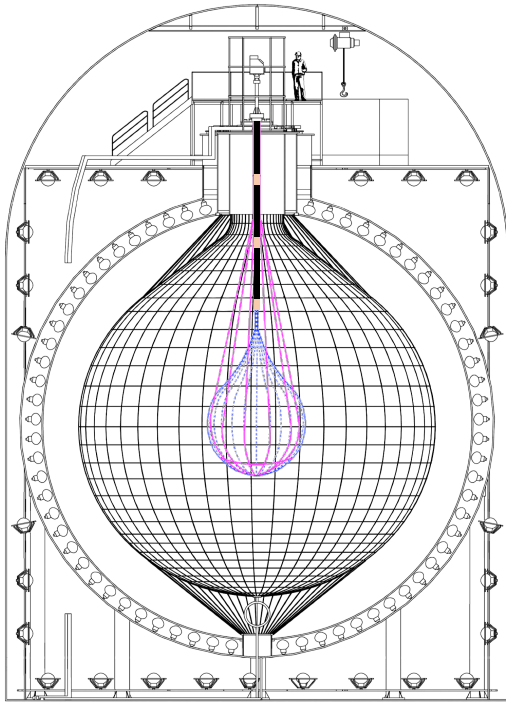


PROGRESS REPORT

Research center for neutrino science
GPPU MC2
Kawada Nanami

KamLAND-Zen



KamLAND detector

the biggest anti-neutrino detector using liquid scintillator in the world
PMT and liquid scintillator

KamLAND-Zen experiment

- ^{136}Xe loaded as double-beta decay source
- searching **neutrino-less double-beta decay ($0\nu 2\beta$)**
 - > Majorana nature of neutrino
 - > **explanation of the matter domination**
- giving a limit on $0\nu 2\beta$ lifetime
 - > **limit on neutrino mass (the most sensitive in the world)**

Background reduction for better sensitivity

BG reduction method : detector purification, muon veto, tagging analytically
present main backgrounds : $2\nu 2\beta$, ^{10}C and solar neutrino

separated by **energy** tagged by DC

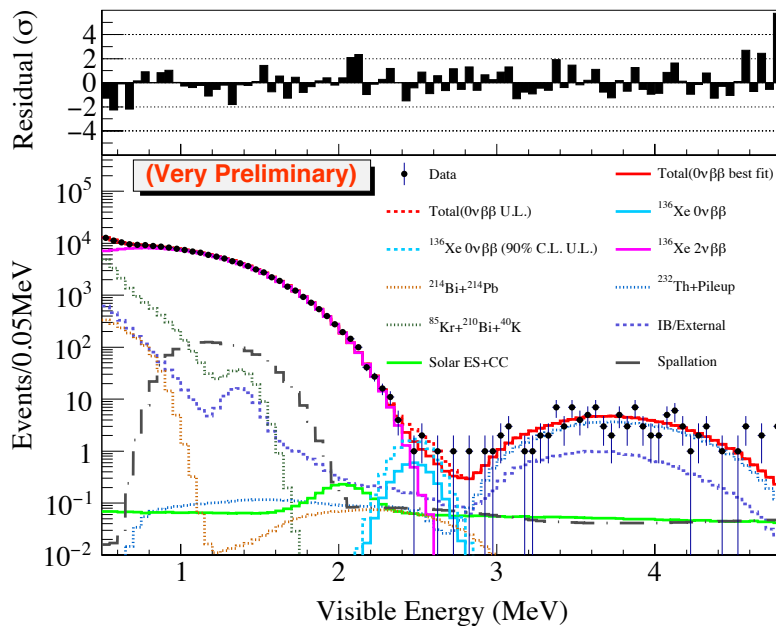
Problem : Increasing Bad PMTs

They are masked in analysis.

increasing bad PMT -> energy resolution getting worse -> **more $2\nu 2\beta$ backgrounds**

Reducing HV to save PMTs -> smaller gain -> worse S/N ratio of PMT

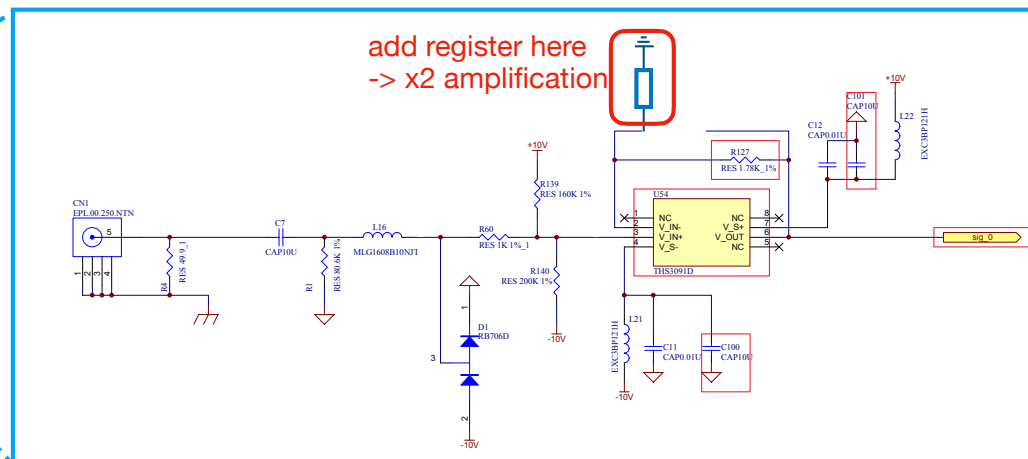
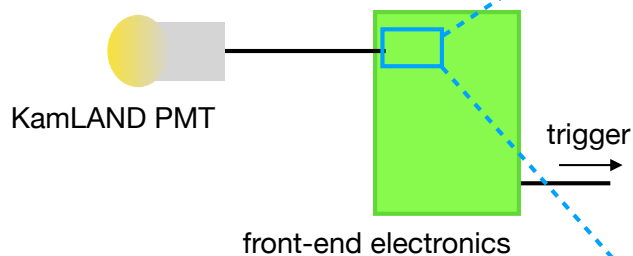
Update electronics to keep S/N ratio by amplifying PMT pulse and recover Bad PMTs : my work



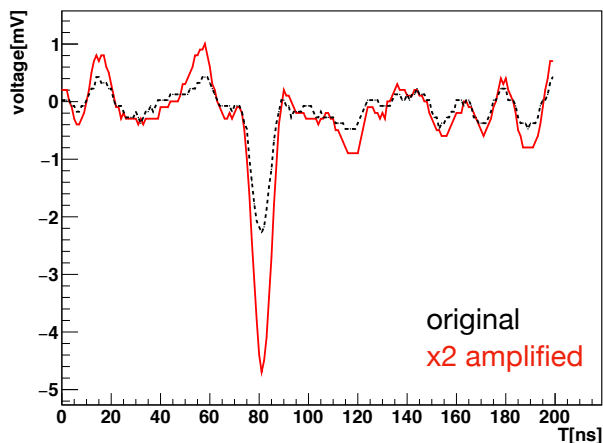
Status



Update overview

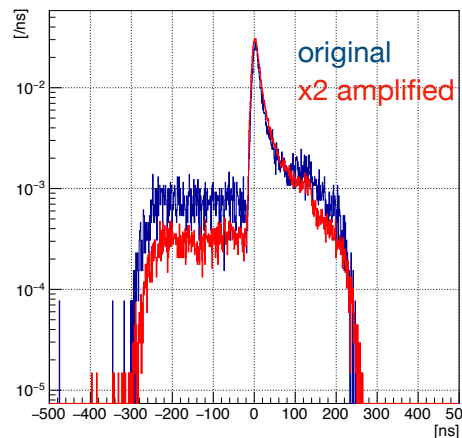


Lab. test

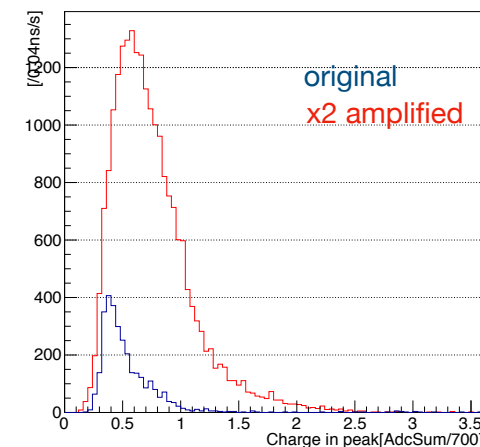


- amplification check
- noise check

On-site test on 1 channel



- Signal/dark ratio check
- pulse finding efficiency evaluation



~370ch on-site test to verify **energy resolution improvement** will be in this fall.

Prospect



main work

Update of KamLAND
Front-end electronics

Solar flare neutrino
search by KamLAND

KamLAND-Zen 800
analysis

MC2

verification (master thesis)

event selection optimization
sensitivity calculation

“Bi-Po pileup BG” rejection
Dataset stability check

DC1

Full install to KamLAND

summarize

(first result)

DC2

$0\nu 2\beta$ search analysis

DC3

summarize

Study abroad



Until now

- I have not studied abroad yet.
- I have got many opportunities of co-working and discussing with foreign researchers in KamLAND collaboration.

Future plan

- I do not have any concrete plan yet.
- I would like to try accelerator experiments or astronomical observation.