

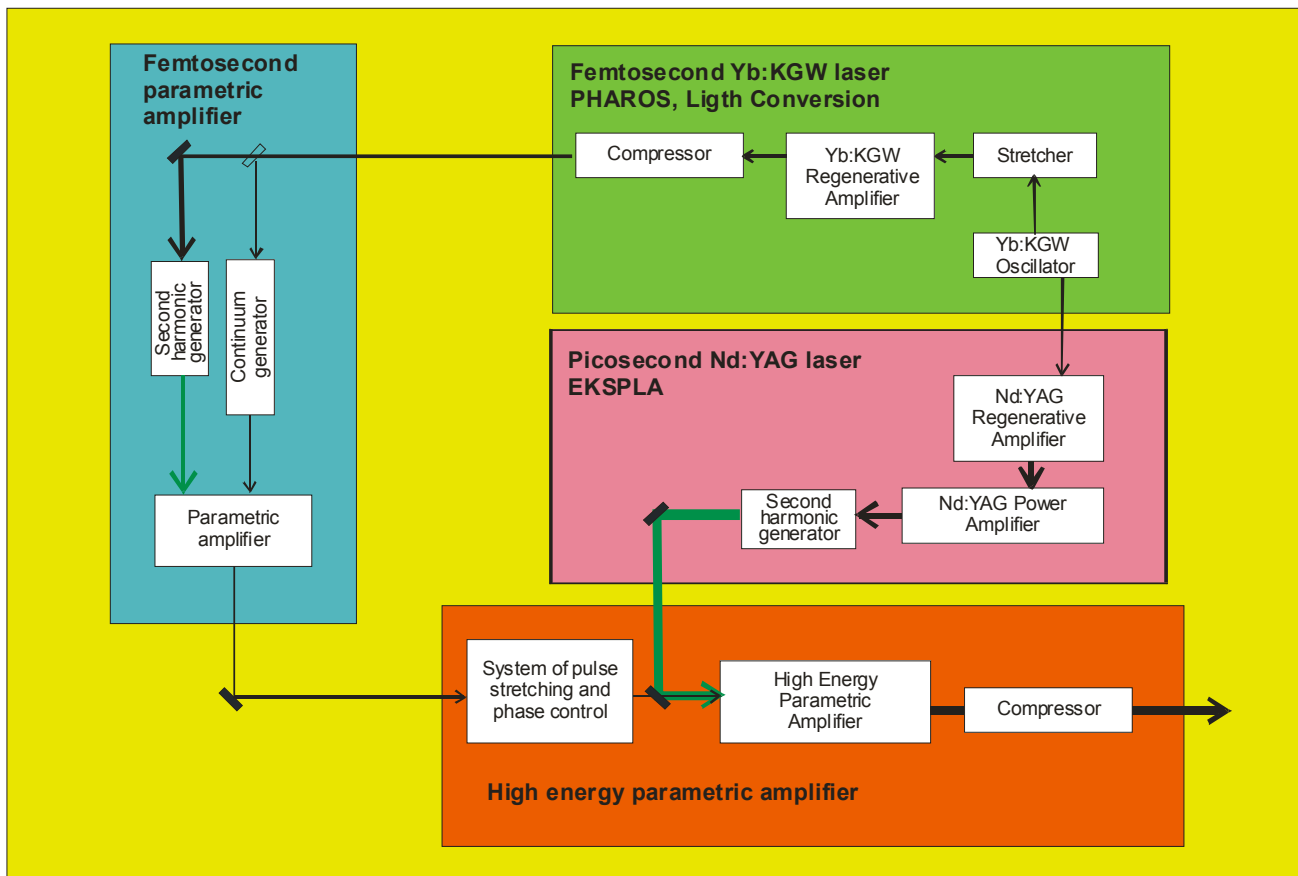
Hybridly pumped OPCPA laser system

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LASER RESEARCH CENTER VILNIUS UNIVERSITY

**3rd International EULASNET II Meeting.
Vilnius (Lithuania), 9-10 June 2008**

HIGH ENERGY ULTRASHORT PULSES BY OPCPA



PARTNERS:

Vilnius university, Light Conversion, Ekspla

PHAROS

High power femtosecond Ytterbium DPSSL system



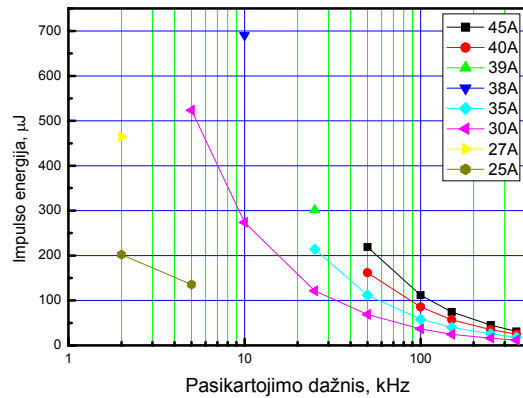
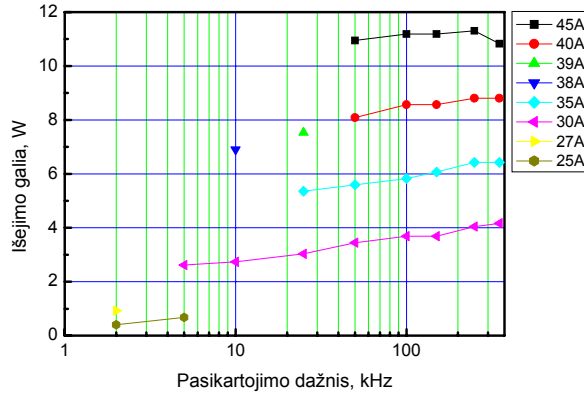
INCLUDES:

- Oscillator
- Regenerative amplifier
- Stretcher/Compressor
- OPA

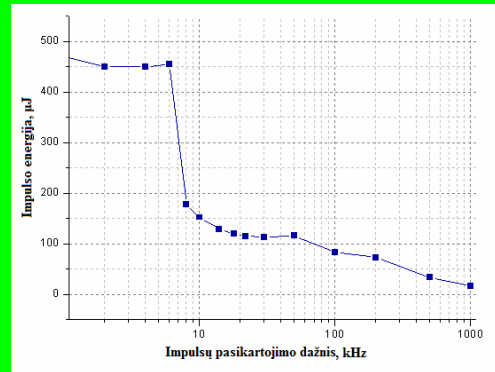
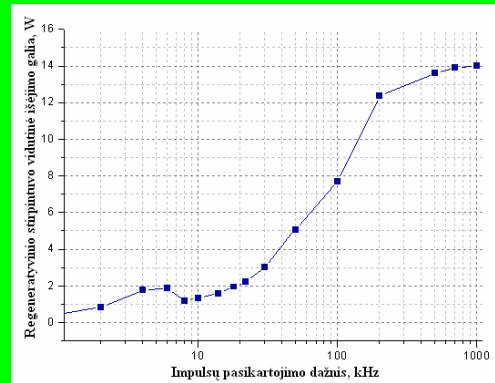
Footprint: 570 x 400 mm !!!

“PHAROS” ENERGY PARAMETERS

Medium repetition rate



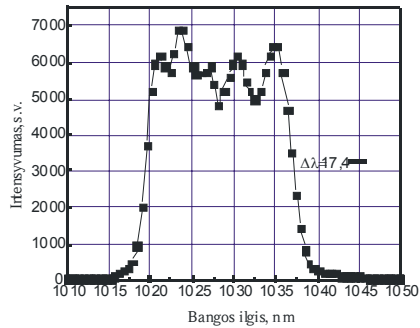
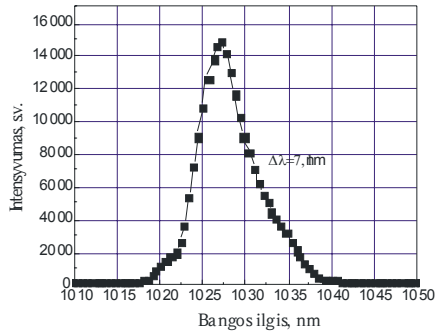
High repetition rate



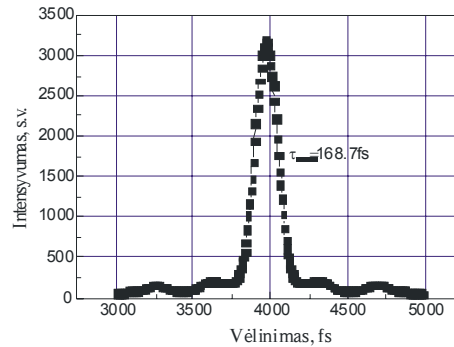
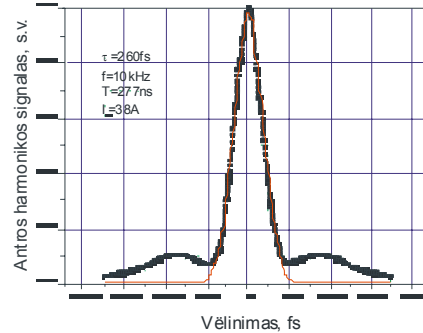
Recent Light Conversion achievements !!!

"PHAROS" TIME and SPACE PARAMETERS

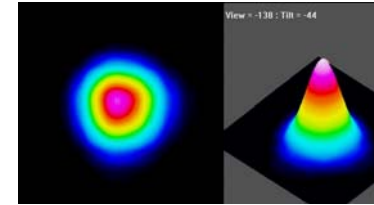
Spectrum



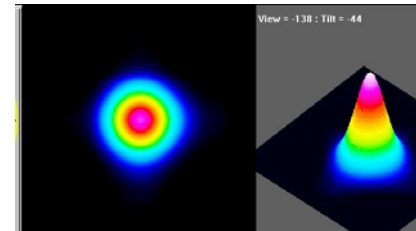
Pulse duration



Beam profile



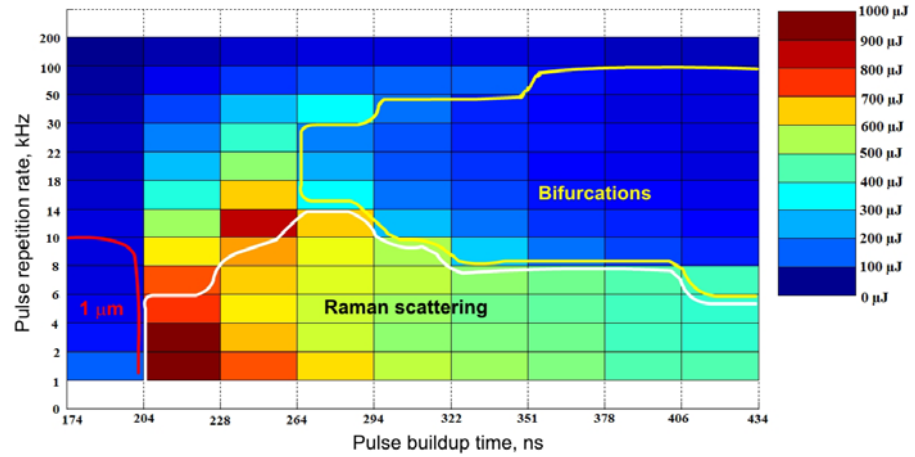
$P_{\text{iš}} = 6 \text{ W}$
 $M^2_x = 1.02$
 $M^2_y = 1.05$



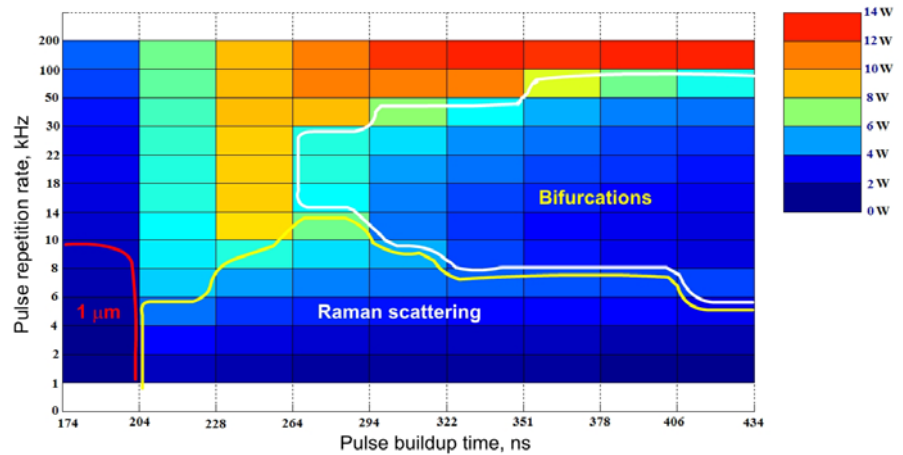
$P_{\text{iš}} = 12 \text{ W}$
 $M^2_x = 1.12$
 $M^2_y = 1.15$

“PHAROS” OPERATION REGIMES

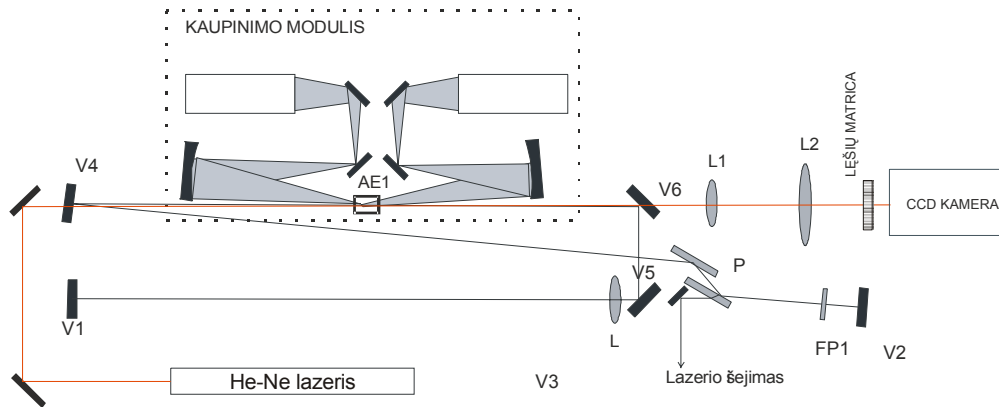
PULSE ENERGY



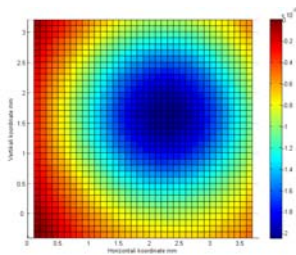
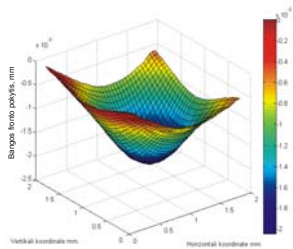
AVERAGE POWER



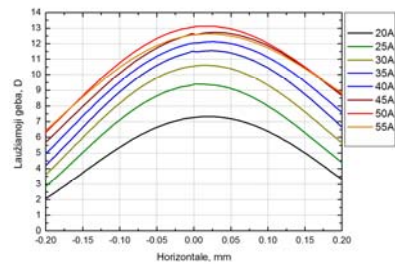
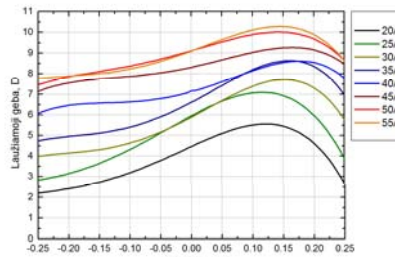
THERMAL LENS IN Yb:KGW



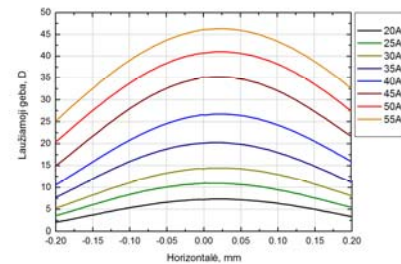
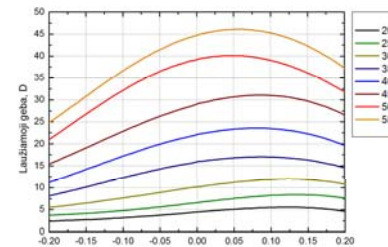
Phase profile



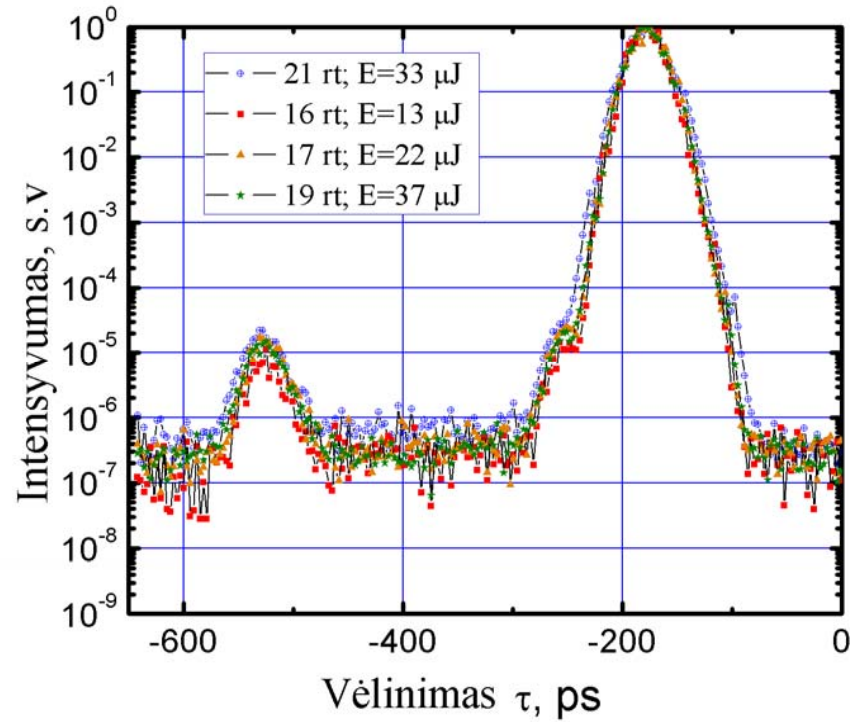
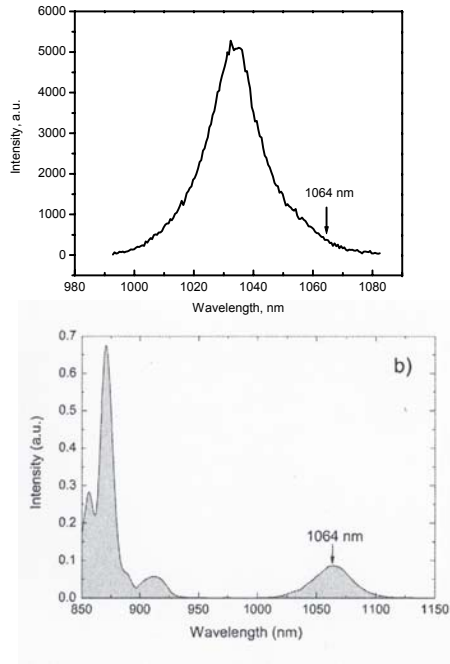
Pump induced thermal lens



Pump and laser radiation induced thermal lens



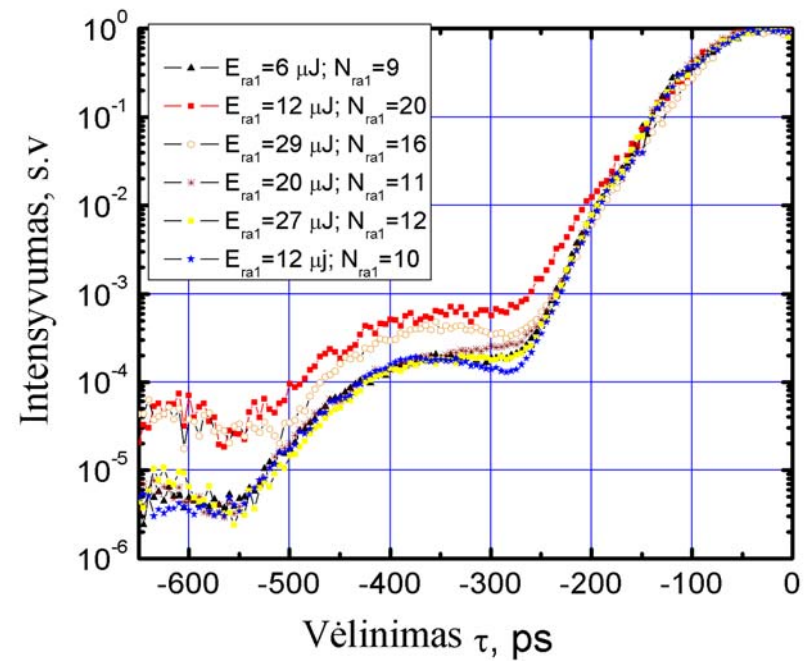
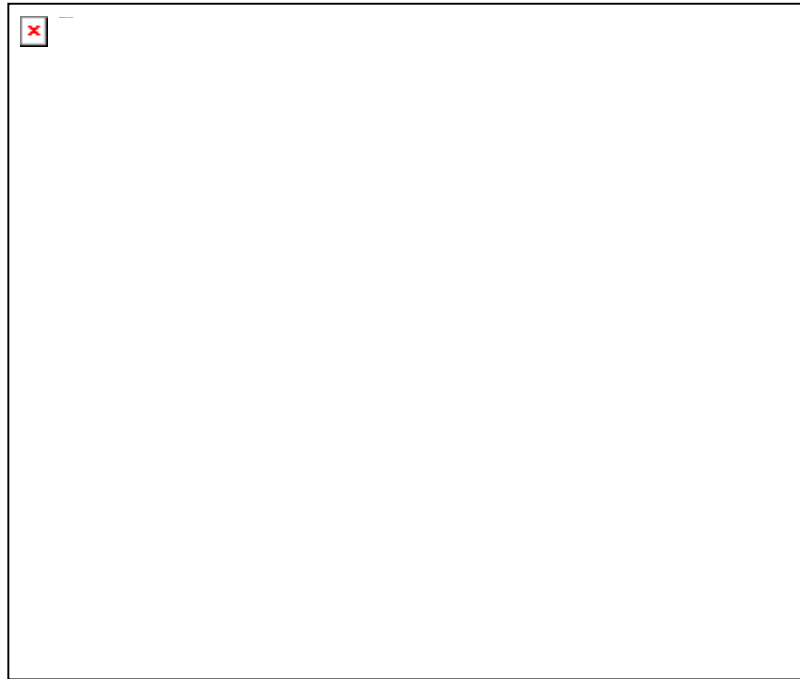
CONTRAST IN “PHAROS “ SEEDED Nd:YAG RA (1)



$$K = \frac{I_{ASE1} G_0^{N_{SAT}}}{I_{ING} G}$$

After first stage contrast $I_{ASE} / I_P \sim 3 \cdot 10^{-7}$

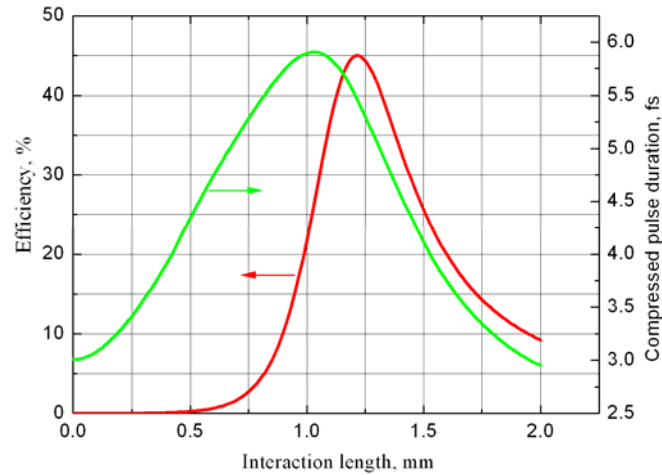
CONTRAST IN "PHAROS " SEEDED Nd:YAG RA (2)



After second stage contrast $I_{ASE} / I_P \sim 5 \cdot 10^{-6}$

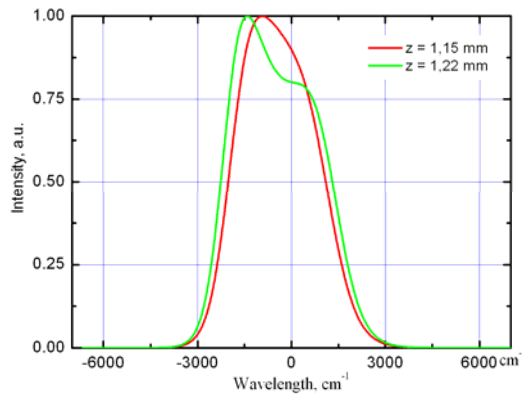
OUTPUT FROM NONCOLLINEAR OPA

Crystal length optimization

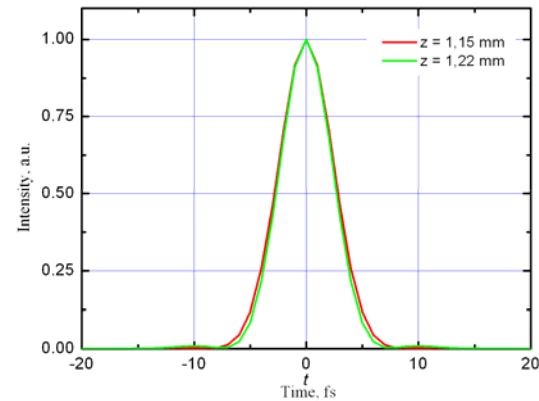


Efficiency up to $\sim 40\%$
Pulse duration down to
several fs

Spectrum



Compressed pulse duration



TARGET PARAMETERS

- PULSE ENERGY > 50 mJ
- PULSE DURATION < 10 fs
- REPETITION RATE 10 Hz
- CONTRAST better than 10^9