VACUUM VESSELS

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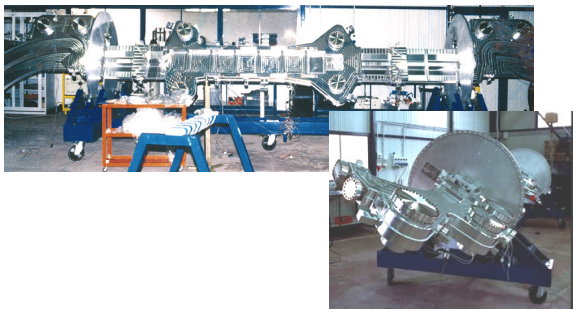
CECOM collaboration with several physics research institutes has led to the achievement of technologies and production techniques needed for manufacturing, cleaning and testing Ultra-High-Vacuum (UHV) components.
Several vacuum vessels, different each other in size, scope, materials and mechanical features, have been produced. Most of them were developed and manufactured for particle accelerators and beamlines. Other applications in Ultra-High-Vacuum and High-Vacuum are: vacuum vessels for IR-interferometers, multi-target UHV systems for laser ablation and vacuum ovens.

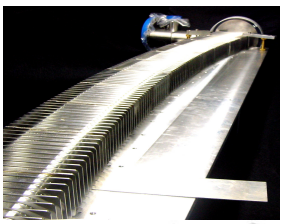
CECOM has a great experience in design and construction of vacuum chambers for synchrotron storage rings, colliders interaction regions, and vacuum components of front-ends and beamlines. Our experience and technologies allow to obtain excellent performances for vacuum components: a leak rate lower than $1x10^{-10}$ mbar·l/s and a outgassing rate lower than $1x10^{-12}$ mbar·l/(s·cm^2) are achieved for standard components. Further information about our standard procedures are detailed in our Quality Plan.

A relevant example is represented by the long vessels for the bending magnets of DAFNE: 10 m aluminium vacuum vessels, with a roughness of 0.2 R_a for inner surfaces, including water cooled OFHC copper absorbers and Beam Position Monitors.



A tolerance better than 0.1 mm were achieved for the longitudinal distance between the four installed BPMs of each vessel, while the transversal axis of BPMs were aligned within 0.05 mm.
Special tools were developed and produced for the construction of these chambers.

Another critical application is represented by the thin vacuum chambers for *CNAO* dipoles. These chambers are characterized by a *0.3 mm thickness* along the whole length and a *0.2 R_a roughness* of inner surfaces. In order to guarantee the required vacuum performances and mechanical precision, these chambers were obtained by welding several sections, manufactured from forged stainless steel blocks; wire eroding technique was applied for machining the inner profile.



Other vacuum vessels produced for physics research and in particular for particle accelerators are: mirror vessels, beam stoppers, beam position monitors, absorbers, vessel for in-vacuum undulator, chambers for straight sections and for dipole magnets, special vessels for interaction regions and for kickers.

References: **CERN, INFN, DLS, CNAO, CELLS, CNRS, CEA-Saclay, SOLEIL, ESRF, ILL, MEDAUSTRON**