Multi-branch, FERA-based data acquisition system for medium size experiments

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Reliable and efficient data acquisition systems, easily scalable from small to medium size experiments, are of crucial importance for most of experimental activities in nuclear physics. In the following we present an implementation of such a system based on parallel readout of multiple FERA[1] buses directed to the dedicated double port memories hosted in VME crate. Such solution, supplemented with a custom made Tagger-Extender CAMAC module, for the purpose of internal event synchronization[2], and MBS software package[3] running under the control of the real time operation system LynxOS at RIO III processor, was successfully applied in several experiments performed at Paul Scherrer Institute in Villigen, Switzerland and at Kernfysisch Versneller Instituut in Groningen, the Netherlands.

Avoiding dead time induced by CAMAC readout, inherent in that mode of operation of FERA-compatible modules, the described system allows to exploit the high theoretical throughput of VME data-bus, making use of rich supply of high quality CAMAC analog-to-digital converters. Application of, working in flip-flop mode, pairs of memories dedicated to each FERA subsystem, resulted in virtually dead time free readout of these subsystem and allowed for the data rates limited by the bandwidth of VME data-bus and by the capacity of mass storage device connected to the RIO processor. Using standard TCPIP connection to the remote storage the event rates as high as 15 kHz for medium size events ($\approx$150 Bytes) with overall dead-time at the level of 10 %, could have easily been achieved in real implementations.

[1] FERA stands for Fast Encoding and Readout Adc, LeCroy standard;

[2] St. Kistryn, Readout System for Medium-Size Experiments, in Advanced Knowledge Application in Practice, 2010, ISBN 978-953-307-141-1;

[3] N. Kurz, Multi Branch System User Manual, GSI, Darmstadt 1999;

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