

Industry R&D Related to 2- μ m Lidars

Second Review of 2- μ m Solid State Laser Technology
NASA, Washington D.C. May 18-19, 1992



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TOPICS

Survey of industrial programs

History of 2- μ m laser programs at SEO

Technology discussion

Some thoughts on system design



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SURVEY OF RELATED INDUSTRIAL PROGRAMS

Space-based lidar

- SEO
- Lightwave Electronics
- CT (?)
- Ground-based lidar
- CT
- Lockheed

Wind-shear, CAT lidar

- Lockheed/CT
- Litton APD
- SEO

Aerosol measurements

- SEO, USF

"DOD"

- Sanders Associates/Lockheed
- Northrop
- Lightwave Electronics

Scientific

- Spectra-Physics

Interested Observers

- Raytheon, Boeing, STI
- OADS bidders



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PAST AND PRESENT PROGRAMS AT SEO

Solid State Lasers for Coherent Lidar

– 4/88 to 4/91, AFGL, Hanscom

SF 2.1 System

– Litton APD, 6/90

The Development of Cr,Tm,Ho:YAG Lasers for Airborne Lidar

– 7/91 to 2/93, AFGL, Hanscom

An Airborne Coherent Lidar System for the Detection of CAT

– 2/92 to 8/92, DARPA

Solid State Laser Development

– 9/90 to 9/92, (classified)



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REVIEW OF TECHNICAL RESULTS

SF 2.1 System at Litton APD

Comparison of gain in $Tm, Ho:YAG$ and $Tm, Ho:YLF$

Q-switched, lamp-pumped CTH:YAG oscillators

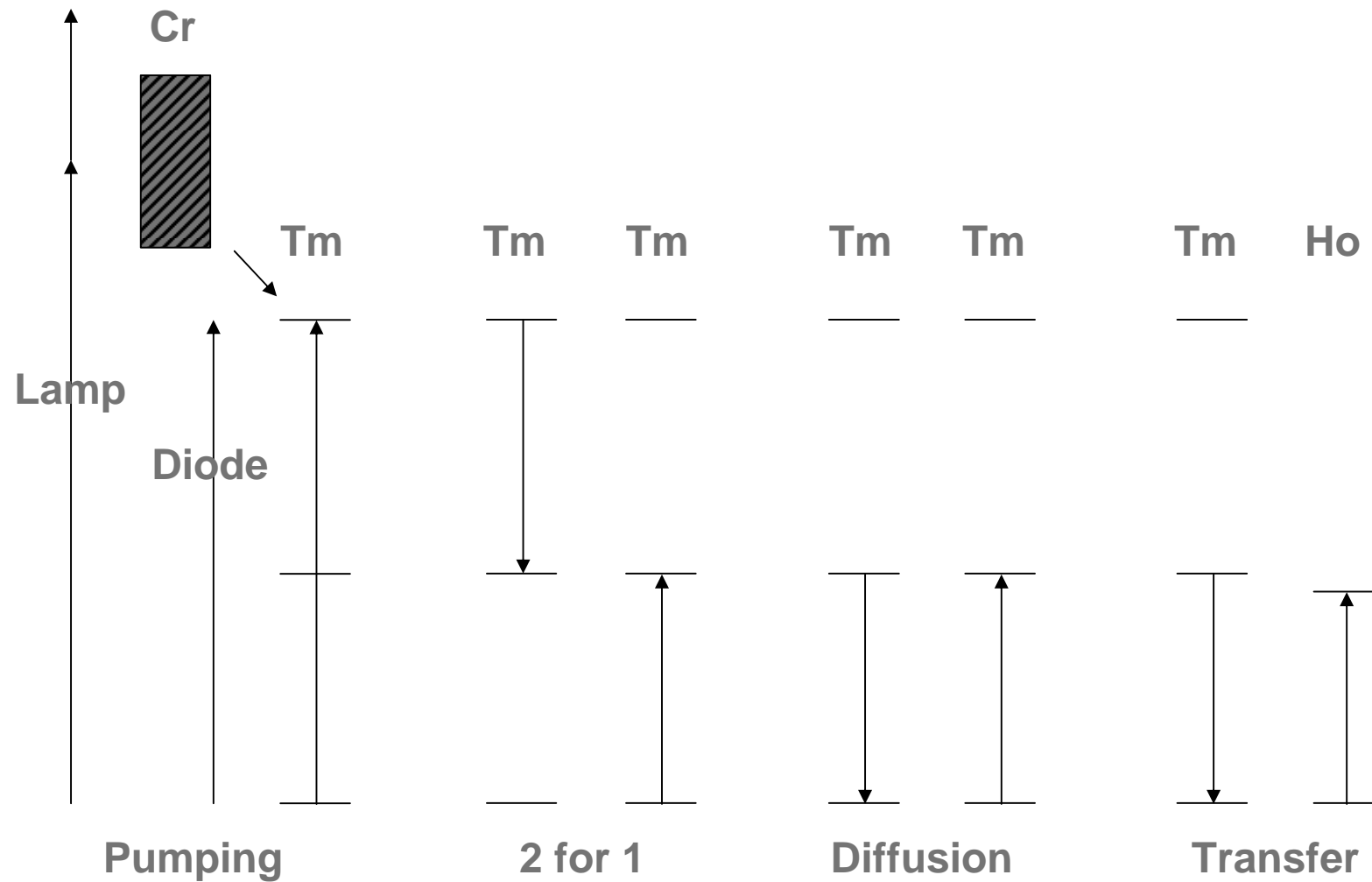
- water-cooled, room temperature
- fluorinert-cooled, -30 C

High-average-power lamp-pumped CTH:YAG



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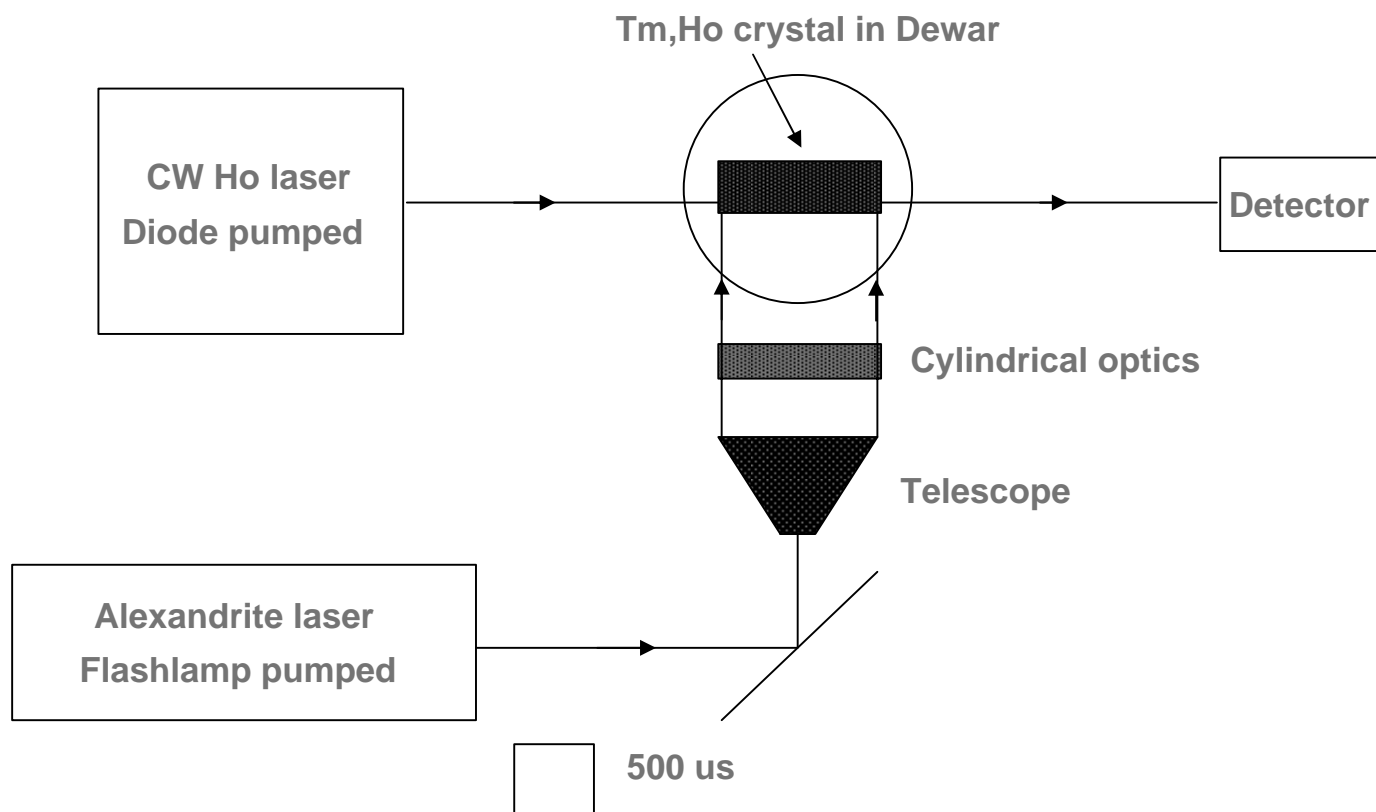
T_m,H_o PUMPING PROCESS





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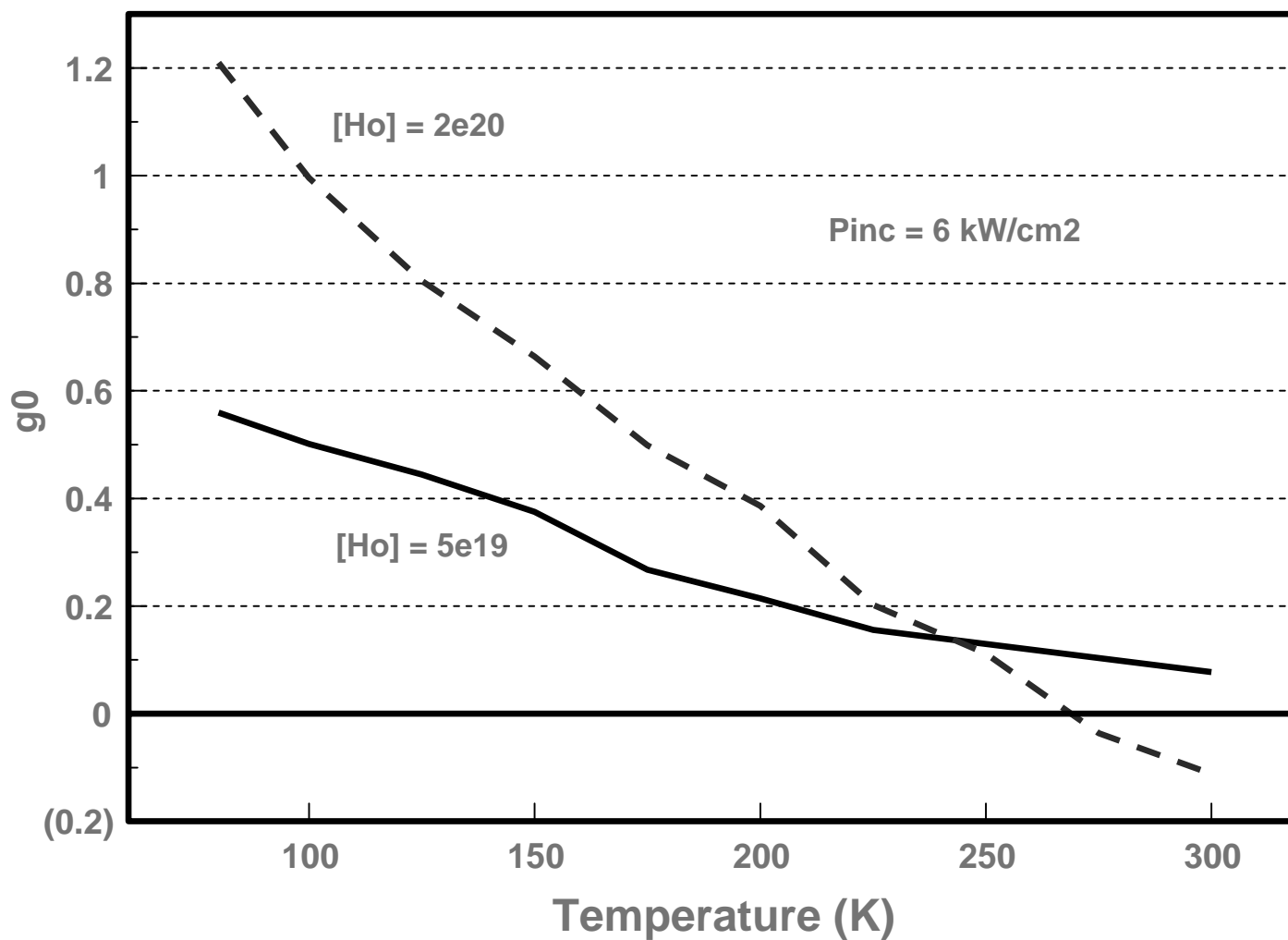
Tm,Ho GAIN-PROBE EXPERIMENT





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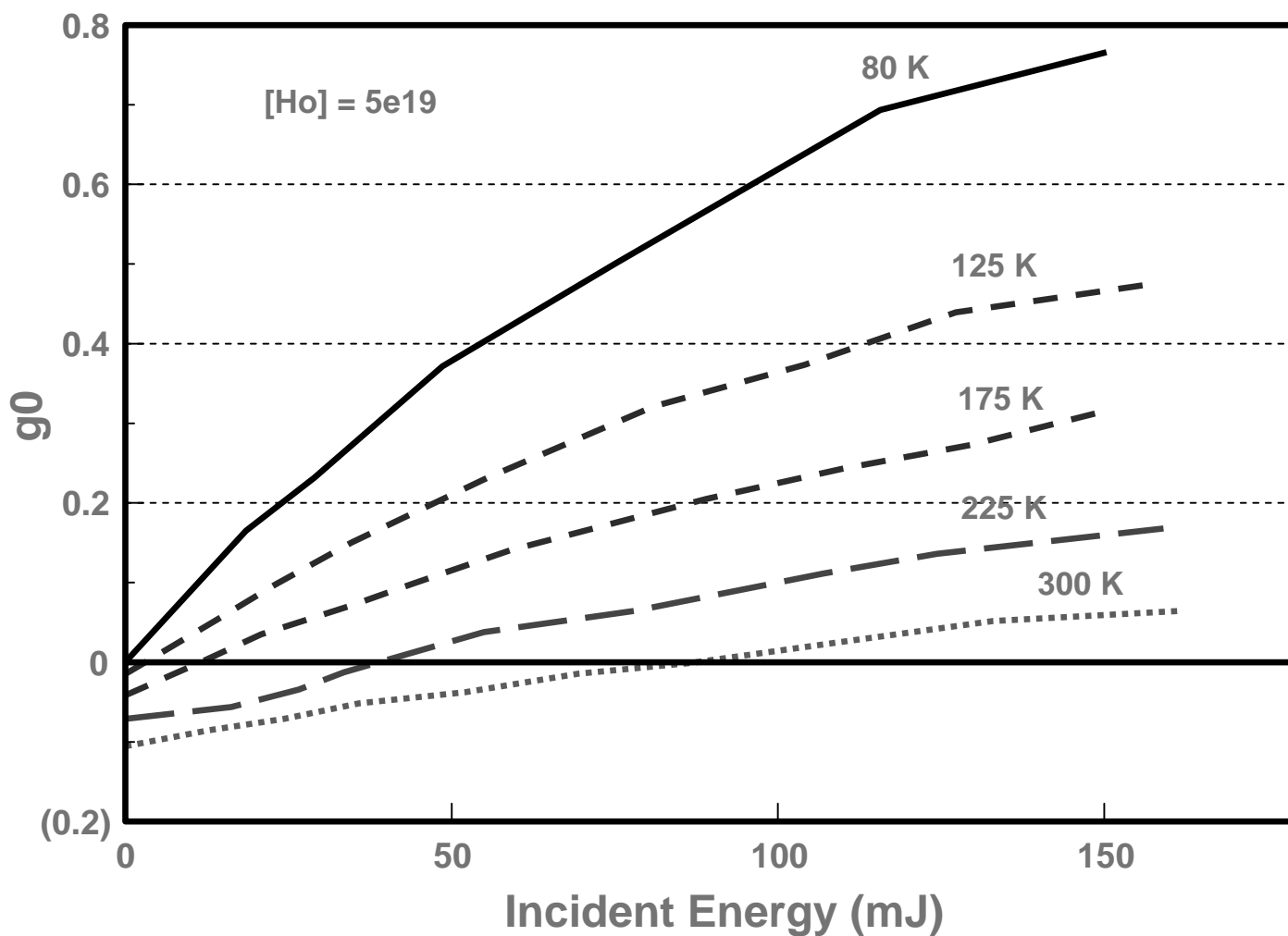
GAIN COEFFICIENT VS TEMPERATURE TWO Ho CONCENTRATIONS IN YAG





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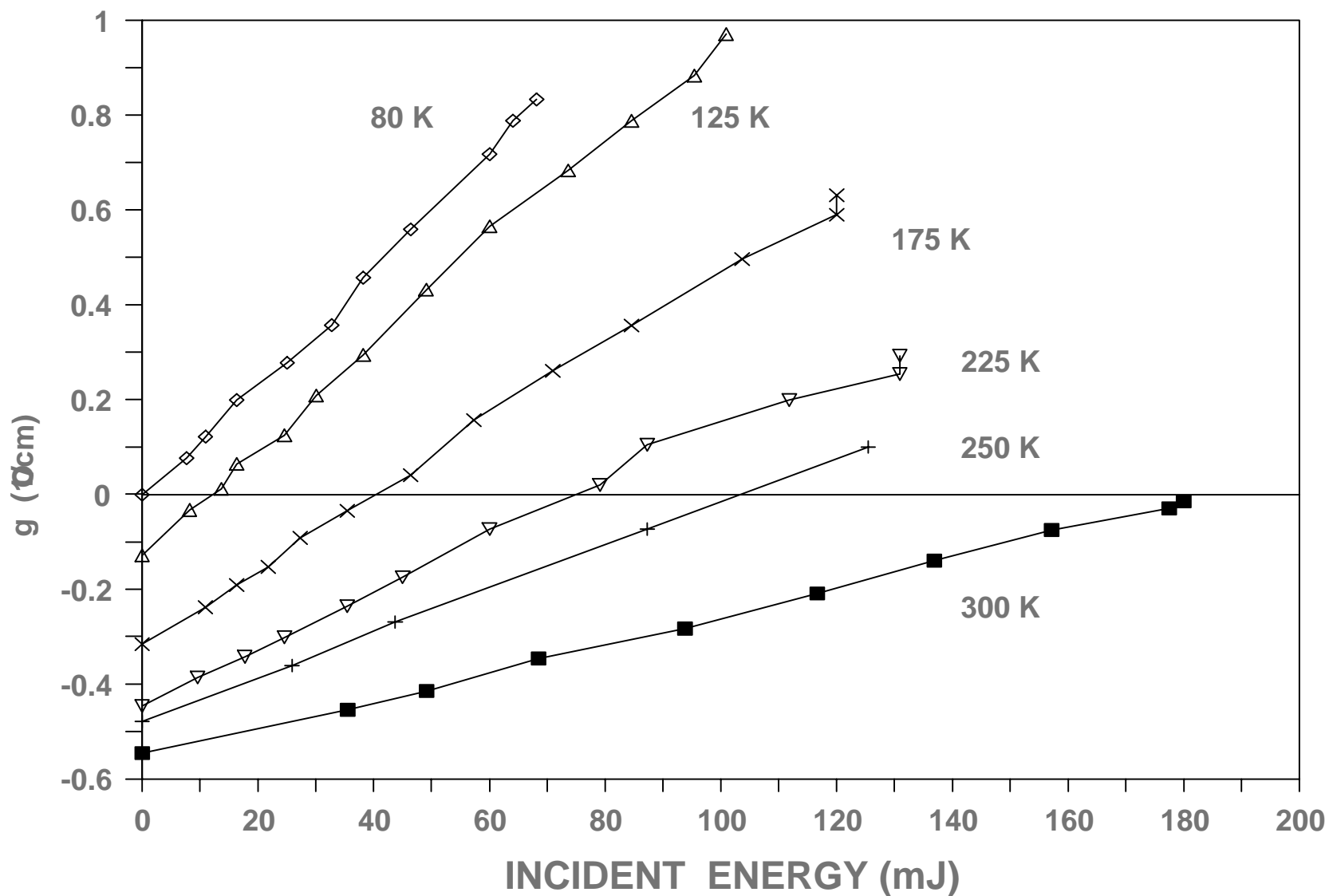
Tm, Ho:YAG GAIN VS. PUMP ENERGY FOR DIFFERENT TEMPERATURES





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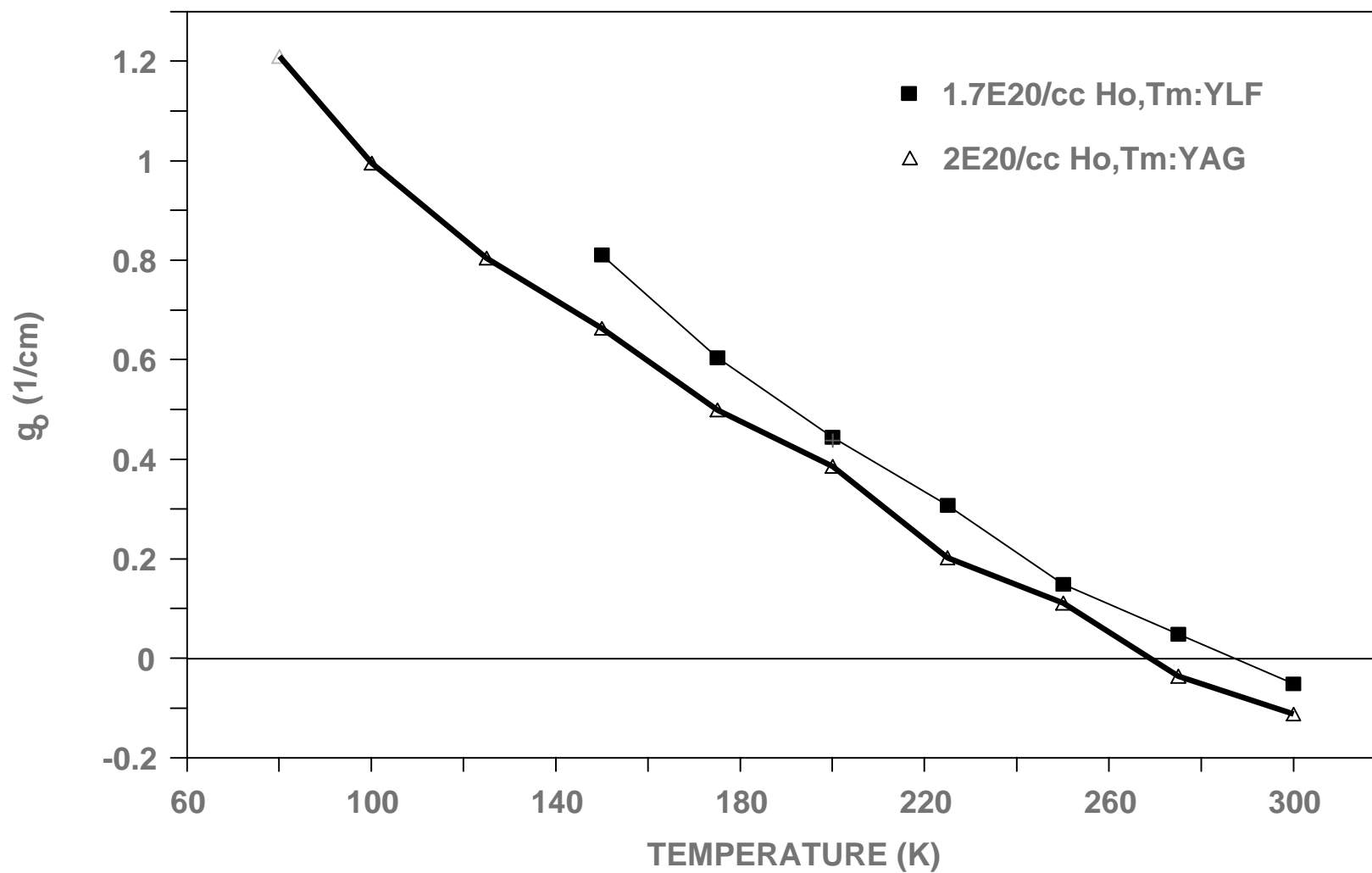
Tm,Ho:YLF GAIN VS. PUMP ENERGY FOR DIFFERENT TEMPERATURES





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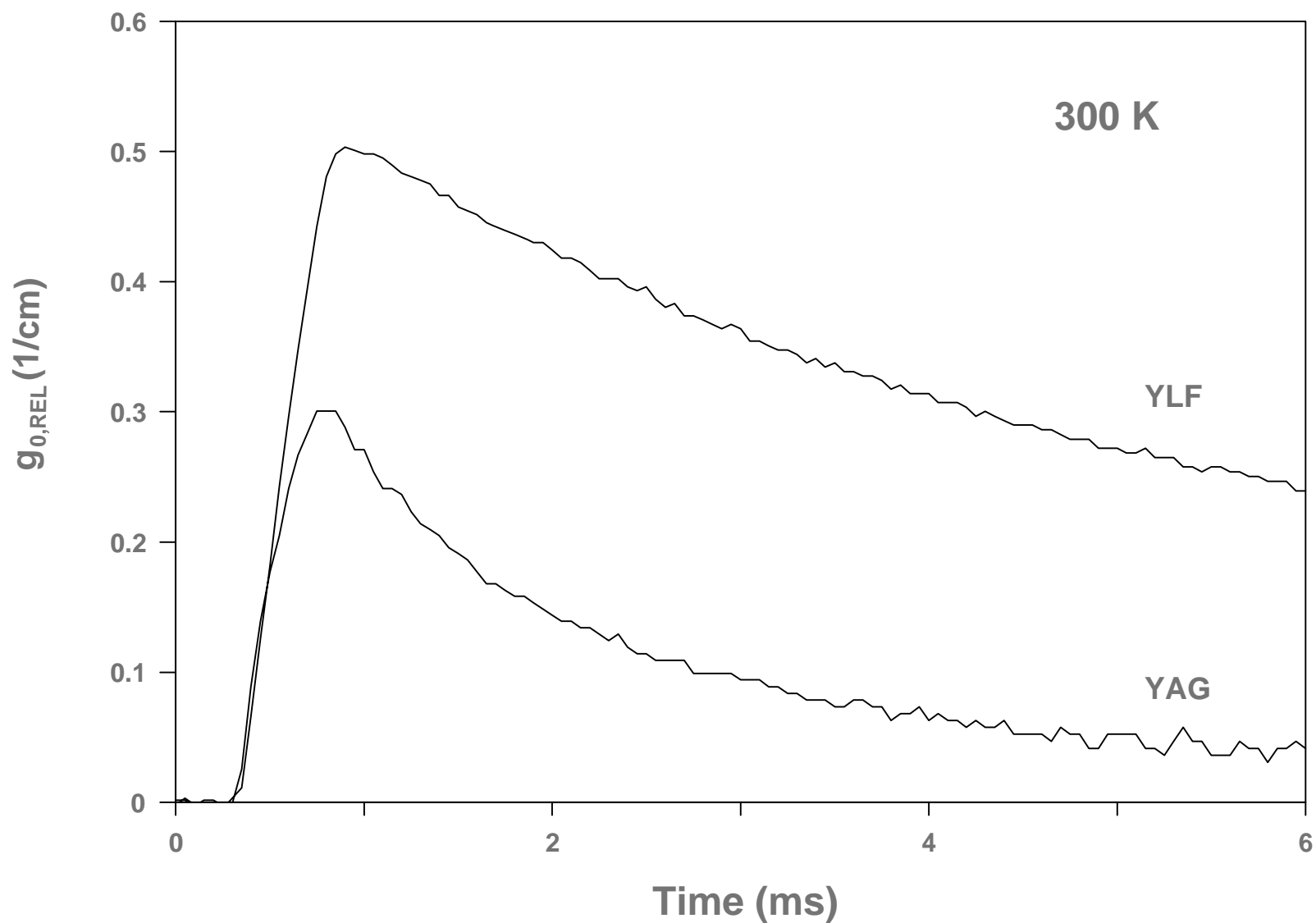
COMPARISON OF GAIN IN YAG AND YLF HIGH Ho CONCENTRATIONS





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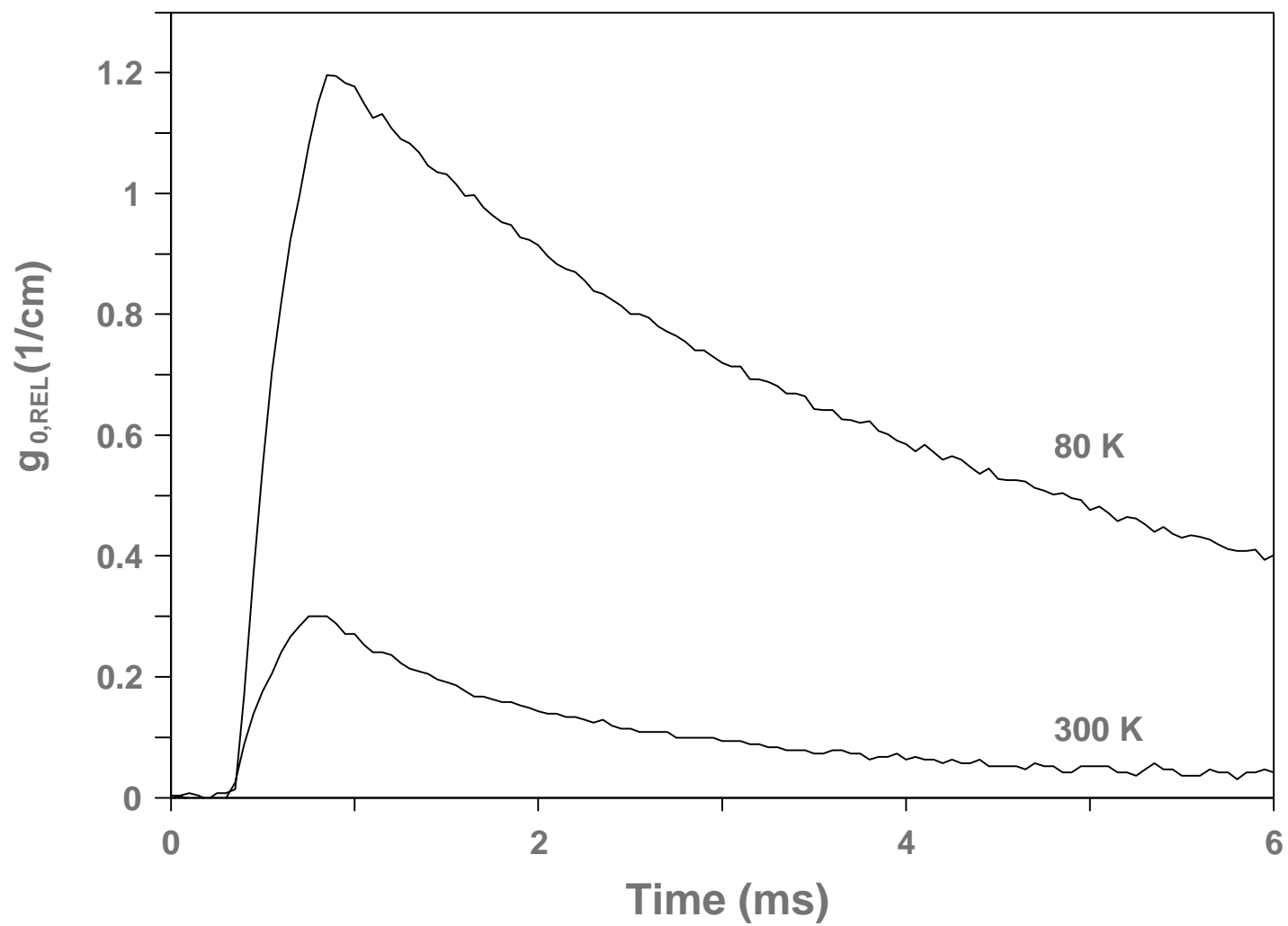
GAIN DECAY: YAG vs. YLF HIGH H_0 CONCENTRATIONS





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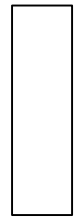
GAIN DECAY IN YAG AT TWO TEMPERATURES





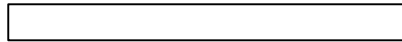
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HOLMIUM Q-SWITCHING CAVITY LAYOUT

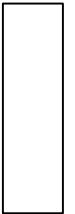
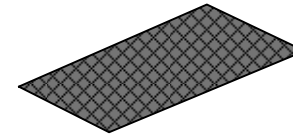


FLAT HR

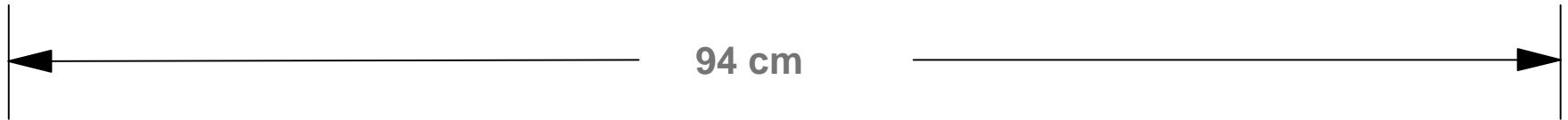
4x100mm CTH:YAG



AO MODULATOR

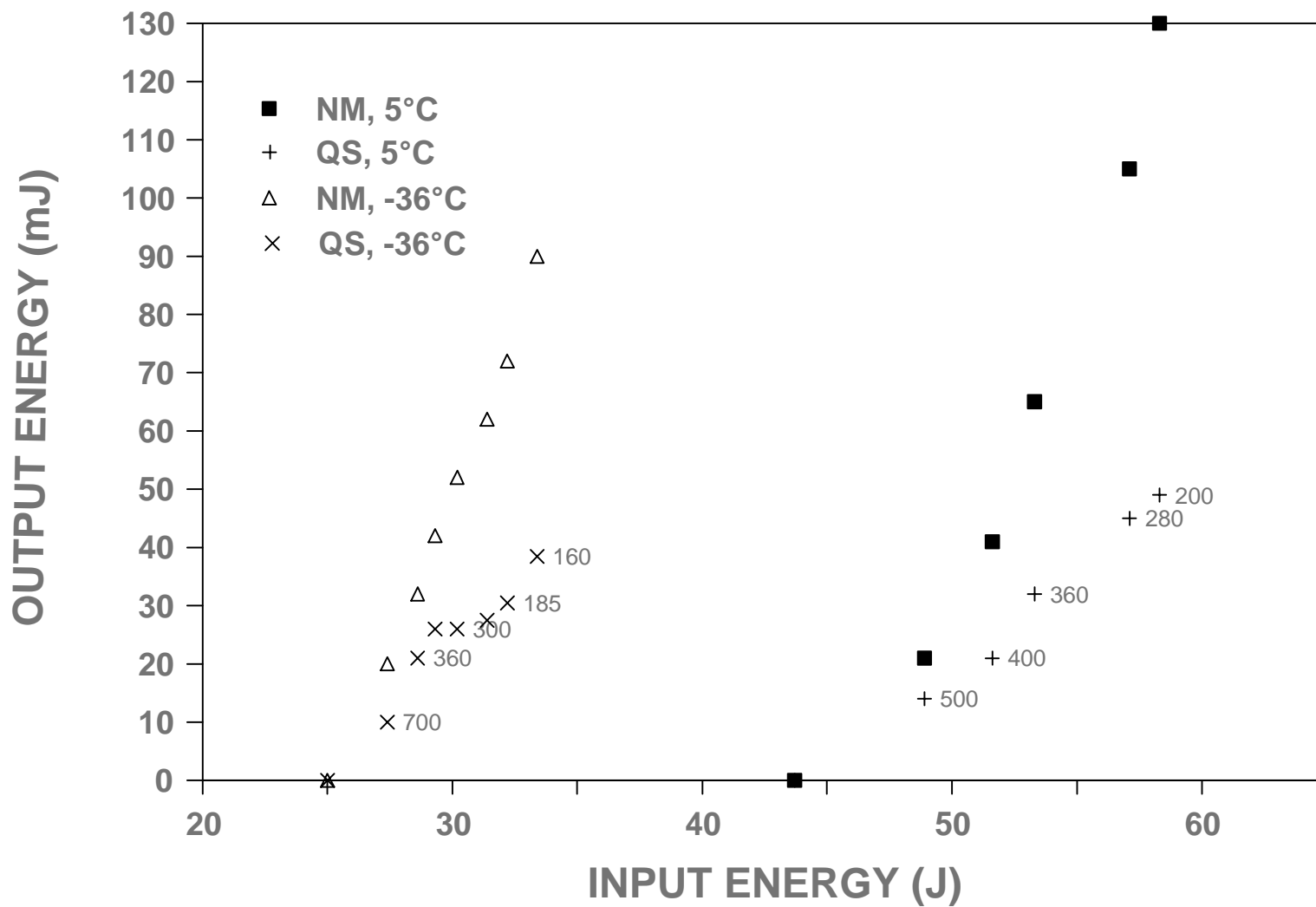


FLAT 82%R





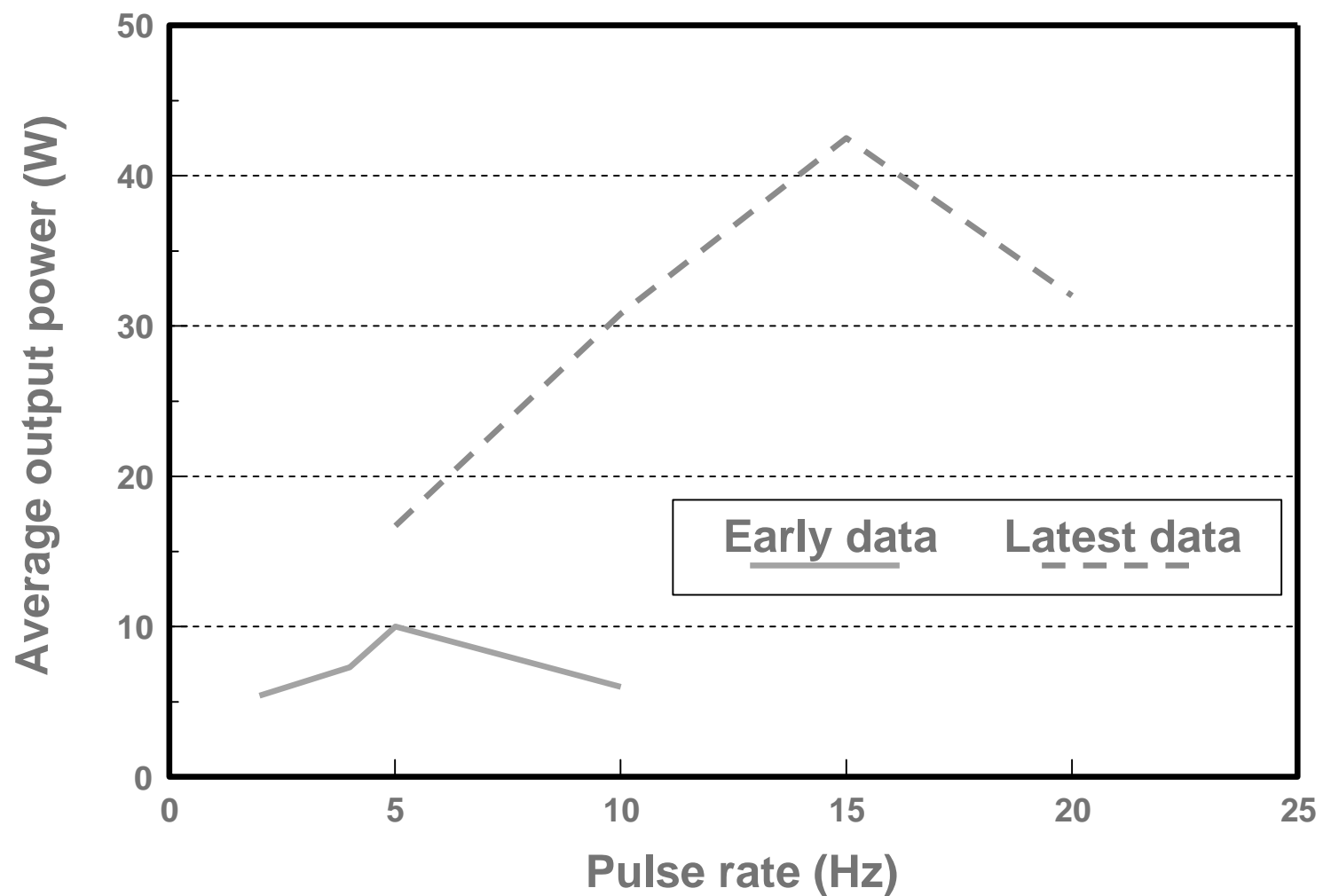
CTH:YAG PERFORMANCE AT 4 Hz





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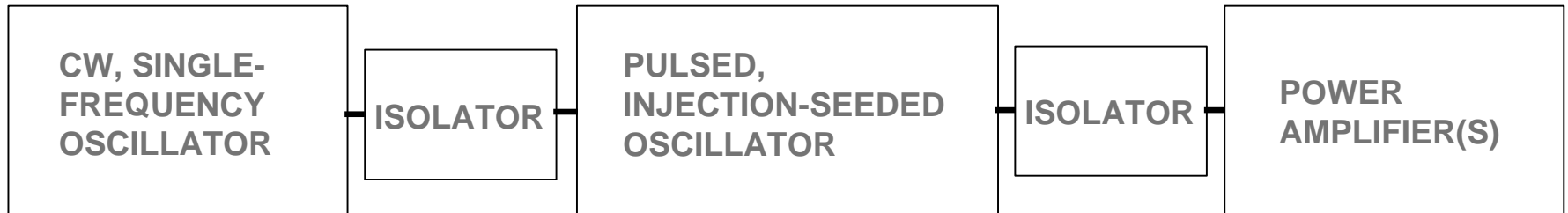
OUTPUT POWER - LAMP-PUMPED CTH:YAG





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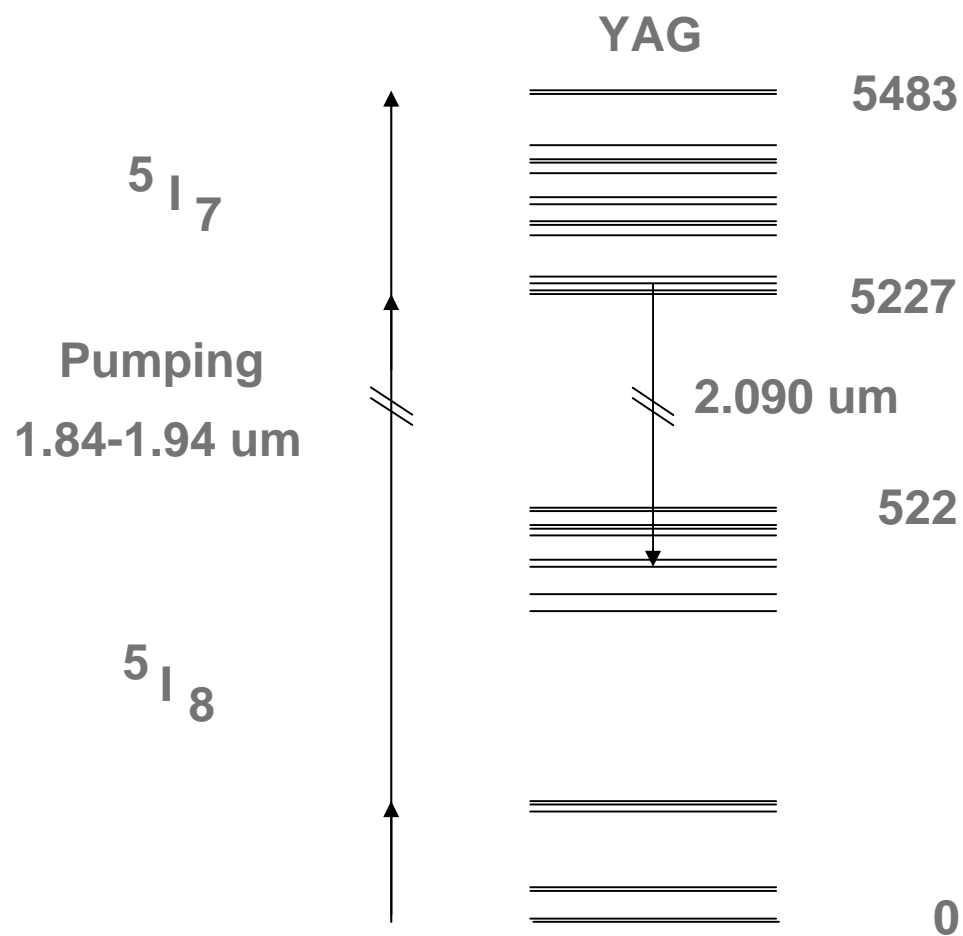
SIMPLIFIED SYSTEM ARCHITECTURE





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Ho:YAG RESONANT PUMPING



Energy in cm⁻¹



PUMPING OPTIONS

