Period 13 High PT Lepton Efficiencies and SF - Muon Trigger Eff

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Tufts

Muons

Dataset bhelmi: Runs 241665-246231
MC sample : zewkgm (Dec 2007)
GRL : v19 GRL

Data: P13 Lepton Skims
MC: dataset zemtgm on SAM

Trigger Efficiencies

Use the two legs from the reconstructed Z (both legs pass muon ID and fiducial cuts)

Level 1:

ε^{L1}_{CMUP} is calculated from 2 independent samples, using CMUP-CMUP and CMUP-CMX samples:

$$\mathring{a}^{L1(A)}_{CMUP} = \frac{\#\text{ of events with both legs triggered}}{\#\text{ of events with 1 CMX leg triggered}}$$

$$\mathring{a}^{L1(B)}_{CMUP} = \frac{2R}{1+R}$$

$$R = \frac{\#\text{ of events with both legs triggered}}{\#\text{ of events with} \geq 1\text{ CMUP leg triggered}}$$

The final efficiency is an average of $\varepsilon^{L1(A)}_{CMUP}$ and $\varepsilon^{L1(B)}_{CMUP}$ weighted by the errors.

Level 2: (both leg pass L1)

$$\mathring{a}^{L2}_{CMUP} = \frac{\#\text{ of events pass both L2 triggers}}{\#\text{ of events pass L2 CMX trigger}}$$

Level 3: (both leg pass L2)

$$\mathring{a}^{L3}_{CMUP} = \frac{\#\text{ of events pass both L3 triggers}}{\#\text{ of events pass L3 CMX trigger}}$$

CMX trigger efficiency is calculated in similar way.

Efficiencies not corrected for livetimes

1st leg	2nd leg	1st passes	both pass	Efficiency (%)
CMUP	CMUP	1414	1236	-
CMX	CMUP	1593	1497	$93.55^{+0.42}_{-0.40}$
CMUP	CMX	1699	1497	-
CMX	CMX	552	437	$88.20^{+0.70}_{-0.65}$
CMUP	ARCH	1360	1297	-
CMUP	MK	339	200	-
ARCH	ARCH	407	360	-
ARCH	MK	109	60	-
MK	ARCH	67	60	$94.78^{+0.53}_{-0.48}$
MK	MK	29	17	$69.27^{+2.21}_{-2.14}$

TABLE I: Dataset bhmumj_p13_All-1: Muon L1 trigger efficiencies

Category	Events Passing	Efficiency (%)
Pass L1	1497	-
CMUP	1384	$97.61^{+0.41}_{-0.47}$
CMX	1341	$94.58^{+0.59}_{-0.68}$
CMUP-CMX	1309	-
CMUP-A	1197	-
CMUP-MK	187	-
CMUP-CMX-A	1135	$94.82^{+0.64}_{-0.73}$
CMUP-CMX-MK	174	$93.05^{+1.78}_{-2.33}$

TABLE II: Dataset bhmumj_p13_All-1: Muon L2 trigger efficiencies

Category	Events Passing	Efficiency (%)
Pass L1	1497	-
CMUP-CMUP$_S$	1261	-
CMX-CMX$_S$	1292	-
CMUP-CMX-CMUP$_S$	1193	$88.96^{+0.83}_{-0.93}$
CMUP-CMX-CMX$_S$	1262	$91.18^{+0.76}_{-0.80}$
CMUP-CMX-CMX$_S$-A	1091	$91.14^{+0.80}_{-0.86}$
CMUP-CMX-CMX$_S$-MK	171	$91.44^{+2.01}_{-2.48}$

TABLE III: Dataset bhmumj_p13_All-1: Muon L2 SLAM trigger efficiencies

Trigger Eff

Category	Events Passing	Efficiency (%)
Pass L2	1309	-
CMUP	1302	$99.54^{+0.18}_{-0.28}$
CMX	1298	$99.23^{+0.24}_{-0.32}$
CMUP-CMX	1292	-
CMUPA	1129	-
CMUPMK	173	-
CMUPARCH	1120	$99.20^{+0.28}_{-0.35}$
CMUP-MK	172	$99.42^{+0.43}_{-1.33}$

TABLE IV: Dataset bhmumj_p13_All-1: Muon L3 trigger efficiencies

<u>Livetimes and correction factors</u>
CMUP 2-D Livetime .933077
CMUP 3-D Livetime .999954
CMX 2-D Livetime .895904
CMX 3-D Livetime .948004

CMUP 2-D correction 1
CMX 2-D correction .960160

Category	Efficiency (%)
CMUP	$90.90^{+0.58}_{-0.64}$
CMX	$82.78^{+0.85}_{-0.90}$
CMX A	$89.15^{+0.82}_{-0.88}$
CMX MK	$64.08^{+2.39}_{-2.69}$
CMUP SLAM	$82.84^{+0.87}_{-0.96}$
CMX SLAM	$79.81^{+0.94}_{-0.95}$
CMX SLAM A	$85.69^{+0.92}_{-0.97}$
CMX SLAM MK	$62.98^{+2.45}_{-2.72}$

TABLE V: Dataset bhmumj_p13_All-1: Muon combined trigger efficiencies

CMX = 82.78 / 0.96 = 86.23
CMX SLAM = 79.81 / 0.96 = 83.13
CMX A = 89.15 / 0.96 = 92.86
CMX SLAM A = 85.69 / 0.96 = 89.26

P12 Trigger Efficiencies (not corrected)

1st leg	2nd leg	1st passes	both pass	Efficiency (%)
CMUP	CMUP	803	720	-
CMX	CMUP	868	818	$94.44^{+0.55}_{-0.49}$
CMUP	CMX	939	818	-
CMX	CMX	335	259	$87.15^{+0.99}_{-0.89}$
CMUP	ARCH	731	694	-
CMUP	MK	208	124	-
ARCH	ARCH	231	203	-
ARCH	MK	80	46	-
MK	ARCH	48	46	$94.61^{+0.77}_{-0.65}$
MK	MK	22	10	$70.36^{+2.87}_{-2.73}$

TABLE I: Dataset bhmumjP12-1: Muon L1 trigger efficiencies

Category	Events Passing	Efficiency (%)
Pass L1	818.000000	-
CMUP	772.000000	$98.12^{+0.47}_{-0.63}$
CMX	743.000000	$94.43^{+0.83}_{-0.92}$
CMUP SLAM	699.000000	$89.37^{+0.47}_{-0.63}$
CMX SLAM	708.000000	$90.03^{+0.83}_{-0.92}$
CMUPMK	121.000000	-
CMUPARCH	615.000000	$94.47^{+0.89}_{-1.06}$
CMUP-MK	114.000000	$94.21^{+2.07}_{-2.91}$

TABLE II: Dataset bhmumjP12-1: Muon L2 trigger efficiencies

Category	Events Passing	Efficiency (%)
Pass L2	729.000000	-
CMUP	725.000000	$99.72^{+0.19}_{-0.37}$
CMX	726.000000	$99.86^{+0.13}_{-0.31}$
CMUP SLAM	660.000000	$99.72^{+0.19}_{-0.37}$
CMX SLAM	692.000000	$99.86^{+0.13}_{-0.31}$
CMUPMK	112.000000	-
CMUPARCH	612.000000	$99.84^{+0.13}_{-0.39}$
CMUP-MK	112.000000	$100.00^{+0.00}_{-1.63}$

TABLE III: Dataset bhmumjP12-1: Muon L3 trigger efficiencies

Category	Efficiency (%)
CMUP	$92.41^{+0.72}_{-0.84}$
CMX	$82.18^{+1.18}_{-1.19}$
CMUP SLAM	$84.17^{+0.68}_{-0.80}$
CMX SLAM	$78.35^{+1.15}_{-1.16}$
ARCH	$89.23^{+1.12}_{-1.23}$
MK	$66.29^{+3.07}_{-3.46}$

: Dataset bhmumjP12-1: Muon combined trigger efficiencies

Comparison with previous periods (Eric James numbers)

Combined (L1+L2+L3) CMUP 2-D Trigger efficiencies

Period	Measured (SR)	Livetime Corr.	Corr. Efficiency
8	0.9130(67)	1.000	0.9130(67)
9	0.9270(67)	1.000	0.9270(67)
10	0.9196(56)	1.000	0.9196(56)
11	0.9198(61)	1.000	0.9198(61)
12	0.9241(78)	1.000	0.9241(78)
13	0.9090(61)	1.0	0.9090(61)
13(Eric)	0.9089(64)	1.0	0.9089(64)

CMUP

Combined (L1+L2+L3) CMUP 3-D Trigger efficiencies

Period	2-D Efficiency	2-D+3-D/2-D (SR)	3-D Efficiency
10	0.9196(56)	0.9265(78)	0.8520(89)
11	0.9198(61)	0.9375(88)	0.8623(98)
12	0.9241(78)	0.9108(105)	0.8417(120)
13	0.9090(61)		0.8284 (91)
13 (Eric)	0.9090(64)		0.8284 (90)

Comparison with previous periods

Combined (L1+L2+L3) CMX 2-D Trigger efficiencies

Arches-only:

Period	Measured (SR)	Livetime Corr.	Corr. Efficiency
12	0.8923 (118)	0.945	0.944 (125)
13	0.8915 (85)	0.9601	0.9285 (85)
13 (Eric)		0.9601	0.9267 (83)

CMX

Combined (L1+L2+L3) CMX 3-D Trigger efficiencies

Arches-only

Period	2-D Efficiency	3-D Efficiency
12	0.8923 /0.945 = 0.94(125)	0.9002 (140)
13	0.8915 / 0.9601= 0.93 (85o)	0.8569 / 0.9601 = 0.8926 (94)
13 (Eric)	0.93 (83)	0.8934 (94)

Conclusions

- P13 high PT lepton Efficiencies and SF have been calculated.
  - Muon Trigger Eff ok, we checked the errors as requested at the last meeting.