LeddarSteer™
Digital Beam Steering

Overview
LeddarSteer™ is a digital beam steering (DBS) technology based on liquid crystals and polarization gratings which steers light to the desired angles rapidly, accurately and reliably, enabling a field of view up to 120° x 60°.

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

LeddarSteer digital beam steering 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
- DBS 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 60° 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 DBS can be fully customized for volume production (number of layers, steering angles, aperture and more) with up to 7 cm clear aperture.
LeddarSteer DBS for LiDAR: Overview

Without LeddarSteer

With LeddarSteer

LeddarSteer can be seamlessly integrated into an existing LiDAR and expand the field of view while maintaining high resolution. In the example above, using the Evaluation Kit, a resonant micromirror semi-flash architecture is used. Simply adding LeddarSteer DBS 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 (accelerated and natural, of 50 μs and <750 μs respectively). Non-sequential scanning optimizes the number of accelerated transitions and the frame rate.

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
### Specifications

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Standard Part</th>
<th>Evaluation Kit¹</th>
<th>Limits²</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Full field of view (azimuthal x elevation)</td>
<td>120 x 30</td>
<td>120 x 24</td>
<td>Up to 120 x 60 or 60 x 120</td>
<td>Degrees (°)</td>
</tr>
<tr>
<td>Single tile optical minimum FoV (azimuthal x elevation)</td>
<td>8.3 x 8.3</td>
<td>7.1 x 6.0</td>
<td></td>
<td>Degrees (°)</td>
</tr>
<tr>
<td>Number of tiles (H x V)</td>
<td>12 x 4</td>
<td>14 x 4</td>
<td>Customer-specific</td>
<td>Segments</td>
</tr>
<tr>
<td>Horizontal steering angles</td>
<td>Base steering ±4.15</td>
<td>Base steering ±3.56</td>
<td></td>
<td>Degrees (°)</td>
</tr>
<tr>
<td>Vertical steering angles</td>
<td>Base steering ±3.0</td>
<td></td>
<td></td>
<td>Degrees (°)</td>
</tr>
<tr>
<td>Form factor (H x V)</td>
<td>30 x 30</td>
<td>65 x 75</td>
<td></td>
<td>mm</td>
</tr>
</tbody>
</table>

¹ Typical.
² LeddarSteer DBS can be fully customized for volume production (number of layers, steering angles, aperture and more).

### Transition Time

<table>
<thead>
<tr>
<th>Transition Type</th>
<th>Transition Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accelerated (low voltage to high voltage)</td>
<td>50 μs to 100 μs</td>
</tr>
<tr>
<td>Natural (high voltage to low voltage)</td>
<td>≤750 μs @ 55°C</td>
</tr>
</tbody>
</table>

### LeddarSteer Evaluation Kit

The LeddarSteer Evaluation Kit allows you to test DBS features on a stand-alone platform and experiment the integration of the DBS technology within your own LiDAR design. The Evaluation Kit’s DBS 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 DBS 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