

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

Dark Room 5

الالواح المقوية
INTENSIFYING SCREENS

By

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Session 3

Intensifying Screens

الألواح المقوية

What is the most Important layer in The Film ?

▶ **Sensitive Layer**

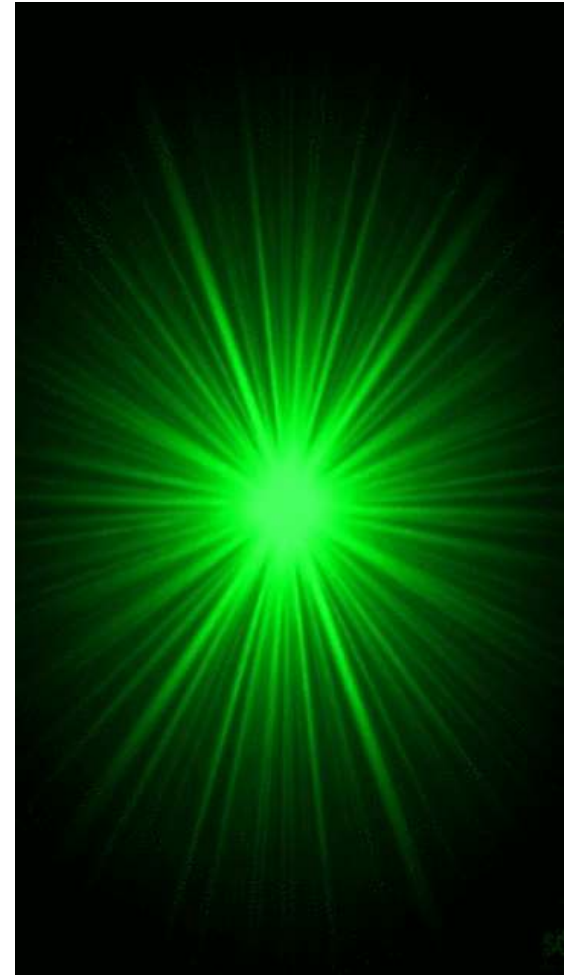
Intensifying screens

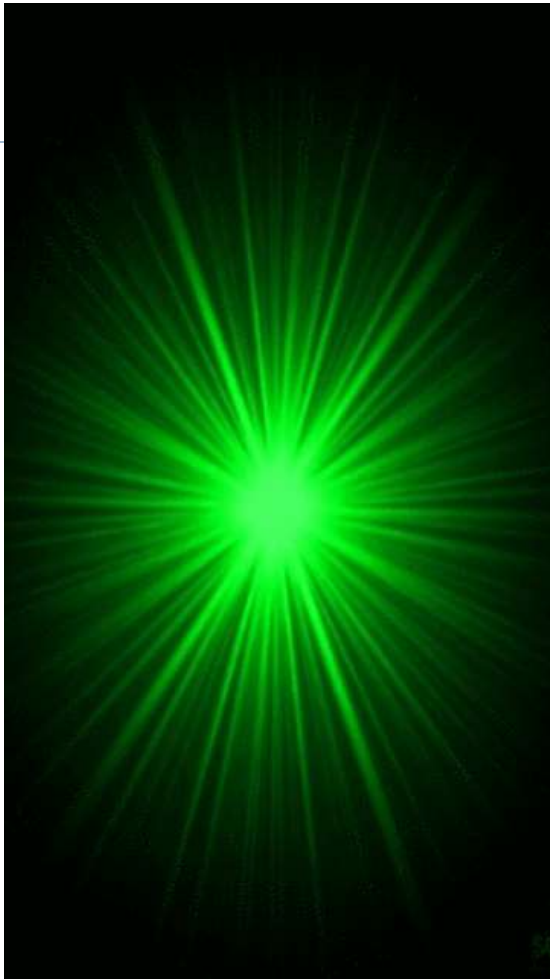
- ▶ are devices used in the **x-ray cassette** to **intensify the effect of the x-ray photon** → by producing a larger number of light photons.

Principle of work

► **Fluorescence :**

material absorbs energy from X ray
and re -emits it as a visible light





Fluorescence was the key for X-Ray Discovery



Importance

- X ray is **non visible**
- Screens convert it to **light**
- X ray films are **more sensitive to light** many time > X ray

so let us know

INTENSIFYING SCREEN .



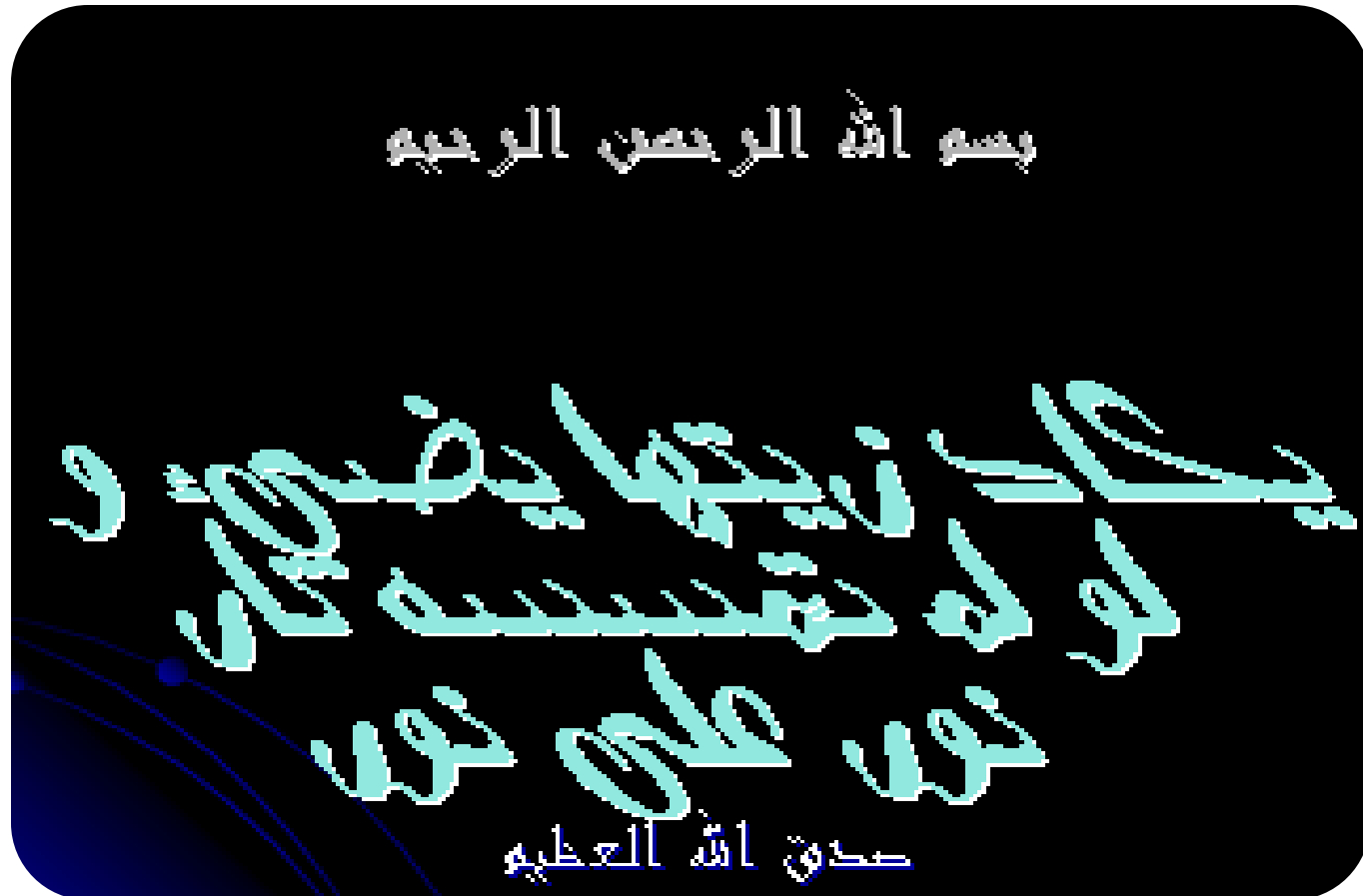
INTENSIFYING SCREEN

- Screen convert **X ray** → to **light**
- **Film** is much more sensitive to light
- That it intensify X ray action → **better image** & **less dose**

-
- **2 screens** are present , one on both side of the cassette
 - Some films used with **one side screen** eg. Mammography or **with out** screens.

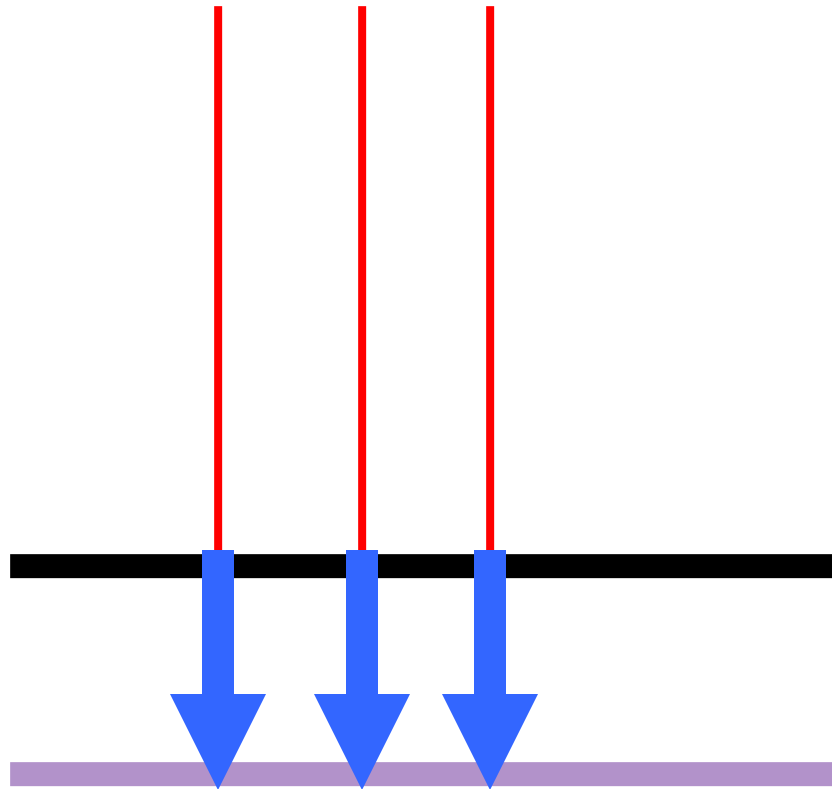


Fluorescence in Qouran



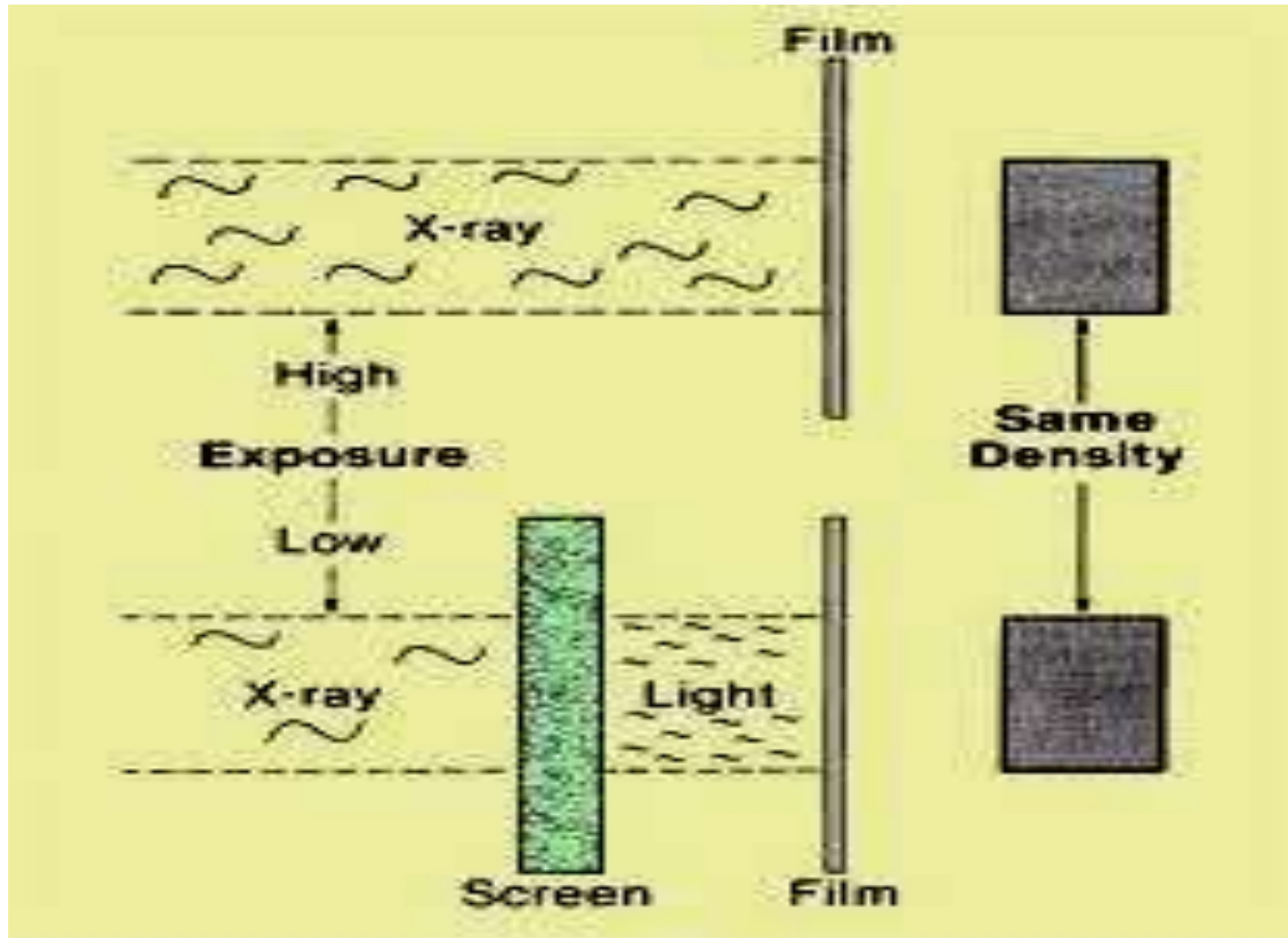
formation of X ray Image

- ▶ **95 %** from **light**
- ▶ **5%** only from **direct X ray** effect.



Screen

FILM

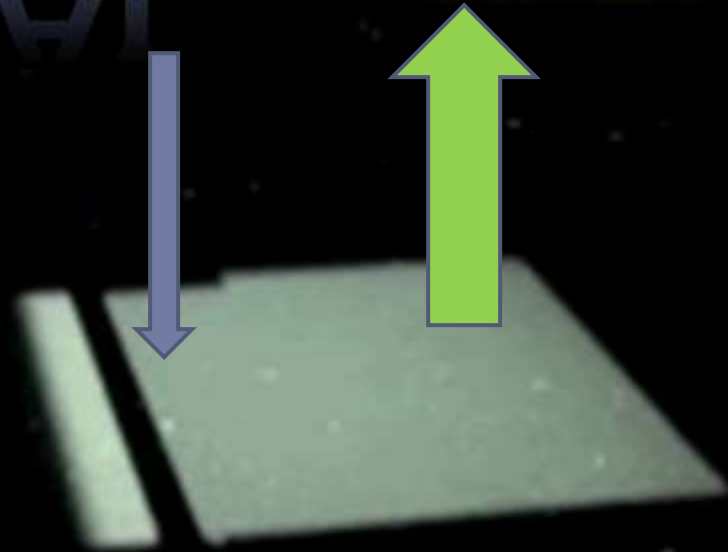




X RAY ACTION ON INTENSIFYING SCREEN

X RAY

LIGHT

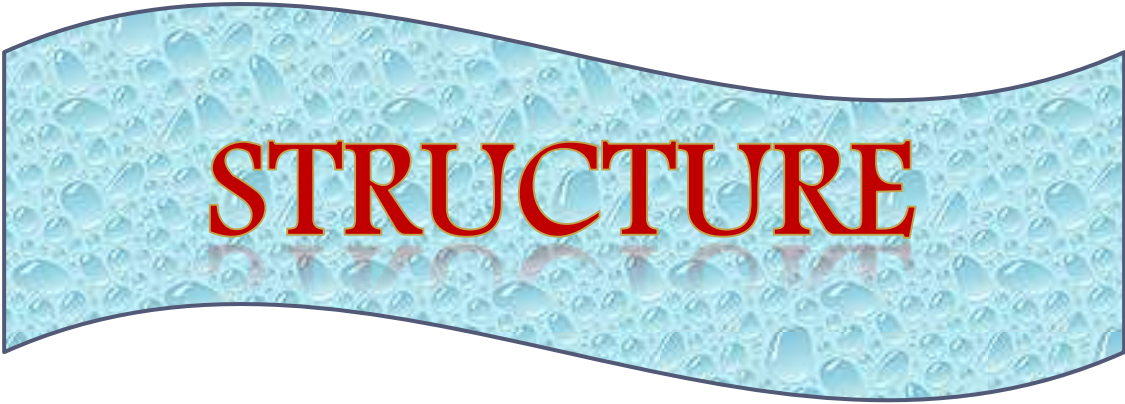


Advantages of Use

. **Magnify** effect of X ray on Film →

- ▶ **Less dose** of X ray & shorter time
- ▶ **Less harm** For patient
- ▶ **Longer life** of X ray Tube
- ▶ Use of portable apparatuses with its smaller (**Lower**) tubes

All These → Better Image quality



STRUCTURE

- **Shape** : white board
- **Thickness** : (About **0.4 mm**)
- **Dimensions** : As cassette
- **Component** : **4 Layers**

Base قاعدة ١-

Reflecting layer الطبقة العاكسة ٢-

Phosphorus layer الطبقة الفسفورية ٣-

Protective plastic layer طبقة الحماية ٤-

STRUCTURE OF SCREEN :

ภาคตัดขวางของ X-ray intensifying Screen



The common used film size are:

In inch

in centimeter

6 x 12

13 x 18

8 x 10

18 x 24

10 x 12

24 x 30

12 x 15

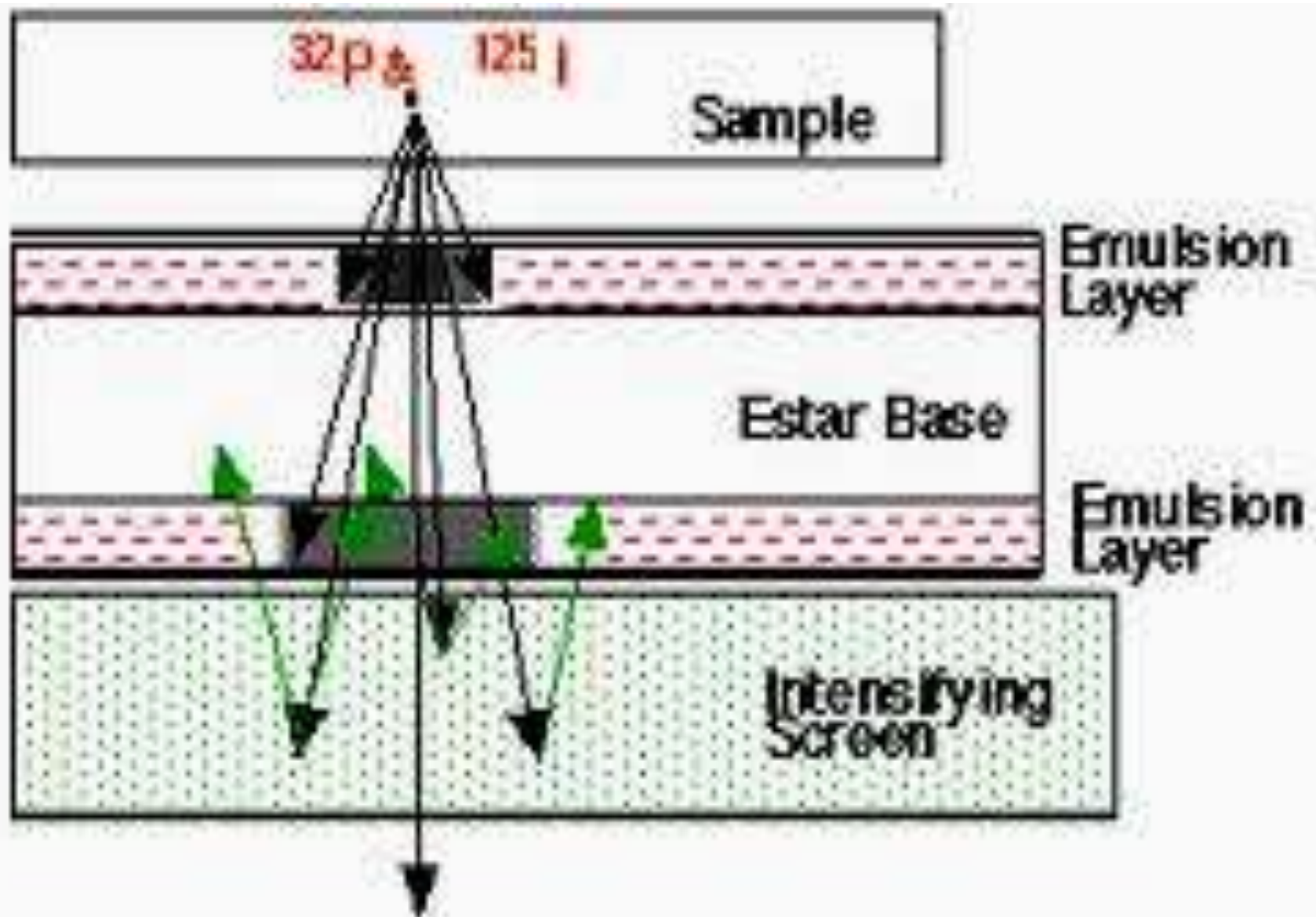
30 x 40

14 x 14

35 x 35

14 x 17

35 x 43



1- BASE القاعدة

- *Plastic Board*
- *thickness 1 mm*
- *Carrier of sensitive material*



➔ **Criteria of Base Material :**

- **Inert**
- **Radio resistive**
- **Radio transparent**
- **Humidity resistive**
- **Flexible & smooth**

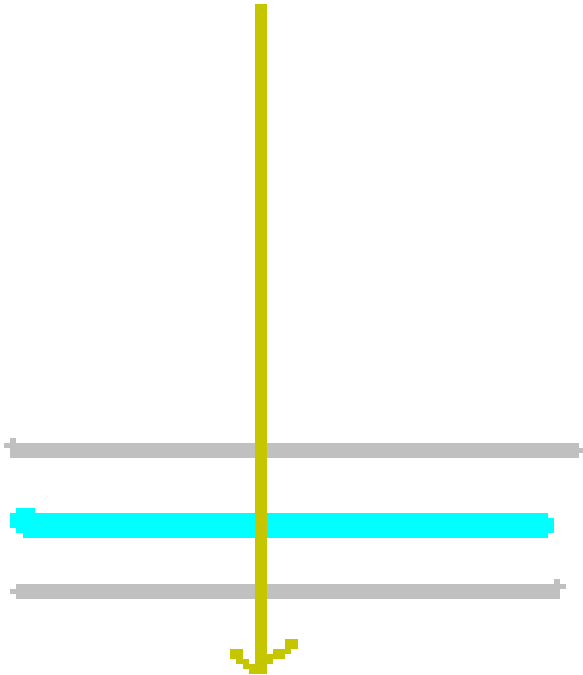
٢-الطبقة العاكسة Reflecting Layer

- ▶ Very Thin
- ▶ Light reflecting
- ▶ .Magnesium Oxide or Titanium dioxide

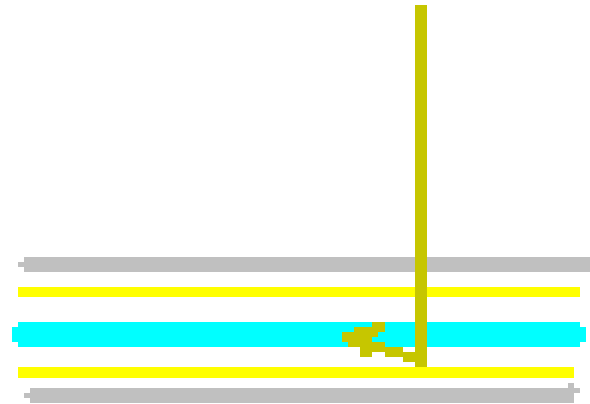
اكسيد المغنسيوم او ثانى اكسيد التيتانيوم

Reflect light photons to film & improve image

Action of reflecting layer:



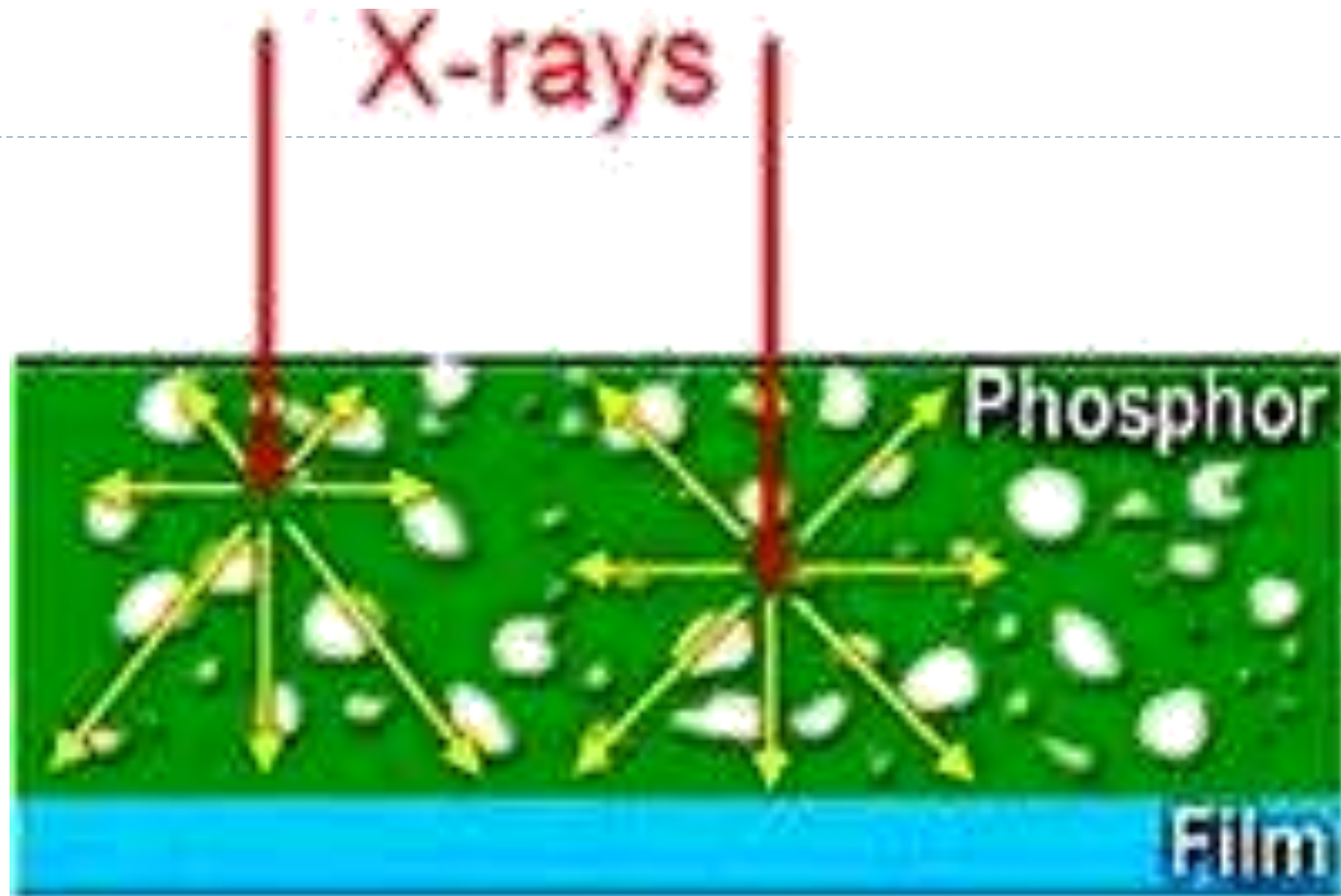
With
out



With

٣-الطبقة الفوسفورية 3-Phosphorus Layer

- Active layer
- Convert X ray to light
- 3 substances are used :
- *Ca tungstate* تنجستات الكالسيوم : *Ideal & Most used*
 - كبريتيد الزنك
 - Barium sulfite & lead sulfite سلفات الباريوم و الرصاص



Type & Color :

- ▶ **Calcium tungstate (CaWO_4)**: blue light
- ▶ **Lanthanum oxybromide (LaOBr)**: blue light
- ▶ **Gadolinium oxysulfide ($\text{Gd}_2\text{O}_2\text{S}$)**: green light

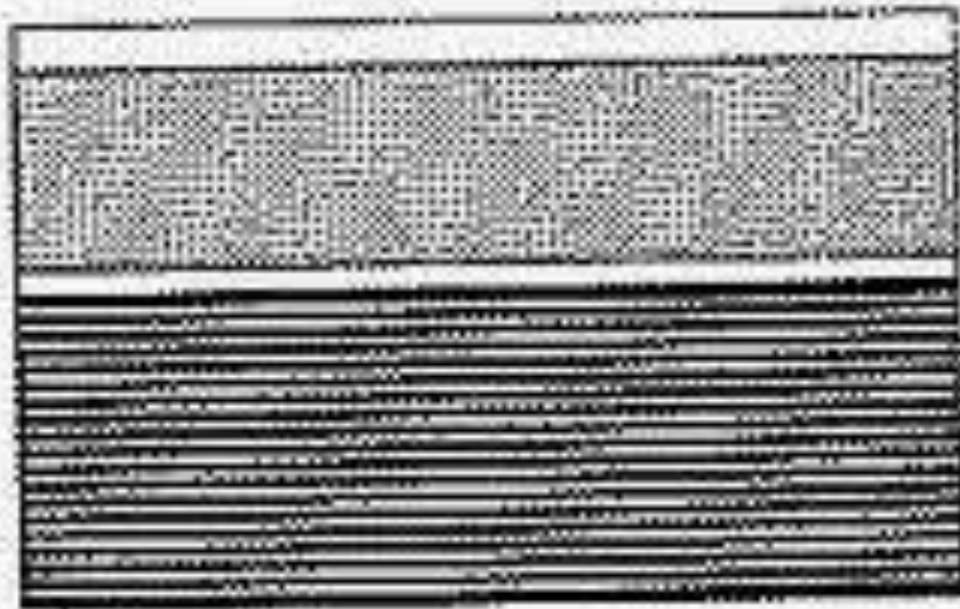
Figure 10-1

PROTECTIVE
LAYER 0.7-0.8 mil

PHOSPHOR
IN PLASTIC

TiO_2
REFLECTING
LAYER 1 mil

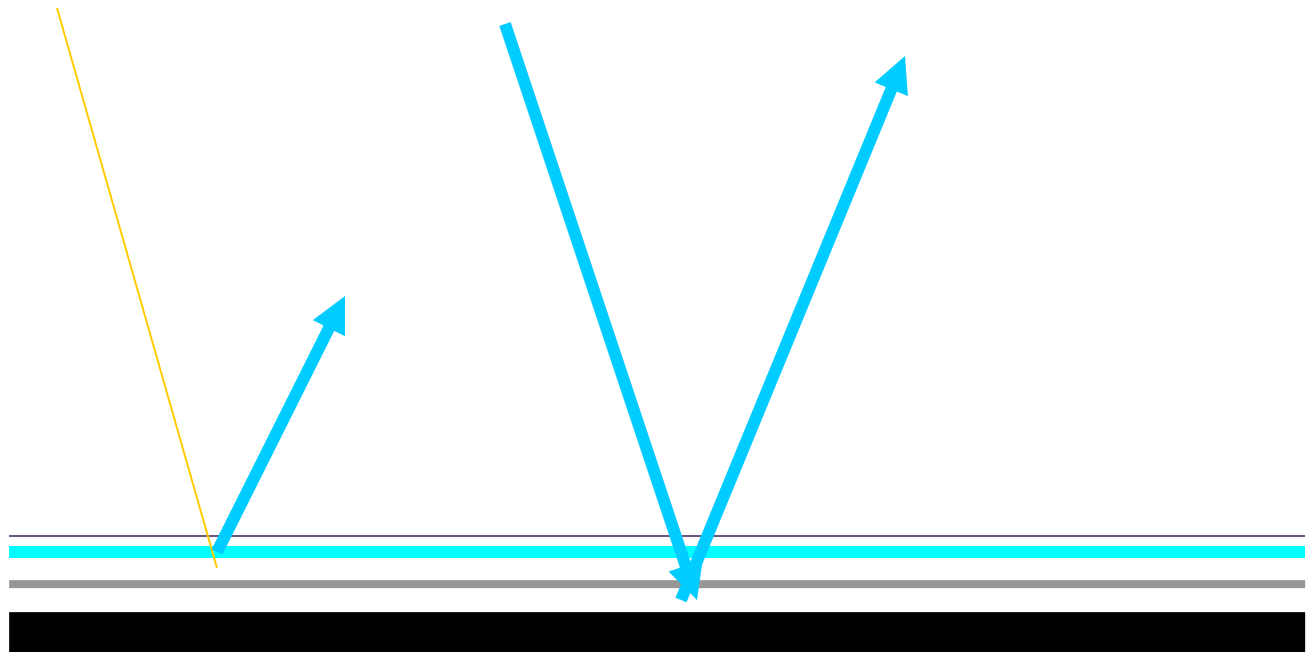
PLASTIC
BASE



4-6 mil

10 mil

NB. Posterior screen is **more thick** → less X ray reach it → to compensate photons on both side → **homogenous images** on both sides of the film



1-Ca Tungstate	2-Barium lead sulphate	3-Zinc sulphide
*Most common		
•*→3500:5200 A	*→3000:4700A	*→3900:5500A
i.e. ultraviolet, violet & blue (to <u>which film is most sensitive</u>)	* intensifying>Ca Tungstate .	i.e. v. b.& green *were used e low kv
• <u>SO</u> •* IT IS <u>Ideal</u>		*→ <i>afterglow</i> *large grains so Not used
▶ ٣٤	Session 3 - Intensifying Screen 17 November 2025	

Film Types & Sensitivity

✓ conventional films:

sensitive to **ultraviolet** and **blue lights**

✓ Polychromatic films:

sensitive to **ultraviolet**, **blue** and **green** lights

٤-الطبقة الواقية Protective Layer

- Plastic protective layer
- Very thin
- Transparent & water proof

Screens Care

Avoid

- ▶ Direct touch , Remove finger prints by piece of cotton
- ▶ Processing Fluids → Destroy screens
- ▶ Electrostatic charges → remove by opening cassettes or using special spray .

SCREEN SPEED

- Relative number represent **screen activity** .
- Classified as :

<i>Slow speed</i> بطيئة	<i>Medium speed</i> متوسطة	<i>High speed</i> سريعة
0.5	1 (it is the base of comparison)	2 : 2.5
Smallest crystals	Average	Largest crystals
Thinnest	Average	Thickest

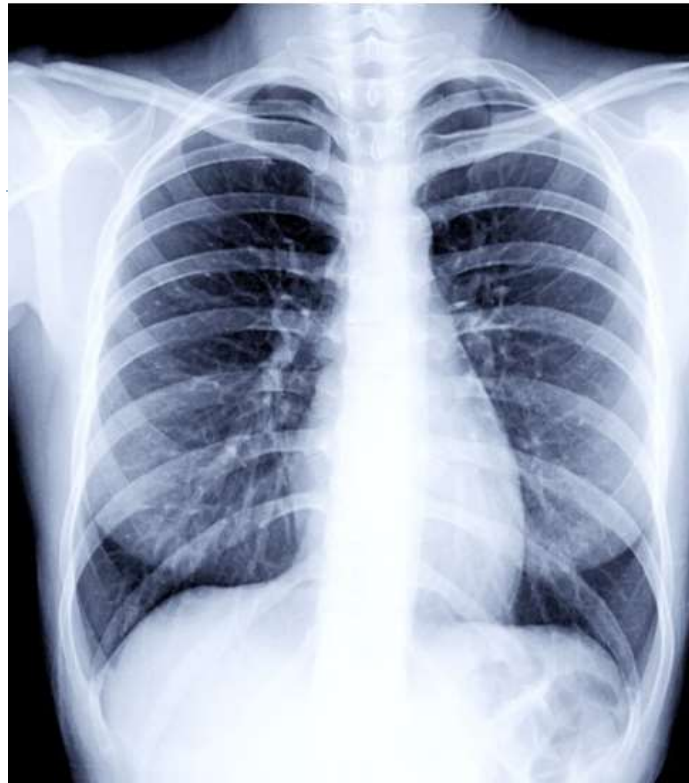
**screen speed is related to*

1 - Size of crystals of phosphorus layer

2- Thickness of phosphorus layer

- Time of exposure with out screen / Time of exposure with screen

■ بما ان الالواح المقوية ، تقلل كمية الاشعة وقت التعرض
■ اذا فان عدم استخدامها = زيادة كمية الاشعة . و وقت التعرض
■ النسبة بين وقت التعرض بدون الواح / وقت التعرض باستخدام
الالواح = عامل التقوية



بدون الالواح المقوية

٣ ثانية

باستخدام الالواح المقوية

١ ثانية

■ عامل التقوية = $\frac{1}{3}$ = ٣

■ بمعنى ان الالواح المقوية ، قامت بتقوية تاثير الاشعة على

الفيلم ٣ اضعاف

Sources & Further reading :

- ▶ **Dark Room** – Prof Dr. Nabeel Khattar
- ▶ **Dark Room** – MOH Institute –

PROFF. DR. AHMED FARID YOUSIF

- ▶ Video Lecture – Dr. Ahmad Mokhtar Abodahab – 2016



GOOD LUCK

Dr. Ahmad Mokhtar Abodahab, MD
NOV 2025

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