A.3: Indus-2 magnet power supply ramping verification system

The beam in Indus-2 SRS is ramped from injection energy to 2.5 GeV. The overall ramping process is carried out by Indus-2 control system, developed by ACSD. Beam energy ramping requires increasing the power supply currents flowing through various magnets and increasing the RF cavity voltage synchronously.

The process involves ramp data generation for each of the 117 power supplies based on user defined profile and then synchronously setting these profiles as per user defined clock rate.

Deviations occurring during the ramping process, if any, may be one of the cause of beam-loss/partial beam-loss, orbit distortion or tune shift. Despite of adequate error handling and reporting, it is difficult to quickly identify such a deviation in the present system as it involves tedious manual process of analyzing the data of 117 power supplies.

A system providing automatic verification of the ramping process is developed and put in regular use. The system verifies the correctness of ramping for all power supplies participating in ramp process. It is developed using WinCCOA SCADA and MATLAB modules. The SCADA system is same as the one reported in RRCAT Newsletter, Vol. 30, Issue 2, 2017, Page-6. Various sequential tasks are executed by these coordinating software modules as depicted in Figure A.3.1.
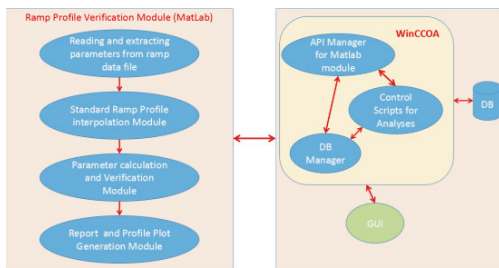

Fig. A.3.1: Overall ramping verification process.

An algorithm was developed to verify that each magnet power supply has followed the ramp profile as per the standard ramp file selected.

The system verifies that:

● All the required power supplies have been selected for ramping or not.
● All the selected power supplies have participated in ramping or not.
● The ramp profile matches the standard profile.

Verification process involves checking of deviation of key

parameters viz. initial value, final value and profile correlation factor beyond the tolerance limits. The tolerance limits were finalized by analyzing the historical ramp data and the algorithm was tested with archived, online and simulated ramp data.

The system is modular and has configurable tolerance limits. The system provides verification status in the form of pass/fail status of individual magnet power supply for all three signals viz. power supply current read-back, reference read-back and digital set as shown in Figure A.3.2. A detailed report indicating the faulty key parameter(s) is also available, in case of any problem, which helps in quick identification of the faulty system.

Fig. A.3.2: WinCCOA panel showing overall verification status of all magnet power supplies to the operator.
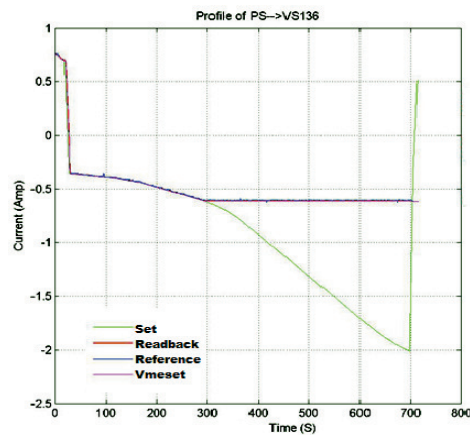

Fig. A.3.3: Signal plot for vertical steering coils when the ramp profile is not OK.

The report also provides plots of above signals (Figure A.3.3) for all power supplies. The overall integrated system is deployed for regular operation. This has resulted in quick identification of ramping related faults.

Reported by:
Bhavna N. Merh (bhavna@rrcat.gov.in) & colleagues