4.65 terbium

149\text{Tb} with a half-life of 4.1 hours is being used in targeted radiotherapy using alpha particles for labeling radioimmunoconjugates in cancer treatments [455, 456]. 161\text{Tb} (with a half-life of 6.9 days) attached to a bioconjugate (two covalently linked molecules, one or more of which is a biomolecule), is being used in cancer therapy as a targeted radiation treatment of cancer cells [456, 457]. 161\text{Tb} is being used for imaging as it allows for on-line monitoring of its distribution using gamma cameras [457]. 149\text{Tb} is produced by the reaction \text{142Nd(}^{12}C,5n\text{)}\text{149Dy} \rightarrow 149\text{Tb} + \beta^+.
and by $^{141}\text{Pr}$(12C,4n)$^{149}\text{Tb}$, and beam geometry is important for satisfactory yield of $^{149}\text{Tb}$ (Figure 4.65.1) [458].

**Fig. 4.65.1:** Relative production of $^{149}\text{Tb}$ from the reaction $^{142}\text{Nd}$(12C,5n)$^{149}\text{Dy} \rightarrow ^{149}\text{Tb} + \beta^+$ for two different beam geometries. A ten-fold increase in production is achieved by optimal beam geometry (January 1996) (modified from [458]).