

Maël Le Garrec

CS ENGINEER · ACCELERATOR PHYSICS PHD STUDENT

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Experience



KEK

Tsukuba, JP

VISITING SCIENTIST

2024

- Measurement of linear optics of SuperKEKB
- First observations of higher chromaticity non-linear orders
- First observations of sextupolar Resonance Driving Terms



CERN

Geneva, CH

PHD STUDENT - ACCELERATORS AND BEAM PHYSICS

2021 — 2024

- Measurements and corrections during LHC's commissioning
 - Linear optics: β -beating, dispersion, energy, coupling
 - Non-linear optics via chromaticity: Q'' and Q'''
- Measurement, modelling and correction of decapole fields via Chromatic Amplitude Detuning, Q''' and RDTs.
- Observation and modelling of higher order fields (dodecapole and decatetrapole).
- Measurement and correction of skew octupole fields via RDTs.
- Analytical calculations from Hamiltonians.

Geneva, CH

TRAINEE - ACCELERATORS AND BEAM PHYSICS

2019 — 2021

- Software development for Optics Measurements and Corrections for LHC Run III commissioning.
- Particle tracking simulations ; dev in Python and Java.



Scaleway

Paris, FR

DEVOPS

2018 — 2019

- Maintenance of Python APIs, server images and system software.
- Administration of thousand of hypervisors and servers.

Skills and Interests

Coding Python, C/C++, Java, bash, LaTeX, Rust

Web Flask, HTML, CSS, Apache

Others Archlinux, Debian, Git, pgSQL, Scipy, Sympy, Numpy, Pandas, Matplotlib

Languages French, English (C1), German (A2)

Interests Electronics, CAD Design & 3D Printing, Automotive Mechanics, Climbing, Paragliding

Professional Knowledge

Particle Tracking and Analysis

MAD-X, MAD-NG, OMC3, XSUITE

2019-

- LHC single particle tracking with field errors.
- Frequency and Optics analysis for beta-beating, dispersion, RDTs, etc.
- Correction of Optics based on response matrices (Chromaticity, RDTs)
- Modelling of machine errors.
- Dynamic Aperture simulations with XSuite.

Education

EPITA

Paris, FR

COMPUTER SCIENCE ENGINEERING

2013 - 2019

- Focus on systems and network security
- Low-level development and system administration

CERN Accelerator School

Chavanne de Bogis, CH / Sévrier, FR

ACCELERATOR PHYSICS COURSES - [HTTPS://CAS.WEB.CERN.CH](https://cas.web.cern.ch)

2021-2022

- Introduction to Accelerator Physics, 2 weeks focused on basic accelerator physics subjects.
- Advanced Accelerator Physics, continuation of previous school, focused on advanced subjects.

Publications

Journal Publications (co-author)

- (1) Rogelio Tomás et al. “Optics for Landau damping with minimized octupolar resonances in the LHC”. in: *Journal of Instrumentation* 19.05 (2024). doi: 10.1088/1748-0221/19/05/T05010. URL: <https://iopscience.iop.org/article/10.1088/1748-0221/19/05/T05010>
- (2) Ewen H. Maclean et al. “Prospects for beam-based study of dodecapole nonlinearities in the CERN High-Luminosity Large Hadron Collider”. In: *The European Physical Journal Plus* 137.11 (2022). doi: 10.1140/epjp/s13360-022-03367-2. URL: <https://link.springer.com/10.1140/epjp/s13360-022-03367-2>
- (3) Joschua Dilly et al. “First operational dodecapole correction in the LHC”. in: *Physical Review Accelerators and Beams* 26.12 (2023). doi: 10.1103/PhysRevAccelBeams.26.121001. URL: <https://link.aps.org/doi/10.1103/PhysRevAccelBeams.26.121001>

Conference Proceedings

- (1) Mael Le Garrec et al. “Measurement and modelling of decapole errors in the LHC from beam-based studies”. In: *IPAC’23*. Venice, Italy, 2023. doi: 10.18429/JACOW-IPAC2023-MOPL024. URL: <https://jacow.org/ipac2023/doi/jacow-ipac2023-mopl024>
- (2) Mael Le Garrec et al. “First measurement of fourth and fifth order chromaticity in the LHC”. in: *IPAC’23*. Venice, Italy, 2023. doi: 10.18429/JACOW-IPAC2023-MOPL027. URL: <https://jacow.org/ipac2023/doi/jacow-ipac2023-mopl027>

Conference Proceedings (co-author)

- (1) Tobias Persson et al. “LHC Optics Commissioning in 2023 and 2024”. In: *IPAC’24*. Nashville, Tennessee, USA, 2024
- (2) Vittorio Ferrentino et al. “LHC 2023 Ion Optics Commissioning”. In: *IPAC’24*. Nashville, Tennessee, USA, 2024
- (3) Sasha J. Horney et al. “Sextupole RDTs in The LHC at Injection and in the Ramp”. In: *IPAC’24*. Nashville, Tennessee, USA, 2024
- (4) Tuuli Nissinen et al. “LHC Optics Measurements from Transverse Damper for the High Intensity Frontier”. In: 2023. doi: 10.18429/JACOW-HB2023-THBP14. URL: <https://jacow.org/hb2023/doi/JACoW-HB2023-THBP14.html>
- (5) Rogelio Tomás García et al. “Optics for Landau Damping with Minimized Octupolar Resonances in the LHC”. in: 2023. doi: 10.18429/JACOW-HB2023-THBP20. URL: <https://jacow.org/hb2023/doi/JACoW-HB2023-THBP20.html>
- (6) Jacqueline Keintzel et al. “60° phase advance optics measurements in the Large Hadron Collider at CERN”. in: *IPAC’23*. Venice, Italy, 2023. doi: 10.18429/JACOW-IPAC2023-MOPL026. URL: <https://jacow.org/ipac2023/doi/jacow-ipac2023-mopl026>
- (7) Felix Carlier et al. “Challenges of K-modulation measurements in the LHC Run 3”. In: *IPAC’23*. Venice, Italy, 2023. doi: 10.18429/JACOW-IPAC2023-MOPL014. URL: <https://jacow.org/ipac2023/doi/jacow-ipac2023-mopl014>
- (8) Felix Carlier et al. “LHC Run 3 optics corrections”. In: *IPAC’23*. Venice, Italy, 2023. doi: 10.18429/JACOW-IPAC2023-MOPL015. URL: <https://jacow.org/ipac2023/doi/jacow-ipac2023-mopl015>
- (9) Elena Fol et al. “Experimental Demonstration of Machine Learning Application in LHC Optics Commissioning”. In: *Proc. 13th Int. Part. Accel. Conf. IPAC22*. Vol. IPAC2022. Bangkok, Thailand: JACoW, 2022. doi: 10.18429/JACOW-IPAC2022-MOPOPT047

- (10) Tobias Persson et al. “Optics Correction Strategy for Run 3 of the LHC”. in: *Proc. 13th Int. Part. Accel. Conf. IPAC22*. Vol. IPAC2022. Bangkok, Thailand: JACoW, 2022. doi: 10.18429/JACoW-IPAC2022-WEPOST008
- (11) Tobias Persson et al. “Optics Measurements and Correction Plans for the HL-LHC”. in: *IPAC’21*. Campinas, Brazil: JACOW Publishing, Geneva, Switzerland, 2021. doi: 10.18429/JACoW-IPAC2021-WEPA026. URL: <https://accelconf.web.cern.ch/ipac2021/doi/JACoW-IPAC2021-WEPA026.html>
- (12) Tobias Persson et al. “Optics Correction Strategy for Run 3 of the LHC”. in: *IPAC’21*. Campinas, Brazil: JACOW Publishing, Geneva, Switzerland, 2021. doi: 10.18429/JACoW-IPAC2021-WEPA027. URL: <https://accelconf.web.cern.ch/ipac2021/doi/JACoW-IPAC2021-WEPA027.html>
- (13) Ewen Maclean et al. “Optics Measurement by Excitation of Betatron Oscillations in the CERN PSB”. in: *IPAC’21*. Campinas, Brazil: JACOW Publishing, Geneva, Switzerland, 2021. doi: 10.18429/JACoW-IPAC2021-THPAB168

Notes and Reports

- (1) Joschua Dilly and Mael Le Garrec. *On the derivation of Amplitude Detuning and Chromaticity Formulas for Particle Accelerators*. 2023. URL: <http://arxiv.org/abs/2301.09132>
- (2) Maël Le Garrec et al. *MD6864 — Decapole studies at injection*. Accelerators & Technology Sector Note CERN-ACC-NOTE-2023-0018. CERN, 2023. URL: <https://cds.cern.ch/record/2879070>
- (3) Xavier Buffat et al. *Optics Measurement and Correction Strategies for HL-LHC*. Accelerators & Technology Sector Note CERN-ACC-2022-0004. CERN, 2022. URL: <https://cds.cern.ch/record/2808650>
- (4) O. Aberle et al. *High-Luminosity Large Hadron Collider (HL-LHC): Technical Design Report*. CERN Yellow Reports: Monographs CERN-2020-010. Geneva: CERN, 2020. doi: 10.23731/CYRM-2020-0010. URL: <https://cds.cern.ch/record/2749422>

Seminars and Conferences

- (1) Maël Le Garrec. *Correction of Decapolar Resonances in the LHC*. Goethe Universität, Frankfurt, 2023
- (2) Maël Le Garrec. *Les champs décapolaires du LHC*. Roscoff, France, 2023. URL: <https://indico.iijclab.in2p3.fr/event/9312/contributions/30982/>