This WBS element includes all activities associated with conceptual design and engineering of the following Sources’ items: The Bunching system (injector up to 80 MeV) in the Electron Sources area, Positron target and positron collection system, polarized positron system. The electrical design and cost of the bunching system and the positron target baseline design are detailed in a separate definition sheet. Detailed beamline layout up to 80 MeV.

Activities in this element include:

- Bunching system optimization using codes PARMELA and SAD. Specific items are: multiple bunches, beam loading, tolerances, alternate rf frequency (357 MHz), superposition of harmonic frequencies, optimization of gun HV and laser pulse length, thermionic vs. polarized gun output, and work on beam bunchlength and energy dispersion and minimize losses at 80 MeV.

- Interact with RF design group on bunching system low level and high power rf requirements.

- Interact with Accelerator Physics to optimize the electron beam quality delivered at 80 MeV to the injectors.

- Optimize the layout and diagnostics of the bunching system area.

- Create a detailed layout of the laser and gun systems, polarized and thermionic.

- Create a detailed beamline layout of the bunching system to 80 MeV.

- Positron target yield optimization using EGS.

- Interact with LLNL engineers to design the positron target with minimum possibility from damage due to heating, stress, shock, and radiation.

- Assess the possibility of doing positron target beam experiments to investigate damage issues. Specifically, design beam experiments with close to NLC parameters. Analyze targets for stress.

- Positron capture system optimization using ETRANS and other codes. Specifically, design the beam loading compensation, study de-acceleration and optimize accelerator rf frequency.

- Create a detailed beamline layout of the positron system to 250 MeV.

- Study possibilities for polarized positrons. Specifically, interact with groups which are designing polarized positron sources based on laser Compton scattering and helical undulators. Also study new schemes for positron polarization.

- Develop cost and schedule for the construction of all the above items.