Computer Control of RF system

Takashi OHSHIMA, Hiroyasu EGO, Masahiro HARA, Naoyasu HOSODA, Yoshitaka KAWASHIMA,
Yuji OHASHI, Hiromitsu SUZUKI, Takeo TAKASHIMA, Atsushi TAKETANI and Hiroto YONEHARA

SPring-8, Kamigori, Ako-gun, Hyogo 678-12, Japan

We have already developed a computer control program for cavity conditioning on a personal computer based system [1] [2]. Carrying over this experience, a computer control program has been developed for the operation of RF system of the storage ring under the frame of the SPring-8 control system [3].

The operator uses a graphical user interface (GUI) to control RF systems. The command is sent to a message sever (MS) from GUI, then is sent to an access server (AS), and finally is reached to an equipment manager (EM) working on a VME. There the command is analyzed and is executed which controls RF equipments through VME I/O modules. Control commands are sent with text form. For example, to turn on RF switch of B station, a command of "put/sr_rf_rfsw_b/on" is sent to EM, then a digital pulse signal is sent to the RF switch to turn on. Another example, to get the vacuum pressure of C station, the command of "get/sr_rf_ccg_1_c/pressure" is sent to the EM, then an analog data is taken from the analog input board, the voltage is converted to the vacuum pressure using the conversion coefficient and the result is sent back to the GUI program.

The RF control system is composed with three kind of panels: a main panel, a control panel for klystron power supplies and a low level control panel for each RF station. Figure 1 shows the relation of RF control panels.

Functions of main panel are to set total acceleration voltage to parameter data base, to set phase of each RF station to parameter data base, to change the RF frequency of master oscillator, to display present values of the acceleration voltage, the phase and the vacuum pressure of each RF station. Figure 2 shows the main control panel.

The control panel for klystron power supplies is used to start up the supplies, or to shut down supplies and to monitor status of supplies.

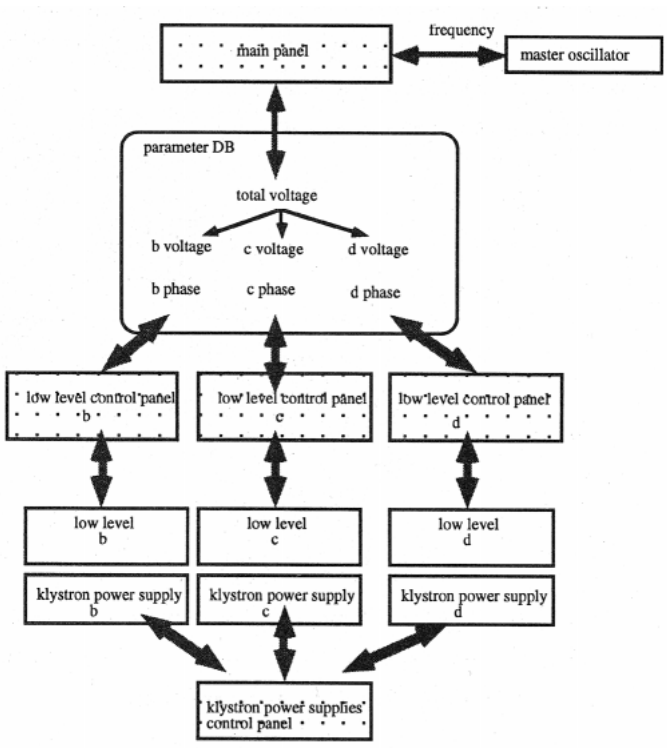

Fig.1. RF control panel.

The main roll of the low level control panel are to set the acceleration voltage and phase. These values are stored in the parameter database written by the main panel. Also they are input manually at the low level control panel. Another roll of the panel is monitoring the status of each klystron and cavities. During changing RF power into the cavities, occasional arcs increase the reflected power from the cavities and the vacuum pressure inside the cavities. The pressure is important parameter to control RF power.

At the first system, the low level control panel gets the pressure value and controls RF power through MS, AS, and EM. It takes about 100msec for single software feedback loop operation instead of 20msec of vacuum gauge response time. We have developed the new system called Equipment Manager Agent (EMA), which have a feedback loop on the local VME CPU system. The response time of the new feedback loop is improved to about 10msec and the load of the

workstation used by the operator is reduced. Parameters sent to EMA are an acceleration voltage, a vacuum pressure threshold, an interval for sequential power change. The EMA changes the acceleration voltage when all the following conditions are fulfilled: the vacuum pressure of the cavity is lower than the threshold value, the tuners of the cavities are all tuned and the limiter of the voltage feedback controller module does not work. Automatic recovery function is also provided. When the RF switch is cut off by excessive power reflection from cavity and so on, a reset signal is automatically sent and the acceleration voltage is recovered.

These control panels are working well now. We will continue updating the program to better one.

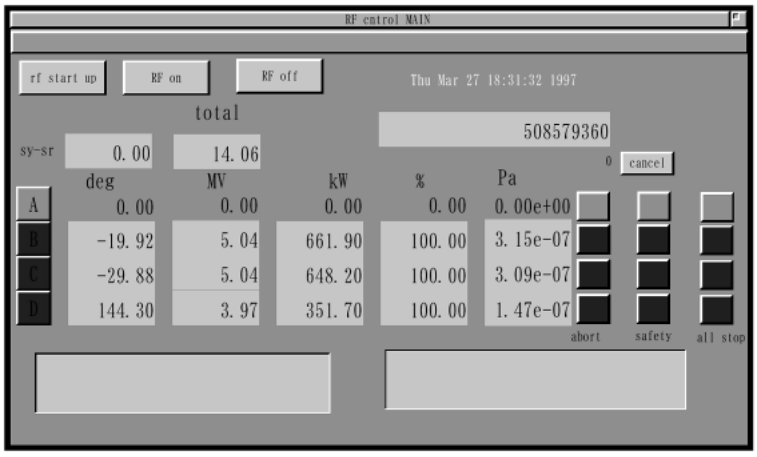

Fig.2. RF main control panel.

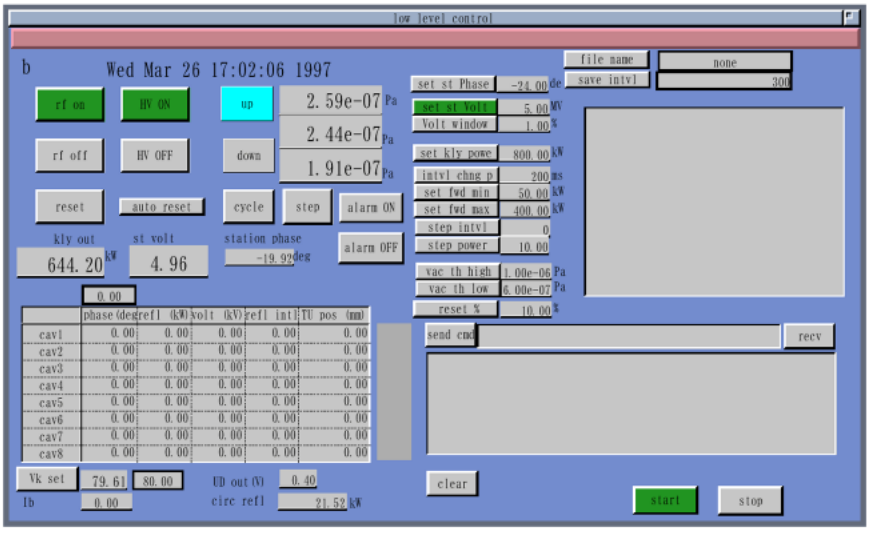

Fig.3. Low level control panel.

References

[1] T.Ohshima et al., SPring-8 Annual Report, 125 (1995).

[2] T.Ohshima et al., Proc. of the 5th European Particle Accelerator Conf., SITGES (Barcelona), 2047 (1996).

[3] T.Wada et al., SPring-8 Annual Report, 26 (1995).