Research Center for Nuclear Physics
Osaka University

大阪大学 核物理研究センター

http://www.rcnp.osaka-u.ac.jp/

RCNP 大阪大学 核物理研究センター

- Founded in 1971
  - User based research center for nuclear physics
- 1973 AVF cyclotron (80 MeV proton and light Ion)
- 1991 Ring cyclotron (400 MeV proton and medium ion)
- 1997 Oto Cosmo Observatory (underground science)
- 2000 LEPS @SPrin8 (~3 GeV photon, Hadron)
- 2010 Research Center for Subatomic Science (6 years)

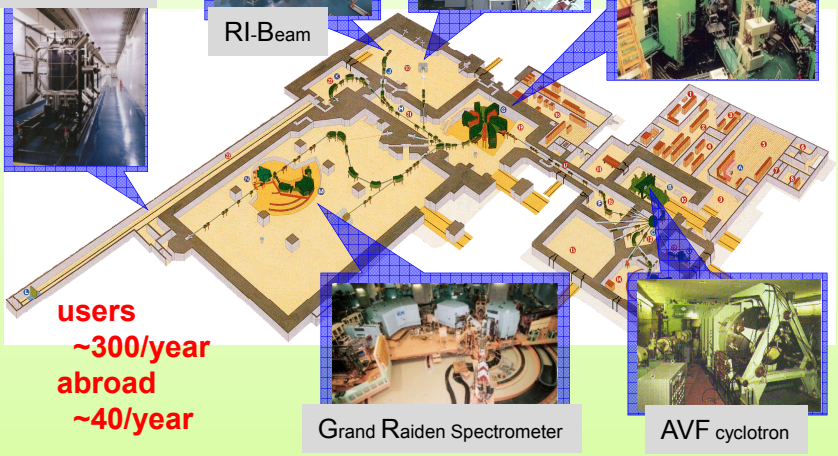
Cyclotron Facility (Suita Campus)

100-m Long Time of Flight Neutron Spectrometer

Ultra-Cold Neutron source

RING Cyclotron

RI-Beam

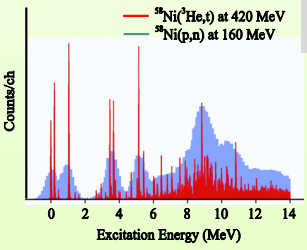


users
~300/year
abroad
~40/year

Grand Raiden Spectrometer

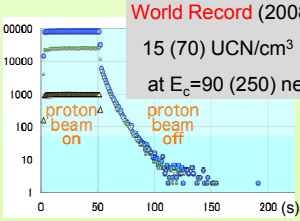
AVF cyclotron

Research Highlights at the Ring Cyclotron



World Highest E-Resolution Spectrometer for Nuclear Structure and Reaction

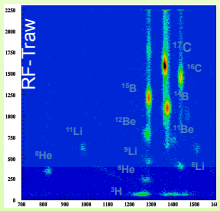
- Giant Resonances and their decays
- Nuclear Matrix Element (ββ decay)
- Nuclear Force:
  - Three body force
  - Tensor Force



World Record (2008):
15 (70) UCN/cm^3
at E_c=90 (250) neV

UCN for Studies of Neutron Electric Dipole Moment.

80 A MeV ^{18}O → 30 A MeV



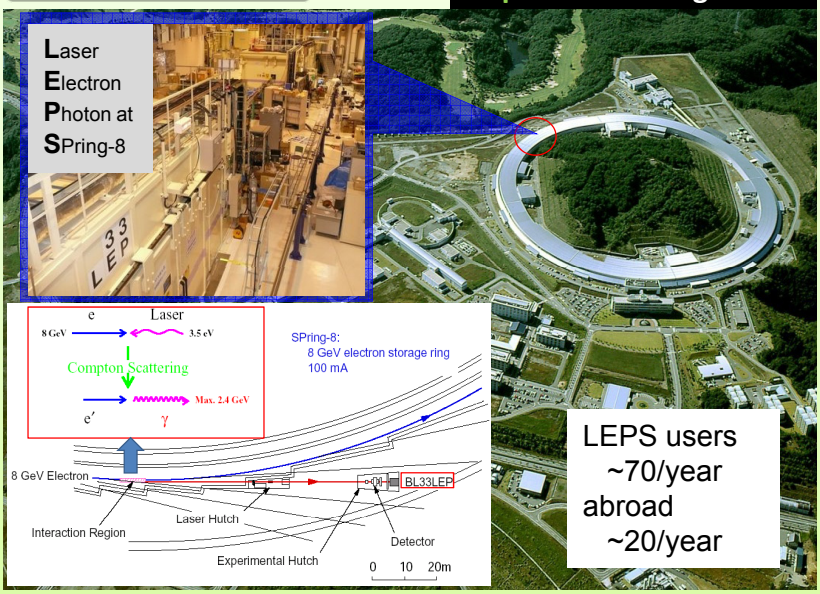
F2Si Araw

RI-Beam for Studies of Nuclei far from stability. Nucleo-Synthesis in Universe

LEPS Facility @ SPring-8

Super Photon ring-8 GeV

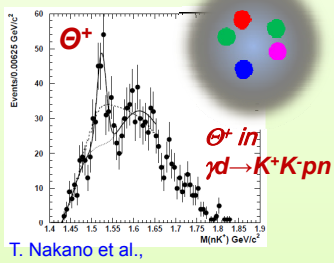
Laser Electron Photon at SPring-8



LEPS users
~70/year
abroad
~20/year

Research Highlights at LEPS

Pentaquark State?

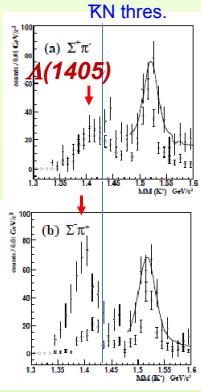


T. Nakano et al.,
Phys. Rev. C79, 025210 (2009)

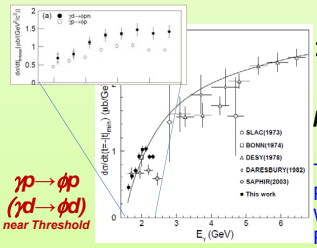
Meson-Baryon Molecule State?

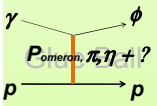
Λ(1405) in γp→K+Σπ

K̄N thres.



M. Niiyama et al.,
PRC78, 035202(2008)



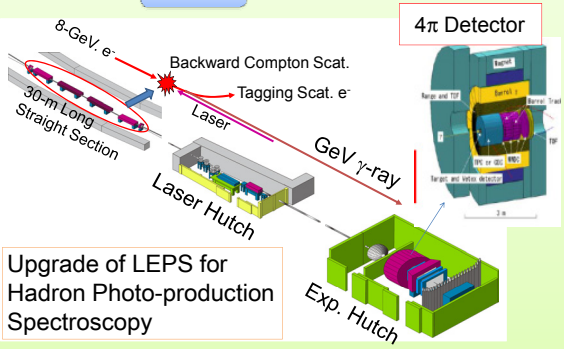


T. Mibe et al.,
PRL95, 182001(2005)
W. C. Chang et al.,
PLB686, 6(2010)

Research Center for Subatomic Science

Quest for Signals beyond the "Standard" Model

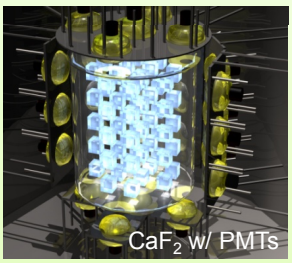
LEPS2



Upgrade of LEPS for Hadron Photo-production Spectroscopy

Exotic Hadrons reveal Mechanism of
How Quarks are Confined in Hadron
How Hadron Mass is Generated
(Chiral Symmetry Breaking in QCD).

CANDLES

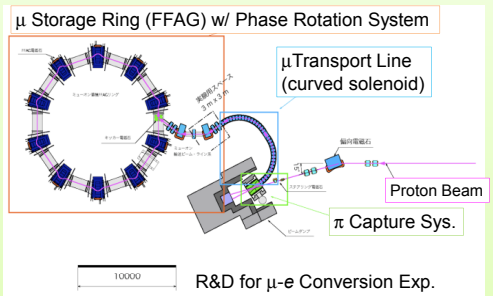


Neutrinoless ββ Decay

$If\ \nu = \bar{\nu},\ ^{48}Ca \rightarrow ^{48}Sc + 2e^-$

Why quarks >> antiquarks (matter>>antimatter) in Universe?

MUSIC



R&D for μ-e Conversion Exp.

Charged Lepton Flavor Violation

$Br(\mu^- + {}^AZ \rightarrow e^- + {}^AZ)$

Sensitive to New Physics (New Elementary Particles)