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COLUMBUS FLEXIBLE THERMAL CONTROL HUB

Abstract

Columbus Infrastructure for Experiments and Payloads is available in different Classes, the major category is Class-1 Racks; some Racks in Columbus are dedicated to certain experimental categories, such as Biolab (BLB) or Fluid Science Lab (FSL). In the recent past years, the need for Multi-Purpose Racks became apparent and resulted as an example in European Drawer Rack Mark II (EDR MkII); a Class-1 Multi-Purpose Rack basically provides engineering budgets like accommodation volume, Power Interfaces, Cooling Interface, Vacuum- / Venting Line access, Nitrogen access and Data / communication access. In other words, a Class-1 Rack is a distribution device of Columbus engineering budgets.

Class-1 and / or System Racks shape the aisle of Columbus and are important contributors to the Columbus infrastructure; this also applies to the Multi-Purpose facilities EDR and EDR Mk II; these Racks provide flexibility to Class-2 Payloads and experiments, but still at the penalty for low internal volume, compared to the external International Standard Payload (ISPR) Rack Volume. In some cases, the Volume of (Class-2) Experiments can be maximized on Waiver / Deviation basis, but this is not a recommendable way forward. A better way to proceed is to maximize Rack internal Volumes for the Experiments and minimize the volume, required for Rack internal distribution Services and Rack internal Sub-Systems. As a consequence, basic Services can be made available to facilities that do no more require Rack facility computing or a Class-1 Telemetry / Telecommand instance. One of these basic Services is cooling. The Flexible thermal control hub is a device that allows cooling capability distribution to any customer Experiment or Payload; it acquires access to Columbus Active Thermal Control System at any possible Rack Location / utility Interface Panel. Once installed, it allows up to four Interface Customers that can be supported in standalone configuration or in parallel. The flexible Thermal Control Hub therefore allows more utilization in Columbus and opens the barriers of Class-1 architectures; it allows new ways of Class-1 utilization in case a science dedicated Rack is no more needed; it supports new Rack types and allows access to the customers, using commercial couplings. The major benefit is the maximization and diversification of standard cooling Interfaces to new Payload generations at lower cost on Unit Level and Integrated Level.