

# AuxDets and the New LArG4

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# Background

- SBND has a Cosmic Ray Tagger (CRT).
  - Similar to MicroBooNE and ICARUS
- In LArSoft, the CRT is considered an AuxDet
  - Technically, arrays of scintillating strips are the AuxDets
  - Scintillating strips within the CRT are AuxDetSensitives
  - We get `sim::AuxDetHits` in the CRT.
- Previously, Geant converted `sim::AuxDetHits` into `sim::AuxDetSimChannels`
  - The new LArG4 does not.
- `sim::AuxDetSimChannels` are necessary for the CRT detsim.

# Background

- A separate module needs to perform this “translation.”
- GDML has also been modified to account for changes necessary to run with the new LArG4.
  - In particular, the `<auxiliary auxtype="SensDet" auxvalue="AuxDet"/>` tag.
  - Arrays of scintillating strips are AuxDets (133).
  - Scintillating strips are AuxDetSimChannels (2152).
- This presentation is about this translation module.
- I don't deserve all the credit for this.
  - Andrzej, Andy, Joseph, Marco, Marina, Varuna and Wes helped me greatly.

# The Translation Module

- Can be found in larsim feature/ilepetic\_genericcrt
  - Hopefully in larsim develop soon!
- Takes IDE information and places it into an AuxDetSimChannel
- Looks up the correct AuxDet and AuxDetSensitive
  - Via FindAuxDetSensitiveAtPosition
  - More on this in a minute.
- Makes a vector of AuxDetSimChannels
  - AuxDetSimChannels are used in the detsim.
  - Eventually, CRT hits and tracks are made.
- ProtoDUNE does not use such a module.
  - Instead, they go directly from AuxDetHit to CRT hit.

# FindAuxDetSensitiveAtPosition

- Found in larcorealg
- I use FindAuxDetSensitiveAtPosition to find the correct AuxDet and AuxDetSensitive.
  - The function takes coordinates as input and outputs ID numbers.
- In testing, I found that I would occasionally just miss the AuxDet(Sensitive).
  - The IDE location was just outside of the bounds ( $< 10$   $\mu\text{m}$ ).
- To resolve this, I added a tolerance to FindAuxDetSensitiveAtPosition.
  - Tolerance defaults to 0 cm.
  - Also found in associated functions

# Pull Requests and Feature Branches

- Pull Requests
  - [sbndcode](#)
  - [larsim](#)
  - [larcorealq](#)
- Feature branches
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  - [larsim](#)
  - [larcorealq](#)