Update of the ZDC design

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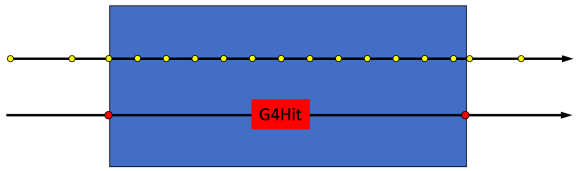
ZDC status

- First design of ZDC is ready to be implemented in Fun4All.
  - Crystal + ALICE FoCal style EM and Hadron Calorimeter. *(slide 3)*

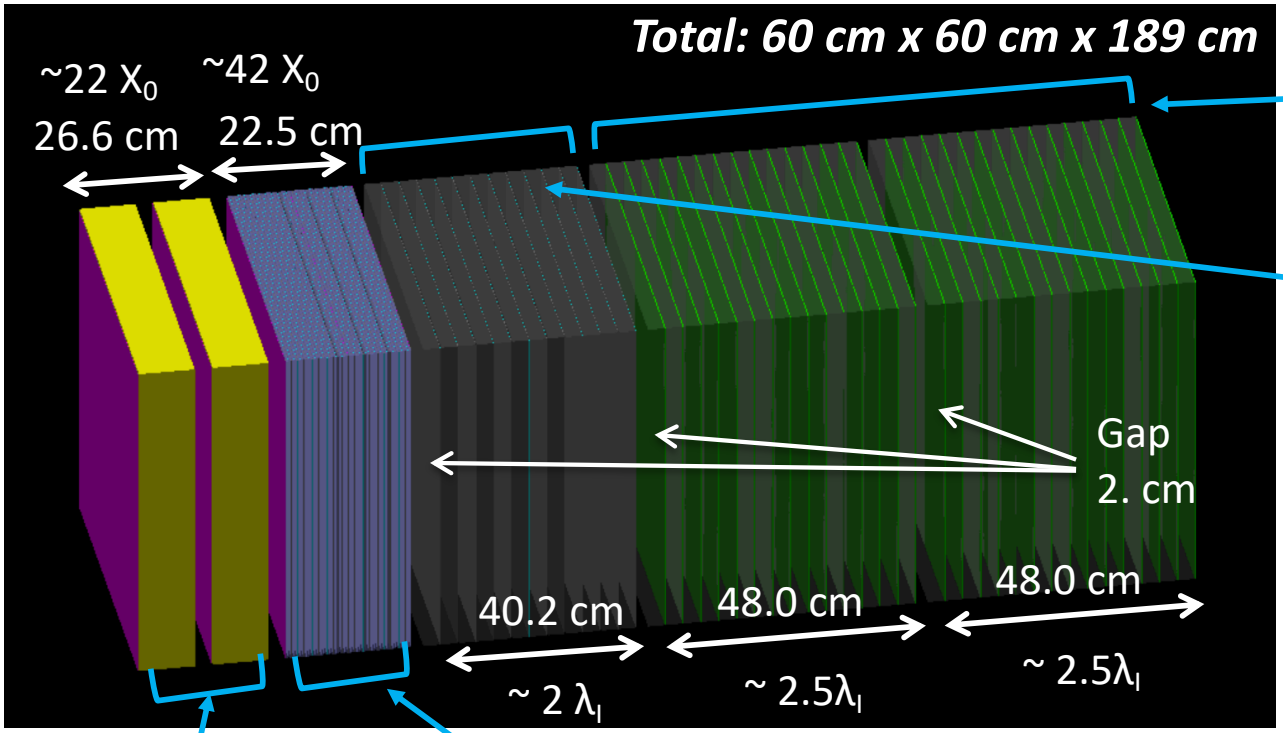
- Output variables are:
  - Information of ZDC G4Hits.
  - Availables in TTree or TNtuple.
  - Variables:
    Detector type (Silicon/Crystal/Scintillator),
    Layer ID, x and y ID, position (x,y,z), timing
    and energy deposits of ZDC G4Hits.



- First check of the energy deposits in the implemented ZDC. *(slide 4, 5)*
  - Using particle gun of photon and neutron.
  → Looks reasonable for the current structure.

- Submitting codes to eic/fun4all_eicdetectors. *(slide 6)*

First ZDC design



30 layers (15 layers x 2)

Pb 3cm Thickness

Scintilator

10 cm x 10 cm x 2 mm

Gap 0.0013 mm

12 layers

Pb 3cm Thickness

PET (Glue) 0.11 mm

Silicon

1 cm x 1 cm x 320 µm

PET (Glue, FPC) 0.41 mm

Gap 1. mm

2 layers

Silicon

3 mm x 3mm x 300 µm

PET (Glue, FPC) 0.39 mm

Gap 1.2mm

Crystal (PbWO4)

3cm x 3cm x 10 cm

Gap 3 cm

Si: 3 layers,

Si: 40 layers,

W: 42 layers

= **Si** + 2 x

20 layers

Tungsten 3.5 mm Thickness

PET (Glue) 0.11 mm

Silicon 1 cm x 1 cm x 320 µm

PET (Glue, FPC) 0.41 mm, Gap 1.mm

+

1 layer

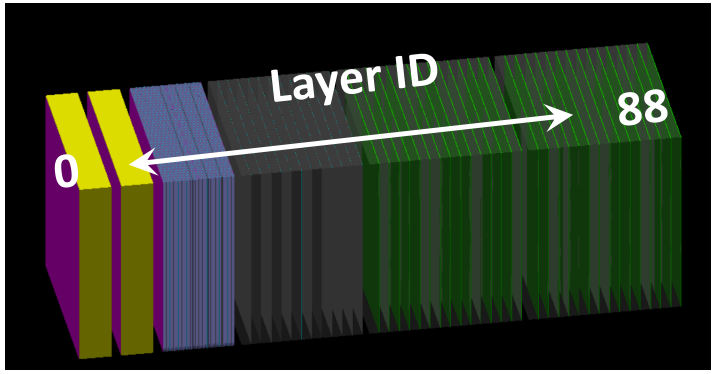
Tungsten 3.5 mm Thickness

PET (Glue) 0.11 mm

Silicon 3 mm x 3mm x 300 µm

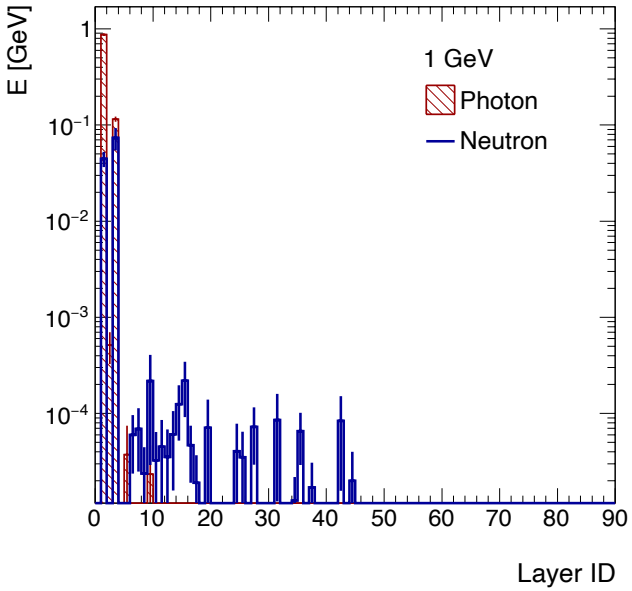
PET (Glue, FPC) 0.39 mm, Gap 1.2mm

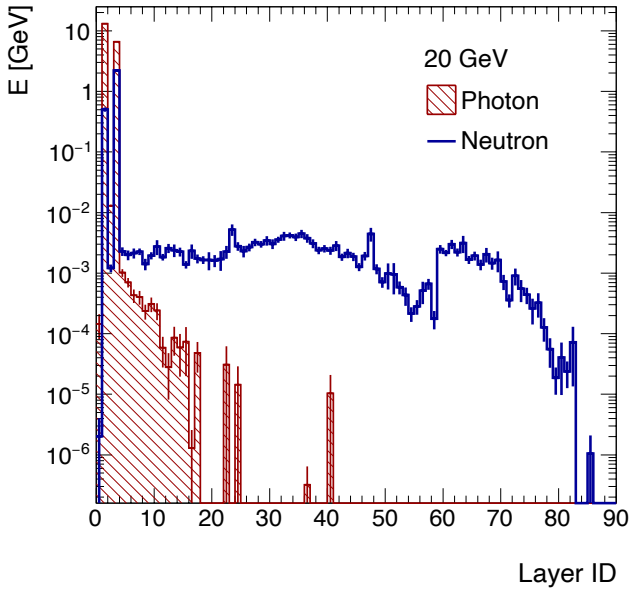
Energy deposition per layer

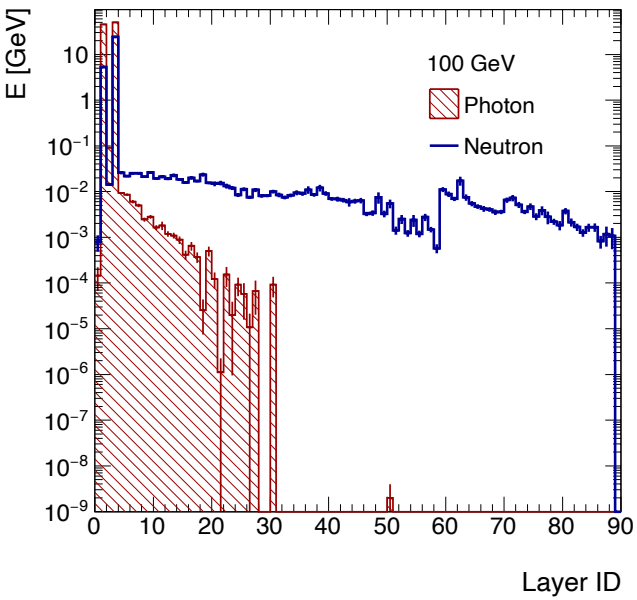


- Using particle gun of photon and neutron.
  - 1, 20, 100 GeV

• Layer 1, 3:	Crystal 3cm x 3cm	10cm thick
• Layer 0, 2, 4, 25, 46:	Silicon 3mm x 3mm	300μm thick
• Layer 5-24, 25-45:	Silicon 1cm x 1cm (w/ Tungsten)	320μm thick
• Layer 47-58:	Silicon 1cm x 1cm (w/ Pb)	320μm thick
• Layer 59-88:	Scintillator 10cm x 10cm (w/ Pb)	2mm thick







Energy map w/ 100 GeV photon or neutron

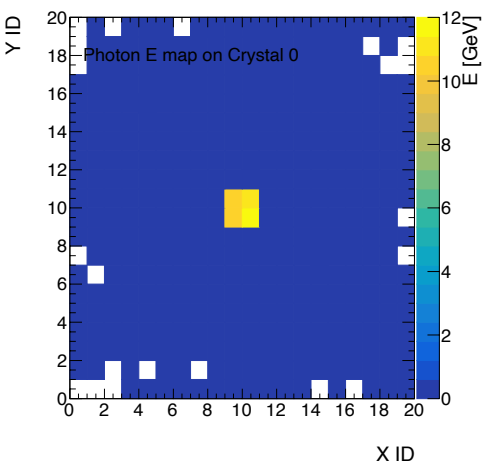
Layer 1
(Crystal 0)

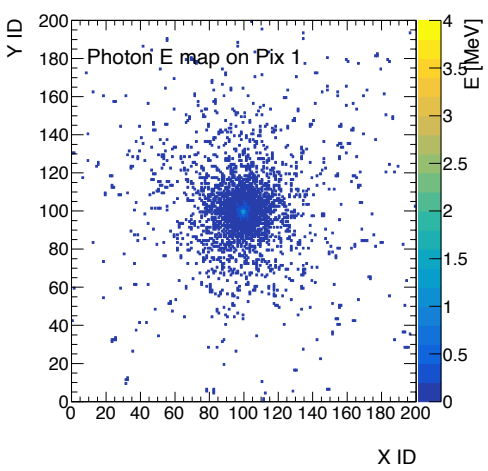
Layer 2
(3mm x 3mm Silicon)

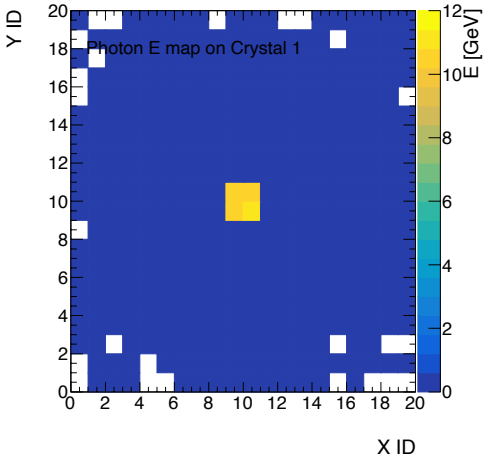
Layer 3
(Crystal 1)

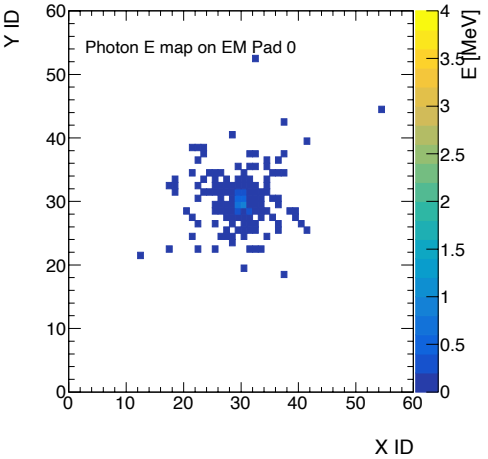
Layer 5
(1cm x 1cm Silicon)

Photon

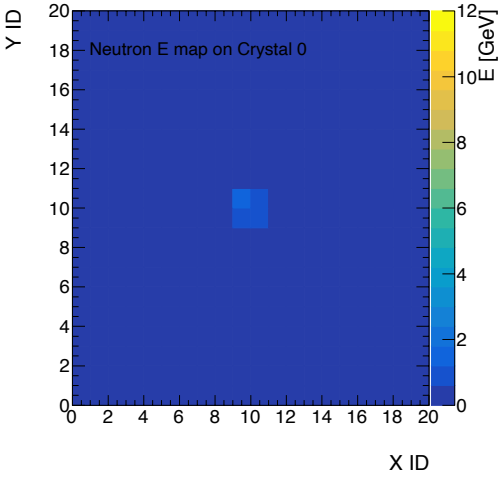


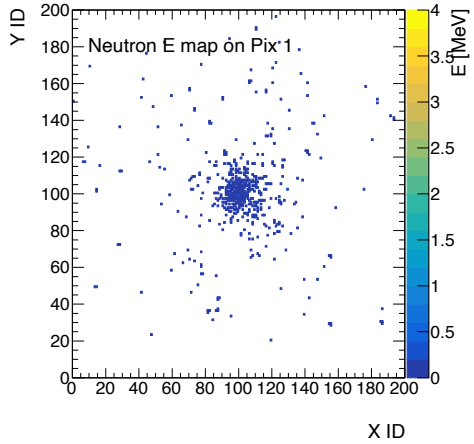


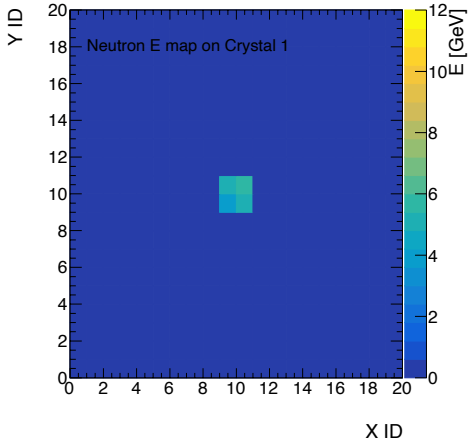


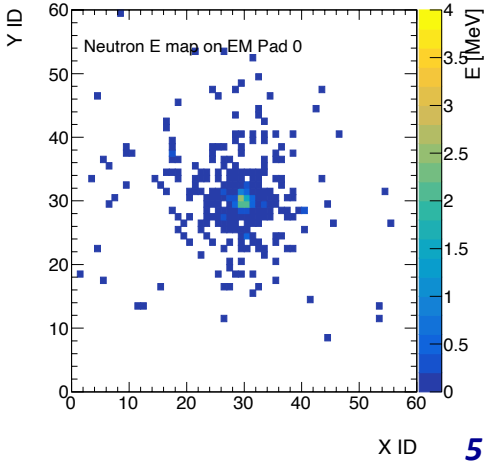


Neutron



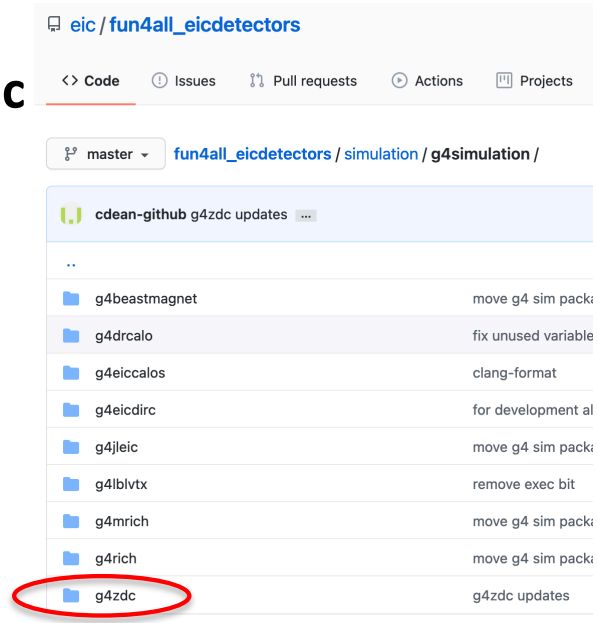






Submission to eic/fun4all_eicdetectors github

- Codes are placed under:
  eic/fun4all_eicdetectors/simulation/g4simulation/**g4zdc**



- Will be **EICG4ZDC** library.
  - In Fun4All_XX.C macro:

```
#include <eicg4zdc/EICG4ZDCSubsystem.h>
#include <eicg4zdc/EICG4ZDCHitTree.h>

EICG4ZDCSubsystem *mydet = new EICG4ZDCSubsystem("EICG4ZDC");
mydet->SetActive();
g4Reco->registerSubsystem(mydet);

EICG4ZDCHitTree *zdctree = new EICG4ZDCHitTree("Hits");
zdctree->AddNode("EICG4ZDC_0", 0);
se->registerSubsystem(zdctree);
```

  - Placement of ZDC can be modified in the macro

```
//for test
mydet->set_double_param("place_z",375.);
mydet->set_double_param("place_x",0.);
mydet->set_double_param("rot_y",0.);
```

- Next: modification of G4_hFarFwdBeamLine_EIC.C
  - It takes care of forward configuration (incl. magnet, pipe, RP, B0, OM) for both IP6 and IP8.

What's next?

- Diffractive group seems to make a switch to use this ZDC or a simplified ZDC.
- Simulation group needs "reconstruction codes".
  - Need discussion of read-out?
  - Is it ok to simply sum up energies for each channel/towers?
    - Can we do anything more sophisticated?
    - Timing?

- It is a starting point for ZDC studies.
  - Which generator to use?
  - What to be checked for the first?
  - etc.