



KamLAND-Zen Analysis

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KamLAND-Zen

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

A mode of double beta decay, which can happen only when neutrinos are Majorana particles ($\nu = \bar{\nu}$).

- Lepton # violation (beyond SM)
- related to **baryon asymmetry of the Universe**
- information about **neutrino's mass** (mass scale, hierarchy...)

Requirement for $0\nu\beta\beta$ search

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



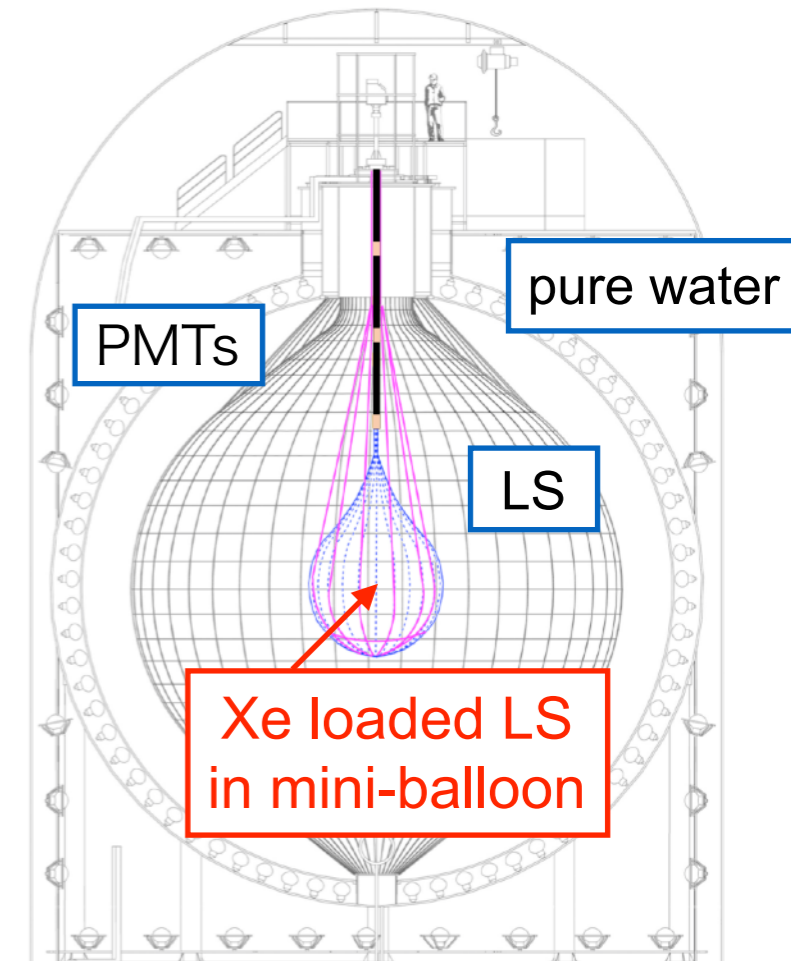
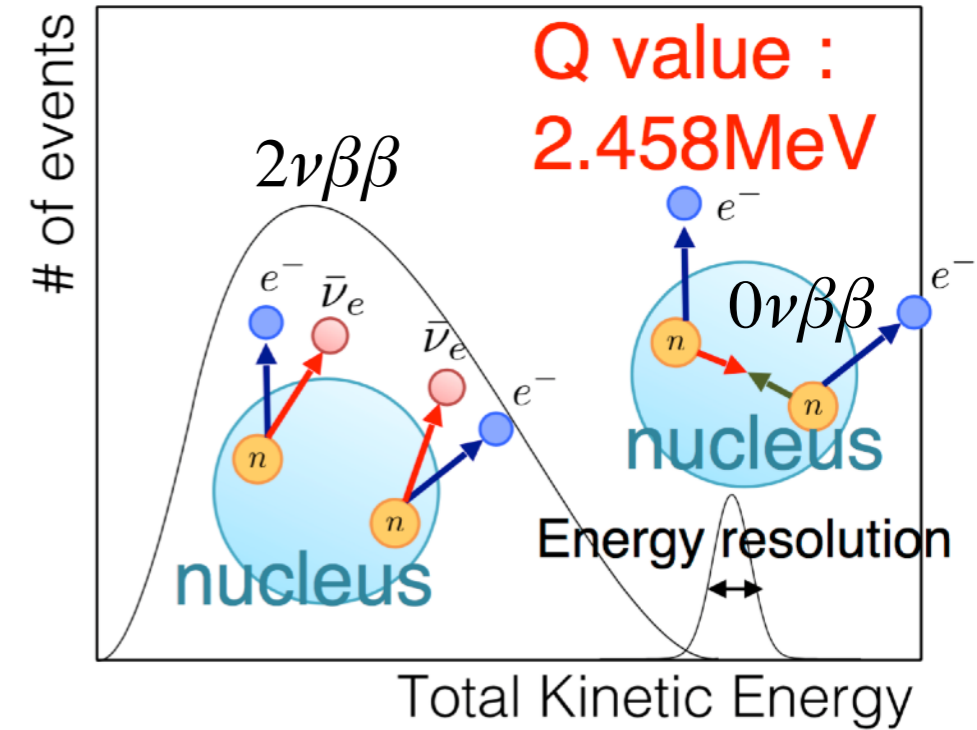
KamLAND-Zen

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

- Very low background environment
 ^{238}U : 5.0×10^{-18} g/g, ^{232}Th : 1.3×10^{-17} g/g
- Large amount of double beta decay nucleus
Scalability ... can accommodate 1000 kg Xe

Set the very strict limit to the half-life of ^{136}Xe $0\nu\beta\beta$ in KamLAND-Zen400.

Data taking of KamLAND-Zen800 with ~745kg enriched Xenon is on going.



Current Status

We have 2 main strategies in KamLAND-Zen analysis.

- Improvement of previous phase (Zen400).
- New result with Zen800 data.

Zen400

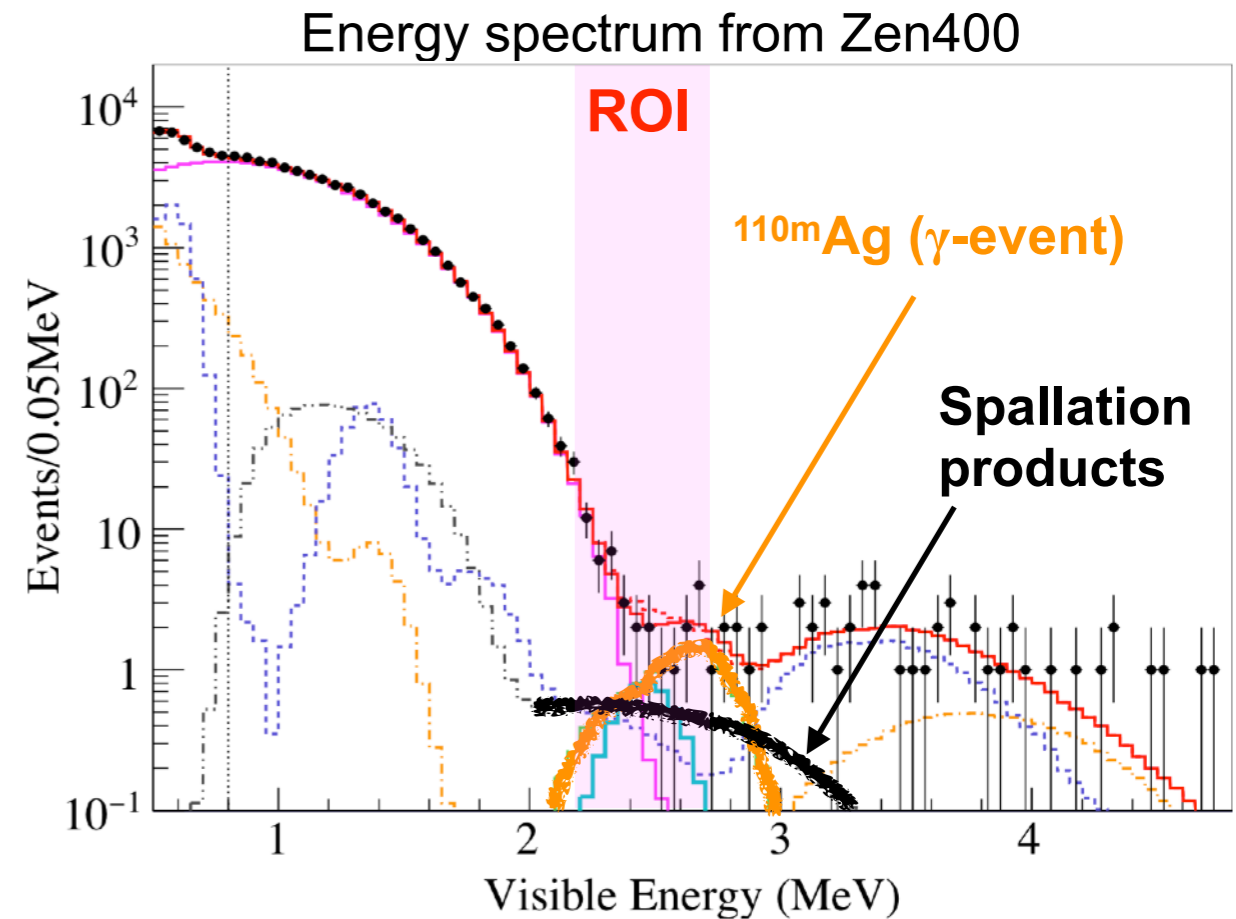
- β/γ -particle identification by neural network
- spallation cut by correlation with muon

➔ Higher sensitivity!

Zen800

- much lower background environment

current
my study



Status

Zen400

- It is confirmed that the new BG reduction methods work well and improve the sensitivity.
- I am going to finalize the study.

Zen800

- Analysis with very low background data shows that precise study for new kinds of background is important.
→ I am going to study it.

Time Line

● Zen400 study

- Finish the analysis of Zen400.

● 海外研修

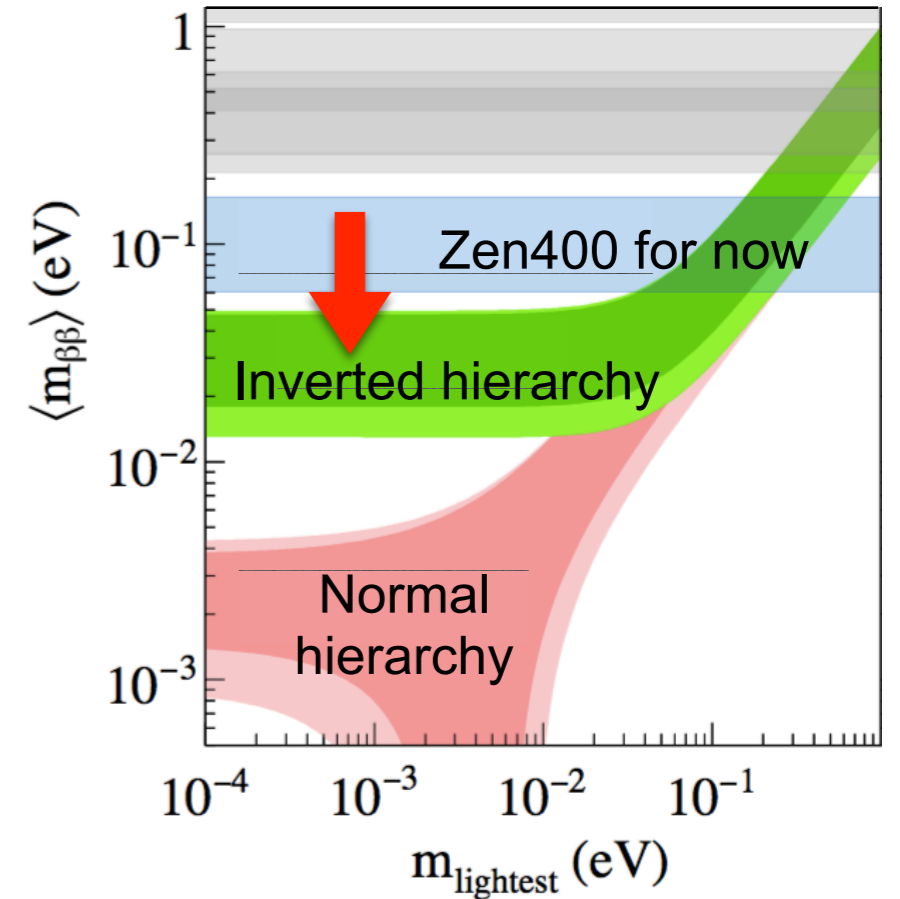
- Not decided yet.
- Study on BG reduction for KL-Zen(?)
- I am going to contact my collaborators.

● Zen800 analysis

- Precise BG studies
- Some new ideas
- Search in the inverted hierarchy region.

● Ph.D thesis

- Write Ph.D thesis with Zen800 study.
(• 0vbb discovery?)



海外研修等について

海外研修

- So far : APS/JPS joint meeting and DBD(international workshop)
- A meeting with collaborators and a plan to join ABRACADABRA (axion search experiment) are canceled because of COVID.
- Would like to find supervisor for KamLAND-Zen study.

We have collaborators in MIT who also engage KamLAND-Zen.

I am going to contact them and get advises about BG study for Zen800 via phone systems.

Others

- Point : GSP+GASP = 17pts, GEP = 7pts (+ 6pts予定)
- International Conference : TAUP2019、新学術、 Neutrino2020