

# A More Efficient Method of Generating Gamma Ray Bursts by the Intermodulation of Static Magnetic Fields

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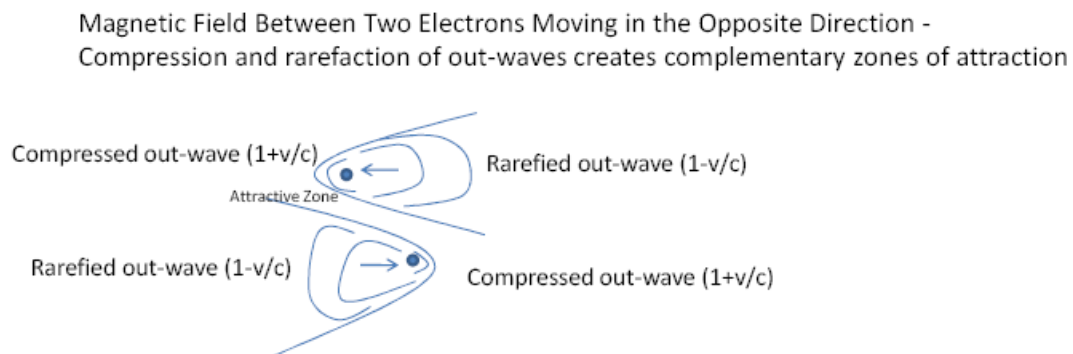
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**Abstract:** It is shown that by introducing two static magnetic fields into the same iron core which drives the core into its saturation region, that the non-linear response of the core inter-modulates the magnetic fields and produces gamma rays. This is consistent with the Wave Structure of Matter model which shows that a static magnetic field is a free-space wave with a Compton wavelength equal to that of the electron. The intermodulation of these free-space waves produces sum and difference products, generating gamma rays in the energy range that is measurable by a common Geiger counter.

**Keywords:** Maxwell's equations, magnetic fields, Wave Structure of Matter

## I. Introduction

The concept of magnetic monopoles has intrigued physicists ever since the development of Maxwell's equations. Gauss' law for magnetic fields clearly shows from the divergence of the magnetic field that there is symmetry and therefore there should be no magnetic monopoles. But what if there existed magnetic monopoles in pairs up until a certain energy that breaks this symmetry? To date, there are no indications from the LHC or other high-energy experiments that the symmetry of the magnetic field is broken at any energy. Therefore we are left to conclude that magnetic monopoles do not exist. This is still not much of a satisfying answer and we endeavor in this paper to show experimentally what has been suggested in previous papers, that the magnetic field is really the Doppler-shifted wave-structure of the electron, with the compressed wave in front of the moving wave structure and the rarefied wave behind the movement of the wave structure [1][2][3].



**Figure 1. Magnetic Field Model Based On Doppler-Shifted Standing Waves**

From this model in Figure 1, it is easy to see that the compressed and rarefied waves must always exist together and therefore there would never be a magnetic monopole. It can be seen that if the waves from these two poles are modulated together, the traditional sum and difference products will occur:

$B_1 = A_1 \sin(f_1 t)$  where  $f_1 = f_0(1 + v/c)$ ,  $f_0 =$  Compton frequency of electron

$B_2 = A_2 \sin(f_2 t)$  where  $f_2 = f_0(1 - v/c)$ ,  $f_0 =$  Compton frequency of electron

Intermodulation Product =  $B_1 \times B_2 = 0.5A_1A_2[\sin[(f_2 + f_1)t] + \sin[(f_2 - f_1)t]$

And depending upon the velocity of the electrons and the relative angle of the interacting fields (the equations above assume linear interaction but the interaction of the fields at an acute angle can produce very high-frequencies resulting from the sum and difference products), a variety of sum and difference frequencies starting from the Compton frequency of the electron can be produced.

As of 2018, there is precedence for the interaction of intense magnetic fields on the Sun producing gamma rays that are 50 GeV or higher, observed through the sunspot cycle where the gamma ray bursts follow the location of the sunspots [4]. It is interesting to note that the gamma ray bursts on the Sun follow the magnetic field where the surface temperature is lower, indicating that the interaction of the fields occurs within the inner part of the Sun where intermodulation of the fields is a plausible explanation for the generation of gamma rays.

To verify the existence of these high-frequency space waves, an experiment was designed to inter-modulate them in order to produce photons, the observable evidence of free-space waves. By introducing two strong magnetic fields into a small iron core, the saturation region of the core is quickly reached and the wave-structure of the fields inter-modulate, producing sum and difference frequencies of the Compton wavelength of the electron that are in the wavelength range of gamma rays. The rarefied wave of one magnetic field inter-modulates with the rarefied wave of the other magnetic field to produce a sum frequency that is twice the frequency (half the wavelength) of the Compton wavelength of the electron, or  $1.21315511835 \times 10^{-12}$  m.

## II. Experimental Setup

The experimental setup consists of two sets of 3 stacked, 1/2 x 1/4 Inch Neodymium Rare Earth Disc Magnets N48. Each magnet is rated at 5020 Gauss with the following specifications [5]:

Size: 0.5 x 0.25 in (Diameter x Thickness)

Metric Size: 12.7 x 6.35 mm

Grade: N48

Pull Force: 12.43 lb

Coating: Nickel-Copper-Nickel (Ni-Cu-Ni)

Magnetization: Axially

Material: Neodymium (NdFeB)

Tolerance: +/- 0.004 in

Max Operating Temperature: 176 F

Surface Field: 5,020 Gauss

The magnets are initially stacked with 3 in a set and two sets are used to create two distinct magnetic fields that saturate the iron core of an audio transformer. The audio transformer is an 8 Ohm primary to 1000 Ohm secondary with an iron core laminate that brackets the windings. An equivalent part number is Xicon 42TL013-RC.

The Geiger counter used for the experiment is a Radex RD1503 with its scale set to 120 microREMs/hour. All measurements are made after 2 minutes of averaging after the start of an event (when the magnets are placed on the iron core).

### III. Procedure

The Geiger counter is placed on a white piece of paper with the magnets and iron core removed from the environment and a background measurement is taken showing 11 microREMs/hour after 10 minutes of averaging:



The transformer core is then placed 7 inches from the Geiger counter and two sets of magnets are placed further away from the iron core (so as not to saturate it) to

demonstrate that the Geiger counter was not affected by these additions:



The two sets of three magnets are then simultaneously attached to the iron core in its position at 7 inches from the Geiger counter (the magnets are at right angles to each other to take advantage of the small portion of iron in between them which will saturate with the fields interacting in close proximity). The movement of the magnets generates the gamma rays, their final resting position is complete saturation of the core where no dynamic response is expected:



After 3 minutes of averaging, the count rises to 19 microREMs/hour and stays there for approximately 5 minutes:



The counter reading then resumes to its previous background level of 11 microREMs/hour. A video of the demonstration is available at this link:

<https://drive.google.com/file/d/1Hzqdox9VzjxmR1uW24TZAikpoCI7ThZR/view?usp=drivesdk>

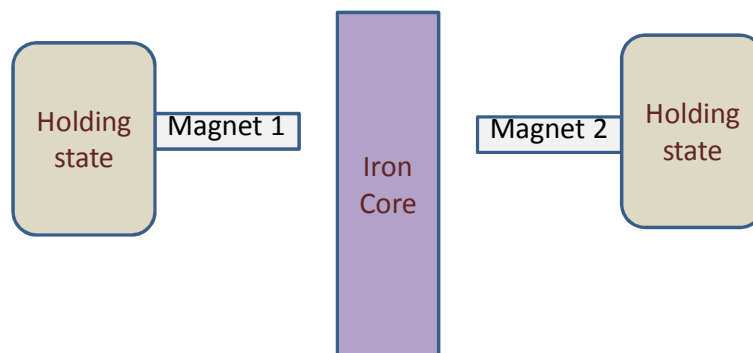
The movement of the magnets towards the iron core creates a dynamic response on the portion of the hysteresis curve that is non-linear but not completely saturated. During this short time as the magnets are approaching the iron core, the field intermodulates in the non-linear region (that is still not complete saturation). When the magnets are static in their final position, the iron core is in complete saturation and no more gamma rays are generated.

#### **IV. Applications**

There are several applications that would benefit from the effect described above. A few applications are described below, which are patent-pending (USPTO). Based on the experiment above with additional data accumulated, the generation of gamma rays using permanent magnets that connect through motion to an iron core provides for gamma ray signal generation based on a trip sensor using magnets as the switch closing mechanism. In this embodiment, the magnets are mechanically held in a fixed state and are activated by some mechanical force (motion, pulling or pushing force) so

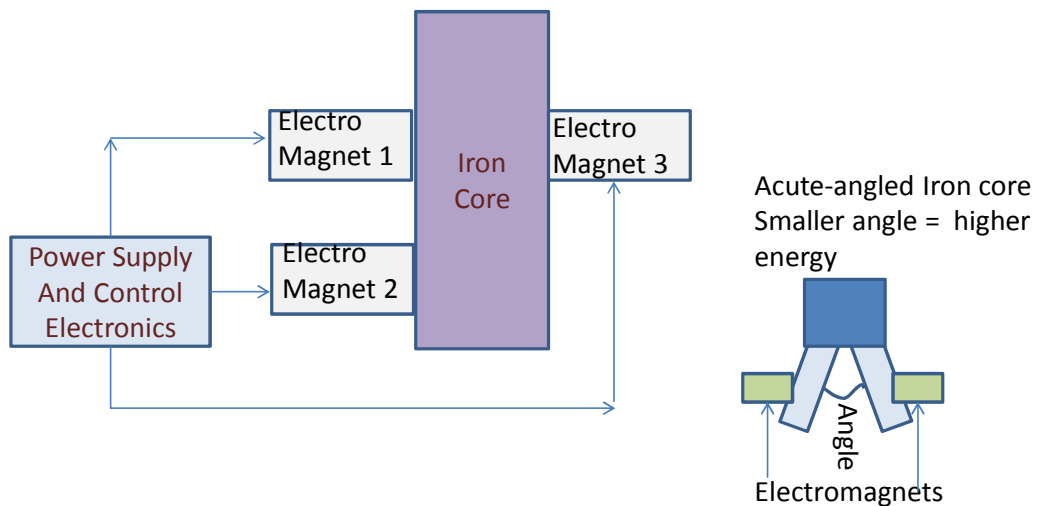


that the magnets will leave their fixed state which allows the force of attraction between the magnets and the iron core to take over and pulls the magnet to the iron core. Once this motion takes place (which may include rotation of the magnets while in contact with the iron core surface), a gamma ray signal is generated which can be used as an indicator for the movement of the magnets from their mechanically fixed state, as shown in Figure 2. One example of the holding state may be a weaker iron core that holds the magnets temporarily until they come closer to the stronger iron core that attracts both magnets and pulls them towards the stronger core. Once they contact the stronger core they then generate the gamma ray signal that is used to indicate a change of state. Many variations on this version exist but essentially the system acts as a mechanical proximity sensor that then generates gamma rays from the change of state.

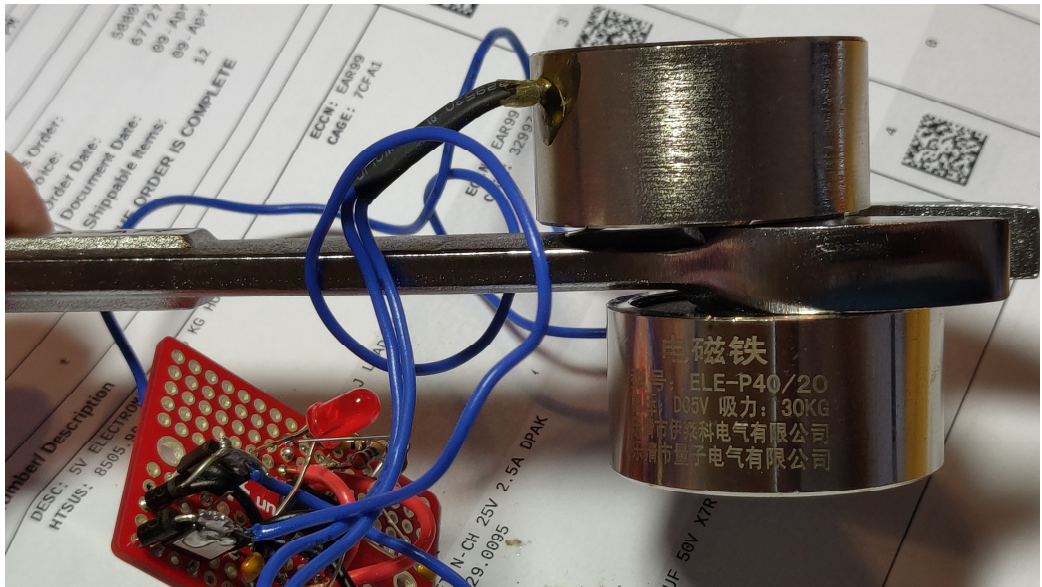


**Figure 3. Mechanically-Activated Gamma Ray Generator**

An additional application is for the use of a gamma ray source for laboratory experiments or as a source for gamma ray imaging (microscopy). The generation of gamma rays in this case can be implemented with electromagnets attached to an iron core and an electronic signal activating the electromagnets so that two or more electromagnets produce fields (possibly alternating) inside of an iron core and the field strength is controlled electronically in order to adjust the strength of gamma ray emission as shown in Figure 3. Through electronic control of the magnetic fields (via the electromagnets), the strength, direction and phasing of the gamma ray signals can be controlled. The placement of the magnets and phasing of their control can simulate the rotation of a magnetic field in the core, which appears to be the key to the aspects of intermodulation of the fields. Also, an embodiment of the above description involves using an angled steel bracket with electromagnets attached to it, where the angle is acute (as narrow as 20 degrees). From the mathematical description in the beginning of this paper showing the interaction of the fields through modulation of the Doppler-shifted Compton frequencies, the narrow angle bracket allows mixing to produce very short wavelengths after modulation. The short wavelength intermodulation products then have higher frequencies which results in higher-energy gamma rays.



**Figure 3. Electromagnetically-Activated Gamma Ray Generator**



**Picture 1. Electronic Prototype**

An electronic prototype reduced to practice is shown in Picture 1. The prototype generates 4 Hz drive signals to the electromagnets (ADA Fruit Industries 3875), which saturates the steel bar at a 4 Hz rate and so continuously crosses a threshold of optimal saturation to deliver continuous gamma ray generation. Through repeated tests, it has been found that this design does result in a more continuous and stable emission profile, although further optimization of emissions from the surface of the steel is required as much of the gamma generation inside the steel is attenuated before reaching the surface.

## **v. Conclusions**

The Wave Structure of Matter postulates that the electron is a standing wave structure and that the electrons motion Doppler shifts this wave structure which is the nature of the magnetic field and its associated polarity (as an electron moving towards an observer will generate a field that appears blue shifted and the electron moving away from an observer will generate a field that appears red-shifted). The experiment performed validates this concept by inter-modulating these fields to produce photons of the same wavelength as the wave structure (approximately the Compton wavelength of the electron within the gamma ray spectrum). The generation of gamma rays by static magnetic fields and an iron core to introduce modulation is a novel concept that may be find utilization in proximity sensing and medical imaging. More research is required to take advantage of these developments.

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