Frame Dragging Lense-Thirring Time Dilation and More

sgm, 2108/DEC/24

The fact gravitational time-dilation happens *at all* means there is, *at least*, a loose coupling between space-time and masses. Masses *affect* space-time. Lense-Thirring, also known as frame dragging, is a *geometric effect* on space-time as such:
https://www.youtube.com/watch?v=J2UPupRIrq4
https://en.wikipedia.org/wiki/Lense%E2%80%93Thirring_precession

Newton’s law of universal gravitation:
https://en.wikipedia.org/wiki/Newton's_law_of_universal_gravitation
shows where G comes into play with units m^3/s^2kg
If you look closely, it’s a kind of inverse-density.

G:
https://en.wikipedia.org/wiki/Gravitational_constant
again with units m^3/s^2kg.

The Lorentz factor (relating to Special Relativity):
https://en.wikipedia.org/wiki/Lorentz_factor
has General Relativity / gravitational analog:
$(1-r_s/r)^{-1/2}$, where r_s is the Schwarzschild radius:
https://en.wikipedia.org/wiki/Schwarzschild_radius

So intuitively, the Lense-Thirring effect *must* be a function of: G, mass, spin, r_s, radius, and time. It must be proportional to [powers of] G, m, *s*, and t – while *inversely* proportional to V, volume, and Schwarzchild factor, $(1-r_s/r)^{1/2}$:

$$L\text{-}S \propto \frac{Gmst^3}{V\sqrt{(1-r_s/r)}}$$

with units: $\frac{m^3kgs^{-1}s^3}{s^2kgm^3(.)}$ = dimensionless / unit-less

Notice how the units cancel leaving a dimensionless Lense-Thirring factor based on distance from center-of-mass, r, and time elapsed, t.

$$L\text{-}S(r,t) \propto \frac{Gmst^3}{V\sqrt{(1-r_s/r)}}$$

Intuitively, the Lense-Thirring effect is proportional to the universal gravitational constant, mass, spin, time-cubed – and – inversely proportional to volume and Schwarzchild factor.

If mass is zero, the effect is zero.

If spin is zero, the effect is zero.

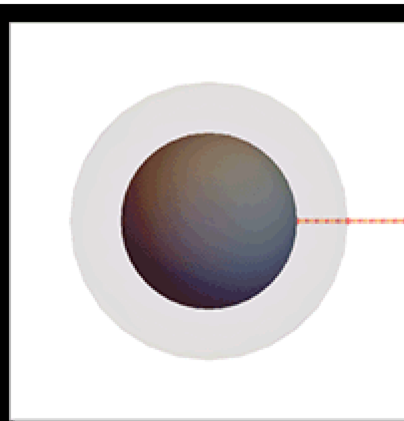
If time passed/measured is zero, the effect is zero.

If volume is large, the effect is small.

If inverse-Schwarzchild factor / gravitational time-dilation is large, the factor is large.

The only factor that needs explanation is about volume. Increased volume means lower density / energy/mass density which implies less 'stuff' to interact with space-time, affect it, and change it. Spreading mass out, lowering mass/energy density, means *less stuff to couple with* an *already extremely lowly coupled factor* – to begin with, as evinced by time-dilation of neutronium – the ***only*** way to change time / dilate time is to *concentrate nuclear material*. *High volume* implies *low density* which implies *less coupling material* which implies *less effect*.

Conventional General Relativity asserts *entire space-time* is curved/distorted by masses but we see above that Lense-Thirring is an effect based on ***TIME*** and radial distance *alone*. G is a function of c which is a function of Z_0. This implies that ultimately, Lense-Thirring is an effect based on the impedance of space. The magnitude/amount of defect/warp, of course, is based on Y_0, temporal elasticity. So Lense-Thirring is ultimately based on two factors alone: Z_0 and Y_0, the impedance of space and elasticity of time.



an animated gif about how time is warped near a black-hole
from: https://en.wikipedia.org/wiki/Lense%E2%80%93Thirring_precession