MD title: Electron cloud effects characterization at 4TeV

Requesters: G. Arduini, V. Baglin, G. Rumolo, L. Tavian

Participants:

G. Arduini, Ph. Baudrenghien, V. Baglin, H. Bartosik, T. Bär, G. Bregliozzi, R. Bruce, S. Claudet, O. Dominguez, J. Esteban Muller, W. Höfle, G. Iadarola, J.M. Jimenez, G. Lanza, T. Mastoridis, H. Maury-Cuna, E. Métral, S. Redaelli, G. Rumolo, B. Salvachua Ferrando, B. Salvant, E. Shaposhnikova, L. Tavian, F. Zimmermann et al.

Description

- The **goal** is to study the behavior of the beam and of the machine with 25ns beam (≥72b. trains) at 4TeV (ecloud expected to be worse due to photoelectrons)

- Monitor **electron cloud indicators**:
  - Vacuum pressure rise
  - Heat load on beam screens in arcs and other SC magnets
  - e^- flux on BPMs (tbc)
  - Stable phase shift along the train
  - Beam losses
  - Emittance blow-up
  - Stability (damper pick-ups, head-tail monitor)

- Time requested: **12h** (up to 2 ramps with 4h at flat top)

Beam parameters

- **Bunch spacing:** 25ns
- **Bunch intensity:** up to 1.3×10^{11}ppb
- **Optics**: injection
- **Energy:** 450GeV ➔ 4TeV
- **Number of bunches:** ≤400 (1^{st} ramp), ≤800 (2^{nd} ramp)

  (exact number and filling scheme to be defined after the scrubbing run)
- **Tr. emittance:** minimum possible for given bunch int.
- **Bunch length:** nominal

Possible parallel studies:

UFOs, beam stability, components heating, RF

Setup

- **Collimation:** whole hierarchy retracted by 1.4σ (more margin for ecloud induced emitt. blow-up, see R. Bruce and S. Redaelli proposal)
- **RF system:** klystron DC parameters increased in order to get higher saturation power (tested without beam on 12/9/2012)
- **Transverse feedback:** Settings for 25ns beam and larger bandwidth (should be already tested during the scrubbing run)

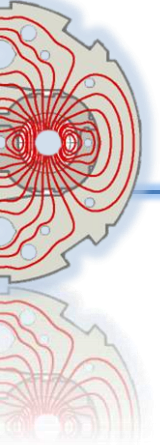
Proposed plan for 4 TeV 25 ns studies

	Time	# bunches/beam
Collimation setup and validation	3 shifts	2-3
Ramp down and Recovery	2 h	
Long range beam-beam MD (IR1/5)	5 h	72+12
Long range beam-beam MD (IR1/2/5/8)	5 h	2x72+12
Ramp down and Recovery	2 h	
E-cloud ramp (no squeeze)	**6 h**	**~400 (tbc)**
E-cloud ramp (no squeeze)	**6 h**	**~800 (tbc)**
Ramp down and Recovery	2 h	
… possible 25ns physics run		

See LMC#149 presentation

Regular measurements during scrubbing

- → Chromaticity measurement before starting any high intensity fill
- → Beam measurements
  - Transverse emittance:
    - LHC: Wire scanner (up to 156 bunches), BSRT in fast scan mode, BGI
    - SPS: Wire scanner in bunch-by-bunch mode at SPS extraction
  - Bunch-by-bunch intensity (FBCT) and total intensity (DCBCT)
  - Transverse oscillations:
    - BBQ and Hump buster
    - ADT pickup (bunch-by-bunch position)
    - Head-tail monitor
  - Longitudinal parameters:
    - Bunch length evolution
    - Longitudinal beam spectra
- → Electron cloud measurements
  - Heat load in the arcs, stand-alone and triplets
  - Bunch-by-bunch RF stable phase
  - Vacuum pressures (selection of gauges to be defined with vacuum team)



Additional slides

Equipment checks

- Heat loads (also stand-alones and triplets)
- BSRT temp. (especially if frequent alignment needed)
- TDI temp./ angle
- MKIs temp. and press.
- Collimators' temp

Contacts with equipment groups and procedures being established

4 TeV e-cloud MDs

- Rather confident to accelerate few trains of 72 bunches to flat-top (e-cloud wise) to fulfil requirement for beam-beam long-range MDs: 1-2 trains of 72 bunches

- Criterion for the choice of the filling pattern (at the end of the scrubbing run) number of trains of 72 (or larger) bunches that do not show:
  - Sign of instability / important blow-up at injection
  - Vacuum pressures above 10^{-7} mbar