

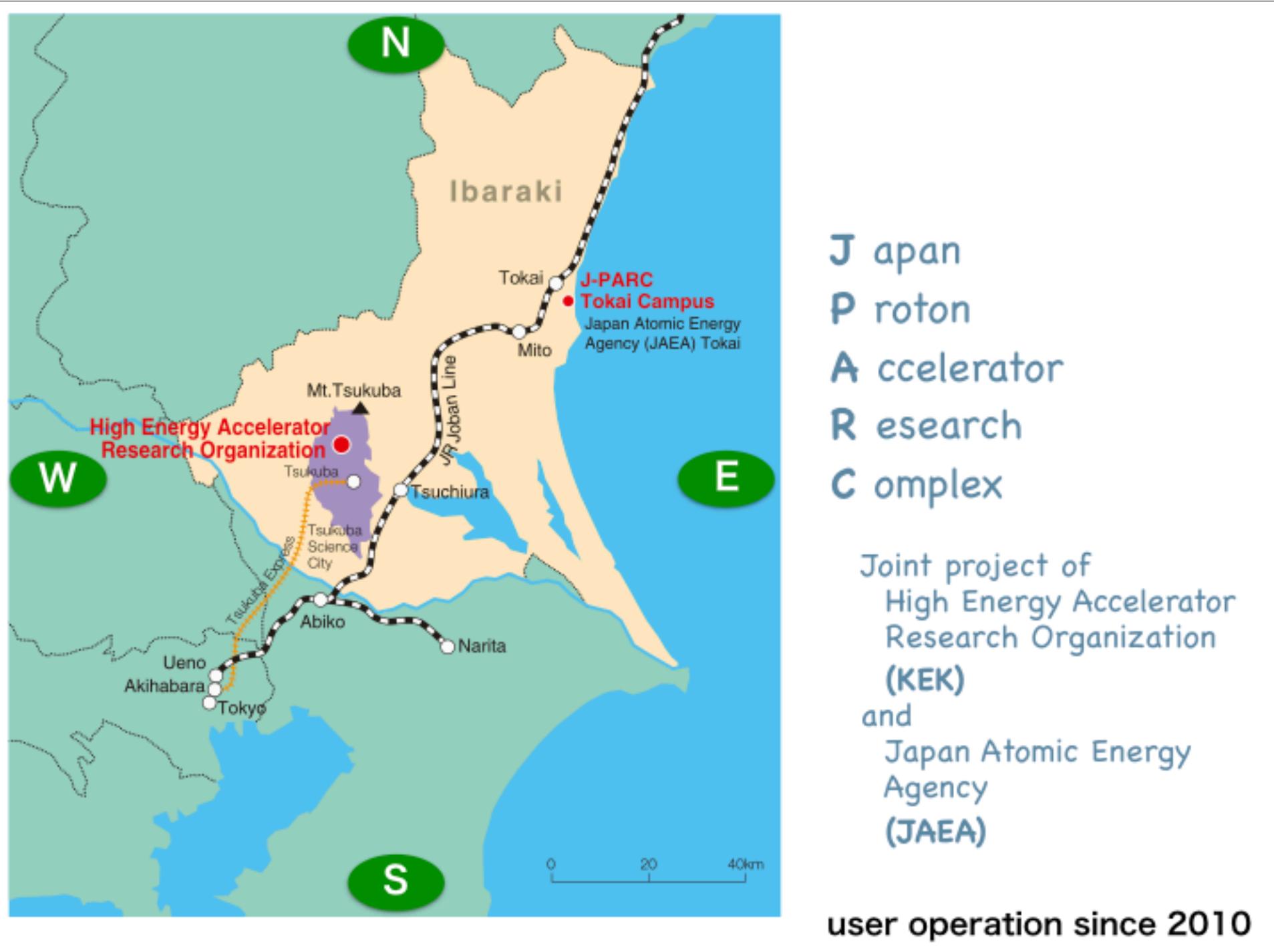
for virtual tour to J-PARC, Tokai
JENNIFER2 Summer School
2021.June.24(Sat)

Introduction to J-PARC

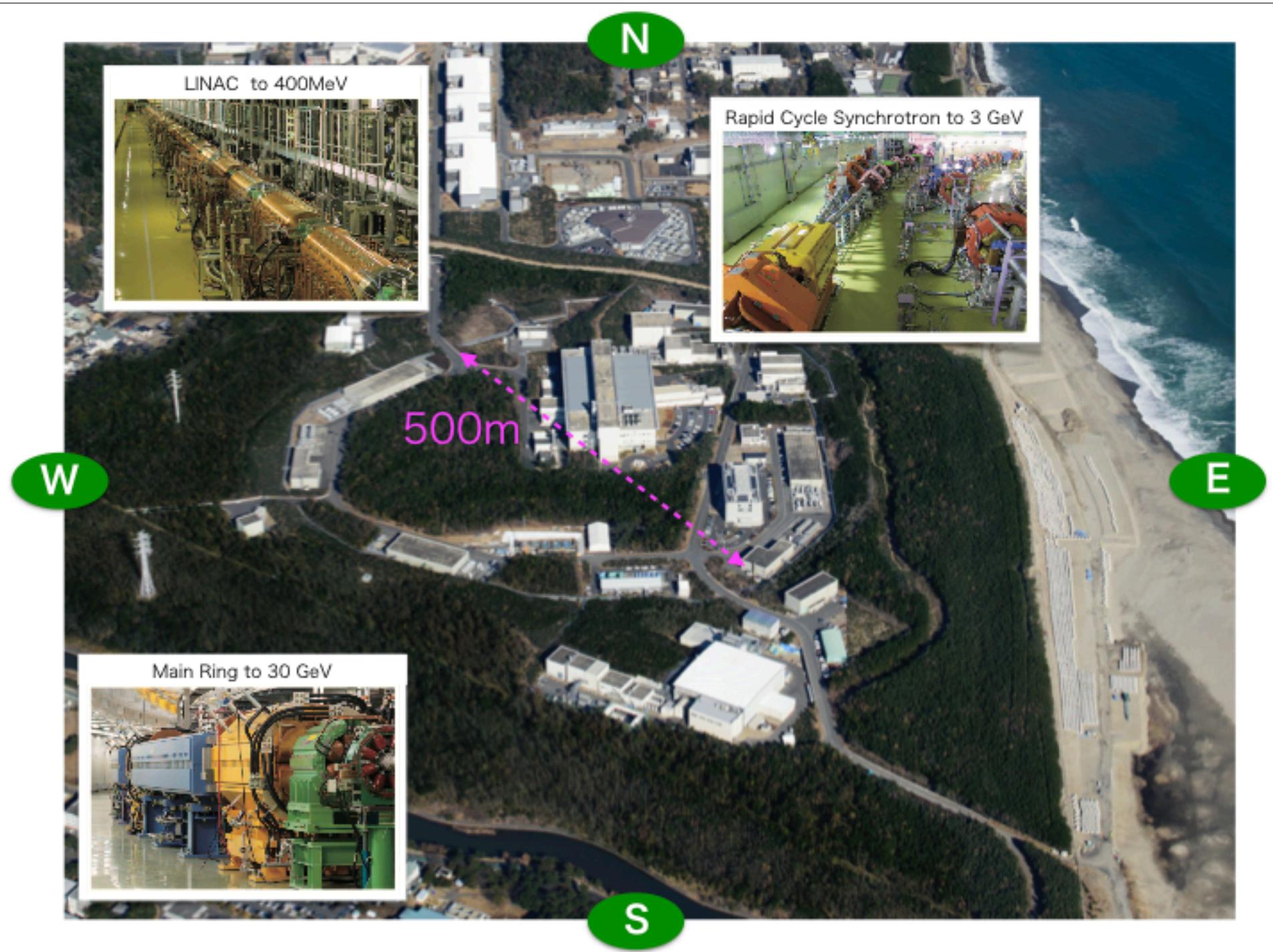
Takeshi K. Komatsubara
J-PARC/KEK

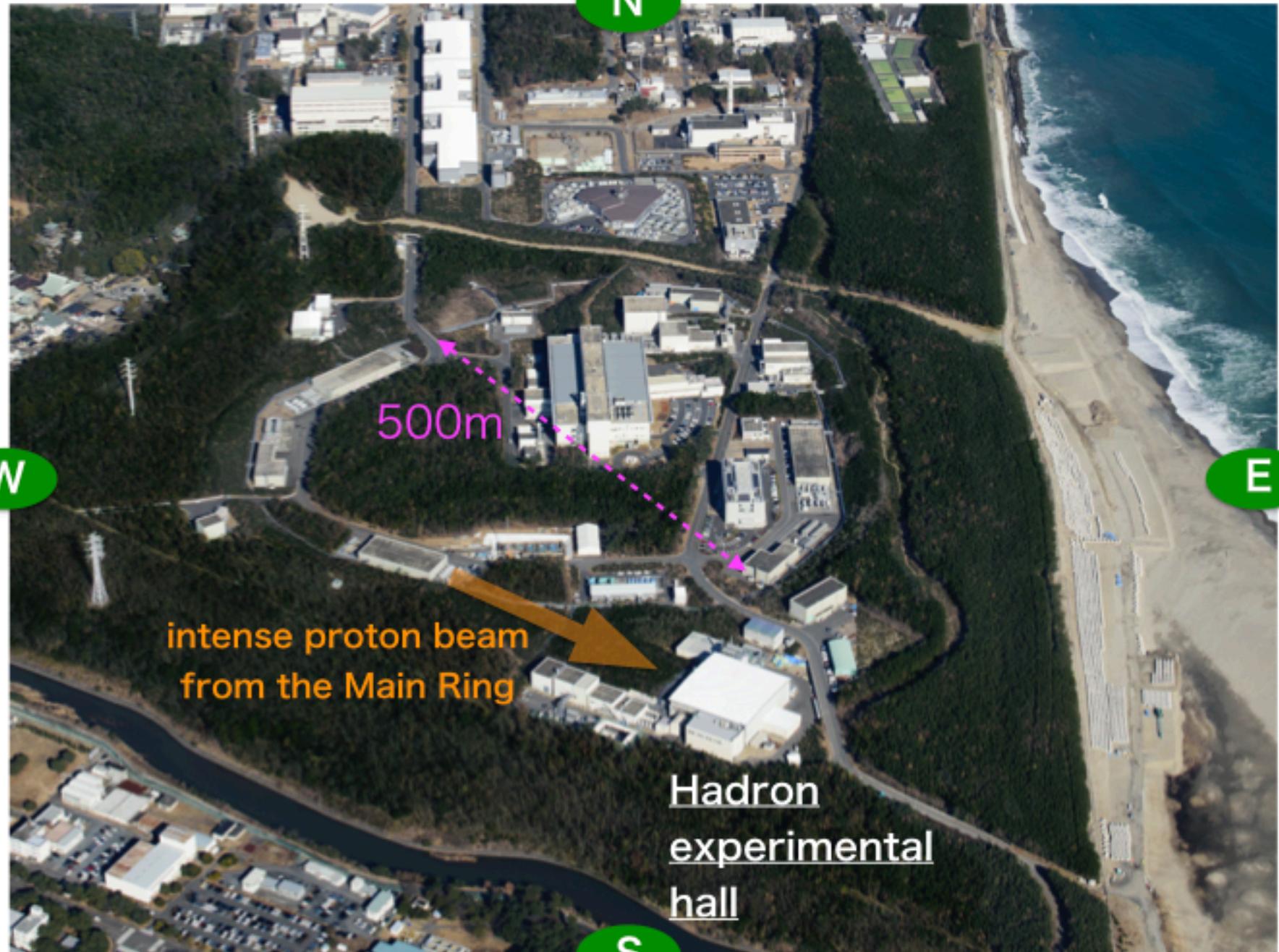
KEK50年

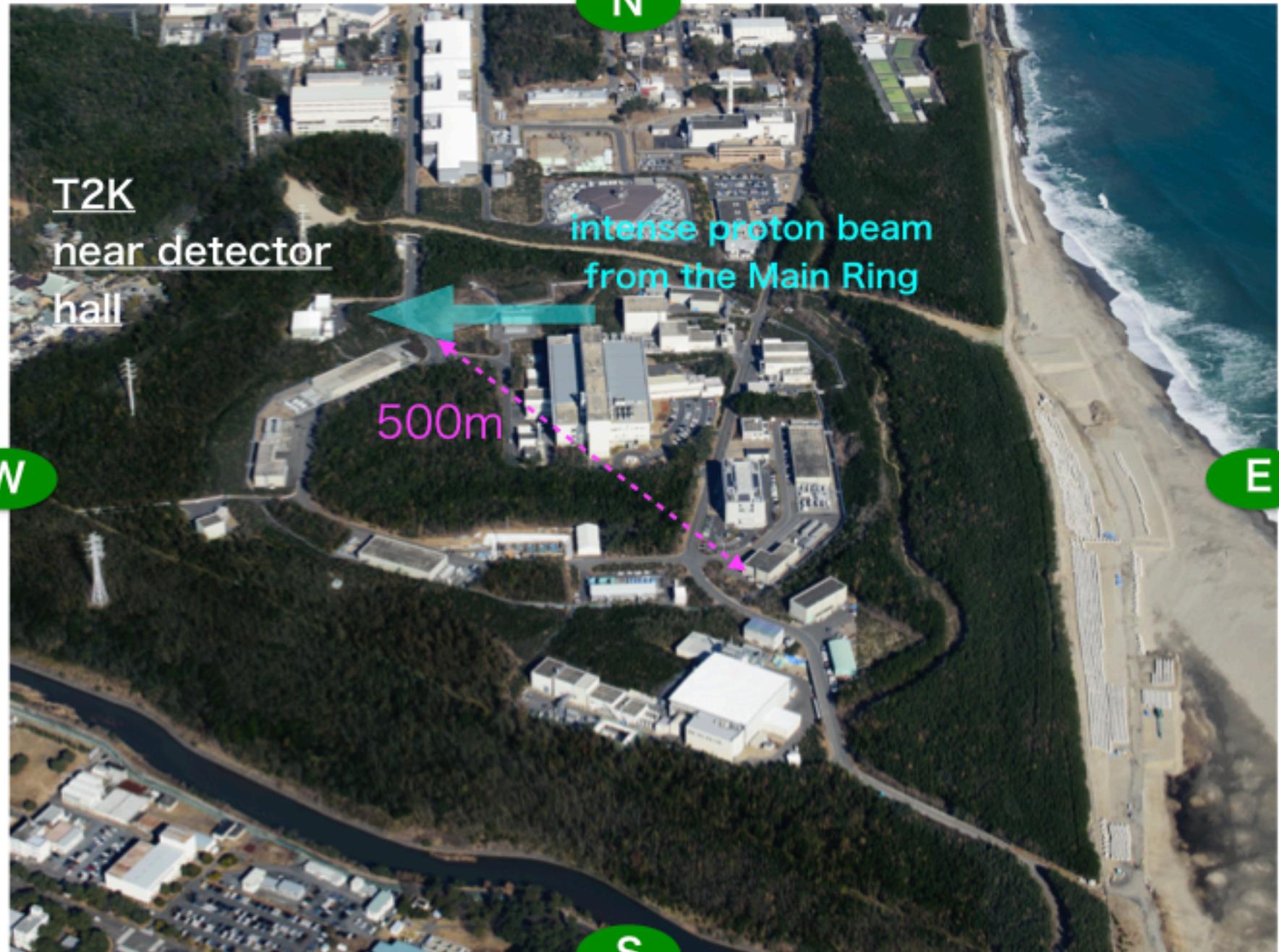




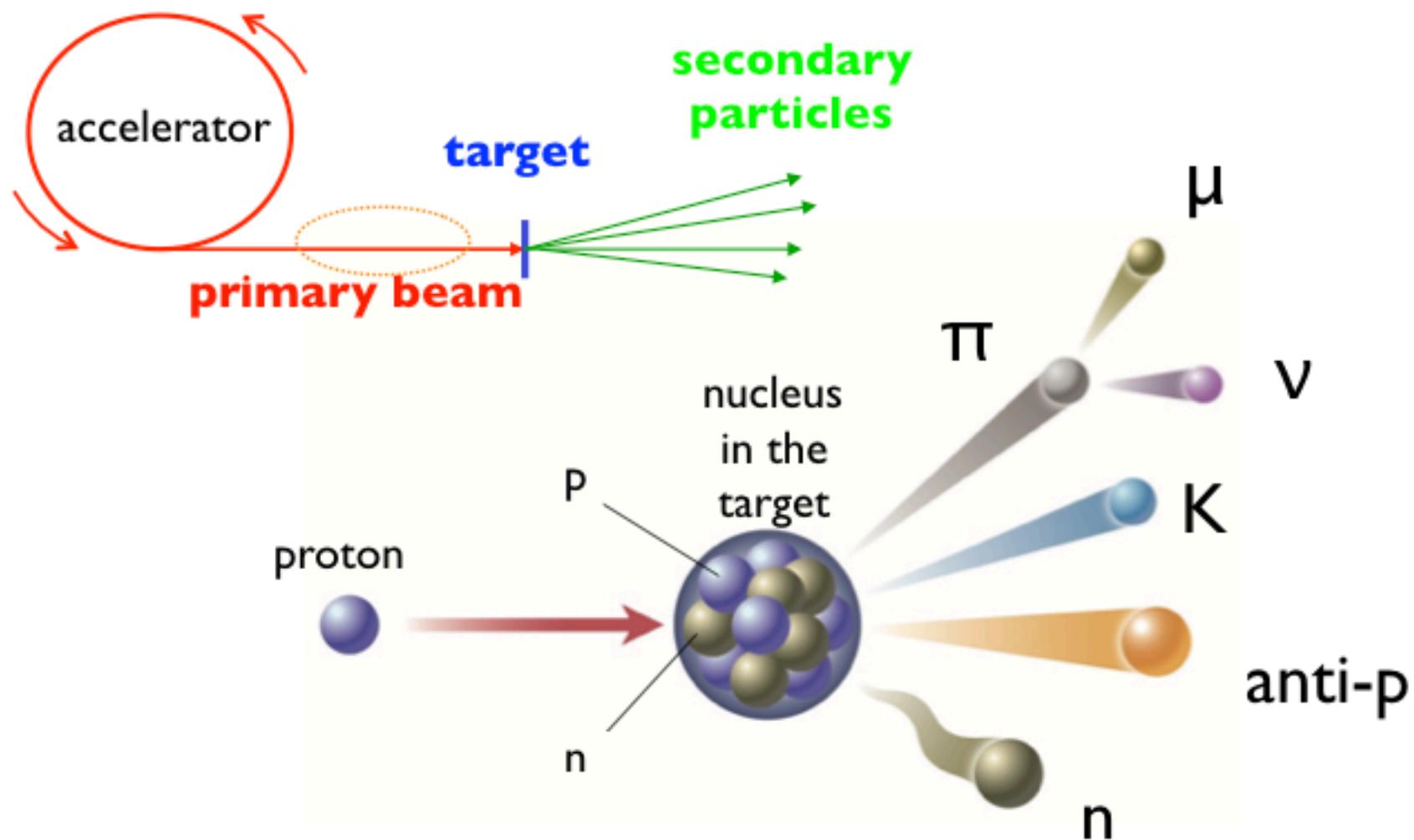


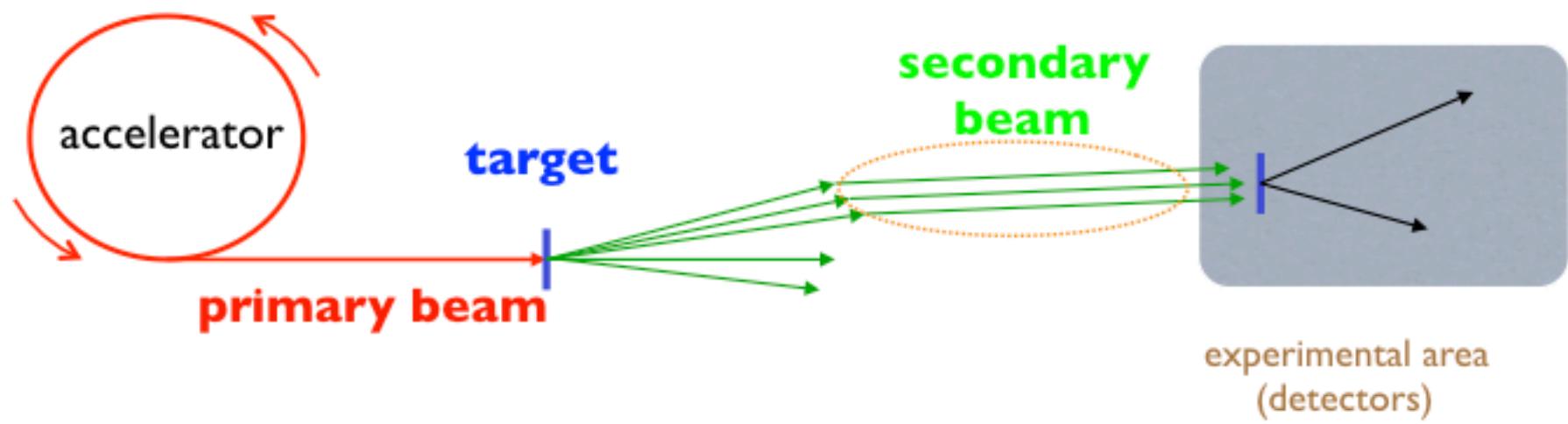






particle explosion (inelastic scattering) in high energy collision

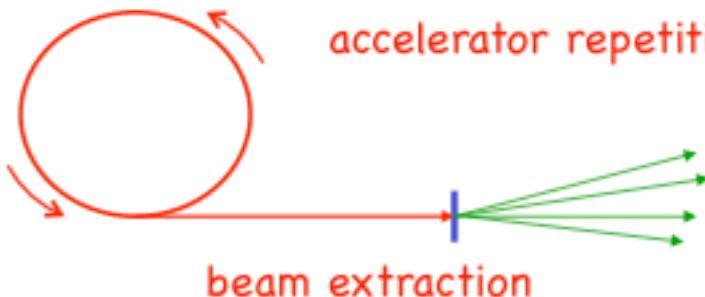




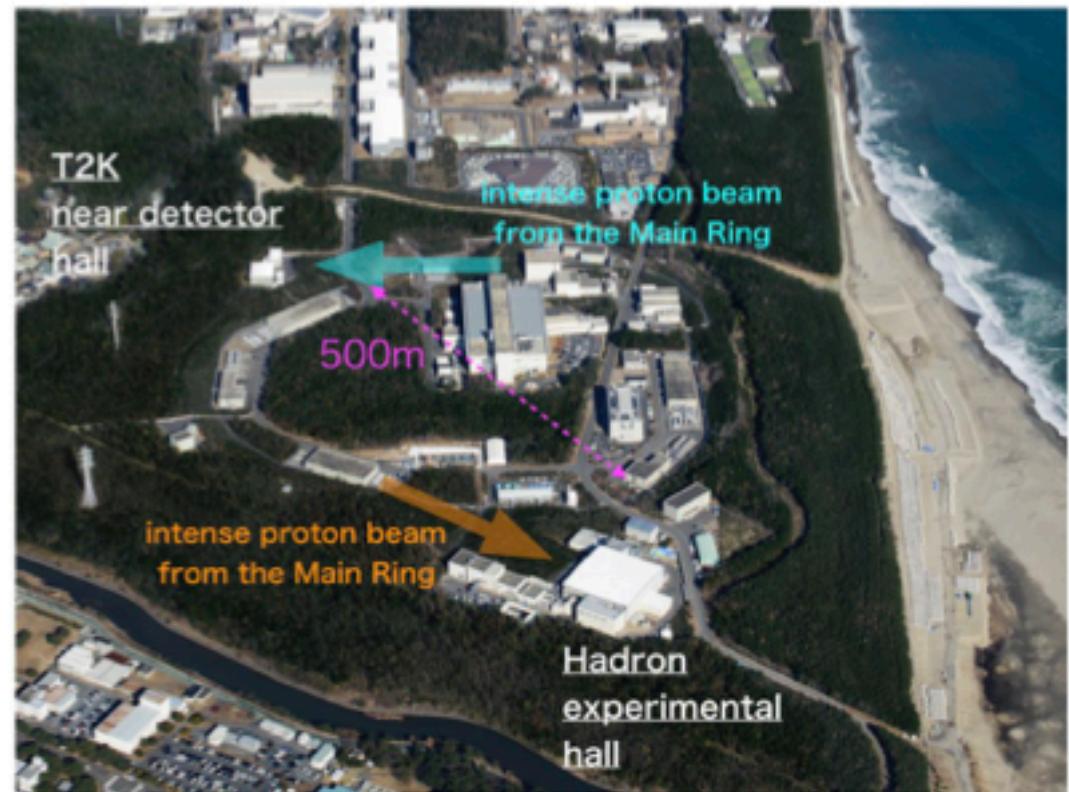
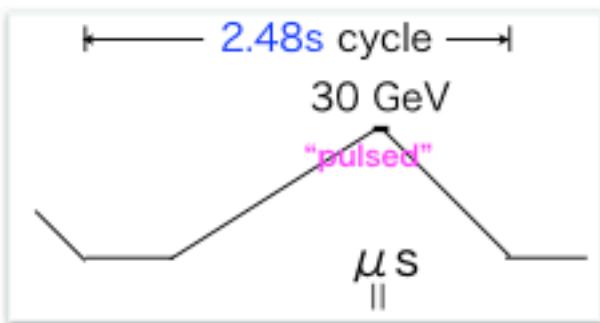
fixed-target experiments

beam :
flux of particles to a specific direction

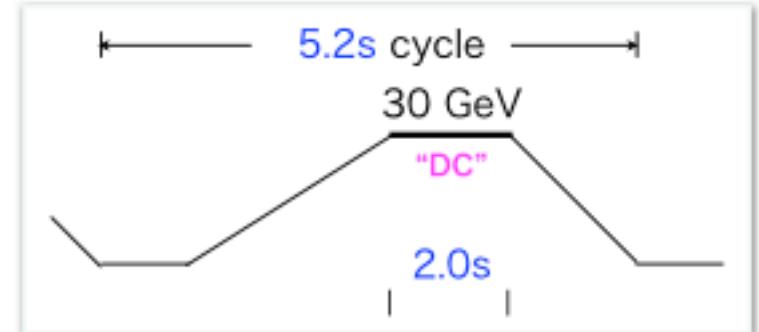
energy, intensity, and collimation (or focusing)

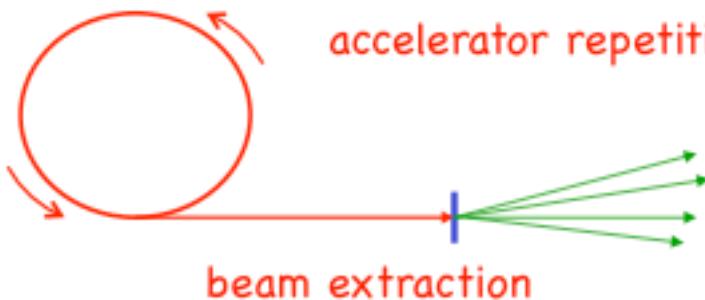


Fast extraction by kicker magnet



Slow extraction by extraction device



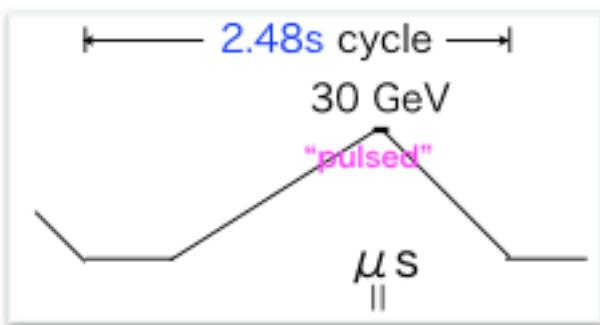


accelerator repetition ("cycle")

beam power

(beam energy) x (protons per pulse)/(cycle)

Fast extraction by kicker magnet



$$30 \text{ GeV} \times 260 \text{ E}12 / 2.48 \text{ sec}$$

$$= 30G \times 1.602 \text{ E}-19 \text{ C} \times V \times 260 \text{ E}12 / 2.48 \text{ sec}$$

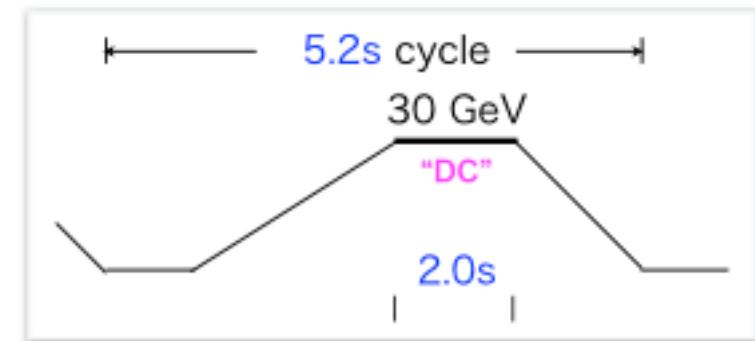
$$= 30G V \times 17 \mu\text{A} = 510 \text{ kW}$$

$$30 \text{ GeV} \times 54 \text{ E}12 / 5.2 \text{ sec}$$

$$= 30G \times 1.602 \text{ E}-19 \text{ C} \times V \times 70 \text{ E}12 / 5.2 \text{ sec}$$

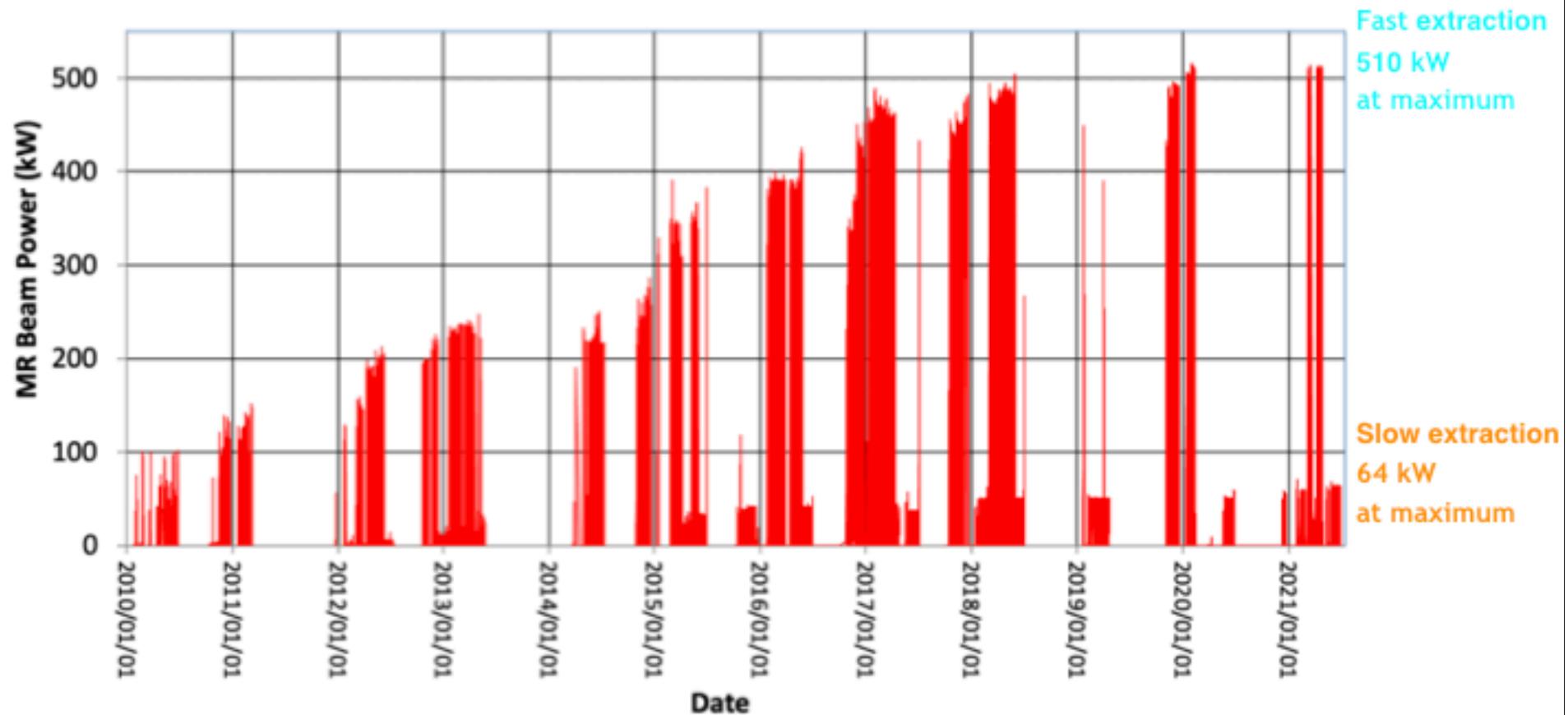
$$= 30G V \times 2.1 \mu\text{A} = 64 \text{ kW}$$

Slow extraction by extraction device

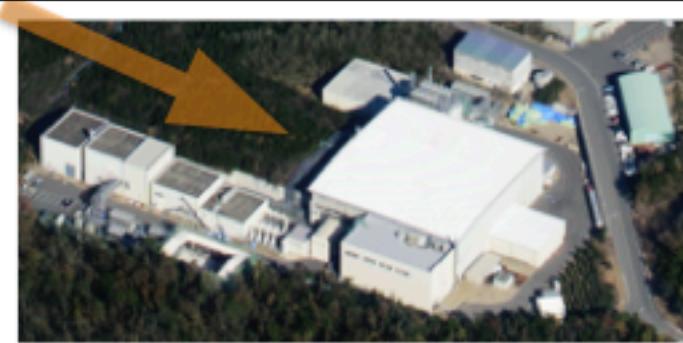


beam power

(beam energy) x (protons per pulse)/(cycle)



intense proton beam
from the Main Ring



upstream

downstream

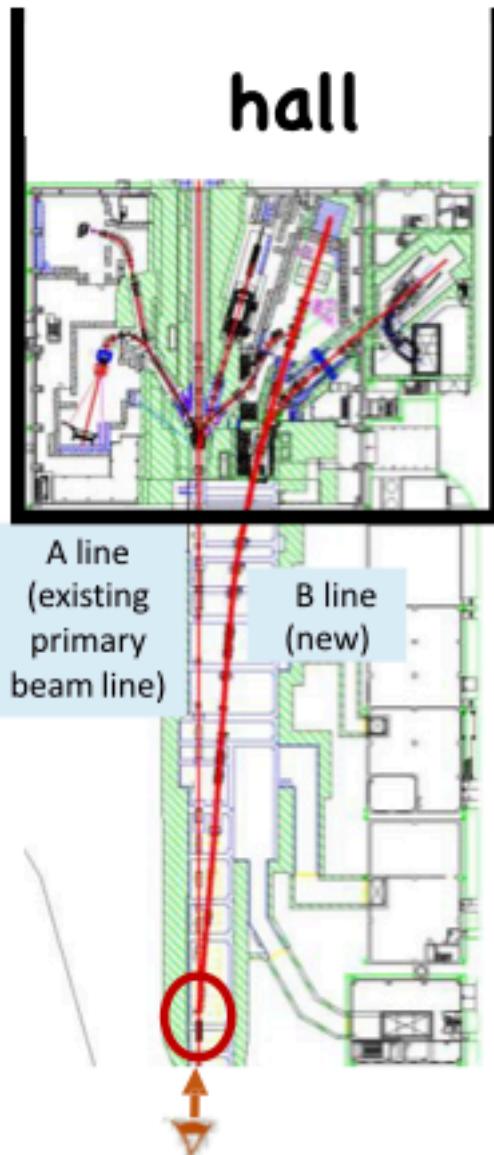
ハドロン実験施設全体図 Overview of the Facility



Switchyard

downstream

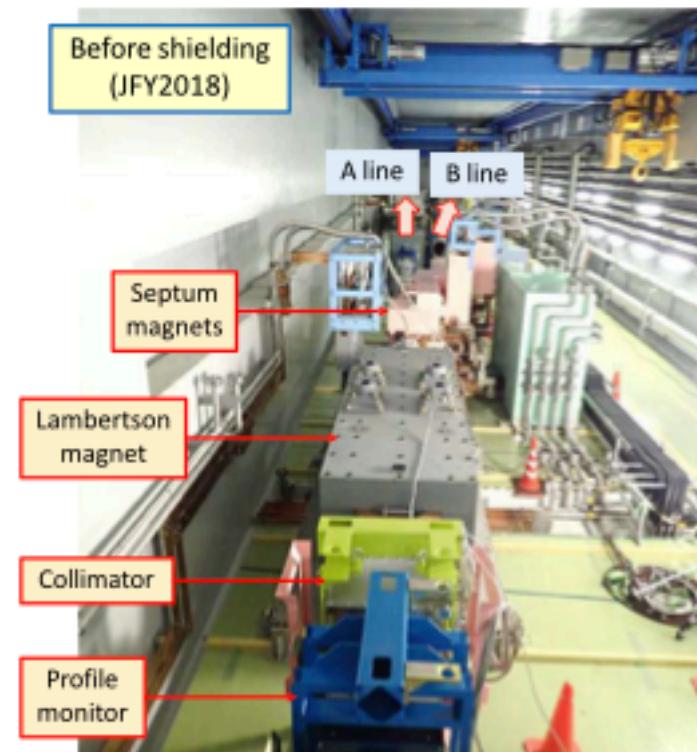
upstream



hall



Before shielding
(JFY2018)

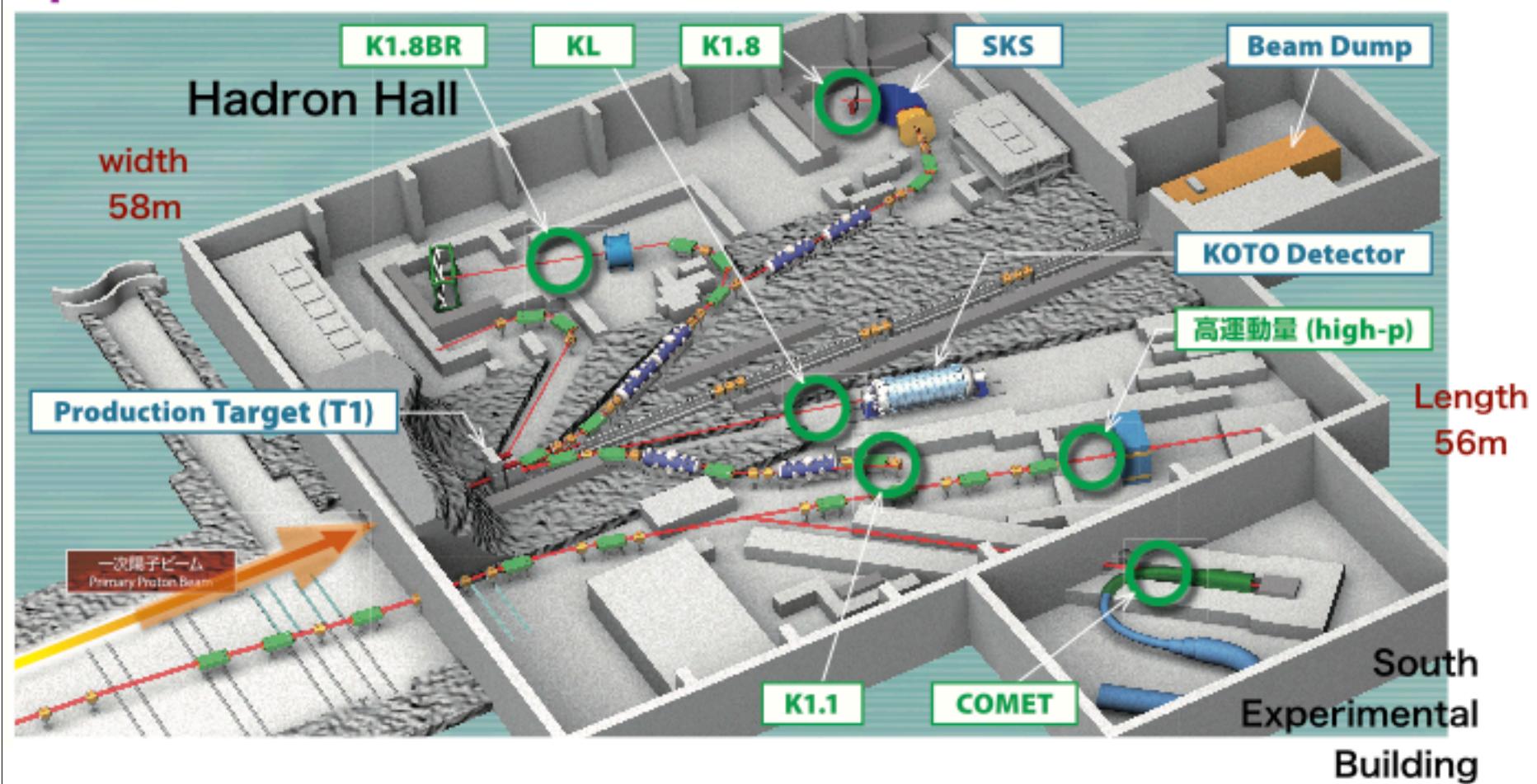


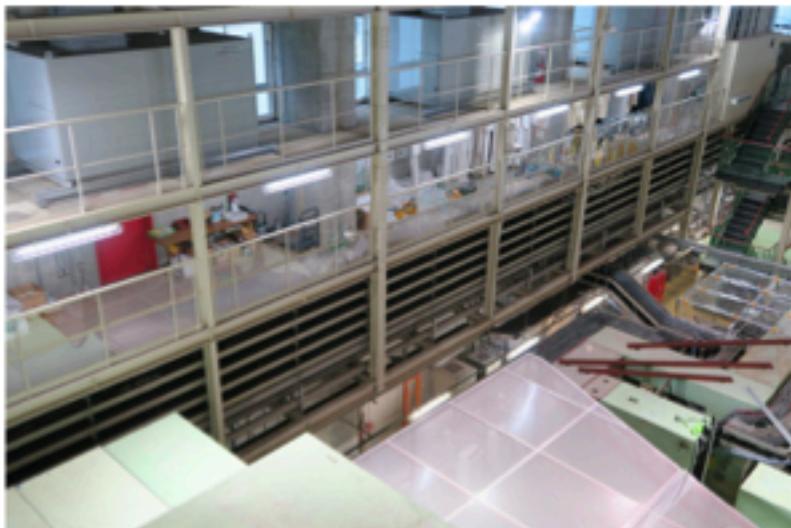
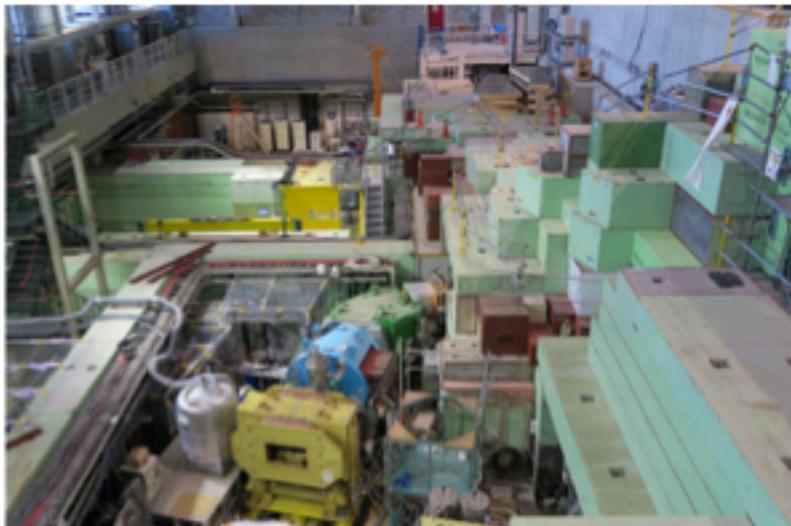
intense proton beam
from the Main Ring



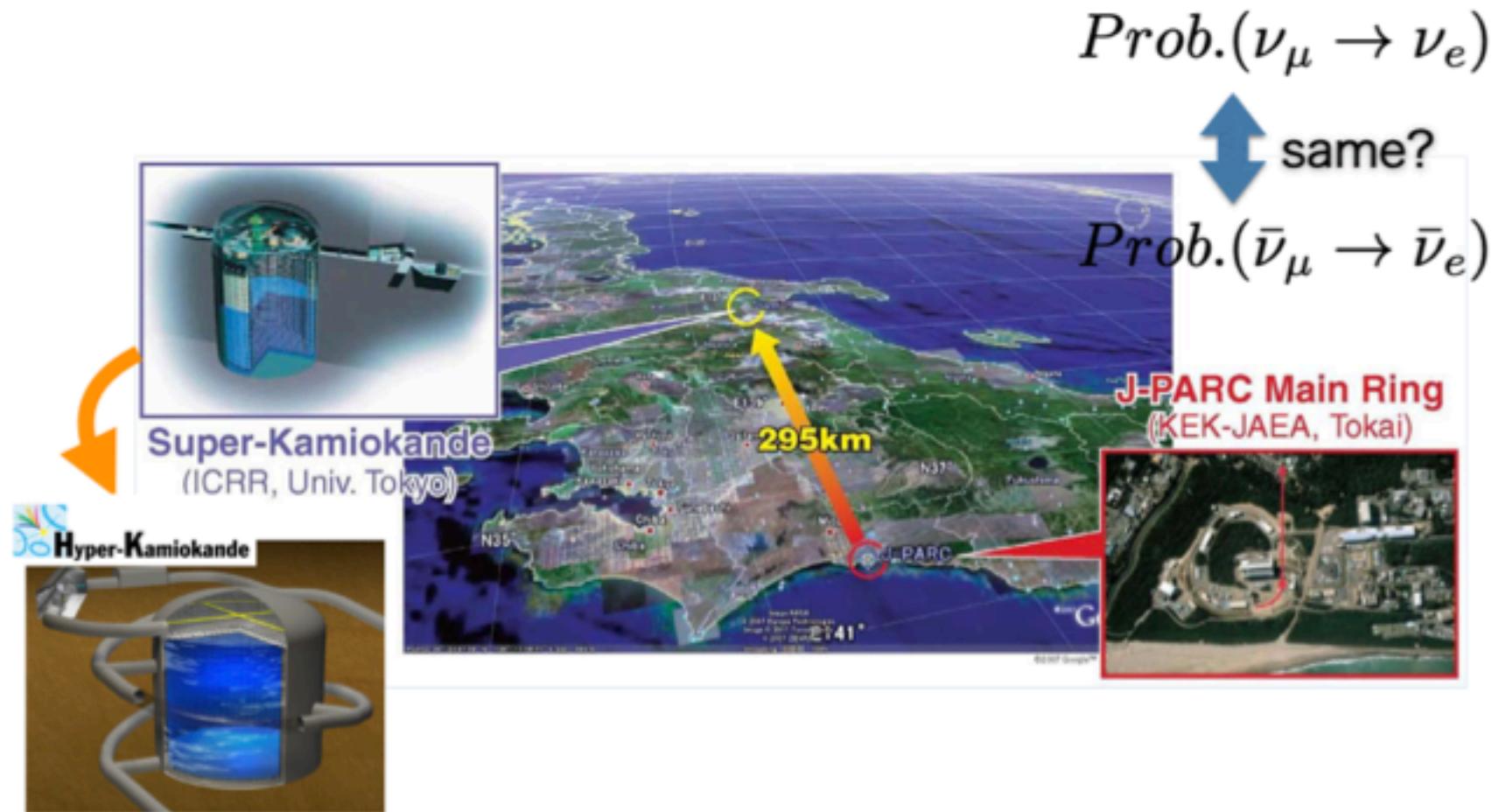
upstream

downstream



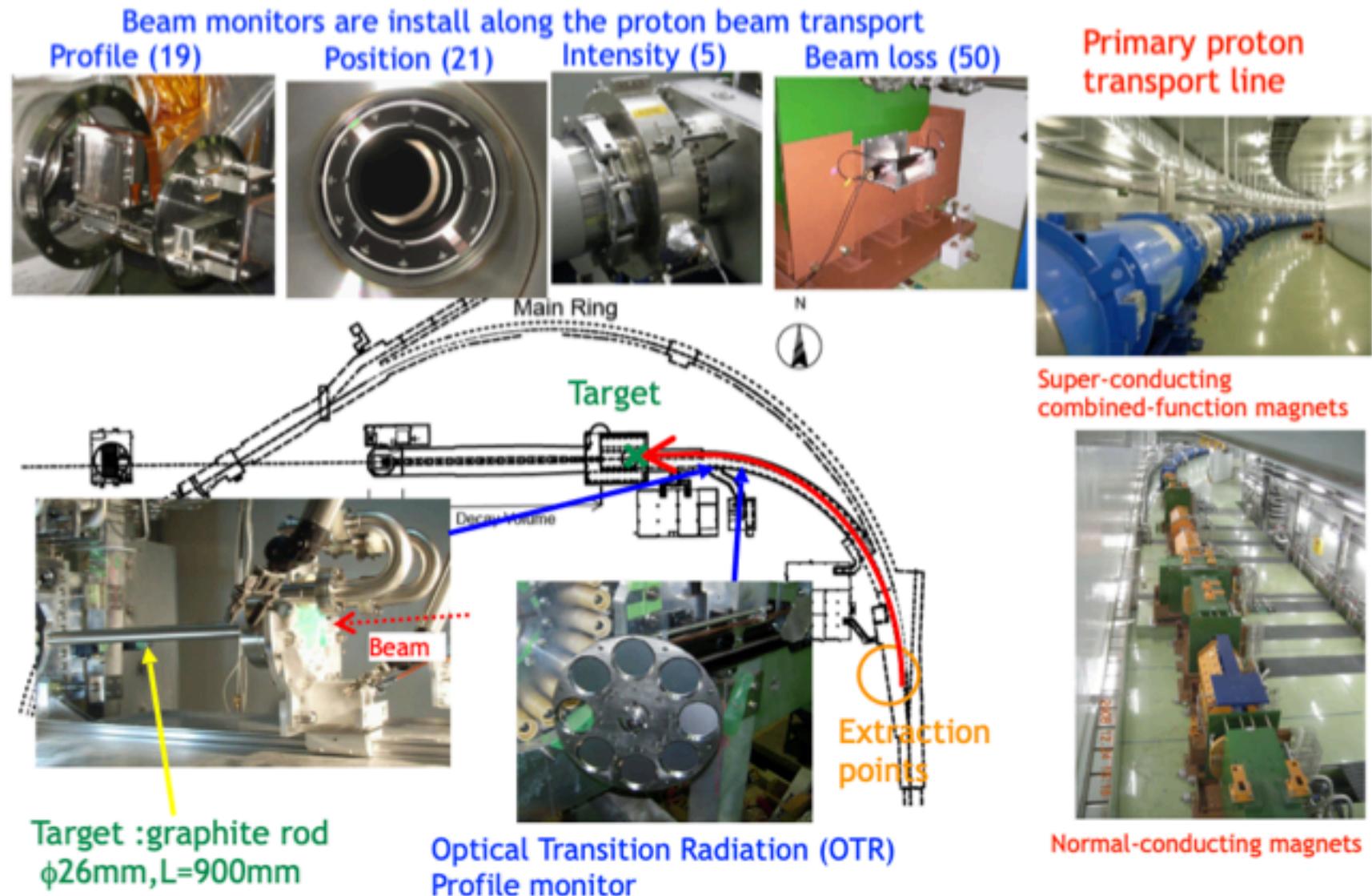


T2K (Tokai to Kamioka) experiment



- ▶ Precise measurement of ν_e appearance
- ▶ Precise meas. of ν_μ disappearance
- Measure CPV phase, contribution to mass hier. determ.

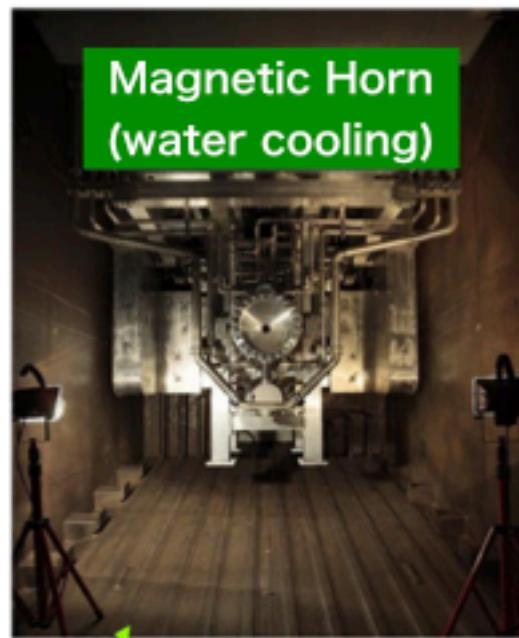
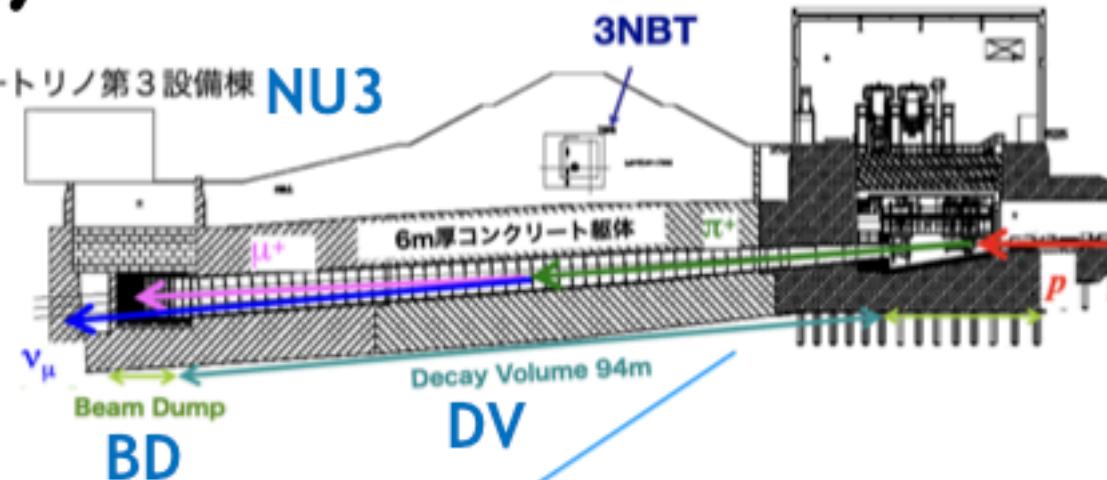
primary proton beam line for T2K



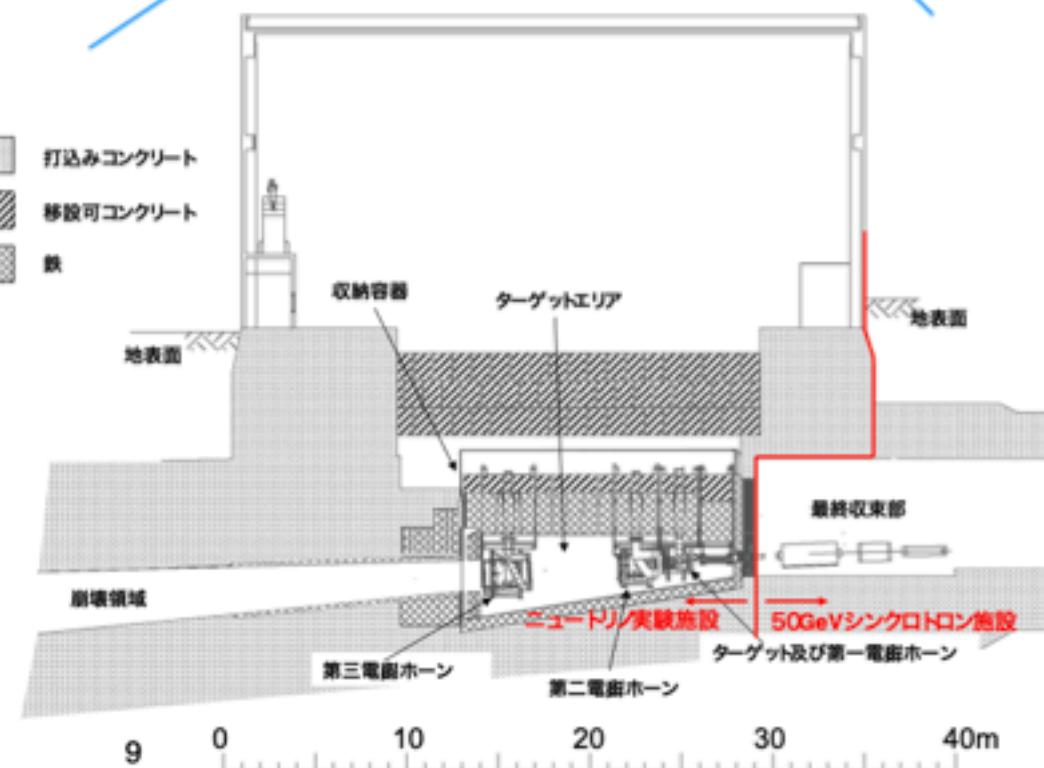
secondary beam line

Target Station

ニュートリノ第3設備棟 NU3

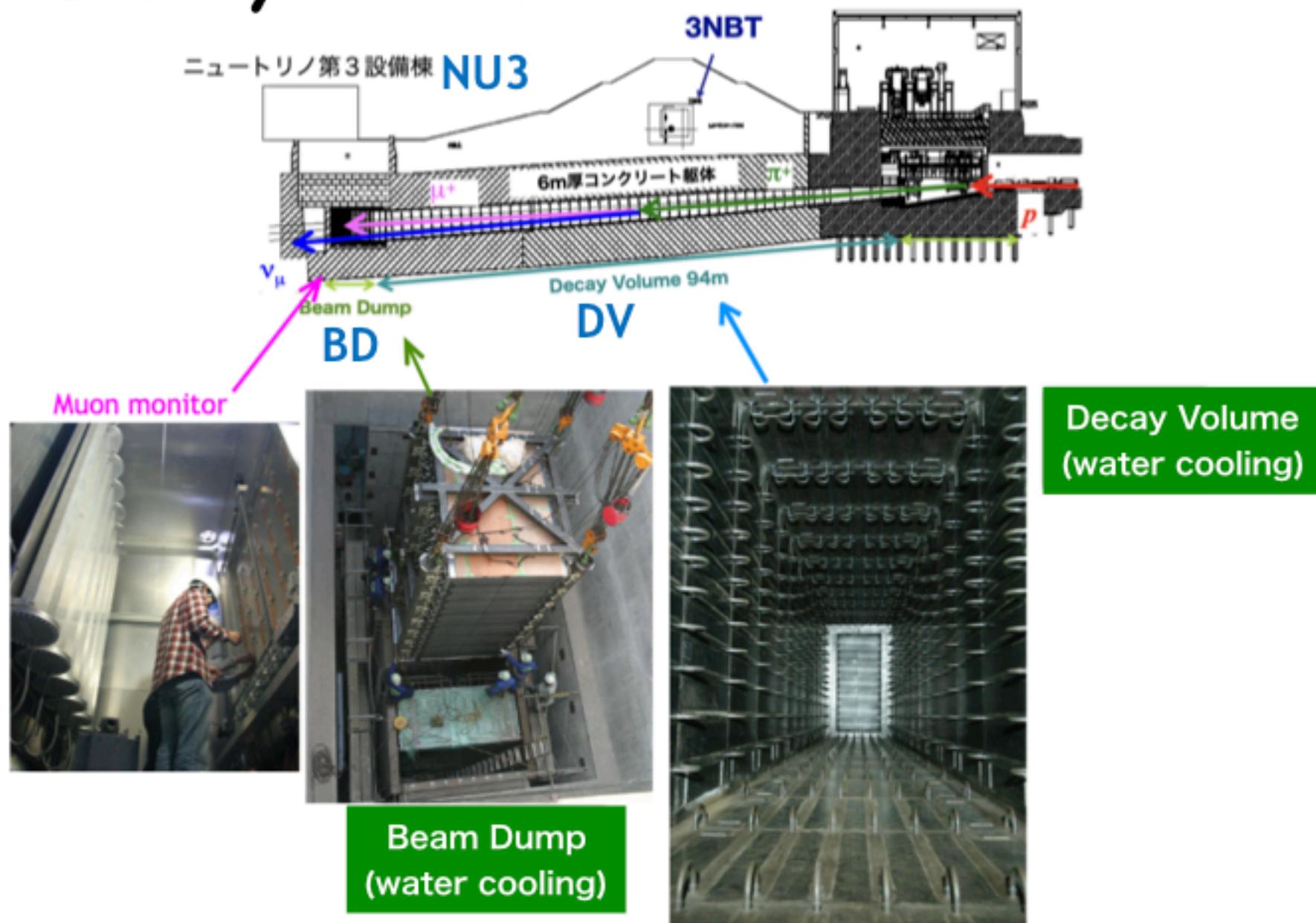


He vessel
(water cooling)



secondary beam line

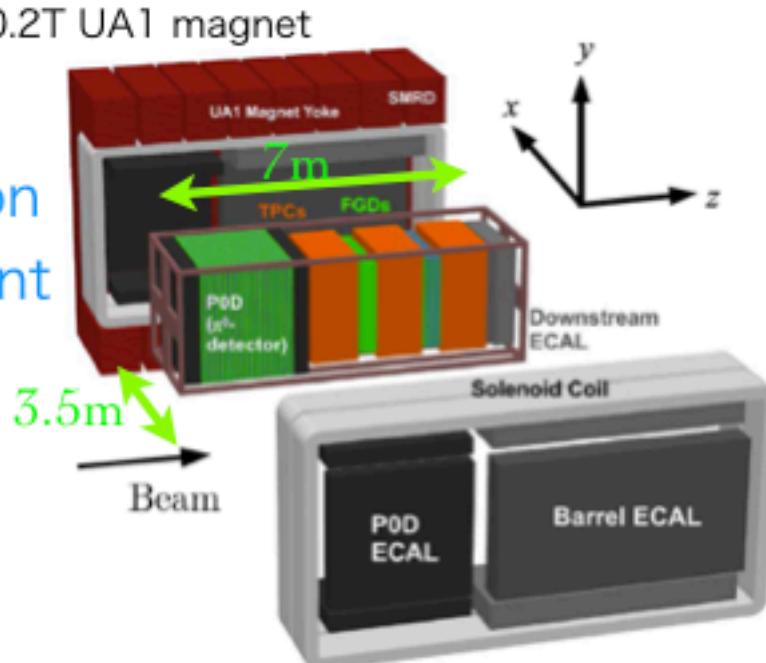
Target Station



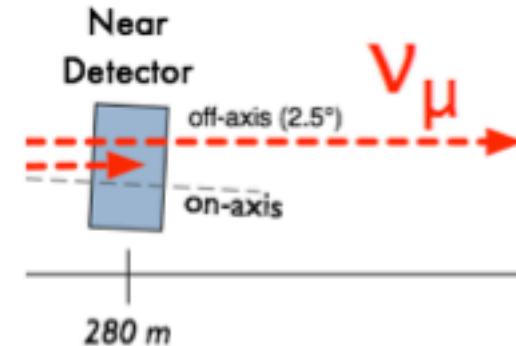
Near Detectors

ND280 @ Off-axis

- ✓ flux,
- ✓ interaction measurement

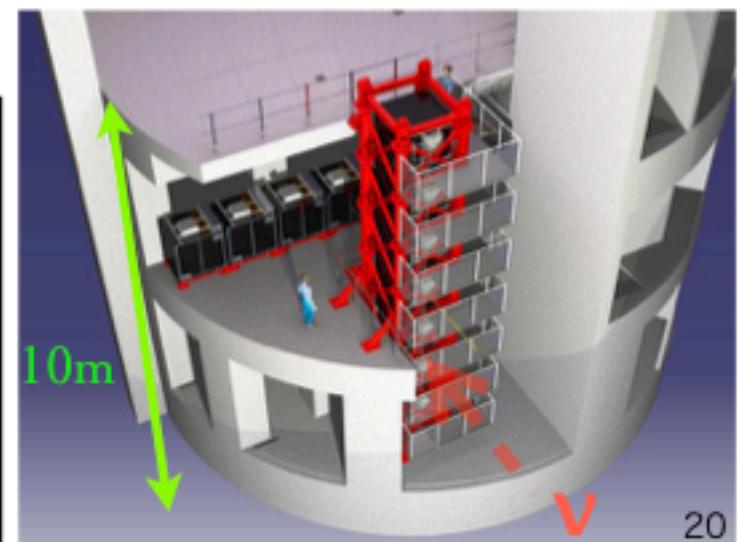


- FGD
 - scintillator bars target (water target in FGD2)
- TPC
 - momentum, dE/dx measurement



INGRID @ On-axis

- ✓ beam direction, intensity measurement



FERMIIONS

matter constituents
spin = 1/2, 3/2, 5/2, ...

Leptons spin = 1/2

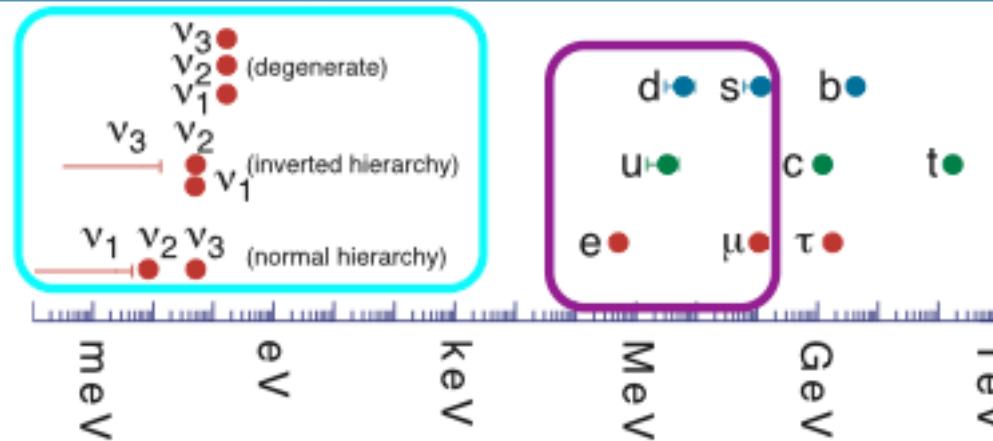
Flavor	Mass GeV/c ²	Electric charge
ν_L lightest neutrino*	$(0-0.13) \times 10^{-9}$	0
e electron	0.000511	-1
ν_M middle neutrino*	$(0.009-0.13) \times 10^{-9}$	0
μ muon	0.106	-1
ν_H heaviest neutrino*	$(0.04-0.14) \times 10^{-9}$	0
τ tau	1.777	-1

Quarks spin = 1/2

Flavor	Approx. Mass GeV/c ²	Electric charge
u up	0.002	2/3
d down	0.005	-1/3
c charm	1.3	2/3
s strange	0.1	-1/3
t top	173	2/3
b bottom	4.2	-1/3

ordinary
matter

neutrino
physics



“light”
flavor
physics,
hadron
nuclear
physics

Particle and Nuclear physics at J-PARC



- intense beams
- rare processes,
precise measurements
to observe New Physics

international collaborations

