$$\begin{cases}\Delta x = \cos\beta\,\Delta 1 - \sin(\beta+\varphi)\,\Delta 2 \\ \Delta y = \sin\beta\,\Delta 1 + \cos(\beta+\varphi)\,\Delta 2\end{cases}$$

$$\begin{cases}\cos\beta\, CM1\, K_1 - \sin(\beta+\varphi)\, CM2\, K_2 = 0 & \cdots ① \\ \sin\beta\, CM1\, K_1 + \cos(\beta+\varphi)\, CM2\, K_2 = 222 & \cdots ② \\ \sin\beta\, CM1\, K_1' + \cos(\beta+\varphi)\, CM2\, K_2' = 0 & \cdots ③ \\ \cos\beta\, CM1\, K_1' - \sin(\beta+\varphi)\, CM2\, K_2' = 222 & \cdots ④\end{cases}$$

由①③

$$CM1\, K_1 \cos\beta = CM2\, K_2 \sin(\beta+\varphi)$$

$$CM1\, K_1' \sin\beta = -CM2\, K_2' \cos(\beta+\varphi)$$

得：

$$\frac{K_1}{K_1'} \cot\beta = -\frac{K_2}{K_2'} \tan(\beta+\varphi)$$

由②④

$$CM1\,(K_1 \sin\beta - K_1' \cos\beta) +$$

$$CM2\,(K_2 \cos(\beta+\varphi + K_2' \sin(\beta+\varphi)) = 0$$

$$\therefore \frac{CM1}{CM2} = -\frac{K_2\cos(\beta+\varphi) + K_2'\sin(\beta+\varphi)}{K_1\sin\beta - K_1'\cos\beta}$$

由①③

$$CM1\,(K_1\cos\beta + K_1'\sin\beta) +$$

$$CM2\,(-K_2\sin(\beta+\varphi) + K_2'\cos(\beta+\varphi)) = 0$$

$$\therefore \frac{CM1}{} \quad K_2\sin(\beta+\varphi) - K_2'\cos(\beta+\varphi)$$

$$\frac{\quad}{cm2} = \quad k_1\cos\beta + k_1'\sin\beta$$

$$\frac{k_2\cos(\beta+\varphi)+k_2'\sin(\beta+\varphi)}{-k_1\sin\beta+k_1'\cos\beta} = \frac{k_2\sin(\beta+\varphi)-k_2'\cos(\beta+\varphi)}{k_1\cos\beta+k_1'\sin\beta}$$

$$k_1k_2\cos\beta\cos(\beta+\varphi)+k_1k_2'\cos\beta\sin(\beta+\varphi)$$
$$+k_1'k_2\sin\beta\cos(\beta+\varphi)+k_1'k_2'\sin\beta\sin(\beta+\varphi)$$
$$=-k_1k_2\sin\beta\sin(\beta+\varphi)+k_1k_2'\sin\beta\cos(\beta+\varphi)$$
$$+k_1'k_2\cos\beta\sin(\beta+\varphi)-k_1'k_2'\cos\beta\cos(\beta+\varphi)$$

即: $k_1k_2\cos(\beta-\beta-\varphi)+k_1k_2'\sin(\beta+\varphi-\beta)$
$+k_1'k_2\sin(\beta-\beta-\varphi)+k_1'k_2'\cos(\beta+\varphi-\beta)=0$

$$k_1k_2\cos\varphi+k_1k_2'\sin\varphi-k_1'k_2\sin\varphi+k_1'k_2'\cos\varphi=0$$

$$\therefore \cos\varphi(k_1k_2+k_1'k_2')=\sin\varphi(k_1'k_2-k_1k_2')$$

$$\therefore \tan\varphi=\frac{k_1k_2+k_1'k_2'}{k_1'k_2-k_1k_2'}$$

$$\frac{k_1}{k_1'}\cot\beta=-\frac{k_2}{k_2'}\tan(\beta+\varphi)$$

$$\tan(\beta+\varphi)=\frac{\tan\beta+\tan\varphi}{\quad}$$

$$1-\tan\beta\tan\varphi$$

$$\frac{k_1}{k_1'}\,\frac{1}{\tan\beta} = -\frac{k_2}{k_2'}\,\frac{\tan\beta+\tan\varphi}{1-\tan\beta\tan\varphi}$$

$$-\frac{k_1k_2'}{k_1'k_2}\,\frac{1}{\tan\beta} = \frac{\tan\beta+\tan\varphi}{1-\tan\beta\tan\varphi}$$

$$k(1-\tan\beta\tan\varphi) = \tan^2\beta+\tan\varphi\tan\beta$$

$$k-k\tan\beta\tan\varphi = \tan^2\beta+\tan\varphi\tan\beta$$

$$\tan^2\beta+(1+k)\tan\beta\tan\varphi-k=0$$

$$\therefore \tan\beta = \frac{-(k+1)\tan\varphi \pm \sqrt{b^2+4k}}{2}$$

$$\begin{cases} \cos\beta\,\mathrm{cm}1\,k_1 - \sin(\beta+\varphi)\,\mathrm{cm}2\,k_2 = 0 & \cdots ① \\ \sin\beta\,\mathrm{cm}1\,k_1 + \cos(\beta+\varphi)\,\mathrm{cm}2\,k_2 = 144 & \cdots ② \\ \sin\beta\,\mathrm{cm}1\,k_1' + \cos(\beta+\varphi)\,\mathrm{cm}2\,k_2' = 0 & \cdots ③ \\ \cos\beta\,\mathrm{cm}1\,k_1' - \sin(\beta+\varphi)\,\mathrm{cm}2\,k_2' = 144 & \cdots ④ \end{cases}$$

$$\mathrm{cm}1\,k_1\sin\beta + \mathrm{cm}1\,m\,k_2\cos(\beta+\varphi) = y$$

$$\mathrm{cm}1 = \frac{k_2\sin(\beta+\varphi)-k_2'\cos(\beta+\varphi)}{}$$

$$\frac{}{CM_2} = k_1\cos\beta + k_1'\sin\beta$$

$$\frac{CM_2}{CM_1} = \frac{k_1\cos\beta + k_1'\sin\beta}{k_2\sin(\beta+\varphi) - k_2'\cos(\beta+\varphi)} = m$$

$$CM_1 = \frac{y}{k_1\sin\beta + mk_2\cos(\beta+\varphi)}$$

对于X，Y运动方向不同的两种情况
区别仅在于解方程时 ①+③，②+④
结果变为

$$\tan\varphi = -\frac{k_1k_2 + k_1'k_2'}{k_1'k_2 - k_1k_2'}$$

β，CM_1、CM_2，形式不变