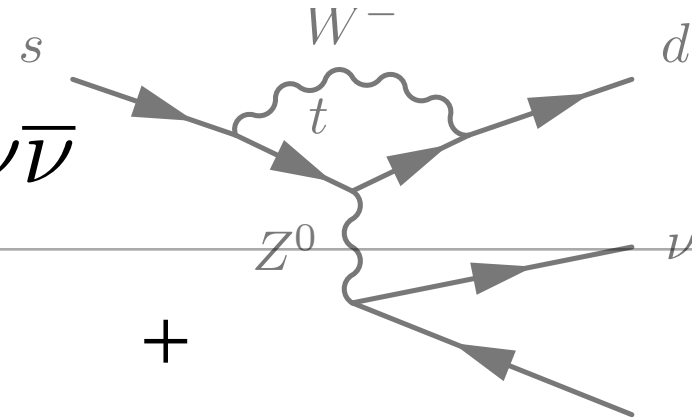
The KTeV CsI Crystals

Taku Yamanaka
Osaka Univ.
Sep. 6, 2008 @ KTeV Collaboration Meeting

J-Parc E14 - $K_L \to \pi^0 \nu\bar{\nu}$



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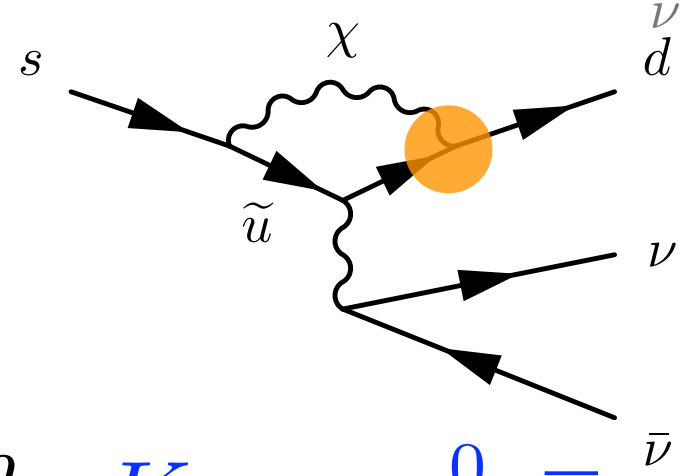
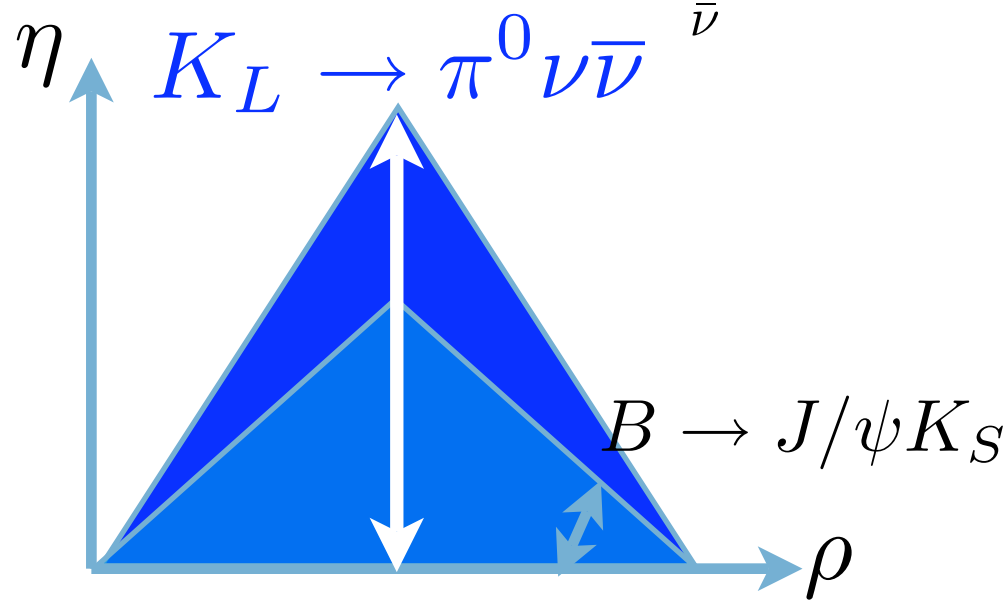
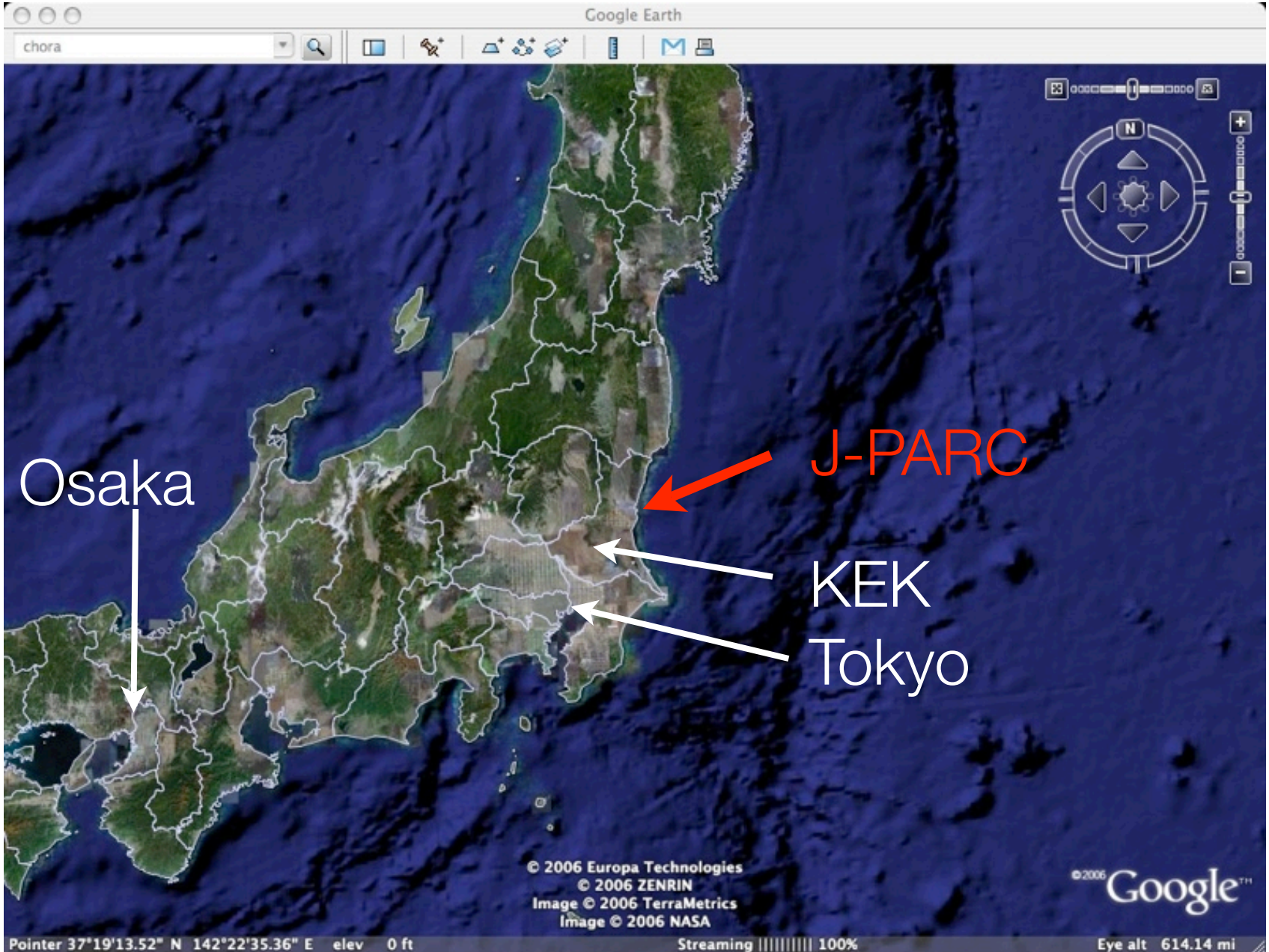


- Physics
  - Measure the imaginary part of CKM η and probe new physics beyond the standard model.
- Goals
  - Step 1(E14): First observation of the decay
  - Step 2: Measure BR to <10%



J-PARC


Google Earth
chora
Osaka
J-PARC
KEK
Tokyo
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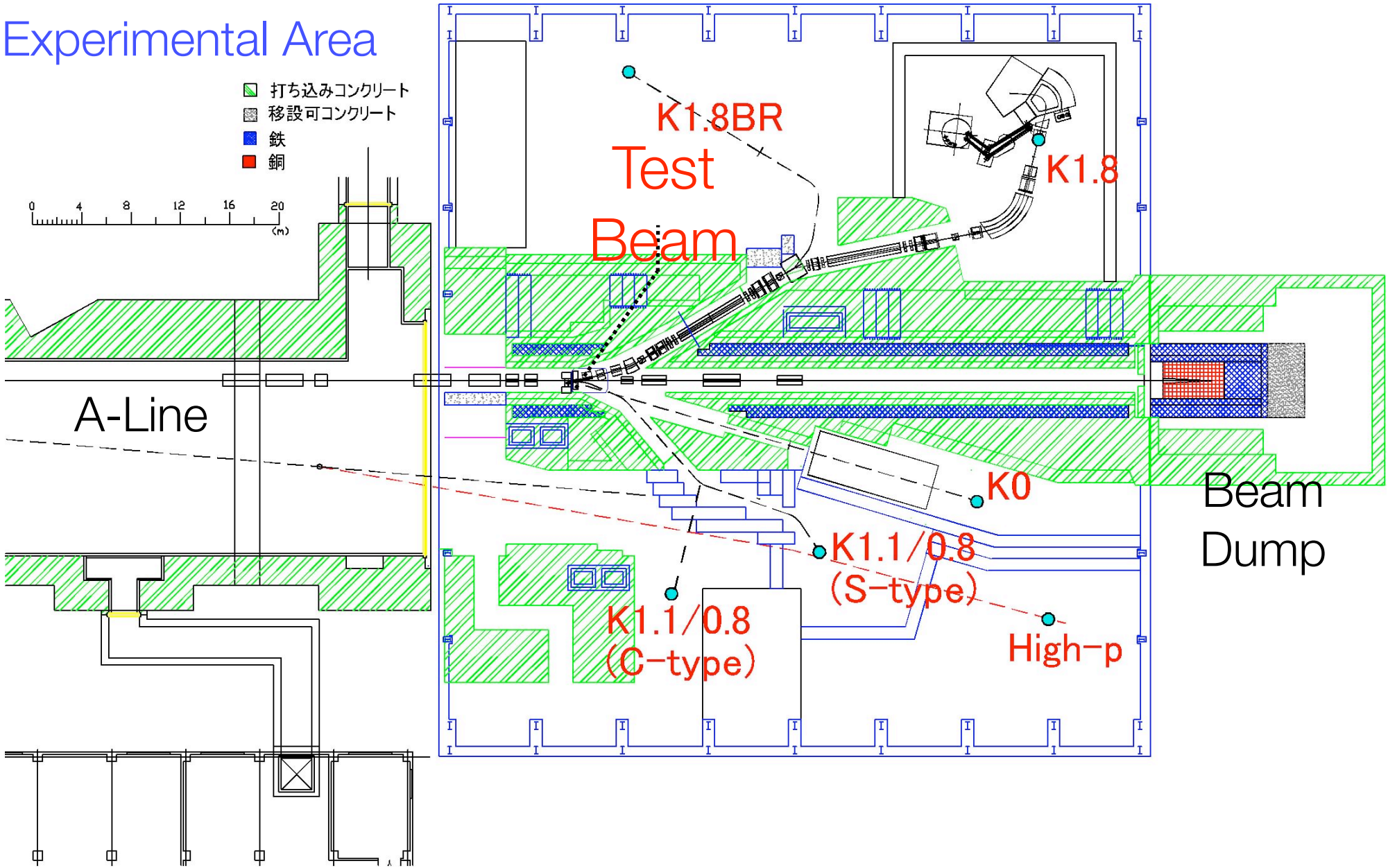
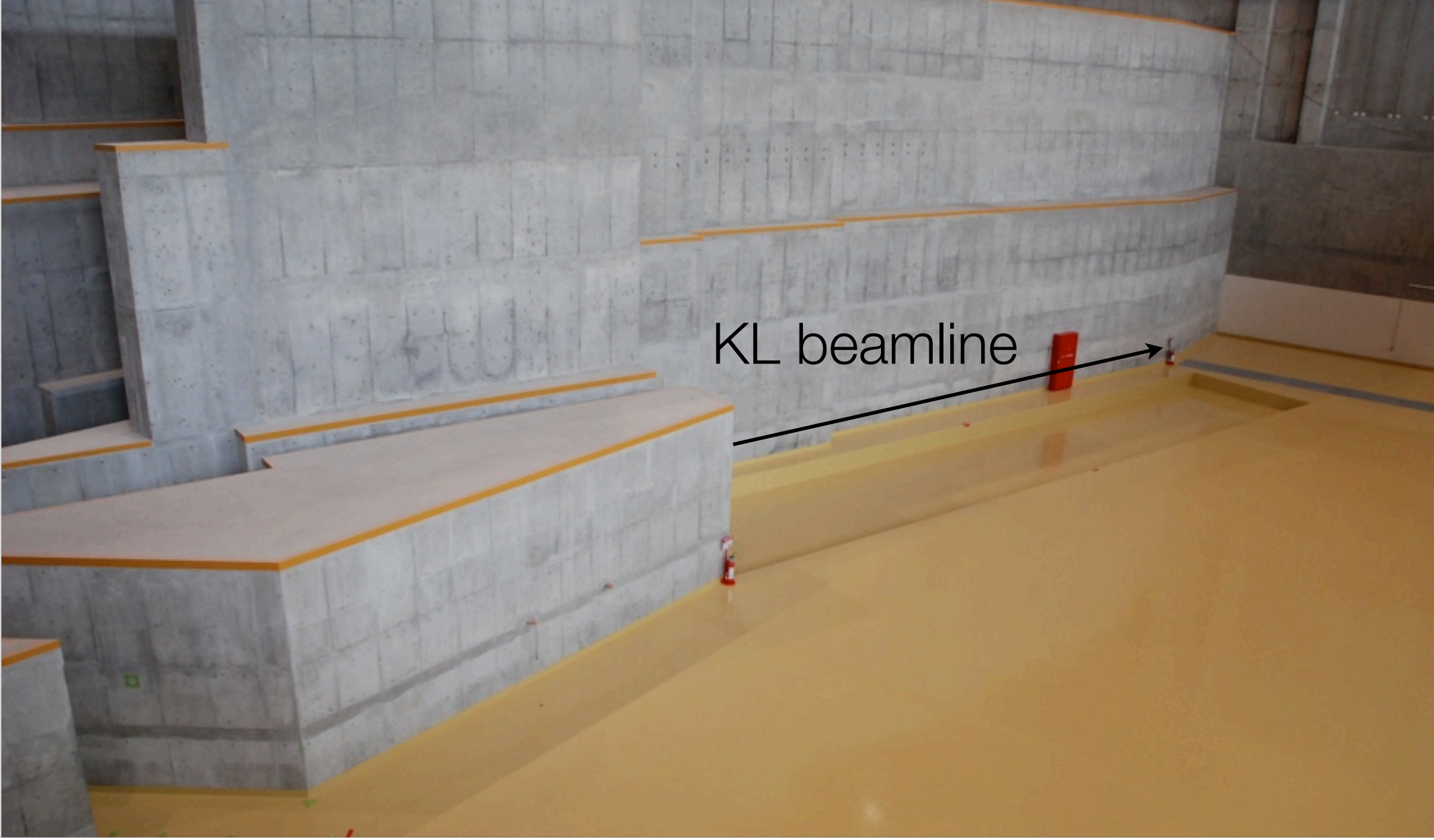
Pointer 37°19'13.52" N 142°22'35.36" E elev 0 ft
Streaming 100%
Eye alt 614.14 mi

J-PARC 50GeV Ring
and our experimental hall

Feb. 2008

Plan view of Hadron Experimental Hall





KL beamline
in the Experimental Hall

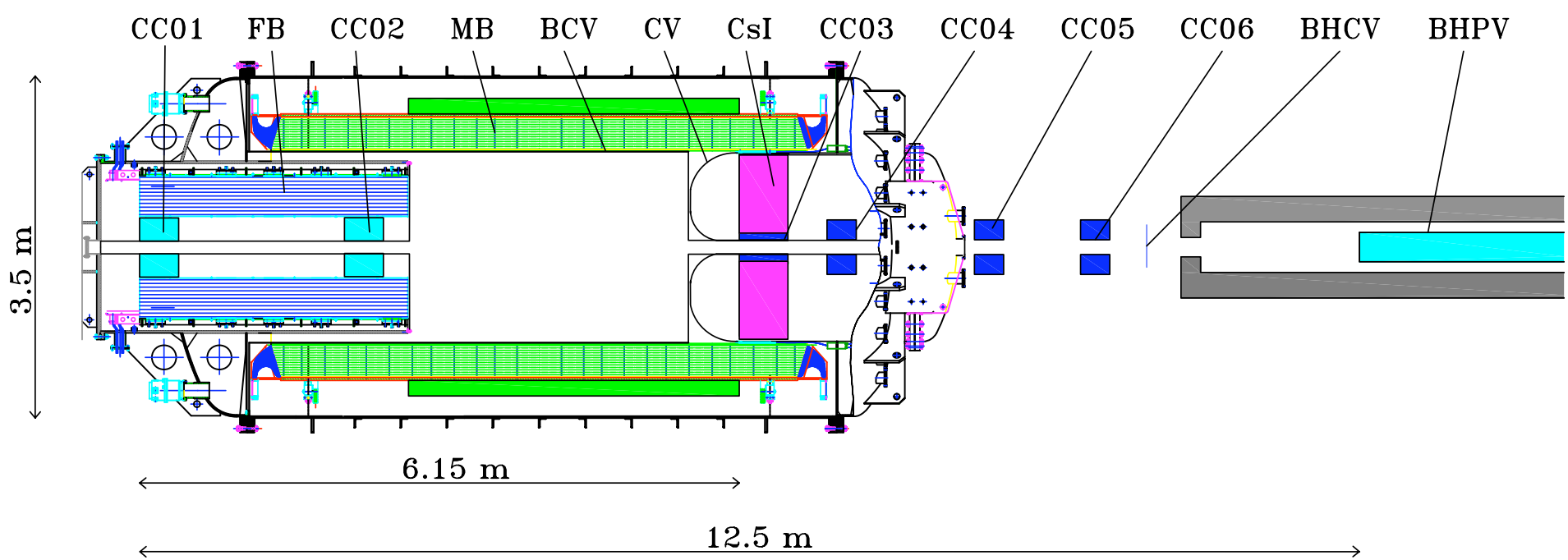
July 2007

E14 Collaborators with the detector drawing

May 2008

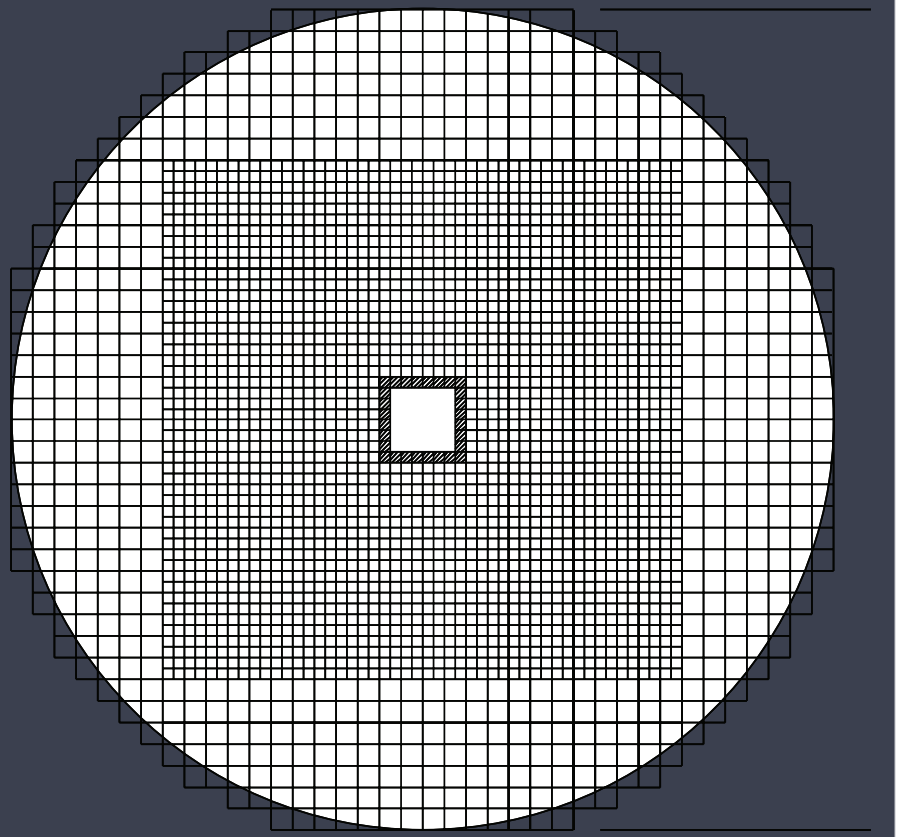
E14 Detector

- CsI : 7cm square x 30cm --> 2.5cm square x 50cm
- New photon veto in the beam
- Enhanced photon veto
- Wave form digitization



KTeV crystals

- Performance
  - >20p.e./MeV
  - dE/E ~ 2%/sqrt(E(GeV))+0.6%
  - uniformity <5% over full length
- E14 requirements
  - gain : $>10^4$ @ 1500V
  - rate dependence <1%@0.4uA
  - rad. dose: 0.2krads

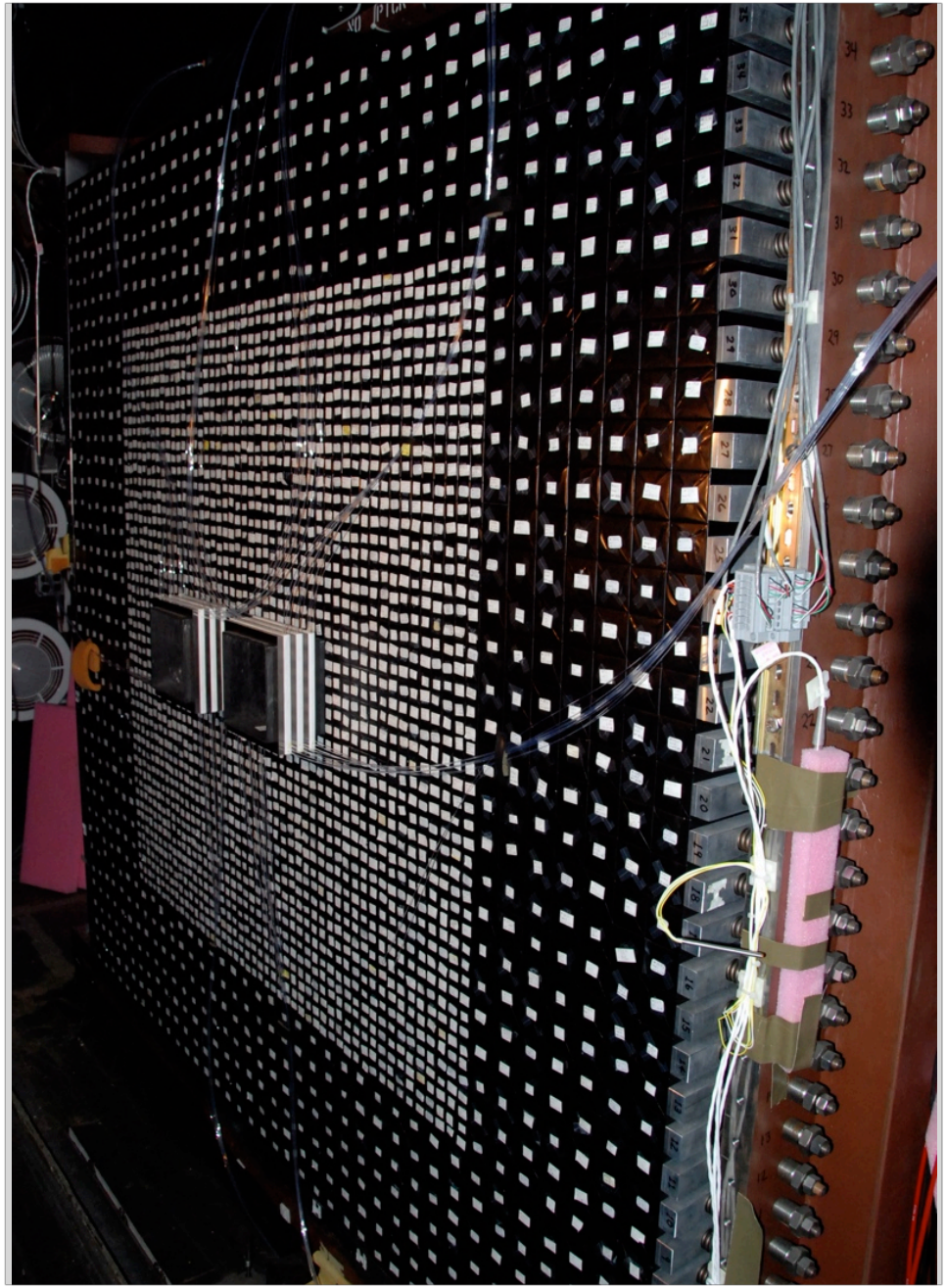


Transfer of KTeV CsI crystals

- Wah is on E14, working on the CsI readout system, etc.
- Logically, “ownership” was transferred from Fermilab to University of Chicago (Wah) in Nov. 2007.
- Physically, the crystals are shipped from Fermilab to Osaka for testing, repairing and storage.
  - 2232 + spare small crystals, and ~650 large crystals go to Osaka
  - Rest of large crystals go to Chicago
- In 2010, the crystals will be shipped from Osaka to J-PARC for stacking.

Unstacking/packing/shipping the crystals

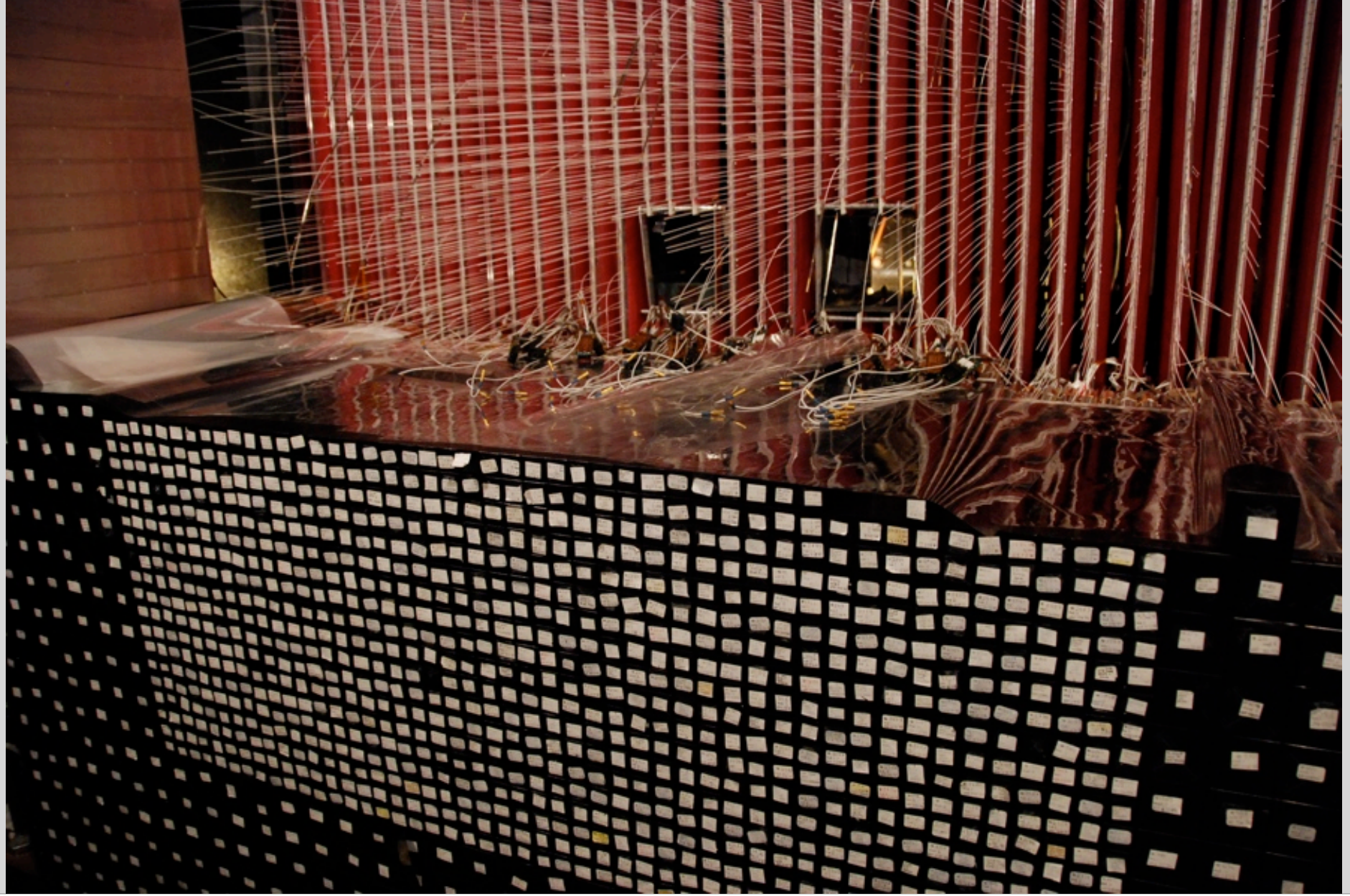
- Each crystal is
  - placed on a 1cm thick floating glass plate
  - vacuum sealed in a humid-tight bag (ESD bag)
  - sandwiched between Al angles with rubber plates inside
  - placed in a specially cut foam inside plastic shipping container
- Each container holds 48 small crystals or 24 large crystals
- ~10 crates / batch, with 4 week cycle
  - ~8 days to unstack/pack, 1 week to ship, ~3days@Osaka, ~1 week to send back, + margin
- March ~ December 2008



The KTeV CsI Calorimeter (2007 / 2005)

and now, it looks like this

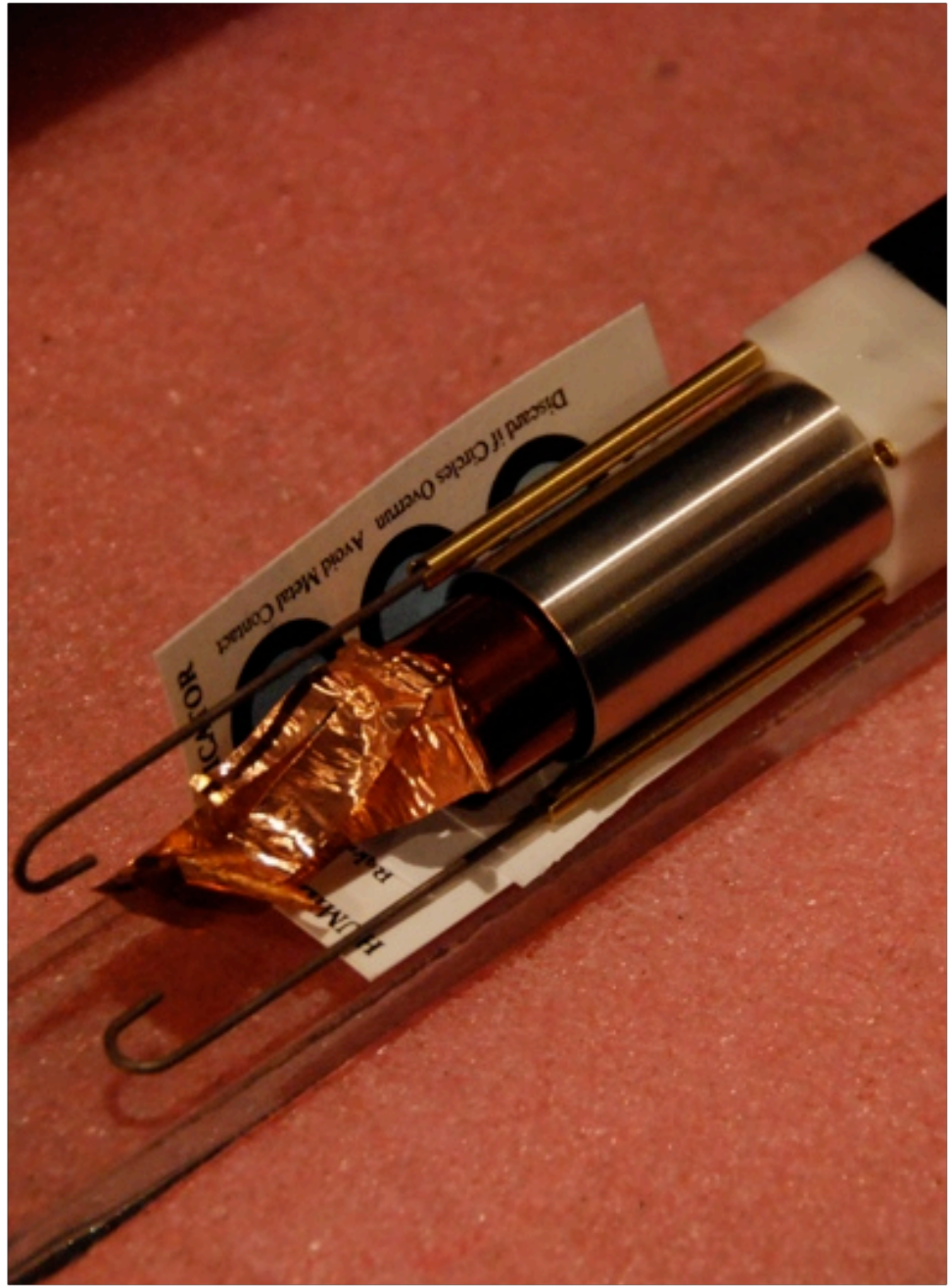

DON'T
PANIC!



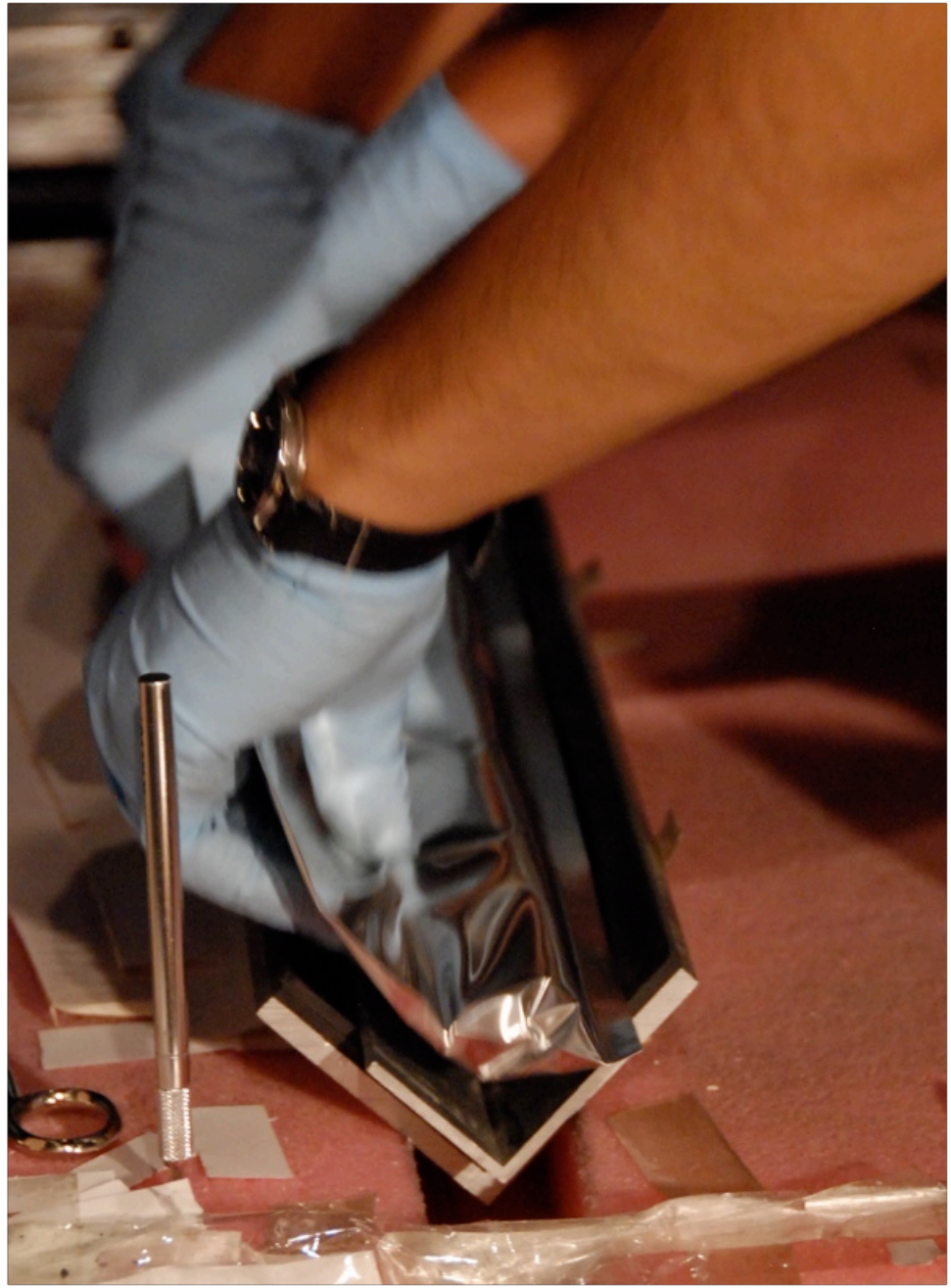
Sep. 5, 2008

In the morning (7:30~), load Al angles and glass plates for the day.

Remove the base,

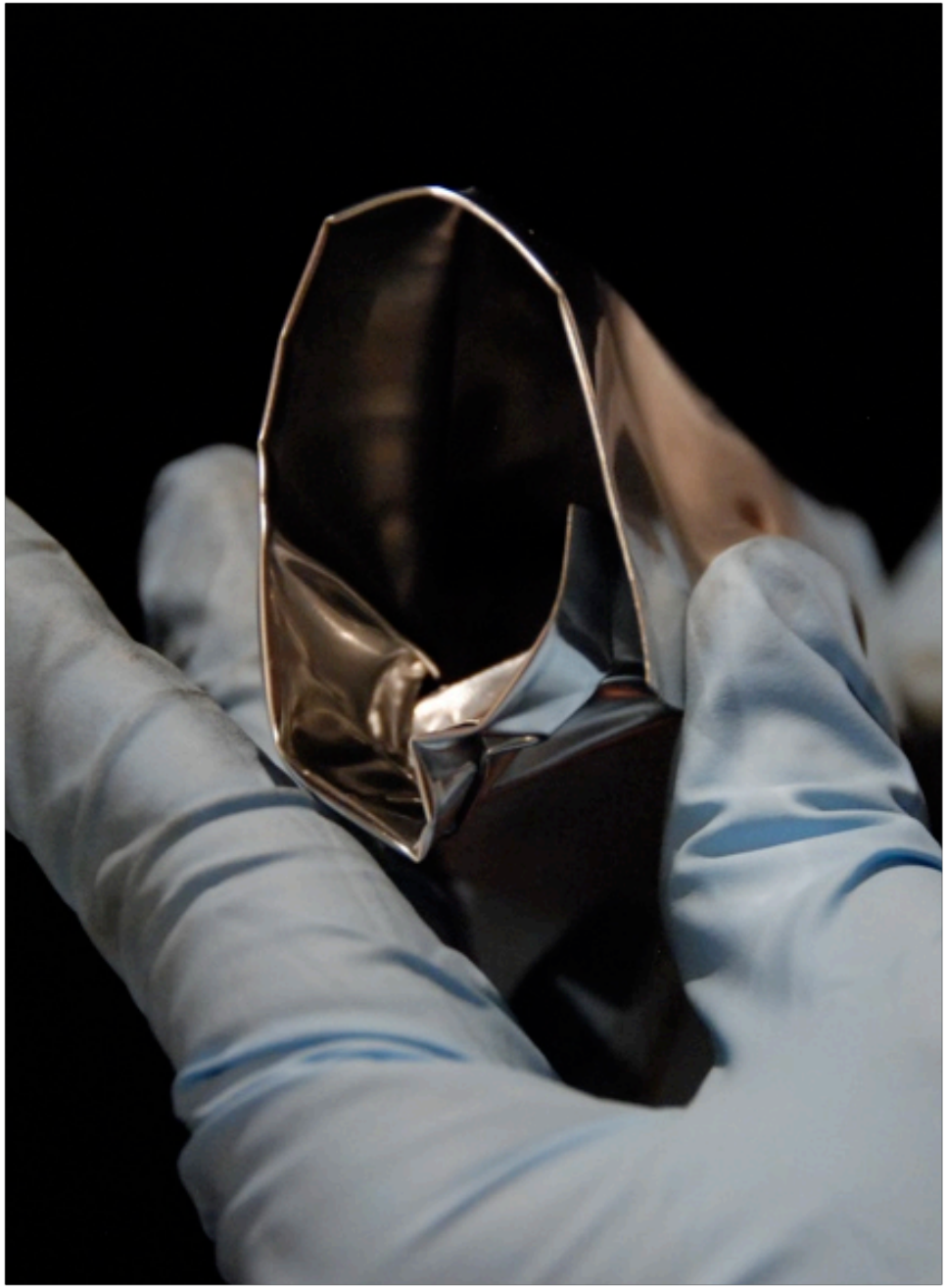


open up ESD bag with a broom stick,
place humidity monitor and paper shim underneath the can



put the crystal + glass plate in ESD bag,
place it on Al-angle guide to line up the crystal and the glass plate correctly

vacuum seal

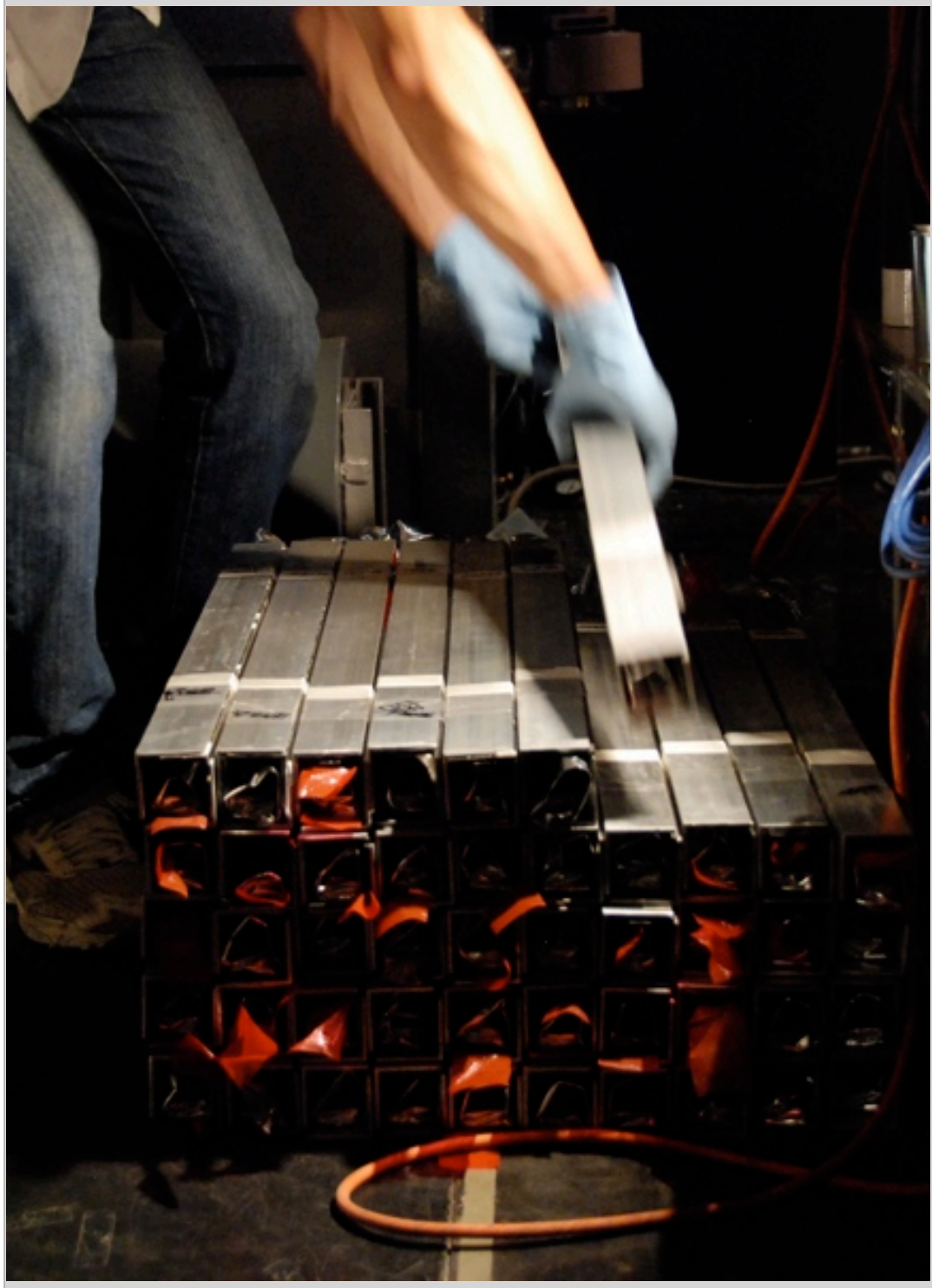


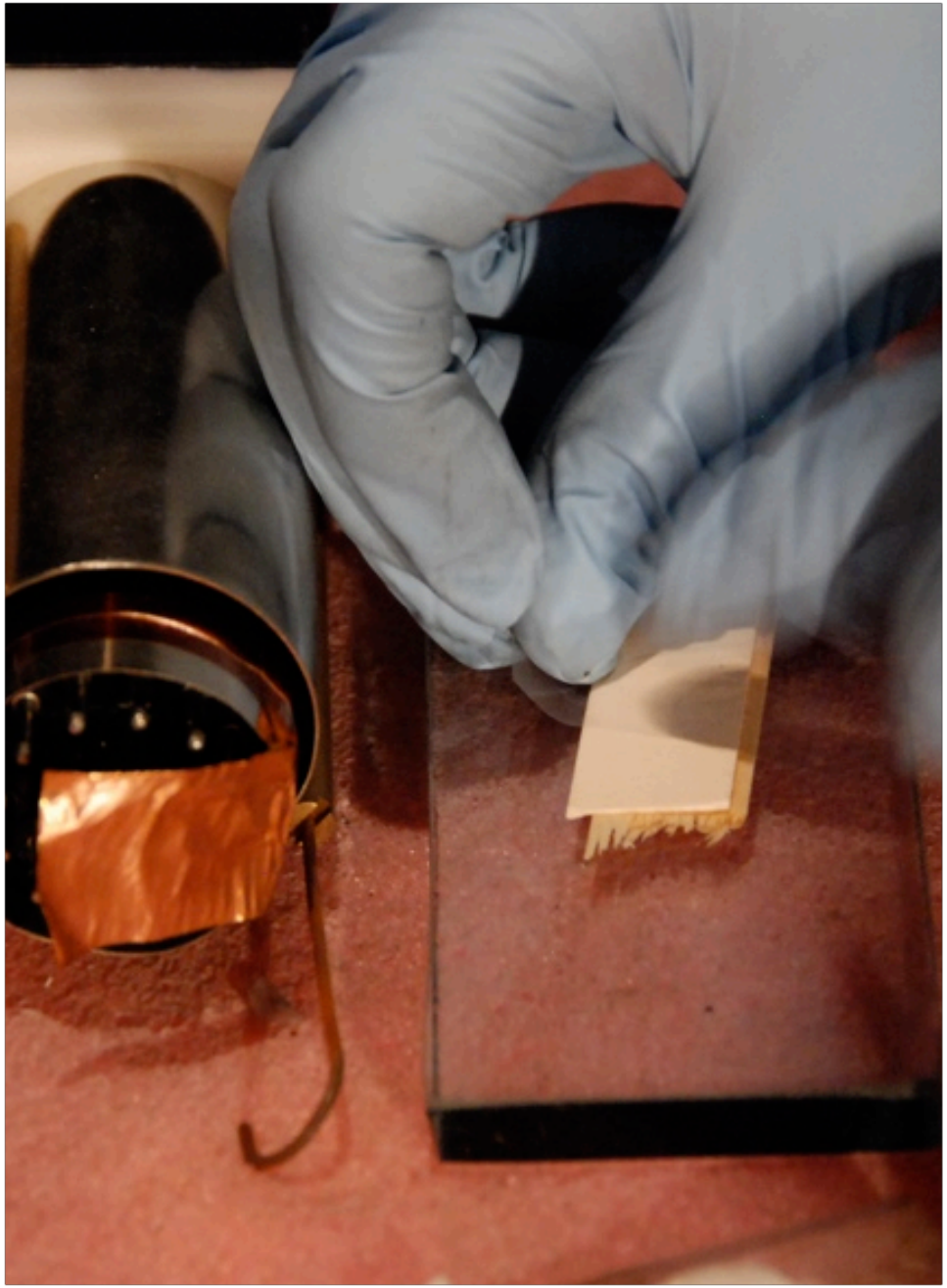
wrap excessive ESD bag, and insert the glass plate into rubber groove on Al angle

Cover with Al angles, tape them, and write ID number on it.

Time

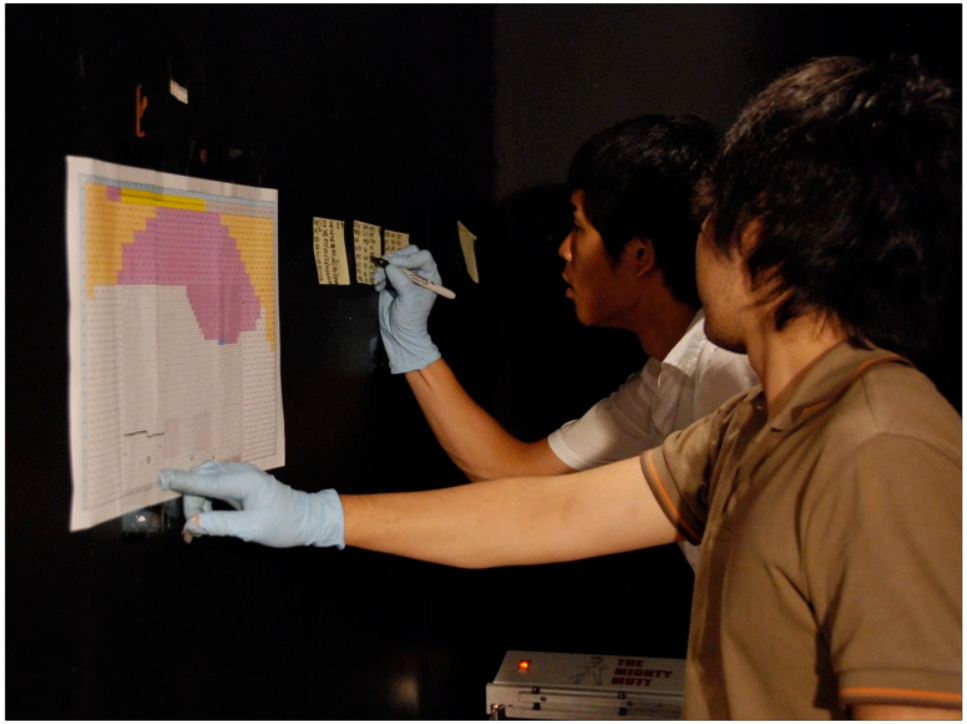
- Processing 16~18 small blocks per hour (3’45”~3’20”/block)
- with 2 people in front, and
- 1 person going back and forth to unplug DPMT cards, prepare next block, supply Al angles and glass plates, etc., anything to make the process run smoother.



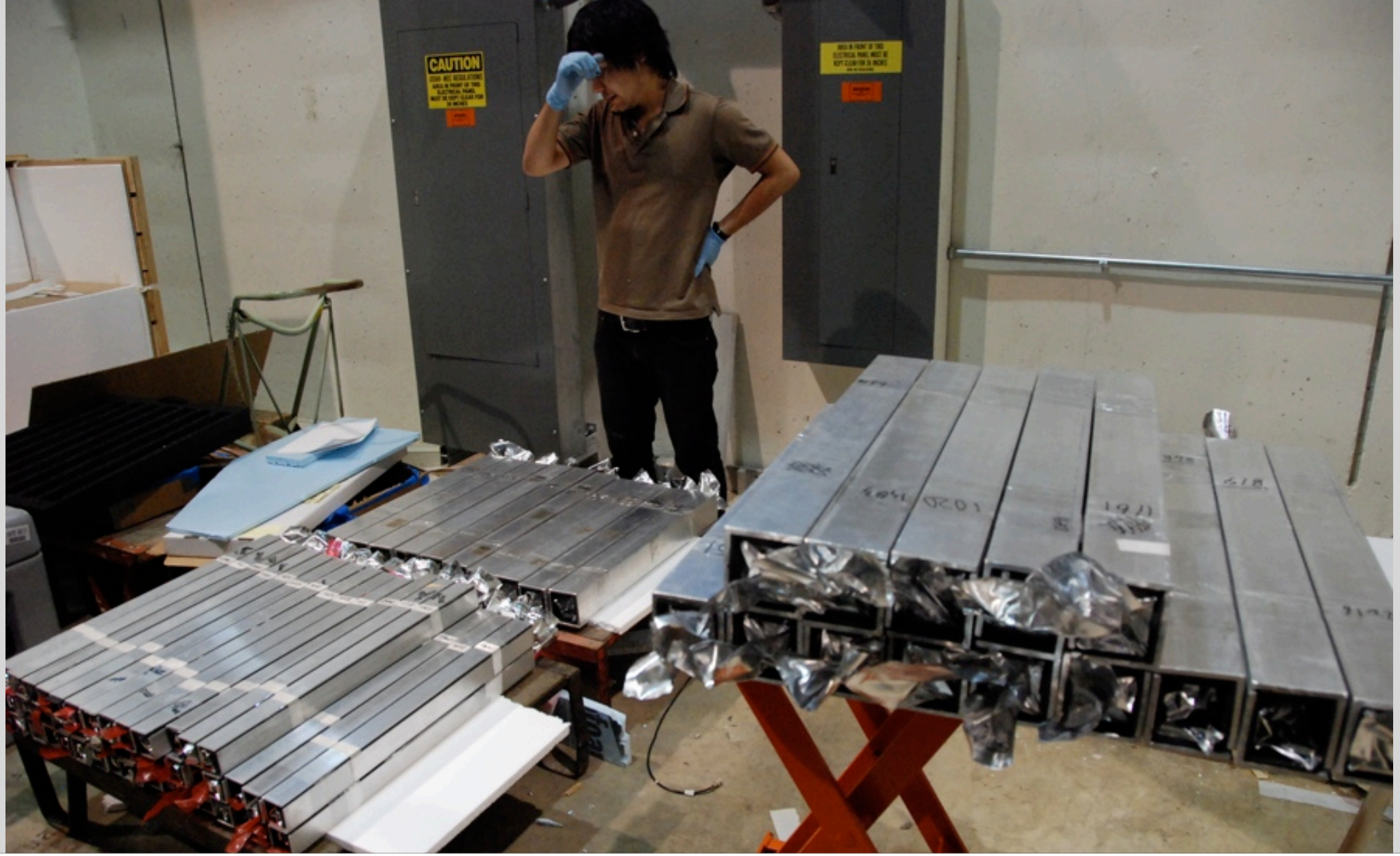


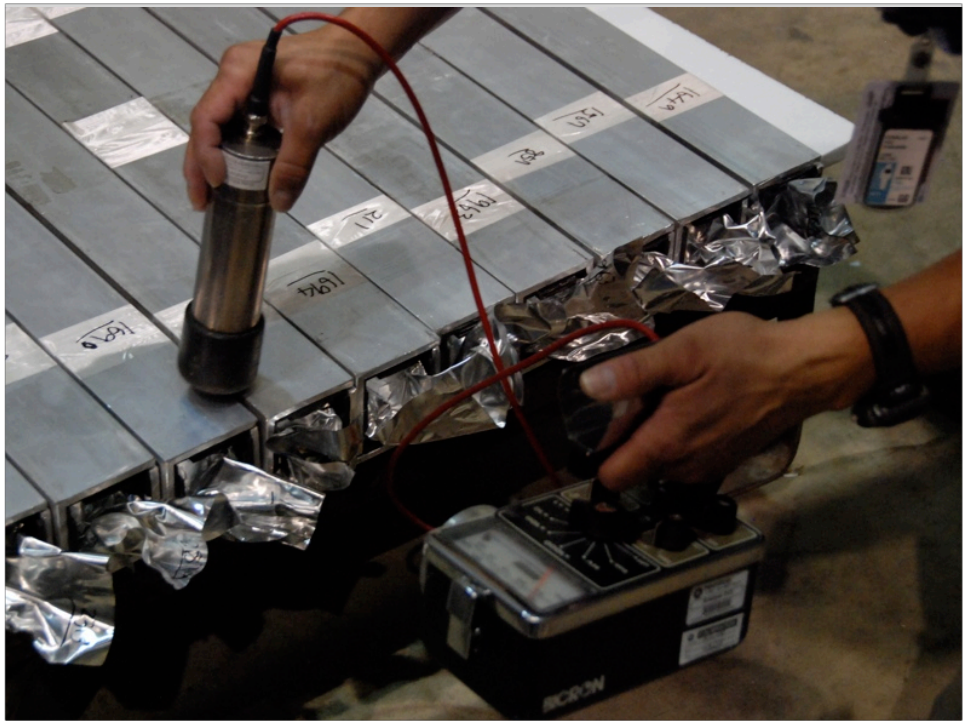
For LARGE crystals, thicker shim

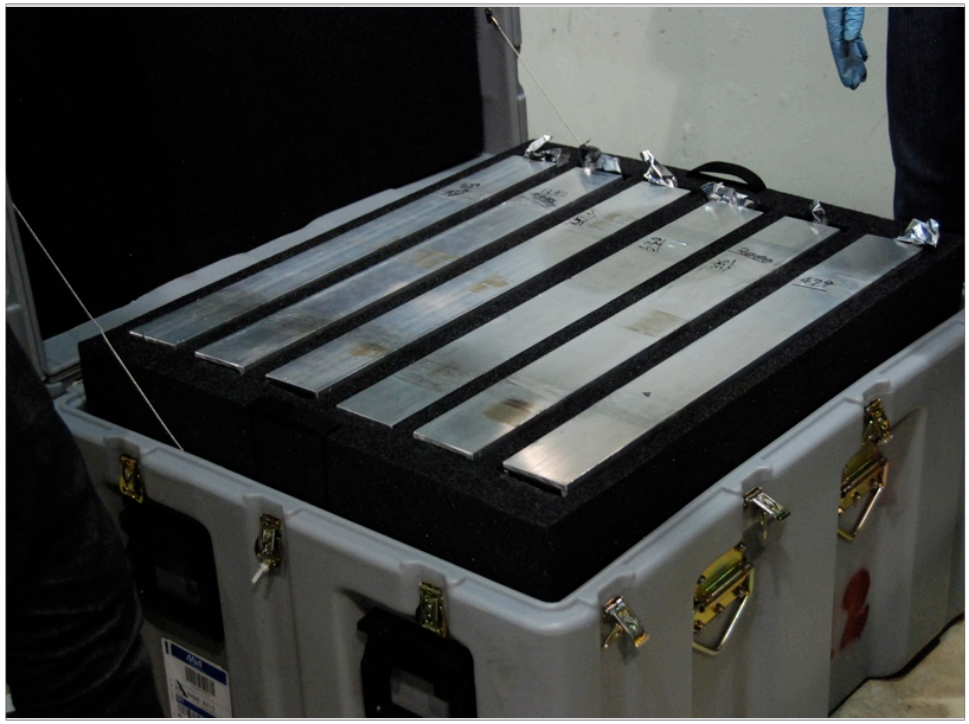
Special wooden block to put ESD bag all the way in without scratching it



At the end of the day, check ID numbers, take out the crystals,


CAUTION





Have a rad survey, and pack the blocks in crates.

Email from Bruce

- Taku: that would be too difficult for me to watch!

  Cheers,

  Bruce

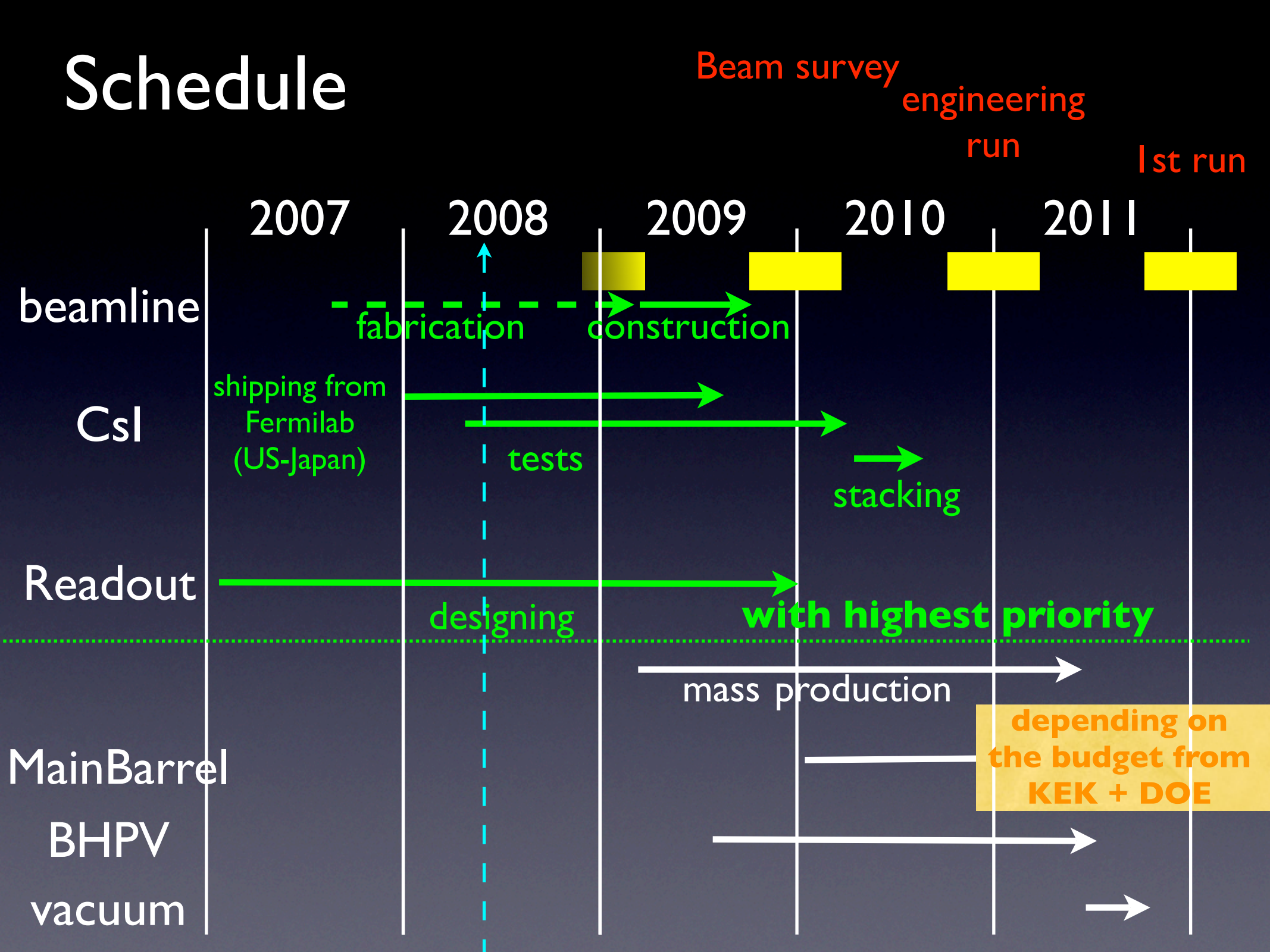
Many Thanks to:

- BobT, Ron, Greg Bock, Hugh Montgomery, Young-kee Kim, Pierr, Yoji Totsuka, Atsuto Suzuki for making the transfer to reality at various levels,

- The building manager for keeping the KTeV Hall and the block house even after the experiment is over and people have left,

- Hogan and Ray Safarik for helping out the unstacking/shipping process

Schedule


Beam survey
engineering run
Ist run
2007
2008
2009
2010
2011
beamline
fabrication
construction
CsI
shipping from Fermilab (US-Japan)
tests
stacking
Readout
designing
with highest priority
mass production
depending on the budget from KEK + DOE
MainBarrel
BHPV
vacuum