New Data Acquisition System Implemented Based on MTCA.4 Form Factor for KSTAR Diagnostic System

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Introduction

- The KSTAR Control System has been developed using EPICS (Experimental Physics and Industrial Control System) as a middleware of control and DAQ system.
- From 2008, the KSTAR has various form factor DAQ systems for measuring the various plasma properties: VME, PCIe, PXI, SPCI, and etc. [1]
- Using two types of database: EPICS Channel Archive; continuously produced machine operational data at a low rate
- MDplus - shot-based experimental pulse data with a large volume
- Development & Operating software: EPICS, MDplus, Qt, Linux, Vxworks, Windows, C++, etc.
- Cyclic Feedback Control on Plasma current(q0), Radial Position(Rz), and density (n) using MD and MMW interferometer

Currently, over 21 types of diagnostics installed for plasma operation

Requirements and Technical issues:
- Raises maintenance and development issue the various form factor DAQ systems (HW & SW)
- Use as real-time control without interfering with data archiving
- Malfunction due to the Ageing of equipment
- Requires new technology: data processing in diagnostic system using FPGA or GPGPU

Upgrade of DAQ Systems

1. Adopt the MTCA.4 for standardization of a fast controller (DAQ):
   - Developed the KSTAR Multi-function Control Unit at 15 ~ 16; ver KMCU-Z35 [High performance]
   - Developed new version of KMCU for suitable device at 16 ~ 17; ver KMCU-Z30 (2 SFP+) [2]
   - At 2017, change 6 digitizer and one additional install with new version of KMCU-Z30 [3]

2. Software Spec:
   - Developed the KMCU IOC device/driver for control standardization DAQ with SFW
   - Edit the EPICS IOC to suit the purpose of the diagnostic DAQ system (number of channels, software Spec)
   - From 2008, the KSTAR has various form factor DAQ systems for measuring the various plasma properties: VME, PCIe, PXI, SPCI, and etc. [1]
   - Use front panel Ethernet for monitoring the current state of the system

3. Operation Results & Plan:
   - New developed DAQ systems has been upgraded and successfully operated during KSTAR experiments.
   - To reduce the cost of chassis and MCH, we plan to use 1U commercial chassis without MCH

References