

Progress Report on ECal Simulation in Delphes

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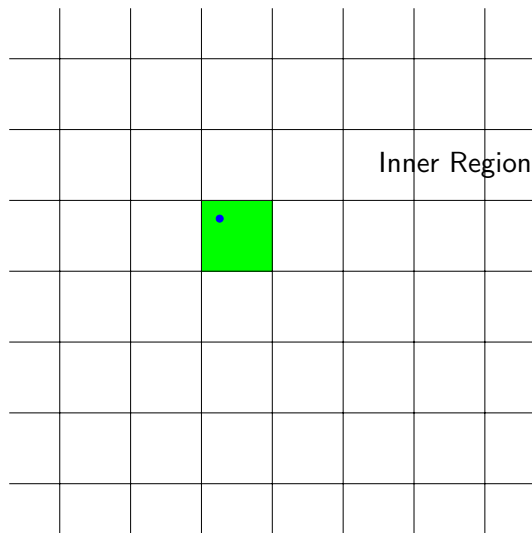
Since last time

- ▶ Big push to make physics studies possible
 - ▶ Neutral protoparticle maker prototyped → write protoparticles directly to TES
 - ▶ This skips Brunel
 - ▶ Geometry is defined in Delphes configuration, interpreted in protoparticle maker
 - ▶ Factorizes geometry problem
 - ▶ Up to external constraints from [CondDB](#), ported to LHCb Geometry conventions on the fly
 - ▶ Revision of charged protoparticle efficiency (see [Presentation by Benedetto in last FastSim meeting](#))
 - ▶ Meetings with PID and T&A group to more accurately describe physics
 - ▶ Port particle gun PV from Rec to LHCb for use in Delphes
 - ▶ Use PIDCalib (Meerkat) with produced particles for PID info
 - ▶ Make lookup table for track covariance matrices
 - ▶ Follow on JIRA epic: [LHCBGAUSS-1084](#)
- ▶ Goal for Ancey: have physics studies at DaVinci level from Delphes output

On the neutral protoparticle maker

- ▶ Right now, the only one calorimeter cell is hit for development purposes
- ▶ Need to consider overlap into neighboring cells.
- ▶ In protoparticle maker, this is simply adding more cells to the protoparticle with the correct energy fraction
- ▶ Easiest way: just draw a circle of Molière radius (3.5cm current), take the energy fraction total energy times fractional area of circle in each cell

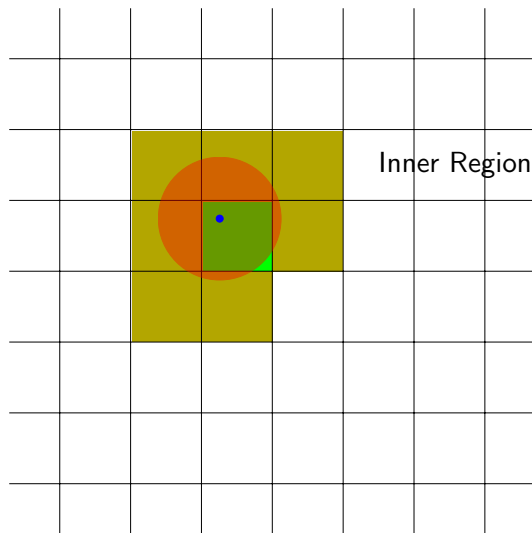
- ▶ Question: What is the best way to consider multiple particles hitting the same cell?



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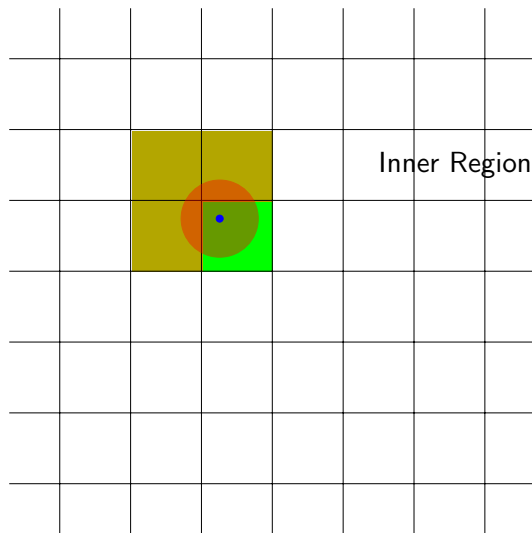
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- ▶ Easily allows changing of material. Example: 2.2cm PbWO_4
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Timing

- ▶ Some timing information is available at the Delphes level
- ▶ Caveat: does not include any effects due to electronics response (rise time, multiple signals)
- ▶ Question: What is the "most correct" way to incorporate this?
- ▶ Can implement a similar look-up table to the other parameters, but we need an idea of the right way to do it
- ▶ First: take Delphes time, perform single particle MC level/protoparticle level study
- ▶ Studies ongoing, but expert help would be great!
- ▶ Once we have a good answer to all of these questions, information can easily be combined with an appropriate timing from the VELO (given correct PV insertion)

Roadmap

- ▶ Validation of neutral protoparticle maker is ongoing
- ▶ First study of current LHCb Geometry on physics modes is next, e.g. $B_s^0 \rightarrow \phi\gamma$
- ▶ Once physics makes sense, decrease Molière radius
- ▶ Add timing info in regions
- ▶ Implement change of geometry (the hard part)
- ▶ At all stages, expert feedback is necessary and welcome

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