Diode-pumped, High-Power CW and Modelocked Nd:YLF Lasers

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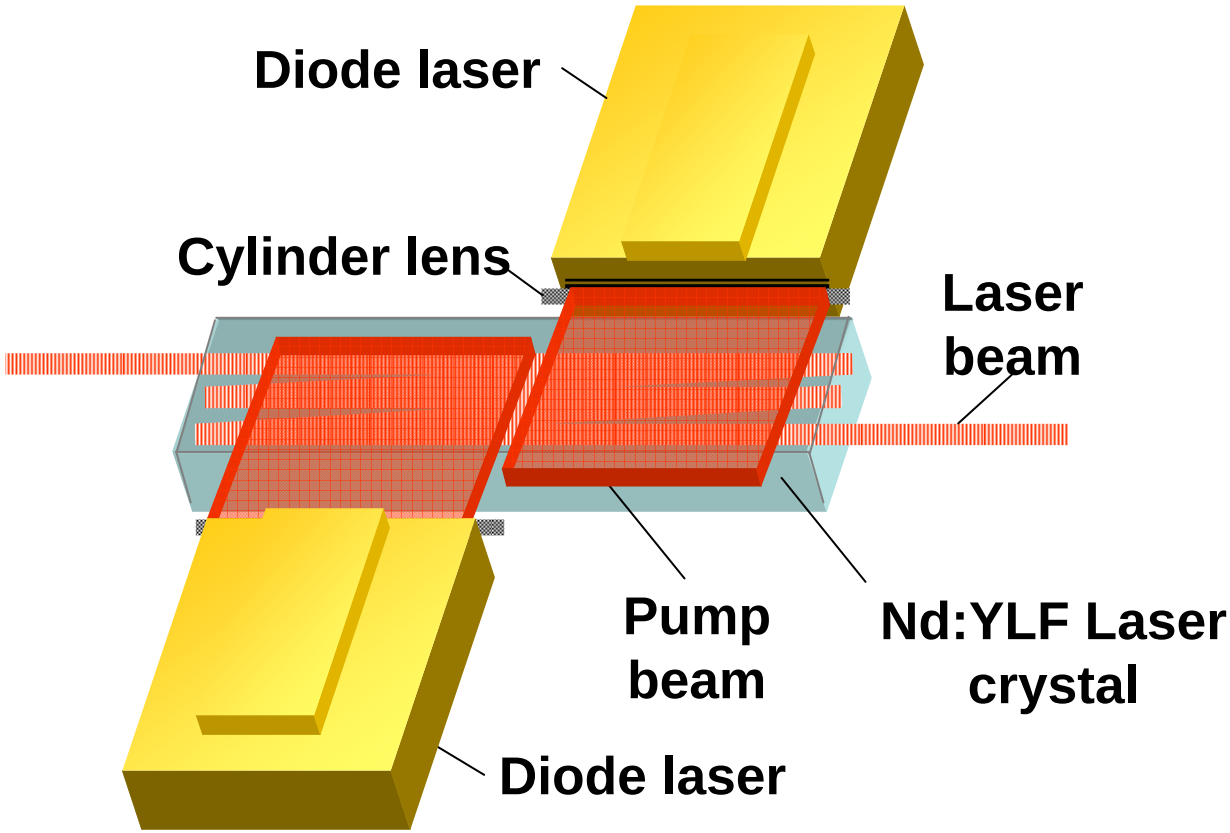
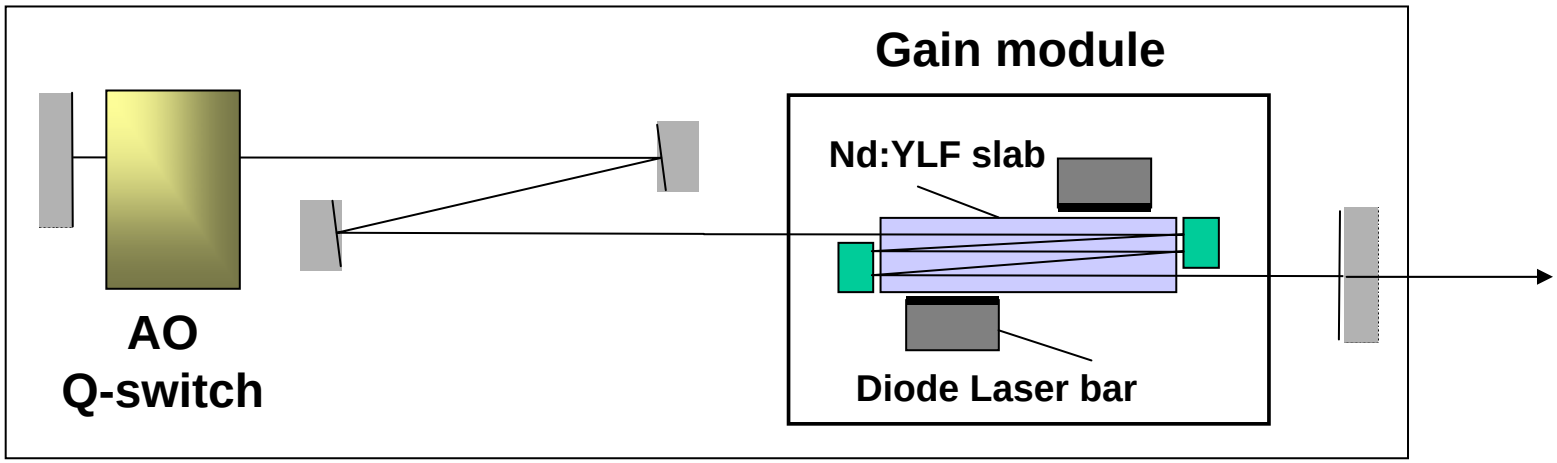
Outline

- Review of MPS design, performance
- Scaling results with higher-power pump lasers
  - CW performance
  - Q-switched performance
- MPS amplification of a SESAM mode-locked laser
- Conclusions

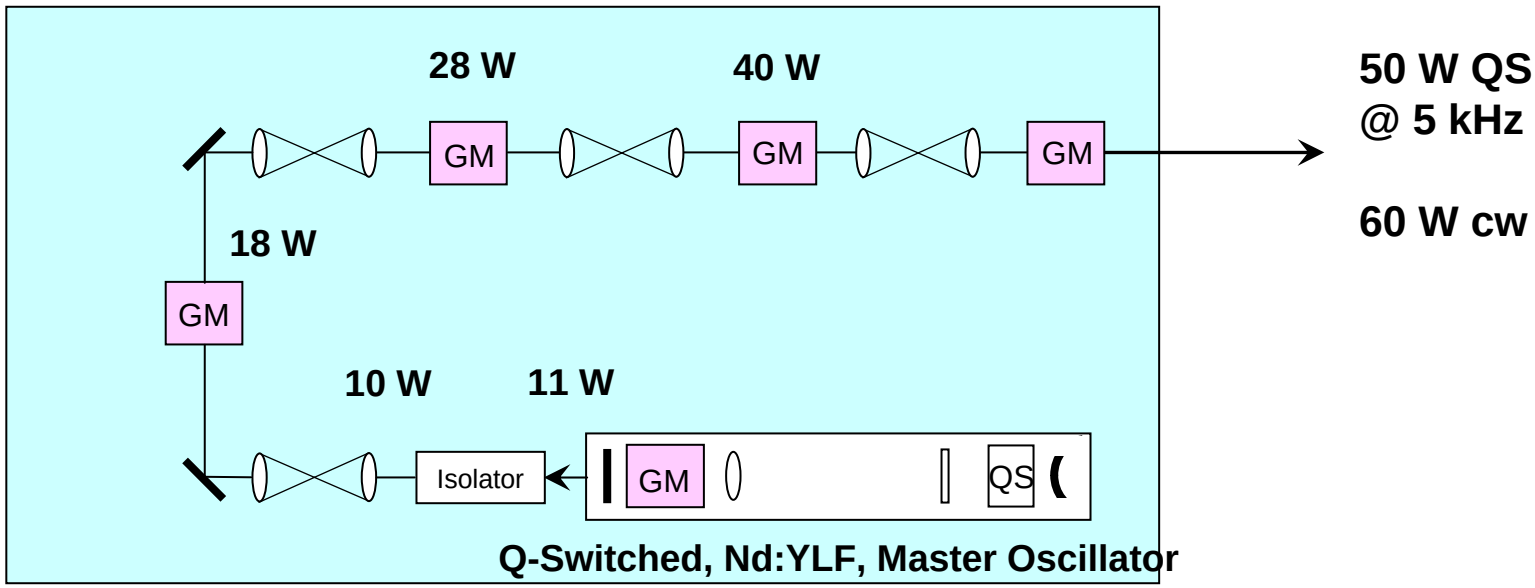
Multi-pass slab (MPS) design is side-pumped



Resonator added makes a MPS oscillator



MOPA design allows scaling to 60 W cw



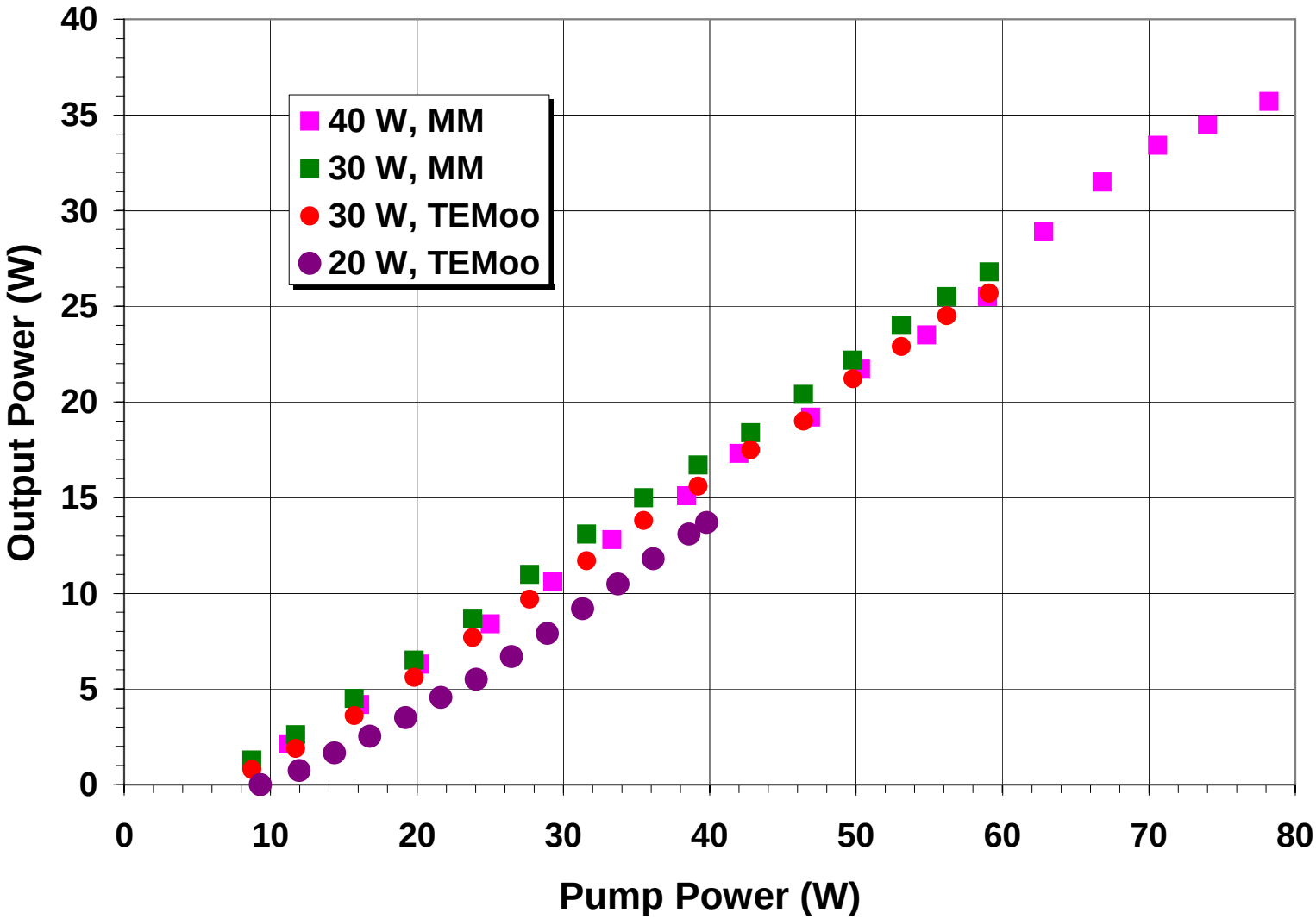
Relay Optics

Mirrors

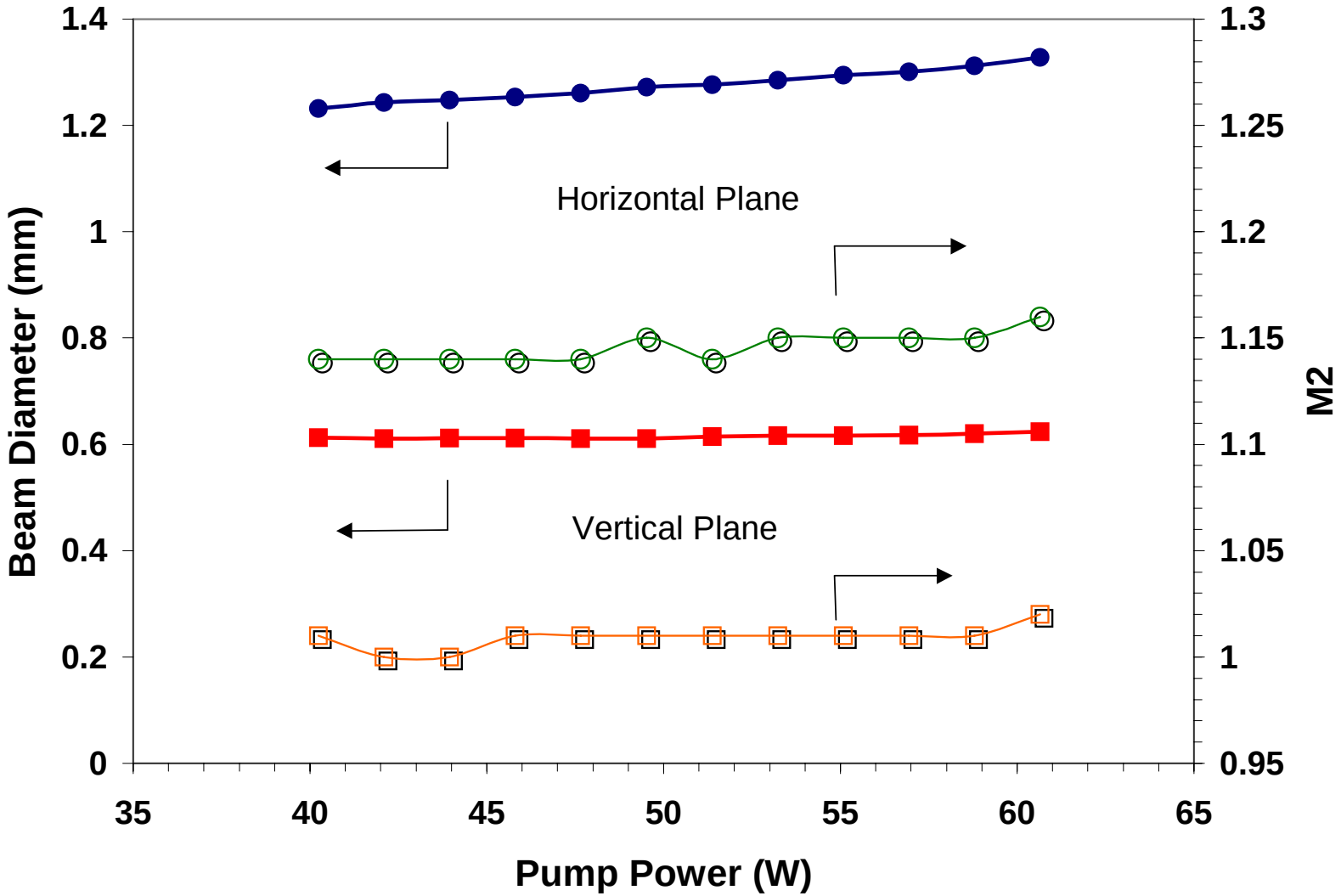
GM Gain Module

QS AO Q Switch

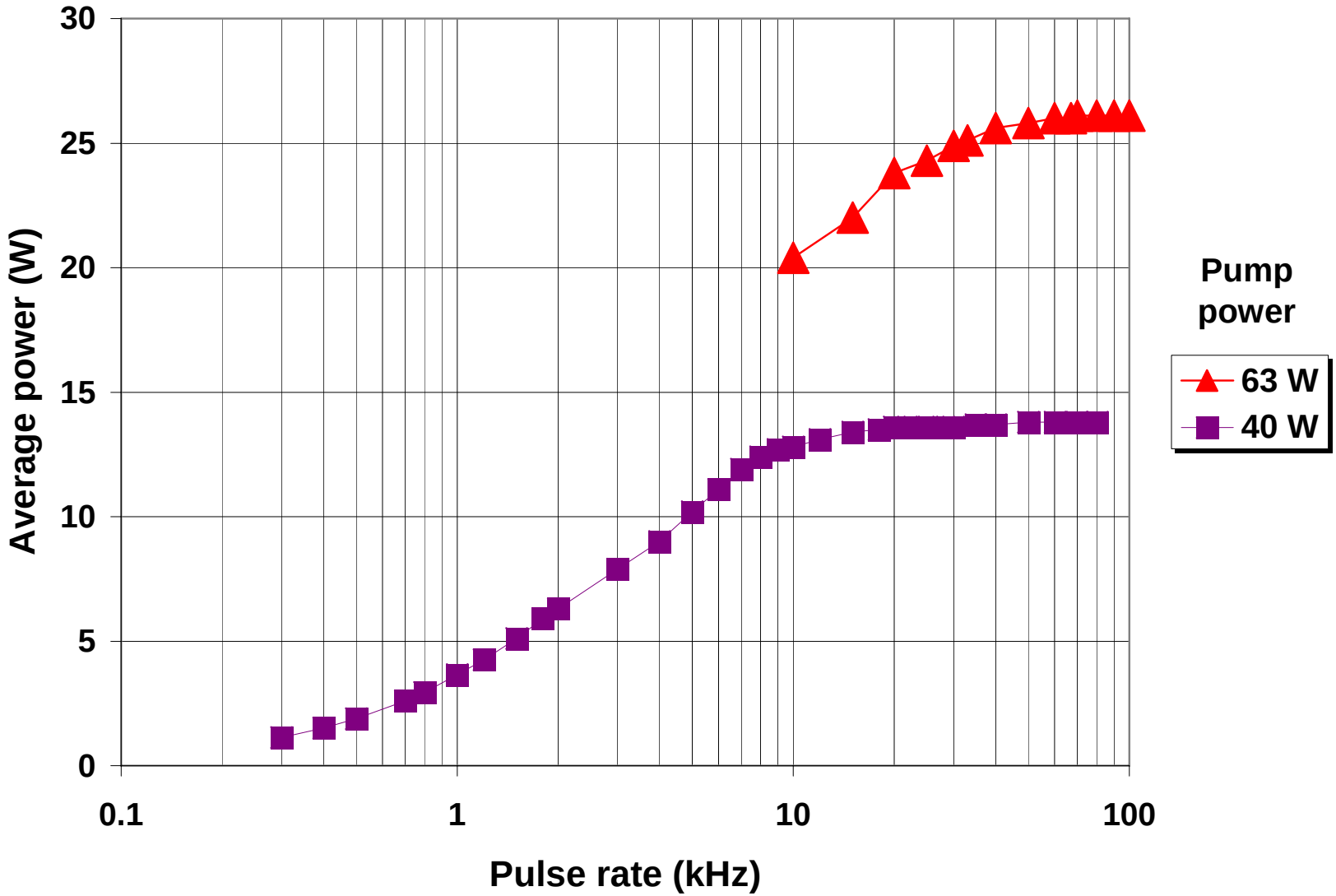
CW performance scales with pump lasers



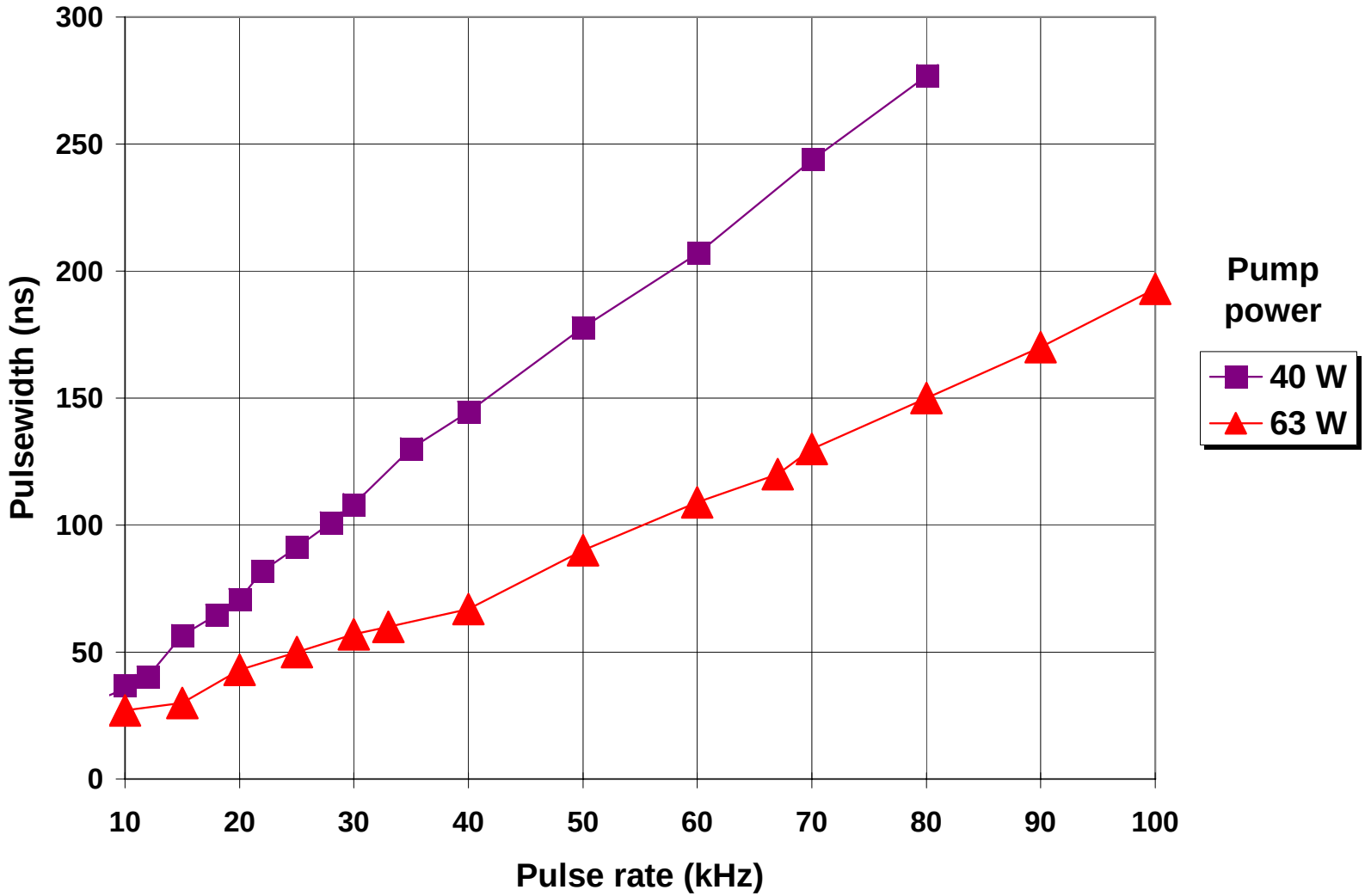
TEMoo properties are power-independent



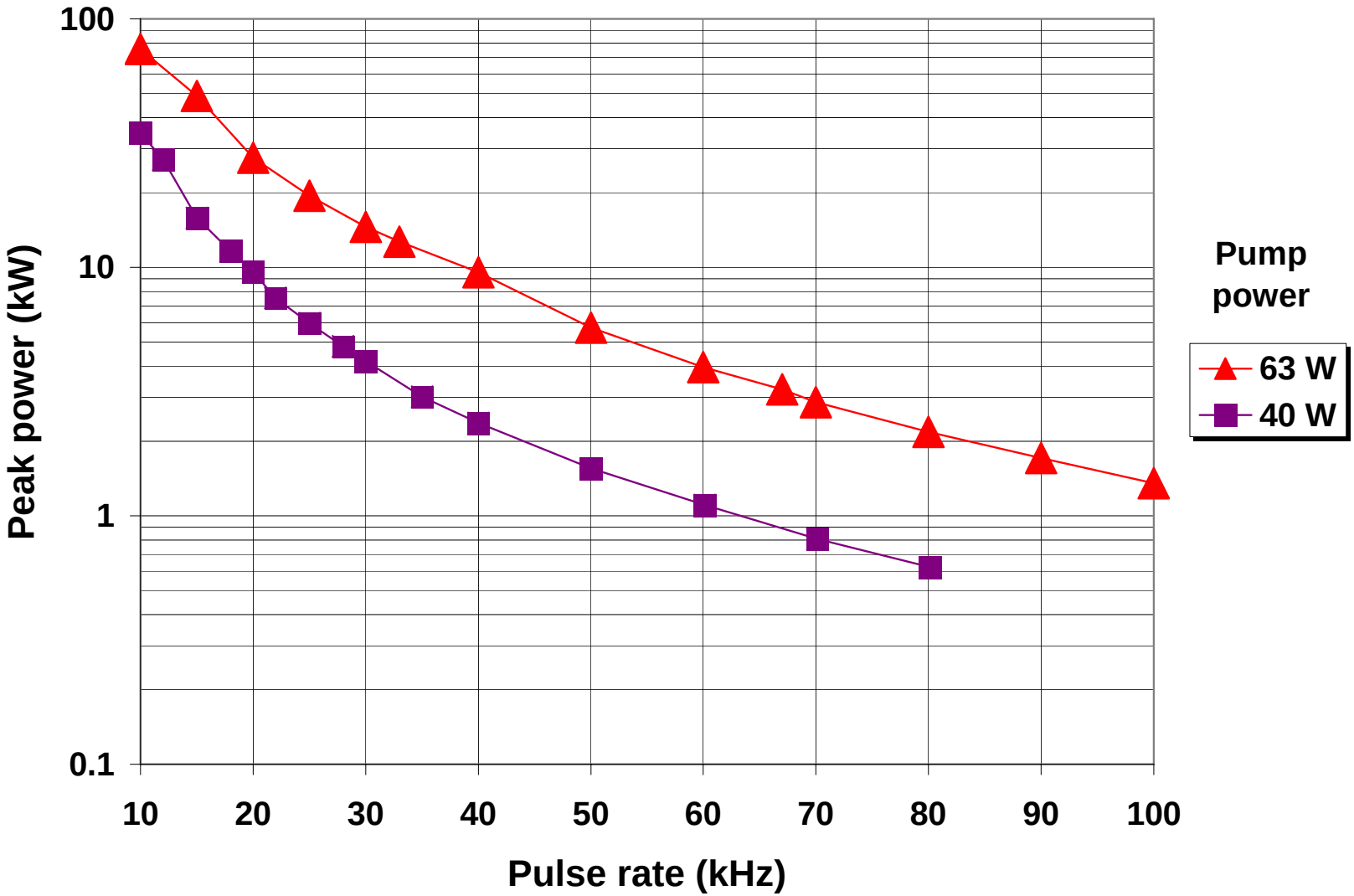
Q-switched average power is nearly doubled



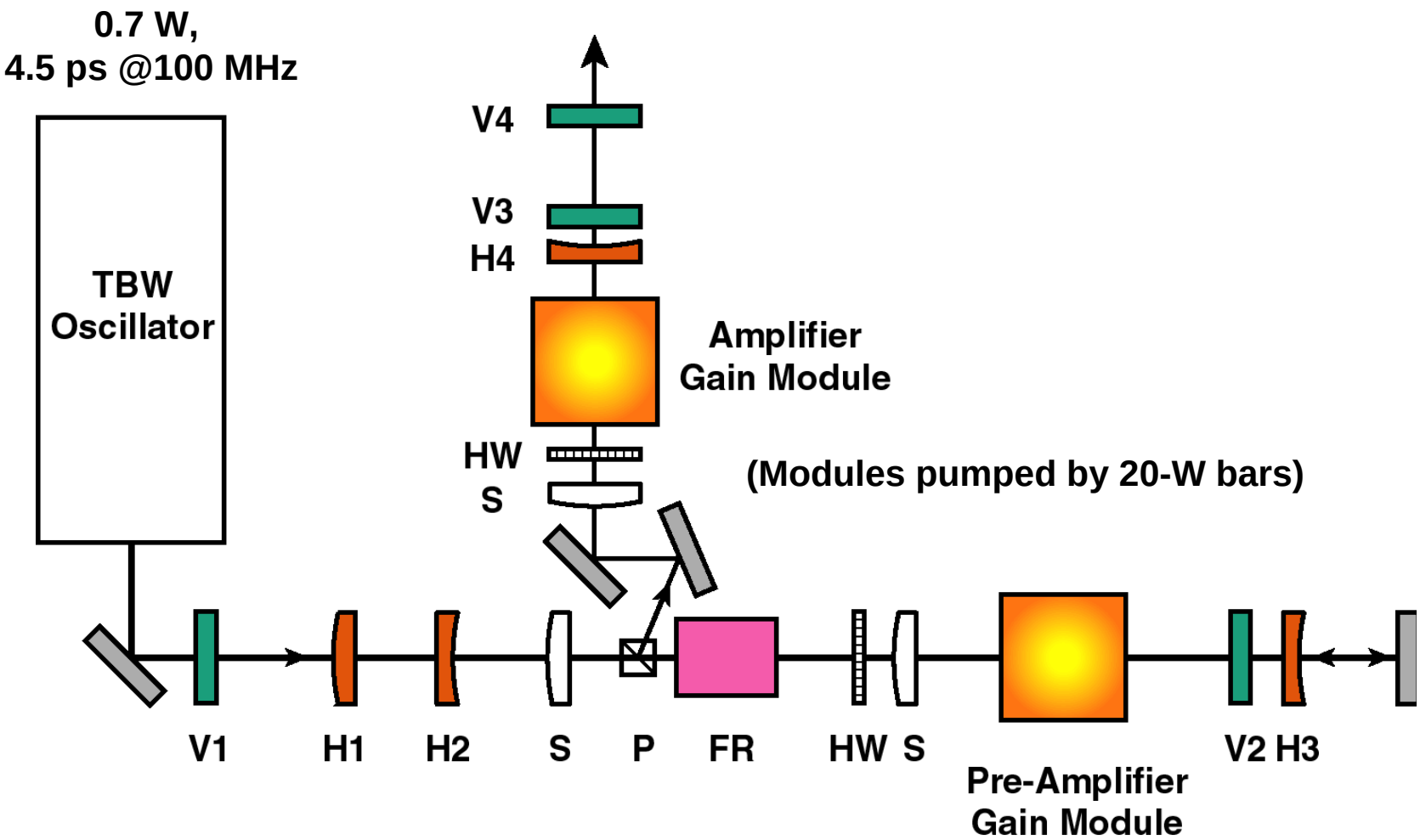
Higher gain yields shorter pulses



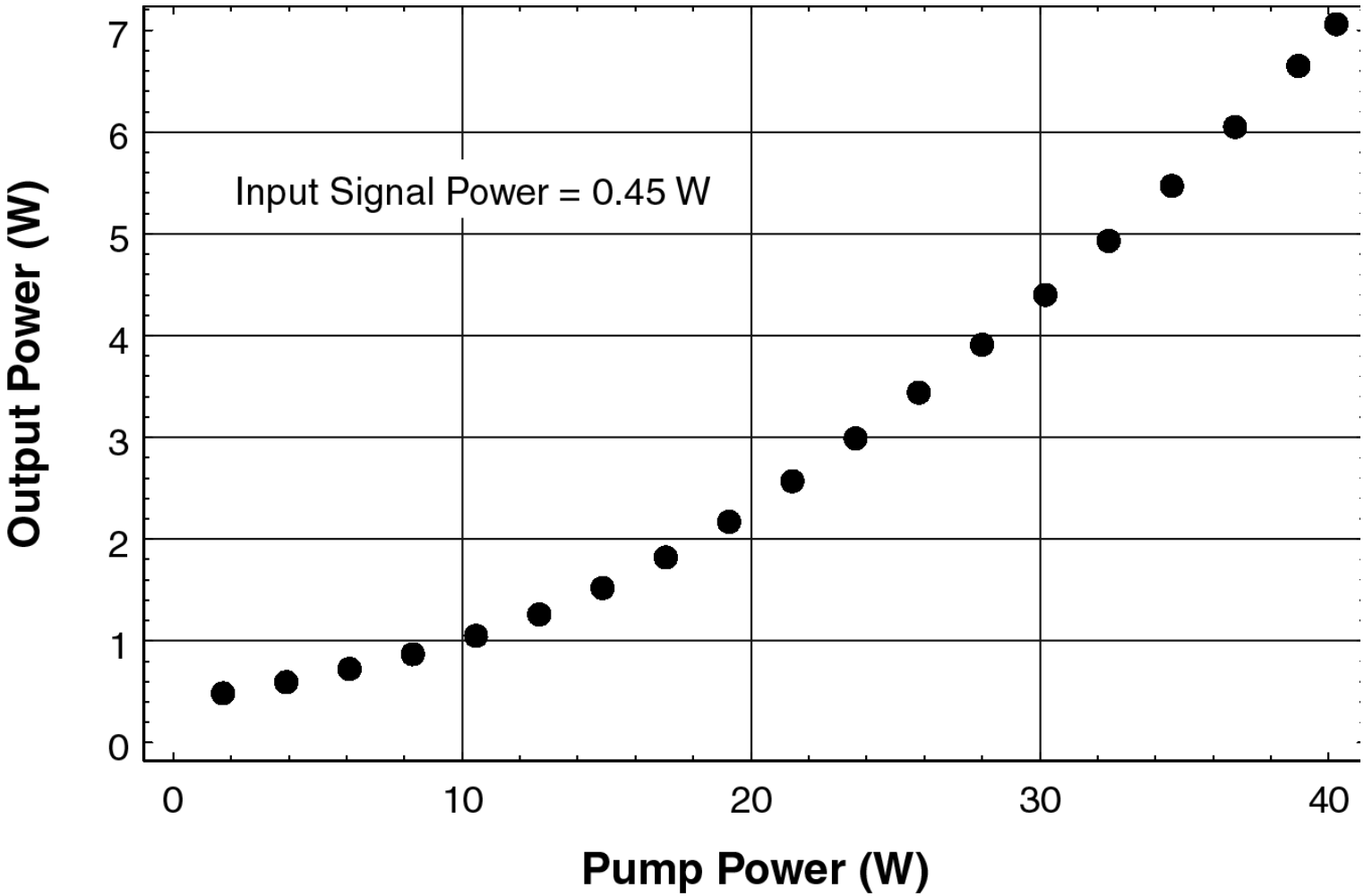
Peak power is increased at high PRR



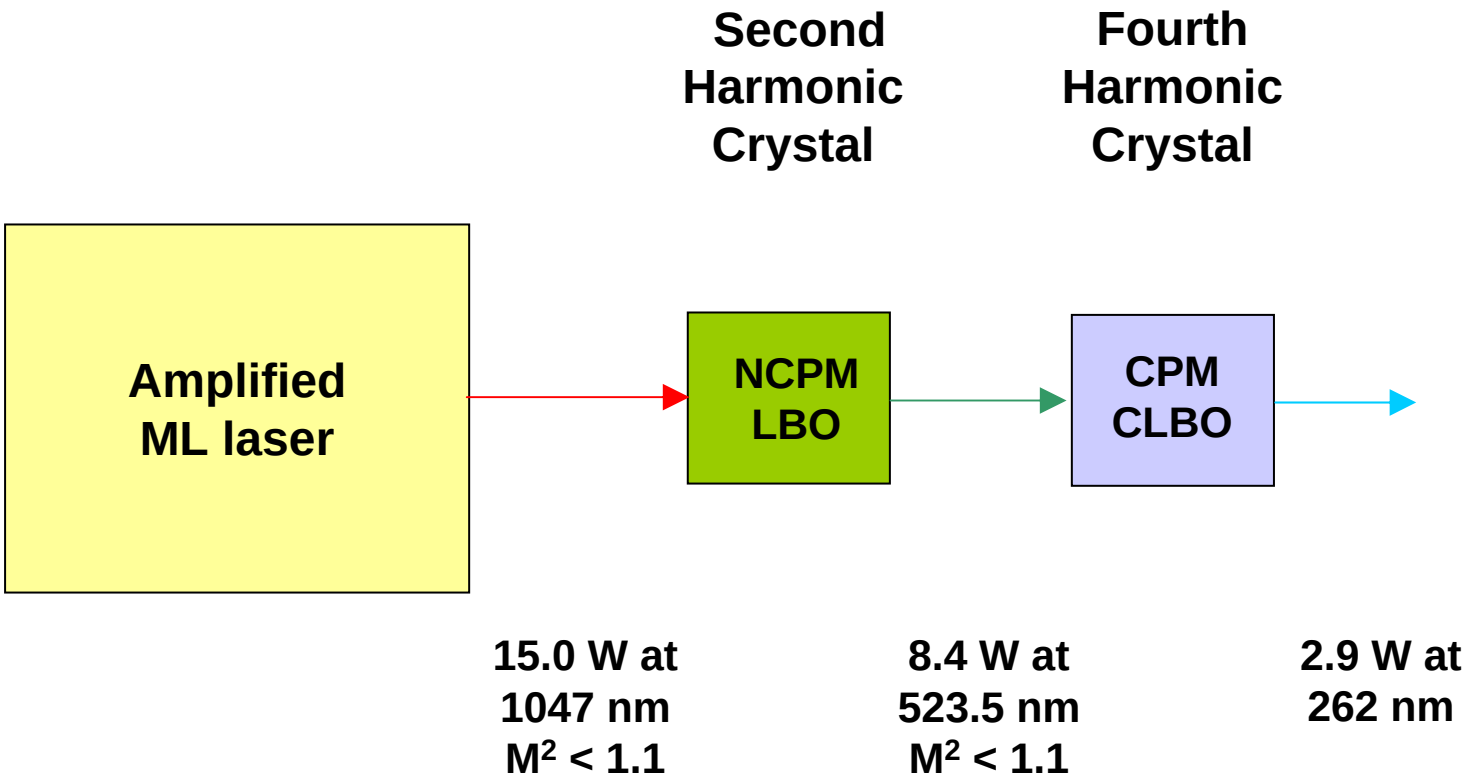
MPS modules amplify a mode-locked laser



Preamp saturates at full pump power



Amplified ML laser converts efficiently



Conclusions

- MPS design with Nd:YLF can be scaled in cw power with higher-power pump lasers
  - 25.7 W TEMoo with 59 W of pump
  - 36 W multimode with 79 W of pump
  - approaching 50% optical conversion, 20% electrical
- MPS Q-switched performance enhanced in:
  - average power (26 W for PRR >50 kHz)
  - peak powers for PRR > 10 kHz but
  - performance limited by holdoff, switching time of Q-switch
- MPS amplifiers can increase power of SESAM mode-locked Nd:YLF laser
  - 15.8 W average ($M^2 < 1.1$) for 4.5 ps pulses at 100 MHz
  - 8.8 W at second harmonic, 2.9 W at fourth
- 100 W average power next??