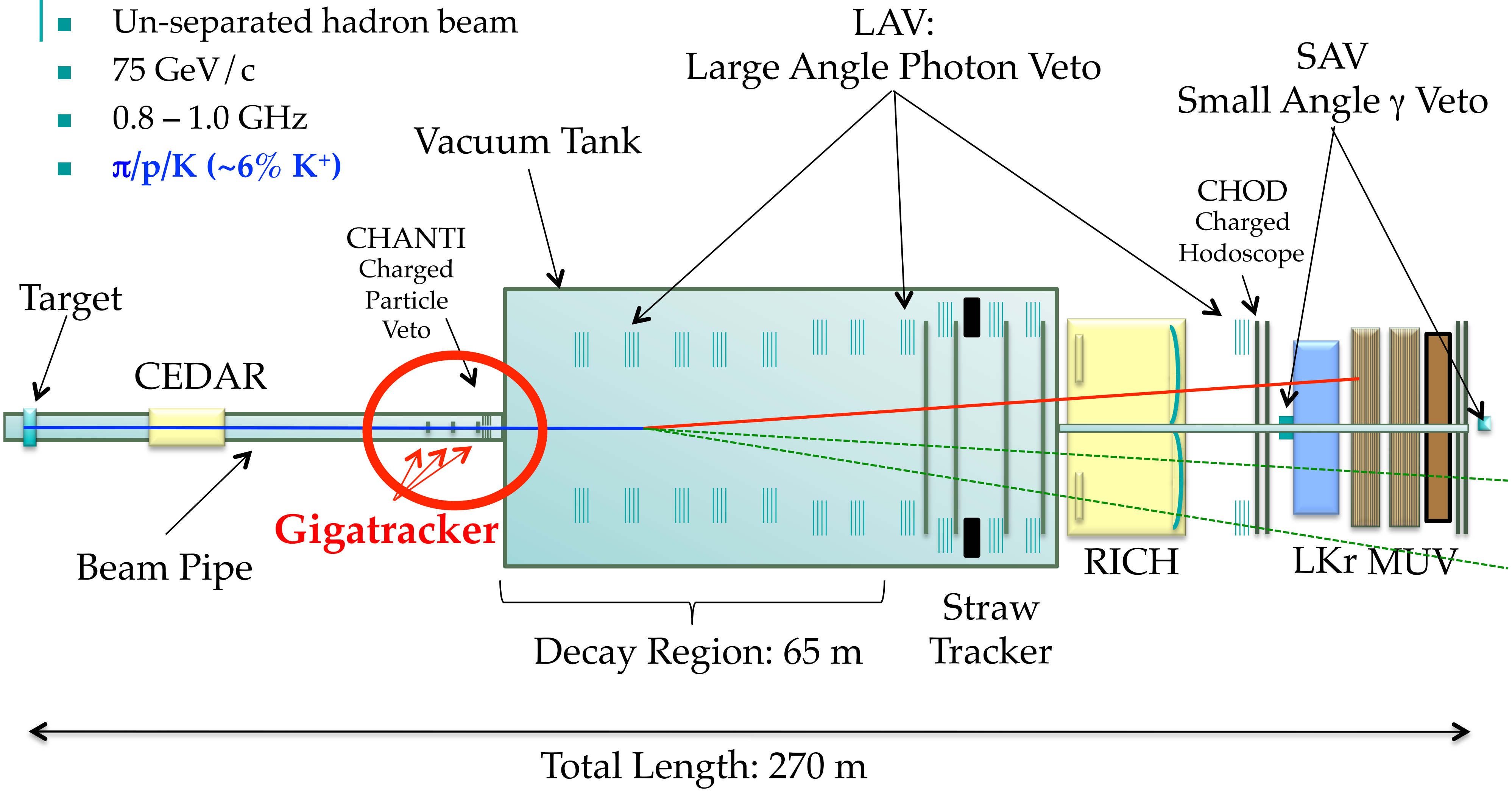
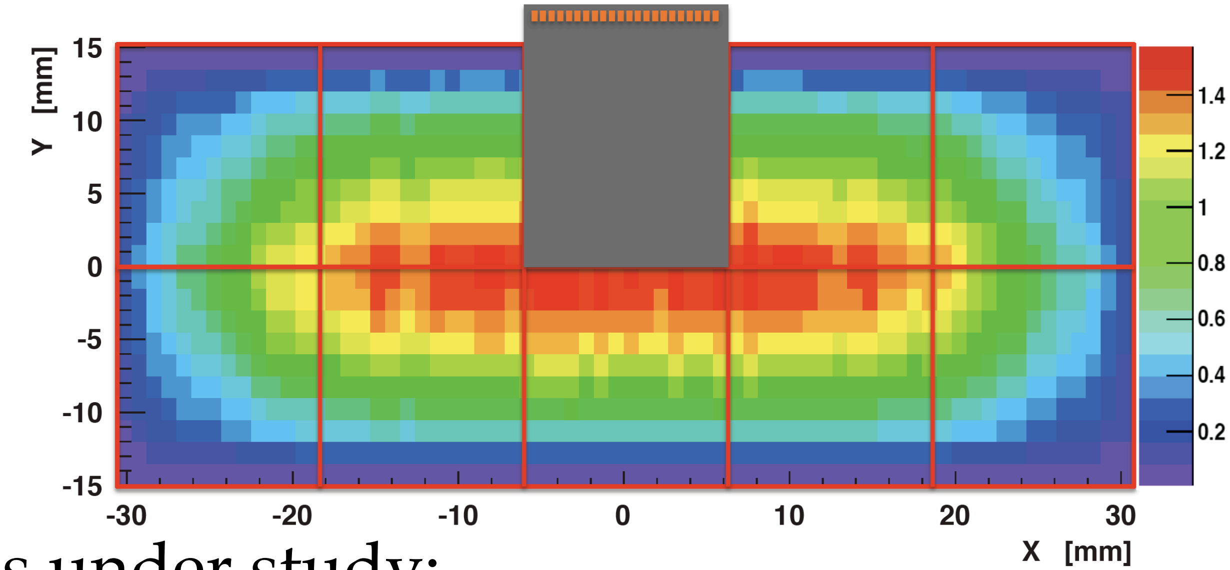
NA62 detector layout

- Measurement of $K^+ \rightarrow \pi^+ \nu \bar{\nu}$ at the CERN SPS
- Un-separated hadron beam
- 75 GeV/c
- 0.8 – 1.0 GHz
- **π/p/K (~6% K⁺)**



Operating environment

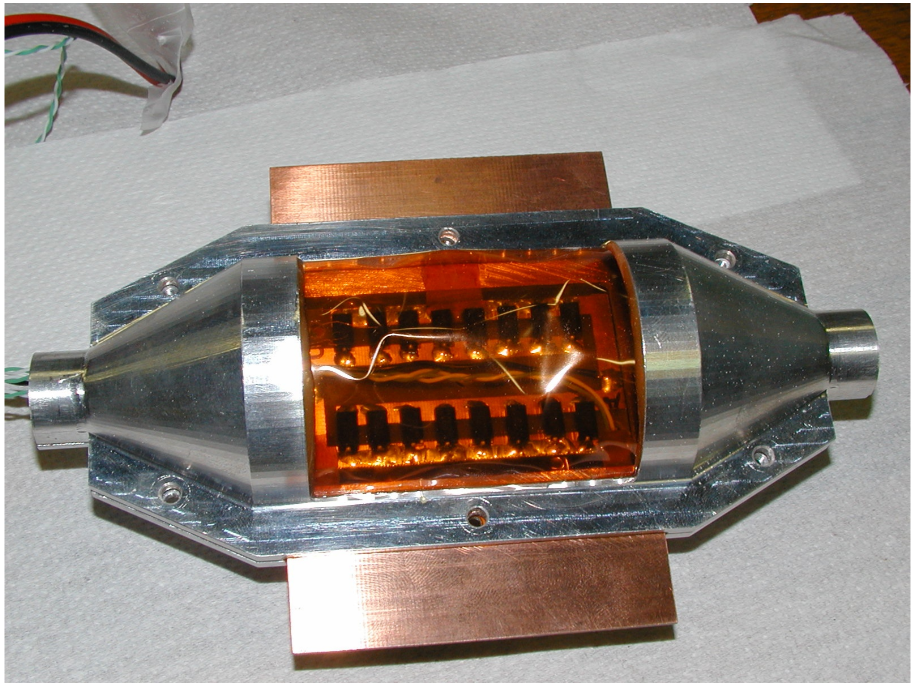
- GTK stations installed in **vacuum**
- High and non-uniform radiation levels
  - expected fluence is ~2×10^{14} (1 MeV n_{eq}/cm^2) during one year of operation (100 days) in the sensor center
- Efficient cooling necessary for stable detector operation
  - Very low material budget (**~0.15% X_0**) in the active beam area

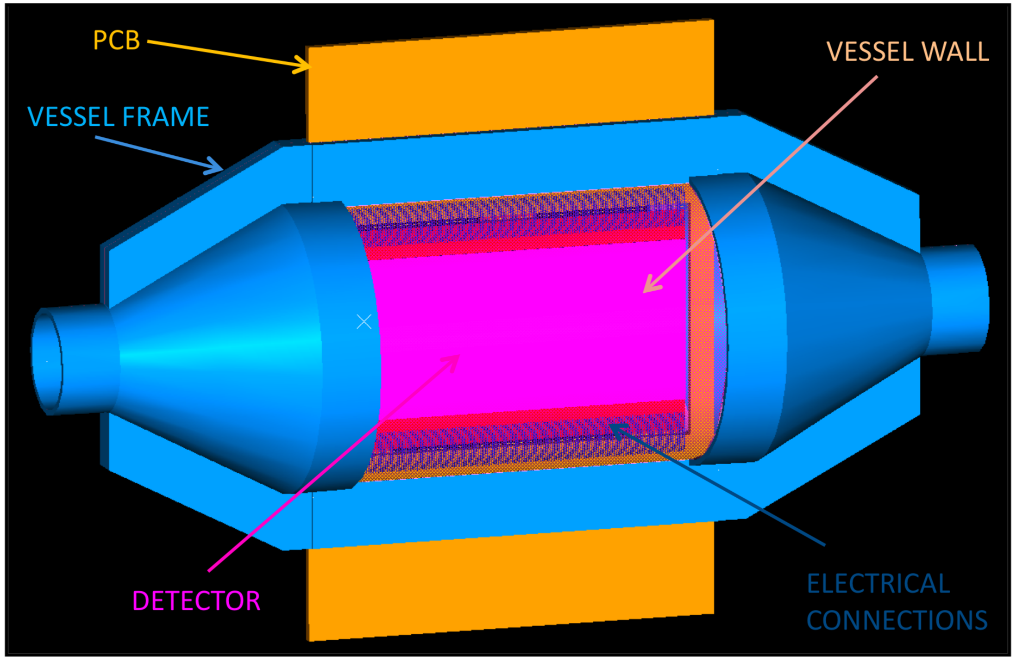


- Two cooling options under study:
  - convective cooling in a vessel (gas cooling)
  - micro-channel cooling (liquid cooling)

Gas cooling

- cooling via flow of cold gaseous nitrogen (100 K)
- thin cylindrical kapton windows (100 μm total)
- aluminum vessel frame

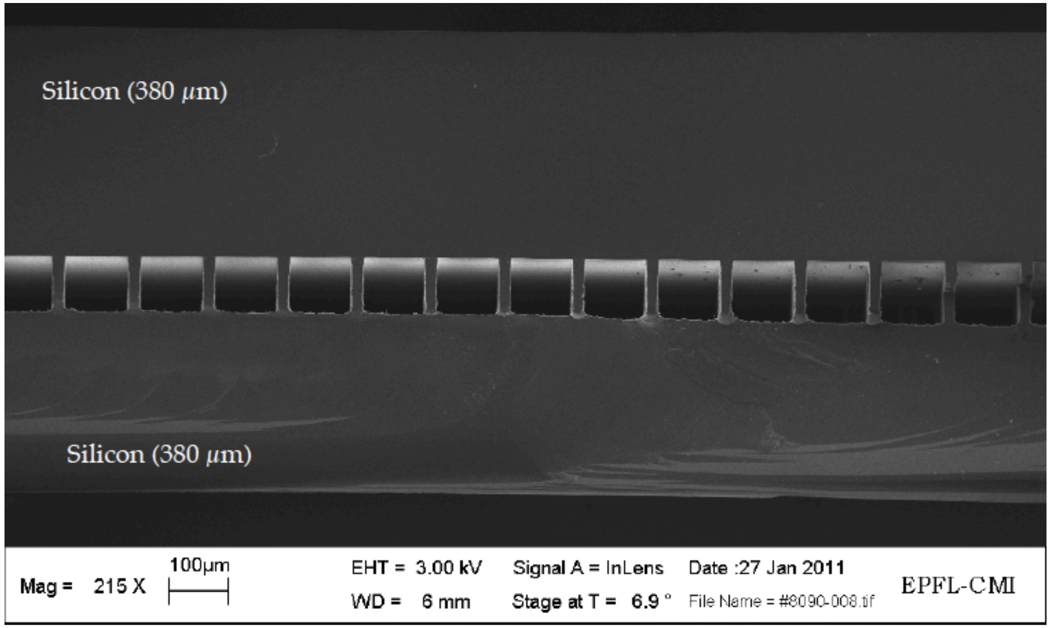


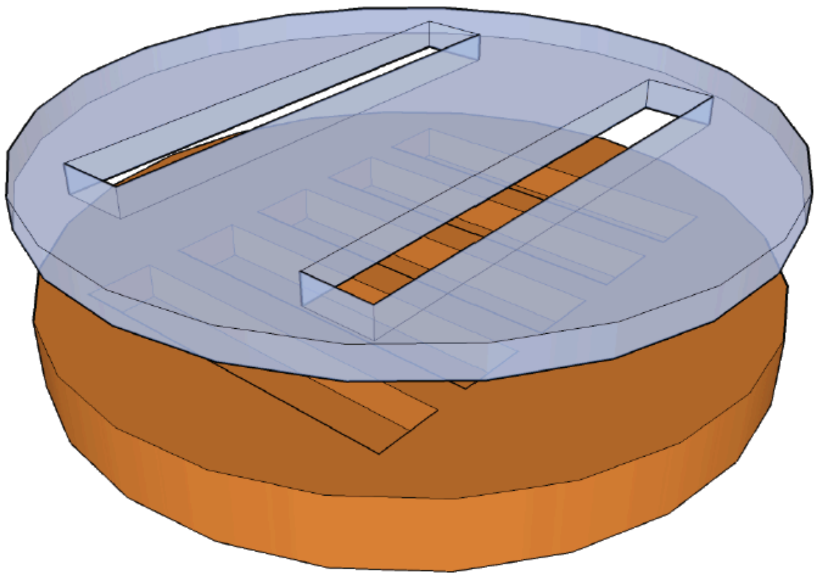


- full size prototype built
- optimizations ongoing to improve uniformity of temperature distribution across sensor area

Micro-channel cooling

- micro-channel cooling plate: 2 bonded Si wafers (150 μm total thickness in the active detector area)
  - channels plus opening for inlet and outlet manifolds



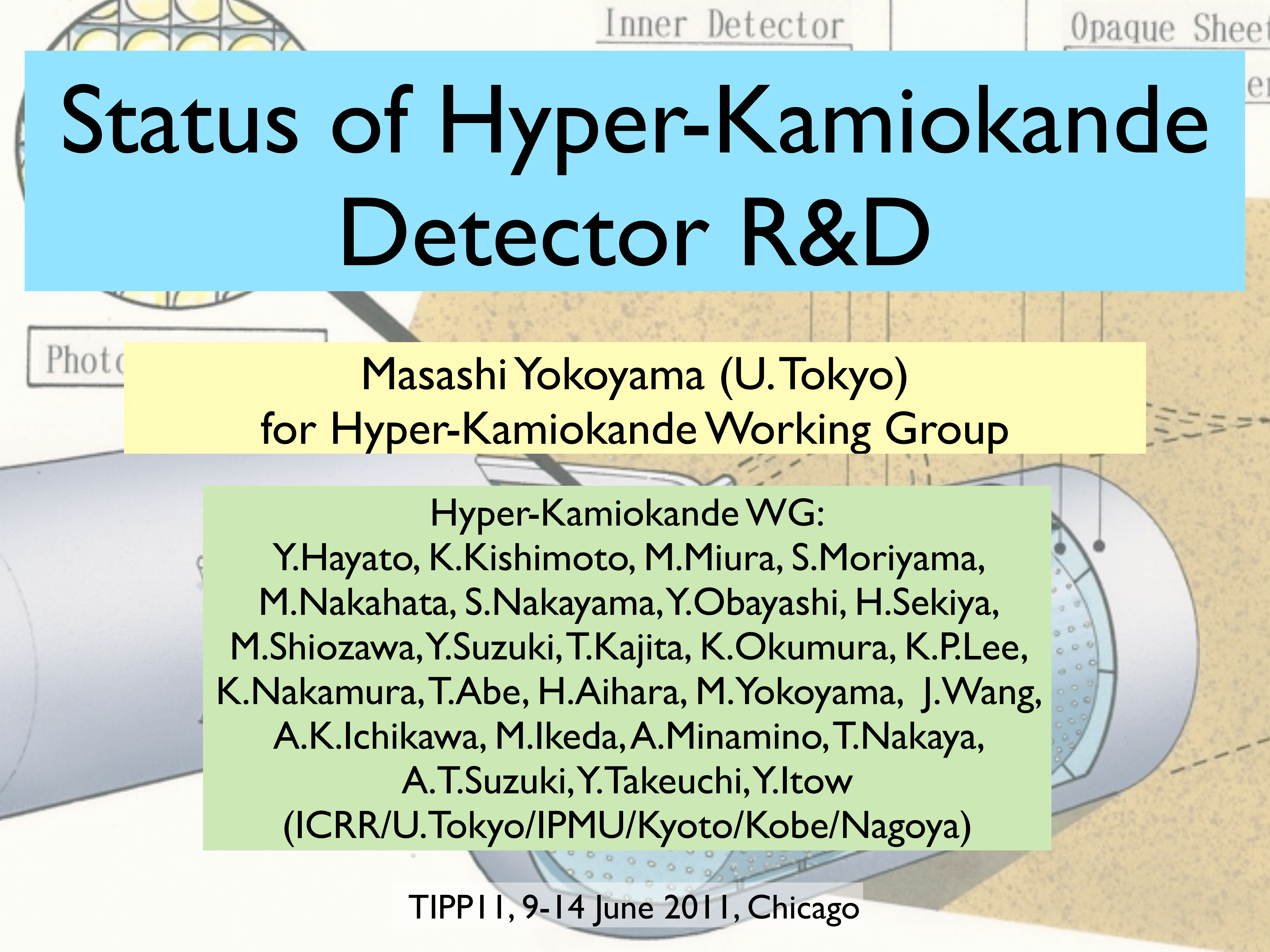


- 100 μm × 100 μm micro-channels
- rad-hard liquid coolant (C_6F_{14})
- full-scale prototype and vacuum test stand built
  - optimize manifold to reduce pressure plus wafer thinning

R/O chip specifications

Pixel matrix	40 columns × 45
Pixels per chip	1800
Chip size	12 mm × 19 mm
Dissipated power	~2 W/cm^2
Dynamic range	3600 – 60000 e$^-$ (0.6 – 10 fC)
Time resolution	< 200 ps
Peaking time	5 ns
Maximum rate per pixel	140 kHz
Maximum data bandwidth	~8 Gb/s

- "End of column" chip architecture presented on June 9th by G. Aglieri Rinella ("Front-end electronics" session)



Status of Hyper-Kamiokande Detector R&D

Masashi Yokoyama (U. Tokyo)
for Hyper-Kamiokande Working Group

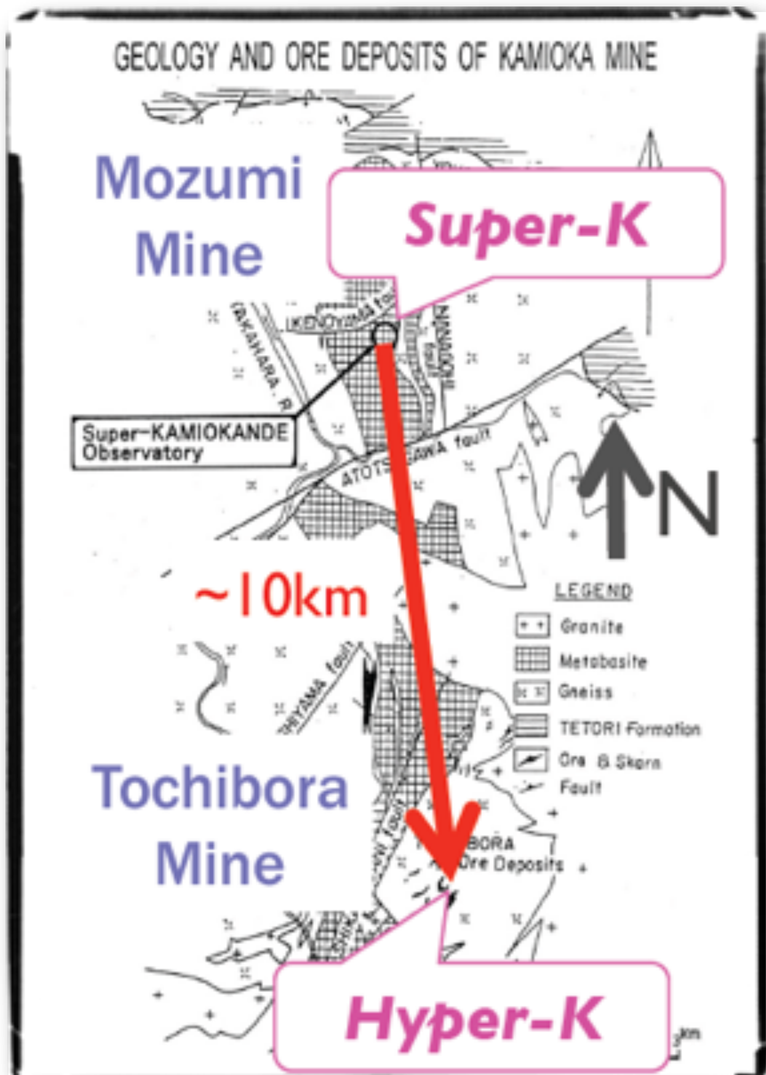
Hyper-Kamiokande WG:
Y.Hayato, K.Kishimoto, M.Miura, S.Moriyama, M.Nakahata, S.Nakayama, Y.Obayashi, H.Sekiya, M.Shiozawa, Y.Suzuki, T.Kajita, K.Okumura, K.P.Lee, K.Nakamura, T.Abe, H.Aihara, M.Yokoyama, J.Wang, A.K.Ichikawa, M.Ikeda, A.Minamino, T.Nakaya, A.T.Suzuki, Y.Takeuchi, Y.Itow
(ICRR/U.Tokyo/IPMU/Kyoto/Kobe/Nagoya)

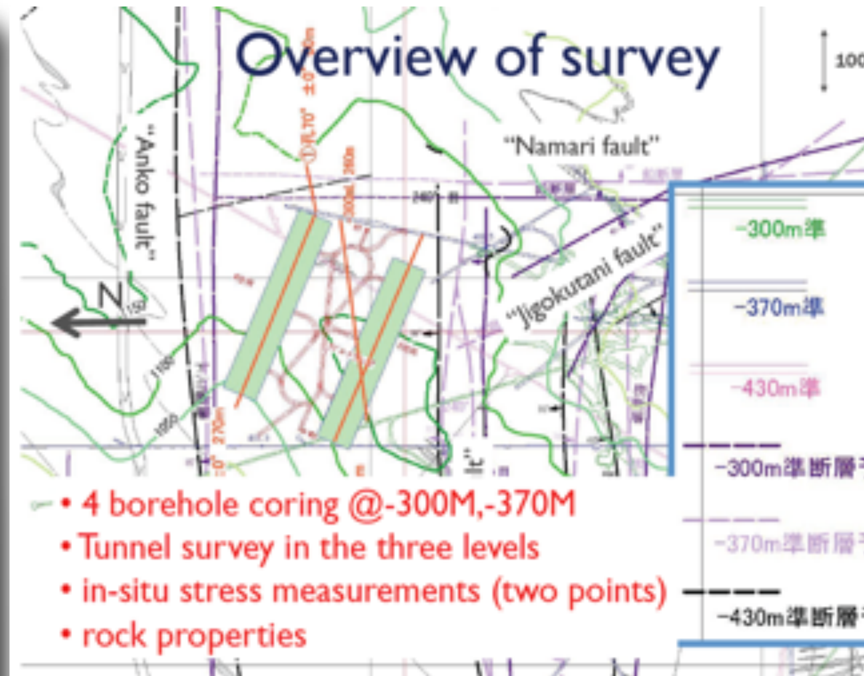
TIPP11, 9-14 June 2011, Chicago

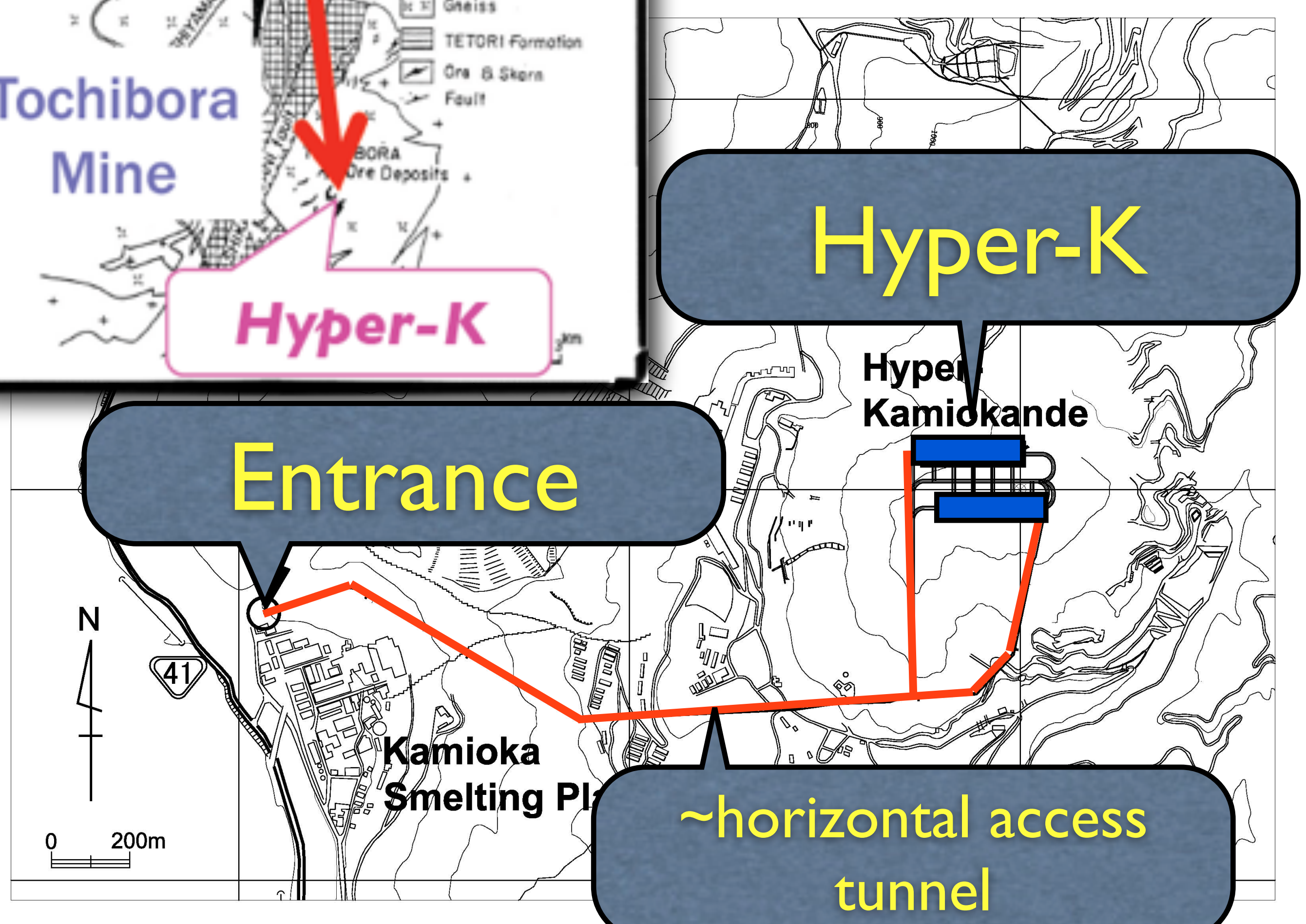
Long baseline experiment

Quest for *CP* violation in lepton sector

Candidate site and geological survey





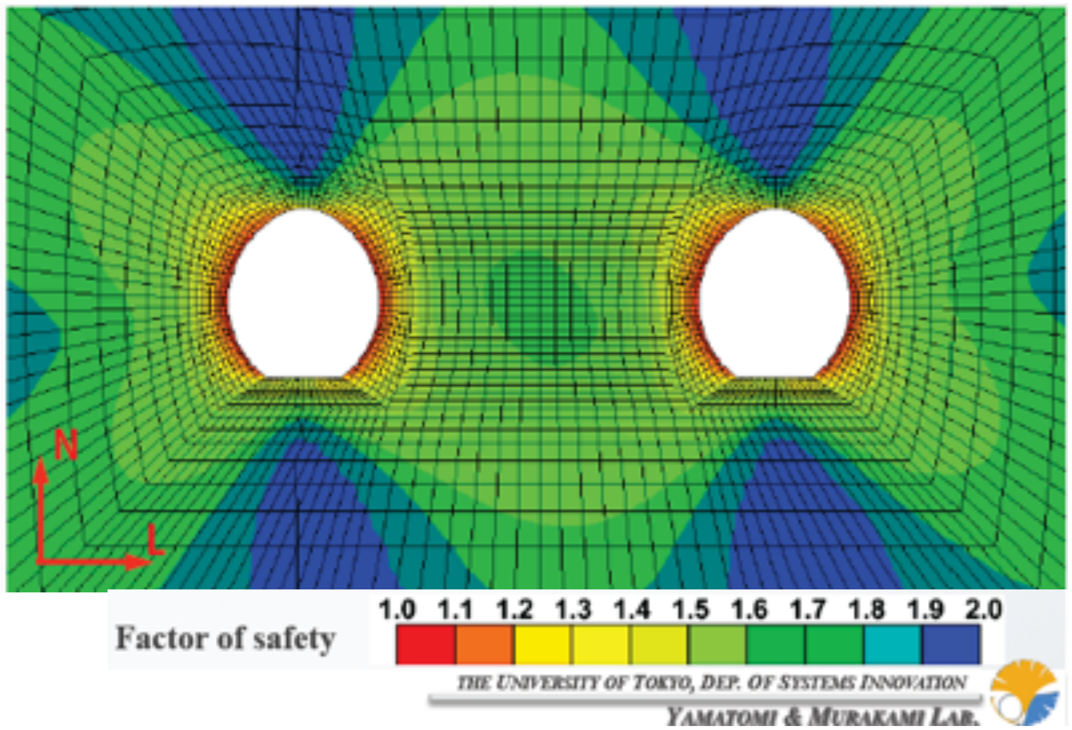


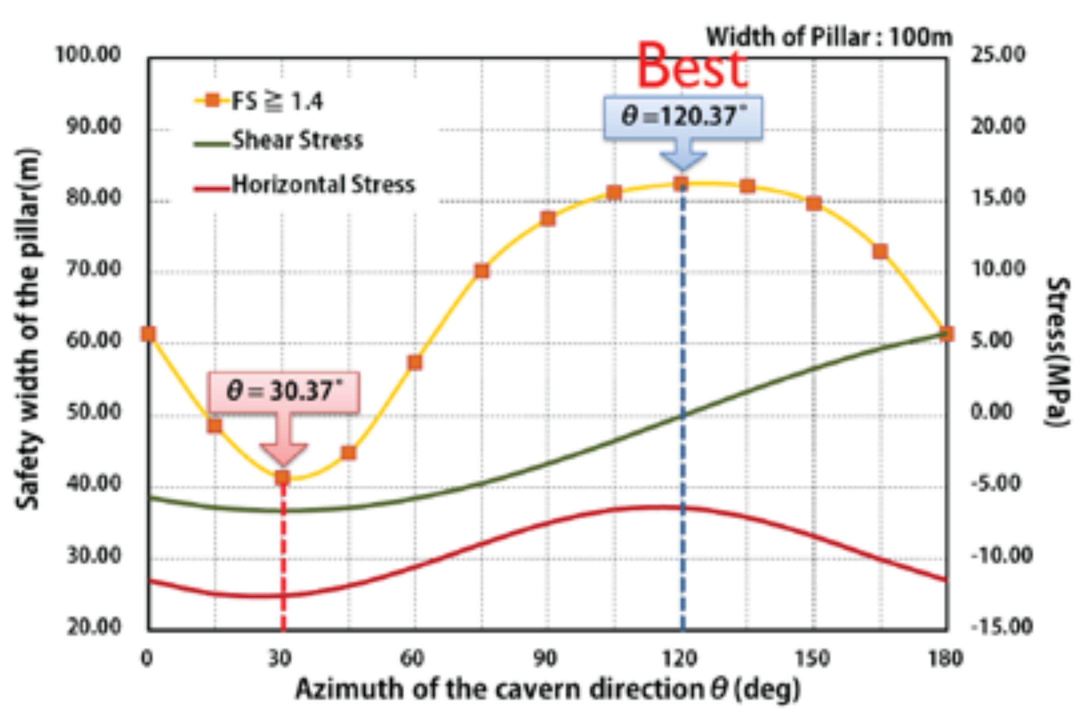
1750m.w.e (648m overburden)

Effect to low-E physics under study

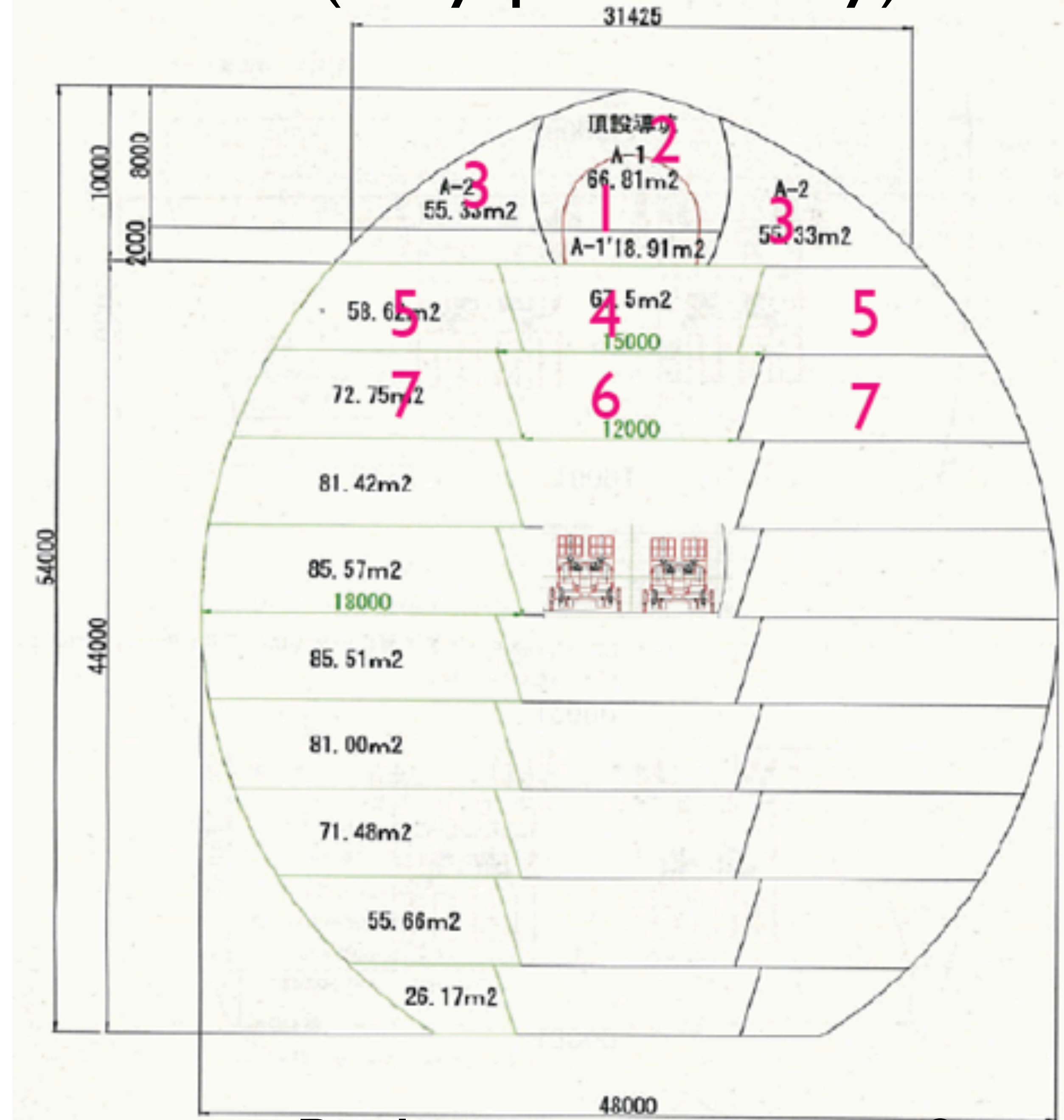
R&D for cavern design

3D analysis with measured rock stress



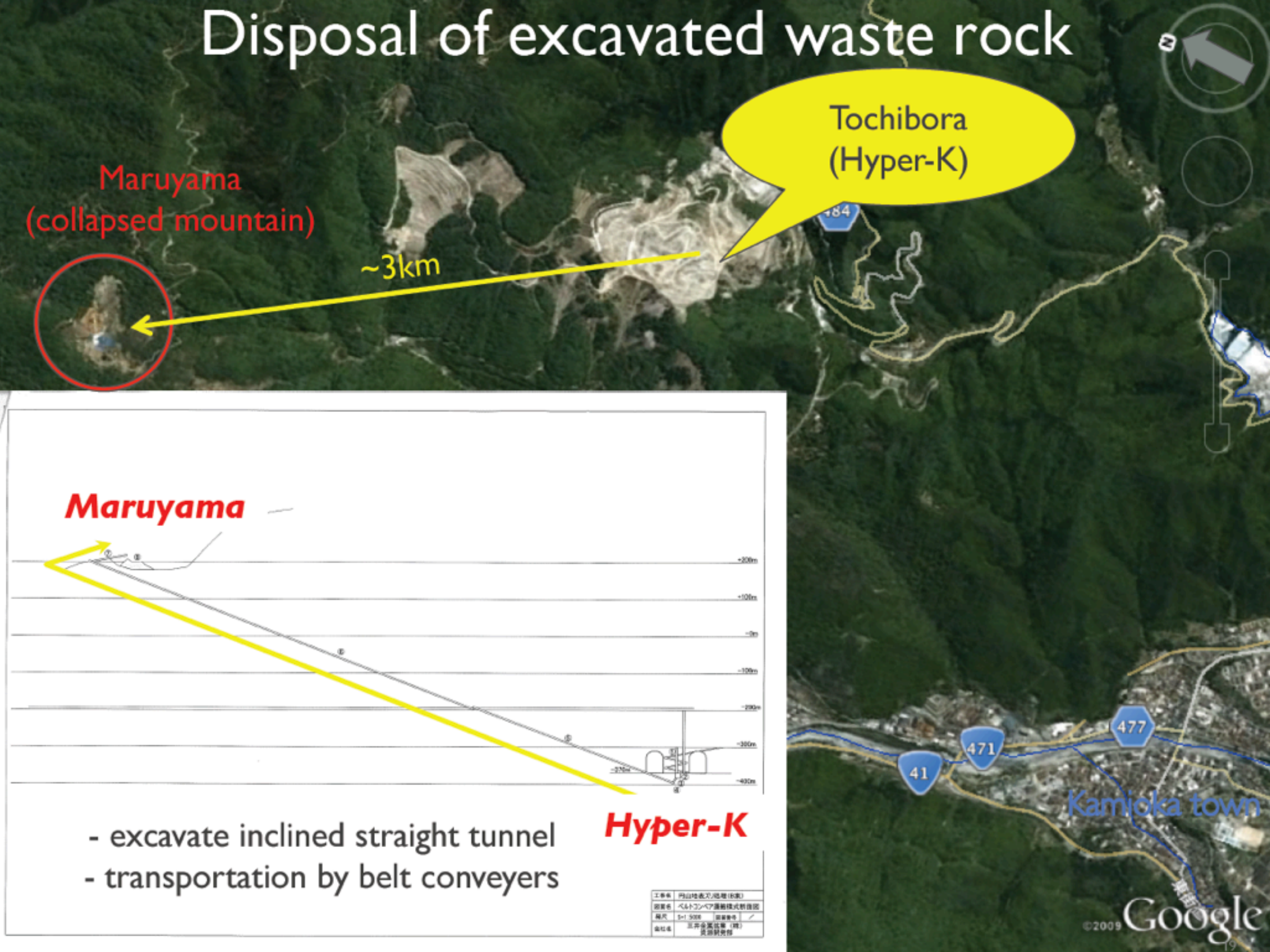


Excavation procedure (very preliminary)

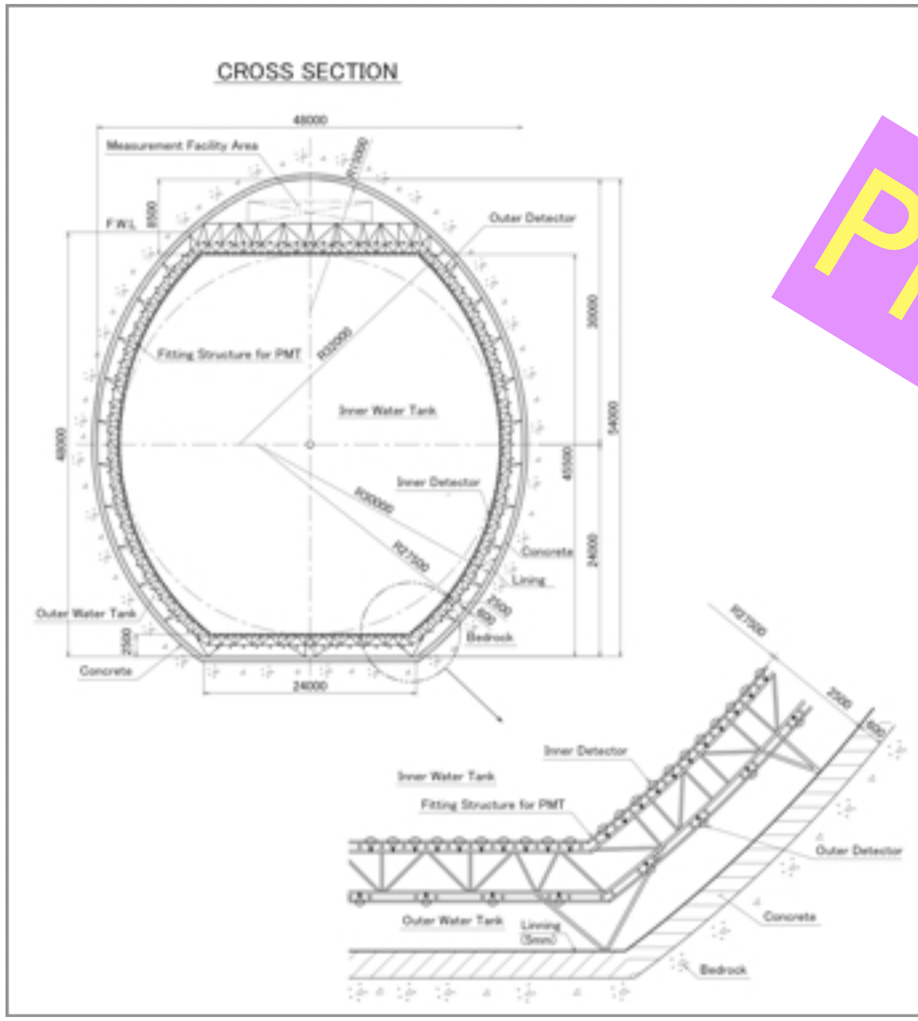


Preliminary estimate: 2years under optimization

Disposal of excavated waste rock

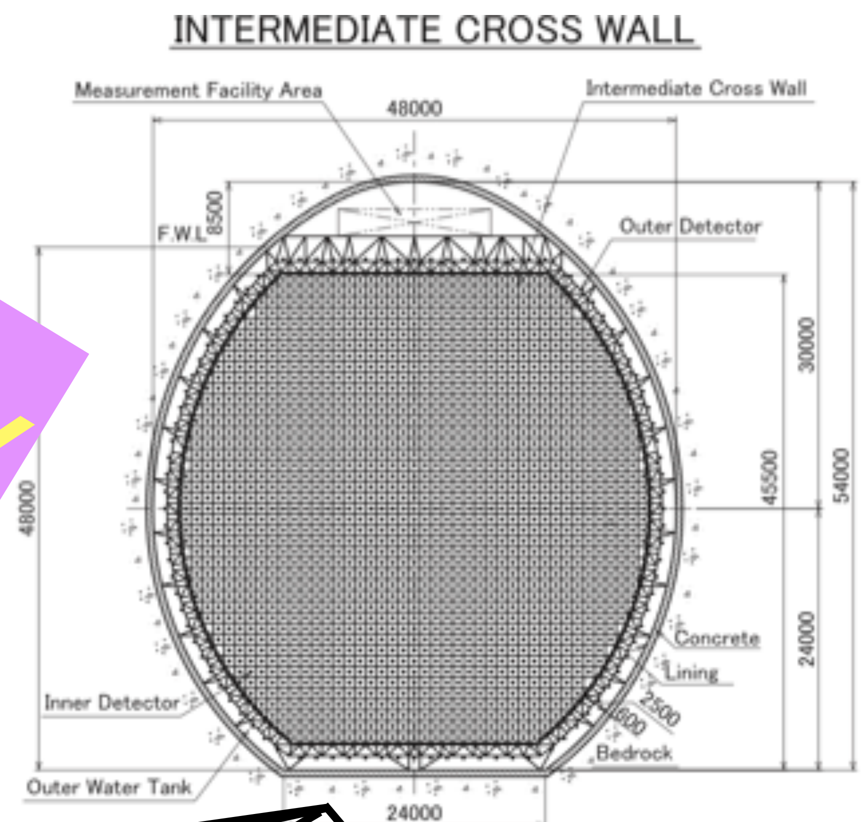


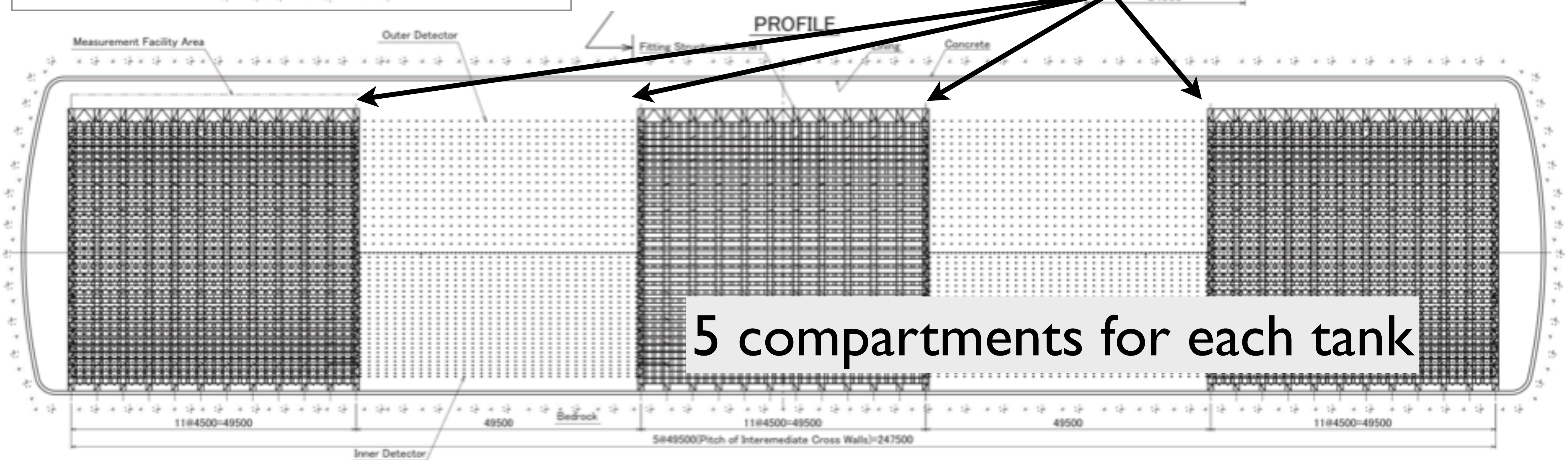
Designing tank



Preliminary

Optical separation

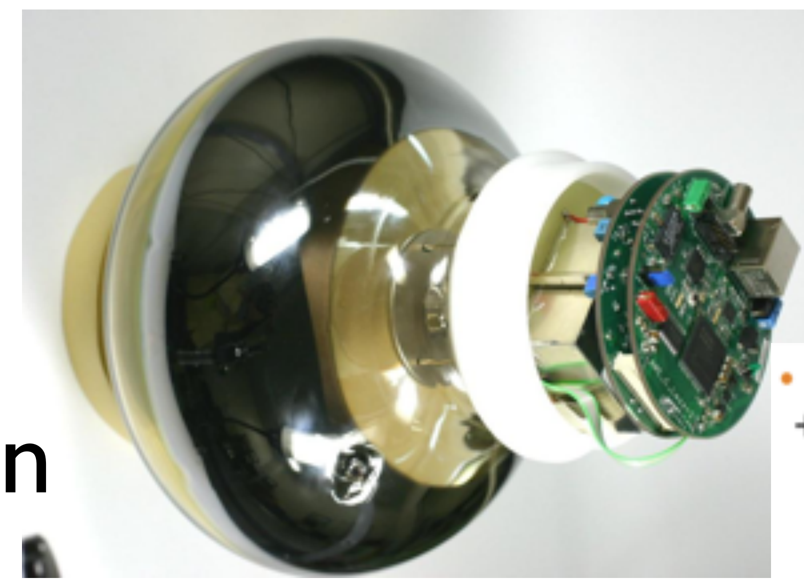


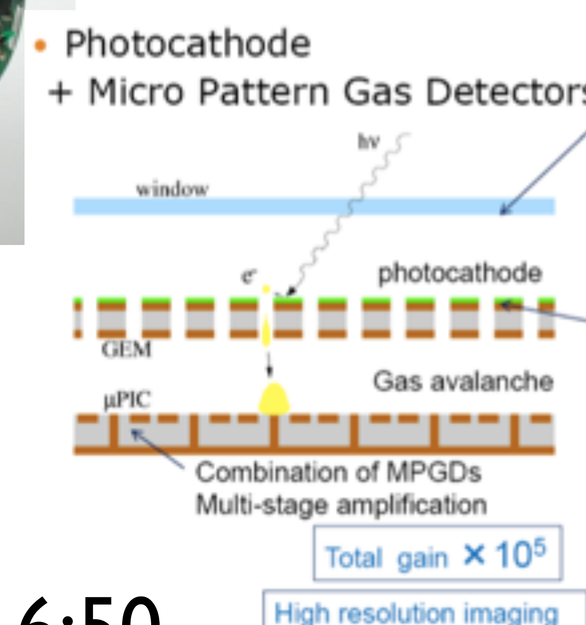


5 compartments for each tank

Photosensor

- Baseline: 20inch PMT (same as SK)
  - Proved to work!
  - Single photon capability, low dark rate, timing resolution
- One of cost drivers
- R&D ongoing/starting
  - Size/number optimization
  - New sensor (high QE PMT, HPD, gas PMT? ...)
  - Pressure tolerance, avoiding chain implosion





Dr. T. Abe : Fri. 16:50-
Dr. H. Sekiya: Sat. 11:00-

Development of large aperture HAPD

T. Abe
On behalf of the collaboration for HAPD
(U. of Tokyo, KEK, and Hamamatsu Photonics)
2011/06/10

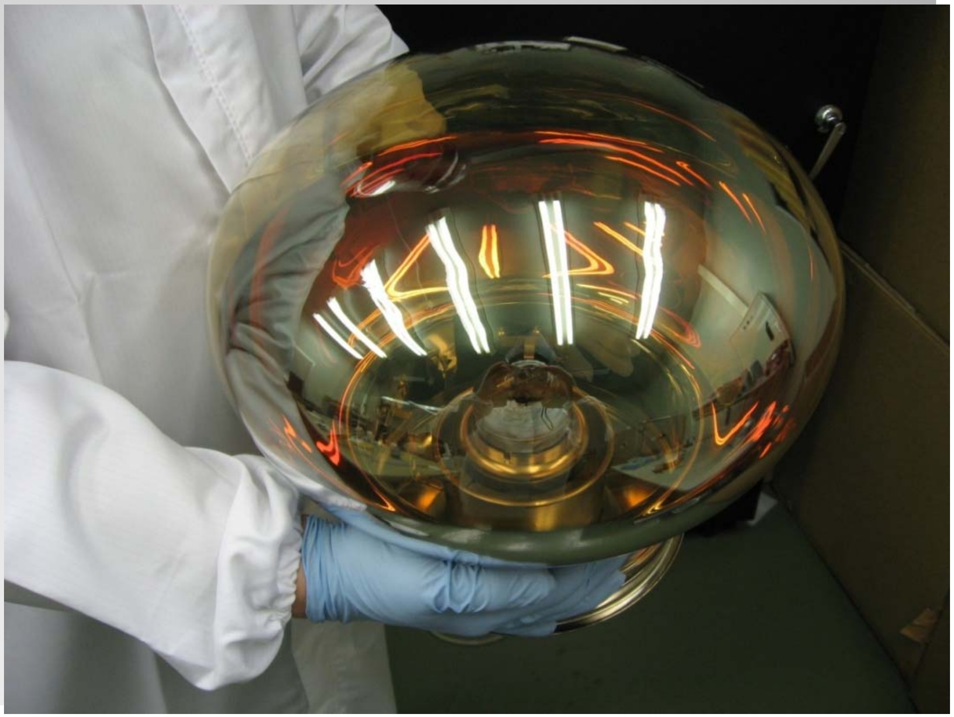
- We develop large aperture Hybrid Avalanche Photo-Detector (HAPD) and its readout system for neutrino/anti-neutrino experiments.
- HAPD is scheduled to commercially release on the next March.
- We show current status of the HAPD development.

Introduction

Themes

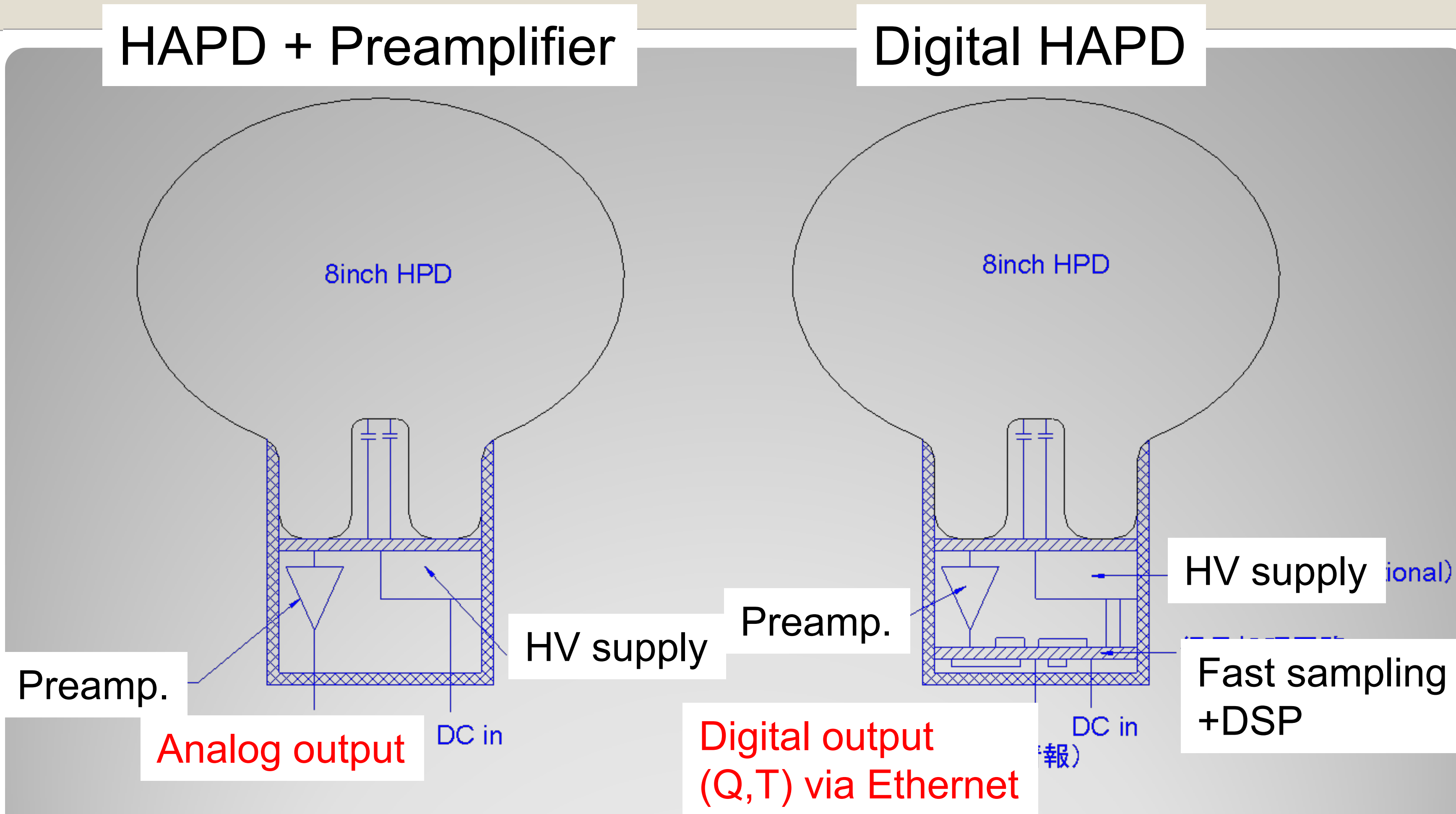
- Motivation
- PMT vs. HAPD
- Digital HAPD
  - All-glass HAPD
  - New HV supply
  - Readout
- Summary

13inch HAPD



Parameters*	13inch HAPD	13inch PMT (R8055)	20inch PMT (for SK)
# of parts elements	~10	>200	>200
Single Photon Time Resolution (σ)	190ps	1400ps	2300ps
Single Photon Energy Resolution	24%	70%	150%
Quantum efficiency	20%	20%	20%
Collection efficiency	97%	70%	70%
Power consumption	<<700mW	700mW	700mW
Order of Gain	10^5	10^7	10^7

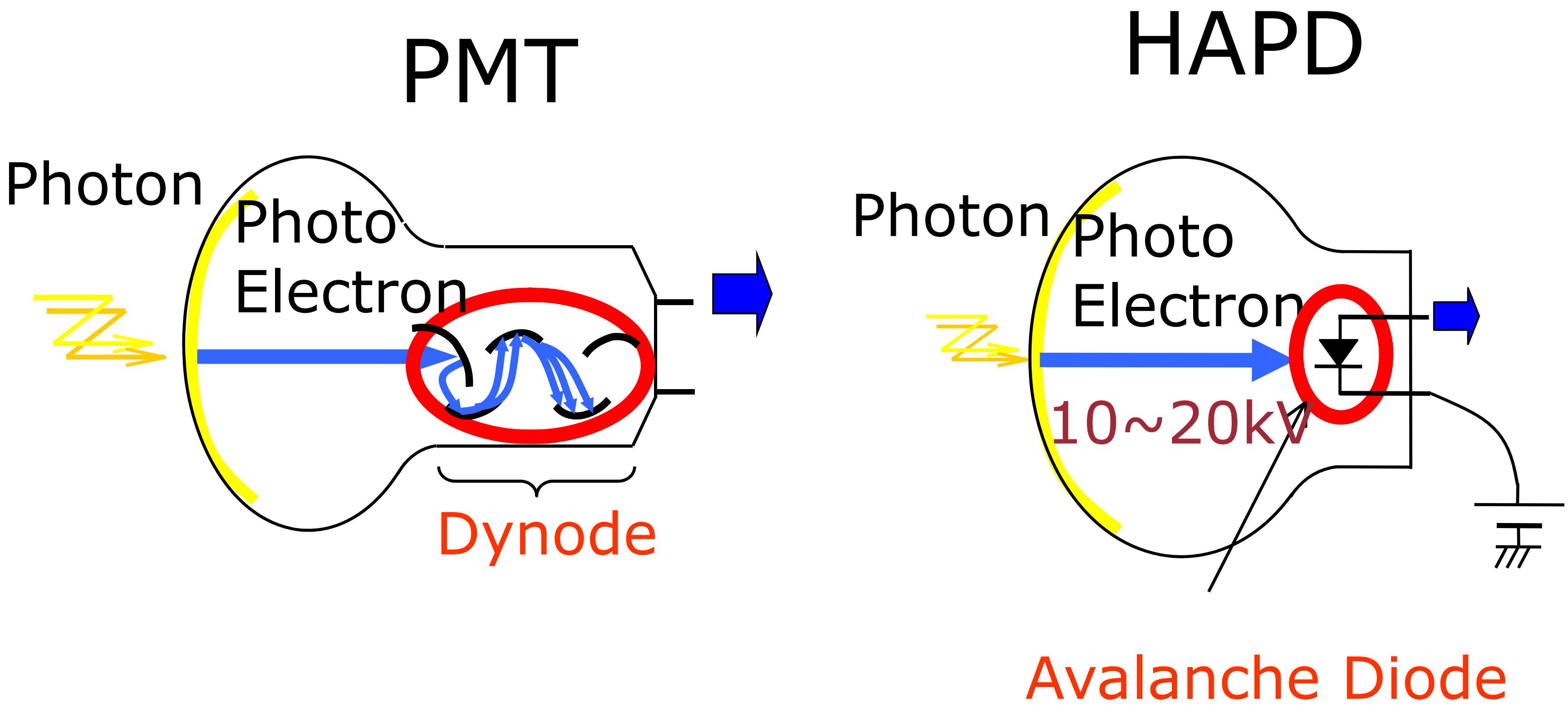
HAPD vs. PMT



HAPD scheme planned for commercial production

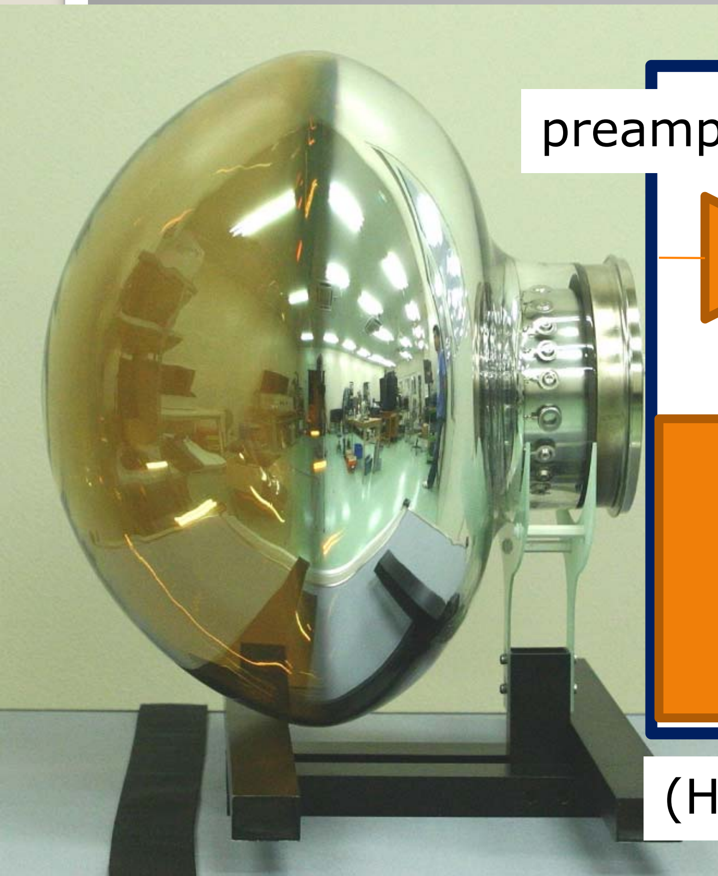
- We develop large aperture HAPD and its readout system showing superiority than conventional PMTs.
- HAPD will be commercially released on the next March.
- All-glass HAPD is developed and its dark count rate downs to PMT level.
- Compact HV supply is available.
- Compact readout system including fast sampling + DSP + Ethernet output is developed.

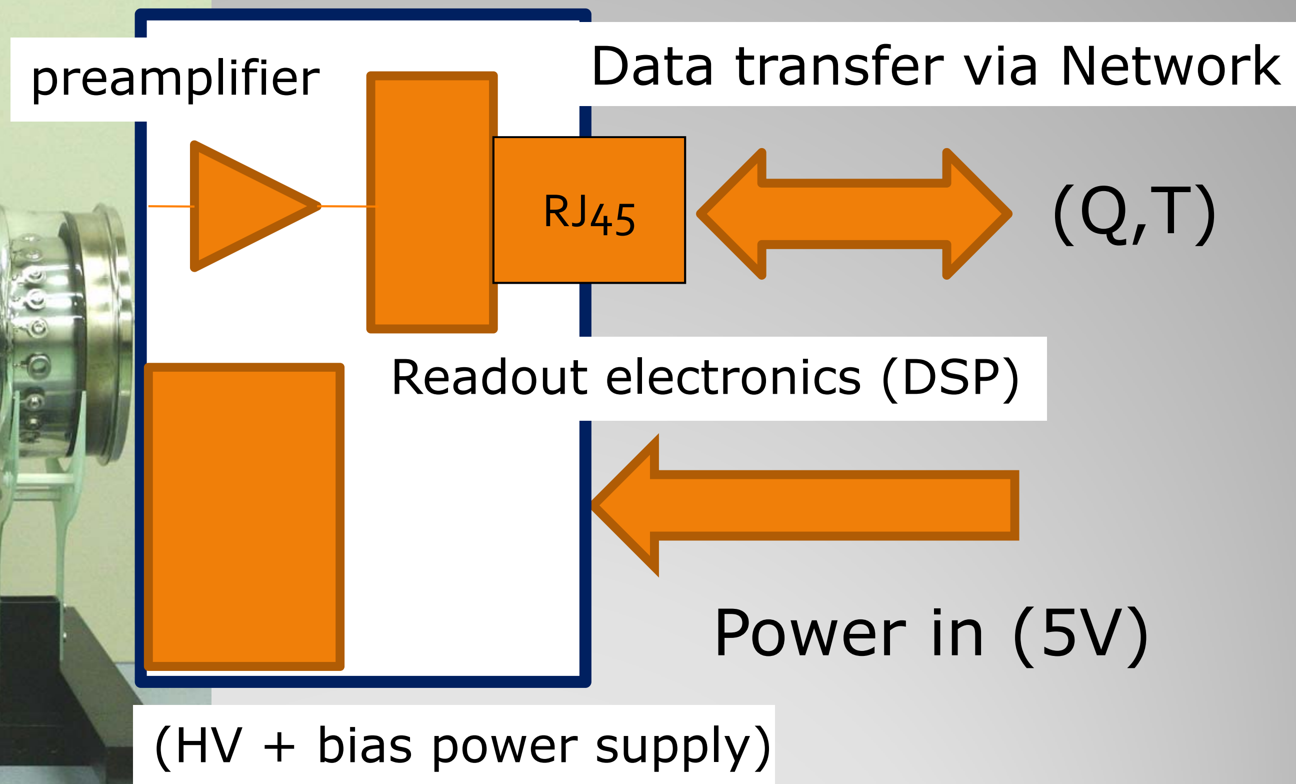
Summary



Operation principle

Compact detector with only Network + Power supplies.





Digital HAPD