ACTIONS FOR THE RLIUP WORKSHOP AND HL-LHC WP2

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- **RLIUP** => Comments to be given on several scenarios considered: http://emetral.web.cern.ch/emetral/ICEsection/2013/2013-10-02/RLIUP_LHC_scenarios.pptx

- **HL-LHC WP2** (16th meeting, 13/09/2013) => https://indico.cern.ch/getFile.py/access?resId=minutes&materialId=minutes&confId=270585
### RLIUP (1/3)

|       | $N_{b_{\text{inj}}}$ [$10^{11}$] | $\epsilon_{\text{inj}}$ [\text{[um]}] | $N_{b_{\text{coll}}}$ [$10^{11}$] | $\epsilon_{\text{coll}}$ [\text{[um]}] | B-B Sep $[\alpha]$ | Min $\beta^*$ (xing/sep) [cm] | Xing angle [$\mu$rad] | $L_{\text{peak}}$ [10$^{34}$ cm$^{-2}$s$^{-1}$] | $L_{\text{ev}}$ [10$^{34}$ cm$^{-2}$s$^{-1}$] | $\tau_{\text{lumi}}$ [h] | Lev. time [h] | Machine eff. 6 h fills [%] | Machine eff. opt. fill length [%] | Opt. Fill length [h] | Avg. Peak-pile-up density [ev/mm] | Target int. Lumi [fb$^{-1}$/year] |
|-------|----------------------------------|---------------------------------|----------------------------------|----------------------------------|-----------------|-------------------------------|------------------------|---------------------------------------|-------------------------------|-------------------|-----------------|-------------------------------|-------------------------------|-----------------|-----------------|-----------------|-----------------|
| PIC   | 1.3                             | 1.28                            | 1.24                              | 1.54                              | 12               | 40/20                         | 285                     | 3.6                                   | -                             | 5.8               | -               | 33.9                                         | 33.6                                         | 5.1             | 1.24            | 70              |
| PIC   | 1.3                             | 1.65                            | 1.24                              | 1.98                              | 12               | 40/20                         | 323                     | 3.1                                   | 8.1                           | 35.0                                         | 35.0                                        | 6.1             | 0.97            | 70              |
| US1   | 1.45                            | 1.37                            | 1.38                              | 1.8                               | 10$^4$           | 40/10                         | 256                     | 6.2                                   | 5.1                           | 5.6                           | 49.6                                         | 49.3                                         | 5.1             | 1.53            | 170             |
| US1   | 2.0                             | 2.18                            | 1.9                               | 2.6                               | 10$^4$           | 40/10                         | 320                     | 7.4                                   | 4.6                           | 8                             | 3.7                           | 41.8                                         | 41.4                                         | 7.2             | 1.45            | 170             |
| US1   | 2.0                             | 2.18                            | 1.9                               | 2.6                               | 10$^4$           | 40/20                         | 310                     | 5.4                                   | 4.6                           | 8                             | 1.2                           | 49.4                                         | 49.4                                         | 6.2             | 1.45            | 170             |
| US2   | 2.32                            | 2.08                            | 2.2                               | 2.5                               | 12               | 15/15                         | 590$^{3}$               | 20                                    | 5.1                           | 8.2                           | 11.2                          | 57.3                                         | 47.3                                         | 13.0            | 1.16            | 270             |
| US2   | 2.32                            | 2.08                            | 2.2                               | 2.5                               | 10$^4$           | 30/7.5                        | 420                     | 19                                    | 5.1                           | 8.2                           | 10.7                          | 57.3                                         | 48.0                                         | 12.6            | <1.24$^{5}$     | 270             |

- **PIC** => Experiments compatible with 140 PU-events crossing
- **US1** => PIC + BBLR in 1 and 5 + needs for 40 / 10 optics
- **US2** => US1 + Crab cavities + 800 MHz? + e- lens?
Transverse beam stability and heating

- Are the above schemes compatible with transverse stability taking into account the collimator settings (assuming present jaw materials) presented by Roderik at the WP2 meeting on 13/9?
- At which stage do we need to have Molybdenum-Graphite jaws with Molybdenum coating for impedance reduction?
- Is the octupole strength sufficient for all cases up to 7 TeV?
- When heating is becoming an issue for the present hardware?

Beam-beam

- Is there any scheme among those proposed for BCMS (see next slide) that could pose problems for beam-beam effects?
- What is the required beam-beam separation for flat optics and no BBLR? What is the dependence on intensity?
- BBLR position vs emittance, flat beam crossing angle with BBLR. Is it compatible with collimation?
RLIUP (3/3)

- Filling patterns with BCMS and max of 5 PS train per SPS extraction => Any proposal or other suggestion?

<table>
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<th>$k_{ip1/ip5}$</th>
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- **E-cloud effects**
  - What are the heat loads that we can expect after scrubbing for the considered scenarios? And during scrubbing?
  - What is the required SEY to achieve in the triplets to avoid electron cloud build-up?
  - What are the electron cloud effects that we can expect after scrubbing during the various phases?
  - Countermeasures?

- Abort Gap Keeper at 276 bunches
- Max. 5 PS train/SPS extraction (=240 bunches)
- No isolated bunches to ATLAS and CMS
- 12 bunches intermediate injection
- Over injection over pilot
BS to contact ElenaS and StephaneF to get estimates of the parameters that they are considering for the scaling of the beam-induced RF heating for HL-LHC

GR should try and include, in his presentation on the heat load on the triplets beam screens due to electron cloud, the effect of the simultaneous presence of the 2 beams

EM to discuss with the equipment teams about the possibility of testing with measurements and simulations the cooling effectiveness

EM to provide estimates including the trapped mode analysis for the new TDI (being refurbished during LS1 and new design should be foreseen for after LS2)

EM to ask for more accurate analysis of heat management (cooling effectiveness)

Impedance team to analyze the MKI temperature data collected in 2012
EM to transmit the information concerning the heat load on the striplines for the HL-LHC triplet

Impedance team to check the new design of the BSRT (which should reduce the RF heating) for the HL-LHC parameters

Impedance team to create a table with the expected heat loads for all the LHC components for which the impedance is known assuming the HL-LHC nominal beam parameters

Impedance team to estimate the RF heating for the various upgrade scenarios (RLIUP), highlighting the need of possible interventions on some of the hardware components