TRIUMF Beam Physics Note
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Transmission Measurement under Different Dee Voltage Using the LE2 Probe

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Abstract: To study the transmission at the different RF Dee voltage settings, first we calibrate the LE2 probe using PIP2 probe, second we inject a 5 uA unbunched beam from ISIS and measure the radial intensity by scanning the LE2 probe at different RF Dee voltages.

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1 Probe Calibration

5 uA unbunched beam is injected from ISIS, 5.0 uA is read from the ISIS toroid. PIP2 probe measured beam intensity is 0.65 uA. After moving the LE2 probe to the same radius as the PIP2 probe, LE2 measured beam intensity is 0.65 uA. Thus, we think the LE2 probe intensity signal is well calibrated.

1.1 Transmission at different RF voltage settings

We've scanned LE2 probe from 13 inch radius to 60 inch radius. Figure 1 shows the intensity signal from the sum probe. With the RF Dee voltage setting under 66.5 keV, the transmission is 0.

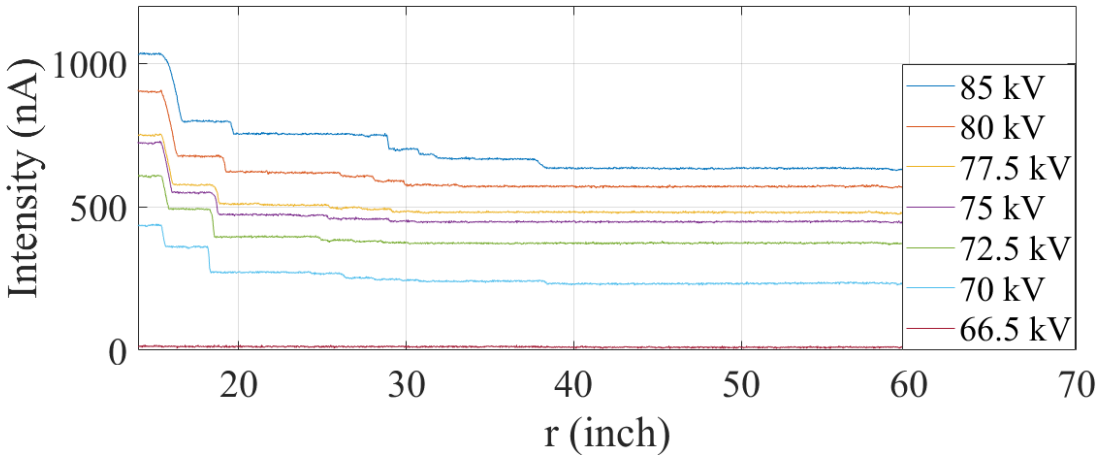

Figure 1: Beam intensity signal from the sum probe.

Table 1: Transmission vs. RF voltage

RF readback voltage	**RF probe average voltage**	**Transmission**
85.0 kV	83.7 kV	0.126
80.0 kV	78.5 kV	0.114
77.5 kV	75.1 kV	0.095
75.0 kV	73.4 kV	0.089
72.5 kV	70.8 kV	0.074
70.0 kV	68.2 kV	0.046
66.5 kV	64.8 kV	0.002

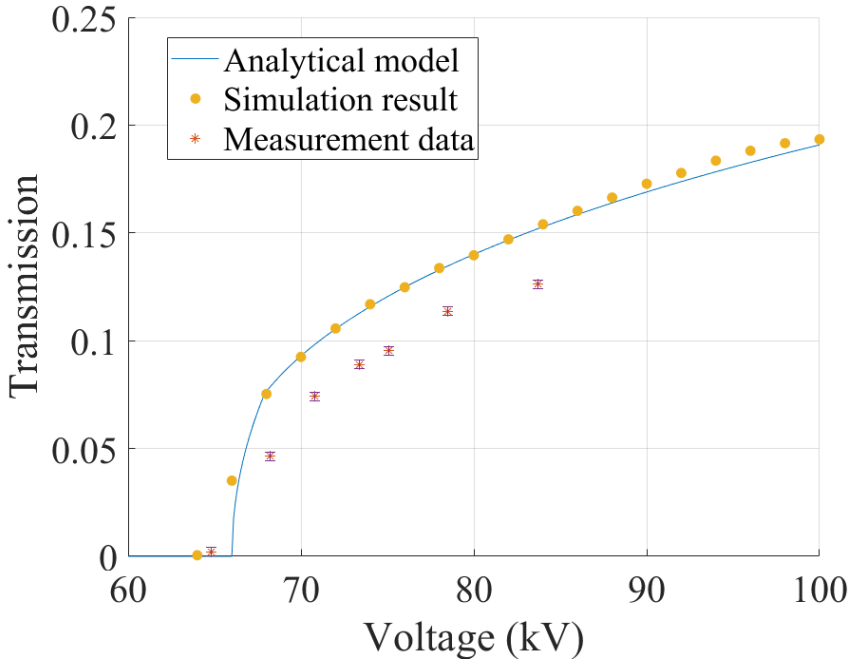

Figure 2: Transmission vs. RF Dee voltage.The blue line is the transmission result from Rick's analytical model where the right-hand edge of the phase acceptance window is $\cos^{-1}(66kV/V_D)$ and left-hand edge, which depends on the vertical focusing, is $20^o * V_D/100kV$. The yellow dot is the result from Yi-Nong's particle tacking result, it agrees with the analytical result. The measured result is lower than the other two results, it may resulted from: 1)the beam loss in the inflector, because we can only measure the beam intensity at the entry of the inflector; 2) Intensity measurement error from LE2 probe; 3)unknown beam loss.