is now evidence for $B^0 - \overline{B}^0$ mixing ($\Delta B = 2$), with the corresponding mass difference between the eigenstates $(m_{B^0_{\rm H}} - m_{B^0_{\rm L}}) = (0.71 \pm 0.06)\ \Gamma_B = (3.1 \pm 0.4) \times 10^{-10}$ MeV. No evidence exists for $D^0 - \overline{D}^0$ mixing, which is expected to be much smaller in the Standard Model.

c) Flavor-changing neutral currents. In the Standard Model the neutral-current interactions do not change flavor. The low rate $\Gamma(K_L \to \mu^+\mu^-)/\Gamma(K_L \to \text{all}) = (7.4 \pm 0.4) \times 10^{-9}$ puts limits on such interactions; the nonzero value for this rate is attributed to a combination of the weak and electromagnetic interactions. The best test should come from a limit on $K^+ \to \pi^+\nu\overline{\nu}$, which occurs in the Standard Model only as a second-order weak process with a branching fraction of $(1 \text{ to } 8) \times 10^{-10}$. The current limit is $\Gamma(K^+ \to \pi^+\nu\overline{\nu})/\Gamma(K^+ \to \text{all}) < 5.2 \times 10^{-9}$. Limits for charm-changing or bottom-changing neutral currents are much less stringent: $\Gamma(D^0 \to \mu^+\mu^-)/\Gamma(D^0 \to \text{all}) < 1.1 \times 10^{-5}$ and $\Gamma(B^0 \to \mu^+\mu^-)/\Gamma(B^0 \to \text{all}) < 5.9 \times 10^{-6}$. One cannot isolate flavor-changing neutral current (FCNC) effects in non leptonic decays. For example, the FCNC transition $s \to d + (\overline{u} + u)$ is equivalent to the charged-current transition $s \to u + (\overline{u} + d)$. Tests for FCNC are therefore limited to hadron decays into lepton pairs. Such decays are expected only in second-order in the electroweak coupling in the Standard Model.

References

1. R. Carosi *et al.*, Phys. Lett. **B237**, 303 (1990).
2. M. Karlsson *et al.*, Phys. Rev. Lett. **64**, 2976 (1990); L.K. Gibbons *et al.*, Phys. Rev. Lett. **70**, 1199 (1993).

TESTS OF DISCRETE SPACE-TIME SYMMETRIES

CHARGE CONJUGATION (C)

$\Gamma(\pi^0 \to 3\gamma)/\Gamma_{\rm total}$		$<3.1 \times 10^{-8}$, CL = 90%
$\Gamma((e^+e^-)_{J=0} \to 3\gamma)/\Gamma((e^+e^-)_{J=0} \to 2\gamma)$	[a]	$<1 \times 10^{-5}$, CL = 90%
$\Gamma((e^+e^-)_{J=1} \to 4\gamma)/\Gamma((e^+e^-)_{J=1} \to 3\gamma)$	[a]	$<1 \times 10^{-5}$, CL = 90%
η C-nonconserving decay parameters		
$\pi^+\pi^-\pi^0$ left-right asymmetry parameter		$(0.09 \pm 0.17) \times 10^{-2}$
$\pi^+\pi^-\pi^0$ sextant asymmetry parameter		$(0.18 \pm 0.16) \times 10^{-2}$
$\pi^+\pi^-\pi^0$ quadrant asymmetry parameter		$(-0.17 \pm 0.17) \times 10^{-2}$
$\pi^+\pi^-\gamma$ left-right asymmetry parameter		$(0.9 \pm 0.4) \times 10^{-2}$
$\pi^+\pi^-\gamma$ parameter β (D-wave)		0.05 ± 0.06 (S = 1.5)
$\Gamma(\eta \to 3\gamma)/\Gamma_{\rm total}$		$<5 \times 10^{-4}$, CL = 95%
$\Gamma(\eta \to \pi^0 e^+ e^-)/\Gamma_{\rm total}$	[b]	$<4 \times 10^{-5}$, CL = 90%
$\Gamma(\eta \to \pi^0 \mu^+ \mu^-)/\Gamma_{\rm total}$	[b]	$<5 \times 10^{-6}$, CL = 90%

PARITY (P)

e electric dipole moment	$(-0.3 \pm 0.8) \times 10^{-26}$ $e$cm
μ electric dipole moment	$(3.7 \pm 3.4) \times 10^{-19}$ $e$cm
τ electric dipole moment	$<5 \times 10^{-17}$ $e$cm, CL = 95%
$\Gamma(\eta \to \pi^+\pi^-)/\Gamma_{\rm total}$	$<1.5 \times 10^{-3}$
p electric dipole moment	$(-4 \pm 6) \times 10^{-23}$ $e$cm
n electric dipole moment	$<11 \times 10^{-26}$ $e$cm, CL = 95%
Λ electric dipole moment	$<1.5 \times 10^{-16}$ $e$cm, CL = 95%

TIME REVERSAL (T)

e electric dipole moment		$(-0.3 \pm 0.8) \times 10^{-26}$ $e$cm
μ electric dipole moment		$(3.7 \pm 3.4) \times 10^{-19}$ $e$cm
μ decay parameters		
transverse e^+ polarization normal to plane of μ spin, e^+ momentum		0.007 ± 0.023
α'/A		$(0 \pm 4) \times 10^{-3}$
β'/A		$(2 \pm 6) \times 10^{-3}$
τ electric dipole moment		$<5 \times 10^{-17}$ $e$cm, CL = 95%
Im(ξ) in $K^{\pm}_{\mu 3}$ decay (from transverse μ pol.)		-0.017 ± 0.025
Im(ξ) in $K^0_{\mu 3}$ decay (from transverse μ pol.)		-0.007 ± 0.026
p electric dipole moment		$(-4 \pm 6) \times 10^{-23}$ $e$cm
n electric dipole moment		$<11 \times 10^{-26}$ $e$cm, CL = 95%
$n \to p e^- \nu$ decay parameters		
ϕ_{AV}, phase of g_A relative to g_V	[c]	$(180.07 \pm 0.18)^\circ$
triple correlation coefficient D		$(-0.5 \pm 1.4) \times 10^{-3}$
Λ electric dipole moment		$<1.5 \times 10^{-16}$ $e$cm, CL = 95%
triple correlation coefficient D for $\Sigma^- \to n e^- \overline{\nu}_e$		0.11 ± 0.10

CHARGE CONJUGATION TIMES PARITY (CP)

τ weak dipole moment		$<3.7 \times 10^{-17}$ $e$cm, CL = 95%
$\Gamma(\eta \to \pi^+\pi^-)/\Gamma_{\rm total}$		$<1.5 \times 10^{-3}$
$K^{\pm} \to \pi^{\pm}\pi^+\pi^-$ rate difference/average		(0.07 ± 0.12)%
$K^{\pm} \to \pi^{\pm}\pi^0\pi^0$ rate difference/average		(0.0 ± 0.6)%
$K^{\pm} \to \pi^{\pm}\pi^0\gamma$ rate difference/average		(0.9 ± 3.3)%
$(g_{\tau^+} - g_{\tau^-}) / (g_{\tau^+} + g_{\tau^-})$ for $K^{\pm} \to \pi^{\pm}\pi^+\pi^-$		(-0.7 ± 0.5)%
CP-violation parameters in K^0_S decay		
$\text{Im}(\eta_{+-0})^2 = \Gamma(K^0_S \to \pi^+\pi^-\pi^0$, CP-violating$)$ / $\Gamma(K^0_L \to \pi^+\pi^-\pi^0)$		<0.12, CL = 90%
$\text{Im}(\eta_{000})^2 = \Gamma(K^0_S \to 3\pi^0) / \Gamma(K^0_L \to 3\pi^0)$		<0.1, CL = 90%
charge asymmetry j for $K^0_L \to \pi^+\pi^-\pi^0$		0.0011 ± 0.0008
$\lvert\eta_{+-\gamma}\rvert = \lvert A(K^0_L \to \pi^+\pi^-\gamma)/A(K^0_S \to \pi^+\pi^-\gamma)\rvert$		$(2.15 \pm 0.26 \pm 0.20) \times 10^{-3}$
$\phi_{+-\gamma}$ = phase of $\eta_{+-\gamma}$		$(72 \pm 23 \pm 17)^\circ$
$\lvert\epsilon'_{+-\gamma}\rvert/\epsilon$		<0.3, CL = 90%
$\Gamma(K^0_L \to \pi^0\mu^+\mu^-)/\Gamma_{\rm total}$	[d]	$<5.1 \times 10^{-9}$, CL = 90%
$\Gamma(K^0_L \to \pi^0 e^+ e^-)/\Gamma_{\rm total}$	[d]	$<4.3 \times 10^{-9}$, CL = 90%
$\Gamma(K^0_L \to \pi^0 \nu\overline{\nu})/\Gamma_{\rm total}$	[e]	$<2.2 \times 10^{-4}$, CL = 90%
$[\Gamma(D^0 \to K^+K^-) - \Gamma(\overline{D}^0 \to K^+K^-)]$/sum		<0.45, CL = 90%
$\lvert\text{Re}(\epsilon_{B^0})\rvert$		<0.045
$[\alpha_-(\Lambda) + \alpha_+(\overline{\Lambda})] / [\alpha_-(\Lambda) - \alpha_+(\overline{\Lambda})]$		-0.03 ± 0.06

CHARGE CONJUGATION TIMES PARITY (CP) VIOLATION OBSERVED

charge asymmetry in $K^0_{\ell 3}$ decays		
$\delta(\mu) = [\Gamma(\pi^-\mu^+\nu_\mu) - \Gamma(\pi^+\mu^-\overline{\nu}_\mu)]$/sum		(0.304 ± 0.025)%
$\delta(e) = [\Gamma(\pi^- e^+\nu_e) - \Gamma(\pi^+ e^-\overline{\nu}_e)]$/sum		(0.333 ± 0.014)%
parameters for $K^0_L \to 2\pi$ decay		
$\lvert\eta_{00}\rvert = \lvert A(K^0_L \to 2\pi^0) / A(K^0_S \to 2\pi^0)\rvert$		$(2.259 \pm 0.023) \times 10^{-3}$ (S = 1.1)
$\lvert\eta_{+-}\rvert = \lvert A(K^0_L \to \pi^+\pi^-) / A(K^0_S \to \pi^+\pi^-)\rvert$		$(2.269 \pm 0.023) \times 10^{-3}$ (S = 1.1)
$\epsilon'/\epsilon \approx \text{Re}(\epsilon'/\epsilon) = (1 - \lvert\eta_{00}/\eta_{+-}\rvert)/3$	[f]	$(1.5 \pm 0.8) \times 10^{-3}$ (S = 1.8)
ϕ_{+-}, phase of η_{+-}		$(44.3 \pm 0.8)^\circ$
ϕ_{00}, phase of η_{00}		$(43.3 \pm 1.3)^\circ$
$\Gamma(K^0_L \to \pi^+\pi^-)/\Gamma_{\rm total}$		$(2.03 \pm 0.04) \times 10^{-3}$ (S = 1.2)
$\Gamma(K^0_L \to \pi^0\pi^0)/\Gamma_{\rm total}$		$(9.14 \pm 0.34) \times 10^{-4}$ (S = 1.8)

Limits are given at the 90% confidence level, while errors are given as ± 1 standard deviation.