

STRONG-2020 PrecisionSM status and plans



SCUOLA
NORMALE
SUPERIORE

Alberto Lusiani

Scuola Normale Superiore and INFN, sezione di Pisa



PrecisionSM meeting

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Introduction

goals (my view)

- ▶ build repository of low-energy precision measurements data
 - ▶ in a format and with instructions and examples to be readily usable
- ▶ provide instances of useful elaborations, e.g. calculation of (part of) muon $g-2$ HVP contribution

current plans

- ▶ rely on [HEPData.net](https://hepdata.net) as **measurements repository**
 - ▶ check existing data, promote / organize data submissions
- ▶ build **web site** that links to measurement data on HEPData.net and organizes the content
- ▶ provide **code examples** that download and elaborate data of precision measurements
 - ▶ store in git repository

measurements selection

- ▶ $\sigma(e^+e^- \rightarrow \text{hadrons})$ to compute HVP & LBL contributions to muon $g-2$
- ▶ possible extension: tau spectral functions

HEPData.net

- ▶ HEP data public storage web site, mainly used by LHC experiments
- ▶ well defined submission data format, functionally adequate for our data of interest
- ▶ uses YAML and JSON, can export to Root format and other formats
- ▶ measurements on [HEPData.net](https://hepdata.net) link their [InspireHEP.net](https://inspirehep.net) publication
InspireHEP.net back-links HEPData.net
- ▶ possible to download data and metadata programmatically
- ▶ first release of HEPData.net involved some autonomous measurement data harvesting
 - ▶ these old submissions were checked and found to fall short of our requirements
- ▶ second (current) HEPData.net release authorizes submissions from contact persons from experiments
 - ▶ submissions with higher quality
 - ▶ some experiments are quite active in promptly uploading their published data

HEPData.net (2)

- ▶ coordinator has privileges for submission (A.L. accepted as STRONG-2020 coordinator)
- ▶ coordinator appoints **uploader** and **reviewer**, giving appropriate permissions
- ▶ **Stefan Mueller** has prepared a working submission of data provided by a KLOE paper
 - ▶ submission OK and follows all HEPData.net prescriptions
 - ▶ personally, would like to use a leaner data format on submissions
 - ▶ have discussed the matter with Graeme Watt of HEPData:
 - leaner formats can be used for submissions
 - plan to design a leaner submission format and understand all implications

HEPData.net provisional submission of KLOE10 $e^+e^- \rightarrow \pi^+\pi^-(\gamma)$ <https://www.hepdata.net/record/sandbox/1599143175>

HEPData Sandbox

Search HEPData

Submit Sandbox About Submission Help Dashboard Log out

Download Submission as

Hide Publication Information

Additional Resources

Upload New Files

Download All

Filter 12 data tables

Figure 3a

Data from Fig. 3, Left and Table 2

Differential cross section for $e^+e^- \rightarrow \pi^+\pi^-\gamma$, with $50^\circ < \theta_\gamma < 130^\circ$

Resources

JSON

Abstract (data abstract)

We have measured the cross section of the radiative process $e^+e^- \rightarrow \pi^+\pi^-\gamma$ with the KLOE detector at the Frascati ϕ -factory DAΦNE, from events taken at a CM energy $\sqrt{s}=1$ GeV. Initial state radiation allows us to obtain the cross section for $e^+e^- \rightarrow \pi^+\pi^-\gamma$, the pion form factor $|F_\pi|^2$ and the dipion contribution to the muon magnetic moment anomaly, $\Delta a_\mu^{\text{had}} = (478.5 \pm 2.0_{\text{stat}} \pm 5.0_{\text{ppq}} \pm 4.5_{\text{th}}) \times 10^{-11}$ in the range $0.1 < M_{\pi\pi}^2 < 0.85 \text{ GeV}^2$, where the theoretical error includes a SU(3) ChPT estimate of the uncertainty on photon radiation from the final pions. The discrepancy between the Standard Model evaluation of a_μ and the value measured by the Muon g-2 collaboration at BNL is confirmed.

Figure 3a

Data from Fig. 3, Left and Table 2

Differential cross section for $e^+e^- \rightarrow \pi^+\pi^-\gamma$, with $50^\circ < \theta_\gamma < 130^\circ$

cmenergies

1.0

observables

DSIG/DQ**2

phrases

Exclusive

E+E- Scattering

Section

reactions

E+ E- -> PI+ PI- GAMMA

Covariance matrix values for differential cross section

Data from <https://www.infn.it/kloe/ppg/ppg>

Statistical covariance matrix for differential cross section for $e^+e^- \rightarrow \pi^+\pi^-\gamma$, with $50^\circ < \theta_\gamma < 130^\circ$

Inverse Covariance matrix values for differential cross section

Data from <https://www.infn.it/kloe/ppg/ppg>

Inverse statistical covariance matrix for differential cross section for $e^+e^- \rightarrow \pi^+\pi^-\gamma$, with $50^\circ < \theta_\gamma < 130^\circ$

Showing 50 of 75 values

Show All 75 values

SQRTS(S)	1000 MeV
RE	E+ E- -> PI+ PI- GAMMA
$M_{\pi\pi}^2$ [GeV ²]	$d\sigma/dM_{\pi\pi}^2$ [nb/GeV ²]
0.105	0.34 ±0.06 stat ±0.03 syst
0.115	0.49 ±0.06 stat ±0.03 syst

Visualize

PrecisionSM collaborative web site

<https://precision-sm.github.io/>

PrecisionSM [Posts](#) [About](#) [RSS feed](#)

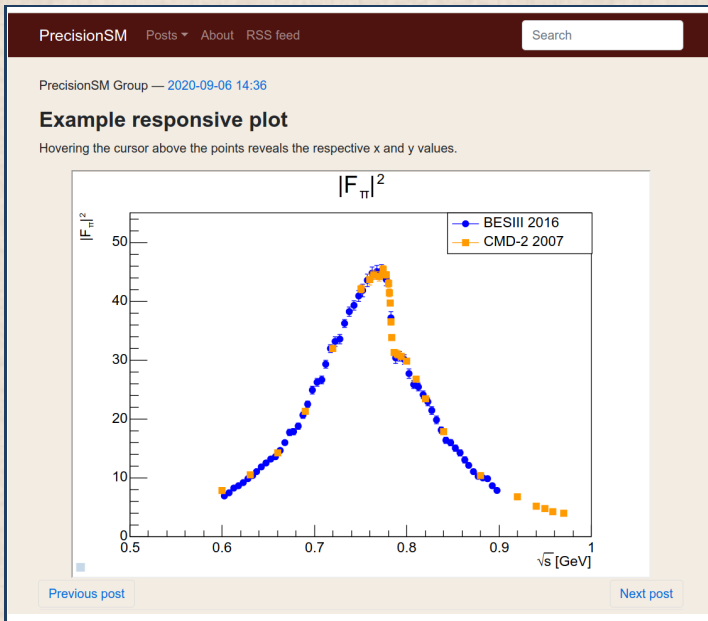
Draft PrecisionSM web site

- [Example code to create a responsive plot using results stored in HEPData.net](#)
- [Example of responsive plot integrated in this website](#)
- [Example notebook](#)
- [Fedor Ignatov responsive plots](#)



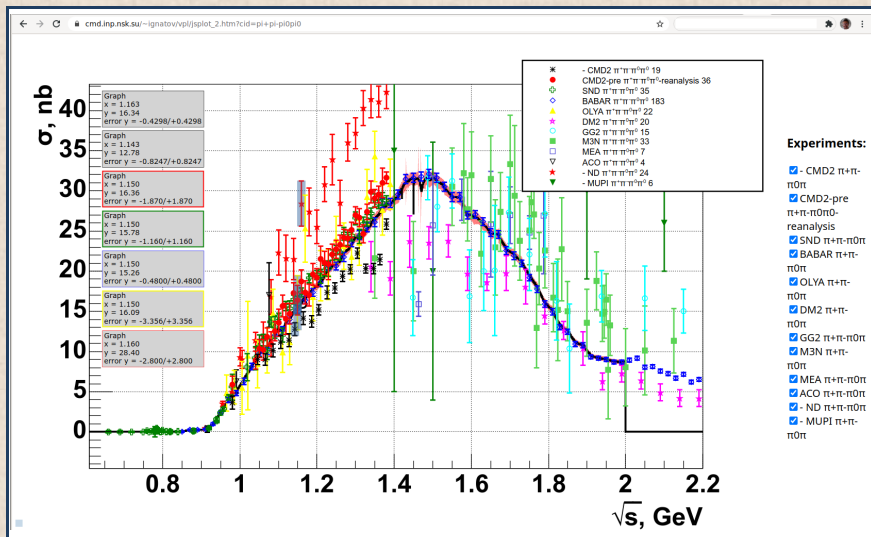
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PrecisionSM collaborative web site, responsive plot

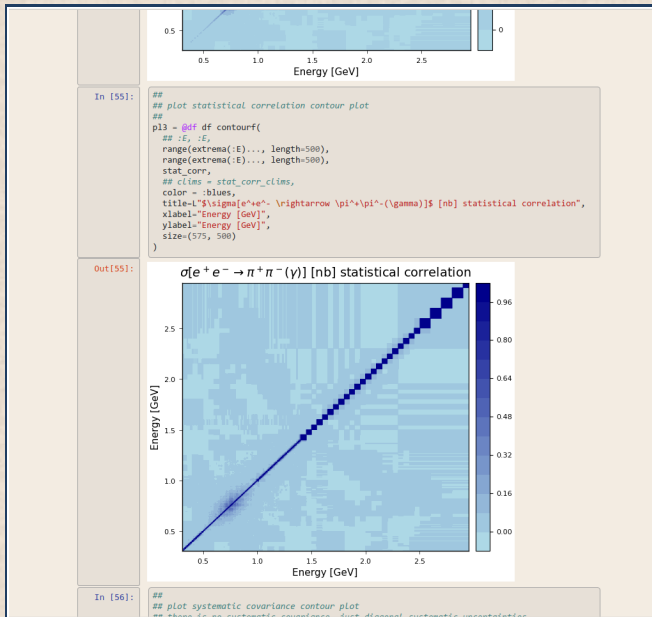


PrecisionSM collaborative web site, responsive plot (2)

► re-using (with his collaboration) techniques used by F. Ignatov in <https://cmd.inp.nsk.su/~ignatov/vpl/>



PrecisionSM collaborative web site, segment of a notebook



Web site collaborative framework

- ▶ source web site files on Github repository
- ▶ Nikola static web generator generates website (= HTML, CSS and javascript)
- ▶ simple procedure to publish on Github Pages at <https://precision-sm.github.io/>
 - ▶ generated web site can be published anywhere else if more convenient
- ▶ web pages are edited in simplified markup languages like Markdown
 - ▶ but HTML, CSS and Javascript can be used if desired
- ▶ collaborators can be added as editors of Github repository
- ▶ written, tested and documented procedure to convert data into responsive jsRoot plots (<https://precision-sm.github.io/posts/mk-hepdata-plot/>)

Next steps

- ▶ responsive plot feature of channel selection (know how to do it, just matter of available time)
- ▶ collect list of measurements to be uploaded to HEPData.net
- ▶ organize and collaborate with experiments to upload the measurements' data
- ▶ produce responsive plots from data uploaded on HEPData.net (semi-automatic)
- ▶ document measurements in web site
 - ▶ link to HEPData.net, inspirehep, brief description, plots
- ▶ organize measurements in categories
- ▶ publish example code pieces: data downloading, elaborations

Thanks for your attention!

Backup Slides

Website workflow

```
##-- install code
shell: pip3 install -user -U nikola notebook ghp-import2
##-- get website source
shell: git clone git@github.com:precision-sm/precision-sm.github.io.git
shell: cd precision-sm.github.io/

##-- web files in branch "master", source in branch "src"
shell: git branch
* master
shell: git checkout src
shell: git branch
master
* src

##--source of web pages in rst, markdown, jupyter notebooks and other
shell: ls pages posts

##-- build web site, destination in output/
shell: nikola build

##-- upload to github pages
shell: nikola github_deploy

##-- view web site locally for development
shell: nikola auto -browser
```

Additional notes on collaborative web site

- ▶ Nikola documentation:
 - ▶ <https://getnikola.com/getting-started.html>
 - ▶ <https://getnikola.com/creating-a-site-not-a-blog-with-nikola.html>
- ▶ Github Pages documentation: <https://pages.github.com/>
 - ▶ master & src branches are specific to github pages
- ▶ if web site hosted elsewhere
 - ▶ content of src branch should be in master branch
 - ▶ content of output/ directory (generated web site) should not be included in versioned repository
 - ▶ content of output/ should be copied in the web site root directory
- ▶ free account functionality of github appropriate for the moment
- ▶ evolution to different hosting framework is straightforward

home page source index.rst

```
.. title: Main Page
.. slug: index
.. date: 2020-06-28 18:41:26 UTC+02:00
.. tags:
.. category:
.. link:
.. description:
.. has_math: true
.. type: text
.. hidetitle: true

.. image:: /images/colibri-plain.svg
   :target: /images/colibri-plain.svg
   :width: 12 em
   :align: right
```

Draft PrecisionSM web site

=====

- * `'Example code to create a responsive plot using results stored in HEPData.net </posts/mk-hepdata-plot/>'_`
- * `'Example of responsive plot integrated in this website </posts/example-responsive-plot/>'_`
- * `'Example notebook </posts/BaBar-ep-em-to-pip-pim/>'_`
- * `'Fedor Ignatov responsive plots </posts/fedor-ignatov-e%2Be-to-hadrons-plots/>'_`

home page source for responsive plot

```
.. title: example responsive plot
.. slug: example-responsive-plot
.. date: 2020-09-06 14:36:05 UTC+02:00
.. tags:
.. category:
.. link:
.. description:
.. type: text
.. hidetitle: true
```

```
Example responsive plot
=====
```

```
.. TEASER_END
```

Hovering the cursor above the points reveals the respective x and y values.

```
.. raw:: html
```

```
<iframe
  style="width:90%; height:67.5vh; margin:0px auto; display:block;"
  src="/jsroot/index.htm?nobrowser&file=../resp-plots/precsm-resp-plot-example.root&item=F_pip_pim&opt=ep">
</iframe>
```