Off-plane charge recovery in `LArG4`

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Fermilab

Charge lost

- `LArG4` transports the ionisation electrons from the TPC volume to the wire planes
- transportation is implemented as pure geometry: a projection on the planes
- if this projection, from whatever reason, falls outside the planes:

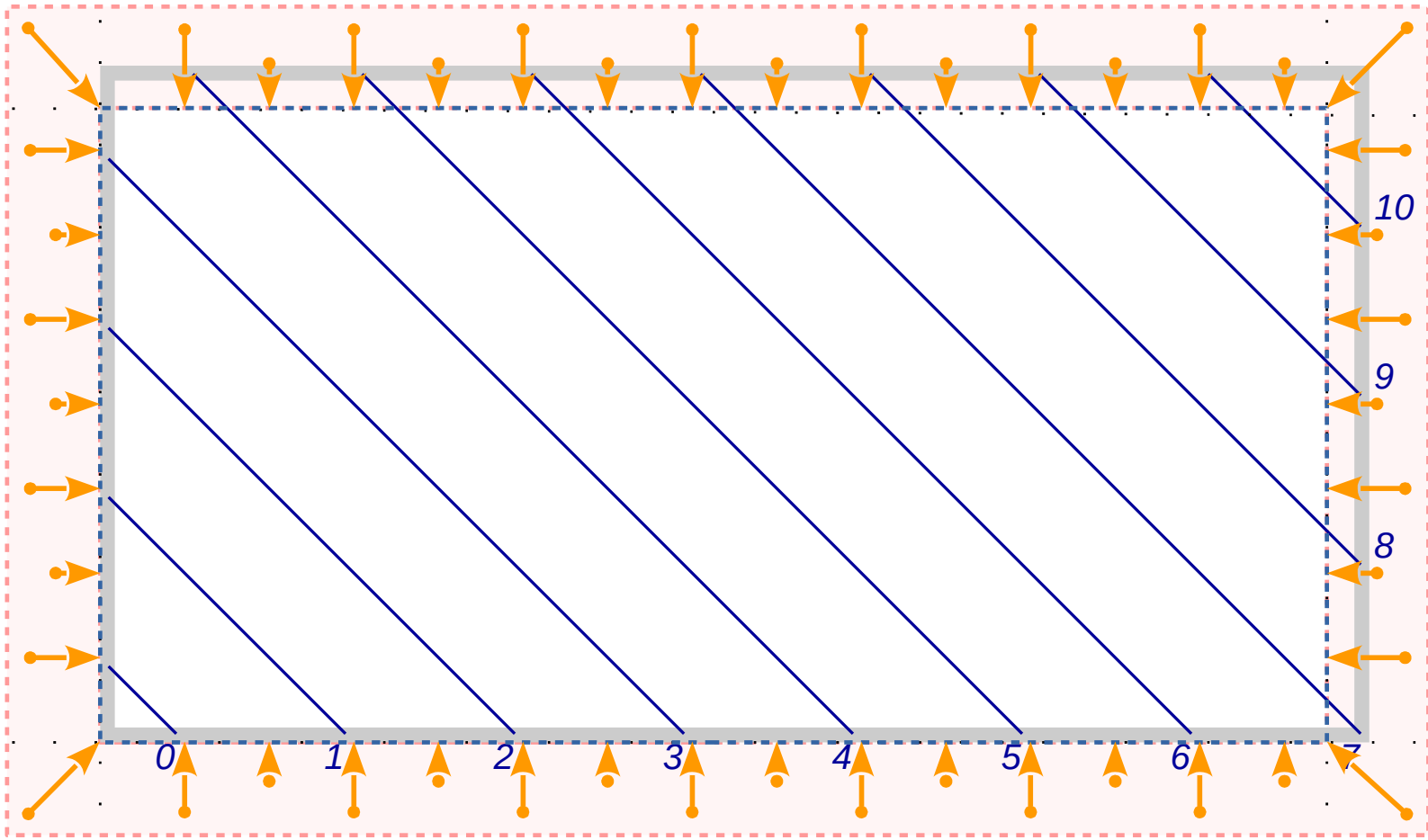
```
%MSG-w LArVoxelReadout:  LArG4:largeant 04-Apr-2017 08:33:45 CDT  run
unable to drift electrons from point (-279.785,343.693,695.005)
with exception ---- Geometry BEGIN
  Can't find nearest wire for position ( -359.416 ; 343.849 ; 694.986
    in plane C:0 T:9 P:2 approx wire number # 479 (capped from 481)
---- Geometry END
```

(here wrapped) is sent to the log

Charge regained

- a new feature allows charge landing *not too far* from the plane to be rerouted toward the closest wire
- parameter `ChargeRecoveryMargin` tunes the recovery distance
- each wire plane has an “active area”
- when feature enabled (by non-zero `ChargeRecoveryMargin`):
  - charge inside the active area and charge outside it by more than `ChargeRecoveryMargin` are treated as usual (including usual weird behaviour)
  - charge outside that area by less than `ChargeRecoveryMargin` is moved to the border of the active area

Picture



The active area is defined as a rectangle of only points less than half a pitch away from a wire.

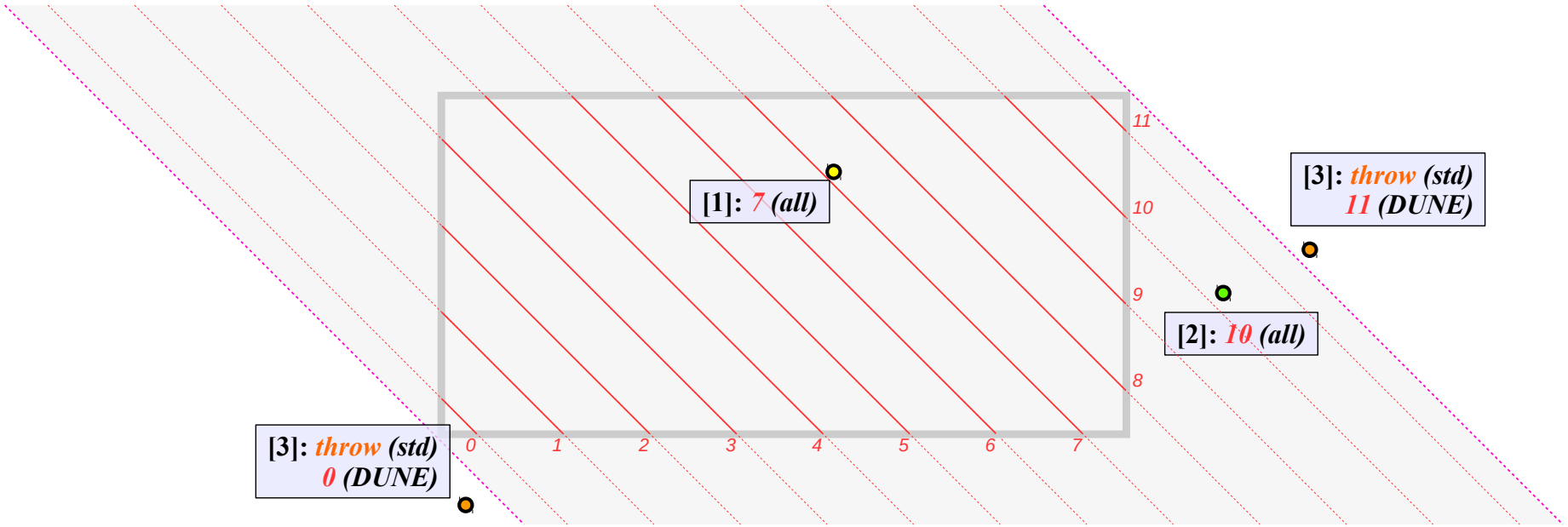
Summary

- a new option `ChargeRecoveryMargin` has been added to `LArG4` module
- it enables collecting charge that would be transported off-plane
- no change is introduced to the default behaviour
- related ticket: feature request #16129
- behaviour is still not very ideal... we may be improve after `LArG4` refactoring

Additional material

Old picture

This is a reminder of the current behaviour (“weirdness”):



This behaviour is still unchanged, except in the marginal area highlighted in the previous slide.