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Fri-Af-Po.03-04: The design and performance of the Canis 3x3 magnet array support systems

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Thea Energy, Inc has designed, developed, and tested the “Canis” 3x3 array of high-temperature superconductor (HTS) planar coils, which will serve as a prototype for the development of the “Eos” planar coil stellarator. The Canis 3x3 magnet array support systems consist of a vacuum vessel, a radiation shield, first and second stage cooling systems, a magnet current distribution system, and a mechanical support structure. The support systems were designed, developed, and deployed to enable the operation and test of the Canis 3x3 magnet array. A custom vacuum vessel houses and provides an environment for the array and support systems. The radiation shield and first stage current leads are cooled to a temperature of 79 K by a liquid nitrogen (LN2) distribution system with 600 W of cooling power, supplied by LN2 dewars. The HTS magnet array and second stage current leads are further cooled to a temperature of 20 K using supercritical helium (ScHe) supplied by an external cryoplant and ScHe cryo-circulation system with 250 W of cooling power. The magnet array is supplied with 150 A of operating current by 9 pairs of hybrid current leads, made of copper and HTS. Finally, the magnet array and associated hardware is mechanically supported and thermally isolated by a custom G-10 and stainless-steel support structure. The Canis 3x3 magnet array test campaign infrastructure is housed in a dedicated test cell at Thea Energy’s headquarters in Kearny, NJ. This poster will describe the design of the Canis 3x3 magnet array support systems and report on their performance as part of the test campaign.

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