Status of Laser Zentrum Hannover Laser Program

Maik Frede

Martina Brendel, Carsten Fallnich, Renê Gau, Philipp Huke, Ralf Wilhelm, Ivo Zawischa

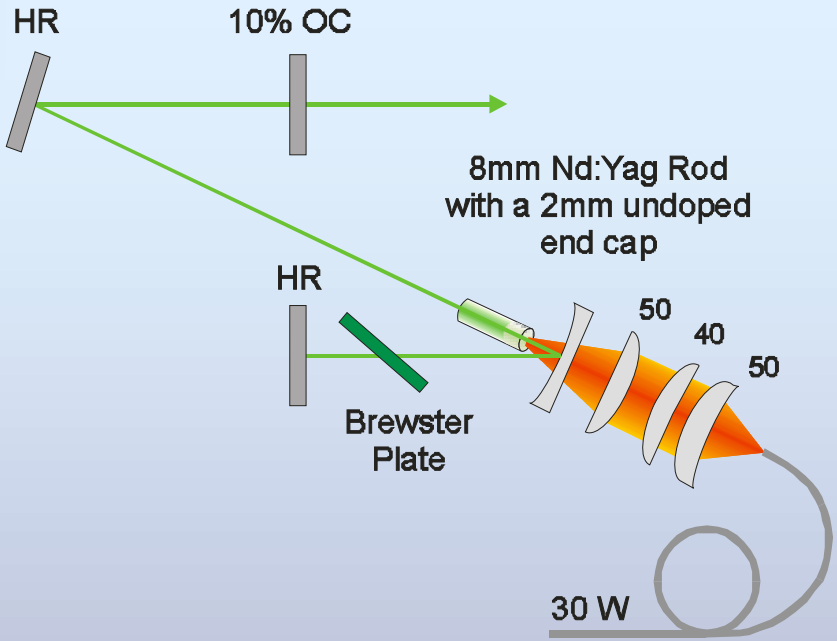
Laser Zentrum Hannover

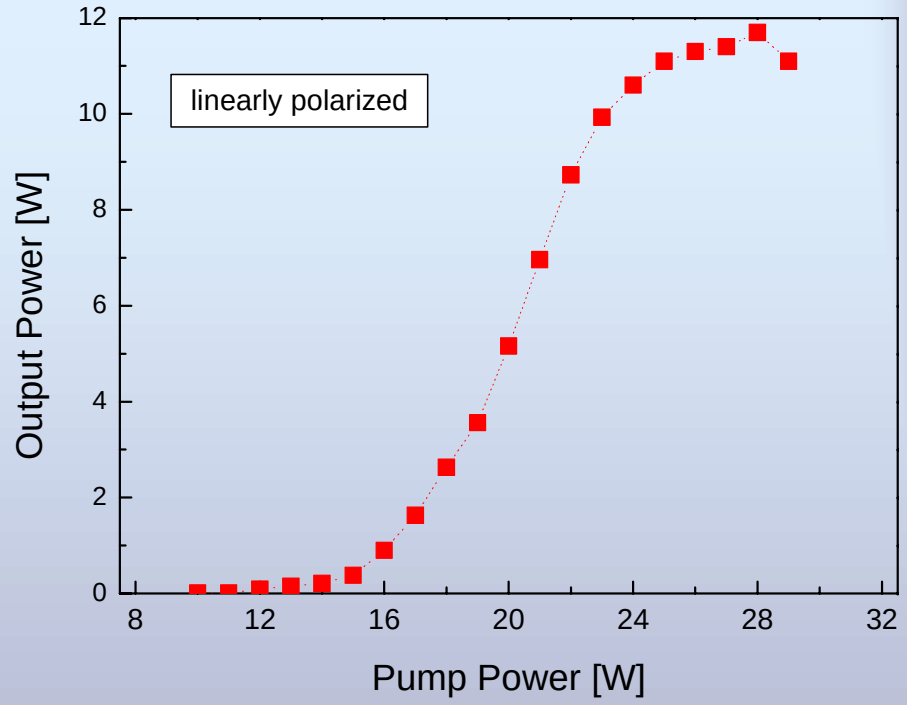
Aug. 2002

LSC Meeting-Hanford

LIGO-G020326-00-Z

Medium Power Stage

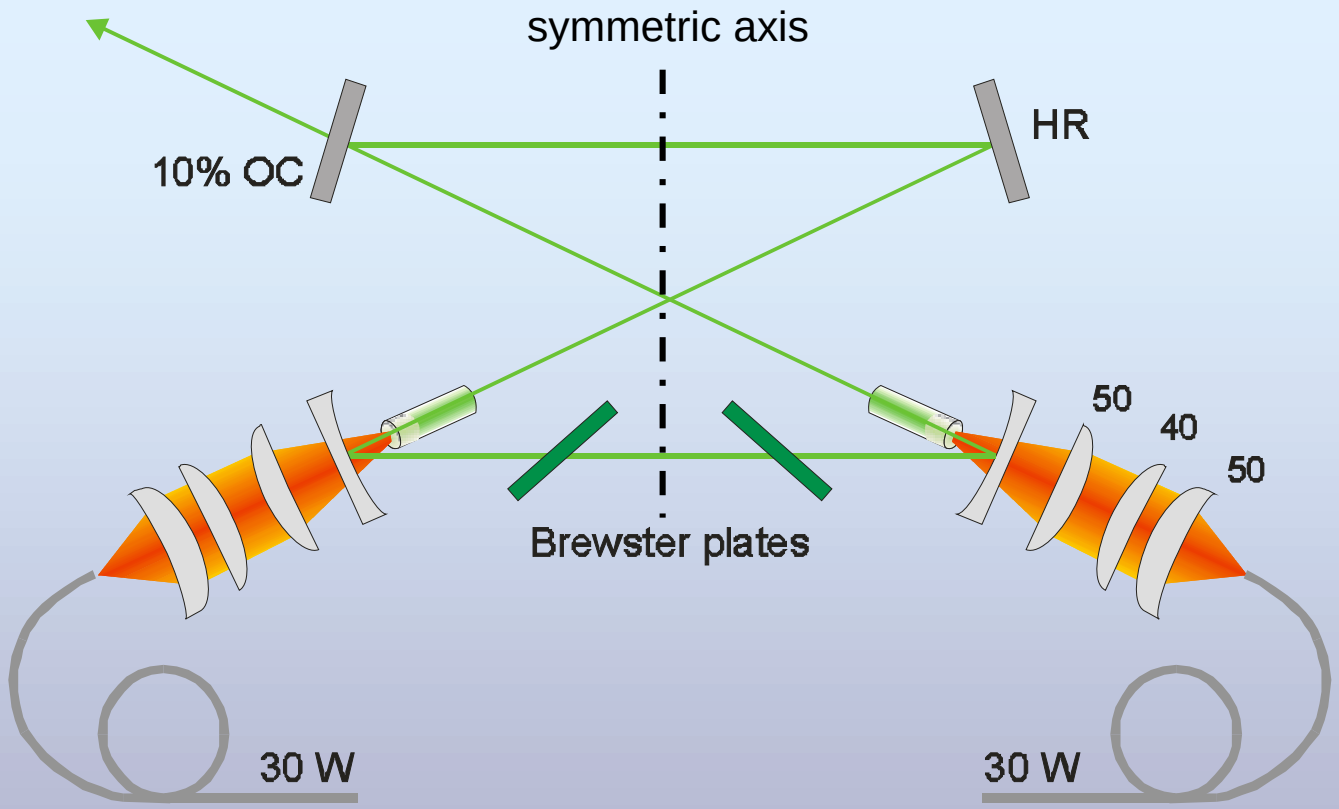




fundamental mode output : 12 W

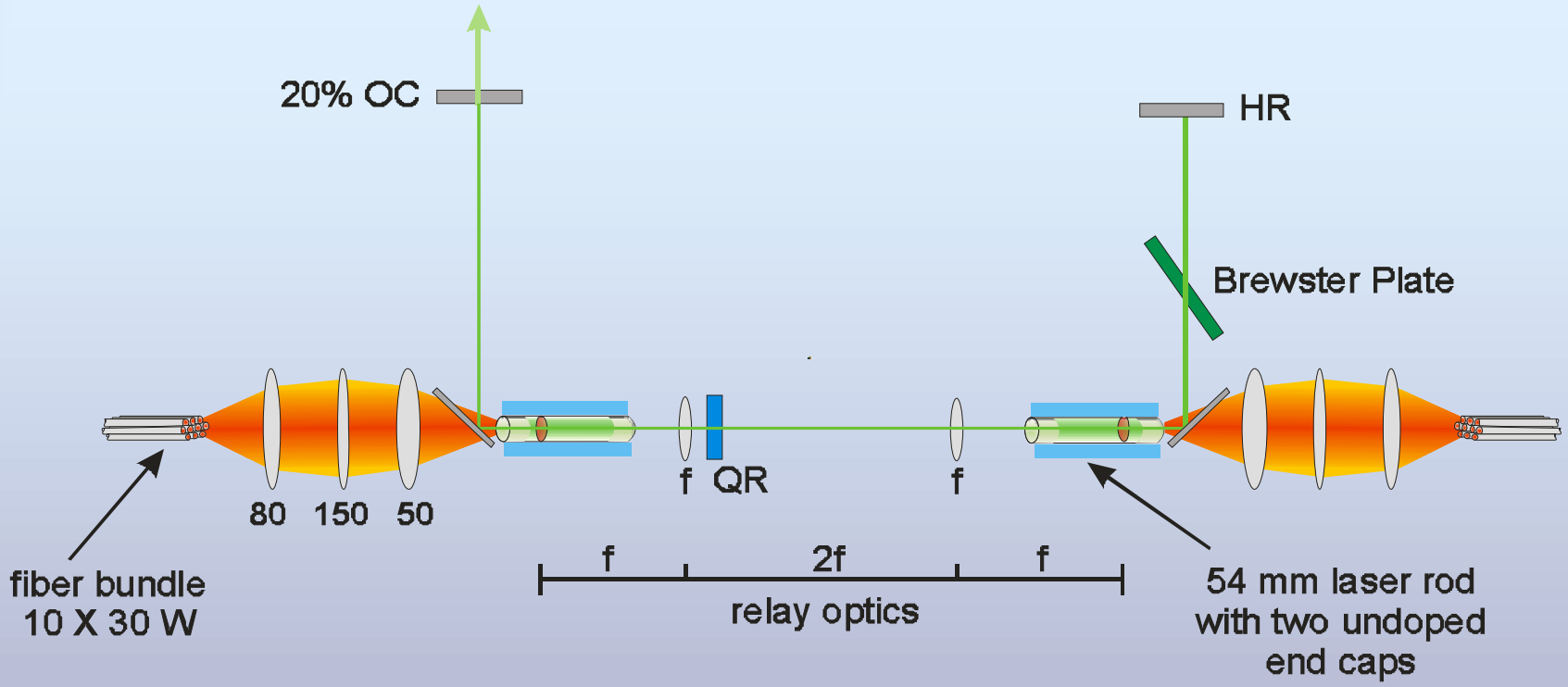
$\eta_{opt} = 42\%$, $M^2 < 1.2$

Medium Power Stage

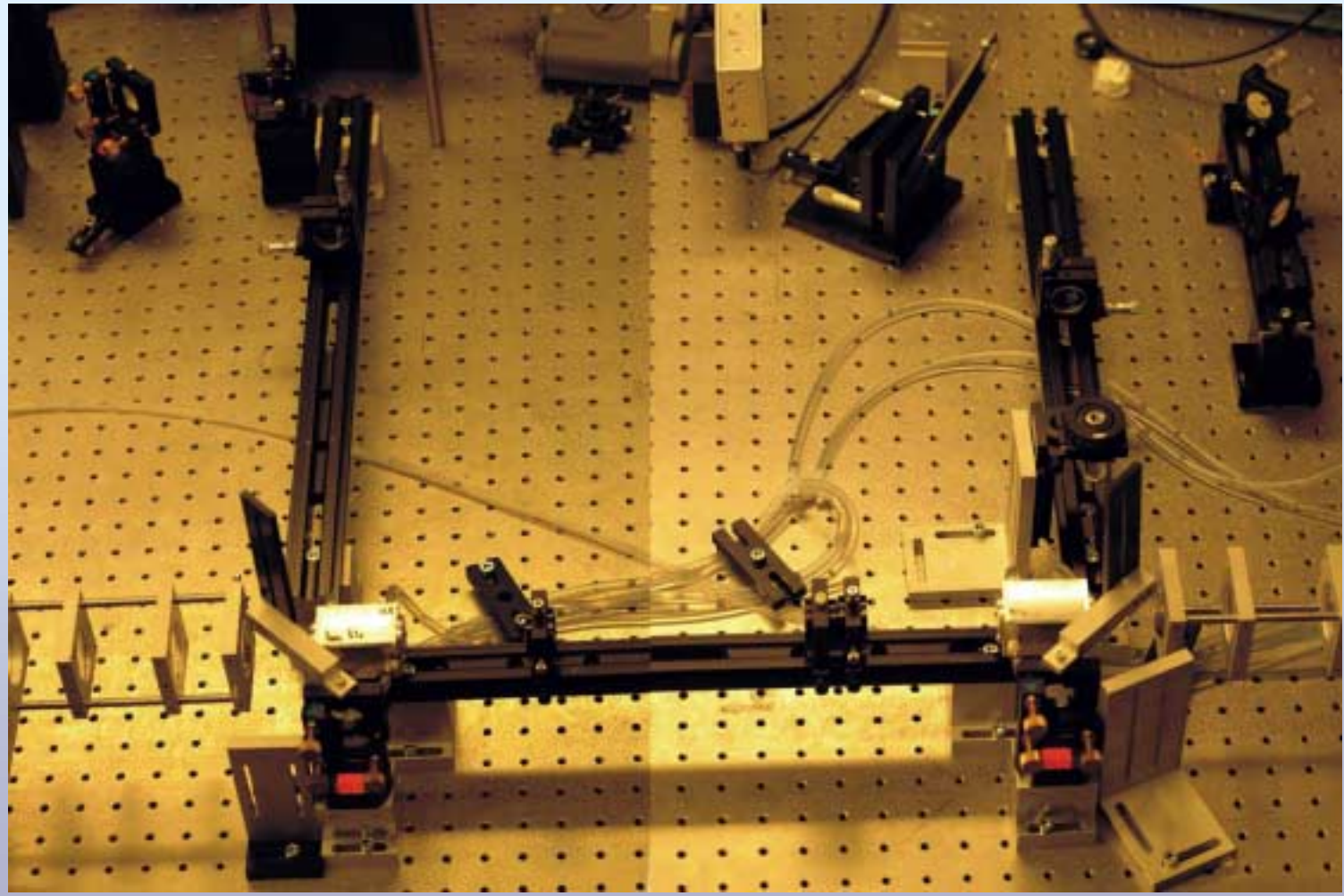


doubling output power by extension from V - to ring resonator

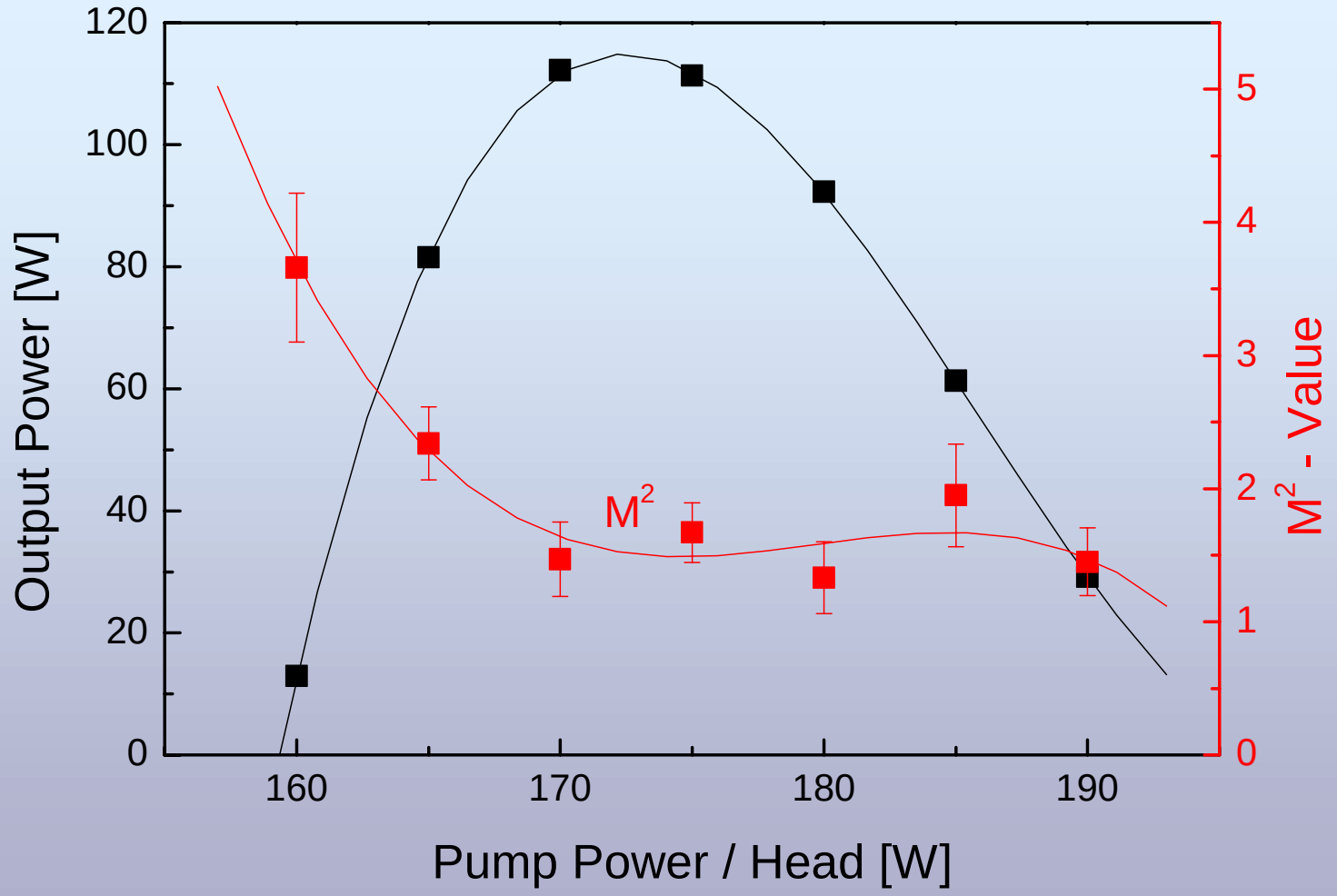
High Power Stage - *Setup*



High Power Stage - *Setup*

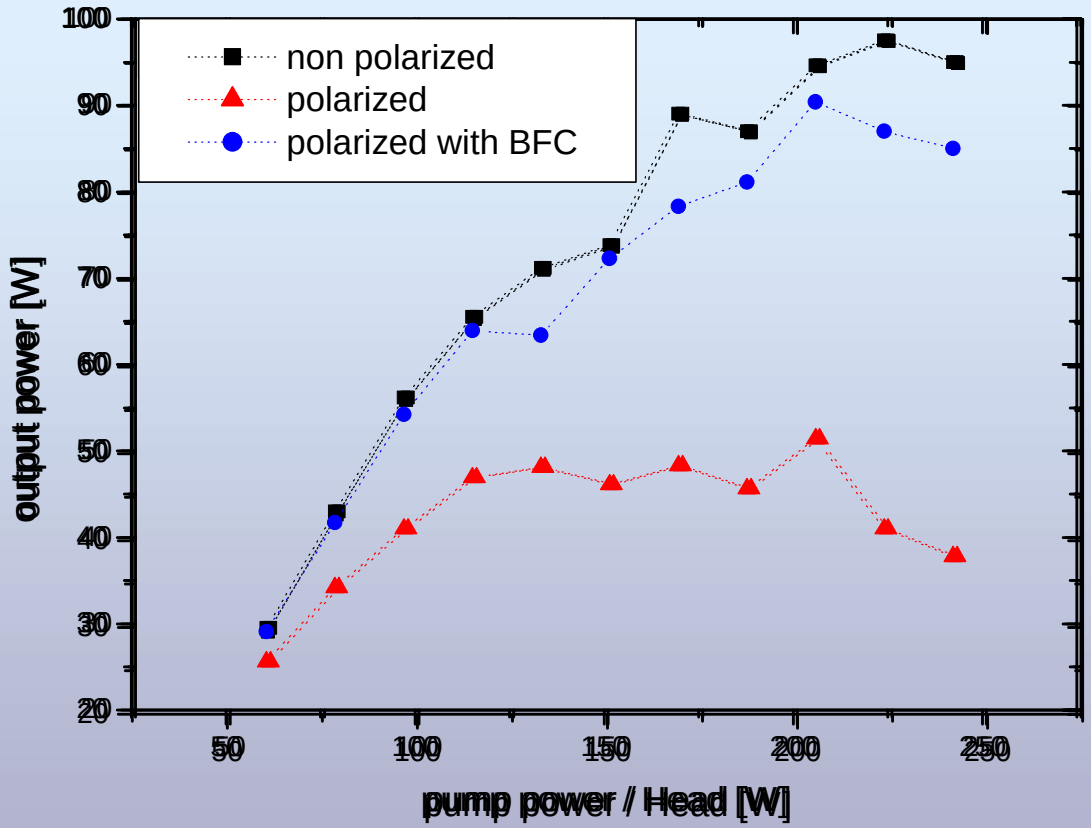


Modeling of the realized laser system



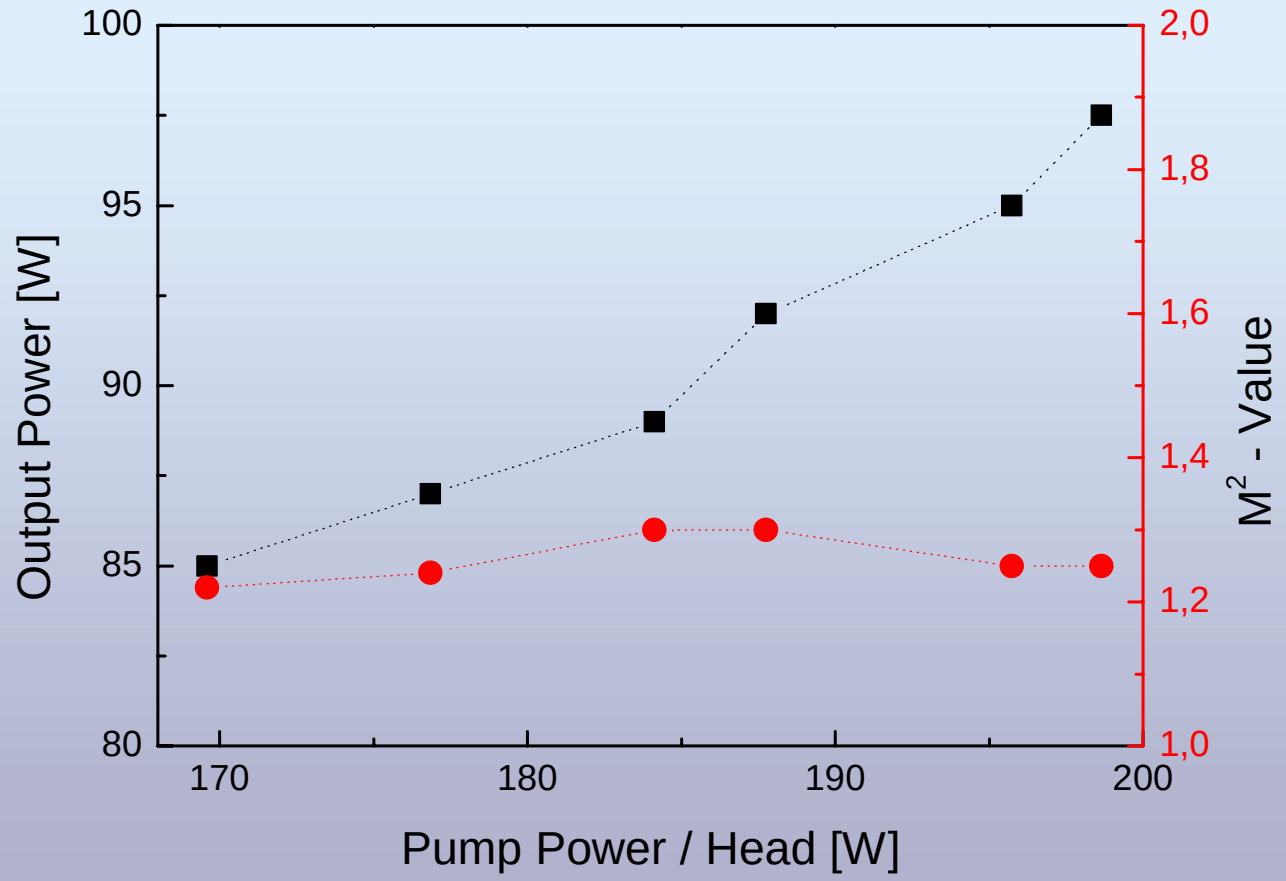
High Power Stage - *first Results*

multimode Resonator ($M^2 < 7$, OC = 12%)



High Power Stage - *first Results*

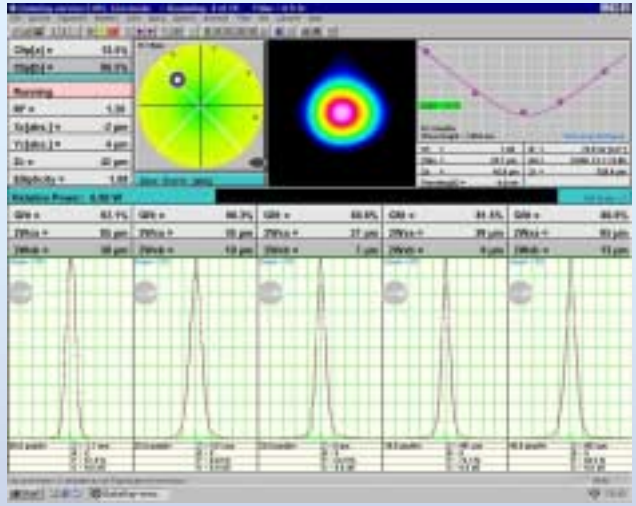
fundamental mode resonator ($M^2 < 1.3$)



High Power Stage - *Results*

- fundamental mode

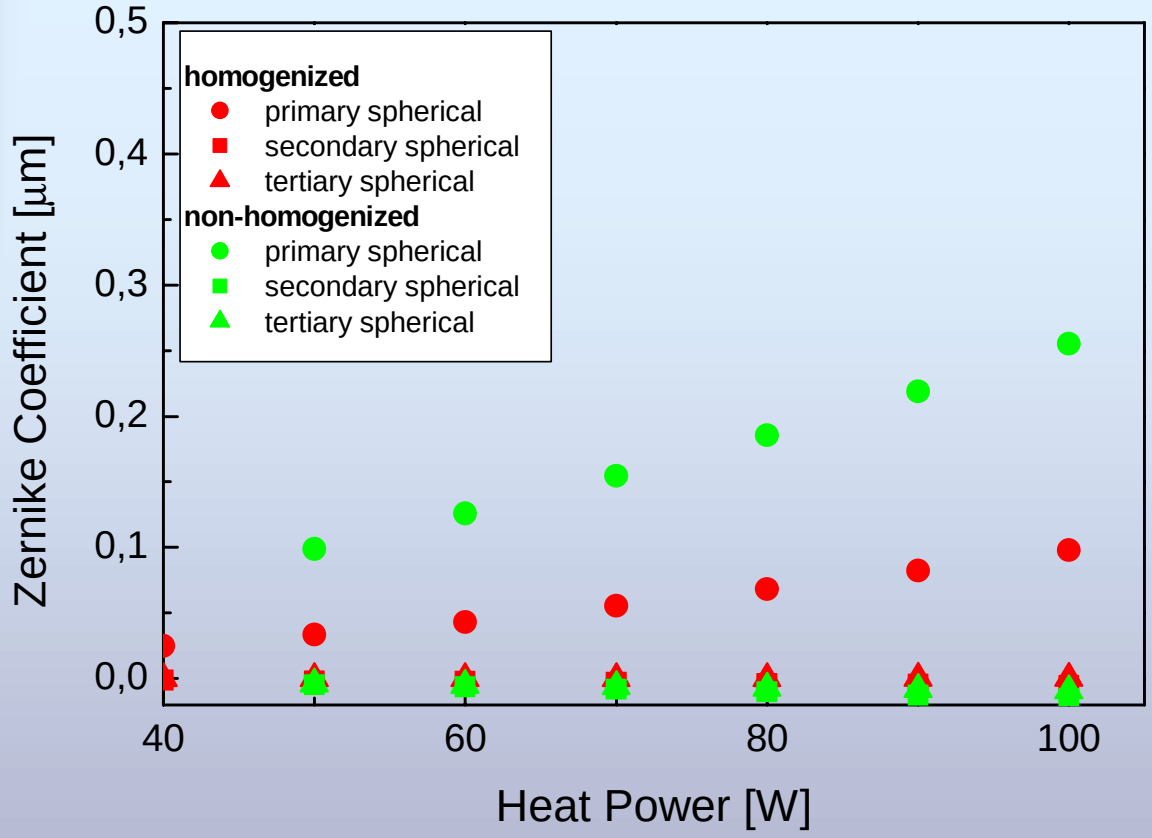
  output power : 97 W
- $M^2_{x,y}$: 1.25
- optical efficiency : 25%
- polarization ratio : > 200
- depolarization loss < 0,5%



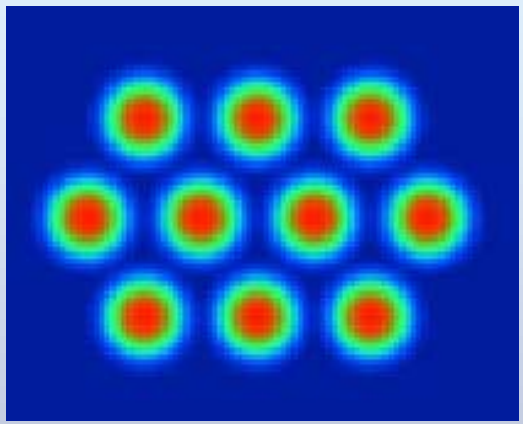
- M^2 measurements with *Beam Map, Data Ray Inc*.

⇨ output power and M^2 are limited by aberrations !

Homogenized vs Non-Homogenized Pumping Scheme

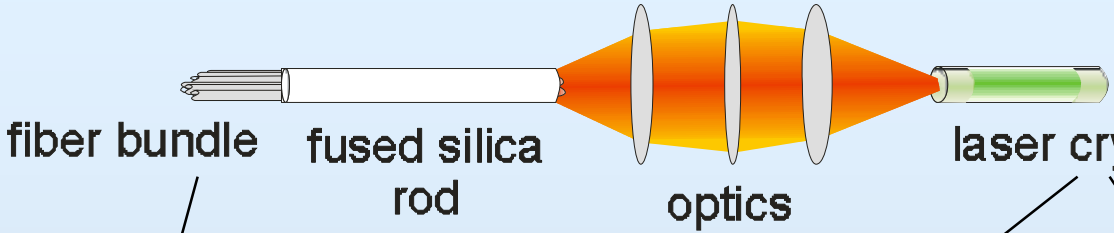


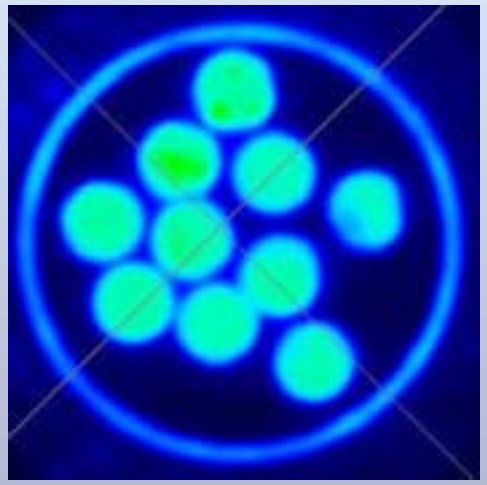
non - homogenized pump light distribution



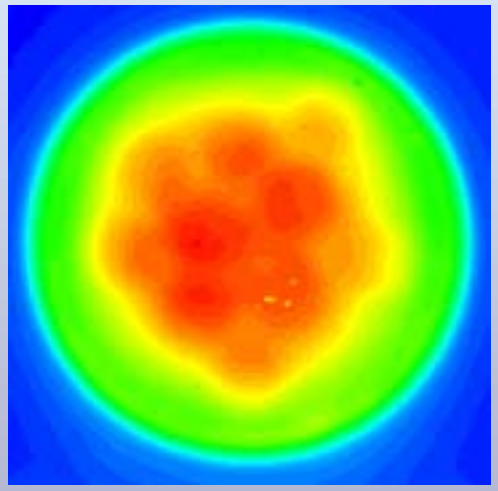
⇨ Increase of spherical aberrations through asymmetrical pump light distribution

Pump light homogenization

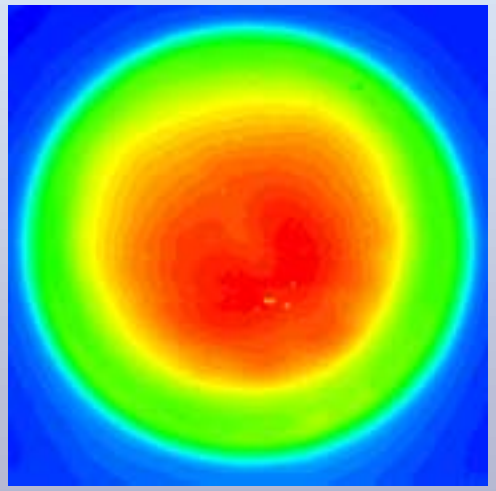




fiber arrangement



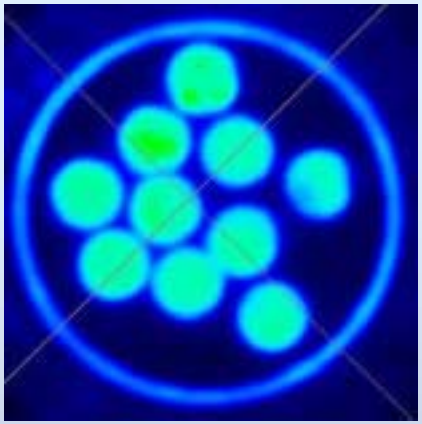
fluorescence w/o homogenization

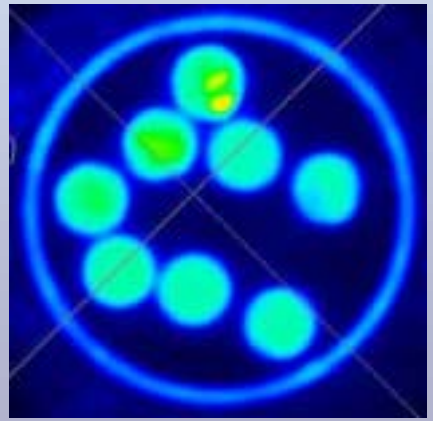


fluorescence with homogenization

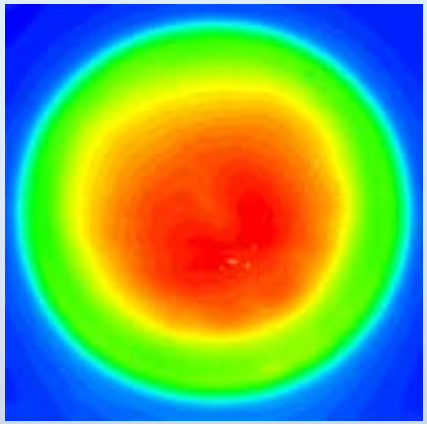
Fluorescence under assuming diode failure

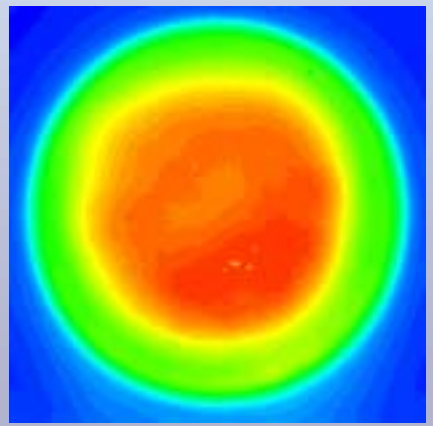
fiber arrangement





fluorescence





non-significant change in fluorescence distribution

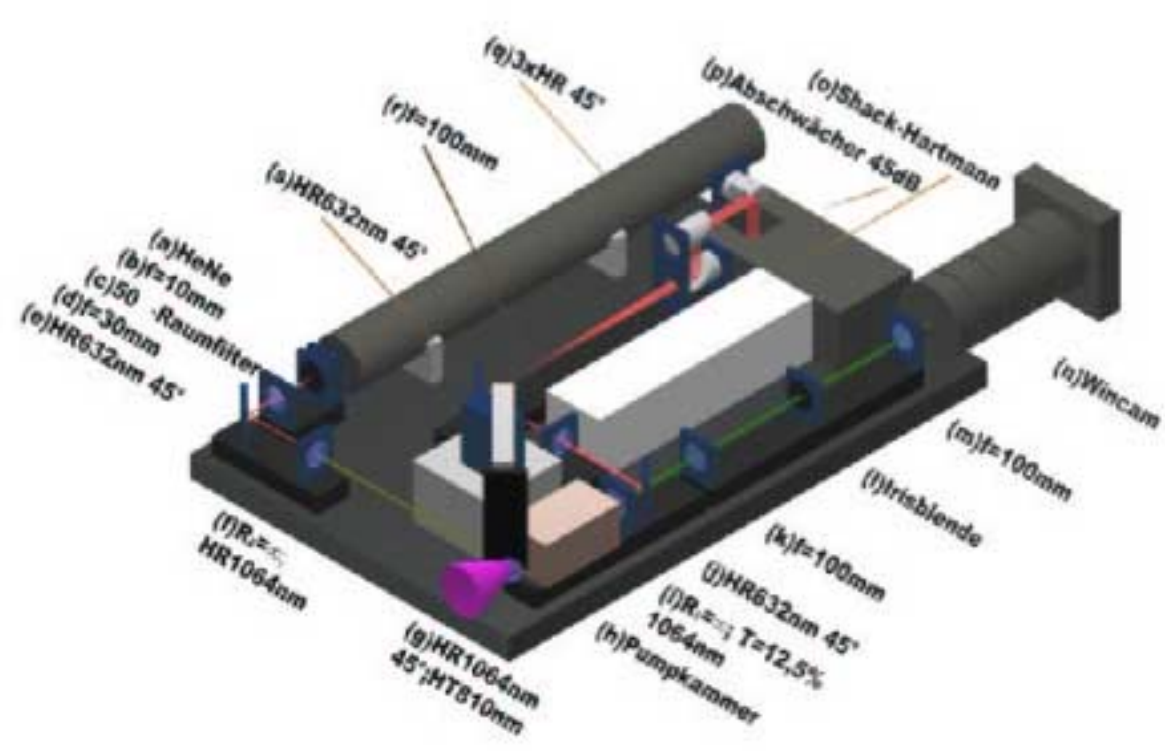
⇩

stable laser conditions by holding pump power constant

⇩

maintenance during laser operation possible

Preparation of Wave front measurement



- measure wave front distortion from optical components
- measure thermal lens and aberrations
- data acquisition for theoretical model
- optimize crystal cooling

Outlook / Summary