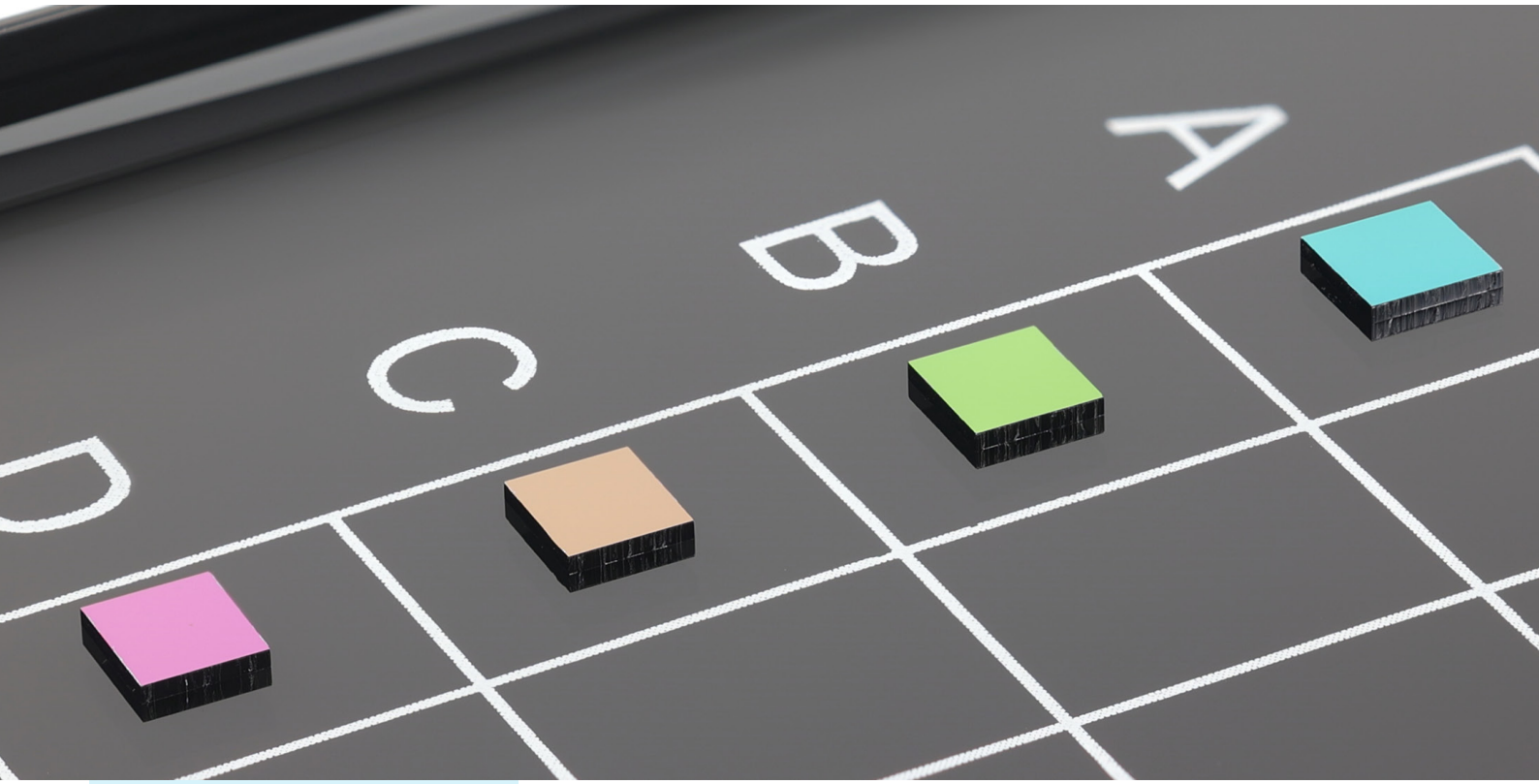
CUSTOM InP-BASED SEMICONDUCTOR SATURABLE ABSORBER MIRRORS (SESAMS) FOR 1.56 µm

Fraunhofer HHI



AT A GLANCE

Highly customizable, strain-free Semiconductor Saturable Absorber Mirrors (SESAMs) based on InP-based technology

Features

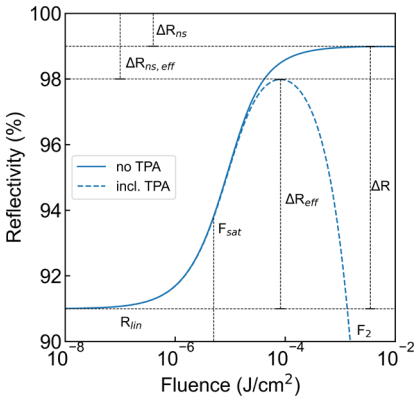
- Realization of custom designs
- Robust, strain-free semiconductor stack
- Application-specific dielectric coatings
- Highly customizable performance
- Wafer-scale production

Applications

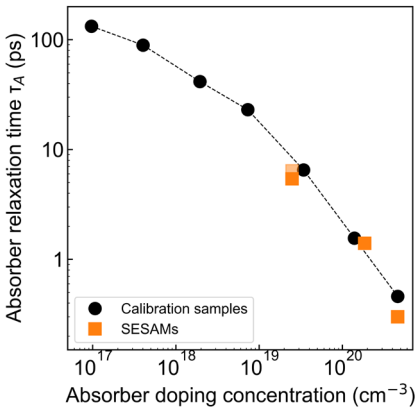
- Solid-state lasers
- Fiber lasers
- Semiconductor lasers

Technical Background

Robust, high-quality semiconductor saturable absorber mirrors (SESAMs) are a prerequisite for implementing mode-locked pulsed laser systems with high performance and long-term stability. The InP-based SESAM platform at Fraunhofer HHI combines highly customizable device performance, long lifetime and excellent wafer-to-wafer reproducibility for volume production. Our SESAM designs are based on monolithic, strain-free semiconductor structures supplemented with application-specific dielectric coatings. This enables the adaptation of our SESAMs to your specific laser design.



Model function for the non-linear, fluence dependent SESAM reflectivity R(F)



Absorber relaxation time as a function of doping concentration for calibration samples and SESAMs

Specifications

- Operating wavelength — 1500 to 1600 nm
- Relaxation time τ_A — 200 fs to 100 ps
- Modulation depth ΔR — typ. 1 to 20 %
- Non-saturable losses ΔR_{ns} — down to <1 %
- Saturation fluence F_{sat} — typ. 10 to 100 µJ/cm²
- Roll-over fluence F_2 — typ. 10 to 1000 µJ/cm²
- Stopband FWHM — typ. 100 nm

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A. Dohms, et al., „Strain-free SESAMs with iron doped absorber for femtosecond fiber laser mode locking at 1560 nm," Opt. Express 30, 21609-21620 (2022)

A. Dohms, et al., „Versatile, strain-free, InP-based SESAMs with iron-doped InGaAs absorber for ultrafast lasers at 1560 nm," in CLEO 2025, Technical Digest Series (Optica Publishing Group, 2025)