

A.Zhemchugov
JINR Dubna Russia

**Integration of
two new event generators
EvtGen and Bhlumi
into the BESIII software**

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EvtGen

- Initially developed to simulate decays of B mesons and other resonances in CLEO and BaBar.
- **Well suits to simulate charmed meson decays in BESIII**
- Capable to handle complex sequential decays, semi-leptonic and CP-violating decays
- Has variety of already implemented decay models, both commonly used and highly specialized (but largely for B-physics :()
- Has an interface to PHOTOS to generate final state radiation
- Has an interface to JETSET to handle generic hadronic decays, if no special implementation exists in EvtGen
- **Highly configurable: it is easy to add new decay model**
- More info at *<http://www.slac.stanford.edu/~lange/EvtGen>*

EvtGen interface to BESIII software

- **Based on ATLAS and LHCb implementation**
- **Inherited from Gaudi Algorithm class**
- **Uses BesRndmGenService to get random engine**
- **Gets input particles from TDS McGenEventCol, tries to decay all particles in final state, and puts decay products back to the same event in McGenEventCol in TDS**
- **If there is no model to decay particle, leaves particle “as is”**
- **Code is committed to Generator/EvtGen_i package**

How to use EvtGen (I)

To include EvtGen interface to your program:

- put to your *requirements* file

use EvtGen_i EvtGen_i-* Generator

- add to your *jobOptions.txt*

ApplicationMgr.DLLs += { "EvtGen_i" };

ApplicationMgr.TopAlg += { "EvtDecay" };

or use **#include "EvtGen.txt"** statement

- algorithm EvtDecay should be called between event generation (like BesGenModule) and BesSim algorithms.
- check that

ApplicationMgr.DLLs += { "BesServices" };

ApplicationMgr.ExtSvc += {"BesRndmGenSvc"};

are also present in your *jobOptions.txt*. If not, add these lines too

- change algorithm options if needed

How to use EvtGen (II)

Algorithm options:

- **EvtDecay.DecayDecDir="DECAY.DEC"**

Default list of decay channels, including branching ratios.

Maybe you will want to update it.

- **EvtDecay.PdtTableDir="pdt.table"**

List of particles and particle properties. Change if you introduce new particle or change particle properties

- **EvtDecay.userDecayTableName="NONE"**

User defined decay table (by default there is no one). Use it if you want to test your own decay models, or redefine default decay channels. Consult with EvtGen manual how to do it.

BHLUMI

- **Small angle multiphoton Bhabha event generator**
- **Mainly used to calculate precisely (0.11%) cross-section of Bhabha scattering in small angle.**
- **Can be used as event generator for detector simulation, especially to optimize luminosity monitor detector**
- **More details at <http://cern.ch/~jadach/>**

BHLUMI interface to BESIII software

- **Inherited from Gaudi Algorithm class**
- **Uses Cfortran to access Fortran Bhlumi routines from BESIII C++ code**
- **Uses internal Bhlumi random number generator**
- **Generates Bhabha event according to options requested by user**
- **Stores both incoming beam e^+ and e^- as well as product e^+ , e^- and photons to McGenEventCol in TDS**
- **Code is committed to Generator/Bhlumi package**

How to use BHLUMI (I)

To include Bhlumi interface to your program:

- put to your *requirements* file

use Bhlumi Bhlumi-* Generator

- add to your *jobOptions.txt*

ApplicationMgr.DLLs += { "Bhlumi" };

ApplicationMgr.TopAlg += { "Bhlumi" };

or use **#include "Bhlumi.txt"** statement

- algorithm Bhlumi should run as primary event generator before BesSim algorithm.
- change algorithm options if needed

How to use BHLUMI (II)

Algorithm options:

- **Bhlumi.CMEnergy="3.097"**

Center-of-mass energy: $2 * E_{\text{beam}}$, [GeV]

- **Bhlumi.MinThetaAngle="0.104"**

Minimum electron/positron scattering polar angle, [rad]

- **Bhlumi.MaxThetaAngle="0.245"**

Maximum electron/positron scattering polar angle, [rad]

Summary

- **Two new generators have been interfaced to BESIII software**
 - **EvtGen - particle decay generator**
 - **BHLUMI – small angle Bhabha event generator**
- **PLEASE, USE THEM FOR YOUR PHYSICS STUDY!**
- **Any corrections/comments/questions: *zhemchugov@jinr.ru***

Thank you!