Los Alamos
NATIONAL LABORATORY
memorandum

Los Alamos Neutron Science Center, LANSCE-1
Accelerator Physics and Engineering Group

To/MS: Distribution
From/MS: Robert Garnett, H817
Phone/Fax: 5-2835/5-2904
Symbol: LANSCE-1:00-061
Date: June 27, 2000
Email: rgarnett@lanl.gov

SUBJECT: SNS DTL TANK 1 TRANSMISSION WITH RF OFF

Simulations using 10,000 macroparticles have been completed to determine whether or not the full-current-injected beam can be transported through Tank 1 of the SNS DTL with the RF off. The simulated RFQ distribution was transported through the MEBT and through Tank 1 with the tank RF amplitude set to zero. This is of interest since it may be useful during commissioning to transport an unaccelerated beam through the tank. Tank 1 uses permanent magnet quadrupoles and therefore, no re-tuning of the magnets is possible to better transport the 2.5-MeV RFQ output beam. At LANSCE for example, the electromagnetic quadrupoles can be re-tuned to different settings to transport the injected 750 keV beam through the first DTL tank with RF off. The design output energy of this tank is 5.39 MeV. Our results are given below.

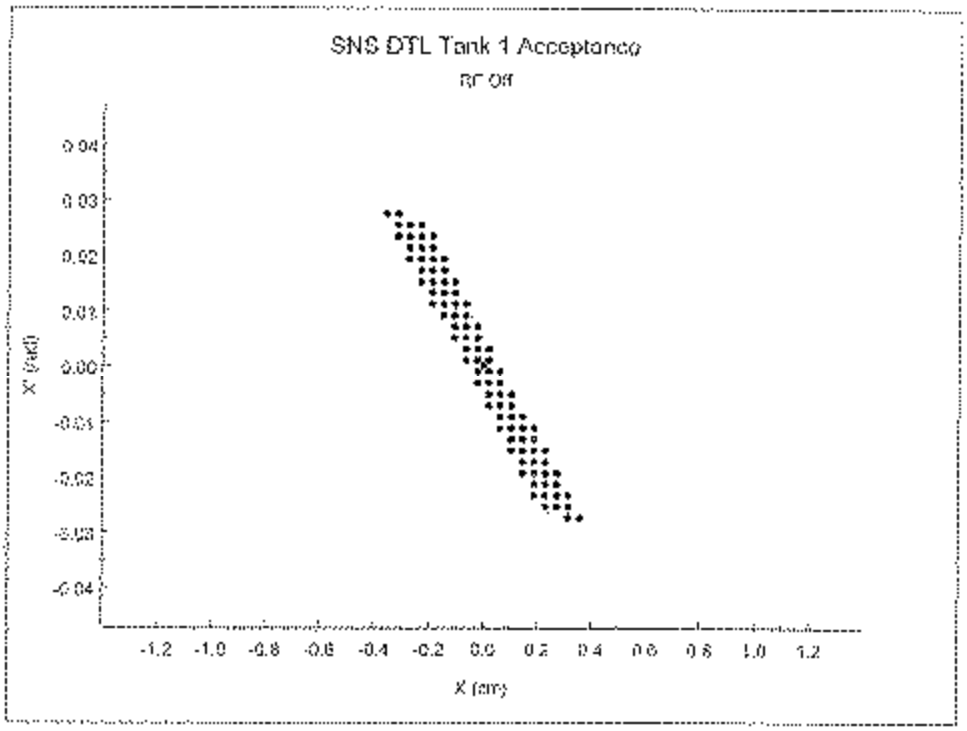
Tank 1 of the DTL contains 60 accelerating cells. With the tank RF amplitude set to zero the transmission is found to be 44.2%. All particle loss occurred in accelerating cells 50-60. The effect of turning the quadrupoles in cells 50-60 off was examined. This resulted in a transmission of 21.9%. The effect of increasing the bore size in cells 50-60 (all quadrupoles on) to improve the transmission was also examined. Table 1 summarizes the results. Obviously, an unacceptably large bore size would be required to fully transport the beam.

Table 1 – Tank 1 transmission for various cell 50-60 bore sizes.

1.25 (nominal)	44.2%
1.50	57.4%
2.00	78.2%
2.50	89.7%
3.00	95.1%

Figure 1 shows the Tank 1 xx'-acceptance with RF on and RF off. Figure 2 shows the yy'-acceptance for the two cases. As can been seen, the acceptance is dramatically reduced when the tank RF is off. A grid of particles was used as the input distribution to generate the acceptance plots [1].

[1] R. Garnett, "SNS MEBT Steering Requirements and DTL Tank 1 Acceptance," LANL Memorandum, LANSCE-1:00-052, June 26, 2000.



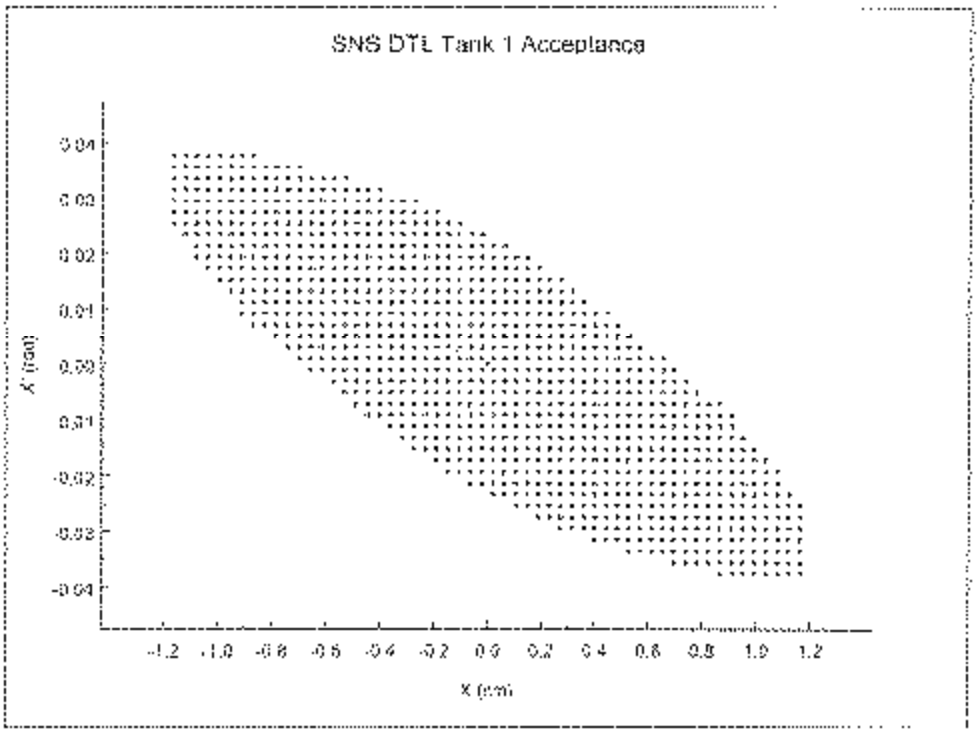


Figure 1 – DTL Tank 1 xx'-acceptance with the tank RF off and on.