

the mixer power level is set to 10 dBm and the RF port power level range can be set from -26 dBm to 5 dBm to make sure the PLL loop works good. Mechanical Phase Shifter also used for PLL loop to adjust error signal to lock the cavity frequency. The power sensors which have high dynamic range in this system are used for measuring forward, reflect and pick-up power of the superconducting cavity. The environmental monitor contains cavity temperature sensors, LHe level sensors, He gas pressure sensor, cavity vacuum gauge and X-ray radiation detector. Each sensor is connected to its own equipment, which communicated with computer by GPIB or RS232.

The software system is based on Labview. The main code structure is mixed state machine and event structure. Cavity testing data acquisition and data analysis parts are separated and each subvi can be run fast and independently. Environment monitoring data acquisition part can be also run separated but slower running speed and synchronism. The main code screenshot and user interface are shown in Figs. 2 and 3.

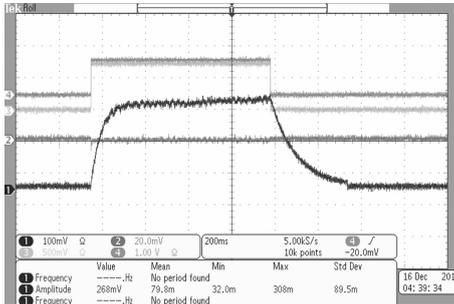


Fig. 4 Multiplexing.

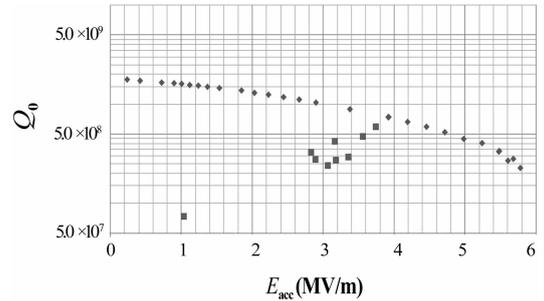


Fig. 5 IMP-HWR010-02 cavity test result.

IMP-HWR010-02 cavity has been test twice time on this system. At the first time, the HWR cavity hadn't do HPR processing, the cavity was showed very strong multipacting (Fig. 4) and a little X-ray dose. Ready for second test, the BCP and HPR processing had been done and low temperature vacuum baking was used for cavity cleaning surface during 3 d. After that, the cavity test result was good. No multipacting and no X-ray, the cavity performance was reached $Q_0 = 5.2 \times 10^8 @ E_{acc} = 4.7 \text{ MV/m}$. The test result plot is shown in Fig. 5.

6 - 13 Development and Research of Machine Protection System with PLC Redundancy based on EPICS

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Machine protection system is mainly used for RFQ control in China ADS project. The flow and temperature monitoring for waterway are provided in this system, and if the temperature is above $22.5 \text{ }^\circ\text{C}$, the power source will be closed.

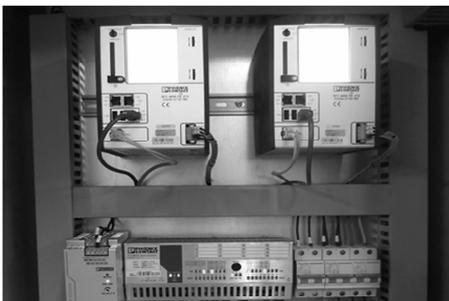


Fig. 1 Hardware of PLC controllers.

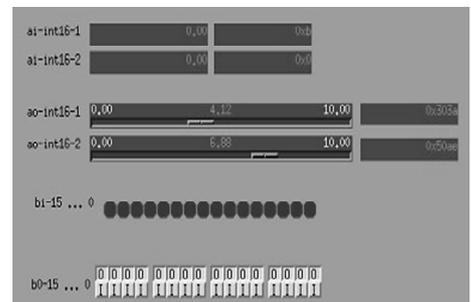


Fig. 2 Interface of communication for MPS.