

# *In situ* wavefront distortion measurements

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# *In situ* wavefront distortion measurements

## – Introduction

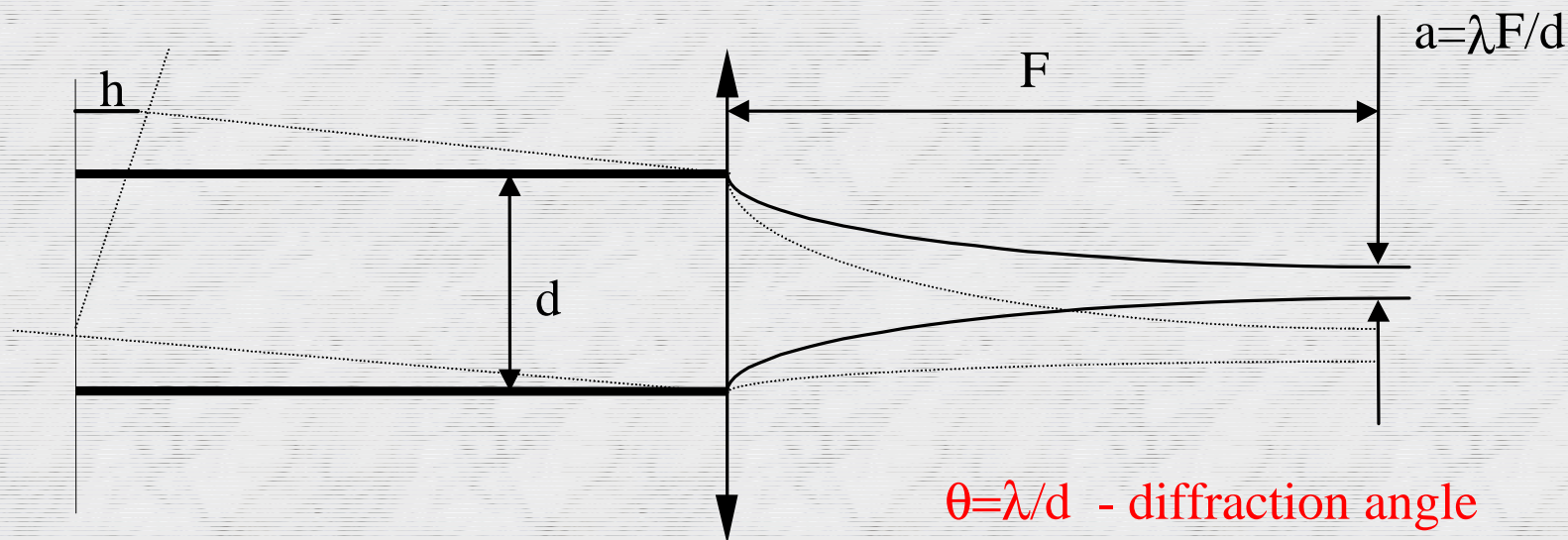
- I. Nonlinear Hartmann Sensor.
- II. Polarization Phase-Modulation method. **!New**
- III. Beam scanning technique.
- IV. White Light *In Situ* Measurement Interferometer.

## – Conclusions



# Nonlinear Hartmann Sensor. Idea.

In linear electrodynamics the major limitation to measure wave front deviations angles comes from a finite size of the focal spot

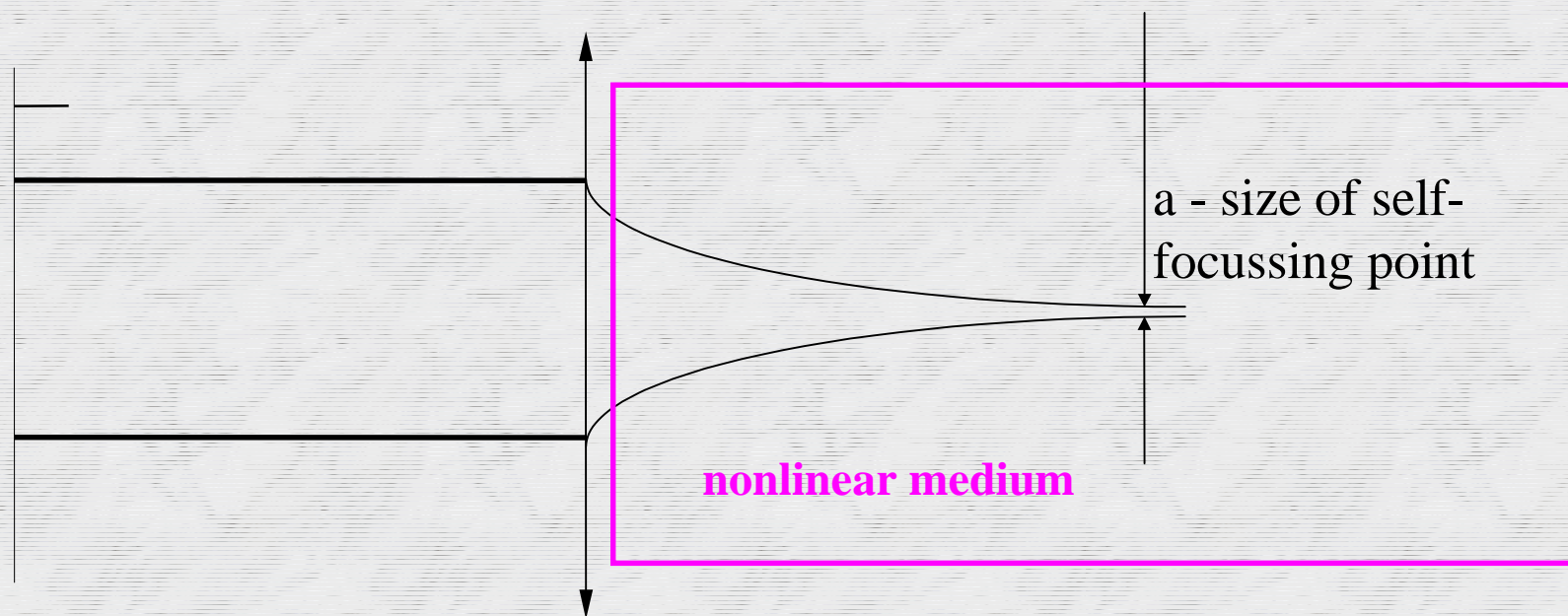


$h = \lambda / 20 \dots \lambda / 50$  is achieved by an accurate measurement of the transverse beam distribution

# Nonlinear Hartmann Sensor. Idea.

How to get  $\lambda/1000$  ?

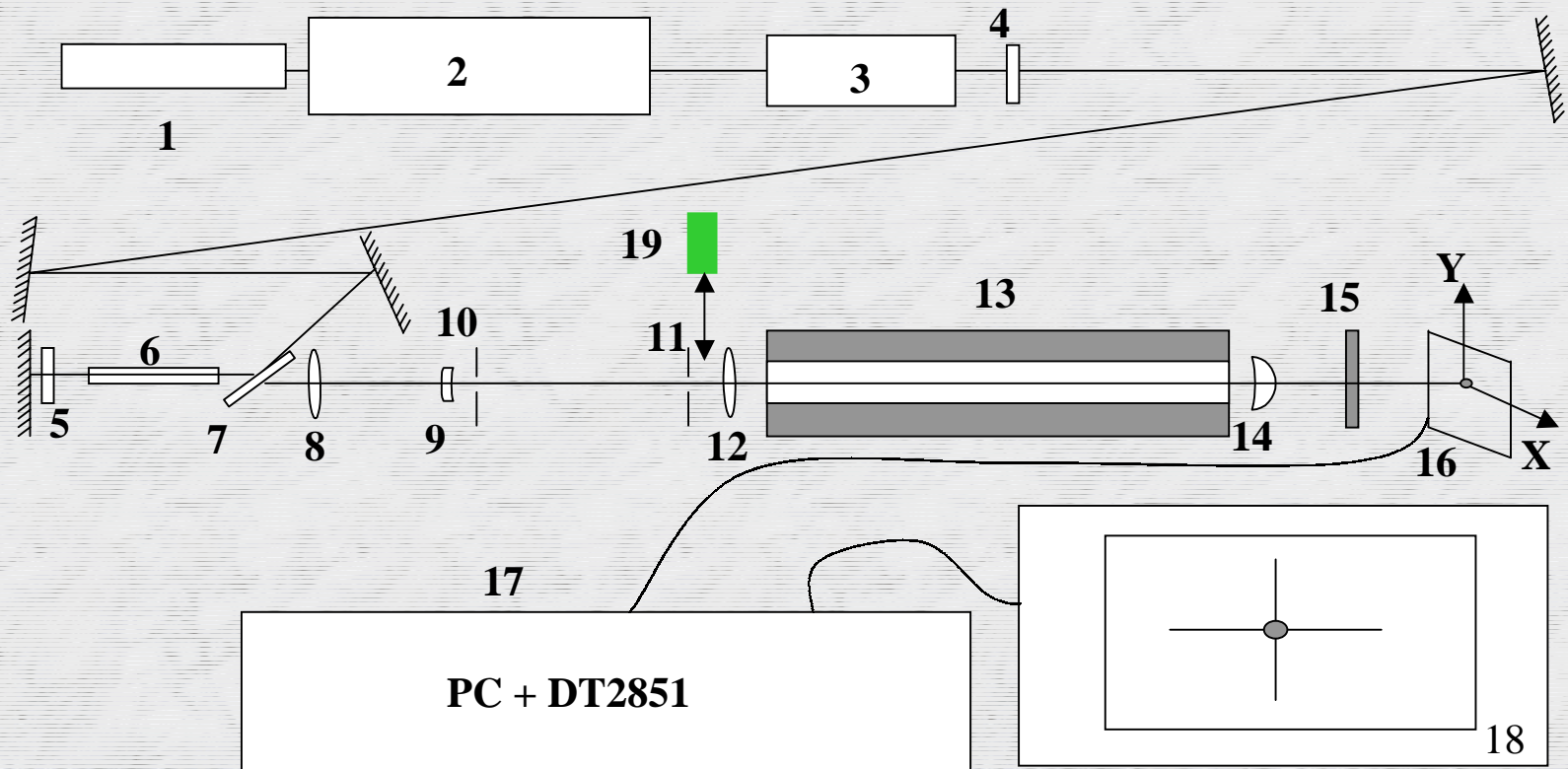
Use self-focusing to decrease the size of the focal spot



At  $P=P_{\text{critical}}$   $a \rightarrow 0$  and is determined by nonlinear medium properties

# Nonlinear Hartmann Sensor.

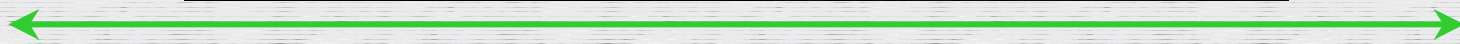
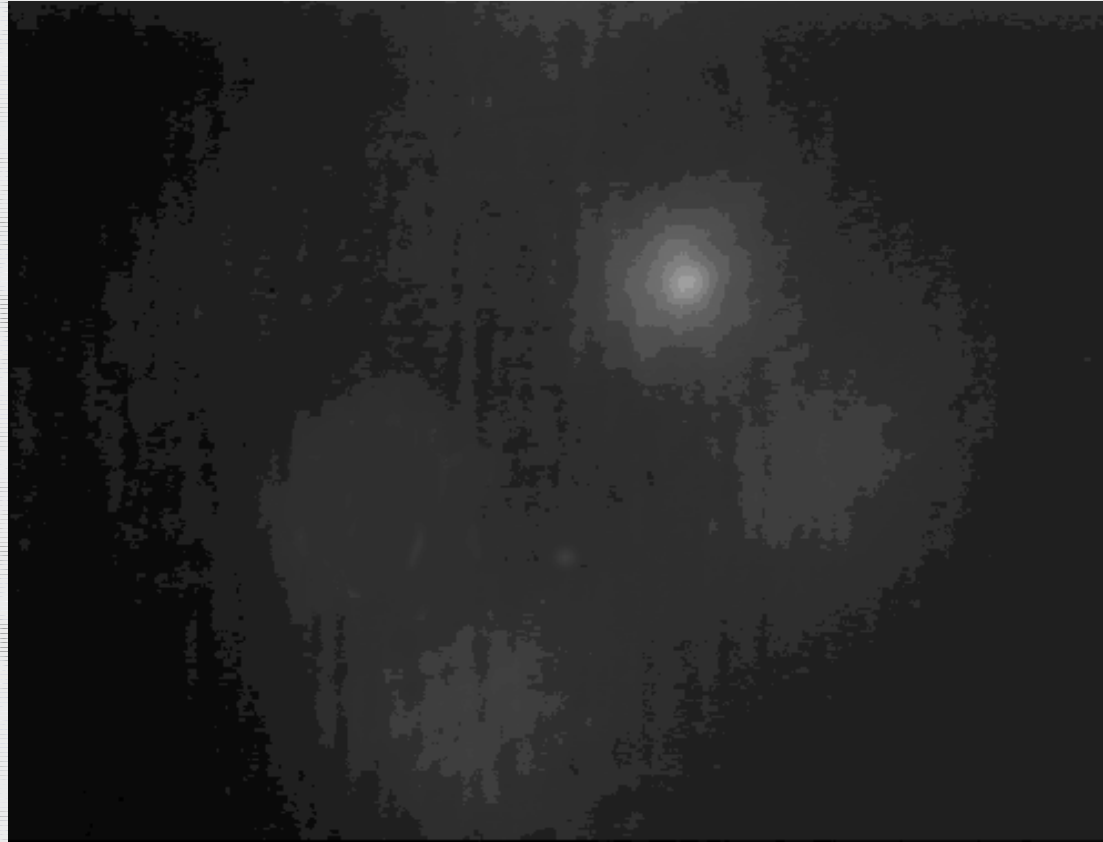
## Experimental setup with moving sample.



1- HeNe laser, 2-Nd master oscillator, 3-single pulse selector, 4- $\lambda/2$ , 5- $\lambda/4$ , 6-Nd amplifier, 7- polarizer, 8,9,12,14-lenses, 10,11-pinholes, 13-bensen cell (L=40 cm), 15-attenuator, 16-CCD camera, 17- PC+Frame Grabber, 18- analog monitor, 19-sample.

# Nonlinear Hartmann Sensor.

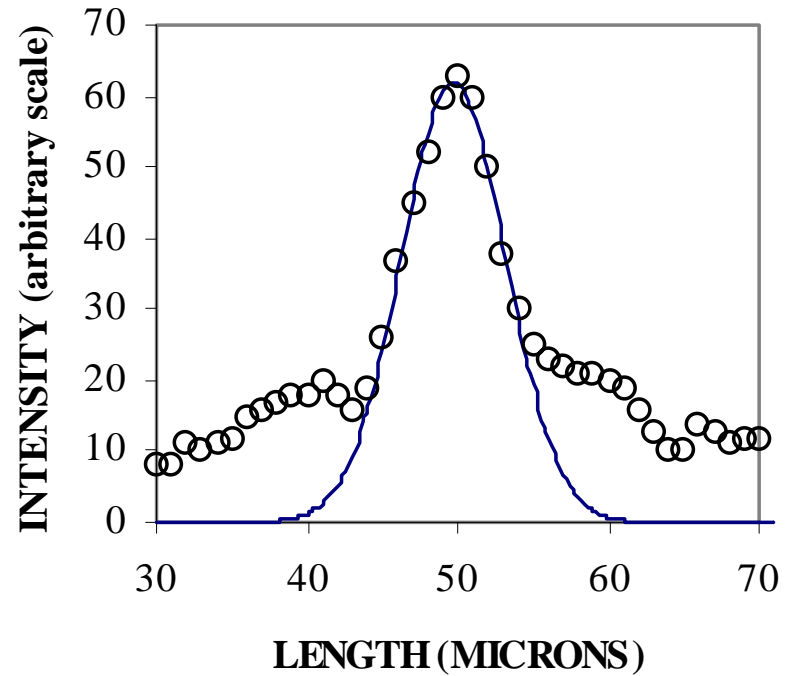
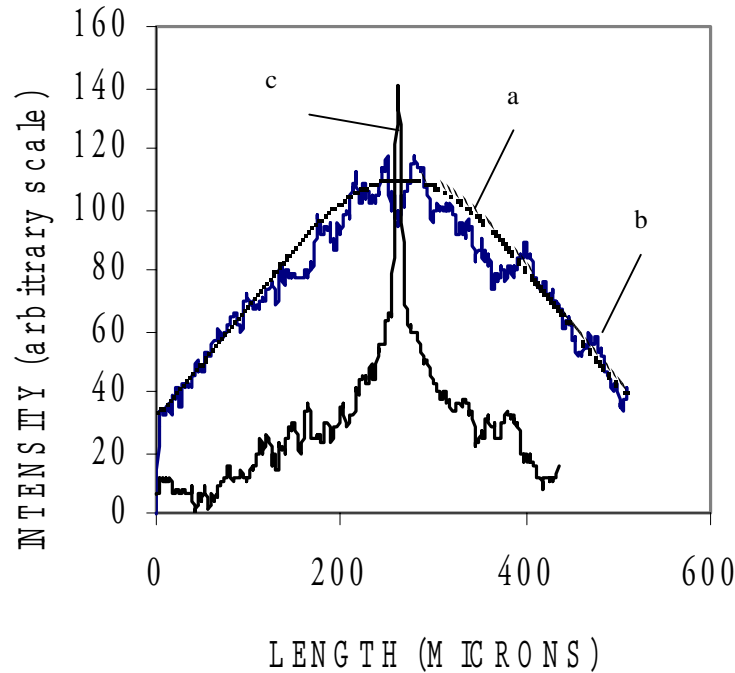
Self-focusing points.



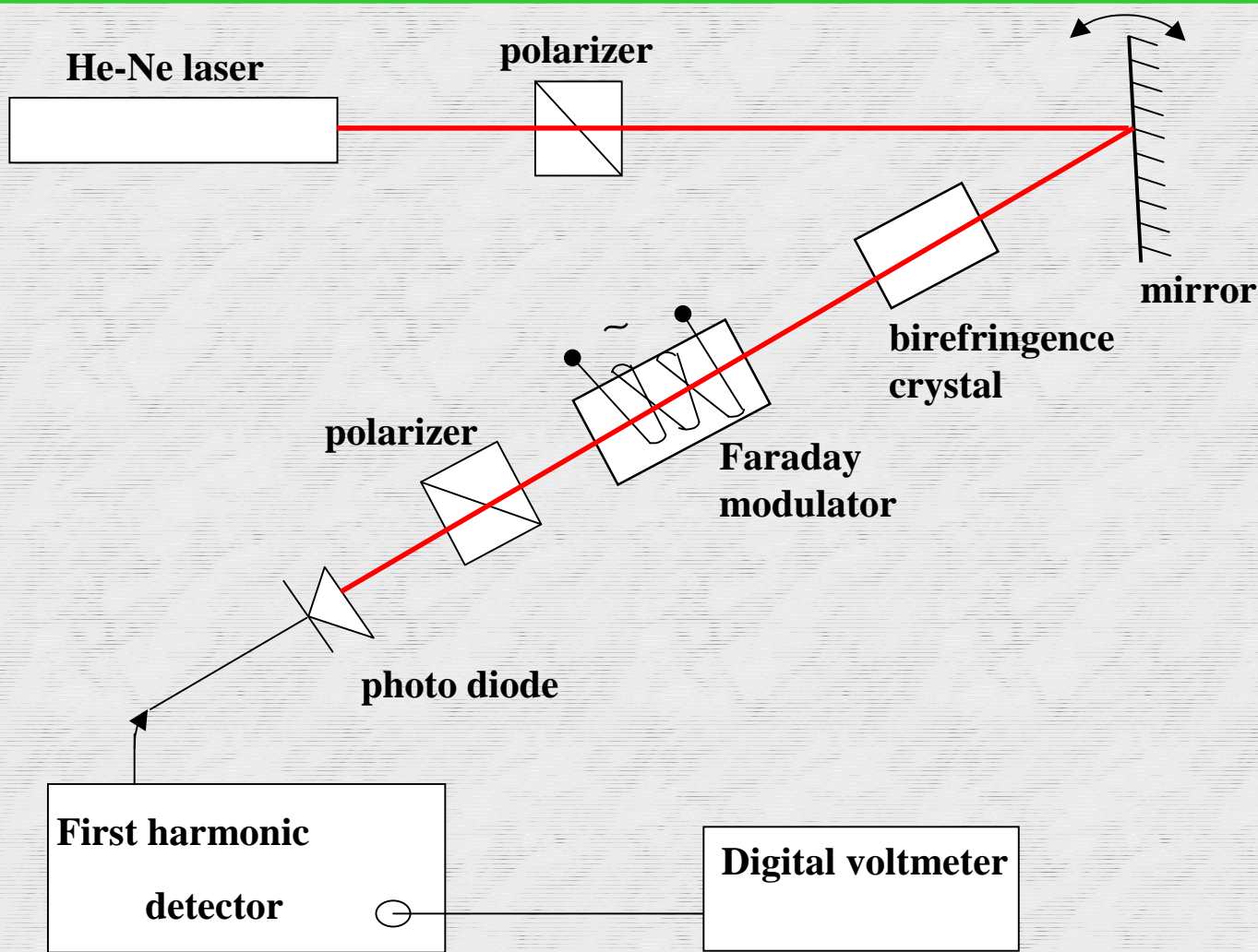
diffraction limited diameter

# Nonlinear Hartmann Sensor.

## Results with moving sample.



# Polarization Phase-Modulation method. Idea.



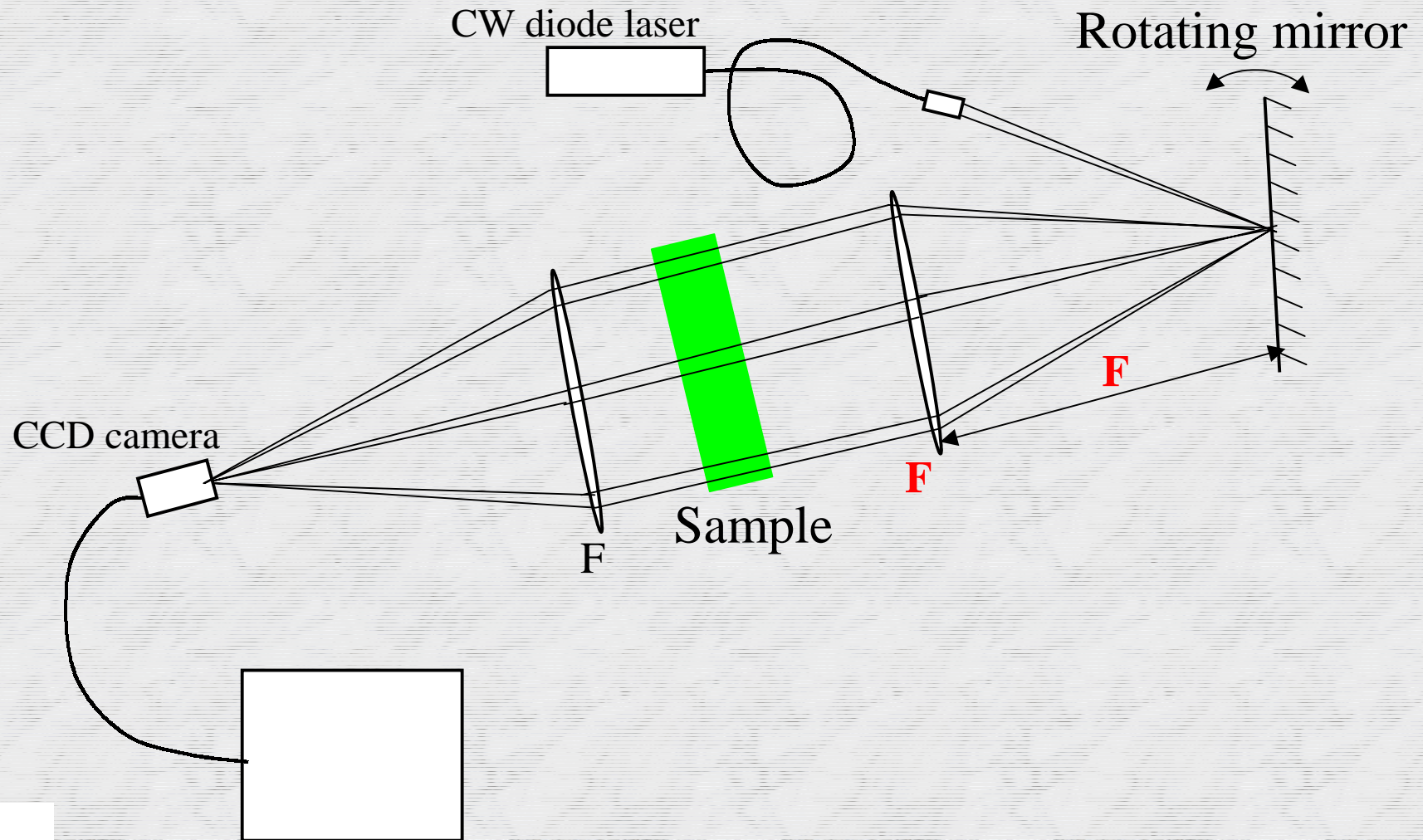


# Polarization Phase-Modulation method.

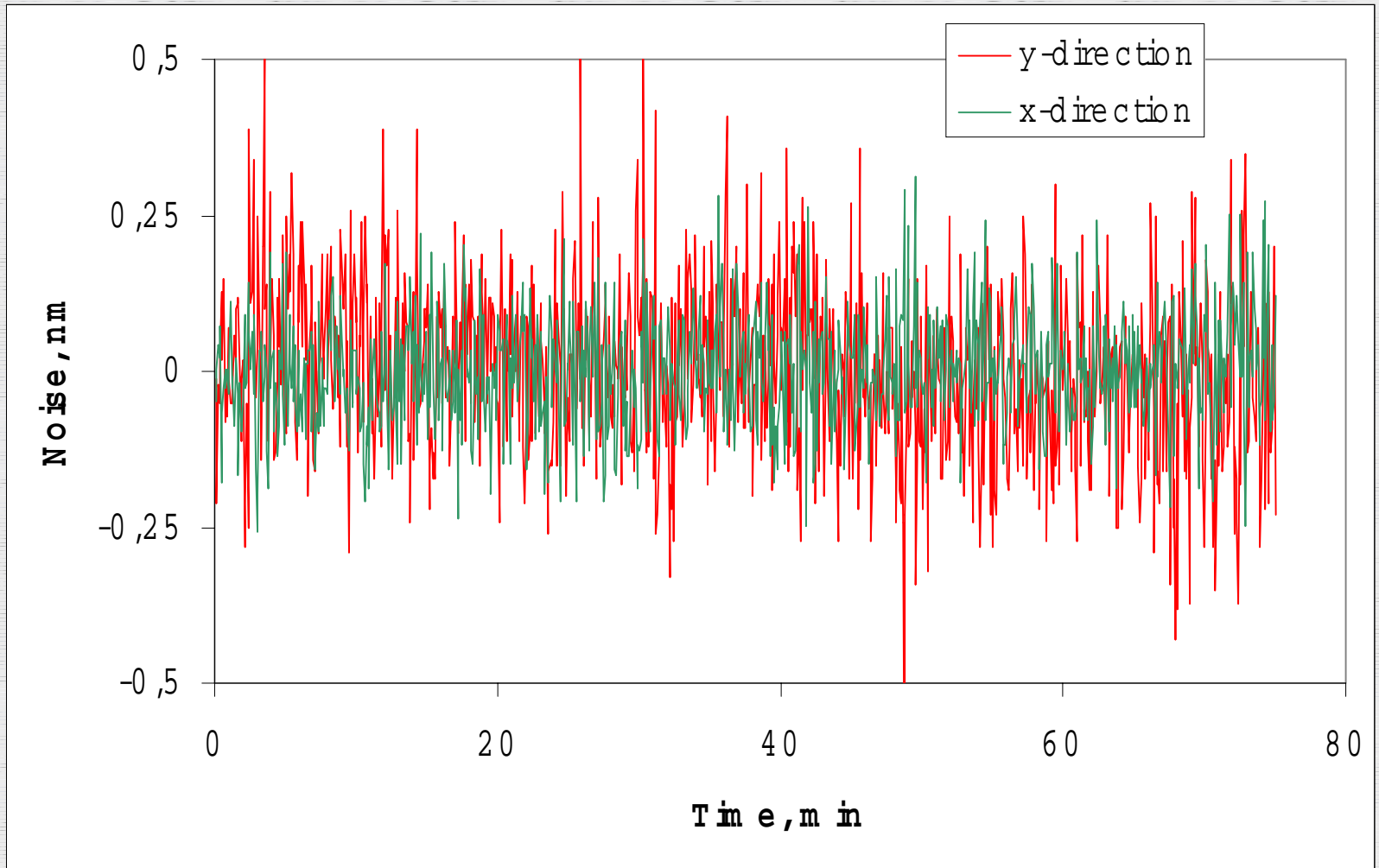
First test.



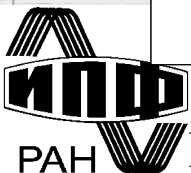
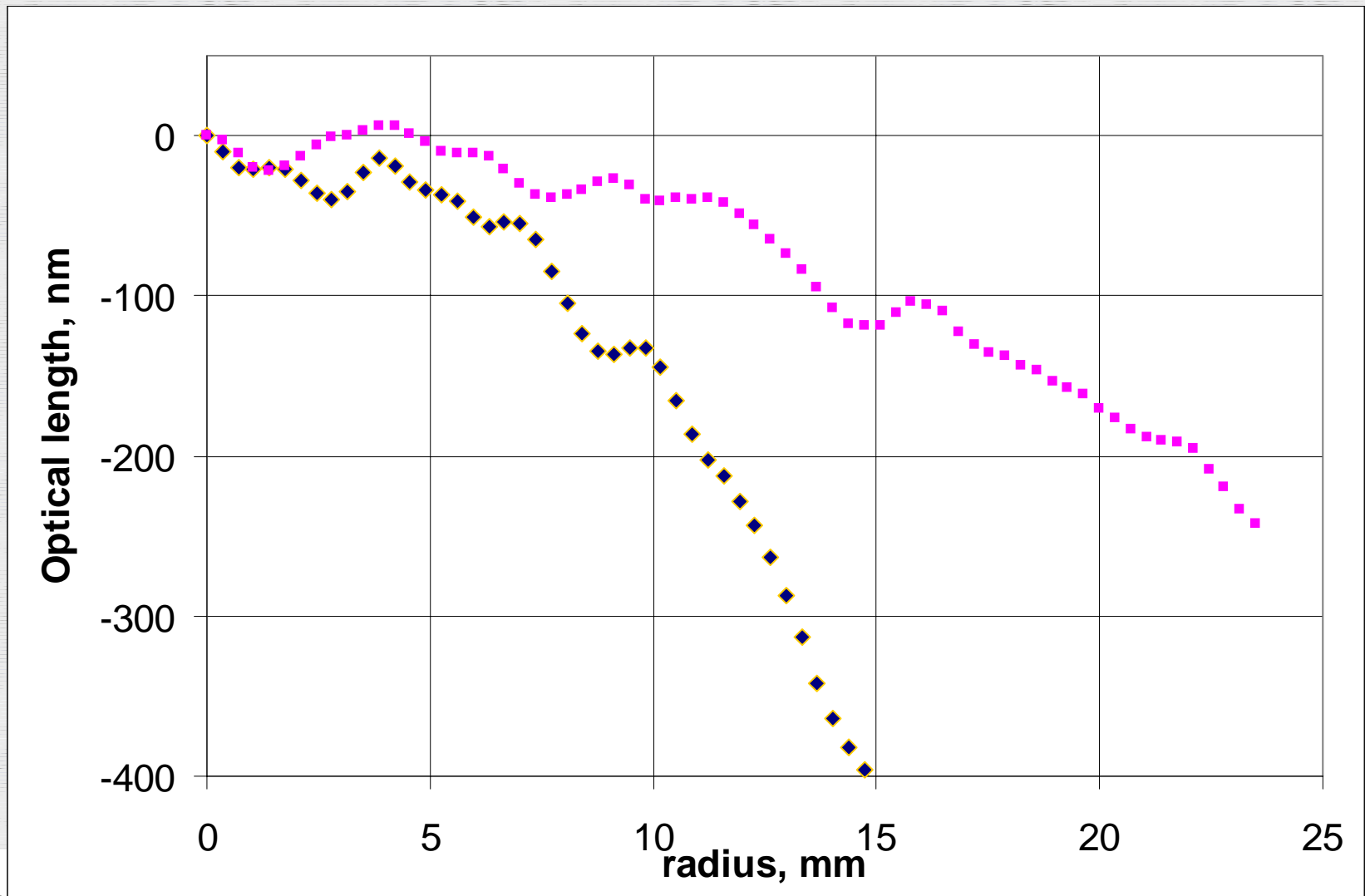
# Beam scanning technique. Idea.



# Beam scanning technique. Noise measurements.

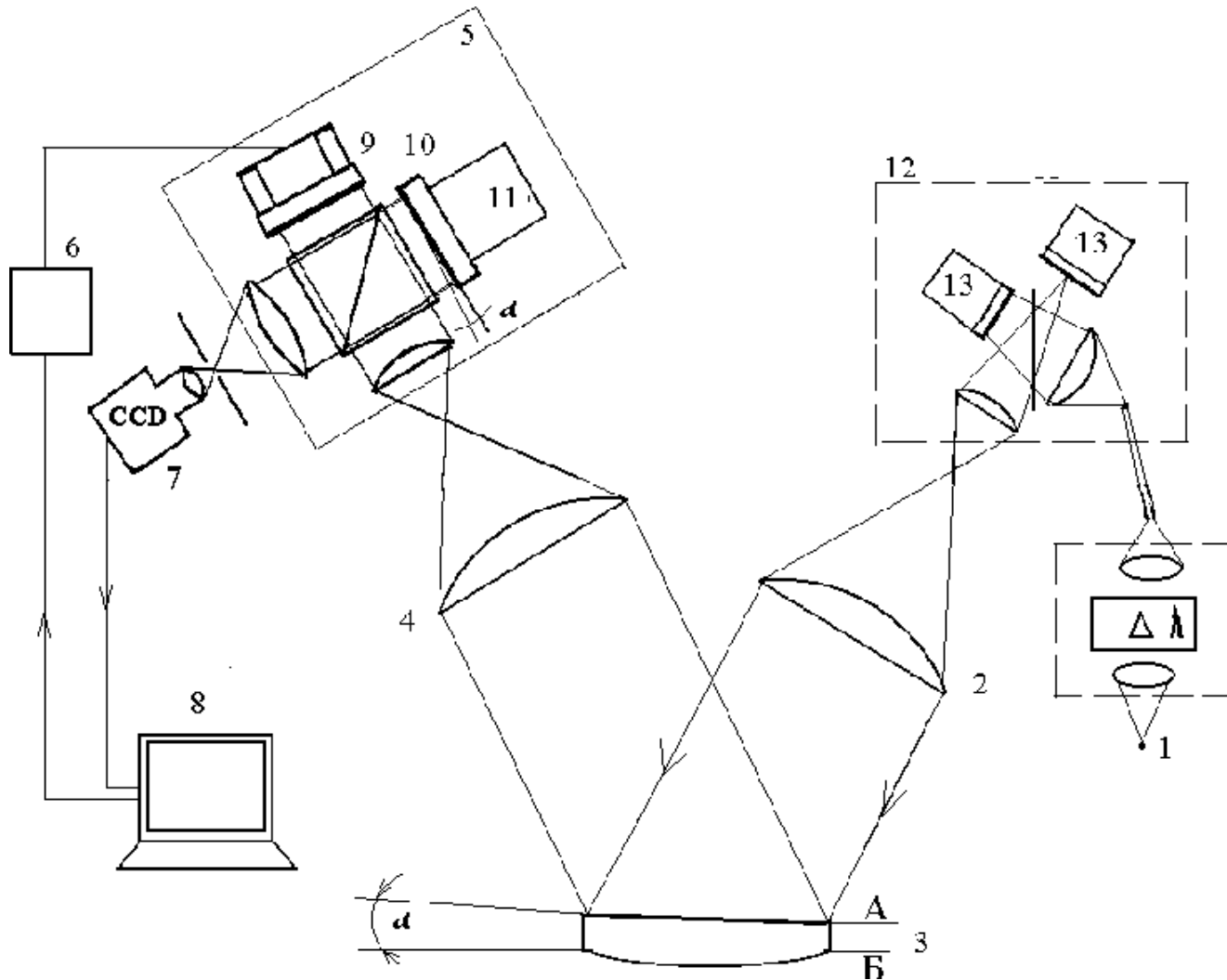


# Beam scanning technique. First phase maps.



# White Light *In Situ* Measurement Interferometer.

## Experimental setup.



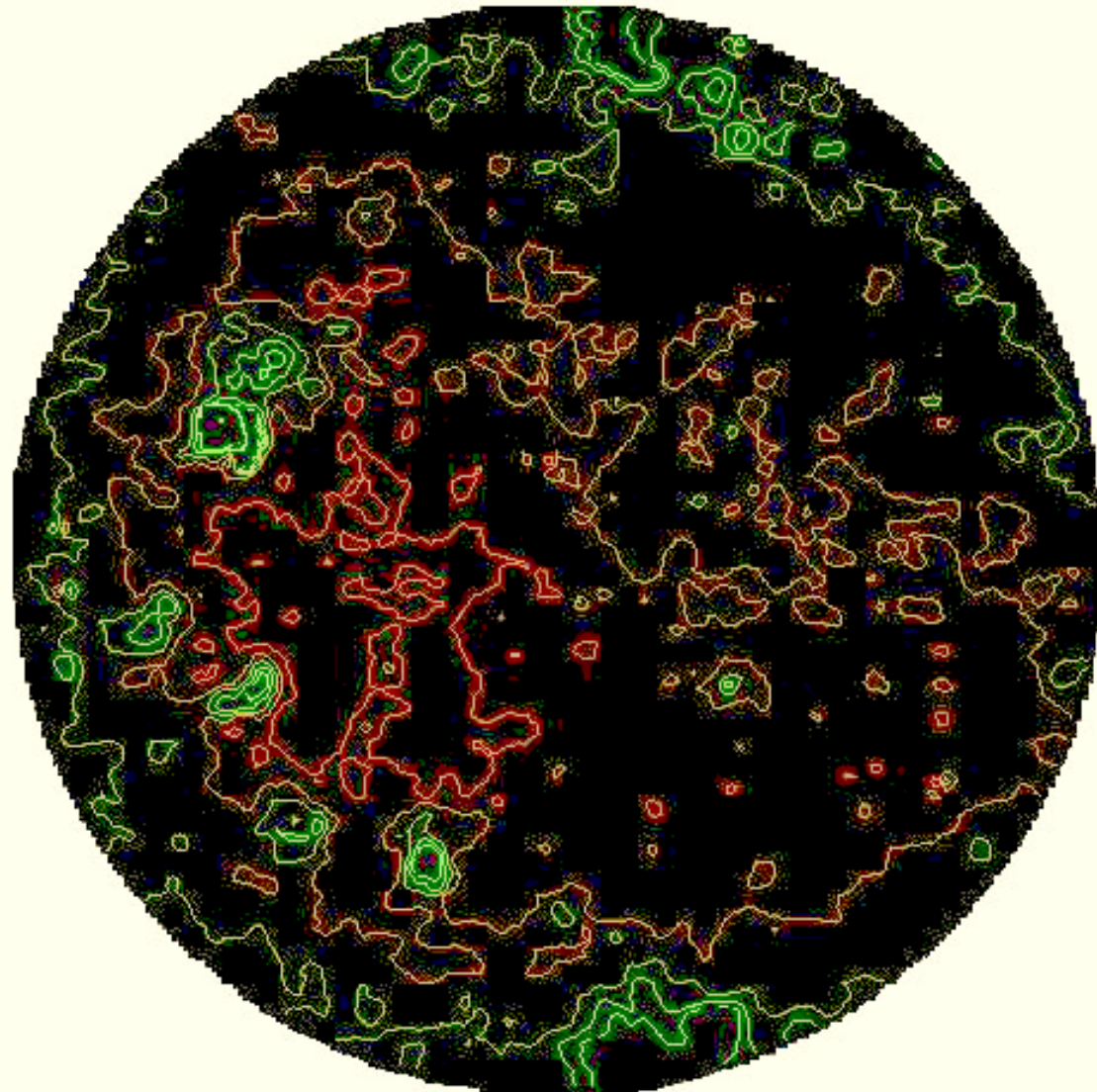
- 1 - light source,
- 2 - objective,
- 3 - sample,
- 4 - ocular,
- 5 - measurement interferometer,
- 6 - unit for synchronization and control,
- 7 - CCD camera,
- 8 - PC computer,
- 9 - modulating mirror,
- 10 - adjusting mirror,
- 11, 13 - motors,
- 12 - wave front shaper

# White Light *In Situ* Measurement Interferometer.

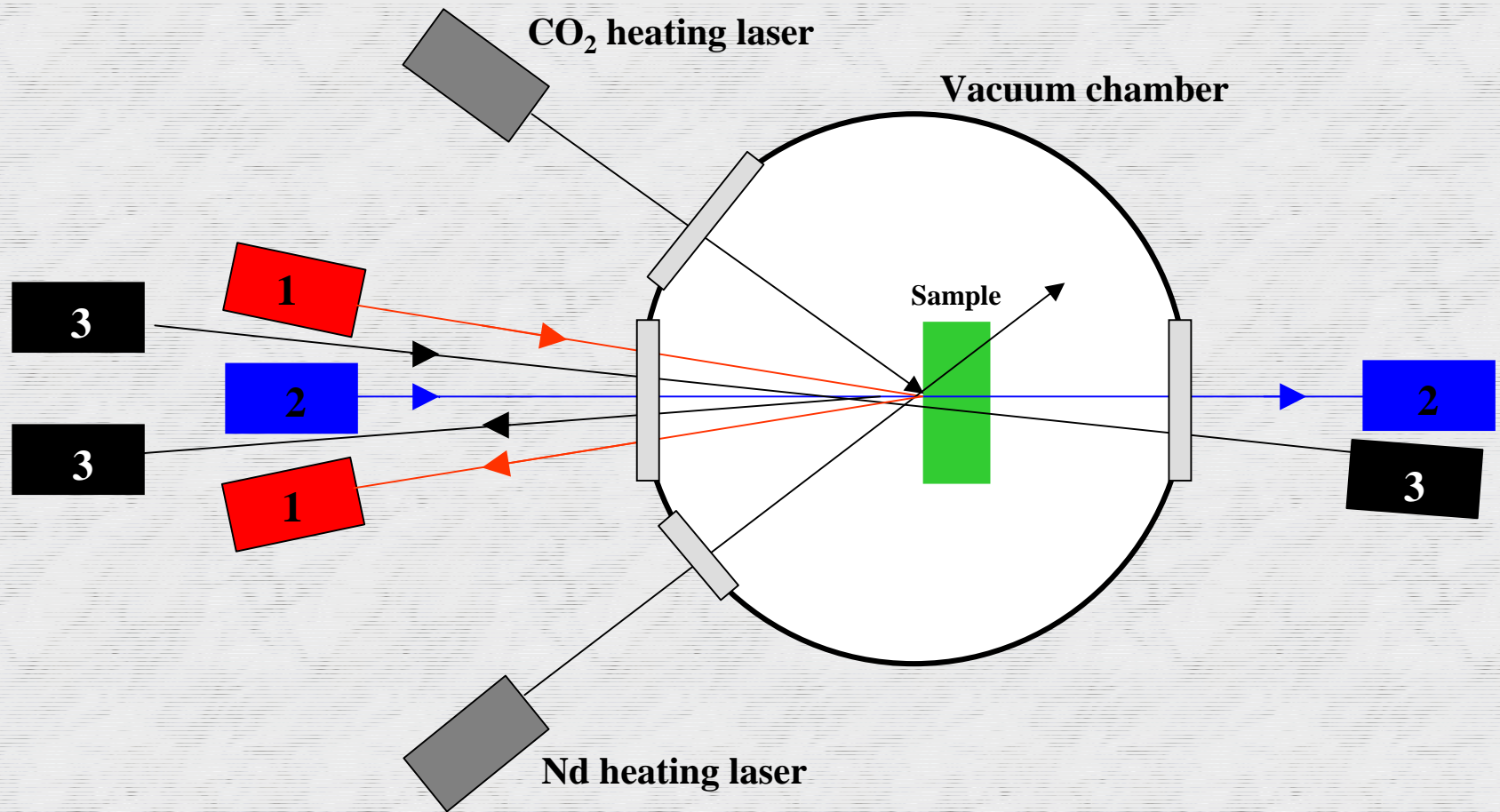
## First phase map.

Diameter 40 mm

Thickness 10 mm



# Future research.



1 - WLPMI, 2 - NHS, 3 - polarization technique