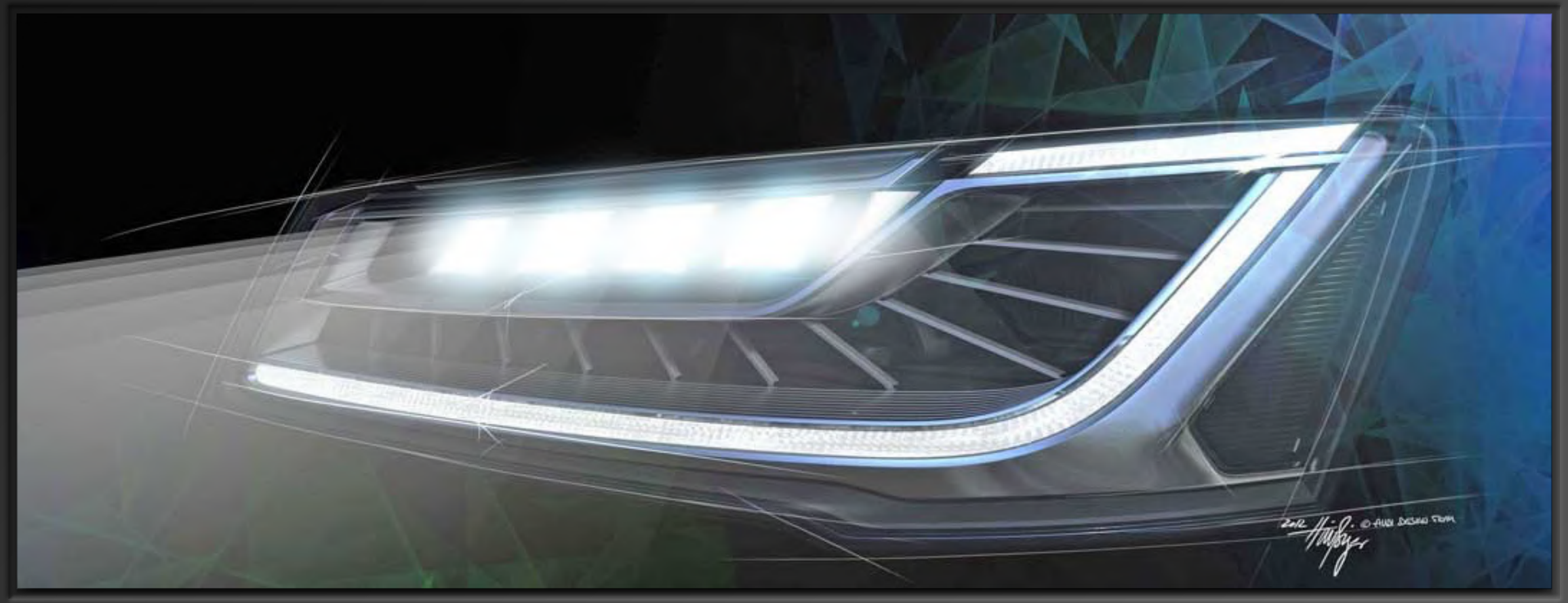
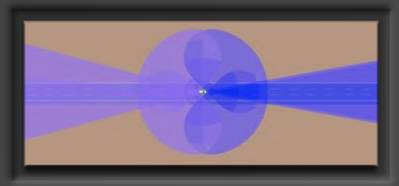


SensLight

8th DVN Sensing & Applications Conference

What is SensLight?



SensLight – Measuring Lights for Smart Vehicles

SensLight performs lighting and sensing with the same components, making every vehicle light a sensor.
With lights positioned around the car, SensLight easily enables a 360° field of view.
Because SensLight is the light itself, it offers major integration and cost advantages.
It supports ADAS and AD, with sensor functions such as distance, speed, object size, and visibility measurement.

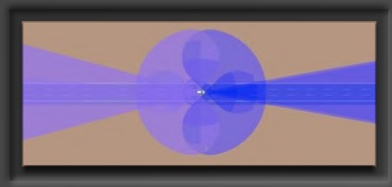
Highlights:

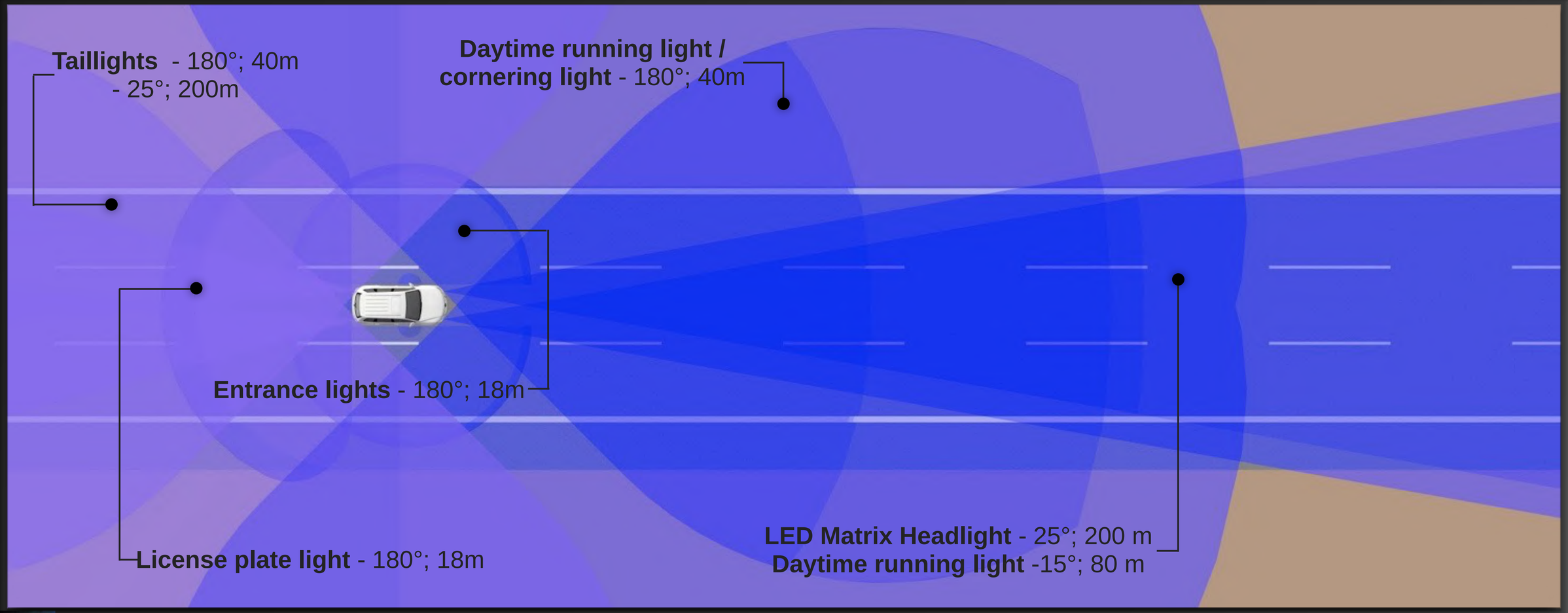
- Works in near-, mid-, and long-range detection
- Handles multiple pixel and multiple targets per pixel
- Operates in all weather conditions
- Can quantify driver visibility

First hardware tests show a range of over 145 m using only a quarter of one LED.

SensLight for automated driving and ADAS

SensLight is a sensor technology that enables 360° detection of objects around the car. Existing LEDs and lasers around the car are used as light sources. The sensors are to be integrated into existing lights.





SensLight Technology - Overview in Numbers

Realisations with different Lights

Light	Range	Angular Field h / v	Angular Resolution
DTRL Cornering Lights	80 m	up to 180° / up to 40°	≥ 0.1 °
Taillights with supporting IREDs	up to 200 m	up to 180° / up to 40°	≥ 0.1 °
Entrance Lights	18 m	up to 180° / up to 85°	≥ 0.1 °
Licence Plate Lights	18 m	up to 180° / up to 85°	≥ 0.1 °
LED Matrix Headlamps or Laser Handlamps	≥ 200 m	about 25 ° / 10°	≥ 0.1 °

Common Properties			
Cycle Time	2 … 10 msec	Distance Accuracy	0.02 m
Segment size	1 … 0.5 °	Distance Seperation	1,6 m … 0.16 m
Bandwith	100 MHz … 1 GHz		

Integration - Sensor Dimensions

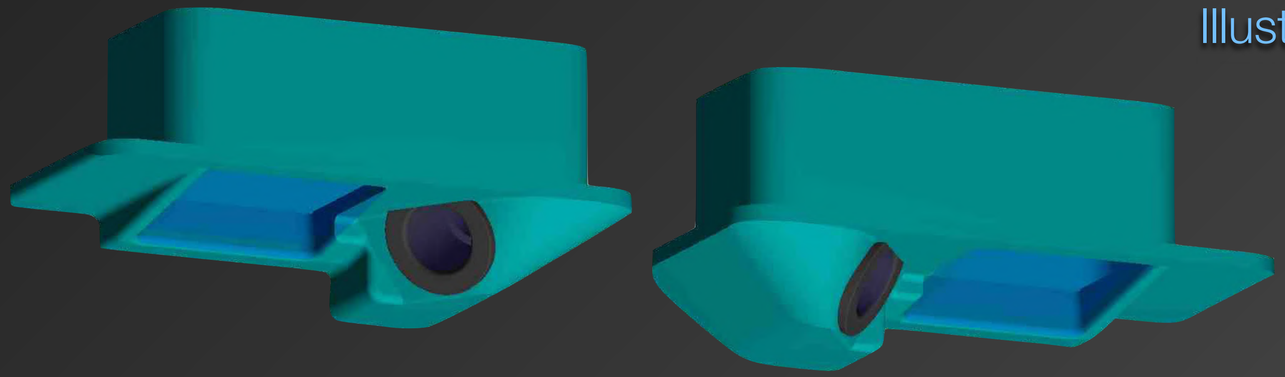
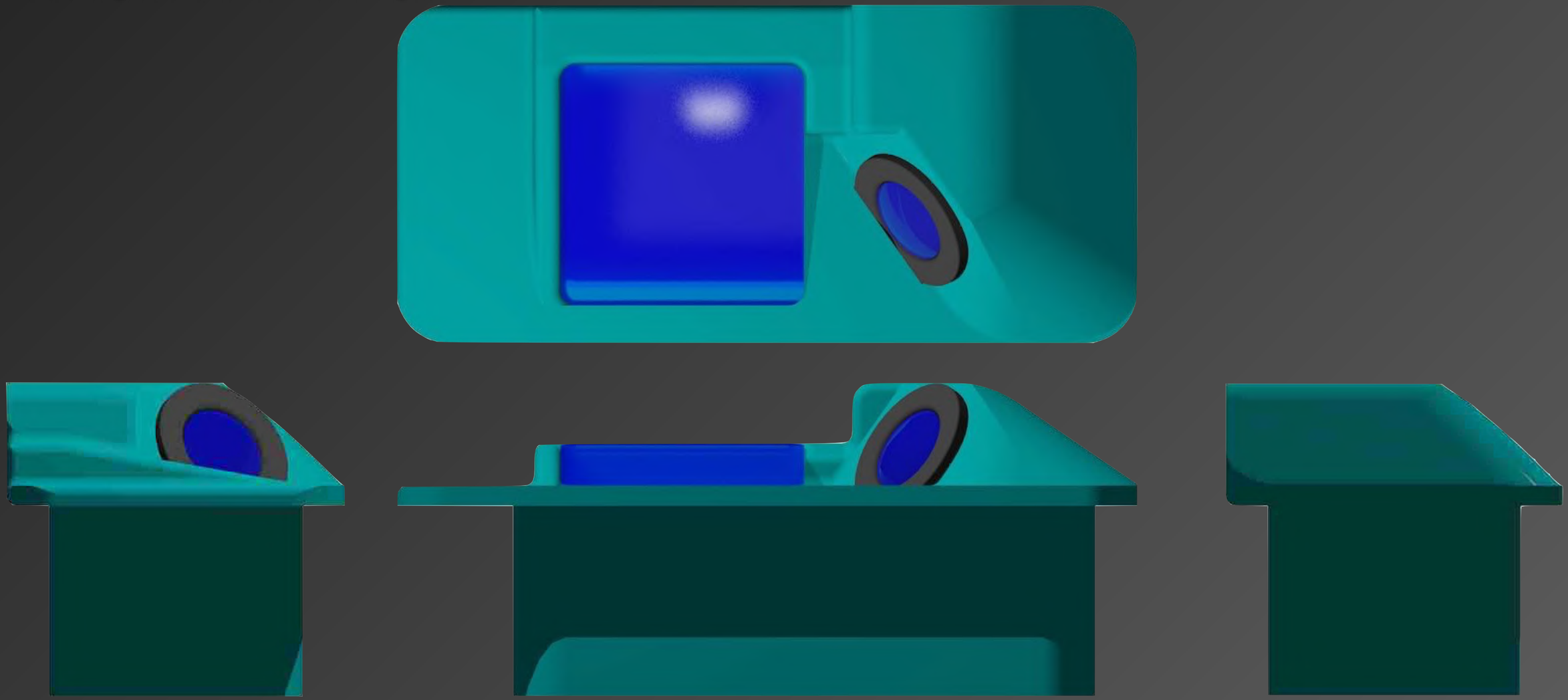


Illustration of the integration into the license plate lighting

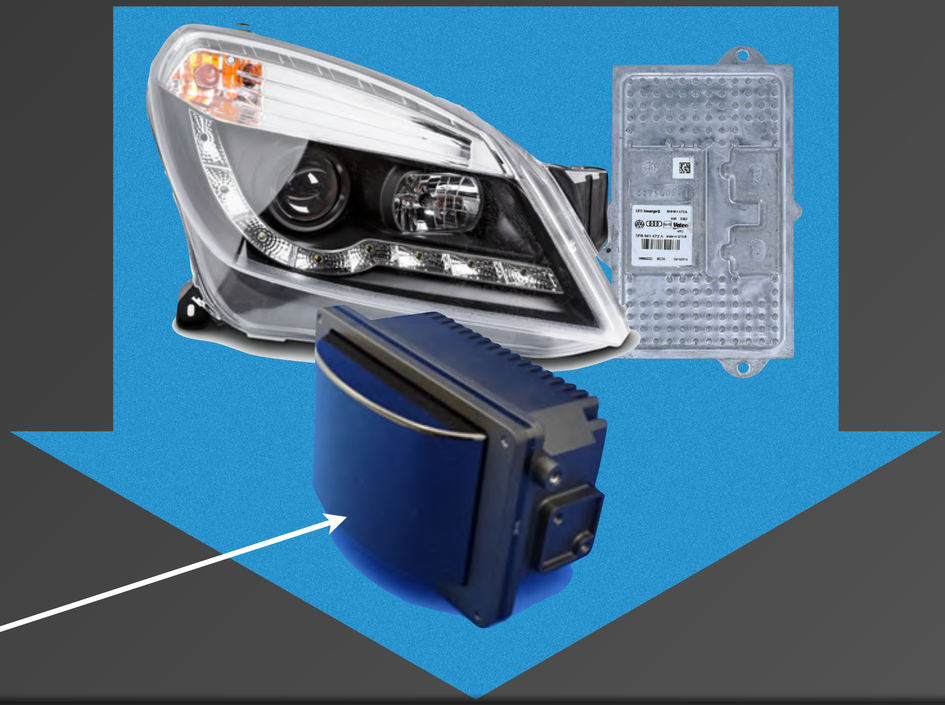
Integration - Sensor Dimensions

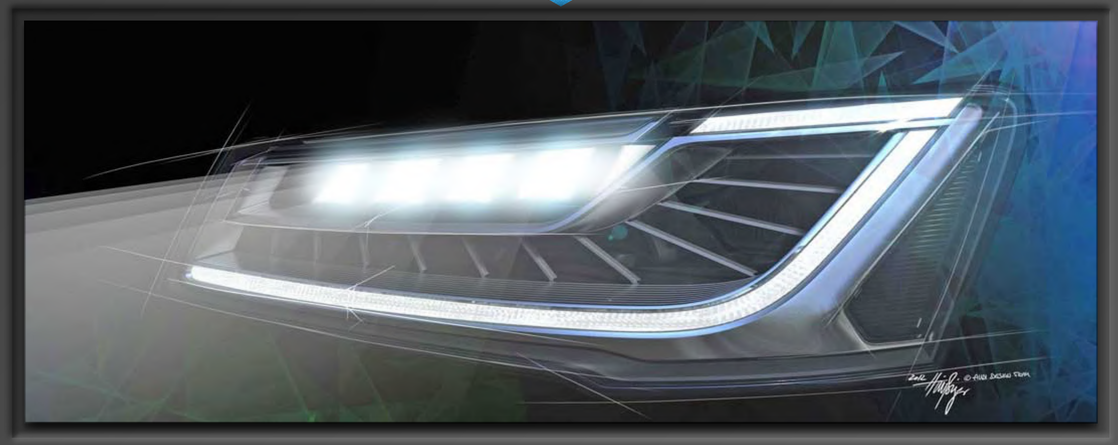
SensLight “License Plate Light”



SensLight Costs - Benefits

- The integration of lighting and sensors creates a new product called "SensLight" with a significantly lower cost structure than current solutions.
- Only a receiver module with signal processing needs to be integrated into the light – not a complete sensor!
- Significant savings potential can be identified compared to current solutions.





SensLight Technology - Advantages Vehicle Integration

- SensLight sensors do not require any additional mounting brackets or installation spaces on the vehicle.
- SensLight sensors are installed with the respective light source, so no additional installation time is required on the vehicle assembly line.
- No additional adjustments are required on the vehicle assembly line. Workshops do not require any additional tools or workstations for SensLight sensors.

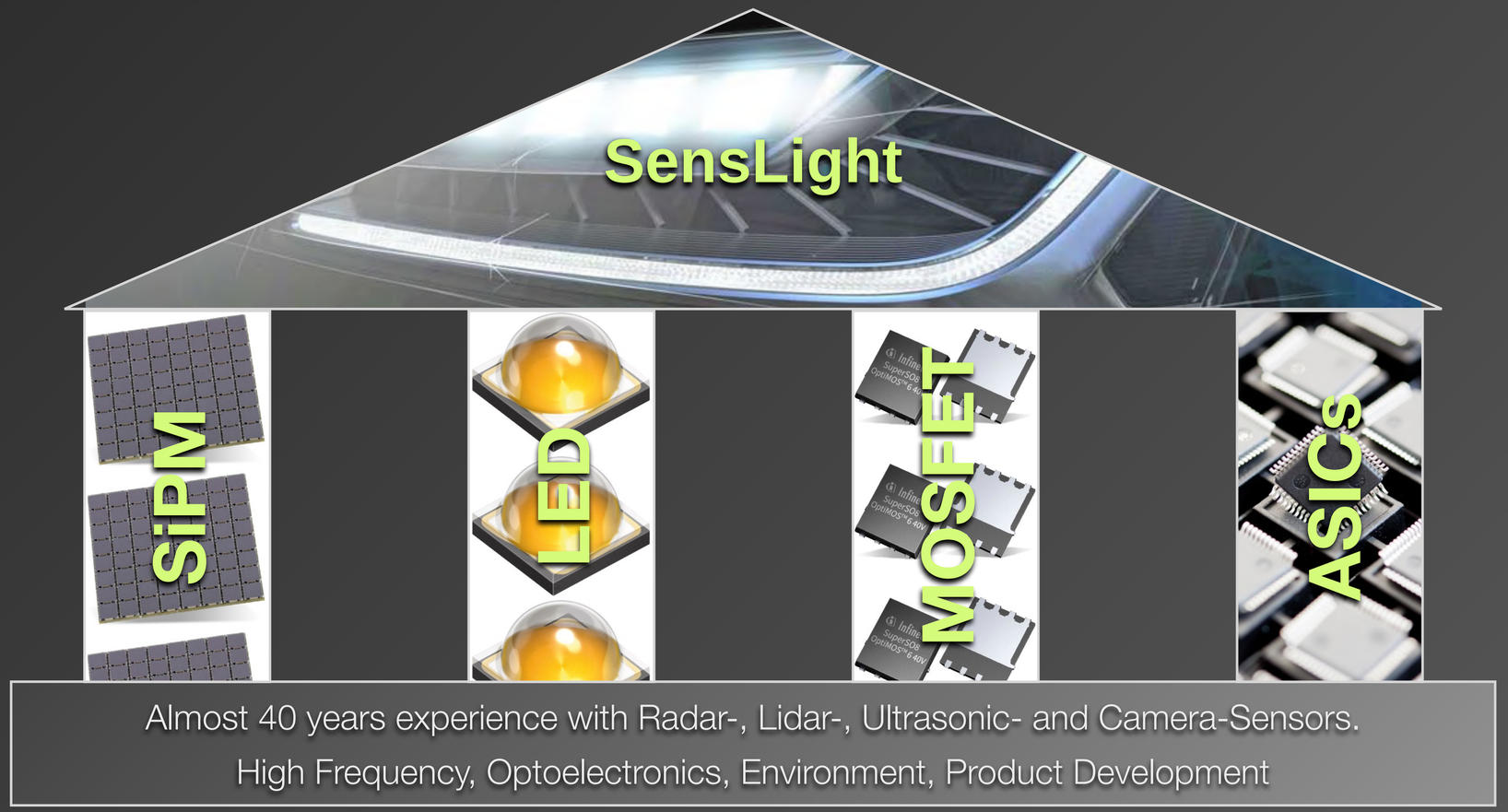
Actual Integration

Integration using SensLight

Why is the time ripe for SensLight?

SensLight – Enabled by Many Innovations

There is not a single reason or trick that makes SensLight possible — it is the result of several combined advancements in technology, design, and system integration.



Almost 40 years experience with Radar-, Lidar-, Ultrasonic- and Camera-Sensors.

High Frequency, Optoelectronics, Environment, Product Development

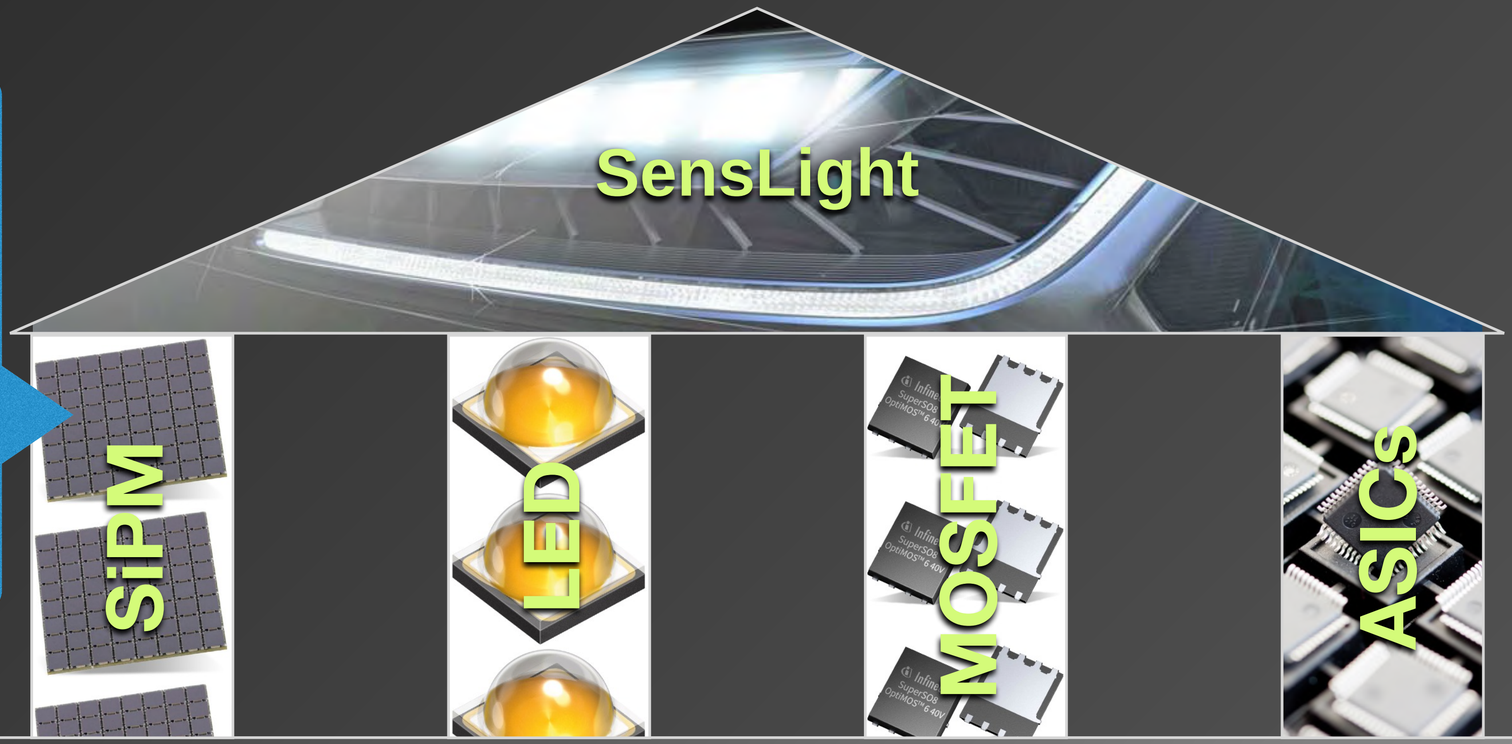
Why is the time ripe for SensLight?

SensLight – Enabled by Many Innovations

There is not a single reason or trick that makes SensLight possible — it is the result of several combined advancements in technology, design, and system integration.

SiPM – The Ideal Detector for SensLight

The SiPM (Silicon Photomultiplier) is a highly sensitive detector that perfectly complements the SensLight technology.
In our implementation, we overcome the typical overload issues that occur in bright environments.
SensLight fully leverages the SiPM's strengths — speed, sensitivity, and precision.

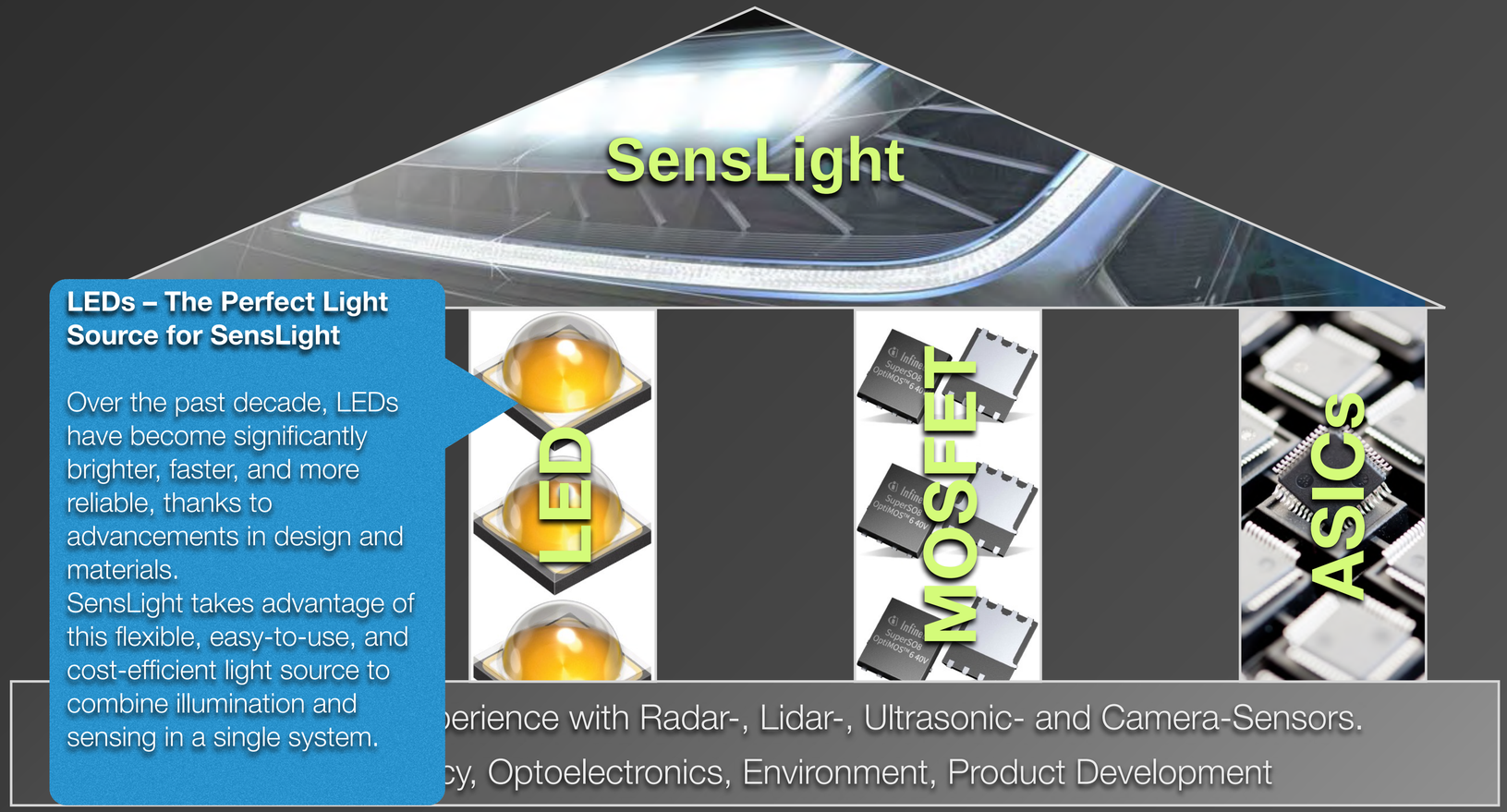


Almost 40 years experience with Radar-, Lidar-, Ultrasonic- and Camera-Sensors.
High Frequency, Optoelectronics, Environment, Product Development

Why is the time ripe for SensLight?

SensLight – Enabled by Many Innovations

There is not a single reason or trick that makes SensLight possible — it is the result of several combined advancements in technology, design, and system integration.



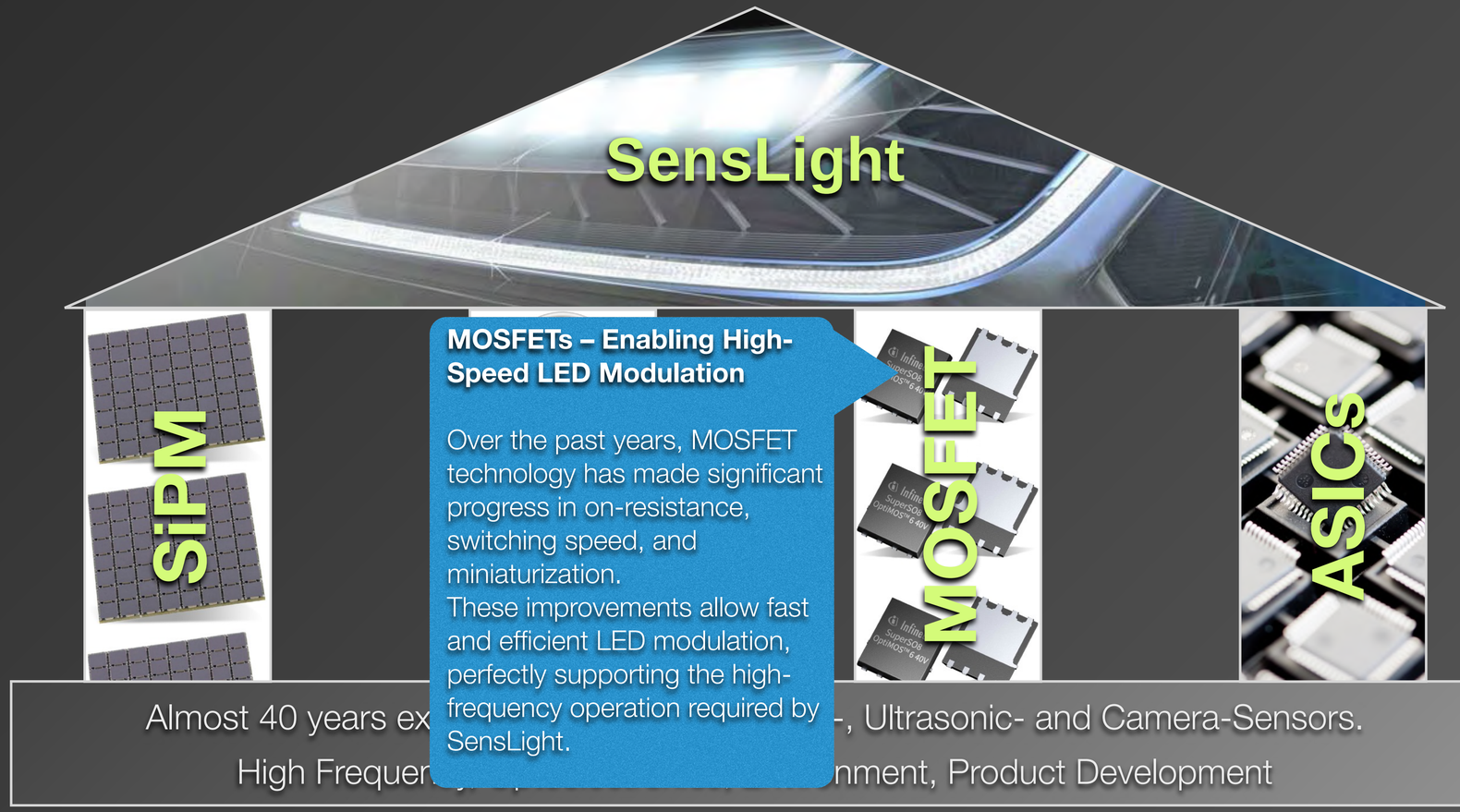
LEDs – The Perfect Light Source for SensLight

Over the past decade, LEDs have become significantly brighter, faster, and more reliable, thanks to advancements in design and materials.
SensLight takes advantage of this flexible, easy-to-use, and cost-efficient light source to combine illumination and sensing in a single system.

Why is the time ripe for SensLight?

SensLight – Enabled by Many Innovations

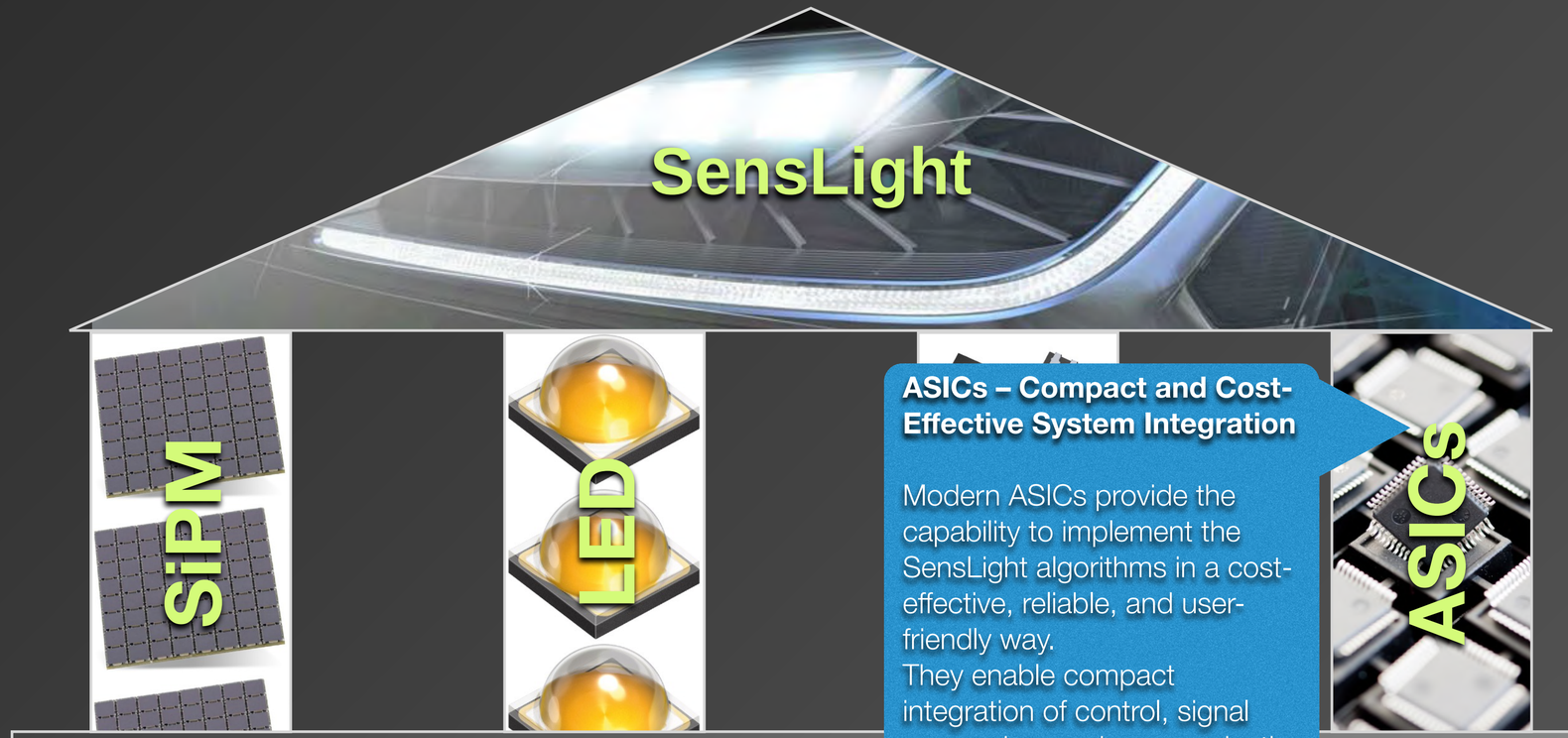
There is not a single reason or trick that makes SensLight possible — it is the result of several combined advancements in technology, design, and system integration.



Why is the time ripe for SensLight?

SensLight – Enabled by Many Innovations

There is not a single reason or trick that makes SensLight possible — it is the result of several combined advancements in technology, design, and system integration.



ASICs – Compact and Cost-Effective System Integration

Modern ASICs provide the capability to implement the SensLight algorithms in a cost-effective, reliable, and user-friendly way.
They enable compact integration of control, signal processing, and communication functions within a single chip, perfectly suited for automotive applications.

Why is the time ripe for SensLight?

SensLight – Enabled by Many Innovations

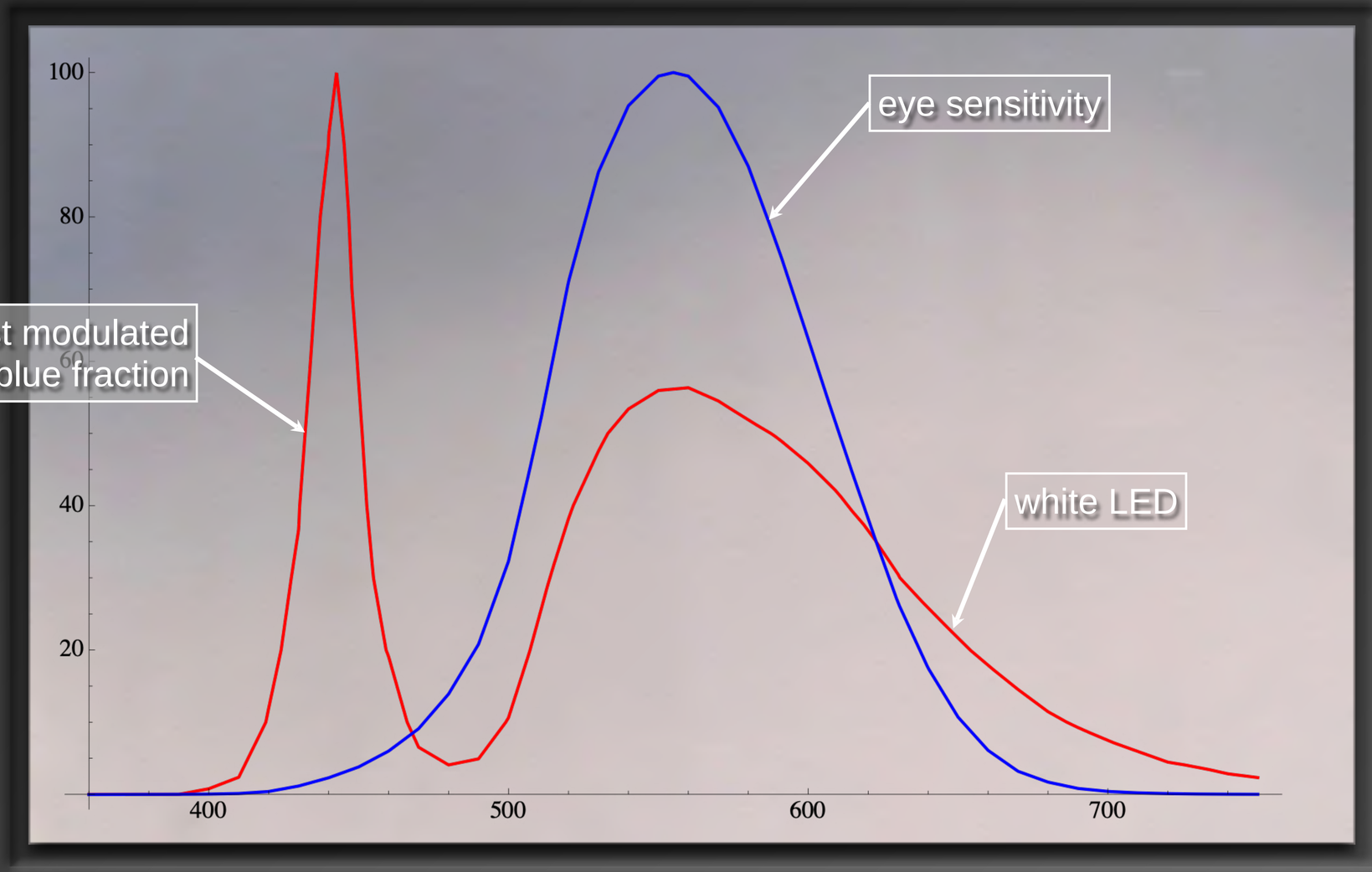
There is not a single reason or trick that makes SensLight possible — it is the result of several combined advancements in technology, design, and system integration.

SensLight Technology Advantages

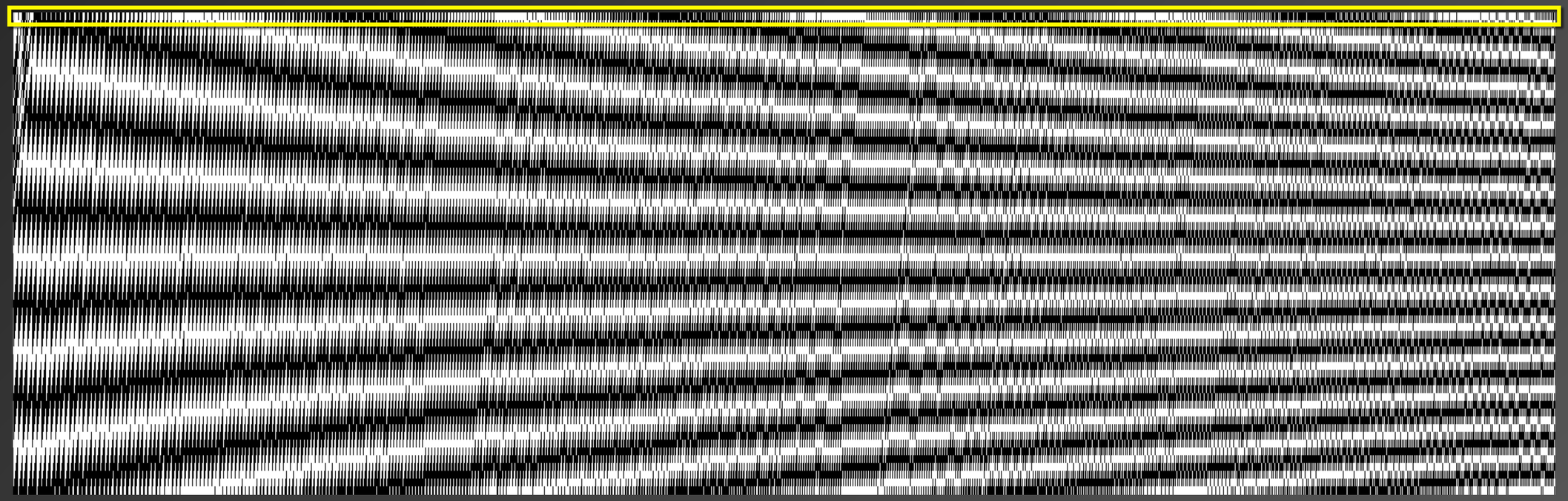
- SensLight is much more sensitive than pulsed lidar technologies (factor 120 to 180) by mixing the TX signal with the RX signal like a radar.
- SensLight technology can better separate and identify multiple objects because it uses a higher bandwidth than, for example, "photon mixing devices" and similar technologies.
- The acquisition time is very short. It can be in the range of 32 µs to 256 µs, even for "images" with 240,000 pixels.
- SensLight technology does not require high-power light sources and therefore does not require wavelengths such as 1.5 µm.
- SensLight technology can process multiple targets in each “pixel."
- In many cases – especially with very cost-sensitive sensors – the SensLight technology is part of the lamp and not just integrated into a lamp.

SensLight Technology - Applied effect

Use blue component of the white LEDs

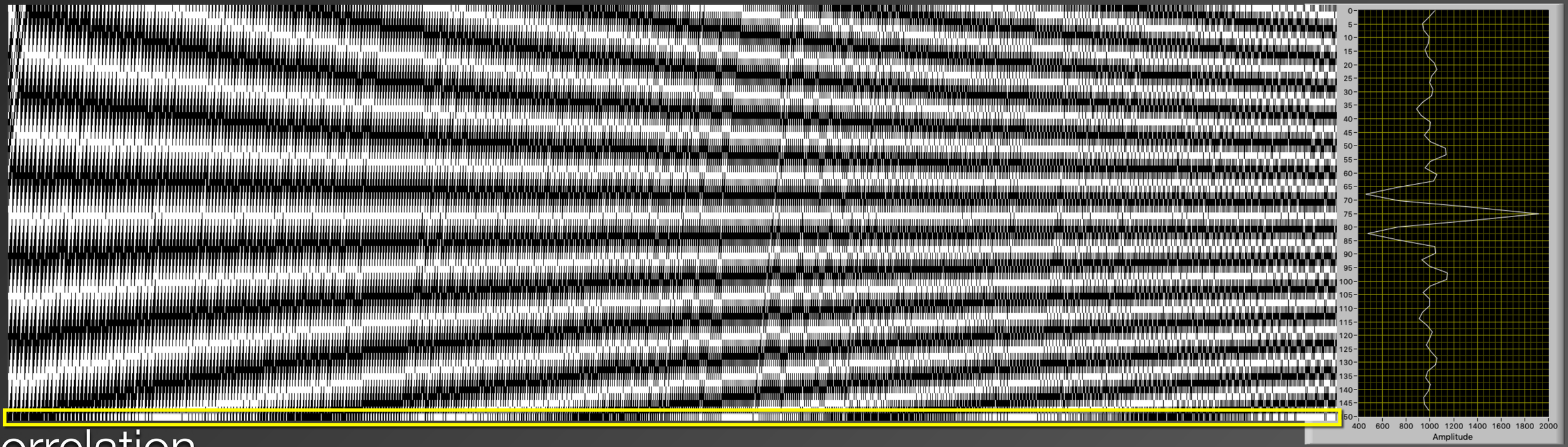


SensLight Technology - How it works



Correlation

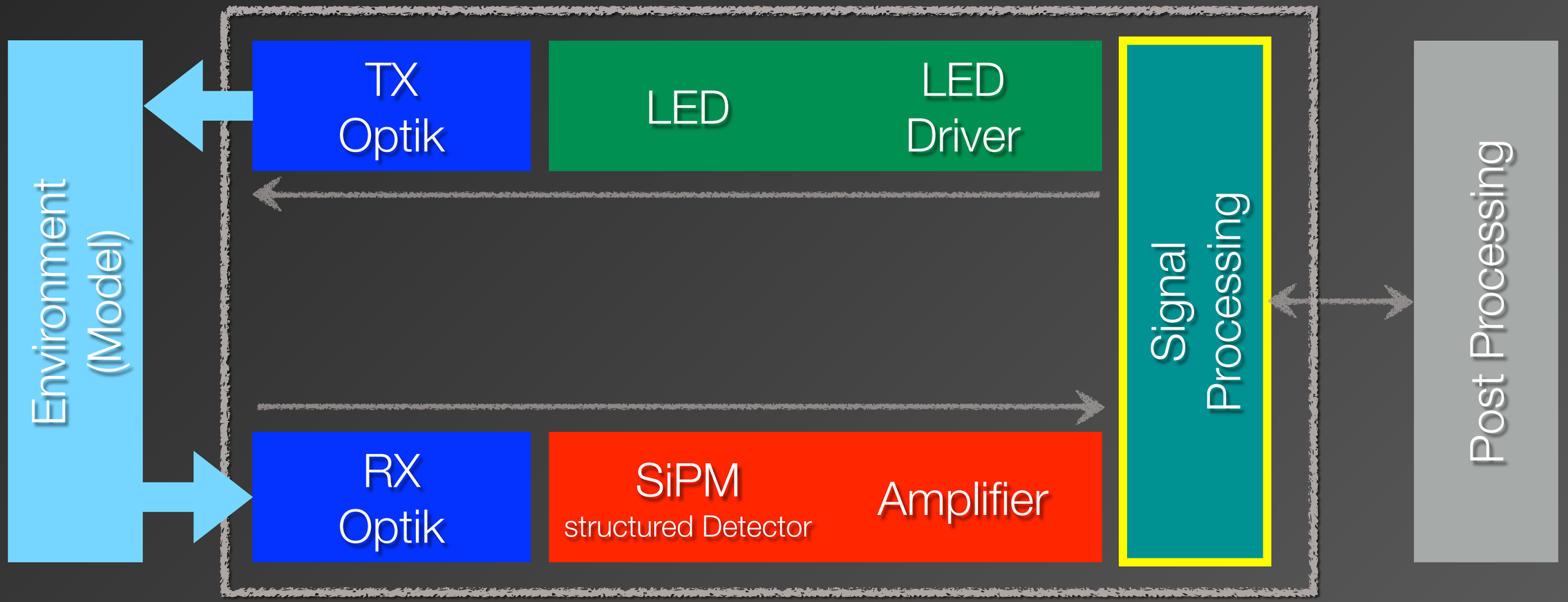
SensLight Technology - How it works



Correlation

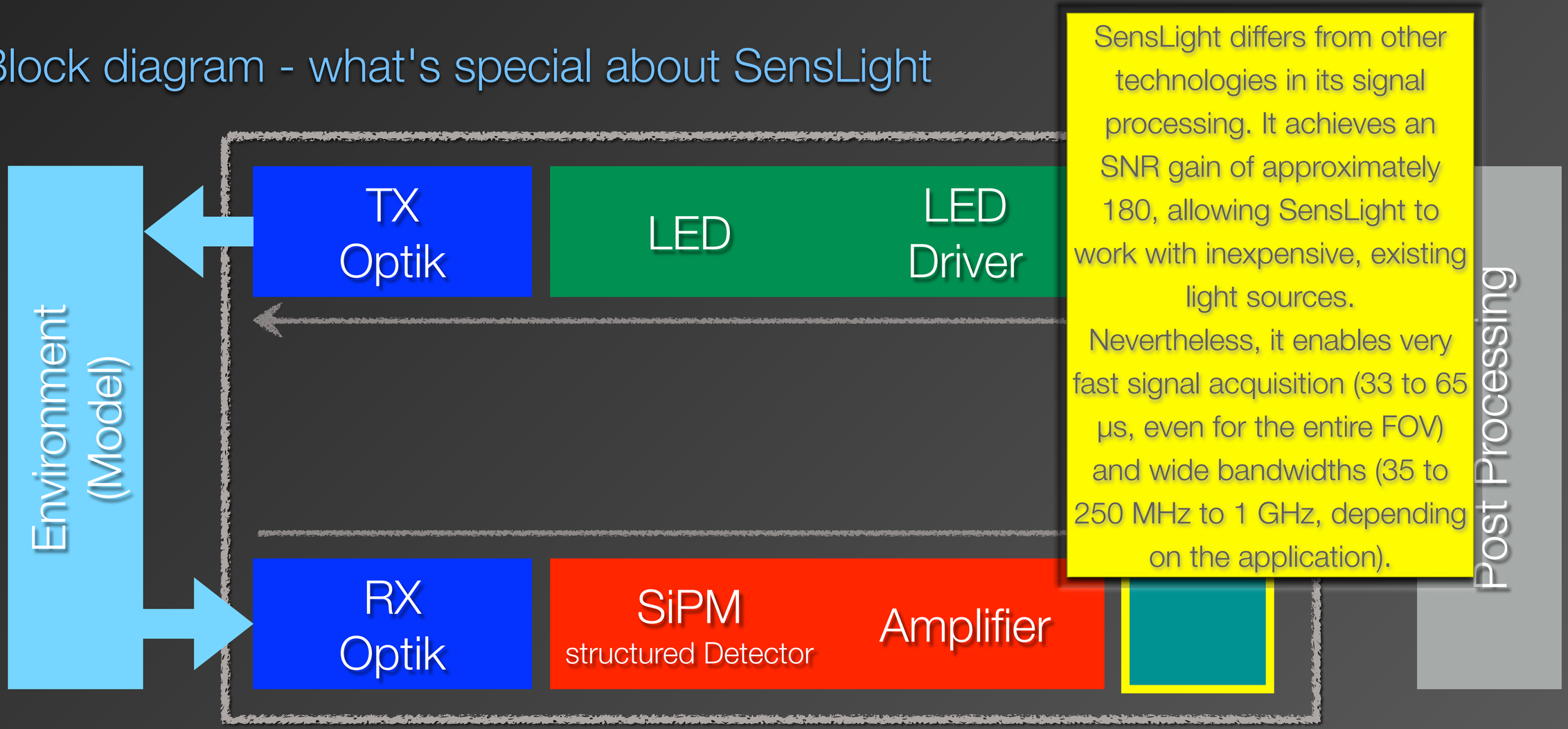
SensLight Technology - Block Diagram

Block diagram - what's special about SensLight



SensLight Technology - Block Diagram

Block diagram - what's special about SensLight



SensLight differs from other technologies in its signal processing. It achieves an SNR gain of approximately 180, allowing SensLight to work with inexpensive, existing light sources.
Nevertheless, it enables very fast signal acquisition (33 to 65 µs, even for the entire FOV) and wide bandwidths (35 to 250 MHz to 1 GHz, depending on the application).

In Short: Why SensLight is needed?

Challenge: For ADAS and AD, functional improvements and a broader range of functions are required at reduced costs.

SensLight is the solution because:

- SensLight provides the right performance for relevant ADAS and AD functions.
- SensLight sensors are easy to integrate with minimal effort. Potentially resulting in reduced costs.
- SensLight sensors operate reliably in all typical driving environments.
- SensLight sensor costs are extremely low, even compared to well established technologies.

Finally

- Today, I was only able to give you a brief overview of SensLight.
- If you find the concept interesting and would like to learn more, please don’t hesitate to contact us.

Contact Adress:
Joachim Tiedeke
Eichenstrasse 1
8280 Kreuzlingen
Schweiz
P.: 0041 71 552 0072
Email: jtiedeke@bluewin.ch