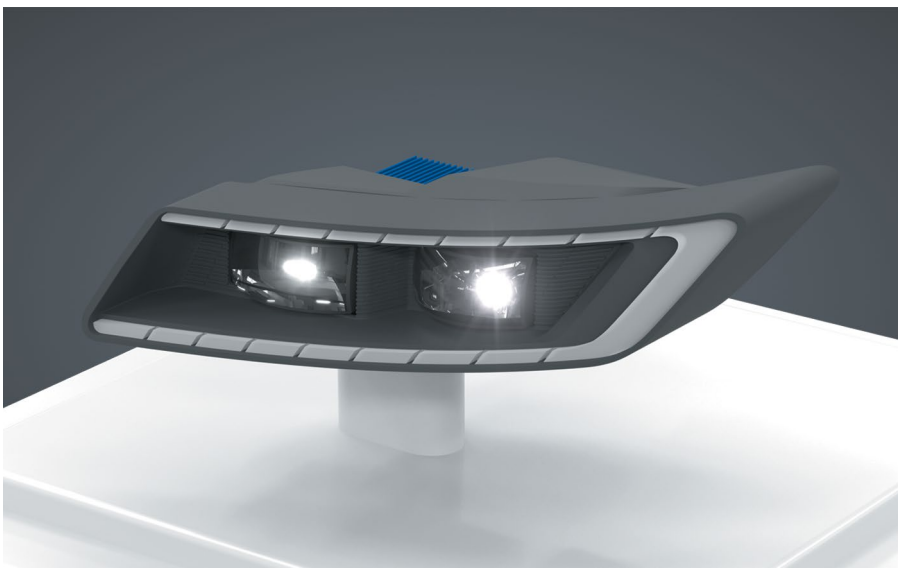




## LUXEON NeoExact ADB matrix

Benefits of direct imaging for adaptive driving beams on US roads



The new FMVSS regulation for adaptive driving beam (ADB) headlights in the United States prescribes a sharp transition between areas of reduced and unreduced intensity, creating demanding requirements in beam contrast. LUXEON NeoExact matrix solutions, combined with direct-imaging optics, are ideally suited to meet such requirements due to their excellent contrast properties. Our application demonstrator shows how US road-users could benefit from reduced glare and enhanced safety.

### FEATURES AND BENEFITS

- The superior contrast of LUXEON NeoExact enables sharp transitions between matrix beam segments, reducing glare and enhancing safety
- The proprietary thin-film side coat of LUXEON NeoExact results in an extremely compact footprint, enabling close-die spacing down to 50  $\mu\text{m}$  and compact direct-imaging optics
- 0.5 and 1.0  $\text{mm}^2$  light-emitting areas (LEAs) available, allowing customization and design flexibility for the matrix configuration
- LUXEON NeoExact matrix-board solutions offer easy design-in integration

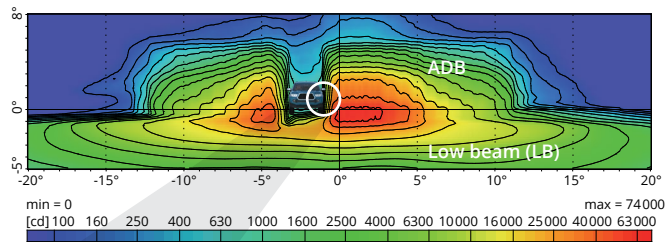
### PRIMARY APPLICATIONS

- Adaptive driving beam (ADB)
- Adaptive front-lighting system (AFS)
- Glare-free high beam

# Direct imaging with LUXEON NeoExact for adaptive driving beams in the USA

## FMVSS regulation for ADB in the US and implication for beam contrast

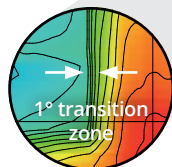
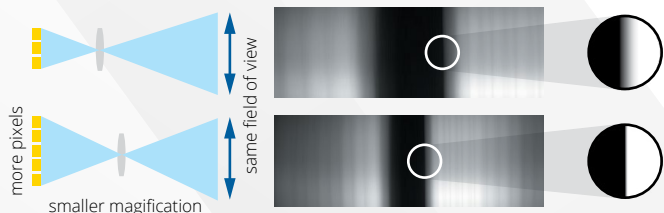
- The SAE prescribes a sharp cutoff in vertical beam segments: The transition from an area of unreduced intensity to one of reduced intensity must take place within 1°.
- This requirement translates into a requirement for beam contrast, which is most critical in the center of the beam: To achieve reasonable intensity in the high beam while not exceeding the glare values above the low-beam cutoff line in a neighboring area of reduced intensity, calls for a contrast of ~1:150 within the 1° transition zone.



## Direct-imaging approach

### Principle:

- Big object field (source size) and small optics magnification results in sharp images of pixels
- Minimized gaps between the LEDs for sharp transition zones and homogeneous beam

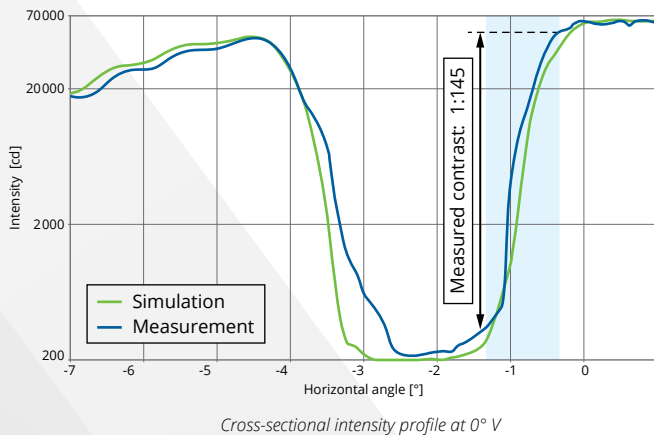
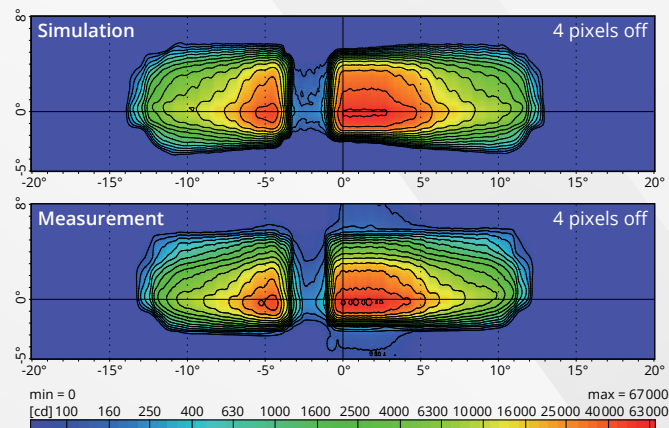


Demonstrator: ADB and complementary low-beam system

### ADB optical system:

- LEA with 28 x LUXEON NeoExact 1.0 mm<sup>2</sup>
- Doublet of PMMA lenses
- 1<sup>st</sup> lens: 3 mm back focal length, anamorph
- Dimensions of 2<sup>nd</sup> lens: 68 mm x 30 mm
- Effective focal length: 71 mm → 0.8°/mm (at center)
- Distance from LEA surface to tip of 2<sup>nd</sup> lens: 112 mm

## Optical performance: ADB contrast

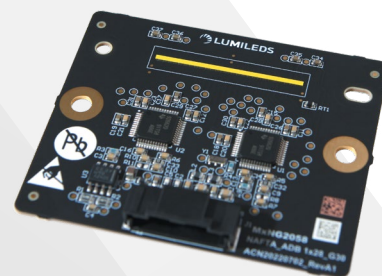


## LUXEON NeoExact ADB matrix

For the application demonstrator, we used:

- FR4 AIN-inlay board with 28 x LUXEON NeoExact 1.0 mm<sup>2</sup> in one row
- Board dimensions: 63 mm x 52 mm, inlay dimensions: 31.5 mm x 6.0 mm
- Gaps of 50 μm between the LEDs
- Two 12-channel matrix managers

LUXEON NeoExact matrix solutions can be customized to your needs: 1 to 4 rows, any pixel count per row, electronic controls as specified. LUXEON NeoExact LEDs are available with light-emitting areas of 0.5 mm<sup>2</sup> and 1.0 mm<sup>2</sup>.



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