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## **Significant acceleration of development by automating quality assurance of a medical particle accelerator safety system using a formal language driven test stand**

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At the Centre for Proton Therapy at the Paul Scherrer Institute cancer patients are treated with a fixed beamline and in two gantries for ocular and non-ocular malignancies, respectively. For the installation of a third gantry a new patient safety system (PaSS) was developed and is sequentially being rolled out to update the existing areas. The aim of PaSS is to interrupt the treatment whenever any sub-system detects a hazardous condition. To ensure correct treatment delivery, this system needs to be thoroughly tested as part of the regular quality assurance (QA) protocols as well as after any upgrade. In the legacy safety systems, unit testing required an extensive use of resources: two weeks per area in the laboratory in addition to QA beam time. In order to significantly reduce the time, an automated PaSS test stand for unit testing was developed based on a PXI chassis with virtually unlimited IOs that are synchronously stimulated or sampled at 1 MHz. It can emulate the rest of the facility using adapters to connect each type of interface. With it PaSS can be tested under arbitrary conditions. A VHDL-based formal language was developed to describe stimuli, expected behaviour and specific measurements, interpreted by a LabView runtime environment. This article describes the tools and methodology being applied for unit testing and QA release tests for the new PaSS. It shows how automation and formalization made possible an increase in test coverage while significantly cutting down the lab testing time and facility's beam usage.

### **Minioral**

Yes

### **Description**

### **Speaker**

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