

LOW ENERGY INDUCED NUCLEAR
FUSION THROUGH COHERENCE
OF THE QUANTUM VACUUM
ZERO-POINT ENERGY

EXPERIMENTAL EVIDENCE AND
CONCEPTUAL THEORY

Mark Porringa, PEng © 2004

ZEROPOINT TECHTONIX Inc.

Objectives

- ◆ Intro to Carbon Arc in Water experiments
- ◆ Theoretical background
- ◆ Experimental apparatus & Results
- ◆ Conceptual Fusion Theory
- ◆ Conclusions & Recommendations

Introduction

- ◆ Carbon Arc in water experiment replications
 - Texas A & M, J. Bockris
 - BARC, M. Singh
 - TESRE, R. Monti
 - EW Institute, G. Oshawa
- ◆ Anomalous presence of Iron and other metals
 - Too high for contamination or impurities
- ◆ Excess heating of cell over input power
 - $COP > 1$
- ◆ Related experiments
 - SONOFUSION, ORNL, R. Teliyarkhan, 2002
 - Deuterium Fusion in Acetone driven by Ultrasonic waves > Sonoluminescence

Theoretical Background

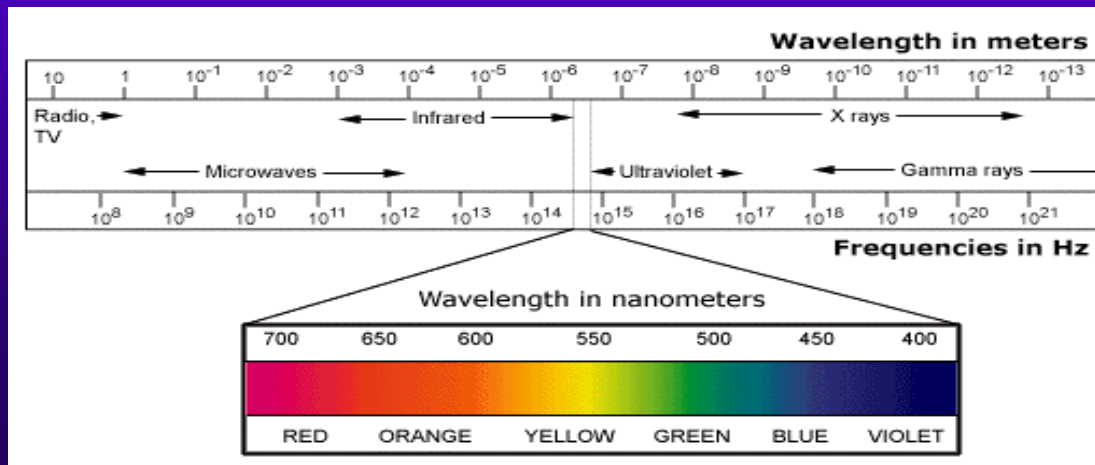
- ◆ Zero-Point Energy (ZPE) of Quantum Vacuum Fluctuations
- ◆ Casimir Effect from Coherence of ZPE
- ◆ Casimir Effect in Sonoluminescence
- ◆ In Condensed Charge / Electron Clusters
- ◆ In Cavity Quantum Electrodynamics (QED)

Zero-Point Energy, ZPE

- ◆ Residual, Incoherent background energy of Space
 - Quantum Vacuum Fluctuations
- ◆ Persists even in cold, hard vacuum > Zero-Point
 - Isotropic, random, homogenous, ubiquitous
- ◆ Responsible for Quantum jitter at absolute zero
 - Zero net effect at macro scale of bulk matter
- ◆ Predicted by Quantum Field theory
 - Empirical Data and Observations came later
- ◆ Must be Accounted for in the math of QM > Lamb shift
- ◆ Theoretically up to Planck Frequency ($\nu=10^{44} \text{ s}^{-1}$, $\lambda =10^{-32} \text{ m}$)
 - Derived from Planck's constant
- ◆ Extremely high energy density
 - Sum of all frequency Modes and Directions
 - Energy per photon is proportional to Frequency

Zero-Point Energy (Cont'd)

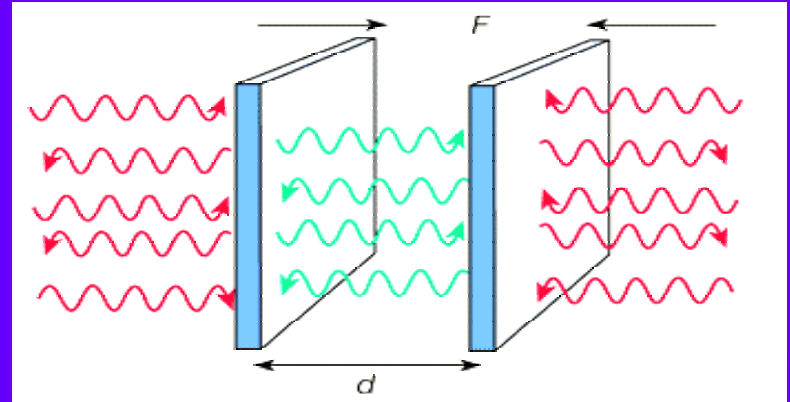
- ◆ Non Hertzian, Longitudinal scalar waves
 - No Transverse EM Field Vectors > one dimensional “tempic” wave
 - Field Oscillation and propagation along same axis
 - Like Sound waves (compression/rarefaction wave)
- ◆ Largely unobservable with existing technology/instruments
 - Electrons do not respond/oscillate above $\sim 10^{22}$ Hz
 - Little spacial effect from single dimension wave
- ◆ Detection requires Coherence of Random energy
 - Best prospect is the CASIMIR Effect



➤ ZPE extends way beyond known EM spectrum

➤ $f \gg \gg 10^{22}$ Hz
(hard gamma rays)

Casimir Effect



- ◆ Metallic or Dielectric plates forced together in vacuum
- ◆ Theorized by H. Casimir on the basis of QT, 1948
- ◆ Based in the *coherence* of Zero-Point Energy
- ◆ Casimir Force, $F_c = \pi^2 \hbar c A / 240 d^4 > P_c = F_c / A$
- ◆ Verified Experimentally, Sparnaay, 1958
- ◆ Measured down to 0.1 microns (10^{-7} m), Mohideen, 1998
- ◆ At 10^{-8} m translates to a pressure of 1 atm or 100 kPa
- ◆ At the Atomic dimension of 10^{-9} to 10^{-10} m $> 10^6$ to 10^{10} kPa
- ◆ Atomic Bonds?
- ◆ At the Nuclear dimension of 10^{-15} m $> 10^{30}$ kPa
- ◆ Nuclear Bonds? $>$ Strong Force!
 - External pressure not internal attraction “gluons”
- ◆ Absolute Photon pressure in vacuum may be above 10^{30} kPa!

Sonoluminescence

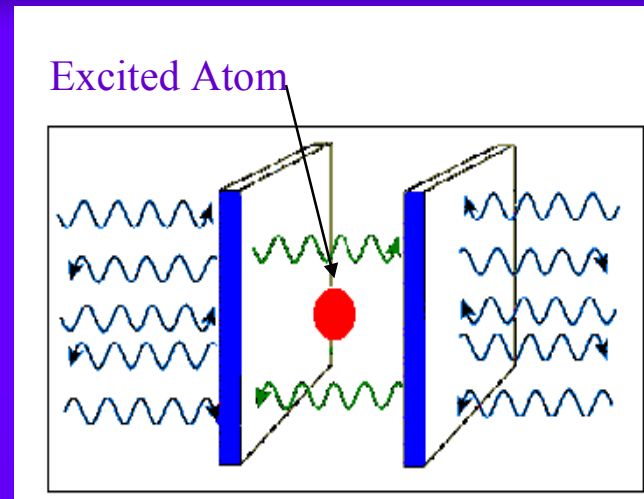
- ◆ High intensity picosecond light pulses from cavitation bubble collapse in dielectric fluids
- ◆ Driven by Ultrasonic waves
- ◆ Temperatures exceeding 10^6 Kelvin
- ◆ Responsible for Cavitation damage in Pumps
- ◆ Special case of Casimir effect
- ◆ Dielectric bubble wall replaces metal plates
- ◆ Based in Coherence of ZPE
- ◆ Sonofusion at ORNL, DD fusion in Acetone

High Density Electron Clusters

- ◆ Deals with collapse of electron plasmas above a critical flux density $> K$. Shoulders
- ◆ Forms high density cluster referred to as an EV
 - EV $>$ Electron Valudum (Large Electron)
- ◆ EV consists of up to 10^{11} electrons!
- ◆ About 1 micron in diameter
- ◆ Existence contrary to expectations
 - Mutual Coulomb repulsion should prevent formation?
- ◆ EV Clusters invariable contain a relatively small number of Ions ($>10^6$)
- ◆ Another special case of the Casimir effect
- ◆ Electron Cloud replaces metal plates
- ◆ Based in ZPE Coherence

Cavity QED

- ◆ Deals with behaviour of excited atoms within micron sized Metallic/Dielectric cavities
- ◆ Application of Casimir Effect
- ◆ Excited Atoms within cannot radiate or receive certain wavelengths from vacuum, ZPE
- ◆ Spontaneous emission time increased / decreased
- ◆ Shielding out of longer wavelengths of ZPE
- ◆ Extrapolation to nuclear / sub-atomic level likely
- ◆ Spontaneous processes of Nucleus may be altered
 - High states of ionization known to reduce half-life
 - Radioactive decay (α , β , γ , n) and Fission changed



Simple Experimental Apparatus



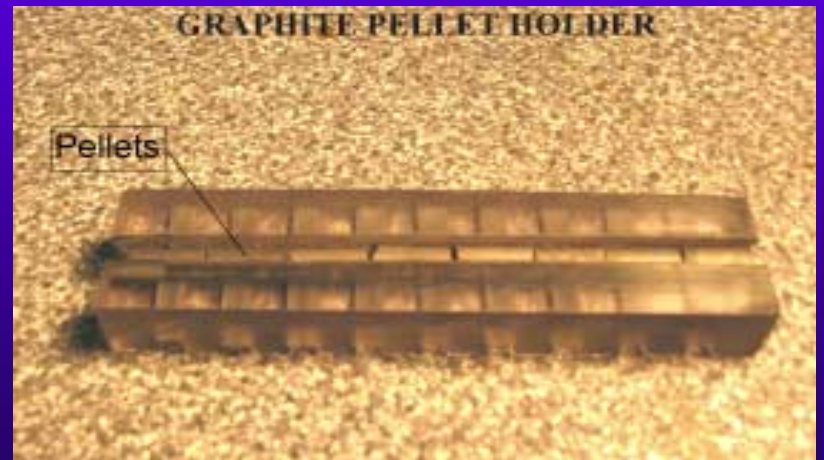
Graphite Electrodes

- ◆ Ultra Pure Graphite
- ◆ Certified 99.99995 %
- ◆ For Gold Assays
- ◆ DC Arc Spectroscopy
- ◆ Manufactured by
ULTRA CARBON
- ◆ Electrodes and Pellets



Graphite Pellet Holders

- ◆ Series discharge for faster production of carbon residue
 - Single discharge also works
- ◆ Stable materials used
 - Fused Quartz tube (99.9 % Silica)
 - Ceramic Glass
 - Plexiglas
- ◆ Fluted or Milled for circulation of water and gasses



Water Properties

- ◆ Ultra pure
- ◆ Reagent grade
- ◆ Double distilled
- ◆ Deionized to $< 1\mu\text{mho}$
- ◆ Micro filtered to 0.5 microns
- ◆ Certified analysis $< 1\text{ppm}$ total impurities
- ◆ 0.5 to 1.0 Liter used per run

Procedure

- ◆ Pulsed DC at 120 Hz
- ◆ Up to 10 arcs in series >1000 arcs/sec
- ◆ 8 Volts rms per arc > 5 Amps
- ◆ Light contact to avoid short circuit current
- ◆ One hour elapsed arcing time
- ◆ Yields ~ 0.5 g of carbon residue for analysis
- ◆ Rough Calorimetry comparing input power to cell heating
- ◆ Monitor for Radioactivity

Carbon Arcing Process



Observations

- ◆ Plasma discharge, with broadband RF Noise
- ◆ Electrode consumption > carbon residue
 - Primarily at Anode ends
- ◆ Electrolysis > Oxygen and Hydrogen
- ◆ Other Gasses produced or present
 - CO, CO₂, O₃, N₂, etc.
- ◆ Slight Sulfur odour
- ◆ No radiation detected (or expected)
 - α , β , γ , η ?
- ◆ Excess heat energy
- ◆ Metals produced
 - Analysis using ICP-AES, performed by SRC

Preliminary Calorimetry Results

- ◆ Cell temperature rise exceeded input power
 - 72K Joules supplied at ~400 watts
 - 100K Joules of Water heating
 - COP 1.4
 - Fusion Yield?
 - ZPE coherence?
- ◆ Inconclusive, but very likely real
 - Power measurement, current spikes, instrumentation issues, system losses

Qualitative Fusion Test

- ◆ Magnetic material extraction
- ◆ Iron and Nickel containing residue
- ◆ Fine dark grey powder residue
- ◆ High concentration of Iron



Carbon Residue Analysis (ICP-AES)

	Raw C Pellet	Residue	Pellet + H ₂ O	Residue + H ₂ O			
Element	Control A (µg/g)	Sample A (µg/g)	Control B (µg/g)	Sample B1 (µg/g)	Sample B2 (µg/g)	MAX YIELD (Increase)	B.A.R.C. For Ref. (µg/g)
Al 13	3	540	28	740	890	30 X	200
Ba 56	2	16	1	26	9	25 X	N/A
B 5	0	4	2	N/A	11	5 X	N/A
Ca 20	2	210	42	1930	800	50 X	N/A
Cr 24	0	47	0	16	13	All new	100
Cu 29	1	63	4	24	100	25 X	N/A
Fe 26	3	950	20	750	450	50 X	1000
Pb 82	0	18	2	N/A	4	10 X	N/A
Mg 12	2	120	6	530	140	90 X	N/A
Mn 25	0	8	0	13	8	All new	50
Ni 28	1	10	0	12	16	All new	500
P 15	<10	50	<10	N/A	40	5 X	N/A
K 19	<40	180	<40	N/A	640	15 X	N/A
Na 11	2	210	50	430	670	15 X	N/A
Si 16*	N/A	N/A	N/A	N/A	N/A	N/A	500
Sr 38	0	3	0	22	10	All new	N/A
Ti 22	0	46	1	N/A	13	50 X	N/A
Zn 30	1	170	8	500	290	60 X	N/A

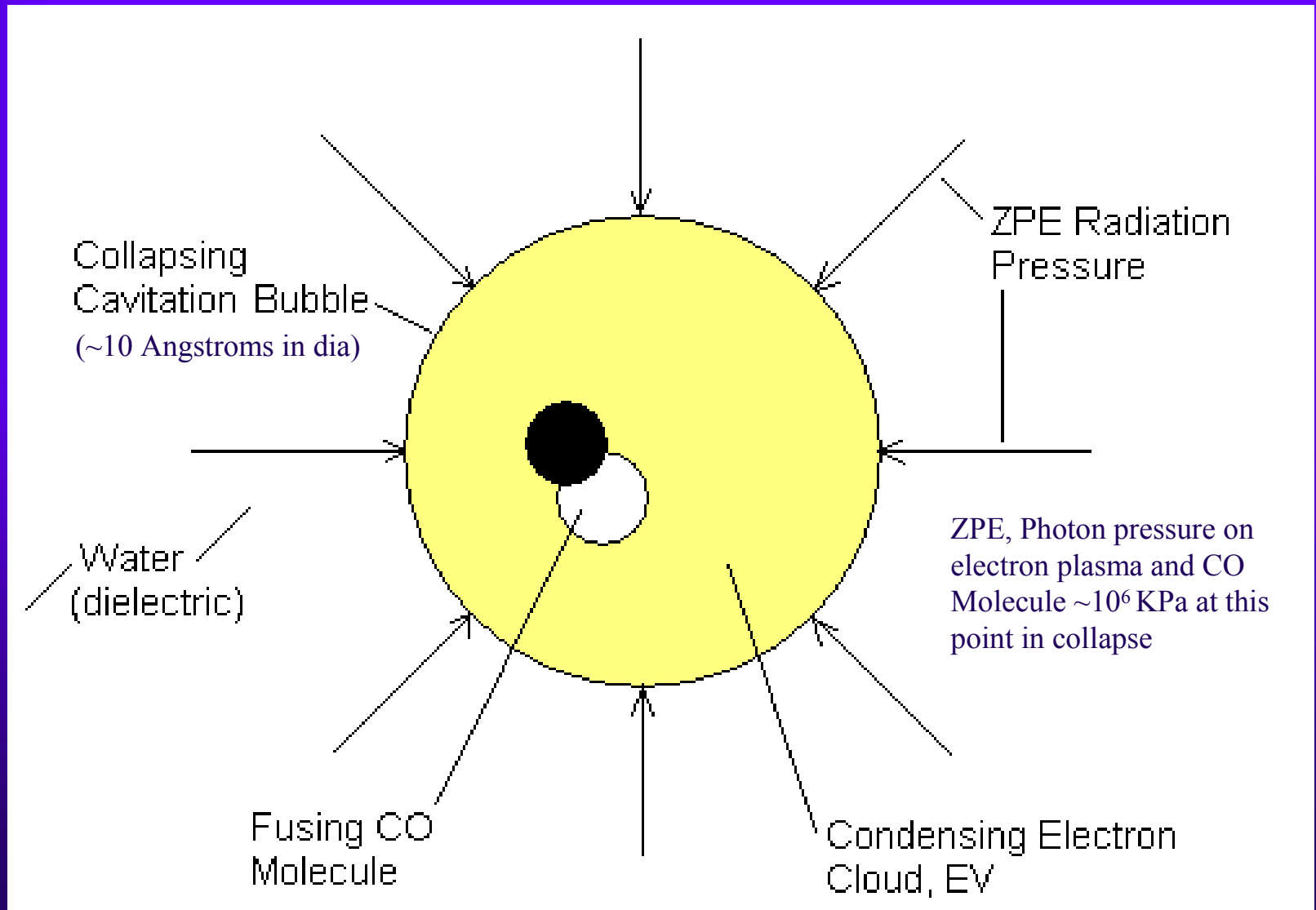
Fusion Process

- ◆ Plasma arc Electrolysis produces H_2 , O_2 , CO , etc.
- ◆ Water confined plasma discharge also forms micro-void channels filled with electrons and some entrained Ions from dissolved gasses & particulates
- ◆ Void channels break up into microscopic cavitation bubbles filled with electrons and entrained Ions
- ◆ Coherence of ZPE via Casimir Effects begins
- ◆ Electron filled cavitation bubble collapses due to rapidly escalating radiation pressure
- ◆ Entrained ionized atoms and simple molecules compressed within collapsing EV/bubble at extremely high radial pressure & energy

Fusion Process (Cont'd)

- ◆ Nuclei Fuse gently to form new element
 - No violent disruptive impact
- ◆ Electron Capture converts excess protons to neutrons
 - Or Ejection of protons to form hydrogen
- ◆ EV breaks up on impact with anode releasing new atoms and expelling carbon residue
- ◆ Cycle repeats at >1000 arcs/sec
 - 10^5 micro-plasma bubbles per arc?
 - 10^6 fusions per plasma bubble?
 - $> 10^{19}$ new atoms created per hour
- ◆ Cohered ZPE stored internal to new atom
 - Some released as heat
- ◆ Labeled ZEIPPIEN Fusion - truncated to ZIPP Fusion
 - Zero-point Energy Induced Plasma Pinch of Ionized Entrained Nuclei

ZIPP Fusion Illustrated



Passive Inertial Confinement? > ZPE Coherence replaces Laser array

ZIPP Fusion Reactions

- ◆ Atomic reactions
 - Between individual atoms/ions such as C, N
- ◆ Diatomic reactions
 - Diatomic molecules O₂, N₂, C₂, Al₂
- ◆ Molecular reactions
 - Simple molecules such as CO, CO₂
- ◆ Unconfirmed (Precision MS required)
- ◆ Yields of up to $\sim 10^{19}$ atoms formed (Ca)

Atomic Reactions



◆ Many others suspected

Diatomic Reactions



Molecular Reactions



Some Properties of ZIPP Fusion

- ◆ Normally produces stable Isotopes
- ◆ Without significant radiation - α , β , γ , n
- ◆ High MeV fusion energies supplied from ZPE Coherence via Casimir effects of Sonoluminescence and Electron Plasma condensation
- ◆ Triggered by low input energy of plasma discharge and or cavitation bubble collapse
- ◆ Fusion of relatively large nuclei implies uniform, smooth compression as opposed to violent impact
- ◆ Simple molecules such as CO and diatomic forms are particularly well suited
- ◆ Electron capture by fusing nuclei to convert excess protons to neutrons is a common occurrence
- ◆ Excess energy is attainable from coherence of ZPE
- ◆ Passive form of Inertial Confinement Fusion

Conclusions

- ◆ Low Energy Induced fusion occurs with surprising abundance
- ◆ Low Energy Induced fusion is simply a fact despite the lack of theory
- ◆ Cold Fusion is a misnomer
 - High MeV energy from Vacuum ZPE undetected
 - Remains stored as the energy of the new atom
- ◆ Lavoisier's law does not apply here
 - Both Chemistry and Nuclear physics involved
- ◆ Strong force appears to be an ultra close range Casimir effect due to ZPE radiation pressure
- ◆ Excess energy appears to be attainable

Recommendations

- ◆ Commit resources for refinement of ZIPP Fusion
 - Many other fusion & fission processes envisioned
- ◆ Prompt application to nuclear waste treatment
 - Accelerated decay, sub-critical fission, stabilize nuclei
- ◆ Atomic theory requires revision
 - Bohr model accurate for hydrogen only
 - Cannot explain much of chemistry (bonding, etc.)
 - Rutherford's estimate of nuclear radius is suspect

Closing Comments

- ◆ Believe the facts
- ◆ Question “Pet” theories
- ◆ Paradigm shift happening
 - Energy fills space, No closed systems
 - Interacts with *Everything*
- ◆ Return to a more logical determinism
 - QT becoming far less statistical
 - “God doesn’t play dice with the Universe”
Albert Einstein
- ◆ Scientific Renaissance around the corner...