Conditioning Program for RF Input Couplers and Cavities

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A computer program has been developed for the conditioning of RF input couplers and cavities for the synchrotron and the storage ring of the SPring-8. The conditioning has been carried out at the test station of the storage ring. The RF input power is controlled by a personal computer through CAMAC modules.

The input power level is renewed according to the current value of the RF input power and the vacuum pressure in the cavity. We have five operating modes; UP, DOWN, CYCLE, STEP and AUTO. In UP mode, the input power is increased when the vacuum pressure is lower than a lower threshold value (PL). On the other hand, if the pressure is higher than a higher threshold value (PH), the input power is decreased. After a power increment, the pressure is monitored for 1 second. In case of steep increase of the pressure, the input power is decreased. When the pressure is between PL and PH, the input power is kept at the current value. If the power reaches a maximum value (RFmax), the power is kept at that value. In DOWN mode, the power is decreased if the vacuum pressure is lower than PL. If the pressure is high, the power is kept until the pressure becomes lower than PL. The time interval for successive decrease of the power is 1 second. If the power reaches a minimum value (RFmin), the power is kept at that value.

The remaining modes CYCLE, STEP and AUTO are the combination of UP and DOWN modes. In CYCLE mode, the power is changed repeatedly between RFmax and RFmin in order to improve the vacuum pressure low during the power change. In STEP mode, the input power is held for a given time interval with a certain power step. This mode is provided for a measurement of a relation of the temperature of the cavity and the input power. In AUTO mode, the power is increased to RFmax and is kept for a given interval, then CYCLE mode is executed for a given time interval, and the power is hold at RFmax.

The RF input power is cut off by an RF switch if interlock signals caused by a large reflection of the RF power from the cavity, bad vacuum of the cavity, failure in the klystron power supply or the arc in the circulator are sent to the switch. If the interlock signal comes from the failure in the klystron power supply, the computer makes a phone call to the RF staff. If the interlock is caused by another reason, the reset signal is sent from the computer to the RF switch module when the vacuum pressure becomes lower than PL, and the conditioning is continued.

The data such as an input power and a vacuum pressure are numerically and graphically displayed. These data are saved in a MO disk. An example of the display of the computer is shown in Figure 1.

The conditioning of couplers and cavities for the synchrotron has been completed successfully using this computer control system. The conditioning of those for the storage ring is underway.
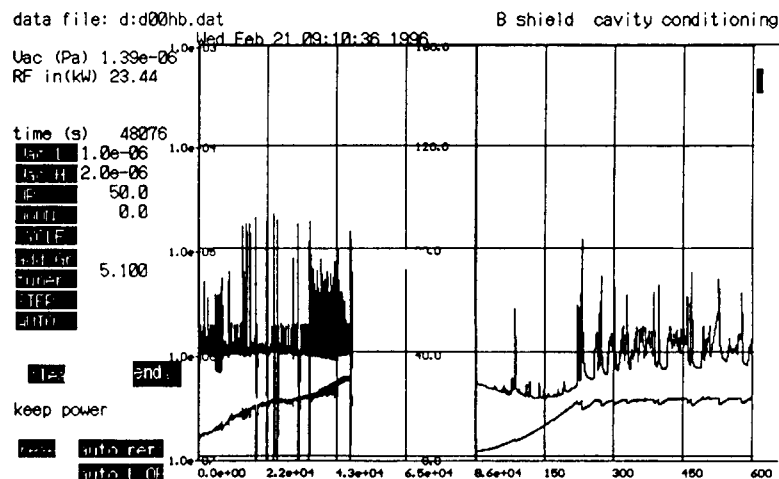

Fig. 1. An example of the display of the computer. The holizontal axis shows the time passage. The vertical axis shows the RF power and the vacuum pressure of the cavity.