SoLID Simulation Overview

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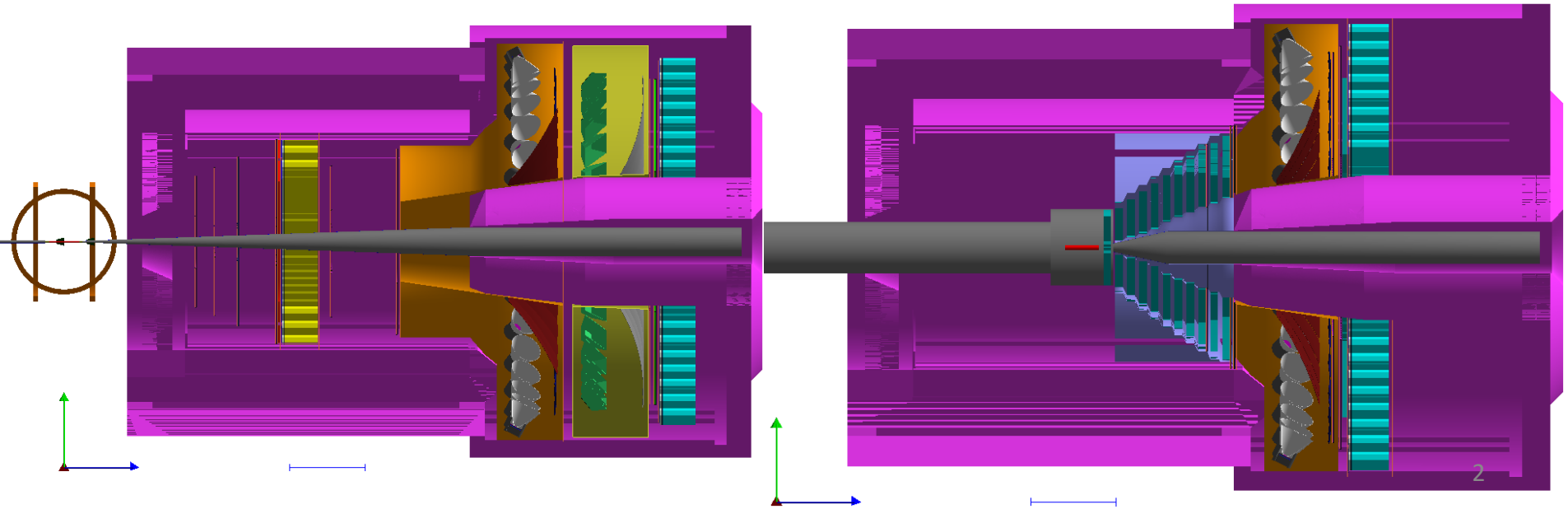
Setup with longer endcap

Prepare for next iteration of design, don't update everything for science review

- Layout change
  - enlarge endcap space in Z by 45cm=(530-485)
  - Move downstream of FASPD,MRPC,GEM 4,5 of PVDIS, and FAEC
  - Adjust LGC,HGC position in Z and optics
- Other change
  - Magnet geometry from CAD model directly
  - Magnet field map 3D with 4fold rotation symmetry from TOSCA



Software Status

- solid_gemc
  - for preCDR, using production version based on modified gemc 2.3 and geant4.10.1.p03 and physcis list “QGSP_BERT_HP”
  - For longer endcap setup, testing devel version based on latest gemc 2.x and geant4.10.06
    - This geant4 has fix of correct treatment for the recoiled nucleon with Deuterium, but not Tritium and Helium3 yet
- Digitization
  - MRPC, standalone code
  - GEM, standalone code using Analyzer
  - Others, simple optical photons and energy deposition
- Reconstruction and analysis
  - MRPC, standalone code
  - Tracking, standalone code using Analyzer
  - Root scripts with some structures

Tasks for Science Review in early Fall

- Defend preCDR as it is but include new progress (longer endcap setup)
- Improve some physics studies (Jpsi and SIDIS_He3) to the same level of other studies.
- support preRD

item	description	who	status	end
1	Cerenkov simulation for preRD to support test	Zhiwen, Michael	some results	Aug beyond
2	GEM digitization with VMM and update tracking	Jinlong	some results	Aug beyond
3	GEM frames,dead area,layout in the simulation and update tracking	Weizhi, UVa	Need to start	Aug
4	SIDIS_NH3 tracking (single particle only)	Weizhi	some results	July
5	check longer endcap setup: acceptance	Zhiwen	ongoing	July
6	check longer endcap setup: background and trigger with existing method (PVDIS, SIDIS_He3)	Ye	Start soon	Aug
7	JPsi, background and trigger	ANL	Need to start	Aug
8	SIDIS_NH3, background and trigger	Vlad	some results	Aug

https://hallaweb.jlab.org/wiki/index.php/SoLID_Study#Science_Review_preparation_.282020.2F05-2020.2F09.29

Tasks in mid term before FY22

Simulation goal

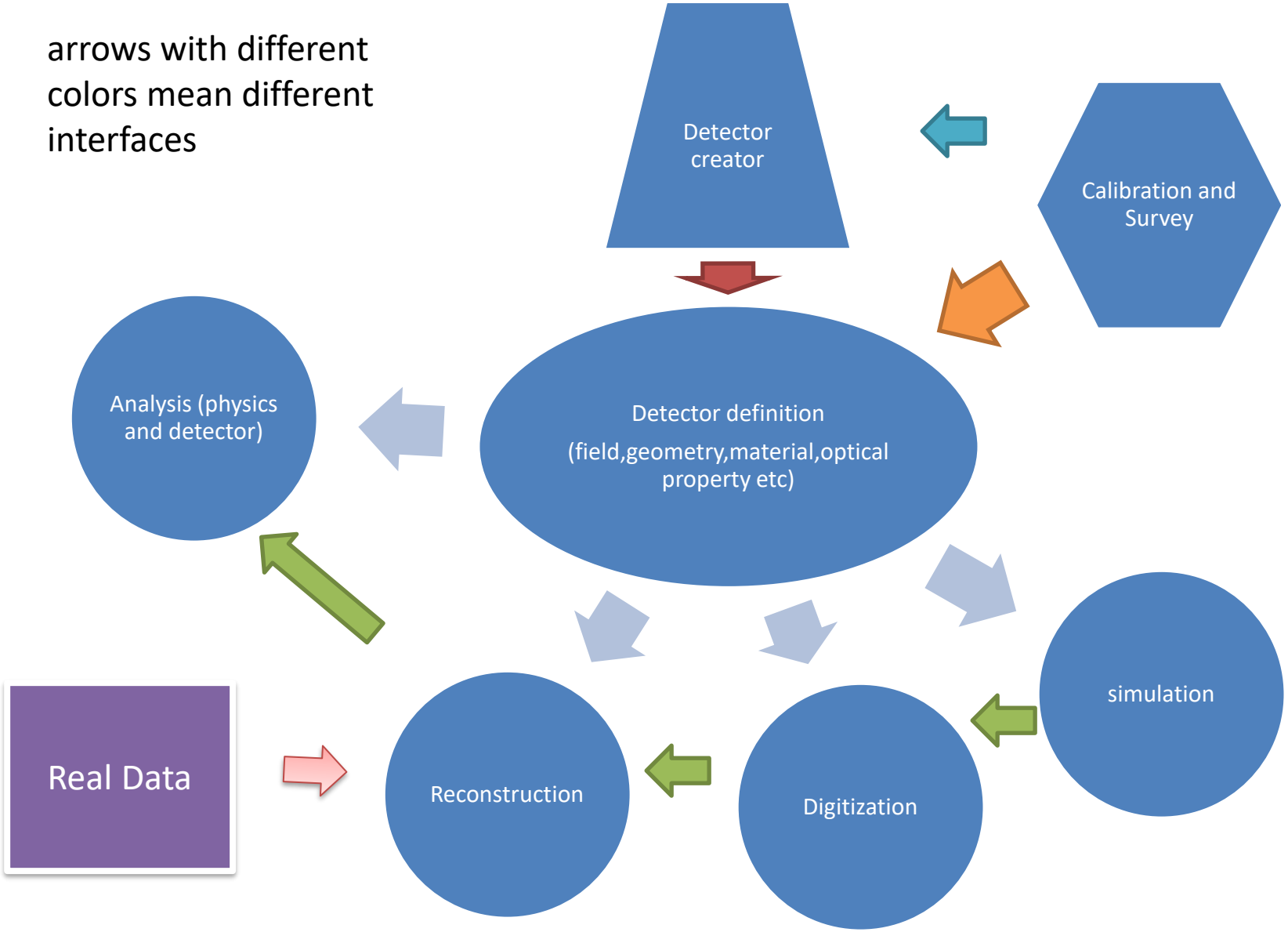
- Study figure-of-merit for experiments
- Optimize detector designs
- Understand experimental conditions and mitigate technical risks.

Item	Curr.per.(FTE)	Req.per. Y1(FTE)	Req.Per. hY2(FTE)
GEM	0.2 (Duke) 0.3 (SBU)	0.5 (UVa Liyanage)	0.25 (UVa Liyanage)
Other detector	0.3 (SBU) 0.1 (Temple) 0.1 (Duke)	0.3 (UVa Zheng) 0.1 (Temple Sparv.) 0.1 (Duke)	0.15 (UVa Zheng) 0.05 (Temple Sparv.) 0.05 (Duke)
physics	1.0 (Syracuse) 0.5 (Duke)	0.5 (Duke) 0.5 (Temple Sparv.)	0.4 (Duke) 0.4 (Temple Sparv.)
General software		0.5 (JLab*)	0.25 (JLab*)
reconstruction	0.3 (Syracuse)		
Total	2.8	2.5	1.55

- With existing effort only, we can cover different aspects, but with less deliverables. We don't have general software covered
  - GEM has no UVa part and simulation can't be connected to hardware well
  - EC simulation and reconstruction conflict. EC need to study edge effect for longer endcap. Reconstruction needs improvement to do better high level study combining different sub-detectors
  - We need to move forward with general software
- To ramp up effort, we need more people
  - Some standalone efforts in detector study and software can be a few months efforts. But overall performance and physic studies are constantly involving. There is a learning curve for any work.
  - It's ideal to have long term commitment from new contributors
  - How to get new contributors?

Idea of SoLID software ecosystem

arrows with different colors mean different interfaces



How to move forward with general software

Is DD4hep the solution for detector definition?

- Need instruction to test solid in DD4hep
- Need some comparison studies between DD4hep and current simulation

Simulation software

- How good is the geant4 interface in DD4hep?
- Can gemc/solid_gemc work with DD4hep?

Digitization, reconstruction and analysis software

- Need some framework to combine information from different subdetectors for high level analysis like PID and trigger
- Need some consistent data format or model