# Beyond QED: A Classical Field Approach to Energy Absorption and Redistribution

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**Abstract:** ***This paper is part of a series exploring the interaction of light with matter across a wide range of physical forms. It proposes a unified, classically grounded alternative to modern quantum theory, known as Augmented Newtonian Dynamics (AND) Theory. While the Standard Model and Quantum Electrodynamics (QED) rely heavily on abstract constructs—such as wavefunctions, virtual particles, and uncertainty—AND Theory seeks to restore physical clarity through a continuous, deterministic framework rooted in observable mechanisms. In AND Theory, electrons are treated as real, self-regulating entities that emit and absorb photons to maintain energy equilibrium. These interactions take place within a structured field of virtual photons—identified with dark matter—which serves as the universal medium for electromagnetic and gravitational processes. Rather than invoking virtual particles as ad hoc solutions, AND Theory integrates them into a coherent picture of energy exchange that never departs from empirical logic or classical principles. This paper applies the AND framework to a comparative analysis of how heat and radiation interact with different classes of matter, including metals, insulators, and organic materials. The result is a compelling alternative to the prevailing quantum paradigm—one that offers simplicity, consistency, and a return to physically intelligible science.***

**Keywords:** Augmented Newtonian Dynamics (AND Theory), Classical field theory, Light–matter interaction, Photon absorption, Virtual photon aether, Energy redistribution, Electromagnetic propagation, Dark matter as medium, Deterministic physics, QED alternatives, Electron-photon interaction, Wavefront formation, Thermal radiation, Reflection and transmission, Structured photon field

## 1. Introduction

Modern physics, for all its predictive power, remains conceptually fragmented and deeply counterintuitive. The Standard Model and quantum electrodynamics rely heavily on abstract constructs — wavefunctions, uncertainty, virtual particles — that, while mathematically elegant, often obscure rather than illuminate physical understanding. Augmented Newtonian Dynamics (AND) offers a radically different path. This paper is part of a series of papers exploring the interaction of light with matter in all its forms, offering an alternative framework that seeks to restore clarity, causality, and coherence to fundamental physics.

Rooted in classical physics, AND Theory restores physical transparency to phenomena long shrouded in quantum formalism. It reasserts the primacy of the electron as a real, self-regulating particle that emits and absorbs photons in strict adherence to energy conservation. It revives deterministic dynamics in place of probabilistic interpretation, and locates all interactions — including reflection, emission, and gravity — within a structured, universal photon field that echoes the lost concept of the aether.

Where the Standard Model introduces complexity through abstraction, AND provides coherence through simplicity. It explains colour reflection without wavicles, gravity without curved spacetime, and light propagation without vacuum fluctuations — all through lawful, continuous, classical processes. Every departure from conventional theory is guided by a single imperative: to explain the physical world as it actually behaves, rather than how equations predict it might.

This paper presents AND as a unified framework that not only challenges the Standard Model at every level, but offers a clearer, physically grounded alternative — one capable of restoring unity and intelligibility to fundamental physics. It is divided into three sections: Section 1 Reflection, Section 2 Absorption and heat, Section 3 Transmission and refraction.

### Section1: Reflection

### The Standard model : Reflection According to Feynman's QED Approach (Integrated Analysis)

Feynman's explanation of the reflection of light draws deeply on Maxwell's classical theory, yet replaces its continuous wave picture with a quantum view. In Maxwell's formulation, light behaves as a wave that impinges on a surface, and reflection results from constructive and destructive interference of secondary wavelets emitted from each point on the surface — a view that leads to well-defined rules such as the angle of incidence equaling the angle of reflection. Feynman admired this insight, and in *QED: The Strange Theory of Light and Matter*, he adapted it to the quantum domain by replacing wavelets with the concept of probability amplitudes.

When photons encounter a surface, they interact with the electrons—whether bound or free—within the material. According to quantum electrodynamics (QED), this interaction is not as straightforward as a simple bounce. Instead, QED suggests that the photon is first absorbed by an electron and then re-emitted. However, this already stretches classical and thermodynamic reasoning, since true absorption and re-emission involve strict energy thresholds, quantum transitions, and time delays. In standard quantum mechanics, re-emission typically requires the electron to jump to a higher energy level and later return to its original state, emitting a photon in the process. Such transitions are quantized and inelastic, making it difficult to explain how the re-emitted light could preserve the colour and direction of the incoming wave. Yet QED bypasses these constraints by invoking *virtual processes* that supposedly occur so rapidly and subtly that conservation laws appear momentarily suspended.

But even after suspending disbelief on the issue of instantaneous re-emission, a deeper puzzle remains: directionality. If photons are being absorbed and then re-emitted, why aren't they scattered randomly in all directions? Why does reflection still so precisely follow the classical law—where the angle of incidence equals the angle of reflection? In Feynman's approach, a single photon does not follow a single path from the source to the detector. Instead, it explores all possible paths, and each path contributes a complex number — a rotating arrow — to the total probability amplitude. These arrows (or amplitudes) are governed by the action S along the path, with a phase given by $e^{iS/\hbar}$ Most paths interfere destructively due to rapidly varying phases, while paths near the classical path (the shortest-time route — which, for reflection, obeys Snell's law or the law of reflection) interfere constructively, producing the observed behavior. Thus, even though the photon could in principle take any path, the paths that contribute meaningfully to the outcome cluster around the classical trajectory.

However, this explanation abstracts away how the photon interacts with matter. In real materials, the reflection of light involves not merely a single photon encountering a single electron, but a collective interaction between the incoming wavefront and trillions of atoms that make up the reflective surface. Each atom, with its electron cloud, can absorb and re-emit photons — and this process is tightly constrained by quantum rules, such as conservation of energy and angular momentum, and allowed energy transitions in bound systems. Even in metals, where electrons are not bound to discrete shells but form conduction bands, the collective behavior across the atomic lattice determines how the wavefront is absorbed and re-emitted.

This raises an inconsistency or gap in Feynman's account. While the path integral approach sums amplitudes over different spatial routes, it says little about how millions or trillions of atoms in the surface coordinate the reflection process. If the photon's path is "smeared" over all possible angles, what exactly is interacting with the material? If the photon is a point particle, how does it sense a vast surface? The summing of amplitudes over space, while elegant, skirts over the microscopic interaction with the medium — especially since no single atom reflects the photon, but instead, the entire front of atoms coherently influences the reflection. Feynman's theory integrates Maxwell's wave picture, but translates it into a sum over abstract paths, rather than providing a concrete mechanism by which atoms jointly re-emit the photon. Moreover, the very act of defining the "action" S over paths presumes that the interaction medium (the atoms of the surface) acts as a passive boundary — not an active quantum system with energy levels, dipoles, and coupling constraints. The path integral, beautiful as it is, becomes a formal tool — one that omits the granular physics of what each atom does, or how the collective phase response is established across the interface.

**Virtual Photons and Elastic Scattering**

In Feynman's QED, in order to make reflection an elastic scattering process: the incident photon interacts elastically with the charges (mostly electrons) in the medium via virtual photon exchange. The incoming and outgoing photons are real, but the forces involved are mediated by virtual photons, allowing the laws of energy and momentum conservation to remain intact. Therefore, the photon isn't absorbed and re-emitted — it's scattered elastically. The electron remains nearly stationary, and the entire process respects conservation laws. However, proponents of AND Theory point out that invoking the concept of virtual particles only when need dictates, is epistemologically unsound and undermines the very concept of a moral science.

**AND Theory of Reflection: A Rebuttal of Quantum Theory**

The Augmented Newtonian Dynamics (AND) theory challenges the standard quantum model of reflection — including interpretations from quantum mechanics, and related aspects of the Standard Model — on both physical and conceptual grounds. According to the prevailing view of quantum mechanics, incident photons are absorbed by electrons, prompting transitions to higher energy levels, followed by spontaneous emission as the electron returns to its original state. However, this two-step mechanism raises significant concerns: in order to preserve the energy and wavelength of the incoming photon, the electron must not only absorb energy precisely but also return to its initial state and re-emit a photon of exactly the same energy. Such transitions are typically associated with inelastic processes, yet elastic reflection — as observed in mirrors and other reflective surfaces — preserves both energy and momentum. This discrepancy suggests that the standard model's treatment of reflection may be incompatible with the known speed, fidelity, and conservation behavior of optical interactions, especially in materials where no permanent excitation or thermal loss is detected, this is why QED is accepted theory for reflection and other processes related to light matter interactions.

**Table 1:** Comparison of Reflection Models

| Feature | Classical (Maxwell) | Quantum (Feynman/QED) | AND Theory model |
|---|---|---|---|
| Description of Light | Wavefronts (E & B fields) | Photons + sum-over-paths (path integrals) | Streams of photons via aligned virtual photon field |
| Interaction Site | Continuous interaction with surface | Probabilistic interaction with multiple atoms | Interaction with bound electrons only |
| Mechanism of Reflection | Wavefront redirects at interface | Probability amplitudes cancel/ reinforce | Elastic bounce via energy-shell-bound electrons |
| Angle of Reflection | Angle of incidence = angle of reflection | Emerges statistically | Determined directly by interaction geometry |
| Distinction from Absorption | Not clearly separated | Overlapping mechanisms | Distinct: reflection by bound, absorption by free |
| Lapses Problems | Cannot explain atomic detail | Involves trillions of atoms without mechanism | Physically plausible via selective shell interaction |

Table 1. Showing classical, quantum and Augmented Newtonian Dynamics explanations for the reflection of light

**No Transitions, No Leaps: Continuous Physical Interaction**

In AND Theory, no transitions or jumps occur. Instead, reflection is described as a direct and continuous physical process. A bound electron absorbs an incoming photon and is propelled toward the nucleus. It then **recoils elastically** off the nucleus — which, being over 1800 times more massive than the electron, acts as an essentially immovable reflective plane. This recoil preserves the classical condition:

$$\theta_i = \theta_r \quad (1)$$

where $\theta_i$ is the angle of incidence and $\theta_r$ is the angle of reflection, measured with respect to the normal. The photon is not lost or annihilated — it is dynamically stored by the electron, then re-emitted when the electron reaches a mirrored position on its shell. The emission causes a second recoil that returns the electron to its original position, ready to repeat the process. This closed, cyclic motion satisfies locally and continuously:

$$E_{\text{in}} = E_{\text{out}} = h\nu,\ \vec{p}_{\text{in}} = \vec{p}_{\text{out}} = \frac{h\nu}{c} \quad (2)$$

**Reflection Occurs at the Rate of the Incoming Frequency**

According to AND Theory, the frequency of a photon is not an abstract property. If a photon has a frequency of 500 THz, this simply means it is part of a train of identical photons being emitted and re-absorbed at a rate of 500 trillion times per second:

$$\nu = \text{emission rate (Hz)} \quad (3)$$

This aligns photon interaction rates with the demands of high-speed optical and communication technologies, such as fiber optics and photonic chips, where reflection and detection occur on sub-femtosecond timescales — far faster than any theoretical absorption-transition-emission sequence could allow for.

**Reflection and (AND) theory:**

In the AND model, when a photon strikes the surface of a material, it is absorbed by a bound electron in a specific shell (usually the outermost). The directionality of the photon is preserved during this absorption, and the electron gains energy and momentum propelling it towards the nucleus. The electron then recoils of the nucleus in keeping with $\theta_i = \theta_r$ until the electron reaches a mirror point within the atom — a turning point determined by the electron's recoil and the geometry of incidence; when it reaches its mirror position in the shell, the electron re-emits an identical photon to that absorbed.

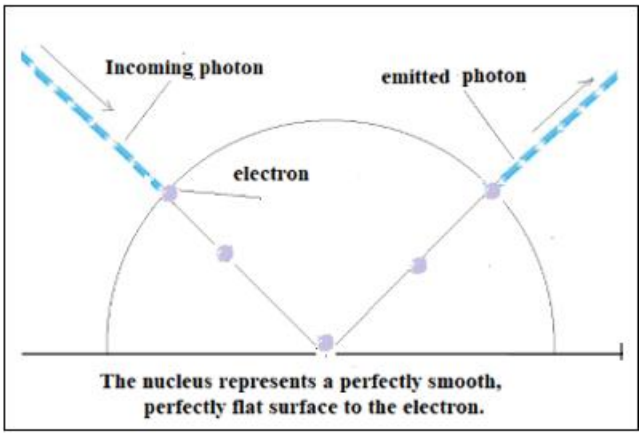



**Figure 1:** Showing the (AND) theory of reflection, photon absorption takes place at the rate of hundreds of Terahertz with the angle of reflection equal to the angle of incidence.

The recoil caused by emission then sends the electron back to its original orbital position, where it is ready to absorb the next photon, in a process that repeats at the rate of hundreds of Terahertz. It should be noted that only optical photons are involved in this process; x -rays and gamma rays are too powerful and if absorbed, will likely result in ejection of the electron, while the long infra-red, microwaves and radio waves lack the energy to leave the atom. The absorption–emission cycle occurs at rates of hundreds of trillions of times per second per atom, ensuring uninterrupted and highly accurate reflection. Crucially, emission occurs from the same shell level as absorption; there is no change in the electron's quantum number — the process is vibrational rather than transitional, enabling high-speed photon handling in line with modern technological precision and timing. It is recoil in keeping with elastic recoil in the classical sense with no net gain or loss in energy or momentum.

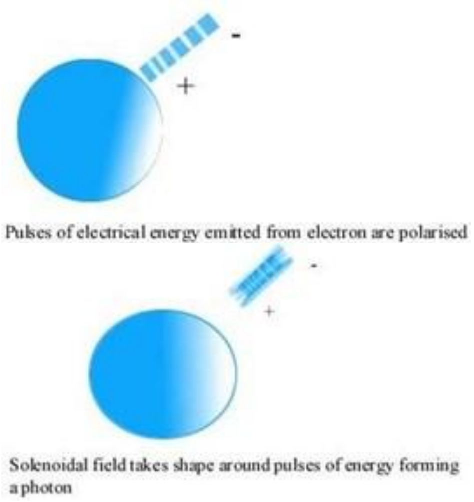
## 2. Why Reflection Must Involve Only Bound Electrons

In the framework of the AND Theory, it is not merely tempting but fundamentally necessary to assert that only bound electrons are responsible for the reflection of light. This is not an optional refinement but a strict consequence of preserving both energy conservation and the perfect elastic character of reflection as observed experimentally. If free electrons were involved in the process, the recoil associated with photon absorption and subsequent emission would lead to significant disturbances. For instance, consider a photon of energy 2 eV (approximately $3.2 \times 10^{-19}$ joules). When this energy is transferred to a free electron of classical rest mass $9.10 \times 10^{-31}$ kg, the resulting recoil velocity can be estimated using the classical kinetic energy relation:

$$\frac{1}{2}mv^2 = E \Rightarrow v = \sqrt{\frac{2E}{m}} = \sqrt{\frac{2 \times 3.2 \times 10^{-19}}{9.10 \times 10^{-31}}} \approx 2.65 \times 10^5 \text{ m/s} \quad (4)$$

Such a velocity — over 265,000 m/s — is enormous in atomic terms. A free electron moving at such speed cannot possibly emit a photon elastically and return to its prior state. It will either scatter inelastically, be absorbed by surrounding atoms, or transfer energy into the lattice, resulting in decoherence and energy degradation. This contradicts the high precision, directionality, and frequency preservation we observe in elastic reflection. In contrast, bound electrons are confined within atomic or molecular potential wells. When a bound electron absorbs a photon coming from a well-defined direction, it undergoes a temporary displacement or excitation but remains tethered. Once it returns to its prior energy level, it re-emits a photon in accordance with the laws of classical optics. Since the entire atom or lattice system absorbs and redistributes the recoil internally, the reflection is functionally recoil-free, coherent, and elastic. Moreover, the faithful reproduction of colors in reflected light, especially across the visible spectrum, becomes possible when the composition of the object is viewed, different colours will result from the mixing of the emission of two electrons and so on. Bound electrons, with a distribution of energy levels and couplings across the material, ensure spectral continuity, allowing each component of composite white light to be reflected without distortion or gaps. Thus, the AND Theory demands — and observations confirm — that elastic reflection must be a function of bound electrons alone. This accounts for both the directional precision and spectral completeness of reflected light. The alternative, involving free electrons, leads to predictions of massive recoil, energy loss, and color breakdown, none of which are observed. Hence, reflection, to remain a coherent and energy-conserving process, must involve bound electron dynamics and exclude free electron participation in any primary reflective role.

In AND Theory, all proposed mechanisms and interactions stem from two fundamental postulates: first, the existence of an all-pervasive virtual photon field — identified with dark matter — that fills all of space, and second, the photon as the exclusive mediator of the electron's energy regulation. Within this framework, the photon is not simply a mathematical abstraction but a physical structure formed by discrete pulses of electric energy emitted by the electron. These pulses, stronger at the outset and weakening progressively, undergo polarization to yield a stable dipolar configuration. This configuration imparts to the photon both periodicity and a fixed energy, quantitatively described by the Planck relation $E = h\nu$, thus satisfying classical expectations while remaining consistent with the quantization of energy. Look at Figures 1 and 2 to see how photons are formed through emissions of electric pulses by the electron:




**Figures 2 & 3**: Showing how electric pulses emitted by the electron undergo polarisation due to initial pulses of energy being stronger than subsequent pulses of energy. This gives the photon a stable dipole configuration.

In the next figure (Figure 3) we can see what a photon might look like; it is quantized having a fixed energy, it is without mass having no substance, it is stable and can retain its energy for a long time unless absorbed, it always travels at the speed of light and obeys the inverse square law in keeping with the manner of a wave propagating in a medium.


**Figure 4:** This is what a photon might look like according to AND theory, note the pulses of energy separated by a di-electric (empty space). Enabling the photon to retain its energy and contributing to the di-pole structure.

This construction of the photon is dipolar in structure enabling it to link up with other photons of similar structure. It should be noted that all photons (whether virtual or real) have a similar identical structure, only the energy and the frequency (rate of emission) varies. The photon has a diameter of about $10^{-16}$ m and can therefore be directly absorbed by the electron in a one-on-one process, negating the need for wave functions, wave particle duality, multiple dimensions, Hilbert spaces and other statistical and philosophical criteria. When an electron emits a real photon, the virtual photons of the virtual photon field (dark matter) that are in its line of propagation form into a line whose ends rest on the shoulders of infinity and the energy of the real photon travels along the line of aligned photons. It is only the energy of the real photon that travels, bringing the propagation of light into keeping with the manner in which all other waves travel. This alignment of virtual photons in the direction of propagation of a real photon, accounts for the rectilinear propagation of light; since photons are emitted at rates of 100's of Terahertz, it follows that lines or rays of identical photons are formed. This structure also explains why light follows the inverse square law as it propagates.

**Section 2: Absorption and Heat**

**Absorption and Heat Generation According to QM and the Standard Model**

According to QED Quantum Electrodynamics, light is absorbed when photons are not reflected or transmitted by a material. In quantum mechanics, absorption involves the transfer of a photon's energy to an electron. If the photon energy matches the gap between two quantized electronic states, the electron is absorbed and the electron, as the result of the absorbed energy, leaps to a neighbouring quantum shell, it may then return to a lower energy state via spontaneous emission or cascade transitions, releasing lower-energy photons. Even without a perfect energy match, virtual transitions can occur via the Heisenberg uncertainty principle, followed by cascade relaxation. Particular note should be taken that in QED, if photons are not reflected off an object they are absorbed, this lends objects their colour, with only the reflected light being visible. [1]

1.Particular notice should be taken of this point: if photons are not reflected off an object, they are absorbed — this lends objects their colour, with only the reflected light being visible. *Pedrotti, F.L., Pedrotti, L.M., & Pedrotti, L.S. (2017). Introduction to Optics (3rd ed.). Cambridge University Press.*

Put more directly, this means that although the absorption of such a photon is formally forbidden by the energy-level rules of quantum mechanics, it is nonetheless permitted through the introduction of virtual interactions and the application of the Heisenberg Uncertainty Principle. In this way, QED provides a mechanism to account for processes such as transmission and refraction — even in cases where standard quantum transitions cannot occur. On a purely conceptual basis, this may appear to invoke special mechanisms whenever needed. It should be noted that this use of virtual interactions is a consistent strategy employed by QED to explain a wide range of phenomena — including reflection, absorption, heat transfer, transmission, and refraction in transparent materials. In solids, especially crystalline materials, absorbed photon energy often converts to lattice vibrations (phonons), manifesting as thermal energy. Infrared emission from these vibrations is a signature of heat. Hence, absorption that does not result in reflectiom leads to heating. This illustrates the fact that even if the photon energy does not match the energy gap precisely, it may still be absorbed and its energy redistributed within the atom or material. In such cases, the absorbed energy can raise the electron into a virtual or intermediate state, from which it relaxes in one or more steps through cascade transitions. At each stage, a photon of lower energy may be emitted.[2] In QED where solid, crystalline materials are concerned, photons that are not reflected are generally absorbed. Rather than being re-emitted as visible light, this energy is transferred into lattice vibrations (phonons), which increases the material's thermal energy and results in heating. Subsequent infrared emission from the material serves as a signature of these thermal vibrations — the manifestation of heat.[3]

**Augmented Newtonian Dynamics (AND) Theory of Absorption and Heat** According to AND theory, photon absorption under ambient conditions depends on the electron's receptivity. If electrons are not in a receptive state, photons are not absorbed but diverted into interstitial lattice spaces, where they transfer energy to surrounding ions via collision or lattice excitation, generating heat directly without electronic excitation. In contrast to the Standard Model, where photons primarily interact with bound electrons, AND theory proposes that photons which are not reflected deposit energy directly into the lattice or voids, avoiding electronic transitions. This ensures local conservation of energy and momentum without invoking uncertainty principles or virtual states. In quantum electrodynamics (QED), virtual interactions refer to processes that involve virtual particles, especially virtual photons, which mediate forces but do not satisfy the usual energy and momentum conservation rules for real particles. On a purely conceptual basis, this may appear to invoke special mechanisms whenever needed. It should be noted, that the use of virtual interactions is a consistent strategy employed by QED to explain a wide range of phenomena — including reflection, absorption, heat transfer transmission, and refraction in transparent materials. This raises a deeper philosophical question: how do electrons 'know' how to respond under specific conditions? When incoming photons possess energies that do not match any allowed electronic transitions in the atom, is a different mechanism automatically invoked to enable absorption without real transitions? And if so, does this mechanism rely on the invocation of virtual particles or interactions to bypass standard quantum rules?

2.Loudon, R. (2000). *The Quantum Theory of Light* (3rd ed.), Oxford University Press, pp. 123–127.

"In spontaneous emission, the atom may descend to the ground state in several steps, emitting lower energy photons at each transition. Even when the energy of the incoming photon does not match exactly the energy difference between two stationary states, absorption may still occur via transient or virtual states, followed by relaxation through cascades."

3. "Electromagnetic radiation generated by the thermal motion of particles … At room temperature, most of the emission is in the nfrared (IR) spectrum" Wikipedia.org Thermal radiation.

These interactions occur within the limits allowed by the Heisenberg Uncertainty Principle (HUP) — specifically the energy–time uncertainty relation:

$$\Delta E \Delta t \geq \frac{\hbar}{2} \quad (5)$$

this means that for very short durations ( Δt ), energy conservation can appear to be "violated" by a small amount (ΔE ), allowing fleeting, intermediate states that are not physically observable but have calculable effects.

**A Photon of 4 eV Interacting with a Band Gap of 5 eV**
Imagine a transparent material (like quartz) where the band gap is 5 eV. A 4 eV photon arrives — not enough energy to cause a real transition across the gap.

Yet, in QED, a virtual excitation can still take place for a very brief moment:

- Energy shortfall:
$$\Delta E = 5 \text{ eV} - 4 \text{ eV} = 1 \text{ eV} = 1.6 \times 10^{-19} \text{ J} \quad (6)$$
- Maximum allowable time:
$$\Delta t = \frac{\hbar}{2\Delta E} = \frac{1.05\times10^{-34}}{2\cdot1.6\times10^{-19}} \approx 3.28 \times 10^{-16} \text{ seconds} \quad (7)$$

So, for roughly 330 femtoseconds, the system can "borrow" the extra 1 eV needed for a virtual transition without violating quantum rules.

**The Conundrum: Transmission vs. Spectral Lines**
The conundrum arises because quantum electrodynamics (QED) attempts to have it both ways — asserting a universal interaction between all photons and matter during transmission, while maintaining that only certain photons are

absorbed during atomic transitions. In QED, the explanation for light transmission through transparent media is that photons interact elastically with tightly bound electrons — not by being absorbed and re-emitted in the classical sense, but through virtual photon exchange that enables non-resonant, non-energy-transferring interactions. These interactions are allowed by the uncertainty principle and involve so-called off-shell processes, where energy conservation can be momentarily violated within $\Delta E \cdot \Delta t$ limits. Thus, photons are said to "scatter" without any net energy exchange, leading to a delay in propagation (interpreted as refractive index). However, the irony is clear: the same electrons must also be invoked in absorption and emission spectra, where they do absorb real photons and transfer energy. This duality — where photons are either selectively absorbed or magically pass through via virtual interactions — introduces a fuzzy and unsatisfying boundary between "real" and "virtual" processes, highlighting the internal tensions of QED when applied to macroscopic transmission phenomena. It also raises deeper contradictions: how can a single photon, constrained by the uncertainty principle, interact simultaneously with all possible atoms across a material's surface or travel every possible path, yet yield a definite, singular outcome? Together with other anomalies highlighted in this paper, these issues point to unresolved tensions within QED's account of transmission and of the interaction of matter and light in general.

QED attempts to resolve this by insisting that virtual interactions are energetically forbidden from transferring real energy, but this distinction is mathematically convenient rather than physically explanatory. In effect, QED's explanation of transparency, of absorption and reflection, reveals deep conceptual flaws.

**The Augmented Newtonian Dynamics (AND) version of absorption and the generation of heat:**

According to **(AND) theory**, the absorption of light under ambient conditions is strictly governed by constraints placed on the electron's energy state. If the electrons in an atom are in a *non-receptive state*, the incident photon is not absorbed. Instead, it is diverted around the atom and into the interstitial spaces of the crystalline lattice, where it gives up its energy to the surrounding ions either through collision or by contributing to lattice vibrations. This process leads directly to heat generation without the need for electron excitation or re-emission. The difference between the two frameworks thus becomes clear. According to the Standard Model, photons are absorbed primarily by bound electrons.[4] These excited electrons may then re-emit the energy via radiative or non-radiative transitions, or pass the energy on to the lattice indirectly.

In contrast, (AND) theory proposes that photons not absorbed in the reflection process are not taken up by electrons at all. Rather, they deposit their energy directly into the lattice structure or into voids within the material, bypassing the need for electronic transitions. A polarizer demonstrates how light is extinguished in the presence of adverse conditions: light polarized perpendicular to the filter's axis is neither transmitted nor reflected. Standard theory struggles to account for this without electronic absorption. AND theory explains it structurally: such photons are rejected, and their energy dissipated into the lattice.

A practical demonstration in support of the (AND) model is the action of a polarizer (seen in Figure 5). A polarizer can completely block light that is not aligned to its axis — effectively extinguishing it. The light is not reflected or transmitted, nor is it absorbed by any electronic transition in the conventional sense. Instead, the light appears to be extinguished by a structural process, consistent with (AND) theory, which posits that such photons are rejected and their energy is dissipated into the lattice.

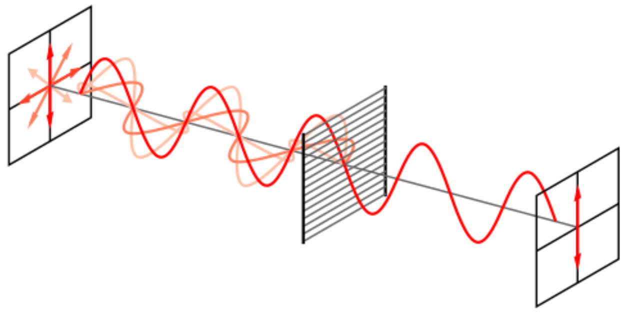


**Figure 5**. Demonstrates the extinction of light when no viable options are available. Here only the vertical component of light is allowed through the polarizer while the horizontal component is extinguished

4. A free electron cannot absorb a photon without violating conservation of both energy and momentum. This constraint is fundamental in quantum electrodynamics. See: M. Alonso and E. J. Finn, Fundamental University Physics, Vol. III: Quantum and Statistical Physics, Addison-Wesley (1971), p. 133.

When a photon is absorbed by a material, the energy carried by the photon must be conserved. In the Standard Model, this typically occurs through the excitation of electrons to higher energy levels. If the excited state does not lead to photon re-emission, the electron undergoes non-radiative relaxation, transferring its energy to the surrounding atomic lattice. This process is mediated by inelastic collisions between electrons and lattice atoms, or through electron-phonon interactions. The net effect is the conversion of photon energy into thermal energy, manifesting as a rise in temperature or the emission of infrared radiation.[5]

**Material-Dependent Absorption and Heat Generation**

Heat generation varies with material structure. Metals, with free electrons, absorb photons via inelastic collisions, transferring energy to the lattice. Semiconductors require photon energies above the band gap for electron excitation. Dielectrics like glass have tightly bound electrons and typically reflect or transmit visible light with minimal heat generation. However, in the infrared, dielectrics absorb energy via molecular vibrations. AND theory explains these differences through both electron receptivity and the lattice's ability to engage in inelastic collisions. Materials with dense or flexible lattices (e.g., metals, ceramics) efficiently convert light to heat via momentum exchange, while ordered lattices (e.g., crystals) transmit light with minimal energy loss.

**Material-Based Heat Behavior Under AND Theory**
*Metals*: Free electrons form photon chains that rapidly transfer energy. Resulting thermal emission follows Wien's Law.

*Dielectrics/Insulators*: Bound electrons engage in localized photon interactions. Heat accumulates slowly due to limited photon mobility.

*Organics*: Behave initially like insulators, but prolonged energy buildup destabilizes bonds, leading to pyrolysis and combustion. Photon-driven reactions amplify heat release.

**Table:** Heat Interaction by Material (AND Framework)

| Material | Electron Environment | Photon Interaction | Heat Generation Mechanism | Thermal Behavior |
|---|---|---|---|---|
| Metals | Free electrons | Continuous emission/ absorption | Energy transmitted via photon chains | Rapid heating; Wien's Law emission |
| Dielectrics | Tightly bound electrons | Localized photon absorption | Trapped energy, slow redistribution | Poor conduction; remains cool |
| Organic Materials | Bound molecular electrons | Local photon activity → combustion | Pyrolysis and chemical heat release | Slow start, then rapid heat rise |

5. *Toyozawa, Y., & Iwata, S.* (2010). "Photo-induced lattice relaxation and non-radiative transition processes in crystals." In *Optical Processes in Solids* (pp. 34–35). Cambridge University Press.

**Quantized Heat and Emission** Heat is not continuous; it is quantized. In both models, photon energy is eventually deposited into the system. In metals, discrete energy packets transfer via inelastic collisions, with thermal emission tied to these quantized events, often in the infrared. AND theory adds structure while remaining consistent with the rules of quantum mechanics by proposing that photons which are not reflected do not simply pass through but instead relinquish their energy within the lattice voids of the material. In cases where photons are not absorbed by atomic electrons, they transfer their energy through inelastic collisions with the lattice or conduction electrons. This energy is then redistributed as thermal vibrations, which manifest as the emission of infrared photons. The frequency and intensity of this re-emitted radiation depend on both the energy of the incoming photons and the properties of the material, in accordance with the laws governing blackbody radiation. In this way, AND theory reinforces and extends classical thermodynamic principles while maintaining compatibility with observed quantum phenomena.

**Phonons vs. Direct Transfer in AND Theory** The Standard Model uses phonons—quantized lattice vibrations—to explain energy transfer. Energy absorbed by electrons is passed to phonons, which then thermalize. Though mathematically valid, this model uses abstract statistical constructs.

AND theory avoids phonons, proposing direct inelastic collisions between photons and lattice ions or electrons. Energy and momentum transfer occurs locally and deterministically. Infrared radiation results from kinetic rearrangements post-collision, not phonon decay.

**Rejection of Quasiparticles, Endorsement of Virtual Particles** AND theory distinguishes between quasiparticles (e.g., phonons, excitons) and virtual particles. Quasiparticles are statistical abstractions without localized identity or trajectory, and thus rejected.

Virtual photons, by contrast, are accepted as real transient elements of the virtual photon field. These guide real photon propagation and mediate interactions, forming the substrate for energy transfer. They are physical, structured, and essential for directional energy continuity.

In summary, AND theory offers a locally deterministic, structured model for light absorption and heat generation that avoids reliance on probabilistic or abstract constructs, while maintaining conservation laws and aligning with observed thermal phenomena.

**Summary to Section on absorption and heat**
It should be noted that the QED explanation of heat absorption and transmission is logically inconsistent, while the theory may work in one context it fails in another as in the QED theory of transmission versus absorption and emission spectra. Often for the same substances as in the manner which light is transmitted through certain gases while the same gas shows an absorption spectrum. AND theory avoids the conundrum presented in conventional quantum models, which suggest that only photons with energies matching specific atomic transitions are reflected or absorbed. In contrast, AND theory posits that bound electrons play no role in the absorption of light under normal conditions, they only participate in reflection. Instead, absorption is mediated through interactions with the material's lattice or conduction electrons. Bound electrons are only involved under extreme conditions—such as when the atom undergoes a chemical change or structural transformation. This view offers a more unified and physically grounded explanation for light–matter interactions, especially in transparent and dielectric materials.

## Section 3. Transmission and refraction

### The Quantum View: Transmission Through Interaction Without Absorption

In quantum electrodynamics (QED), light consists of discrete packets called photons. When photons encounter a transparent medium—like glass or air—they may be reflected, absorbed, or transmitted. Transmission, though seemingly straightforward, involves subtle quantum interactions. Electrons in atoms occupy discrete energy levels, and a photon can only be absorbed if its energy precisely matches the gap between these levels — this is what constitutes an electronic transition. In transparent materials, the band gap is typically large (often greater than 7 eV), rendering visible photons, with energies around 1.7–3.1 eV, incapable of inducing such transitions. As a result, they are not absorbed. Instead, quantum mechanics proposes that photons engage in *virtual interactions* — brief disturbances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of the electron cloud that are said not to violate conservation laws because they occur within time intervals permitted by the Heisenberg Uncertainty Principle (HUP). However, this explanation is mathematically consistent *only because* it invokes these very constructs — virtual interactions and the HUP — to account for processes that would otherwise contradict the conservation of energy and momentum. Technically, if any exchange of energy or momentum occurred during these encounters, they would be inelastic interactions and should result in observable changes in the photon's energy, direction, or coherence — none of which are seen. The photon passes through the medium unchanged, with no sign of recoil, thermalization, or scattering. However, one objection if such a construct were true is that if taken at face value it should mean that absorption and emission spectra should not exist, since in effect all light could be transmitted by this means. Thus, while the quantum electrodynamics account apparently maintains formal consistency within the quantum framework, it does so by invoking mechanisms that cannot be directly verified. To some, this makes the explanation appear less like a factual description of physical reality and more like a theoretical patch — a construct designed to save the model rather than reveal the underlying mechanism. The QED theory of the transmission of light through a transparent medium further states that these interactions induce tiny delays, collectively manifesting as a reduction in the speed of light through the medium. This is the origin of the refractive index, a measure of how much light slows down. Importantly, the coherence of the photon is preserved—no energy is lost, and the phase is maintained. Thus, QED describes transmission as a sequence of non-destructive virtual events, producing clear transmission, refraction, and familiar optical phenomena.

**The AND Theory: Propagation via Virtual Photon Alignment**

In Augmented Newtonian Dynamics (AND) theory, photons cannot travel unaided through space or matter. Instead, their transmission depends on a virtual photon field—a pervasive, structured aether akin to dark matter. When a photon is emitted, it aligns nearby virtual photons in the direction of motion, forming a transient but coherent transmission line. This alignment enables the real photon to propagate with speed and identity intact, analogous to energy being handed along a well-laid track. In air, where electrons are tightly bound and widely spaced, real photon interactions are negligible. The virtual photon alignment occurs almost without obstruction, allowing light to travel at nearly the speed of light in vacuum, with minimal refraction caused by weak polarization effects. In transparent solids like quartz or diamond, the story is similar. These materials have large band gaps (greater than the 1.7 eV – 3.1 eV range of visible light) and rigid electron structures, so visible photons cannot be absorbed or even cause recoil effects. No energy is exchanged with electrons, yet transmission still occurs. According to AND theory, this is because the dense, ordered lattice permits a stable, continuous alignment of virtual photons, guiding the real photon across the medium. Here, a little thought should be given to the standard theory of light transmission through transparent materials. Since electric and magnetic fields cannot exist as free-standing entities within dielectric insulators like glass — due to the bound nature of charges and the absence of free carriers — the classical electromagnetic wave model encounters a conceptual difficulty. If light is to travel through such materials, there must exist some underlying mechanism for the transmission of its energy. AND theory offers a consistent and physically grounded explanation: it proposes that real photons propagate via alignment within a virtual photon field — a structured medium permeating the Universe that enables the seamless transfer of electromagnetic energy without relying on conventional field propagation.

**The QED theory of refraction:**

In quantum electrodynamics (QED), refraction is explained as the net result of countless virtual interactions between photons and the bound electrons of a transparent medium. Although visible photons lack the energy to excite electrons to real transitions, they still momentarily disturb the electron cloud — a process permitted by the Heisenberg uncertainty principle. These disturbances cause tiny delays in the photon's progress, without actual absorption or scattering. The cumulative effect of these delays across many atoms. slows the effective speed of light in the material, giving rise to the refractive index.

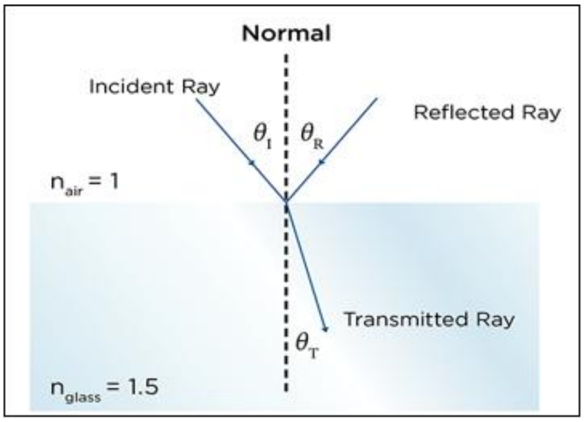


**Figure 8:** Showing reflection and refraction of light (photons) through a transparent medium.

**Refraction Reimagined through AND : Alignment Time, Not Absorption**

Refraction is classically attributed to the delay caused by temporary absorption and re-emission by bound electrons. However, this model is problematic: it implies momentum exchange without recoil in systems where electrons cannot freely move. In tightly bound materials like glass or diamond, the lack of heating, scattering, or phonon generation suggests that absorption does not occur at all. AND theory offers a cleaner explanation. When light crosses into a denser medium, aligning virtual photons takes longer due to tighter atomic packing. This delayed alignment, not electron absorption, causes the effective slowing of light. At an interface, the wavefront bends because parts of it enter the denser alignment zone earlier than others—producing the observed angle of refraction. Importantly, this interaction is **coherent**: photons retain their phase, direction, and energy, allowing for wave-like phenomena such as interference and diffraction. The bending of light at interfaces — refraction — emerges because parts of the wavefront enter the medium and begin experiencing this delay before others, causing a rotation of the wavefront consistent with Snell's Law. Thus, the refractive index becomes a measure of how easily virtual photons can align within a material, not how much light is


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absorbed or re-emitted. Greater structural density causes slower alignment and hence a higher refractive index. This framework not only preserves classical observations but grounds them in a consistent, energy-conserving theory of transmission and refraction.

In both QED and AND theory, light transmission through transparent materials does not involve traditional absorption. Quantum theory explains it as virtual delays with no energy exchange, while AND theory attributes it to the structured alignment of virtual photons in a dark matter-like aether. Refraction, in the AND model, is a geometric consequence of differing alignment speeds—not of interactions with electrons—offering a novel yet physically consistent picture of light's journey through matter.

## 3. Conclusion

AND Theory offers a more structured and physically intuitive explanation for the interaction of light with matter. It asserts that bound electrons primarily participate in reflection and do not, under normal conditions, absorb photons. Absorption by bound electrons only occurs in exceptional cases involving metastable states, chemical reactions, or structural changes within the material. In contrast, QED often relies on the concept of virtual interactions and the Heisenberg Uncertainty Principle to account for phenomena such as transmission, absorption, and emission spectra — even when such interactions appear forbidden by standard model energy-level rules. While mathematically consistent, this approach can seem ad hoc, as it introduces auxiliary mechanisms to reconcile apparent contradictions. AND Theory, by contrast, maintains adherence to classical intuition while still respecting the underlying principles of quantum mechanics, offering a coherent alternative for understanding light–matter interactions.

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