

# FOCUS PEEM in SPring-8 designed for magnetic dynamics study with synchrotron radiation

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In the synchrotron radiation facility, SPring-8, we newly installed FOCUS PEEM in 2017 [1] and now it has routinely been used in domestic / public experimental subjects. Previously, we had complementarily used two types of PEEM machines. One is a spectroscopic low-energy/photoemission electron microscope (LEEM III, ELMITEC GmbH) at a-branch of BL17SU RIKEN soft X-ray beamline, which has dedicated to high resolution and static imaging. Another PEEM (PEEMSPECTOR, ELMITEC GmbH) had been utilized in BL25SU soft X-ray beamline as a versatile machine whose resolving power was moderate but useful for experiments under extreme situations (e.g. time-resolved measurements, imaging under applied external fields), thanks to its simple optics structure. However, since the performance of PEEMSPECTOR has been deteriorated due to long-term use, the FOCUS PEEM installed at b-branch of BL17SU is now succeeding its role as a higher-end machine. In our FOCUS PEEM system, instead of adopting integral sample (IS) stage (which is very convenient for laboratory experiments with fixed research targets), we independently constructed a high-stiffness six-axis (X, Y, X-tilt, Y-tilt, Z, and  $\phi$ ) sample manipulator, in order to cope with samples of various shapes and experimental conditions. A robust manipulator body attached to a stiff carved chamber offers a highly stable measurement environment, with which an achieved spatial resolution of an image with mercury lamp was 36.7 nm.

In the talk, I introduce specifications of our PEEMs and light sources available in our soft X-ray beamline, previous scientific achievements with a focus on time-resolved magnetic structures analyses such as an observation of gigantic spin waves in the process of pulsed laser irradiation to ferrimagnetic thin films [2], and future outlook of magnetic dynamics studies using the FOCUS PEEM such as observations of nucleation process of micron-sized magnetic vortices, as well as technical development plans.

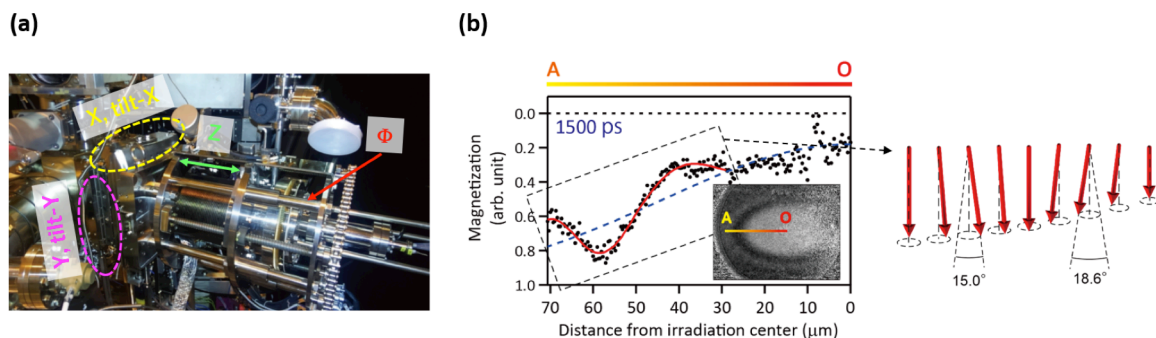


Figure 1: (a) 6-axis manipulator equipped in our FOCUS PEEM system. (b) Laser-pulse induced giant spin waves discovered in  $\text{Gd}_{22}\text{Fe}_{70}\text{Co}_8$  ferrimagnetic thin film observed by time-resolved XMCD-PEEM ( $\text{Gd } M_5$ ).

## References

- [1] T. Ohkochi *et al.*, Jpn. J. Appl. Phys, **58**, 118001 (2019).
- [2] T. Ohkochi *et al.*, Appl. Phys. Express **10**, 103002 (2017).