Claims

1. A spectrometer comprising:

a 2 dimensional detector that captures multiple spectra within a lower resolution broad range (LRBR) and a higher resolution narrow range (HRNR) simultaneously; and

a 2 dimensional grating having grooves with variable groove density and period function, the groove density G(z) and period function d(y, z) are adaptable to focus incident EUV/X-ray source from a slit onto the 2 dimensional detector where z is a direction along the grooves and y is a direction across the grooves.

2. The spectrometer according to claim 1 wherein the groove density G is linearly increased from 300 to about 1500 along a positive z direction where the period function can be expressed as

$$\boldsymbol{d(y)} = \frac{\mathbf{1}}{\boldsymbol{G(z)}\left(\mathbf{1} + \frac{\mathbf{2}\boldsymbol{b_2(z)}}{\boldsymbol{R}}|\boldsymbol{y}|\right)}$$

where $\mathbf{G(z)} = \mathbf{300} + \mathbf{40.1z}$, $\mathbf{b_2} = -\mathbf{19.5} - \mathbf{0.003z}$, R = 5567mm and z ranges between 0-30mm.

3. The spectrometer according to claim 1 wherein the 2 dimensional grating is arranged such that the incident angle from the slit is 87^0 and at an incident distance of 237mm.

4. The spectrometer according to claim 1 wherein the 2 dimensional detector is apart from the 2 dimensional grating by a distance of 235mm from a center along the y direction of the 2 dimensional grating, between -3.5mm and 3.5mm of the z direction, and between 17 and 43mm in an x direction, the x direction being perpendicular to the y direction.

5. The spectrometer according to claim 1 further comprising a cylindrical mirror and a spherical mirror arranged such that the cylindrical mirror is between the spherical mirror and the slit.

6. The spectrometer according to claim 5 further comprising a concave mirror arranged between the slit and the 2 dimensional grating.

7. The spectrometer according to claim 5 wherein the 2 dimensional grating has a curved surface.