FUTURE MEASUREMENTS OF VECTOR MESONS IN NUCLEUS AT J-PARC

K. Ozawa (KEK) for the J-PARC E16 collaboration

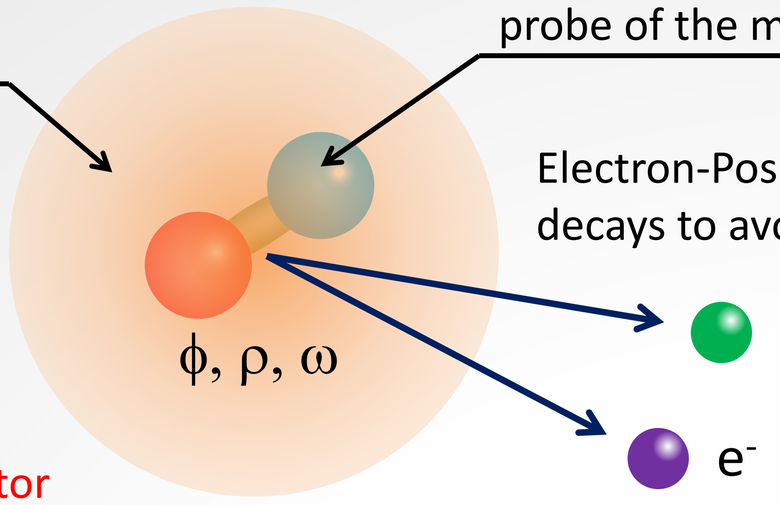
PHYSICS

Chiral symmetry and nuclear medium

Nucleus as a QCD medium

Vector meson as a probe of the medium

Chiral properties are characterized By $\langle qq \rangle^n$ condensates

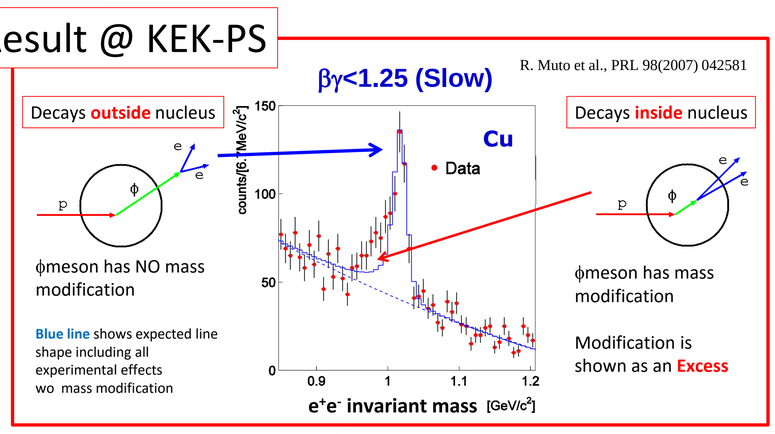


Electron-Positron decays to avoid FSI.

Mass spectra of vector mesons and amount of the condensates are strongly correlated.
cf. QCD sum rule
Hatsuda and Lee, PRC 46 R34

Precise measurements of mass spectra are essential to study QCD medium.

Result @ KEK-PS



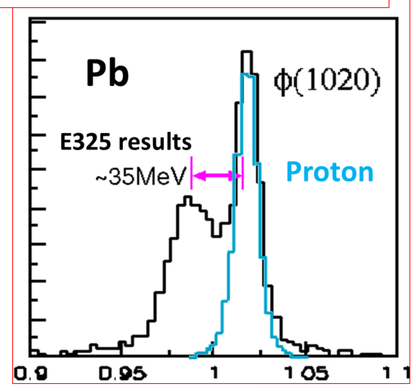
NEW EXPERIMENT AT J-PARC

A new experiment is under preparation at J-PARC to measure mass spectra of light vector mesons in nucleus with a good resolution and high statistics.

Features of the new experiment

- ➢ 100 times better statistics than KEK
  - ✓ Large acceptance for a target rapidity region
  - ✓ High counting rate (~ 10^7 Hz)
    - However, thin target (0.1% int. length) to avoid a radiation tail
    - High enough beam intensity
- ➢ Two times better resolution
  - ✓ Evaluation of $\langle qq \rangle^n$ condensates precisely
- ➢ Newly developed tracking devices and electron identification detectors to satisfy both requirements

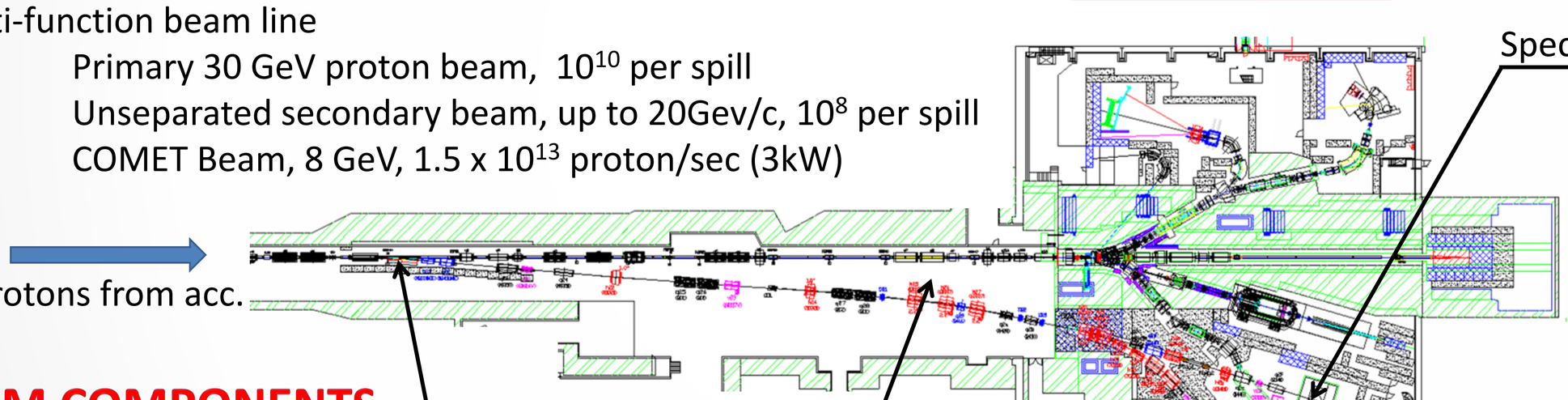
Expected Result @ J-PARC

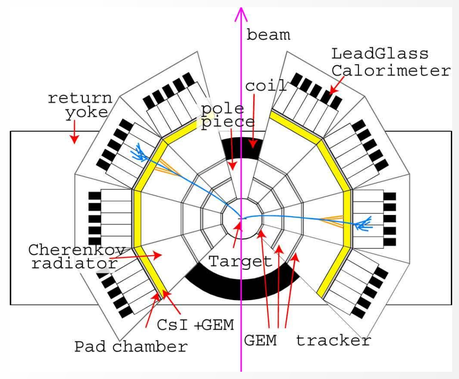


Clear mass modification can be expected.
Even if the mass modification would be small, we could study QCD medium properties with mass spectra in nucleus.

NEW BEAM LINE

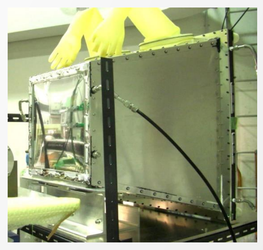
Multi-function beam line
- Primary 30 GeV proton beam, 10^{10} per spill
- Unseparated secondary beam, up to 20Gev/c, 10^8 per spill
- COMET Beam, 8 GeV, 1.5 x 10^{13} proton/sec (3kW)





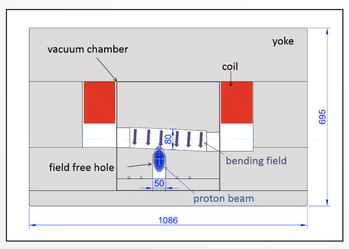
GEM Tracker

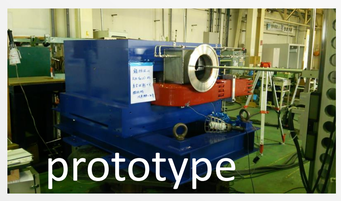
Hadron Blind Detector



A "Lambertson type" magnet is used at the branching point.

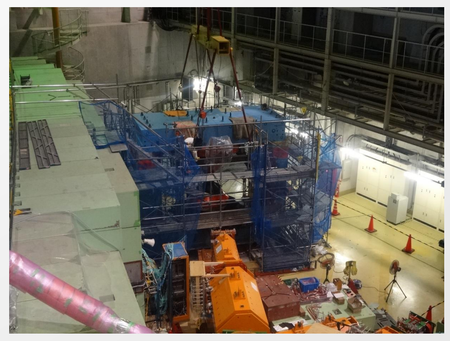
Very small fraction (10^{-4}) is branched.
Main beam goes through no magnetic field region.





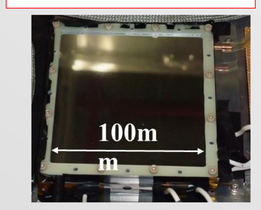
Part of beam line magnets for the new beam line are already placed at the right place!!

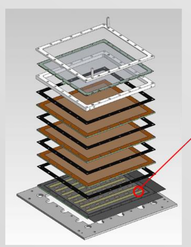
Civil Construction is finished!!

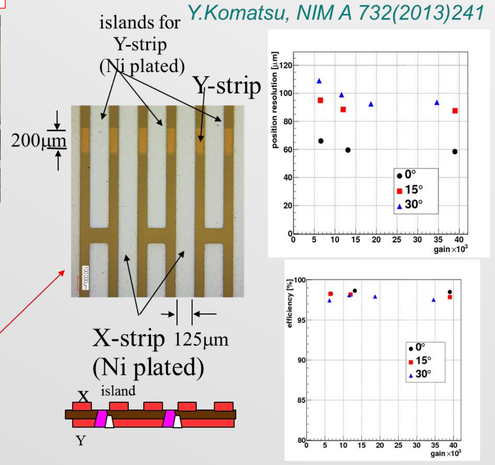


DETECTOR DEVELOPMENTS

GEM Tracker

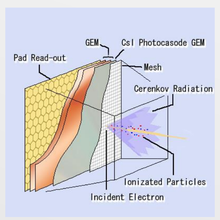




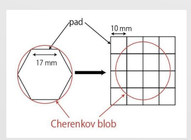


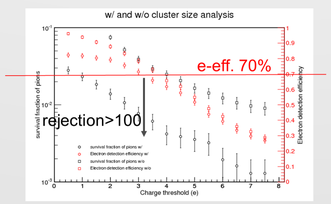
Y.Komatsu, NIM A 732(2013)241

Hadron Blind Detector



Pad size is optimized to have a cluster size analysis





SCHEDULE

Construction of the beam line will be finished in two years.
The first experiment (J-PARC E16) will start in 2017.

SUMMARY

A new beam line is under construction at J-PARC Hadron Facility to deliver high momentum primary.
New experiments to investigate nuclear chiral property are under preparation.