The u,v coordinate system

The new coordinates are defined with respect to the impact point in the LGD plane ($Z0 = 120cm$) of the incoming generated photon. The radial position of impact point $\vec{r}$ defines the u axis while the v axis is the perpendicular one. The new origin is keept at the beem axis, so that the incoming photon has coordinates ($u = \vec{r}$, $v = 0$). The rules for transforming i-th reconstructed shower positions into the relative coordicantes are as follows:

$$u = |\Delta\vec{r}| \cos\beta + |\vec{r}|, \tag{1}$$

$$v = |\Delta\vec{r}| \sin\beta, \tag{2}$$

where $\Delta\vec{r}$ and β are given by

$$\Delta\vec{r} = \vec{r_i} - \vec{r}, \tag{3}$$

and

$$\cos\beta = \frac{\Delta\vec{r} \cdot \vec{r}}{|\Delta\vec{r}||\vec{r}|}. \tag{4}$$

In terms of shower coordinates in the local XY LGD system, which can be expresed by the shower momentum components for the fixed z-plane, u and v are

$$u = \frac{(x_i - x_{MC})x_{MC} + (y_i - y_{MC})y_{MC}}{r_{MC}} + r_{MC}, \tag{5}$$

$$v = \frac{(x_i - x_{MC})y_{MC} + (y_i - y_{MC})x_{MC}}{r_{MC}}. \tag{6}$$