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C2Po1C-02: Development of a moisture removal device for helium cryogenic plants

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Water contamination represents a critical challenge in helium cryogenic systems, presenting multifaceted operational risks for advanced industrial and scientific facilities. These water contaminants undergo complex phase transformations during system operations, crystallizing under extreme low-temperature conditions and posing significant threats to precision engineering infrastructure. Such crystallized particles can critically damage sensitive mechanical components, particularly turbines within Cold box assemblies, and accumulate within intricate heat exchanger networks, progressively compromising thermal transfer efficiency and overall system performance.

At National Synchrotron Radiation Research Center (NSRRC), we have developed an innovative moisture removal device capable of eliminating water contaminants both during offline maintenance and online system operation. Currently, four of these devices are deployed: one at the Taiwan Photon Source (TPS), two at the Taiwan Light Source, and one integrated with the purification system to enhance moisture contaminant removal capabilities. This paper will detail the device's design and present comprehensive testing results.

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