



Curriculum Vitae, Lars Buhrkall

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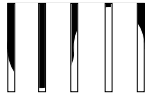
General

Lars Buhrkall is a free-lance electrical engineering consultant with prime focus on EMC and functional compatibility within railway systems. He has more than 25 years of experience from development, analysis, design, and testing of converters, electrical drives, traction vehicles and electrical railway systems.

Occupation

06-1995 – present: Freelance consultant engineer with the following major activities (contract partners in parentheses):

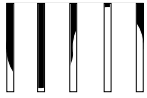
- 2000 – present: Specification and execution of numerous test campaigns with Danish, Swedish, Norwegian, German, and Austrian locomotives and EMUs, for demonstration of compatibility with Danish, Swedish and Norwegian electric railway infrastructure requirements and climatic (winter) conditions (DSB, DB, Siemens, Bombardier, Hector Rail, DB Schenker Rail, Green Cargo)
- 2008 – present: Specification, development, and analysis of compatible traction systems for the Talent2, Zefiro China, SNCF Regio 2N, DB and SBB double-deckers, FS Frecciarossa 1000, QR Gold Coast, US CX100 people-mover, UK Cross-Rail, and numerous other rail vehicle projects around the world (Bombardier)
- 2009 – present: Safety Analysis, Risk Assessment, and development of the required safety documentation to the relevant authorities, for the approval of the introduction of new rail vehicles in existing railway systems (DB Schenker Rail, Bombardier, Siemens)
- 2014: Analysis of line harmonics, Auckland EMU project (CAF)
- 2006 – 2008 and 2010-2014: Electrical power engineering and EMC work on the automated people mover system in Uppsala, Sweden (prototype), and in Suncheon, South Korea (commercial system) (Vectus Ltd., South Korea)
- 2013: Trouble-shooting and development of solutions for EMUs having problems to operate at conditions with ice on the overhead line (Transitio (SE))
- 2012 – 2013: EMC Manager for the Fehmarnbelt Fixed Link railway/motorway tunnel pre-project (FEMCO group (DK))
- 2011 – 2012 and 2014: Analysis and comparison of the EMC-properties of several different configurations of Luxembourg railway lines after re-electrification from DC 3 kV to AC 25 kV 50 Hz (CFL)
- 2008 – 2009: Project manager for a joint project (Jernbaneverket, Banverket, and Bombardier) investigating the problems of low-frequency power oscillations in the power supply systems for Scandinavian railways (Banverket)
- 2008 – 2009: Analysis of Norwegian weather statistics, and assessment of the risk that a modified overhead line system could lead to increased build-up of ice on the contact wire (Jernbaneverket)
- 2003 – 2010: Specification and development of compatible traction systems for the VLU and SSL projects of London Underground (Bombardier)
- 2005 – 2009: Development of a specification for the electrical interface between vehicles and infrastructure systems in the Swedish and Norwegian railways (Banverket, Jernbaneverket)
- 2004 – 2005: Analysis, fault tracking, and tests of old Metro cars rebuild with new static auxiliary converters (Oslo Sporveier)



- 2004: Analysis and correction of problems caused by ice on the overhead supply line for trolley busses in Landskrona, Sweden (Municipality of Landskrona)
- 2004: Development of interference requirements for DC track circuits (Banverket)
- 2003 – 2004: Analysis fault conditions leading to excessive levels of signalling interference currents, A32 tram for Den Haag, Netherlands (Bombardier)
- 2002 – 2004: Leader of the ‘OHL Ice Team’ with representatives from SBB, Banverket, Siemens, Bombardier, ABB, the University of Luleå, and others, with the aim of explaining the phenomena in relation to ice on the overhead lines of AC electrified railways (Bombardier)
- 2002: Analysis of functional compatibility problems between dual-voltage EMUs and a rotating 50 Hz – 16.7 Hz converter system in DSB's workshop in Copenhagen (DSB)
- 1997 – 2002: Specification and development of the traction system for the UK Electrostar EMU, to make it compatible with UK railway infrastructure requirements. Including tests, analysis, and other activities for the Safety Case (Bombardier)
- 1999 – 2001: Analysis, fault tracking, and specification and analysis of tests with CFL and DB locomotives for demonstration of compatibility with Luxembourg railway infrastructure requirements (CFL, DSB)
- 1999 – 2001: Specification and analysis of tests with DSB's new dual-voltage locomotives and EMU's for demonstration of compatibility with Danish railway infrastructure requirements (DSB)
- 1997 – 1998: Analysis and fault tracking of existing vehicles and systems, and specification of a compatible traction system for the new SMU generation of EMUs for Queensland Railways (Adtranz)
- 1996 – 1997: Leader of the joint ABB-NSB task force set down to analyse, specify, and develop a compatible traction system for the Gardermoen Airport Shuttle for NSB (ABB Traction / Adtranz)
- 1996 – 1997: Representing Adtranz Sweden in Adtranz's international Advanced Technology Project "Electrical Systems Compatibility" (Adtranz)
- 1995 – 2000: Specification and analysis of EMC requirements for the railway part of the fixed link across Øresund (Øresundskonsortiet)
- 1995 – 1997: Leader of the joint ABB-DSB task force set down to solve the compatibility problem of the IR4 EMU for DSB (ABB Traction / Adtranz)
- In addition to this, numerous smaller activities also in relation to railway EMC (Banestyrelsen, SJ, Copenhagen Metro, DSB, Adtranz/Bombardier, Øresundskonsortiet, Hector Rail, Green Cargo, Banverket, and others)

02-1990 – 06-1995: Development engineer and department manager, ABB Traction, Västerås:

- 1994 – 1995: Leader of the joint ABB-DSB task force set down to solve the compatibility problem of the IR4 EMU for DSB
- 1993 – 1994: Manager of the department for electrical and mechanical development and design of converter systems for EMUs (26 engineers and technicians)
- 1992 – 1993: Manager of the department for development of electric traction systems (14 engineers)
- 1990: Fault tracking, Los Angeles metro cars



- 1990 – 1992: Development engineer, GTO-converters for EMUs
- Various other activities, including management of numerous tender projects and project coordination within the international ABB Transportation Group.

01-1989 – 02-1990: Teacher (part time), freelance consultant engineer (part time):

- Development and start-up of a new course 'Electrical Drives', and teaching the course 'Electrical Machines', Copenhagen University College of Engineering
- System analysis and development of a 75 Hz interference monitor for Stockholm Metro (ABB Traction)
- Writing a booklet on electrical traction drives (ABB Scandia)
- Various other activities

11-1988 – 01-1989: Electrical engineer, ABB Scandia, Denmark

08-1984 – 11-1988: Electrical engineer, ASEA Denmark. **09-1984 – 04-1987** located at ASEA Traction in Västerås:

- 1987 – 1988: Development of protection systems for electrolytic capacitor banks
- 1986 – 1988: Fault tracking and identification of systematic failure modes, Copenhagen S-trains
- 1986 – 1987: Development of GTO auxiliary converters for Istanbul tramcars
- 1985 – 1986: Development of GTO traction converters for X2000 high-speed trains
- 1984 – 1985: Development and testing of chopper equipment for Copenhagen S-trains
- Various other activities

Education

Formal Education:

- 1980 – 1984: B. Sc., Electrical Power Engineering, Copenhagen University College of Engineering. Average grade: 93.8% (12.2 on the former Danish scale where 13 is max.).
- 1976 – 1980: Electrician. Evening courses in mathematics and economics
- 1967 – 1976: Public school

Training and courses:

- 1997: Railway safety engineering (16 h, Praxis)
- 1993: Leadership and management (138 h, ABB internal)

Publications

- *DC components due to ice on the overhead contact wire of AC electrified railways.* Elektrische Bahnen 8/2005, pp. 380-389.
- *Condition monitoring of pantograph contact strip* (coauthor), Paper presented at the 4th IET conference on Railway Condition Monitoring (RCM 2008), Derby 2008.
- *Low-frequency oscillations in Scandinavian railway power supply – Part 1: Basic considerations.* Elektrische Bahnen 1-2/2010, pp. 56-64, and – *Part 2: Test of traction units.* Elektrische Bahnen 3/2010, pp. 103-111 (coauthor).



Personal Data

Born 02-02-1960.

Languages: Danish, English, and Swedish: Speaking, reading, and writing fluently.
German (and Norwegian): Speaking and reading fluently, writing some.

Computer systems and tools: Windows-based PC, MS Office, Matlab, PSpice, DeweSoft, and others.



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