

### Claims

1. A spectrometer comprising:

5 a 2 dimensional detector that captures multiple spectra within a lower resolution broad range (LRBR) and a higher resolution broad range (HRBR) 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  
10 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  
15 period function can be expressed as

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

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

3. The spectrometer according to claim 1 wherein the 2 dimensional grating is  
20 arranged such that the incident angle from the slit is  $87^\circ$  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  
25 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  
30 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.

5