SoLID Simulation Update

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SoLID Collaboration Meeting

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- Introduction
- GEMC Update
- Simulation Study
- Summary

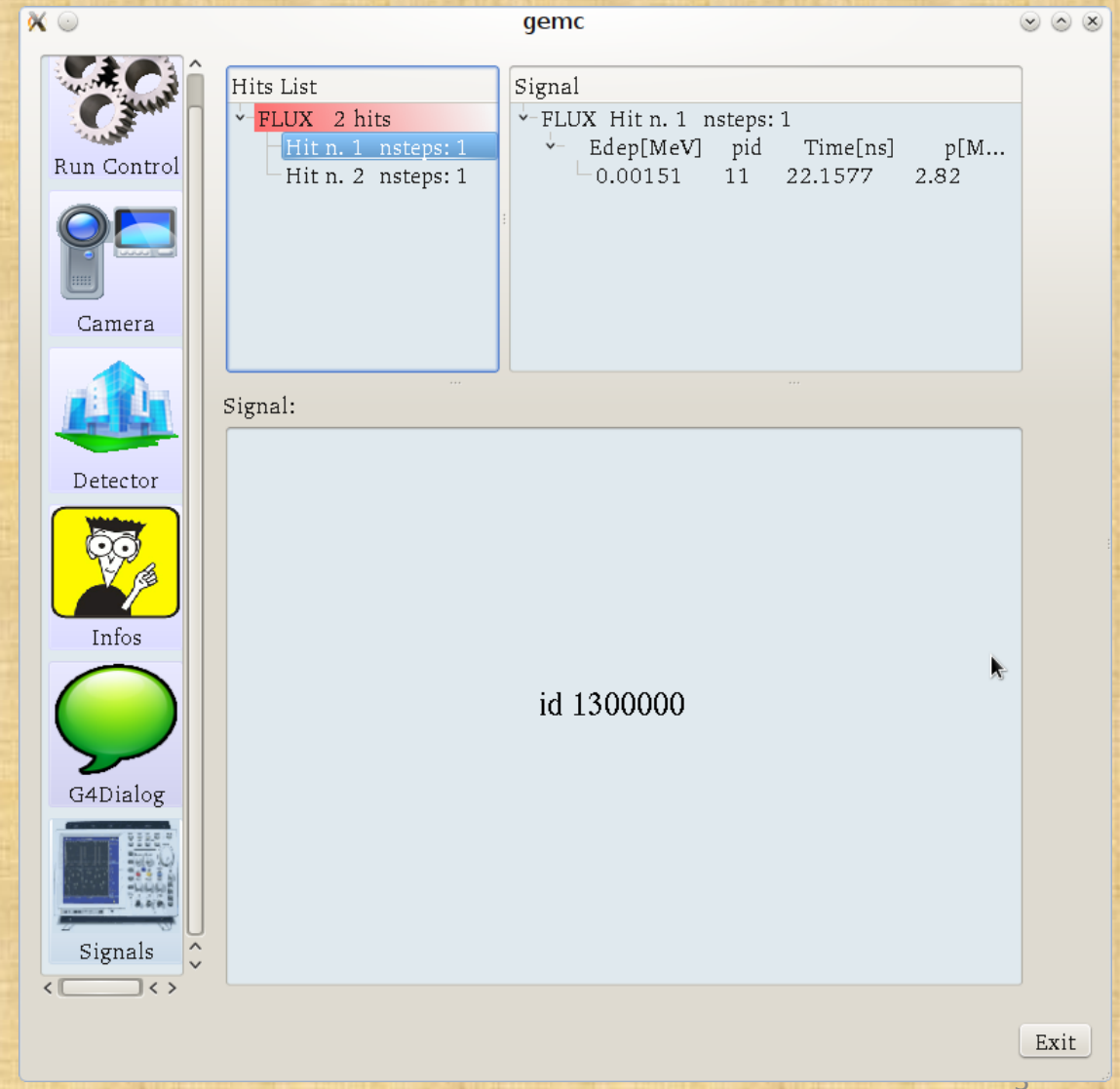
Introduction

- SoLID collaboration has successfully adopted GEMC as its Geant4 simulation framework and joined in GEMC development. The framework is used for various studies to help detector design.
- A lot of subsystem design and simulation progresses have been made. More studies are under way.

GEMC Update

(Maurizio Ungaro)

- GDML output support
- Option to record passby particle or not
- “Signal” interface for every step of each hit



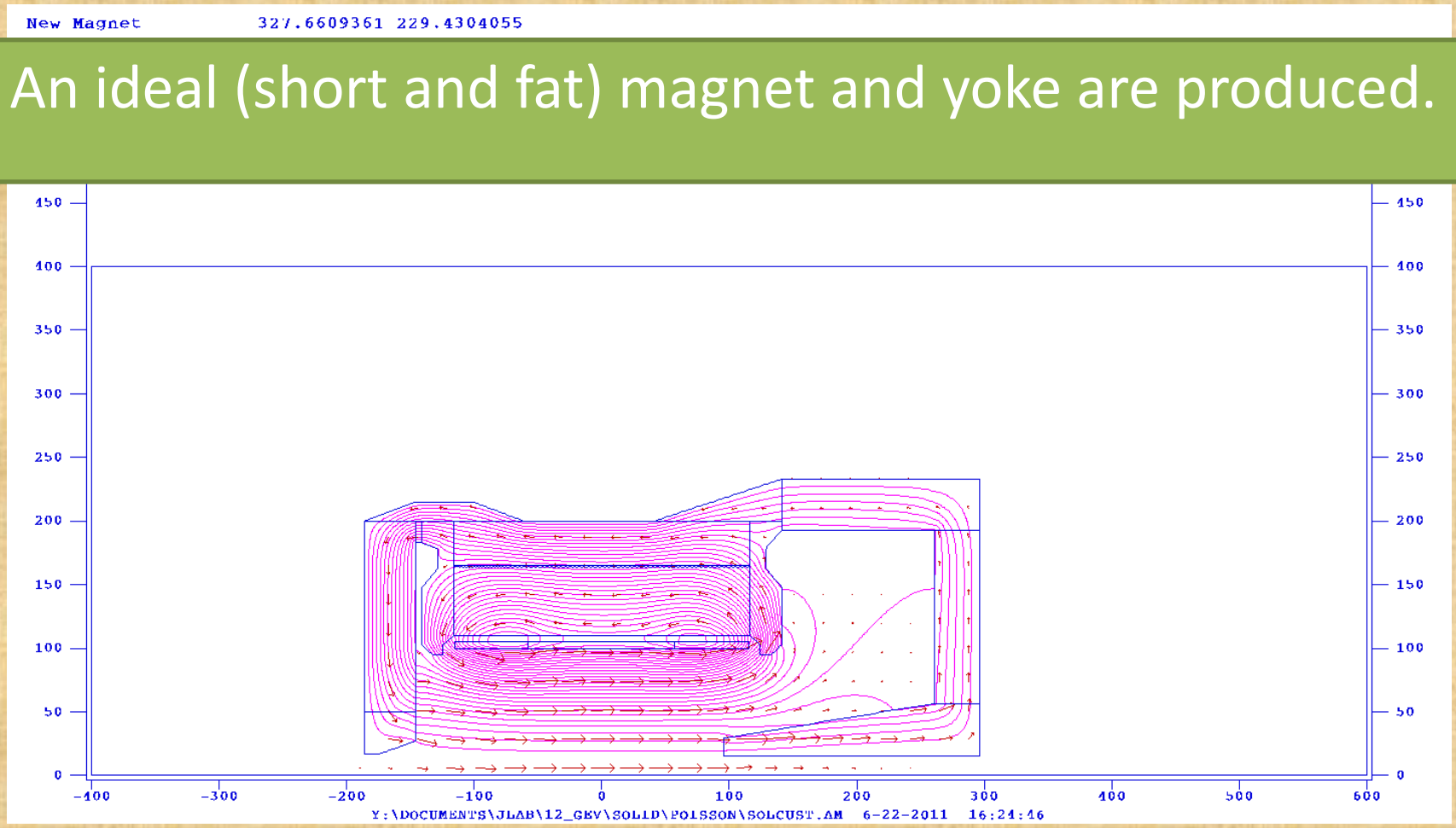
SoLID Simulation Study

- Ideal magnet design
- CLEO magnet design and detector layout
- Energy flux at EC
- GEM response and digitazation

Ideal Magnet

(Mehdi Meziane, Yang Zhang, Paul Reimer, Zhiwen Zhao)

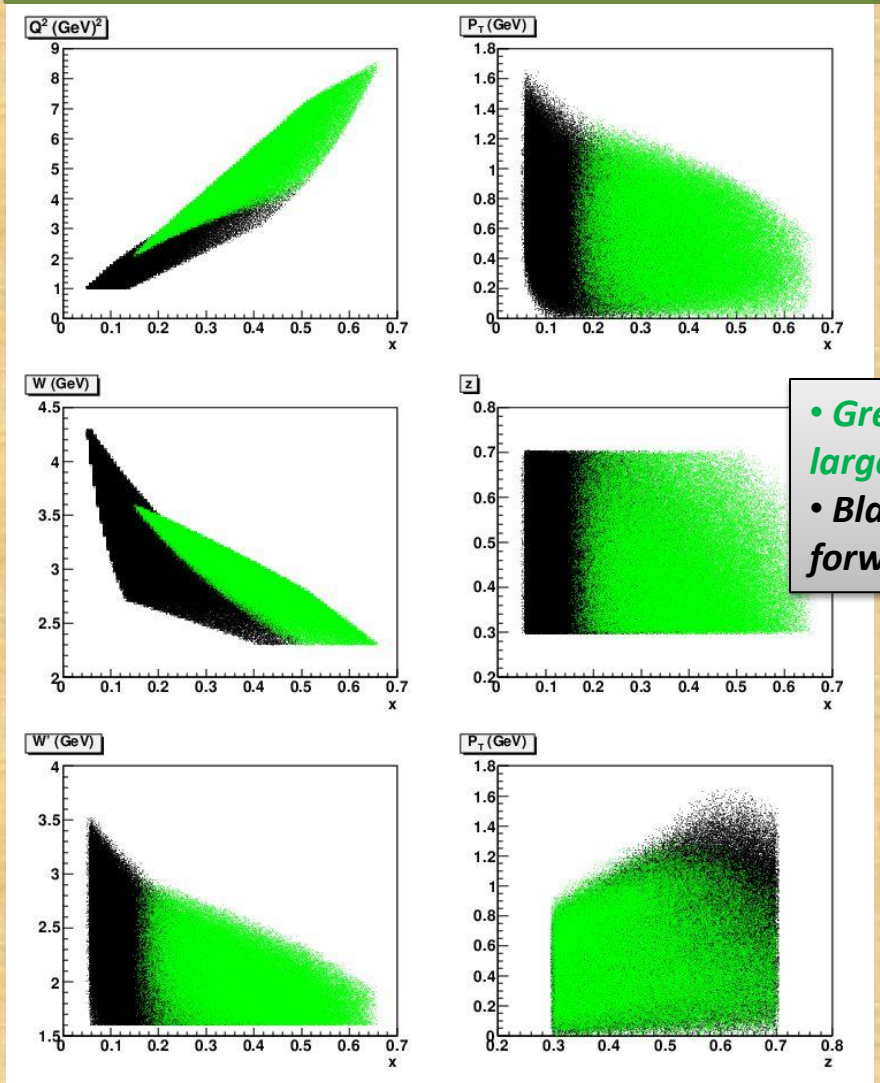
An ideal (short and fat) magnet and yoke are produced.

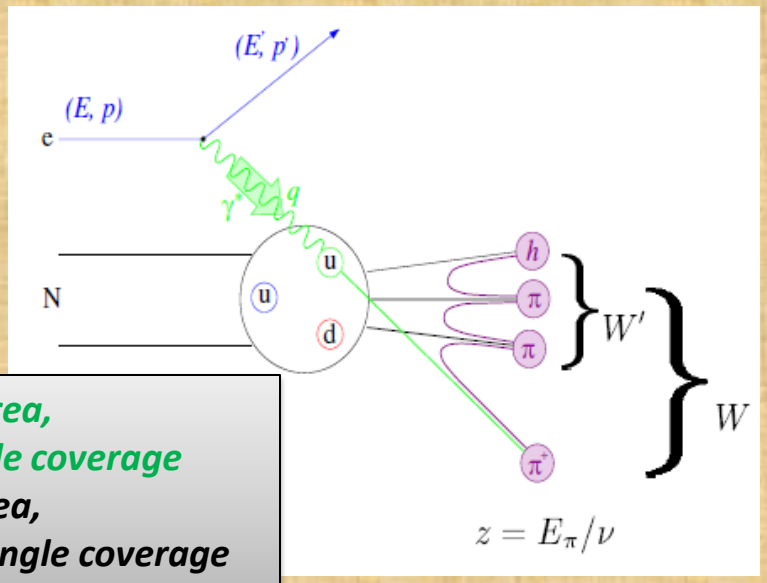


SIDIS Kinematic Coverage@11GeV

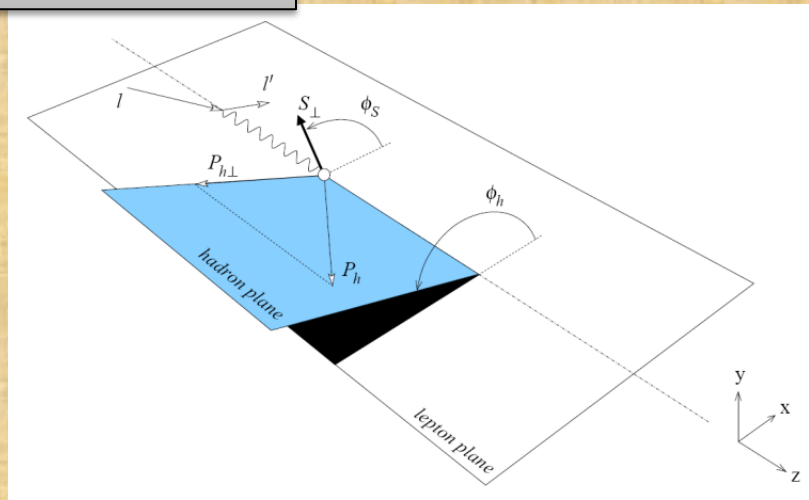
(Mehdi Meziane, Yang Zhang, Paul Reimer, Zhiwen Zhao)

SIDIS kinematics for the ideal magnet is studied





- ***Green area, large angle coverage***
- ***Black area, forward angle coverage***



SIDIS Kinematic Coverage@11GeV

(Mehdi Meziane, Yang Zhang, Paul Reimer, Zhiwen Zhao)

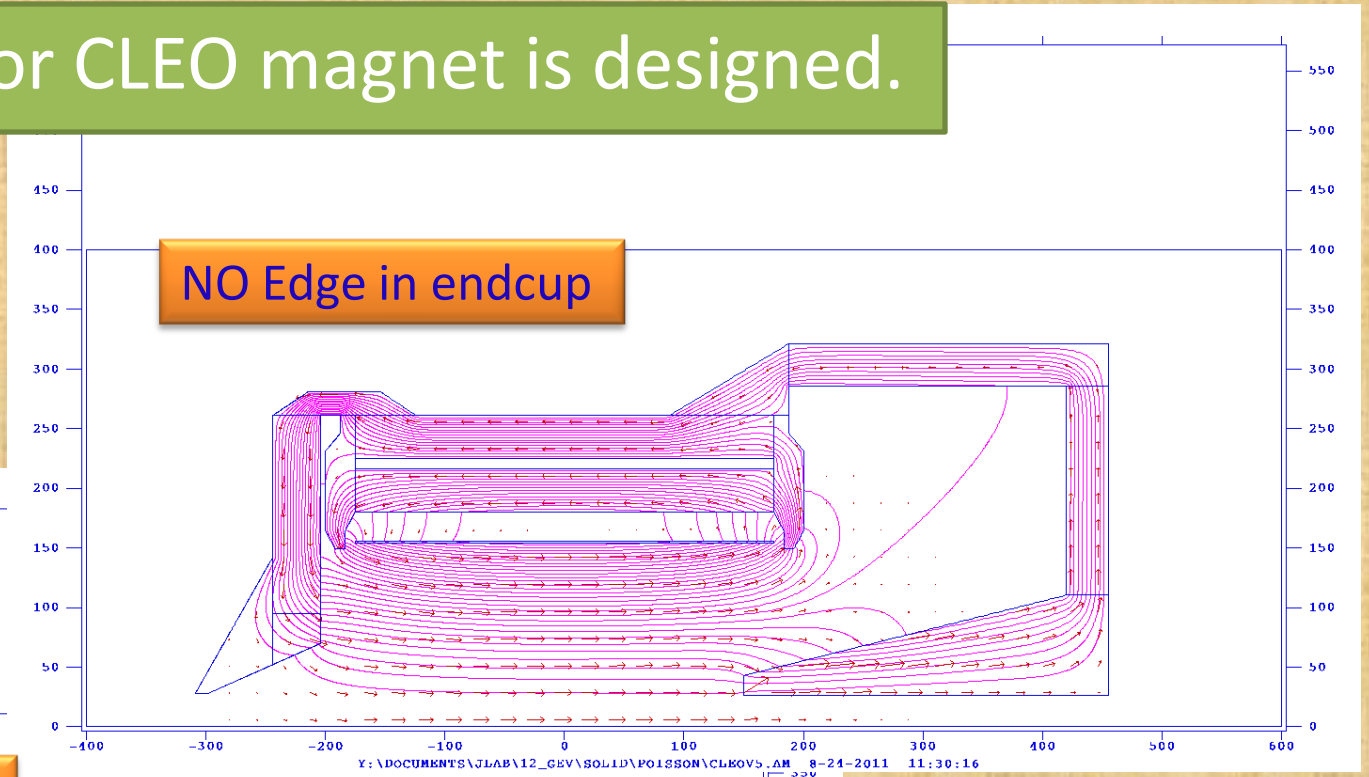
The result of the ideal magnet is similar to BaBar/CLEO.

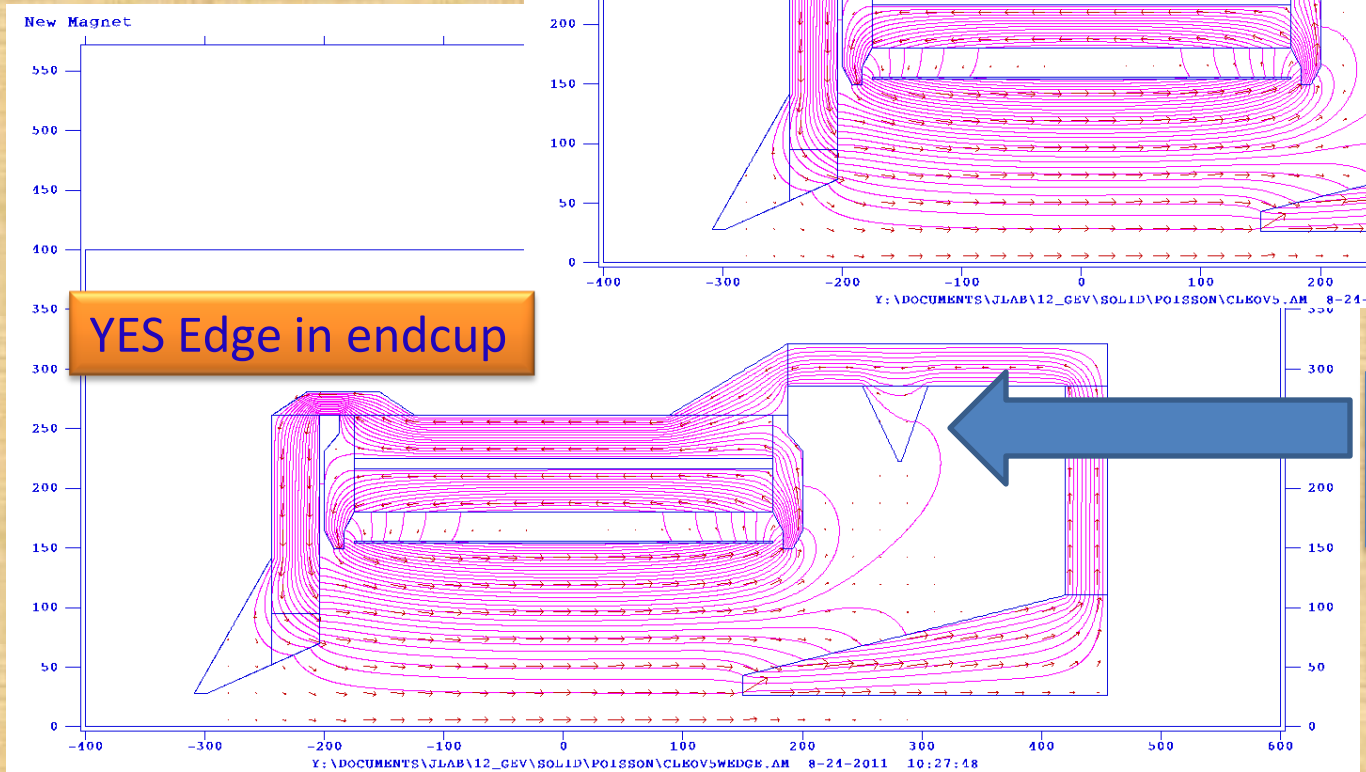
	ZEUS	BaBar/CLEO	CDF	Glue-X	Ideal Magnet
x	0.05-0.58	0.05-0.65	0.05-0.64	0.05-0.64	0.05-0.65
z	0.3-0.7	0.3-0.7	0.3-0.7	0.3-0.7	0.3-0.7
Q^2	1-6	1-9	1-7.2	1-8	1-9
W	2.3-4.2	2.3-4.4	2.3-4.2	2.3-4.2	2.3-4.3
W'	1.6-3.4	1.6-3.5	1.6-3.4	1.6-3.4	1.7-3.5
P_T	0-1.45	0-1.7	0-1.45	0-1.45	0-1.6

CLEO Magnet Yoke Design

(Paul Reimer, Yang Zhang, Zhiwen Zhao, Eric Fuchey, Simona Malace)

A new yoke for CLEO magnet is designed.





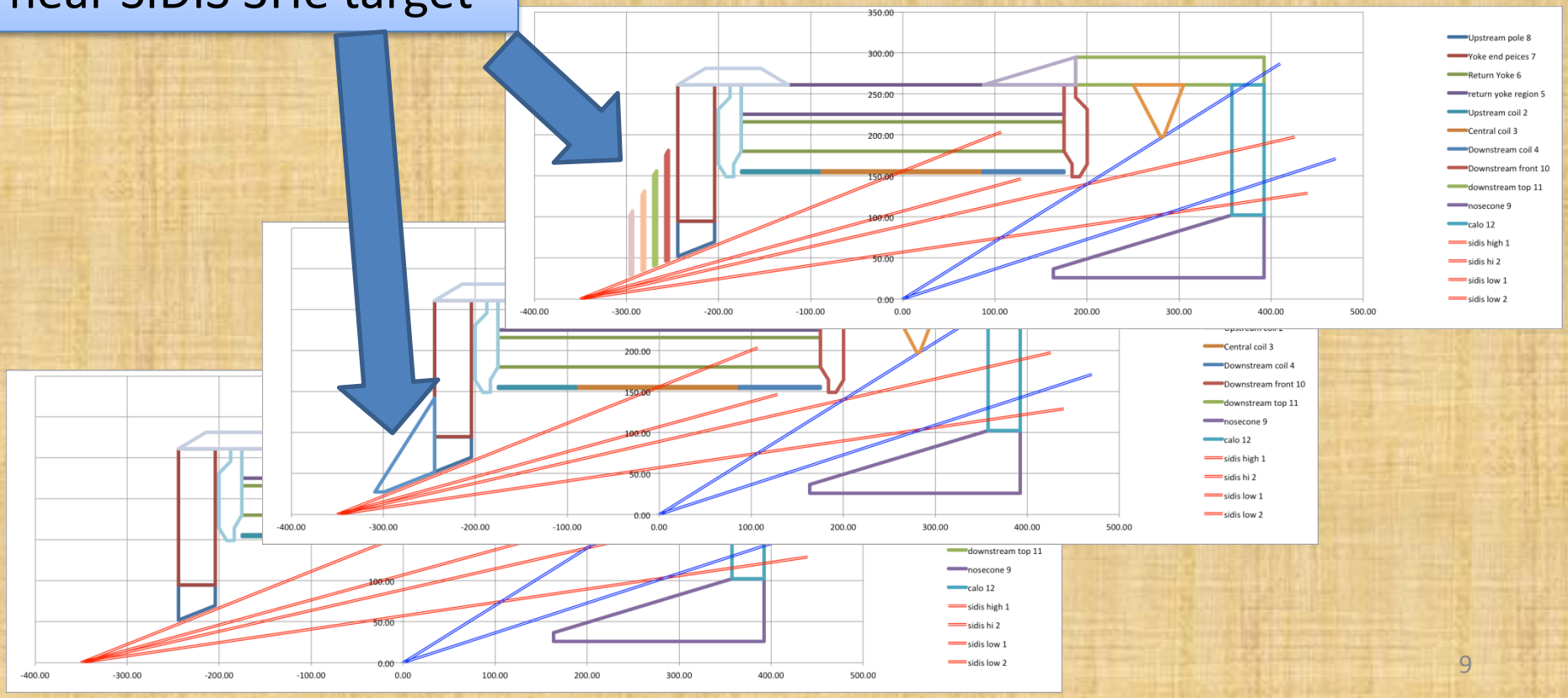
Minimize field at endcup

CLEO Magnet Yoke Design

(Paul Reimer, Yang Zhang, Zhiwen Zhao, Eric Fuchey, Simona Malace)

A new yoke for CLEO magnet is designed.

Minimize field in front near SIDIS 3He target

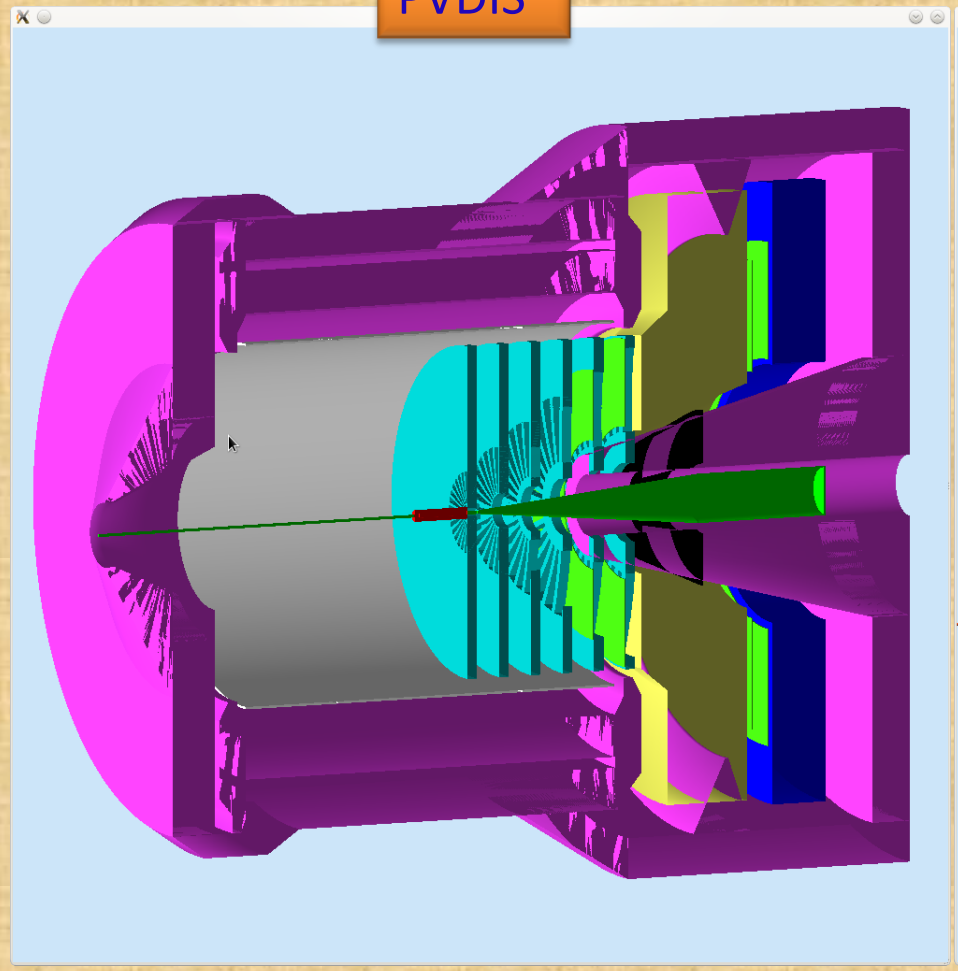


CLEO Magnet Yoke Design

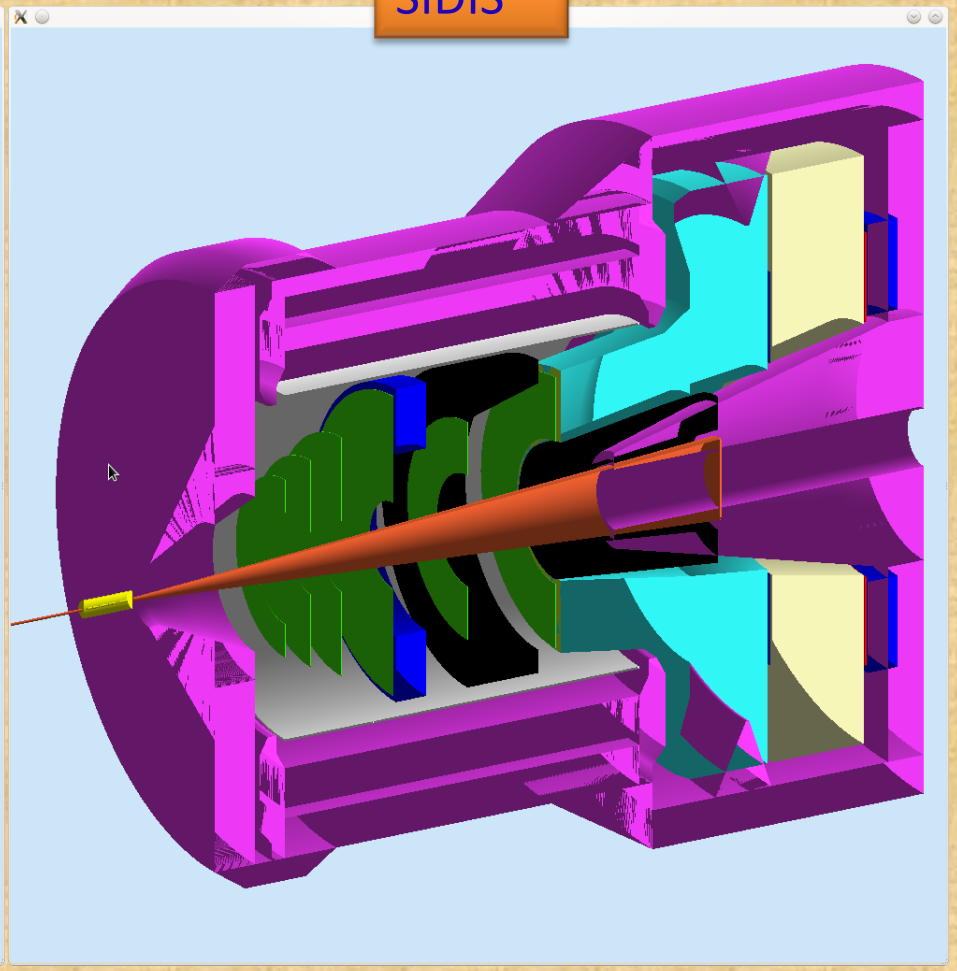
(Paul Reimer, Yang Zhang, Zhiwen Zhao, Eric Fuchey, Simona Malace)

Its field map and geometry are implemented in GEMC.

PVDIS



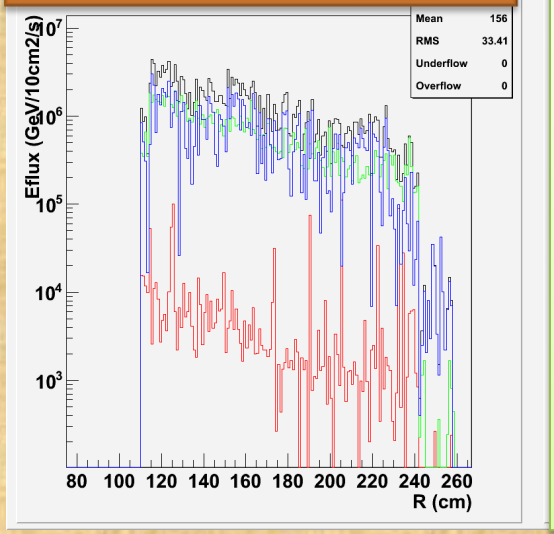
SIDIS



Background in EC

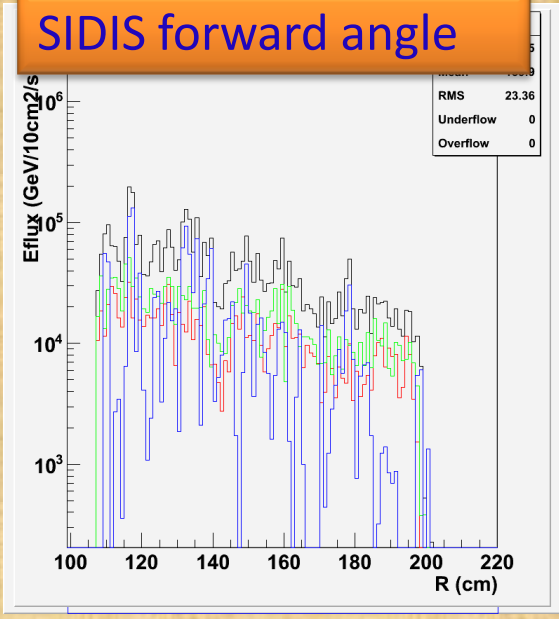
(Zhiwen Zhao, Xin Qian)

PVDIS forward angle

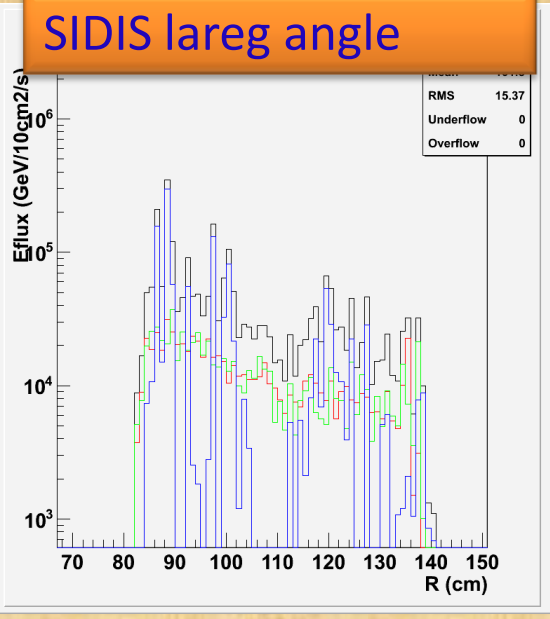


- GEMC electron and photon energy flux confirms Geant3 result.
- Hadron energy flux is under study.

SIDIS forward angle



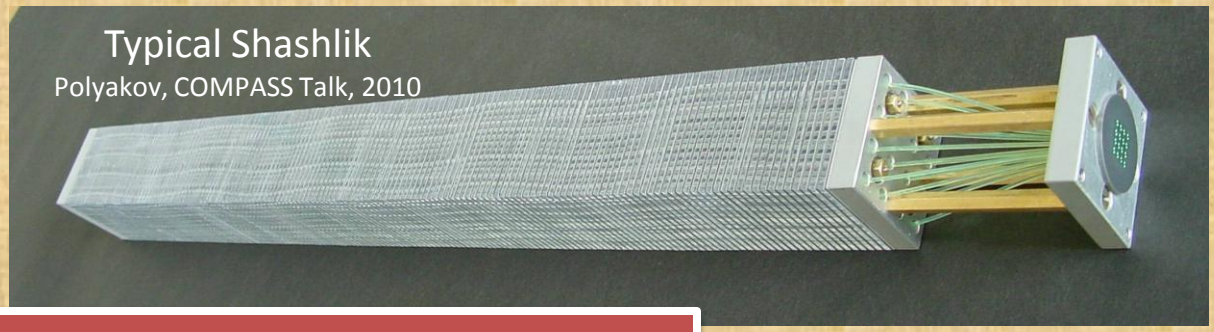
SIDIS lareg angle



- Black: total
- Red: electron
- Green: photon
- Blue: hadron

EC Radiation Resistant

- PVDIS forward angle
  - EM <=2k GeV/cm^2/s + pion, total ~<60 krad/year
- SIDIS forward angle
  - EM <=5k GeV/cm^2/s + pion , total ~<100 krad/year
- SIDIS large angle
  - EM <=20k GeV/cm^2/s + pion, total ~<400 krad/year



COMPASS module Radiation hardness ~ 500kRad,
See EC talk for improving the property

GEM Response

(Zhiwen Zhao, Evaristo Cisbani)

```
#  * HoneyComb
#  *  0   NEMA G10 120 um
#  *  1   NOMEX    3
#  *  2   NEMA G10 120 um
#  * Drift Cathode
#  *  4   Kapton 50 um
#  *  3   Copper 5 um
#  *  5   Air 3 mm
#  * GEM0
#  *  6   Copper 5 um
#  *  7   Kapton 50 um
#  *  8   Copper 5 um
#  *  9   Air 2 mm
#  * GEM1
#  * 10   Copper 5 um
#  * 11   Kapton 50 um
#  * 12   Copper 5 um
#  * 13   Air 2 mm
#  * GEM2
#  * 14   Copper 5 um
#  * 15   Kapton 50 um
#  * 16   Copper 5 um
#  * 17   Air 2 mm
#  * Readout Board
#  * 18   Copper 10 um
#  * 19   Kapton 50 um
#  * 20   G10 120 um + 60 um (assume 60 um glue as G10)
# not implmented yet
#  * Honeycomb
#  * 21   NEMA G10 120 um
#  * 22   NOMEX    3 um
#  * 23   NEMA G10 120 um
```

- To obtain more realistic GEM response, we borrow from SBS GEM simulation and the geometry and material of GEM module are realized in GEMC.
- The EM background study is underway.
- For GEM Digitization, see Tracking talk.

Summary

- SoLID GEMC Framework is moving forward.
- Many simulation study is well under way.
- Several tutorials and hand on sessions have been given when I was in China at Tsinghua Univ., CIAE, USTC, and Huangshan Univ.