A.5: Upgradation in the Indus-2 Control software:

Control system software of Indus-2 is continuously being enhanced by Accelerator Control System experts to meet new requirements from machine physics and sub-system experts. Following up gradations were recently done for performance improvement and meeting new user requirements.

1. Upgradation in the Ramp Clock generation module:

Indus-2 beam energy ramping software has various modules like file load module, device selection module, data calculation module and clock generation module. All these modules work in a distributed manner in all the three layers of the control system. The Graphical User Interface (GUI) layer has all the configurations and monitoring services running under PVSS SCADA. The general architecture is shown in Fig. A.5.1.

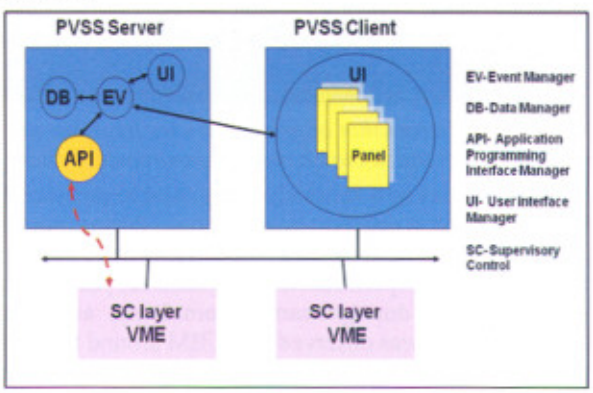

Fig. A.5. 1 : Control software architecture

The clock generation software module has two panels, namely single row panel and multiple row panels. Earlier the calculation of clock pulses sent was done in these two panels. So in case of unexpected events during ramping like re-booting of the UI manager PC, re-launching the panel at multiple locations or closing the panel, the information of the clock pulses already sent could not be known. Therefore it was not possible to resume the ramping operation further. In order to resolve these issues the ramp clock generation module design has been modified. The over all logic has been implemented in the API Manager in PVSS. Moreover, the API Manager code was implemented such that it retains the state of the last operation, thus even the API Manager re-run will not affect the clock generation operation. All the information about clock pulses required for ramping is updated on events like ramp pause, ramp resume, change of row count etc.

The multi row clock panel shown in Fig. A.5.2 was also redesigned to provide a facility to continue the ramp process further by re-filling the clock table.

2. Enhancements in Ramping module for higher beam availability:

Indus-2 beam injection requires the magnet power supplies and RF Cavities to operate at predefined current and gap voltage values respectively. This is the ***DC mode*** of operation where the operator can change the settings as required.

After the beam accumulation is over, the beam energy is ramped. The beam energy ramping process involves synchronously increasing the references of number of magnet power supplies and also the gap voltages of all the RF cavities. This is known as ***Ramp mode*** of operation where the settings are controlled by the ramping software.

Enhancements were done in the ramping software to handle the tripping of any auto-ramping RF station during beam energy ramping. If any such RF station trips during beam energy ramping, the operation is paused and all RF cavities are brought to DC mode and removed from auto-ramping. The magnet power supply ramping can, however, be resumed by the operator to further increase the beam energy while the RF stations can be continued to be ramped manually.

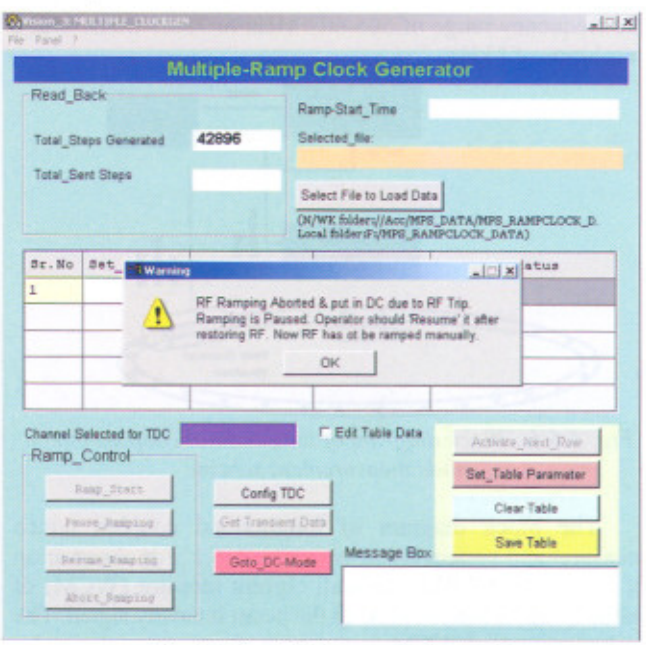

Fig. A.5.2: Multi row clock panel

This feature has resulted in higher beam availability by allowing the beam energy ramping process to continue even when any auto-ramping RF- cavity trips while earlier such a condition was causing a beam loss.

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