Experimental Setup of Temperature-Dependent Coherent Soft X-ray Scattering

Y.Y. Chu[1], H.W. Shiu[1], L.Y. Chang[1,2], S. Amol[1], C.H. Du[3], P. Hatton[4], T.Tyliszczak[5], D. J. Huang[1]

[1]*National Synchrotron Radiation Research Center, Hsinchu, Taiwan*
[2]*Institute of Functional Nano & Soft Materials, Soochow University, Soochow, China.*
[3]*Department of Physics, Tamkang University, Tamsui District, New Taipei City, Taiwan*
[4]*Department of Physics, Durham University, Durham DH1 3LE, United Kingdom*
[5]*Advanced Light Source, Lawrence Berkeley National Laboratory, Berkeley, CA, USA*

We present a design of temperature-dependent soft X-ray coherent scattering at the Taiwan Photon Source. This two-circle diffractometer endstation enables performing lensless imaging which includes spatially-resolved soft X-ray diffraction and scanning coherent diffractive imaging, i.e. ptychography.

With installation of a unique capillary focusing optic, the incident X-ray beam with 200 nm focusing spot size at sample position (working distance about 8.5 mm) is expected. This enables us to perform temperature-dependent imaging experiments in both transmission and reflection. We also exploit a high-precision laser interferometer feedback system with a nanometer scale resolution to compensate the sample position change due to thermal drift and vibration.

Using this new setup, we can perform coherent soft X-ray scattering to reveal electronic and magnetic properties of strongly correlated-electron materials at the nanometer scale.

Keywords – Soft X-ray Coherent scattering, ptychography, capillary focusing optic.