

LeddarSteer™

Digital Beam Steering Device

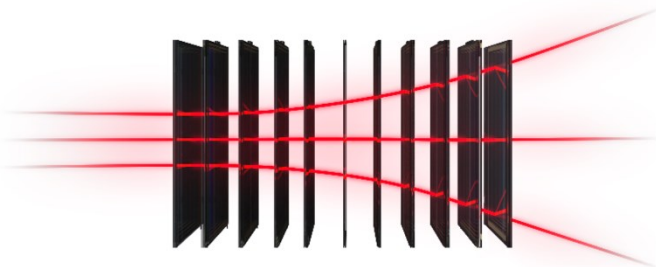


Overview

LeddarSteer™ is a digital beam steering device (or DBSD) based on liquid crystal and polarization gratings which steers light to the desired angles rapidly, accurately and reliably.

DBSD represents the ideal solution for LiDAR makers aiming to build their next generation of sensors with true, reliable solid-state beam steering and field of view agile re-configuration capability.

LeddarSteer DBSD divides the FoV into discrete tiles that can be assembled to create the complete frame, with or without a specific region of interest. These FoV configurations can be changed on-the-fly, based on the vehicle's speed or environment, to fulfill multiple ADAS and AD use cases from a single LiDAR design.



Higher Range

- Reduction of ambient noise by steering receiver to a sub-segment of the FoV
- Emitter steering enables higher collimation and peak power while maintaining eye safety and acceptable power consumption and thermal dissipation

Higher Resolution

- Emitter beam steering and/or receiver detector / detector array steering to sub-segments of the FoV with repeatable sub-milliradian precision
- Reduced size and complexity, smaller FoV of the receiver and/or emitter optical sub-system
- Reduces the number of laser and detector elements needed

Scalable

- DBSD component can be designed into next generations of existing LiDAR designs
- Compatible with a broad range of wavelengths (NIR, SWIR, MWIR, LWIR)
- Up to 120° x 24° addressable steering
- Fast transition time down to 50 microseconds, can support high frame rates

Adaptable

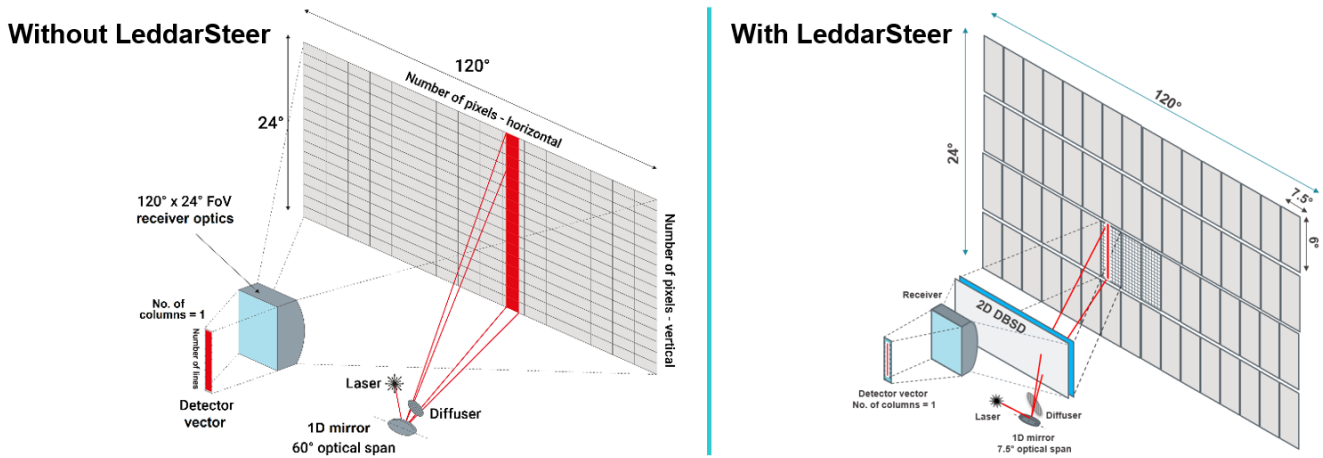
- Compatible with a variety of LiDAR architectures

Reliable

- 100% true solid-state technology (no moving parts)

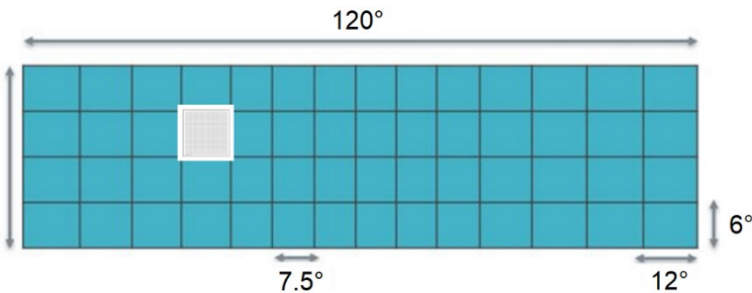
LeddarSteer DBSD can be fully customized for volume production (number of layers, steering angles, aperture and more) with up to 15 cm clear aperture.

LeddarSteer DBSD for LiDAR: Overview



LeddarSteer can be seamlessly integrated into an existing LiDAR and expand the field of view while maintaining high resolution. In the example above, a resonant micromirror semi-flash architecture is used. Simply adding LeddarSteer DBSD in front of the emitting and receiving optics significantly enhances LiDAR performance and FoV. The scanning pattern can be in any desired order on any tiles.

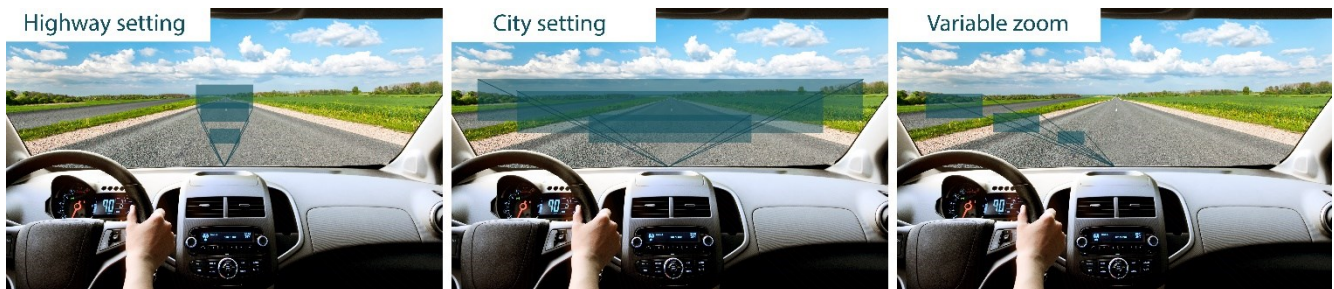
LeddarSteer Field of View



The field of view of a tile is finer in the center and is linearly extended towards the edges. There are two types of transitions (excitation and relaxation, of 50 μ and 750 μ respectively). A multiple combination of the device states yields the same angle, so the scanning is optimized to maximize the fast transitions.

Flex View: On-the-Fly Field-of-View Adjustments

The Flex View feature enables modifying the FoV, the resolution and the number of acquisitions on a specific tile during operation and as fast as from frame to frame. This provides a valuable advantage when dealing with hazardous objects or adverse conditions such as fog, rain or snow. It is also perfect for switching between a highway and city setting.



Long-range FoV

Front LiDAR covers large FoV and high frame rate (vs. 2-corner LiDAR design)

On-the-fly SNR and resolution adjustment in adverse weather conditions

Specifications¹

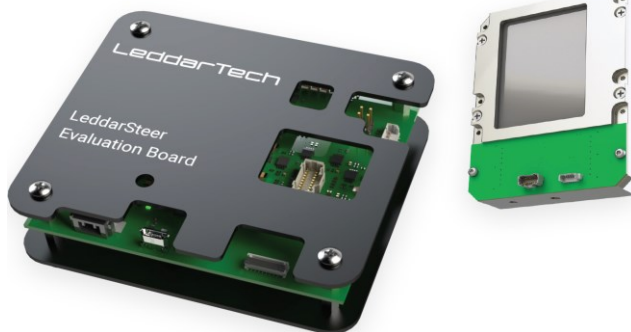
Parameter	Value	Units
Full field of view (azimuthal x elevation)	Up to 120 x 24	Degrees (°)
Single tile optical minimum FoV (azimuthal x elevation)	7.5 x 6	Degrees (°)
Number of tiles (H x V)	14 x 4	Tiles
Horizontal steering angles	±3.56	Degrees (°)
	±10.73	
	±18.09	
	±25.75	
	±33.97	
	±43.06	
Vertical steering angles	±3.07	Degrees (°)
	±9.24	
Aperture, receiver section (H x V)	46.3 x 46.3	mm
Aperture, emitter section (H x V)	46.3 x 17.5	mm

¹ Based on a DBSD configuration containing 7 liquid crystal layers of 7,5° x 6° FoV and >5cm clear aperture. LeddarSteer DBSD can be fully customized for volume production (number of layers, steering angles, aperture and more) with up to 15 cm clear aperture.

Transitions

Transition Type	Transition Time	Number of Transitions ²
Up-voltage (low voltage to high voltage)	50 μs to 100 μs	29
Relaxation (high voltage to low voltage)	≤ 750 μs @ 60°C	13

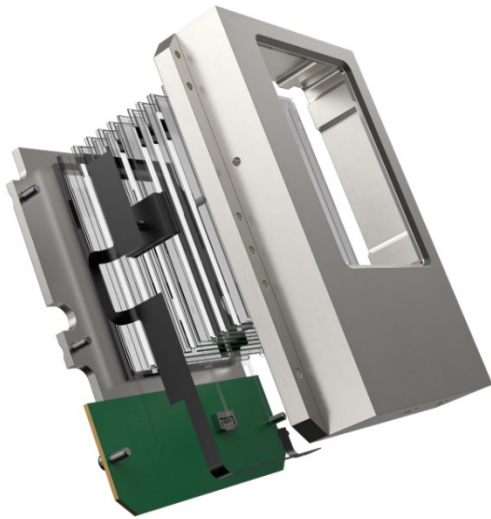
² The number of transitions of both types depends on the tile acquisition sequence, which is chosen to maximize the number of up-voltage transitions to cover the FoV. For example, the number of transitions shown in the table above applies to a 120° x 18° FoV containing 42 tiles.



LeddarSteer Evaluation Board

The LeddarSteer Evaluation Board allows you to test DBSD features on a stand-alone platform and experiment the integration of the DBSD technology within your own LiDAR design. The Evaluation Kit's DBSD contains 7 liquid crystal layers with 7.5° x 6° FoV and >5 cm clear aperture.

- Easy interface and control through SPI, USB and hardware trigger
- Compact and well adapted for characterization of the different modes
- Configuration and settings can be fine-tuned
- Programmable tile switching sequences
- Interface with other products such as the LCA3 Evaluation Board



**Ask about LeddarSteer DBSD
for your LiDAR development
project today.**



**Integrates seamlessly into LiDAR
system designs**



**Drastically reduces optical design
requirements, hence cost, size and
complexity**



**On-the-fly field of view and resolution
adjustment, providing tools to assess
adverse conditions such as rain, fog,
snow and objects of interest**



**Drastically mitigates ambient light noise,
extending the range**

LeddarTech® has made every effort to ensure that the information contained in this document is accurate. Any information herein is provided “AS IS.” LeddarTech shall not be liable for any errors or omissions herein or for any damages arising out of or related to the information provided in this document. LeddarTech reserves the right to modify design, characteristics and products at any time, without notice, at its sole discretion. LeddarTech does not control the installation and use of its products and shall have no liability if a product is used for an application for which it is not suited. You are solely responsible for (1) selecting the appropriate products for your application, (2) validating, designing and testing your application and (3) ensuring that your application meets applicable safety and security standards. Furthermore, LeddarTech products are provided only subject to LeddarTech’s Sales Terms and Conditions or other applicable terms agreed to in writing. By purchasing a LeddarTech product, you also accept to carefully read and to be bound by the information contained in the User Guide accompanying the product purchased.

LeddarTech®

CANADA – USA – AUSTRIA – FRANCE – GERMANY – ITALY – ISRAEL – HONG KONG – CHINA

Head Office

4535, boulevard Wilfrid-Hamel, Suite 240
Québec (Québec) G1P 2J7, Canada
leddartech.com

Phone: + 1-418-653-9000
Toll-free: 1-855-865-9900