ICSC 2019

Core Competence Enhanced by MBD

IDAJ CAE Solution Conference

汽车车灯光学仿真分析

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关于光与人眼视觉

我们所看到的，不是物体本身，而是
物体反射的光或者自身发出的光

软件介绍

SPEOS

物理级光学仪真

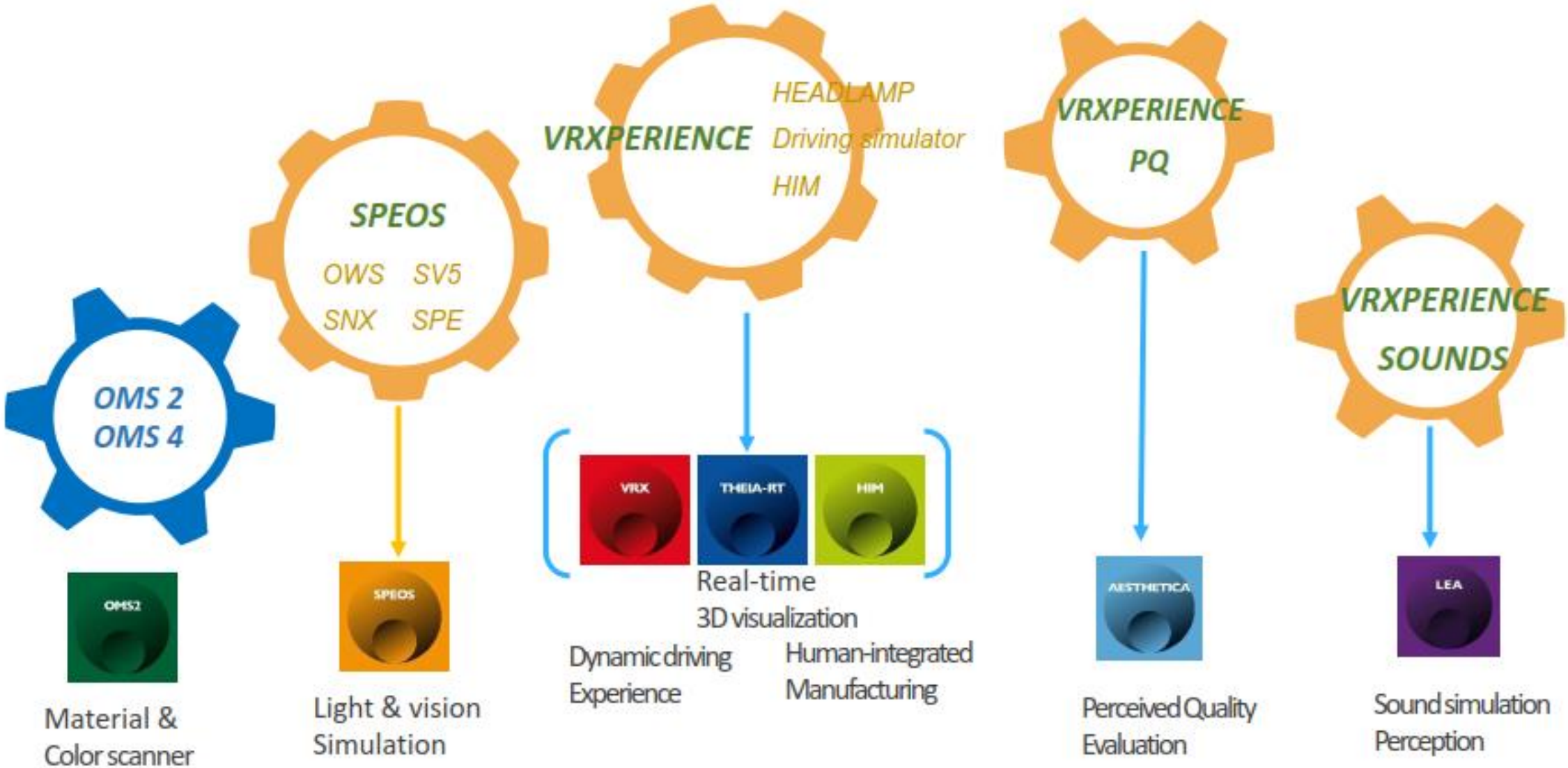
模拟人眼所见内容

软件支持多3D平台

CIE认证

CAD INTEGRATED

CATIA SOLIDWORKS PLM Software SIEMENS NX PTC creo



车灯重要性

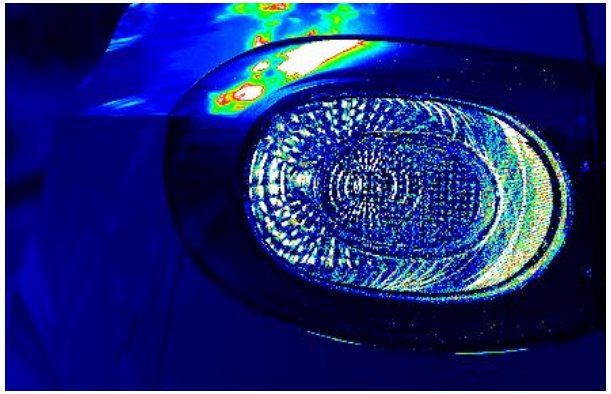
- 家族传承式特征
- 科技感的象征
- 个性化展示窗口
- 功能性



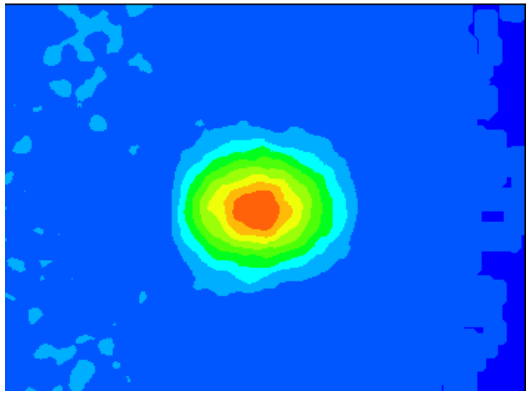


仿真与分析

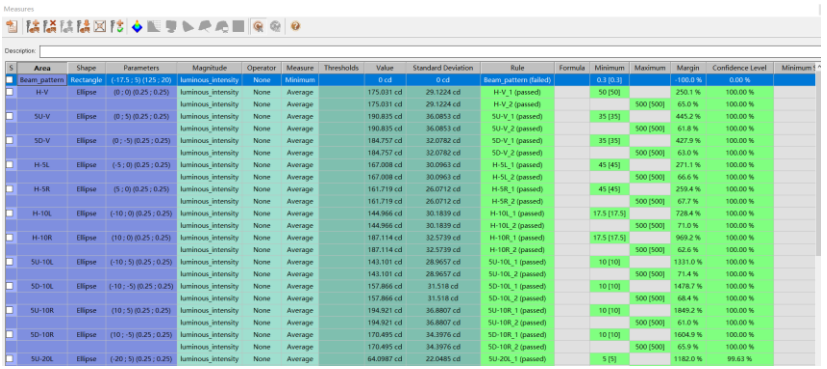
仿真分析



亮度能量模拟



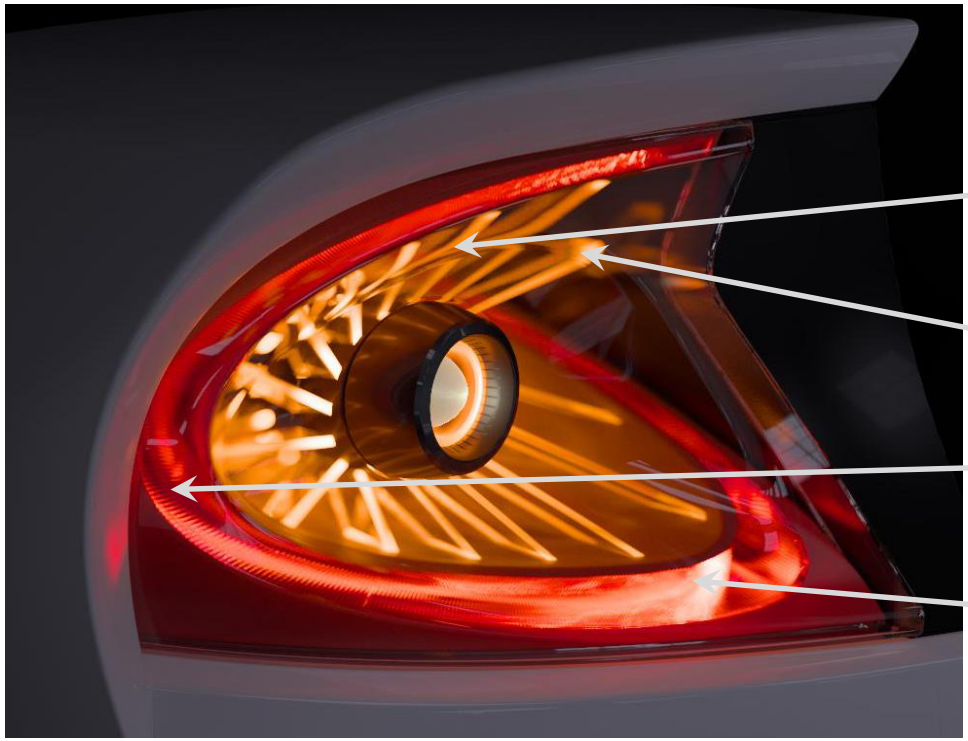
光强能量模拟



法规验证

SPEOS可以模拟出汽车前大灯与尾灯的亮度能量分布、光强能量分布，并可以从speos的官方数据库中直接下载并导入相关法规，做到快速验证法规。同时speos还可以分析灯具表面均匀性，根据色度学原理分析颜色一致性。

点亮效果仿真



人眼视觉仿真结果

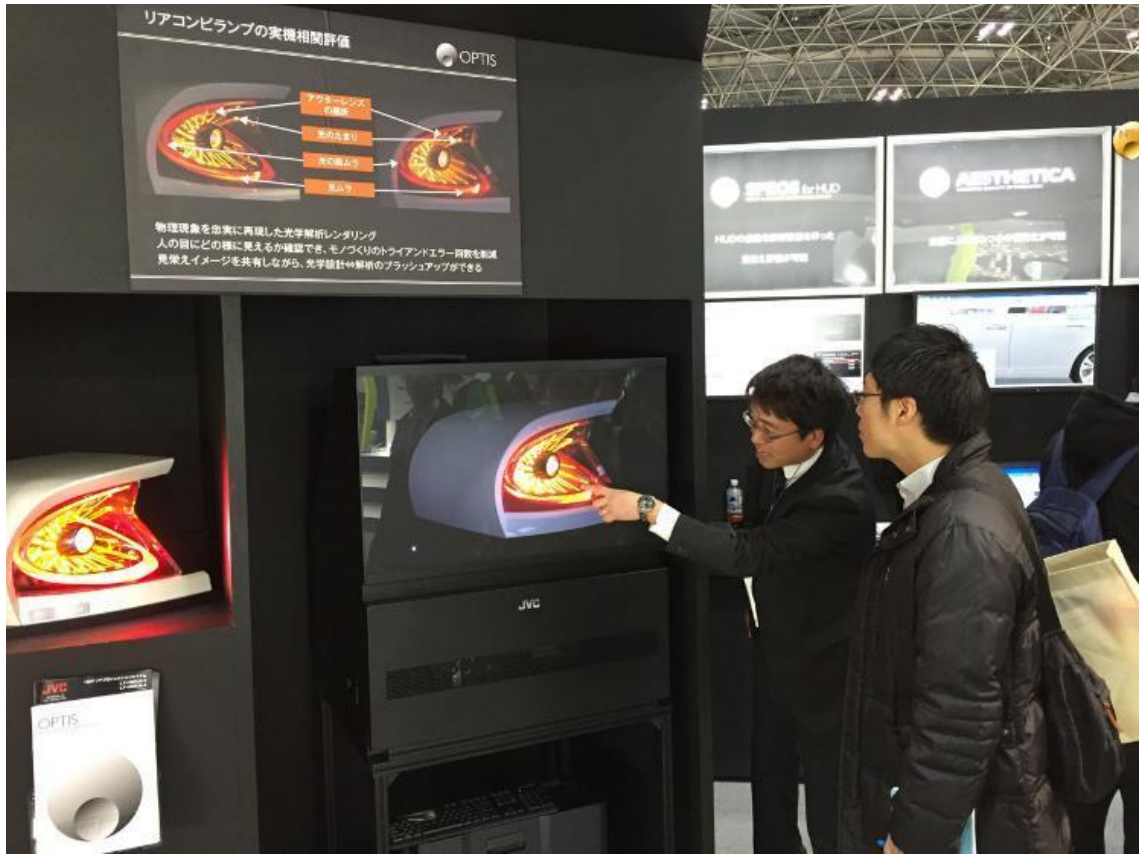
Refraction of light

hot point

lit & dark line

hot area

实际点亮效果



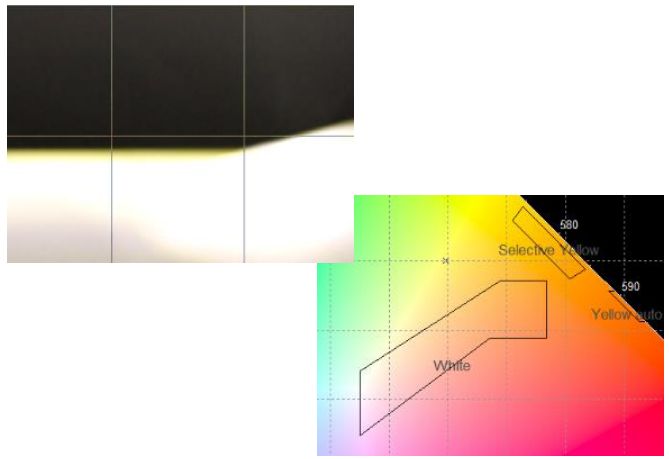
人眼视觉

物理亮度查看

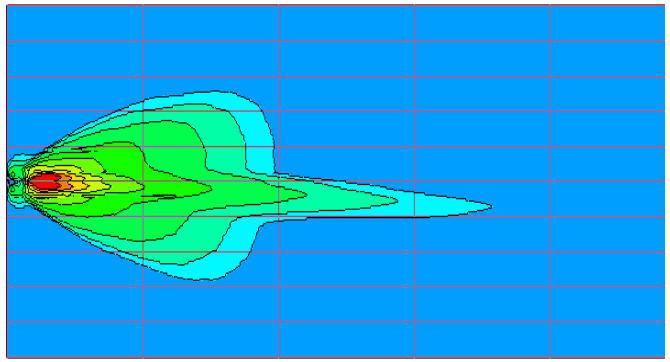
人眼视觉查看

SPEOS不仅可以仿真得到物理亮度的仿真结果，更参考了大量人眼生理参数如人眼瞳孔大小、自适应亮度、人的年龄等，得到更接近人眼实际效果的结果。

大灯分析



色彩颜色分析模拟

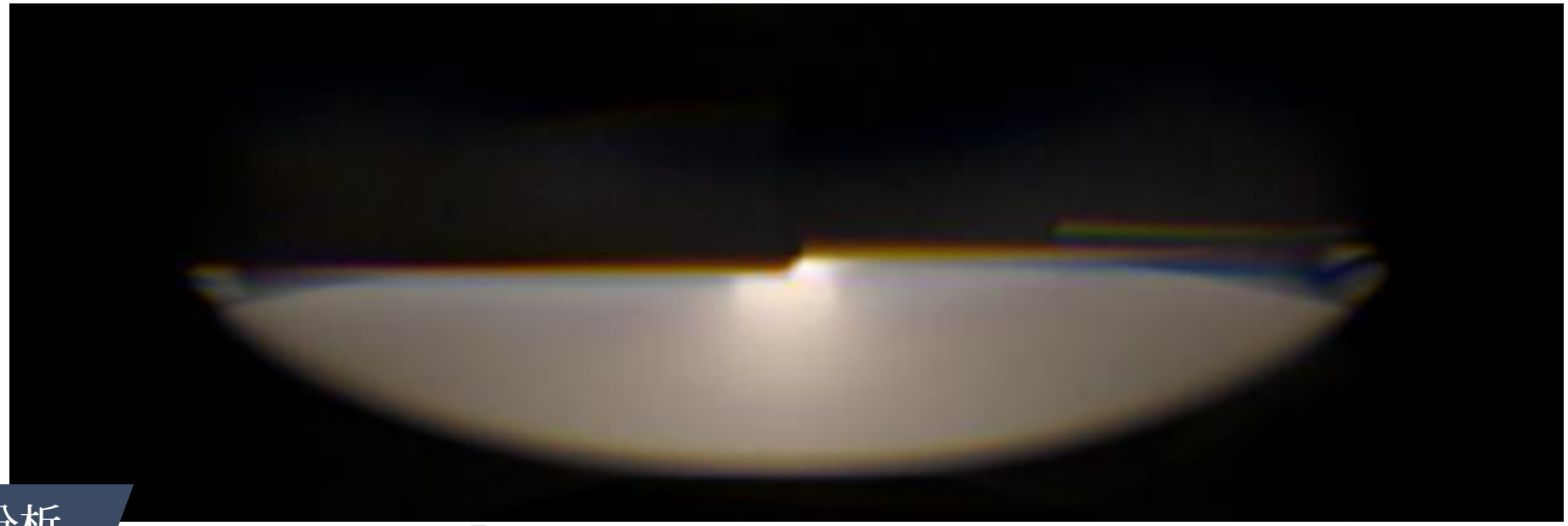


夜间路面能量模拟

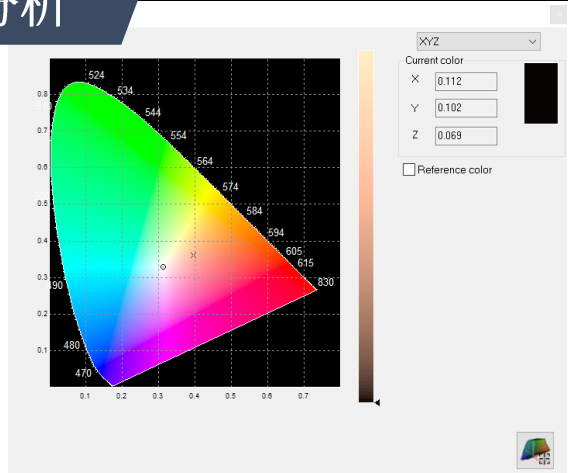
夜间路面视觉模拟

SPEOS除了可以模拟前大灯的光强、亮度能量分布外，还可以分析前大灯的路面照能量分布，并且可以模拟在该大灯照明环境下，驾驶员的视角，帮助设计者更好的评估产品。

截止线色彩分析

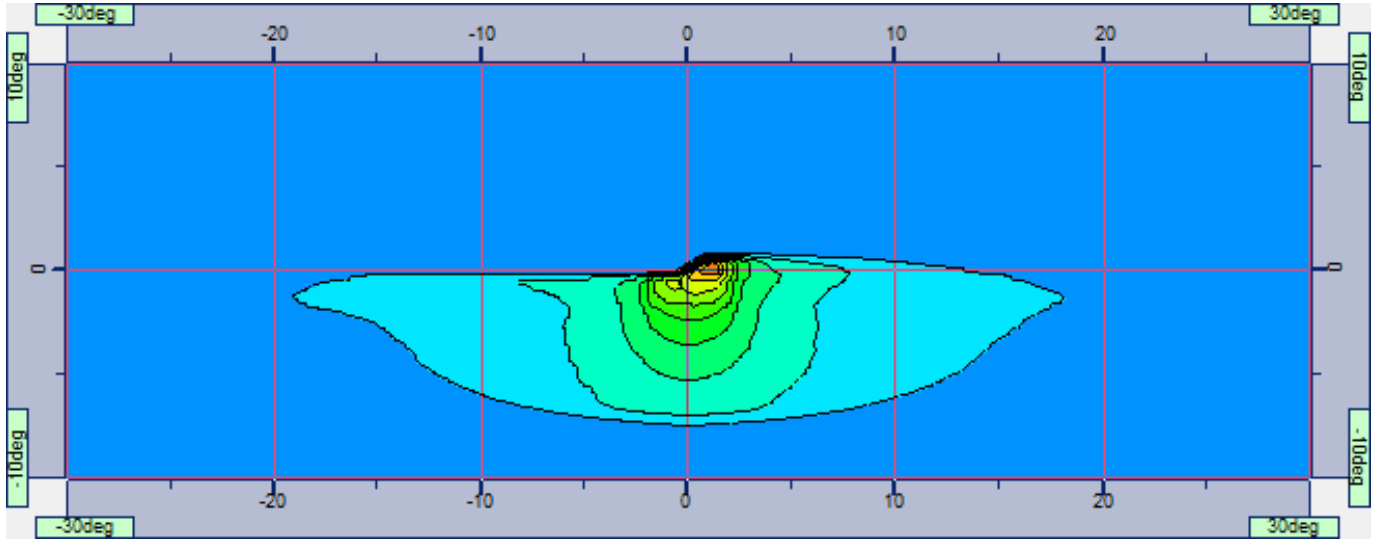


色坐标分析



实际场景分析

法规分析



Measures

Description:

S	Area	Magnitude	Operator	Measure	Value	Standard Deviation	Rule	Formula	Minimum	Maximum	Confidence Level	Mini
☐	B50L	luminous_intensity	None	Average	206.268 cd	-nan(ind) cd	B50L_1 (passed)		50 [50]		-nan(ind) %	
		luminous_intensity	None	Average	206.268 cd	-nan(ind) cd	B50L_2 (passed)			625 [625]	-nan(ind) %	
☐	HV	luminous_intensity	None	Average	17255.3 cd	-nan(ind) cd	HV (passed)		50 [50]		-nan(ind) %	
☐	BR	luminous_intensity	None	Average	1055.88 cd	-nan(ind) cd	BR_1 (passed)		50 [50]		-nan(ind) %	
		luminous_intensity	None	Average	1055.88 cd	-nan(ind) cd	BR_2 (passed)			1750 [1750]	-nan(ind) %	
☐	BRR	luminous_intensity	None	Maximum	3161.29 cd		BRR (passed)			3550 [3550]		
☐	BLL	luminous_intensity	None	Maximum	238.9 cd		BLL (passed)			880 [880]		
☐	P	luminous_intensity	None	Average	871.067 cd	-nan(ind) cd						
☐	50R	luminous_intensity	None	Average	20150.6 cd	-nan(ind) cd						
☐	75R	luminous_intensity	None	Average	24244.2 cd	-nan(ind) cd	75R (passed)		15200 [15200]		-nan(ind) %	
☐	50V	luminous_intensity	None	Average	22252.5 cd	-nan(ind) cd	50V (passed)		10100 [10100]		-nan(ind) %	
☐	50L	luminous_intensity	None	Average	9269.01 cd	-nan(ind) cd	50L (passed)		6800 [6800]		-nan(ind) %	
☐	25LL	luminous_intensity	None	Average	3546.76 cd	-nan(ind) cd	25LL (passed)		1180 [1180]		-nan(ind) %	
☐	25RR	luminous_intensity	None	Average	4452.12 cd	-nan(ind) cd	25RR (passed)		1180 [1180]		-nan(ind) %	

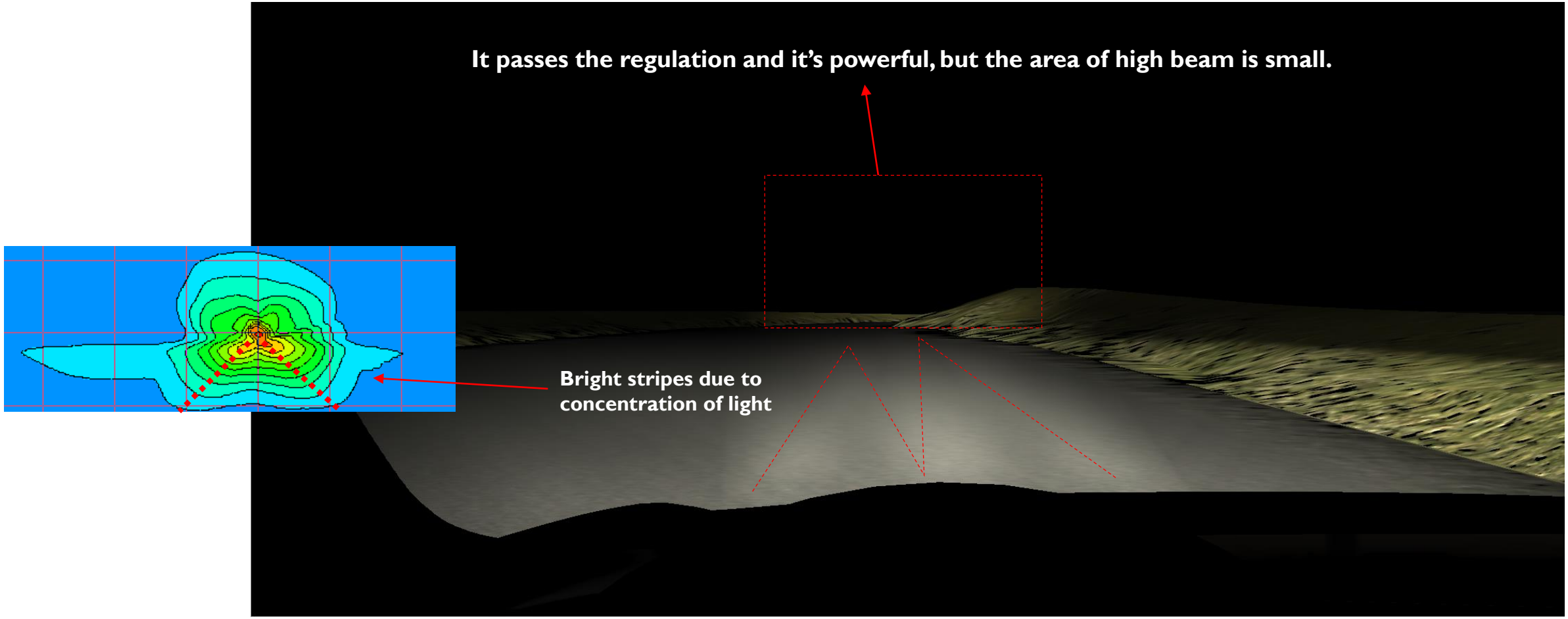
Center
H -3.43 deg
V 0.57 deg

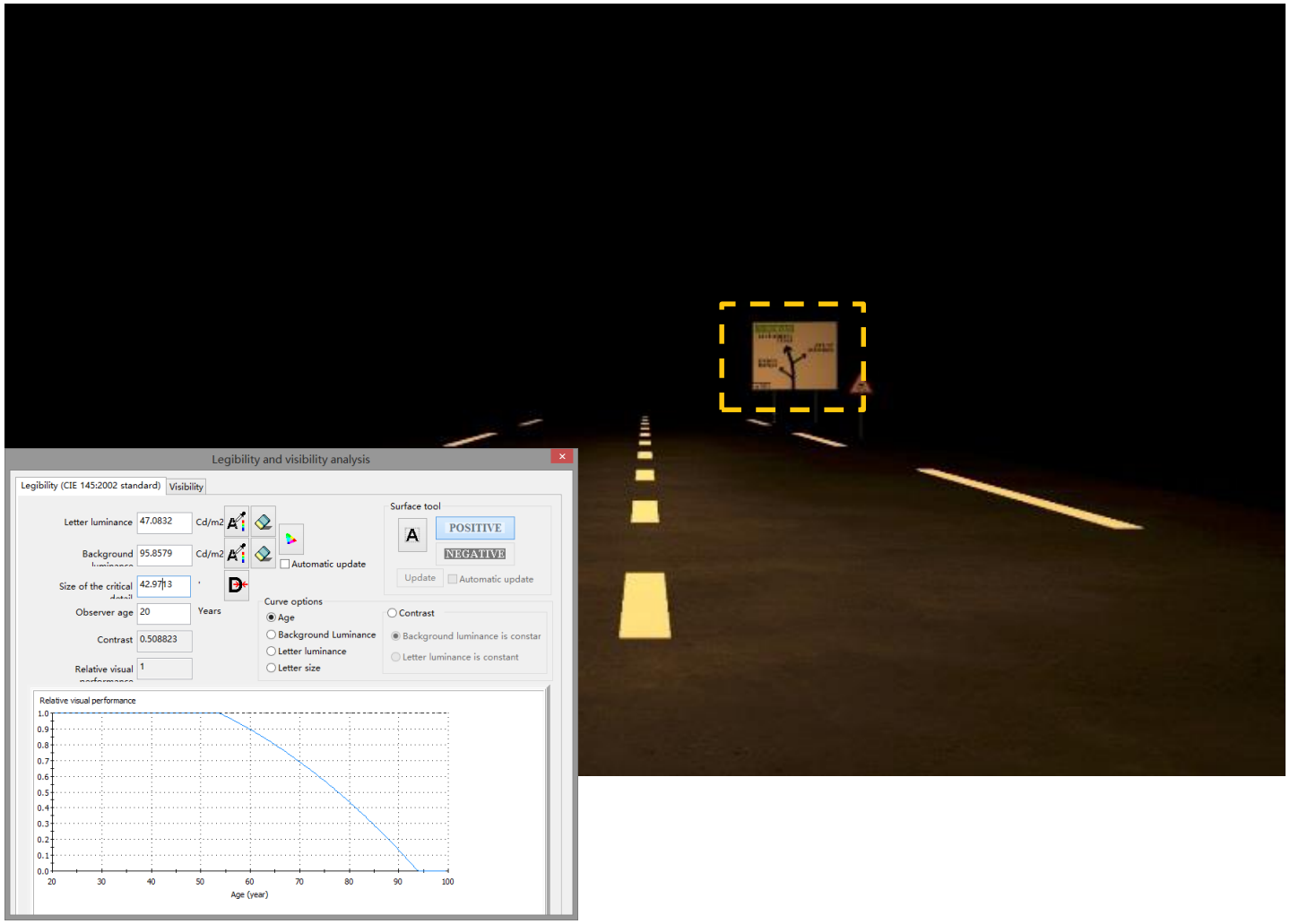
Dimension
Rx 0.05 deg
Ry 0.05 deg

Thresholds
☐ Minimum 0.000246436 cd
☐ Maximum 31051.5 cd

软件内置查看器，可以查看结果中任意点、线、区域的光学参数，同时软件支持一键导入模板，对法规点进行判断

路照分析

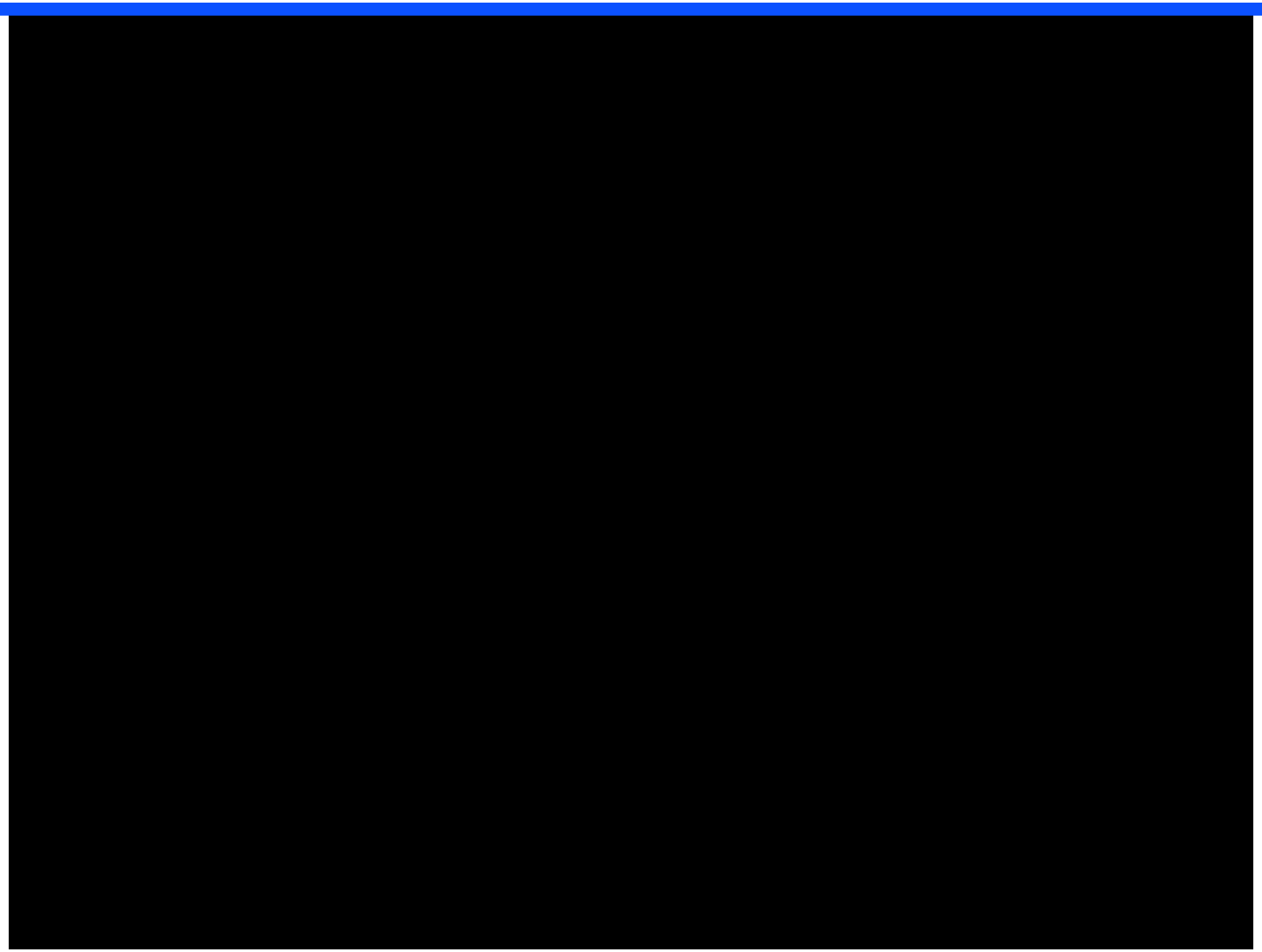




用户可在软件中搭建任意需要场景，查看大灯实际路照状况。同时软件内置CIE标准，可查看标志牌等识别区域的光照下的对比度，做可读可视性判断

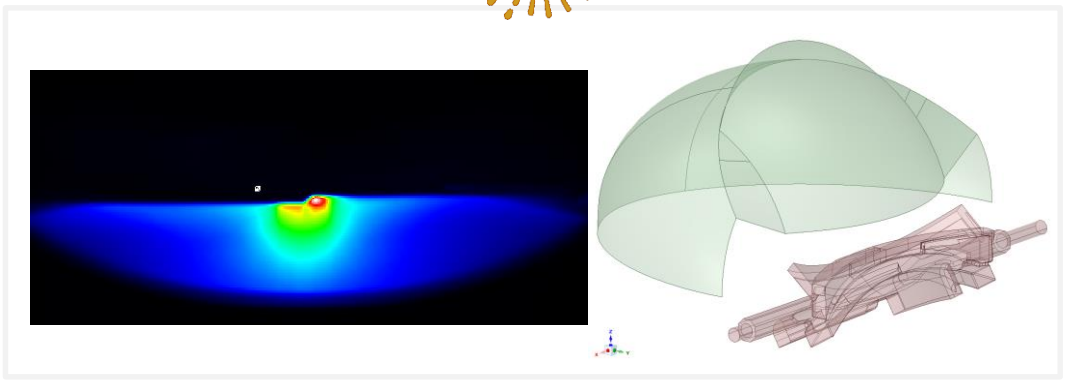
实际场景分析

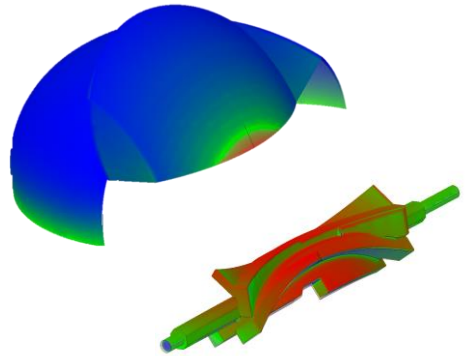
动态驾驶

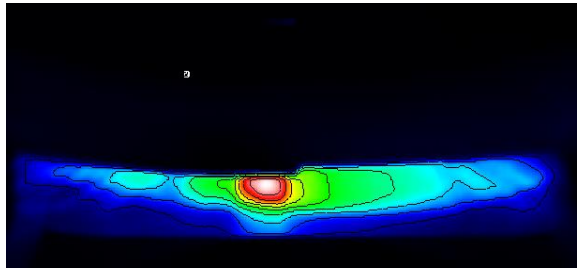


多仿真接口

Optical simulation → Thermal simulation → Mechanical deformation → Optical simulation







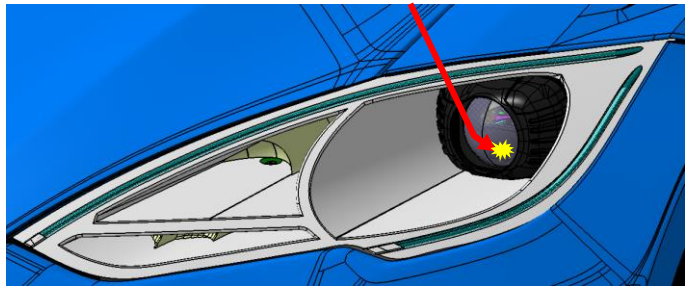
➲ Nominal

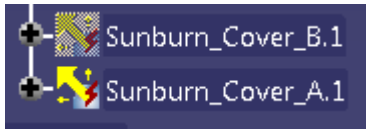
➲ Deformed surface

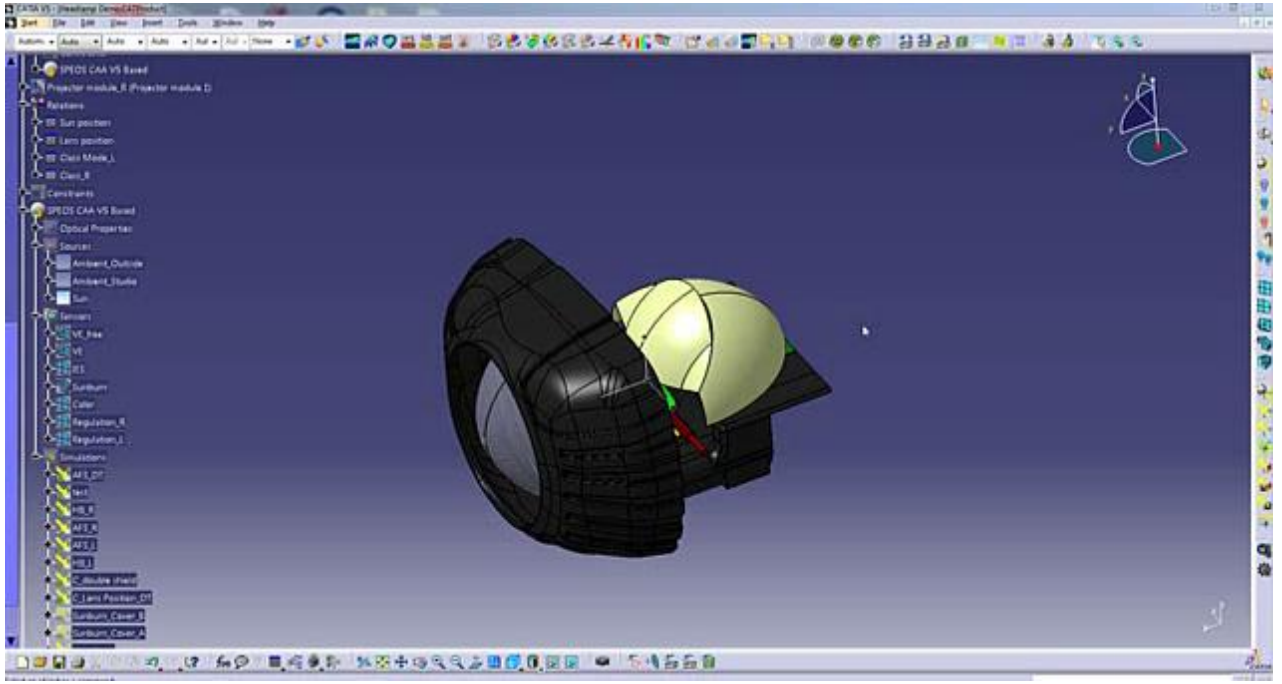
预判断其它环境变化对光学的影响

Sunburn分析

有时太阳光会被投影镜头会聚，
并对其他部分造成严重损坏。







Multi-config simulation
Reverse ray tracing
CAD integration

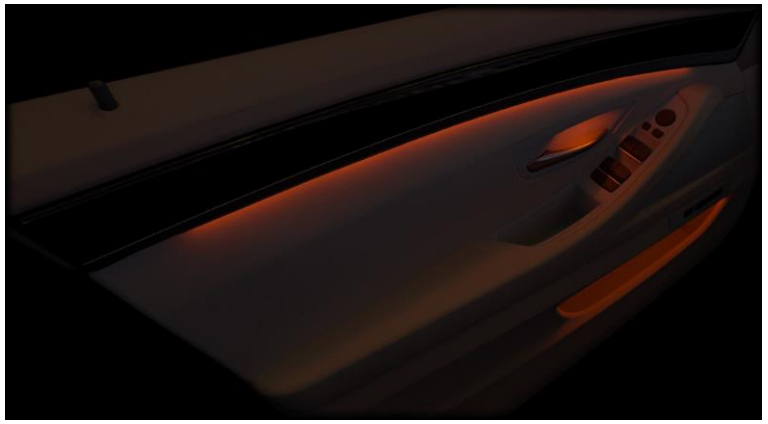
→

Issue detection in early phase
Alternative design option

→

Achieve best compromise
Keep design intent
Faster development

氛围灯模拟

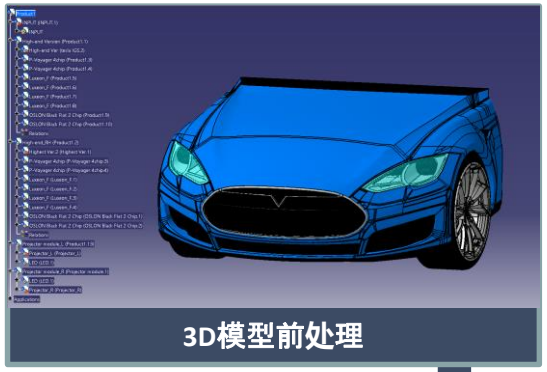


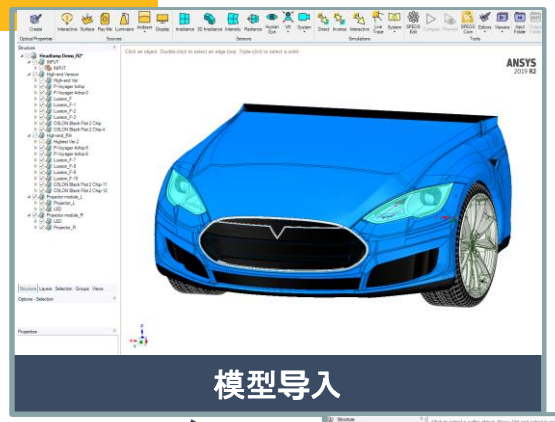
- 模拟lightguide自身发光情况
- 模拟氛围灯与材质作用时的效果

仿真流程

工作流程

高效的过程

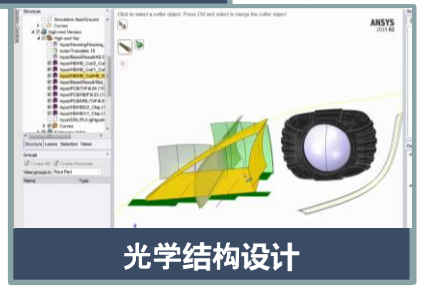

3D模型前处理



模型导入

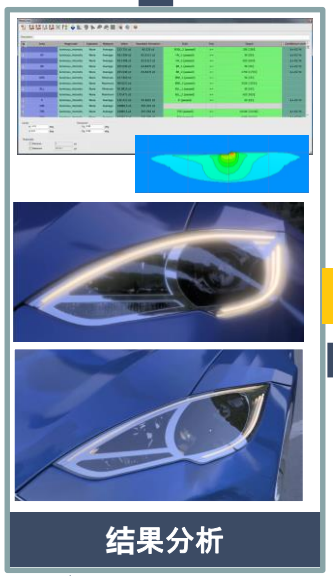

结果优化


结果导出



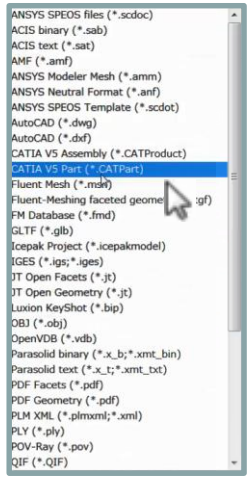
光学结构设计

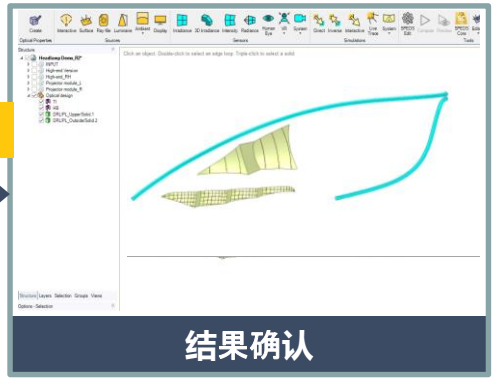
Iterations


结果分析

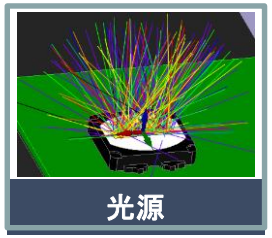
Final

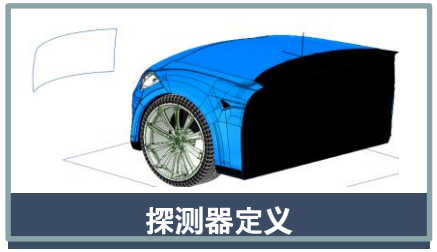
Save As




结果确认

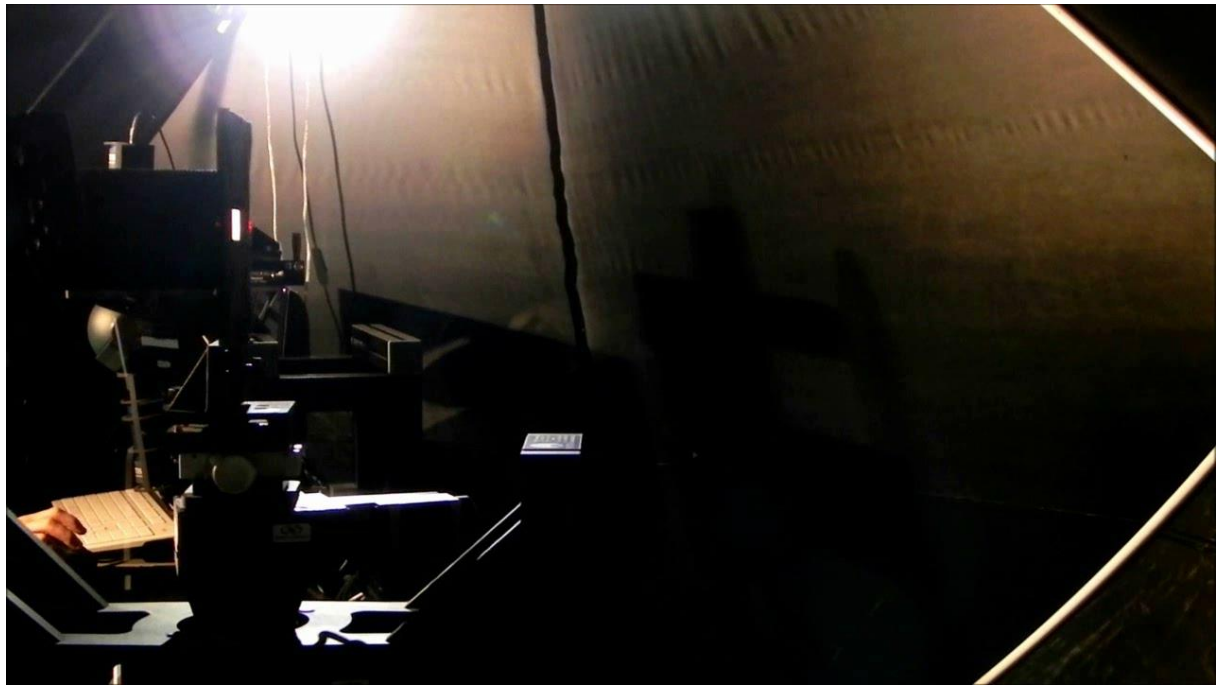
赋光学材料属性


光源


探测器定义

仿真搭建

材料光学属性测量



感谢您的聆听！