

Meta mirror

2D silicon grating on fused silica with ultra-high
reflectivity at wavelength 1550 nm

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500 nm

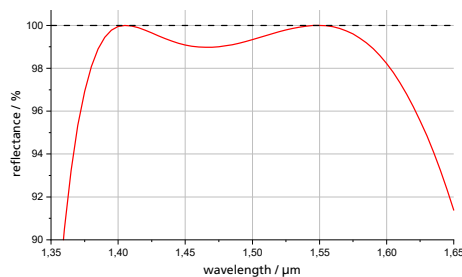
Cover: Photograph of the meta mirror.
The grating area is 120 mm in diameter.
Top: SEM-image of the 2D-sub-wavelength siliconstructure.

Description

The meta mirror bases on principles of resonant waveguide grating structures and is designed to achieve a reflectivity of $> 99.9\%$ for both polarizations. The presented meta mirror bases on only a single material system (silicon on a fused silica substrate), though, also monolithic approaches are possible. This makes it predestined for applications under extreme environmental conditions and highest optical powers. Its principle can be applied to different wavelengths

Parameters

- The meta mirror is designed for maximum reflectivity at 1550 nm
- Bandwidth of 300 nm with reflectivity $> 90\%$
- 2D-resonant sub-wavelength structure with period of 670 nm, illuminated under 0° angle of incidence
- Polarization independent structure



Calculated reflectivity spectrum of the silicon grating.

Technology

The grating is realized by electron beam lithography in combination with reactive ion etching processes in the uppermost amorphous silicon layer.

Application

- Laser cavity mirror
- Ultra-lightweight mirror for acceleration sensing in gravitational wave astronomy

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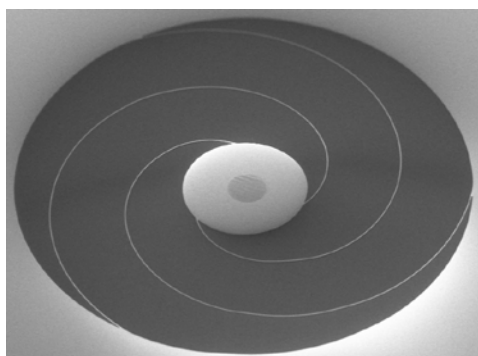
Websites:



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Meta mirror ($\varnothing 320\ \mu\text{m}$) on spiral mount, fabricated on SOI-Wafer (courtesy IAP, University of Jena)