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C1Or1B-06: Cryogenic management of the LHC Run 2 dynamic heat loads

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During the LHC (Large Hadron Collider) Run 2 between 2015 and 2018 inclusive, significant dynamic heat loads have been generated and successfully managed by the LHC cryogenic system. These dynamic heat loads are generated by several physical phenomena occurring at two temperature levels and with different time constants. On the magnet cold-mass maintained at 1.9 K, dynamic heat loads are coming from eddy currents generated during the magnet transients, resistive heating in welds of superconducting electrical circuits, beam gas scattering, beam losses and secondary particles escaping from collisions (debris). On the beam screens, actively cooled between 4.6 K and 20 K, the circulating beams produce also dynamic heat loads due to synchrotron radiations, image current and photo-electron clouds. This paper presents the measurements inventory performed during the Run 2 to assess these dynamic heat loads as function of the different accelerator parameters (beam energy, beam intensity, injection scheme, etc.). Then, the related compensation measures and adapted cryogenic operation modes applied to manage the induced transients at the different time scales will be presented.

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