The next generation of CBM MVD read-out electronics[*]

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The on-going development of the support electronics of the CBM Micro-Vertex-Detector (MVD) focuses on two major aspects: First, the integration in a new DAQ system (based on the TRB3 system developed by HADES) and, second, the design of an integrated control and monitoring interface for systems consisting of several sensors.

New Electronics

The major goal of front-end electronics development was to migrate the read-out to a new, more powerful read-out platform, TRB3. Even though the central parts of software and FPGA designs need not to be changed, the read-out chain between digital electronics and sensors was re-designed to gain better performance and additional monitoring features. Here, also the principal structure of the chain was simplified by dropping the separated connection for control signals and merging all supply and data lines for a sensor on one common cable.

Special care was taken for the most sensitive supply voltage, a biasing voltage for the pixel matrices of the sensors. Several generation and distribution schemes were implemented to investigate which setup results in the best noise performance. Furthermore, all relevant voltages and currents can be monitored remotely to further study the behavior of sensors and, subsequently, to design a matching powering scheme for the final detector setup.

In the current connection scheme, the new FPGA platform can support up to 16 sensors in parallel. Note that this value is mostly limited by the number of I/O connections for the huge number of control and monitoring signals in the current design version and is likely to increase in future iterations. The resources of the FPGA also allow for further data sparsification algorithms like cluster detection as described in [1].

New Control Interface

The MVD user software serves three main purposes: Editing the sensor and electronics settings, coordination of data taking, and continuous monitoring of sensor parameters (power consumption, temperature, etc). In order to make the functionality accessible to non-hardware-experts, the development of an elaborate graphical user interface has been initiated.

The user software consists of two parts: a back end software suite implemented in Perl and a web interface front
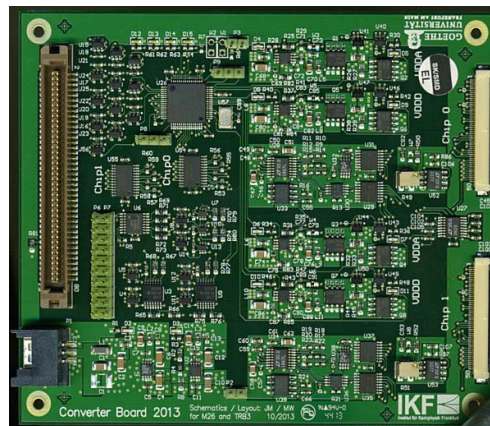

Figure 1: The new Converter Board with power supply, control and monitoring for two sensors.

end written in HTML/CSS/Javascript. Though this approach appears intricate, the strict separation of front end and back end has substantial advantages: The DAQ is inherently remotely accessible to multiple users on different machines, while the design flexibility of HTML and CSS helps providing a clear structure and a good overview of the functionality. Furthermore the back end scripts can be also used from the command line or shell scripts to automate complex configure and/or measurement tasks.

All configuration files are stored in the strictly hierarchical but human readable XML format in order to keep the system transparent to the developer. The user interface does not only include access to all vital configuration options of each individual sensor, but also allows to monitor all information gathered on the converter board, i.e. voltages and currents as mentioned above.

These developments are a further steps towards the final read-out electronics, although it is evident that further steps will be taken this year. The plans foresee to adapt the read-out to a new sensor generation (Mistral) with higher data band-width and to develop cabling schemes for the geometry of the complete MVD detector setup.

References

[1] Qiyan Li, FPGA-based Cluster Finding, this issue.