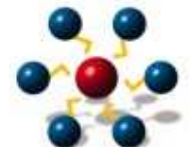
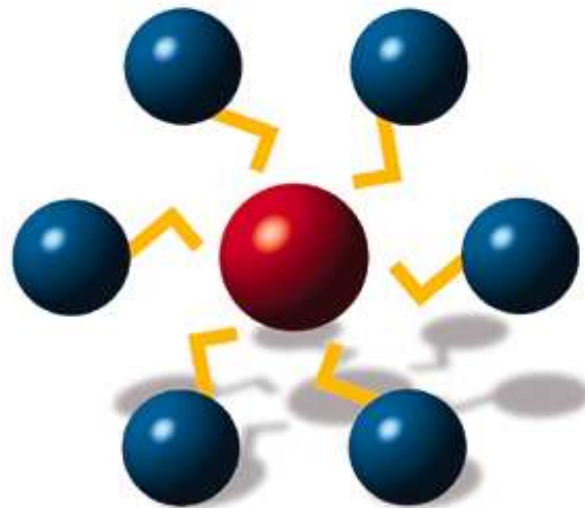


UV-vis spektrometer

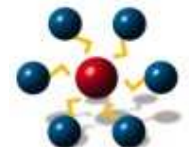
Matti Hotokka
Fysikalisk kemi



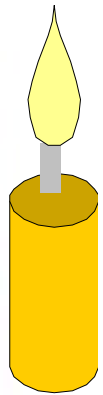
Innehåll

⇒ Apparatur

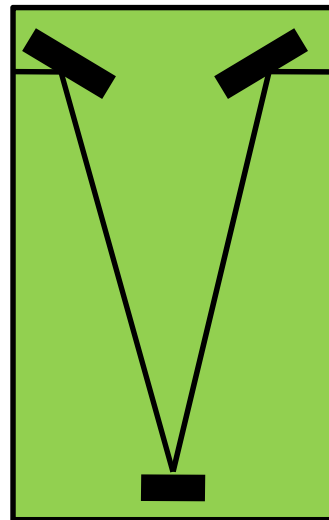
⇒ Mätmetoder



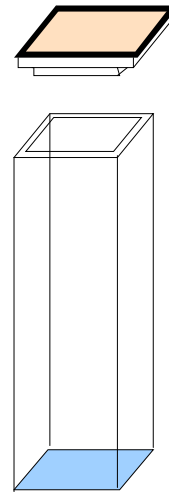
UV-vis spektrometer schematiskt



Ljus-
källa



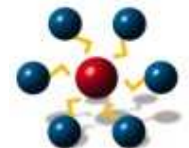
Monokromator



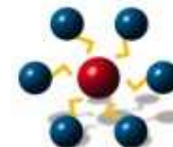
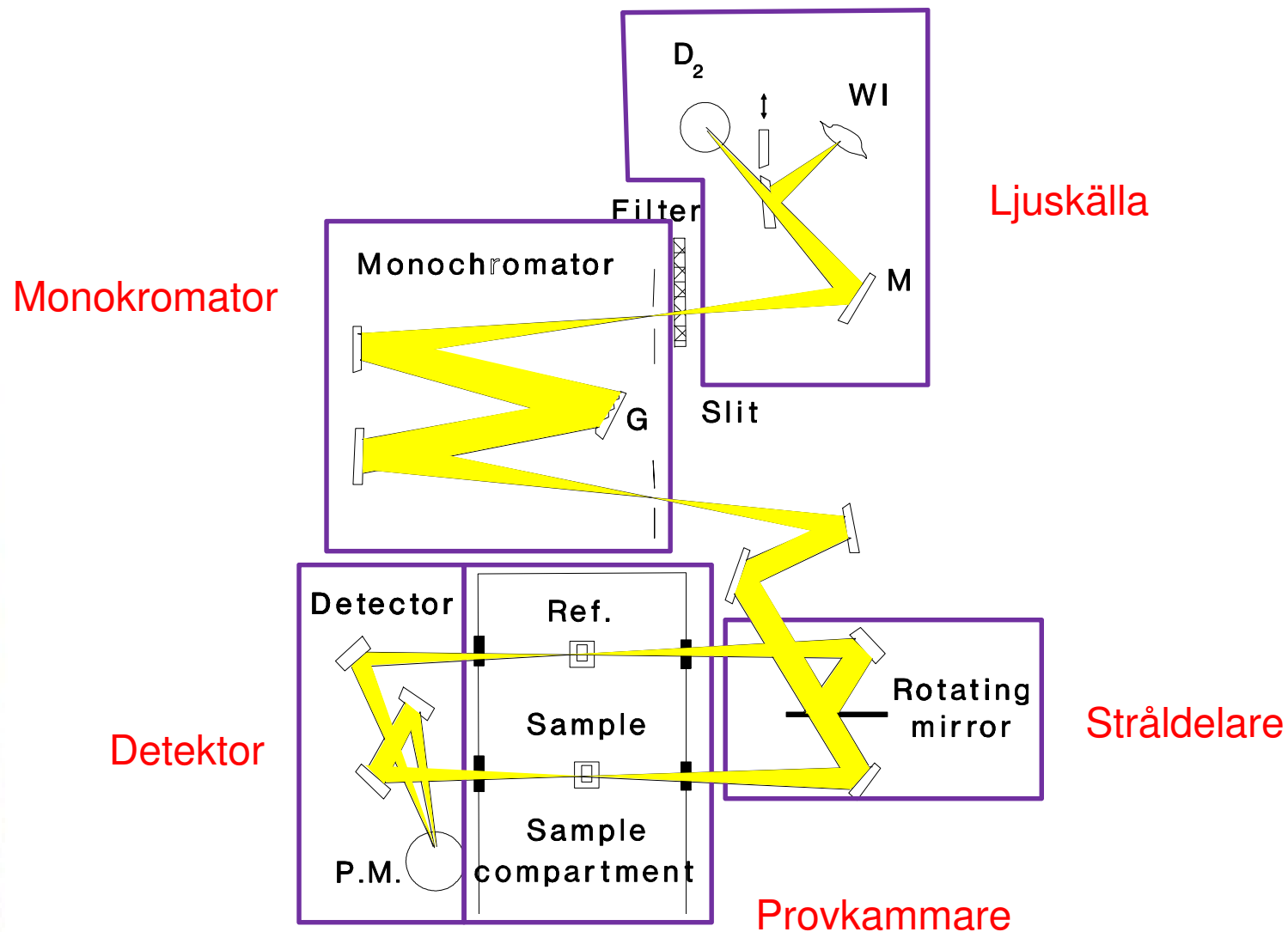
Prov



Detektor



Shimadzu



Shimadzu

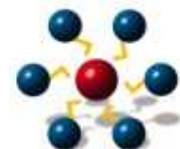
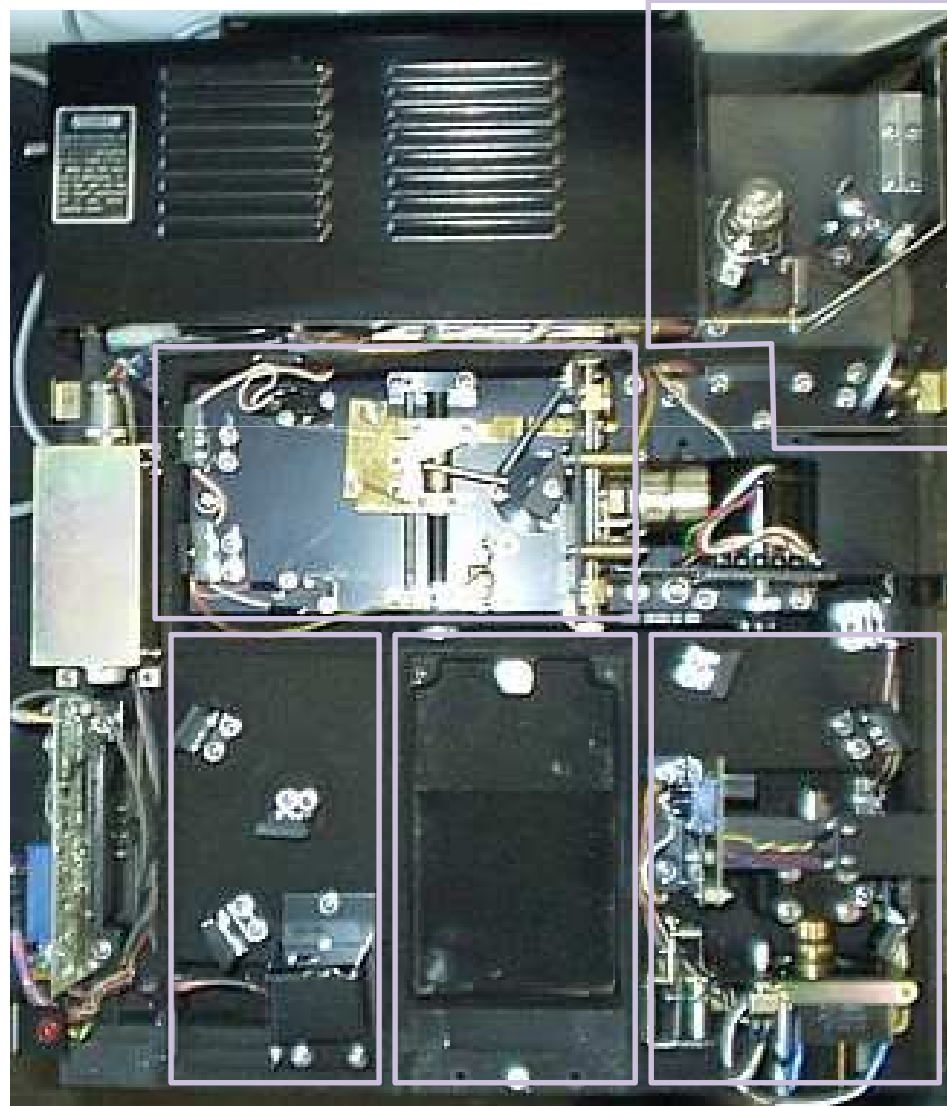
Monokromator

Detektor

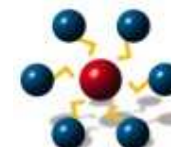
Ljuskälla

Stråldelare

Provkammare



Shimadzu UV-vis spektrometer



Ljuskällor

⇒ Glödlampor med wolframtråd

Ø Synligt och nära UV-ljus

⇒ Deuteriumlampor

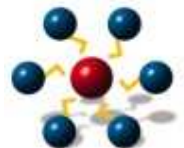
Ø UV-området



Ljuskälla

Deuterium-lampa

Wolfram-glödlampa

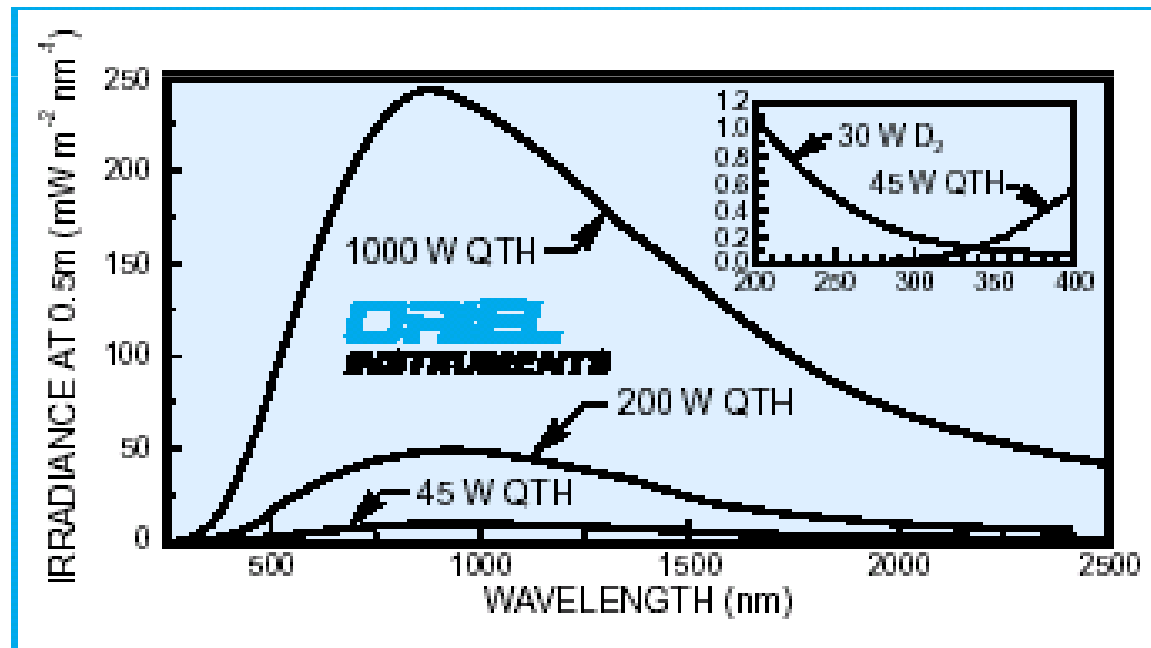


Glödlampa

Tungsten filament source

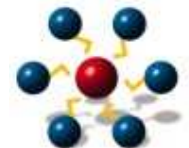
⇒ I princip en svart kropp

⇒ Hög intensitet i det synliga området



<http://www.oriel.com>

Fig. 1 Typical irradiance of calibrated lamps, calibrated ranges are: 200 - 400 nm for the D₂ lamp and 250 - 2500 nm for QTH lamps.



Deuteriumlampa

⇒ Typiskt 30 W

⇒ Hög intensitet i UV-området

<http://www.oriel.com>

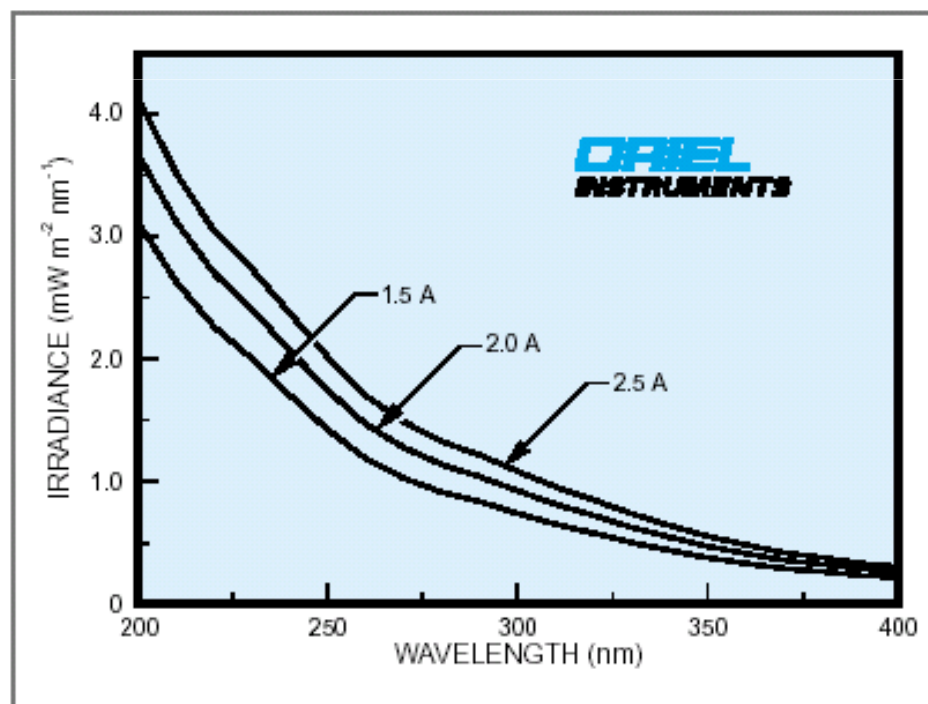
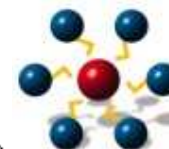
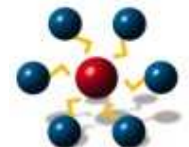
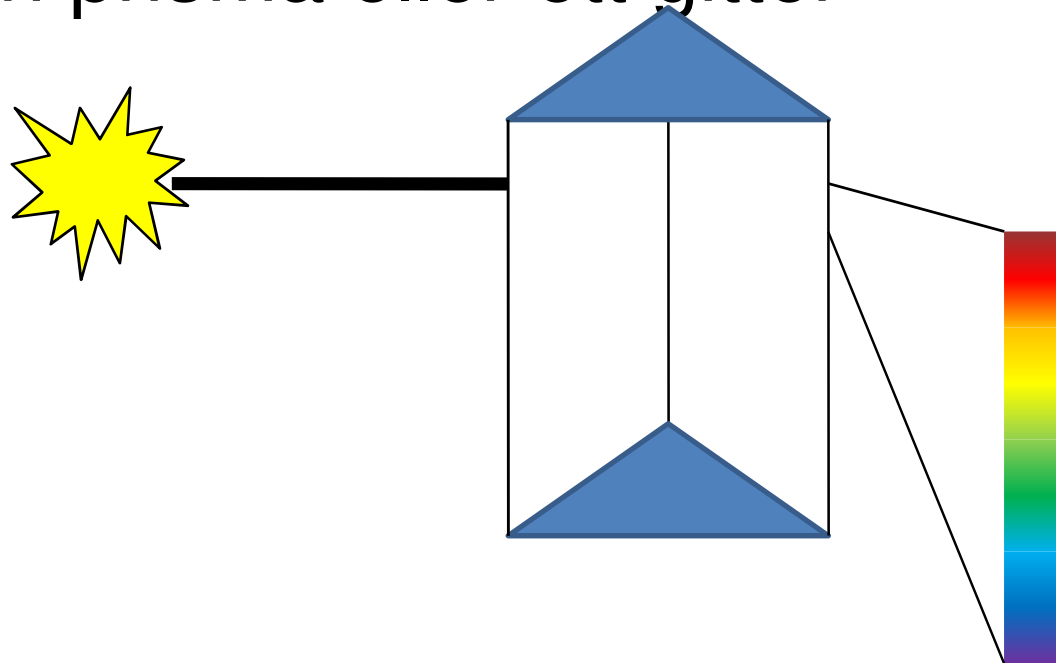


Fig. 1 Irradiance of 66136 High Power Deuterium Lamp run at various currents. Measured at 50 cm from the lamp.



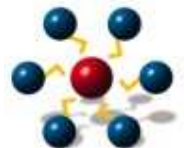
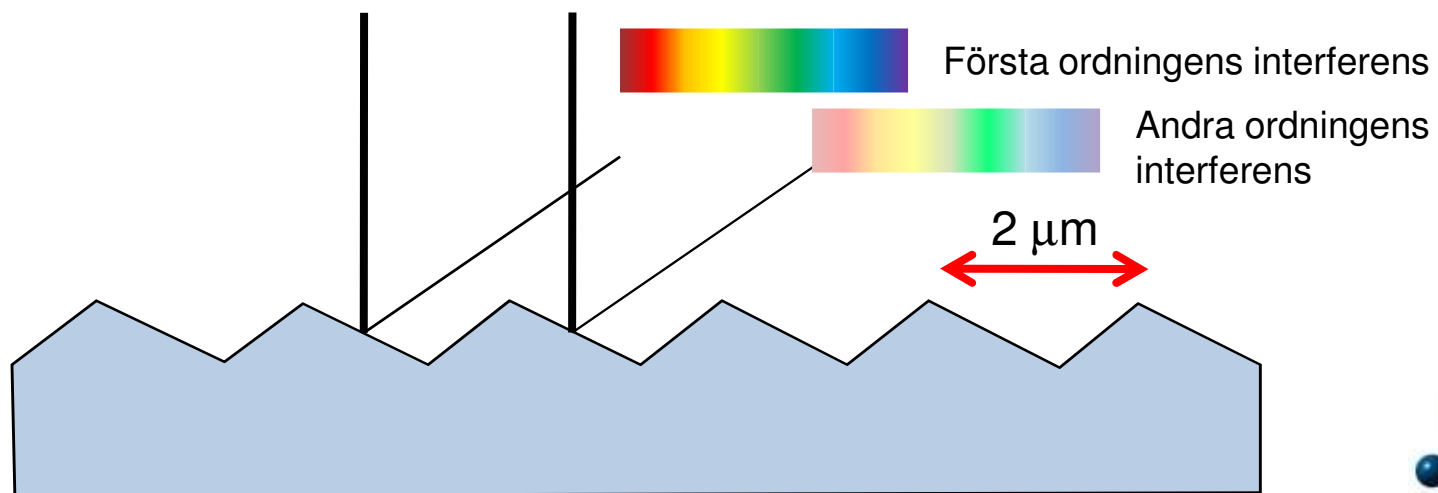
Ljusdispersion

Dispersion betyder, att de olika färgerna separeras. Detta åstadkommer man med en prisma eller ett gitter

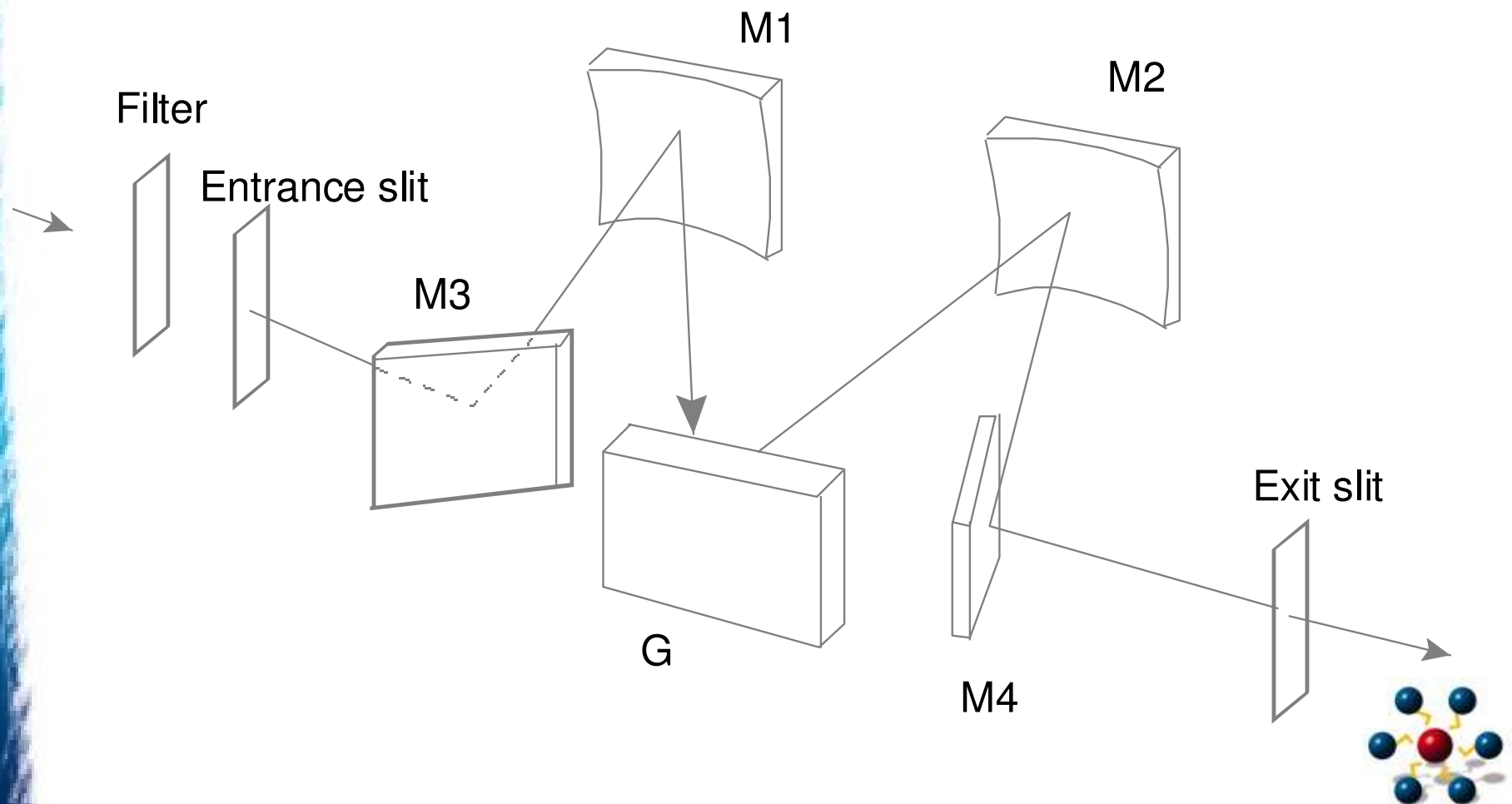


Gitter

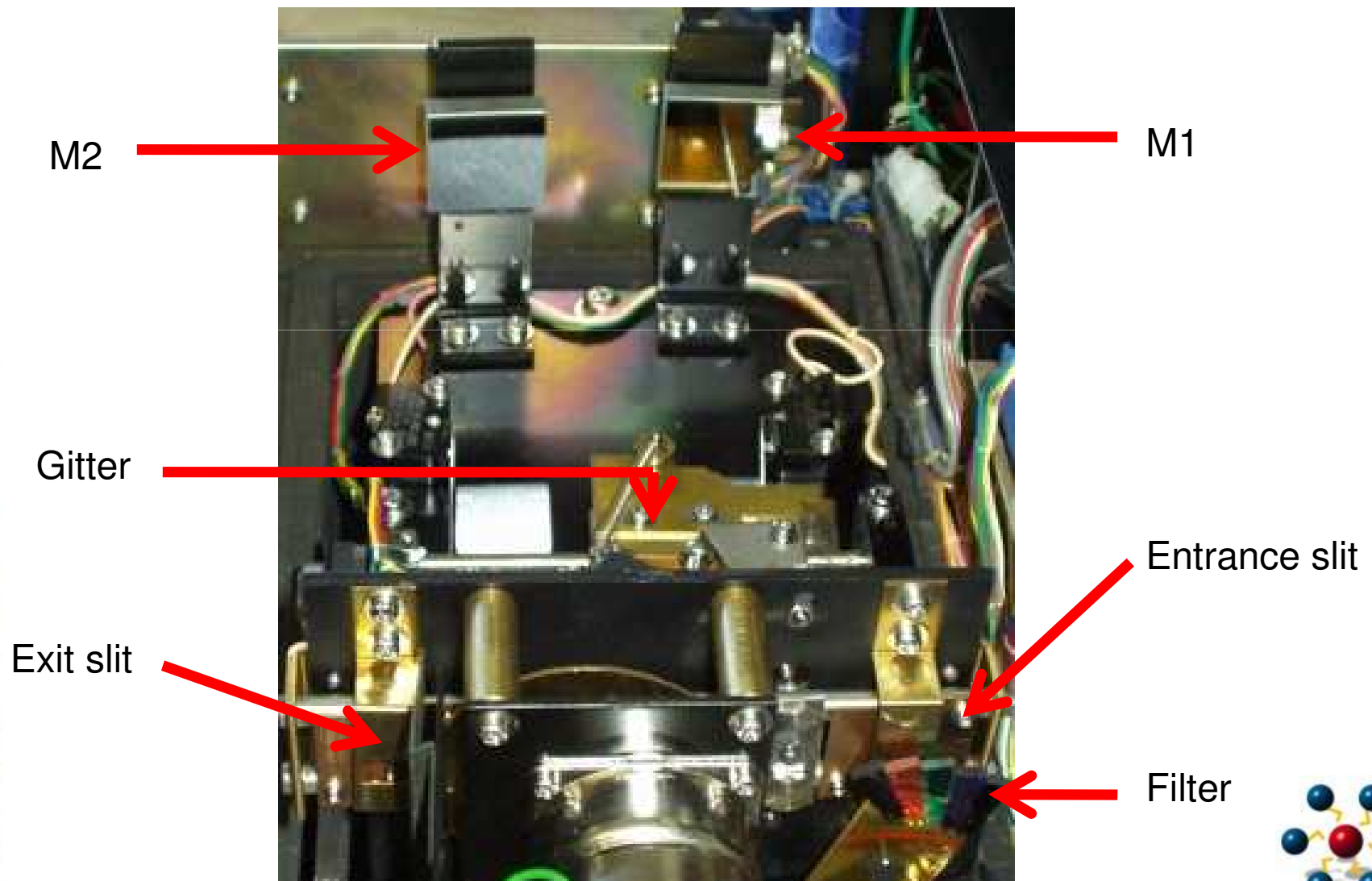
Gitter baserar sig på interferens. Skråmornas täthet bestämmer för vilket våglängdsområde gittret passar. I en spektrometer finns oftast två olika gitter för täcka hela spektret



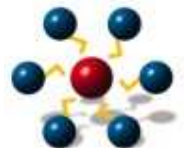
Monokromator



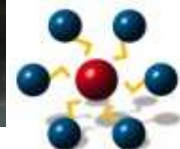
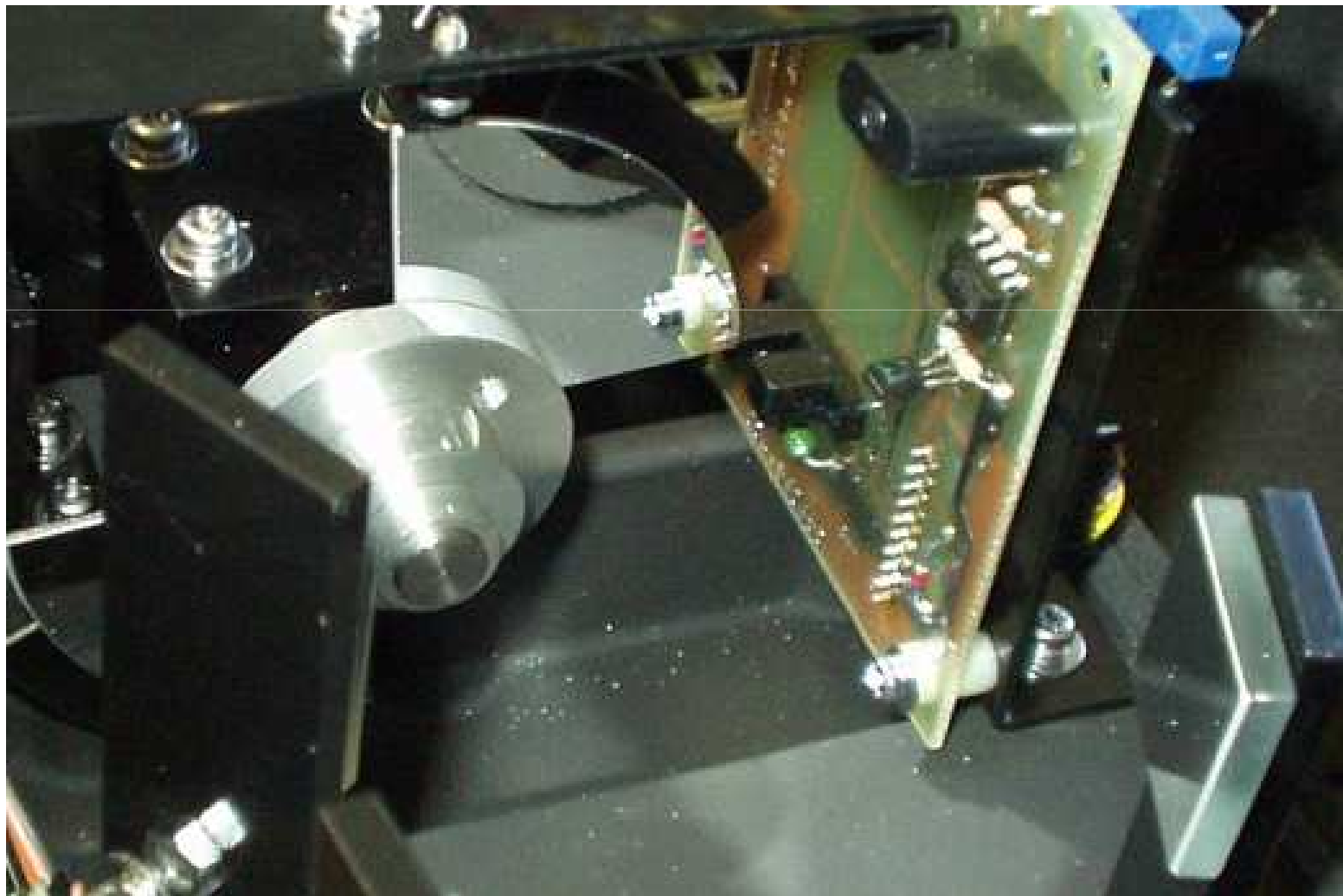
Monokromator



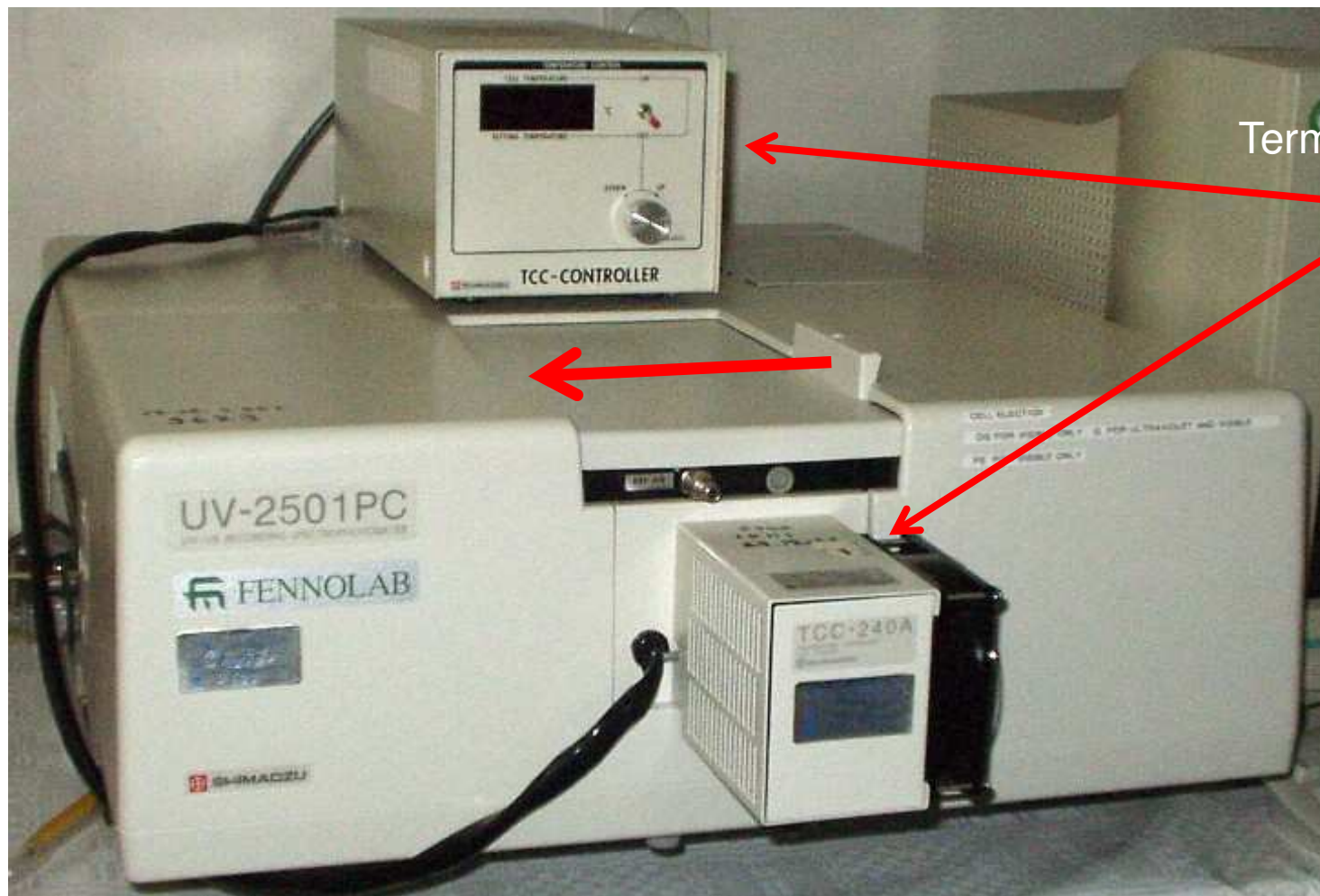
Monokromator



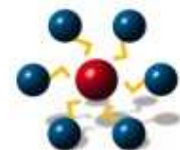
Stråldelare



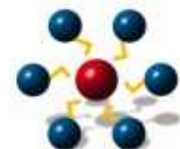
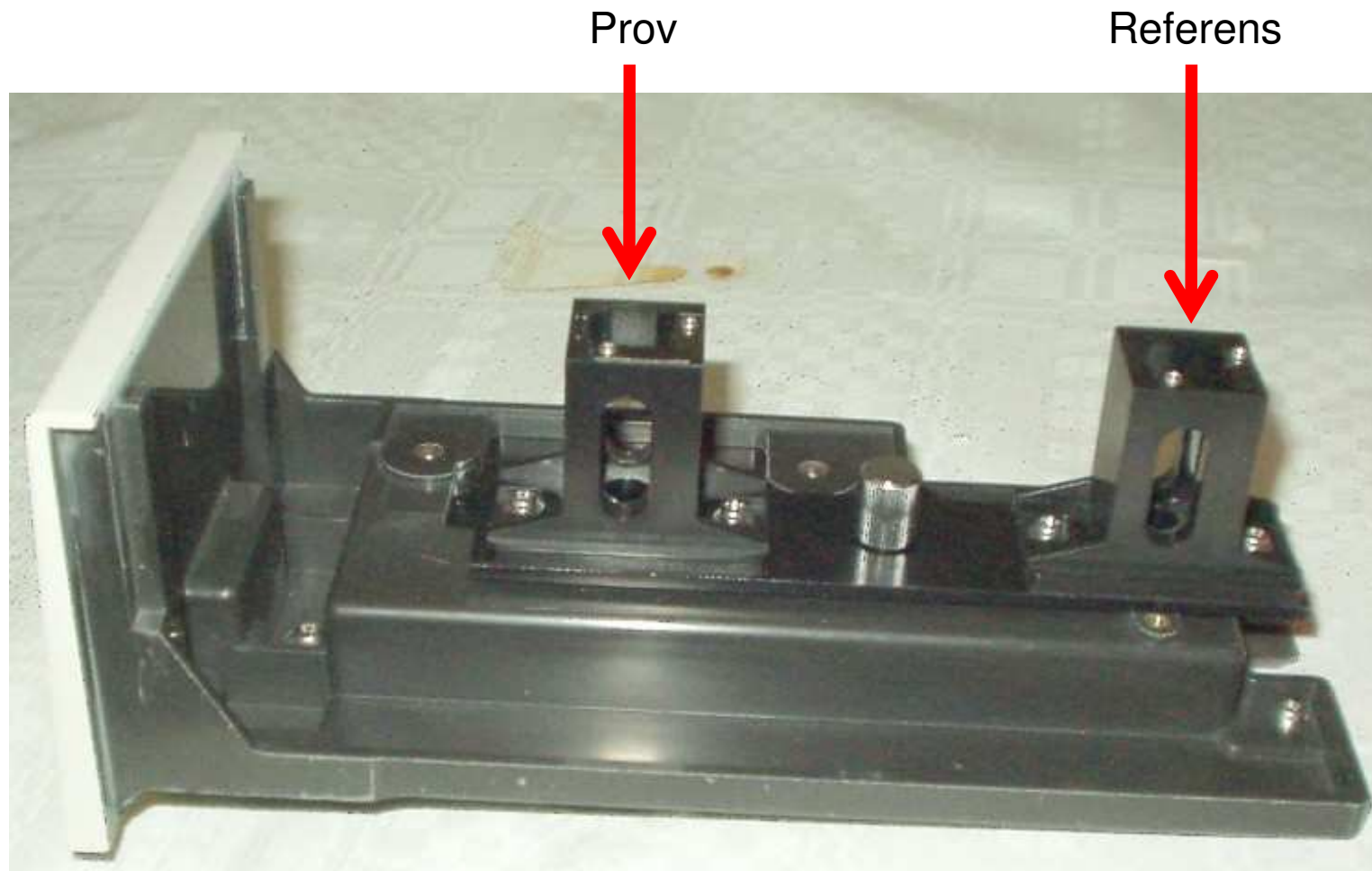
Provkammare



Termostering

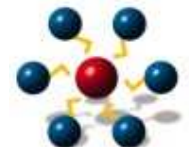


Provkammare

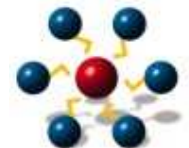


Detektorer

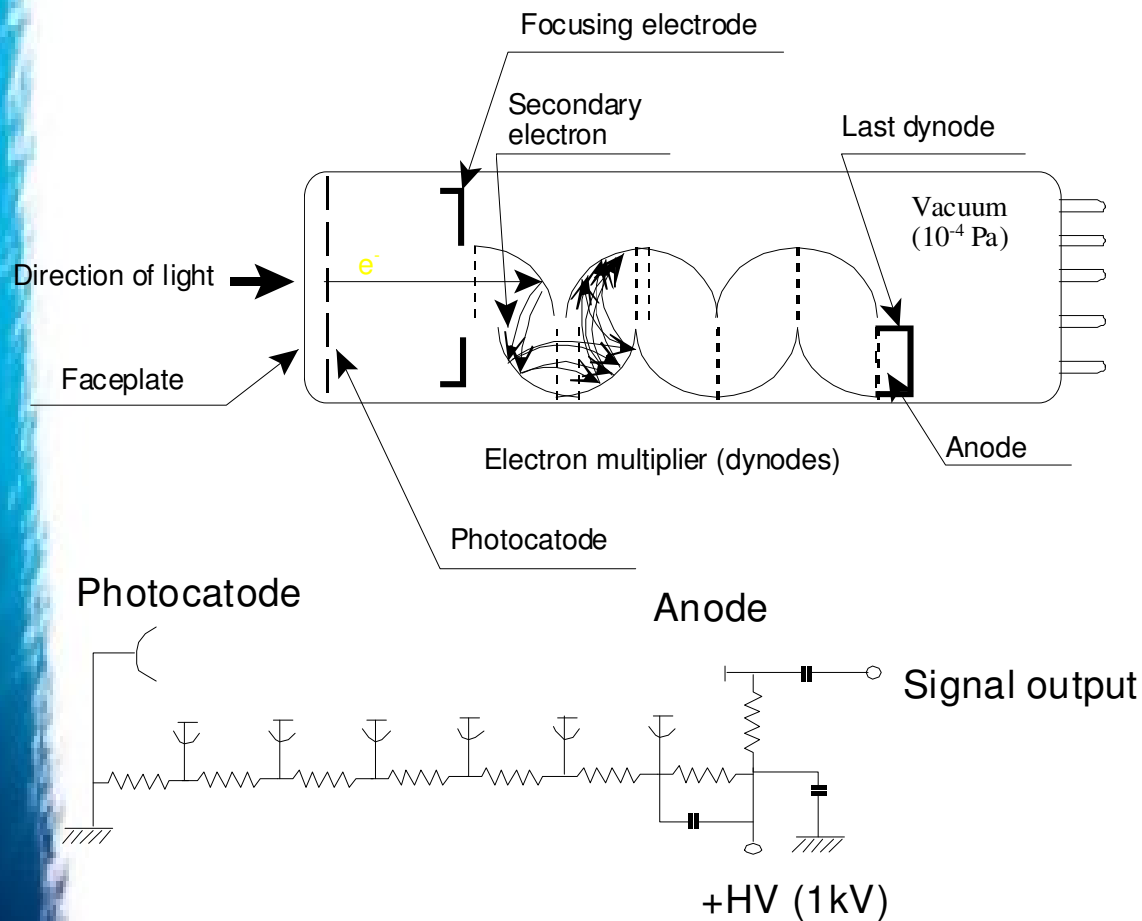
- ⇒ Fotomultiplikatorrör
- ⇒ Fotodiod
- ⇒ Diodraddetektor
- ⇒ CCD



Fotomultiplikatorrör



Fotomultiplikatorrör



b) Head-On Type



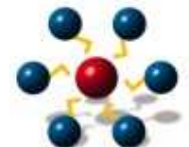
TPMHF0192



[Http://www.hamamatsu.com/](http://www.hamamatsu.com/)

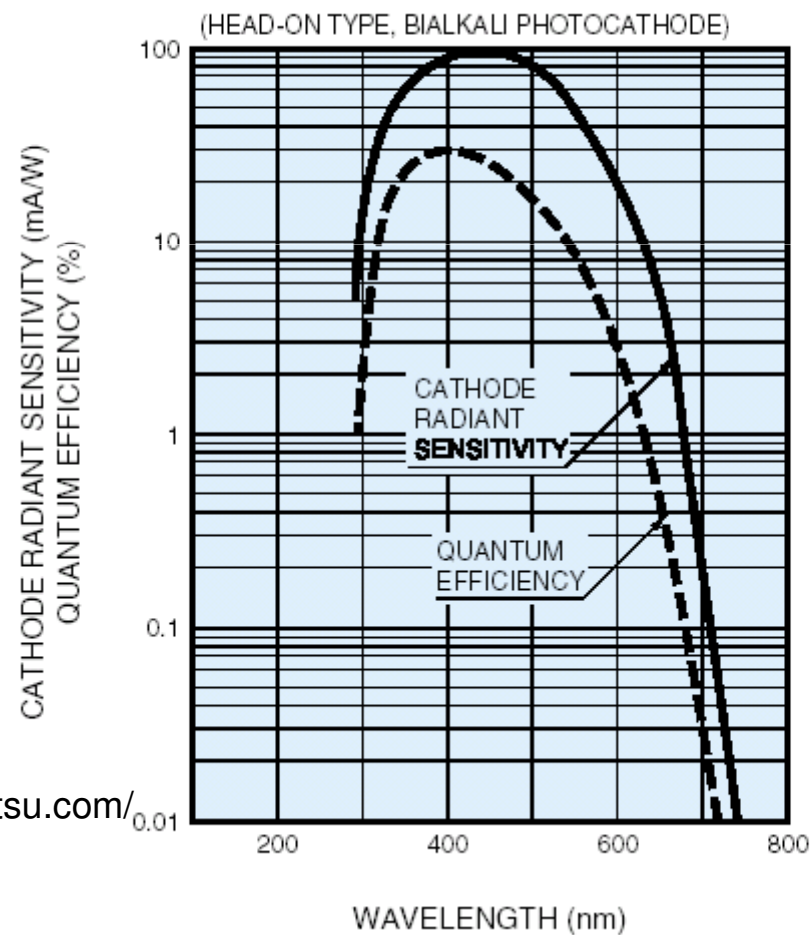
Fotomultiplikatorrör

- ⇒ Hög känslighet
- ⇒ Kräver hög spänning



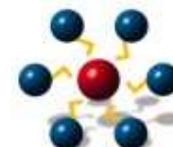
Fotomultiplikatorrör

Känslighet



<http://www.hamamatsu.com/>

TPMOB0070EAST



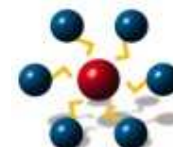
Fotodiod

⇒ Känslig

⇒ Kräver inte hög spänning



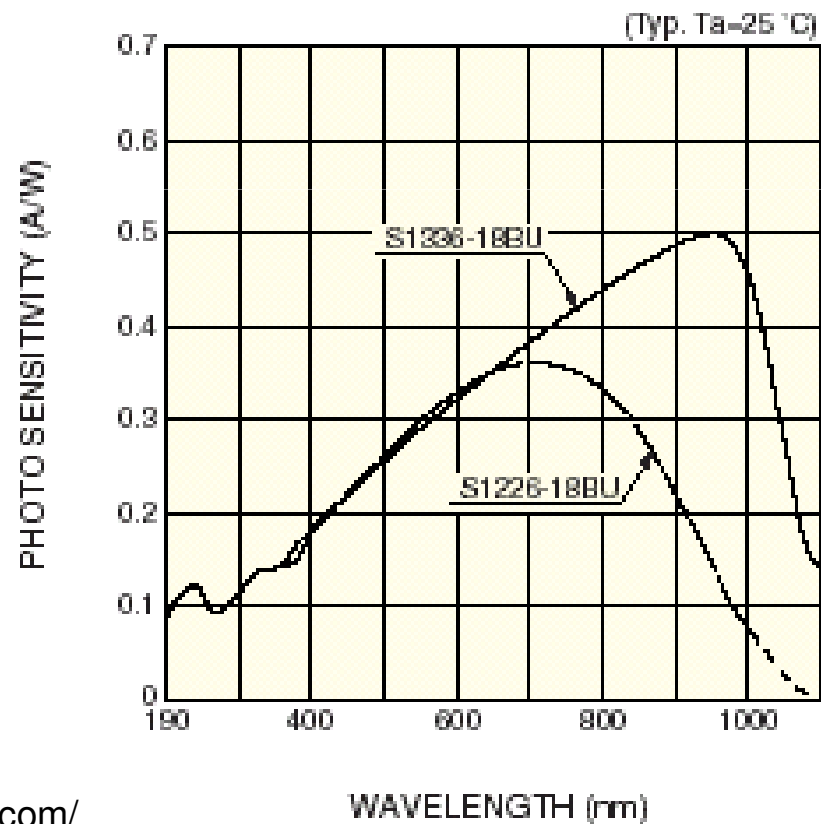
<http://www.hamamatsu.com/>



Fotodiod

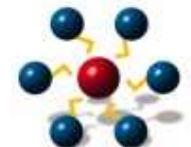
Fotokänslighet

■ Spectral response



<http://www.hamamatsu.com/>

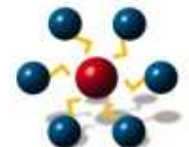
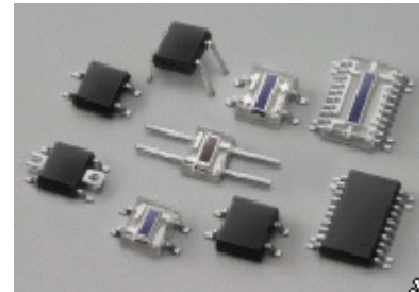
KSP000130E4
Am



Raddetektor

Photodiode array detector

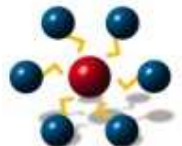
- ⇒ Består av en rad smala fotodioder
- ⇒ Varje diod är 50 μm bred och 1 mm hög
- ⇒ Upptar hela spektrerna på en gång



CCD

Charge Coupled Device

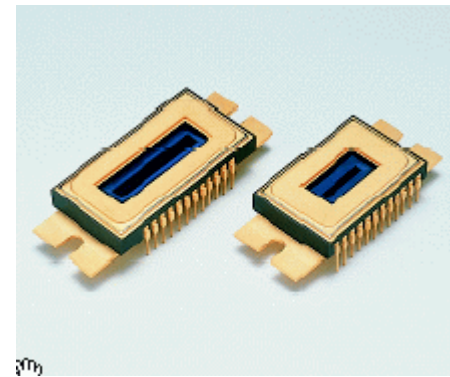
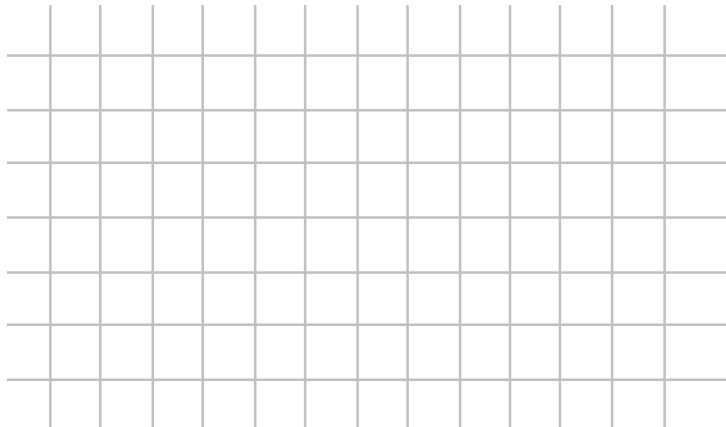
- ⇒ Hög känslighet, speciellt med tunn botten
- ⇒ Ger hela spektret på en gång
- ⇒ Lågt brus vid låg temperatur
- ⇒ Kräver inte hög spänning



CCD

Består av pixelmatis

- ⇒ Består av 1024x124 pixel
- ⇒ En pixel är 20x20 μm
- ⇒ Ljusintensitet vid varje pixel kan läsas skilt
- ⇒ Hela matrisen läses i mikrosekunder



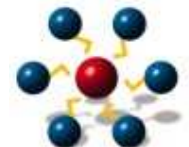
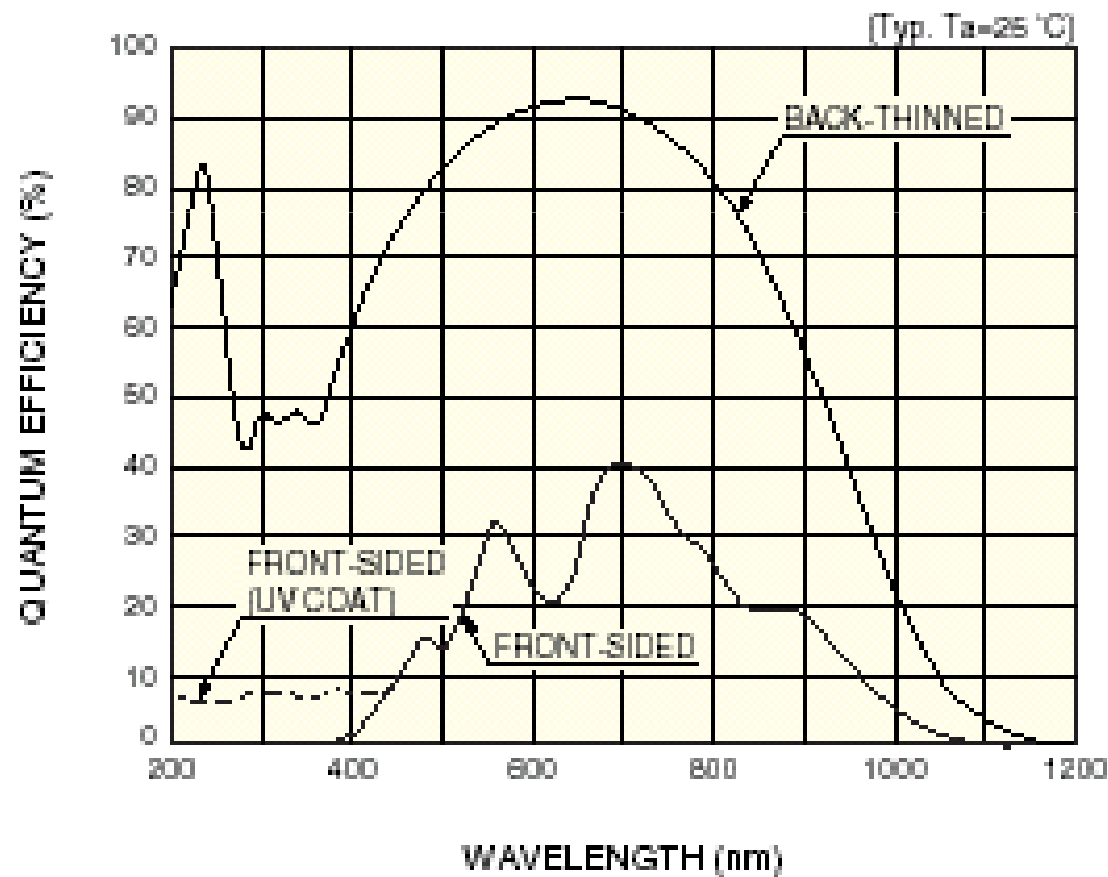
<http://www.hamamatsu.com/>



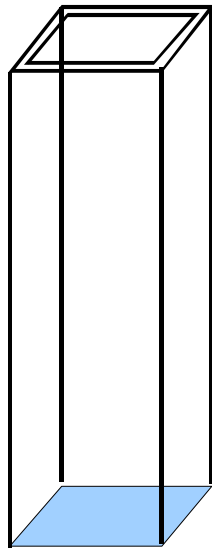
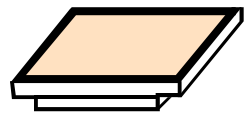
CCD

Känslighet

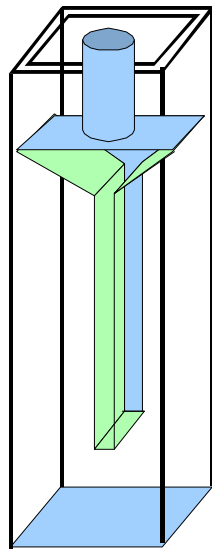
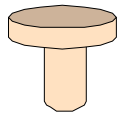
■ Spectral response (without window) *10



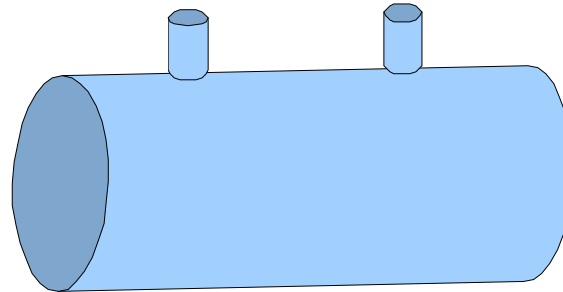
Provkyvetter



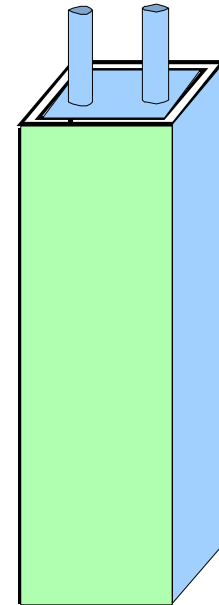
Vätskekyvett
10 mm



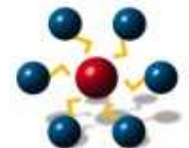
Mikrokyvett
4 mm



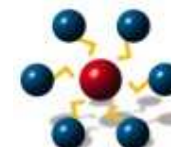
Gaskyvett
100 mm



Genomströmningss-
kyvett



Kyvetter



Kyvettmaterial

⇒ Optiskt glas

Ø Inte användbart i UV-området: fluorescens

⇒ Kvarrtsglas

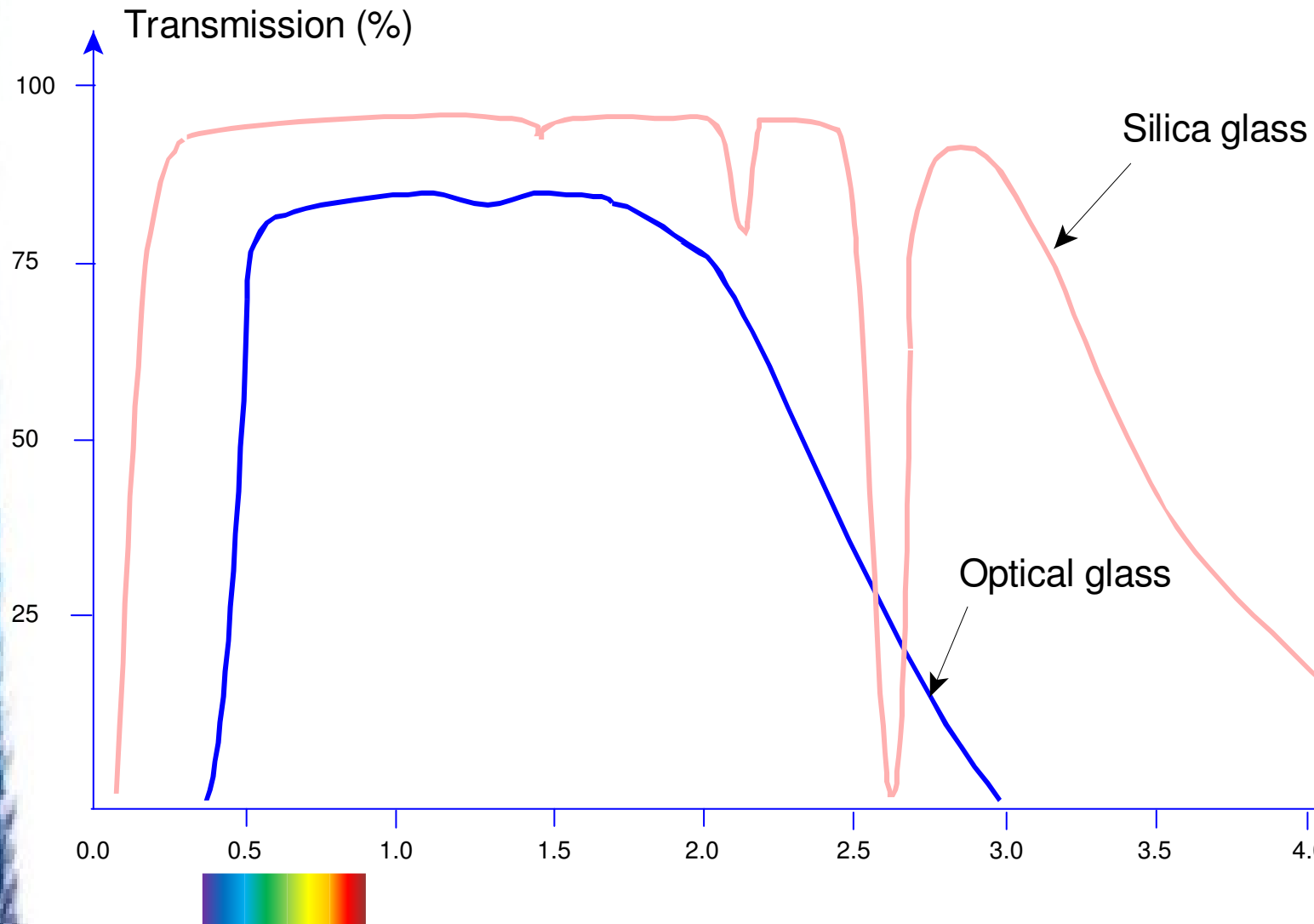
Ø Dyrt

⇒ Plast

Ø Klart det mest populära

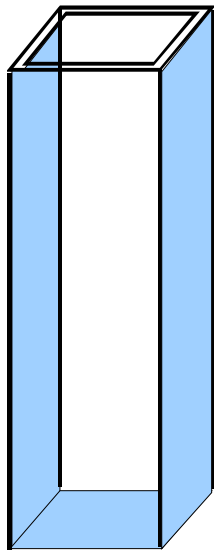


Glasmaterial's transmission

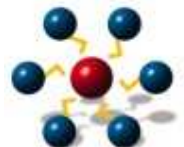


Hantering av kyvetter

Två av kyvettens sidor brukar vara optiskt polerade och två mattslipade. Rör inte vid de polerade ytorna. Fingeravtrycken stör mätningar.

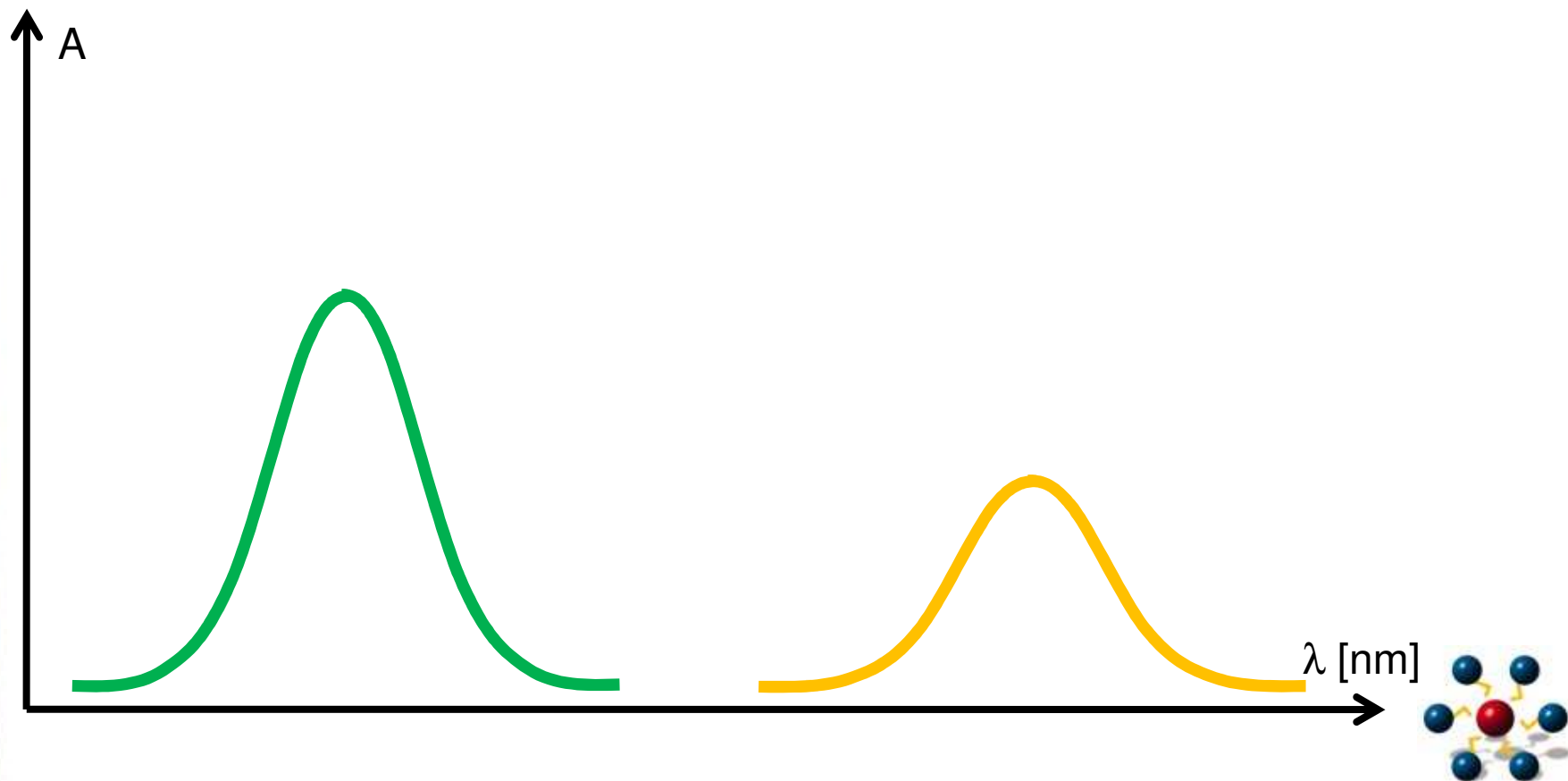


Kyvetter tvättas med lösningsmedel (acetone), som är optiskt rena. De torkas med optiskt papper eller tryckluft (efter oljeseparening).



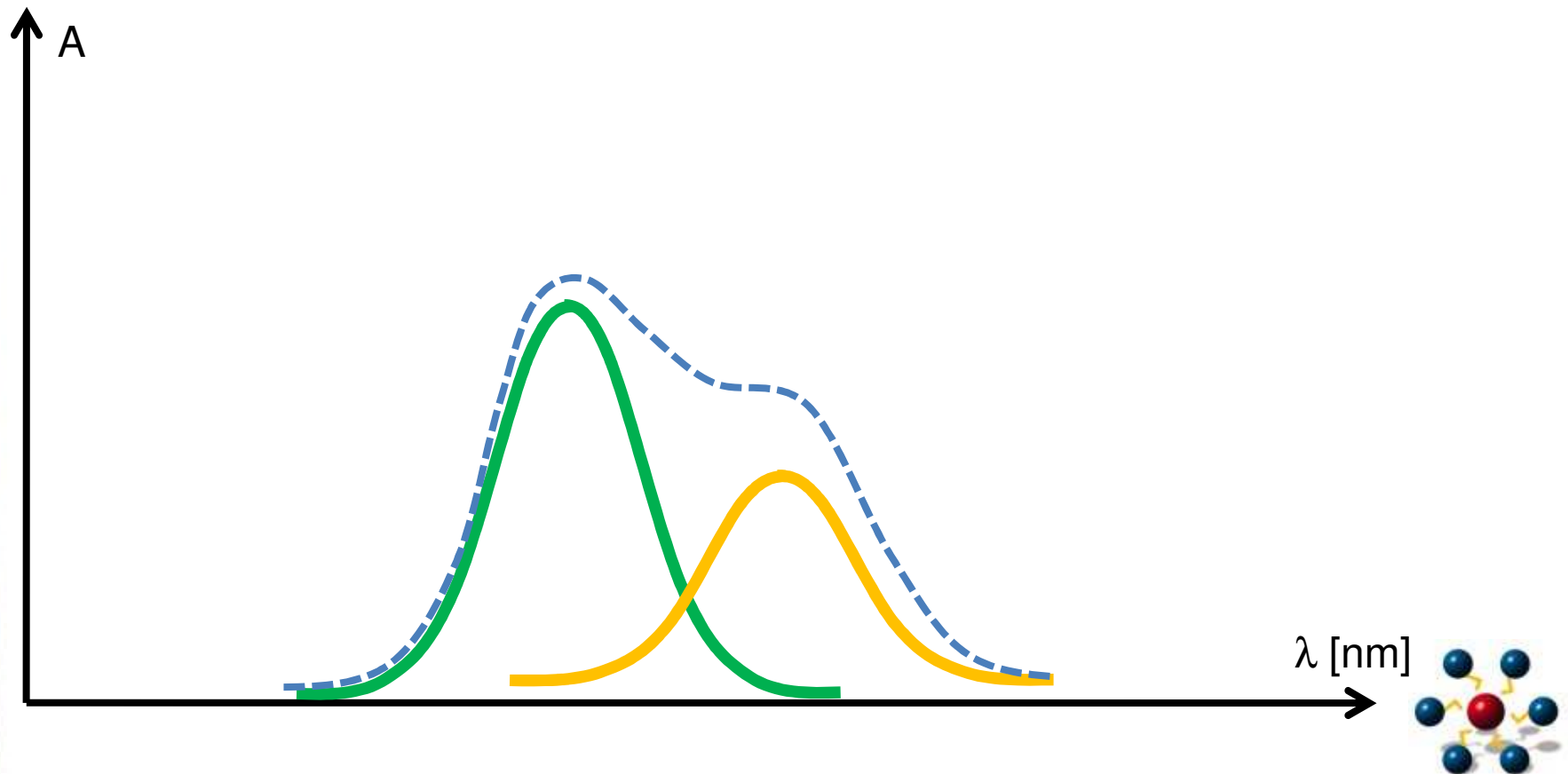
Analys av blandningar

Skilda band – mät skilt



Analys av blandningar

Överlappande kurvor kan separeras matematiskt



Atomabsorptionsspektrometri

