

# 8th High Power Targetry Workshop (HPTW2023)



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## Performance test of Granular flow target

*Tuesday, 7 November 2023 17:45 (1 minute)*

The granular flow target is a novel target type for high-power applications. By utilizing granular material as a circulation medium, it combines the advantages of circulation cooling and the use of various solid materials to achieve better performance in both heat removal and neutronics properties.

To evaluate the performance of this target, a system was established that is connected to a low-energy ion beam. A C-shaped elevator served as the circulator, which drove the granular flow target using 1mm ZrO ceramic spheres. An upper storage canister buffered the granules and controlled the mass flow through a gate valve. The flow status formed a channel with an adjustable slope, where the beam bombarded the target material. At the bottom, the flow was collected and cooled by a plate heat exchanger. The granules flowed down along the space between the plates, and the cooling was achieved.

To stabilize the material level in the heat exchanger, a flow control structure was designed to synchronize the flow. The outflow from the heat exchanger entered the elevator and formed a loop. The entire system was vacuumized by mechanical and molecular pumps. The flow achieved through this setup was up to 500g/s, and it was tested using a 210 keV@12 mA proton beam.

The connection was windowless. Though the granular flow system caused slightly vacuum disturbance, the beam line still works well. The beam forms a heat point of about 1cm width, and reaches about 191°C measured by an inferred thermal imager.

### Themes for the contribution

4 Target design, analysis, and validation of concepts:

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**Session Classification:** Poster session