**Advancing RIXS: New Instrumental Capabilities for Operando and Field-Dependent Studies at the SEXTANTS Beamline**

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Over the past decade, Resonant Inelastic X-ray Scattering (RIXS) has emerged as a powerful experimental tool for probing key electronic, magnetic, and lattice excitations in condensed matter systems. Recent advancements, particularly in spectral resolution and theoretical understanding, have enabled RIXS to capture these excitations with unprecedented precision, establishing it as essential for exploring complex material properties. With this evolution, interest in applying RIXS to study materials under specific conditions—such as operando and under external fields—is rapidly growing, motivating new experimental developments.

To address this growing demand for studying materials under specific conditions, a unique sample environment was designed on the RIXS spectrometer at the SEXTANTS beamline (SOLEIL). This setup, called MAGELEC, enables RIXS measurements under controlled electric and a vectorial magnetic field up to 0.5 T, allowing for operando RIXS(-MCD/MLD) studies. Additionally, we have integrated a new spectrometer dedicated to X-ray Excited Optical Luminescence (XEOL) measurements, enabling the measurement of photoluminescence phenomena and to correlate them with the electronic structure measured by RIXS. Finally, a newly commissioned CMOS detector drastically improves data acquisition and preprocessing for RIXS. All together, these advancements provide enhanced experimental versatility, enabling more comprehensive investigations of material properties in controlled settings.

In this presentation, I will provide an overview of these recent improvements, including the MAGELEC sample environment, the integration of the XEOL spectrometer, and the enhanced capabilities offered by our new detector. In addition to experimental illustrations of the instrument’s new capabilities, I will present how these features can be combined to study systems of current interest, exemplified by the topical van der Waals magnet CrSBr.