

Florian Maillard

Systems Engineer | Scientific Computing | Energy Systems

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Profile

Engineer and PhD with experience in railway certification, systems engineering, verification and validation, electrochemical energy systems, multiphysics modelling and scientific computing.

Strong background in Python for scientific modelling, engineering automation, data processing and technical tooling. Experience spans Li-ion batteries, railway systems and PEM fuel cells, with a focus on technically rigorous, reproducible and maintainable engineering methods.

Professional Experience

Segula Technologies — PEMFC Digital Twin Modelling Engineer

Internal R&D | Mar. 2026–present

- Development of a complete multiphysics digital twin for proton-exchange membrane fuel cells (PEMFC).
- Coupled modelling of electrochemical, thermal, fluidic and water-management phenomena.
- Development of nonlinear state-estimation methods based on an Unscented Kalman Filter (UKF).
- Scientific implementation in Python, with emphasis on numerical robustness, testing, reproducibility and maintainability.
- Current work focuses on model formulation, numerical implementation and internal consistency; experimental validation has not yet been performed.

Segula Technologies for CAF — Certification Engineer

Reichshoffen, France | Dec. 2024–Mar. 2026

- Certification activities for hydrogen-train and Oxygène (AMLD) projects.
- Interface with NoBo, DeBo and SNCF stakeholders.
- Compliance assessment against TSI PRM, LOC&PAS and CCS requirements, as well as French national technical rules.
- Technical analysis of certification evidence and project requirements.
- Autonomous handling of technical certification topics.
- Development of tools to compare regulatory requirements with project requirements managed in IBM DOORS.

Segula Technologies for Socomec — Test Engineer

Benfeld, France | Jan. 2024–Nov. 2024

- Migration and maintenance of automated test benches.
- Adaptation of test sequences and engineering tooling.
- Use of Python and test automation tools to support validation activities.

Segula Technologies for Alstom / CAF — Validation Engineer

Reichshoffen, France | Feb. 2020–Dec. 2023

- Validation activities on Régiolis railway systems using the Laborame test platform.
- Use of a train simulator reproducing the software and hardware architecture required for system-level testing.
- Development of Python-based test tooling, including the PyMamut library.
- Numerical validation, test preparation and analysis of validation results.
- Engineering automation and support for test execution.

Alstom Aptis — Electrical Engineer / Battery Expert

Hangenbieten, France | Jul. 2019–Oct. 2019

- Electrical engineering activities for the Aptis electric-bus project.

- Integration of battery packs into the vehicle electrical architecture.
- Technical follow-up of battery-related integration topics and supplier issues.

ALTEN for Zodiac Aerospace — Work Package Manager

Niort, France | Jan. 2019–Jun. 2019

- Management of a team of approximately ten consultants in an aircraft electrical-core qualification team.
- Coordination of technical activities and qualification workload.

ALTEN for Safran — Systems & V&V Engineer

Éragny-sur-Oise, France | Jun. 2018–Dec. 2018

- Verification and validation activities for the SKYNAUTE civil inertial navigation system.
- Writing of test procedures.
- Deployment of ARINC 429 and Ethernet test facilities.
- Numerical simulations and representativeness studies.
- Vehicle testing and internal test harmonisation.
- Development of MATLAB tools for test-data analysis.

AGAP2 for Saft — Technical Lead & IVVQ Engineer

Poitiers, France | Apr. 2016–Oct. 2017

- Technical coordination of Li-ion battery systems for naval and torpedo applications.
- Systems architecture, systems engineering, specifications and user documentation.
- Troubleshooting and commissioning at customer sites.
- Writing of V&V procedures and test reports accepted by certification bodies, including DNV-GL and Lloyd's Register.
- Delivery of several operational naval and torpedo battery systems.

Lycée Jean Giraudoux — Mathematics Teacher

Châteauroux, France | 2016

- Mathematics teaching.

Education

PhD — Energy, Thermal Engineering and Combustion

University of Poitiers / Institut Pprime | 2012–2015

Thesis: *Methodology for Li-ion battery diagnosis using electrochemical noise measurements.*

- Development of a non-intrusive diagnostic methodology for Li-ion batteries.
- Statistical signal processing for battery-state characterisation.
- Research topics included electrochemical noise, ageing, state of charge, state of health, signal processing and complex impedance.
- PhD awarded with highest honours and congratulations from the jury.

Engineering Degree — Energy Engineering

ENSI Poitiers | 2009–2012

- General engineering curriculum with a focus on energy systems.
- Specialisations included electrical energy and sound / energy impacts.

Preparatory Classes — MPSI / MP

Lycée Pierre d'Ailly, Compiègne | 2007–2009

Earlier R&D Experience

Institut Pprime / PSA — R&D Internship

2012

- Psychoacoustics and aerodynamic intermittency studies.
- Autoregressive modelling and signal analysis.

GYS — R&D Internship

2011

- Power electronics.
- Power-factor-correction topics.

Core Expertise

- Systems engineering, V&V, IVVQ and certification
- Railway regulatory compliance and requirements engineering
- Scientific Python and engineering automation
- Multiphysics modelling of electrochemical energy systems
- Numerical methods and nonlinear state estimation
- Li-ion batteries and PEM fuel cells

Technical Skills

Scientific Computing

Python, NumPy, SciPy, pandas, scikit-learn, statsmodels, xarray

Software Engineering

Git, pytest, Ruff, mypy, uv, CI/CD, packaging, Bash, GNU/Linux

Systems & Certification

V-cycle, IVVQ, V&V, requirements engineering, IBM DOORS, NoBo / DeBo interfaces, TSI compliance, French national technical rules

Modelling

PEMFC, Li-ion batteries, multiphysics modelling, UKF, numerical simulation, signal processing

Test & Engineering Tools

MATLAB, Simulink, LabVIEW, TestStand, ControlBuild, LTspice

Communication Protocols

Ethernet, CAN, CANopen, ARINC 429

Selected Publications

- Serguei Martemianov et al. *New methodology of electrochemical noise analysis and applications for commercial Li-ion batteries*. Journal of Solid State Electrochemistry, 19, 2015, pp. 2803–2810. DOI: 10.1007/s10008-015-2855-2
- Serguei Martemianov et al. *Noise Diagnosis of Commercial Li-ion Batteries Using High-Order Moments*. Russian Journal of Electrochemistry, 52(12), 2016, pp. 1122–1130. DOI: 10.1134/S1023193516120089
- Florian Maillard et al. *Electrochemical Noise as diagnostic tool for Li-ion batteries*. 10th International Frumkin Symposium on Electrochemistry, 2015.
- Florian Maillard et al. *Measurements and Signal Processing of Li-ion Electrochemical Noise*. 10th International Frumkin Symposium on Electrochemistry, 2015.

Languages

- French — native
- English — professional working proficiency