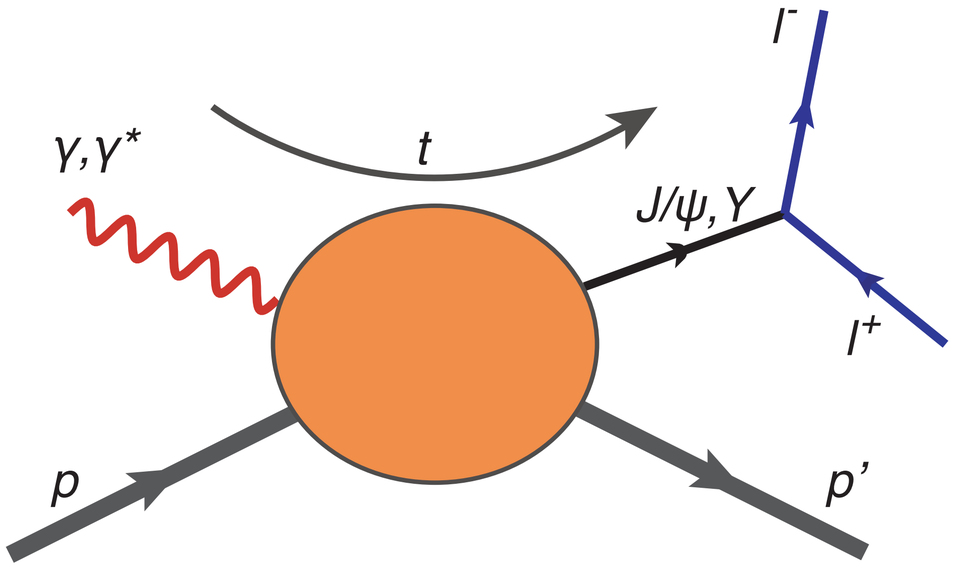
STATUS OF YR VM PRODUCTION STUDIES



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Exclusive WG Meeting
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J/PSI STUDIES WITH HANDBOOK DETECTOR

(before new matrix detector)

η	Nomenclature			Tracking			Electrons / Photons / Pi0		π/K/p		HCAL	Muons
				Resolution	Allowed X/X0	Si-Vertex	Resolution σE/E	PID	p-Range (GeV/c)	Separation	Resolution σE/E	
-6.9 to -5.8			low-Q2 tagger	σθ/θ < 1.5%; 10-6 < Q2 < 10-2 GeV2								
...												
-4.5 to -4.0	↓ p/A	Auxiliary Detectors	Instrumentation to separate charged particles from photons				2%/√E					
-4.0 to -3.5												
-3.5 to -3.0		Central Detector	Backward Detector	σp/p ~ 0.1%⊕0.5%	~5% or less X	TBD	2%/√E	π suppression up to 1:104	≤ 7 GeV/c	≥ 3 σ	~50%/√E	TBD
-3.0 to -2.5												
-2.5 to -2.0				σp/p 0.1%⊕0.5%			7%/√E					
-2.0 to -1.5				σp/p 0.05%⊕0.5%			7%/√E					
-1.5 to -1.0												
-1.0 to -0.5			Barrel	σp/p ~0.05%×p+0.5%		σxyz ~ 20 μm, d0(z) ~d0(rΦ) ~ 20/pTGeV μm + 5 μm	(10-12)%/√E		≤ 5 GeV/c			
-0.5 to 0.0												
0.0 to 0.5												
0.5 to 1.0												
1.0 to 1.5			Forward Detectors	σp/p ~0.05%×p+1.0%		TBD			≤ 8 GeV/c		~50%/√E	
1.5 to 2.0												
2.0 to 2.5									≤ 20 GeV/c			
2.5 to 3.0												
3.0 to 3.5				σp/p ~ 0.1%×p+2.0%					≤ 45 GeV/c			
3.5 to 4.0	↑ e	Auxiliary Detectors	Instrumentation to separate charged particles from photons									
4.0 to 4.5												
...			Neutral Detection				4.5%/sqrt{E} for photon energy > 20 GeV	<= 3 cm granularity				
> 6.2			Proton Spectrometer	σintrinsic(|t|)/|t| < 1%; Acceptance: 0.2 < pt < 1.2 GeV/c								

- Electron pseudo-rapidity between -4.5 and 4.5
- Muon between -3.5 and 3.5
- Protons above 6.2 (pT between 0.2 and 1.2 GeV)
- Extra cut of 0.01 < y < 0.8
- *Did not yet use low-Q2 tagger in these studies. Relevant for threshold physics.*

- Considered all 4 beam settings
- Using J/psi and Upsilon production as main DVMP channels

CONCLUSIONS SO FAR

Based on handbook detector

- Muon acceptance in central tracker sufficient for GPD physics
- Far-forward proton tagging not sufficient for lower energy configurations
- Extra muon acceptance in ion detection helpful for threshold physics
- Di-lepton background not an issue for J/psi and Upsilon production, given conservative IM resolutions (better than 200MeV). Also should not be an issue to distinguish from psi(2S)/Y(2S) states.

NEW MATRIX DETECTOR (AS OF JULY 2020)

Open questions

η	Nomenclature			Tracking: Resolution	Tracking: Allowed X/X0	Tracking: Si-Vertex	Electrons / Photons / Pi0: Resolution σE/E	Electrons / Photons / Pi0: PID	π/K/p: p-Range (GeV/c)	π/K/p: Separation	HCAL: Resolution σE/E	Muons
-6.9 to -5.8	↓ p/A	Auxiliary Detectors	low-Q2 tagger	σθ/θ < 1.5%; 10-6 < Q2 < 10-2 GeV2								
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-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	σp/p ~ 0.1%⊕0.5%		TBD	2%/√E		≤ 7 GeV/c		~50%/√E	
-3.0 to -2.5												
-2.5 to -2.0				σp/p 0.1%⊕0.5%			7%/√E					
-2.0 to -1.5				σp/p 0.05%⊕0.5%			7%/√E	π suppression up to 1:104				
-1.5 to -1.0												
-1.0 to -0.5			Barrel	σp/p ~0.05%×p+0.5%	~5% or less X	σxyz ~ 20 µm, d0(z) ~d0(rΦ) ~ 20/pTGeV µm + 5 µm			≤ 5 GeV/c	≥3 σ		TBD
-0.5 to 0.0												
0.0 to 0.5												
0.5 to 1.0												
1.0 to 1.5			Forward Detectors	σp/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				σp/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											
...			Neutral Detection				4.5%/sqrt{E} for photon energy > 20 GeV	<= 3 cm granularity				
> 6.2			Proton Spectrometer	σintrinsic(|t|)/|t| < 1%; Acceptance: 0.2 < pt < 1.2 GeV/c								

1. Precise proton spectrometer requirements
2. How well can we distinguish decay and scattered electrons given the nominal resolutions? How about radiative effects?
3. How would extra muon detection in the forward region impact threshold physics?
4. How do the different backward detector regions compare for photo-production?

NEXT STEPS

Answering the open questions

1. Precise proton spectrometer requirements
   - **A. Use eic_smear for different accelerator configurations, can do by next week**
2. How well can we distinguish decay and scattered electrons given the nominal resolutions? How about radiative effects in material?
   - **A. Use eic_smear for first study, work in progress, due next week**
   - **B. Radiative losses in material needs full simulation —> maybe by end of September**
3. How would extra muon detection in the forward region impact threshold physics?
   - **A. Use eic_smear, can do by next week**
4. How do the different backward detector regions compare for photo-production?
   - **A. Can do by end of month, most likely not critically important for detector groups.**