

# **Feedback from last Lighting Events**

以往车灯活动的反馈

# **Expectations for 2019**

2019年预期

# Feedback from last Lighting Events

## 5 last important events on Lighting in 2018-2019:

2018-2019年，汽车照明界的5项重要活动：

- DVN WS in Munich: *Digital Light*

*DVN慕尼黑技术交流研讨会：数字照明*

- DVN WS in Tokyo: *Technology and Regulation*

*DVN东京技术交流研讨会：技术和法规*

- VISION congress in Paris: *Lighting and ADAS*

*VISION大会：照明和ADAS*

- Lidar conference in Frankfurt: *Lidar technologies and integration in headlamp and rear lamp*

*激光雷达会议：激光雷达技术及其与头灯、尾灯的集成*

- DVN WS in Rochester (Detroit) : *Safer, Smaller and Smarter technologies*

*DVN罗切斯特（底特律）技术交流研讨会：更安全、更紧凑和更智能的技术*

# Feedback from last Lighting Events

**The 3 conclusions of the different lectures**  
**演讲提炼的4项结论:**

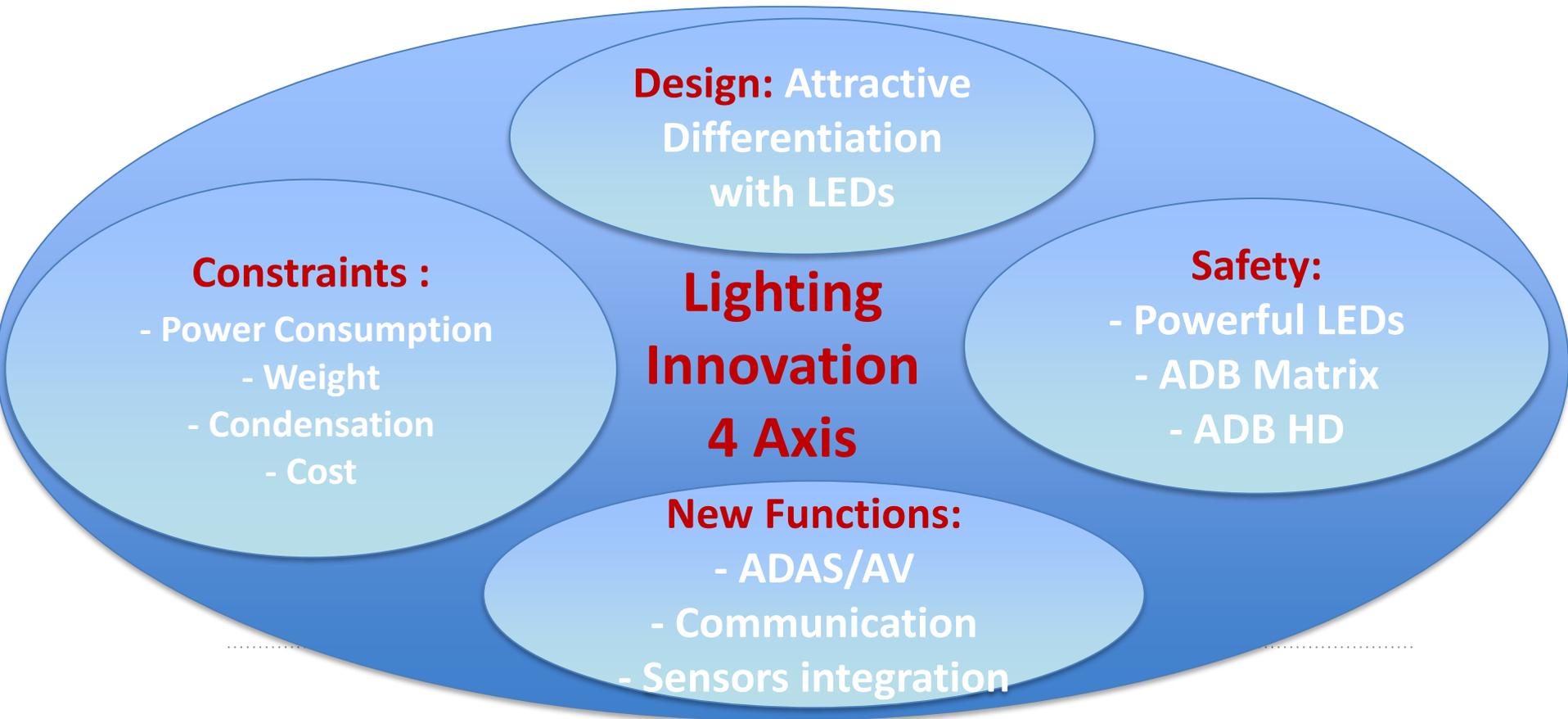
**Lighting is led by :车灯引领要素:**

**1- Innovations创新**

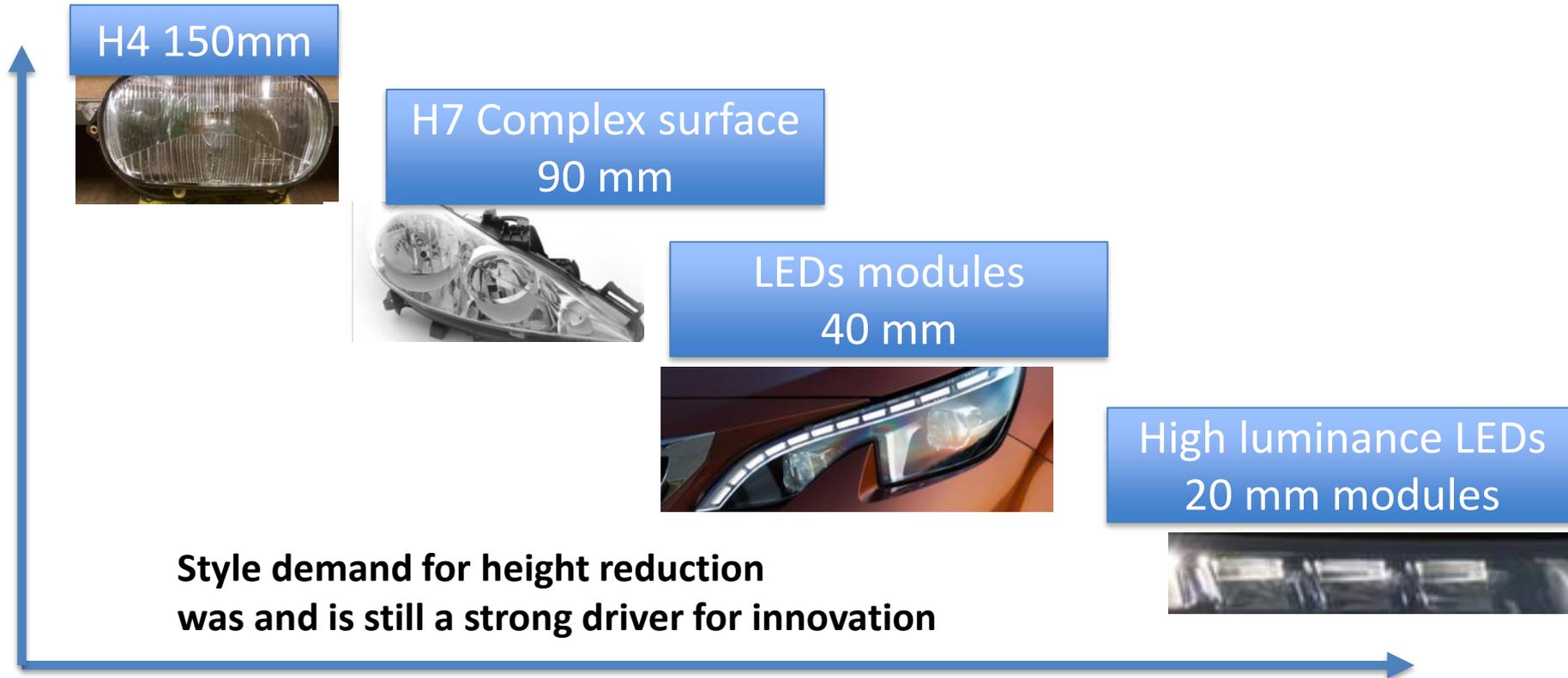
**2- Networking网联**

**3- Regulations法规**

## 2- Innovations Feedback from last Lighting Events



# 1-Styling Height reduction



# 1-Styling Height reduction

Towards 10mm height modules with high luminance light sources



DVN workshop Hella prototype



Concept car  
Alfa Romeo Tomale  
Geneva 2019



Concept BYD e-seed GT2019

# 1-Styling Interest of generalization Full LEDs

**Main driver for progress for headlamps: Height reduction**

**If an halogen version is maintained, the style of the body cannot take all the advantages of height reduction**

**➔ Generalization of LEDs is a strong driver for style improvement**



**Citroen C5 Aircross Halogen**

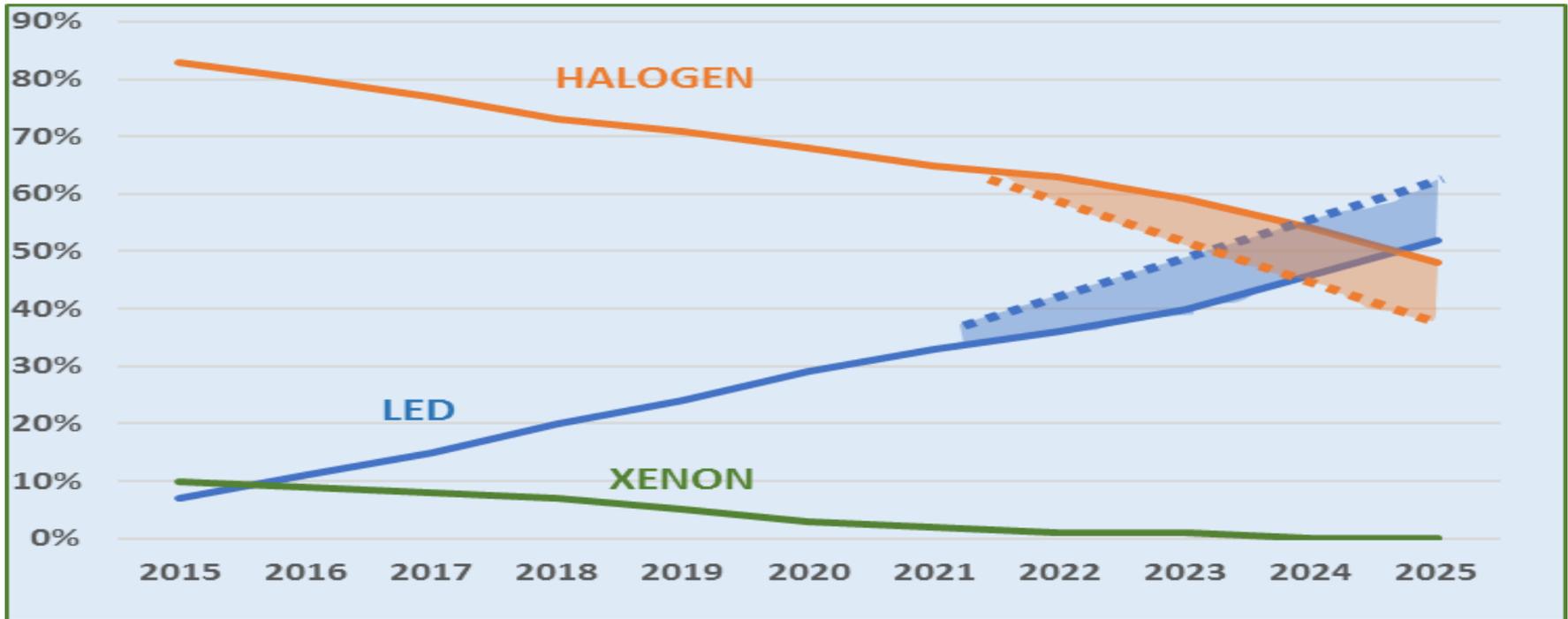


**Citroen C5 Aircross LEDs**

# 1-Styling with generalization of Full LEDs HL

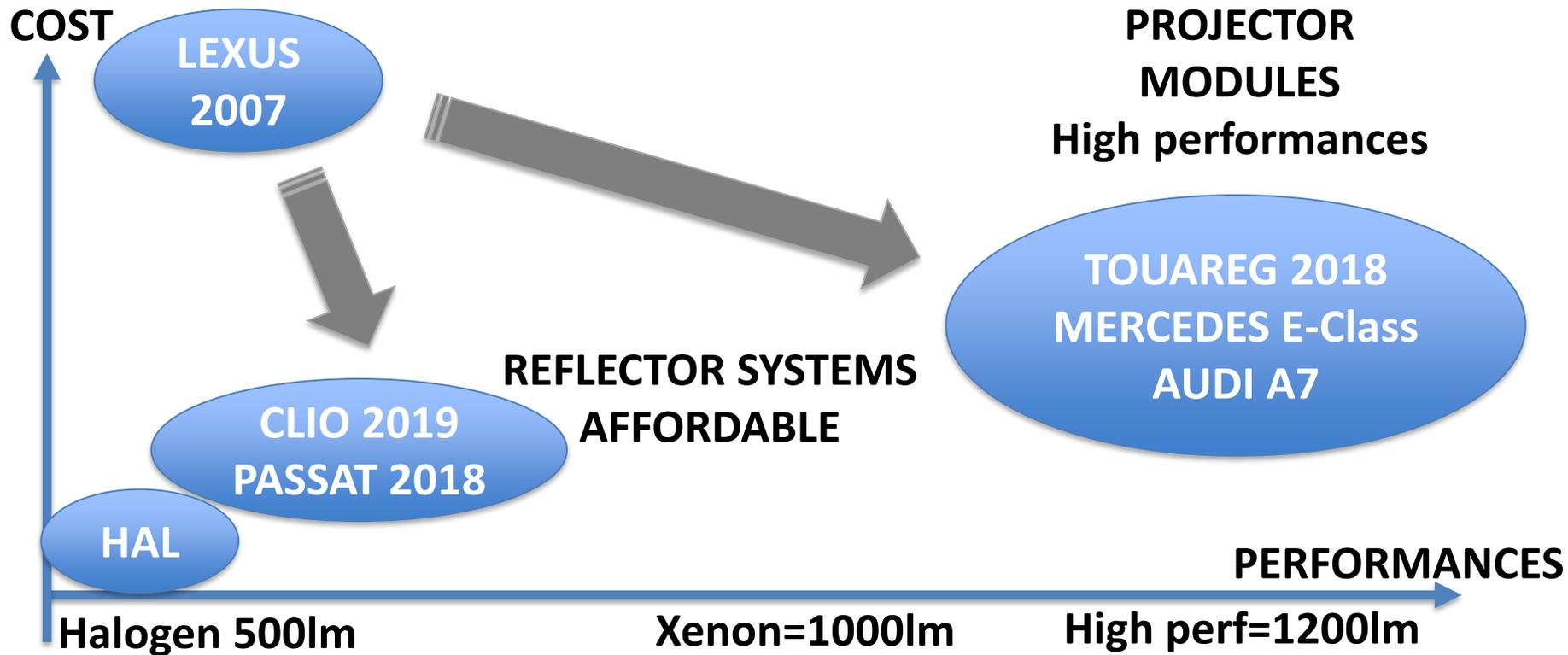
## Generalization of Full LEDs systems for Front lighting

*Estimation of install rates of headlighting technologies upward potential for higher LED prevalence (dotted line) DVN Study*



Decision to use Full LED on all future models (at least for Europe, NA, Asia) already taken by several car makers

# 1- Styling with Generalization of LEDs



# 1-Styling with affordable LEDs

## Affordable Full LEDs with reflector systems



**Volkswagen Passat 2018 US**



**New Renault Clio 2019**

# 1-Styling High range LEDs Differentiation

**Projector modules with jewel aspect  
with very reduced height**



*Honda Legend 2018*

*Volvo XC 40*

**DRL emphasized with main lighting  
modules hidden**



*Range Rover 2019  
Plug-in hybrid*



# 1- Style Differentiation with LEDs Rearlamps



**Citroen C5 Aircross 3D effect**



**BMW Serie 5  
Homogeneous structural**



**OLED Audi TT**

# 1- Style Differentiation with LEDs Rearlamps

## Volkswagen Click-Clack Rearlamp systems -

Source Volkswagen- DVN Workshop



Passat 2014



Tiguan 2016

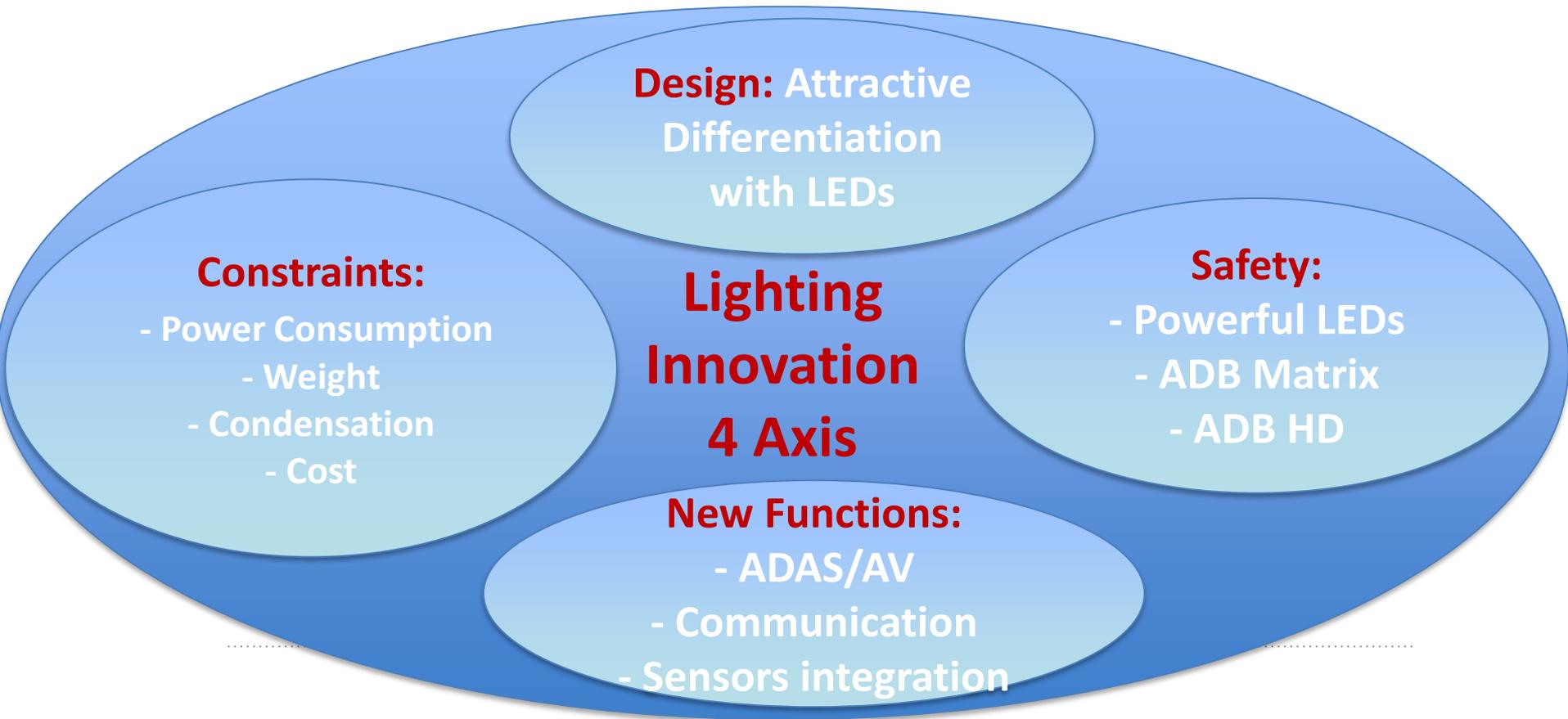


Golf 2017



Touareg 2018

## 2- Innovation Feedback from last Lighting Events



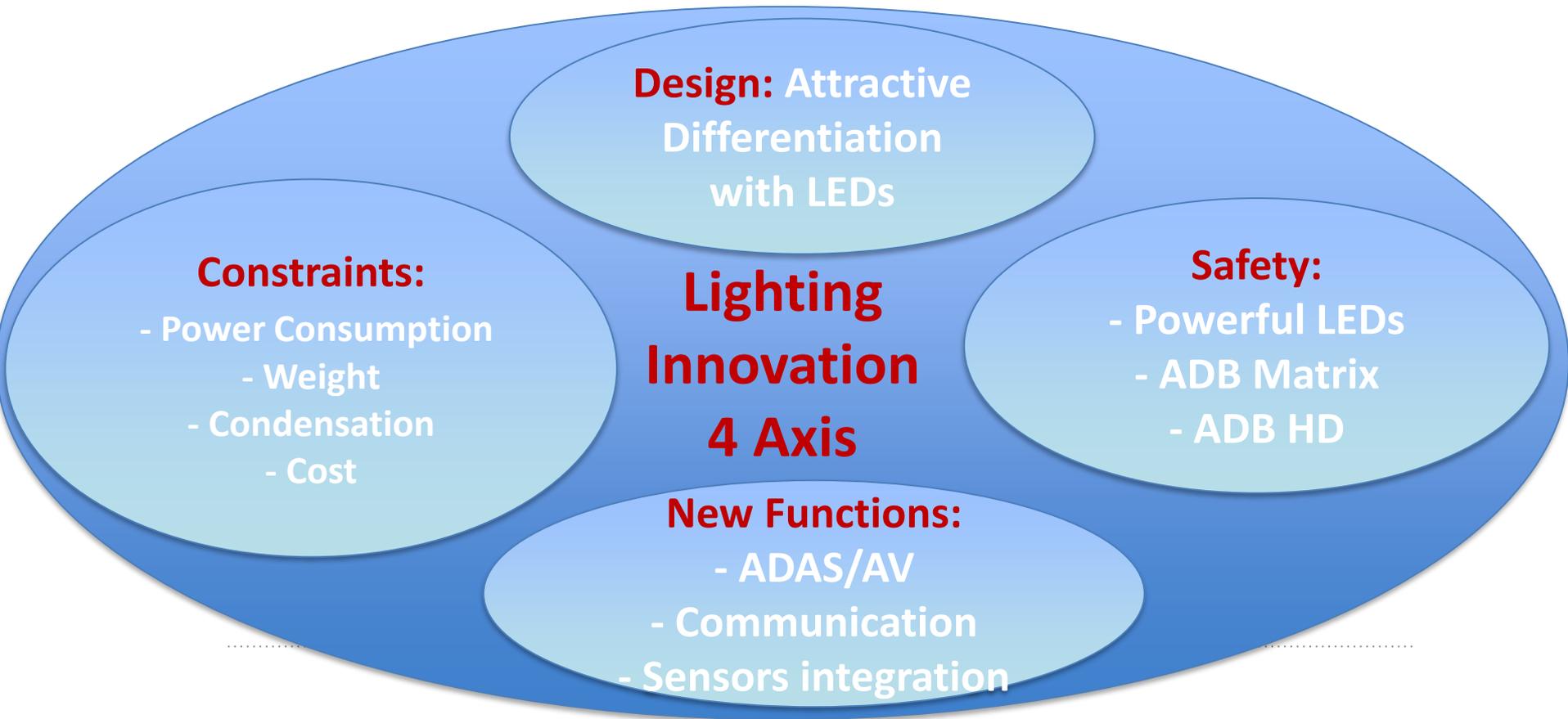
# 2- Innovation for Constraints

## Constraints:

- Power Consumption
- Weight
- Condensation
- Cost

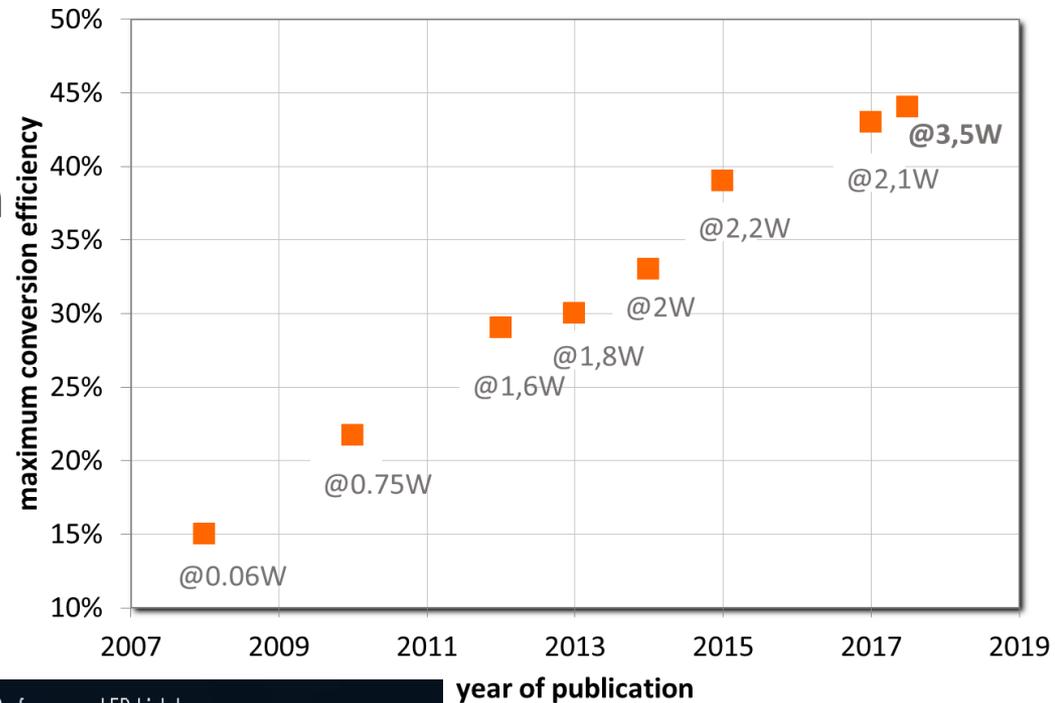
- **Power consumption:**
  - Targets for LEDs democratization:
    - Better performances than halogen: > **600lm** (LB) instead 500lm
    - Better power consumption: < **20W** instead 60W thanks to LEDs efficiency multiplied by 3 since their introduction in 2007: 90lm/W instead 30lm/W
- **Weight reduction:** important now with new regulation for CO2 or electric vehicles
- **Cost:** Affordable LEDs have an on cost estimated currently at +50%/halogen  
→ On cost to be divided by 2 in the next 3 years

## 2- Innovation Feedback from last Lighting Events



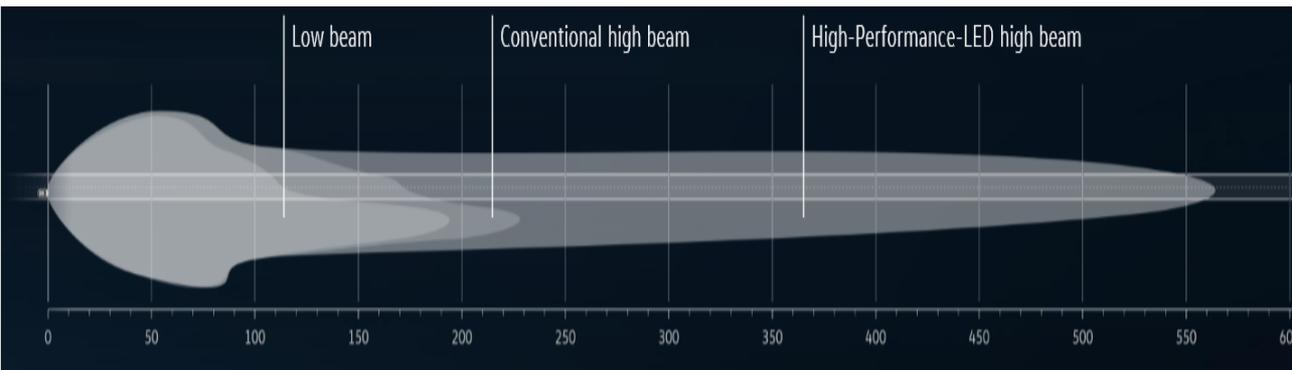
## 2- Innovation for Safety for long range high beam

- Laser light was introduced to improve high beam range, extending it to 600m
- Laser is improving, but still with a relatively high cost
- It is now challenged by high luminance LEDs



year of publication

Osram blue laser roadmap –  
DVN workshop



Volkswagen high performance-LED high beam

## 2- Innovation for Safety with ADB

- ADB is confirmed as the most interesting innovation for safety with an average range enhancement of more than 20m
- Matrix beam is now replacing progressively mechanical systems
- Number of pixels is increasing with current state of the art at 100



*VW IQ-Light 128 LEDs/ HL*



*Mercedes e-class  
Multibeam with 84 LEDs*



*Audi A7 Matrix HB with Laser*

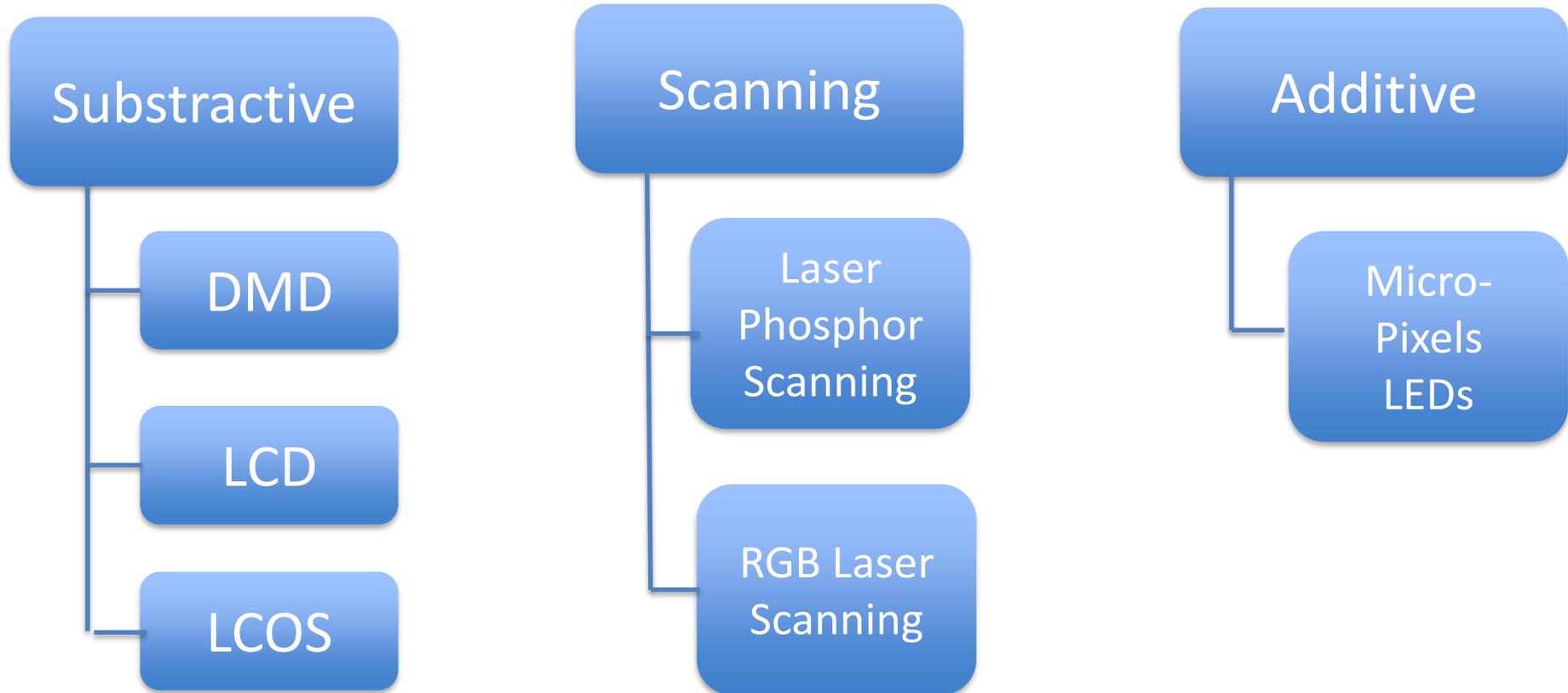
# 2- Innovation for Safety with Digital Light

- **Digital for improved Safety:**

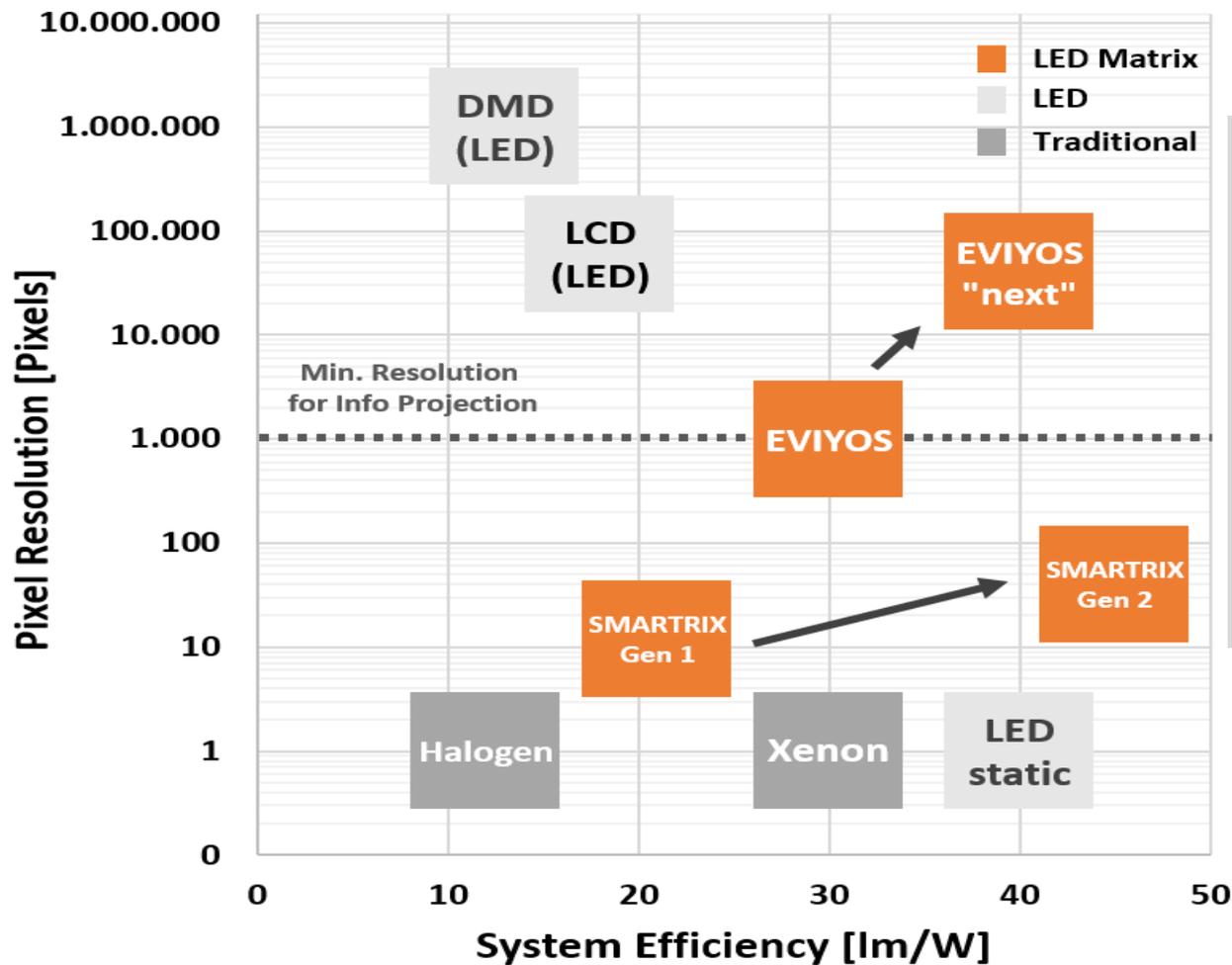
- Dynamic Light
- Guidance tool
- Hazard Warning



## 2- Innovation for Safety with Digital ADB HD



# 2- Innovation for safety with Digital ADB HD



**LED Matrix will likely be the short term winner for:**

- Power consumption
- Cost
- Competition

**Long term winner not yet fixed**

Source Osram-DVN Workshop

# 2- Innovation with Smarter and Smarter Lighting Systems

First SOP	Function	Embedded SW in the HL	Sensors	Network
1995	AFS	1-3ko	4	LIN
2003	DBL	2-5ko	7	LIN
2010	ADB	60-130ko	8	CAN
2016	ADB Pixel	300-700ko	8	CAN
2020	Road Marking	800-1500kO	9	CANFD FPD link Ethernet

Source Valeo - DVN Workshop

# 2- Innovation Rearlamps

## Examples of Lighting Features for Matrix Tail lights

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Individual signature/animations



Function on demand



Safety functions



Source Volkswagen – DVN Workshop

21% Rear-end-collision

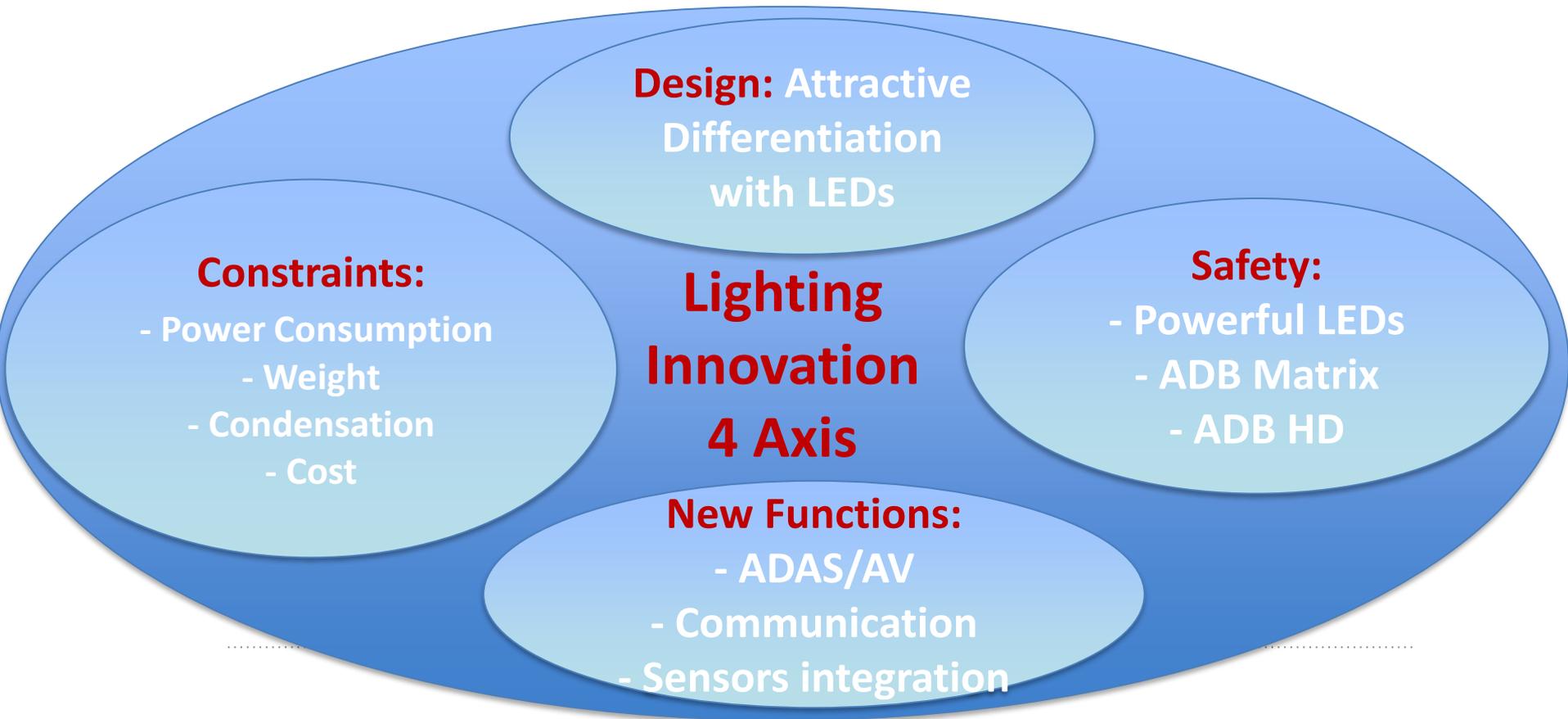
## 2- Innovation with new source OLEDs

### New Audi A8 Rearlamp

- OLEDs are used on high range cars
- Bringing new styling possibilities
- With still high prices



## 2- Innovation Feedback from last Lighting Events



# 2-Innovation Communications with Lighting



# 2-Innovation Communications with Lighting

Why?  
Where to install?  
Which signal (Shape,  
Color,..)?  
How to proceed and  
standardize?



## 2- Innovation for which communication

- Consensus to have new signal functions
  - Status of Automated Driving
  - Prediction of driver-less car's motion
    - To replace current information from driver's attitude
    - To enhance current information by signal lamps
      - For instance Parking departure
- Requirements:  
Simple, directly understandable,  
standard



Source: Hella - DVN Workshop



Source: Valeo-Ichikoh - DVN Workshop

# 2- Innovations Communications with Lighting

## How to communicate?

どの様にコミュニケーションを取る？

### Communication difficulties in Japan (examples)



Case 1: When expressing "Thanks" to other traffic users

Case1: "ありがとう"を他交通者に伝える時



+



Thank you!

Case 2: When expressing "Please GO first" to other driver

Case2: "お先にどうぞ"を他交通者に伝える時



OR



OR

Honk!  
Honk!



Is it the same?



Communication items are very complicated but it is important

Source: Honda - DVN Workshop

# 2- Innovations Communications with Lighting

## *Communication by*

### Projection



### Signaling



### Display



Source: Ichikoh - DVN Workshop

## 2- Innovation communication by signaling

Symbols need to be learned



Turquoise is not the first choice of colors



Introducing Symbols in manual Driving Mode



Source: Audi – Vision Congress

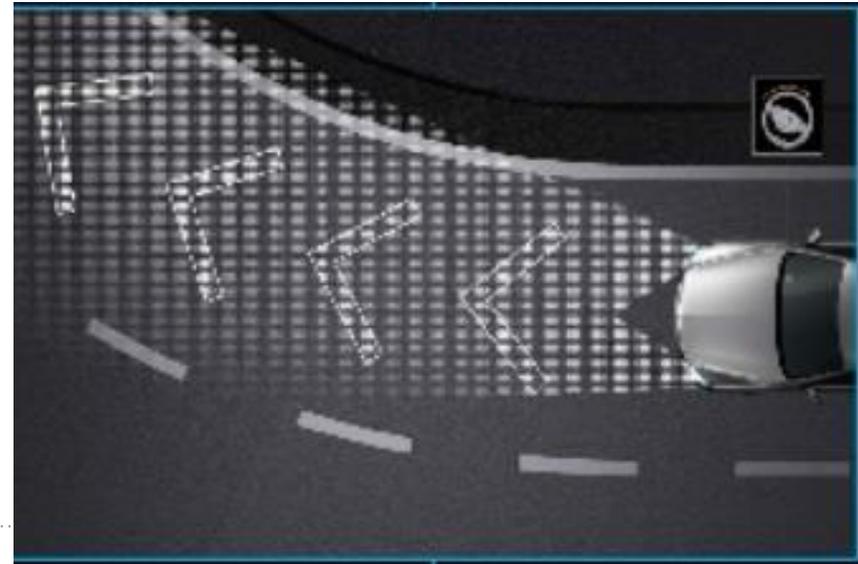
# 2- Innovations Communications with Light projection



Source: Varroc - DVN Workshop

Trajectory  
Projection  
showing the path

Light Projection  
for Parking  
Departure



Source: Mercedes - DVN Workshop

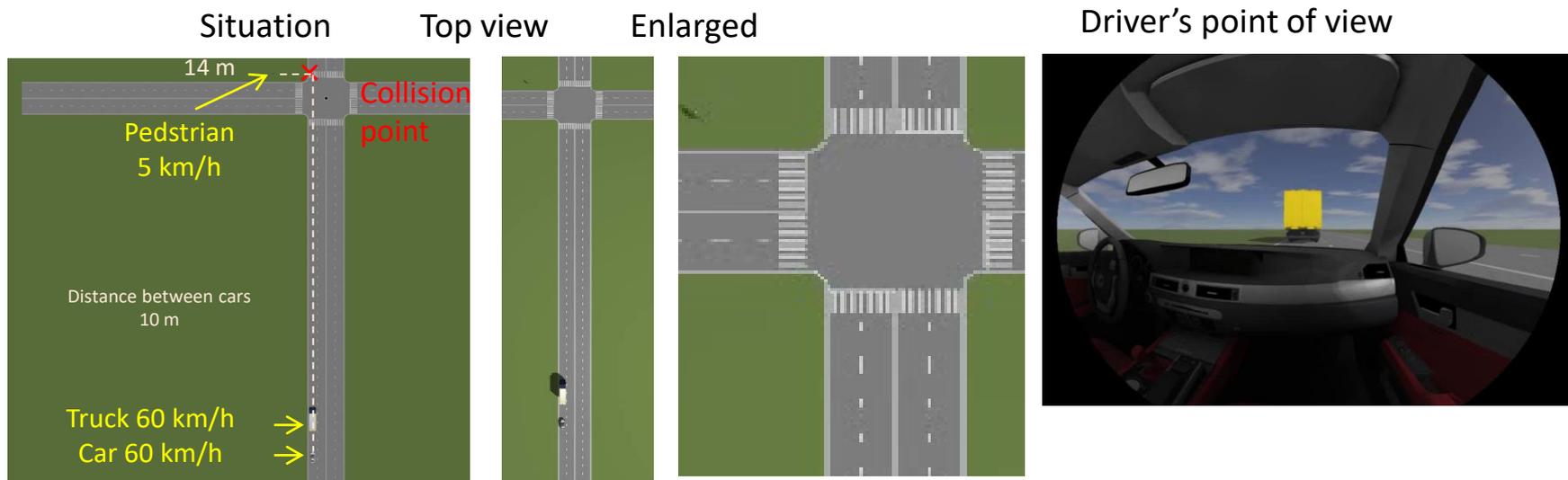
## 2- Innovation Communication with LIFI

- First step of communications: by projection, by signaling or by display
- Second step: By LIFI
- Few presentation in 2018
- Nevertheless, for the future with Autonomous driving:
  - Redundant information will be necessary
  - Communication with other users or environment not easy with radio due to risk of interferences
  - LIFI will be useful and perhaps necessary
  - Technology not totally mature currently



# 2- Innovation with integration of LIDAR in HL

## Driving behind the truck, pedestrian cross the road from the left side



Position of LiDAR	In the headlamp	On the roof
Time to collision	5.9sec	2.8sec

Source: Koito - DVN Workshop

# 2- Innovation with integration of Camera in HL/RL

Situation at a crossing or at parking exit with other vehicles for instance trucks being parked in the street



More and more camera  
Some integrated in  
HL/RL



2010

2015

2020

>2025?

Source Yole-Autoliv

# 2- Importance of a good lighting system for ADAS

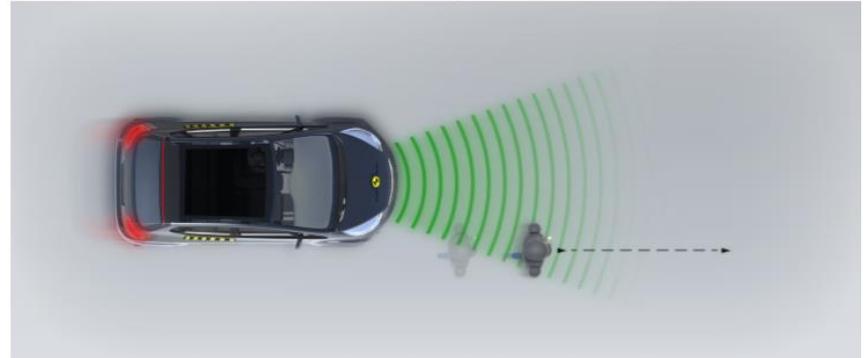
Day time

EXAMPLE OF EURONCAP RESULT (C5 AIRCROSS)

Adult crossing the road



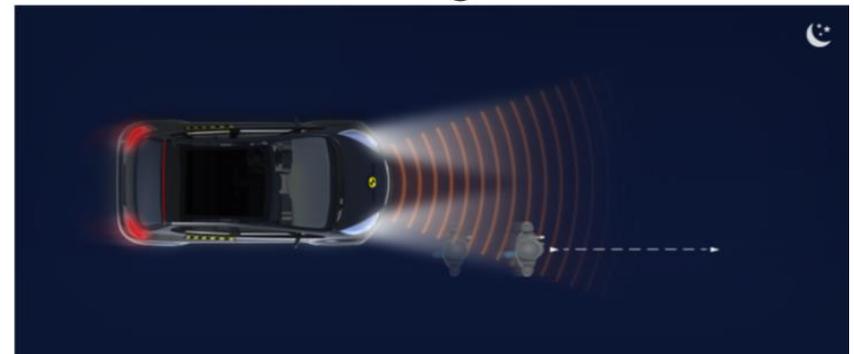
Adult along the roadside



Adult crossing the road



Adult along the roadside



Night time : **NOT GOOD ENOUGH**

## 2-Innovations with Autonomous cars and Lighting

- **Main question: Which future for Lighting with AV?**
- **Lighting function will remain very important:**
  - Traditional cars, pedestrian, cyclists will need to see AV cars
  - Lighting will help sensors particularly cameras
  - Passengers of AV will need to see the environment
  - New functions will be integrated particularly for communication or detection
  - Styling will remain with new challenges

# 3- Need of Networking

- **Need of benchmark, information, networking**

- DVN Congresses and Workshops:

More than :100 companies involved

- 2018 VISION : 600 attendees

- 2018 Munich, Tokyo, Frankfurt, Detroit:  
More than 300 attendees in each workshop

***Total of more than 100 lectures on lighting in 2018***



# 4- Feedback from 2018 Lighting - Regulation



- **Strong need of Harmonization**

- GTB needs direct input from company executives to help establish its strategy toward the fast moving developments in Geneva and other key areas of our lighting world
- Good work initiated by the GTB working groups for:
  - Simplified regulation targeting the result and no more the way to obtain it
  - Extended regulation for new functions and systems: Digital Light, Communication and AV
  - Presentations done several times in DVN workshops
- Harmonization requested also with USA particularly for ADB

# 2019 Expectations

- **2018 trends with improvements:**
  - Styling differentiation
  - **CO2 saving:** weight, volume, power consumption
  - **ADB and smart/digital lighting**
  - **New functions for ADAS/AV**
  - **Regulations: ADB in US, Digital Light**
- **Mega trends to be better integrated:**
  - **Megacities → Specific ADB system**
  - **Ageing population → better performances**
  - **Complexity of mixed traffic**



Mercedes at CES 2019