FAST MONTE CARLO

P. Kim

- Physics feasibility Studies with

  25 million τ-pairs /year

  or

  100 million $D\bar{D}$-pairs/year

  or

  (?) billion ψ, ψ'/year

  $\oplus$ 200 million $u\bar{u}d\bar{d}s\bar{s}$ (QED cont.)

- Detector Design

NEEDS FOR FAST SIMULATION

- Understand Kinematics
- Identify major source of background
- Fast turn around understanding of detector resolution & efficiencies

PHYSICS GENERATORS

- KORALB Version 2.5

  22 Decay modes ⇐ PDG '98 values

  Initialization (CLEO, BABAR) settings

- JETSET 7.4

  $e^+e^- \to (c\bar{c}) \to ggg, gg\gamma$

  $J/\psi, \psi', \ldots$

  $e^+e^- \to \psi''(3770) \to D\bar{D}$

  $\psi(4030) \to D_s\bar{D}_s, D\bar{D}^{(*)}$

  $e^+e^- \to q\bar{q}$ continuum

  uds light quark fragmentation (LUND model)

  $\ell=1$ mesons allowed

  ISR turned on.

Tau Decay Table (PDG 98)

```
DECAY TAU-
CHANNEL 2001 0.1781 NUEB E- NUT
CHANNEL 2002 0.1737 NUMB MU- NUT
CHANNEL 2003 0.1108 PI- NUT
CHANNEL 2004 0.2532 RHO- NUT
CHANNEL 2005 0.1825 A1- NUT
CHANNEL 2006 0.0071 K- NUT
CHANNEL 2007 0.0128 K*- NUT
CHANNEL 2008 0.0450 PI- PI- PI+ PI0 NUT
CHANNEL 2009 0.0123 PI- PI0 PI0 PI0 NUT
CHANNEL 2010 0.0050 PI- PI- PI+ PI0 PI0 NUT
CHANNEL 2011 0.0008 PI- PI- PI- PI+ PI+ NUT
CHANNEL 2012 0.0003 PI- PI- PI+ PI0 PI0 PI0 NUT
CHANNEL 2013 0.0002 PI- PI- PI- PI+ PI+ PI0 NUT
CHANNEL 2014 0.0019 K- PI- K+ NUT
CHANNEL 2015 0.0012 K0 PI- KB NUT
CHANNEL 2016 0.0030 K- K0 PI0 NUT
CHANNEL 2017 0.0010 PI0 PI0 K- NUT
CHANNEL 2018 0.0023 K- PI- PI+ NUT
CHANNEL 2019 0.0039 PI- KB PI0 NUT
CHANNEL 2020 0.0017 ETA PI- PI0 NUT
CHANNEL 2021 0.0016 PI- PI0 GAMM NUT
CHANNEL 2022 0.0016 K- K0 NUT
ENDDECAY
```

FAST SIMULATION

- Simple Parametrization of Charged track
  Showers

  { detection eff. ⇐ Jasper's list
  { resolution

  NO PARTICLE I.D.

  NO splitoffs

  NO machine background

- DETAILED DETECTOR STRUCTURE will go in.

- working on writing events to a file.

  small size < 1 KB /event.

BASELINE TCF DETECTOR PERFORMANCE

Jasper Kirkby
CERN
5 January 1999

Table 1: Baseline performance of a generic τcF detector, based on current BF detectors and previous τcF studies. The symbol '$\oplus$' denotes addition in quadrature.

Item	Baseline τcF detector performance
Charged particles:	
Momentum resolution: σ_p/p(GeV/c)	$0.2\%p \oplus 0.2\%/\beta$
Angular resolution: $\sigma_{\theta,\phi}$ (mr)	$2/p\beta$
$p_t^{\rm min}$(MeV/c) for efficient reconstruction	50
Acceptance	95%
Photons:	
Energy resolution: σ_E/E(GeV)	$1\%/\sqrt{E} \oplus 2\%$
Angular resolution: $\sigma_{\theta,\phi}$ (mr)	$4/\sqrt{E} \oplus 2$
2γ angular separation (mr)	50
$E^{\rm min}$(MeV) for efficient detection	10
Acceptance	95%
Particle identification (inc. Če.):	
K/π separation	$< 10^{-6}$ below 1.5 GeV/c
e/π separation	10^{-4}
μ/π separation	$2\%/p$(GeV/c) + 2%
Acceptance	90%
Additional particle identification:	
$p_t^{\rm min}$(MeV/c) for efficient ν tagging by $E_{\rm miss}$	100
K^0_L acceptance × detection efficiency	80%
μ polarisation acceptance	20%

K_L^0 Veto efficiency ?

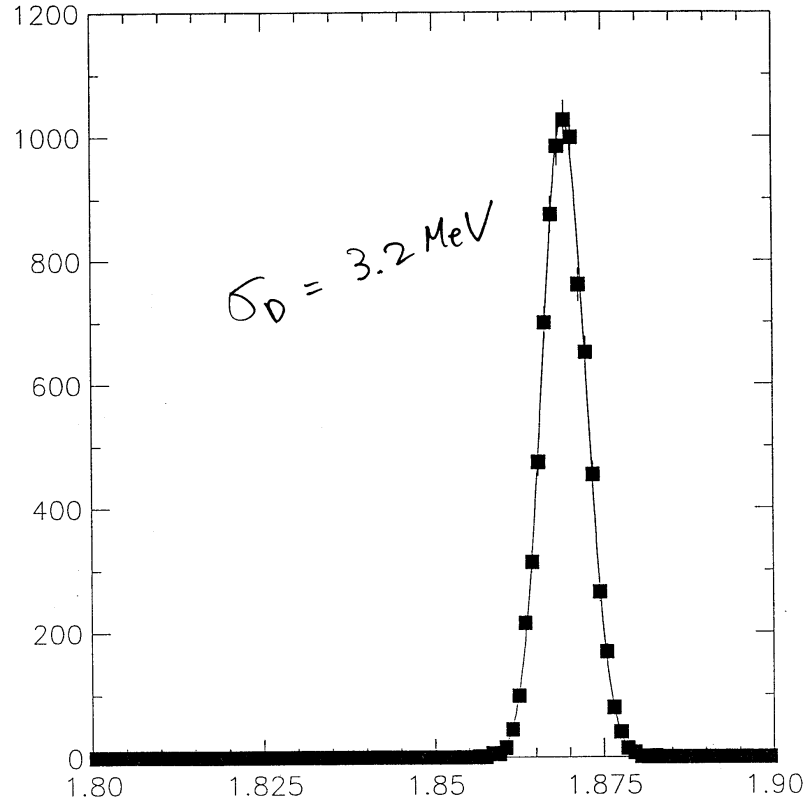
$\sigma_{E_{beam}} = 1.3$ MeV $\Rightarrow$ $\sigma_w = 1.7$ MeV at $E_{beam} = 2$GeV

Plot Area Total/Fit 8194.0 / 8194.0 Fit Status 3
Func Area Total/Fit 8194.0 / 8194.0 E.D.M. 2.236E-06

Likelihood = 26.7

χ^2 = 27.7 for 100 − 3 d.o.f., C.L.=100.0%

Errors		Parabolic	Minos	
Function 1: Gaussian (sigma)				
AREA	8194.0	±90.52	− 0.	+ 0.
MEAN	1.8694	±3.5035E−05	− 0.	+ 0.
SIGMA	3.17140E−03	±2.4774E−05	− 0.	+ 0.



Portability

Minimum Set of Libraries

CERNLIB : PACKLIB
KERNLIB
MATHLIB

JETSET 7.4
ICORALB
FAST SIM CODE
} 1 MB Source code

Compile / link with GNU Fortran compiler

Executable size ~ 2MB
runs on ALL platforms

SPEED

25 minutes / 1 million JETSET $q\bar{q}$ continuum.
(SUN Ultraspare II; 333 MHz)

⇒ 100 million / day !

FUTURE IMPROVEMENTS

τ decay modes 17 additional from CLEO (A. Weinstein)

Better tuning of J/ψ decay, $q\bar{q}$ fragmentation

Input from BES data

write capability for event transfer

documentation.

The Package will be available very shortly ...