rg1

$$(\frac{l\sin(\theta)}{2} - l\cos(\beta))\hat{\mathbf{r}}_{\mathbf{x}} + (-l\sin(\beta) - \frac{l\cos(\theta)}{2})\hat{\mathbf{r}}_{\mathbf{y}} \tag{1}$$

rg2

$$(\frac{l\sin(\phi)}{2} + l\cos(\beta))\hat{\mathbf{r}}_{\mathbf{x}} + (l\sin(\beta) - \frac{l\cos(\phi)}{2})\hat{\mathbf{r}}_{\mathbf{y}} \tag{2}$$

vg1

$$(l\sin(\beta)\dot{\beta} + \frac{l\cos(\theta)\dot{\theta}}{2})\hat{\mathbf{r}}_{\mathbf{x}} + (\frac{l\sin(\theta)\dot{\theta}}{2} - l\cos(\beta)\dot{\beta})\hat{\mathbf{r}}_{\mathbf{y}} \tag{3}$$

vg2

$$(-l\sin(\beta)\dot{\beta} + \frac{l\cos(\phi)\dot{\phi}}{2})\hat{\mathbf{r}}_{\mathbf{x}} + (\frac{l\sin(\phi)\dot{\phi}}{2} + l\cos(\beta)\dot{\beta})\hat{\mathbf{r}}_{\mathbf{y}} \tag{4}$$

ag1

$$(l\sin(\beta)\ddot{\beta} - \frac{l\sin(\theta)\dot{\theta}^2}{2} + l\cos(\beta)\dot{\beta}^2 + \frac{l\cos(\theta)\ddot{\theta}}{2})\hat{\mathbf{r}}_{\mathbf{x}} + (l\sin(\beta)\dot{\beta}^2 + \frac{l\sin(\theta)\ddot{\theta}}{2} - l\cos(\beta)\ddot{\beta} + \frac{l\cos(\theta)\dot{\theta}^2}{2})\hat{\mathbf{r}}_{\mathbf{y}} \tag{5}$$

ag2

$$(-l\sin(\beta)\ddot{\beta} - \frac{l\sin(\phi)\dot{\phi}^2}{2} - l\cos(\beta)\dot{\beta}^2 + \frac{l\cos(\phi)\ddot{\phi}}{2})\hat{\mathbf{r}}_{\mathbf{x}} + (-l\sin(\beta)\dot{\beta}^2 + \frac{l\sin(\phi)\ddot{\phi}}{2} + l\cos(\beta)\ddot{\beta} + \frac{l\cos(\phi)\dot{\phi}^2}{2})\hat{\mathbf{r}}_{\mathbf{y}} \tag{6}$$

absvg1

$$\sqrt{\left(l\sin(\beta(t))\frac{d}{dt}\beta(t) + \frac{l\cos(\theta(t))\frac{d}{dt}\theta(t)}{2}\right)^2 + \left(\frac{l\sin(\theta(t))\frac{d}{dt}\theta(t)}{2} - l\cos(\beta(t))\frac{d}{dt}\beta(t)\right)^2} \tag{7}$$

absvg2

$$\sqrt{\left(-l\sin(\beta(t))\frac{d}{dt}\beta(t) + \frac{l\cos(\phi(t))\frac{d}{dt}\phi(t)}{2}\right)^2 + \left(\frac{l\sin(\phi(t))\frac{d}{dt}\phi(t)}{2} + l\cos(\beta(t))\frac{d}{dt}\beta(t)\right)^2} \tag{8}$$

Simple absvg1

$$\frac{\sqrt{l^2\left(4\sin(\beta(t) - \theta(t))\frac{d}{dt}\beta(t)\frac{d}{dt}\theta(t) + 4\left(\frac{d}{dt}\beta(t)\right)^2 + \left(\frac{d}{dt}\theta(t)\right)^2\right)}}{2} \tag{9}$$

Simple absvg2

$$\frac{\sqrt{l^2\left(-4\sin(\beta(t) - \phi(t))\frac{d}{dt}\beta(t)\frac{d}{dt}\phi(t) + 4\left(\frac{d}{dt}\beta(t)\right)^2 + \left(\frac{d}{dt}\phi(t)\right)^2\right)}}{2} \tag{10}$$

VL kropp 1

$$-\frac{glm_1\sin(\theta)}{2}\hat{\mathbf{r}}_{\mathbf{z}} \tag{11}$$

HL kropp 1

$$(\frac{l^2 m_1\ddot{\theta}}{12} + \frac{lm_1\left(l\sin(\beta)\dot{\beta}^2 + \frac{l\sin(\theta)\ddot{\theta}}{2} - l\cos(\beta)\ddot{\beta} + \frac{l\cos(\theta)\dot{\theta}^2}{2}\right)\sin(\theta)}{2} + \frac{lm_1\left(l\sin(\beta)\ddot{\beta} - \frac{l\sin(\theta)\dot{\theta}^2}{2} + l\cos(\beta)\dot{\beta}^2 + \frac{l\cos(\theta)\ddot{\theta}}{2}\right)\cos(\theta)}{2})\hat{\mathbf{r}}_{\mathbf{z}} \tag{12}$$

simple VL kropp 1

$$-\frac{glm_1\sin(\theta)}{2}\hat{\mathbf{r}}_{\mathbf{z}} \tag{13}$$

simple HL kropp 1

$$\frac{l^2 m_1\left(6\sin(\beta - \theta)\ddot{\beta} + 6\cos(\beta - \theta)\dot{\beta}^2 + 4\ddot{\theta}\right)}{12}\hat{\mathbf{r}}_{\mathbf{z}} \tag{14}$$

kropp1

$$-\frac{glm_1\sin(\theta(t))}{2} = \frac{l^2 m_1\left(6\sin(\beta(t) - \theta(t))\frac{d^2}{dt^2}\beta(t) + 6\cos(\beta(t) - \theta(t))\left(\frac{d}{dt}\beta(t)\right)^2 + 4\frac{d^2}{dt^2}\theta(t)\right)}{12} \tag{15}$$

simple kropp1

$$\frac{glm_1\sin(\theta(t))}{2} = -\frac{l^2 m_1\left(3\sin(\beta(t) - \theta(t))\frac{d^2}{dt^2}\beta(t) + 3\cos(\beta(t) - \theta(t))\left(\frac{d}{dt}\beta(t)\right)^2 + 2\frac{d^2}{dt^2}\theta(t)\right)}{6} \tag{16}$$

VL kropp 2

$$-\frac{glm_2\sin(\phi)}{2}\hat{\mathbf{r}}_{\mathbf{z}} \tag{17}$$

HL kropp 2

$$(\frac{l^2 m_2\left(-2\sin(\beta - \phi)\ddot{\beta} - 2\cos(\beta - \phi)\dot{\beta}^2 + \ddot{\phi}\right)}{4} + \frac{l^2 m_2\ddot{\phi}}{12})\hat{\mathbf{r}}_{\mathbf{z}} \tag{18}$$

simple VL kropp 2

$$-\frac{glm_2\sin(\phi)}{2}\hat{\mathbf{r}}_{\mathbf{z}} \tag{19}$$

simple HL kropp 2

$$\frac{l^2 m_2\left(-3\sin(\beta - \phi)\ddot{\beta} - 3\cos(\beta - \phi)\dot{\beta}^2 + 2\ddot{\phi}\right)}{6}\hat{\mathbf{r}}_{\mathbf{z}} \tag{20}$$

kropp2

$$-\frac{glm_2\sin(\phi(t))}{2} = \frac{l^2 m_2\left(-3\sin(\beta(t) - \phi(t))\frac{d^2}{dt^2}\beta(t) - 3\cos(\beta(t) - \phi(t))\left(\frac{d}{dt}\beta(t)\right)^2 + 2\frac{d^2}{dt^2}\phi(t)\right)}{6} \tag{21}$$

simple kropp2

$$\frac{glm_2\sin(\phi(t))}{2} = -\frac{l^2 m_2\left(-3\sin(\beta(t) - \phi(t))\frac{d^2}{dt^2}\beta(t) - 3\cos(\beta(t) - \phi(t))\left(\frac{d}{dt}\beta(t)\right)^2 + 2\frac{d^2}{dt^2}\phi(t)\right)}{6} \tag{22}$$

VL hela

$$(glm_1\cos(\beta) - glm_2\cos(\beta))\hat{\mathbf{r}}_{\mathbf{z}} \tag{23}$$

HL hela

$$(-lm_1\left(l\sin(\beta)\dot{\beta}^2 + \frac{l\sin(\theta)\ddot{\theta}}{2} - l\cos(\beta)\ddot{\beta} + \frac{l\cos(\theta)\dot{\theta}^2}{2}\right)\cos(\beta) + lm_1\left(l\sin(\beta)\ddot{\beta} - \frac{l\sin(\theta)\dot{\theta}^2}{2} + l\cos(\beta)\dot{\beta}^2 + \frac{l\cos(\theta)\ddot{\theta}}{2}\right)\sin(\beta) + lm_2\left(-l\sin(\beta)\dot{\beta}^2 + \frac{l\sin(\phi)\ddot{\phi}}{2} + l\cos(\beta)\ddot{\beta} + \frac{l\cos(\phi)\dot{\phi}^2}{2}\right)\cos \tag{24}$$

simple VL hela

$$gl\left(m_1 - m_2\right)\cos(\beta)\hat{\mathbf{r}}_{\mathbf{z}} \tag{25}$$

simple HL hela

$$\frac{l^2\left(m_1\sin(\beta - \theta)\ddot{\theta} - m_1\cos(\beta - \theta)\dot{\theta}^2 + 2m_1\ddot{\beta} - m_2\sin(\beta - \phi)\ddot{\phi} + m_2\cos(\beta - \phi)\dot{\phi}^2 + 2m_2\ddot{\beta}\right)}{2}\hat{\mathbf{r}}_{\mathbf{z}} \tag{26}$$

hela

$$gl\left(m_1 - m_2\right)\cos(\beta(t)) = \frac{l^2\left(m_1\sin(\beta(t) - \theta(t))\frac{d^2}{dt^2}\theta(t) - m_1\cos(\beta(t) - \theta(t))\left(\frac{d}{dt}\theta(t)\right)^2 + 2m_1\frac{d^2}{dt^2}\beta(t) - m_2\sin(\beta(t) - \phi(t))\frac{d^2}{dt^2}\phi(t) + m_2\cos(\beta(t) - \phi(t))\left(\frac{d}{dt}\phi(t)\right)^2 + 2m_2\frac{d^2}{dt^2}\beta(t)\right)}{2} \tag{27}$$

simple hela

$$gl\left(m_1 - m_2\right)\cos(\beta(t)) = \frac{l^2\left(m_1\sin(\beta(t) - \theta(t))\frac{d^2}{dt^2}\theta(t) - m_1\cos(\beta(t) - \theta(t))\left(\frac{d}{dt}\theta(t)\right)^2 + 2m_1\frac{d^2}{dt^2}\beta(t) - m_2\sin(\beta(t) - \phi(t))\frac{d^2}{dt^2}\phi(t) + m_2\cos(\beta(t) - \phi(t))\left(\frac{d}{dt}\phi(t)\right)^2 + 2m_2\frac{d^2}{dt^2}\beta(t)\right)}{2} \tag{28}$$