High resolution electronic spectra of three torsional bands in the $S_1 \leftarrow S_0$ electronic transition of toluene have been recorded in a molecular beam. The analyses of these spectra provide a unique and unambiguous determination of the sign of the $V_6$ hindering potential in both electronic states; $V_6(S_0) = -4.874 \text{ cm}^{-1}$ and $V_6(S_1) = -26.375 \text{ cm}^{-1}$. Furthermore, the data show that both $F$ and the frame rotational constant $A_F$ vary between torsional levels within the $S_1$ manifold. Information about geometric changes responsible for these differences will be discussed, along with the validity of the one-dimensional, rigid frame-rigid top model.

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