

# Sino-German Cooperation Group



Max-Planck-Institut für Physik  
(Werner-Heisenberg-Institut)



EBERHARD KARLS  
UNIVERSITÄT  
TÜBINGEN



## Deutsch-Chinesische-Kooperationsgruppe

Development of High Purity Germanium Detector Techniques  
for Applications in Fundamental Research

Finanziell unterstützt durch: Chinesisch-Deutsches Zentrum für Wissenschaftsförderung Peking, China

2012

2015

中德合作研究小组

应用于基础研究的高纯锗探测器技术研发

资助者:中德科学中心 / 中国 北京

I.Abt, MPI für Physik, April 2016

# Scale and Subjects

1 workshop 2011  $\Rightarrow$  3 years fixed period

- Detector technology itself



- Electronics and readout

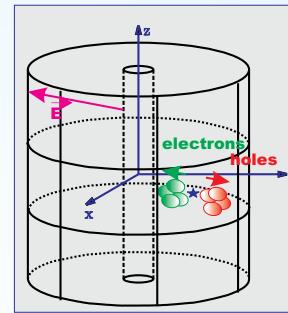
- Testing

- Backgrounds: especially neutrons

- Experimental conditions

- Experiments to be planned

$\Rightarrow$  collaboration

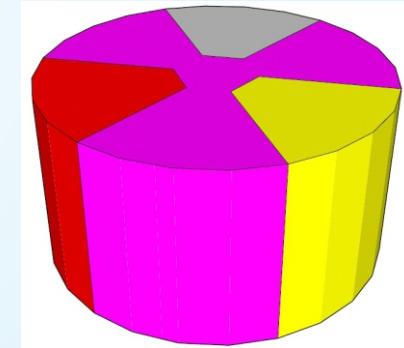


← still  
ongoing

EoI

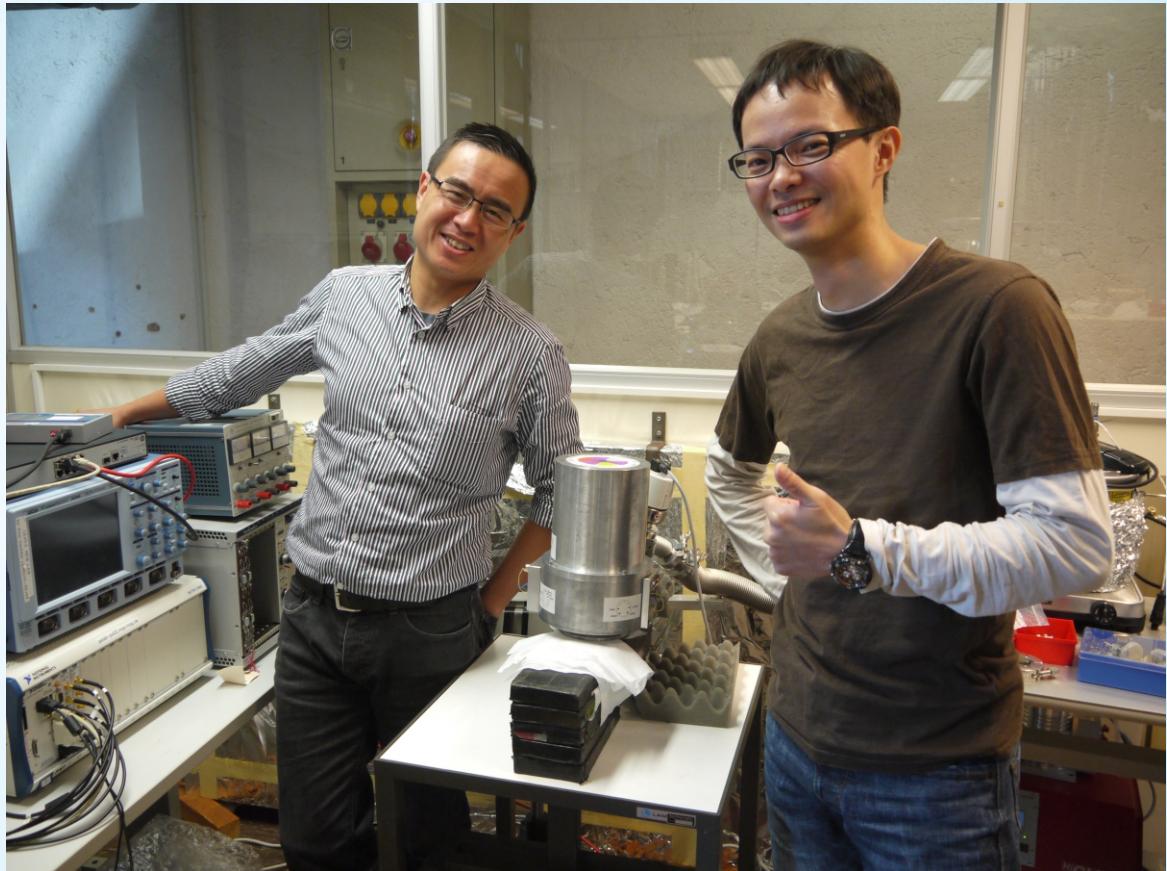
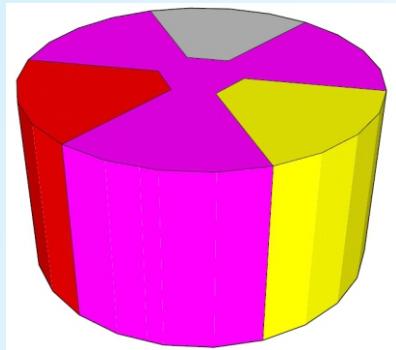
# Projects of the Cooperation

- Detector technology itself
  - n-type segmented BeGe [Canberra]
    - \* 60 k€ from cooperation, rest MPI
  - Design
    - Bela Majorovits [MPI]**
    - Burcin Donmez [MPI at Tsinghua]**
  - Testing
    - HengYe Liao [MPI]**
    - Ma Hao [Tsinghua]**
    - Xiang Liu [Jiatong, MPI]**
  - Publication soon to come



# Projects of the Cooperation

- **n-type segmented BeGe**



# Projects of the Cooperation

- **Electronics and readout**
  - **Try an ASIC from Tsinghua on a segmented detector at the MPI**
  - **ASIC**  
**Deng Zhi [Tsinghua]**
  - **Integrate at MPI**  
**Oliver Schulz [MPI]**

**This is a typical case of “things take longer”.  
I still hope it will happen.**

# Projects of the Cooperation

- **Backgrounds: especially neutrons**

- **MINIDEX**

**An Experiment to measure muon induced neutrons**

**Matteo Palermo [MPI]**

**Raphael Kneissl [MPI]**

**Oliver Schulz [MPI]**

**Chris Gooch [MPI]**

**plus fast neutrons**

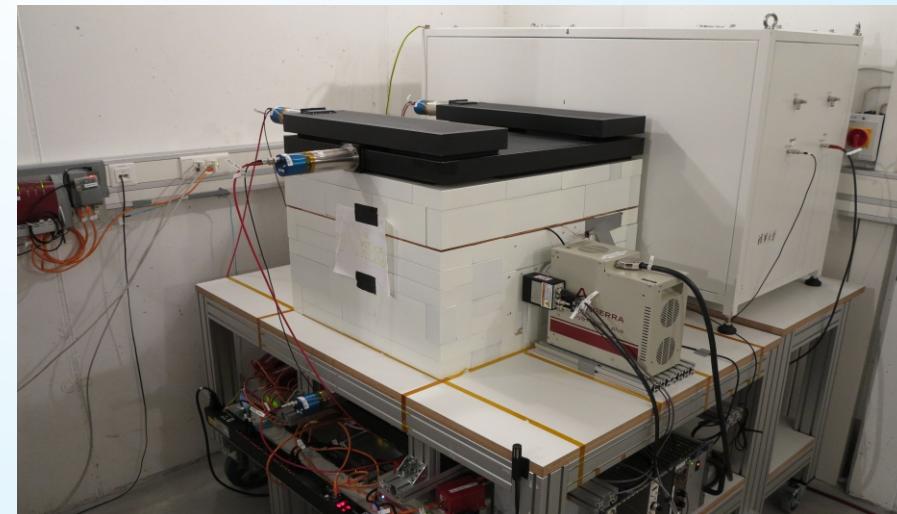
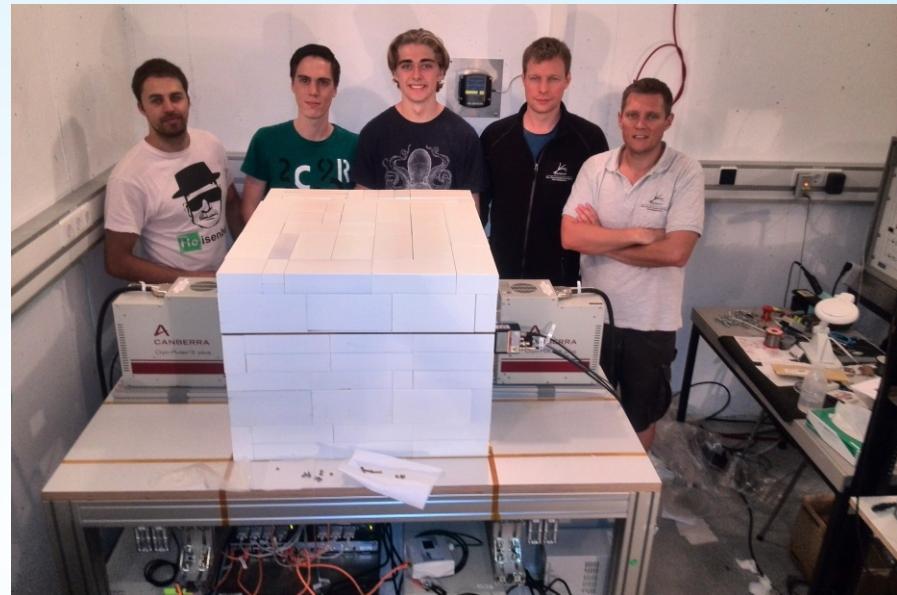
**Wang Li [Tsinghua]**

**installed in Tübingen.**



# Projects of the Cooperation

## • MINIDEX



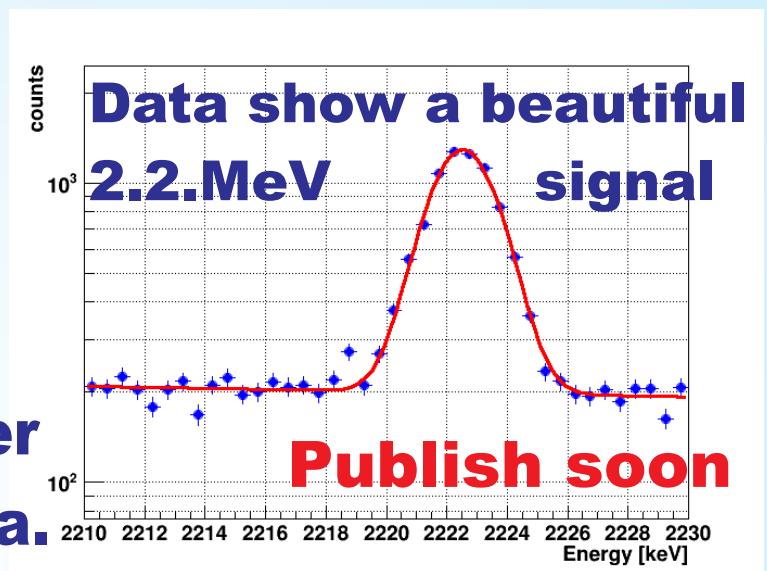
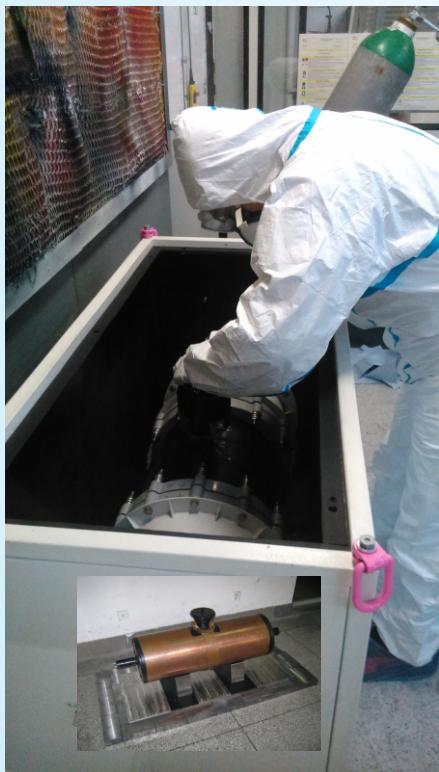
# Projects of the Cooperation

## MINIDEX run I

**70 - 100% neutron excess  
compared to GEANT4**

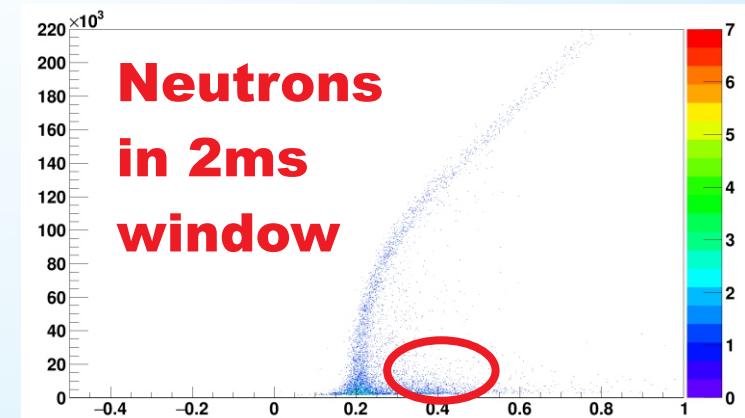
**predictions.**

**MC signal faster  
signal than data.**



## MINIDEX run II

**Improved  
trigger  
fast  
neutrons**



# Projects of the Cooperation

- Experiments to be planned
  - Expression of Interest

**A large scale experiment based on  
germanium technology at CJPL**

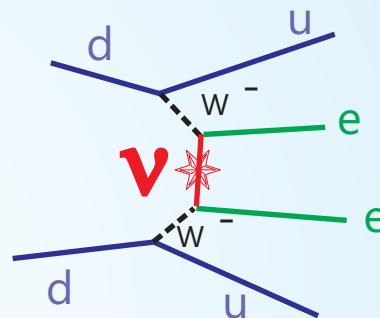
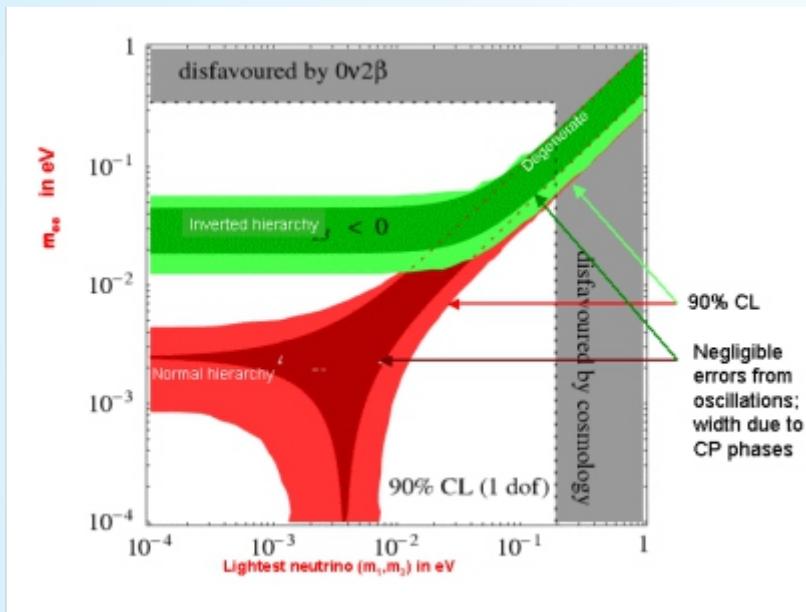


**Iris Abt  
Henry Wong  
Qian Yue**



# EoI – Physics Case

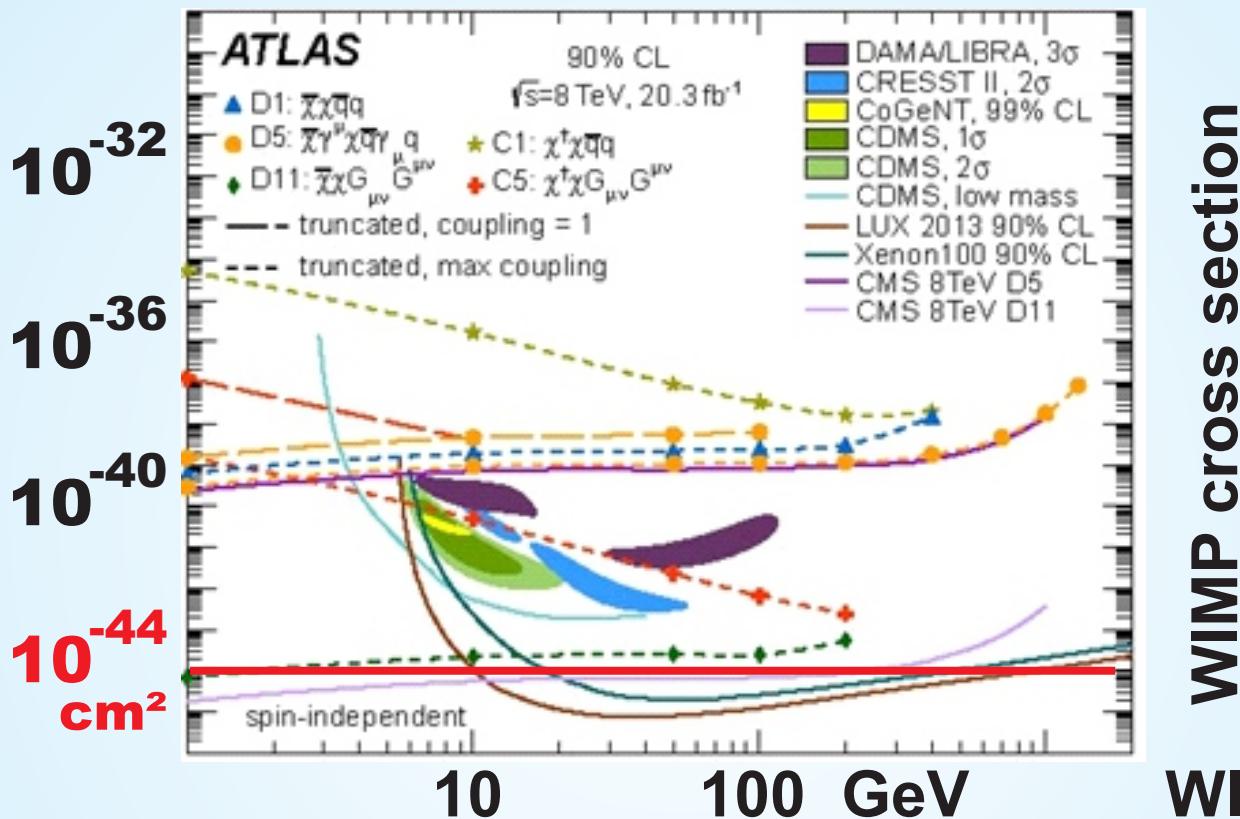
## Neutrinoless Double Beta Decay



**old goal is 10 meV  
related to inverted  
hierarchy**

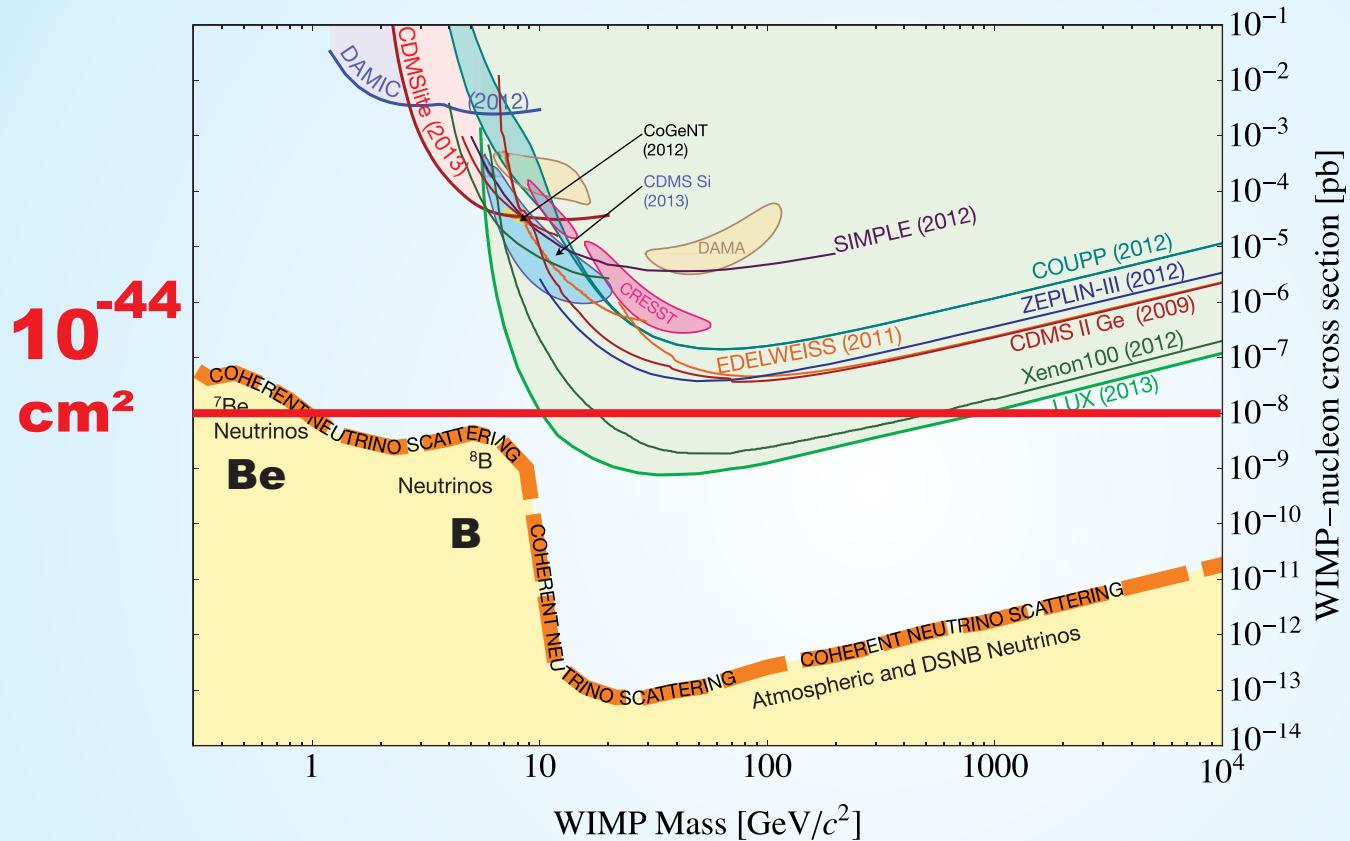
**Look as far as you can....**

# EoI – Physics Case



**Look for low mass dark matter, if it is a byproduct or if LHC finds something which should be surrounding us.**

# EoI – Physics Case



**Solar  
Neutrinos**

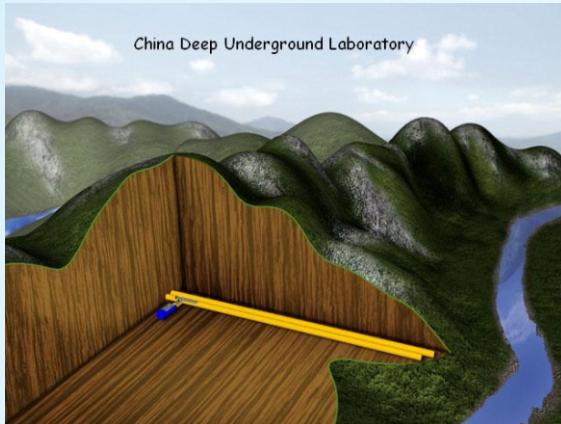
**NC  
[coherent]  
scattering**

**This requires more than a ton!**

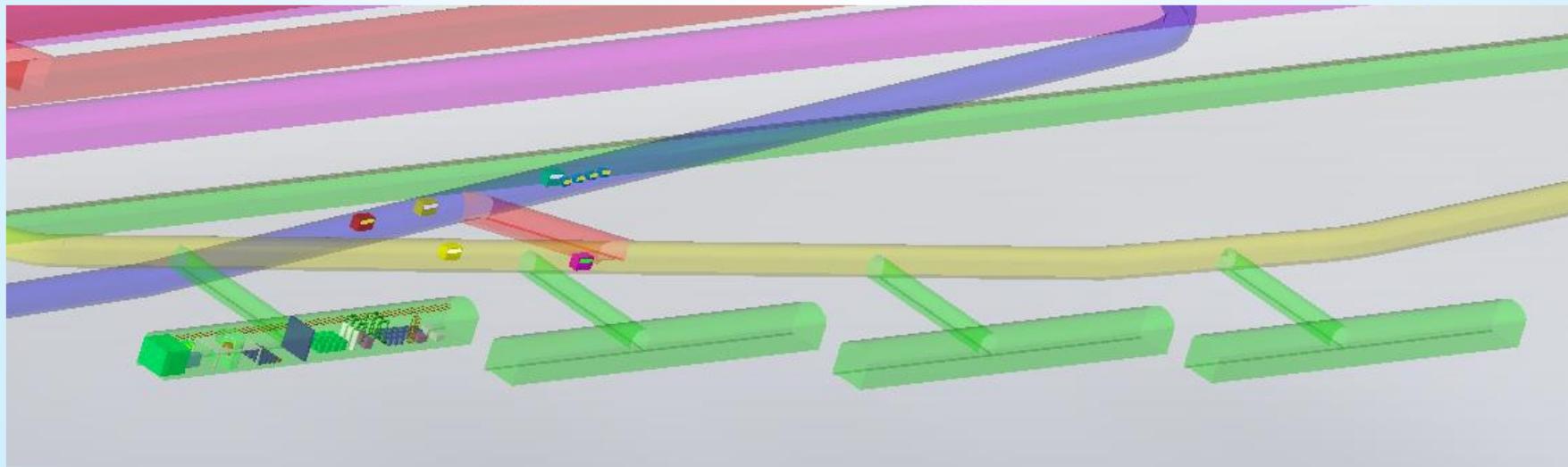
**Axions?**

# EoI – Location

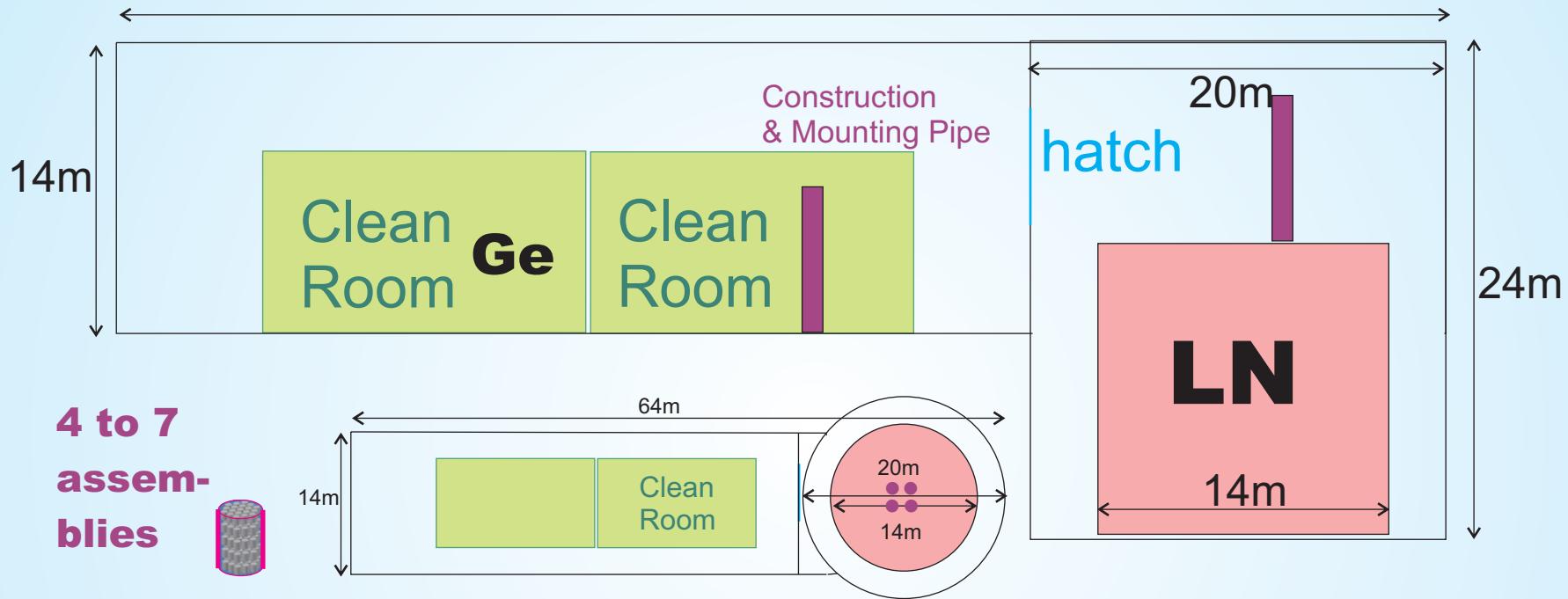
**really  
deep  
horizontal access**



**CJPL would be a good place for a large scale experiment which needs a lot of space for itself and its support.**



# EoI – Concept



**Insert modular assemblies into  
a large LN tank —or LAr or many other things.  
That is what R&D is for [5 years foreseen].**

## EoI – R&D

**Detectors** — reduce and identify background  
— reduce threshold  
→ see low E reactor neutrinos

**Electronics** — ASICs

— integrate on germanium

**Cables** — improve radiopurity and bandwidth

**Holders** — improve radiopurity

**Shells** — improve radiopurity with low Z  
→ build some PEN structures

**System integration and production**

**A lot has to happen before a proposal, TDR become possible.**

# EoI – What Next

**Who will sign the EoI:**

**I.Abt**

**A.Caldwell**

**X.Liu**

**B.Majorovits**

**O.Schulz**

**Dongming Mei**

**Jing Liu**

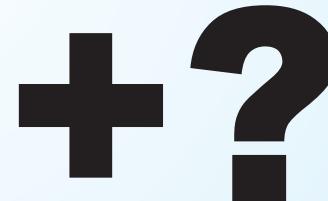


Max-Planck-Institut für Physik  
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**Keyun Kang**  
**Qian Yue**



**Henry Wong**



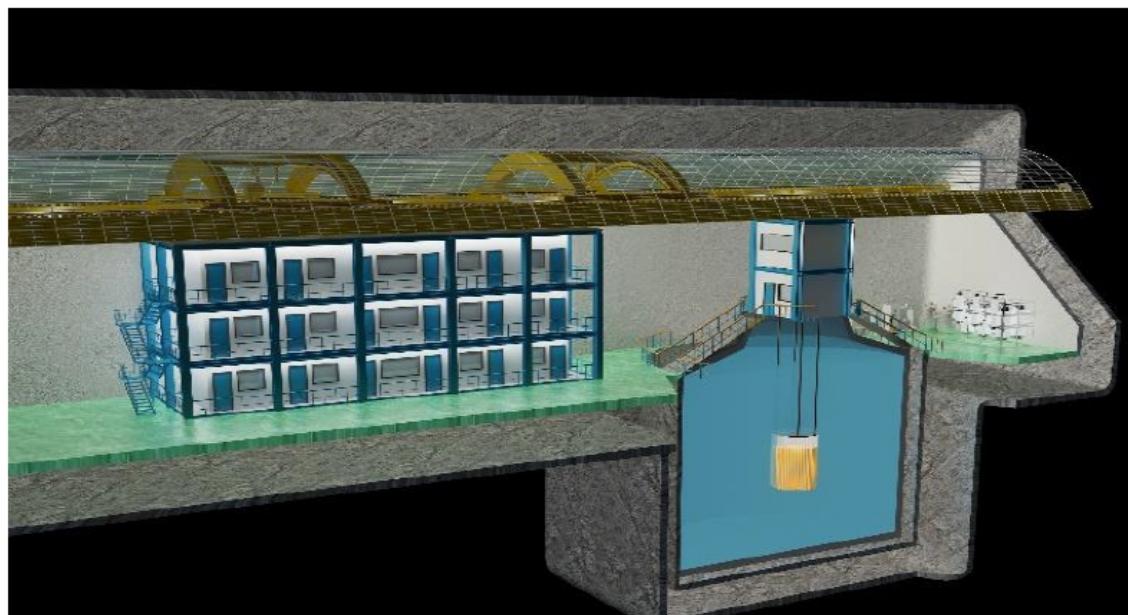
**We need a structured effort for R&D !**

**Are we willing to form a proto-collaboration for this?**

# Meanwhile at CJPL

## Dark Matter

**CDEX 200 at CJPL will establish capability for**



**large scale  
structures  
at CJPL.**

→ **Yue  
Qian**

**Many of the R&D activities can be shared.**

# Impressions



# Impressions



# Impressions

