Experiments extract various ratios of these rates, including Γ_+/Γ_-, $\Gamma_L/\Gamma_T = \Gamma_0/(\Gamma_- + \Gamma_+)$, the lepton forward-backward asymmetry $A_{FB} = (3\eta/4)(\Gamma_- - \Gamma_+)/\Gamma$, and the polarization parameter $\alpha = 2\Gamma_0/(\Gamma_+ + \Gamma_-) - 1$. The three form factors can be obtained by fitting the measured distribution of the variables q^2, θ_ℓ, θ_V, and χ.

III. *D*-meson semileptonic decays

In this Section, we review the main results on D and D_s semileptonic decays, including measurements of $D \to \overline{K}\ell^+\nu_\ell$ and $D \to \overline{K}^*\ell^+\nu_\ell$ form factors. An important question is whether the sum of the exclusive rates for these two modes, plus the corresponding Cabibbo-suppressed rates, saturate the inclusive rate. This issue can also be addressed by searching for Cabibbo-favored semileptonic decays to hadronic systems other than the K or K^*, referred to here as nonresonant states. It is also of great interest to measure the Cabibbo-suppressed semileptonic decays of the D^0 and D^+ and the semileptonic decays of the D_s^+. These decays differ from the dominant K or K^* decays by the strange quark content of either the initial meson or the final meson, or both. Although there are differences in the q^2 ranges and the pole masses for Cabibbo-favored and Cabibbo-suppressed decays, the form-factor intercepts for these modes should be similar. We review the measurements that attempt to address these questions. In our tables, averages of experimental results labeled "*PDG value*" are not necessarily an exact average of the numbers in the tables but come from making an overall fit to the branching ratios in the Full Listings that follow this Note.

$D \to \overline{K}\ell^+\nu_\ell$ decays

With the new CLEO-II measurement [4], the ratio $\Gamma(D^0 \to K^-e^+\nu_e)/\Gamma(D^0 \to K^-\pi^+)$ is one of the most accurately determined quantities in charm physics. This measurement, together with the new, more precise value of the absolute $D^0 \to K^-\pi^+$ branching fraction, yields a much improved measurement of $B(D^0 \to K^-e^+\nu_e)$, as shown in Table 1. Note that e–μ universality is assumed, and that muon measurements have been scaled up by a factor of 1.03 to account for the reduced phase space. Therefore, all results are expressed as electron branching fractions. The transition rate, $\Gamma(D^0 \to K^-e^+\nu_e) = (8.9 \pm 0.5) \times 10^{10}\ \mathrm{s}^{-1}$, shown in Table 10, is obtained using the PDG branching fraction of Table 1 and the PDG value of the D^0 lifetime.

Table 1: Measurements of the $D^0 \to K^-e^+\nu_e$ branching fraction. The PDG branching fraction for $D^0 \to K^-\pi^+$ has been used, where needed, to normalize.

Experiment	Reference†	Lepton	Norm. mode	$B(D^0 \to K^-e^+\nu_e)\%$	m_p (GeV)
E691	[5] ANJOS 89F	e	$D^0 \to K^-\pi^+$	3.65 ± 0.54	$2.1^{+0.4}_{-0.2} \pm 0.2$
CLEO-I	[6] CRAWFORD 91B	e	$D^0 \to K^-\pi^+$	3.61 ± 0.37	$2.1^{+0.4+0.3}_{-0.2-0.2}$
CLEO-I*	[6] CRAWFORD 91B	μ	$D^0 \to K^-\pi^+$	3.26 ± 0.50	
E687*	[7] FRABETTI 93I	μ	$D^0 \to K^-\pi^+$	3.39 ± 0.75	
CLEO-II*	[4] BEAN 93C	e, μ	$D^0 \to K^-\pi^+$	3.92 ± 0.25	$2.00 \pm 0.12 \pm 0.18$
MARK-III	[8] ADLER 89	e	absolute	3.4 ± 0.6	
E653*	[9] KODAMA 93B	μ	μ inclusive	2.5 ± 0.6	
PDG value				3.68 ± 0.21	

*Muon measurements have been scaled up by 1.03 to be equivalent to electrons.
† Here and in several later Tables, the reference ID used in the Data Listings is given following the reference number.

Isospin symmetry requires equal transition rates for the Cabibbo-favored D^0 and D^+ decays. The D^+ branching fraction measurements are given in Table 2, using our branching fractions for the normalizing modes. The average $D^+ \to \overline{K}^0e^+\nu_e$ transition rate is $(6.3 \pm 0.8) \times 10^{10}\ \mathrm{s}^{-1}$, significantly lower than $\Gamma(D^0 \to K^-e^+\nu_e)$, although it is less well measured. The discrepancy may be be due, in part, to poorly measured normalizing branching fractions. In any case, we use the average transition rate $\Gamma(D \to \overline{K}e^+\nu_e) = (8.2 \pm 0.4) \times 10^{10}\ \mathrm{s}^{-1}$ to compute the form factor discussed below.

Table 2: Measurements of the $D^+ \to \overline{K}^0e^+\nu_e$ branching fraction.

Experiment	Reference	Norm. mode	$B(D^+ \to \overline{K}^0e^+\nu_e)\%$
MARK-III*	[10] BAI 91	absolute	$6.8^{+1.6}_{-1.1}$
E691	[11] ANJOS 91C	$D^+ \to K^-\pi^+\pi^+$	6.0 ± 1.6
CLEO-II*	[4] BEAN 93C	$D^+ \to \overline{K}^0\pi^+$	7.1 ± 0.8
PDG value			6.7 ± 0.8

* Average of electrons and muons.