MAXIC: **M**ultiple **A**pplication **X**-ray **I**maging **C**hamber

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The project was to establish a multiple-application x-ray imaging chamber as a platform to accommodate various experiments of coherent x-ray scattering and imaging at SACLA. The MAXIC is designed to promote cutting-edge research carried out by best utilizing the unique characteristics of the new x-rays from SACLA. The research has put significant emphasis on developing particle injectors to facilitate XFEL single-particle imaging research.

The project of MAXIC has been progressed under active discussion with Prof. F. Mafune (Tokyo Univ.), Prof. Y. Nishino (Hokkaido Univ.) and Prof. S. Wada (Hiroshima Univ.), which helps us to ascertain enough flexibility to incorporate various coherent x-ray scattering experiments. On finishing the project we have completed to build an adaptable diffraction chamber and single particle injectors as detailed below.

(1) X-ray diffraction chamber

Technical specification:

- Compatible with high vacuum 1E-4 Pa
- Compatible with the liquid-jet injector
- Compatible with the gas-jet injector
- Minimum sample-to-detector distance is 70 mm: NA~0.58 using the MPCCD
- Maximum sample-to-detector distance ~ 3.0 m
- View ports available for pump-probe experiments

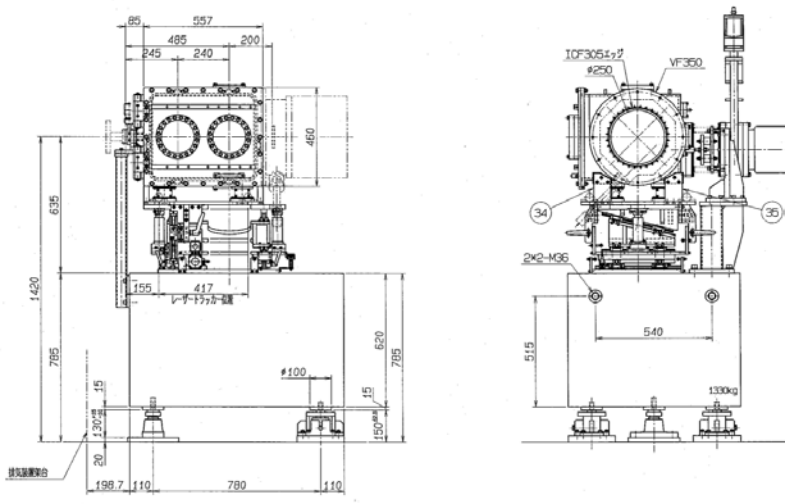

Figure 1 Schematics of the x-ray diffraction chamber mounted on granite for anti-vibration (Left) side view of the chamber (Right) front view. Dimensions are specified in mm scale.

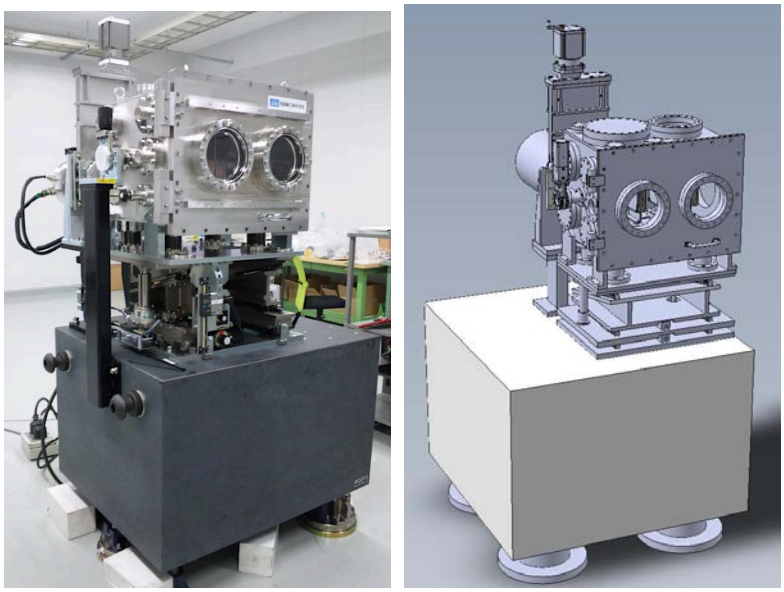

Figure 2 Coherent x-ray diffraction chamber built as a project of MAXIC. The diffraction chamber provides flexibility to accommodate various experiments such as single-shot diffraction imaging and fixed target experiments.

(2) Liquid jet injector

Technical specification:

- Liquid-beam diameter: tunable from 20 μm to less than 3 μm
- Flow rate: minimum 10 μL/min for 3 μm liquid-beam diameter
- Delivery liquid: DI water, ethanol, protein detergent solution, etc
- Focusing by pressurized He or Air
- Precise manipulation of the injector nozzle
- Available components: bore-lens for inline microscope, HPLC, etc

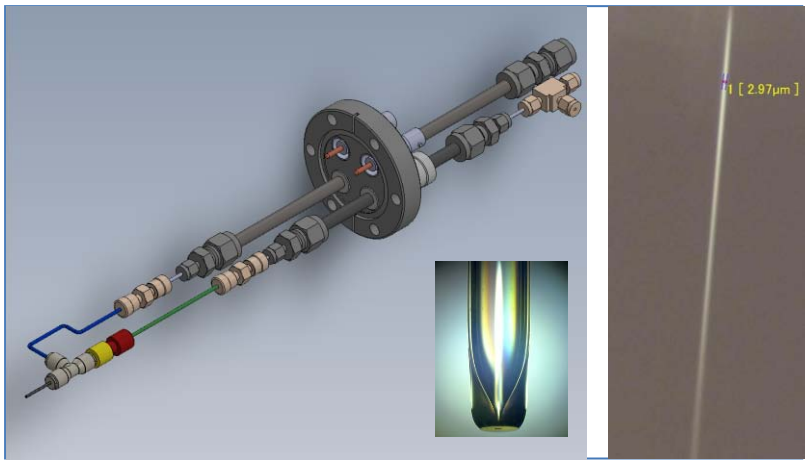

Figure 3 Liquid injector with air focusing. (Left) Schematics of the liquid jet injector developed for the single-particle experiment is displayed with the inset showing glass capillary. (Right) 3 micron liquid beam focusing is casually achieved.

(3) Aerosol gas jet injector

Technical specification:

- Loadable specimen size:
  ADL-I (available): optimized for 30 nm to 300 nm
  ADL-II (under consideration) 10 nm to 100 nm
- Focused gas-jet diameter: ~ 100 μm (ADL-I)
- Flow rate: 1.0 SLM
- Available components: TSM electro-spray, air compressor, etc.

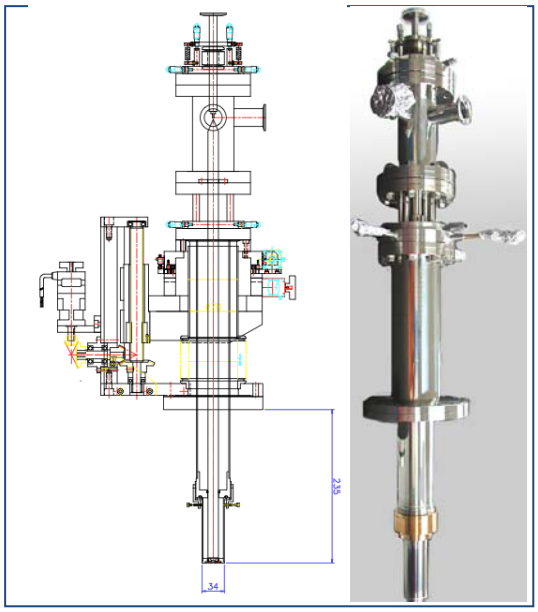

Figure 4 Aerosol injector developed for single-particle diffraction experiments at SACLA. The injector can be conveniently mounted on the diffraction chamber.