GPPU Progress Status Presentation

Progress status of E03 experiment at J-PARC

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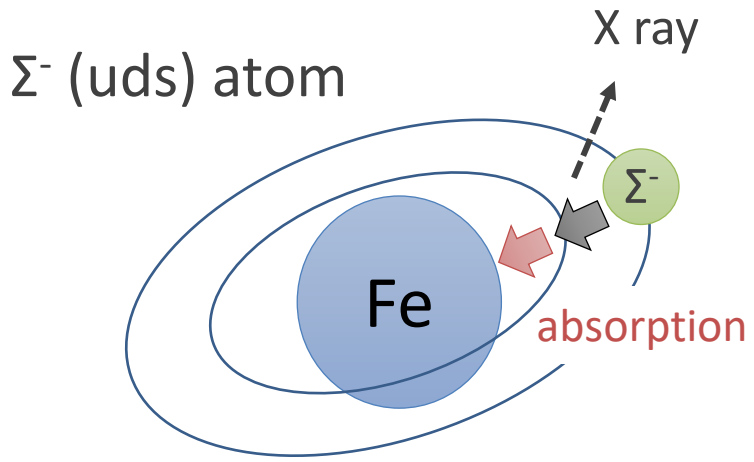
Introduction

J-PARC E03 : Measurement of Ξ^--atomic X rays

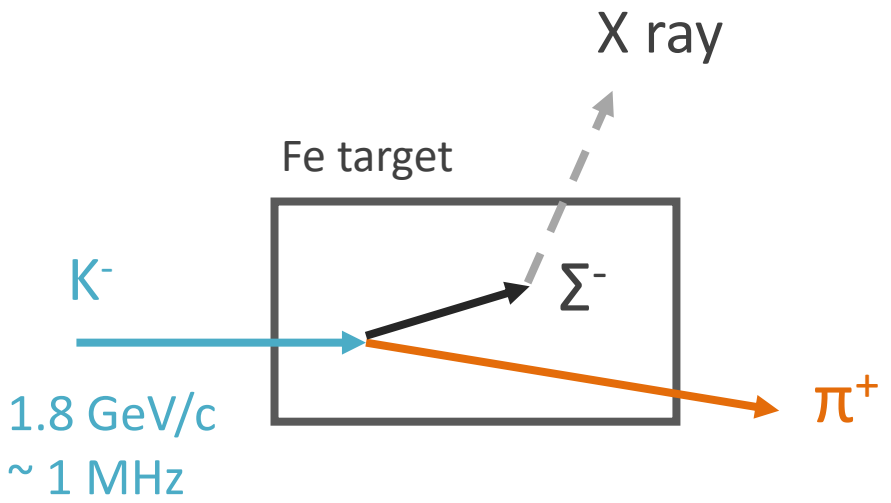


By-production : Measurement of Σ^--atomic X rays

- Measure X-ray energy shift and width by strong interaction
  → ΣN interaction
- We think remeasure of Σ^--atomic X rays is needed.
  Σ^- production method
  Past experiment (1970s – 90s) : stopped K^- reaction
  E03 experiment : in-flight (K^-, π^+) reaction
  → Suppress background by K^-- atomic X rays
- No data of Fe Σ^--atomic X rays

Method

- Produce Σ^- in Fe target by the in-flight (K^-, π^+) reaction
- Measure K^- and π^+ with magnetic spectrometers
- Measure X rays using Ge detectors

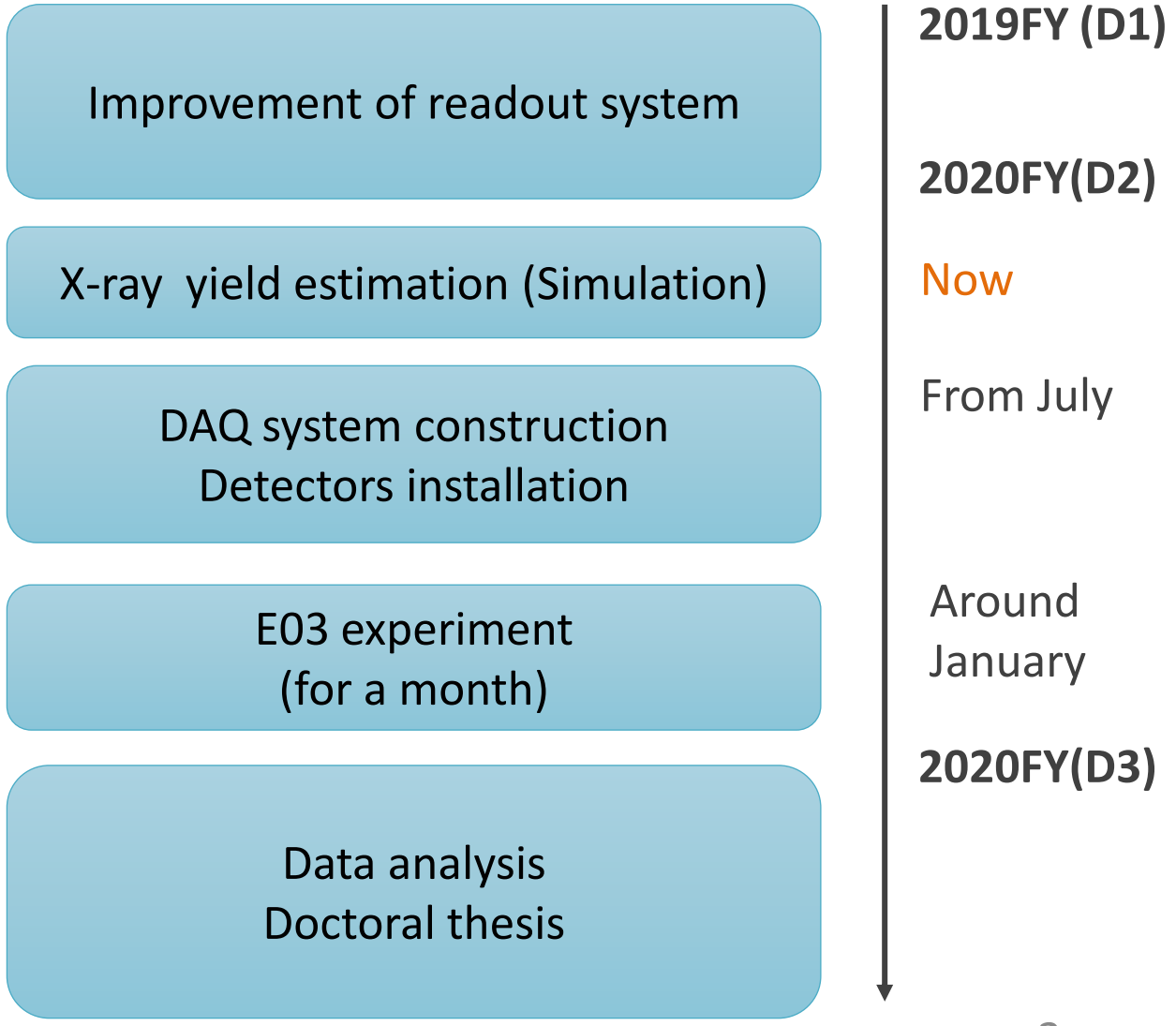


Plan

For measurement of Σ^--atomic X rays in E03 experiment.

- **Need to improve Ge detector readout system** (almost done)
  - Σ^- and Ξ^- are produced by different reaction
    Σ^- : (K^-, π^+) reaction
    Ξ^- : (K^-, K^+) reaction
  - When collecting data for both events simultaneously, DAQ efficiency is decrease in conventional DAQ system
  - Ge detector part of DAQ system is bottleneck

- **Estimate realistic X-ray yield (simulation)**
  - (K^-, π^+) reaction rate
  - Probability of Σ^- stopping in target etc.



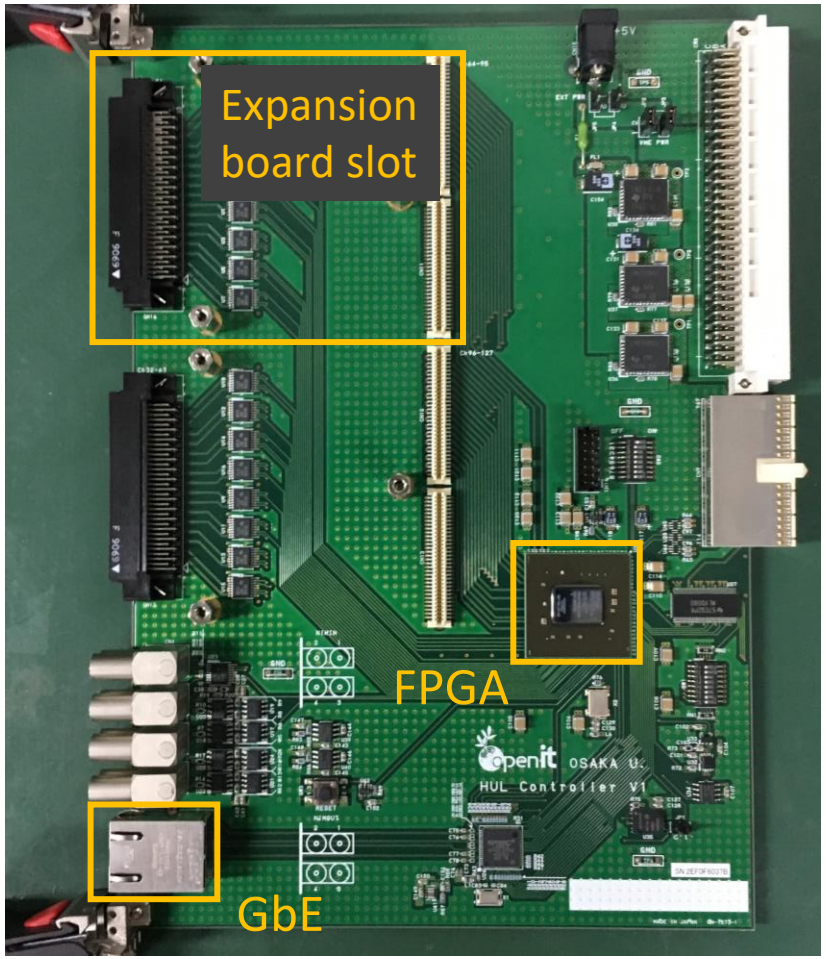
Improvement of readout system for Ge detectors (Progress status)

Ge detector ADC readout

CAMAC ADC module
+ VME memory module
- VME bus cycle
- DAQ busy : ~ 100 us

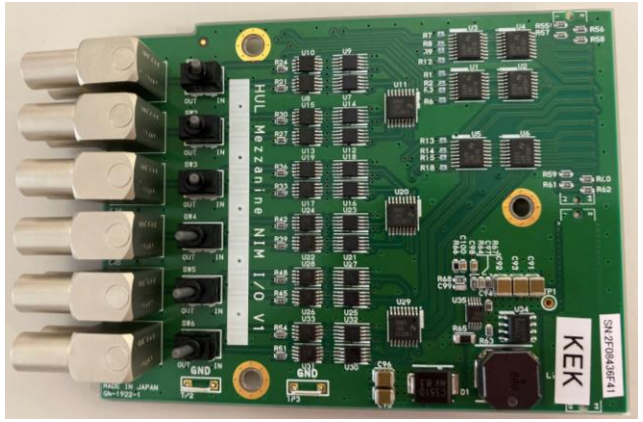
CAMAC ADC module
+ HUL module
- TCP communication (GbE)
- DAQ busy : ~ 10 us
  (only A/D conversion time)

General purpose FPGA module
(Hadron Universal Logic module)



Function expansion board (NIM I/O)

For generating ADC gate
using HUL instead of NIM modules



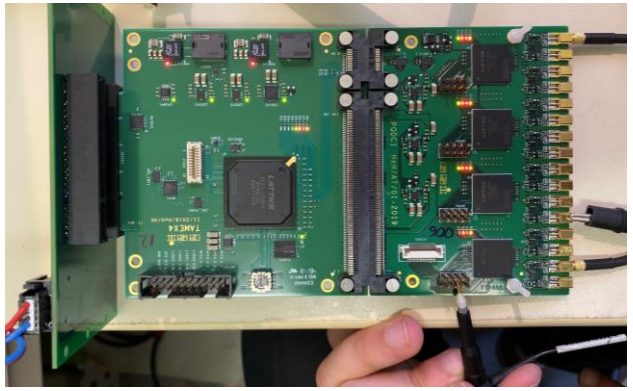
Measure preamplifier reset timing of Ge detector

For improving detection efficiency of Ge detectors

Overseas study

Hypernucler spectroscopy with heavy ion beams (FRS/GSI)

- ^{6}Li + ^{12}C at 2 A GeV
- nnΛ search
- $^{3}_{\Lambda}$H, $^{4}_{\Lambda}$H lifetime measurement



- 10/16 ~ 11/30, 2019 (1.5 month) in GSI (Germany)
  - ➢ Operation test of circuit for fiber tracking detectors.

- February to March 2021 (1.5 month) in GSI
  - ➢ Join beamtime after E03 experiment