

Preventivi scientifici-finanziari 2019

JLAB12

Peculiar features of The JLAB accelerator facility:

Polarized electrons with E up to 12 GeV

Hybrid ring-linear structure and fast acceleration

--> **continuous beam with high luminosity** (e.g. $10^{35} \text{ s}^{-1} \text{ cm}^{-2}$ on a 5 cm LH2 target)

--> **High statistics of rare events** (e.g. proton form factors pushed to several GeV)

p, d (n), nuclear targets both long and transversely polarized.

4 experimental halls A, B, C, D simultaneously taking data

--> **great variety of measurements.**

JLAB12 Experiment

The physics program

*Nucleon Structure

- EM, EW, and Flavor-Separated Form Factors
- Structure functions
- Transverse Momentum Distributions (TMD)

*The Physics of Confinement

- Baryon spectroscopy
- Meson spectroscopy

*Nuclear Structure and the Quark Structure of Nuclei

- Hypernuclear Physics
- Lead radius

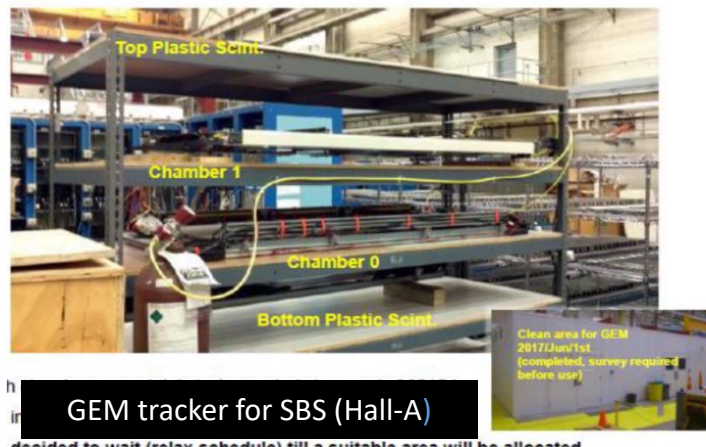
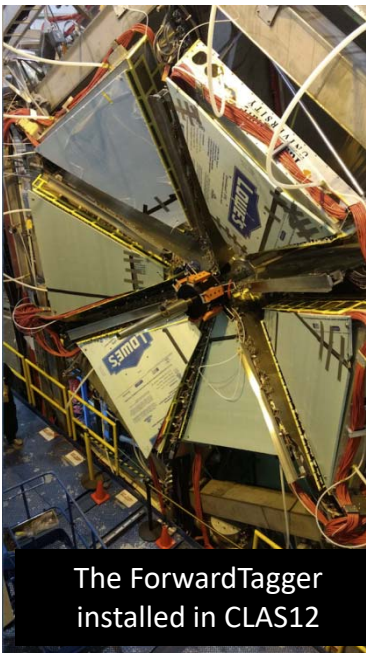
*Search for physics Beyond the Standard Model

- Dark Forces search, light Dark Matter at accelerators
- Weak couplings measurement

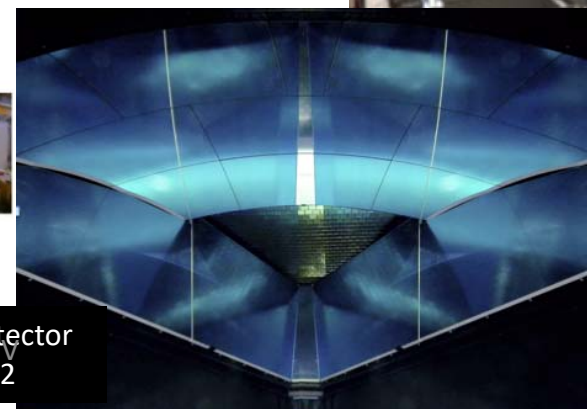
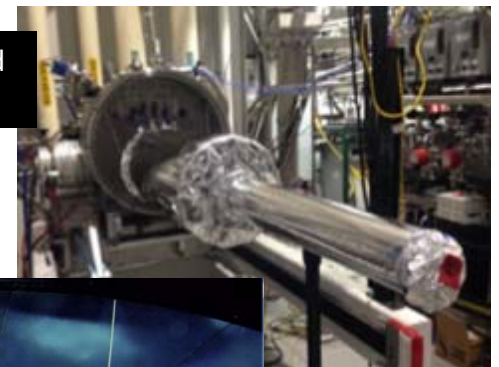
JLAB12, 67 scientists (~42 FTE, 11 INFN Units) is supporting the JLab broad experimental program in Hall-A and Hall-B

INFN theoretical community, 30 scientists involved in JLAB12 physics is supporting the experimental effort

JLAB12 activity is linked to the hadron physics experiments in Europe: HPH, ALICE, COMPASS, PANDA

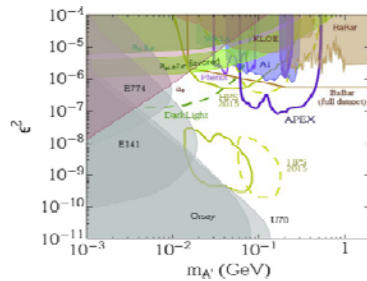


The HD polarized target for Hall-B



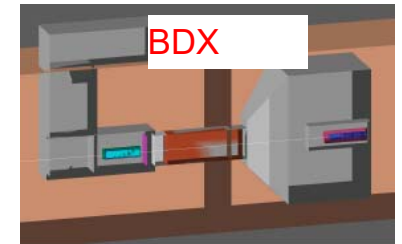
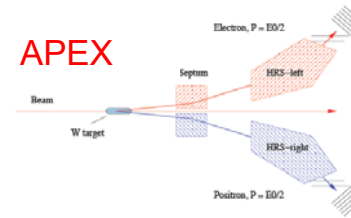
10/7/2018 CDS INFN-PV

Light Dark Matter Searches



Heavy photon search through its $\tilde{e}^+e^-$ decay

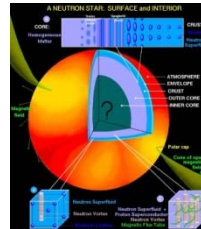
APEX



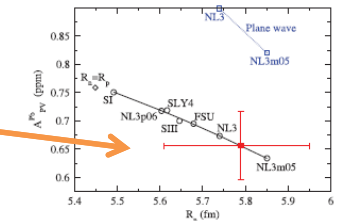
Beam dump experiments

Physics of Nuclei

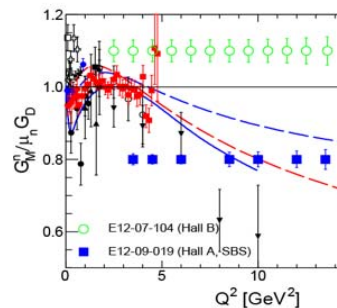
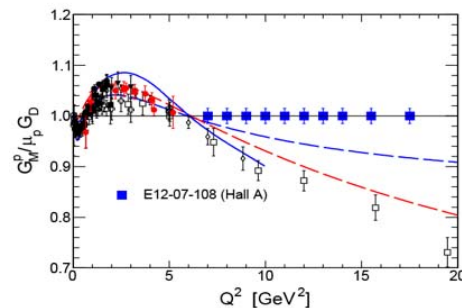
Measurement of neutron radius in Lead has connection with Neutron stars crust thickness, Existence of exotic cores in Neutron stars, Neutron star way of cooling.



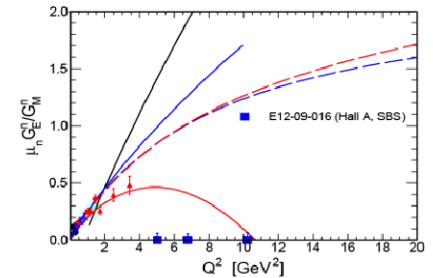
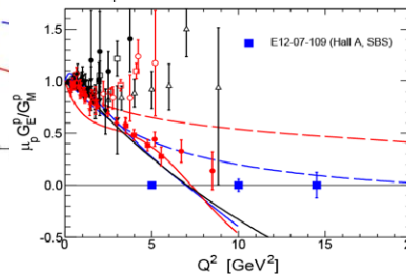
PREX has been the first model independent measurement of a neutron skin in a nucleus (Lead).
PREX-II will complete PREX measurement.



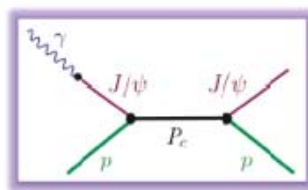
Structure of the nucleon



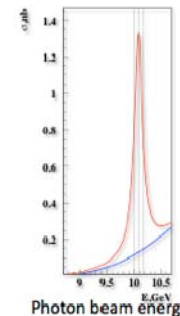
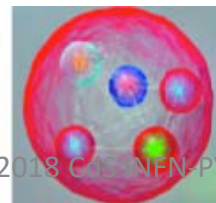
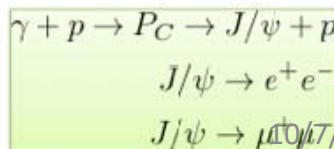
Measurement of electric and magnetic proton and neutron form factors at large Q² via polarization transfer



Hadron Spectroscopy



Search for pentaquark



$$BR(P_c \rightarrow J/\psi p) = 1\% \quad L = 10^{35} \text{ cm}^{-2} \text{ s}^{-1}$$

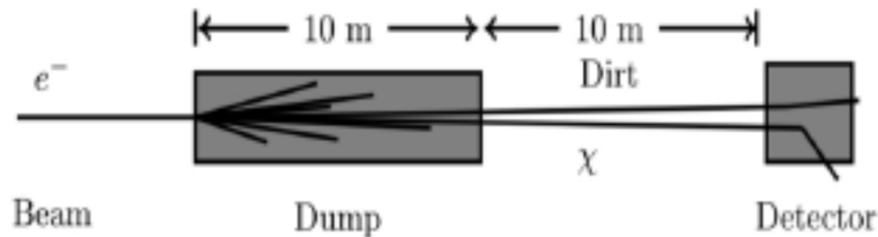
	$P_c(4380)$		$P_c(4450)$	
	Minimum	Maximum	Minimum	Maximum
Untagged mode	48	500	70	220
Tagged mode	20	600	28	880
Total	68	1100	98	1100

98 events/day for narrow $P_c(4450)$ pentaquark state at nominal CLAS12 luminosity

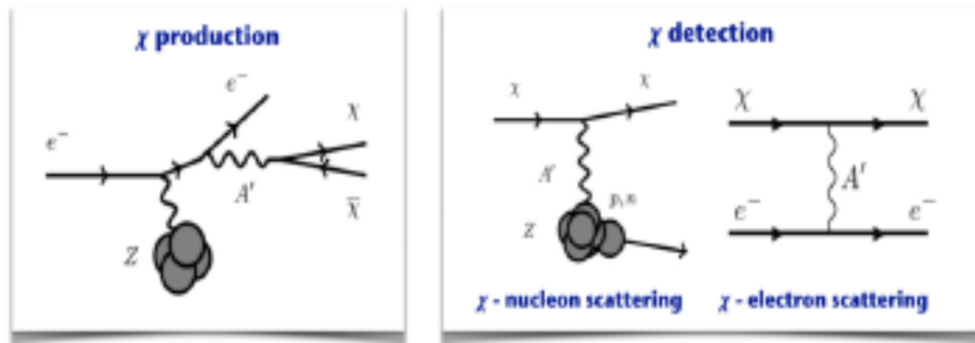
attività prevista - PV

- (LIGHT) **DARK MATTER** search

Beam Dump eXperiment (**BDX**) → search for light DM particles (χ) with mass < 1 GeV): ...

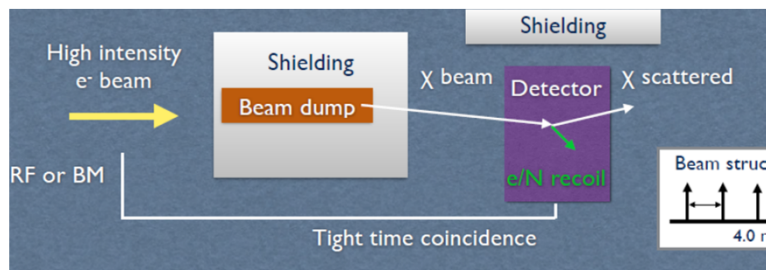


A dark photon produced by electron bremsstrahlung in a beam dump would decay into a pair of light dark matter particles (χ) ("invisible decay" complementary to the "visible" decay into e^+e^- pairs).



The dark matter beam will cross undisturbed the beam-dump, then a fraction would scatter off nucleons or electrons in the detector volume via a dark photon exchange.

The χ -proton scattering will produce a slow recoil proton with $\sim$ MeV energy whereas the χ -electron scattering will give rise to an electromagnetic shower generated by a GeV recoil electron. BDX aims to measure both signals by using an electromagnetic calorimeter



10^{22} electrons-on-target at 12 GeV in a one-year period

attività prevista - PV

* Meson spectroscopy (CLAS12)

p continuously converts into p + virtual meson

$e + p \rightarrow e + \text{virtual meson} + \text{slow } p \rightarrow \text{special meson} + \text{slow } p$
 $\rightarrow \text{selected final products} + \text{slow } p$

Searching states with quantum numbers not predicted by only-quark model

prese dati + analisi dati + attività di servizio (calibrazioni, referaggi interni, software generale, ...)

anagrafica 2019 - PV

JLAB12 Pavia Resp.Locale Andrea Bianconi

cognome nome	TIPO	Ricercatori	Tecnologi	FTE%2019
Bianconi Andrea	assoc	Prof.Associato		100
Craig Evans	assoc.	assegnista		50
Leali Marco	assoc	Tecn.Laureato	x	50
Mascagna Valerio	assoc.	RTDA (Como)		10
Solazzi Luigi	assoc	Ric. Univ		50
Venturelli Luca	assoc	Prof.Ordinario		30

TOTALE = 2.9 FTE

preventivi finanziari 2019 - PV

JLAB12 ANNO 2019

keuro

RICHIESTE MISSIONI

Riunioni Collaborazione

2

Prese dati (4 persone x 9 keuro)

36

38

APPARATI

10

CONSUMO

1

SPSERVIZI (common fund)

0

TOT 49

RICHIESTE DA DISCUTERE NELLA PROSSIMA RIUNIONE NAZIONALE DI JLAB12

N.B. Richieste ai servizi INFN-PV: nessuna