# Demonstration of Hard X-ray Self-seeded XFEL with High Brightness and Stability for Serial Femtosecond Crystallography

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Researchers at the Pohang Accelerator Laboratory XFEL demonstrated a hard X-ray self-seeded XFEL, achieving a peak brightness of **3.2 × 10³⁵ photons s⁻¹ mm⁻² mrad⁻² 0.1% BW⁻¹** at **9.7 keV**. The system produced a narrow bandwidth of **0.19 eV**—about **1/70** of that in self-amplified spontaneous emission (SASE)—with **40 times higher spectral brightness** and improved stability. The self-seeding performance was consistent across photon energies from **3.5 keV** to **14.6 keV**. At **14.6 keV**, the XFEL achieved a bandwidth of **0.32 eV** and a peak brightness of **1.3 × 10³⁵ photons s⁻¹ mm⁻² mrad⁻² 0.1% BW⁻¹**. The cleaner spectrum and higher reproducibility of the self-seeded FEL led to superior data quality in serial femtosecond crystallography (SFX) experiments, compared to SASE mode. A demonstration experiment using **9.7 keV** self-seeded XFEL successfully mapped the **three-dimensional structure of lysozyme** from chicken egg white.

#### [1] Nam, I., Min, CK., Oh, B. et al. (2021) *Nat. Photonics***15**, 435–441.