# Meson Full Listings

## $K^{\pm}$

### $K^{\pm}$ DECAY RATES

**$\Gamma(\mu^+\nu_\mu)$** **$\Gamma_1$**

| VALUE ($10^6$ s$^{-1}$) | DOCUMENT ID | | TECN | CHG |
|---|---|---|---|---|
| **51.34±0.20 OUR FIT** | Error includes scale factor of 1.5. | | | |
| **51.2 ±0.8** | FORD | 67 | CNTR | ± |

**$\Gamma(\pi^+\pi^+\pi^-)$** **$\Gamma_4$**

| VALUE ($10^6$ s$^{-1}$) | EVTS | DOCUMENT ID | | TECN | CHG |
|---|---|---|---|---|---|
| **4.52 ±0.04 OUR FIT** | Error includes scale factor of 1.9. | | | | |
| **4.511±0.024** | | [6] FORD | 70 | ASPK | |
| • • • We do not use the following data for averages, fits, limits, etc. • • • | | | | | |
| 4.529±0.032 | 3.2M | [6] FORD | 70 | ASPK | |
| 4.496±0.030 | | [6] FORD | 67 | CNTR | ± |

[6] First FORD 70 value is second FORD 70 combined with FORD 67.

### $(\Gamma(K^+) - \Gamma(K^-))\ /\ \Gamma(K)$

**$K^{\pm} \to \mu^{\pm}\nu_\mu$ RATE DIFFERENCE/AVERAGE**

Test of $CPT$ conservation.

| VALUE (%) | DOCUMENT ID | | TECN |
|---|---|---|---|
| **−0.54±0.41** | FORD | 67 | CNTR |

**$K^{\pm} \to \pi^{\pm}\pi^+\pi^-$ RATE DIFFERENCE/AVERAGE**

Test of $CP$ conservation.

| VALUE (%) | EVTS | DOCUMENT ID | | TECN | CHG |
|---|---|---|---|---|---|
| **0.07±0.12 OUR AVERAGE** | | | | | |
| 0.08±0.12 | | [7] FORD | 70 | ASPK | |
| −0.50±0.90 | | FLETCHER | 67 | OSPK | |
| • • • We do not use the following data for averages, fits, limits, etc. • • • | | | | | |
| −0.02±0.16 | | [8] SMITH | 73 | ASPK | ± |
| 0.10±0.14 | 3.2M | [7] FORD | 70 | ASPK | |
| −0.04±0.21 | | [7] FORD | 67 | CNTR | |

[7] First FORD 70 value is second FORD 70 combined with FORD 67.
[8] SMITH 73 value of $K^{\pm} \to \pi^{\pm}\pi^+\pi^-$ rate difference is derived from SMITH 73 value of $K^{\pm} \to \pi^{\pm}2\pi^0$ rate difference.

**$K^{\pm} \to \pi^{\pm}\pi^0\pi^0$ RATE DIFFERENCE/AVERAGE**

Test of $CP$ conservation.

| VALUE (%) | EVTS | DOCUMENT ID | | TECN | CHG |
|---|---|---|---|---|---|
| **0.0 ±0.6 OUR AVERAGE** | | | | | |
| 0.08±0.58 | | SMITH | 73 | ASPK | ± |
| −1.1 ±1.8 | 1802 | HERZO | 69 | OSPK | |

**$K^{\pm} \to \pi^{\pm}\pi^0$ RATE DIFFERENCE/AVERAGE**

Test of $CPT$ conservation.

| VALUE (%) | DOCUMENT ID | | TECN |
|---|---|---|---|
| **0.8±1.2** | HERZO | 69 | OSPK |

**$K^{\pm} \to \pi^{\pm}\pi^0\gamma$ RATE DIFFERENCE/AVERAGE**

Test of $CP$ conservation.

| VALUE (%) | EVTS | DOCUMENT ID | | TECN | CHG | COMMENT |
|---|---|---|---|---|---|---|
| **0.9± 3.3 OUR AVERAGE** | | | | | | |
| 0.8± 5.8 | 2461 | SMITH | 76 | WIRE | ± | $E_\pi$ 55–90 MeV |
| 1.0± 4.0 | 4000 | ABRAMS | 73B | ASPK | ± | $E_\pi$ 51–100 MeV |
| 0.0±24.0 | 24 | EDWARDS | 72 | OSPK | | $E_\pi$ 58–90 MeV |

### $K^+$ BRANCHING RATIOS

**$\Gamma(\mu^+\nu_\mu)/\Gamma_{total}$** **$\Gamma_1/\Gamma$**

| VALUE (units $10^{-2}$) | EVTS | DOCUMENT ID | | TECN | CHG | COMMENT |
|---|---|---|---|---|---|---|
| **63.51±0.18 OUR FIT** | Error includes scale factor of 1.3. | | | | | |
| **63.24±0.44** | 62k | CHIANG | 72 | OSPK | + | 1.84 GeV/$c$ $K^+$ |
| • • • We do not use the following data for averages, fits, limits, etc. • • • | | | | | | |
| 56.9 ±2.6 | | [9] ALEXANDER | 57 | EMUL | + | |
| 58.5 ±3.0 | | [9] BIRGE | 56 | EMUL | + | |

[9] Old experiments not included in averaging.

**$\Gamma(\mu^+\nu_\mu)/\Gamma(\pi^+\pi^+\pi^-)$** **$\Gamma_1/\Gamma_4$**

| VALUE | EVTS | DOCUMENT ID | | TECN | CHG |
|---|---|---|---|---|---|
| **11.36±0.12 OUR FIT** | Error includes scale factor of 1.8. | | | | |
| • • • We do not use the following data for averages, fits, limits, etc. • • • | | | | | |
| 10.38±0.82 | 427 | [10] YOUNG | 65 | EMUL | + |

[10] Deleted from overall fit because YOUNG 65 constrains his results to add up to 1. Only YOUNG 65 measured ($\mu\nu$) directly.

**$\Gamma(e^+\nu_e)/\Gamma_{total}$** **$\Gamma_2/\Gamma$**

| VALUE (units $10^{-5}$) | CL% | EVTS | DOCUMENT ID | | TECN | CHG |
|---|---|---|---|---|---|---|
| • • • We do not use the following data for averages, fits, limits, etc. • • • | | | | | | |
| $2.1^{+1.8}_{-1.3}$ | | 4 | BOWEN | 67B | OSPK | + |
| <160.0 | 95 | | BORREANI | 64 | HBC | + |

**$\Gamma(e^+\nu_e)/\Gamma(\mu^+\nu_\mu)$** **$\Gamma_2/\Gamma_1$**

| VALUE (units $10^{-5}$) | EVTS | DOCUMENT ID | | TECN | CHG |
|---|---|---|---|---|---|
| **2.45±0.11 OUR AVERAGE** | | | | | |
| 2.51±0.15 | 404 | HEINTZE | 76 | SPEC | + |
| 2.37±0.17 | 534 | HEARD | 75B | SPEC | + |
| 2.42±0.42 | 112 | CLARK | 72 | OSPK | + |
| • • • We do not use the following data for averages, fits, limits, etc. • • • | | | | | |
| $1.8^{+0.8}_{-0.6}$ | 8 | MACEK | 69 | ASPK | + |
| $1.9^{+0.7}_{-0.5}$ | 10 | BOTTERILL | 67 | ASPK | + |

**$\Gamma(\pi^+\pi^0)/\Gamma_{total}$** **$\Gamma_3/\Gamma$**

| VALUE (units $10^{-2}$) | EVTS | DOCUMENT ID | | TECN | CHG | COMMENT |
|---|---|---|---|---|---|---|
| **21.16±0.14 OUR FIT** | Error includes scale factor of 1.1. | | | | | |
| **21.18±0.28** | 16k | CHIANG | 72 | OSPK | + | 1.84 GeV/$c$ $K^+$ |
| • • • We do not use the following data for averages, fits, limits, etc. • • • | | | | | | |
| 21.0 ±0.6 | | CALLAHAN | 65 | HLBC | | See $\Gamma(\pi^+\pi^0)/\Gamma(\pi^+\pi^+\pi^-)$ |
| 21.6 ±0.6 | | TRILLING | 65B | RVUE | | |
| 23.2 ±2.2 | | [11] ALEXANDER | 57 | EMUL | + | |
| 27.7 ±2.7 | | [11] BIRGE | 56 | EMUL | + | |

[11] Earlier experiments not averaged.

**$\Gamma(\pi^+\pi^0)/\Gamma(\mu^+\nu_\mu)$** **$\Gamma_3/\Gamma_1$**

| VALUE | EVTS | DOCUMENT ID | | TECN | CHG | COMMENT |
|---|---|---|---|---|---|---|
| **0.3332±0.0028 OUR FIT** | Error includes scale factor of 1.1. | | | | | |
| **0.3316±0.0032 OUR AVERAGE** | | | | | | |
| 0.3329±0.0047±0.0010 | 45K | USHER | 92 | SPEC | + | $p\bar{p}$ at rest |
| 0.3355±0.0057 | | [12] WEISSENBE... | 76 | SPEC | + | |
| 0.305 ±0.018 | 1600 | ZELLER | 69 | ASPK | + | |
| 0.3277±0.0065 | 4517 | [13] AUERBACH | 67 | OSPK | + | |
| • • • We do not use the following data for averages, fits, limits, etc. • • • | | | | | | |
| 0.328 ±0.005 | 25k | [12] WEISSENBE... | 74 | STRC | + | |

[12] WEISSENBERG 76 revises WEISSENBERG 74.
[13] AUERBACH 67 changed from 0.3253 ± 0.0065. See comment with ratio $\Gamma(\pi^0\mu^+\nu_\mu)/\Gamma(\mu^+\nu_\mu)$.

**$\Gamma(\pi^+\pi^0)/\Gamma(\pi^+\pi^+\pi^-)$** **$\Gamma_3/\Gamma_4$**

| VALUE | EVTS | DOCUMENT ID | | TECN | CHG |
|---|---|---|---|---|---|
| **3.79±0.04 OUR FIT** | Error includes scale factor of 1.5. | | | | |
| **3.84±0.27 OUR AVERAGE** | Error includes scale factor of 1.9. | | | | |
| 3.96±0.15 | 1045 | CALLAHAN | 66 | FBC | + |
| 3.24±0.34 | 134 | YOUNG | 65 | EMUL | + |

**$\Gamma(\pi^+\pi^+\pi^-)/\Gamma_{total}$** **$\Gamma_4/\Gamma$**

| VALUE (units $10^{-2}$) | EVTS | DOCUMENT ID | | TECN | CHG | COMMENT |
|---|---|---|---|---|---|---|
| **5.59±0.05 OUR FIT** | Error includes scale factor of 1.9. | | | | | |
| **5.52±0.10 OUR AVERAGE** | Error includes scale factor of 1.3. See the ideogram below. | | | | | |
| 5.34±0.21 | 693 | [14] PANDOULAS | 70 | EMUL | + | |
| 5.71±0.15 | | DEMARCO | 65 | HBC | | |
| 6.0 ±0.4 | 44 | YOUNG | 65 | EMUL | + | |
| 5.54±0.12 | 2332 | CALLAHAN | 64 | HLBC | + | |
| 5.1 ±0.2 | 540 | SHAKLEE | 64 | HLBC | + | |
| 5.7 ±0.3 | | ROE | 61 | HLBC | + | |
| • • • We do not use the following data for averages, fits, limits, etc. • • • | | | | | | |
| 5.56±0.20 | 2330 | [15] CHIANG | 72 | OSPK | + | 1.84 GeV/$c$ $K^+$ |
| 5.2 ±0.3 | | [16] TAYLOR | 59 | EMUL | + | |
| 6.8 ±0.4 | | [16] ALEXANDER | 57 | EMUL | + | |
| 5.6 ±0.4 | | [16] BIRGE | 56 | EMUL | + | |

[14] Includes events of TAYLOR 59.
[15] Value is not independent of CHIANG 72 $\Gamma(\mu^+\nu_\mu)/\Gamma_{total}$, $\Gamma(\pi^+\pi^0)/\Gamma_{total}$, $\Gamma(\pi^+\pi^0\pi^0)/\Gamma_{total}$, $\Gamma(\pi^0\mu^+\nu_\mu)/\Gamma_{total}$, and $\Gamma(\pi^0e^+\nu_e)/\Gamma_{total}$.
[16] Earlier experiments not averaged.