Abstract

This paper was written for the general public and it outlines the basics of General Keplerian Dynamics (GKD). GKD is a three dimensional generalization of Newton and Kepler's two dimensional laws of celestial mechanics. The dynamics of stellar systems are shown to have the same wave characteristics as de Broglie matter-waves as they orbit galactic nuclei vice the elliptical formalism proposed by Kepler and Newton. This PDF gets updated periodically. The latest date of publication was on 11/06/14.
The 1st Law of General Keplerian Dynamics (GKD1)

Newton’s version of Kepler’s 1st law of planetary motion (NVK1L) can be stated as:

**NVK1L:** The shape of a planet’s orbit is a **conic section**, with the center of mass (COM) positioned at one of two possible foci of an ellipse.

![FIG. 1: Kepler's elliptical model has been undisputed for over 400 years.](image)

> “Only the existence of a field of force can account for the motion of the bodies as observed...” –Nikola Tesla

The 1st law of General Keplerian Dynamics (GKD1) can be stated as:

**GKD1:** The shape of a planet’s orbit **traces the surface area of a torus**, with the center of mass (COM) positioned at the **center of the toroidal cavity**.

![FIG. 2: Image is exaggerated. GKD1 can be modeled with a torus (red) embedded within a three dimensional coordinate system (gray). The “x” centered within the cavity represents the COM. The yellow and brown dots represent a primary and secondary body respectively. The blue and green paths are Villarceau circles (three dimensional ellipses). The secondary’s orbital inclination is what constitutes the third spatial dimension. The radius of the coplanar Toroidal axis (black circle) is equivalent in length to the semi-minor axis of the two dimensional ellipse. The toroid’s outer and inner tube distances relative to the COM are equivalent to the secondary’s apoapsis and periapsis distances respectively.](image)
The toroidal (gravitomagnetic) field of a celestial body will be referred to as its Tesla field\[1\].

**FIG. 3: An example Tesla field. Conic shapes have mirror symmetry along the z-axis of a three dimensional inertial frame of reference. The coplanar Toroidal axis (black circle in FIG. 2) is oriented along the x and y plane.**

**The 2\textsuperscript{nd} Law of General Keplerian Dynamics (GKD2)**

Kepler's 2\textsuperscript{nd} law of planetary motion can be stated as:

A **line** joining a planet and the Sun sweeps out **equal areas** during equal intervals of time relative to an inertial 2D frame of reference (excluding precession).

**GKD2(a) can be stated as:**

The **radii** of a planet's **Toroidal** \((r_1)\) and **Poloidal** \((r_2)\) axes sweep out **equal sectors** during equal intervals of time relative to an inertial 3D frame of reference (excluding precession).

**FIG. 4: Image is exaggerated. A secondary's orbit is bicyclic. The radius \(r_1\) sweeps out equal sectors during equal intervals of time relative to the Toroidal frame of reference (the radii are overlapping since**
the planet is at perihelion). The radius $r_2$ simultaneously sweeps out equal sectors during equal intervals of time relative to the Poloidal frame of reference (seen as the orange circle that has mirror symmetry).

**GKD2(b)** can be stated as:

The angle of a secondary’s **Toroidal axis** is equivalent to the angle of $r_1$ when the secondary’s position is at **crest** or **trough** (when $r_2$ is perpendicular to $r_1$).

**GKD2(c)** can be stated as:

The **Toroidal axis** radius ($r_1$) is equivalent in length to the semi-minor axis of the secondary’s 2D ellipse when unperturbed by outside forces, or

$$[1] \ r_1 = b = a\sqrt{1-e^2},$$

where $b$ is the semi-minor axis of the ellipse, $a$ is the semi-major axis, and $e$ is the eccentricity of the secondary's orbit. The radius ($r_1$) is also equivalent to the geometric mean of the secondary’s apoapsis and periapsis distances relative to the **Major COM**, or

$$[2] \ r_1 = \sqrt{r_{\text{min}}r_{\text{max}}}. $$

The length of the **Poloidal axis** radius ($r_2$) is equivalent to half of the vertical distance between the secondary’s **crest** and **trough** positions relative to the $z$-axis of a three dimensional inertial frame of reference, or:

$$[3] \ r_2 = 0.5r_{\text{CT}},$$

where $r_{\text{CT}}$ is the vertical distance between the secondary’s **crest** and **trough**. The radius ($r_2$) is also equivalent in length to the distance between the **Minor COM** and the **crest** or **trough** positions:

$$[4] \ r_2 = r_{\text{mX}}$$

where $r_{\text{mX}}$ is the distance between the **Minor COM** and the **crest/trough** positions).
GKD2(d) can be stated as:

The amplitude peaks per revolution ($J$) of a secondary’s orbit is equivalent to the ratio between its Toroidal axis revolution period ($P_T$) and Poloidal axis revolution period ($P_P$):

$$J = \frac{P_T}{P_P}$$

$J = 1, 2, 3, 4, n, \text{etc.}$

Our Sun experiences 4 amplitude peaks per revolution as it orbits the Milky Way$^2$, resembling the wave seen in the outer layer of the image above. The Earth experiences 1 amplitude peak per revolution as it orbits the Sun, resembling the Villarceau circle in the inner wave layer (a three dimensional ellipse).

Additional wave related formulas which are analogous to de Broglie matter-waves are:

where $\lambda$ is a secondary’s wavelength, $v$ is its wave velocity, $j$ is a proportionality constant, $\zeta$ is the reduced constant, $p$ is momentum (measured in Solar Mass units), $L$ is angular momentum, $N$ is the node quantity, $d$ is distance in light units, and $t$ is time in terrestrial Poloidal periods (the amount of time that elapses between two passages of a crest/trough).

For instance, the radius of the Earth’s Toroidal axis ($r_1$) relative to the Major COM is:

$$[4] r_{E1} = \sqrt{r_{\text{min}}r_{\text{max}}} = a\sqrt{1-e^2} \approx 149,577,008,570.259 \text{ metres.}$$

The radius can then be converted into light minutes by:

$$[5] \frac{r_{E1}}{1 \text{ lm}} \approx 8.315586578451509 \text{ lm.}$$

Since the node quantity is 2 for the Earth’s orbit ($J = 1$), the Earth’s wavelength $\lambda_E$ is:

$$[6] \lambda_E = \frac{2\pi r_{E1}}{2(0.5)} \approx 52.24837218216248 \text{ lm.}$$
The Earth's wave velocity can then be determined from:

\[ 7 \] \( \nu = \frac{\lambda_E}{P_p} \approx \frac{52.24837218216248 \text{ lm}}{P_{EP}} \]

where \( P_{EP} \) is the Earth's Poloidal period. Since the Earth experiences 1 amplitude peak per revolution its Poloidal period is also equivalent to its Toroidal period (i.e. 1 year). The wave velocity can then be used to deduce the proportionality constant:

\[ 8 \] \( j = \lambda_p \approx \frac{8.1963883545229 \cdot 10^{-3} \text{ lm}^2 \cdot M\odot}{P_{EP}} \)

The reduced constant is simply:

\[ 9 \] \( \psi = j / 2\pi \),

and the quantized angular momentum for celestial systems is:

\[ 10 \] \( L = J\psi \).

**The 3\textsuperscript{rd} Law of General Keplerian Dynamics (GKD3)**

According to Kepler's 3\textsuperscript{rd} law of planetary motion, the square of a secondary's orbital period is proportional to the cube of the semi-major axis of its orbit. Newton later modified this law to include the mass of each body:

\[ 11 \] \( m_1 + m_2 = \frac{A^3}{P^2} \),

where \( m_1 \) and \( m_2 \) are each of their masses (in Solar Mass units), \( A \) represents the semi-major axis distance (in Astronomical Units), and \( P \) represents the orbital period (in years). According to GKD, however, a secondary's orbit is bicyclic and there are two periods which must be considered (Toroidal and Poloidal). When the amplitude peaks per revolution (J) term is included in Newton's formula \[ 11 \] it eliminates the necessity of dark matter:

\[ 12 \] \( m_1 + m_2 = \frac{A^3}{JP_T^2} \).
Current estimates for our solar system’s **Toroidal period** range from 225-250 Myr, and geological evidence\(^2\) indicates a **Poloidal period** of \(\approx 60 \pm 2\) Myr, from which \(J \approx 4\) may be deduced. The mass within our solar system’s radius is therefore (approximately):

\[
[13] \quad m_1 + m_2 \approx \frac{1,708,860,759.5^3}{4(240,000,000)^2} \approx 2.17 \times 10^{10} M_\odot.
\]

![Graph](image)

**FIG. 5:** The consistency of a star’s rotation speed, independent of its distance from the galactic Major COM, can be explained with GKD due to the quantized angular momenta of celestial systems \((L = J\xi)\).

Stars with greater distance from the galactic Major COM experience more amplitude peaks per revolution \((J)\). According to GKD, the consistency in the rotation speeds are simply due to the law of conservation of angular momentum and not dark matter.

**Acknowledgements**

This paper is dedicated to Cindy Lett (whom the reduced proportionality constant \(\xi\) in the quantized angular momentum equation \(L = J\xi\) is named after). GKD would not have been possible without her.

**References**
