Hyper-K calibration WG Overview

Hide-Kazu TANAKA (ICRR)

5th HK Open Meeting at TRIUMF/UBC, July 21, 2014

R&D projects

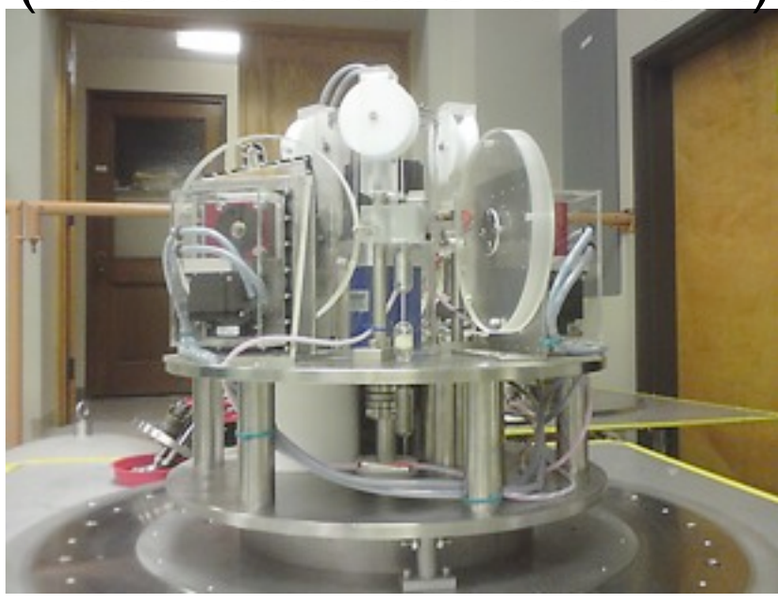
- Goal: Design HK calib based on R&Ds and prototyping
  - Calibration method, calibration sources, source deployment system, photo-sensor response measurement
- LED light source R&D
  - Presentation by Niel M. (U. Liverpool)
- Calib source insertion system
  - Presentation by A. Suzuki., T. Yano (Kobe U.)
- Photosensor Test Facility
  - Presentation by Tom F. (UBC)
    ➜ Just started a collaborative work with Photosensor WG
- Compact neutron generator
  - Roger W. (ICRR)
  - No presentation this time (see his slides at 4th HK meeting).

- SNO+ detector and calibration
  - Presentation by Szymon M.

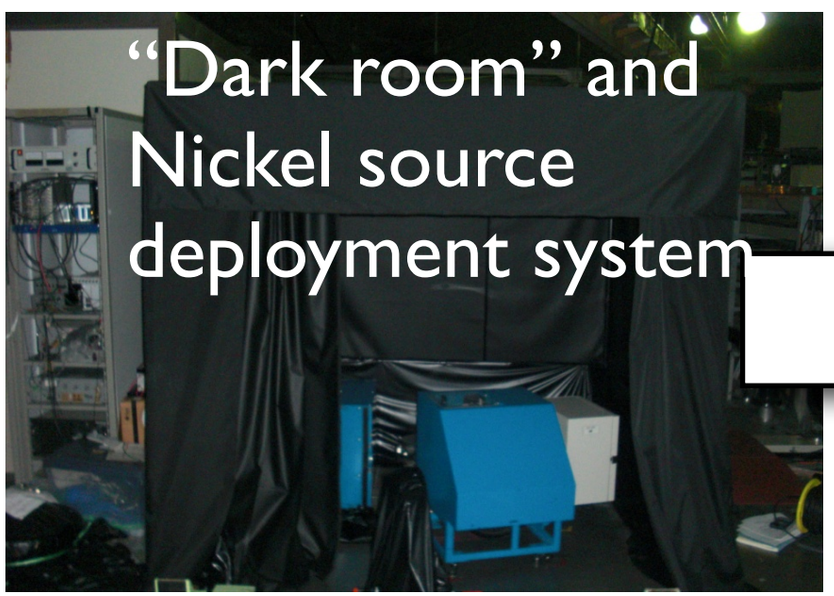
Calib source insertion system

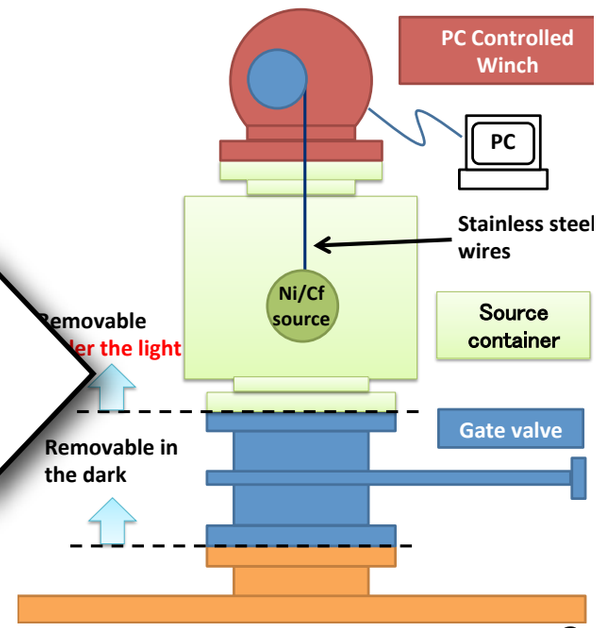
- Many types of calibration systems
  - SK, SNO, Borexino, KamLAND, Daya Bay
- Compile the ideas of these systems and design HK calibration system
- → Prototyping to asses the feasibility
  - Automation, 3D scanning, scalability, etc

Daya Bay
(Automated Calibration Unit)



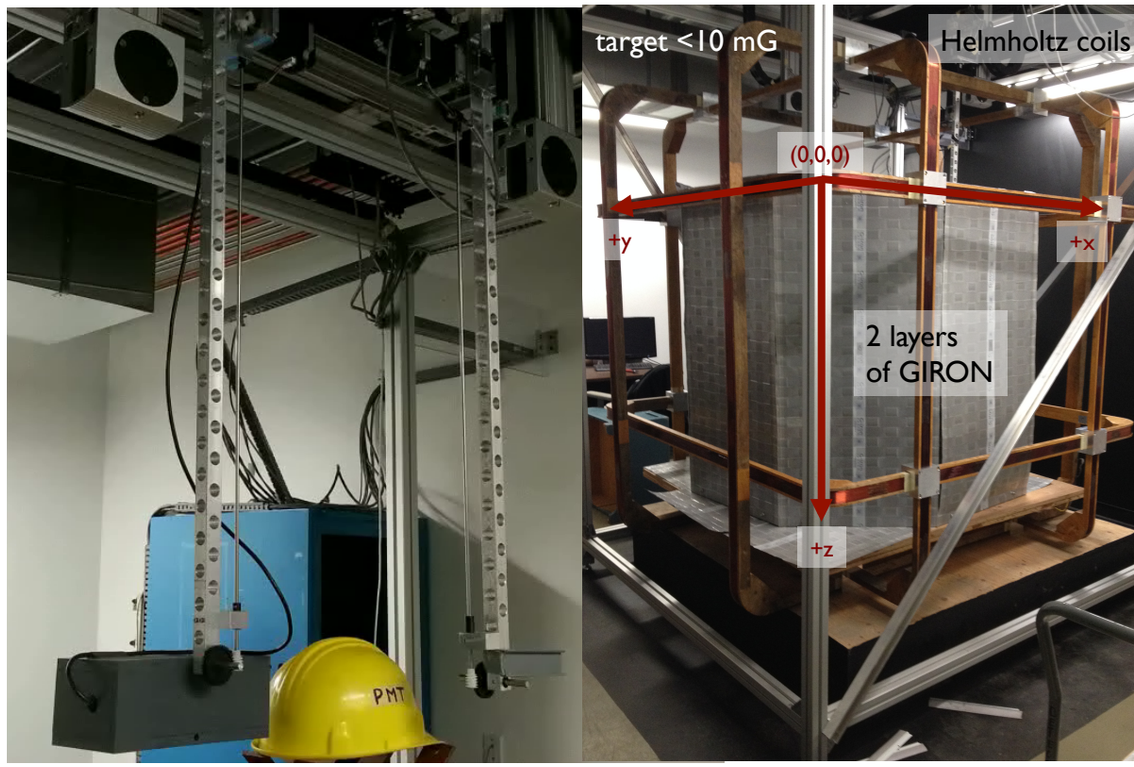
- As the first step, develop a simple semi-automated calib system (to be employed in SK)
  - Remote control & detector safety
  - Repeatability/stability
  - Operability
  - See Atsumu-san's talk





Photosensor Testing Facility

- Study response & reflection of large photosensors in water
  - e.g. dependence of light incident angle and position
- Photosensor Testing Facility at TRIUMF
  - Mechanical and optical systems in operation
  - Control magnetic field (Helmholtz coils, shielding)
- Collaborative work with Photosensor WG
  - Characterization of new sensors
  - 8” HPD prototype in the facility
- See Tom’s talk for details



Other on-going R&Ds

- LED light source R&D at UK
  - Light source with lower cost & able to use for wide range of calibrations
  - Develop a fast pulsed LED driver
  - Test/measure LEDs characterization

- Compact neutron generator
  - Neutrons are useful for water Č detector calibrations
  - Potential replacement of "Nickel" source (Ni+Cf) and DT generator for energy and *n*-tagging calibrations

- Fission triggered nickel source
  - Potential energy calibration source
    - Has been developed & tested by Koshio-san

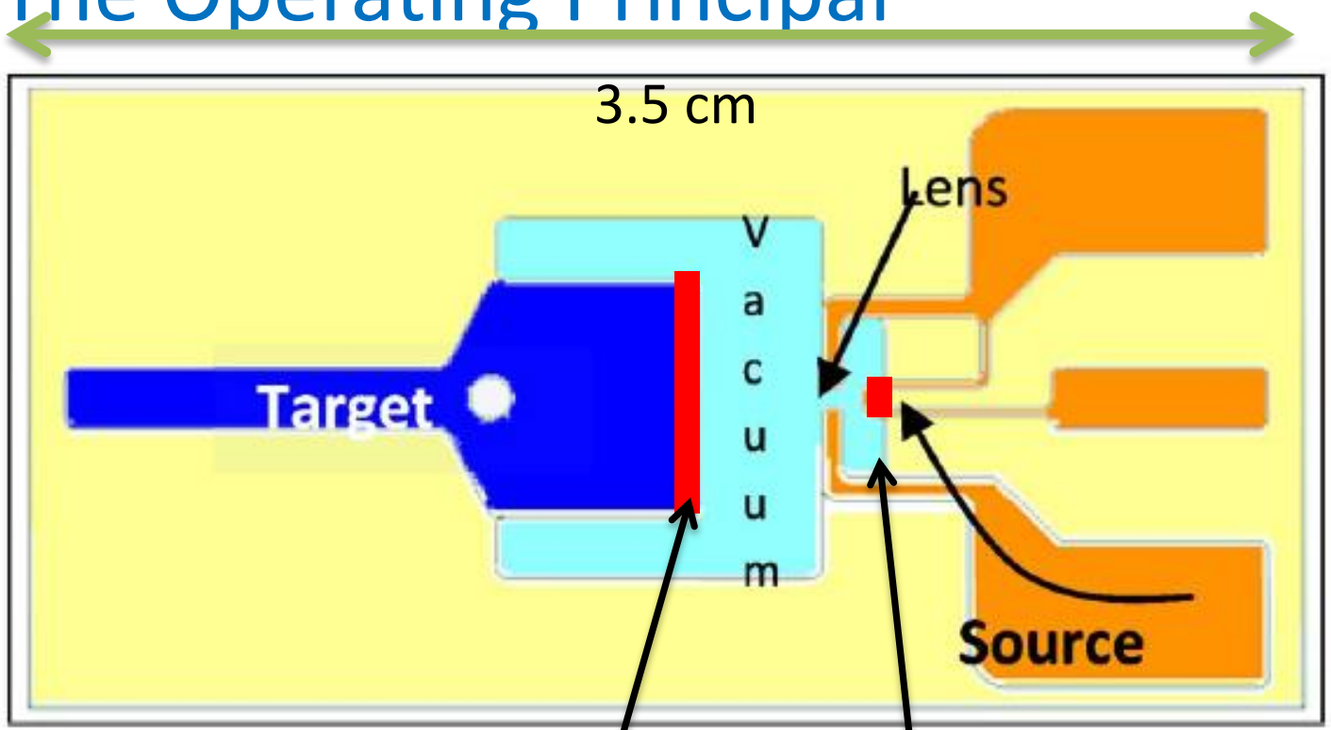
Summary

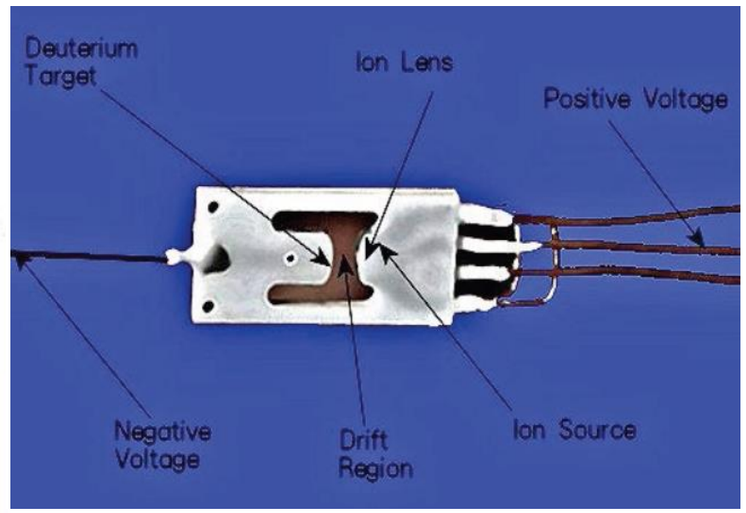
- Several R&D and prototyping projects are in progress

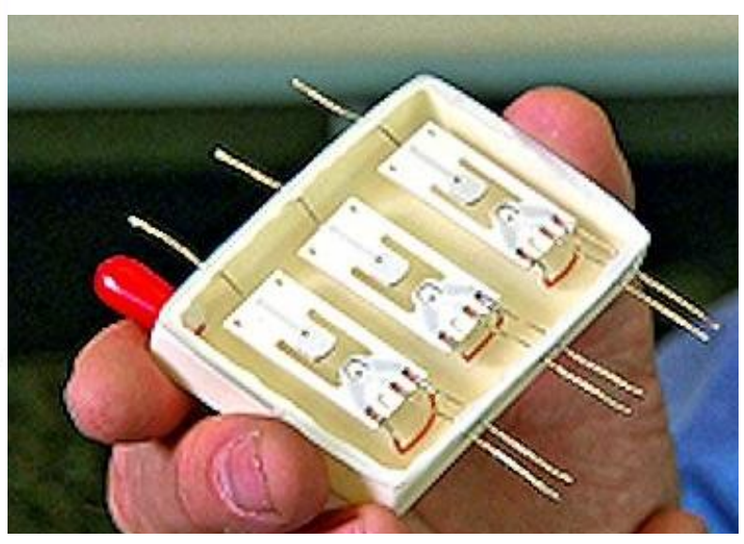
- A special talk on SNO+ detector & calibrations in this session

- Enjoy the calibration session!

Neutristor : The Operating Principal



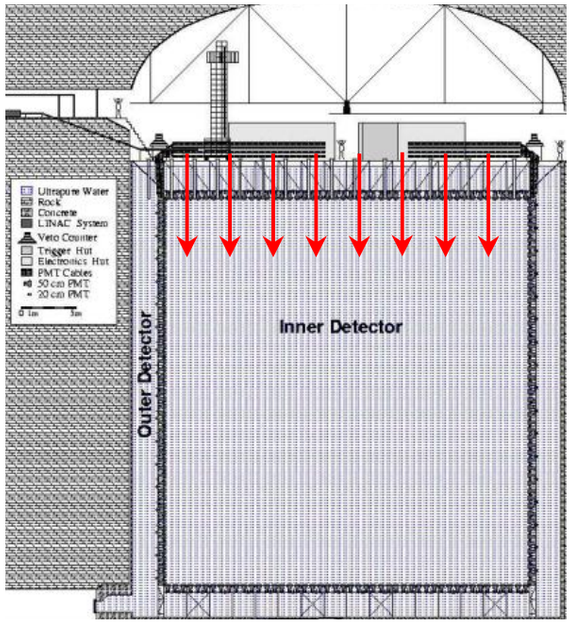


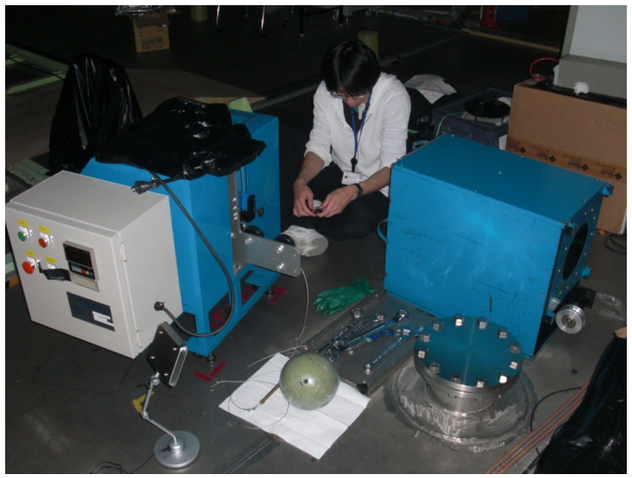


- Deuterium and Tritium thin films are deposited onto to the ion source and target elements
- Applying O(300)V at the source gap causes breakdown and the formation of an arc. The arc heats the source film releasing deuterium into the vacuum and ionizing it at the same time
- An accelerating voltage O(15)kV across the target is used to accelerate $^{2}H^{+}$ (etc.) ions onto the target film to induce D-T fusion
- An electrostatic lens is used to focus the ion flow to the target

Source insertion systems

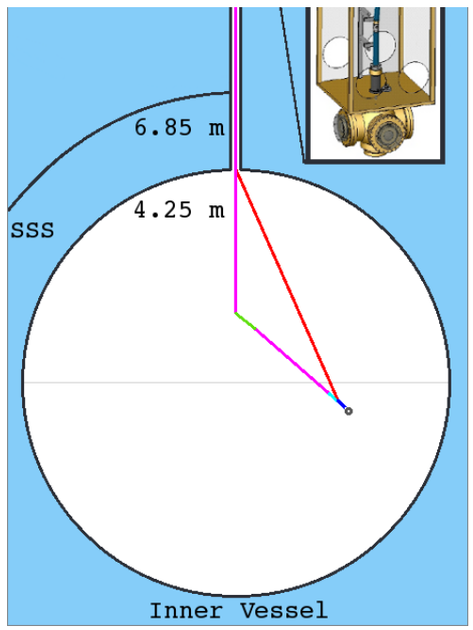
Super-K

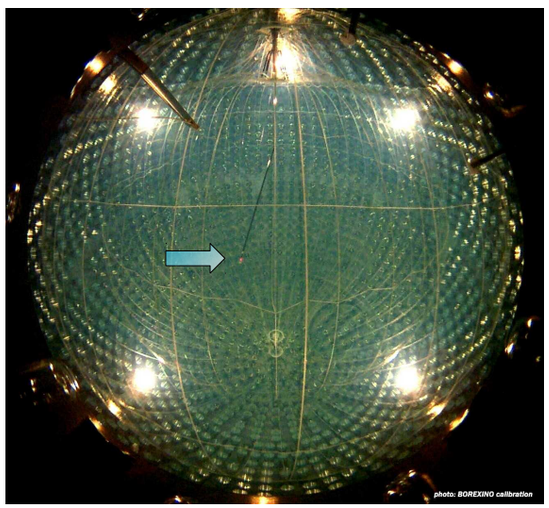




One wire move along z-axis, manual operation

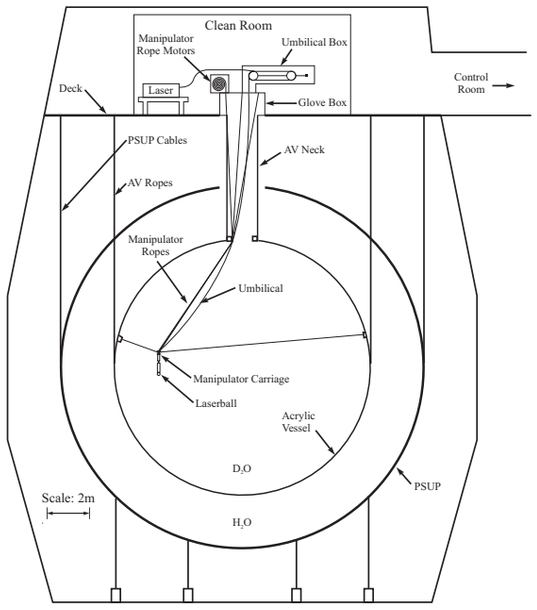
Borexino





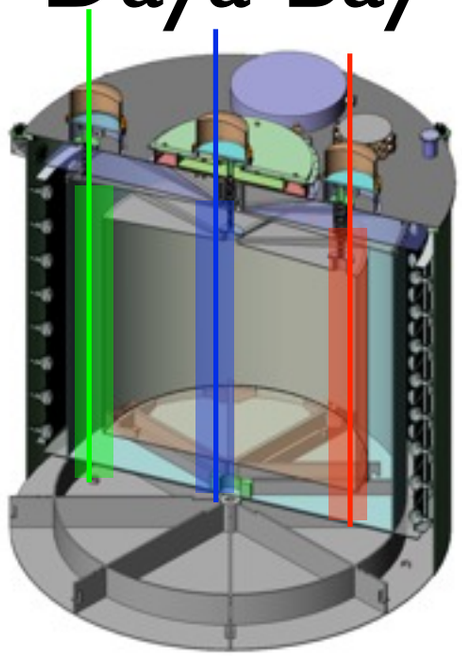
Rod move 3D, fully manual operation

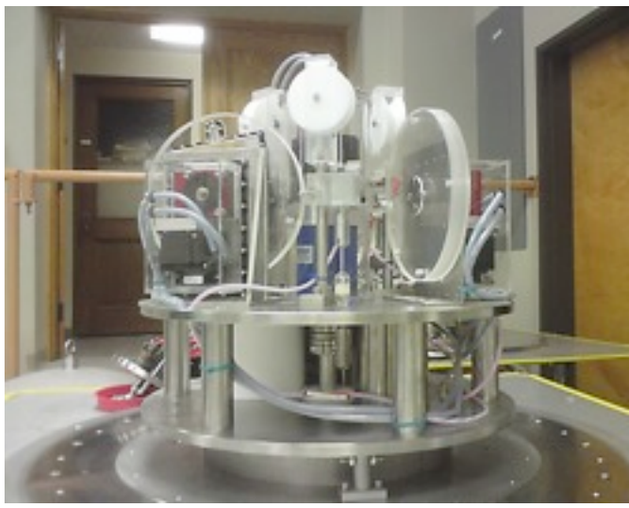
SNO



Two wires control source position, move in 2D plane

Daya Bay





One wire move along z-axis, fully automated, handle 3 calib sources

No single system fully satisfies the HK requirements