加速器科学とニュートリノ

ACCELERATOR SCIENCE & NEUTRINO

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What kind of (new) neutrino experiment can be done at J-PARC?

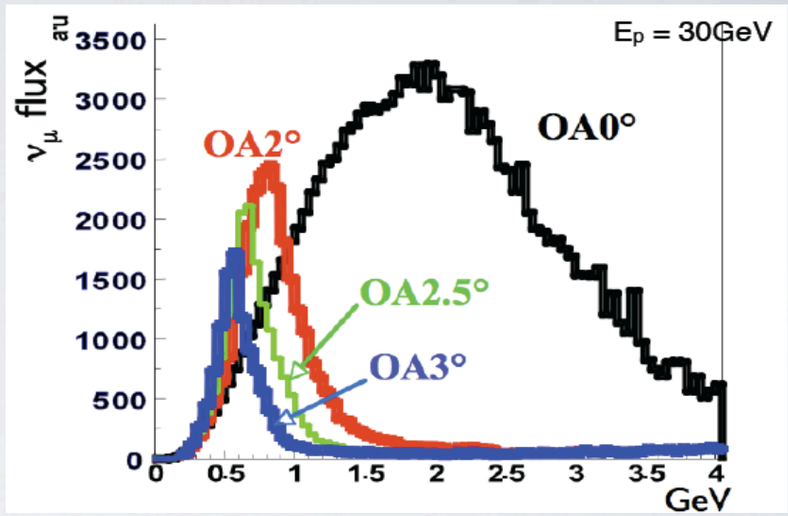
J-PARC

400MeV LINAC + 3GeV RCS +30GeV MR

Neutron/Muon source, Hadron EF, Neutrino EF

NEUTRINO PRODUCED AT J-PARC

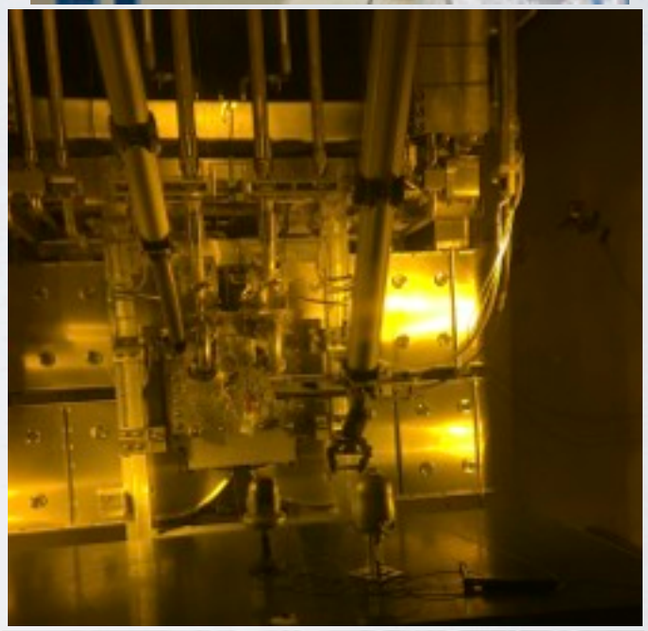
- Neutrino Beam-line
  - On-axis: ~2GeV WBB
  - Off-axis (2~2.5deg for SK): ~0.7GeV NBB
    - ~4deg at ground surface level



- Beam dumps as the neutrino source from pion/Kaon decay at rest.
  - MLF Hg Target: 25Hz 3GeV ~1MW (design)
  - Neutrino beam-line dump (30GeV ~0.3Hz, ~20% of 750kW)
  - Hadron beam dump (30GeV, ~0.2Hz slow ext, ~?% of ~100kW)
  - COMET beam dump 8GeV, ~0.2Hz bunched slow ext. ~?% of ~50kW

PRODUCING HIGH INTENSITY NEUTRINO BEAM IS KEY OF ACC. NEUTRINO PHYSICS

- Accelerator: Proton Intensity => Statistical Reach of Neutrino exp.
  - WR for p/pulse for synchrotron:
    Beam dynamics, beam diagnostics, beam-loss control
- Neutrino beam-line: Acceptable beam power => Statistical Reach of Neutrino exp.
  - Well controlled proton beam transport
  - Production Target/Beam window/dump: determines the ultimate beam power.
  - Secondary beam optics (secondary particle focussing)
    - Is there room to improve nu flux / proton?
    - Is there new method of secondary particle focusing?
      - Is it possible to focusing for continuous beam from LINAC?
- Treatment of radio-active material
  - Remote maintenance (Mechanical engineering): Robot/Drone technology?
  - Treatment of tritium:
    Pain in the neck for all the high intensity proton facilities.
    It may become bottleneck.

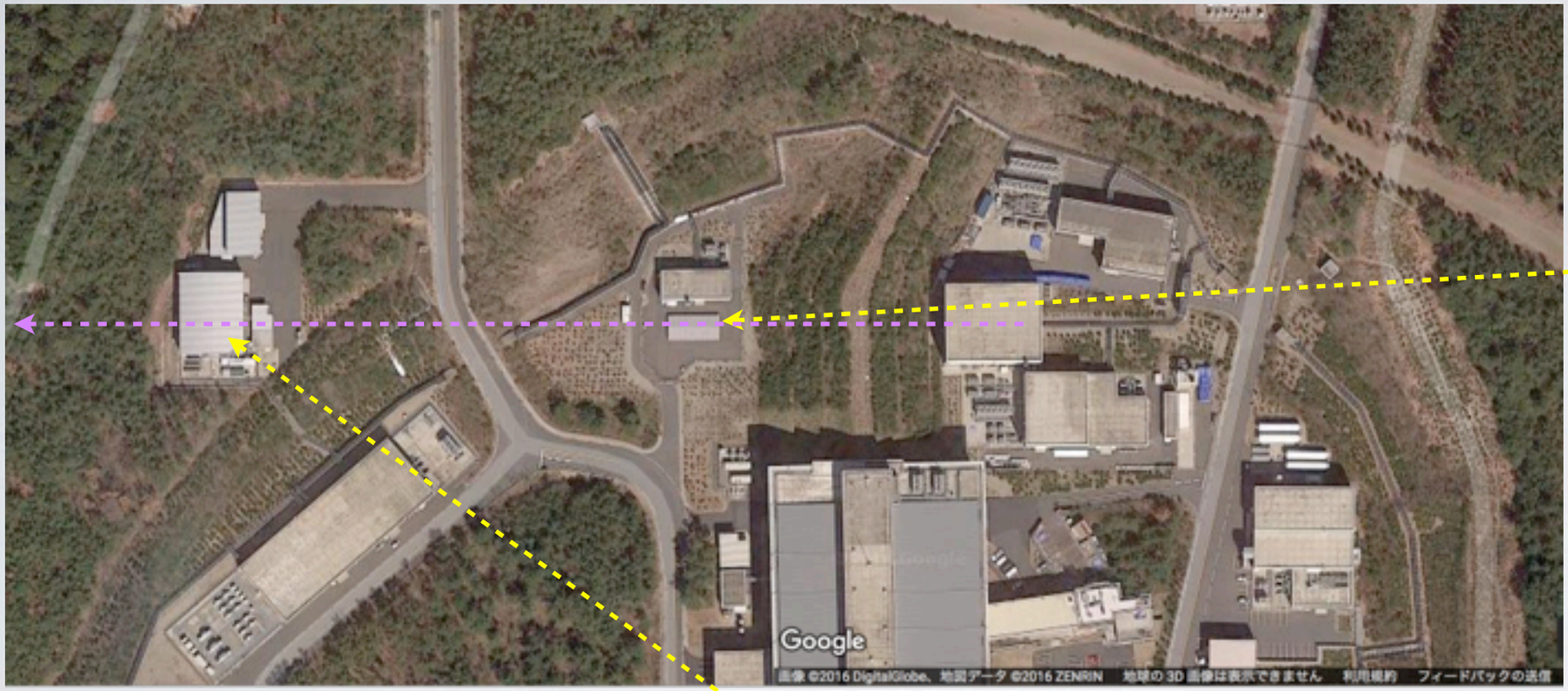


NEUTRINO EXPERIMENTAL ACTIVITIES

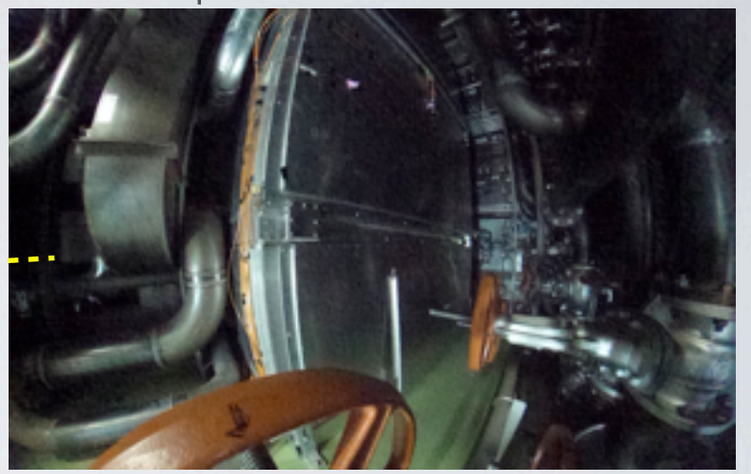
- Neutrino experimental facility
  - Running LBL oscillation exp. : E11,E64 (T2K)
  - Proposal/In preparation: P58(LBL w/ HK), E61(NuPrism)
  - Test experiments: T35(LR), T39(Mizuche), T59(WAGASCI), T60/T65(Emulsion)
- Hadron experimental facility
  - T32 (LAr detector)
- Material & Life science Facility
  - E56 (JSNS^2), (LOI for another experiment was submitted to PAC)

- Is there room for more (new) neutrino experiment at J-PARC?

NEUTRINO EXPERIMENTAL FACILITY AT J-PARC

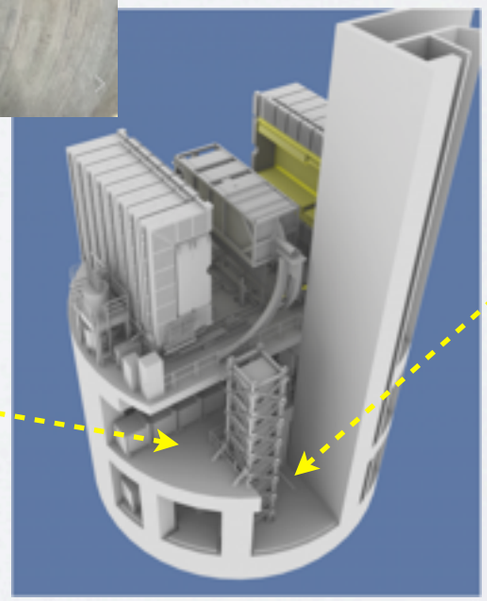


- MU pit

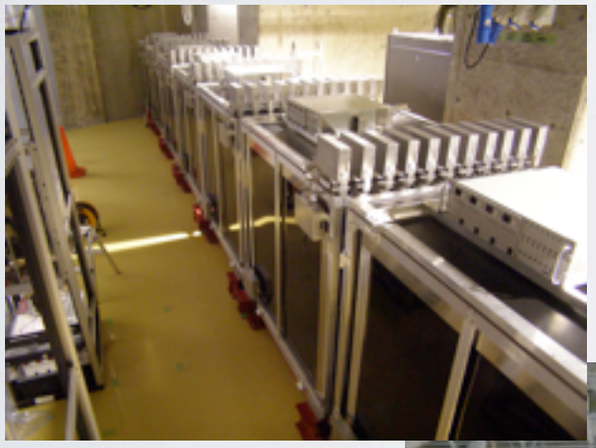


- NM-B2

- NM-1F

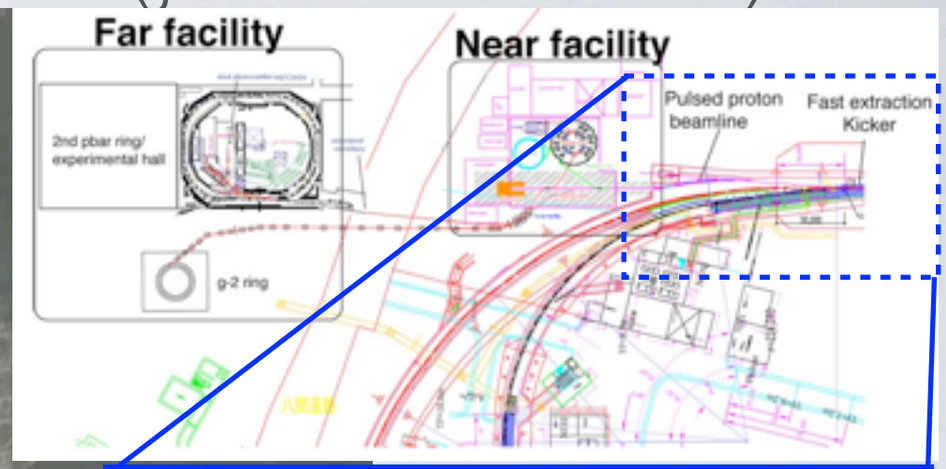


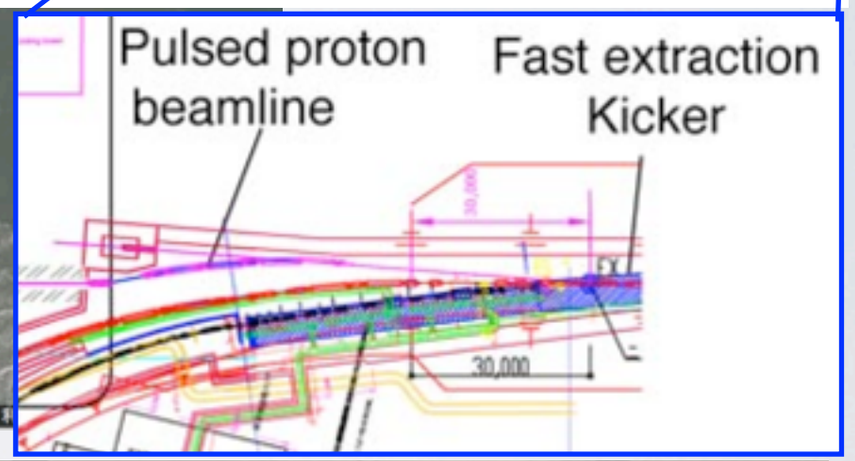
- NM-SS



IS THERE ROOM FOR EXTENSION?

- Another FX beam-line used to be proposed.(J-PARC P20 LOI)





QUESTIONS AT LAST

- Is it interesting to considering another neutrino beam-line from J-PARC?
  - What kind of neutrino beam can enhance the neutrino physics? (NBB?, WBB?)
- Neutron community is considering the 2nd target for RCS for Material/Life-science in future.
  Is it can be usable for neutrino physics, too?
- Accelerator people shows the idea of 9GeV 9MW (1% duty) LINAC after SuperKEKB. (http://dx.doi.org/10.7566/JPSCP.8.011013)
  Is it possible for neutrino physics to give new breakthrough?