ThP38

Status of the ATLAS Upgrade Cryomodule

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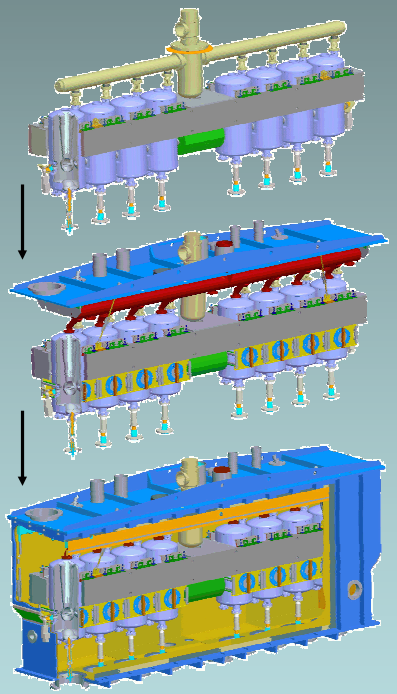
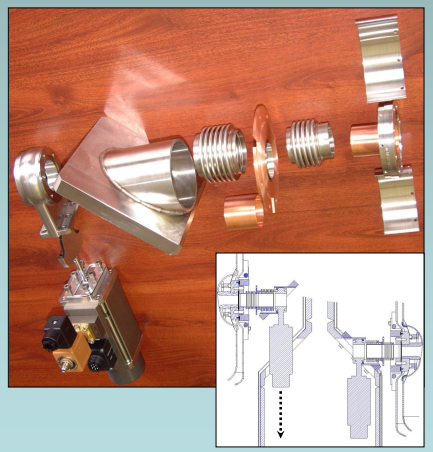
ABSTRACT

A new cryomodule for TEM-class superconducting (SC) cavities is under construction both as part of an accelerator improvement project to upgrade the existing ATLAS heavy ion linac at ANL and also to prototype a cryostat design for RIA. A novel design feature is the provision of separate cavity and insulating vacuum systems, which has not previously been attempted with TEM-class SC cavities. The separated vacuum systems will facilitate clean assembly of the cavity string. We present an update on the status of this effort, including progress on mechanical assembly as well as magnetic shield performance data. Initial cooldown and engineering run of the cryostat should take place before the end of CY05.

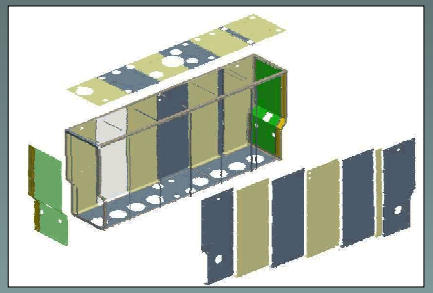


Separate beam and insulating vacuum spaces minimize the number of components involved in clean assembly. Cavities, couplers, vacuum manifold, inter-cavity spools, and beam valves are assembled under clean conditions, then sealed off and removed from the clean environment. Subsequent assembly involves fast and slow tuners, cryogenic connections, instrumentation, and alignment – none of which require clean conditions. The string of dressed cavities is suspended from the lid, then lowered into the vacuum box to complete the assembly.

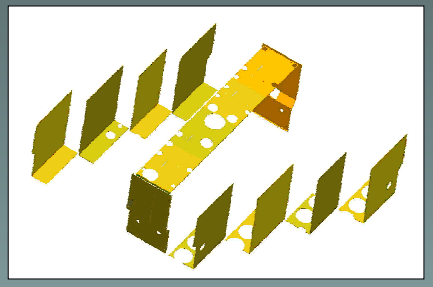
The vacuum vessel is a top-loading rectangular box design with angled endwalls to permit a sealed cavity string assembly to drop in. The beam valve actuators on both ends of the assembly pass through holes in the endwalls. A plate welded to the valve assembly makes a vacuum seal against the inside of the box.

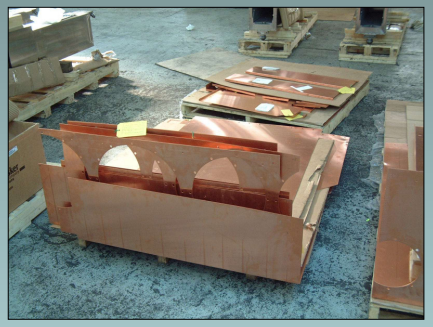


Beam valve spool assemblies mount to the first and last cavities in the string. These spools are part of the clean string assembly and, together with the vacuum manifold valve, serve to isolate the clean interior surfaces from the environment. The valves are stock VAT Series 01 Mini UHV gate valves. To fit the tight spacing requirement the valves are welded directly to both the angled endplate and the 300K-to-80K bellows. Copper tubes sunk at 80K and 4K extend through their respective bellows to screen radiation and to pump residual gas from the warm beam tube section.



Magnetic shielding is provided by a single 0.040" thick layer of AD-MU-80 by Ad-Vance Magnetics, Inc. To simplify fabrication and installation, pre-punched shield sections are laid over threaded studs welded to the vacuum box interior. The overlapping sheet edges are secured with stainless steel batten strips to ensure intimate contact. Shielding on the lid compresses a spring-loaded shield angle attached at the box flange for good box-to-lid shield contact. The design goal of <20 mG residual field was exceeded, with measured fields not exceeding 16 mG in the spaces occupied by cavities. Shielding levels will further improve once large holes at the coupling ports are patched.





Keeping the insulating vacuum separate from the cavity vacuum permits the use of multilayer insulation (MLI). Reduced heat load on the LN2-cooled thermal shield saves nitrogen and allows a thinner, conduction cooled shield. Prefabricated copper panels hang from two rectangular LN2 manifolds mounted to the top of the box, standing off of the interior with G10 buttons.