arXiv:1105.5069v1 [physics.acc-ph] 25 May 2011

CAS - CERN Accelerator School: Magnets

Bruges, Belgium, 16 - 25 June 2009

Proceedings - CERN Yellow Report CERN-2010-004

editor: D. Brandt

These proceedings present the lectures given at the twenty-third specialized course organized by the CERN Accelerator School (CAS), the topic being 'Magnets'. The course was held in Bruges, Belgium, from 16 to 25 June 2009. This is the first time this topic has been selected for a specialized course. Taking into account the number of related applications currently in use in accelerators around the world, but, even more important, the worrying decrease in the corresponding expertise in the different laboratories, it was recognized that such a topic should definitively be incorporated into the CAS series of specialized courses. The specific aim of the course was to introduce the participants to the basics of resistive magnet design and its underlying theoretical concepts. The first part of the school dealt with basic introductory courses such as Maxwell's equations for magnets, beam optics, physics and measurement of magnetic materials, the different types of resistive magnets and their respective performance, an introduction to numerical field computation, and a core lecture on basic magnet design. The second part of the course focused more on quality control, the different measurement systems with their electronics, calibration techniques and respective applications as well as the question of stability and reproducibility. For the first time, in addition to the actual lectures, a Case Study was proposed to the participants. This consisted of eight hours of a guided practical exercise, where the participants had to propose their own design for a magnet fulfilling the boundary conditions corresponding to a combined-function magnet developed for the ALBA Synchrotron Light Source in Barcelona, Spain. This Case Study was enthusiastically received by the participants, who praised both the proposed approach and the amount of practical information acquired from this exercise.

Lectures

arXiv:1103.0713 [pdf, other]
Title: Maxwell's Equations for Magnets
Authors: Andrzej Wolski
Comments: Presented at the CERN Accelerator School CAS 2009: Specialised Course on Magnets, Bruges, 16-25 June 2009
Subjects: Accelerator Physics (physics.acc-ph)

arXiv:1103.1069 [pdf]
Title: Physics and measurements of magnetic materials
Authors: S. Sgobba (CERN)
Comments: 25 pages, presented at the CERN Accelerator School CAS 2009: Specialised Course on Magnets, Bruges, 16-25 June 2009
Journal-ref: CERN-2010-004, pp. 39-63
Subjects: Accelerator Physics (physics.acc-ph); Materials Science (cond-mat.mtrl-sci)

arXiv:1103.1119 [pdf]
Title: Basic design and engineering of normal-conducting, iron-dominated electromagnets
Authors: Th. Zickler (CERN)
Comments: 38 pages, presented at the CERN Accelerator School CAS 2009: Specialised Course on Magnets, Bruges, 16-25 June 2009
Journal-ref: CERN-2010-004, pp. 65-102
Subjects: Accelerator Physics (physics.acc-ph)

arXiv:1103.1800 [pdf]
Title: Eddy currents in accelerator magnets
Authors: G. Moritz (GSI, Darmstadt)
Comments: 38 pages, presented at the CERN Accelerator School CAS 2009: Specialised Course on Magnets, Bruges, 16-25 June 2009
Journal-ref: CERN-2010-004, pp. 103-140
Subjects: Accelerator Physics (physics.acc-ph)

arXiv:1103.1583 [pdf]
Title: Injection and extraction magnets: kicker magnets
Authors: M.J. Barnes, L. Ducimetiére, T. Fowler, V. Senaj, L. Sermeus
Comments: 26 pages, presented at the CERN Accelerator School CAS 2009: Specialised Course on Magnets, Bruges, 16-25 June 2009
Journal-ref: CERN-2010-004, pp. 141-166
Subjects: Accelerator Physics (physics.acc-ph)

arXiv:1103.1062 [pdf]
Title: Injection and extraction magnets: septa
Authors: M.J. Barnes, J. Borburgh, B. Goddard, M. Hourican (CERN)
Comments: 18 pages, presented at the CERN Accelerator School CAS 2009: Specialised Course on Magnets, Bruges, 16-25 June 2009
Journal-ref: CERN-2010-004, pp. 167-184
Subjects: Accelerator Physics (physics.acc-ph)

arXiv:1103.1573 [pdf]
Title: Permanent magnets including undulators and wigglers
Authors: J. Bahrdt
Comments: 45 pages, presented at the CERN Accelerator School CAS 2009: Specialised Course on Magnets, Bruges, 16-25 June 2009
Journal-ref: CERN-2010-004, pp. 185-230
Subjects: Accelerator Physics (physics.acc-ph)

arXiv:1103.1815 [pdf]
Title: Specifications, quality control, manufacturing, and testing of accelerator magnets
Authors: D. Einfeld (CELLS-ALBA, Barcelona)
Comments: 41 pages, presented at the CERN Accelerator School CAS 2009: Specialised Course on Magnets, Bruges, 16-25 June 2009
Journal-ref: CERN-2010-004, pp. 231-272
Subjects: Accelerator Physics (physics.acc-ph)

arXiv:1104.0799 [pdf]
Title: Dimensional metrology and positioning operations: basics for a spatial layout analysis of measurement systems

Authors: A. Lestrade (SOLEIL, Saint-Aubin)
Comments: 60 pages, presented at the CERN Accelerator School CAS 2009: Specialised Course on Magnets, Bruges, 16-25 June 2009
Journal-ref: CERN-2010-004, pp. 273-333
Subjects: Accelerator Physics (physics.acc-ph)

arXiv:1104.0802 [pdf]
Title: Dielectric insulation and high-voltage issues
Authors: D. Tommasini (CERN)
Comments: 21 pages, presented at the CERN Accelerator School CAS 2009: Specialised Course on Magnets, Bruges, 16-25 June 2009
Journal-ref: CERN-2010-004, pp. 335-355
Subjects: Accelerator Physics (physics.acc-ph)

arXiv:1104.3784 [pdf, ps, other]
Title: Magnetic measurement with coils and wires
Authors: L. Walckiers (CERN)
Comments: 29 pages, 26 figures, presented at the CERN Accelerator School CAS 2009: Specialised Course on Magnets, Bruges, 16-25 June 2009. For higher-resolution figures see this http URL
Journal-ref: CERN-2010-004, pp. 357-385
Subjects: Accelerator Physics (physics.acc-ph)

arXiv:1104.0803 [pdf]
Title: Fabrication and calibration of search coils
Authors: M. Buzio (CERN)
Comments: 35 pages, presented at the CERN Accelerator School CAS 2009: Specialised Course on Magnets, Bruges, 16-25 June 2009
Journal-ref: CERN-2010-004, pp. 387-421
Subjects: Accelerator Physics (physics.acc-ph)

arXiv:1103.1271 [pdf]
Title: Hall probes: physics and application to magnetometry
Authors: S. Sanfilippo (Paul Scherrer Institut)
Comments: 40 pages, presented at the CERN Accelerator School CAS 2009: Specialised Course on Magnets, Bruges, 16-25 June 2009
Journal-ref: CERN-2010-004, pp. 423-462
Subjects: Accelerator Physics (physics.acc-ph)

arXiv:1103.1575 [pdf]
Title: Magnet stability and reproducibility
Authors: N. Marks (ASTeC, STFC, Daresbury Laboratory and University of Liverpool, The Cockcroft Institute, Daresbury)
Comments: 21 pages, presented at the CERN Accelerator School CAS 2009: Specialised Course on Magnets, Bruges, 16-25 June 2009
Journal-ref: CERN-2010-004, pp. 463-483
Subjects: Accelerator Physics (physics.acc-ph)