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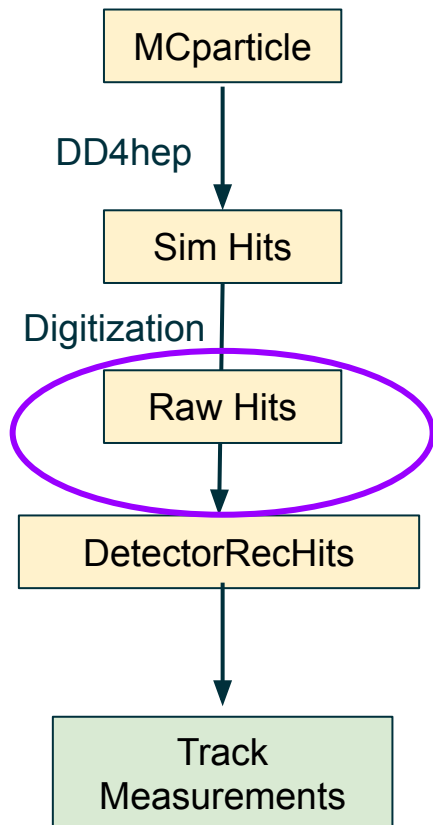
# Insert SVT pixel noise in simulation

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ePIC reconstruction WG meeting

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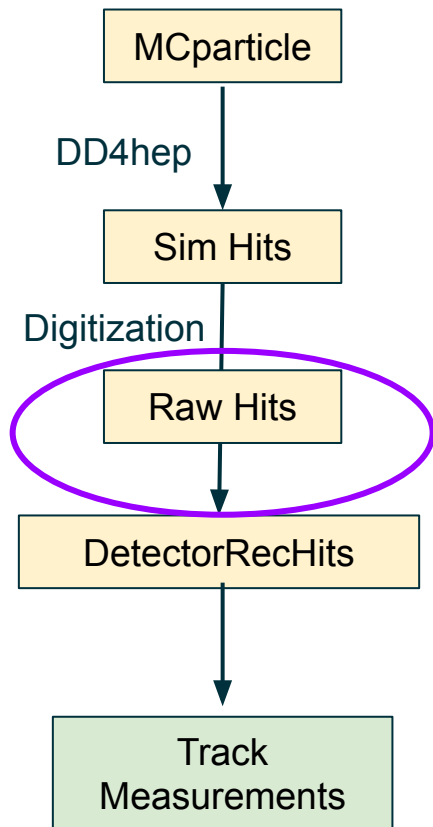
# How to insert random noise hits to simulation



- **Approach 1**

- Based on DD4hep segmentation of pixels
- Randomly generate cell ID → position on surface
- **Challenges:**
  - Need to know a valid cell ID range
    1. Pre-define the range by inspecting the cell ID distribution (See Mito's [work](#) on Inner Barrel)
      - Issue: not scalable
    2. Generate cell ID, then use dd4hep volume manager to check if it's valid
      - eicrecon/si\_noise\_hits (PR [1643](#))
      - Issue:
        - slow (64 bit phase space)
        - Valid cell id != valid hit on surface

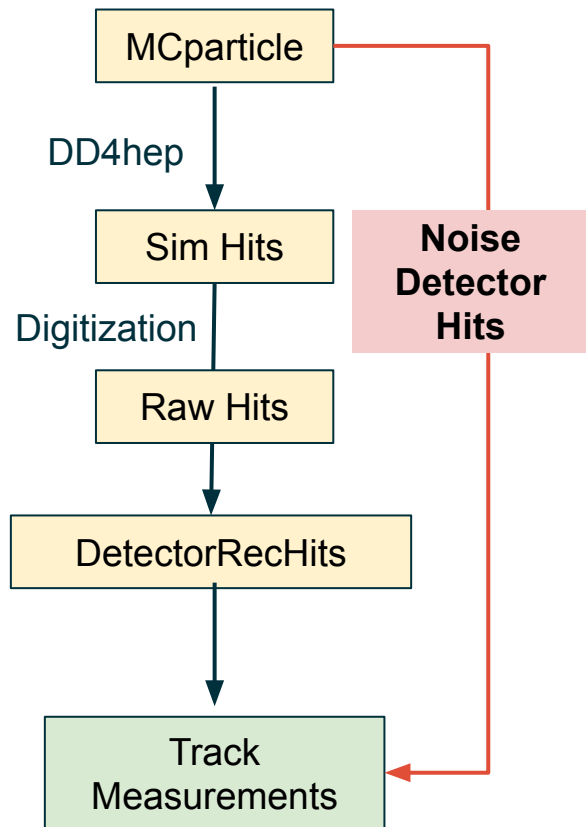
# How to insert random noise hits to simulation



- **Approach 2:**

- Suggestions from DD4hep experts:  
<https://github.com/AIDASoft/DD4hep/issues/1335>
- Access volume/surface boundary, calculate the valid position range → pick a point and convert to cell ID. Expected to work for simple geometry
- See more discussions on ePIC mattermost/eicrecon
- **Challenges:**
  - Dedicated development and test needed
  - Not sure if it can handle tiles and inactive areas

# How to insert random noise hits to simulation



## Alternative approach

- Generate random event sample with dd4hep
  - Effectively randomized (Q: how to uniform in R and Z)
  - DD4hep takes care of surface check and validation
  - Extract hits per detector
- In EICrecon:
  - For every event:
    - For each detector,
      - Randomly decide a starting index  $i$
      - Pick  $i$  to  $i+N$  hits from the noise sample
      - Save it in measurements as e.g. `VertexTrackerNoiseRecHits`

## Pros and Cons:

- Minimal software development.
- Need pre-generated noise sample.
- Only fit for dedicated study (like the background study). Won't change the default simulation campaign results.