Performance evaluation of new parallel VME readout system for unstable nuclear physics

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Outline

- **MPV** (MOCO with parallelized VME)
- **Purpose**
- **Experiment**
- **Result**
- **Summary**

Collaborators

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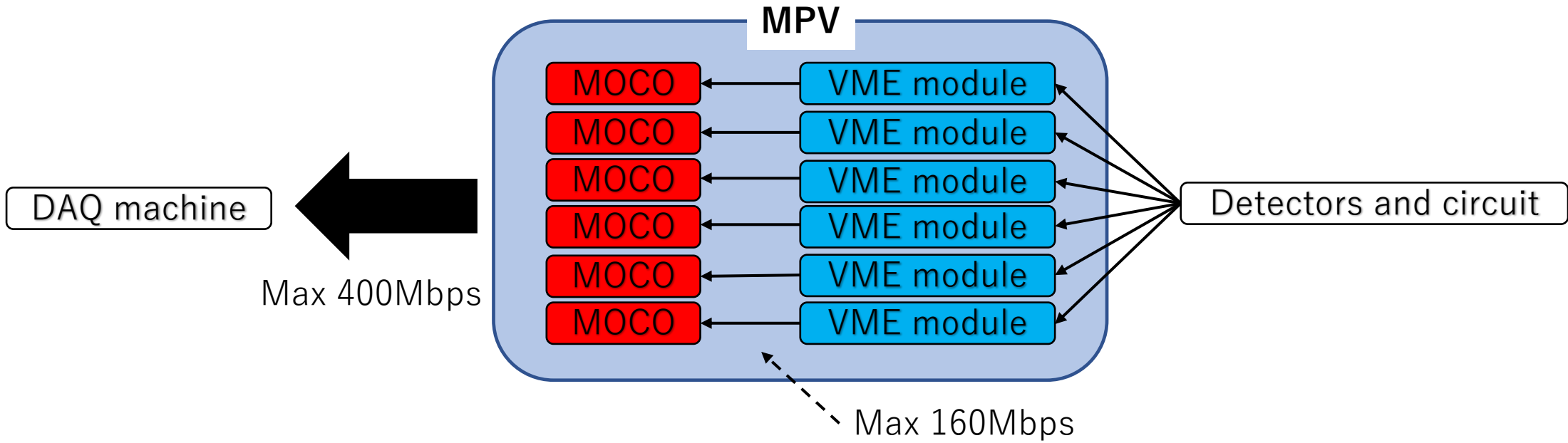
- **Saitama University** :S.Harayama,T. Suzuki , T. Yamaguchi
- **RI Center Niigata University** : T. Izumikawa
- **Niigata University** : N.Noguchi, M.Ogose, T. Ohtubo,
- **Kyushu University** : M. Tanaka
- **Tsukuba University** :T.Moriguchi

MPV (MOCO with parallelized VME)

MPV is readout system
that shortened dead time by reading VME module in parallel.

dead time is about **15 us**



New readout system for VME

- Conventional system:

CAMAC(computer automated measurement and control)

→dead time is about **150 us**

- New system:

MPV(MOCO with parallelized VME)

→dead time is about **15 us**

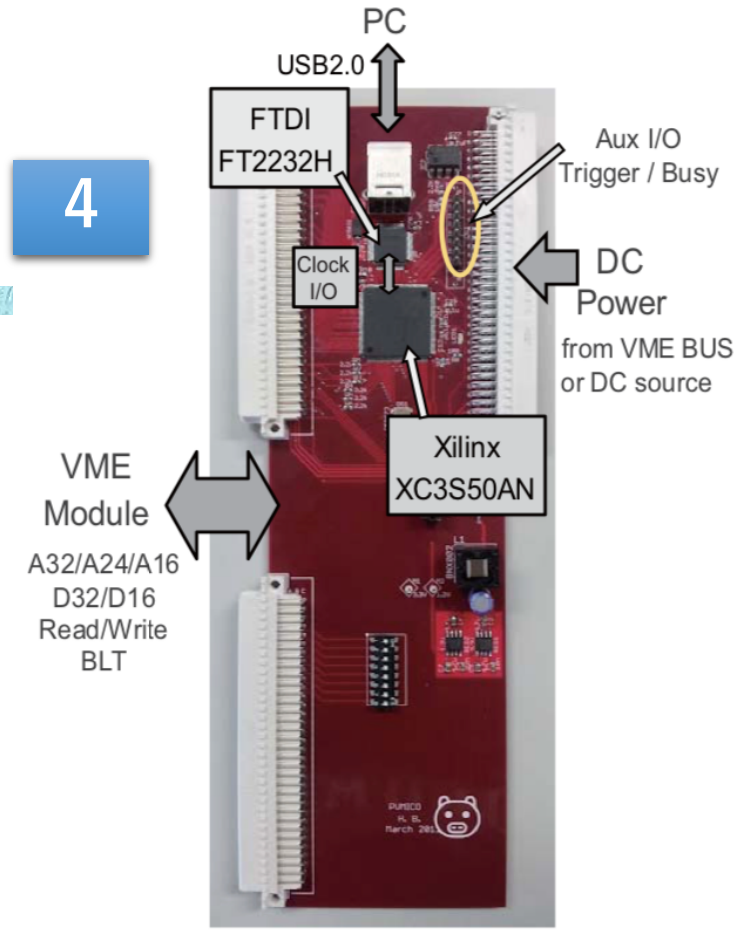


Fig. 1. Photograph of the mountable controller for VME (MOCO).

c.f. H.Baba et al., RIKEN Acc.Prog.Rep. 52, 146, (2019)
and poster presentation in this conf.

By using VME-MPV+MOCO system,
the efficiency of DAQ system has been improved to be about **10 times**.

Purpose

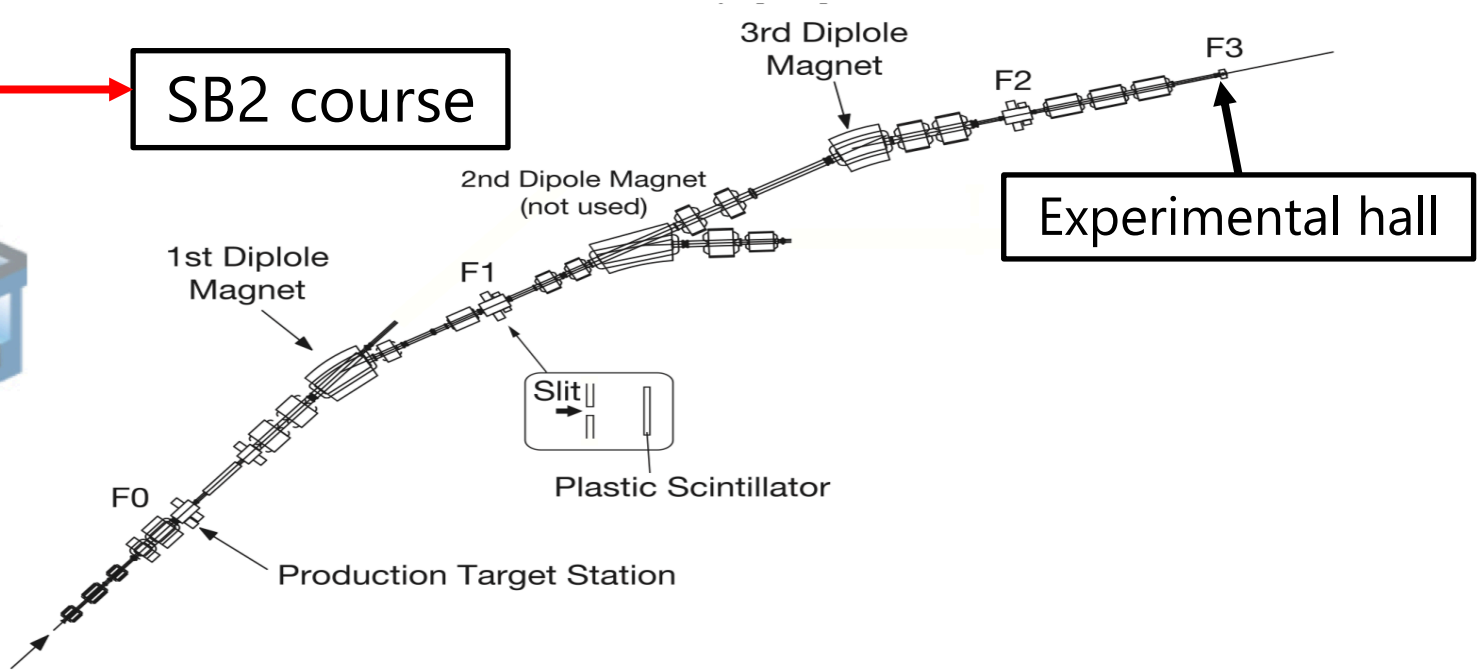
Data accuracy is more than 99.99% (counting loss << 0.01%)
for MPV system in accelerator experiments

Facility

QST-NIRS-HIMAC

heavy-ion
synchrotron
accelerator

SB2 course



Experimental hall

M. Kanazawa et al., Nucl. Phys. A746, 393c (2004).
S. Yamaki et al., NIMB 317, 774 (2013).

Fig.2: HIMAC accelerator and SB2 beam line

Modules of CAMAC and VME

VME

TDC(CAEN V1290)
QDC(Mesytec MQDC32)
ADC(Mesytec MADC32)

CAMAC

TDC(REPIC RPC180)
QDC(TechnolandCQV715)
ADC(Technoland CTM405)

redundantly acquired

We compared ADC of these.

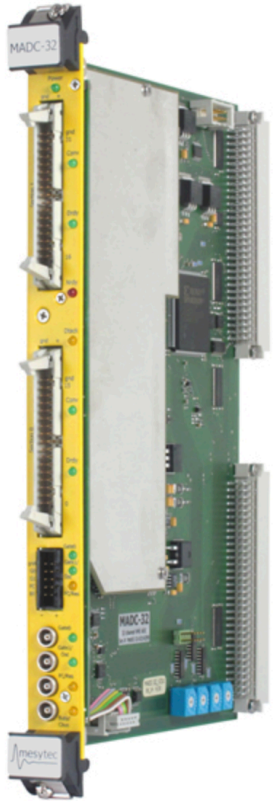


Fig.3:Photograph of Mesytec MADC32

Results

- Experimental conditions

-Primary beam : ^{136}Xe, 400 MeV/u

-Production target : none

-beam intensity : 1kppp

-duration : 500 ms

-beam interval : 3.3 s

- Missed data counts

・Missed data of CAMAC = 58 counts

・Missed data of MPV = 23 counts

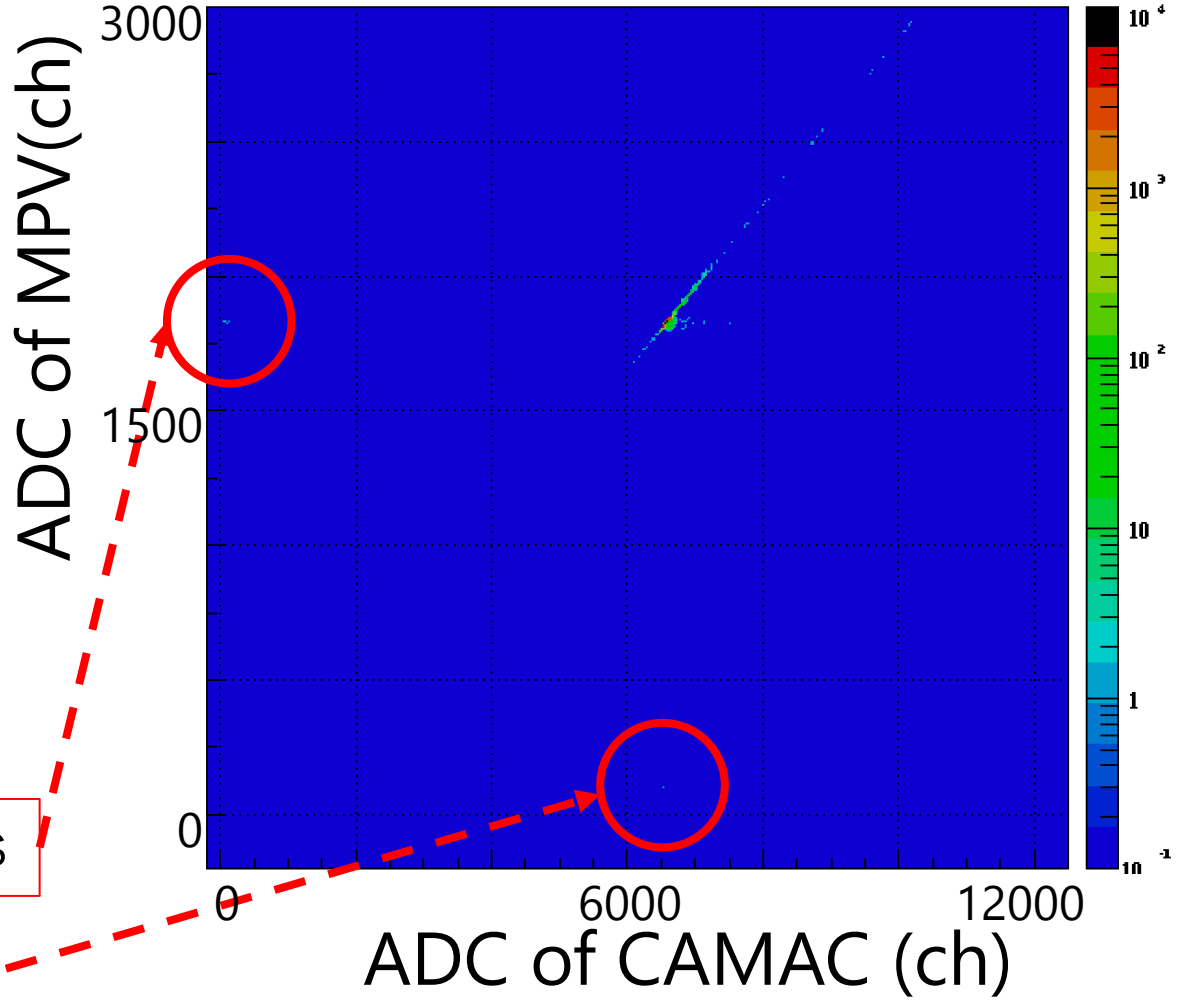


Fig.4: CAMAC vs MPV

Results

- MPV accuracy is

$$\frac{673464 - 673441}{673464} = 0.99997$$

(counting loss is 0.003%)

- CAMAC accuracy is

$$\frac{673464 - 673406}{673464} = 0.99991$$

(counting loss is 0.009%)

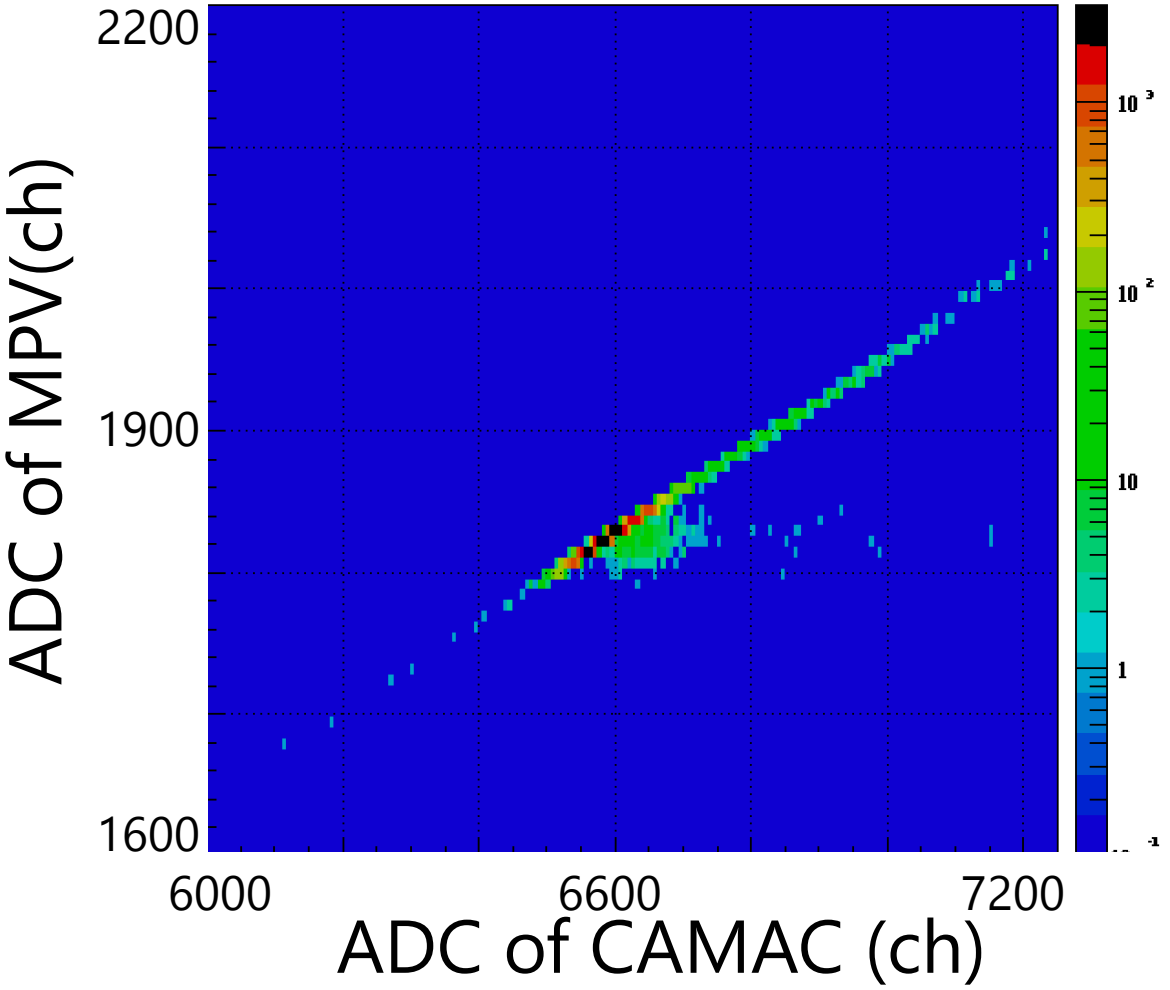


Fig.5: enlarged view of fig4

Results

- **The fluctuation of difference between MPV and CAMAC is 1.3ch(1.3mV)**

Data accuracy is reasonable.

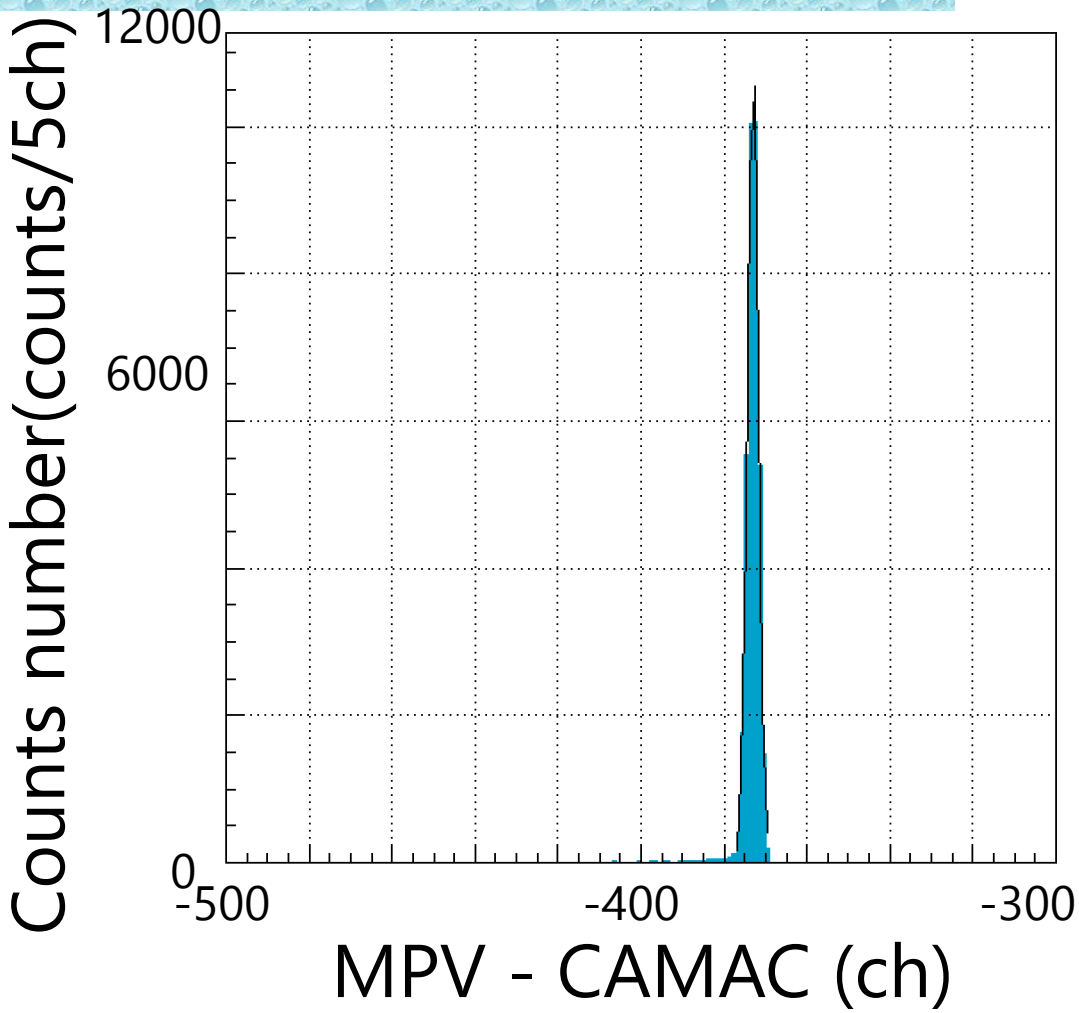


Fig.6: **difference between MPV and CAMAC**

Prospects for the future

- We will compare MPV with CAMAC as the accuracy test in experimental values with QDCs and TDCs.

- Measurement of cross section using MPV.

Summary

- By using VME-MPV+MOCO system,the efficiency of DAQ system has been improved to be about 10 times.
- We compared MPV with CAMAC as the accuracy test in experimental value.
- MPV accuracy achieves 99.996% in experimental values with MADC.
- The fluctuation of difference between MPV and CAMAC is 1.29ch(1.2mV)