



Contribution ID: 73

Type: **Poster**

10 Order of OF Magnitude Current Measurement Digitizers for the CERN Beam Loss Systems.

Wednesday 25 September 2013 18:01 (1 minute)

A wide range current digitizer card is needed for the acquisition module of the beam loss monitoring systems in the CERN Injector Complex. The fully differential frequency converter allows measuring positive and negative input currents with a resolution of 31nA in an integration window of 2 μ s. Increasing the integration window, the dynamic range covers 2•10¹⁰ where the upper part of the range is converted by measuring directly the voltage drop on a resistor. The key elements of this design are the fully differential integrator and the switches operated by an FPGA. The circuit is designed to avoid any dead time in the acquisition and reliability and failsafe operational considerations are main design goals. The circuit will be discussed in detail and lab and field measurements will be shown

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Session Classification: Poster