to terms of higher order in $\lambda = \sin(\theta_{\rm Cabibbo})$ for $b \to s$ decays. When the decay also involves a K_S in the final state an additional contribution to the phase from the K-mixing phase must be included in relating the measured asymmetry to the CKM parameters.

The columns labeled "Sample B_d Modes" and "Sample B_s Modes" list some of the simplest CP-eigenstate modes for each case. The columns labeled "Angle" show the particular combination of CKM phases $\phi_M + \phi_D$ that is measured by the CP-violating asymmetry in these decays, given as an angle of the unitarity triangle. For most channels the measured asymmetry in a time-dependent measurement is $\pm\sin(2(\phi_M + \phi_D))\sin(\Delta Mt)$ while in a time-integrated measurement the asymmetry is $\pm x_q/(1+x_q^2)\sin(2(\phi_M+\phi_D))$. The sign is given by the CP eigenvalue of the particular final state studied. The exception to these statements is the channel DK discussed below.

The assumptions needed to obtain the results in the "Angle" columns are noted in the comments below the table. Terms of higher order in $\lambda = \sin(\theta_{\rm Cabibbo})$ have been dropped. Penguin diagrams that occur at the same order of λ as the corresponding tree diagrams are neglected in stating the relationship of the asymmetry to angles in the unitarity triangle. In cases where the tree and penguin diagrams are expected to give comparable contributions with different CKM phases there is no simple relationship between the measured asymmetry and a CKM phase, and thus no entry in the "Angle" columns in Table 1.

The mode $D^0K^*(892)$ is listed even though it is not a CP eigenstate because it has been shown that an analysis of this mode can be used to extract the angle γ. [10]. The same type of analysis can also be applied for charged B decays. However the relationship between the decay asymmetry and the angle is not as simple as Eq. (19) in this case. The result depends on measurements of a number of branching ratios. It will be very difficult to obtain accurate results by this method.

In the case of the $b \to u\overline{u}d$ and $b \to d\overline{d}d$, the penguin contributions occur at the same order in λ as the tree diagrams and are thus are expected to be small compared to them because of the $\alpha(m_b)/\pi$ suppression factor. The result given in Table 1 makes this approximation. If however this expectation proves false, so that the contributions are comparable, one still may be able to extract a measurement of $\sin(2\alpha)$ from the $\pi^+\pi^-$ asymmetry. This is achieved by measuring the rates in several isospin-related channels and using a multiparameter fit to separate tree and penguin contributions to the amplitudes [12]. This will require measuring the decay rate for channel $\pi^0\pi^0$, which will be a challenge. For the $\rho\pi$ decays, if penguins are not negligible, the restrictions due to isospin can again be used to make a multiparameter fit to the ρ-regions of the Dalitz plot for $\pi^+\pi^-\pi^0$ distribution [13]. The interference between different ρ-charge channels is significant and may provide sufficient information to allow the separation of tree and penguin effects and thus extraction of the parameter α. Such analyses at the very least can be used to test whether the penguin contributions are indeed small enough to be neglected in the determination of α.

There are some common decay channels of the B^0 and $\overline{B}^0$ which are not CP eigenstates. For example the channel $J/\psi(1S)K^*(892)$ where the $K^*(892) \to K_S\pi^0$, the final state is not a CP eigenstate because both even and odd relative angular momenta between the $J/\psi(1S)$ and the $K^*(892)$ are allowed. If there is sufficient data one can use angular analysis to separate the different CP final states and measure the asymmetry in each [14]. The same applies in many quasi-two-body decays, such as other vector-vector channels, or those with higher-spin particles in final states. The branching ratio to these channels can be significantly larger than the CP-eigenstate (vector-scalar or scalar-scalar) channels with the same quark content. Such angular analyses may therefore be important in achieving accurate values for the parameters α and β.

Beyond Standard Model effects: The predictions given above are all for the Standard Model. Models beyond the Standard Model may introduce additional contributions to the mixing amplitudes and thereby destroy the relationships given here; in addition they may introduce further direct CP violation.

One model often used as a "straw man" in evaluating the potential of experimental tests of Standard Model predictions is the superweak model, which was one of the earliest proposals for the mechanism of CP violation, in fact prior to the Standard Model [15]. In the modernized version of this model it is assumed that the CKM matrix is real and that all CP-violating effects arise from a contribution to the mixing that comes from beyond the Standard Model. In this case *all* the CP-eigenstate channels for B decay would have the same CP-violating asymmetry (up to a sign which differs for CP-odd and CP-even channels) [16]. This applies even to those channels predicted to have zero asymmetry in the Standard Model, as well as those for which the Standard Model prediction is complicated by the competition between tree and penguin contributions. Observation of significantly different asymmetries in any two neutral B decay CP-eigenstate channels would rule out such a model. In addition the observation of any asymmetry in a charged B decay or a neutral B decay to flavor-tagging final state would be evidence for direct CP violation and would exclude the superweak model, as would an unequivocal nonzero result for the parameter ϵ' in K decays.

Many other models for the physics beyond the Standard Model have been discussed in the literature [17]. The most common additional CP-violating effect is a new contribution to the mixing process, due for example to charged Higgs contributions. The appearance of such contributions in K mixing is already severely restricted by the neutral-K mass difference. However this does not rule out additional contributions to B mixing that would destroy the relationship between the mixing phase ϕ_M and the CKM-matrix elements. This in turn would lead to violations of the predictions given in Table 1 which are based on