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The ICARUS T600 Module liquid argon purification system

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The ICARUS detector is a liquid argon time projection chamber with unique features that make it an ideal device to be used for several particle physics applications. After years of R&D activities, the ICARUS Collaboration proposed the construction of the T600 Module in strict partnership with industry to guarantee the necessary and viable scaling-up of the technology from prototypal dimensions to sized plants in order to study neutrino oscillations and matter stability in an effective way. The T600 Module represents the largest LAr detector (760 t LAr mass) ever realized. It was installed and successfully operated for 3 years inside the underground Gran Sasso Laboratory. One of the most important issues for the success of the detector technology is the liquid argon purity. Purity requirements are stronger and stronger with the increase of the detector dimensions: for a plant of the ICARUS T600 Module size it is necessary to keep the residual electronegative impurity content to a level of the order of 0.1 parts per billion or better all over the argon volume during the whole detector run, thus allowing the ionization tracks, created by interacting particles inside LAr, to be transported without suppression along the drift path. We present the solutions adopted for the LAr re-circulation and purification systems that permitted to reach impressive results in terms of LAr purity thus representing a milestone for future projects and developments at higher LAr mass scale.

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