# Advanced Capabilities of the HESEB Soft X-ray Beamline at SESAME for Multi-disciplinary Scientific Research

Dr. Mustafa Fatih Genişel, Dr. Zeynep Reyhan Öztürk

SESAME, JORDAN

The HESEB (Helmholtz-SESAME Soft X-ray Beamline) at SESAME (Synchrotron-light for Experimental Science and Applications in the Middle East) is an advanced research facility specializing in the generation and utilization of soft X-rays for a wide range of scientific studies. This facility specifically focuses on scientific investigations in materials science, environmental science, and cultural heritage.

HESEB, the first Soft X-ray beamline at SESAME, is dedicated to providing researchers with advanced tools and capabilities for conducting experiments in the energy range of approximately 70 eV to 1800 eV. Its photon source, an Apple II-type Undulator, produces highly collimated and tunable X-ray beams, while a Plane Grating Monochromator (PGM) allows researchers to finely select the desired energy range for their experiments. The HESEB end station is well-equipped with essential components, including an analysis chamber containing a motorized sample holder and detectors. Within this chamber, researchers can investigate various aspects of materials and samples, spanning from probing electronic structures and chemical compositions to exploring elemental specific magnetic properties. The HESEB end station contains a fluorescence detector to measure the characteristic X-ray fluorescence emission. Researchers can perform total electron yield measurements using a motorized manipulator to provide information about the electronic properties and surface behavior of materials. The capability of differential pumping at the end station is a critical technical component that enables the application of soft X-ray techniques for non-destructive analysis and preservation of cultural heritage. Of particular note is the HESEB's capability to investigate elemental-specific magnetic properties through the application of X-ray Magnetic Circular Dichroism (XMCD) techniques, utilizing circular polarization.

The Soft X-ray beamline HESEB at SESAME is a state-of-the-art research facility with a specific focus on soft X-ray spectroscopy. It empowers researchers to conduct a diverse range of experiments and investigations across multiple scientific disciplines, ultimately fostering collaboration and contributing to scientific advancements not only in the Middle East but globally.

**Keywords:** SESAME, HESEB, Soft X-Ray techniques, XMCD.