

PAUL SCHERRER INSTITUT



Bill Pedrini on behalf of the user team and Bernina staff :: Paul Scherrer Institut

“Broadband mode damage” user experiment at Bernina

SwissFEL Exchange Meeting (SEM), 12.10.2020

Proposal 20200933

Title
Destruction of electronic order by X-rays in a model magnet

charge density wave system

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- Dr. Daniel Mazzone (NUM)
- Pratyush Anand (PSD, QT group)
- Dr. Alexander Steppke (UZH)
- Stephan Allenspach (NUM)

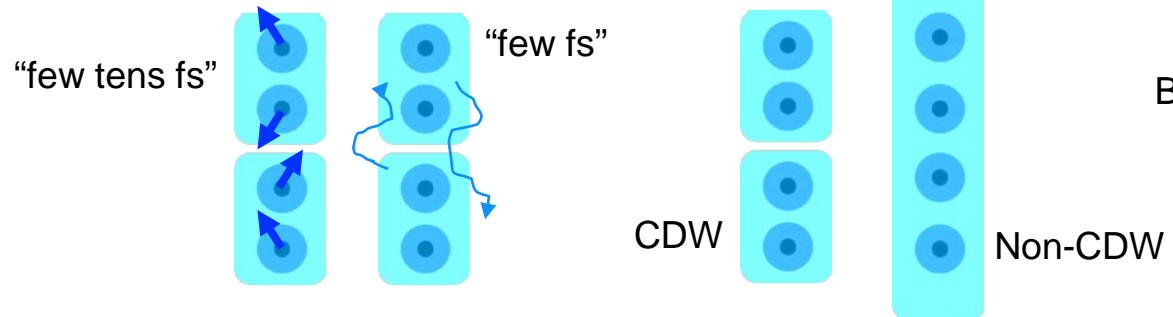
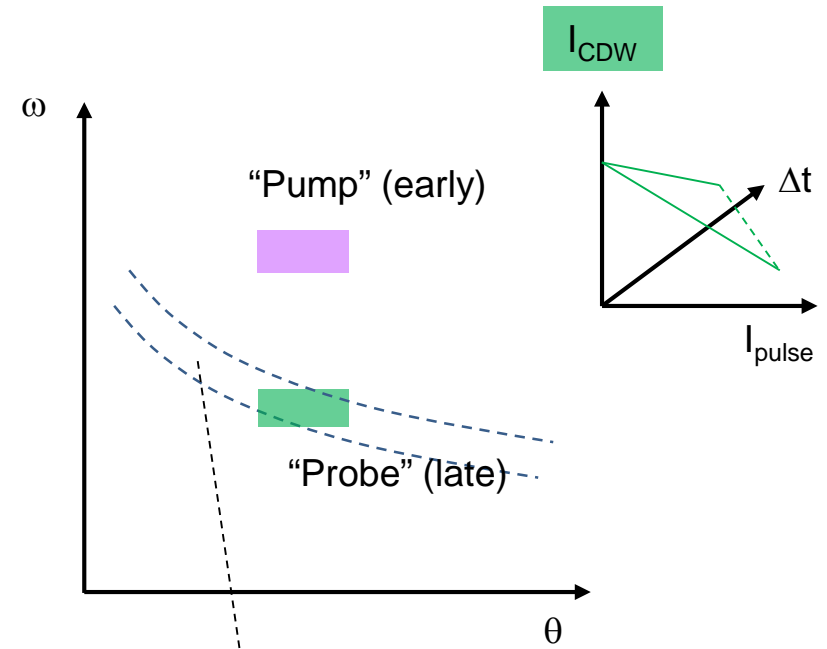
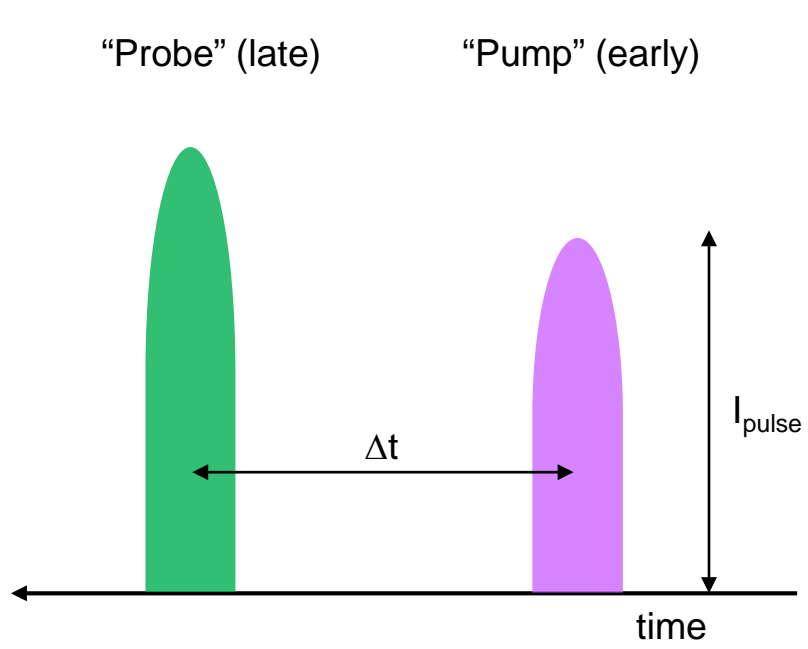
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	Thu 8	PC	PC	PC	MW - cand
	Fri 9	BC	BC	BC	MW - cand
	Sat 10	AC	AC	AC	MW - cand
	Sun 11	AC	AC	AC	MW - cand
42	Mon 12	MS	MS	MS	
	Tue 13	BE	BE	BE	Pedrini
	Wed 14	BE	BE	BE	
	Thu 15	AC	AC	MS	
	Fri 16	BE	BE	BE	
	Sat 17	BE	BE	BE	
	Sun 18	BE	BE	BE	
43	Mon 19	MS	MS	MS	
	Tue 20	AE	AE	AE	
	Wed 21	AE	AE	AE	

X-ray pump / X-ray probe – ideal scheme

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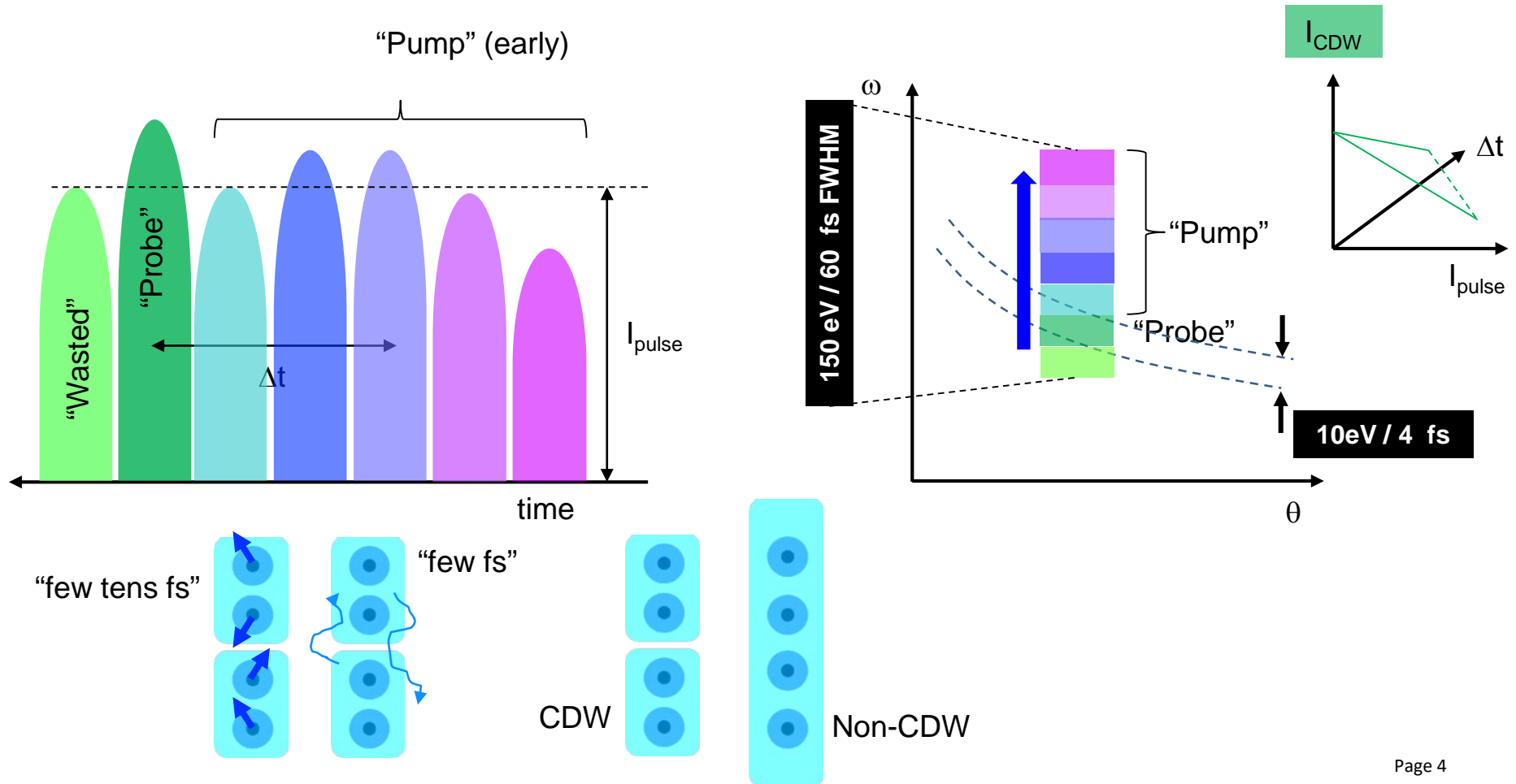


X-ray pump / X-ray probe – bb mode

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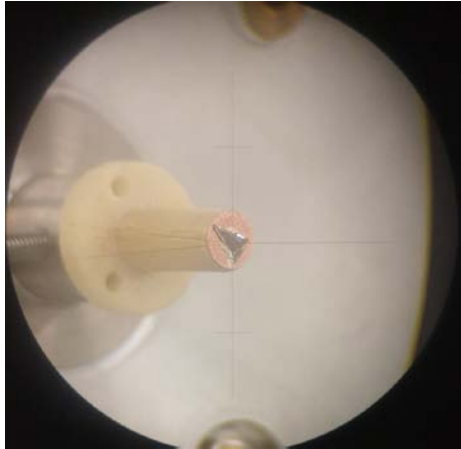
Title
Destruction of electronic order by X-rays in a model ~~magnet~~

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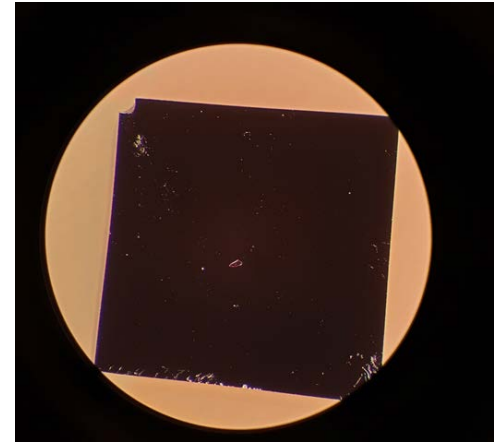


TaS₂ samples

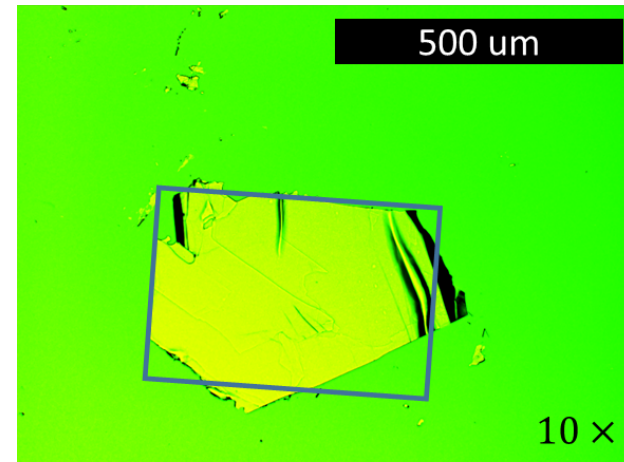
Large samples



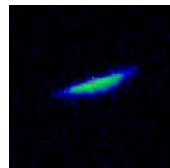
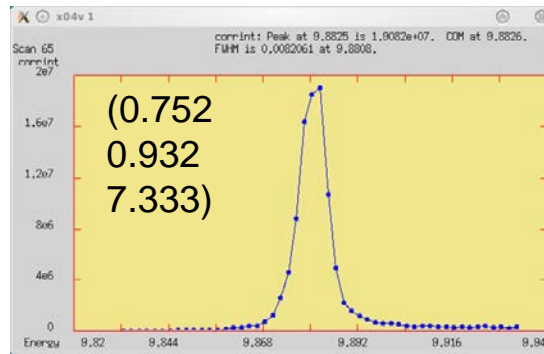
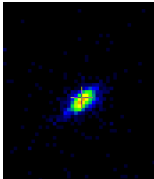
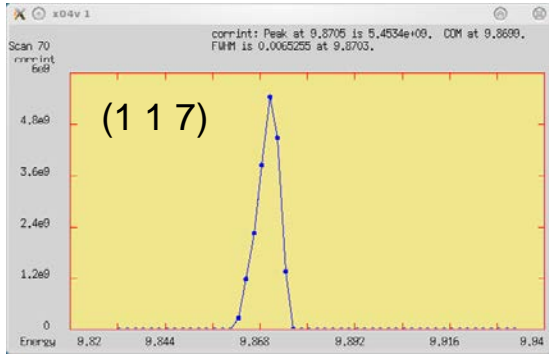
Flakes



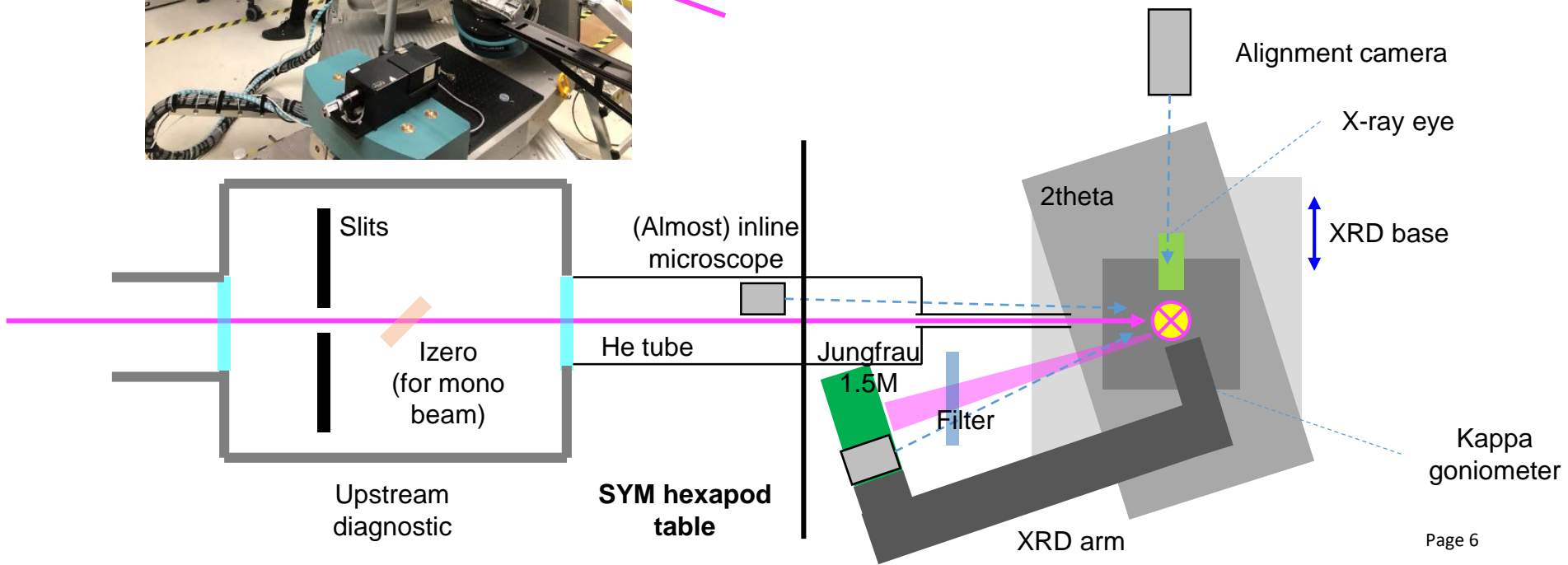
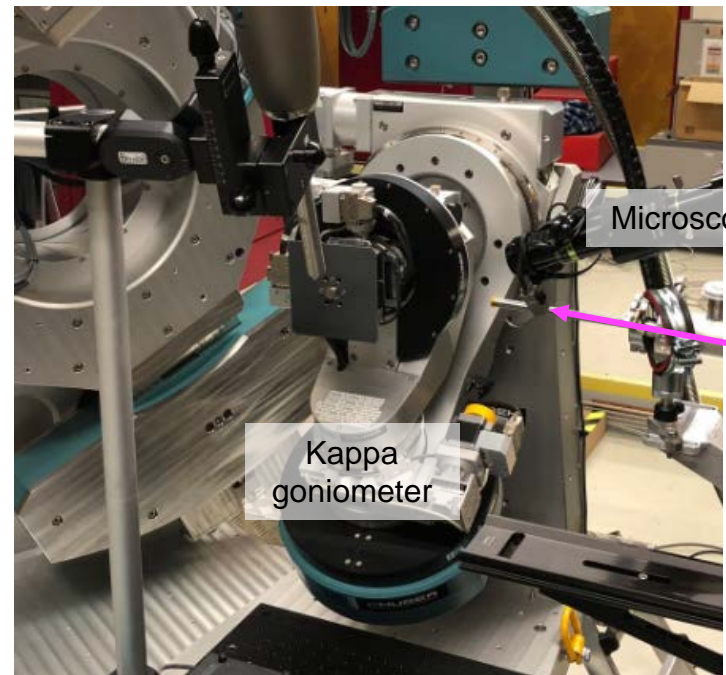
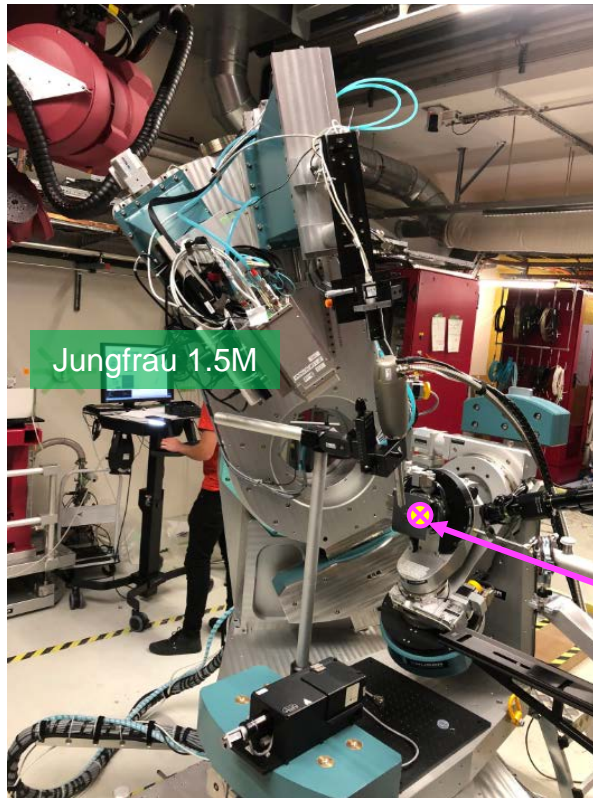
BerFL08



490 μm × 332 μm × 350 nm



Setup at Bernina



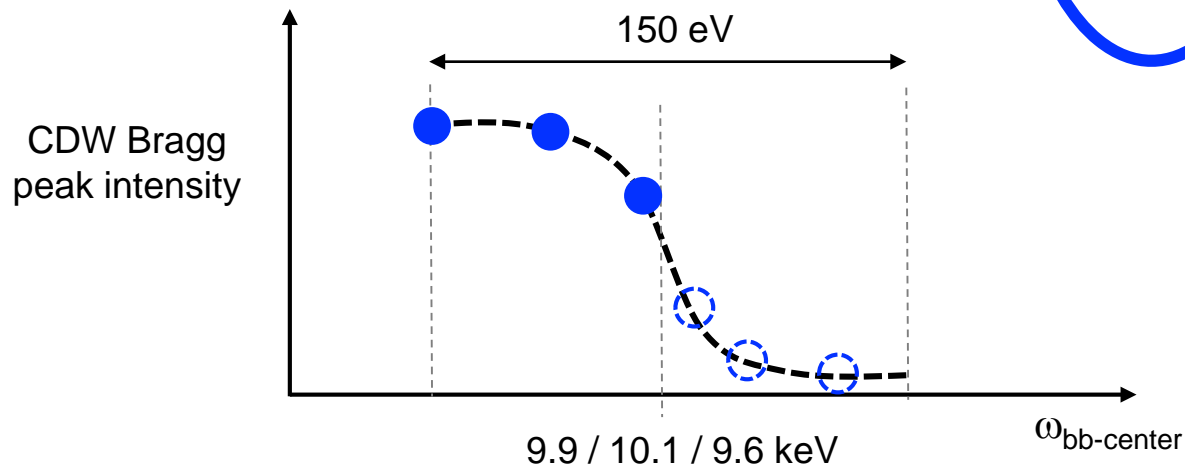
Experiment procedure

- Broadband mode characterization (bandwidth, trajectory, spectrometer readout, ...)

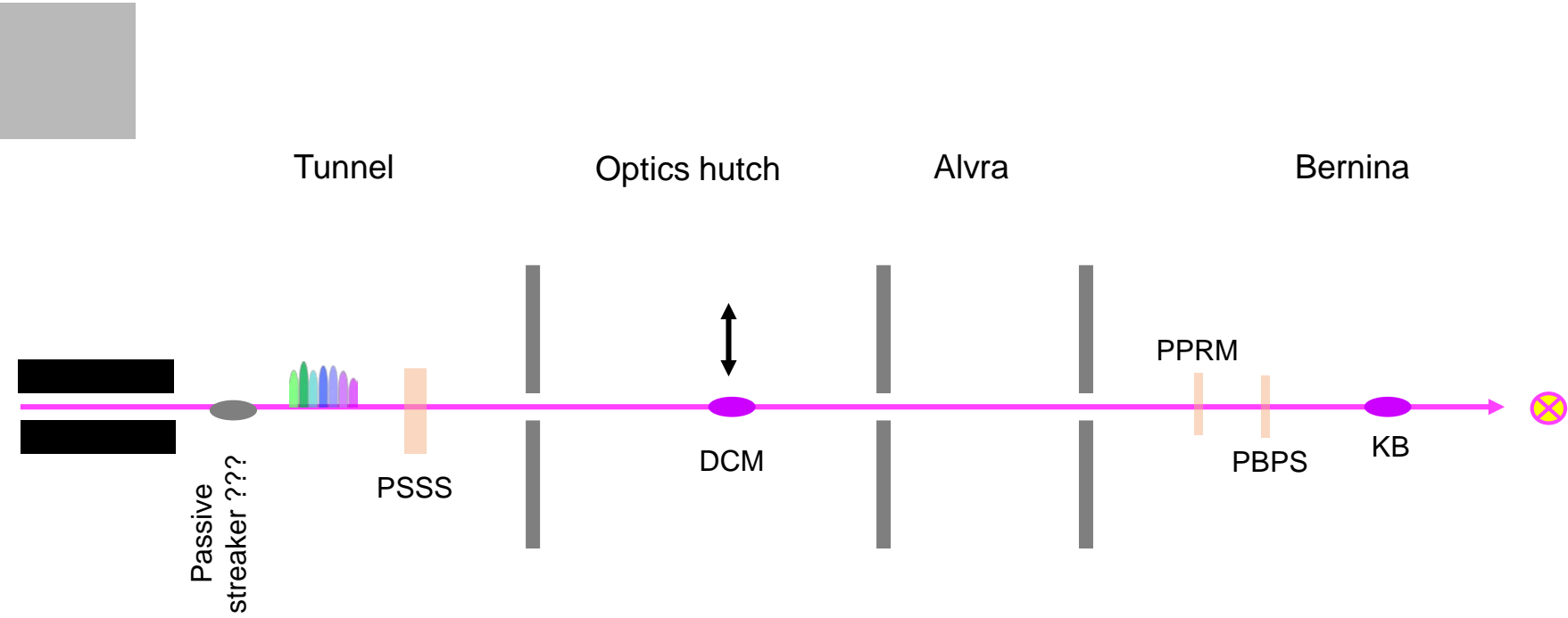
- Set center energy of broadband mode
- Measure Bragg peak intensity

Checks (trajectory, spectrum, ...)

Normalization



Machine and beamline setup



- Purely X-ray experiment, no optical pump
- Aiming at X-ray damage studies at timescales smaller than 10 fs
- «Playing» with the broadband mode: frequent move of central energy with cross-checks on trajectory and bandwidth
- Backup experiment: Silicon, valence order peak (222)
- Wished parameters:
 - Broadband mode, standard configuration (150 eV bw, 60 fs FWHM pulses)
 - ~10 keV, starting at 9.88 / 10.1 keV; backup 5 – 6 keV
 - Tunability of central photon energy by user over 200 eV (must) / 600 eV (wish)
 - Pulse energy > 300 μ J