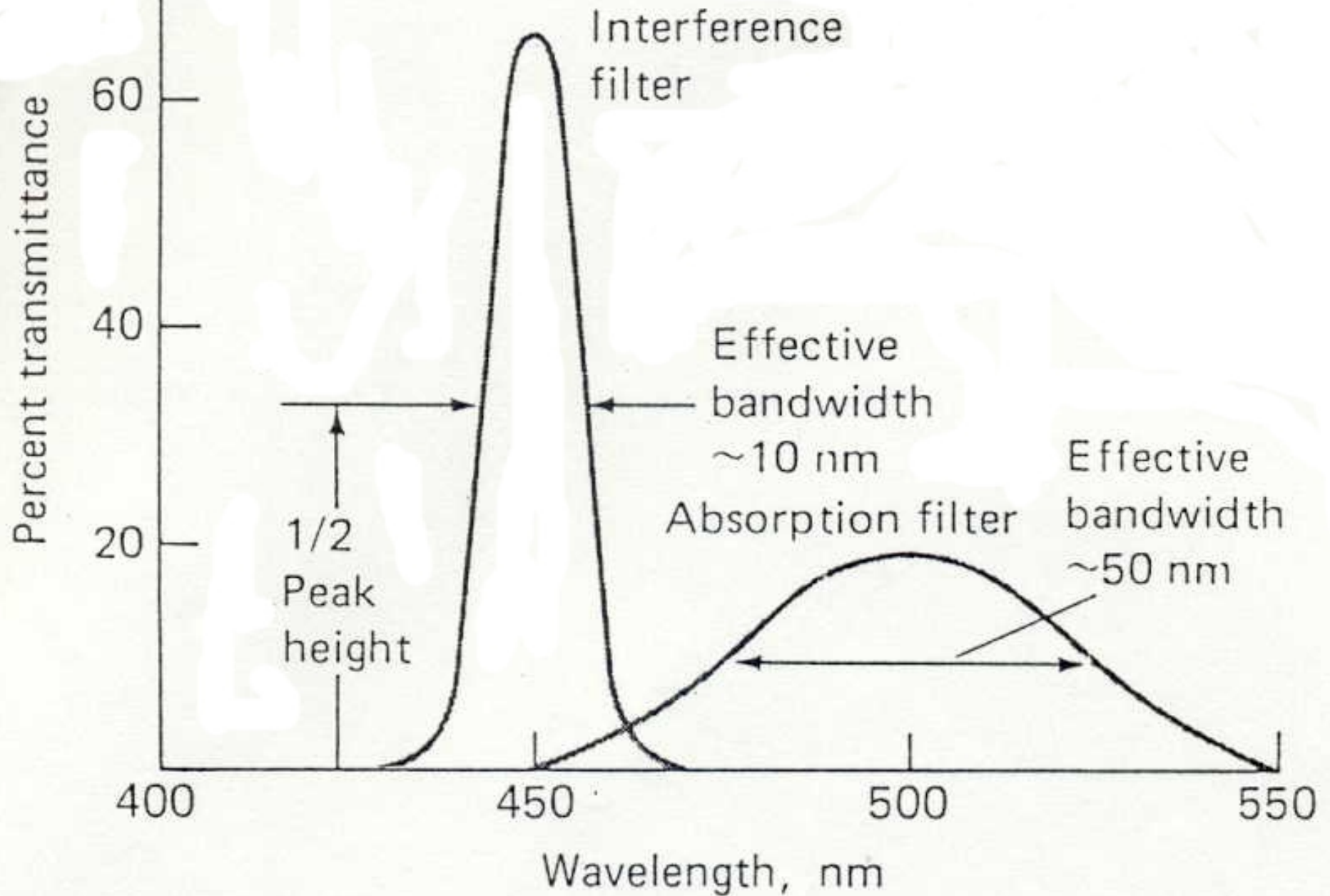
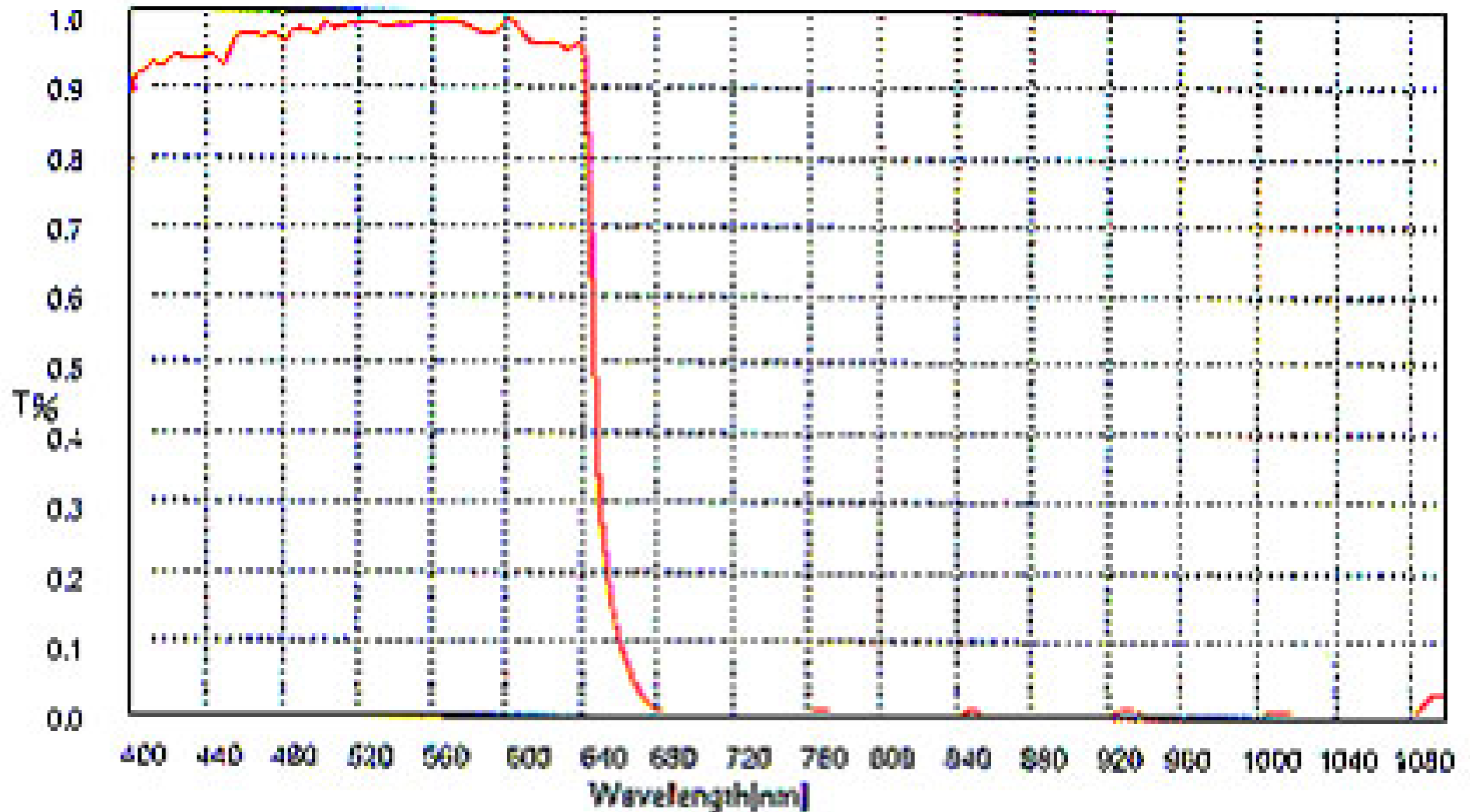


Transmittance Curves for Optical Filters

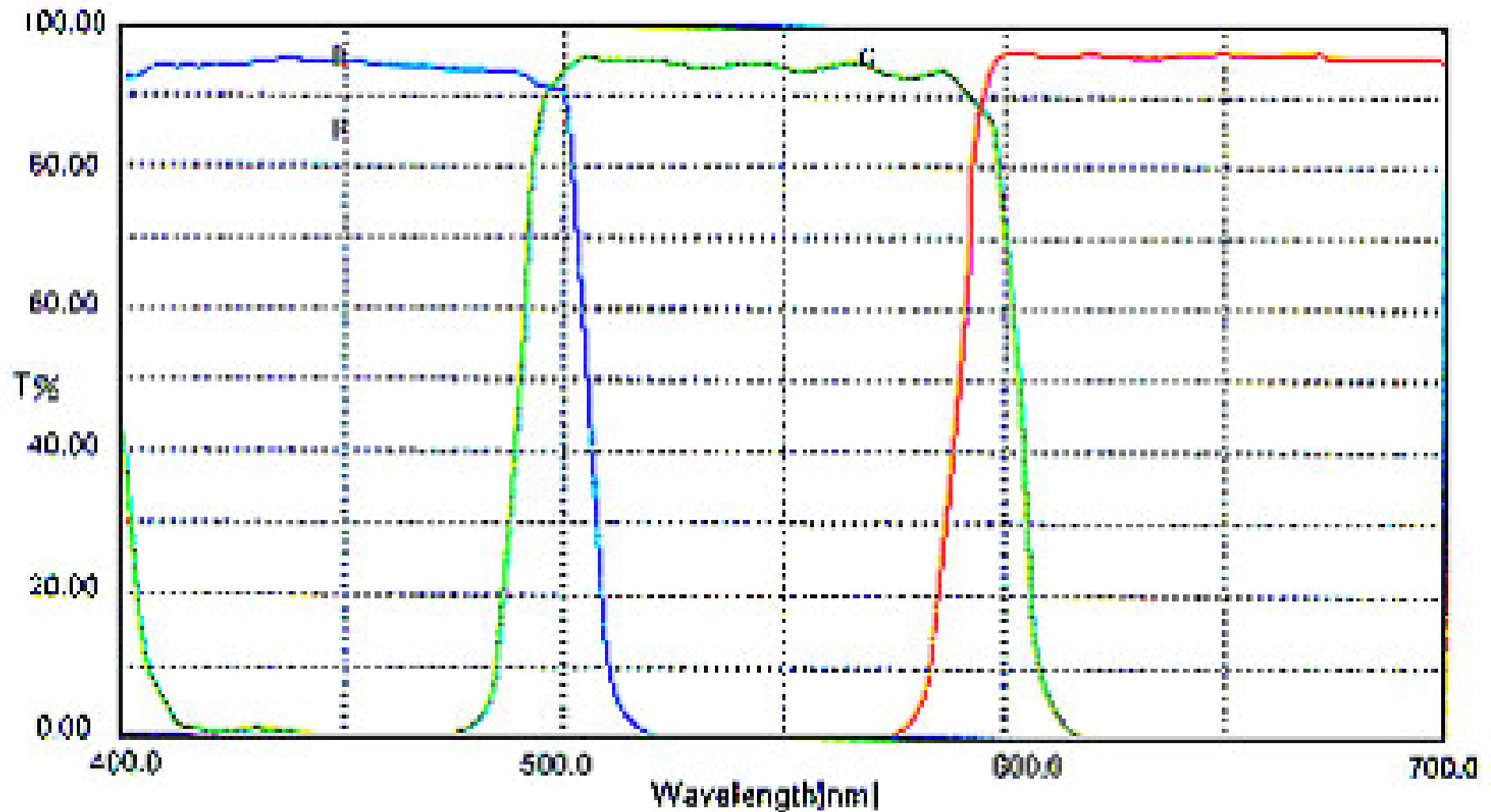


- Absorption filters are also known as bandpass filters
- Usually exhibit low peak transmittance
- Typically have a broad peak profile
- Can use two or more absorption filters together to produce desired transmittance characteristics
- Generic filters are 2 x 2 inch glass or quartz
- Relatively inexpensive

Cut-off filters or sharp-cut filters are also available
such as the 650 nm cut-off filter shown here
Cut-on filters have reverse profile



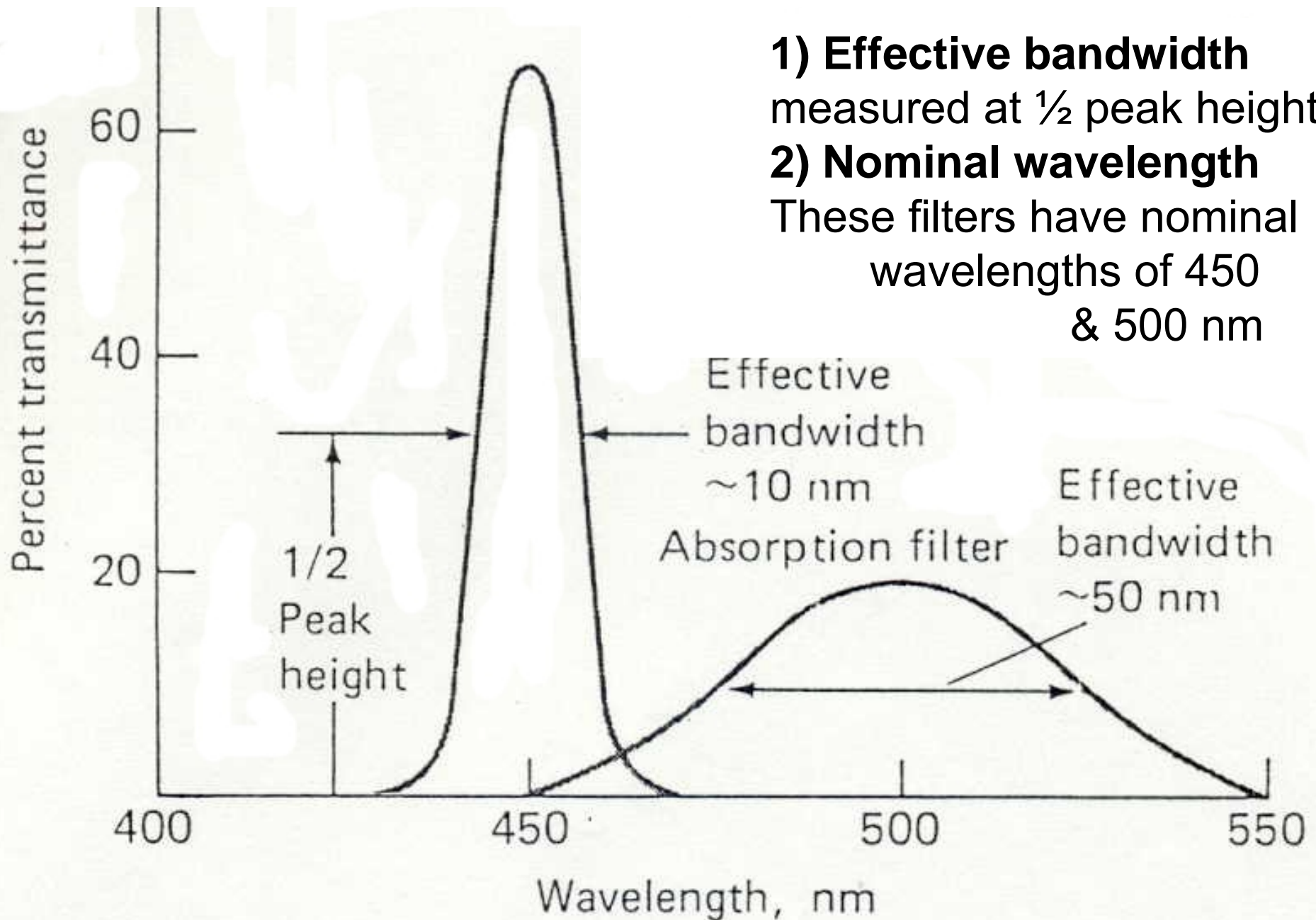
Combining two appropriate cut-off filters produces a bandpass filter. The example shown here comes from 3 filters producing bands at 500 & 600 nm.



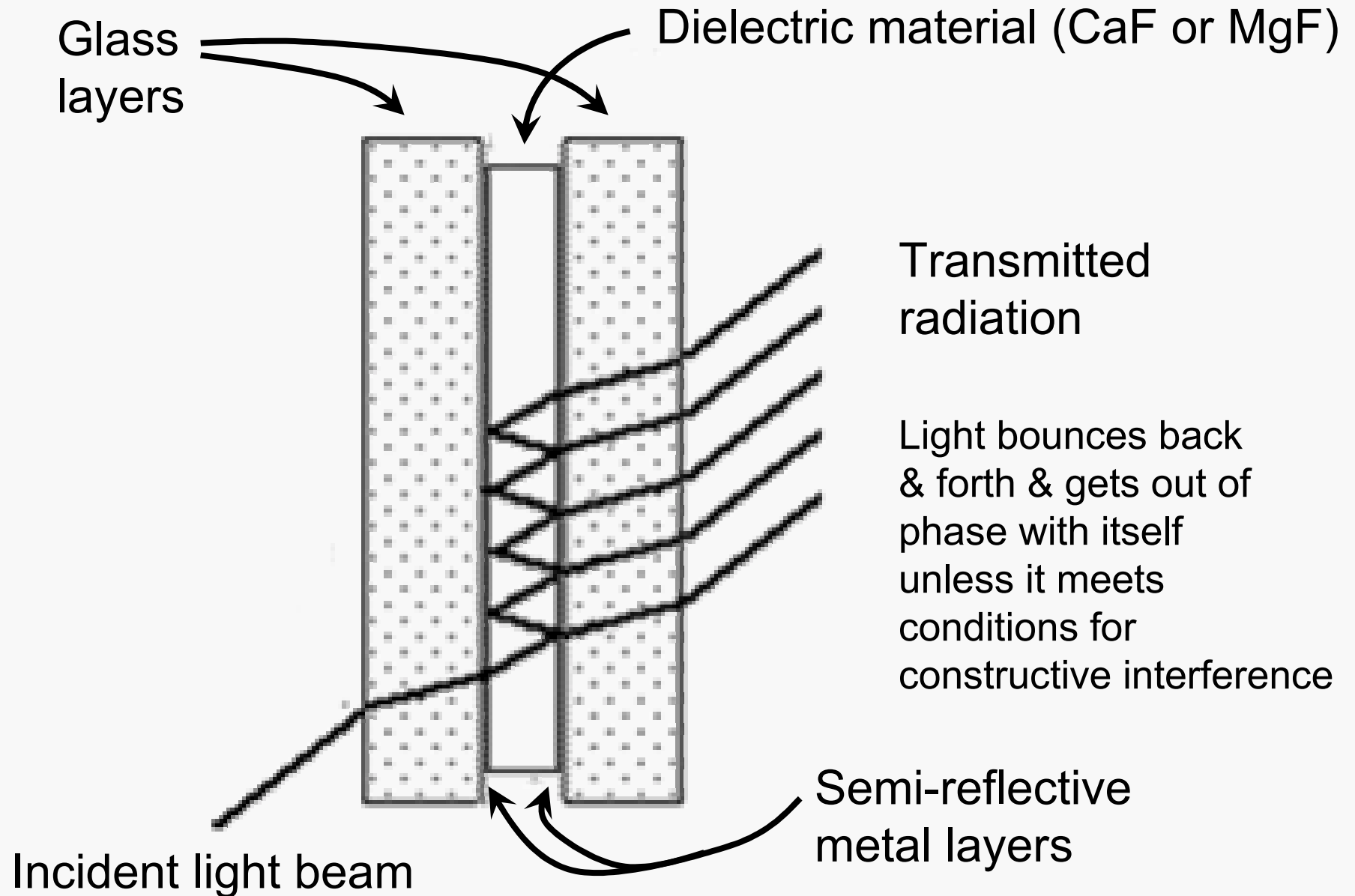
Two terms associated with optical filters are:

1) Effective bandwidth
measured at $\frac{1}{2}$ peak height

2) Nominal wavelength
These filters have nominal
wavelengths of 450
& 500 nm



2) Interference filters – usually Fabrey-Perot type



Condition for constructive interference

$$2d = \frac{m\lambda}{\eta}$$

distance between semi-reflective layers

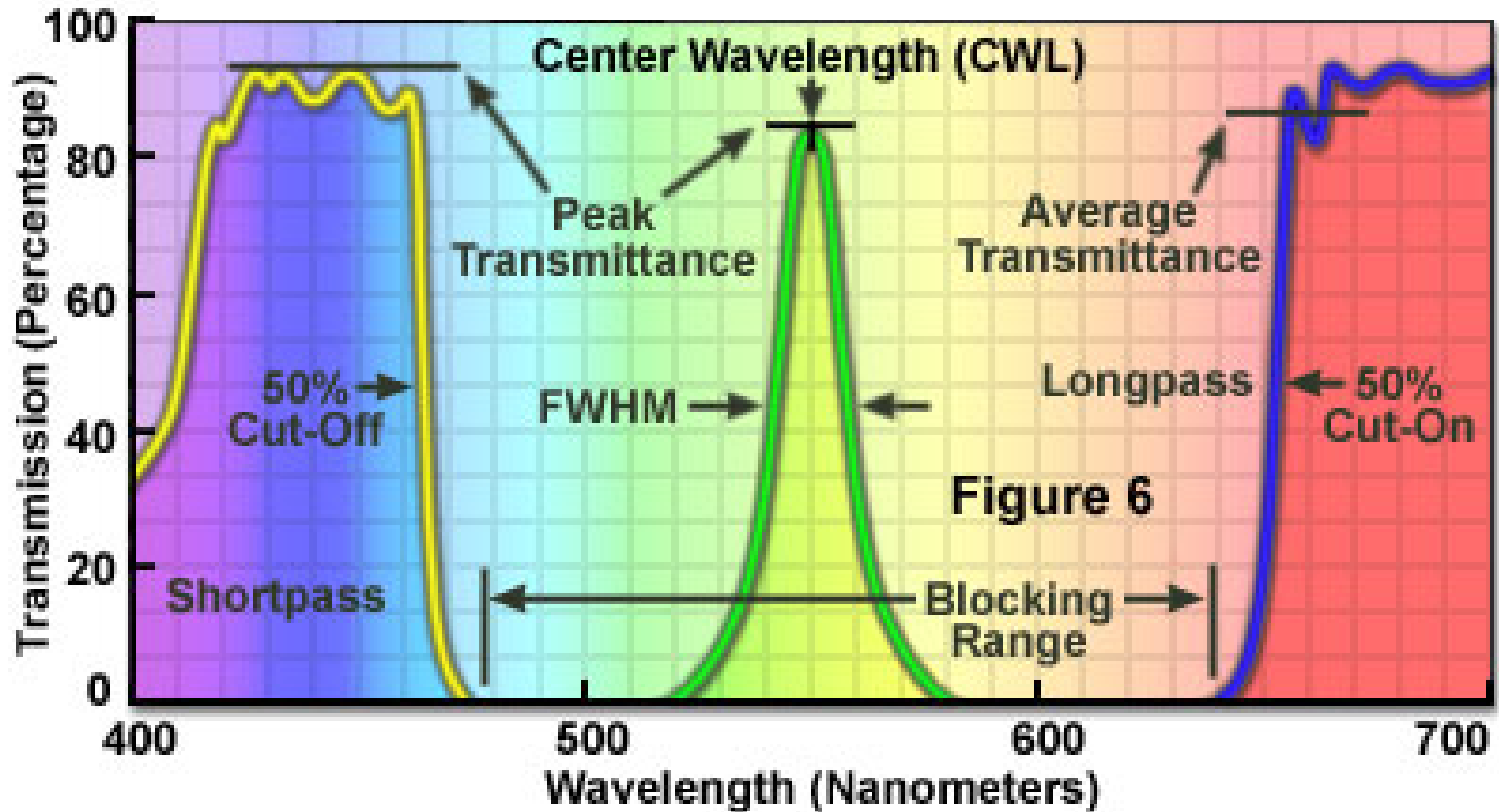
order of interference

refractive index of dielectric

If distance (d) is multiple (m) of wavelength (λ) then it won't be interfered with

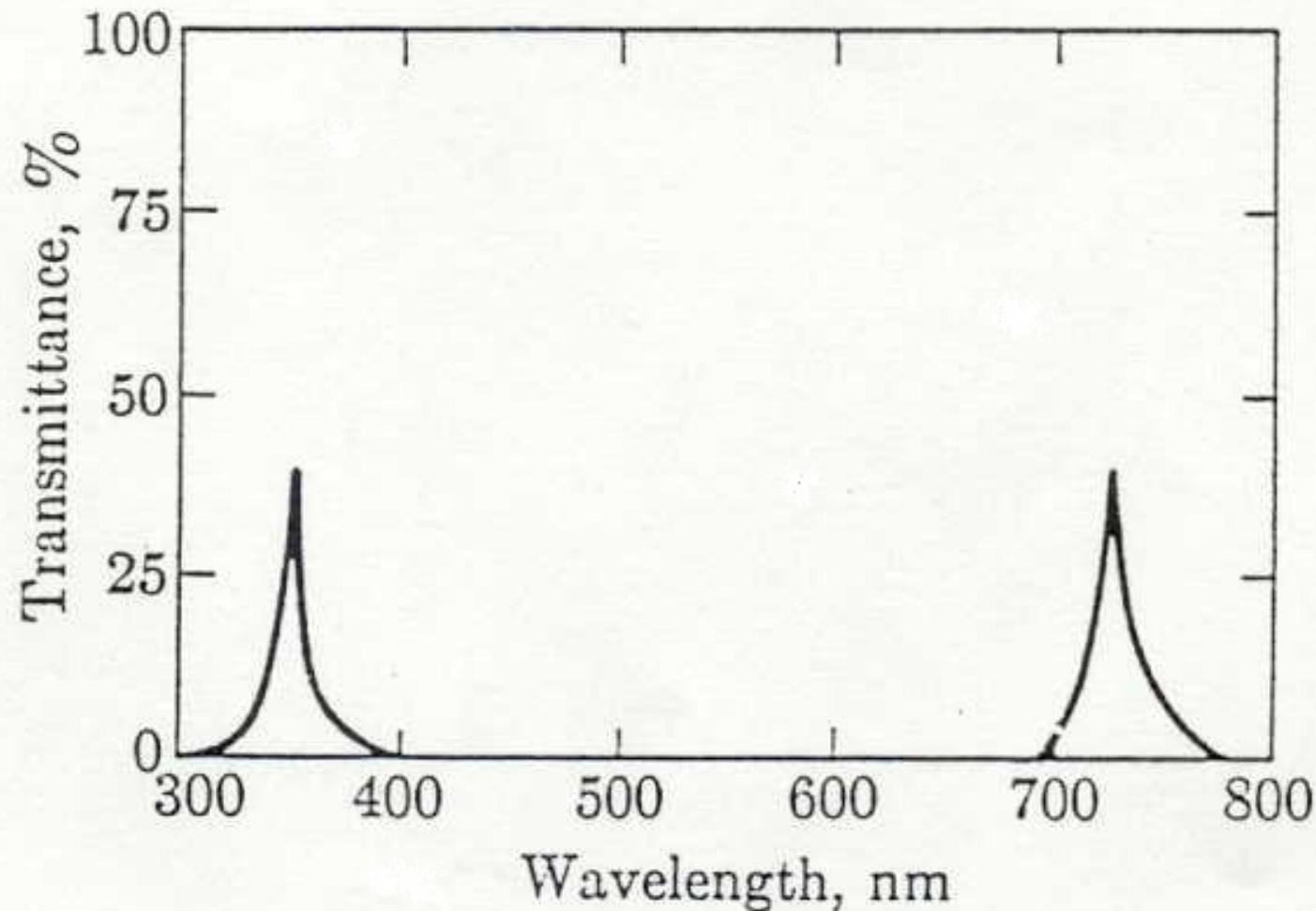
Concept of Order – constructive & destructive interference causes waves with different phase angles to be eliminated except if they are multiples of each other

Interference Filter Characteristics and Nomenclature

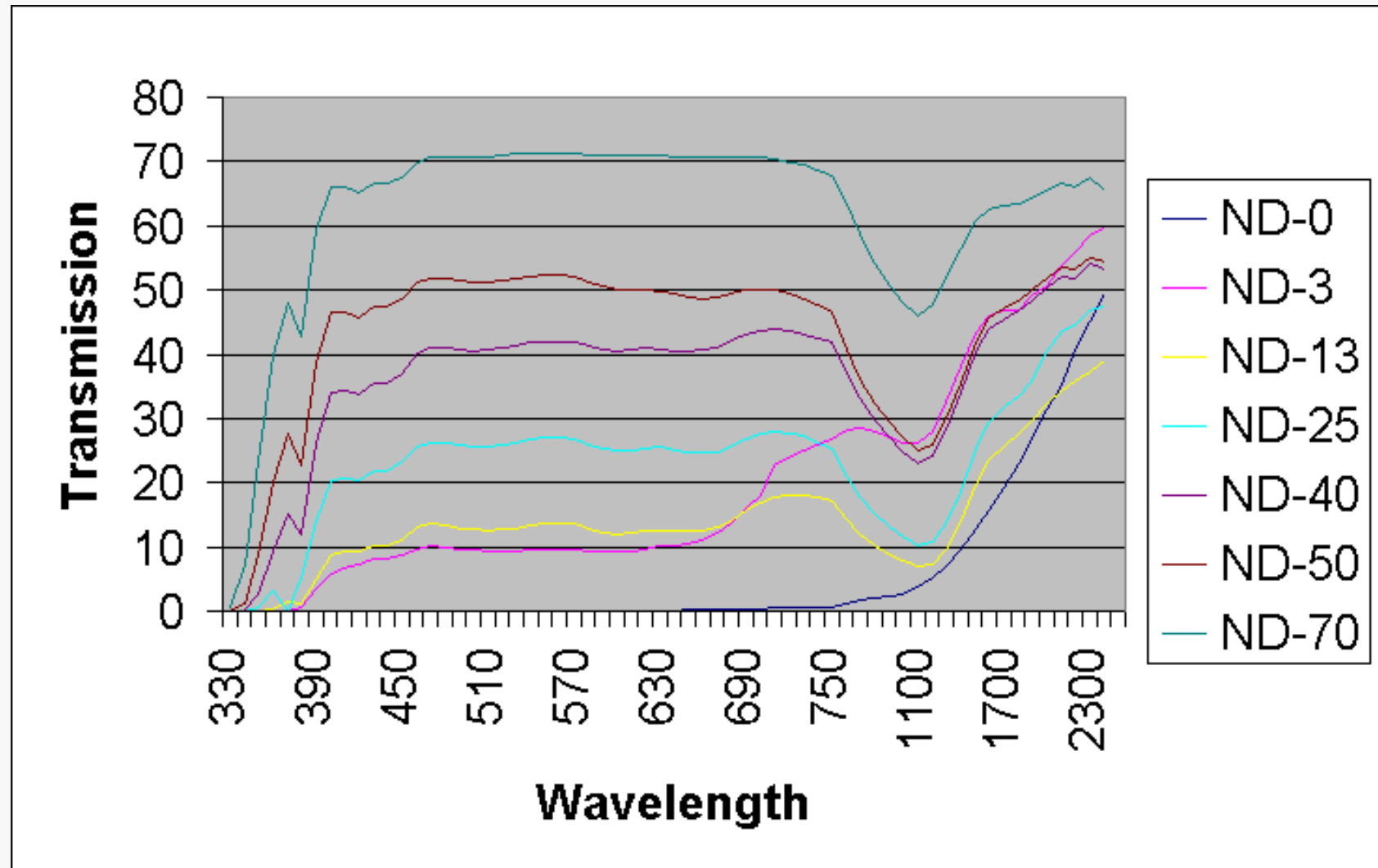


FWHM – full width at half maximum

Transmittance vs. wavelength for typical Fabrey-Perot Interference filter showing first and second order λ 's ($m = 1$ & $m = 2$)

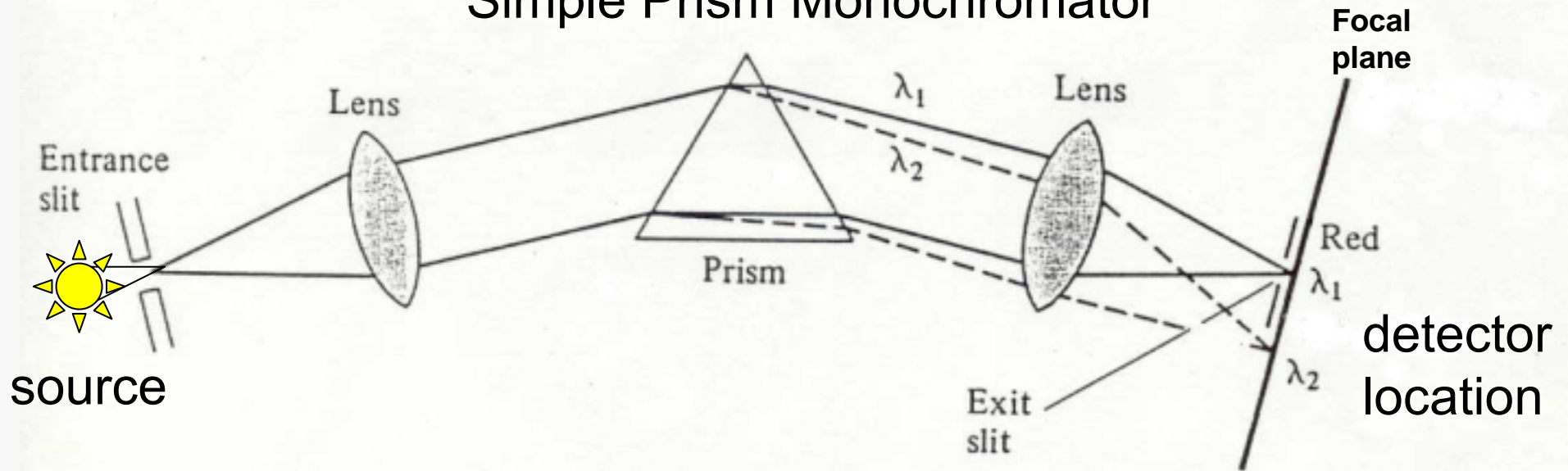


3) Neutral density filters – reduces intensity without any λ discrimination



II) MONOCHROMATORS

Simple Prism Monochromator



Entrance slit allows source radiation to illuminate the first lens which collimates the light spreading it across the face of the **prism**. Prism disperses radiation into component wavelengths and the second lens focuses the spectrum at the **focal plane**. An **exit slit** selects the band of radiation to reach the detector. Dispersing element can be a **prism** or a **diffraction grating**. Focusing elements can be **lenses** or **mirrors**.

- Optical Materials – need optically transparent materials for lenses, prisms & sample cells
- In visible region – can use glass down to 350 nm
- In the UV region – quartz is material of choice
- In the IR region – NaCl, KBr, etc. The heavier the atoms of the salt, the farther into the IR region (i.e., longer λ) before significant absorption occurs

Problem – sensitivity to moisture