Pending actions after 26/10/2018

1. From action 24/10/2015: Estimate the Laslett tune shifts and benchmark with measurements. Action: Elias.

> => No formula available from HSC (except the approximate one mentioned for instance in FrancescoR's review of single-beam instabilities: http://cds.cern.ch/record/279204/files/sl-95-009.pdf, Eq. (4)). I think Massimo followed this up in the past.

2. From meeting on 31/10/2017 - https://indico.cern.ch/event/674481/ and AOB on 24/11/2017 from X. Buffat (https://indico.cern.ch/event/678685/). Need to verify that the proposed operational scenario with negative octupoles is robust both for the nominal and ultimate scenario: => After request from Gianluigi, a note will be written (by XavierB et al.) for March 2019 to explain why we think that the scenario with negative octupole should work (reviewing also what we think happened in 2012).

> a. verification at injection. Stability at injection with latest model of impedance and latest information on TDIS (From meeting on 10/08/2017 (https://indico.cern.ch/event/657954/)) => The strong instabilities at injection are due to e-cloud and not impedance (e-cloud is the reason for the high octupoles current and high chromaticity => should be much better at high intensity, as predicted by simulations in the past and confirmed in a recent MD: no octupole needed for 1.9E11 p/b!).
>
> b. spread and stability during the ramp and squeeze and pre-squeeze/squeeze => Should be done already…
>
> c. stability during the collision process. Do we risk having stability issues for separations at ~1.5 sigmas (=> No if we don't stay there for a long time as it was the case in 2012… This was predicted and confirmed in a dedicated MD by StéphaneF et al.: observation of an instability if we stayed there for a long time and no observation of instability if we just go through). Is it sufficient to cross these points rapidly? (=> Yes). What happens if due to orbit movements we end-up with a separation of 1-1.5 sigma (=> This should be recommendation that we should not end up at 1-1.5 sigmas, which should be feasible according to past experience: maybe one should ask OP for confirmation. If problem, we can ask to go say from - 2 sigmas to + 0.5 sigma and come back slowly to 0 sigma…)? Follow-up presentations by Xavier on 12/6/2018 (https://indico.cern.ch/event/733521/) and on 4/9/2018 (https://indico.cern.ch/event/752397/) with the need to verify the compatibility of the proposed scenarios with weak-strong simulations noting that a staggered collapse of the two IPs will induce tune shifts during the intermediate phase. The compatibility with separation by levelling should be also assessed as a complement to beta* levelling. (this point came out also during meeting on 19/9/2017 (https://indico.cern.ch/event/666617/)).
>
> d. Impact of separation and crossing angle on stability in the various phases should be checked and used to guide the choice of these parameters in all the phases of the cycle.
>
> e. Concerning the beam stability with realistic longitudinal profiles the studied should be completed including the effect of the octupoles => WP2 presentation by AdrianO (https://indico.cern.ch/event/674481/contributions/2769372/attachments/1549686/2434126/hllhc_headtails.pdf) + the octupole thresholds in the HSC meeting (https://indico.cern.ch/event/760008/contributions/3152436/attachments/1725452/2787088/hllhc_headtails.pdf). The 27/11/18 WP2 presentation by AdrianO should then finally summarise on octupole thresholds for the current impedance.
>
> f. From Annual meeting in Madrid (https://indico.cern.ch/event/647714/contributions/2646112/attachments/155863

3/2452414/Machine_impedance_and_HOM_power_update_7th_HLLHC_
Meeting.pptx) verify that the latest tables for the Crab Cavity HOM impedance have been used
and determine what has been the impact in terms of reduction of the octupole current reduction
=> Waiting for new HOM tables as they are still in the process of iterating on the design of the
couplers (info from SergeyAnt on 05/11/18).
3. From WP2 meeting on 22/5/2018 (https://indico.cern.ch/event/726043/)
a. ACTION (Xavier): Estimate the effect of crab cavity noise on stability => There is a bit of
work needed still on the CC noise on beam stability (relevant only if we turn them on before
collision. This requirement is in the OP scenario due to a study done by ClaudiaT, which is a
bit outdated, XavierB no longer thinks this is necessarily needed. This aspect is discussed in
the note we wrote recently).
b. ACTION (Elias, Xavier): to summarize the stability threshold measurements without damper
in the LHC. This was started and should be included in the review of all instabilities in Run II,
foreseen for Evian.
c. Gianluigi inquired about the progress on understanding how the beam distribution and
stability diagram are changed due to noise and whether non-linearities (e.g. octupoles) can
enhance the changes. => This is indeed the important work, which needs to be done after the
1st (major) step of this year which was the experimental confirmation of the detrimental effect
of a weak source of noise on the beam stability.
d. Scaling of latency vs. octupole current and impedance to be studied => This is indeed the
important work, which needs to be done after the 1st (major) step of this year which was the
experimental confirmation of the detrimental effect of a weak source of noise on the beam
stability.
4. From meeting on 18/01/2018: SPS Crab Cavity tests
a. Identify possible tests that could be used to benchmark the impedance (longitudinal and
transverse) and stability models. Done.
5. Documentation of the findings on the study of an RFQ for HL-LHC. Impact on stability and DA. =>
M. Schenk

=> Plan is to use the studies shown in MichaelS' s PhD thesis: goal is to finish it before the end
of November.

6. Shall we increase the crossing angle during ramp and squeeze up to collision to reduce the
compensation of the octupole spread by the long range?
7. Beam stability at injection with the updated TDIS design and the present impedance model (see e-
mail from Benoit Salvant on 01/11/2017 under WP14) => Same as 2.a? See answer there.
8. Update the estimates of the beam stability including the estimated reduction of the geometric
impedance => Work on geometric impedance to be finalised first.
9. Define tolerances on bunch-to-bunch population and emittance (also H/V differences) from stability
considerations => Could be done (easily) if the limitations would come from usual impedance-induced
instabilities but this is not the case… see 3c and d... Will be done after having understood this.