Toward Simulation of Background in Linear Colliders with Dynamic and Static Misalignments

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Goal:

- Understand effects of static errors and dynamic errors on background
- At these moment we see how one can treat
  - Beamstrahlung photons from IP for non-ideal machine
  - SR photons for non ideal machine (QSRAD - but no rescattering)
  - Probably can estimate how the halo influx on spoiler varies - but big question about halo dynamics
- Do not yet really know how to (or if we need to) include static and dynamic errors in e.g. muon-generating programs
Integrated Simulations of NLC

DR => IP <= DR

Can be Included:
- ground motion (e.g. A,B,C models)
- IP feedback
- RF structure and quad misalignments
- Beam-beam effects ...
- SR photons (QSRAD code) ...

Mat-LIAR code
Question: what is beam jitter at the spoilers?

• What are fluctuations of beam position at spoilers with ground motion?
  - Examples for NLC with GM B and C are shown below

• Mat-LIAR is suitable for the beam core tracking, not for halo tracking (ideas how to include halo?). Will show an example for the core of the beam.

• Caveat: suppose we see 1 sigma motion of the nominal beam at the spoiler. Would it be valid to assume that the halo is also moving by 1 sigma?
Nominal betatron beam sizes (top) and rms of BPM readings over the first 256 trains for one particular seed with ground motion B.

An un-ideal tuned NLC machine was used.
Example: BPM readings at SP2 spoiler

Example of BPM reading near the SP2 spoiler for the first 256 trains for one particular seed with ground motion B and C
Relative (to the nominal beam size) rms of BPM readings over the first 256 trains for one particular seed with ground motion B
Nominal beam sizes and rms of BPM reading for GM C

Nominal betatron beam sizes (top) and rms of BPM readings over the first 256 trains for one particular seed with ground motion C
Relative BPM reading for GM C

Relative (to the nominal beam size) rms of BPM readings over the first 256 trains for one particular seed with ground motion C
How to proceed?

- See about 3% (gm B) and 50% (gm C) of beam position fluctuation at BDS spoilers

- Fluctuation of the beam => fluctuation of the halo flux on spoilers => estimate fluctuations of muons...

- Qualitatively - the effects should be noticeable (in gm C) but not be very large

- But haven’t taken into account many other errors - for example jitter of phases of klystrons, BC errors, etc.
Summary

- **First priority:**
  - SR with un-ideal machine (QSRAD ~ready)
  - Beamstrahlung in non-ideal case and dump line

- **Second priority:**
  - Muons with un-ideal machine