



RIKEN

Present status of J-PARC E15

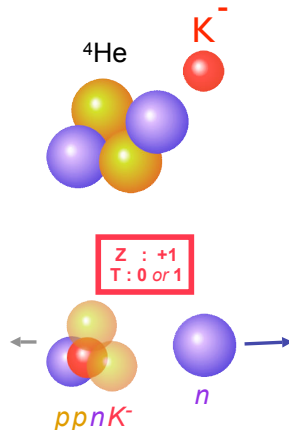
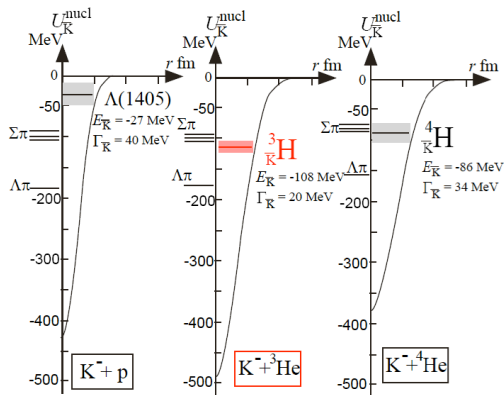
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仁科加速器研究センター

Embedding K^- in nucleus?

Motivation of KEK PS-E471/E549

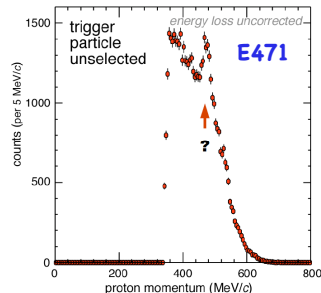
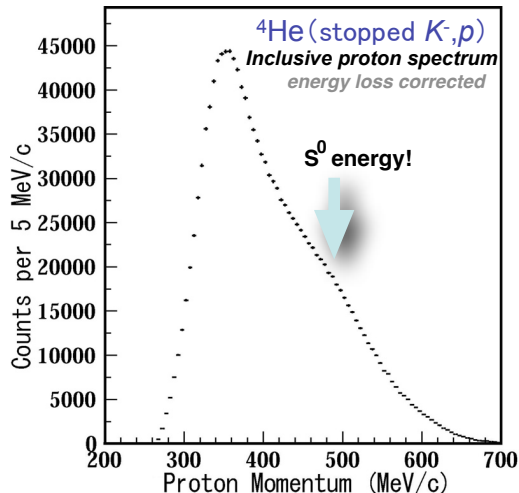


Y. Akaishi & T. Yamazaki : PRC 65 (2002) 044005

$^4\text{He}(\text{stopped } K^-, n)$ spectroscopy

Result of E549

proton narrow peak of E471 excluded

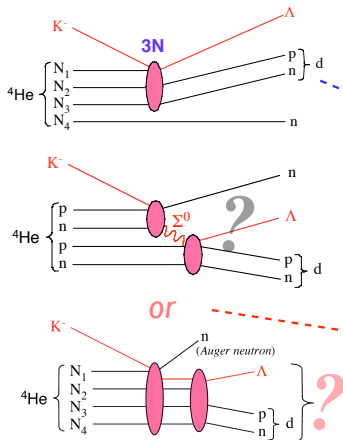


higher redundancies
 higher statistics
 better resolution
 inclusive for proton

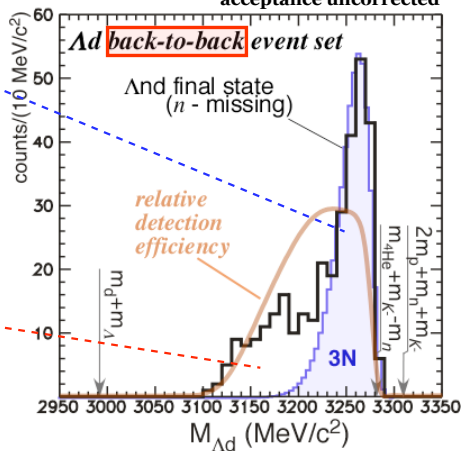
reason is described in
 e-Print: arXiv:0706.0297 [nucl-ex]

Invariant mass study

3-body final state



T. Suzuki et al., Phys. Rev. C76 (2007) 068202
acceptance uncorrected



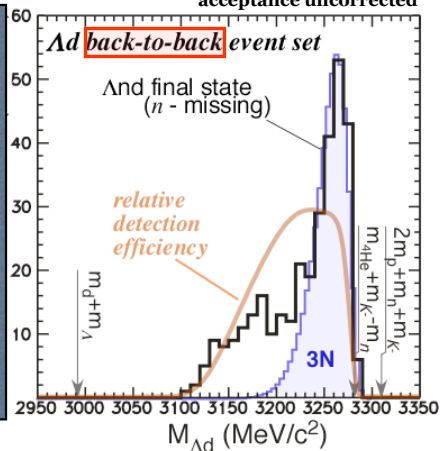
Invariant mass study

3-body final state



not for upload

T. Suzuki et al., Phys. Rev. C76 (2007) 068202
acceptance uncorrected



New data from Osaka group

(one of new data : in-flight)

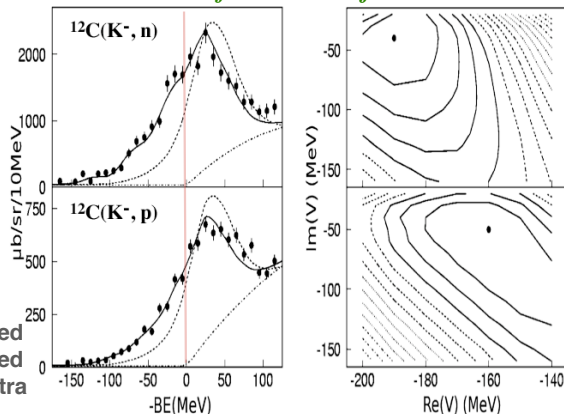
in-flight (K^- , n) reaction @ 1 GeV/c

*indicating very deep potential
Kaon condensation?*

T. Kishimoto et al., Prog. Theor. Phys. 118 (2007) 181

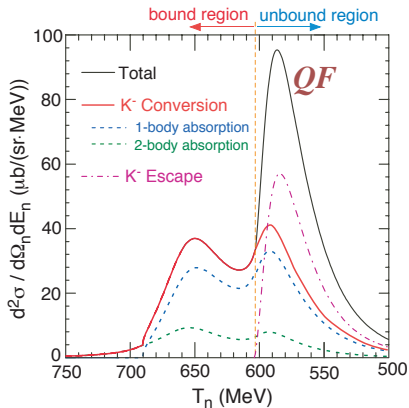
fit = Green's function

- deep & wide KN pot.
Re(V) \sim 180 MeV
Im(V) \sim 50 MeV
- lower background
in-flight ensures ...
2N process suppressed
kinematically separated
not seen in the spectra



Theoretical progress

- bound state will be seen
- yield $5 \sim 40 \mu\text{b} / (\text{sr MeV})$
- resolution must $< 20\text{MeV}$



T. Koike, T. Harada, Phys. Lett. B652 (2007) 262

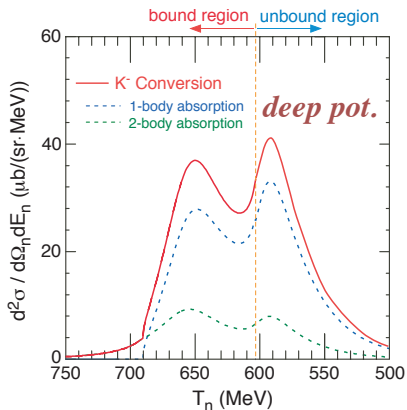
Chiral unitary

not for upload

J. Yamagata et al., conf. chiral07 osaka

Theoretical progress

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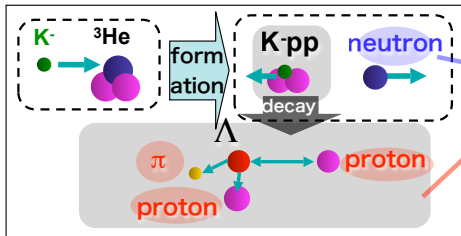
Chiral unitary

shallow pot.

not for upload

J. Yamagata et al., conf. chiral07 osaka

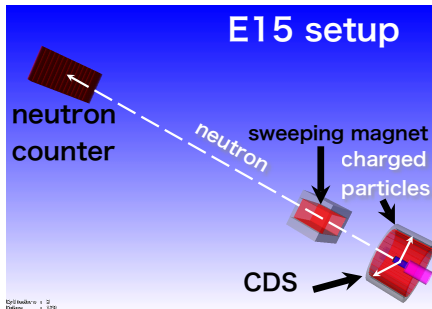
in-flight $^3\text{He}(K^-,n)$ reaction Search for Kaonic Nuclei







▶ lightest : **K^-pp**

▶ **observation of**
“formation” and “decay”

cf. $\Sigma^\pm \pi^\mp p$ decay channel
can also be tagged
by $\pi^+ \pi^-$ tag



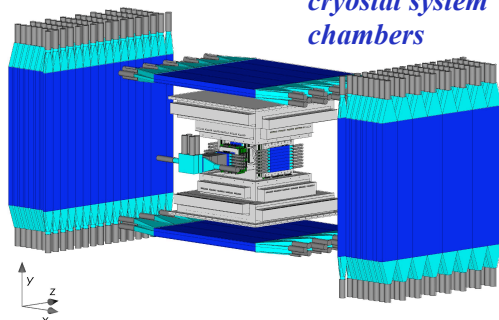
-  Cylindrical Detector System
- 1) solenoid
- 2) CDC
- 3) hodoscope
-  ^3He target
-  neutron counter
-  beam line detector

Preparation Status of E15

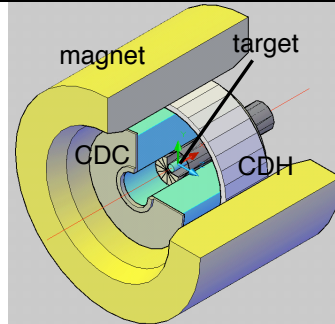
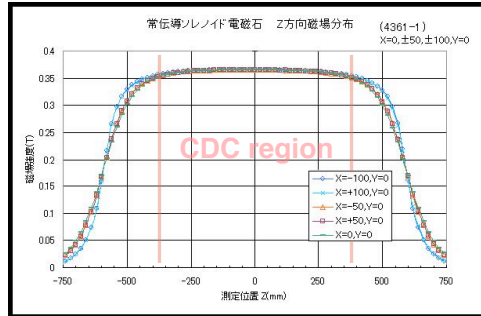
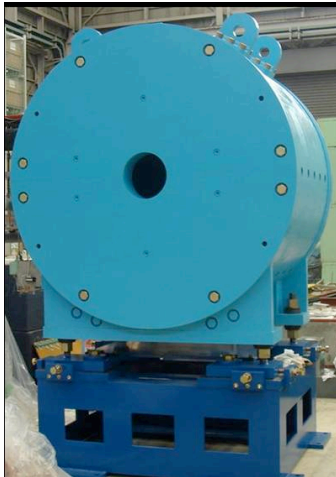
many components from E471

NC

*cryostat system
chambers*

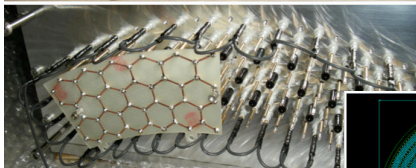


Cylindrical magnet for CDS



CDC development

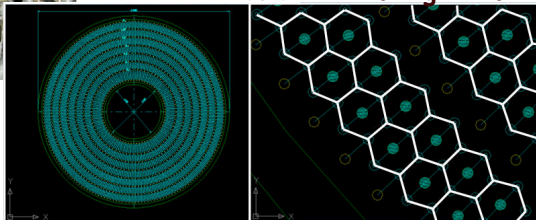
HV distributor



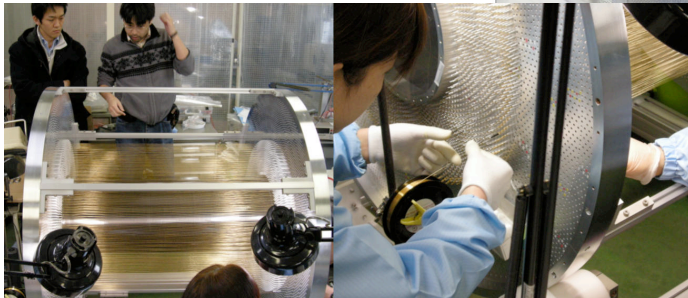
CDC prototype



CDC wire configuration

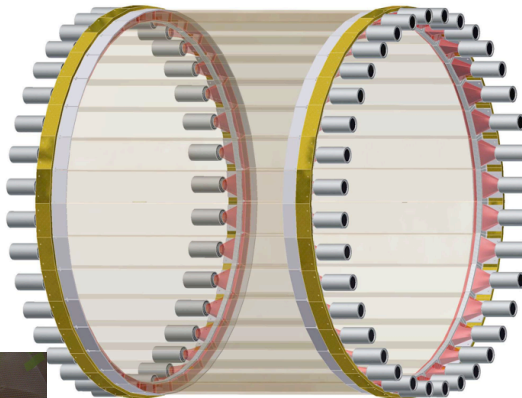


CDC fabrication



CDH R&D

CDH mounting study on
solenoid mock-up

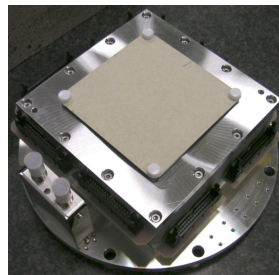
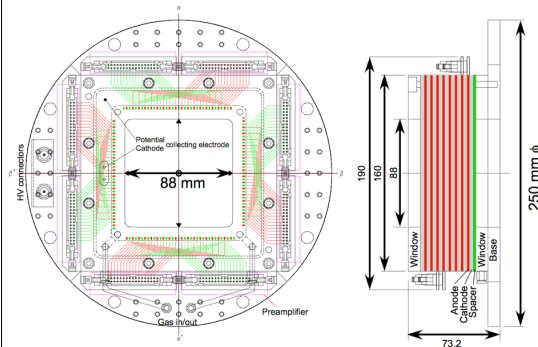


CDH supporting structure

Beam line chamber in CDS

kaon tracker in front of target

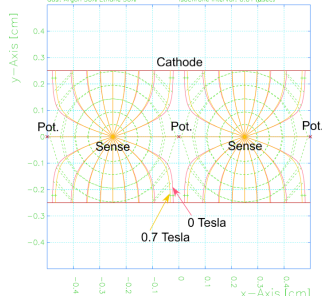
inside the magnetic field
fits inside CDC



small time distortion due to field

Gas: Argon 50% Ethane 50%

Isochrone interval: 0.01 μ s/cd



^3He target R & D

J-PARC E15 LHe-3 Target

**modified based on E471
helium target system**

Liq. N_2 Radiation Shield ($\sim 77\text{ K}$)

^4He Separator ($\sim 4\text{ K}$)

^4He Evaporator ($\sim 1.3\text{ K}$)

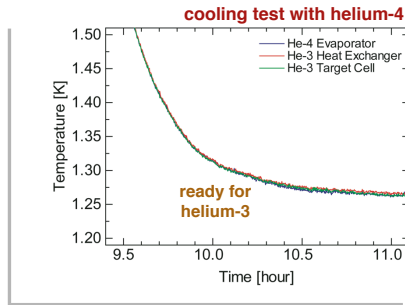
^3He Heat Exchanger ($\sim 1.3\text{ K}$)

^3He Target Cell ($\sim 1.3\text{ K}$)

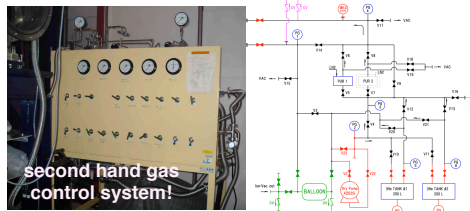
CFRP Vacuum Vessel

500

**target cell is in R & D
to be better than
conventional one**

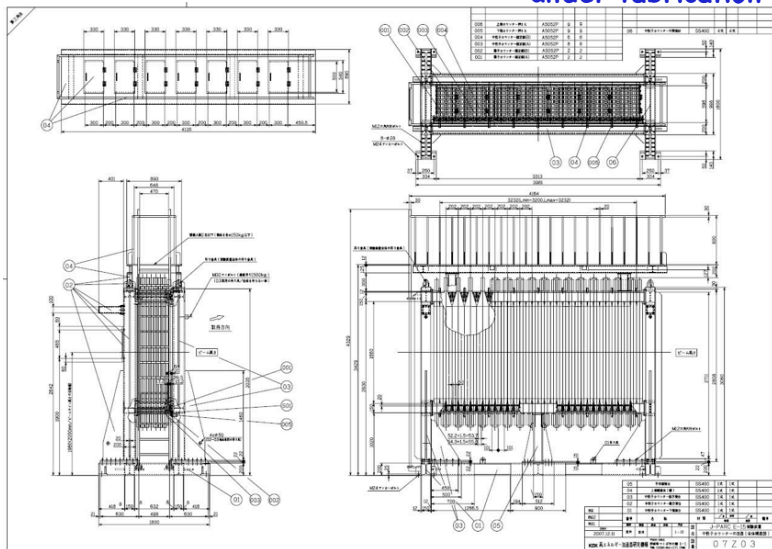


**safe & close gas system is required
helium-3 is expensive!**



Support for NC

under fabrication



Time Table

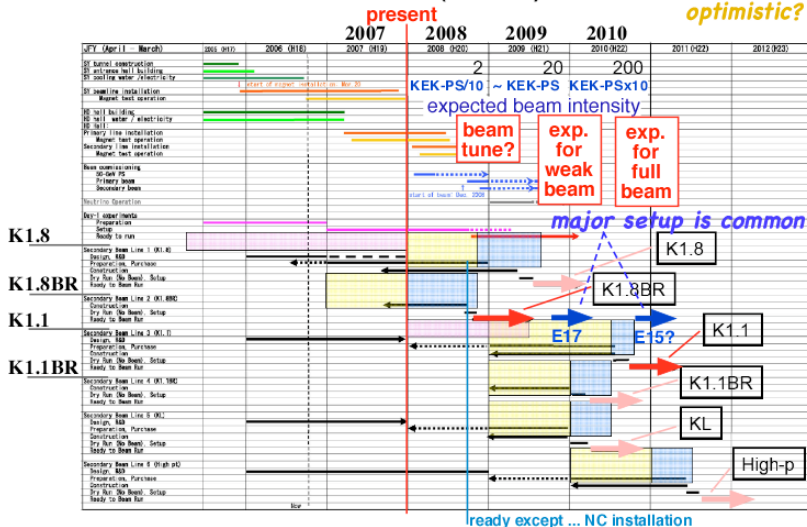
target date : Sep. 2008

E15 preparation is in good shape
to be ready for the first beam

Where to do ... & when?

Hd (Phase 1) Construction Schedule

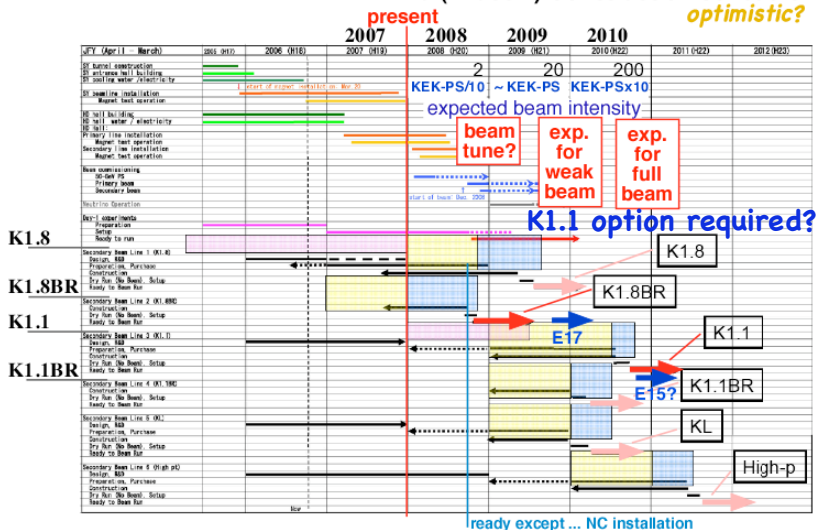
optimistic?



Where to do ... & when?

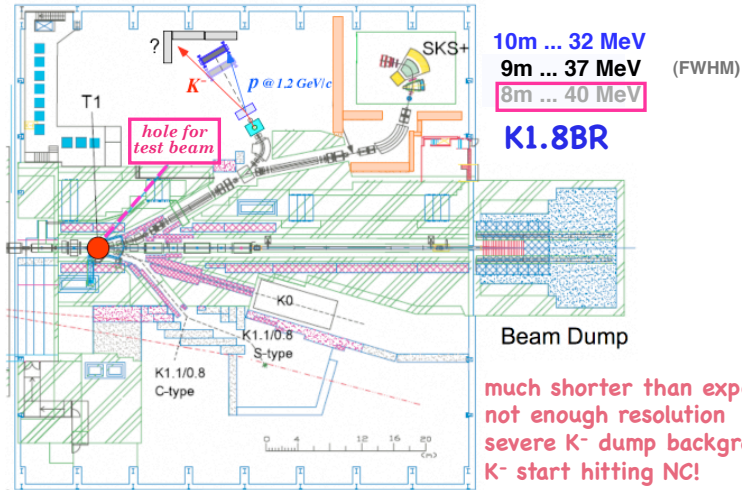
Hd (Phase 1) Construction Schedule

optimistic?



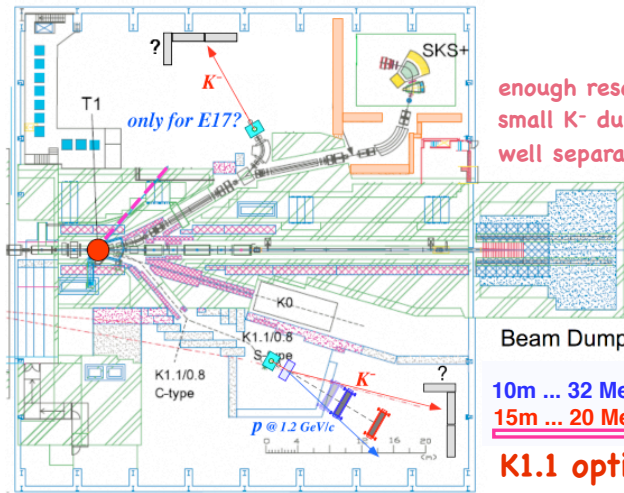
Where to do ... ?

radiation safety not allow us to place NC where we wish ...



Where to do ... ?

Hadron hall is not very big



enough resolution
small K^- dump background
well separated K^- beam

Beam Dump

10m ... 32 MeV (FWHM)
15m ... 20 MeV as in proposal

K1.1 option

extraction angle must be reconsidered, though...

Conclusion

- KN interaction : need to be studied!
- Clarify the situation of deeply bound kaonic state
most of the theory at present give bound state
width will be as wide as > 30 MeV
- preparation ... will be ready in run-2009
- all K stop run (E17 & calib.) at K1.8BR **unchanged!**
- main run for E15 : K1.1 / K1.8BR ... need more info.



where to install NC?

resolution = K1.1

background = K1.1

if TOF length < 10 m

Request

for physics output of this experiment

- long beam time at full intensity (as requested)

*difficult to achieve by sharing beam with
other first priority experiments at K1.8BR*

- need enough TOF length to achieve resolution

*either
special consideration to keep TOF length at K1.8BR
or
realization of K1.1 as first as possible*

Thank you!

Spare

