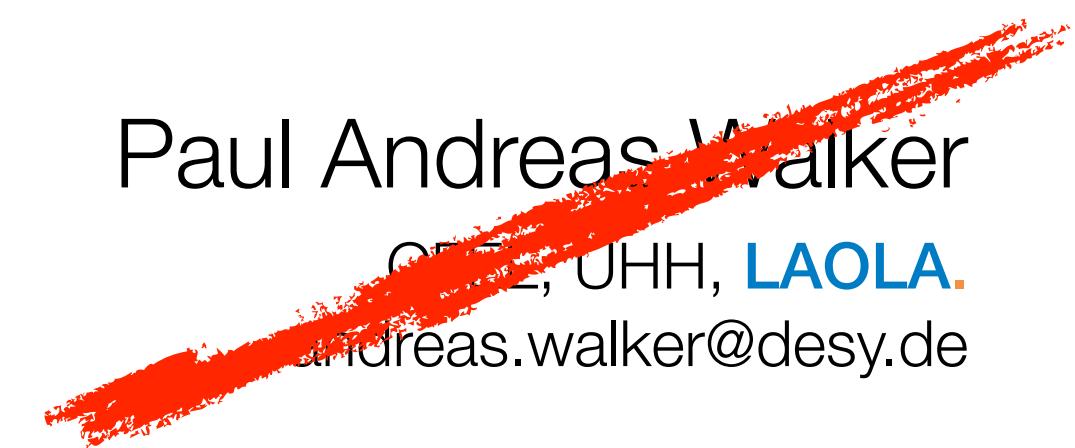


Laser transport for the LUX laser plasma beamline

N.M.Delbos, H.Groth, S.Jolly, M.Kirchen, D.Kocon, V.Leroux, P.Messner, N.Plambeck,
M.Schnepp, D.Trosien, M.Trunk, C.M.Werle, P.Winkler, B.Zeitler, and A.R.Maier

Andreas R. Maier on
behalf of P. A. Walker
CFEL, UHH, **LAOLA**.
andreas.maier@desy.de

Paul Andreas Walker
CFEL, UHH, **LAOLA**.
andreas.walker@desy.de



LAOLA. is a collaboration of



LUX Junior Research group

Junior Research group at CFEL and
Hamburg University

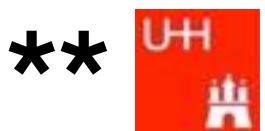
commission & operate 200 TW
ANGUS laser system

build and operate the LUX beamline
for laser-plasma driven undulator
radiation

lux.cfel.de



also group Georg Korn



group Prof. Grüner



Andi Maier

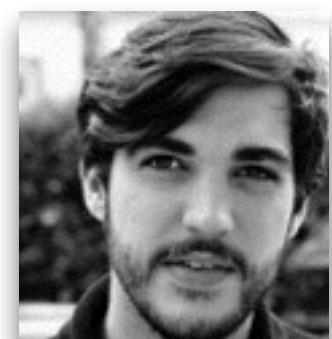
Andi
Walker



Matthias **
(Prof. Grüner
group, UHH)



Paul



Manuel



Chris



Niels



Vincent *



Spencer *



Irene (Prof. Grüner
group, UHH)) **



Max



Sören



Henning



Philipp

Our philosophy...

clash of cultures
(laser people & accelerator guys)

*get the best of both worlds together
learn and adopt
quality before schedule*

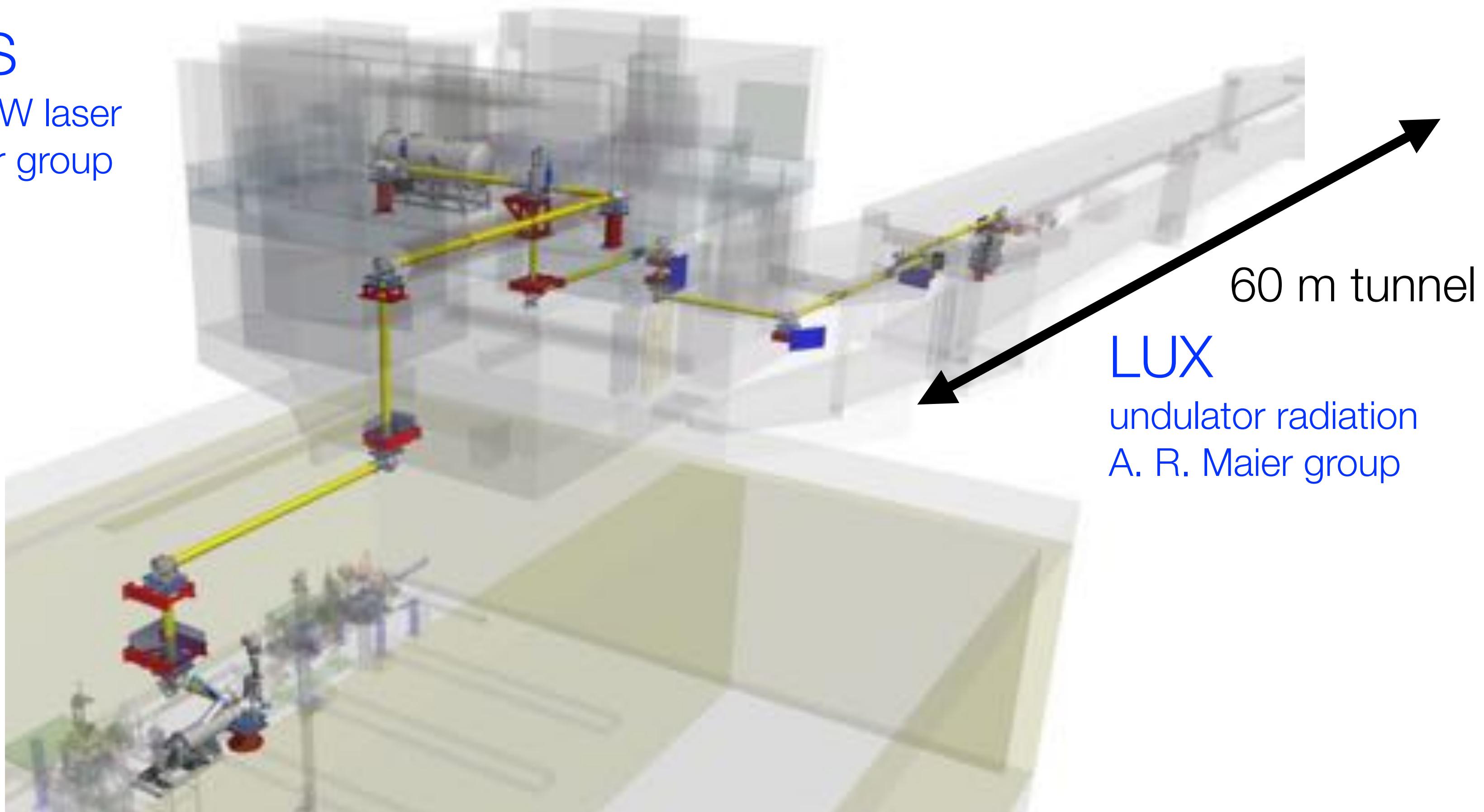
Laser-Driven Plasma Acceleration

ANGUS

new 200 TW laser
A. R. Maier group

REGAE

external injection
K. Flöttmann, B. Zeitler

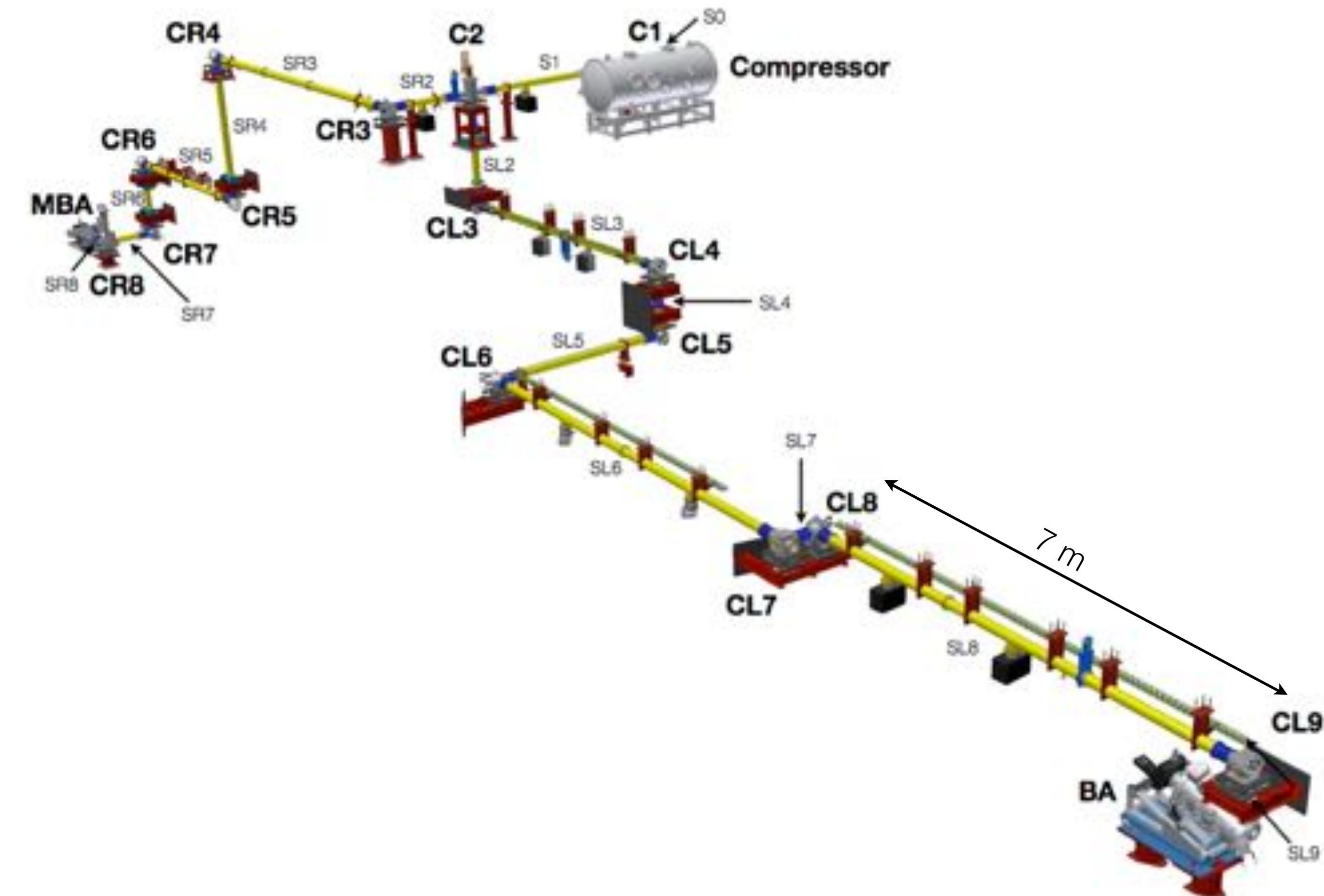


Laser Transport

this is an engineering talk on laser transport

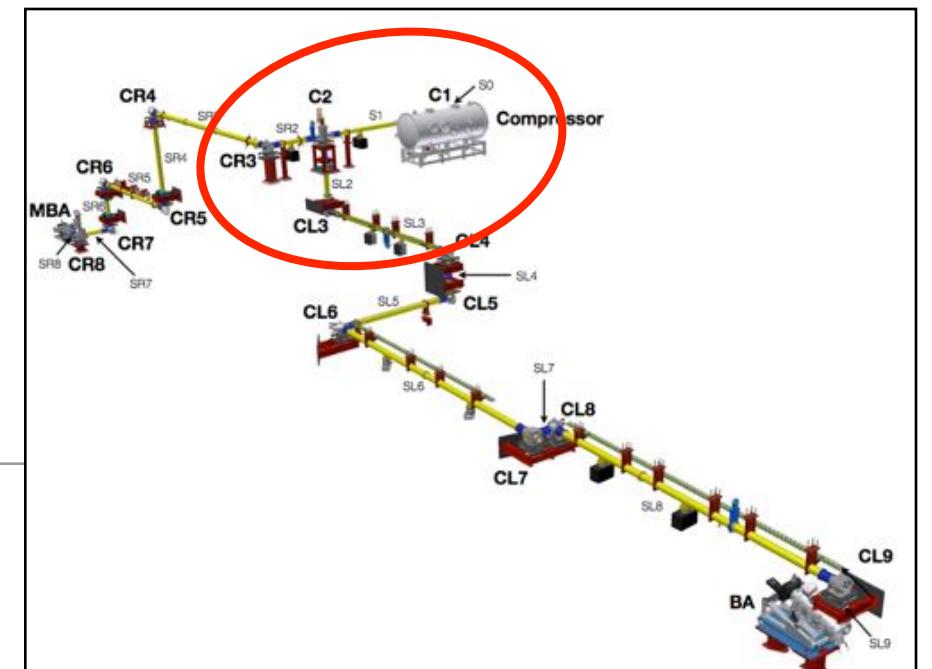
we want to trigger discussions about technical details during the coffee break

many design constraints at an accelerator facility, but mostly
>> vacuum
>> don't touch mirrors



Walk-through: ANGUS laser area

- ▶ Common to LUX and REGAE laser beamlines
- ▶ ANGUS laser lab provides 200 TW:
 - ▶ 5 Hz repetition rate
 - ▶ 25 fs pulse length
 - ▶ 5 J energy
- ▶ 1st mirror chamber
 - ▶ mirror
 - ▶ out-of-vacuum motorization
 - ▶ diagnostics
- ▶ Switchyard
 - ▶ mirror in: laser is reflected to LUX
 - ▶ mirror out: laser propagates to REGAE

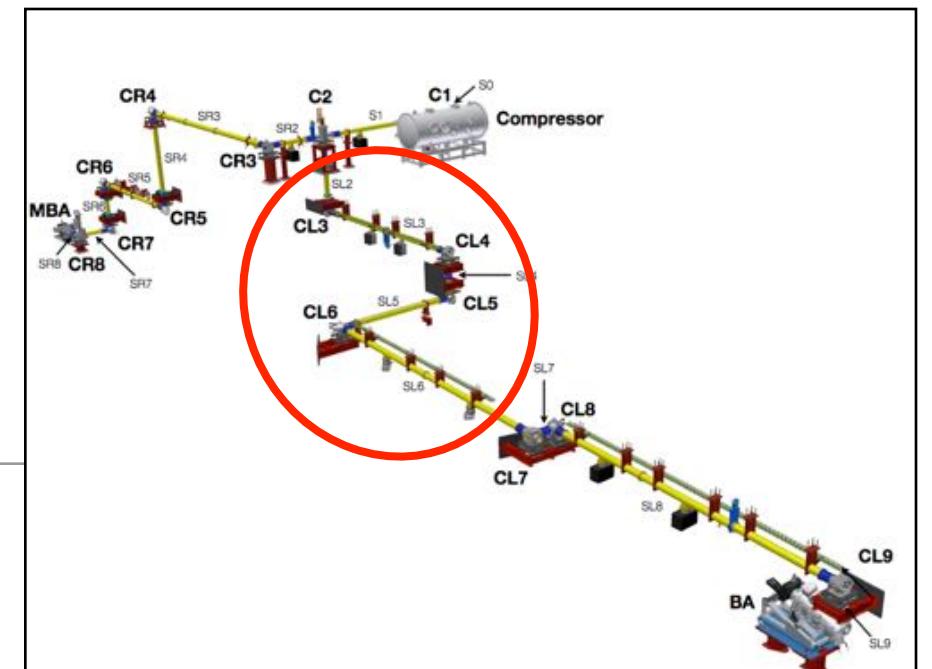


Walk-through: LUX-Beamline

- ▶ Transport beamline
 - ▶ 10 chambers
 - ▶ accelerator vacuum/particle free

- ▶ Outcoupling chamber
 - ▶ mirror chamber
 - ▶ pump-probe
 - ▶ 2nd beamline

- ▶ Final focusing chamber
 - ▶ 2 m focal length paraboloid
 - ▶ 5 axis out-of-vacuum motorization

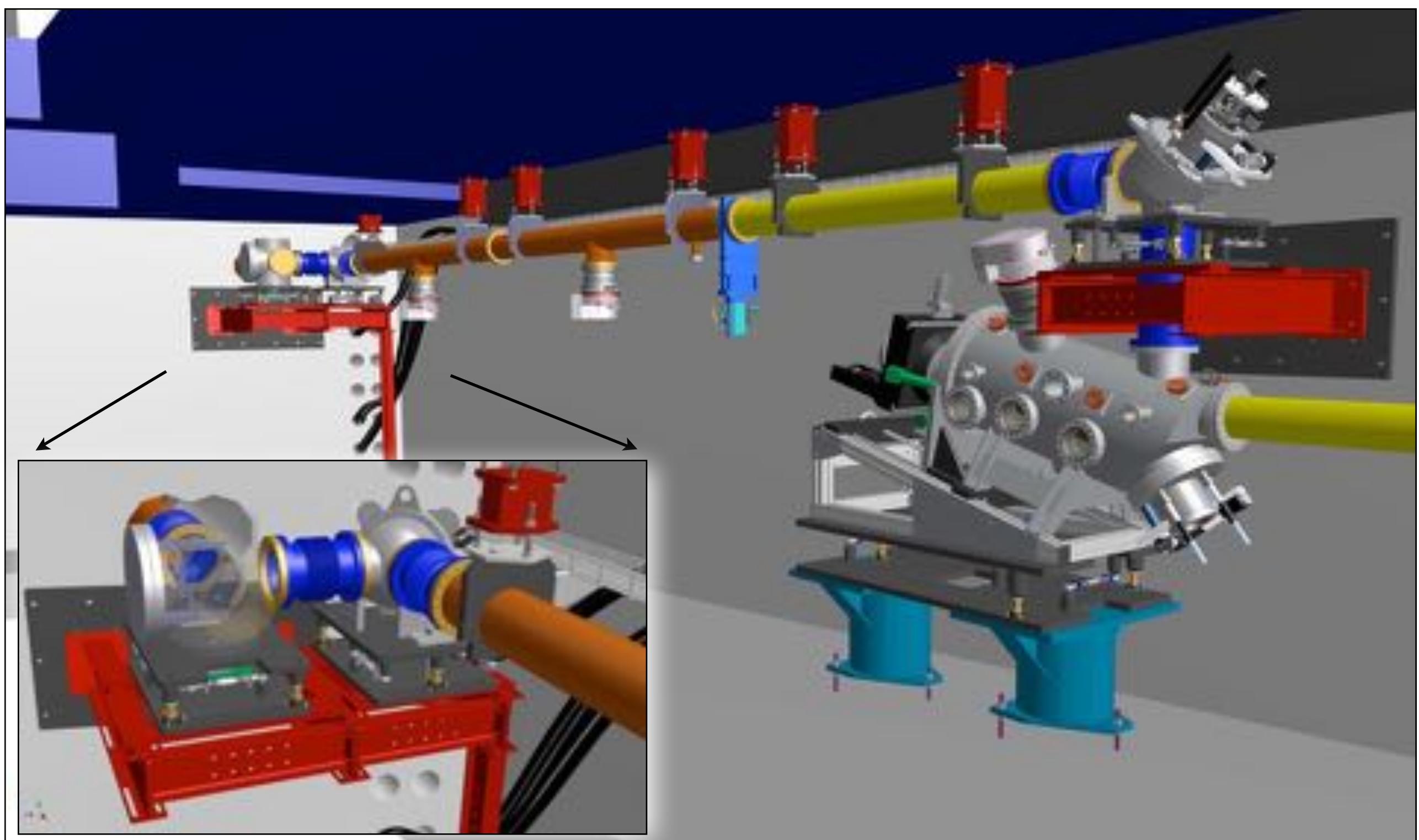
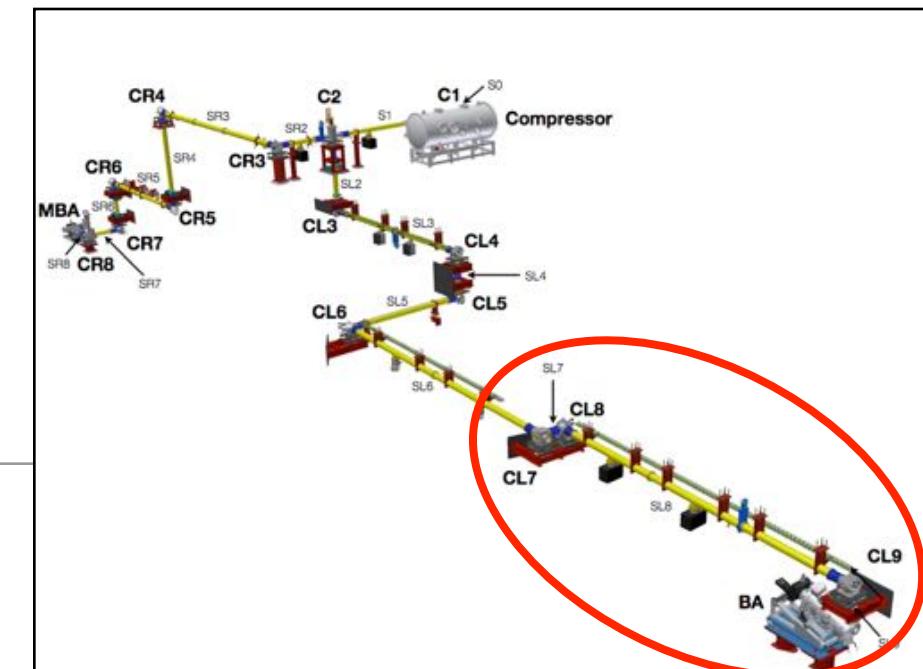


Walk-through: LUX-Beamline

- ▶ Transport beamline
 - ▶ 10 chambers
 - ▶ accelerator vacuum/particle free

- ▶ Outcoupling chamber
 - ▶ mirror chamber
 - ▶ pump-probe
 - ▶ 2nd beamline

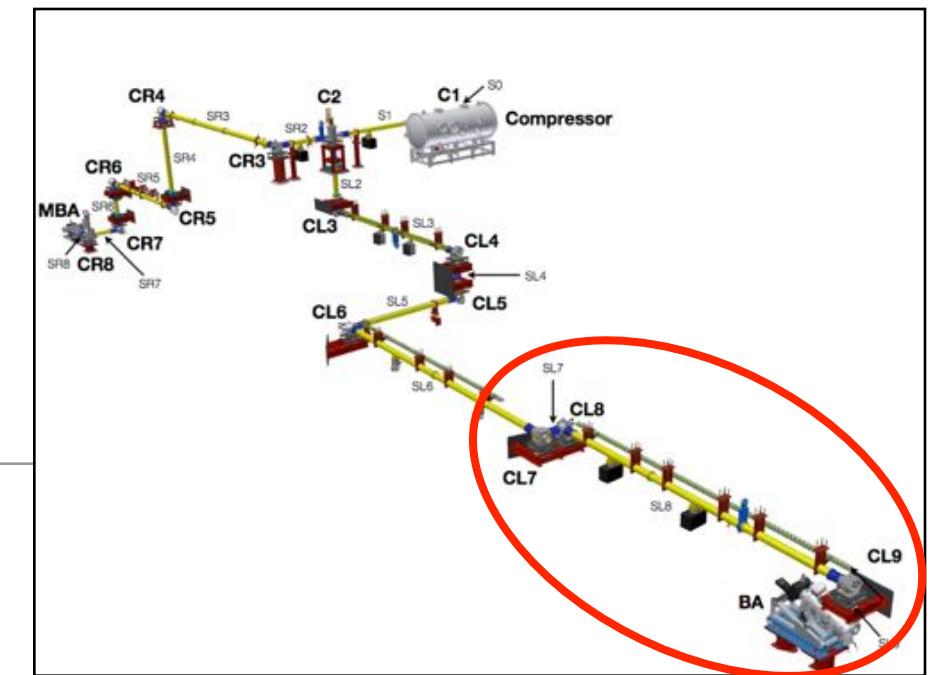
- ▶ Final focusing chamber
 - ▶ 2 m focal length paraboloid
 - ▶ 5 axis out-of-vacuum motorization



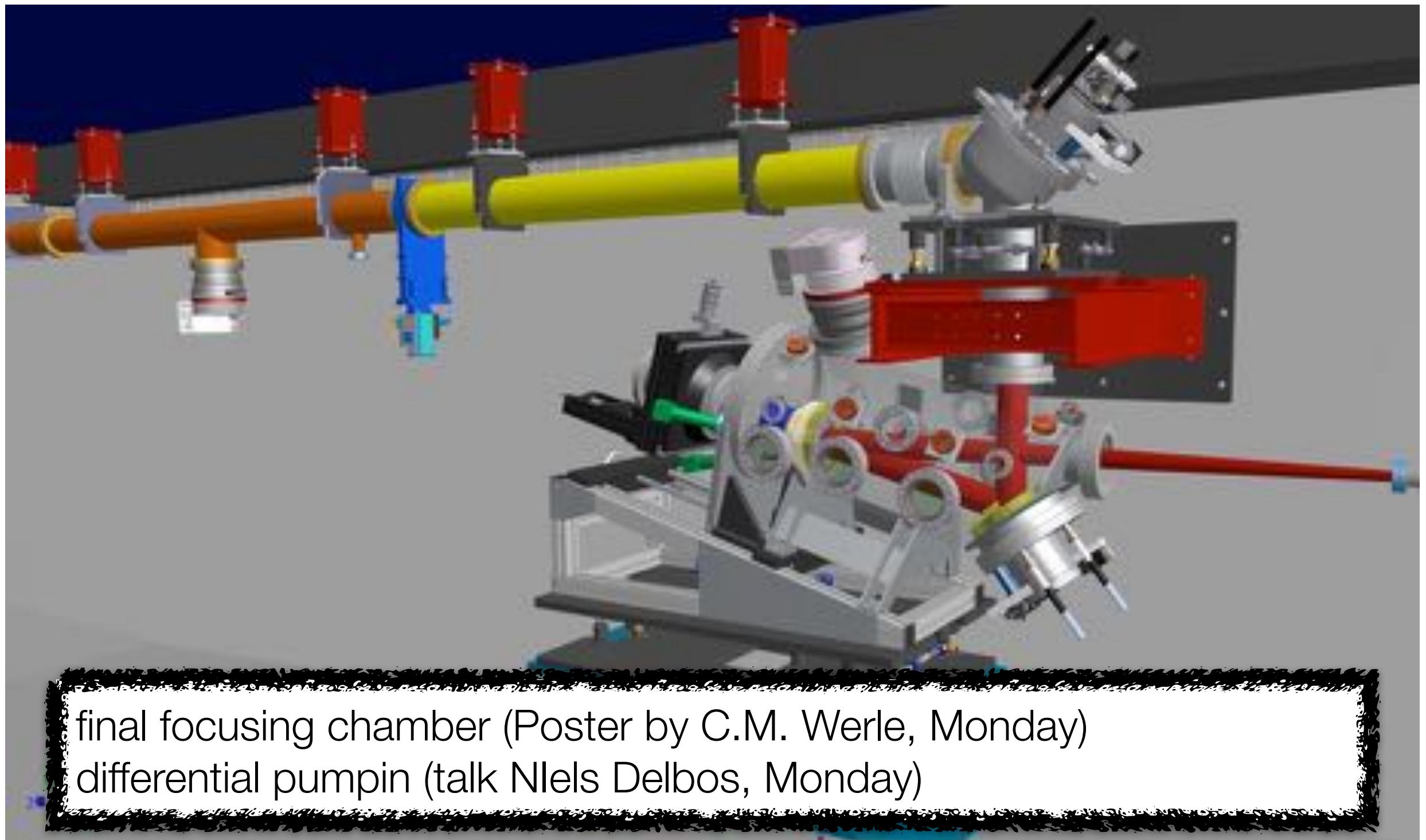
out-coupling chamber

Walk-through: LUX-Beamline

- ▶ Transport beamline
 - ▶ 10 chambers
 - ▶ accelerator vacuum/particle free

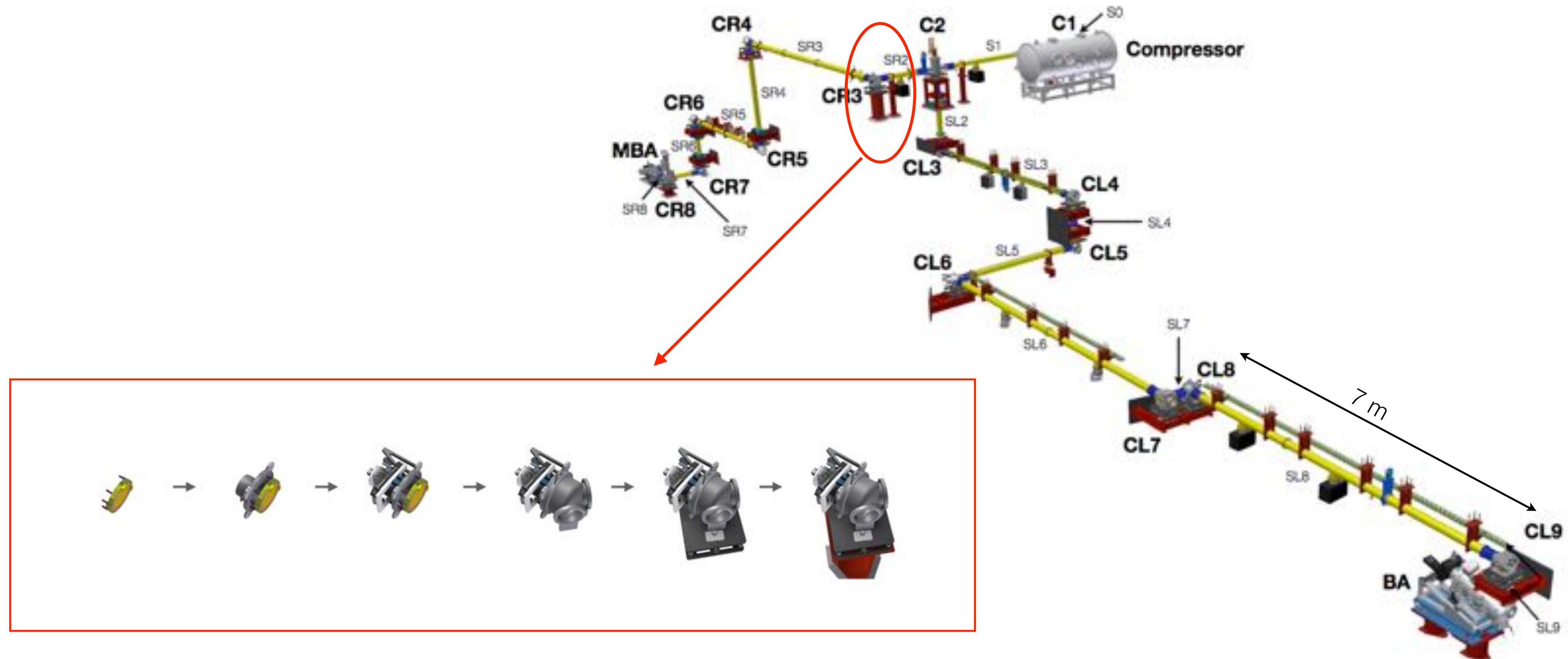


- ▶ Outcoupling chamber
 - ▶ mirror chamber
 - ▶ pump-probe
 - ▶ 2nd beamline
- ▶ Final focusing chamber
 - ▶ 2 m focal length paraboloid
 - ▶ 5 axis out-of-vacuum motorization



final focusing chamber (Poster by C.M. Werle, Monday)
differential pumpin (talk Niels Delbos, Monday)

Overview



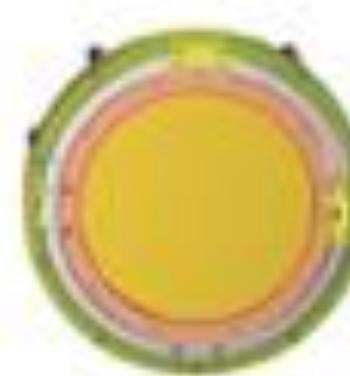
BL components in detail

- ▶ Laser components
 - ▶ mirrors
 - ▶ mounts
 - ▶ laser diagnostics



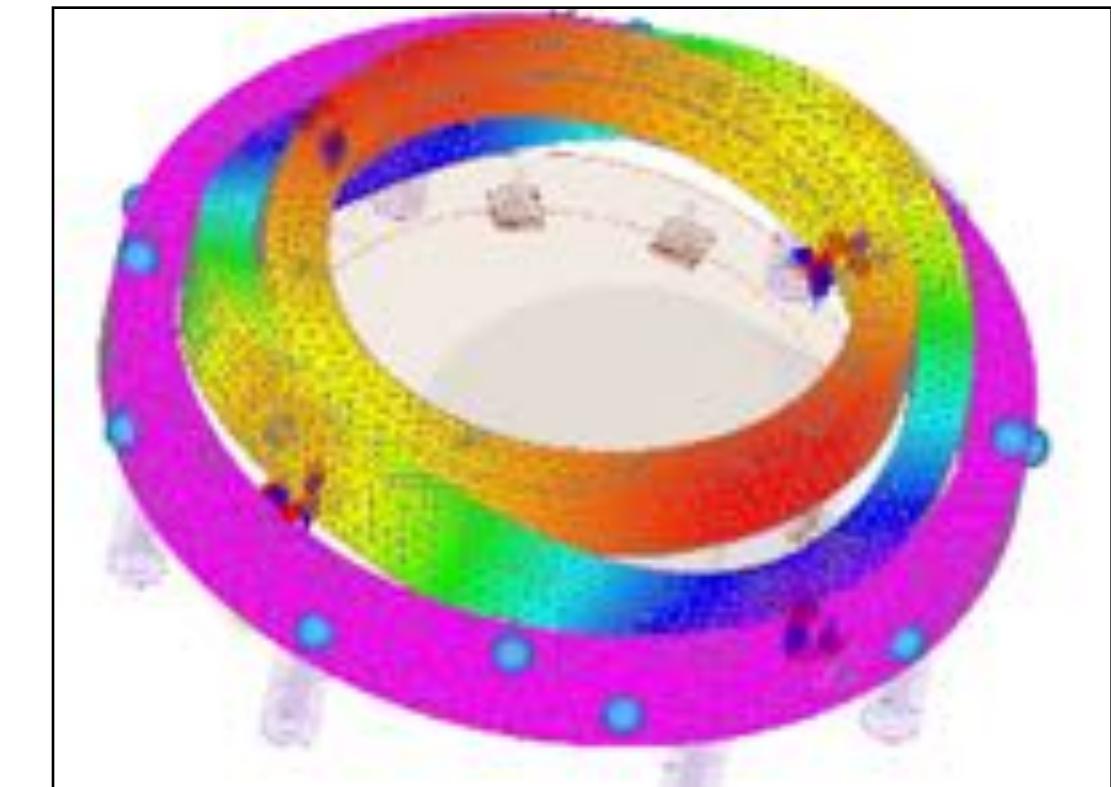
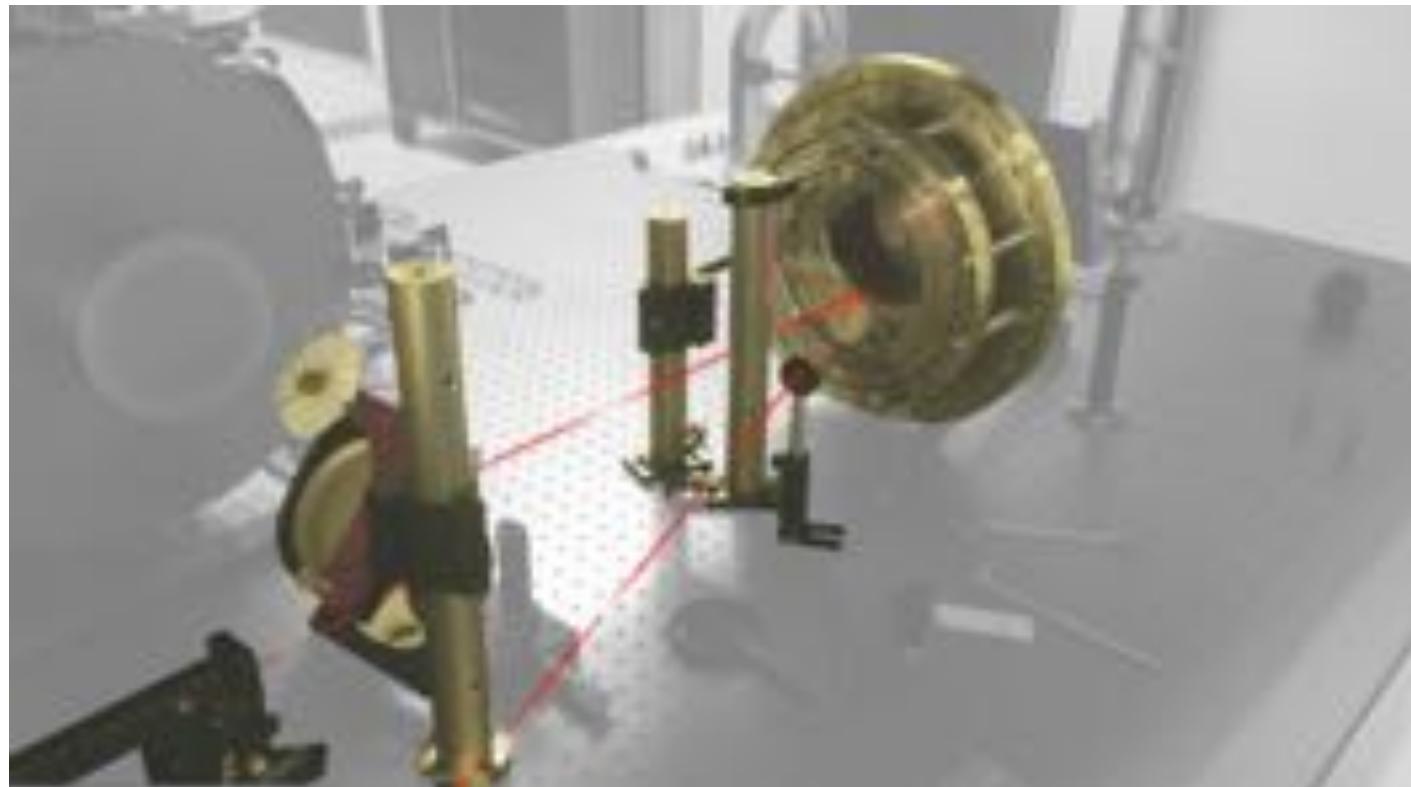
- ▶ Vacuum components
 - ▶ vacuum chambers
 - ▶ bellows & vacuum tubes

175 mm
↔



mirror mount

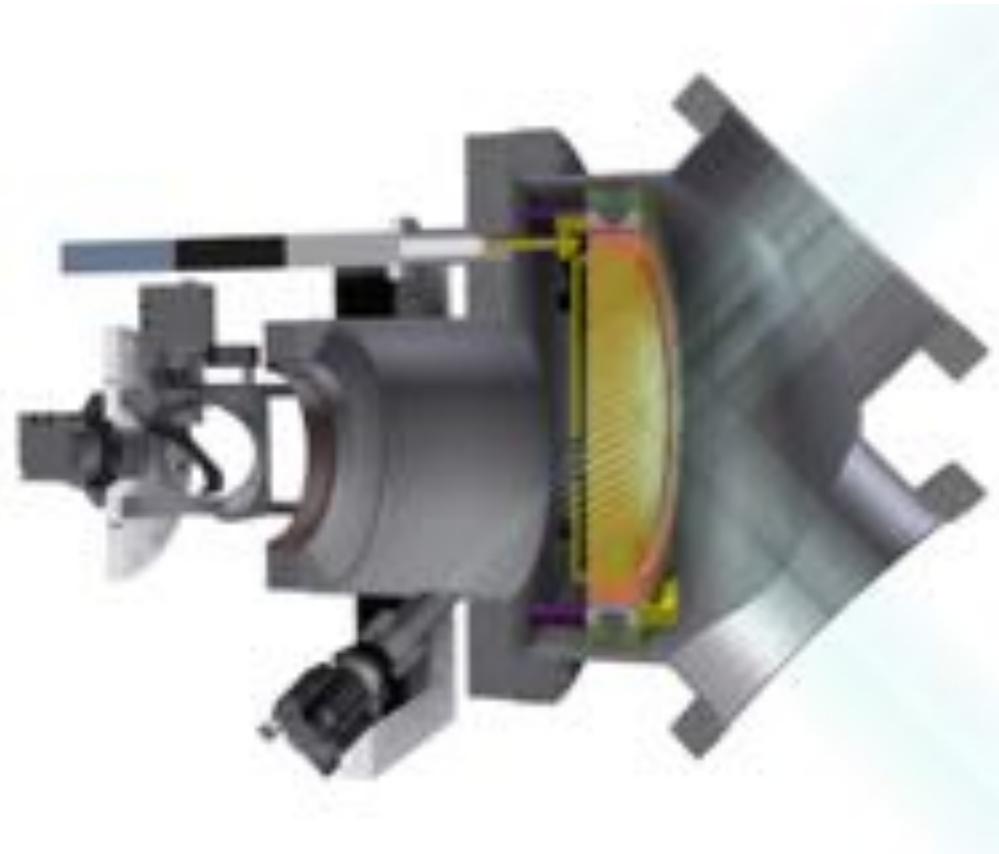
- ▶ Non-vacuum components
 - ▶ adjustment table
 - ▶ structural support



BL components in detail

- ▶ Laser components

- ▶ mirrors
- ▶ mounts
- ▶ laser diagnostics



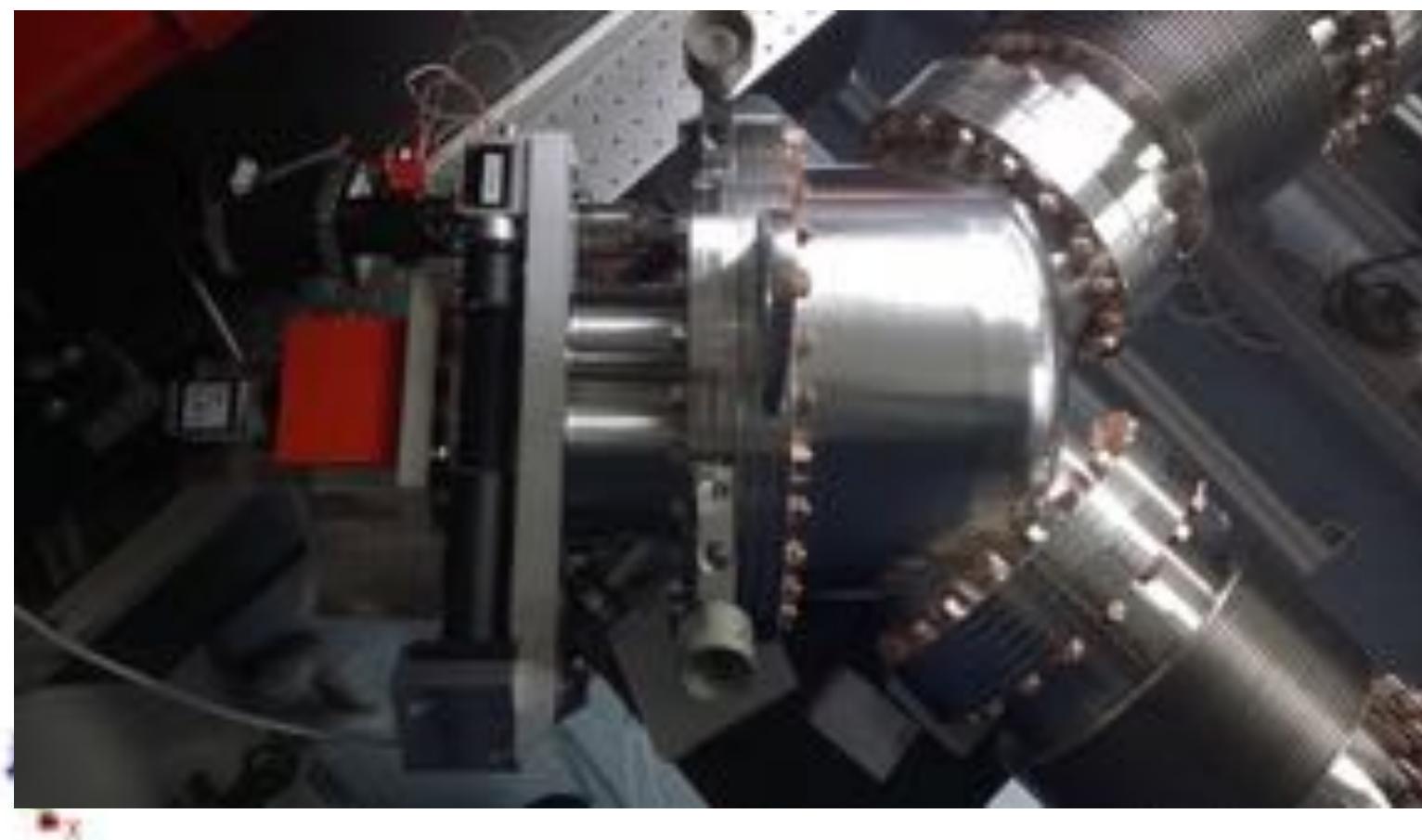
175 mm



laser diagnostics

- ▶ Vacuum components

- ▶ vacuum chambers
- ▶ bellows & vacuum tubes

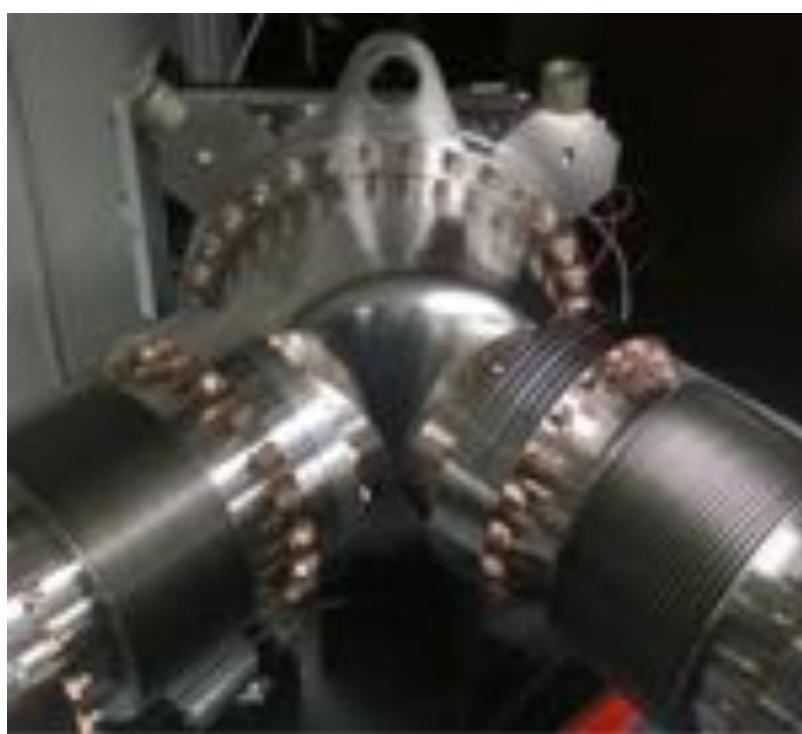


- ▶ Non-vacuum components

- ▶ adjustment table
- ▶ structural support

BL components in detail

- ▶ Laser components
 - ▶ mirrors
 - ▶ mounts
 - ▶ laser diagnostics



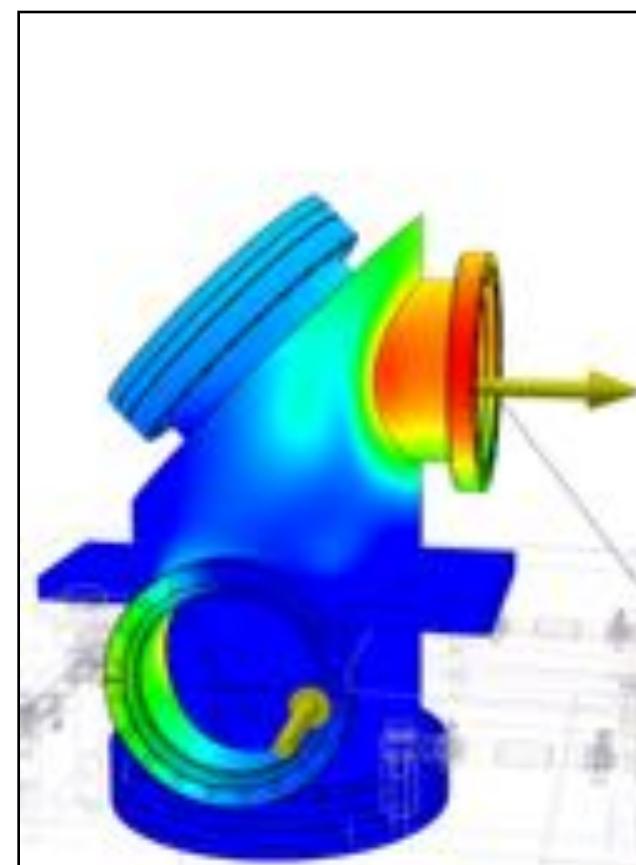
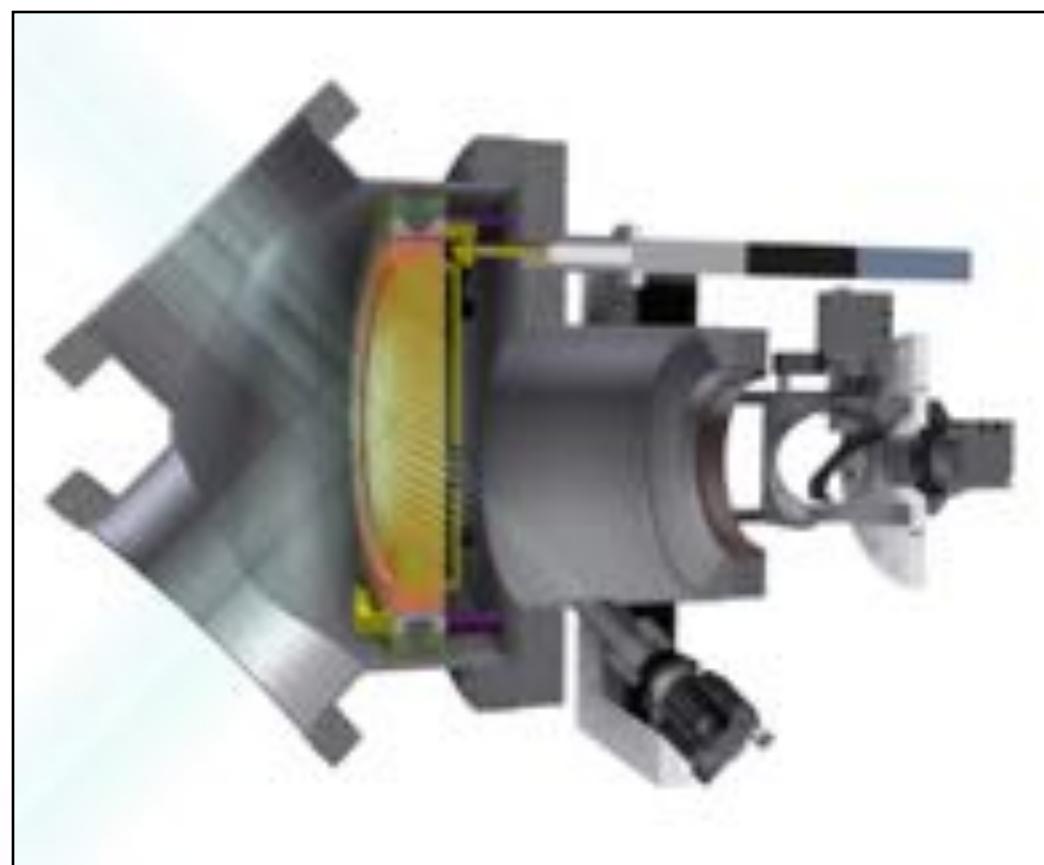
- ▶ Vacuum components
 - ▶ vacuum chambers
 - ▶ bellows & vacuum tubes

175 mm



UHV chamber

- ▶ Non-vacuum components
 - ▶ adjustment table
 - ▶ structural support



BL components in detail

- ▶ Laser components

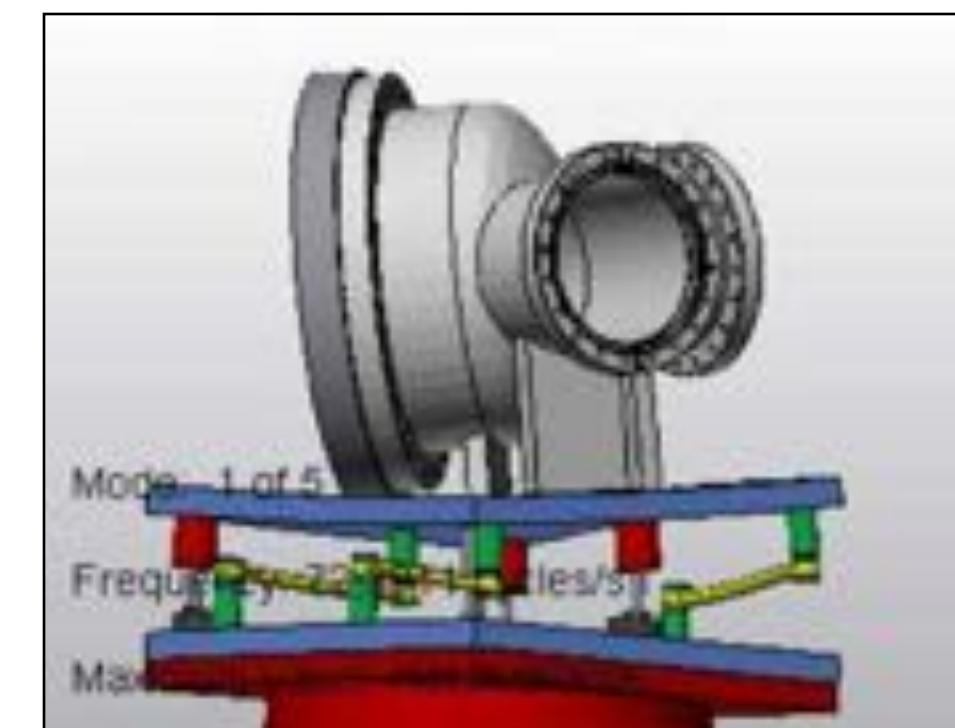
- ▶ mirrors
- ▶ mounts
- ▶ laser diagnostics



adjustment tables

- ▶ Vacuum components

- ▶ vacuum chambers
- ▶ bellows & vacuum tubes



- ▶ Non-vacuum components

- ▶ adjustment table
- ▶ structural support

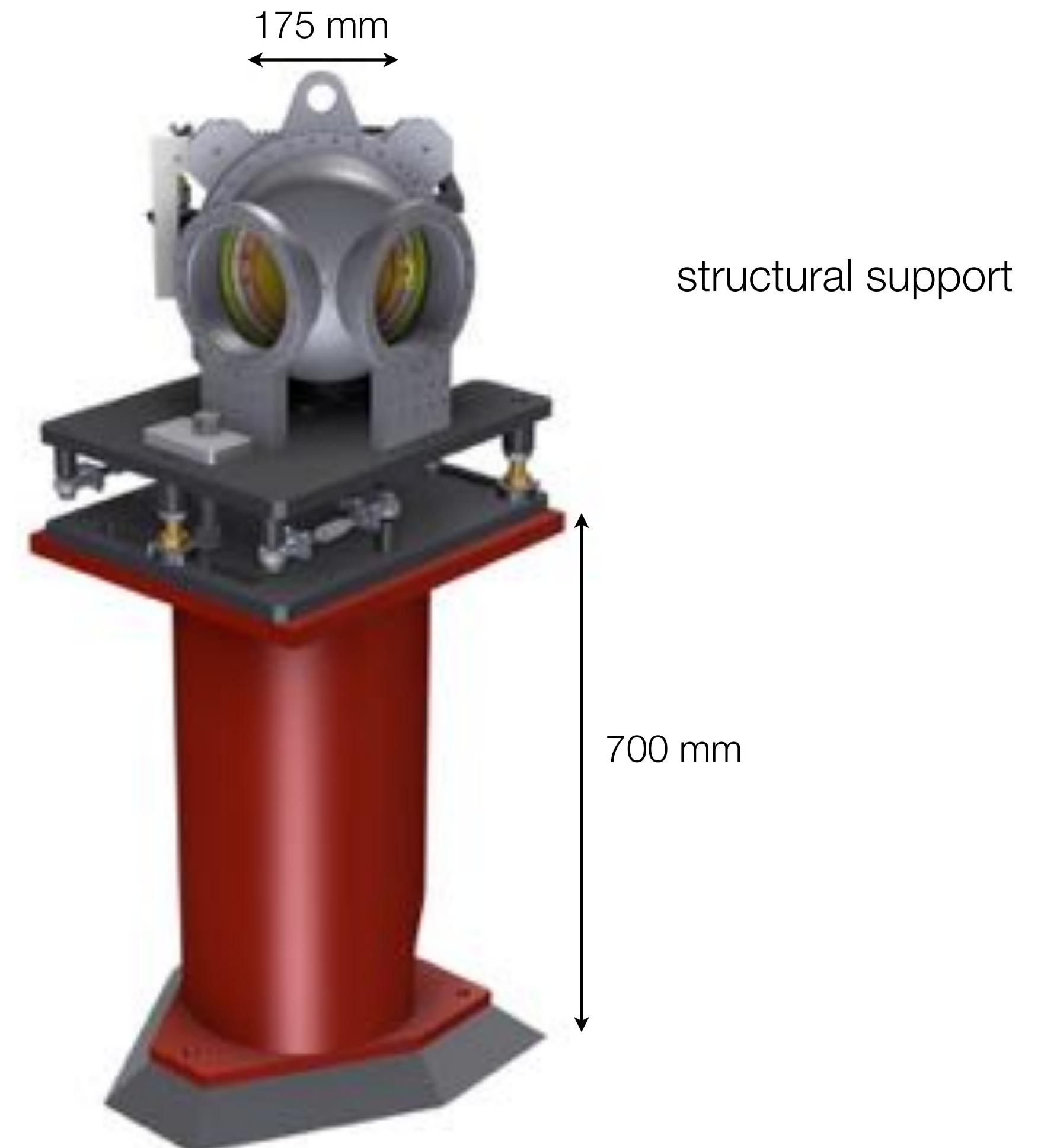
BL components in detail

- ▶ Laser components
 - ▶ mirrors
 - ▶ mounts
 - ▶ laser diagnostics



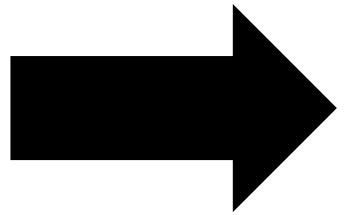
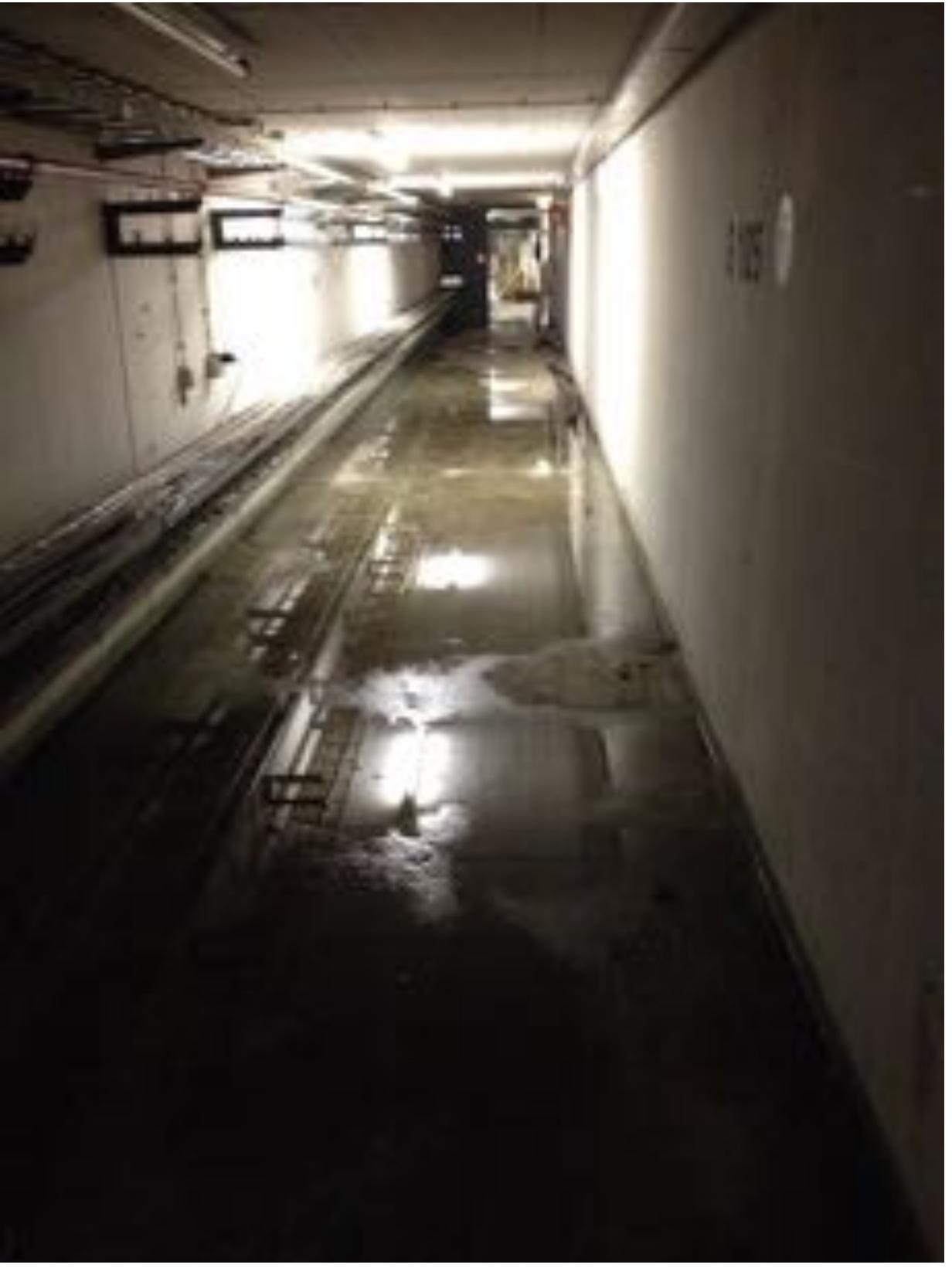
- ▶ Vacuum components
 - ▶ vacuum chambers
 - ▶ bellows & vacuum tubes

- ▶ Non-vacuum components
 - ▶ adjustment table
 - ▶ structural support



status & near future

Status: LUX tunnel and target area



LUX tunnel 2014

LUX tunnel ready for installation

Status: LUX beamline



2013



2014



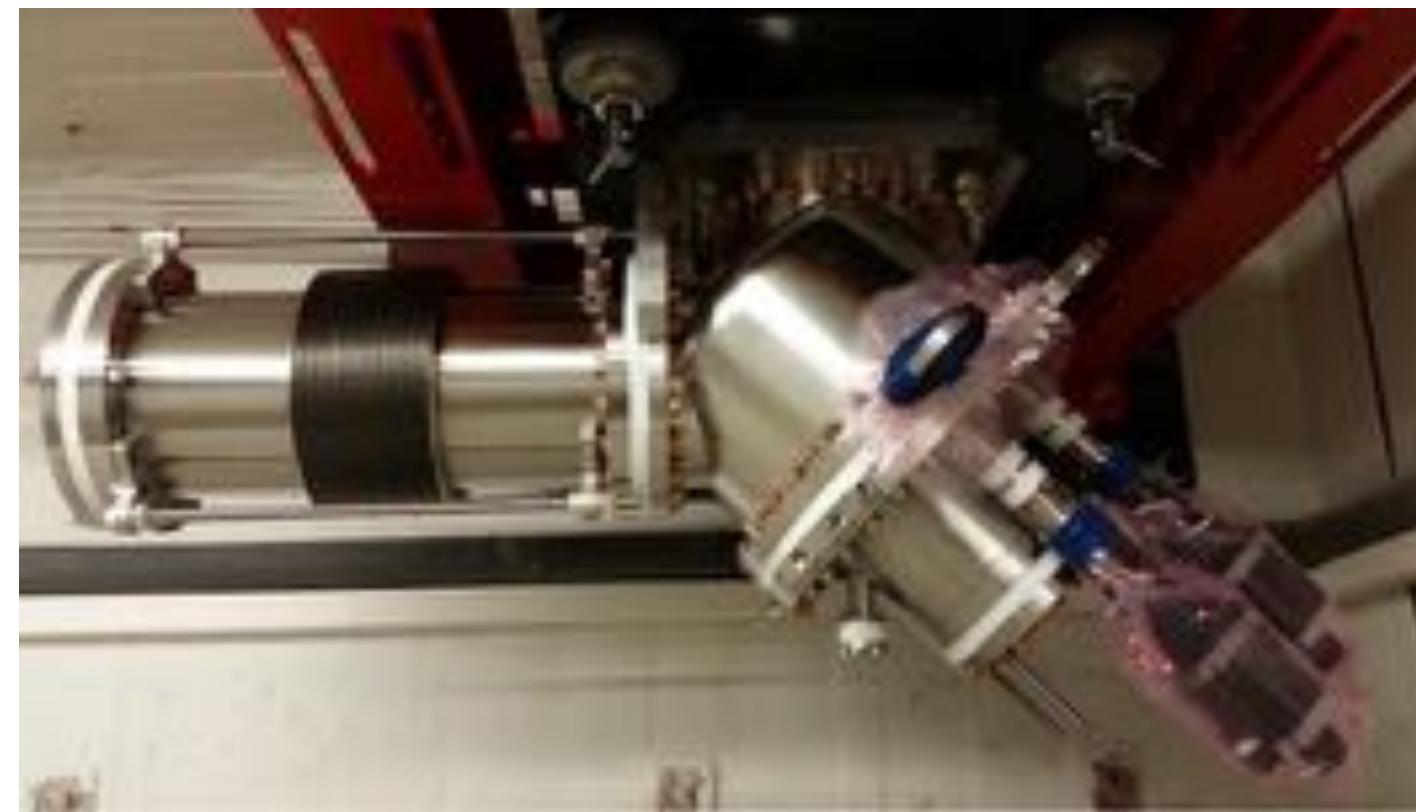
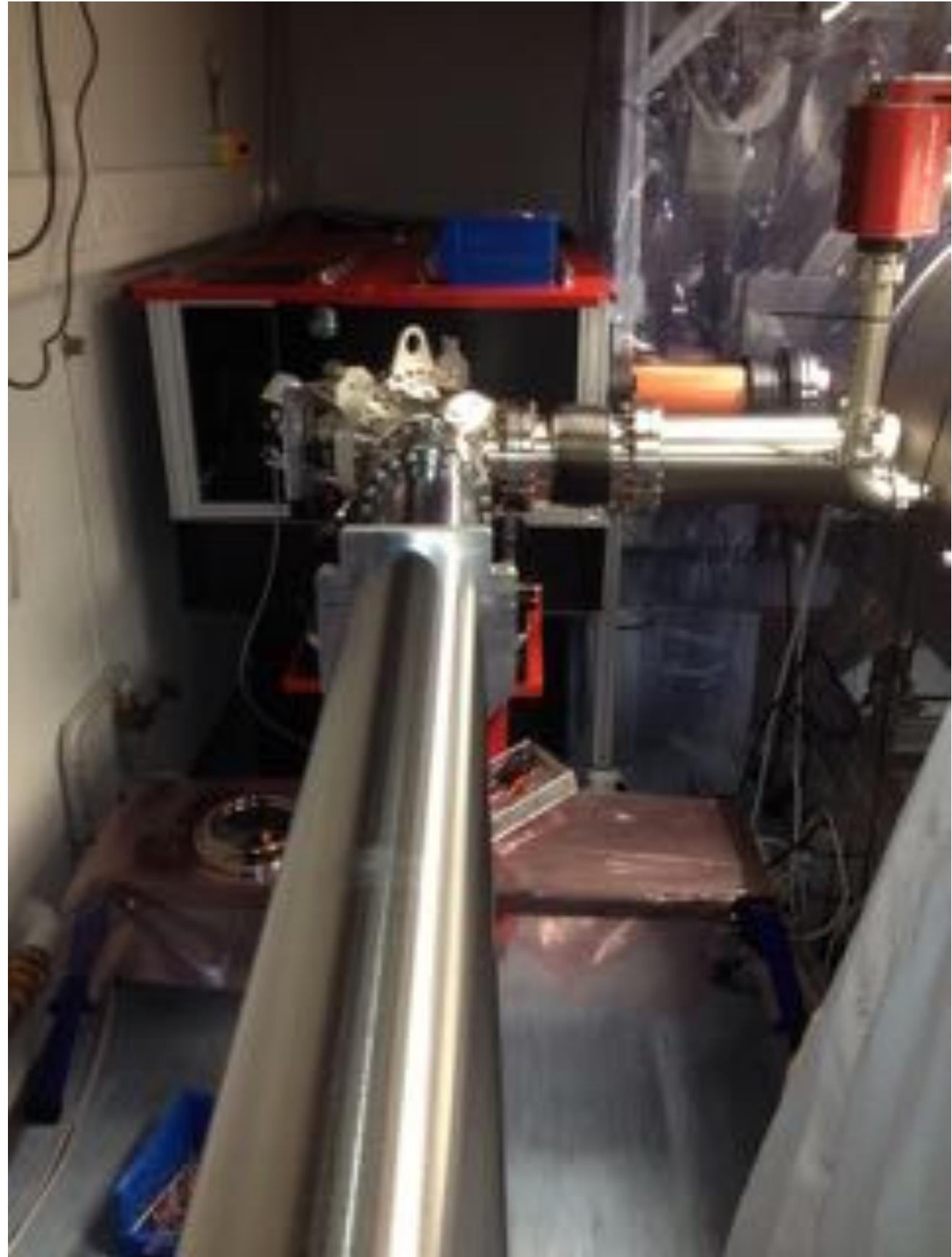
2015



Status: vacuum chamber preparations



Status: vacuum components installation



Status: time table (but quality first)



Non-vac installation: completed December 2014



Vacuum preparations: spring/summer 2015



First experiments starting soon...

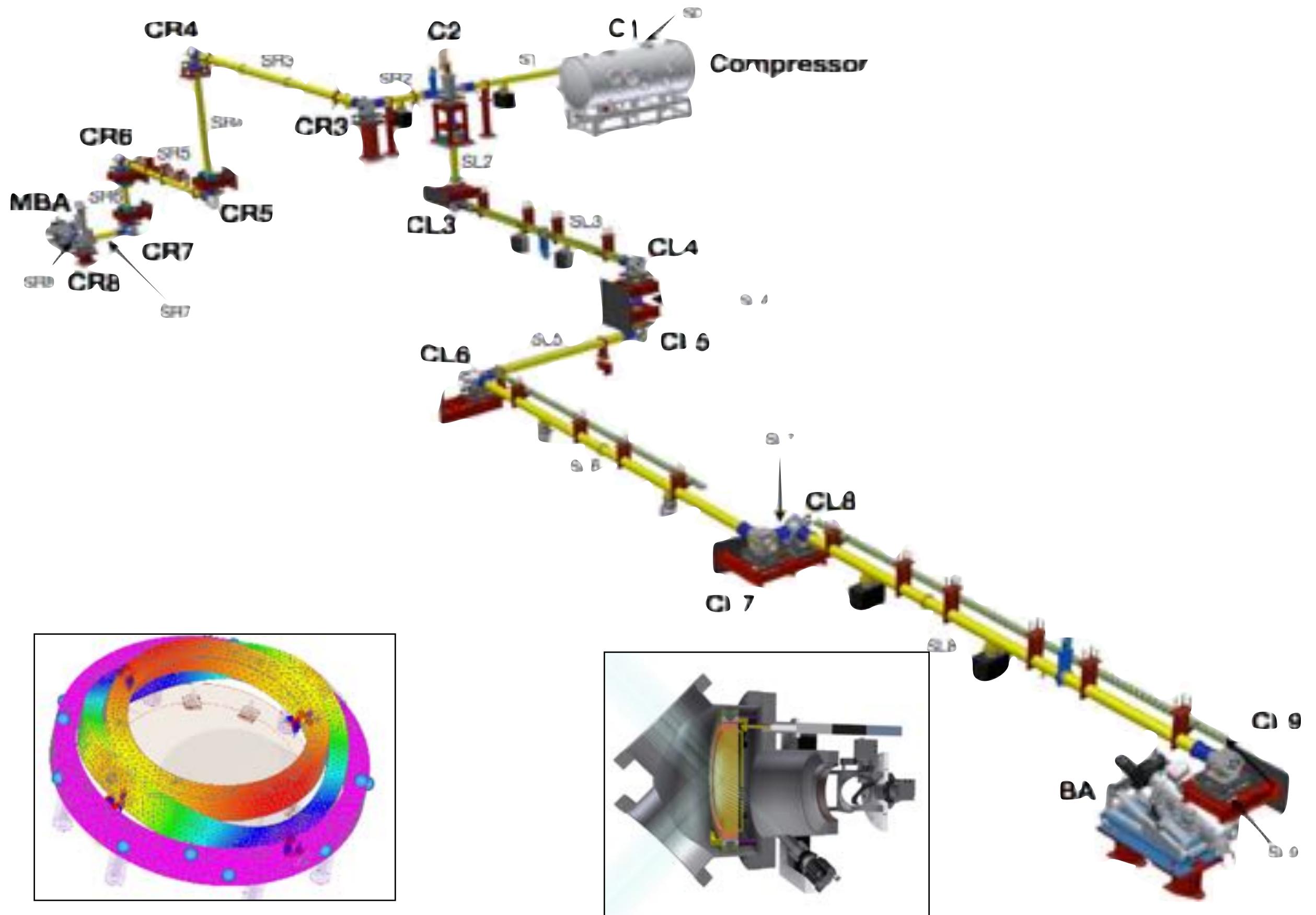
Vacuum installation: summer/fall 2015

Summary

- ▶ LUX Junior research group
- ▶ lux.cfel.de

driven by

- > clash of cultures
- > desire to learn
- > „quality before schedule“



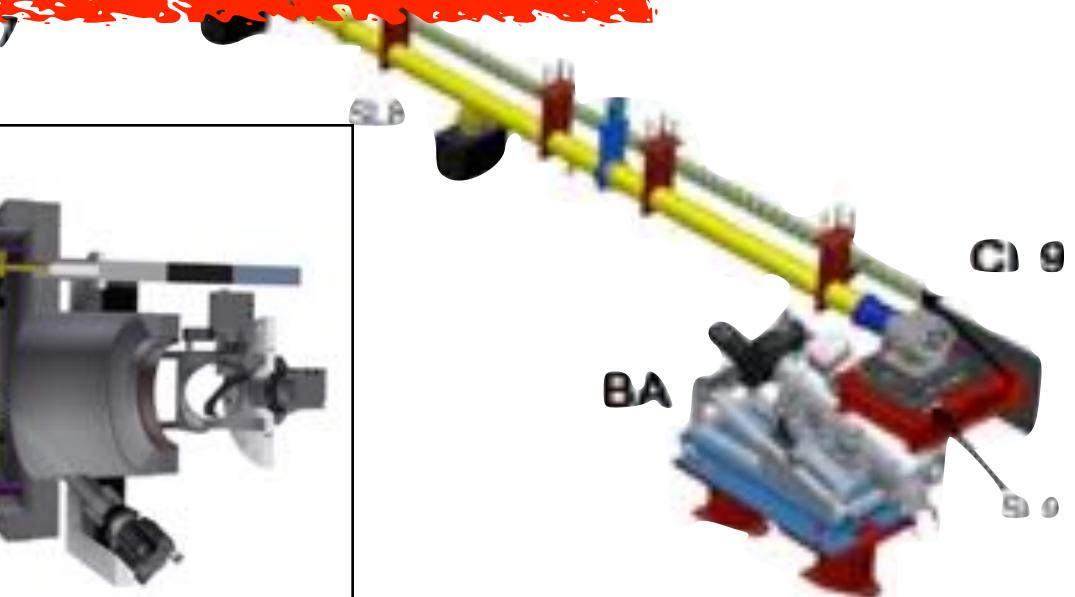
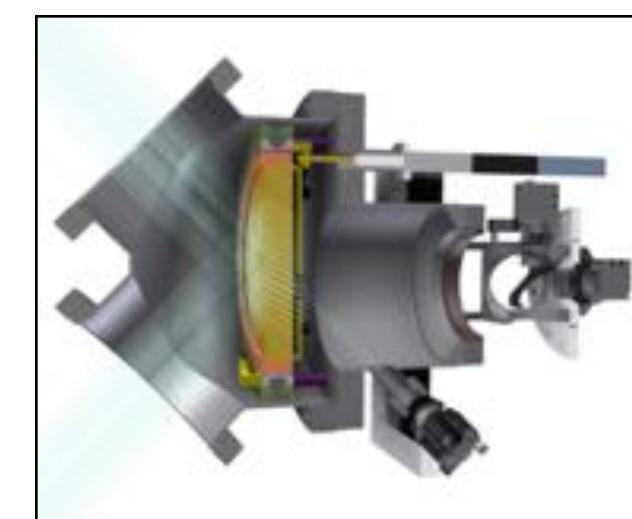
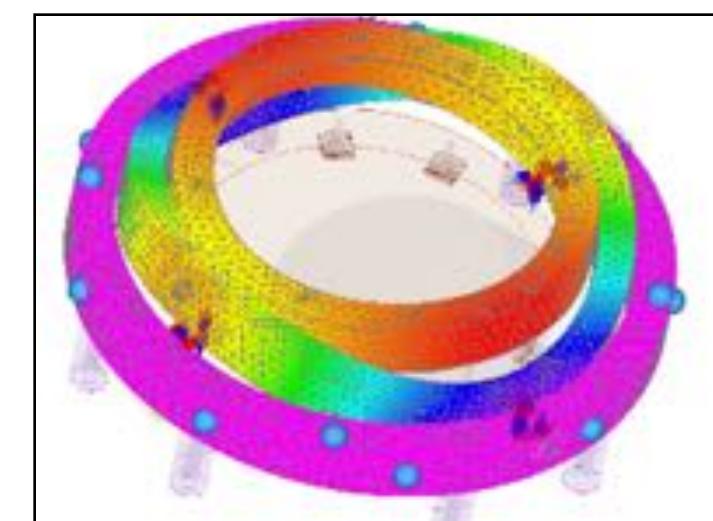
Summary

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driven by
➢ clash of cultures
➢ desire to learn
➢ „quality before schedule“



the laser is just a klystron...
see our talk in second session
(and probably a live demo)



Acknowledgement

funding

partners



project HHH20



DESY - M



DESY FS-LA



LBNL
J.-L. Vay
WARP code



group Georg Korn



group
Johannes Bahrdt

