A.10: Beam orbit display and alarms system for Indus-2

The Indus-2 electron synchrotron radiation source is operated on round the clock basis, currently with up to 200 mA beam current at 2.5 GeV energy. Such high current operation of Indus-2 with repeatable performance and machine vacuum protection, among other systems, also requires precise monitoring of beam orbit and generation of alarms when the orbit deviates from a given reference orbit.

There is an existing facility for measuring and displaying the current beam orbit. However, regular operation with different reference orbits requires a check on the deviation around the defined reference orbit. Accordingly a software system was developed for providing the facility to declare a reference orbit and to generate alarms on the deviations in the beam orbit from the defined reference orbit.

Indus-2 is a booster cum storage ring, therefore there are two reference orbits; one at injection energy and the other at storage energy. Alarms have to be defined and configured for these two energy levels for both horizontal and vertical planes. During the energy ramping process, these alarms should be automatically disabled. The machine orbit is measured by Beam Position Indicators (BPIs) whose response depends on the beam current and accordingly the alarms are enabled after a certain beam current is stored in the ring.

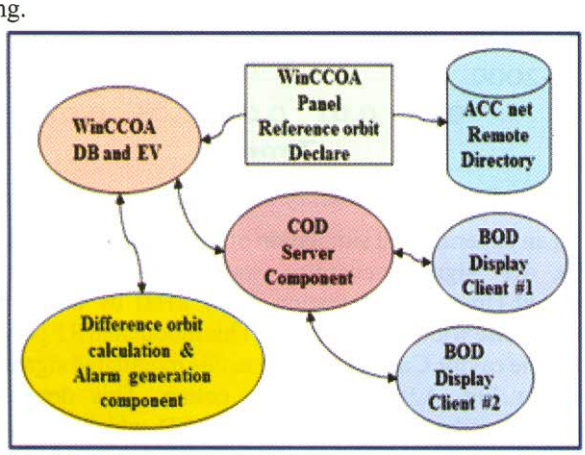

Fig.A.10.1: Scheme of beam orbit display and alarms system

The software also provides a configurable time hysteresis to filter the momentary drift of orbit at any location beyond the threshold value. There are 56 BPIs in the Indus-2 ring and the orbit data is continuously acquired by the control system.The alarm is generated based on the maximum deviation at any BPI persisting beyond a specified time hysteresis and is displayed on the central alarm panel. This software system also provides saving the data in file. The software system, consisting of various components, is depicted in Fig.A.10.1.

The major components of the software system are described below-

1. Difference orbit calculation and alarm generation module:
   This module is responsible for calculating the difference orbit after comparing the present beam orbit with the defined reference orbit as per the energy level. It acquires the BPI data from the three layer Indus-2 control system having WinCCOA as the SCADA system.
   It reads all the configuration information like reference orbit, alarm limits, time hysteresis and alarm enable beam current level. It also calculates the maximum, minimum and rms orbit values for the difference orbit. It generates the alarms based on these limits which are then displayed on the central alarm panel. This component sends all the information to the WinCCOA SCADA database for onward communication to the display client component.
2. COD server module:
   This module is responsible for communicating the reference orbit, difference orbit and other related information to the orbit display client component on TCP/IP link. It provides the required information as per the energy level to all the display clients. It is a multithreaded application communicating to the WinCCOA SCADA on one end and to the beam orbit display modules at the other.
3. Beam orbit display client module:
   The beam orbit display client module is shown in Fig.A.10.2. This module displays present beam orbit, reference orbit and difference orbit for both the horizontal and vertical planes graphically along with all the calculated orbit parameters. This module polls the COD server component on the TCP /IP link periodically to get these orbit data. This is written in Java.

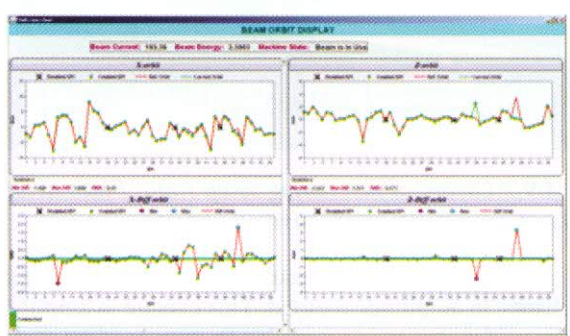

Fig.A.10.2: Beam orbit display client module

4. Reference orbit declaration component:
   Indus machine operator can declare the present beam orbit as reference orbit as per the requirement through this component.

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