



Solid-State Lidar for Long- and Short-Range Applications

Thomas Luce, VP Business Development

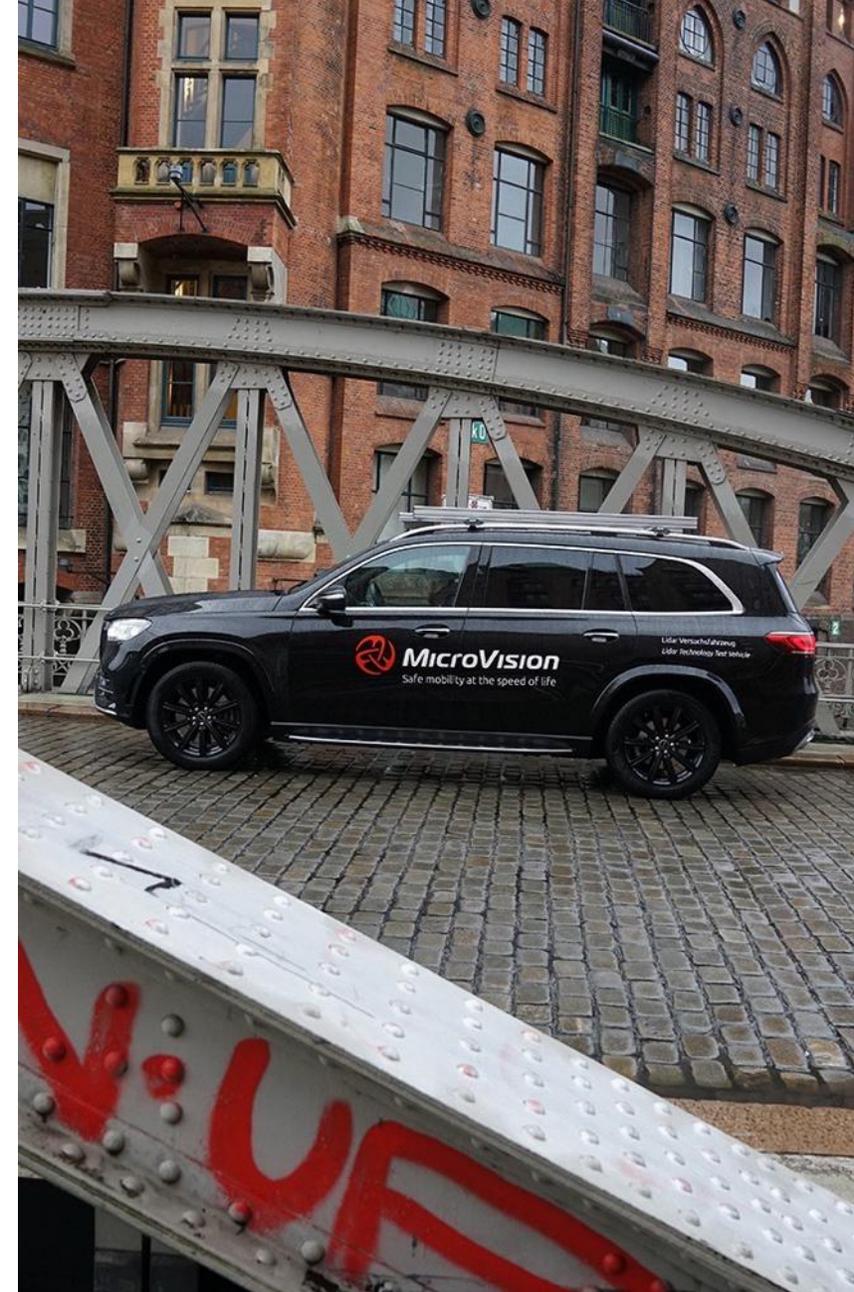
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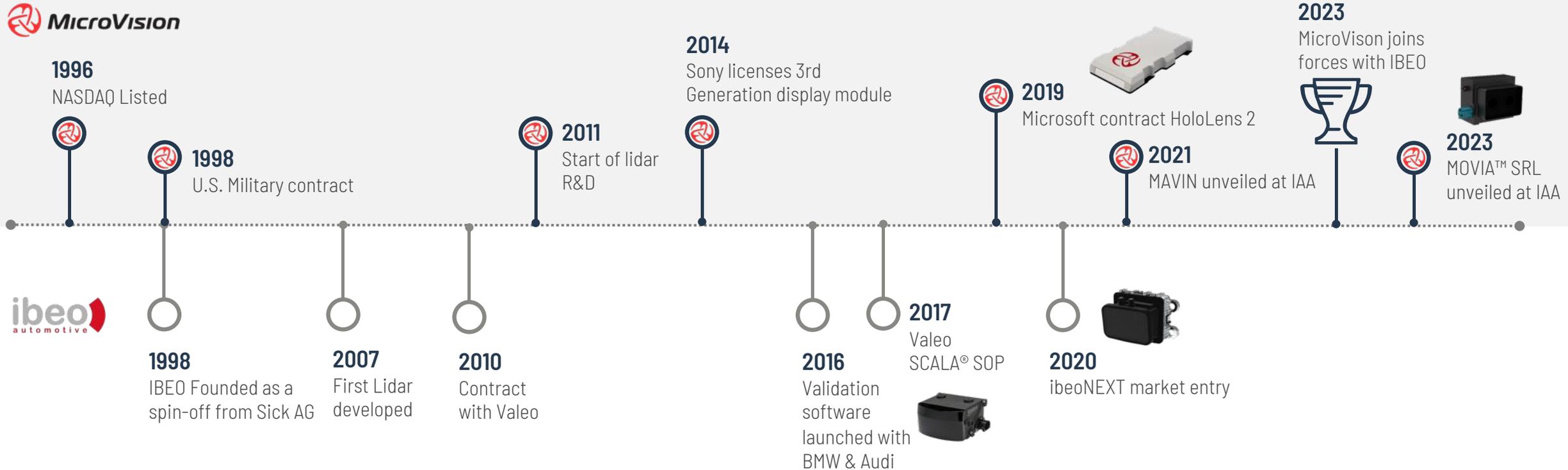
Solid State Lidar for Long- and Short Range Applications

Agenda

1. MicroVision at a Glance
2. Why Solid-State - Advantages
3. Long-Range Solution
4. Short-Range Solution
5. Summary / Outlook



MicroVision: The Only Full Stack Solid-State Lidar Company

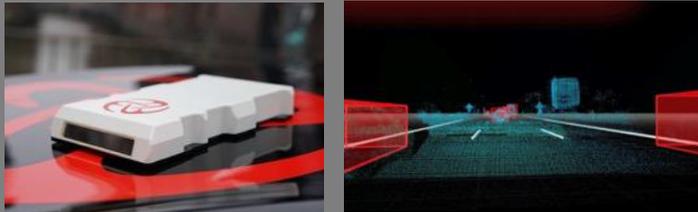


- **30+ years of experience with lasers, MEMS, LiDAR and software**
- **350+ employees in US and Europe**



MicroVision: The Only Full Stack Solid-State Lidar Company

Long-range lidar MAVIN™ with Perception



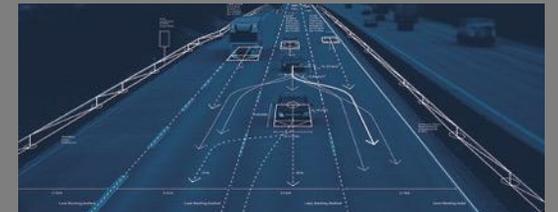
Dynamic range performance with object detection, classification, and tracking

Short-range lidar MOVIA™



Small, light, robust, and suitable for industrial and automotive applications

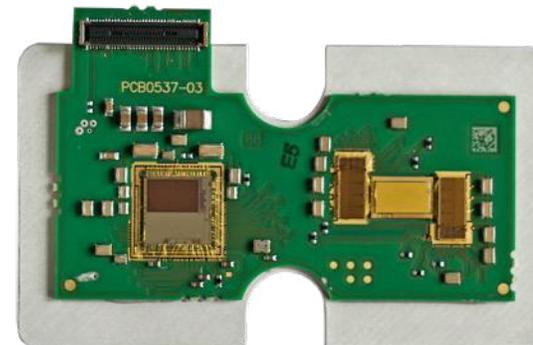
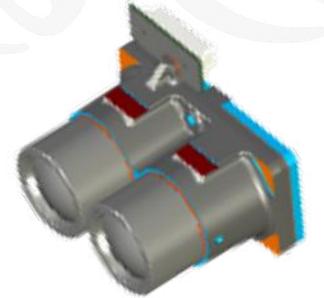
Auto-Annotation / ground truth software MOSAIC™ Suite



Automated validation of sensors and algorithms, enabling machine learning and AI projects

Why Solid-State ?

- Robust - no mechanical components
- Scalable - low cost
- Highly automated production leveraging silicon/semiconductor industry
- Highly reliable - no wear and tear due to mechanical movement
- Precise - micrometer alignment



Long-Range Solid-State Lidar

Customer demands for level 3 highway driving

- Small form factor -> easy integration in roof, behind windshield or bumper
- Large detection distance and high resolution, to detect small objects
- Low power for easy integration
- Cost competitiveness

Solid-state solutions with 905 nm emitters are ideal candidates for these requirements

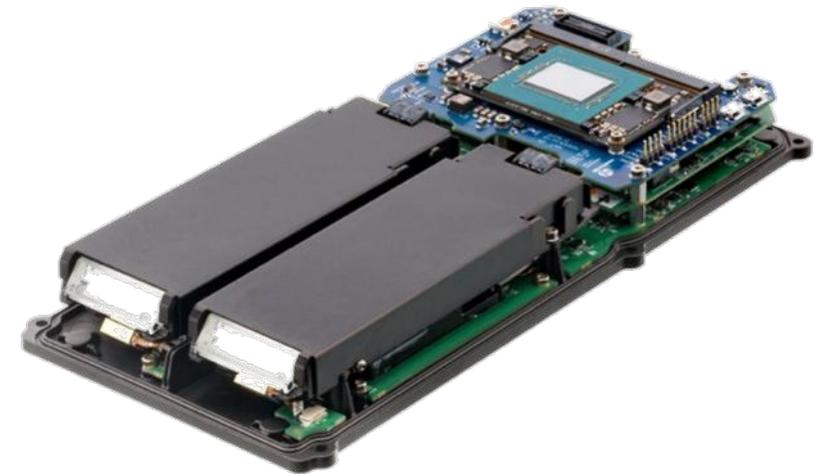
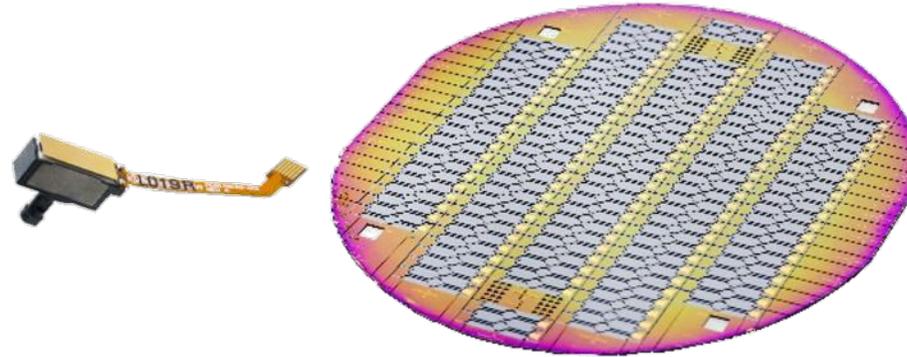
- High reliability and robustness
- Long life without wear and tear
- Scalability and cost effectiveness of silicon semiconductor solutions



Long-Range Solid-State Lidar

Our solution: MAVIN

- MEMS based beam-steering
- Edge-emitting lasers
- SiPM-array detector
- Detection distance up to 350m, very high resolution (13 Mio pts per second)
- 5th gen. MEMS with proven reliability
- Scalable 905nm silicon technology
- Pixel by pixel Laser class 1 with automatic emission control
- Bistatic optical design for 99.9% suppression of interference, plus individual pulse coding
- Custom ASIC with integrated perception for low power consumption



Short-Range Solid-State Lidar

Customer demands for level 3 / level 4 urban driving:

- Large field of view to cover vehicle surrounding with low number of sensors
- Easy car integration at various mounting locations
- Very low power to avoid heat management efforts
- Resilient against soiling to achieve high availability
- Very low cost, since multiple sensors are required

Solid-state solution with VCSEL / SPAD array are ideal:

- Low power / low cost due to silicon wafer production technology
- Heavy duty quality e.g. for assembly in trunk lid (e.g. shock-reliance up to 500g, product lifetime > 12.000 h possible)



Short-Range Solid-State Lidar

Our solution: MOVIA

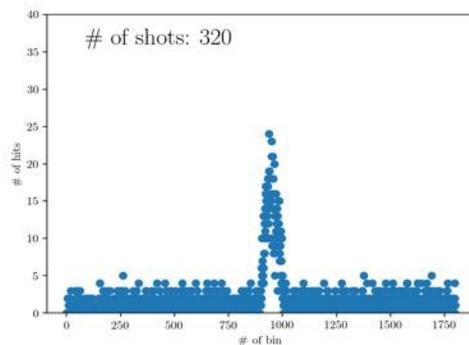
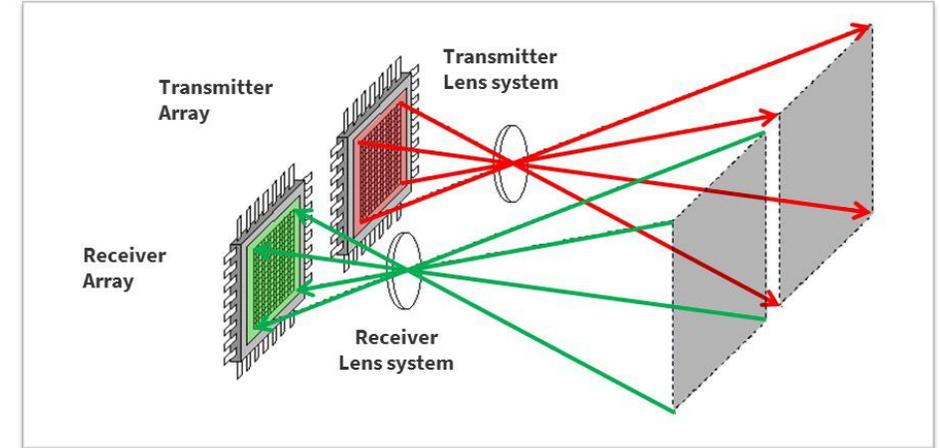
- Solid-state sequential flash sensor
- Custom 885 nm VCSEL/SiPM Array detector optimized for automotive SRL application
- Low power, no cooling required
- Integrated sensor model for easy E/E integration
- No moving parts, pure solid-state
- Intrinsically laser class 1 due to sequential flash approach
- Modular solution with 60°, 120°, 150° field of view
- C-sample status with DV carried out



Short-Range Solid-State Lidar

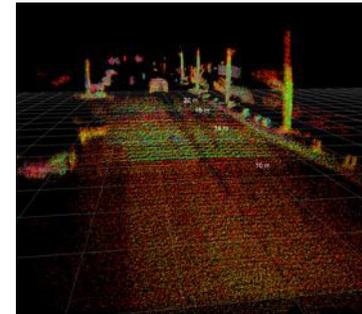
MOVIA performance

- SPAD array and VCSEL array are focal plane arrays mounted behind identical camera lens like optics
- Scene is illuminated row-wise, a whole row of Lasers are active at a time
- A shot sequence per line is used to accumulate events from SPAD pixels in a histogram (time-correlated single photon counting)



Proprietary signal processing

Histogram is processed to generate point cloud with point attributes: distance, intensity, noise floor, ...



Histogram statistics with high sampling results in strong improvement of signal reliability esp. under adverse weather conditions.

Short-Range Solid-State Lidar

MOVIA status

Winter test campaign



DV tests (shock, vibration, IPX, dust, temperature, endurance etc.)



Laser class 1 compliance



Adverse weather scenario



Volume production line ready



Summary

MicroVision relies on solid-state 900 nm lidar solutions

- Solid-state lidar is easily scalable
- Only solid-state lidar will meet future cost expectations (-> look at RADAR!)
- Increasing reliability requirements favor no-moving-parts solutions
- MicroVision solid-state lidar solution is available today





Thank you for your attention