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HRXS – a new High Resolution X-ray Spectrometer for LMJ

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HRXS (High Resolution X-ray Spectrometer) is a new plasma diagnostic recently implemented on the LMJ facility. It is dedicated to atomic physics and more specifically to NLTE [a] spectroscopy and opacity measurements in the 0.8 - 30 keV energy range.

This diagnostic consists in ten measurement channels implemented in three different boxes. The central box contains four measurement channels associated to an MCP X-ray framing camera for time-resolved spectra measurements. Each of the two lateral boxes contains a set of three channels and a CCD camera to record time-integrated spectra.

Each channel is equipped with a cylindrical Bragg crystal in either reflection or transmission geometry, an adjustable shot-to-shot filter (thanks to a four-position filter wheel), and a slit for spatial resolution. The channels are fully customizable, allowing both spectral range and spectral resolution to be adapted to experimental requirements. The slits positions can also be easily changed between experimental campaigns to adjust the magnification and thus the field of view along the spatial dimension.

Opacity measurements can be performed by combining each of the four central channels with a grazing incidence spherical mirror (half-KB [b]). This geometry allows hard X-rays to be filtered out, using the energy cut-off of the mirrors, which tends to improve the spectra quality by suppressing the higher order of diffraction of the crystals.

HRXS is also equipped with a tungsten alloy collimator at the front end and a debris shield consisting of three successive rolls of aluminized Mylar filters to protect the crystals and detectors.

This poster will outline the latest results obtained from the qualification campaign and the first opacity measurements.

[a] Non-Local Thermodynamic Equilibrium
[b] Kirkpatrick-Baez microscope