

DIRECTIONS · CONTACT

FRAUNHOFER INSTITUTE FOR APPLIED OPTICS
AND PRECISION ENGINEERING IOF

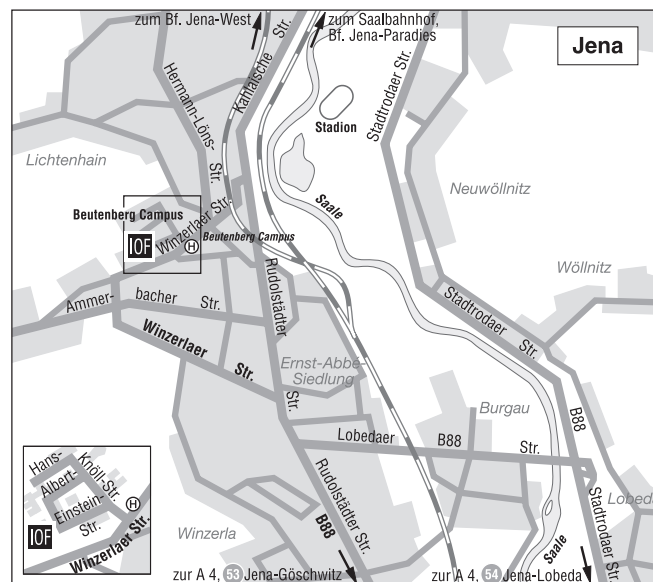
ELECTRON BEAM LITHOGRAPHY SYSTEM VISTEC SB350 OS

Supported by

- European Union
- Thuringian ministry of education and culture
- Fraunhofer-Gesellschaft

In collaboration with

- Institute of Applied Physics
of the Friedrich-Schiller-University Jena



Person to contact

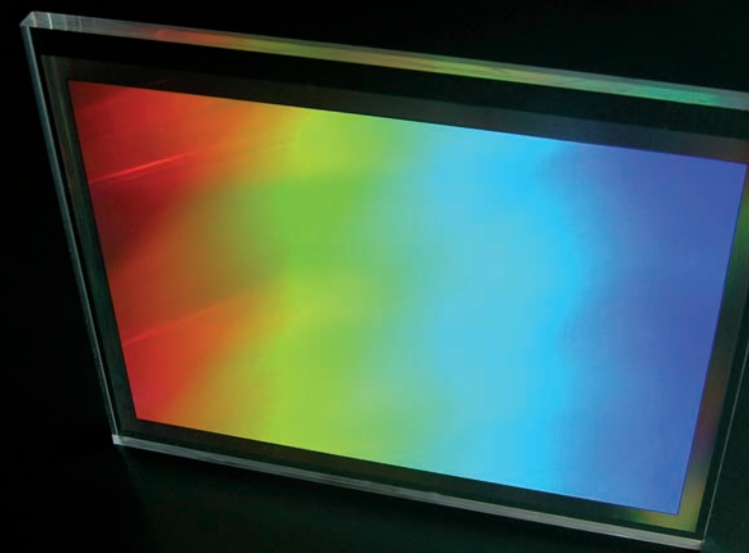
- Dr. Uwe Detlef Zeitner

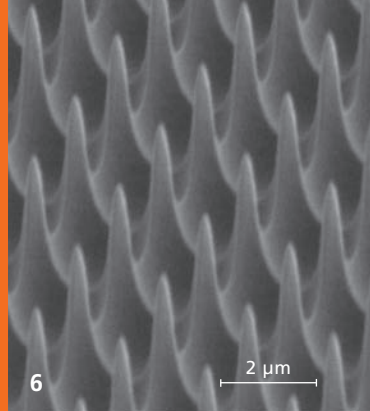
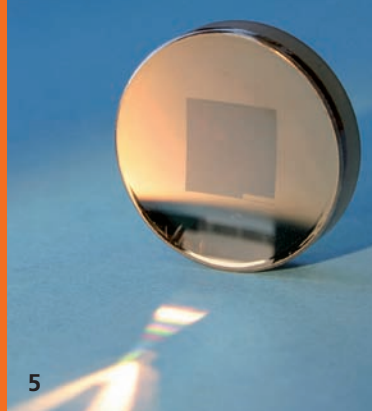
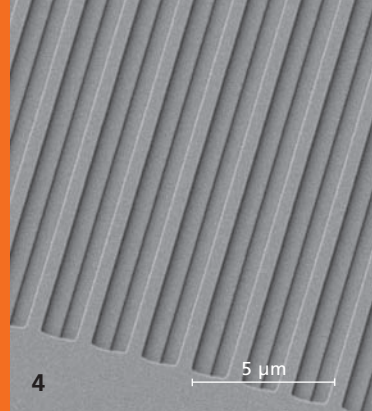
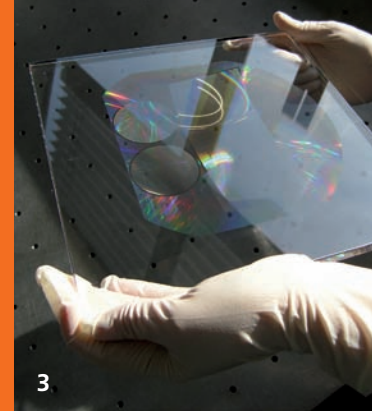
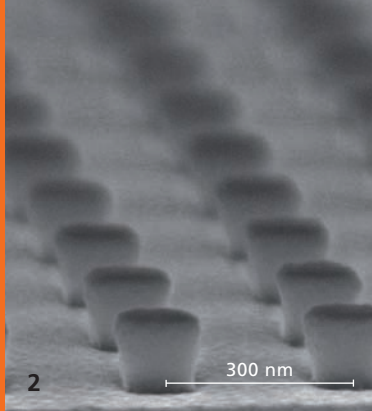
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CMN-OPTICS

CENTER FOR ADVANCED
MICRO- AND NANO-OPTICS





CUSTOMIZED OPTICAL FUNCTIONALITY

Optical element fabrication is part of a whole development chain including

- Optical systems design
- Adapted fabrication technologies for advanced element generation
- Integration of single components into complex systems

Customer needs are solved by services for

- Application specific optical and mechanical design
- Technology consulting and fabrication of customized elements
- Optical and profilometric characterization of element functionality
- Assembling of prototypes



1 Nano optical grating interferometer

2 High resolution resist pattern

3 Complex CGH for large mirror testing

4 Multi level blazed grating in resonance domain

5 Blazed grating on concave surface

6 Microstructure for plasmonic effects

TECHNOLOGY

Structure generation

- Electron Beam Lithography System SB350 OS
 - 300 mm writing capability
 - Minimum feature size < 65 nm
 - Address grid 1 nm
 - Placement accuracy < 15 nm
 - Advanced multilevel technology
 - Efficient data processing capability
- Laser Lithography System DWL400-FF
 - 200 x 200 mm² writing capability
 - Writing on non-planar substrates, tilt < 10°
 - Substrate thickness up to 30 mm
 - Resolution 1 μm
 - Continuous profile writing (128 levels)

Accompanying technologies

- Planarization / ion beam figuring of substrates
- Resist technology for 12" substrates
- Reactive ion etching
 - Silicon, fused silica, high index materials
 - Etching aspect ratio < 1:10
- Coating
 - HR, AR, metals
 - Sputtering, evaporation, ALD
- Wafer dicing and ultra precision machining
- Nano imprint and wafer scale replication

CHARACTERIZATION

Tooling for large substrates

- Scanning electron microscope
 - Focused ion beam tooling
 - Material analysis (EDX, EBSD)
- Atomic force microscope on 12" substrates
 - Height resolution 0.05 nm
- 12" plane-wave interferometer
 - 11" reference plane, WFE < 4 nm rms
- Interference optical surface profiler
- Ellipsometer for layer stack characterization

APPLICATIONS

Micro- and nano-optical elements

- Computer generated holograms (CGH)
- Micro-lens and grating arrays
- Beam splitters
- Sub-wavelength gratings, e.g. polarizer
- High efficient large scale pulse compression gratings
- Concave spectrometer gratings
- Photonic crystals

Selected references

- Effective medium grating for RVS spectrometer in ESA GAIA mission
- Nano-optical grating interferometer array for multichannel MEMS testing (EU project SMARTIEHS)