

review of few selected examples, out of many live collaborations and future initiatives, from the point of view of an Italian experimentalist

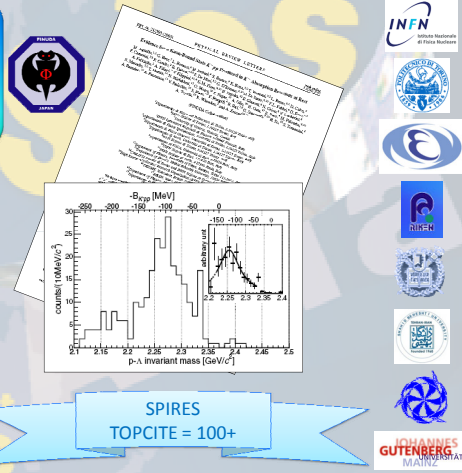
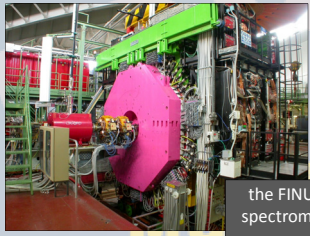


Activity at INFN-LNF: the FINUDA experiment

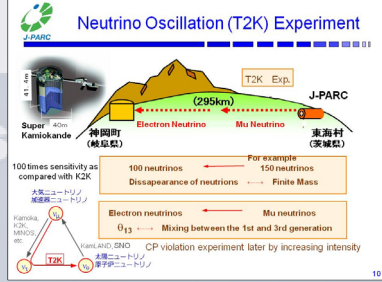
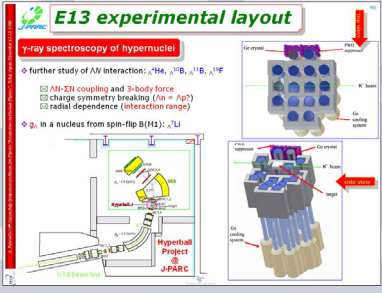
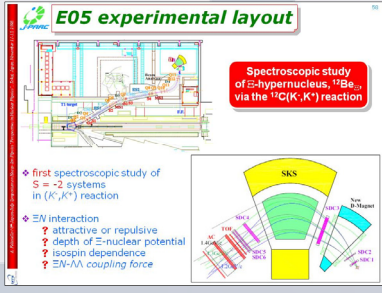
$$e^- + e^+ \rightarrow \phi \rightarrow K^- K^+$$

$$K_{\text{trap}}^- + {}^A_Z \rightarrow {}^A_Z + \pi^-$$

$${}^A_Z \rightarrow \begin{cases} {}^A(Z+1) + \pi^- \\ {}^{(A-2)}(Z-1) + p + n \\ {}^{(A-2)}Z + n + n \end{cases}$$



INFN activity at J-PARC



The ULYSSES initiative

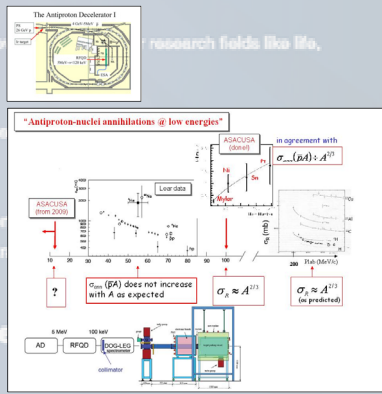
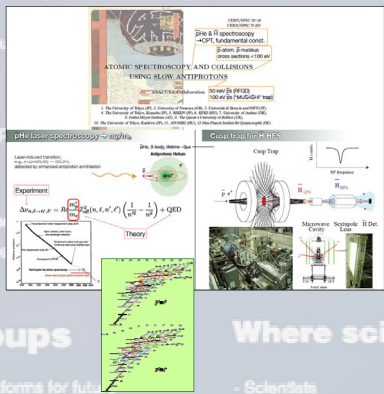
INFN collaborations with RIKEN

- Nuclear Dynamics**
 - Structure of light halo exotic nuclei and of unbound nuclei (INFN-PI/th)
- Nuclear Structure**
 - Many-body nuclear structure theory and interdisciplinary applications (atomic physics) (INFN-MI/th)
 - Neutron-rich nuclei with RIB and shell time-evolution (INFN-MI, NA, PD, LNL/ex)
- Nuclear Matter**
 - Nuclear physics for compact stellar objects (neutron stars) (INFN-MI/th)
- Nuclear Astrophysics**
 - Indirect measurement of reaction of astrophysical interest (Trojan horse method) (INFN-CT/ex)
- H.I. Physics**
 - participation of Japanese researchers in the NA60 and ALICE experiments

Nuclear structure with γ -decay, using fragment beams at BigRIPS



The ASACUSA experiment



The BES III experiment

BESIII statistics @ designed peak luminosity ($10^{33} \text{ cm}^{-2} \text{ s}^{-1}$)

- R_{had} and precision test of Standard Model
- Light hadron spectroscopy (Φ , ρ , ω , η , η' , χ , ψ , ψ')
- Charm and charmonium physics
- τ physics
- Precision measurements of CKM matrix elements
- Search for new physics / new particles
- Nucleonic time-like form factors

Physics	Energy (GeV)	Peak Luminosity ($10^{33} \text{ cm}^{-2} \text{ s}^{-1}$)	Events/year	Existing data
J/ψ	3.097	0.6	10×10^9	60×10^9 (BESII)
ψ'	3.67(7)	1.0	12×10^9	—
ψ''	3.686	1.0	3×10^9	27×10^9 (CLEO)
χ	3.77	1.0	3×10^9	14×10^9 (BESII)
η	4.83	0.6	1×10^9	4×10^9 (BESII)
η'	4.17	0.6	3×10^9	0.3×10^9 (CLEO)
R scan	3.0-4.6	0.6(7)-1.0	—	—

BESIII Physics Book - arXiv: hep-ex/0609.1869

10's data taking time each year

Italian contribution: Time-like Nucleon Form Factors

An exciting scenario allow for the investigation of Form Factors @ BESIII

Possible data taking plans:

- $e^+e^- \rightarrow p\bar{p}$
- $e^+e^- \rightarrow n\bar{n}$
- $e^+e^- \rightarrow \Delta\bar{\Delta}$
- $e^+e^- \rightarrow \Sigma\bar{\Sigma}$
- $e^+e^- \rightarrow \Lambda\bar{\Lambda}$
- Time-like $\langle \mathcal{G}_E^p, \mathcal{G}_M^p, \mathcal{G}_E^n, \mathcal{G}_M^n \rangle$ and $\langle \mathcal{G}_E^{\Lambda}, \mathcal{G}_M^{\Lambda} \rangle$

Investigation performed @ unprecedented luminosities:

- $\Psi(2S)$ achieved $\mathcal{L} = 3.3 \times 10^{32} \text{ cm}^{-2} \text{ s}^{-1}$
- J/P: achieved $\mathcal{L} = 0.7 \times 10^{32} \text{ cm}^{-2} \text{ s}^{-1}$

Investigation performed in a wide energy range

- $\sqrt{s}_{\text{max}} = 2 - 4.6 \text{ GeV}$.

The IFMIF project

