

JULIEN BARRAT

Profile on [INSPIRE HEP](#) | [GOOGLE SCHOLAR](#)



CONTACT

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IN SHORT



INTERESTS

- Defect CFT
- Thermal CFT
- Bootstrap
- Holography
- Phase transitions

LANGUAGES

- French (native)
- English (fluent)
- German (fluent)

MISC

- Reviewer for JHEP

SUMMARY

I am a theoretical physicist and postdoctoral researcher at PRINCETON UNIVERSITY, working with SIMONE GIOMBI. I develop **analytic** and **numerical bootstrap** methods for conformal field theories with **defects**, at **finite temperature** and in **finite volume**. My research explores connections between correlation functions, confinement, phase transitions and holography.

EXPERIENCE

Postdoc | PRINCETON (Princeton, USA) | 2026–present

Group leader: SIMONE GIOMBI

Project: We study **conformal defects** at **finite temperature** and in **finite volume**, using **analytic** and **numerical bootstrap** methods to constrain their correlators. A particular focus is the Polyakov loop in the confining phase of $\mathcal{N} = 4$ super Yang–Mills theory.

Postdoc | DESY (Hamburg, Germany) | 2023–2026

Group leader: ELLI POMONI

Project: We aim to develop **bootstrap methods** for **CFTs at finite temperature**, with and without conformal defects. Our methodology relies on numerical and analytical constraints centered around the validity of the OPE at small distances, which are supplemented by the periodicity of thermal correlators.

PhD | HUMBOLDT-UNIVERSITÄT (Berlin, Germany) | 2020–23

Advisors: JAN PLEFKA and VALENTINA FORINI

Thesis: Line defects in conformal field theories ([link](#))

Summary: I studied **conformal line defects** in the weak- and strong-coupling regimes. My main results are a **dispersion relation** for defect CFT, **new strong-coupling expressions** for defect correlators, and a conjecture for **multipoint superconformal Ward identities**.

Master of Science | HUMBOLDT-UNIVERSITÄT (Berlin, Germany) | 2018–20

Advisors: JAN PLEFKA and THOMAS KLOSE

Thesis: Two-point function with Wilson-line defect in $\mathcal{N} = 4$ Super Yang–Mills ([link](#))

Bachelor of Science | HUMBOLDT-UNIVERSITÄT (Berlin, Germany) | 2015–18

Advisors: CATHERINE DUBOURDIEU and TED MASSELINK

Thesis: Helium and neon ion milling of β -Ga₂O₃ nanostructures ([link](#))

GRANTS

DFG Walter Benjamin Programme | 2026–28

Bootstrapping confinement and black hole phase transitions with AI

Two-year research funding at **Princeton University** and **Universität Hamburg**, combining conformal bootstrap methods and machine learning to study phase transitions.

PUBLICATIONS

- 15 *The pinning-field line defect at finite temperature*
By **JB**, S. Giombi | Submitted to JHEP | [Link](#)
- 14 *Analytic thermal bootstrap in momentum space: From thermal OPE to QNMs*
By **JB**, D. Bozkurt, E. Marchetto, A. Miscioscia, E. Pomoni | Submitted to JHEP | [Link](#)
- 13 *Analytic thermal bootstrap meets holography*
By **JB**, D. Bozkurt, E. Marchetto, A. Miscioscia, E. Pomoni | JHEP 05 (2026) 180 | [Link](#)
- 12 *The analytic bootstrap at finite temperature*
By **JB**, D. Bozkurt, E. Marchetto, A. Miscioscia, E. Pomoni | JHEP 05 (2026) 10 | [Link](#)
- 11 *The thermal bootstrap for the critical $O(N)$ model*
By **JB**, E. Marchetto, A. Miscioscia, E. Pomoni | Phys. Rev. Lett. 134 (2025) 21 | [Link](#)
- 10 *Perturbative bootstrap of the Wilson-line defect CFT: Multipoint correlators*
By D. Artico, **JB**, G. Peveri | JHEP 02 (2025) 190 | [Link](#)
- 9 *Perturbative bootstrap of the Wilson-line defect CFT: Bulk-defect-defect correlators*
By D. Artico, **JB**, Y. Xu | JHEP 03 (2025) 191 | [Link](#)
- 8 *Conformal line defects at finite temperature*
By **JB**, E. Marchetto, A. Miscioscia, E. Pomoni | SciPost Phys. 18 (2025) 018 | [Link](#)
- 7 *Line defect correlators in fermionic CFTs*
By **JB**, P. Liendo, P. Van Vliet | JHEP 05 (2025) 146 | [Link](#)
- 6 *Multipoint correlators on the supersymmetric Wilson line defect CFT. Part II. Unprotected operators*
By **JB**, P. Liendo, G. Peveri | JHEP 08 (2023) 198 | [Link](#)
- 5 *A dispersion relation for defect CFT*
By **JB**, A. Gimenez-Grau, P. Liendo | JHEP 02 (2023) 255 | [Link](#)
- 4 *Multipoint correlators on the supersymmetric Wilson line defect CFT*
By **JB**, P. Liendo, G. Peveri, J. Plefka | JHEP 08 (2022) 067 | [Link](#)
- 3 *Bootstrapping holographic defect correlators in $\mathcal{N} = 4$ super Yang-Mills*
By **JB**, A. Gimenez-Grau, P. Liendo | JHEP 04 (2022) 093 | [Link](#)
- 2 *Two-point correlator of chiral primary operators with a Wilson line defect in $\mathcal{N} = 4$ SYM*
By **JB**, P. Liendo, J. Plefka | JHEP 05 (2021) 195 | [Link](#)
- 1 *High Field-Emission Current Density from β -Ga₂O₃ Nanopillars*
By A. Grillo, **JB**, Z. Galazka, M. Passacantando, F. Giubileo, L. Iemmo, G. Luongo, F. Urban, C. Dubourdieu and A. Di Bartolomeo | Appl. Phys. Lett. **114**, 193101 (2019) | [Link](#)

AWARDS

- LISE-MEITNER PRIZE | Best PhD thesis in physics at HUMBOLDT UNIVERSITÄT | 2024
- SPRINGER THESIS AWARD | PhD thesis published in the series RECOGNIZING OUTSTANDING PHD RESEARCH | 2024

- DESY SPECIAL ACHIEVEMENT AWARD | For achievements in the study of conformal defects | 2024

SELECTED TALKS & POSTERS

- *The pinning-field line defect at finite temperature* | 12.11.26 | NIELS BOHR INSTITUTE | Copenhagen (Denmark)
- *The pinning-field line defect in thermal geometries* | 10.09.26 | STONY BROOK U | Stony Brook (USA)
- *Bootstrapping thermal CFTs* | 07.25 | IGST 2025 | London (UK)
- *Conformal line defects at finite temperature* | 26.09.24 | DESY THEORY WORKSHOP | Hamburg (Germany)
- *Line defects in conformal field theories* | 29.06.23 | LAPTh | Annecy (France)
- *A dispersion relation for bootstrapping holographic defect correlators* | 31.01.23 | NORDITA | Stockholm (Sweden)
- *A dispersion relation for bootstrapping holographic defect correlators* | 22.11.22 | PRINCETON U. | Princeton (USA)
- *Multipoint correlators on the supersymmetric Wilson line defect CFT* | 07.11.22 | KING'S COLLEGE | London (UK)
- *Bootstrapping holographic defect correlators* | 18.07.22 | STRINGS | Vienna (Austria) | Poster

TEACHING & SUPERVISION

- Supervision of the master's thesis *Scattering amplitudes in supermembrane theory* of TOMÁŠ DIKÁČZ | HUMBOLDT-UNIVERSITÄT | 2022
- Active participation in the master's thesis of JONAS MARSCHNER | HUMBOLDT-UNIVERSITÄT | 2022
- Supervision of experiments for bachelor and master students (e.g. data analysis for the mass of the Z-boson) as a student assistant in the particle physics group of THOMAS LOHSE | HUMBOLDT-UNIVERSITÄT | 2019-2020

ACADEMIC SERVICE

- Co-founder and organiser of THERMAL SEMINARS, an online seminar series on thermal quantum field theory ([link to website](#), [link to YOUTUBE channel](#) with 60+ videos) | 2024–present
- Co-organiser of research seminars at DESY | 2024–25
- Referee for *Journal of High Energy Physics* | 2024–present

OUTREACH

- Co-founder of the YOUTUBE channel NON-STANDARD MODELS ([link](#)) about theoretical physics and featuring PI's and PhD students of the program RTG 2575: Rethinking QFT | 2022–23
- Two active participations in the LONG NIGHT OF SCIENCE | Berlin | 2022–23