

192(S) : Comparison of Processing Ellipse and Logarithmic Spiral

Processing Ellipse

$$r = \frac{d}{1 + e \cos(x\theta)}$$

$$\frac{dr}{d\theta} = \left(\frac{x e}{d}\right) r^2 \sin(x\theta)$$

$$n(r) = \frac{\frac{1}{b^2} - \left(\frac{x e}{d}\right)^2 + \left(\frac{x}{d}\right)^2 \left(1 - \frac{d}{r}\right)^2}{\frac{1}{a^2} + \frac{1}{r^2}}$$

e = eccentricity

$2d$ = latus rectum

$$a = \frac{L}{mc} = \text{constant}$$

$$b = \frac{Lc}{E} = \text{constant}$$

E = total energy

L = angular momentum

Solar System

Logarithmic Spiral

$$r = r_0 \exp(\gamma \theta)$$

$$\frac{dr}{d\theta} = \gamma r$$

$$n(r) = \frac{\frac{1}{b^2} - \frac{\gamma^2}{r^2}}{\frac{1}{a^2} + \frac{1}{r^2}}$$

γ = pitch

$$a = \frac{L}{mc} = \text{constant}$$

$$b = \frac{Lc}{E} = \text{constant}$$

Whirlpool Galaxy