TESLA Collaboration Meeting

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Zeuthen, Germany

Status Laser Upgrade

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- **TTF2 Laser upgrade MBI**
- **New beam mode selector/fast machine interlock interface**
- **Pulse stacker**
- **Laser beamline**
- **New laser room**
- **Summary**

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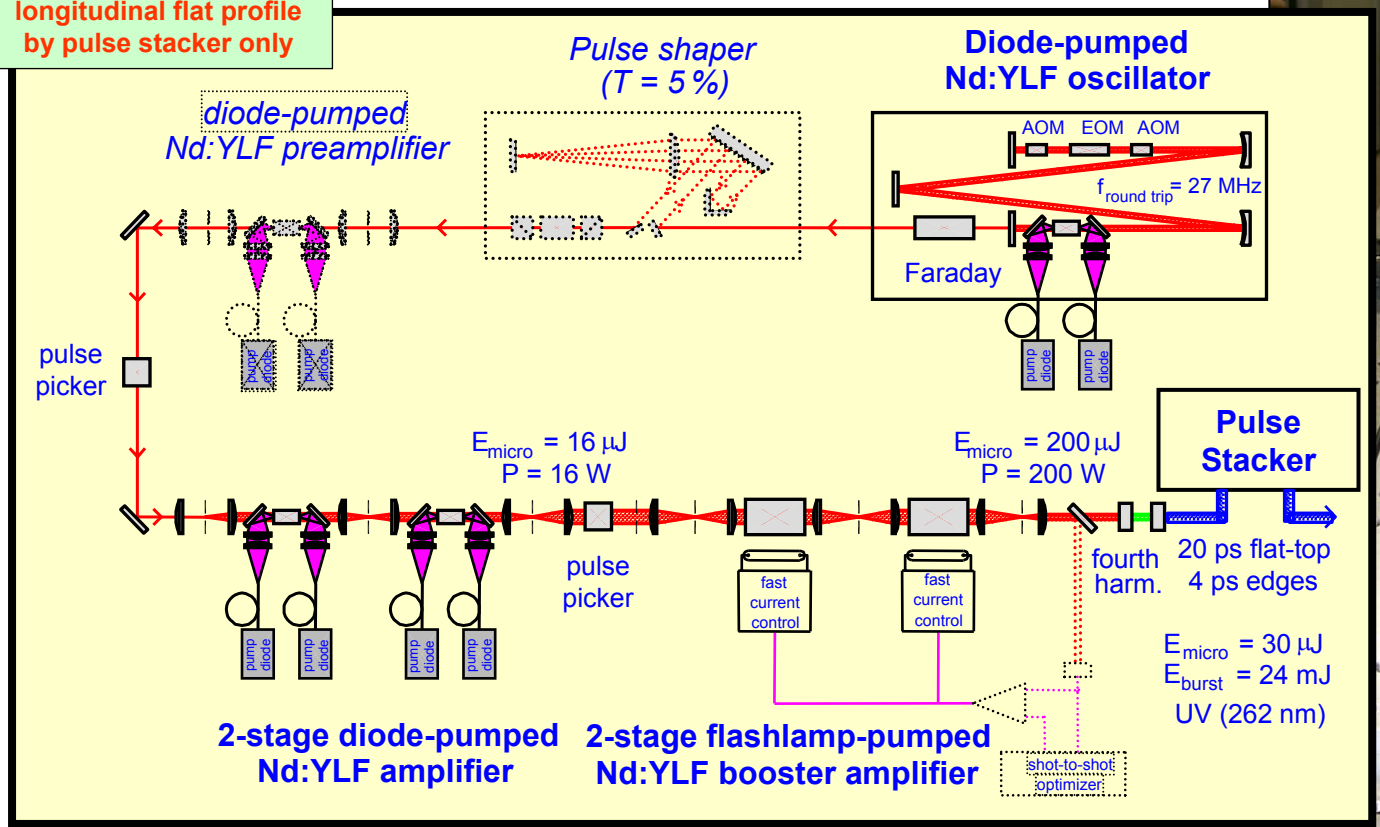
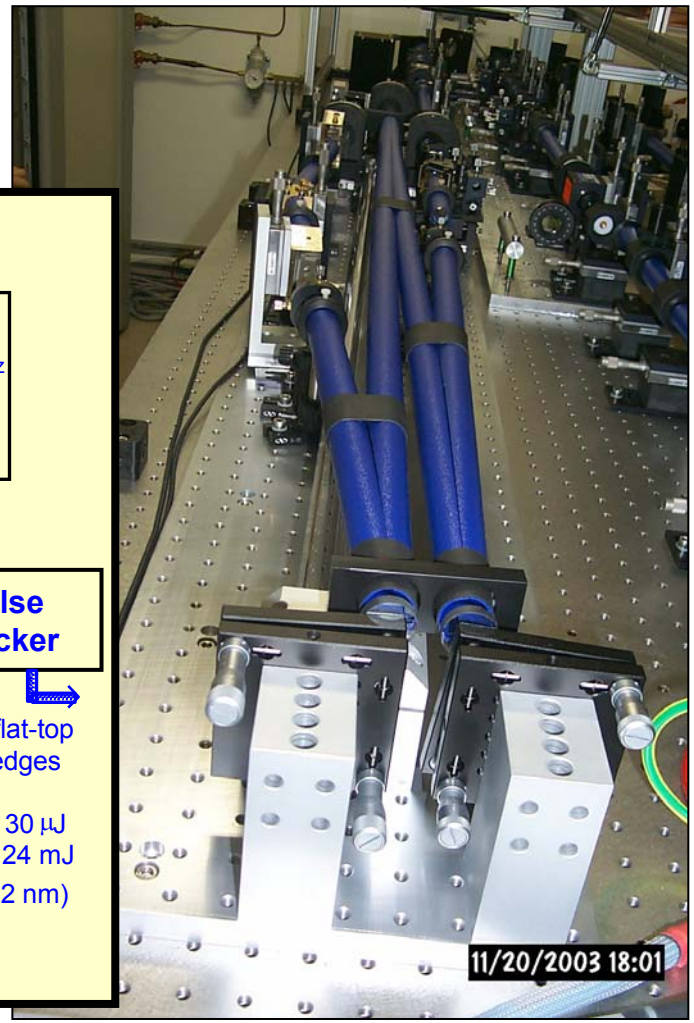
TTF 2 Laser Upgrade

- Together with Max-Born-Institute, Berlin (I. Will et al.)
- Upgrade has been tested at PITZ

Note:
longitudinal flat profile by pulse stacker only

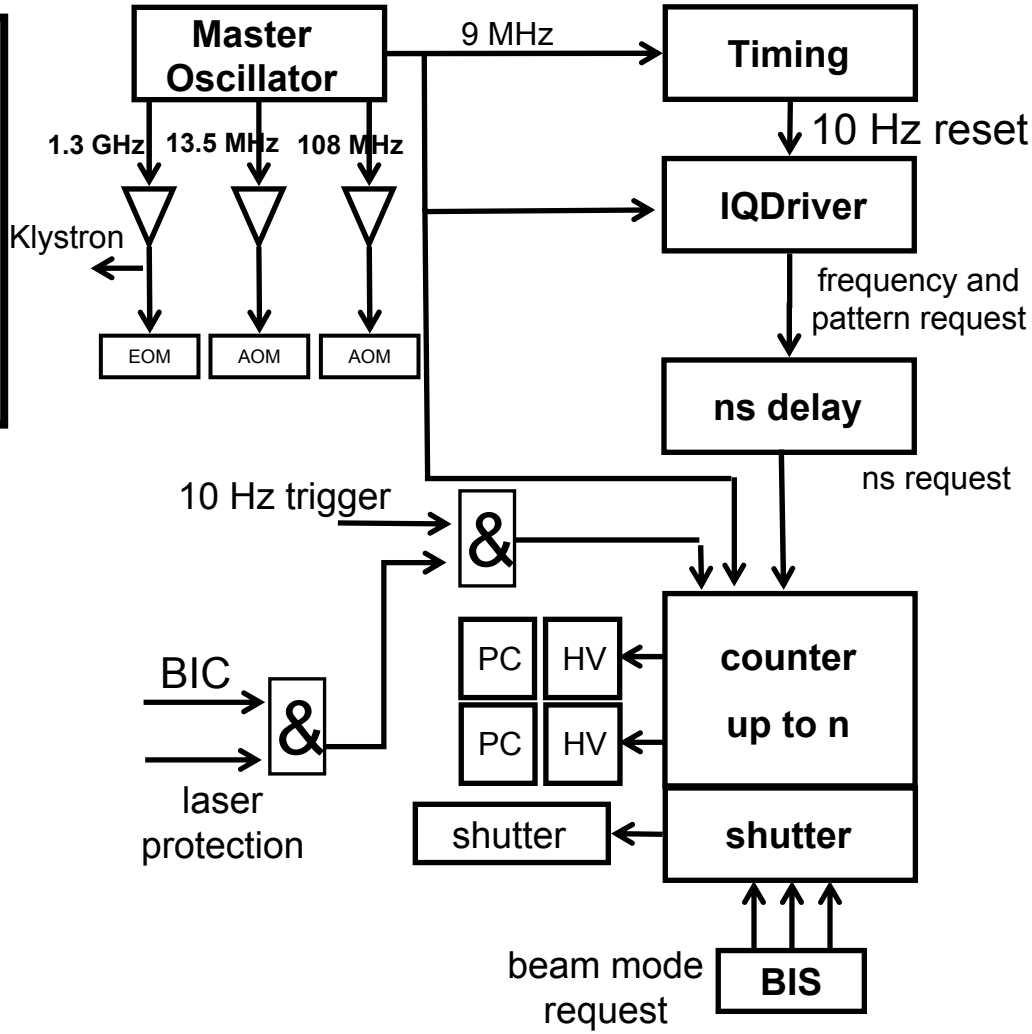




Beam Mode Selector / Fast Machine Interlock Interface

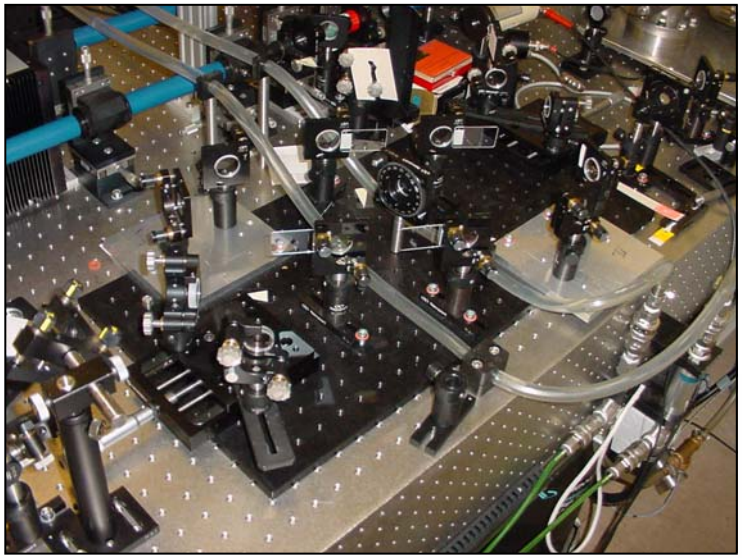
We have 5 different modes :

- beam on/off mode	shutter closed
- single bunch mode	max. < 4 bunches
- short pulse mode	max. < 32 bunches
- long pulse mode	up to 7200
- standalone mode	



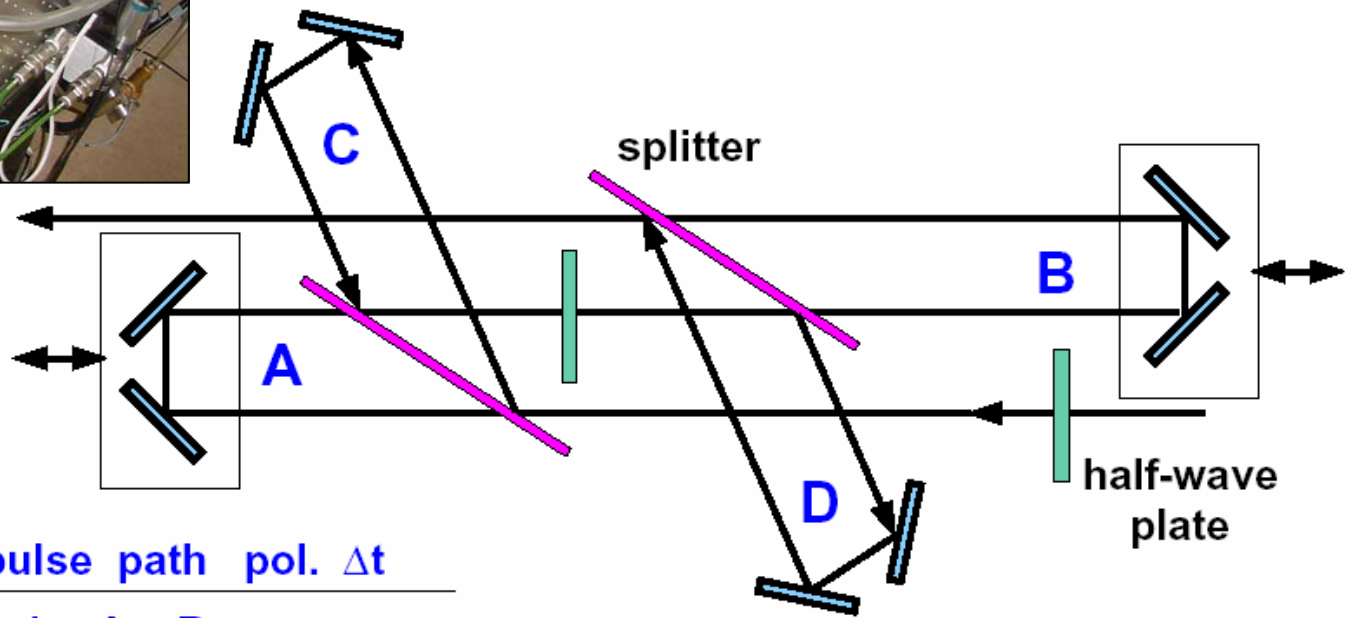
Difference to old system :

- we have now a single bunch beam mode
- we protect by counting the number of pulses
- only one input from machine protection via BIC
- operator may choose number of pulses instead of train length



Pulse Stacker

(until MBI pulse shaper is available)



pulse	path	pol.	Δt
1	A + B	p	
2	A + D	s	D-B
3	C + B	p	(C-A)-(D-B)
4	C + D	s	D-B

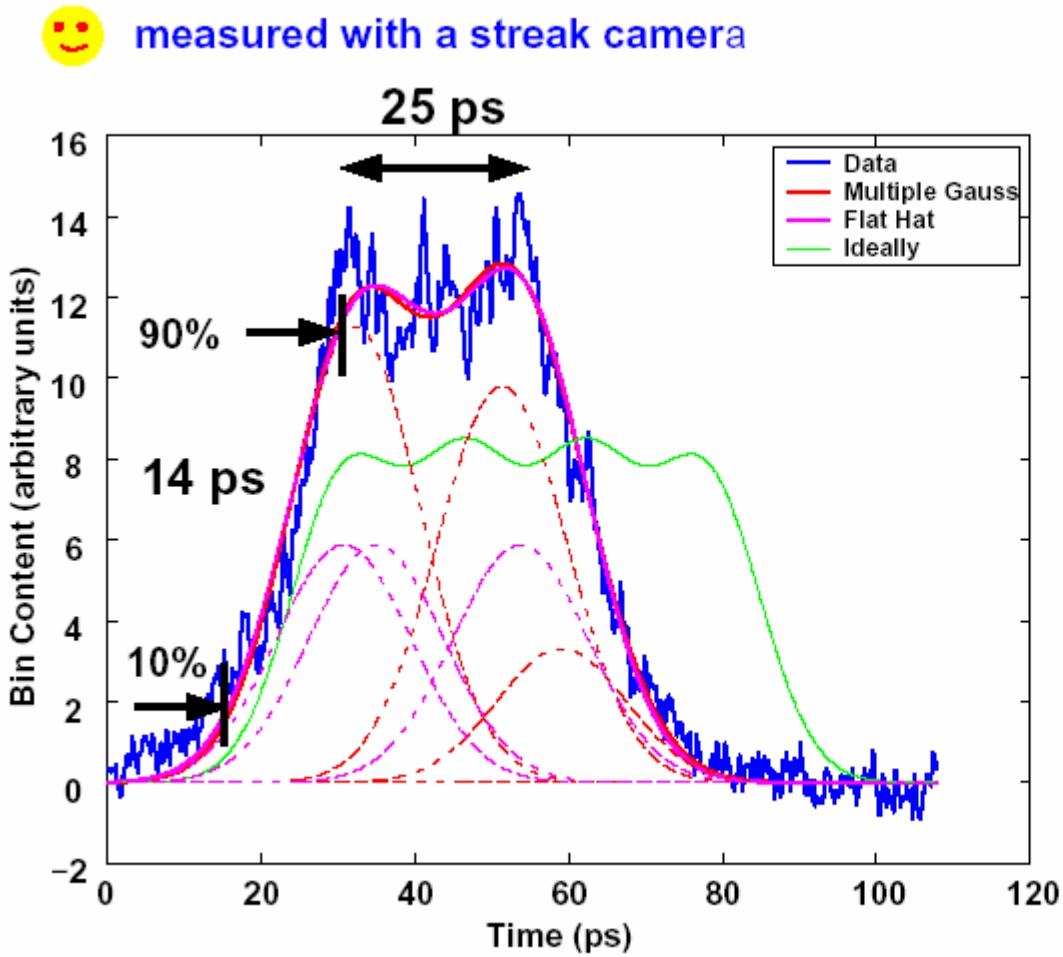
condition, to have all Δt equal:

A = C - 2(D-B)

for C=D -> A = 2B-D

and D/2 < B < D

Example of measured longitudinal profile



Fits:
1. four gaussians,
   σ same for all 4
2. flat hat
   σ and intensities
   are the for same for all

Ideal profile:
distance of pulses = 2.25 σ
σ = 7 ps

Results:
from flat hat fit:
- rise time = 14.8 ps
- flat top width = 23 ps

from multiple gauss fit
(same sigma for each gauss):
- rise time = 14.2 ps
- flat top width = 27 ps

Laser Beamline

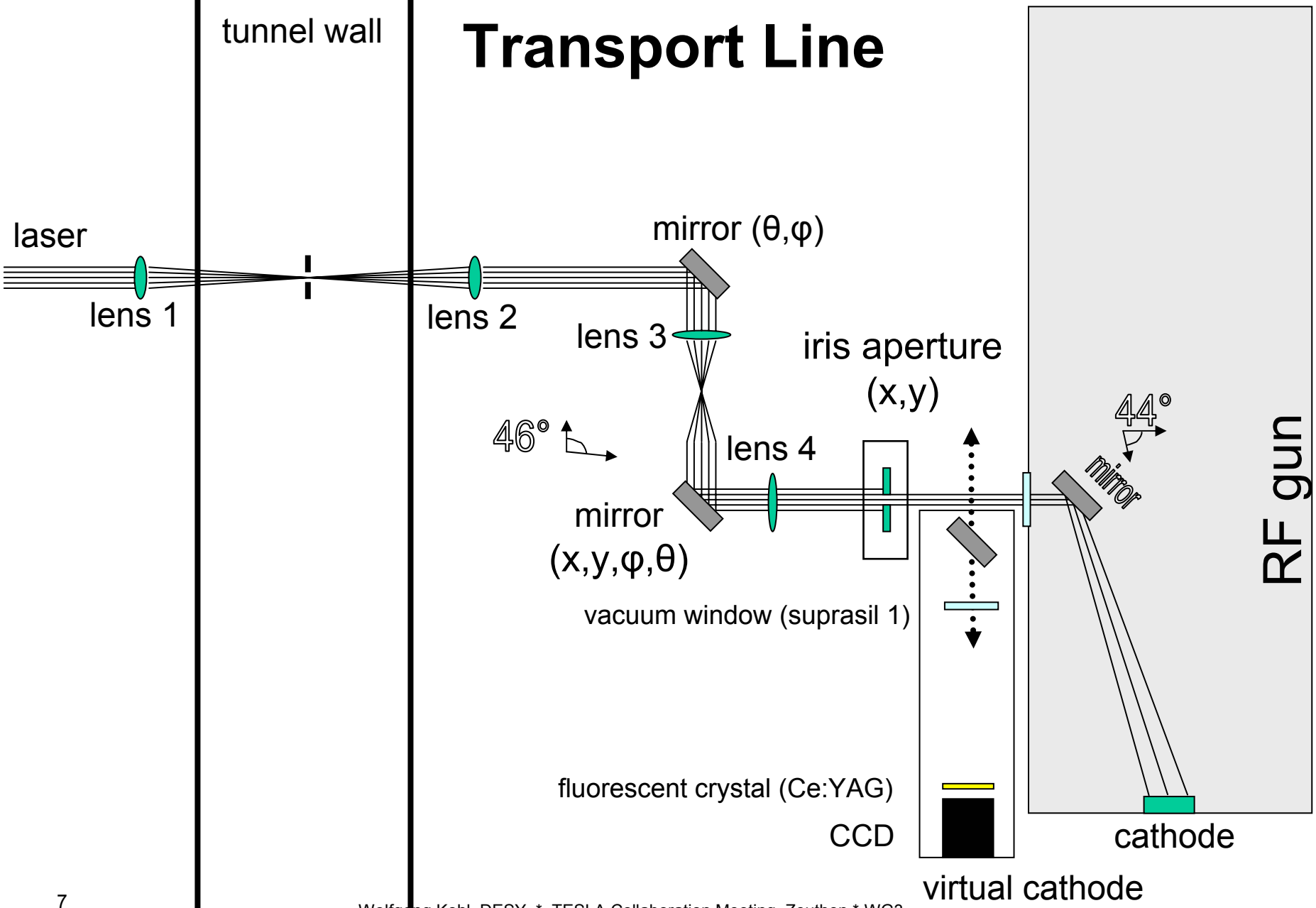
Aim:

- to transport laser beam from laser room to cathode (by imaging the beam to cathode)

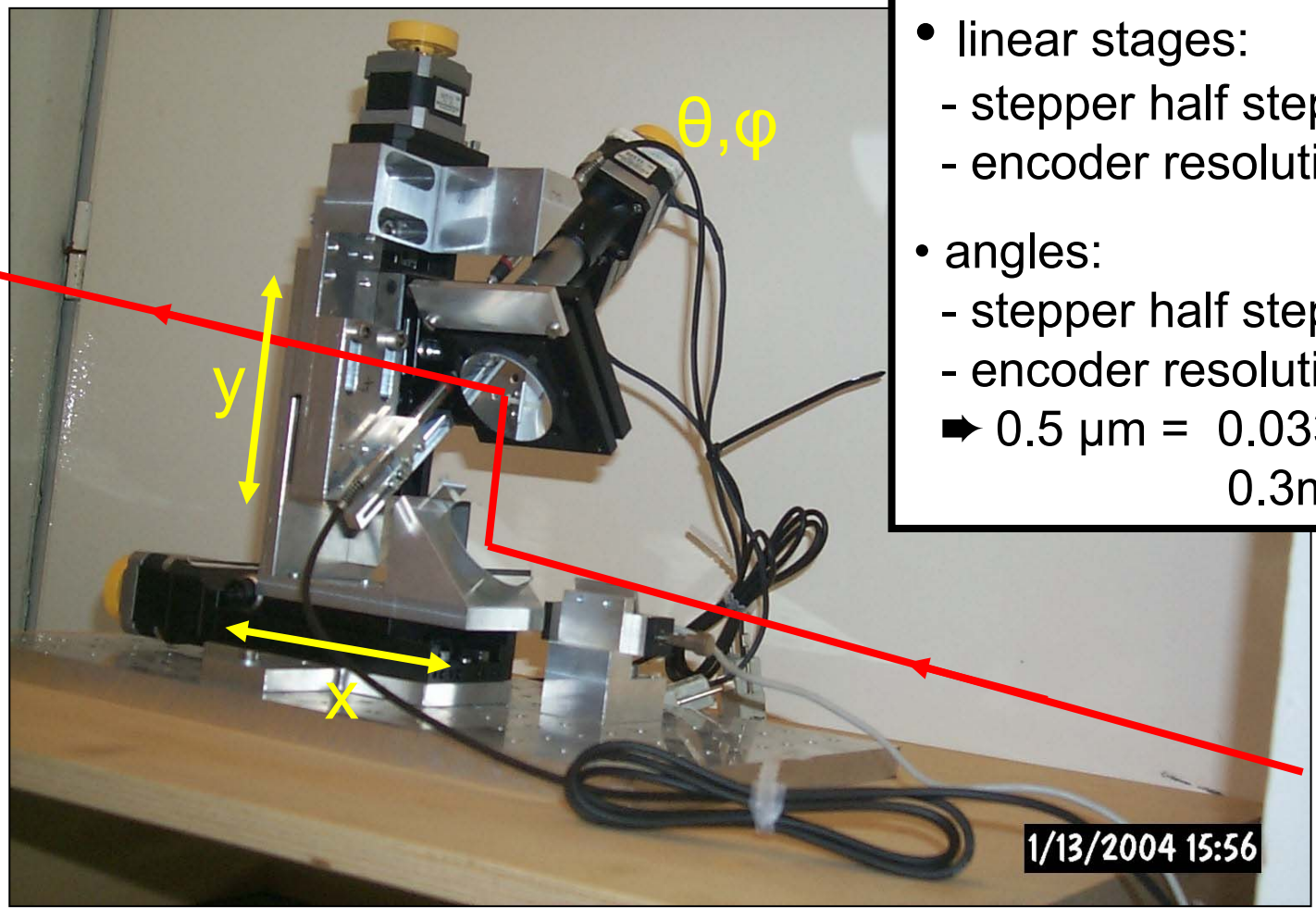
- to stear laser onto the cathode

- magnification of laser spot size

Transport Line



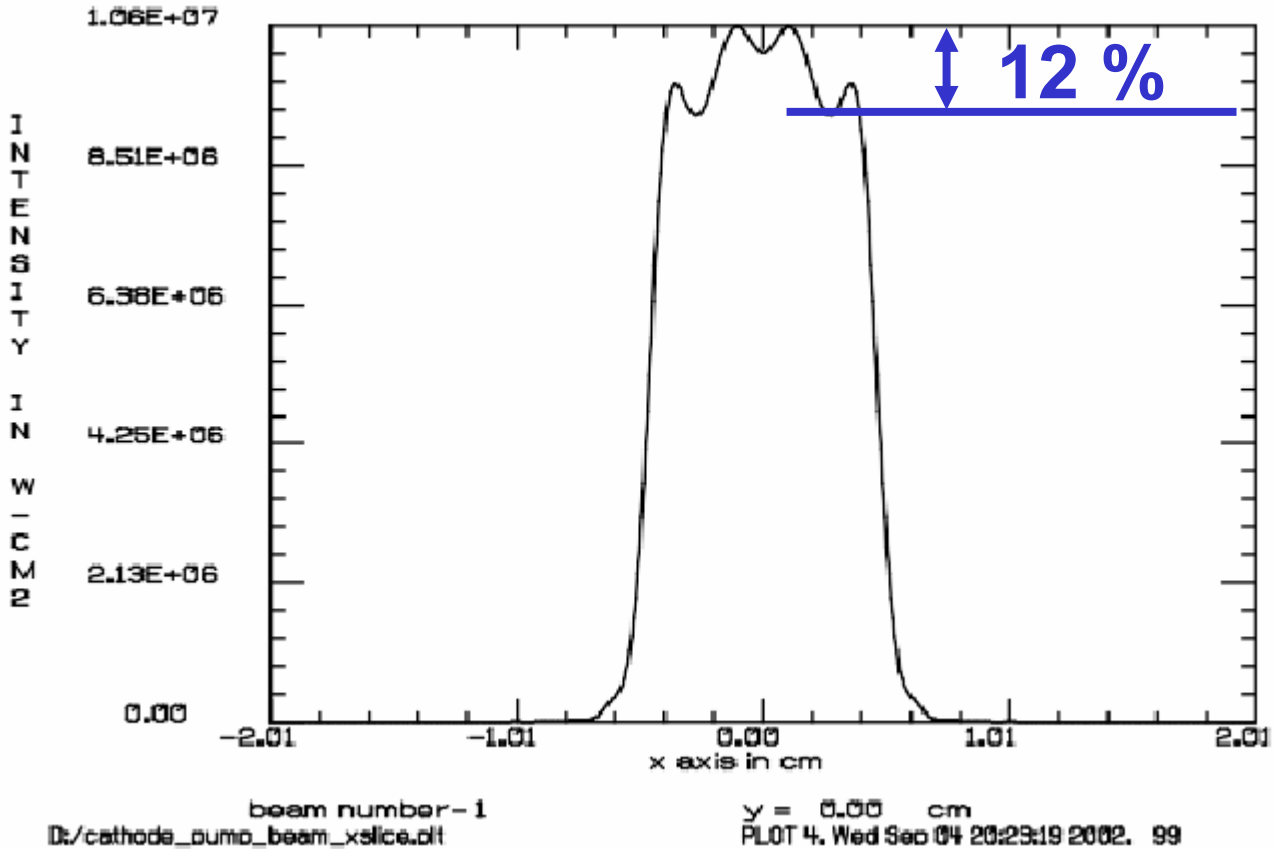
Last Steering Mirror (x,y,θ,φ)



- linear stages:
  - stepper half step 0.5 µm
  - encoder resolution: 10 µm
- angles:
  - stepper half step 0.5 µm
  - encoder resolution: 0.1 µm

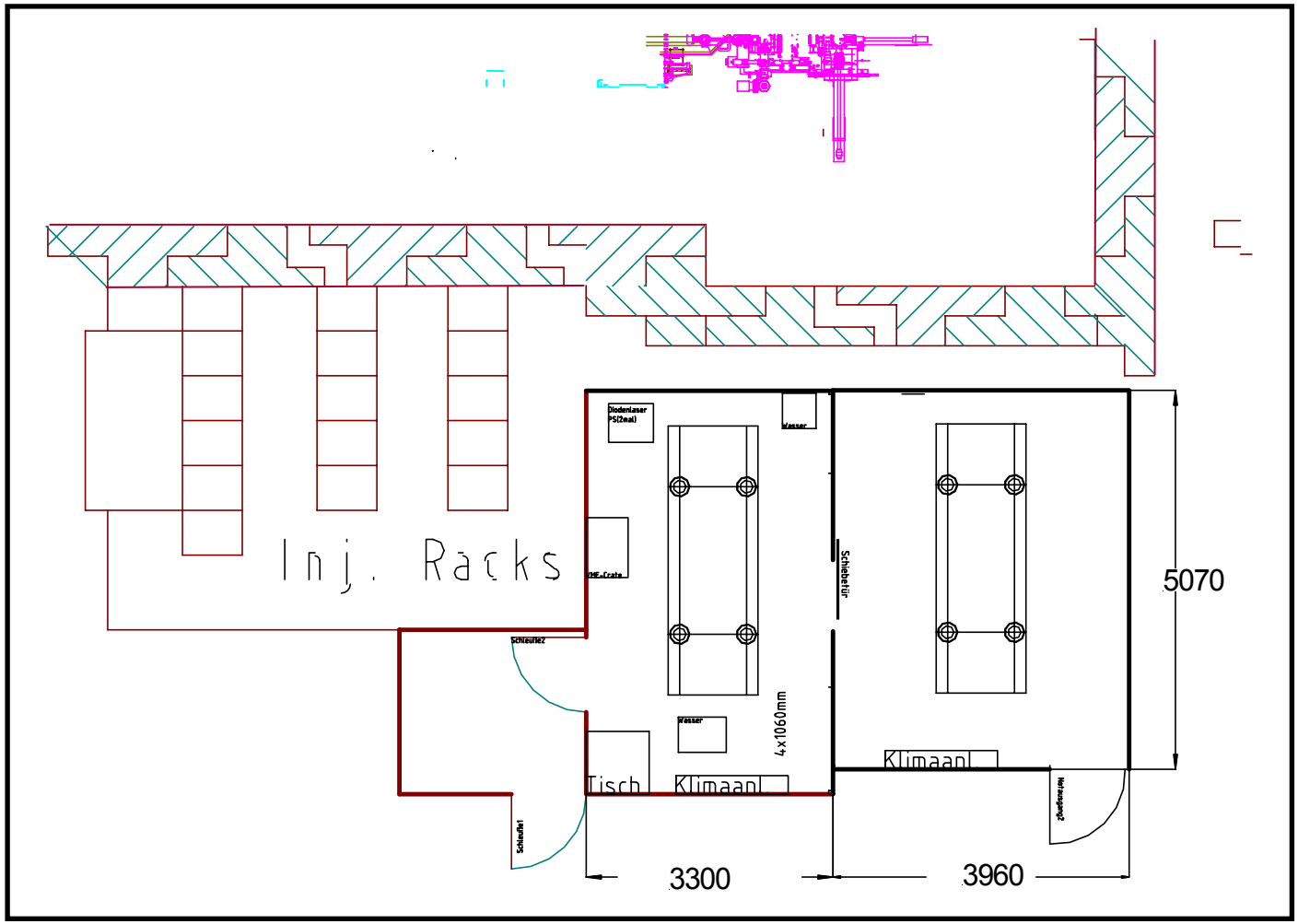
➡ 0.5 µm = 0.033 degree or
0.3mm on cathode

Expected Diffraction Effects due to Iris and Imaging



calculated transverse intensity profile for the TTF1 laser beamline (with GLAD by J. Petrovic)

Second Laser Room for the Backup Laser System



Artist View of the New Laser Room

Summary

- The first step of the upgrade of the laser system is almost finished by now:
  - new diode pumped oscillator, 2 diode pumped amplifiers
  - to do: replace last 2 flashlamp pump amplifiers by diode pumped amplifiers, longitudinal pulse shaper
- New beam mode selection and interlock electronics
- Pulse stacker for close to flat top longitudinal profile tested
- improved laser beam transport line
- second laser hut ready for the backup laser system