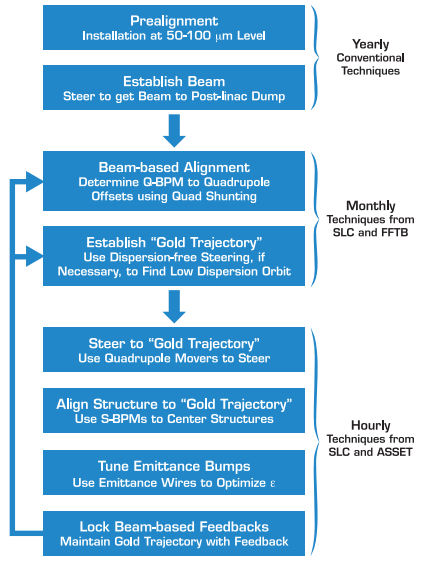
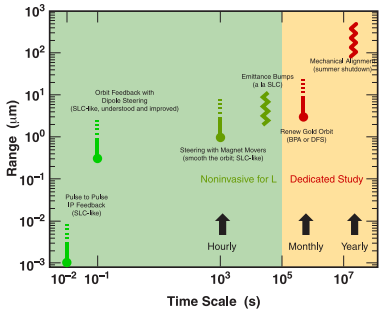
Steering and Beam-based Alignment Procedures

GOAL: Minimize Emittance Growth

1. Correct Dispersion by Aligning Quadrupoles to Beam
2. Correct Wakefields by Aligning RF Structures to Beam





Ranges of motion and time scales for beam-based corrections in the NLC main linac and final focus. Corrections in red are invasive to luminosity, corrections in green can proceed while delivering luminosity.

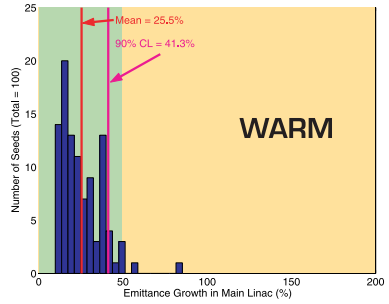
Main Linac Tuning Simulations- US Warm and US Cold

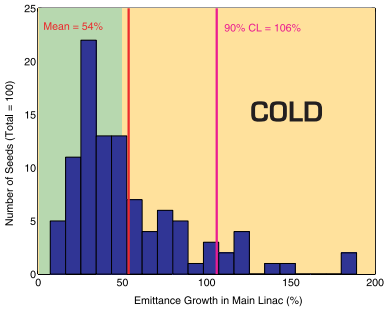
Begin with Specifications for Installation Alignment, Diagnostic and Control Performance:

Specification	US Warm	US Cold
Quadrupole Offset with Respect to	50 μm Survey Line	300 μm Cryomodule
Quadrupole Roll	300 μrad	300 μrad
BPM Offset with Respect to	100 μm Quadrupole Center	200 μm Cryomodule
BPM Resolution	0.4 μm	1 μm
Structure Offset with Respect to	25 μm RF Girder	300 μm Cryomodule
Structure Pitch with Respect to	33 μrad RF Girder	300 μrad Cryomodule
Structure BPM Accuracy	6 μm	N/A
Girder/module Offset	50 μm	200 μm
Girder/module Pitch	15 μrad	20 μrad

Specifications used in linac tuning and alignment simulations. Specifications are from the US reference designs.

Generate 100 Machines and Apply the Tuning Alogrithm:





US Warm (top) and US Cold (bottom) linac emittance distributions after tuning. Budget is 50% growth (border between green and yellow backgrounds).

Better diagnostics and controls compensate for stronger wakefields in the X-band main linac.