



UPPSALA
UNIVERSITET

SeIKC2XFEL: Laser Heater

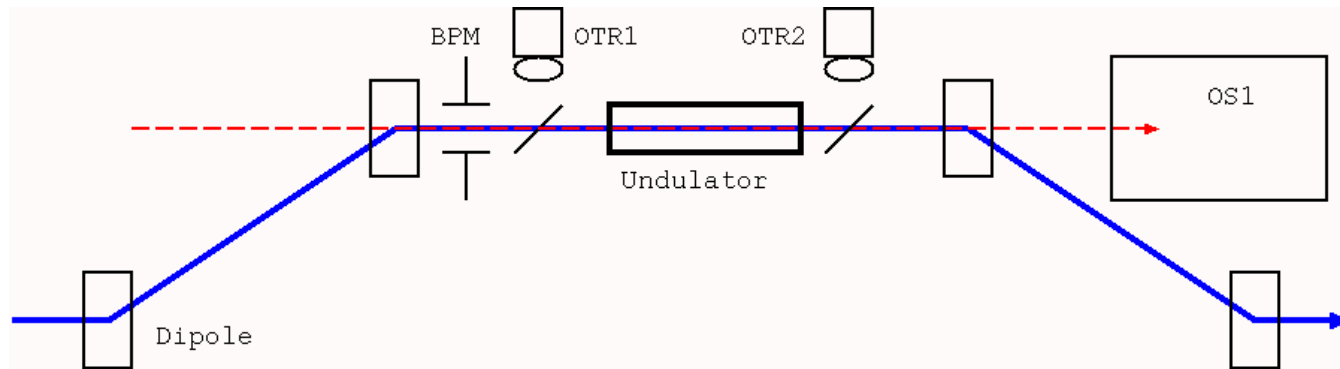
Volker Ziemann, Uppsala Universitet

What is it?
Technical Description
Time, Money, and Interfaces
Lessons



What is it?

- Electrons have small momentum spread (\sim keV)
 - susceptible to microbunching instabilities
- Add Landau damping (decoherence) in a well-controlled way to increase momentum spread
 - induce moderate momentum modulation by passing a laser over the electrons in an undulator





UPPSALA
UNIVERSITET

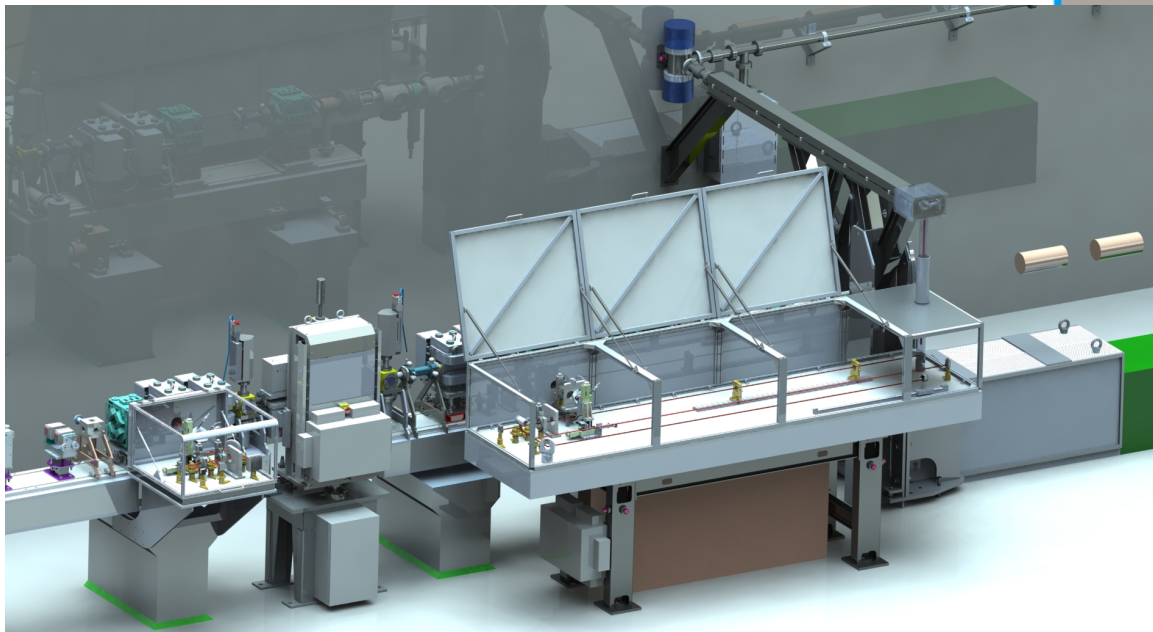
Why Uppsala University?

- After closing Celsius and Cryring SU+UU+KTH founded FEL center in 2006.
- In-kind money for the XFEL start-up phase for three projects (~1 MEuro)
 - Magnet measurement, Vacuum, Optical replica
- In collaboration we built and tested the ORS in FLASH (2006-2009)
 - Laser-ebeam interaction, experience with achieving overlap
- Colleagues at DESY suggested that we might take on the laser heater.

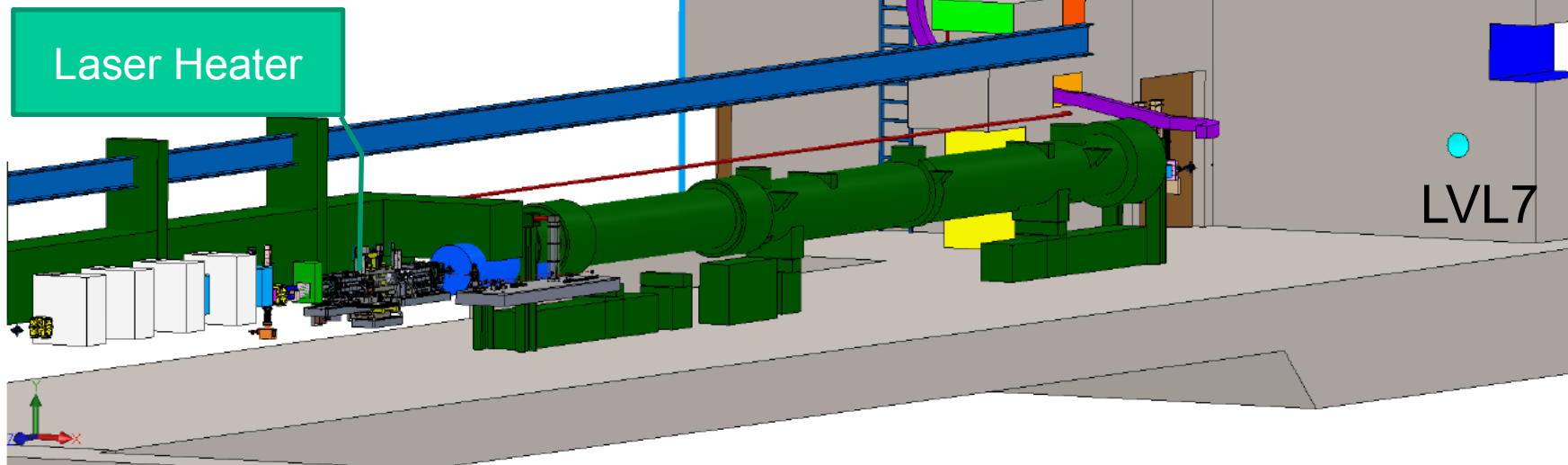


Scope: the hardware

Laser Tables



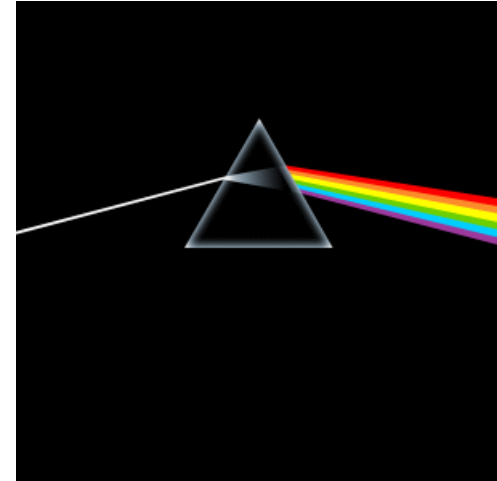
Laser Heater





The crucial concepts

- Time
 - Delays on both ends of the project
- Money
 - Cost-book
 - Delays cost money
- Interfaces
 - Electrical, Vacuum, Controls, Space, Access
 - Independence in technical details
 - Specifications for hardware
 - Subcontractors
 - Administration (follow-up, accounting)





Time

- Feb/Mar 2008: Call from Swedish Research Council
- May 2008: Positive decision with request to reduce the scope
- The long wait: nothing happened, and for several reasons in June 2009 I cancelled my application
 - because I could not with a good conscience guarantee to DESY/XFEL colleagues to complete project in the then current time schedule.
- Request to reopen application in October 2009.
- Positive decision in April 2010 with funds for salary for three years and an optional fourth year.
- First money in Oct 2010 (hire Mathias Hamberg 1/2011)
- Installation and partial commissioning in 2014
- First beam in 2015



Money

- Cost-book value 660 kEuro(2005 value)
 - based on 'doing it' at DESY with experienced personnel
 - guesstimate, I tried to talk DESY into a more realistic level, but...
- Raised to 850 kEuro for VR. Too late to help me in my negotiations with VR...
- It's more expensive for an external contributor
 - start from scratch and build up experience
 - decision's take longer (no common coffee or lunch...)
 - need to out-source tasks that DESY might do in-house
- Different modes of operation
 - DESY: many people do expert work on a small subsystem
 - UU: few people work on many aspects
 - Less pipe-lining of work possible, larger friction losses
- Delays take time and money, difficult to predict



Interfaces 1

- **Electrical, Vacuum, Controls, Space, Access**
 - mostly not a problem, talk to the DESY experts and follow their advice, but could come up with our own 'solutions' to technical challenges.
 - small glitch with vacuum, unclear specifications, we had needed more guiding than we actually received in the beginning
 - sometimes long response time when questions arose, understandable due to busy schedules, BUT...
 - ...DESY had not anticipated time and man-power for baby-sitting in-kind contributors, but that is needed.
- **Laser related issues**
 - no responsible partner at DESY for a loooooong time



Interfaces 2

- Administration

- was sometimes a bit forgotten, both my WP leader and I were more interested in the technical issues
- lazy book-keeping of milestones and deliverables
- different milestones for XFEL-VR than XFEL-UU, bad!
- dates of milestones were originally based on a much more aggressive schedule than actually came (undulator is in storage now, awaiting...). We adjusted mentally the dates, but not in writing.
- milestones may fall off the end of the money. I cannot pay salaries for waiting for commissioning with beam (try to interleave with other projects, but unclear)



Interfaces 3

- Subcontractors, the larger ones
 - Laser guiding and stabilization system: well-proven (also at DESY) system ordered.
 - Electron vacuum chamber. Technically very demanding, we're iterating. Avoid triangle dramas.
 - Undulator, KYMA:
 - Kyma won the tender (help from UU admin with tendering process)
 - Travelled several times to witness progress, discuss technical issues
 - ...and participate in commissioning with pleasant colleagues.
 - sub-optimal split of responsibilities regarding control system
 - delivered on time and worked flawlessly during the acceptance tests at DESY (was a bit difficult to get time on a bench at DESY, but Hasylab came to the rescue)
 - Transparent interactions, well documented. Well defined (by Kyma) milestones that we ticked off.



Lessons

- For me
 - Start Yoga, patience is a virtue!
 - Pay more attention to the administrative issues!
- For you
 - In-kind contributors need baby-sitting to be able to conform to the rules and guidelines. Foresee resources for that!
 - In-kind contributors are more expensive, they need to become 'experts' in many fields do not mass-produce.
 - Foresee contingencies when schedule slips! Who pays?
 - Try to make the cost-book semi-realistic!
 - Build up expertise at collaborators! Next time they know...