1 Vorwärtsproblem

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

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

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

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

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

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

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

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

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

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

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

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

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

$$b(l_r, l_e, h_m, h_b, \phi, \psi) =$$

$$\left[\frac{1}{-\sqrt{1 - \left(\frac{l_r}{\sqrt{l_e^2 + h_m^2 - 2 l_e h_m \cdot cos(\phi)}} \right)^2} + cos(2 * arcsin(\frac{l_e * sin(\phi)}{\sqrt{l_e^2 + h_m^2 - 2 l_e h_m \cdot cos(\phi)}}) + 2 * \psi - arcsin(\frac{l_r}{\sqrt{l_e^2 + h_m^2 - 2 l_e h_m \cdot cos(\phi)}})) } \right.$$

$$\left. + \frac{1}{\sqrt{1 - \left(\frac{l_r}{\sqrt{l_e^2 + h_m^2 - 2 * l_e * h_m * cos(\phi)}} \right)^2} - cos(2 * arcsin(\frac{l_e * sin(\phi)}{\sqrt{l_e^2 + h_m^2 - 2 * l_e * h_m * cos(\phi)}}) + 2 * \psi - arcsin(\frac{l_r}{\sqrt{l_e^2 + h_m^2 - 2 * l_e * h_m * cos(\phi)}})) } \right]$$

$$\cdot \left(2 * \frac{l_r}{\sqrt{l_e^2 + h_m^2 - 2 * l_e * h_m * cos(\phi)}} * sin(\phi) * h_b \right)$$