

## 7 - 10 R&D Progress of Digital Controllers for Power Supplies in HIAF

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All power supplies in HIAF are fully digitally controlled. A new generation of FPGA-based digital controllers, named the SZF-3 series have been developed and upgraded. High-speed serial communication is used to realize master-slave control. And a distributed real-time high computing performance control system combined with a 10-Gigabit optical communication network is designed. They are suitable for DC module power supplies, low-power single-module pulse power supplies, high-power single-module pulse power supplies, multi-module pulse power supplies, Kicker power supplies, *etc.* In terms of software, the controller adopts a highly modular design method, and can optionally observe hundreds of analogue and digital signals with time stamps, which greatly improves the convenience and safety of power supply debugging. In addition, real-time data of the power supply output can be sent to the HIM (Human Machine Interface) and presented on the screen. They have been used for more than 2 years and finalized. And nowadays mass controllers have been produced and assembled. Figure 1 shows the final physical picture of the different types of digital controllers.



Fig. 1 (color online) The series of digital controller SZF-3. The left panel is the SZF-3-F1D1. The right panel is the SZF-3-F2E.