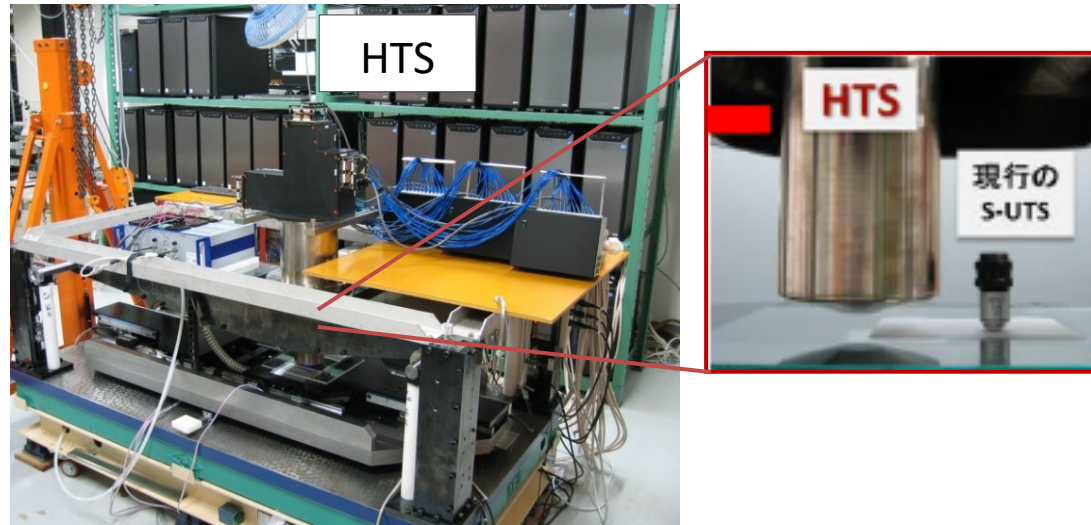# ν_e search with new scanning system HTS

Nue search with HTS

・Current nue search method by CS shower hint is difficult to detect upstream events or low energy shower.

・To improve it, large volume ECC scanning by faster scanning system and direct shower searh in ECC is required. ---introduce HTS.

・scaning time … Assuming 5*5cm and 20 films, 20 hours/event is needed with SUTS. In contrast, 2 hours with HTS.
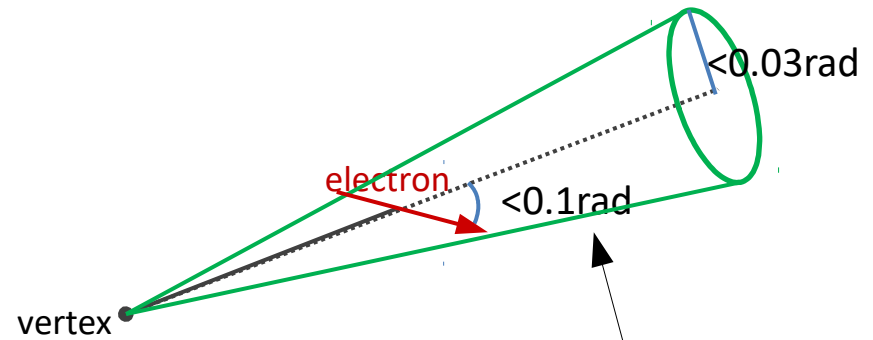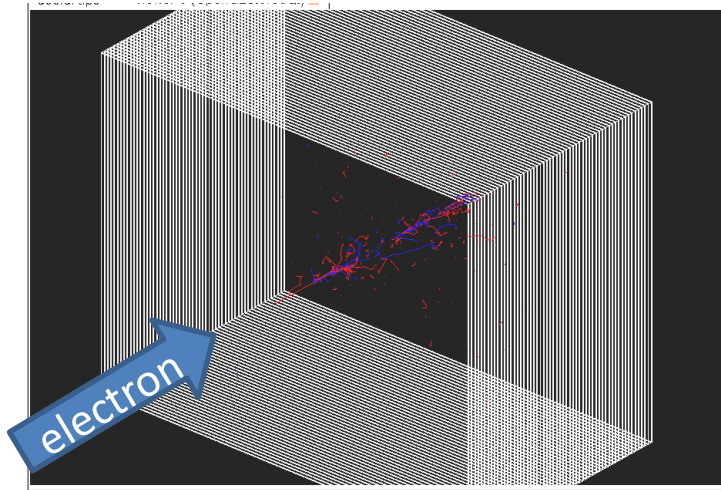
Track detection efficiency of HTS
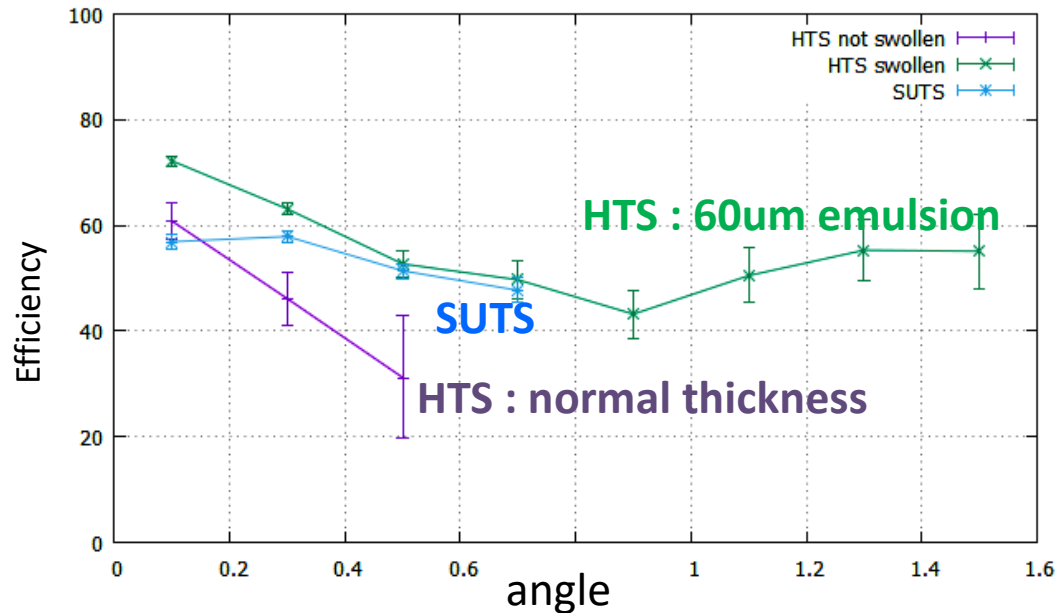
- The efficiency of HTS is improved equal or greater than SUTS by increasing the emulsion layer thickness, but not so high.

Track counting methods is used for shower detection. Therefore, even if the tracks are not connected the shower tracks can be detected.
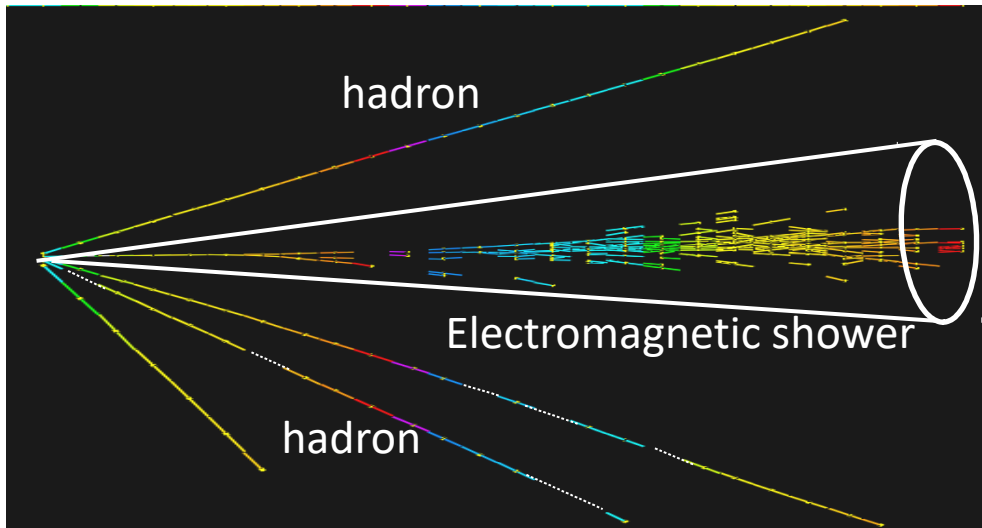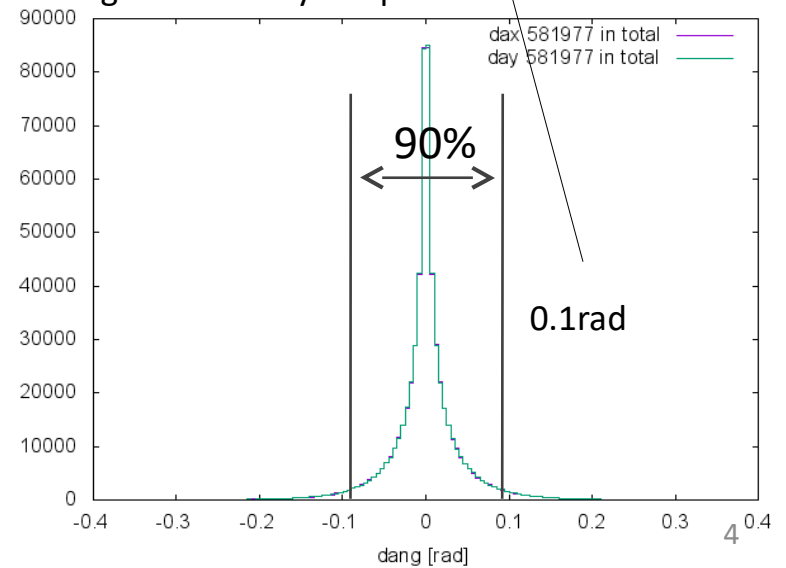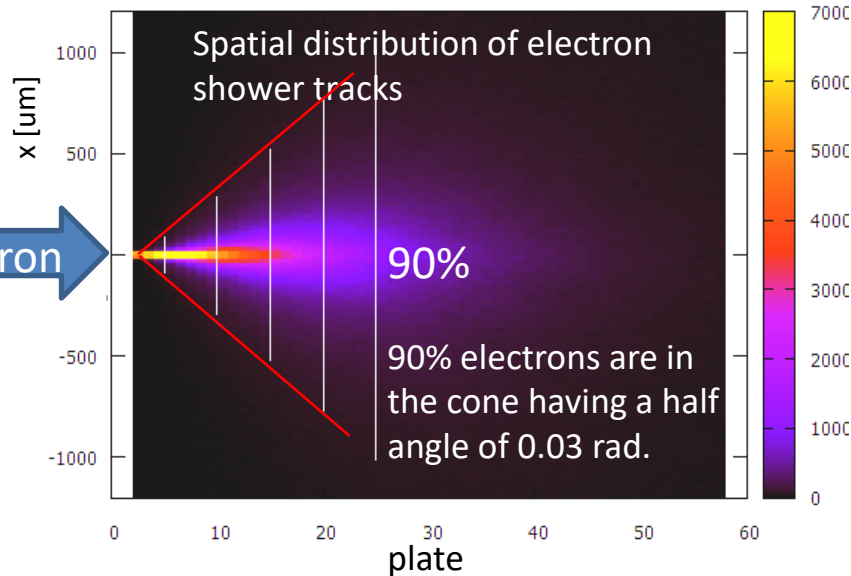
Searching the direction of a cone whose apex is placed at the interaction vertex and which contains a lot of tracks.
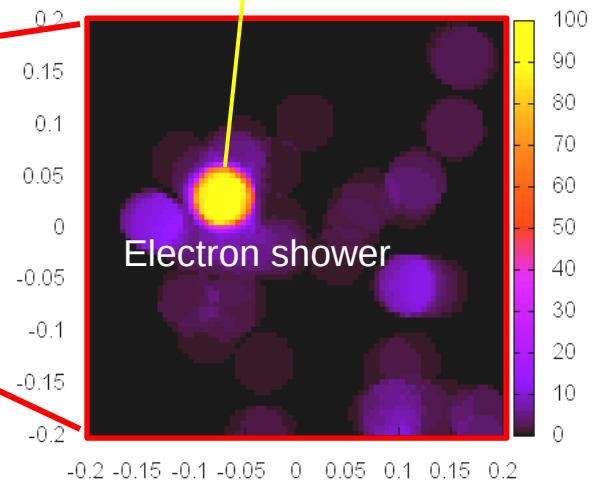
simulation by Geant4

electron

<0.03rad

electron

<0.1rad

vertex

Angular difference of between electron track angle and the angle created by the position of vertex and electron

Spatial distribution of electron shower tracks

90%

90% electrons are in the cone having a half angle of 0.03 rad.

x [um]

electron

plate

dax 581977 in total
day 581977 in total

90%

0.1rad

dang [rad]

4

Test scan with a nue event

Cones are created to all directions(<1.5).
The number of tracks in the each cone.

Almost all the small peaks (<10 tracks) are made by fake tracks or cosmic rays.

electron:
angle (ax, ay) = (-0.068, 0.043) [rad]
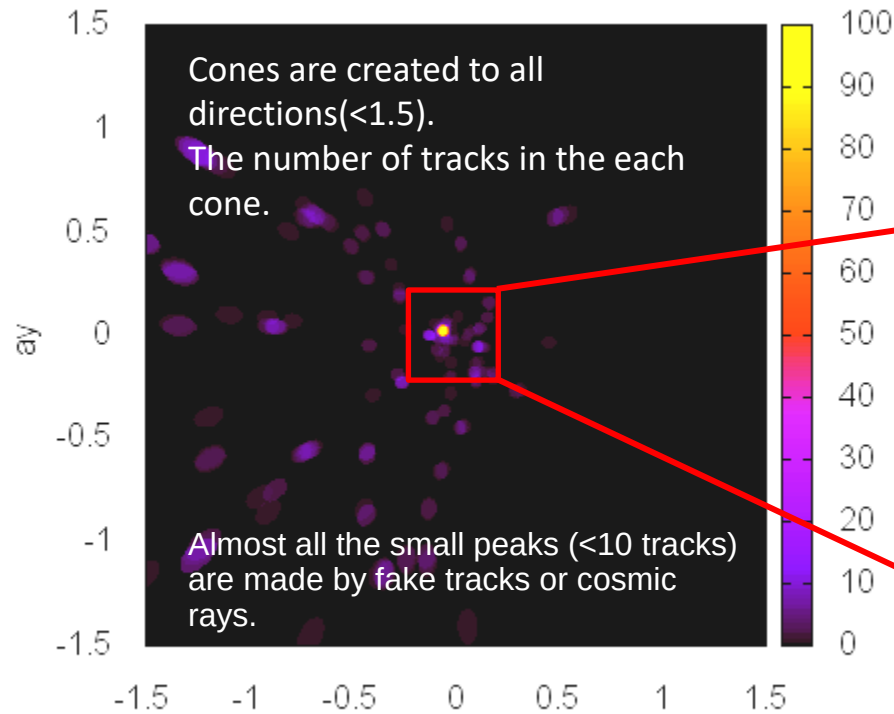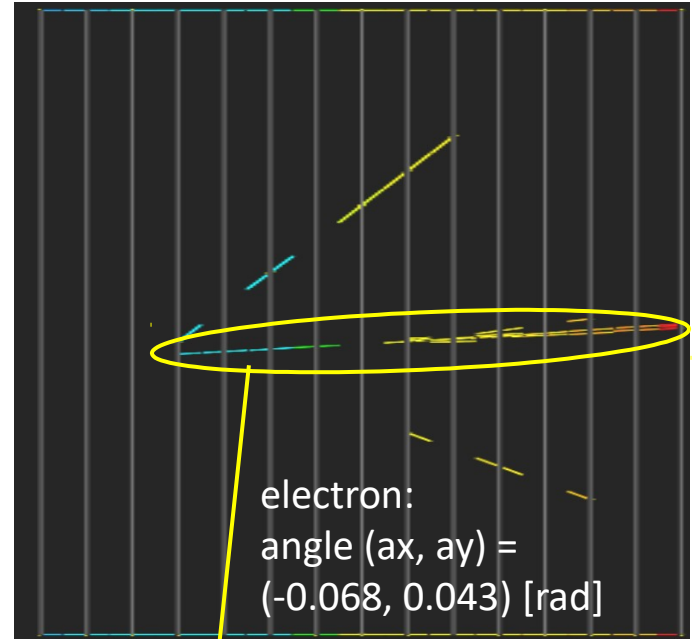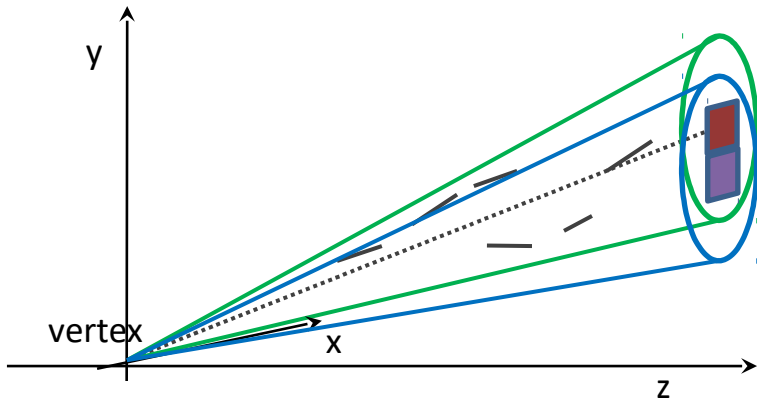
Electron shower

Test scan with NC like events
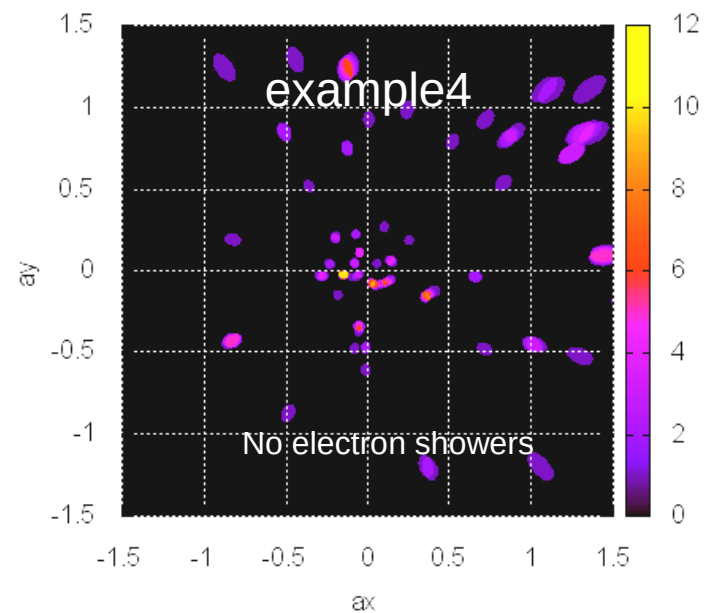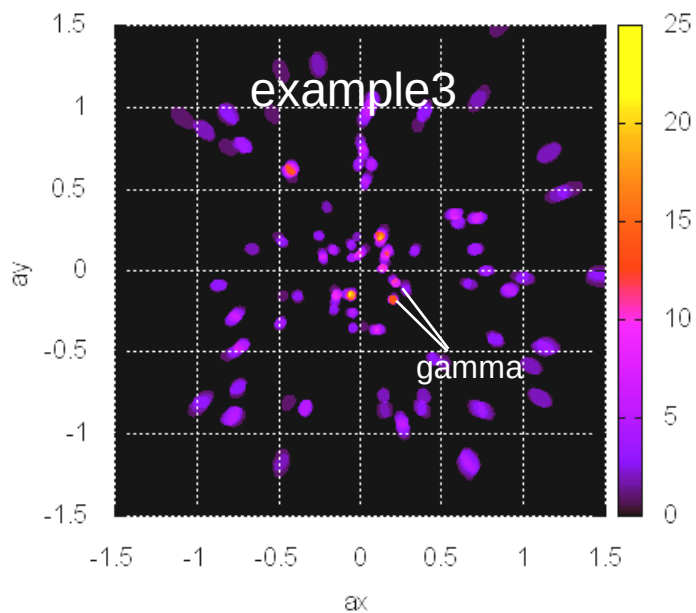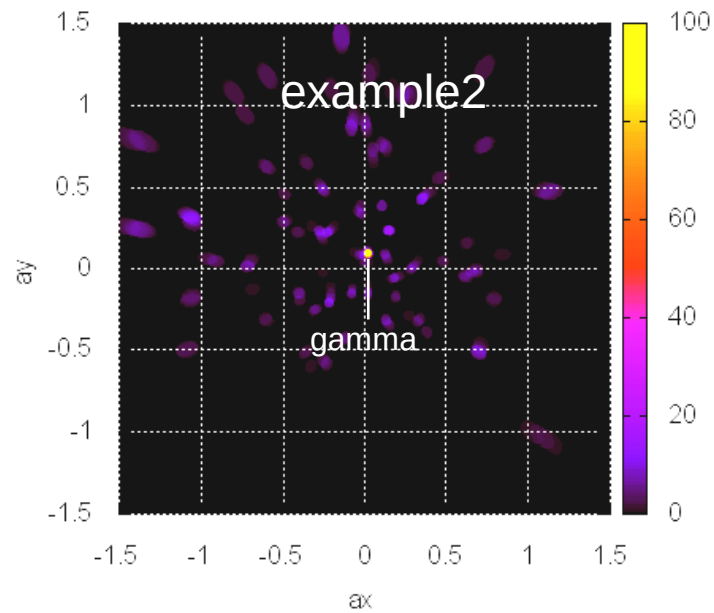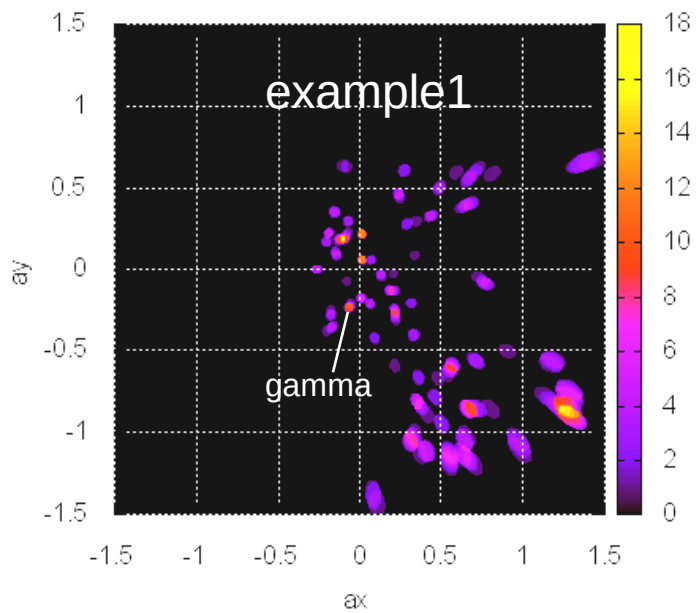
Expected improvement of shower detection efficiency

Shower detection efficiency estimated by simulation
(Not corrected by location efficiency)

Upstream

Downstream

10GeV electron with ECC
5GeV ECC
2GeV ECC
10GeV CS
5GeV CS
2GeV CS

CS 2GeV
CS 5GeV
CS 10GeV
ECC with HTS 2GeV
ECC with HTS 5GeV
ECC with HTS 10GeV

Plate

Vertex Plate (2010 strategy)

NC Location efficiency
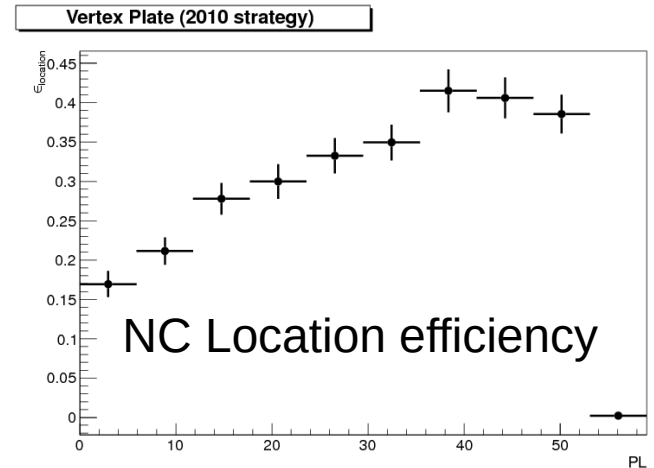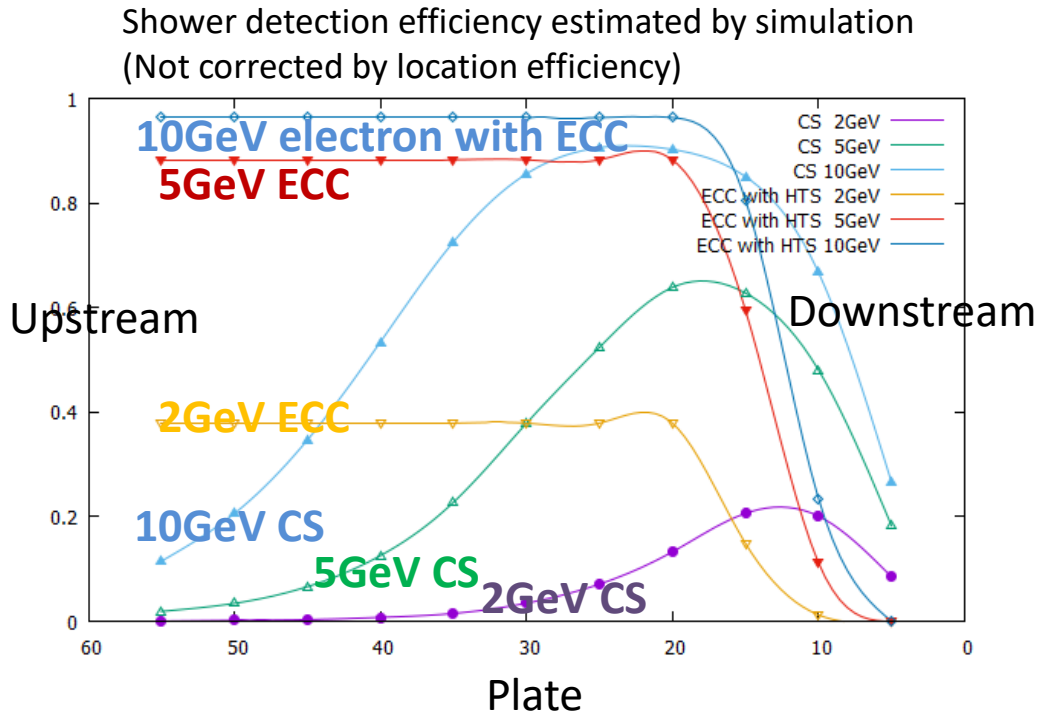
improvement rate of nue
detection efficiency
 2GeV : 3.0 times
 5GeV : 1.9 times
10GeV : 1.3 times

- The efficiency of the electron shower detection in ECC is expected to be 40% (2GeV) – 90%(5-10GeV) at the upstream.
  Considering location efficiency, the expectation of the number of nue events compared with CS becomes about 2 times.

Schedule

- There are about 250 NC events interacted at more upstream location than film 30.

  Works

  I.   1 day for swelling films, 2 day for drying.

  II. Scanning with HTS, 2 hours/event.

  They can be handled in parallel.

  We assumed to scan 12 events/week and all events will be finished in a half year.

Summary

- HTS is introduced for nue event search by large volume ECC scanning.

- The track detection efficiency of HTS is 50~70%.

- Track counting method have been tested with a nue event and some NC like events. The shower detection is demonstrated with this method.

- The expectation of the number of nue events compared with CS becomes about 2 times by this method.

- We will scan 12 events/week and all events will be finished in a half year.