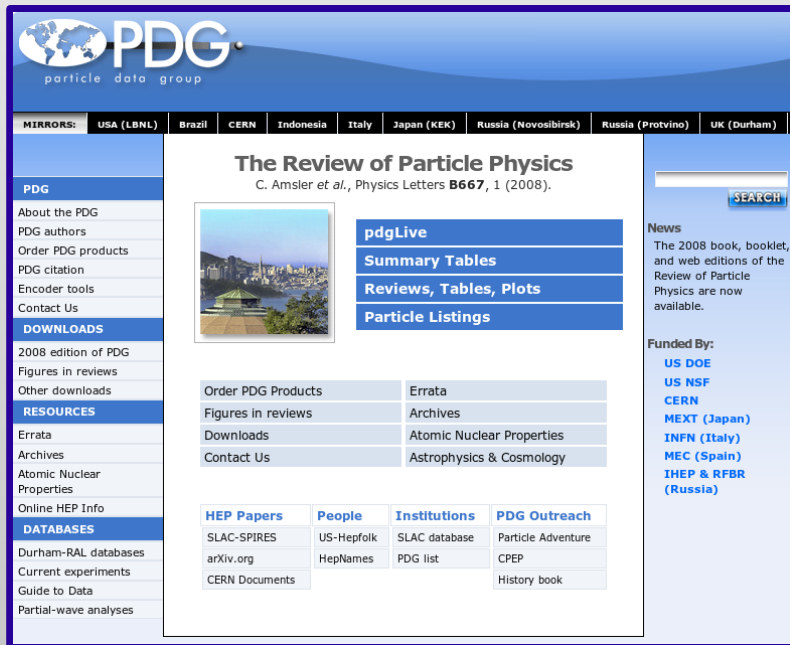


# Particle Data Group

**Juerg Beringer**  
 Physics Division  
 Lawrence Berkeley National Laboratory



The screenshot shows the PDG website interface. At the top, there's a navigation bar with 'MIRRORS:' and links for USA (LBNL), Brazil, CERN, Indonesia, Italy, Japan (KEK), Russia (Novosibirsk), Russia (Protvino), and UK (Durham). The main content area features the title 'The Review of Particle Physics' by C. Amsler et al., Physics Letters B667, 1 (2008). Below the title is a search bar and a 'pdgLive' section with links for 'Summary Tables', 'Reviews, Tables, Plots', and 'Particle Listings'. There are also sections for 'Order PDG Products', 'Errata', 'Archives', and 'Atomic Nuclear Properties'. A 'Funded By:' section lists US DOE, US NSF, CERN, MEXT (Japan), INFN (Italy), MEC (Spain), IHEP & RFBR (Russia). At the bottom, there are links for 'HEP Papers', 'People', 'Institutions', and 'PDG Outreach'.

## Outline:

- Overview of PDG
- Interaction with SPIRES
- PDG computing upgrade makes innovations possible
- Opportunities to collaborate

- **PDG is an international collaboration charged with summarizing Particle Physics, as well as related areas of Cosmology and Astrophysics**
- **Review of Particle Physics (RPP) includes**
  - A compilation and **evaluation** of measurements of the properties of the elementary particles (“Listings”)
  - Review articles covering most of particle physics (“Reviews”)
  - Summary tables
- **Review of Particle Physics available in print and online**
  - By far most cited article in HEP (total of over 32,000 citations over all editions)

- **170 authors** from 20 countries and 108 institutions
- **Plus 700 consultants** in the HEP community
- **Close collaboration with working groups at LEP, Tevatron, B-factories, ...**



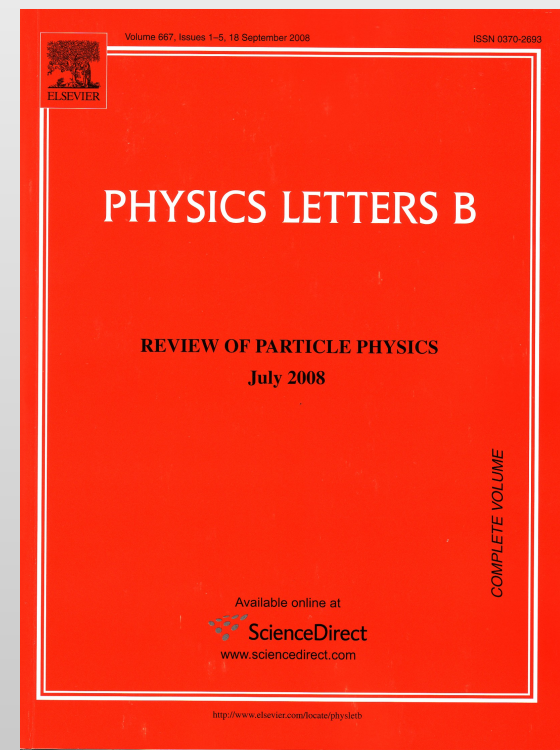
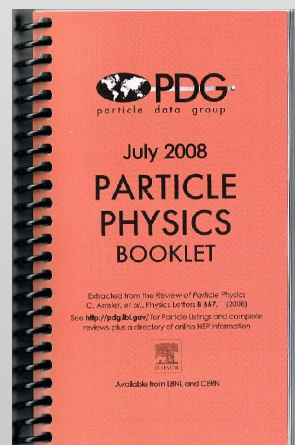
**2,778** new measurements from **645** new papers

(in addition to 24,559 measurements from 7,104 papers that first appeared in previous editions)

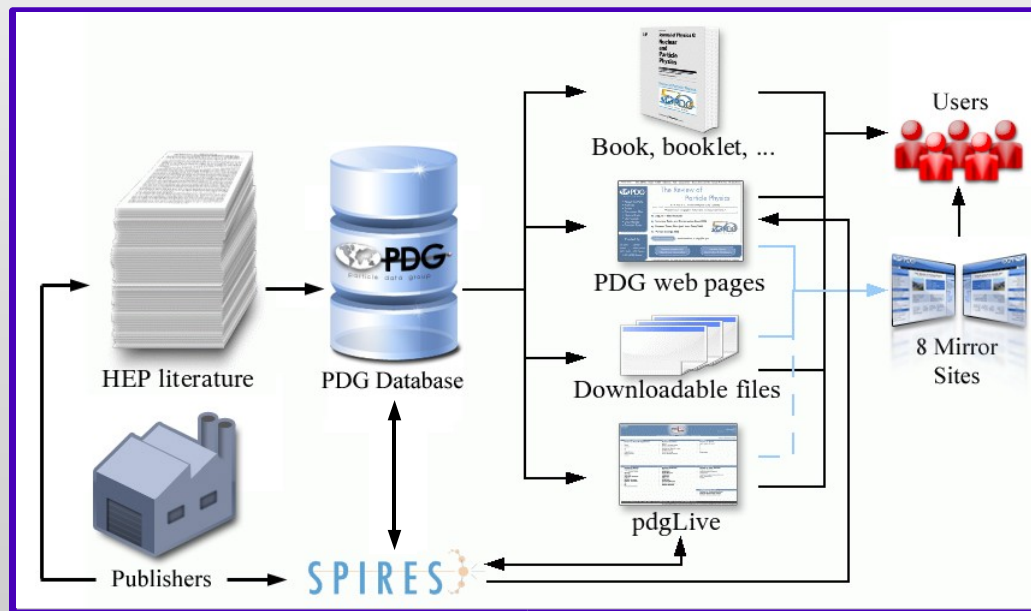
**108** reviews written by experts

RPP: **1344** pages

Booklet: **294** pages



- Primary goal of PDG is to **evaluate** and **review** available published data in order to give authoritative answers endorsed by the experts in the field
  - We rely on publishers and libraries (in particular through SPIRES) for access to published data



- As part of doing its work, PDG naturally catalogs published results, but this is not our primary goal

So far have interacted with SPIRES in two ways:

- **Harvesting of information based on paper reference**
  - Authors and titles
  - Used e.g. to display paper titles in popup windows in pdgLive

VALUE (GeV)	DOCUMENT ID	TECN	COMMENT
171.2 ± 2.1			OUR EVALUATION See comments in the header above.
170.8 ± 2.2 ± 1.4	1, 2	AALTONEN	071 CDF lepton + jets (b-tag)
176.2 ± 9.2 ± 3.9	3	ABAZOV	AALTONEN 2007I : Physical Review Letters <b>99</b> (2007) 182002
179.5 ± 7.4 ± 5.6	3	ABAZOV	Precise Measurement of the Top-Quark Mass in the Lepton+Jets Topology at CDF II
164.5 ± 3.9 ± 3.9	4, 2	ABULENCIA	
180.7 <sup>+15.5</sup> <sub>-13.4</sub> ± 8.6	5	ABULENCIA	07J CDF lepton + jets

- **Cross-referencing between SPIRES and PDG**
  - From pdgLive to SPIRES, and from SPIRES to pdgLive
  - From internal pages for encoders to SPIRES (as a convenient way to point encoders to relevant papers)
  - Based on “**CODEN,Volume,Page**” where possible, on **SLAC IRN** otherwise

- From pdgLive to SPIRES



HOME: [pdgLive](#) | [Summary Tables](#) | [Reviews, Tables, Plots](#) | [Particle Listings](#)

from the 2008 Review of Particle Physics.  
Please use this **CITATION**: C. Amsler *et al.* (Particle Data Group), Phys. Lett.

## t-Quark Mass in $p\bar{p}$ Collisions

OUR EVALUATION of  $171.2 \pm 1.2 \pm 1.8$  GeV (TEVEWWG 2008A) is an average from Tevatron Run-I (1992 – 1996) and Run-II (2001–present) that were included in this Review. This average was provided by the Tevatron Electroweak Working Group, which correlated uncertainties properly into account and has a  $\chi^2$  of 10.6 for 10 degrees of freedom. For the most recent unpublished top mass measurements from Run-II, the TEVEWWG average is  $172.6 \pm 0.8 \pm 1.1$  GeV (TEVEWWG 2008). See the note “The Top Quark”.

For earlier search limits see PDG 1996, *Physical Review D* **54** (1996) 1. We note that indirect top mass determinations from Standard Model Electroweak fits in the literature can be found in the Listings of the 2007 partial update). For a discussion of current status see “The Top Quark” and “Electroweak Model and Constraints on New Physics.”

VALUE (GeV)	DOCUMENT ID	TECN	COMMENT
<b><math>171.2 \pm 2.1</math></b>	OUR EVALUATION		See comments in the header
$170.8 \pm 2.2 \pm 1.4$	1, 2 AALTONEN 07I CDF		lepton
$176.2 \pm 9.2 \pm 3.9$	3 ABAZOV 07W D0		dilepton
$179.5 \pm 7.4 \pm 5.6$	3 ABAZOV 07W D0		dilepton
$164.5 \pm 3.9 \pm 3.9$	4, 2 ABULENCIA 07D CDF		dilepton
$180.7 \pm 13.5 \pm 8.6$	5 ABULENCIA 07J CDF		lepton + jets
$170.3 \pm 4.1 \pm 1.2$	6, 2 ABAZOV 06LD D0		lepton + jets (b tag)

**SPIRES**

HEP :: HEPNAMES :: INSTITUTIONS :: CONFERENCES :: EXPERIMENTS :: JOBS

FIND KEY 7025270  
[Browse Author](#) | Format: Standard (incl. cites) | Sort: No Sort (fastest)  
[Display again](#)

**Precision measurement of the top quark mass from dilepton events at CDF II.**  
 By CDF - Run II Collaboration (A. Abulencia *et al.*). FERMILAB-PUB-06-490-E, Dec 2006. 7pp.  
 Published in *Phys.Rev.D* **75:031105,2007**.  
 e-Print: [hep-ex/0612060](#)

[References](#) | [LaTeX\(US\)](#) | [LaTeX\(EU\)](#) | [Harvmac](#) | [BibTeX](#) | [Keywords](#) | Cited **22 times**  
[Abstract](#) and [Postscript](#) and [PDF](#) from arXiv.org (mirrors: [au](#) [br](#) [cn](#) [de](#) [es](#) [fr](#) [il](#) [in](#) [it](#) [jp](#) [kr](#) [ru](#) [tw](#) [uk](#) [za](#) [aps](#) [lanl](#))  
 Journal Server [doi:[10.1103/PhysRevD.75.031105](#)]  
[Fermilab Library Server \(fulltext available\)](#)  
[OSTI Information Bridge Server](#)  
[pdgLive \(measurements quoted by PDG\)](#)  
[EXP FNAL-E-0830](#)  
[Bookmarkable link to this information](#)

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SPIRES HEP is a joint project of SLAC, DESY & FNAL as well as the worldwide HEP community.  
 Mirrors: [DESY](#) (Germany), [FNAL](#) (US), [IHEP](#) (Russia), [IPPP](#) (UK), [SLAC](#) (US), [YITP](#) (Japan) [LIP](#) (Indonesia);  
[spires@slac.stanford.edu](mailto:spires@slac.stanford.edu)

List of RPP sections, measurements, reviews for reference PR D75 031105R. (ABULENCIA 2007D)

Physical Review **D75** (2007) 031105R  
**ABULENCIA 2007D** Precision Measurement of the Top-Quark Mass from Dilepton Events  
 A. Abulencia ... [CDF Collab.](#)

Measurement	(Unit)	Particle (Section)	Observable
used $164.5 \pm 3.9 \pm 3.9$	(GeV)	t	t-Quark Mass in $p\bar{p}$ Collisions

<sup>1</sup> Based on  $1.0 \text{ fb}^{-1}$  of data at  $\sqrt{s} = 1.96$  TeV. [ABULENCIA 2007D](#) improves the matrix element description including the effects of initial-state radiation.  
<sup>2</sup> Matrix element method.

- From SPIRES to pdgLive
  - Only if paper is included in Listings



HOME: **pdgLive** Summary Tables Reviews, Tables, Plots Particle Listings

from the 2008 Review of Particle Physics.  
Please use this **CITATION**: C. Amstler *et al.* (Particle Data Group), Phys. Lett. **B667**, 1 (2008)

ABULENCIA 2007D (PHRVA,D75,031105R)

Physical Review **D75** (2007) 031105R  
**ABULENCIA 2007D Precision Measurement of the Top-Quark Mass from Dilepton Events at CDF II**

A. Abulencia ... **CDF Collab.**

Measurement	(Unit)	Particle (Section)	Observable
used $164.5 \pm 3.9 \pm 3.9$	(GeV)	$t$	$t$ -Quark Mass in $p\bar{p}$ Collisions

<sup>1,2</sup>

<sup>1</sup> Based on  $1.0 \text{ fb}^{-1}$  of data at  $\sqrt{s} = 1.96 \text{ TeV}$ . **ABULENCIA 2007D** improves the matrix element description by including the effects of initial-state radiation.

<sup>2</sup> Matrix element method.

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FIND | PHYS.REV.,D75,031105

[Browse Author](#) | Format: Standard (incl. cites) | Sort: Newest (fastest)

Display again

**Precision measurement of the top quark mass from dilepton events at CDF II.**  
By CDF - Run II Collaboration (A. Abulencia *et al.*). FERMILAB-PUB-06-490-E, Dec 2006. 7pp.  
Published in **Phys.Rev.D75:031105,2007**.  
e-Print: [hep-ex/0612060](#)

[References](#) | [LaTeX\(US\)](#) | [LaTeX\(EU\)](#) | [Harvmac](#) | [BibTeX](#) | [Keywords](#) | Cited **22 times**  
[Abstract](#) and [Postscript](#) and [PDF](#) from arXiv.org (mirrors: [au](#) [br](#) [cn](#) [de](#) [es](#) [fr](#) [il](#) [in](#) [it](#) [jp](#) [kr](#) [ru](#) [tw](#) [uk](#) [za](#) [aps](#) [lanl](#) )  
Journal Server [doi:[10.1103/PhysRevD.75.031105](#)]  
[Fermilab Library Server](#) (fulltext available)  
[OSTI Information Bridge](#) Search

**pdgLive (measurements quoted by PDG)**

[EXTRNAL E-0630](#)  
[Bookmarkable link to this information](#)

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[spires@slac.stanford.edu](#)



- **Presently used PDG system dates back to late eighties**
  - This is before the web was born!
  - Hardware upgraded from original VAX to now Linux PCs
  - Software philosophy still dates back to single-user data entry on an ASCII terminal



- **Became clear that required PDG computing upgrade cannot be accomplished without additional resources**

- **Developed plan and asked for funding from DOE and NSF**
- **Comprehensive review by DOE last Fall**

Written in 2006

## High-Level Requirements and Roadmap for PDG Computing

*Juerg Beringer  
Particle Data Group  
Lawrence Berkeley National Laboratory*

This document summarizes the high-level requirements for the upgraded PDG computing system and proposes a roadmap for completing the upgrade. It is intended to serve as a starting point for a cost estimate for the completion of the upgrade project.

- **Vital role of PDG is reaffirmed**
  - “The PDG publications are crucial to the field ...” (DOE reviewer)
  - “The work of the PDG is absolutely necessary for rapid progress of elementary particle physics.” (NSF reviewer)
- **Funding from DOE and NSF for computing upgrade**
  - 2 FTE for 3 years
  - 0.5 FTE of a programmer for ongoing support after initial development
- **Work on computing upgrade started at the end of last year with team of experienced computing professionals**

- **A modern, modular, extendable, easy-to-use, maintainable and well-documented **computing infrastructure for PDG****
- **Production quality system – PDG data must be correct**
  - Extensive error-checking and cross-checking built into system
- **Support all areas of our work, including in particular:**
  - Decentralized, web-based data entry and verification for Listings
  - Interaction with over 100 review authors
  - Monitoring of progress in RPP production
  - Programs for evaluation of data (fits, averages, plots, ...)
  - Expert tools for editor, including creation of book manuscript and static web pages (PDF files)
  - Interactive browsing of PDG database similar to pdgLive
- ***See backup slides for technical details on new system***

- **Immediate and primary goal of the PDG computing upgrade is to ensure PDG can continue to function well**
  - This has absolute priority over any fancy extensions
- **New computing system will also provide platform where innovative new features can be implemented easily**
- **Planned new features will include for example**
  - Search functionality for pdgLive
  - Downloading of PDG data in machine-readable format
  - “pdgLive” on Blackberry / iPhone / ... mobile devices
- **Other ideas are under discussion**
  - RSS feed, Twitter, or e-mail lists for announcements?
  - Web-based user participation in PDG (“Web 2.0”)?
  - ...

**Are there areas, where it would be useful if users could give input to PDG via the web?**

- **Possibility to comment on reviews or sections in the Listings?**
  - In public, not just via e-mail or as feedback on pdgLive
  - On pdgLive pages? Via public discussion lists?
- **Could current manual scanning of HEP literature by PDG be augmented by community input via web?**
- **Tagging of HEP articles based on PDG classification?**

Behind the scene, the PDG Listings define a well-established classification scheme for HEP data:

**LIGHT UNFLAVORED MESONS**  
( $S = C = B = 0$ )

For  $l = 1$  ( $\pi, b, \rho, a$ ):  $u\bar{d}, (u\bar{u} - d\bar{d})/\sqrt{2}, d\bar{u}$ ;  
for  $l = 0$  ( $\eta, \eta', h, h', \omega, \phi, f, f'$ ):  $c_1(u\bar{u} + d\bar{d}) + c_2(s\bar{s})$

---

**$\pi^\pm$**   $I^G(J^P) = 1^-(0^-)$

Mass  $m = 139.57018 \pm 0.00035$  MeV ( $S = 1.2$ )

Mean life  $\tau = (2.6033 \pm 0.0005) \times 10^{-8}$  s ( $S = 1.2$ )

$c\tau = 7.8045$  m

$\pi^\pm \rightarrow \ell^\pm \nu \gamma$  form factors [a]

$F_V = 0.017 \pm 0.008$

$F_A = 0.0115 \pm 0.0005$  ( $S = 1.2$ )

$R = 0.059^{+0.009}_{-0.008}$

$\pi^-$  modes are charge conjugates of the modes below.

For decay limits to particles which are not established, see the appropriate Search sections (Massive Neutrino Peak Search Test,  $A^0$  (axion), and Other Light Boson ( $X^0$ ) Searches, etc.).

$\pi^+$ DECAY MODES	Fraction ( $\Gamma_i/\Gamma$ )	Confidence level	$P$ (MeV/c)
$\mu^+ \nu_\mu$	[b] (99.98770 $\pm$ 0.00004) %		30
$\mu^+ \nu_\mu \gamma$	[c] ( 2.00 $\pm$ 0.25 ) $\times 10^{-4}$		30
$e^+ \nu_e$	[b] ( 1.230 $\pm$ 0.004 ) $\times 10^{-4}$		70

Code

Description

S008

$\pi^\pm$  (particle code)

S008M

$\pi^\pm$  mass

S008T

$\pi^\pm$  life time

S008CTA

$\pi^\pm c\tau$

S008FV

$\pi^\pm$  form factor  $F_V$

S008, 1

$\pi^\pm$  decay mode:  $\mu^+ \nu_\mu$

S008, 2

$\pi^\pm$  decay mode:  $e^+ \nu_e$

- The classification code is a unique string that leads directly to the corresponding PDG data
  - Similarly for PDG reviews

S008T →



PDGLive Particle Summary - Mozilla Firefox <2>

http://pdglive.lbl.gov/popubblockdata.brl?node=S008T

PDG Live  
particle data group

HOME: pdgLive Summary Tables Reviews, Tables, Plots Particle Listings

from the 2008 Review of Particle Physics.  
Please use this CITATION: C. Amsler *et al.* (Particle Data Group), Phys. Lett. **B667**, 1 (2008)

**$\pi^\pm$  MEAN LIFE**  
Measurements with an error  $> 0.02 \times 10^{-8}$  s have been omitted.

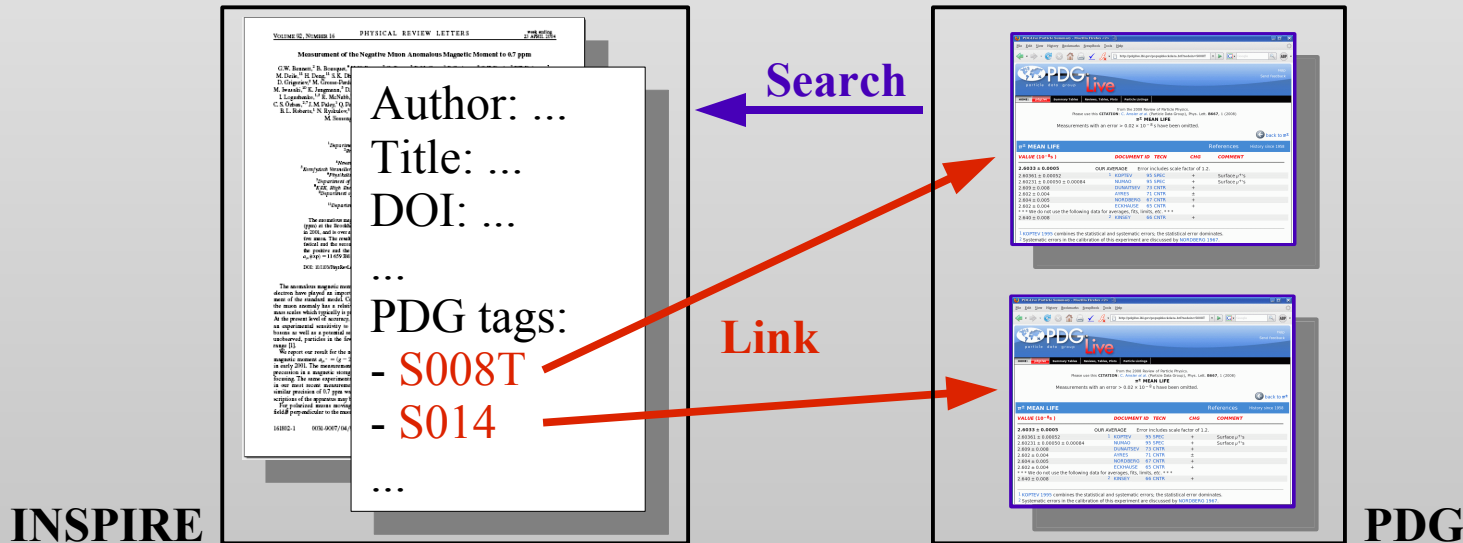
[back to  \$\pi^\pm\$](#)

VALUE ( $10^{-8}$ s)	DOCUMENT ID	TECN	CHG	COMMENT
<b>2.6033 ± 0.0005</b>	OUR AVERAGE	Error includes scale factor of 1.2.		
2.60361 ± 0.00052	<sup>1</sup> KOPTEV	95 SPEC	+	Surface $\mu^{+'s}$
2.60231 ± 0.00050 ± 0.00084	NUMAO	95 SPEC	+	Surface $\mu^{+'s}$
2.609 ± 0.008	DUNAITSEV	73 CNTR	+	
2.602 ± 0.004	AYRES	71 CNTR	±	
2.604 ± 0.005	NORDBERG	67 CNTR	+	
2.602 ± 0.004	ECKHAUSE	65 CNTR	+	
*** We do not use the following data for averages, fits, limits, etc. ***				
2.640 ± 0.008	<sup>2</sup> KINSEY	66 CNTR	+	

<sup>1</sup> KOPTEV 1995 combines the statistical and systematic errors; the statistical error dominates.  
<sup>2</sup> Systematic errors in the calibration of this experiment are discussed by NORDBERG 1967.

- Proposal:**

- Agree on fine-grained classification scheme for HEP results, similar to the one presently used by PDG
- **Allow classification codes in INSPIRE's article metadata**
- Ask authors to tag their articles with classification codes through a convenient interface, e.g. when submitting a preprint to arXiv
  - Tags might be entered by navigating web pages similar to pdgLive
  - Might allow others to submit or vote on tags





- **Benefits:**
  - Allows **searches within INSPIRE and pdgLive based on a well-known classification**
    - “What articles contain information about the top mass?”
  - INSPIRE can directly **link from article to relevant PDG data**
    - By pointing at PDG pages using classification tags
    - Independently of whether article has been included in RPP
    - Can point to both PDG Listings and Reviews
  - pdgLive can **point user to articles that have not been included in PDG** but might still be relevant for the user
    - By searching INSPIRE for the corresponding classification tag
    - Example: most recent unpublished top mass results
  - Helps PDG to **efficiently scan HEP literature** for relevant results to be included into RPP

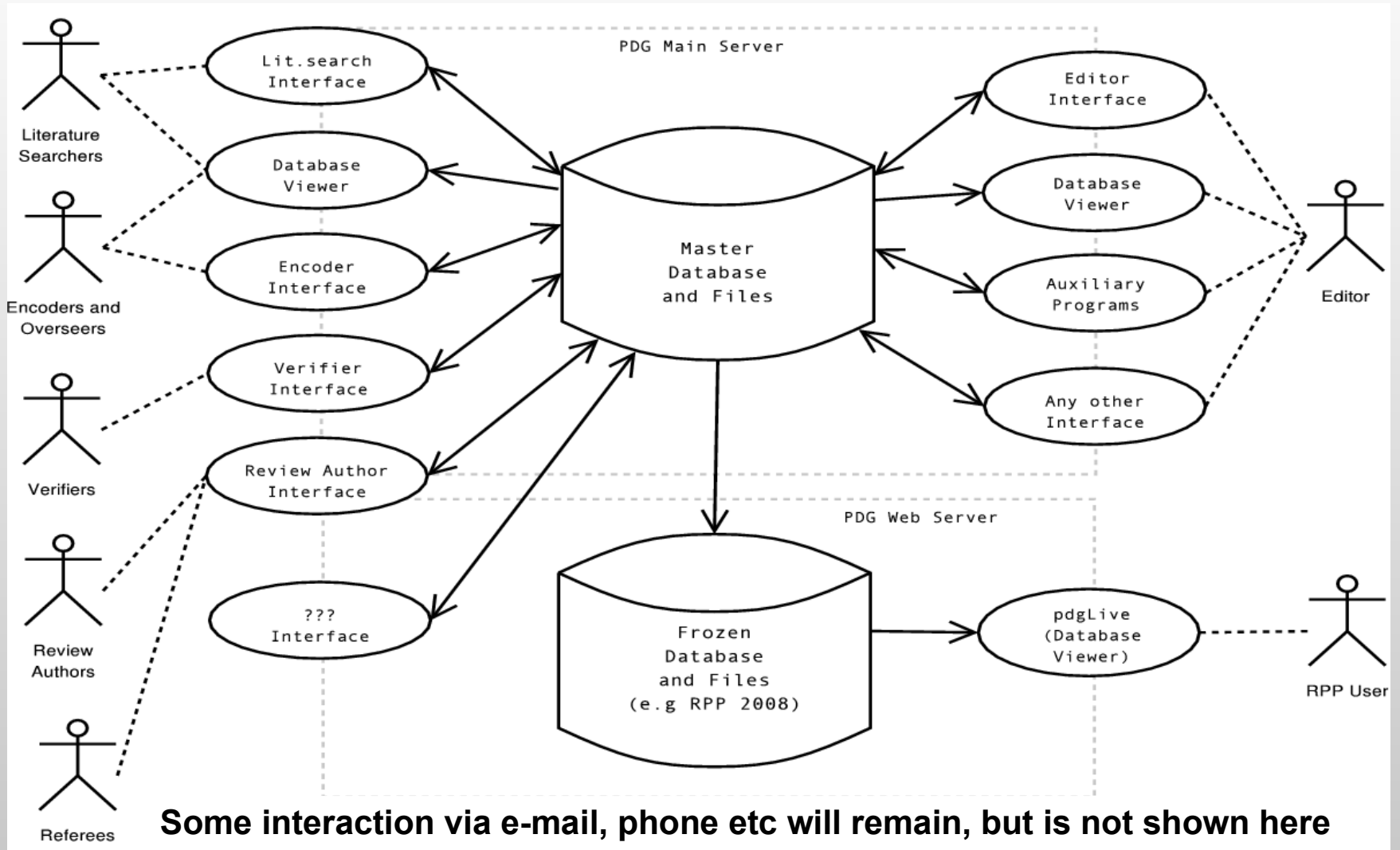
- What can PDG provide to you?
- What are your ideas of how PDG should evolve?

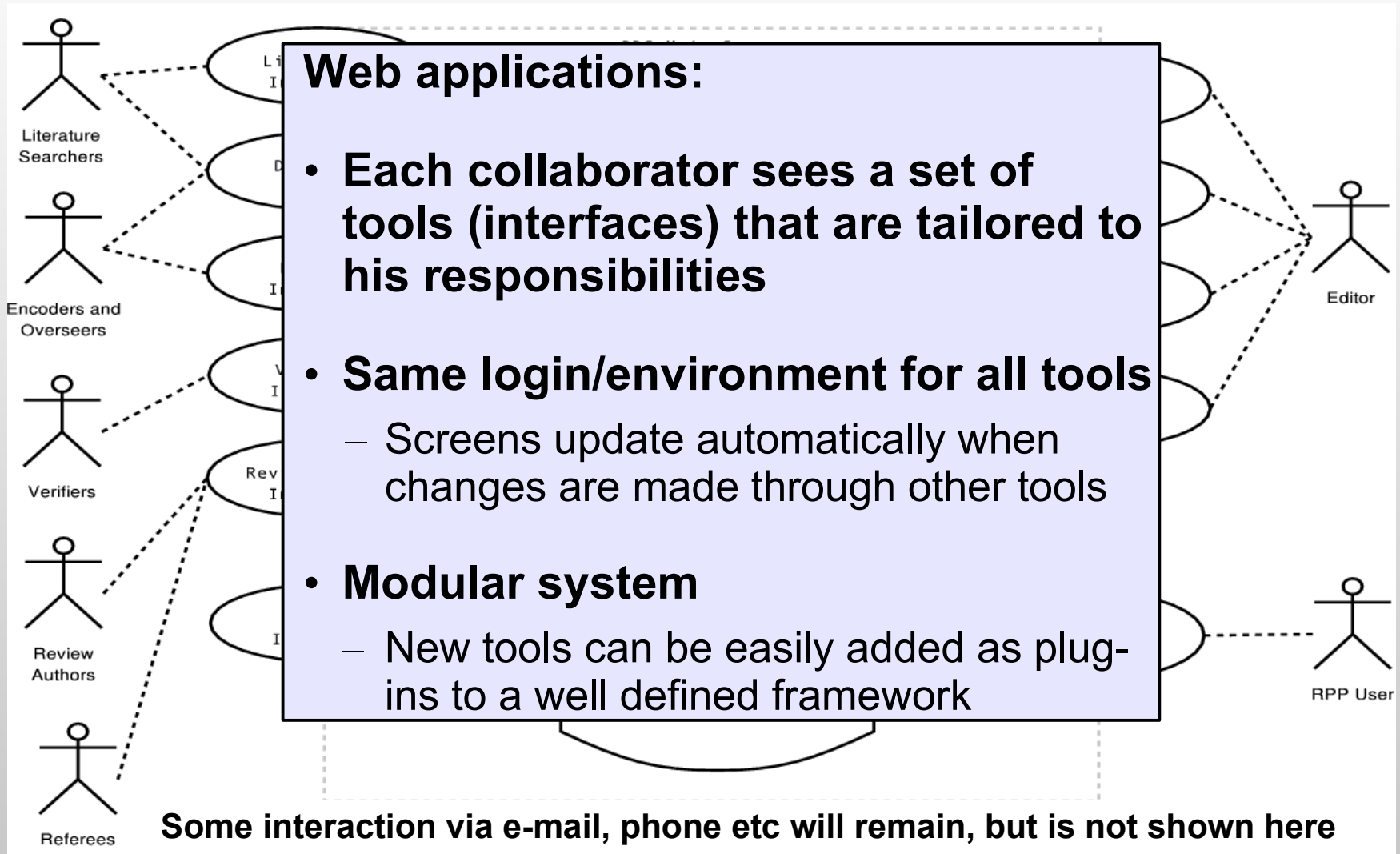
*Please contact us – during this Summit  
or by e-mail to [JBeringer@lbl.gov](mailto:JBeringer@lbl.gov)*

*Thank you!*

- **Computing upgrade will allow implementation of new innovative features**
- **Continue collaboration started long ago with SLAC with INSPIRE regarding**
  - Cross-linking
  - Information interchange
- **Propose to collaborate on and implement a common fine-grained classification scheme for HEP results**

# Backup Slides

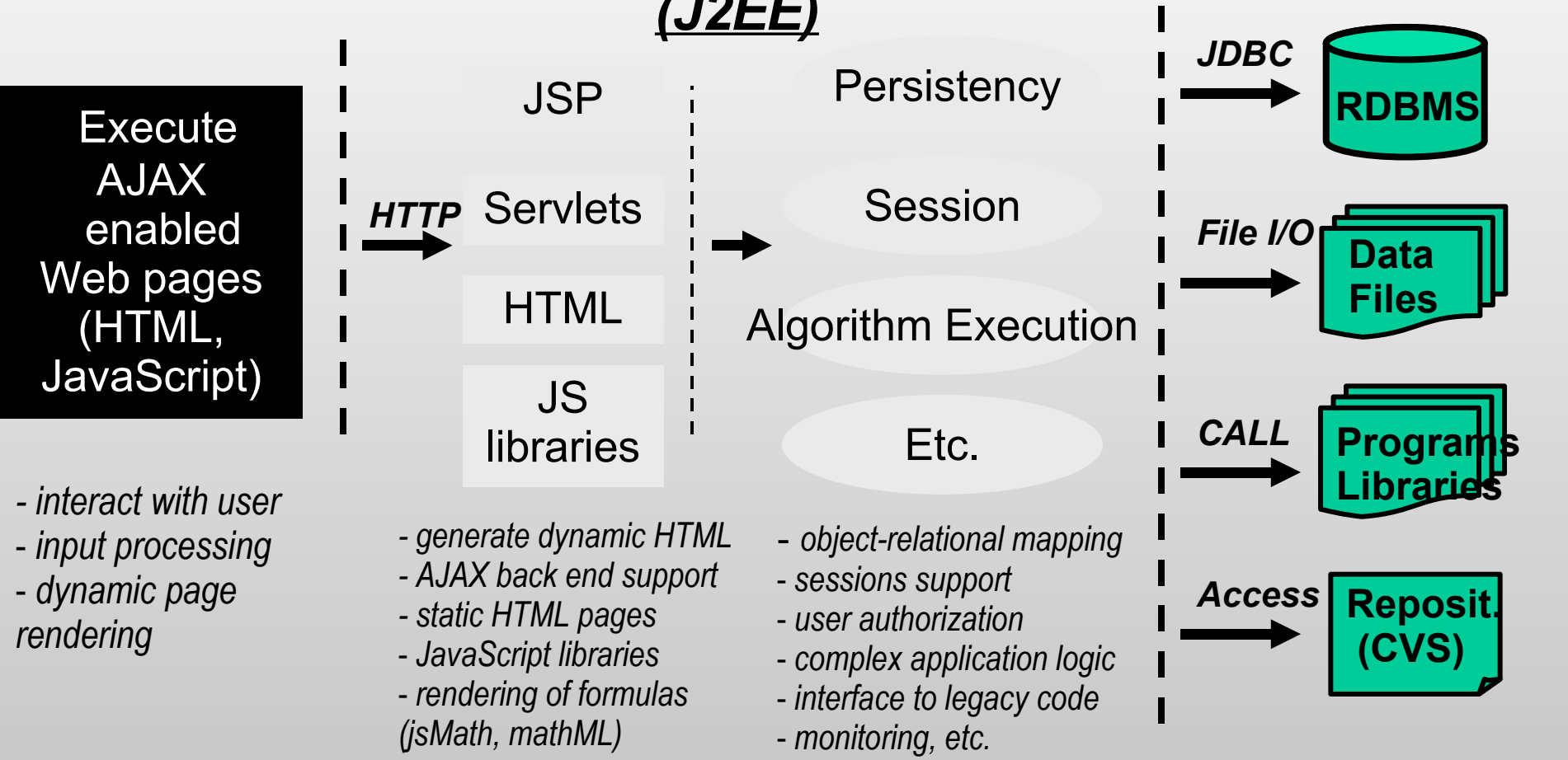




## Web Browser

## Web Application Server (J2EE)

## Resources



- **J2EE-based web application framework**
  - Commonly used industry standard for building scalable, distributed web applications
- **AJAX-enabled web pages**
  - User-friendly and highly interactive GUI behavior
- **Relational database (PostgreSQL)**
  - $O(100)$  database tables
- **Programming languages**
  - Java and JSP for web application framework backend
  - JavaScript for client-side HTML (AJAX)
  - Python API for programmatic access to database
  - Legacy Fortran applications restructured as libraries