Small aperture Hall probe bench: concept

- Systems based on Hall sensors are the standard solution to measure maps of the magnetic field distribution in a given region.
- A typical setup consists on a Hall sensor at the tip of an arm which is controlled by a high precision driving system. This systems typically require that the region to be measured has lateral access.
- In the case of "closed" structures (SC devices, in-vacuum devices, etc) the typical solution consists in introducing the mechanics of the driving system inside the structure, leading to highly tailored experimental setups.
- At ALBA we looked for a more general approach, with an external driving system based on a granite bench, but replacing the probe holding arm by a C-shape structure stretching a carbon fiber taper between its ends.





ALBA Hall probe bench for closed structures



Small aperture Hall probe bench: interest

- A first prototype was built and successfully tested in 2015. It can only be used to characterize devices operating at room temperature.
- The aim of this project is to adapt the system for measurements under vacuum and in cryogenic conditions.
- The system can be potentially used to map (among others):
 - Accelerator magnets and insertion devices, with gaps down to at least
 4mm
 - Magnets for **medical applications**.
 - Systems for **electrical engineering** industry.
- Thanks to the architecture of the system, the same instrument can be used in a large variety of situations, requiring at most a minimum adaptation.
 - Its main limitation is the available longitudinal range (currently 1.2m).



ALBA prototype bench measuring a SC cyclotron magnet at CIEMAT



Small aperture Hall probe bench: status

- The feasibility of the bench operating in a cryogenic environment has been validated by means of thermomechanical FEA simulations, for devices operating both at LN₂ (~80K) and LHe (~4K).
- The detailed mechanical design of the bench adaptation has been completed and fully reviewed.



Task	Due date
Design Review meeting	24 Feb '23 📀
Request for offers	Mar- Apr '23 📀
Budget revision	Beginning May '23 父
Procurement of parts	May-Jun '23
Assembly (estimated 1 week)	Before Summer '23
System test (estimated 2 weeks)	Autumn '23

General view of adapted bench with long bellows for vacuum connection



Detail of new in-vacuum tape-gripping mechanism with connection flange

