



# News from AC-LGAD activity

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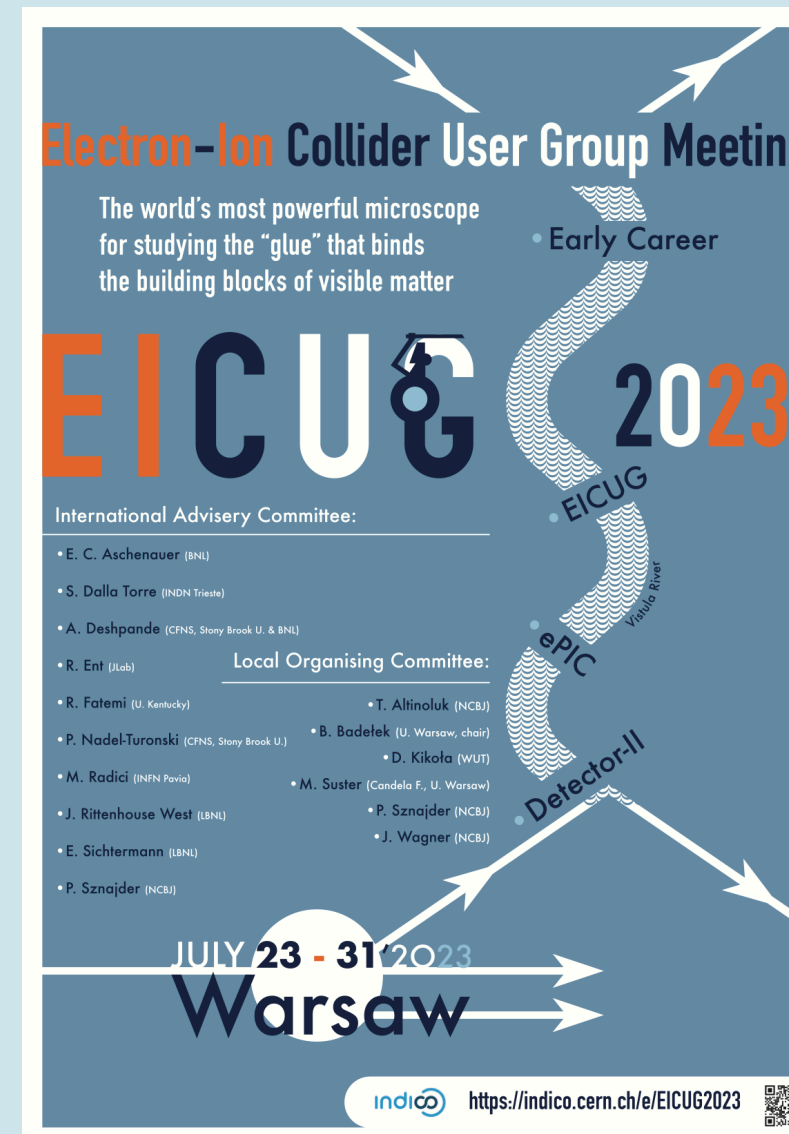
RHIC and AGS Annual User's Meeting

08/24/2023



# EICUG meeting @ Warsaw

- 07/25-07/29 @ Warsaw University
  - EIC + ePIC sessions
- Goto-san, Shigaki-san, and Yano (3/110)
- Commissioning and detector R&D status
- DSC-AC-LGAD-TOF by Zhenyu (& Yano)
- Session chair of last day by Yano
- Met with Zhenyu and discuss TOF future and shared Japanese group intension



SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY	SUNDAY	MONDAY
23 JUL	24 JUL	25 JUL	26 JUL	27 JUL	28 JUL	29 JUL	30 JUL	31 JUL
Early Career Workshop	Early Career Workshop	EIC	EIC	ePIC	ePIC	ePIC	Trip 3	Det II / IP8
Early Career Workshop	Early Career Workshop	EIC	ePIC evening: Conference Dinner	ePIC evening: Trip 1	ePIC	Trip 2	Det II / IP8	Det II / IP8

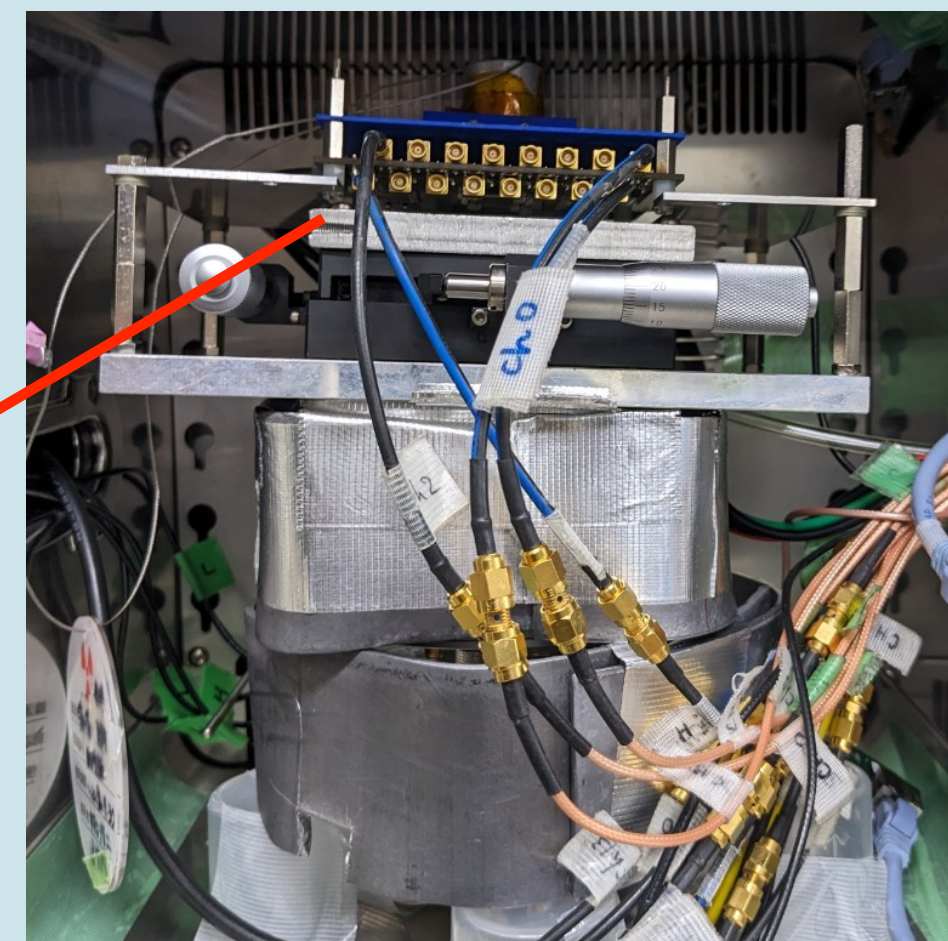
# AC-LGAD activity @ KEK

- 08/07-08/10 @ KEK with Nakamura-san
- Kawade-san (Shinshu Univ.), Matsutani-kun (Hiroshima Univ.), and Yano
- We learned how to proceed the AC-LGAD R&D

Test setup



Test bench



Amp board

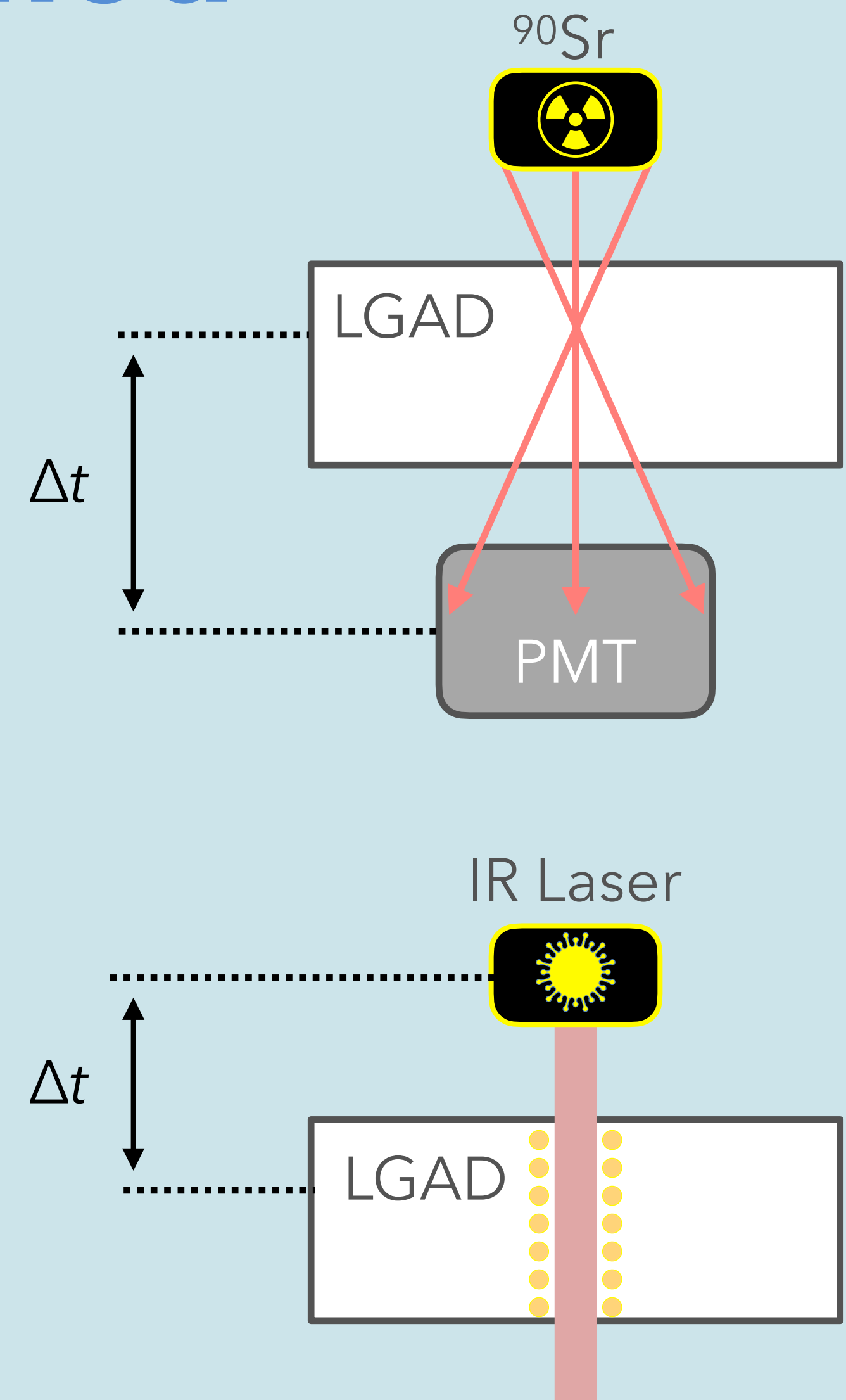


AC-LGAD



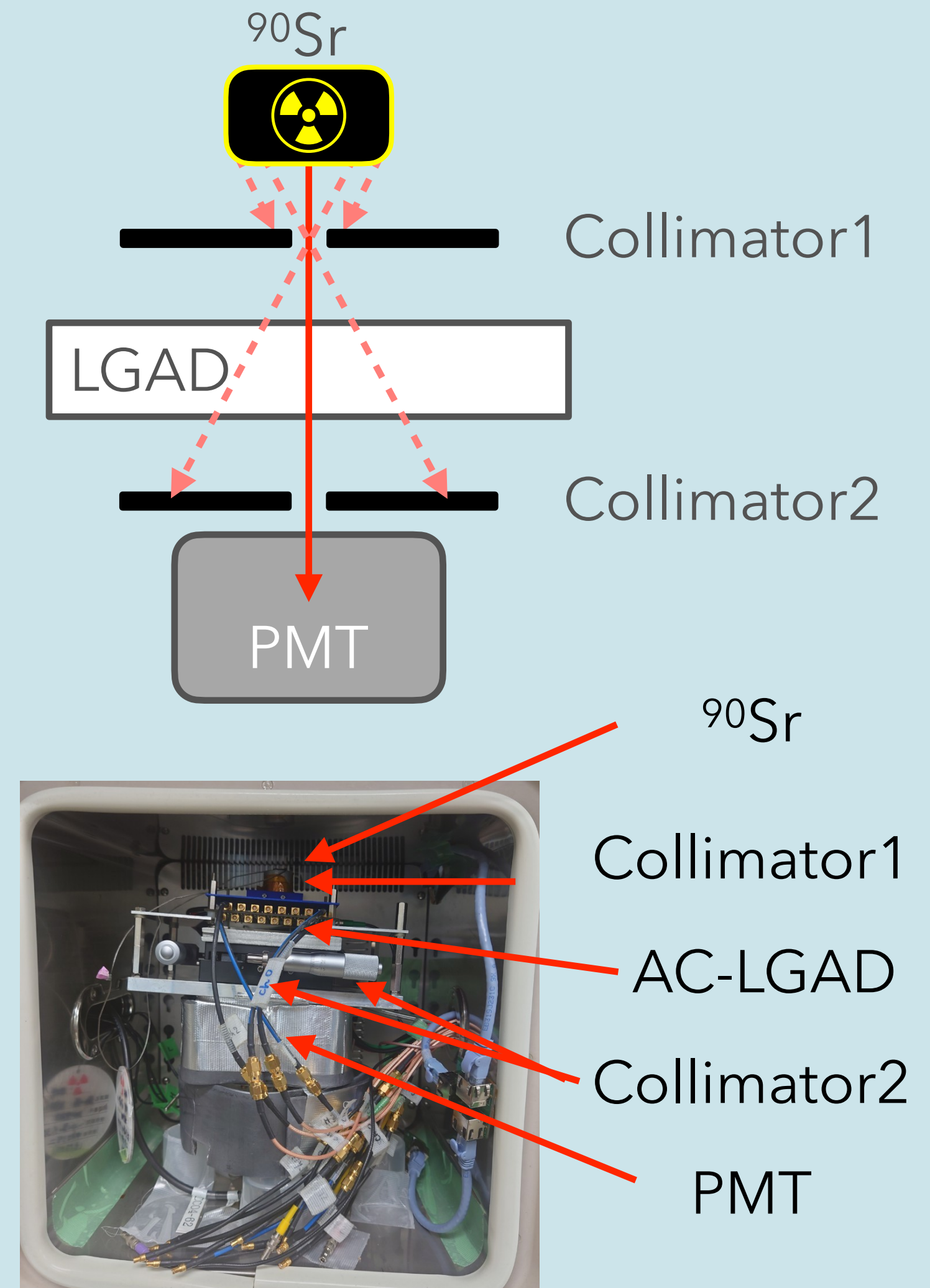
# AC-LGAD R&D method

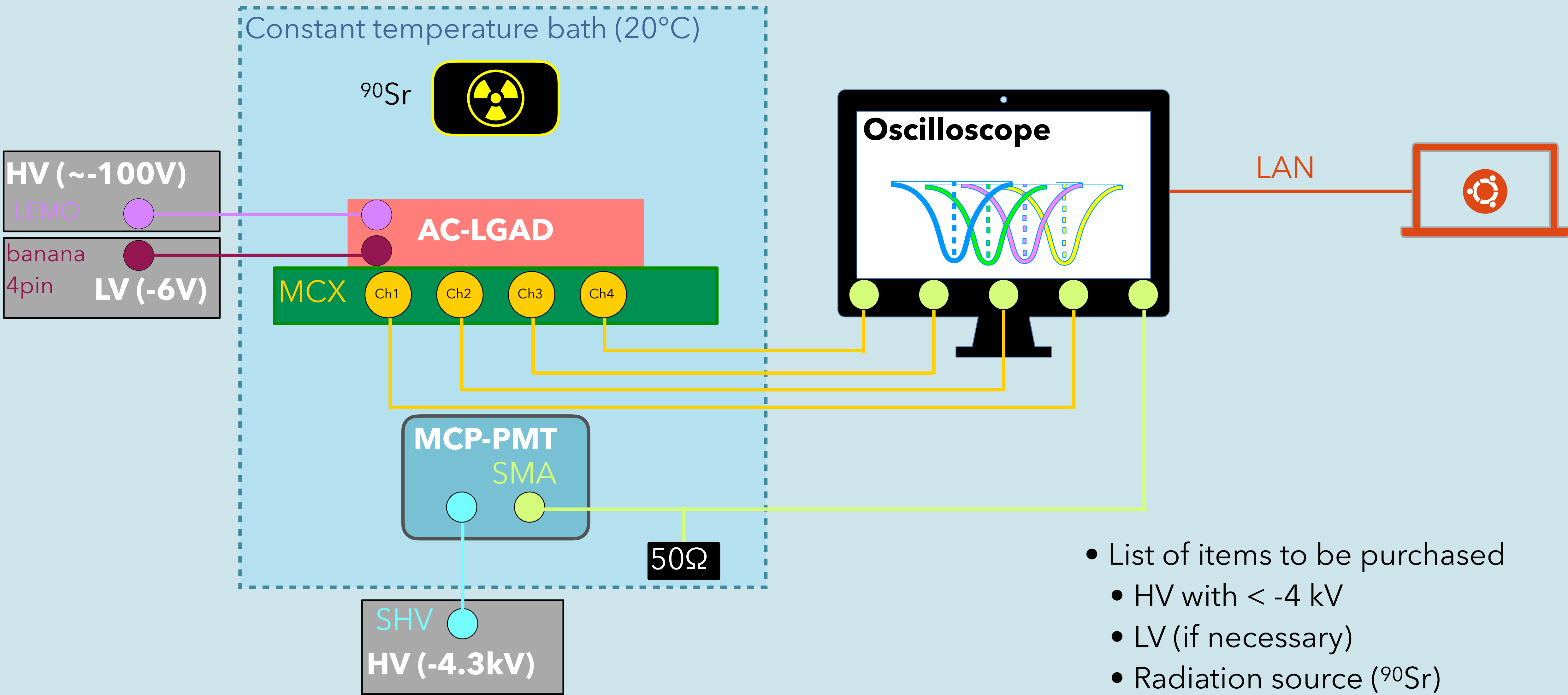
- Radiation source ( $^{90}\text{Sr}$   $O(1)$  MeV )
  - MIP is available (realistic S/N)
  - It is difficult to control path length (worse timing resolution than realistic)
  - Easiest test bench setup
- IR laser
  - Signal magnitude can be controlled with laser strength
  - Landau fluctuation noise doesn't exist (better timing resolution than MIP)
  - It is easy to control positioning and reference timing
- Beam ( $O(1-100)$  GeV/c)
  - MIP is available (realistic S/N)
  - Injected position can be measured by an additional telescope system
  - Most accurate test but cannot be operated often



# Improve radiation source test with collimators

- If the path length problem can be solved the radiation source method can measure accurate timing resolution easily
- Collimators can restrict beta radiation path length
  - $\sigma_{\text{timing}} = 40 \text{ ps} \rightarrow 28 \text{ ps}$  (analysis in progress)
- The trigger rate with  $^{90}\text{Sr}$  (1M Bq), collimator1 and PMT is  $\sim 400 \text{ Hz}$ , but adding collimator2 is  $O(1) \text{ Hz}$
- Design of the test bench with collimators by using GEANT4 is crucial to speed up the AC-LGAD R&D

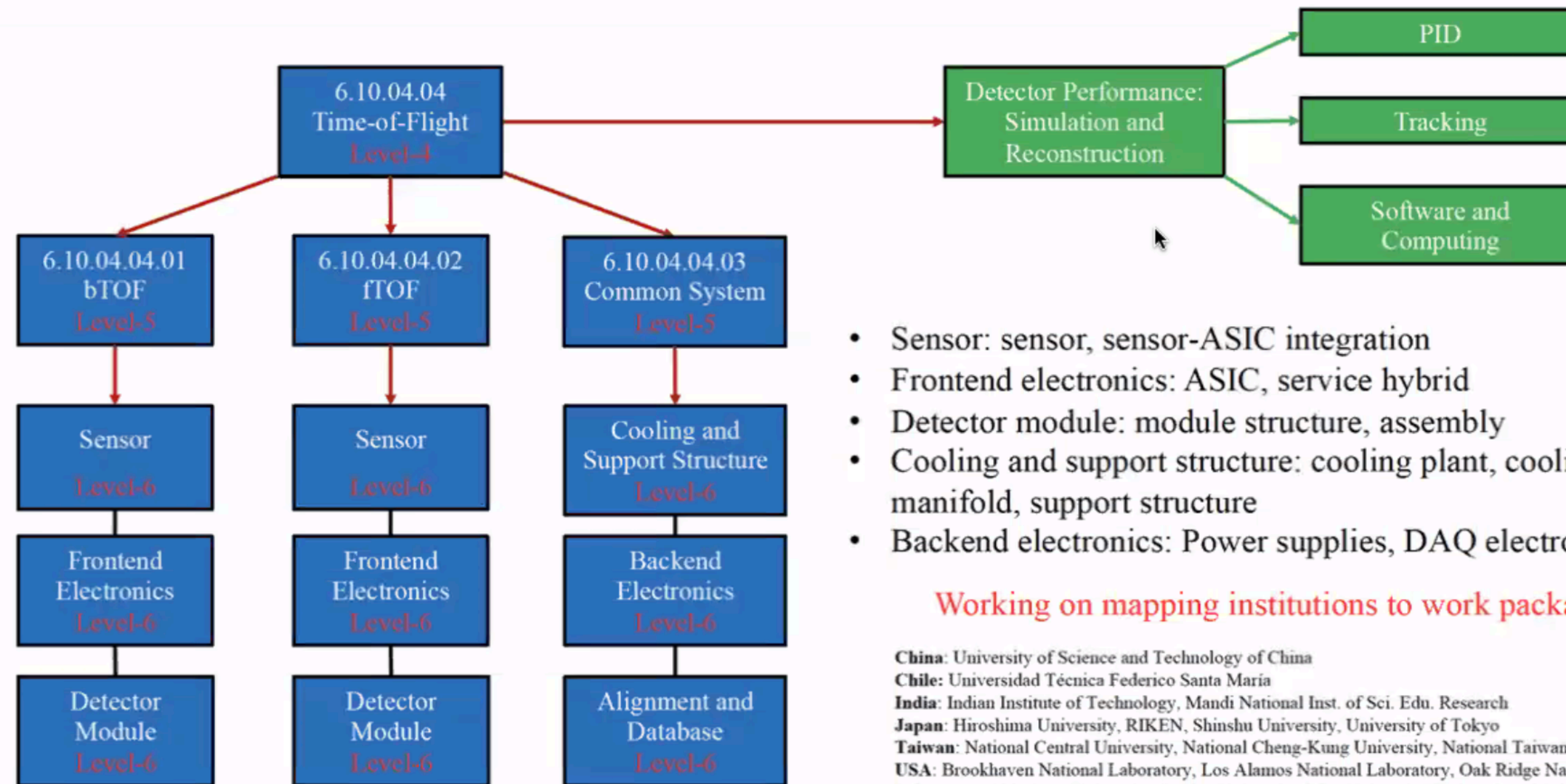




- List of items to be purchased
  - HV with < -4 kV
  - LV (if necessary)
  - Radiation source ( $^{90}\text{Sr}$ )
  - Connectors
  - Ubuntu PC

# News from TOF

## Proposed Working Package Structure



- Sensor: sensor, sensor-ASIC integration
- Frontend electronics: ASIC, service hybrid
- Detector module: module structure, assembly
- Cooling and support structure: cooling plant, cooling manifold, support structure
- Backend electronics: Power supplies, DAQ electronics

Working on mapping institutions to work packages

**China:** University of Science and Technology of China  
**Chile:** Universidad Técnica Federico Santa María  
**India:** Indian Institute of Technology, Mandi National Inst. of Sci. Edu. Research  
**Japan:** Hiroshima University, RIKEN, Shinshu University, University of Tokyo  
**Taiwan:** National Central University, National Cheng-Kung University, National Taiwan University  
**USA:** Brookhaven National Laboratory, Los Alamos National Laboratory, Oak Ridge National Laboratory, Ohio State University, Purdue University, Rice University, University of California - Santa Cruz, University of Illinois at Chicago

- bTOF (Lv.5)
  - Zhenyu Ye
  - Satoshi Yano
  - Mathew Gignac
- fTOF (Lv.5)
  - Mathieu Benoit
  - Wei Li
- Common system (Lv.5)
  - Zhangbu Xu
  - Andreas Jung

# Summary

- Three Japanese people participated in the RICUG meeting in 2023 @ Warsaw
  - We discussed how to contribute to the TOF project from the Japanese community
- AC-LGAD R&D exercise campaign with Nakamura has been done
  - We learned how to proceed with the AC-LGAD R&D
  - It became clear what to buy to build the AC-LGAD test bench @ HU
  - (Before getting EICROC, we can use the KEK amplifier board)
- Satoshi Yano is one of the bTOF (Lv.5) leader
- I am staying at BNL to learn how to proceed with the EICROC R&D



# Purchase list

- HV for MCPMT: -4300V
- HV (Back bias voltage) for sensor: -190 ~ -110 V
- LV for sensor: 6V
  
- Oscilloscope has SMA port x 8
  
- Circuit board of sensor has MCX port x 16
- LV is supplied to board by 4 pin/banana cable
- HV (BB) is supplied by LEMO cable
  
- HV is supplied to MCPMT by SHV cable
- Trigger signal from MCPMT is sent by SMA cable (the cable must be split into two ways one is an oscilloscope and the other one has 50 $\Omega$  resistivity to save oscilloscope)