Stephan Bökelmann

Engineer (M.Eng.) and Physicist | Embedded Systems, Instrumentation, DAQ, Linux
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SUMMARY

Engineer and physicist with more than 10 years of experience in embedded hardware and firmware development, instrumentation, data acquisition (DAQ) and condition monitoring at the interface of industry and research. Managing director of an engineering consultancy, former COO of a company group and research associate in experimental particle physics (PANDA/FAIR, collaboration with GSI). Core areas: C/C++ and Python, STM32 microcontrollers, FPGA (VHDL, Zynq), mixed-signal PCB design (KiCad), Linux and DevOps, silicon detectors, IoT (LoRa, PoE), international product certification (CE, FCC, CCC). Lecturer in programming, OOP and database systems.

CORE SKILLS

- **Embedded and Firmware:** C, C++ (modern, ISO C++ committee), STM32 (ARM Cortex-M), microcontrollers, bare-metal firmware, JTAG
- **FPGA and Digital Design:** VHDL, Xilinx Zynq, bitstream deployment, high-throughput DAQ, mixed-signal silicon detectors, HV-MAPS
- **Hardware:** circuit design, mixed-signal PCB design (KiCad), EMC, enclosure design, 3D CAD (Autodesk Inventor), 3D printing, wire bonding, prototyping, production setup
- **Software and IT:** Python, Linux (Debian/Ubuntu), Bash, Docker, DevOps, routing and networking, CephFS, PostgreSQL, SQL, REST APIs, Git, web technologies
- **Instrumentation and Data:** sensors, actuators, data acquisition (DAQ), signal processing, condition monitoring, predictive maintenance, machine learning, data fusion, Geant4
- **IoT and Connectivity:** LoRa/LoRaWAN, Power over Ethernet (PoE), Wi-Fi, cloud integration, telemetry, observability
- **Management:** project management, team leadership, product development, product certification (CE, FCC, CCC), lean/Kanban production, requirements engineering, teaching and didactics
- **Languages:** German (native), English (C1–C2, fluent, business level), Chinese (HSK 1)

PROFESSIONAL EXPERIENCE

Managing Director
nabla B Engineering and Services UG, Bochum, Germany
since 2021

- Leading an engineering consultancy focused on measurement systems, embedded hardware and custom development projects
- Development and commissioning of reflow monitoring and temperature profiling systems (HORUS) for Kurtz Ersa / GlobalPoint, including on-site deployment in Denmark
- Embedded vision PCB with AI acceleration (2026, NDA); Zynq bitstream deployment pipeline from JTAG to REST API (open source)
- Infrared interferometry camera for remote assessment of air-fin coolers (Kelvion); process monitoring concept for ADNOC, Abu Dhabi
- EMC laboratory work and CCC certification in Dongguan, China; quality inspection of aluminium enclosures at HLH Prototypes

Research Associate, Geomonitoring
Research Center of Post-Mining, Technische Hochschule Georg Agricola (THGA), Bochum, Germany
2023 – 2025

- Multi-sensor geomonitoring and data fusion in post-mining applications
- MineBerry-LoRa: LoRa-based monitoring of the stability of mine shaft closures for RAG
- Set-up of a big-data storage cluster based on CephFS

Research Associate, Experimental Hadron Physics
Ruhr University Bochum, Germany, group of Prof. Dr. Miriam Fritsch
2020 – 2025

- Development of mixed-signal silicon detectors and high-throughput DAQ systems for the PANDA experiment at FAIR
- Design and construction of the Luminosity Detector (LMD), mechanical simulation and positioning mechanism
- Set-up of several test stands for the characterisation of HV-MAPS sensors in collaboration with GSI Darmstadt
- Set-up of a wire-bonding production line for HV-MAPS silicon detectors
- Electrical impedance spectroscopy (EIS) instrument for biofilm assessment, research stays at Montana State University, USA

Chief Operating Officer (COO)
AI Group (Auto-Intern GmbH, CCD Car Diagnostics UG, nerd_force1 UG), Bochum, Germany
2018 – 2021

- Overall operational responsibility for the company group, strategic development of the product lines
- Set-up of scalable production processes, management of international certification and development projects (incl. China)
- skAInet / PowerSense: PoE-based monitoring of critical infrastructure, incl. for DB Netz AG (German railway infrastructure)
- autowerkstatt4null (funded by the German Federal Ministry for Economic Affairs): ML-based diagnostics and OmnAIScope digital oscilloscope (patent pending)
- Import and licensing negotiations with Ross-Tech LLC, USA (VCDS project)

Head of Development
Auto-Intern GmbH, Bochum, Germany
2016 – 2018

- Leadership of the development team, responsibility for the system architecture of diagnostic and monitoring systems for automotive and railway infrastructure
- Co-development of the IDS current sensor for intelligent switch-point diagnostics in Deutsche Bahn's DIANA system
- Sensor and analysis method for structure-borne vibration on plastic injection moulding machines
- Training of 6 apprentices in total (2016 – 2026)

Development Engineer
Auto-Intern GmbH, Bochum, Germany
2014 – 2016

- Hardware and software development for vehicle diagnostics and condition monitoring solutions, incl. for DB Netz AG
- Co-development of a lean/Kanban production line for the HEX-V2 diagnostic interface

Lecturer
THGA Bochum, Bochum University of Applied Sciences, Ruhr University Bochum
since 2018

- Introduction to Programming (since 2019), Object-Oriented Programming (since 2020), Database Management Systems (since 2026), THGA Bochum
- Introduction to Low-Level Programming (2023 – 2025) and Programming for Geoscientists (2024), Ruhr University Bochum
- Web Technologies 2 (2025), Bochum University of Applied Sciences; supervision of 12 bachelor theses

Junior Consultant
PROLAB Produkt + Produktion, Germany
2010 – 2011

Maintenance, Testing and Installation Work (occasional assignments)
CERN, Geneva, Switzerland
since 2012

EDUCATION

Doctoral Studies (Dr. rer. nat.), Experimental Hadron Physics
Ruhr University Bochum, Germany
since 2020

Thesis: Implementation of a test system and characterisation of the CLIC_v3_HVGR HV-MAPS pixel detector for MIPs (submission expected 2026)

Master of Engineering (M.Eng.), Electrical Engineering and Information Technology
Technische Hochschule Georg Agricola (THGA), Bochum, Germany
2016 – 2020

Thesis: Design, development and realisation of a linear positioning unit for the Luminosity Detector of the PANDA experiment at FAIR

Physics Studies (Bachelor of Science)
Ruhr University Bochum, direct admission to the doctoral programme
2014 – 2020

Bachelor of Engineering (B.Eng.), Electrical Engineering and Information Technology
Technische Fachhochschule Bochum, Germany
2011 – 2016

State-Certified Engineering Technician, Design and Development Engineering
Max-Born-Berufskolleg, Recklinghausen, Germany
2007 – 2011

Vocational Training as Electronics Technician for Automation Technology (IHK)
Evonik Industries, Marl, Germany
2007 – 2010

State-Certified Technical Assistant, Design and Manufacturing Engineering
Berufskolleg Kemnastraße, Recklinghausen, Germany
2004 – 2007

SELECTED PROJECTS

- 2022 – 2026: HORUS monitoring system for predictive assessment of soldering quality factors on reflow ovens, Kurtz Ersa
- 2020 – 2026: Test stands for the characterisation of HV-MAPS sensors for minimum ionising particles, PANDA/FAIR
- 2022 – 2024: Battery-powered temperature profiling system with Wi-Fi, web frontend and cloud integration, Kurtz Ersa
- 2024: Multi-level soil moisture sensor "Smart Green City" with LoRa connectivity
- 2020 – 2024: OmnAIScope digital oscilloscope within autowerkstatt4null (patent pending)
- 2022: Enclosureless housing for PCB cavities (patent pending)
- 2020 – 2022: Vibration analysis of asynchronous machines based on electromagnetic signatures, DB Netz AG
- 2021: Measurement and analysis system for predicting heavy-rain cells using PoE, 25square (patent pending)
- 2026: Dual-uplink Starlink failover for an office network (Linux routing)

SELECTED PUBLICATIONS

- Bökelmann, S. et al. (2025): autowerkstatt4null: An Off-Board-Diagnostics Ecosystem for Car-Workshops
- Bökelmann, S. et al. (2025): Microfabricated Electrochemical Sensors as a Sentinel System to Detect Biofilms in River Systems. ECS Meeting Abstracts
- Bernsdorf, B.; Rudolph, T.; Pawlik, M.; Bökelmann, S. (2023): Multisensorales Geomonitoring – Ein Beitrag zur Datenfusion im Nachbergbau
- Bökelmann, S. et al. (2022): IT-Infrastruktur zukunftsgerichteter Geomonitoringsysteme
- PANDA Collaboration (2019 – 2021): five publications in European Physical Journal A, incl. PANDA Phase One

COMMUNITY AND MEMBERSHIPS

- Since 2021: Chairman and founding member, open Skunkforce e. V.
- Since 2016: Organiser of emBO++, international symposium on embedded systems development, Bochum
- Since 2020: Organiser of KiCon Europe; 2025 co-organiser of KiCon Asia, Shenzhen
- Co-organiser of the Practical Data Science Congress Bochum
- 2023 – 2025: Chair of the Young Scientists, 2024 – 2025 member of the Collaboration Board, PANDA experiment at FAIR/GSI
- Since 2020: Member of the IHK examination board for IT specialists (Chamber of Commerce, Central Ruhr Region); certified trainer (IHK)
- Contributor to the ISO C++ standardisation committee (ISO/IEC 14882), incl. committee meeting Kona 2019
- Regular conference talks on embedded systems, instrumentation and physics (since 2017)

ADDITIONAL INFORMATION

Born 24 June 1988 in Haltern am See, German citizen. Driving licence categories A and B. Available for remote, part-time and freelance/contract work.

Bochum, September 2026