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CesrTA Experimental Plan

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for the CesrTA Collaboration

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Outline

- Overview of CesrTA Program
- Electron Cloud Plans
  - Near Term
  - Through the remainder of program
- Summary

CesrTA Program

- R&D Targets:
  - Now through mid-2009
    - Complete low emittance machine reconfiguration and upgrades
    - Deploy and commission instrumentation needed for low emittance program
    - Study EC growth studies in wigglers, dipoles, quadrupoles and drift regions in CESR
    - Initial EC mitigation studies
  - Mid-2009 through April 1, 2010
    - Work towards progressively lower emittance operation
    - Complete EC mitigation studies
    - EC beam dynamics studies and instability measurements at the lowest achievable emittances
    - Focus shifts much more heavily to experiment versus machine modifications
- Immediate focus:
  - Finishing all invasive aspects of machine reconfiguration
  - Preparation/testing of EC vacuum chambers, vacuum diagnostics, and beam instrumentation

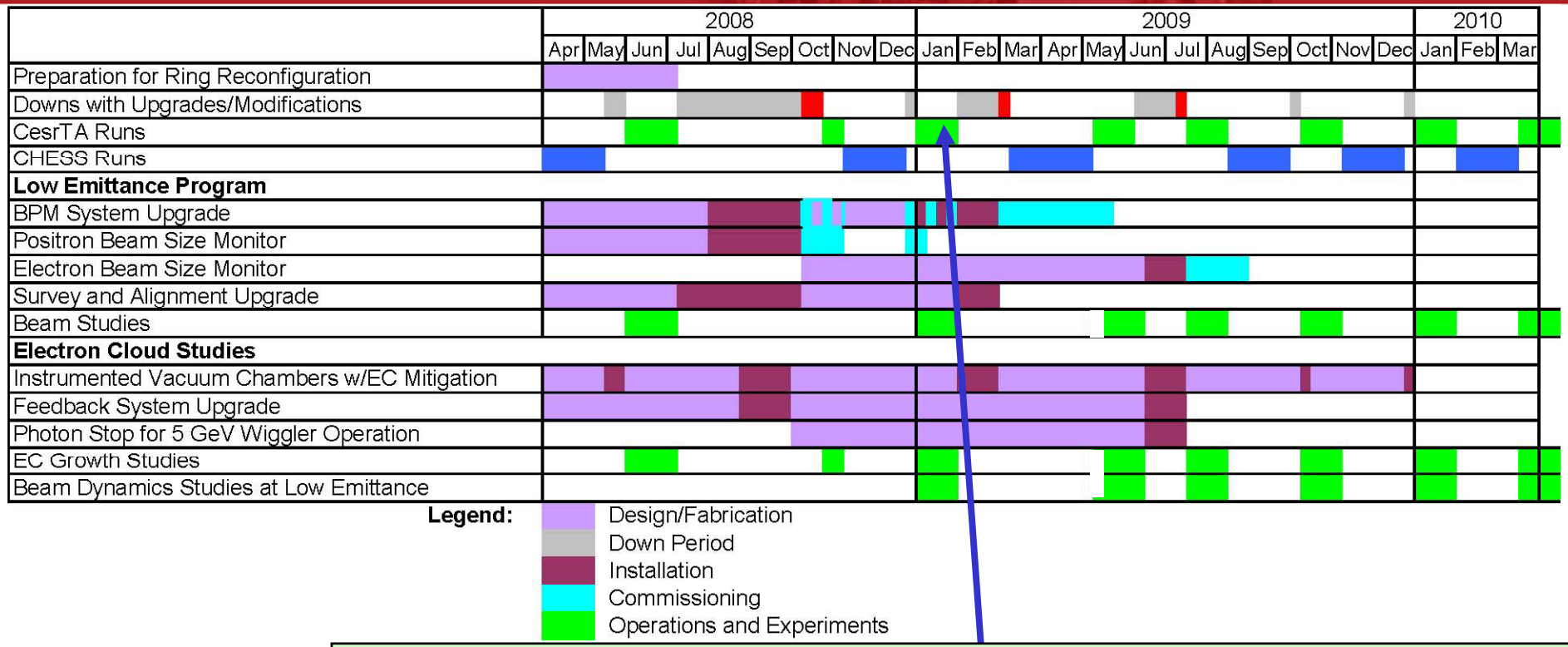
Electron Cloud Experimental Planning

- Overview

  Two major issues will drive the remainder of the experimental program:

  - First of all, we will be ramping up our capability for low emittance tests over the course of the next *several* runs. We expect that the effort to reach ultralow emittance will take considerable time and effort to correct errors in the machine, to validate the necessary low emittance tuning tools, and to provide sufficient operating time to learn how to achieve these conditions.
  - Secondly, given the short timescale of the CesrTA program, there is a very limited period of time during which we can make invasive modifications of the ring. This is due to the need for us to be able to successfully scrub the machine and because significant down-time will directly impact the available experimental time as we head towards mid-2010. We have ongoing upgrade work planned for two remaining month-scale downs (February 2009, June-July 2009). Subsequent downs focus on installation of specific experimental hardware – major machine work will occur only on a contingency basis.

Schedule Overview



- xBSM optics commissioning
- BPM system commissioning
- Beam-based alignment effort
- Ultra low emittance lattice development
- Characterize electron cloud growth in chambers around the CESR ring (wigglers, dipoles and drifts)
- Begin beam dynamics measurements

Short Term I

- Basic Goals for January Run:
  - Low Emittance Tuning
    - Begin detailed tuning of baseline lattice
    - Beam-based alignment
    - Integrate improved BPM system
  - Electron Cloud
    - Systematic studies of EC growth in CESR drifts, dipoles and wigglers
      - Versus wiggler parameters and primary photon flux (all adjustable in wiggler straight)
      - Impact of detectors on measurements
      - Versus bunch spacing
      - Versus energy
      - Detailed comparison of measurements with RFAs, measurements with TE wave transmission, and simulations
      - Electrons versus electrons
    - Continue dynamics studies
      - Explore recent observation of conditions with significant ΔQ_x
      - Explore new measurement techniques (both new hardware and suggested
      - Further checks of systematic effects
      - Instability measurements at lowest emittances achieved during January run
        - » Bunch-by-bunch tunes, bunch-by-bunch vertical beam size, and mode spectra for various train configurations

Inputs

- As has been shown in earlier talks, CesrTA offers a very flexible machine for these studies
  - Sometimes seems too flexible – there are far more measurements that we could make than we have time for
  - Would like to solicit your input on the highest priority items to explore
- Detailed scheduling of the January run is beginning now
  - Please send comments and experimental suggestions

Short Term II

- February Down
  - 3 items directly associated with EC portion of program
    - Installation of PEP-II EC hardware
    - Wiggler photon stop to provide more flexible energy range for wiggler tests
    - Possible installation of collaborator test chambers

Longer Term

- Hardware
  - Extend RFA diagnostics to CESR quadrupoles
  - Deploy higher bandwidth detectors to study rise and fall time of EC directly
  - Test chambers
    - From collaborators for testing at 15E or W, or in L3 experimental area
    - Wiggler chambers with clearing electrodes and grooves
    - Test chambers in PEP-II chicanes
    - Evaluation of EC mitigation methods
  - Installation of SEY measurement setup
    - Deploy initially at CESR
    - Then re-deploy at FNAL
    - Will provide the ability to cross-check performance of vacuum chamber surfaces with direct SEY measurement
    - Long-term will provide an opportunity to check response of surfaces to processing by both synchrotron radiation and particles
- Beam dynamics
  - Characterization of emittance growth and instability thresholds at ultralow emittance
  - This will be the primary focus of the end of the CesrTA program

Summary

- Our short term goals are to characterize the growth of the EC around CESR and to begin the process of characterizing the impact of the cloud at progressively lower emittances in CesrTA
- As the program continues, we will focus heavily on two principal areas:
  - Evaluating the efficacy of EC mitigation techniques
  - Measuring the impact of the EC on the beam at ultralow emittance
- Time permitting, there will be a discussion period at end of this session:
  - We would appreciate your inputs on our experimental plans; particularly for January
  - We would also like to solicit support for both the experimental and simulation effort
    - We expect to carry out a significant number of interesting experiments throughout the next several runs.
    - Further modeling of EC growth (3D) and detailed modeling of the CesrTA beam dynamics is critical for us to be able to make reliable projections for the ILC damping ring.