

# GP-PU Status Report

## KamLAND-Zen Analysis

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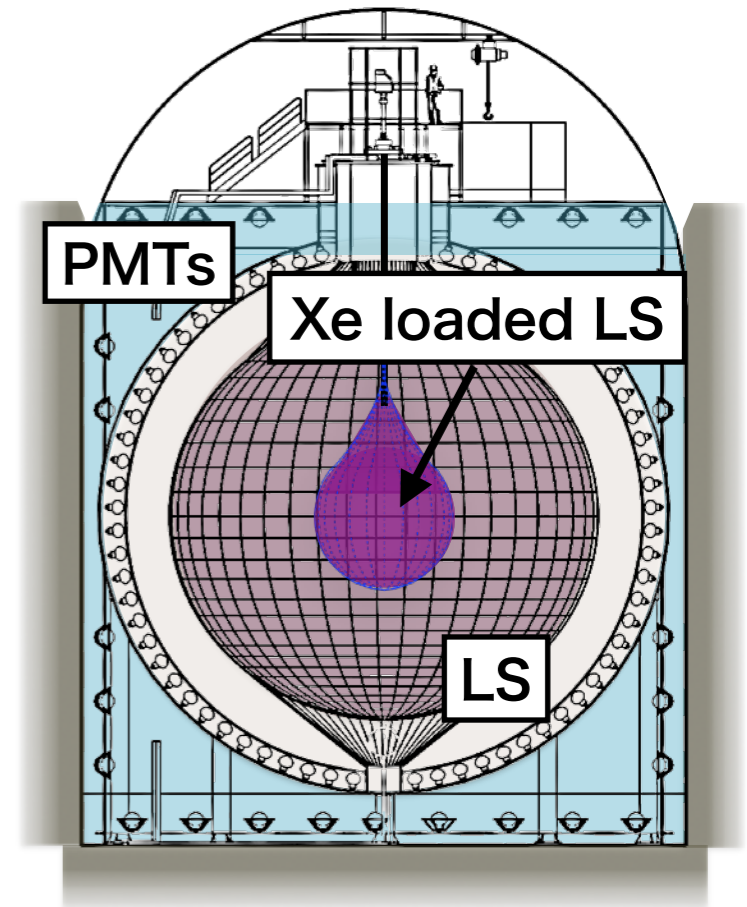
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# KamLAND-Zen

## Neutrinoless double beta decay ( $0\nu\beta\beta$ -decay)

- Can occur only when neutrinos are Majorana particles ( $\nu = \bar{\nu}$ )
  - Lepton # violation (beyond SM)
  - related to baryon asymmetry of the Universe
- has a long life-time ( $T_{1/2}^{Xe} > 10^{26}$  year)

- Very low background environment
- High energy resolution
- Large amount of double beta decay nucleus



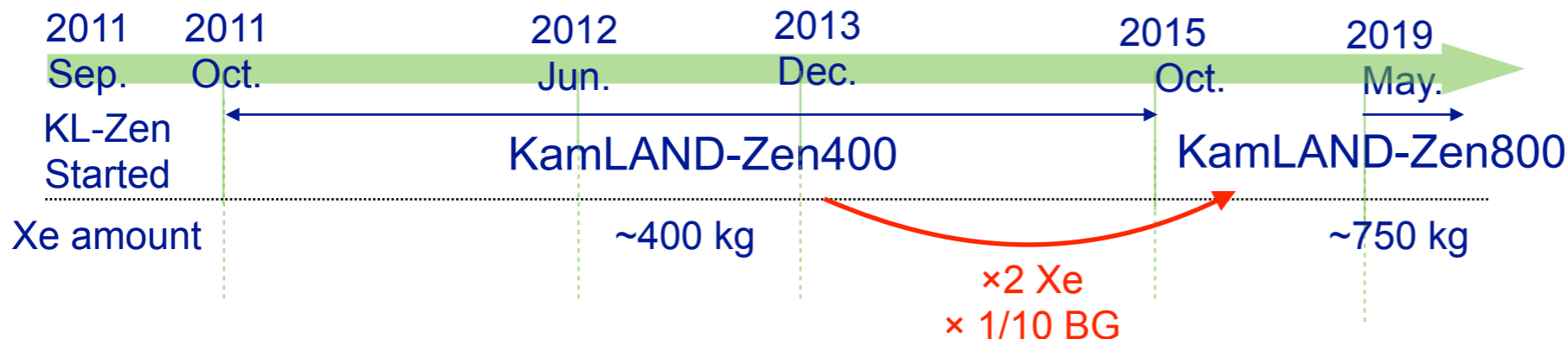
## KamLAND-Zen

- $0\nu\beta\beta$  search w/ KamLAND (low BG liquid scintillator detector)

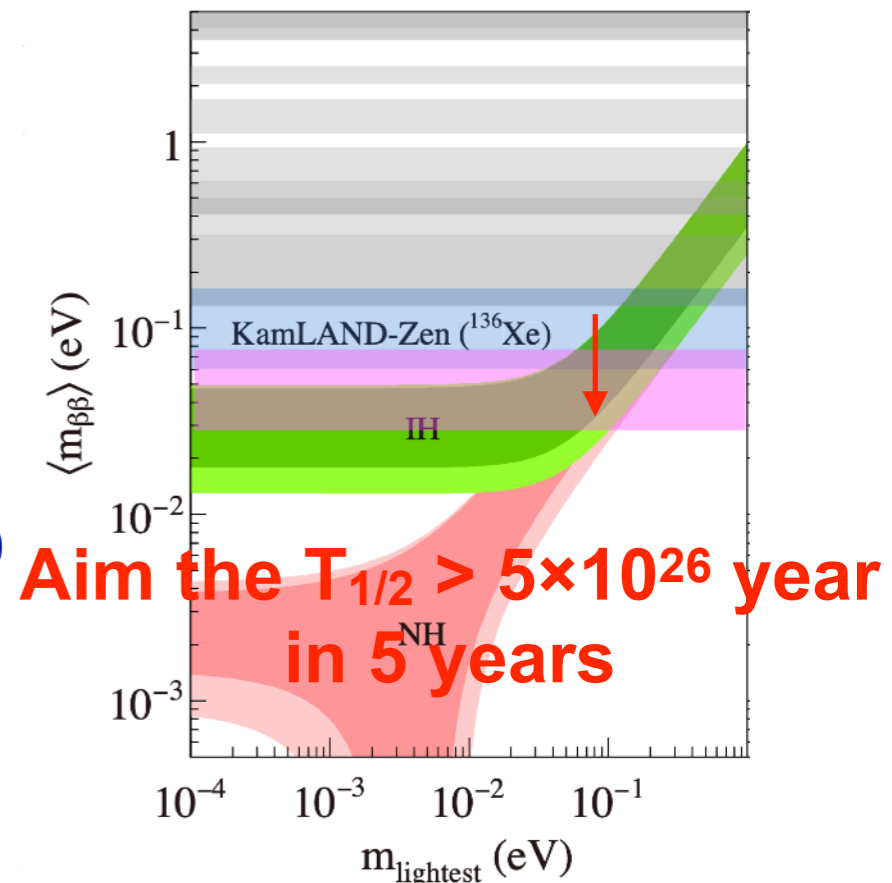
- Low radio active environment

$^{238}\text{U} : 5.0 \times 10^{-18}$  g/g,  $^{232}\text{Th} : 1.3 \times 10^{-17}$  g/g

- Large amount of double beta decay nucleus (100 kg orders of Xe)

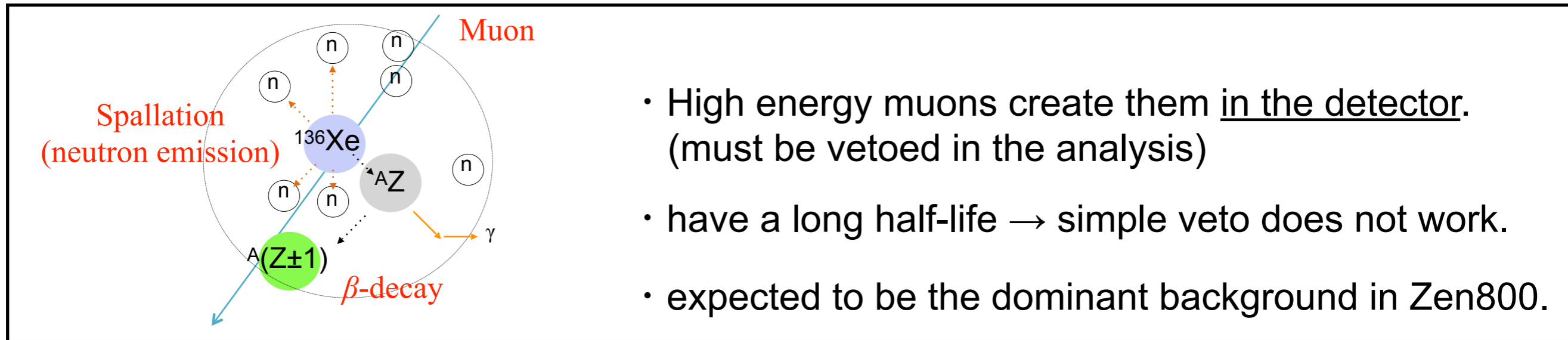


Since BG rate is reduced dramatically, new kind of BG has become important in Zen800  $\rightarrow$  heavy(Xe) spallation products.



# Current Status

- I have worked on improvement of KamLAND-Zen400 until recent times and am going to start  $0\nu\beta\beta$  search with Zen800.
  - The most important assignment → **Heavy spallation products**.



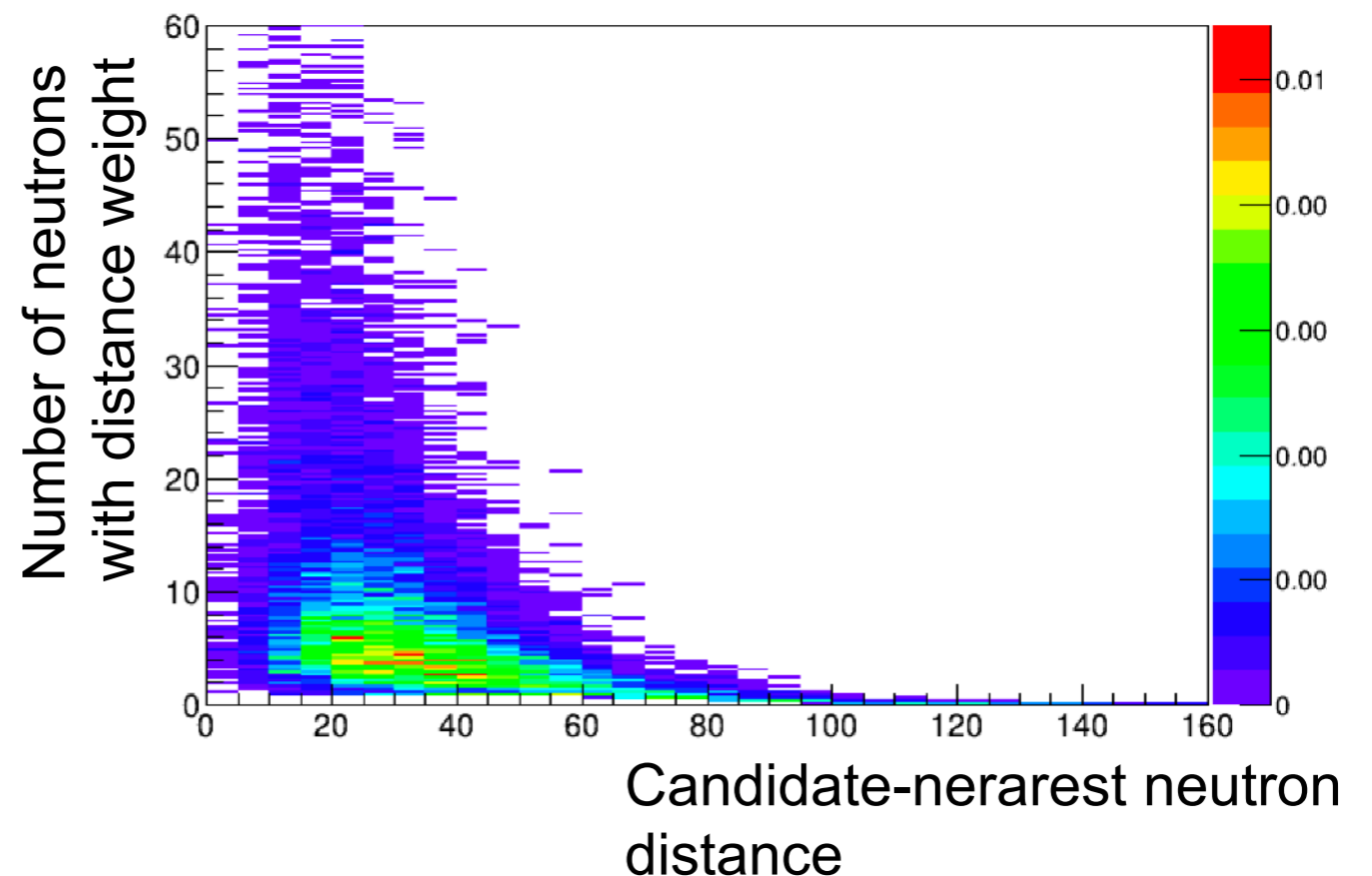
## Point

- creation with neutron emission
- decay with  $\gamma$ -ray emission



Can reject spallation products with these features?

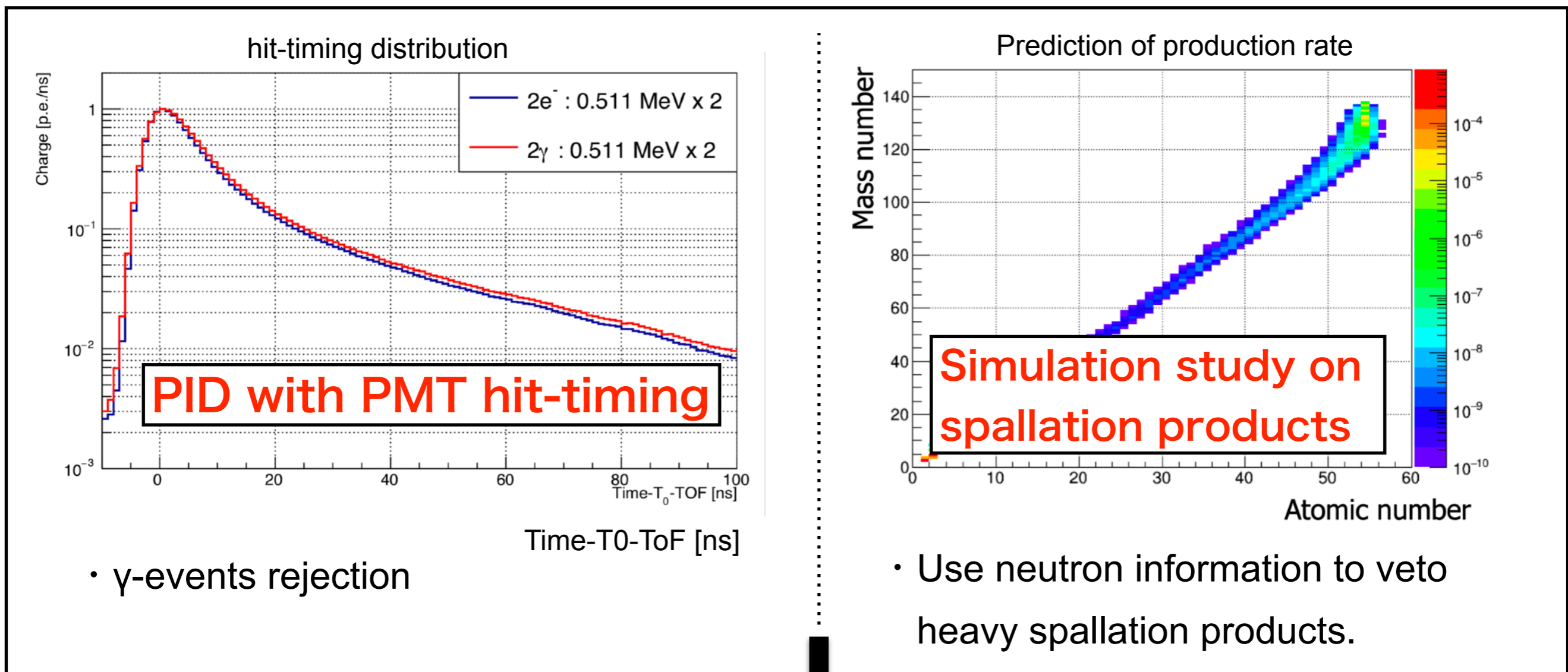
This may be a topic in my Ph.D thesis.



# Prospect during my GP-PU period

- The purpose is to search for  $0\nu\beta\beta$ -decay in inverted neutrino mass hierarchy.
- In order to realize this, I'm going to perform Heavy spallation rejection and  $0\nu\beta\beta$  search with KamLAND-Zen800 data during my GP-PU period I have left.

## Plans

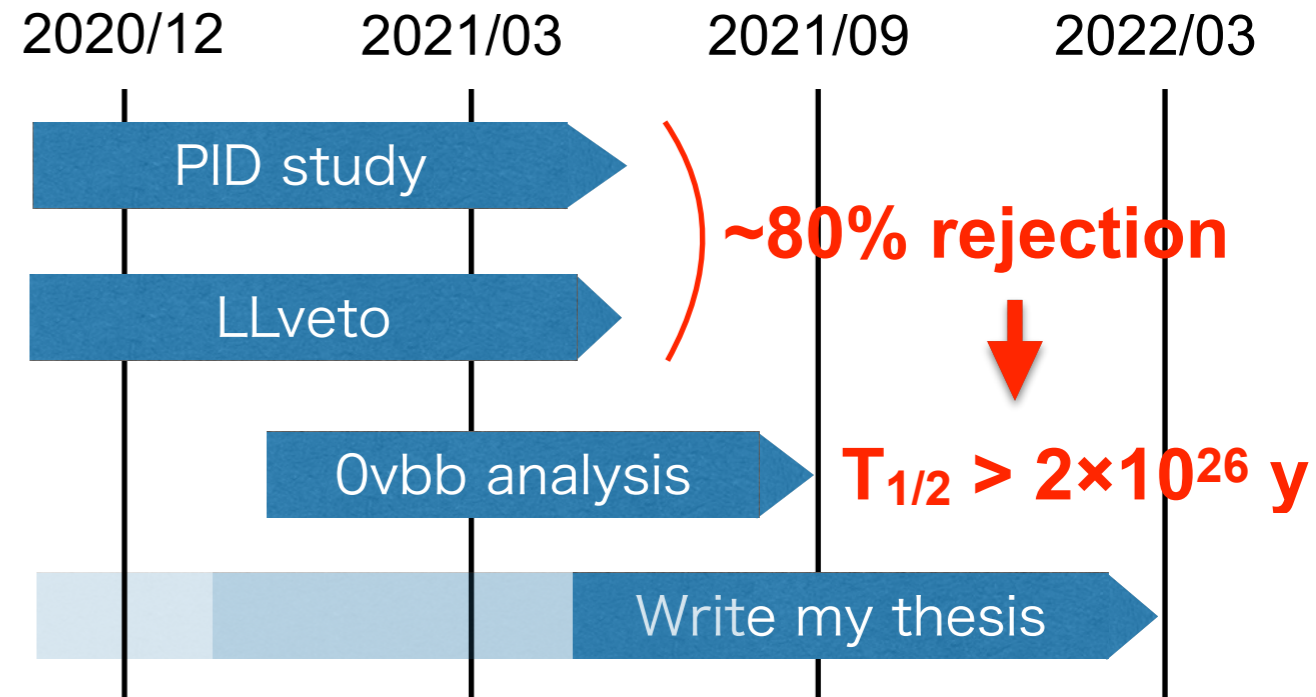


**$0\nu\beta\beta$  search in the inverted neutrino mass hierarchy**

# Others

## Time Line

- I will develop study on heavy spallation rejection in the first half-year +  $\alpha$ .
  - Detector calibration
  - Spallation study with simulation
  - Evaluation of the new methods
- I hope I can finish  $0\nu\beta\beta$  study in the 1st semester of my 3rd grade.
- Then I start writing my Ph.D thesis.



## Study abroad

- So far : APS/JPS joint meeting and DBD(international workshop)
- It is planned to be advised remotely.
  - Main topics will be KamLAND-Zen analysis
  - Now under negotiation with my collaborator.
  - I hope I can get some advised about nuclear spallation studies.
  - I already have meetings with foreign collaborators once per a week ~ two weeks and report my status.