Abstract

Time Perspective Bias (TPB) predicts that all quantum experimental results will vary with the difference of scales between the source subject, and the effect observed.

TPB offers an alternate explanation to the "undetermined probability wavefunction Ψ". In TPB, time-divergence (perspective distortions in time), occur in observations between classic scale and nano scales.

Explanations, resolutions and insights gained from TPB

TPB explains all of the following mysteries with beauty, simplicity and persuasion:

In nanoscales:
- The cloud appearance of electron orbits
- The gaps between electron orbits are very much predicted
- The shapes of orbitals
- Collapse, as well as duality
- Why orbital density appears closest to nucleus
- Progression of energy states
- TPB suggests that information about energy states and position can be gained from comparing observations at two separate points in time.

In macroscales:
- Accelerated expansion
- Millisecond pulsars
- Galaxy outer rim rotation mysteries
- The nonuniform expansion of supernovae remnant clouds

A great many mysteries are simply explained by the single novel concept that events (durations of time) appear to converge in macro scales and diverge in nanoscales. The key is understanding that the effect only occurs between scales of great magnitude difference. Furthermore the effect is nullified, in quantum mechanics, when these two events are brought to the same scale by the introduction of an apparatus.

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1. INTRODUCTION

Time Perspective Bias is best understood within the more broad framework of Cosmology. I begin with nanoscales in Quantum Mechanics, then proceed to macroscales of Cosmology. Predictions are well supported.
2. QUANTUM SCALE TPB - TIME DIVERGENCE

Understanding Time Divergence:

With great respect to the accurate mathematics of wavefunction, the "time divergence" model of quantum mechanics offers alternative and novel concepts which provides a more intuitive understanding of quantum mechanics:

Concepts of Time Divergence:

- Observations from the nanoscopic scale to the classic scale are biased with a linear time perspective, (TPB).
- The TPB effect, on such observations, is a divergence of time (both in past and present).
- Thus, this observation (between \( \Delta \) scales) does not represent just a single point in time, but rather a time range from \(-\Delta t\) past to \(+\Delta t\) future.
- The observer, who is at classic scale, sees this range all at one moment (from his perspective) like a time-lapse.

\[
t_p \epsilon = \frac{h}{I \lambda} \tag{1}
\]

Most significantly, an analog proportional relationship occurs between \( \Delta \) scales and the amount of time divergence: As the scale between the observer and quantum event increases, the appearance of wavelength increases in proportion. Note that in DeBroglie wave equation \( \lambda \) is inversely proportional to mass.

TPB predicts that introducing an intermediate apparatus, such as detection devices, will essentially bring the two events to the same scale. Thus, the effect of perspective time divergence is no longer significant.

How is time divergence distinct from superposition?

A detection of an electron orbit, is between the two greatly differing scales of classic and nanoscopic space. The effect of time divergence is significant per equation 1. During a single moment (to the observer) he detects a range of time from past to present of electron rotations. Thus, there appears to be an integration of total phases of energy and position. However, TPB proposes that the appearance is actually a projection in perspective, and that electrons actually do orbit from ground to excited states (Bohr model). Over a range of time they are superimposed, as opposed to a superposition of all probable states. Figure 1 illustrates observed multiple rotations over a range of time and what the observer sees (detects), in his single moment; a more dense shape which is actually multiple orbits over an expanded range of time (Similar to a time lapse).

FIG. 1. Time Divergence model of superposition

Time divergence is more like a time-lapse photography, which is superimposed in a progression of time, instead of superposition

FIG. 2. Similar to time-lapse photography; A progression in time
Gaps between electron orbits:
Since time divergence occurs at a specific range, whatever occurs outside of that range is not detectable to the observer at classic scale. Now Consider the case where the orbit is greater than the range of divergence; The observer would detect a particles world-line path from the present to a future point and then vanish. He would also detect a path from the present back into the past and vanish at some point, as well. Figure 3 illustrates both a graph of orbit paths over time, within an integrated viewable range.

Why "orbitals" are more dense toward center
Superimposed multiple orbits, within a range of time, form an s-sphere which naturally has more geodesic paths toward the center. See figure 1

TPB, in magnification, proposes that time has the same geometric divergence, and convex distortions, as does spatial magnification [1]. See figure 4

TPB offers an alternate explanation to the undetermined probability wavefunction Ψ, in favor of a more objective reality. See "On the reality of the quantum state" [2].

In TPB, time magnification, and divergence appears to be pluralistic in time and, subsequently, in position. The effect is essentially equivalent to a field.

3. HOW THE TIME DIVERGENCE MODEL MIGHT PROVIDE INSIGHT INTO MODULUS STATES OF ENERGY AND POSITION

TPB suggests that information about energy states and position can be gained from comparing observations at two separate points in time.

An electron cloud, observed at two minutely spaced points in time, will mutually overlap at the same point in their diverged range of time. Example: If an electron, in the first instance, is at position x approaching +Δt Then the second instance will contain the electron at the same point x, only it will be approaching −Δt. The two observations will be of the exact same event, at the exact same time.

This knowledge, of two present moment electron states, if successfully mapped onto a superimposed shell, can provide a practical link between what is observed and the actual excited or ground states.

TPB suggests that an extrapolation can be derived from the knowledge of superimposed dynamic rotations over time range, (even though they are collectively viewed at an instant).
4. DAVVISON-GERMER EXPERIMENT

My theory does not attempt to contradict the proven Davvison-Germer Experiment. Rather, it addresses the novel concept of the difference in scales between events. This is not particular to the DG experiment. It is equally applicable to all particle-wave duality experiments.

Note the following observations about the relative scales within particle-wave duality experiments:

**Davvison-Germer**
- The Farady Box detector is at a classical scale (familiar classical mechanics).
- The emitted electron beam is at a nanoscopic scale of quantum mechanics.
- The observation is between an event from the classic scale and an event which emanated at the quantum scale
- An interference pattern is demonstrated.

**Double-Slit with optical plate**
- The optical plate (similarly) is at a classical scale.
- The electron is, of course, at a nanoscopic scale of quantum mechanics.
- The observation is (again) between an event from the classic scale and an event which emanated at the quantum scale
- An interference pattern is demonstrated.

**Double-Slit with optical plate and detection at the slits**
- The optical plate is at a classical scale.
- The event of a detection apparatus at the slits (although very small) is also at a classical scale.
- Thus, the observation is between two events at the same scale.
- A particle is demonstrated.

TPB Theory recognizes that there are two distinct observational conditions:

1. An observation between two events at scales greatly differing in magnitude, demonstrating wave interference.
2. An observation between two events at the same scale in magnitude, demonstrating particles.

TPB Theory raises the question, in the Davvison Germer experiment:

What would happen to the electron charge, over the same angle, if the two events of (particle emission and detection) could be brought to the same essential scale during the observation?

The two logical approaches to achieve this would be:

1. By adding a system, such as a field of photons and thereby causing an observable event of scattered photons for each individual electron, between the emitter and the nickel target.
2. By replacing the Farady box with nanoscopic detection near the point of beam scattering.

The principle behind TPB is a linear perspective of events, similar to linear perspective of spatial dimensions, which are represented by the inverse proportionate formulas: 5 and 1.

**Wave collapse explained:**
To reiterate; TPB predicts that introducing an intermediate apparatus, such as detection devices, will essentially bring the two events to the same scale. Thus, the effect of perspective is no longer significant. This novel concept of bringing events to the same scale is best described by the Double-Slit Experiment. See Section 5
TPB calculation in the Bohr atom:

Figure 5 is a simple case 3D graph of the Bohr model electron orbit, at Bohr radius. The t dimension shows the range of time divergence at that scale, giving the false appearance of the conventionally accepted "1s-orbital cloud". Notice that only scale affects Time-Divergence. v is only significant in density.

\[
t = 5.3910^{-44} \text{s}
\]

(t the time duration that the observer measures. Assume one plank second)

\[
d = 1.058354 \times 10^{-10} \text{m} \quad (2 \times \text{the Bohr radius, at ground state})
\]

\[
h = 6.626 \times 10^{-34} \quad \text{(Planck’s constant)}
\]

From equation 1,

\[
t_p \epsilon = \frac{(6.626 \times 10^{-34})}{(5.39 \times 10^{-44}) \times (1.058354 \times 10^{-3})}
\]

\[
t_p \epsilon = 1.162 \times 10^{13}
\]

So, the range of time divergence \(t_p \epsilon\) approached a scale much closer to a nanosecond.

5. ALTERNATE EXPLANATION FOR THE MEASUREMENT PROBLEM

The TPB effect only occurs between scales, which is the key to resolving the "measurement problem" [3].

In the experiments below, note that (s) is the source and (e) is the effect.

Figure 6 shows the case where (s) is at the quantum scale and (e) is at the observer’s scale. Since the measurement between these two scales is of great magnitude difference, \((t_p \epsilon)\) then becomes significant and TPB is demonstrated. Consequently, a wave / interference pattern is observed.

\[
\text{FIG. 6. Without a detector present, is a measurement between scales.}
\]

Figure 7 shows the case where (s) is the detector, which is at the observer's scale, and (e) is the optical plate, which is also at the observer’s scale. Since, the measurement is precisely within the same scale, \((t_p \epsilon)\) then does not become significant and TPB is not demonstrated. Consequently, a particle is observed.

\[
\text{FIG. 7. With detector is a measurement within the same scale.}
\]
The Time Divergence model interprets the interference pattern (alternatively), as overlapping events, viewed between two scales (of significant magnitude difference), with resulting perspective divergence and distortions.

Since this perspective divergence is in time, a range of present, past and future are all represented in the distribution. The diffracted distribution of values are more dense toward the center, which captures more photons within the $t_p \epsilon$ time range.

Two overlapping distributions, at $n$ multiples of $t_p \epsilon$, either mutually cancel or mutually reinforce (at fringe separation). This effect depends on their alignment in time, as opposed to the conventionally accepted phase alignment ("wave and Trough") model. Within this range of past and future events, overlapping alignment of $\Delta - t$ and $\Delta + t$ cancel. No energy is absorbed, because this effect is only a distortion of perspective.

6. MACROSALSE TPB - TIME CONVERGENCE

Velocity with decreasing time intervals is equivalent to acceleration.

TPB can be thought of as a perspective in the time dimension, analogous to linear perspective in architecture. Time intervals appear to decrease and converge.

Imagine an observer, with a reference scale, measuring the ties of a railroad track in perspective. See figure 8. The scale will measure each successive tie ($n$) with decreasing spatial intervals, according to the inverse linear perspective equation [1]

$$n_p = \frac{n_\perp}{d}$$  \hspace{1cm} (4)

Where $n_\perp$ is true orthogonal length and $n_p$ is the skewed length, as a result of perspective.

Now, imagine the observer with a reference clock, measuring some motion with velocity ($v$) across ($x$). See figure 9. In TPB, The clock will measure each successive ($d/v$) with apparent decreasing time intervals, according to the equation:

$$t_p = \frac{t_\perp}{1 + d^2 h}$$  \hspace{1cm} (5)

Where ($h$) is Planck’s constant.

t$_\perp$ is $d/v_1$ at the observer’s clock

d is distance from the observer to the event $d/v_2$

t$_p$ is the resulting converged time interval of event $d/v_2$, from Time Perspective (TPB)

Note that $t_p$ is only significant on scales represented in light years.

7. DECREASING TIME INTERVALS APPEAR EQUIVALENT TO ACCELERATION

Figure 10 illustrates uniform expansion, without TPB distortions. The ($t$) dimension is time. The ($x$) dimension is expansion with uniform time intervals).
Figure 11 illustrates time perspective, as proposed in TPB. Remote galaxies appear to be expanding with acceleration, as \((t_p)\) intervals appear to be decreasing. However, the acceleration is only an illusion of perspective.

\[ \text{FIG. 11. Decreasing time intervals appear as acceleration} \]

8. MILLISECOND PULSARS

TPB suggests that the further away a pulsar is from an observer, the more frequent it’s flashes will appear to be.

Current theories of neutron star structure and evolution predict that millisecond (and sub-millisecond) pulsars would break apart if they spin at a rate of 1500 rotations per second or more.\(^4\) TPB offers a simple resolution, which does not compromise the rate of gravitational radiation.

Imagine a series of pulsating sources, spaced at equal distances, respectively. The reference clock is at \(X = 1\) and the observer is behind the reference line at \(X = 0\). Photons are travelling to the earth, from the remote past. Time intervals between flashes are uniform \((\Delta t \perp)\). See figure 12.

Figure 13 demonstrates the TPB effect. Photons appear to be arriving with decreased time intervals. Between flashes, \((\Delta t)\) appears to be decreasing. Thus, flashes appear to be occurring more frequently, per \((t_p)\).

\[ \text{FIG. 12. Shows the actual uniform distances between flashes} \]

\[ \text{FIG. 13. Flashes appear to be occurring more frequently, per} \ (t_p). \]

9. ROTATIONAL VELOCITIES OVER DISTANCES

TPB also suggests that the further away a galaxy, or any rotating object (black holes, etc), is the greater it’s rotational velocity will appear to be.

Decreasing time intervals are interpreted to be increased rotational velocities. TPB predicts a positive correlation between distance measured and rotational velocity, according to \((t_p)\).

Figure 14 imagines a series of galaxies at equal intervals from the observer, with equal size and rotational velocity, per the classic orbital velocity formula \(^5\)

\[ v = \sqrt{\frac{GM}{r}} \]  \hspace{1cm} (6)
(x) dimension represents events in remote distance, as well as the remote past. Photons from each successive duplicate galaxy arrive at the observer with **apparent** shorter time intervals. Thus, each successive rotational velocity \( v \) appears to increase, according to \( t_p \).

\[
v \propto t_p \quad (7)
\]

**FIG. 14.** Thought experiment with uniformly spaced galaxies.

10. OUTER RIM ROTATION VELOCITY PROBLEM

The "Outer Rim Rotation Velocity Problem" [6] can, conceivably, be resolved by comparing the geodesics between photons traveling from the outer rim to photons traveling from the locus. If the outer geodesic paths have greater arc-lengths, then the TPB effect is greater and, by extension, rotational velocity is greater, per \( t_p \).

In TPB, greater arc-lengths \( \implies \) greater distance \( \implies \) greater perspective distortion \( \implies \) apparent increase of velocity.

11. PREDICTIONS IN MACROSCALES

Note that In TPB, Physics are unaltered, and orbital paths do not deviate from Keplers laws.

The principle in my manuscript, Time perspective Bias only predicts perspective distortions resulting in the **appearance of altered velocity**. Proportional to the distance from the observer.

**Prediction 1:**
Supernovae remnant velocity will appear to vary with distance from the observer, such that; Receding debris will appear to accelerate and projecting debris will appear to decelerate.

Supernovae particles are expelled equally in all directions, without bias. However, If the expelled electron x-rays (observed from x-ray space telescopes) of supernovae have measured velocities with a bias of greater velocity away from the Earth and less velocity toward the earth, that would be in support of my theory.

Figure 15 shows a hypothetical remnant cloud of \( r \) radius, and \( x \) distance from the Earth.

**FIG. 15.** Hypothetical supernova remnant cloud at \( r \) radius, and \( x \) distance from the Earth. Time intervals appear to decrease per TPB perspective.

Figure 16 Calculates the effect of TPB (apparent velocity decrease) using \( \theta \) degrees at point A (which is on the cloud outer boundary) by first deriving \( \Delta x \) (the \( x \) component displacement from the epicenter) then \( d = (x - \Delta x) \) in equation 1.

**FIG. 16.** deriving \( \Delta x \) from point A on \( \theta \), then calculating tpb
The following parameters are similar, in magnitude, to Cassiopeia A, except the velocity of expansion is only $0.003 \text{ m/s}$:

\[
\begin{align*}
   r &= 2500 \text{ ly} = 2.365 \times 10^{19} \text{ m} \\
   \theta &= \frac{\pi}{4} \text{ radians} \\
   x &= 10000 \text{ ly} = 9.461 \times 10^{19} \text{ m} \\
   \Delta x &= r \cos \theta = 1.672 \times 10^{19} \text{ m} \\
   d &= x - \Delta x = 7.789 \times 10^{19} \text{ m} \\
   h &= 6.626 \times 10^{-34} \\
   t_\perp &= 1 \text{ s (see note below)} \\
   v_\perp &= 0.003 \text{ m/s} \quad \text{(true expansion velocity)}
\end{align*}
\]

Note:

- Distance dimensions are in the same units as $h$
- The remnant expansion velocity $v$ is essentially uniform
- $t_\perp$ can be any time period measured, using $d$, because $d$ varies with any non-perpendicular trajectory.

from equation 1,

\[
t_p = \frac{1}{1 + (7.789 \times 10^{19})^2 \times (6.626 \times 10^{-34})}
\]

\[
t_p = 2.488 \times 10^{-7}
\]  

(8)

(9)

Between the scale of the observer and 10k ly, the observer measures velocity with a time perspective distortion factor of $2.488 \times 10^7$. That is to say that he measures velocity with a $t$ at $2.488 \times 10^{-7}$ of it’s actual value.

To arrive at the observer’s perceived (TPB distorted) velocity $v_p$, we simply divide the correct velocity by $t_p$, thus,

\[
v_p = \frac{0.003 \text{ m/s}}{2.488 \times 10^{-7}} = 12,059.692 \text{ m/s}
\]

(10)

Note that 12,059.692 m/s is approximately the perceived velocity of Cassiopeia A’s expansion.

Thus, TPB makes the bold statement that the true velocity of Cassiopeia A’s remnant expansion is much closer to $0.003 \text{ m/s}$.

Figure 17 shows multiple points of $\theta$ degrees, in orientation to the direction of observation:

FIG. 17. Points a thru d of $\theta$ degrees, in orientation to the direction of observation

The table in figure 18 lists the perceived (false) velocities observed at points a thru d. Notice that the further away a point is, the faster the velocity appears to be.

Note, for $\theta$,

velocity is radial (from epicenter)

\[
v_\perp \rightarrow \text{true velocity}
\]

(11)

\[
v_p \rightarrow \text{perceived false velocity (with TPB distortion)}
\]

(12)

<table>
<thead>
<tr>
<th>point</th>
<th>$\theta$</th>
<th>$V_\perp$ (true)</th>
<th>$V_p$ (perceived falsely)</th>
</tr>
</thead>
<tbody>
<tr>
<td>a</td>
<td>$\pi/4$</td>
<td>0.003 m/s</td>
<td>12,059.692 m/s</td>
</tr>
<tr>
<td>b</td>
<td>$3\pi/2$</td>
<td>0.003 m/s</td>
<td>17,793.594 m/s</td>
</tr>
<tr>
<td>c</td>
<td>$3\pi/4$</td>
<td>0.003 m/s</td>
<td>24,650.780 m/s</td>
</tr>
<tr>
<td>d</td>
<td>$\pi$</td>
<td>0.003 m/s</td>
<td>27,803.521 m/s</td>
</tr>
</tbody>
</table>

FIG. 18. Points a through d, of $\theta$ degrees correspond to various distances from the observer, and resulting perceived velocities.

Thus, TPB explains the perceived nonuniform velocity of remnants.
The graph in figure 19 illustrates the magnitude differences of $t_p$ perceived velocities, from $\theta = 0$ thru $\theta = 2\pi$

FIG. 19. Magnitude differences of $t_p$ perceived velocities, from $\theta = 0$ thru $\theta = 2\pi$

**Prediction 2:**

Galaxy rotation will appear to increase on the far side from the observer and decrease on the near side.

**Preliminary adjustment of perceived rotational velocity:**

Before deriving galaxy rotations effects, it is necessary to first compensate for time perspective bias distortions in perceived rotational velocity.

Figure 20 shows a remote, non-perpendicular galaxy and observer on Earth. TPB time intervals appear to be decreasing to observer.

Again, TPB makes the bold assertion that the actual galaxy rotational velocities are much less than the conventionally accepted values, which defy physics.

In order to calculate the true rotational velocity $t_\perp$ from the perceived velocity $v_p$, we must solve for $t_\perp$ from equation 1

Note:

Based on Messier 31

TPB requires that more remote galaxy distances, calculated solely from red-shift (involving velocity), to be adjusted.

\[
d = 2.54 \times mly = 2.403 \times 10^{22} m
\]

\[
h = 6.626 \times 10^{-34}
\]

\[
t_p = 1s \text{ (Can be any time period)}
\]

\[
t_\perp = > \text{ (adjusted, true time)}
\]

\[
v_p = 275 km/s \text{ (perceived, false rotational speed)}
\]

\[
v_\perp = > \text{ (adjusted, true rotational speed)}
\]

Solving for $t_\perp$,

\[
t_\perp = t_p \times (1 + d^2h)
\]

\[
t_\perp = 1 \times (1 + (2.403 \times 10^{22})^2 \times 6.626 \times 10^{-34})
\]

\[
t_\perp = 3.826 \times 10^{11}
\]

$t_\perp$ is the true time period. To clarify, the observer perceives a remote event that occurred in $3.826 \times 10^{11}$ seconds to be only 1 second. (This would sound quite radical, however it explains the physics defying receding and rotational velocities (approaching c) of very remote galaxies)

To find the corrected velocity, we simply divide the numerator by $t_\perp$. Thus,

\[
v_\perp = \frac{275,000}{3.826 \times 10^{11}} = 7.187 \times 10^{-7} m/s
\]

Comparing two points equal distance from the center, but on opposite sides, with respect to the viewer

Figure 21 shows two pints on a spiral galaxy, at equal distance from the center, but on opposite sides with respect to the viewer.
FIG. 21. Two pints on a spiral galaxy, at equal distance from the center, but on opposite sides with respect to the viewer.

Per the rotational velocity formula:

\[ v = \sqrt{\frac{GM}{r}} \]  

At 13,000 ly from it’s core, M31 has a rotational velocity of 225 km/s (without considering TPB).

If points \( a \) and \( b \) measure different velocities per my equation 5, that would be in support of my theory.

Calculating the perceived differences from points \( a \) and \( b \):

\[ d = 2.54 \times 10^6 \text{ly} = 2.403 \times 10^{22} \text{m} \]  
\[ r = 1.229 \times 10^{20} \text{m} \]  

Adjusting for 12.7R tilt from line of sight:

\[ \Delta x = r \cos(12.7R) = 1.199 \times 10^{20} \]  
\[ x_b = d + \Delta x = 2.415 \times 10^{22} \text{m} \]  
\[ x_a = d - \Delta x = 2.391 \times 10^{22} \text{m} \]

Distance \( x_b (d + \Delta x) \) gives a perceived time factor \( (t_p) \) of 3.864 \( \times \) 10\(^{11} \)

Distance \( x_a (d - \Delta x) \) gives a perceived time factor \( (t_p) \) of 3.788 \( \times \) 10\(^{11} \)

To reiterate, TPB asserts that the actual rotational velocity \( (t_\perp) \) of M31 (without time perspective distortions) is only 7.18710\(^7\) m/s at it’s core.

Deriving the perceived velocities \( (t_p) \) from corrected velocities \( (t_\perp) \):

\[
\begin{align*}
t_p \text{ of point } a &= (7.18710^7 \text{m/s}) \times 3.864 \times 10^{11} \\
&= 2.722 \times 10^5 \text{m/s} \\
&= 272.244 \text{Km/s (perceived)}
\end{align*}
\]

Deriving the perceived velocities \( (t_p) \) from corrected velocities \( (t_\perp) \):

\[
\begin{align*}
t_p \text{ of point } b &= (7.18710^7 \text{m/s}) \times 3.864 \times 10^{11} \\
&= 2.777 \times 10^5 \text{m/s} \\
&= 277.705 \text{Km/s (perceived)}
\end{align*}
\]

thus, the difference of perceived velocity, between points \( a \) and \( b \) is: 5.46144Kms

Prediction 3

Exocomets will measure velocities that appear to deviate from Kepler’s laws, such that: Approaching velocities will appear more slightly decelerated (in comparison), while receding velocities will appear slightly more accelerate (in comparison) Note that I use the word “appear” because the actual orbit does not deviate from Kepler’s laws, only the TPB perspective distortion in the time dimension causes the appearance of deviation.

Figure 22 shows four points on an exocomet orbit ellipse. The comet is approaching the observer near the perihelion. Areas \( A_1 \) and \( A_2 \) are equal.

FIG. 22. Four points on an exocomet orbit ellipse. The comet is approaching the observer near the perihelion. Areas \( A_1 \) and \( A_2 \) are equal.
Since area $A_1 = A_2$, the time intervals of travel should be equal: $(pt_d - pt_c) = (pt_b - pt_a)$

To reiterate, the actual time intervals does not deviate from Kepler’s laws. However, TPB distortions in observations between scales of great magnitude predicts a perceived difference of $t$ between $(pt_d - pt_c)$ and $(pt_b - pt_a)$

Assume the following values:

\[

d_a = 1.8 \times 10^{14} \\
\quad (41)

d_b = 2.50 \times 10^{13} \\
\quad (42)

d_c = 2.8 \times 10^{15} \\
\quad (43)

d_d = 5.0 \times 10^{15} \\
\quad (44)
\]

\[
A_1 \bar{d} = 2.25 \times 10^{13} \\
\quad (45)
\]

\[
A_2 \bar{d} = 7.00 \times 10^{15} \\
\quad (46)
\]

\[
t_\perp = 10 \text{yr} = 3.154 \times 10^8 \text{s (true time)} \\
\quad (47)
\]

\[
h = 6.626 \times 10^{-34} \\
\quad (48)
\]

Per equation 5,

For Area $A_1$,

\[
t_p = \frac{1}{1 + (2.25 \times 10^{13})^2 * (6.626 \times 10^{-34})} \\
\quad (49)
\]

\[
t_p = 0.999 \times 10^{-1} \\
\quad (50)
\]

For Area $A_2$,

\[
t_p = \frac{1}{1 + (7.00 \times 10^{15})^2 * (6.626 \times 10^{-34})} \\
\quad (51)
\]

\[
t_p = 0.9686 \times 10^{-1} \\
\quad (52)
\]

Thus,

\[
\Delta t_p = \text{is the observed } \Delta \text{ time factor} \\
\quad (53)
\]

\[
\Delta t_p = 0.999 \times 10^{-1} - 0.9686 \times 10^{-1} = 3.146 \times 10^{-2} \\
\quad (54)
\]

Thus,

if the time interval $\Delta t_{A2}$ (between points d to c) is perceived to be (for example) 5yrs, then the time interval $\Delta t_{A1}$ between points b to a would only be perceived to be $5yrs * (1 - \Delta t_p)$:

Thus,

\[
\Delta t_{A1} = 5\text{yrs} * (1 - 3.146 \times 10^{-2}) \\
\quad (55)
\]

\[
\Delta t_{A1} = 4.843\text{yrs} \\
\quad (56)
\]

Note: This difference is less significant at this magnitude

For this particular experiment, measurements should be conducted without using red-shifting, which involves velocity, and hence need to be adjusted for TPB.

Parallax system of measurement recommended to verify the effects of TPB.

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