

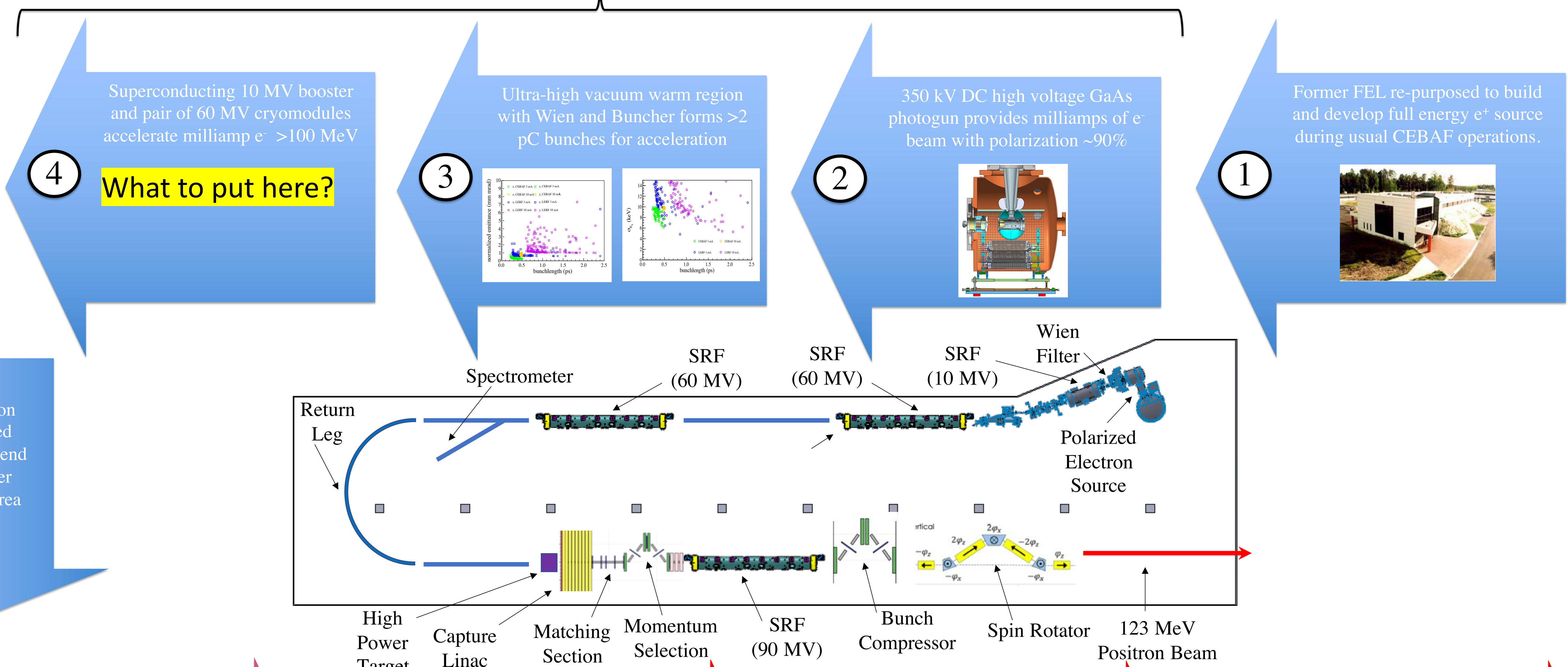
POSITRON BEAMS AT Ce⁺BAF

J. Grames¹, L. Cardman¹, S. Covrig¹, J. Benesch¹, M. Bruker¹, P. Ghoshal¹, S. Gopinath¹, J. Gubeli¹, S. Habet^{1,2}, C. Hernandez-Garcia¹, A. Hofler¹, R. Kazimi¹, F. Lin³, S. Nagaitsev¹, M. Poelker¹, B. Rimmer¹, Y. Roblin¹, V. Lizarraga-Rubio⁴, A. Seryi¹, M. Spata¹, A. Sy¹, D. Turner¹, A. Ushakov¹, C.A. Valerio-Lizarraga⁵, E. Voutier²

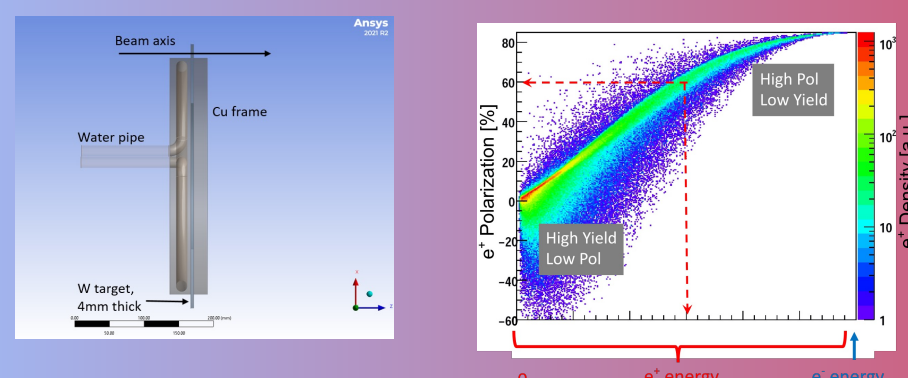
¹Thomas Jefferson National Accelerator Facility, Newport News, VA 23606, USA, ²Université Paris-Saclay, CNRS/IN2P3/IJCLab, 91405 Orsay, France, ³Oak Ridge National Laboratory, Oak Ridge, TN 37830, USA ⁴Universidad de Guanajuato, 37150 Leon, Gto., México, ⁵Universidad Autónoma de Sinaloa, 80010 Culiacán, México

Abstract: We present a scheme for the generation of a high polarization positron beam with continuous wave (CW) bunch structure for the Continuous Electron Beam Accelerator Facility (CEBAF) at Jefferson Laboratory (JLab). The positrons are created in a high average power conversion target and collected by a CW capture linac and DC solenoid.

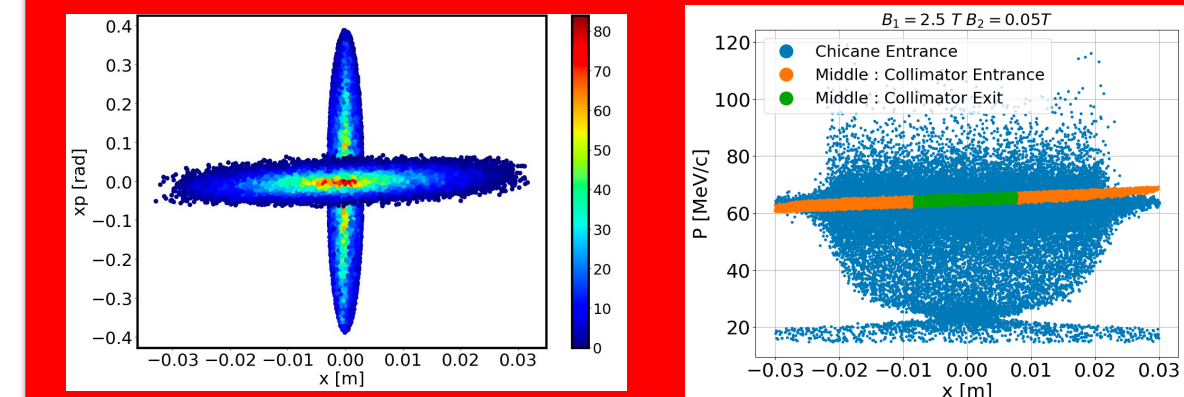
Please visit WEPA035 "Polarized electron injector for positron capability at CEBAF 12 GeV"



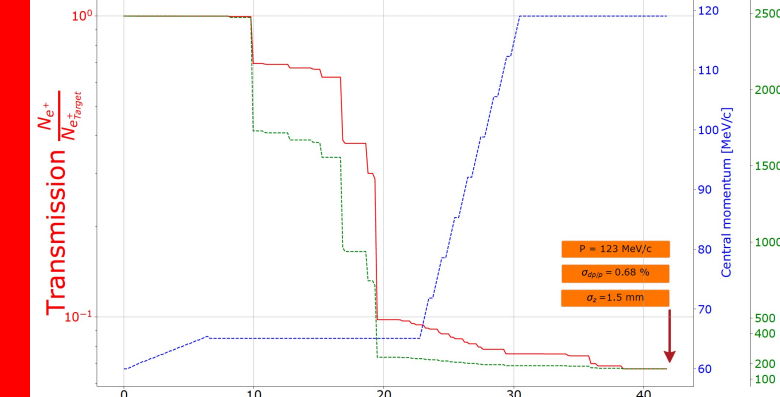
120 kW e⁻ beam irradiates water cooled spinning W target, yielding large 6D volume of polarized e⁺



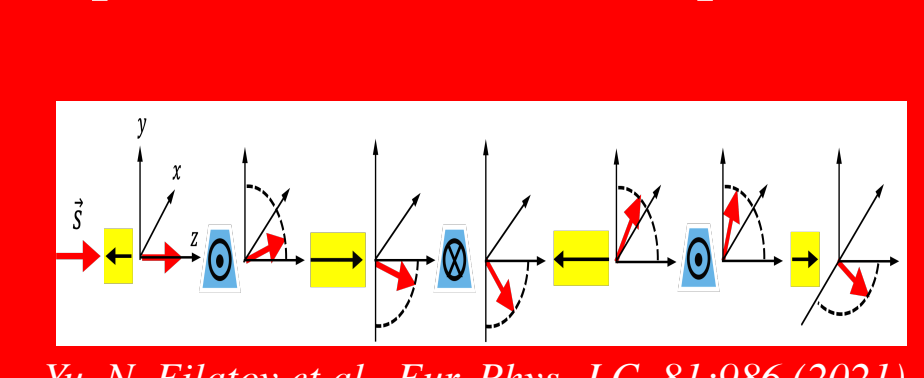
High field >1 T dc solenoid rotates e⁺ phase space through CW NC capture and dp/p defined in momentum collimating chicane



e⁺ of 30-60 MeV are accelerated off-crest in a 90 MV cryomodule to 123 MeV and bunched in a chicane



e⁺ are deflected through vertical chicane with interleaved solenoids leaving orbit unchanged & spin precessed in horizontal plane



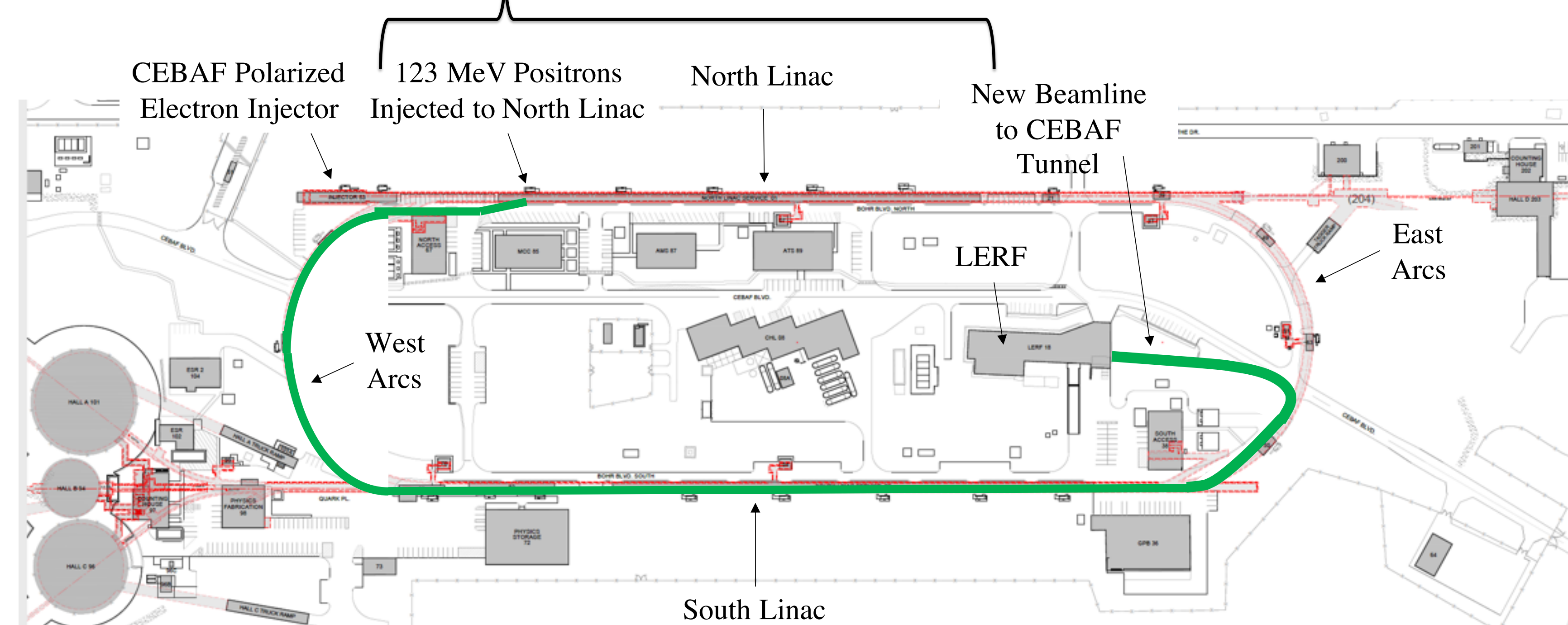
Please visit WEPM120 "Conceptual design of a high-power target for positron production at CEBAF"

Please visit MOPM081 "Degraded beamline design at the CEBAF injector for machine acceptance studies"

The LERF provides a CW polarized e⁺ beam with parameters approaching goals for CEBAF injection.

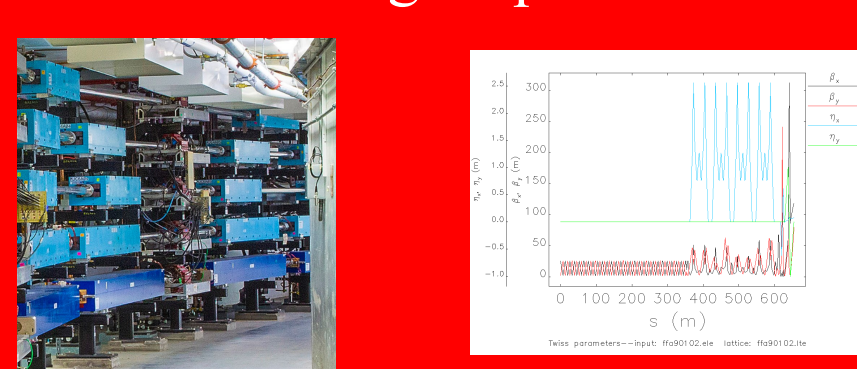
Ce ⁺ BAF Parameter	Status	Goal
p ₀ (MeV/c)	60	60
σ _{xy} (%)	0.08	±1
σ _z (ps)	3	≤ 4
Normalized ε _x (mm-mrad)	140	≤ 40
p _T (MeV/c)	123	123
I _e (P > 60%) (nA)	170	> 50

Table 1: Simulated parameters of the Ce⁺BAF injector.

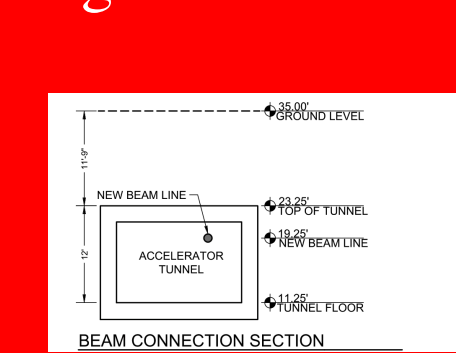


Maximum current for positrons will depend on whether or not polarized beam is needed. Initially the goals are >1 uA available for unpolarized positron beams and >50 nA expected for ~60% polarized positrons.

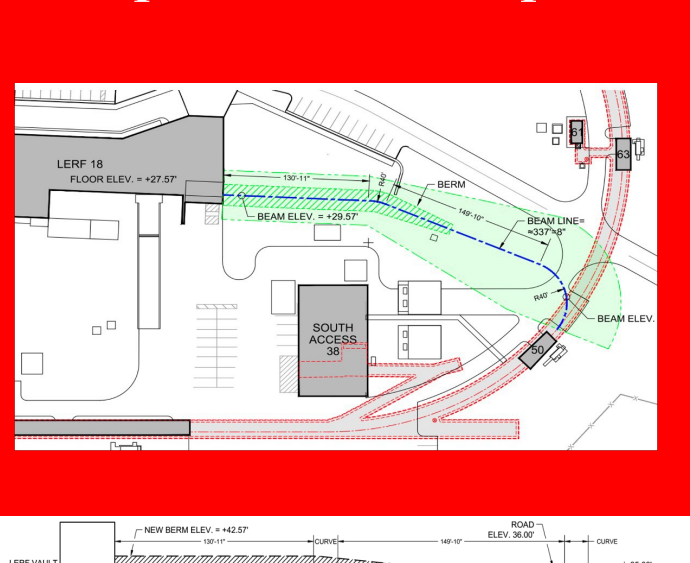
e⁺ beam is transported along the West Arc & injected to North Linac for acceleration to 12 GeV with magnet polarities reversed.



Once in CEBAF the 123 MeV e⁺ beam is transported in a new beam line along the South Linac tunnel



Once the e⁺ source is ready, civil construction connects the LERF by a new tunnel to CEBAF. The transport line will maintain the e⁺ polarization in plane.



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