

CLAS12 simulations on OSG

GEMC/OSG status and Outlook
How to submit Jobs

GEMC Recent and Upcoming changes

5.10 (“pro” since Monday) most notable release notes since 5.5:

- Eric Fuchey, Whitney Armstrong: Alert geometry, digitization
- RICH geometry / digitization update (Connor Pecar)
- Moved downstream shield volumes from beamline to torus where the apex is implemented (Raffaella)
- Added beamline fton ftoff gcards, fixed ftoff vacuum entrance and airpipe length
- Fixed raster options for LUND format
- Added SQLITE support for geometry and materials
- Added uRwell geometry and digitization
- Target and beamline vacuum windows now native geant4 volumes

Geant4 updated from 10.6.2 to 10.7.4 (no differences in output)

Current Modules**:

gemc/4.4.2 gemc/5.9 gemc/5.10 gemc/dev

**growing pains: switch to alma9 and modules improvements by Nathan highlight shortcoming of simulation modules to be addressed in the upcoming months

OSG Resources Summary

1 core = 24*365 = 8760 hours / year

Dedicated, paid for by CLAS12 institutions

OSG Name	Country/Institution	Number of CPUs	MHours / Year
INFN-T1	Istituto Nazionale di Fisica Nucleare, Italy	600	5.3
UKI-SCOTGRID-GLASGOW	Glasgow University, Scotland	1300	11.4
MIT*	Massachusetts Institute of Technology, USA	320 (2500)	2.8
LAMAR	Lamar University, USA	200	1.7

Offline since June 8, coming back online

Currently Offline

* accepts other projects if cores are idles. Occasionally allocates more.

Summary of resources

OSG Name	Number of CPUs	MHours / Year
Dedicated (Guaranteed)	2000	19.5
High Priority	16000	140
Opportunistic	10000	88
Total	28000	247.5

High Priority and Opportunistic

OSG Name	Country/Institution	Number of CPUs	MHours / Year
UCONN	University of Connecticut, USA	2,500	17.5
SU	Syracuse University	13,000	113
GRIF	Grille au service de la Recherche en Ile-de-France, France	500	4.4
OSG	OSG Opportunistic	10,000	88

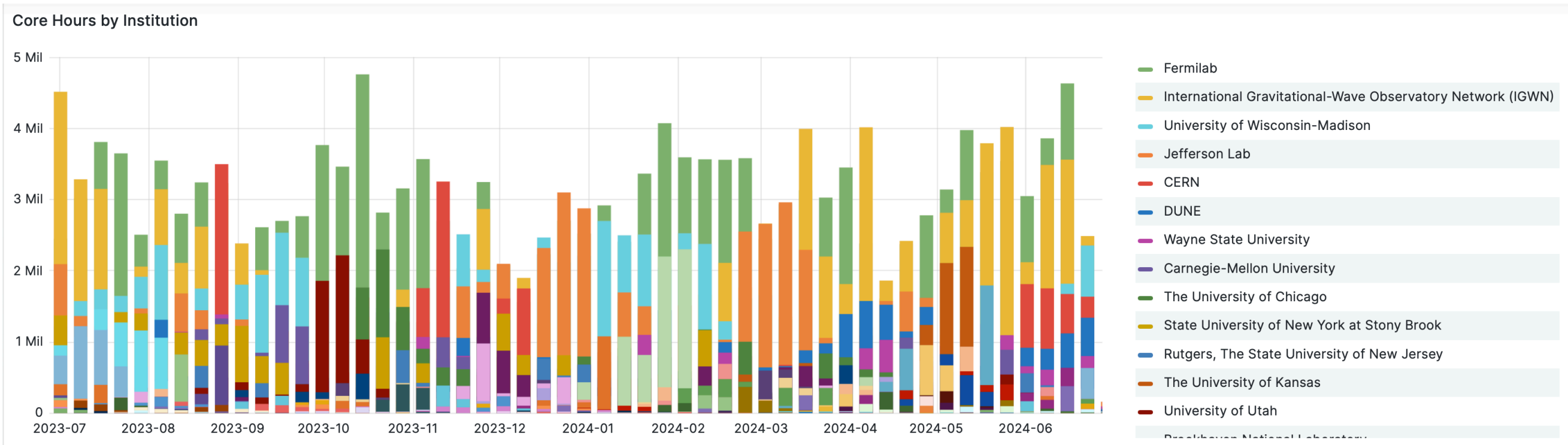
Down

Summary of current jobs

user	submission	total	done	run	idle
carman	5	50000	16629	28353	4987
total	5	50000	16629	28353	4987

CLAS12 Simulations on OSG: usage

Last 12 months Project Accounting



Field of Science	Organization	PI Name	Project Name	Core Hours
Astrophysics	University of Wisconsin-Madison	Francis Halzen	IceCube	77.33 Mil
High Energy Physics	Fermilab	Joe Boyd	fermilab	54.89 Mil
Gravitational Physics	International Gravitational-Wave Observatory Network (IGWN)	Peter F. Couvares	LIGO	53.10 Mil
Particle Physics	CERN	Achille Petrilli	cms.org.cern	43.90 Mil
Nuclear Physics	Jefferson Lab	Maurizio Ungaro	CLAS12	42.38 Mil
High Energy Physics	DUNE	Thomas Robert Junk	dune	37.64 Mil
Nuclear Physics	Wayne State University	Chun Shen	WSU_3DHydro	34.51 Mil

CLAS12 up ~5M since November

However: currently opportunistic usage + high priority is significantly reduced

CLAS12 Simulations on OSG: Generators: v3.10

<https://github.com/JeffersonLab/clas12-mcgen>

name	description	maintainer	
clasdis	SIDIS MC based on PEPSI LUND MC	Harut Avakian	Fortran
claspith	SIDIS full event generator based on PYTHIA	Harut Avakian	Fortran
clas-stringspinner	SIDIS PYTHIA with hadronization spin effects	Christopher Dilks	C++, New
dvcsngen	DVCS/pi0/eta generator based on GPD and PDF parameterizations	Harut Avakian	Fortran
genKYandOnePion	KY, pi0P and pi+N	Valerii Klimenko	C++
inclusive-dis-rad	Inclusive electron and optionally radiative photon using PDFs	Harut Avakian	Fortran
tcsgen	Timelike Compton Scattering	Rafayel Paremuzyan	C++
jpsigen	J/Psi photoproduction	Rafayel Paremuzyan	C++
twopeg	pi+pi- electroproduction off protons	Iuliia Skorodumina	C++
clas12-elspectro	General electroproduction final states	Derek Glazier	C++
MCEGENpiN_radcorr	Exclusive single pion electroproduction based on MAID	Maksim Davydov	C++
deep-pipi-gen	Deep double pion production	Dilini Bulumulla	C++
genepi	Photon and meson electroproduction	Noémie Pilleuxi	C++
onepigen	Single charged pion production based on AO/Daresbury/MAID	Nick Tyler	C++
GiBUU		Ahmed El Alaoui	C++, New
GENIE	Not ready for OSG	Rhidian and e4nu group	Not ready yet

Please consider adding generator to clas12-mcgen. Contact Nathan / Mauri.

Recent changes to OSG Portal

- Software loaded through **modules** from **CVMFS** for both simulation and reconstruction
- Alma9 container not suitable for many CPUs. Reverted to Fedora36 container**
- Experiment Configuration selections now drives:
 - ◆ Software Versions (linked to experiments) which drives:
 - Vertex Manipulations
 - ◆ Magnetic fields configuration
 - ◆ Background Merging configuration

** Almost half jobs failing. One week down.

https://gemc.jlab.org/web_interface

Home

Summary of current jobs

user	submission	total	done	run	idle
valerii	2	1020	0	1020	0
lixu	1	1000	747	253	0
pillieux	1	1000	968	31	0
yijie	1	25	3	22	0
shrestha	1	100	0	100	0
total	6	3145	1718	1426	0

Click to submit to OSG

Generator

- clas12-mcgen or gemc internal generator
- Arbitrary number of jobs
- Arbitrary number of events per job (max 10,000)

LUND Files

- LUND files (.txt) from a web location
- One job per LUND file
- File define number of events per job (max 10,000)

Buttons:

Type1: Generator
Type2: LUND Files

Details of current OSG Jobs

user	job id	submitted	total	done	run	idle	hold	or
valerii	6745	11/02 18:28	1000	0	1000	0	0	2
valerii	6747	11/04 01:02	20	0	20	0	0	2
lixu	6752	11/06 06:06	1000	747	253	0	0	2
pillieux	6755	11/06 11:44	1000	968	31	0	1	2
yijie	6762	11/08 14:58	25	3	22	0	0	2
shrestha	6763	11/08 15:54	100	0	100	0	0	2

About

Submitting Jobs

When you click the "Submit" button:

- 1. Your submission is saved in our mysql db
- 2. Within a few minutes your jobs will be submitted to OSG and visible in this portal.
- 3. When the jobs are completed, the job will be deleted from the portal.
- 4. The output directory is synced every hour on /volatile/clas12/osg2

The number of events per job are limited to 10,000 corresponding to a time on the OSG between 4-10 hours depending on the node CPU

HOWTOS:

- Submit Jobs to OSG [CLAS12 Software Center](#)

Experiment Configurations, Gcards and Yaml Files

The job workflow and steering cards are maintained in the [clas12-config](#) repo.

Background Merging

The user choice of experiment and magnetic fields enable the possibility of background merging in the dropdown menu. If selected, a random file among the available pool files of 10k events each) is merged to the simulated events before reconstruction.

Output

The output is synced hourly on

`/volatile/clas12/osg/"username"/job_OSGID`

where "username" is your job account name and OSGID is the OSG submission ID. The optional string identifier STRINGID, the OSG_JOB ID and the JOBINDEX are used to form the filenames:

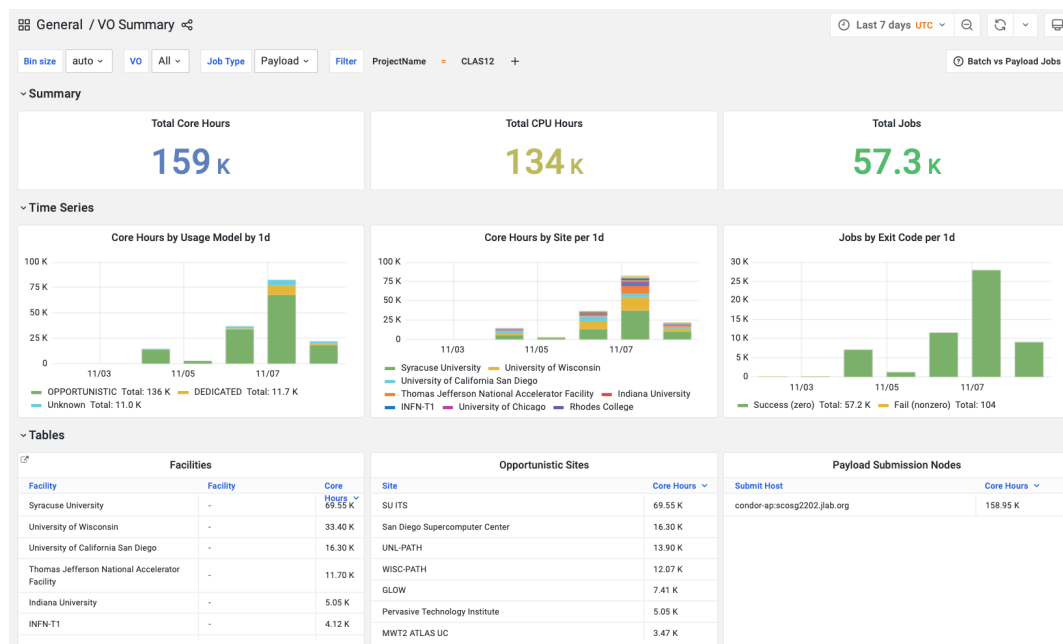
- `STRINGID-OSGID-JOBINDEX.hipo` for type 1 submissions
- `STRINGID-LUNDFILENAME-OSGID-JOBINDEX.hipo` for type 2 submissions

STRINGID may be set by users on the submission form. If you submit 500 jobs, JOBINDEX will run from 0 to 499.

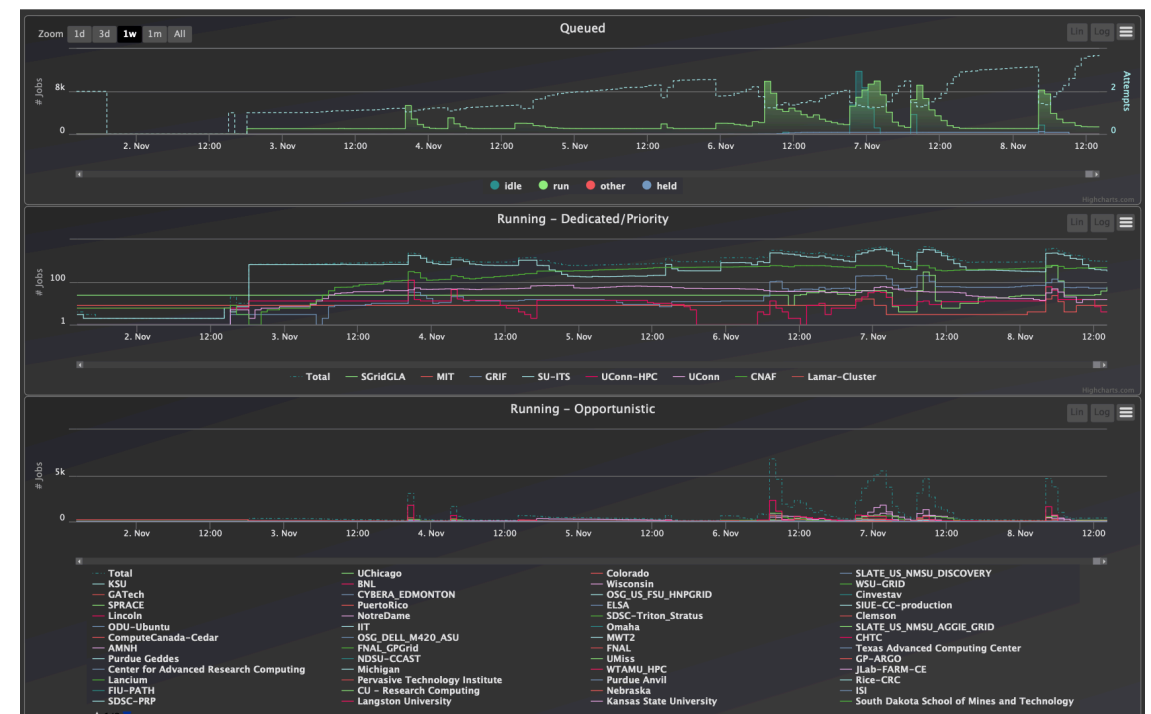
Priority

A priority system is in place to ensure that the resources are shared among all submissions. Analysis groups can submit the [Priority Permission Increase Form](#) to increase an account priority.

OSG Stats



Monitors



OSG Portal: Submit a Type 1 (Generator) Job

Configurations:

Defines Dropdown for:

- Software Versions,
- Magnetic Fields Configuration
- Background Merging

Notice: the lists are about to change with additions and improvements

<u>Configuration</u>	<input type="text"/>
<u>Versions (see README)</u>	<input type="text"/>
MC Gen Versions (see README) Consider testing the generators	3.10 <input type="text"/>
<u>Magnetic Fields</u>	<input type="text"/>
<u>Vertex</u>	<input type="text"/> n/a <input type="text"/> n/a <input type="radio"/> Relative to Generator Vertex
<u>Generator</u>	<input type="text"/>
<u>Generator Options</u>	<input type="text"/> Once you've chosen a generator, you can specify options for it. Do not utilize the <code>+</code> character in options. and insert the desired options above. Example: <code>--docker, output file name, --trig .</code>
Number of Events per Job	<input type="text"/>
Number of Jobs	<input type="text"/>
Total Number of Events	<input type="text"/> M
<u>Background Merging</u>	Not Available <input type="text"/>
<u>String Identifier (optional)</u>	<input type="text"/>
<input type="button" value="Submit"/>	

- rga_spring2018
- rga_fall2018
- rga_fall2018_target_at_m3.5
- rga_spring2019
- rgb_spring2019
- rgb_fall2019
- rgc_summer2022_Elmo
- rgc_summer2022_FTOn
- rgk_fall2018_FTOff
- rgk_fall2018_FTOn

OSG Portal: Submit a Type 1 (Generator) Job

Software versions

4.4.2 has evio output, uses evio2hipo, no vertex manipulation

5.10 has hipo output, uses de-noising, vertex manipulation, RF from CCDB, binary field maps, uses Geant4 10.7.4

dev: development version, use for testing

The software pairing list will change soon with additions / improvements

<u>Configuration</u>	rga_fall2018
<u>Versions (see README)</u>	gemc/4.4.2 coatjava/6.5.6.1
<u>MC Gen Versions (see README)</u> Consider test	3.10
<u>Mag</u>	tor-1.00_sol-1.00
<u>Generator</u>	clasdis
<u>Generator Options</u>	
Once you've chosen the generator, review the linked documentation and insert the desired options above. Do not utilize the following options, as they are automatically included: <code>--docker</code> , <code>output file name</code> , <code>--trig</code> .	
Number of Events per Job	
Number of Jobs	
Total Number of Events	M
<u>Background Merging</u>	45nA_10604MeV
<u>String Identifier (optional)</u>	
Submit	

✓ gemc/4.4.2 coatjava/6.5.6.1
gemc/5.10 coatjava/10.0.2
gemc/dev coatjava/10.0.2

✓ tor-1.00_sol-1.00
tor+1.00_sol-1.00
tor+1.01_sol-1.00

✓ 45nA_10604MeV
50nA_10604MeV
55nA_10604MeV

OSG Portal: Submit a Type 1 (Generator) Job

Vertex manipulation:

- Enabled if gemc > 4.4.2
- Target position and length
- Beam spot and size
- Rastering

- Can overwrite generator / LUND files or be relative to them

<u>Configuration</u>	rga_spring2019 ▾
<u>Versions (see README)</u>	gemc/5.10 coatjava/10.0.2 ▾
MC Gen Versions (see README) Consider testing the generators	3.10 ▾
<u>Magnetic Fields</u>	tor-1.00_sol-1.00 ▾
<u>Vertex</u>	<input checked="" type="checkbox"/> z: adjust for target position and semi-length -3.0*cm, 2.5*cm <input checked="" type="checkbox"/> x/y: smear beamspot 0.0*mm, 0.0*mm, 0.0*mm, 0.0*mm, 0*deg <input checked="" type="checkbox"/> x/y: raster 0.0*cm, 0.0*cm <input checked="" type="radio"/> Ignore Generator Vertex <input type="radio"/> Relative to Generator Vertex

OSG Portal: Submit a Type 1 (Generator) Job

<u>Configuration</u>	<input type="text" value="rga_fall2018"/>
<u>Versions (see README)</u>	<input type="text" value="gemc/4.4.2 coatjava/6.5.6.1"/>
<u>C Gen Versions (see README)</u> Consider testing the generators	<input type="text" value="3.10"/>
<u>Magnetic Fields</u>	<input type="text" value="tor-1.00_sol-1.00"/>
<u>Vertex</u>	z: adjust for target position and semi-length <input type="text" value="n/a"/> x/y: smear beamspot <input type="text" value="n/a"/> x/y: raster <input type="text" value="n/a"/>
<u>Generator</u>	<input type="text" value="clasdis"/>
<u>Generator Options</u>	<input type="text"/>
Once you've chosen the generator, review the linked documentation and insert the desired options above. Do not utilize the following options, as they are automatically included: <code>--docker</code> , <code>output file name</code> , <code>--trig</code> .	
Number of Events per Job	<input type="text"/>
Number of Jobs	<input type="text"/>
Total Number of Events	<input type="text"/> M
<u>Background Merging</u>	<input type="text" value="45nA_10604MeV"/>
<u>String Identifier (optional)</u>	<input type="text"/>
<input type="button" value="Submit"/>	

- clas12-elSpectro
- clasdis
- claspyth
- deep-pipi-gen
- dvcs-gen
- genKYandOnePion
- inclusive-dis-rad
- JPsiGen
- MCEGENpiN_radcorr
- TCSGen
- twopeg
- genepi
- onepigen
- gibuu
- clas-stringspinner
- gemc

Generator
README
with
available
options

[clasdis options](#)

OSG Portal: Submit a Type 1 (Generator) Job

README links
to clas12-mcgen

<u>Configuration</u>	<input type="text" value="rga_fall2018"/>
<u>Versions (see README)</u>	<input type="text" value="gemc/4.4.2 coatjava/6.5.6.1"/>
MC Gen Versions (see README) Consider testing the generators	<input type="text" value="3.10"/>
<u>Magnetic Fields</u>	<input type="text" value="tor-1.00_sol-1.00"/>
<u>Vertex</u>	z: adjust for target position and semi-length <input type="text" value="n/a"/> x/y: smear beamspot <input type="text" value="n/a"/> x/y: raster <input type="text" value="n/a"/>
<u>Generator</u>	<input type="text" value="clasdis"/>

Before Submitting Massive Jobs Please Test the generator

Test Generators

Before submitting large scale jobs to OSG it is recommended to test the generator. This can be done on the JLab cue machines.

To test mcgen version X (2.33 for example):

```
module load clas12
module switch mcgen/X
clasdis --t 20 25
dvcsngen --beam 10.604 --x 0.05 0.85 --trig 100 --q2 0.9 14 --t 0 0.79 --gpd 101 --y 0.15 0.9 --w 3.61 --zpos -3 --zwidth 5 --raster 0.025
```

Notice on the portal the additional arguments will be given:

```
--trig #nevents
--docker
--seed #seed
```

OSG Portal: Submit a Type 1 (Generator) Job

Type 1

STRINGID = non given

```
$ ls -l job_391/output
```

```
391-0.hipo  
391-10.hipo  
391-11.hipo  
391-12.hipo  
391-13.hipo  
391-14.hipo  
391-15.hipo  
391-16.hipo  
391-17.hipo  
391-18.hipo  
391-19.hipo  
391-1.hipo  
391-20.hipo  
391-21.hipo
```

Sub Job ID

OSG ID

Configuration	<input type="text"/>
Versions (see README)	<input type="text"/>
MC Gen Versions (see README) Consider testing the generators	3.10 <input type="text"/>
Magnetic Fields	<input type="text"/>
Vertex	<input checked="" type="checkbox"/> z: adjust for target position and semi-length <input type="text" value="n/a"/> <input checked="" type="checkbox"/> x/y: smear beamspot <input type="text" value="n/a"/> <input checked="" type="checkbox"/> x/y: raster <input type="text" value="n/a"/> <input checked="" type="radio"/> Ignore Generator Vertex <input type="radio"/> Relative to Generator Vertex
Generator	<input type="text"/>
Generator Options	<input type="text"/>
Once you've chosen the generator, review the linked documentation and insert the desired options above. Do not utilize the following options, as they are automatically included: <code>--docker</code> , <code>output file name</code> , <code>--trig</code> .	
Number of Events per Job	<input type="text"/>
Number of Jobs	<input type="text"/>
Total Number of Events	<input type="text"/> M
Background Merging	Not Available <input type="text"/>
String Identifier (optional)	<input type="text"/>
<input type="button" value="Submit"/>	

OSG Portal: Submit a Type 1 (Generator) Job

Type 1
STRINGID :
"test2-33-old_new"

```
$ ls -l job_393/output
```

```
test2-33-old_new-393-0.hipo
test2-33-old_new-393-10.hipo
test2-33-old_new-393-11.hipo
test2-33-old_new-393-12.hipo
test2-33-old_new-393-13.hipo
test2-33-old_new-393-14.hipo
test2-33-old_new-393-15.hipo
test2-33-old_new-393-16.hipo
test2-33-old_new-393-17.hipo
test2-33-old_new-393-18.hipo
test2-33-old_new-393-19.hipo
test2-33-old_new-393-1.hipo
test2-33-old_new-393-20.hipo
test2-33-old_new-393-21.hipo
test2-33-old_new-393-22.hipo
test2-33-old_new-393-23.hipo
test2-33-old_new-393-24.hipo
test2-33-old_new-393-25.hipo
test2-33-old_new-393-26.hipo
test2-33-old_new-393-27.hipo
test2-33-old_new-393-28.hipo
```

Configuration	<input type="text"/>
Versions (see README)	<input type="text"/>
MC Gen Versions (see README) Consider testing the generators	3.10 <input type="text"/>
Magnetic Fields	<input type="text"/>
Vertex	<input checked="" type="checkbox"/> z: adjust for target position and semi-length <input type="text" value="n/a"/> <input checked="" type="checkbox"/> x/y: smear beamspot <input type="text" value="n/a"/> <input checked="" type="checkbox"/> x/y: raster <input type="text" value="n/a"/> <input checked="" type="radio"/> Ignore Generator Vertex <input type="radio"/> Relative to Generator Vertex
Generator	<input type="text"/>
Generator Options	<input type="text"/>
Once you've chosen the generator, review the linked documentation and insert the desired options above. Do not utilize the following options, as they are automatically included: <code>--docker</code> , <code>output file name</code> , <code>--trig</code> .	
Number of Events per Job	<input type="text"/>
Number of Jobs	<input type="text"/>
Total Number of Events	<input type="text"/> M
Background Merging	Not Available <input type="text"/>
String Identifier (optional)	<input type="text"/>
<input type="button" value="Submit"/>	

STRINGID prefixed to OSGID - SUBJOBID

OSG Portal: Submit a Type 2 (Generator) Job

Type 2

STRINGID:

"test2_test1_new-old"

LUND FILES:

dis_1.txt

dis_2.txt

number of Events per Job	<input type="text"/>
Number of Jobs	<input type="text"/>
Total Number of Events	<input type="text"/> M
Background Merging	Not Available ▾
String Identifier (optional)	<input type="text"/>
<input type="button" value="Submit"/>	

```
$ ls -l job_386/output
```

```
test2_test1_new-old-dis_1-386-3.hipo
```

```
test2_test1_new-old-dis_2-386-4.hipo
```

LUND Submission preserve lund filename root in the output filename

Questions, Feedback?

Home

Summary of current jobs

user	submission	total	done	run	idle
valeri	2	1020	0	1020	0
liu	1	1000	747	253	0
pillux	1	1000	968	31	0
yji	1	25	3	22	0
shrestha	1	100	0	100	0
total	6	3145	1718	1426	0

Click to submit to OSG

Generator

- clas12-mcgen or genic internal generator
- Arbitrary number of jobs
- Arbitrary number of events per job (max 10,000)

LUND Files

- LUND files (.dat) from a web location
- One job per LUND file
- File define number of events per job (max 10,000)

Details of current OSG Jobs

user	job id	submitted	total	done	run	idle	hold	or
valeri	6745	11/02 18:28	1000	0	1000	0	0	2
valeri	6747	11/04 01:02	20	0	20	0	0	2
liu	6752	11/06 06:06	1000	747	253	0	0	2
pillux	6755	11/06 11:44	1000	968	31	0	1	2
yji	6742	11/08 14:58	25	3	22	0	0	2
shrestha	6763	11/08 15:54	100	0	100	0	0	2

Buttons:

Type1: Generator

Type2: LUND Files

About

Submitting Jobs

When you click the "Submit" button:

1. Your submission is saved in our myqgl db
2. Within a few minutes your jobs will be submitted to OSG and visible in this portal.
3. When the jobs are completed, the job will be deleted from the portal.
4. The output directory is spiced every hour on /volatile/klas12/osp2

The number of events per job are limited to 10,000 corresponding to a time on the OSG between 4-10 hours depending on the node CPU HOWTOS.

- Submit Jobs to OSG CLAS12 Software Center

Experiment Configurations, Gcards and Yaml Files

The job workflow and steering cards are maintained in the [clas12-config](#) repo.

Background Merging

The user choice of experiment and magnetic fields enable the possibility of background merging in the dropdown menu. If selected, a random file among the available pool (files of 10k events each) is merged to the simulated events before reconstruction.

Output

The output is spiced hourly on

```
/volatile/klas12/osp2/username/job_OSGID
```

where "username" is your job account name and OSGID is the OSG submission ID. The optional string identifier STRINGID, the OSG JOB ID and the JOBINDEX are used to form the filenames:

- STRINGID-OSGID-JOBINDEX.npc for type 1 submissions
- STRINGID-LUNDFILENAME-OSGID-JOBINDEX.npc for type 2 submissions

STRINGID may be set by users on the submission form. If you submit 500 jobs, JOBINDEX will run from 0 to 499.

Priority

A priority system is in place to ensure that the resources are shared among all submissions. Analysis groups can submit the [Priority Permission Increase Form](#) to increase an account priority.

OSG Stats

General / VO Summary <=

Bin size: auto | VO: All | Job Type: Payload | Filter: ProjectName: CLAS12 | Batch vs Payload Jobs

Summary

- Total Core Hours: **159k**
- Total CPU Hours: **134k**
- Total Jobs: **57.3k**

Time Series

- Core Hours by Usage Model by 1d
- Core Hours by Site per 1d
- Jobs by Exit Code per 1d

Tables

Facility	Core Hours	Site	Core Hours	Submit Host	Core Hours
Syracuse University	83.55 K	SU-ITS	69.55 K	sender.ep.scsag2002.job.org	158.95 K
University of Wisconsin	33.40 K	San Diego Supercomputer Center	16.30 K		
University of California San Diego	16.30 K	UNL-PATH	13.90 K		
Thomas Jefferson National Accelerator Facility	11.70 K	WISC-PATH	12.07 K		
Indiana University	5.05 K	GLDW	7.41 K		
INFN-T1	4.12 K	Perseus Technology Institute	5.05 K		
		MW2 ATLAS UC	3.47 K		

Monitors

Zoom: 1d | 3d | 1w | 1m | All

Queued

Running - Dedicated/Priority

Running - Opportunistic