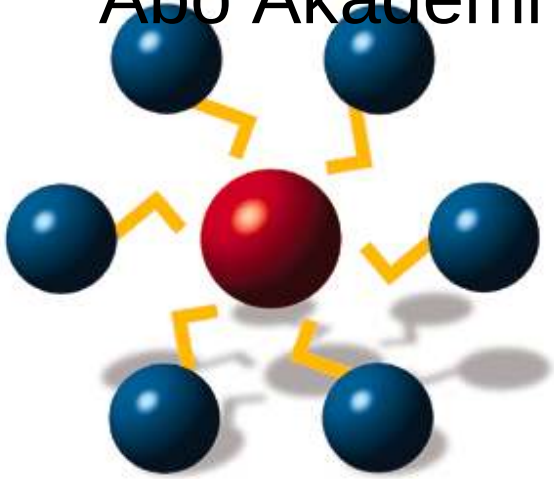
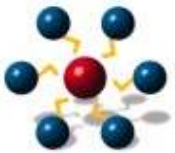
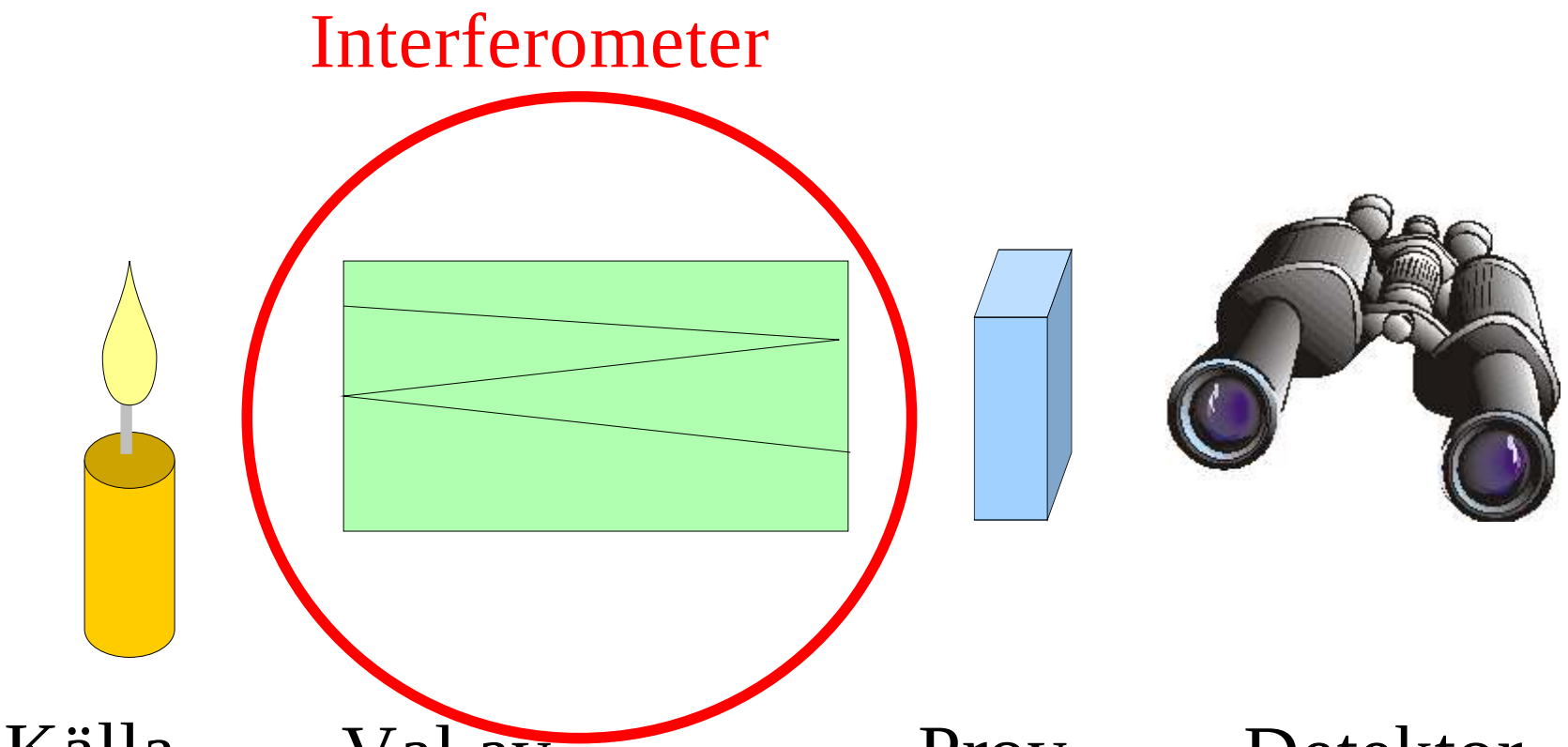
Spektrometer

Matti Hotokka
Institutionen för Fysikalisk Kemi
Åbo Akademi

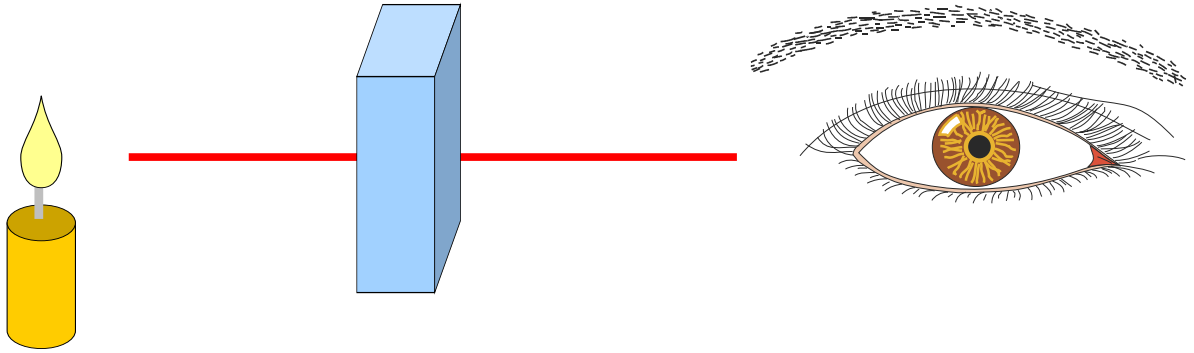


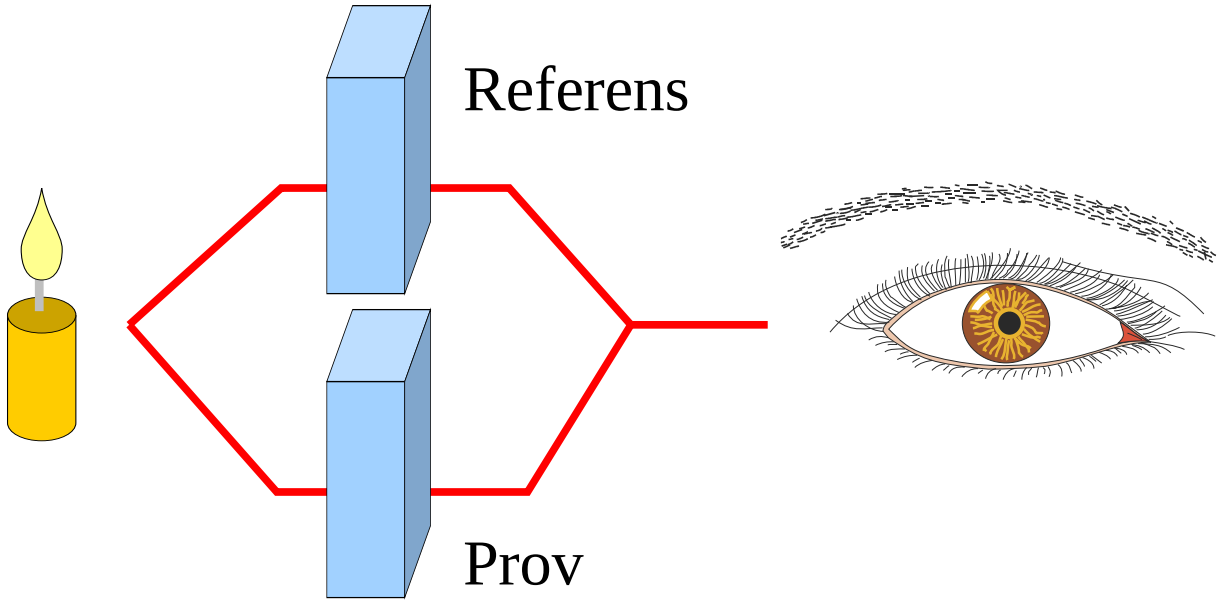


Spektrometer schematiskt



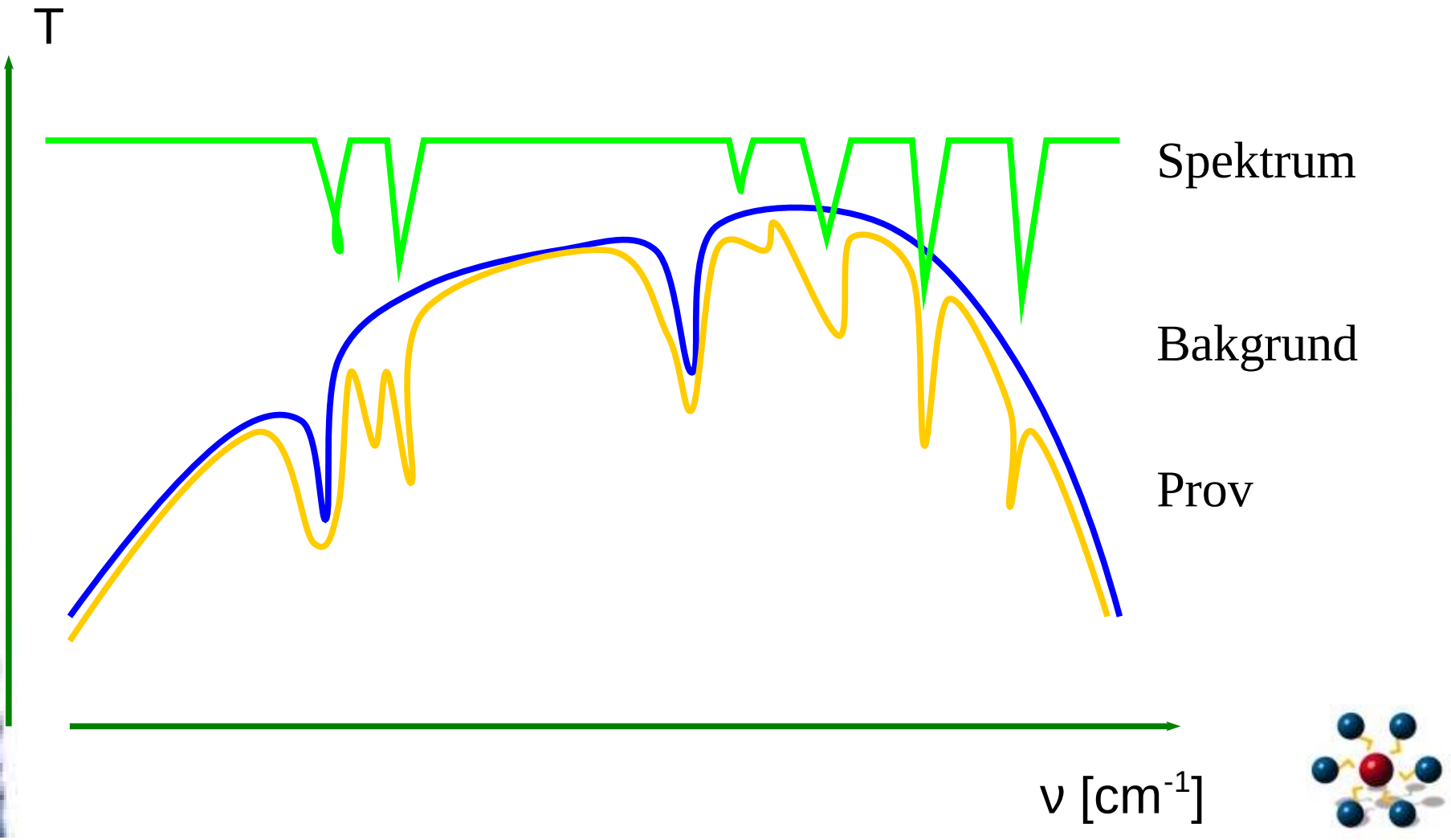
Enstråleapparat





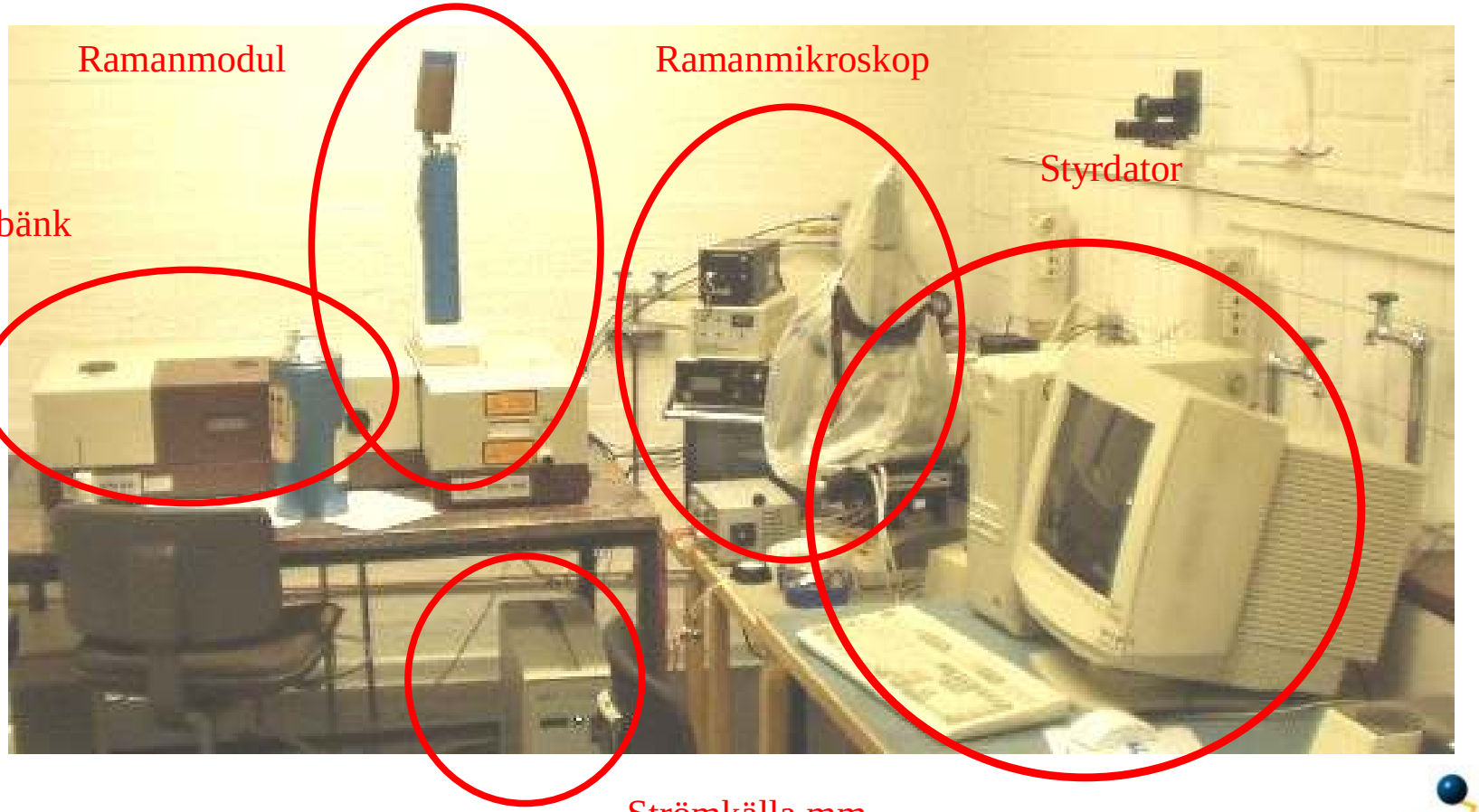
Enstråleapparat

Spektret fås genom att subtrahera



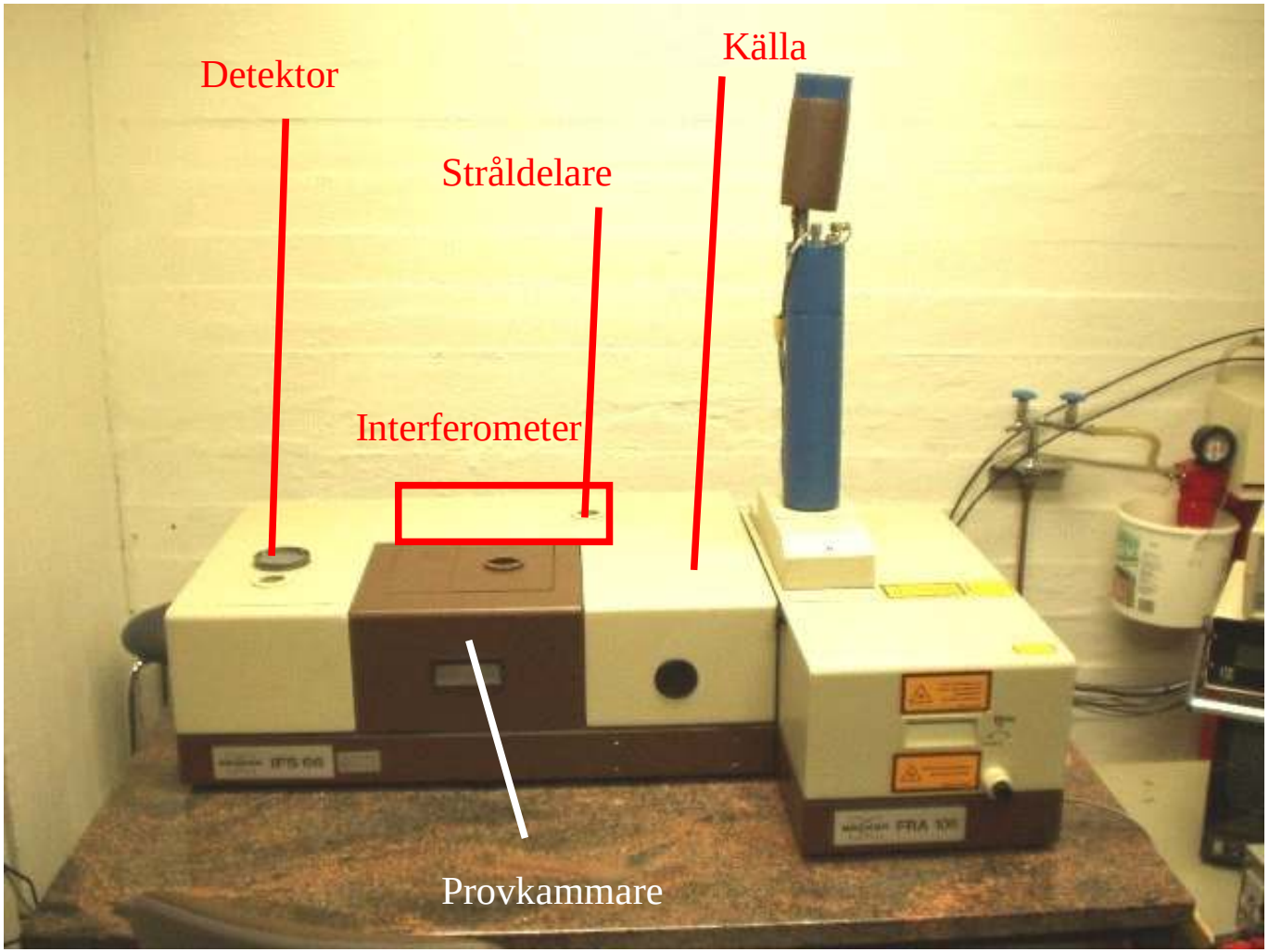
Exempel på apparat

Bruker IFS66

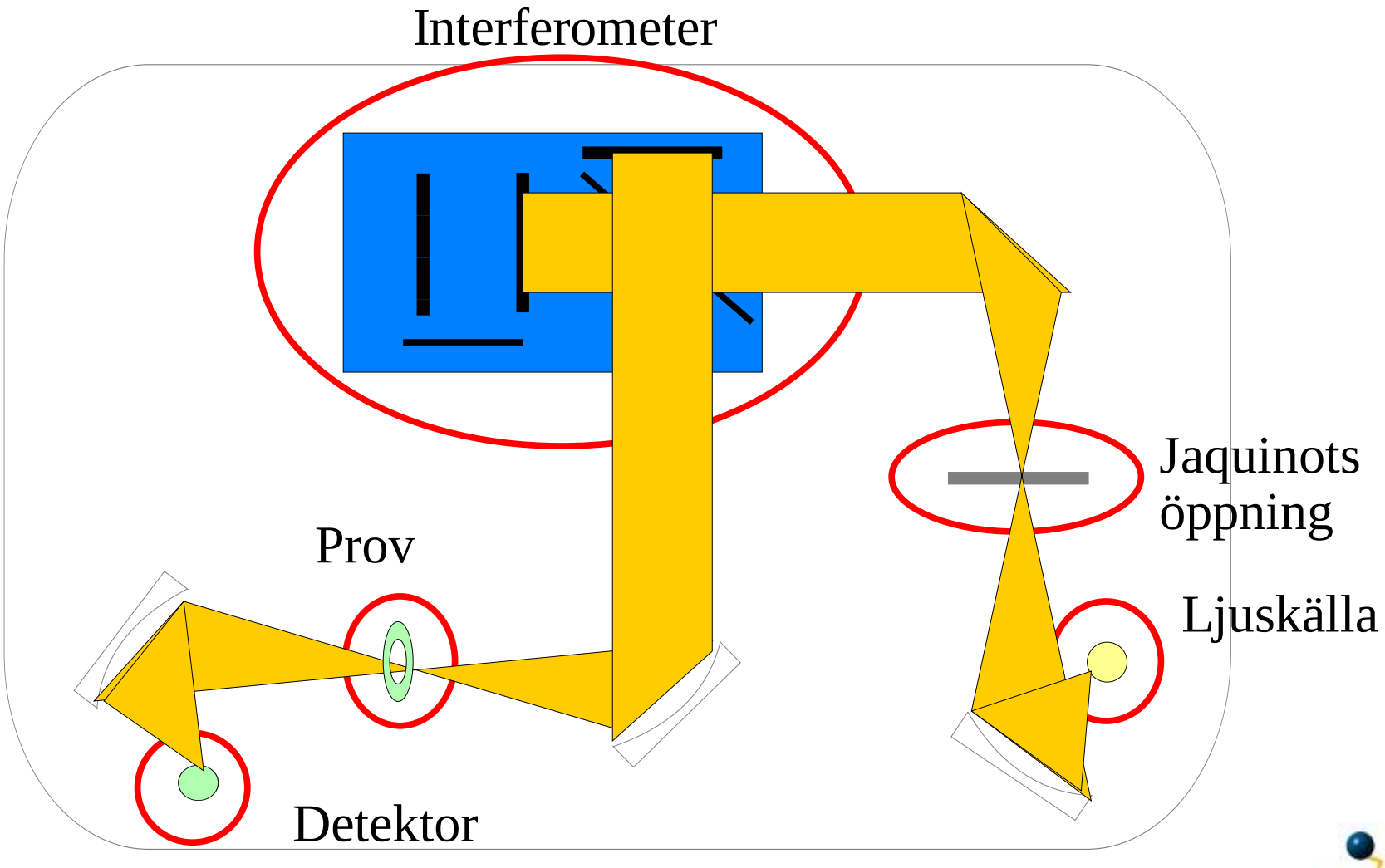


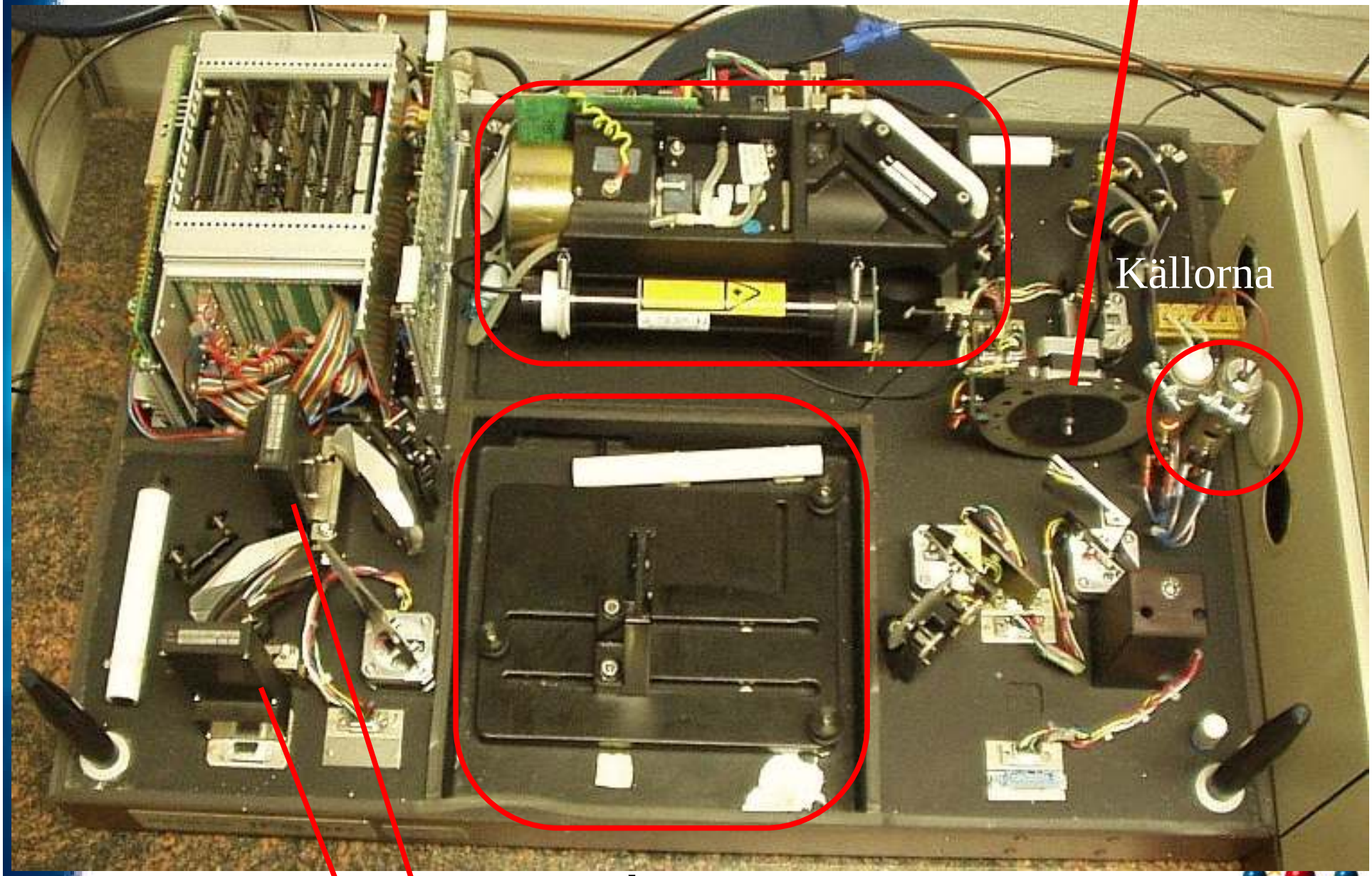
Exempelapparat

Bruker IFS66



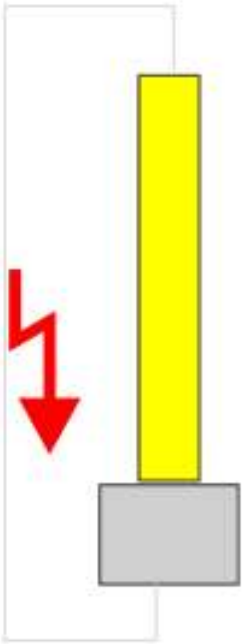
Bruker IFS66

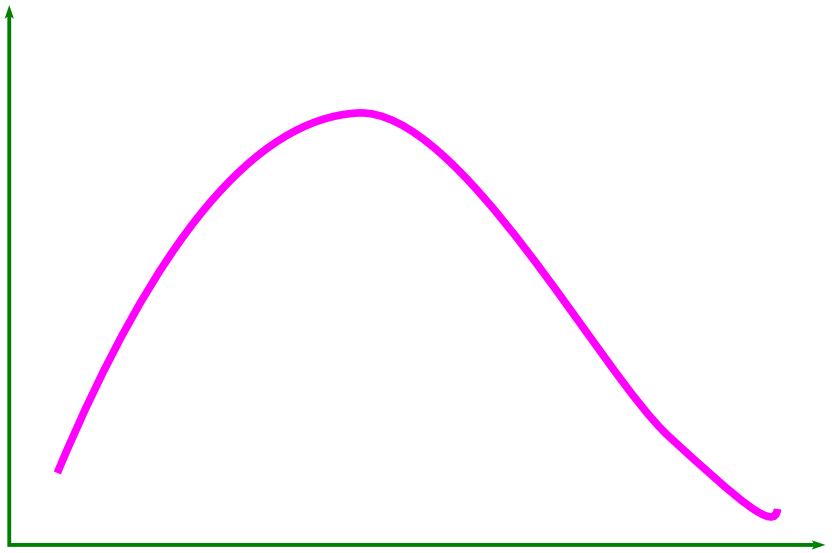



Interferometer
Jaquinotöppning
Källorna
Detektorerna
Provkammare

Ljuskällan

Nernstkälla

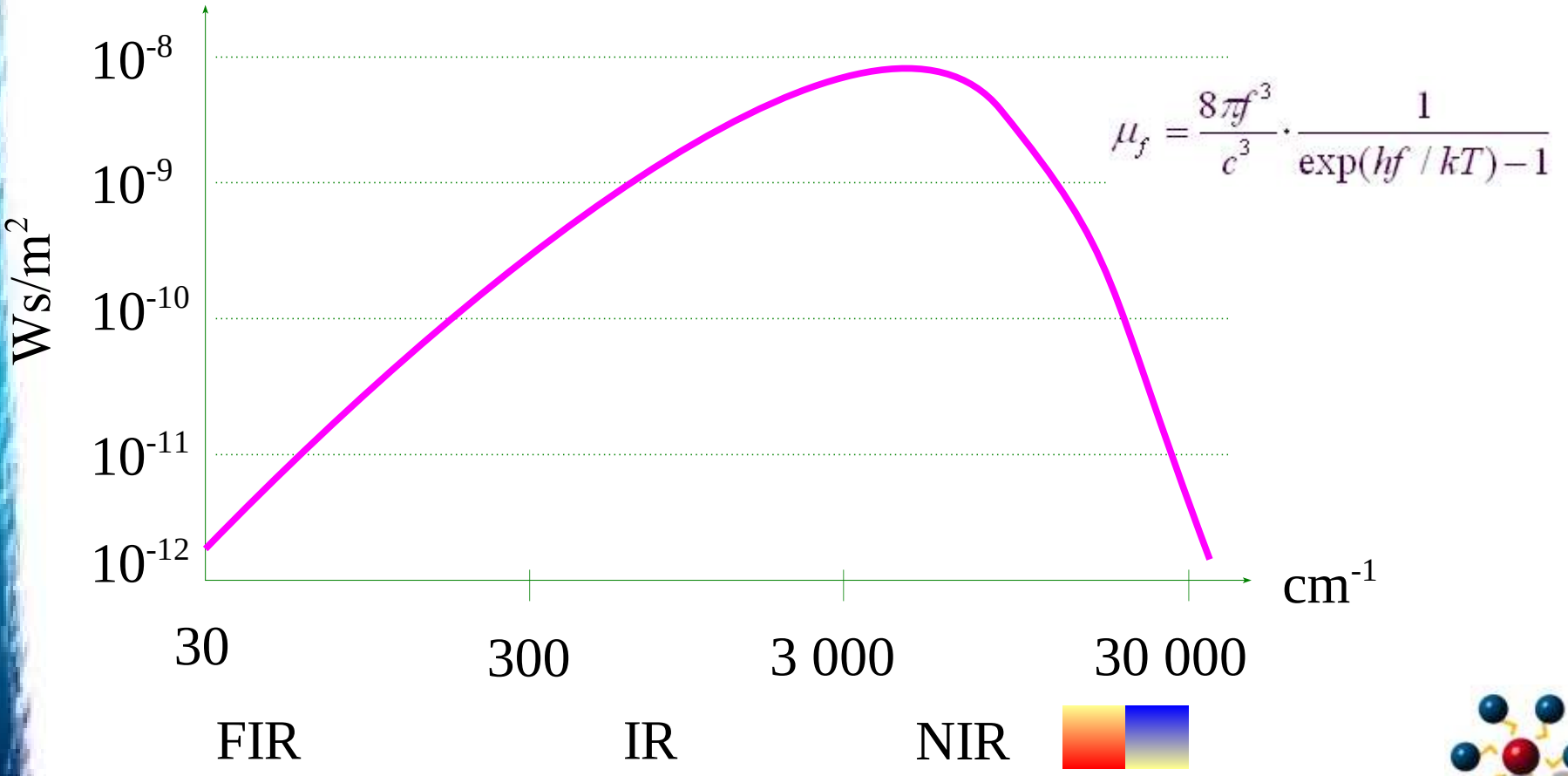




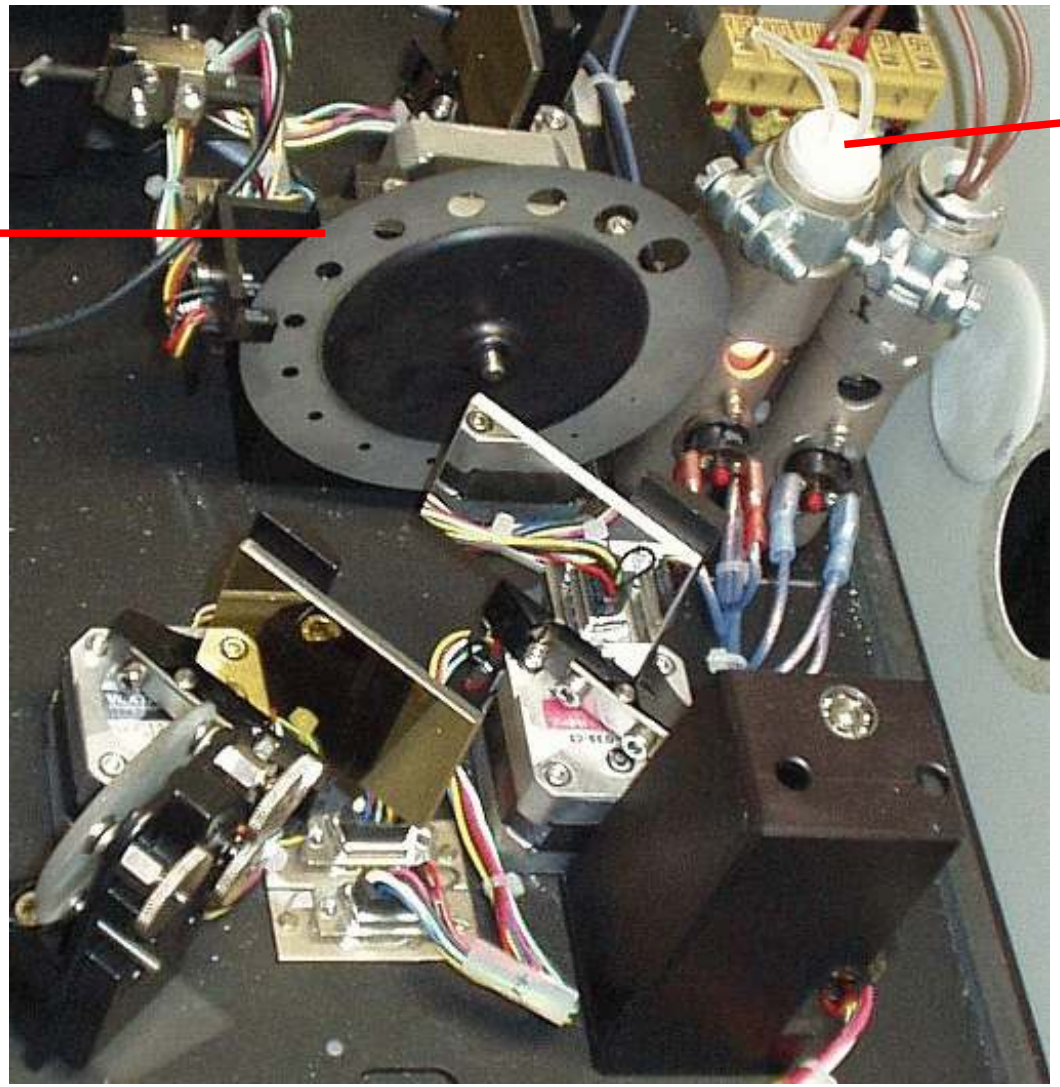
Sällsynta jordarters oxider.
Ca. 1500 °C

Källans ljusintensitet

Glödande svarta kroppens strålning

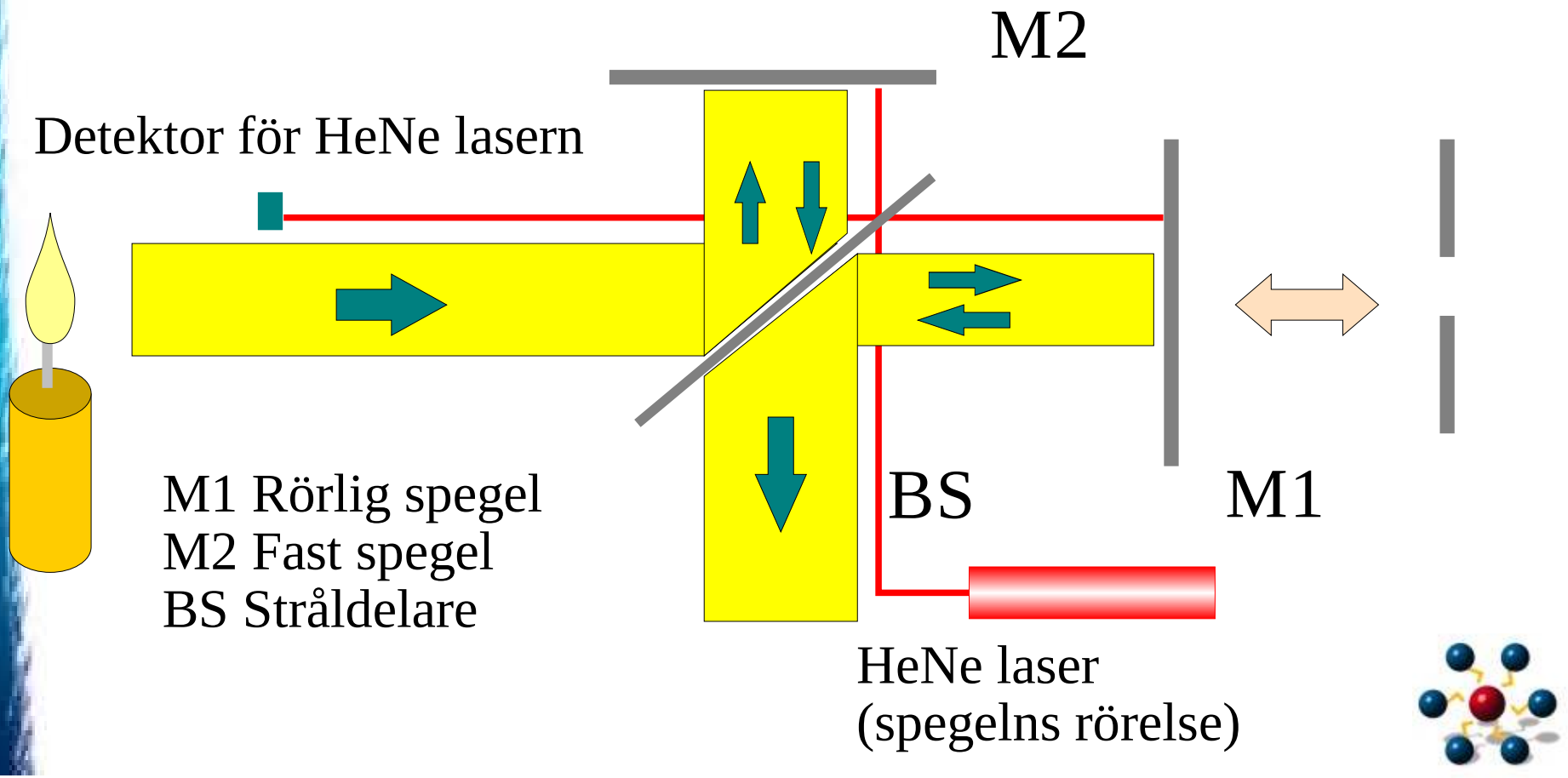


Källan

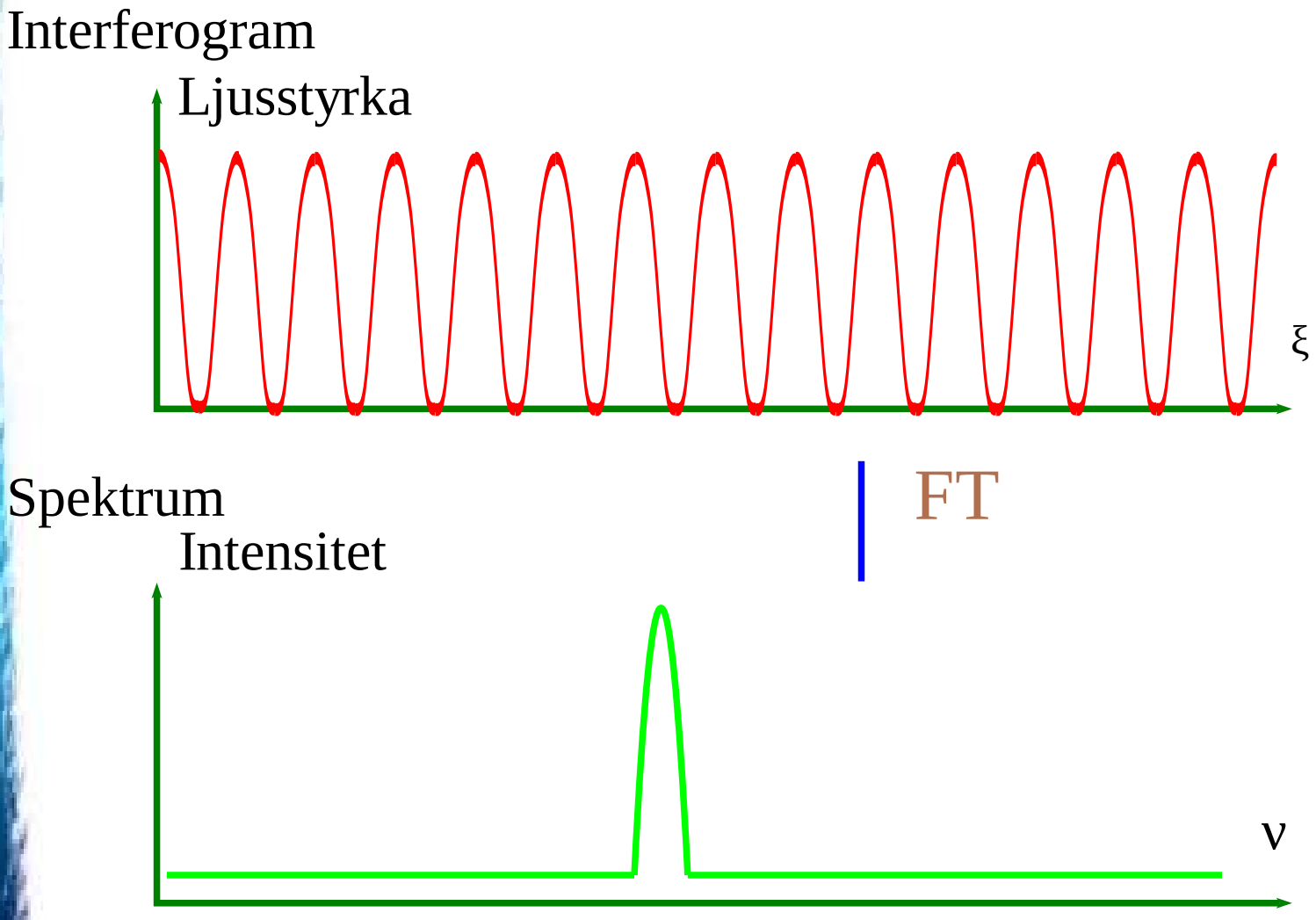


Michelsons interferometer

Schematiskt



Fouriertransformation

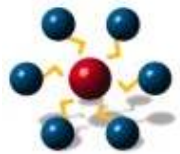


Fouriertransformation

$$S(\nu) = \int_0^{\infty} P(\xi)\cos(2\pi\nu\xi)d\xi$$

IR-spektrum

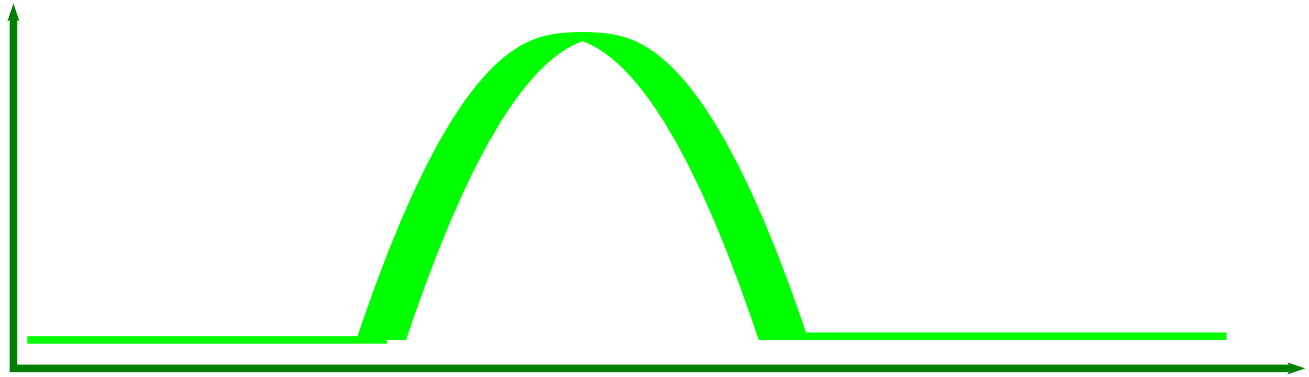
Interferogram

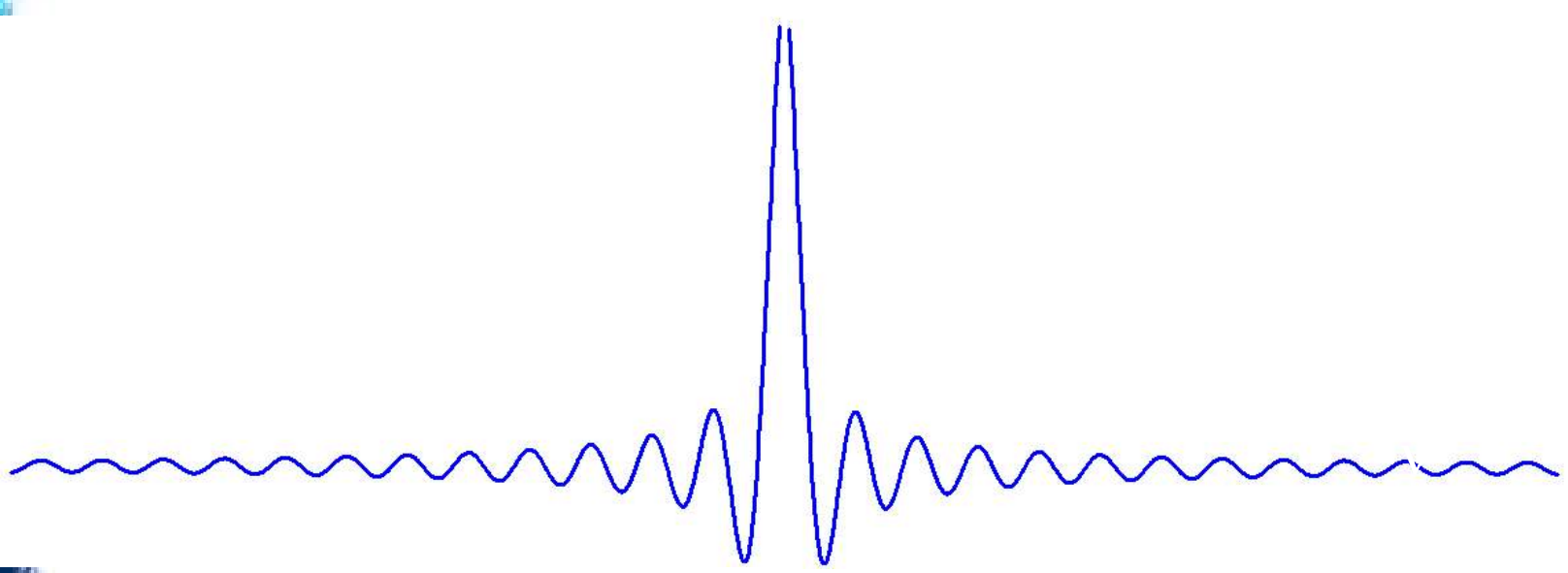


Fouriertransformation

Brett spektrum

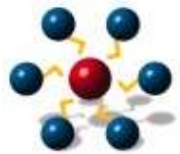
Intensitet





Fouriertransformation

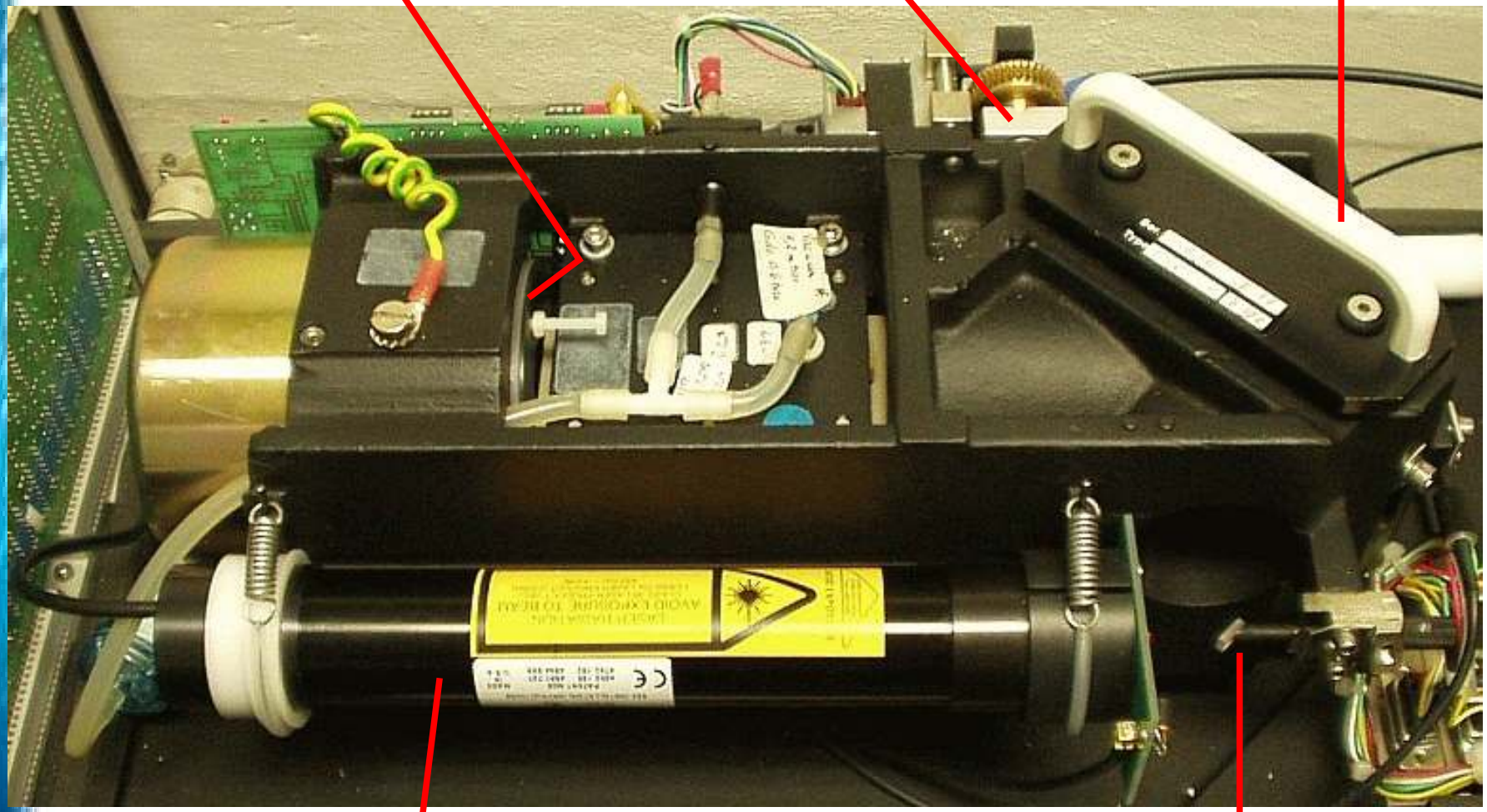
- Längre spegelrörelse => högre upplösning
- Tätare provtagning => högre frekvens



Rörlig spegel

Fast spegel

Stråldelare



HeNe laser

Spegel för laserstrålen

Interferometer

Stråldelare

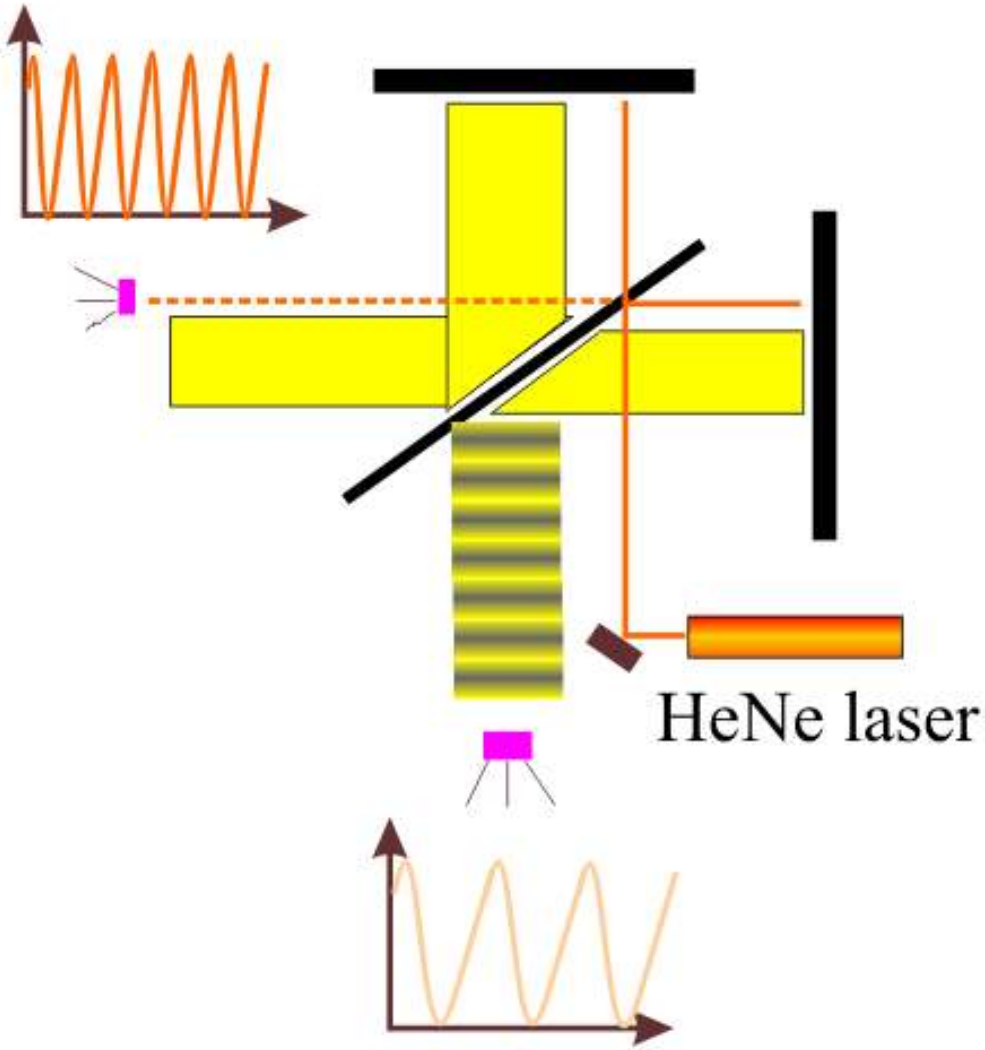
Interferometer

Stråldelare

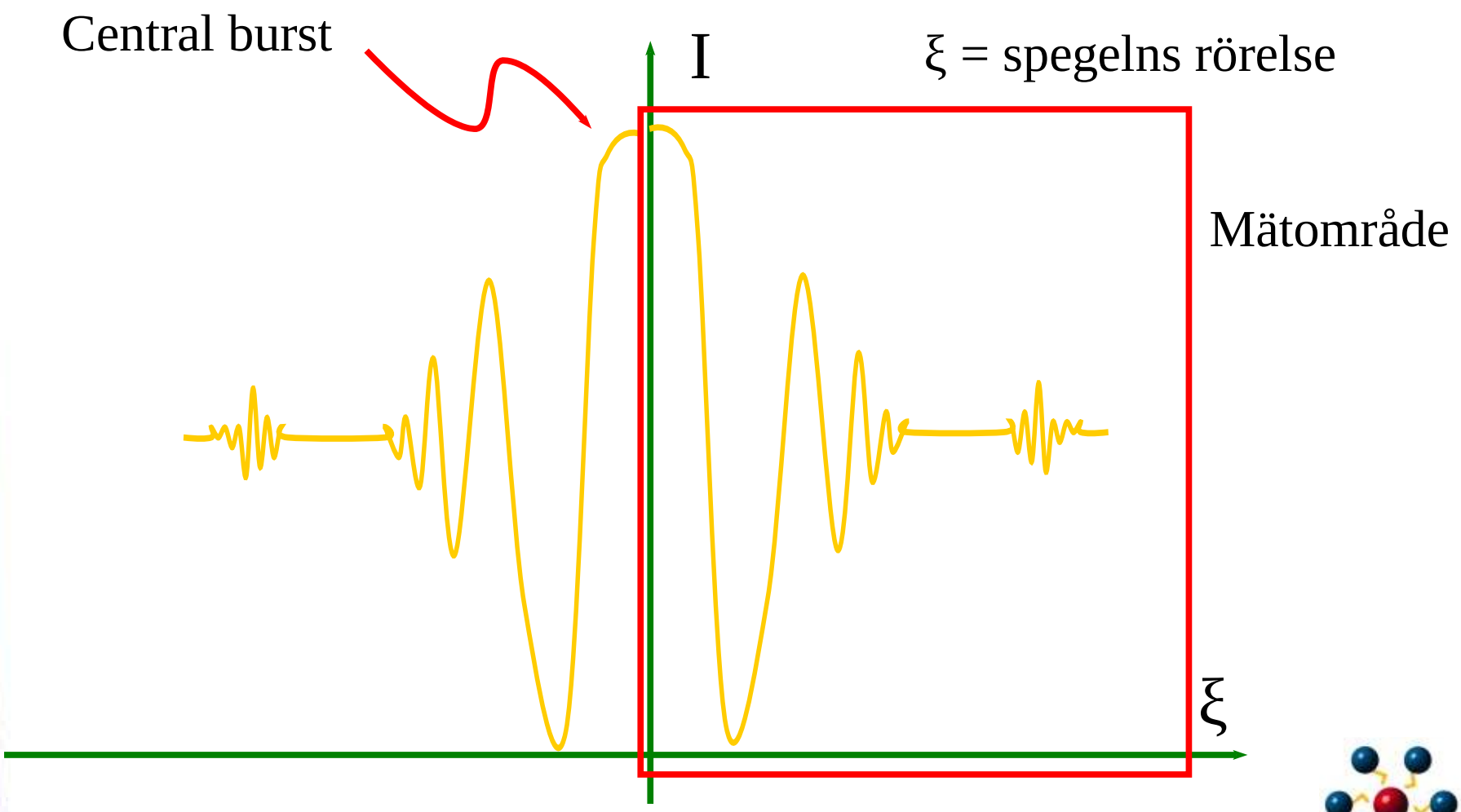
Interferometer

Stråldelare

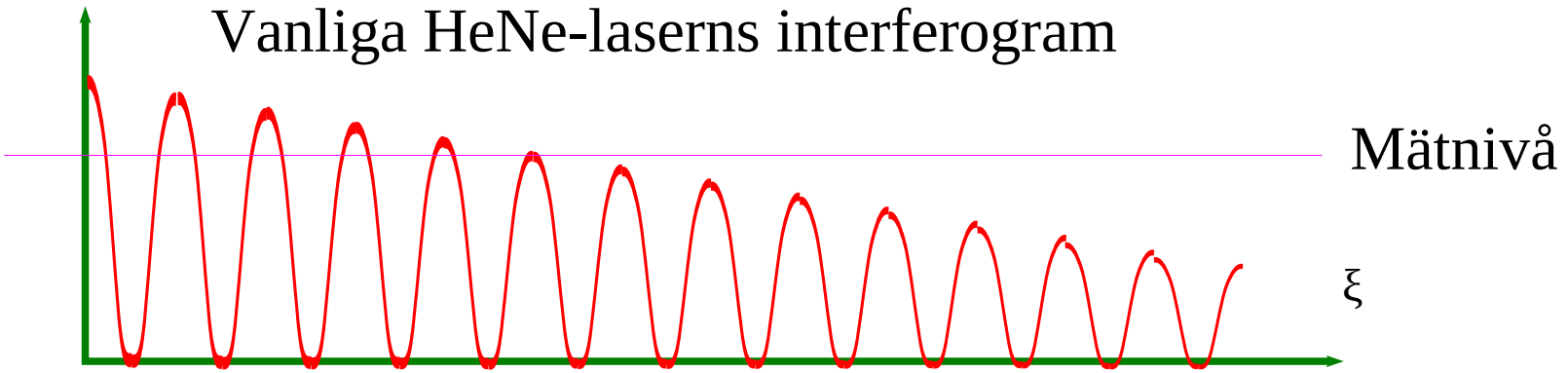
Interferometerns funktion

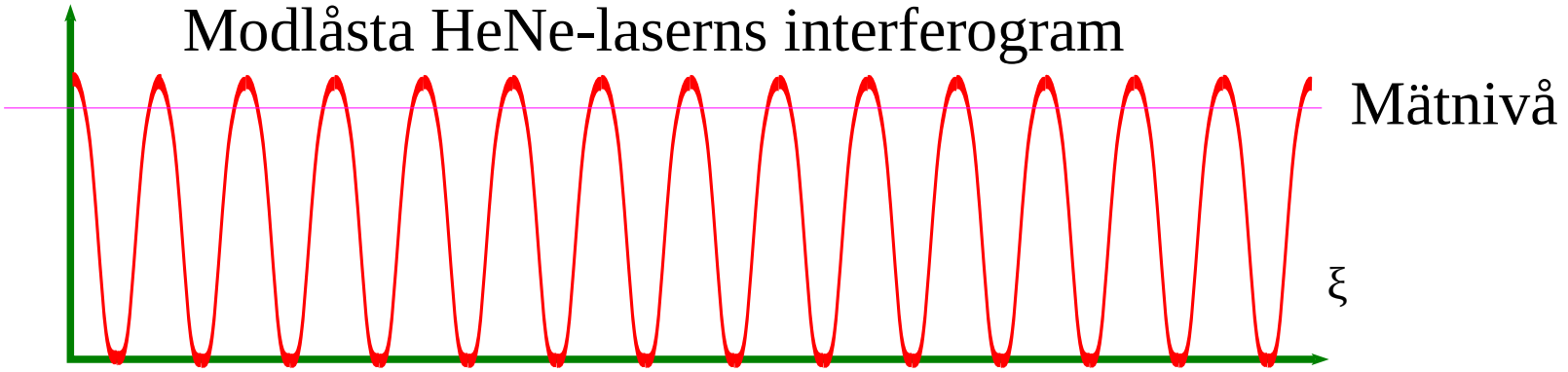


Interferogram



Laser för avståndsmätning

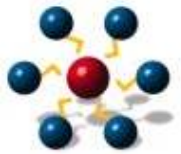




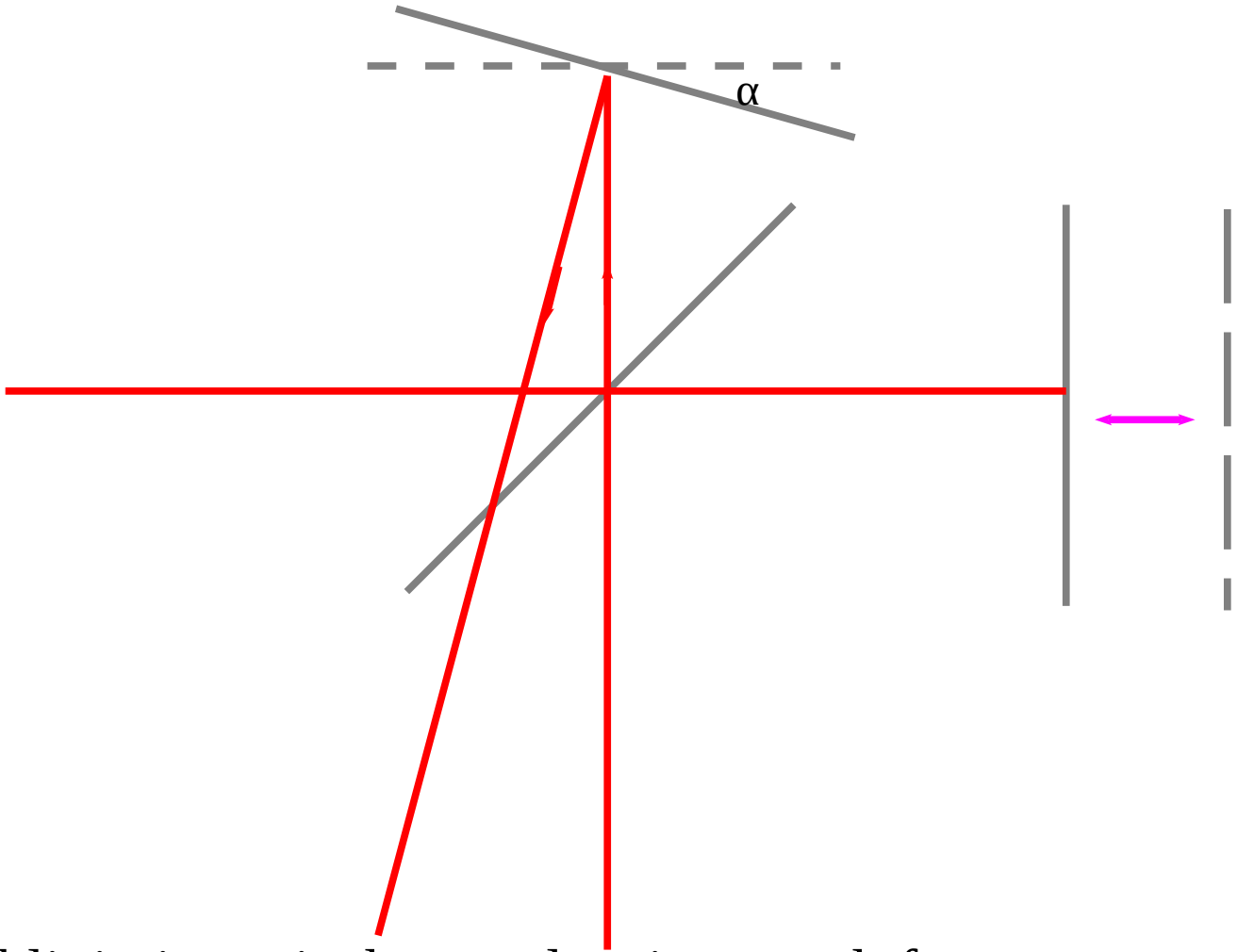
Spektrometerns linjering

Linjering betyder, att interferometerns speglar, speciellt den fasta spegeln, vrids så, att det centrala bandet (central burst) har den största möjliga ljusstyrkan.

Då interferometern inte är rätt justerad, lider spektret av dålig känslighet och många andra brister.

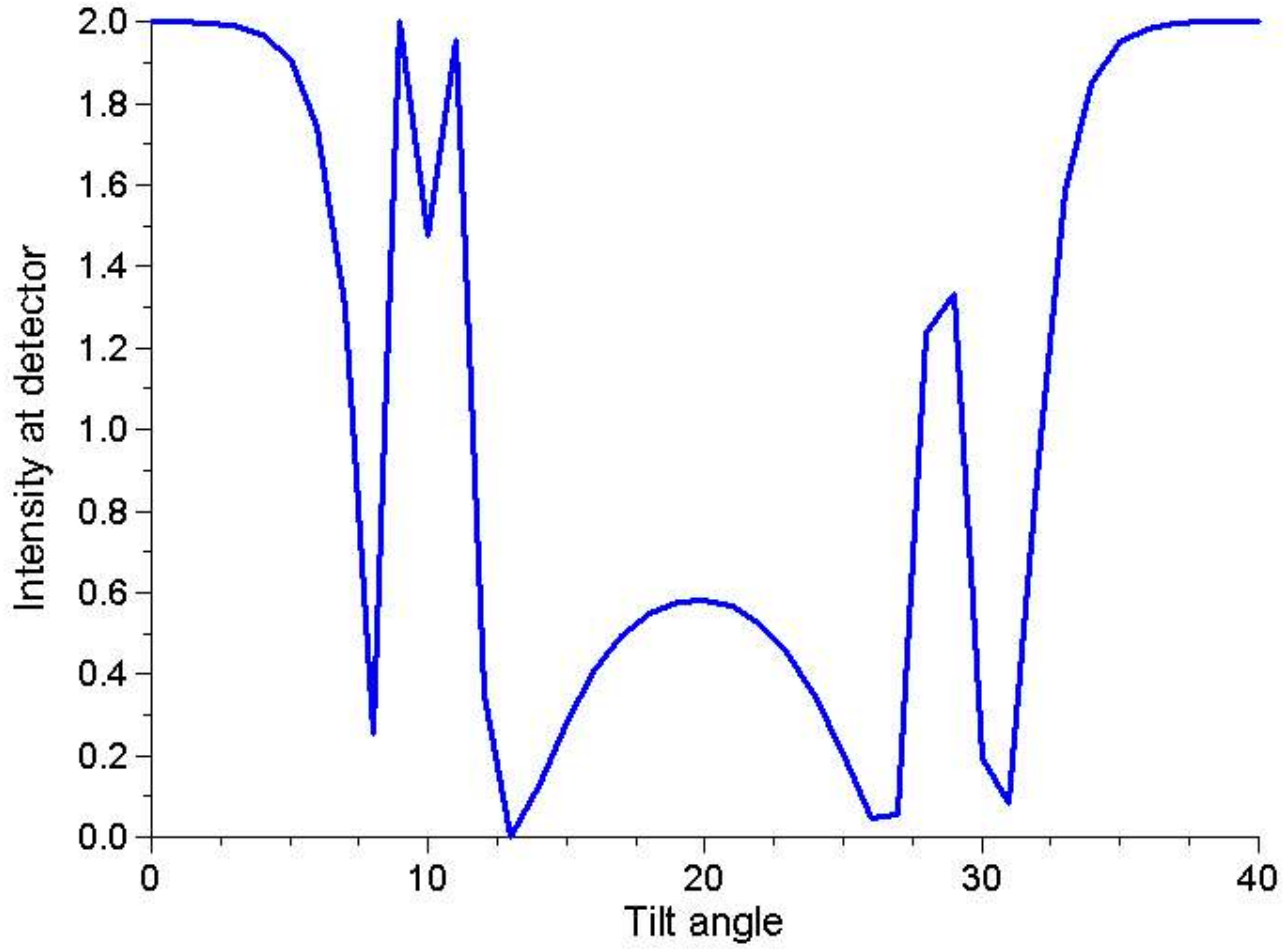


Fel linjering



Fel linjering minskar upplösningen och förvränger vågtalsaxeln.

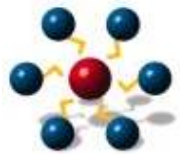
Fel linjering



Detektor

Halvledardetektortyperna

- DTGS
  - Deuterium TriGlycine Sulphate
  - Fungerar vid rumstemperatur
  - Brett vågtalsområde
  - Inte speciellt känslig
- MCT
  - Mercury Cadmium Telluride
  - Känslig
  - Måste kylas
  - Snävt vågtalsområde

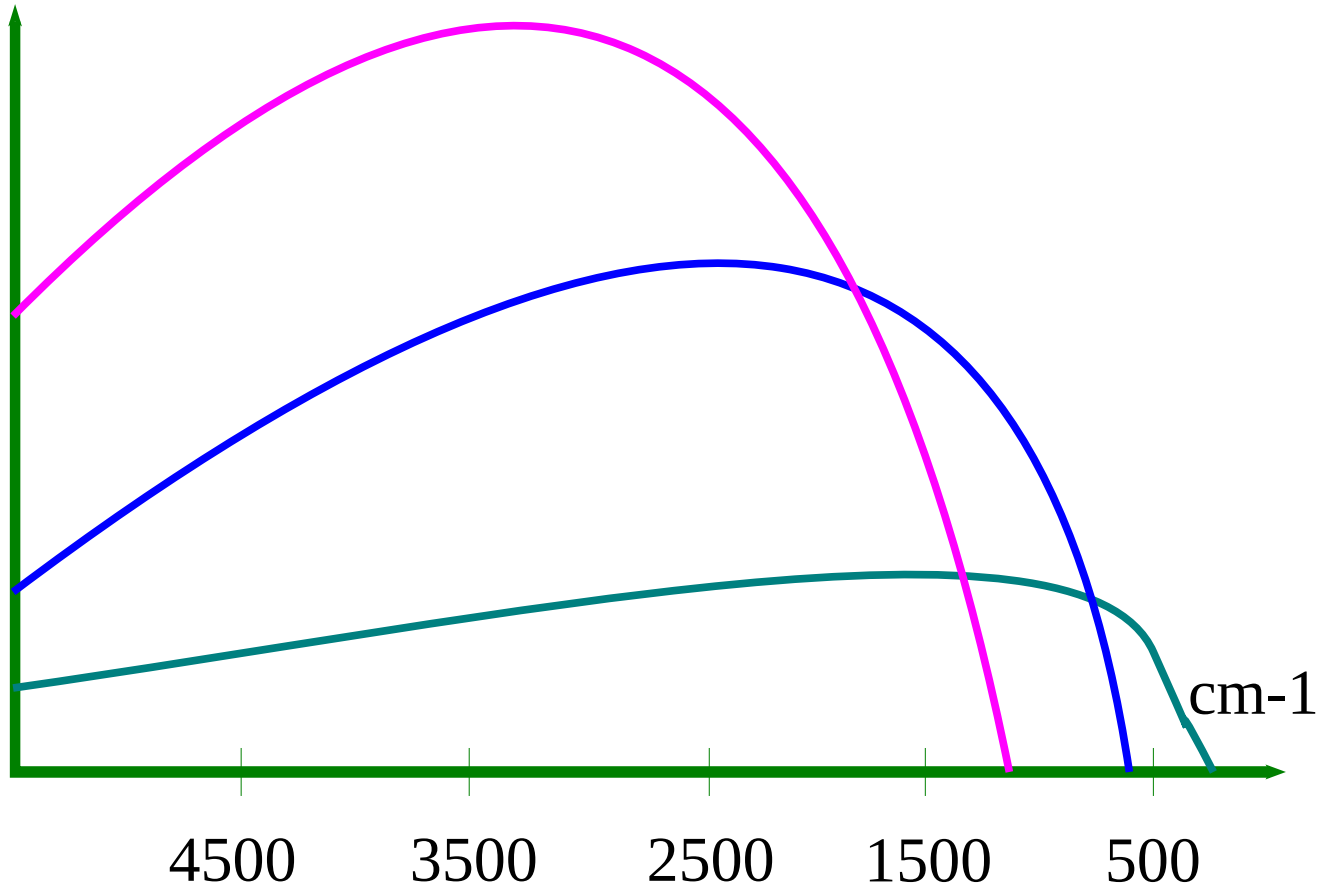


IFS66

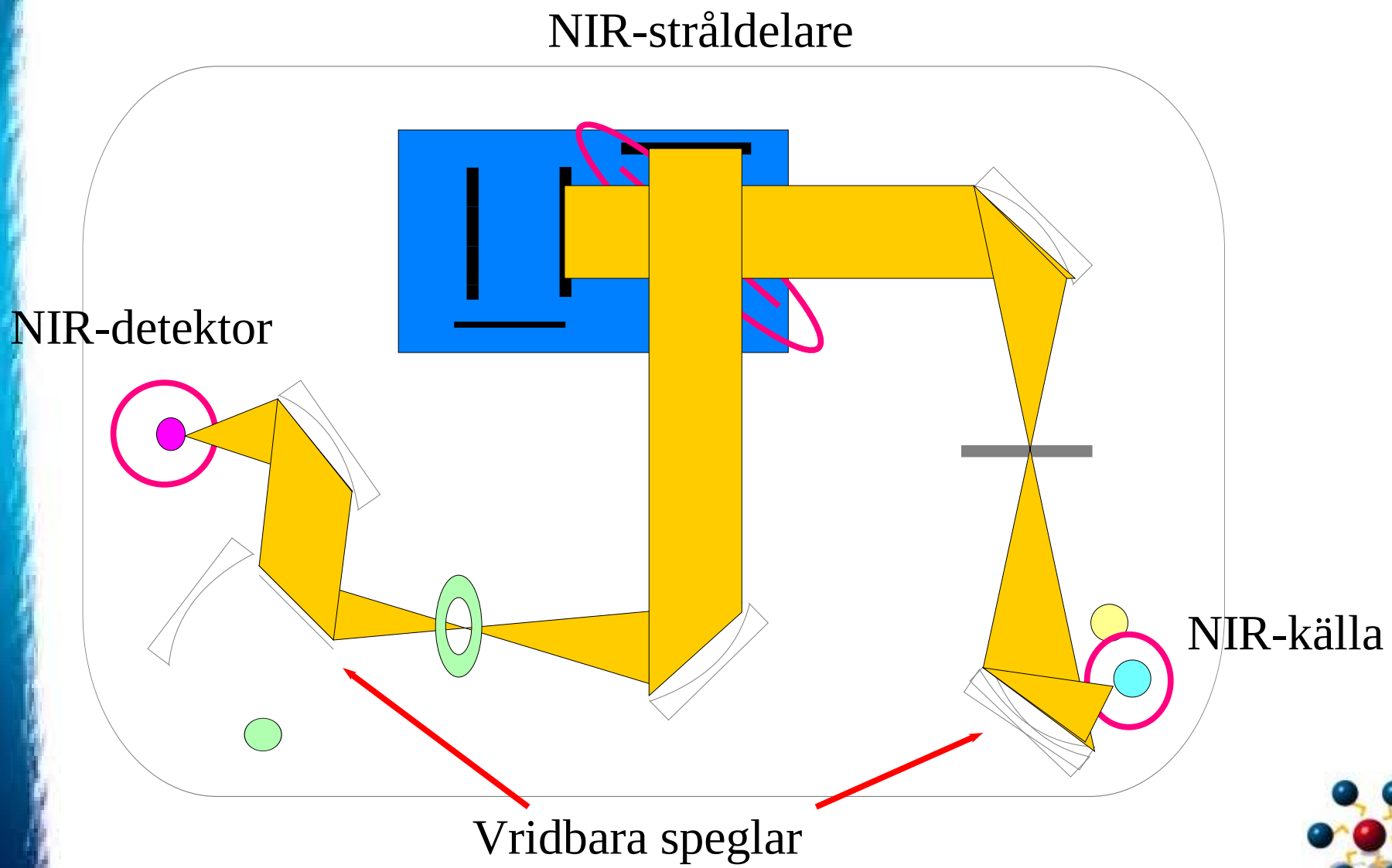
Mid-IR detektor

MCT-detektorerna

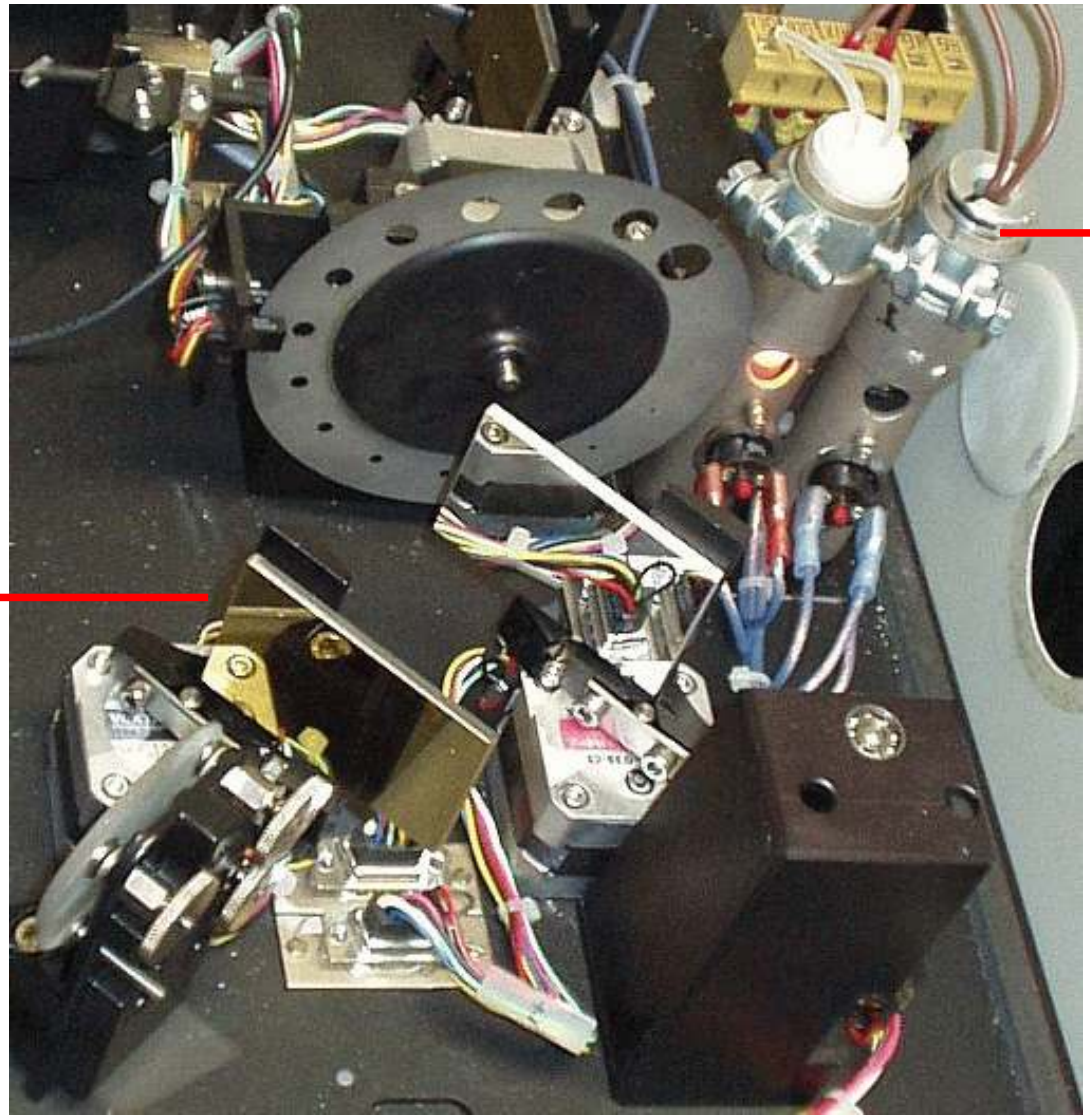
Känslighetskurvor



NIR-option



IFS66

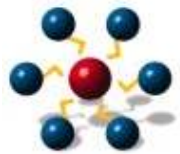


NIR-källa

Strålens
styrning

NIR-källa

- Wolframglödlampa

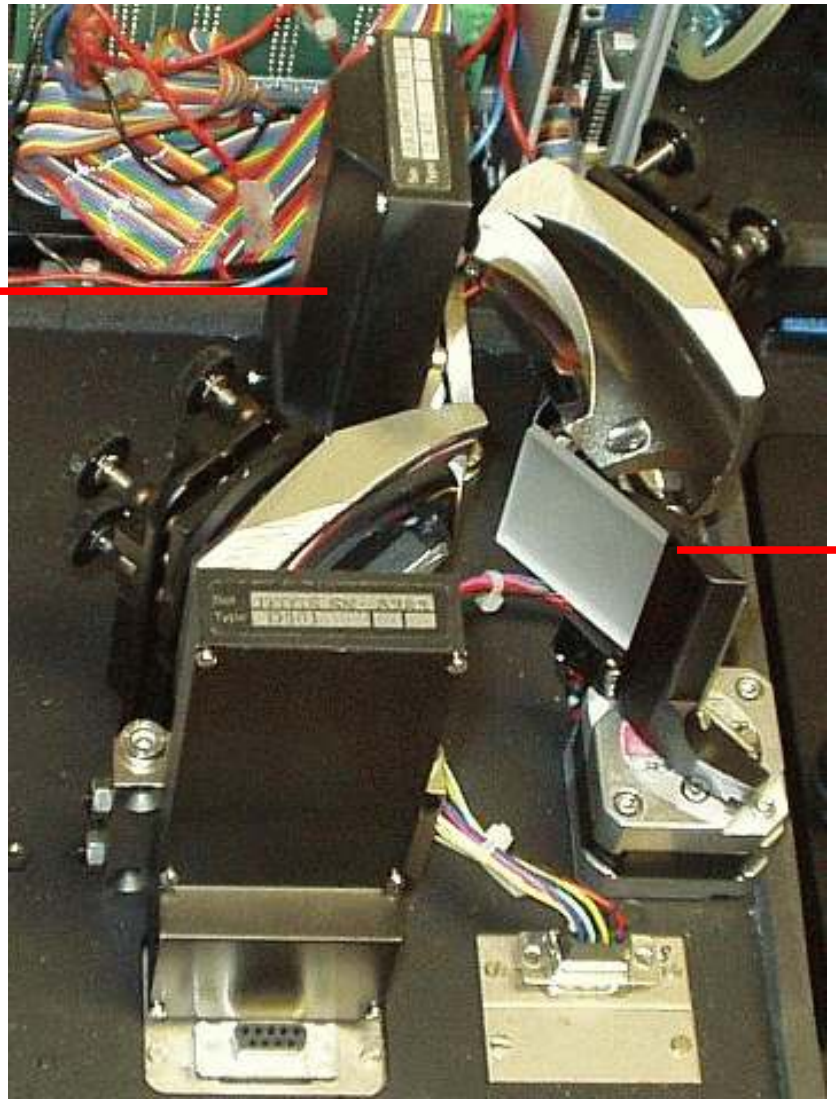


NIR-stråldelare

- Oftast inbyggd i apparaten (i en revolver)

IFS66

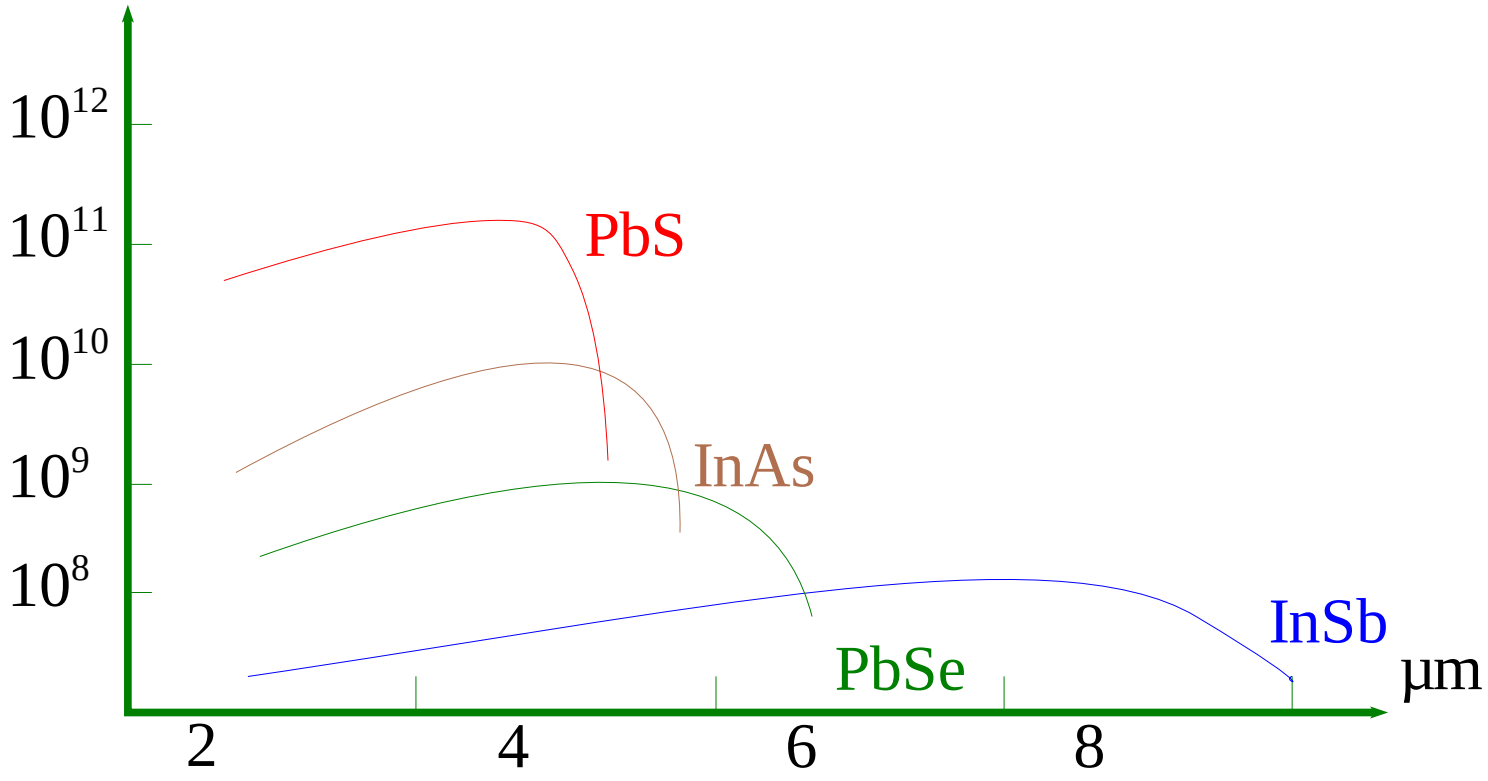
NIR-detektor



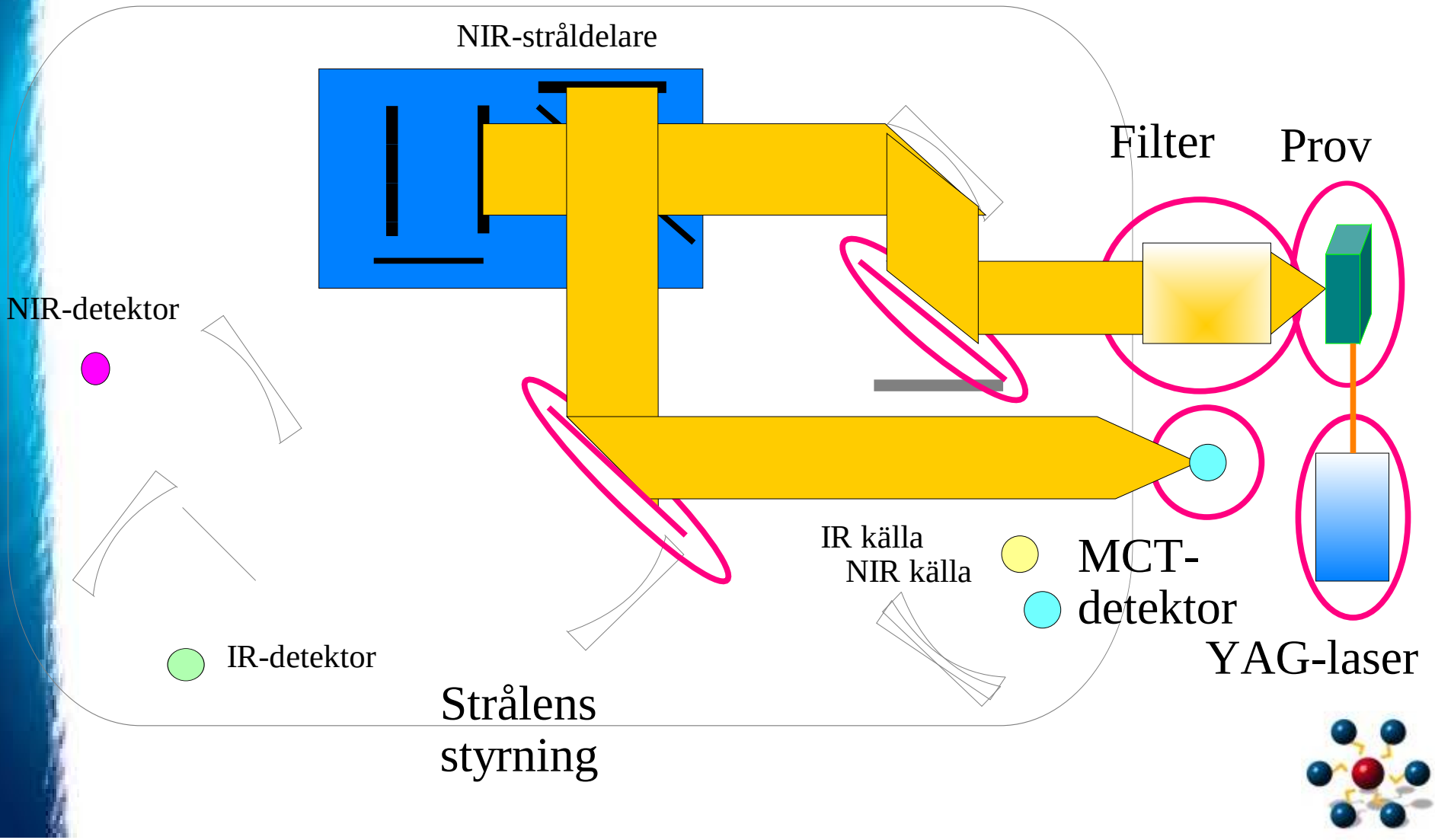
Strålens styrning

NIR-detektor

⇨ Dioddetektorer

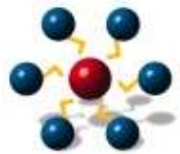


Ramanoption



Väckning

- Normalt en laser
  - YAG-laser: NIR-ljus, λ = 1 µm
  - Ibland laser som emitterar synligt ljus, t.ex. HeNe eller Ar
  - Hög ljusstyrka => stark Raman-signal
  - Lätt att fokusera i provet



Filter