Low Background Facility Setup in CJPL
A Brief Introduction

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Outline

- Group introduction
- Objective
- Strategy
- Conceptual Design
- Future works

Group Introduction

Group Leader
Director of CJPL

Prof. Cheng Jianping

Dr. Zeng Zhi

Physical Design
&Monte Carlo simulation

Dr. Ma Hao

Prof. Li Jianming

Mechanical
Design&construction

Ass. Prof. Wu Qifan

Calibration&
Measurement

Consultors: Prof. Li Jin, Prof. Yue Qian, and others.

Objective

- To develop a ultra-low-level Ge gamma spectrometry in CJPL, used for
  - Material Screening for CDEX, PANDAX,…
  - Environmental Samples measurements;

- Project name: GeThu

GeThu Stategy

- Goal of Stategy(sensitivity for U/Th/K):
  - GeThu-Zero, as a prototype study in current status
  - <1 mBq/kg (recent years)
    - → Like other underground labs
  - μBq/kg (few years later)
    - → Like GeMPI-III in LNGS
  - nBq/kg (a long way to go)
    - → Who, where and when?

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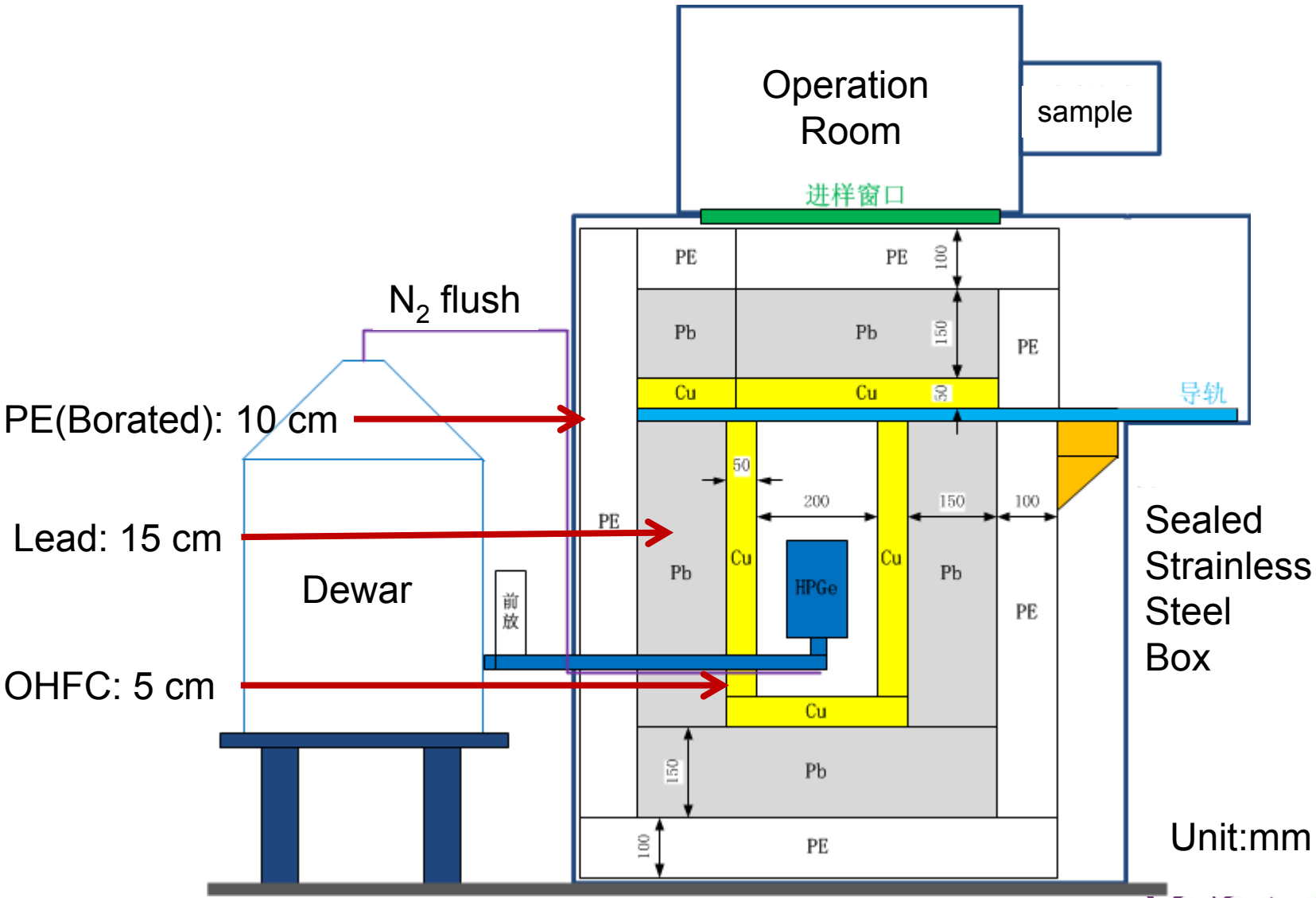
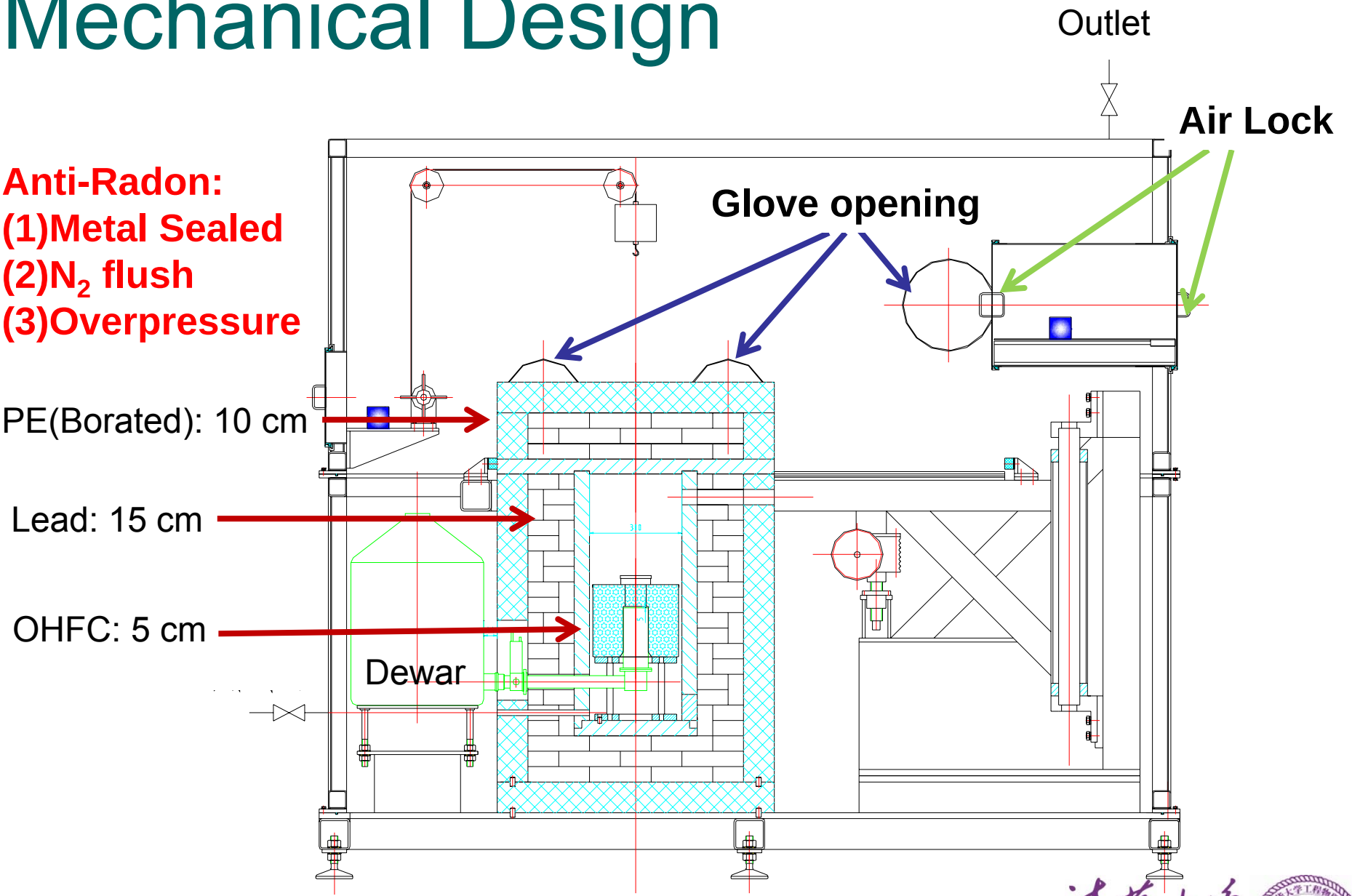
CONCEPTUAL DESIGN

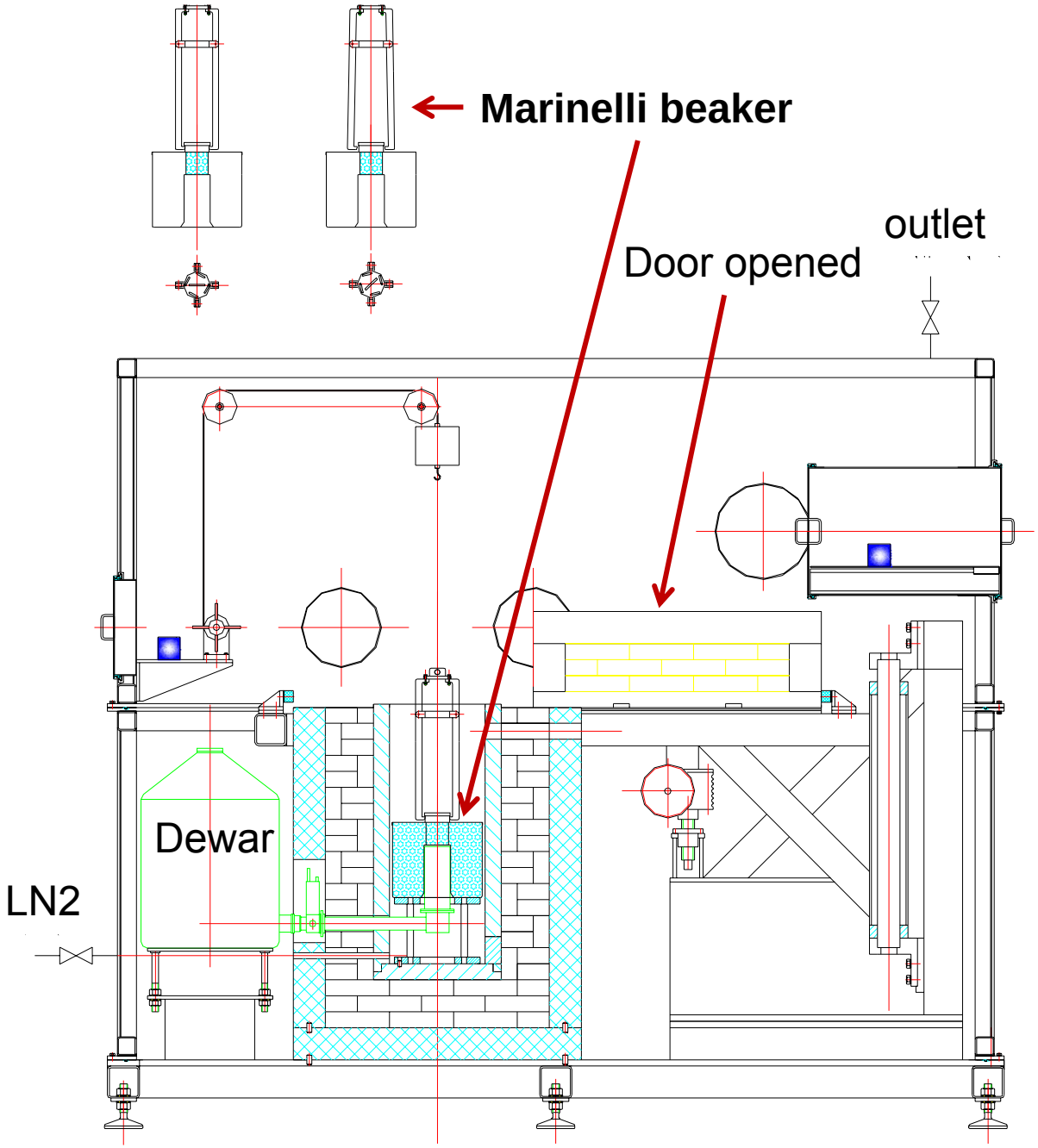
Conceptual design for GeTHU



Mechanical Design

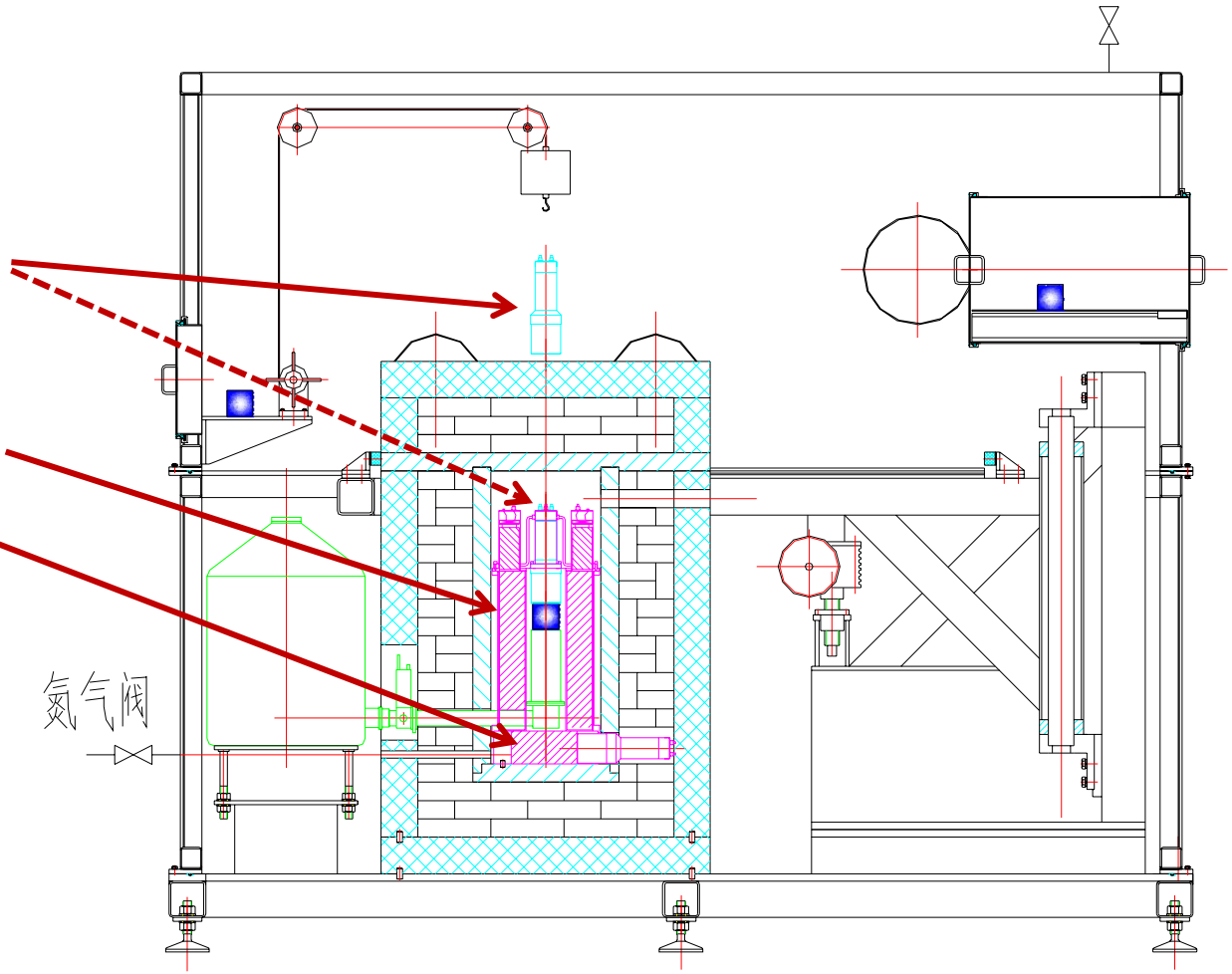
Anti-Radon:
(1)Metal Sealed
(2)N_2 flush
(3)Overpressure




Marinelli beaker
outlet
Door opened
Dewar
LN2

4π anticoincidence with scintillators(optional)

Scintillators:
(1)NaI(Tl);
(2)CsI(Tl);
(3)others?
Researching

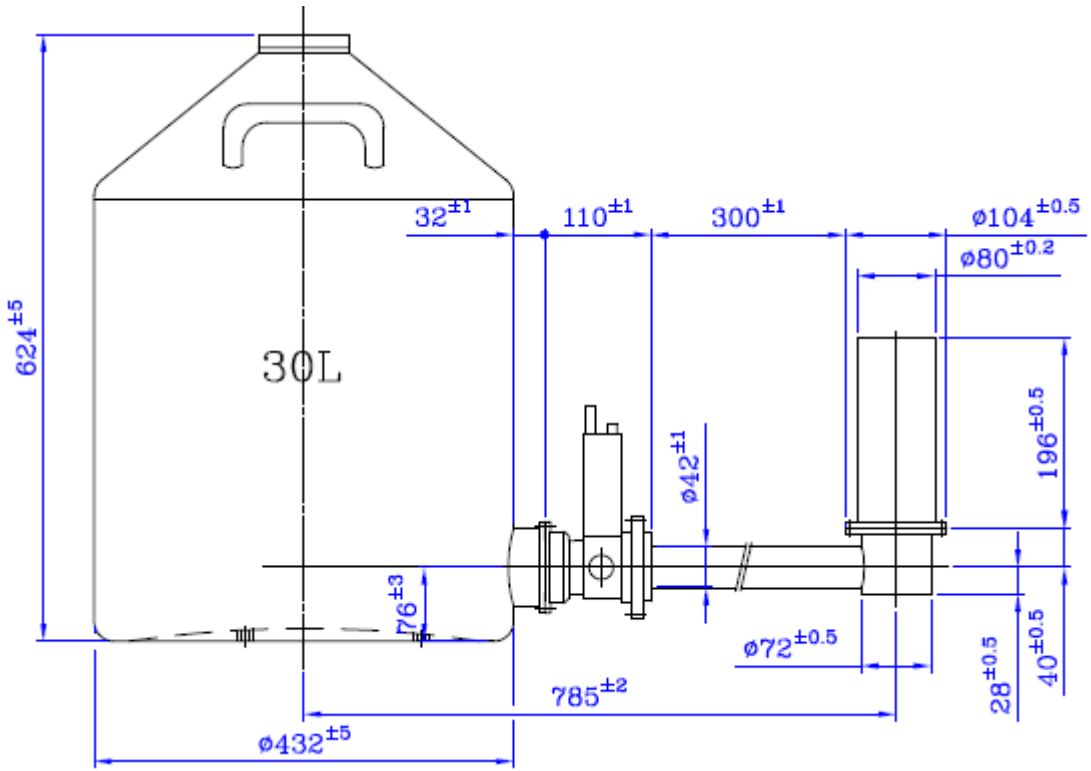


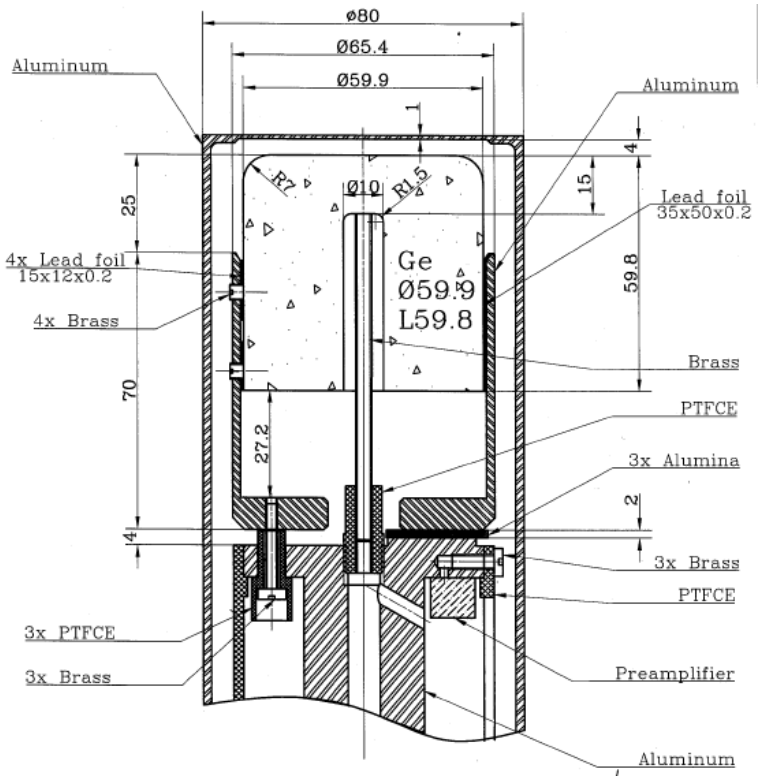
GeThu-ZERO HPGe detector

GeThu-ZERO detector HPGE Canberra

- **Coaxial N type Germanium detector**
- **EGC 40-195-R in SB 99 30A cryostat.**
- FWHM at 1.33MeV: 1.92keV
- FWHM at 122keV: 0.80keV
- Peak shape at 1.33MeV:
- FWTM / FWHM: 1.92
- FWFM / FWHM: 2.6
- Relative efficiency: 40%
- Peak to Compton ratio: 61
- ULB Aluminium endcap.

GeThu-ZERO detector □Canberra France





GeThu-ZERO shielding materials

sample	nuclide	specific activity(Bq/kg)
Lead	^{210}Pb	166.2

sample	nuclides	specific activity(Bq/kg)
Copper	^{238}U	$< 2.5\times10^{-1}$
	^{235}U	$< 1.2\times10^{-2}$
	^{226}Ra	$< 7.5\times10^{-3}$
	^{228}Ac (^{232}Th daughter)	$< 8.8\times10^{-3}$
	^{212}Pb (^{232}Th daughter)	$< 1.2\times10^{-2}$
	^{40}K	$< 5.3\times10^{-2}$
	^{137}Cs	$< 2.9\times10^{-3}$
	^{60}Co	$< 3.6\times10^{-3}$

Testing in CJPL

Future works

- Background measurements;
- Calibration measurements and efficiency determination;
- Data analysis;
- Update GeThu-ZERO to GeThu-I
  - Material screening selection;
  - New ULB HPGe detector design;
- …

Thank you!

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