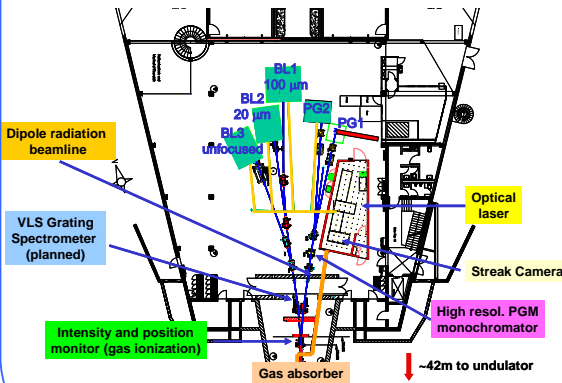


First user experiments at the VUV-FEL at DESY

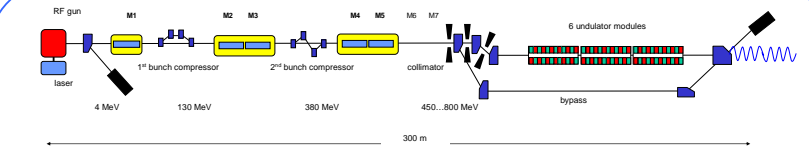


TESLA Test Facility (TTF 1, 1995-2002)
TTF 2
experimental hall

Design parameters	
Photon energy	~20-200 eV
Bandwidth $\Delta\lambda/\lambda$	~0.5 %
Peak power	>1 GW
Pulse duration	~100 fs
Pulses per second	up to 72000

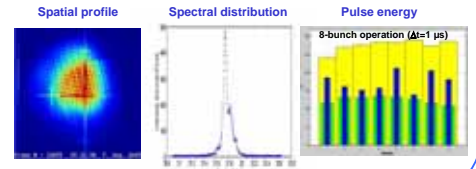


Layout of the Experimental Floor



Present performance

Parameter	Expected (08/04)	Measured
Wavelength	30 nm	32 nm
Pulse duration	15-50 fs	20-40 fs
Pulse energy	50-150 μ J at saturation	up to 130 μ J (mostly 5-10)
Bandwidth	0.8%	0.5-1.0%
Divergence	70-80 μ rad	< 150 μ rad

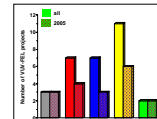


The First User Experiments

VUV-FEL Proposals in Sept. 2002

30 proposals submitted
29 proposals accepted
200 scientists involved
60 institutes
11 countries

Available beam time heavily overbooked (98 weeks were requested for the first year)



Areas of research

- Many groups have formed collaborations
- Many groups have built new instrumentation
- Substantial funding has been allocated for these experiments (e.g. 10 projects funded by BMBF, 5 by HGF)

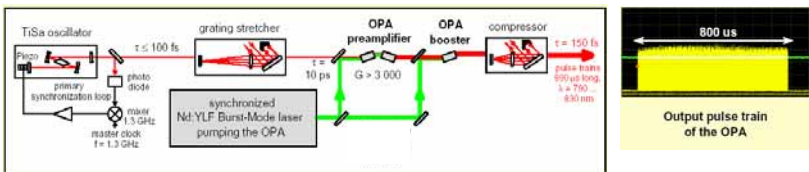
Areas of Proposed Research

- Femtosecond time-resolved experiments**
 - synchronisation FEL - optical laser
 - chemical reactions
 - magnetism dynamics
- Interaction of ultra-intense XUV pulses with matter**
 - multiphoton excitation of atoms, molecules, clusters...
 - plasma physics
- Investigation of extremely dilute samples**
 - free radicals
 - mass selected clusters
 - ions
- High-resolution spectroscopy**
 - nanometer focus
 - meV-resolution photon and photoelectron spectroscopy of surfaces and solids with nm resolution

Two-colour pump-probe facility combining the VUV-FEL and a high-power optical laser

Funded by the 5th Framework Programme of the European Commission (HPRI-CT-1999-50009)

Layout of the optical laser system

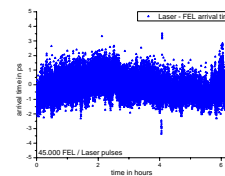
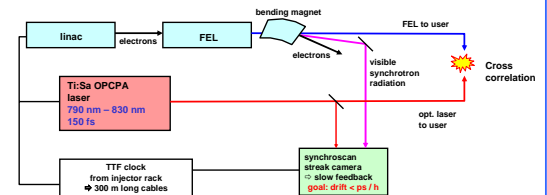


Laser parameter	
Wavelength:	Ti:Sapphire 800 nm, Nd:YLF 523 nm
Pulse duration:	~100 fs, 12 ps
pulse energy for single laser pulse:	20 μ J, 250 μ J

Funded by the EC FP5 (HPRI-CT-1999-50009)

- DESY (Coordinator)
- Research Centre Jülich / BESSY
- Max-Born-Institute, Berlin
- Dublin City University
- CNRS / LURE
- Lund Laser Centre / MAX-Lab

Synchronization Laser - FEL: First results



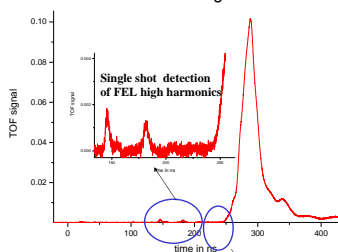
Laser - dipole jitter

- rms = 0.5 ps (short term)
- rms = 0.8 ps (6 h)

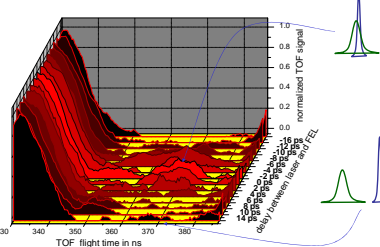


First cross correlation experiments

Single shot TOF spectrum With 10⁻⁷ mbar Argon



2 photon signal - "sidebands" cross correlation between the optical laser and the FEL



FEL: 32 nm, 3 μ J average, 50 μ m focus, 50 fs Intensity ~ 10¹³ W/cm²
Laser: 523nm, 250 μ J, 50 μ m Focus, 12 ps, Intensity ~ 10¹¹ W/cm²
Each trace average over 64 FEL shots

