international linear collider

Questionnaire on Recommendation for Mitigations of the Electron Cloud effect in the ILC Damping Ring

Dear Colleague,
We appreciate you taking the time to go through this questionnaire in preparation for the recommendation of electron cloud mitigations and our meeting on October 13, 2010 at Cornell University (Webex connection).

The goal of our October 13 meeting is to go through and evaluate the mitigations that have been tested in the various regions and on the basis of this, to fill a mitigation comparison table for the ILC Damping Ring. In the process, we would need to 1) identify a set of criteria for this evaluation, 2) identify the mitigation alternatives for each of the DR regions and 3) list them in a ranked fashion.

Please, consider alternative electron cloud mitigations for drifts, quads, bends, wigglers and how to rank and rate them. Any information you have please be prepared to discuss it and bring references to support it.

Please, take a moment to read and go through the points 1 and 2 below that show an overview of what we are going to discuss during the meeting.
Thank you!
Mauro Pivi and Mark Palmer

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1. We need to identify the criteria to evaluate the mitigation alternatives. So far, the identified criteria and sub-criteria for the evaluation are:

- Efficacy of the mitigation with respect to electron cloud suppression:
  including: Photoelectric yield (PEY), Secondary emission yield (SEY), Ability to keep the vertical emittance growth below 10%
- Costs
  including: Design and Manufacturing of mitigation, Durability of mitigation, Maintenance of mitigation, Impact on machine operations
- Risks
  including: Mitigation manufacturing challenges, Missing experimental evidences yet, etc.
- Impact on Machine Performances
  including: Impact on vacuum performances, impact on machine impedance, impact on optics

Question: In your opinion, are there additional criteria that we missed and should be included for the evaluation of mitigations?
Answer: _____
_____

Furthermore, the criteria have different importance when evaluating electron cloud mitigations. Thus, we need to assign them a "weighting factor".

One possible way is to compare all the criteria "pairwise" on an "importance" scale that we choose to range from 1 to 4, where: 1 = equal importance, 2 = Moderate importance, 3 = strong importance, 4 = very strong or extreme importance.

In preparation to our meeting and with reference to Table 1 below, please take a moment to think about what would be the "Preferred" criterion and the scale of "Importance" in the two-by-two comparison.

For example, we may ask: for a technical mitigation, is it more important its "Efficacy of electron cloud mitigation" or its "Cost"?

Table 1. Pairwise comparison of the criteria. As an example, two rows are already filled in.

A	B	Preferred	Importance
Efficacy of mitigation	Costs	A	4
Efficacy of mitigation	Risks	–	–
Efficacy of mitigation	Impact on Machine	–	–
Costs	Risks	–	–
Costs	Impact on Machine	–	–
Risks	Impact on Machine	B	2

(Example: **Rationale for the judgment**:

To suppress electron cloud we accept higher costs. In any case, the costs to implement electron cloud mitigations are a small fraction of the damping ring costs.

If we do not have complete experimental evidence that a particular mitigation will work in a particular region, we may be willing to take some risks for its implementation. Although, the risks should not impact the machine performances too much.)

2. Finally, we will evaluate the possible mitigations as shown in **Table 2** below, using a scale that we choose to range from -4 to +4 where:

Positive Values = Helpful
0 = No impact
Negative Values = Detrimental

Please, take a moment to think about mitigation alternatives for drifts, quads, bends, wigglers and how to rate the possible mitigations. Any information you have please be prepared to discuss it and bring references to support it.

Table 2. Example: comparison of mitigations for the wiggler region.

	Efficacy of mitigation	Costs	Risks	Impact on Machine
Mitigation 1	**2**	**0**	**0**	**0**
Mitigation 2	**2**	**0**	**0**	**0**
Mitigation 3	**1**	**0**	**0**	**1**
Mitigation 4	**3**	**-1**	**-1**	**-1**
Mitigation 5	**4**	**-1**	**-1**	**-1**