The LOSVD of stars at projected radius R on the sky $\sigma_{\rm los}(R)$ is given by

$$\sigma_{\rm los}^2(R) = \frac{1}{\Sigma_\star(R)} \int_{R^2}^{\infty} \rho_\star(r)\sigma_{\rm r}^2(r) \left[1 - \frac{R^2}{r^2}\beta(r)\right] \frac{dr^2}{\sqrt{r^2 - R^2}}, \tag{1}$$

where $\rho_\star(r)$ is the volume stellar density, $\Sigma_\star(R)$ is the surface stellar mass density projected on the sky, $\sigma_{\rm r}(r)$ is the radial stellar VD, and $\beta(r)$ is the VD anisotropy.

Let $u \equiv \sqrt{r^2/R^2 - 1}$ with $0 \le u < \infty$. Then equation (1) becomes

$$\sigma_{\rm los}^2(R) = \frac{2R}{\Sigma_\star(R)} \int_0^{\infty} \rho_\star(R\sqrt{1+u^2})\sigma_{\rm r}^2(R\sqrt{1+u^2}) \left[1 - \frac{\beta(R\sqrt{1+u^2})}{1+u^2}\right] du. \tag{2}$$

Now let $v \equiv u + a$ with a positive constant a so that $a \le v < \infty$. Finally, let $w \equiv e^{-v}$ so that $0 \le w \le e^{-a}$. Then equation (2) takes the following form with a finite integration range

$$\sigma_{\rm los}^2(R) = \frac{2R}{\Sigma_\star(R)} \int_0^{e^{-a}} \rho_\star(R\ t(w))\sigma_{\rm r}^2(R\ t(w)) \left[1 - \frac{\beta(R\ t(w))}{t^2(w)}\right] \frac{dw}{w}, \tag{3}$$

where $t(w) \equiv \sqrt{1 + (\ln w + a)^2}$. We may choose $a = 1/2$ or some other positive number.