Grazing Incidence Spectrometers

Modes of Operation

There are several ways the Grazing Incidence Spectrometer can be configured. Typically the decision about the configuration is determined by the application or experimental requirements. For example, to diagnose transient plasmas the user will likely want (or need) to collect a range of data quickly and possibly with temporal resolution. This would result in an instrument equipped with a microchannel plate intensifier possibly with gating capabilities. In contrast, to monitor a narrow region of spectra (e.g. x-ray laser) a CCD can be used for higher resolution direct detection but with much longer time scales.

- Grazing Incidence with scanning exit slit for access to shortest wavelengths and use with conventional detectors (channel electron multiplier or scintillated photomultiplier tubes).
- Grazing Incidence with microchannel plate intensifier for direct detection tangent to the Rowland circle focus is averaged over detector surface.
- Grazing Incidence in reverse configuration with light source on scanning carriage. Tune to specific wavelengths and have a fixed trajectory exit beam for calibration and reflectometry applications.

Historical

McPherson designed and built the first commercial grazing incidence spectrometer for Columbia University in 1967. Until then a void between the operating range of crystal and Normal Incidence monochromators existed. The grazing incidence geometry pushed the limits of reflective optics, diffraction gratings and precision machining.

A 10.6 meter focal length Grazing Incidence instrument was built for the National Institute of Standards and Technology which (NIST) uses large film plates for operation as a spectrograph. This instrument collects unsurpassed data to this day.

McPherson 10.6-meter focal length Grazing Incidence Spectrograph at the National Institute of Standards.