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Development, Implementation and Final Performance of the new PS Booster Distributor Generators (PFN, 6.3kV/1kA) with Fast Protection System

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The LHC Injector Upgrade project aims at increasing the performance of the LHC injectors and includes the replacement of Linac2 by Linac4 as injector to the Proton Synchrotron Booster (PSB). In order to distribute the 160 MeV beam from Linac4 to the four rings of the PSB, a new distributor system has been built. The required five pulse generators have a pulse length ranging from 20 μ s to 620 μ s with a rise time of less than 2 μ s and a maximum flattop ripple of ± 1 %. Four generators distribute the beam to the four vertically stacked PSB rings whilst the fifth generator dumps the beam tail. The basic generator hardware consists of a Pulse Forming Network (PFN), two series connected IGBT switches, an optical trigger interface and a Fast Interlocks Detection System (FIDS) for hardware protection. During the iterative development phase, solutions to fulfil the required performance relating to rise time, jitter, long-term stability and reliability have been implemented and will be presented. The different failure modes of the generator have been studied, identified and mitigated, mostly by means of the FIDS. The FIDS is integrated into a larger control system infrastructure via an Ethernet backbone and industrial bus (Profinet). The industrial bus manages all PLC controllers for slow supervision of ancillary systems and remote control systems from the operating room. The process of the generator, the hardware protection system, the final design choices and its performance.

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