

# CURRICULUM VITAE



## BAARTMAN, Richard A.

### Degrees

Simon Fraser University 1975 B.Sc.  
Simon Fraser University 1981 M.Sc.

### Employment History

1980-1988 Staff Scientist, TRIUMF  
1988-1995 Research Scientist, TRIUMF  
1995-present Senior Scientist, TRIUMF  
2005-present Head, Accelerator Physics group, TRIUMF

### Awards, Committees, Service to the community

1975 Governor General's Gold Medal (SFU)  
1996 Visiting scientist at KEK (Japan Society for the Promotion of Science fellowship)  
1997-2004 Member, DOE review committee for SNS construction project (Oak Ridge)  
1998 Convener ICFA WS on Beam Loading  
2001, Oct. Visiting scientist, CERN-ISOLDE  
2002-2005 Member, DOE review committee for Fermilab's Run 2 progress  
2003, Dec. Visiting Scientist MSU.  
2004 Member, EBIT review at Brookhaven National Lab  
2005, Jan. Visiting Scientist, CIAE (China).  
2005 Convener, Beam Dynamics session, HPSL2005  
2006-2009 Member, Editorial Board, Physical Review Special Topics - Accelerators and Beams  
2008 Convener, Beam Dynamics session, HB2008  
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  
2009 Fellow, American Physical Society

### Highly Qualified Personnel Supervised

Undergraduate students: 5  
M. Sc students: 0  
Ph. D. students: 1

### Publications

Refereed Journal Publications: 29  
Invited Conference Talks: 5  
Seminars & Colloquia: 5  
Conference Publications: 78

### Most Significant Research Contributions.

- [1] A spiral inflector is an optical element used in injecting a particle beam into a cyclotron. We found the canonical momenta in the magnetic field of the cyclotron, and used the standard optics technique of expanding about the (spirally-rotating) reference trajectory. We thus derived the Hamiltonian for linear motion. This advance allowed for quicker calculations plus the incorporation of space charge.
- [2] With Ph. D. student, developed a new technique and understanding of finding stability threshold of synchrotron bunches, due to mode coupling of longitudinal eigenmodes.
- [3] Up to this time, most efforts to try to understand space charge effects in synchrotrons were based upon the frequencies of motion of the individual particles. This work demonstrated that this is an incorrect picture; the collective modes of oscillation are key and the details of the motion of the individual particles in the beam core are not relevant.
- [4] For all the main types of charged particle optics elements, canonical transformations were found that eliminate the lowest order derivatives of the strength function. The benefit is that forces do not become singular in the hard-edge limit, so simple formulas can be derived for the lowest order aberrations, and aberration-free beamlines can be designed without resorting to tedious high order transfer maps.
- [5] I designed the beam optics to inject into the  $\beta$ -NMR facility at TRIUMF. Special features that complicate the design are: (1) Deceleration electric field to slow the  $^8\text{Li}$  ions down from 30 keV to 300 eV, and (2) axial magnetic field up to 9 T. These result in resp. radial electric and magnetic fields that strongly perturb the ion beam.

### References

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- [3] R. Baartman. Betatron resonances with space charge. *AIP Conference Proceedings*, 448:56, 1998.
- [4] R. Baartman. End Effects of Beam Transport Elements. *Talk at Snowmass*, 2001.
- [5] RF Kiefl, WA MacFarlane, GD Morris, P. Amaudruz, D. Arseneau, H. Azumi, R. Baartman, TR Beals, J. Behr, C. Bommas, et al. Low-energy spin-polarized radioactive beams as a nano-scale probe of matter. *Physica B: Physics of Condensed Matter*, 326(1-4):189–195, 2003.
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