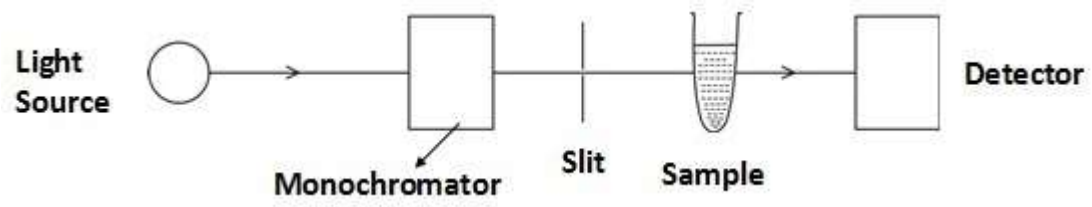
Benefits of Double Beam over Single Beam UV- Visible Spectrophotometers

UV-Visible spectrophotometric studies are based on absorption of light by sample solution placed in a cell made of transparent quartz. The solution should contain light absorbing molecules in the UV visible range or should form coloured speices on combining with complex forming reagents.

The single beam design came into existence before double beam and it offered high sensitivity as the entire beam energy was transmitted through the sample but once the double beam design was introduced it placed a greater reliability on absorption is measurements.

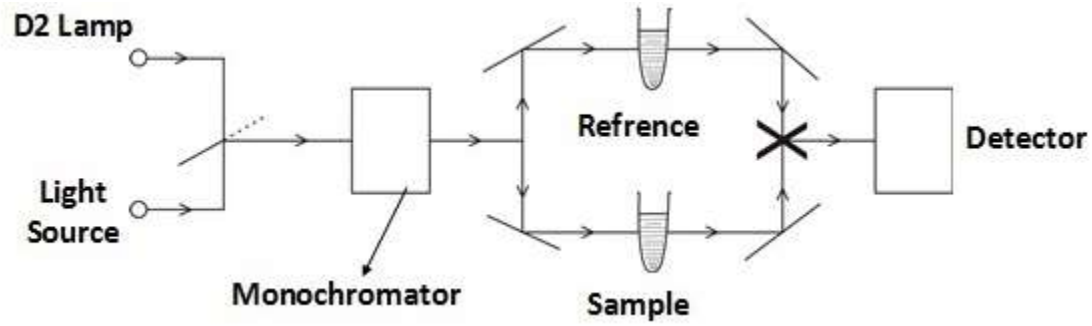
Single Beam Design



Single Beam UV-VIS Spectrometer

A single beam instrument records the ratio of the incident beam energy to the transmitted beam energy. The logarithm of this ratio is the absorbance of the sample. The ratio is obtained by taking a reading at the detector with no sample in the light path and subsequently with the sample in the light path. The ratio recording is achieved by using a beam splitter or a pulsed light source.

Double Beam Design



Double Beam UV-VIS Spectrometer

The incident beam is split into two portions with one portion passing through the sample and the other portion passing through the blank reference solution. The detector records the ratio of the two beams in real-time

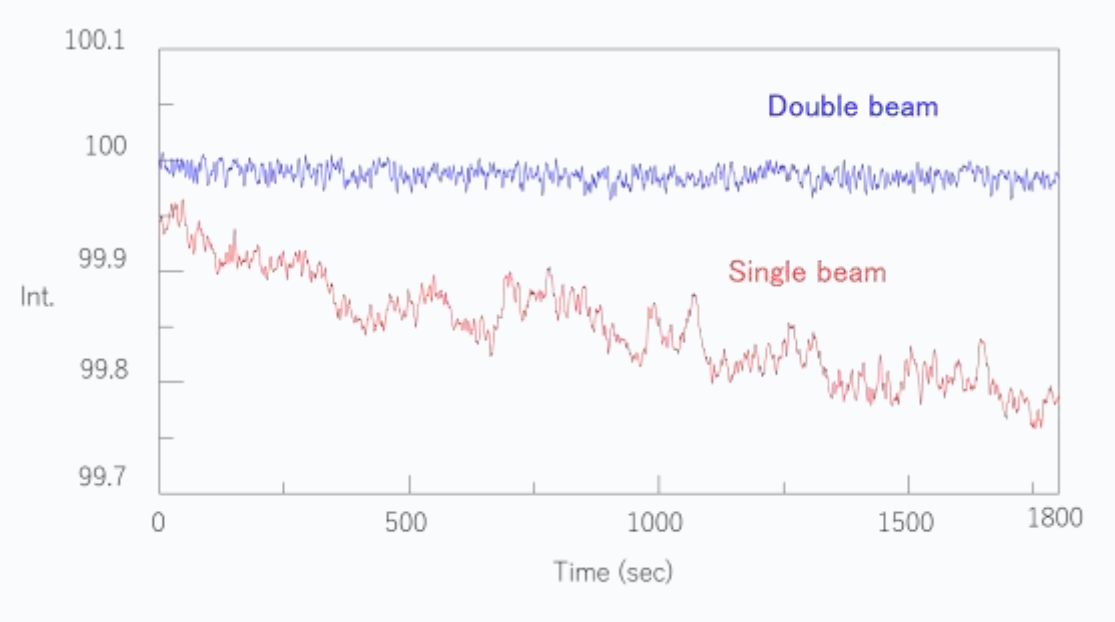
Benefits of Single Beam Design

- Less number of optical components results in improved light transmission and reduced noise
- Affords greater sensitivity due to higher light throughput

Benefits of Double Beam Design

- Correction of absorbance for solvent blank
- In single beam design there can be fluctuations in lamp energy between the ratio recording measurements.
- Correction due to fluctuations in stray light, beam intensity variations and electronic noise are applied in real-time

The benefits offered by double beam design far outweigh the sensitivity benefits of single beam systems. Current advances in optics and electronics have contributed to greater acceptance of double beam systems.



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