

**Implications of Improved Limits on $\mu \rightarrow e\gamma$
and $\tau \rightarrow \mu\gamma$**

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**March 1999, SLAC
Workshop on the τ -charm Factory**

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Introduction

A reminder that there are good reasons to look for $\tau \rightarrow \mu\gamma$.

- Long history (even a textbook example: Cheng and Li, 1984)*
- Obviously lepton flavour violating
- Generically expected with massive neutrinos
- In SUSY theories, SUSY scale parameters can replace m_ν

$$*\text{BR}(\mu \rightarrow e\gamma) = \frac{3\alpha}{32\pi} \left(\sum_{\text{neutrino } j} U_{ej}^* U_{j\mu} \frac{m_{\nu_i}^2}{M_W^2} \right)^2 \quad \text{Squared again!}$$

Together with searches for $\mu \rightarrow e\gamma$, this is a good place to constrain SUSY-GUT models!

Current Limits

Experiment	BR($\tau \rightarrow e\gamma$)	BR($\tau \rightarrow \mu\gamma$)	# of tau pairs	$\int \mathcal{L} dt$
ARGUS	$< 1.2 \times 10^{-4}$	$< 3.4 \times 10^{-5}$	374,300	387 pb $^{-1}$
CLEO	$< 2.7 \times 10^{-6}$	$< 3.0 \times 10^{-6}$	4.24×10^6	4.68 fb $^{-1}$
DELPHI	$< 1.1 \times 10^{-4}$	$< 6.2 \times 10^{-5}$	81,000	70 pb $^{-1}$
τcF (est.)	$< 2.7 \times 10^{-7}$	$< 3.0 \times 10^{-7}$	5×10^7	100 fb $^{-1}$ (10 yr)

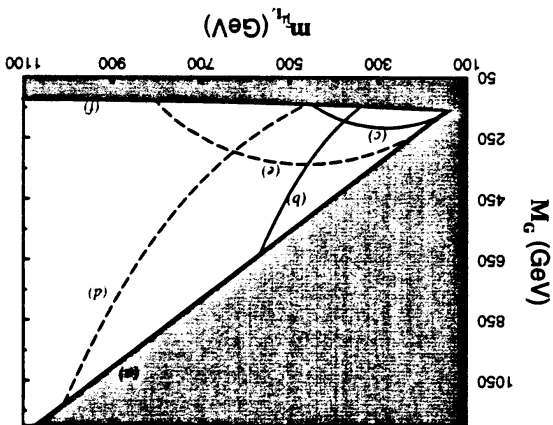
Table 1: Existing limits on $\tau \rightarrow (e/\mu)\gamma$ at 90% CL.

*maybe
CC?*

- Current best limit on BR($\mu \rightarrow e\gamma$) $< 4.9 \times 10^{-11}$ (LAMPF)
- Hoped for: 4.9 replaced by 3.6
- $\sim 10^{-13}$ or 10^{-14} at PSI?

(g-2) exclusions?
T. Kitso

Figure 1: (M_G, m_{H_1}) parameter space excluded by present and (possible) future data (all curves are for $\tan\beta = 3, \mu > 0, A_0 = 0$). Area below line (f) is excluded by direct chargino search at the M_Z pole. Area above line (a) is excluded by the R-G analysis. Area between lines (a) and (b) is excluded by present upper limit on $BR(\mu \rightarrow e\gamma)$. Area between line (c) ($x = 0.5$) and axes is excluded by present upper limit on $\tau \rightarrow \mu\gamma$. Lines (d) and (e) show the range of parameters excluded if current limits were decreased by a factor of 10.



i.e. Goldberg and Gomez, PRD 53 (1996) 5244.

An $SU(2)_C \times U(1)$ Model Calculation

Conclusions

- A tau-charm factory can dramatically improve our knowledge of $\tau \rightarrow \mu\gamma$
- Together with $\mu \rightarrow e\gamma$, this is a good place to look for \sim TeV-scale SUSY signatures.
- This is one of many examples where a τ CF fits into a larger picture, supplying data complementary to that from other facilities.