A method utilizing the linear relationship between the ratio of the areas under peaks 3 to 5 in the CaF_2:Tm (TLD-300) glow curve and the ratio of gamma to total dose (D_γ/D_T) in fast neutron beams was applied to the dosimetry of d(48.5)+Be neutrons from Harper Hospital superconducting cyclotron. While the relative gamma component was derived from the ratio of the peaks, the total (neutron + gamma) dose was determined by treating the TLDs already irradiated in neutron beam with a known dose of ^{60}Co, and solving a pair of linear equations. The 1 x 1 x 6 mm^3 TLD-300 rods were preselected into groups in which the standard deviation in their responses was within 2% of the mean. Sets of 9 TLDs encapsulated in A-150 tissue equivalent (TE) plastic were irradiated in the neutron beam at various locations in a water phantom. The neutron and gamma doses at these locations were determined by TE ionchamber and miniature G-M counter. The D_γ/D_T varied from 0.042 to 0.166. Some of the TLDs were then transferred to the ^{60}Co unit and given a well defined dose in A150 plastic. The TLD readout was performed in Harshaw 3500 reader and the glow curves were analyzed off-line using Peakfit. The slope of the linear regression fit to the measured data is 1.96±0.05. The results demonstrate that the proposed method may be used in separation of high and low LET components in fast neutron beams as well as for determination of total dose.