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TECHNICAL NOTE



MICE Spectrometer Solenoid: Magnet Drawings and 3D CAD Model

1. Introduction

One of the deliverable items for the Spectrometer Solenoid magnets is a complete package of the as-built fabrication drawings. Prior to the magnets being delivered to RAL, the drawings will be used to confirm that the correct geometric parameters were used in the analyses. In parallel with this effort, a 3D CAD model is being developed to aid in the integration of the magnets at the site.

2. Fabrication Drawings

A collection of nearly 200 detail fabrication drawings representing the latest assembly of the Spectrometer Solenoid (Magnet 2B) has been collected from Wang NMR. The drawings have been organized in a preliminary drawing tree list (see page 3). The drawings appear to be a fairly complete representation of the previously as-built magnet. Some of the recent drawings also provide details of modifications to the system that have been proposed by Wang NMR, primarily related to improvements in the thermal shield. Where determined to be appropriate by our analyses, these design changes have been included in our proposed magnet modifications.

Remaining tasks include the completion of the drawing tree and developing a list of errors and omissions. The drawing package is missing a top level assembly drawing and several of the sub-assembly drawings. LBNL will be working with the vendor to complete all of the details of the drawing package, including the revised drawings that will reflect the modifications to the magnet design. Where necessary, LBNL Engineering will complete the necessary missing assembly drawings.

3. 3D CAD Model

LBNL is also developing a detailed 3D CAD model of the Spectrometer Solenoids based on the current version of the drawings. As the modifications to the design are approved, the LBNL model will be updated to reflect the latest design. Until now, the only 3D model of the magnets was developed at RAL and was based on a much earlier magnet design. The final version of the LBNL CAD model will be an accurate representation of the as-built magnets and will be integrated into the overall MICE cooling channel model being maintained at RAL. Several views of the preliminary 3D model of the outer vacuum vessel are shown in Figures 1 to 3. Note that Wang NMR has not used 3D modeling at any point during the design and fabrication of the magnets.

Preliminary Spectrometer Solenoid Drawing List

MICE-L000 MICE TRACKER MODULE 25T COLD MASS SUPPORT

- MICE-L001 4.2K-50K FIBERGLASS STRIP
- MICE-L002 50K-300K FIBERGLASS STRIP
- MICE-L003 PIN
- MICE-L004 WASHER
- MICE-L005 BUSHING
- MICE-L006 50K BRACKET
- MICE-L007B SPACER
- MICE-C007 4.2K BRACKET

MICE-C000 COLD MASS AND CONDENSER CIRCUIT ASSEMBLY

- MICE-C001 Cryocooler 4K Condenser
- MICE-C0002B1 COIL FORM COVER
- MICE-C002 COIL FORM COVER
- MICE-CO04B COOLER SLEEVE-1
- MICE-C005B SUSPENSION RING
- MICE-C005B SUSPENSION BLOCK
- MICE-C005B MICE TRACKER MODULE 4.5T SOLENOID MAGNET
- MICE-C005B BI-METAL COUPLING
- MICE-C006B BI-METAL COUPLING
- MICE-C006B COOLER SLEEVE-2
- MICE-C006C BI-METAL COUPLING
- MICE-C007C COLD MASS HEAT INTERCEPT
- MICE-C007C1 COLD MASS
- MICE-C007C2 COLD MASS
- MICE-C007D SLEVE BOTTOM PLATE
- MICE-C008B SUPPORT RING
- MICE-C008B BI-METAL COUPLING FOR NIPPLE
- MICE-C009B BI-METAL COUPLING FOR BELLOW
- MICE-C009C NECK TUBE

MICE-M000 1ST STAGE COPPER PLATE ASSEMBLY

- MICE-1-M001 77K SHIELD CU PLATE
- MICE-1-M002 77K SHIELD CU PLATE
- MICE-1-M003 77K SHIELD CU PLATE
- MICE-1-M004 77K SHIELD CU PLATE
- MICE-1-M005 77K SHIELD CU PLATE
- MICE-2-M001 CRYOCOOLER MOUNTING PLATE
- MICE-2-M002 SIDE PLATE 2
- MICE-2-M003 SIDE PLATE 2
- MICE-2-M004 END PLATE
- MICE-2-M005 WINDOW FRAME
- MICE-2-M006 WINDOW FRAME

- MICE-2-M007 *COOLER TUBE*
- MICE-2-M008 *COOLER FLANGE*
- MICE-2-M009 *COPPER PLATE*
- MICE-2-M009 *COPPER PLATE*
- MICE-2-M010 *FLEXIBLE CU STRIP*
- MICE-2-M011 *PLATE*
- MICE-2-M011A *PLATE*
- MICE-2-M013 *COPPER PLATE*
- MICE-2-M014 *COPPER PLATE*
- MICE-2-M015 *THERMAL TRANSIT*

MICE-N000 *LN CAN ASSEMBLY*

- N001 *LN2 CAN*
 - N001-1 *LN2 CAN PLATE*
 - N001-1A *LN2 CAN PLATE*
 - N001-2 *LN2 CAN PLATE*
 - N001-3 *LN2 CAN PLATE*
 - N001-4 *LN2 CAN PLATE*
 - N001-5 *LN2 CAN SUPPORT*
- N002 *SUPPORT*
- N002A *SUPPORT*
- N002B *SUPPORT*
- N003 *SUPPORT*
- N004 *THERMAL TRANSMIT*
- N005 *LN2 TUBE*
- N005A *LN2 TUBE*
- N006 *THERMAL TRANSMIT*
- N007 *THERMAL TRANSMIT BI-METAL*

MICE H000 *77K-HANGER*

- MICE H001 *77K-HANGER-RING*
- MICE H002 *77K-HANGER-HOOK*
- MICE H003 *77K-HANGER-FRAME*
- MICE H004 *77K-HANGER-PIN*
- MICE H005 *77K-HANGER-ANGLE*

MICE He000 *CRYOCOOLER CONNECTION ASSEMBLY*

- MICE-He001 *MICE-He001*
- MICE-He002 *BI-METAL COUPLING FOR BELLOW*
- MICE-He003 *MICE-He003*
- MICE-He003A *MICE-He003A*
- MICE-He004 *MICE-He004*
- MICE-He004A *MICE-He004A*
- MICE-He004B *MICE-He004B*
- MICE-He005 *MICE-He005*

- MICE-He005A *MICE-He005A*
- MICE-He005B *MICE-He005B*
- MICE-He006B *DISC*
- MICE-He007B *TUBE*

MICE-T000 *FILL TUBE ASSEMBLY*

- MICE-T001B *TUBE 1*
- MICE-T004B *TUBE SUPPORT*
- MICE-T005B *TUBE 5*
- MICE-T005 *TUBE 5*
- MICE-T007B *TUBE 7B*
- MICE-T0008 *COPPER TUBE*

MICE-F000 *MICE LEG MODIFICATION*

- MICE-F000B-01 *MICE LEG MODIFICATION*
- MICE-F000B-02 *MICE LEG MODIFICATION*

MICE-6000 *60K SHIELD ASSEMBLY*

- MICE-6100B *OUTER CYLINDER*
- MICE-6400 *CENTER CYLINDER*
- MICE-6400 *CENTER CYLINDER*
- MICE-6500 *1ST STAGE COPPER PLATE ASSEMBLY*
 - MICE-6510C *MOUNTING PLATE*
 - MICE-6511 *COPPER LEAF*
 - MICE-6512B *MOUNTING PLATE*
 - MICE-6512C *MOUNTING PLATE*
 - MICE-6513B *MICE-6513B*
 - MICE-6514B *MICE-6514B*
 - MICE-6515B *MICE-6515B*
 - MICE-6515C *MICE-6515C*
 - MICE-6516B *MICE-6516B*
 - MICE-6517B *MICE-6517B*
 - MICE-6518B *MICE-6518B*
 - MICE-6519B *MICE-6519B*
 - MICE-6523B *G-10 PLATE S*
 - MICE-6524B *SUPPORT PLATE S*

MICE-3000 *VACUUM VESSEL ASSEMBLY*

- MICE-3100 *OUTER CYLINDER*
 - MICE-3110B *CYLINDER*
 - MICE-3120B *END FLANGE*
 - MICE-3150 *CRYOCOOLER TOWER*
 - MICE-3151B *SIDE PLATE 2*
 - MICE-3152B *SIDE PLATE 2*
 - MICE-3153B *END PLATE*
 - MICE-3154B *WINDOW*

- MICE-3155B *COVER*
 - MICE-3160 *LHE INPUT TOWER*
 - MICE-3161B *TUBE*
 - MICE-3162B *DISC*
 - MICE-3164B *NIPPLE*
 - MICE-3165B *DISC*
- MICE-3200B *BACK END PLATE*
- MICE-3200B-1 *BACK END PLATE*
- MICE-3300B *FRONT END PLATE*
- MICE-3300B-1 *END PLATE ASSEMBLY*
- MICE-3300-2 *END RING PLATE*
- MICE-3300B-3 *FRONT END PLATE*
- MICE-3500 *COLD MASS SUPPORT*
 - MICE-3510B *SUPPORT RING*
- MICE-3600B *CRYOCOOLER MOUNTING PLATE*
- MICE-3700 *LHE SERVICE TOWER*
 - MICE-3710B *TUBE*
 - MICE-3720B *DISC*

MICE S000C *MICE SOLENOID MAGNET WARM LEADS ASSEMBLY*

- MICE-S001 *SUPPORT-1*
- MICE-S001B *S001B*
- MICE-S002 *SUPPORT-2*
- MICE-S002B *S002B*
- MICE-S003A *S003A*
- MICE-S003B *S003B*
- MICE-S003C *S003B*
- MICE-S-004B *HTC LEAD MTG DETAIL PARTS*
- MICE-S-004C *SUPPORT*
- MICE-S-005B *CABLE PARTS*
- MICE-S-006B *S006B*
- MICE-S-007B *S007B*
- MICE-S-008B *MICE TRACKER MODULE 4.5T SOLENOID MAGNET*
- MICE-S-009B *CABLE PARTS*
- MICE-S-010B *CONNECTOR SUPPORT*
- MICE-S-010B *CABLE SUPPORT*
- MICE-S-011B *CONNECTOR SUPPORT*
- MICE-S-012B *CONNECTOR SUPPORT*
- MICE-S-013B *CONNECTOR SUPPORT*
- MICE-S-014B *CONNECTOR SUPPORT*
- MICE-S-016B *CONNECTOR SUPPORT*

OTHER DRAWINGS

- V001-2 *VALVES INSTALL TUBE*
- V002-1 *VALUE INSTALL TUBE PLATE*

- V002-2 VALVE INSTALL TUBE PLATE
- V002-3 VALVE INSTALL TUBE PLATE
- V003 RELIEF VALUVE INSTALL TUBE
- V003B RELIEF VALVE INSTALL TUBE
- V004 RELIEF VALVE INSTALL PLATE
- V005 BOTTOM SADDLE PLATE
- V006 BOTTOM SADDLE
- V007 FLANGE
- MICE-E0001 Angle-H
- MICE-E0002 Angle-H
- MICE-E0003 Angle-H

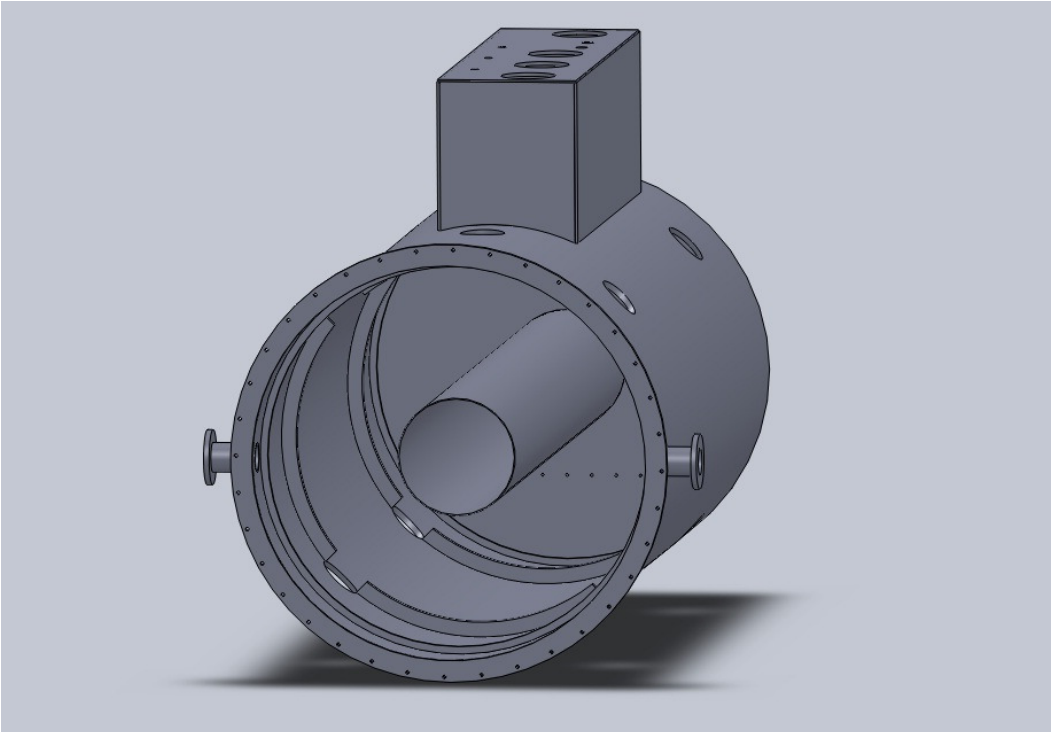


Figure 1: Preliminary vacuum vessel model (end view)

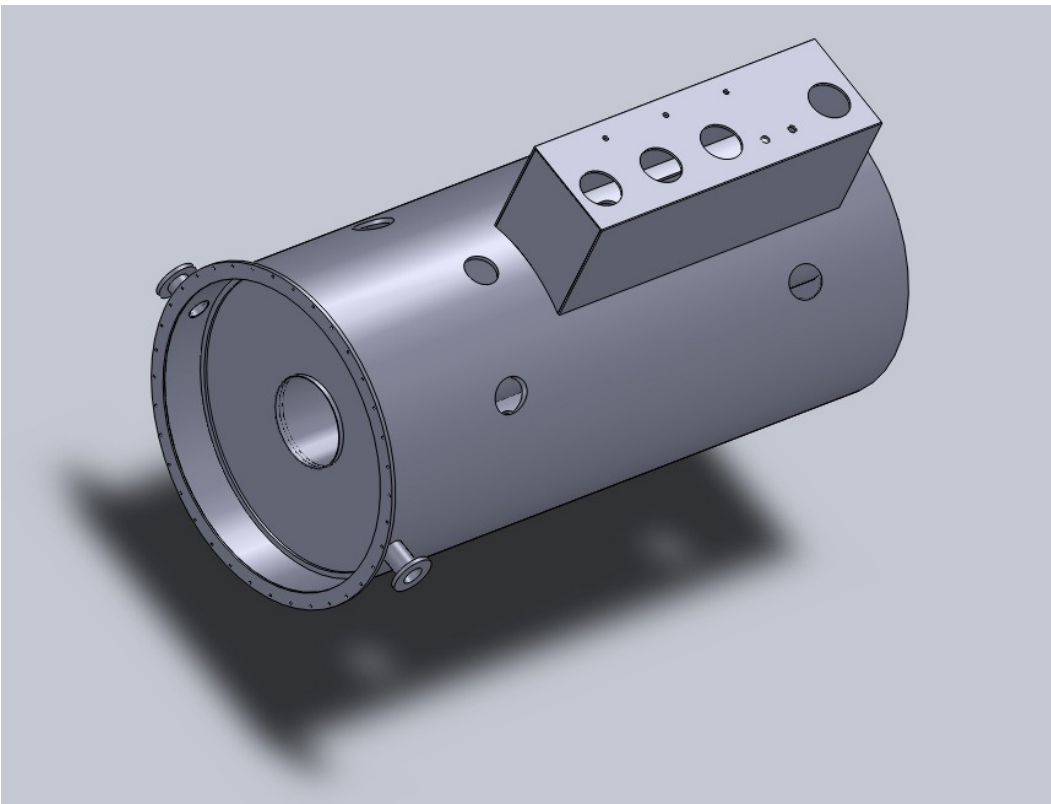


Figure 2: Preliminary vacuum vessel model (iso view)

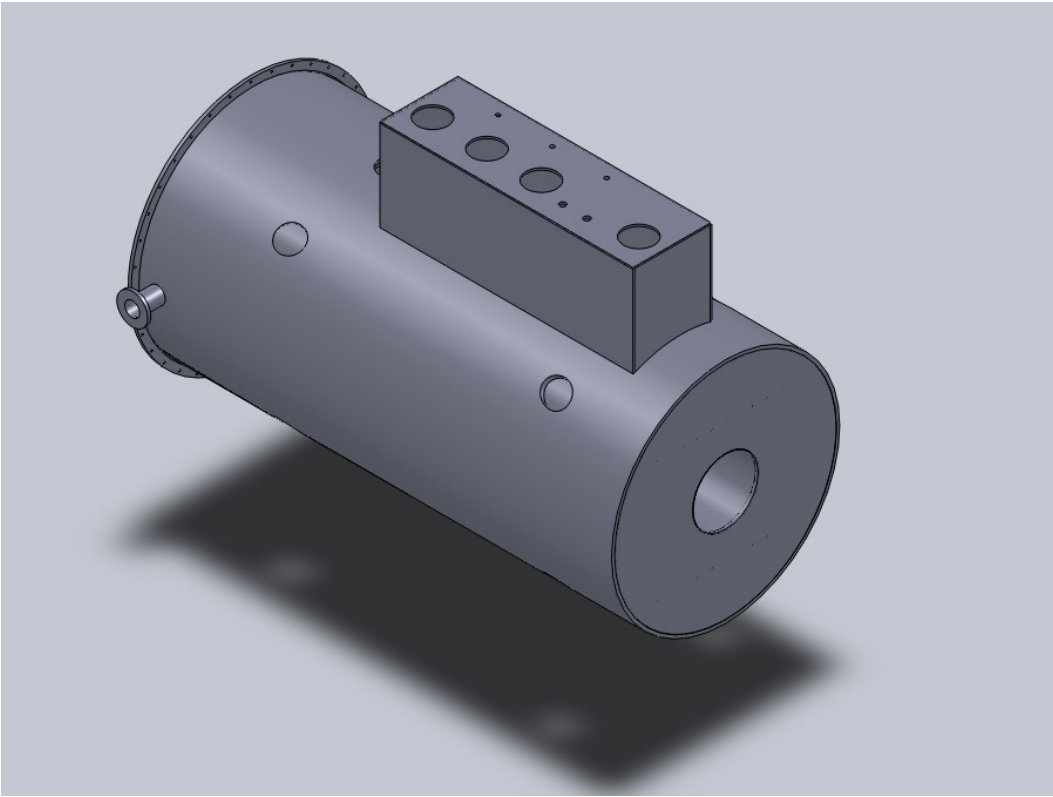


Figure 3: Preliminary vacuum vessel model (iso view)