

PROPOSED DESIGN FOR A MAGNETICALLY PUMPED LASER

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ABSTRACT. This short paper describes a proposed new laser using magnetic pumping. The idea is simple. A ruby laser may just be embedding a laser ruby rod inside the primary coil of an a/c transformer together with the iron core. According to contemporary electromagnetism, electrical energy is transmitted by a current-carrying conductor through the magnetic field around it. The author's new aether photoelectricity theory offers a different explanation. The energy flow in current-carrying conductors is through aether apulses, single aether electrical wavelet of one wavelength (the equivalent of the photon). The flow of such photons (microwave around $10 \mu\text{m}$) within the conductors is the actual physical mechanism of electrical energy transfer by metal conductors. There is no magnetism in photoelectricity theory. The energy currents entering the primary coil of an a/c transformer would *jump the air gap* into the iron core. The iron core (when active) conducts the flow of photons towards the secondary winding. The photons again jump the air gap and enters into the secondary winding giving rise to the energy current flowing across the long distance electrical power lines towards its destination. In the new magnetically pumped ruby laser, the photon flow across the copper windings and the iron core would have some photons entering into the embedded ruby rod. Such photons may be able to activate lasing of the ruby.

1. INTRODUCTION

The first laser was operated successfully by Theodore Maiman in 1960 by shining a high-powered flash lamp on a ruby rod with silver-coated surfaces. A simple modern version of a ruby laser may be constructed with a synthetic ruby crystal rod with precise flat end surfaces. One end is coated as a mirror reflecting light from within the crystal. The other end is a semi-transparent mirror that would allow about 50% of light to pass through. If the light of a strong flashlamp shines on the crystal rod, the photons entering into the ruby would cause '*stimulated*' amplification of the photons within the crystal. When sufficient photons have been produced, a stage would be reached when a coherent laser beam of red light at 694 nm is produced coming out from the semi-transparent end of the ruby rod.

This paper proposes a new novel design for powering a laser where laser pumping is done magnetically. Currently, the most common laser pump energy is usually provided in the form of light or electric current. There are other exotic forms including using chemical energy, thermal energy and even nuclear

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energy. The new design proposed here employs '*magnetic pumping*'. Such an approach has not been found mentioned in the current literature on lasers. In reality, though, the term magnetic pumping is only a misnomer as will be shown.

2. A NEW THEORY OF ENERGY TRANSFER IN CURRENT-CARRYING CONDUCTORS

In order to understand magnetic pumping, it is necessary to first discuss the author's new theory on a most fundamental issue in electromagnetism[1]. In contemporary electromagnetism based on Maxwell's theory, electrical energy transfer by current carrying-conductors is assumed to be through the magnetic fields surrounding the conductors. The Poynting theorem is invoked to give the rate of energy transfer. The author is not comfortable with Maxwell's theory as it requires the concept of the magnetic field. The concept of the magnetic field should by now be retired; it is a legacy of an anachronism from the early days which assumes that a permanent bar magnet has two magnetic poles. We now know magnetic poles do not exist. The phenomenon of magnetism comes from electrical interactions of charged particles when they have relative motion. The source of '*magnetic*' forces is still Coulomb electrical forces.

In the author's Simple Unified Theory, SUT [2] - an aether theory - an '*apulse*' is a quantum of light of a single wavelength. All our supposed electromagnetic waves are waves in the aether of space due to electric polarization of the aether. No magnetism is involved. Light is electrical aether polarization waves. Apulses are emitted only through the Bohr's mechanism when an electron falls from a higher energy states to a state that is lower. The Bohr's mechanism is the only physical method in nature by which light is generated - there is no other. In the case of nuclear radiations, it would be the equivalent of a nucleon transiting to a lower state. Light is generated one apulse at a time. The continuous train of electromagnetic waves as depicted in introduction to Maxwell's theory does not exist in reality. It is because light consists only of apulses, each of a single wavelength, that it appears to have particle property giving rise to the so called '*wave particle duality of light*'. There is no duality or any ambiguity as to the nature of light. Light is a wave.

In the author's theory of photoelectricity without magnetism[1], energy transfer by current-carrying conductors is through absorption and re-emission of apulses within the conductor; the actual physical mechanism does not involve any energy supposed to be carried through magnetic fields.

3. HOW THE TRANSFORMER WORKS

With the new photoelectricity theory, a new explanation of how the transformer works is found. The schematic of the transformer is shown in Fig 1. In the case of electricity being generated in a power station, apulses are generated within the rotor electromagnets due to its motion relative to the copper windings of the stator - it is apulses generated due to Faraday's law of electromagnetic induction. The apulses '*jump the air gap*' and enters into the stator armature

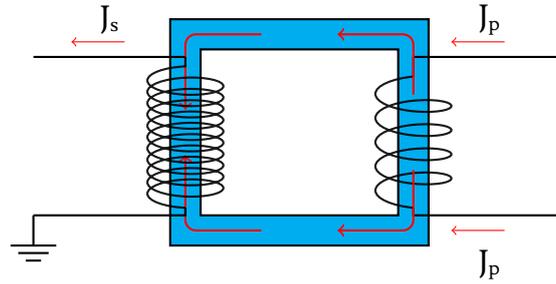


FIGURE 1. Delta-wye (Δ -Y) step-up transformer action. The right primary winding is connected to the stator armature winding through a 3-phase delta connection. The left secondary winding connects to the transmission cables through a wye connection. Energy current J_p jumps the air gap entering the iron towards the secondary and jumps the air gap into the winding giving the secondary energy current J_s .

winding that connects to the primary copper winding of a step-up transformer. So the initial scenario is an energy current (of apulses) generated in the power station that enters into the primary winding of the transformer as depicted in the figure. The apulses again jump the air gap from the primary windings into the iron core of the transformer. The permeability of the soft iron, when active, 'conducts' apulses which travel towards the secondary winding and enters into it across the air gap. So the actual physical mechanism of energy transfer across a transformer is through energy currents - the equivalent of photon currents - travelling within the conductors and the active soft iron core.

4. A PROPOSED 'MAGNETICALLY' PUMPED LASER DESIGN

The current literature on lasers does not seem to have any mention of lasers that derive energy from a magnetic source. The schematic of the proposed design is shown in Fig 2. The reason why no one has yet proposed such a design is because the current assumption about the working of the a/c transformer is that energy transfer is all through the magnetic fields produced by the copper windings and magnified by the presence of the soft iron core. The current theory only states that 'electrical' energy - somehow - is transferred from input source as output in the secondary windings.

There is only three forms of energy known in physics, i.e. potential, kinetic and radiation (light photons). Current electromagnetism does not give the actual physical form of energy transferred except the generic label 'electrical' energy. There is no suspicion at all that photons may be involved in the working of the transformer. In the author's photoelectricity theory, the actual form of energy is aether apulses (the photon equivalent) that flows within the transformer. It is this new phenomenon that - if correct - may be the source of pump energy for lasing medium embedded within the transformer coils.

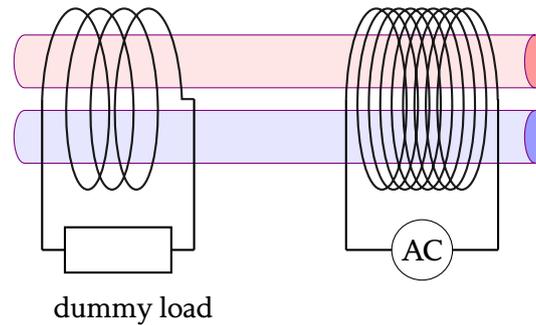


FIGURE 2. Magnetically Pumped Laser. The upper pink rod is the laser rod. The grey rod is the soft iron. When apulses (photons) jump between transformer windings and the iron core, some may be absorbed by the laser rod that may result in lasing.

With a lasing medium embedded within the transformer coil together with the soft iron core, some photons that traverse the air gap would enter the lasing medium and excites the atoms of the medium. This may finally lead to lasing giving rise to the emission of a laser beam.

If we assume that the apulses of the energy current in conductors follows blackbody distribution, at ambient temperature of 20°C , the radiation wavelength with peak intensity is about $10\ \mu\text{m}$ - in the microwave range. As to whether such microwaves could trigger lasing is best left to experiments. There are other parameters like a/c frequency, transformer voltage or power that may need to be tuned.

It is uncertain that a dummy load is needed for such a laser to work. If it works, it may also work without the secondary winding. The setup would then be just an a/c electromagnet with its polarity reversing periodically. Just to reverse the magnetic field in the soft iron requires energy. The small initial energy current flowing across the copper windings towards the iron core may be sufficient to finally trigger lasing.

5. CONCLUSION

This new laser design has never been attempted before. If it works, it may open a large field for laser research. The power of such a laser may only be limited by the input power source. This design may have the potential to produce lasers more powerful than any achieved so far.

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