

Lighting & Optics



COGNEX

镜头

COGNEX

镜头的种类

- 广角镜头

- 焦距小于标准焦距50mm的。例如：16mm
- 景深大，聚焦距离更近

- 远距照像镜头

- 焦距大于标准焦距50mm的：例如：75mm
- 景深浅，放大远距离物体

- 变焦镜头

- 焦距有范围，例如：35-70mm

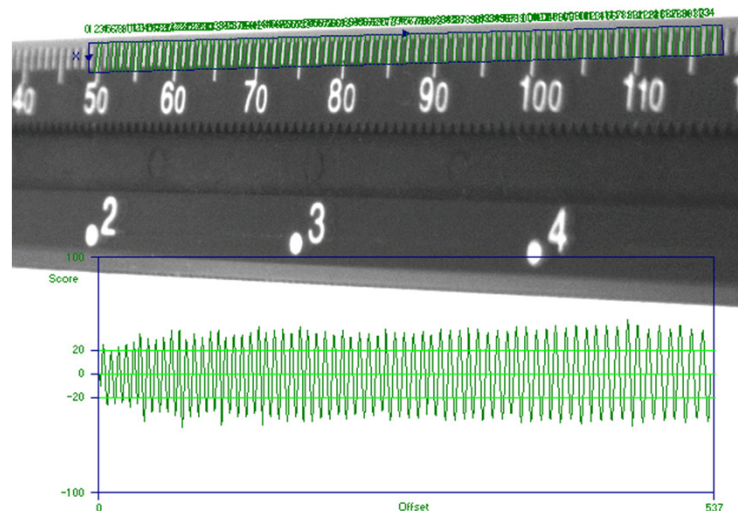
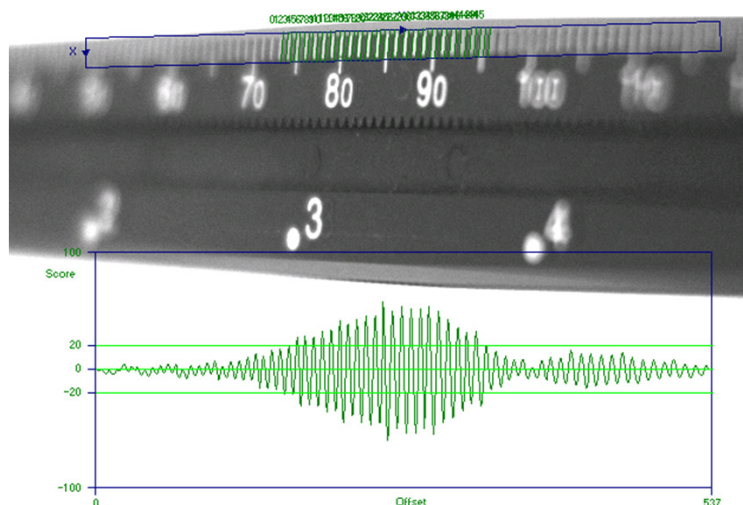
- 微距镜头

- 图像的大小= 物体的尺寸（1:1）

- 远心镜头

- 没有透视变形

景深



在对焦范围内的前后距离(能够清晰成像).

尤其是在测量上的应用.

直接受光圈的影响 - 光圈越小景深越大.

镜头选择参考

1. WHAT DO YOU WANT TO DO?
Find a lens

2. SELECT A PRODUCT AND MODEL
☒ In-Sight In-Sight Micro 1400
☐ DVT DVT 515
☐ VisionPro JAI CV-A1
☐ DataMan** DM100

3. WHAT UNITS DO YOU WANT TO USE?
mm

4. ENTER THE WORKING DISTANCE
500 mm

5. ENTER THE FOV WIDTH AND HEIGHT
Width: 120 mm
Height: 120 mm

Currently showing updated results.

6. Calculate*	FOCAL LENGTH	WORKING DISTANCE	FOV WIDTH	FOV HEIGHT
CLOSEST HIGHER	16.0 mm	540.541 mm	160.000 mm	120.000 mm
EXACT	14.8 mm	500.000 mm	160.000 mm	120.000 mm
CLOSEST LOWER	12.5 mm	422.297 mm	160.000 mm	120.000 mm

PN	IMAGE	DESCRIPTION	WEB REC
LFC-16F1		Fujinon 2/3" 16mm Lens F/1.4	☒ ★
LTC-16F		Tamron 2/3" 16 mm Standard Lens	☒ ★
LFC-12.5F		Fujinon 2/3" 12.5mm Lens F/1.4	☒ ★
LTC-12F		Tamron 2/3" 12mm Standard Lens	☒ ★

* All calculations are approximations only to be used as a guide. Testing with the actual lens is prudent. In some cases the minimum object distance for a specific lens will be greater than the input/calculated working distance, in which case spacers may be necessary. Please check the lens specs.

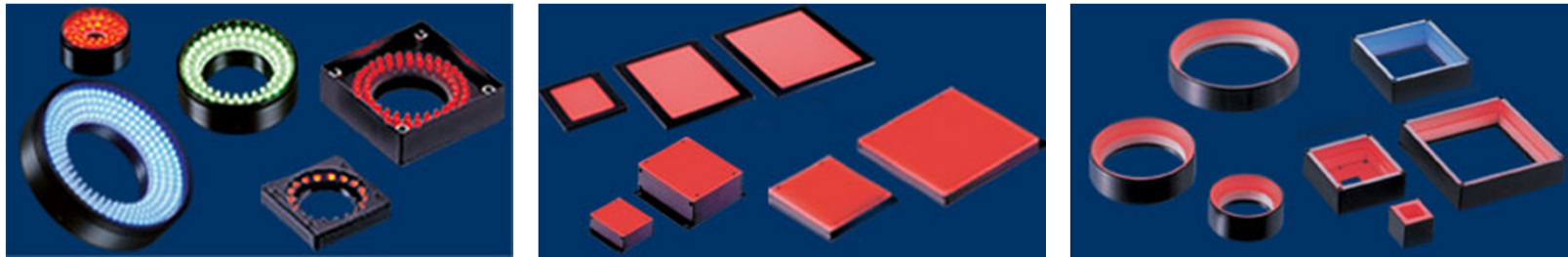
** The DataMan 100 can only use C-mount lenses if fitted with the C-mount lens adapter kit (DM100-CMNT-000).



光源

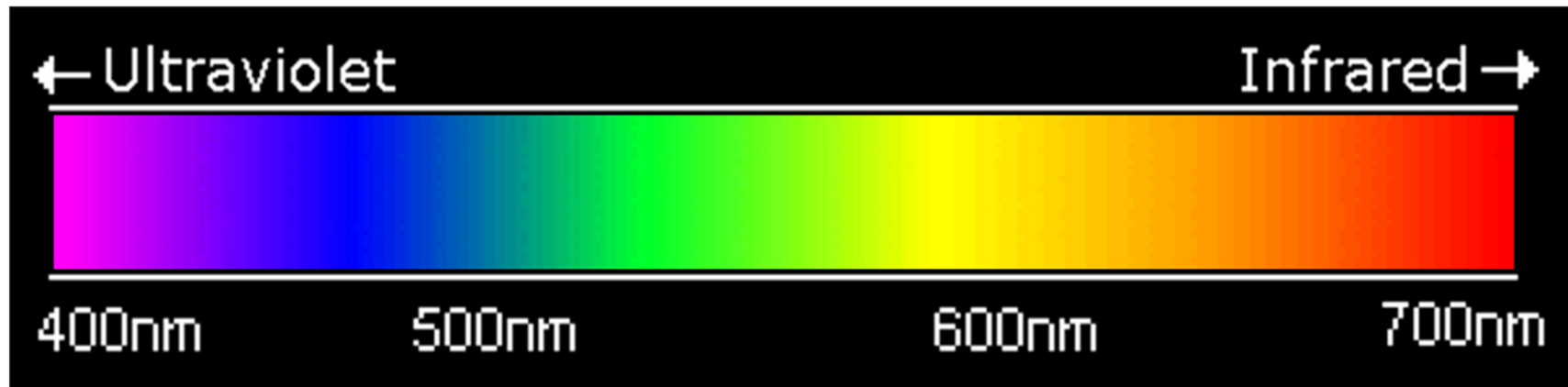
COGNEX

选择光源需要考虑的因素



- 表面是镜反射（光滑并有光泽）还是漫反射（粗糙并且暗淡）？
- 表面是否有定向反射比？（以特定的方向反射光）
- 元件的外表在不同颜色光下会发生变化吗？（变深或者变淡）
- 元件的表面是扁平的还是三维的？弯曲的？不规则的？蚀刻的？浮雕？凸起？
- 元件的表面是稳定的还是会随着时间而发生变化？（生锈、氧化、褪色）

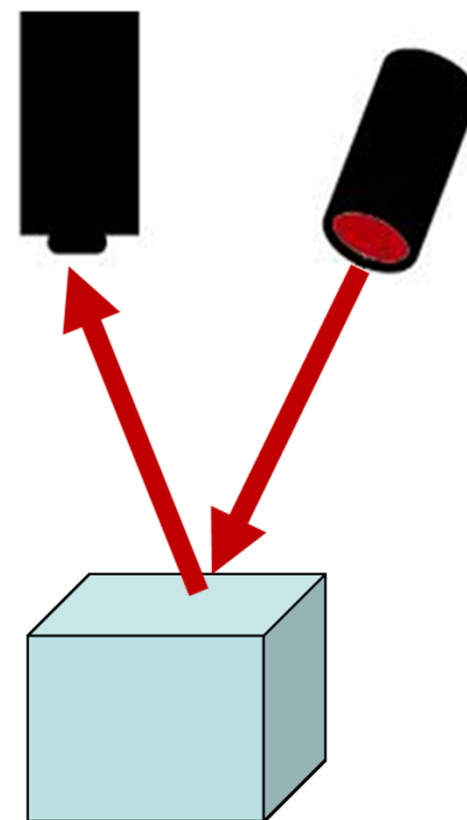
光谱



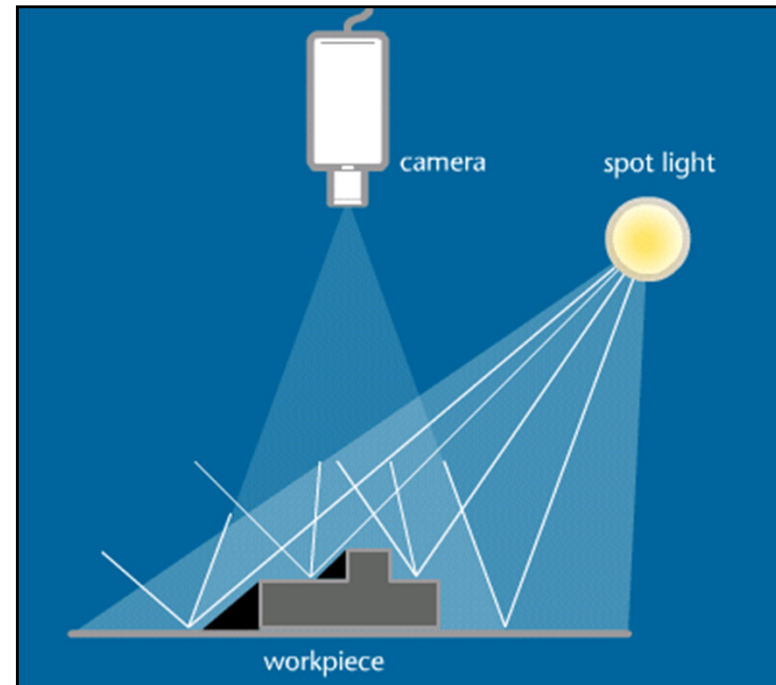
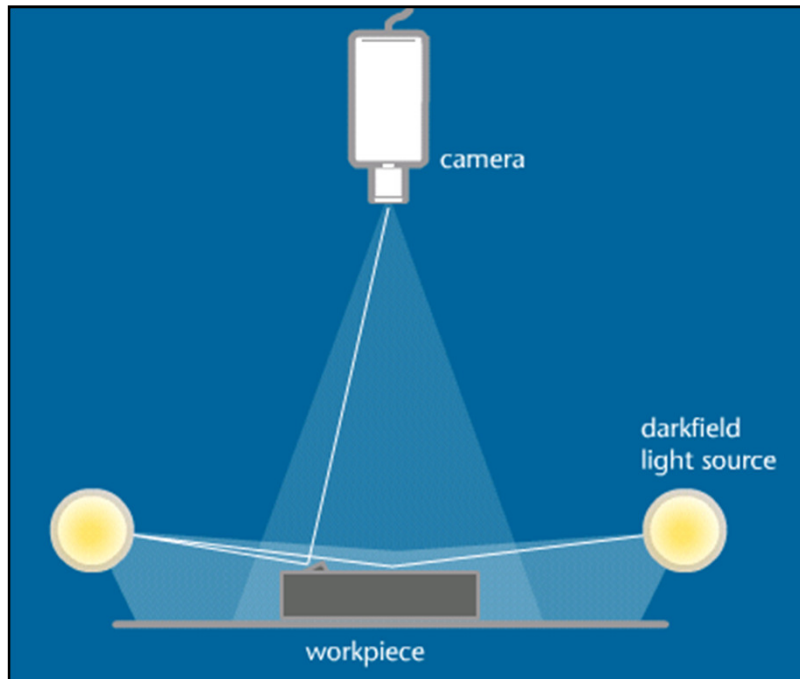
- 可见光
- 白光包含所有波长的光线
- 白光的折射可以看到上面的光谱图

光线和相机

- 当有光线进入相机即可建立图像
 - 亮即有光线直接进入相机
 - 暗即无光线进入相机



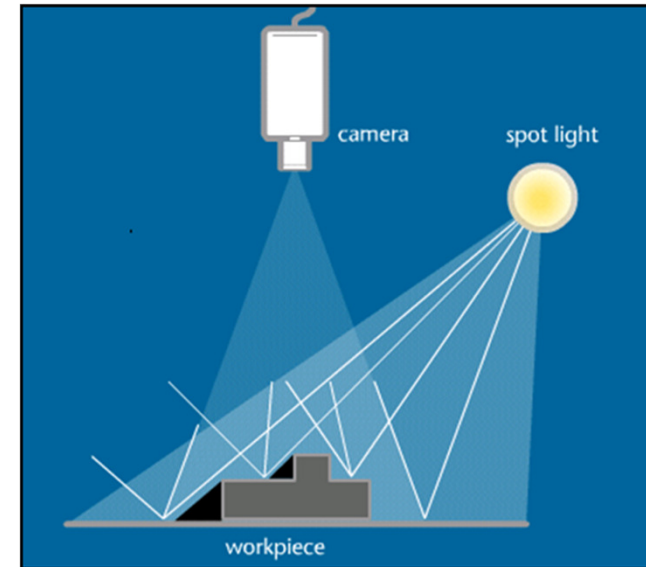
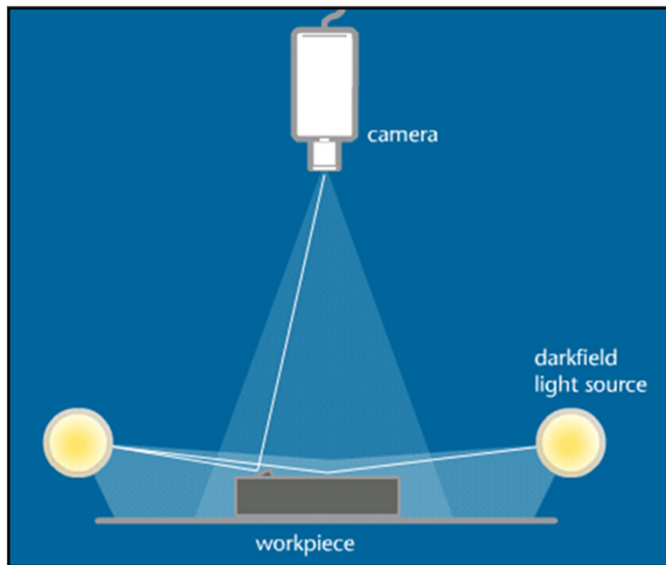
光源的选择



光源可以做成各种形状.

光源的安装角度和方向直接决定图象的效果.

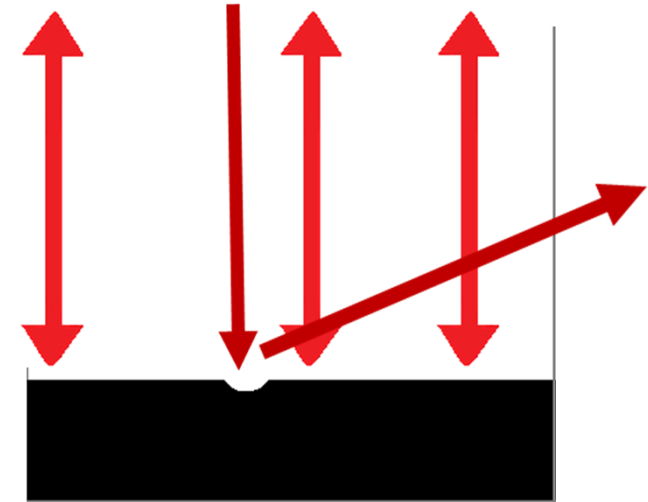
光源的选择



Same Part -
Different Light Position

亮视场Bright Field

- 光线垂直打在物体表面
- 增强外形和轮廓



Ambient Light



Bright Field Lighting

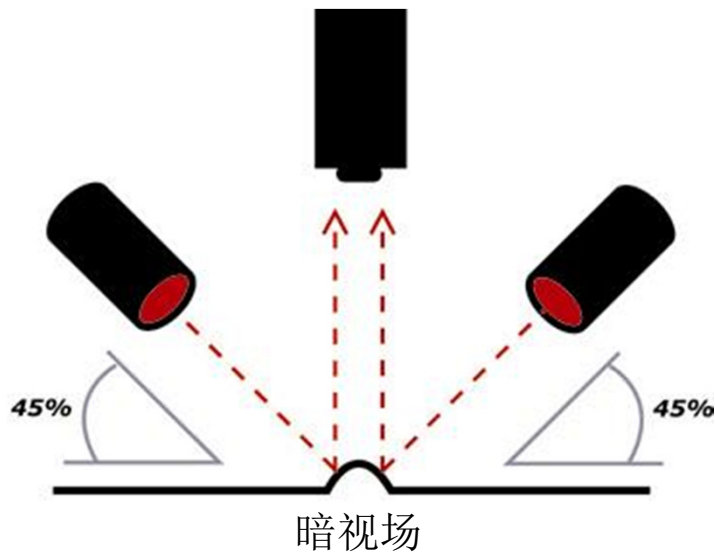


暗视场 Dark Field

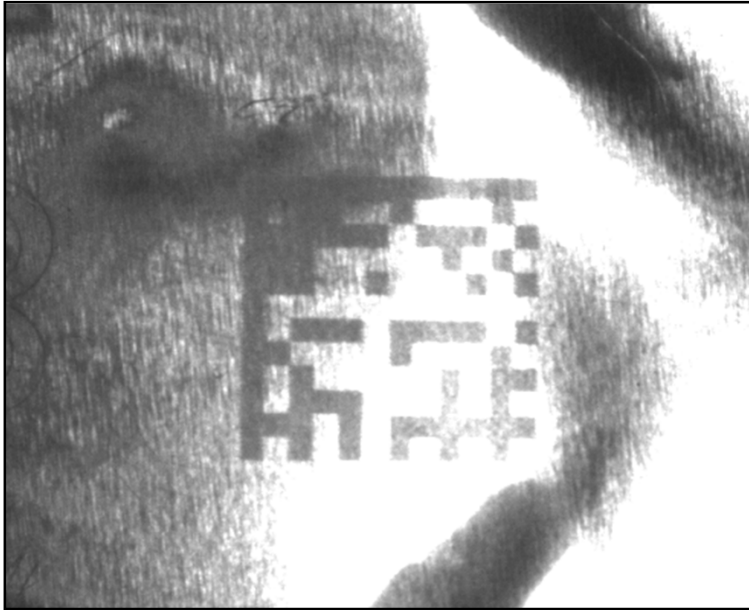
增强轮廓和物体的形状

用于增强高度有变化的特征:

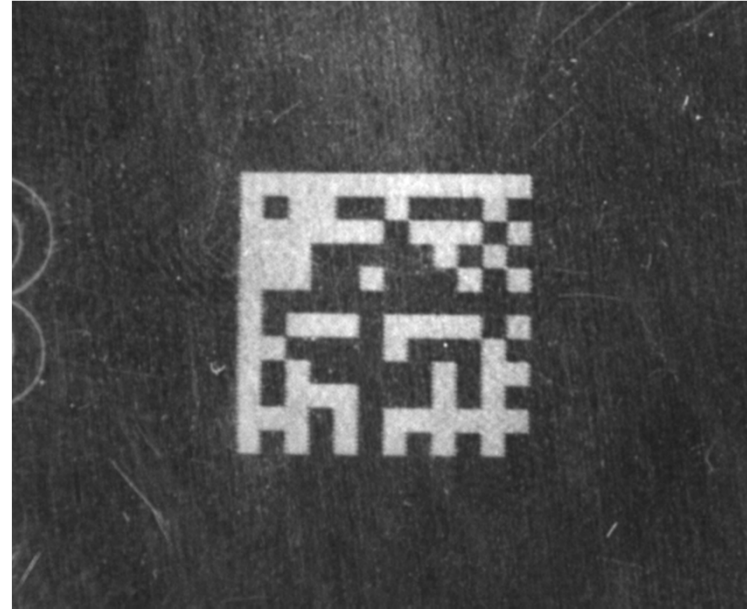
- 表面检测
- 边沿探测



暗视场应用



环形光



底角度光

暗视场应用



环境光



环形光

光源的类型

卤素灯

白炽灯

荧光灯

激光

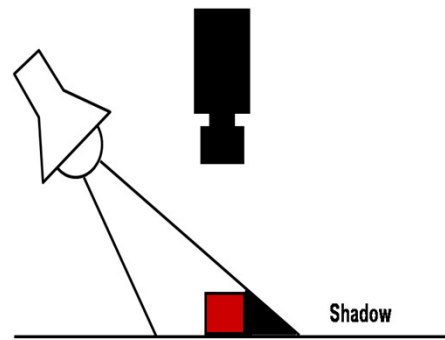
发光二极管 (*LED*)

氙气灯

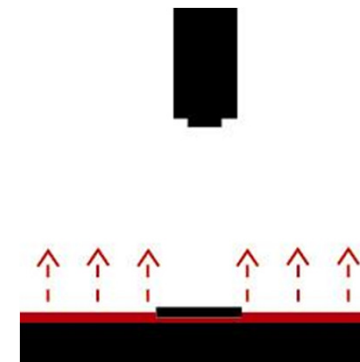
Overview – 光源

Type	响应速度 Response Speed	价格 Cost	亮度 Intensity	寿命 Life	发热 Heat
卤素灯 Halogen	Poor	Fair	Good	Poor	Poor
白炽灯 Incandescent	Poor	Good	Fair	Poor	Poor
荧光灯 Fluorescent	Poor	Good	Poor	Fair	Fair
激光 Laser	Good	Poor	Good	Good	Good
二极管 LED	Good	Fair	Fair	Good	Good
疝气灯 Xenon	Good	Poor	Good	Poor	Poor

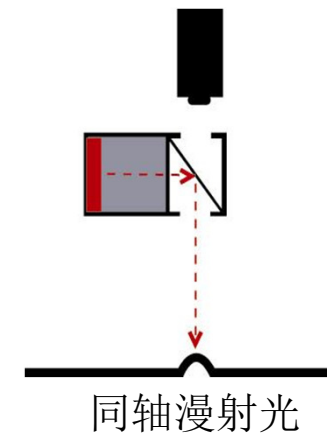
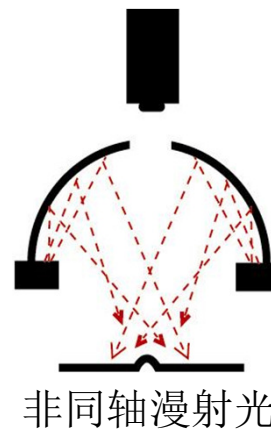
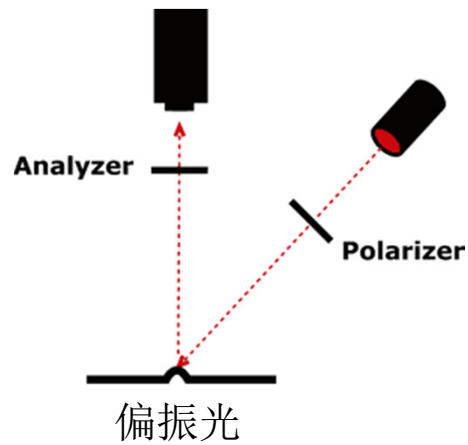
照明技术



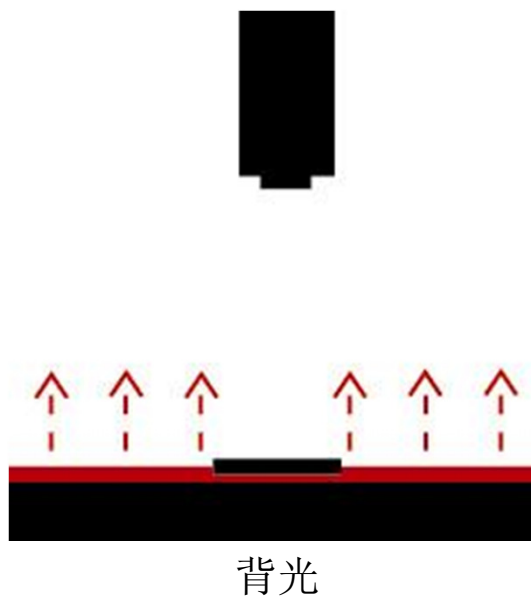
Direct (or Front)



背光源



背景光源

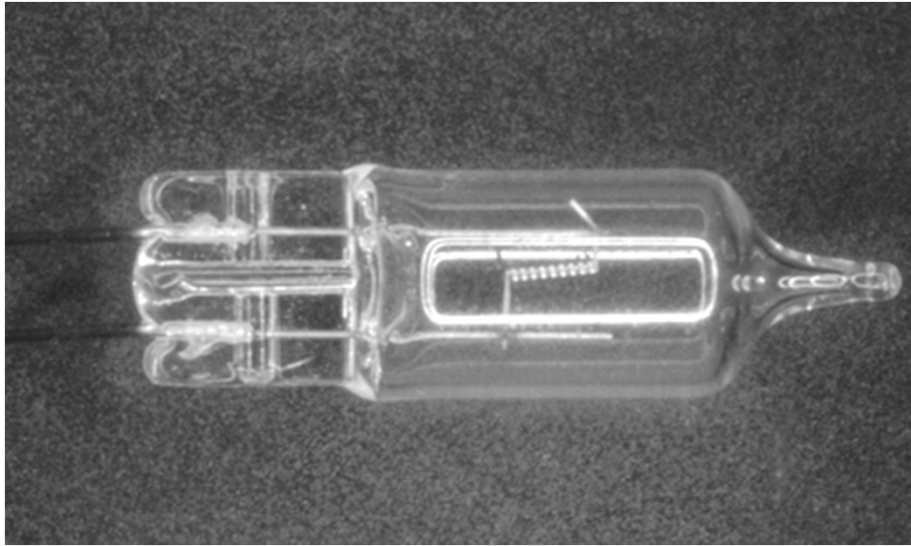


提供最佳对比度.

- 零部件的轮廓和边线检测.

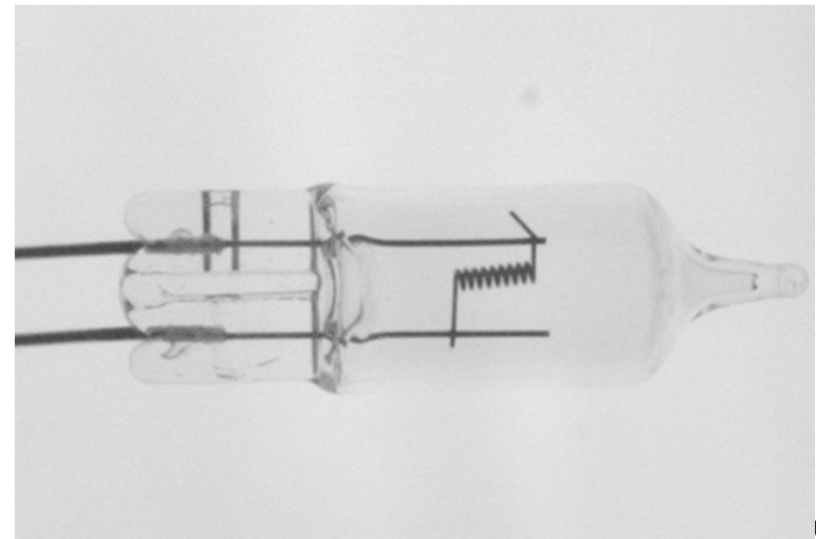
丢失的光源非常少.

背光源应用



环形光源

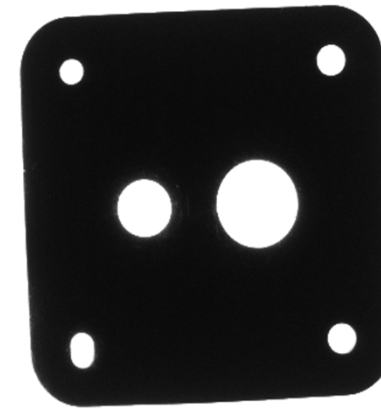
背光源



背光源应用

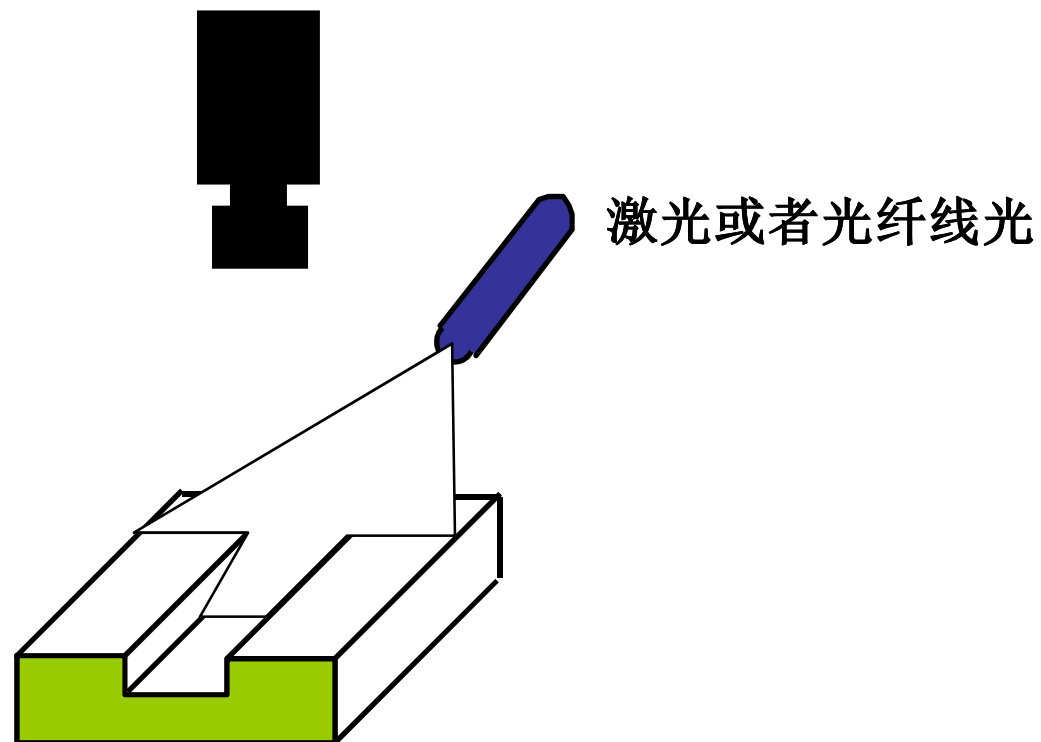


Ring Light

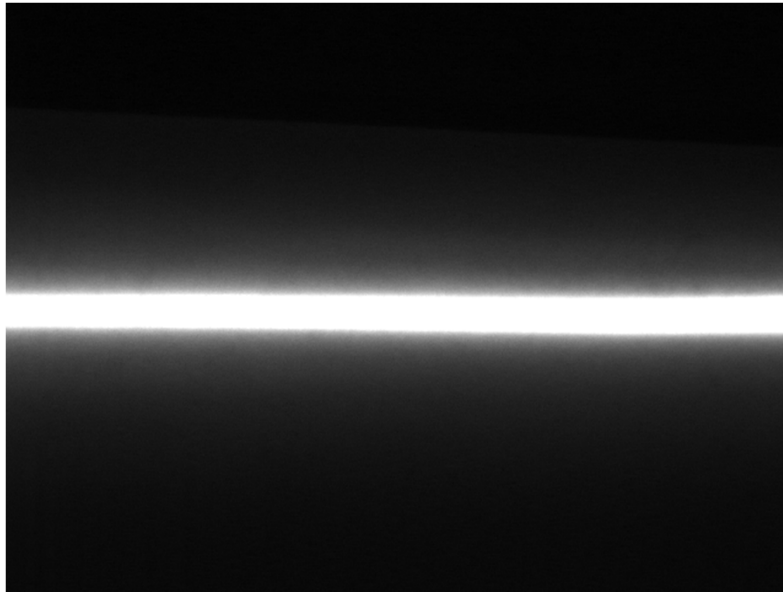


Back Light

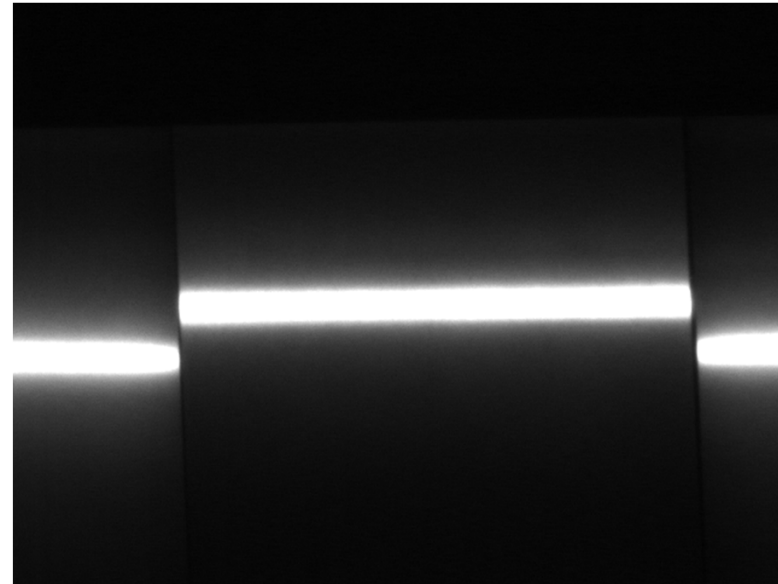
结构光



激光应用

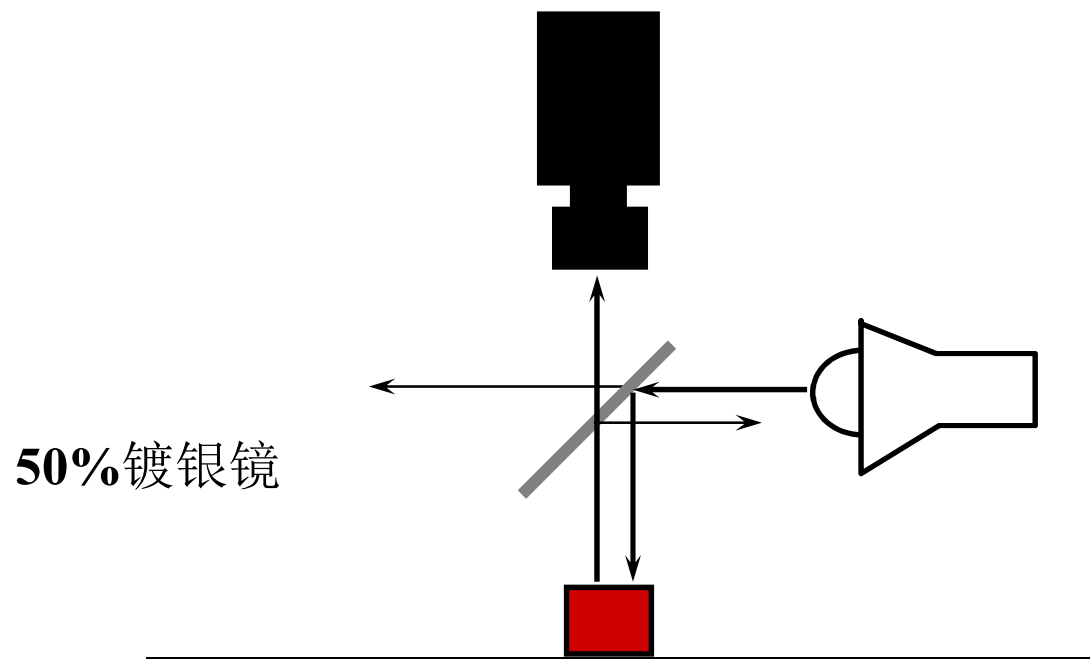


线性光源

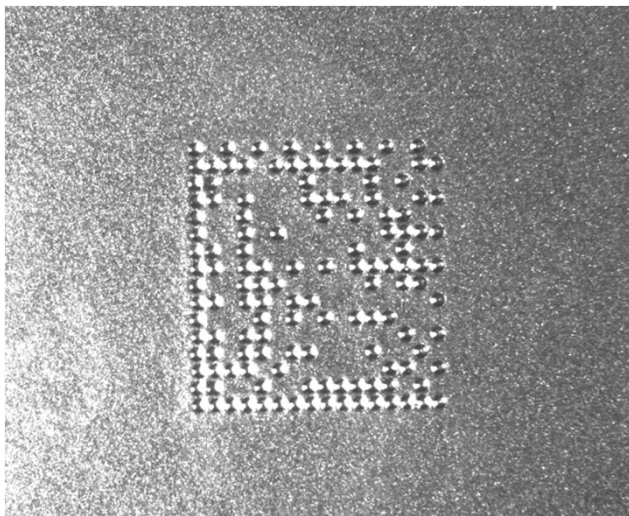


高度上有变化

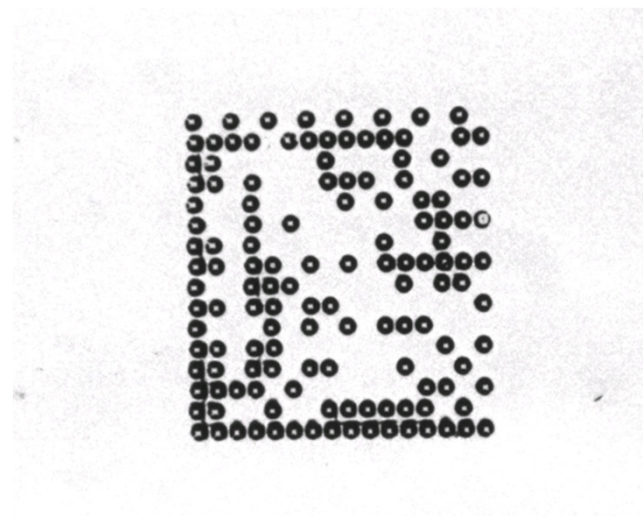
同轴光



同轴光应用

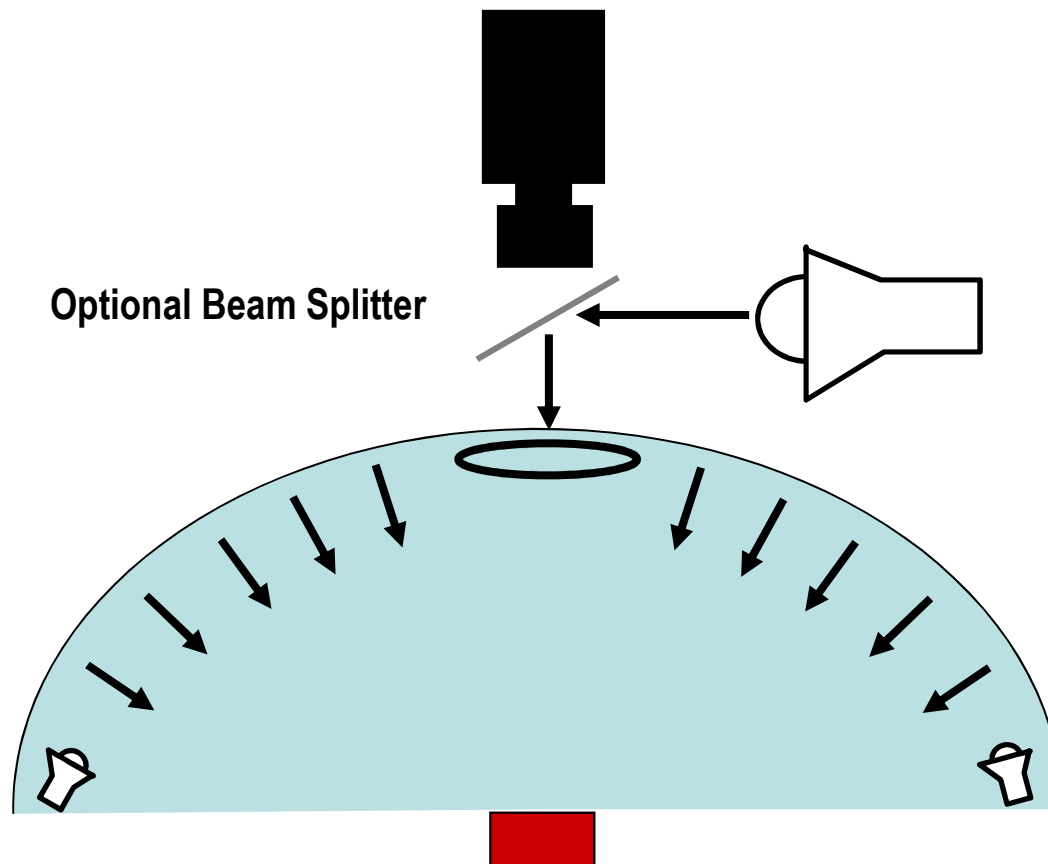


环境光

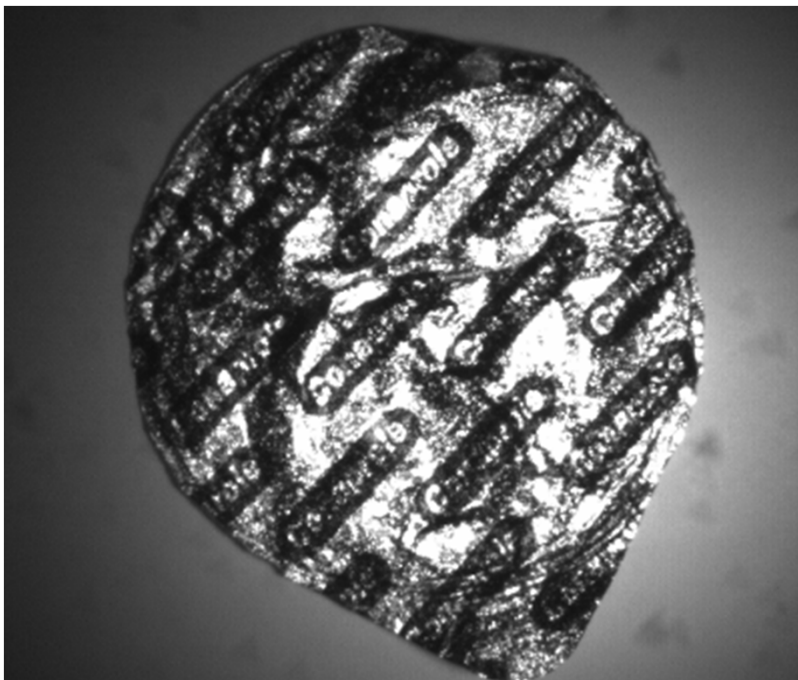


同轴光

非同轴漫射光(Dome)



Dome光应用

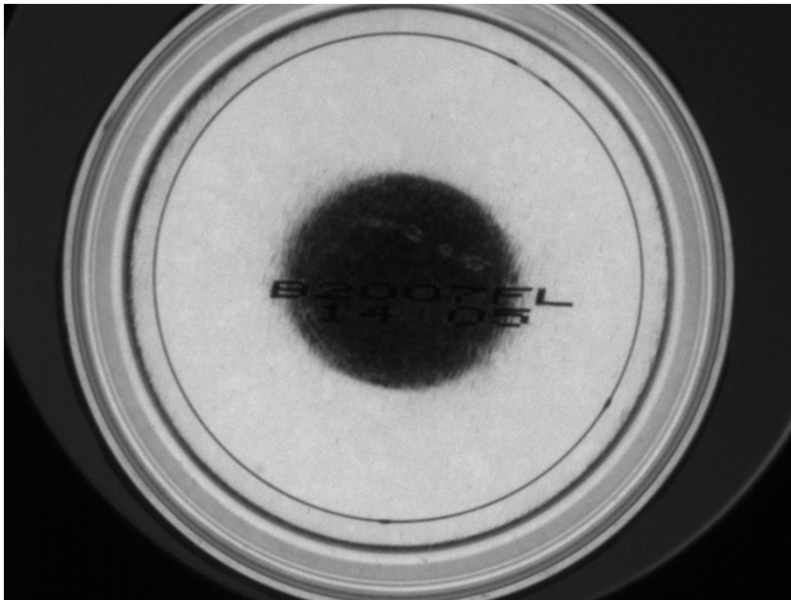


用直向型前光源的铝铂密封



用CDI的铝铂密封

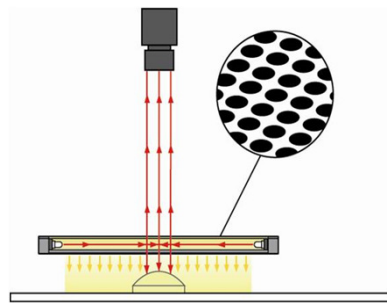
Dome光应用



Dome

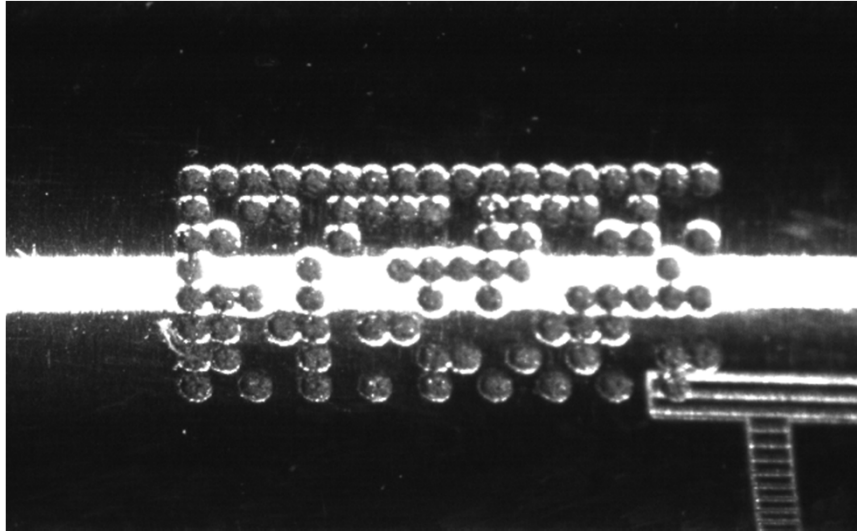


**Flat Dome
(by CCS)**

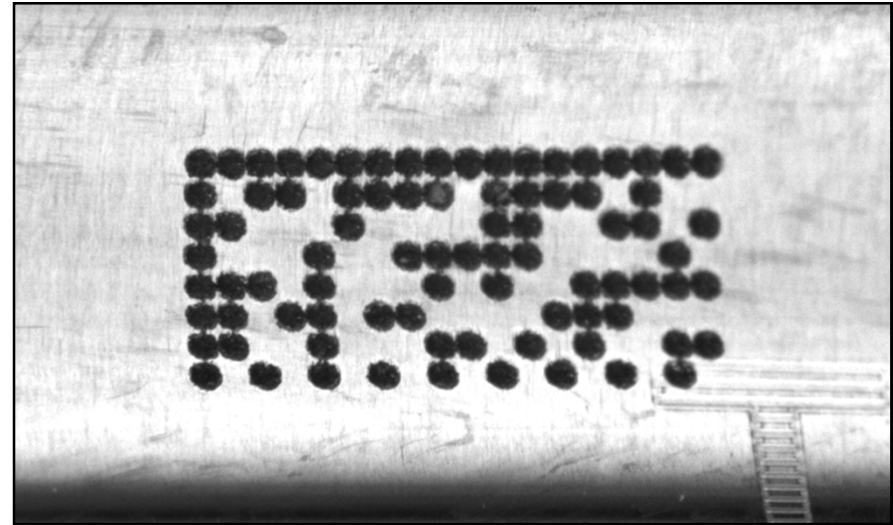


Note: The “dead spot” is gone

Dome光应用



环形光



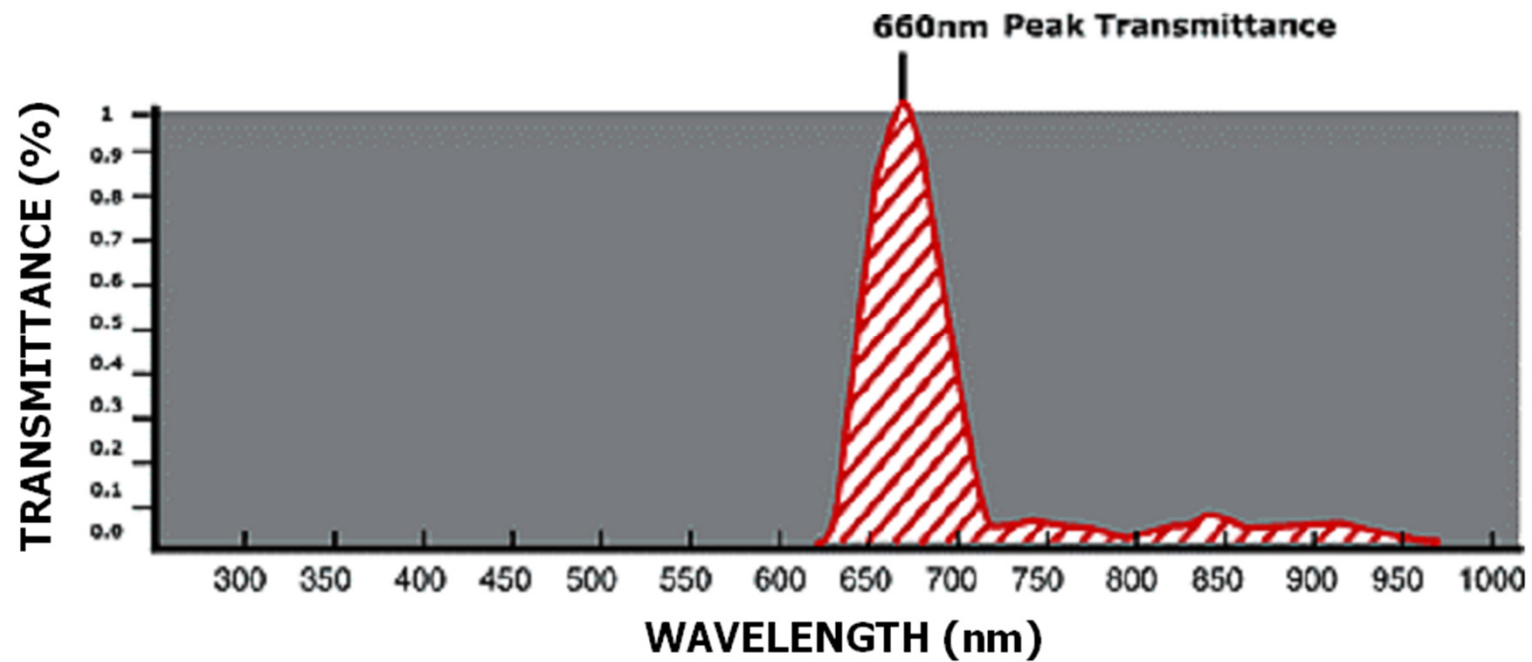
非同轴漫射光(Dome)



Filters and Colored Light

COGNEX

过滤器

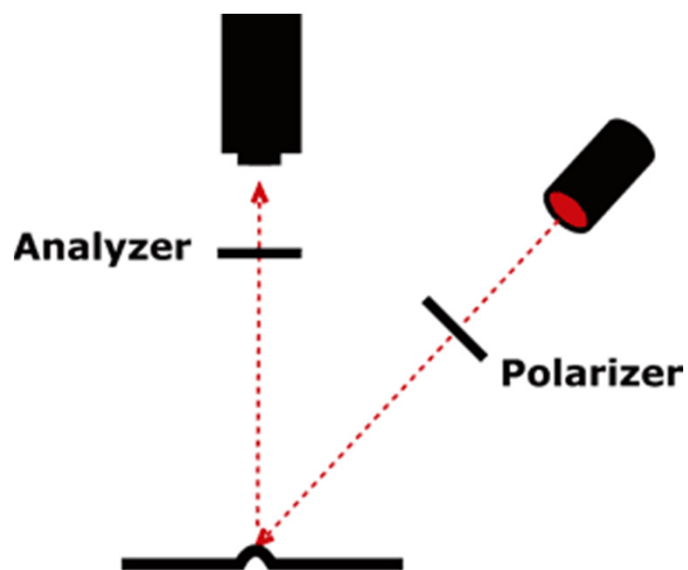


可以选择所通过的光.

- 低通,高通

有效减少环境光的干扰.

偏振光

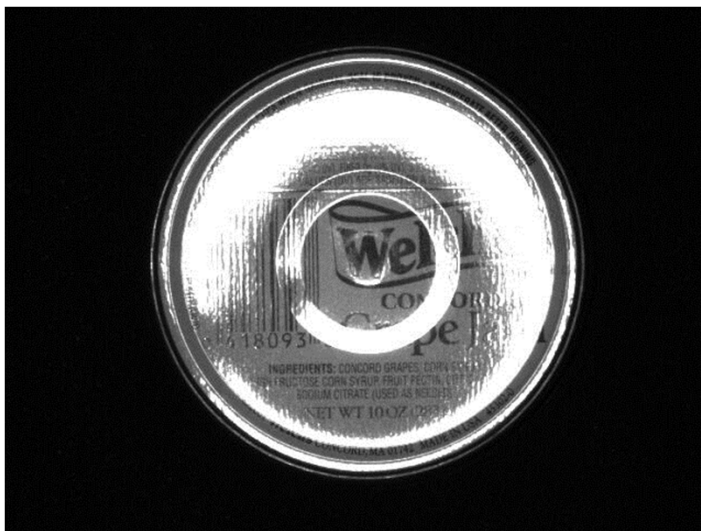


用于减少眩光或者是镜面反射.

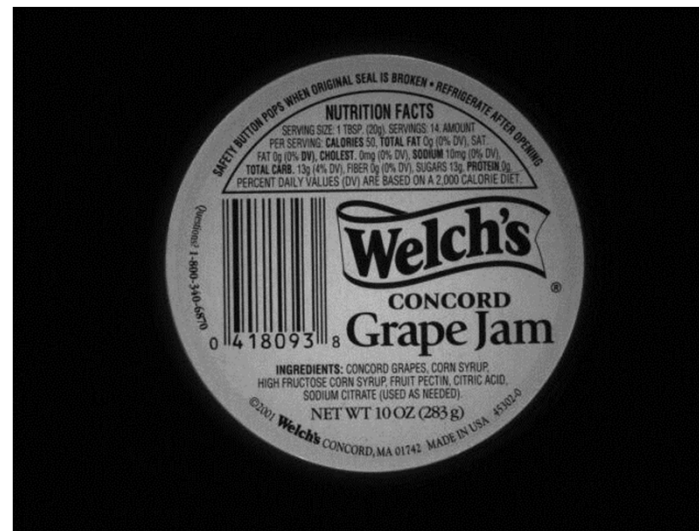
光线经偏振片过改变传播方向.

镜头前的偏振片配合使用.

偏振光应用

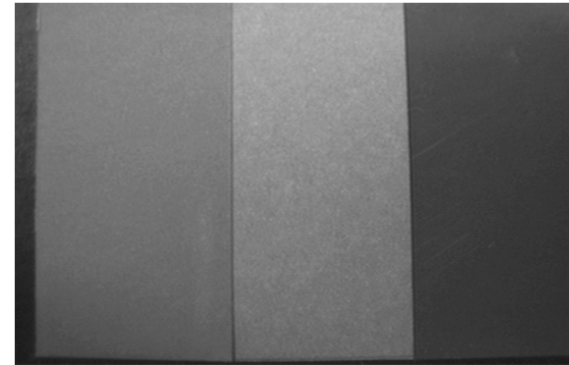
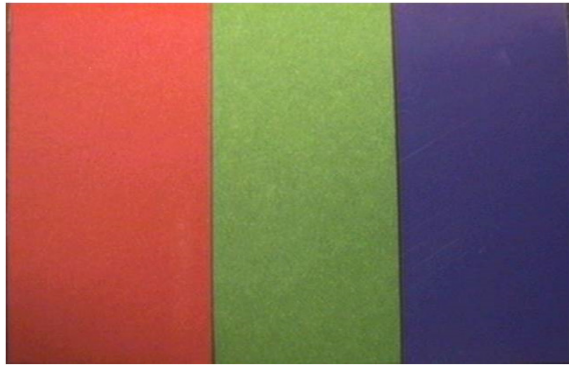


无偏振环形光

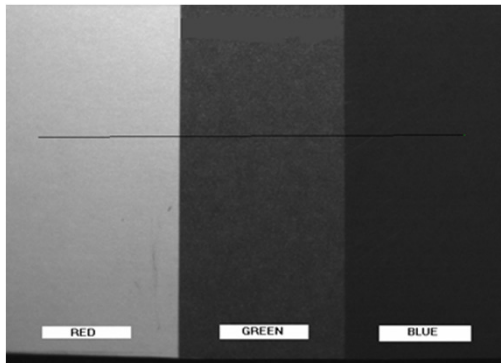


带偏振环形光

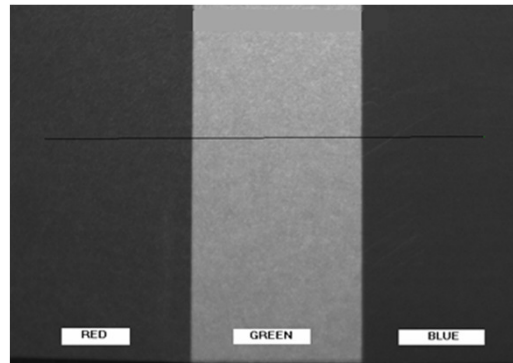
彩色应用



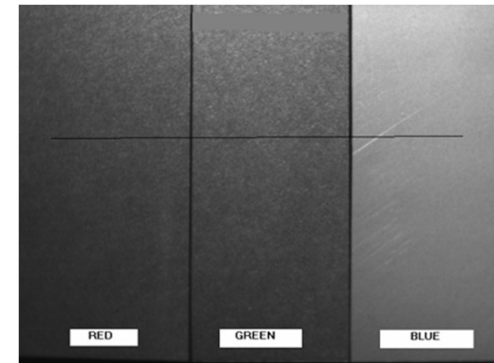
白光



红光



绿光



蓝光

彩色光源应用



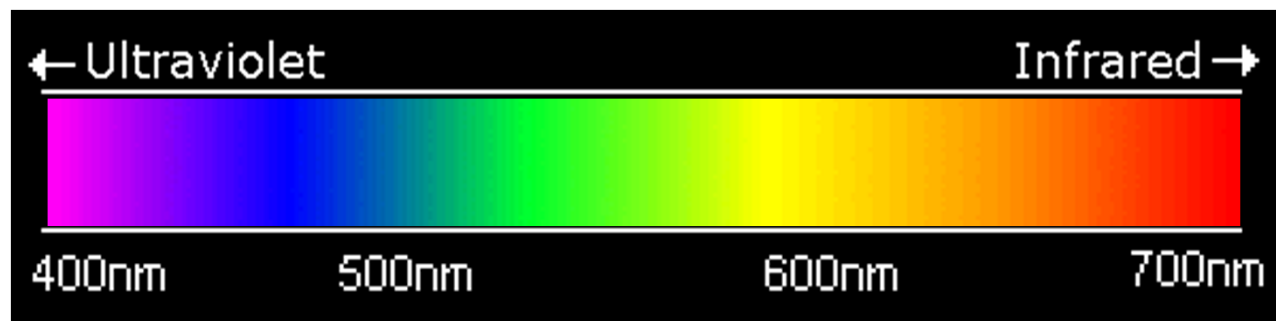
环境光



蓝光

- Date information is accentuated with blue light
 - 蓝色变淡
 - 红色加深

红外光



- **IR**光人的肉眼不可见
- 操作人员不知道使用了红外光源
- 红外光的穿透性能强

红外光应用



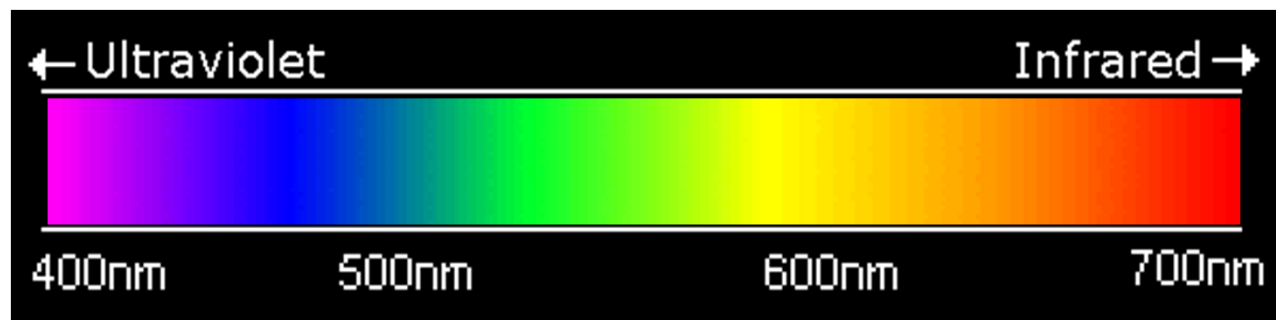
环境光



红外光及滤镜
(IMIF-BP850)

* 多数IR 和 UV的应用会用到滤镜

紫外光



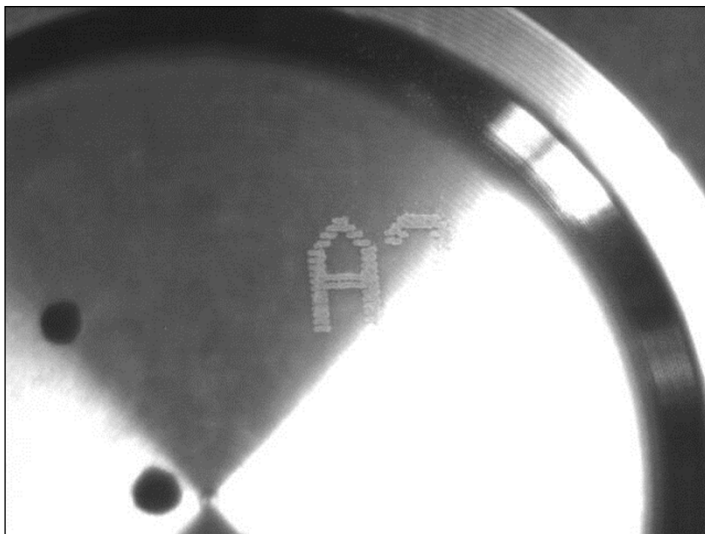
很多物体在紫外光的照射下会发出荧光.

- 墨水,标签,胶水

直接用**UV (or Near-UV)** 光源照射到物体上,物体将发出荧光.

可使用过滤器将**UV**光过滤掉,仅允许荧光波长的光源进入相机.

紫外光应用



不滤光



高通 (UV) 滤光器

使用**UV**背景光源,墨水字发出荧光.

Quick Quiz...

COGNEX

Question 1

- 什么光源最适合用于金属圆柱物体表面检测？
 - A. 暗场 Dark Field
 - B. 背光 Back Light
 - C. 亮场 Bright Field
 - D. Demo (Cloudy Day Illumination/Dome)

D

Question 2

- 下图中仅需检测蓝色字符，请问使用什么光源？

- A. 红光
- B. 绿光
- C. 蓝光
- D. 红外光

A

