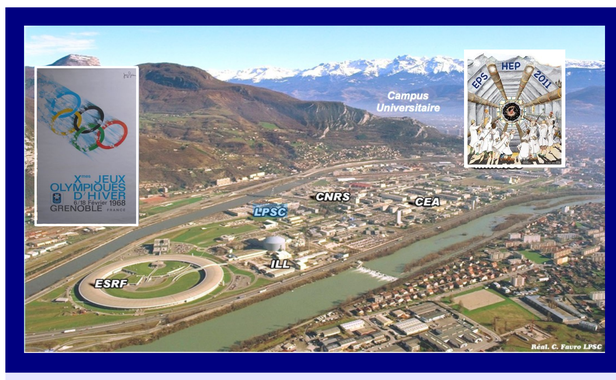


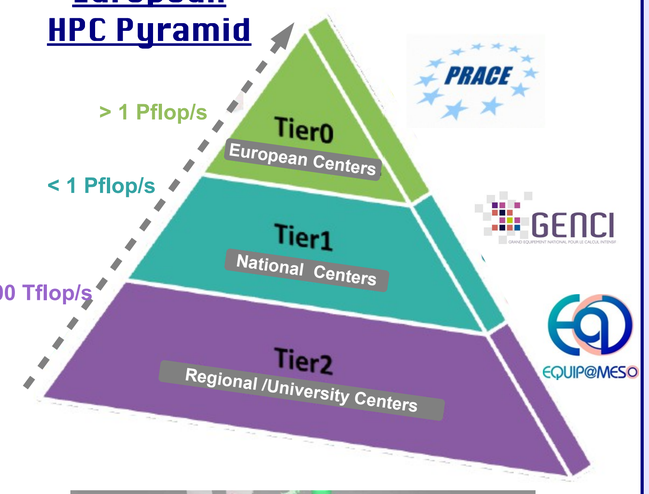
Synergy between the CIMENT tier-2 HPC centre in Grenoble (France) and the HEP community at LPSC

The CIMENT HPC centre (since 1998)

- Federation of 12 HPC clusters localised in the Grenoble area
- 5700 cores, 89.3 Tflop/s, 19 TB memory, 760 TB disk space
- Partners: Grenoble universities and ~30 research lab (CNRS, INRIA, CEA)
  - Chemistry, Earth Science, Environment, Climate, Health, Biology, Modelling
- 200 active users
- T2 HPC centre includes testing phases for further T1 usage

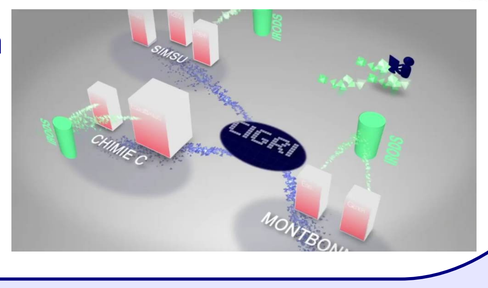
A brand new cluster
54 Tflop/s shared
+18 Tflop/s this month
(> 3000 cores)
+GPU and Xeon Phi

European HPC Pyramid



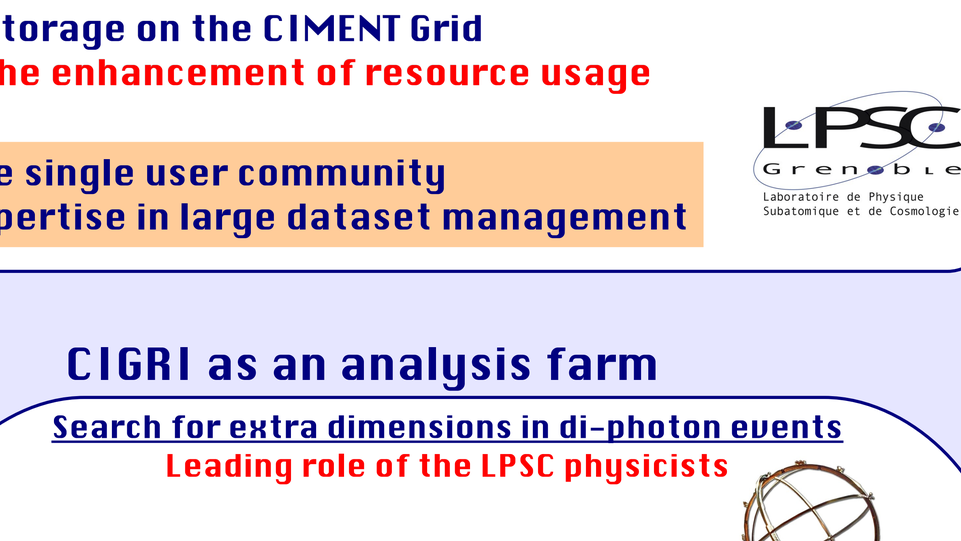
Grid build on the HPC clusters

- Opportunistic usage
  - Automatic resubmission
  - Ideal for short tasks, low parallelism
- 520 TB distributed storage (iRODS)
  - Some resources located at LPSC
  - Well suited for heterogeneous technologies



The WLCG site at LPSC (since 2008)

- LPSC (IN2P3): subatomic physics and cosmology
  - D0, ATLAS, ALICE, Lattice QCD, ...
- > 800 cores, 700 TB storage (DPM, xROOTd)
- WLCG-T2 since 2011 (ALICE and ATLAS)



- Aim at keeping the production site busy
  - Long latency to get analysis tasks running
- Insufficient CPU to absorb peak in analysis tasks ahead of main physics conferences

Collaboration CIMENT-LPSC

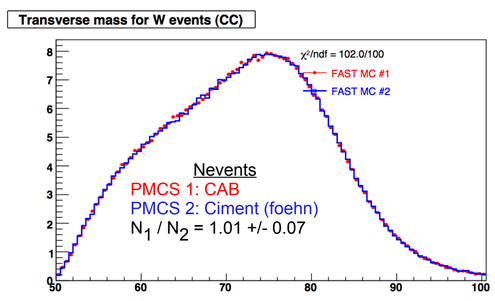
Started in 2010 with the installation of iRODS storage on the CIMENT Grid
New synergy between two different communities for the enhancement of resource usage

- multi-disciplinary communities - expertise in HPC and GPU	⟷	- one single user community - expertise in large dataset management

First HEP use case for CIGRI

Indirect search for the Higgs boson
By the precise measurement of the W boson mass
Leading role of the LPSC physicists

- Multi parametrised detector simulation
  - High number of short tasks
- Development
  - Porting standard HEP tools collection
  - Porting D0 application and validate
- High availability of CIGRI



Results
- Most precise single W mass measurement
  - Calculations on CIGRI included
- Complements the LHC searches
  - Highly competitive for the next decade

Easy-to-use middleware

JDL FILE

```
DEFAULT{
  name = dezero_pmcs_test ;
  paramFile = params_dzero.txt ;
}
foehn.ujf-grenoble.fr{
  prologue = /applis/ciment/x86_64/bin/iget -rf DZERO_SOURCE/pmcs.tar % /applis/ciment/x86_64/bin/iget -rf DZERO_SOURCE/extras.tar % ...
  execFile = /home/ciment/biscarat/DZERO_RUN/dzero.bash ;
  walltime = 00:40:00 ;
  resources = /nodes=1/core=1 ;
  execDir = /home/ciment/biscarat/DZERO_RUN ;
}
```

PARAMETER FILE

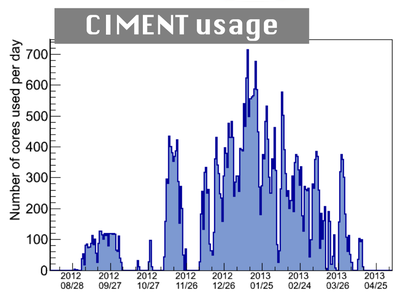
```
resbos_w_ct6.1m_240_100000_884452.root parameters.rc_default_SETadj 100000000 1 6012971
resbos_w_ct6.1m_240_100000_885482.root parameters.rc_default_SETadj 100000000 1 6022971
resbos_w_ct6.1m_240_100000_854502.root parameters.rc_default_SETadj 100000000 1 6032971
resbos_w_ct6.1m_240_100000_866482.root parameters.rc_default_SETadj 100000000 1 6042971
resbos_w_ct6.1m_240_100000_866492.root parameters.rc_default_SETadj 100000000 1 6052971
//
resbos_w_ct6.1m_240_100000_865452.root parameters.rc_default_SETadj 100000000 1 7192971
resbos_w_ct6.1m_240_100000_876502.root parameters.rc_default_SETadj 100000000 1 7202971
```

CIGRI as an analysis farm

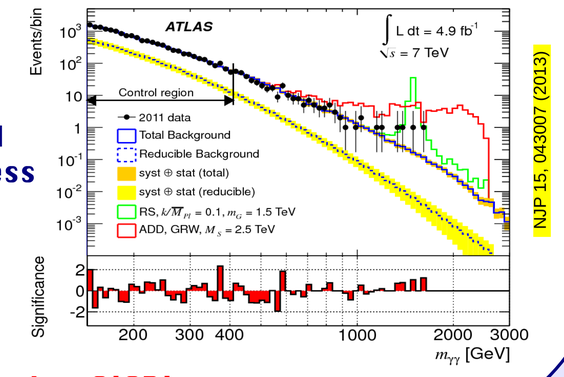
Search for extra dimensions in di-photon events
Leading role of the LPSC physicists

- Production cross-section calculations
  - Including systematic uncertainties
  - High statistic needed
- Exclusion limit calculations
  - Hundreds short tasks at a time
  - Repeated many times
  - High turn-over needed

Analysis elaboration
- Usage spikes meet the LPSC-T2 capacity
- For 6 months: 196 cores/day on average



Results
- Good SM-data agreement observed at high mass
- The high statistics computed on CIGRI improves the process modelling



Coming 8 TeV paper
all cross-sections computed on CIGRI

Conclusion

The CIMENT-LPSC collaboration is **productive**.
The CIMENT grid CIGRI has been **consolidated** by the iRODS storage grid.
CIGRI is a **performant** tool for scientific research, such as **HEP**, and **high profile** subjects.
Sharing expertise and **resources** between fields is an asset for **enabling timely results**.

Catherine Biscarat and Bruno Bzeznik