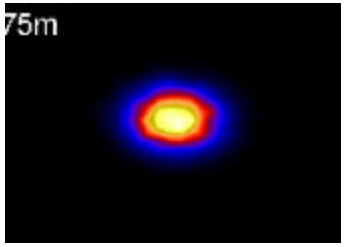
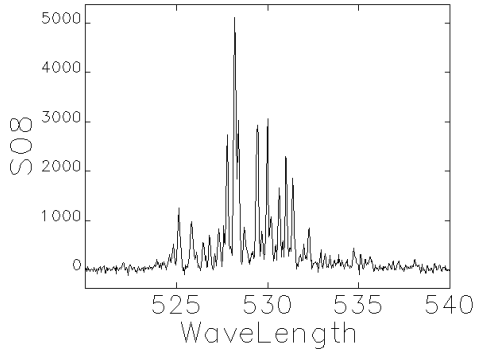
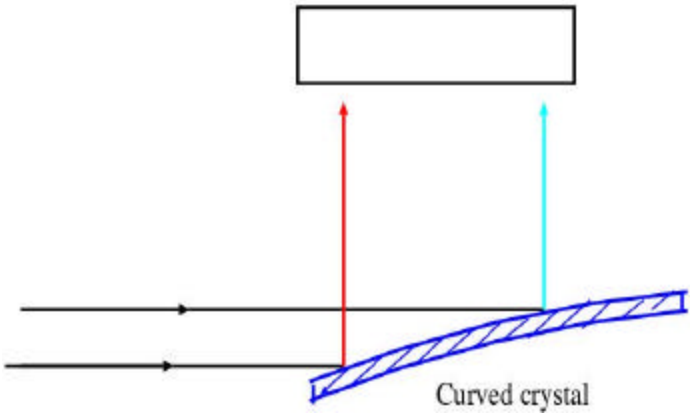
Summary of Sessions on Radiation Simulations and X-Ray Techniques



J. Arthur
SLAC



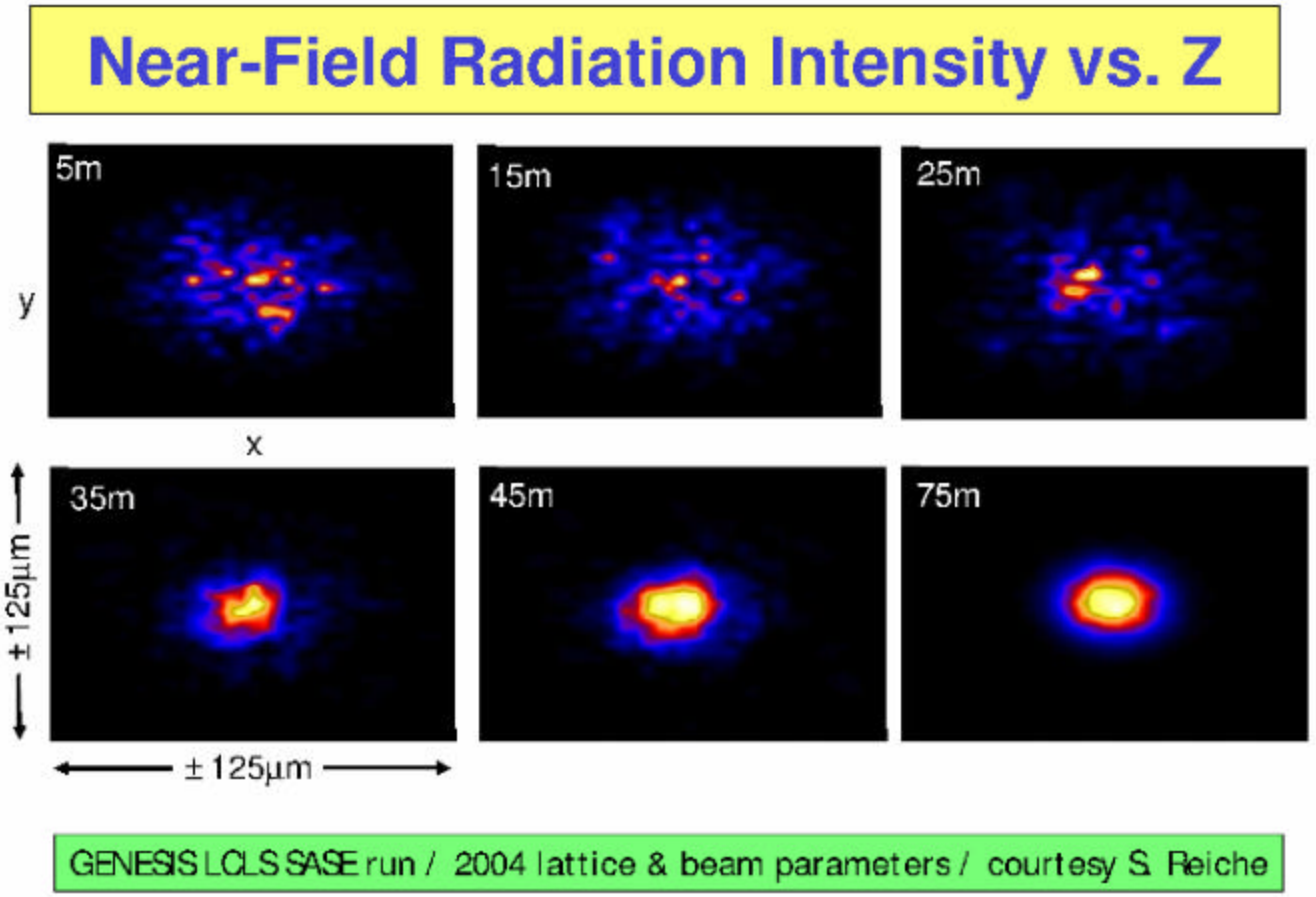


Tuesday afternoon

Simulations of FEL and Spontaneous radiation

Expected Properties of Coherent LCLS FEL Emission

W. Fawley



Fluctuation Properties of Electromagnetic Field

M. Zolotorev

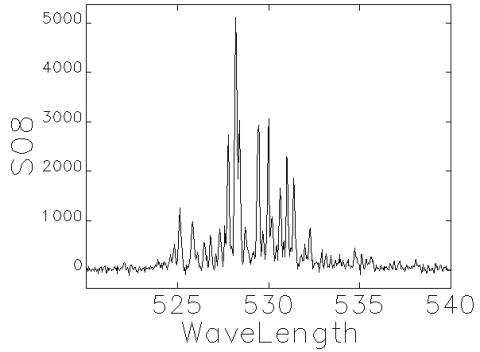
Spike structure of FEL pulse gives pulse length

Need resolution of $\delta E/E<10^{-6}$ to resolve LCLS spike structure

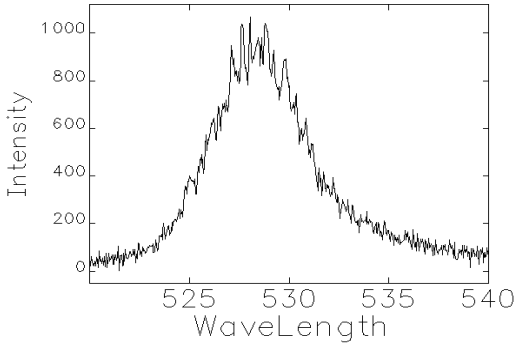
Measurement of Incoherent Radiation Fluctuations and Bunch Profile Recovery

V. Sajaev

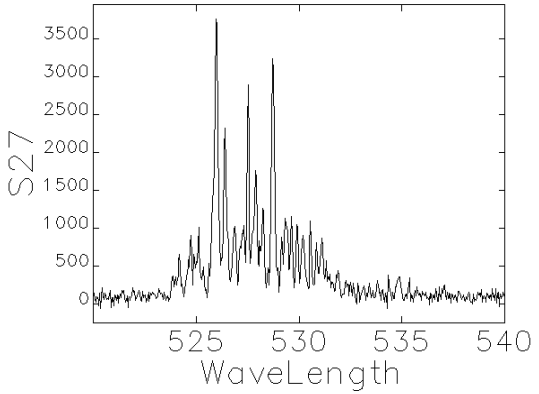
Typical single-shot spectrum



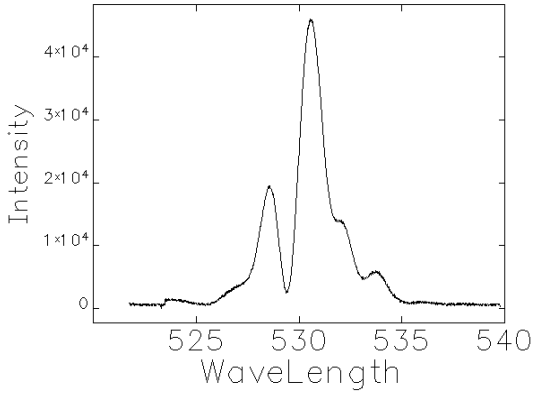
Average spectrum



long bunch



short bunch



Summary of Simulations and X-Ray Techniques

J. Arthur

XFEL 2004

in addition…

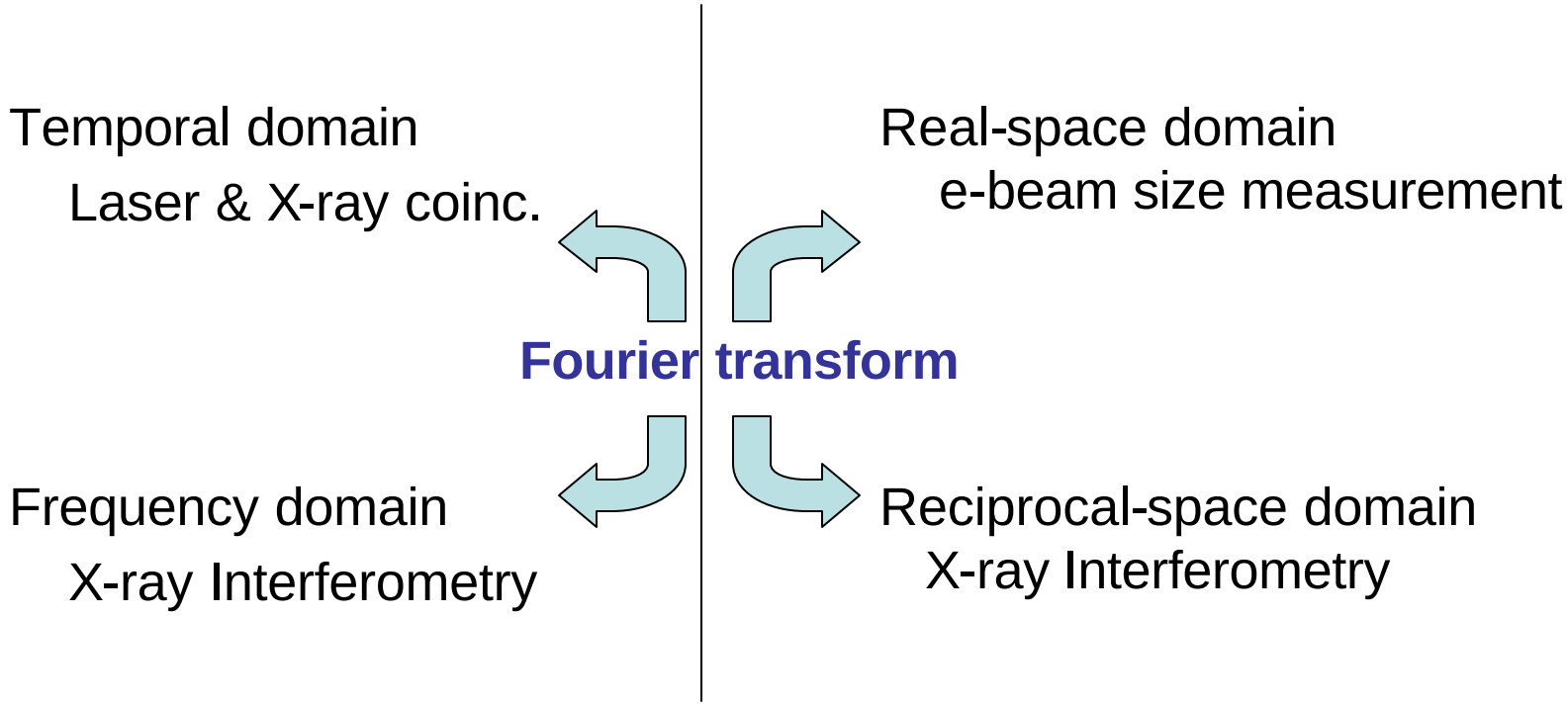
Spontaneous radiation properties S. Reiche

Wednesday (and Monday)

X-Ray Techniques

Overview of x-ray techniques

Makina Yabashi

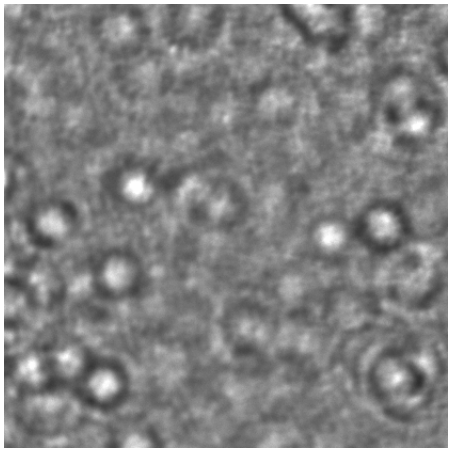


Yabashi, cont.

Optical elements degrade the radiation properties

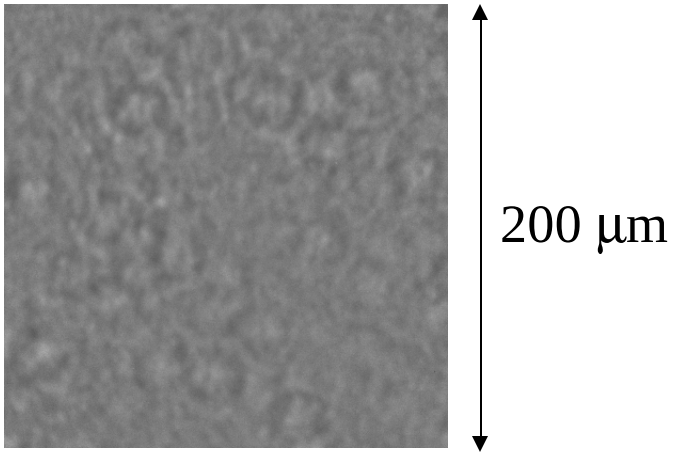
Beryllium window distorts wavefront

NGK, BR-3



Purity: 98.5 %
Roughness: > 1 μm Ra
Thickness: 200 μm

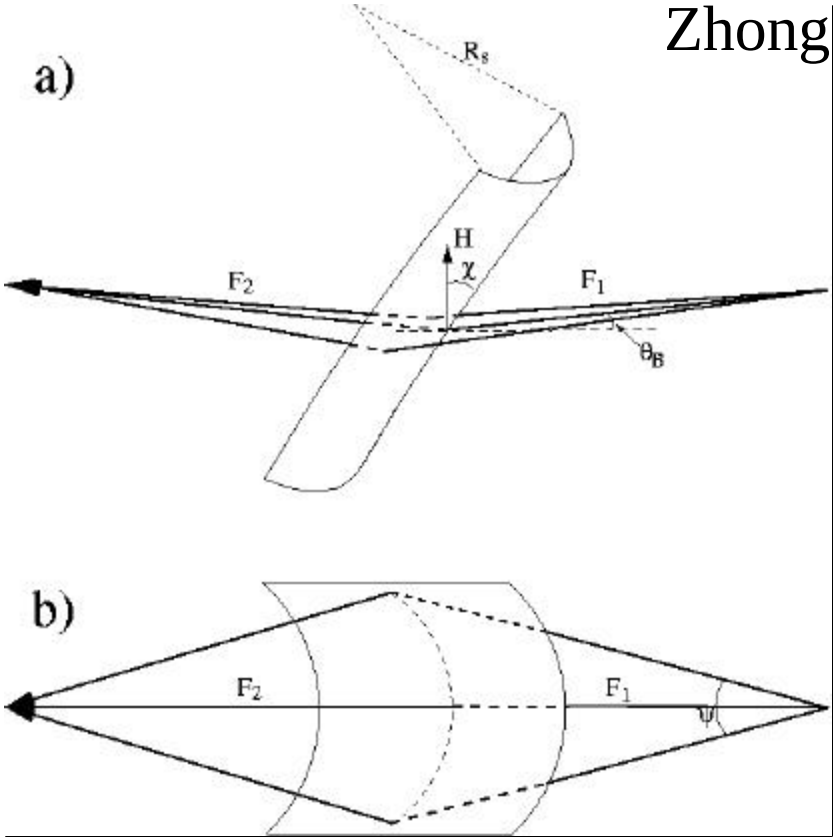
Brush-Wellman, IF-1



Purity: 99.8 %
Roughness: 0.1 μm Ra
Thickness: 250 μm t

Flash Spectroscopy using Meridionally- or Sagittally-bent Laue Crystals: Three Options

Zhong Zhong



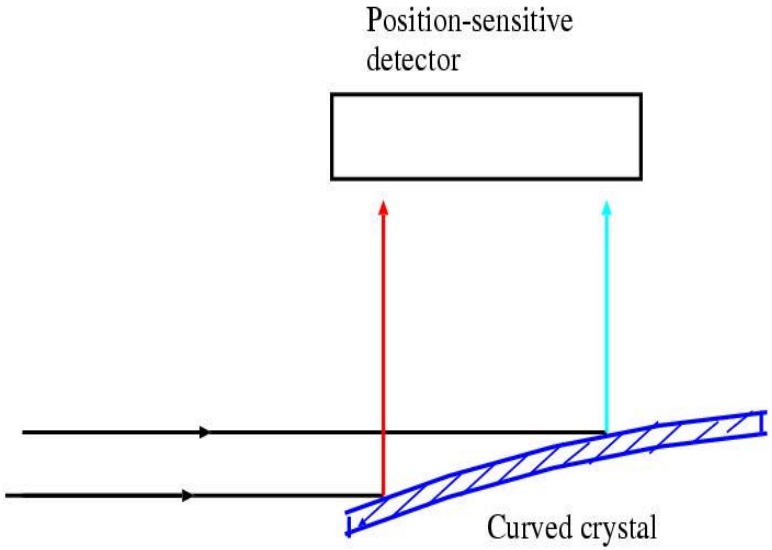
Several geometries can work

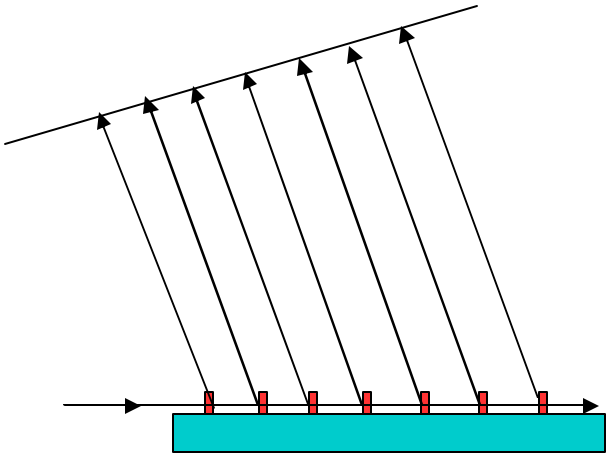
At 8 keV,
Range of $\delta E/E > 10^{-3}$ possible
Resolution of 10^{-5} possible

Easier at higher energy, very hard at lower energy

Bragg Spectrographs for LCLS Diagnostics and Science

D. Peter Siddons



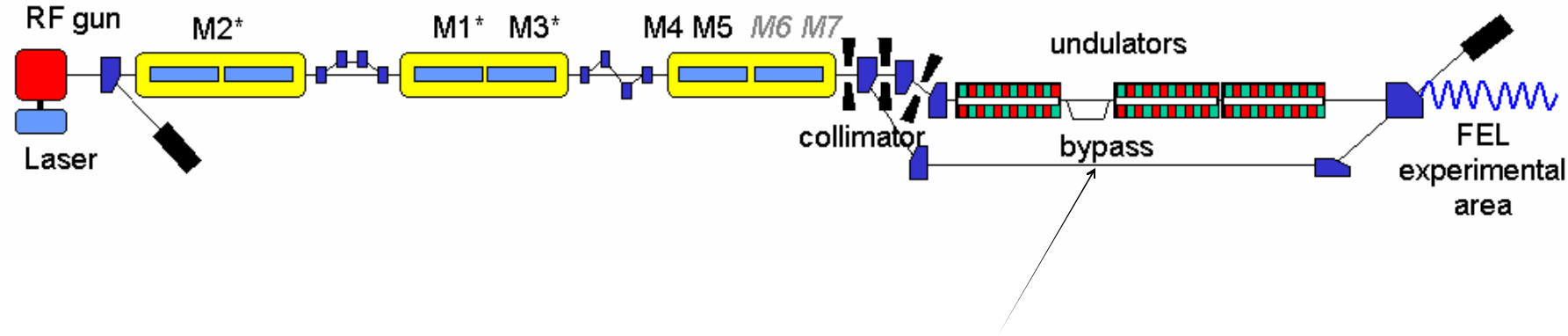


At 8 keV,
Range of $\delta E/E > 10^{-3}$ possible
Resolution of 10^{-5} possible

Resolution of 10^{-6} possible with backscattering and asymmetric reflections, but range would be reduced

Streak camera monitoring of the arrival timing jitter

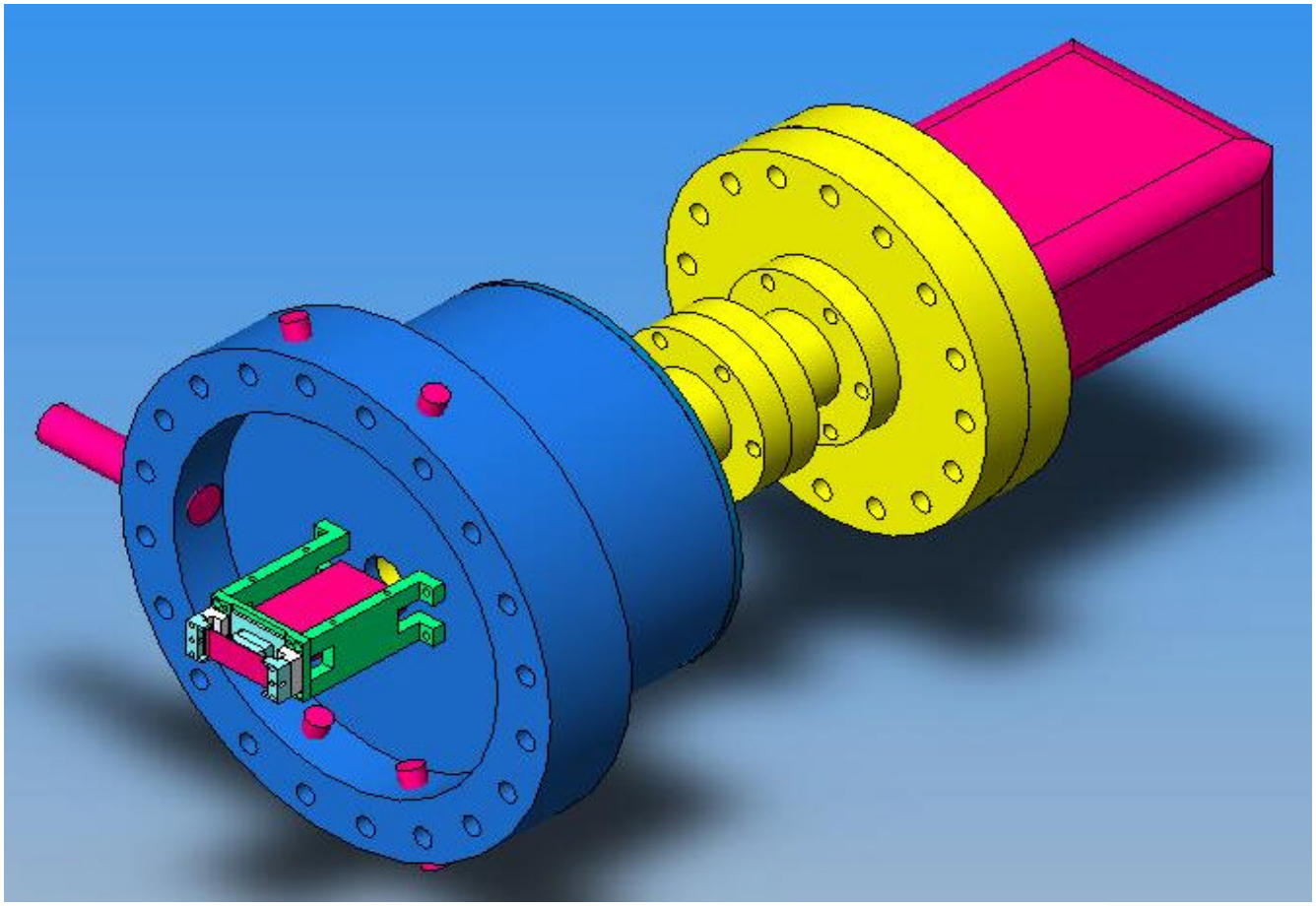
Stefan Düsterer



Visible radiation from VUV-FEL bend magnet brought to experimental area for correlation with optical laser

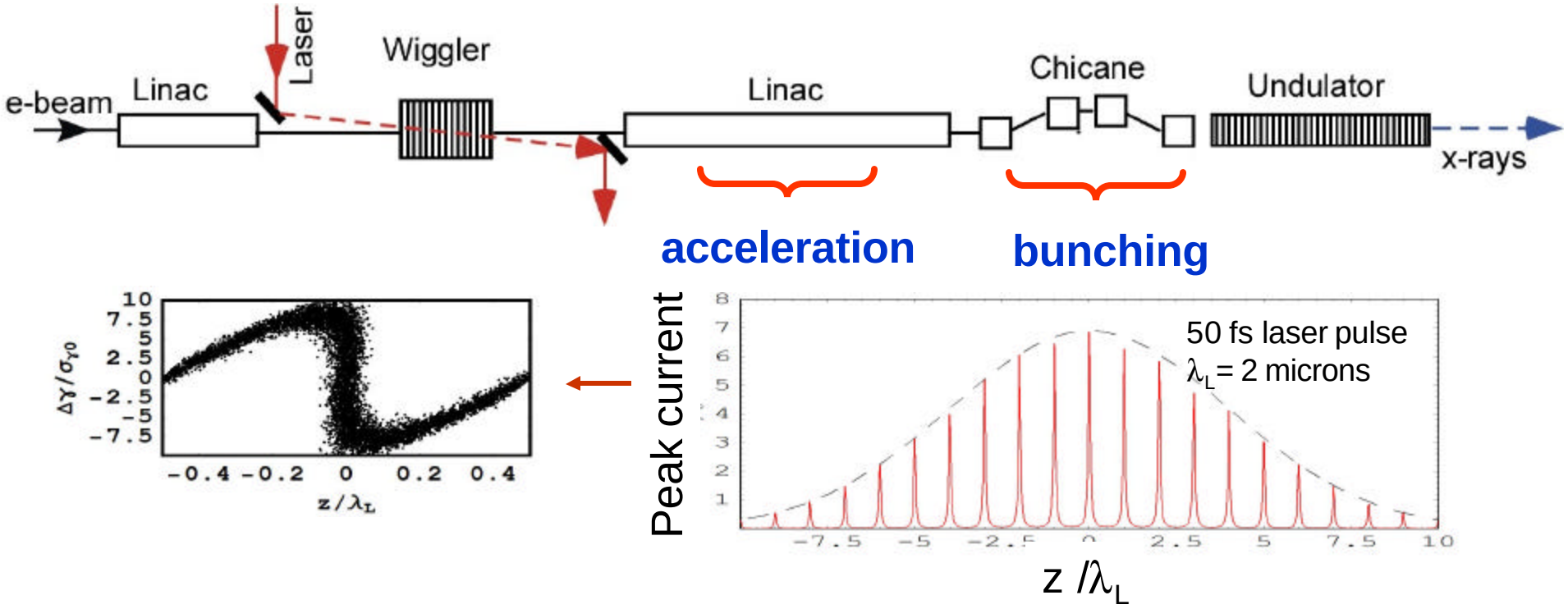
SPPS / Laser pump-probe synchronisation measurements using a streak camera

Andrew MacPhee



Timing Controls Using Enhanced SASE Technique

A. Zholents



Laser provides synchronized microbunching

in addition…

RadSensor Mark Lowry

X-ray/laser correlation using Auger spectra R. Kienberger

Spatial coherence measurements R. Ischebeck

Discussions of x-ray diagnostics and radiation properties

Focused on diagnostics which will help FEL performance
Intensity, propagation of pulse shape, spectrum are all important
Need diagnostics over full spectral range of LCLS (0.8-8 keV)
Spectral measurement needs $dE/E<10^{-6}$ to see spikes at 8 keV
Ability to turn off undulator sections is vital (measure characteristics as a function of undulator length)

Questions:
Effect of reflections/aperturing by beam pipe
How chirp helps or hurts
How to organize data
How best to correlate x-ray with optical laser
How coherent (spatially) will the LCLS be