| Cut | Count | Efficiency (%) |
|---|---|---|
| No cut | 3039 | |
| $E_{EM}$ cut | 2951 | $97.10^{+0.28}_{-0.35}$ |
| $E_{HAD}$ cut | 2980 | $98.06^{+0.26}_{-0.28}$ |
| COT hits cut | 3036 | $99.90^{+0.05}_{-0.09}$ |
| $d_0$ cut | 3020 | $99.37^{+0.15}_{-0.17}$ |
| Isolation cut | 2865 | $94.27^{+0.43}_{-0.45}$ |
| $\Delta x_{CMU}$ cut | 3029 | $99.67^{+0.10}_{-0.14}$ |
| $\Delta x_{CMP}$ cut | 2973 | $97.83^{+0.24}_{-0.29}$ |
| All above cuts | 2648 | $87.13^{+0.61}_{-0.66}$ |
| All cuts excl. isol. | 2800 | $92.14^{+0.47}_{-0.51}$ |
| Sliding isol. cut | 2920 | $96.08^{+0.38}_{-0.41}$ |
| All cuts (sliding isol.) | 2694 | $88.65^{+0.56}_{-0.61}$ |
| $\chi^2$ cut | 3039 | $100.00^{+0.00}_{-0.06}$ |
| All cuts ($\chi^2$) | 2648 | $87.13^{+0.61}_{-0.66}$ |
| All track cuts | 2718 | $89.44^{+0.55}_{-0.62}$ |
| All trk cuts excl. isol. | 2874 | $94.57^{+0.42}_{-0.45}$ |

TABLE I: Dataset bhmummP25_SAM: Muon ID efficiencies for CMUP

| Cut | Count | Efficiency (%) |
|---|---|---|
| No cut | 1935 | |
| $E_{EM}$ cut | 1871 | $96.69^{+0.40}_{-0.48}$ |
| $E_{HAD}$ cut | 1893 | $97.83^{+0.34}_{-0.39}$ |
| COT hits cut | 1934 | $99.95^{+0.04}_{-0.12}$ |
| $d_0$ cut | 1930 | $99.74^{+0.11}_{-0.17}$ |
| Isolation cut | 1838 | $94.99^{+0.50}_{-0.53}$ |
| $\Delta x_{CMX}$ cut | 1923 | $99.38^{+0.17}_{-0.25}$ |
| All above cuts | 1733 | $89.56^{+0.72}_{-0.74}$ |
| All cuts excl. isol. | 1815 | $93.80^{+0.59}_{-0.59}$ |
| Sliding isol. cut | 1861 | $96.18^{+0.43}_{-0.50}$ |
| All cuts (sliding isol.) | 1754 | $90.65^{+0.71}_{-0.75}$ |
| $\chi^2$ cut | 1935 | $100.00^{+0.00}_{-0.10}$ |
| All cuts ($\chi^2$) | 1733 | $89.56^{+0.72}_{-0.74}$ |
| All track cuts | 1744 | $90.13^{+0.64}_{-0.72}$ |
| All trk cuts excl. isol. | 1827 | $94.42^{+0.55}_{-0.62}$ |

TABLE II: Dataset bhmummP25_SAM: Muon ID efficiencies for CMX

| Cut | Count | Efficiency (%) |
|---|---|---|
| No cut | 1564 | |
| $E_{EM}$ cut | 1516 | $96.93^{+0.46}_{-0.52}$ |
| $E_{HAD}$ cut | 1529 | $97.76^{+0.36}_{-0.42}$ |
| COT hits cut | 1563 | $99.94^{+0.06}_{-0.15}$ |
| $d_0$ cut | 1559 | $99.68^{+0.14}_{-0.21}$ |
| Isolation cut | 1485 | $94.95^{+0.51}_{-0.66}$ |
| $\Delta x_{CMX}$ cut | 1553 | $99.30^{+0.20}_{-0.29}$ |
| All above cuts | 1401 | $89.58^{+0.80}_{-0.86}$ |
| All cuts excl. isol. | 1468 | $93.86^{+0.62}_{-0.65}$ |
| Sliding isol. cut | 1505 | $96.23^{+0.48}_{-0.55}$ |
| All cuts (sliding isol.) | 1419 | $90.73^{+0.73}_{-0.84}$ |
| $\chi^2$ cut | 1564 | $100.00^{+0.00}_{-0.12}$ |
| All cuts ($\chi^2$) | 1401 | $89.58^{+0.80}_{-0.86}$ |
| All track cuts | 1411 | $90.22^{+0.75}_{-0.81}$ |
| All trk cuts excl. isol. | 1479 | $94.57^{+0.60}_{-0.67}$ |

TABLE III: Dataset bhmummP25_SAM: Muon ID efficiencies for CMX Arches

| Cut | Count | Efficiency (%) |
|---|---|---|
| No cut | 300 | |
| $E_{EM}$ cut | 286 | $95.33^{+1.25}_{-1.49}$ |
| $E_{HAD}$ cut | 296 | $98.67^{+0.60}_{-1.06}$ |
| COT hits cut | 300 | $100.00^{+0.00}_{-0.61}$ |
| $d_0$ cut | 300 | $100.00^{+0.00}_{-0.61}$ |
| Isolation cut | 289 | $96.33^{+1.03}_{-1.51}$ |
| $\Delta x_{CMX}$ cut | 299 | $99.67^{+0.26}_{-0.77}$ |
| All above cuts | 272 | $90.67^{+1.62}_{-2.09}$ |
| All cuts excl. isol. | 281 | $93.67^{+1.35}_{-1.77}$ |
| Sliding isol. cut | 291 | $97.00^{+1.00}_{-1.35}$ |
| All cuts (sliding isol.) | 274 | $91.33^{+1.73}_{-1.98}$ |
| $\chi^2$ cut | 300 | $100.00^{+0.00}_{-0.61}$ |
| All cuts ($\chi^2$) | 272 | $90.67^{+1.62}_{-2.09}$ |
| All track cuts | 273 | $91.00^{+1.68}_{-2.04}$ |
| All trk cuts excl. isol. | 282 | $94.00^{+1.41}_{-1.71}$ |

TABLE IV: Dataset bhmummP25_SAM: Muon ID efficiencies for CMX Miniskirt

| Cut | Count | Efficiency (%) |
|---|---|---|
| No cut | 71 | |
| $E_{EM}$ cut | 69 | $97.18^{+1.74}_{-3.53}$ |
| $E_{HAD}$ cut | 68 | $95.77^{+2.47}_{-3.78}$ |
| COT hits cut | 71 | $100.00^{+0.00}_{-2.56}$ |
| $d_0$ cut | 71 | $100.00^{+0.00}_{-2.56}$ |
| Isolation cut | 64 | $90.14^{+3.41}_{-4.79}$ |
| $\Delta x_{CMX}$ cut | 71 | $100.00^{+0.00}_{-2.56}$ |
| All above cuts | 60 | $84.51^{+4.36}_{-5.41}$ |
| All cuts excl. isol. | 66 | $92.96^{+2.94}_{-4.48}$ |
| Sliding isol. cut | 65 | $91.55^{+3.18}_{-4.64}$ |
| All cuts (sliding isol.) | 61 | $85.92^{+4.12}_{-5.25}$ |
| $\chi^2$ cut | 71 | $100.00^{+0.00}_{-2.56}$ |
| All cuts ($\chi^2$) | 60 | $84.51^{+4.36}_{-5.41}$ |
| All track cuts | 60 | $84.51^{+4.36}_{-5.41}$ |
| All trk cuts excl. isol. | 66 | $92.96^{+2.94}_{-4.48}$ |

TABLE V: Dataset bhmummP25_SAM: Muon ID efficiencies for CMX Keystone

| Cut | Count | Efficiency (%) |
|---|---|---|
| No cut | 371 | |
| $E_{EM}$ cut | 355 | $95.69^{+1.09}_{-1.25}$ |
| $E_{HAD}$ cut | 364 | $98.11^{+0.67}_{-0.99}$ |
| COT hits cut | 371 | $100.00^{+0.00}_{-0.50}$ |
| $d_0$ cut | 371 | $100.00^{+0.00}_{-0.50}$ |
| Isolation cut | 353 | $95.15^{+1.04}_{-1.30}$ |
| $\Delta x_{CMX}$ cut | 370 | $99.73^{+0.25}_{-0.63}$ |
| All above cuts | 332 | $89.49^{+1.63}_{-1.89}$ |
| All cuts excl. isol. | 347 | $93.53^{+1.29}_{-1.64}$ |
| Sliding isol. cut | 356 | $95.96^{+1.02}_{-1.28}$ |
| All cuts (sliding isol.) | 335 | $90.30^{+1.60}_{-1.72}$ |
| $\chi^2$ cut | 371 | $100.00^{+0.00}_{-0.50}$ |
| All cuts ($\chi^2$) | 332 | $89.49^{+1.63}_{-1.89}$ |
| All track cuts | 333 | $89.76^{+1.55}_{-1.77}$ |
| All trk cuts excl. isol. | 348 | $93.80^{+1.22}_{-1.52}$ |

TABLE VI: Dataset bhmummP25_SAM: Muon ID efficiencies for MiniKey

| Cut | Count | Efficiency (%) |
|---|---|---|
| No cut | 743 | |
| $E_{EM}$ cut | 715 | $96.23^{+0.69}_{-0.87}$ |
| $E_{HAD}$ cut | 726 | $97.71^{+0.58}_{-0.69}$ |
| COT hits cut | 743 | $100.00^{+0.00}_{-0.25}$ |
| $d_0$ cut | 739 | $99.46^{+0.27}_{-0.41}$ |
| Isolation cut | 698 | $93.94^{+0.83}_{-1.02}$ |
| $\Delta x_{CMU}$ cut | 740 | $99.60^{+0.22}_{-0.39}$ |
| All above cuts | 655 | $88.16^{+1.20}_{-1.34}$ |
| All cuts excl. isol. | 697 | $93.81^{+0.87}_{-0.99}$ |
| Sliding isol. cut | 714 | $96.10^{+0.73}_{-0.83}$ |
| All cuts (sliding isol.) | 669 | $90.04^{+1.07}_{-1.22}$ |
| $\chi^2$ cut | 743 | $100.00^{+0.00}_{-0.25}$ |
| All cuts ($\chi^2$) | 655 | $88.16^{+1.20}_{-1.34}$ |
| All track cuts | 656 | $88.29^{+1.26}_{-1.28}$ |
| All trk cuts excl. isol. | 698 | $93.94^{+0.83}_{-1.02}$ |

TABLE VII: Dataset bhmummP25_SAM: Muon ID efficiencies for CMU-only

| Cut | Count | Efficiency (%) |
|---|---|---|
| No cut | 836 | |
| $E_{EM}$ cut | 821 | $98.21^{+0.45}_{-0.57}$ |
| $E_{HAD}$ cut | 830 | $99.28^{+0.30}_{-0.43}$ |
| COT hits cut | 836 | $100.00^{+0.00}_{-0.22}$ |
| $d_0$ cut | 830 | $99.28^{+0.30}_{-0.43}$ |
| Isolation cut | 788 | $94.26^{+0.81}_{-0.95}$ |
| $\Delta x_{CMP}$ cut | 818 | $97.85^{+0.54}_{-0.61}$ |
| All above cuts | 749 | $89.59^{+1.08}_{-1.17}$ |
| All cuts excl. isol. | 793 | $94.86^{+0.80}_{-0.86}$ |
| Sliding isol. cut | 798 | $95.45^{+0.69}_{-0.87}$ |
| All cuts (sliding isol.) | 757 | $90.55^{+1.00}_{-1.15}$ |
| $\chi^2$ cut | 836 | $100.00^{+0.00}_{-0.22}$ |
| All cuts ($\chi^2$) | 749 | $89.59^{+1.08}_{-1.17}$ |
| All track cuts | 765 | $91.51^{+0.92}_{-1.13}$ |
| All trk cuts excl. isol. | 810 | $96.89^{+0.62}_{-0.75}$ |

TABLE VIII: Dataset bhmummP25_SAM: Muon ID efficiencies for CMP-only

| Cut | Count | Efficiency (%) |
|---|---|---|
| No cut | 783 | |
| $E_{EM}$ cut | 753 | $96.17^{+0.66}_{-0.81}$ |
| $E_{HAD}$ cut | 765 | $97.70^{+0.49}_{-0.68}$ |
| COT hits cut | 780 | $99.62^{+0.20}_{-0.36}$ |
| $d_0$ cut | 778 | $99.36^{+0.27}_{-0.41}$ |
| Isolation cut | 731 | $93.36^{+0.93}_{-1.02}$ |
| Min E cut | 756 | $96.55^{+0.67}_{-0.80}$ |
| All above cuts | 670 | $85.57^{+1.25}_{-1.29}$ |
| All cuts excl. isol. | 710 | $90.68^{+1.07}_{-1.17}$ |
| Sliding isol. cut | 744 | $95.02^{+0.73}_{-0.93}$ |
| All cuts (sliding isol.) | 681 | $86.97^{+1.21}_{-1.33}$ |
| $\chi^2$ cut | 783 | $100.00^{+0.00}_{-0.23}$ |
| All cuts ($\chi^2$) | 670 | $85.57^{+1.25}_{-1.29}$ |

TABLE IX: Dataset bhmummP25_SAM: Muon ID efficiencies for CMIO

| Cut | Count | Efficiency (%) |
|---|---|---|
| No cut | 598 | |
| $E_{EM}$ cut | 582 | $97.32^{+0.67}_{-0.79}$ |
| $E_{HAD}$ cut | 582 | $97.32^{+0.67}_{-0.79}$ |
| COT hits cut | 596 | $99.67^{+0.22}_{-0.43}$ |
| $d_0$ cut | 593 | $99.16^{+0.37}_{-0.56}$ |
| Isolation cut | 560 | $93.65^{+1.03}_{-1.12}$ |
| Min E cut | 595 | $99.50^{+0.28}_{-0.50}$ |
| All above cuts | 536 | $89.63^{+1.29}_{-1.45}$ |
| All cuts excl. isol. | 564 | $94.31^{+0.95}_{-1.10}$ |
| Sliding isol. cut | 572 | $95.65^{+0.88}_{-0.97}$ |
| All cuts (sliding isol.) | 546 | $91.30^{+1.18}_{-1.36}$ |
| $\chi^2$ cut | 598 | $100.00^{+0.00}_{-0.31}$ |
| All cuts ($\chi^2$) | 536 | $89.63^{+1.29}_{-1.45}$ |

TABLE X: Dataset bhmummP25_SAM: Muon ID efficiencies for SCMIO

| Category | Fiducial | w/ Stub | Efficiency (%) |
|---|---|---|---|
| CMUP | 3427 | 2961 | $86.40^{+0.56}_{-0.61}$ |
| CMX | 1978 | 1863 | $94.19^{+0.49}_{-0.58}$ |
| CMX Arches | 1561 | 1506 | $96.48^{+0.47}_{-0.55}$ |
| CMX Miniskirt | 343 | 289 | $84.26^{+1.97}_{-2.13}$ |
| CMX Keystone | 74 | 68 | $91.89^{+3.23}_{-4.59}$ |
| CMU-only | 822 | 722 | $87.83^{+1.13}_{-1.21}$ |
| CMP-only | 948 | 821 | $86.60^{+1.14}_{-1.20}$ |
| CMX MiniKey | 417 | 357 | $85.61^{+1.79}_{-1.92}$ |

TABLE XI: Dataset bhmummP25_SAM: Muon reconstruction efficiencies

| 1st leg | 2nd leg | 1st passes | both pass | Efficiency (%) |
|---|---|---|---|---|
| CMUP | CMUP | 1004 | 900 | - |
| CMX | CMUP | 1171 | 1107 | $94.54^{+0.45}_{-0.40}$ |
| CMUP | CMX | 1255 | 1107 | - |
| CMX | CMX | 414 | 328 | $88.27^{+0.78}_{-0.75}$ |
| CMUP | ARCH | 1012 | 957 | - |
| CMUP | MK | 243 | 150 | - |
| ARCH | ARCH | 301 | 263 | - |
| ARCH | MK | 86 | 49 | - |
| MK | ARCH | 49 | 49 | $94.32^{+0.68}_{-0.57}$ |
| MK | MK | 27 | 16 | $71.96^{+2.57}_{-2.47}$ |

TABLE XII: Dataset bhmummP25_SAM: Muon L1 trigger efficiencies

| Category | Events Passing | Efficiency (%) |
|---|---|---|
| Pass L1 | 1107 | - |
| CMUP | 913 | $98.39^{+0.46}_{-0.57}$ |
| CMX | 809 | $87.19^{+1.19}_{-1.20}$ |
| CMUP-CMX | 796 | - |
| CMUPA | 789 | - |
| CMUPMK | 124 | - |
| CMUPARCH | 681 | $86.31^{+1.29}_{-1.25}$ |
| CMUP-MK | 115 | $92.74^{+2.38}_{-3.09}$ |

TABLE XIII: Dataset bhmummP25_SAM: Muon L2 trigger efficiencies

| Category | Events Passing | Efficiency (%) |
|---|---|---|
| Pass L1 | 1107 | - |
| CMUP-CMUP$_S$ | 863 | - |
| CMX-CMX$_S$ | 762 | - |
| CMUP-CMX-CMUP$_S$ | 751 | $92.83^{+0.87}_{-0.98}$ |
| CMUP-CMX-CMX$_S$ | 752 | $82.37^{+1.33}_{-1.41}$ |
| CMUP-CMX-CMX$_S$-A | 645 | $81.75^{+1.36}_{-1.57}$ |
| CMUP-CMX-CMX$_S$-MK | 107 | $86.29^{+2.97}_{-3.67}$ |

TABLE XIV: Dataset bhmummP25_SAM: Muon L2 SLAM trigger efficiencies

| Category | Efficiency (%) |
|---|---|
| CMUP | $93.02^{+0.62}_{-0.70}$ |
| CMX | $76.58^{+1.26}_{-1.27}$ |
| ARCH | $80.94^{+1.36}_{-1.33}$ |
| MK | $66.74^{+2.94}_{-3.37}$ |
| CMUP$_S$ | $87.76^{+0.92}_{-1.02}$ |
| CMX$_S$ | $72.34^{+1.34}_{-1.41}$ |
| ARCH$_S$ | $76.66^{+1.40}_{-1.59}$ |
| MK$_S$ | $62.09^{+3.08}_{-3.54}$ |

TABLE XVI: Dataset bhmummP25_SAM: Muon combined trigger efficiencies

| Category | Events Passing | Efficiency (%) |
|---|---|---|
| Pass L2 | 796 | - |
| CMUP | 796 | $100.00^{+0.00}_{-0.23}$ |
| CMX | 792 | $99.50^{+0.23}_{-0.40}$ |
| CMUP-CMX | 792 | - |
| CMUPA | 681 | - |
| CMUPMK | 115 | - |
| CMUPARCH | 677 | $99.41^{+0.27}_{-0.46}$ |
| CMUP-MK | 115 | $100.00^{+0.00}_{-1.59}$ |

TABLE XV: Dataset bhmummP25_SAM: Muon L3 trigger efficiencies