

NPS Collaboration Meeting

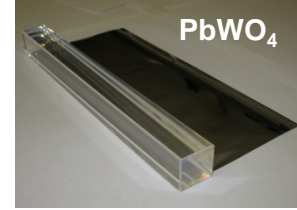
JLab, Newport News, VA

21 January 2016

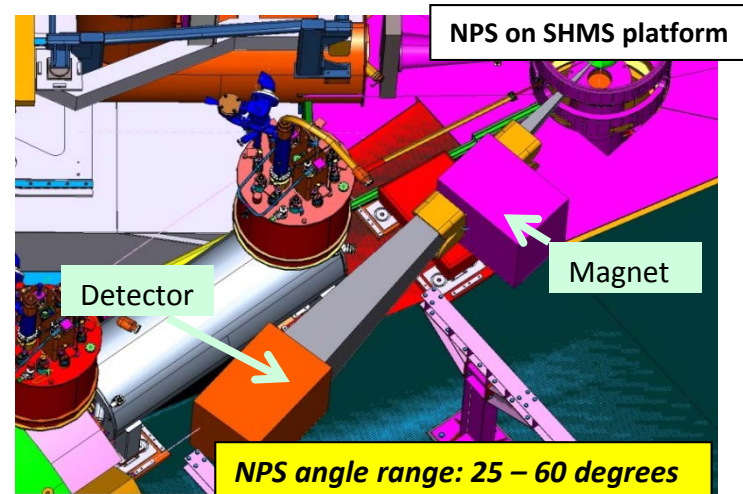
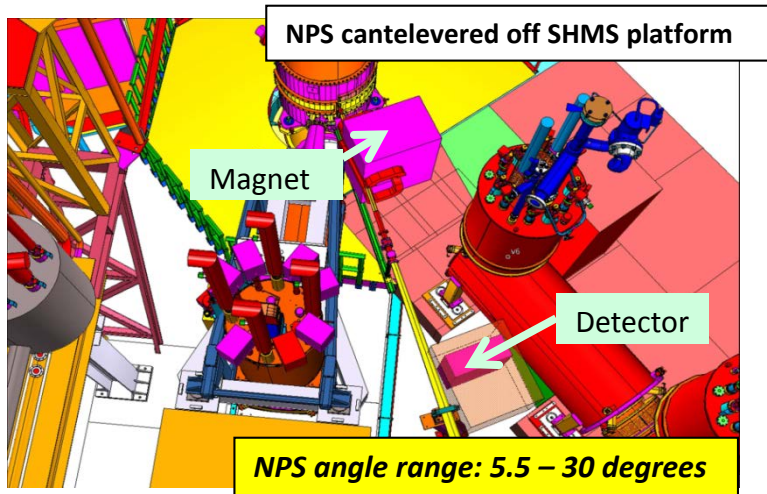
T. Horn



The Neutral-Particle Spectrometer (NPS)



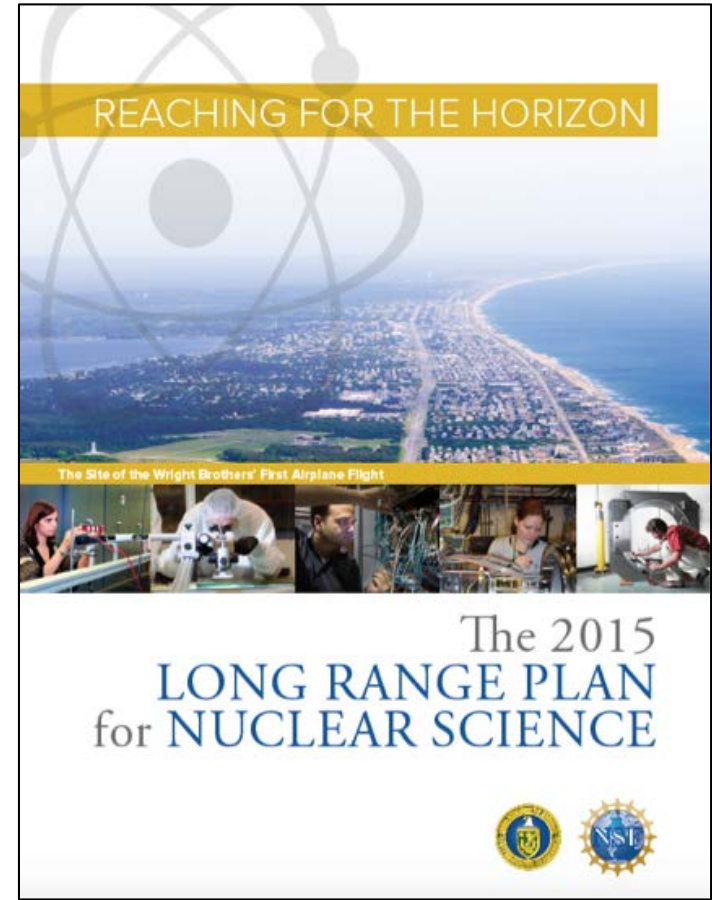
- The NPS is envisioned as a facility in Hall C, utilizing the well-understood HMS and the SHMS infrastructure, to allow for precision (coincidence) cross section measurements of neutral particles (γ and π^0).



- Scientific program: 5 experiments approved by PAC (40, 42) to date
 - E12-13-007: Measurement of Semi-inclusive π^0 production as Validation of Factorization
 - E12-13-010 – Exclusive Deeply Virtual Compton and π^0 Cross Section Measurements in Hall C
 - E12-14-003 – Wide-angle Compton Scattering at 8 and 10 GeV Photon Energies
 - E12-14-005 – Wide Angle Exclusive Photoproduction of π^0 Mesons
 - E12-14-006 – Initial State Helicity Correlation in Wide-Angle Compton Scattering

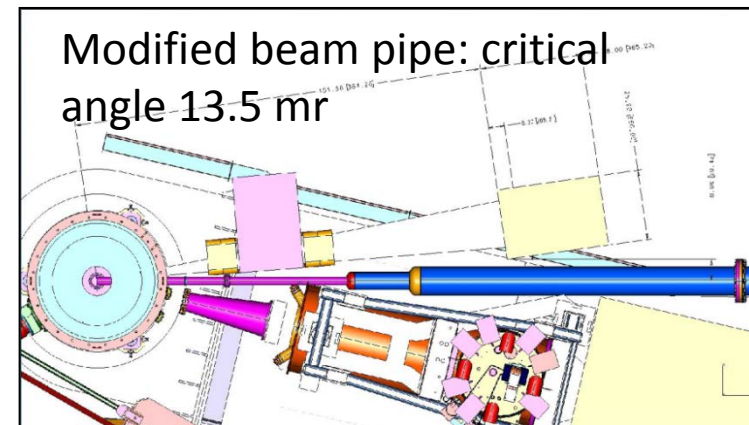
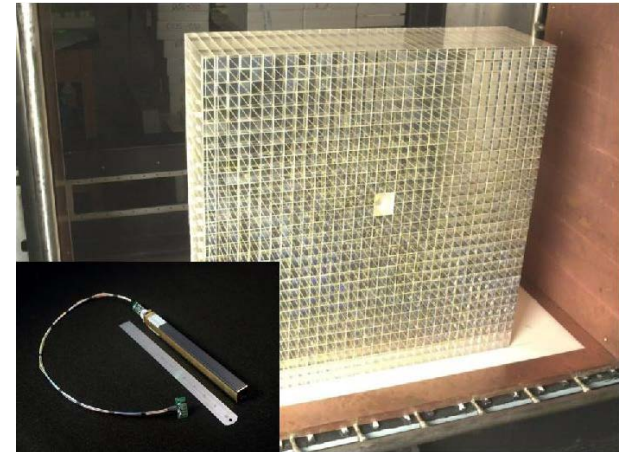
NSAC 2015 Long Range Plan

- ❑ “Precision measurements in semi-inclusive pion and kaon production from unpolarized, as well as longitudinally and transversely polarized proton ... targets in the JLab 12 GeV era will allow access to both flavor and spin dependent transverse momentum distributions in the valence quark region.”
- ❑ “Multiple instruments bring essential elements to this campaign: ... HMS-SHMS and the ... NPS”
- ❑ “Some of the most important tools for describing hadrons are Generalized Parton Distributions, [which] can be investigated through the analysis of hard exclusive processes”
- ❑ “The HMS-SHMS ...[and] the NPS will allow ...refined high resolution imaging of the nucleon’s internal landscape...”

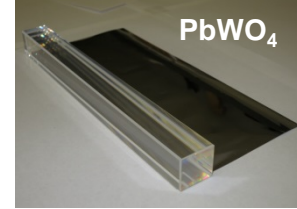


NPS General Design Concept

- ❑ a ~25 msr neutral particle detector consisting of up to 1116 **PbWO₄ crystals** in a **temperature-controlled frame** including gain monitoring and curing systems
- ❑ **HV distribution bases with built-in amplifiers** for operation in a high-rate environment
- ❑ Essentially deadtime-less digitizing electronics to independently sample the entire pulse form for each crystal – JLab-developed Flash ADCs
- ❑ A new **sweeping magnet** allowing for small-angle operation at 0.3 Tm (for electro-production) and large angle operation at 0.6 TM (for photo-production). The magnet is compatible with existing JLab power supplies.
- ❑ **Cantelevered platforms off the SHMS carriage** to allow for remote rotation (in the small angle range), and platforms to be on the SHMS carriage (in the large angle range) – new
- ❑ A beam pipe with as large critical angle as possible to reduce beamline-associated backgrounds – further study showed only a small section needs modification (JLab/Hall C)



NPS Project Status



- ❑ 2015 NSF/MRI funding proposal was selected for an award
 - Award will provide for NPS infrastructure, including the magnet, assuming existing crystals
 - Additional UK award (D. Hamilton) with emphasis on additional equipment aimed at WACS requirements



- ❑ Significant efforts of the NPS collaboration have recently been related to PbWO_4 crystals

See talk by C. Munoz-Camacho

- ❑ Also much progress on procurement and plans for machining magnet steel

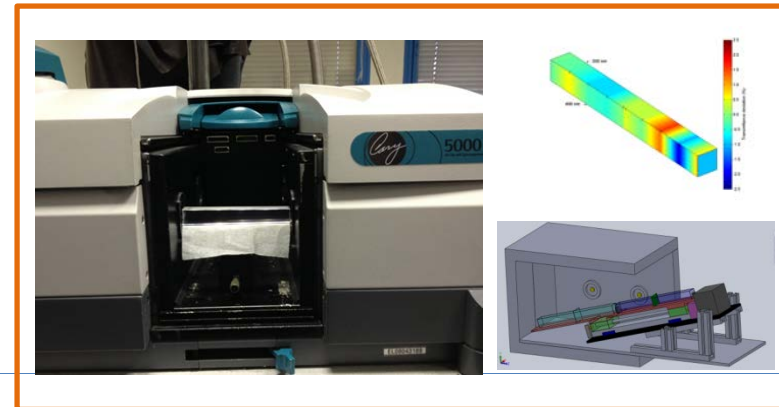
See talk by M. Fowler

- ❑ Ongoing efforts on development of a compact photon source and additional experiments

See talks by J. Zhang, G. Niculescu, and A. Mkrtchyan and M. Boer

- ❑ Alternative HV base designs have been explored

See talk by C. Hyde



Goals of this meeting



- Formulate a plan for NPS construction items over the next year
- Discuss the timeline of engineering and design for NPS
- Discuss optimization of NPS components
 - Discussion of PbWO₄ availability and future use of PbWO₄ at an EIC
 - Discussion of PMT availability
 - Frame design and cooling
- Discuss path forward for photon source and future experiments with NPS
- NPS collaboration formalities
- Publication of crystal testing results
 - Road towards defining crystal quality

Agenda



UPDATES

8:45 – 9:00 – *Welcome and Plans for the Day*

9:00 – 9:25 – *Progress with crystal testing and selection* – Carlos Munoz-Camacho

PbWO4 crystals at an EIC – Pawel Nadel-Turonski

9:25 – 9:50 – *Magnet design* – Mike Fowler/Paul Brindza

9:50 – 10:15 – *PMT HV divider* – Charles Hyde

10:15 – 10:45 – *Coffee Break*

PHOTON SOURCE AND EXPERIMENTS

10:45 – 11:10 – *Photon Source for WACS experiments I* – Jixie Zhang

11:10 – 11:35 – *Photon Source for WACS experiments II* – Gabriel Niculescu
and B. Wojtsekhowski

11:35 – 12:00 – *TCS with photon beam in Hall A/C* – Arthur Mkrtychyan and Marie Boe

EXP. NO.	Hall	Title	Spokespersons	Institutions	Beam Days	Rating	PAC	Run Group
E12-13-007	C	Measurement of Semi-Inclusive π^0 Production as Validation of Factorization	R. Ent	JLab	25	A-	40	A
			T. Horn	CUA				
			H. Mkrtchyan	Yerevan				
			V. Tadevosyan	Yerevan				
E12-13-010	C	Exclusive Deeply Virtual Compton and Neutral Pion Cross-Section Measurements in Hall C	C. Munoz Camacho	IPN Orsay	53	A	40	A
			R. Paremuzyan	IPN Orsay				
			T. Horn	CUA				
			C. Hyde	ODU				
			J. Roche	Ohio U				
E12-14-003	C	Wide-angle Compton Scattering at 8 and 10 GeV Photon Energies	B. Wojtsekhowski	JLab	18	A-	42	B
			D. Hamilton	Glasgow				
			S. Sirca	Ljubljana				
E12-14-005	C	Wide Angle Exclusive Photoproduction of π^0 Mesons	D. Dutta	Miss. State	18	B	42	B
			M. Amaryan	ODU				
			H. Gao	Duke				
			M. Kunkel	ODU				
			S. Sirca	Ljubljana				
			I. Strakovsky	GWU				
E12-14-006	C	Initial State Helicity Correlation in Wide-Angle Compton Scattering	D. Keller	UVa	15	B	42	C
			D. Day	UVa				
			J. Zhang	UVa				

Approved PAC days

129

Run Group days

86