# Status and Plans for RTML LET Studies at SLAC

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# The Past

- LET studies in RTML have not necessarily been too organized.
- Only looked at static alignment
- Each subsection on its own
- Have shown that different BBA methods effective in different regions.
  - **Return Line**
    - Kick minimization works well on its own.
    - Magnet/beam jitter may be a problem => feed-forward may fix this
  - **Turnaround, spin rotator up to BC1**
    - Kick minimization not good enough on its own must be augmented with dispersion bumps => prefer not have to rely on magic dispersion bumps
    - Coupling correction critical
  - **Bunch compressor**
    - Dispersion Free Steering shows much promise.
    - Pitched RF cavities most critical, especially in BC1

# The future

- Past studies on RDR lattice.
  - **Should be updated with changes to lattice**
- Reinvestigate canonical misalignments
- Every study should have at least one independent verification
- Virtually no dynamic studies (i.e. ground motion, power supply jitter) have been studied
- SLAC will contribute to pre-defined work packages for EDR as preliminarily laid out in Work Package Document distributed earlier.

# RTML Work Packages

- Static Tuning 1
  - **Apply standard set of misalignments and errors (not necessarily realistic)**
    - Perfect BPMs (infinite resolution and no scale error)
    - Phase and voltage errors? Maybe add these
  - **Simulate BBA and confirm <4 nm emittance growth is achievable at 90% confidence**
  - **Whole RTML together using different methods for each section (if needed)**
  - **If 4 nm is not achievable given standard misalignments, identify improvements needed to achieve budget.**
    - Either tighter tolerances and/or better BBA
    - Best not to have to rely on magic bumps
      - They're our last line of defense and shouldn't need to use up our safety buffer.
  - **Deadline ~May 2008**

# RTML Work Packages

- Work Package 2
  - **As more accurate/better misalignment models develop incorporate them into simulations.**
  - **Include:**
    - BPM scale and resolution errors.
    - Failure modes.
      - Failed BPMs, Corrector coils, maybe even failed quads and wire scanners
    - RF errors
      - phase and voltage
  - **Possible failed dependencies:**
    - WP relies on technical experts giving us accurate misalignment/ failure models
      - How do we update our canonical set of misalignments?
        - » i.e. what is the expected phase error for the RF?
  - **Deadline ~November 2009**

# RTML Work Packages

- Work Package 3
  - **Re-examine error parameters developed during WP 2.**
  - **Make recommendations to Area Leaders on which realistic errors are unacceptable from an emittance preservation perspective.**
    - I.e. An RF phase error of 2% may be found to be unacceptable, and a reduction to 1% may be necessary for acceptable emittance growth.
  - **Deadline ~November 2009**

# RTML Work Packages

- Work Package 4
  - **Dynamic Tuning**
  - **Develop requirements for orbit feedback systems**
  - **How many 5 Hz feedback loops and where to put them?**
  - **What about intra-train feedback?**
  - **Turnaround feed-forward**
  - **Simulations should include:**
    - ground motion
    - component and power supply jitter
    - stray fields
    - DR extraction kicker jitter
  - **Cannot commit to this work at this time**
    - May need more FTEs
    - Work on this WP should probably progress in parallel to other WPs

# Codes to use

- Steve Molloy: Lucretia
  - **MatLIAR used in the past so requires writing plenty of scripts/code**
    - Good exercise for Steve!
  - **But takes time...**
- Jeff Smith: BMAD or Lucretia
  - **Could continue with BMAD and help Cornell or switch to Lucretia and help Steve.**
  - **Decision pending.... (haven't done anything yet...)**

# Current Progress

- Not many results yet.
  - **Steve just started working on implementing BBA in Lucretia.**
  - **Jeff admittedly hasn't done anything lately.**
    - This will change!
  - **Work will ramp up over the next couple months**