A twin-elliptical-crystal time and space-resolved soft x-ray spectrometer

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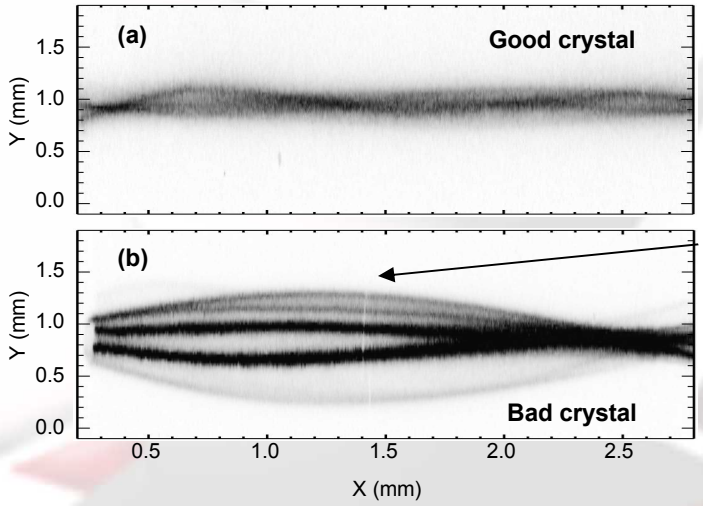
ABSTRACT

Elliptical crystal spectrometers equipped with a time gated microchannel plate (MCP) detectors provide time-, space-, and spectrally- resolved data. A common problem is that the number of time resolution elements is limited by the number of MCP frames. The number of frames that fit on a given MCP is in turn limited by the image size and the alignment tolerance. In practice, this limits the number of frames used for ICF capsule implosion spectroscopy measurements to 6 – 8. At the Z facility these problems have been addressed with twin elliptical spectrometers. Using two crystals doubles the number of frames available. This enables measurements with 350 psec time resolution while still recording data from a ~ 4 nsec wide time window.

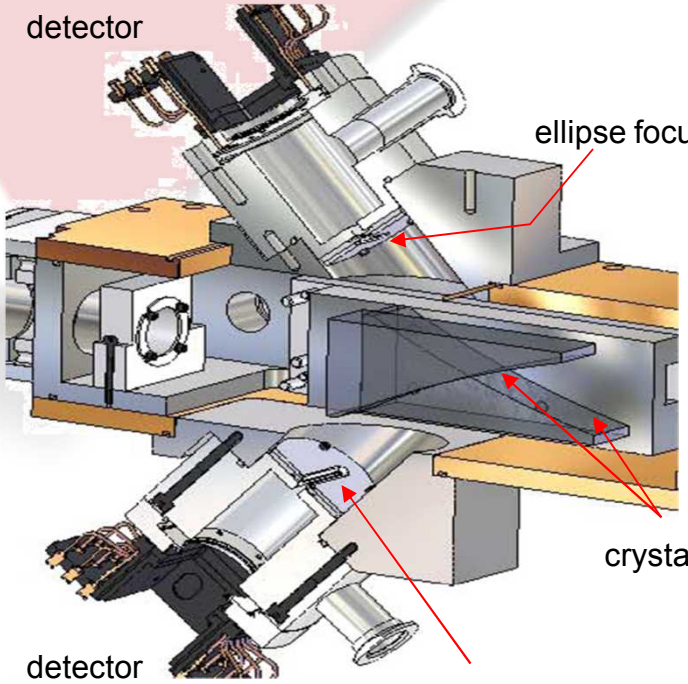
Alternatively, the twin crystal design allows simultaneous measurements with different crystals to investigate different spectral regimes. The spatial and spectral resolutions are ~ 85 microns and $\lambda/\delta\lambda$ ~ 800 – 1000, respectively. The spectra provided information about capsule implosion plasma symmetry, temperature, and density

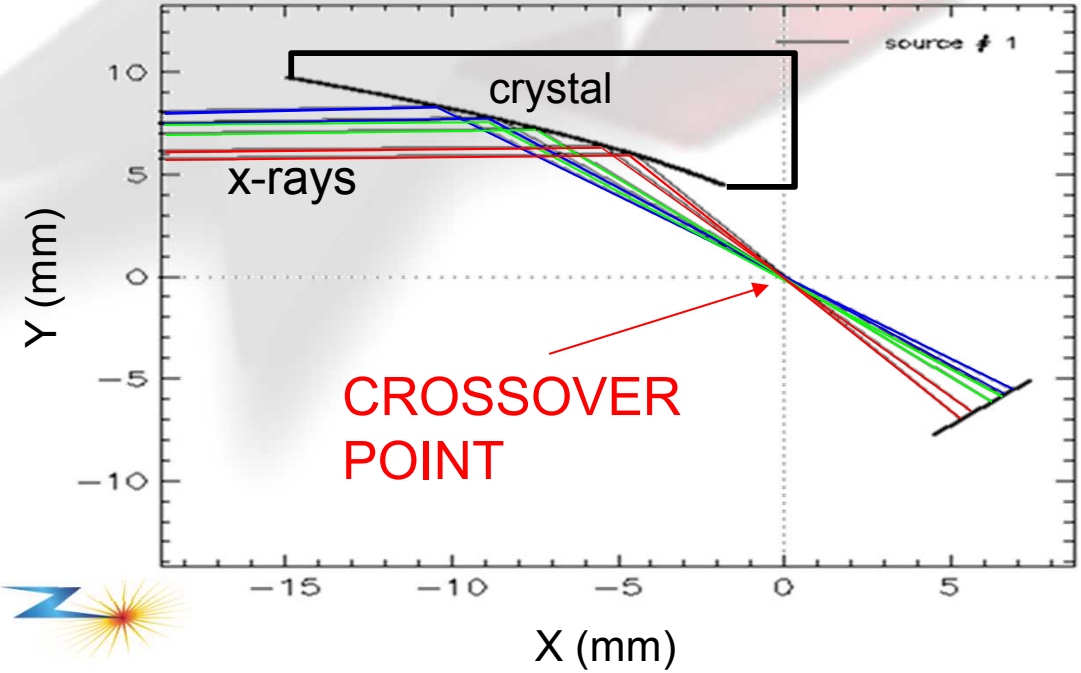
CROSSOVER CALIBRATION

Image at crossover



Rays not focusing due to Imperfections in crystal





Def film placed at crossover point for calibrations

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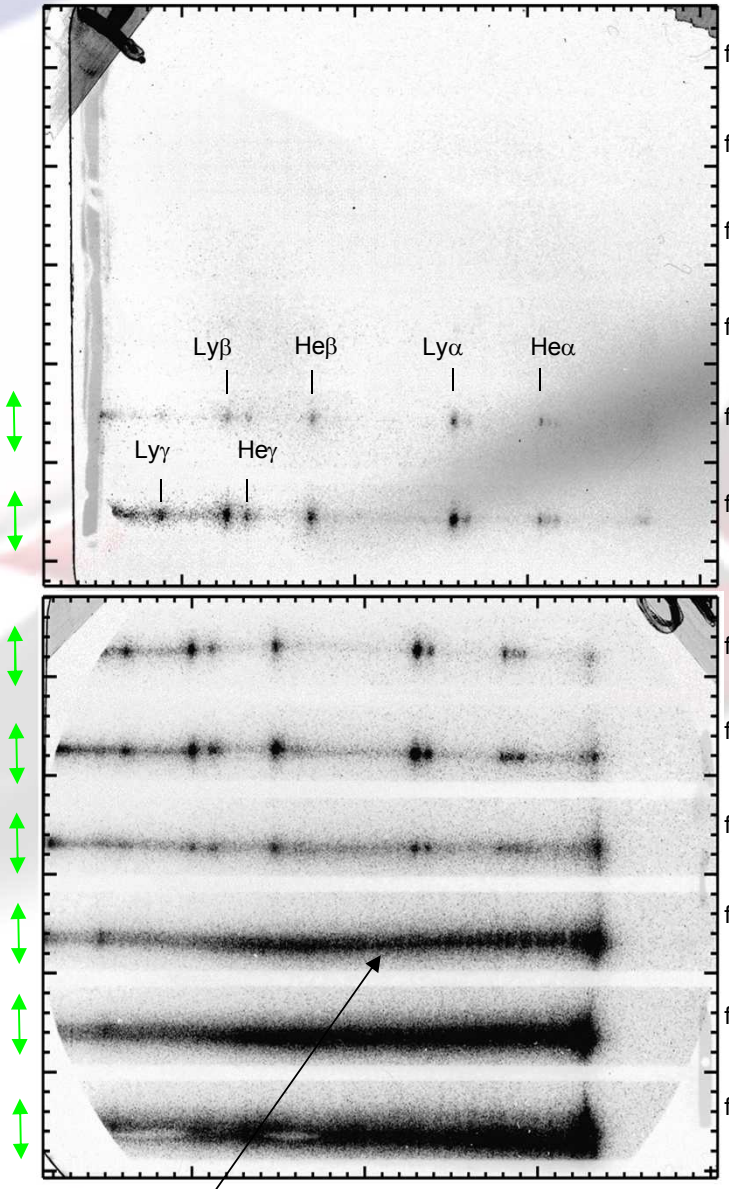
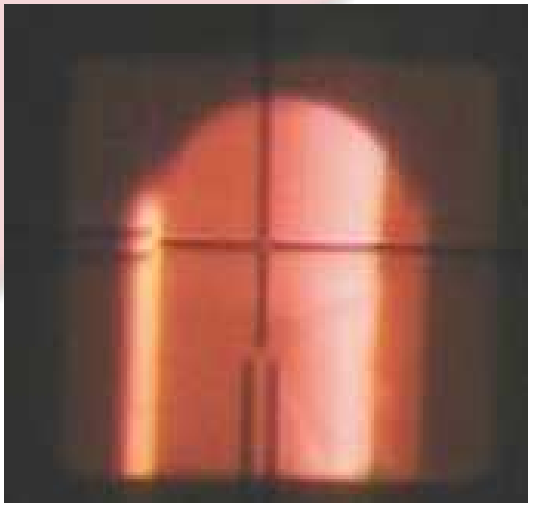
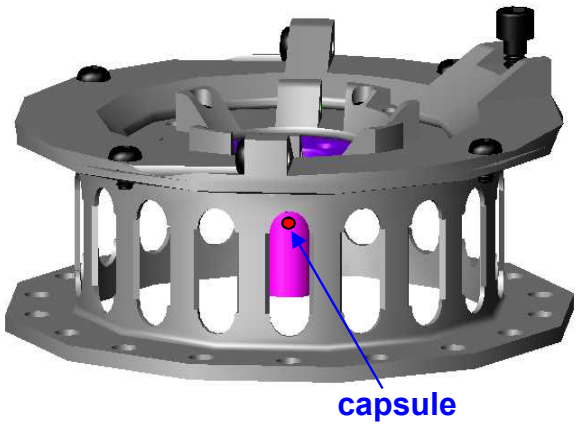
Shot data of Ar capsule core emission



View through telescope at 4.1 meters



Modeled view



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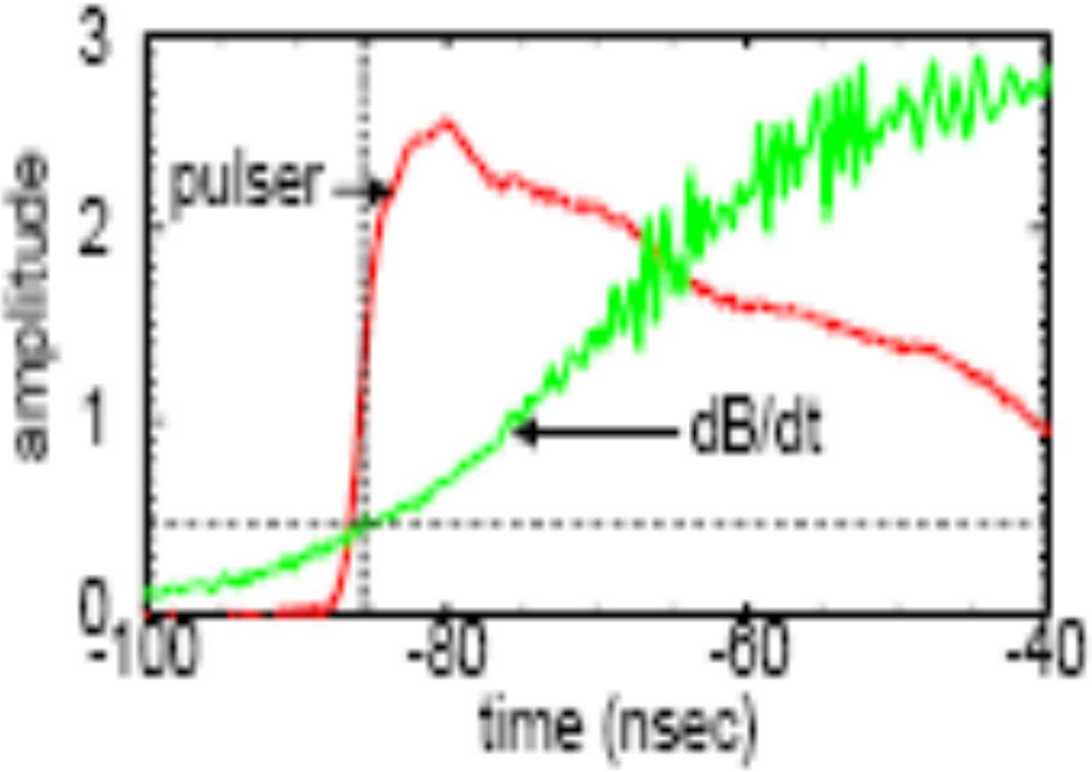

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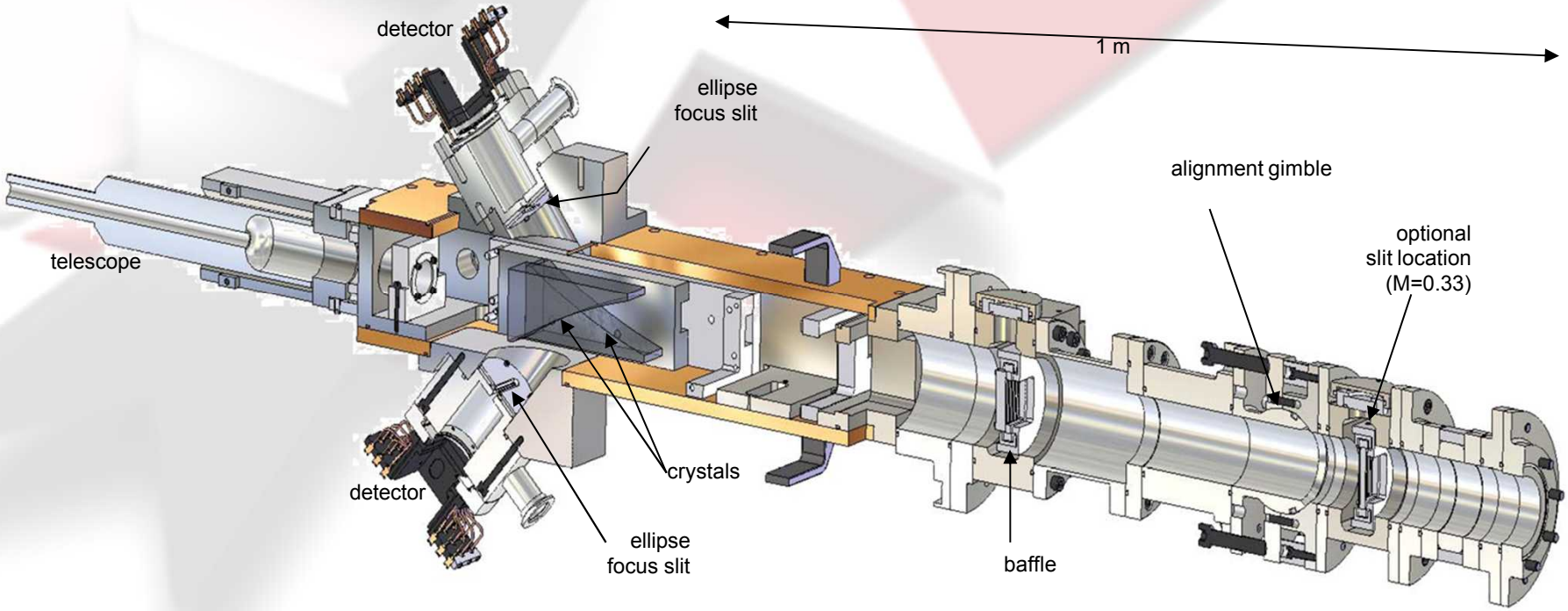

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