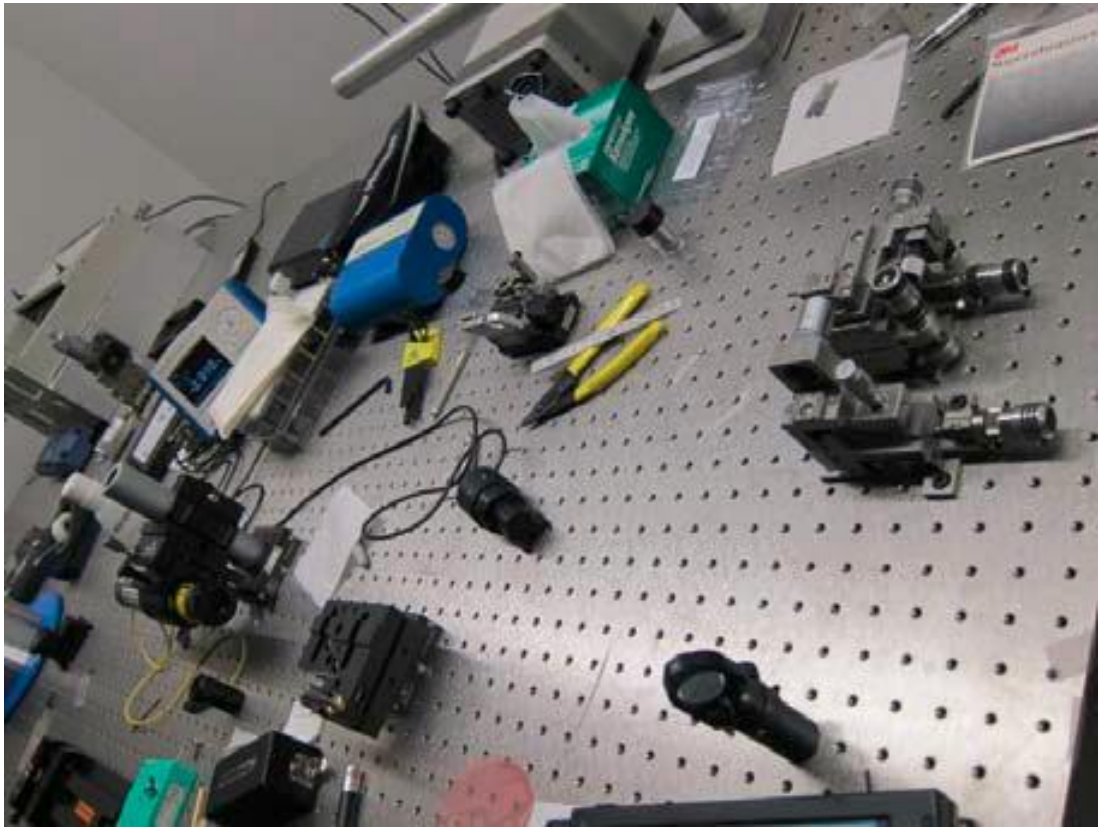
Project 4: Free space fiber coupling



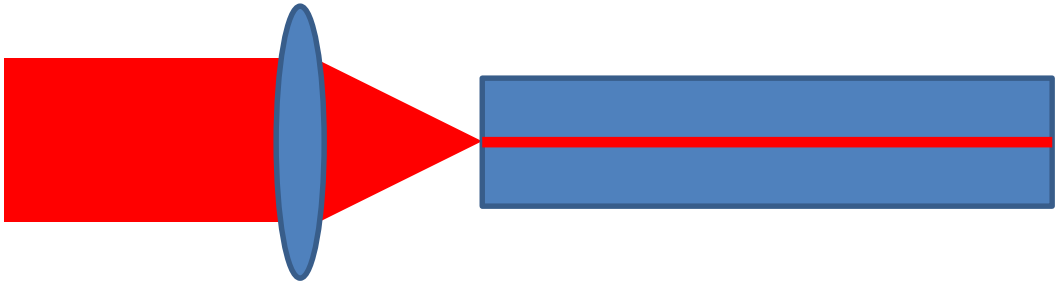
Projects

1. Handling optical fibers, numerical aperture
2. Measurement of fiber attenuation
3. Connectors and splices
4. Free space coupling of laser into fibers
5. Bending loss in optical fibers
6. Components for fiber communication and fiber lasers
7. Fiber lasers and amplifiers
8. Mode-locked fiber lasers
9. Soliton transmission in optical network
10. Fiber optics interferometric sensors

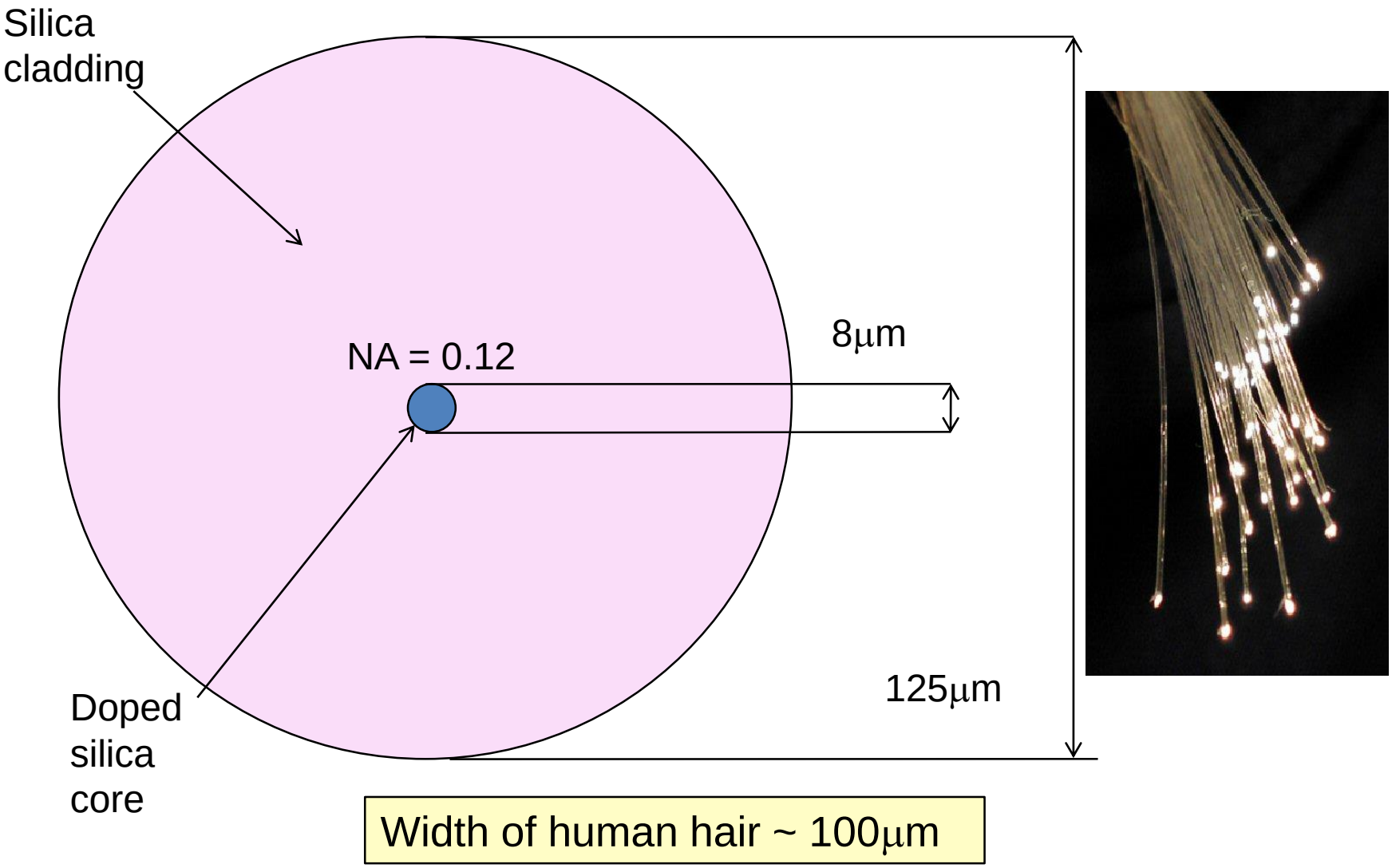
Free space coupling

Goal: learn how to couple a laser beam from free-space into a singlemode optical fiber.

- Choose the right lens: need to match the NA and spot size to the core size of the fiber
- Perform alignment: can take a long time if you use bruce-force. Can be done very quickly with some “tricks”

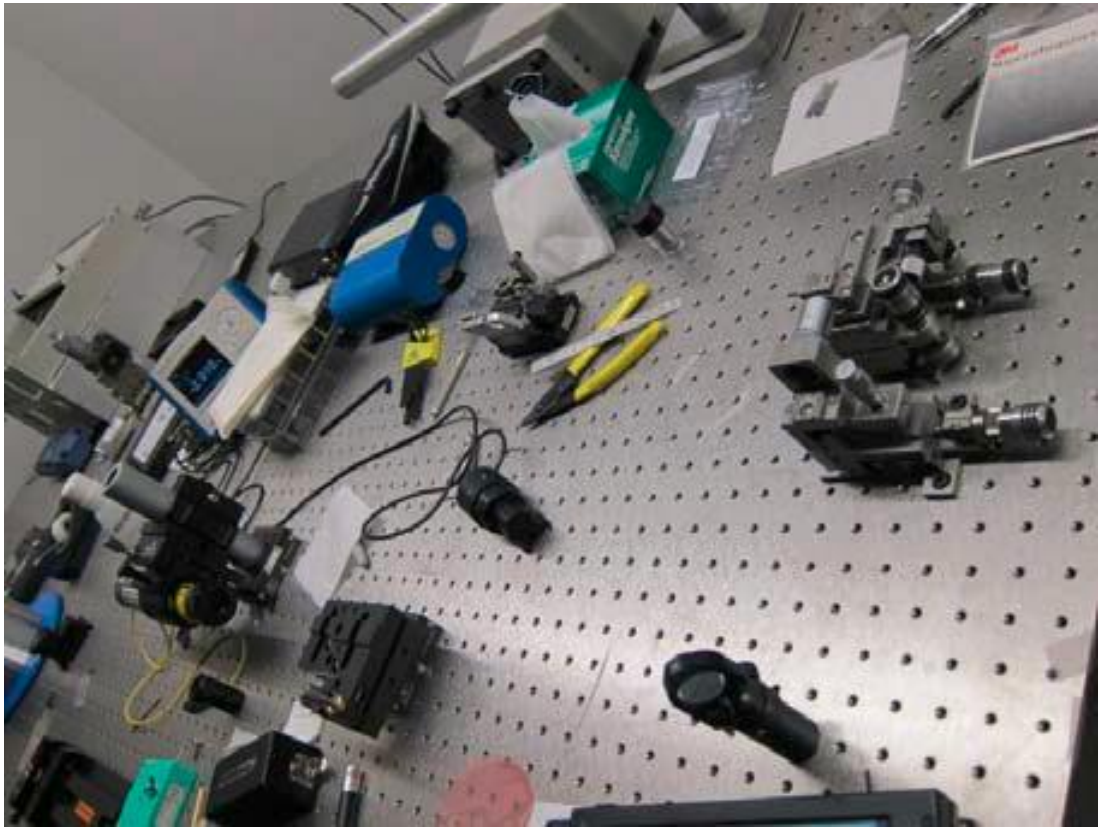


Free space coupling



Width of human hair ~ 100μm

Free space coupling



What a graduate student need to do before the thesis defense?

To become an expert in a particular field

- What is a field of study?
- What is an expert?

Fields of study in Optics

Optics Classification and Indexing Scheme (OCIS)

The Optics Classification and Indexing Scheme (OCIS) provides a flexible, comprehensive classification system for all optical author input and user retrieval needs. OCIS has a two-level hierarchical structure containing 36 main headers and approximately 1100 subcategories. OSA authors, presenters, and reviewers use OCIS to classify and index journal articles, meeting abstracts and presentations, and areas of research interest and expertise.

Suggestions for changes or additions can be sent to OCIS@osa.org.

Main Categories

000.0000	General	110.0110	Imaging systems	230.0230	Optical devices
010.0010	Atmospheric and oceanic optics	120.0120	Instrumentation, measurement, and metrology	240.0240	Optics at surfaces
020.0020	Atomic and molecular physics			250.0250	Optoelectronics
030.0030	Coherence and statistical optics	130.0130	Integrated optics	260.0260	Physical optics
040.0040	Detectors	140.0140	Lasers and laser optics	270.0270	Quantum optics
050.0050	Diffraction and gratings	150.0150	Machine vision	280.0280	Remote sensing and sensors
060.0060	Fiber optics and optical communications	160.0160	Materials	290.0290	Scattering
		170.0170	Medical optics and biotechnology	300.0300	Spectroscopy
070.0070	Fourier optics and signal processing	180.0180	Microscopy	310.0310	Thin films
		190.0190	Nonlinear optics	320.0320	Ultrafast optics
080.0080	Geometric optics	200.0200	Optics in computing	330.0330	Vision, color, and visual optics
090.0090	Holography	210.0210	Optical data storage	340.0340	X-ray optics
100.0100	Image processing	220.0220	Optical design and fabrication	350.0350	Other areas of optics

What is an expert in a field?

Expert: one with the special skill or knowledge representing mastery of a particular subject (Merriam-Webster)

1. Know everything about what has been done in the field
2. Know about the remaining challenges
3. Come up with solution from time to time to solve one of the remaining challenges
4. Collaborate with experts from other fields to solve a common problem
5. Can do something that nobody else can do

To do list

1. Identify your field of study (very important)
2. Study about what has been done in your field
3. Who are the people that are working in your field?
4. Is there a conference session or meeting where people in the field come together?
5. Come up with new ideas that help solve some of the outstanding problems
6. Go to the lab and realize your ideas
7. Report them so that other people can use the results