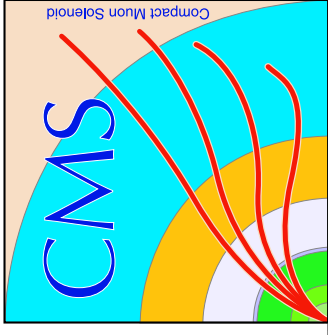




Muon HLT production 2000

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CMS week,
CERN 6 may 2000

Outline

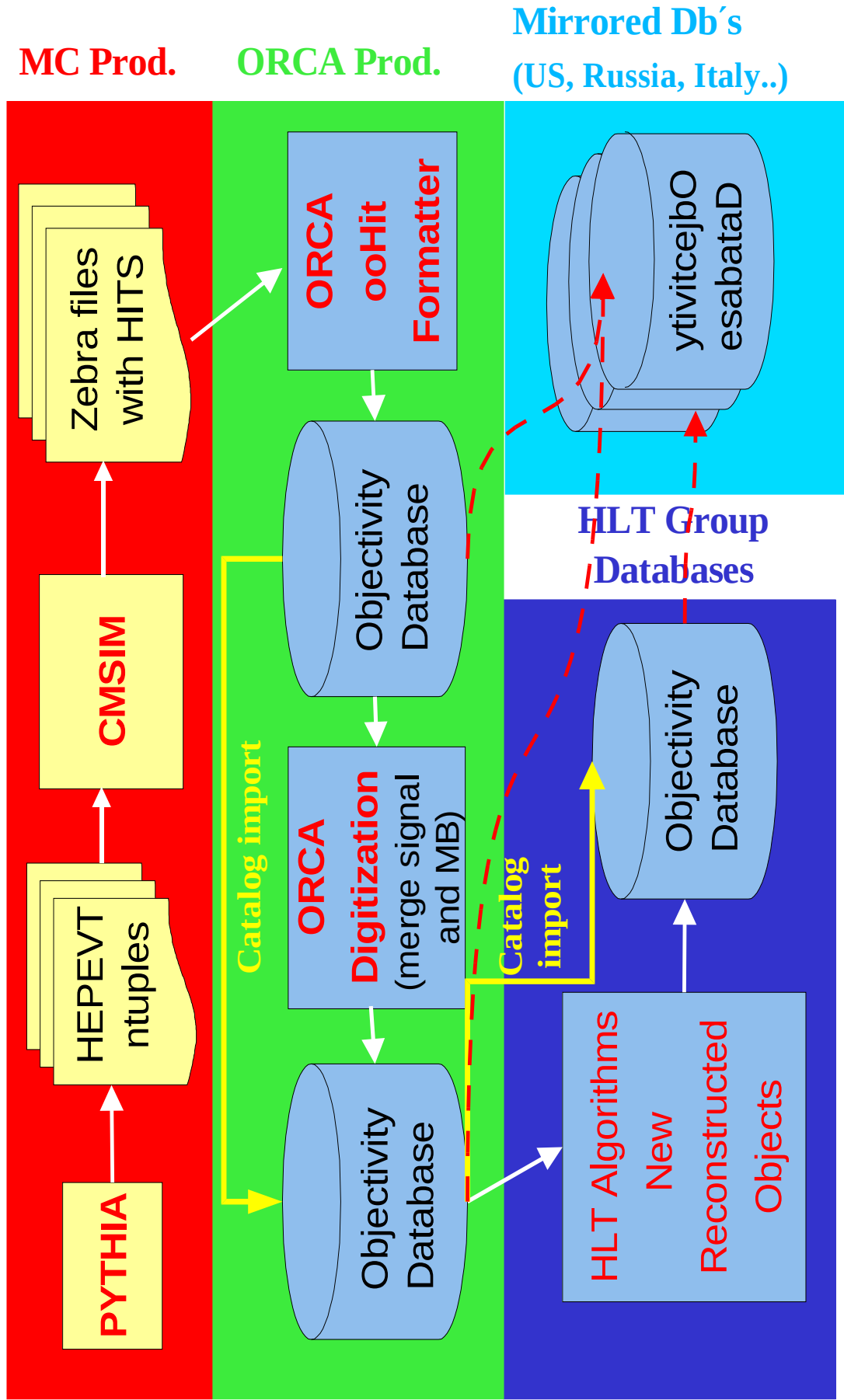
- ◇ Introduction
- ◇ Dataset produced
- ◇ Current status
- ◇ JUNK production
- ◇ L1 efficiencies
- ◇ conclusion

Introduction

HLT muon production comes in four step:

- | | | |
|-----------------|--------------------------------------|-------------|
| Step 1) | PHYTIA generation + CMSIM simulation | Done |
| Step 2) | OO-HIT formatter (muonHitPU) | Done |
| Step 3) | DIGI production (muonDigiPU) | Done |
| Step 4) | Analysis (L1 trigger + HLT studies) | in progress |

Production 2000 schema



Data Sets

Single muon topology:

- ◇ minimum bias $\rightarrow 1\mu + X$, weighted sample:
 1. **MB1mu_pt1** : $p_t^\mu > 1.5 \text{ GeV}, \hat{p}_t > 0 \text{ GeV}$
 2. **MB1mu_pt3** : $p_t^\mu > 3 \text{ GeV}, \hat{p}_t > 5 \text{ GeV}$
 3. **MB1mu_pt4** : $p_t^\mu > 4 \text{ GeV}, \hat{p}_t > 10 \text{ GeV}$
 4. **MB1mu_pt10** : $p_t^\mu > 10 \text{ GeV}, \hat{p}_t > 20 \text{ GeV}$
- ◇ **W_1mu** : $W \rightarrow 1\mu + X; \quad p_t^\mu > 3 \text{ GeV}$
- ◇ **Z_1mua** : $Z \rightarrow 1\mu + X; \quad p_t^\mu > 3 \text{ GeV}$
- ◇ **Z_1mu** : $Z, \gamma^* \rightarrow 1\mu + X; \quad p_t^\mu > 3 \text{ GeV}$

Data Sets

Di-muon topology:

- ◇ minimum bias $\rightarrow 2\mu + X$, weighted sample: $p_t^{\mu 1} > 8 \text{ GeV}, p_t^{\mu 2} > 4 \text{ GeV}$
- 1. **MB2mu** : 2 muons from a single MB event;
- 2. **MBmix_mu2** : 2 muons from 2 single muon MB events overlapped (same BX);
- ◇ **WZ2mu** : $W, Z \rightarrow 2\mu + X$;
- ◇ **tt2mu** : $t\bar{t} \rightarrow 2\mu + X$

Signal samples:

- ◇ **HZZ4m** : $H \rightarrow ZZ \rightarrow 4\mu$ ($m_H = 130, 150, 200, 300, 500 \text{ GeV}$);
- ◇ **HWW2m** : $H \rightarrow WW \rightarrow 2\mu$ ($m_H = 120, 140, 160, 200, 300 \text{ GeV}$);

Pile-up sample:

- ◇ **MB0mu** : MB events with no muons;

CMSIM production

- ◇ PYHTIA 6.136
- ◇ CMSIM 118
- ◇ stored KINE and HITS MB, ME, RPC, Calo, Tracker (no digitization)
- ◇ ~ 500 events for run, ~ 1.5 min/events ~ 1.5 Mb/ev.
- ◇ production takes place in several places (CERN, INFN, Moscow, UC Davis, Florida, Helsinki)
fz-file transferred to CERN and stored in HPSS (~ 1.2 Tbyte)
- ◇ started on 18th feb $\rightarrow$ last file arrived on 4th apr **took much longer than foreseen!**
- ◇ problem: integrity of fz-files, MBmix_mu2 with wrong weight (fixed), Tracked and PRS hit corrupted, ...

oo-Hit formatting

- ◇ ORCA 4.0.0
- ◇ took place at CERN
- ◇ skip events with no GEANT muons above threshold
- ◇ populate DB ([Events](#), [MCInfo](#), [Hits](#), [THits](#))
- ◇ Huge I/O, CPU not the limiting factor
- ◇ **many problems!!**:
 - late release of ORCA 4.0.0
 - late arrival of fz-files
 - problem related with corrupted fz-files . . . lots of crash
 - AMS, HPSS, CDR problem
 -

DIGI production

- ◇ ORCA 4.1.0
- ◇ digitize MB, ME, RPC, Calo, not Tracker
- ◇ Pile Up for in time BX
- ◇ took place at CERN
- ◇ CPU, I/O intensive
- ◇ CPU time ~ 1.5 min/event, I/O ~ 1 Mb/ev read-written
- ◇ lot of CPU available, ~ 80 jobs running ($+$ ~ 80 for jetmet)
- ◇ start on 15th May, end by 31st May (some tail)
- ◇ good tool and script to submit, monitor and crash recovery
- ◇ people involved: Annalina V., Norbert N., Stefano L., Alessandro F., Riccardo V. (+ David S., Tony W.)

DIGI production: problems

- ◇ production went smooth (compared with oo-hit formatting)
- ◇ AMS (thus limit jobs to 80 at a time) HPSS
- ◇ some oo-Hit DB has to be reprocessed due to HPSS problem (done with some trouble)
- ◇ still to be fully validated, some double run (this week)
- ◇ not all DB yet attached to user federation
- ◇ last week we experience lots of problem accessing FDB, HPSS problem

DIGI production: How to access

- ◇ User Federation: 00_FD_BOOT =
shift20: : /cms/reconstruction/muon0300DigiPU/muon0300DigiPU.boot
- ◇ DB's are partially on disk, the big part on HPSS, so it may takes some time to access some data (HPSS timeout ~ 500 s.)
WARNING!!: in these days we are experiencing a lots of problem on accessing DB on HPSS!
- ◇ “Official” HLT ntuplas in (still preliminary, no muon tracks yet)
/afs/cern.ch/cms/Physics/muon/output/[DataSetName].ntpl
- ◇ To access the UF the easiest things is to wait for *ORCA_4_2_0 Release* (forseen for the end of this week).
If you cannot wait so long . . .

DIGI production: How to access

- ◇ Example L2_ntuple maker available on

`/afs/cern.ch/cms/Physics/muon/ORCA/L2Ntuple/L2MuonNtuple.cc (.h)`

Has to be compiled against the code provided in

`/afs/cern.ch/cms/Physics/muon/ORCA/production/ORCA_4_2_0_pre1/`

BuildFile and .cpp example on

`... /ORCA/production/ORCA_4_2_0_pre1/src/workspace`

- ◇ Script to generate LSF jobs (info on the file itself):

`/afs/cern.ch/cms/Physics/muon/run/hlt_analysisjob_create`

- ◇ WEB page: <http://cern.ch/cmsmuon>

Events summary

Dataset	num of events	$\int \mathcal{L} dt$ [nb ⁻¹]
MB0mu	99500	0.001804
MB1mu_pt1	163988	0.04571
MB1mu_pt3	120483	0.04811
MB1mu_pt4	135020	0.4405
MB1mu_pt10	36519	4.436
W_1mu	48992	3162.
Z_1mu	48990	898.1
Z_1mua	27498	7979.
MB2mu	63198	74.08
MBmix_mu2	44255	5.789
WZ2mu	10000	$6.794 \cdot 10^5$
tt2mu	9500	$1.645 \cdot 10^5$
HWW2m ($m_H = 120\text{GeV}$)	5000	$1.934 \cdot 10^8$
($m_H = 140\text{GeV}$)	5000	$6.034 \cdot 10^7$
($m_H = 160\text{GeV}$)	5000	$3.589 \cdot 10^7$
($m_H = 200\text{GeV}$)	5000	$6.194 \cdot 10^7$
($m_H = 300\text{GeV}$)	5000	$1.209 \cdot 10^8$
HZZ4m ($m_H = 130\text{GeV}$)	3072	$5.970 \cdot 10^9$
($m_H = 150\text{GeV}$)	4101	$4.102 \cdot 10^9$
($m_H = 200\text{GeV}$)	6418	$2.891 \cdot 10^9$
($m_H = 300\text{GeV}$)	5000	$3.284 \cdot 10^9$
($m_H = 500\text{GeV}$)	3956	$6.033 \cdot 10^9$

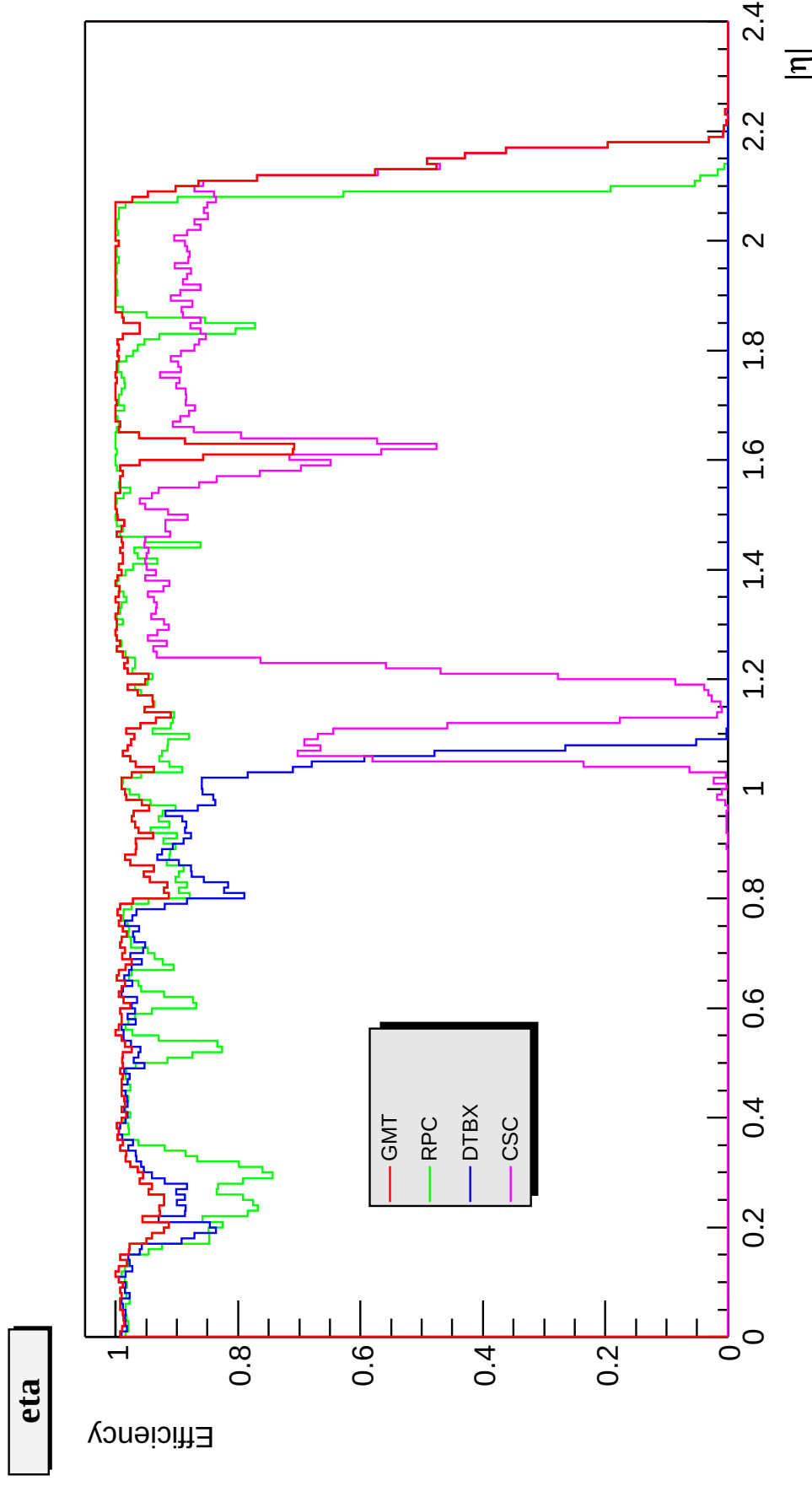
JUNK production

Minimum bias events with neutron gas hits

- ◇ production done is without JUNK,
- ◇ need to study it exp. for L1
- ◇ dedicated production of **MB1mu_pt4** $p_t^\mu > 4 \text{ GeV}$
- ◇ will take place in **Padova**, complete chain (Pythia, CMSIM, [oo-hit formatter](#), [ORCA digitization](#))
- ◇ also important test for populating objectivity FDB in a remote site, **test for future distributed production**
- ◇ **STATUS**
 - fz-file** already available (the easy part)
 - oo-hit formatter** successfully tested, we should agree on DBid's sharing
 - digitization** not tested yet, need a local copy of Pile-up events

L1 efficiencies

taken from Norbert N. talk at Physics Reconstruction & Selection Meeting (PRS):
today at 16:30 40-S2-A01



Conclusion

- ◇ CMSIM production finished
 - ◇ OO_hit formatting finished
 - ◇ Digitization finished
 - ◇ ~ 650 k-events on DB (MCInfo, Hits, Thits, Digi (no tracker))
 - ◇ a User Federation has been prepared (still not fully available and validated)
 - ◇ Dedicated production with JUNK foreseen
 - ◇ [Now it's time for analysis](http://cern.ch/cmsmuon)
- Information about the production on <http://cern.ch/cmsmuon>