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Engineering Specifications on Controlled Longitudinal Emittance Blow-up

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Draft Specifications

- Document viewable in EDMS
  https://edms.cern.ch/document/2114577/0.1
  - *Please comment by 12th April*

- Baseline scenario (pLHC): blow-up as used in Run II
  - Phase noise injection in beam phase loop, acting on 200 MHz system, but not seen by 800 MHz system (with present CIC filter settings)
  - Algorithm of Joachim implemented in FESA ("VariNoise" generation)
  - Increased streaming rate from 20 kS/s to 40 kS/s

- Alternative algorithms on noise generation are to be studied; different algorithms can be implemented & toggled in FESA

Additional Options for Flexibility in the Future

- Batch-by-batch blow-up for LHC ions

  - Phase noise injection in 200 MHz cavity controller, while masking the beam phase loop in this segment of the ring

  - Batches as short as 3x75 ns; batch spacing of 100 ns can be an issue

- Amplitude noise injection, for the entire beam or a portion of it

  - Injection in the cavity controller (not seen by the beam phase loop)

- Phase or amplitude noise injection in the 800 MHz system only

- Phase or amplitude noise injection, for the entire beam, in the 200 MHz + 800 MHz set points, with beam phase loop open

Diagnostics

- In addition to presently available diagnostics, we can envisage built-in diagnostics in the new beam control
  - Stable phase, bunch length (e.g. bunch-by-bunch average and r.m.s. spread over several synchrotron periods)

- Expert diagnostics on FW and SW level to diagnose (even without beam) whether the noise is injected and has the correct spectrum

- Commissioning tools and operational panels are foreseen, too