

Posis Technology

Basic of Light & Optics



Automatic Optical Inspection System

www.posishome.co.kr

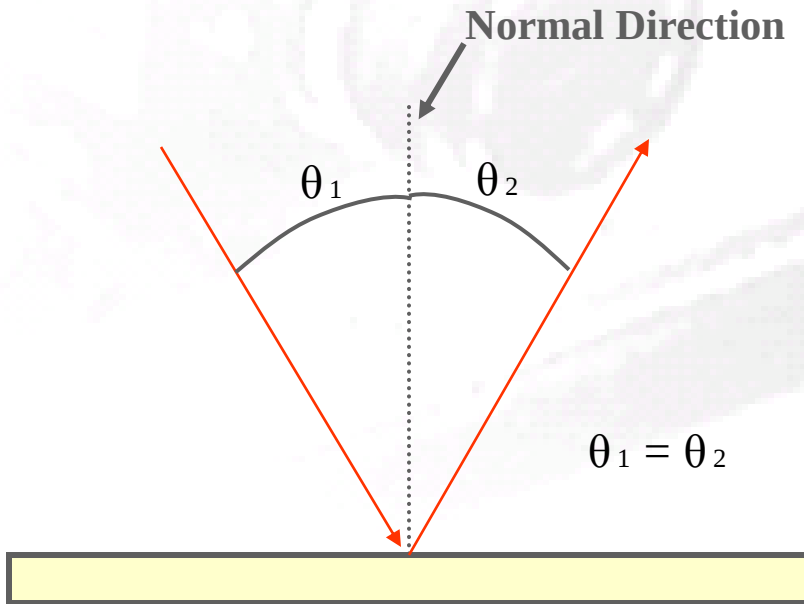
www.posistechnology.com



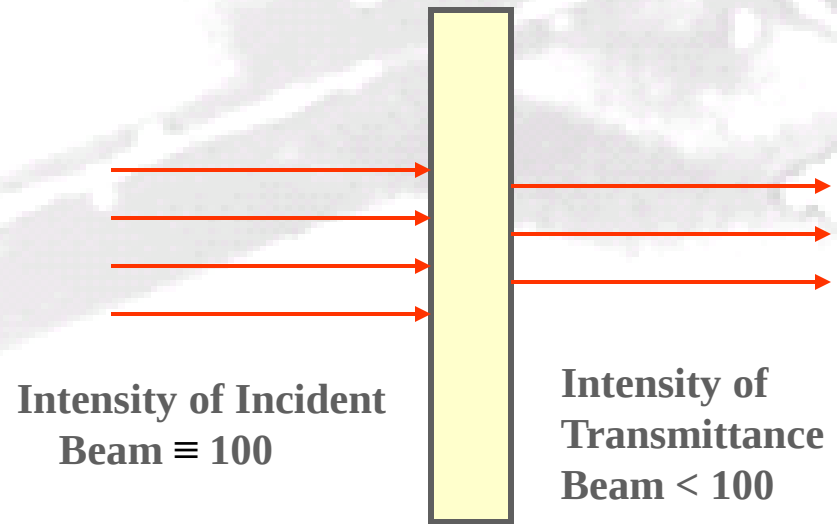
|주|포|씨|스|테크|놀|로|지

1. Reflection and Transmittance

Reflection



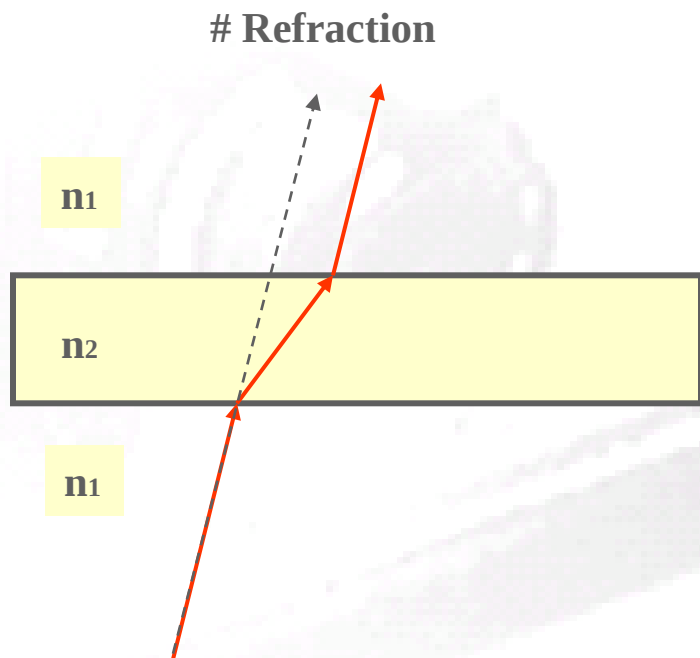
Transmittance



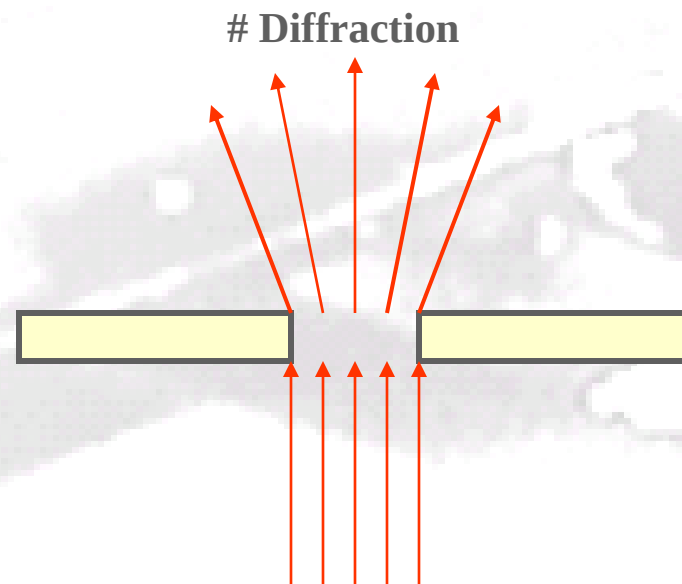
$$\text{Transmittance} = \frac{\text{Intensity of Transmittance Beam}}{\text{Intensity of Incident Beam}}$$

$$\underline{\text{Transmittance} < 1}$$

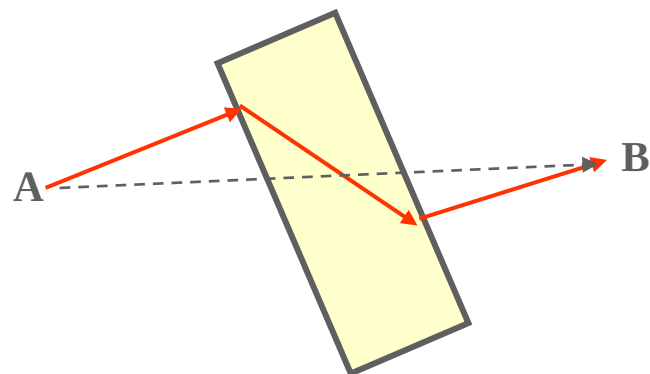
2. Refraction and diffraction



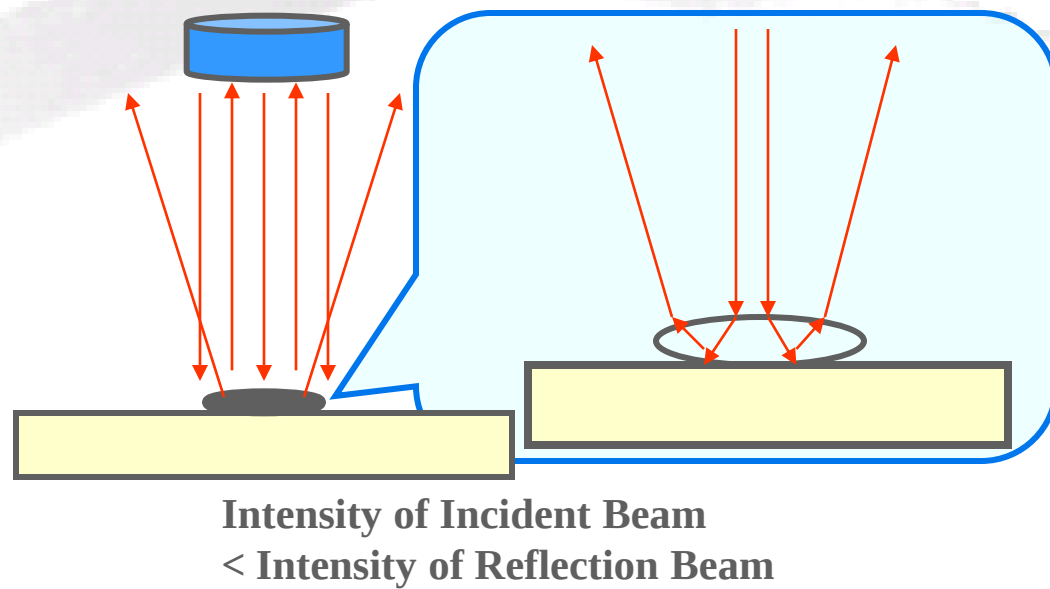
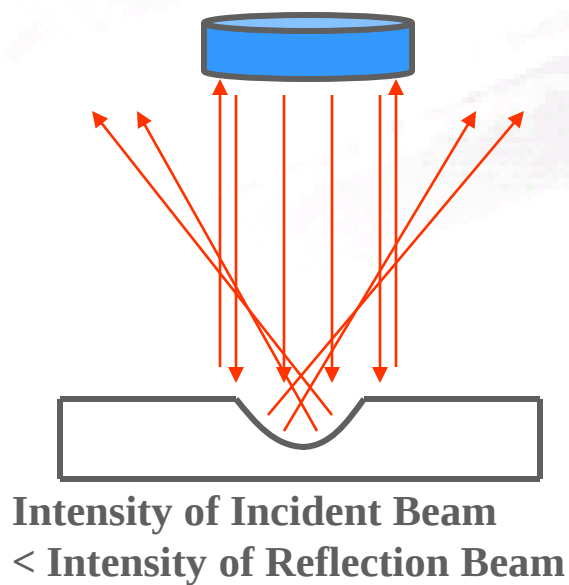
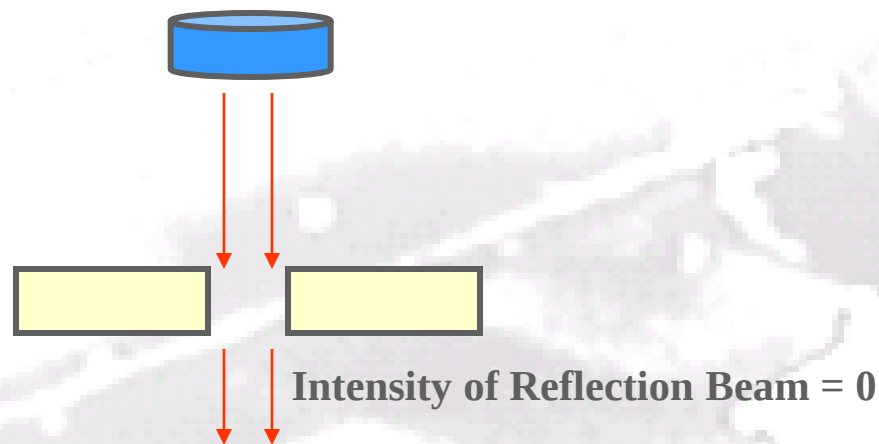
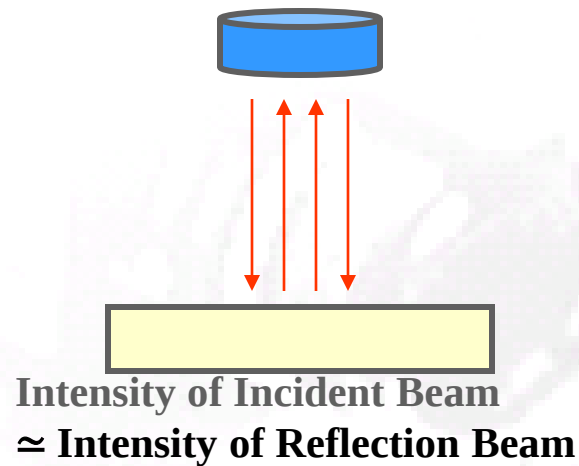
Ex) fisheye, gel, Bubble on Film



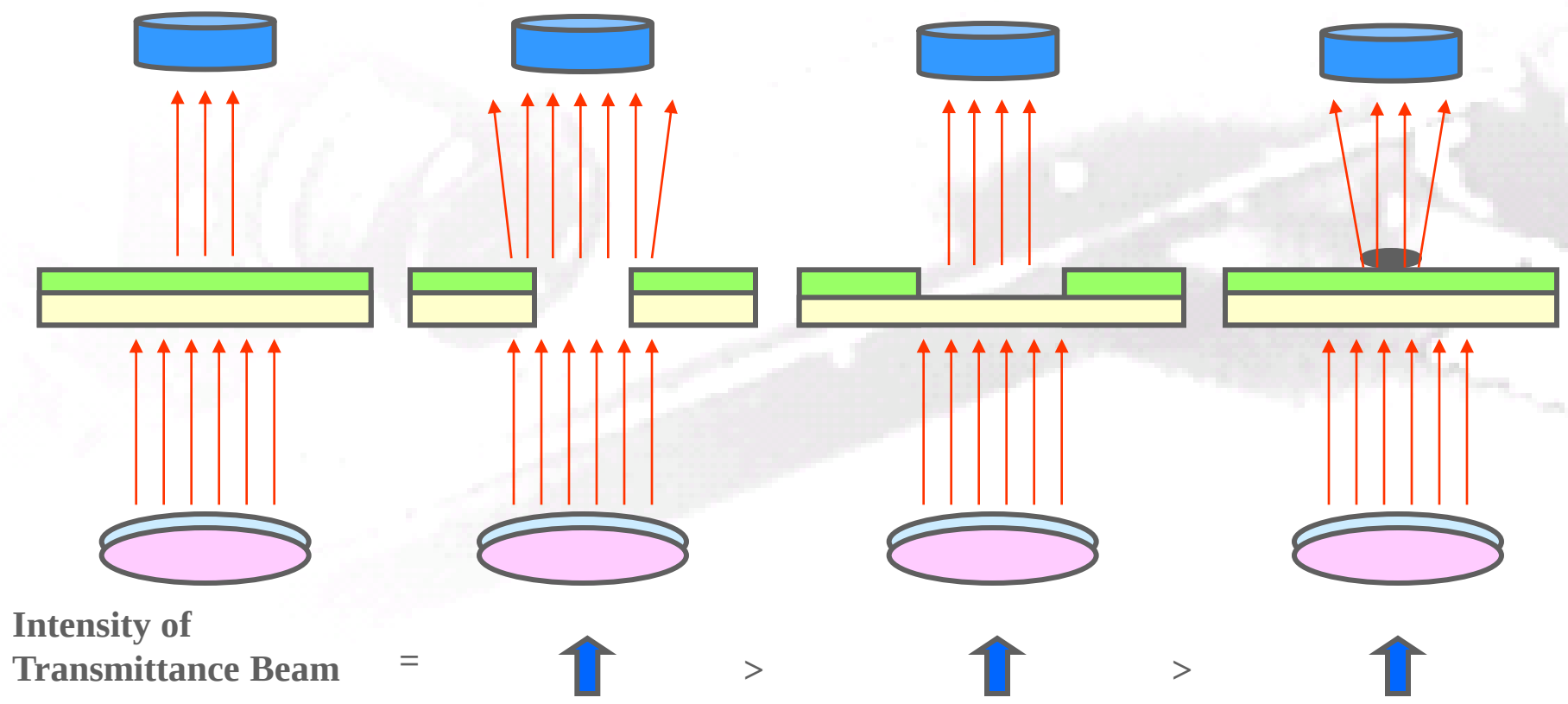
Ex) Pinhole on Film



3. Light Intensity of Reflection Object

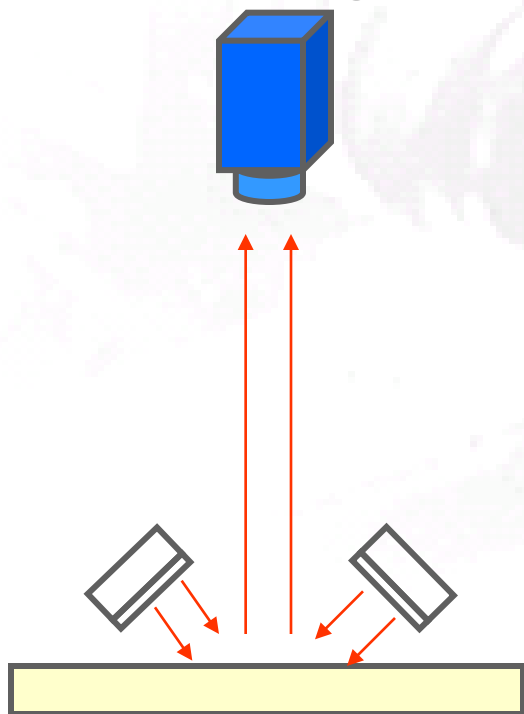


4. Light Intensity of Transmittance Object

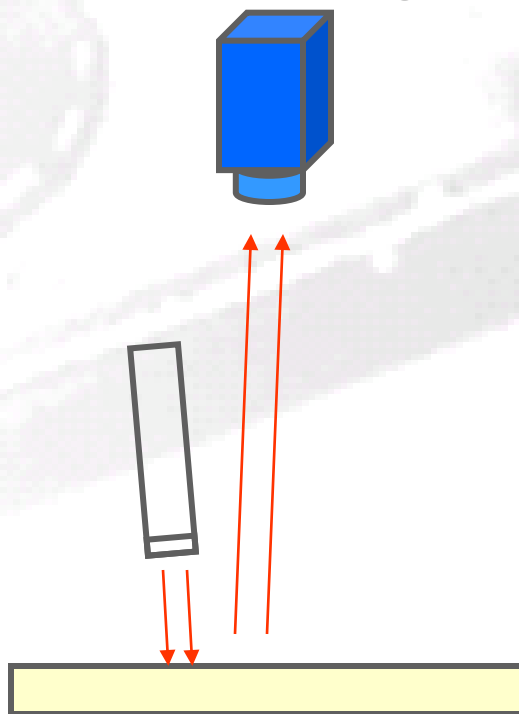


5. Light for Reflection Object

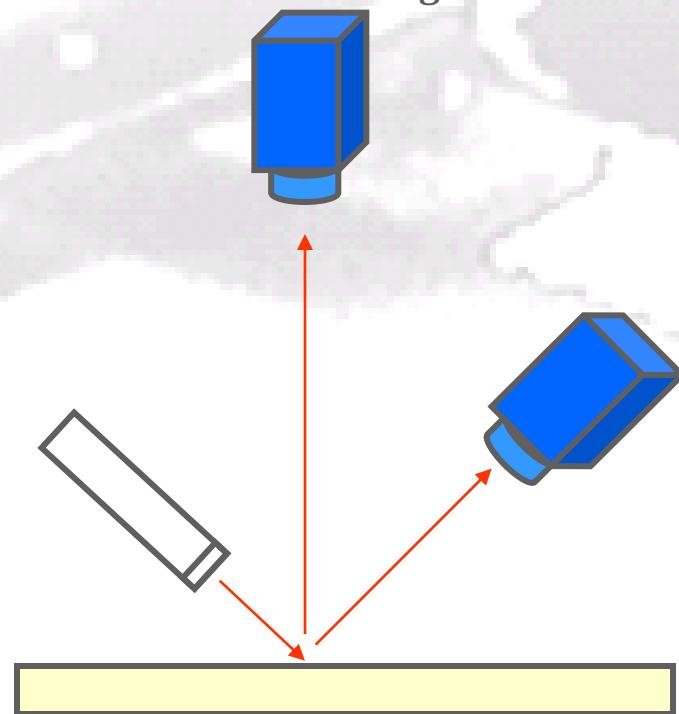
Cross Light



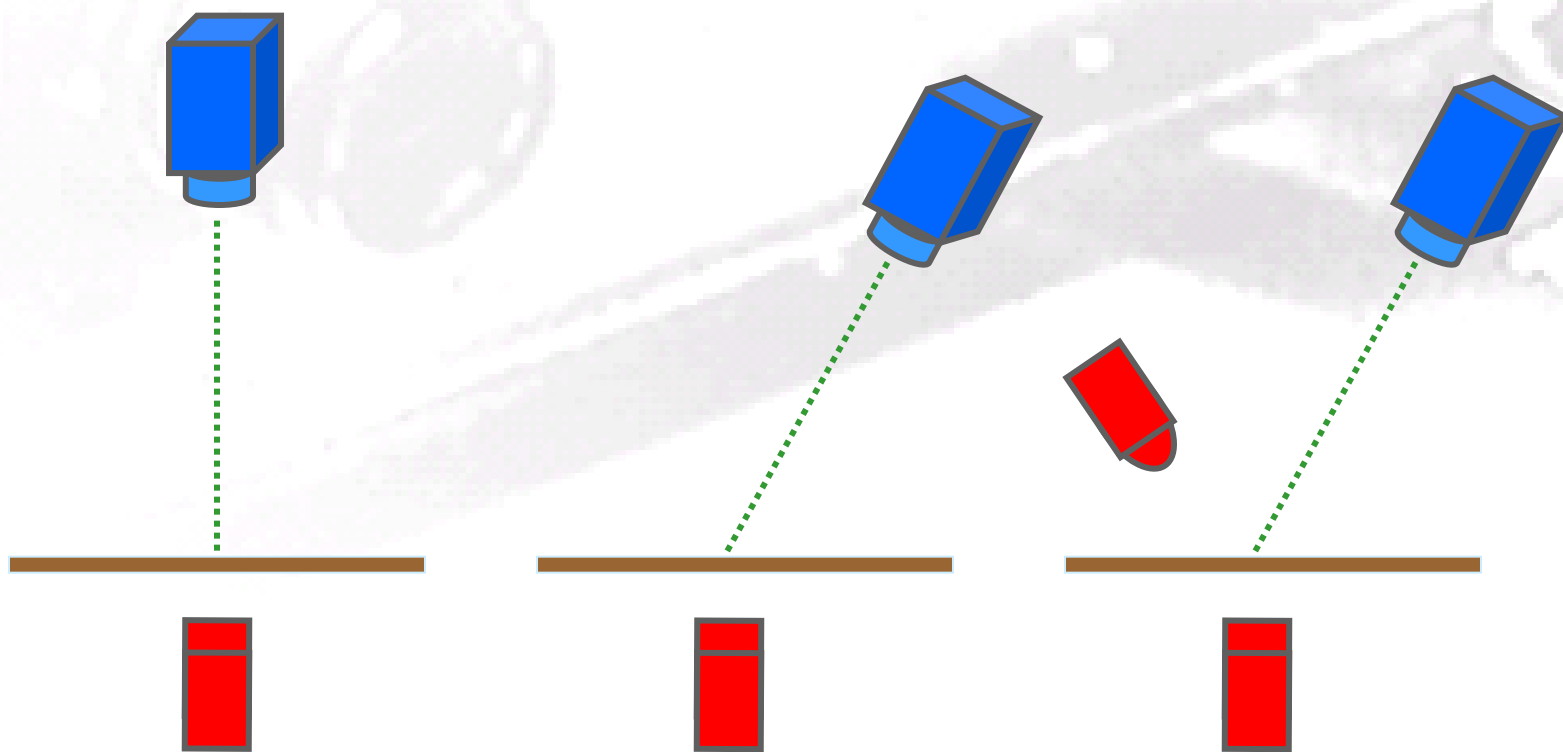
On-Axis Light



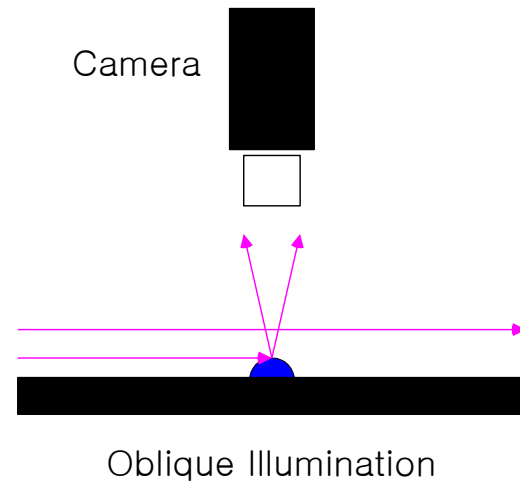
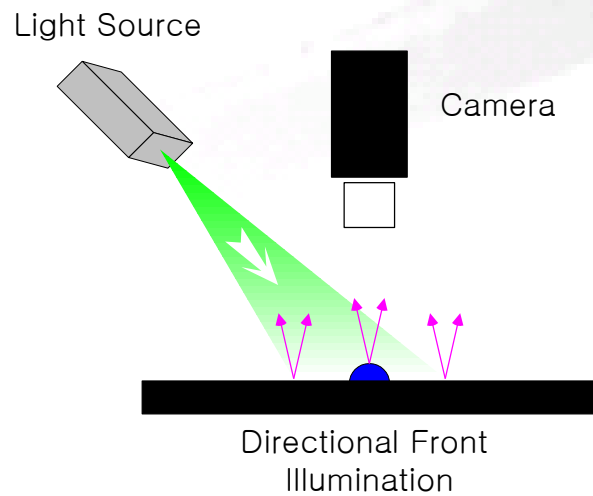
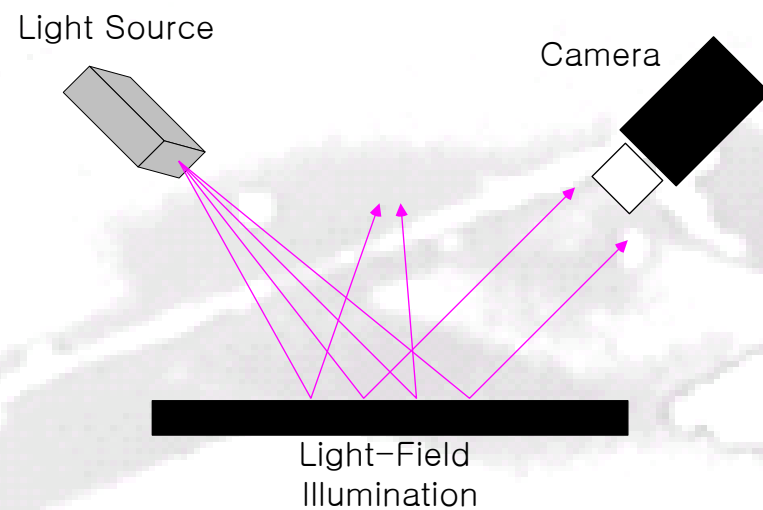
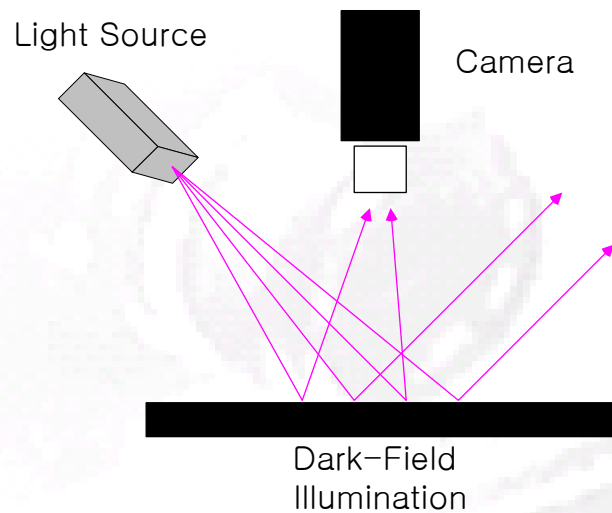
Slanted Light



6. Light for Transmittance Object



7. Type of Lighting System



8. Light Angle and Test Condition

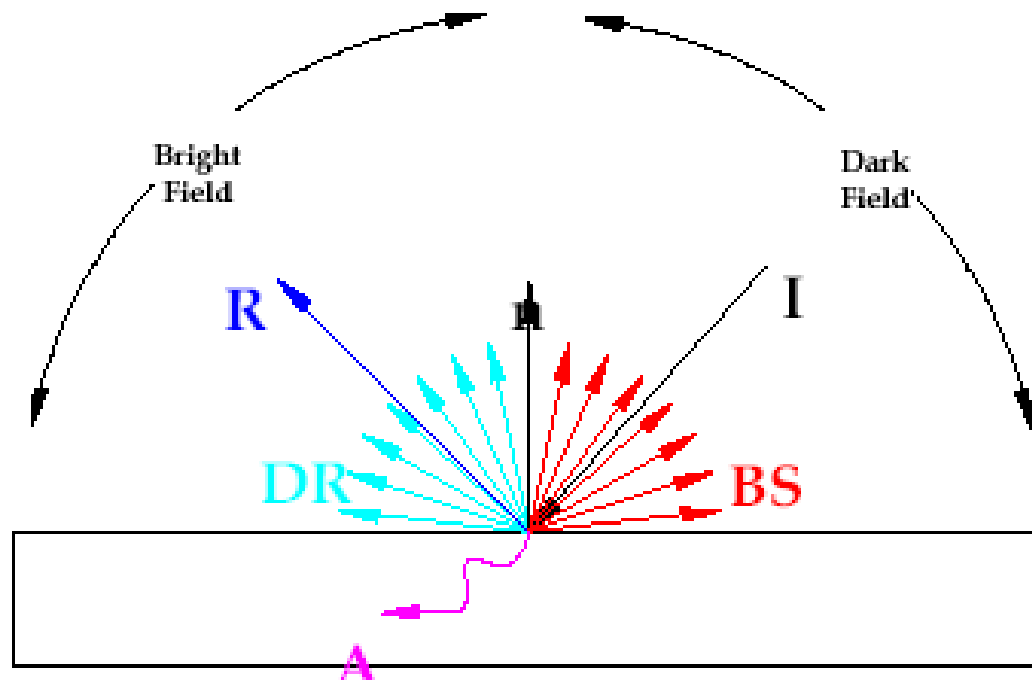


Fig 3: Interaction of Light at the steel interface

* I : Incident ray
 R : Reflection
 A : Absorption
 DR : Diffuse Reflection
 BS : Back Scattered radiation

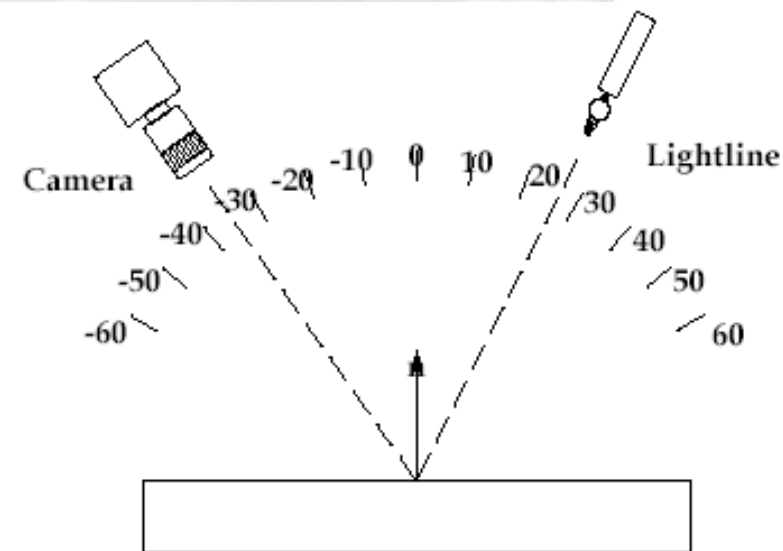


Fig 4: Line scan test set-up

9. Test condition

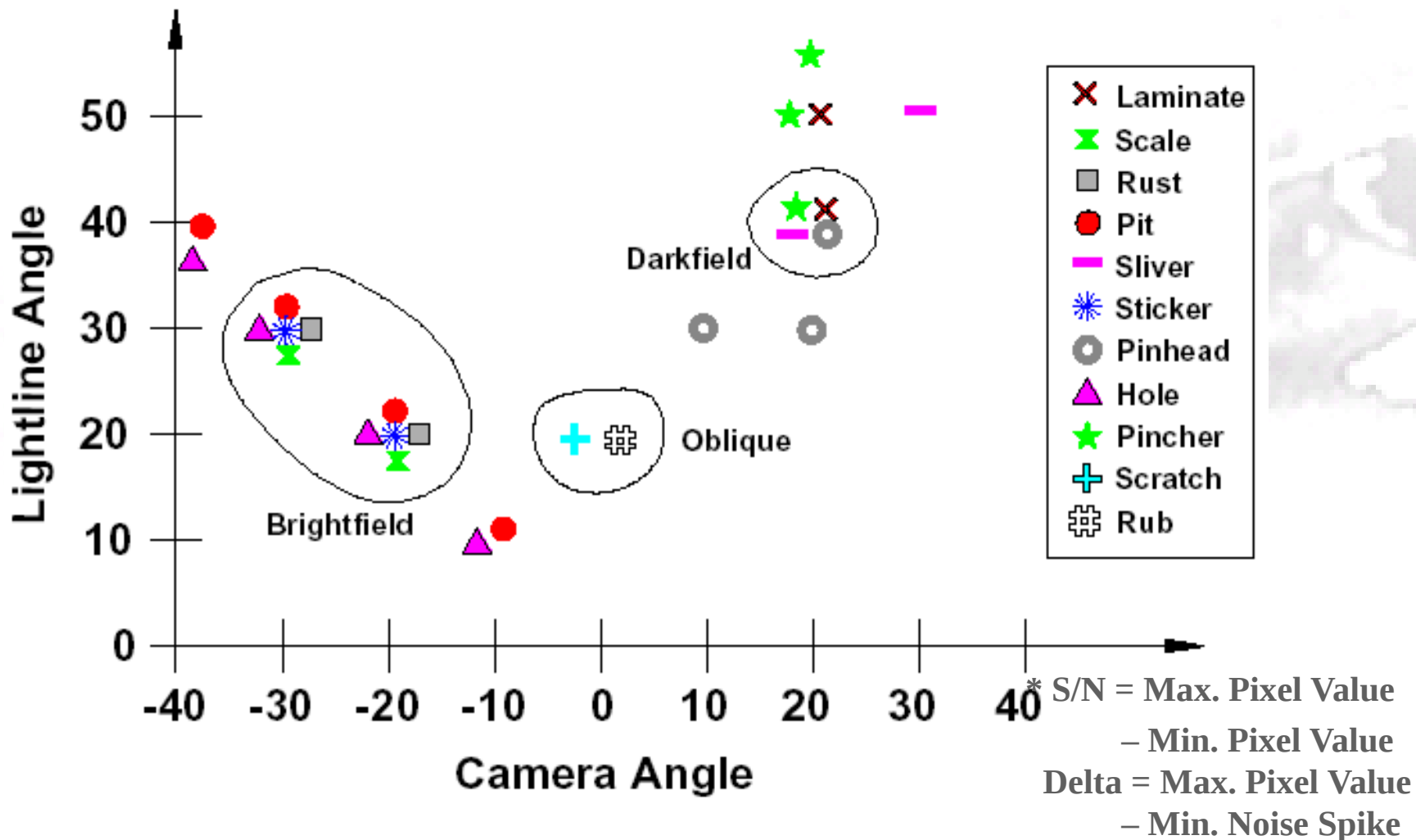


Fig 8: Defect Analysis vs Camera & Lighting Angles
[S/N > 1.8 AND Delta > 40]

10. Test Result (example)

* Bright-field, Dark-field, Oblique mode

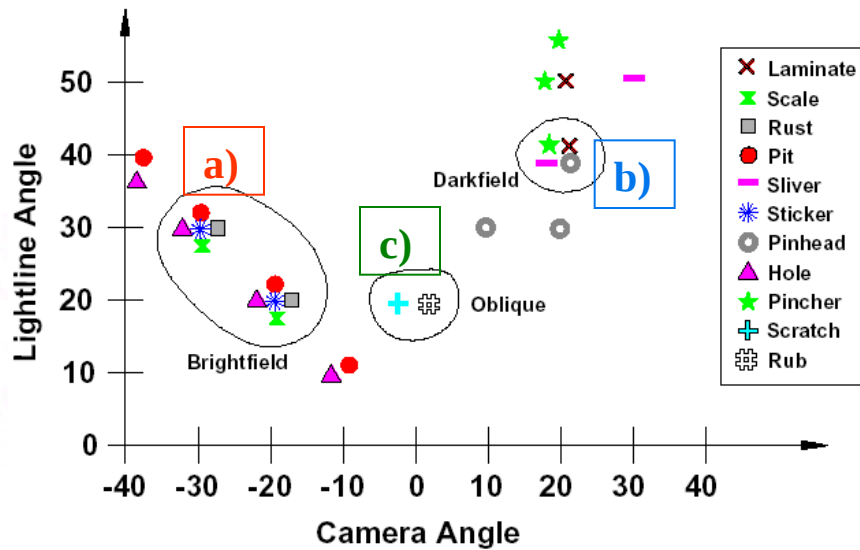
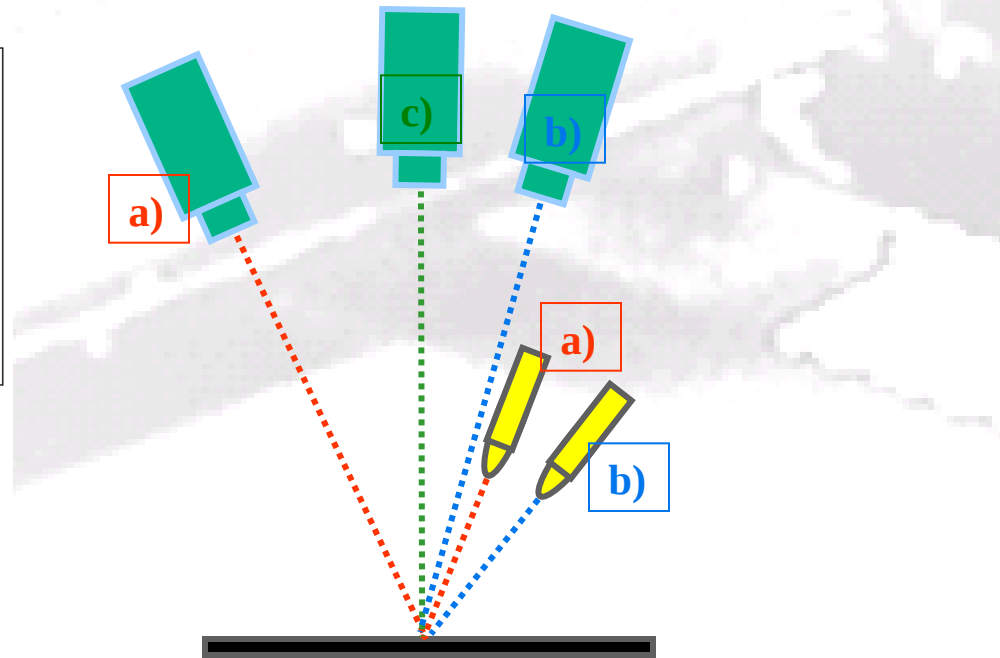


Fig 8: Defect Analysis vs Camera & Lighting Angles
[S/N > 1.8 AND Delta>40]

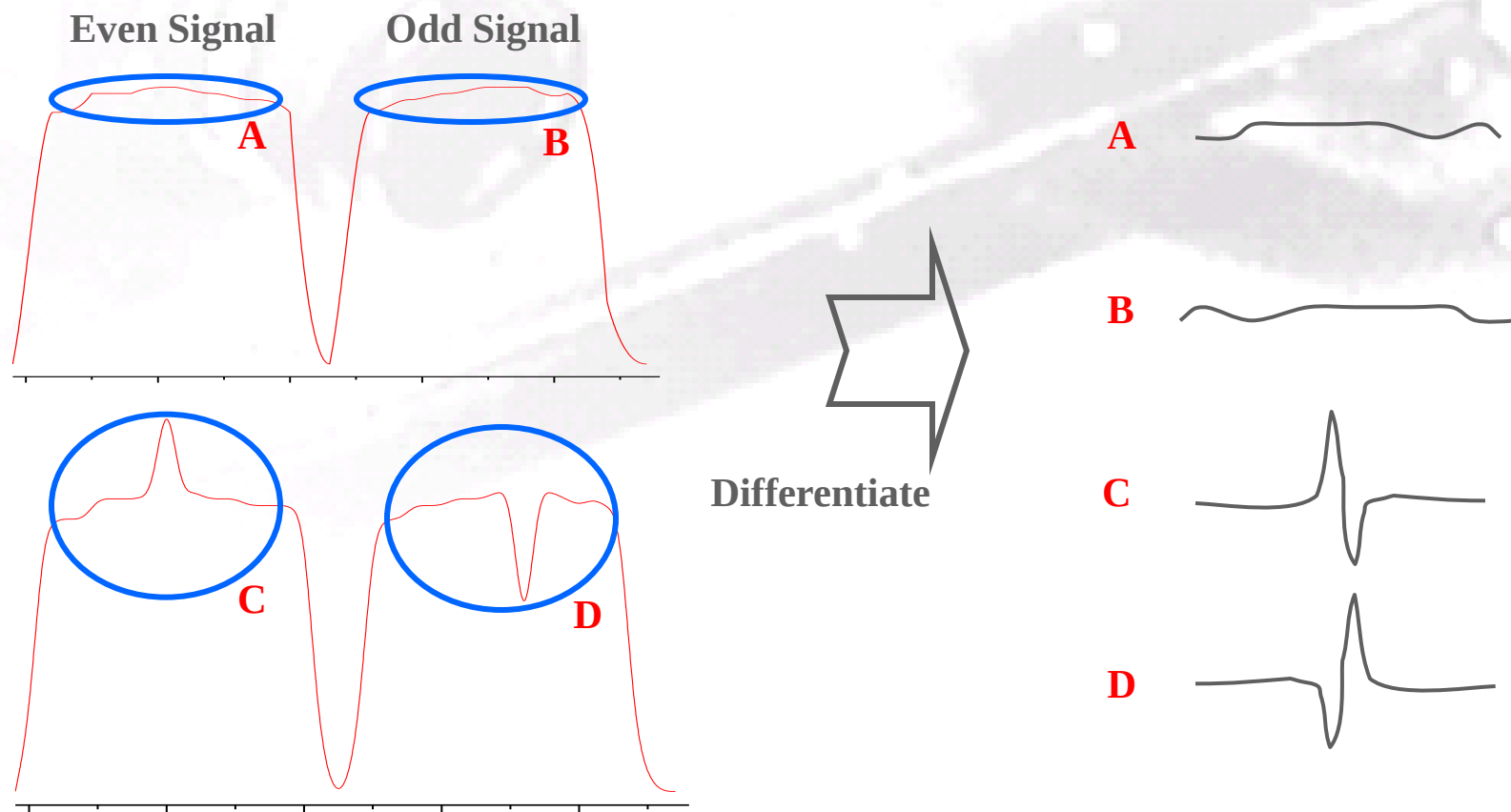
- 3 cameras
- 2 light sources(darkfield ,brightfield)
but different light intensity



- a) **Bright-field mode**
- b) **Dark-field mode**
- c) **Oblique mode**

11. Image Signal

Beam Profile of each signal from cross Light Signal



12. Threshold

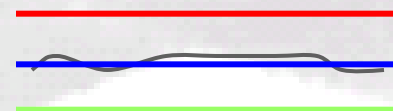
LED Cross Light

A



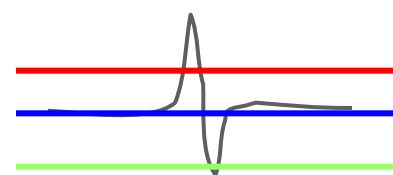
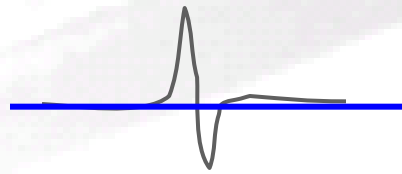
⇒ (0, 0)

B



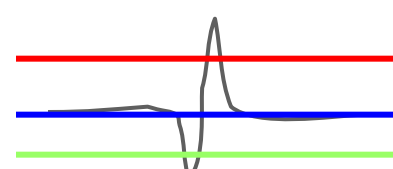
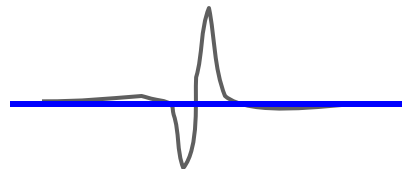
⇒ (0, 0)

C



⇒ (+, -)

D



⇒ (-, +)

Reference(—)

Positive(—), Negative(—)
Threshold

13. Threshold

