A New PAC Measurement System Using 6 Clover-type HPGe Detectors

II. 2. A New PAC Measurement System Using 6 Clover-type HPGe Detectors

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A new perturbed angular correlation (PAC) measurement system has been installed in combination with the new ion-guide technique at the ISOL facility in CYRIC. The ion-guide is a kind of ion source for the ISOL and has a great advantage of widely applicable to any elements[1]. Recently, a new type of the ion-guide system called "RF ion-guide" have been developed to obtain higher efficiency[2]. The new RF ion-guide system provides us more neutron-rich unstable nuclei produced by proton-induced fission reactions. In addition to a search for double magic ^{78}Ni nuclei and a precise β-γ spectroscopy around this region, the nuclear g-factor measurement for the low lying isomeric states of short-lived isotopes have also been planned. We have already developed 6 sets of clover-type HPGe detectors equipped with 12 pieces of BGO compton suppressors for each clover detector[3]. A new PAC system, which consists of the goniometer for these 6 sets of clover detectors and the permanent magnet with magnetic-flux density of 1.2 T, has been constructed and placed at 2 m higher place than the ISOL beam line (see figure 1). The mass-separated unstable nuclei are transferred to the magnet position from ISOL beam line by the tape transport system.

A VME (Versa Module European) based data acquisition system for this PAC measurement system has been developed as substitute for a CAMAC (Computer Aided Measurement And Control) based one. Since the maximum data transfer rate of a CAMAC system is only ~900 kbyte/sec, it is not suitable for the large scale detector system. On the other hand, the maximum data transfer rate of a VME bus is 40 Mbyte/sec theoretically. In addition, a VME module has high CH density in general, so it can serve to

keep the cost low.

However a VME system is considered to have much noise than a CAMAC system, so it has been kept away from using high-resolution detectors such as HPGe detectors. Therefore we have needed to ascertain whether a VME system can be applied to this PAC measurement system. We have examined a V785 ADC module for the clover-type HPGe detectors, which is multievent peak sensing ADC with 32 CH input and has 12 bit resolution. The Integral Non Linearity (INL) and the Differential Non Linearity (DNL) of this module have been measured and results are listed in table 1 along with the warranted values of a CAMAC ADC module (AD413A). The INL has been found to be in good agreement with the warranted value, however the DNL has a little exceeded the warranted value. Although further efforts to reduce noise must be needed to decrease the DNL, this V785 ADC module has been found to be applicable in our purpose. In regard to the speed of data transfer, it has been found to be 1.5 Mbyte/sec, but it can be much faster by use of the DMA transfer.

References

1) Ärje J., Äystö J., Honkanen J., Valli K. and Hautojärvi A., Nucl. Inst. Methods **186** (1981) 149.
2) Sonoda T. et al., in this volume.
3) Fujita M. et al., CYRIC annual report (2001).

Table 1. A comparative table between a V785 ADC module (VME) and a AD413A module (CAMAC). The warranted values are shown in parentheses.

	V785 (VME)	AD413A (CAMAC)
Input CH number	32	4
resolution	12 bit	13 bit
INL	± 0.049 % (± 0.1 %)	(± 0.025 %)
DNL	3.73±1.57 % (± 1.5 %)	(± 1.0 %)
A/D conversion	Sliding Scale method	Sliding Scale method

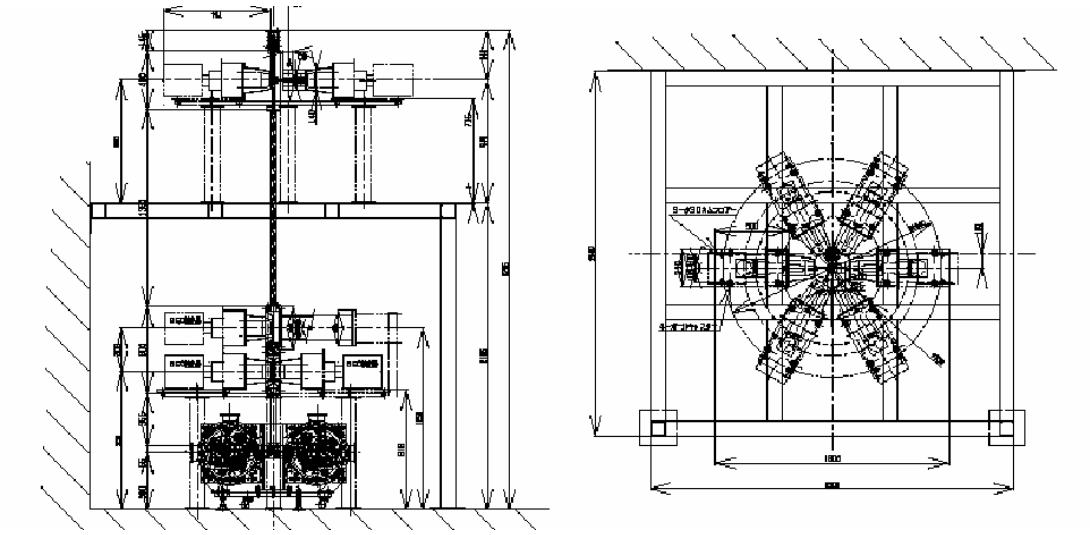

Figure 1. A schematic view of the new PAC measurement system.