

Two-dimensional and Three-dimensional Models of SoLID Magnet’s Structural Components

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For efficient operation of the SoLID magnet, the new generation of controls and monitoring screens—Human Machine Interface (HMI) and Control System Studio-Best OPI Yet (CSS-BOY)—demand graphics of high quality that are self-descriptive and easy to follow. This note describes the development of two-dimensional and three-dimensional computer-aided design (CAD) models for some of the SoLID magnet’s structural components.

Engineering drawings [1], two-dimensional versions, of the SoLID magnet’s mechanical components and instrumentation were made available to the Detector Support Group (DSG). These drawings, some of which were hand-drawn, were generated ca. 1986 by the magnet’s manufacturer Oxford Instruments Inc. All drawings provided to DSG were in a scanned *pdf* format, blurry and not easy to follow, Fig. 1. These drawings cannot be used in the new HMI and CSS-BOY screens. Therefore, new two-dimensional and three-dimensional CAD models were developed.

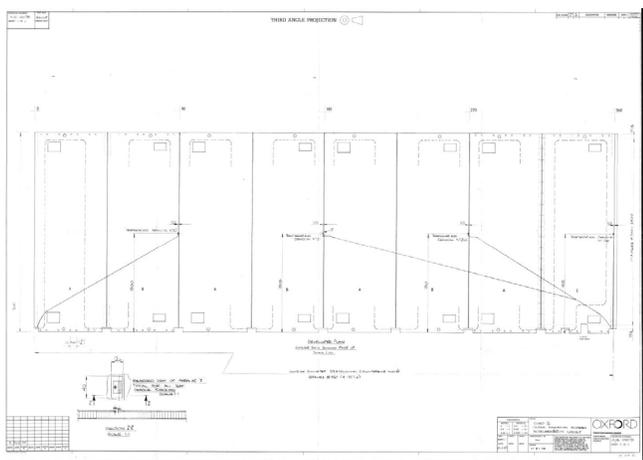


FIG. 1. Oxford drawing shows temperature sensors located in the outer radiation screen.

To develop the CAD model from the Oxford drawings, mechanical components’ dimensions were extracted and sensors’ locations were determined. Some dimensions were not visible in the scanned copies and therefore had to be estimated.

The CAD models were developed with NX12 software. A CAD model, Fig. 2, shows the location of temperature sensors in the coil shell and inner and outer radiation screens. Figure 3 shows an isometric view of the neck. Figure 4 shows the locations of load cells and strain gauges, which measure the forces in the axial and radial supports; Fig. 5 shows an isometric view of the assembled magnet’s cryostat with the neck, turret, and supports.

To summarize, the two-dimensional and three-dimensional CAD models provide detailed information on locations of sensors and instrumentation, and when used in the HMI and CSS-BOY screens, enhance visualization of mechanical components. Development of CAD models will continue on an as-needed basis.

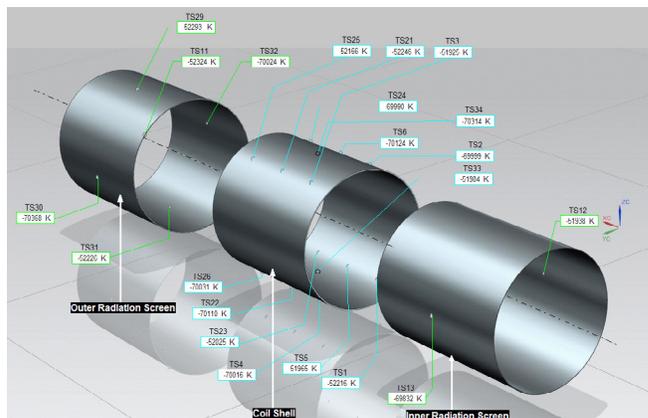


FIG. 2. Three-dimensional model shows temperature sensors’ locations in the outer radiation screen, coil shell and inner radiation screen.

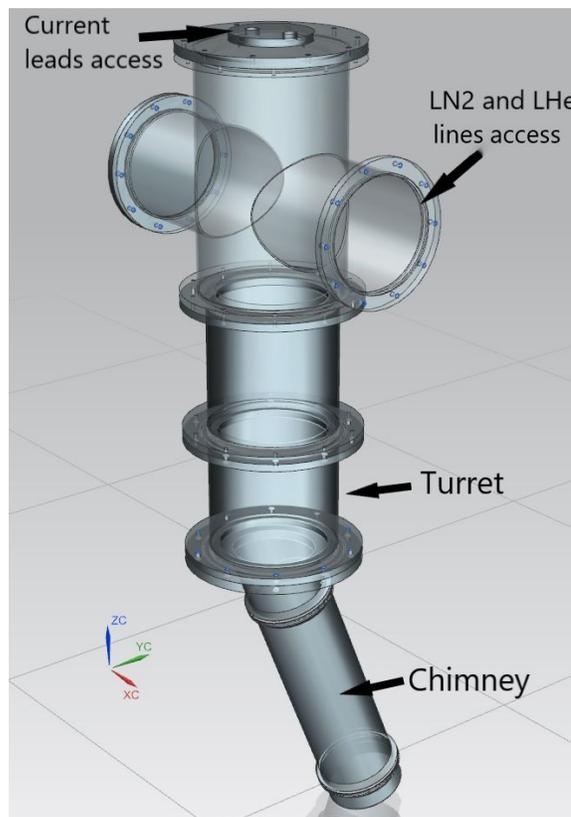


FIG. 3. Magnet neck with transparency effect added to allow the visualization of internal elements, such as LN₂ and He piping, current leads, and temperature sensors.

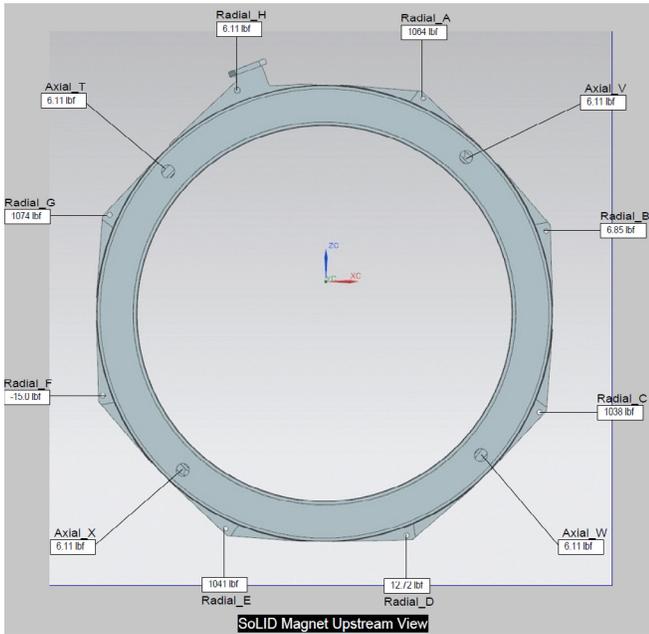


FIG. 4. Two-dimensional view of the magnet shows location of axial and radial support sensors.

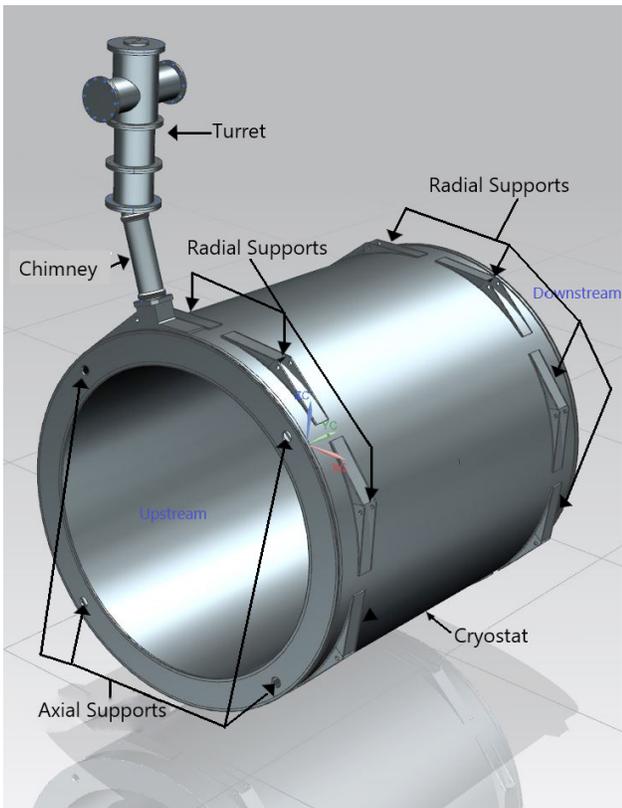


FIG. 5. Three-dimensional model for all magnet's components assembled.

[1] *Operating Manual for Cleo II Superconducting Magnet*, Oxford Instruments LTD, Oxford, England, 1987.