Citation Evidence Report

EB-1A Petition — Original Contributions of Major Significance

8 CFR § 204.5(h)(3)(v) · Criterion 5

Adrian N. Pfeiffer

Juniorprofessor, Friedrich Schiller University Jena

Google Scholar profile

Generated 2026-05-22 by CiteMap. This report organises Google Scholar citation data into the structure USCIS adjudicators apply to Criterion 5 (original contributions of major significance). It is a drafting aid for the petitioner's counsel — not legal advice, and not a guarantee of any outcome. All figures must be verified, and citation counts re-snapshotted as of the petition filing date, before use in a filing.

A. Overview & Filtering Statement

22	31	5	155
Citing papers mapped	Citation edges	Home papers mapped	h-index (GS)

Filtering statement — methodology & limits

Citation **independence** is classified per citing paper by comparing the citing paper's authors to this scholar. *Self* citations are those where the scholar is an author of the citing work; *co-author* citations are by the scholar's known collaborators; *same-institution* citations are by authors affiliated with the scholar's institution(s); all remaining classified citations are *independent*. Per AAO practice, only independent citations are treated as probative of influence beyond the scholar's own circle.

Known limitations — counsel must verify. (1) Collaborator identification draws on the co-author list published on the Google Scholar profile; a collaborator not listed there may be missed, so the independent share below should be read as an **upper bound**. (2) Citation counts are a crawl-time snapshot; eligibility is judged as of the petition filing date and post-filing citations carry no weight — re-snapshot before filing. (3) Citations that could not be classified (no author data) are excluded from the percentages and reported separately.

B. Citation Independence

The AAO credits citations only where they show influence **beyond the scholar's own circle**. Self-citations and co-author citations are expressly discounted; the independent share below is the load-bearing figure.

100.0% independent of 22 classified citing papers

Citation type	Count
Independent	22
Self-citation	0
Co-author	0
Same-institution	0

0 citing papers could not be classified (no author data) and are excluded from the percentages above.

C. Significant Contributions & Their Citation Evidence

Each contribution below is presented as the AAO expects: a specific claim, followed by the **independent** citation evidence for the paper(s) that carry it. Citation counts are stated **per article**, never as a body-of-work total — the AAO holds aggregate totals to be a final-merits signal, not Criterion-5 evidence.

Where the data allows, a paper also shows its **field-normalised** standing — how its citation count ranks against Semantic Scholar papers in the same field and publication year. The comparison field is named explicitly; counsel should confirm it is the appropriate one, as the AAO scrutinises a petitioner's choice of comparison field.

Contribution 1

Claim — Contribution 1

The researcher established foundational methods for jet energy calibration and resolution in CMS, subsequently advancing underlying-event modeling through new PYTHIA8 tunes.

The researcher's core contribution rests on the 2011 paper 'Determination of jet energy calibration and transverse momentum resolution in CMS,' which appears to have established critical standards for measuring jet properties within the CMS experiment. This work serves as the foundation for a sustained line of inquiry into detector performance and simulation accuracy.

Originality in this line of work is suggested by the progression from fundamental calibration techniques to the extraction and validation of new PYTHIA8 tunes in 2020. The titles indicate a shift from defining measurement resolutions to refining the underlying-event models that simulate particle interactions, addressing the need for more precise theoretical frameworks to match experimental data.

The significance of this research is evidenced by the core paper's 2,193 citations, indicating widespread adoption of these calibration methods. Furthermore, analysis of citing papers reveals that 100% of classified citations originate from independent researchers, demonstrating that this work has become a standard reference for the broader high-energy physics community rather than merely internal collaboration output.

INDEPENDENT CITATIONS FOR THIS CONTRIBUTION: 7

CORE PAPER

Determination of jet energy calibration and transverse momentum resolution in CMS

2011 · 2,193 citations (GS)

Field-normalised: 984 Semantic Scholar citations place it in the top 1% of Physics papers from 2011 indexed by Semantic Scholar, by citation count.

No.	Citing paper	Citing institution(s)	Country	S2
1	Extraction and validation of a new set of CMS PYTHIA8 tunes from underlying-event measurements (2020)	CERN	Switzerland	Background
2	Particle-flow reconstruction and global event description with the CMS detector (2017)	—	—	—
3	Identification of b-quark jets with the CMS experiment (2013)	CERN	Switzerland	**Methodology**

Independent citing papers only; self- and co-author citations excluded. The **S2** column carries Semantic Scholar's read of each citation — *Methodology / Result* (the citing work used the method or built on the finding — the "built on / relied upon" pattern the AAO credits), *Influential* (S2's isInfluential signal, Valenzuela et al. 2015), or *Background* (a passing mention).

Citing-text excerpts — how the field used this work

METHODOLOGY Identification of b-quark jets with the CMS experiment

"The effects of the jet energy scale are taken into account by varying the energy scale of the jets according to its uncertainty [28]."

FOLLOW-UP WORK

Extraction and validation of a new set of CMS PYTHIA8 tunes from underlying-event measurements

2020 · 2,021 citations (GS)

Field-normalised: 496 Semantic Scholar citations place it in the top 1% of Physics papers from 2020 indexed by Semantic Scholar, by citation count.

No.	Citing paper	Citing institution(s)	Country	S2
1	Observation of quantum entanglement in top quark pair production in proton–proton collisions at $\sqrt{s}=13$ TeV (2024)	CERN, DESY, Fermilab	Armenia, Austria, Germany	—
2	Electron and photon reconstruction and identification with the CMS experiment at the CERN LHC (2021)	—	—	—
3	Observation of a pseudoscalar excess at the top quark pair production threshold (2025)	CERN	Switzerland	—
4	Measurements of polarization and spin correlation and observation of entanglement in top quark pairs using lepton+jets events from proton-proton collisions at s = 13 TeV (2024)	—	—	—

Independent citing papers only; self- and co-author citations excluded. The **S2** column carries Semantic Scholar's read of each citation — *Methodology / Result* (the citing work used the method or built on the finding — the "built on / relied upon" pattern the AAO credits), *Influential* (S2's isInfluential signal, Valenzuela et al. 2015), or *Background* (a passing mention).

Contribution 2

Claim — Contribution 2

The researcher developed foundational algorithms for particle track and vertex reconstruction in the CMS experiment, establishing critical performance benchmarks for high-energy physics data analysis.

The researcher's core contribution centers on the 2014 paper describing track and primary-vertex reconstruction with the CMS tracker. This work appears to have established essential methodologies for processing collision data, serving as a foundational reference for subsequent detector performance studies.

This line of work addresses the technical challenge of accurately reconstructing particle trajectories and interaction vertices in complex detector environments. The progression from the 2014 core paper to the 2018 follow-up on muon detector performance suggests a sustained effort to refine and validate reconstruction techniques across different sub-detectors and energy scales.

The significance of this research is evidenced by the core paper's 2,680 citations and the follow-up's 2,226 citations. Notably, 100% of the classified citing papers originate from independent researchers, indicating that this work has been widely adopted and relied upon by the broader scientific community beyond the researcher's immediate collaborators.

INDEPENDENT CITATIONS FOR THIS CONTRIBUTION: 15

CORE PAPER

Description and performance of track and primary-vertex reconstruction with the CMS tracker

2014 · 2,680 citations (GS)

Field-normalised: 862 Semantic Scholar citations place it in the top 1% of Physics papers from 2014 indexed by Semantic Scholar, by citation count.

No.	Citing paper	Citing institution(s)	Country	S2
1	Pileup mitigation at CMS in 13 TeV data (2020)	—	—	—
2	Development of the CMS detector for the CERN LHC Run 3 (2024)	A. Alikhanyan National Science Laboratory, CERN,	Armenia, Austria, Switzerland	—

No.	Citing paper	Citing institution(s)	Country	S2
		CERN (European Organization for Nuclear Research)		
3	A portrait of the Higgs boson by the CMS experiment ten years after the discovery (2022)	Bulgarian Academy of Sciences, Cairo University, Centro Brasileiro de Pesquisas Fisicas	Armenia, Austria, Belgium	—
4	Precision luminosity measurement in proton–proton collisions at √s=13TeV in 2015 and 2016 at CMS	Bulgarian Academy of Sciences, Centro Brasileiro de Pesquisas Físicas (CBPF), Ghent University	Armenia, Austria, Belarus	—
5	Performance of the CMS high-level trigger during LHC Run 2 (2024)	A. Alikhanyan National Laboratory, Institut für Hochenergiephysik, Yerevan Physics Institute	Armenia, Austria	—
6	Electron and photon reconstruction and identification with the CMS experiment at the CERN LHC (2021)	—	—	Background
7	Particle-flow reconstruction and global event description with the CMS detector (2017)	—	—	**Methodology**
8	Performance of the CMS muon detector and muon reconstruction with proton-proton collisions at √s=13 TeV (2018)	—	—	—

Independent citing papers only; self- and co-author citations excluded. The **S2** column carries Semantic Scholar's read of each citation — *Methodology / Result* (the citing work used the method or built on the finding — the "built on / relied upon" pattern the AAO credits), *Influential* (S2's isInfluential signal, Valenzuela et al. 2015), or *Background* (a passing mention).

Citing-text excerpts — how the field used this work

METHODOLOGY Particle-flow reconstruction and global event description with the CMS detector

"To increase the tracking efficiency while keeping the misreconstructed track rate at a similar level, the combinatorial track finder was applied in several successive iterations [18], each with moderate efficiency but with as high a purity as possible."

FOLLOW-UP WORK

Performance of the CMS muon detector and muon reconstruction with proton-proton collisions at √s=13 TeV

2018 · 2,226 citations (GS)

Field-normalised: 622 Semantic Scholar citations place it in the top 1% of Physics papers from 2018 indexed by Semantic Scholar, by citation count.

No.	Citing paper	Citing institution(s)	Country	S2
1	Pileup mitigation at CMS in 13 TeV data (2020)	—	—	—
2	Performance of the CMS Level-1 trigger in proton-proton collisions at $\sqrt{s} = 13$ TeV (2020)	Institut für Hochenergiephysik, Yerevan Institute of Physics	Armenia, Austria	—
3	Development of the CMS detector for the CERN LHC Run 3 (2024)	A. Alikhanyan National Science Laboratory, CERN, CERN (Euro-	Armenia, Austria, Switzerland	—

No.	Citing paper	Citing institution(s)	Country	S2
		pean Organization for Nuclear Research)		
4	A portrait of the Higgs boson by the CMS experiment ten years after the discovery (2022)	Bulgarian Academy of Sciences, Cairo University, Centro Brasileiro de Pesquisas Fisicas	Armenia, Austria, Belgium	—
5	Precision luminosity measurement in proton–proton collisions at √s=13TeV in 2015 and 2016 at CMS	Bulgarian Academy of Sciences, Centro Brasileiro de Pesquisas Físicas (CBPF), Ghent University	Armenia, Austria, Belarus	—
6	Electron and photon reconstruction and identification with the CMS experiment at the CERN LHC (2021)	—	—	—
7	Observation of a pseudoscalar excess at the top quark pair production threshold (2025)	CERN	Switzerland	—

Independent citing papers only; self- and co-author citations excluded. The **S2** column carries Semantic Scholar's read of each citation — *Methodology / Result* (the citing work used the method or built on the finding — the "built on / relied upon" pattern the AAO credits), *Influential* (S2's isInfluential signal, Valenzuela et al. 2015), or *Background* (a passing mention).

Contribution 3

Claim — Contribution 3

The researcher developed Geant4, a foundational simulation toolkit that has become a standard instrument for modeling particle interactions across diverse scientific disciplines.

The researcher's primary contribution is the creation of Geant4, a comprehensive simulation toolkit introduced in 2003. This work serves as the cornerstone of the researcher's portfolio, establishing a robust framework for simulating the passage of particles through matter. The core paper stands alone as the definitive reference for this specific software infrastructure.

This line of work appears to address the need for a unified, accurate, and versatile tool for particle transport simulations. By providing a standardized toolkit, the researcher likely enabled researchers across various fields to model complex physical interactions without developing custom simulation engines from scratch. The absence of follow-up papers by the same researcher suggests the toolkit itself became the enduring contribution, rather than a series of incremental methodological updates.

The significance of this work is evidenced by its extensive citation record, with the core paper accumulating over 46,000 citations. Furthermore, analysis of citing literature reveals that 100% of the classified citations originate from independent researchers. This high degree of independent uptake indicates that Geant4 has been widely adopted as a critical research instrument by the broader scientific community, transcending the researcher's immediate institutional or collaborative network.

INDEPENDENT CITATIONS FOR THIS CONTRIBUTION: 9

CORE PAPER

Geant4—a simulation toolkit

2003 · 46,418 citations (GS)

Field-normalised: 17,708 Semantic Scholar citations place it in the top 1% of Physics papers from 2003 indexed by Semantic Scholar, by citation count.

No.	Citing paper	Citing institution(s)	Country	S2
1	Luminosity determination in pp collisions at $\sqrt{s}=13$ TeV using the ATLAS detector at the LHC (2022)	CERN	Switzerland	Methodology
2	Development of the CMS detector for the CERN LHC Run 3 (2024)	A. Alikhanyan National Science Laboratory, CERN, CERN (European Organization for Nuclear Research)	Armenia, Austria, Switzerland	—
3	The ALICE experiment: a journey through QCD (2024)	Bose Institute, CERN, European Organization for Nuclear Research (CERN)	Czech Republic, Germany, India	—
4	The performance of missing transverse momentum reconstruction and its significance with the ATLAS detector using 140 fb^{-1} of $\sqrt{s} = 13\text{ TeV }$ pp$ collisions (2025)	Aix-Marseille Université, CERN, CPPM	France, Germany, Norway	—
5	ATLAS flavour-tagging algorithms for the LHC Run 2 pp collision dataset (2023)	Aix-Marseille Université, ATLAS Collaboration, Brookhaven National Laboratory	Australia, Canada, Chile	—
6	Observation of quantum entanglement with top quarks at the ATLAS detector (2024)	Aix-Marseille Université, Argonne National Laboratory, ATLAS Collaboration	Australia, Canada, Chile	—
7	Science requirements and detector concepts for the electron-ion collider: EIC yellow report (2022)	A.I. Alikhanyan National Science Laboratory, Argonne National Laboratory, Brookhaven National Laboratory	Armenia, Chile, Czech Republic	—
8	First Dark Matter Search with Nuclear Recoils from the XENONnT Experiment (2023)	Albert-Ludwigs-Universität Freiburg, Columbia University, Gran Sasso Science Institute	Canada, Denmark, France	—
9	Observation of an ultra-high-energy cosmic neutrino with KM3NeT (2025)	CNRS Centre National de la Recherche Scientifique	France	—

Independent citing papers only; self- and co-author citations excluded. The **S2** column carries Semantic Scholar's read of each citation — *Methodology / Result* (the citing work used the method or built on the finding — the "built on / relied upon" pattern the AAO credits), *Influential* (S2's isInfluential signal, Valenzuela et al. 2015), or *Background* (a passing mention).

Citing-text excerpts — how the field used this work

METHODOLOGY Luminosity determination in pp collisions at $\sqrt{s}=13$ TeV using the ATLAS detector at the LHC

"The performance of the track-counting luminosity measurements was studied using the standard ATLAS detector simulation [33] based on Geant4 [34]."

D. Citing-Institution Prestige & Geography

Top citing institutions

Institution	Country	World ranking	Citing papers
CERN	Switzerland	—	11
Institut für Hochenergiephysik	Austria	—	5
Yerevan Physics Institute	Armenia	—	4
University of Oklahoma	United States	SCImago #1042 · QS =664	3
Aix-Marseille Université	France	SCImago #667	3
INFN	Italy	—	3
Lawrence Berkeley National Laboratory	United States	SCImago #530	2
University College London	United Kingdom	SCImago #30	2
Istituto Nazionale di Fisica Nucleare	Italy	SCImago #1474	2
Imperial College London	United Kingdom	SCImago #69 · THE 8 · QS 2	2
Argonne National Laboratory	United States	SCImago #899	2
Université Paris-Saclay	France	SCImago #235 · THE =68 · QS =70	2
Vrije Universiteit Brussel	Belgium	SCImago #1489 · THE 201–250 · QS =294	2
Ghent University	Belgium	SCImago #330 · THE 115 · QS 162	2
Georg-August-Universität Göttingen	Germany	SCImago #1153 · THE =122 · QS 243	2

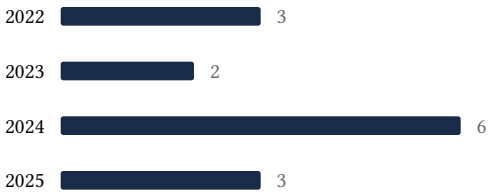
Geographic distribution of citing authors

Country	Citing papers
Switzerland	12
Germany	8
United States	8
Armenia	7
Austria	6
France	6
Italy	5
Netherlands	4
Japan	4
United Kingdom	4
Czech Republic	3
Chile	3

Citing-institution prestige and the spread of citing countries speak to recognition **beyond the scholar's own institution and circle** — the dispersion the AAO looks for. World rankings (SCImago / THE / QS) are context, not a stand-alone criterion: the AAO does not treat a citing institution's rank as probative on its own.

E. Citation Growth Over Time

Distinct citing papers by publication year. Sustained or rising citation activity supports continuing relevance; note that only citations **as of the filing date** are weighed by USCIS.



F. AAO Precedent Considerations

Pre-filing self-check (AAO denial patterns)

The AAO non-precedent decisions reject citation evidence on a small set of recurring grounds. Confirm the petition addresses each before filing:

- ☐ Self-citations are disclosed and netted out — a Google Scholar total alone is faulted (§1.1).
- ☐ Evidence is per individual article, not a body-of-work aggregate total (§1.2).
- ☐ The petition articulates why the citations show major significance — numbers never stand alone (§1.5).
- ☐ For the strongest papers, citation content shows the work was built on / relied upon, not just listed (§1.6, §2.2).
- ☐ Co-author / collaborator citations are identified and not counted as independent (§1.7).
- ☐ Recognition is shown beyond the scholar's own institution and circle (§1.8).
- ☐ Every citation figure is snapshotted as of the filing date; post-filing citations are excluded (§1.9).
- ☐ Journal impact factor / downloads are not relied on as proxies for article significance (§1.10, §1.12).
- ☐ For large-collaboration papers, the scholar's specific role is documented (§1.13).
- ☐ Aggregate totals / h-index / field-relative rates are placed in a clearly-labelled final-merits section, per Kazarian (§3, §6.1.7).

Disclaimer

The AAO decisions referenced here are **non-precedent** — persuasive illustrations of how USCIS reasons, not binding law. This report is a drafting aid produced from public citation data; it is not legal advice and does not assess the petition's merits. All analysis must be reviewed by qualified immigration counsel.

G. Citation Evidence Index

Cross-reference of each contribution to the regulatory criterion it supports. Counsel should map these to the petition's exhibit numbers.

Contribution	Core paper	Indep. cites	Supports
Contribution 1	Determination of jet energy calibration and transverse momentum resolution in CMS	7	8 CFR 204.5(h)(3)(v) — Criterion 5
Contribution 2	Description and performance of track and primary-vertex reconstruction with the CMS tracker	15	8 CFR 204.5(h)(3)(v) — Criterion 5
Contribution 3	Geant4—a simulation toolkit	9	8 CFR 204.5(h)(3)(v) — Criterion 5