YR Physics Working Group meeting

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Discussion of YR Timeline

From 01/23/2020 EICUG Remote Meeting, folding in lab/project planning

SC (Rolf's) slides at Temple

August 3-7	Status reports at EICUGM @ FIU – Miami, FL *Goal: Conveners/sub-conveners inform community about status and progress. Conveners identify possible issues (if any) in meeting with EICUG Steering Committee.*
September 17-19	Third workshop at CUA – Washington, DC *Goal: present mature studies of detector requirements from physics processes, balance detector concepts versus impact on physics measurements. Discuss possible systematics reduction among complementary detector choices. Complete final "to-do" list for YR(s).*
November 19-21	Fourth workshop at UCB/LBL – Berkeley, CA or Final Meeting (assembly of Yellow Report(s)) *Goal: distribute draft YR sections before meeting*

Summarize/formulate initial detector requirements

Active PWG ↔ DWG collaboration

Finalize detector requirements

Discussion of YR Timeline

Straw-man plan of attack:

a.- Review previous existing work related to your subgroup.

b.- Converge on a set of important and representative measurements for your subgroup.

c.- Break-down physics deliverables into “physics objects” (PO) [electron, hadron (ID/noID), muon, jet]; map out kinematics for each PO.

d.- Cross-check PO maps across physics subgroups to determine the most challenging constraints in terms of detector design; resolve overlaps [decide who runs what].

e.- Focus on fast simulations for the most demanding measurements first; determine the optimal/acceptable detector performance; confirm/check resulting impact on the rest of the measurements

Post-Pavia focus

Discussion of YR Timeline

Towards “DC meeting”

Early August
(we propose PWGC meeting ~August 5)

Summarize emerging requirements in terms of the Detector Matrix elements

Discuss/finetune YR outline

Mid-August

Get feedback from DWG on feasibility/possible technology/additional constraints

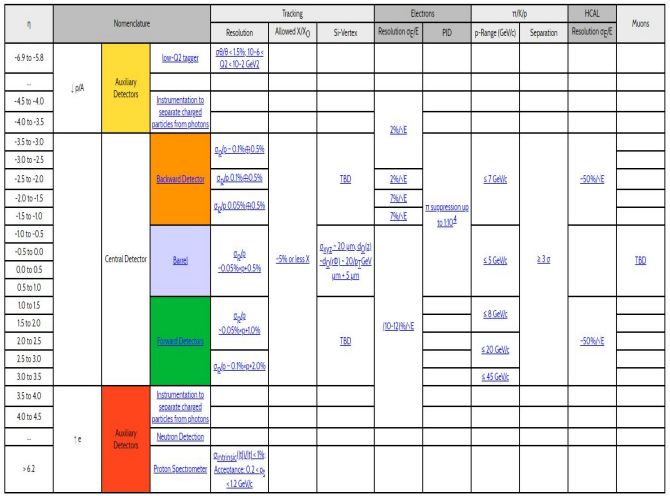
Begin drafting of YR PWG summaries

End of August
(another PWGC meeting?)

Get feedback from DWG on feasibility/possible technology/additional constraints

Miami->DC: Collaboration with DWG

- ✔ Document studies/results in the wiki: https://wiki.bnl.gov/eicug/index.php
- ✔ Need to start updating the detector matrix!



η	Nomenclature			Tracking			Electrons		π/K/p		HCAL	Muons
				Resolution	Allowed X/X_0	Si-Vertex	Resolution dp/E	PID	p-Range (GeV/c)	Separation	Resolution dp/E	
-6.9 to -5.8	↓ p/A	Auxiliary Detectors	Low-Q2 tagger									
...												
-4.5 to -4.0			Instrumentation to separate charged particles from photons									
-4.0 to -3.5							2%/√E					
-3.5 to -3.0		Central Detector	Backward Detector	σ_p/p ~ 0.1%⊕0.5%	~5% or less X	TBD		TI suppression up to 10^4	≤ 7 GeV/c	≥ 3 σ	~50%/√E	
-3.0 to -2.5												
-2.5 to -2.0				σ_p/p 0.1%⊕0.5%			2%/√E					
-2.0 to -1.5							2%/√E					
-1.5 to -1.0				σ_p/p 0.05%⊕0.5%			2%/√E					
-1.0 to -0.5			Barrel	σ_p/p ~0.05%⊕<0.5%		σ_{xyz} ~ 20 um, σ_{p_T}/p_T ~$\sigma_{y'}(\theta)$ ~ 20/(pTGeV um + 5 um			≤ 5 GeV/c			TBD
-0.5 to 0.0												
0.0 to 0.5												
0.5 to 1.0												
1.0 to 1.5			Forward Detector	σ_p/p ~0.05%⊕<1.0%		TBD	(10-1)/(N)/E		≤ 8 GeV/c		~50%/√E	
1.5 to 2.0												
2.0 to 2.5									≤ 20 GeV/c			
2.5 to 3.0				σ_p/p ~ 0.1%⊕<2.0%								
3.0 to 3.5									≤ 45 GeV/c			
3.5 to 4.0	↑ e	Auxiliary Detectors	Instrumentation to separate charged particles from photons									
4.0 to 4.5												
...			Neutron Detection									
> 6.2			Proton Spectrometer	$\sigma_{momentum}/p$(GeV) < 1% Acceptance: 0.2 < σ_θ < 1.2 GeV/c								

https://physdiv.jlab.org/DetectorMatrix/

To summarize emerging requirements from each group: update (**excel**) table.
Our proposed "color-coding"/updating scheme is as follows:

- Unchanged cell -- only if this parameter has not yet been considered but it may have an impact on your processes
- Fill **green** -- if listed performance is sufficient and/or will have no impact on your processes. If known, add an updated performance quantifier of what your measurements could "tolerate" without loss of physics
- Fill **red** & update the cell -- if improvements are shown necessary

Input from SC regarding YR timeline

On Tue, Jun 16, 2020 at 5:48 PM Thomas Ullrich <thomas.ullrich@bnl.gov> wrote:
Dear Carlos and All,

While we understand you worries about the pace of the YR exercise, it is very crucial to keep the YR timeline. The timeline was presented at both the January remote EICUGM and then the Temple meeting, with ample chance for community discussion. There are multiple reasons for the pace:

* It is in all of our benefit to obtain CD-1 as expedient as possible.
  * It drives the start of EIC science date.
  * It allows more serious engineering and design.
  * It also would qualify the EIC as an official project for CERN, such that we can apply as recognized experiment at CERN, benefiting our European users.

* Much of the EIC science requires a highly integrated detector and accelerator, an integration that is much more difficult when accelerator and detector are separate projects.

* Keeping the YR timeline as is allows to point to a plausible scenario reference detector design and that it can do the WP/LRP/NAS science.

* The Yellow Report thus functions as surrogate for the EIC experimental equipment definition such that we only need a reference detector concept at CD-1. This allows the detector to proceed at same pace as the accelerator scope.

* Separating accelerator and detector projects and timelines runs the risk that accelerator scope changes within the formal DOE Project priorities highly impacting the EIC science and performance, or at least delaying important parts of it.

* Keeping the YR activities in phase, and knowing the YR content at CD-1, simplifies later refinements of the detector.

* Many detector concepts are at the stage now they would benefit from more detailed design, which is only possible after CD-1.

* The call for expression of interest timeline and its evaluation is built around the YR timeline.

We note that the above schedule also keeps open the possibility of a 2nd detector and IR from day-one of an EIC, which if out of phase will at best be a few years later if we lose synchronization.

We are puzzled by the statement "would help make detector choices to be really driven by physics and not by the project schedule" as your colleagues in the Detector Working Group have given their sub-groups strict guidance for an initial detector technology survey and to keep technologies open.

We hope that answers your question and helps to understand why we need to keep the timeline.

Bernd, Rolf & Thomas