

CLAS Workshop
Nov 21st 2013

JLab/PANDA Collaboration

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Motivation

Strengthen the collaboration between
JLab-CLAS and FAIR- PANDA
experiments finding area of overlap

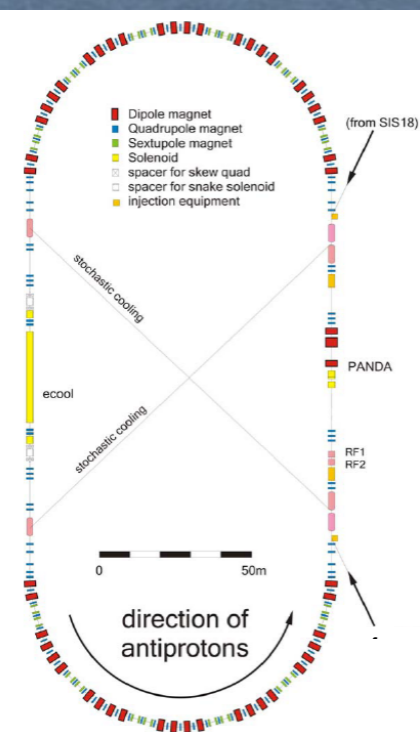
- to promote and defend hadron physics
- to present common programs at funding agencies (NSF, DOE, HPH ...)
- to facilitate data/analysis exchanges
- to help PANDA students/post-docs and now staff to (limited membership)

Started from PANDA spokesperson request followed by meetings involving the spokesman of the two collaborations

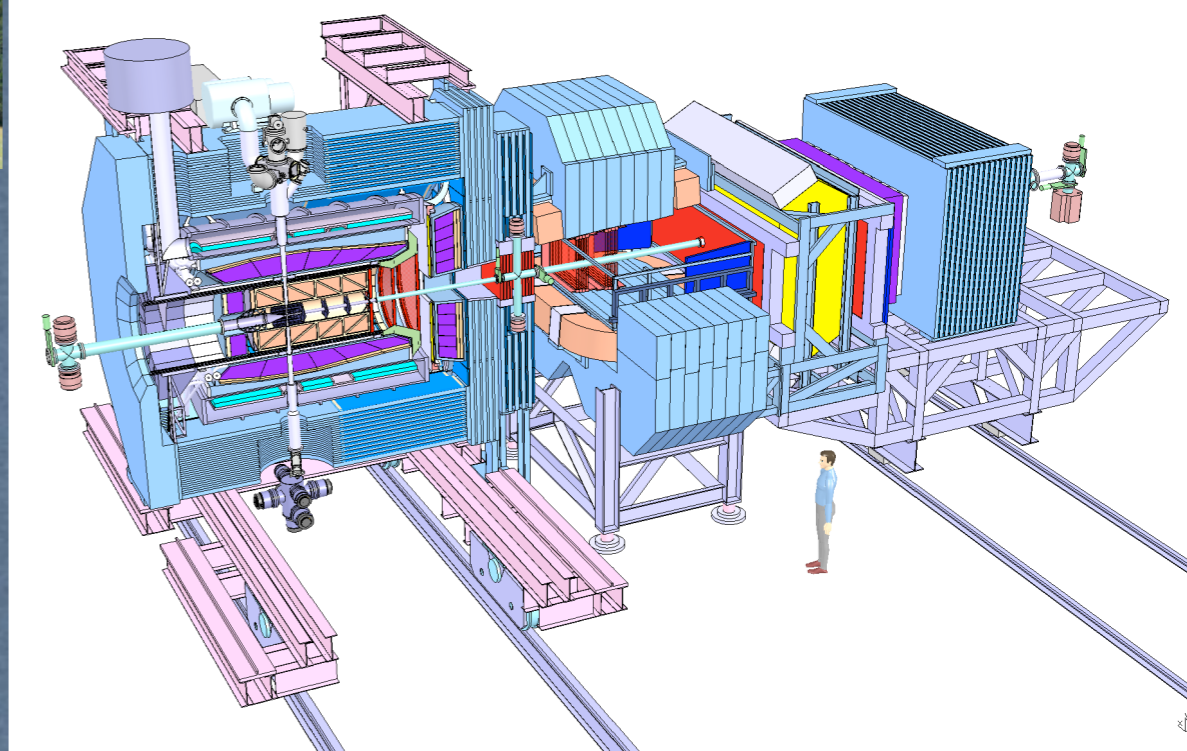
... presentation at PANDA & CLAS Collaboration Meetings

... plan a common workshop to be held in 2014

High Energy Antiproton Ring



Experiment Mode	High Resolution Mode	High Luminosity Mode
Target	Pellet Target with $4 \cdot 10^{15} \text{ cm}^{-2}$	
rms-emittance	1 mm mrad	
Momentum	1.5 – 8.9 GeV/c	1.5 – 15.0 GeV/
Intensity	$1 \cdot 10^{10} \text{ p}$	$1 \cdot 10^{11} \text{ p}$
Luminosity	$2 \cdot 10^{31} \text{ cm}^{-2} \text{ s}^{-1}$	$2 \cdot 10^{32} \text{ cm}^{-2} \text{ s}^{-1}$
rms-momentum resolution	10^{-5}	10^{-4}



Physics program

- ★ Charmonium/Open Charm States
 - Precise Spectroscopy
 - Investigation of Confinement Potential
 - X, Y, Z, D_s States up to 5.5 GeV
- ★ Exotic Matter
 - Search for Glueballs and Hybrids
- ★ Hadrons in Media
 - In-medium Modification of Hadrons

- ★ Nucleon-Structure
 - Generalized Parton Distributions
 - Timelike Form Factor of the Proton
 - Drell-Yan Processes
- ★ Double-Strange Systems
 - Ξ -atoms and Nuclei
 - $\Lambda\Lambda$ -hypernuclei

JLAB/CLAS - FAIR/PANDA Collaboration

**Four Working Group with one representative for each
collaboration**

Board: M.Battaglieri (coordinator), V.Burkert, D. Ireland, P.Gianotti, J.Ritman

Nucleon structure: K. Griffioen, F. Maas

Hadron Spectroscopy: R. De Vita, D. Bettoni

Physycs Analysis: A. Szczepaniak, K. Goetzen

Detectors: L. Elouadrhiri, L. Shmitt

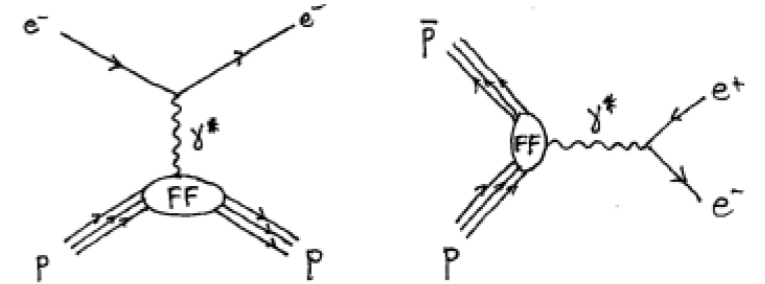
**The collaboration just started producing a 2-pages document
per each WG that will form a reference document for future
actions**

Nucleon Structure

- * Quantify the non-perturbative distributions that characterise the nucleon
- * Universality of the distribution function \rightarrow complementarity of ep $\bar{p}p$
- * Complementary kinematics and phase space accessible
- * Results exchange for a global fit
- * Data sharing before and after publication
- * Transverse polarized target and enhanced P_{id} (RICH/DIRC) required by both experiments

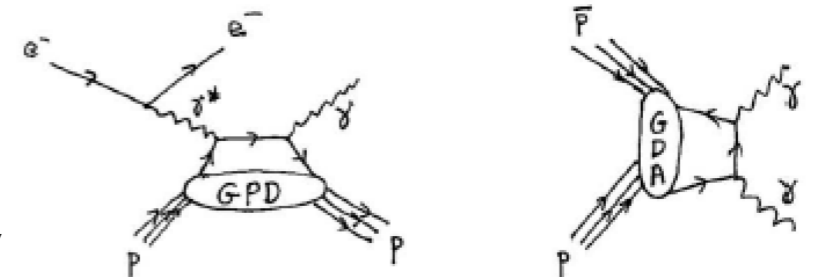
Form Factors

space-like, time-like
pQCD: same at large q^2



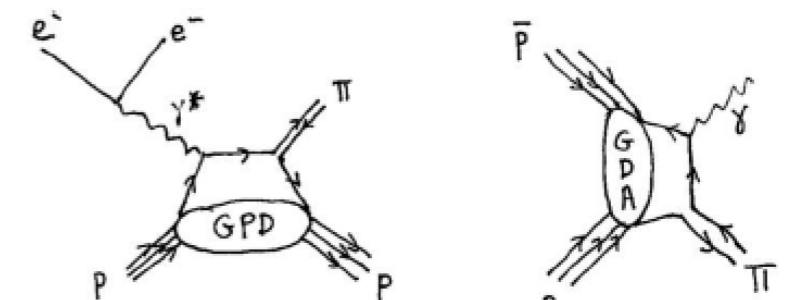
Compton Scattering

DVCS, WACS
GPD and GDA sensitivity



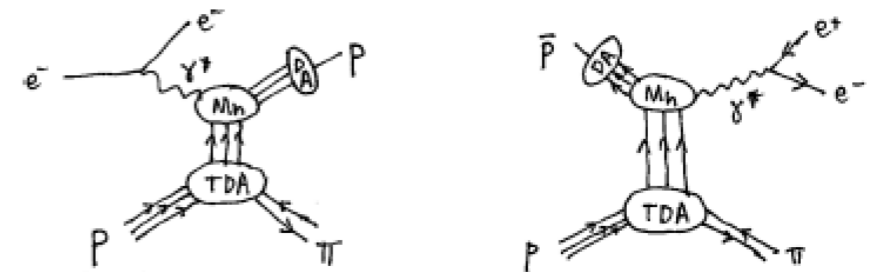
Exclusive Meson

DVMP, HEMP
GPD and GDA sensitivity



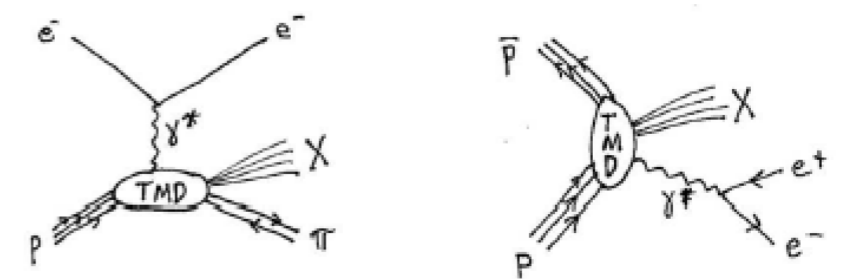
TDA

proton to meson by emitting 3 p quarks



TMD

SIDIS, Drell-YAN
spin-orbit correlation

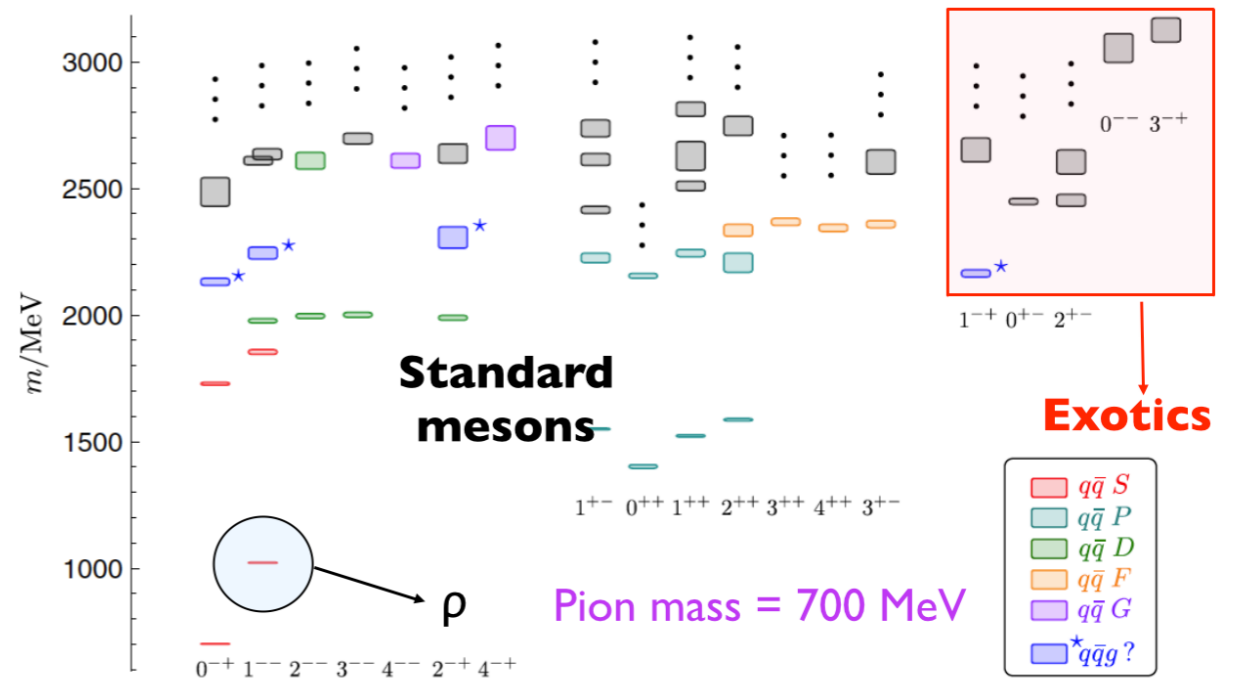
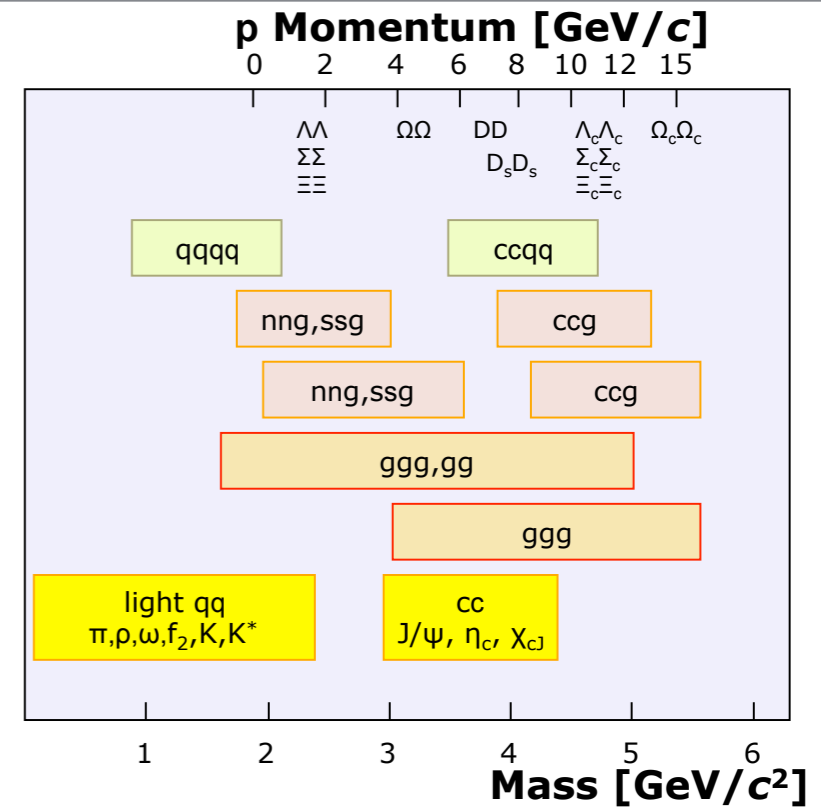


K.Griffioen, F.Mass

Hadron Spectroscopy

- * Understanding hadron spectrum and QCD confinement
- * Production vs. formation \rightarrow complementarity of γp and $p_{bar}p$
- * Light q vs charm, hybrids vs glueball: complementary kinematics
- * PANDA: X-Y-Z in charmonium spectrum, precise width determination, D-meson
- * CLAS12: enhanced exotic production, strange-rich final states, scalar mesons
- * Cross checks and validation of any possible discovery
- * Overlap in baryon (cascades) and hyperon spectroscopy

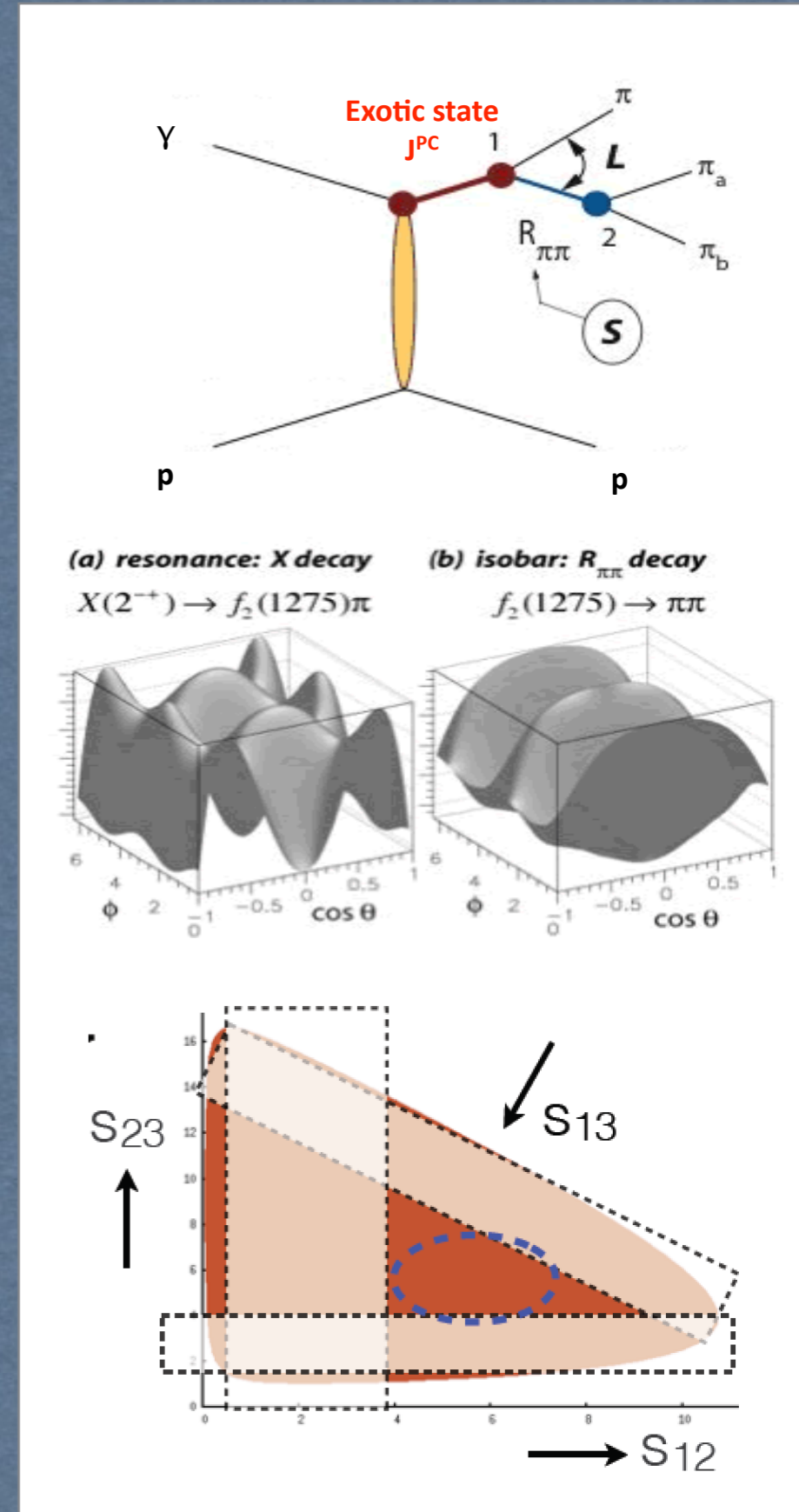
PANDA and CLAS12 accessible kinematics



Data Analysis

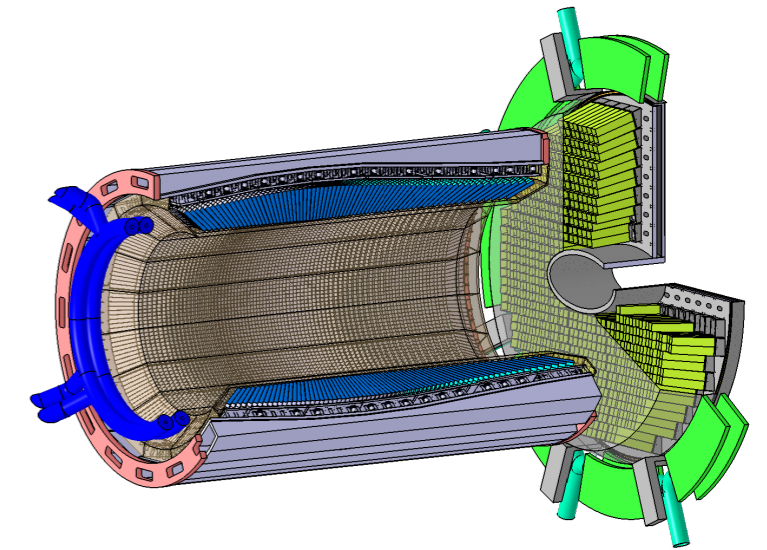
- * Identify and extract resonance parameters from data
- * Develop a reliable theoretical framework
- * Isobar model (sequence of two-body interactions) as starting point
- * Include other effects such as wave truncation and rescattering
- * Use of the Regge parametrisation to deal with PWA truncation
- * Determine where the different approaches are appropriate
- * Exchange DST for new analysis
- * Exchange tools for cross checks (ComPWA and AmpTools)

A.Szczepaniak,

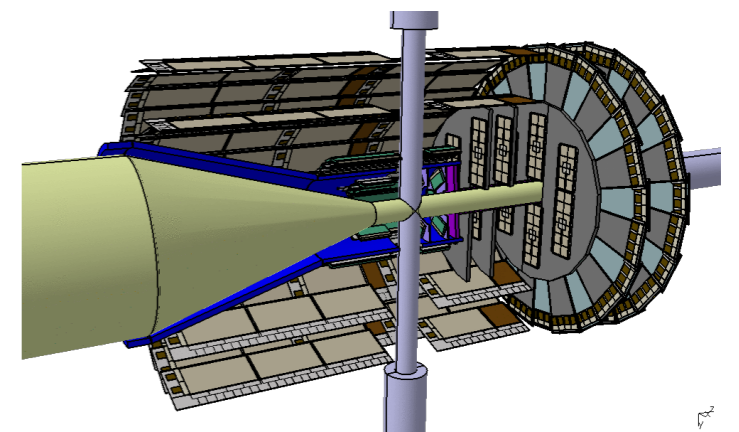


Equipment

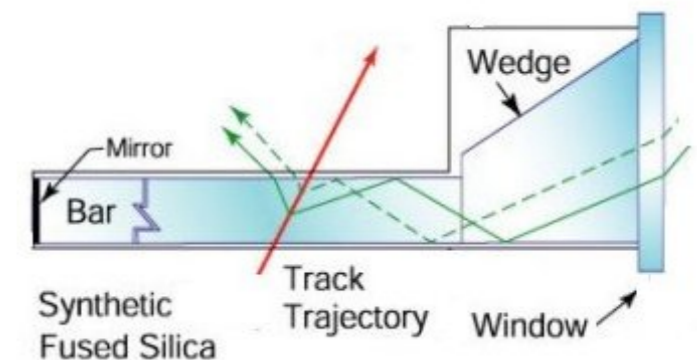
- * Similarities in equipment and reconstruction algorithms
- * SVT and SMVD share a similar technology
- * FT-Cal and EMC both use cooled PbWO crystals
- * DIRC and RICH requires similar reconstruction algorithms
- * Trigger/DAQ
- * Data reconstruction software : FairRoot, CLARA



Electromagnetic calorimeter



Silicon Micro Vertex Detector



DIRC

First appointment: EU-HPH call

Horizon 2020 Framework Programme HadronPhysicsHorizon

Call for Proposal

The first EU Calls for the Program Horizon 2020 will be issued early next year with the instrument of Integrating Activities.

The HadronPhysics3 Management Board, together with the selected Coordinator for the HadronPhysics project in Horizon 2020, will serve as Steering Committee to prepare the new Proposal to be submitted to the European Commission in the upcoming Calls.

Following the strategy adopted in the previous HadronPhysics projects, the Steering Committee is hereby launching an internal call for work packages to be included in the future Proposal.

The overall EC contribution is expected to be of the order of that of HadronPhysics3 for a duration of three years. Therefore the budgets of the new work packages cannot exceed on average the actual HadronPhysics3 budgets.

► SCIENTIFIC FRAMEWORK

An Integrating Activity shall combine, in a closely coordinated manner, following the FP6 Integrated Infrastructure Initiative (I3) model, three categories of activities: (i) Networking activities; (ii) Transnational access and/or service activities; (iii) Joint research activities.

All three categories are mandatory, since synergic effects are expected from these different components.

Therefore, the activities to be carried out in the context of our future Integrating Activity must include:

(i) Networking activities

These activities should foster a culture of cooperation in the scientific communities benefitting from the research infrastructures.

Networking activities should address (not exhaustive list):

- coordination of scientific and technological activities;
- foresight studies of new instruments, methods, concepts and technologies;

- * Hadron Physics Horizon (H2020) continuation of Hadron Physics 3 (FP7)
- * Open to collaboration with non-EU labs
- * Mutual benefit presenting EU/US common physics programs
- * Priorities of the program: excellence science, industrial leadership, societal challenges
- * Strong competition with other proposal: same budget as FP7 but more competitors
- * CLAS12 activities in HPH:
 - GPD (M.Guidal)
 - TMD (M.Mirazita)
 - HS (M.Battaglieri)
 - Hadronization (R.Dupre)
 - Equipment: transverse target, RICH ... (?)
 - Technology: computing, data management ... (?)
- * Proposal due for March 1st 2014