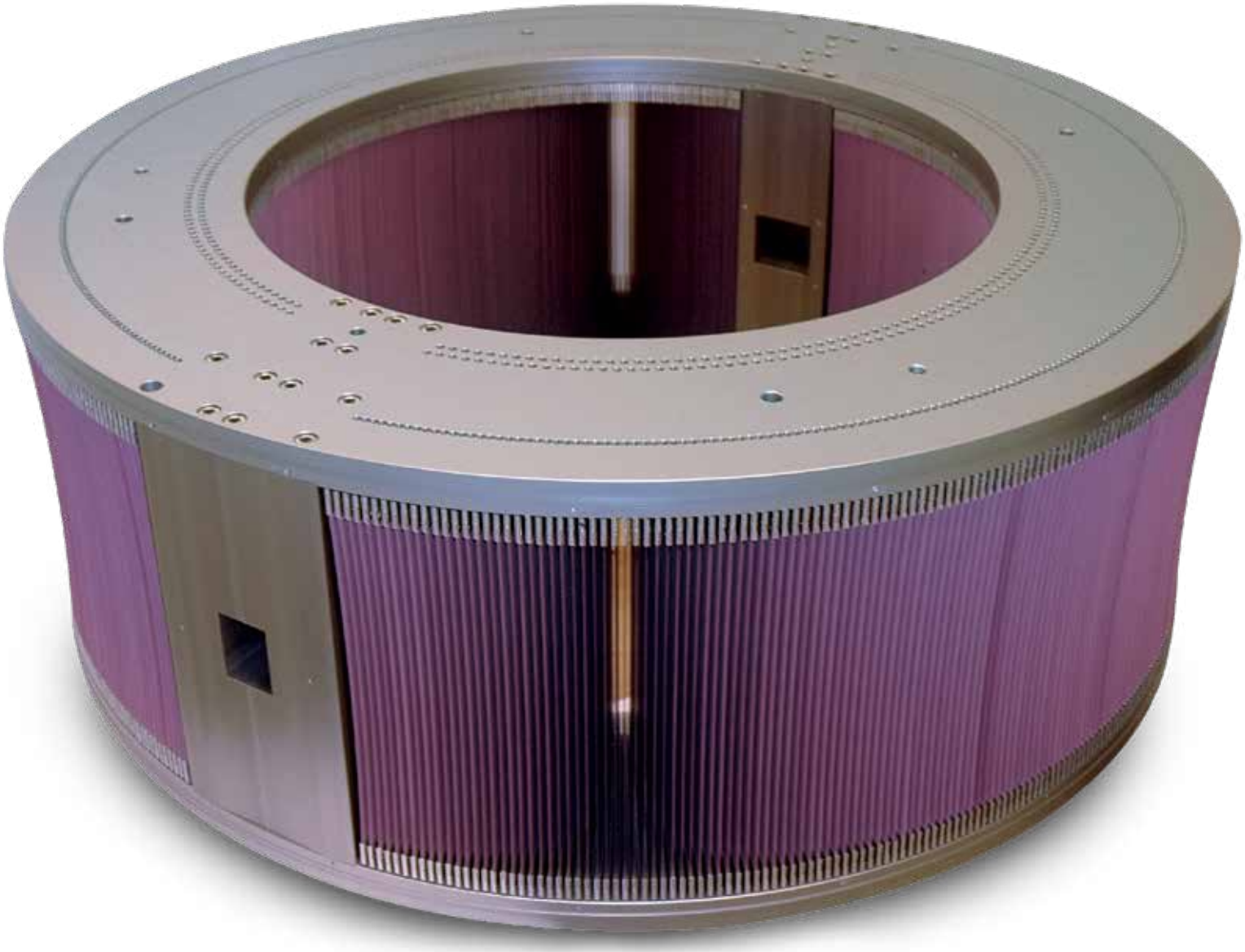
JJ X-RAY COLLIMATORS - AN INTRODUCTION



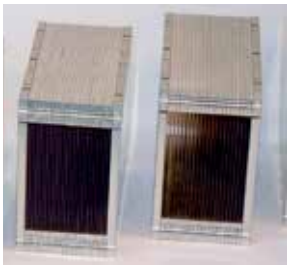
JJ X-RAY

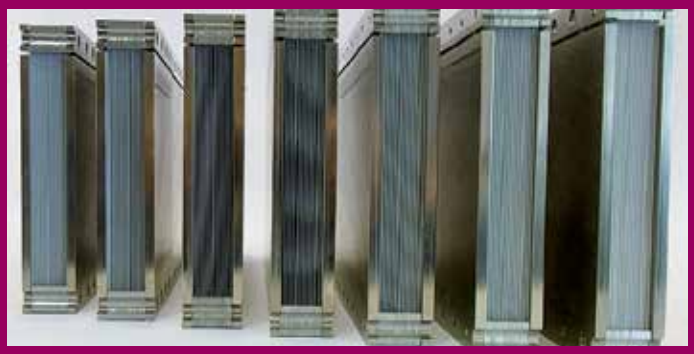
Danish Science Design

ABOUT US

Over the years, JJ X-Ray has produced hundreds of collimators for neutron facilities all over the world.

Thorugh this, we have gained unparalleled experience and know-how, pushing the limits of the achieveable. In addition, we have developed special tools and techniques for the most complicated designs.





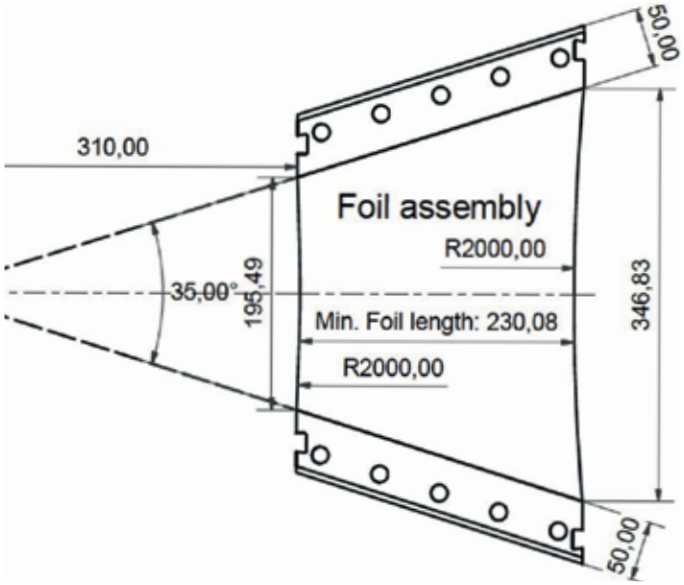
BASICS

- All collimators are based on a custom design and are divided into three categories defined by the orientation of the foils.
- The soller collimator is a collimator with parallel, rectangular foils.
- The radial collimator has foils angled in the horizontal plane, often assembled in a large angular range or even a 360 degrees frame.
- The double converging collimator is an advanced radial collimator where foils are angled both in the vertical and horizontal plane and often with very small angular foil separation <0.1°

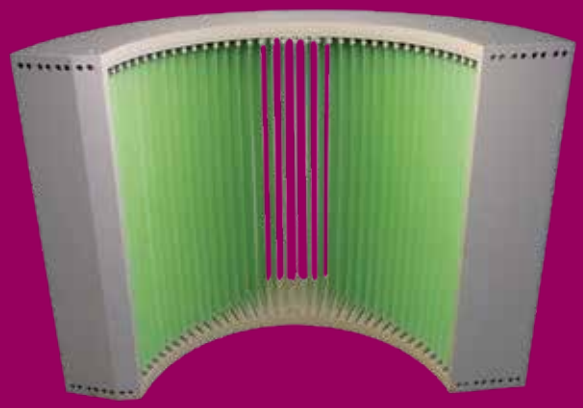
THE FOILS

The collimating foils are typically made of thin PETP or Kapton sheets with a coating of gadolinium oxide (Gd_2O_3) or enriched Boron-10 Carbide ($^{10}B_4C$).

The individual foils are supported using a stretch-foil technique where they are positioned and slightly stretched between accurately machined spacers. The result is a robust and cost efficient solution.



COLLIMATOR OPTIONS

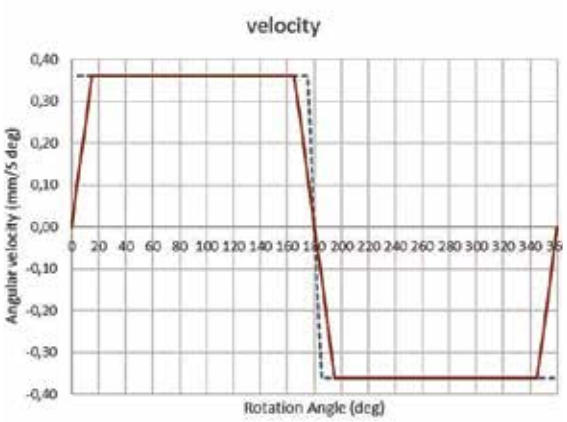


- A WIDE RANGE OF SIZES AND GEOMETRIES
- GADOLINIUM OXIDE COATING
- BORON-10 CARBIDE COATING
- PETP, KAPTON OR STEEL FOILS
- NON-MAGNETIC MATERIALS
- COLLIMATORS INSIDE VACUUM

RADIAL OSCILLATING COLLIMATOR

The oscillator is based on an offset cam with geometry of an Archimedean Spiral, providing a constant angular velocity over the desired angular interval.

- Oscillating interval is typically over 2-3 foils (1°-3°) and with a frequency of 0.01 Hz – 0.1 Hz
- Non-magnetic option

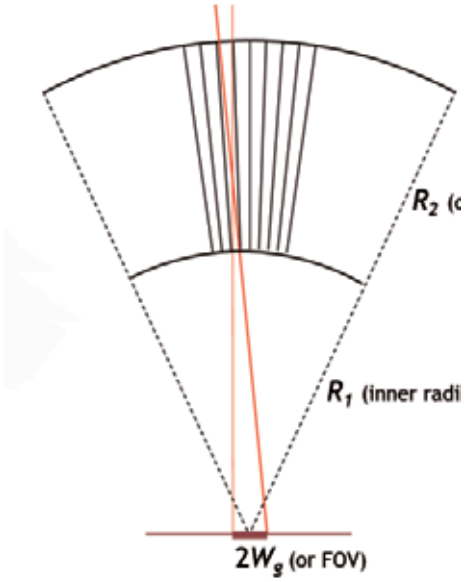


WHAT´S NEXT?

Due to the rising development of advanced 3D printing technology, some of our future collimators may be produced with this new method. This will impose new ways of thinking if a honeycomb structure can be embedded in the experimental setup.

Right now, we are engaged with focused R&D projects to meet the customers request on this field as well.

DEFINITION AND CALCULATION OF GAUGE WIDTH

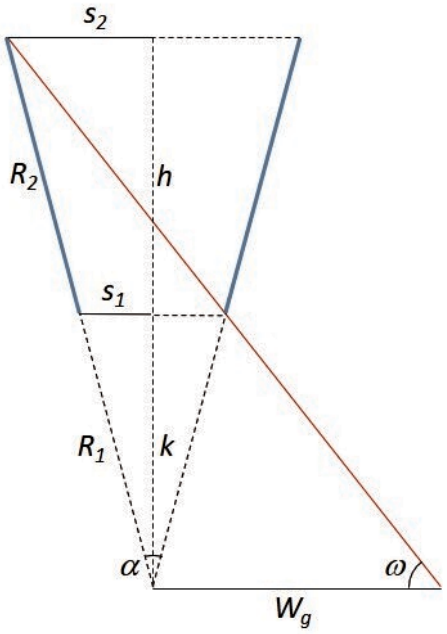


The angular foil separation, α can be calculated as:

$$\alpha = 2\sin^{-1}\left(\frac{W_g}{2}\cdot\frac{R_2}{R_1R_2+R_1^2}\right) \quad (1)$$

The gauge width is then given by:

$$W_g = 2\sin\left(\frac{\alpha}{2}\right)\left(\frac{R_1^2}{R_2}+R_1\right) \quad (2)$$



DEFINITIONS:

W_G = FOV / 2 ~ FWHM

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