1 Vorwärtsproblem

$$h_r = \sqrt{l_e^2 + h_m^2 - 2l_e h_m \cdot cos(\phi)}$$

$$\alpha = \arcsin\left(l_e \cdot \frac{sin(\phi)}{h_r}\right)$$

$$\beta = \pi - \alpha - \psi$$

$$h = \sin(\phi) \cdot \frac{h_b}{sin(\beta)}$$

$$\gamma = \arcsin(\frac{l_r}{h_r})$$

$$\delta = \pi - \beta - \gamma$$

$$b_{bottom} = \frac{sin(\gamma)}{sin(\delta)} \cdot h$$

$$\epsilon = \pi - \beta$$

$$\zeta = \pi - \epsilon - \gamma$$

$$b_{top} = \frac{sin(\gamma)}{sin(\zeta)} \cdot h$$

$$b = b_{top} + b_{bottom}$$

$$b(l_{r}, l_{e}, h_{m}, h_{b}, \phi, \psi) = \frac{\sin\left(\arcsin\left(\frac{l_{e}*\sin(\phi)}{\sqrt{l_{e}^{2}+h_{m}^{2}-2*l_{e}*h_{m}*\cos(\phi)}}\right) + \psi\right)}{\sin(-\arcsin\left(\frac{l_{r}}{\sqrt{l_{e}^{2}+h_{m}^{2}-2*l_{e}*h_{m}*\cos(\phi)}}\right) + \pi - \arcsin\left(\frac{l_{e}*\sin(\phi)}{\sqrt{l_{e}^{2}+h_{m}^{2}-2*l_{e}*h_{m}*\cos(\phi)}}\right) - \psi\right)} + \frac{l_{r}}{\sqrt{l_{e}^{2}+h_{m}^{2}-2*l_{e}*h_{m}*\cos(\phi)}} + \arcsin\left(\frac{l_{r}}{\sqrt{l_{e}^{2}+h_{m}^{2}-2*l_{e}*h_{m}*\cos(\phi)}}\right) + \arcsin\left(\frac{l_{e}*\sin(\phi)}{\sqrt{l_{e}^{2}+h_{m}^{2}-2*l_{e}*h_{m}*\cos(\phi)}}\right) + \psi\right)} \cdot \left(\frac{\sin(\phi)*h_{b}}{\sin(\pi - \arcsin\left(\frac{l_{e}*\sin(\phi)}{\sqrt{l_{e}^{2}+h_{m}^{2}-2*l_{e}*h_{m}*\cos(\phi)}}\right) - \psi\right)}\right)$$

$$b(l_r, l_e, h_m, h_b, \phi, \psi) = \frac{1}{-\sqrt{1 - \left(\frac{l_r}{\sqrt{l_e^2 + h_m^2 - 2l_e h_m \cdot cos(\phi)}}\right)^2 + cos(2 * arcsin(\frac{l_e * sin(\phi)}{\sqrt{l_e^2 + h_m^2 - 2l_e h_m \cdot cos(\phi)}}) + 2 * \psi - arcsin(\frac{l_r}{\sqrt{l_e^2 + h_m^2 - 2l_e h_m \cdot cos(\phi)}}))} + \frac{1}{\sqrt{1 - \left(\frac{l_r}{\sqrt{l_e^2 + h_m^2 - 2l_e k_m \cdot sos(\phi)}}\right)^2 - cos(2 * arcsin(\frac{l_e * sin(\phi)}{\sqrt{l_e^2 + h_m^2 - 2l_e k_m \cdot sos(\phi)}}) + 2 * \psi - arcsin(\frac{l_r}{\sqrt{l_e^2 + h_m^2 - 2l_e k_m \cdot sos(\phi)}}))} - \frac{l_r}{\sqrt{l_e^2 + h_m^2 - 2 * l_e * h_m * cos(\phi)}} * sin(\phi) * h_b)}$$