8 - 44 Design of Control System for Afterglow Mode of Ion Source in HIRFL

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As afterglow phenomenon in the ECR source, a spike will appear in the highly charged ion beam when the microwave pulse stops. The peak intensity of beam current can typically be several times higher than in CW mode, as shown in Fig. 1. So the requirements for control system, is to capture the timing signal of the start of the accelerator cycle, and output a specific number, pulse width, delay time, and duty cycle which is adjustable trigger signal to the microwave system of ion source. The system contains the timing system, controller which was developed based on FPGA for afterglow and microwave system.

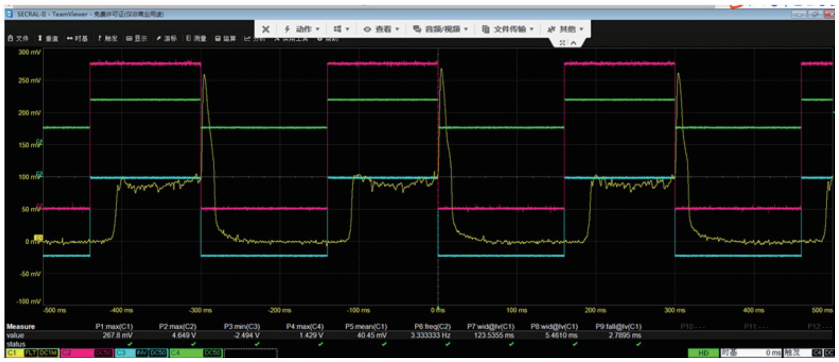

Fig. 1 (color online) AG mode of Ion Source.

The whole system was tested under the SECRAL II platform, single-frequency heating (18 GHz@900 W), and Fe^{15+} pulsed ion beam, and the extraction beam of ion source increased from ∼30 eμA in CW mode to ∼60 eμA in AG mode, and the intensity of cumulative current in the storage ring increased from ∼120 eμA in CW mode to ∼200 eμA in AG mode with obvious gain, as shown in Fig. 2.

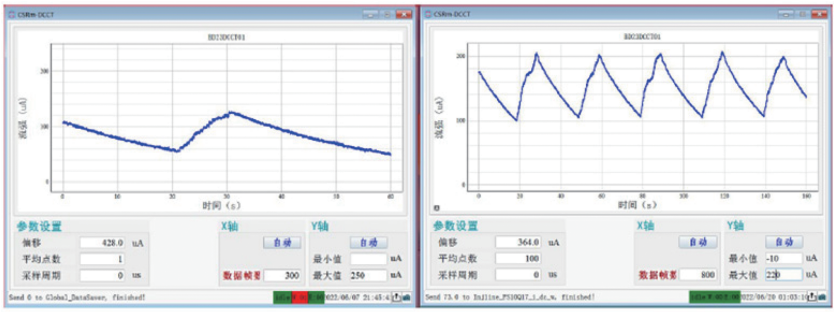

Fig. 2 (color online) Comparison of CW and AG Mode.

This trigger control solved the timing problem required for the AG mode operation of the ion source, and provides a reliable guarantee for the improvement of the intensity of beam.