HIGH-SENSITIVITY AND LONG-RANGE FMCW LIDAR WITH REAL-TIME POINTCLOUD GENERATION

AT A GLANCE

- Direct frequency modulation at 1550 nm and coherent detection enable longer range, intrinsic amplification and glare suppression

- High resolution (sub-cm) at long range

- High sensitivity (signal < 1nW detectable)

- Effective DSP and mirror control

- All fiber-based optics

- Reduced system complexity by monostatic design using 2D mirror scan

Features

- Scalability by using standard communication components

- Quasi-solid-state solutions for scanning

- Fiber-based optical frontend

- Real-time pointcloud by FPGA

- Effective DSP and mirror control for high resolution

- High sensitivity receiver for long range at low reflectance

- Eye-safe operation

Applications

- Advanced Driver Assistance Systems (ADAS)

- 3D Imaging

- Augmented Reality (AR)

- Smart Infrastructure & Logistics

- Robotics and Automation

- Industry 4.0

Technical Background

The Fraunhofer Institute HHI demonstrates a real-time LiDAR prototype for robotics and automation applications using a fiber-based design with FMCW detection and 2D mirror scanning. Its high resolution (sub-cm) and long range (>200m) show our latest advancements in high-sensitivity coherent detection and signal processing technology.
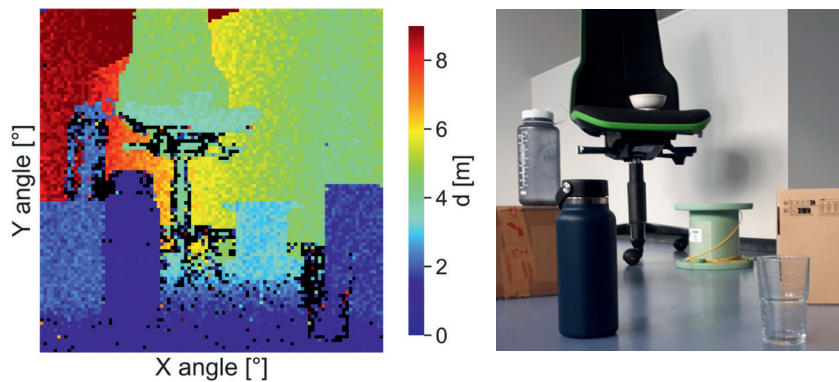
Figure 1: Raw pointcloud showing objects of different shape and reflectance.

Parameter	Version A	Version B	Version C
Scanning Mechanism	Galvo Mirror	Galvo Mirror	MEMS Mirror
Frequency Modulation	External Mod.	Direct Mod.	Direct Mod.
Resolution (°)	0.01	0.01	0.01
Range (10% target) (m)	> 200	~ 200	~ 20
Horizontal Field of View (°)	40	40	~ 8
Vertical Field of View (°)	40	40	~ 8
Distance Precision (1σ spread)	0.0005%	0.1%	0.2%
Accuracy (cm)	< 0.5	1–3	5
Framerate (Hz)	0.1	0.1	> 0.1 - 1
Standoff (cm)	10	10	5
Application	ADAS Industry 4.0	Robotics Industry 4.0	ADAS Monitoring Robotics

Sarah Cwalina

Photonic Networks and Systems

Phone +49 30 31002 - 753 | - 414
info-pn@hhi.fraunhofer.de

Fraunhofer Heinrich Hertz Institute
Einsteinufer 37, 10587 Berlin
Germany

www.hhi.fraunhofer.de/en/lidar