EIC Detector Working Group (DWG)

The Detector Working Group's aim is to develop and study detector concepts based on the requirements defined by the Physics Working Group. Detector Working Group is lead by four conveners and is divided into various subgroups in which dedicated aspects are studied and discussed.

DWG Conveners

Ken Barish (UC Riverside)

Tanja Horn (CUA)

Peter Jones (U. Birmingham)

Silvia dalla Torre (Trieste)

Markus Diefenthaler, ex officio (JLab)

Electron-Ion Collider User Group

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http://www.eicug.org/web/content/yr-detector-working-group

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YR Detector Working Group

View Edit

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Subgroups

The Working Group is divided in the following subgroups. to join a group and its mailing list, contact the conveners.

- **Tracking (including vertexing),** Conveners: Kondo Gnanvo (UVA), Leo Greiner (LBNL), Annalisa Mastroserio (INFN)
- **Particle ID**, Conveners: Tom Hemmick (SBU), Patrizia Rossi (JLab)
- **Calorimetry (EM and Hadronic),** Conveners: Vladimir Berdnikov (CUA), Eugene Chudakov (JLab)
- **Far-Forward Detectors**, Conveners: Alexander Jentsch (BNL), Michael Murray (Kansas)
- **DAQ/Electronics**, Conveners: Andrea Celentano (INFN), Damien Neyret (CEA Saclay)
- **Polarimetry/Ancillary Detectors**
  - Conveners: Elke Aschenauer, Dave Gaskell
  - Mailing list: eicug-polarimetry@eicug.org
  - Indico
- **Central Detector/Integration & Magnet,** Conveners: Alexander Kiselev (BNL), TBA
- **Forward Detector/IR Integration,** Convener: Yulia Furletova (JLab)
- **Infrastructure and Installation,** Convener: TBA
- **Detector Complementarity,** Conveners: Elke Aschenauer (BNL), TBA
- **Simulations,** Convener: Markus Diefenthaler (JLAB)

Logistics

- The Calendar
- Indico categories for the Yellow Report Detector working groups
- Mailing lists
- Dropbox (soon)

Navigation

- Add content

User menu

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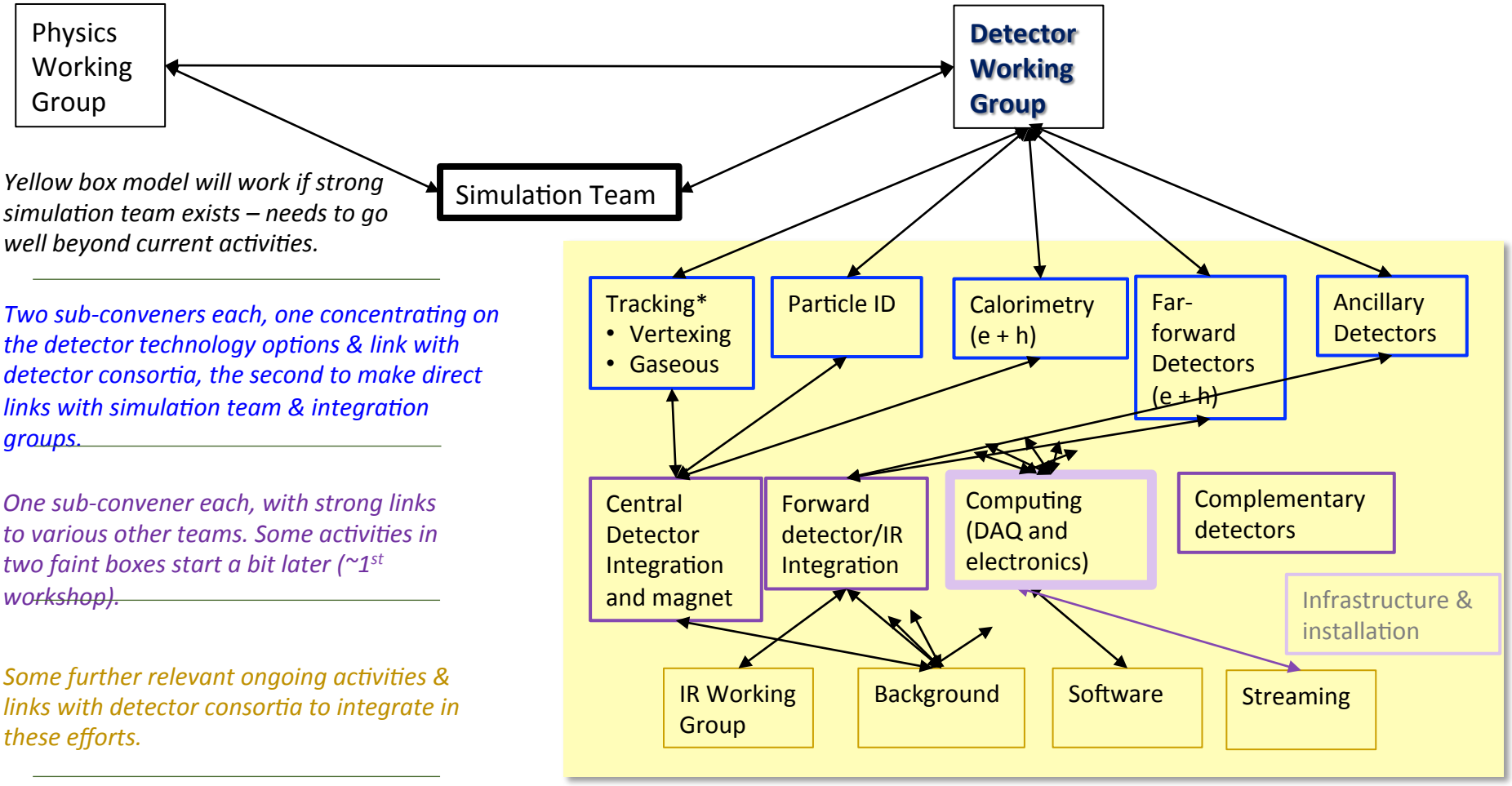
- **Subconvener names and contact information**
- **Calendar for EIC YR Activities**
- **Mailing Lists (e-mail subconvener to be added)**
- **Indico sites for each subgroup.**

- **Subgroups recently formed and are just starting up now.**
- **eRD member contributes are absolutely central to the success of the YR efforts.**
  - **Join subgroups now!**

DWG Sub-conveners

System	Sub-convener names	Sub-convener task	Convener name
Tracking	1. Kondo Gnanvo (UVA) 2. Leo Greiner (LBL) 3. Annalisa Mastroserio (INFN)	(gaseous) detector technologies (vertex) detector technologies simulation, integration coordination	Peter
Particle Identification	1. Tom Hemmick (SBU) 2. Patrizia Rossi (JLab)	detector technologies simulation, integration coordination	Silvia
Calorimetry (e + h)	1. Eugene Chudakov (JLab) 2. Vladimir Berdnikov (CUA)	detector technologies simulation, integration coordination	Ken
Far-forward detectors	1. Alexander Jentsch (BNL) 2. Michael Murray (Kansas)	detector technologies Simulation, integration coordination	Tanja
Ancillary detectors	Polarimetry and Luminosity Det. WG	detector technologies	N/A
Central detector integration and magnet	1. TBA 2. Alexander Kiselev (BNL)	integration tasks, field strength need, pro and con	Peter, Silvia
Forward detector/IR integration	1. Yulia Furletova (JLab)	integration tasks	Tanja
DAQ and Electronics	1. Damien Neyret (Saclay) 2. Andrea Celentano (INFN)	list of activities/tasks needed	Silvia
Infrastructure and Installation	NA yet/conveners	NA yet	TBD
Detector Complementarity	Elke Aschenauer (BNL)	NA yet	Ken
Simulations (shared w. Physics WG)	Markus Diefenthaler (JLAB)	work w. both WGs central to progress	

EIC Detector Working Group Organization Model



Yellow box model will work if strong simulation team exists – needs to go well beyond current activities.

Two sub-conveners each, one concentrating on the detector technology options & link with detector consortia, the second to make direct links with simulation team & integration groups.

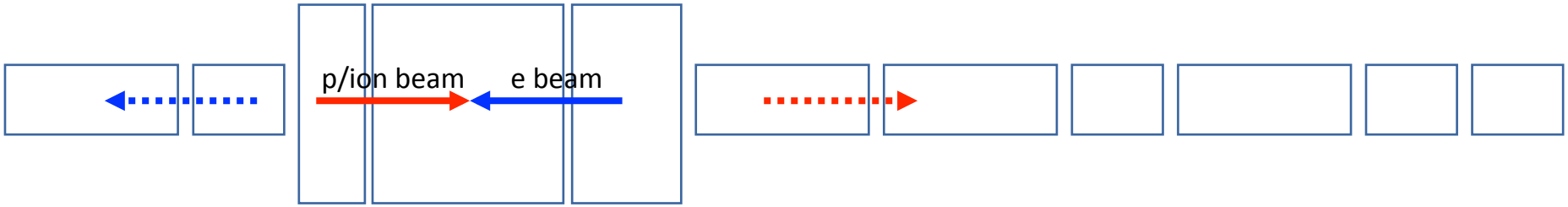
One sub-convener each, with strong links to various other teams. Some activities in two faint boxes start a bit later (~1st workshop).

Some further relevant ongoing activities & links with detector consortia to integrate in these efforts.

**One additional sub-convener (to cover each of these distinct and evolving detector technologies)*

Organizational Cartoon/Model of the Extended Detector and IR

- EIC physics covers the entire region (backward, central, forward)
- Many EIC science processes rely on excellent and fully integrated forward detection scheme



far-backward e detection	e final-focus quads	"Central detector", includes e endcap, central, and p/ion endcap detectors	Ion final-focus quads	far-forward h detection	forward dipole	far-forward h detection	forward dipole	far-forward h detection
Low-Q^2 spectroscopy		Inclusive Structure Functions, TMDs, heavy flavors and jets, electrons for GPDs		Baryon decay π/K structure evaporated n		GPDs/DVCS, tagging, diffraction		lowest-t, diffraction
GEMs Diamond detectors?		Vertex and Tracking detectors, particle identification detectors, calorimetry detectors, muon detectors, etc.		GEMs ZDCs e/γ calorim.		GEMs Roman pots e/γ calorim.		Roman pots GEMs?

physics examples

detector examples

DWG Overall Goals

- ❑ Work out requirements to carry out the EIC physics
- ❑ Integrate technologies to meet the requirements

Details for Zero-Degree Neutron Detection

Abstract:

Geometry needs for zero-degree calorimeter used to detect neutrons from incoherent nuclear breakup reactions.

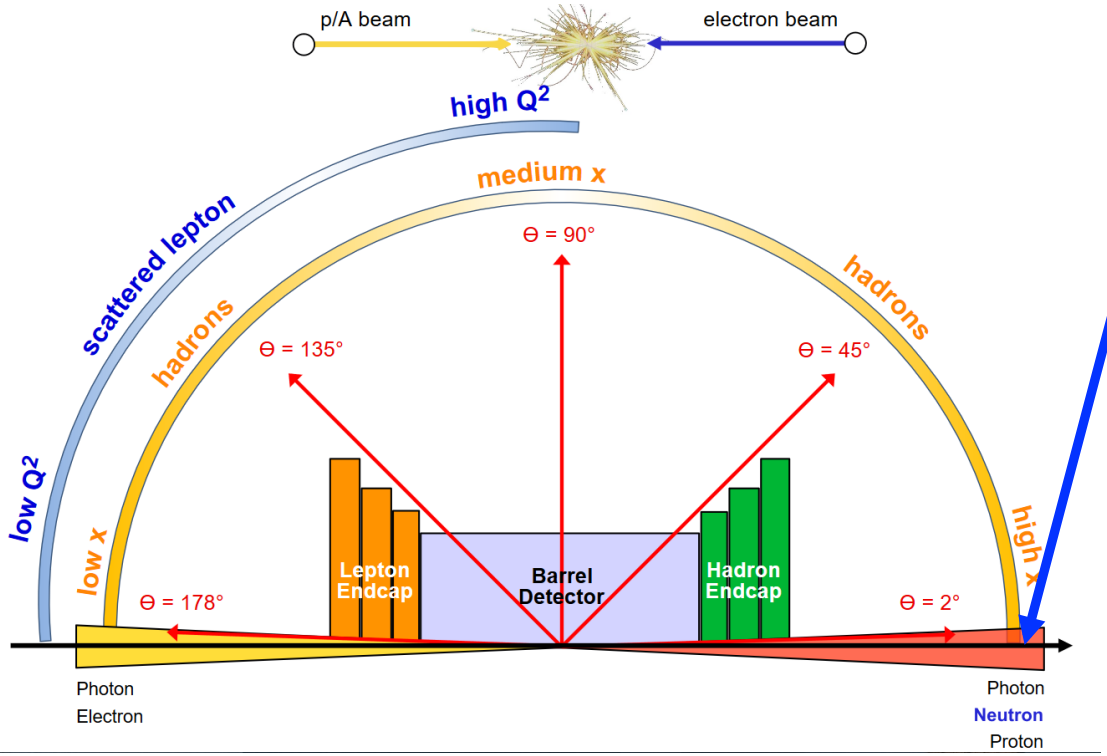
Referenced Files:

- ZDC neutron angle as function of energy.
- Zero-Degree High Precision Hadronic Calorimetry.

Notes:

ZDC: size 60x60x200cm

Example of zero-degree neutron detection



As a first step to guide and document the efforts towards these goals, we are in the process of making an interactive map

First version of an interactive map

Thanks to: Walt Akers, Elke Aschenauer, Rolf Ent, Thomas Ullrich

DWG Overall Goals

- Interactive table of detector requirements for each region of physics

Details for the Barrel Calorimeter HCAL

Abstract:

The resolution was determined in a study, which looked to the energy-resolution of jets using a the information of a hadron calorimeter in the unfolding.

Referenced Files:

- Jet study in Barrel HCAL

Notes:

Barrel HCAL: 75%/sqrt(E) + 15%

Example of Barrel Calorimeter HCAL

η	Nomenclature			Tracking			Electrons		π/K/p		HCAL	Muons
				Resolution	Allowed X/X_0	Si-Vertex	Resolution σ_E/E	PID	p-Range (GeV/c)	Separation	Resolution σ_E/E	
-6.9 to -5.8	↓ p/A	Auxiliary Detectors	low-Q2 tagger	δθ/θ < 1.5%; 10-6 < Q2 < 10-2 GeV2								
...												
-4.5 to -4.0			Instrumentation to separate charged particles from photons				2%/√E					
-4.0 to -3.5												
-3.5 to -3.0		Central Detector	Backward Detector	σ_p/p ~ 0.1%×p+2.0%	~5% or less	TBD		π suppression up to $1:10^4$	≤ 7 GeV/c	≥ 3 σ	~50%/√E	
-3.0 to -2.5												
-2.5 to -2.0				σ_p/p ~0.05%×p+1.0%								
-2.0 to -1.5				7%/√E								
-1.5 to -1.0												
-1.0 to -0.5			Barrel	σ_p/p ~0.05%×p+0.5%		σ_{xyz} ~ 20 μm, $d_0(z) \sim d_0(r\Phi) \sim 20/p_T$GeV μm + 5 μm			≤5 GeV/c		TBD	TBD
-0.5 to 0.0												
0.0 to 0.5												
0.5 to 1.0												
1.0 to 1.5			Forward Detectors	σ_p/p ~ 0.05%×p+1.0%		TBD	(10-12)%/√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% ×p+2.0%								
3.0 to 3.5									≤ 45 GeV/c			
3.5 to 4.0		Auxiliary Detectors	Instrumentation to separate charged particles from photons									
4.0 to 4.5												
...	↑e		Neutron Detection									
> 6.2			Proton Spectrometer	σintrinsic(|t|)/|t| < 1%; Acceptance: $0.2 < p_t < 1.2$ GeV/c								

First version of an interactive table

Thanks to: Walt Akers, Elke Aschenauer, Rolf Ent, Thomas Ullrich