HARPIA | TG

NEW

Transient Grating Spectrometer

- Carrier diffusion coefficient in a matter of minutes
- Non-invasive measurement technique
- Fully automated and computer controlled
- Continuous setting of grating period
- Sensitivity down to μJ/cm² excitation level
- Advanced measurement and analysis software
- Photoluminescence (PL) measurement option

Specifications

Model	HARPIA-TG
Grating recording wavelength [1]	340 – 560 nm
Probe wavelength [2]	1030 nm
Grating period [3]	1.15 – 15 μm
Pulse duration	< 290 fs
Delay range	Up to 8 ns

MEASUREMENT RANGES

Diffusion coefficient	0.1 – 50 cm²/s
Carrier lifetime	1 ps – 80 ns

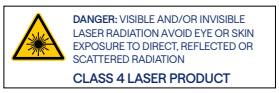
DIMENSIONS

Physical dimensions (L × W × H)	730 × 420 × 188 mm

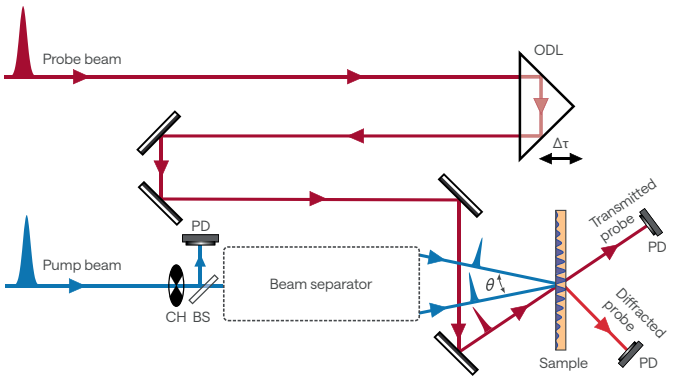
HARPIA-TG is a transient grating spectrometer for the measurement of carrier diffusion and lifetime. Measurements are based on the laser-induced transient grating (LITG) technique. This method enables simultaneous observation of non-equilibrium carrier recombination and diffusion by all-optical means.

HARPIA-TG allows the characterization of electrically non-conductive or non-fluorescent samples. It is suitable for semiconductors materials and derivatives, e.g., silicon carbide (SiC), gallium nitride (GaN), perovskites, organic and inorganic solar cells, quantum dots, and even complex nanostructures such as quantum wells.

[1] *Extendable to long-wave VIS/NIR. Contact sales@lightcon.com for details.*
[2] *SH (515 nm) or OPA-based probe is available upon request. Contact sales@lightcon.com for details.*
[3] *Depends on the excitation wavelength.*



HARPIA-TG principal scheme



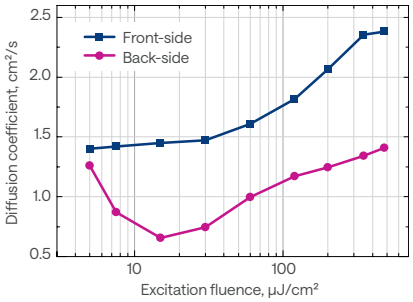
BS – beam splitter
CH – chopper
ODL – optical delay line
PD – photodiode
PM – parabolic mirror
θ – intersection angle
Δτ – delay

Performance

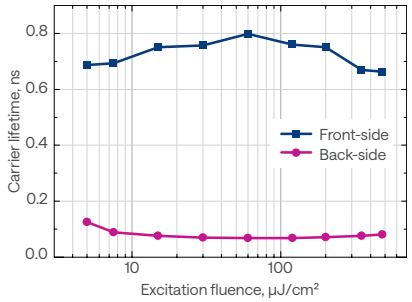
GaN

The graphs below indicate the carrier diffusion coefficient, diffusion length, and lifetime of GaN at the back and at the front of the layer as a function of fluence. The thicker the GaN, the better the quality of the grown layer due to better coalescence. It is evidenced by the lower diffusivity and shorter lifetimes that indicate poor structural quality and higher defect density at the interface between the sapphire substrate and GaN. Measurements were performed using **HARPIA-TG** combined with **CARBIDE-CB5** laser and **I-OPA**. Measurement conditions: 60 kHz, 355 nm pump wavelength, 1030 nm probe wavelength.

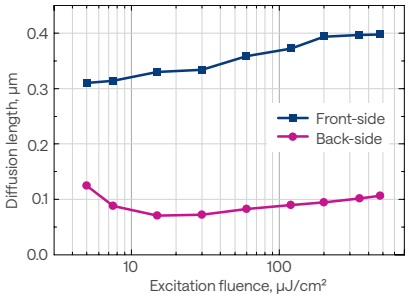
Diffusion coefficient of GaN as a function of fluence



Carrier lifetime of GaN as a function of fluence



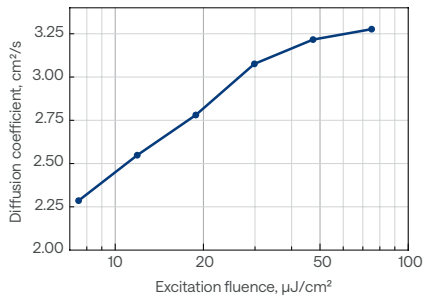
Diffusion length of GaN as a function of fluence



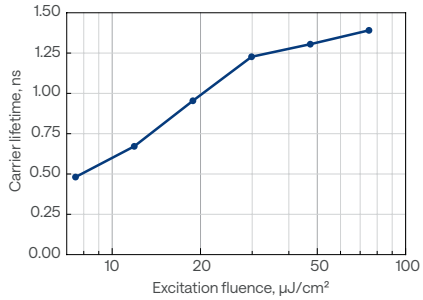
SiC

Silicon carbide (SiC) is a compound semiconductor with unique properties, valued for its high thermal conductivity, wide bandgap, and excellent electrical performance. In SiC devices, where high-frequency, high-temperature, and high-voltage operation is common, managing carrier diffusion is particularly critical to ensure efficient and reliable device performance, making it a key consideration in SiC semiconductor technology.

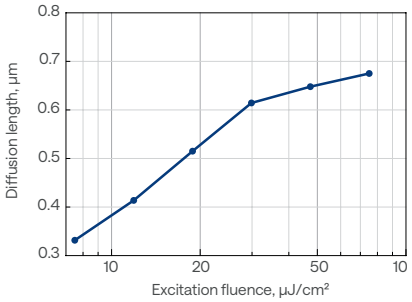
Diffusion coefficient of SiC as a function of fluence



Carrier lifetime of SiC as a function of fluence

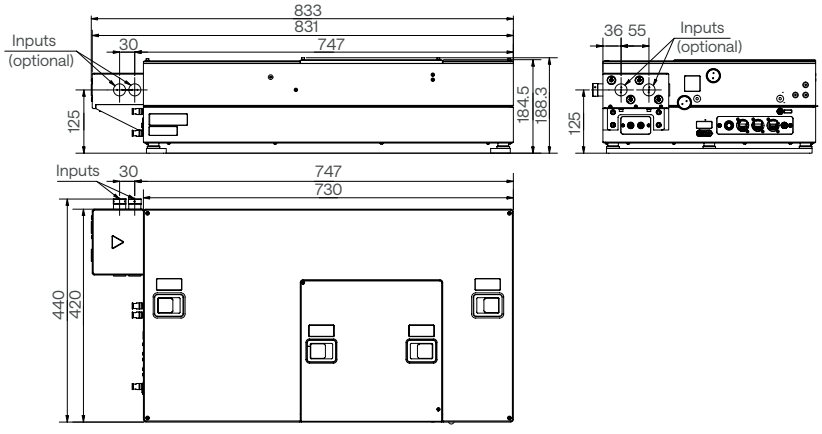


Diffusion length of SiC as a function of fluence



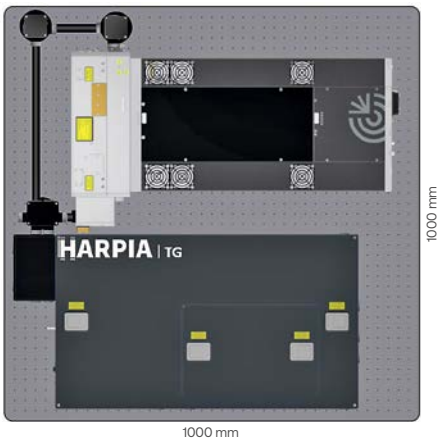
Drawings

HARPIA-TG drawing



Recommended layout

HARPIA-TG with **CARBIDE-CB5** and **I-OPA**



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