Barrel EMCal simulations in DD4hep and Fun4All

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BECAL Digitization algorithm in Fun4All

» Uses "kSiPM_photon_digitization"
https://github.com/ECCE-EIC/macros/blob/a92f9085537508a259e48038fc2199c60223e6fa/common/G4_BECAL.C#L57.

» ECCE BECAL assumes 5000 photoelectrons/GeV
https://github.com/ECCE-EIC/macros/blob/a92f9085537508a259e48038fc2199c60223e6fa/common/G4_BECAL.C#L118.

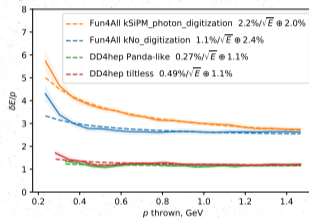» ... and a default value of 160k pixels – corresponding to 4x Hamamatsu PMTs
https://github.com/sPHENIX-Collaboration/coresoftware/blob/f5299566b17abcd3ef97389f21672e010847f51a/simulation/g4simulation/g4calo/RawTowerDigitizer.h#L245-L247.

» The "kSiPM_photon_digitization" algorithm is implemented in
https://github.com/sPHENIX-Collaboration/coresoftware/blob/f5299566b17abcd3ef97389f21672e010847f51a/simulation/g4simulation/g4calo/RawTowerDigitizer.cc#L358-L425.
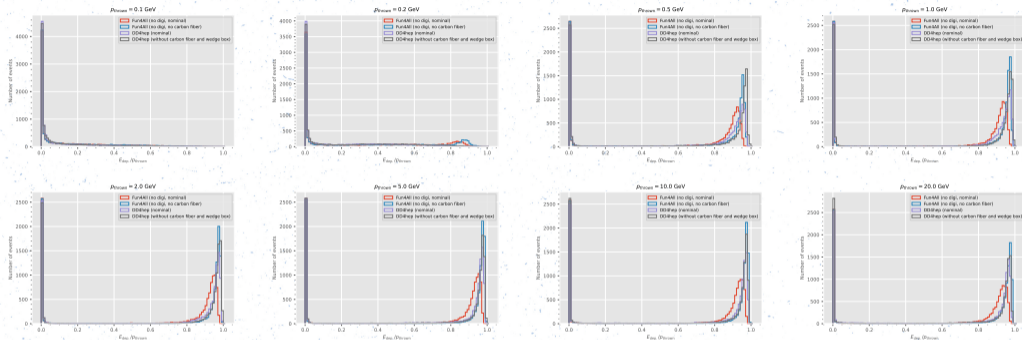
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https://indico.bnl.gov/event/17074/

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Resolution from the simulations

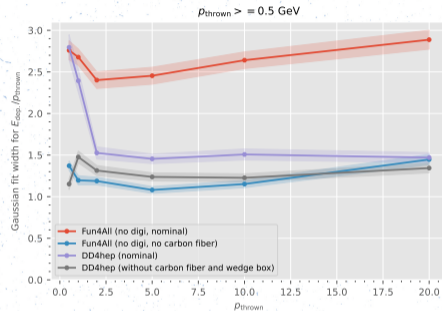

https://indico.bnl.gov/event/17074/

Resolution: Fun4All vs DD4hep

» **Fun4All with kNo_digitization** (has tilt)

» **Fun4All with kNo_digitization, and without carbon fiber wrapping** (has tilt)

» **DD4hep** (no tilt)

» DD4hep without carbon fiber and aluminum supports (no tilt)

Resolution: Fun4All vs DD4hep summary using fits

$p_{\mathrm{thrown}} >= 0.5$ GeV

- » Fun4All with kNo_digitization (has tilt)
- » Fun4All with kNo_digitization, and without carbon fiber wrapping (has tilt)
- » DD4hep (no tilt)
- » DD4hep without carbon fiber and aluminum supports (no tilt)

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Conclusion

Disabling the supports allows to bring Fun4All and DD4hep simulations to a decent agreement.

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