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Upgrade of Triggering System of the SPS Beam Dumping System at CERN

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In order to prevent uncontrolled beam losses in the Super Proton Synchrotron (SPS) at CERN, which can cause thermal and radiation damages to machine components, an internal beam dumping system is used. It consists of three fast pulsed magnets which deflect the circulating beam vertically onto an absorber block within one accelerator revolution. The excitation current for each magnet is generated by the discharge of a Pulse Forming Network (PFN) through the magnet into a matched terminating resistor. Until now, thyratrons with a column of ignitrons in parallel have been used as switching element. Since the development of new power semiconductor devices now offers a good alternative and thanks to the experience gained with the use a solid state switches within the LHC beam dumping system, the replacement of the thyratrons and ignitrons with two parallel stacks of twelve Fast High Current Thyristors (FHCT) has been decided. As triggering circuits are one of the most critical components that will determine the global performance of a pulsed power system, a matched triggering system with the stacks of FHCT has been developed with the objectives to improve FHCT stack performance by reducing switching losses and turn on spread. The baseline triggering solution will be discussed in this paper with few alternative solutions that have been evaluated during prototyping such as pulse compression or the use of a Laser Pumped Silicon Thyristor. Power switches identified for this application are briefly described and compared in terms of performance in an equivalent triggering configuration of a 10-stage high power GTO stack. The limiting factors of the different switching techniques are highlighted in this comparative review.

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