QQ and Run II

Robert K. Kutschke
Fermilab

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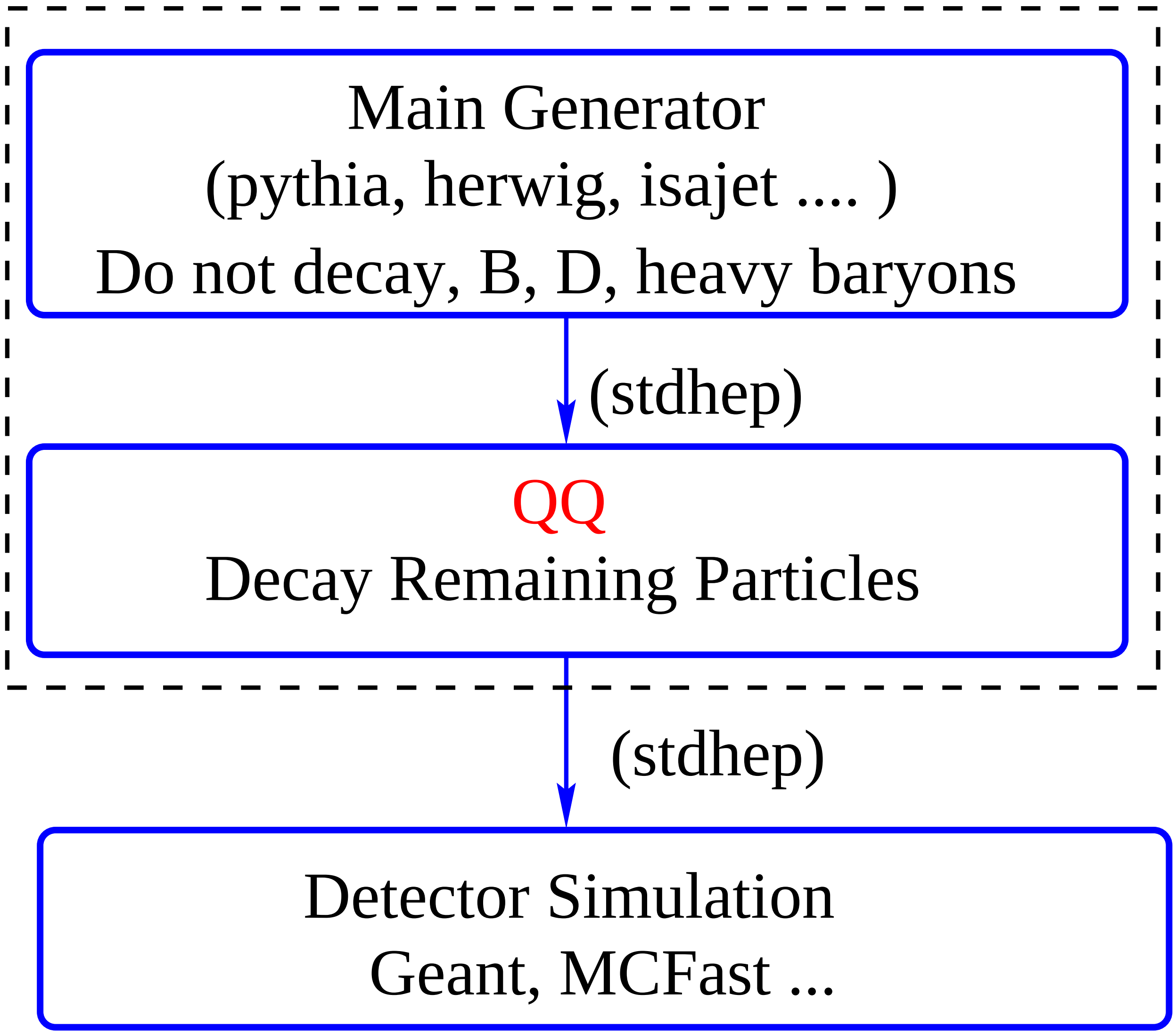
- What is QQ?
- How is it used?
- Recent Improvements
- Upcoming Improvements

http://www-pat.fnal.gov/mcgen/mcgen.html

What is QQ?

- QQ is a framework for generating Monte Carlo events in the CLEO software the environment.
- Includes a table driven model of the decays of particles and resonances. (The "B Decay Model").
- CLEO has agreed to publish and support their "B Decay Model" for the use of rest of the HEP community. This is what we mean when we say QQ.
- Their response to feedback varies with the identity of the QQ Czar. Currently excellent (Karen Lingel). Until July 1.
- Available as UPS product at FNAL (setup qq). FNAL local changes and feedback from FNAL to CLEO should go via Lynn Garren (garren@fnal.gov).

How we Use QQ Now



How to Use QQ in Future

Main Generator
(pythia, herwig, isajet ....)
Do not decay, B, D, heavy baryons

(stdhep)

QQ

Decay particles with lifetime
below some cutoff.

(stdhep)

Detector Simulation

Geant,
MCFast
...

QQ

Decay particles after
transport in field/material

Recent Improvements

- Version v9.2a at FNAL is double precision. Currently negotiating with CLEO for inclusion in their source.
- Precision problems inside other generators sometime cause wildly offshell particles. QQ now traps this and treats such particles as stable.
- There is an stdhep routine `stdfixmass` which will force particles to have $e = \sqrt{p^2 + m^2}$.
- Many small bug fixes submitted to CLEO (many from JDL).
- Recently submitted code to keep track of particles which mix incoherently. Previously this information was simply lost.
- User code callled at time that a decay mode is selected.

Important Caveat

- Since CLEO's physics program does not include B_s mesons and b baryons, the tables for these modes are only as good as our feedback to them.
- Large chunks of the B branching fractions are unknown. About 44% of the branching fraction goes to $(u\bar{d})(c\bar{q})$. CLEO tries to ensure that the average particle yields are correct, that the inclusive D momentum spectrum is correct and that the inclusive lepton momentum spectra are correct.

Implementation Details

- Written in FORTRAN.
- Interface is simple but not elegant. Copy in/`CALL DECADD`/Copy Out.

Future Plans — evtgen

- Also decay table driven.
- Embedded in QQ or standalone.
- Knows all about angular momentum theory and carries a polarization vector along with every particle.
- Simple interface to different form-factor models.
- Gets angular distributions correct in long decay chains.
- If a decay has several allowed partial waves, then the relative strengths and phases of the amplitudes must be specified in the decay table.
- Also knows about Dalitz plots.
- Written in C^{++}.