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Machine Studies: What did we achieve, what remains to be done and what could be improved?

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In 2004 an ambitious programme of machine studies has been conducted in the PS and SPS complex. Beams for LHC commissioning and physics have been prepared in the injector chain and progress has been made in the understanding and in the solution of the present performance limitations. The SPS has been heavily used as a test-bed for LHC hardware prototypes and to study the electron cloud build-up and scrubbing in cryogenic surfaces. Excellent results have been obtained also in the preparation of the PS and SPS complex for the CNGS challenge both in the new multi-turn extraction scheme in the PS and in the revival of the high intensity beams. After an overview of the status of the LHC and high intensity beams and of the main (preliminary) results of the machine studies, the main performance limitations of the PS-SPS accelerator chain and the outstanding issues for future studies will be outlined. Finally a summary will be given of the recommendations issued by the APC to improve machine performance, to increase the efficiency of the use of Machine Development time and to make new beams operational.

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