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Probable Axion Detection via Consistent Radiographic Findings after Exposure to a Shpilman Axion Generator

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Abstract: This paper reports the preliminary findings of novel methodologies employed for the detection of charged particles using a presumed axion particle generator. Axions are believed to be light neutral pseudoscalar particles produced through the Primakoff effect.[1,2,3] Pseudoscalars are defined as a scalar quantity that changes sign when the sense of the orientation of the coordinate system is changed. It has been postulated that even if its mass is only a few electron volts, it could be detected in the laboratory when the axion is converted into an X-ray by the inverse process in a magnetic field.[4] If correct, this process could theoretically expose a dental X-ray film, the target in this experimental setup used. Furthermore, in the presence of a static magnetic field, there is a small probability for axions to decay into microwave photons via the Primakoff effect.[5,6] which should be detectable with standard equipment. The results of these preliminary studies demonstrated unidentified particle tracks on dental X-ray films (n>200), chemical alterations in experimental X-rays, and consistent harmonic radio/microwave emissions from the axion generator.

Keywords: axion, charged particle, Shpilman axion generator.

INTRODUCTION

In this paper are the preliminary experimental findings of tests conducted using a magnetically-charged spin (axion) generator built by the Russian engineer Alexander A. Shpilman.[7] Axions, to date undiscovered elementary particles, were introduced theoretically in relation to the problem of charged particle (CP)-invariance in quantum chromodynamics. At present they are considered as main candidates for the makeup of dark matter, the hidden mass of the Universe. The axion mass is still unknown, however there are a number of astrophysical and cosmological arguments that confine it to between 10^{-6} eV to 10^{-3} eV.[8,9,10] Researchers hypothesize that the structure of an object's axionic field can be significantly altered by the influence of an external axion (spin) field. As a result of such an influence, the new configuration of the axionic field will be fixed as a metastable state (as a polarized state) and will remain intact even after the source of the external axionic field has been moved to another area of space. Thus, it has been posited that axionic fields can be "recorded" on physical objects including photoemulsions.[11,12,13] Widely used in the 1950s and 1960s, photoemulsions are extremely sensitive with the ability to resolve particle tracks to less than 1 μm (micron). "Emulsion detection is essentially the same as conventional photography. Grains of silver halides (AgBr) are suspended in a gelatin. Either light (as in conventional photography) or charged particles ionize these compounds. Ionization due to light occurs when electrons are ejected through photoelectric processes. Charged particles ionize AgBr by interacting, through Coulomb forces, with the atoms' electrons. There are three measurable characteristics of particle tracks: length, ionization density, and direction. All of this information is used to determine what particle has passed through, with what mass, and at what speed" (http://www-donut.fnal.gov/web_pages/DONUT/Emulsions.html). Scientists have further postulated that axionic fields can be detected by various types of physical, chemical, and biological indicators.[14,15,16]

According to physicist Dr. John Cramer, "Axions have a geometrical resemblance to an electric and a magnetic field oriented parallel to each other. In theory, this property can be exploited to convert axions into photons (radio/light/gamma-rays) through the use of intense electric and/or magnetic fields. If cosmic axions were converted to photons, their estimated mass-energy would make electromagnetic microwaves like those used in home microwave ovens. It has been suggested that the axion-saturated space in our vicinity constitutes a 'population inversion' of the sort exploited for lasers, and that under the proper circumstances it might be possible to make an axion-laser which converts this hidden energy embedded in space itself into a coherent beam of microwaves. . . the available microwave power would at best be only about 3 milliwatts/cm^2 (about 2% of the energy content of sunshine on the equator at noon)."[17]

The type of axion-field generator used in the following experiments can be described as a rotating hollow cylinder made of ferrite-magnetic material with the axis of rotation coinciding with the cylinder's main symmetry axis. Four (wedge-like) permanent magnets are inserted into the cylinder and are magnetized perpendicularly to their own plane. The cylinder is in the shape of a hand-held tube. It is possible to induce the cylinder's rotation (to create the motor) with different methods, but it is necessary to take into account that external electromagnetic (EM) fields, and the materials used in the motor, can alter the properties of the spin-field significantly. An internal ring rotates counterclockwise with a velocity of several thousand revolutions per minute while magnets inserted into the cylinder create a magnetic field against the direction of rotation. The elements of attachment and cylinder rotation (the engine) are made of non-magnetic materials.

METHODS

Over 200 experiments were conducted to test the hypothesis that a Shpliman axion generator could influence photoemulsions and produce particle tracks. The following protocol was employed:

- *Film type and preparation*: Kodak Ultra-speed intra-oral dental film (predominately lot 3100881; Exp. 2003-08) was used. The film remained secured within its original light protecting vinyl outer packaging such that it was not inadvertently exposed to any radiation sources prior to the experiment.
- *Exposure distance*: The film was placed a distance of two centimeters from the axion generator during irradiation.
- *Exposure time of film*: Seven minutes.
- *Development procedure*: The X-rays were manually developed according to film requirements and manufacturer's specifications using GBX developer and fixer. The fixing time was adjusted for solution temperature and an employed minimum fixing time allotted for dental films.
- *Control films*: For each experimental X-ray, a separate control film, from the same lot number as the experimental film, was tested and developed simultaneously with the experimental film.

RESULTS

The developed X-rays from the experimental trials consistently demonstrated distinctive "dots" and "tracks" that appeared similar to the charged particle tracks in emulsions (Figure 1). Control films did not produce the distinctive "dots" and "tracks" that were observed.

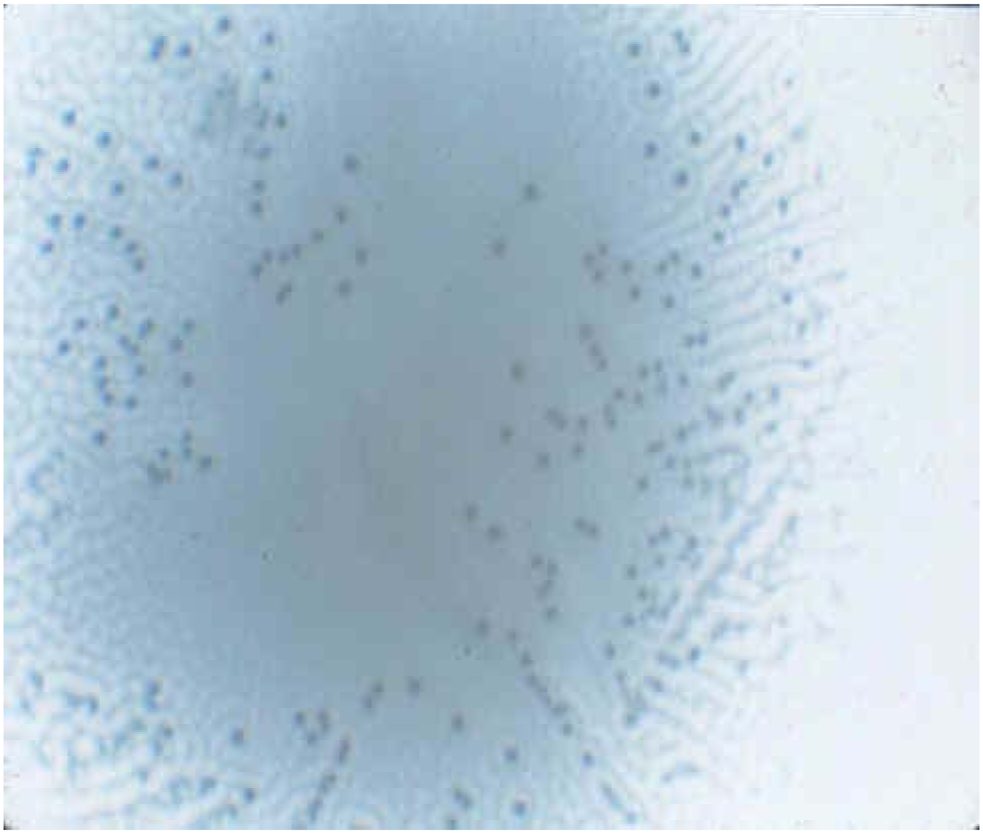

Figure 1. Dental X-ray demonstrating characteristic "dots" and "tracks" along with surrounding "halos" on many dots. This phenomenon appears in the surface emulsion of treatment exposed films and not in the control films.

Blinded reviews of multiple experimental films were conducted by experts at The Ohio State University (OSU) Nuclear Engineering department, NASA's Marshall Space Flight Center, Argonne Labs, and the Rochester Institute of Technology (RIT). Each concluded that the "dots" and "tracks" on the X-rays were of no known nuclear track origin. Dr. Walter Fountain, of NASA writes, “The ‘images’ on these three X-ray film samples do not have characteristics consistent with nuclear track images in either a macroscopic view or a microscopic view that are familiar to our knowledge and experience.... We are convinced, after detailed microscopic examinations...that the images referred to by you as ‘dots’ and ‘tracks’ were not caused by the passage of nuclear particles through the films.” (source: emails between 5/9/01 and 5/10/01 with the author).

The nuclear engineers at OSU examined the X-rays using software designed to identify specific nuclear particle tracks used in medical applications. Their conclusion was that the small black dots were characteristic of both the control and experimental backgrounds; however, the larger black dots were only seen on the experimental films. These dots did not match any of the particles that the engineers had seen before (Figure 2).

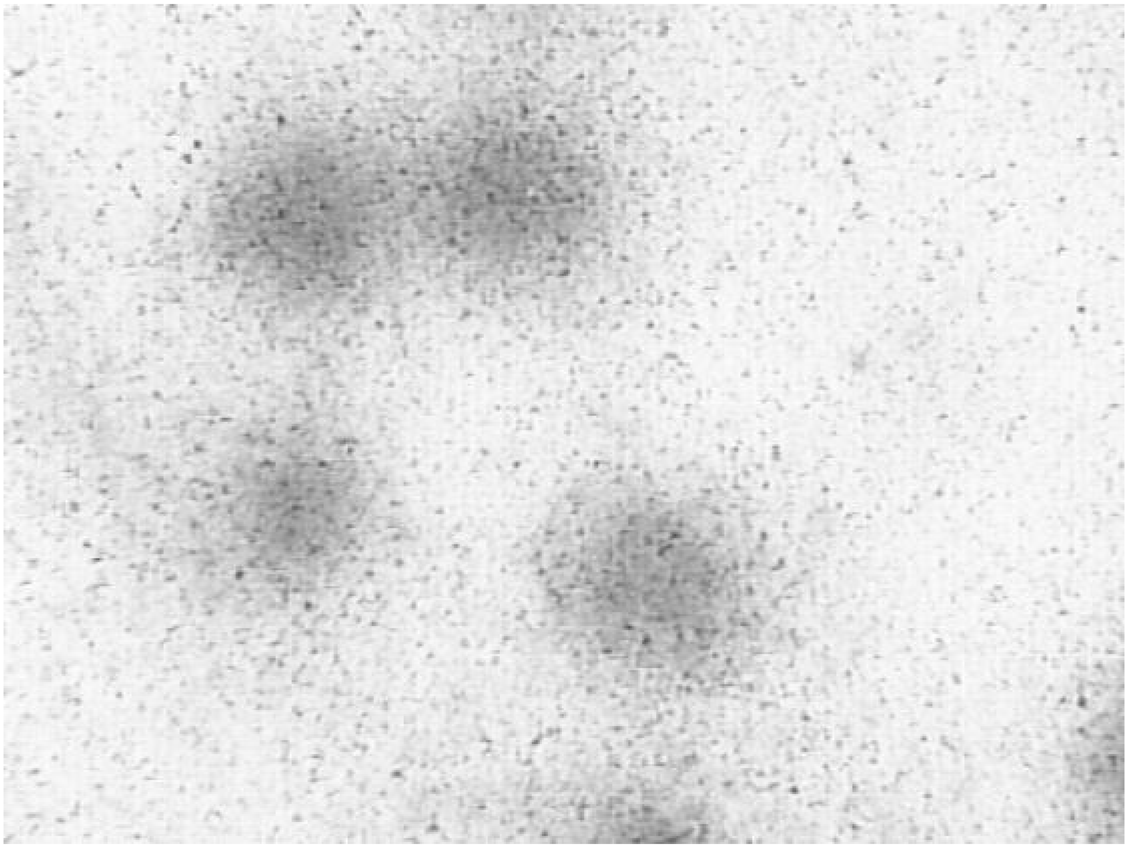

Figure 2. This 10x microphotograph was taken at The OSU Nuclear Engineering Department and clearly delineates the larger unidentifiable "dots" from the smaller specks that also were seen in on the control films.

An important observation was made by Dr. Richard Hailstone of RIT who noted, "I have not seen these 'dots' on films before. Since they can be seen without magnification, they are much larger than the specks we see in our samples where a transmission electron microscope operating at 7500-10,000 times magnification is needed. As they do not appear in the background we can presume they only appear when the film is exposed and processed," (source: correspondence to the author dated 5/8/01). Dr. Hailstone explained in a follow-up email that, "If the dots are silver they should be bleached back to silver ions in a [fixing] bath." (source: email of 5/11/01). This implies that a chemical alteration occurred in the surface emulsion changing the chemical structure of the impacted silver compounds.

A JSM-820 scanning electron microscopic (SEM) analysis was conducted at The OSU Microscopic and Chemical Analysis Research (MARC) laboratory on one of the X-ray films to ascertain whether there were any changes in the surface emulsion that may have impeded the removal of the observed characteristics on the X-ray film's surface. The results demonstrated that the exposed region (with dots and tracks) contained trace amounts of sulfur, magnesium, and aluminum (Figure 3); whereas, the background region contained only carbon, nitrogen, and oxygen.

Processing option: All elements analyzed (normalized).

Spectrum	C	N	O	Mg	Al	S	Total
Spectrum 1	49.29	23.45	27.23		0.02	0.02	100.00
Spectrum 2	52.42	16.96	30.48	0.03	0.03	0.08	100.00
Max.	52.42	23.45	30.48	0.03	0.03	0.08	
Min.	49.29	16.96	27.23	0.03	0.02	0.02	

All results in atomic percent.

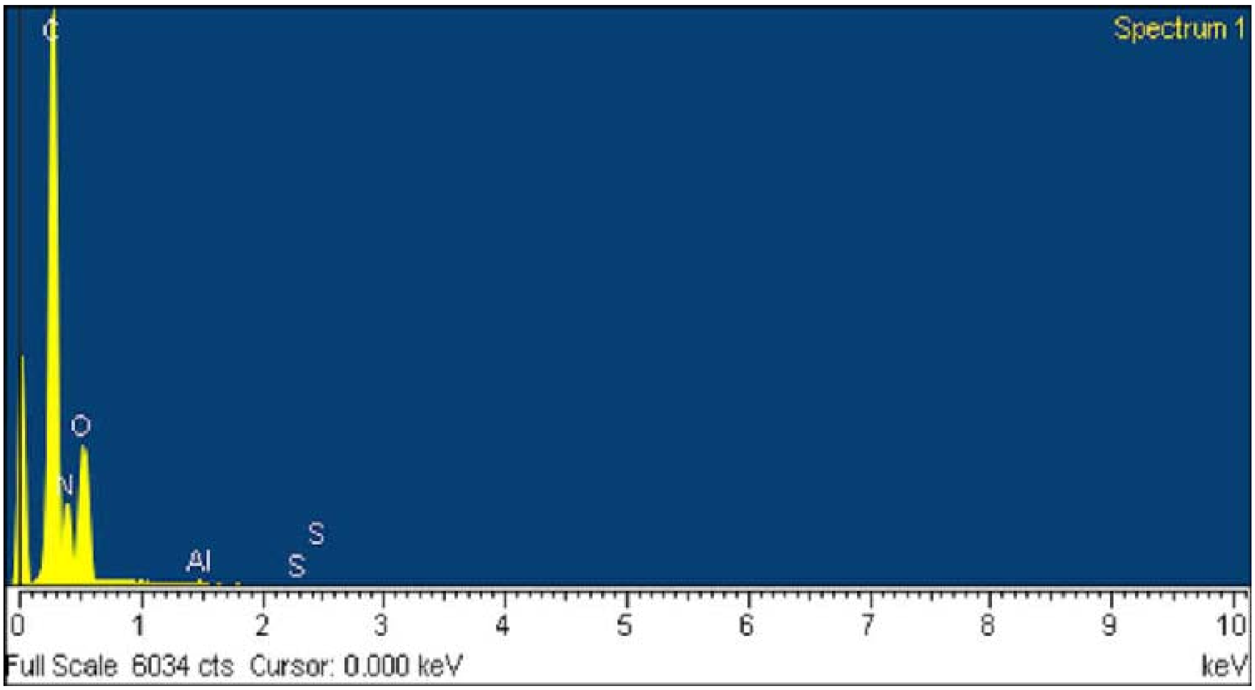

Figure 3. Scanning Electron Microscope (SEM) analysis done at The OSU MARC lab demonstrated subtle changes in the chemistry on the track containing X-rays and not on the control films.

The Shpilman axion generator was tested for radio/microwaves using a Model 2 TriField® Meter (AlphaLabs, Inc). The detector is sensitive from 100,000 to 2.5 billion oscillations per second (100 KHz to 2.5 GHz) with an error factor of two. Its minimum and maximum detectable signal strengths are 0.01 milliwatt/cm^2 and 1.0 milliwatt/cm^2 respectively. Repeated tests demonstrated that, when a detector was placed touching the operating axion generator, the detector registered 0.25 milliwatts/cm^2 (error range 0.15 to 0.45). The signal strength decreased proportionally when the detector was moved gradually away from the generator until complete dissipation had occurred at 2.5 inches.

The device was analyzed at The Ohio State University Electrical Engineering Microwave Lab under the direction of Dr. Patrick Roblin. Several tests were conducted using different oscilloscopes and numerous frequency ranges. The results were compared to a "control" device (a hand-held electric drill) that had a magnet attached to the tip to mimic the magnetic and spinning component of the axion generator.

The results demonstrated that the axion device generated both radio (~4 MHz) and microwaves (into the GHz range) in an observable harmonic pattern. The motorized control device (the drill) also demonstrated frequencies throughout the spectrum but in a random, unstructured pattern. The axion generator which appeared to "pulse" at certain intervals, was well organized and consistent. These characteristics did not apply to the control. Further, the TriField® detector did not register any radio/microwaves for the drill, whereas, it consistently detected these energies for the axion generator.

CONCLUSION

We have preliminarily demonstrated (in over 200 trials) that dental X-ray films exposed to the Shpilman axion generator can repeatedly produce dots and tracks on these films that are similar to charged particle tracks on surface emulsions. However, these could not be attributed to known particles by leading experts in the field of particle physics; thus giving support to the thesis that these tracks were created by a yet unidentified charged particle. Limitations of these experiments include the use of an unorthodox photoemulsion (dental X-ray films), which may have contributed to unknown artifacts on the experimental films' surface. These tests should be repeated using standard nuclear track emulsions.

Also documented in these experiments were subtle chemical alterations that occurred in the X-ray films after exposure to the axion generator. However, the changes observed were of such small proportions (0.03 to 0.08) that additional testing needs to be done in order to confirm or refute that the actual chemical changes were due to the films' exposure to the axion generator. Furthermore, other organic and non-organic items should be tested for chemical alterations post-axion generator irradiation.

Harmonic patterns of radio/microwaves were confirmed as being consistently generated by the device, which potentially supports one of the theorized properties of the pseudoscalar axion. Although compelling, additional testing should be conducted using a variety of Shpilman's axion devices. The focus of these experiments should be to measure and record various energy wavelengths and outputs in comparison with Shpilman's claims, e.g., some devices are said to generate higher energies than others, etcetera.

Given these preliminary findings, we can not rule out the possibility that an unknown particle, perhaps an axion, is being produced and/or excited by the Shpilman axion generator. Clearly, further research is warranted.

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