Introduction: Types of Holograms
February 2019
Types of holograms

In-line holography -- Gabor 1948

- In-line holography with divergent illumination

Recording

![Diagram of in-line holography with divergent illumination showing a laser, particles, and a hologram.](image-url)
Types of holograms

In-line holography -- Gabor 1948

- In-line holography with collimated illumination
Types of holograms
Fourier transform holograms

Recording

Reconstruction

Object Illumination (if Opaque Object)
Reference Wave
Object Illumination (if Transparent Object)

Zero Diffraction Order
Primary Image

Reconstruction Beam
Conjugate Image
Types of holograms
Fourier transform holograms: lensless

Recording

Object Illumination
(if Opaque Object)

Hologram

Reference Wave

Object Illumination
(if Transparent Object)

z

z_0
Optical Fourier transform
Forward and inverse 4-f system

Forward Fourier transform

Inverse Fourier transform

Object plane

Plane wave

f(x, y)

Lens

Fourier plane

Lens

Image plane

x

y

z

f

f

f

f
Optical Fourier transform
Forward and inverse 4-f system: filtering

Forward Fourier transform

Filter

Inverse Fourier transform
Optical Fourier transform
Filtering: effects of masking

Low-pass filter
High-pass filter
Band-pass filter
Types of holograms

Image hologram

Recording

Object Illumination (if Opaque Object)

Reference Wave

Hologram

Object Illumination (if Transparent Object)

2f 2f
Types of holograms

Fraunhofer hologram

Recording

Object Illumination (if Opaque Object)

Reference Wave

Object Illumination (if Transparent Object)

Hologram
Types of holograms

Frenel hologram

Recording

Object Illumination
(if Opaque Object)

Reference Wave

Object Illumination
(if Transparent Object)

Hologram
Types of holograms

Frenel hologram

Recording

Reconstruction
Recording and reconstruction

- Note: speckles on holograms: noise/signal?
- Recording and reconstruction holograms
- Lab tour and properties of holograms