Thrown Vertex "Smearing"

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Motivation

- The reconstructed vertex could serve as a discriminating variable for separation of signal and background

- This was used in the July software tutorial

Problem

- Many programs within the GlueX repository have the ability to change the primary vertex position, but there is no agreed-upon way to do this

- This leads to duplicated (and often half-hearted) efforts

- Inconsistent distributions depending on which program generated the events, making this variable unusable as a discriminator

Examples of What We Have

- genr8_2_hddm — Option allows randomizing of v_z over a given range, fixes x and y for all events

- hdgeant — Setting TGTWIDTH within control.in randomizes vertex in cylindrical volume only for particle gun events

- gen_3pi — Uses `libraries/AMPTOOLS_DATAIO/` `HDDMDataWriter::writeEvent` where option allows for v_z to be randomized over a given range, but v_x, v_y are fixed at 0. This was used to generate 3π n events for the July software tutorial

- bggen — `programs/Simulation/bggen/code/bg_ctrl.inc` and `bg_CFglue.F` has options that allow for vertex smearing (?)

Each program does it's own thing, and we lack consistency

Proposal

- At the very least, have a consistent scheme applicable to events from all generators

- Need some flexibility, since we will want to be able to tune the distribution according to data - actual data distribution may turn out to be non-flat within the target volume

- I would prefer that hdgeant do this

  - since all analyses will pass events through hdgeant

  - this could be put in as an option flag

  - but I do understand that having hdgeant do this is non-intuitive

  - but I would also rather not have another program added to the already rather-long list of programs to run

Smearing Example

- I checked in a program last week `programs/Utilities/hddm_select_events` that allows the selection of events based on thrown information - this is primarily for strangeness events that need hdgeant to decay the particles to know how the event decays

- It is easy to modify this to smear the thrown vertex

- Open hddm file → Get reactions, vertex → Change vertex → Write out event

- This could be a standard tool to use before hdgeant, if we don't want to put this in as an option within hdgeant itself

Questions? Discussion?