STATUS OF THE GEO HF SQUEEZED LIGHT SOURCE

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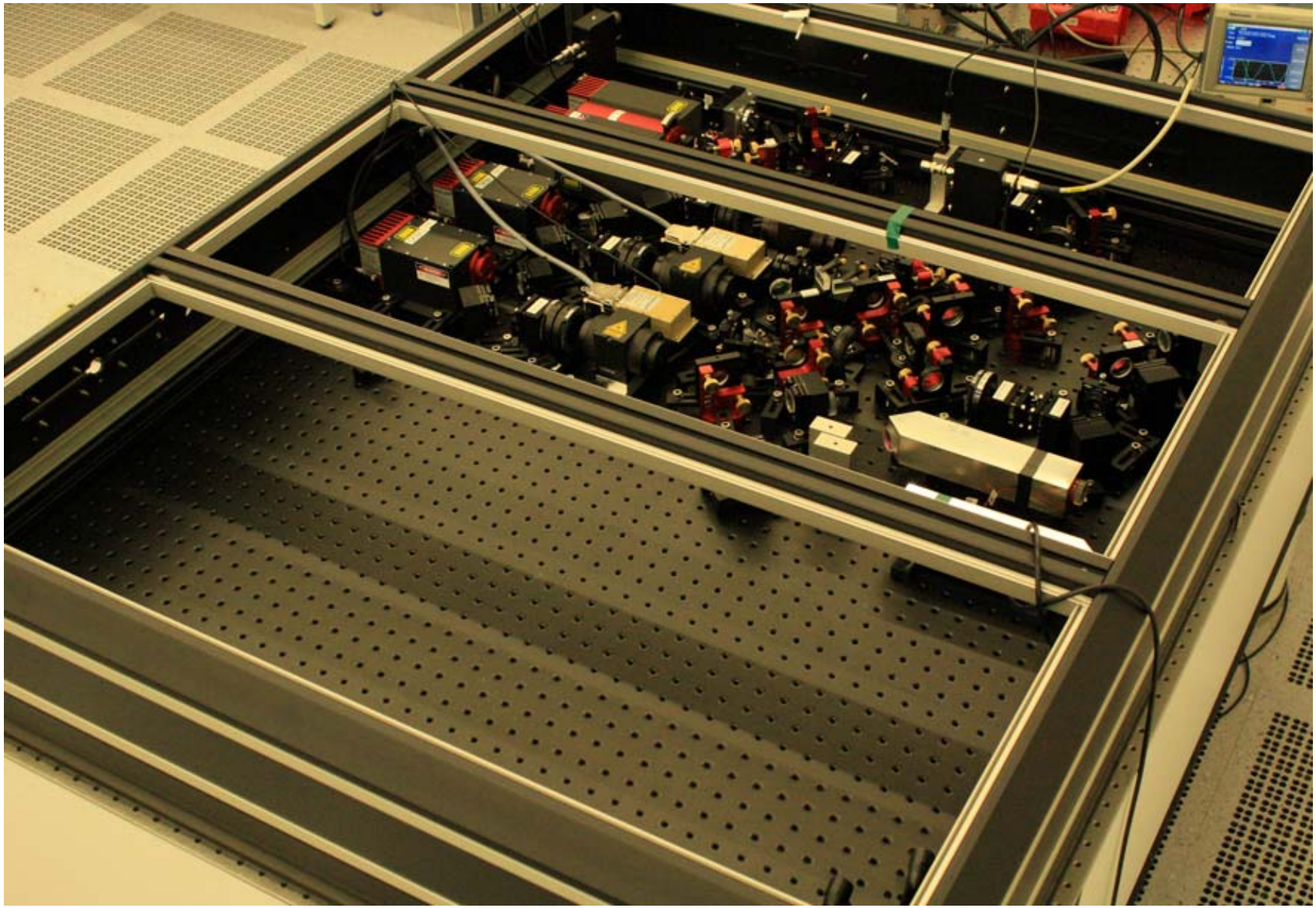
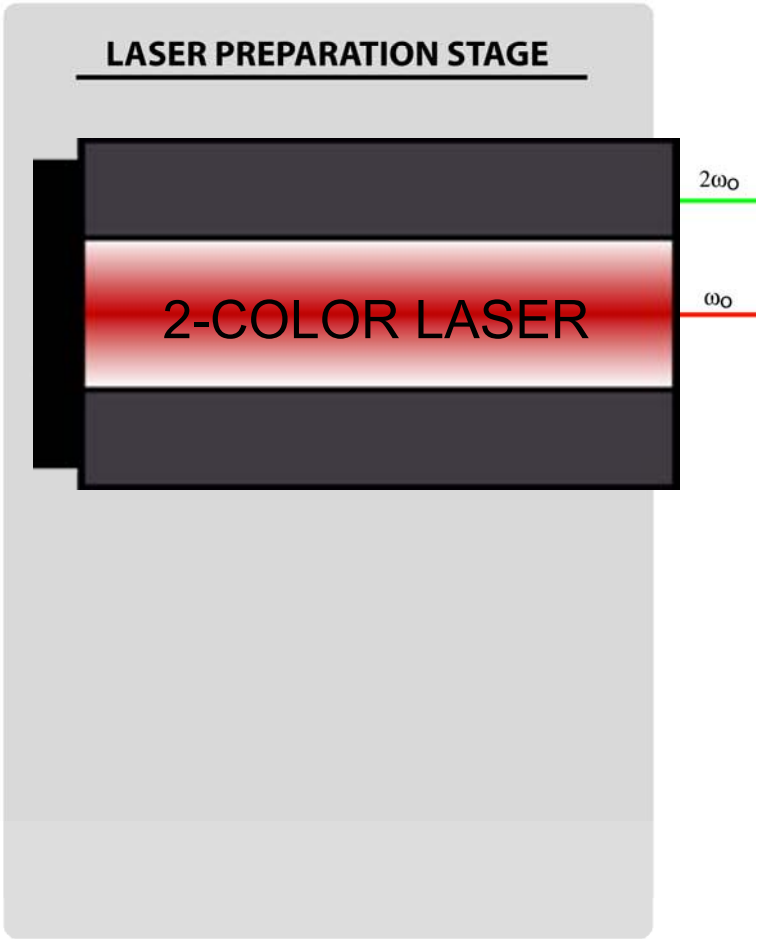
AEI Hannover

LIGO-G0900232-v1

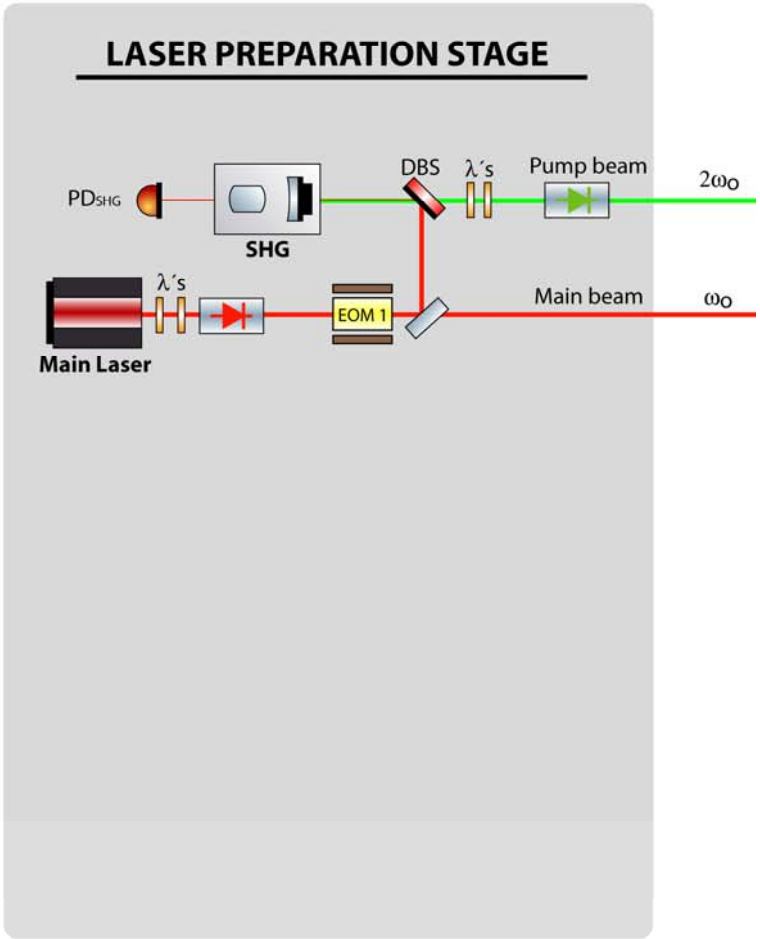
IN A NUTSHELL



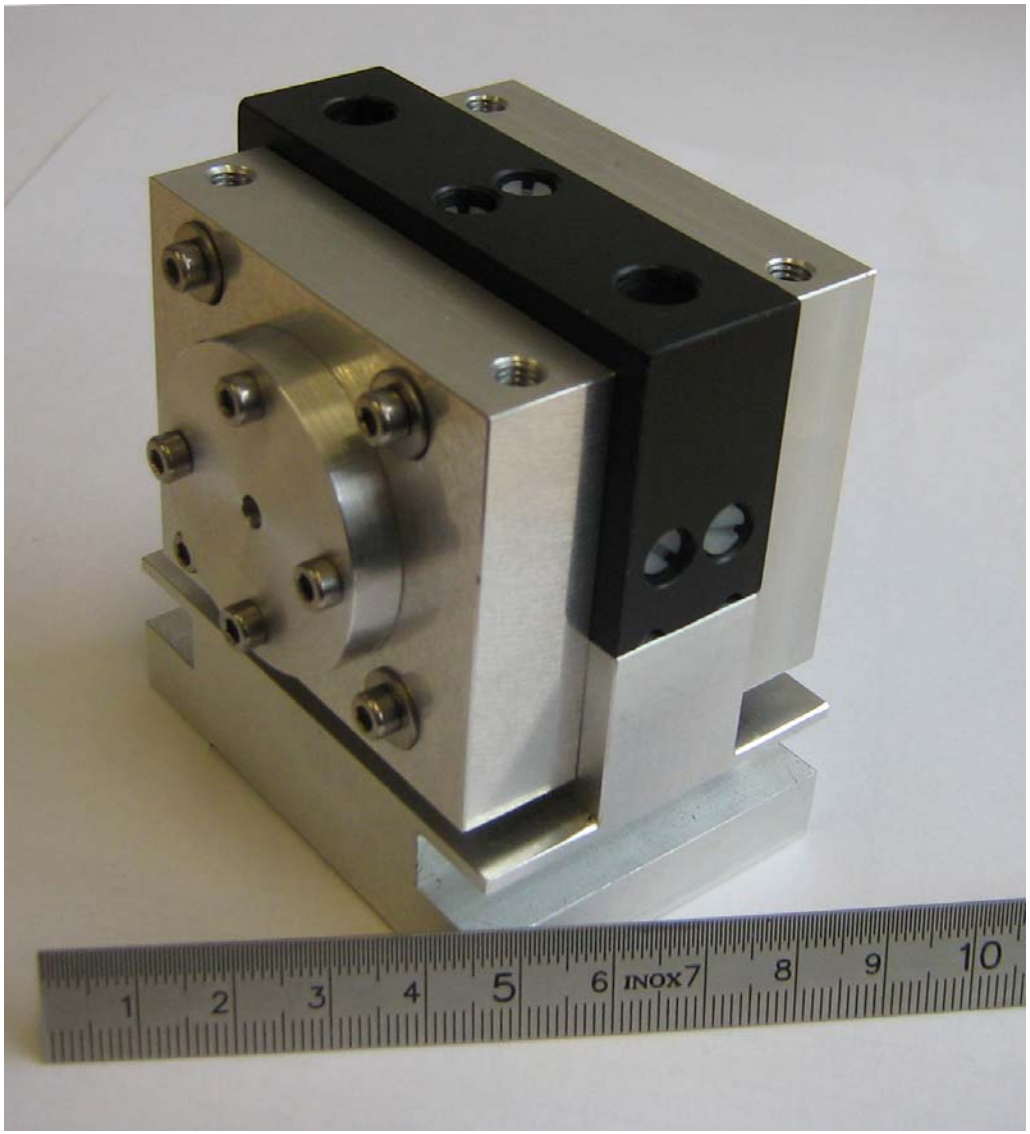
EXPERIMENTAL LAYOUT SCHEME I



EXPERIMENTAL LAYOUT SCHEME I

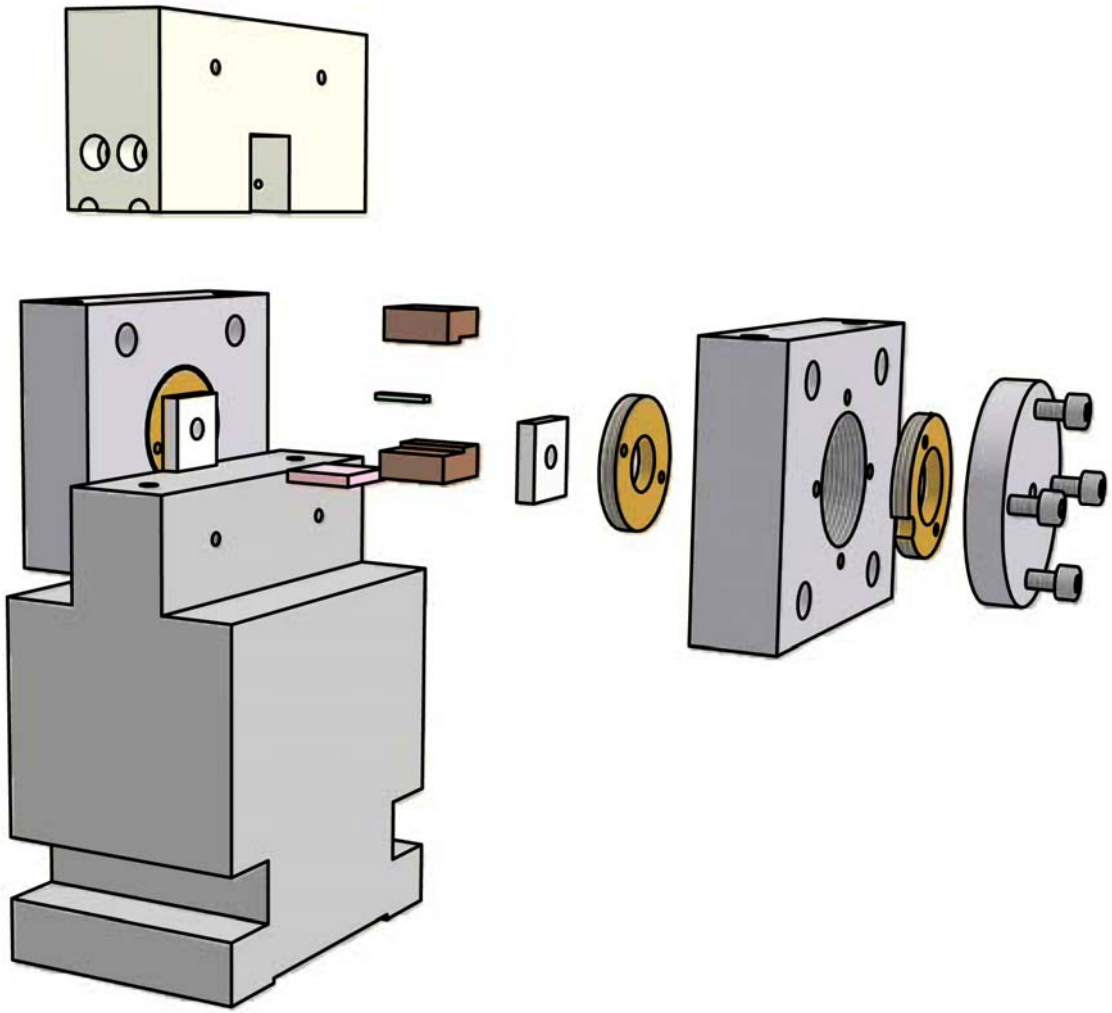


SECOND HARMONIC GENERATOR

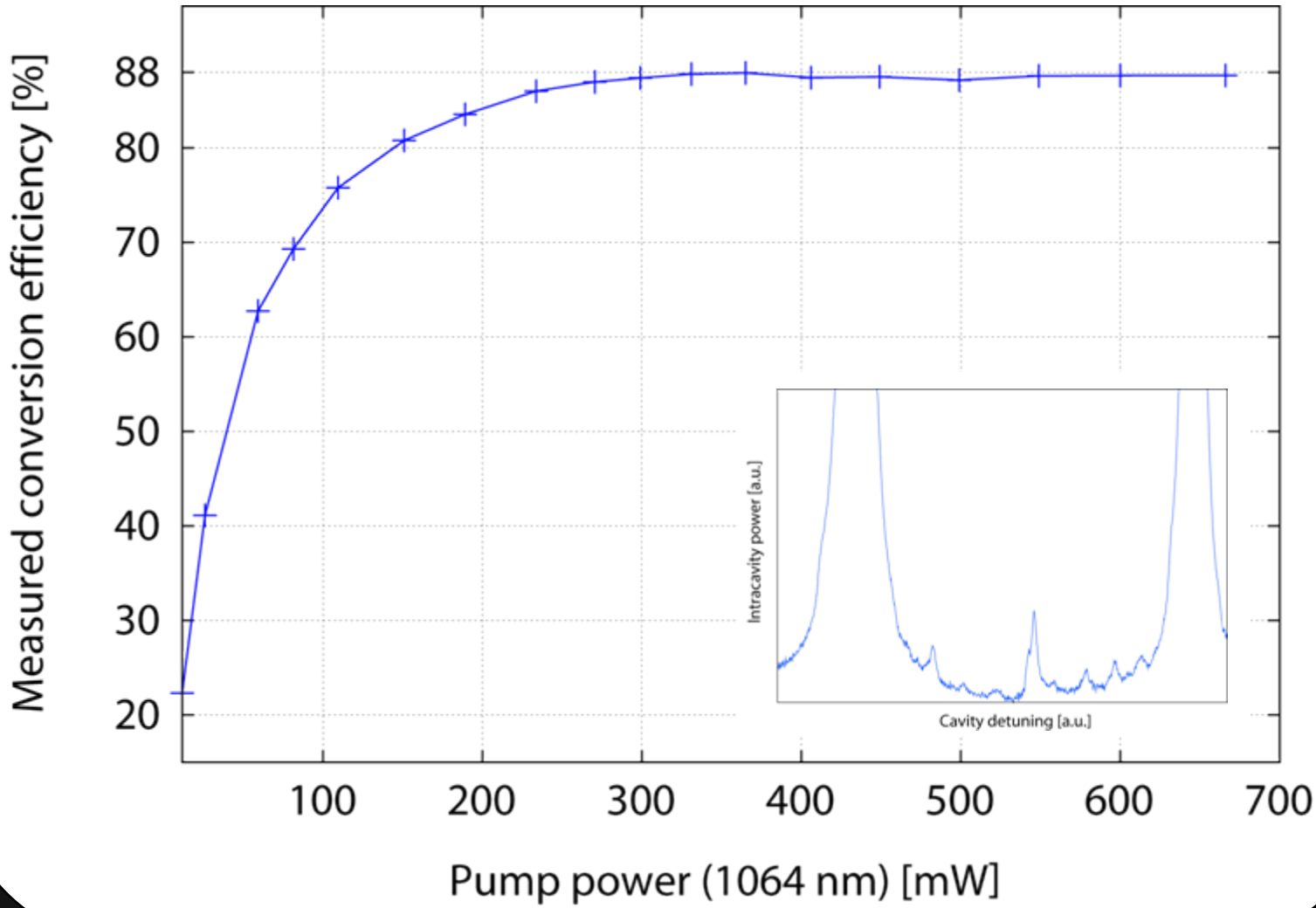


- Hemilithic cavity
- Nonlinear medium:
  1 x 1.5 x 10 mm PPKTP crystal
- Singly resonant at 1064 nm
- Coupling mirror: R = 90%
  $\Rightarrow$ Finesse $\approx$ 60
- Compact design
- High intrinsic mechanical stability

SHG/SQUEEZER DESIGN



EFFICIENT SHG



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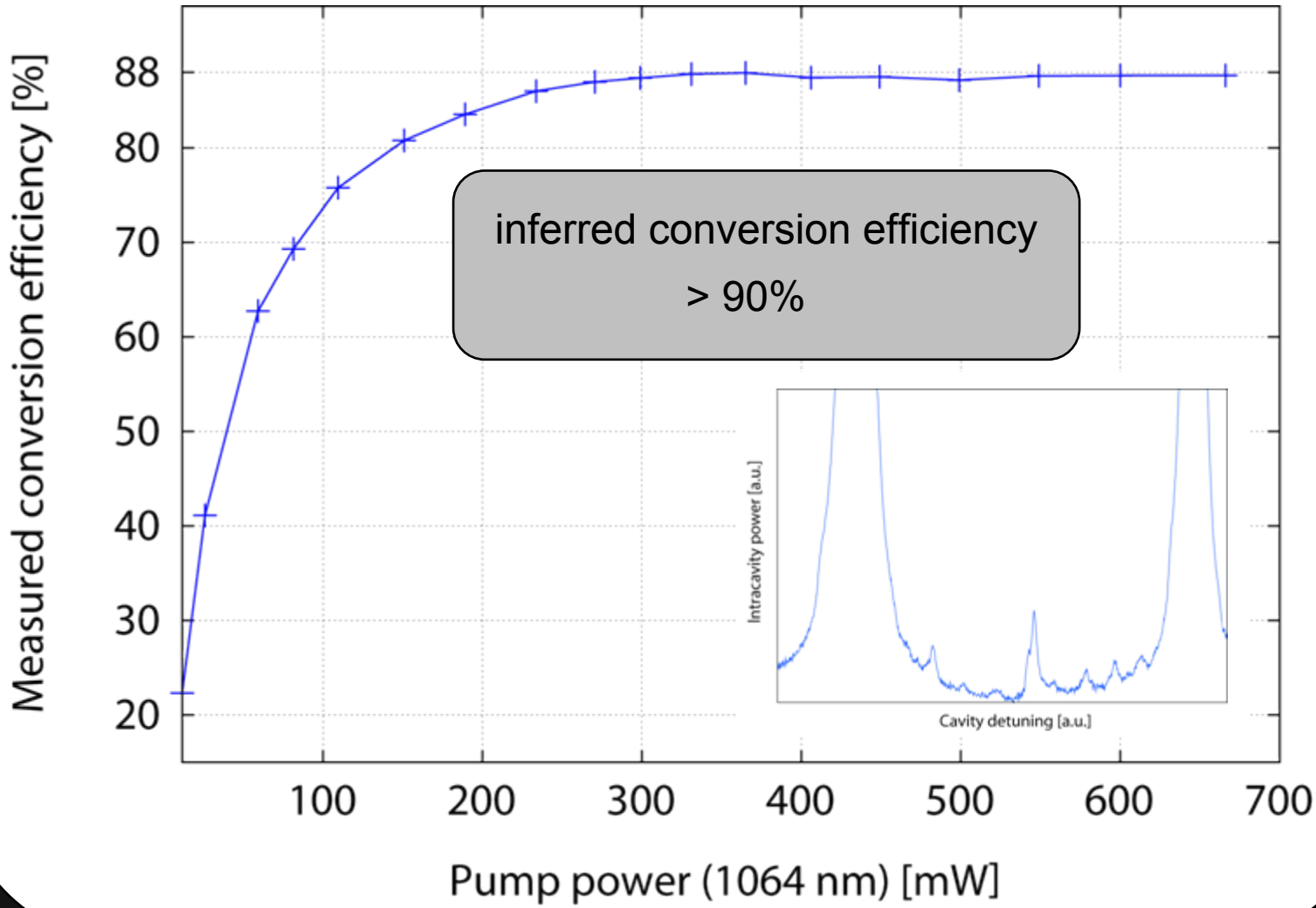

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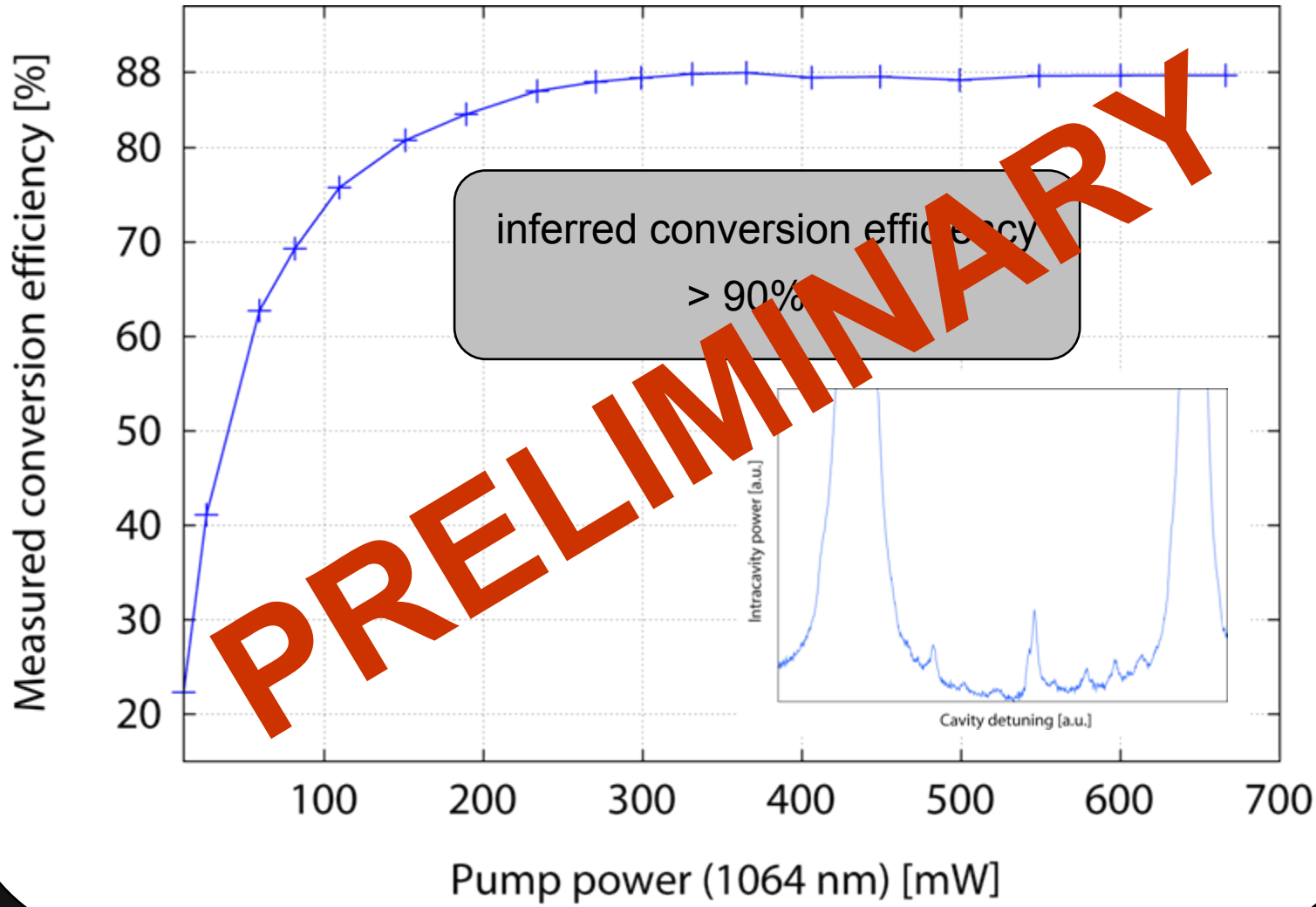
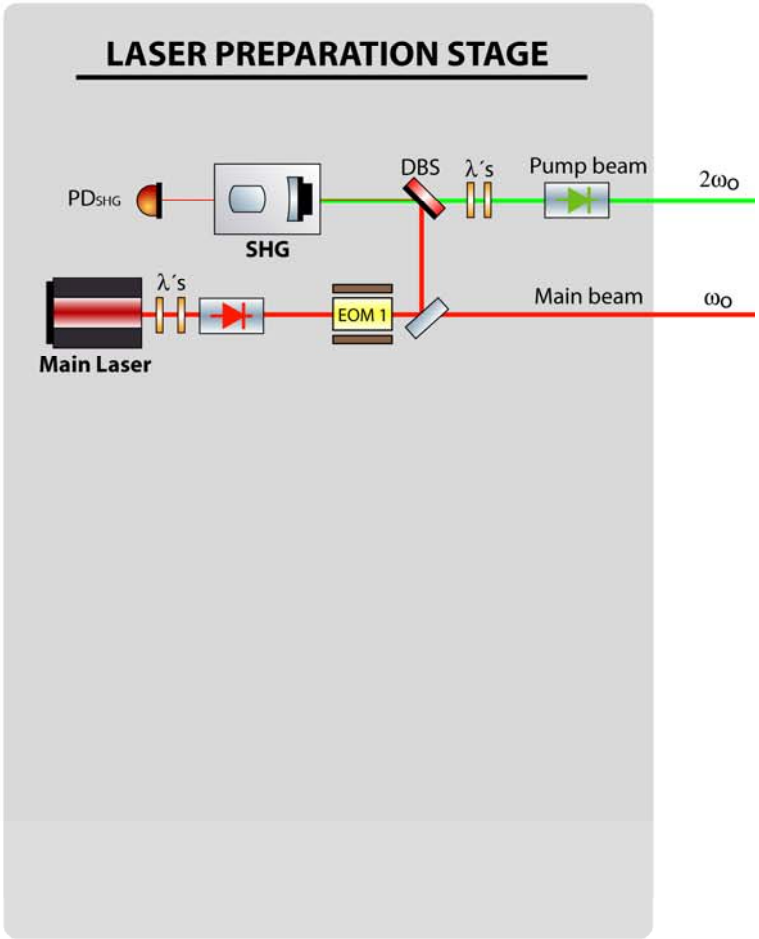


EXPERIMENTAL LAYOUT SCHEME II



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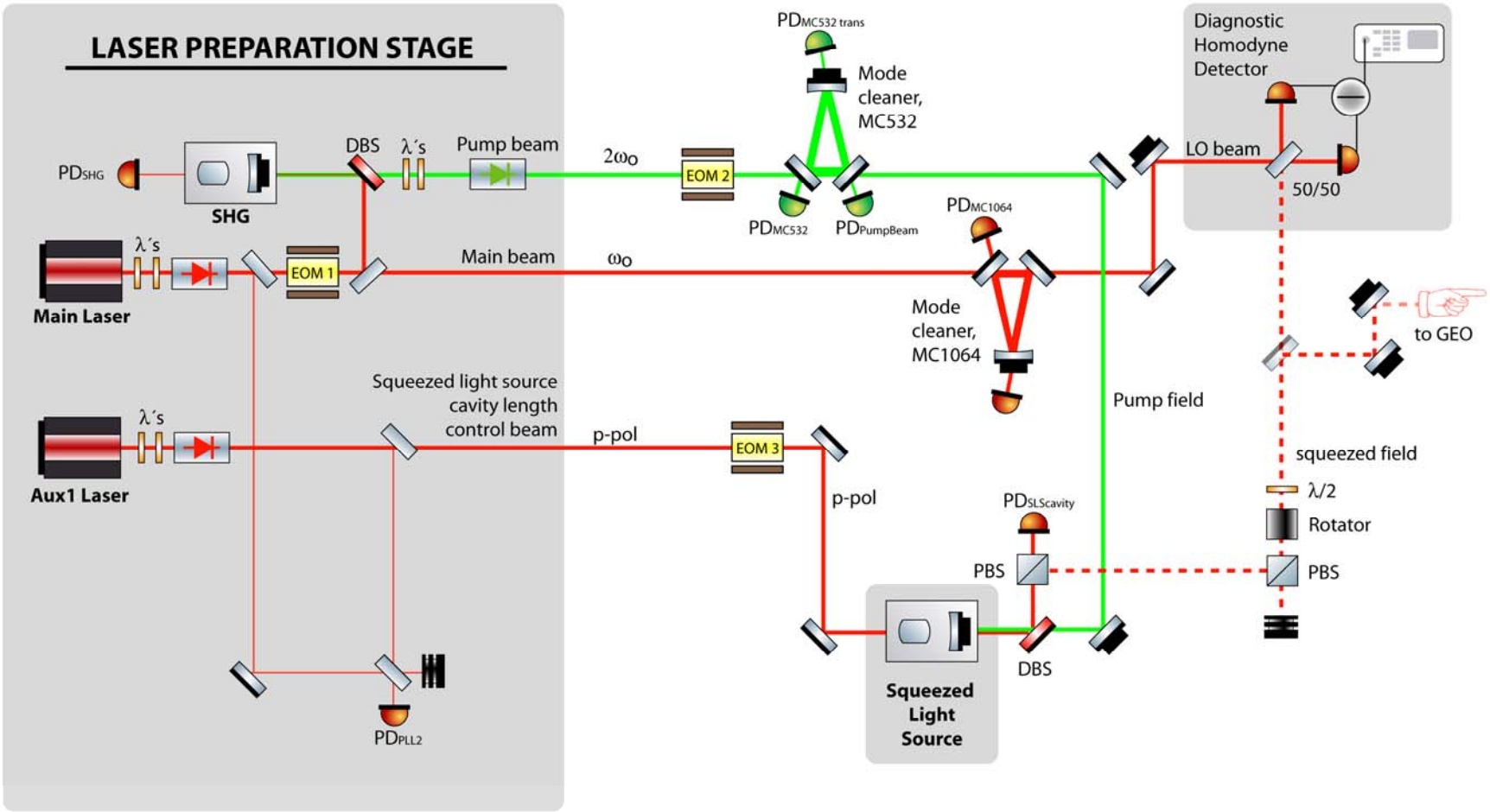
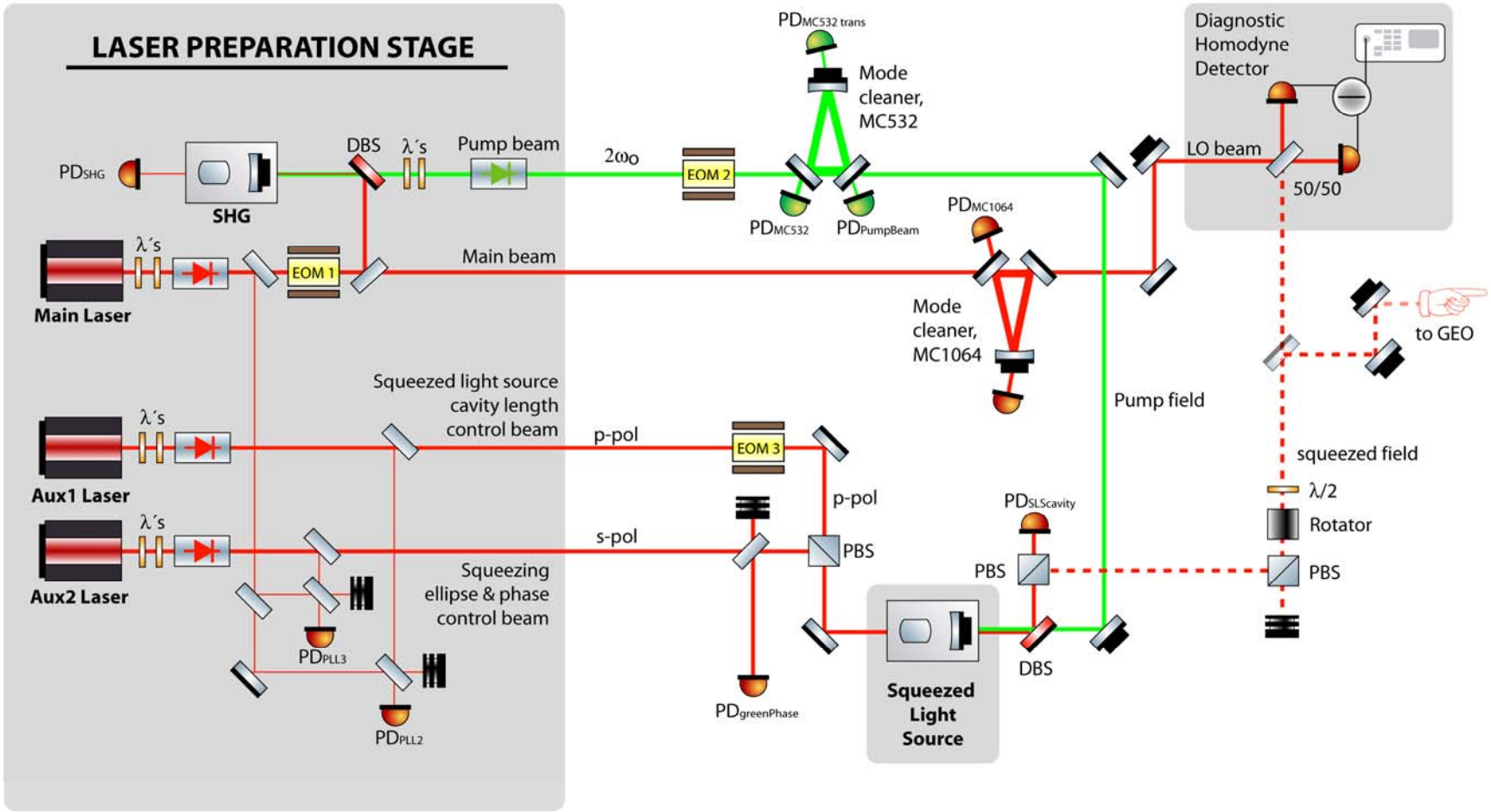
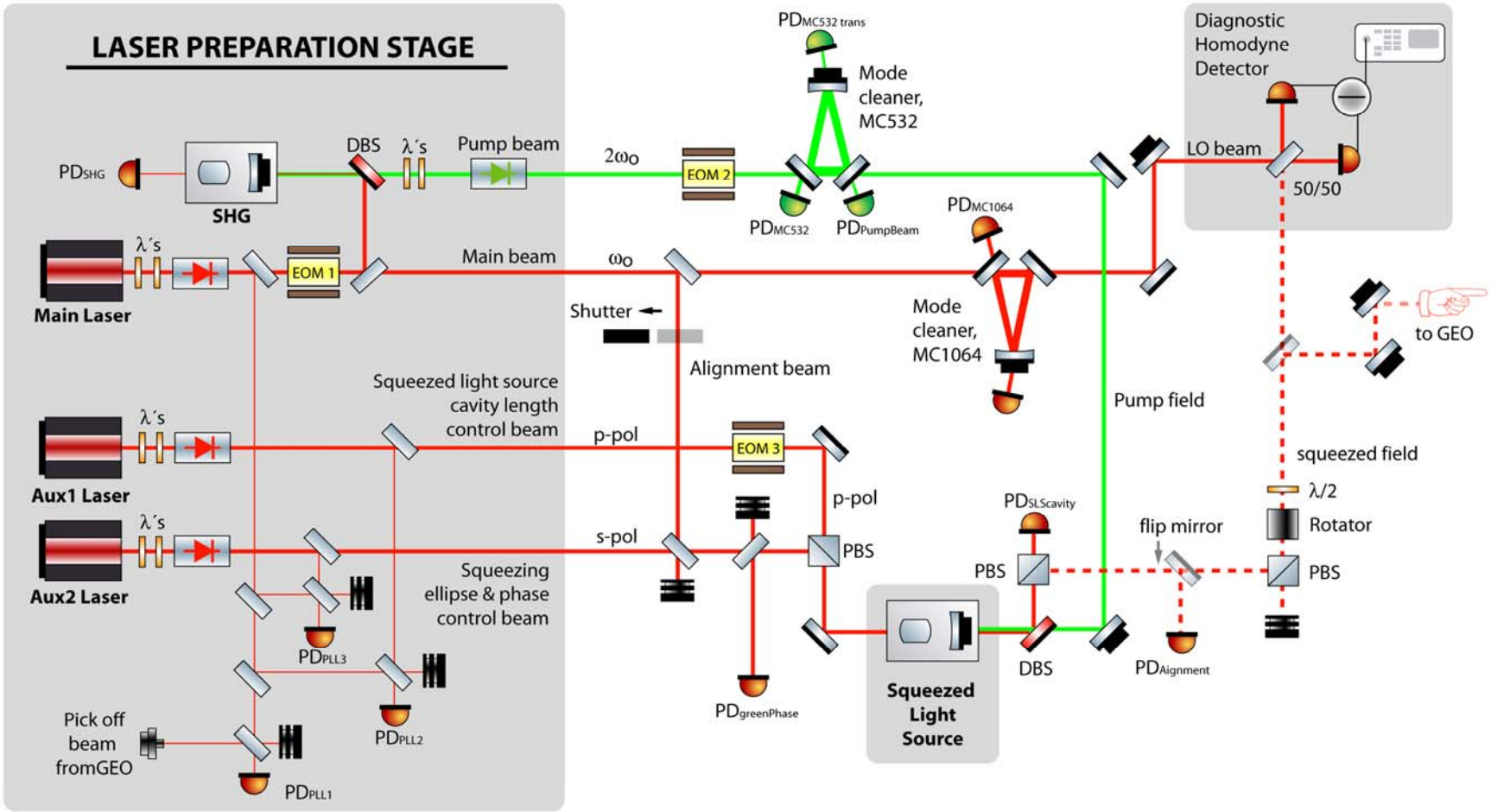


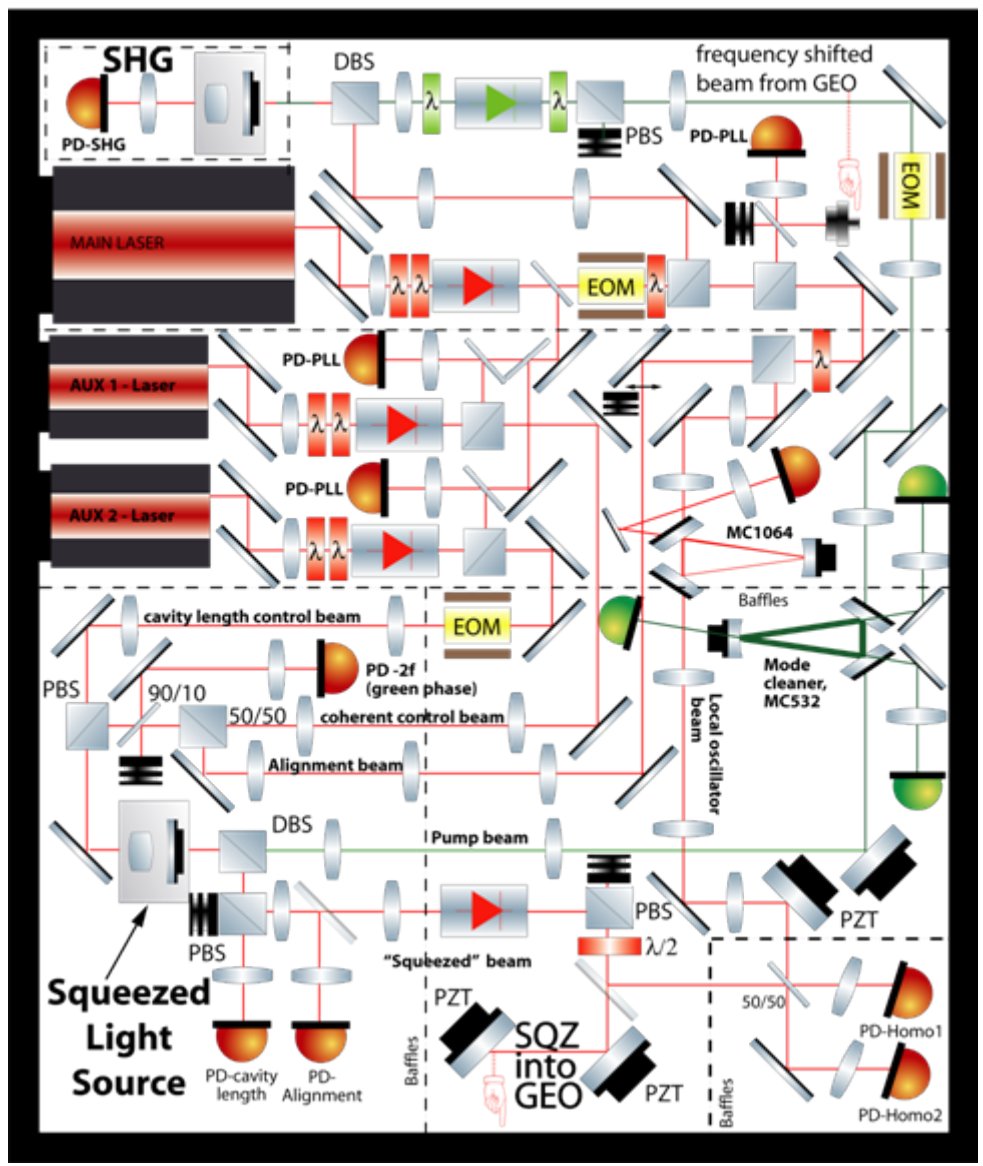
EXPERIMENTAL LAYOUT SCHEME IV



EXPERIMENTAL LAYOUT SCHEME V



GEO SQUEEZING BREADBOARD



Main Laser: InnoLight Mephisto

Aux. Lasers: Mephisto OEM

Optics: ATF (superpolished)

Nonlinear medium: PPKTP

Breadboard: 113x135 cm

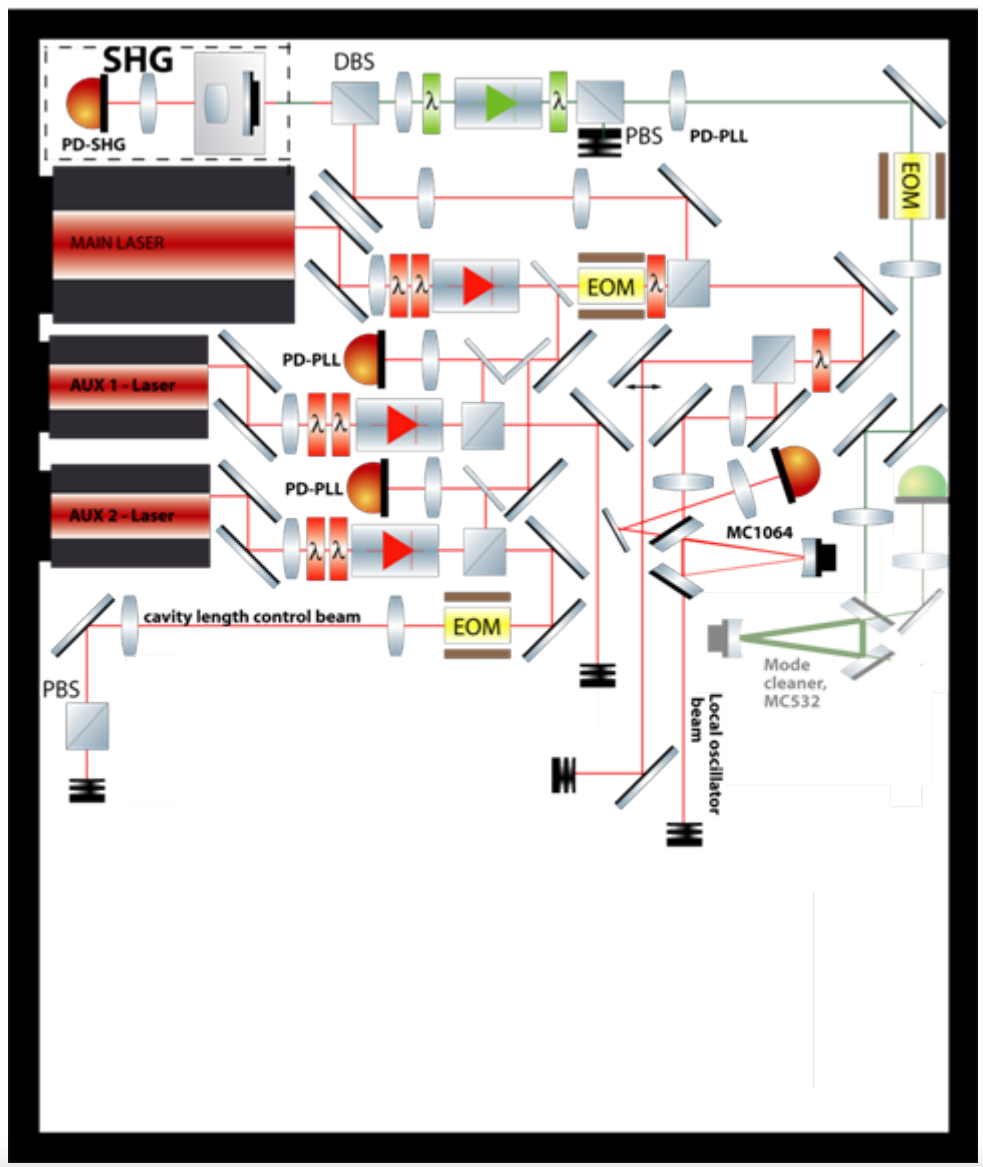
Beam height: 50mm

Compact design

> 120 opt. components

total weight ≈ 120 kg

STATUS OF THE EXPERIMENT I



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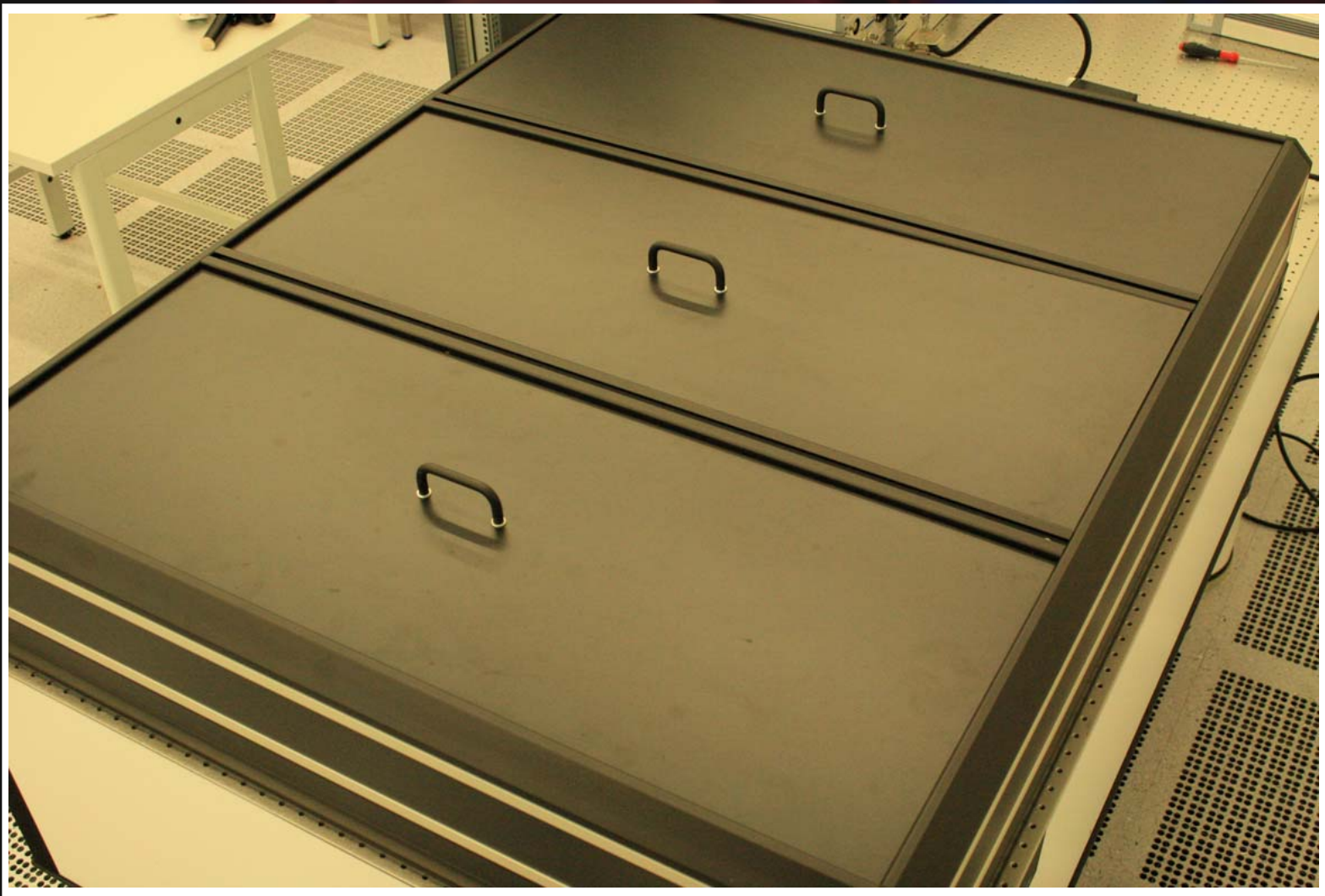

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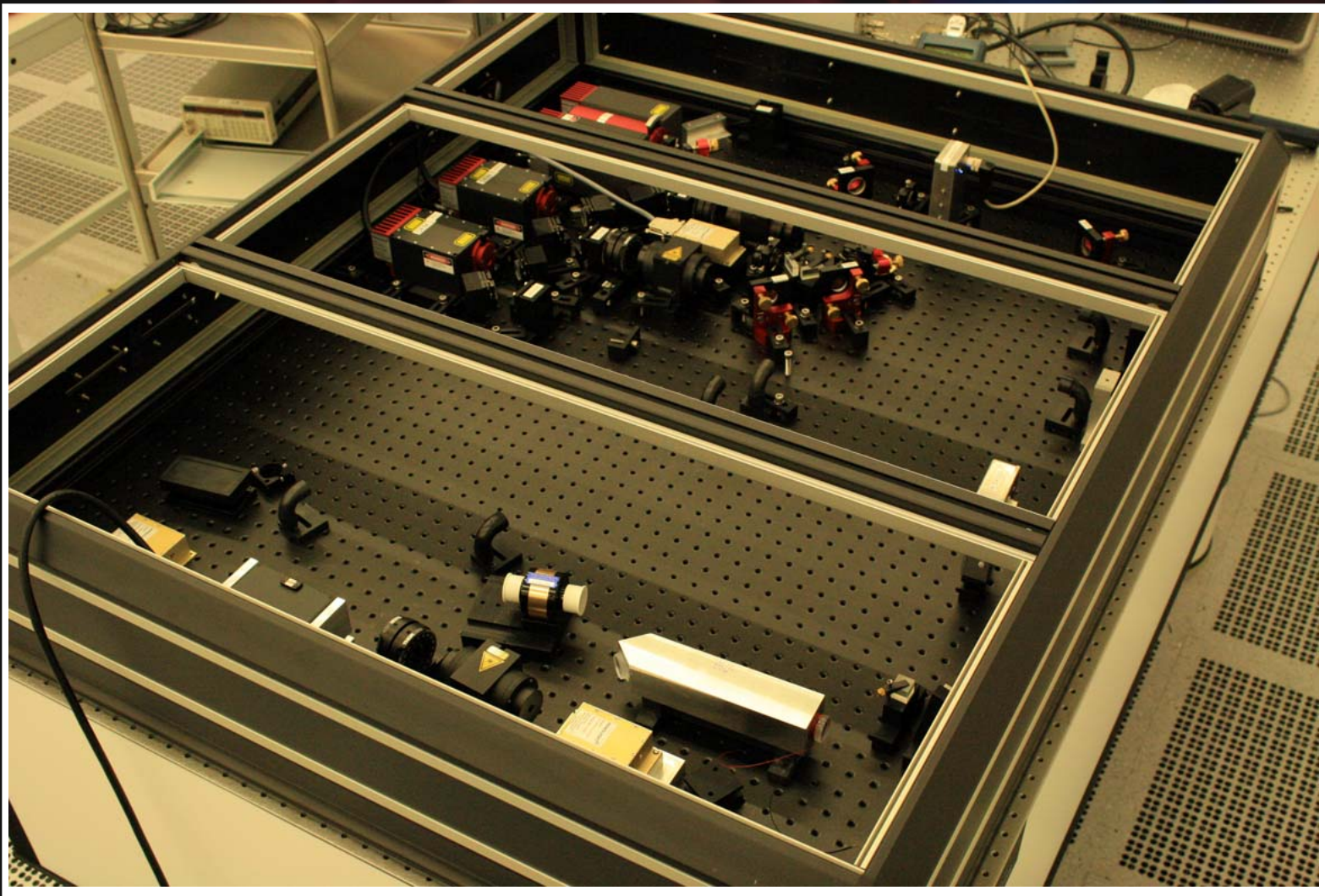

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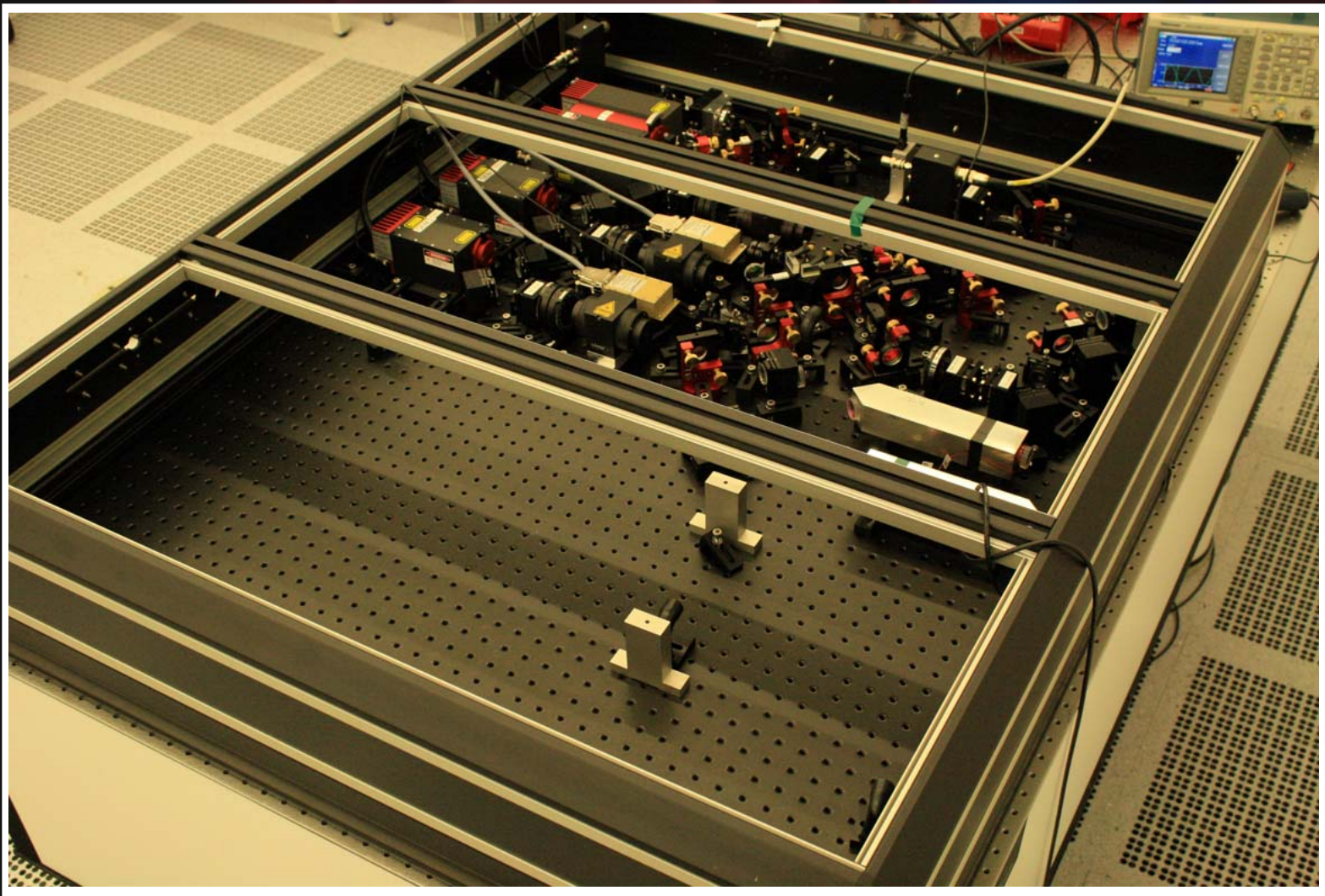

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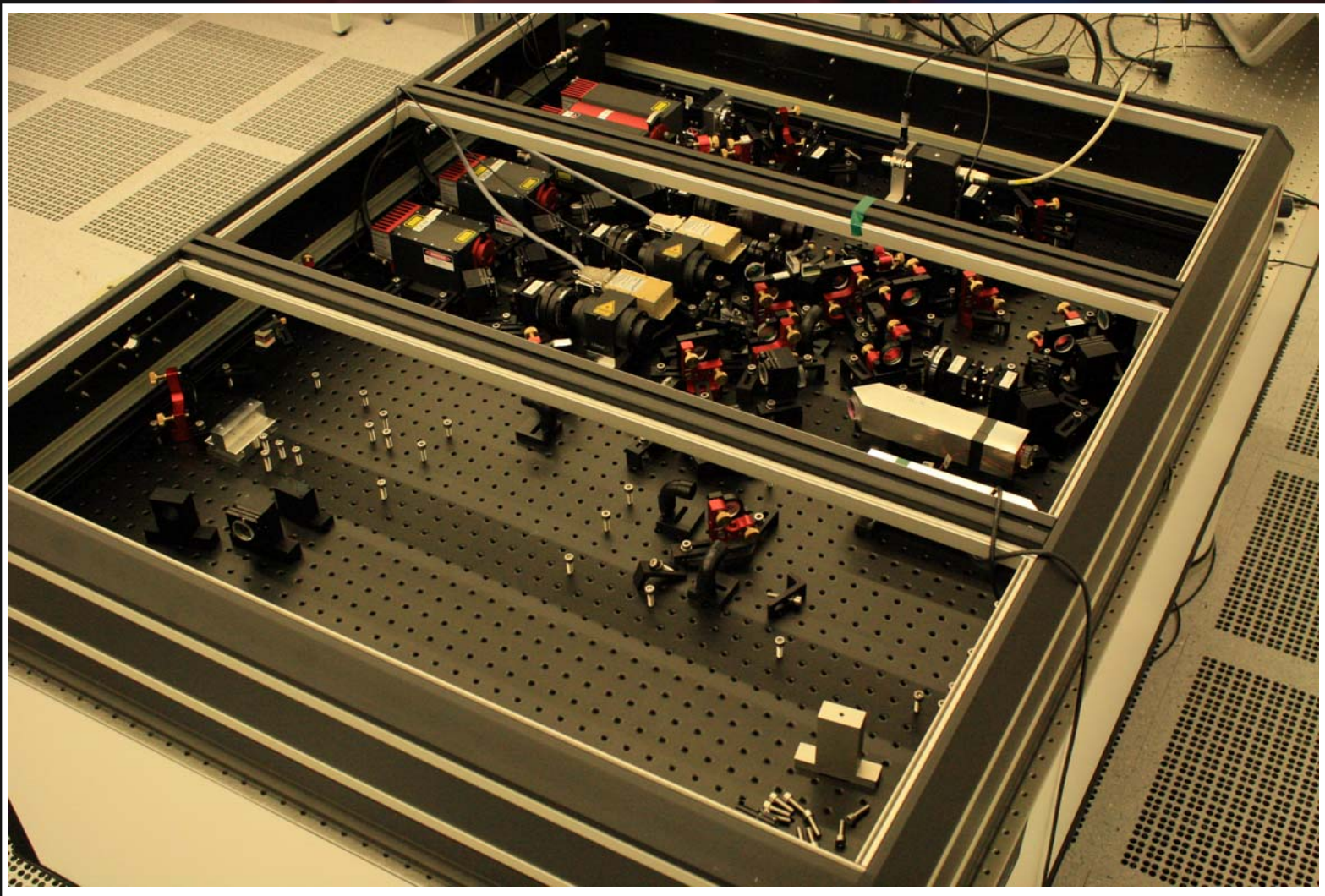
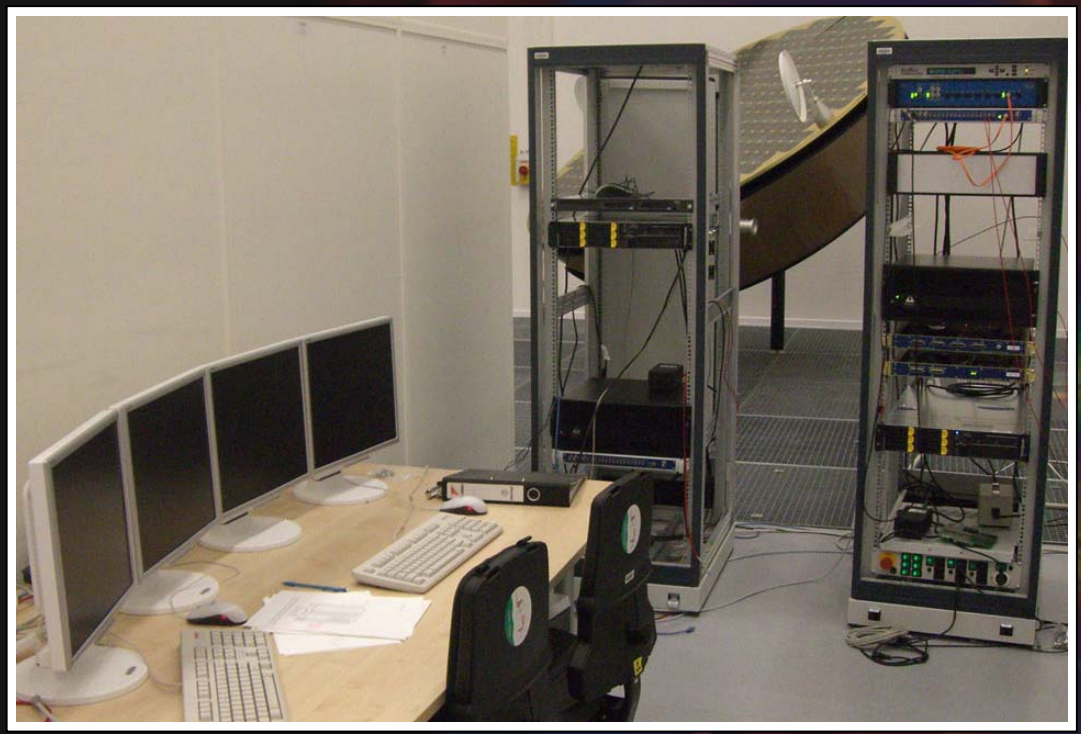


ELECTRONIC CONTROL



- Analog electronics for high bandwidth control loops
- Digitally interfaced
- Real time LINUX control system (EPICS)
- Operation in 24 h/day, 7 days/week self-relocking mode

TIMELINE AND SUMMARY

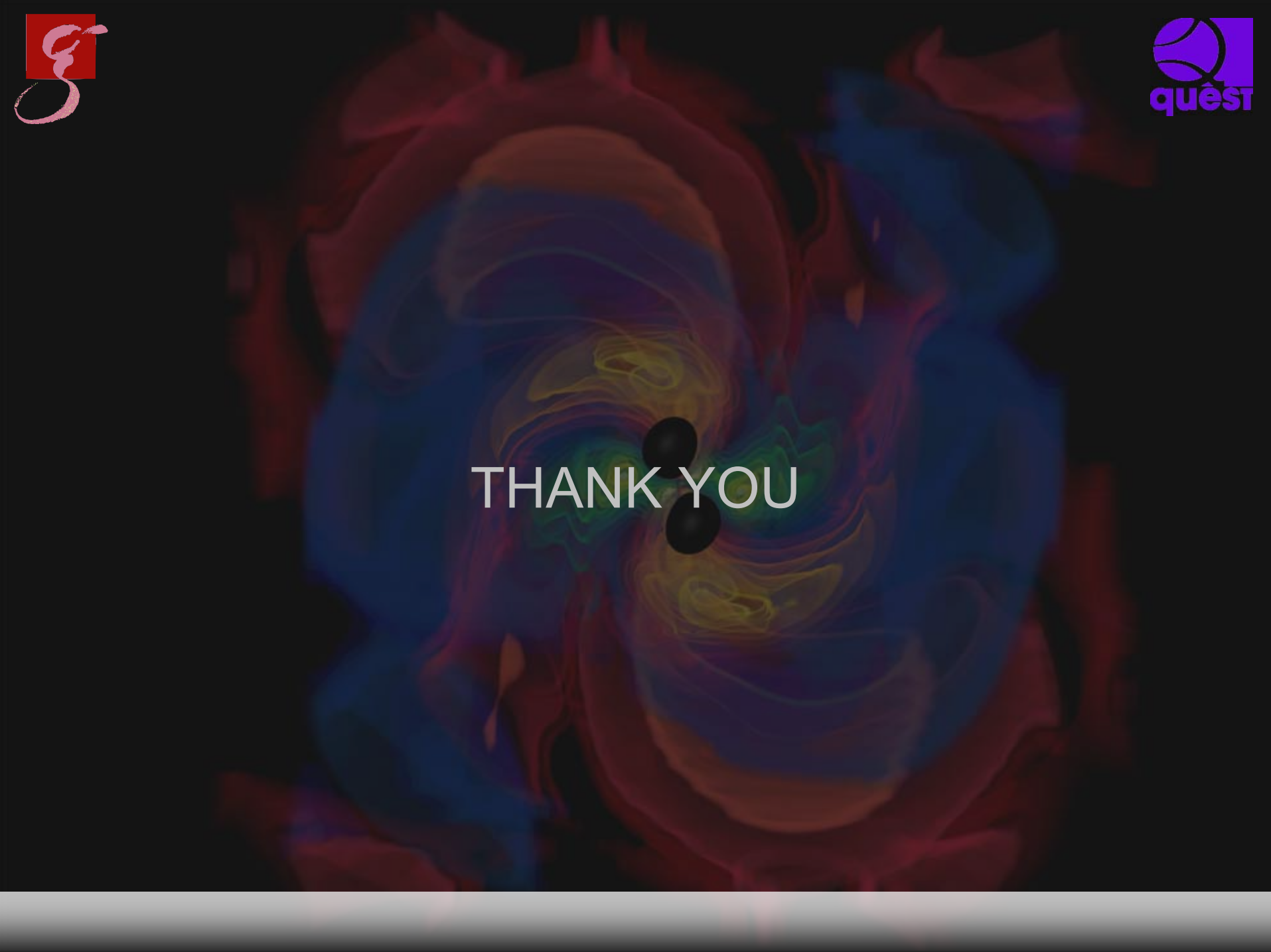
TIMELINE

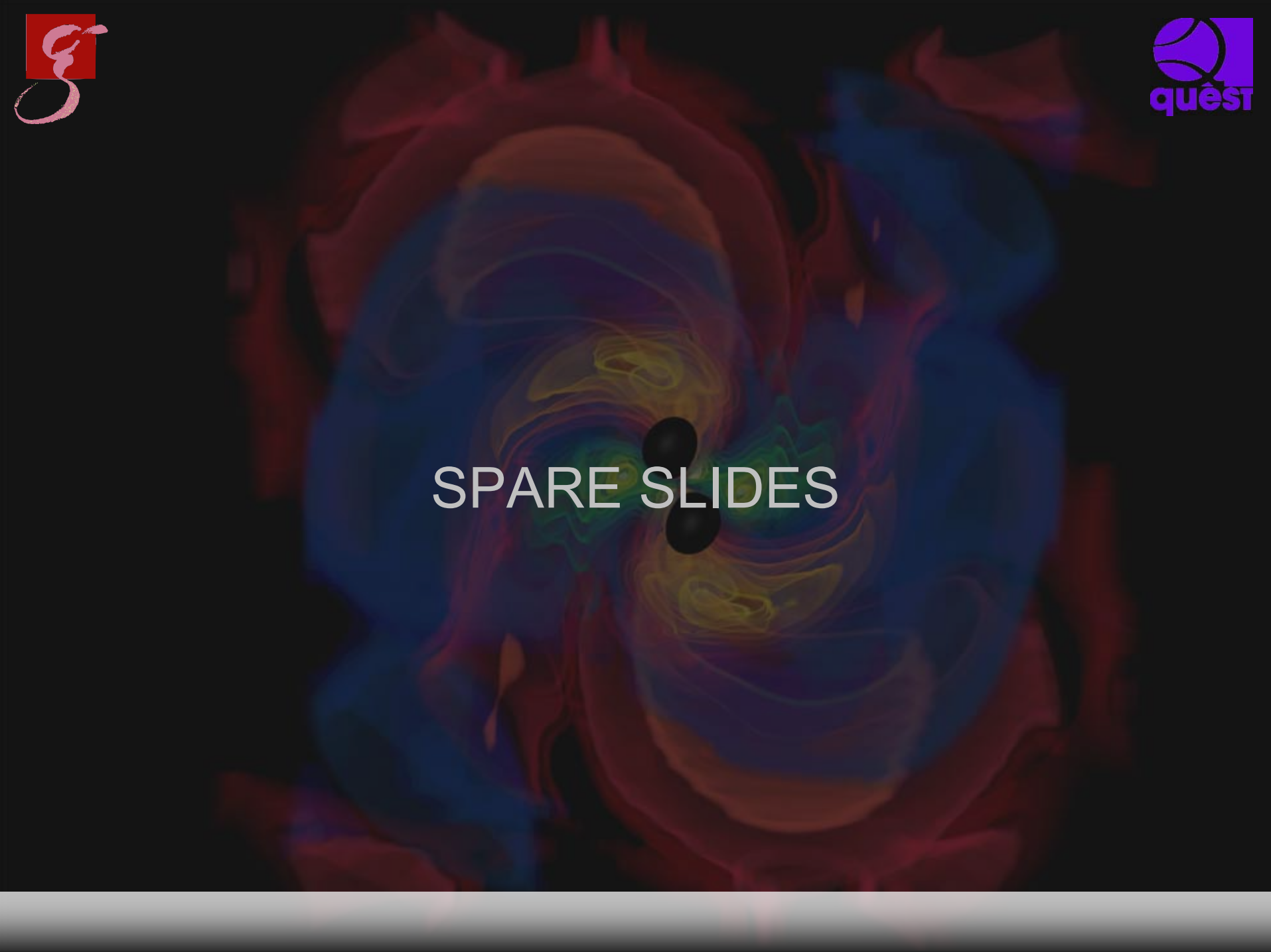
- Assembling started!
- Squeezed light injection into GEO 600:

Spring/Summer 2009

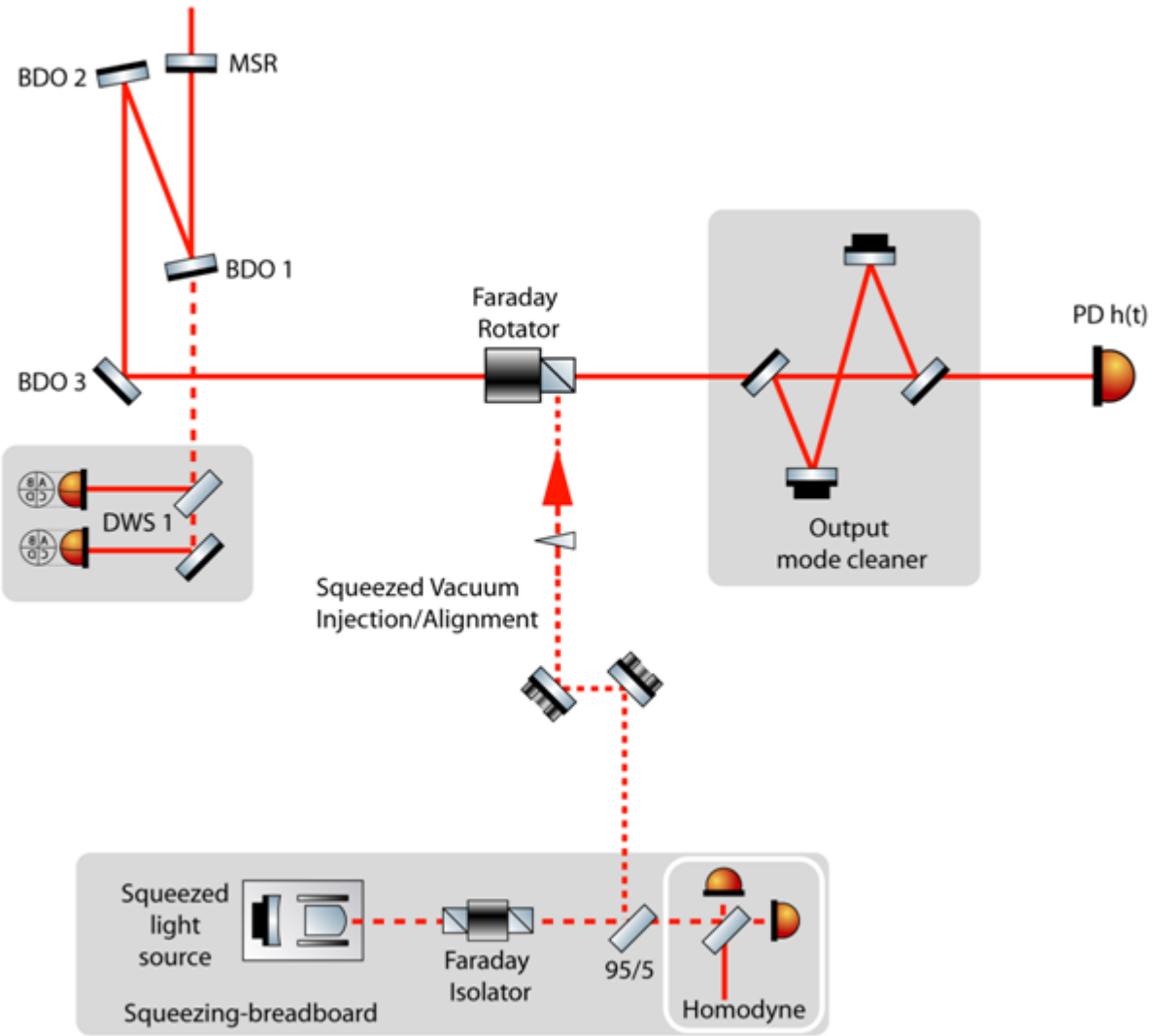
GOAL

- Squeezing-improved sensitivity for GEO 600
- Test of squeezing as standard tool for future GW detectors

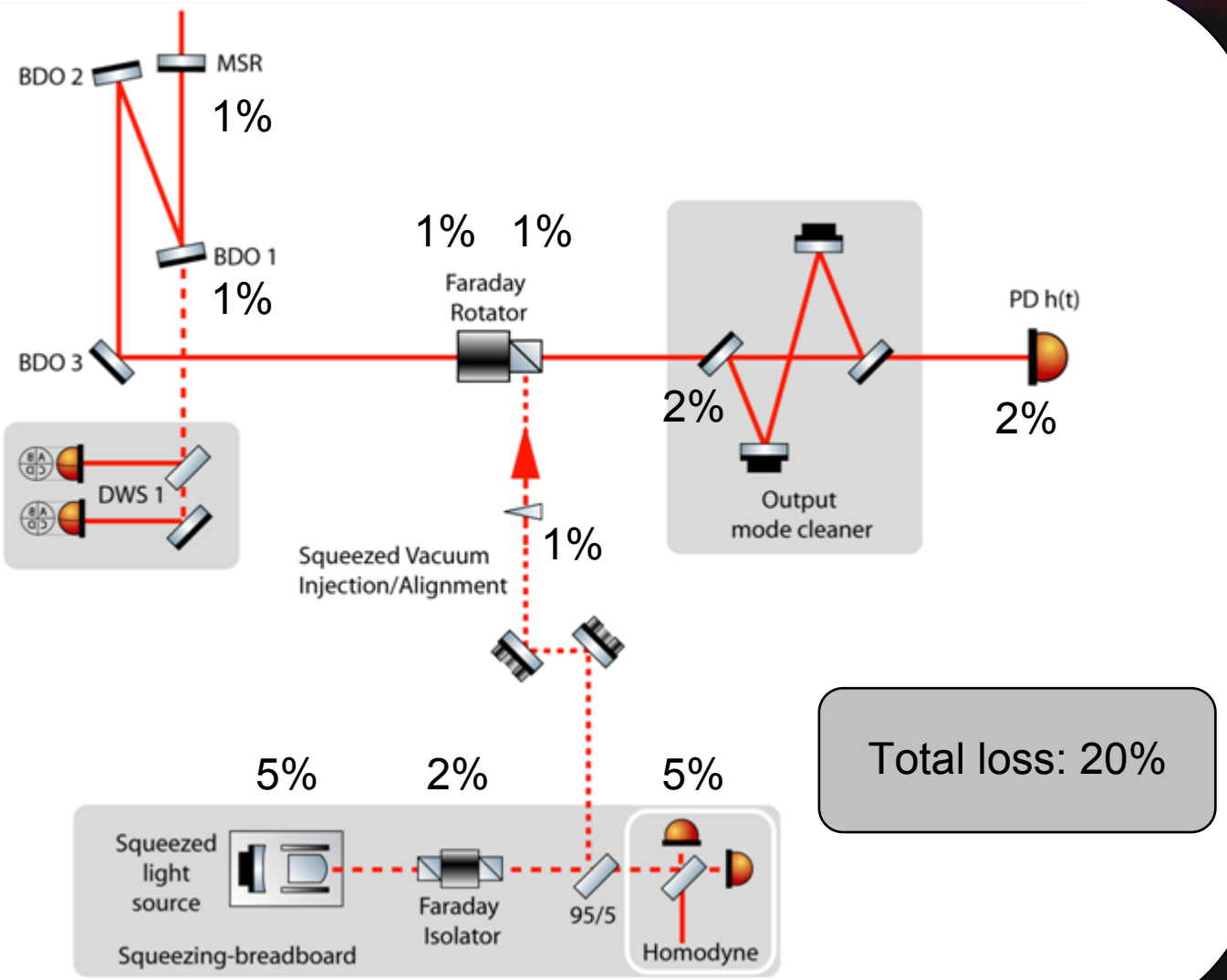

THANK YOU


SPARE SLIDES

AUTO-ALIGNMENT SCHEME

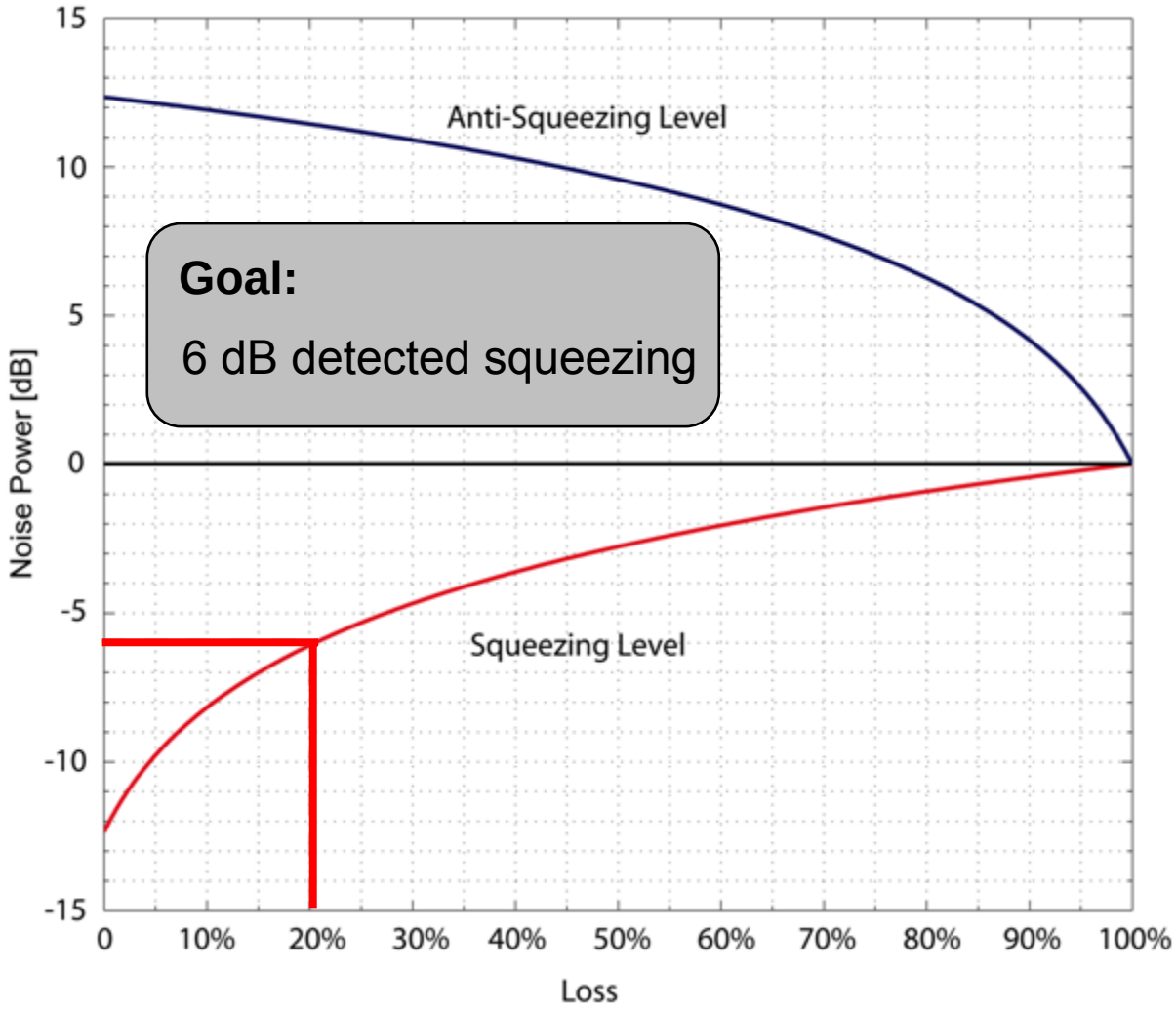


LOSS BUDGET



Total loss: 20%

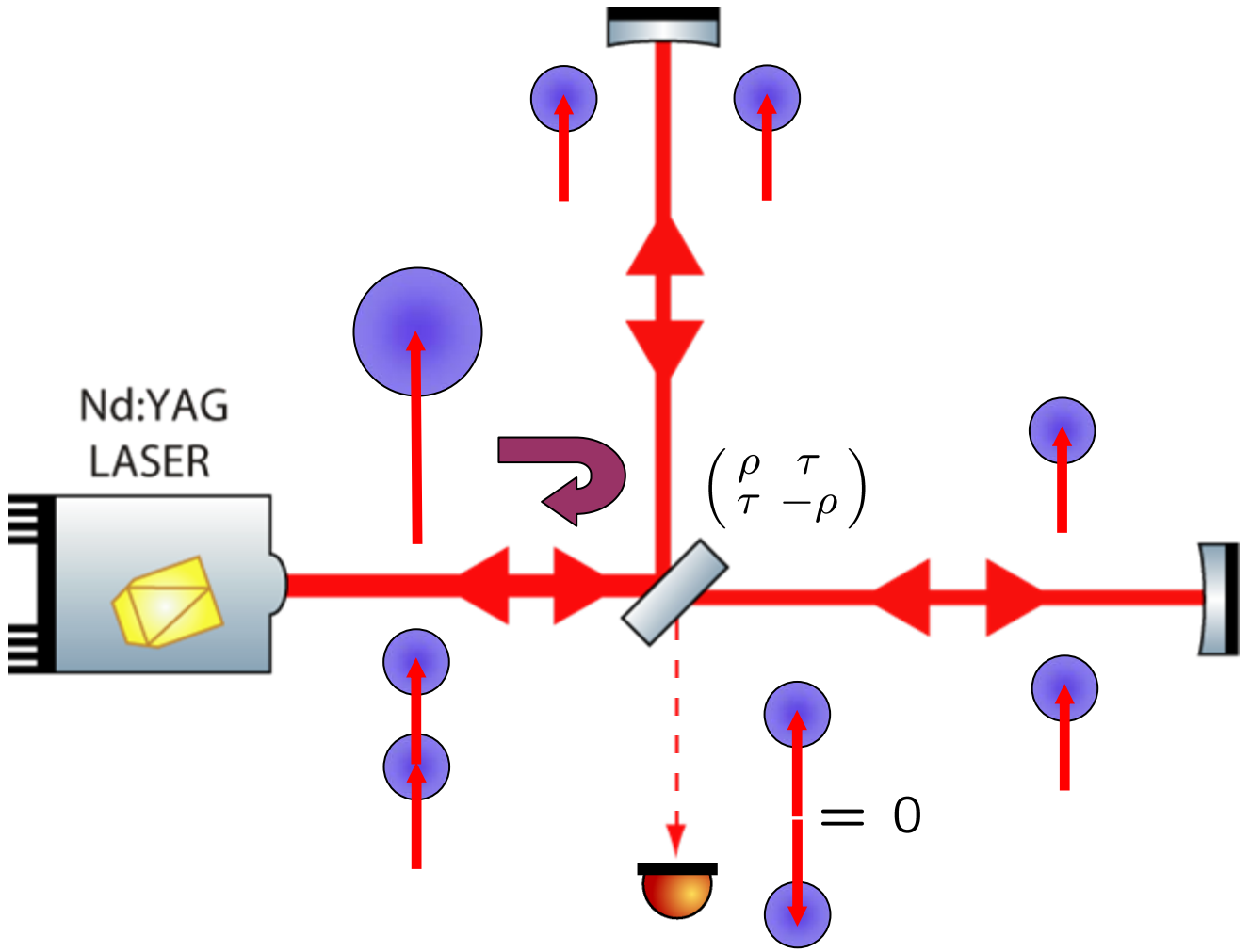
LOSS BUDGET II



Goal:

6 dB detected squeezing

SHOT NOISE (DARK FRINGE OPERATION)



BACK-ACTION NOISE