

Target Holder for probe testing

For a specific testing of an iron meteorite probe performed at CERN's HiRadMat facility (High-Radiation to Materials), a target holder had to be designed and manufactured to ensure the correct placement within the high-energy, high-intensity proton beam during testing. In cooperation with the company OuSoCo a new fixation mechanism was developed. The conical support structure incorporated within the target holder was required to guarantee a precise positioning of the longitudinal axis of the cylindrically-shaped meteorite sample with respect to the proton beam, but at the same had to allow for free radial oscillations of the meteorite surface (resulting from the proton beam irradiation).

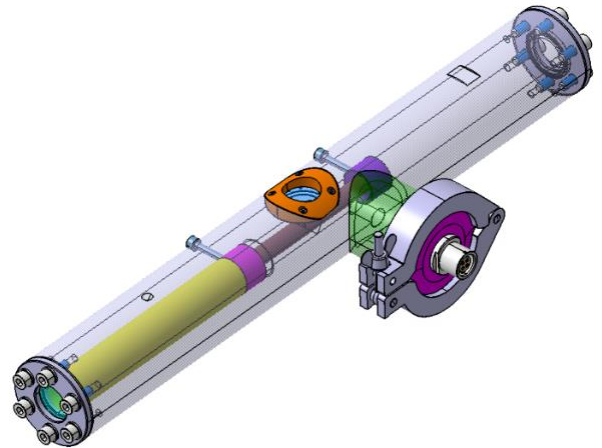


Figure 1: simplified CAD view of the target holder assembly

In close cooperation with OuSoCo as well as their experimental collaboration team comprising CERN team members and several other international institutions the design was developed, drawings made, and the manufacturing precision checked.

The assembly of the parts was done at CAE Simulation & Solutions. OuSoCo successfully carried out the experimental campaign in May 2024, measuring for the first time worldwide the dynamic material response in real-time of an iron meteorite under high-energy proton beam irradiation.

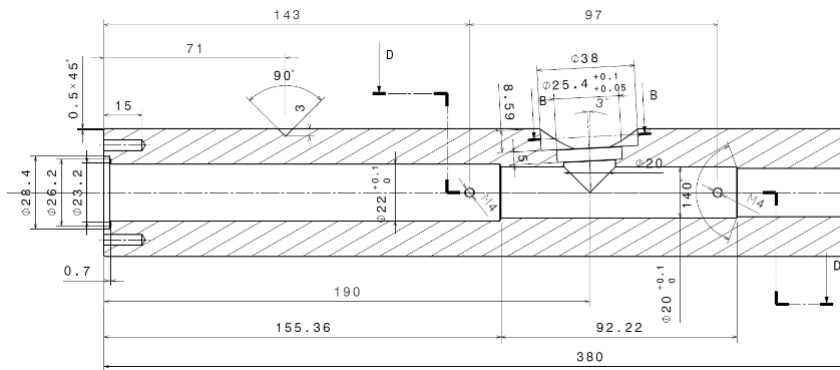


Figure 2: technical drawing of the target holder

Using the specifications provided by OuSoCo, CAE Simulation & Solutions developed a design of the target holder combining optical components and electrical feedthrough concepts. A crucial part of the experimental setup was measuring the surface displacement of the meteorite through a Laser Doppler Vibrometer (LDV), installed above the target holder. Therefore, an UV fused silica high-precision window with an anti-reflection coating – transmissive for the utilized measurement Laser - was incorporated into target envelope.

To monitor the temperature conditions during the experiment, a temperature sensor was mounted onto the meteorite probe, and the wires routed through the envelope and electrical feedthrough. The combination of newly developed parts and modifications of market-ready solutions in CAD proved to be crucial during the tight project period.



Figure 3: high-precision window