

半导体照明全程设计和优化解决方案

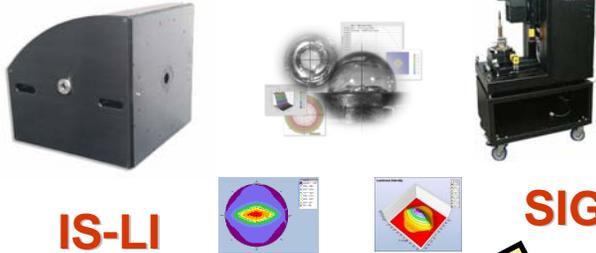
参数特性～设计、优化～实际测量、评价

サイバネットシステム株式会社

つくる情熱を、支える情熱。
CYBERNET

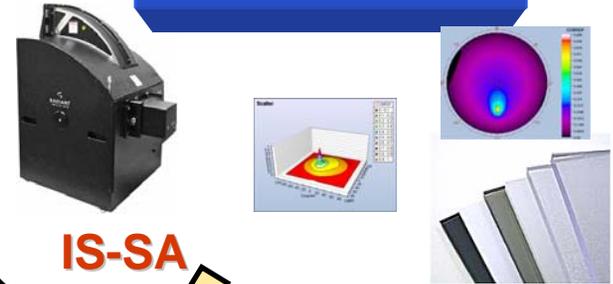
- 莎益博的半导体照明的全程解决方案
- 光源测试：LED近场测试图（NFP）和远场测试图（FFP）
- 材料特性：IS-SA (材质散射测试)
- 照明设计解析软件LightTools：LED照明光源模型设计和仿真
 - 事例:汽车尾灯的设计
- LightTools设计和优化：LED背光制作顺序的介绍
 - 事例：各种模型板制作、最优化
 - 事例：背光的仿真、实际测量
- 性能评价 · 实际测量：背光的和性能评价和实际测量
- 结语

光源测试



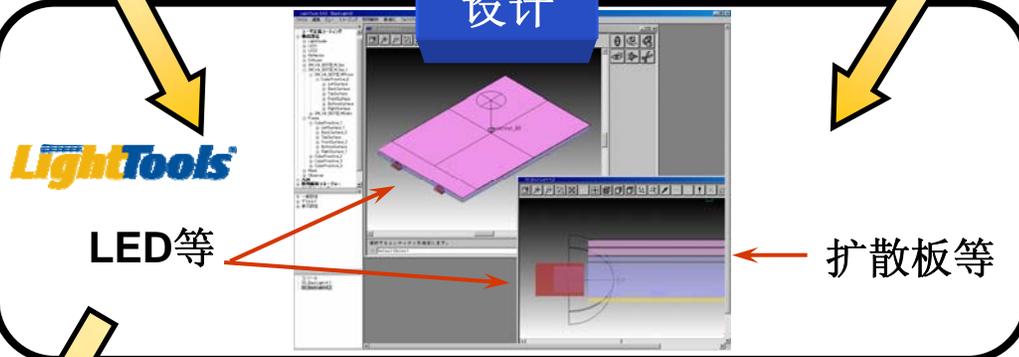
获取配光分布数据

材料特性评价

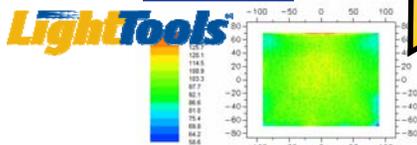


获取材料特性数据

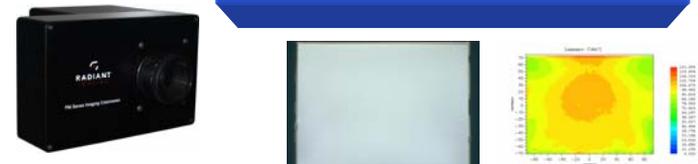
设计



优化



实际测量·性能评价



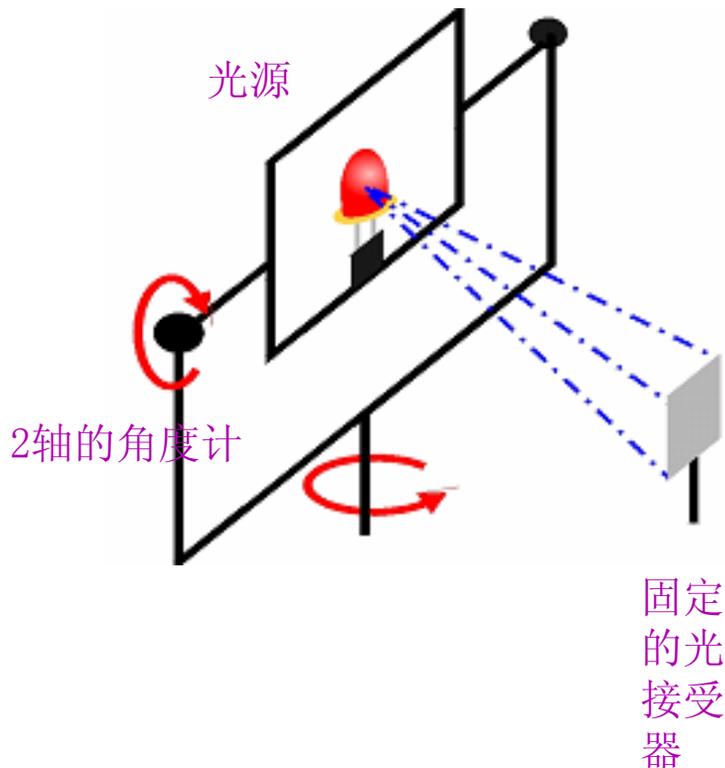
优化结果和实际测量的比较

光源测试:

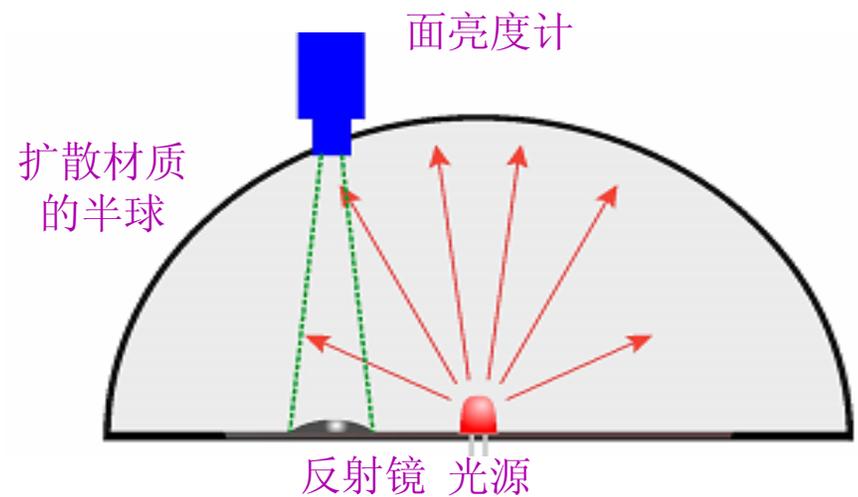
CYBERNET LED近场测试图 (NFP) 和远场测试图 (FFP)

LED实际测量

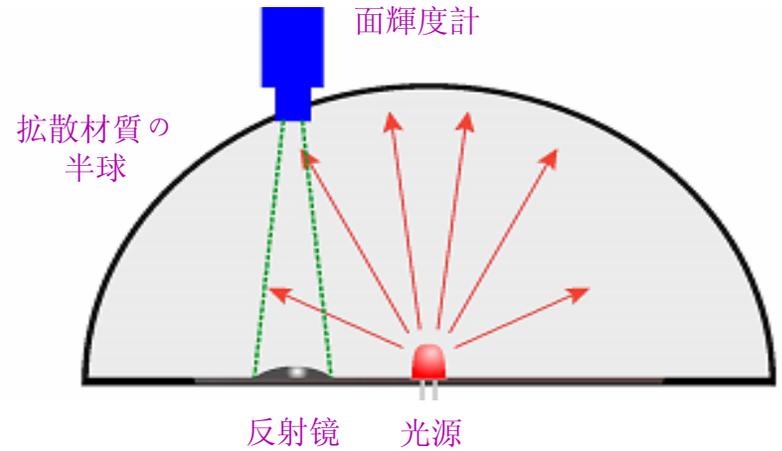
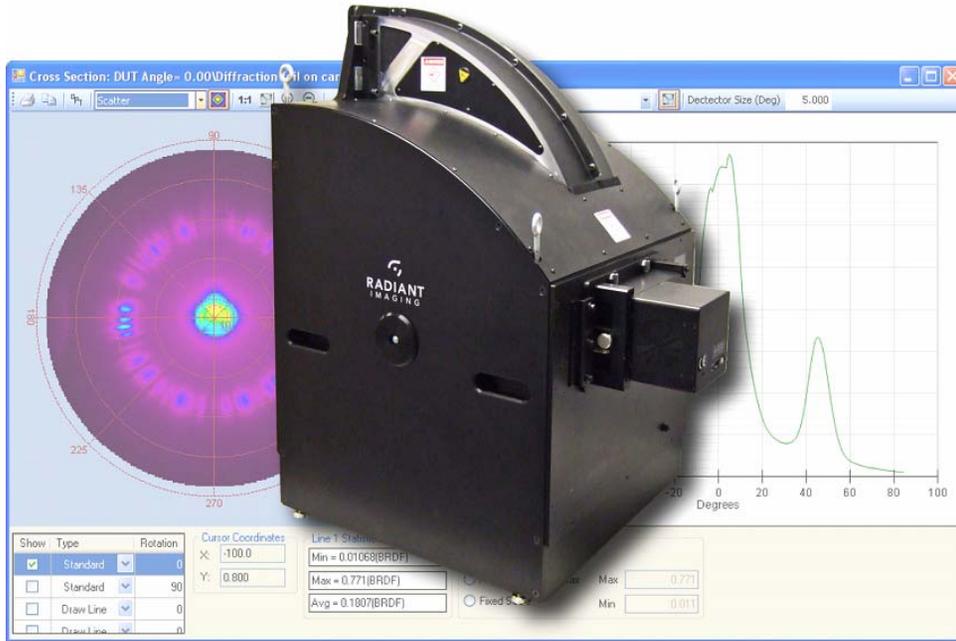
NFP <测试方法①>



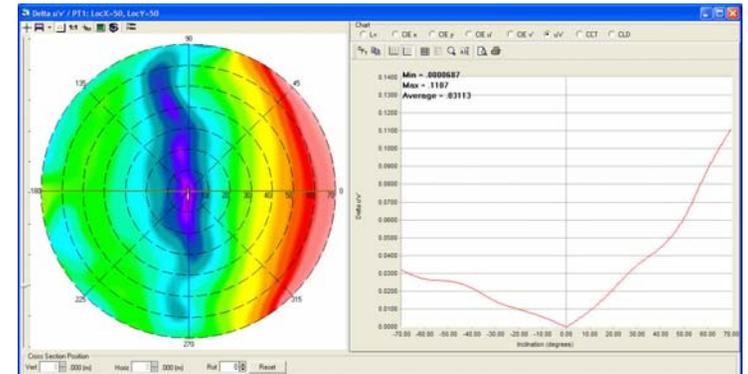
FFP <测试方法②>



Imaging Sphere (FFP)

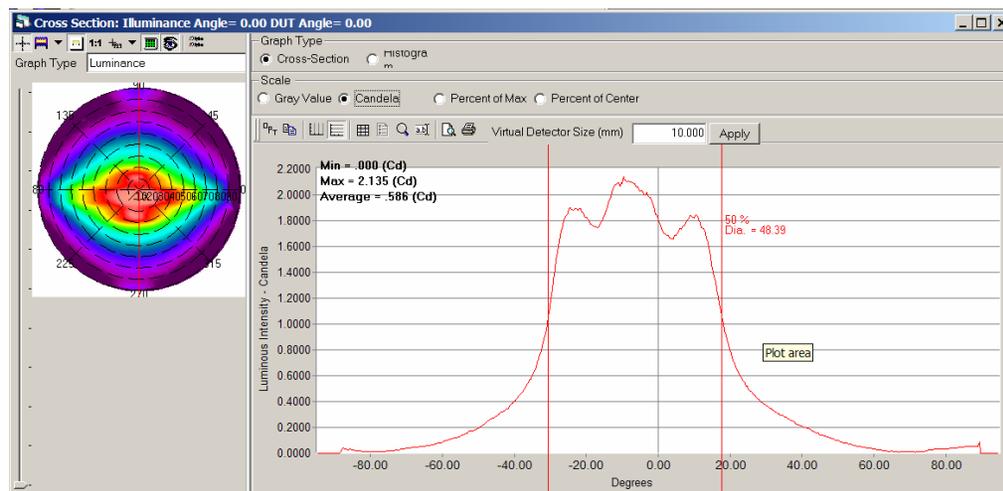
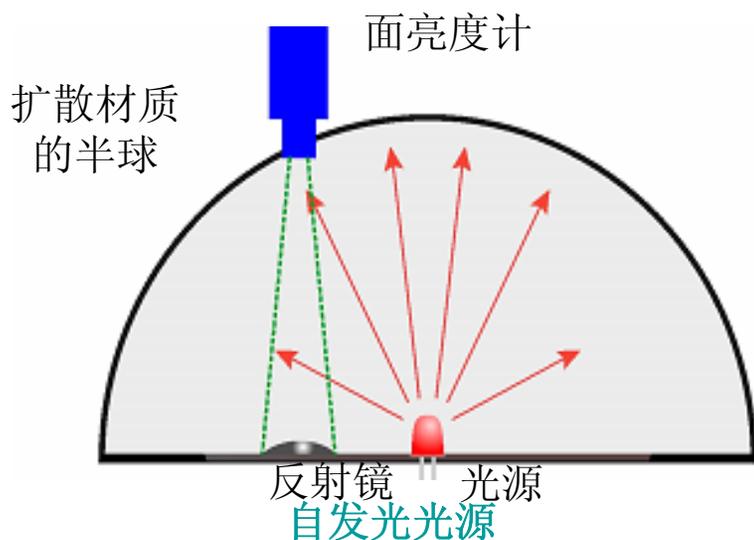


- 瞬时测试配光分布
- 可以评价三种类型
 - 光源的配光分布
 - 显示器的视角特性
 - 扩散板的散射特性



CYBERNET 光源测试: IS-LI (光源distribution配光测定)

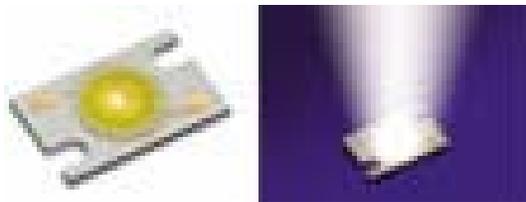
- 测试LED等光源的光强分布
- 在制造过程中也适用于LED的质量检测



绿色LED的光度分布

光源测试：NFP（近场测试）的用途

- 详细解析LED发光分布
- 帮助LED光源的开发研究
- 使用LED设计应用产品
- RMS的行业标准

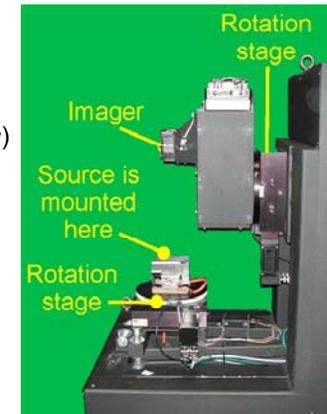
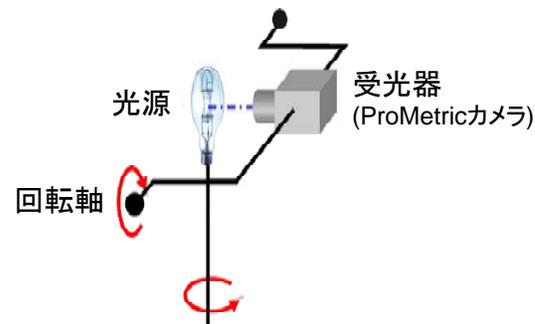


光源测试： NFP测试系统 SIG400



SIGの構造

- 2軸のゴニオステージを使用します
- 受光部は、ProMetricカメラを使用します
 - 標準の解像度は、512x512 (1画素20 μ m)



Source Imaging Goniometer (SIG)是可以在3维中测试光源的近场测试系统。

可以测试光源的配光分布和空间分布。这些分布主要应用于光源的开发以及光源的优化仿真中。

光源测试： SIG400的规格

目标光源： LED芯片、小型光源等

测试内容： 亮度配光分布、色度配光分布

可以测试的角度： $10^\circ \leq \theta \leq 350^\circ$

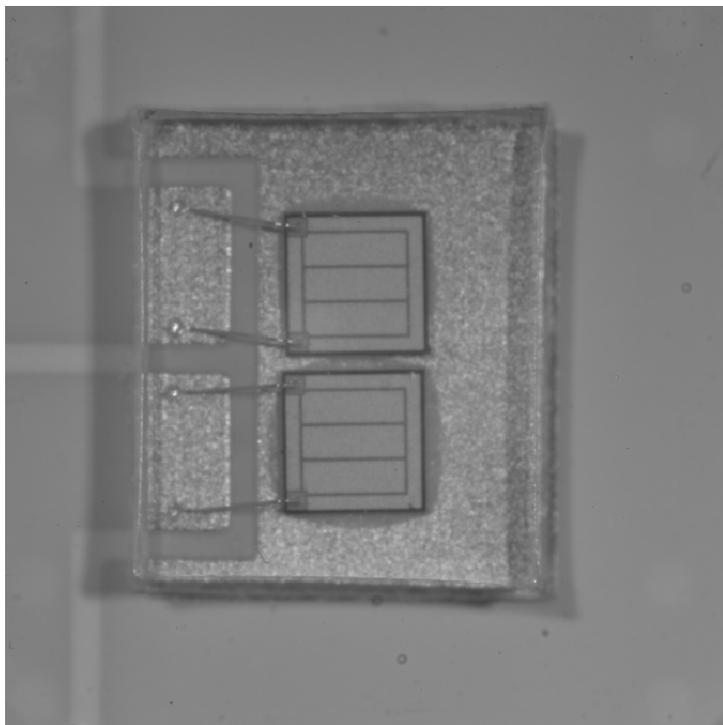
$0^\circ \leq \phi \leq 360^\circ$

可以测试的波长： $350\text{nm} \leq \lambda \leq 1100\text{nm}$

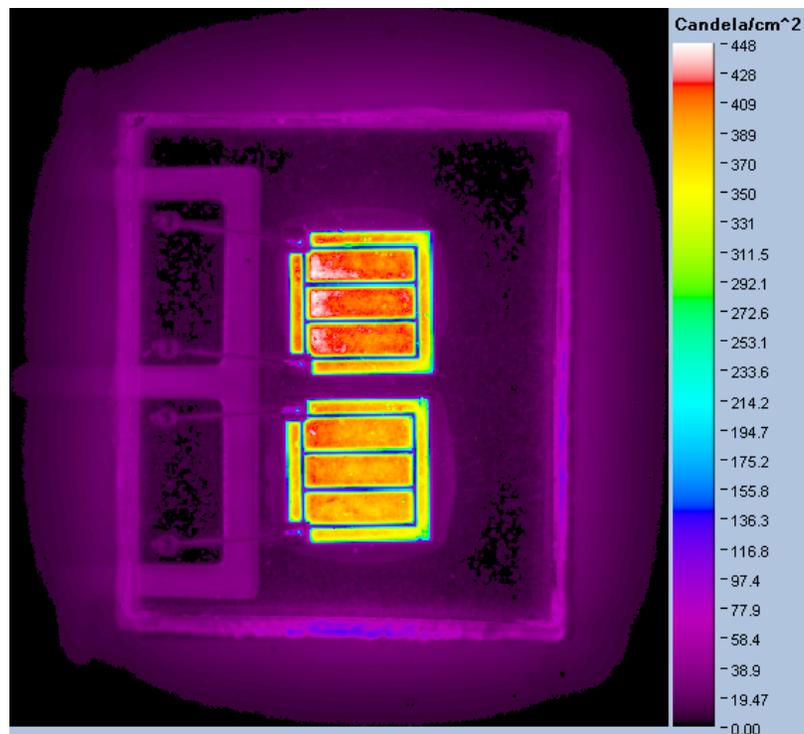
配光测试时间： 90分钟~120分钟 (色度测试需要3倍的时间)

对应仿真软件： LightTools、CODE V等

光源测试： LED发光分布（LSHL-LW5C）



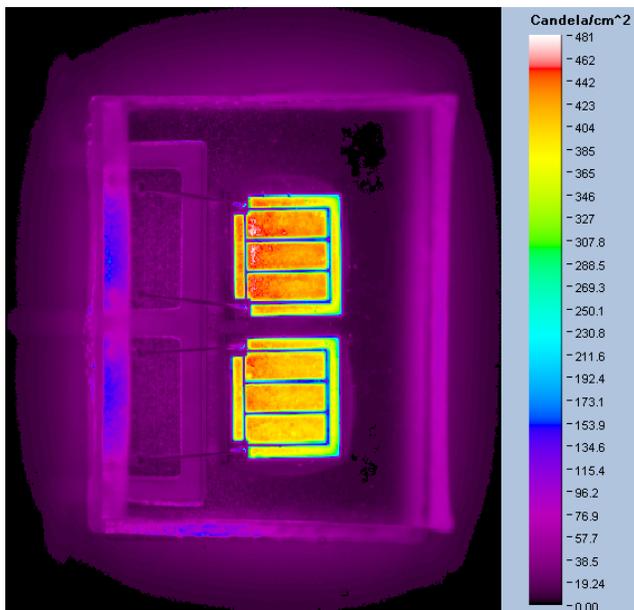
LED成像



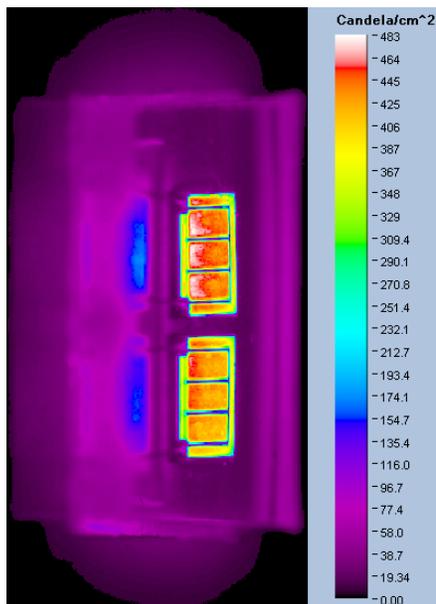
LED亮度分布（法线方向分布）

测试贵公司提供的LED

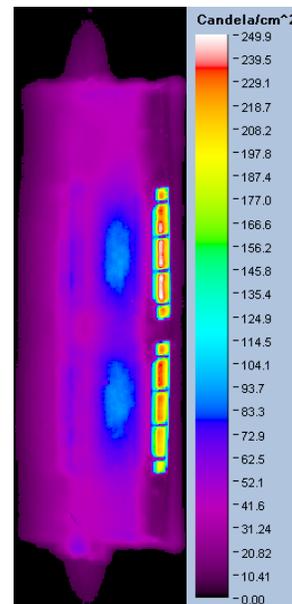
光源测试： NFP的旋转分布（LSHL-LW5C）



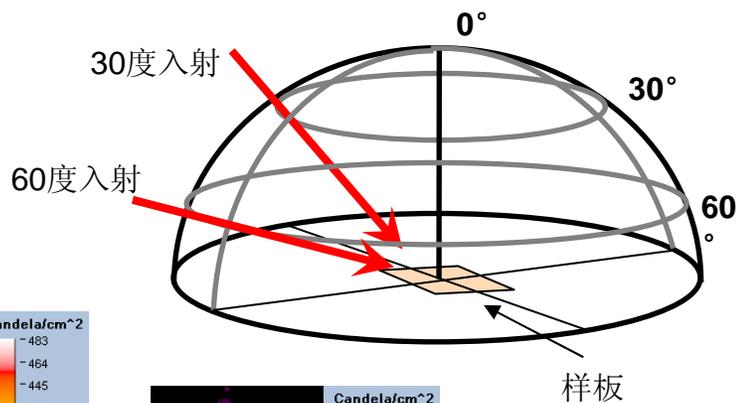
30度旋转



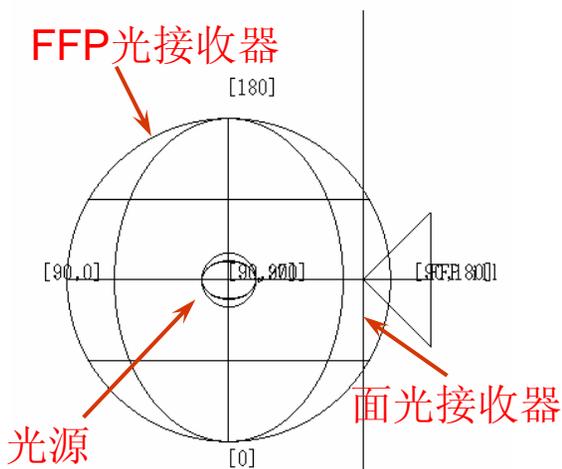
60度旋转



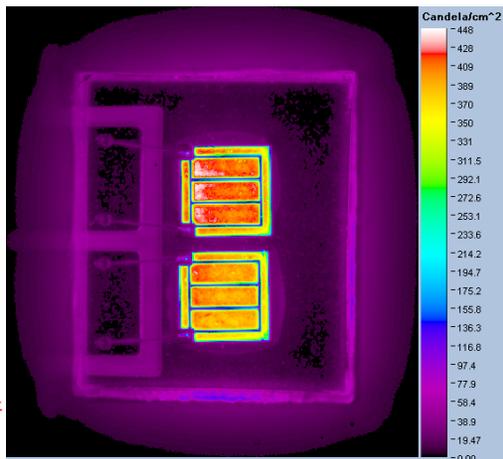
80度旋转



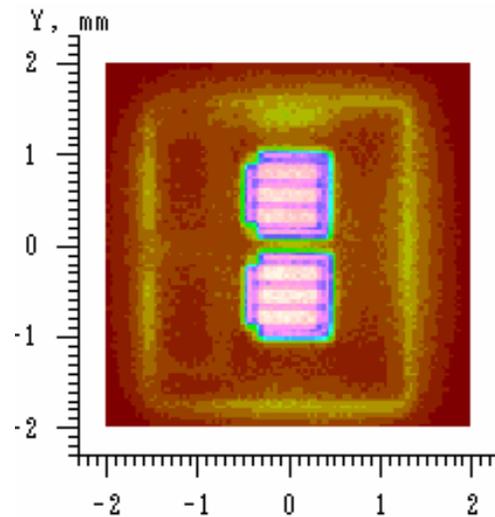
LightTools NFP解析结果 (LSHL-LW5C)



在解析中使用的光学系统

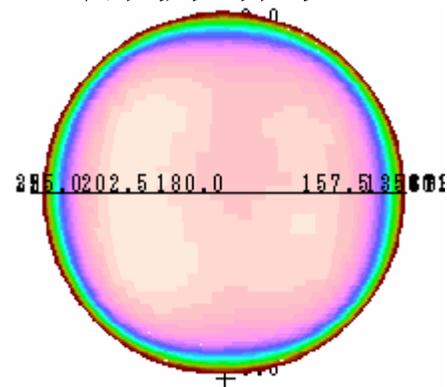
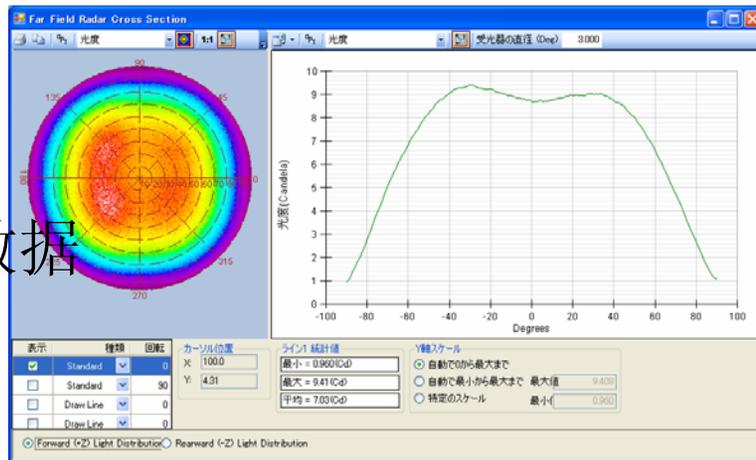


使用的光源



LT解析结果 (NFP)

FFP断面数据

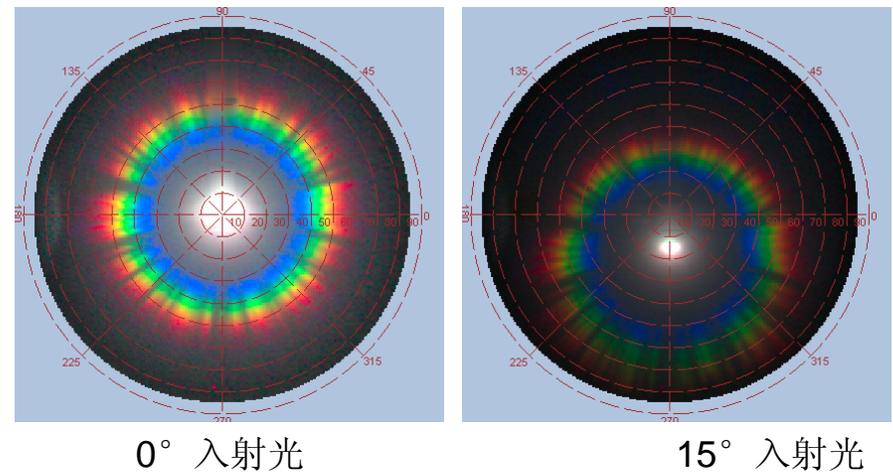
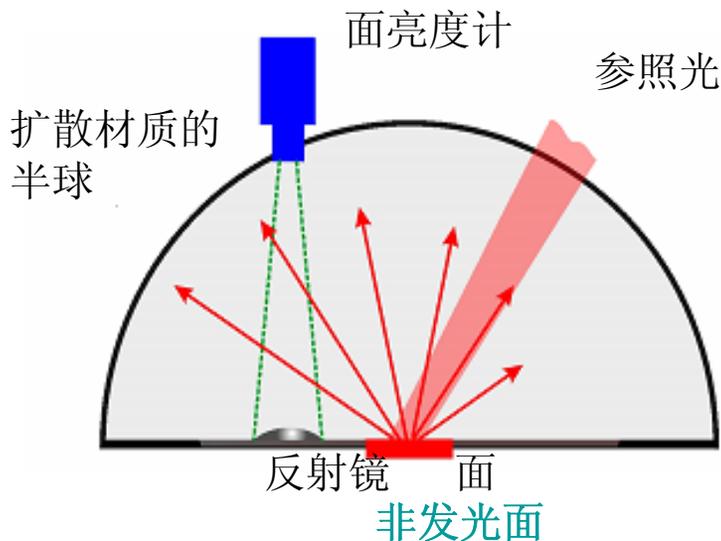


LT解析结果 (FFP)

光源测试： SIG400 NFP（近场测试）的优点

- ✓利用近场测试图可以得到更详细的信息。
- ✓利用近场测试图可以进行更精确的照明解析仿真。

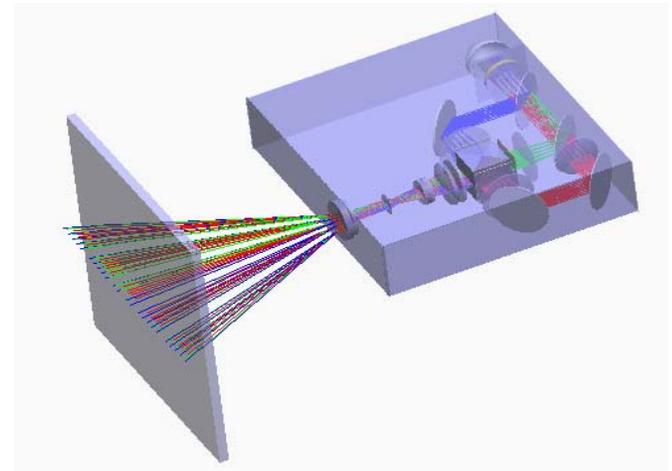
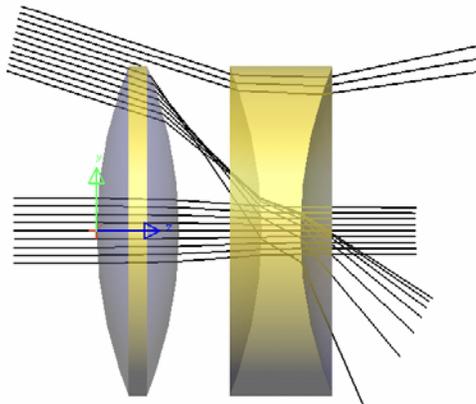
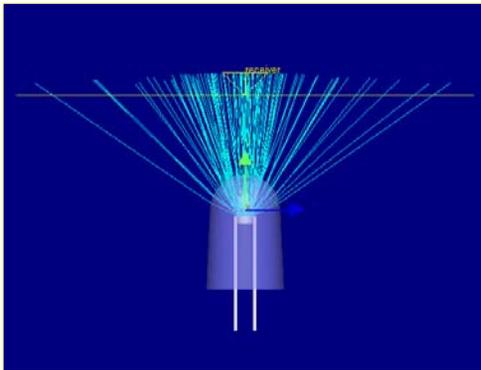
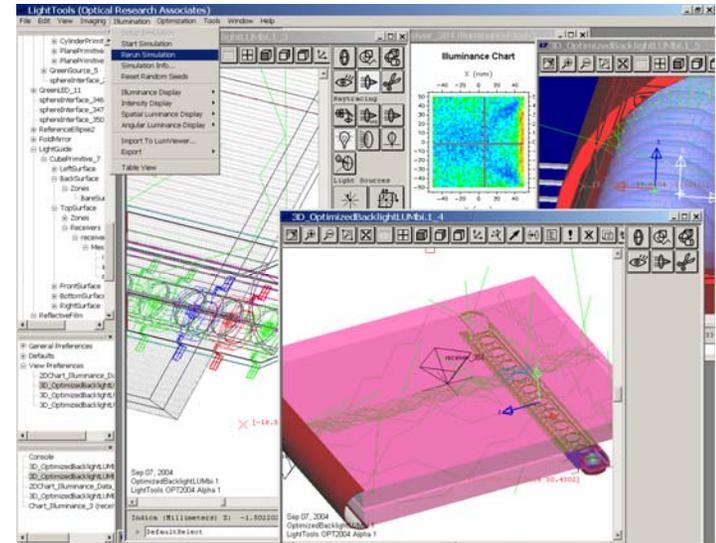
- 可以在不同的入射角中实现材料的照射
- 解析面上的散射光
- 可以测试反射光・透射光
(LT没有的, RI测量以后导入LT里)

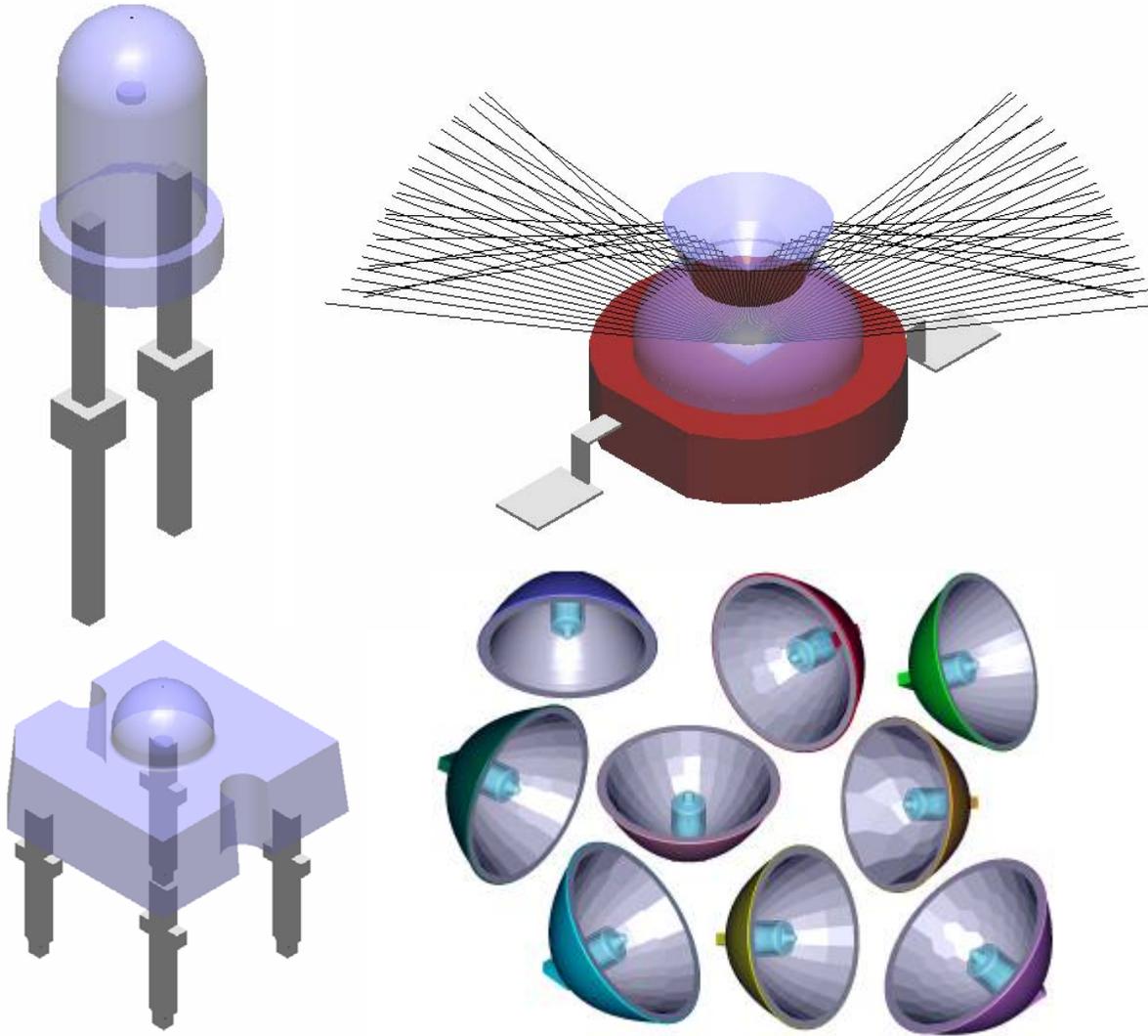


胶片的反射散射分布

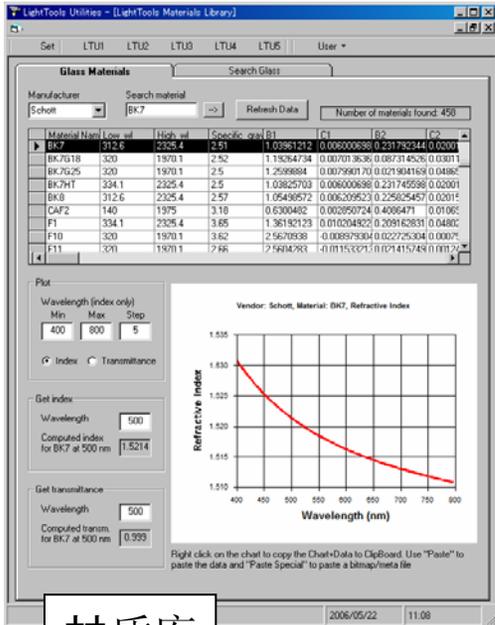
LightTools®

- 光学产品 + 机械产品的设计
- 即时光线追迹和照明解析
- 散射光的调查
- 照明系统的最优化设计

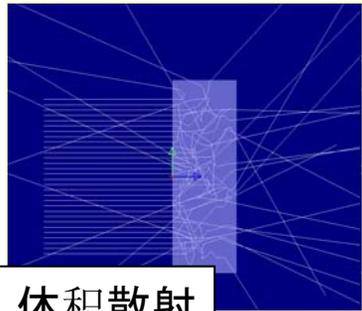




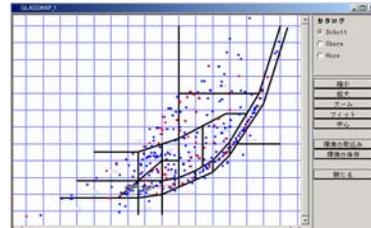
- 玻璃, 塑料在目录库中存在的, 可以直接指定材质特性
 - 在没有目录的情况下, 作为用户可自定义材质折射率, 透射率
- 也能够用户自定义扩散材质, 荧光体
 - 设定扩散材质的时候, 需要具备“粒子的折射率”和“粒子的密度”、“粒径分布”
- 附属制作光源模型的实用宏指令
- 约附属400个光源库, 超过300个 LED按生产厂商提供的数据建立的模型



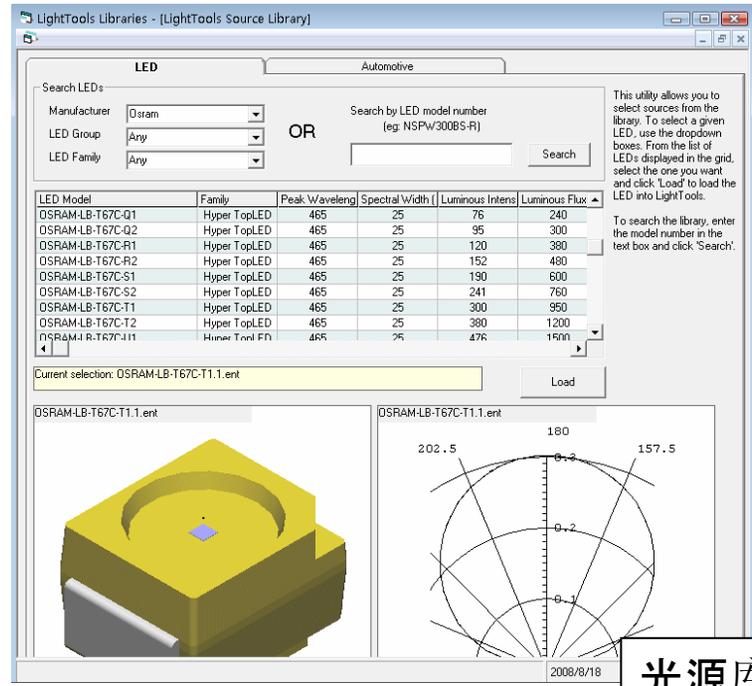
材质库



体积散射



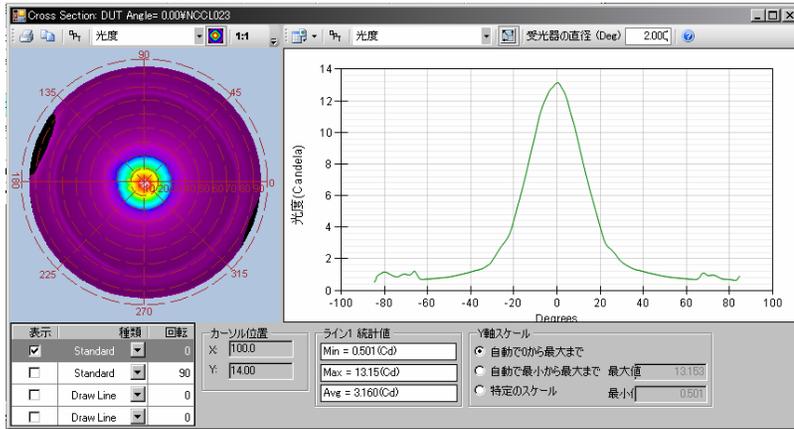
玻璃图



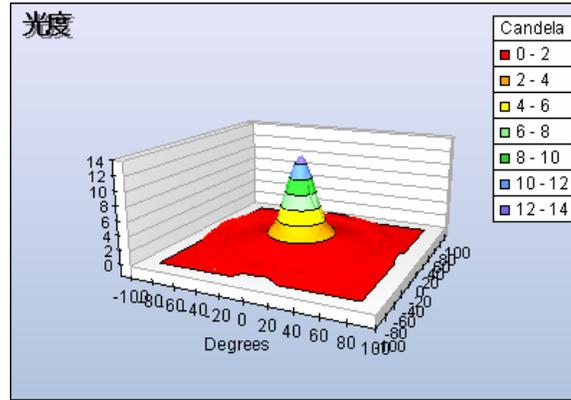
光源库

LED实际测量

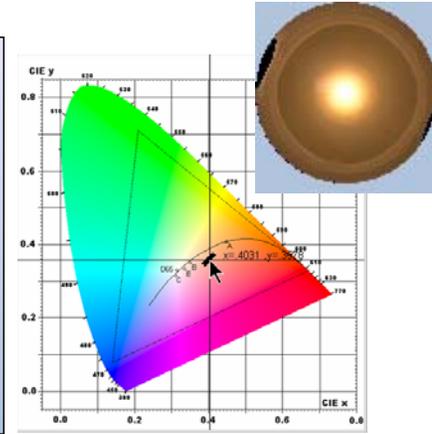
<指向性强的LED>



配光分布和断面输出

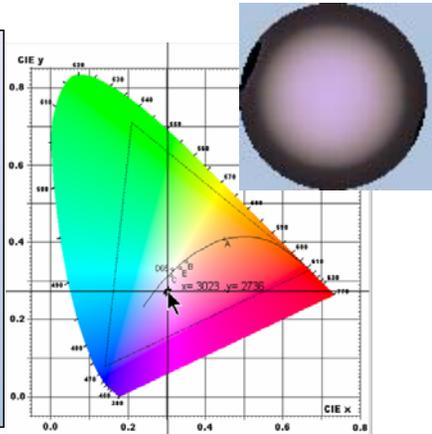
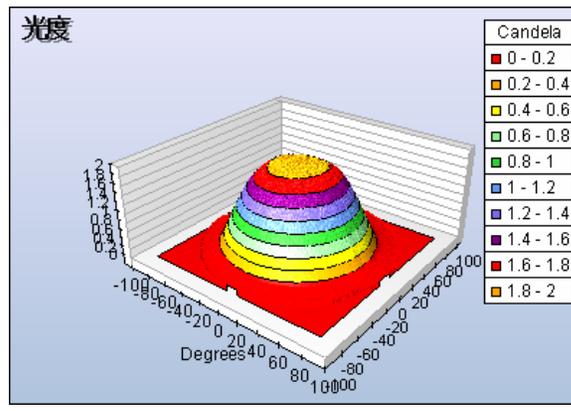
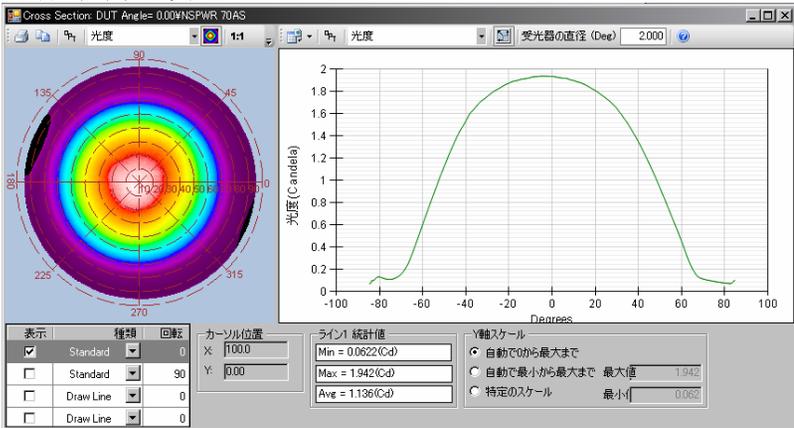


三维画像



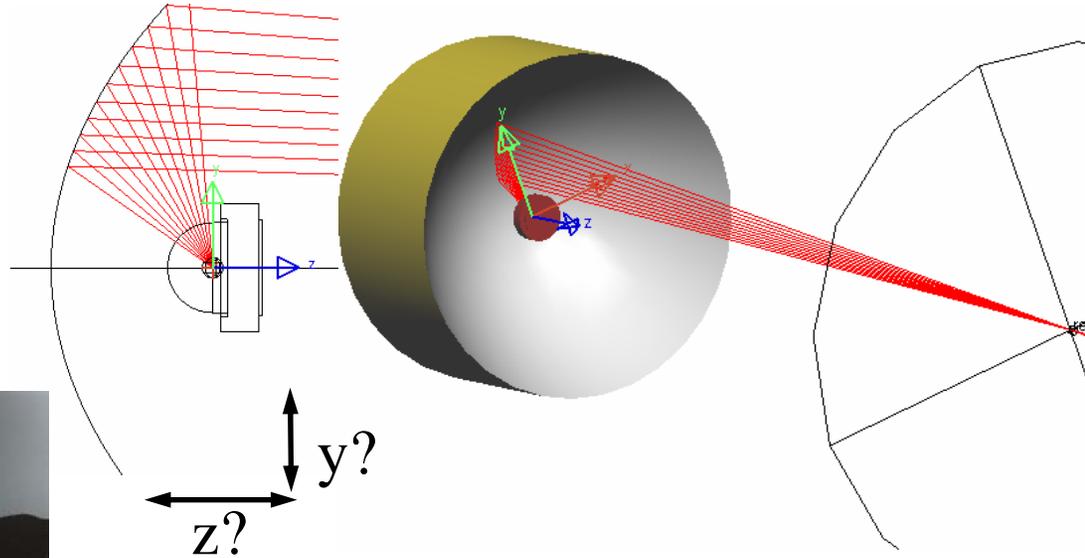
制作色度图

<指向性弱的LED>

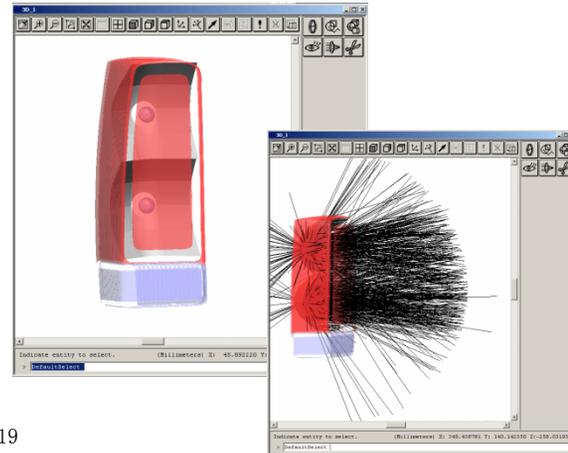


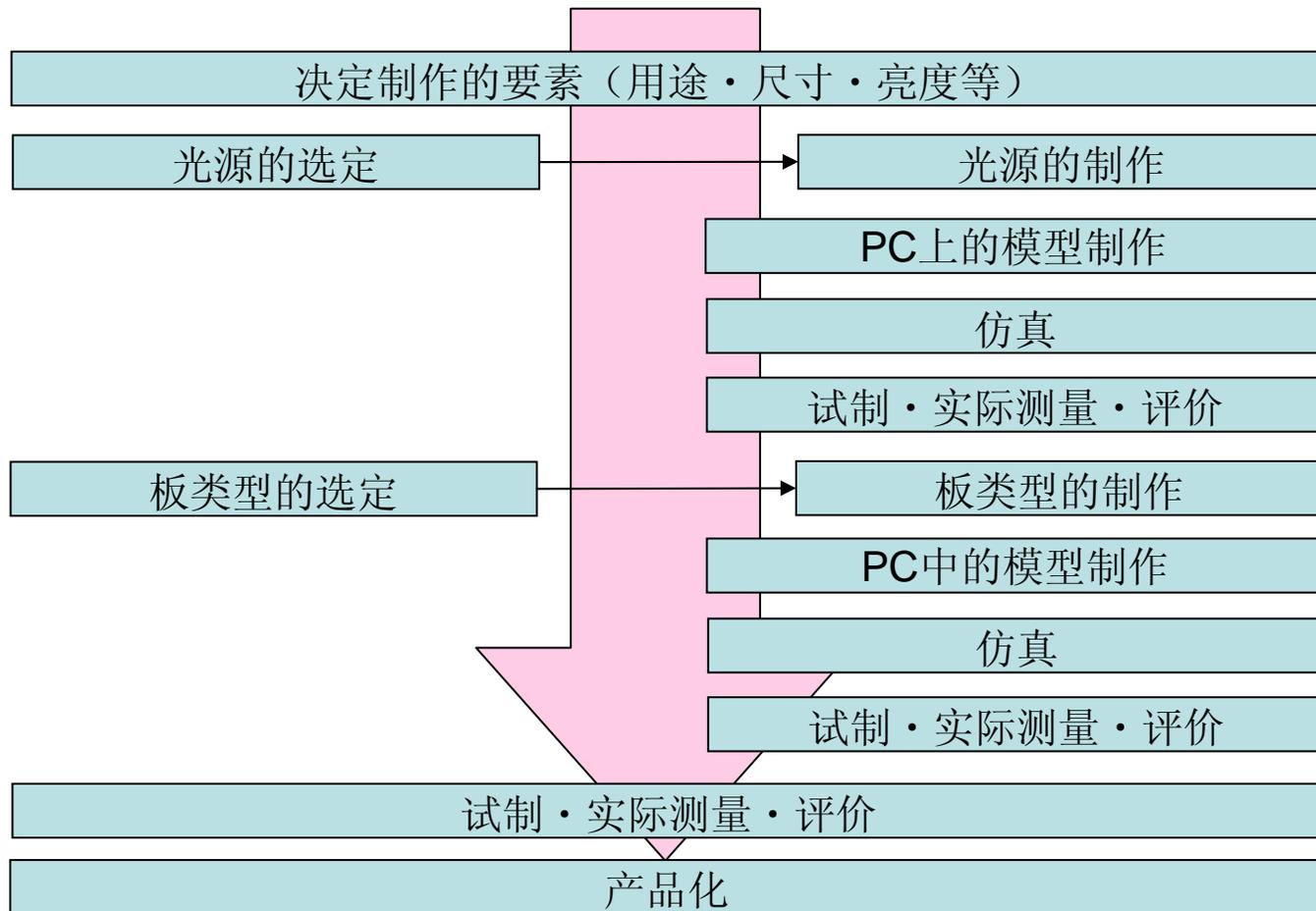
事例：汽车尾灯的设计

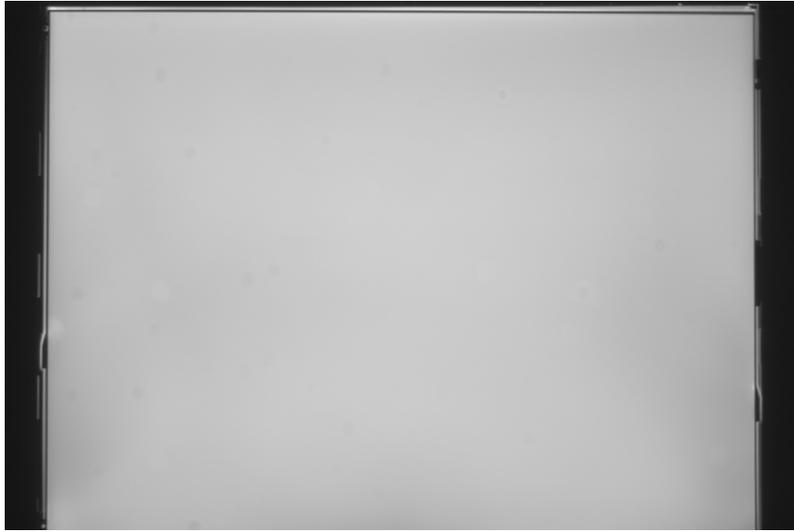
- 举个例子，可以研究这样一个模型，即：在椭圆反光板的一个焦点上有55流明的LED光源在另外一个焦点上有20mm的方形的受光器，可以研究其全光量假定最小必须汇集24流明，那么只有哪个才能正确的将LED配置在Y和Z轴上？



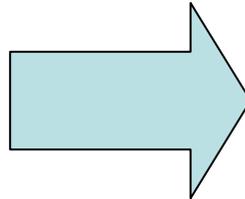
LightTools®



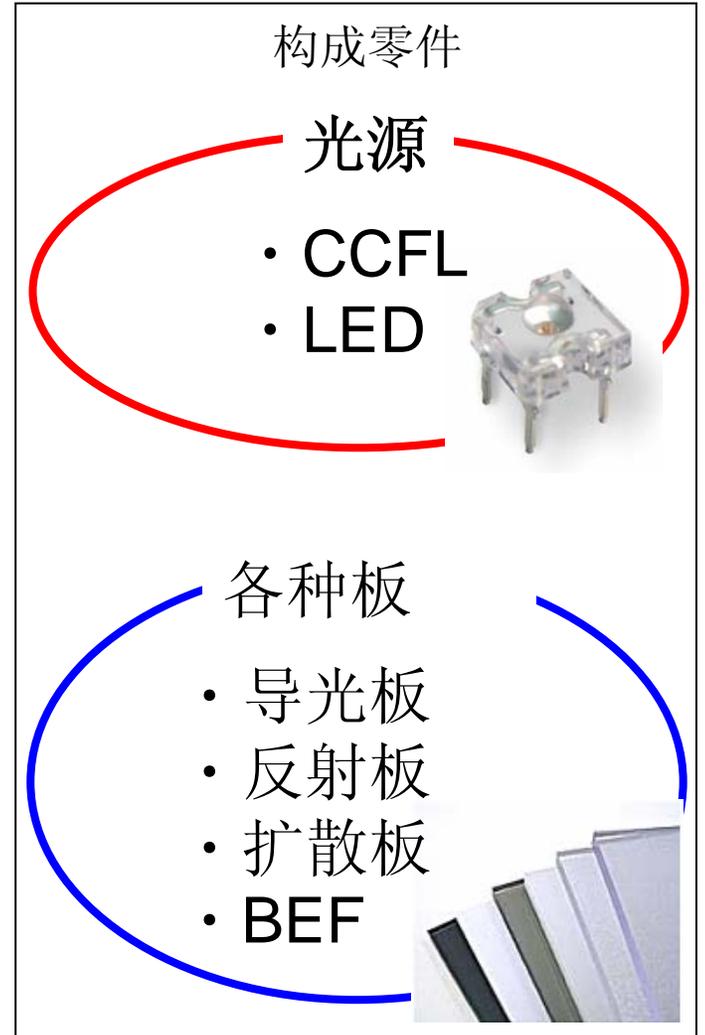


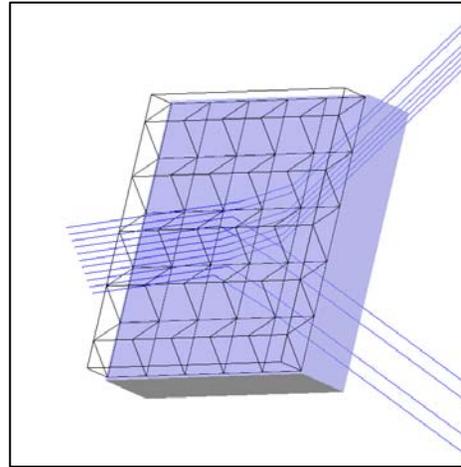
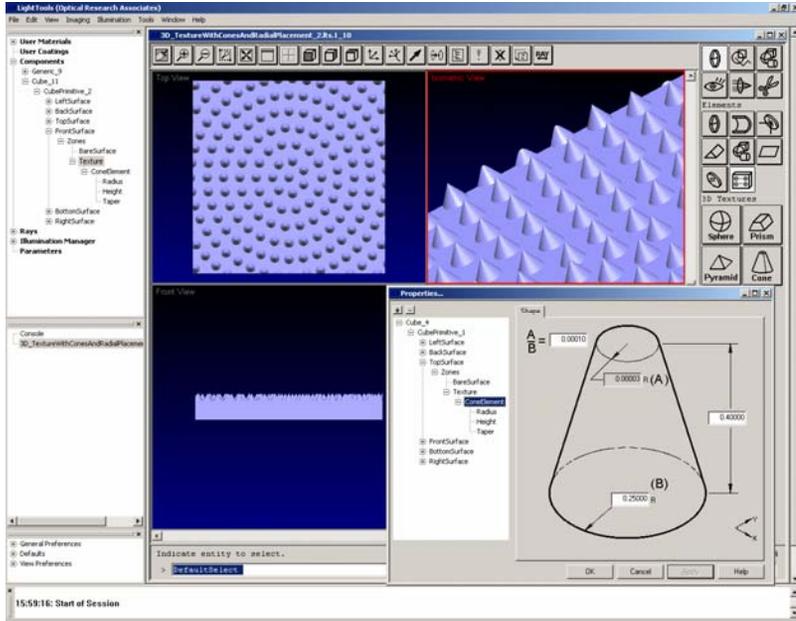


背光正面图

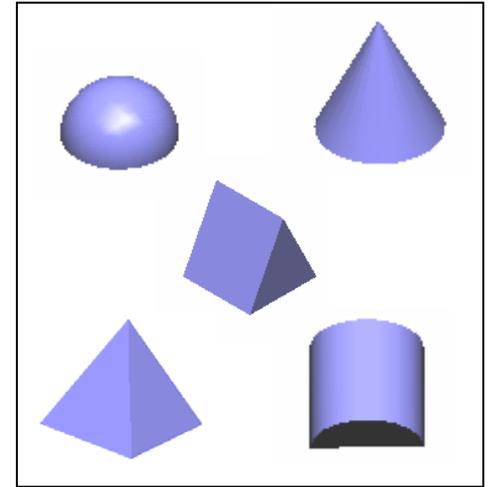


背光断面模式图

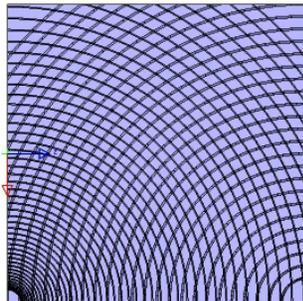
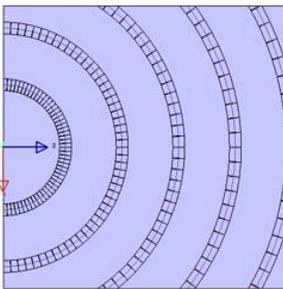




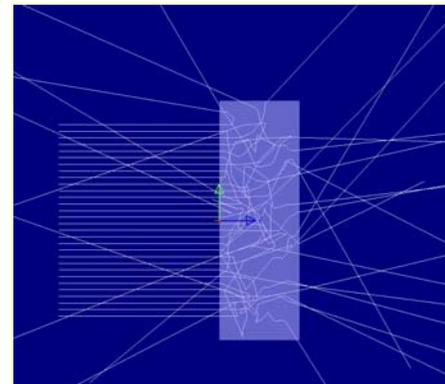
三棱镜板



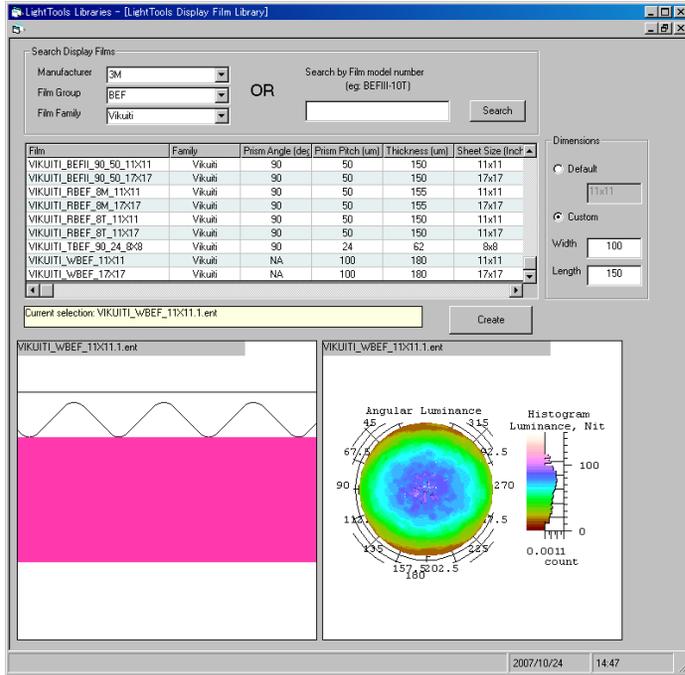
各种形状



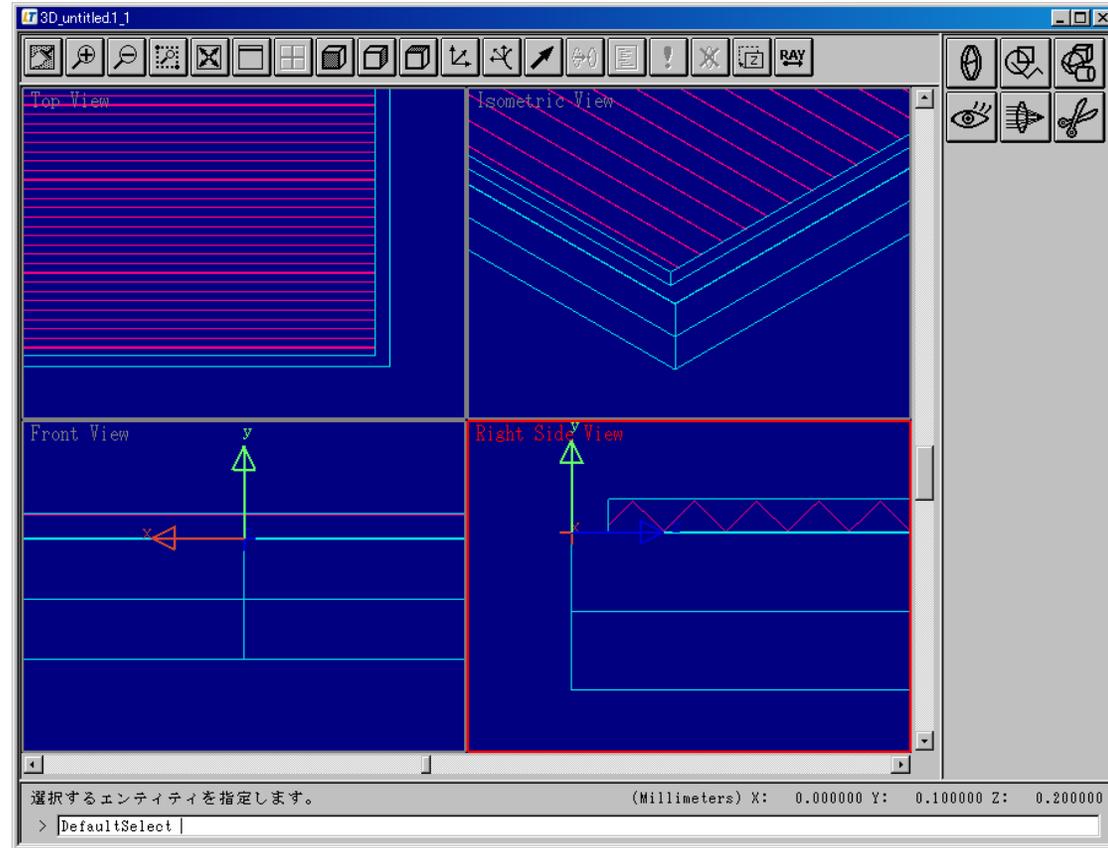
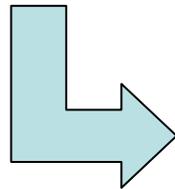
任意类型设定



材质定义



程序庫のデータ



制作模型

The screenshot displays the LightTools 6.00 (BLU 3LEDs 2) interface. The main window shows a 3D model of a backlight unit (BLU) with a grid of LEDs. The left sidebar contains a tree view of the model's components, including 'ユーザー定義材質' (User Defined Materials), 'ユーザー定義コーティング' (User Defined Coatings), '構成部品' (Components), 'LightGuide', 'Zones', 'Texture', 'SphericalE', 'Maximu', 'Radius', 'RightSurface', 'ReflectiveFilm', 'Receiver Plane', 'SourceHousing', 'BEF1_layer3', 'BEF2_layer3', '光線' (Rays), '照明解析マネージャー' (Illumination Analysis Manager), '光源リスト' (Source List), '受光器リスト' (Receiver List), '霧度計リスト' (Haze Meter List), 'forwardSim_1', 'スタジオマネージャー' (Studio Manager), '最適化マネージャー' (Optimizer), and 'パラメータのコントロール' (Parameter Control).

The 'BPO - [BPO 3D BLU 3LEDs 2.3 (LT PID= 2960)]' window is open, showing optimization settings and results. The 'Exit Criteria and Starting Point' section includes:

- Maximum Iterations: 5
- Signal To Noise Ratio (MF/NF): 1.2
- Starting Configuration: Uniform Pattern and Iterate

 The 'Current Performance' section shows:

- Merit Function (MF): 0.0667
- Signal To Noise (MF/NF): 3.4741
- Mesh TotalPower: 2.4547
- Mesh Average Deviation: 0.258
- 1/sqrt(RaysPerBin): 0.130
- Ray Efficiency (Mesh Rays/Start Rays): 0.8857
- Total Rays To Trace: 50000

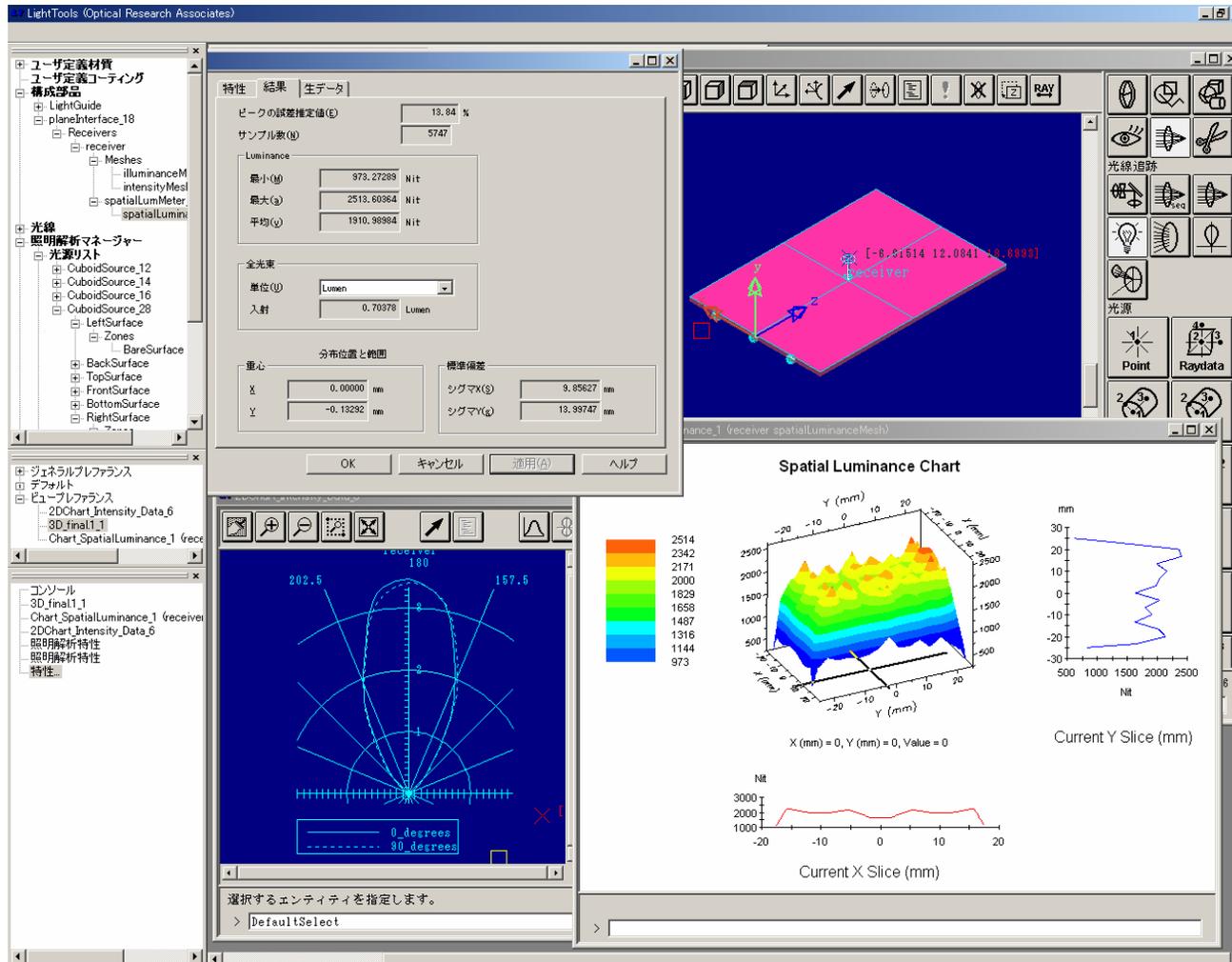
 The 'BPO Results on 2007/10/24' table is as follows:

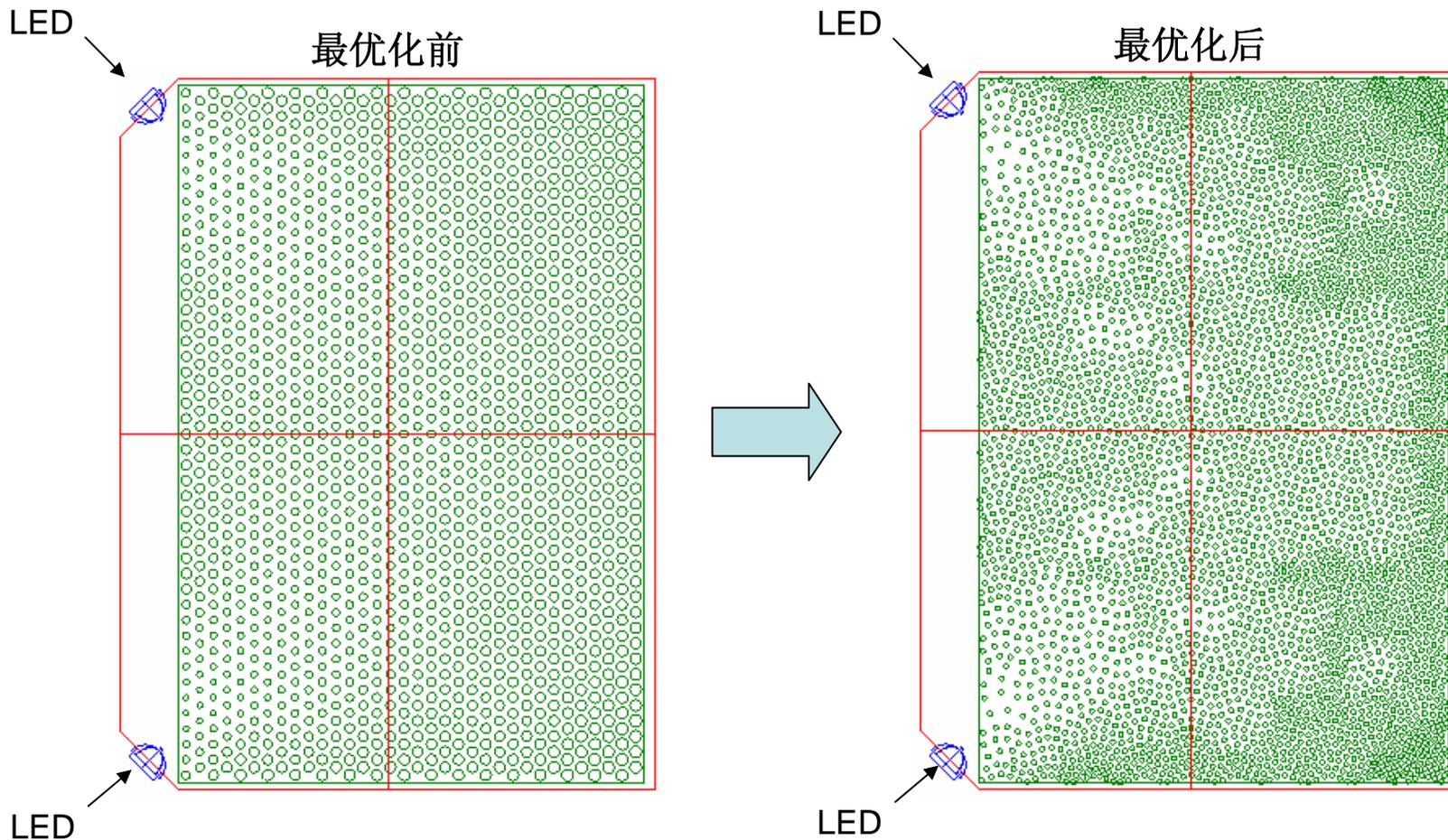
Time	Iteration	SNR	Total Power	Mesh Total	Avg. Mesh	Center A
16:20:12	0	26.26	2.6098	959.9317	795.0840	1.000
16:21:20	1	6.39	2.5421	847.3524	671.1807	0.521
16:22:42	2	3.35	2.4527	817.5784	817.9382	0.419
16:23:55	3	7.90	2.5351	845.0248	897.2639	0.542
16:25:12	4	6.44	2.5158	838.6043	699.5370	0.498
16:26:31	5	3.47	2.4547	818.2218	810.8772	0.362

 Below the table are three heatmaps: 'Last Acquired Density', 'Last Acquired Mesh Target', and 'Last Acquired Mesh Data'. The '2DChart [Illuminance_Data_1]' window shows a 2D plot of illuminance with axes 'Y, mm' and 'X, mm', and a color scale for 'Illuminance, l' ranging from 0 to 200. The console at the bottom shows the following message:


```

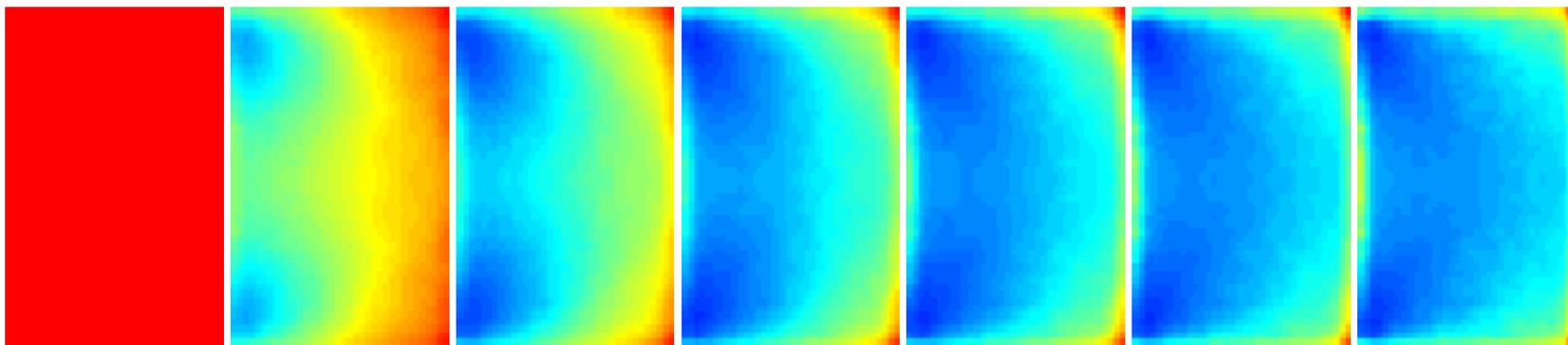
    BPO 16:26:36: UDV is done Reading Density from C:\LTUser\BPO_tempDensity.1.txt
    MF,NF,SNR,Flux,StDev,Pk,CR= 0.066866 , 0.019190 , 3.474074 , 2.4547 , 0.258 , 2088.508 , 0.683
    
```





2种不同密度的点测试图的背光

点的密度



0

1

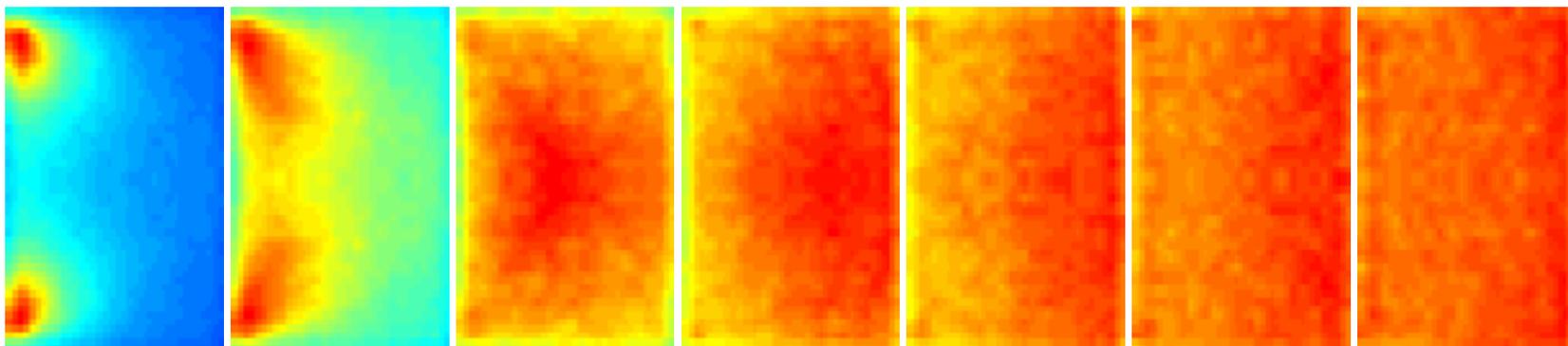
2

3

4

5

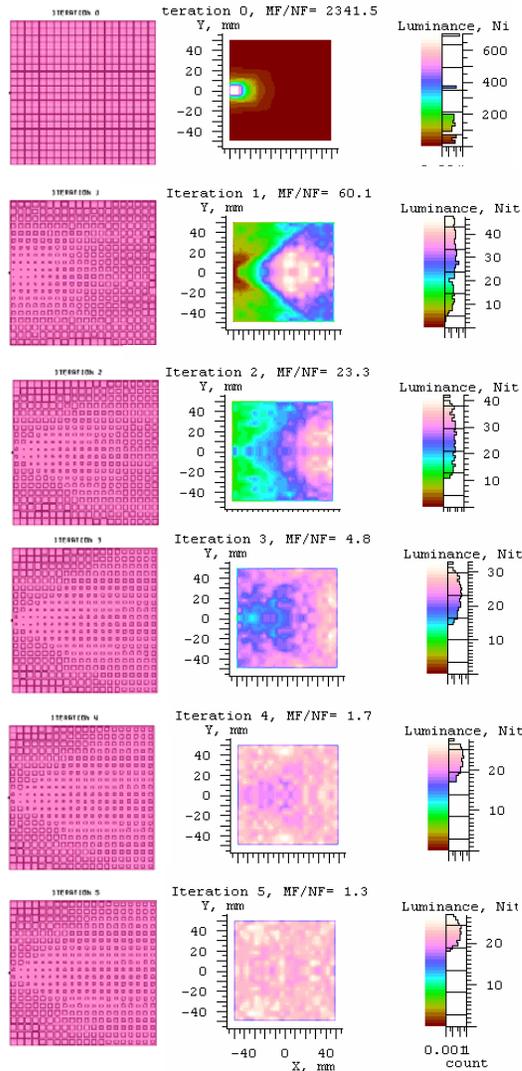
6



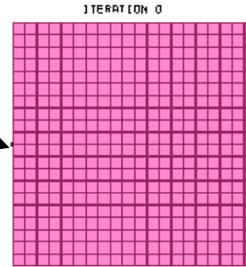
照度

- 最优化周期次数数= 6
- 元件数 = 20X30
- 光线追迹数 = 1E+6
- 构造类型 = 球的凹形状(3D)

事例：背光模型的最优化

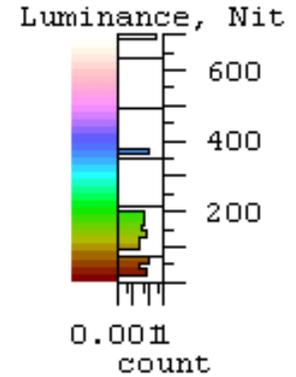
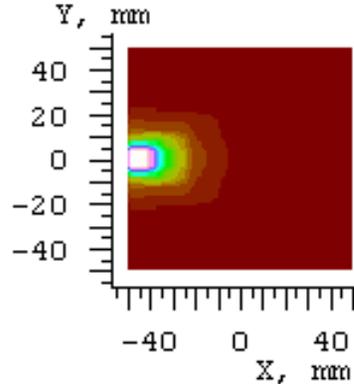


小光源
(例 LED)

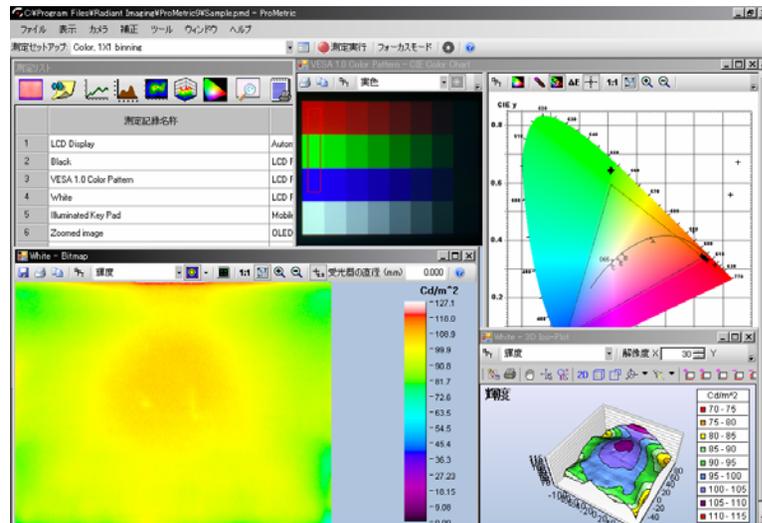


2D 显示

Iteration 0, MF/NF= 2341.5



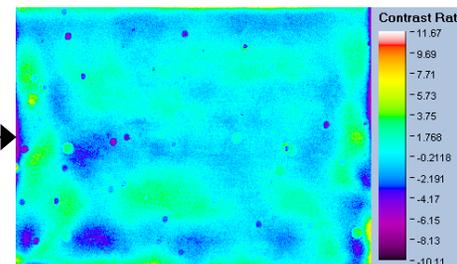
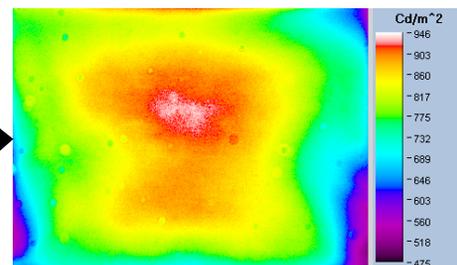
演示从同样的栅极开始进行6次评价函数的计算,得到合适的2DTexture样本的解。



- 采用高动态范围CCD
- 测定亮度和色度的绝对值
- Mura解析功能
- 基于Active-的定做

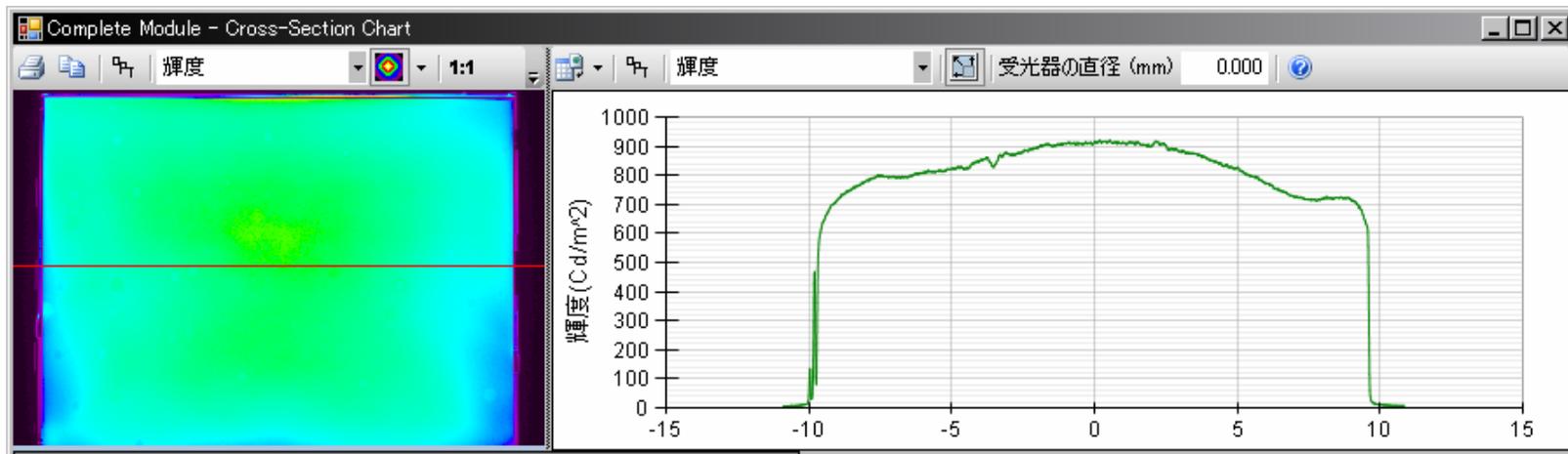


背光

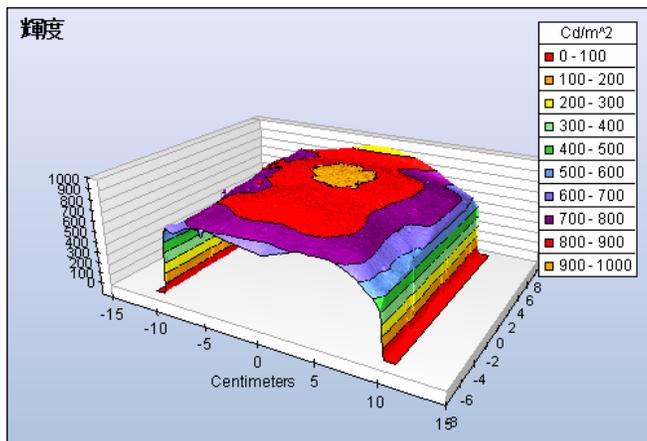


上段：亮度分布
下段：Mura解析

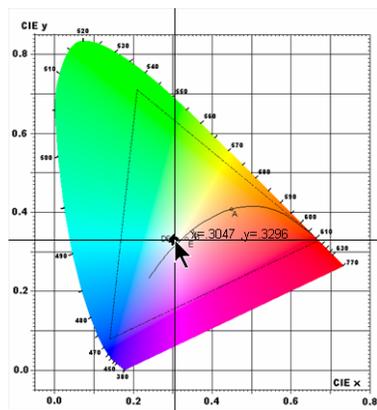
CYBERNET 事例：背光的实际测量（面上的分布）



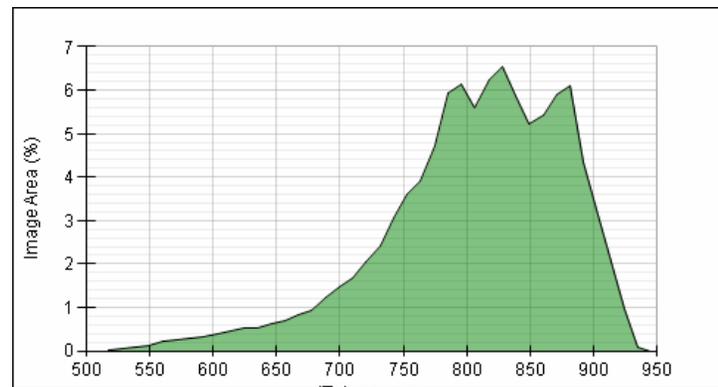
断面亮度分布



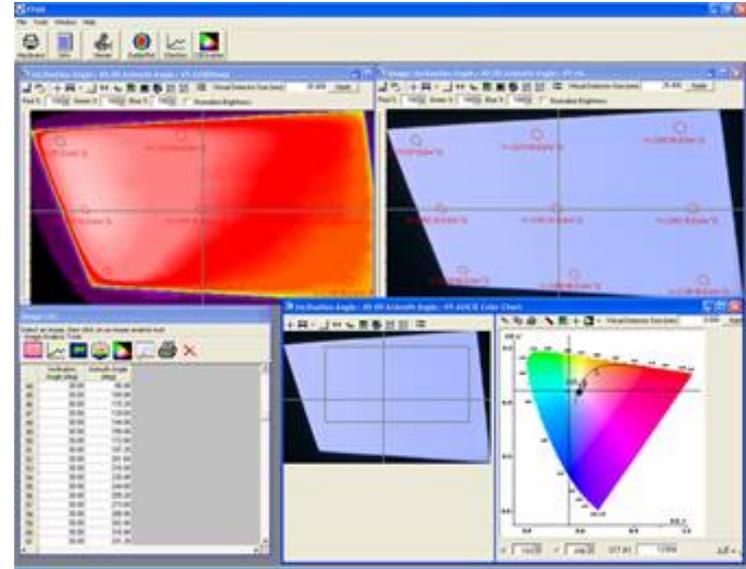
三维亮度分布



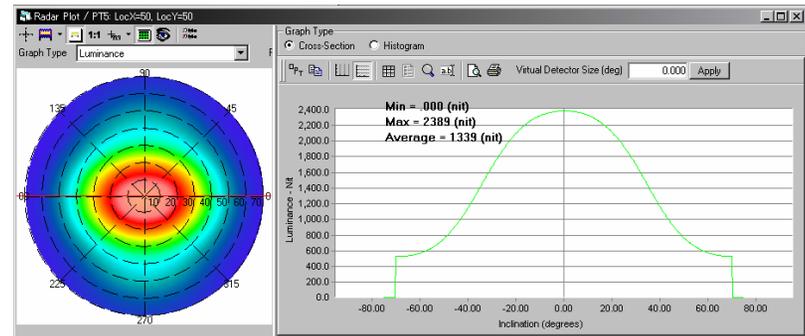
色度图



柱状图

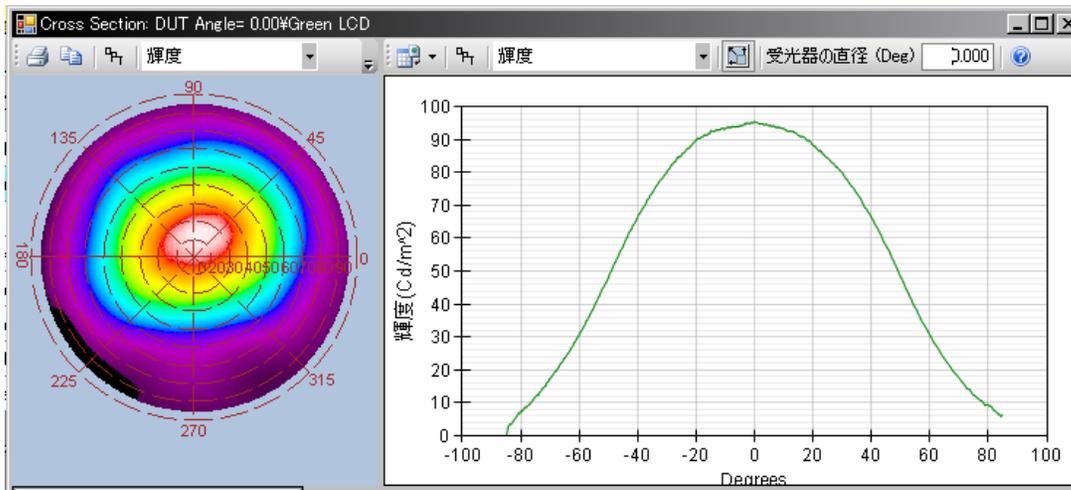


- ProMetric的选项
- 视角特性的评价
- 自动识别发光部位
- 可以输出法线亮度值

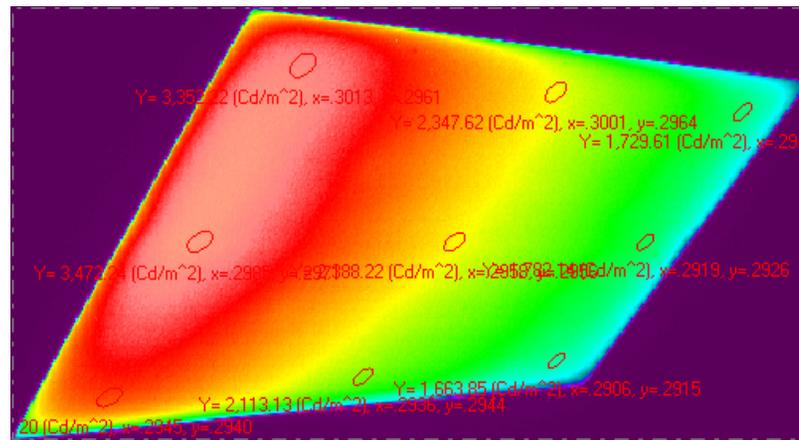
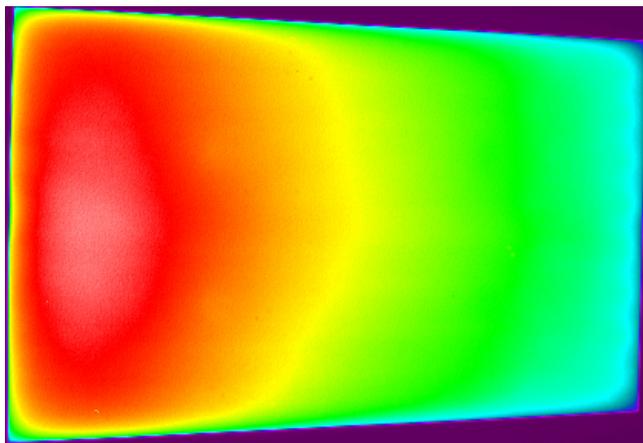


视角特性

事例：背光的实际测量（视角特性）

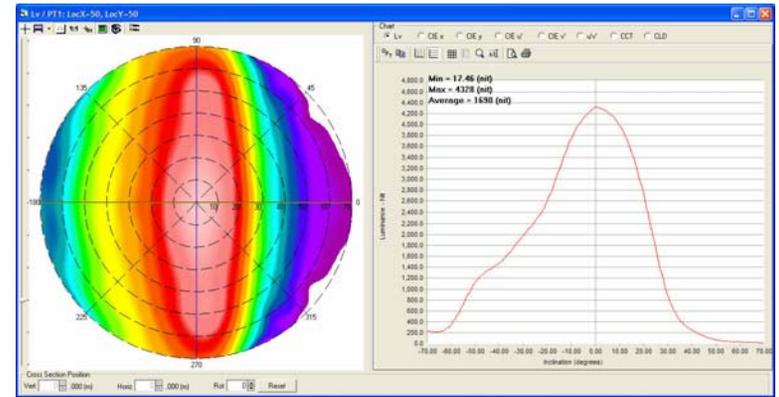
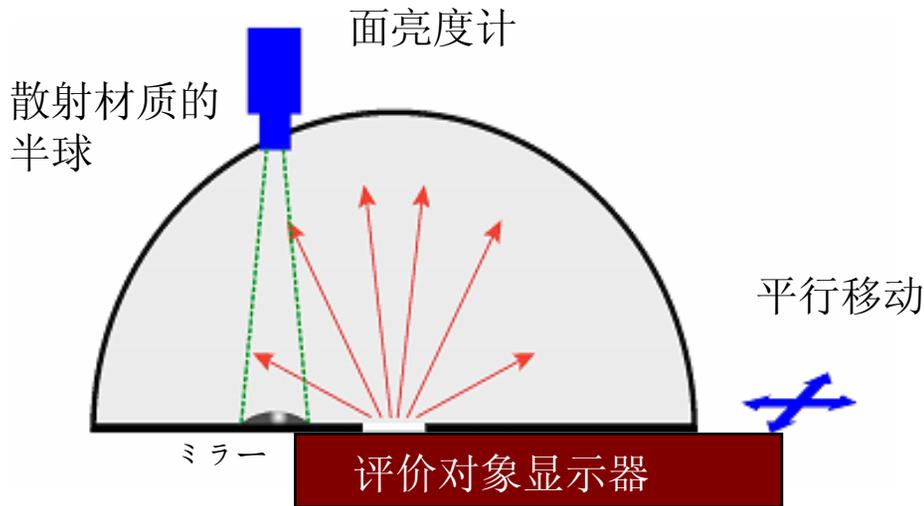


视角特性和断面曲线图

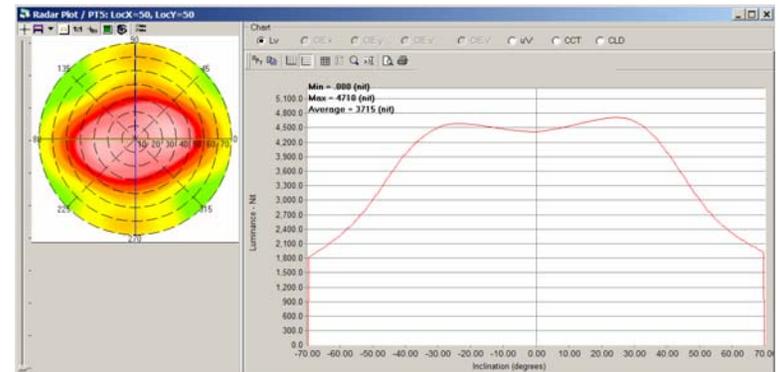


改变角度时所看到的

- 测试背光和各种FPD
- 每个角度的亮度
- 每个角度的色度
- 每个角度的对比度

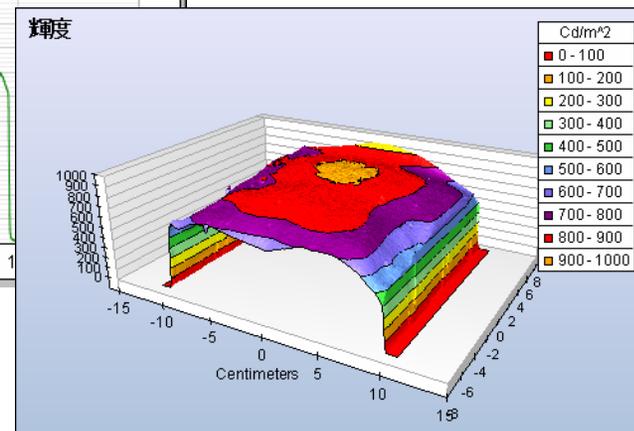
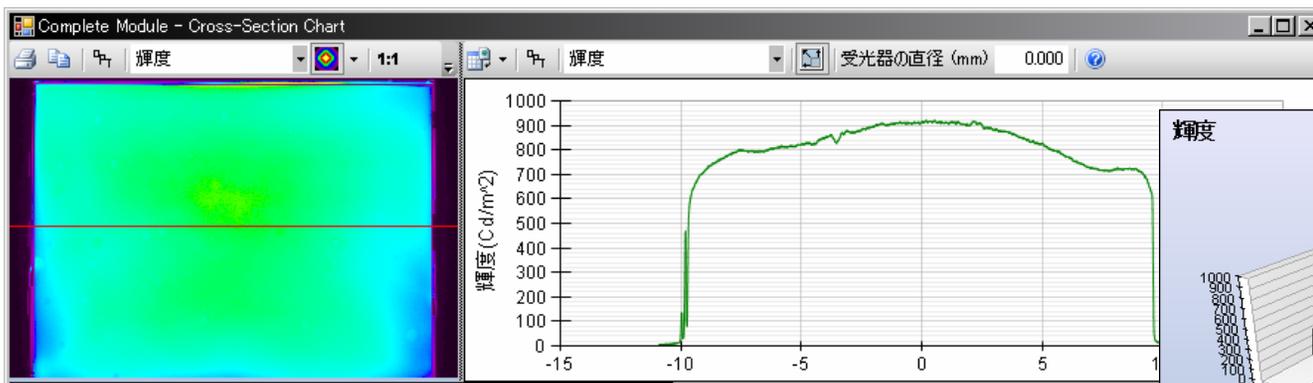
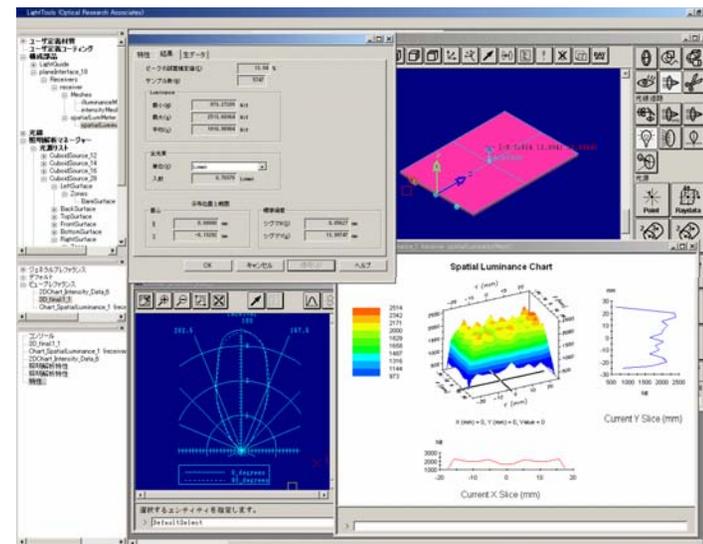
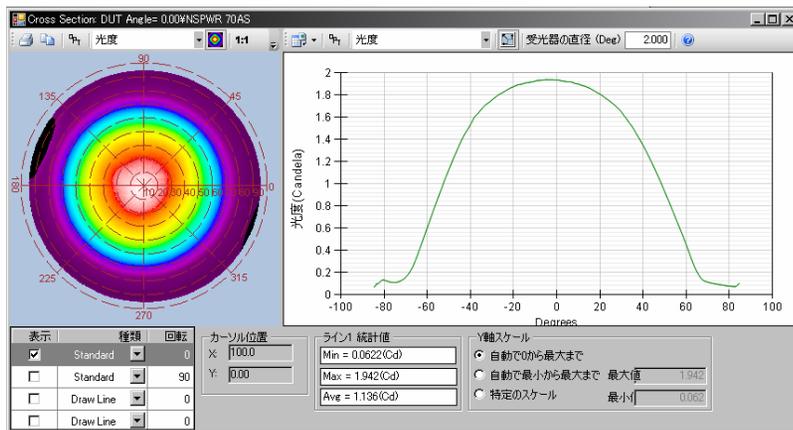
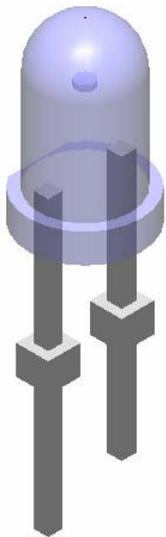


背光+BEF



背光(汽车导航)

事例：背光的实际测量

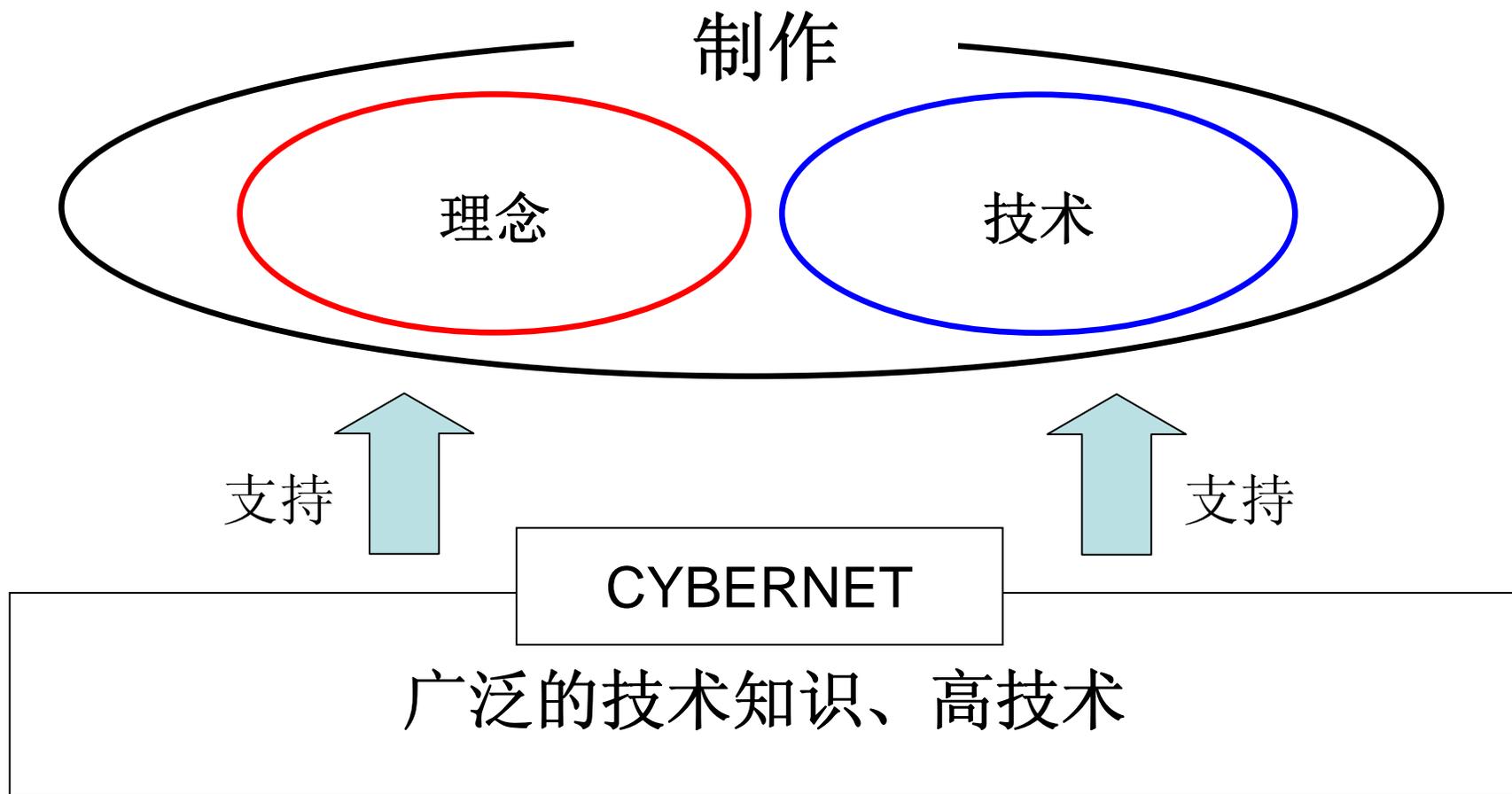


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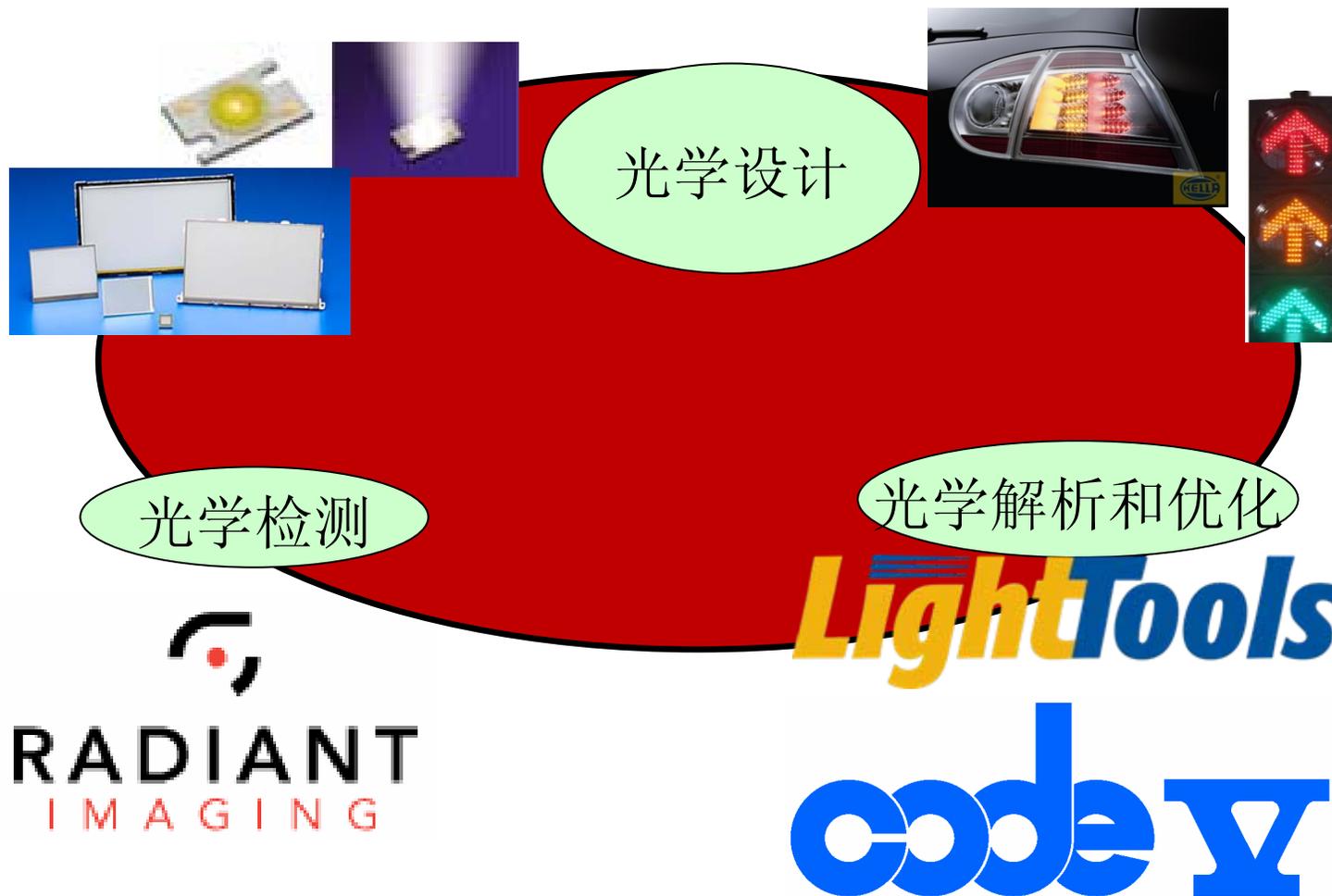
成立： 1985年

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