# XUV, Soft X-ray and Extreme Ultraviolet (EUV) spectroscopy using a cooled direct detection CCD Camera

McPherson Instruments designs precision analytical tools that help scientists and researchers to investigate molecular and atomic spectra from the infrared into the soft x-ray and short ultraviolet wavelength regions. The company is based in Chelmsford, MA.

Their Model 251MX flat field spectrograph uses spherical substrate gratings with aspheric wave-front recording for an aberration corrected, high resolution spectrometer working through the deep UV and soft x-ray region. The instrument is ideal for soft x-ray, extreme UV (EUV) and vacuum ultraviolet analysis. The long focal length and straight spectral lines provide excellent spectral resolution. The spectrograph is ideal for use with direct detection CCD detectors. The combination provides fast, easy collection of high-energy XUV spectra.

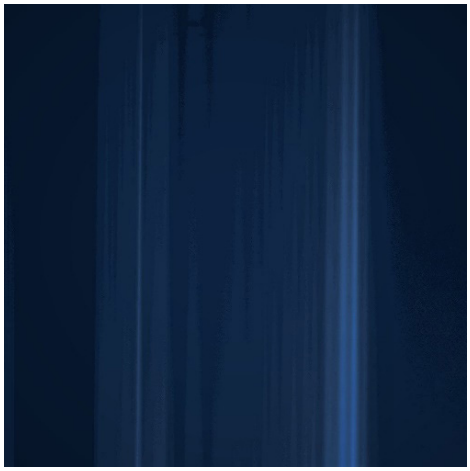

**Figure 1:** Full sensor Image acquired with deuterium light source: (short wavelength Lyman-α towards right side)

McPherson was able to collect spectra with a deep cooled (-80  C) CCD, the Eagle 47-10 having the 1024 x 1024 pixel sensor and with 13 um square pixels.

There was enough wavelength range to see the complete deuterium emission spectrum as seen in Figure 1.

According to Erik Schoeffel, Sales Coordinator at McPherson Instruments, “We were pleasantly surprised that this combination of direct-detection CCD and grating allows for simplified setup! With slits at 25 microns width or less, the mercury 184.9 nanometer emission line is easily detected. This is very useful since the mercury emission line may be observed without cooling the sensor or even having vacuum in the spectrometer. Operating in this manner, in air and with ambient temperature CCD detector, allows one to set-up and focus the 251MX instrument on the bench. No need to also operate a vacuum system or push the performance of the detector during initial testing. Very nice.”

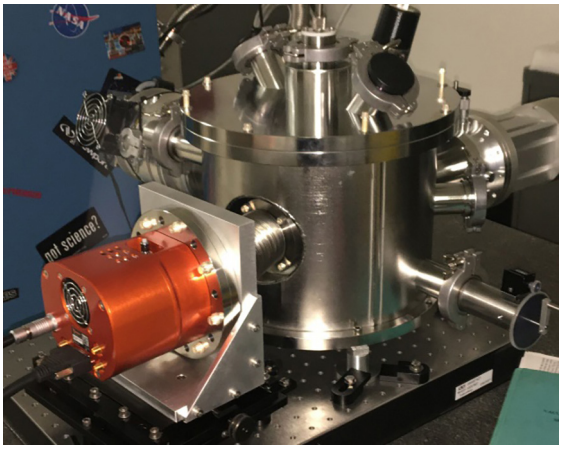


**Figure 2:** The Eagle XO on the 251MX spectrometer

“The deep cooled Raptor Photonics Eagle XO camera package with the 47-10, or with other sensors, is an excellent detector system for ultraviolet and even soft x-ray spectroscopy depending on the spectrograph’s optical design and wavelength capabilities” Mr. Schoeffel continued.

The new 120 g/mm diffraction grating for the Model 251MX provides great wavelength coverage, 50~200 nanometers or more on a 25 mm wide sensor.
The Raptor Photonics Eagle uses a 13.3 mm wide sensor which translates to seeing about 80 nm range simultaneously. It is enough range to see the complete deuterium emission spectrum.

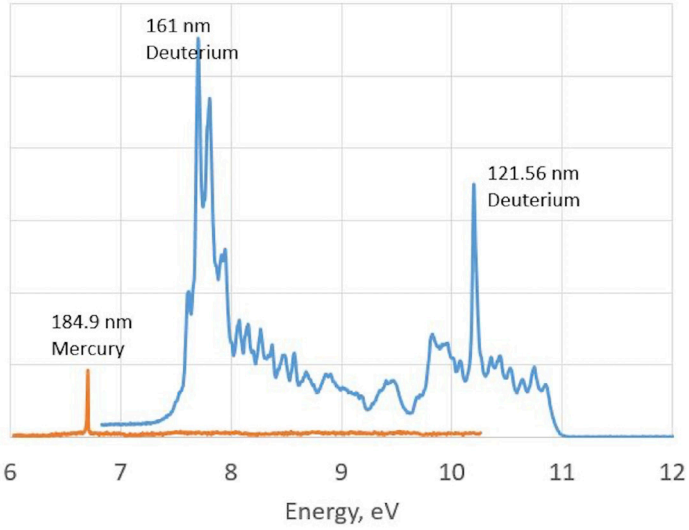


**Figure 3:** Spectra showing both Mercury and Deuterium lines

*Images and data courtesy of McPherson, USA*

The McPherson 251MX is easy to use. It has a two position grating mount for precise wavelength selection and positioning of multiple optics. Micrometer adjustable slits vary from 0.01~3 mm in width. This instruments flat field design is just as easy to use as a spectrograph with a microchannel plate intensifier or direct-detection CCD detector.

Raptor has worked closely with McPherson to develop an OEM CCD camera solution.

**Figure 4:** Eagle XO CCD camera

Raptor works with many OEMs and instrumentation companies across the world in scientific, surveillance and industrial applications, who need custom designs to meet their exact detection requirements. We develop robust solutions through a detailed project management system. Our quality, reliability, flexibility, and fast delivery make us a very attractive solution for OEMs.

**Raptor UK (Headquarters)**
T: +44(0)2828 270 141
E: sales@raptorphotonics.com
**www.raptorphotonics.com**

**McPherson Inc.**
T: +1 (978) 256-4512
E: sales@McPhersonInc.com
**www.mcphersoninc.com/**

**Raptor USA**
T: +1 (877) 240-4836
E: sales@raptorphotonics.com
**www.raptorphotonics.com**