Direct Current Generation of Radio Wave Photons from an Antenna

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***Abstract*— Radio wave trains are the basic unit for communication and it is assumed that antennas require alternating resonant electric vibrations to operate. This assumption is challenged by experiments that created, sent and received single photon sized energy between a transmitting wire and a receiving wire. By completely avoiding resonance and impedance changes, single photon duration signals made by direct current were transmitted and received by wires placed 3.5 wavelengths apart. The transmitting antenna is analogous to a long molecule that has delocalized valence electrons throughout its long dimension. Radio photons may be emitted from an antenna by the same basic process whereby light photons are emitted from long molecules.**

***Index Terms*—beverage antenna, class A amplifier, photon communications, photon pulse, RF transmitters**

I. INTRODUCTION

Most of what we know about photons, including radio photons, came from experiments that explore emission of light photons from individual atoms and molecules. For example, we know that a ground state electron can be excited to a higher state, and subsequently fall back to a lower energy level, with simultaneous emission of a photon. This is exemplified in the familiar Bohr model of the hydrogen atom wherein a single electron has a probability wave with allowable energy levels. Excitation of the electron leads to an altered probability wave, where the electron generally moves away from the nucleus, and then emits a photon when falling back to a more stable energy level.

A. LONGER ELECTRON ORBITALS (INCLUDING THOSE IN ANTENNAS) CREATE LONGER WAVELENGTH PHOTONS

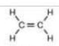
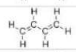
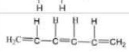
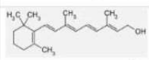
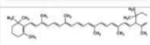
Electronically excited states of large molecules having delocalized electrons shared by many nuclei also decay to ground states, with emission of photons [1]. The most well-known delocalized electrons are those that are shared over multiple nuclei via resonant pi bonds. These electron shared-nuclei orbits are much more linear. Their energy transitions are lower, with longer wavelength photon emissions, compared to the hydrogen atom S1 electron.

The long, delocalized electron orbitals shared over many atoms are found in large molecules used as colored dyes and for fluorescence. See Table 1. These elongated photon emitters exhibit properties of antennas, as they emit and absorb electromagnetic energy at right angles to a long axis [2]. The polarization and directionality of the photon based on the delocalized electron path or "orbit" is exploited to detect molecular motion in a diagnostics assay called "fluorescence polarization immunoassay [3]." In this photonic technique, photons are absorbed by different molecules as a function of their orientation relative to the exciting light and emitted at different angles based on changing orientation [4].

Also like an antenna, molecules emit longer wavelength photons as their delocalized electron orbitals become longer. Table I compares the calculated delocalized conjugated electron path length versus associated photon wavelength for various sized molecules. The longer extended orbital electrons exhibit longer wavelength photon absorption and emission spectra. And, as they become more linear, the electron delocalization length begins to approach the wavelength of the emitted photon.

The orbits of the delocalized valence electrons in some extended molecules approach one dimension as they become longer. The wave functions of electrons that emit the radio photons may be approximated by the "particle in a one-dimensional box" simplification, which assumes that the pi electrons are not hindered in their motion along the chain, but at the end of the chain there lies an energy "wall [5]." This simplification might allow use of the measured delocalization bond lengths to estimate the wavelength of the photon that is absorbed or emitted from that electron energy wave.

Table I
Linear electron orbit size vs photon size

molecule	structure	Length of conjugated delocalized electron orbital[6]	Photon wavelength	Photon wavelength / e orbit length
ethene		.134 nm	165nm	1231
1,3 butadiene		.413nm	217nm	525
1,3,5 hexatriene		.65nm	258nm	396
Retinol[7]		1.21nm	350nm	289
carotene		2.4nm	450nm	187
Wire used in this study	Delocalized metallic binding electrons	30m	30m (proposed)	~1

In sum, large molecules are employed as miniature light photon receivers and transmitters, wherein the photon energy frequency/wavelength corresponds to conditions of the extended electron wave function. Although not well appreciated, metals formed as wires are extreme examples of where free electrons have extremely long wave functions. The

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valence electrons of metal in a wire are shared among the metal nuclei and are said to freely move along the entire wire, analogous to that of conjugated pi electrons in a molecule. The wave functions are determined from the weak attraction of metallic bonded valence electrons to a long wire of seemingly infinite number of metallic atomic nuclei. Because of the large number of metallic nuclei, the large size of the valence band, and the overlap between the valence band and conduction band, the actual energies needed to excite a metallic bond electron to a higher orbit/energy are extremely numerous and resemble a smear [8].

The probability clouds or "orbits" of these circulating metallic bond electrons are more than a million times longer than that of a typical colored molecule. Despite the extreme differences in size these delocalized metallic bond electrons give rise to photons used in radio communications. However, models of electromagnetic wave generation at radio frequencies ignore the individual electron as a photon emitter but instead emphasize waves as the basic unit of electromagnetic energy production.

B. RADIO ENERGY IS DESCRIBED AS WAVES BUT COMPRISES PHOTONS

Radio wave photons routinely are generated as long wave trains by resonating electric energy in a long metal antenna

Fig. 1 shows a resonating dipole antenna. The antenna length is ½ of the wavelength size of the emitted radio frequency photon. The antenna emits a half wave of energy (180 degrees of a sine wave) for each complete movement of electrical acceleration force in a single direction.

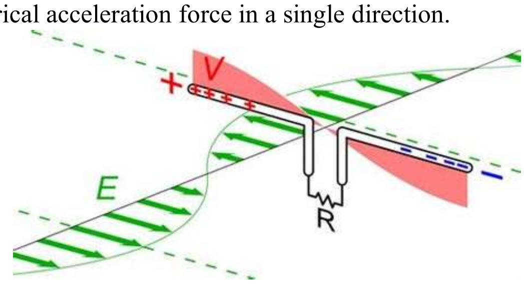

Fig. 1 Radio waves emitted by a resonating dipole antenna

A positive direction electric acceleration in the antenna is followed by an equal negative acceleration. Each generated 180-degree wavelet is followed by an opposite polarity 180-degree wavelet. Many assume that an individual photon occupies one wavelength of time, implying that one back and forth motion in the antenna of Fig. 1 is required to make one photon as one sine wave. However, there is no *a priori* reason to expect that a 180-degree wave portion of a sine cannot transfer energy into a photon because 180 degrees (half of a sine wave) contains the necessary information of phase, frequency and wavelength.

According to this standard view, a standing wave must be created in a resonant form or multiple traveling waves (in the case of non-resonant antennas) to produce radio electromagnetic energy. Therefore, radio communication techniques have been developed that form and detect very long wave trains over long time periods from resonant energy applied to the antenna. These "carrier" wave trains are modulated to impress bits of information onto them. "For communication purposes, the basic periodic charge oscillation (the *carrier frequency*) is given modulation, in amplitude, frequency or phase, in which the information is encoded [9]." In modern "digital" communications the Fourier transform is applied to the wave trains to resolve the information embedded in their modulation patterns.

This visualization (Fig. 1) of radio wave emission used in radio does not comport with the extensive documentation of photon emission from electrons in the vastly smaller calculated orbits of atoms and molecules. Single photon behavior is simply not considered at the long wavelengths used in radio communications.

C. WAVE TRAINS LIMIT COMMUNICATION SPEED

The resonance technique limits radio communication speed because signals are necessarily impressed into long wave trains that are manipulated by the Fourier transform. Every sent or received bit of information requires the generation or reception, respectively, of a wave train. As the Fourier transform analysis is applied to shorter and shorter wave trains of fewer and fewer repeating wave cycles, the bandwidth of the detected signal increases. While the wave train communication signal approaches a single wavelength in size, the bandwidth approaches infinity. This prompts the conclusion that single wavelength (photon wavelength bit size) communication is impossible. The author concludes however that this endpoint of the Fourier relation is merely a singularity. This singularity is not a roadblock but a road sign. We need a new paradigm to account for this singularity, which could allow communication via individual photon pulses.

This study began by rejecting the wave theory of electromagnetic energy production and learning to generate individual photon pulses by avoiding resonance to separately create groups of radio wave photons. Electronic circuits that lack resonance were developed to pulse-excite metallic bond electrons in non-resonant antennas and generate individual coherent, separate pulses of identical radio photons that coexist at the same general location and time. The term "photon" as used here is defined as a conjectured smallest unit of electromagnetic energy that travels from an energy emitter electron to an energy receiver electron, and has a characteristic energy, wavelength, direction and wavelength.

The first results described are new tools for making and discovering radio photons. These new tools allowed separate generation of pure pulses of single wavelength or half wavelength long electromagnetic energy that were successfully transmitted from a transmitter wire to a receiver wire. Details for building the tools are described in Materials and Methods. The second results are transmission and reception data obtained by use of these new tools. These data showed successful transmission and reception of individual photon sized pulses. Ramifications from this are reviewed in the discussion.

II. RESULTS

A. RESONANCE IN A CIRCUIT DESTROYS PHOTON-SIZED SIGNAL INFORMATION

Initial attempts to purify an isolated pulse signal (<= 2 pi radians) caused the signal to smear out or converted the pulse into a wave train of synchronized pulses.

As an example, a 10 MHz sine wave was applied to the input of a 2-pole passive bandpass filter having a bandpass (-3db point) of 0.8MHz. Top panel A of Fig. 2, top plot shows the waveform of the applied sine wave at the input with 200mV per vertical division and the bottom plot of panel A shows the waveform of the output from this passive filter with 200mV per vertical division.

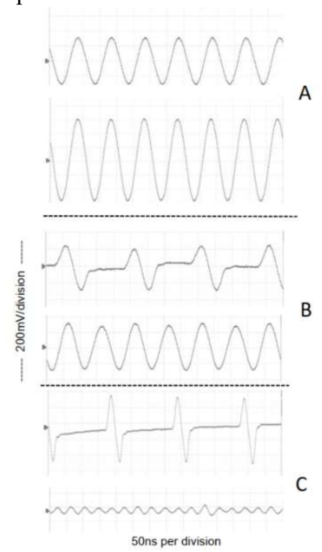

Fig. 2 Effect of bandpass filter on single, multiple pulses.

The peak-to-peak voltage of the sinewave signal into this filter was 632mV and a peak to peak sine wave (both 10MHz) output from this filter was 298mV for about a 3db loss.

Next, a 10MHz sine pulse signal was created by blanking out every other sine wave, and then applied to the filter with 536mV peak to peak as shown in the top scope trace of middle panel B of Fig. 2. The output of this signal from the filter is shown smeared in the lower scope trace of panel B. The peak-to-peak voltage of the degenerated wave train is 152mV, which is 28% of the applied peak to peak voltage.

Finally, a 10MHz sine signal pulse separated by 3 blank spaces was applied to the filter. This signal was prepared by using a 2.5MHz square wave at 75 duty cycle to blank 3 sines after each sine of a 10MHz sine wave. The filter smeared this into a sine wave train.

As shown in the lower panel of Fig. 2, the filter degenerated this 10MHz wavelet into a series 10MHz wave train with peak-to-peak voltage of about 150mV, which is 17% of the applied peak-to-peak voltage. For each 864 mV sine wave that entered the filter, four 150mV sine waves exited the filter. Most of the energy of the incoming signal was divided down into multiple smaller signals.

These plots reveal how a typical filter in a radio handles a single photon duration sized impulse of information and why new circuits are required. The information becomes lost into a wave train.

A frequency filter in a radio consumes the energy of the first waves of a wave train to energize (ring up) the filter into a state of resonance. Then the prepared resonating filter can filter the remaining waves of the train [10]. Generally, each filter and each resonator in a transmitter such as a cell phone introduces some delay and consumes some energy at the beginning edges of changes in train modulations.

These tuned circuits modify the phase relationship between electric and magnetic fields of the signals that they process. Tuned antennas further add resonance and delay. This was incompatible with efforts to generate and detect single pulses. Even most operational amplifiers and differential amplifiers failed to work well because of frequency compensation built into them.

B. TRANSMITTER DEVELOPMENT RESULTS

Wavelets as shown in the middle panel of Fig. 2 were used to develop circuits that can amplify and transmit individual photon length pulsed signals. Typically, a single repeating sine wave pulse at 10MHz followed by an equal sized non-pulse blank region was used as a signal to amplify and apply to an antenna. A variety of narrow, wide, active and passive filters were examined. All filters destroyed signal integrity.

1) FIRST TRANSMITTER: DIODE SEPARATED DIRECT CURRENT ACCELERATION OF ANTENNA ELECTRONS

Finally, a transmitter was constructed without any filters and consisted only of individual class A transistor amplifiers. The first version of this transmitter used diodes to separate acceleration pulses into an attached antenna as described in Materials and Methods. Metallic bond electrons of an antenna wire were accelerated back in forth in opposite directions ("AC"-alternating current) and also accelerated in only one or the other ("DC" direct current) direction at 10.15MHz pulsing frequency (30 meter wavelength). Each of the DC acceleration experiments (signal applied to antenna via one diode or the other reversed diode) generated about half as much photon energy detected 3.5 wavelengths away compared to driving the antenna with an alternating current through both diodes.

The transmitter circuit details are described in Materials and Methods. Basically, high frequency diodes were used between a non-resonating transmitter and a non-resonating antenna to block either side vs no sides of a 10MHz sine wave passed to the antenna. In the control, both diodes were connected to allow both directions of approximately 70 volt sine wave energy to accelerate antenna electrons. Then either one or the other was separately connected to allow acceleration from the sine wave in only one of the alternate directions.

Results 65 db signal from the AC transmission
63 db signal received for – direction DC
63 db signal received for + direction DC

The resolution of the receiver was 1db.

2) SECOND TRANSMITTER: SEPARATED SINE WAVELETS OUTPUT TO ANTENNA, ANTENNA CONNECTION SWITCHED TO CHANGE DIRECTION OF ELECTRON ACCELERATIONS

A second transmitter was developed to accelerate antenna electrons with short, spaced single sine wavelength pulses of energy. This was similar to the first transmitter except that no alternating current electric force was created and instead of connecting the transistor output to the antenna by a capacitor (with optional diode blocking), the transistor was directly connected to the antenna. The other end of the antenna was grounded to the high voltage plus side. In this way electron acceleration force directly from the amplifier enters the antenna and travels to the other end.

Sine wave pulses isolated from each other were made by combining a sine wave with a square wave in a manner to blank out part of the sine wave with the square wave, leaving only isolated 2 pi radian sine portions of the wave.

Figure 3 is a transmitter block diagram of the circuit that generated the wavelets. A two-channel signal generator outputted a 10MHz sine wave and a 5MHz synchronized square wave. The square wave blocked every other sine wavelet via a fast JFET switch. The square wave duty cycle was typically adjusted to 50% but was increased in some experiments to obtain a 90-degree (0.5 pi radian) pulse signal. The resulting intermittent signal was output to a series of class A amplifiers, terminating with a high voltage MOSFET. The output of the MOSFET was directly connected to a non-resonant antenna.

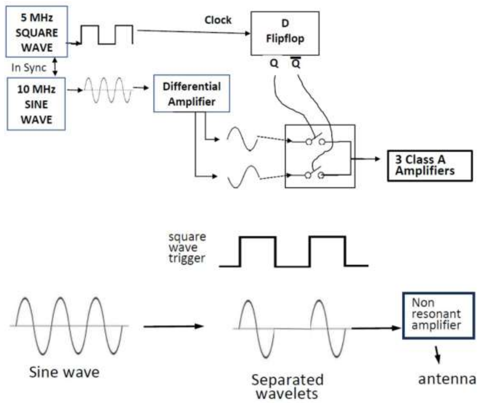

Fig. 3 Transmitter block diagram.

The separated wavelets signal was used as a probe for developing non resonant transmitter circuits and connecting them to non-resonant antennas. By separating each one-wavelength sine "wavelet" with an equal time duration of no energy, circuit effects on signal integrity could be evaluated to remove resonance. Unacceptable circuits caused collapse of the signal into a continuous wave train, while clean circuits preserved the separate wavelets.

3) CONSTRUCTION OF A DC-PULSING TRANSMITTER FOR 10MHZ PHOTONS

A transmitter described by the block diagram of Fig. 3 was used to test the effects of direct current acceleration pulses on generation of radio wave energy, which was detected 3.5 wavelengths away by a radio receiver. Details of this simple transmitter are provided in Materials and Methods. Basically, 3 transistors amplified signals, creating high voltage versions of the pulses to accelerate electrons in the non-resonant antenna.

4) DETECTING WAVELET SIGNALS FROM THE TRANSMITTER

The receiver initially used for these experiments was a non-resonant antenna 5 meters high, exposed to radio signals from all directions, and connected to an oscilloscope. All radio wave energies of all frequencies from far away were absorbed and displayed on the oscilloscope. This swamped out the oscilloscope signal.

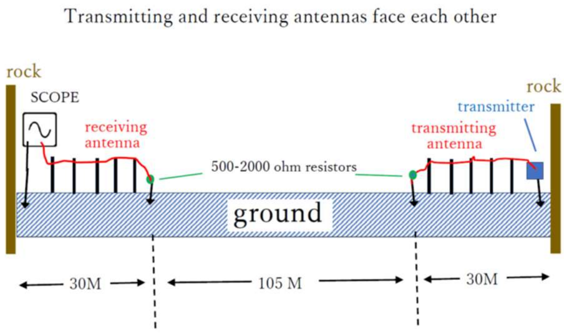

Fig. 4 Transmitting and receiving antennas face each other

To overcome this problem, two beverage antennas 30 meters long and 2 meters high above the ground were constructed facing each other and pointing along the same radial line as shown in Fig. 4. The beverage antenna is very directional, does not significantly absorb radio energy except from the direction to where it points, and is very quiet [11]. The two antennas were spaced 105 meters apart (total distance end-to-end of the two antennas 175 meters). A 500-ohm resistor was attached between the left side of the transmitter antenna and the grounding rod there. A 500-ohm resister was attached between the right side of the receiver beverage antenna and the ground rod there, after some optimization.

Behind each beverage antenna, and within a few meters of each end was a rock wall about 5 meters high. The rock walls were expected to block outside radio signals along the receiving line and thus minimize background signals.

To evaluate the possibility that signals could be transmitted via ground path, in a set of experiments the beverage antenna ground connection was removed and the ground path replaced with an insulated wire placed near the ground.

C. *EXPERIMENTS TO TRANSMIT AND RECEIVE INDIVIDUAL PULSES OF PHOTONS*

These experiments employed an oscilloscope connected to a receiving antenna to directly sense and display electron movements in the receiver antenna. The oscilloscope receiver lacked any tuning circuit and received the entire radio spectrum.

In these experiments large pulses of in-phase radio photons were created and detected with the apparatus shown in Fig. 4. Some pulses were 180 degrees of a 10MHz wavelet (50ns long) and some pulses were 360 degrees of the 10MHz wavelet (100ns long).

1) DIRECT CURRENT ACCELERATION OF ELECTRONS AT 10 MHZ

Using the circuit described in Materials and Methods, electrons were pulsed in one direction directly from the output transistor into the transmitting antenna. Voltage measured at the antenna, i.e between the MOSFET output drain and earth ground, showed peak to peak values of 114V.

The earth ground was connected to the plus side of the high voltage. This was necessary because electron energy flow was from the negative power supply into the MOSFET source pin, and out from the MOSFET drain pin, into the antenna. The distal end of this transmitting antenna, being connected to ground, allowed flow of electron energy back into the plus side of the supply located at the transmitter. The plus side of the circuit was grounded to provide a return path for electron energy.

The received signal on the receiver oscilloscope showed a positive peak, but not a negative peak every 200ns, as shown in the upper scope plot of Fig. 5.

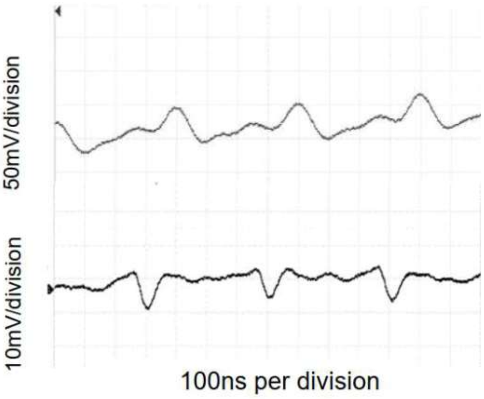

Fig. 5 Received signals from pulsed output.

This shows that the positive going pulses of excitation of the metallic bond electrons in the wire from the MOSFET caused similar shaped positive pulses in the receiver circuit. The received signals are pulses, not complete sine waves.

The antenna connections were then reversed. In other words, the negative polarity electron pulses from the MOSFET were fed into earth ground at the (proximal) transmitter end of the transmitter antenna. The high voltage plus connection was connected to the antenna at this proximal end. In this case, electron energy flow entered the ground at the transmitter location, and entered the distal end of the transmitting antenna, to flow back to the transmitter via the antenna wire.

The lower scope display in Fig. 5 shows the response of the receiver to these reversed electron accelerations. The electron energy pulses in the receiver antenna have been reversed and are still not in sine wave form.

2) REMOVE GROUND FROM THE TRANSMITTER TO AVOID GROUND LOOPS

The beverage antenna can be constructed with its own return ground wire and thus avoid a connection to ground. To eliminate the possibility that one antenna might be communicating with the other via a common earth connection the earth grounds were removed for the transmitter. Instead, a separate wire generally a few cm above the ground replaced the grounds. The proximal end close to the transmitter was connected to the high voltage plus lead. The distal end of this isolated "ground" wire was connected to the distal end of the antenna via a 1000-ohm resistor. A scope shot of the received signal in the receiving antenna is shown as the top plot in Figure 6.

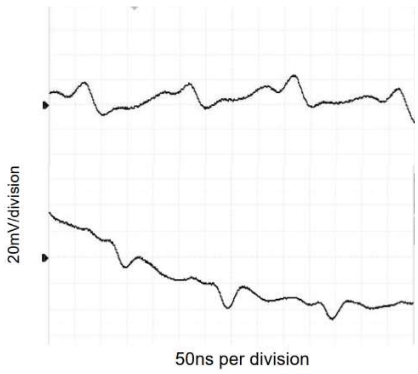

Fig. 6 Received signals, no ground on transmitter.

After reversal of the antenna connections opposite direction pulses were found in the receiver antenna as shown in the scope shot in the lower half of Fig. 6. The receiver power supply generated a small amount of very low frequency interference, which showed up here as a downward sloped baseline. This configuration of the antenna (with extra wire loop) was not well balanced and possibly added some resonance to the emitted signal.

3) TRANSMIT COMPLETE SINGLE CYCLE SINE PULSES OF 10MHZ (100NS LONG) PHOTONS SEPARATED BY 100NS SPACING

In this next experiment, complete 360-degree 10MHz sine signals 100ns long were applied to the transmitting antenna separated by 100ns long blank (non-transmitting) spaces. The top panel of Fig. 7 shows the high voltage signal applied at the antenna (50ns per division on the x axis) and the signal received. The signal to the antenna seemed to spread out to 150 ns and this difference was found in the received signal. This increase was found associated with signal strength of the amplified pulse. At very low voltage output the pulse length was 100ns.

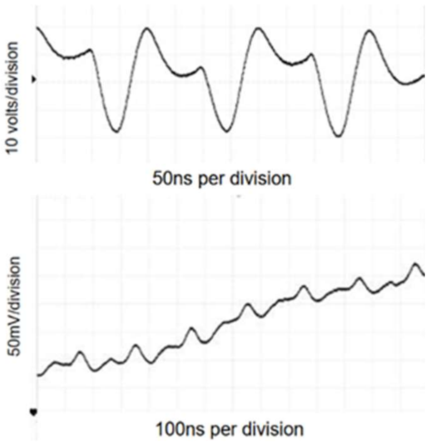

Fig. 7 Transmitter antenna vs receiver antenna voltages.

These 39-volt, separated sine wavelets were fed into the transmitting antenna as seen in the top scope display in Fig. 7. The bottom scope display shows the received electrical sine waves in the receiving antenna. (100ns per division on the x axis).

4) TRANSMIT COMPLETE SINGLE CYCLE SINE PULSES OF 10MHZ (100NS LONG) PHOTONS SEPARATED BY 300NS SPACING

Next, 10MHz sine waves were separated by longer time spaces of 300ns via adjusting the square wave blanking mechanism to allow one 100ns sine wave every 400ns. The top scope display of Fig. 8 shows a plot of the voltage applied to the antenna above a plot of the voltage sensed at the receiver antenna, at the same time scale.

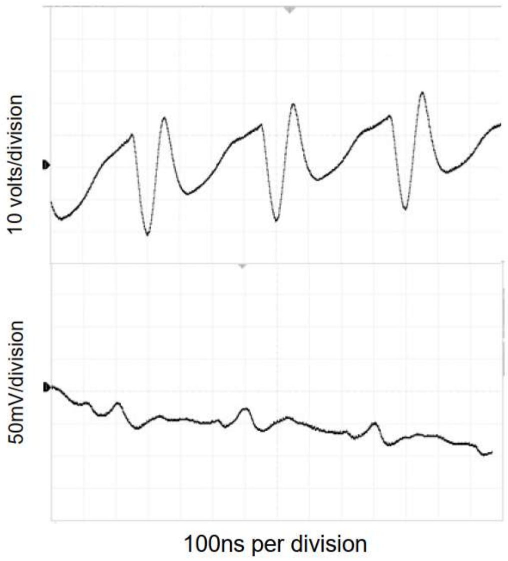

Fig. 8 Transmitter antenna vs receiver antenna voltages.

These more widely spaced high voltage pulses applied to the transmitting antenna are shown in the top scope display of Fig. 8. These electron accelerations caused the electrical activity on the receiver antenna as sine pulses separated by 300ns as seen in the lower plot.

The experiment was repeated with 15MHz sine pulses separated by 250ns, and the pulses from the transmitter were found in the same timing in the receiving antenna.

III. DISCUSSION

Radio electronics circuits generally add impedance matching or a frequency selective filter at each stage. Even a very minor resonance-inducing element such as frequency compensation in a linear amplifier, or impedance matching between stages of a circuit ruined the integrity of a single photon-sized wavelength pulse. And, most antennas used for communication are resonant and degrade short photon-sized wavelets of energy into synchronous wave trains.

Accordingly, a strategy evolved for amplifier and output circuits that do not change impedance and do not frequency discriminate. Capacitor coupling of transistor stages and even negative capacitor feedback within a stage worked, but many chips such as linear amplifiers and differential op amps did not work well because they included frequency compensation. Eventually individual transistors configured in class A amplification were relied on instead.

Resonance is not required for radio transmission.

The data from the first experiment, which used diodes to separate current pulses show that alternating current is not required for photon emission from an antenna. The control for this experiment applied a back and forth alternating electric force to the antenna that produced radio photon emission as detected on a radio receiver. Applying unidirectional pulses of either polarity generated electromagnetic emissions that were roughly half of the magnitude of the control.

Other experiments used an oscilloscope for a receiver and showed that by scrupulously avoiding resonance in the drive circuitry and antenna, direct current accelerations produced photons that were received by a non-resonant antenna. The received signals were inverted when the direction of electric energy and current in the transmitter output was reversed. The magnitudes of these transmitted signals were similar to the magnitude of signals transmitted by a sine wave output. This indicates that a regular resonance created wave train comprises a series of independently created half waves wherein each half wave has half the energy and half the time duration of a complete 360-degree sine.

A single wavelength or half wavelength long signal can be transmitted and received

When a complete sine wave of energy was applied to a transmitter antenna wire, a complete sine wave of electron movement in the receiver antenna wire was recorded. (Fig. 7). Adding more time between sine wave pulses did not alter this result (lower scope display of Fig. 8). This indicates that each sine wave pulse signal is independent of the others.

These data suggest that a series of random binary pulses could be sent and received for digital communication. A complete sine wave comprises two halves, a positive going half and a negative going half. Each of these halves contains frequency and wavelength information and apparently can independently create a putative photon. These photon pulses can be created from a non-resonant transmitter and can be detected by a non-resonant receiver. This implies that a single direction movement of an electron, stimulated by a single direction voltage pulse in an antenna produces a photon and can be used for communication.

Different combinations of sine-wave pulses and even half-sine wave pulses in time series conceivably could be used for digital communication. By creating and detecting these photon pulses the time limitations of using wave trains to encode signals can be alleviated. However, Fourier transform techniques are no longer applicable and new systems and new circuits would be needed for a potentially much faster communication.

A. THE NON-RESONANT ANTENNA/TRANSMITTER CONTINUOUS CIRCUIT IS ANALOGOUS TO A CONTINUOUS ELECTRON ORBITAL PATH WITH BALANCED ELECTRIC AND MAGNETIC FIELDS

We know from chemistry that when a valence electron is shared by many nuclei and has a wave function probability that is delocalized throughout a long one dimension of the molecule, the wavelength of a corresponding photon is commensurately longer. See Table I, which lists some photon energy wavelengths for molecules with increasing path length of conjugated pi electrons, and compares with the presumed metallic bond electrons used in the experiments.

In this context, an antenna and transmitter output circuit may be an extreme example wherein the electron wave function (or "orbit" in the Bohr sense) probability wave approaches one dimensional and at the same time, approaches the wavelength and the speed of the emitted photon. If the antenna (with driving circuit) accelerates electrons that result in photon emission, then the wave function equation could be simplified to describe where the electron most likely is. This is because we can both control and measure voltage and current distribution of the electrons along the one-dimension box of the antenna.

As the probability distribution changes from a 3-dimensional sphere shape to a primarily one-dimensional wire surface, the calculated velocity from the average electron kinetic energy wave increases as seen in Table 1. The calculated velocity from the kinetic energy for the hydrogen atom 1s electron is 1/137 times light speed (the fine structure constant). But the apparent velocity of the electron energy wave in the antenna wire is almost 1 times light speed. We know this because of our ability to electrically determine electron density at different points on the antenna and see it changing at the resonance frequency. Understanding the difference between the electron wave function of a very three-dimensional space (the 1s orbital of the hydrogen atom) and a one-dimensional wire therefore may provide clues to the origin of the fine structure constant.

The MOSFET transistor together with the antenna and ground comprised a circuitous route that resulted in emission of 10-meter long energy wavelength photons. Existing radio transmitters use frequency filters, which vary the phase relationships of voltage (electric field) and current (magnetic field) based on frequency [12]. In other words, their filters alter the electric field to magnetic field strength ratio (i.e. impedance) in a time dependent manner and also cause a delay in the signal [13]. But transmitters eventually convert the energy into a resonance, which is an equality of electric and magnetic fields. This energy is then released as photon(s) to free space having a natural impedance (ratio of magnetic field magnitude and electric field magnitude) of about 377 ohms [14].

If RF engineers can learn to produce and detect individual single wavelength pulses of identical radio photons, insights obtained may help in our study of light photons. This is because radio photons are produced and reflect from surfaces on time scales $1*10^8$ slower than visible light photons, the usual subject matter for photon studies. For example, conversion of 10MHz electron wave energy from an antenna electron into a 30M long photon (or reflection from a surface) consumes 100ns of time. This reaction can be interrupted within this time frame, by for example fast switching a load to the antenna, using fairly simple equipment. This cannot be done easily with light photons.

IV. MATERIALS AND METHODS

First amplifier, using capacitive coupling of AC and DC to an antenna

This circuit was constructed on a small circuit board that was attached directly to an antenna without a transmission line. The antenna was a 25-meter long T2FD non resonant antenna from COMET, having a measured 1200 ohm resistive impedance. This circuit and the antenna were not earth grounded. The circuit board ground plane and the capacitor coupled drain output from the MOSFET were directly connected across the antenna leads without a balun (impedance matcher).

A sine wave of 0.1-volt RMS 10.15 MHz was applied to the bipolar transistor amplifiers, which output a high current signal of about 1.3 peak to peak voltage. This current amplified signal was applied to the gate of an IRF710 MOSFET that was biased for class A operation. The transmitter and T2FD antenna were located 5 meters above ground level. Circuit details of connections with alternate diodes and electron energy flow paths are in Fig. 9-12. This circuit amplified a 10.15MHz sine wave supplied to it at the connection shown but separated the sine wave output to the antenna into electron flow directions according to the switch that alternately selected either diode or both diodes in the path to the antenna.

Generation of + spin, vs – spin photons

The signal output of the IRF710 drain was connected to two 1N4148 signal diodes connected in opposite directions for rectification of the radio frequency ("RF") signal before connection to the antenna.

In a first experiment the outputs of both diodes were switched to the antenna to allow both forward and reverse electric force on the wire according to the sine wave input.

In a second experiment the RF signal output from only one signal diode D1 as shown in Fig. 9 was connected to the antenna. The other output from the second diode was shorted to ground via a 1000-ohm resistor.

In a third experiment the RF signal output from the other signal diode D2 was connected to the antenna. The other output from diode D1 was shorted to ground via a 1000-ohm resistor.

A Tecsun PL330 receiver positioned 105 meters away was used to detect radio photon emissions in these 3 experiments. The receiver had a bandpass of about 5 kilohertz and displayed signal strength in db with a resolution of 1 db.

Construction of a transmitter for individual wavelets at 10MHz

The wavelet generation circuit outlined in Fig. 3 was built with a wavelet generation portion described in Fig. 10, and a three-stage transistor amplifier described in Fig. 11. The first two transistors in the amplifier served to buffer and amplify the current of the wavelet signal. These were NPN bipolar type biased for Class A operation. The third transistor was a MOSFET that controlled a 300-volt direct current power that was applied to a transmitting antenna in the system described in Fig. 4.

As seen in Fig. 4, the inner ends of the antennas were grounded with 50cm deep ground rods. The transmitter was connected to the right side of the right antenna and an oscilloscope was connected to the left side of the left antenna and to a ground rod there. Power supplies for the transmitter and an oscilloscope to record the transmission signals were powered by an AC inverter connected to a battery. The power supply for the receiving oscilloscope was powered by a separate AC inverter powered by a 12 volt battery. None of the power supplies were grounded.

Twelve volts direct current power were applied to the bipolar transistor circuit and a 150-270 volt direct current was applied to the MOSFET. An approximately 4.4-volt bias voltage obtained from a Zener diode regulated resistor divider was used to bias the MOSFET gate into its linear region. Total power consumption by the bipolar transistor portion of this circuit was about 2.5 watts and total power consumption by the MOSFET output stage (including loss in the series resistance and antenna resistance) was about 20 watts.

The receiver comprised a long antenna directly connected to an oscilloscope (Siglent Model SDS 1202X-E digital storage oscilloscope 200MHz response and sampling 1 gigahertz/sec). The receiver absorbed photon energy created by accelerated electrons from the transmitting antenna and the connected oscilloscope displayed screen shots, which were recorded and shown as data for this study.

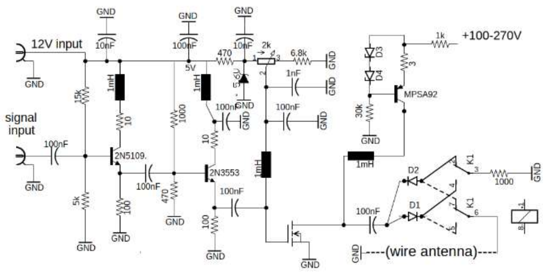

Fig. 9 AC vs DC transmitter circuit.

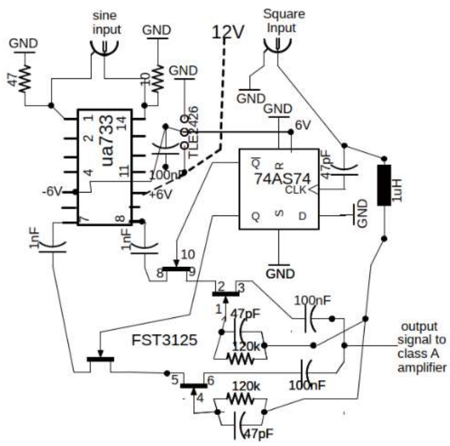

Fig. 10 Wavelet generator.

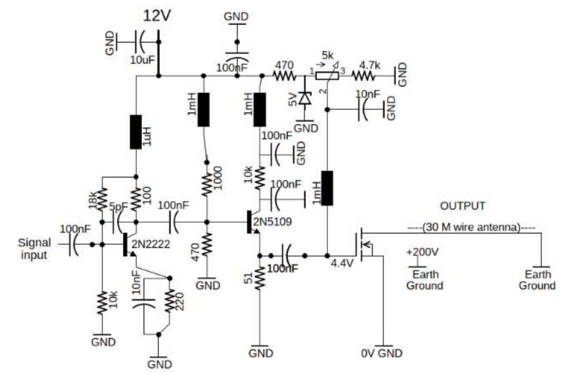

Fig. 11 3 transistor class A amplifier.

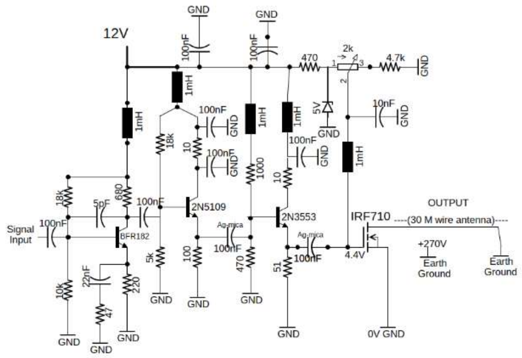

Fig. 12 4 transistor class A amplifier

A frequency generator FeelTech FY3200S Dual Channel Signal Generator/Counter was adjusted to supply a sine wave input and a square wave input to the upper left connections shown in the schematic of Fig. 10. The data pin on the 74F74 D flip flop was set to ground. This data pin can be operated to select between 180-degree reversed sines and is intended for use in future experiments. The four JFET switches shown in the lower left of this schematic are in chip FST3125.

Wavelet transmitter combines wavelet generator with amplifier

The circuit in Fig. 11 is an amplifier that accepts the combined sine/square wave signal prepared by FST3125 of the first circuit and inputs to the base of 2N2222, a bipolar transistor that is biased for class A voltage amplification. The output from the 2N2222 transistor is input to the 2N5109 transistor, which is biased for class A current amplification. The output from the 2N5109 transistor drives the gate of high voltage MOSFET IRF710. High voltage energy electrons enter the source pin of the MOSFET and exit the drain pin, which is connected directly to the antenna wire, allowing the transistor output to accelerate the metallic bond electrons in that metal wire. The other end of the antenna wire is connected via an approximately 500 ohm resistor to earth ground, and the earth ground connects to the positive pole of the 300 volt power supply, allowing return of the electrons in the output circuit.

Electron accelerations were carried out in two directions. In a first direction, electron energy flowed from the transmitter into a transmitting antenna towards a receiver antenna. In the second direction, electron energy flowed from the transmitter into earth ground and then into the distal end of the transmitting antenna. The energy flowed back to the transmitter in a direction opposite from the receiver in this later case.

The data of Fig. 5 indicate that the transmitter was not linear enough, leading to some oscillations in the received signal but also non-linearities in the high voltage applied to the antenna For the remaining experiments the 3-transistor amplifier described in Fig. 11 was replaced with the 4-transistor amplifier described in Fig. 12.

The latter 4 transistor amplifier allowed a stronger gate signal to the IRF710 MOSFET and use of a higher voltage to get a more linear output onto the antenna. The Fig 12 circuit shows an amplifier having a first voltage amplifier BFR182 followed by two current amplifiers 2N5109 and 2N3553. For some situations the additional (voltage follower) current amplification, while surprising was a significant improvement. This extra amplification allowed a cleaner pulse to accelerate electrons in the transmitting antenna. This is a result of having to drive the very capacitive gate of the MOSFET.

Despite this improvement the output (tested with a 10MHz sine wave) was about 99-99.9% pure, having 1% or less second and third harmonics. The second harmonic was routinely measured on the scope at 20-30 db (voltage units) lower than the first harmonic.

About the author

Marvin Motsenbocker received his PhD from the University of California, Davis and worked for some years in the field of chemiluminescence, where he became interested in the phenomena of photon emission from long molecules. He holds a number of patents, mostly in the field of power control.

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