



Rochester Institute of Technology

-Proposal to join the LSC-

Shally Saraf

Rochester Institute of Technology Quantum Electronics
Group (RITQEG)

August 15, 2006

LIGO-G060437-00-Z



Who is RITQEG?

- Shally Saraf
 - Part of LSC since 1999
 - 1999-2005: Graduate student in Bob Byer's high power laser lab at Stanford
 - 2005-present: *Asst. Prof. Electrical Engineering, RIT*
- Two MS students from electrical engineering
- Potentially a few undergraduate students from EE and Physics



Where is Rochester, NY?





Rochester Institute of Technology

- Founded in 1829, moved to Henrietta campus 1968
- Current Enrollment 15,200 students
 - 85% undergraduate
 - 6600 resident on campus
 - 50% from New York State
- Ph.D. program in Microsystems engineering
- 2,700 faculty and staff
- 360 career-oriented and professional programs
- Extensive cooperative education program
 - 1,300 companies
 - 3,000 students



Rochester Institute of Technology...

- Eight Colleges
 - The College of Applied Science and Technology
 - The College of Business
 - The B. Thomas Golisano College of Computing and Information Sciences
 - The Kate Gleason College of Engineering
 - The College of Imaging Arts and Sciences
 - The College of Liberal Arts
 - The College of Science
 - The National Technical Institute for the Deaf



“The Sentinel”





College of Engineering





College of Science





National Technical Institute for the Deaf





RIT “Tigers”





Research interests of RITQEG

- High power solid-state lasers
- Quantum noise measurements
- Squeezed light generation
- Terahertz generation and imaging

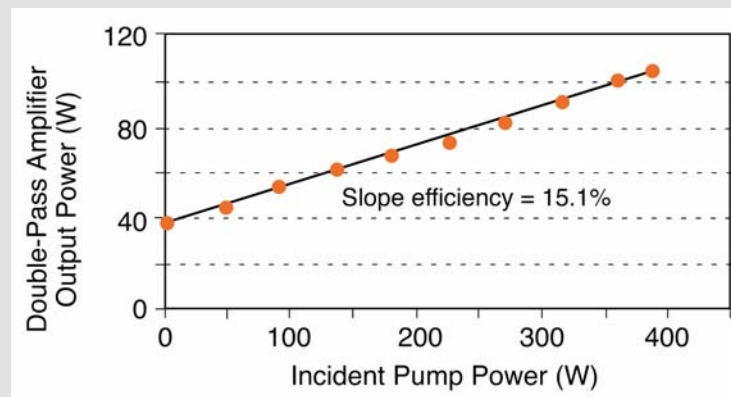
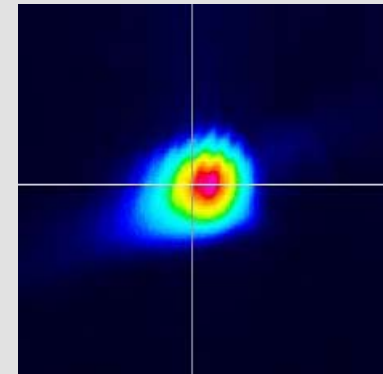
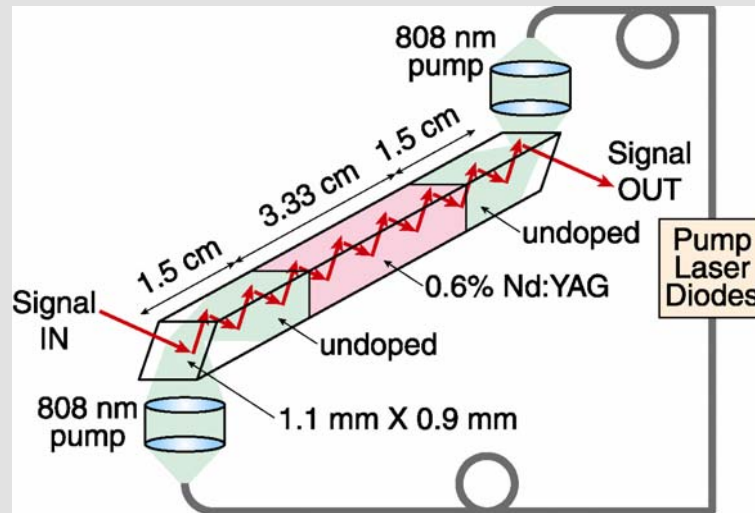


Past research for LIGO

- Developed 100-W class Nd:YAG MOPA for Advanced LIGO
- Performed quantum noise measurements in free-space saturated amplifiers
- Developed Resonant Cavity Polarizers



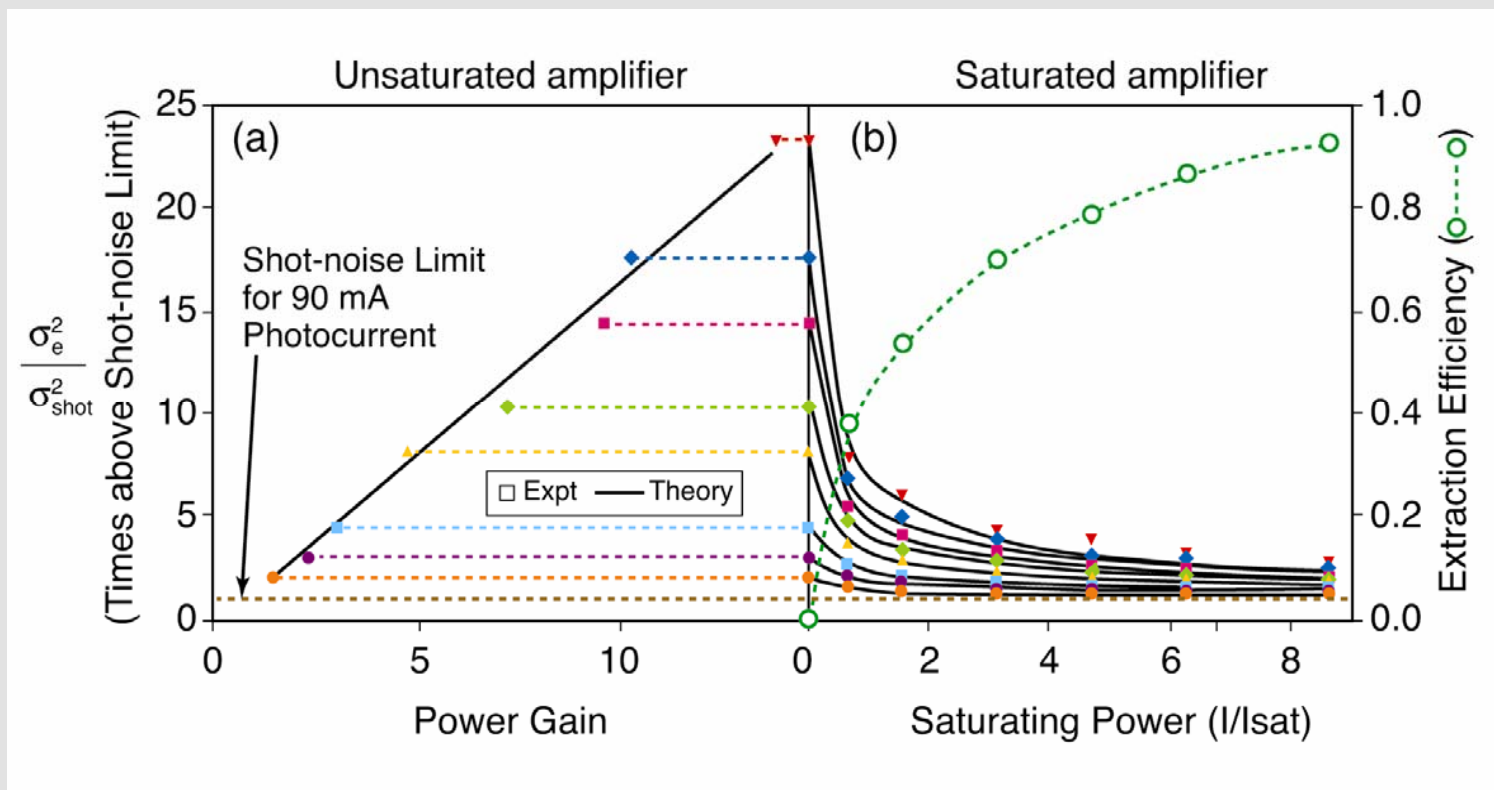
100-W-class zigzag slab amplifier



- 90% in TEM_{00} mode at 104 W output power!



Amplifier quantum noise measurements



- Extraction efficiency increases and quantum noise decreases as the amplifier is saturated!

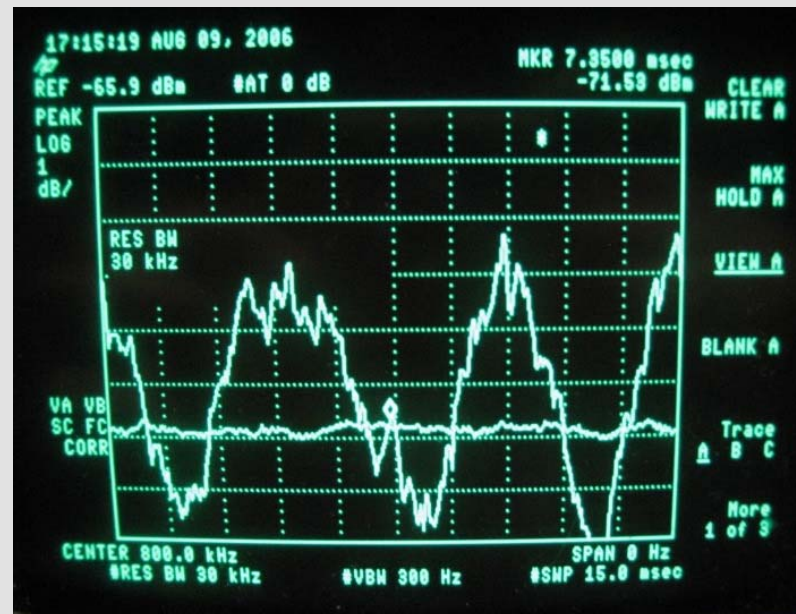


Proposed work

- Build a compact OPO-based squeezer at RIT
 - start off with PPLN/PPKTP
 - investigate other low-loss, high non-linear coefficient materials (GaAs?)
 - achieve >10 dB squeezing with “squeezer-in-a-box”
- Investigate frequency-dependent squeeze angle generation
 - cavities and other techniques (EIT?)
- Develop collaborations within LIGO
 - Nergis's group at MIT



Squeezing at the 40 m



- >2 dB squeezing achieved in PPKTP!
- OPO and homodyne detector to be optimized
- Several PPKTP crystals to be tested
- Quantum noise locking of OPO to be implemented



Proposed work for the period August' 06- August' 07

- Design test bed for qualifying nonlinear crystals for squeezer. Start off with PPKTP (?) to develop a baseline similar to the MIT design.
- Design and build PPLN based SHG for pumping OPO.
- Design and build quantum noise locking (QNL) servos for locking OPO and squeeze angle.



Rochester in the fall

