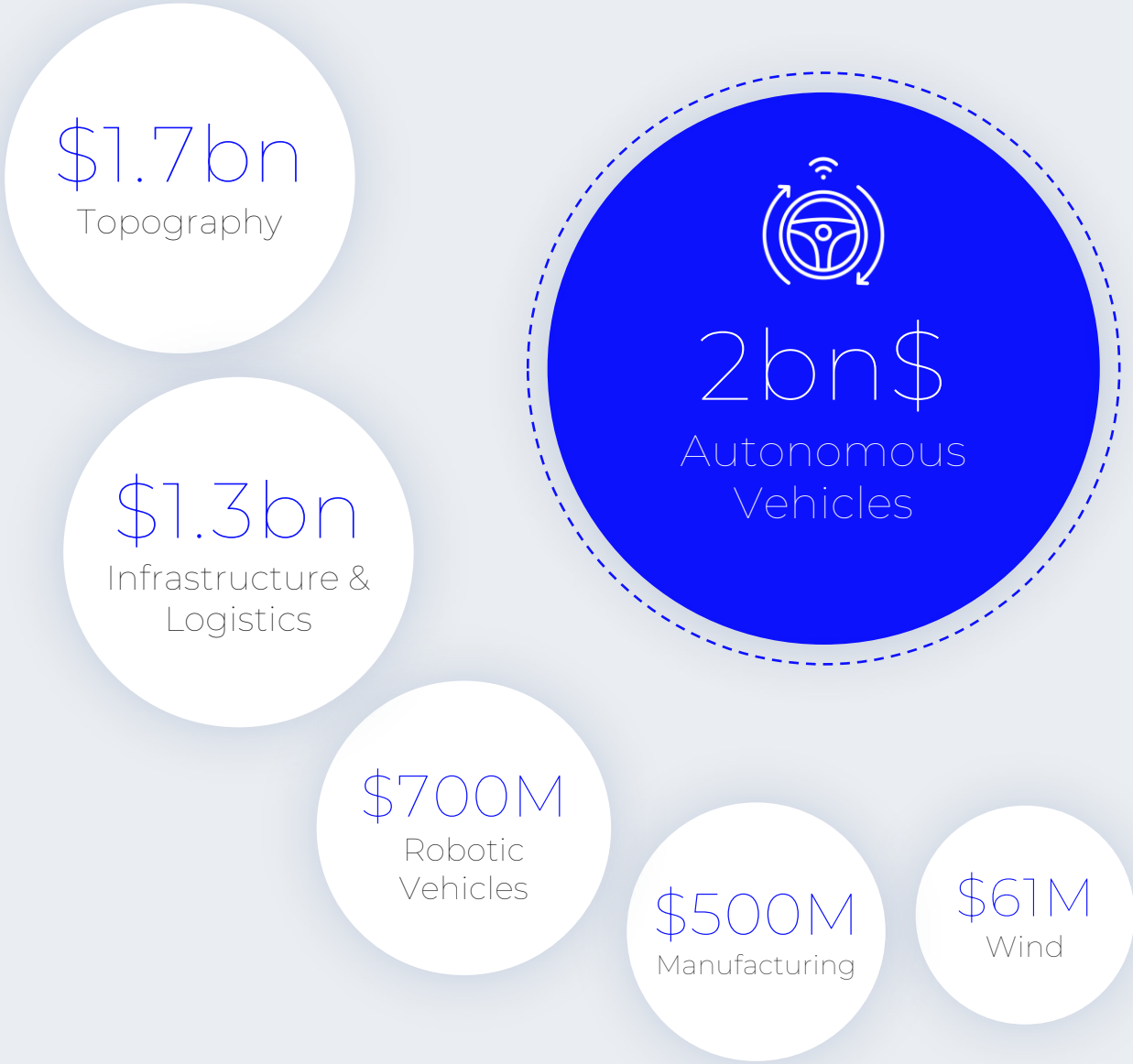


Strictly private and confidential

Huge Potential in Automotive with Attractive Opportunities in Side Markets

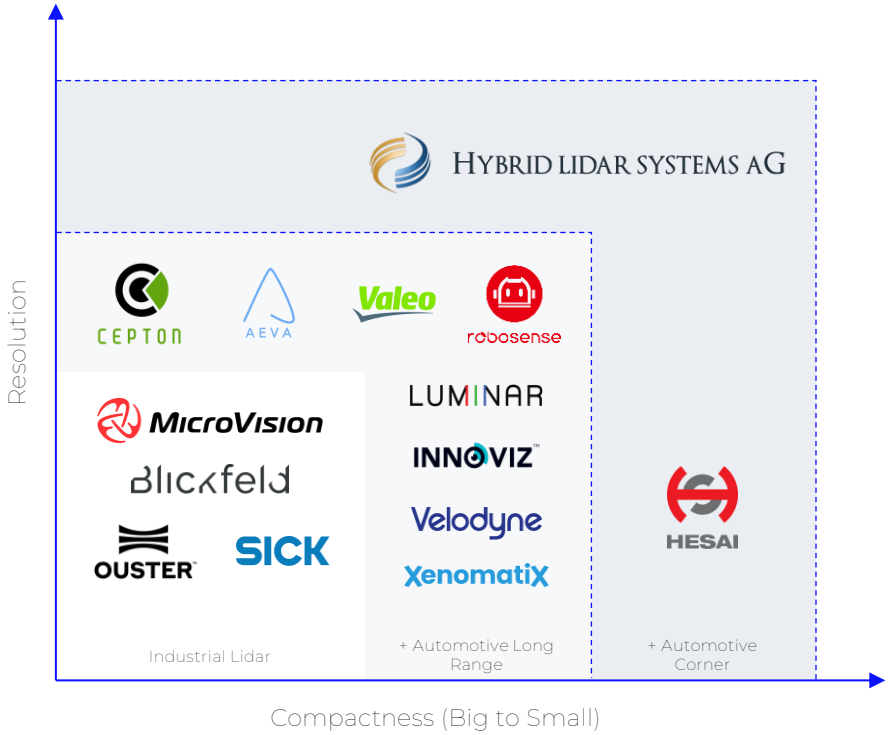
$6.3bn by 2027

Automotive & Industry Lidar Market
(excl. Consumer Electronics)
22% CAGR 2021-2027



Strictly private and confidential

Competitors' Lidars Not Suitable for Corners and Have Low Resolution



Market Segments

01 **Industrial Lidar:**
First generations of lidar technology are not suitable for automotive.

02 **Automotive Long Range Lidar (can be used for above applications):**
Market players sell expensive lidars based on old, complex technology. Low Resolution. High competition.

03 **Automotive Corner Lidar (can be used for above applications):**
Compactness is a limiting factor for most lidar companies. Hybrid Lidar Systems is the only company with high resolution suitable for corners. Hesai with much lower resolution.

Strictly private and confidential

Current Lidar Manufacturers Do Not Have the Technology to Build a Compact High-Resolution Lidar in the Next Years

We are in a unique position to enter the corner and long range markets with a head start

Competitor Intelligence:

All Lidar Makers Focussing On Their Current Technology and Are Blocked for New Developments

LUMINAR

Focus on long range and ultra near field. Corner solution not possible with current technology in terms of compactness and price.

HESAI

Has presented a corner lidar mock up. However it does not fulfil automotive requirements. Need to generate cash flows from current technology first. Focus on long range. Corner solution not possible with current technology in terms of compactness and price.

INNOVIZ

Initial technology failed. Now focus on long range with new technological approach. Too early to enter corner market.

robosense

Needed to cancel orders because could not manage production. Therefore no capacity to start developing a corner lidar.

Velodyne

Have issues with their current technology that must be solved first. Corner solution too expensive with current technology.

AEVA

Focus on very long range lidar. Technology way too expensive for corner solution.

CEPTON

Current technology with low resolution. Corner solution too expensive with current technology.

XenomatiX

Focussing on digital twins of streets at the moment.

Valeo

Focus on long range lidar. No corner solution, current technology too expensive for corner.

Blickfeld

Withdrew from automotive market due to technological disadvantages.

Strictly private and confidential

Our Product

LiSSA Industrial

Development finished

Pilot selling started

Starting serial production

LiSSA Automotive Corner

Technology proved

Seeking funding for development

LiSSA Automotive Long Range

Technology proved

Seeking funding for development



Strictly private and confidential

HYBRID LIDAR SYSTEMS AG

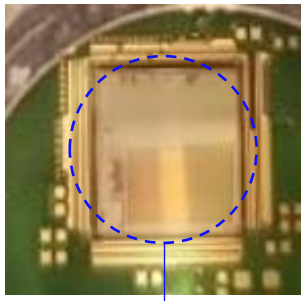
Our IP: A Smart Method to Compute Distances

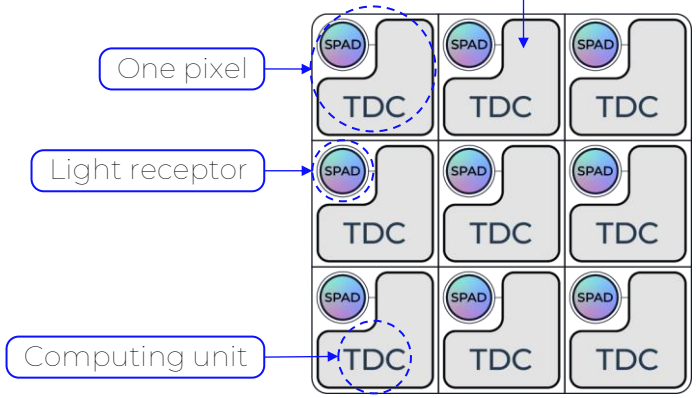
Current Technology

Each image pixel has an own computing unit to calculate distances:
Expensive manufacturing

Or to reduce costs, combination of several pixels for one computing unit:
Less resolution

Imager Chip

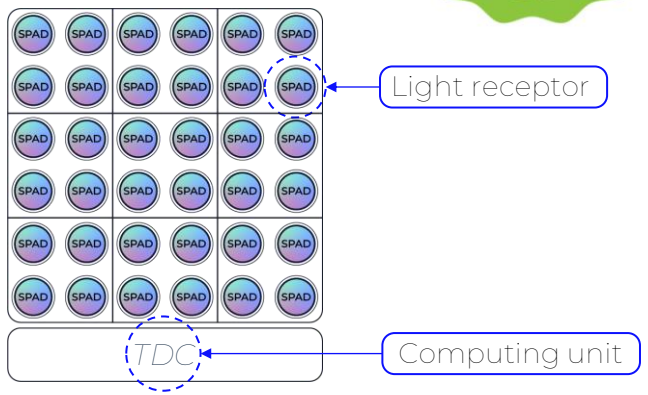




Hybrid Lidar Systems

Our smart computation method requires only one computing unit for all pixels.





Technology Benefits

- 50% lower manufacturing costs
- 10x higher resolution
- Much smaller sensor
- Defendable patented computation algorithm

Strictly private and confidential

We Started Selling Our Industrial Lidar and Launching Serial Production

Leads

- 142 Logistics
- 273 Robotics
- 354 Drones
- 22 Sensors
- 497 Smart City
- 2 Racing

Contracts Closed

motor

10k€ + 450k€ Option

Logical Safety

120k€ + 1,0 Mio.€ Option

Shipped

Leuze

motor

CARISSMA
Automotive Safety Research

Ostfalia
Hochschule für angewandte Wissenschaften

SENMAX

HOCHSCHULE HANNOVER
UNIVERSITY OF APPLIED SCIENCES AND ARTS

FIXPOSITION

JOMOO

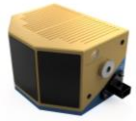
Strictly private and confidential

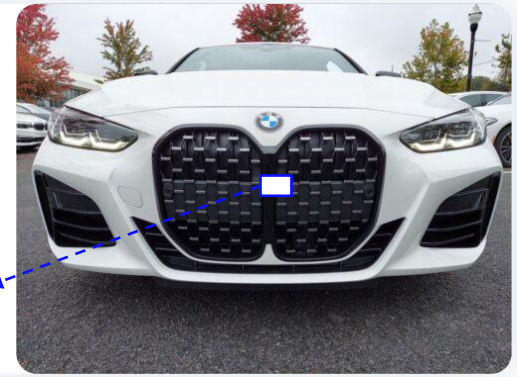
High Interest From European and Asian Automakers

Germany

Participation in pre-tendering phase for LiDAR from 2025 of BMW and VW

Regular status updates





China

LEAPMOTOR

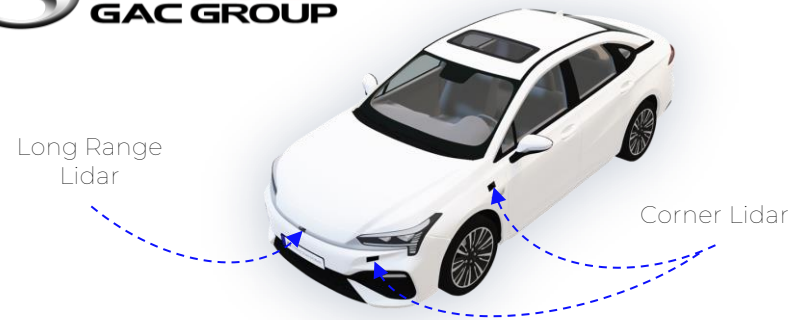
In person meetings with Leapmotor general management conducted.

Interest to use our LiSSA Automotive in future products.



China

GAC GROUP 广汽集团



In person meetings with GAC general management conducted.

Interested to use our LiSSA Automotive long range and corner.

Cross-model concept studies are underway.



Competitors Are Interested in Implementing Our Technology



Valeo

Las Vegas, January 7, 2024

Clément Nouvel
Valeo LiDAR CTO
clement.nouvel@valeo.com

Dear Mr Dietterle, Mr Eltaher,

Following our recent fruitful discussions related to Hybrid LiDAR System AG technology, Valeo LiDAR management is pleased to share the following technical and business statements.

The new SPAD receiver HLS Technology is developing, where all TDCs on the chip could be exchanged by only one global counter, would provide the advantage of achieving a parallel distance measurement for an unlimited number of SPAD cells.
From a business perspective, this new SPAD receiver would require much less die size, therefore reducing substantially its manufacturing cost.

Should this new type of SPAD receiver chip be available in 2025 or 2026, demonstrating the previously mentioned advantages as well as being state of the art with respect to range and resolution with a suitable number of pixels (e.g. more that 240.000 point cloud pixels) and a proven substantial cost advantage as highlighted above, Valeo would be very much interested in evaluating this SPAD receiver for a new type of LiDAR sensor dedicated to automotive high volume production, for instance for L3 or L4 applications.

Best regards,
Clément Nouvel

Christophe Minster
Valeo Lidar Product Group Vice president

HYBRID LIDAR SYSTEMS AG

We Supply Our already Developed LiSSA Industry to a Major European Sensor Manufacturer Dealvolume: 270m€ in 10 yr.



PEPPERL+FUCHS Your automation, our passion.

Pepperl+Fuchs SE • Postfach 480280 • 12252 Berlin • Germany

Fa
Hybrid Lidar Systems AG
Herrn Ingo Dieterle
Tec Center 1
31162 Bad Salzdetfurth

Name: Hinrik Weber
Tel.: +49 30 616 72-239
E-Mail: hweber@de.pepperl-fuchs.com

Datum: 15.04.2025

Lidar Technologie Kooperation

Guten Tag, Herr Dieterle,

vielen Dank für die angenehmen Gespräche auf der Hannover Messe 2025. Ich fasse nachfolgend die Ergebnisse für uns zusammen:

Die Pepperl+Fuchs SE entwickelt, produziert und vertreibt PRT Lidar Sensoren für industrielle Anwendungen insbesondere für den Markt der autonomen Fahrzeuge in der Intralogistik.
Wir verfügen in diesem Bereich über ein breites Anwendungs-Know-How.

Die Hybrid Lidar System AG hat eine neue hochmoderne Solid State Flash Lidar Technologie entwickelt. Diese Technologie birgt hohes Potential innovative Sensorlösungen für die Automatisierungstechnik in der Intralogistik zu realisieren.

Pepperl+Fuchs SE hat vor neue Lidar Sensoren zu entwickeln und großes Interesse an einer technologischen Zusammenarbeit mit Hybrid Lidar Systems mit dem Ziel, die Tauglichkeit und Skalierung der Hybrid Laser Technologie für einen neuen P+F Lidar Sensor zu untersuchen und anschließend in eine Produktentwicklung einzusteigen.

Wir schätzen die aktuellen Stückzahlen der Fahrzeuge mit Lidar Sensorbedarf auf >250 TStk. per anno. Diese Fahrzeuge benötigen einen oder mehrere Sensoren vornehmlich zur Navigation und Antikollision.

PEPPERL+FUCHS Your automation, our passion.

In Abhängigkeit der technischen Skalierung sehen wir 2 realistische Stückzahlszenarien für die Zukunft:

Szenario 1: 10.000 Einheiten pro Jahr
Szenario 2: 100.000 Einheiten pro Jahr.

Als nächsten Schritt schlagen wir vor, zügig unsere Zusammenarbeit mit der Erarbeitung der spezifischen Anforderungen an den neuen Lidar Sensor zu starten.

Wir sind überzeugt, dass eine enge Zusammenarbeit unserer beiden Häuser zu erfolgreichen neuen Produkten führen kann.

Wir freuen uns auf das gemeinsame Projekt.

Mit freundlichen Grüßen

ppa. Hinrik Weber
Leiter IU OMS

i. A. Thorsten Schroeder
IU OMS Global Product Manager

13 Person Team With 80+ Years of Experience in Industry and Automotive

Founders and Management



Ingo Dietterle
CEO

11y senior manager at OEM
12y own tier 1 supplier firm

TAIPAN INVESTMENT · CENTIC · VW



Jens Gallhoff
CTO / COO

20+ years in supply chain

BMW · fuba Automotive Electronics · VW



Dr. Ulrich Lages
CSO

Founder ibeo

ibeo automotive · SICK Sensor Intelligence.



Evgenij Bakulin
CFO

10y CFO and Finance

pwc · CLUNO · IDnow

Advisory Board



Prof. Dr. Rer. Nat. Jäger
University Duisburg-Essen

Former Head of Optoeclectr. Dept. at IEE Photonics Network



Prof. Dr. Szyska
University Hannover

Chairman of German Public Relations Ass.



Hubert Moik
CEO Silicon Valley Opportunity Fund

Serial entrepreneur

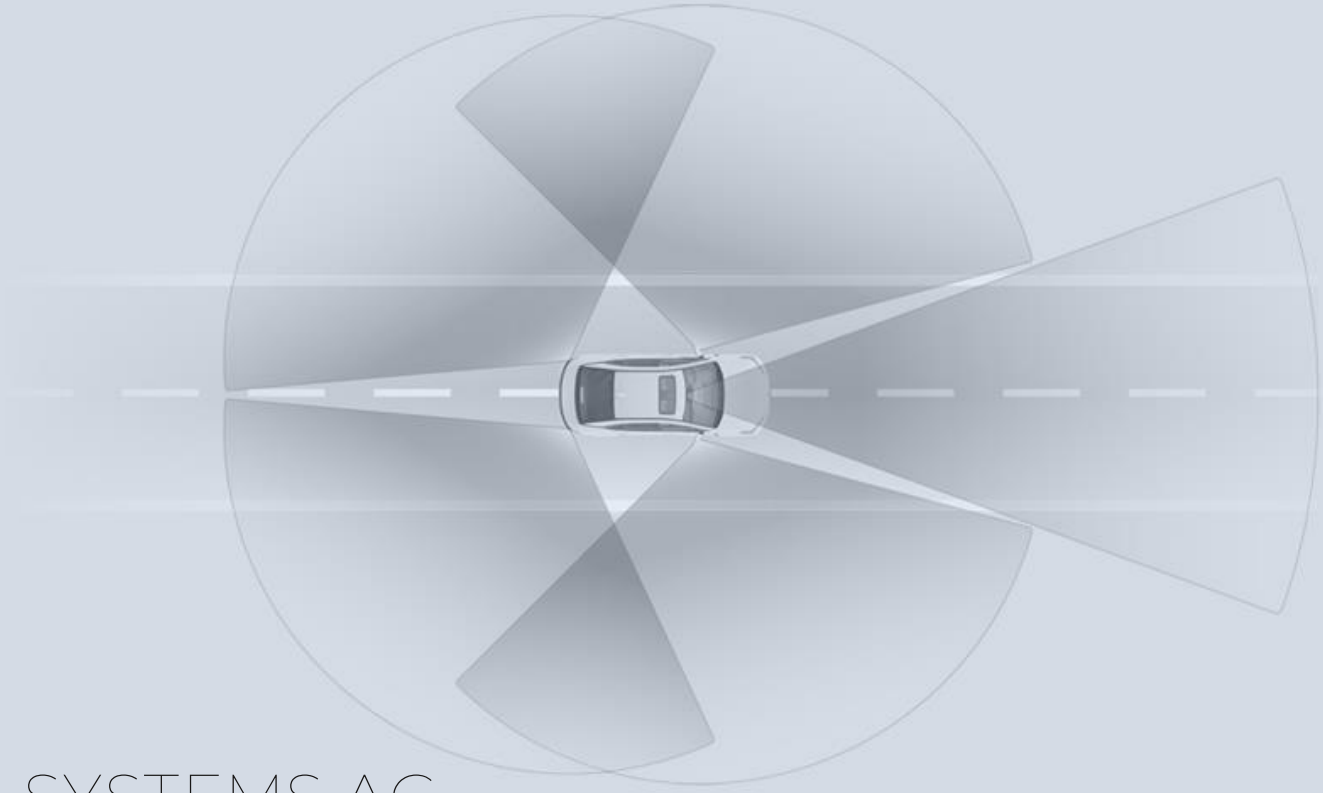


Veaceslav Driglov
CEO THINKT Digital

Former Innovation Manager Daimler

Strictly private and confidential

HYBRID LIDAR SYSTEMS AG



HYBRID LIDAR SYSTEMS AG

TecCenter 1

31162 Bad Salzdetfurth

Germany

www.hybrid-Lidar.com

dietterle@hybrid-Lidar.com

Mobil: +49 160 6322326

Disclaimer

This document contains information of a confidential and commercially sensitive nature, is issued on a strictly confidential basis only and must not be distributed to or otherwise shared with any third party.

All information contained in this document must be treated with the strictest confidentiality, shall not be disclosed to any person and may not be copied, distributed, published or reproduced, in whole or in part, to any other person at any time.

The information contained in this document and all and any evaluations or assessments stated herein represent our personal opinions. No representation or warranty express or implied, is or will be made in relation to, and no responsibility is or will be accepted by us or by our officers, employees, agents, advisers, subsidiaries or affiliates as to the accuracy or completeness of this document.

Information contained in this document may contain forward-looking statements, projections, valuations, benchmarks and/or investment performance calculations. Such material has not been audited or independently verified. Projections, valuations, benchmarks and/or investment performance calculations may be based on subjective assessments and assumptions; they may also use or be derived from particular models or methodologies, when possible alternative models or methodologies exist that might produce different results.

The information contained in this document is intended for informational purposes only and does not constitute advice.