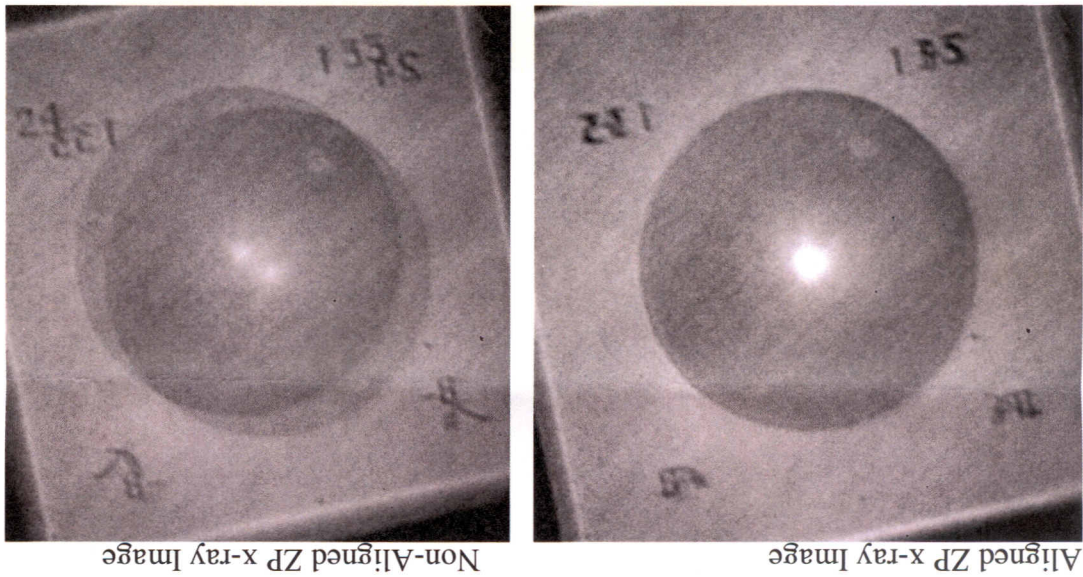


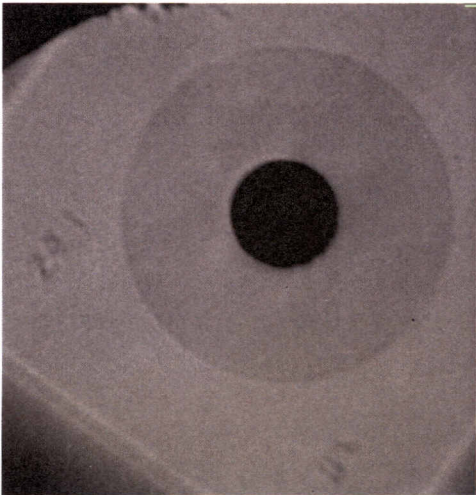
## Product Data Sheet Stack ZP 24-133-3

### Zone Plate Parameters:

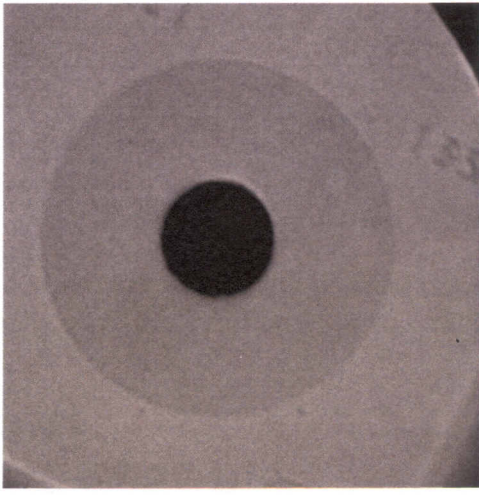
Zone Plate 1	SN	1753.4-2
Zone Plate 2	SN	1753.4-3
Outermost Zone Width	nm	24
Zone Plate Diameter	µm	133
Measured Efficiency at 8.4keV	%	3.0%
Measured Bonding Gap	µm	3
Bonding Date		2/14/11



The peak intensity of the aligned zone plate, compare to the peak intensity of the non-aligned zone plate, increases **278%** after the alignment.



90 Degree X-ray Image with Stop



0 Degree X-ray Image with Stop

CS misalignment = (3.9 pixels) \* (133um/670pixels) = 0.77 um

Where 670 pixels = 133 um

**Product Data Sheet ZP24-133-3  
Serial # 1753.4-3**

Thank you for your purchase of an Xradia zone plate optic. In this document you find the parameters and fabrication tolerances of the zone plate.

**Zone Plate Parameters:**

Outer Diameter	µm	133
Inner Diameter (no zones)	µm	N/A
Outermost Zone Width	nm	24
Zone Material		Electroplated Gold
Zone Height	nm	300 +/- 8%
Number Of Zones <sup>2</sup>		1385
Suggested Energy Range <sup>3</sup>	keV	
Measured Diffraction Efficiency <sup>1</sup>	%	0.85% @ 8.4keV
Support Membrane Material		Si <sub>3</sub> N <sub>4</sub>
Support Membrane Thickness	µm	0.1
Support Membrane Size	mm	0.2 x 0.2
Support Silicon Frame Size	mm	2 x 2
Central Stop Diameter <sup>4</sup>	µm	45
Central Stop Height / Material	µm	Au

<sup>1</sup> Xradia delivers zone plates with a focusing efficiency exceeding 50% of the theoretically calculated value.  
<sup>2</sup> Number of fabricated rings calculated for a full zone plate (no missing inner zones).  
<sup>3</sup> Energy range for which the theoretical efficiency is greater 10%.  
<sup>4</sup> The placement accuracy of the stop is 10µm (typical 5 µm).

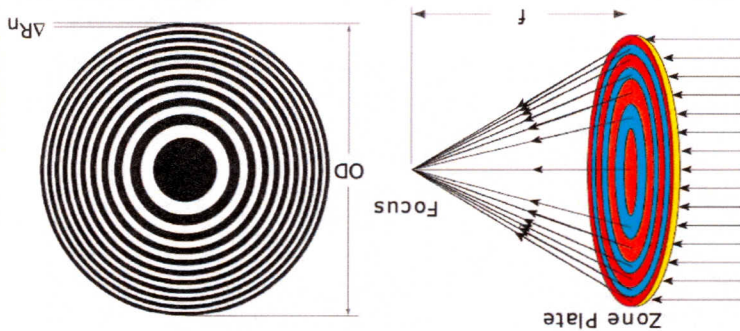
**Zone Plate Focal Length**

The focal length of the zone plate is given by:

$$f = \frac{OD \Delta R_n}{\lambda}$$

$$= \frac{3.192 \text{ mm}}{\lambda \text{ [nm]}}$$

$$= 2.575 \text{ mm} \cdot E \text{ [keV]}$$

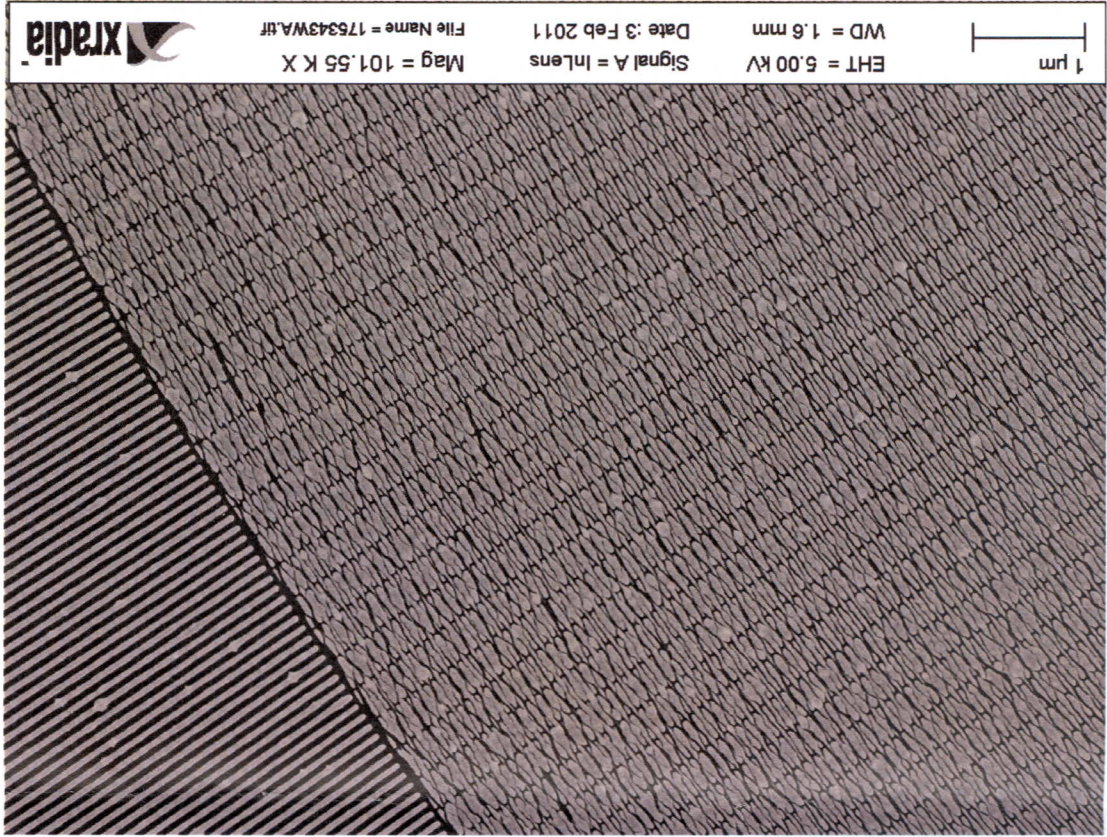


**Product Data Sheet ZP24-133-3  
Serial # 1753.4-3**

***Use in Vacuum***

- Zone plates can be used in vacuum. Several precautions need to be taken:
- No pressure differential can be applied between both sides of the zone plate water.
  - Change the ambient pressure slowly. Avoid shocks generated by opening large conductance pneumatic valves.
  - Zone plates can be damaged by ultra-sonic particles generated during venting of the vacuum system. Vent slowly and with a clean gas (use filter if possible). Avoid venting through a port which is in direct line-of-sight of the zone plate. Install a shield if necessary.
  - Make sure that the zone plate heat load is small and removed through proper thermal connections. If in doubt, consult Xradia for advice.

SEM image of the outermost zone area



**Product Data Sheet ZP24-133-3  
Serial # 1753.4-2**

Thank you for your purchase of an Xradia zone plate optic. In this document you find the parameters and fabrication tolerances of the zone plate.

**Zone Plate Parameters:**

Outer Diameter	µm	133
Inner Diameter (no zones)	µm	N/A
Outermost Zone Width	nm	24
Zone Material		Electroplated Gold
Zone Height	nm	300 +/- 8%
Number Of Zones <sup>2</sup>		1385
Suggested Energy Range <sup>3</sup>	keV	
Measured Diffraction Efficiency <sup>1</sup>	%	0.9% @ 8.4keV
Support Membrane Material		Si <sub>3</sub> N <sub>4</sub>
Support Membrane Thickness	µm	0.1
Support Membrane Size	mm	0.2 x 0.2
Support Silicon Frame Size	mm	2 x 2
Central Stop Diameter <sup>4</sup>	µm	45
Central Stop Height / Material	µm	Au

<sup>1</sup> Xradia delivers zone plates with a focusing efficiency exceeding 50% of the theoretically calculated value.  
<sup>2</sup> Number of fabricated rings calculated for a full zone plate (no missing inner zones).  
<sup>3</sup> Energy range for which the theoretical efficiency is greater 10%.  
<sup>4</sup> The placement accuracy of the stop is 10µm (typical 5 µm).

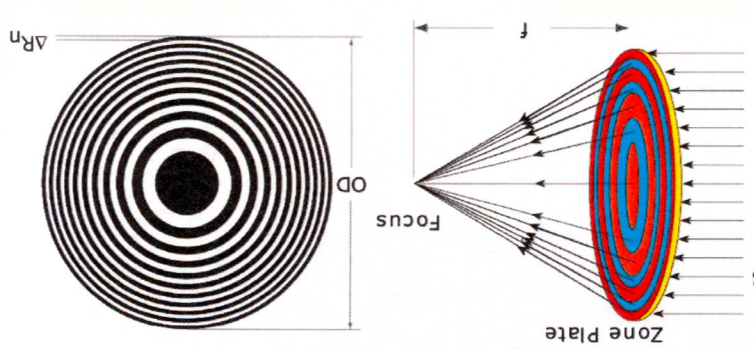
**Zone Plate Focal Length**

The focal length of the zone plate is

$$f = \frac{OD \Delta R_n}{\lambda}$$

$$= \frac{3.192 \text{ mm}}{\lambda [\text{nm}]}$$

$$= 2.575 \text{ mm} \cdot E [\text{keV}]$$



**Product Data Sheet ZP24-133-3  
Serial # 1753.4-2**

**Use In Vacuum**

- Zone plates can be used in vacuum. Several precautions need to be taken:
- No pressure differential can be applied between both sides of the zone plate water.
  - Change the ambient pressure slowly. Avoid shocks generated by opening large conductance pneumatic valves.
  - Zone plates can be damaged by ultra-sonic particles generated during venting of the vacuum system. Vent slowly and with a clean gas (use filter if possible).
  - Avoid venting through a port which is in direct line-of-sight of the zone plate. Install a shield if necessary.
  - Make sure that the zone plate heat load is small and removed through proper thermal connections. If in doubt, consult Xradia for advice.

SEM image of the outermost zone area

