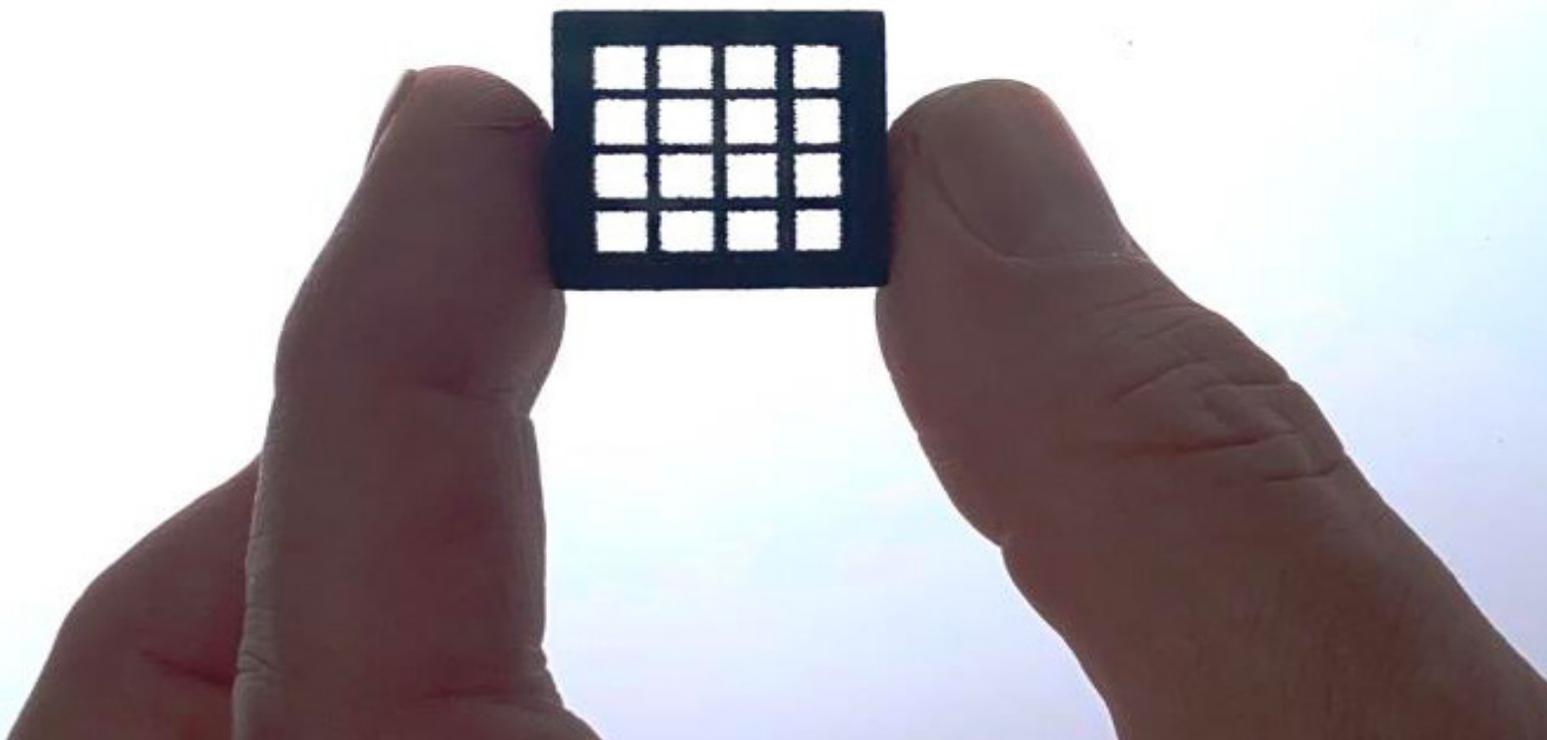


JJ X-Ray

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2D collimator 3D
printed in enriched
boron carbide



**Customer**

JJ X-Ray

Location

Hørsholm, Denmark

Industry

Analytical x-ray, synchrotron radiation, and neutron research

Application

2D Neutron Collimator

Machines

InnoventX

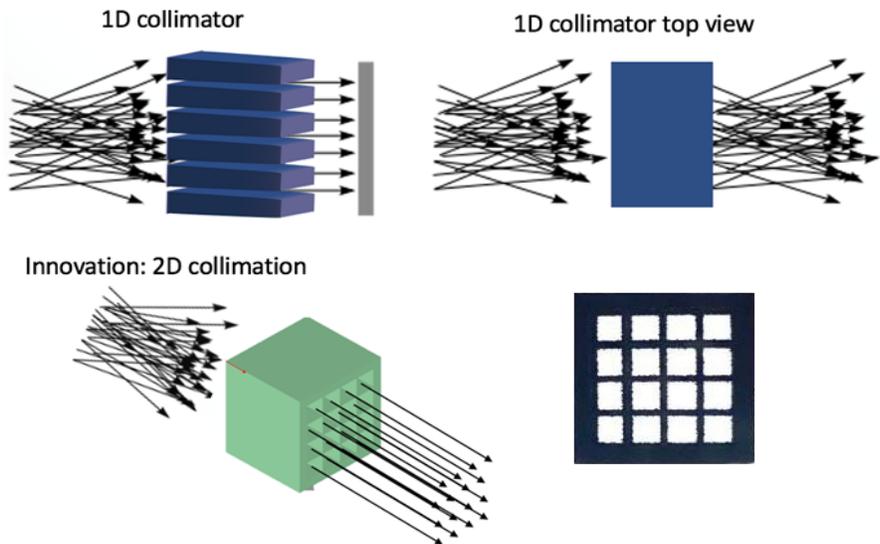
Material $^{10}\text{B}_4\text{C}$ **Website**www.jjxray.com

About JJ X-Ray

JJ X-Ray shares a passion for developing mechanical systems that facilitate ground-breaking research results in synchrotron radiation and neutron scattering communities all over the world. JJ X-Ray develops extremely durable, high-end solutions targeting the analytical x-ray, synchrotron radiation, FELs, and neutron research and is dedicated to delivering state-of-the-art scientific instrumentation with innovative designs.

Located at DTU Science Park in Denmark, JJ X-Ray was founded in 1996 and manufactures slit systems, collimators, full beamline solutions for synchrotron sources and end-stations for neutron instruments. Always looking to innovate, the company has a dedicated expert team to lead research and development projects and to serve customers.

The design freedom of binder jetting technology enables the JJ X-Ray team to develop more advanced geometries for precision collimation



Advancing 2D collimation with the design freedom of 3D printed technical ceramics

Common collimator designs based on blades inherently collimate in only one dimension. Design freedom and material flexibility afforded by ExOne binder jetting enable research into new collimator designs to advance neutron scattering experiments for microstructure characterization of liquids and solids.

To obtain the high-resolution that allows researchers to map properties of a material, neutron collimators are used to absorb stray neutrons and improve results in experiments. They enhance resolution and reduce background signals in experiments, such as diffraction and spectrometry. Common designs consist of blades coated with highly absorbent material, such as enriched boron carbide, in a parallel or diverging arrangement.

However, collimators based on blades inherently collimate in only one dimension. Utilizing 3D printing technology allows the experts at JJ X-Ray to develop more intricate designs for 2D collimation. The team recently received its first binder jet 3D-printed cubes in enriched boron carbide powder ($^{10}\text{B}_4\text{C}$). The 20mm³ collimator prototypes feature 5x5 mm straight-walled channels that could not be produced with any other technology.

“We expect the advanced, intricate designs we can achieve with 3D printed collimators to open up new research opportunities and develop the field further,” said Dr. Isja de Feijter, Application Specialist at JJ X-Ray.

If a honeycomb structure, for example, could be embedded into an experimental setup, the paradigm of future experiments would shift. “We’re exploring how far we can push the design with curved structures and thinner walls and tapered and narrow channels,” she explained.

The team continues to work together with ExOne to test wall thicknesses, improvements on the processing of the brittle material, and infiltration with different materials like molten aluminum or cyanoacrylate.

“We expect the **advanced, intricate designs we can achieve with 3D printed collimators** to open up new research opportunities and develop the field further.”

Dr. Isja de Feijter, Application Specialist, JJ X-Ray



About Desktop Metal Inc.

Desktop Metal, Inc. is accelerating the transformation of manufacturing with end-to-end metal 3D printing solutions. Founded in 2015 by leaders in advanced manufacturing, metallurgy, and robotics, the company is addressing the unmet challenges of speed, cost, and quality to make metal 3D printing an essential tool for engineers and manufacturers around the world. In 2017, the company was selected as one of the world’s 30 most promising Technology Pioneers by the World Economic Forum, and was recently named to MIT Technology Review’s list of 50 Smartest Companies. For more information, visit www.desktopmetal.com.