

# Recent Progress with the EvtGen Upgrade

- JETSET74 dependency:
  - no longer needed
  - use models PYTHIA and PYCONT instead of JETSET, JSCONT
- PHOTOS:
  - PHOTOS communicates using HEPEVT common block
  - HEPEVT common block used in many places in CDF
  - EvtGen – PHOTOS interface assumes nobody else uses HEPEVT
  - for now keep private PHOTOS version (but use double precision interface)
    - will seek better solution with EvtGen authors
- Incoherent mixing crash:
  - fixed in latest EvtGen pre-release (provided last Monday)
- Script to import a new EvtGen release
- **Upgraded EvtGen is working**



# Validation Tools

- Some validation/example programs supplied with EvtGen distribution
- evtGen AC++ executable
  - clone of cdfGen with additional modules
  - EventDump module
  - HepgNtuple module (produces ntuples of HEPG bank)
  - validation module(s) producing specific histograms
- Library of ROOT macros to analyze evtGen output
  - print HEPG “bank” entries for a given event in different formats
  - multiplicity of charged/neutral decay products
  - multiplicity of direct or stable (for EvtGen) decay products
  - analyze generated lifetime, mixing, ...
  - scripts to produce validation plots included in the CDF EvtGen User Guide



# Examples 1: Examine Decay Tree

```
root [12] dumpEvent(2,nt)
```

```
Read 2644 bytes, 33 entries for event 2:
```

INDX	ISTD	IDHEP	Q	NAME	DAUGHTER	MOTHER	MASS	P(GEV)	E(GEV)	T0(mm/c)
0	22	-5	*	b_bar	1 ... 1	0 ... 0	4.75	9.4	10.5	0
1	8	531	0	B_s0	2 ... 2	0 ... 0	5.37	8.33	9.91	0
2	2	-531	0	B_s0_bar	3 ... 8	1 ... 0	5.37	8.33	9.91	5.55
3	2	431	+	D_s+	9 ... 10	2 ... 0	1.97	3.72	4.21	5.55
4	2	111	0	pi0	19 ... 20	2 ... 0	0.135	0.288	0.318	5.55
5	1	-211	-	pi-	0 ... 0	2 ... 0	0.14	0.214	0.255	5.55
6	2	111	0	pi0	21 ... 22	2 ... 0	0.135	1.78	1.78	5.55

```
...
```

```
root [13] showEvent(2,nt)
```

```
Decay tree for event 2:
```

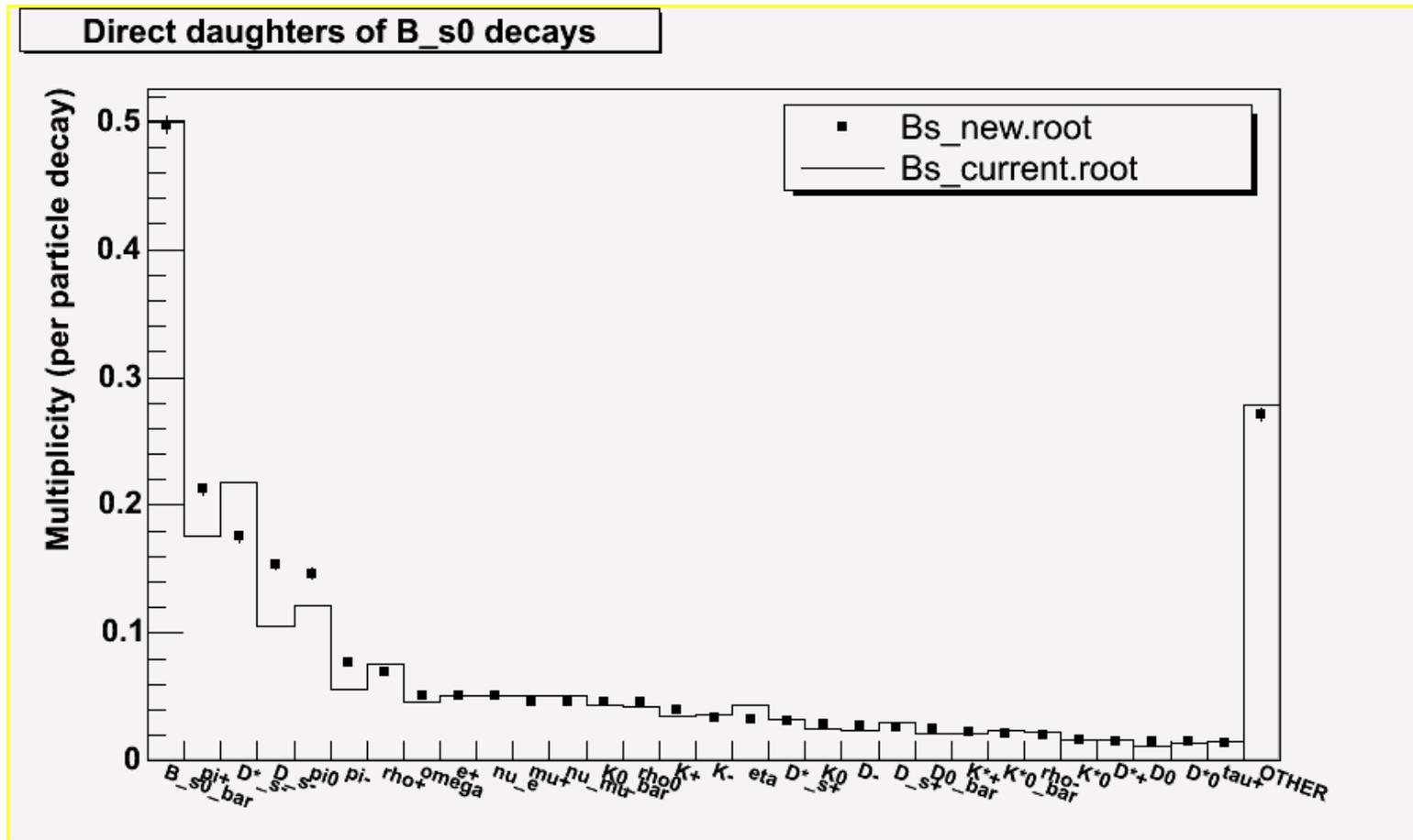
```

b_bar --> B_s0
  B_s0 --> B_s0_bar
    B_s0_bar --> D_s+ pi0 pi- pi0 pi0 eta'
      D_s+ --> phi rho+
        phi --> K_L0 K_S0
          K_S0 --> pi+ pi-
            rho+ --> pi+ pi0
              pi0 --> gamma gamma
                pi0 --> gamma gamma
                pi0 --> gamma gamma
                pi0 --> gamma gamma
            eta' --> pi+ pi- eta
              eta --> pi- pi+ pi0
                pi0 --> gamma gamma

```



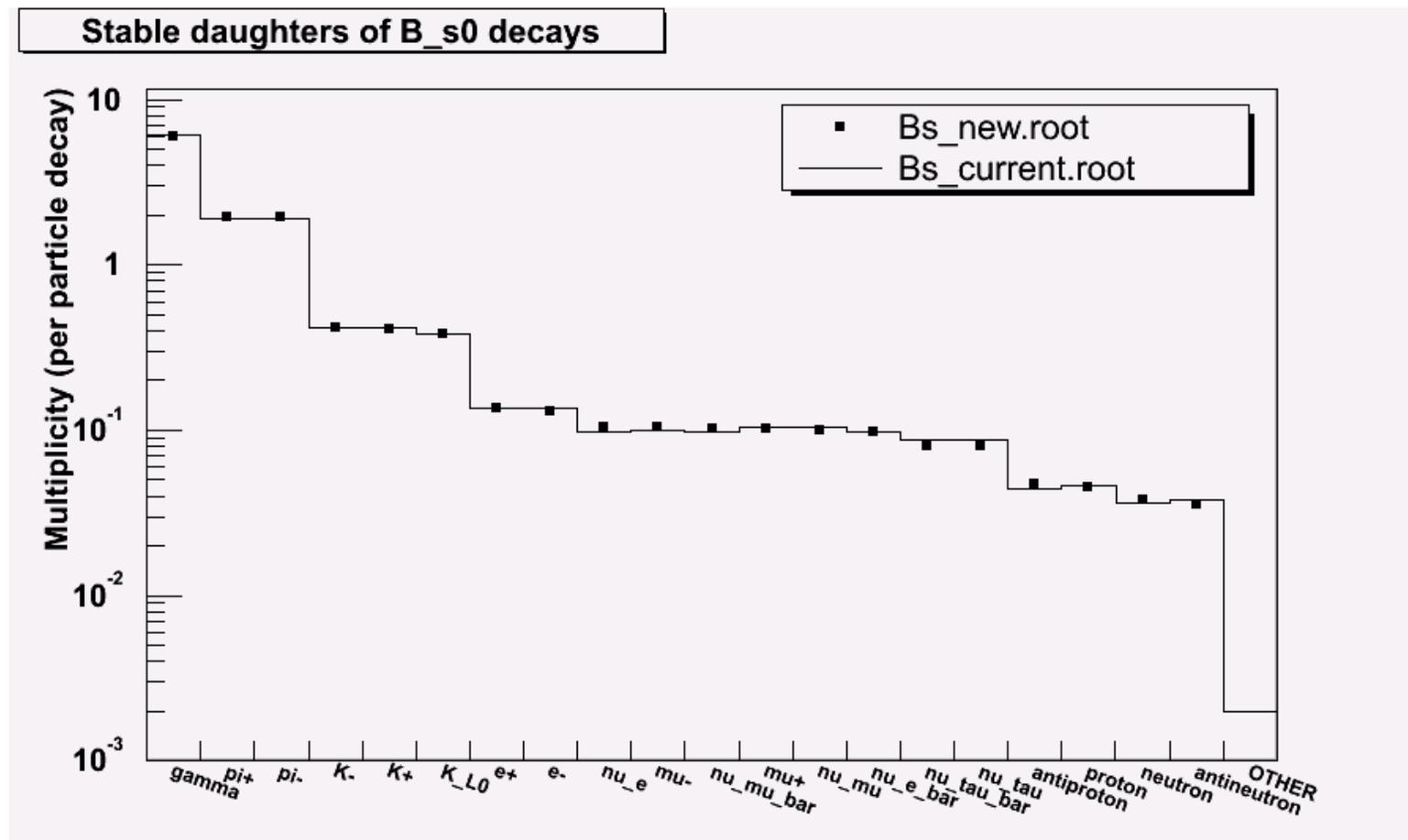
# Examples 2: Direct Daughters of $B_s$ Decays



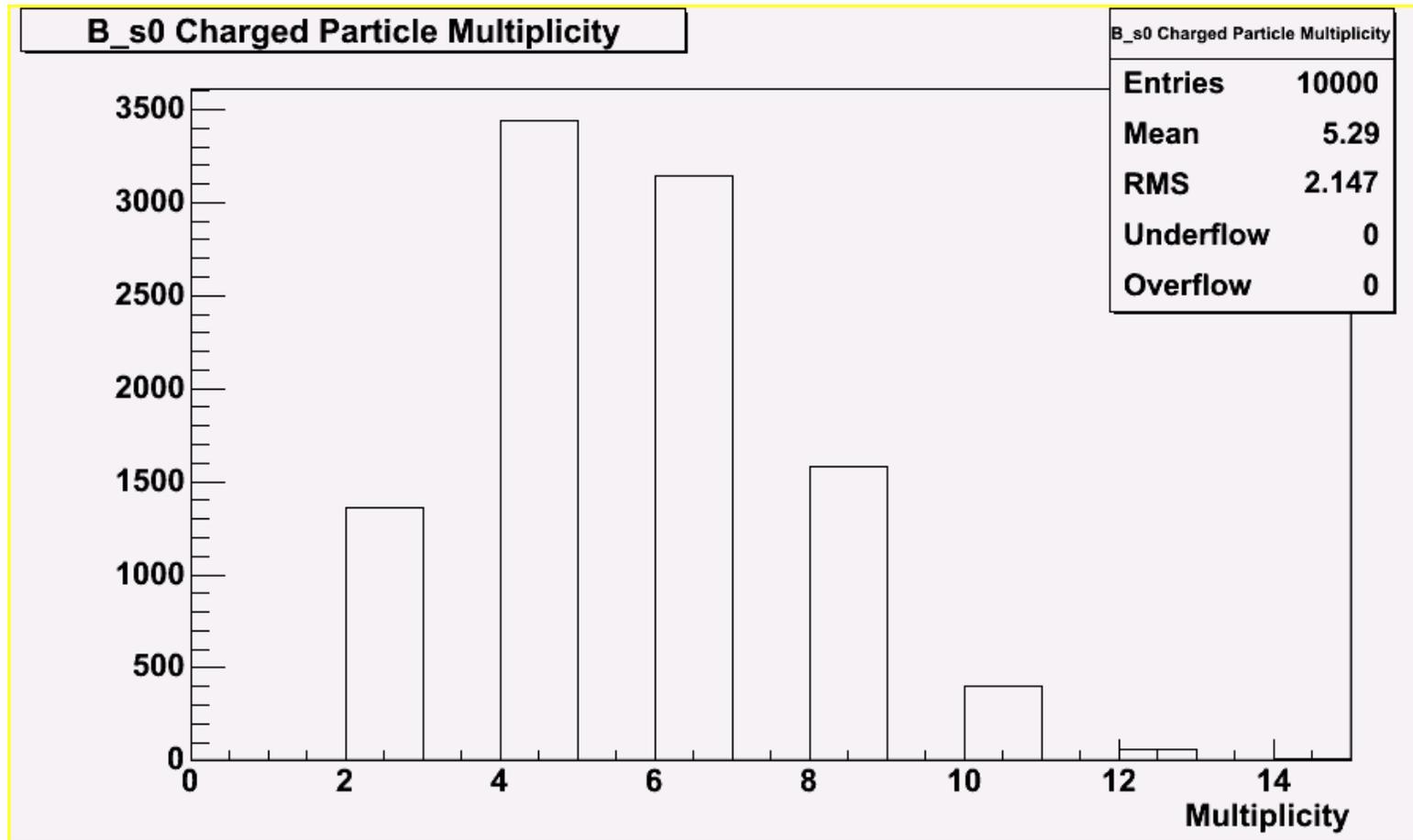
- Note: this plot shows only 30 most frequent types of decay products (out of 140)



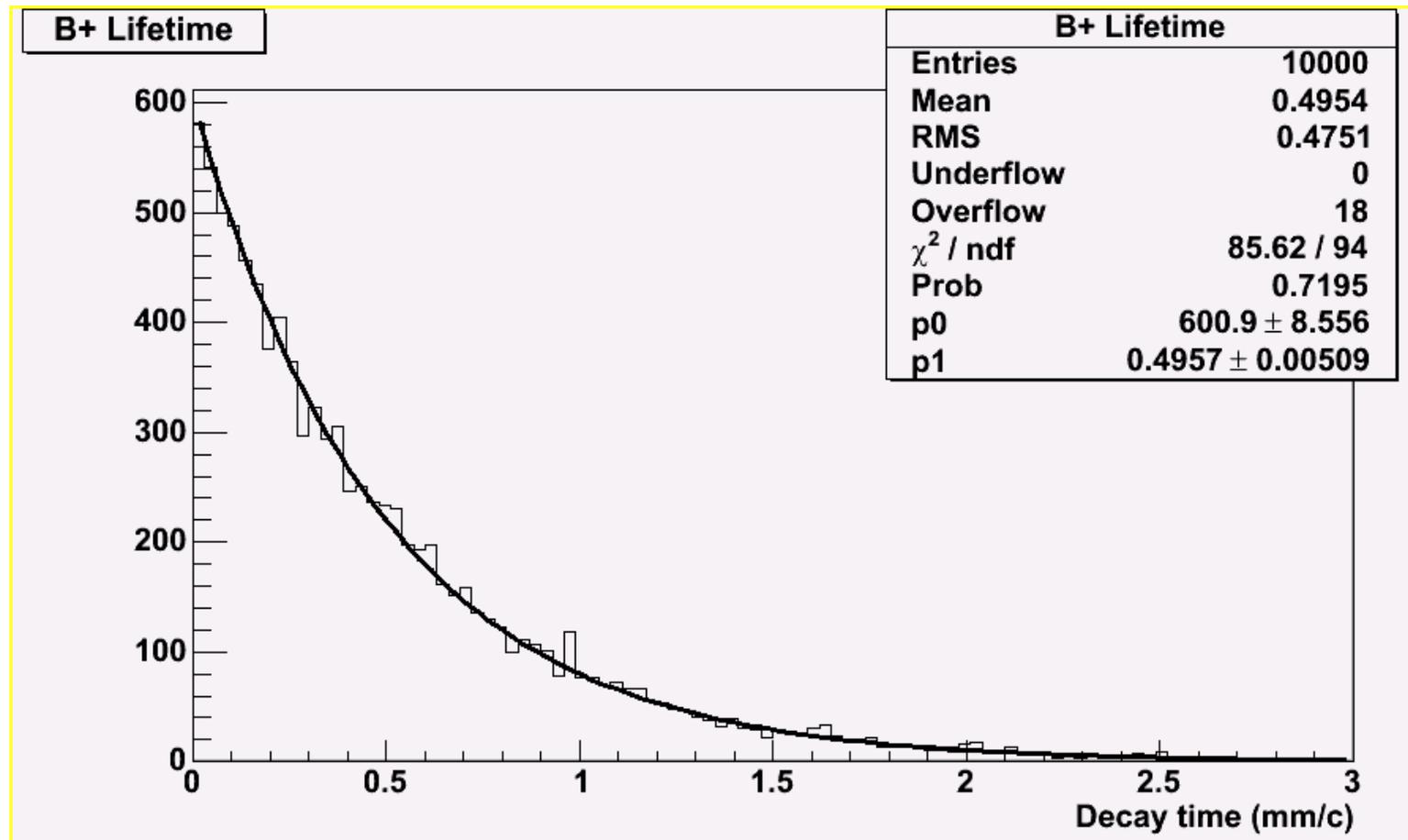
# Example 3: Stable Daughters of $B_s$ Decays



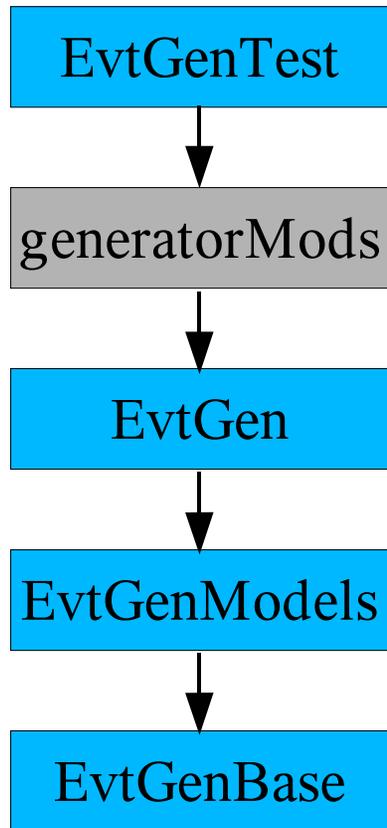
# Example 4: $B_s$ Charged Particle Multiplicity



# Example 5: B<sup>+</sup> Lifetime



# Package Structure



- EvtGenBase & EvtGenModels:
  - from EvtGen distribution, minimal changes
- EvtGen:
  - main package with interface to CDF software
  - CDF additions (new models) go here until incorporated into official EvtGen release
  - official DECAY.DEC and pdt.table
  - documentation
- EvtGenTest (need not be in release):
  - BaBar and CDF test code and executables
  - ROOT macros for validation plots etc
  - collection of sample decay files



# Looking Ahead: Switching to the New EvtGen

- Develop and test upgraded EvtGen without disturbing production using current version of EvtGen
  - New EvtGen packages set up in CVS within a private package
  - When ready to switch to upgraded EvtGen, switch everything at once
  - Will replace and restructure existing EvtGen package
  - Changes to generatorMods and PackageList/link\_all.mk
- Until we're ready for the switch, I will provide a script to checkout and build the upgraded EvtGen for testing (available next week)
- Would like to get some input on when people want to switch
  - Allow ~1 month for testing by interested physics groups
  - When we switch, the CVS HEAD of the EvtGen package will be switched to the upgraded EvtGen
    - any further commits to current EvtGen would have to use a CVS branch



# Next Steps

- A few more days for testing and incorporating existing CDF extensions
- Announce availability of upgraded EvtGen for testing in physics groups
  - EvtGen users should check and make sure that the physics they care about has been included, and the desired decays are properly represented in DECAY.DEC. I will be happy to help fixing problems and adding anything that may have been lost, but I cannot possibly know about everything that is important for your particular analysis!
- Iterate with EvtGen authors to incorporate any bug fixes and try to get all remaining CDF extensions included into official EvtGen release
- Update documentation
- Currently not clear when EvtGen authors will release their next version (last statement from authors was “early January 2005”)
  - Do we want to wait for official release or go ahead with the latest pre-release version?

