

## **LHC Machine Protection Performance and Issues during 2012**

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### **Abstract**

Operating the LHC with stored beam energies up to 140MJ (40% of nominal value) in 2012 was only possible due to the experience with and confidence into the machine protection systems gained in the 2 previous running periods - 2010 and 2011, where the stored beam intensity was slowly increased. In this paper the performance of the machine protection system during 2012 will be briefly discussed and compared to the previous running periods. Issues, which appeared during the operation of the MP systems during 2012 are reviewed. Special attention will be given to MPS issues, which risked compromising the protection of the LHC and, therefore, lead to a stop or delay of the standard operation of the LHC. The immediate actions taken as well as the mid- and long-term mitigations in these cases will be discussed. The efficiency of machine protection procedures during intensity increase, intensity cruise and the preparation of machine development periods will be reviewed. Finally, improvements of the MP systems and procedures for operation after LS1 are proposed.