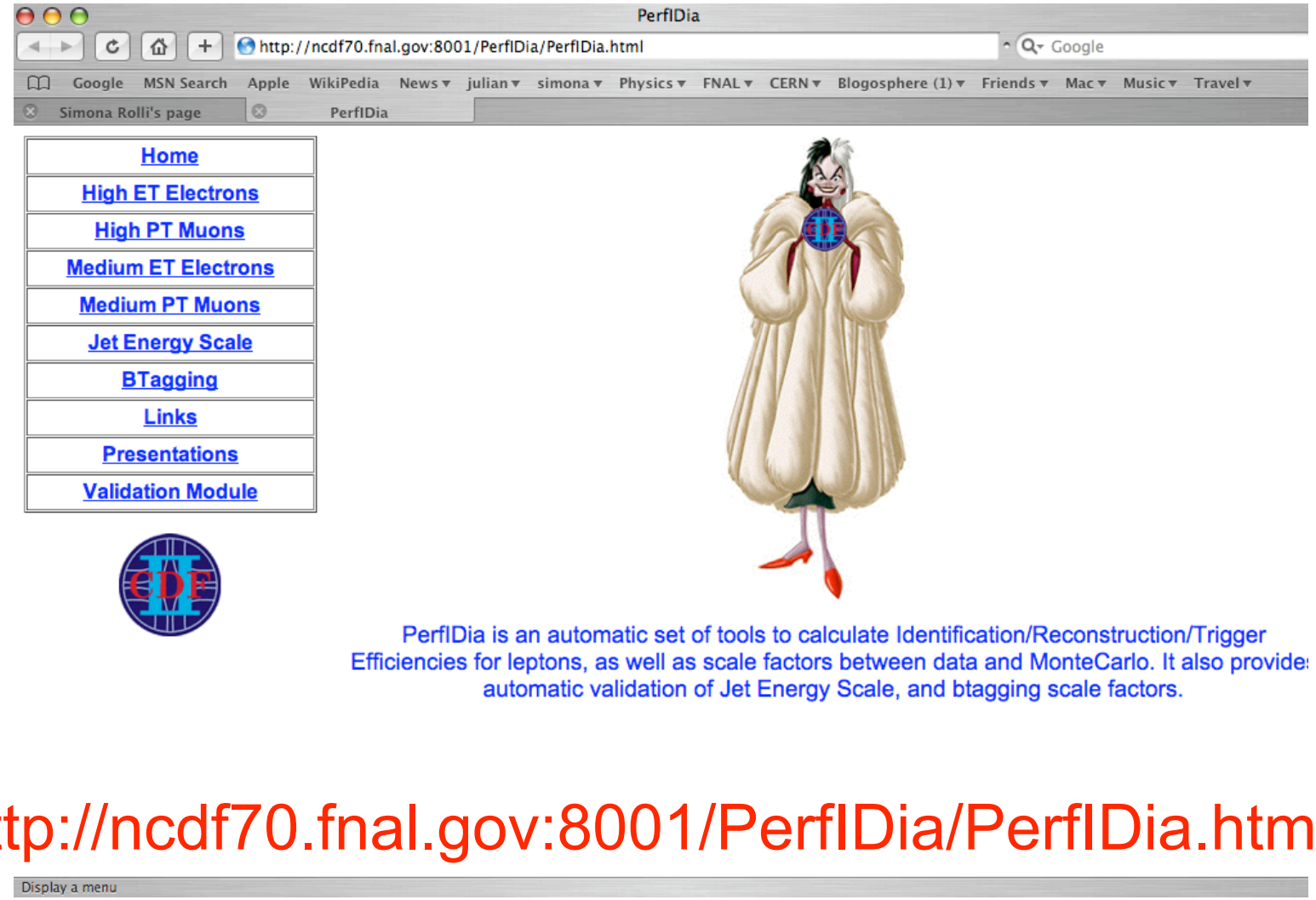
Lepton Efficiencies for Period 9 Data using PerfIDia (blessing)

Simona Rolli

Web Page



http://ncdf70.fnal.gov:8001/PerfIDia/PerfIDia.html

Talk Outline

- Current validation of the new high PT leptons samples (200 pb): bhelmi, bhmumi aka Period 9 data (run 222529 to 228596)
  - High Et Electron ID (w/ D. Hare) -bhelmi
  - High Et Electron Trigger (w/ BY Han) -bhelmi
  - High PT Muons (L. Lovas) -bhmumi

Electrons ID

PerflDia

http://ncdf70.fnal.gov:8001/PerflDia/PerflDia.html

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  - CDF Note 8274, June 1st, 2006
  - CDF Note 8614, November 27, 2006
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- Code:
  - Instructions on how to run the code
- Results:
  - Period 9 data ( ): Runs 222529 to 228596 (MC sample zewkcd):
    - Mass distributions with comparisons between data and MC
    - Efficiencies and Scale Factors for data and MC (file not formatted!)
  - Post ShutDown data (June 2006 to September 2006): Runs 217990 to 222426 (MC sample zewkcd):
    - Mass distributions with comparisons between data and MC
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  - bhel0i Pre ShutDown data (September 2005 to June 2006): Runs 203819 to 212133: (MC sample zewkcd)
    - Mass distributions with comparisons between data and MC
    - Efficiencies and Scale Factors for data and MC (file not formatted!)
  - bhel0h (December 2004 to September 2005): Runs 190697 to 203799 (MC sample zewkcd)
    - Mass distributions with comparisons between data and MC
    - Efficiencies and Scale Factors for data and MC (file not formatted!)
  - bhel0d (2002 to August 2004) : Runs 138425 to 186598 (MC sample zewkcd)
    - Mass distributions with comparisons between data and MC
    - Efficiencies and Scale Factors for data and MC (file not formatted!)

How to run the electron efficiency code on TopNtuple
The code runs in two steps:

- A standalone executable runs on TopNtuple:
  - 1.) main_lepid: basically reads in the command line arguments and then runs ana_lepid

Electrons ID: Samples

Dataset bhelmi: Runs 222529 to 228596
MC sample : zewkcd (reprocessed as zewkmd)
GRL : goodrun_em_nosi_v15

Complete lists of files used here:
http://ncdf70.fnal.gov:8001/PerfIDia/validation/bhelmi/bhelmi_feb26.rootlist
http://ncdf70.fnal.gov:8001/PerfIDia/validation/bhelmi/bhelmi2.rootlist
(skimmed leptons)
http://ncdf70.fnal.gov:8001/PerfIDia/validation/bhelmi/zewkcd.rootlist

Electron ID: Cuts

CEM Selection Cuts

Variable	Tight (CEM)
Region	== CEM
Fiducial	Fiducial == 1
E_T	$\geq$ 20 GeV
Track Z_0	$\leq$ 60 cm
Track p_T	$\geq$ 10 GeV/c
COT Ax. Seg.	≥ 3
COT St. Seg.	≥ 2
Conversion	$\neq 1$
Had/em	$\leq (0.055 + (0.00045 \times E))$
Isolation	≤ 0.1
LshrTrk	≤ 0.2
E/P	≤ 2.0 unless $p_T \geq$ 50GeV/c
CES ΔZ	$\leq$ 3.0 cm
Signed CES ΔX	$-3.0 \leq q \times \Delta X \leq 1.5$
CES StripChi2	≤ 10.0

Plug Selection Cuts

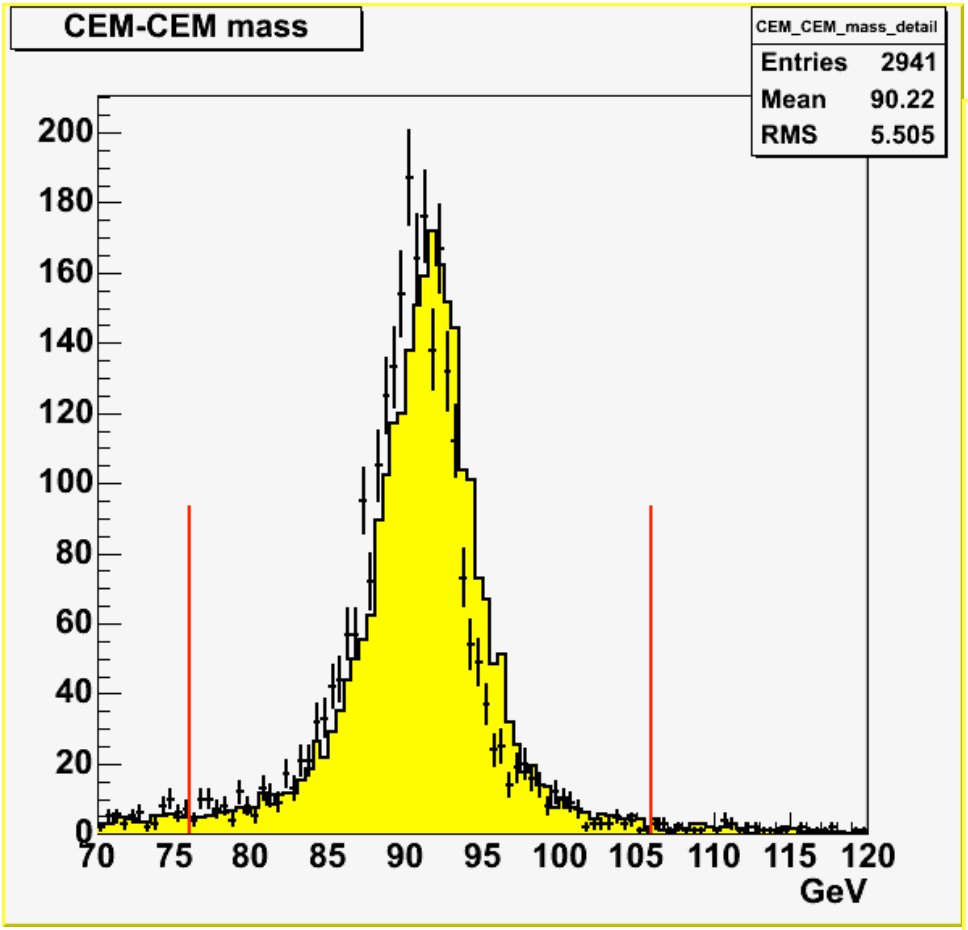
Variable	PHX	PEM
E_T	$\geq$ 20GeV	$\geq$ 20GeV
Pes2dEta	$1.2 \leq \lvert\eta\rvert \leq 2.8$	$1.2 \leq \lvert\eta\rvert \leq 2.8$
Had/Em	≤ 0.05	≤ 0.05
Pem3x3FitTow	$\neq 0$	$\neq 0$
Pem3x3Chisq	≤ 10	≤ 10
Pes5by9U	≥ 0.65	≥ 0.65
Pes5by9V	≥ 0.65	≥ 0.65
Isolation	≤ 0.1	≤ 0.1
ΔR	$\leq$ 3.0 cm	$\leq$ 3.0 cm
PhxMatch	TRUE	-
N_{hits}^{Si}	≥ 3	-
$\lvert z_0^{PHX} \rvert$	$\leq$ 60 cm	-

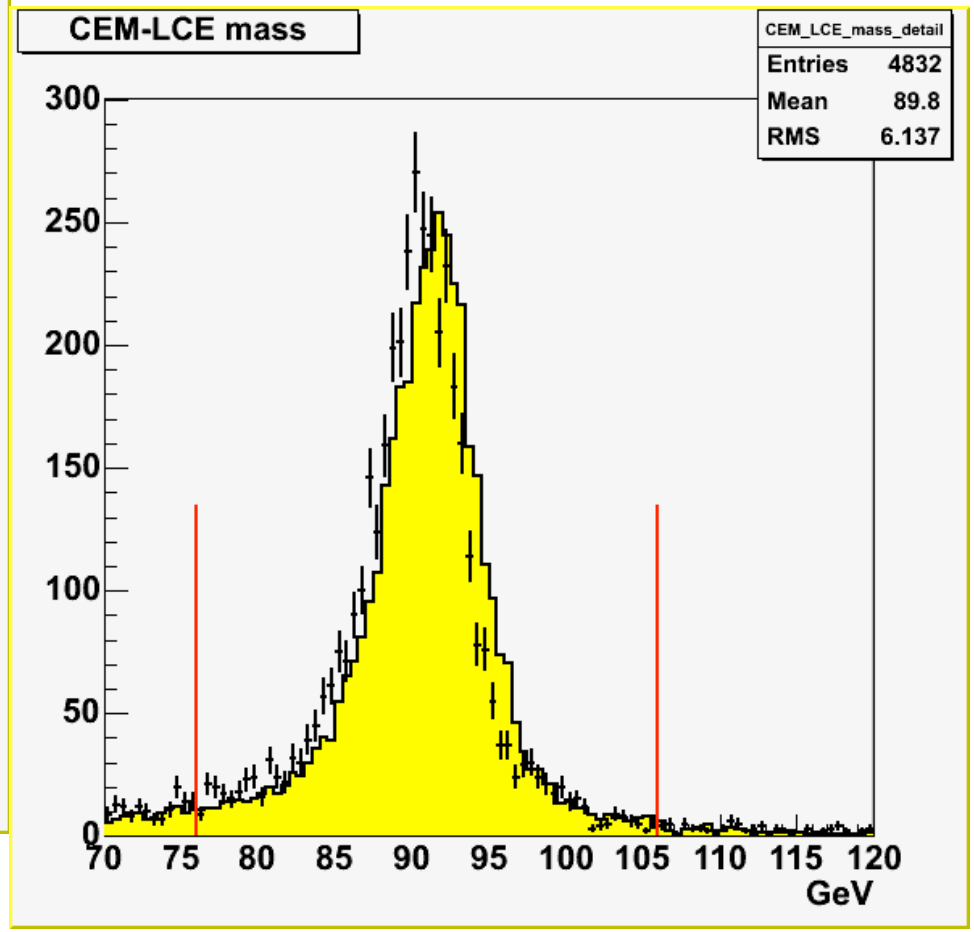
Electron ID: Results

Efficiency	0d	0h	0i PreSD	0i PostSD	bhelmi
CEM	0.802 +/- 0.003	0.796 +/- 0.003	0.787 +/- 0.003		0.789 +\- 0.005
NonIsol CEM	0.826 +/- 0.003	0.822 +/- 0.003	0.814 +/- 0.003		0.817+\0.004
Loose CEM	0.924 +/- 0.002	0.923 +/- 0.002	0.915 +/- 0.002		0.914 +/- 0.001
NonIsol Loose CEM	0.950 +/- 0.002	0.949 +/- 0.002	0.944 +/- 0.002		0.945 +/- 0.001
PHX (|Etal < 2.0)	0.714 +/- 0.005	0.719 +/- 0.004	0.714 +/- 0.004		0.700 +/- 0.007
PHX (|Etal < 2.8)	0.638 +/- 0.004	0.637 +/- 0.004	0.641 +/- 0.005	0.623 +/- 0.006	0.620 +\-0.006
PEM (|Etal < 2.0)	0.834 +/- 0.004	0.825 +/- 0.004	0.815 +/- 0.004		0.804 +/- 0.006
PEM (|Etal < 2.8)	0.822 +/- 0.003	0.804 +/- 0.003	0.791 +/- 0.004	0.784 +/- 0.005	0.775+\-0.006

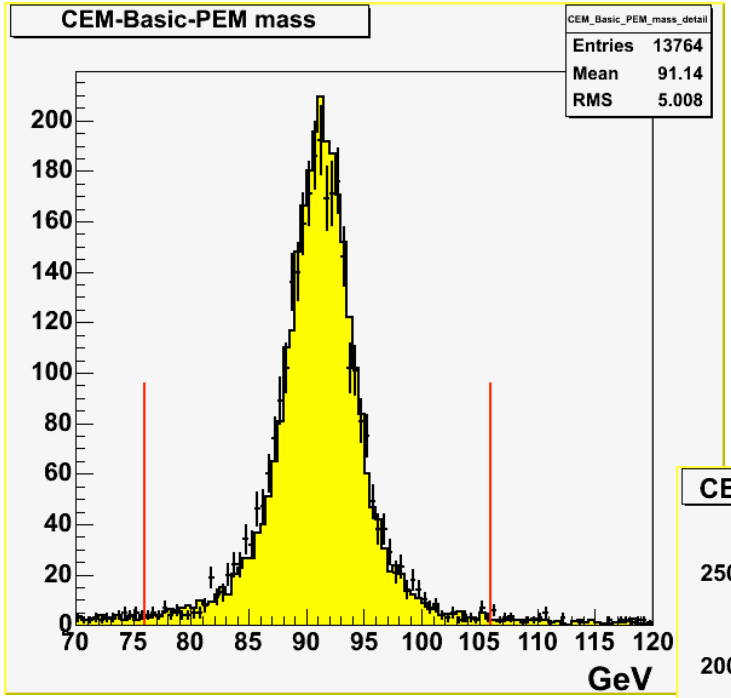
Scale Factor	0d	0h	0i PreSD	0i PostSD	bhelmi
CEM	0.991 +/- 0.004	0.985 +/- 0.004	0.974 +/- 0.004		0.978 +/- 0.006
NonIsol CEM	0.996 +/- 0.004	0.990 +/- 0.003	0.981 +/- 0.003		0.984 +/- 0.006
Loose CEM	1.001 +/- 0.002	1.003 +/- 0.002	0.996 +/- 0.002		0.996 +/- 0.004
NonIsol Loose CEM	1.004 +/- 0.002	1.004 +/- 0.002	0.998 +/- 0.002		0.998+/- 0.003
PHX (|Etal < 2.0)	0.929 +/- 0.006	0.943 +/- 0.006	0.937 +/- 0.006		0.920+/- 0.010
PHX (|Etal < 2.8)	0.937 +/- 0.006	0.952 +/- 0.006	0.959 +/- 0.007	0.929 +/- 0.009	0.936+\-0.010
PEM (|Etal < 2.0)	0.936 +/- 0.004	0.941 +/- 0.004	0.930 +/- 0.004		0.925 +/- 0.007
PEM (|Etal < 2.8)	0.939 +/- 0.004	0.941 +/- 0.004	0.926 +/- 0.005	0.922 +/- 0.006	0.919+\-0.007

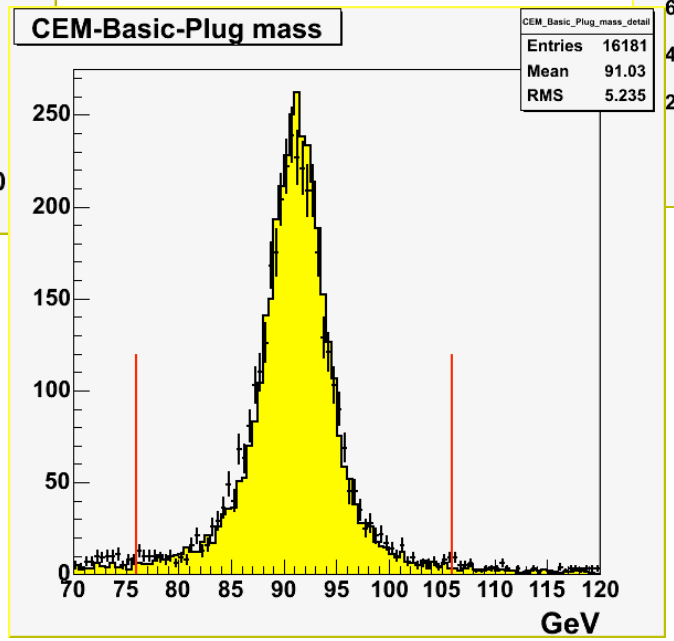
Electron ID Z candidates

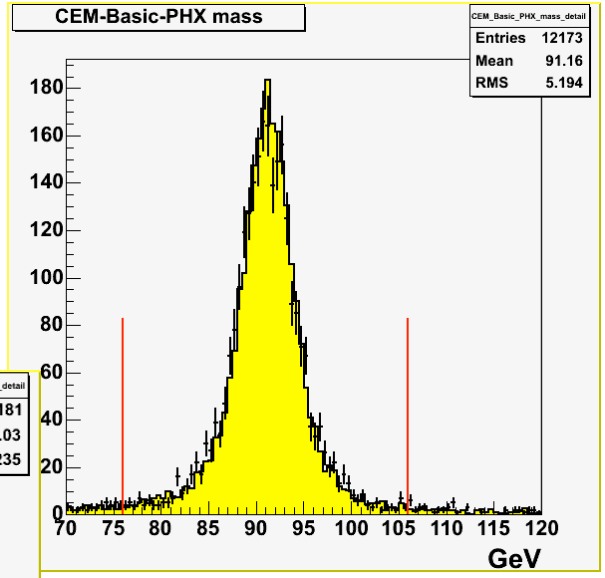




Electron ID Z candidates







Electron Trigger

PerflDia

http://ncdf70.fnal.gov:8001/PerflDia/PerflDia.html

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- Results:
  - Post ShutDown data (June 2006 to September 2006): Runs 217990 to 222426 (MC s zewkcd):
    - Number of events for NoSi GRL
    - Number of events for Si GRL
  - bhel0i Pre SD
  - bhel0h
  - bhel0f

How to run the electron trigger efficiency code on TopNtuple
Preliminary
There are two steps in producing trigger efficiencies (tracking only for the moment):

- First step: a standalone (release dependent code runs on TopNt). Here are the instructions:
  newrel -t 6.1.4 testrel;
  cd testrel;
  addpkg TopMods; setenv USESHLIBS yes ; gmake TopMods.nobin
  addpkg JetUser jetCorr06b
  gmake JetUser.lib LINK_SHARED_ROOT=yes
  cvsroot zoom
  addpkg ZMutility
  addpkg Exceptions
  gmake ZMutility.all USESHLIBS=1
  gmake Exceptions.all USESHLIBS=1
  in the test release add the following files (tar file with them here :
  ana.cc
  ana.hh

Electron Trigger: Tracking

1 electron with $E_T > 25GeV$
$\not{E}_T > 25GeV$
reject cosmic events

Table: Offline W selection.

Electron Variables	Current baseline cuts
E_T	> 20 GeV
p_T	> 10 GeV/c
N_{SL}^{axial} with 5 hits	≥ 3
N_{SL}^{stereo} with 5 hits	≥ 2
Fiducial	1
Had/Em	$< 0.055 + 0.00045E$
L_{shr}	< 0.2
E/p	< 2 (for $p_T < 50GeV$)
$\lvert Z_{vertex} \rvert$	< 60 cm
$\lvert \Delta X \rvert$	$-3.0 < Q_{trk}\Delta X < 1.5$ cm
$\lvert \Delta Z \rvert$	< 3 cm
χ^2_{strip}	< 10
Conversion	$\neq 1$ (not)

Table: Offline baseline cuts for central electrons.

L1 Tracking Efficiency

$$\epsilon(\text{L1_XFT_PT8}) = \frac{\text{numW \& passed L1_CEM8_PT8}}{\text{numW}}$$

numW means the number of *W* candidates that passed the W_NOTRACK path.

L2 Tracking Efficiency

At L2, there is no additional tracking done except for receiving the XFT information from L1.

$$\epsilon(\text{L2_XFT_PT8}) = \frac{\text{numW \& passed L1_CEM8_PT8 \& passed L2_CEM16_PT8}}{\text{numW \& passed L1_CEM8_PT8}}$$

L3 Tracking Efficiency

$$\epsilon(\text{L3_PT9}) = \frac{\text{numW \& passed L1_CEM8_PT8 \& L2_CEM16_PT8 \& L3_CEM18_PT9}}{\text{numW \& passed L1_CEM8_PT8 \& L2_CEM16_PT8}}$$

Electron Trigger: Calorimeter

L2 Calorimeter Efficiency

- Require at least 1 electron satisfying the baseline cuts and $E_T >$ 18GeV.
- Use ELECTRON_CENTRAL_18_NO_L2 path.
- Efficiency reaches 100% at about 25 GeV.

$$\epsilon(\text{L2_CEM16}) = \frac{\text{numEl \& passed L1_CEM8_PT8 \& L2_PS \& L2_CEM16}}{\text{numEl \& passed L1_CEM8_PT8 \& L2_PS}}$$

L3 Calorimeter Efficiency

- Use the calibration dataset(blpc).
- Use ELECTRON_CENTRAL_8_NO_L2 path.
- Efficiency reaches 100% at about 20 GeV.

$$\epsilon(\text{L3_CEM18}) = \frac{\text{numEl \& passed EL_CENT_8_NO_L2 \& L2_CEM16 \& L3_CEM18}}{\text{numEl \& passed EL_CENT_8_NO_L2 \& L2_CEM16}}$$

Electron Trigger: Results

Summary of central electron trigger

Trigger	Period 8	Period 9	Period 9(PerfIDia)
L1_XFT_PT8	0.9631(6)	0.9651(6)	0.9650(4)
L2_XFT_PT8	0.9993(1)	0.9992(1)	0.99894(7)
L3 tracking	0.9959(2)	0.9954(2)	0.9951(7)
Total Tracking	0.9585(7)	0.9598(7)	0.9593(8)
L1_CEM8	100%	100%	100%
L2_CEM16	$1.00 - 85036e^{-0.71E_t}$	$1/\{1+e^{(-0.5Et-15)}\}$	$1/(1+e^{(-0.5Et-13)}\}$
L3_CEM18	100%	100%	$1/(1+e^{-0.27Et)})$

Table: Summary of trigger efficiencies for central electrons.

(BoYoung Han)

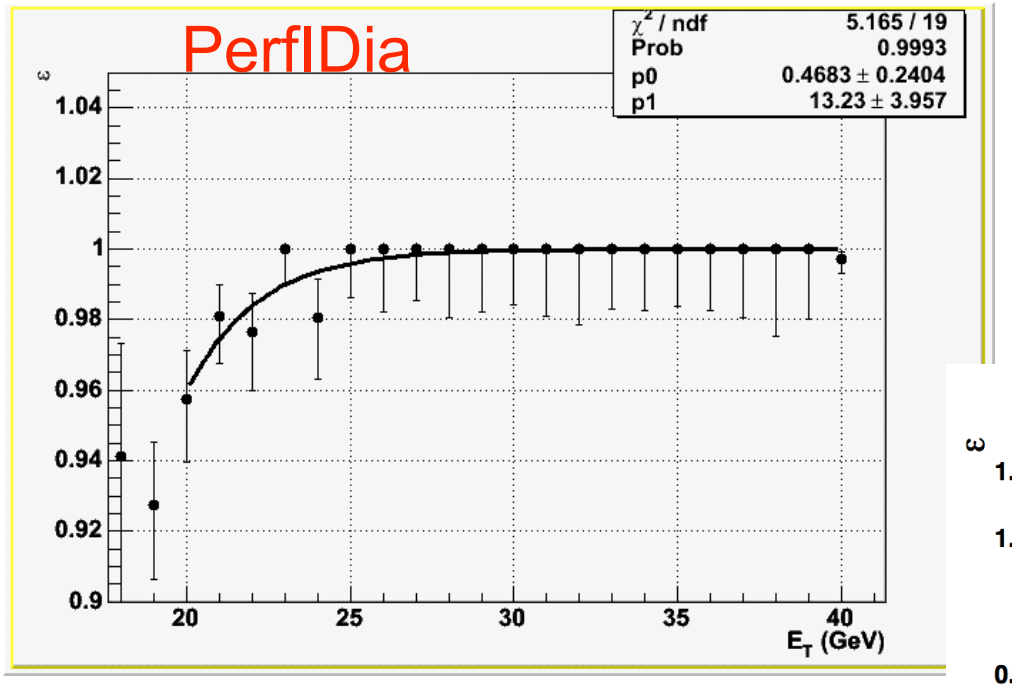
Dataset bhelmi: Runs 222529 to 228596

GRL : goodrun_em_nosi_v15

Complete lists of files used here:

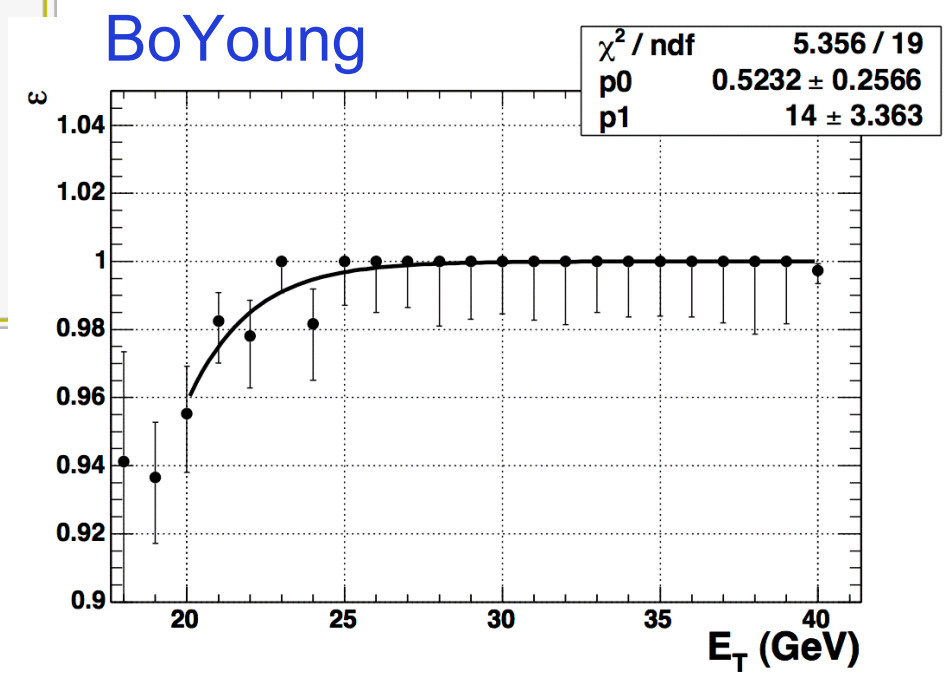
http://ncdf70.fnal.gov:8001/PerfIDia/validation/bhelmi/bhelmi_fieb26.rootlist

Electron Trigger : Results



L2_CEM16 calo efficiency

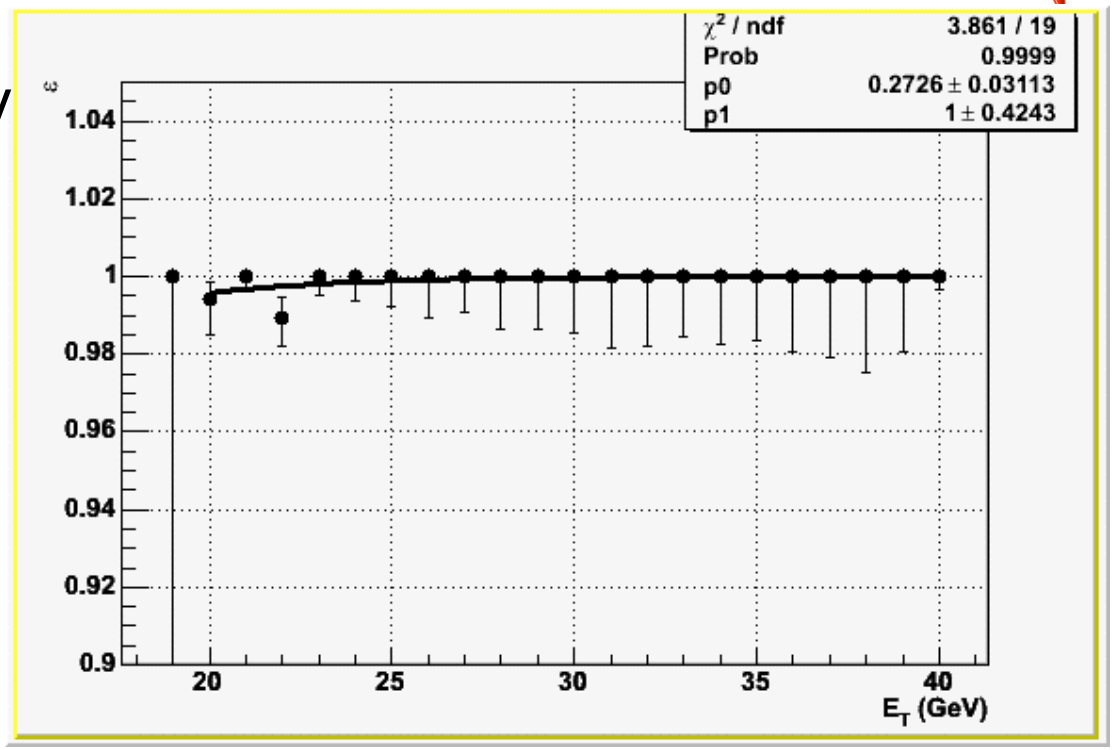
$\varepsilon = 1/[1+\exp(-p0E_t - p1)]$



Electron Trigger : Results

L3_CEM16 calo efficiency

$\varepsilon = 1/[1+\exp(-p0E_t)]$



Dataset blpcmi: Runs 222529 to 228596

GRL : goodrun_em_nosi_v15

Complete lists of files used here:

http://ncdf70.fnal.gov:8001/PerfIDia/validation/blpcmi/bhlpcmi.rootlist

Muons

PerfIDia

http://ncdf70.fnal.gov:8001/PerfIDia/PerfIDia.html

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  - CDF Note 8262, June 1st, 2006
  - Post Shutdown data and efficiencies for Winter 2007 (Lepton Group, November 29 2006)
- Code:
  - Instructions on how to run the code
- Results (PRELIMINARY) :
  - Period 9 Data : Runs 222529 to 228596)
    - Root file of distributions
    - Efficiencies TeX file
  - Post Shut Down Data (June 2006 to September 2006): Runs 217990 to 222426
    - Root file of distributions
    - Efficiencies TeX file
  - Pre Shut Down Data (September 2005 to June 2006): Runs 203819 to 212133
    - Root file of distributions
    - Efficiencies TeX file
  - bhmu0h (December 2004 to September 2005): Runs 190697 to 203799
    - Root file of distributions
    - Efficiencies TeX file
  - bhmu0d bhel0d (2002 to August 2004) : Runs 138425 to 186598
    - Root file of distributions
    - Efficiencies TeX file

How to run the muon efficiency code on TopNtuple
The code lives in CVS (from the head of the repository) under /MuonUser/macros/MuonEffTopNt/.
setup a new test release:
source ~cdfsoft/cdf2.cshrc; setup cdfsoft2 6.1.4; newrel -t 6.1.4 newrel; cd newrel;
add from the head MuonUser and TopMods
addpkg -h MuonUser ; addpkg -h TopMods;
go to the area in MuonUser/macros/MuonEffTopNt/ which will be your working area.
cd MuonUser/macros/MuonEffTopNt/ ;

Muons: Samples

Dataset bhelmi: Runs 222529 to 228596
MC sample : zewkcm
GRL : goodrun_em_si_cmxignored.v15

Complete list used here:
http://ncdf70.fnal.gov:8001/PerfIDia/validation/bhmumi/bhmumi.rootlist
http://ncdf70.fnal.gov:8001/PerfIDia/validation/bhmumi/zewkcm.rootlist

Muon ID: Cuts

cdf 8618

For all events:

No cosmic tag.

For all muon types (including stubless muons):

P_T	$>$	20 GeV/c
E_{EM}	$<$	$2+\max(0,(p-100)\cdot 0.0115)$ GeV
E_{HAD}	$<$	$6+\max(0,(p-100)\cdot 0.028)$ GeV
$E_T^{isol.}/P_T$	$<$	0.1
Number of axial SL with ≥ 5 hits	$\geq$	3
Number of stereo SL with ≥ 5 hits	$\geq$	2
$\lvert z_0 \rvert$	$<$	60 cm
Tracks w/ no silicon hits: $\lvert d_0 \rvert$	$<$	0.2 cm
Tracks w/ silicon hits: $\lvert d_0 \rvert$	$<$	0.02 cm

Additionally for tight CMUP muons:

$\lvert \Delta x_{CMU} \rvert$	$<$	7 cm
$\lvert \Delta x_{CMP} \rvert$	$<$	5 cm
No bluebeam muons, run	$<$	154449

Additionally for tight CMX muons:

$\lvert \Delta x_{CMX} \rvert$	$<$	6 cm
Run	$>$	150144
No miniskirt or keystone muons, run	$<$	190697
No muons in wedge 14 west, runs	$\geq$	190697 and $\leq$ 209760

Table 1: Standard muon ID cuts for 6.1.4 data MC.

Fiducial cuts

Fiducial distance from CMU:

x-fid < 0 cm

z-fid < 0cm

Fiducial distance from CMP:

x-fid < 0 cm

z-fid < -3 cm

ρCOT > 140 cm

Fiducial distance from CMX:

x-fid < 0 cm

z-fid < -3 cm

No muons from keystone for run < 190697

No muons from miniskirt for run < 190697

Arches:

$0^o \leq \phi < 75^o$ or $105^o < \phi < 225^o$

or $315^o < \phi < 360^o$

Keystone:

$(75^o \leq \phi \leq 105^o)$ and $\eta < 0$

Miniskirt:

$225 \leq \phi \leq 315^o$

ID Efficiencies: Data (Period 9)

Cut	Count	Efficiency (%)
No cut	2774	
E_{EM} cut	2700	97.33 ± 0.31
E_{HAD} cut	2729	98.38 ± 0.24
COT hits cut	2772	99.93 ± 0.05
d_0 cut	2760	99.50 ± 0.13
Isolation cut	2687	96.86 ± 0.33
Δx_{CMU} cut	2767	99.75 ± 0.10
Δx_{CMP} cut	2719	98.02 ± 0.26
All above cuts	2508	90.41 ± 0.56
All cuts excl. isol.	2582	93.08 ± 0.48
Sliding isol. cut	2717	97.95 ± 0.27
All cuts (sliding isol.)	2536	91.42 ± 0.53
χ^2 cut	2774	100.00 ± 0.00
All cuts (χ^2)	2508	90.41 ± 0.56
All track cuts	2566	92.50 ± 0.50
All trk cuts excl. isol.	2643	95.28 ± 0.40

TABLE I: Dataset bhmumi: Muon ID efficiencies for CMUP

Cut	Count	Efficiency (%)
No cut	1635	
E_{EM} cut	1592	97.37 ± 0.40
E_{HAD} cut	1600	97.86 ± 0.36
COT hits cut	1635	100.00 ± 0.00
d_0 cut	1631	99.76 ± 0.12
Isolation cut	1586	97.00 ± 0.42
Δx_{CMX} cut	1626	99.45 ± 0.18
All above cuts	1510	92.35 ± 0.66
All cuts excl. isol.	1552	94.92 ± 0.54
Sliding isol. cut	1592	97.37 ± 0.40
All cuts (sliding isol.)	1515	92.66 ± 0.64
χ^2 cut	1635	100.00 ± 0.00
All cuts (χ^2)	1510	92.35 ± 0.66
All track cuts	1516	92.72 ± 0.64
All trk cuts excl. isol.	1558	95.29 ± 0.52

TABLE II: Dataset bhmumi: Muon ID efficiencies for CMX

		Efficiency (%)			
		bhmu0d	bhmu0h	bhmu0i	bhmu0i2
CMUP	All above cuts	91.03 ± 0.40	91.09 ± 0.36	89.84 ± 0.47	89.53 ± 0.58
	All cuts excl. isol.	92.93 ± 0.36	93.51 ± 0.31	92.73 ± 0.41	92.34 ± 0.51
CMX	All above cuts	93.52 ± 0.49	91.75 ± 0.44	92.27 ± 0.52	92.22 ± 0.66
	All cuts excl. isol.	95.21 ± 0.42	94.38 ± 0.36	94.23 ± 0.45	94.08 ± 0.58

ID Efficiencies MC (zewkcm)

Cut	Count	Efficiency (%)
No cut	59264	
E_{EM} cut	57021	96.22 ± 0.08
E_{HAD} cut	58264	98.31 ± 0.05
COT hits cut	59261	99.99 ± 0.00
d_0 cut	59185	99.87 ± 0.01
Isolation cut	57627	97.24 ± 0.07
Δx_{CMU} cut	59256	99.99 ± 0.00
Δx_{CMP} cut	58927	99.43 ± 0.03
All above cuts	54221	91.49 ± 0.11
All cuts excl. isol.	55673	93.94 ± 0.10
Sliding isol. cut	57877	97.66 ± 0.06
All cuts (sliding isol.)	54446	91.87 ± 0.11
χ^2 cut	59264	100.00 ± 0.00
All cuts (χ^2)	54221	91.49 ± 0.11
All track cuts	54532	92.02 ± 0.11
All trk cuts excl. isol.	55997	94.49 ± 0.09

TABLE I: Dataset zewkcm-1: Muon ID efficiencies for CMUP

Cut	Count	Efficiency (%)
No cut	37280	
E_{EM} cut	35907	96.32 ± 0.10
E_{HAD} cut	36488	97.88 ± 0.07
COT hits cut	37279	100.00 ± 0.00
d_0 cut	37235	99.88 ± 0.02
Isolation cut	36323	97.43 ± 0.08
Δx_{CMX} cut	37216	99.83 ± 0.02
All above cuts	34193	91.72 ± 0.14
All cuts excl. isol.	35041	93.99 ± 0.12
Sliding isol. cut	36465	97.81 ± 0.08
All cuts (sliding isol.)	34319	92.06 ± 0.14
χ^2 cut	37280	100.00 ± 0.00
All cuts (χ^2)	34193	91.72 ± 0.14
All track cuts	34253	91.88 ± 0.14
All trk cuts excl. isol.	35103	94.16 ± 0.12

TABLE II: Dataset zewkcm-1: Muon ID efficiencies for CMX

ID Efficiencies: Scale Factors

Period 9 SF

All above cuts	0.9882 ± 0.0062
All cuts excl. isol.	0.9908 ± 0.0052

CMUP

All above cuts	1.0069 ± 0.0073
All cuts excl. isol.	1.0099 ± 0.0059

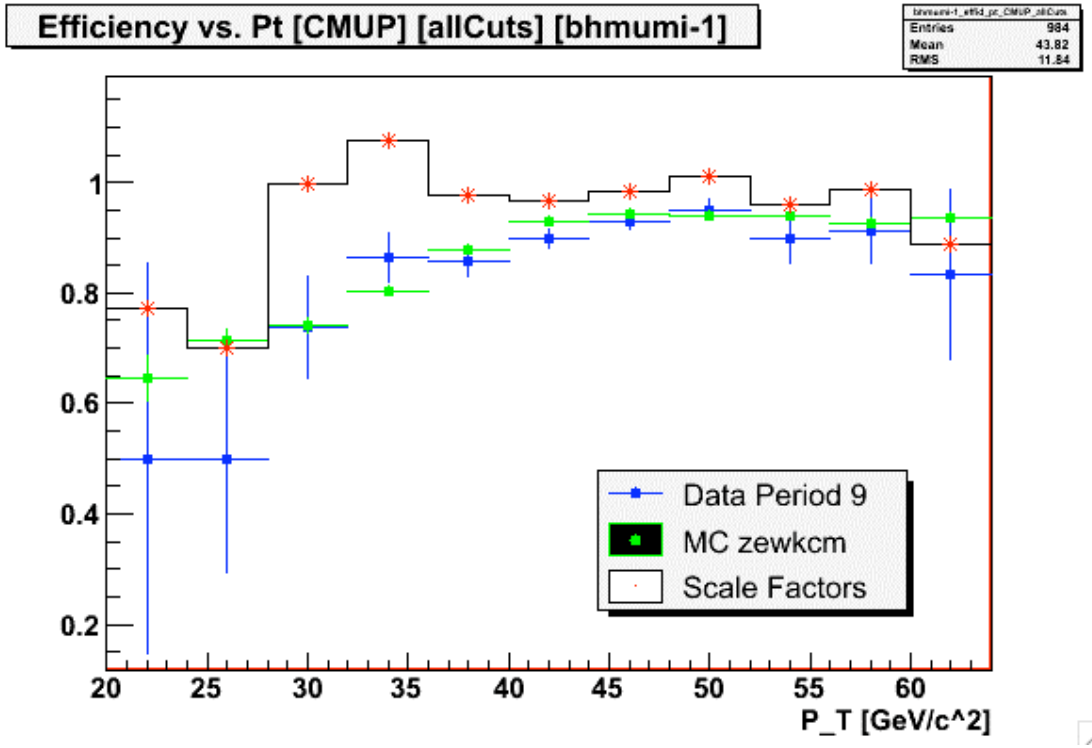
CMX

Period 8

	Factor	
Category	bhmu0i	bhmu0i2
CMUP	0.9753 ± 0.0052	0.9751 ± 0.0064
Excl. isol.	0.9854 ± 0.0044	0.9821 ± 0.0055
Sliding isol.	0.9804 ± 0.0050	0.9776 ± 0.0063
CMX	1.0012 ± 0.0057	1.0001 ± 0.0073
Excl. isol.	1.0010 ± 0.0049	0.9989 ± 0.0063
Sliding isol.	1.0020 ± 0.0056	1.0028 ± 0.0070

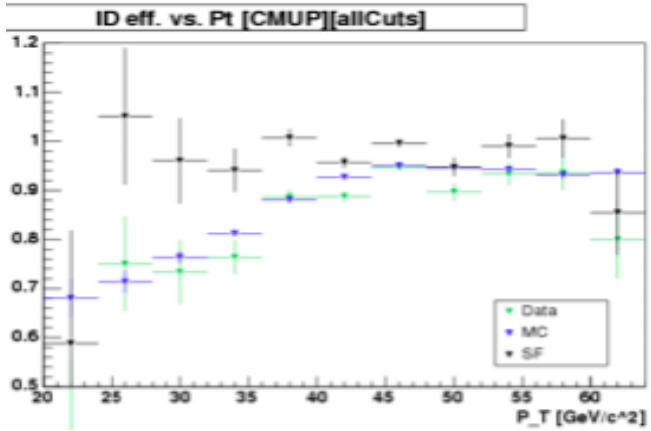
Muons: ID Efficiencies

CMUP



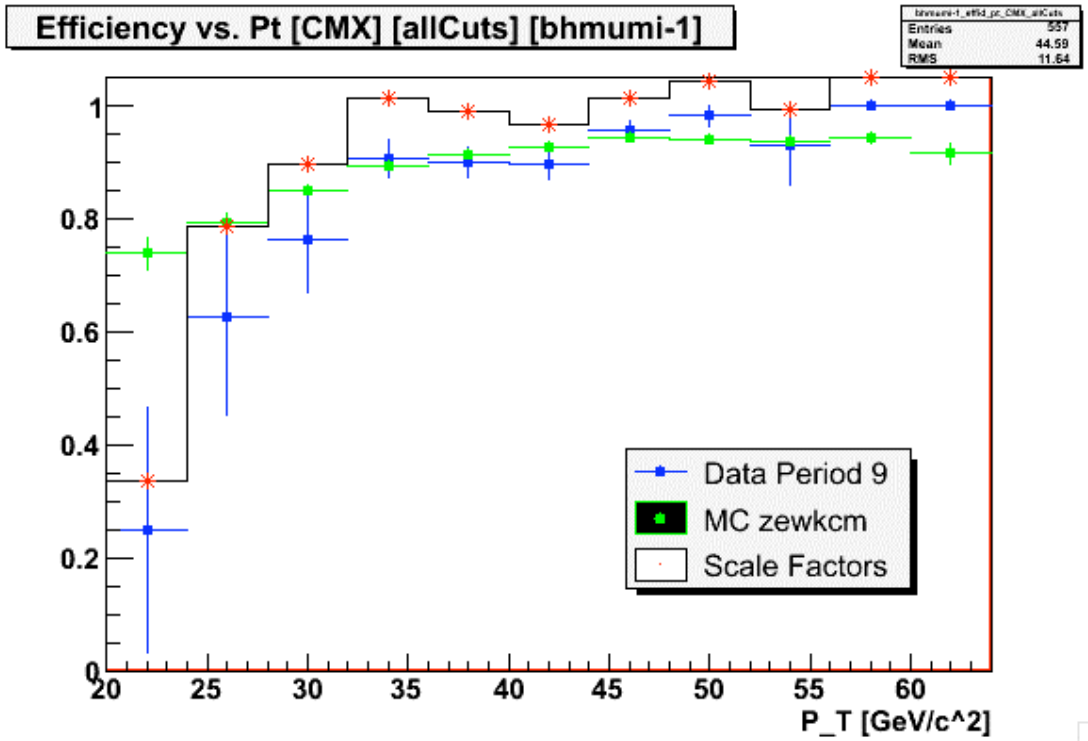
Period 9

Period 8



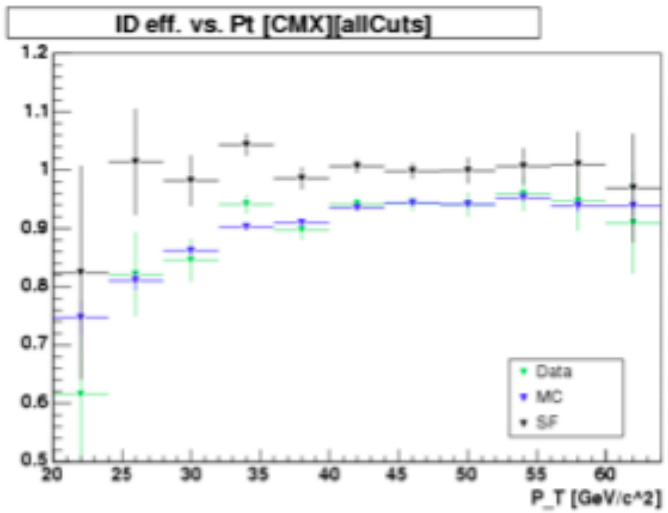
Muons: ID Efficiencies

CMX



Period 9

Period 8

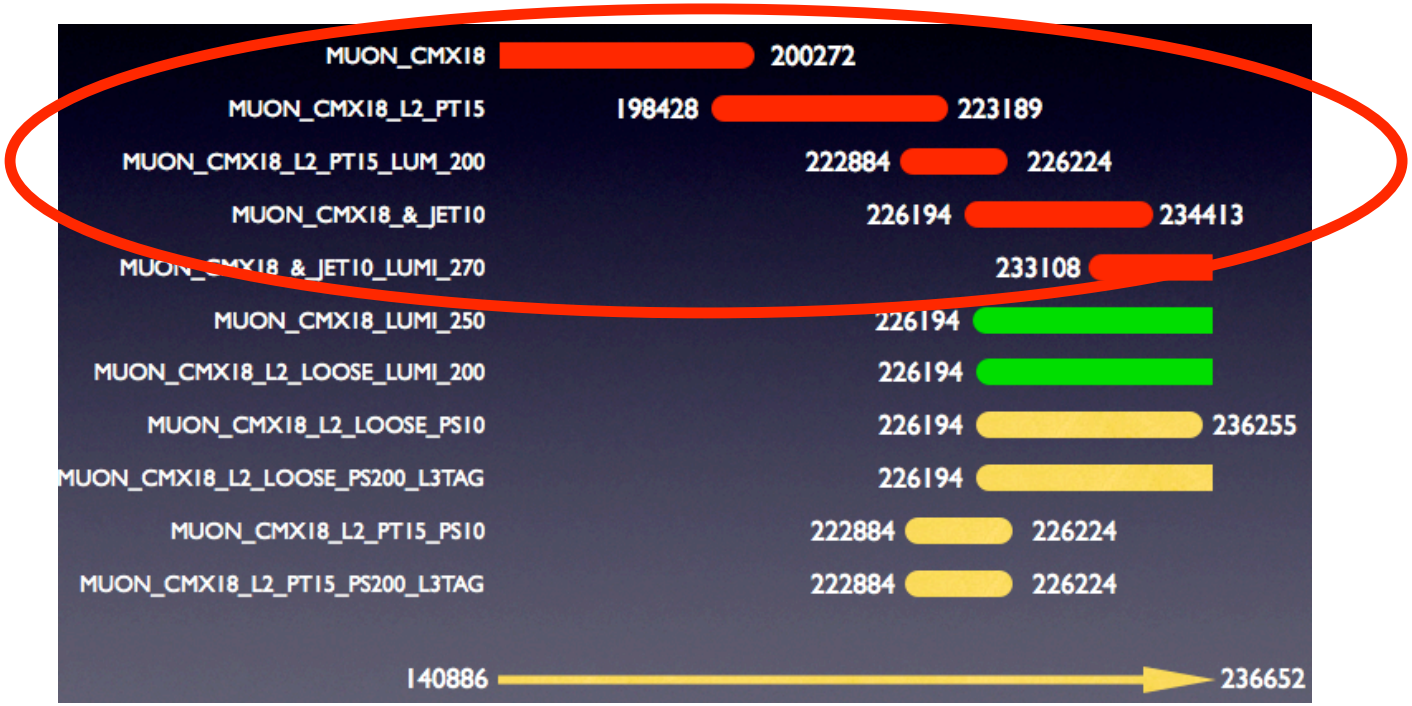


Muons: Trigger

CMUP Trigger

	CMUP18 trigger path
Level 1	L1_CMUP6_PT4
Level 2	L2_AUTO_L1_CMUP6_PT4 (run≤152949) L2_TRK8_L1_CMUP6_PT4(152949<run≤179056) L2_CMUP6_PT8(181013≤run≥202717) L2_CMUP6_PT15(run≥198428)
Level 3	L3_MUON_CMUP18

CMX Trigger: changed



Muons: Trigger Eff

Based on the muon types, there are three combinations, CMUP-CMUP, CMX-CMX, CMUP-CMX. The CMUP-CMUP (CMX-CMX) and CMUP-CMX events have been used in the calculation of L1 CMUP (CMX) trigger efficiency. There is no significant difference in the L1 trigger efficiency between the two sets of events. Therefore, we only use CMUP-CMX in the calculation of L3 trigger efficiencies.

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Level 1

	Efficiency (%)			
	bhmu0d	bhmu0h	bhmu0i	bhmu0i2
CMUP	90.49 ± 0.42	93.03 ± 0.33	92.80 ± 0.41	92.57 ± 0.51
CMX	96.77 ± 0.35	89.39 ± 0.49	89.36 ± 0.60	88.90 ± 0.77
Arches	96.77 ± 0.35	96.06 ± 0.35	95.57 ± 0.45	95.15 ± 0.58
Mini./Key.		77.36 ± 0.39	74.75 ± 1.83	75.98 ± 2.25

$$\epsilon_{CMUP}^{L1(A)} = \frac{\text{number of events with both legs triggered}}{\text{number of events with 1 CMX trigger leg}} \quad (1)$$

Second, using the CMUP-CMUP trigger sample:

$$R = \frac{\text{number of events with both legs triggered}}{\text{number of events with } \geq 1 \text{ CMUP triggered leg}} \quad (2)$$

$$\epsilon_{CMUP}^{L1(B)} = \frac{2R}{1+R} \quad (3)$$

bhmumi

1st leg	2nd leg	1st passes	both pass	Efficiency (%)
CMUP	CMUP	918	830	-
CMX	CMUP	1026	948	94.21 ± 0.45
CMUP	CMX	1060	948	-
CMX	CMX	359	272	88.49 ± 0.79
CMUP	ARCH	856	814	-
CMUP	MK	204	134	
ARCH	ARCH	251	217	-
ARCH	MK	86	44	
MK	ARCH	46	44	94.53 ± 0.62
MK	MK	20	11	75.53 ± 2.43

TABLE XI: Dataset bhmumi-1: Muon L1 trigger efficiencies

Muons: Trigger Eff (L3)

$$\epsilon^{L3}_{CMUP} = \frac{\text{number of events pass both L3 triggers}}{\text{number of events pass L3 CMX trigger}}$$

$$\epsilon^{L3}_{CMX} = \frac{\text{number of events pass both L3 triggers}}{\text{number of events pass L3 CMUP trigger}}$$

Level 3

	Efficiency (%)			
	bhmu0d	bhmu0h	bhmu0i	bhmu0i2
CMUP	99.62 ± 0.16	98.79 ± 0.23	98.91 ± 0.27	98.63 ± 0.38
CMX	99.87 ± 0.09	99.48 ± 0.15	99.79 ± 0.12	99.47 ± 0.24
Arches	99.87 ± 0.09	99.41 ± 0.18	99.83 ± 0.12	99.48 ± 0.26
Mini./Key.		99.76 ± 0.24	99.58 ± 0.42	99.41 ± 0.59

bhmumi

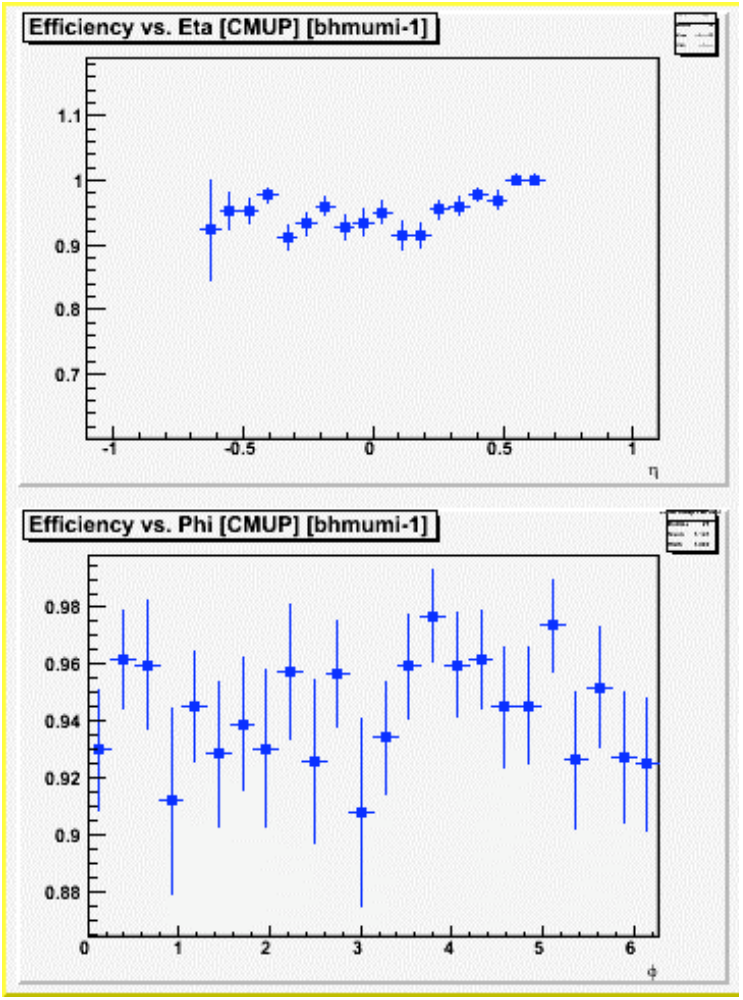
Category	Events Passing	Efficiency (%)
Pass L2	948	-
CMUP	933	98.80 ± 0.45
CMX	582	61.63 ± 1.59
CMUP-CMX	575	-
CMUPA	799	-
CMUPMK	134	-
CMUPARCH	498	62.33 ± 1.71
CMUP-MK	77	57.46 ± 4.27

TABLE XIII: Dataset bhmumi-1: Muon L3 trigger efficiencies

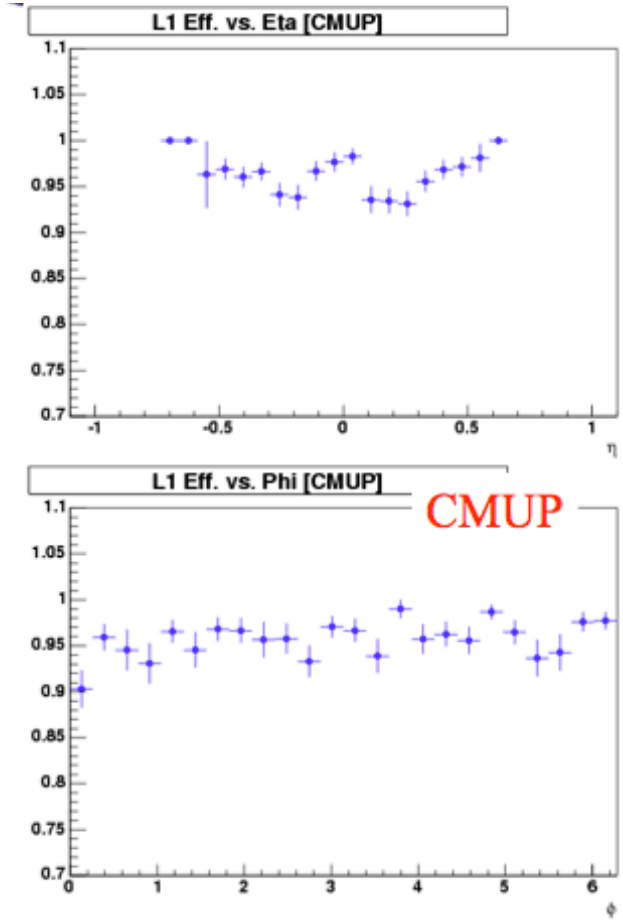
CMX Trigger Eff need to be redefined

Muons: L1 Trigger Eff

Period 9

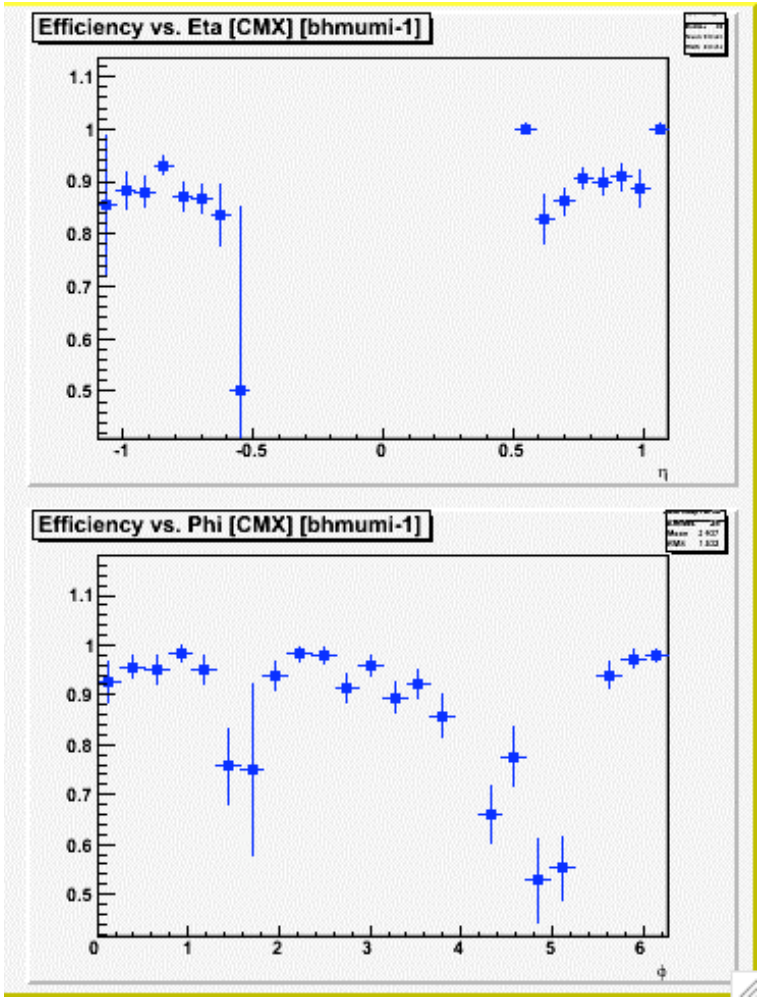


Period 8



Muons: L1 Trigger Eff

Period 9



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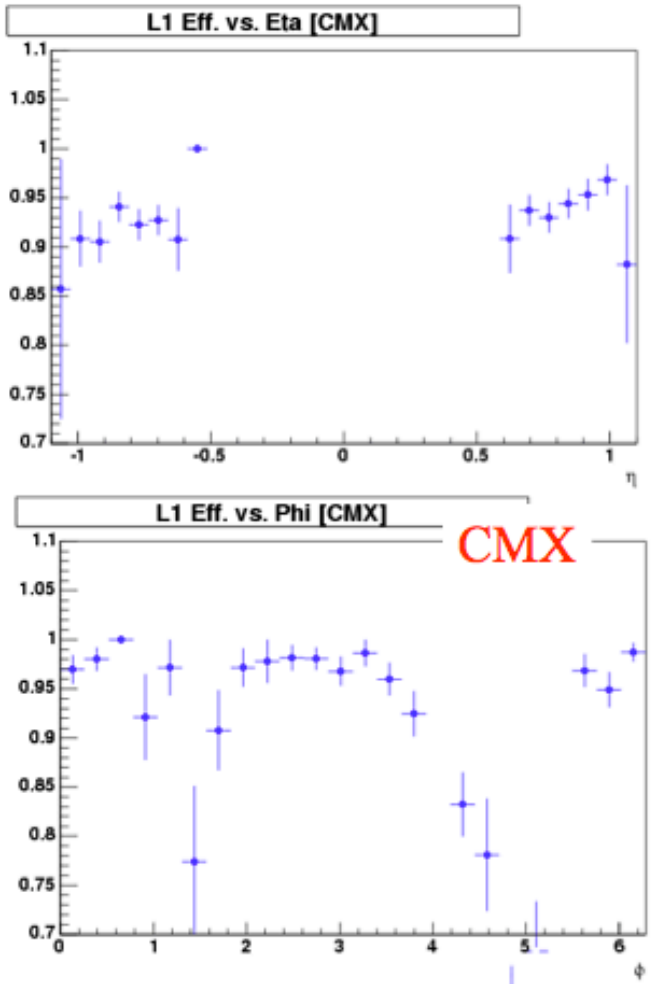

Muons: Reconstruction

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To calculate the reconstruction efficiency we select events with no cosmic tag and two tracks passing the following cuts:

- Oppositely charged.
- $|z_0^{(1)} - z_0^{(2)}| < 4$ cm.
- $81\ \mathrm{GeV}/c^2 < m(\mu^+\mu^-) < 101\ \mathrm{GeV}/c^2$
- The first leg must be a reconstructed `CdfMuon` passing all the ID and fiducial cuts given in Tables 1 and 2. It must also match to the level 1 trigger information.
- The second leg must be fiducial in both the CMU and CMP sub-detectors (or the CMX sub-detector) and satisfy:
  - $P_T > 20$ GeV.
  - $E_{EM} < 1.5 \cdot (2 + \max(0, (p - 100) \cdot 0.0115))$ GeV
  - $E_{HAD} < 1.5 \cdot (6 + \max(0, (p - 100) \cdot 0.028)$ GeV

Muons: Reconstruction Eff

Category	Fiducial	w/ Stub	Efficiency (%)
CMUP	2928	2715	92.73 ± 0.48
CMX	1673	1590	95.04 ± 0.53
CMX Arches	1316	1290	98.02 ± 0.38
CMX Miniskirt	295	242	82.03 ± 2.24
CMX Keystone	62	58	93.55 ± 3.12
CMU-only	727	651	89.55 ± 1.13
CMP-only	741	673	90.82 ± 1.06
CMX MiniKey	357	300	84.03 ± 1.94

TABLE XI: Dataset bhmumi: Muon reconstruction efficiencies

	Efficiency (%)			
Category	bhmu0d	bhmu0h	bhmu0i	bhmu0i2
CMUP	92.71 ± 0.35	91.63 ± 0.34	91.78 ± 0.42	93.04 ± 0.47
CMX	99.36 ± 0.16	97.47 ± 0.25	97.39 ± 0.31	96.67 ± 0.44
Arches	99.36 ± 0.16	99.07 ± 0.18	98.68 ± 0.25	98.91 ± 0.29
Miniskirt		92.57 ± 0.94	92.62 ± 1.18	87.96 ± 1.81
Keystone		91.67 ± 2.13	94.50 ± 2.18	95.77 ± 2.39

Category	Scale Factor
CMUP	0.9518 ± 0.0050
CMX	0.9537 ± 0.0053
CMX Arches	0.9822 ± 0.0039
CMX Miniskirt	0.8265 ± 0.0225
CMX Keystone	0.9478 ± 0.0317
CMU-only	0.9173 ± 0.0117
CMP-only	0.9234 ± 0.0108
CMX MiniKey	0.8475 ± 0.0196

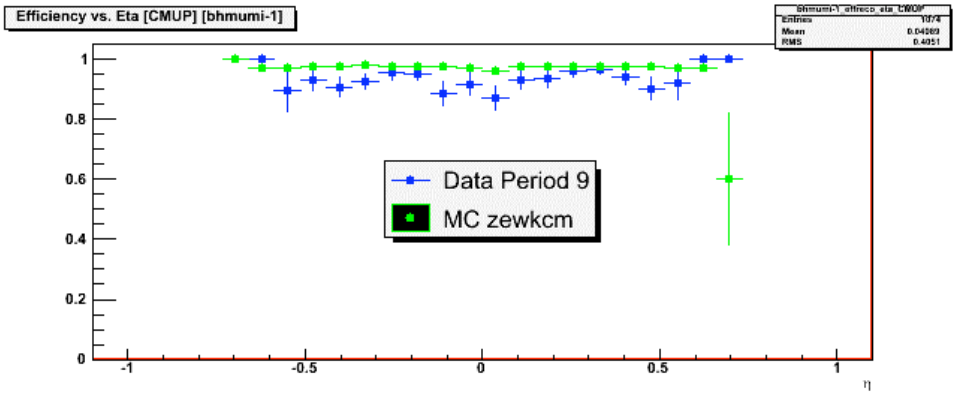
Category	Fiducial	w/ Stub	Efficiency (%)
CMUP	58947	57426	97.42 ± 0.07
CMX	36213	36086	99.65 ± 0.03
CMX Arches	27747	27692	99.80 ± 0.03
CMX Miniskirt	6853	6802	99.26 ± 0.10
CMX Keystone	1613	1592	98.70 ± 0.28
CMU-only	13547	13225	97.62 ± 0.13
CMP-only	16909	16631	98.36 ± 0.10

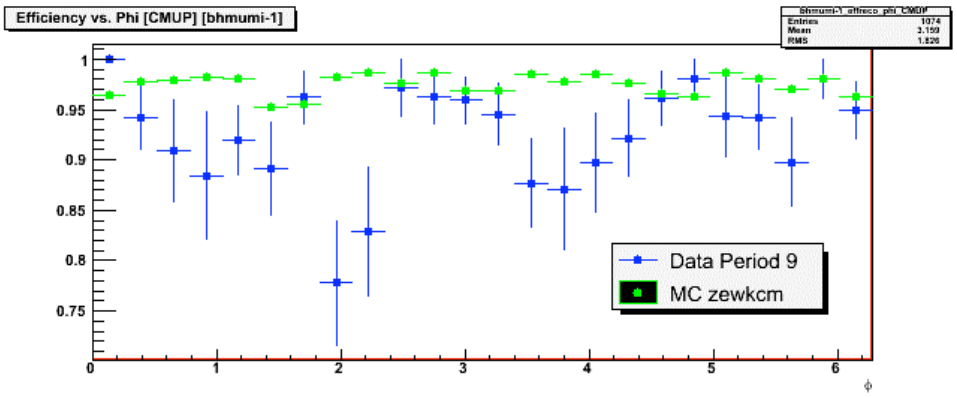
TABLE X: Dataset zewkcm-1: Muon reconstruction efficiencies

	Efficiency (%)		
Category	zewkam	zewk9m	zewkbm
CMUP	97.53 ± 0.05	97.57 ± 0.03	97.43 ± 0.06
CMX	99.81 ± 0.02	99.61 ± 0.02	99.62 ± 0.03
Arches	99.84 ± 0.02	99.79 ± 0.02	99.80 ± 0.03
Miniskirt		99.06 ± 0.06	99.07 ± 0.12
Keystone		98.99 ± 0.13	98.90 ± 0.26

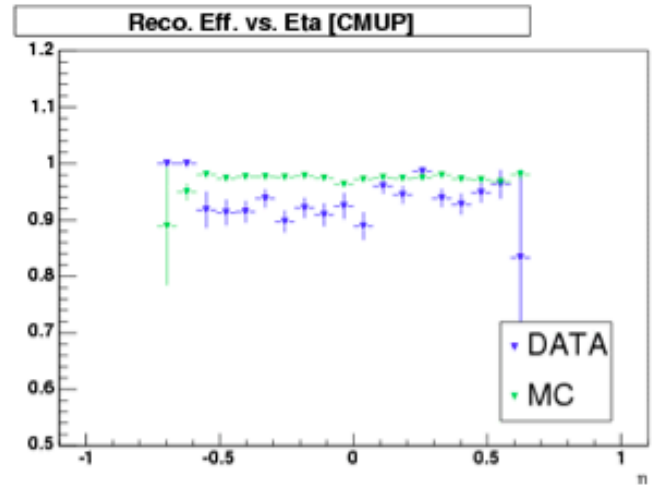
Muons: Reconstruction Eff

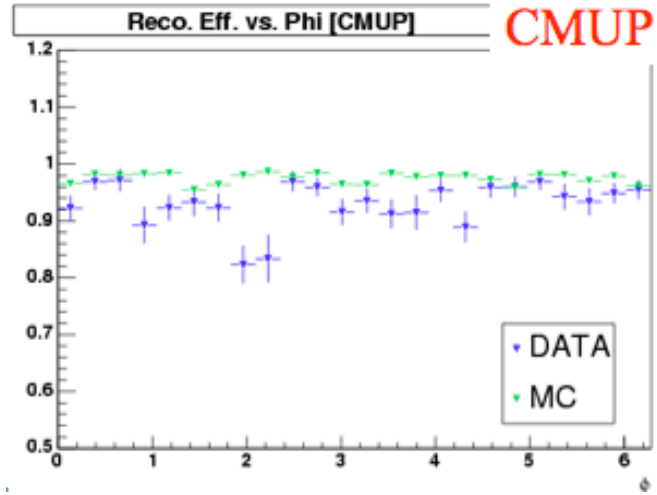
Period 9





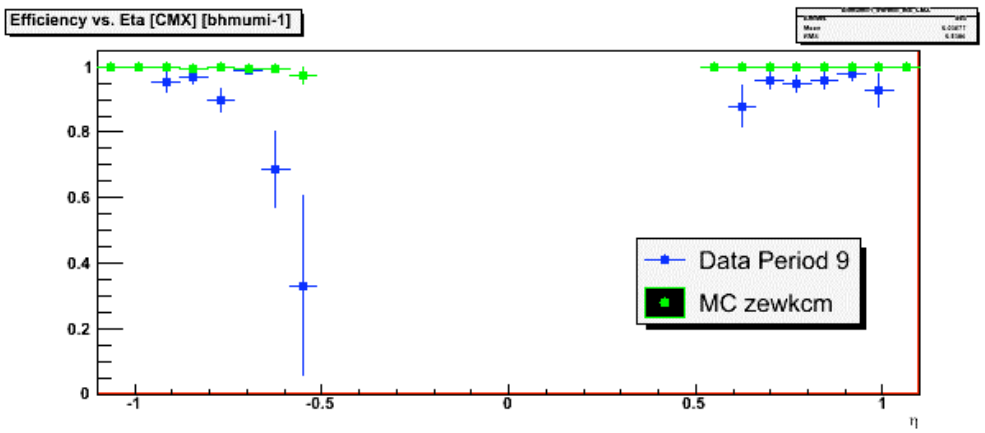
Period 8

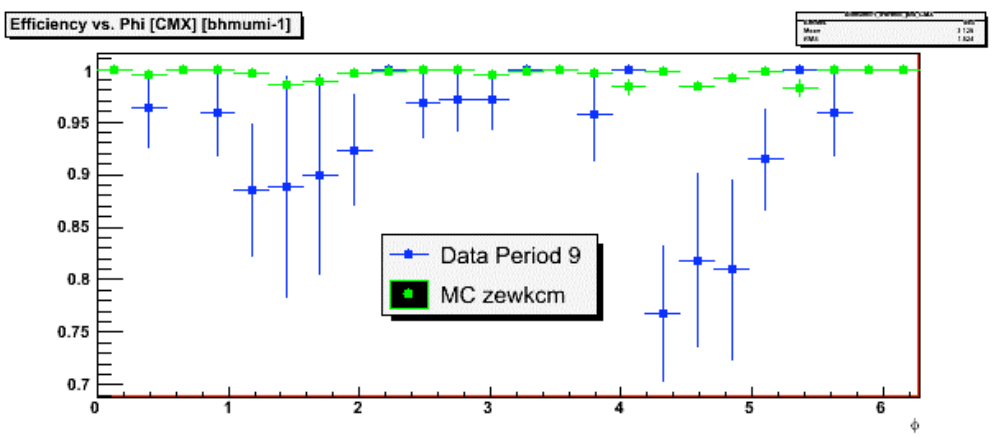




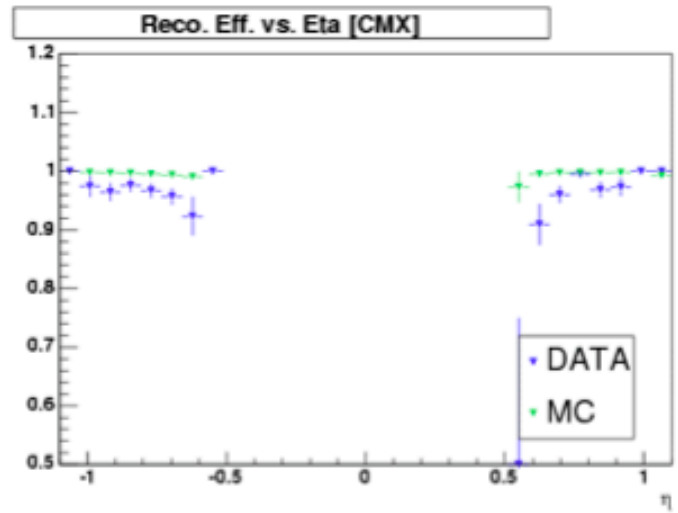
Muons: Reconstruction Eff

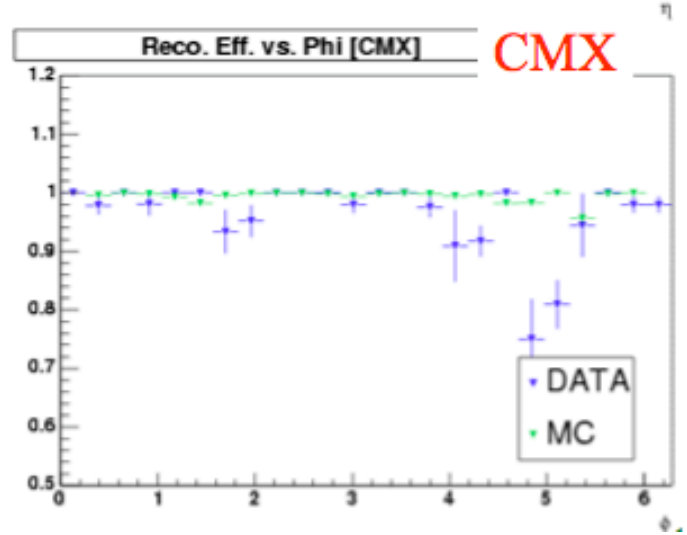
Period 9





Period 8





Conclusions and missing Items

- Electrons ID:
  - ok - new code available in beta version for next period
- Electron Trigger Efficiencies:
  - ok
- Muons:
  - ID/Reco ok (might need to run on the final skimmed set and check the CMX trigger requirements)
  - CMX trigger redefined: efficiencies will need to be redefined and recalculated

Muon: Reco SF (previous)

	Scale Factor			
Category	bhmu0d	bhmu0h	bhmu0i	bhmu0i2
CMUP	0.9505 ± 0.0037	0.9390 ± 0.0035	0.9406 ± 0.0043	0.9550 ± 0.0049
CMX	0.9955 ± 0.0016	0.9785 ± 0.0025	0.9777 ± 0.0031	0.9703 ± 0.0044
Arches	0.9955 ± 0.0016	0.9928 ± 0.0018	0.9889 ± 0.0025	0.9911 ± 0.0029
Mini./Key.		0.9330 ± 0.0087	0.9386 ± 0.0106	0.9024 ± 0.0157