

Figure 11. from

galpy: A python Library for Galactic Dynamics

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1 from galpy.orbit import Orbit
2 from galpy.potential import MWPotential2014
3 o= Orbit([0.8,0.3,0.75,0.,0.2,0.]) # setup R,vR,vT,z,vz,phi
4 times= numpy.linspace(0.,10.,1001) # Output times
5 o.integrate(times,MWPotential2014) # Integrate
6 o.E() # Energy
7 -1.2547650648697966
8 o.L() # Angular momentum
9 array([[ 0. , -0.16,  0.6 ]])
10 o.Jacobi(OmegaP=0.65) #Jacobi integral E-OmegaP Lz
11 array([-1.64476506])
12 o.ER(times[-1]), o.Ez(times[-1]) # Rad. and vert. E at end
13 (-1.27601734263047, 0.021252201847851909)
14 o.rperi(), o.rap(), o.zmax() # Peri-/apocenter r, max. |z|
15 (0.44231993168097, 0.87769030382105, 0.077452357289016)
16 o.e() # eccentricity (rap-rperi)/(rap+rperi)
17 0.32982348199330563
18 o.R(2.,ro=8.) # Cylindrical radius at time 2. in kpc
19 3.5470772876920007
20 o.vR(5.,vo=220.) # Cyl. rad. velocity at time 5. in km/s
21 45.202530965094553
22 o.ra(1.), o.dec(1.) # RA and Dec at t=1. (default settings)
23 (array([ 288.19277]), array([ 18.98069155]))
24 o.jr(type='adiabatic'), o.jz() # R/z actions (ad. approx.)
25 (0.05285302231137586, 0.006637988850751242)
26 # Rad. period w/ Staeckel approximation w/ focal length 0.5,
27 o.Tr(type='staeckel',delta=0.5,ro=8.,vo=220.) # in Gyr
28 0.1039467864018446
29 o.plot(d1='R',d2='z') # Plot the orbit in (R,z)
30 ...
31 o.plot3d() # Plot the orbit in 3D, w/ default [x,y,z]
```
