



# Holography

# **Abstract:**

## **Goal of the experiment:**

- understand the basic concepts of holography, interferometry and Gaussian beam propagation
- learn and practice laser alignment on critical components
- handle chemicals
- experimental optimization of exposure time

# **Experimental setup and student tasks**



# **Background of experiment:**

#### Holography:

- Amplitude and phase information of an object are recorded as localized interference patterns between a reference plane wave and and the object wave



- The object can be entirely reconstructed with the reference beam



#### Tasks

#### - Object selection: diffuse, scattering, light colored object

#### Components

- HeNe laser: Long coherence length
- Optical elements with critical alignment
  - Beam splitter variable intensity ratio object/reference arm
  - Routing mirrors straight beams on optical table
  - Spatial filter homogeneous, plane wave on object and plate
- Holographic plate: Red emulsion sensitive to laser wavelength (633 nm)
- Chemistry for plate development
  - Developer: Dokumol
  - Stop bath: Acetic Acid
  - Fixer: Commercial fixer







- Beam alignment, equal length of interferometer arms
- Spatial filters, check homogeneity of gaussian beam > 80% over the size of the object and plate
- Test different exposure times and intensity ratios for optimal hologram (high contrast)

## Acquired skills

- Laser alignment on critical components
- Gaussian beam propagation and spatial filtering
- Optimization of a development process (in complete darkness!)
- Chemistry and laser safety







## Schematic of the setup

**Picture of the object** illuminated directly with the HeNe laser

## **Obtained hologram**

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