PS Internal Dump Core Review

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Scientific Programme

The current dumps of the PS machine have to be replaced during the long shutdown 2 by two new devices. It has been shown that the current dumps would not be able to withstand the new beam parameters available from run 3 and that the proton leakage would be detrimental for the downstream magnets. Several consecutive beam cycles constituted by up to 5×1013 protons/spill and a maximum energy of up to 26 GeV are expected to be dumped during run 3 and onwards. The two new objects will be built, installed and maintained by the EN-STI Group. The two sets of internal dumps are used during PS operation as a machine and material safety system as well as a protection preventing to extract the beam to TT2 when needed. The PS internal dumps are not to be considered for personnel safety purposes. Presently, each current dump consists of a copper block actuated via a mechanism installed right next to the dump. The mechanism is in atmospheric pressure environment. The dumps are cooled with a water piping system and their motion occurs in UHV. The new dumps are proposed to be constituted by a material different than copper, in order to be able to survive the new beams and maintain a reasonable proton leakage. Several thermo-mechanical simulations have been executed, in order to simulate the material response to the beam impacts and to help selecting the new materials for the dumps. The new PS internal dump Project is very critical due to complex requirements as the amount of dumping cycles foreseen (300 000 per year) together with the high stress induced by the beam. Other critical parameters are the expected lifetime of the equipment (20 years), the reduced maintenance required due to the high radiation levels, the fast movement (the dump should be inside the beam area within 0.25 seconds), the vacuum level (10-9 mbar), and the need of an efficient cooling system. The review shall focus on the dump core configuration.