

# Preliminary results of

$$\tau \rightarrow \mu \gamma$$

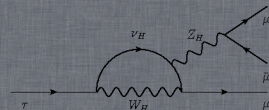
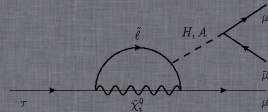
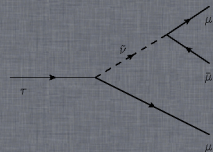
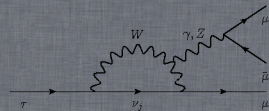
Alberto Lusiani<sup>1,2</sup>, Marcin  
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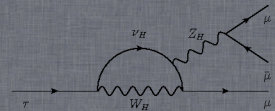
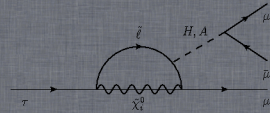
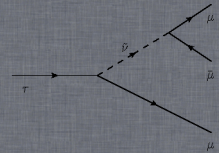
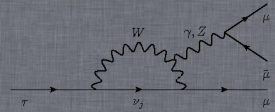


Motivation

SuperB vs SuperC

Studies done so far

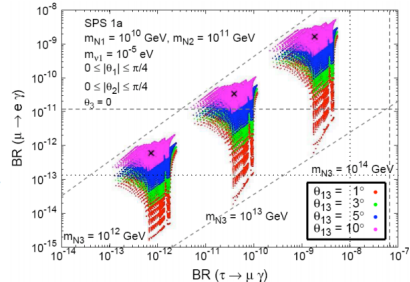
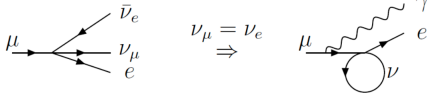
MC studies



# LFV hunting, "Who ordered that?" I. Rabi

The history of LFV dates back to the discovery of muon:

- After discovery of  $\mu$  it was natural to think about it as an excited electron.
- Unless you have an other neutrino.

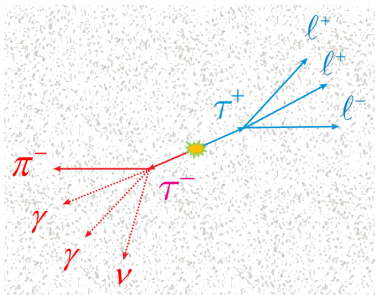


- Analogy to GIM mechanism.

# Flavour wars, $\Upsilon(4S)$ vs $\psi(3770)$

At  $B$  factories one did the following:

- Calculate the thrust axis.
- Divide the particles among two hemispheres.
- No possibility to mix tracks from one  $\tau$  with other!
- We are making a kind of topological tag.



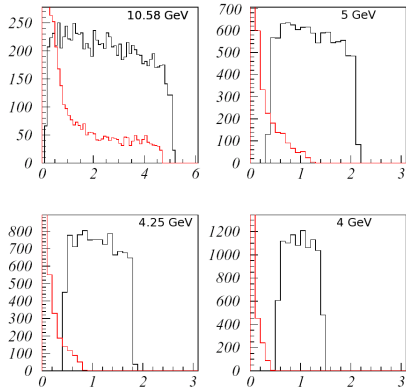
# Flavour wars, $\Upsilon(4S)$ vs $\psi(3770)$

What about  $\psi(3770)$ ?

- $\tau$ 's are produced "almost" at rest  $\rightarrow$  No boost.
- Tracks mix hemispheres.
- No previous  $\tau$  analysis done under this conditions.

# Studies done so far

H.Hayashii (2008) emphasizes that close to the tau pair production threshold the ISR photon spectrum is limited to small energies and the overlap with the  $\tau \rightarrow \mu\gamma$  signal photon spectrum tends to zero.



Preliminary report on a work-in-progress to estimate the sensitivity to  $\tau \rightarrow \mu\gamma$  at a tau-charm factory with Monte Carlo simulated events

# MC studies

What we have done (not everything up to date):

- Simulation done with FastSim 3.2.
- SuperB detector.
- SuperB beams, with  $\beta\gamma = 0.28$ .
- Simulated bck:  $\tau\tau$  and continuum up to integrated luminosity of  $1\text{ab}^{-1}$ .
- CM energy  $\psi(3770)$ .
- Beam energies: 2.2 and  $-1.6\text{GeV}$ .



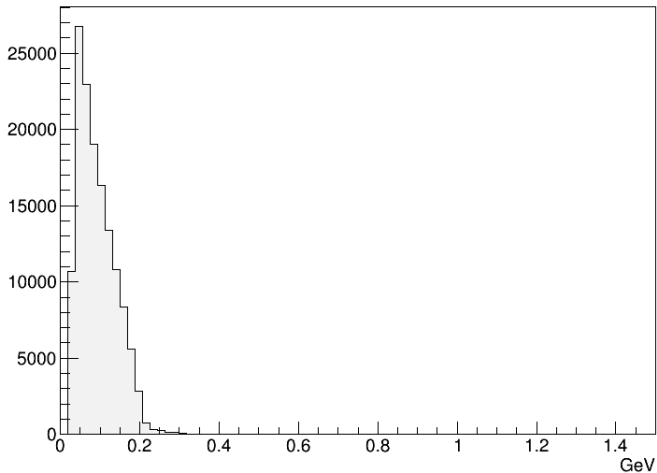
# Preselection

We demand from each event:

- Require events with just two charged tracks (85% of other (tag)  $\tau$  decays)
- $\tau$  reconstructed with energy constrain to CM.
- select tau candidates with:
  - muon ID(SuperB lists)
  - $E_\gamma > 50\text{MeV}$  in CM.

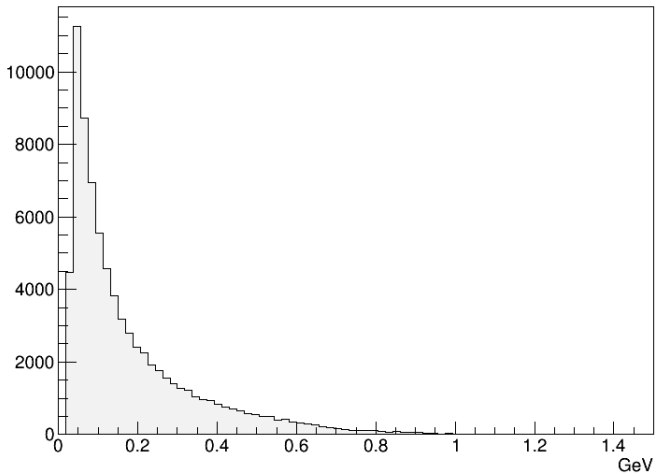
# Photon spectrum

$\gamma$  energy for ISR

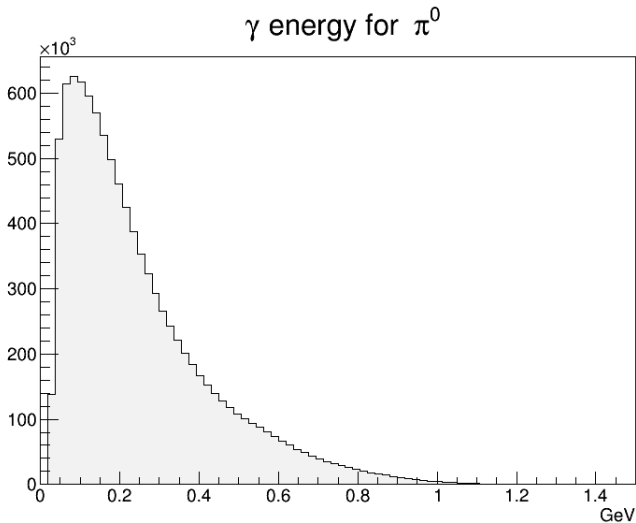


# Photon spectrum

$\gamma$  energy for FSR

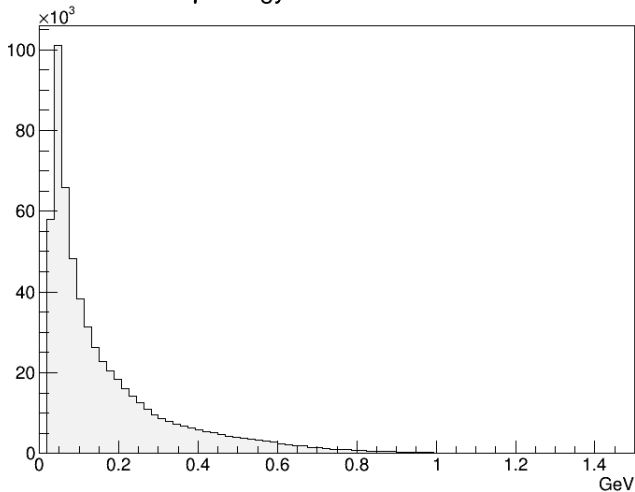


# Photon spectrum

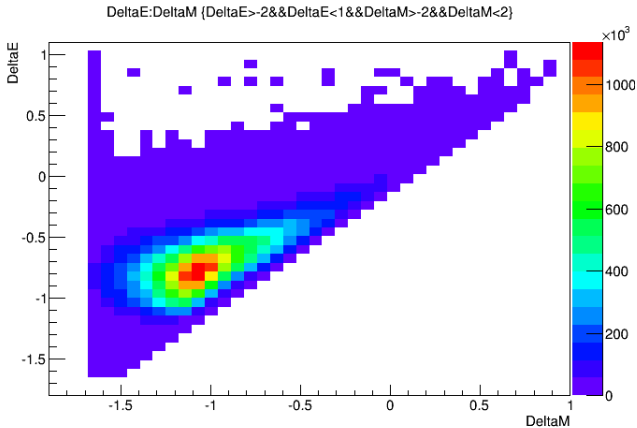


# Photon spectrum

$\gamma$  energy for other sources

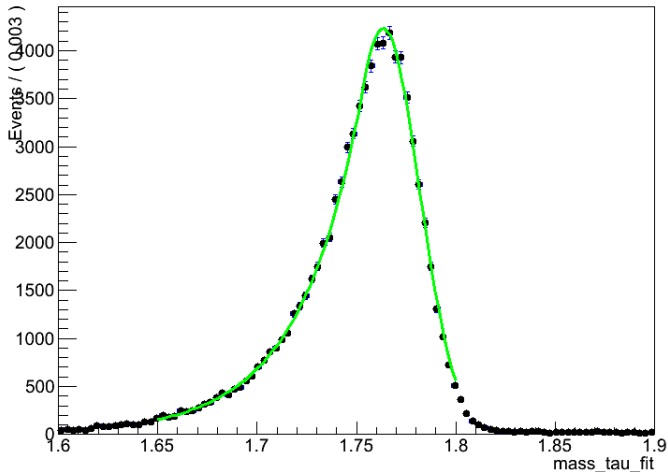


# Background estimate in $\Delta E$ vs $\Delta M$



# Resolution

A RooPlot of "mass\_tau\_fit"



Resolution:  $\approx 18\text{MeV}$ .

# Preliminary conclusions

- Analysis is ongoing.
- Completely different environment than  $\Upsilon(4S)$ .
- Need to somehow select/reconstruct/tag the other tau, otherwise the problem looks fatal.
- found few thousand background events in the signal window.
- Need to VETO  $\pi^0$ .