Real Analysis of Phenomenological Velocity

by Parker Emmerson

$$\left(-\sqrt{c^2} < \frac{\sqrt{-a^2 c^2 l^2 + c^2 q^2 - 2 c^2 q s + c^2 s^2 + a^2 c^2 l^2 \mathrm{Sin}[b]^2}}{\sqrt{-1.\, a^2 l^2 + q^2 - 2.\, q s + s^2 + a^2 l^2 \mathrm{Sin}[b]^2}} < \sqrt{c^2} \;\&\&\; q > s \;\&\&\; l > 0 \;\&\&\; a > \frac{q-s}{l} \;\&\&\; \mathrm{Sin}[b] == \sqrt{\frac{a^2 l^2 - q^2 + 2 q s - s^2}{a^2 l^2}} \;\&\&\; c > 0\right)$$

Abstract : Performing this real analysis of the Phenomenological Velocity shows that the computed solution to the phenomenological velocity, $v = \frac{\sqrt{-a^2 c^2 l^2 + c^2 q^2 - 2 c^2 q s + c^2 s^2 + a^2 c^2 l^2 \mathrm{Sin}[b]^2}}{\sqrt{-1.\, a^2 l^2 + q^2 - 2.\, q s + s^2 + a^2 l^2 \mathrm{Sin}[b]^2}}$ *from solving the equality:*

$$h = \frac{\sqrt{-q^2 + 2 q s - s^2 + l^2 \alpha^2}}{\alpha} == \frac{\sqrt{-(q-s-l\alpha)}\ \sqrt{(q-s+l\alpha)}}{\alpha} = \frac{\sqrt{(l\alpha + x\gamma - r\theta)\ \sqrt{1-\frac{v^2}{c^2}}}\ \sqrt{(l\alpha - x\gamma + r\theta)\Big/\sqrt{1-\frac{v^2}{c^2}}}}{\alpha}$$

within the Lorentz Coefficient satisfies the conditions placed upon it by a full Real Analysis of the form found when not using a specified constant for c. Therefore, the computed phenomenological velocity is a true solution.

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$$\mathrm{Solve}\left[\frac{\sqrt{-(q-s-l\alpha)\ \sqrt{1-\frac{v^2}{c^2}}}\ \sqrt{(q-s+l\alpha)\Big/\sqrt{1-\frac{v^2}{c^2}}}}{\alpha} == l\,\mathrm{Sin}[\beta],\ \mathrm{Reals}\right]$$

$$\left\{\left\{\beta \to \boxed{\begin{array}{l} -\mathrm{ArcSin}\left[\frac{\sqrt{-c}\ \sqrt{\frac{q-s+l\alpha}{\sqrt{1-\frac{v^2}{c^2}}}}\ \sqrt{\sqrt{c^2-v^2}\ (-q+s+l\alpha)}}{c\,l\,\alpha}\right] + 2\pi\,c_1 \ \ \text{if} \\ \left(l > 0 \;\&\&\; \alpha \geq \frac{q-s}{l} \;\&\&\; c < 0 \;\&\&\; -\sqrt{c^2} < v < \sqrt{c^2} \;\&\&\; c_1 \in \mathbb{Z} \;\&\&\; s < q\right) \;||\\ \left(s > q \;\&\&\; l > 0 \;\&\&\; \alpha \geq \frac{-q+s}{l} \;\&\&\; c < 0 \;\&\&\; -\sqrt{c^2} < v < \sqrt{c^2} \;\&\&\; c_1 \in \mathbb{Z}\right) \;||\\ \left(s > q \;\&\&\; c < 0 \;\&\&\; -\sqrt{c^2} < v < \sqrt{c^2} \;\&\&\; c_1 \in \mathbb{Z} \;\&\&\; l < 0 \;\&\&\; \alpha \leq \frac{-q+s}{l}\right) \;||\\ \left(c < 0 \;\&\&\; -\sqrt{c^2} < v < \sqrt{c^2} \;\&\&\; c_1 \in \mathbb{Z} \;\&\&\; l < 0 \;\&\&\; s < q \;\&\&\; \alpha \leq \frac{q-s}{l}\right)\end{array}}\right\},\right.$$

$$\left\{\beta \to \boxed{\begin{array}{l} \pi + \text{ArcSin}\left[\dfrac{\sqrt{-c}\ \sqrt{\frac{q-s+l\,\alpha}{\sqrt{1-\frac{v^2}{c^2}}}}\ \sqrt{\sqrt{c^2-v^2}\ (-q+s+l\,\alpha)}}{c\,l\,\alpha}\right] + 2\,\pi\,\mathbb{c}_1 \\ \quad \text{if}\ \ \left(l>0\ \&\&\ \alpha \geq \dfrac{q-s}{l}\ \&\&\ c<0\ \&\&-\sqrt{c^2}<v<\sqrt{c^2}\ \&\&\ \mathbb{c}_1\in\mathbb{Z}\ \&\&\ s<q\right)\ || \\ \quad \left(s>q\ \&\&\ l>0\ \&\&\ \alpha \geq \dfrac{-q+s}{l}\ \&\&\ c<0\ \&\&-\sqrt{c^2}<v<\sqrt{c^2}\ \&\&\ \mathbb{c}_1\in\mathbb{Z}\right)\ || \\ \quad \left(s>q\ \&\&\ c<0\ \&\&-\sqrt{c^2}<v<\sqrt{c^2}\ \&\&\ \mathbb{c}_1\in\mathbb{Z}\ \&\&\ l<0\ \&\&\ \alpha \leq \dfrac{-q+s}{l}\right)\ || \\ \quad \left(c<0\ \&\&-\sqrt{c^2}<v<\sqrt{c^2}\ \&\&\ \mathbb{c}_1\in\mathbb{Z}\ \&\&\ l<0\ \&\&\ s<q\ \&\&\ \alpha \leq \dfrac{q-s}{l}\right) \end{array}}\right\},$$

$$\left\{\beta \to \boxed{\begin{array}{l} \pi - \text{ArcSin}\left[\dfrac{\sqrt{\frac{q-s+l\,\alpha}{\sqrt{1-\frac{v^2}{c^2}}}}\ \sqrt{\sqrt{c^2-v^2}\ (-q+s+l\,\alpha)}}{\sqrt{c}\ l\,\alpha}\right] + 2\,\pi\,\mathbb{c}_1\ \ \text{if} \\ \left(c>0\ \&\&\ l>0\ \&\&\ \alpha \geq \dfrac{q-s}{l}\ \&\&-\sqrt{c^2}<v<\sqrt{c^2}\ \&\&\ \mathbb{c}_1\in\mathbb{Z}\ \&\&\ s<q\right)\ || \\ \quad \left(c>0\ \&\&\ s>q\ \&\&\ l>0\ \&\&\ \alpha \geq \dfrac{-q+s}{l}\ \&\&-\sqrt{c^2}<v<\sqrt{c^2}\ \&\&\ \mathbb{c}_1\in\mathbb{Z}\right)\ || \\ \quad \left(c>0\ \&\&\ s>q\ \&\&-\sqrt{c^2}<v<\sqrt{c^2}\ \&\&\ \mathbb{c}_1\in\mathbb{Z}\ \&\&\ l<0\ \&\&\ \alpha \leq \dfrac{-q+s}{l}\right)\ || \\ \quad \left(c>0\ \&\&-\sqrt{c^2}<v<\sqrt{c^2}\ \&\&\ \mathbb{c}_1\in\mathbb{Z}\ \&\&\ l<0\ \&\&\ s<q\ \&\&\ \alpha \leq \dfrac{q-s}{l}\right) \end{array}}\right\},$$

$$\left\{\beta \to \boxed{\begin{array}{l} \text{ArcSin}\left[\dfrac{\sqrt{\frac{q-s+l\,\alpha}{\sqrt{1-\frac{v^2}{c^2}}}}\ \sqrt{\sqrt{c^2-v^2}\ (-q+s+l\,\alpha)}}{\sqrt{c}\ l\,\alpha}\right] + 2\,\pi\,\mathbb{c}_1\ \ \text{if} \\ \left(c>0\ \&\&\ l>0\ \&\&\ \alpha \geq \dfrac{q-s}{l}\ \&\&-\sqrt{c^2}<v<\sqrt{c^2}\ \&\&\ \mathbb{c}_1\in\mathbb{Z}\ \&\&\ s<q\right)\ || \\ \quad \left(c>0\ \&\&\ s>q\ \&\&\ l>0\ \&\&\ \alpha \geq \dfrac{-q+s}{l}\ \&\&-\sqrt{c^2}<v<\sqrt{c^2}\ \&\&\ \mathbb{c}_1\in\mathbb{Z}\right)\ || \\ \quad \left(c>0\ \&\&\ s>q\ \&\&-\sqrt{c^2}<v<\sqrt{c^2}\ \&\&\ \mathbb{c}_1\in\mathbb{Z}\ \&\&\ l<0\ \&\&\ \alpha \leq \dfrac{-q+s}{l}\right)\ || \\ \quad \left(c>0\ \&\&-\sqrt{c^2}<v<\sqrt{c^2}\ \&\&\ \mathbb{c}_1\in\mathbb{Z}\ \&\&\ l<0\ \&\&\ s<q\ \&\&\ \alpha \leq \dfrac{q-s}{l}\right) \end{array}}\right\},$$

$$\left\{l \to \boxed{0\ \ \text{if}\ \ \left(c>0\ \&\&-\sqrt{c^2}<v<\sqrt{c^2}\right)\ ||\ \left(c<0\ \&\&-\sqrt{c^2}<v<\sqrt{c^2}\right)}\right.,$$

$$s \to \boxed{q \text{ if } \left(c > 0 \,\&\&\, -\sqrt{c^2} < v < \sqrt{c^2}\right) \,||\, \left(c < 0 \,\&\&\, -\sqrt{c^2} < v < \sqrt{c^2}\right)}\Big\},$$

$$\Big\{s \to \boxed{\begin{array}{l} q \text{ if } \left(c > 0 \,\&\&\, l > 0 \,\&\&\, \alpha > 0 \,\&\&\, -\sqrt{c^2} < v < \sqrt{c^2} \,\&\&\, c_1 \in \mathbb{Z}\right) \,|| \\ \quad \left(c > 0 \,\&\&\, -\sqrt{c^2} < v < \sqrt{c^2} \,\&\&\, c_1 \in \mathbb{Z} \,\&\&\, l < 0 \,\&\&\, \alpha < 0\right) \end{array}},$$

$$\beta \to \boxed{\begin{array}{l} \pi - \text{ArcSin}\left[\dfrac{\sqrt{l\,\sqrt{c^2 - v^2}\,\alpha}\,\sqrt{\dfrac{l\,\alpha}{\sqrt{1-\frac{v^2}{c^2}}}}}{\sqrt{c}\,l\,\alpha}\right] + 2\,\pi\,c_1 \\ \quad \text{if } \left(c > 0 \,\&\&\, l > 0 \,\&\&\, \alpha > 0 \,\&\&\, -\sqrt{c^2} < v < \sqrt{c^2} \,\&\&\, c_1 \in \mathbb{Z}\right) \,|| \\ \quad \left(c > 0 \,\&\&\, -\sqrt{c^2} < v < \sqrt{c^2} \,\&\&\, c_1 \in \mathbb{Z} \,\&\&\, l < 0 \,\&\&\, \alpha < 0\right) \end{array}}\Big\},$$

$$\Big\{s \to \boxed{\begin{array}{l} q \text{ if } \left(c > 0 \,\&\&\, l > 0 \,\&\&\, \alpha > 0 \,\&\&\, -\sqrt{c^2} < v < \sqrt{c^2} \,\&\&\, c_1 \in \mathbb{Z}\right) \,|| \\ \quad \left(c > 0 \,\&\&\, -\sqrt{c^2} < v < \sqrt{c^2} \,\&\&\, c_1 \in \mathbb{Z} \,\&\&\, l < 0 \,\&\&\, \alpha < 0\right) \end{array}},$$

$$\beta \to \boxed{\begin{array}{l} \text{ArcSin}\left[\dfrac{\sqrt{l\,\sqrt{c^2 - v^2}\,\alpha}\,\sqrt{\dfrac{l\,\alpha}{\sqrt{1-\frac{v^2}{c^2}}}}}{\sqrt{c}\,l\,\alpha}\right] + 2\,\pi\,c_1 \text{ if} \\ \quad \left(c > 0 \,\&\&\, l > 0 \,\&\&\, \alpha > 0 \,\&\&\, -\sqrt{c^2} < v < \sqrt{c^2} \,\&\&\, c_1 \in \mathbb{Z}\right) \,|| \\ \quad \left(c > 0 \,\&\&\, -\sqrt{c^2} < v < \sqrt{c^2} \,\&\&\, c_1 \in \mathbb{Z} \,\&\&\, l < 0 \,\&\&\, \alpha < 0\right) \end{array}}\Big\},$$

$$\Big\{s \to \boxed{\begin{array}{l} q \text{ if } \left(l > 0 \,\&\&\, \alpha > 0 \,\&\&\, c < 0 \,\&\&\, -\sqrt{c^2} < v < \sqrt{c^2} \,\&\&\, c_1 \in \mathbb{Z}\right) \,|| \\ \quad \left(c < 0 \,\&\&\, -\sqrt{c^2} < v < \sqrt{c^2} \,\&\&\, c_1 \in \mathbb{Z} \,\&\&\, l < 0 \,\&\&\, \alpha < 0\right) \end{array}},$$

$$\beta \to \boxed{\begin{array}{l} -\text{ArcSin}\left[\dfrac{\sqrt{-c}\,\sqrt{l\,\sqrt{c^2 - v^2}\,\alpha}\,\sqrt{\dfrac{l\,\alpha}{\sqrt{1-\frac{v^2}{c^2}}}}}{c\,l\,\alpha}\right] + 2\,\pi\,c_1 \\ \quad \text{if } \left(l > 0 \,\&\&\, \alpha > 0 \,\&\&\, c < 0 \,\&\&\, -\sqrt{c^2} < v < \sqrt{c^2} \,\&\&\, c_1 \in \mathbb{Z}\right) \,|| \\ \quad \left(c < 0 \,\&\&\, -\sqrt{c^2} < v < \sqrt{c^2} \,\&\&\, c_1 \in \mathbb{Z} \,\&\&\, l < 0 \,\&\&\, \alpha < 0\right) \end{array}}\Big\},$$

$$\left\{s \to \boxed{\begin{array}{l} q \;\; \text{if} \;\; \left(l > 0 \,\&\&\, \alpha > 0 \,\&\&\, c < 0 \,\&\&\, -\sqrt{c^2} < v < \sqrt{c^2} \,\&\&\, \mathbb{c}_1 \in \mathbb{Z}\right) \;||\; \\ \quad \left(c < 0 \,\&\&\, -\sqrt{c^2} < v < \sqrt{c^2} \,\&\&\, \mathbb{c}_1 \in \mathbb{Z} \,\&\&\, l < 0 \,\&\&\, \alpha < 0\right) \end{array}},\right.$$

$$\left.\beta \to \boxed{\begin{array}{l} \pi + \text{ArcSin}\left[\dfrac{\sqrt{-c}\;\sqrt{l\,\sqrt{c^2-v^2}\;\alpha}\;\sqrt{\dfrac{l\,\alpha}{\sqrt{1-\frac{v^2}{c^2}}}}}{c\,l\,\alpha}\right] + 2\,\pi\,\mathbb{c}_1 \\ \quad \text{if} \;\; \left(l > 0 \,\&\&\, \alpha > 0 \,\&\&\, c < 0 \,\&\&\, -\sqrt{c^2} < v < \sqrt{c^2} \,\&\&\, \mathbb{c}_1 \in \mathbb{Z}\right) \;||\; \\ \quad \left(c < 0 \,\&\&\, -\sqrt{c^2} < v < \sqrt{c^2} \,\&\&\, \mathbb{c}_1 \in \mathbb{Z} \,\&\&\, l < 0 \,\&\&\, \alpha < 0\right) \end{array}}\right\}\right\}$$

In[∘]:=
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Reduce[
 (Sqrt[(a l + q - s) / Sqrt[1 - v^2 / c^2]] Sqrt[-((-(a l) + q - s) Sqrt[1 - v^2 / c^2])]) /
   a == l Sin[b], {v}, Reals]
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Out[∘]=

$$\Bigg(q < s \,\&\&\, \Bigg(\Bigg(\Bigg(l < 0 \,\&\&\, \Bigg(\Bigg(a < \frac{-q+s}{l} \,\&\&\, \text{Sin}[b] == \sqrt{\frac{a^2\,l^2 - q^2 + 2\,q\,s - s^2}{a^2\,l^2}} \,\&\&\, \Big(\Big(c < 0 \,\&\&\, -\sqrt{c^2} < v < \sqrt{c^2}\Big) \;||\; \Big(c > 0 \,\&\&\, -\sqrt{c^2} < v < \sqrt{c^2}\Big)\Big)\Bigg) \;||\; \Bigg(a == \frac{-q+s}{l} \,\&\&\, \text{Sin}[b] == 0 \,\&\&\, \Big(\Big(c < 0 \,\&\&\, -\sqrt{c^2} < v < \sqrt{c^2}\Big) \;||\; \Big(c > 0 \,\&\&\, -\sqrt{c^2} < v < \sqrt{c^2}\Big)\Big)\Bigg)\Bigg)\Bigg) \;||$$

$$\Bigg(l > 0 \,\&\&\, \Bigg(\Bigg(a == \frac{-q+s}{l} \,\&\&\, \text{Sin}[b] == 0 \,\&\&\, \Big(\Big(c < 0 \,\&\&\, -\sqrt{c^2} < v < \sqrt{c^2}\Big) \;||\; \Big(c > 0 \,\&\&\, -\sqrt{c^2} < v < \sqrt{c^2}\Big)\Big)\Bigg) \;||\; \Bigg(a > \frac{-q+s}{l} \,\&\&\, \text{Sin}[b] == \sqrt{\frac{a^2\,l^2 - q^2 + 2\,q\,s - s^2}{a^2\,l^2}} \,\&\&\, \Big(\Big(c < 0 \,\&\&\, -\sqrt{c^2} < v < \sqrt{c^2}\Big) \;||\; \Big(c > 0 \,\&\&\, -\sqrt{c^2} < v < \sqrt{c^2}\Big)\Big)\Bigg)\Bigg)\Bigg)\Bigg)\Bigg) \;||$$

$$\Bigg(q == s \,\&\&\, \Bigg(\Bigg(l < 0 \,\&\&\, a < 0 \,\&\&\, \text{Sin}[b] == \sqrt{\frac{a^2\,l^2 - q^2 + 2\,q\,s - s^2}{a^2\,l^2}} \,\&\&\, \Big(\Big(c < 0 \,\&\&\, -\sqrt{c^2} < v < \sqrt{c^2}\Big) \;||\; \Big(c > 0 \,\&\&\, -\sqrt{c^2} < v < \sqrt{c^2}\Big)\Big)\Bigg) \;||$$

$$\Big(l == 0 \,\&\&\, \Big(\Big(a < 0 \,\&\&\, \Big(\Big(c < 0 \,\&\&\, -\sqrt{c^2} < v < \sqrt{c^2}\Big) \,||\, \Big(c > 0 \,\&\&\, -\sqrt{c^2} < v < \sqrt{c^2}\Big)\Big)\Big) \,||$$
$$\Big(a > 0 \,\&\&\, \Big(\Big(c < 0 \,\&\&\, -\sqrt{c^2} < v < \sqrt{c^2}\Big) \,||\, \Big(c > 0 \,\&\&\, -\sqrt{c^2} < v < \sqrt{c^2}\Big)\Big)\Big)\Big)\Big) \,||$$
$$\Bigg(l > 0 \,\&\&\, a > 0 \,\&\&\, \mathrm{Sin}[b] == \sqrt{\frac{a^2 l^2 - q^2 + 2 q s - s^2}{a^2 l^2}} \,\&\&$$
$$\Big(\Big(c < 0 \,\&\&\, -\sqrt{c^2} < v < \sqrt{c^2}\Big) \,||\, \Big(c > 0 \,\&\&\, -\sqrt{c^2} < v < \sqrt{c^2}\Big)\Big)\Bigg)\Bigg)\Bigg) \,||$$
$$\Bigg(q > s \,\&\&\, \Bigg(\Bigg(l < 0 \,\&\&\, \Bigg(\Bigg(a < \frac{q-s}{l} \,\&\&\, \mathrm{Sin}[b] == \sqrt{\frac{a^2 l^2 - q^2 + 2 q s - s^2}{a^2 l^2}} \,\&\&$$
$$\Big(\Big(c < 0 \,\&\&\, -\sqrt{c^2} < v < \sqrt{c^2}\Big) \,||\, \Big(c > 0 \,\&\&\, -\sqrt{c^2} < v < \sqrt{c^2}\Big)\Big)\Bigg) \,||\, \Bigg(a == \frac{q-s}{l} \,\&\&$$
$$\mathrm{Sin}[b] == 0 \,\&\&\, \Big(\Big(c < 0 \,\&\&\, -\sqrt{c^2} < v < \sqrt{c^2}\Big) \,||\, \Big(c > 0 \,\&\&\, -\sqrt{c^2} < v < \sqrt{c^2}\Big)\Big)\Bigg)\Bigg)\Bigg) \,||$$
$$\Bigg(l > 0 \,\&\&\, \Bigg(\Bigg(a == \frac{q-s}{l} \,\&\&\, \mathrm{Sin}[b] == 0 \,\&\&\, \Big(\Big(c < 0 \,\&\&\, -\sqrt{c^2} < v < \sqrt{c^2}\Big) \,||\, \Big(c > 0 \,\&\&$$
$$-\sqrt{c^2} < v < \sqrt{c^2}\Big)\Big)\Bigg) \,||\, \Bigg(a > \frac{q-s}{l} \,\&\&\, \mathrm{Sin}[b] == \sqrt{\frac{a^2 l^2 - q^2 + 2 q s - s^2}{a^2 l^2}} \,\&\&$$
$$\Big(\Big(c < 0 \,\&\&\, -\sqrt{c^2} < v < \sqrt{c^2}\Big) \,||\, \Big(c > 0 \,\&\&\, -\sqrt{c^2} < v < \sqrt{c^2}\Big)\Big)\Bigg)\Bigg)\Bigg)\Bigg)\Bigg)$$

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$$\left(-\sqrt{c^2} < v < \sqrt{c^2} \,\&\&\, q < s \,\&\&\, l < 0 \,\&\&\, a < \frac{-q+s}{l} \,\&\&\, \mathrm{Sin}[b] == \sqrt{\frac{a^2 l^2 - q^2 + 2 q s - s^2}{a^2 l^2}} \,\&\&\, c < 0\right) \,||$$
$$\left(-\sqrt{c^2} < v < \sqrt{c^2} \,\&\&\, q < s \,\&\&\, l < 0 \,\&\&\, a < \frac{-q+s}{l} \,\&\&\, \mathrm{Sin}[b] == \sqrt{\frac{a^2 l^2 - q^2 + 2 q s - s^2}{a^2 l^2}} \,\&\&\right.$$
$$\left. c > 0\right) \,||\, \left(-\sqrt{c^2} < v < \sqrt{c^2} \,\&\&\, q < s \,\&\&\, l < 0 \,\&\&\, a == \frac{-q+s}{l} \,\&\&\, \mathrm{Sin}[b] == 0 \,\&\&\, c < 0\right) \,||$$
$$\left(-\sqrt{c^2} < v < \sqrt{c^2} \,\&\&\, q < s \,\&\&\, l < 0 \,\&\&\, a == \frac{-q+s}{l} \,\&\&\, \mathrm{Sin}[b] == 0 \,\&\&\, c > 0\right) \,||$$
$$\left(-\sqrt{c^2} < v < \sqrt{c^2} \,\&\&\, q < s \,\&\&\, l > 0 \,\&\&\, a == \frac{-q+s}{l} \,\&\&\, \mathrm{Sin}[b] == 0 \,\&\&\, c < 0\right) \,||$$
$$\left(-\sqrt{c^2} < v < \sqrt{c^2} \,\&\&\, q < s \,\&\&\, l > 0 \,\&\&\, a == \frac{-q+s}{l} \,\&\&\, \mathrm{Sin}[b] == 0 \,\&\&\, c > 0\right) \,||$$

$$\left(-\sqrt{c^2} < v < \sqrt{c^2} \text{ \&\& } q < s \text{ \&\& } l > 0 \text{ \&\& } a > \frac{-q+s}{l} \text{ \&\& } \mathrm{Sin}[b] == \sqrt{\frac{a^2 l^2 - q^2 + 2 q s - s^2}{a^2 l^2}} \text{ \&\& } c < 0\right) \text{ || } \left(-\sqrt{c^2} < v < \sqrt{c^2} \text{ \&\& } q < s \text{ \&\& } l > 0 \text{ \&\& } a > \frac{-q+s}{l} \text{ \&\& } \mathrm{Sin}[b] == \sqrt{\frac{a^2 l^2 - q^2 + 2 q s - s^2}{a^2 l^2}} \text{ \&\& } c > 0\right) \text{ ||}$$

$$\left(-\sqrt{c^2} < v < \sqrt{c^2} \text{ \&\& } q == s \text{ \&\& } l < 0 \text{ \&\& } a < 0 \text{ \&\& } \mathrm{Sin}[b] == 1 \text{ \&\& } c < 0\right) \text{ ||}$$

$$\left(-\sqrt{c^2} < v < \sqrt{c^2} \text{ \&\& } q == s \text{ \&\& } l < 0 \text{ \&\& } a < 0 \text{ \&\& } \mathrm{Sin}[b] == 1 \text{ \&\& } c > 0\right) \text{ ||}$$

$$\left(-\sqrt{c^2} < v < \sqrt{c^2} \text{ \&\& } q == s \text{ \&\& } l == 0 \text{ \&\& } a < 0 \text{ \&\& } c < 0\right) \text{ ||}$$

$$\left(-\sqrt{c^2} < v < \sqrt{c^2} \text{ \&\& } q == s \text{ \&\& } l == 0 \text{ \&\& } a < 0 \text{ \&\& } c > 0\right) \text{ ||}$$

$$\left(-\sqrt{c^2} < v < \sqrt{c^2} \text{ \&\& } q == s \text{ \&\& } l == 0 \text{ \&\& } a > 0 \text{ \&\& } c < 0\right) \text{ ||}$$

$$\left(-\sqrt{c^2} < v < \sqrt{c^2} \text{ \&\& } q == s \text{ \&\& } l == 0 \text{ \&\& } a > 0 \text{ \&\& } c > 0\right) \text{ ||}$$

$$\left(-\sqrt{c^2} < v < \sqrt{c^2} \text{ \&\& } q == s \text{ \&\& } l > 0 \text{ \&\& } a > 0 \text{ \&\& } \mathrm{Sin}[b] == 1 \text{ \&\& } c < 0\right) \text{ ||}$$

$$\left(-\sqrt{c^2} < v < \sqrt{c^2} \text{ \&\& } q == s \text{ \&\& } l > 0 \text{ \&\& } a > 0 \text{ \&\& } \mathrm{Sin}[b] == 1 \text{ \&\& } c > 0\right) \text{ ||}$$

$$\left(-\sqrt{c^2} < v < \sqrt{c^2} \text{ \&\& } q > s \text{ \&\& } l < 0 \text{ \&\& } a < \frac{q-s}{l} \text{ \&\& } \mathrm{Sin}[b] == \sqrt{\frac{a^2 l^2 - q^2 + 2 q s - s^2}{a^2 l^2}} \text{ \&\& } c < 0\right) \text{ ||}$$

$$\left(-\sqrt{c^2} < v < \sqrt{c^2} \text{ \&\& } q > s \text{ \&\& } l < 0 \text{ \&\& } a < \frac{q-s}{l} \text{ \&\& } \mathrm{Sin}[b] == \sqrt{\frac{a^2 l^2 - q^2 + 2 q s - s^2}{a^2 l^2}} \text{ \&\& } c > 0\right) \text{ ||}$$

$$\left(-\sqrt{c^2} < v < \sqrt{c^2} \text{ \&\& } q > s \text{ \&\& } l < 0 \text{ \&\& } a == \frac{q-s}{l} \text{ \&\& } \mathrm{Sin}[b] == 0 \text{ \&\& } c < 0\right) \text{ ||}$$

$$\left(-\sqrt{c^2} < v < \sqrt{c^2} \text{ \&\& } q > s \text{ \&\& } l < 0 \text{ \&\& } a == \frac{q-s}{l} \text{ \&\& } \mathrm{Sin}[b] == 0 \text{ \&\& } c > 0\right) \text{ ||}$$

$$\left(-\sqrt{c^2} < v < \sqrt{c^2} \text{ \&\& } q > s \text{ \&\& } l > 0 \text{ \&\& } a == \frac{q-s}{l} \text{ \&\& } \mathrm{Sin}[b] == 0 \text{ \&\& } c < 0\right) \text{ ||}$$

$$\left(-\sqrt{c^2} < v < \sqrt{c^2} \text{ \&\& } q > s \text{ \&\& } l > 0 \text{ \&\& } a == \frac{q-s}{l} \text{ \&\& } \mathrm{Sin}[b] == 0 \text{ \&\& } c > 0\right) \text{ ||}$$

$$\left(-\sqrt{c^2} < v < \sqrt{c^2} \text{ \&\& } q > s \text{ \&\& } l > 0 \text{ \&\& } a > \frac{q-s}{l} \text{ \&\& } \mathrm{Sin}[b] == \sqrt{\frac{a^2 l^2 - q^2 + 2 q s - s^2}{a^2 l^2}} \text{ \&\& } c < 0\right) \text{ ||}$$

$$\left(-\sqrt{c^2} < v < \sqrt{c^2} \text{ \&\& } q > s \text{ \&\& } l > 0 \text{ \&\& } a > \frac{q-s}{l} \text{ \&\& } \mathrm{Sin}[b] == \sqrt{\frac{a^2 l^2 - q^2 + 2 q s - s^2}{a^2 l^2}} \text{ \&\& } c > 0\right)$$

In[∘]:= $$\text{Solve}\left[l\,\text{Sin}[\beta] == \frac{\sqrt{(l\,\alpha + x\,\gamma - r\,\theta)\,\sqrt{1-\frac{v^2}{c^2}}}\,\sqrt{(l\,\alpha - x\,\gamma + r\,\theta)\Big/\sqrt{1-\frac{v^2}{c^2}}}}{\alpha},\ v\right]$$

Out[∘]= $$\Big\{\Big\{v \to -\Big(\Big(1.\,\sqrt{\left(-8.98755\times10^{16}\,l^2\,\alpha^2 + 8.98755\times10^{16}\,x^2\,\gamma^2 - 1.79751\times10^{17}\,r\,x\,\gamma\,\theta + 8.98755\times10^{16}\,r^2\,\theta^2 + 8.98755\times10^{16}\,l^2\,\alpha^2\,\text{Sin}[\beta]^2\right)}\Big)\Big/\Big(\sqrt{-1.\,l^2\,\alpha^2 + x^2\,\gamma^2 - 2.\,r\,x\,\gamma\,\theta + r^2\,\theta^2 + l^2\,\alpha^2\,\text{Sin}[\beta]^2}\Big)\Big)\Big\},$$
$$\Big\{v \to \Big(\sqrt{\left(-8.98755\times10^{16}\,l^2\,\alpha^2 + 8.98755\times10^{16}\,x^2\,\gamma^2 - 1.79751\times10^{17}\,r\,x\,\gamma\,\theta + 8.98755\times10^{16}\,r^2\,\theta^2 + 8.98755\times10^{16}\,l^2\,\alpha^2\,\text{Sin}[\beta]^2\right)}\Big)\Big/\Big(\sqrt{-1.\,l^2\,\alpha^2 + x^2\,\gamma^2 - 2.\,r\,x\,\gamma\,\theta + r^2\,\theta^2 + l^2\,\alpha^2\,\text{Sin}[\beta]^2}\Big)\Big\}\Big\}$$

$$v = \frac{\sqrt{-c^2\,l^2\,\alpha^2 + c^2\,x^2\,\gamma^2 - 2\,c^2\,r\,x\,\gamma\,\theta + c^2\,r^2\,\theta^2 + c^2\,l^2\,\alpha^2\,\text{Sin}[\beta]^2}}{\sqrt{-1.\,l^2\,\alpha^2 + x^2\,\gamma^2 - 2.\,r\,x\,\gamma\,\theta + r^2\,\theta^2 + l^2\,\alpha^2\,\text{Sin}[\beta]^2}} \tag{1}$$

Modus ponens substitutions for the respective arc lengths and imaginary arc lengths.

$$v = \frac{\sqrt{-c^2\,w^2 + c^2\,q^2 - 2\,c^2\,s\,q + c^2\,s^2 + c^2\,w^2\,\text{Sin}[\beta]^2}}{\sqrt{-1.`\,w^2 + q^2 - 2.`\,s\,q + s^2 + w^2\,\text{Sin}[\beta]^2}}$$

Rewrite variables α = a, b = β

In[∘]:= $$v := \frac{\sqrt{-c^2\,l^2\,a^2 + c^2\,q^2 - 2\,c^2\,s\,q + c^2\,s^2 + c^2\,l^2\,a^2\,\text{Sin}[b]^2}}{\sqrt{-1.`\,l^2\,a^2 + q^2 - 2.`\,s\,q + s^2 + l^2\,a^2\,\text{Sin}[b]^2}}$$

Out[∘]= $$\left(-\sqrt{c^2} < \frac{\sqrt{-a^2\,c^2\,l^2 + c^2\,q^2 - 2\,c^2\,q\,s + c^2\,s^2 + a^2\,c^2\,l^2\,\text{Sin}[b]^2}}{\sqrt{-1.\,a^2\,l^2 + q^2 - 2.\,q\,s + s^2 + a^2\,l^2\,\text{Sin}[b]^2}} < \sqrt{c^2}\ \&\&\ q < s\ \&\&\ l < 0\ \&\&\ a < \frac{-q+s}{l}\ \&\&\ \text{Sin}[b] == \sqrt{\frac{a^2\,l^2 - q^2 + 2\,q\,s - s^2}{a^2\,l^2}}\ \&\&\ c < 0\right)\ ||$$

$$\left(-\sqrt{c^2} < \frac{\sqrt{-a^2\,c^2\,l^2 + c^2\,q^2 - 2\,c^2\,q\,s + c^2\,s^2 + a^2\,c^2\,l^2\,\text{Sin}[b]^2}}{\sqrt{-1.\,a^2\,l^2 + q^2 - 2.\,q\,s + s^2 + a^2\,l^2\,\text{Sin}[b]^2}} < \sqrt{c^2}\ \&\&\ q < s\ \&\&\ l < 0\ \&\&\ a < \frac{-q+s}{l}\ \&\&\ \text{Sin}[b] == \sqrt{\frac{a^2\,l^2 - q^2 + 2\,q\,s - s^2}{a^2\,l^2}}\ \&\&\ c > 0\right)\ ||$$

$$\left(-\sqrt{c^2} < \frac{\sqrt{-a^2\,c^2\,l^2 + c^2\,q^2 - 2\,c^2\,q\,s + c^2\,s^2 + a^2\,c^2\,l^2\,\text{Sin}[b]^2}}{\sqrt{-1.\,a^2\,l^2 + q^2 - 2.\,q\,s + s^2 + a^2\,l^2\,\text{Sin}[b]^2}} < \sqrt{c^2}\ \&\&\ q < s\ \&\&\ l < 0\ \&\&\ a == \frac{-q+s}{l}\ \&\&\ \text{Sin}[b] == 0\ \&\&\ c < 0\right)\ ||$$

$$\left(-\sqrt{c^2} < \frac{\sqrt{-a^2 c^2 l^2 + c^2 q^2 - 2 c^2 q s + c^2 s^2 + a^2 c^2 l^2 \text{Sin}[b]^2}}{\sqrt{-1.\ a^2 l^2 + q^2 - 2.\ q s + s^2 + a^2 l^2 \text{Sin}[b]^2}} < \sqrt{c^2}\ \&\&\ q < s\ \&\&\ l < 0\ \&\&\ a == \frac{-q + s}{l}\ \&\&\ \text{Sin}[b] == 0\ \&\&\ c > 0\right) \mid\mid$$

$$\left(-\sqrt{c^2} < \frac{\sqrt{-a^2 c^2 l^2 + c^2 q^2 - 2 c^2 q s + c^2 s^2 + a^2 c^2 l^2 \text{Sin}[b]^2}}{\sqrt{-1.\ a^2 l^2 + q^2 - 2.\ q s + s^2 + a^2 l^2 \text{Sin}[b]^2}} < \sqrt{c^2}\ \&\&\ q < s\ \&\&\ l > 0\ \&\&\ a == \frac{-q + s}{l}\ \&\&\ \text{Sin}[b] == 0\ \&\&\ c < 0\right) \mid\mid$$

$$\left(-\sqrt{c^2} < \frac{\sqrt{-a^2 c^2 l^2 + c^2 q^2 - 2 c^2 q s + c^2 s^2 + a^2 c^2 l^2 \text{Sin}[b]^2}}{\sqrt{-1.\ a^2 l^2 + q^2 - 2.\ q s + s^2 + a^2 l^2 \text{Sin}[b]^2}} < \sqrt{c^2}\ \&\&\ q < s\ \&\&\ l > 0\ \&\&\ a == \frac{-q + s}{l}\ \&\&\ \text{Sin}[b] == 0\ \&\&\ c > 0\right) \mid\mid$$

$$\left(-\sqrt{c^2} < \frac{\sqrt{-a^2 c^2 l^2 + c^2 q^2 - 2 c^2 q s + c^2 s^2 + a^2 c^2 l^2 \text{Sin}[b]^2}}{\sqrt{-1.\ a^2 l^2 + q^2 - 2.\ q s + s^2 + a^2 l^2 \text{Sin}[b]^2}} < \sqrt{c^2}\ \&\&\ q < s\ \&\&\ l > 0\ \&\&\ a > \frac{-q + s}{l}\ \&\&\ \text{Sin}[b] == \sqrt{\frac{a^2 l^2 - q^2 + 2 q s - s^2}{a^2 l^2}}\ \&\&\ c < 0\right) \mid\mid$$

$$\left(-\sqrt{c^2} < \frac{\sqrt{-a^2 c^2 l^2 + c^2 q^2 - 2 c^2 q s + c^2 s^2 + a^2 c^2 l^2 \text{Sin}[b]^2}}{\sqrt{-1.\ a^2 l^2 + q^2 - 2.\ q s + s^2 + a^2 l^2 \text{Sin}[b]^2}} < \sqrt{c^2}\ \&\&\ q < s\ \&\&\ l > 0\ \&\&\ a > \frac{-q + s}{l}\ \&\&\ \text{Sin}[b] == \sqrt{\frac{a^2 l^2 - q^2 + 2 q s - s^2}{a^2 l^2}}\ \&\&\ c > 0\right) \mid\mid$$

$$\left(-\sqrt{c^2} < \frac{\sqrt{-a^2 c^2 l^2 + c^2 q^2 - 2 c^2 q s + c^2 s^2 + a^2 c^2 l^2 \text{Sin}[b]^2}}{\sqrt{-1.\ a^2 l^2 + q^2 - 2.\ q s + s^2 + a^2 l^2 \text{Sin}[b]^2}} < \sqrt{c^2}\ \&\&\ q == s\ \&\&\ l < 0\ \&\&\ a < 0\ \&\&\ \text{Sin}[b] == 1\ \&\&\ c < 0\right) \mid\mid$$

$$\left(-\sqrt{c^2} < \frac{\sqrt{-a^2 c^2 l^2 + c^2 q^2 - 2 c^2 q s + c^2 s^2 + a^2 c^2 l^2 \text{Sin}[b]^2}}{\sqrt{-1.\ a^2 l^2 + q^2 - 2.\ q s + s^2 + a^2 l^2 \text{Sin}[b]^2}} < \sqrt{c^2}\ \&\&\ q == s\ \&\&\ l < 0\ \&\&\ a < 0\ \&\&\ \text{Sin}[b] == 1\ \&\&\ c > 0\right) \mid\mid$$

$$\left(-\sqrt{c^2} < \frac{\sqrt{-a^2 c^2 l^2 + c^2 q^2 - 2 c^2 q s + c^2 s^2 + a^2 c^2 l^2 \text{Sin}[b]^2}}{\sqrt{-1.\ a^2 l^2 + q^2 - 2.\ q s + s^2 + a^2 l^2 \text{Sin}[b]^2}} < \sqrt{c^2}\ \&\&\ q == s\ \&\&\ l == 0\ \&\&$$

$$a < 0 \,\&\&\, c < 0\Big) \,||\, \left(-\sqrt{c^2} < \frac{\sqrt{-a^2 c^2 l^2 + c^2 q^2 - 2 c^2 q s + c^2 s^2 + a^2 c^2 l^2 \text{Sin}[b]^2}}{\sqrt{-1.\, a^2 l^2 + q^2 - 2.\, q s + s^2 + a^2 l^2 \text{Sin}[b]^2}} < \sqrt{c^2} \,\&\&\right.$$

$$q == s \,\&\&\, l == 0 \,\&\&\, a < 0 \,\&\&\, c > 0\Big) \,||$$

$$\left(-\sqrt{c^2} < \frac{\sqrt{-a^2 c^2 l^2 + c^2 q^2 - 2 c^2 q s + c^2 s^2 + a^2 c^2 l^2 \text{Sin}[b]^2}}{\sqrt{-1.\, a^2 l^2 + q^2 - 2.\, q s + s^2 + a^2 l^2 \text{Sin}[b]^2}} < \sqrt{c^2} \,\&\&\right.$$

$$q == s \,\&\&\, l == 0 \,\&\&\, a > 0 \,\&\&\, c < 0\Big) \,||$$

$$\left(-\sqrt{c^2} < \frac{\sqrt{-a^2 c^2 l^2 + c^2 q^2 - 2 c^2 q s + c^2 s^2 + a^2 c^2 l^2 \text{Sin}[b]^2}}{\sqrt{-1.\, a^2 l^2 + q^2 - 2.\, q s + s^2 + a^2 l^2 \text{Sin}[b]^2}} < \sqrt{c^2} \,\&\&\right.$$

$$q == s \,\&\&\, l == 0 \,\&\&\, a > 0 \,\&\&\, c > 0\Big) \,||$$

$$\left(-\sqrt{c^2} < \frac{\sqrt{-a^2 c^2 l^2 + c^2 q^2 - 2 c^2 q s + c^2 s^2 + a^2 c^2 l^2 \text{Sin}[b]^2}}{\sqrt{-1.\, a^2 l^2 + q^2 - 2.\, q s + s^2 + a^2 l^2 \text{Sin}[b]^2}} < \sqrt{c^2} \,\&\&\right.$$

$$q == s \,\&\&\, l > 0 \,\&\&\, a > 0 \,\&\&\, \text{Sin}[b] == 1 \,\&\&\, c < 0\Big) \,||$$

$$\left(-\sqrt{c^2} < \frac{\sqrt{-a^2 c^2 l^2 + c^2 q^2 - 2 c^2 q s + c^2 s^2 + a^2 c^2 l^2 \text{Sin}[b]^2}}{\sqrt{-1.\, a^2 l^2 + q^2 - 2.\, q s + s^2 + a^2 l^2 \text{Sin}[b]^2}} < \sqrt{c^2} \,\&\&\right.$$

$$q == s \,\&\&\, l > 0 \,\&\&\, a > 0 \,\&\&\, \text{Sin}[b] == 1 \,\&\&\, c > 0\Big) \,||$$

$$\left(-\sqrt{c^2} < \frac{\sqrt{-a^2 c^2 l^2 + c^2 q^2 - 2 c^2 q s + c^2 s^2 + a^2 c^2 l^2 \text{Sin}[b]^2}}{\sqrt{-1.\, a^2 l^2 + q^2 - 2.\, q s + s^2 + a^2 l^2 \text{Sin}[b]^2}} < \sqrt{c^2} \,\&\&\, q > s \,\&\&\right.$$

$$l < 0 \,\&\&\, a < \frac{q - s}{l} \,\&\&\, \text{Sin}[b] == \sqrt{\frac{a^2 l^2 - q^2 + 2 q s - s^2}{a^2 l^2}} \,\&\&\, c < 0\Big) \,||$$

$$\left(-\sqrt{c^2} < \frac{\sqrt{-a^2 c^2 l^2 + c^2 q^2 - 2 c^2 q s + c^2 s^2 + a^2 c^2 l^2 \text{Sin}[b]^2}}{\sqrt{-1.\, a^2 l^2 + q^2 - 2.\, q s + s^2 + a^2 l^2 \text{Sin}[b]^2}} < \sqrt{c^2} \,\&\&\, q > s \,\&\&\right.$$

$$l < 0 \,\&\&\, a < \frac{q - s}{l} \,\&\&\, \text{Sin}[b] == \sqrt{\frac{a^2 l^2 - q^2 + 2 q s - s^2}{a^2 l^2}} \,\&\&\, c > 0\Big) \,||$$

$$\left(-\sqrt{c^2} < \frac{\sqrt{-a^2 c^2 l^2 + c^2 q^2 - 2 c^2 q s + c^2 s^2 + a^2 c^2 l^2 \text{Sin}[b]^2}}{\sqrt{-1.\, a^2 l^2 + q^2 - 2.\, q s + s^2 + a^2 l^2 \text{Sin}[b]^2}} < \sqrt{c^2} \,\&\&\right.$$

$$q > s \,\&\&\, l < 0 \,\&\&\, a == \frac{q-s}{l} \,\&\&\, \text{Sin}[b] == 0 \,\&\&\, c < 0\Big) \,||$$

$$\Bigg(-\sqrt{c^2} < \frac{\sqrt{-a^2 c^2 l^2 + c^2 q^2 - 2 c^2 q s + c^2 s^2 + a^2 c^2 l^2 \text{Sin}[b]^2}}{\sqrt{-1.\, a^2 l^2 + q^2 - 2.\, q s + s^2 + a^2 l^2 \text{Sin}[b]^2}} < \sqrt{c^2} \,\&\&$$

$$q > s \,\&\&\, l < 0 \,\&\&\, a == \frac{q-s}{l} \,\&\&\, \text{Sin}[b] == 0 \,\&\&\, c > 0\Big) \,||$$

$$\Bigg(-\sqrt{c^2} < \frac{\sqrt{-a^2 c^2 l^2 + c^2 q^2 - 2 c^2 q s + c^2 s^2 + a^2 c^2 l^2 \text{Sin}[b]^2}}{\sqrt{-1.\, a^2 l^2 + q^2 - 2.\, q s + s^2 + a^2 l^2 \text{Sin}[b]^2}} < \sqrt{c^2} \,\&\&$$

$$q > s \,\&\&\, l > 0 \,\&\&\, a == \frac{q-s}{l} \,\&\&\, \text{Sin}[b] == 0 \,\&\&\, c < 0\Big) \,||$$

$$\Bigg(-\sqrt{c^2} < \frac{\sqrt{-a^2 c^2 l^2 + c^2 q^2 - 2 c^2 q s + c^2 s^2 + a^2 c^2 l^2 \text{Sin}[b]^2}}{\sqrt{-1.\, a^2 l^2 + q^2 - 2.\, q s + s^2 + a^2 l^2 \text{Sin}[b]^2}} < \sqrt{c^2} \,\&\&$$

$$q > s \,\&\&\, l > 0 \,\&\&\, a == \frac{q-s}{l} \,\&\&\, \text{Sin}[b] == 0 \,\&\&\, c > 0\Big) \,||$$

$$\Bigg(-\sqrt{c^2} < \frac{\sqrt{-a^2 c^2 l^2 + c^2 q^2 - 2 c^2 q s + c^2 s^2 + a^2 c^2 l^2 \text{Sin}[b]^2}}{\sqrt{-1.\, a^2 l^2 + q^2 - 2.\, q s + s^2 + a^2 l^2 \text{Sin}[b]^2}} < \sqrt{c^2} \,\&\&\, q > s \,\&\&$$

$$l > 0 \,\&\&\, a > \frac{q-s}{l} \,\&\&\, \text{Sin}[b] == \sqrt{\frac{a^2 l^2 - q^2 + 2 q s - s^2}{a^2 l^2}} \,\&\&\, c < 0\Bigg) \,||$$

$$\Bigg(-\sqrt{c^2} < \frac{\sqrt{-a^2 c^2 l^2 + c^2 q^2 - 2 c^2 q s + c^2 s^2 + a^2 c^2 l^2 \text{Sin}[b]^2}}{\sqrt{-1.\, a^2 l^2 + q^2 - 2.\, q s + s^2 + a^2 l^2 \text{Sin}[b]^2}} < \sqrt{c^2} \,\&\&$$

$$q > s \,\&\&\, l > 0 \,\&\&\, a > \frac{q-s}{l} \,\&\&\, \text{Sin}[b] == \sqrt{\frac{a^2 l^2 - q^2 + 2 q s - s^2}{a^2 l^2}} \,\&\&\, c > 0\Bigg)$$

In[∘]:=
$$\Bigg(-\sqrt{c^2} < \frac{\sqrt{-a^2 c^2 l^2 + c^2 q^2 - 2 c^2 q s + c^2 s^2 + a^2 c^2 l^2 \text{Sin}[b]^2}}{\sqrt{-1.\grave{}\, a^2 l^2 + q^2 - 2.\grave{}\, q s + s^2 + a^2 l^2 \text{Sin}[b]^2}} < \sqrt{c^2} \,\&\&$$

$$q > s \,\&\&\, l > 0 \,\&\&\, a > \frac{q-s}{l} \,\&\&\, \text{Sin}[b] == \sqrt{\frac{a^2 l^2 - q^2 + 2 q s - s^2}{a^2 l^2}} \,\&\&\, c > 0\Bigg)$$

In[∘]:= **q := c**

In[∘]:= **s := 5**

In[∘]:= **a := π**

```
In[∘]:= l := c

In[∘]:= b := 1.2468502254630345`

In[∘]:= c := 2.99792458`*^8
```

In[∘]:=
$$\left(-\sqrt{c^2} < \frac{\sqrt{-a^2\,c^2\,l^2 + c^2\,q^2 - 2\,c^2\,q\,s + c^2\,s^2 + a^2\,c^2\,l^2\,\text{Sin}[b]^2}}{\sqrt{-1.\grave{}\;a^2\,l^2 + q^2 - 2.\grave{}\;q\,s + s^2 + a^2\,l^2\,\text{Sin}[b]^2}} < \sqrt{c^2}\ \&\&\ q > s\ \&\&\ l > 0\ \&\&\ a > \frac{q-s}{l}\ \&\&\ \text{Sin}[b] == \sqrt{\frac{a^2\,l^2 - q^2 + 2\,q\,s - s^2}{a^2\,l^2}}\ \&\&\ c > 0\right)$$

```
Out[∘]= True
```