



# A Tour of HepSim From a User's Perspective

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# What is HepSim?

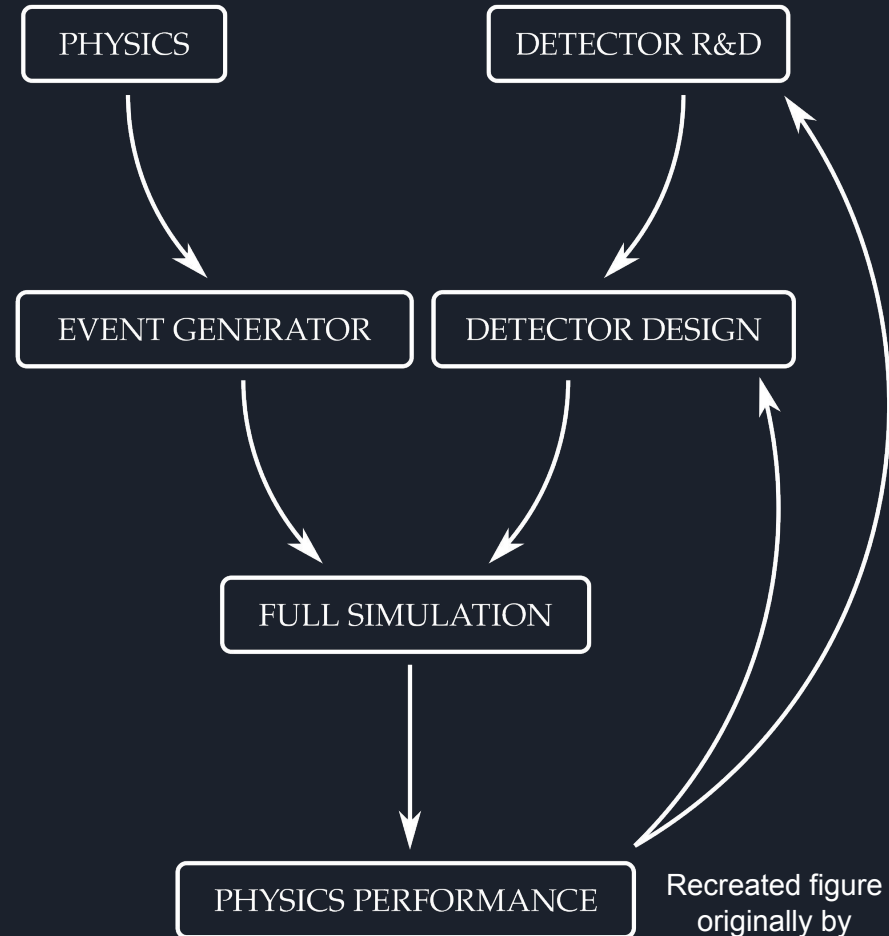
- A simple but powerful tool for building a “Repository with MC simulations for particle physics”
  - Consists of a [web interface](#) and [command-line tools](#)
- Already contains ~2 Billion events
  - LO+PS, NLO, and NLO+PS
- Environment to study detector effects with fast and full simulations
- Platform that continues to evolve
- NOT a storage service
  - Files are hosted where convenient, and linked to by HepSim

The screenshot displays the HepSim web interface. At the top, there is a navigation bar with links: "Get involved", "Full Search", "Experiments", "Manual", "Mirrors", "Tools", "About", and "Login". The main header features the "HepSim" logo and the tagline "Repository with Monte Carlo simulations for particle physics". A search bar on the right contains two entries: "Jun.29, 2017: rfui058 tag with improved tracking strategy from D.Blyth" and "Jun.20, 2017: rfui057 tag with alternative tracking strategy from D.Blyth". Below the header, a "Show" dropdown is set to "25" entries, and a "Search:" field is present. The main content is a table with columns: "Id", "E [TeV]", "Dataset name", "Generator", "Process", "Topic", "Files", and "Created". The table lists various simulation entries, such as "286 e+e- 3 tev3ee\_pythia8\_qcdjets\_tunes\_qedoff" and "285 e+e- 0.38 gev380ee\_pythia8\_qcdjets\_tunes\_qedof".

Id	E [TeV]	Dataset name	Generator	Process	Topic	Files	Created
286	e+e- 3	tev3ee_pythia8_qcdjets_tunes_qedoff	PYTHIA8	QCD dijet events with 7 tunes without ISR	SM	Info	2017/07/14
285	e+e- 0.38	gev380ee_pythia8_qcdjets_tunes_qedof	PYTHIA8	QCD dijet events with 7 tunes without ISR	SM	Info	2017/07/14
284	e-p 0.035	gev35ep_pythia8_dis1q2	PYTHIA8	DIS events at Q2>1 GeV2	SM	Info	2017/06/26
283	e-p 0.035	gev35ep_lepto6ard_dislowq2_jlab	LEPTO/ARIADNE	DIS events at Q2>1 GeV2 and W2>4 GeV2	SM	Info	2017/06/16
282	e+e- 0.5	gev500ee_pythia8_ttbar_tunes	PYTHIA8	top (ttbar) production with 7 tunes	SM	Info	2017/06/12
281	e+e- 14	tev14pp_pythia8_ttbar_tunes	PYTHIA8	top (ttbar) production with tune 14.	SM	Info	2017/06/09
280	e+e- 3	tev3ee_pythia8_ttbar_tunes	PYTHIA8	top (ttbar) production with 7 tunes	SM	Info	2017/06/03
279	e+e- 0.38	gev380ee_pythia8_ttbar_tunes	PYTHIA8	top (ttbar) production with 7 tunes	SM	Info	2017/06/03
278	e+e- 3	tev3ee_pythia8_qcdjets_tunes	PYTHIA8	QCD dijet events with 7 tunes	SM	Info	2017/05/20
277	e+e- 0.38	gev380ee_pythia8_qcdjets_tunes	PYTHIA8	QCD dijet events with 7 tunes	SM	Info	2017/05/19
276	e-p 0.035	gev35ep_lepto6ard_dislowq2	LEPTO/ARIADNE	DIS events at Q2>1 GeV2 and W2>4 GeV2	SM	Info	2017/05/17
275	e-p 0.035	gev35ep_lepto6_dis1q2	LEPTO/PYTHIA	DIS events at Q2>1 GeV2 and W2>5 GeV2	SM	Info	2017/05/01
274	e+e- 3	tev3ee_pythia8_higgs_ww	PYTHIA8	Higgs to WW	SM	Info	2017/04/29
273	e+e- 3	tev3ee_pythia8_higgs_bbar	PYTHIA8	Higgs to bbar	SM	Info	2017/04/29
272	e+e- 3	tev3ee_pythia8_qcdjets	PYTHIA8	QCD dijet events	SM	Info	2017/04/29
271	e-p 0.035	gev35ep_lepto6ard_dis1q2	LEPTO/ARIADNE	DIS events at Q2>1 GeV2 and W2>5 GeV2	SM		
270	pp 13	tev13pp_pythia8_wh2l	PYTHIA8	WH			
269	pp 13	tev13pp_pythia6_rho_technci	PYTHIA8				
268	pp 14	tev14pp_pythia8_higgs2mumu					
267	pp 13	tev13pp_pythia8_wprime					

# Why HepSim?

- Began at Snowmass 2013
- Open access
  - No authentication for use of sample sets
  - Grab samples with `hs-toolkit`, `wget`, `curl`, etc... your choice!
- Preservation and publication of MC samples and simulated data
- **Cache for iterative experiment design process**
- Comparison with experimental data



Recreated figure  
originally by  
W. Armstrong

## Truth-level event samples

## Simulated event samples

## Detector descriptions

Low  $q^2$  DIS events  
Gen: LEPTO/ARIADNE  
L:  $57 \text{ pb}^{-1}$   
CM energy: 35 GeV

Verification

Reconst. tags  
- rfull056  
- rfull057  
- rfull058

Low  $q^2$  DIS events  
Gen: PYTHA8  
L:  $78 \text{ pb}^{-1}$   
CM energy: 35 GeV

Verification

Reconst. tags  
- rfull058  
- rfull059

Low  $q^2$  DIS events  
Gen: LEPTO/ARIADNE

Verification

rfull056  
fpadsim-1.3

Det: SiEIC5

rfull057  
fpadsim-1.3.2

Det: SiEIC5

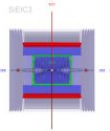
rfull058  
fpadsim-1.3.4

Det: SiEIC5

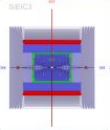
rfull059  
fpadsim-1.4

Det: SiEIC5

SiEIC2: compact,  
GDML, etc



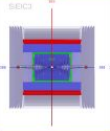
SiEIC3: compact,  
GDML, etc



SiEIC4: compact,  
GDML, etc



SiEIC5: compact,  
GDML, etc



Web Interface





Show all

# HepSim

Repository with Monte Carlo simulations for particle physics

- Jun.29, 2017: [rfull058](#) tag with improved tracking strategy from D.Blyth
- Jun.20, 2017: [rfull057](#) tag with alternative tracking strategy from D.Blyth

$p \rightarrow \leftarrow p$

8 TeV

13 TeV

14 TeV

27 TeV

33 TeV

100 TeV

$e^+ \rightarrow \leftarrow e^-$

250 GeV

380 GeV

500 GeV

1 TeV

3 TeV

Show 25 entries

Previous

1

2

3

4

5

...

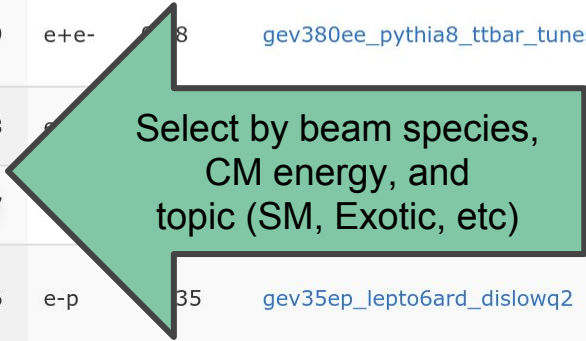
11

Next

Search:

Id	$\rightarrow \leftarrow$	E [TeV]	Dataset name	Generator	Process	Topic	Files	Created
286	$e^+e^-$	3	<a href="#">tev3ee_pythia8_qcdjets_tunes_qedoff</a>	PYTHIA8	QCD dijet events with 7 tunes without ISR	SM	<a href="#">Info</a>	2017/07/14
285	$e^+e^-$	0.38	<a href="#">gev380ee_pythia8_qcdjets_tunes_qedof</a>	PYTHIA8	QCD dijet events with 7 tunes without ISR	SM	<a href="#">Info</a>	2017/07/14
284	$e^-p$	0.035	<a href="#">gev35ep_pythia8_dis1q2</a>	PYTHIA8	DIS events at $Q^2 > 1 \text{ GeV}^2$	SM	<a href="#">Info</a>	2017/06/26
283	$e^-p$	0.035	<a href="#">gev35ep_lepto6ard_dislowq2_jlab</a>	LEPTO/ARIADNE	DIS events at $Q^2 > 1 \text{ GeV}^2$ and $W^2 > 4 \text{ GeV}^2$			
282	$e^+e^-$	0.5	<a href="#">gev500ee_pythia8_ttbars_tunes</a>					

1 TeV	283	e-p	0.035	<a href="#">gev35ep_lepto6ard_dislowq2_jlab</a>	<a href="#">LEPTO/ARIADNE</a>	DIS events at $Q_2 > 1$ GeV2 and $W_2 > 4$ GeV2	SM	<a href="#">Info</a>	2017/06/16
3 TeV									
$\mu^+ \rightarrow \leftarrow \mu^-$	282	e+e-	0.5	<a href="#">gev500ee_pythia8_ttbar_tunes</a>	<a href="#">PYTHIA8</a>	top (ttbar) production with 7 tunes	SM	<a href="#">Info</a>	2017/06/12
1 TeV									
5 TeV	281	e+e-	14	<a href="#">tev14pp_pythia8_ttbar_tunes</a>	<a href="#">PYTHIA8</a>	top (ttbar) production with tune 14.	SM	<a href="#">Info</a>	2017/06/09
10 TeV									
20 TeV	280	e+e-	3	<a href="#">tev3ee_pythia8_ttbar_tunes</a>	<a href="#">PYTHIA8</a>	top (ttbar) production with 7 tunes	SM	<a href="#">Info</a>	2017/06/03
40 TeV									
$e^- \rightarrow \leftarrow p$	279	e+e-	8	<a href="#">gev380ee_pythia8_ttbar_tunes</a>	<a href="#">PYTHIA8</a>	top (ttbar) production with 7 tunes	SM	<a href="#">Info</a>	2017/06/03
318 GeV									
141 GeV	278	e+e-	7	<a href="#">gev370ee_pythia8_ttbar_tunes</a>	<a href="#">PYTHIA8</a>	QCD dijet events with 7 tunes	SM	<a href="#">Info</a>	2017/05/20
35 GeV	277	e+e-	7	<a href="#">gev370ee_pythia8_ttbar_tunes</a>	<a href="#">PYTHIA8</a>	QCD dijet events with 7 tunes	SM	<a href="#">Info</a>	2017/05/19
Misc.									
1 particle	276	e-p	35	<a href="#">gev35ep_lepto6ard_dislowq2</a>	<a href="#">LEPTO/ARIADNE</a>	DIS events at $Q_2 > 1$ GeV2 and $W_2 > 4$ GeV2	SM	<a href="#">Info</a>	2017/05/17
2 particles									
1 jet	275	e-p	0.035	<a href="#">gev35ep_lepto6_dis1q2</a>	<a href="#">LEPTO/ARIADNE</a>	DIS events at $Q_2 > 1$ GeV2 and $W_2 > 4$ GeV2	SM	<a href="#">Info</a>	2017/05/17





Show all

# HepSim

Repository with Monte Carlo simulations for particle physics

Selected:  $e^- p$  collisions, 35 GeV energy, sm type

Show 25 entries

Previous 1 Next Search:

<b>Id</b>	<b><math>e^- p</math></b>	<b>E [TeV]</b>	<b>Dataset name</b>	<b>Generator</b>	<b>Process</b>	<b>Topic</b>	<b>Files</b>	<b>Created</b>
284	$e^- p$	0.035	<a href="#">gev35ep_pythia8_dis1q2</a>	PYTHIA8	DIS events at $Q_2 > 1 \text{ GeV}^2$	SM	<a href="#">Info</a>	2017/06/26
283	$e^- p$	0.035	<a href="#">gev35ep_lepto6ard_dislowq2_jlab</a>	LEPTO/ARIADNE	DIS events at $Q_2 > 1 \text{ GeV}^2$	SM	<a href="#">Info</a>	2017/06/16
276	$e^- p$	0.035	<a href="#">gev35ep_lepto6ard_dislowq2</a>	LEPTO/ARIADNE	DIS events at $Q_2 > 1 \text{ GeV}^2$	SM	<a href="#">Info</a>	2017/05/17
275	$e^- p$	0.035	<a href="#">gev35ep_lepto6_dis1q2</a>	LEPTO/PYTHIA8	DIS events at $Q_2 > 1 \text{ GeV}^2$ and $W_2 > 5 \text{ GeV}^2$	SM	<a href="#">Info</a>	2017/05/01
271	$e^- p$	0.035	<a href="#">gev35ep_lepto6ard_dis1q2</a>	LEPTO/ARIADNE	DIS events at $Q_2 > 1 \text{ GeV}^2$	SM	<a href="#">Info</a>	2017/05/01

Choose dataset based on generator and process descriptions



Then click on data set name to look at more closely



- $p \rightarrow \leftarrow p$
- 8 TeV
- 13 TeV
- 14 TeV
- 27 TeV
- 33 TeV
- 100 TeV

- $e^+ \rightarrow \leftarrow e^-$
- 250 GeV
- 380 GeV
- 500 GeV
- 1 TeV
- 3 TeV



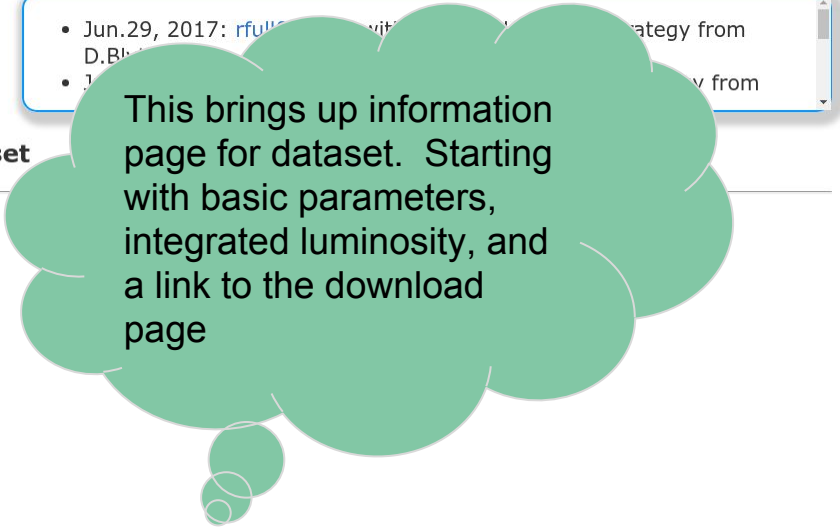
# HepSim

Repository with Monte Carlo simulations for particle physics

## Information about "gev35ep\_lepto6ard\_dislowq2" dataset

Name: *gev35ep\_lepto6ard\_dislowq2*  
 Collisions: e-p  
 CM Energy: 0.035 TeV  
 Entry ID: 276  
 Topic: SM  
 Generator: [LEPTO/ARIADNE](#)  
 Calculation level: LO+PS+hadronisation  
 Process: DIS events at  $Q^2 > 1 \text{ GeV}^2$  and  $W^2 > 4 \text{ GeV}^2$   
 Total events: 25000000  
 Number of files: 500  
 Cross section ( $\sigma$ ):  $4.376\text{E}+05 \pm 1957.1871 \text{ pb}$   
 Luminosity (L):  $57.1245 \text{ pb}^{-1}$  (or)  $0.0571 \text{ fb}^{-1}$  (or)  $5.712\text{E}-05 \text{ ab}^{-1}$   
 Format: ProMC  
 Download URL: [http://mc1.hep.anl.gov/web/hepsim/events/ep/35gev/lepto6ard\\_dislowq2/](http://mc1.hep.anl.gov/web/hepsim/events/ep/35gev/lepto6ard_dislowq2/)  
 Status: **Available**  
 Mirrors: [http://eicsim01.jlab.org/hepsim/events/ep/35gev/lepto6ard\\_dislowq2/](http://eicsim01.jlab.org/hepsim/events/ep/35gev/lepto6ard_dislowq2/)  
[http://mc.hep.anl.gov/asc/hepsim/events/ep/35gev/lepto6ard\\_dislowq2/](http://mc.hep.anl.gov/asc/hepsim/events/ep/35gev/lepto6ard_dislowq2/)  
<http://portal.nersc.gov/>

- Jun.29, 2017: rfull... with... category from D.Bh...
- J... by from



Show all

p →← p

8 TeV

13 TeV

14 TeV

27 TeV

33 TeV

100 TeV

e<sup>+</sup> →← e<sup>-</sup>

250 GeV

380 GeV

500 GeV

1 TeV

3 TeV

- $e^- \rightarrow e^- e^-$
- 250 GeV
- 380 GeV
- 500 GeV
- 1 TeV
- 3 TeV

- $\mu^+ \rightarrow \mu^- \mu^-$
- 1 TeV
- 5 TeV
- 10 TeV
- 20 TeV
- 40 TeV

- $e^- \rightarrow e^- p$
- 318 GeV
- 141 GeV
- 35 GeV

Misc.

Process: DIS events at  $Q^2 > 1 \text{ GeV}^2$  and  $W_2 > 4 \text{ GeV}^2$

Total events: 25000000

Number of files: 500

Cross section ( $\sigma$ ):  $4.376\text{E}+05 \pm 1957.1871 \text{ pb}$

Luminosity (L):  $57.1245 \text{ pb}^{-1}$  (or)  $0.0571 \text{ fb}^{-1}$  (or)  $5.712\text{E}-05 \text{ ab}^{-1}$

Format: ProMC

Download URL: [http://mc1.hep.anl.gov/web/hepsim/events/ep/35gev/lepto6ard\\_dislowq2/](http://mc1.hep.anl.gov/web/hepsim/events/ep/35gev/lepto6ard_dislowq2/)

Status: Available

Mirrors: [http://eicsim01.jlab.org/hepsim/events/ep/35gev/lepto6ard\\_dislowq2/](http://eicsim01.jlab.org/hepsim/events/ep/35gev/lepto6ard_dislowq2/)  
[http://mc.hep.anl.gov/asc/hepsim/events/ep/35gev/lepto6ard\\_dislowq2/](http://mc.hep.anl.gov/asc/hepsim/events/ep/35gev/lepto6ard_dislowq2/)  
[http://portal.nersc.gov/project/m1758/data/events/ep/35gev/lepto6ard\\_dislowq2/](http://portal.nersc.gov/project/m1758/data/events/ep/35gev/lepto6ard_dislowq2/)

EVGEN size: 15.896 GB

 **Tags:**

---

Fast simulation:

Full simulation:

<a href="#">rfull058   Info</a>	<a href="#">rfull057   Info</a>	<a href="#">rfull056   Info</a>
519 / 13.03 GB 06/28/2017	484 / 15.50 GB 06/19/2017	496 / 12.43 GB 05/17/2017

---

Fast/Full size: 40.96 GB

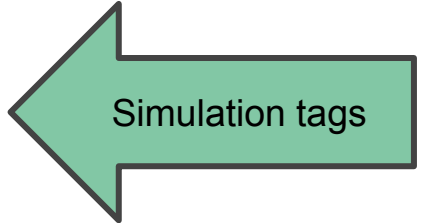
Record slimmed: No

Events weighted: No

Submission time: Wed May 17 16:30:14 CDT 2017

Updated on: Mon Jul 24 14:44:56 CDT 2017

Electron-proton collisions. LEPTO 6.5 with ARIADNE 4.12.  $Q^2 > 1 \text{ GeV}^2$ . Min  $W_2 > 4 \text{ GeV}^2$ , and the minimum energy of scattered electron was set to 0.1 GeV. MSTW2008lo68cl PDF (LHAPDF= 21000) is used. Collision energy  $\sqrt{s} = 27.5 \text{ GeV}$ .  $E(e^-) = 5 \text{ GeV}$ . These energies are designed to be used for the experiment requested by J. Remond for the study of the structure of the nucleon.



$e^- \rightarrow \leftarrow p$

318 GeV

141 GeV

35 GeV

**Misc.**

1 particle

2 particles

1 jet

Record slimmed: No

Events weighted: No

Submission time: Wed May 17 16:30:14 CDT 2017

Updated on: Mon Jul 24 14:44:56 CDT 2017

Description:

Electron-proton collisions. LEPTO 6.5 with ARIADNE 4.12.  $Q_2 > 1 \text{ GeV}^2$ . Min  $W_2$  was set to  $4 \text{ GeV}^2$ , and the minimum energy of scattered electron was set to  $0.3 \text{ GeV}$ . MSTW2008lo68cl PDF (LHAPDF= 21000) is used. Collision energy:  $E(p)=60 \text{ GeV}$  and  $E(e^-)=5 \text{ GeV}$ . These energies are designed for the JLab EIC proposal. The samples were requested by J.Repond for ANL LDRD detector studies.

Note that all exclusive processes were removed, therefore, this sample is not realistic for physics.


### Comment

Event  $Q_2$ ,  $W$ ,  $X$  and  $Y$  are encoded as

```
eve->set_scale(W)
eve->set_alpha_qed(y)
eve->set_alpha_qcd(x)
eve->set_scale_pdf(q2)
eve->set_x1(x)
eve->set_x2(y)
```

Starting from the tag rfull054, truth-level event variables are included in the LCIO files as "parameters" with the keys:

```
parameter EVGEN:eCM [float]
parameter EVGEN:Process [string]
parameter EVGEN:ID1 [int]
parameter EVGEN:ID2 [int]
parameter EVGEN:ProcessID [int]
parameter EVGEN:DIS:Q2 [float]
```



Event generator  
details

```



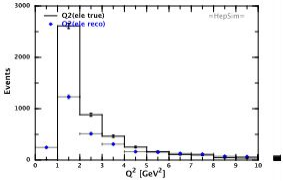


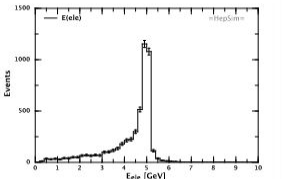


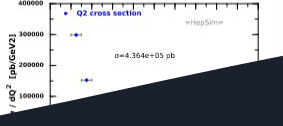
parameter EVGEN:ProcessID [int] // Truth-level Q^2
parameter EVGEN:DIS:Q2 [float] // Truth-level W
parameter EVGEN:DIS:W [float] // Truth_level x_bjorken
parameter EVGEN:DIS:XB [float] // Truth_level y_bjorken
parameter EVGEN:DIS:YBJ [float] // Truth_level y_bjorken

```

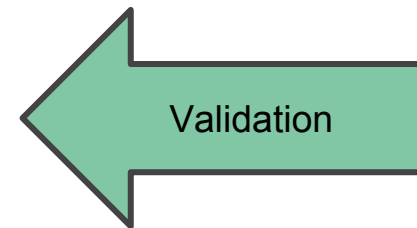
Please refer the HepSim manual

File metadata:

Show

Nr	Analysis code	Output image	Output data
1	 <code>truth_q2_dislowq2_lcio.py</code>  Run		JDAT file
2	 <code>truth_ele_dislowq2_lcio.py</code>  Run		JDAT file
3	 <code>lepto6ard_dislowq2.py</code>  Run		

Validation:

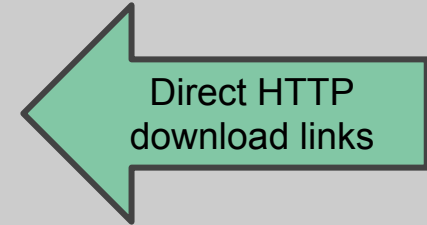


## Dataset: [gev35ep\\_lepto6ard\\_dislowq2](#)

[http://mc1.hep.anl.gov/web/hepsim/events/ep/35gev/lepto6ard\\_dislowq2/](http://mc1.hep.anl.gov/web/hepsim/events/ep/35gev/lepto6ard_dislowq2/)

Download: `hs-get gev35ep_lepto6ard_dislowq2`

	File name	Size
1	<a href="#">lepto6ard_dislowq2_0001.promc</a>	32.55 MB
2	<a href="#">lepto6ard_dislowq2_0002.promc</a>	32.62 MB
3	<a href="#">lepto6ard_dislowq2_0003.promc</a>	32.56 MB
4	<a href="#">lepto6ard_dislowq2_0004.promc</a>	32.48 MB
5	<a href="#">lepto6ard_dislowq2_0005.promc</a>	32.53 MB
6	<a href="#">lepto6ard_dislowq2_0006.promc</a>	32.52 MB
7	<a href="#">lepto6ard_dislowq2_0007.promc</a>	32.55 MB
8	<a href="#">lepto6ard_dislowq2_0008.promc</a>	32.57 MB
9	<a href="#">lepto6ard_dislowq2_0009.promc</a>	32.61 MB
10	<a href="#">lepto6ard_dislowq2_0010.promc</a>	32.5 MB
11	<a href="#">lepto6ard_dislowq2_0011.promc</a>	32.62 MB
12	<a href="#">lepto6ard_dislowq2_0012.promc</a>	32.5 MB
13	<a href="#">lepto6ard_dislowq2_0013.promc</a>	32.5 MB
14	<a href="#">lepto6ard_dislowq2_0014.promc</a>	32.5 MB



# HepSim

Repository with Monte Carlo simulations for partic...

- Detectors
- RecoTags**
- EVGN validation
- RECO validation
- Jas4PP



Show 25 entries

Previous 1 2 3 4 5 ... 11 Next Search:

<b>Id</b>	<b>→←</b>	<b>E [TeV]</b>	<b>Dataset name</b>	<b>Generator</b>	<b>Process</b>	<b>Topic</b>	<b>Files</b>	<b>Created</b>
286	e+e-	3	tev3ee_pythia8_qcdjets_tunes_qedoff	PYTHIA8	QCD dijet events with 7 tunes without ISR	SM	<a href="#">Info</a>	2017/07/14
285	e+e-	0.38	gev380ee_pythia8_qcdjets_tunes_qedof	PYTHIA8	QCD dijet events with 7 tunes without ISR	SM	<a href="#">Info</a>	2017/07/14
284	e-p	0.035	gev35ep_pythia8_dis1q2	PYTHIA8	DIS events at Q2>1 GeV2	SM	<a href="#">Info</a>	2017/06/26
283	e-p	0.035	gev35ep_lepto6ard_dislowq2_jlab	LEPTO/ARIADNE	DIS events at Q2>1 GeV2 and W2>4 GeV2			
282	e+e-	0.5	gev500ee_pythia8_ttbars_tunes					

Show all

p →← p

8 TeV

13 TeV

14 TeV

27 TeV

33 TeV

100 TeV

e+ →← e-

250 GeV

380 GeV

500 GeV

1 TeV

3 TeV

# HepSim

















Repository with Monte Carlo simulations for particle

Navigate by detector and/or experiment

Here is a list of tags with simulation of detectors.

rfull058 tag with improved tracking strategy from  
rfull057 tag with alternative tracking strategy from



























## Tags with full simulations

Nr	Find data	Detector	Experiment	Description
1	 rfull001	sidloi3	ILC	 Info
2	 rfull002	sidcc1	CEPC	 Info
3	 rfull003	sidloi4	ILC	 Info
4	 rfull006	sifch4	FCC-hh, SppC	 Info
5	 rfull009	sifch7	FCC-hh, SppC	 Info
6	 rfull010	sifch8	FCC-hh, SppC	 Info
7	 rfull011	sifch9	FCC-hh, SppC	 Info
8	 rfull012	sifch10		
9	 rfull013			

5 TeV
10 TeV
20 TeV
40 TeV



$e^- \rightarrow \leftarrow p$
318 GeV
141 GeV
35 GeV

Misc.
1 particle
2 particles
1 jet

11	 rfull015	sifcch7	FCC-hh, SppC	 Info
12	 rfull016	sifcch7	FCC-hh, SppC	 Info
13	 rfull017	sifcch7	FCC-hh, SppC	 Info
14	 rfull051	sieic1	EIC	 Info
15	 rfull052	sieic2	EIC	 Info
16	 rfull053	sieic3	EIC	 Info
17	 rfull054	sieic4	EIC	 Info
18	 rfull056	sieic5	EIC	 Info
19	 rfull057	sieic5	EIC	 Info
20	 rfull058	sieic5	EIC	 Info
21	 rfull059	sieic5	EIC	 Info
22	 rfull101	sidcc2	CEPC	 Info
23	 rfull201	siddlic1	CLIC	 Info

Use Info link to learn more about a tag

### Tags with fast simulations

Nr	Available datasets	Detector	Experiment
1	 rfast001	delphes_fcchh1	
2	 rfast002		



Show all

$p \rightarrow \leftarrow p$

8 TeV

13 TeV

14 TeV

27 TeV

33 TeV

100 TeV

$e^+ \rightarrow \leftarrow e^-$

250 GeV

380 GeV

500 GeV

1 TeV

3 TeV

# HepSim

Repository with Monte Carlo simulations for particle physics

 **Information about the "rfull058" production tag**

From here, detector information and a list of simulated/reconstructed datasets can be found

## Summary

Name: **rfull058**  
 Detector: [sieic5](#)  
 Description: SiEIC detector based on "all-silicon" concept  
 Experiment: EIC  
 Simulation: fpadsim-1.34 on OSG: SLIC version 5.0.1 with Geant 10.3p1  
 Reconstruction: fpadsim-1.34 on OSG: lcsim 3.4, slicPandora, pandoraPFA. Compared to rfull057, this version has improved track strategy developed by D.Blyth. In addition, speed of track reconstruction was increased by a factor 4-5 compared to the previous versions.  
 Submission time: Tue Jun 20 10:00:55 CDT 2017  
 Updated on: -  
 Submitter: S.Chekanov, D.Blyth

## Available data

Find data:  [rfull058](#)

 Dataset list

# HepSim

Repository with Monte Carlo simulations for particle physics

- Jun.29, 2017: [rfull058](#) tag with improved tracking strategy from D.Blyth
- Jun.20, 2017: [rfull057](#) tag with alternative tracking strategy from D.Blyth

## Search results

Searching for: **rfull058**

	Dataset Name	Generator	EVGEN	Fast simulation	Full simulation
1	<a href="#">gev35ep_lepto6ard_dislowq2</a>	LEPTO/ARIADNE	<a href="#">URL</a>		<a href="#">rfull058 (info)</a> <a href="#">rfull057 (info)</a> <a href="#">rfull056 (info)</a>
2	<a href="#">gev35ep_pythia8_dis1q2</a>	PYTHIA8	<a href="#">URL</a>		<a href="#">rfull059 (info)</a> <a href="#">rfull058 (info)</a>

HepSim. A data catalog with HEP predictions © 2014-2017. HEP Division, ANL, US Department of Energy

Click on a link highlighted in yellow

Show all

$p \rightarrow \leftarrow p$

8 TeV

13 TeV

14 TeV

27 TeV

33 TeV

100 TeV

$e^+ \rightarrow \leftarrow e^-$

250 GeV

380 GeV

500 GeV

1 TeV

3 TeV

## Dataset: [gev35ep\\_pythia8\\_dis1q2%rfull058](#)

[http://mc1.hep.anl.gov/web/hepsim/events/ep/35gev/pythia8\\_dis1q2//rfull058](http://mc1.hep.anl.gov/web/hepsim/events/ep/35gev/pythia8_dis1q2//rfull058)

Download: `hs-get gev35ep_pythia8_dis1q2%rfull058`

	File name	Size
1	<a href="#">gev35ep_pythia8_gev1q2_002_hepsim.slcio</a>	22.58 MB
2	<a href="#">gev35ep_pythia8_gev1q2_003_hepsim.slcio</a>	22.75 MB
3	<a href="#">gev35ep_pythia8_gev1q2_005_hepsim.slcio</a>	22.43 MB
4	<a href="#">gev35ep_pythia8_gev1q2_006_hepsim.slcio</a>	23.7 MB
5	<a href="#">gev35ep_pythia8_gev1q2_007_hepsim.slcio</a>	22.86 MB
6	<a href="#">gev35ep_pythia8_gev1q2_012_hepsim.slcio</a>	22.91 MB
7	<a href="#">gev35ep_pythia8_gev1q2_014_hepsim.slcio</a>	22.42 MB
8	<a href="#">gev35ep_pythia8_gev1q2_015_hepsim.slcio</a>	22.75 MB
9	<a href="#">gev35ep_pythia8_gev1q2_017_hepsim.slcio</a>	21.97 MB
10	<a href="#">gev35ep_pythia8_gev1q2_019_hepsim.slcio</a>	23.12 MB
11	<a href="#">gev35ep_pythia8_gev1q2_021_hepsim.slcio</a>	22.4 MB
12	<a href="#">gev35ep_pythia8_gev1q2_022_hepsim.slcio</a>	
13	<a href="#">gev35ep_pythia8_gev1q2_023_hepsim.slcio</a>	
14	<a href="#">gev35ep_pythia8_gev1q2_024_hepsim.slcio</a>	

Note that `hs-toolkit` command is now tagged



Show all

$p \rightarrow \leftarrow p$

8 TeV

13 TeV

14 TeV

27 TeV

33 TeV

100 TeV

$e^+ \rightarrow \leftarrow e^-$

250 GeV

380 GeV

500 GeV

1 TeV



3 TeV

# HepSim

Repository with Monte Carlo simulations for particle physics

## Information about the "sieic5" detector

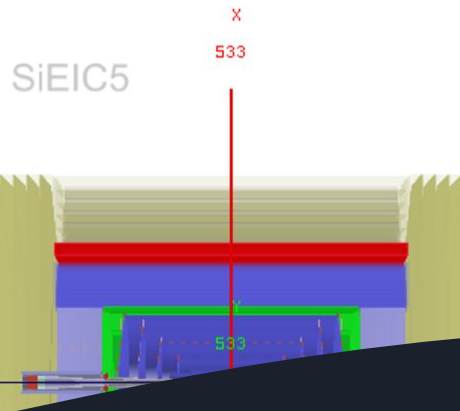
### Summary

Name: [sieic5](#)  
 Level: Geant4 simulation and full event reconstruction  
 Description: [summary](#)  
 Calibrations: [view](#)  
 Tracking: [view](#)  
 3D View:   
 GeoManager:   
 Last modified: July 31, 2017

### Reconstruction tags

Tag lists: [rfull056](#) | [rfull057](#) | [rfull058](#) | [rfull059](#)

- Jun.29, 2017: [rfull058](#) tag with improved tracking strategy from D.Blyth
- Jun.20, 2017: [rfull057](#) tag with alternative tracking strategy from D.Blyth



14 TeV

27 TeV

33 TeV

100 TeV

$e^+ \rightarrow \leftarrow e^-$

250 GeV

380 GeV

500 GeV

1 TeV

3 TeV

$\mu^+ \rightarrow \leftarrow \mu^-$

1 TeV



5 TeV

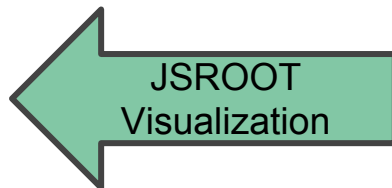
10 TeV

20 TeV

40 TeV

## Summary

Name: [sieic5](#)  
Level: Geant4 simulation and full event reconstruction  
Description: [summary](#)  
Calibrations: [view](#)  
Tracking: [view](#)  
3D View:   
GeoManager:   
Last modified: July 31, 2017

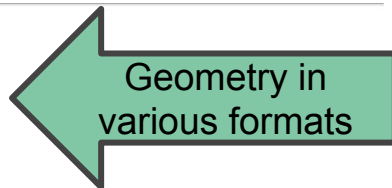


## Reconstruction tags

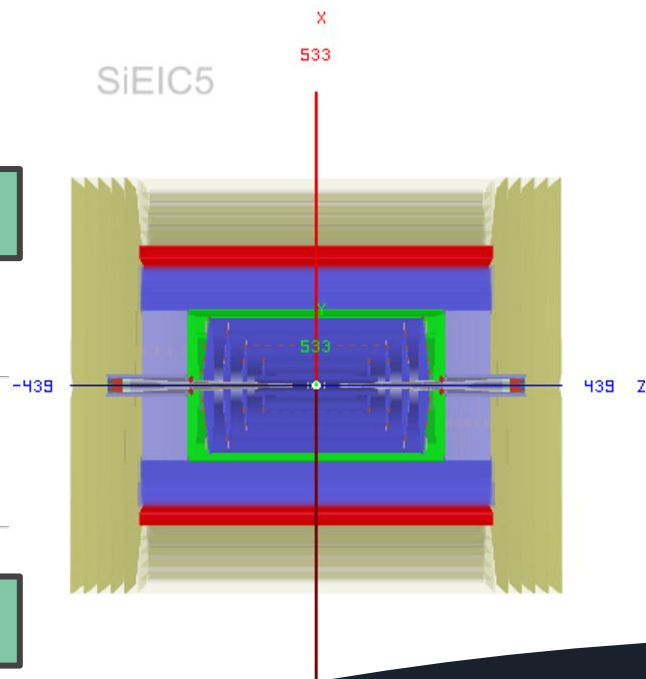
Tag lists: [rfull056](#) | [rfull057](#) | [rfull058](#) | [rfull059](#)

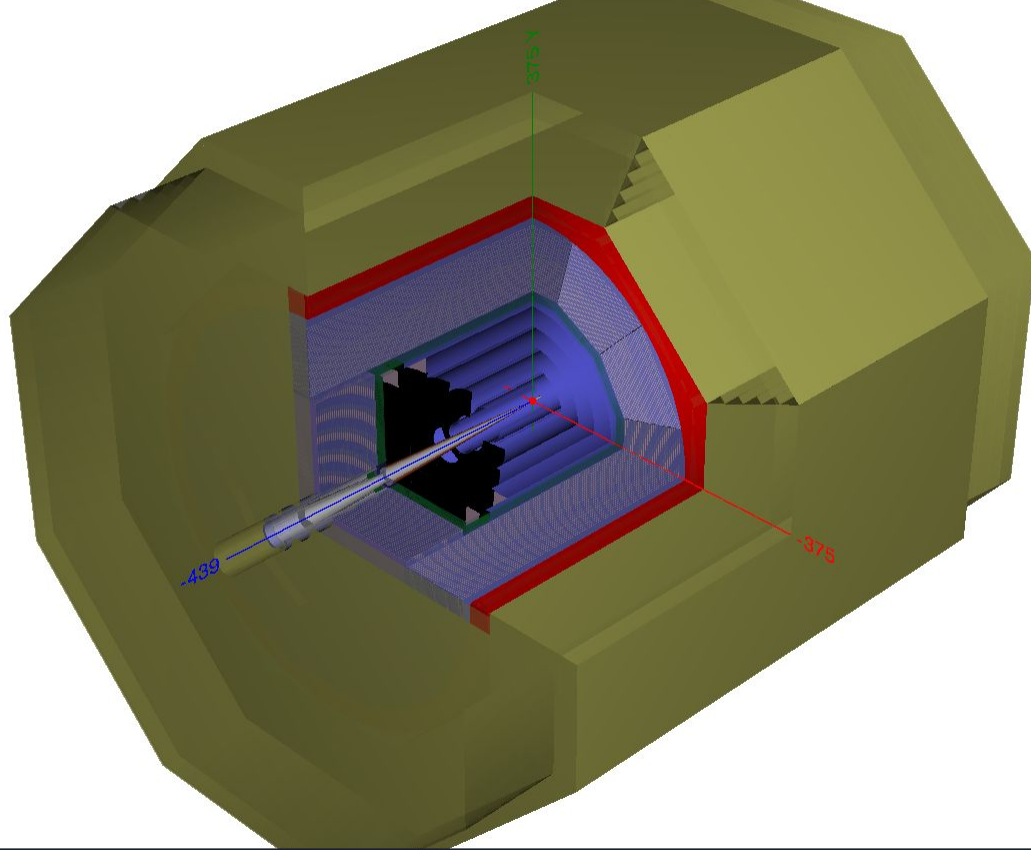
## Detector geometry files

HEPREP: [sieic5.heprep](#)  
GDML: [sieic5.gdml.gz](#)  
JSON: [sieic5.json.gz](#)  
LCDD: [sieic5.lcdd](#)  
Pandora: [sieic5.pandora](#)

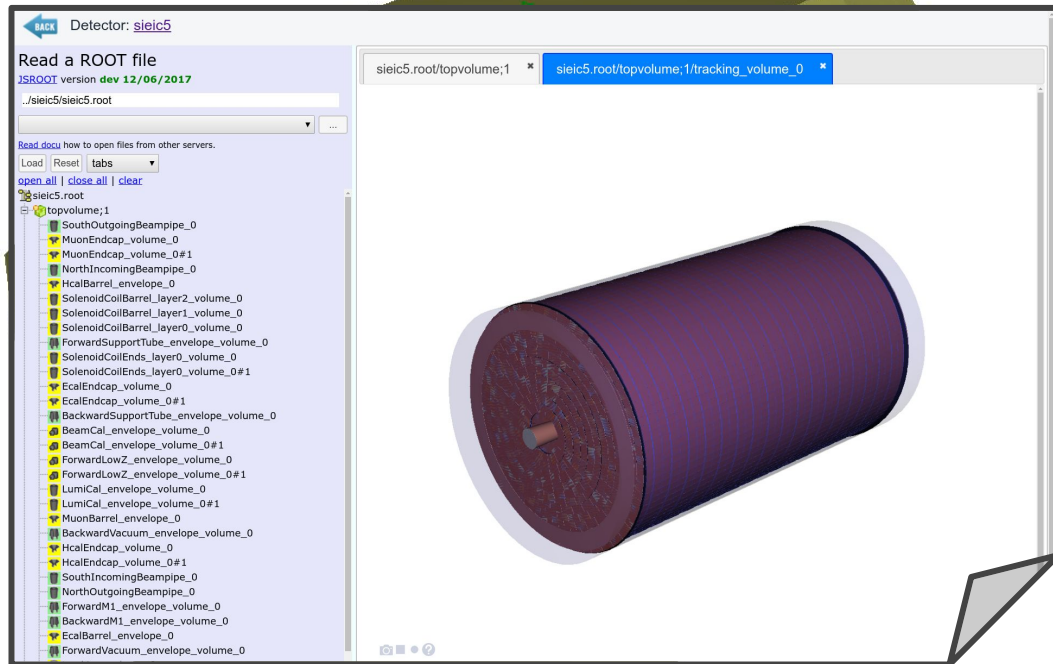


## Full detector





Web Interface - Detector Visualization



hs-toolkit





```
[dblyth@brutus ~]$ wget -q http://atlaswww.hep.anl.gov/hepsim/soft/hs-toolkit.tgz
[dblyth@brutus ~]$ tar -xzf hs-toolkit.tgz
[dblyth@brutus ~]$ ls hs-toolkit
browser_promc.jar      hs-exec      hs-index     hs-version   README.md
Changelog.txt         hs-extract   hs-info      hs-view      scripts
help.txt              hs-find      hs-ls        jython.jar   setup.sh
hepsim.jar            hs-get       hs-meta      LICENSE.md   version
hepsim.jnlp           hs-getmain   hs-mirror    licenses-gpl.jar
hepsim_licenses-1.1.jar hs-help      hs-pileup    mirrors.conf
hs-distiller          hs-ide       hs-run       modules.jar

[dblyth@brutus ~]$ . hs-toolkit/setup.sh
Setting hs-toolkit-6 (Java 1.8.0_131) from /home/dblyth/hs-toolkit
[dblyth@brutus ~]$ hs-help | less
```

```
[dblyth@brutus ~]$ hs-get gev35ep_pythia8_dis1q2 data 2 10
```

```
HepSim: Downloading using 2 threads
```

```
HepSim server: http://atlaswww.hep.anl.gov/hepsim/
```

```
HepSim: The directory data is created!
```

```
Start downloading in 2 threads
```

```
From: http://mc1.hep.anl.gov/web/hepsim/events/ep/35gev/pythia8_dis1q2/
```

```
To: data
```

```
Nr files: A subsample with 10 files will be downloaded
```

```
0% -> gev35ep_pythia8_gev1q2_001.promc gev35ep_pythia8_gev1q2_002.promc
```

```
20% -> gev35ep_pythia8_gev1q2_003.promc gev35ep_pythia8_gev1q2_004.promc
```

```
40% -> gev35ep_pythia8_gev1q2_005.promc gev35ep_pythia8_gev1q2_006.promc
```

```
60% -> gev35ep_pythia8_gev1q2_007.promc gev35ep_pythia8_gev1q2_008.promc
```

```
80% -> gev35ep_pythia8_gev1q2_009.promc gev35ep_pythia8_gev1q2_010.promc
```

```
[dblyth@brutus ~]$
```

NAME

OUTPUT DIR

NUM THREADS

NUM  
FILES

```
File Edit View Search Terminal Help
[dblyth@brutus ~]$ hs-info data/gev35ep_pythia8_gev1q2_001.promc
File = data/gev35ep_pythia8_gev1q2_001.promc
ProMC version = 4
Last modified = 2017-06-28 14:59:38
Description = PYTHIA-8.226; ApplyParticleSlim=off;Random:setSeed = on;Random:seed = 0
;Beams:frameType = 2;Next:numberShowEvent = 10;Beams:idA = 2212 ;Beams:idB = 11;Beams:e
A = 60.;Beams:eB = 5.;HardQCD:all = off;PDF:lepton = off;TimeShower:QEDshowerByL = off;
WeakBosonExchange:ff2ff(t:gmZ) = on;SpaceShower:dipoleRecoil = on;SpaceShower:dipoleRec
oil = on;PhaseSpace:pTHatMin = 1.;PDF:pSet = LHAPDF6:MSTW2008lo68cl.LHgrid;PDF:extrapol
ate = on;ParticleDecays:limitTau0 = on;ParticleDecays:tau0Max = 10;EventsNumber=50000;
Events = 50000
Requested = 50000
Sigma (pb) = 3.22057E5 ± 7.49622E2
Lumi (pb-1) = 1.55252E-1
Varint units = E:10000000 L:10000
Log file: = logfile.txt
#### The file is healthy! ####
[dblyth@brutus ~]$
```

```
[dblyth@brutus ~]$ hs-view data/gev35ep_pythia8_gev1q2_001.promc
Monte Carlo file was found. Wait..
Open file=data/gev35ep_pythia8_gev1q2_001.
```

File: data/gev35ep\_pythia8\_gev1q2\_001.promc

File MetaData Data layout Help

Search (Regex Pattern):

No	Na...	PID	Sta...	M1	M2	D1	D2	Px ...	Py ...	Pz ...	E (...)	M (...)	X (...)	Y (...)	Z (...)	T (...)	Bar...
0	gener	90	11	0	0	0	0	0	0	54...	65	34...	0	0	0	0	0
1	p <sup>+</sup>	22...	4	0	0	7	0	0	0	59...	60	0.9...	0	0	0	0	0
2	e <sup>-</sup>	11	4	0	0	4	0	0	0	-5	5	0.0...	0	0	0	0	0
3	u	2	21	7	7	5	6	0	0	7...	7...	0	0	0	0	0	0
4	e <sup>-</sup>	11	21	2	0	5	6	0	0	-5	5	0	0	0	0	0	0
5	u	2	23	3	4	8	8	1...	0...	6...	7...	0.33	0	0	0	0	0
6	e <sup>-</sup>	11	1	3	4	0	0	-1...	-0...	-4...	5.05	0.0...	0	0	0	0	0
7	u	2	61	1	0	3	3	1...	-0...	17...	17.7	0	0	0	0	0	0
8	u	2	62	5	5	10	14	2...	0...	16...	17...	0.33	0	0	0	0	0
9	ud_0	21...	63	1	0	10	14	-0...	0...	42...	42...	0.5...	0	0	0	0	0
10	pi <sup>0</sup>	111	2	8	9	16	17	1...	-0...	9...	9...	0.1...	0	0	0	0	0
11	pi <sup>+</sup>	211	1	8	9	0	0	0...	0...	2.5	2...	0.14	0	0	0	0	0
12	K <sup>0</sup>	311	2	8	9	15	15	0...	0...	3...	3...	0.4...	0	0	0	0	0
13	Lamb	31...	1	8	9	0	0	0...	0...	20...	20...	1.1...	0	0	0	0	0
14	pi <sup>0</sup>	111	2	8	9	18	19	-0...	-0...	22...	22...	0.1...	0	0	0	0	0
15	K <sup>+</sup>	310	1	12	12	0	0	0...	0...	3...	3...	0.4...	0	0	0	0	0
16	gamn	22	1	10	0	0	0	1...	-0...	8...	8...	0	0	0	0	0	0
17	gamn	22	1	10	0	0	0	0.2	-0...	1...	1...	0	0	0	0	0	0
18	gamn	22	1	14	0	0	0	-0...	-0...	3...	3.18	0	0	0	0	0.0...	0.0...
19	gamn	22	1	14	0	0	0	-0...	-0...	19...	19...	0	0	0	0	0.0...	0.0...

ProMC v4 Total events=50000 Event=1

27/119Mb

```
[dblyth@brutus ~]$ hs-pileup p3 \  
> data/gev35ep_pythia8_gev1q2_001.promc \  
> data/gev35ep_pythia8_gev1q2_002.promc \  
> output.promc  
ProMC: Mixing 3 (Poisson average) events  
  Signal    Input=data/gev35ep_pythia8_gev1q2_001.promc  
  MinBias   Input=data/gev35ep_pythia8_gev1q2_002.promc  
           Output=output.promc  
5% complete  
10% complete  
15% complete  
20% complete  
25% complete  
30% complete  
35% complete  
40% complete  
45% complete
```

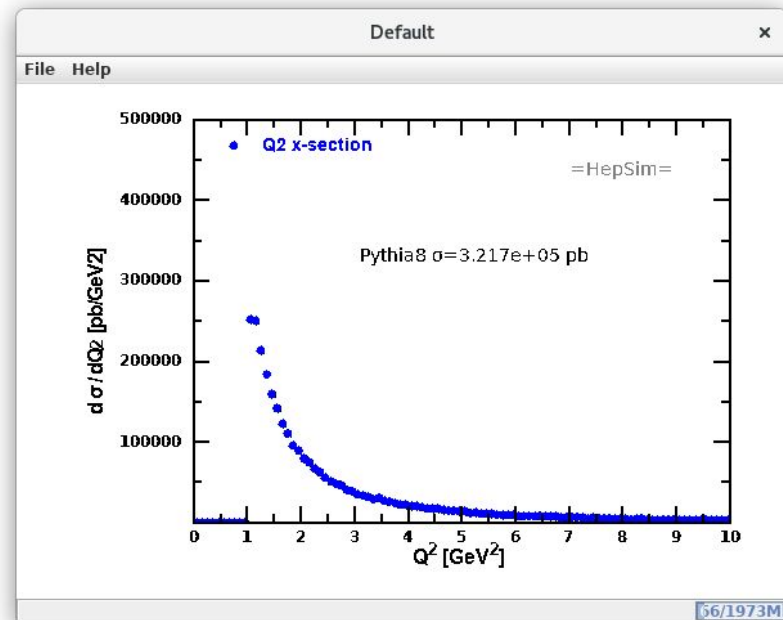
```
[dblyth@brutus ~]$ hs-find %rfull058
HepSim server: http://atlaswww.hep.anl.gov/hepsim/
Searching for: %rfull058
Found 2 results
[1] gev35ep_lepto6ard_dislowq2 LEPT0/ARIADNE 25000000 events
INFO: http://atlaswww.hep.anl.gov/hepsim/info.php?item=276
URL: http://mc1.hep.anl.gov/web/hepsim/events/ep/35gev/lepto6ard_dislowq2/

[2] gev35ep_pythia8_dislq2 PYTHIA8 25000000 events
INFO: http://atlaswww.hep.anl.gov/hepsim/info.php?item=284
URL: http://mc1.hep.anl.gov/web/hepsim/events/ep/35gev/pythia8_dislq2/

[dblyth@brutus ~]$ hs-get gev35ep_pythia8_dislq2%rfull058 rData 2 10
```

```
[dblyth@brutus ~]$ wget -q http://mc1.hep.anl.gov/web/hepsim/events/ep/35gev/pythia8_dis1q2//macros/pythia8_dis1q2.py  
[dblyth@brutus ~]$ hs-run pythia8_dis1q2.py █
```

```
Event= 148800 done= 66 %
Event= 148900 done= 66 %
Event= 149000 done= 66 %
Event= 149100 done= 66 %
Event= 149200 done= 66 %
Event= 149300 done= 66 %
Event= 149400 done= 66 %
Event= 149500 done= 66 %
Event= 149600 done= 66 %
Event= 149700 done= 66 %
Event= 149800 done= 66 %
Event= 149900 done= 66 %
Event= 150000 done= 66 %
Lumi=4.663e-01 pb
Total cross section (pb)= 321682.362805
pythia8_dis1q2.jdat created
pythia8_dis1q2.svg created
```







# How my work uses HepSim

- EIC experiment design
  - Development of simulation and reconstruction software chain
    - Using HepSim's truth-level samples as input
    - Produce simulated/reconstructed samples at key points as software chain evolves
    - HepSim simulation tags serve as a means to distribute and organize samples within research group
  - Detector geometry iteration
    - Using HepSim's truth-level samples as input
    - Each geometry iteration is documented with simulation tags
    - Research group collaboratively assesses change in detector performance by referencing tags



# Near-future HepSim developments

- Better argument handling in hs-toolkit
- Associating simulation/reconstruction tags with container image tags
  - Provide the ability to exactly reproduce tag datasets
  - Snapshot of all software and parameters that went into producing a tag

# Thanks!

For more information, please see the HepSim web manual and `hs-help` on the command line.

HepSim contributors:

<http://atlaswww.hep.anl.gov/hepsim/doc/doku.php?id=hepsim:contributions>

