

BAARTMAN, Richard A.

Employment History

1980-present TRIUMF scientist
2005-present Head, Beam Physics group, Accelerator Division, TRIUMF

Awards

1975 Gold Medal, Graduating class Simon Fraser University
2009 Fellow, American Physical Society
2011 Outstanding Referee, American Physical Society

Recent Research Contributions

Grants

2011-2014 Cyclotron Space Charge Physics,
Natural Sciences and Engineering Research Council of Canada

Committees, Service to the community

2006-2009 Member, Editorial Board, Physical Review Special Topics - Accelerators and Beams
2008-2009 Program Committee PAC09 (BDEMF session chair)
2009-2012 Vice-Chair, Publications Committee of the Division of Physics of Beams, APS
2009- Member, Int. Collaboration on Future Accelerators (ICFA) Beam Dynamics Panel
2011-2013 Program Committee Chair, Int. Cyclotron Conference 2013
2011- Reviewer, FNAL Project X, PIXE, PIP, P2MAC
2014 Design Study, Future Circular Collider Design Study, CERN

Invited Talks; last 5 years

2013 *Space Charge Limit in Separated Turn Cyclotrons*,
Cyclotrons2013, Vancouver, Canada, 2013-09-16
2013 *Optimal 3D Quadrupoles Shapes*, NA-PAC13
(North American Particle Accelerator Conf.), Pasadena, USA.
2014 *Status of Superconducting Electron Linac Driver*, LINAC2014, Geneva, Switzerland.
2015 *TRIUMF 300 keV Vertical Injection Line*, European Cyclotron Progress Meeting,
Louvain-la-Neuve Belgium.
2016 *Linac Envelope Optics*, LINAC2016, East Lansing, Michigan, USA.

Research Summary; last 5 years

Participated in the Proton EDM international collaboration, in particular the theory of completely electrostatic storage rings[2].

Head of the design team of the CANREB High Resolution Separator[3].

Member of team designing a megawatt-class electron accelerator. [4, 13, 16, 17, 18, 19, 12] Oversee beam dynamics issues, and have contributed personally to the theory of electron envelopes from rest[10], and for the linac[1], the optics layout of the low energy section, and quadrupole design[11]. As a result of this work, have devised a new method of calculating optimal pole shapes of standard charged particle focusing elements (quadrupoles)[8]. This resulted in an invited talk (2013). Used this method to design the 77 quadrupoles for the transport of electrons from the ARIEL electron linac to the targets.

Aided in the design of transfer lines for the CERN ELENA project[5, 7], and in the design of the high resolution separator for the GANIL DESIR project[6]

Developed a new technique for matching to cyclotrons[15, 14]. The technique used is to calculate the 3D beam envelopes (6 phase space dimensions) including space charge, axial magnetic field, and acceleration at the dee gaps in the cyclotron. The calculation is first order, but contains all the relevant physics of that order: in the cyclotron it includes electric focusing, the gap-crossing resonance, and the radial-longitudinal coupling (vortex) effect of space charge.

Used this technique to design a new vertical section of the beam line between the ion source and matching to the cyclotron. This line is 12 m in length and contains 26 quadrupoles. It has been installed, commissioned, and performs in agreement with theory.[9]

References

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- [2] EDM Collaboration. A storage ring experiment to detect a proton electric dipole moment. Technical report, 2015.
- [3] JA Maloney, R Baartman, and M Marchetto. New design studies for triumphs ariel high resolution separator. *Nuclear Instruments and Methods in Physics Research Section B: Beam Interactions with Materials and Atoms*, 2015.
- [4] Marchetto, Ames, Ang, Baartman, Bylinskii, Chao, Dale, Fong, Iranmanesh, Jones, et al. Commissioning and operation of the ariel electron linac at triumph. In *IPAC*, pages 2444–2449, 2015.
- [5] Borburgh, Balhan, Bartmann, Fowler, Sermeus, Vanbavinckhove, Baartman, Pricop, and Barna. Concept for elena extraction and beam transfer elements. In *IPAC13*, 2013.
- [6] T Kurtukian-Nieto, R Baartman, B Blank, T Chiron, C Davids, F Delalee, M Duval, S El Abbeir, A Fournier, D Lunney, et al. Spiral2/desir high resolution mass separator. *Nuclear Instruments and Methods in Physics Research Section B: Beam Interactions with Materials and Atoms*, 317:284–289, 2013.
- [7] Vanbavinckhove, Bartmann, Butin, Choynet, Baartman, Barna, and Yamada. Geometry and optics of the electrostatic elena transfer lines. In *IPAC13*, 2013.
- [8] R. Baartman. Quadrupole shapes. *Phys Rev Special Topics Accelerators and Beams*, 15:074002–074011, 2012.
- [9] R. Baartman, F. Bach, I. Bylinskii, R. Laplante, Yi-Nong Rao, and Roman Ruegg. Commissioning the TRIUMF 300 keV H⁻ Vertical Injection Line. In *Proc. International Particle Accelerator Conference*, 2011.
- [10] R. Baartman. Bunch dynamics through accelerator column. In *Proceedings of IPAC*, 2011.
- [11] R. Baartman. Quads for ariel electrons. Technical report, Technical Report TRI-BN-11-02, TRIUMF, 2011.
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- [13] L. Merminga, F. Ames, R. Baartman, P. Bricault, Y. Bylinski, YC Chao, R. Dawson, D. Kaltchev, S. Koscielniak, R. Laxdal, et al. Ariel: Triumph's advanced rare isotope laboratory. In *IPAC'11, San Sebastian, Spain*, 2011.
- [14] R. Baartman. Optics design of the ISIS vertical section replacement. Technical Report TRI-DN-09-11, TRIUMF, 2009.
- [15] R.A. Baartman. Cyclotron Matching Injection Optics Optimization. In *Proc. Particle Accelerator Conference, Vancouver, Canada*, 2009.

- [16] I. Bylinskii, F. Ames, R. Baartman, PG Bricault, Y. Chao, K. Fong, SR Koscielniak, R.E. Laxdal, M. Marchetto, L. Merminga, et al. An Electron Linac Photon-Fission Driver for the Rare Isotope Program at TRIUMF. In *Proc. Particle Accelerator Conference, Vancouver, Canada, 2009*.
- [17] R.E. Laxdal, F. Ames, R.A. Baartman, S.R. Koscielniak, M. Marchetto, L. Merminga, A.K. Mitra, I. Sekachev, V.A. Verzilov, A. Yan, F. (TRIUMF) Bandyopadhyay, A. Chakrabarti, and V. (DAE/VECC) Naik. The TRIUMF/VECC Collaboration on a 10MeV/50kW Electron Injector. In *Proc. Particle Accelerator Conference, Vancouver, Canada, 2009*.
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