A Possible Path for Improving the Review of Particle Physics

An APS Perspective

Mark Doyle

Director, Journal Information Systems, APS

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Thanks

APS and *Physical Review D* are pleased to have the opportunity to share some thoughts with the Particle Data Group. We regret not being able to attend in person.

Assumptions

- PDG database must remain the definitive source of all information
- Need to minimize conversions from this definitive source, whether rendering on pdgLive, publishing in a journal, or providing content for a mobile app
- Tables, author lists, references, particle/decay data, etc. stored in PDG database and largely converted to TeX for book(let) and HTML for pdgLive programmatically
- PDG should be in control of the primary conversions from source database to ensure quality

A possible progression towards mobile

- Develop an XML-based representation for text, tables, author/affiliations, references, etc.
- Continue to use TeX for math to avoid complexity of MathML
- Create a backend API to deliver content to the pdgLive web site (if not already using one)
- Use a responsive design for pdgLive to automatically adapt web site to a variety of screen sizes
- Use readily available XSLT transform for rendering OASIS tables
- Continue to MathJax for math

XML for Text and Tables

- Use JATS (or BITS) industry standard
  - Used by many publishers now. APS switched to JATS this past year for journal articles. BITS is derived from JATS, but is for books
  - Full text HTML renders (chunks of) XML on the fly
- Use OASIS table model for tables
  - Readily available XSLT transform for rendering in HTML available from National Library of Medicine
  - APS using it with very little modification

Some rendered OASIS examples

- The following screenshots are example tables taken directly from our full text HTML rendering
- The OASIS table markup is rendered via NLM's XSLT2 transform to HTML
- No fine tuning of the HTML is done
- The XML is rendered to the PDF as well

Example Table 1

http://journals.aps.org/prd/abstract/10.1103/PhysRevD.90.072003

$K^-(892)^0$	-0.75±0.08±0.16±0.72	0.74±0.08±0.13±0.33	1.06±0.02±0.03±0.03	2.36±0.13±0.20±0.76
$\bar{K}^*(1410)^0$	-0.25±0.03±0.02±0.15	-0.04±0.05±0.12±0.22	0.25±0.04±0.02±0.14	-2.96±0.21±0.50±1.09
LASS nonresonant	-0.43±0.09±0.16±0.14	0.59±0.06±0.06±0.18	0.73±0.06±0.05±0.11	2.19±0.16±0.26±0.26
$\bar{K}_0^*(1430)^0$	-0.49±0.10±0.22±0.14	0.73±0.07±0.07±0.08	0.88±0.04±0.03±0.07	2.16±0.20±0.25±0.16
$\bar{K}_2^*(1430)^0$	0.09±0.05±0.08±0.26	-0.37±0.03±0.02±0.03	0.38±0.03±0.02±0.05	-1.34±0.10±0.20±0.65
$\bar{K}^*(1680)^0$	-0.08±0.04±0.06±0.14	0.12±0.04±0.02±0.20	0.14±0.06±0.04±0.11	2.16±0.26±0.32±2.66
$\bar{K}_0^*(1950)^0$	0.11±0.03±0.03±0.21	-0.01±0.04±0.04±0.23	0.11±0.04±0.03±0.22	-0.09±0.41±0.32±1.71
$D_{s2}^*(2573)^-$	1.00	0.00	1.00	0.00
$D_{s1}^*(2700)^-$	-0.22±0.04±0.02±0.06	-0.13±0.04±0.06±0.13	0.25±0.04±0.03±0.04	-2.61±0.17±0.18±0.53
$D_{s1}^*(2860)^-$	-0.41±0.05±0.05±0.24	0.16±0.06±0.05±0.09	0.44±0.05±0.03±0.17	2.78±0.20±0.12±0.52
$D_{s3}^*(2860)^-$	0.27±0.02±0.03±0.05	-0.12±0.03±0.02±0.04	0.29±0.02±0.02±0.03	-0.42±0.07±0.10±0.18
Nonresonant	0.58±0.07±0.25±0.28	-0.39±0.06±0.04±0.28	0.70±0.08±0.15±0.19	-0.59±0.10±0.36±0.48
D_{sv}^{*-}	0.36±0.04±0.04±0.18	0.23±0.05±0.05±0.17	0.43±0.05±0.05±0.16	0.57±0.12±0.08±0.43
$D_{s0v}^*(2317)^-$	0.18±0.08±0.22±0.18	0.24±0.04±0.05±0.09	0.30±0.06±0.16±0.13	0.91±0.21±0.72±0.43

Example Table 2

http://journals.aps.org/prd/abstract/10.1103/PhysRevD.90.072003

State	Mass	Width	Comment
		BABAR	
$D_{s1}^{*}(2700)^{-}$	$2710 \pm 2^{+12}_{-7}$	$149 \pm 7^{+39}_{-52}$	Seen in DK and $D^{*}K$
$D_{sJ}^{*}(2860)^{-}$	$2862 \pm 2^{+5}_{-2}$	$48 \pm 3 \pm 6$	Seen in DK and $D^{*}K$
$D_{sJ}(3040)^{-}$	$3044 \pm 8^{+30}_{-5}$	$239 \pm 35^{+46}_{-42}$	Seen in $D^{*}K$ only
		LHCb	
$D_{s1}^{*}(2700)^{-}$	$2709.2 \pm 1.9 \pm 4.5$	$115.8 \pm 7.3 \pm 12.1$	Only DK studied
$D_{sJ}^{*}(2860)^{-}$	$2866.1 \pm 1.0 \pm 6.3$	$69.9 \pm 3.2 \pm 6.6$	

Example Table 3

http://journals.aps.org/prd/abstract/10.1103/PhysRevD.90.072003

$K^{-}(1410)^{0}$	0.06	0.11	0.06	0.07	0.00	0.04	0.16
LASS nonresonant	0.37	0.68	0.72	0.93	0.15	0.55	1.52
$\bar{K}_0^*(1430)^0$	0.50	0.33	0.18	0.21	0.15	0.24	0.72
LASS total	0.49	0.54	0.43	0.36	0.05	0.24	0.95
$\bar{K}_0^*(1430)^0$	0.22	0.18	0.13	0.22	0.01	0.09	0.39
$\bar{K}^*(1680)^0$	0.18	0.10	0.05	0.05	0.00	0.14	0.26
$\bar{K}_0^*(1950)^0$	0.06	0.03	0.03	0.03	0.03	0.10	0.13
$D_{s2}^*(2573)^-$	0.50	0.53	0.08	0.20	0.16	0.13	0.78
$D_{s1}^*(2700)^-$	0.41	0.07	0.14	0.05	0.04	0.02	0.44
$D_{s1}^*(2860)^-$	0.42	0.25	0.36	0.19	0.00	0.10	0.65
$D_{s3}^*(2860)^-$	0.03	0.07	0.05	0.15	0.02	0.21	0.28
Nonresonant	3.53	1.06	1.13	1.05	0.45	1.51	4.30

Example Table 4

http://journals.aps.org/prstper/abstract/10.1103/PhysRevSTPER.10.020109

	Tutorial-based interactive lecture instruction			Traditional lecture instruction					
	Original sequence (students arrive at an answer)						Modified sequence (students justify a correct answer)		
Student performance on screening questions (percentage correct)	Q1	Q2		Q1	Q2		Q1	Q2	
	65%	55%		43%	26%		37%	41%	
	Both screening questions			Both screening questions			Both screening questions		
	52%			24%			27%		
Performance on target question of those students who answered both screening questions correctly	Correct formal reasoning	Compensation reasoning	Other	Correct formal reasoning	Compensation reasoning	Other	Correct formal reasoning	Compensation reasoning	Other
	25%	24%	3%	12%	12%	0%	23%	1%	3%

Data Behind the Tables

- If I have made a poor assumption that the data behind the tables are stored in a database and the TeX for the tables is created programmatically, then:
  - A format neutral data model/database should be developed as the source for all data within the the PDG
  - Alternatively, if the TeX is structured well enough, automatic conversion to OASIS can be done with high-fidelity.

Responsive Design

- Uses JavaScript + CSS to render site adaptively to the devices screen size
- Allows a single web site to provide a good experience on desktop, tablet, and phone
- Standard libraries exist to support this; APS uses Foundation framework
- Mutli-column layout gracefully reduces as screen narrows
- Navigational and other page elements collapse away so that content remains front and center
- Try it by visiting http://journals.aps.org/prd and narrowing your browser window slowly.

Moving to an App

- Responsive design will offer a good experience if someone follows a link on the web to pdgLive (users won't end up in the app)
- A simple first app could be a thin client interface that talks to pdgLive API (preferably the same one that backs the website)
- If app is to provide offline access, need to figure out how to store all of the information locally on device for rendering and searching

Additional Benefits

- XML for author/affiliations would make it easier for the publisher of the RPP. ORCIDs would be a good addition as well.
- XML for all referenced works would also help the publisher, but more importantly would help the cited articles get proper credit within CrossRef
- API might be re-usable to allow other content providers to use PDG as a direct source of information

Opening up the Data

- If there isn't sufficient funding to redo the web site, develop the APIs, or create the app, PDG should focus on how to make the source data openly available so that others can contribute. There are many people in the HEP community that would likely be willing and able to help out.
- It might be desirable to place the data in Zenodo or other data repository in any case

Questions or Follow Up

- Please contact me if you have any questions:
  - Mark Doyle, doyle@aps.org