

# Joonsuk Bae

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*ALICE PWG-JE Run 3 charged-particle jets – end-to-end pipeline for the first inclusive cross-section measurement at  $\sqrt{s} = 13.6$  TeV (preliminary; paper in preparation; EPS-HEP 2025 PWG-JE merge talk on behalf of ALICE).  
Pb/scintillating-fiber calorimetry R&D for the ePIC Barrel Imaging Calorimeter.*

## Education

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**Ph.D. Candidate, Physics**, Sungkyunkwan University 2022.03 – expected 2027.02  
Advisor: Beomkyu Kim. Thesis: *R-dependent charged-particle jet production in pp at  $\sqrt{s} = 13.6$  TeV with ALICE.*  
Defense expected 2026.11–12; degree conferral 2027.02.

**B.S., Physics**, Sungkyunkwan University 2021.02

## Appointments and Collaboration Membership

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ALICE Collaboration, CERN 2022.10 – present  
ePIC Collaboration, Brookhaven National Laboratory 2024.02 – present  
LAMPS Collaboration, RAON 2022.03 – 2024.04

## Research Highlights

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- **Main analyzer**, first ALICE Run 3 inclusive charged-particle jet cross section at  $\sqrt{s} = 13.6$  TeV (in preparation, target 2026): end-to-end pipeline (O<sup>2</sup>Physics task, QA, Bayesian/SVD unfolding, full systematic-uncertainty programme); PWG-JE-approved preliminary; presented on behalf of ALICE at EPS-HEP 2025 (PWG-JE merge talk).
  - **PWG-JE tracking-efficiency systematics for Hard Probes 2026**: contributed the pp  $\sqrt{s} = 13.6$  TeV charged-particle tracking-efficiency systematic ( $p_T$ -binned,  $\sim 1.5\%$  across the dominant range) for 2022/2023/2024 periods; ITS-TPC matching code reused by a PWG-JE colleague as a starting point for PbPb tracking studies.
  - **Central-framework contribution to ALICE O<sup>2</sup>Physics** (AliceO2Group/O2Physics, 2023 – present): Common/Tools patch fixing the graph-based TrackTuner  $Q/p_T$  smearing path; authored `jetCrossSectionEfficiency.cxx`, the PWG-JE task used by the SKKU Run 3 charged-jet analyses (pp 13.6 TeV, O–O) for cross-section normalization.
  - **ePIC Barrel Imaging Calorimeter**: lead offline analyst for the CERN PS T10 (2025.07) Pb/scintillating-fiber campaign (in preparation, 2026); co-author on the first beam-test paper (submitted, NIMA-D-26-00482) with module-construction support and PMT/module performance characterization.
  - **Mentoring of two MSc analyzers** on the ALICE Run 3 O–O charged-jet measurement: jet reconstruction methodology, correction procedures, and systematic-uncertainty estimation; co-author with W. Ham on the corresponding Analysis Note.

## Selected Publications

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Full list at [inspirehep.net/authors/2117232](https://inspirehep.net/authors/2117232); ALICE Collaboration co-author since 2022.10.

- **FLAGSHIP** ALICE Collaboration, *R-dependent charged-particle jet production in pp collisions at  $\sqrt{s} = 13.6$  TeV with ALICE* (in preparation, target 2026). [*main analyzer; first ALICE Run 3 inclusive charged-jet publication; thesis paper*]
- Korea-BIC Collaboration, *Beam-test characterization of a Pb/SciFi BIC prototype – CERN PS T10 (2025.07)* (in preparation, 2026). [*lead offline analyst; on-site prompt analysis and follow-up offline reconstruction*]
- H. Lee, C. Lee, J. Ryu, G. An, **J. Bae** *et al.*, “Beam test of a Pb/SciFi prototype for the BIC at the EIC,” submitted to *Nucl. Instrum. Meth. A* (NIMA-D-26-00482; arXiv preprint). [*co-author; module support and PMT/module performance characterization*]
- Y. Hong, J. Bok, G. An, **J. Bae** *et al.*, “Test-beam performance of the AstroPix silicon sensor for imaging calorimetry,” submitted to *Nucl. Instrum. Meth. A* (NIMA-D-26-00572). [*co-author; ePIC BIC silicon-layer test beam*]
- J. K. Adkins *et al.* (ECCE Coll.), “Design of the ECCE detector for the EIC,” *Nucl. Instrum. Meth. A* **1073** (2025) 170240. [*co-author; ECCE consortium*]
- Y. J. Kim *et al.* (LAMPS), “Large Acceptance Multi-Purpose Spectrometer (LAMPS) at the RAON,” *J. Korean Phys. Soc.* **87** (2025) 670–682. [*co-author; Time-of-Flight maintenance and on-site checks*]

## Invited and Contributed Talks (since 2022)

**Summary:** 3 invited workshops · 5 invited collaboration-meeting talks · 6 international conference contributions (one on behalf of the ALICE Collaboration at EPS-HEP 2025) · 8 domestic (KPS) · regular PWG-JE working-group speaker since 2023.

### Invited (external workshops, seminars).

- **FKPPN Workshop**, Inha University — *Cross-section normalization in Run 3; charged-jet studies in ALICE Run 3* — 2025.12
- **HIM 2025**, APCTP — *From precision to structure: jet measurements in ALICE Run 3 and ongoing substructure studies* — 2025.05
- **FKPPN Workshop**, Inha University — *Charged-jet studies in ALICE Run 3* — 2023.11

### Invited collaboration-meeting talks.

- **Korea-BIC 2025 Summer Workshop** — *Data analysis of the recent beam test at CERN* — 2025.09
- **KoALICE National Workshop 2024** — *Jet analysis status: first look at the charged-particle jet spectrum in Run 3 pp collisions* — 2025.01
- **ALICE Physics Week 2024** — *Charged-particle jet production in Run 3* — 2024.12
- **KoALICE National Workshop 2023** — *Charged-jet  $O^2$  MC and data QA* — 2024.01
- **KoALICE National Workshop 2022** — *Dijet studies with ALICE at the LHC* — 2023.01

### Contributed talks and posters.

- **EPS-HEP 2025**, Marseille [on behalf of the ALICE Collaboration; PWG-JE merge talk] — *Inclusive and semi-inclusive jet cross-section measurements in pp collisions at  $\sqrt{s} = 13.6$  TeV with ALICE* — 2025.07
- **INPC 2025**, Daejeon [international, talk] — *Charged-particle jet and jet quenching measurement in pp collisions at  $\sqrt{s} = 13.6$  TeV during LHC Run 3 with ALICE* — 2025.05
- **Quark Matter 2025**, Frankfurt [international, poster] — *Inclusive charged-particle jet spectrum in pp collisions in Run 3 at  $\sqrt{s} = 13.6$  TeV with ALICE* — 2025.04
- **Hard Probes 2024**, Nagasaki [international, poster] — *First measurements of charged-particle jet production in pp collisions at  $\sqrt{s} = 13.6$  TeV with ALICE* — 2024.09
- **Quark Matter 2023**, Houston [international, poster] — *Charged-particle multiplicity distribution in pp collisions at  $\sqrt{s} = 13.6$  TeV with ALICE* — 2023.09
- **ATHIC 2023**, Incheon [international, poster] — *Dijet studies at the LHC* — 2023.04
- **KPS Fall 2025** [domestic, talk] — *Inclusive and semi-inclusive jet cross-section measurements in pp collisions at  $\sqrt{s} = 13.6$  TeV with ALICE* — 2025.10
- **KPS Spring 2025** [domestic, talk] — *Inclusive charged-particle jet spectrum in pp collisions in Run 3 at  $\sqrt{s} = 13.6$  TeV with ALICE* — 2025.04
- **KPS Spring 2025** [domestic, poster] — *Prototype calorimeter QC for the Barrel Imaging Calorimeter at the EIC* — 2025.04
- **KPS Fall 2024** [domestic, talk] — *First jet measurement in ALICE Run 3: charged-particle jet production* — 2024.10
- **KPS Spring 2024** [domestic, talk] — *Charged-particle jet production in pp collisions at  $\sqrt{s} = 13.6$  TeV* — 2024.04
- **KPS Fall 2023** [domestic, talk] — *First look at charged-particle jet production in pp collisions at  $\sqrt{s} = 13.6$  TeV with ALICE Run 3 data* — 2023.10
- **KPS Spring 2023** [domestic, poster] — *Dijet studies at the LHC* — 2023.04
- **KPS Fall 2022** [domestic, poster] — *Dijet studies with ALICE at the LHC* — 2022.10

## Software and Computing

ALICE O<sup>2</sup>Physics (AliceO2Group/O2Physics, 2023 – present): 37 PRs, 18 merged. Key contributions:

- **Central-framework patch** in Common/Tools (PR #15174, merged) — TrackTuner  $Q/p_T$  smearing-path fix.
- **Author of jetCrossSectionEfficiency.cxx** (PR #14057, merged) — PWG-JE task used by the SKKU Run 3 charged-jet analyses (pp 13.6 TeV, O–O) for cross-section normalization.
- Code review on community PRs across PWG-JE and Common.

## Detector and Test-beam Experience

- **ePIC Barrel Imaging Calorimeter** — on-site at CERN PS T10 (2025.07; lead offline analyst) and KEK AF-AR (2025.03; DAQ, equalization, prompt analysis); Pb/scintillating-fiber module-construction support and PMT/SiPM-level QA on prototype modules used in the 2025 campaigns; JANA2 / EIC-recon studies for sampling-fraction and energy response.
- **ALICE ITS2 alignment monitoring** (CTF level) — service work providing period-by-period tracking-performance diagnostics from compressed time-frame data, below the standard AO2D analyzer interface.

- **LAMPS Forward Tracker** (2022 – 2024) – MPPC/scintillator-plane forward-tracking concept design and Geant4 feasibility simulations.

## Service and Mentoring

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- **Student mentoring** (non-supervisory) – W. Ham (M.Sc.) and one further MSc co-analyzer on the ALICE Run 3 O–O charged-jet measurement: jet reconstruction methodology, correction procedures, and systematic-uncertainty estimation; co-author with W. Ham on the corresponding Analysis Note.
- **KoALICE O<sup>2</sup> Tutorial** (2024.01.22–23, SKKU; co-organizer with H. Lee and listed Indico contact) – two-day Run 3 analysis-framework tutorial for the Korean ALICE community; instructor on *Running O<sup>2</sup> Physics with Hyperloop* (solo) and on *PWG-JE practical tasks*.
- **ePIC Korea-BIC analysis coordination** – analysis liaison between the SKKU group and the Korea-BIC consortium for beam-test data products.

## Technical Skills

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**Programming.** C++, Python, ROOT, Geant4, JANA2 / EIC-recon, PYTHIA, FastJet, Bash, Git, L<sup>A</sup>T<sub>E</sub>X.

**Analysis.** jet reconstruction and unfolding (Bayesian, SVD), efficiency and systematic-uncertainty evaluation, data/MC validation, test-beam calibration and energy-response fitting.

**Detector hardware.** PMT and SiPM readout characterization, cosmic-ray and source calibration, optical-coupling QA, calorimeter module assembly.

**Languages.** English (professional working proficiency), Korean (native).

## References

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Available on request.