

# 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  $3\pi$  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

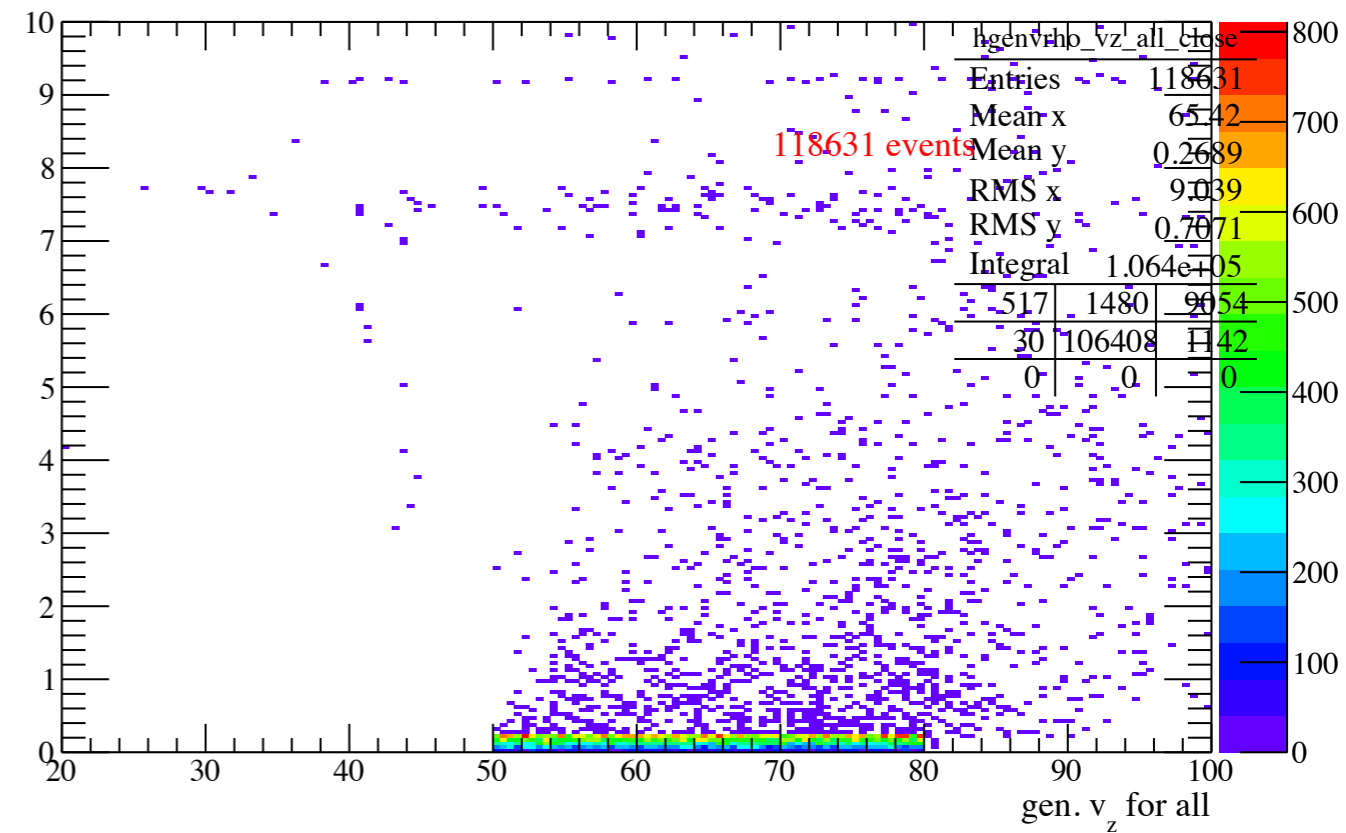
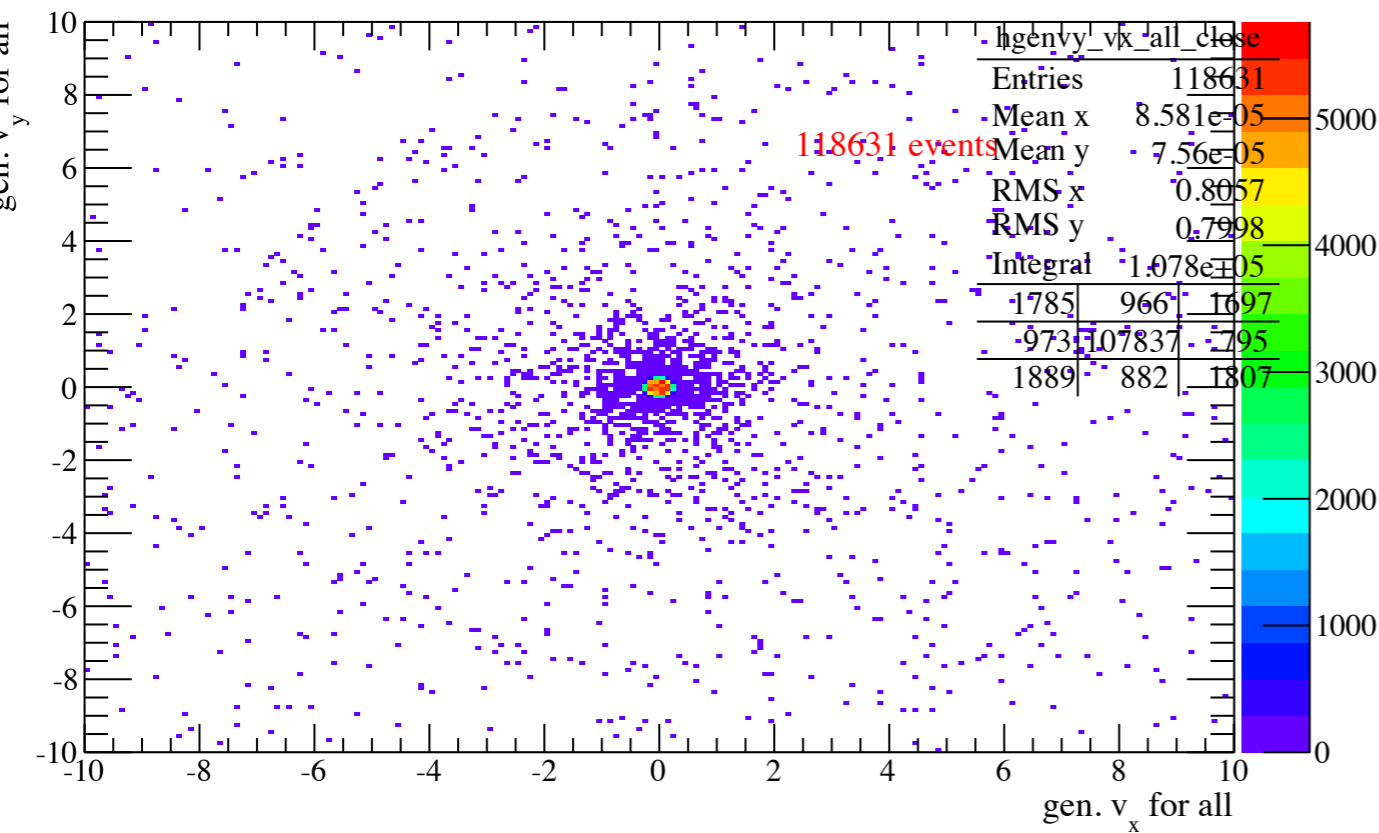
# Smearing Example

- 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?

# July Software Tutorial

reconstructed through Thrown\_Tree, all particles



- radius is 0.2 cm?
- z smeared along 50 - 80 cm, GlueX target