Secondary statistical analysis of MIT’s thermoelectrically pumped "over unity" LED study [1] identifies an unknown nuclear particle which eliminated Peltier-cooling band-gap resistance to make "over unity" possible

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A study published in 2012 by the *Research Lab of Electronics, Massachusetts Institute of Technology* found that a temperature influenced LED could produce greater light power output than electric power input at sub nanowatt resolutions. A secondary statistical analysis of the MIT data shows that the explanation offered for the over unity is inadequate. Prior to the fall to a forward bias voltage level which allowed lattice heat to supplement electrical power input, thermal radiance entanglement with the LED's light output addressed increasing band-gap resistance from Peltier cooling. Below the entanglement point, only the highest diode temperature eliminated Peltier cooling band gap resistance so that over unity could occur. Two lower temperatures actually increased band-gap resistance. A set of quantum-dimensional equations were developed for the thermal radiance power output of an unrecognized nuclear particle attached to neutrons; a particle which is proposed to induct proton charges into a Curie free magnetic current within the nucleus. These equations accurately calculated the "wall-plug" efficiency divergences for the three temperatures which had been statistically revealed to exist.

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The study published in March of 2012 in the Physical Review Letter revealed that a light emitting diode, under certain temperature conditions, could exceed a power output-to-input efficiency of “1.”

> *"A heated semiconductor light-emitting diode at low forward bias voltage $V < k_B T/q$ is shown to use electrical work to pump heat from the lattice to the photon field. Here the rates of both radiative and non radiative recombination have contributions at linear order in V. As a result the device’s wall-plug (i.e., power conversion) efficiency is inversely proportional to its output power and diverges as V approaches zero. Experiments directly confirm for the first time that this behavior continues beyond the conventional limit of unity electrical-to-optical power conversion efficiency." [1]*

Measurement were made for three different temperature conditions for the light emitting diode. These measurements supplied a graph of radiant wattage output to electrical wattage input with a resolution down to less than a tenth of a nanowatt for 135° C (408 K) for 84° C (357 K) and for 25° C (298 K).

Current solid-state theory holds that, the forward bias voltage across the band gap initiates Peltier cooling which exchanges heat for light emissions. Solid-state theory predicts that, when forward bias voltage falls below the energy state provided by diode temperature, then the energy supplied by temperature should begin to increase the efficiency of the ratio of light output to electrical input.

The MIT data graph does not fully support conventional solid-state theory. The output/input data graph has been subjected to a secondary statistical analysis. That analysis reveals that the “*rates of both radiative and non radiative recombination*” are not inclining towards greater “wall-plug” efficiencies for all temperatures. The temperatures curves on the graph begin diverging from one another at a single point . However, the slopes of the different temperature curves do not begin to incline toward greater efficiency, as predict. The two lowest temperature curves (25° and 84°) begin to incline further away from greater efficiency or in a direction which is the exact opposite of that predicted. Only the 135° curve consistently inclines toward greater efficiency.

The amounts and directions of this statistically-revealed temperature divergence is predicted by a new nuclear model. The divergence is caused by thermal radiance entanglement with the LED’s light power output.

A new system of mathematics, designated “quantum-dimensional mathematics,” has been developed to replace primitive quantum mechanics. When applied to the nucleus, this system reveals the neutrino to be a functioning nuclear particle which has been stripped from neutrons during solar fusion. When attached to neutrons, the neutrino supplies the dynamic force required to induct nuclear proton charges into “a free magnetic current” which was predicted to be possible by Pierre Curie. The magnetic current provides a thermal signature and the particle controls the power output of the peak thermal radiation signature for any temperature [comment 2] . When attached to the neutron, the neutrino has been designated the “Hoffman particle [3] ” by its mathematical discovererers.

The mathematics developed for nuclear magnetic current induction allows us to calculate peak thermal radiance power outputs for all temperatures. All such peak thermal radiance power outputs are determined by their relationship to the Hoffman particle’s peak thermal signature as well as by a nuclear Boltzmann amplification factor which is revealed from Blackbody thermal radiation curves .

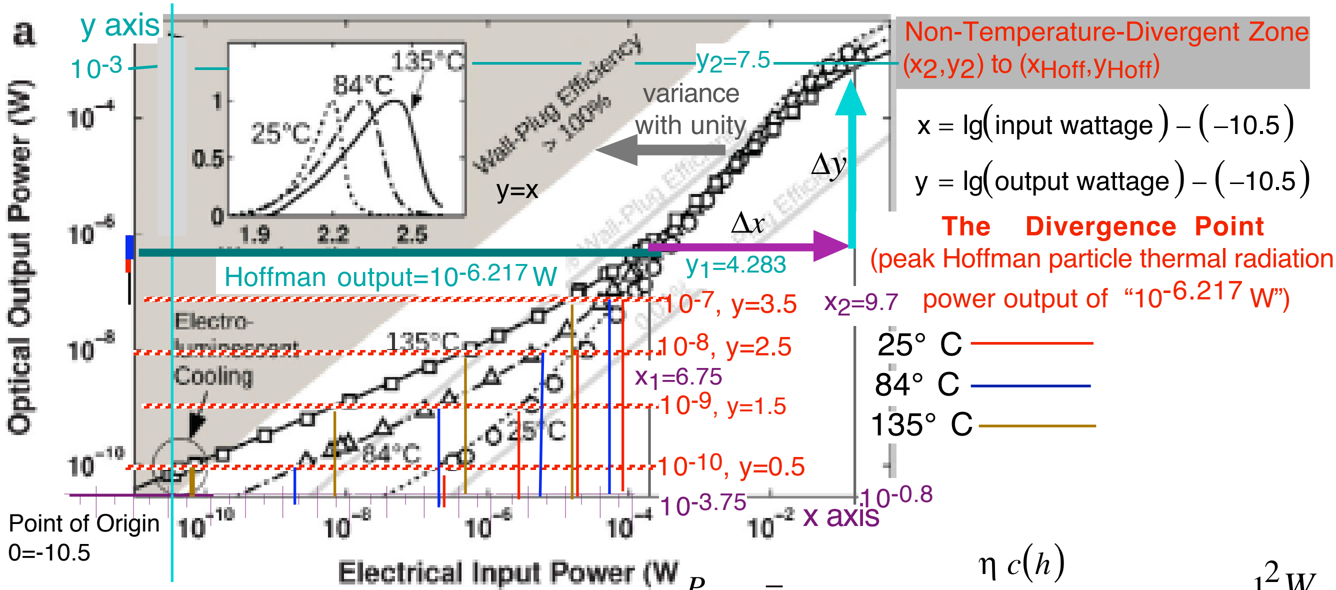
$$P_{out} = \frac{\eta c(h)}{\lambda_{Peak}(2.0468e\text{-}13\ seconds)} I_{+e}^{2};$$

$$\{\text{Percentage of proton charge induction per magnetic current pulse}\} = I_{+e} = \frac{\lambda_{\text{PeakHoff.}}}{\lambda_{\text{Peak}}} \qquad (1)$$

$$\{\text{Nuclear - amplification factor}\}^{*} = \eta = \frac{(10^{3})c(h)}{3k_B} = 4.7958955344$$

* Nuclear - amplification factor calculated from Blackbody thermal radiation curves [4].

The Hoffman particle’s peak thermal radiance power output is the point at which the thermal signatures for the three temperatures begin to entangle with the LED’s light power output. Depending upon the temperature’s relationship to the Hoffman thermal signature, the entanglement either suppresses or increases light power output. The direction and amount of any temperature’s divergence toward or away from wall-plug efficiency is calculable by this relationship to the Hoffman thermal signature.



$$P_{Hoff} = \frac{\eta\ c(h)}{\lambda_{Hoff}(2.046777792e\text{-}13\ seconds)} 1^{2}\,W$$

$$\lambda_{Hoff} = 7.67\ \mu m; \qquad T_{Hoff} = 391\ K\ (118°\ C\ )$$

FIG. 1. *MIT's output/input temperature curves diverge at the point Hoffman nuclear thermal radiance output entangles light output. Hoffman is determined by quantum-dimensional formulas.*

The Statistical Parameter "ΔSlope-bias/ Δx" to be applied to the Temperature Curves

$$\left\{Variance\ with\ maximum\ efficiency\ for\ any\ measurment\right\} = vu = 1-\frac{y}{x}$$

$$\left(\Delta Slope\text{ - }Bias\right)_{from\ Hoff.} = \frac{1-\left(y/x\right)}{1-\left(y_{Hoff}/x_{Hoff}\right)}-1$$

$$\left\{Slope\ Hoffman\right\} = \frac{y_{Hoff}}{x_{Hoff}} = \frac{4.283}{6.75} = 0.6345; \quad vu_{Hoff} = 1-\frac{y_{Hoff}}{x_{Hoff}} = 0.3655 \qquad (2)$$

$$\left\{\Delta Slope\text{ - }Bias\ from\ Hoffman\ per\ unit\ of\ x\right\} = \frac{\left(\Delta Slope\text{ - }Bias\right)_{from\ Hoff.}}{x_{Hoff}-x}$$

TABLE I (color): **Table of statistical data**

Temp.	Graph values x_{Hoff}=6.75	@10^{-7} optical y=3.5	@10^{-8} optical y=2.5	@10^{-9} optical y=1.5	@10^{-10} optical y=0.5
25° C	x	6.3125	5.6875	4.8125	3.78125
	Δx	0.4375	1.0625	1.9375	2.96875
	y/x	0.5545	0.4396	0.3117	0.1322
	1–y/x	0.4455	0.5604	0.6883	0.8678
	$\frac{\Delta Slope\text{ - }bias}{\Delta x}$	0.5006	0.5020	0.4558	0.4629
84° C	x	6.09375	5.1875	3.71875	1.7185
	Δx	0.65625	1.5625	3.03125	5.0315
	y/x	0.5744	0.4819	0.4034	0.2910
	1–y/x	0.4256	0.5181	0.5966	0.7090
	$\frac{\Delta Slope\text{ - }bias}{\Delta x}$	0.2507	0.2672	0.2086	0.18681
135° C	x	5.625	4.0625	2.21875	0.3125
	Δx	1.125	2.6875	4.53125	6.4375
	y/x	0.6222	06154	0.6761	1.6
	1–y/x	0.3778	0.3846	0.3239	-0.6
	$\frac{\Delta Slope\text{ - }bias}{\Delta x}$	0.02986	0.01946	-0.02509	-0.41034

The MIT data graph [1] shows that, for radiant power output below "exponent -3," the curves for the three temperatures follow a common slope until the Hoffman peak thermal radiant power output is reached. For LED radiant power outputs below Hoffman, the temperature curves begin to diverge in slope relative to one another. The Hoffman particle is a nuclear component which controls all peak thermal radiation power outputs. By carefully constructing a “ruler” for the MIT “x” axis (electrical power input), measurements for the divergence of “y/x” slopes between temperatures can be made for sub-Hoffman radiant power output data points.

A statistic is developed which shows how the slope of any point upon the MIT temperature curves varies with the “unity slope.” The “unity slope” is defined as “(power-output/ power-input)=1” and is identified by the slope of the line on the MIT graph for “Wall-Plug Efficiency=100%.” It is the slope of the line for which power-output is equal to power-input.

The “variance with unity” for the slope of any empirical point is “1-(y/x)” where “y=power output, x=power input” as measured in exponential units from the MIT graph’s Point of Origin:

$$\textit{Point of Origin} = (\textit{input exponent } -10.5, \textit{ output exponent } -10.5) = (x=0, y=0) \qquad (3)$$

A parameter of the “variance with unity” statistic shows the “bias” of the change in slope, relative to unity, in the fall between two points; the “Δ(Slope-bias)/ Δ(x)” parameter. “Δ(Slope-bias)” means the way that the slope is inclining relative to the unity slope between the two points.

$$\left\{\Delta\left(Slope\text{-}bias\right)\right\} = \frac{1-y_1/x_1}{1-y_2/x_2} - 1;\ \ (x,y)_2 > (x,y)_1;\ \ \frac{\Delta\left(Slope\text{-}bias\right)}{\Delta x} = \frac{\Delta\left(Slope\text{-}bias\right)}{x_2 - x_1} \qquad (4)$$

The statistical parameter is constructed such that, if a curve's variance with the wall-plug unity slope is greater for the higher point than the lower point (the curve is inclining towards efficiency in the drop), then the change in slope bias will be negative. In contrast, if the curve's variance with the wall-plug unity slope for the higher point is less than the lower point (the curve is inclining away from efficiency), then the change in slope bias will be positive.

These changes in a curve's slope bias between a higher point and a lower point are then converted into a rate per drop in exponential unit of electrical power input. This conversion of the change in slope bias to a rate per unit drop is applied to Hoffman and any inferior data point . This treatment allows for all the changes in rates between Hoffman and all sub-Hoffman data points to be fairly compared.

The statistical parameter measures the changes in the amount of power input required to produce light power output via Peltier cooling by comparing Hoffman and sub-Hoffman data points. If the slope bias is increasing across the drop, then the lower point power output requires relatively more power input to achieve. This increase in power input requirements represents a change in band-gap resistance to Peltier cooling. The statistical parameter correlates with changes in band-gap resistance between Hoffman and sub-Hoffman data points.

(SEE NEXT PAGE FOR DATA GRAPH)

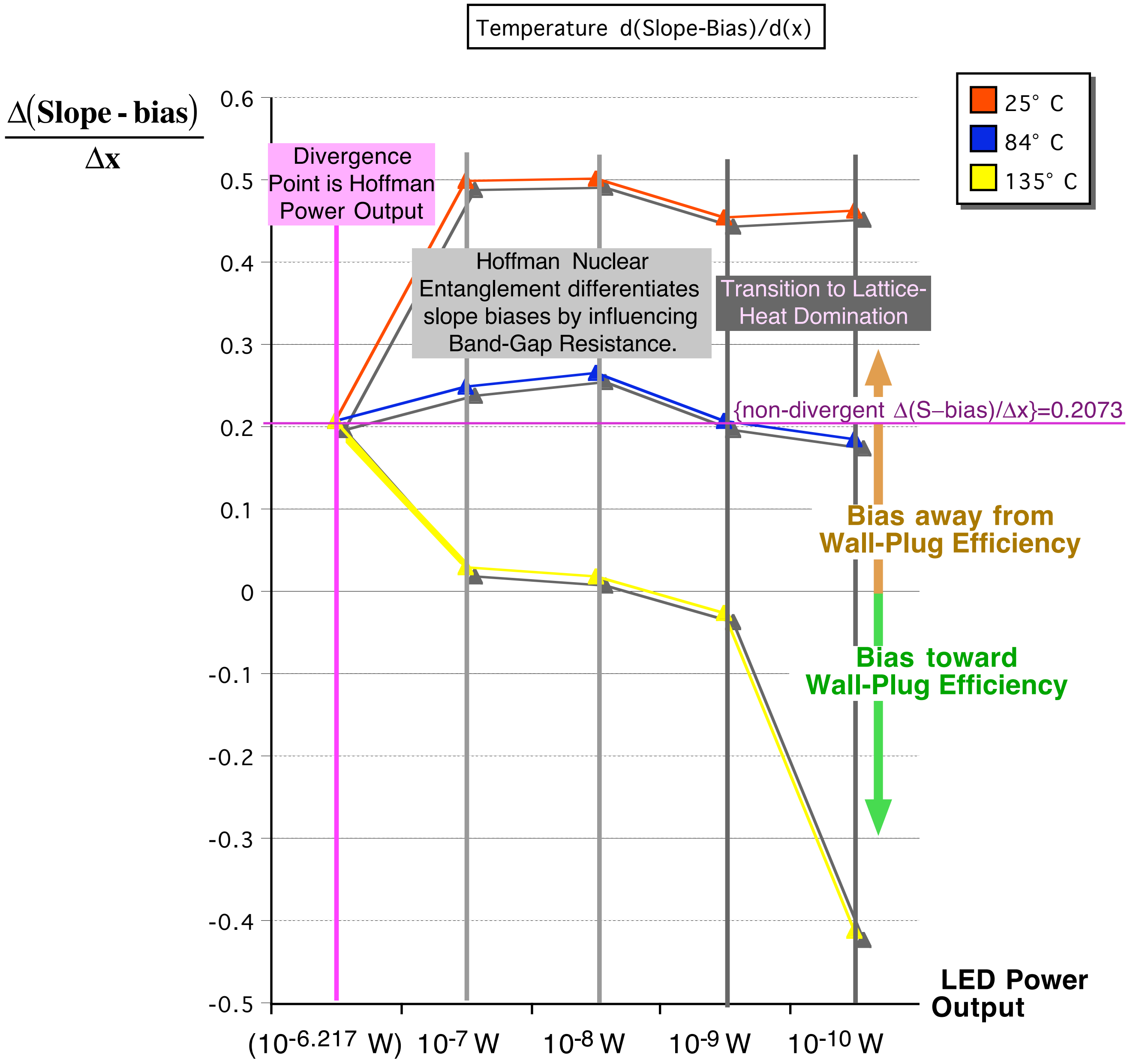


FIG. 2. *The common inclination in slope bias shared by the three temperatures prior to Hoffman is lost when light power output falls below Hoffman to the first sub-Hoffman data point. For the 25° curve, the inclination away from the wall-plug unity slope has increases by 2.41 times. For the 84° curve, the inclination away from the unity slope has increased by 1.21 times. For the 135° slope, the pre-Hoffman common inclination away from unity has decreased by 85.6%. The variances are explained by a temperature's relationship to Hoffman. Both 25° and 84° are cooler than Hoffman's 118°. Only 135° is warmer.*

I. PELTIER COOLING AND BAND-GAP RESISTANCE

Electrical current flow across the band gap initiates Peltier cooling which exchanges heat for a light power output within the LED frequency range. The energy exchange initiated by cooling across the band-gap is a constant equal to the frequency of the light emission *times* Planck's constant. Prior to a fall to the Hoffman point, the only energy input which can provide for this constant cooling to light output is electrical energy input.

Electrical energy input decreases for lower points on the temperature curves. Lower electrical energy input to initiate the same light energy output requires an increase in the time required for the light output and, therefore, provides a lower light wattage. The decrease in light wattage output will be greater than the decrease in electrical wattage input. This provides increasing band-gap resistance to Peltier cooling as power input drops. It explains why the temperature curves prior to Hoffman have a common slope bias away from wall-plug efficiency of "0.2073" per drop in unit of wattage input.

The slopes of the output-to-input curves are inclining away from the the one-to-one slope by an average of 20.73% for every drop in a unit of power input. This change in slope bias per unit drop of power input is due to increasing band-gap resistance; a resistance increase which is being supplied by the Peltier cooling energy constant as electrical input energy falls.

The Sub-Hoffman Curves comparing Wattage to Amperage Inputs show Divergence is due to Resistance Changes [5]

Fig. 3-a

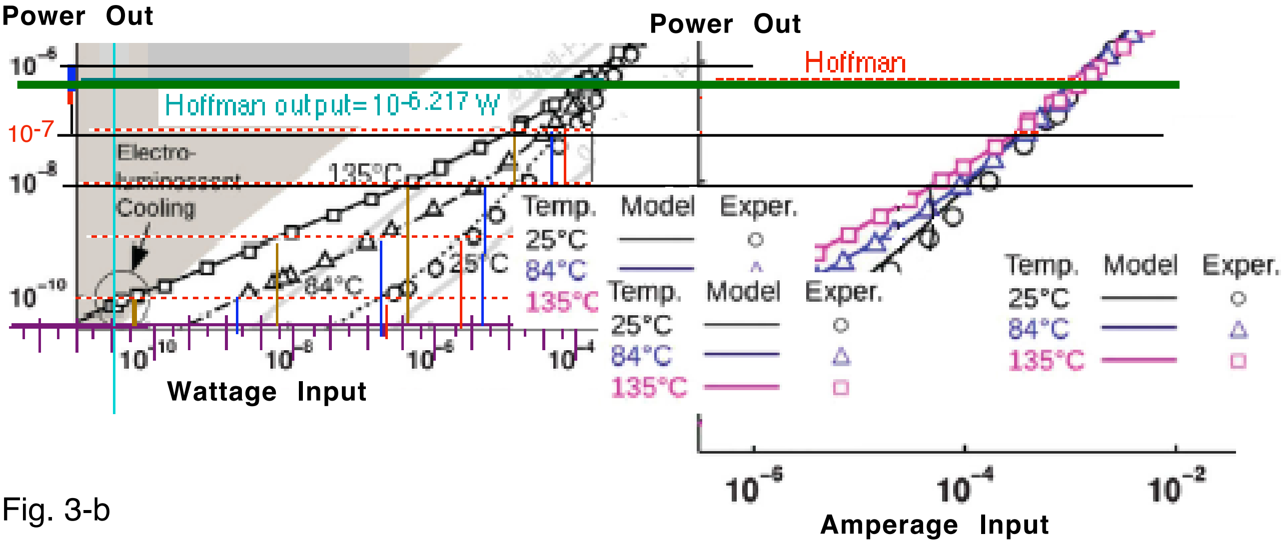


Fig. 3-b

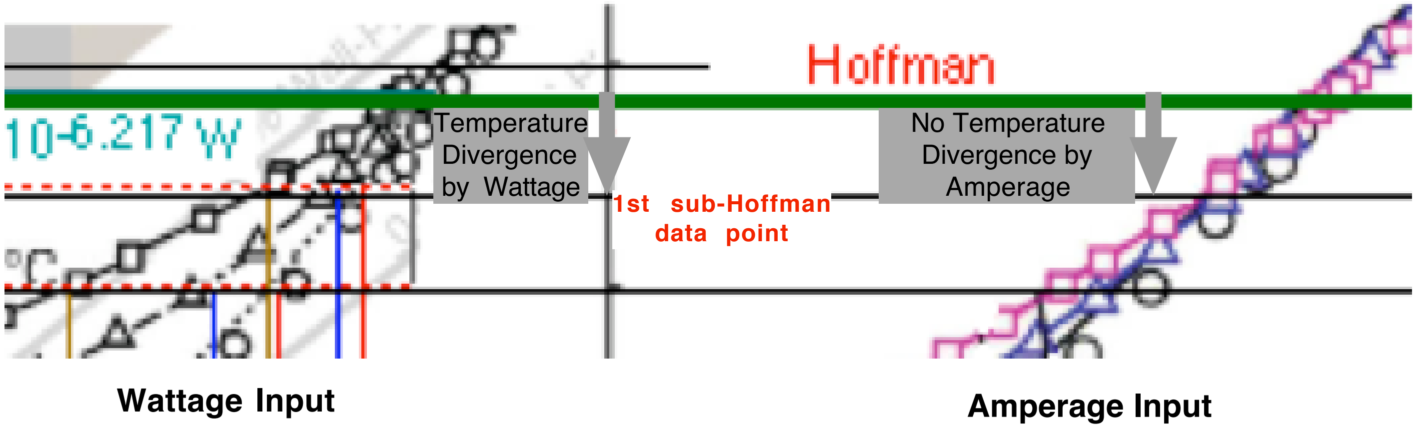


FIG. 3. *Comparisons of wattage input to amperage input in the fall from Hoffman to the first sub-Hoffman data point, shows that divergence of the curves is caused by variations in changing band-gap resistance across the fall. The temperature curves track one another by amperage but not wattage. The input wattage difference between the curves is explained by differences in voltage input. If amperage is held constant, variance in voltage must be explained by variance in resistance.*

II. NUCLEAR THERMAL ENTANGLEMENT AND BAND-GAP RESISTANCE

The sub-Hoffman divergence of the temperature-curve slopes is caused by nuclear thermal radiance power entanglement with light power output on the level of electron orbitals. Below the light power output equivalence with Hoffman power output the thermal signatures from the various temperatures modify light power output. The direction of this influence is determined by the percentage of proton charge being inducted into each pulse of the nuclear magnetic current by Hoffman particle free-charge spin (charge-induction factor) [3].

If the entangling nuclear charge-induction factor for the temperature reduces light power output, then band-gap resistance is increased. If the nuclear entangling charge-induction factor increases light power output, then the band-gap resistance is reduced.

TABLE II: **Table of Thermal Radiance Power Outputs for MIT Temperatures**

Temp.	**Power Gain/Loss** ΔWattage from Hoffman $\Delta P_{Hoff} = I_{+e}^3$	**Thermal Power Output** $P_{out} = \frac{\eta c(h)}{\lambda_{Peak}(2.0468e-13\ seconds)} I_{+e}^2;$ *All above first sub-Hoffman data point of power-output exp. -7*	**Hoffman Charge-Induction Factor** $I_{+e} = \frac{\lambda_{\text{PeakHoff.}}}{\lambda_{\text{Peak}}}$	**Thermal Peak wave-length**
Hoff. 391 K	0	exp. -6.217	1	7.67 µm
135° C (408 K) above Hoff	*exp. 0.05501 113.5% Hoff.*	*exp. -6.1619*	*1.0431*	*7.353 µm*
84° C (357 K) below Hoff	*exp. -0.1189 76.05% Hoff.*	*exp. -6.3358*	*0.9128*	*8.403 µm*
25° C (298 K) below Hoff	*exp. -0.3543 44.23% Hoff.*	*exp. -6.5712*	*0.7619*	*10.067 µm*

$$I_{+e} = \{\%\ proton\ charge\ induction\ per\ magnetic\ current\ pulse\} = \frac{\lambda_{\text{PeakHoff}}}{\lambda_{\text{Peak}}}$$

$$\Delta P_{Hoff} = \frac{P_{Temp}}{P_{Hoff}} = \frac{\eta c(h) I_{+e}^2 / \lambda_{PeakTemp}(2.0468e-13\ seconds)}{\eta c(h) 1^2 / \lambda_{PeakHoff}(2.0468e-13\ seconds)} = I_{+e}^2 \left(\frac{\lambda_{PeakHoff}}{\lambda_{PeakTemp}} \right) = I_{+e}^3 \tag{5}$$

III. MAGNETIC CURRENT CHARGE-INDUCTION FACTOR CONTROLS PELTIER COOLING RESISTANCE FOR SUB-HOFFMAN DATA POINTS

For all diode light-power emissions below the Hoffman peak thermal radiance power output, the diode's nuclear thermal temperature will permanently alter Peltier-cooling band-gap resistance and band-gap electron voltage [5]. Only 135° C thermal influence will completely eliminate Peltier-cooling band-gap resistance to allow the diode's fall in electrical power input to trend towards "Wall-Plug" over unity.

1. *25° charge-induction factor increases Peltier cooling band-gap resistance by 2.42 times per unit drop of power output.*

When the LED's light power output falls below the Hoffman thermal radiance output, thermal radiance power outputs from the various LED temperatures will begin to entangle light power outputs. For the 25° C (298 K) curve, sub-Hoffman light power output will be reduced to 44.23% of its pre-Hoffman level by this entanglement. This reduction is caused by the fact that the amount of proton charge being inducted into each magnetic current pulse at 25° C is only 76.19% of a full charge ($0.7619^3 = 0.4423$ [6]. This reduced charge induction results in a reduced power output relative to pre-Hoffman levels of 44.23% ($0.7619^3 = 0.4423$).

The impact of such a reduction in power output upon "wall-plug" efficiency is the inverse of the reduction. A reduction to 44.23% of pre-Hoffman light power output levels for a 25° diode temperature will increase shared Peltier-cooling band gap resistance by "2.26 *times" (*1/ 0.4423= 2.26). Below Hoffman, 25° nuclear thermal-radiance power outputs which are "entangling" with diode light power output will require "2.26 *times* " more input for the same output wattage as compared to its pre-Hoffman requirements.

This charge-induction factor is further modified by a negative biasing of band-gap electron voltage through nuclear thermal-radiance entanglement [6]. For the 25° sub-Hoffman data points, the band-gap electron voltage has been reduced by 10.68% due to a downward adjustment on the limit of the light emission wavelength.

At the first sub-Hoffman light-output data point ("exponent -7"), the 25° curve has inclined away from "wall-plug" efficiency by increasing its pre-Hoffman slope bias, Pre-Hoffman slope bias had been inclining away from the the unity slope by an average of 20.73% for every drop in a unit of power input. Below Hoffman, this increases to 50.06% per unit of drop. The slope bias increase represents an increase of Peltier cooling resistance of "2.41 *times* " *per* drop in exponential unit. This is an increase in Peltier cooling band-gap resistance which is even greater than that predicted by the 25° reduced charge-induction factor.

The predicted increase in Peltier cooling resistance per-unit of drop from reduced nuclear charge induction is "2.26 *times*." The empirically determined "2.41 *times* " is 6.64% greater than the predicted "2.26 *times.*" This "6.64%" increase in Peltier cooling resistance over that expected from reduced nuclear charge-induction represents the influence of the 25° change in band-gap electron voltage [6].

2. *The 84° charge-induction factor increases Peltier cooling band-gap resistance by 1.21 times per unit of drop.*

In the the thermal radiance power output table, it can be seen that nuclear thermal power output by 84° C (357 K) is 76.05% of Hoffman power output. This reduction is caused by the fact that the amount of proton charge being inducted into each magnetic current pulse at 84° C is only 91.28% of a full charge ($0.9128^3 = 0.7605$).

The impact of such a reduction in power output upon Peltier cooling resistance is the inverse of the reduction. A reduction to 76.05% of pre-Hoffman light power output levels for an 84° diode should increase band-gap resistance by 1.315 *times* per unit of power input drop *(1/ 0.7605=* 1.315).

At the first sub-Hoffman light-output data point ("exponent -7"), the 84° curve has inclined away from "wall-plug" efficiency by increasing its pre-Hoffman slope bias (relative to unity) from 0.2073 to 0.2507. This represents an increased in Peltier cooling resistance by a factor of 1.21 *times per* unit drop in input-power. This empirical increase in output-to-input inefficiency is less than that predicted by the 84° reduced charge-induction factor (1.315 *times*).

The increase in band-gap resistance inefficiency from reduced charge induction is predicted at "1.315 *times*." The empirically determined "1.21 *times* " is 7.98% less than the predicted "1.315 *times.*"

This "7.98%" decrease in expected band-gap resistance inefficiency represents the influence of the 84° entanglement with band-gap electron voltage. This reduction in the predicted inefficiency is explained by the fact that the 84° entanglement increases the diode's band-gap electron voltage by "7.01%." [6]

3. *The 135° charge-induction factor reduces Peltier cooling band-gap resistance by providing an energy gain to light power output and this allows 135° to reach over unity.*

Light power output which is *increased* by nuclear thermal entanglement has effectively decreased band-gap resistance. Nuclear thermal entanglement provides magnetic current charge induction greater than "1" per pulse. A charge in excess of that provided by the nuclear protons is projected to the electrons established in their subshell orbitals. This projected excess positive charge represents a power gain to the light frequency associated with the orbital.

MIT's InGaAsSb diode operates at a light output of approximately "2.15 μm" (0.5767 eV). This wavelength is output by the "4p" subshell which has a natural wavelength of " 2.17 μm" (0.5726 eV). The "4p" subshell is available as a valence subshell to either the "Ga" or the "As" elements contained within the diode's amalgam [7]. Excessively-charged thermal energy is stored in the "4p" capacitance field and provides a power gain to the "4p-proximate" light emission.

The light-emission power gain is facilitated by a dynamic energy gain provided by protonic spin interfacing with the Hoffman particle's free-charge spin. Hoffman particle spin is an *open energy source* [8] being supplied by the quantum fundamental field force [6]. 135° C excessive proton spin increases proton charge induction into the magnetic current. This spin induced excess charge induction penetrates the fields of facing Hoffman particles to stimulate the creation of new energy. The creation of energy by the penetration of an open energy field can only be described by the quantum open energy integral.

$$\left\{common\ \Delta\left(band\text{ - }gap\ resistance\right)\ per\ unit\ of\ input\ drop\right\} = 0.2072\frac{\Delta SB}{\Delta x}$$

$$\left\{Hoffman\ field\text{ - }penetration\ factor\ from\ proton\ spin\right\} = \xi$$

$$\begin{Bmatrix} reduction\ of\ \Delta\left(band\text{ - }gap\ resistance\right) \\ by\ the\ open-energy\ integral \end{Bmatrix} = \left(1-\int_1^{\xi}\frac{1}{\xi^2}d(\xi)\right)0.2072\frac{\Delta SB}{\Delta x}$$

$$= \left[1-\left(1-\frac{1}{\xi}\right)\right]\ 0.2072\frac{\Delta SB}{\Delta x} = \frac{0.2072}{\xi}\frac{\Delta SB}{\Delta x}$$

$$@\ 10^{-7}\ power\ output:\quad \frac{0.2072}{\xi}\frac{\Delta SB}{\Delta x} = 0.02986\frac{\Delta SB}{\Delta x};\qquad \xi = 6.94$$

$$@\ 10^{-8}\ power\ output:\quad \frac{0.2072}{\xi}\frac{\Delta SB}{\Delta x} = 0.01946\frac{\Delta SB}{\Delta x};\qquad \xi = 10.65$$

The reduction of the increase in slope bias due to Peltier cooling resistance (0.2072 ΔSB/Δx) can never reach "0." The infusion of field created energy can only be described by the quantum open energy integral. The formula for the open energy integral reduces, by division, the common increased slope bias per unit of drop in power input. No value can be reduced to "0" by division. However the slope bias increase can be reduced to near "0" by division. At power output exponent -8 the slope bias increase has been reduced to 9.4% of its pre-Hoffman value. Below power output exponent -8, the lattice heat influence described by the MIT researchers becomes dominant [9] . For 135° C, prior band gap resistance change is reduced to less than 10% of its pre-Hoffman value, allowing lattice heat influence to provide wall plug over unity during further falls.

END NOTES:

[1] Santhanam, Parthiban and Gray, Dodd Joseph and Ram, Rajeev J. *Thermoelectrically Pumped Light-Emitting Diodes Operating above Unity Efficiency,* PhysRevLett.108.097403

[2] Thermal radiance power is the wattage invested in electron orbitals and is not the equivalent of *blackbody spectral radiance power* which is the thermal radiance wattage illuminating meters squared of surface area through a strand three dimensional angle.

[3] Dawson, Lawrence. *Four Dimensional Atomic Structure;* Tab 3 *“The Quantum Geometric Neutron and its Role in Nuclear Cohesion”* and Tab 4 *“The Curie/Quantum Nuclear Model and its Application to the Periodic Table of Elements”.* Paradigm Publishing, 2013.

[4] Dawson, Lawrence. SRNRL Report. *"The Energy Gains of Short Wavelength infrared Semiconductors shown to be supplied by Nuclear Magnetic-Current Power Gains .* Available at: http://paradigmphysics.com/test_consensus.pdf

[5] ORIGINAL SOURCE: PhysRevLett.108.097403, p. 097403-2. Figure 1-a, Figure 2. As arranged and annotated by the author.

[6] Dawson, Lawrence "Massachusetts *Institute of Technology Research found the Efficiency of LED Radiant Wattage output to Electrical Wattage input exceeded “1.” A Secondary Statistical Analysis reveals Nuclear Thermal Entanglement changing Band-Gap Resistance as the Explanation,"* P. 8, *"Nuclear Thermal Entanglement of Band-Gap Electron Voltage* ." Unpublished full SRNRL report upon the MIT study. Found at: http://www.paradigmphysics.com/Statistical_Analysis_MIT_Study.pdf

[7] Dawson, Lawrence. *Four Dimensional Atomic Structure;* Tab 10 *“The Quantum Geometric Periodic Table of Elements”.* Paradigm Publishing, 2013.

[8] Dawson, Lawrence *"Introduction to Quantum-Dimensional Mathematics : The prerequisite to understanding our four-dimensional universe."* P. 5 and forward for the mathematical description of the open-energy integral. Unpublished report available at http://www.paradigmphysics.com/quantum_math_text.pdf

[9] Lattice heat influence begins at the point that forward bias voltage falls below Boltzmann heat energy divided by charge. MIT's own data graph (FIG. 2, p. 097403-2, PhysRevLett.108.097403) shows this lattice heat influence occurs below output exponent -8.