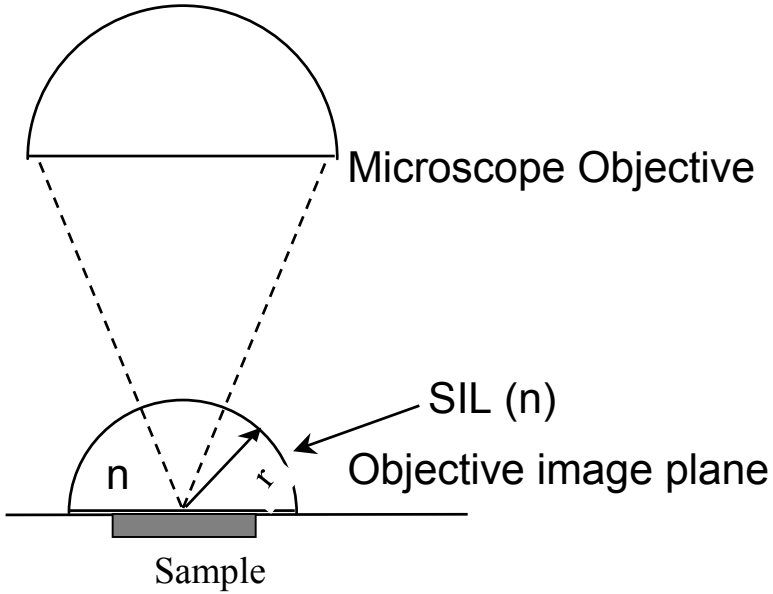
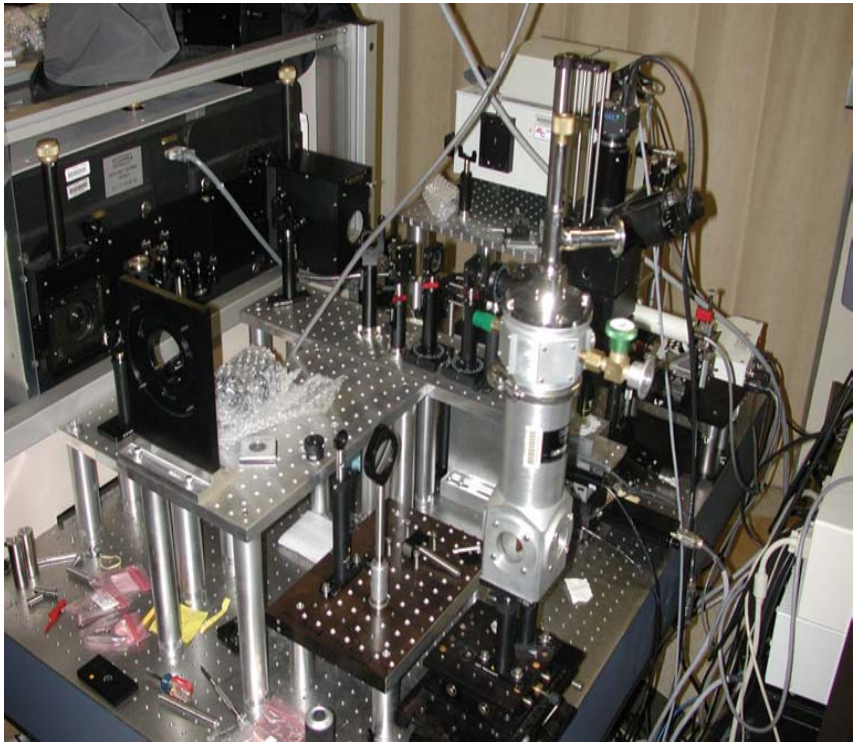
Development of a Solid Immersion Lens Microscope for Optical Spectroscopy





- The Solid Immersion Lens acts on the principle of inserting a high-index of refraction material between a microscope objective and the sample. The system being developed by ASU/U. of A. researchers is unique in that it incorporates computer control of SIL-sample separation, autofocus, a liquid crystal tunable filter for Raman imaging, and a 2-m double monochromator for
- ultrahigh spectral resolution.

Image shows design layout for SIL microscope with diverting optics to allow signal dispersion by:
Low resolution spectrometer (top white),
Sopra 2 m spectrometrer (left),
or LCTF imaging area (foreground)

Arizona State University: Menendez, Poweleit, Drucker, & Woodbury

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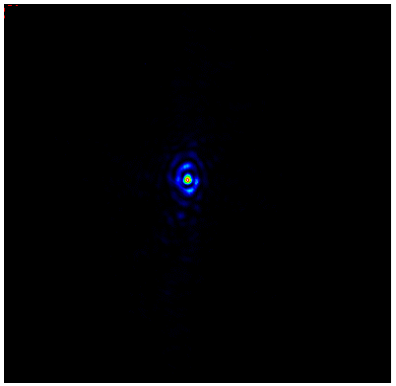
Example: enhanced SIL resolution allows static 2-D measurement of diffusion in InGaP

SIL Laser Spot Image



$$I(r) \propto \int_0^\infty N(r,t)\,dt$$

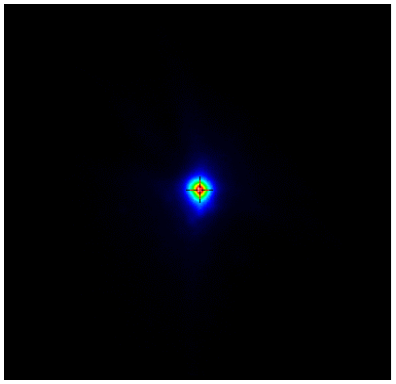
N(r,t) 2D carrier density- radial & time is a function of

D = ambipolar Diffusion constant

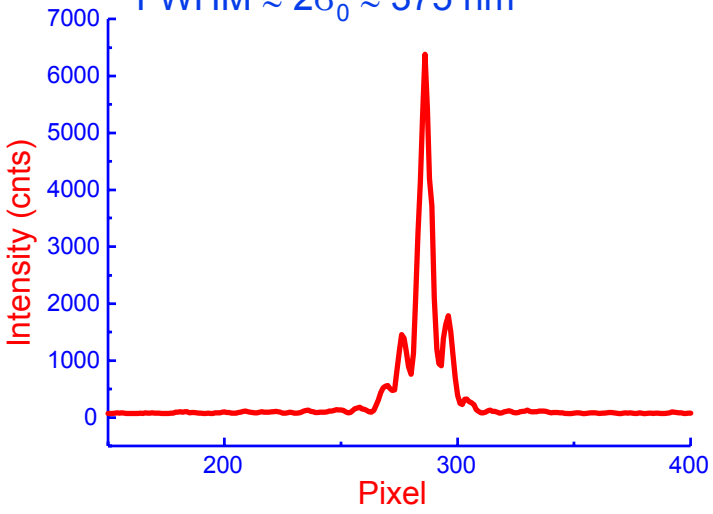
σ_0 = initial distribution (spot size) width

Fit to imaged luminescence profile yields the Diffusion length $L_D = 0.975\ \mu m = (D\tau)^{1/2}$

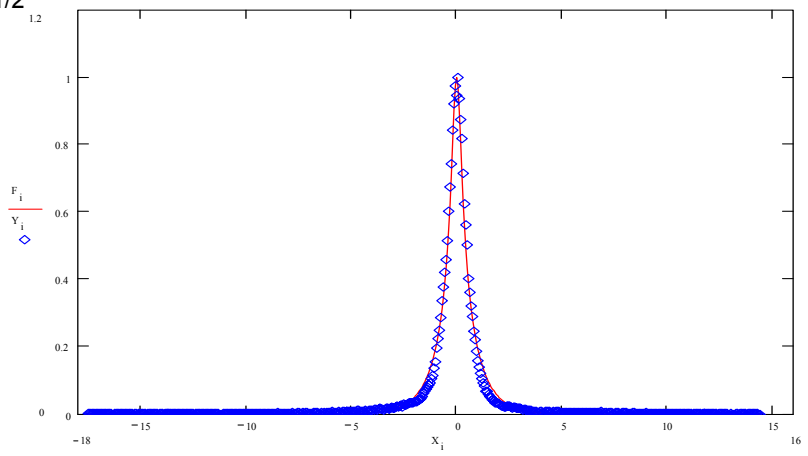
SIL Photoluminescence Image



FWHM ≈ $2\sigma_0$ ≈ 375 nm



FWHM ≈ L_D ≈ 0.98 μm



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