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Numerical Field Analysis of the Magnets for a proposed Ionisation Beam Profile Monitor for High Current Synchrotron and Cooler Rings.

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iThemba LABS was requested by the Institut für Kernphysik at Forschungszentrum Jülich, Germany, to design and calculate a magnet system for a proposed non-destructive Ionization Beam Profile Monitor (IBPM) that can measure beam profiles using the secondary ions produced in the rest gas, planned to be implemented with the FAIR-GSI project in Darmstadt

Apart from the geometrical restrictions by the available space, the main requirements for the magnet system are to comply with the specified field intensity and homogeneity at the plane of measurement and to deliver the primary beam unchanged and aligned with the original beam direction within the GSI storage ring.

The calculated magnets for the IBPM consists of four window-frame, room-temperature, water-cooled, laminated, dipole DC-electromagnets in line with the primary beam. The inner two dipoles of the set are respectively used for horizontal and vertical beam profile analysis and the correct delivery of the beam from the system is facilitated with the aid of two corrector magnets. The magnets are mounted outside and around the vacuum chamber that contains other essential components and therefore will have unusually large pole gaps that are in the order of 0.5 m, which, together with the relative short drift lengths between the magnets, cause significant interference between the magnetic flux distributions of the magnets. This necessitated the use of 3D numerical field analysis that incorporates all the magnets.

The field homogeneities in the regions where the beam profiles are to be measured were found to be very sensitive to the magnet geometries and layout, but a workable solution was found and the calculated results of these magnets and multi-pole and ion beam optics analysis of the system will be presented.

**Level (Hons, MSc,
 PhD, other)?**

All

**Consider for a student
 award (Yes / No)?**

No

**Would you like to
 submit a short paper
 for the Conference
 Proceedings (Yes / No)?**

No

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