FLASH: The soft X-ray FEL at DESY in Hamburg

- Single-pass high-gain SASE Free-Electron Laser
- Wavelength range from THz through vacuum ultraviolet to soft X-rays
- Femtosecond range pulses with high peak brilliance
- FEL user facility since Summer 2005
- Second undulator beam line (FLASH2) under construction

FLASH operation parameters 2011

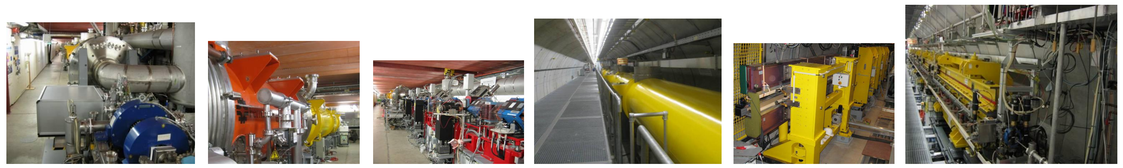
Wavelength range (fundamental)	**4.1 – 45 nm**
Average single pulse energy	**10 – 400 µJ**
Pulse duration (FWHM)	**50 – 200 fs**
Peak power	1 – 3 GW
Photons per bunch	10^{12} – 10^{13}
Average power	up to 300 mW
Spectral width (FWHM)	~ 0.7 - 2 %
Average Brilliance	10^{17} – 10^{21} B*
Peak Brilliance	10^{29} – 10^{31} B*

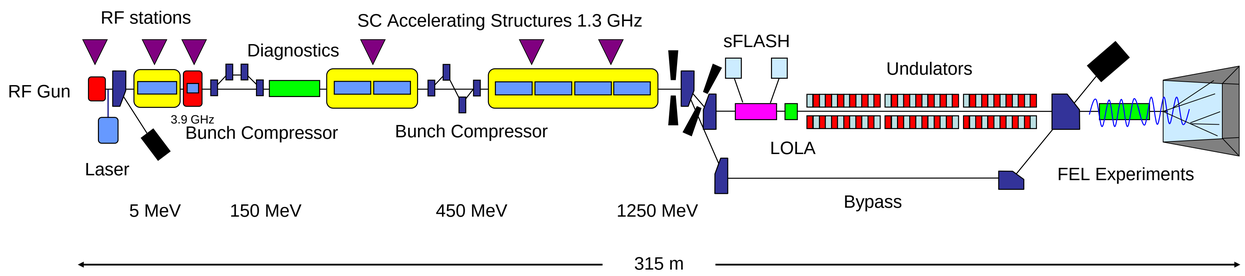
* photons/s/mrad²/mm²/0.1%bw

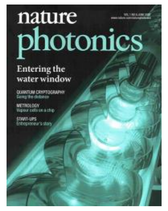
Short-pulse radiation in the experimental hall

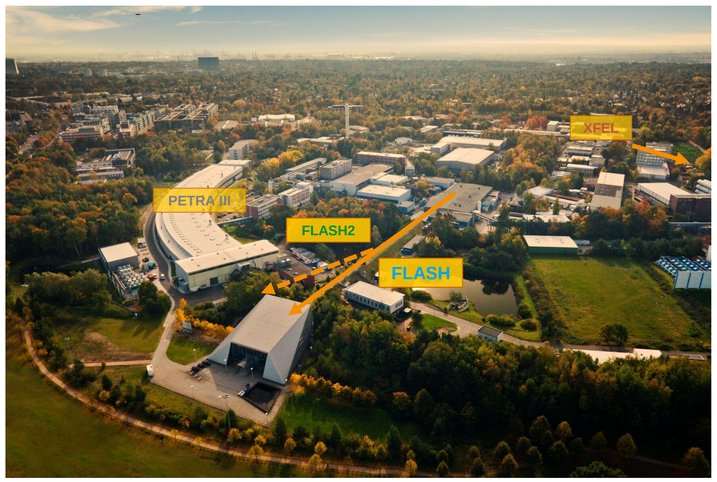
	X- rays	AfterBurner + THz	Laser (VIS/NIR) ♦
Wavelength λ	4 – 45 nm	0.6 – 250 um	350 – 2000 nm
Pulse energy	10 – 400uJ	1 – 100 uJ	50 / 10 000* uJ

♦ with jitter ~100fs
* Only at 10 Hz

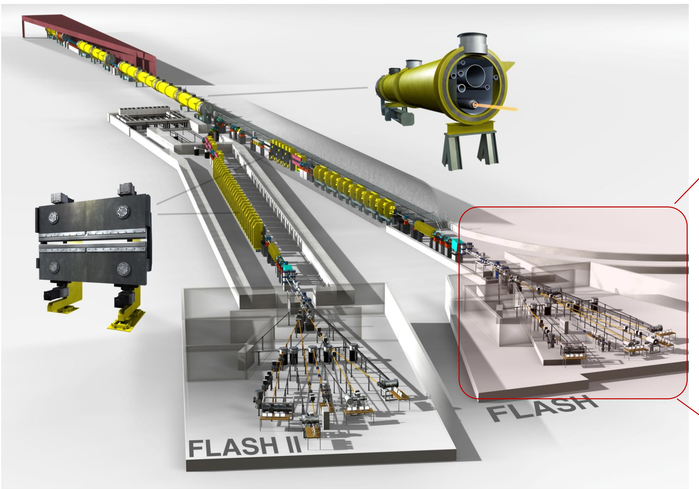




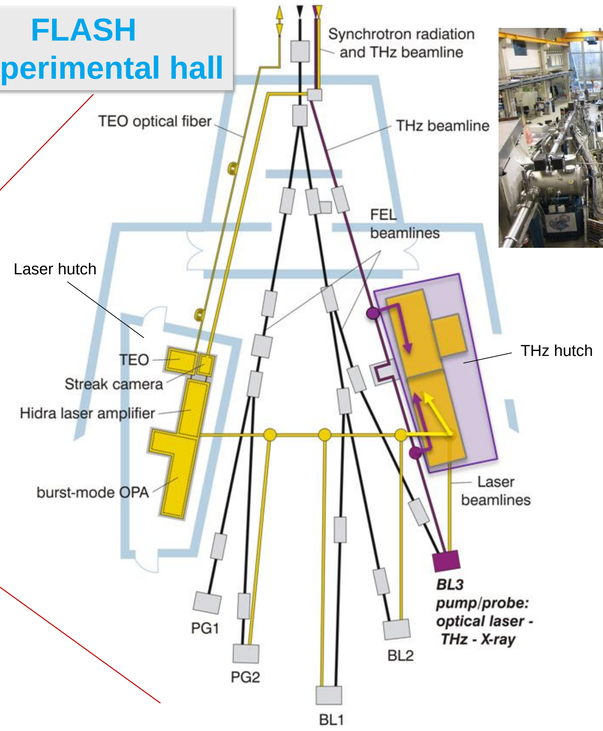




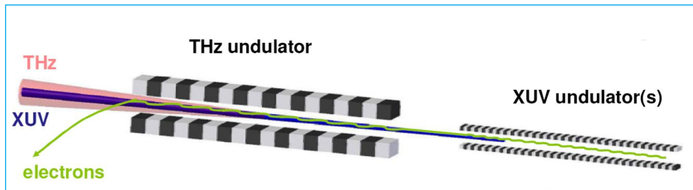
FLASH and FLASH II



FLASH experimental hall



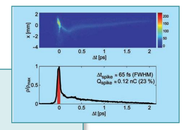
THz at FLASH



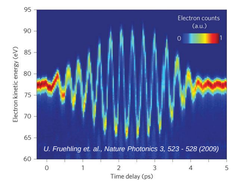
Cascaded design:
- Parasitic operation
- Synchronized to XUV pulse

Ultra-short electron bunch:
- Intensity ~ N_e^2 (up to 70uJ)
- Coherent and CPE stable

Tunable: (1 – 230 um)



Experiment:
THz streak camera



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