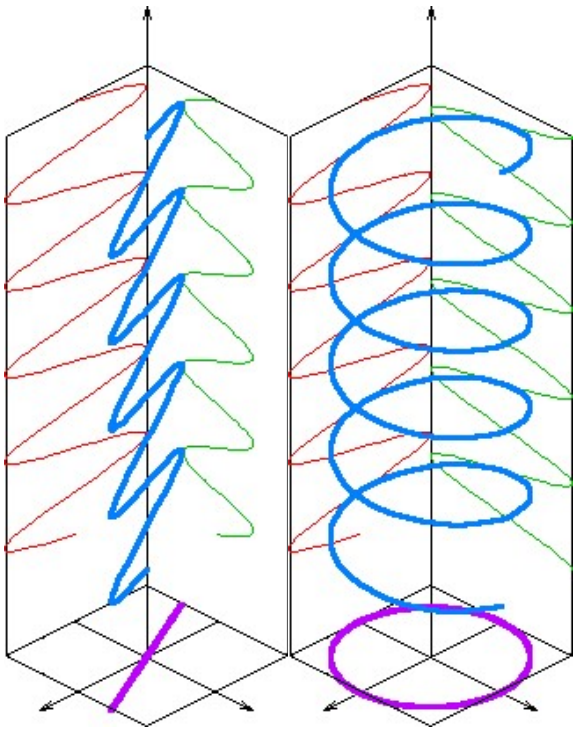
5 Explain the terms linear and circular polarization. How can a camera or a spectrometer be converted to measure polarization? Describe three kinds of polarization modulator and state one advantage and one disadvantage of each.

Linear polarization

- Light whose waves travel in a certain direction is dominate
- Stokes parameter: V=0

Circular polarization

- Electric field vector spins with transmission of light
- We can consider it as the composition of vertical direction of linear polarization
- Stokes parameter: Q=U=0

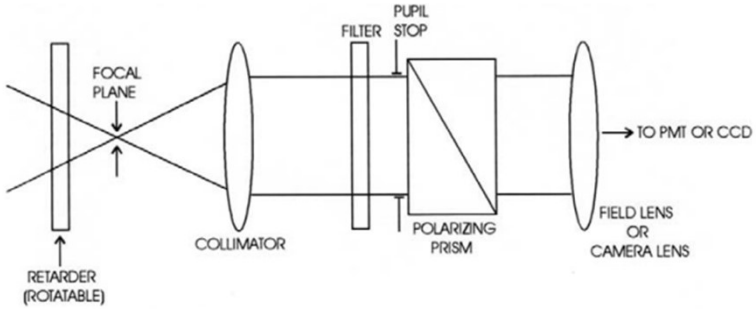


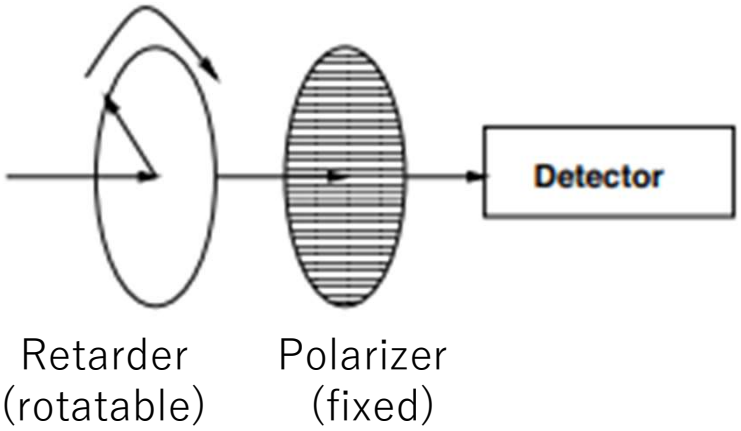
How to measure polarization

Insert retarder & polarizer

- Retarder(like half wave plate): convert vibration direction
- Polarizer: allows one plane of polarization to pass, and reduce others

We can change the vibration direction to pass with rotation of retarder.

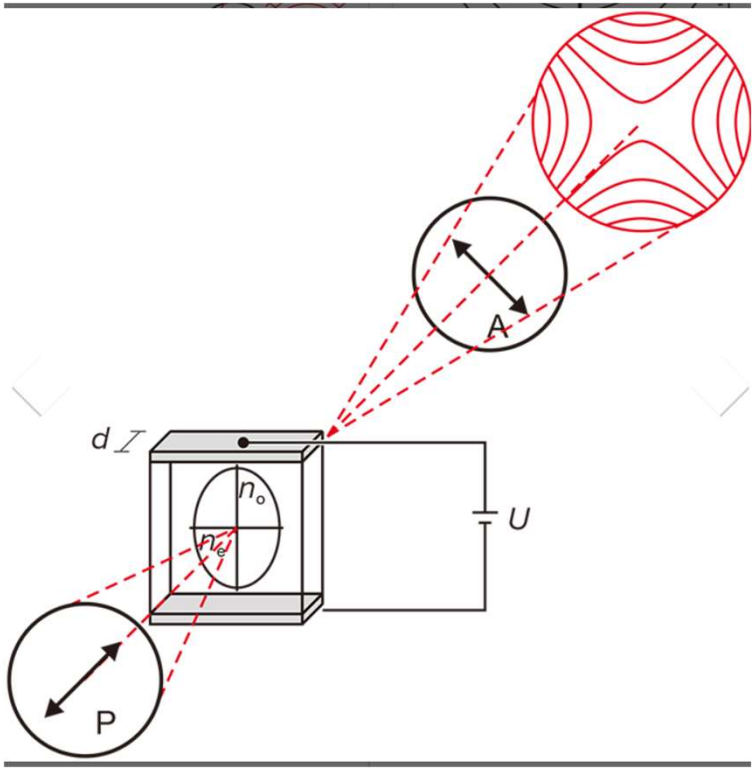




Polarization modulator

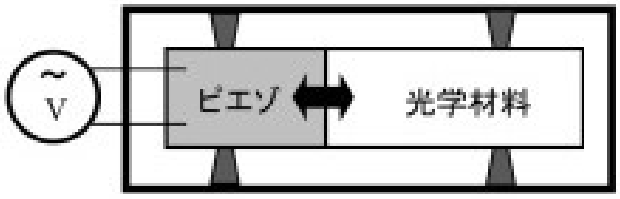
1. Pockels cell

- Convert vibration direction by applying a voltage to some kind of crystal
- Possible to realize any convert with voltage value in a short time (~10ns)
- High voltage (1000~10000V) is required



2. Photoelastic modulator

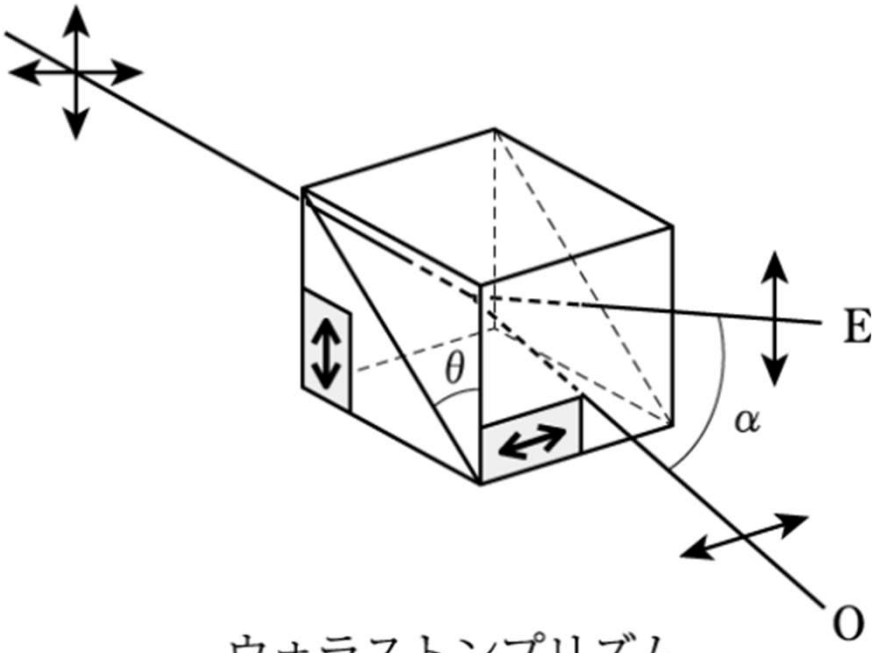
- Apply stress on optical element in periodical by piezoelectric trancducer
- Realize high sensitivity to weak polarization
- Require accurate design to apply unbiassed stress



(b) 光学ヘッド構造

3. Wollaston prism

- Combination of two prism-like optical elements
- Possible to observe two vibration direction of light in once exposure
- Affected heavily by optical aberration



ウォラストンプリズム