What Can We Study in $K^+ \to l^+ \nu e^+ e^-$ Decay ?

A.A. Poblaguev
Institute for Nuclear Research of Russian Academy of Sciences,
117312 Moscow, Russia

Abstract

A sensitivity of E865 experiment to the form factors of $K^+ \to \mu^+(e^+)\nu e^+ e^-$ decays is discussed.

1 Introduction

In Standard Model

$$K^+(p) \to l^+(p_l)\nu(p_\nu)e^+(p_+)e^-(p_-), \quad l = \mu, e \tag{1}$$

decays are supposed to dominate by photon (e^+e^-) and W-boson ($l^+\nu$) exchange [1, 2]. It is convinient to separate decay amplitude into two parts (Fig. 1): Inner Bremstrahlung (IB) and Structure Dependent (SD). Inner

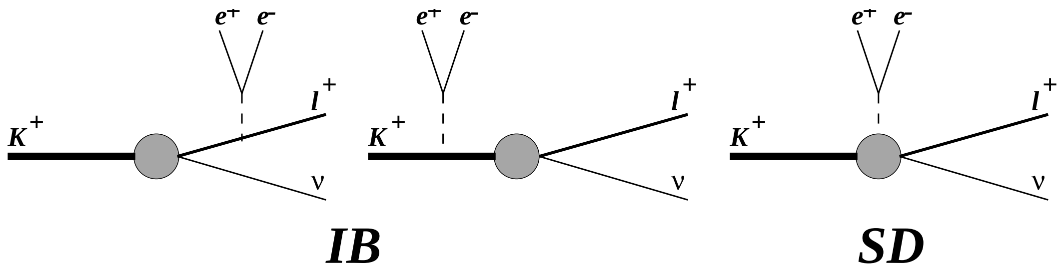

Figure 1: $K^+ \to l^+ \nu e^+ e^-$ graphs.

Bremstrahlung radiation corresponds to photon emmission by lepton l^+ and by kaon, considered as point-like particle. This amplitude is unambigiously defined by $K \to l\nu$ decay constant $f_K V_{us}$:

$$\mathcal{A}_{\rm IB} = \frac{-ieG_F V_{us}^*}{\sqrt{2}} f_K m_l \, \varepsilon_\mu \, \overline{u}_\nu (1+\gamma^5) \left\{ \frac{2p^\mu - q^\mu}{2pq - q^2} - \frac{2p_l^\mu + \hat{q}\gamma^\mu}{2p_l q + q^2} \right\} v_l \qquad (2)$$

The effect of kaon electromagnetic form factor $\mathcal{F}(q^2)$ in Inner Bremstrahlung radiation may be accounted as:

$$\mathcal{A}_{\langle \mathrm{r_K^2} \rangle} = \frac{-ieG_F V_{us}^*}{\sqrt{2}} f_K m_l \, \varepsilon_\mu \, \overline{u}_\nu (1+\gamma^5) \frac{2 f_K W^\mu}{M_K^2 - W^2} \frac{\rho_K q^2}{1 - \rho_K q^2} v_l \qquad (3)$$

The following notations are used: $f_K = 161$ MeV is kaon decay constant, m_l is lepton l^+ mass, quantaty ε^μ stands for

$$\varepsilon^\mu = \frac{e}{q^2} \, \overline{u}_{e^-} \gamma^\mu v_{e^+} \qquad (4)$$

and the four momenta are

$$q = p_+ + p_-, \qquad W = p_l + p_\nu = p - q \qquad (5)$$

such that $q_\mu \varepsilon_\mu = 0$ and $2pq - q^2 = M_K^2 - W^2$. For electromagnetic form factor of kaon we have used pole approximation $\mathcal{F}(q^2) = 1/(1 - \rho_K q^2)$ with $\rho_K = \langle r_K^2 \rangle / 6$ where $\langle r_K^2 \rangle$ stands for kaon charge radius.

The remaining amplitude, reffered as Structure Dependent may be parameterized by one vector $F_V(q^2, W^2)$ and three axial $F_A(q^2, W^2)$, $R(q^2, W^2)$, and $F_P(q^2, W^2)$ form factors, which are, generally, functions of q^2 and W^2:

$$\mathcal{A}_{\rm SD} = \frac{-ieG_F V_{us}^*}{\sqrt{2} M_K} \, \varepsilon_\mu H^{\mu\rho} l_\rho \qquad (6)$$

where

$$l^\rho = \overline{u}_\nu (1+\gamma^5) \gamma^\rho v_l \qquad (7)$$

$$\begin{aligned} H^{\mu\rho} &= -iF_V \varepsilon^{\mu\rho\alpha\beta} q_\alpha p_\beta + F_A \left(qW \, g^{\mu\rho} - W^\mu q^\rho \right) \\ &+ R \left(q^2 \, g^{\mu\rho} - q^\mu q^\rho \right) + F_P \left(qW \, q^\mu - q^2 W^\mu \right) W^\rho / M_K^2 \end{aligned} \qquad (8)$$

We define dimensionless formfactors F_V, F_A, and R in accordance with Particle Data Group (PDG) [3]. These formfactors are related to formfactors of Ref. [2] and Ref. [1] as

$$(F_V, F_A, R, \frac{F_P}{M_K^2}) = -\sqrt{2} M_K (V, A_1, A_2, A3) = \frac{-f_K}{M_K} (a_K, b_K, c_K, e'_K) \qquad (9)$$

The dependence of F_V, F_A, and R on q^2 and W^2 may be anticipated in the framework of the assumption of dominance of the low-lying resonances [1]:

$$
\begin{aligned}
F_V(q^2, W^2) &= F_V^{(0)}[(1 - q^2/M_\rho^2)(1 - W^2/M_{K^*}^2)]^{-1} & (10)\\
F_A(q^2, W^2) &= F_A^{(0)}[(1 - q^2/M_\rho^2)(1 - W^2/M_{K_{A1}}^2)]^{-1} & (11)\\
R(q^2, W^2) &= R^{(0)}[(1 - q^2/M_\rho^2)(1 - W^2/M_{K_{A1}}^2)]^{-1} & (12)
\end{aligned}
$$

where $M_\rho = 770$ MeV, $M_{K^*} = 890$ MeV, and $M_{K_{A1}} = 1270$ MeV are corresponding resonance masses. Due to relatively big kaon mass the slopes of form factors are important in $K \to l\nu e^+e^-$ decay analysis.

Amplitude of decay with real photon $K \to l\nu\gamma$ may be obtained by putting $q^2 = 0$ and considering ε^μ as photon polarization vector. Only form-factors $F_V(q^2 = 0, W^2)$ and $F_A(q^2 = 0, W^2)$ contribute to Structure Dependent part of this decay.

If one searching for interaction of $l^+\nu$ pair with hadrons beyond Standard Model[1], pseudoscalar and tensor amplitudes may be also included in analysis. Since $W^\mu l_\mu = m_l \overline{u}_\nu(1 + \gamma^5)v_l$, form factor F_P describes also pseudoscalar interaction (in this case F_P is not necessarily the same for $K_{\mu 2ee}$ and K_{e2ee} decays). However, we know from $K_{e2}/K_{\mu 2}$ branching ratio that psudoscalar coupling is negligable for $l^+\nu$ current, so we may disregard pseudoscalar interaction in $K \to l\nu e^+e^-$ decay.

A hypothetical tensor interaction may be parameterized by a tensor form factor F_T:

$$
\mathcal{A}_{\mathrm{T}} = \frac{-ieG_F V_{us}^*}{\sqrt{2}} F_T \varepsilon_\mu q^\rho \overline{u}_\nu (1 + \gamma^5)\sigma^{\mu\rho} v_l \qquad (13)
$$

Adding such term to decay amplitude may be usefull in analysis of $K \to \mu\nu e^+e^-$ decay.

2 $\langle r_K^2 \rangle$

Kaon charge radius was experimentally measured [6] to be:

$$
\langle r_K^2 \rangle = 0.34 \pm 0.05 \ \mathrm{fm}^2 \qquad (14)
$$

[1] we are still supposing one photon exchange interaction of e^+e^- pair

Chiral Perturbation Theoty (ChPT) to $\mathcal{O}(p^4)$ gives parameter free prediction for kaon and pion charge radii difference [2]:

$$\langle r_\pi^2 \rangle - \langle r_K^2 \rangle = \frac{1}{32\pi^2 F^2} \log \frac{M_K^2}{m_\pi^2} = 0.036 \text{ fm}^2 \tag{15}$$

Here, $F = f_\pi/\sqrt{2} = 92.4$ MeV. Using high precision experimental value for pion charge radius $\langle r_\pi^2 \rangle = 0.439 \pm 0.008$ fm^2 [7] one can estimate

$$\langle r_K^2 \rangle = 0.403 \pm 0.008 \text{ fm}^2 \tag{16}$$

in agreement with (14). Only an error of experimental measurement of $\langle r_\pi^2 \rangle$ is displayed. Since the difference (15) is only about 10% of the values of kaon and pion charge radii, it is not unlikely if high order $\mathcal{O}(p^6)$ ChPT corrections will strongly change this difference. Indeed, similarly to (15), ChPT to $\mathcal{O}(p^4)$ also allows to relate kaon charge radius to kaon-pion transition vector charge radius $\langle r_{K\pi}^2 = 6\lambda_+/m_\pi^2$, where λ_+ is a slope of vector form factor in K_{l3} decay [2]:

$$\langle r_{K\pi}^2 \rangle - \langle r_K^2 \rangle = -0.024 \text{ fm}^2 \tag{17}$$

Combining PDG average of $\lambda_+ = 0.0276 \pm 0.0021$ for charged kaons with preliminary KTeV result [8] $\lambda_+ = 0.0275 \pm 0.008 \pm 0.012$ for neutral kaons one gets

$$\langle r_K^2 \rangle = 0.354 \pm 0.014 \text{ fm}^2 \tag{18}$$

Poor consistency of (16) and (18) indicate a possible significant error in ChPT to $\mathcal{O}(p^4)$ prediction of charge radii difference. For this reason it is more reliable to use in analysis the experimental value (14).

3 $F_V(q^2, W^2)$

According to the CHPT to $\mathcal{O}(p^4)$ [2]:

$$F_V = \frac{\sqrt{2} M_K}{8\pi^2 F} = 0.095 \tag{19}$$

The kaon formfactor is related to pion one as $F_V = F_V^\pi \frac{M_K}{m_\pi}$. The Conservation of Vector Current (CVC) hypothesis allows to determine F_V^π via π^0 lifetime τ_π. As result one gets:

$$F_V^{CVC} = \frac{M_K}{\alpha m_\pi} \sqrt{\frac{2}{\pi m_{\pi^0} \tau_\pi}} = 0.092 \pm 0.002 \tag{20}$$

in good agreement with (19)

The dependence of F_V on q^2 and W^2 appears only in CHPT to $\mathcal{O}(p^6)$ According to the Fig. 2 of Ref. [4]:

$$F_V(q^2,W^2) = F_V^{(0)}\left(1+0.6\frac{q^2}{M_K^2}+0.5\frac{W^2}{M_K^2}\right) \tag{21}$$

where $F_V^{(0)}$ is defined by Eq. (19). This dependence (dis)agrees with accuracy about 20% with (10).

4 $F_A(q^2,W^2)$

According to the CHPT to $\mathcal{O}(p^4)$ [2]:

$$F_A = \frac{4\sqrt{2}M_K}{F}(L_9+L_{10}), \tag{22}$$

where L_9+L_{10} is CHPT constant, which is known only from $\pi\to e\nu\gamma$ decay. In other words CHPT to $\mathcal{O}(p^4)$ define F_A only via experimentally measured pion axial formfactor [3]:

$$F_A = F_A^\pi\frac{M_K}{m_\pi} = 0.041\pm0.006 \tag{23}$$

CHPT to $\mathcal{O}(p^6)$ calculation of the axial formfactor F_A of the $\pi\to e\nu\gamma$ decay have been performed in Ref. [5]. It was found relatively big correction ($\sim 25\%$) to the value of (22) at $W^2=0$. According to Fig. 2 of Ref. [5] the W^2 depoendence of

$$F_A^\pi = F_A^{(0)}(1+0.019\frac{W^2}{m_\pi^2}) \tag{24}$$

is close to what is expected from dominance of low-lying $a1$-resonance.

It is not clear from Ref. [5] how does p^6 approximation of ChPT change the kaon form factor compared to (22). So we need to add a theoretical error to F_A in (23). If we estimate it as big as $\mathcal{O}(p^6)$ correction to the pion formfactor, then:

$$F_A = 0.041\pm0.006\pm0.010 \tag{25}$$

According to the hard meson approach [1] kaon and pion axial formfactors are related as:

$$F_A = \left(F_A^\pi\frac{M_K}{m_\pi}\right)\left(\frac{2f_\pi}{f_K}-\frac{f_K}{f_\pi}\right)\frac{M_{a1}^2}{M_{K1}^2} = 0.4\left(F_A^\pi\frac{M_K}{m_\pi}\right) \tag{26}$$

5 $R(q^2, W^2)$

According to current algebra and PCAC (partial conservation of axial current) formfactor R may be expressed as:

$$R = \frac{1}{3} M_K f_K \langle r^2 \rangle_V^K, \tag{27}$$

Accepted value of kaon charge radius (14) leads to

$$R = 0.231 \pm 0.032 \tag{28}$$

It must be pointed out [1] that relationship (27) was obtained in limit $M_K = 0$ and then was extrapolated to physical kaon mass. Such extrapolation is certaintly expected to be good for pion decays but may be significantly violated in case of relatively large kaon mass. For example, relationship (27) is expected to be violated in ChPT of order p^6 [2].

The dependence of R on q^2 and W^2 was studied in hard kaon method [1]:

$$R(q^2, W^2) = R^{(0)} (1 - q^2/M_\rho^2)^{-1} (1 + 0.33 q^2/M_{K_{A1}}^2) \tag{29}$$

the dependence on q^2 is the same as in (12), while the dependence on W^2 may be neglected [1].

6 $F_P(q^2, W^2)$

Since $W^\mu l_\mu = m_l \, \overline{u}_\nu (1 + \gamma^5) v_l$, the contribution of pseudoscalar form factor F_P is suppressed by small lepton mass (even in case of muon). Additionally, it is expected that F_P is small. For example, according to ChPT to $\mathcal{O}(p^4)$ [2] $F_P = 0$. Hard kaon method [1] gives

$$F_P = \left(\frac{1}{2} \sum_{V=\rho,\omega} \frac{f_K M_K}{M_V^2} - R \right) \frac{M_K^2}{M_{K_{A1}}} = -0.02 \tag{30}$$

Kaon charge radius contribution (3)to decay amplitude may be parameterized by $F_P = \frac{2 f_K M_K^3}{M_K^2 - W^2} \frac{\mathcal{F}(q^2) - 1}{q^2}$ which is significantly bigger than (30). Howerever, since $\mathcal{A}_{\langle r_K^2 \rangle}$ is rather Inner Bremstrahlung radiation than Structure Dependent, we will consider separately these two contributions to the decay amplitude.

7 F_T

Experimental study of the $\pi^- \to e^-\nu\gamma$ decay in flight [9] indicated a possible disagreement with Standard Model description of this decay. This disagreement might be eliminated by adding a tensor term (13) (with V_{ud} instead of V_{us}) to decay amplitude [10]. To fit experimental data form factor F_T should be equal to:

$$F_T^\pi = -(5.6 \pm 1.7) \times 10^{-3} \tag{31}$$

Such term may not be found in previous $\pi \to e\nu\gamma$ experiments [11, 12, 13, 14] because only a limited kinematical region was available for analysis in this experiments. However, comparative analysis of the published data shows [15] that tensor term (31) does not contradict to experimental data and even allows to improve their consistency. In such reanalysis of experiments [11, 12, 13, 14] one can estimate

$$F_T^\pi = -(8 \pm 4) \times 10^{-3} \tag{32}$$

which match well the value (31) obtained in experiment [9].

Supposing that tensor term in radiative pion amplitude is caused by quark-lepton tensor coupling:

$$\frac{G_F V_{ud} f_t^\pi}{\sqrt{2}} \overline{u}_d \sigma^{\mu\nu} v_u \, \overline{u}_\nu (1+\gamma^5) v_l \tag{33}$$

one gets using QCD sum rules [16]

$$f_t^\pi \approx 2.5 F_T^\pi = 0.014 \pm 0.005 \tag{34}$$

The same relationship (34) is also expected [17] for (us) coupling f_t and kaon decay form factor F_T. Even if (ud) tensor coupling really exists there is no known way to extrapolate this coupling to (us) current. Even tensor coupling of (us) current to $(e\nu)$ and $(\mu\nu)$ currents may not be the same. In particular, there is no reason to suppose that $f_t = f_t^\pi$, however we will do this assumption to make an estimate. In this case

$$F_T \sim -6 \times 10^{-3} \tag{35}$$

As will be shown below, E865 experiment can not detect such small value, however experimental sensitivity to tensor form factor is expected to be $\sim$ 0.01, so important constraints may be set. It is interesting to compare the sensitivity of K_{l2ee} and K_{l3} experiments to tensor coupling f_t. Accordinngto quark graphs calculation [18] K_{l3} tensor form factor f_T is related to f_t as:

$$f_T/f_+ \approx 1.1 f_t \tag{36}$$

This means that

$$|F_T| \approx \frac{1}{3}\left|\frac{f_T}{f_+}\right| = \begin{cases} 0.13 \pm 0.04 & K^\pm \to e^\pm \nu \pi^0 \quad [3] \\ < 0.05 \quad (90\% \text{ CL}) & K_L^0 \to e^\pm \nu \pi^\mp \quad [8] \end{cases} \tag{37}$$

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8 Experimental constraints on Form-Factors

Formfactors F_V and F_A were studied in $\pi \to e\nu\gamma$ experiments, where actually a value $|F_V^\pi + F_A^\pi|^2 + \alpha |F_V^\pi - F_A^\pi|^2$ was measured. Here $\alpha \sim 0.02$ is some constant dependent on the size of kinematical region under consideration. Supposing that F_V^π is known from π^0 lifetime, the $\pi \to e\nu\gamma$ experimental data may be presented as [3]

$$|F_V + F_A| = 0.133 \pm 0.006 \pm 0.010 \tag{38}$$

The second error corresponds to the posiible difference between kaon and pion formfactors (25).

In kaon sector only decays $K \to e(\nu)\nu\gamma$ [19, 20, 21] were studied. Analysis of data had been performed supposing constant formfactors. The results of this experiments reanalysed for form-factors dependent on W^2 are presented in Tabl. 8

One can see that dependence of form-factors on W^2 noticeably modify the values of $|F_V + F_A|$, while choice of actual W^2-dependence (10) or (21) is not so important. Using (21) one can write:

$$|F_V^{(0)} + F_A^{(0)}| = 0.141 \pm 0.008, \tag{39}$$

It may be pointed out that results of experiments [20, 21] are not in good agreement.

Experiment [21] also gave constraints

$$|F_V - F_A| = 0.102 \pm 0.074 \tag{40}$$

Formfactor R was not experimentally studied in kaon decays.

Experiment	Kinematical region	Experimental result	$F_V + F_A$ estimation (1)	(2)	(3)
$K^+ \to e^+\nu\gamma$ [19] (56 evt)	$E_e > 236$ MeV $E_\gamma > 100$ MeV $\theta_{e\gamma} > 120^0$	$\Gamma(SD^+)/\Gamma(K_{e2}) =$ $1.05^{+0.25}_{-0.30}$	$0.156^{+0.018}_{-0.024}$	$0.144^{+0.017}_{-0.022}$	$0.141^{+0.016}_{-0.022}$
$K^+ \to e^+\nu\gamma$ [20] (51 evt)	$E_e > 235$ MeV $E_\gamma > 48$ MeV $\theta_{e\gamma} > 140^0$	$\Gamma(SD^+)/\Gamma(K_{\mu 2}) =$ $(2.33 \pm 0.42) \times 10^{-5}$	0.146 ± 0.12	0.134 ± 0.12	0.130 ± 0.12
$K^+ \to \mu^+\nu\gamma$ [21] (2000 evt)	$T_\mu > 137$ MeV $E_\gamma > 90$ MeV	$\|F_V + F_A\| =$ $0.165 \pm 0.007 \pm 0.011$ (shape fit)	0.165 ± 0.13	0.157 ± 0.13	0.153 ± 0.13

Table 1: Estimation of $|F_V^{(0)} + F_A^{(0)}|$ from $K^+ \to l\nu\gamma$ experiments: (1) $F_V =$ const, $F_A =$ const; (2) $F_V = F_V^{(0)}/(1 - \frac{W^2}{m_\rho^2})$, $F_A = F_A^{(0)}/(1 - \frac{W^2}{m_{K1}^2})$; (3) $F_V = F_V^{(0)}(1 + 0.5\frac{W^2}{M_K^2})$, $F_A = F_A^{(0)}/(1 - \frac{W^2}{m_{K1}^2})$

9 E865 forecast

As was discussed above, there are several contributions to the $K^{\to} l^+\nu e^+e^-$ decay amplitude. Their significance are displayed in Table 2

Expected sensitivity of E865 to K_{l2ee} form factors is shown in Tabl. 3. $FVq = M_K^2 \frac{dF_V}{dq^2}$, e.t.c.. Estimation of *statistical* errors have been performed for 400 K_{e2ee} and 1600 $K_{\mu 2ee}$ events without background and for 100% acceptance of the setup. This may be considered as upper possible resolution. Slopes of form factors were taken according to dominance of low-lying resonances (10,11,12). 50% accuracy of these predictions are supposed. Theoretical error 0.005 of prediction of F_V is supposed. Error 0.05 in contribution of IB term may be considered as reflection of possible uncertainties in calibration.

One can see that only $F_V(0,0)$, $F_A(0,0)$, $R(0,0)$, and F_T may be actually studied in E865. Expected resolution for these values (including correlations) are displayed in Tabl. 9 for two cases: (i) slopes of form factors are fixed at central point of expectation; (ii) slopes of form factors are considered as measured variables constrained by expected theoretical accuracy.

According to Table (9) all other decay parameters except for F_V,F_A,R, and F_T may be fixed according to their theoretical expectations. However, systematical error (of order of statistical one) should be added to R.

	$K^+ \to \mu^+ \nu e^+ e^-$		$K^+ \to e^+ \nu e^+ e^-$	
BR ($m_{ee} > 150$ MeV)	6.54×10^{-8}		2.65×10^{-8}	
	(1)	(2)	(1)	(2)
$IB = 1$	0.565	0.799	6×10^{-5}	$10\times^{-4}$
$\langle r_K^2 \rangle$ fm^2	6×10^{-4}	0.016	5×10^{-8}	-9×10^{-8}
$F_V = 0.095$	0.018	-0.059	0.037	0.087
$F_A = 0.042$	0.006	0.116	0.015	0.188
$R = 0.231$	0.129	0.417	0.740	0.932
$F_P = -0.02$	3×10^{-6}	-0.002	0	0
$F_T = -0.006$	6×10^{-4}	-0.040	0.003	0.002

Table 2: Relative contribution of form factors to total decay probability. (1) is contribution of form factor only without interference; (2) – interference included.

10 Conclusion

Only form factors F_V, F_A, R, and F_T at $q^2 = W^2 = 0$ may be studied in expeiment E865. Slopes of form-factors (10-**??**) are expected to be satisfactory approximation for data analysis. Firs measurement of form factor R and first separate measurement of F_V and F_T will be done. Constraints on tensor interaction (F_T) are expected to be better then in K_{l3} decays.

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$K^+ \to e^+ \nu e^+ e^-$ (400 evnt), $m_{ee} > 150$ MeV.

IB	1.000 +- 0.050	162.003	192.142	532.184
RK	0.340 +- 0.050	1352.056	1352.207	1395.168
FV	0.095 +- 0.005	0.020	0.022	0.088
FVq	0.412 +- 0.206	1.304	1.505	4.365
FVw	0.308 +- 0.154	1.058	1.158	2.534
FA	0.042 +- 0.008	0.010	0.021	0.075
FAq	0.412 +- 0.206	1.291	3.559	8.844
FAw	0.151 +- 0.076	1.039	1.600	4.991
R	0.231 +- 0.030	0.007	0.013	0.047
Rq	0.412 +- 0.206	0.130	0.356	0.765
Rw	0.151 +- 0.076	0.225	0.445	1.140
FS	0.000 +- 0.001	1511.800	1515.406	1546.817
FT	0.000 +- 0.001	0.327	0.424	1.163

```
     |        |          |        |        |-> Free (other) parameters
     |        |          |        |----------> Constrained parameters
     |        |          |-------------------> Fixed parameters
     |        |--> constraints
     |-----------> expected value of parameter
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$K^+ \to \mu^+ \nu e^+ e^-$ (1600 evnt), $m_{ee} > 150$ MeV.

IB	1.000 +- 0.050	0.018	0.028	0.094
RK	0.340 +- 0.046	0.357	0.430	5.098
FV	0.095 +- 0.005	0.017	0.019	0.100
FVq	0.412 +- 0.206	1.170	1.329	3.971
FVw	0.308 +- 0.154	0.836	0.963	3.224
FA	0.042 +- 0.008	0.008	0.019	0.119
FAq	0.412 +- 0.206	1.154	3.103	11.830
FAw	0.151 +- 0.076	0.806	1.559	8.805
R	0.231 +- 0.030	0.009	0.019	0.125
Rq	0.412 +- 0.206	0.186	0.405	1.455
Rw	0.151 +- 0.076	0.212	0.545	2.323
FS	0.000 +- 0.001	0.336	0.410	4.880
FT	0.000 +- 0.001	0.004	0.009	0.025

$K^+ \to e^+ \nu e^+ e^-$ and $K^+ \to \mu^+ \nu e^+ e^-$

IB	1.000 +- 0.050	0.018	0.022	0.066
RK	0.340 +- 0.046	0.357	0.423	4.393
FV	0.095 +- 0.005	0.013	0.015	0.061
FVq	0.412 +- 0.206	0.871	1.014	2.698
FVw	0.308 +- 0.154	0.656	0.762	1.904
FA	0.042 +- 0.008	0.006	0.015	0.055
FAq	0.412 +- 0.206	0.860	2.494	6.157
FAw	0.151 +- 0.076	0.637	1.185	4.134
R	0.231 +- 0.030	0.006	0.012	0.042
Rq	0.412 +- 0.206	0.107	0.297	0.639
Rw	0.151 +- 0.076	0.154	0.366	0.987
FS	0.000 +- 0.001	0.336	0.402	4.128
FT	0.000 +- 0.001	0.004	0.007	0.014

Table 3: Expected sensitivity to form factors.

	F_V	F_A	R	F_T
(i)	0.015	0.017	0.012	0.006
(ii)	0.016	0.018	0.017	0.008

Table 4: Expected resolution of measured in E865 form factors

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