MC Generator for $e^+e^- \to$ hadrons, is it feasible?

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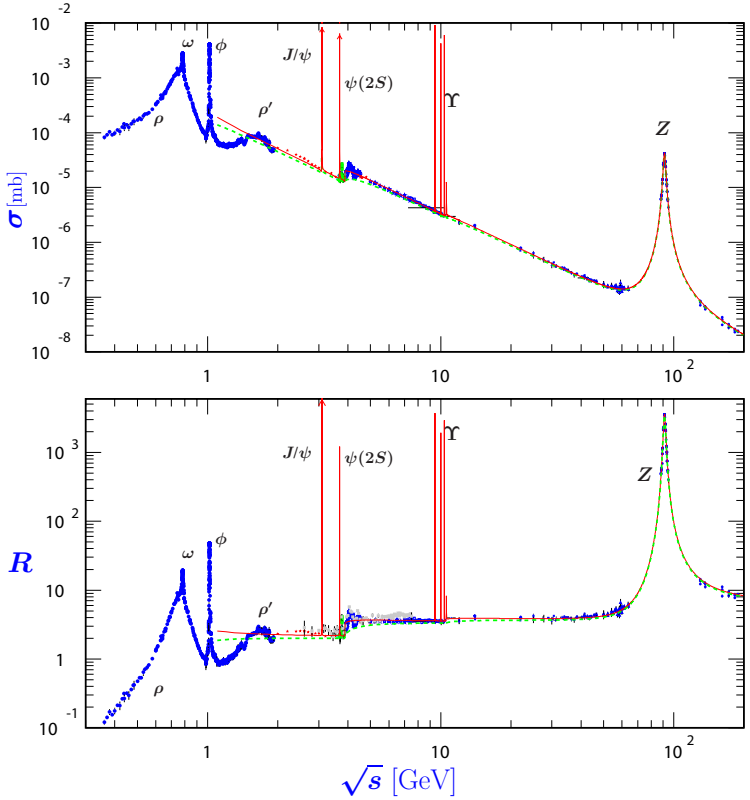
Outline

1. Ideas
2. Conclusions

Original idea (Sergey Serednyakov)

- Experience of BaBar/Belle shows that it is very convenient to have some "generic" generators providing the most general processes/decays, e.g., $q\bar{q}$ continuum ($u,\ d,\ s,\ c$), $\tau^+\tau^-$ with all τ decays on, $\gamma\gamma \to \ldots$, QED, which are possible background (BG) sources
- Even if we do NOT trust the absolute value of the BG, we can use the shape (energy dependence) to construct PDF
- How do we estimate BG now, e.g., for $e^+e^- \to \pi^+\pi^-\pi^0$? An "educated guess" (same signature): $e^+e^- \to \pi^+\pi^-2\pi^0,\ \pi^+\pi^-3\pi^0, \pi^+\pi^-\gamma$, QED and inevitably miss some important BG's
- Can we make a MC generator for R with $\sim 10\%$ accuracy, which gives a more realistic list of BG processes requiring a further study? MC events have a "label" specifying what final state produces BG

Cross section and R



Strong energy dependence because of various resonances below 2 GeV

What is next? A "flow chart"

- The most difficult part is to create a reasonable approximation reproducing the energy dependence of the total cross section as a sum of cross sections of separate channels
- In fact, we should have such an approximation for each specific channel and for it – fractions of intermediate mechanisms
- Once it is ready, the rest is simple. First, we calculate the total cross section as well as all possible final states at a c.m. energy of interest
- We sample, i.e., determine randomly a specific final state, which "occurs"
- If necessary, we take into account dynamics, i.e., possible intermediate channels, e.g., for $2\pi^+2\pi^-$ these are $a_1\pi$, $\rho^0 f_0, \ldots$
- We record the process "number" and pass an event through a detector

Conclusions

- A few not very mature ideas developed together with Sergey Serednyakov
- A rather high precision of measuring exclusive σ expected (needed) in the CMD-3/SND experiments necessitates more accurate BG estimation
- We suggest to create a MC generating (approximately!) a variety of exclusive modes of single-photon annihilation to hadrons
- Such a generator will provide a shape (energy dependence) of BG and most probable sources
- In addition to single-photon annihilation to hadrons there are backgrounds from two-photon and QED processes
- We expect your criticism, comments, suggestions, ...