NSLS-II BOOSTER RAMP HANDLING

BOOSTER PARAMETERS

- Cycle frequency: 1 / 2 Hz
- Circumference: 158.4 m
- Current: 20 mA (100 bunches)
- Bunch number: 1 / 80 - 150
- Acceleration time: 300 msec
- Injection: single / double in 100 msec
- Lin/Extr pulsed power supplies: 9
- Dipoles: combine functions, 3 families
- Quadrupoles: 3 families
- Sextupoles: 8 + 8
- Correctors: 20 X-, 16 Y-direction

Handling Sequence

1. Operator
   - Waveform checking:
     - End values equality,
     - Is in physical value limits,
     - Max derivative

2. Application Level
   - Ramp Manager
     - Caput

3. Server Level
   - Input/Output Controller
     - Upload:
       - No checking, playback synchronization

4. Hardware Level
   - Power Supply Controller

Requirements for Ramp Control

- 10 kHz setting of the reference voltage
- Dipole, quadrupole and RF waveforms should be matched
- 10⁻³ relative matching accuracy of ramping waveforms of main magnetic elements during the beam ramp
- No jumps of 1-st and 2-nd derivatives in dipole and quadrupole PSs waveforms
- Changing the reference voltage for injection kickers in 100 ms interval

IOC Functions

Checking of New Waveform

- Check waveform points (cycle from 0 to 10149)
- Check current value
- Is value \( f(x) \) in limits?
- Check “1-st derivative”
- Is \( d_1 \) < limit?
- Check “2-nd derivative”
- Is \( d_2 \) < limit?
- Check end points
- Are \( f(x) \) and \( f(x_{10149}) \) equal?
- \( f(x) \) and \( g(x_{10149}) \) are equal?
- Calculation of transition table
- Uploading to PSC

Ramp Manager Main Features

- Operations with waveforms:
  - Edition in polynomial and table format
  - Graphical edition
  - Individual and group copying
  - Rescaling
- Visualization:
  - Plot selected waveforms in one graph
  - Plot selected readbacks in one graph
  - Plot 1-st and 2-nd derivatives
- Control operations:
  - Upload selected waveforms to PVs
  - Perform scenarios (RF control, switch ON/OFF operations)
- Save/restore operations:
  - Individual and group save/restore
  - Export/import to/from text format
- Undo operations:
  - Manipulations with graph
  - Waveform edition

October 6-10, 2017, San Francisco, California
The Annual Regents Seminar on Cancer
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