SUMMARY

MOSS is a powerful alternative to traditional grating spectrometers for Doppler and Polarization spectroscopy.

- **One "spectral" sample required ⇨**
  Tomography of flow and temperature

- **One detector per spatial channel ⇨**
  Spectral information is multiplexed in the temporal frequency domain => use PMTs

- **High light throughput ⇨**
  No slit aperture, wide field-of-view

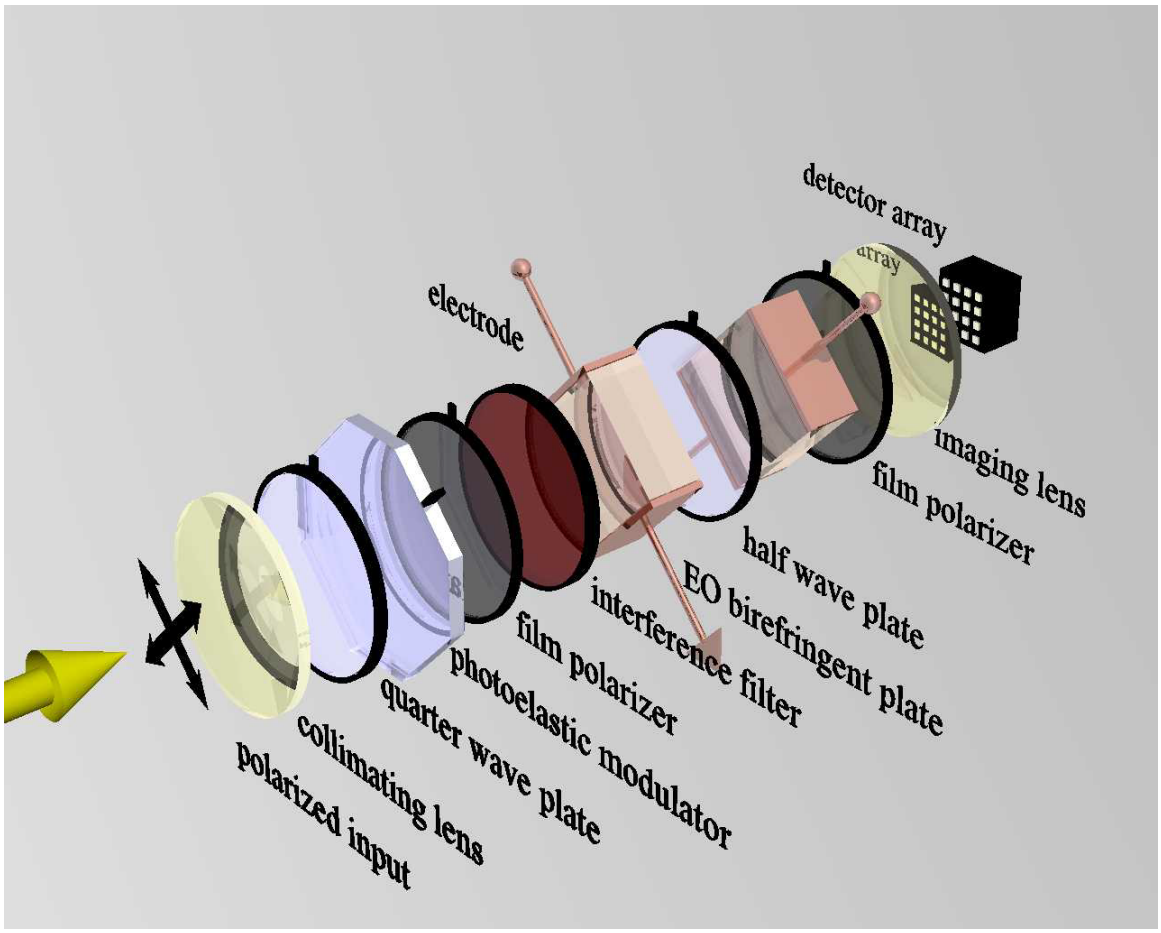
- MOSS is **alignment-robust and compact.**

- **No instrument function deconvolution**

- **2-D imaging capability - MOSS Camera.**

- **Spread spectrum techniques**
  Tomography of velocity distribution function

MOSS CAMERA FOR MSE



Combined polarimeter/MOSS system for MSE measurements

$I(t) = I_0[1 + \zeta_I \zeta_{MSE} \cos(\phi_0 + \phi_m \sin \Omega t)]$

$\zeta_{MSE} = \zeta_\sigma \cos^2 \Psi + \zeta_\pi \sin^2 \Psi$

ζ_σ is the contrast associated with the σ cluster
ζ_π is the contrast associated with the π cluster

$\Psi = 2\psi + \delta \sin \Omega_{PEM} t$ - phase modulation produced by polarimeter
ψ is the polarization orientation of π cluster

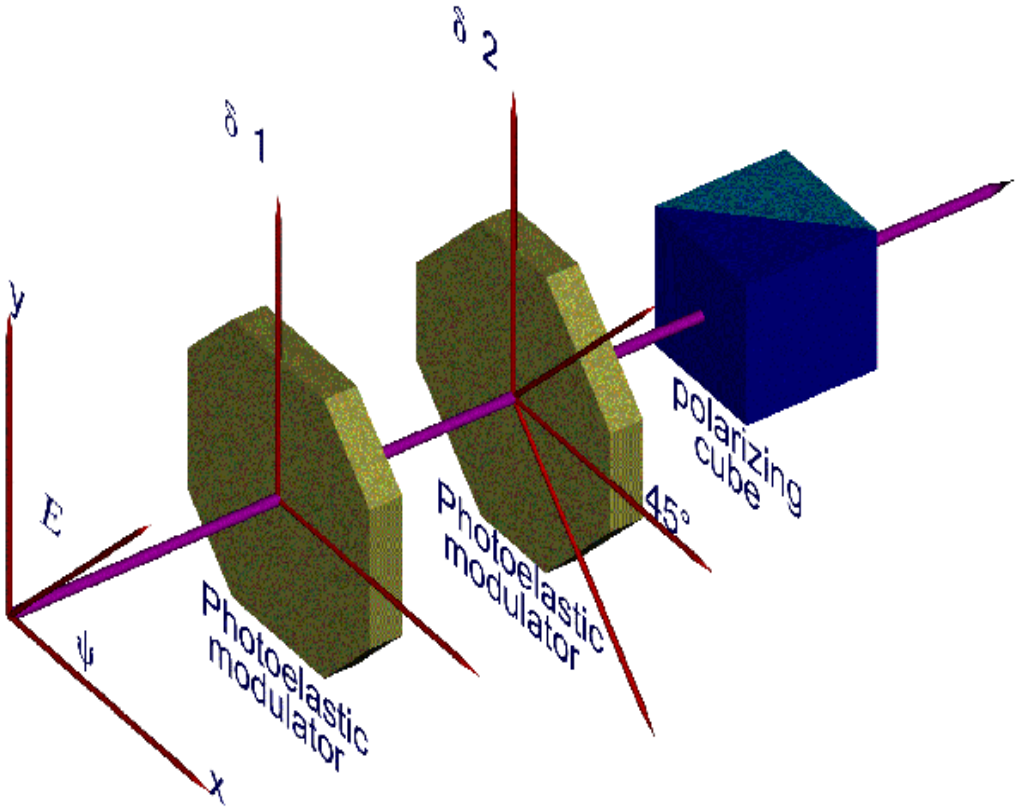
Polarization Spectroscopy

Motional Stark and Zeeman Effect

• The σ and π components of Stark and Zeeman multiplets are spectrally separated and orthogonally polarized.

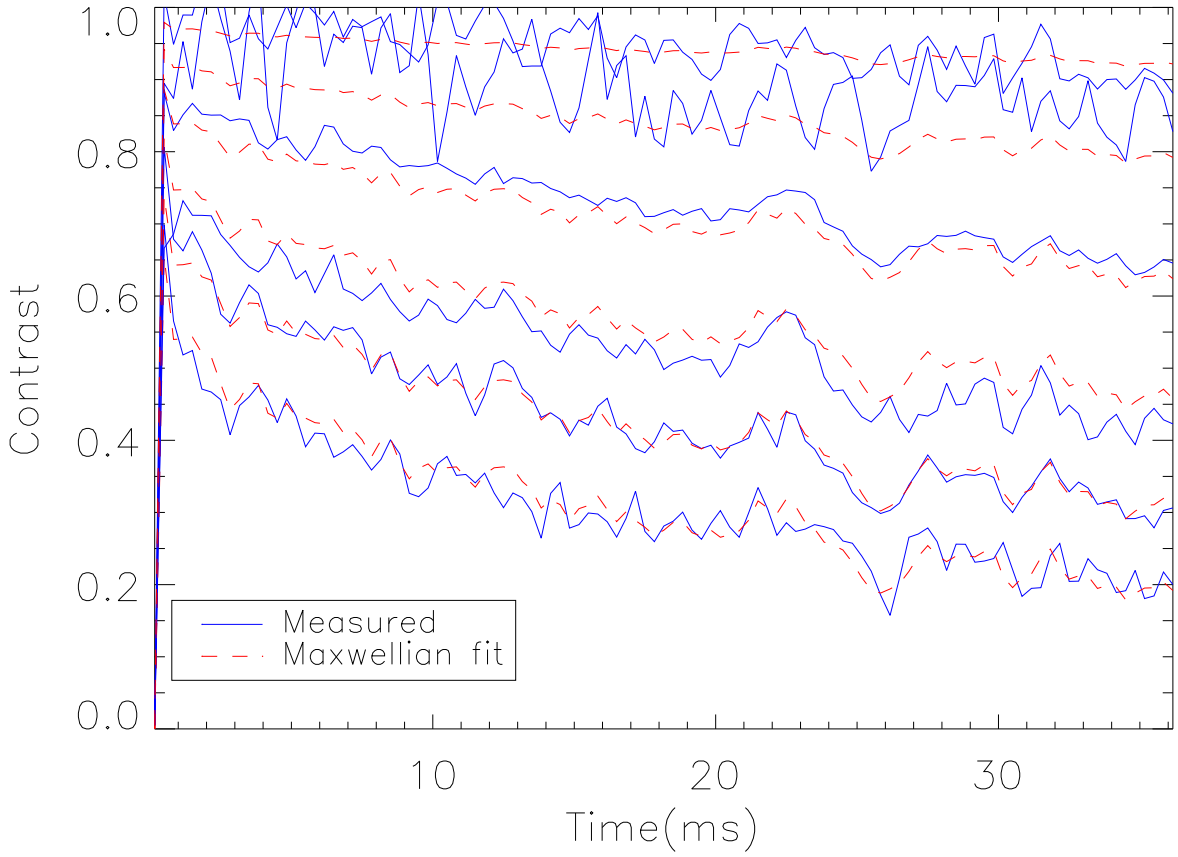
• Modulate polarization state => modulate spectral content (i.e. intensity, shift, width)

• For MSE, polarization orientation gives B-field pitch angle



The various components of the Stokes vector can be isolated with appropriate choice of modulation delays δ_1 and δ_2

SOFT Can Measure the Light Coherence Profile



Blue: Time evolution of contrast at the six independent delays [3,5,7,9,11,13]*1000 wavesgenerated by the three-crystal system

Red: Contrast that would be expected for the best fit Maxwellian distribution.

The contrast decreases in time as the ion temperature increases. Peak temperature for this discharge was 20 eV