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 cryomodule 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 data on the cryomodule should take place before the end of CY05.

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 304L stainless steel gate valves. To fit the tight spacing requirement, the valves are welded directly to both the angled endplates and the 30RKčo6RK flanges.

Copper tubes run at 60K and all extend through their respective baffle to screen radiation and to pump residual gas from the warm beam tube section.

Magnetic shielding is provided by a single 0.040\text{\,}inch-thick layer of AD-40-60 by Ad Vance Magnetics, Inc. To simplify fabrication and installation, pre-punched shield sections are laid over threaded stubs welded to the vacuum box interior. The overlapping sheet edges are secured with stainless steel button strips to ensure intimate contact. Shielding on the lid compresses a spring-loaded shield angle attached to the box flange for good box-to-lid seal contact. The design goal of <0.1 mGy residual field was exceeded, with measured fields not exceeding 16 mGy in the spaces occupied by cavities. Shielding levels will further improve once large holes at the coupling ports are patched.

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, magnetic 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.