International Journal of Science Academic Research
Vol. 07, Issue 08, pp.1273-1278, August 2026
Available online at http://www.scienceijsar.com

ISSN: 2582-6425

Research Article

THE NOVEL IMPLICATION OF LIGHT PERCEPTION AND THE UNIVERSE

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Received 18th June 2026; **Accepted** 13th July 2026; **Published online** 25th August 2026

Abstract

This research paper proposes a novel framework for reinterpreting the apparent discrepancy between the accepted age of the universe, approximately 13.8 billion years, and the observable diameter of about 93.4 billion light-years. This research argues that it may reflect the interaction between light, observation, and measurement. Building on wave-particle photon or particle photon duality, this paper suggests that light may behave differently depending on whether it is directly measured, with observational conditions influencing its apparent form as wave-like or particle-like. From this perspective, telescopes and measurement environments are not neutral instruments but active components in shaping how cosmic scale is perceived. Our paper further proposes a layered form structure of the universe, in which different strata of reality may produce different effective observations while still obeying local constancy of the speed of light. In this model, the values of 13.8 billion years and 93.4 billion light-years represent distinct observational regimes rather than incompatible facts. Our new framework encourages reconsideration of how measurement, perception, and physical reality are related in cosmology. Our research study concludes that understanding the universe may require not only improved instruments but also a broader conceptual account of how observation participates in the construction of measured.

Keywords: Light perception; speed of light; Wave–particle duality; Cosmic scale; Observational regimes; Layered universe; Cosmology; Measurement dependence; Observable universe; Theoretical physics.

INTRODUCTION

When human beings look into the night sky, they are not merely observing distant lights; they are also attempting to understand the structure, scale, and origin of the universe itself. Astronomical observation has long served as one of the most important methods for exploring cosmic reality. Through telescopes and other instruments, scientists estimate the distances to stars, galaxies, and other celestial bodies, and from these measurements they construct theories about the age, extent, and evolution of the universe. Yet even with advanced scientific instruments, some fundamental questions remain unresolved. One of the most striking concerns is the apparent difference between the estimated age of the universe and its observable diameter. The age of the universe is generally accepted to be about 13.8 billion years [1][2], while the observable universe is often described as having a diameter of approximately 93.4 billion light-years. This large difference invites deeper reflection.At first glance, these two values may seem inconsistent. If the universe is 13.8 billion years old, how can it span 93.4 billion light-years across? This question is not only numerical but also conceptual. It raises issues about how light behaves, how observation affects what is observed, and whether current models fully capture the nature of cosmic reality. In this paper, I propose an alternative perspective to interpret this phenomenon. Rather than viewing the discrepancy as a contradiction, I suggest that it may reveal important features of light perception, wave-particle behavior, and the layered structure of the universe.This research paper does not claim to provide a final or universally accepted physical theory. Instead, it aims to offer a speculative but systematic framework for examining the relationship between observation and cosmic scale. The central idea is that light may not be a passive carrier of information. Rather, light may interact with measurement conditions in ways that affect how the universe appears to us. If this is true, then the different values assigned to the universe's age and diameter may reflect different modes of universe layers observation rather than a direct conflict in scientific reasoning.

The Problem of Cosmic Scale

In modern cosmology, the universe is often described in terms of observable limits. These limits are determined by the speed of light and the age of the universe. Since light has only had a finite amount of time to travel since the origin of the universe, the observable universe must be limited by the distance that light has had time to cover. In this sense, 13.8 billion years can be understood not only as the age of the universe, but also as a temporal limit on what can be observed from Earth.However, modern astronomical research also indicates that the observable universe is much larger than 13.8 billion light-years in radius, and therefore about 93.4 billion light-years in diameter. This apparent expansion of scale does not mean that the universe is older than previously believed. Rather, it reflects the expansion of space itself during the time light has been traveling. Even so, the result remains intellectually significant because it suggests that our ordinary understanding of distance may not be sufficient to explain cosmic reality.This leads to a broader question: is the universe truly a single, uniform structure, or does it contain different levels of spatial reality? If the latter is true, then a difference in observed scale may not be due only to expansion in the conventional sense, but also to the fact that light behaves differently in different observational or spatial conditions. In other words, the universe may appear one way under one kind of measurement and another way under a different kind of measurement.

DISSCUSION and OUR NEW IDEA PROPOSE

Light Perception and Observation

A central point of this paper is the proposal that light may possess a kind of sensing behavior. This idea is speculative, but it provides a useful conceptual basis for interpreting wave-particle duality. In standard physics, light exhibits both wave-like and particle-like behavior depending on how it is observed. Under some experimental conditions, light behaves like a wave; under others, it appears as particles or photons. This duality has long been one of the most fascinating and puzzling features of physics.Building on this idea, I suggest that the behavior of light may not be entirely independent of the act of measurement. When light is observed by an instrument, it may respond to that observation in a way that causes it to behave more like a particle. When light is not directly exposed to measurement, it may retain more of its wave-like nature. If this is the case, then the properties of light are not fixed in absolute isolation but may depend on the relation between the observer and the observed.From this perspective, measurement does not simply record reality; it also participates in shaping the form in which reality appears. If light "senses" the presence of measurement, then the process of observing the universe could influence the way distance is perceived. This may help explain why different observational frameworks appear to produce different cosmic scales. The universe is not necessarily changing in an objective physical sense every time it is observed, but its measured form may change according to the mode of observation.This interpretation also invites us to reconsider the relationship between light and space. If light becomes particle-like under direct observation, then its measurable behavior may appear more compressed or localized. If light remains wave-like under less intrusive measurement, then its extent may appear broader. In this sense,the difference between 13.8 billion light-years and 93.4 billion light-years may reflect not only cosmic expansion but also the shift between two different observational regimes.

The Telescope and the Hidden Measurement

Another important part of this discussion concerns the role of telescopes and the environment in which they operate. Traditional telescopes, such as the Hubble Space Telescope, observe the universe from relatively close Earth-based or near-Earth positions. In contrast, newer instruments placed at more stable and less visually intrusive locations, such as the Lagrange points, operate under different observational conditions. These differences may seem technical, but they are conceptually important.If the location and design of a telescope affect the way light is received, then the resulting data may also reflect differences in how light behaves under measurement. A telescope that is more exposed or more directly associated with observation might, in a speculative sense, trigger light into a particle-like response. A telescope located in a more concealed or less disturbing position might allow light to exhibit more wave-like characteristics. This would affect the distances and scales that are inferred from the data.Under this interpretation, the observed diameter of 93.4 billion light-years may arise because light behaves more as a wave when measured in a less intrusive observational environment. The earlier value of 13.8 billion light-years, by contrast, may correspond to a mode of measurement in which light behaves more like a particle. Thus the difference between the two values is not necessarily an error, but a reflection of different measurement conditions. If so, the act of observation itself becomes part of the explanation.

The Speed of Light Question

This brings us to the issue of the speed of light. In classical and modern physics, the speed of light is widely treated as a constant. It is one of the most fundamental principles in physics and serves as a foundation for relativity, electromagnetism, and many other scientific theories. Einstein's formulation of relativity depends on the assumption that the speed of light in a vacuum is constant. This constancy allows scientists to calculate time, distance, energy, and mass with remarkable precision.

However, if light behaves differently under different observational or spatial levels, then we may need to ask whether the constancy of the speed of light is always interpreted in the same way. Could the speed of light be constant only within a specific level of reality, while appearing different across levels? This is not a claim that standard physics is wrong. Rather, it is a proposal that the framework of constant light speed may apply within certain boundaries, while other boundaries may introduce additional complexity.

In this paper, we propose that the universe may contain multiple levels within a single cosmic system. These are not "multiple universes" in the cinematic or popular sense, nor are they necessarily parallel worlds in science fiction. Instead, they are different layers or levels of reality within the same universe. Within each level, light may travel at a constant speed, but the effective behavior of light may vary from one level to another. If that is true, then the different observational results we obtain may be linked to the level at which observation occurs.Such a view offers a possible explanation for why the same universe can appear to have very different scales. The 13.8 billion-year figure and the 93.4 billion-light-year figure may not be contradictory if they are derived from different levels of interaction between light and measurement. In this sense, the constancy of the speed of light remains valid, but its interpretation must be broadened to include the possibility of layered spatial conditions.

Our New Interpretation Wave-Particle Duality and Measurement

One of the most compelling features of modern physics is wave-particle duality. Light behaves as both a wave and a particle, depending on how it is tested. This dual nature has often been explained as a property of quantum systems, but it also carries deeper philosophical implications. It suggests that reality is not always fixed in a single form; rather, it may present different aspects depending on the conditions under which it is observed.In the context of this research paper, wave-particle duality becomes central to explaining the cosmic scale problem. If light behaves like a wave when it is not directly "aware" of observation, then its wavelength may appear longer and more expansive. If light behaves like a particle when it is measured, then its behavior becomes more localized and compressed. This shift could affect the inferred size of the universe itself.

Wave-like and Folding Straight Line Measurement of the Universe (U)

In figure [1,Y] which we illustrate the example, if we measure the universe by the wave like, it is likewise a folding of the straight line, then when we measure the wave distance, we have to fold it into the complete straight line, which these after measurement, will become longer than the wave like photon actually perceived, so as a result these parameter of the direction measurement will be much more farer than the conventional diameter (universe) as it is before.

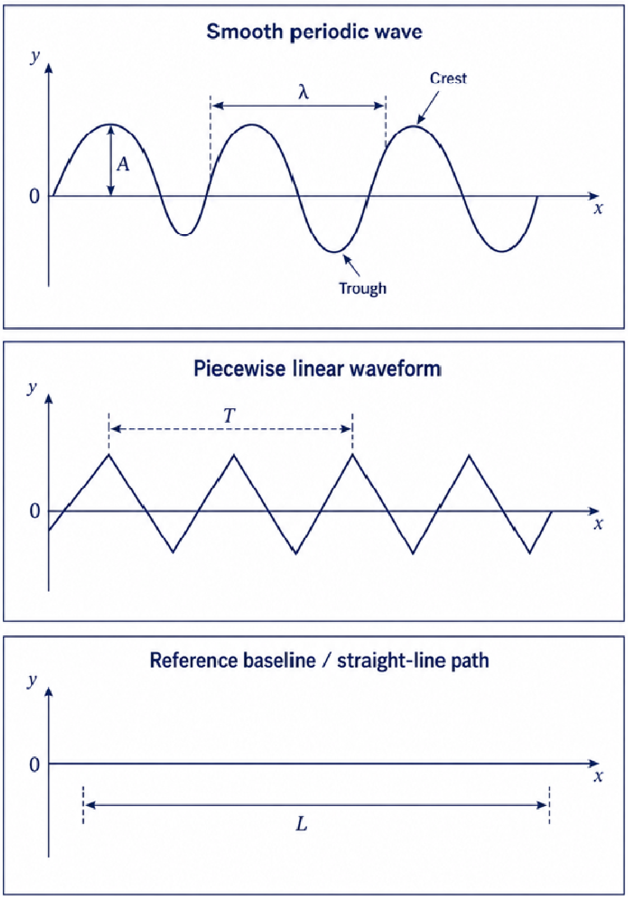

Figure 1. Wave-like and Folding Straight Line Measurement

Moreover, in Figure [1Y] illustrates the underlying principle. If the universe is measured according to a wave-like geometry, its apparent spatial structure may be interpreted as a folded configuration of an otherwise continuous straight line. Accordingly, determining the distance represented by the wave requires mathematically unfolding this configuration and mapping it onto a complete linear coordinate. The resulting unfolded distance would be greater than the apparent distance measured along the photon's wave-like trajectory. Therefore, the inferred parameter associated with the direction of measurement could substantially exceed the conventional estimate of the universe's diameter, which is based on the directly perceived or observationally reconstructed spatial extent.

Hide and Seek Hypothesis (Wave-Particle-Photon or Particle-Photon)

Our possible explanation is the conceptual idea of the hide and seek measurement hypothesis, when our light-wise-universe didn't know we are measuringthem, the photon may behavior like a wave like, so the diameter out there, may be longer, also, if the light-wise-universe know we are measuring them, the light will behave in the form of the particle like, so the measure distance in our universe will become difference, one is the particle photon measurement, the result will be 13.8 billion lights yrs, and other wavelike photon, the measurement will be 93.4 billion lights yrs, although we all know the universe is exist about 13.8 billions lights yrs, but we cannot still rule out all the possible explanation. So, based on our light-wise-universe **Hide and Seek Hypothesis**, we may solve one of the scientific mysteries of the universe's, if we know the position, we may not know the runout, and if we know the runout we may not know the position.

Comparison of a smooth wave, a piecewise-linear wave form, and a straight reference path

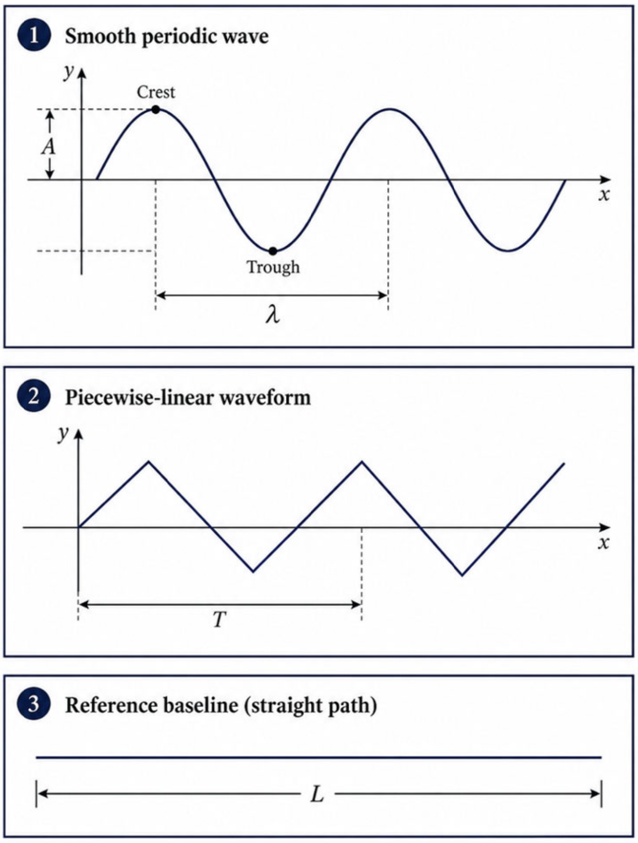

Figure 2. Comparison of a smooth wave, a piecewise-linear wave form, and a straight reference path
(The diagram highlights differences in curvature, periodicity, and path length measurement)

Figure explanation

In Figure 2, we compare three-line forms commonly used in physics and geometry to illustrate differences in shape, periodicity, and length measurement. The top panel shows a smooth periodic wave, characterized by continuous curvature, repeating crests and troughs, and a clearly defined amplitude and wavelength. The middle panel shows a piecewise-linear zigzag waveform, which preserves periodic repetition but replaces smooth curvature with sharp linear segments and abrupt turning points. The bottom panel shows a straight reference baseline, which serves as a geometric control for comparing path length and spatial extent.Together, the three panels demonstrate that visually similar horizontal spans can correspond to very different path structures. In particular, a smooth or zigzag path may have a greater actual length than a straight line across the same endpoints because curvature and angular deviation increase the total distance traveled. This distinction is important in physics when describing wave propagation, signal profiles, path geometry, and the measurement of spatial trajectories.In addition, the figure above presents a comparative geometric representation of three-line types relevant to the description of oscillatory and linear forms in physics. The upper panel illustrates a smooth periodic waveform, in which continuous curvature defines successive crests and troughs and permits standard characterization in terms of amplitude and wavelength. The middle panel depicts a piecewise-linear zigzag waveform, which retains periodic repetition but replaces smooth variation with angular transitions and sharper extrema. The lower panel serves as a straight-line reference baseline, against which path length and geometric complexity may be visually assessed. Collectively, the three panels show that line shape influences both formal description and measured extent, since curved or segmented trajectories may traverse a greater effective distance than a direct linear path across the same horizontal range.

We propose the new conceptual framework that when a photon's quantum state becomes entangled with a measuring apparatus, i.e., when "which-path" information is in principle accessible, the system undergoes decoherence and the wavefunction collapses into a particle-like eigenstate. Conversely, in the absence of such measurement-induced entanglement, the photon remains in a coherent superposition of paths and exhibits wave-like interference behaviour. Moreover, the notion that if the photon's state is subject to a measurement interaction that renders "which-path" information obtainable, decoherence suppresses interference and the state manifests particle-like properties; if no such measurement occurs, the photon remains in a coherent superposition and displays wave-like behaviour, so, it can be used as a conceptual metaphor for measurement dependence. The point is that light does not always reveal itself in the same form. Therefore, differences in observation (w or p) may produce differences in the scale of measurement as it appears to us (the universe), so it may happen as a wave-particle-photonlike measure or particle-photon like disparity (especially in the universe measurement) which it makes the difference. This is especially essential in cosmology, where the observer cannot step outside the universe to measure it directly. All measurements are made from within the system inside measured, which creates unavoidable limitations and possible distortions.

Moreover, our new possible explanation is based on a conceptual "Hide-and-Seek Measurement Hypothesis." Under this hypothesis, the apparent size of the universe could depend on how photons behave during observation.Photons may retain wave-like behaviour. If the light at the universe is not know they are being measured, in that case, the inferred diameter of the observable universe could be substantially larger, perhaps on the order of 93.4 billion light-years. Conversely, photons may behave more like particles.if the light of the universe know they are being measured,a particle-like measurement could then yield a much smaller apparent diameter, such as approximately 13.8 billion light-years.Although the observable universe is conventionally estimated to be about 93.4 billion light-years in diameter, not 13.8 billion light-years, it may still be worthwhile to examine whether the method of observation influences cosmological distance of the measurements. The central question is whether quantum measurement, wave-particle duality, or observer-dependent information could affect the interpretation of light received from extremely distant regions of the universe. Our Hide-and-Seek Measurement Hypothesis therefore proposes that the universe may reveal different properties depending on what is measured. If an observer determines a photon's position, information about its propagation or wave-like distribution may become uncertain. If the observer instead preserves information about its wave-like propagation, the photon's precise position may become less definite. This resembles the quantum-mechanical relationship between complementary observables: obtaining more information about one property can limit the information available about another.

In this interpretation, the universe "hides" certain information when another aspect is observed. While this remains a new conceptual proposal rather than an established cosmological theory, it may offer a possible framework for exploring how quantum measurement, photon behaviour, and cosmological distance estimates could be related.

AnInnovative Novel Model of Cosmic Layers

Based on the discussion above, I propose a new model in which the universe contains different layers of spatial reality. These layers are not separate universes but different strata within one universe. Each layer may have its own effective observational properties, including the way light travels and the way distance is perceived.

$$\mathcal{U} = \bigcup_{i=1}^{n} \mathcal{U}_i, \mathcal{U}_i \cap \mathcal{U}_j = \emptyset \text{(Appendix 1)}$$

When,

$$c(x) = c_i, x \in \mathcal{U}_i \text{ (Appendix 2)}$$

Then,

$$\lambda(R_1) > \lambda(R_2) \Longrightarrow D(R_1) > D(R_2) \text{ (Appendix 3)}$$

So,

$$R_1, R_2 \in \mathscr{R}$$

In the first layer, light may behave in a more particle-like form, which could correspond to the observable range described by 13.8 billion years. In another layer, light may behave more as a wave, allowing a much larger scale to be observed, such as the 93.4 billion light-year diameter. The difference between these layers would not imply that one is true and the other false. Instead, it would indicate that the universe is more complex than a single uniform measurement can fully describe.This layered framework may also help explain why scientific progress often produces results that seem to challenge earlier assumptions. As measurement technology improves, we do not merely obtain more precise data; we may also gain access to different observational levels of reality. Thus, the expansion of our knowledge is not only about better instruments but also about deeper forms of interaction with the universe.

Double Slip Light-Wise-Pattern Universe Effect

As our paper postulate, this difference of result, may come from the form of the likewise double slip experience in our universe system, but this experiment observation, is on our measuring of our universe, so, the result may vary, as the universe may seem to be slip out of more line-ler, such as the liner light pattern, this liner light pattern, may explain the universe of why is more than 13.8 billions of lights years, since they may have just split into more longer and more liner style of light-behavior. So, as the likewise double slip experiment by the Hubble Space Telescope, and the newest Jame Webb Space Telescope, it may cause vary of difference since by the likewise of the double slip effect (Double Slip Light-Wise-Pattern Universe Effect).

Conclusion

The difference between the commonly accepted age of the universe and the measured diameter of the observable universe has often been understood in terms of cosmic expansion. While this explanation is scientifically important, but it may not fully address the deeper conceptual issues involved. This research paper has proposed an alternative perspective: that light perception, wave-particle duality, and the act of measurement may play a more active role in shaping how the universe appears to us.From this viewpoint, light may behave differently depending on whether it is directly observed, and the speed of light may need to be interpreted within layered spatial conditions, although this research paper support the constant speed of light suggestion, but we may suggest that, the universes may have different layers, this layers of light constant may be different, so, it is rather than only within a single uniform framework. The universe may therefore be understood as containing different levels of parallel, withdifference reality, each with its own observational properties. Under this interpretation, the values of 13.8 billion light-years and 93.4 billion light-years are not necessarily contradictory, but may reflect different layers of light behave pattern in the modes of measurement within the same cosmic system.This research paper has offered a novel but structured argument for rethinking the relationship between observation, light, and cosmic scale, in different light behave pattern and different layers form. While further scientific exploration is necessary, our central implication is clear: the universe may have more dynamic, layered, and perception-dependentthan conventional descriptions suggest. Understanding it may require not only more advanced instruments, but also a more advance theory of how observation itself participates in the construction of physical reality, maybe our “difference layers positioning” and “hide and seek” idea, is one of the possible significant of the explanation of the parallel universe. Hope this research can contribute to the world and the humanity.

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Appendix 1:

$$\mathcal{U} = \bigcup_{i=1}^{n} \mathcal{U}_i, \mathcal{U}_i \cap \mathcal{U}_j = \emptyset$$

Definition 1.1 (Observational regime)

An observational regime is a pair $R = (M, \sigma)$, where M denotes a measurement apparatus and $\sigma \in \{W, P\}$ denotes the effective state of light, with W standing for wave-like and P standing for particle-like.

Definition 1.2 (Effective diameter)

Let $D(R)$ denote the diameter inferred from regime R. We assume that D is a real-valued functional

$$D: \mathscr{R} \rightarrow \mathbb{R}_{>0},$$

where $\mathscr{R}$ is the set of admissible observational regimes.

Definition 1.3 (State-dependent wavelength)

Let $\lambda(R)$ be the effective wavelength of light under regime R. We say the regime is wave-dominated if $\lambda(R)$ is large relative to a reference scale λ_0, and particle-dominated if $\lambda(R)$ is small relative to λ_0.

Definition 1.4 (Layered universe)

A layered universe is a decomposition such that each layer $\mathcal{U}_i$ admits an effective light speed c_i that is constant on $\mathcal{U}_i$.

Appendix 2:

Axiom 2.1 (Standard local invariance)

Within each admissible layer $\mathcal{U}_i$, the speed of light is constant:

$$c(x) = c_i, x \in \mathcal{U}_i$$

Axiom 2.2 (Measurement dependence)

The effective state σ of light depends on the interaction between light and the measurement apparatus M.

Axiom 2.3 (Scale-state relation)

The inferred diameter is monotone in the effective wavelength:

$$\lambda(R_1) > \lambda(R_2) \implies D(R_1) > D(R_2)$$

Appendix 3:

Lemma 3.1 (Wave-like regimes yield larger inferred scales)

If an observational regime R is wave-dominated, then the inferred diameter D(R) exceeds the diameter inferred under a particle-dominated regime, all else being equal.

Proof by, Axiom 2.3, larger effective wavelength implies larger inferred diameter. Since wave-dominated regimes are characterized by larger λ(R), the conclusion follows.

Lemma 3.2 (Measurement alters effective state)

If the measurement apparatus interacts nontrivially with light, then the effective state σ may change from W toP or fromP to W.

This is a direct consequence of Axiom 2.2. The apparatus-light interaction need not preserve the state description, and therefore a state transition is permitted.

Lemma 3.3 (Observed diameter is regime-dependent)

There exist regimes $R_1, R_2 \in \mathscr{R}$ such that:

Empirically, our new model interpretation can distinguish between values on the order of 13.8 billion light-years and 93.4 billion light-years. When there is a difference in the photon properties (wave like or particle like) Hence at least two regimes produce distinct inferred diameters.

Appendix 4:

Handwriting Draft in the Wave-like and Folding Straight Line Measurement

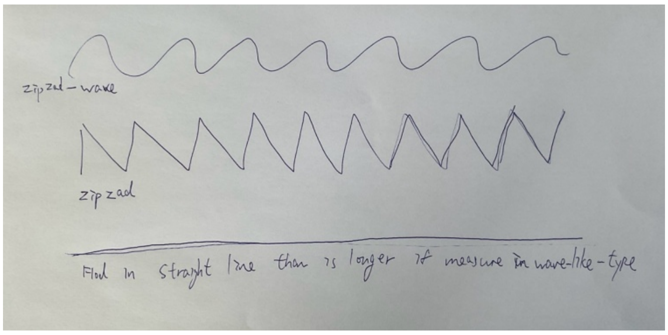

Figure Y. Handwriting Draft in the Wave-like and Folding Straight Line Measurement

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