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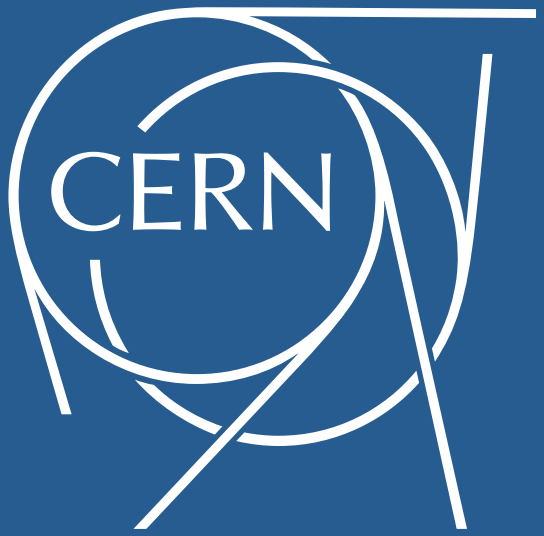

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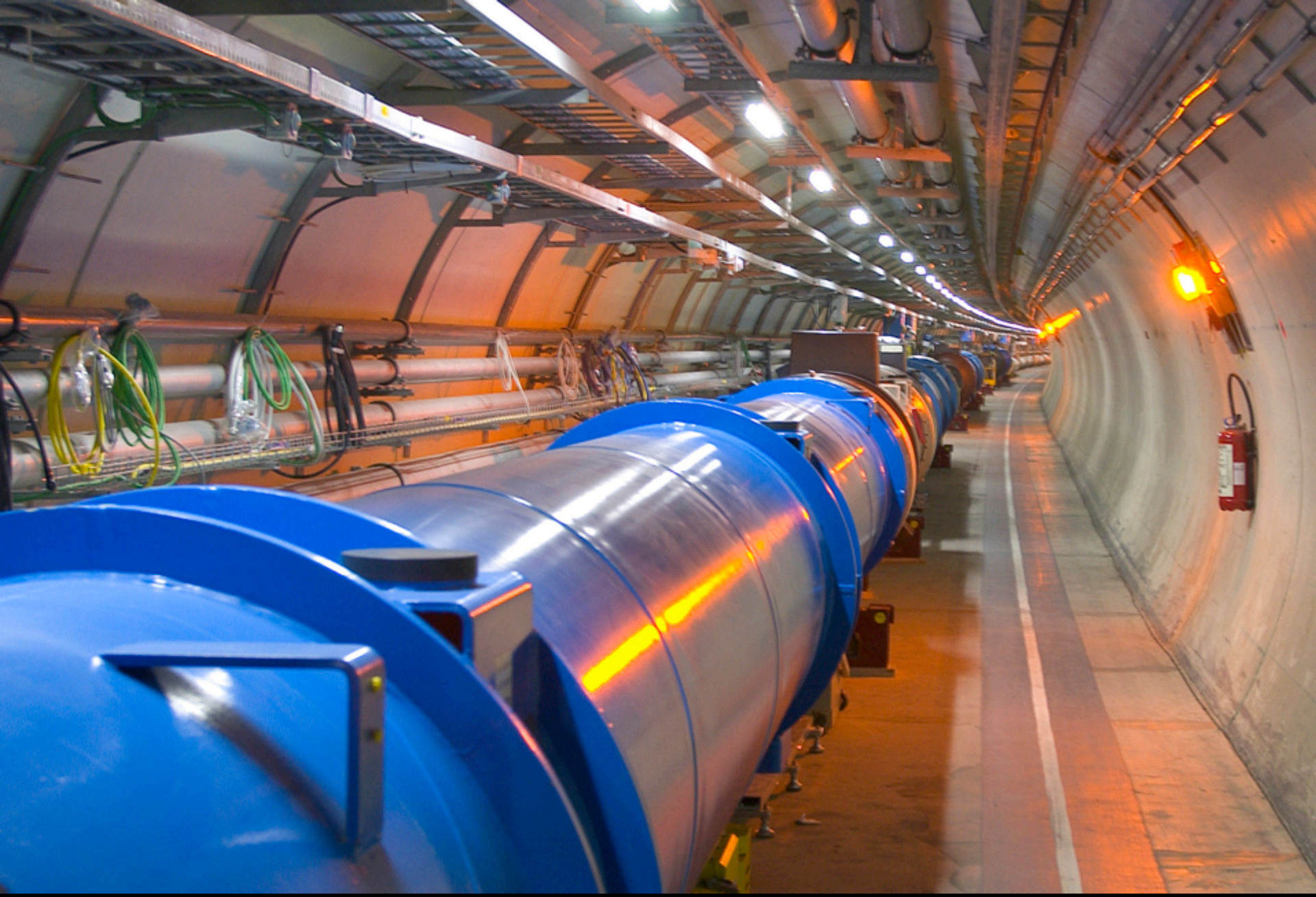

LHC: 27 Km, -271°C, 99.999999% of speed of light

The Nobel Prize in Physics 2013

Photo: A. Mahmoud

François Englert

Prize share: 1/2

Photo: A. Mahmoud

Peter W. Higgs

Prize share: 1/2

The Nobel Prize in Physics 2013 was awarded jointly to François Englert and Peter W. Higgs *"for the theoretical discovery of a mechanism that contributes to our understanding of the origin of mass of subatomic particles, and which recently was confirmed through the discovery of the predicted fundamental particle, by the ATLAS and CMS experiments at CERN's Large Hadron Collider"*

Physics Letters B 716 (2012) 30–61

Contents lists available at SciVerse ScienceDirect

Physics Letters B

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Observation of a new boson at a mass of 125 GeV with the CMS experiment at the LHC ☆

CMS Collaboration *

CERN, Switzerland

This paper is dedicated to the memory of our colleagues who worked on CMS but have since passed away. In recognition of their many contributions to the achievement of this observation.

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Keywords:
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1. Introduction

The standard model (SM) of elementary particles provides a remarkably accurate description of results from many accelerator and non-accelerator based experiments. The SM comprises quarks and leptons as the building blocks of matter, and describes their interactions through the exchange of force carriers: the photon for electromagnetic interactions, the W and Z bosons for weak interactions, and the gluons for strong interactions. The electromagnetic and weak interactions are unified in the electroweak theory. Although the predictions of the SM have been extensively confirmed, the question of how the W and Z gauge bosons acquire mass whilst the photon remains massless is still open.

Nearly fifty years ago it was proposed [1–6] that spontaneous symmetry breaking in gauge theories could be achieved through the introduction of a scalar field. Applying this mechanism to the electroweak theory [7–9] through a complex scalar doublet field leads to the generation of the W and Z masses, and to the prediction of the existence of the SM Higgs boson (H). The scalar field also gives mass to the fundamental fermions through the Yukawa interaction. The mass m_H of the SM Higgs boson is not predicted by theory. However, general considerations [10–13] suggest that m_H should be smaller than ~1 TeV, while precision electroweak measurements imply that $m_H < 152$ GeV at 95% confidence level (CL) [14]. Over the past twenty years, direct searches for the Higgs boson have been carried out at the LEP collider, leading to a lower bound of $m_H > 114.4$ GeV at 95% CL [15], and at the Tevatron proton–antiproton collider, excluding the mass range 162–166 GeV at 95% CL [16] and detecting an excess of events, recently reported in [17–19], in the range 120–135 GeV.

The discovery or exclusion of the SM Higgs boson is one of the primary scientific goals of the Large Hadron Collider (LHC) [20]. Previous direct searches at the LHC were based on data from proton–proton collisions corresponding to an integrated luminosity of 5 fb^{-1} collected at a centre-of-mass energy $\sqrt{s} = 7$ TeV. The CMS experiment excluded at 95% CL a range of masses from 127 to 600 GeV [21]. The ATLAS experiment excluded at 95% CL the ranges 111.4–116.6, 119.4–122.1 and 129.2–541 GeV [22]. Within the remaining allowed mass region, an excess of events near 125 GeV was reported by both experiments. In 2012 the proton–proton centre-of-mass energy was increased to 8 TeV and by the end of June an additional integrated luminosity of more than 5 fb^{-1} had been recorded by each of these experiments, thereby enhancing significantly the sensitivity of the search for the Higgs boson.

This Letter reports the results of a search for the SM Higgs boson using samples collected by the CMS experiment, comprising data recorded at $\sqrt{s} = 7$ and 8 TeV. The search is performed in

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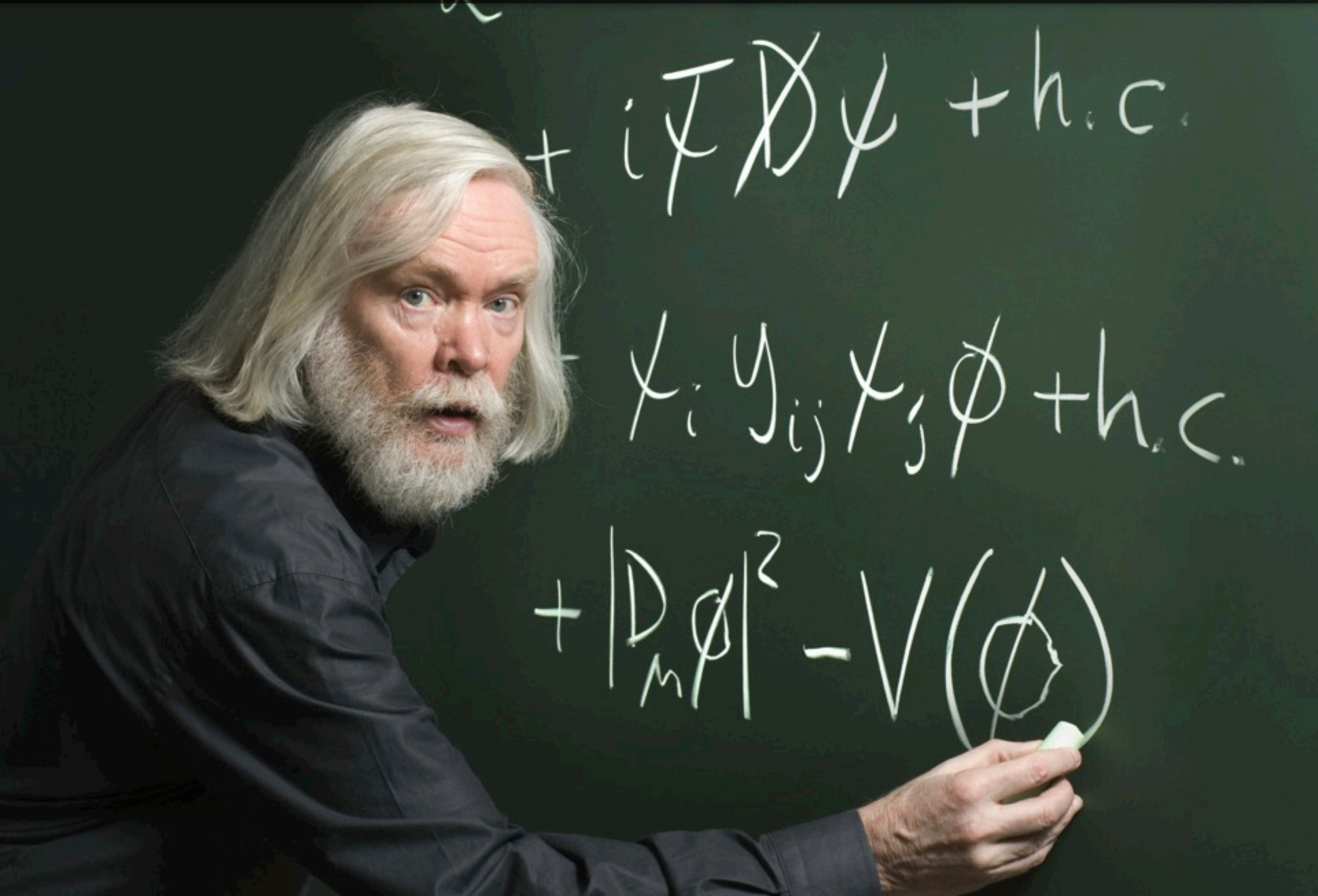

Global communication

High Energy Physics - Phenomenology

New submissions

Submissions received from Thu 18 Sep 14 to Fri 19 Sep 14, announced Mon, 22 Sep 14

- New submissions
- Cross-lists
- Replacements

[total of 28 entries: **1-28**]
[showing up to 2000 entries per page: fewer | more]

New submissions for Mon, 22 Sep 14

[1] **arXiv:1409.5438** [pdf, ps, other]

Simultaneous B and L Violation: New Signatures from RPV-SUSY

Cyrus Faroughy, Siddharth Prabhu, Bob Zheng

Comments: 28 pages (8 pages of appendices), 10 figures

Subjects: **High Energy Physics - Phenomenology (hep-ph)**

Studies of R-parity violating (RPV) supersymmetry typically assume that nucleon stability is protected by approximate baryon number (B) or lepton number (L) conservation. We present a new class of RPV models that violate B and L simultaneously (BLRPV), without inducing rapid nucleon decay. These models feature an approximate $Z_2^e \times Z_2^\mu \times Z_2^\tau$ flavor symmetry, which forbids 2-body nucleon decay and ensures that flavor antisymmetric $L L E^c$ couplings are the only non-negligible L-violating operators. Nucleons are predicted to decay through $N \rightarrow K e \mu \nu$ and $n \rightarrow e \mu \nu$; the resulting bounds on RPV couplings are rather mild. Novel collider phenomenology arises because the superpartners can decay through both L-violating and B-violating couplings. This can lead to, for example, final states with high jet multiplicity and multiple leptons of different flavor, or a spectrum in which depending on the superpartner, either B or L violating decays dominate. BLRPV can also provide a natural setting for displaced $\tilde{\nu} \rightarrow \mu e$ decays, which evade most existing collider searches for RPV supersymmetry. We suggest dedicated searches for events with large jet multiplicity and displaced leptons to constrain colored superpartners in this scenario.

[2] **arXiv:1409.5439** [pdf, other]

Updated fit to three neutrino mixing: status of leptonic CP violation

M.C. Gonzalez-Garcia, Michele Maltoni, Thomas Schwetz

Comments: 28 pages, 10 figures, 1 table. Updated results of the global fit will be available at this http URL

Subjects: **High Energy Physics - Phenomenology (hep-ph)**; High Energy Physics - Experiment (hep-ex)

We present a global analysis of solar, atmospheric, reactor and accelerator neutrino data in the framework of three-neutrino oscillations based on data available in summer 2014. We provide the allowed ranges of the six oscillation parameters and show that their determination is stable with respect to uncertainties related to reactor neutrino and solar neutrino

Pre-prints on arXiv.org

EUROPEAN ORGANIZATION FOR NUCLEAR RESEARCH (CERN)

CERN-PH-EP/2012-220
2013/01/29

CMS-HIG-12-028

Observation of a new boson at a mass of 125 GeV with the CMS experiment at the LHC

The CMS Collaboration

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Submitted to Physics Letters B

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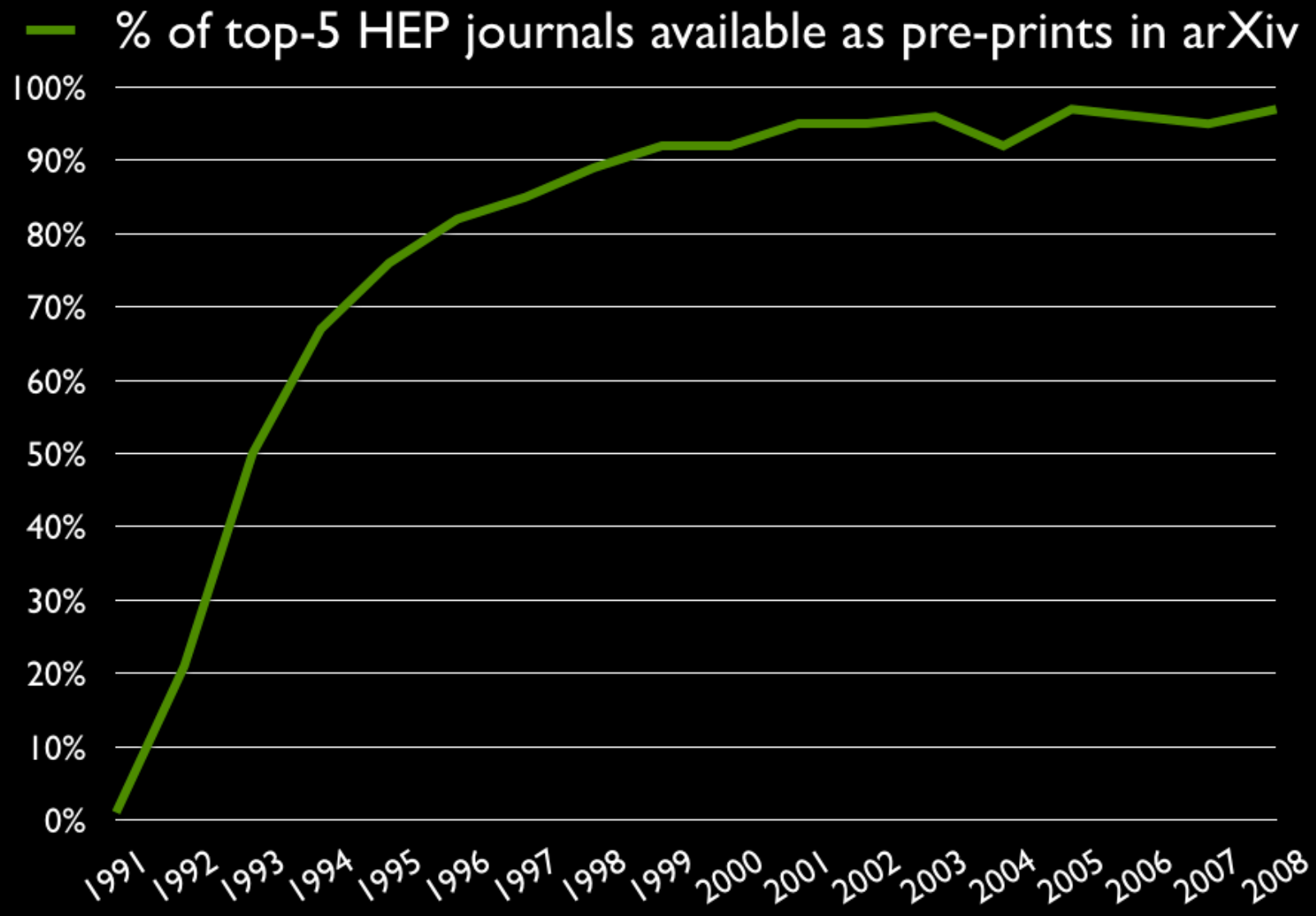

Gentil-Beccot, Mele, Brooks, arXiv:0906.5418

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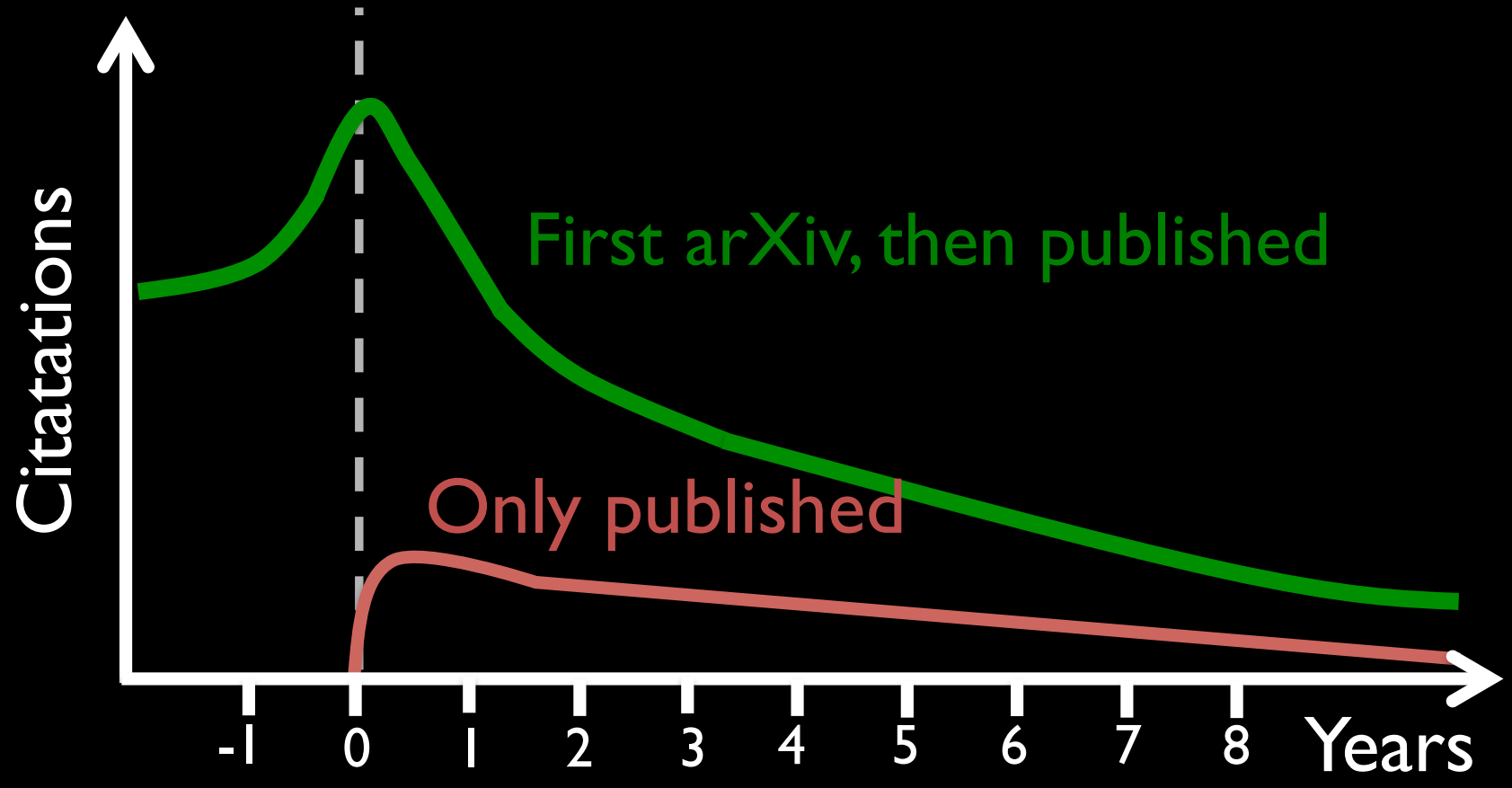

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Do High-Energy Physics scientist need journals?

YES: evaluation, accountability, quality assurance

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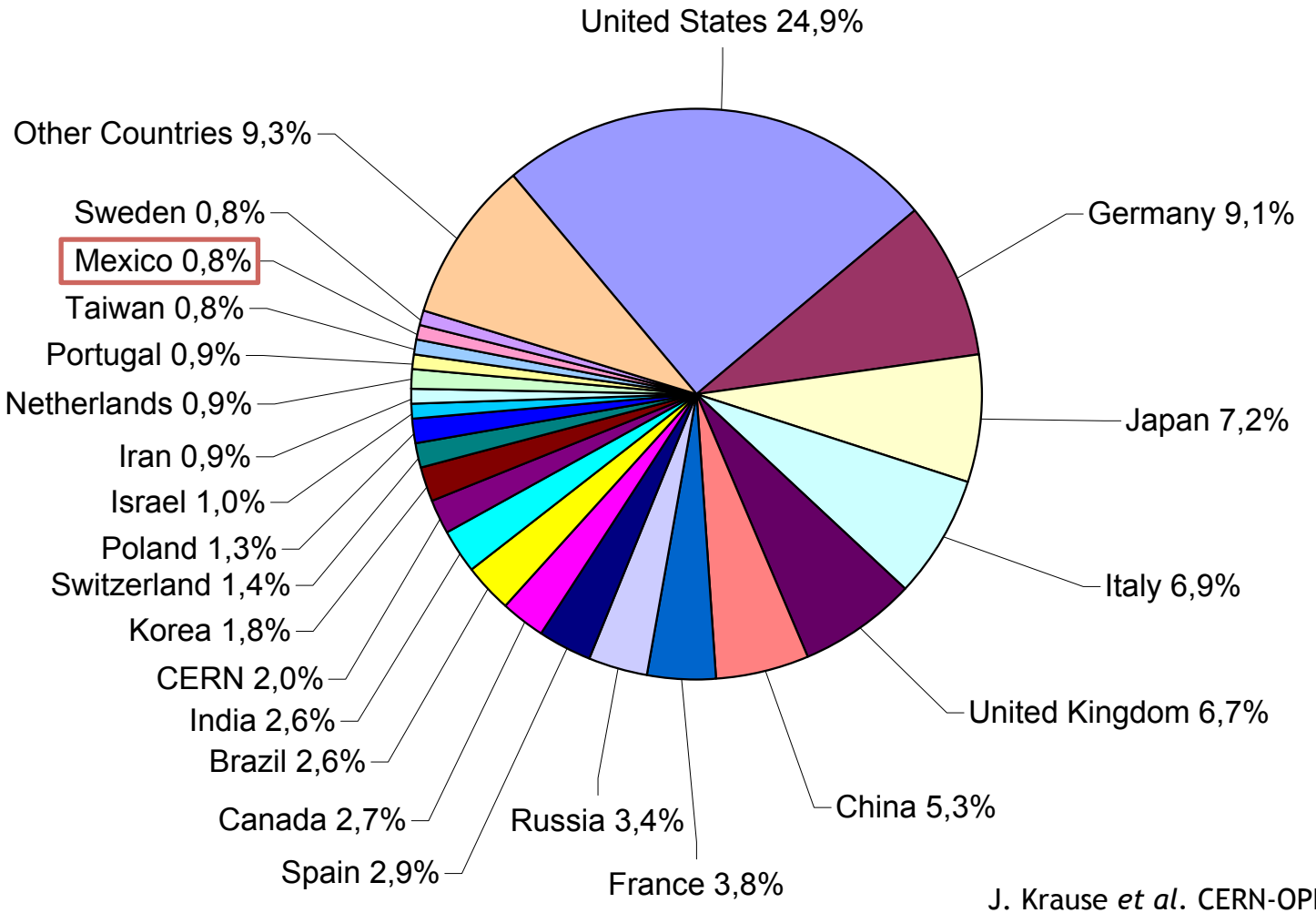

J. Krause *et al*. CERN-OPEN-2007-014


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