Minkowski Diagram II

Minkowski diagrams do not preserve angles and scales. Units on the primed and unprimed axes are related by the following scale factor:

\[
\frac{S'}{S} = \sqrt{\frac{1 + \frac{v^2}{c^2}}{1 - \frac{v^2}{c^2}}}
\]

In the illustration below we use

\[
\frac{v}{c} = 0.6 \Rightarrow \sqrt{1 - \frac{v^2}{c^2}} = 0.8.
\]

Length contraction:
Moving rod viewed from $S$: $\ell = \ell' \sqrt{1 - \frac{v^2}{c^2}}$ [line (ii)].
Moving rod viewed from $S'$: $\ell' = \ell \sqrt{1 - \frac{v^2}{c^2}}$ [line (i)].

Time dilation:
Moving clock viewed from $S$: $\Delta t = \Delta t' \frac{1}{\sqrt{1 - \frac{v^2}{c^2}}}$ [line (iii)].
Moving clock viewed from $S'$: $\Delta t' = \Delta t \frac{1}{\sqrt{1 - \frac{v^2}{c^2}}}$ [line (iv)].