



Contribution ID: 389

Type: **Poster Presentation of 1h45m**

## Accurate 3D Field Mapping of an Iron Shielded Split Coil Spectrometer Magnet

*Tuesday 29 August 2017 13:15 (1h 45m)*

The Magnet Section of the Paul Scherrer Institute (PSI) upgraded in 2017 its Hall probe magnet measurement bench with an in-house developed 3D Hall sensor of a distinctive type and of a high accuracy, named Hallcube. The first major magnetic field measurements at the upgraded bench were performed on a split coil magnet with iron housing. This magnet is routinely used on the low energy muons (LEM) spectrometer on the muE4 beam-line at PSI. At the maximal current the main field component in the magnet aperture is 0.35 T and the side field components due to the split coil configuration rise above 0.1 T. Hence, and for the purpose of tuning the muon beam transport and optimising the operation of this worldwide unique facility, accurate 3D field maps of the spectrometer magnet are crucial. To ensure a high relative accuracy of  $1E-4$ , extra measures were taken to cancel out the influence of the earth magnetic field and the lab environment on the measurements. In addition to the magnetic field measurements, the spectrometer magnet has also been modelled in 3D using the Vector Fields OPERA simulation software. A description of the measurement system, detailed analysis of the results and the comparison with the calculation are presented.

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**Session Classification:** Tue-Af-Po2.02

**Track Classification:** A2 - Resistive Accelerator Magnets