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Electricity and Radio Waves According to Augmented Newtonian Dynamics: (AND)

Dilip D James

Independent Researcher

Physics

Abstract: ***Quantum mechanics has ruled the sub-atomic realm for over a century, asserting that the laws governing sub-atomic particles differ from those prevailing at the macro level. The implementation of wave-particle duality, the Schrodinger wave equation and its associated wave-function have eclipsed all other schools of thought with regard to the sub-atomic realm. Now Augmented Newtonian Dynamics (AND), challenges this outlook and implements Newtonian Dynamics at the sub-atomic level by stating that photons are not created externally to the electron as excitations of the electromagnetic field but rather are produced internally within the electron as a means of mediating its energy. This new paradigm of photon production enables the production and emission of photons at rates that comply with the latest findings through the observation of optical atomic clocks indicating that electrons emit photons in the hundreds of trillions per second. This has enabled the explanation of every branch of physics, not through the inaccurate, and esoteric implementation of wave-functions but through the easily understood and calculable classical physics paradigms. In this paper the conduction of electricity and the formation of radio-waves is discussed.***

Keywords: radio-waves, wave function, wave-particle duality, photons, electron, electrical conduction, alternating current, direct current

1.Introduction

For more than a hundred years quantum mechanics has ruled unchallenged over the domain of the sub-atomic. Quantum mechanics has been the undisputed arbiter of physics during this time. The whole ethos behind quantum mechanics may be summed up by the phrase:" "At the level of the very, very small things work differently than they do at the macro-scale" which can be taken as a simplified explanation of quantum mechanics. Quantum mechanics, according to this reasoning doesn't just show that "things work differently," but that the entire way we understand reality changes at small scales. However, viewed from a more pragmatic perspective quantum mechanics might seem to be esoteric and counter-intuitive advocating concepts such as wave-particle duality, super position, quantum entanglement and the wave-function using as a justification, the fact that the sub-atomic level has been inaccessible to practical discovery. For instance, quantum mechanics states that a particle like an electron possessing a measurable mass, can exist both as a wave and as a particle. But is this statement true? Can an object that possesses measurable mass, like the electron, lose that mass and become spread out like a wave? Augmented Newtonian Dynamics (AND) challenges the quantum mechanics view of wave-particle duality and by doing so has formed new paradigms on almost every aspect of physics, from atomic structure to the propagation of light. In this paper the question of electrical conductivity and the formation of radio-waves are explained according to Augmented Newtonian Dynamics.

The formulation of scientific theories

In science, the process of understanding the world around us typically starts with observations things we notice or measure in nature. From these observations, scientists form hypotheses, which are tentative explanations or predictions that can be tested through further experiments or observations. These hypotheses are used to build theories comprehensive frameworks that explain and predict phenomena based on a large body of evidence. It is often the case that when a phenomenon, like light or electricity, is observed and hypotheses are formed based on those observations, the prevailing justification for officially adopting the hypothesis can usually be summed up as, "It works!" A good example of this process can be seen in the study of electrical conduction in a wire. Over time, numerous theories have been introduced, each aiming to offer a clearer or more accurate description of how electricity behaves in conductors, starting with the work of Lorentz and Drude in 1900.

Beginning with Lorentz and Drude in 1900, the first significant theory of electrical conduction posited that the behavior of electrons in a conductor could be explained by their motion through a "sea" of positive charge. This early model, known as the Drude model, treated electrons as classical particles that collided with atoms, which contributed to resistance. However, this theory was eventually found to be insufficient in explaining certain phenomena, such as the temperature dependence of resistance and the behavior of conductors at very low temperatures. In response, the more sophisticated Bloch–Anderson model emerged in the 1930s, incorporating quantum mechanics to explain electron movement in a periodic potential. By the 1950s, the Fermi gas model had gained traction, suggesting that electrons behave like a gas of free particles, subject to the principles of quantum statistics. Each successive theory was more nuanced, accounting for new experimental data, yet they all built on the same foundational idea: understanding the nature of conduction required better models of how electrons interact within the material. Today, the modern theory of electrical conduction is largely based on quantum mechanics, and the interactions of electrons in a lattice are described by the nearly free electron model and band theory, providing it is thought, an even more comprehensive understanding of electrical properties.

However, in certain instances it turns out that wrong hypotheses have been formed based on the observations, in such a case the entire foundational science built up on successive theories are wrong. The quantum mechanics theory of electrical conduction might be one such case. Critiquing a well-established theory such as quantum mechanics requires the utmost care and thoroughness. It is essential that any criticism is not only well-considered but also rigorously justified, grounded in a clear understanding of the theory and its underlying principles**.** However, scientific progress isn't always linear. This paper attempts to define a new theory for the conduction of electricity in a conductor and the related subject of the formation of radio-waves.

Quantum mechanics and electrical conduction:

Any critique of quantum mechanics must be grounded in a solid understanding of its foundational principles. At the core of non-relativistic quantum mechanics is the Schrödinger equation, which governs the evolution of quantum states. The wave function, derived from this equation, is essential for describing physical systems at the quantum level. In discussing electrical conductivity, the properties of the material are crucial. For this paper, it will be assumed that the material in question is copper, whose properties are well known. In copper, electrical conduction happens when free electrons move through the metal's lattice structure. Copper has a high density of free electrons in its outer shell, which are loosely bound to the atoms. When an electric field is applied, these free electrons drift toward the positive side, creating an electric current. The ease of this electron movement in copper is due to its low resistance, which is why copper is an excellent conductor of electricity.

In copper, electrical conduction is a result of the movement of free electrons through the atomic lattice. However, at the quantum mechanical level, this process cannot be simply described by the drift velocity of individual electrons, as the classical model might suggest. Instead, conduction is governed by the collective behavior of electrons in the presence of an electric field, which must be described by the quantum mechanical framework of energy bands, electron wave functions, and scattering mechanisms. Copper, like all crystalline materials, has a periodic atomic structure that imposes a periodic potential on the electrons. Due to this periodicity, the electrons in a metal can be described by Bloch functions, which are the eigenfunctions of the Schrödinger equation for an electron moving in a periodic potential. These Bloch functions take the form:

$$\psi_k(r) = e^{ikr} u_k(r) \tag{1}$$

Where $\psi_k(r)$ is the wave function of the electron, $e^{ikr}$is a plane wave factor that accounts for the electron's momentum, and $u_k(r)$is a function that has the same periodicity as the underlying crystal lattice. The solutions of the Schrödinger equation in this periodic potential lead to the formation of energy bands and band gaps. In the case of copper, the conduction band is only partially filled, allowing free electrons to move through the lattice.

A few quantum mechanics definitions:

An eigenfunction is a special type of function that, when acted upon by a specific operator (like a Hamiltonian in quantum mechanics), results in the function being scaled by a constant (called the eigenvalue). In other words, the operator does not change the form of the function, only its magnitude or phase. Mathematically, this is expressed as:

$$\hat{O}\psi = \lambda\psi \tag{2}$$

where:

$\hat{O}$ is the operator,
ψ is the eigenfunction,
λ is the eigenvalue.

Eigenfunctions are important in quantum mechanics because they describe stable states of a system, such as energy levels in the case of the Hamiltonian operator.

The Hamiltonian operator is a fundamental operator in quantum mechanics that represents the total energy of a system. It plays a central role in the Schrödinger equation, which governs the evolution of quantum systems.

The Hamiltonian $\hat{H}$ typically consists of two parts:
Kinetic Energy: Describes the motion of the particles (e.g., electrons).
Potential Energy: Describes the forces acting on the particles (e.g., from an electromagnetic field, gravity, etc.).
Mathematically, the Hamiltonian in non-relativistic quantum mechanics is often written as:

$$\hat{H} = \hat{T} + \hat{V} = \frac{-\hbar^2}{2m}\nabla^2 + V(\mathbf{r}) \tag{3}$$

Where:

$$\hat{T} = \frac{-\hbar^2}{2m}\nabla^2 \tag{4}$$

is the kinetic energy operator (with $\hbar$ being the reduced Planck constant, m the particle's mass, and ∇^2 the Laplacian operator, which represents spatial derivatives),

$\hat{V} = V(\mathbf{r})$ is the potential energy operator, which depends on the position r of the particle,

∇^2 is the Laplacian, which operates on the spatial part of the wave function.

In quantum mechanics, the Hamiltonian acts on the wave function of the system, and its eigenvalues correspond to the possible energy levels of the system. In copper, the conduction of electricity is ultimately governed by the behavior of electrons described by Bloch functions, which form energy bands in the material. The presence of free electrons in the conduction band allows them to move in response to an applied electric field, but their movement is not merely a classical drift. Instead, it is characterized by quantum mechanical wave-like behavior, with scattering events influencing the electron's net movement.

In alternating current (AC), the electrons oscillate back and forth in response to the electric and magnetic fields generated by the alternating voltage in the conductor. These fields interact with the electrons, driving the flow of current through the circuit.

Electrical conduction according to Augmented Newtonian Dynamics:

Augmented Newtonian Dynamics (AND) puts forward a new theory for electrical conduction that offers a simpler more cohesive explanation than the explanation offered by quantum mechanics. For instance, in quantum mechanics, what amounts to two separate explanations for the same phenomenon are given. Direct current is explained in terms of the drift velocity of electrons, while alternating current is explained in terms of electron oscillations. The drift velocity of electrons is very slow on the order of 10^{-4} m/s. In the propagation of a direct current, it is this slow drift of electrons through the conductor that gives rise to an electric current, while in an alternating current it is the back-and-forth oscillation of the electron, although over tiny almost imperceptible distances that gives rise to an electric current. AND holds that it is photons that are the carriers of an electrical current and not electrons. In every observed interaction, it is photons that act as mediators of the electron's energy. The photon mediates an electrons energy, therefore the simplest most cohesive explanation that can be given for the conduction of an electrical current is that it is photons that carry the electric current. Quantum mechanics rejected the idea that photons could be the carriers of an electric current on the basis of two main objections. (1) The first objection was that the photon was a neutral particle and therefore could not convey electrical energy (2) the second objection was that free electrons could not emit photons as they did not have the massive nucleus to absorb recoil forces as was the case with bound electrons, and therefore the emission of a photon by a free electron would violate the laws of the conservation of momentum and energy. How does AND explain the emission of photons without violating the conservation of energy laws?

If Max Planck's findings on the discrete nature of energy is to be followed, it would be necessary for all changes in an electron's energy to be mediated by photons. The question here is why use the concept of an electromagnetic wave to convey electrical energy from one electron to the next at all? Why not use the emission and absorption of photons? The answer to this is ironical, classical physics shows that a free electron moving in a conductor would not be able to cope with the forces of recoil that emission or absorption of a photon would give rise to. Therefore, emission or absorption of a photon by a free electron within a conductor is forbidden. Without the benefit of the massive nucleus against which to recoil a free electron cannot cope with the forces of recoil that emission or absorption of a photon would entail. Therefore, emission of a photon by a free electron is forbidden. As regards the fact that a photon is neutral. An electric dipole is neutral, meaning it has no net charge. It consists of two equal and opposite charges separated by a distance. While the charges are opposite, their total sum is zero, so the dipole does not have a net charge and is electrically neutral. Yet under certain circumstances electric dipoles will interact electrically providing the energies are similar. For instance, a 'conduction' photon (as will be explained during the course of this paper) will interact with an electric current while optical photons will not. According to AND photons have a dipole structure. A comprehensive account of how photons are produced by the electron, may be found at: Dilip D James, "Dark Matter According to Augmented Newtonian Dynamics: (AND)", International Journal of Science and Research (IJSR), Volume 13 Issue 12, December 2024, pp. 753-757, https://www.ijsr.net/getabstract.php?paperid=SR241209164228, DOI: https://www.doi.org/10.21275/SR241209164228

This inability to absorb recoil and the photons neutrality is the explanation as to why quantum mechanics opted for the use of an electron wave-function rather than photons to convey an electrical current. The theory that an electric current within a wire was propagated through an electron wave-function also fit in well with one of the corner stones of quantum mechanics, namely wave-particle duality.

A key concept in the Augmented Newtonian Dynamics theory of light is that of limiting the size of the longest wave-length photon that an electron can emit. Present theories hold that low energy electromagnetic radiation like radio waves are created by reason of the jiggling or oscillation of atoms and ions within an electrical conductor (lattice vibrations), while comparatively high energy electromagnetic radiation such as light is directly emitted by electrons within an atom due to stimulation. X-rays are created when a fast electron is brought to a sudden stop and gamma rays are produced at the time of the destruction of the nucleus. The problem with this theory is that some radio waves, like those due to a 60 Hz ac current are more than 5 km in length. It is difficult to imagine these numbers in terms of actual dimensions or sizes, the difference in size between an electron and a wavelength of 5×10^6 m is the unbelievably huge figure of 10^{19} It is almost axiomatic that the two sizes have nothing in common but is there a way in which some commonalty can be established, AND claims that there is? Further, this huge 5×10^6 m wavelength possesses all the properties of a normal photon, it travels at the speed of light, retains its energy etc., how can two such identical phenomena (i.e. high energy light waves and low energy radio waves) be attributed to two (or in fact three) different causative factors? High energy photons being directly emitted by excited electrons while low energy photons (like radio waves) are attributed to the oscillation of atoms and the movement of free electrons under drift velocity in the conductor. Surely this is unacceptable? Therefore, regardless of the number of atoms involved in the jiggling or oscillating process it is difficult to equivocate the differences in size with the production of a 5 Km length radio-wave. The Augmented Newtonian Dynamics Theory states that there is a limit to the longest wave-length photon that an electron can emit and that the size of the wavelength of this photon is about 1.24 x 10^{-6} m, which is considerably longer than the longest wavelength of visible light. Consider that quantum mechanics holds that the radiative elements of the far field (radio-waves) are formed due to the rapid oscillation of the electron. This may be a flawed assumption and indicates that it is time to look for a better theory to explain radio-waves and far fields and near fields.

One of the postulates put forward by AND (Augmented Newtonian Dynamics) is that there is a definite limit to the largest wave-length photon that an electron can emit. According to AND the largest wave-length photon that an electron can emit has a wave-length of 1.24 x 10^{-6} m, this is also the photon that carries an electric current and has been given the name 'conduction photon'. The properties of a conduction photon are as follows:

1) Energy = 1.60 x 10^{-19} J
2) Frequency = 2.42 x 10^{14} Hz
3) Wavelength = 1.24 x 10^{-6} m

Given these facts it is possible to calculate how the emission of such a 'conduction' photon would affect a free electron in terms of recoil:

Find the momentum of the photon

The energy of a photon E_{photon} is related to its momentum p_{photon} by the equation:

$$E_{\text{photon}} = p_{\text{photon}} c \quad (5)$$

where:

$E_{\text{photon}} = 1.6 \times 10^{-19}$J is the energy of the photon,
$c = 3.0 \times 10^{8}$ m/s is the speed of light.

Rearranging this equation to solve for p_{photon}:

$$p_{\text{photon}} = \frac{E_{\text{photon}}}{c} \quad (6)$$

Substituting the values:

$$p_{\text{photon}} = \frac{1.6\times10^{-19}}{3.0\times10^{8}} \approx 5.33 \times 10^{-28}\ \text{kg} \cdot \text{m/s} \quad (7)$$

Find the recoil momentum of the electron:

By the conservation of momentum, the momentum imparted to the photon will be equal and opposite to the recoil momentum of the electron. Therefore, the recoil momentum of the electron is:

$$p_{\text{electron}} = p_{\text{photon}} = 5.33 \times 10^{-28}\ \text{kg} \cdot \text{m/s} \quad (8)$$

Find the recoil velocity of the electron

Now, we can calculate the recoil velocity of the electron. Using the relation between momentum and velocity:

$$p_{\text{electron}} = m_{\text{electron}} v_{\text{recoil}} \quad (9)$$

where:

$m_{\text{electron}} = 9.1 \times 10^{-31}$ kg is the mass of the electron,
v_{recoil} is the recoil velocity of the electron.

Rearranging this to solve for v_{recoil}:

$$v_{\text{recoil}} = \frac{p_{\text{electron}}}{m_{\text{electron}}} \quad (10)$$

Substituting the values:

$$v_{\text{recoil}} = \frac{5.33\times10^{-28}}{9.1\times10^{-31}} \approx 5.86 \times 10^{2}\ \text{m/s} \quad (11)$$

Therefore, the recoil velocity of 586 m/s experienced by the electron is large compared to the size of the electron, especially when we consider the typical size of an electron in terms of its classical electron radius, which is about 2.8 × 10^{-15} meters. This is unacceptably large when viewed from the perspective of the conservation of energy and momentum laws.

The AND theory for electrical conduction:

The case has been made for the adoption of a new theory of electrical conduction. This theory will now be elaborated on. It has been suggested by quantum mechanics that free electrons in a conductor cannot emit photons for reasons that it would violate the laws of the conservation of energy and momentum. Yet there does exist one solution whereby it would be possible for free electrons in a conductor to emit and absorb photons. The most acceptable explanation is that free electrons are able to emit and absorb photons due to the Heisenberg uncertainty principle as applied to time and energy:

$$\Delta E\ \Delta T \geq h \quad (13)$$

One consequence of the Heisenberg Uncertainty Principle is that we can take seriously the possibility of the existence of energy non-conserving processes provided the amount by which energy is not conserved, $E_{\text{violation}}$, exists for a time less than t=h/π $E_{\text{violation}}$. Thus, it is possible for a free electron to emit a photon provided that it immediately reabsorbs that photon in an extremely short time on the order of 10^{-15} s. AND Theory states that this is how electromagnetic fields are formed, a free electron within the conductor emits a photon, but in order to avoid violation of the laws of energy conservation, the photon has to be reabsorbed by the same electron, or one identical to it, within the stipulated time of 10^{-15} s. In the same way photons that are emitted need to be reabsorbed by an electron needing the correct energy level, the nearest source of such electrons are within the conductor, this process also explains the process of induction. Photons outside the conductor will all try to re-enter the conductor simultaneously when the current is switched off or the polarity is changed, resulting in a surge of heat and a temporary current flowing in the opposite direction.

Conditions in a wire at room temperature are chaotic, often the electron that originally emitted the photon has already absorbed another photon before the emitted photon can be reabsorbed! If this happens the original photon leaves the conductor and circles back to be absorbed by another electron. This is why the lines of force form around a conductor. When a photon is emitted by a free electron within a conductor it has to be immediately reabsorbed, often the shortest route for the photon to achieve reabsorption by an electron is to exit the conductor and circle back, when this happens the photons of the 'virtual photon' aether which are present throughout the Universe, line up in the direction of propagation of the real photon resulting in the distinctive lines of force seen around a conductor.

Looked at on a timeline, it would be as follows: At t_1, free electron e_1 emits a photon. In which case, by momentum conservation, e_1 will experience recoil in the opposite direction of the emitted photon. (c) At some time t_2, less than $h/2\pi\ E_{violation}$ (and before the recoil can take place), electron e_1 re-absorbs the photon in such a way that the total energy of the electron e_1 is equal to what it was before the intermediate virtual state. In the second scenario at t_1 electron e_1 emits a photon. In which case, by momentum conservation, e_1 will experience recoil in the opposite direction of the emitted photon. At some time t_2, less than $h/2\pi\ E_{violation}$ (and before the recoil can take place), the photon exits and re-enters the conductor and is absorbed by electron e_2 which has also emitted a photon, while electron e_1 absorbs a photon emitted by another free electron within the same time period. These transactions take place in such a manner that the total energy of the electron e1 and electron e_2 is equal to what it was before the intermediate virtual state. Still looking at the timeline and applying it to real situations e.g., current in a wire it is found that the time stipulation of 10^{-15} s is well within the limits of the possible.

Thus, the theory is advanced herein that the existing explanation of how a current flows in a conductor is unsatisfactory and a suitable explanation for how current propagates in a wire including an explanation for the formation of lines of force is proposed.

The model for the propagation of an electric current within a wire proposed by AND fits observed phenomena very accurately and precisely. The theory establishes on a very sound basis that the electromagnetic force both inside and outside the wire is transmitted by photons. However, both standard theory and quantum mechanics postulate that the current is carried by a bloch wave function representing a free electron's wave-like behavior. Therefore, the electric energy is carried by the wavefunction of the electron. Is such a theory justified or even epistemologically correct from the point of view of the study of physics? Returning to the proof of AND. It is as follows. Consider a wire through which an AC current is flowing, close to the conductor the quality of the EM radiation is different from that further out. Thus, it is possible to hold a coil of wire close to a wire carrying an alternating electrical current and draw off a considerable current through means of induction taking place in the coil. Yet further out, say even at a distance of 5 m from the conductor there is a qualitative difference and it will be impossible to detect even a small induced current in the coil. According to the wave function of quantum mechanics this difference should not occur, or at the very least if it does occur it should follow the inverse square law for intensity.

AND states that electricity is carried neither by electrons nor by an electromagnetic wave nor by a wave-function but by 'conduction photons' that are emitted by free electrons within the conductor. These 'conduction photons (the designation is introduced here for the first time) are the longest wave-length photon that an electron can emit. It possesses a wave length of 1.2×10^{-6} m and a frequency of 242 THz and an energy of 1.6×10^{-19} J. Free electrons are only allowed to emit 'conduction photons' if by the conditions of Heisenberg's Uncertainty principle $\Delta T\ \Delta E \geq h$ they reabsorb a photon of similar magnitude within a given time period. In the case of a current being established in a wire it signifies a time of about 10^{-15} s, for the electron in question to reabsorb a photon of the same energy as was emitted. This means that the emitted 'conduction photons' often have to exit the conductor and re-enter it in order to be absorbed by an electron. The emitted 'conduction photons' also having a need to be absorbed by a receptive electron. The exit and re-entry of the 'conduction photons' in the conductor results in the lining up of the 'virtual photons' of the aether around the conductor which in turn are manifested as the lines of force we are all familiar with. The fact that the lines of force around a conductor carrying an electric current are lines of aligned virtual photons forms an important part of AND. Present day mainstream physics, as in quantum mechanics and standard theory does not offer a compelling explanation for what the lines of force are, how they are formed or what role they play in the conduction of an electric current although it is understood that a large part of the energy in an electrical current is stored in the lines of force surrounding an electrical conductor.

Augmented Newtonian Dynamics and radio-waves

The question of how long wavelength photons (radio-waves) are formed is considered next. The Augmented Newtonian Dynamics Theory answer to this is that all electromagnetic radiation greater than 1.2×10^{-6} m in wave length are ***composite waves*** , i.e. they are made up of joined or connected photons. This joining up of photons is made possible because of their solenoid dipole structure and can take place in two orientations; in series: The point to note that is of interest is that the near field is qualitatively different from the far field in a manner that does not coincide with the inverse square law. The quantum mechanics wave function does not describe how the two fields differ qualitatively, nor is it able to give a mathematical explanation of why this is so. It is time to recap what was already said so that it now makes more sense. The lining up of the photons takes place in two orientations (a) in series:

Figure 1

In the above diagram (Figure 1) the virtual photons of the aether are lined up in series. In this configuration, each line of force carries the energy of one 'conduction photon' or 1.6×10^{-19} J. This is the configuration of lines of force around a conductor that carries the electrical energy of the current namely 1.6×10^{-19} J per line of force. This is true of the near field. Observation shows that these lines of force are innumerable but AND Theory can actually approximate the number of lines of force that are present around a conductor carrying an electric current by knowing the amount of current that is being carried. The other mode of configuration of 'conduction photons' in lines of force around a conductor are those arranged in parallel (Figure 2.):

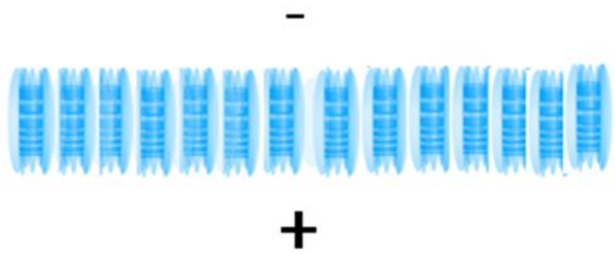

Figure 2

In this parallel configuration the virtual photons are arranged in parallel. Lines of force connected in parallel possess an energy equal to the energy of a conduction photon divided by the number of conduction photons in the line of force. Thus, all parallel configured lines of force are 'composite' lines of force. Consider this explanation of radio-waves by AND explains every aspect of radio-waves, including their size, and the similarity of radio-wave properties to that of light. (ie., possessing zero mass, maintaining energy intact, travelling at c in a vacuum and so on.). It also brings radio-waves into the purview of other phenomena such as light, and current.

Given:

wavelength of composite wave (radio-wave) = 1m
wavelength of conduction photon = 1.24×10^{-6} m
energy of conduction photon = 1.6×10^{-19} J
frequency of conduction photon = 2.42×10^{14} Hz
Number of conduction photons in 1 m wave-length = 806451.61 virtual photons in 1m composite wave.
Energy of composite wave = $\frac{1.6\times10^{-19}}{806451.61} = 1.98 \times 10^{25} J$ (14)
Using equation for photon energy.
Frequency of composite wave = 3×10^{8} Hz
Planck's constant = 6.62×10^{-34} J
$E = hf = (6.62 \times 10^{-34}) \times (3 \times 10^{8}) = 1.98 \times 10^{-25}$ J (15)

Therefore, using different methods, the same result is obtained for energy of the 1 m composite wave, both methods yield an answer of 1.98×10^{-25} J for the energy of the 1m wavelength.

2.Conclusion

The simplicity and absolute logic behind this theory on the formation of radio-waves should be noted. The formation of radio-waves, follows spontaneously from, and is a natural consequence of, the conduction of electricity through a wire. Further the energy in the wire is mainly found to be present in the lines of force outside the conductor as has long been suspected, more importantly the exact energy present in the conductor can be calculated from the number of lines of force being generated given the dimensions of the conductor, its composition, properties etc.,

How different is the quantum mechanics explanation for the conduction of electricity in a wire, with the electron delivering electrical energy as a Bloch wave-function (as opposed to its particle identity). When one considers the quantum mechanics theory that radio waves can be produced by the rapid acceleration and deceleration of electrons in aerials (conductors), it becomes apparent that a lot is left unsaid in this answer. Consider the answer in a little more detail, it says 'accelerating' and decelerating electrons' but according to QM they aren't electrons as they travel within the conductor but wave-functions. The same goes for the actual EM wave that is generated, the EM wave also travels as a wave-function and comes with the associated problem of not existing till it is detected and travelling as something that is abstract and unreal and so on.

The AND theory of electrical conduction and the formation of radio-waves by comparison is simple straight forward and is part of a connected logic, that offers an exhaustive answer as to what radio-waves are, how they form, how they travel and so on.

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