

PAUL SCHERRER INSTITUT



Alexander Steppke on behalf of the Cristallina team

Cristallina commissioning 27/30.10.2022: report

SwissFEL exchange meeting, 31.10.2022

Schedule

		DI	DJ	DK	DL	DM	DN	DO	DP	DQ	DR	DS	DT
October													
		Aramis						Athos					
Wk	Date	A	B	C	S	Comment	D	M	F	S	Comment	V	
	Sat, 8												
	Sun, 9												
41	Mon, 10												
	Tue, 11					Huse, 2.5 keV, narrow BVV							
	Wed, 12												
	Thu, 13												
PC: Camille B.	Fri, 14												
	Sat, 15												
	Sun, 16												
42	Mon, 17												
	Tue, 18					CrMX					XHHG		
	Wed, 19					PRC							
	Thu, 20					PRC							
PC: Kirsten S.	Fri, 21					Open door prep day							
	Sat, 22												
	Sun, 23					Open door day							
43	Mon, 24												
	Tue, 25					Alva: 2.5 keV					User time converted to		
	Wed, 26												
	Thu, 27					CrQ pulsed map.: 6.5 keV							
PC: Kirsten S.	Fri, 28												
	Sat, 29												
PC: Kirsten S.	Sun, 30					CrQ pulsed map.: 6.5 keV							
44	Mon, 31												

Pulsed magnet setup – round 1

Requested photon beam parameters

- ~6.5 keV
 - Geometry of experiment, suitable Bragg peak
 - Need support from machine to scan photon energy (via electron energy) to find Bragg peak
- Pulse length: 20 fs rms (50 fs FWHM)
- Pulse energy: > 800 uJ, the higher the better but not critical
- (Stability in trajectory, 50 Hz jitter included ???)
- PSSS operational with correct Pulse-ID labeling

6.665 keV

> 1 mJ

not evaluable

To be evaluated

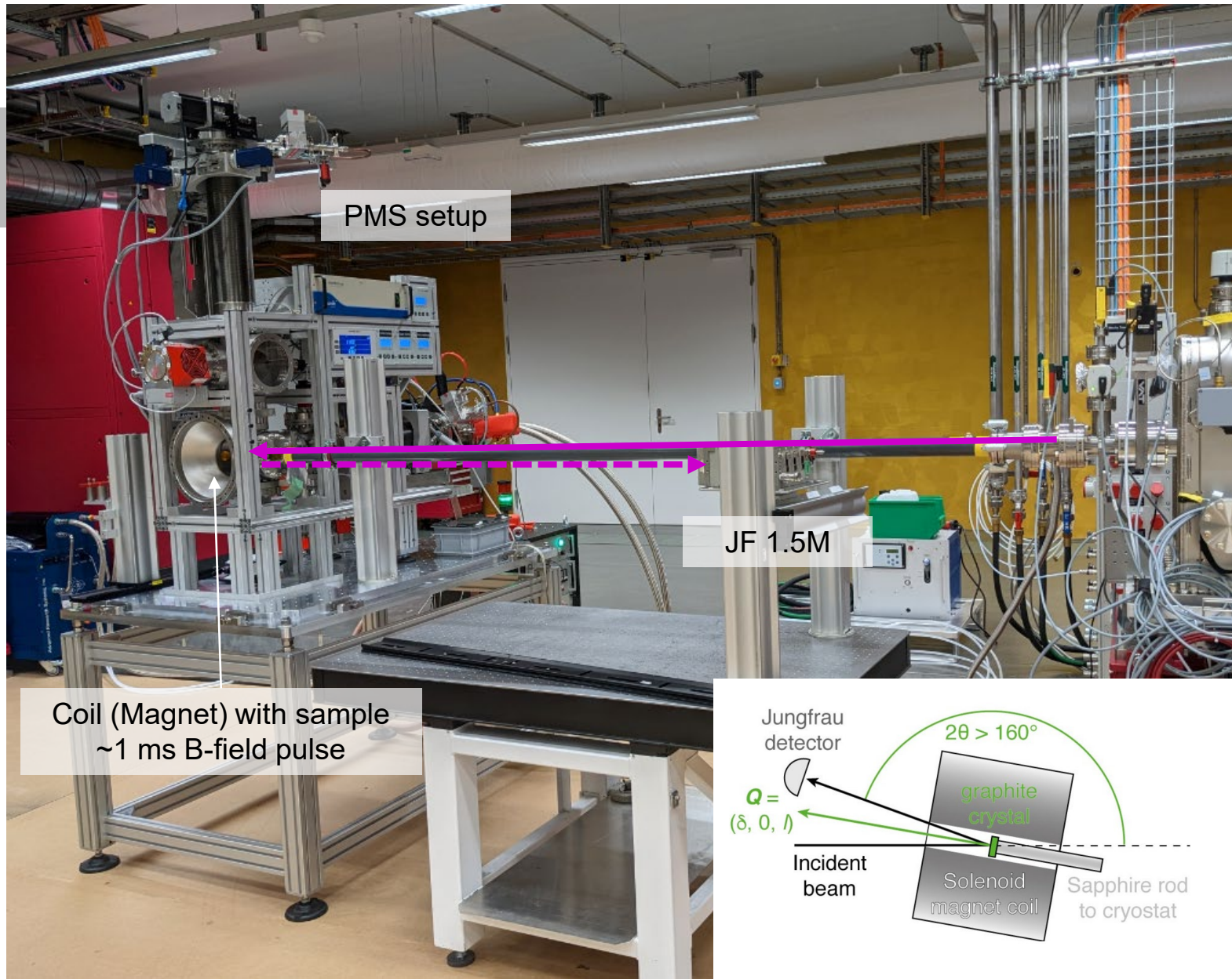
Preconditions:

- commissioning of cryostat ✓ Thanks to UZH workshop!
- motor controls (✓)
- electrical system incl. capacitor bank ✓ Thanks to E. Hüsler and his team!
- Fixing offset mirror motion control on Thursday until 16:00 ✓ Thanks Rolf, Kurt, Thierry!
- Smooth operation ✓ Thanks to control room crew!

Goals:

- Bring the beam on the sample (LSCO) and get the Bragg diffracted beam out of the coil
- Apply “B-field pulse”, measure “100 Hz series (10 data points before pulse, 1 data point on pulse, 89 data points after pulse)
- Measure magnetostriction (Bragg peak shift) as a function of magnetic field intensity up to 30 T

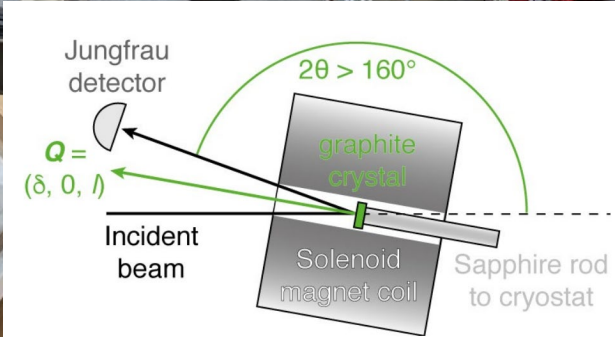
PMS setup



PMS setup

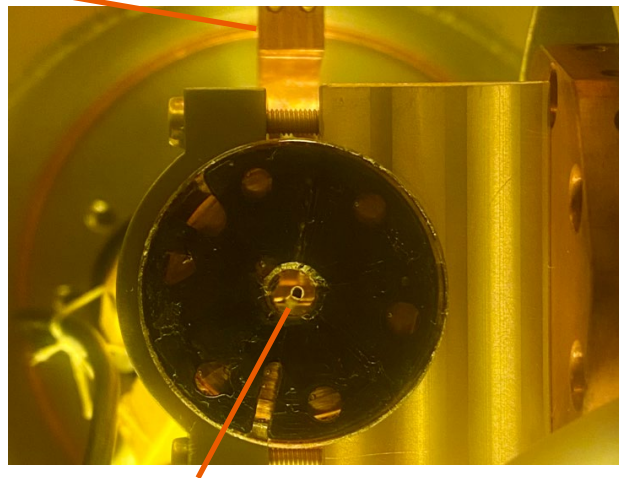
JF 1.5M

Coil (Magnet) with sample
~1 ms B-field pulse



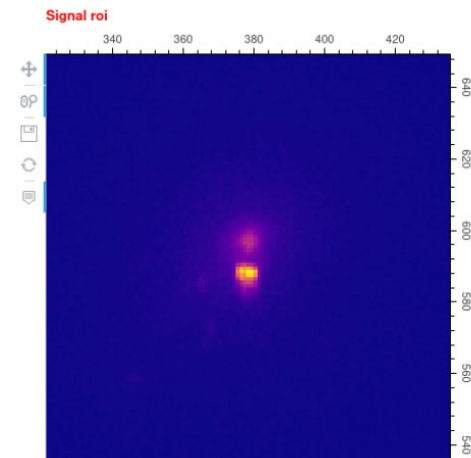
- PMS Instrument has limited degrees of freedom until placement on diffractometer (in spring 2023)
- Two routes to achieve scattering condition:
 1. 'Laue'-like: positioning of system, sample & magnet near nominal scattering condition and focus on energy scans: but unknowns multiply... ✗
 2. Alignment of sample separately, ✓
Bringing magnet and sample together to scattering position ✓

sample cryostat

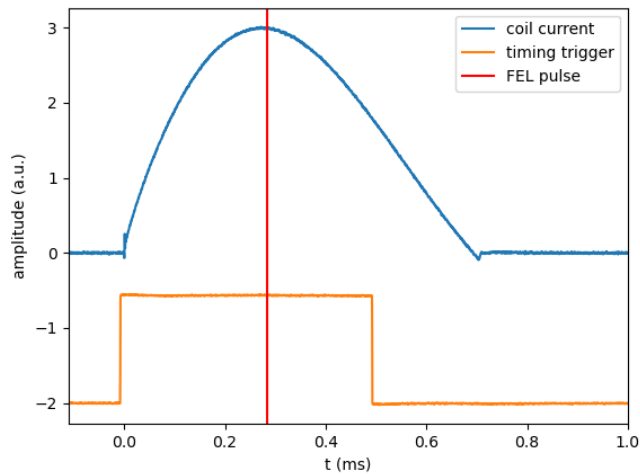


sample on sapphire rod

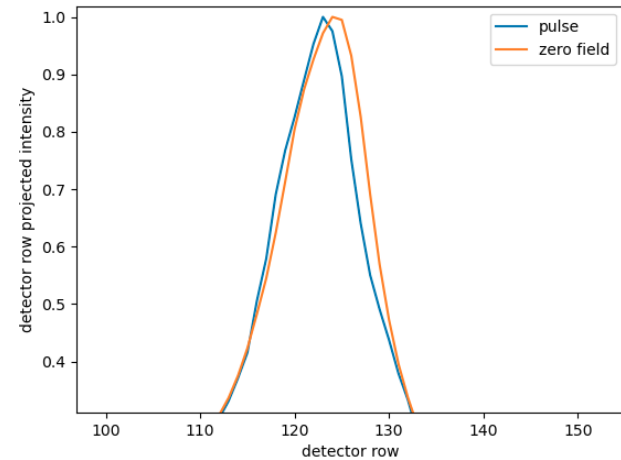
(0 0 14)



Timing adjustment of FEL pulse with maximum of magnet pulse



Preliminary magnetostriction signal from projection at 24T



Goals:

- Bring the beam on the sample (LSCO) and get the Bragg diffracted beam out of the coil ✓
- Apply “B-field pulse”, measure “100 Hz series (10 data points before pulse, 1 data point on pulse, 89 data points after pulse) ✓
- Measure magnetostriction (Bragg peak shift) as a function of magnetic field intensity up to 24 T ✓