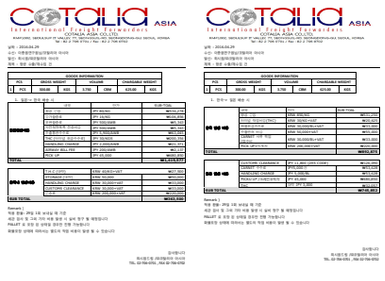
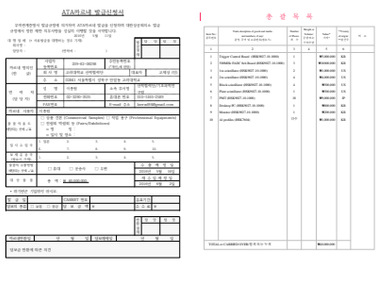
LAMPS neutron detector RCNP N0 beam test

이 종원

Shipping Schedule

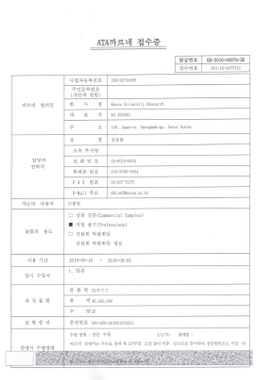


4/29 1차견적
170만/편도



5/11 CARNET신청

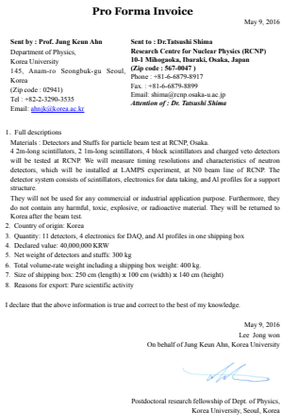
5/17 CARNET 접수
(산단에서 5일 지체)



5/26 RCNP 도착(2일 지연)

4/15 운송업체 접촉

5/9 INVOICE



Pro Forma Invoice

May 9, 2016

Sent by : Prof. Jung Keun Ahn
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Korea University
145, Anam-ro Seongbuk-gu Seoul,
Korea
(Zip code : 02841)
Tel : +82-2-3290-3535
Email: ahnjk@korea.ac.kr

Sent to : Dr.Tatsushi Shima
Research Centre for Nuclear Physics (RCNP)
10-1 Mihogaoka, Ibaraki, Osaka, Japan
(Zip code : 567-0047)
Phone: +81-6-6879-8917
Fax. : +81-6-6879-8899
Email: shima@rcnp.osaka-u.ac.jp
Attention of : Dr. Tatsushi Shima

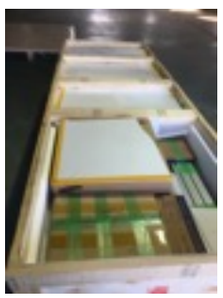
1. Full descriptions
Materials : Detectors and Stuffs for particle beam test at RCNP, Osaka.
4 2m-long scintillators, 2 1m-long scintillators, 4 block scintillators and charged veto detectors will be tested at RCNP. We will measure timing resolutions and characteristics of neutron detectors, which will be installed at LAMPS experiment, at N0 beam line of RCNP. The detector system consists of scintillators, electronics for data taking, and Al profiles for a support structure.
They will not be used for any commercial or industrial application purpose. Furthermore, they do not contain any harmful, toxic, explosive, or radioactive material. They will be returned to Korea after the beam test.
2. Country of origin: Korea
3. Quantity: 11 detectors, 4 electronics for DAQ, and Al profiles in one shipping box
4. Declared value: 40,000,000 KRW
5. Net weight of detectors and stuffs: 300 kg
6. Total volume-rate weight including a shipping box weight: 400 kg.
7. Size of shipping box: 250 cm (length) x 100 cm (width) x 140 cm (height)
8. Reasons for export: Pure scientific activity

I declare that the above information is true and correct to the best of my knowledge.

May 9, 2016
Lee Jong won
On behalf of Jung Keun Ahn, Korea University

Postdoctoral research fellowship of Dept. of Physics,
Korea University, Seoul, Korea

5/12 운송회사위탁



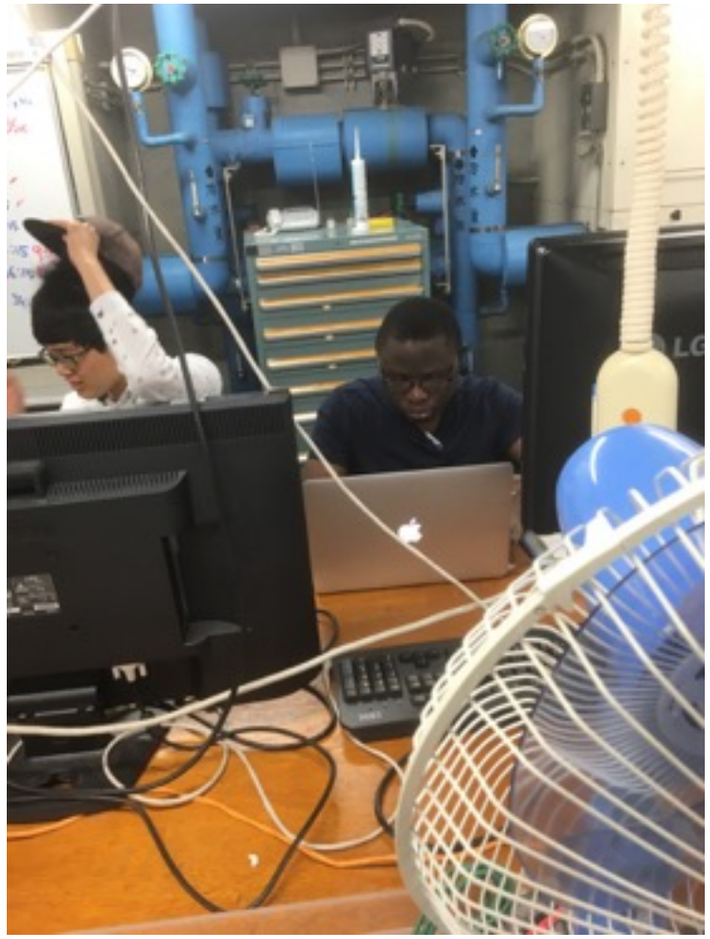
5/19 CARNET 발행
/일본수출

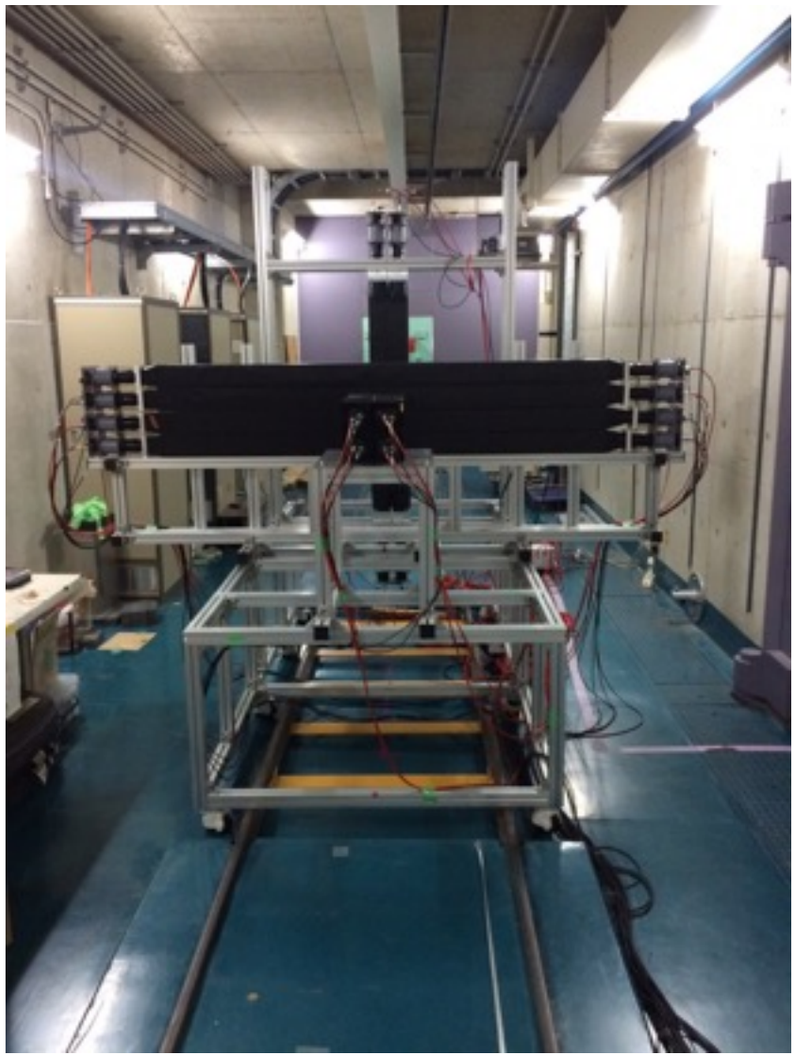
6/9 고려대도착

총 비용 : 140/편도
511Kg / 1.943 CBM

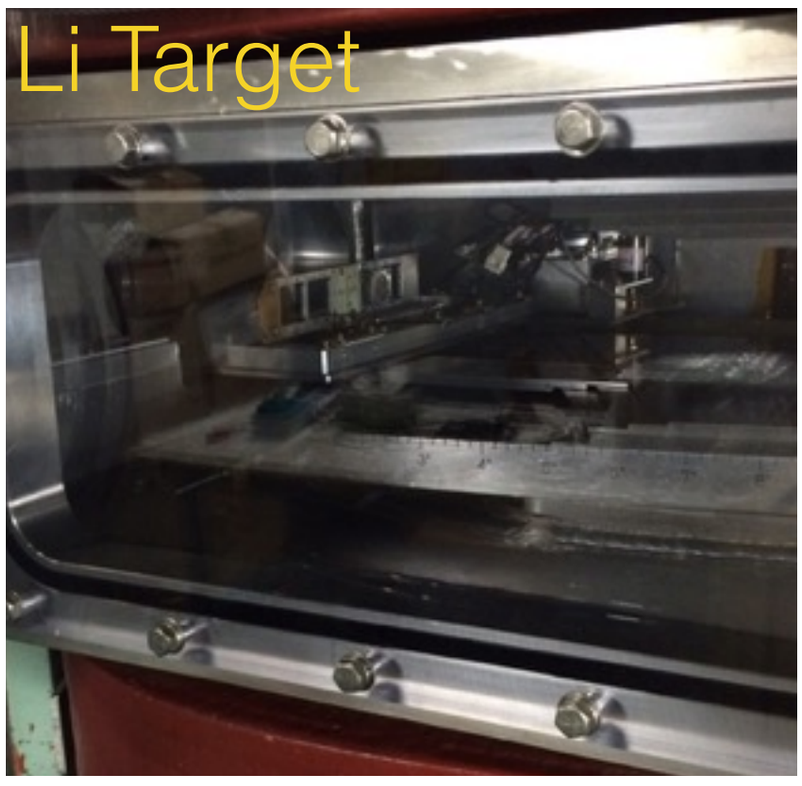
Beam test Time table

1. 5/24-25:Checking area & cable preparation
2. 5/26-27:Unpacking luggage, building support structure, detector preparation
3. 5/28:Cosmic ray data for calibration
4. 5/29:Change setups for beam test and cosmic ray data taking
5. 5/30: 10AM-5PM Al target test. 394MeV (18 run)
6. 5/30: 5PM-12PM Li target 394MeV (50 run)
7. 5/31: 2AM-6AM Li target 65MeV (50 run)
8. 5/31-6/1: Disassemble setup, packing





Setup
(downstream)



Analysis Plan

Cosmic ray	Neutron Data(394) Neutron Data(65)	Waveform
Energy Calibration Hyunha	Electron-equivalent energy vs TOF neutron energy Hyunha	Time from Waveform Benard
Position Calibration Hyunha	T0 Calibration Hyunha	Height vs waveform Benard
Timing resolution (cosmic ray) : Hyunha	Time-information correction Hyunha	Particle vs waveform Benard, Lee
Position resolution (cosmic ray) : Hyunha	G4 MC full simulation Hyunha	Waveform simulation Benard

Hardware design plan - Support structure

1. Currently stopped…
2. A student will start designing in August.
3. Gluing light guide and scintillator.
4. Supporting structure will be fixed at the detector.

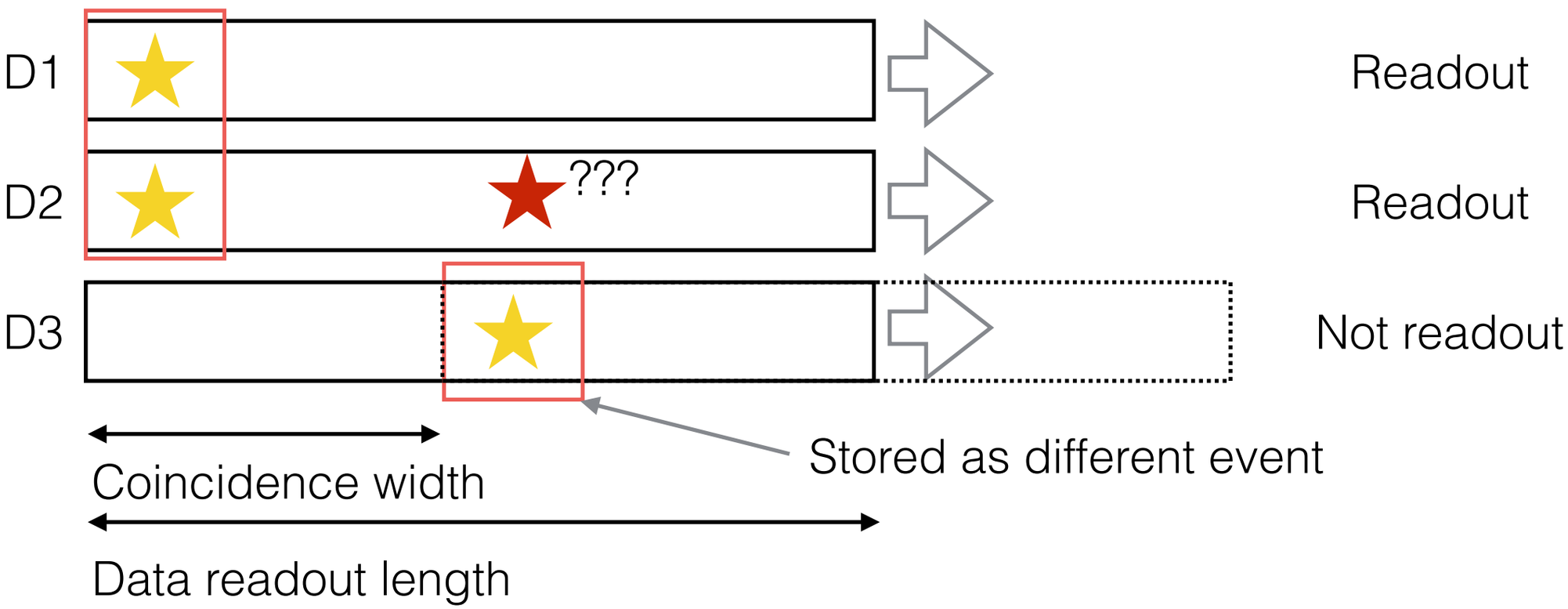
Known problems of FADC Electronics

1. Ambiguity of trigger / Veto
2. Flushing Data - partial data readout
3. Junk data readout
4. High rate problem
5. Protection circuit for FADC

Ambiguity of trigger / Veto

In a case…

If zero suppression was activated..

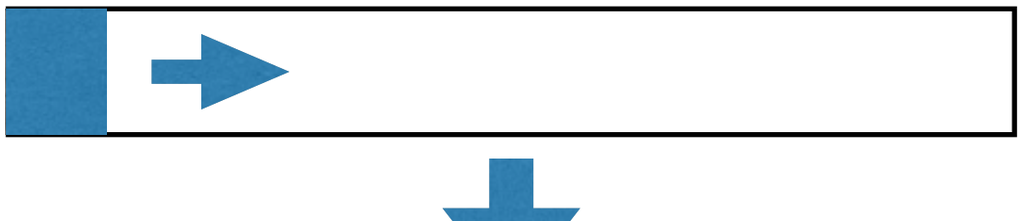


There are no VETO system to issue new trigger within data readout length.(in my opinion) -> They should be VETOed.

Flushing data problem

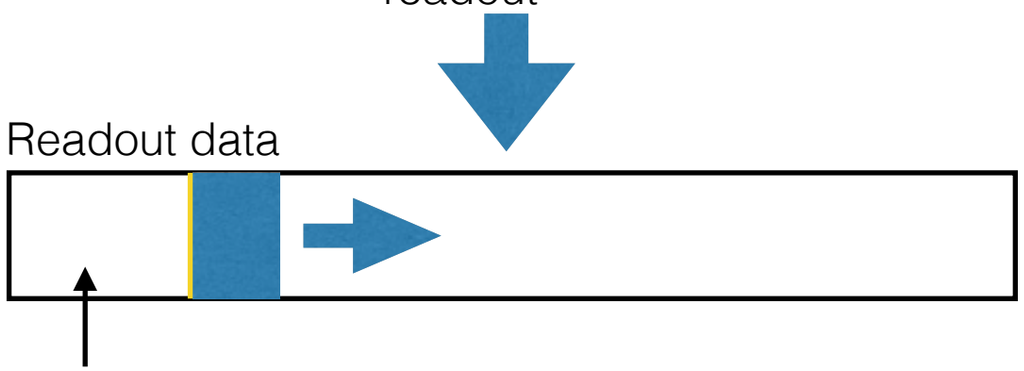
Data readout mechanism

Maximum memory size : 4GB

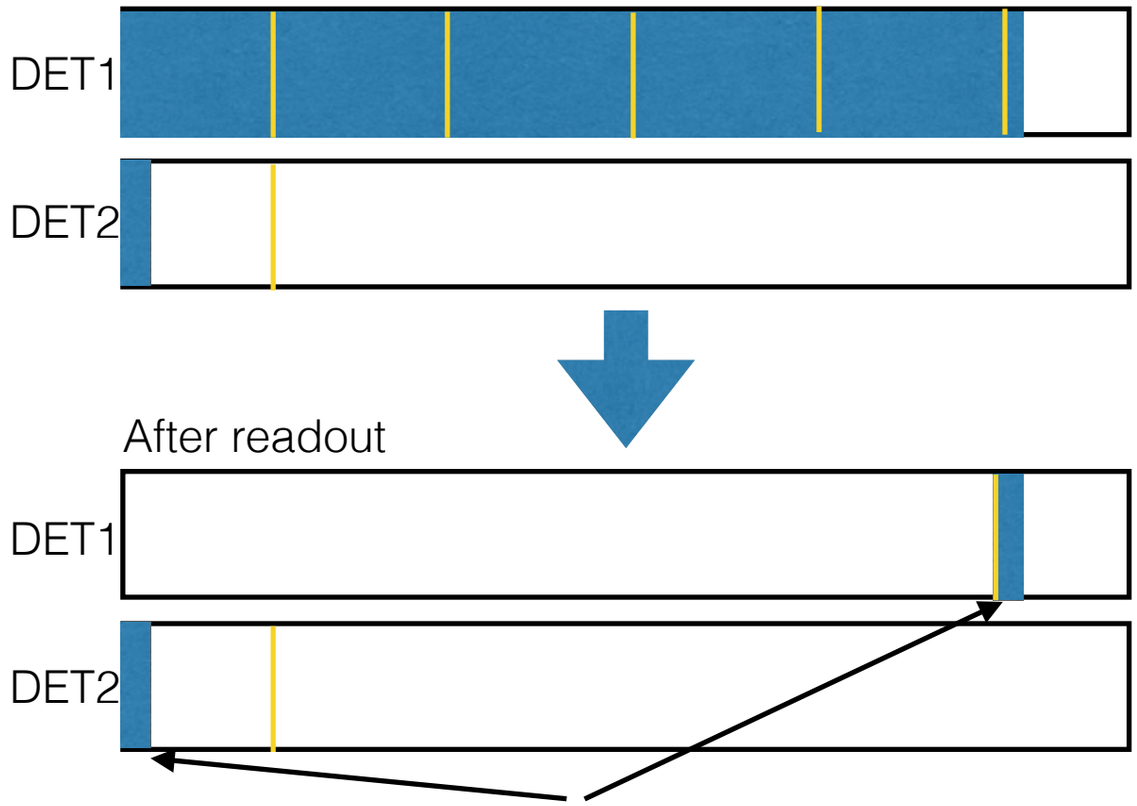


Check Stored Data Size

Minimum readout size : 32kB ~ 32 event 1us readout



If.. : multiple detectors with extremely different trigger rate



If data acquisition was stopped before readout, data of detector 2 will not be recorded for the run….

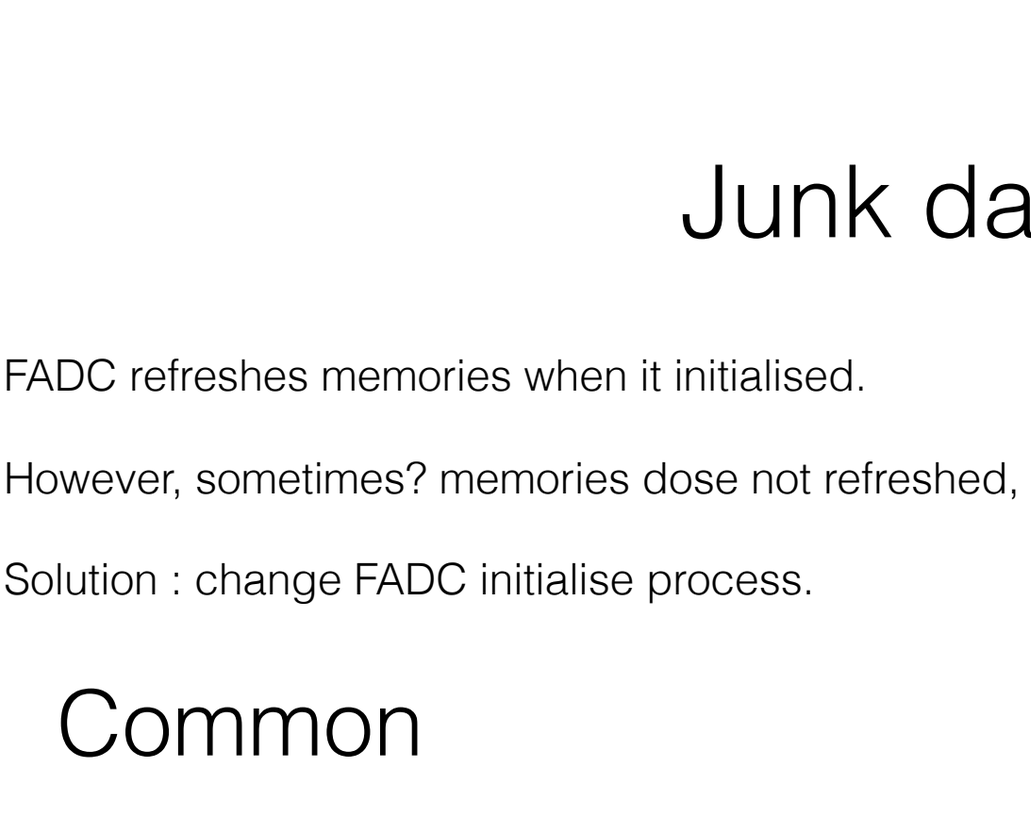
=> Consider trigger rate / data readout speed

Junk data readout

1. FADC refreshes memories when it initialised.
2. However, sometimes? memories dose not refreshed, and FADC readout junk region, binary data conversion fails.
3. Solution : change FADC initialise process.

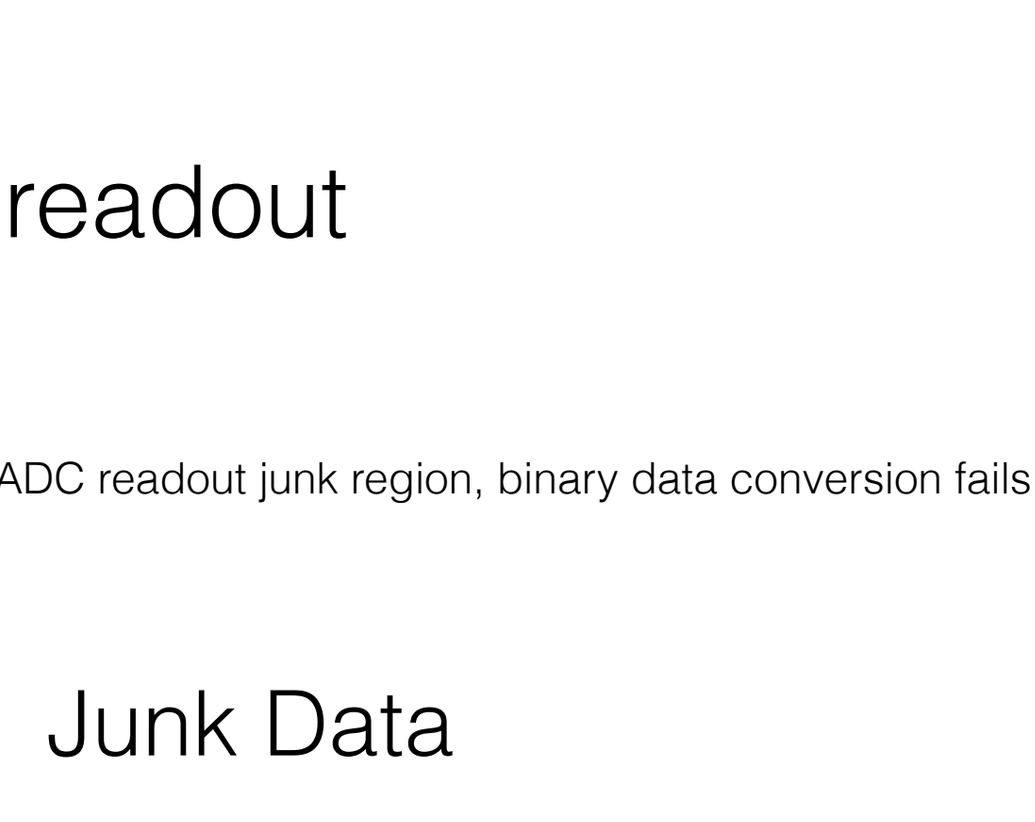
Common

Header(32 char)



Junk Data

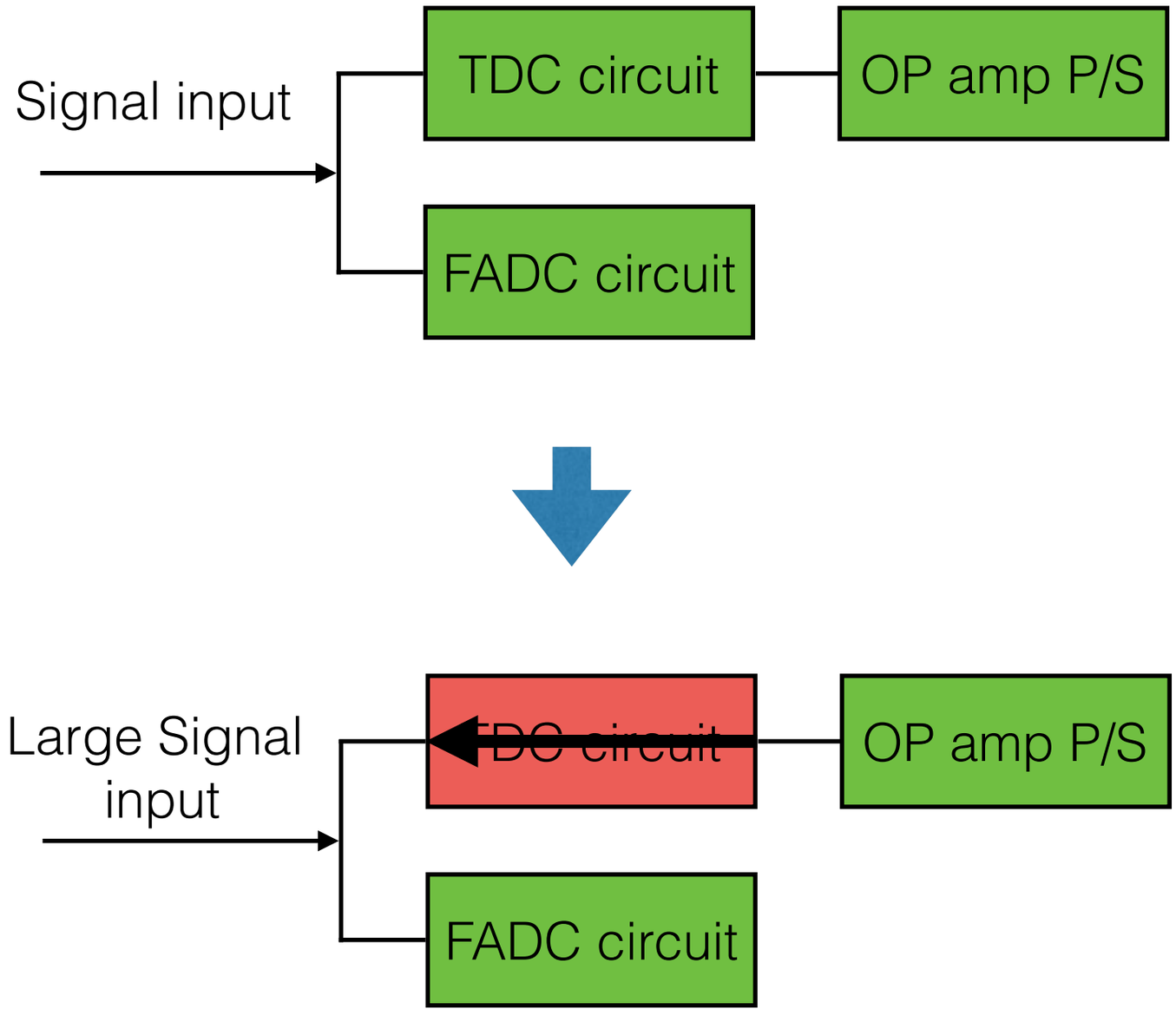
No Header



High rate problem

1. FADC electronics endures up to 500kHz trigger rate. (for single channel)
2. Problem is…
    1. Readout speed via USB3 cannot support maximum recording speed of FADC internal memory.
    2. No signal/VETO system when the internal memory is full.

Protection circuit for FADC



1. Large signal input -> destroy OP amp for TDC
2. The OP amp circuit break down and power line and signal line were connected.
3. A offset readout by FADC will be 0 -> not triggered by trigger setting.
4. Protection circuit is required.

Future electronics plan

- DAQ development

1. Integration with CAMAC / VME
2. Readout data with multiple machine
3. Semi-online event reconstruction

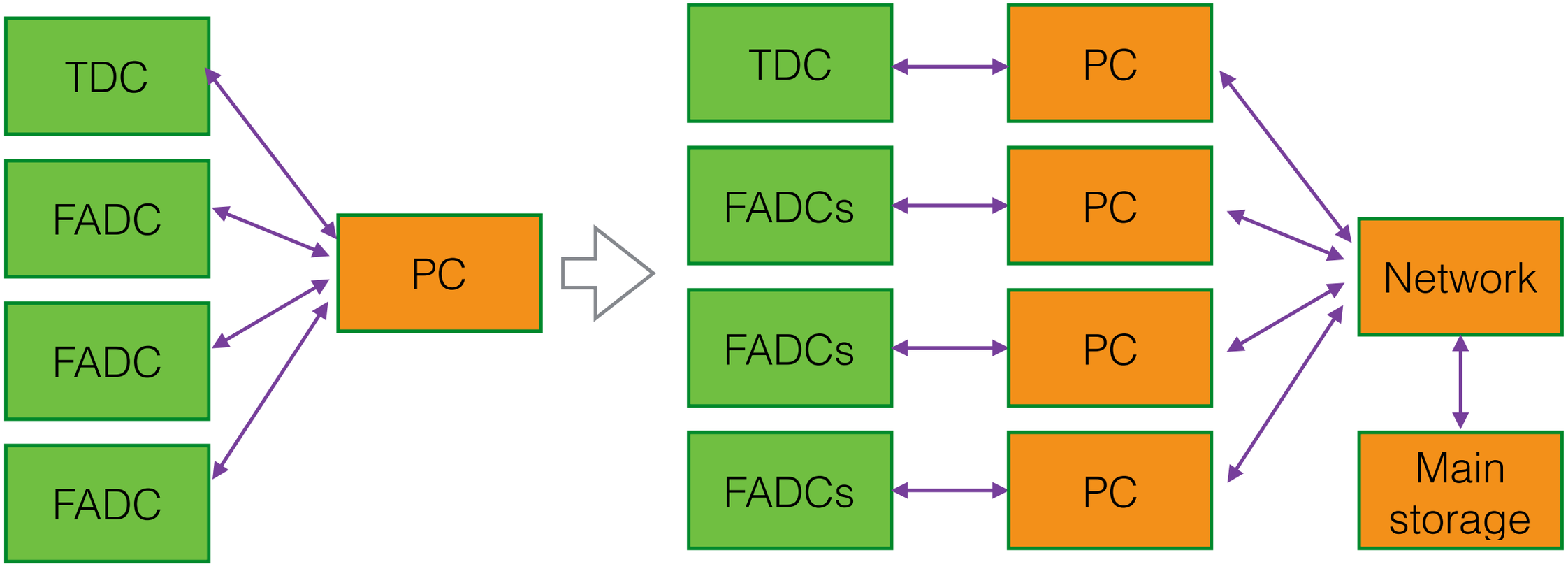
Integration with CAMAC / VME

- For the beam test in Michigan Uiniv.
- Software/hardware development for matching event between FADC and CAMAC/VME system.
- DAQ will be developed with network programming for multiple DAQ PC.

Readout data with multiple machine

1. Current DAQ program is developed for single machine.

2. If there are multiple FADC module, the writing speed of PC(SSD or HDD) will be limited data taking speed. + Physical limits on USB3 cable length.



Semi-online event reconstruction/display

1. Currently, realtime event reconstruction is unavailable due to data store structure.

2. Only semi-online event reconstruction/display is available.

3. Bypass a part of data to independent machine and event reconstruction.