

Comment on RDR, January 30 version. By Paul Lebrun

Read the 2.8 section of the RDR again. Comments:

Section 2.8.1 : First paragraph, end of last sentence: "...and predict the luminosity performance" . I would said " assess potential degradation of the luminosity performance and propose changes to specification for the hardware." The point is: can we really predict the luminosity performance? I know we claim to be able to do so, but what kind of credibility do we really have? Neither the SLC nor the Run-II have achieved their performance goals set when the R&D and simulation effort was at the stage where we are now with the ILC. The b-bar machine worked better, with that respect. Up to you guys, with more experience than I have, to make that judgement call!

Section 2.8.1., 2nd par. last sentence "they cant" ==> they can

Section 2.8.2.1. First paragraph, last sentence needs a bit more clarification. In some lucky cases, it will mean re-adjust the parameter of the Steering Algorithm. But it could also mean a physical re-alignment o some piece will need to be done. I think you mean the later. If so, I would add "such as a physical re-alignment." Note: O.K. if external to the cryo-module. Much more costly if, for instance, the cavities tilts or offset needs to be corrected in the cryo-module. So adding this is likely to raise some eye-brow. But, on the other hand, do you think our funding agencies will give billions of dollar to build a contraption that has 10% chance of not working? (I know, we still fund missile defense systems.. different agencies though!)

Section 2.8.2.2 RTML: My impression is that this is still one the most tricky section, along with BDS final focus. Two items seems particularly difficult:

a. Steering through the first BC and, the first few cryo-modules of the 2nd BC. We can't easily change the energy of the beam by a significant amount (~20%) upstream of these section without making perturbation in the beam trajectory, so "simple DFS" won't work. This item should be mentioned explicitly in either the section 2.8.2.9 or section 2.8.2.2 . (Not to be included in this document, but if I may, I would like to propose a fix: it is very unlikely that the pulses used to DFS-steer in that section, or physically re-align, will not be used for luminosity. They be dumped before we get to the BDS, or even sooner. Why not using an other beam with much lower energy, like a

few hundred MeV, to fix this tuning problem? Imagine an injector similar to the one we have at A0/Fermilab, with one cryo-module, located after the turn-around and before the first BC. It produce a 150 MeV beam with much lower quality than the 5 GeV beam out of the damping ring, both in terms of emittance and intensity. But deflections due to mis-aligned cavities or quadrupole in the BC will be much bigger, because such defect mostly cause spurious Dispersion. At this energy, a Low-Z (LiH, Be) absorber could reduce the energy of such a crummy beam, without changing the average angles nor position of the beam. Whether the BPM will respond to such a beam needs to be studied.. Anyway, this would my way out of this problem. One more injector, one more cryo-module and ~10 m. of beam line, yes, that's an other few million, but the problem is solved.. Now, I haven't done the simulation yet..)

b. The time-varying stray field in the long beam line between RTML and the turn-around. This one is mentioned at the end of section 2.8.2.2. The last sentence of this section made me cringe, frankly. For sure, the dynamical stray field seen by the anti-proton beam in the Fermilab Recycler induced by the Main Injector pulses ought to be bigger than 7.5 nT !!... And these are still a naughty operational problem for us.. We have a 5-bump that changes the orbit length, which mitigate the longitudinal re-heating due to these stray-field, but it is far from perfect, and I don't understand it quantitatively. So this last sentence either needs to be tone down, and a sentence in the last section needs to be added, like suggesting to study a mock-up ILC tunnel, with cables, cryo-module, and a shielded beam pipe, to estimate this remaining fields.. Or, a good reference, in case I am a bit paranoiac...

Section 2.8.2.3 I would remove the paragraph starting with "An important difference between..", since the section 2.8.2.4 addresses this issue.

Section 2.8.2.4 Is the bypass line still in the design? I am afraid it disappeared, cost reduction... If so, we won't be able to distinguish between emittance growth due to the undulator and the ones caused by LINAC upstream or downstream sections. Unless we have emittance measurement sections located before and after the undulator. The section 2.6.4.2 does not mention them explicitly. (Note sure what a "single laser wire every 2.5. km" means in terms of measuring unambiguously the emittance.. Is it really just one beam spot size measurement, in only one plane, every 2.5. km? Do we have an algorithm to estimate the normal emittance growth, in presence of spurious Dispersion, with such a system? Better than nothing, yet... I would add to

the last sentence of section 2.8.2.4 " and specify the required emittance measurement instrumentation."

Section 2.8.2.5 2nd paragraph, typo at "BPMs are Aligned" ==> are aligned (i.e., offsets are measured). Third paragraph: needs to be re-written by the expert, evidently! Also state clearly that these are static simulation (It think it was. not 100% sure).

Section 2.8.2.6 2nd par. 4rth sentence ". ans used to correct", "and used to correct" . Last paragraph. A nosy reviewer would ask about the feasibility of bunch-to-bunch feedback system at the entrance of ML, the way it is phrased. I would add that ongoing simulation work will asses the impact of such a jitter. (That's actually almost true, it is on my list, at least...)

Section 2.8.2.7 First or 2nd sentence: Characterizing "noisy" vs quiet, by referring them to actual site. i.e., by "quiet", we mean a tunnel located in underground solid rock, "noisy" means a machine on the surface, or above the water table and looser ground.

Section 2.8.2.7 hiphen in "intratrain" ==> intra-train.

Section 2.8.2.7: Paragraph 3 and 4 contains too many Ground motion site indices (K, C,..) and not enough summary information. This is one of the thing that really justifies going underground and quiet, isn'tit? so it must be clear, if at all possible...

Section 2.8.2.7 and 2.8.2.8 Why are these separate sections ? Shouldn't we merge them, perhaps?

Section 2.8.2.9 Well written, and to the point! However, in either the Main Linac section or this section must include a one-liner on the impact of long range wakes in the Main Linac on the emittance preservation, in presence of all the other defects. We need to a volunteer to come up with a model of these kicks, starting from the SLAC or DESY simulation of these Wake potential, so that we can insert this model in our dynamical simulation of ML. Very tough problem, but since it is mentioned in the (already published!) Main Linac section (third paragraph of section 2.6.2.4), it will be hard to ignore!..

Paul.