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The Numerical Simulation of a LAr Thermostat

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The experiment designed to search for dark matter WIMPs scattering off 1500L liquid argon(LAr) in an ultra-low background cryostat, will be located in the JINPING Mountain, China. A LAr thermostat, with a self-circulation argon liquefaction system by using two pulse tube cryocoolers (80W@80K), is developed in preparation of this experiment. Due to both the less gas bubble formation and the temperature gradient within 1.0 K in inner cylinder, which is detrimental for the functioning of the detector, an actively-cooled LAr shield is used to intercept heat radiation. In order to analysis the flow and heat transfer characteristics of LAr in the inner cylinder, which plays a role to make the detector work at both stable and efficient conditions, the numerical simulation had to be created. The paper presents an overview of modeling, simulations with the commercially software FLUENT performed on this system.

Author: Dr WANG, Meifen (Institute of High Energy Physics, Chinese Academy of Sciences)

Co-authors: Dr NING, Feipeng (Institute of High Energy Physics, Chinese Academy of Sciences); Dr WANG, Guoping (Institute of High Energy Physics, Chinese Academy of Sciences); Ms YANG, Huan (Institute of High Energy Physics, Chinese Academy of Sciences); Ms ZHANG, Yu (Institute of High Energy Physics, Chinese Academy of Sciences); Prof. ZHU, Zian (Institute of High Energy Physics, Chinese Academy of Sciences)

Presenter: Dr WANG, Meifen (Institute of High Energy Physics, Chinese Academy of Sciences)

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