GPS, CLOCKS & RELATIVITY

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Southern California ION Section

Presentation Outline (1)

- Background
  - Logic & Theme

- Energy Conservation Logic
  - Falling radiation does it change frequency?
  - Multiple implications

- Momentum Conservation Logic: Tolerable Asymmetry--a new route to the LT
  - Introduction
  - Two inertial frames in relative motion
    - Physical effects of Motion (Steps 1 & 2)
    - The Selleri Transformation
    - Induced clock bias and the Lorentz Transformation
    - Speed of light in the moving frame

Presentation Outline (2)

- Extending the inertial frame results to the earth in orbit
  - Earth spin and straight line approximation to orbit
  - Adjusting for the curvature of the orbit
  - The transitive property of the ALT
  - Length contraction & other physical laws
- Extending the result to the GPS orbits
  - Equivalence principle logic problem
  - Infinitesimal LT logic problem

- Conclusions

"No physicist who is even marginally sane doubts the validity of special relativity."

Isaac Asimov

Theme: GPS evidence reveals logical faults in standard relativistic theory and points toward the true underlying physics.

Logic Problems?

- Today is Tuesday if… it does not rain

- If we have not met before… If you're here for the first time… my name is John Doe

- Lab Co. sign… No Eating or No Drinking in the lobby
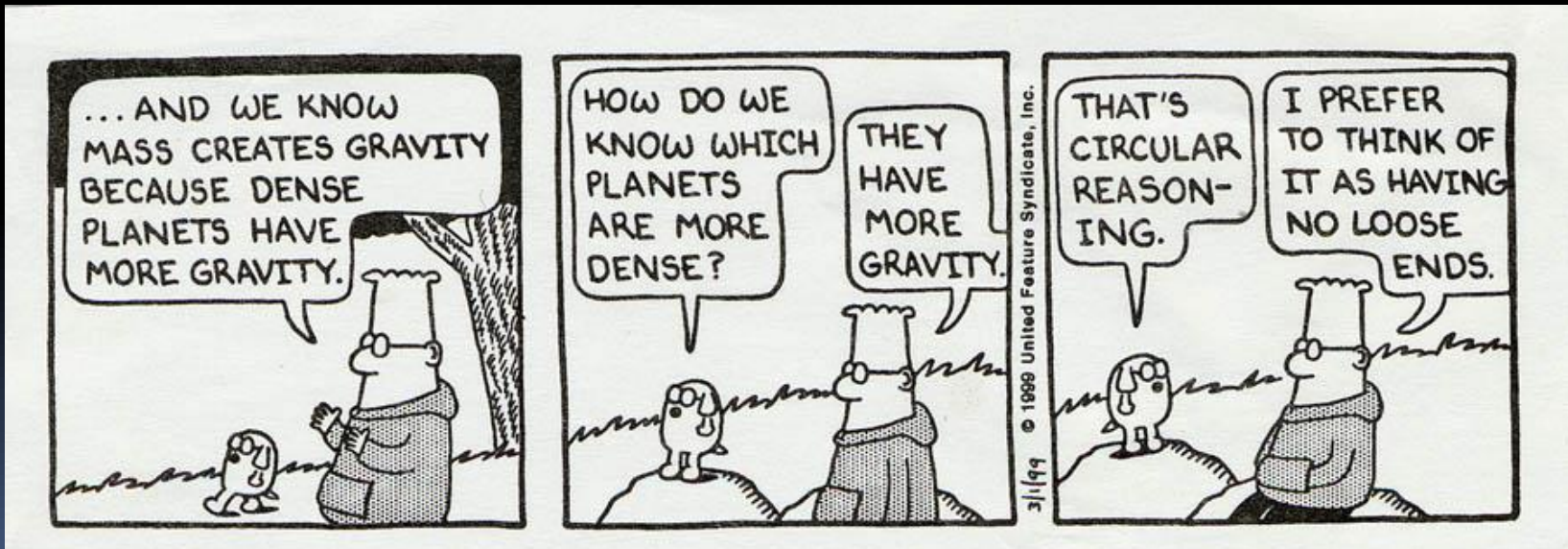
Energy Conservation Logic

- Einstein, Feynman, Clifford Will, and Neil Ashby claim falling electromagnetic radiation is blue-shifted as it falls, i.e. its energy increases as it falls.

- GPS shows that the frequency remains unchanged as it falls in the earth's gravitational potential.
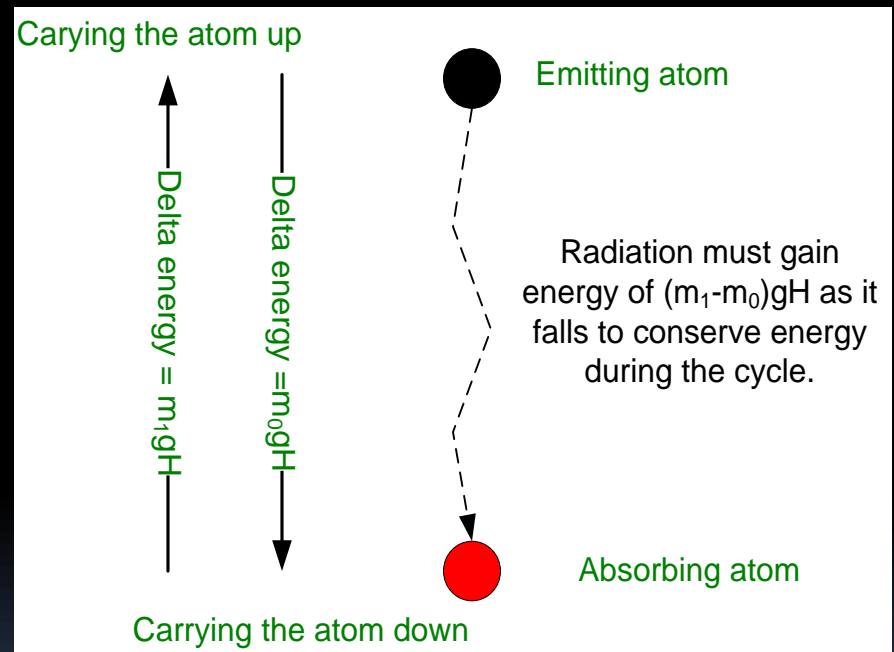
Unusual Logic from World Famous Relativists

- **The Clifford Will equivocation (paraphrased):**
  - You can move clocks to different gravitational potentials and observe that they run at different rates—but that is after the fact. **You still do not know what happens in real time.**

- **The Neil Ashby's "Double or Nothing" quote:**
  - Second, the *strong equivalence principle* implies that light traveling downward in a gravitational field is shifted to a higher frequency; i.e. it is blue shifted and gains energy. **As a consequence, atomic clocks at a high elevation in a gravitational field run faster**. (Italics in the original.)
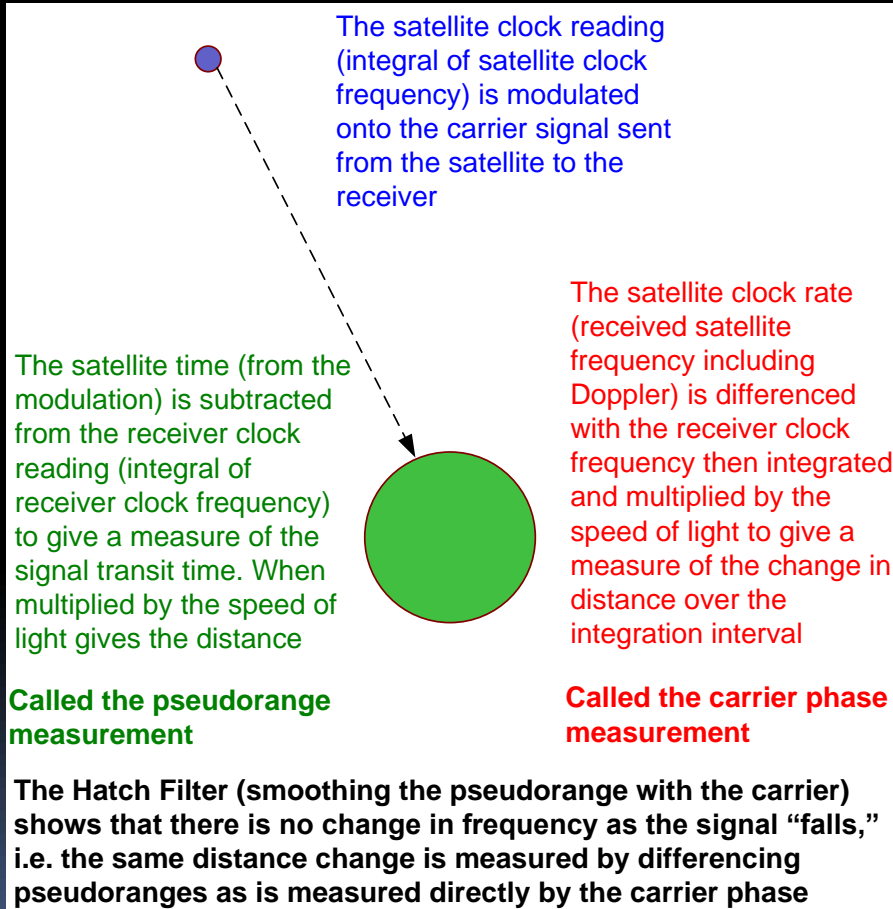
The Logic in Favor (E & F)

The argument is made via the conservation of energy

- It takes energy to move an atom upward in a gravitational field. $(E_1/c^2)*(gH)$

- After moving it up let it emit some radiation and go to lower energy E_o Thus, the photon energy is (E_1-E_o)

- Move the atom back down and recover energy $(E_o/c^2)*(gH)$

- Let it absorb electromagnetic energy from the photon radiated above. This must (via conservation of energy) bring it back to its original state. Therefore the energy received must have increased as it fell by $(E_1-E_o)/c^2*(gH)$

(Emitted radiation function of potential, e.g. Pound-Rebka experiment)
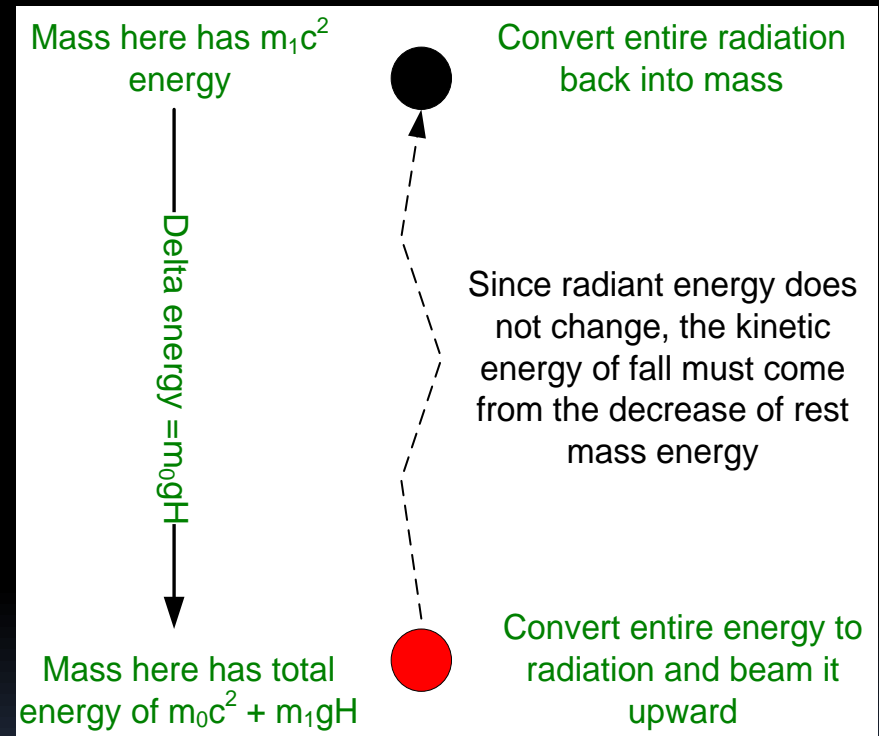

Carying the atom up

Emitting atom

Delta energy = m_1gH

Delta energy = m_0gH

Radiation must gain energy of $(m_1-m_0)gH$ as it falls to conserve energy during the cycle.

Absorbing atom

Carrying the atom down

GPS Logic Against

The satellite clock reading (integral of satellite clock frequency) is modulated onto the carrier signal sent from the satellite to the receiver

The satellite clock rate (received satellite frequency including Doppler) is differenced with the receiver clock frequency then integrated and multiplied by the speed of light to give a measure of the change in distance over the integration interval

The satellite time (from the modulation) is subtracted from the receiver clock reading (integral of receiver clock frequency) to give a measure of the signal transit time. When multiplied by the speed of light gives the distance

Called the pseudorange measurement

Called the carrier phase measurement

The Hatch Filter (smoothing the pseudorange with the carrier) shows that there is no change in frequency as the signal "falls," i.e. the same distance change is measured by differencing pseudoranges as is measured directly by the carrier phase

- If the frequency increased as the signal fell:
  - The PRN Code measurements would measure a longer distance.
  - The Carrier Phase measurements would measure a larger distance change. Integrating the Carrier Phase would cause larger and larger differences.
  - Net result smoothing the code with the carrier (Hatch Filter) would not work.

Implications of the Logic Error

- Reversing the Einstein-Feynman logic: Since the EM energy does not change, the mass energy cannot change. Therefore, the kinetic energy of fall must come from the rest mass (structural) energy.

  - This implies that gravity does not supply energy at all—it simply converts rest mass energy into kinetic when matter falls and vice versa when it rises

Mass here has m_1c^2 energy

Convert entire radiation back into mass

Delta energy = m_0gH

Since radiant energy does not change, the kinetic energy of fall must come from the decrease of rest mass energy

Mass here has total energy of $m_0c^2 + m_1gH$

Convert entire energy to radiation and beam it upward

More Implications

- **If gravitational energy comes from the rest mass energy, then the spatial gradient (derivative) should give the gravitational force.**
  - **How close is close enough?**

- **The gravitational scale factor used in GRT has two different forms: Einstein's and isotropic**
  - **Only the isotropic form is consistent with the force being the gradient of the potential**

- **The isotropic form is consistent with an ether density gradient rather than curved space-time**

- **Einstein's scale factor**

$$s = \sqrt{1 - \frac{2GM}{rc^2}} \approx 1 - \frac{GM}{rc^2} - \frac{1}{2}\left(\frac{GM}{rc^2}\right)^2 + \ldots$$

- **Isotropic scale factor (PPN form)**

$$s = e^{-\frac{GM}{rc^2}} \approx 1 - \frac{GM}{rc^2} + \frac{1}{2}\left(\frac{GM}{rc^2}\right)^2 + \ldots$$

- **Potential energy**

$$E_p = mc^2 s$$

- **Gradient of Potential Energy—Force**

$$F = \frac{d}{dr}E_p = -\frac{GMms}{r^2} = -\left(\frac{G}{c^4}\right)\frac{(Mc^2)(mc^2 s)}{r^2}$$

- **NO BLACK HOLES**

Even More Implications

- **Velocity scale factor**

$$\gamma = 1/\sqrt{1 - V^2/c^2}$$

- **Total Energy**

$$E_T = E_S + E_K$$

- **Components of total energy**

$$mc^2 s\gamma = mc^2 s/\gamma + mV^2 s\gamma$$

- **Identification of structural and inertial mass**

$$m_I c^2 s = m_S c^2 s + m_I v^2 s$$

Proof: Clocks in elliptical orbits (additive effects) & clocks at sea level (cancelling effects)

- **Problem:**
  - Decreased potential energy causes the frequency radiated to decrease (decreased rest mass energy or structural energy)
  - Increased kinetic energy also causes the frequency to decrease
- **Solution:**
  - Same cause—increased kinetic energy causes a decrease in the structural energy, i.e. the true kinetic energy is doubled

- **Structural & Inertial Mass Diverge with Velocity**

Related (Energy) Logic Error

- SRT invariant rest mass claim:

$$E_T^2 = E_R^2 + (pc)^2$$

- Or:

$$(m_0 c^2 \gamma)^2 = (m_0 c^2)^2 + (m_0 \gamma V c)^2$$

- Divide by E_T:

$$m_0 c^2 \gamma = \frac{m_0 c^2}{\gamma} + m_0 V^2 \gamma$$

- Solve for structural energy (earth in sun's frame)

$$E_T - E_K = m_0 c^2 \gamma - m_0 V^2 \gamma = \frac{m_0 c^2}{\gamma}$$
$$= E_S$$

New Topic – Momentum Conservation

- **Related Logical Errors**
  - Equivalence Principle (if valid very limited application)
    - Ashby—earth's acceleration cancels solar gravitational potential
  - Infinitesimal Lorentz Transformations (not valid at all)
    - Goldstein statement—unwritten SRT postulate
    - Ashby—used to counteract his Equivalence Principle error
  - SRT Physical Symmetry
    - Einstein's argument—all inertial frames have equal standing
  - SRT "Block Universe" –all time and space exist together
    - Minkowski—mixing of time and space—no universal "NOW"

Trail to Current Paper

- (2003) My paper "Those Scandalous Clocks" in *GPS Solutions*
  - Disagreed with Ashby and Spilker in the GPS "Bible," Parkinson, et al.
  - Two voted to publish—two against
- (2012, 5 July) Reviewed Ashby and Weiss paper, submitted to *GPS Solutions* "Why there is no noon-midnight redshift in GPS"
- (2013, 29 Jan.) second detailed review (inverted clock logic)
- (2013, 8 Apr.) third review suggested rebuttal paper, with their right to publish reply in same issue.
- (2013, mid July) submitted rebuttal paper
- (2013, 24 July) Ashby & Weiss publish "Why there is no noon-midnight redshift in GPS" online
- (2014, June) rebuttal paper, "Why there is no apparent noon-midnight redshift in GPS," published in *Physics Essays*
- Current paper, "Tolerable Asymmetry: The hidden physics of the Lorentz Transformation. (Detailed description of clock bias as a function of position on the earth.)

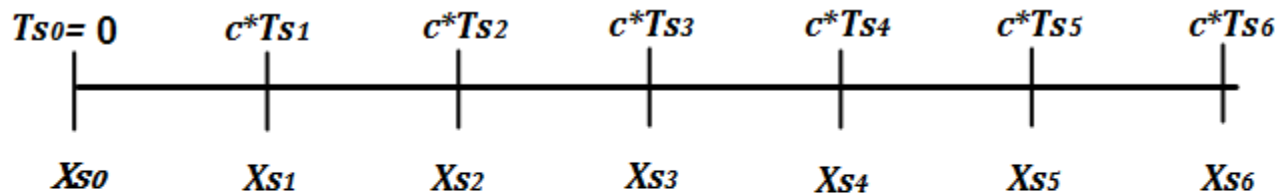# Introduction: Tolerable Asymmetry

- "For if K be a system of co-ordinates relatively to which the Lorentzian ether is at rest, the Maxwell-Lorentz equations are valid primarily with reference to K. But by the special theory of relativity the same equations *without any change of meaning* also hold in relation to any new system of co-ordinates K' which is moving in uniform translation relatively to K. Now comes the anxious question:--Why must I in the theory distinguish the K system above all K' systems, which are *physically equivalent* to it in in all respects, by assuming that the ether is at rest relatively to the K system? For the theoretician such an *asymmetry* in the theoretical structure, with no corresponding asymmetry in the system of experience, *is intolerable*. If we assume the ether to be at rest relatively to K, but in motion relatively to K', the *physical equivalence* of K and K' seems to me from the logical standpoint, not indeed downright incorrect, but nevertheless inacceptable.

Two Inertial Frames in Relative Motion (in the X direction – Step one)

Moving Frame (subscript e or small letter) → V

Reference Frame (Initial Frame) (subscript s or capital letter)
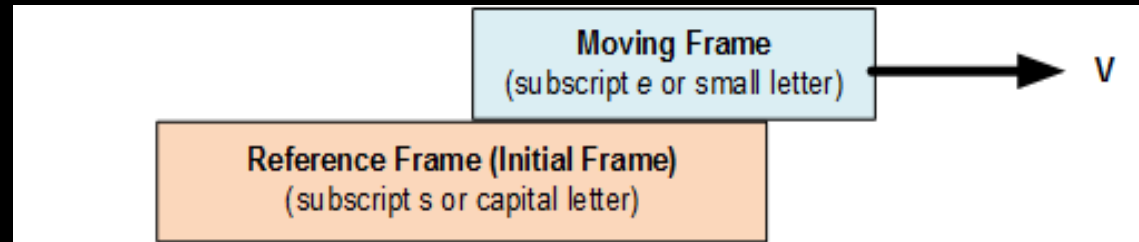
- $f_e = \dfrac{F_s}{\gamma} = F_s\sqrt{1 - \dfrac{V^2}{c^2}} \approx F_s\left(1 - \dfrac{V^2}{2c^2}\right)$ (lower clock frequency)   (1p)

- $t_e = \gamma T_s$ (longer time intervals)   (2p)

- $f = \gamma F \; : \; t = T/\gamma$ (mapped frequency appears larger)   (3m)

- $m_e = \gamma M_s = \dfrac{M_s}{\sqrt{1 - \dfrac{V^2}{c^2}}} \approx M_s\left(1 + \dfrac{V^2}{2c^2}\right)$ (mass is increased)   (4p)

- $p_s = M_s V_s = \gamma M_s \dfrac{V_s}{\gamma} = m_e V$ (momentum is conserved)   (5p)

- $V = \dfrac{V_s}{\gamma} = V_s\sqrt{1 - \dfrac{V^2}{c^2}} \approx V_s\left(1 - \dfrac{V^2}{2c^2}\right)$ (frame velocity is decreased)   (6p)

Stationary Frame Units

$Ts_0 = 0$ $c*Ts_1$ $c*Ts_2$ $c*Ts_3$ $c*Ts_4$ $c*Ts_5$ $c*Ts_6$

Xs_0 Xs_1 Xs_2 Xs_3 Xs_4 Xs_5 Xs_6

Distance units set by speed of light multiplied by time units

$$X_s = cT_s$$

Velocity units set by distance units divided by time units

$$V_s = X_s/T_s$$

Momentum units given by velocity units times mass (units)

$$P_s = M_s V_s = (\gamma M_s)(V_s/\gamma) = (\gamma M_s)\frac{X_s}{\gamma T_s} = m_e \frac{X_s}{t_e} = m_e V_e = p_e$$

Momentum units are automatically in the units of the moving frame—as if the time units were adjusted for movement

Reference Frame (initial frame)

Frames in relative motion

- Frame motion increases inertial mass (stationary frame) but decreases structural mass (moving frame)

- The moving frame U_y and U_z velocities are adjusted by the moving frame time units as well

- Distances are unchanged

- (sf) $m = \gamma M$ (7p)
- (mf) $m = M/\gamma$ (7'p)
- (mf) $m = \gamma M$ (7m)

- $u_y = U_Y/\gamma$ (8p)
- $u_z = U_Z/\gamma$ (8p)
- $u_y = \gamma U_Y$ (10m)
- $u_z = \gamma U_Z$ (10m)

- $y = Y$ (9mp)
- $z = Z$ (9mp)

Add x Motion in the Moving Frame (Step two)
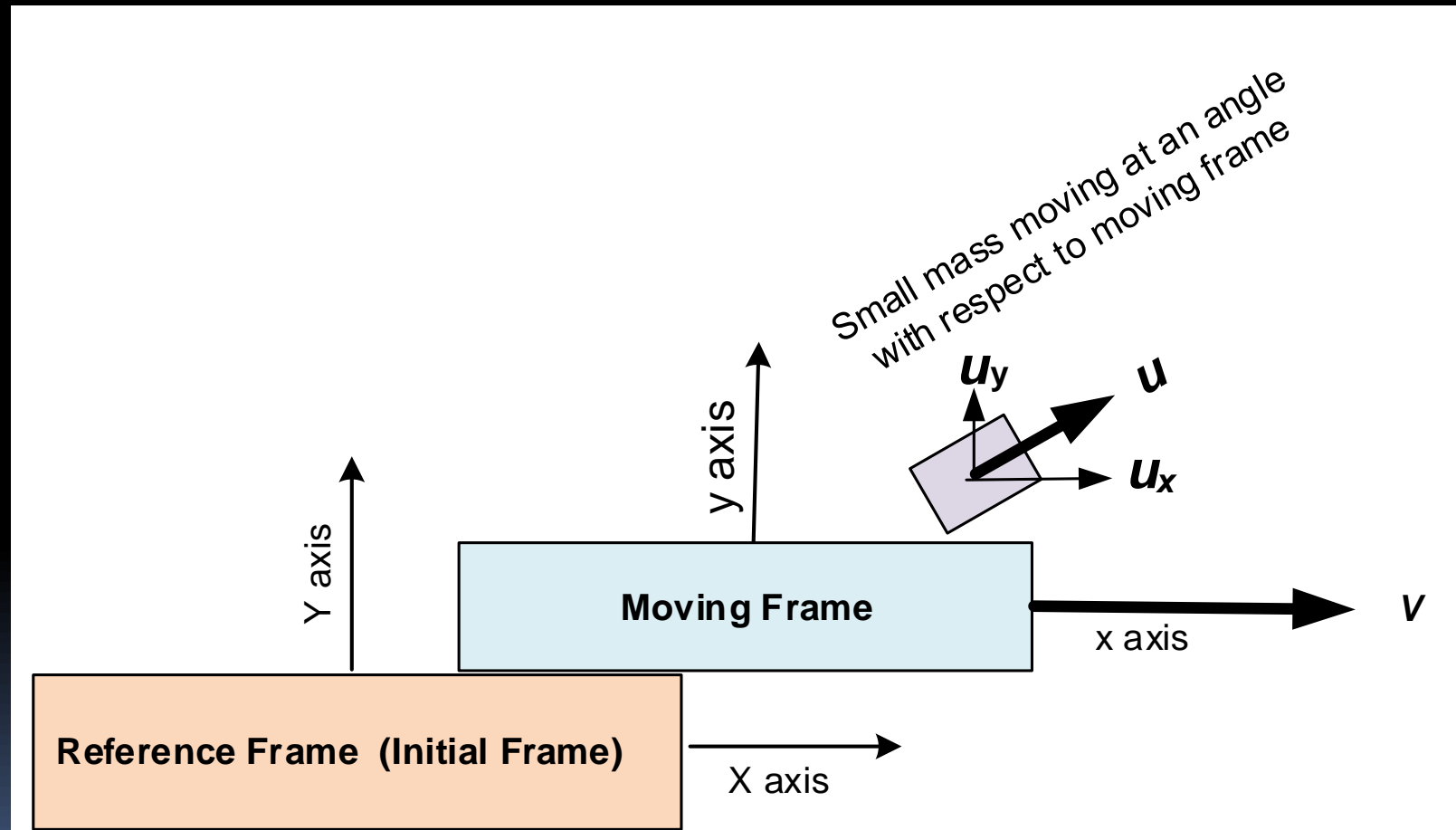
Adding the *Ux* Speed

$$V = \frac{V_s}{\gamma} = V_s\sqrt{1 - \frac{V^2}{c^2}} \approx V_s\left(1 - \frac{V^2}{2c^2}\right) \qquad \text{(6p)}$$

Frame velocity

$$V + u_X = (V_s + u_{Xs})\sqrt{1 - \frac{(V+u_X)^2}{c^2}} \approx (V_s + u_{Xs})\left(1 - \frac{V^2}{2c^2} - \frac{Vu_X}{c^2}\right) \approx V + u_{x'} - \frac{V_s V u_X}{c^2} \qquad \text{(11p)}$$

Frame velocity plus

$$u_{x'} \approx u_X\left(1 + \frac{V^2}{c^2}\right) \approx \gamma^2 u_X \;\; \text{or} \; u_X = u_{x'}/\gamma^2 \qquad \text{(12p)}$$

From first and last expressions of (11p)

$$u_x = u_X/\gamma^2 \qquad \text{(14p)}$$

Decrease the size of the x velocity units by γ^2 (true isotropic value)

$$u_x = \gamma^2 u_X = \gamma^2(U_X - V) \qquad \text{(15m)}$$

True mapping

Completing the Added *Ux*

$$m' \approx M_S \left(1 + \frac{V^2}{2c^2} + \frac{Vu_X}{c^2} + \frac{u_X^2}{2c^2} \right) \approx m_e + M_S \left(\frac{Vu_X}{c^2} \right) \approx m_e \left(1 + \frac{Vu_X}{c^2} \right) \quad \text{(13p)}$$

Mass equation for stationary frame

$$v = \gamma^2 V \qquad \text{(16m)}$$

Frame velocity in moving frame units

$$x = t_e u_x = \frac{(T_s \gamma)(U_X - V)}{\gamma^2} = (X - VT_s)/\gamma \qquad \text{(17p)}$$

Velocity (14p) * time (2p) = distance

$$x = \gamma(X - VT) = \gamma(X - X_0) \qquad \text{(18m)}$$

Mapping distance

The Selleri Transformation

- **The Selleri Transformation mapping is the automatic transformation that results between a stationary frame and a frame put in motion at a velocity of V**

- **Differs from the Lorentz Transformation only in the time mapping**

- **The augmentation is very significant**

- $f = \gamma F$ and $t = T/\gamma$

- $x = \gamma(X - VT)$

- $y = Y$ and $z = Z$

Augmented by:

- $u_x = \gamma^2(U_X - V) = \gamma^2 u_X$

- $u_y = \gamma U_Y$ and $u_z = \gamma U_Z$

- $v = \gamma^2 V$

- $m = \gamma M$

The Inverse Selleri Transformation

- $F = f/\gamma \; : \; T = \gamma t$
- $X = \dfrac{x}{\gamma} + VT = \dfrac{x}{\gamma} + \dfrac{v}{\gamma^2}\gamma t = (x + vt)/\gamma$
- $Y = y$ and $Z = z$

Augmentations:

- $U_X = (u_x + v)/\gamma^2$
- $U_Y = u_y/\gamma$ and $U_Z = u_z/\gamma$
- $V = v/\gamma^2$
- $M = m/\gamma$

The (Apparent) Lorentz Transformation (Clock moving in the moving frame)

- $f' \approx F_s \left(1 - \frac{V^2}{2c^2} - \frac{Vu_X}{c^2} - \frac{u_X^2}{2c^2} \right) \approx f - F_s \left(\frac{Vu_X}{c^2} \right) \approx f \left(1 - \frac{Vu_X}{c^2} \right)$

  The frequency equation is parallel to the mass equation (13p) above

- $t' = \int f' \frac{dt}{k} = \int f \left(1 - \frac{Vu_x}{c^2} \right) \frac{dt}{k} = t - \int \frac{V}{c^2} dx = t - \frac{Vx}{c^2}$

  The frequency modified equation (3m)

- $\Delta t = t' - t = -\frac{Vx}{c^2}$

  Difference Lorentz time equation minus Selleri time equation

- $t' \approx \frac{T}{\gamma} - \frac{\gamma V(X - VT)}{c^2} = \gamma T \left(\frac{1}{\gamma^2} + \frac{V^2}{c^2} - \frac{VX}{Tc^2} \right) = \gamma \left(T - \frac{VX}{c^2} \right)$

  Replacing the t and x in the t' equation with the Selleri mapped values gives the Lorentz time equation

Why the Apparent Lorentz Transformation?

- The clock bias as a function of position converts the Selleri Transformation (ST) to the Apparent Lorentz Transformation (ALT)

- But the mechanical portion of the ST (except time and speed of light) already include the effect of the clock bias as a function of position

- Therefore all of the augmentation equations of the ST are valid still for the ALT which destroys the apparent symmetry of the LT (physical velocities are different)

- The inverse ALT is obtained by removing the clock bias as a function of position and applying the inverse ST

Speed of Light

Selleri speed of light

$$c_y = \gamma c_Y \quad \text{and} \quad c_z = \gamma c_Z \qquad \text{(mapping)}$$

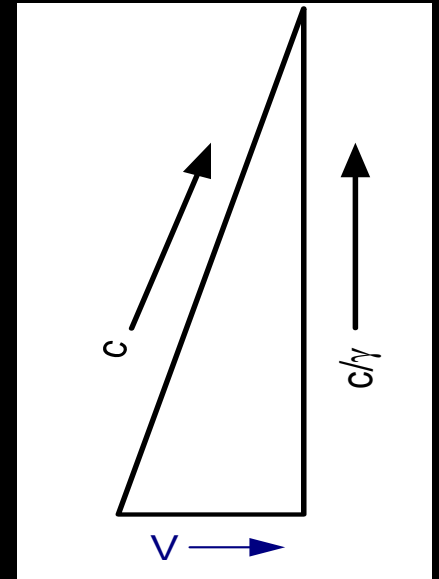$$\overrightarrow{c_x} = \gamma^2(c - V)$$

$$\overleftarrow{c_x} = -\gamma^2(c + V)$$

Lorentz speed of light

$$c_y = c \quad \text{and} \quad c_z = c \qquad \text{(assumes unchanged)}$$

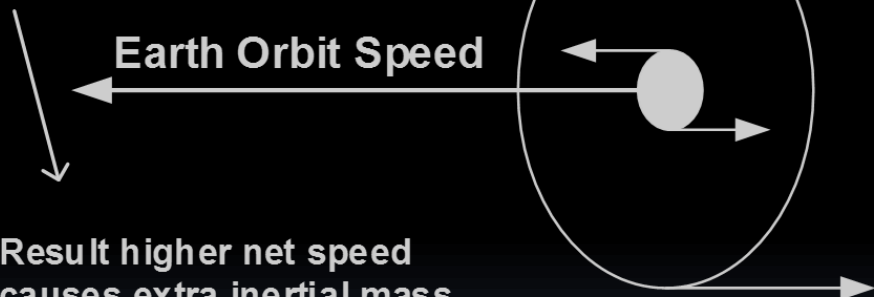$$\overrightarrow{c_x} = c \qquad \text{(clock biases with x position}$$

$$\overleftarrow{c_x} = c \qquad \text{makes the speed appear isotropic)}$$

Extending to the Earth & GPS

Net result: Fore and aft length contraction

Earth spin speed and GPS orbit speed add to earth's orbit speed

Result lower net speed causes smaller inertial mass increase and via conservation of momentum slightly higher speed relative to earth center.

Earth Orbit Speed

Result higher net speed causes extra inertial mass increase and via conservation of momentum slightly slower speed relative to earth center

Earth spin speed and GPS orbit speed subtract from earth's orbit speed

NOT TO SCALE

Clock Bias from Spin & Orbit Velocities

- The fractional frequency change caused by combined velocities

  $$\frac{\Delta f}{f} \approx -\frac{V^2}{2c^2} - \frac{V \cdot v}{c^2} - \frac{v^2}{2c^2}$$

- First and last term combined with earth's sea level gravitational potential is a constant clock rate. The middle term integrates into a clock bias

  $$\Delta t = \int -\frac{V \cdot v}{c^2} dt = -\frac{Vx}{c^2}$$

- The earth's spin combined with the earth's orbital speed causes a cyclic clock bias once per sidereal day, i.e., 366.24 cycles per year.

- Varies from -2.1 μ sec. at the front of orbital direction to +2.1 μ sec. at the rear
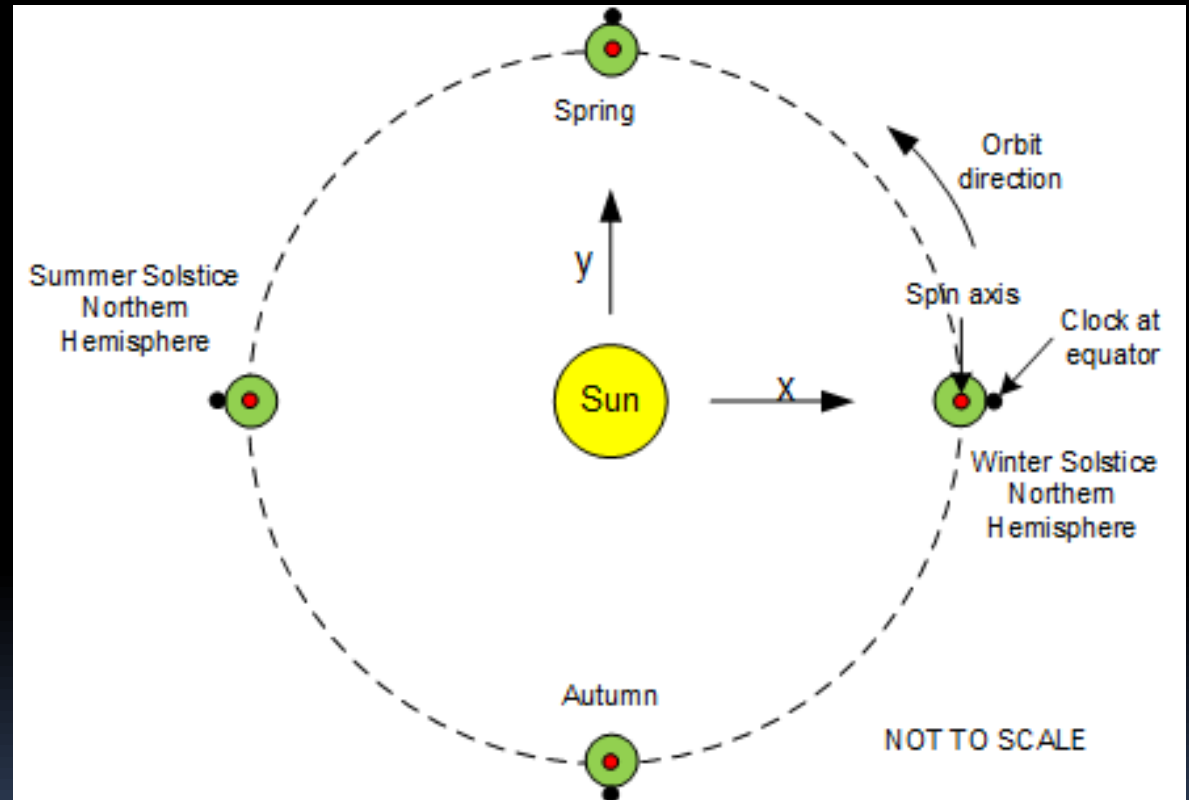
Clock Bias from Solar Gravitational Potential

- Assume we stop the earth's spin, but keep the polar orientation constant in space.

- Assume equatorial plane in ecliptic plane

- Put one clock at pole (or earth center) and one clock at equator.

- The equatorial clock will cycle closer and farther away from the sun in a one year cycle

- The induced fractional frequency difference between the two clocks

  - $$\frac{\Delta f}{f} \approx \left[-\frac{GM}{(R+rCos(\theta))c^2}\right] - \left[-\frac{GM}{Rc^2}\right] \approx \frac{GM}{Rc^2}\left(\frac{r}{R}\right)Cos(\theta)$$

- Substitute circular orbital velocity for Sun's gravitational potential

  - $$\frac{\Delta f}{f} = \frac{V}{c^2}\left\{rCos(\theta)\frac{V}{R}\right\} = \frac{V}{c^2}rCos(\theta)\dot{\theta}$$

- Integrate to get the clock bias

  - $$\Delta t = \frac{V}{c^2}\int rCos(\theta)d\theta = \frac{VrSin(\theta)}{c^2} = \frac{Vx}{c^2}$$

Effect of the Earth's Orbital Curvature

Obliquity angle set to zero (maximum velocity at midnight)

Earth's spin adds and subtracts from orbit velocity which causes fore/aft clock biases of $\pm 2.1 \mu$ sec. and slight earth flattening

Polar Obliquity Angle at 90^0

Clock at N pole at winter solstice runs faster due to solar gravitational potential and at summer solstice slower. Result minus one cycle of 2.1 μ sec. per year

Spin magnitude modulated

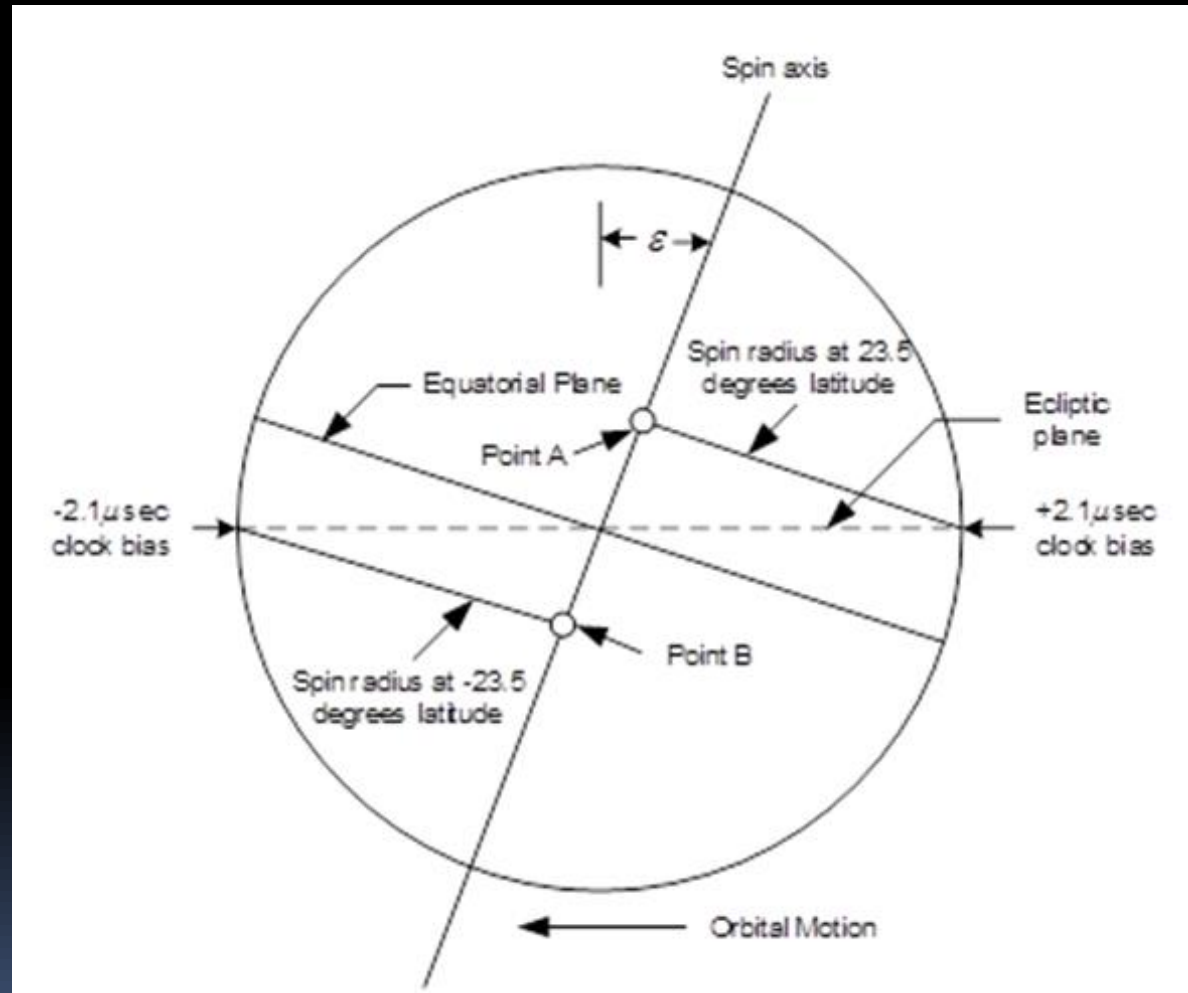No solar acceleration effect on clock
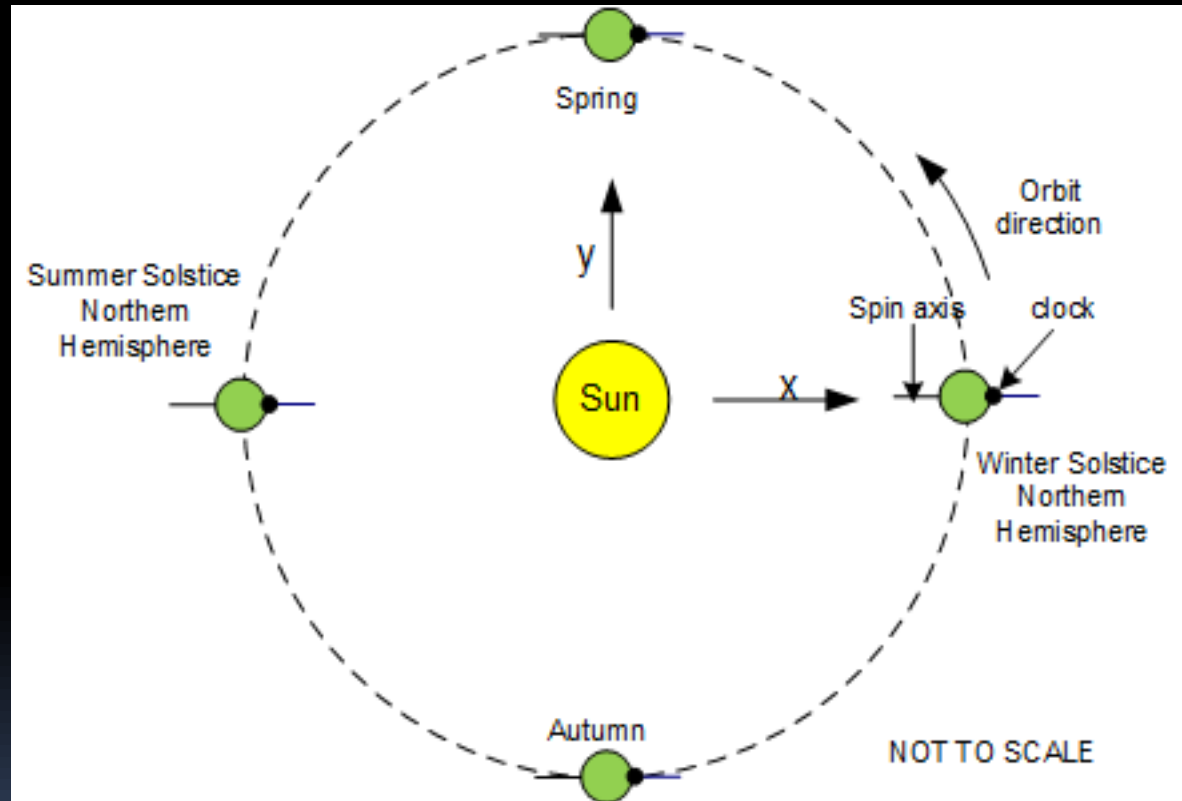
Clock Bias Geometry at Earth's Vernal Equinox

Solar potential clock bias adds to spin induced clock bias to cause direct along orbit clock biases needed to make the solar speed of light look like isotropic earth speed of light

Automatic clock synchronization

Automatic ALT

Transitive Property of the ALT

- Lorentz claim of symmetry insures its transitive property
- ALT shows numerical symmetry rather than physical symmetry. But, via the numerical symmetry its transitive property is insured
- The transitive property means that any child frame which can be shown to be described by an ALT from any parent frame can also be described by a single ALT from the absolute frame to that same child frame. This implies a universal **NOW**
- **Frame hierarchy: moon, earth, sun, galactic, CMB**

Length Contraction and Other Physical Laws

- It was noted earlier the orbital length contraction does not ensure contraction of physical matter

- One needs to show that the specific laws of physics (mechanical and electromagnetic) are numerically equivalent under an ALT

- Gravitational proof largely done in prior paper—gravitomagnetic (kinetic) force adds to gravity force to makes the flattened orbit appear to be a gravitational inverse square law towards center of mass

- Proof needed for electromagnetic forces—has been outlined but not completed

Extending Results to GPS Orbits

- The spin of a clock at the equator of the earth with an arbitrary obliquity to the ecliptic is directly analogous to the spin of a clock on an earth satellite with different orbital plane angles with respect to the ecliptic plane

- Just as the solar gravitational potential subtracts one cycle per year from the clock bias cycles of clocks on the earth, it will also subtract one cycle per year from the satellite clock cycles caused by their cyclic orbits around the earth.

- Neil Ashby and Marc Weiss claim any effect from the sun upon GPS clocks is cancelled by the earth's acceleration per the equivalence principle

The Equivalence Principle

- Ashby and Weiss statement of EP
  - Over a sufficiently small region of space and time the effect of acceleration cannot be distinguished from a gravitational field.
- Gravitational potential affects the clock frequency—which is continually integrated into the GPS satellite time
  - It is not limited to a small period of time (contradicts A&W)
- Acceleration affects the received clock frequency due to path length change during the signal transit time

$$\frac{\Delta f}{f} = -\frac{a\tau}{c} = -\frac{GM}{R^2}\left(\frac{1}{c}\right)\left(\frac{y}{c}\right) = -\frac{GM}{Rc^2}\left(\frac{y}{R}\right)$$

- Acceleration does cancel out the received frequency effect but not the modified time in the satellite

Infinitesimal Lorentz Transformations

- Since A&W denied the solar clock effect (and ignored the spin speed combined with orbit speed effect), they needed another mechanism to generate the clock biases to cause isotropic light speed on the earth.
- They suggested two mechanisms
  - First they reversed cause and effect: indicating that isotropic light speed caused relativity of simultaneity
  - Second they effectively adopted the Goldstein hypothesis

ILTs – The Goldstein Hypothesis

Consider a particle moving in the laboratory system with a velocity v that is not constant. Since the system in which the particle is at rest is accelerated with respect to the laboratory, the two systems should not be connected by a Lorentz transformation. We can circumvent this difficulty by a frequently used stratagem (elevated by some to the status of an additional postulate of relativity). We imagine an infinity of inertial systems moving uniformly relative to the laboratory system, one of which instantaneously matches the velocity of the particle. The particle is thus instantaneously at rest in an inertial system that can be connected to the laboratory system by a Lorentz transformation. It is assumed that this Lorentz transformation will also describe the properties of the particle and its true rest system as seen from the laboratory system.

ILTs falsely imply that all accelerations automatically result in an automatic adjustment to the speed of light. This is not supported by experiment. Accelerations have never been shown to directly affect a clock. How could one ever verify the speed of light across an infinitesimal distance?

Conclusions: Tolerable Asymmetry

- The ALT shows that:
  - Inertial frames are not physically symmetric
    - Revealed by changes in units and augmented velocity equations
  - Inertial frames have a numerical symmetry resulting from the addition of clock biases as a function of position
    - Via the transitive property restores a universal **NOW** to physics
    - **Implies that space-time is a numerical illusion**

Conclusions: Physical Symmetry Problems

- Dirac
  - One can put the calculations of the Lamb shift and of the anomalous magnetic moment of an electron into a sensible form by introducing a cutoff, by taking the upper integration limit in our integrals to be not infinite but some finite value. … One still gets effectively the same Lamb shifts and the same anomalous magnetic moment when one works with this cutoff, to the first order of accuracy. One then has a theory where the infinities are gone, a theory that is sensible mathematically. An unfortunate result is that, of course, the relativistic invariance of the theory is spoiled. … One can thus make quantum electrodynamics into a sensible mathematical theory, but only at the expense of spoiling its relativistic invariance. I think, however, that that is a lesser evil than departing from standard rules of mathematics and neglecting infinite quantities.

- Smolin
  - These two discoveries, of relativity and of the quantum, each required us to break definitively with Newtonian physics. However, in spite of great progress over the century, they remain incomplete. Each has defects that point to the existence of a deeper theory. But the main reason each is incomplete is the existence of the other. … Besides the argument based on the unity of nature, there are problems specific to each theory that call for unification with the other. Each has a problem of infinities.

Conclusions: Resistance to Revision

- Evidenced by twisted logic to avoid physical implications, e.g. Clifford Will and Neil Ashby

- Paul Davies quote:
  - If relativity were wrong, our detailed understanding of much of subatomic physics would collapse. The enormous progress made in understanding the elementary constituents of matter, and the forces and fields that link them, would turn out to be founded upon a false concept. From quarks to quasars, scientists would no longer be able to understand the basis of their own immense knowledge.

Conclusions: Unification at the Base with MLAT

- An aether based model has the potential to combine SRT, GRT and Quantum phenomena with minimal disruption to current knowledge
  - Gravitation based upon aether density gradient rather than curved space-time
    - Elastic equations very similar to the GRT equations
    - Newton speculation: 297 years ago
    - Standing wave-structures displaces internal ether, creating an external exponentially decaying aether density gradient.
  - ALT follows from sensible aether density and shear effects with motion
  - Quantum effects follow from aether resonances and resonant structures
- **Space-time and curved space are illusions**

Conclusions: Predictions

- LIGO will never directly detect gravity waves
  - They are the same as electromagnetic waves and thus will not propagate unimpeded through space.
- The Higgs Particle—true or not, will not contribute to any significant improvement in understanding physics
  - Mass is the result of the exclusion of aether from a small region of space due to the resonant structure and the reaction speed, c, of the aether.
- Tentative: The anomalous earth flyby results will prove to be explained by momentum conservation relative to the CMB absolute frame.

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- **I retain the ownership of any errors**

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