

SoLID Simulation Overview

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Overview

- Move to longer endcap setup in progress
 - A bit delayed waiting for next GEMC release
- support various beam tests, then implement test result back into simulation and digitization
- Test new tool like DD4hep and PODIO in ANL software package
- Keep an eye on new tool like project eAST

Simulation Tasks

	description	who	status
1	Cherenkov simulation for preRD to support test	Zhiwen, Michael	Shift focus to background rejection
2.1	GEM digitization with VMM and tracking	Weizhi	Fine tuning and need UVa help
2.2	GEM frame,dead area,layout in the simulation and update tracking for initial study	Weizhi, Zhiwen	Ongoing and need UVa help
2.3	SIDIS_NH3 electron tracking, SIDIS_He3 hadron tracking, Initial tracking for multiple particles	Weizhi	finished
3.1	check longer endcap setup: acceptance	Zhiwen	ongoing
3.2	check longer endcap setup: EC edge effect	Ye Tian	Finished
3.2	LAEC performance at 15 deg and if we need shorter modules	Ye Tian	ongoing
3.3	EC digitization	UIC	ongoing
4	check longer endcap setup: background and trigger with existing method (PVDIS, SIDIS_He3)	Ye Tian	ongoing with updated generators
5	JPsi, background and trigger	Sylvester	same trigger rate limit like SIDIS, still need some study
6	SIDIS_NH3, background and trigger	Vlad	Finished for shorter endcap
7	evaluate e- and hadron generators and compare to Geant4	Ye Tian	Ongoing

New things we can do and apply funding

- Use AI/ML for SoLID at high rate and high background
 - Use AI/ML to potentially improve tracking
 - Duke did some initial study for PVDIS with a few percent improvement
 - CLAS12 tracking are pushing it hard and see good results
 - Use AI/ML improve PID
 - Duke tried it with cosmic rejection for HCAL in PRad
 - Duke are trying Cherenkov background rejection
- Get end-to-end framework
 - Set it up
 - Transfer existing work into it
 - Make sure it is compatible with streaming readout (like software trigger?)

effort and funding (draft ideas)

	Current effort (fte)	New effort FY22 (fte)	
GEM	0.3 (Syracuse/UVa)	0.5 AI/ML	1 postdoc full time or 2 postdoc half time split between GEM and PID detectors
EC	0.2 (Syracuse/Uva/UIC)	0.2 AI/ML	
Cherenkov	0.2 (NMS/ANL) 0.2 (Duke)	0.3 AI/ML	
SPD and MRPC	0.2 (SBU/?)		
Physics	0.5 (Syracuse) 0.5 (Duke) 0.5 (ANL)		
Overall simulation and analysis	0.2 (Syracuse) 0.3 (Duke)		
Transfer into new framework		0.3	1 postdoc full time Or 2 postdoc half time split between framework and other items
streaming readout		0.1	
Software framework setup		0.6	
total	3.1	2	

- Current effort
 - Just a rough estimation for now. Each detector group should help evaluate how accurate they are. We should consider how to adjust contribution and funding support from different groups if needed
 - Each detector group are expected to do detector related software work
- New effort for FY22
 - Assuming current effort is maintained
 - Funding goes to some university group as labs are expensive? Support continues from CDO funding in FY23?