Muon Efficiencies for Period 9 Data using PerfIDia

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Muons

PerflDia

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

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- Documentation:
  - Web Page
  - 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

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://www-cdf.fnal.gov/internal/physics/top/RunIITopProp/gen6/filelists/gen6/bhmumi2_lepton.rootlist

http://ncdf70.fnal.gov:8001/PerfIDia/validation/bhmumi/zewkcm.rootlist

Trigger Eff: Where we were last time…

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

Category	Events Passing	Efficiency (%)
Pass L1	948	-
CMUP	948	100.00 ± 0.00
CMX	948	100.00 ± 0.00
CMUP-CMX	948	-
CMUPA	814	-
CMUPMK	134	-
CMUPARCH	814	100.00 ± 0.00
CMUP-MK	134	100.00 ± 0.00

TABLE XII: Dataset bhmumi-1: Muon L2 trigger efficiencies

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

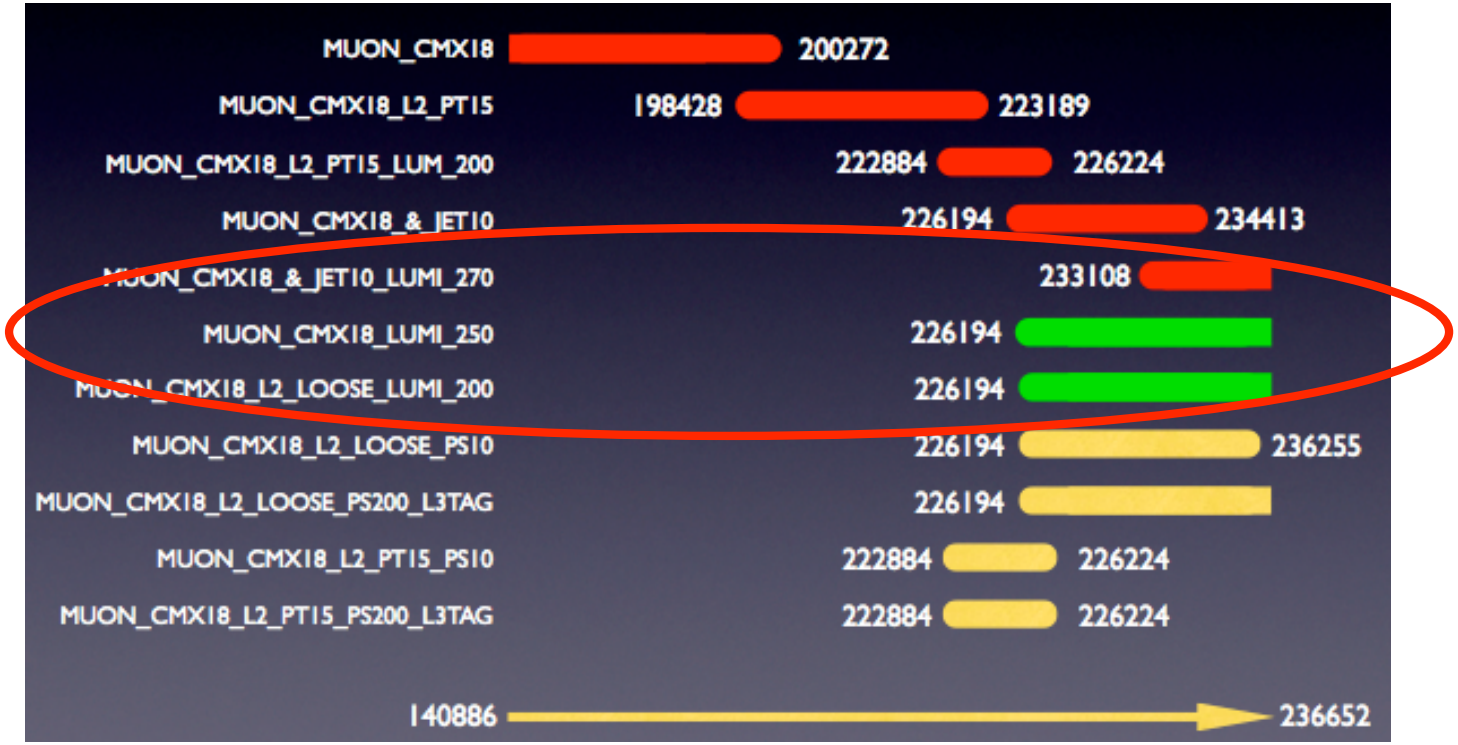
changes in the CMX trigger starting period 9…
Wrong path picked up.

Muon Trigger Eff

The CMX triggers were divided according to the following paths:

- CMX0: MUON_CMX18_LUMI ("old" CMX w/ SLAM confirmation)
- CMX1: MUON_CMX18_L2_LOOSE_LUMI ("old" CMX w/o SLAM conf)
- CMX1: MUON_CMX18_&_JET (new CMX + JET path)

- Each trigger was analyzed separately in the same fashion as the previous CMX trigger



Code to retrieve the trigger info

Outside the even loop

```
if(dataFlag){
      mytool->GetTriggerBitL3("MUON_CMX18_LUMI",
                              "MUON_CMX18_L2_LOOSE_LUMI",
                              "MUON_CMX18_&_JET",
                              chain, evtA,trnmA,"TrigOutput");
   }
```

Inside the event loop:

```
if(dataFlag){
    L3_CMUP0 = (((mytrigInfo->summaryWord >> 1) & 0x1) == 1);
    L3_CMUP1 = (((mytrigInfo->summaryWord >> 1) & 0x1) == 1);
    L3_CMUP2 = (((mytrigInfo->summaryWord >> 1) & 0x1) == 1);

    fired_cmx0 = mytool->testTriggerBitL3(event->runNumber,mytrigInfo,0);
    L3_CMX0  = fired_cmx0;
    fired_cmx1 = mytool->testTriggerBitL3(event->runNumber,mytrigInfo,1);
    L3_CMX1  = fired_cmx1;
    fired_cmx2 = mytool->testTriggerBitL3(event->runNumber,mytrigInfo,2);
    L3_CMX2  = fired_cmx2;

   }
```

Code (cont'd)

```
if(event->runNumber < CMX_FIRST_RUN)
                          {L3_CMX0 = false;L3_CMX1 = false ;L3_CMX2 = false;}

// Three different runs for the following conditions

 if ( event->runNumber > 226194 && event->runNumber!= 226336 && event->runNumber!=227723
    && event->runNumber!=227884) {
// SLAM trigger
    L3_CMX = L3_CMX0; // MUON_CMX18_LUMI_250_v-1
    L3_CMUP = L3_CMUP0;

// NO SLAM trigger
    L3_CMX = L3_CMX1; // MUON_CMX18_L2_LOOSE_LUMI_200_v-1
    L3_CMUP = L3_CMUP1;

// jet trigger
       if ( nAllJet > 0 && AllJet[0]->Et > 15) {
          L3_CMX = L3_CMX2; // MUON_CMX18_&_JET
          L3_CMUP = L3_CMUP2;
       } // if ( nAllJet > 0 && AllJet[0]->Et > 15)

    } // if ( event->runNumber > 226194 )
```

Trigger Eff L1

Period 9

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

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 ± 1.39	74.75 ± 1.83	75.98 ± 2.25

MUON_CMX18_L2_LOOSE_LUMI

No SLAM conf

Category	Events Passing	Efficiency (%)
Pass L2	948	-
CMUP	315	98.70 ± 0.65
CMX	308	96.51 ± 1.03
CMUP-CMX	304	-
CMUPA	272	-
CMUPMK	43	-
CMUPARCH	262	96.32 ± 1.14
CMUP-MK	42	97.67 ± 2.30

TABLE XIII: Dataset bhmumiCMX1-1: Muon L3 trigger efficiencies

Cut	Count	Efficiency (%)
No cut	1642	
E_{EM} cut	1599	97.38 ± 0.39
E_{HAD} cut	1607	97.87 ± 0.36
COT hits cut	1642	100.00 ± 0.00
d_0 cut	1638	99.76 ± 0.12
Isolation cut	1593	97.02 ± 0.42
Δx_{CMX} cut	1632	99.39 ± 0.19
All above cuts	1516	92.33 ± 0.66
All cuts excl. isol.	1558	94.88 ± 0.54
Sliding isol. cut	1599	97.38 ± 0.39
All cuts (sliding isol.)	1521	92.63 ± 0.64
χ^2 cut	1642	100.00 ± 0.00
All cuts (χ^2)	1516	92.33 ± 0.66
All track cuts	1523	92.75 ± 0.64
All trk cuts excl. isol.	1565	95.31 ± 0.52

TABLE II: Dataset bhmumiCMX1-1: Muon ID efficiencies for CMX

Category	Fiducial	w/ Stub	Efficiency (%)
CMUP	2930	2717	92.73 ± 0.48
CMX	1680	1597	95.06 ± 0.53
CMX Arches	1322	1296	98.03 ± 0.38
CMX Miniskirt	296	243	82.09 ± 2.23
CMX Keystone	62	58	93.55 ± 3.12
CMU-only	728	652	89.56 ± 1.13
CMP-only	743	674	90.71 ± 1.06

TABLE X: Dataset bhmumiCMX1-1: Muon reconstruction efficiencies

MUON_CMX18_LUMI

SLAM confirmation

Category	Events Passing	Efficiency (%)
Pass L2	948	-
CMUP	315	98.64 ± 0.67
CMX	295	92.38 ± 1.49
CMUP-CMX	291	-
CMUPA	272	-
CMUPMK	43	-
CMUPARCH	249	91.54 ± 1.69
CMUP-MK	42	97.67 ± 2.30

TABLE XIII: Dataset bhmumiCMX0-1: Muon L3 trigger efficiencies

Cut	Count	Efficiency (%)
No cut	1642	
E_{EM} cut	1599	97.38 ± 0.39
E_{HAD} cut	1607	97.87 ± 0.36
COT hits cut	1642	100.00 ± 0.00
d_0 cut	1638	99.76 ± 0.12
Isolation cut	1593	97.02 ± 0.42
Δx_{CMX} cut	1632	99.39 ± 0.19
All above cuts	1516	92.33 ± 0.66
All cuts excl. isol.	1558	94.88 ± 0.54
Sliding isol. cut	1599	97.38 ± 0.39
All cuts (sliding isol.)	1521	92.63 ± 0.64
χ^2 cut	1642	100.00 ± 0.00
All cuts (χ^2)	1516	92.33 ± 0.66
All track cuts	1523	92.75 ± 0.64
All trk cuts excl. isol.	1565	95.31 ± 0.52

TABLE II: Dataset bhmumiCMX0-1: Muon ID efficiencies for CMX

Category	Fiducial	w/ Stub	Efficiency (%)
CMUP	2930	2717	92.73 ± 0.48
CMX	1680	1597	95.06 ± 0.53
CMX Arches	1322	1296	98.03 ± 0.38
CMX Miniskirt	296	243	82.09 ± 2.23
CMX Keystone	62	58	93.55 ± 3.12
CMU-only	728	652	89.56 ± 1.13
CMP-only	743	674	90.71 ± 1.06

TABLE X: Dataset bhmumiCMX0-1: Muon reconstruction efficiencies

MUON_CMX18_&_JET10_LUMI

Category	Events Passing	Efficiency (%)
Pass L2	948	-
CMUP	41	100.00 ± 0.00
CMX	40	97.56 ± 2.41
CMUP-CMX	40	-
CMUPA	34	-
CMUPMK	7	-
CMUPARCH	33	97.06 ± 2.90
CMUP-MK	7	100.00 ± 0.00

TABLE XXVI: Dataset bhmumiCMX2-1: Muon L3 trigger efficiencies

Cut	Count	Efficiency (%)
No cut	1642	
E_{EM} cut	1599	97.38 ± 0.39
E_{HAD} cut	1607	97.87 ± 0.36
COT hits cut	1642	100.00 ± 0.00
d_0 cut	1638	99.76 ± 0.12
Isolation cut	1593	97.02 ± 0.42
Δx_{CMX} cut	1632	99.39 ± 0.19
All above cuts	1516	92.33 ± 0.66
All cuts excl. isol.	1558	94.88 ± 0.54
Sliding isol. cut	1599	97.38 ± 0.39
All cuts (sliding isol.)	1521	92.63 ± 0.64
χ^2 cut	1642	100.00 ± 0.00
All cuts (χ^2)	1516	92.33 ± 0.66
All track cuts	1523	92.75 ± 0.64
All trk cuts excl. isol.	1565	95.31 ± 0.52

TABLE XV: Dataset bhmumiCMX2-1: Muon ID efficiencies for CMX

Category	Fiducial	w/ Stub	Efficiency (%)
CMUP	2930	2717	92.73 ± 0.48
CMX	1680	1597	95.06 ± 0.53
CMX Arches	1322	1296	98.03 ± 0.38
CMX Miniskirt	296	243	82.09 ± 2.23
CMX Keystone	62	58	93.55 ± 3.12
CMU-only	728	652	89.56 ± 1.13
CMP-only	743	674	90.71 ± 1.06

TABLE XXIII: Dataset bhmumiCMX2-1: Muon reconstruction efficiencies

MUON_CMX18_&_JET10_LUMI

Efficiency as function of jet Et cut

Category	Events passing	Efficiency
Pass L2	948	
Et > 10 GeV	59	75.00 ± 4.97
Et > 13 GeV	49	90.57 ± 4.02
Et > 14 GeV	46	93.75 ± 3.49
Et > 15 GeV	41	97.56 ± 2.41
Et > 20 GeV	28	96.55 ± 3.39
Et > 25 GeV	21	100 ± 0.0
Et > 30 GeV	21	100 ± 0.0

Muons: Reconstruction Eff

Category	Fiducial	w/ Stub	Efficiency (%)
CMUP	2930	2717	92.73 ± 0.48
CMX	1680	1597	95.06 ± 0.53
CMX Arches	1322	1296	98.03 ± 0.38
CMX Miniskirt	296	243	82.09 ± 2.23
CMX Keystone	62	58	93.55 ± 3.12
CMU-only	728	652	89.56 ± 1.13
CMP-only	743	674	90.71 ± 1.06

TABLE X: Dataset bhmumi-1: 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

SF	zewkcm	zewkbm
CMUP	0.9518	0.9550
CMX	0.9539	0.9703
Arches	0.9822	0.9911
MiniSkirts	0.8270	0.9024

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

ID Efficiencies

Cut	Count	Efficiency (%)
No cut	2777	
E_{EM} cut	2703	97.34 ± 0.31
E_{HAD} cut	2731	98.34 ± 0.24
COT hits cut	2775	99.93 ± 0.05
d_0 cut	2763	99.50 ± 0.13
Isolation cut	2690	96.87 ± 0.33
Δx_{CMU} cut	2770	99.75 ± 0.10
Δx_{CMP} cut	2722	98.02 ± 0.26
All above cuts	2510	90.39 ± 0.56
All cuts excl. isol.	2584	93.05 ± 0.48
Sliding isol. cut	2720	97.95 ± 0.27
All cuts (sliding isol.)	2538	91.39 ± 0.53
χ^2 cut	2777	100.00 ± 0.00
All cuts (χ^2)	2510	90.39 ± 0.56
All track cuts	2568	92.47 ± 0.50
All trk cuts excl. isol.	2645	95.25 ± 0.40

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

Cut	Count	Efficiency (%)
No cut	1642	
E_{EM} cut	1599	97.38 ± 0.39
E_{HAD} cut	1607	97.87 ± 0.36
COT hits cut	1642	100.00 ± 0.00
d_0 cut	1638	99.76 ± 0.12
Isolation cut	1593	97.02 ± 0.42
Δx_{CMX} cut	1632	99.39 ± 0.19
All above cuts	1516	92.33 ± 0.66
All cuts excl. isol.	1558	94.88 ± 0.54
Sliding isol. cut	1599	97.38 ± 0.39
All cuts (sliding isol.)	1521	92.63 ± 0.64
χ^2 cut	1642	100.00 ± 0.00
All cuts (χ^2)	1516	92.33 ± 0.66
All track cuts	1523	92.75 ± 0.64
All trk cuts excl. isol.	1565	95.31 ± 0.52

TABLE II: Dataset bhmumi-1: 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

Period 9

SF	CMUP	CMX
All Cuts	0.9879	0.9823
All Cuts excl isol	0.9905	1.0094

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