

Integrated Platform for Ultrafast X-ray Spectroscopy

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SACLA

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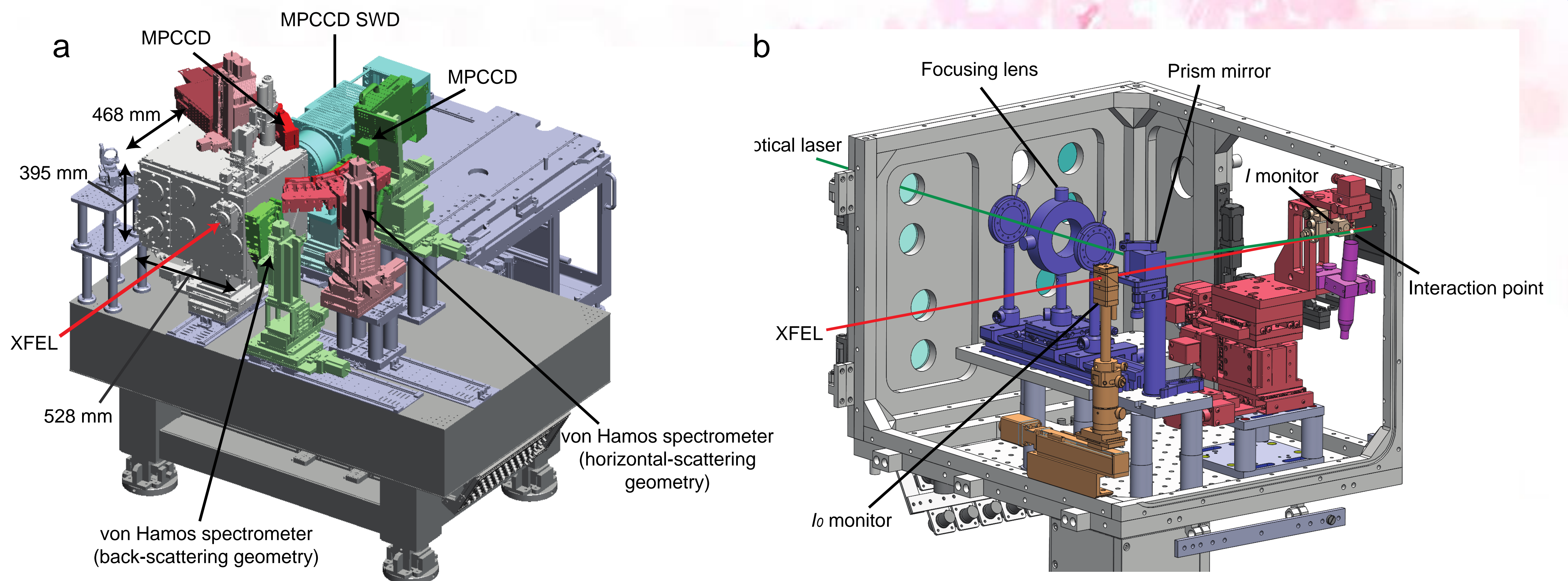
Ultrafast X-ray science using XFEL

X-ray free-electron laser (XFEL) SACLA has provided an unprecedented opportunity for studies of femtochemistry beyond optical-domain observables. To facilitate optical-pump X-ray-probe measurements of liquid samples at SACLA, we have developed a standard instrument, SACLA Pump-probe INstrumEnt for Tracking Transient dynamics (SPINETT), which covers complementary X-ray techniques, i. e. time-resolved X-ray absorption spectroscopy, time-resolved X-ray emission spectroscopy, and time-resolved X-ray solution scattering.

Overview

Main components

- Chamber (He compatible)
- 2 Von Hamos spectrometers
- 2 Single MPCCD
- SWD Octal MPCCD

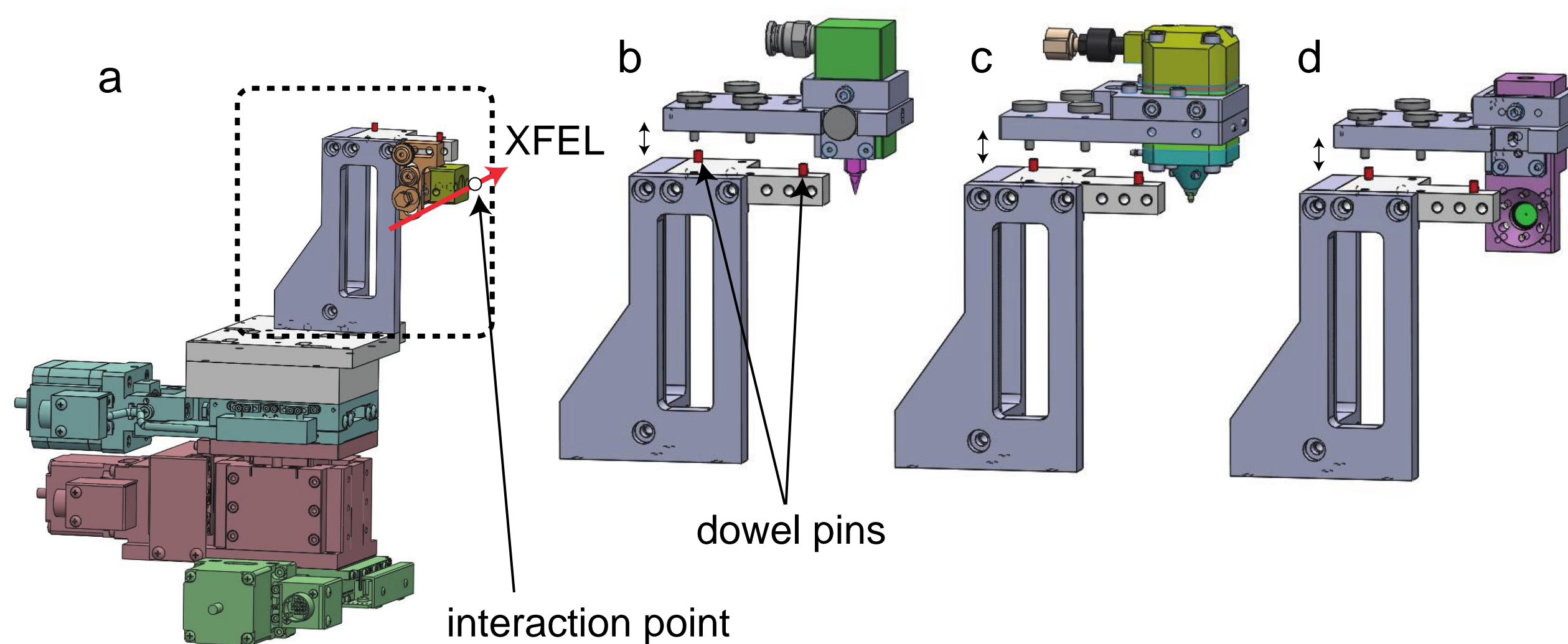


Katayama et al., *Struct. Dyn.* 6, 054302 (2019).

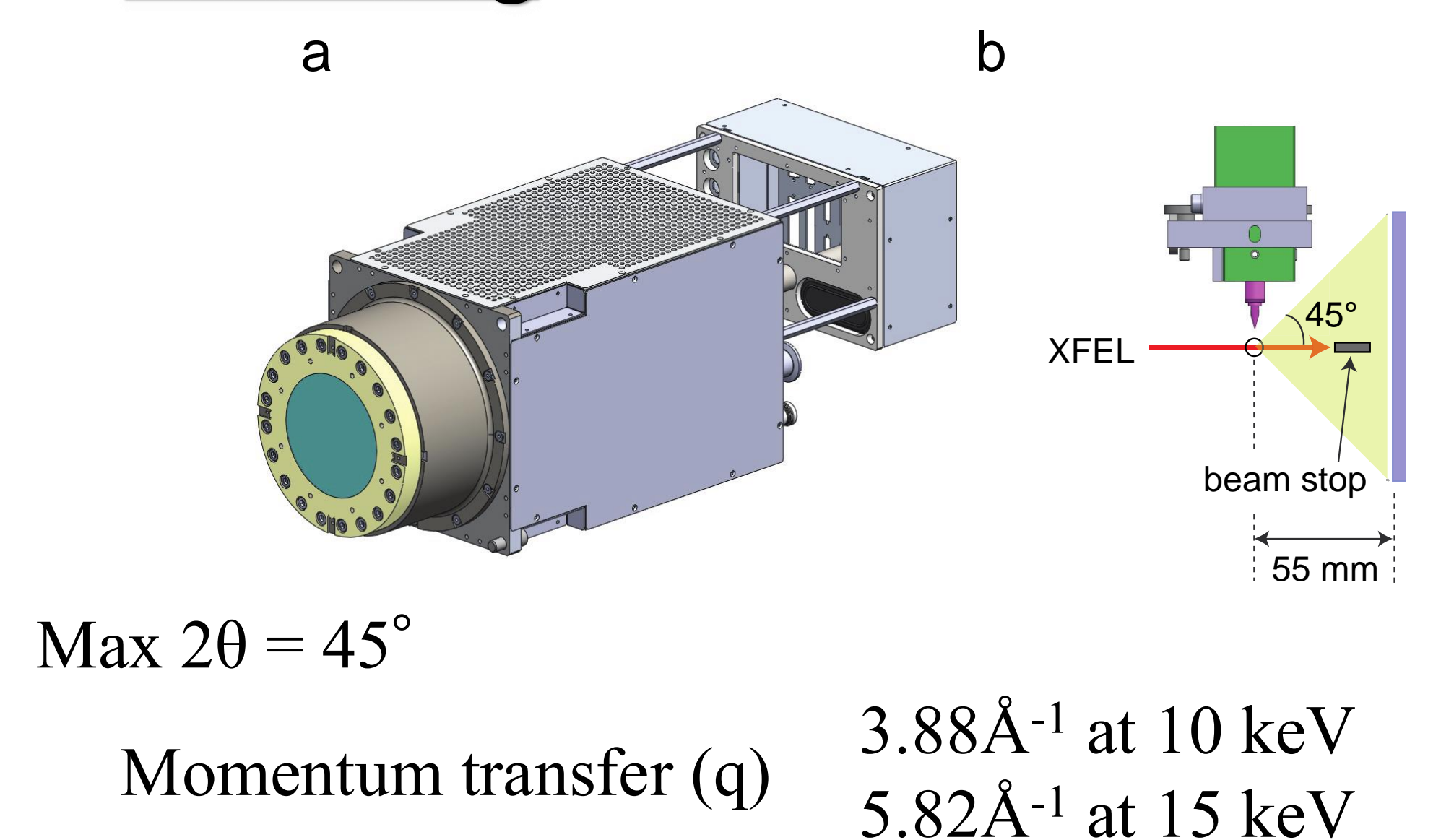
Injectors

For chemical solution (b),
I.D. = 30–500 μm
For protein microcrystals (c),
I.D. = 50–200 μm

Injectors and pinhole (d) are replaceable.



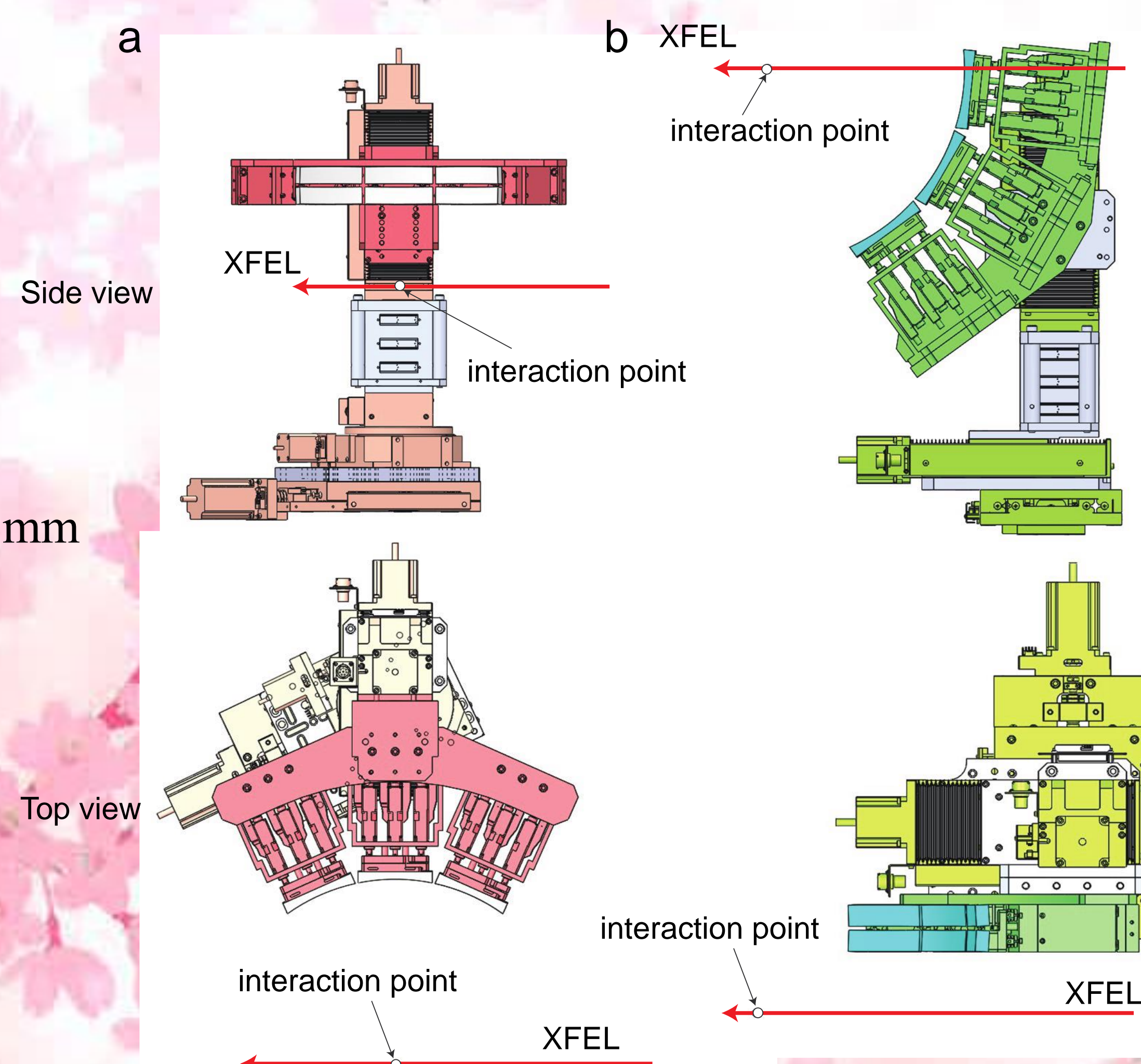
Scattering



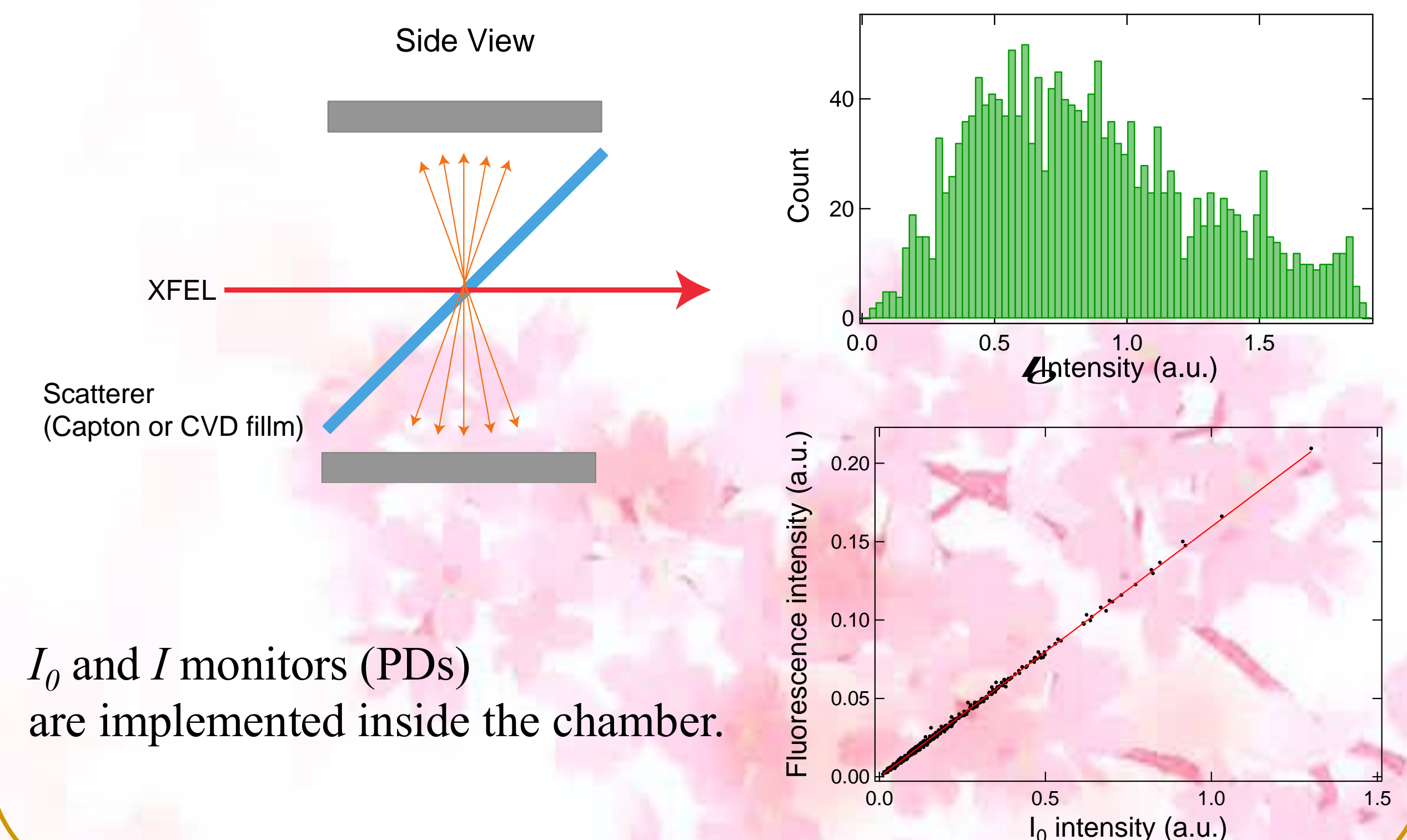
Von Hamos spectrometers

Parameters

- ROC = 250 mm
- $\theta_B = 65\text{--}75^\circ$
- Crystal size: 100 mm x 25 mm x 0.15 mm
- Six Johann crystals mountable
- Available crystals Si(531), Si(111), Ge(111), Ge(110)



Intensity correlation



Highlight publications

- Mara et al., *Chem. Sci.* accepted (2022).
- Katayama et al., *Nat. Commun.* 10, 3606 (2019).
- Kinschel et al., *Nat. Commun.* 11, 4145 (2020).
- Uemura et al., *Angew. Chem. Int. Ed.* 55, 1364-1367 (2016).