Mystery pulmonary and neurological symptoms by EM radiation from the Coronavirus

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Abstract
The Coronavirus causes severe respiratory problems of which the 'cytokine storm' hypothesis suggests the immune system overreacts to the threat of Coronavirus by releasing excess cytokines that reduce the white blood cells (WBCs) of the immune system. Even so, the 'cytokine storm' finds difficulty in explaining Coronavirus mysteries including pulmonary symptoms of blood clotting and the neurological symptom of the loss of smell. The Coronavirus is thought to enter lung cells through ACE2 receptors. But the virus must first pass through the nose, and in mouse models the virus is not found in the lung, but in the brain. Since the nasal olfactory nerve cells lack ACE2 receptors, the virus must somehow burrow through the cell wall. In this regard, point sources of EM radiation are known to burrow through cell walls by ionization, but cannot be translated to the release of cytokines in the nose unless the virus itself is a source of EM radiation. But the theory of simple QED asserts the Coronavirus is indeed a source of EM radiation at levels depending on the size of the virus body and spikes. Simple QED is based on the Planck law that denies the nanoscopic Coronavirus the heat capacity to conserve heat from the surroundings by an increase in temperature, and instead size dependent EM radiation is emitted. The Coronavirus spikes (~15 nm) diameter emit EUV (~ 50 nm) radiation to allow the virus to burrow through cell walls while the virus body (~ 100 nm) emits UVB (~ 320 nm) radiation to initiate the 'cytokine storm' and damage the DNA of brain neurons leading to expressions of neuropathic CNS symptoms. Treatment of patients tested positive for the Coronavirus is disinfection by UVC (~248 nm) radiation by intravenous injections of ~80 nm biodegradable lipid nanoparticle doses in saline. By controlling the dose, the UVC is held to low levels of collateral DNA damage to brain neurons allowing recovery of brain neurons by DNA repair systems.

Keywords: Coronavirus, Planck law, UV, Cytokine Storm, Nanoscale heat transfer.

I. INTRODUCTION

Since April 2020, the Coronavirus pandemic captivated scientific research. Over 60 biotech firms throughout the world are searching for vaccines and treatments for pulmonary symptoms of fever, cough, and difficulty breathing. In a small number of Coronavirus infections, neurological symptoms are also reported including headaches, confusion, loss of smell, tingling and numbness leading to severe inflammation and death.

Neurological symptoms are not thought caused by the Coronavirus itself, but by bursts of cytokine molecules released by the immune system in response to the contact of the virus entering the cell upon binding to Angiotensin converting enzyme II (ACE2) receptors. However, the neuropathic symptom of the loss of smell occurs even though the ACE2 receptors are not expressed in olfactory neuron cells. In mouse models, genetically engineered human ACE2 receptors in the nose exposed to SARS-CoV virus were found [1] in the brain and not in the lung, suggesting ACE2 receptors are not necessary for the virus to reach the brain. Once in the mouse brain, the virus spread rapidly causing widespread nerve damage leading to mouse death. The question is,

How does the Coronavirus enter the brain absent ACE2 receptors?

Absent ACE2 receptors, the path to the brain requires the Coronavirus to express a source of EM radiation moving with the virus to burrow through the cell wall and subsequent blood-brain barrier (BBB) to initiate the 'cytokine storm' and induce WBC apoptosis as illustrated in Fig. 1.

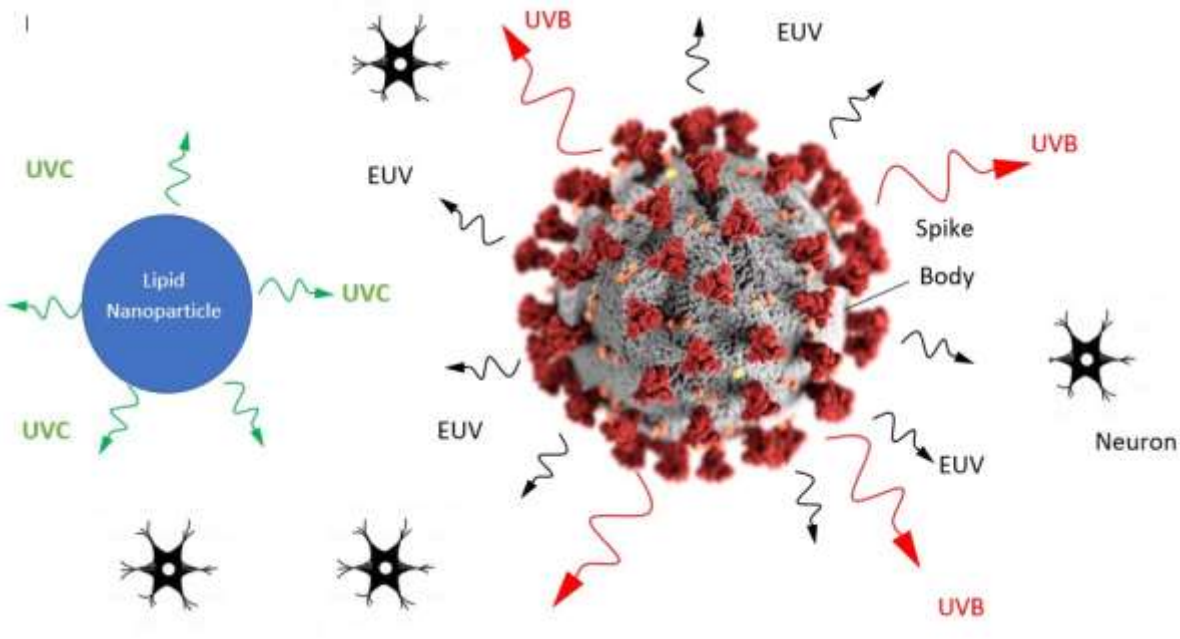

Figure 1. Coronavirus emitting simple QED induced EM radiation

The Coronavirus body and spikes are shown in relation to neurons including Lipid nanoparticles (NPs) proposed for the treatment of the virus by UVC disinfection. The Coronavirus body is shown to emit long wavelength UVB (~320 nm) while the spikes emit EUV (~ 50 nm) radiation to burrow through cell walls and the BBB. The NPs in a saline solution are introduced in the bloodstream upon intravenous injection to inactivate the Coronavirus by disinfection with UVC (~ 248 nm) radiation.

II. PURPOSE

To show simple QED allows the Coronavirus to continually produce EM radiation in conserving heat from adjacent blood-tissue. The UVB radiation assisted by EUV radiation from the spikes moves with the virus to burrow through the cell wall and the BBB. Along the path, the UVB damages DNA and induces the release of cytokines and WBC apoptosis. Upon entering the brain, the UVB damages neurons to cause neurological symptoms leading to multi-organ failure and even death.

III. BACKGROUND

Current Coronavirus vaccines or treatments based on pulmonary symptoms may be misdirected as the virus most likely is not initiated in the lungs, but rather in the nose and by spreading through the CNS and entering the brain expresses neurological symptoms mediated with immune response by astrocytes and microglia. Most neurotropic viruses reach the CNS by crossing the blood-brain barrier with the exception [2] of herpes simplex and rabies viruses which invade the CNS by inter-neuronal transport. Regardless, the neuropathic symptom of loss of smell [1] suggests the Coronavirus is somehow producing UV radiation to send proinflammatory signals for recruiting T lymphocytes to enter the brain, thereby providing the virus with a direct EM nose to brain path.

In the direct EM path of Coronavirus infection, the most important factor is the simple QED induced EM radiation source [3] moving with the Coronavirus powered by the thermal energy of the surroundings. UV is known [4] to enhance immunosuppressive cytokines and induce

apoptosis of WBC from DNA damage. Indeed, exposure to UVB radiation is recognized [5] to suppress cell mediated immunity and adversely affect the course of the coronavirus infection. In this way, the Coronavirus virus may be considered a moving source of UV radiation exciting the release of cytokines and causing apoptosis of WBC in the blood stream prior to burrowing through the BBB.

In the bloodstream, the UVB radiation from the Coronavirus may explain the mystery [6] of why a 'storm of blood clots' are being found in Coronavirus patients. But blood thinners do not prevent young people from dying of strokes caused by the blockages in the brain. Viral infections are suspect, but not yet proven. In contrast, UVB irradiation has been shown to be effective for virus disinfection, but is known [7] to enhance blood clotting. The 'storm of blood clots' in Coronavirus patients is therefore most likely caused by the UVB emission of from the virus itself.

Up to this point, Coronavirus symptoms may be considered pulmonary. But once in the brain, the Coronavirus symptoms become neurological as previously described for the loss of the sense of smell. More importantly, UV excitation induces DNA damage and apoptosis of WBC and brain neurons that may explain how the Coronavirus leads to viral encephalitis [8] attacking the CNS. But the direct path of Coronavirus infection to the brain is complex and need not be simply implied here as pulmonary symptoms may appear only after showing neurologic symptoms. Coronavirus research today is not based on the direct path to the brain, and instead on separate paths of antiviral drugs that reduce virus replication and steroids to prevent the immune system from over reacting by producing immunosuppressive cytokine inflammation. It appears this may not be correct as the brain is the likely target of the Coronavirus.

IV. SIMPLE QED.

Classical physics allows the atom to have heat capacity at the nanoscale, the conservation of heat proceeding by a change in temperature. However, simple QED based on the Planck law of quantum mechanics [9] denies the atom in nanostructures the heat capacity to conserve heat by a change in temperature, the consequence of which is any heat is conserved by creating standing EM radiation that is released to the surroundings.

Unlike electronic quantum states, simple QED is based on size dependent quantum states depending on the dimensions [3] of the nanostructure over which the EM waves stand. Simple QED is a method of nanoscale heat transfer analysis that conserves heat with EM radiation instead of temperature. QED stands for quantum electrodynamics, a complex theory based on virtual photons advanced by Feynman [10] and others. In contrast, simple QED is a far simpler theory based on the Planck law of quantum mechanics (QM) that requires the heat capacity of the atoms in nanostructures to vanish allowing conservation to proceed by the creation of real photons comprising EM waves that stand within and across the nanostructure. The standing waves of interest are in the UVC that by classical physics require extreme temperatures for creation. In Appendix A, simple QED based on the Planck law is shown to allow UV photon creation from EM confinement of absorbed heat in NPs at body temperature.

By classical physics, the kT heat capacity of the atom is independent of the EM confinement wavelength λ, where k is the Boltzmann constant and T absolute temperature. QM differs as the heat capacity of the atom decreases under EM confinement $\lambda < 200$ microns, and at the nanoscale for $\lambda < 100$ nm, the heat capacity may be said to vanish. The Planck law at 300 K is illustrated in Fig. 2.

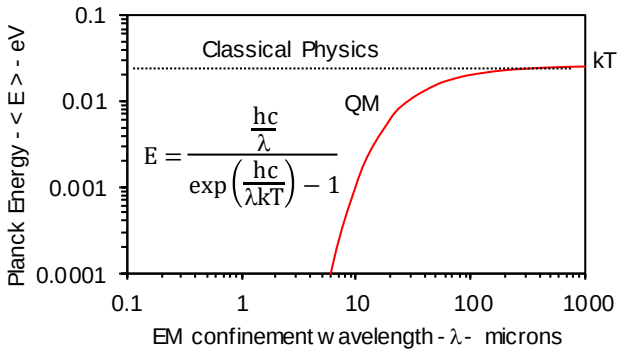

Figure. 2. Planck law of the Atom at 300 °K
In the inset, E is Planck energy, h Planck's constant, c light speed, k Boltzmann's constant, T temperature, and λ the EM confinement wavelength

EM confinement requires the heat Q to almost totally be confined to the nanostructure surface. For a nanoparticle (NP), the surface heat itself absorbed in the penetration depth δ provides the brief EM confinement necessary to create EM waves standing across the diameter d as shown in Fig. 3. Heat (or light) having wavelength λ >> d, the light (yellow) immerses the NP and absorbed over the full NP surface.

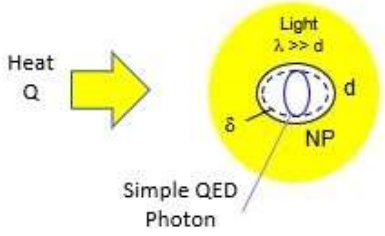

Figure 3. Heat Q (or light) absorbed in NP surface

Confinement of the light Q while creating the standing wave requires EM confinement at least equal to the Planck energy E of the absorbed light. The pressure P acting on the surface is given for bulk modulus B and volume strain ΔV/V by, $P = B \cdot \Delta V/V = 6 \cdot \delta \cdot B/d$. But $P = E / V = 6E/\pi d^3$ giving $\delta = Q/\pi B d^2$. Consider human meibomian lipids [11] at 250 nm having refractive index n ~ 1.55 (extrapolated). For 80 nm lipid NPs, the simple QED wavelength λ ~ 248 nm and E ~ 4.88 eV. Taking a lipid bulk modulus $B \sim 2 \times 10^9$ N/m^2, the absorption depth δ of a single UVC photon is δ ~ 20 fm - a small but necessary depth to confine the absorbed heat Q = E to the geometry of the standing wave.

Simple QED absorbs heat Q in the NP surface given by the penetration δ depth. Unable to conserve the surface heat by a change in temperature, conservation requires the creation of standing EM radiation, with a creation time $\tau = 2d/(c/n)$. The Planck energy $E \sim h/\tau = hc/2nd$ depends on the refractive index n of the NP to correct for the velocity c of light within the NP. The simple QED Planck energy E is quantized by the dimension d of the NP that defines the half-wavelength λ/2 of the nanostructure. Fig. 4 illustrates the standing EM radiation in a spherical NP of diameter d, but NP atoms still follow their quantized electron energy levels.

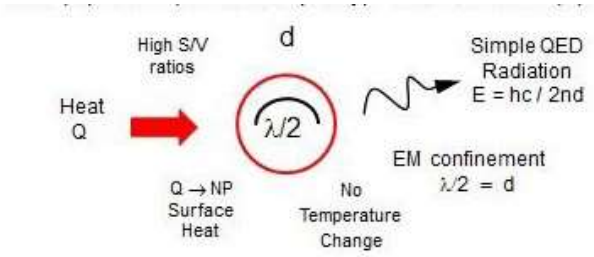

Figure. 4. Planck Energy of EM Radiation

In a rectangular NP with different dimensions of width, thickness, and length there are 3 simple QED quantum states corresponding to the different dimensions of the NP. However, only the minimum dimension is important as by Fermat's principle, the absorbed heat is dissipated in minimum time. Continuous variation in internal nanostructure dimensions produces a broadband spectrum of simple QED dissipated in continuous QED quantum states.

The simple QED radiation induced in the Coronavirus body and spikes including lipid nanoparticles (NPs) proposed for Coronavirus treatment from thermal energy in the surroundings is summarized in Table 1.

Table 1
Simple QED Energy and Wavelengths

	Coronavirus Body	Coronavirus Spike	Nanoparticle
Material	Coronavirus	Coronavirus	Lipid
Diameter d (nm)	100	15	80
Refractive Index n	1.6	1.6	1.55
Wavelength λ (nm)	320	48	248
Planck energy E (eV)	3.88	26	5

The simple QED Planck energy E and wavelength λ are based on the NP diameter d and refractive index n. The Coronavirus body diameter d varies from 80 - 120 nm [12] with 100 nm being the average for the coronaviridae family. Similar to SARS, the Covid-19 spikes are globular proteins d ~ 15 nm in diameter [13] attached to the virus body by a narrow stalk. With regard to the index n of the virus, available data is not clear. Even so, the index in the UV or EUV is required, but only data is available in VIS, e.g., n = 1.42 at λ = 830 nm [14]. Optical fringe measurements [15] show a maximum index n ~ 1.8 with the average of variations across the virus body taken n ~ 1.6. The index n of the spikes could not be resolved [15] and is also taken at n ~ 1.6. The index n ~ 1.55 of the lipid NP described above in relation to the Planck energy E in the compression induce upon the absorption of the 250 nm photon was extrapolated from data [11] at 400 nm.

Recall EUV (< 200 nm), UVC (200 to 280 nm), UVB (280 to 320 nm), and UVA (320 to 400 nm). The Coronavirus body emission (320 nm at long wavelength UVB) and spikes (48 nm in the EUV) while the NP emits (~248 nm near the 254 nm UVC peak). It is noted the Coronavirus body emission increases toward the UVC peak for NP diameters < 80 nm.

V. CORONAVIRUS TREATMENT

The history of vaccines against infectious viruses suggests a Coronavirus vaccine developed by traditional searches for antigens will be difficult, if not impossible in the near term. In contrast, Coronavirus treatments avoiding the serendipity search for antigens are more likely to be developed than vaccines. Indeed, blood plasma is already available, but not actively pursued because the CDC and FDA are subservient to the paradigm of vaccines to disinfect viruses. But vaccines take time for development and testing which is not an option in the current Coronavirus pandemic. Moreover, a Coronavirus vaccine even if found will not likely survive mutations and future viruses that will require development of yet another vaccine.

What this means is a paradigm shift from vaccines to treatment of viral infection is unavoidable. Vaccination even if successful would not be practical for the entire world population. Accordingly, Coronavirus treatment of only the population tested to have the virus emerges as the realistic solution. Indeed, treatment instead of vaccines should be adopted by the CDC and FDA as the new paradigm.

Simple QED proposes UVC disinfection of the Coronavirus using doses of biodegradable lipid NPs in saline delivered intravenously by injections. The interaction between the NPs and the Coronavirus is illustrated in Fig. 1 and summarized in Table 1. Of importance is the DNA absorption spectrum [16] shown in Fig. 5.

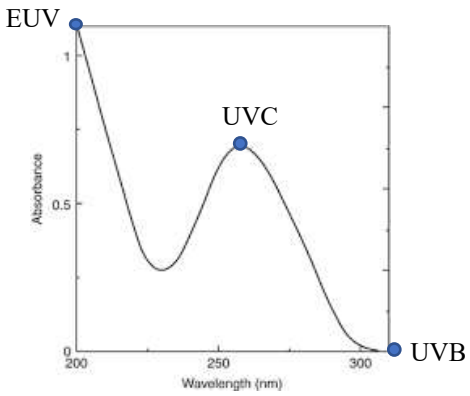

Figure 5. DNA absorption spectrum

The DNA has peaks at 260 nm in the UVC and in the EUV beyond 200 nm. The 100 nm Coronavirus body emission in the UVB at 320 nm is not absorbed by the DNA and does not cause DNA damage to brain neurons. But DNA damage of neurons may be expected for virus diameters < 80 nm. The UVB at 320 nm finds importance only in initiating the 'cytokine storm' and 'blood clot storm'.

UVC disinfection of the Coronavirus from the 80 nm NP emission occurring at 248 nm inactivates the virus DNA. The UVC also damages brain neurons, but at low levels the DNA damage is corrected by DNA repair systems. EUV at 48 nm from the spikes does not damage brain neurons and appears to only assist burrowing through cell walls. However, these predictions depend strongly on the refractive indices of the Coronavirus.

VI. INFLAMMATION

The Coronavirus not only attacks the elderly, but also children under 5 years age. The symptoms are described by multisystem inflammatory syndrome [17] similar to the over-reactive immune response of Kawasaki disease. Unlike Kawasaki disease, children showed antibodies to the virus, indicating they had been infected before inflammation. The inflammatory symptom is similar to the 'cytokine storm' initiated Coronavirus [1] symptom of the loss of smell.

Inflammatory expressions in children, like the sense of smell in Coronavirus patients, are neurological expressions ultimately caused by DNA damage to brain neurons that acts [18] as a trigger for cytokine production. Indeed, the UV absorption spectrum of the pro-inflammatory interleukin (IL-6) was found [19] to be excited by the DNA absorption spectrum (Fig. 5) of pyridine dimers at UVC (~250 nm) levels.

VI. CONCLUSIONS

In simple QED, the Planck law allows the NPs to produce EM radiation to disinfect the Coronavirus from heat at body temperature, a significant difference with classical physics that predicts the NPs only acquire the temperature of the bath. In NPs, UVC photons do not require high temperatures and are produced under EM confinement at body temperature.

With regard to providing Coronavirus disinfection treatments, simple QED induced UV radiation from NPs offers an easily implemented solution. Considerable data exists to support the argument that NPs kill organisms and damage the DNA. However, only simple QED argues the NPs depending on size create UV radiation in equilibrating the thermal energy of the surrounding blood and tissue.

The dose of NPs in saline solution can only be determined by CDC and FDA controlled testing with emphasis placed on neuron and DNA damage. The lowest NP concentration that disinfects the Coronavirus is the goal as collateral DNA damage to adjacent tissue from low intensity UV can be corrected by DNA repair systems. For Coronavirus patients in a life-threatening condition, DNA damage appears justified.

Coronavirus symptoms in the brain expressed by the loss of the sense of smell are neurological induced by simple QED induced UVC radiation. UVC excitation in the brain induces DNA damage and apoptosis in WBC explaining how the Coronavirus may lead to viral encephalitis.

The UVC radiation from the Coronavirus may explain the mystery of why a 'storm of blood clots' are being found in Coronavirus patients and why young children are expressing significant inflammation.

The vaccine paradigm as the norm in controlling infectious disease is no longer applicable as the Coronavirus will simply mutate or other viruses may appear. Genetic basis to the Coronavirus excludes the effect of simple QED induced EM radiation. Only a UVC treatment of patients diagnosed as having the Coronavirus by intravenous injections of 80 nm lipid NPs, or the equal appears relevant.

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APPENDIX

The simple QED analysis of the thermal response of a single lipid NP in a thermal bath of tissue and blood at ambient temperature is illustrated in Fig. A1.

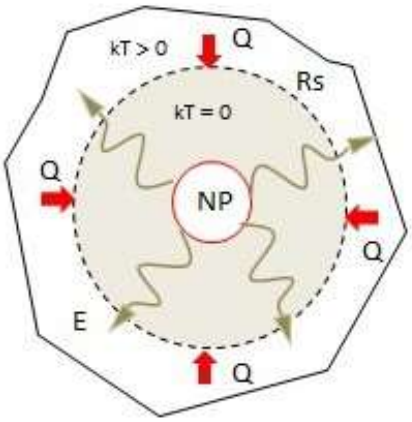

Figure. 5: NP in a Thermal Bath

The NP absorbs heat Q from the thermal bath at absolute temperature T by conduction. Fig 2 shows Fourier's heat conduction equation at 300 K is only valid in the bath for kT = 0.0254 eV. The radius Rs at which bath atoms have thermal E = kT energy is $\lambda > 200$ microns. For body tissue and water having refractive index n = 1.4, the radius $Rs = \lambda/4n \sim 36\ \mu m$. What this means is the heat flow Q from the bath at temperature T is converted at Rs to EM radiation in the far IR ($\lambda = 4nRs$) and upon being absorbed at by the NP is conserved by emitting simple QED radiation. Small temperature changes occur for $\lambda < 200$ microns, but clearly vanish for NPs < 100 nm.

Classically, all atoms in the NP at equilibrium have temperature T equal to the bath temperature. In terms of the Boltzmann constant k and the number N of atoms, the total NP thermal energy U is,

$$U = \frac{3}{2}kNT$$

However, by the Planck law the N atoms do not have E = kT energy. Instead, simple QED conserves the energy U that otherwise would occupy the 80 nm NP by creating standing EM radiation across the NP diameter d as shown in Fig. 4. The molecular weight of the meibomian C44H56O2 is 616 and the number Nm of molecules is, $Nm = (\rho V/616)\cdot Av$, where volume $V = \pi d^3/6 = 2.68 \times 10^{-22}\ m^3$, density $\rho = 1000\ kg/m^3$ and Avagadro's number $Av = 6.023 \times 10^{26}$ mols/kg-mol. Hence, $Nm = 2.62 \times 10^5$ and N = 102 Nm = 26.7 million atoms $\rightarrow$ U ~ 1 MeV. For $E = hc/\lambda$ at $\lambda = 248$ nm, E ~ 5 eV and the NP creates about 200,000 UVC photons upon equilibrating with the 300 °K thermal bath temperature.

But how rapidly does the NP temperature in the bath recover?

The simple QED creation of UVC having Planck energy E ~ 5 eV at wavelength $\lambda = 248$ nm absorbing a pulse of heat from the water changing the temperature ΔT is given [Carslaw and Yeager. Conduction of Heat in Solids, 1959, Oxford Univ. Press.] by,

$$\Delta T = \frac{1.2}{\pi d^2 K}\left(\frac{E}{\Delta t}\right)\sqrt{\frac{\alpha}{\pi}}\left[\sqrt{t+\Delta t}-\sqrt{t}\right]$$

The Planck energy E ~ 5 eV is spread over the spherical surface area πRs^2. In the 80 nm meibomian NP, the pulse duration Δt is $\Delta t = 2d / (c /n) \sim 0.83$ fs. The UVC heat $Q = E/\Delta t \sim 900$ μW. For the NP in water, thermal diffusivity $\alpha = K/\rho C$, where $\alpha = 1.24 \times 10^{-7}$ m^2/s and K = 0.52 W/m-K. Fig. A2 shows the initial drop in temperature ΔT to be an imperceptible ~ 2 μ°C that recovers in < 1 ps.

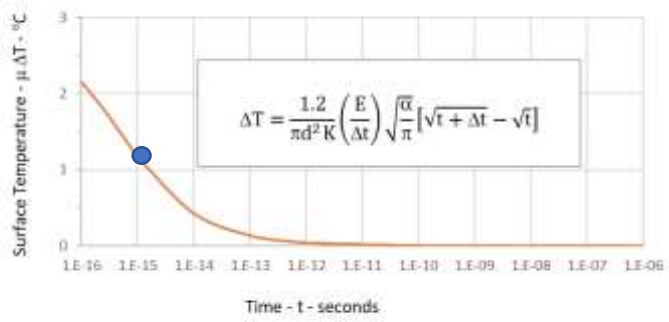

Figure. A2: Single Photon Creation Time

However, the UVC photon must be created promptly, say < 5 fs as noted by the blue circle. What this means is the UVC photon cannot be created from body temperature surroundings. Much higher bath temperatures are required. To create the UVC photon, T = E/1.5k ~ 37,000 °K. But high temperatures are not necessary under high EM confinement.

Indeed, once the incident heat Q is absorbed in the penetration depth δ = 20 fm of the NP, the time τ to create the UVC photon as the EM heat Q travels to the NP center is, $\tau = 2d/(c/n) \sim 0.83$ fs < 5 fs and prompt, i.e., the 80 nm NPs under EM confinement continually produce UVC photons in human tissue at body temperature.