MONITORING AND ARCHIVING OF NSLS-II BOOSTER SYNCHROTRON PARAMETERS

BOOSTER PARAMETERS
- Main NSLS-II ring
- Booster synchrotron 3 GeV
- Linac 200 MeV
- Cycle frequency: 1 (2 Hz)
- Injection: single / double in 100 msec
- Current: 20 mA (100 bunches)
- Bunch number: 1 / 80 - 150
- Acceleration time: 300 msec
- Inj/Extr pulsed power supplies: 9
- Dipole: combine functions, 3 families
- Quadrupole: 3 families
- Sextupole: 8 + 8
- Correctors: 20 X, 16 Y-direction
- Number of monitored signals: ~ 900
- Number of waveforms: ~ 2000

BOOSTER CONTROL SPECIFICS
- Control data:
  - High data flow (plenty of 10k waveforms)
  - Cyclic nature of measurement process
  - Huge amount of data to archive
  - Data synchronization by looking to cycle timestamp

NOT supported in EPICS infrastructure:
- Point-to-point waveform comparison
- Alarm handling for waveforms
- Save/restore of consistent machine state
- Advanced monitoring of machine state
- Automatic parameters adjustment

MONITORING AND ARCHIVING SCHEME
- All values have aligned timestamps equal to the time when the booster cycle started
- Alarm flag is set for a monitored parameter if the difference between live and reference values is out of the specific range (tolerance)
- Two alarm severity levels allow distinguishing between minor and significant deviations
- Reference value can be set either by the machine state restore application, or be equal to an appropriate value setting
- Significant deviations are automatically archived; live value is compared to the last archived value so only significant changes are saved

SOFTWARE COMPOSITION
- Live Compare:
  - Live scalar and waveform data comparison and export
- Save/Restore:
  - Saving PV values at once in order to upload later to restore booster settings
- Parameter Tuner:
  - Automatic compensation of slow deviations in various device parameters
- Status Monitor:
  - Colored status visualization of power supply system during the booster operation

OPERATOR SCREENS
- Save/Restore:
  - Consistent (relevant to one cycle) and snapshot (as-is) saving modes
  - Restoration to support reference values in monitoring scheme
- Browsing of saved states and comparing them with each other or with a snapshot of live parameters
- Data export and extended waveform comparison tools

ALARM FLAG ADJUSTMENT
- When Parameter Tuner application adjusts parameter values, corresponding alarm flags should be ignored
- An additional set of modified flags is formed

Status Monitor:
- Device status is determined from the state of relevant parameters in real time
- Quick access to the detailed device status and diagnostics data is provided