Leibniz Ferdinand Braun Institut

Ferdinand-Braun-Institut gGmbH
Leibniz-Institut für Höchstfrequenztechnik
Gustav-Kirchhoff-Str. 4, 12489 Berlin, Germany
www.fbh-berlin.de

Contact
sales@fbh-berlin.de
+49.30.6392-2634

Miniaturized optical isolator with a volume < 0.5 ml

Optical isolators are components that exhibit a direction-dependent transmission of light. They are used to protect diode lasers against optical feedback that deteriorates the electro-optical performance or may even lead to critical damages.

FBH's Joint Lab Quantum Photonic Components has developed a platform for miniaturized optical isolators with a small volume that can be used for the integration of isolators with wavelengths between approximately 400 nm and 950 nm. Due to their compactness, they are ideal for the usage in diode-based laser systems that have strict constraints in terms of size, mass, and power consumption.

The addressed range of wavelengths closes a gap in the availability of commercial products and enables new applications in the field of optical quantum technologies that require ultra-compact, laser-based light sources.

Advantages

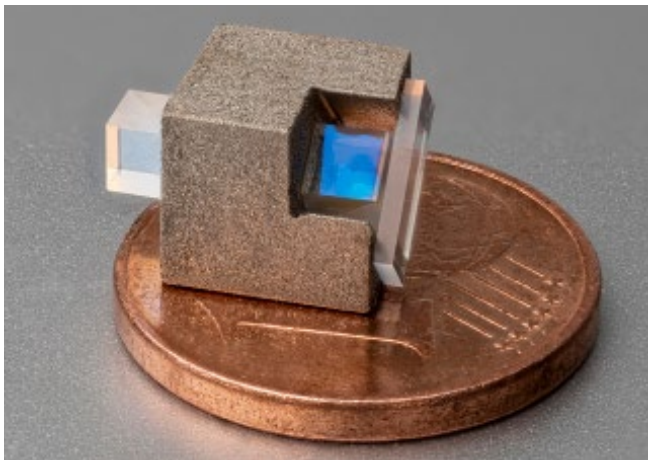
- ultra-compact for miniaturized applications
- broad wavelength range: from 400 nm to 950 nm
- excellent performance with isolation > 30 dB

Key parameters

isolation	> 30 dB
insertion loss	< 1.5 dB (transmission > 70%)
volume	< 0.5 ml (6.5 x 6.5 x 10.3 mm^3)
free aperture	1.4 x 1.4 mm^2 (for 600 µm beam)
polarization rotation	outgoing matches incoming pol.
magneto-optical materials	CeF_3/TGG/TSAG (~400 - 560 nm) CdMnTe (~560 - 950 nm)
magnet material	high-remancence FeNdB alloy

Measured performance

wavelength	isolation	insertion loss
461 nm	> 32 dB	1.4 dB (27%)
689 nm	> 31 dB	1.2 dB (24%)
698 nm	> 32 dB	1.4 dB (27%)
854 nm	> 33 dB	1.5 dB (29%)



FBH's miniaturized optical isolator.

Applications

- optical quantum technologies with strict dimension, mass, and power requirements like
  - (table-top) quantum computers
  - metrology, e.g. compact optical clocks
  - quantum sensors
- utilization in any kind of laser with a corresponding wavelength

Profile

Ferdinand-Braun-Institut (FBH) researches electronic and optical components, modules, and systems based on compound semiconductors. It develops light sources from the near-infrared to the UV spectral range: high-power diode lasers, UV light sources, and hybrid laser systems. Moreover, it manufactures high-frequency devices and circuits for communications, power electronics, and sensor technology. In the field of quantum technologies, FBH translates laboratory-scale proof-of-concept experiments into robust, application-ready systems. Further applications range from medical technology, materials processing and sensors to optical communications in space. In close cooperation with industry, its research results lead to cutting-edge products.

FBH is a member of the Leibniz Association and part of Research Fab Microelectronics Germany (FMD)