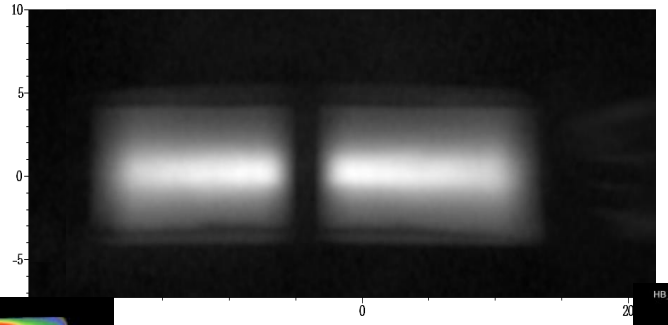
Overview Of Current ADB Solutions Low To High Cost
低成本ADB方案概述

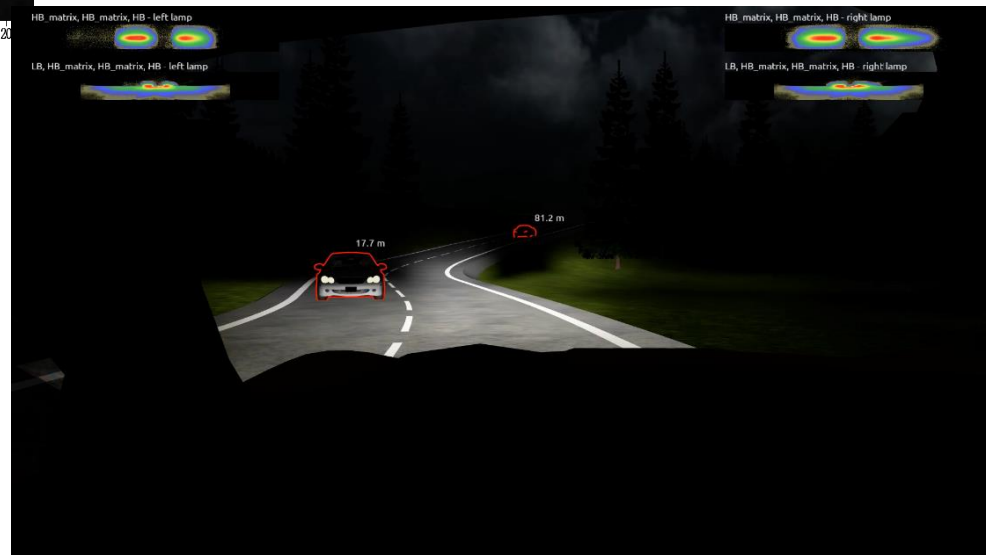
VARROC – David Hynar

ADB Technology ADB技术

- Adaptive Driving Beam = one of the highest leaps in automotive lighting
  ADB是车灯发展史上有一次技术性的变革

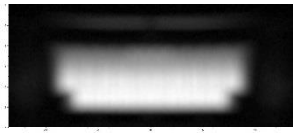
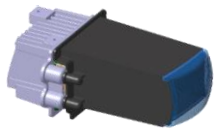
- Low beam segmentation not considered in the analysis (base beam, kink, bottom kink...)
  近光灯区块划分暂时没有被考虑（基础光，截止线等）

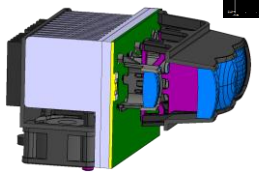


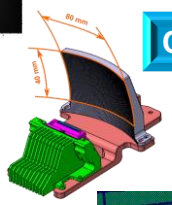


ADB Systems Roadmap
ADB系统的发展路径

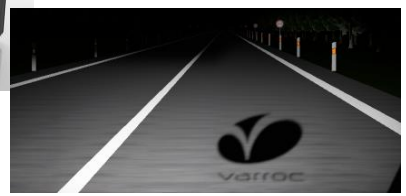
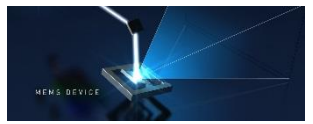
ADB – Varroc Technology Roadmap Forecast
伟瑞柯ADB发展路径







Pixel ADB (2018)

Cost effective ADB (2019)

EVIYOS LED ADB (2020)

10-20 kpix LED ADB (2021-2022)

2D MEMS PHOSPHOR CONVERTED (2022 – 2023)

LED DMD (2018-2019)

2018

2019

2020

2021

2022

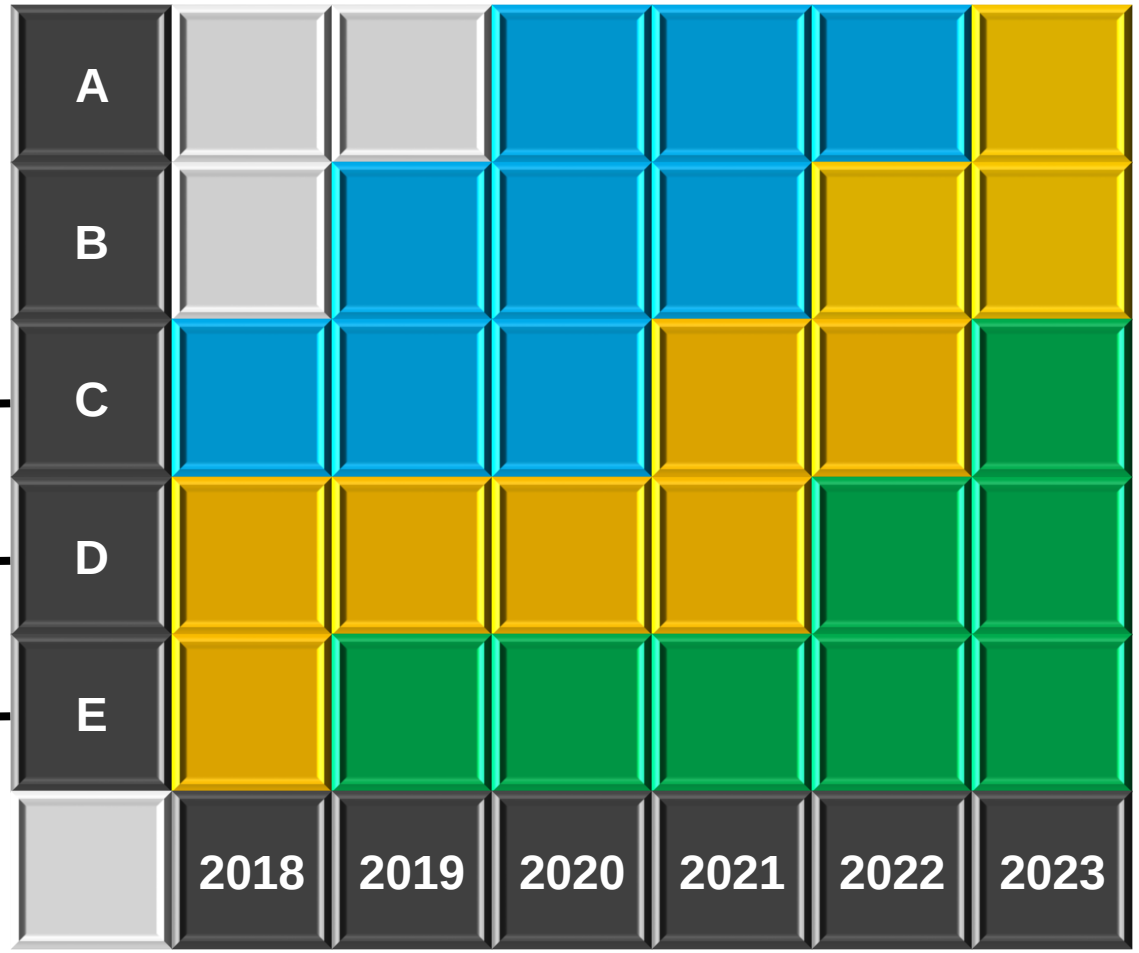
2023

	HIGH 1000+ px
	MID 30-200 px
	LOW up to 29 px

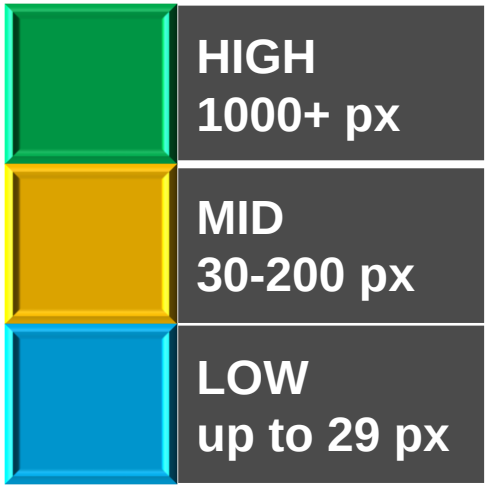
ADB Penetration Road Map Forecast - Technology available at vehicle segment*

ADB路径预测-针对不同级别车辆技术配备

Vehicles in serial production with Varroc ADB (2018)
伟瑞柯ADB在量产车型上的应用



This to be influenced by weight and power consumption of lamp.
车灯的重量和能耗也会对此有影响



More ways are possible. This shows just the first application but other solutions will also be used inside the segment.
对于同级别的车其他的可能性也同样存在。

***) European size segments, the first application**

ADB Systems – Cost Vs. Customer Perception

ADB系统-成本和客户的认知

ADB Main Cost Drivers 影响ADB成本的主要因素

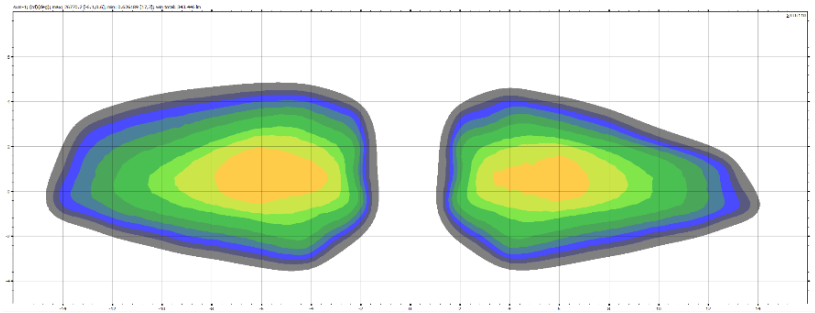
- ADB cost drivers:
  ADB成本的主要因素
  - **Number of segments = LEDs**
    单元格的数量，**也就是LED的数量**
    - Accordingly number of:
      相应的数量在于：
      - Matrix Manager (MM) switches – 12 / 6 channel optimalization
        矩阵开关-12/6**通道**
      - LDM channels LDM**通道**
  - Photometry targets versus optical efficiency/style (incl. required number of modules per lamp)
    - **光学性能目**标及光学效率、**造型**（**包括每个灯需要的模**组数量）
  - Heatsinks + fans
    散热器及风扇
  - Material of primary optics (glass, silicone)
    关键光学元件的材料（**玻璃**，**硅胶**）

ADB Analysis Description – Beams From One Lamp
ADB分析描述-光型

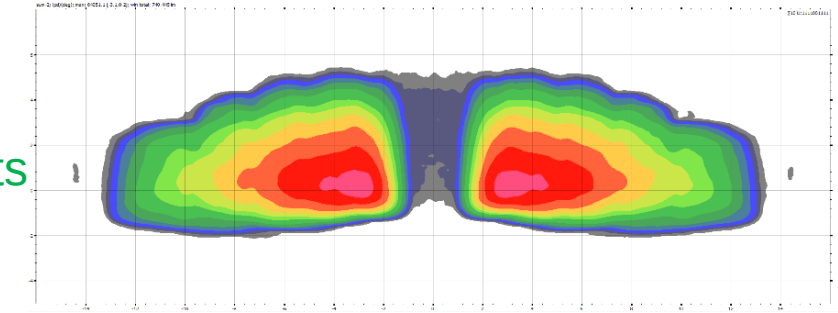
- REFLECTOR SYSTEM
- PROJECTOR SYSTEM

1-ROW ADB

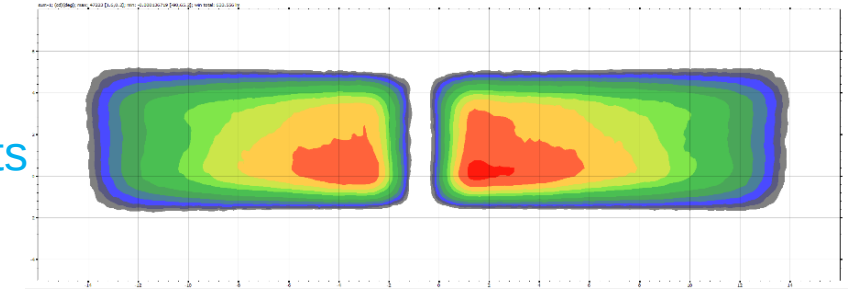
3 segments



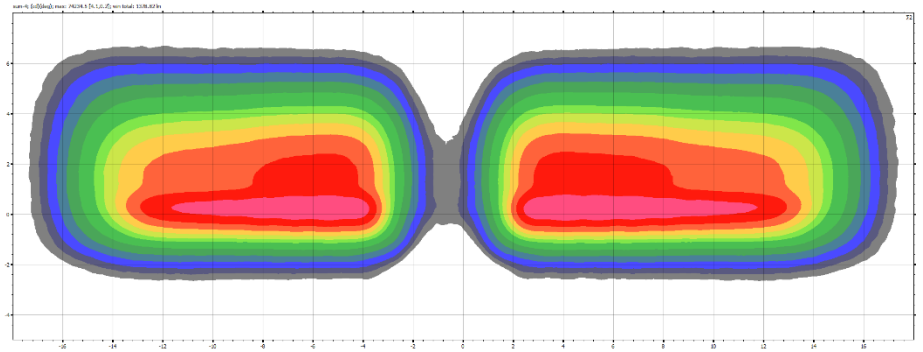
10 segments



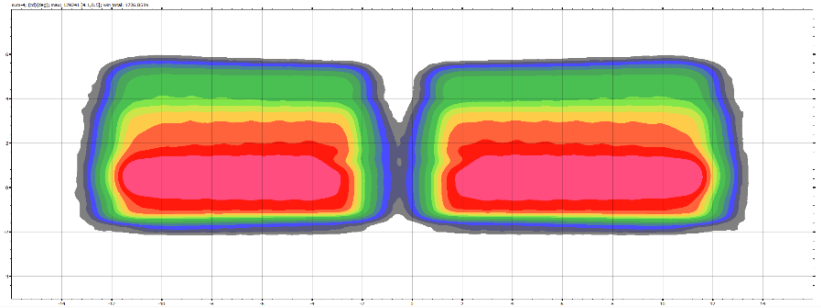
17 segments



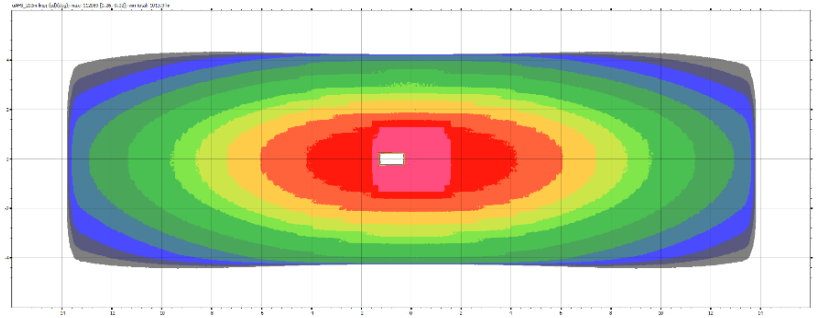
MULTI-ROW ADB



2 rows 19+19



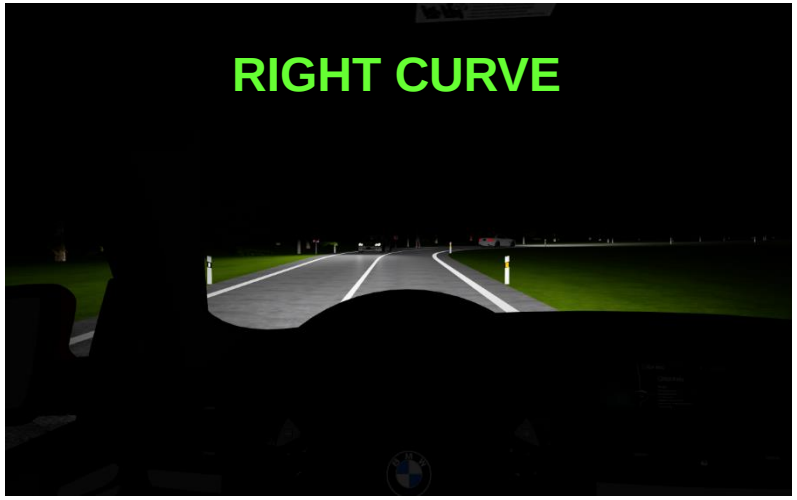
3 rows 20+20+20



3072 pixels

ADB Analysis Description – Scene Types
ADB分析描述-场景

- Varroc software used for night scenes visualization
  伟瑞柯自研发软件对场景进行视觉模拟

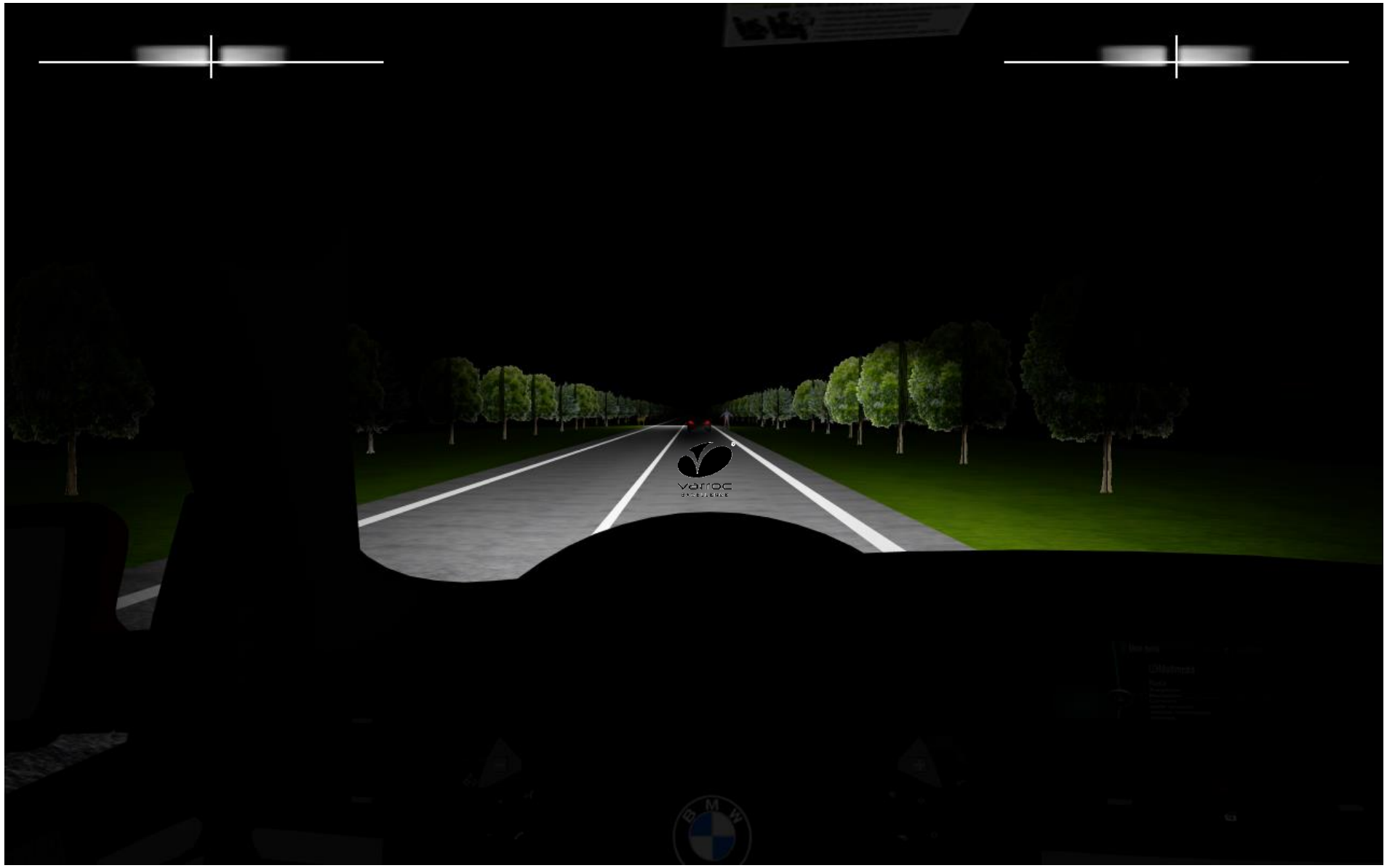


ADB Scene 1 – Straight Road – Low Beam Only
场景1-直行道路（仅近光开启）

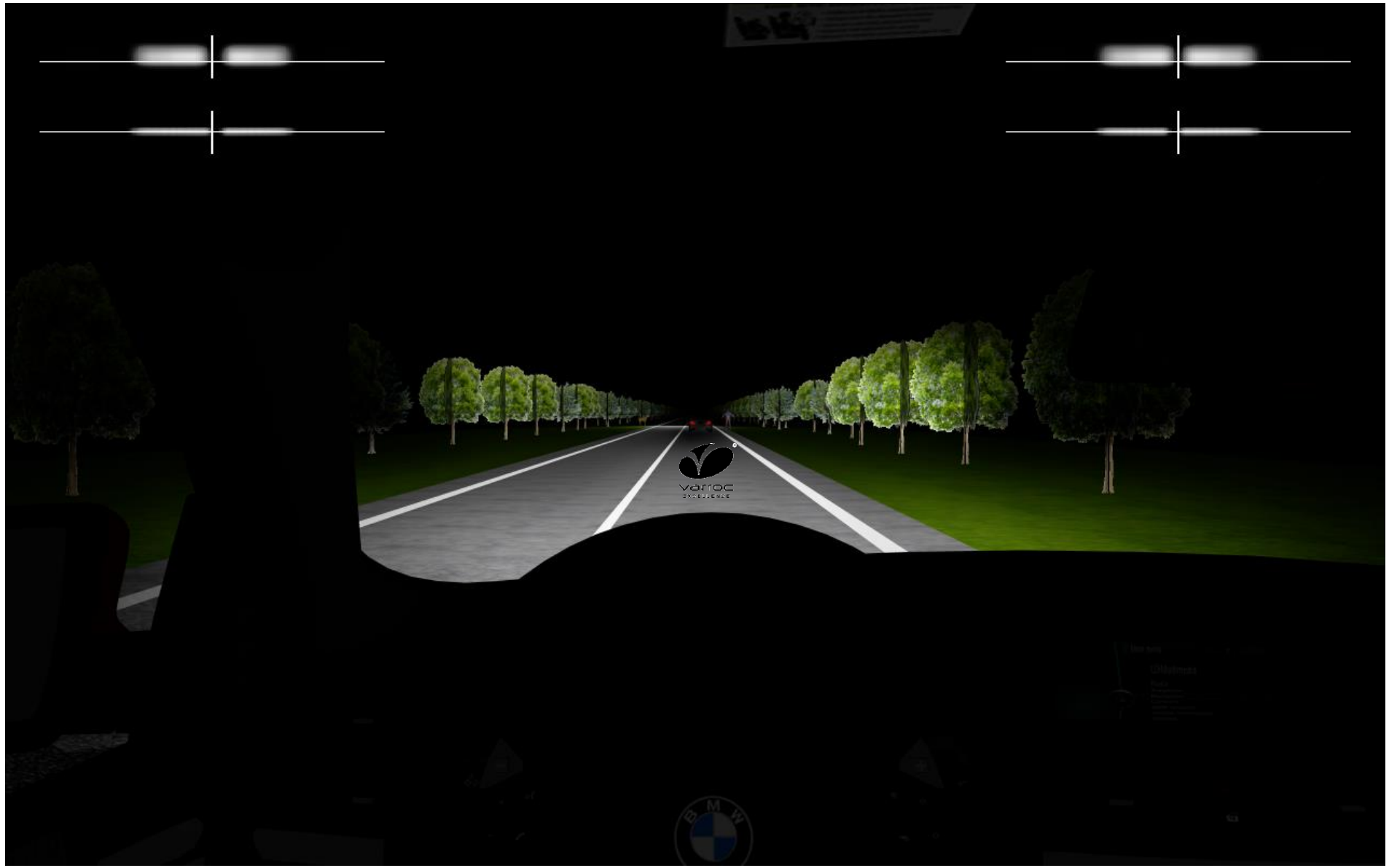
ADB Scene 1 – Straight Road – 3 Segments
场景1-直行道路（远光3个单元格）

ADB Scene 1 – Straight Road – 10 Segments
场景1-直行道路（远光10个单元格）

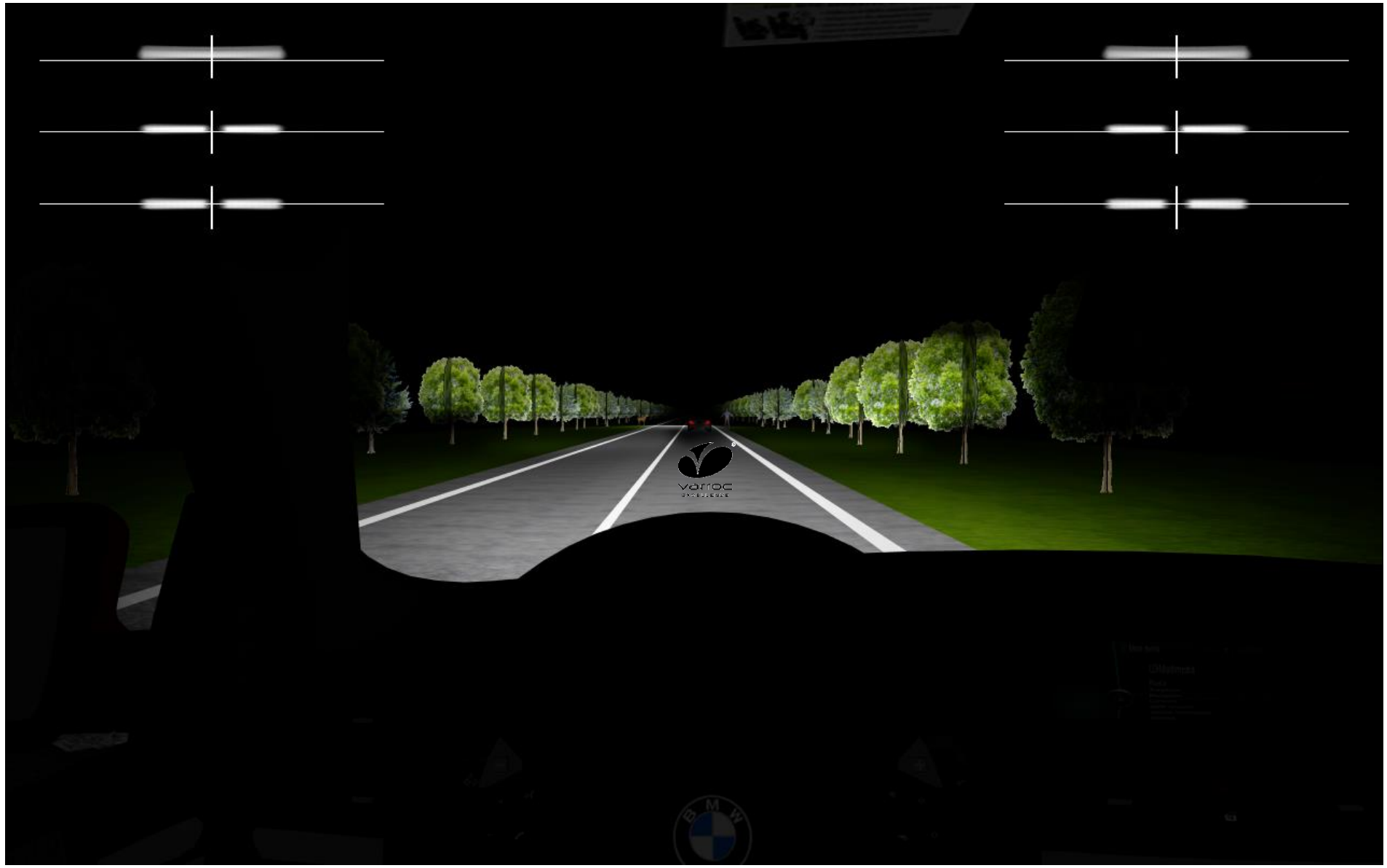
ADB Scene 1 – Straight Road – 17 Segments
场景1-直行道路（远光17个单元格）



ADB Scene 1 – Straight Road – 2 x 19 Segments
场景1-直行道路（2 x 19个单元格）



ADB Scene 1 – Straight Road – 3 x 20 Segments
场景1-直行道路（3 x 20个单元格）

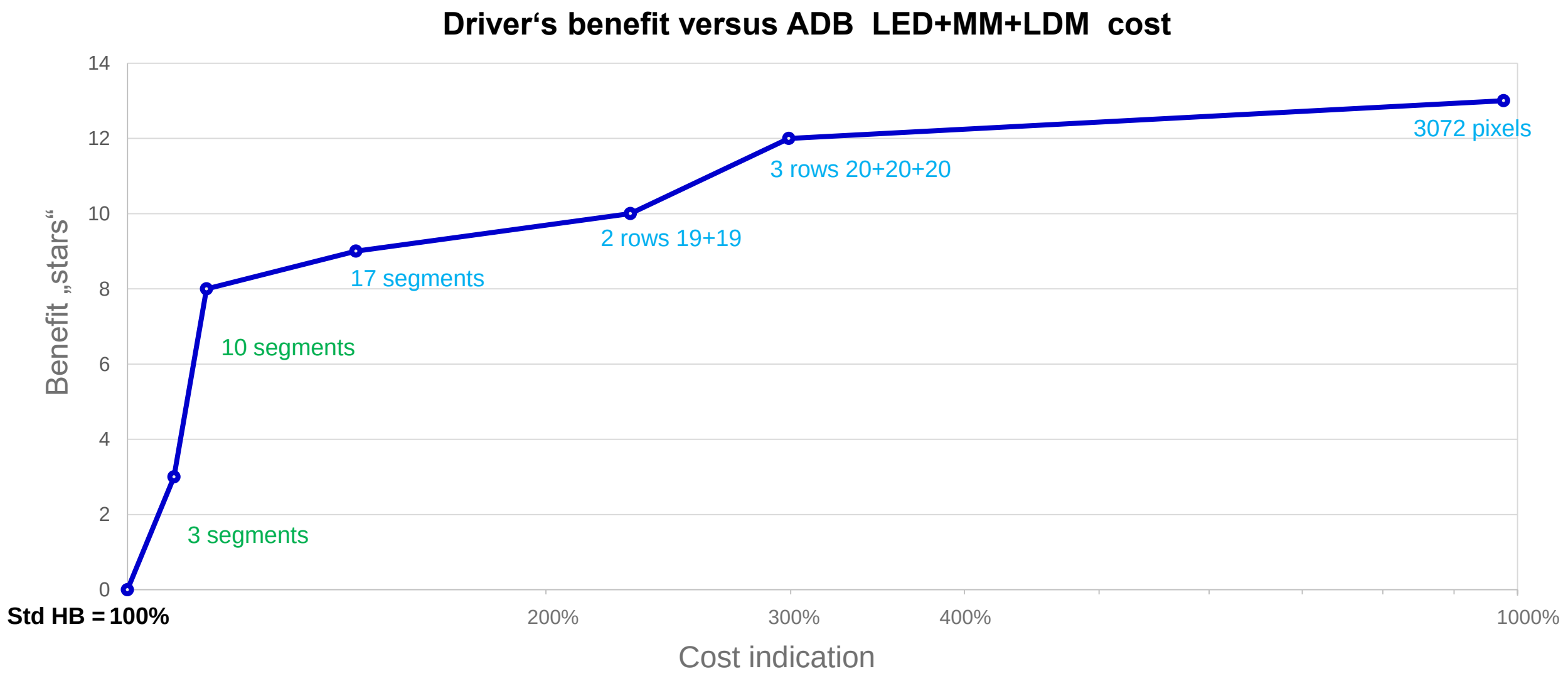


ADB Scene 1 – Straight Road – 3072 Segments
场景1-直行道路（3072个单元格）

Driver Benefits Summary – 0 (LB) up to 4
驾驶者得益汇总-0-4

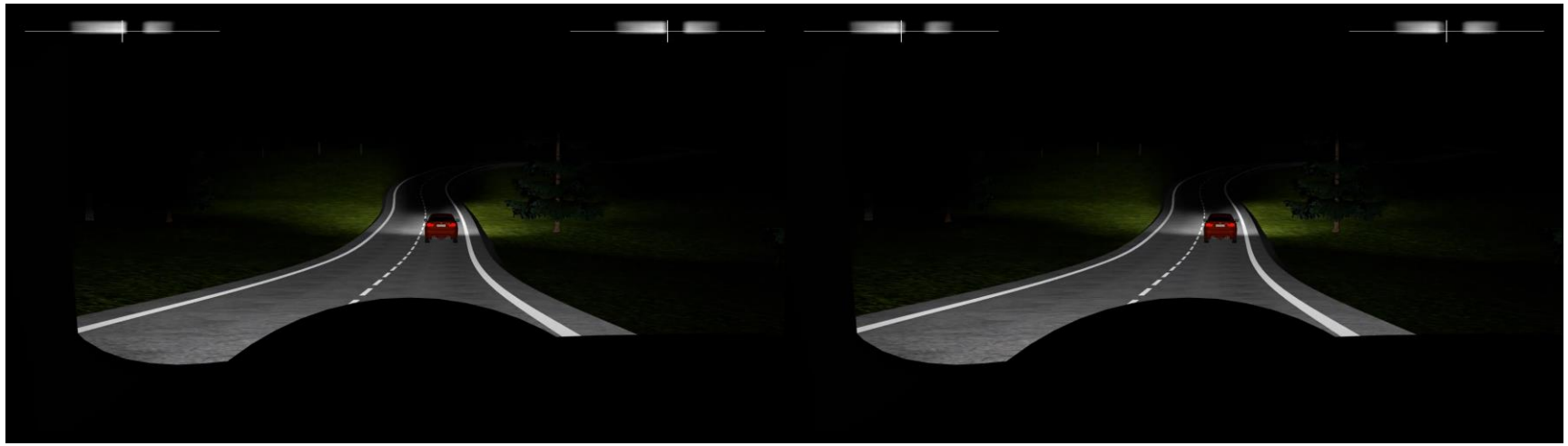
	ADB SYSTEM	STRAIGHT ROAD	RIGHT EU CURVE	LEFT EU CURVE	HILLS	SUM
REFLECTORS	3 segments	++	0	+	0	3+
	10 segments	+++	++	++	+	8+
	17 segments	+++	++	++	++	9+
PROJECTORS	2 rows 19+19	+++	++	+++	++	10+
	3 rows 20+20+20	+++	+++	+++	+++	12+
	3072 pixels	++++	++	+++	++++	13+

Driver Benefits vs. Cost Percentage From Standard HB
驾驶者得益与成本曲线



ADB - Behaviour Impact
ADB-切换方式影响

- Behaviour creates a significant portion of the ADB system comfort:
  单元格切换方式是ADB视觉舒适度的重要部分
  - similar topic to the dynamic bending behaviour in the past
    动态转向也是同样原理
  - too hectic algorithm can harm the overall good beam pattern - generally a smooth-moving wider dark tunnel is more pleasant for the driver
    太过跳跃的明暗变化会有损均匀性-**通常平滑**过渡的明暗变化更让驾驶者满意



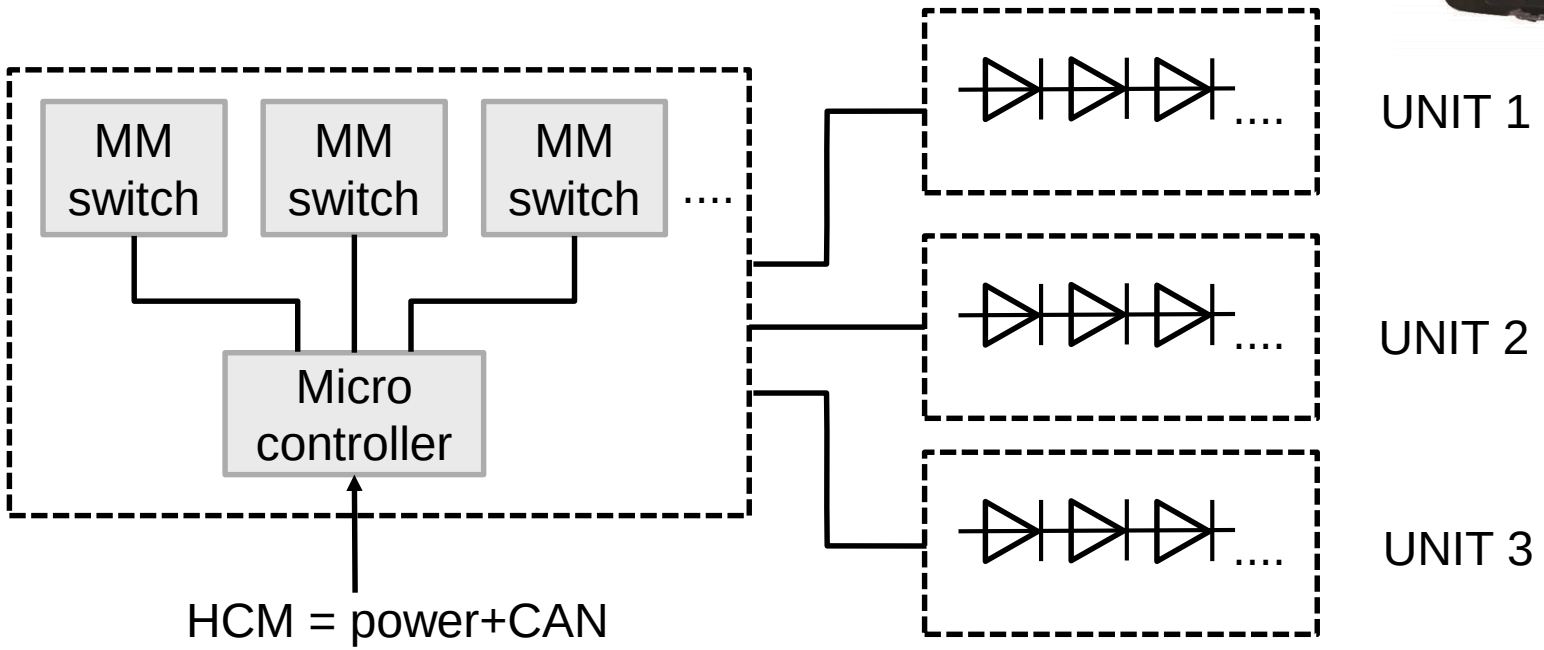
ADB Systems – Power Consumption = CO_2 Emissions

ADB系统-能耗= CO_2 排放

ADB Power Consumption – Reason And Analysed Architecture
ADB能耗-原因及分析架构

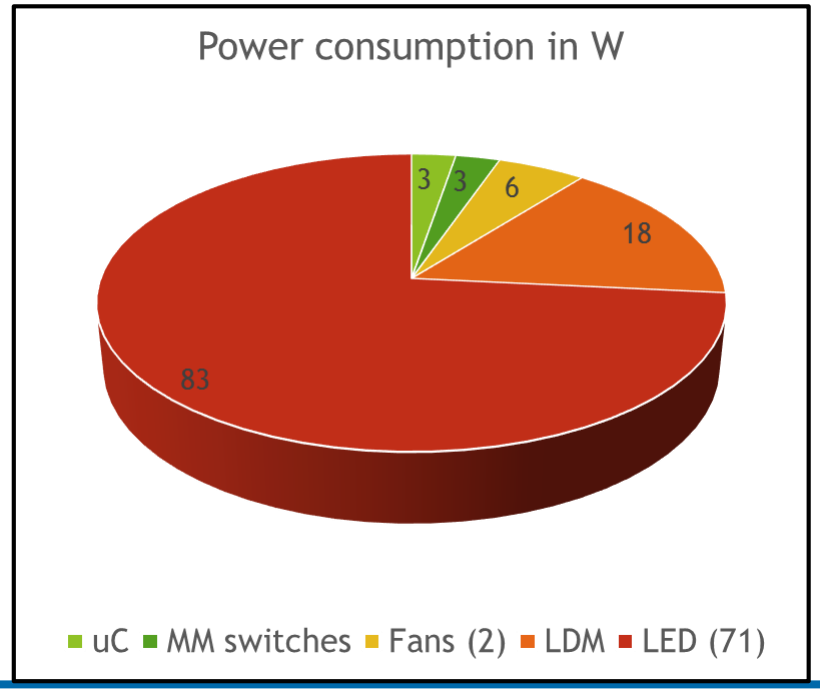
- **Why ADB power consumption?** ADB is by principle activated for most of the night driving cycle
  为何ADB**有能耗？**ADB**理**论上在所有的夜间驾驶都被开启

- Example with separate switch board
  分开开关电路的案例

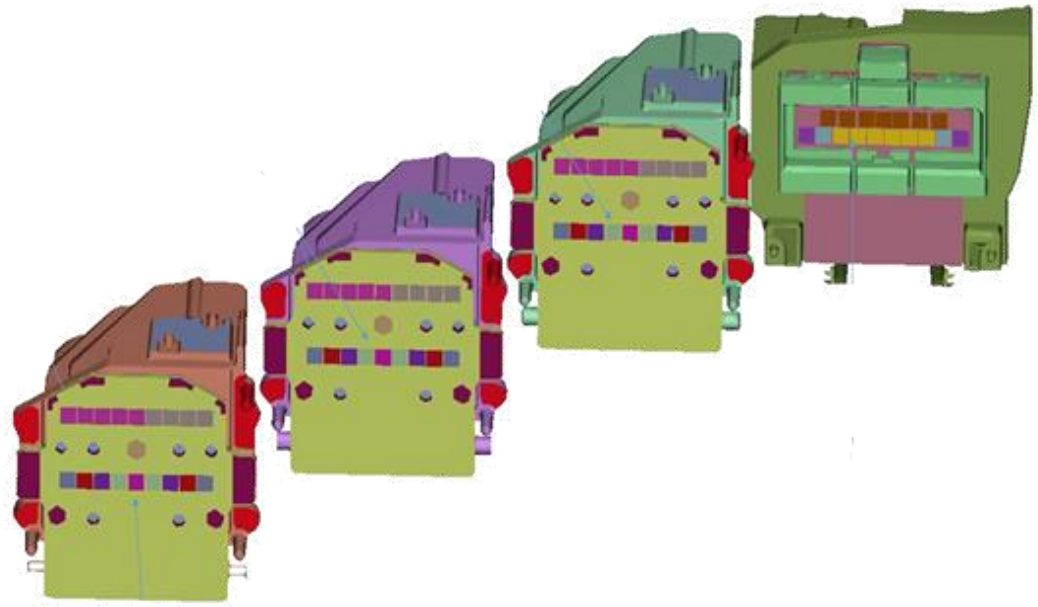


ADB Power Consumption – Comparison And Breakdown
ADB能耗-比较及展开

- 71 LEDs complete beam
  71 LED组成灯光
- 7 MM switches
  7个控制开关
- Gaussian profile applied
  高斯分布

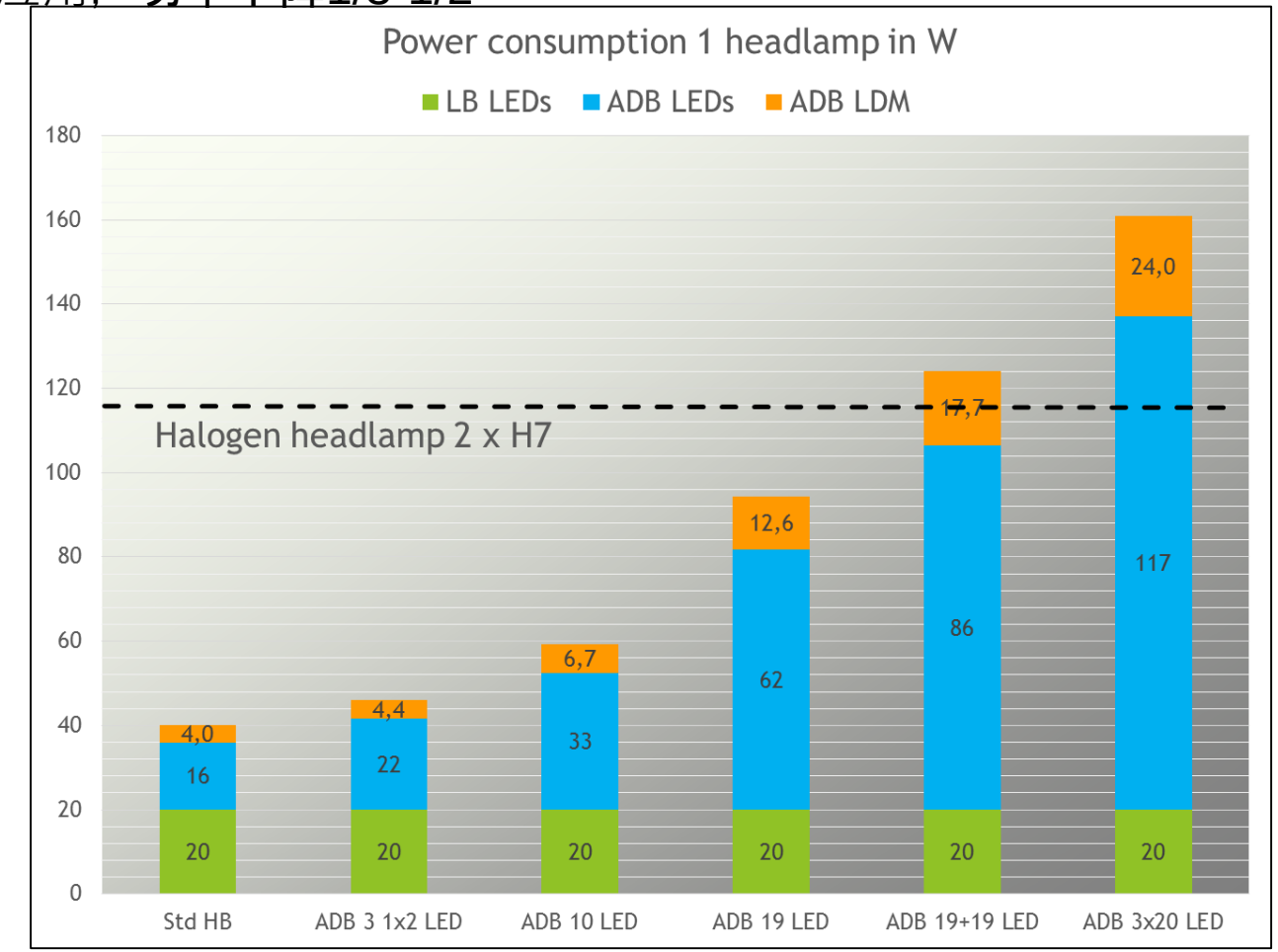


Mode HB	Power (W) nom./max. =	86,25 / 91,73			TI loss PCB (W)
	HB/Kink Module -1	HB/Kink Module -2	HB/Kink Module -3	Base HB/Kink Module	
KINK(LED ID)	12 11 10 9 8 7 6 5 4	12 11 10 9 8 7 6 5 4	12 11 10 9 8 7 6 5 4	7 6 5 4 3 2 1	
LED POWER KINK				1,07 1,07 1,07 1,07 1,07 1,07 1,07	
HB(LED ID)	12 11 10 9 8 7 6 5 4	12 11 10 9 8 7 6 5 4	12 11 10 9 8 7 6 5 4	12 11 10 9 8 7 6 5 4 3	
LED POWER HB	0,31 1,37 2,32 2,87 3,05 3,05 2,71 2,04 1,04	0,61 1,71 2,53 2,99 3,05 2,99 2,53 1,71 0,61	1,04 2,04 2,71 3,05 3,05 2,87 2,32 1,37 0,31	0,92 1,22 3,05 3,05 3,05 3,05 2,75 2,14 0,61 0,00	
LED N	1 4 7 10 13 16 19 22 25	2 5 8 11 14 17 20 23 26	3 6 9 12 15 18 21 24 27	1 2 3 4 5 6 7 8 9 10	
Module HB nom./max. (W)	18,76 / 19,99	18,73 / 19,96	18,76 / 19,99	27,30 / 29,09	
Power Loss Switch (W)	0,64	0,64	0,64	0,79	2,71



ADB Power Consumption – Main Factors
ADB能耗-主要因子

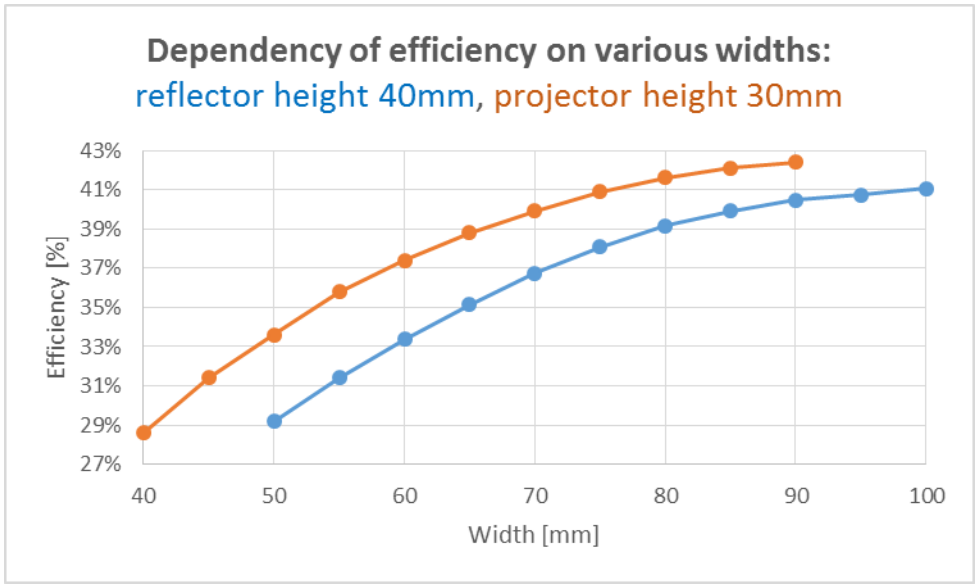
- **Number of segments单元格的数量**
  - no Gaussian profile; when applied, the power reduces by 1/3 – ½
    不成高斯分布，当被应用，功率下降1/3-1/2



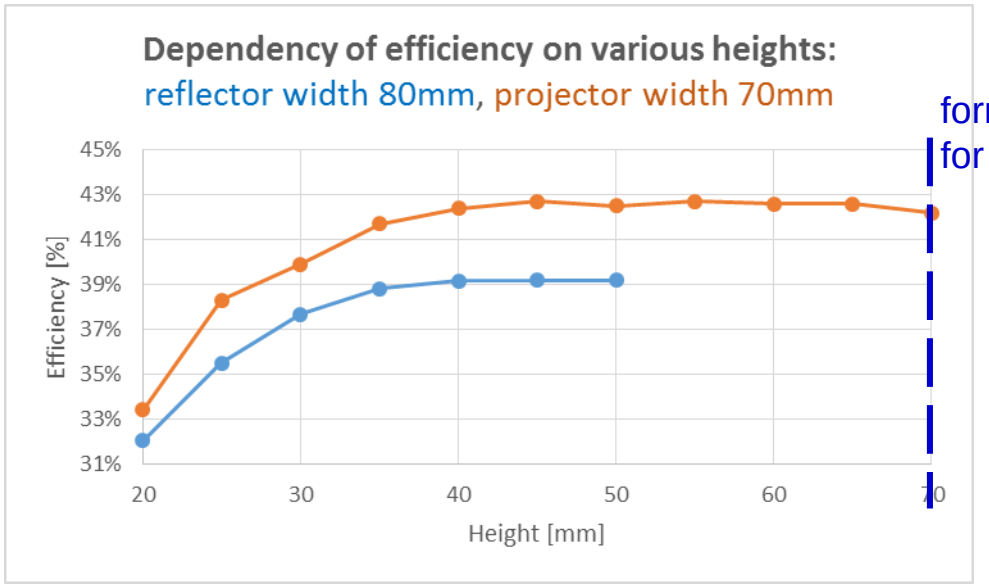
ADB Power Consumption – Main Factors
ADB能耗-主要因子

- **Photometrical targets – the higher performance the higher power consumption**
  光学目标-更高的性能更高的能耗

- **Optical system efficiency** = output reflectors/lens size – typical ADB system with primary optics
  光学系统效率=反射镜/配光镜尺寸-具有主要光学系统的典型的ADB



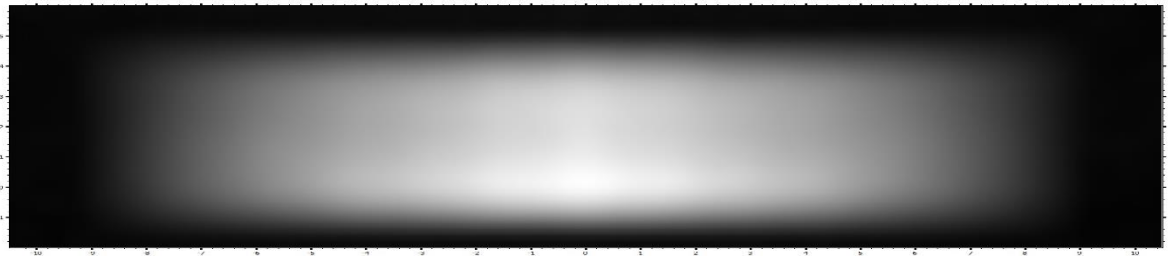
Increasing width: efficiency raises continuously to a certain saturation point (not within this graph)
增加宽度：**效率也持**续增加到某一个极限



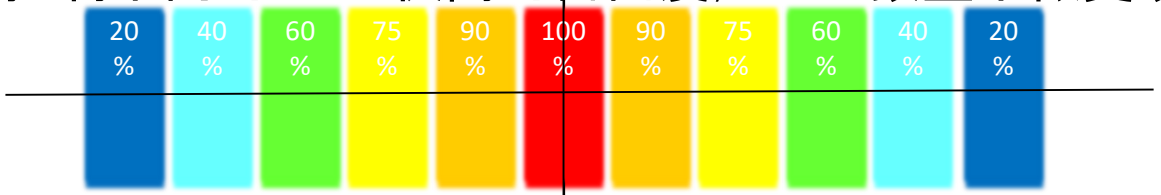
Increasing height: efficiency raises quickly at the low profile lens to become flat from cca. 40mm height
高度增加：**效率会快速增加直到高度**为40时

ADB Power Consumption – Main Factors
ADB能耗-主要因子

- **Gaussian profile = dimming segments from the center towards the sides:**
  高斯分布=中心单元逐渐向两侧渐变

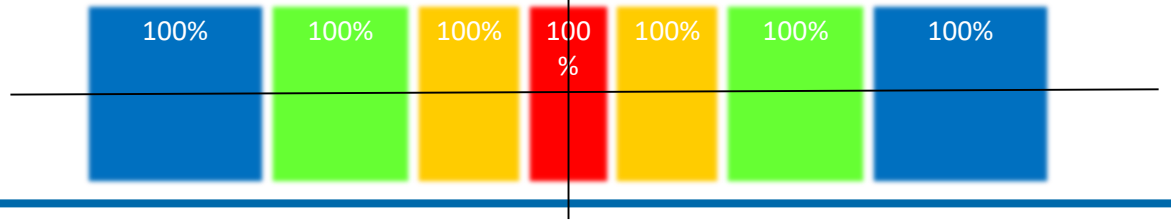


  - electronical – purely by PWM controlling of separate LEDs – highest flexibility, original number of LEDs, allows HB hotspot swiveling
    电子方面-纯PWM控制不同的LED-很高的自由度，LED数量不做更改，中心亮度进行移动



22 W

  - optical – made by the size of each segment (wider segment = lower intensity) – less flexibility, limited HB hotspot swiveling but saving cost by reduced number of LEDs
    光学方面-不同单元尺寸（宽单元=**低照度)-低自由度**,远光的最亮点不能移动但减少LED数量

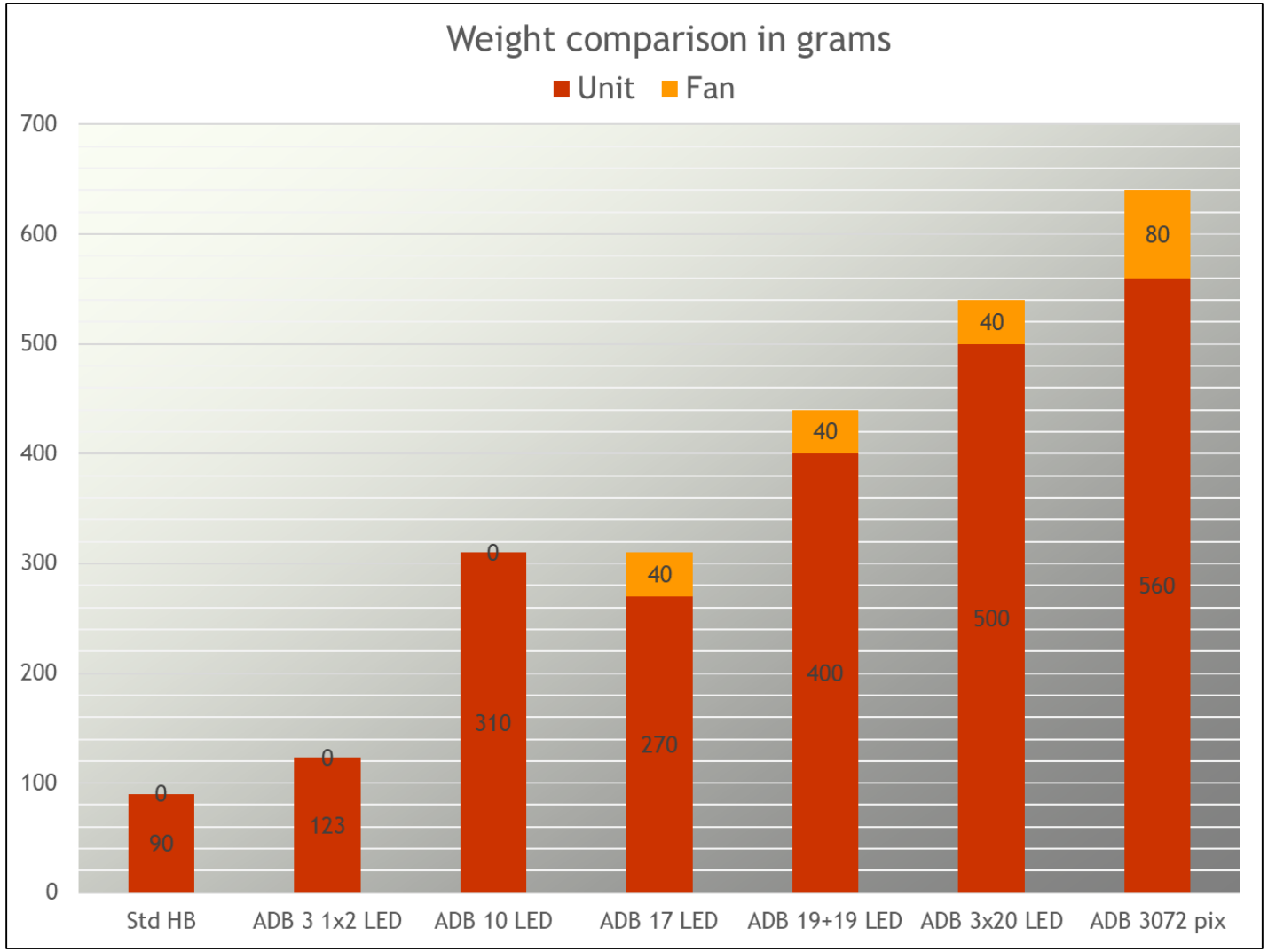


23 W

ADB Power Consumption – Main Factors
ADB能耗-主要因子

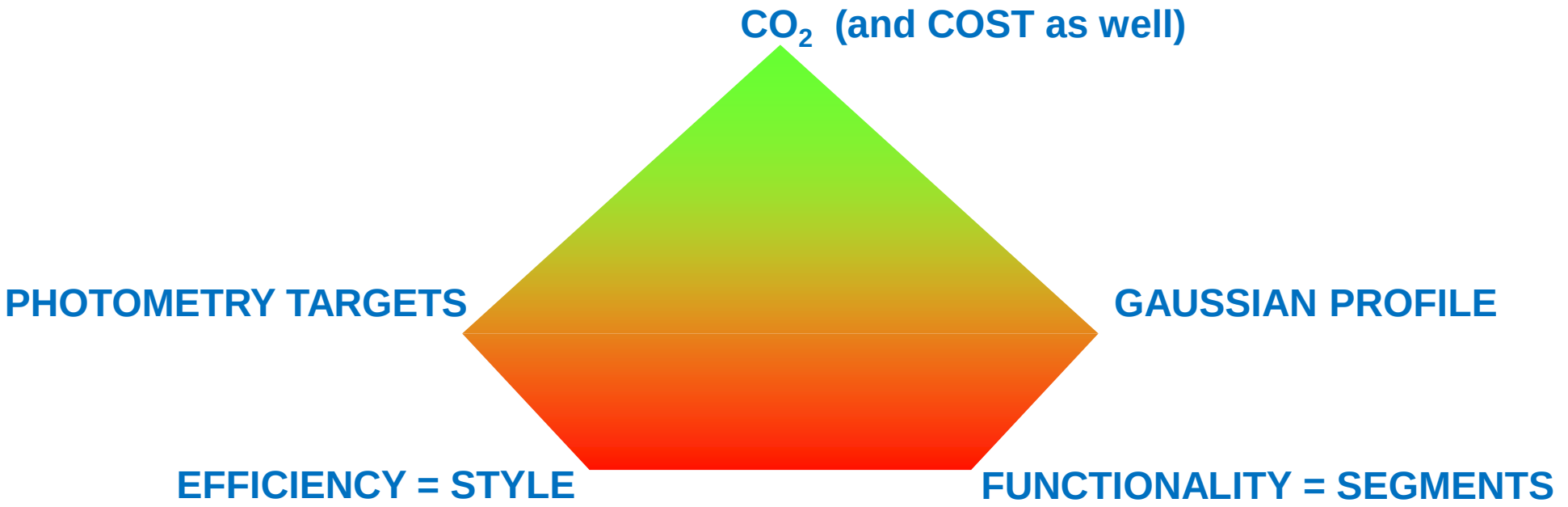
- **Weight of the ADB system**

  ADB系统的重量



ADB Power Consumption – Summary + Future Opportunities
ADB能耗-汇总及潜在的机会

- Balance between the influencing factors needs to be achieved
  各种影响因子之间的相互平衡



- Increase effectivity of the optical systems (trend is quite opposite – thinner and thinner profiles)
  增加光学系统的效率(趋势往相反的方向-窄小的外形)

- Higher efficiency LEDs – lm / W
  更高光效的LED

- Higher efficiency LDMs – from current 75-85% to 85-95%
  更高效的LDMs-由75-85%提高到85-95%

ADB Keynote Message
ADB主旨信息

Let’s make great ADB technology available to the masses, not only striving for higher and higher functionality.
我们可以让ADB得到普遍应用,而不仅仅是追求更好的功能性

We are the ones who are now influencing the overall safety on the roads at night!
我们是可以让夜间道路变得更安全的人

THANK YOU