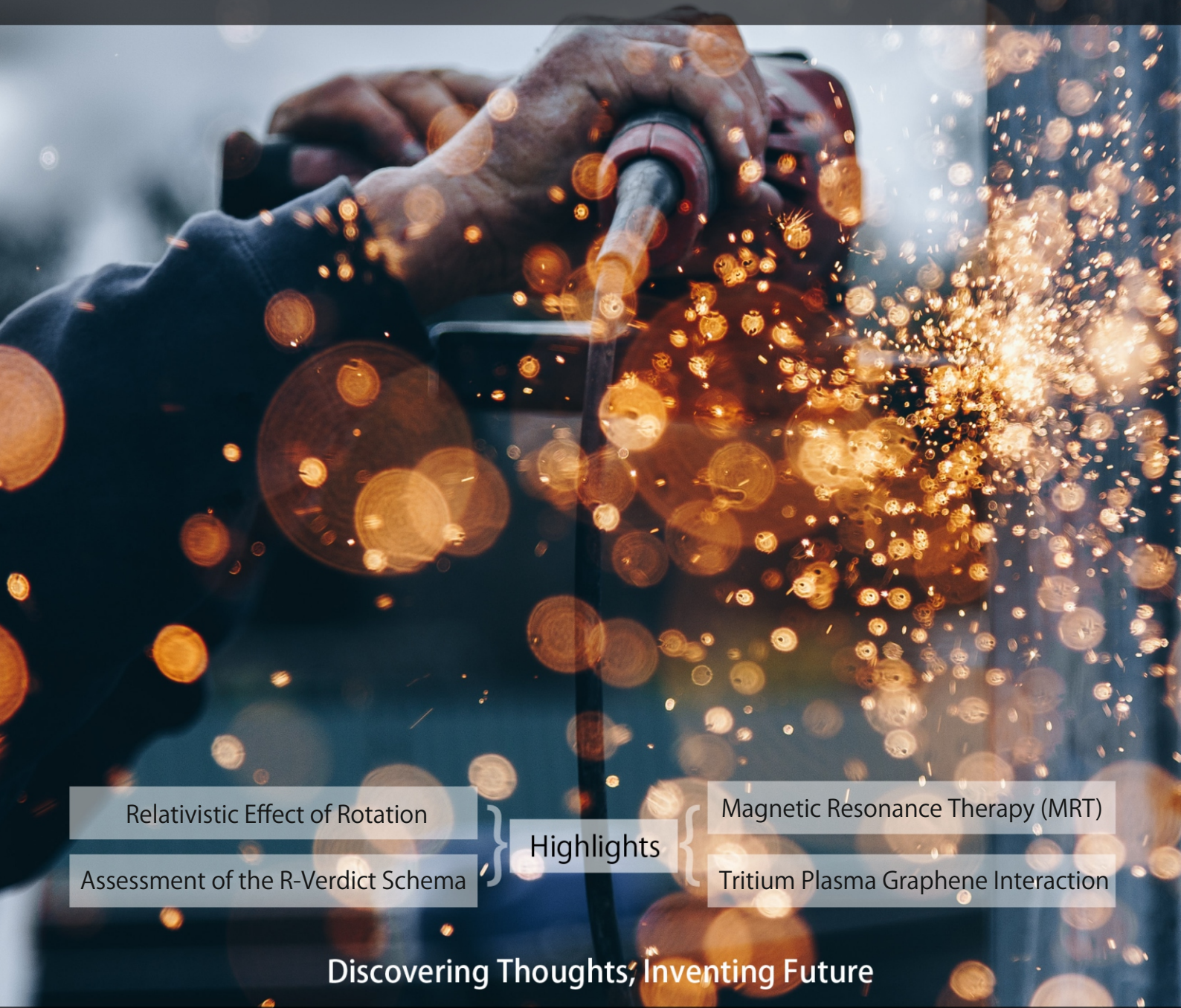


GLOBAL JOURNAL

OF RESEARCHES IN ENGINEERING: J

General Engineering



Relativistic Effect of Rotation

Assessment of the R-Verdict Schema

Highlights

Magnetic Resonance Therapy (MRT)

Tritium Plasma Graphene Interaction

Discovering Thoughts, Inventing Future

VOLUME 25

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CONTENTS OF THE ISSUE

- i. Copyright Notice
- ii. Editorial Board Members
- iii. Chief Author and Dean
- iv. Contents of the Issue
- 1. Magnetic Resonance Therapy (MRT) and Relativistic Effect of Rotation. ***1-34***
- 2. Usability Assessment of the R-Verdict Schema: A New Paradigm for Usage-Centric Design and Evaluation. ***35-43***
- 3. The City as a Stage: The Mirror Reflections of Grand Assemblies in Greece and Australia in the Early 20th Century. ***45-51***
- 4. Pearson Correlation based Comparison of Shannon Entropy Computed Reliability of Tritium Plasma Graphene Interaction. ***53-63***
- v. Fellows
- vi. Auxiliary Memberships
- vii. Preferred Author Guidelines
- viii. Index



Magnetic Resonance Therapy (MRT) and Relativistic Effect of Rotation

By Yin Rui, Yin Ming & Wang Yang

Bei Hang University

Abstract- Epoxide within molecular structures is recognized as hallmarks of potent carcinogenic cells. This paper proposes a novel approach: Magnetic Resonance Therapy (MRT), which selectively eliminates epoxide in cancerous tissues while preserving oxygen in healthy tissues, offering a potentially side-effect-free method for cancer treatment and prevention. The study presents a series of in vitro, in vivo, and clinical experiments to support this innovative therapeutic strategy. The underlying mechanism of MRT is grounded in the principles of relativity for rotational frames, and an experimental validation of this theoretical framework is provided. Furthermore, this research unveils previously undescribed relativistic phenomena, including space-time exchange, critical cylinder effects, strong and sub-strong and weak interactions as well as the source of quantum property and the source of mass as well as dark mas. Due to space constraints, the detailed mechanism of epoxide elimination will be elucidated in a subsequent publication.

Keywords: cancer, epoxide, magnetic resonance therapy, relativity for rotational frames.

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Magnetic Resonance Therapy (MRT) and Relativistic Effect of Rotation

Yin Rui^α, Yin Ming^σ & Wang Yang^ρ

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PART 1. THE PRACTICE OF MRT TREATING CANCER

I. INTRODUCTION

It is well known that lots of diseases is caused by oxidation of cell molecules. As pointed by James D. Watson in his book "Molecular Biology of the Gene" (1): "*the procarcinogens become into powerful carcinogens, as the epoxide appears in their molecules.*" An efficient and non-hazardous way to clean epoxide is proposed in this paper. We call it Magnetic Resonance Therapy (MRT). No medicine, no radioactivity, no scalpel, the MRT uses very weak magnetic field (less than 10 Gs) to clean epoxide. Its equipment is consisted of a signal generator (the gray box in Fig. 1) and a group of coils with air core (the white cylinder in Fig. 1). The signal generator produces currents, those flow through the coils to generate both main and RF magnetic fields acting on the lesion. The coils are positioned 20 cm away from the body surface, since the resonance happens beyond that place until 60 cm. The treatment starts when the signal generator is turned on. The standard dosage is three times one-hour per day. The device is very light (the total weight is 2 Kgs only), easy-managed, so that it can be used not only in hospital but also at home. And since it is no-hazard but benefit for body, it can be used to prevent cancer. Every year take MRT a month, even in sleep time, can keep the cancer away all life.

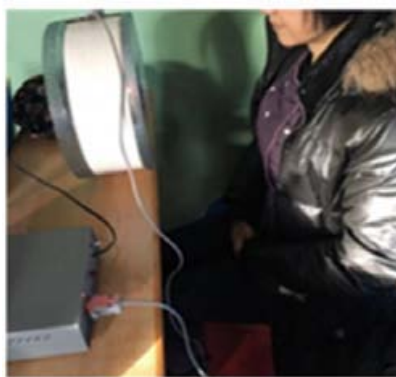


Fig. 1: Equipment and usage

a) Cell and Animal Experiments

i. The Killed Process of Cancer Cells by MRT–Cell Experiment in Vitro

Giving cultured squamous cancer cells MRT and observing the killed process of cells, we find that as MRT has been given for 5 minutes, lots of expanding bubbles bulge on the membrane of cells; as MRT has been given for 10 minutes, all bubbles expand to break, perforations appear at the place covered by bubbles before. The cell is dead currently. Continue MRT, perforations become bigger and bigger, the cell is broken.

Author α σ ρ: Bei Hang University. e-mail: yr195@buaa.edu.cn

ii. Cell Experiment in Vivo

Five days later after inoculating the Ehrlich (liver ascites cancer) line into the abdomen of 20 mice (BALB/c), every mouse grew up ascites including lots of Ehrlich cancer cells. Take 10 of them as experimental group and give them 8 days MRT (90minutes/day). The microscope photo-pictures are shown as Figure 2, where upper left is the cancer cells in control mice, every cell is complete. Upper right are the cells in experimental mice, perforations, overflowing cytoplasm, pieces of broken cells and dissolving into ascites can be observed. Lower left are the blood cells in control mice, lower right are the blood cells in experiment mice. They are no difference, means MRT does not damage blood cells.

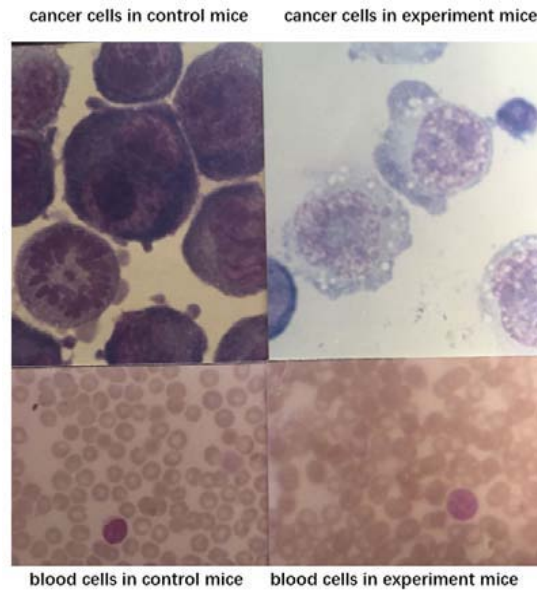


Fig. 2: MRT kill cancer cells but no effect to blood cells

iii. The Efficiency of MRT on Ascitic Hepatoma (Ehrlich) in Mice

Mice were inoculated with Ehrlich line, and significant ascitic growth was observed five days post-inoculation. On the tenth day, efficacy experiments were conducted. Before MRT, a small volume of ascitic fluid was extracted and examined under a microscope for cell count, yielding a concentration of 3.13×10^8 /ml. Magnified images of the cells are shown in Figure 3 (left panel).

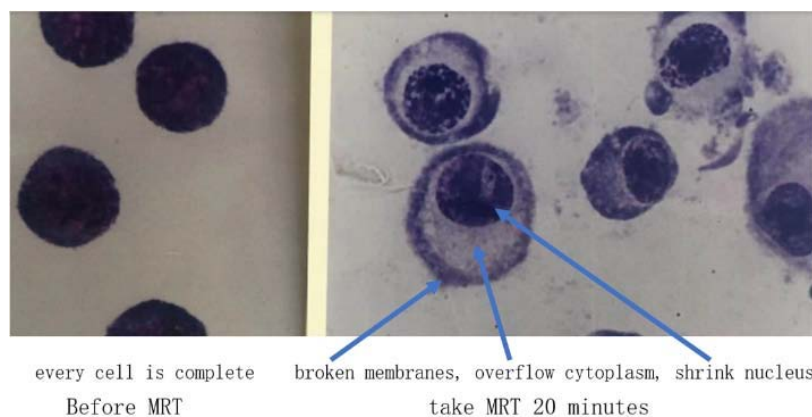


Fig. 3: MRT can kill Ehrlich cancer cell in 20 minutes

After 20 minutes of MRT, another small sample of ascitic fluid was collected for observation. The resulting image is displayed in Figure 3 (the right panel)). It was observed that, prior MRT, the cancer cells appeared intact. However, following 20 minutes of MRT, the cell nuclei exhibited pyknosis, ruptured, and released bubbles, causing perforation (visible as white spots in the images). The cell membranes fragmented, and cytoplasm leakage occurred, displacing membrane debris into a hollow area approximately twice the size of the nucleus. At this stage,

the cells were confirmed to be dead, although complete dissolution into the surrounding fluid required less than an hour

At 1.5 hours MRT, a subsequent ascitic fluid sample was analyzed for cell count, yielding a concentration of $0.117 \times 10^8/\text{ml}$. Compared to pre-treatment levels, this indicated a cell kill rate of 96%.

At 5.5 hours post-treatment, another ascitic fluid sample was examined, showing a cell count of $0.094 \times 10^8/\text{ml}$. This further confirmed a cell kill rate of 97% relative to pre-treatment levels.

iv. MRT Treated Lewis Lung Cancer in Black Mice With 100% Cure Rate

Four days after inoculating Lewis's lung cancer line, eleven mice of C57BL/6J all grew cancer blocks with the size of about 3mm. Three of them were taken as the control group, four of them were taken as the experimental group with small dose (10 minutes/day), and the other four mice were taken as big dose group (70 minutes/day). One week later we ended MRT, the cancer blocks in control mice all grew to the size of about 2cm, but the cancer blocks in six experimental mice (four of big dose group and two of small dose group) disappeared. However, there was a tuber in the size of about 1cm for two mice of small dose group. We dissected four mice. The cancer block in control mouse is shown as Figure 4 (the upper middle one), the upper right one is the tuber in the mouse taken small dose. The picture of dissected mouse without cancer block is shown in Figure 4 lower middle, The lower right is the tuber under Electron-Microscope. It is shown that there isn't any cancer embolus in it.

Two weeks later the other two mice of control group dead. However, one month later the tuber in the left mouse of the small dose group naturally disappeared. Nine months later the left five mice were all alive with very good health, and we ended this experiment. Such cure rate (100%) was scarce for animal experiment of cancer.

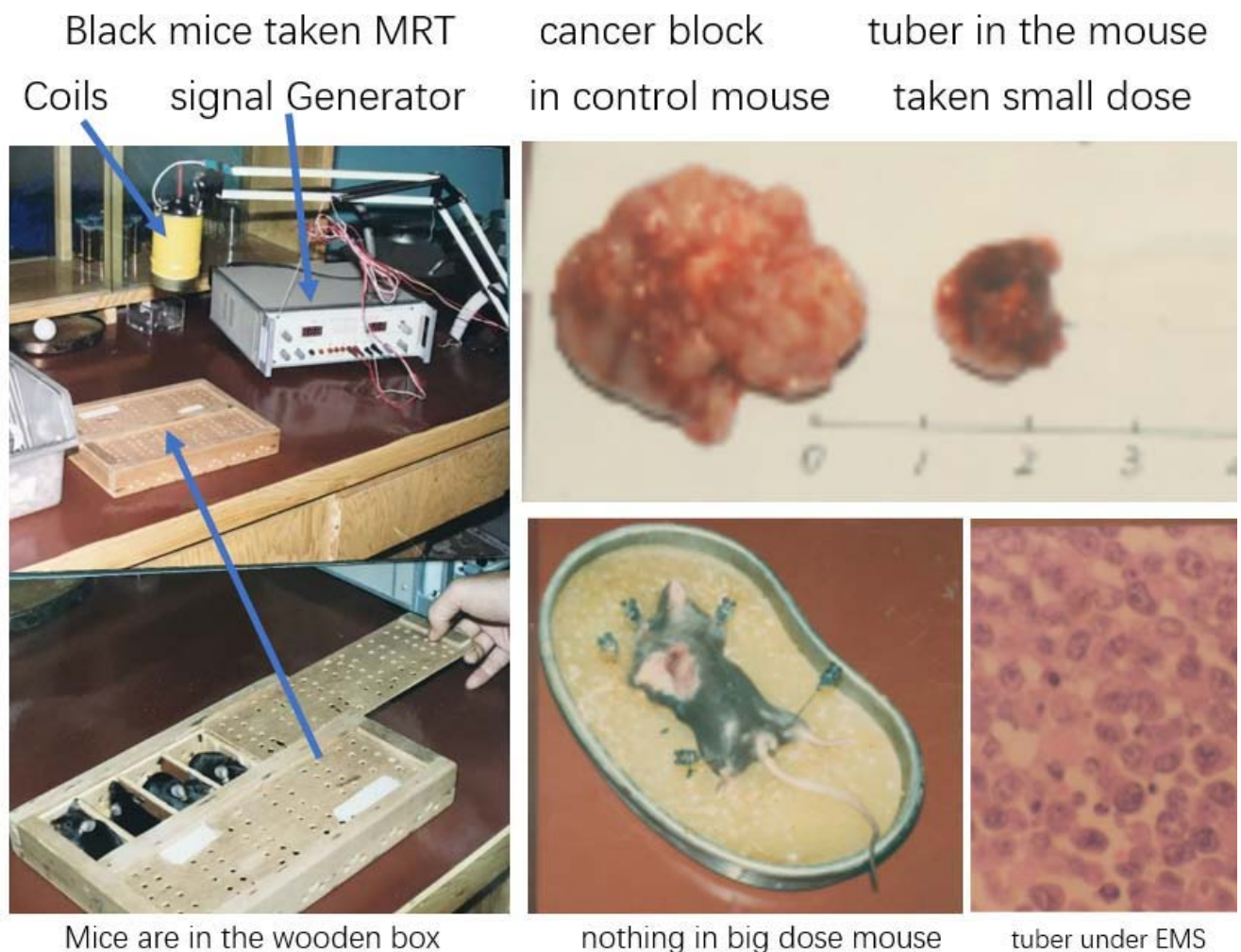


Fig. 4: MRT treated Lewis Lung Cancer in Black Mice

b) *Clinical Experiments*

More than 50 volunteers have taken MRT, Follows are some cases.

MRT treat nasal polyp before MRT



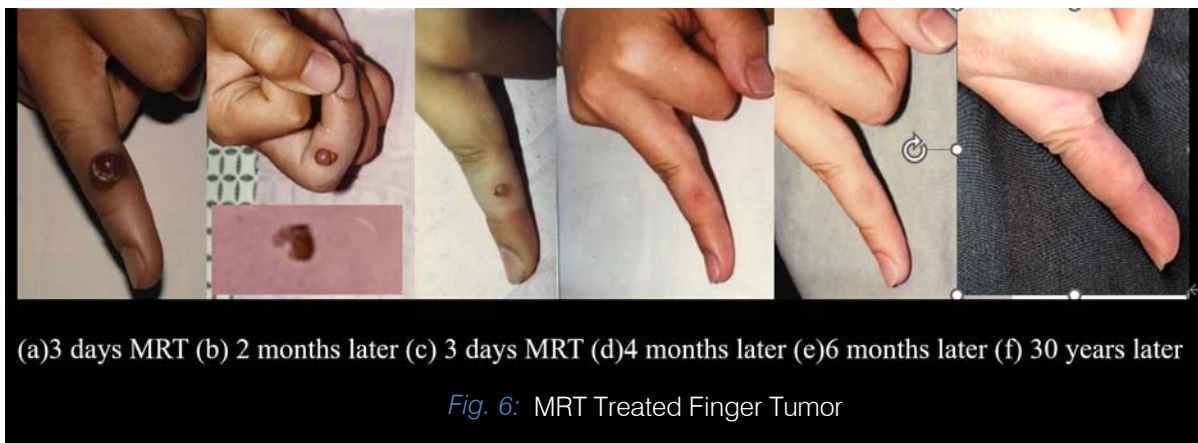
Dropped polyps

after 7 days MRT

Fig. 5: MRT treat nasal polyp

Case 1: A 93-year-old woman suffered from nasal polyp. The polyps filled both nostrils as shown in Fig.5 (upper right). She took one week MRT (2 hours/day) at her bedroom as shown in Fig.5 (upper left). During the second day's MRT, some polyps with the size about $2\text{mm} \times 8\text{mm}$ were come down on their own, as shown in Fig.5(lower left). After a week MRT the polyps were disappeared completely, as shown in Fig. 5 (lower right).

Case 2: A fifteen years old boy suffered from finger tumor as shown in Fig.6 (a). Two months later after taking MRT three days ($3 \times 1\text{hour/day}$), a piece of hard crust shell was taken off the tumor as shown in Fig.6 (b). After taking another three days MRT, the tumor constricted month by month as shown in Fig.6 (c) (d) (e). Another picture taken at 30 years later is shown on Fig.6. (f).



(a)3 days MRT (b) 2 months later (c) 3 days MRT (d)4 months later (e)6 months later (f) 30 years later

Fig. 6: MRT Treated Finger Tumor

Case 3: The bile duct of an old man was obstructed. Jaundice appeared on his face, hands and body as shown in Fig. 7 (a). He had no appetite and dregs-like stool. He took MRT at home. As the MRT had been given for three hours, a boundary line of jaundice appeared on his forehead, above this line the jaundice disappeared. As the MRT was continuing, the boundary line was going down and down. As the MRT had been given for six hours, the jaundice on his face and hands disappeared. As the MRT had been given for nine hours, the old man said: 'I am so hungry'. We ended that day's MRT and give him a bowl of gruel. Gobbling up the gruel, he said: 'I am hungry too'. His daughter smiled and asked: 'can he eat so much?' We said: 'doesn't matter, give him a diner please'. On the second day his stool became normal. Nevertheless, we gave him another two days MRT again, the picture taken on the third MRT day is shown in Fig. 7 (b).



Before MRT

After 3-days MRT

Fig. 7: MRT Treated Bile Duct Blockage

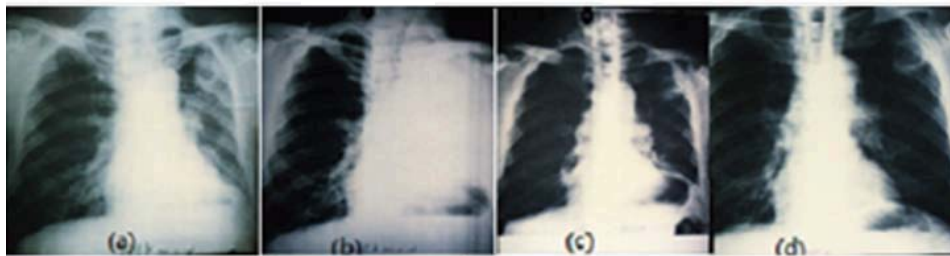
Case 4: MRT Treat Lung Cancer

A 64-year-old man suffered from lung squamous cancer. The x-ray photo taken on 14.3.1994 is shown as Figure 8(a), where the white elliptic part in upper left lung is the original cancer block. Two weeks later the metastasized cancer blocked the bronchus, air couldn't get into left lung, the left lung atelectasis (so-called white lung) as shown in Figure 8(b). Before MRT, the patient could neither sit nor lay, four or five times of shock happened every day. We gave him a one-week MRT. On the second MRT day he could sit, after the third MRT day he could walk in the garden of the hospital. The x-ray photo taken on the last MRT day is shown as Figure 8(c). His left lung could expanse again. 40 days later another x-ray photo was taken and is shown in Fig.8 (d). The situation was much better (Figure 5).



MRT was going

On the second day

On the 3rd day

35 days before MRT

20 days before MRT

After one-week MRT

40 days later after MRT

Fig. 8: MRT Treated Lung Cancer

Case 5: MRT Treat Gastric Cancer

Before treatment, the patient's pylorus was completely obstructed by cancer, rendering oral intake impossible, as shown in Figure 9 (upper left). A narrow channel was created using laser treatment, allowing the patient to sustain life by consuming milk and fruit juice. By the fifth day of MRT (3×1 hour/day), the patient expelled a significant amount of scabs, part of them displayed in Figure 9 (lower left). Following this, the patient was able to consume stewed beef.

The next day, a gastroscopy was performed. Figure 9 (upper right) presents a video screenshot of the pyloric region, showing that the obstructing cancer around the pylorus had disappeared. Other areas of the gastric wall still exhibited scabs tissue that had not yet shed, as indicated in the gastroscopic video screenshot in Figure 9 (lower right). The image reveals that all areas infiltrated by the tumor had formed scabs, while the uninvolved gastric wall remained its original white color. This indicates that MRT not only avoids damage to normal tissue but also ensures comprehensive targeting of pathological tissue.

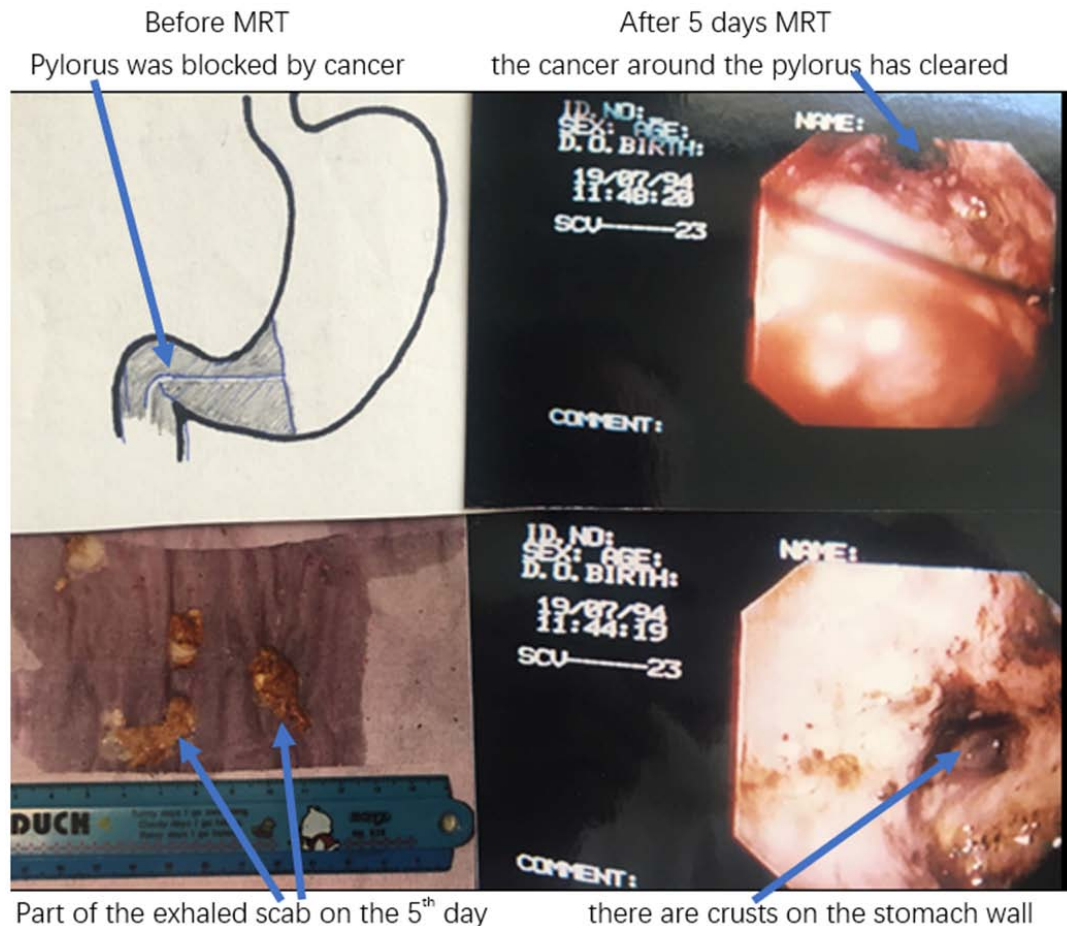


Fig. 9: 5 Days MRT (3hours/day) Cure the Pylorus Cancer

It should be noted that some gastric cancer patients, instead of vomiting necrotic tissue after 4–5 days of treatment, expelled it through defecation, like patients with colorectal cancer.

Above cases show that one or two weeks MRT can cure the cancer with small size. But the big size cancer should take MRT for long time. In this case, MRT can be taken at home and self-service by patients without the help of doctor. Follows are some cases.

Case 6: MRT Treat Lower Jawbone Cancer

A 78 years old woman suffered from lower jawbone cancer, and metastasized. She couldn't eat and sleep. She took MRT at home. The dose was 4×40 minutes/day. Since taking MRT, she could go to sleep every night, because the pain relaxed. Fig. 10 (a) and (b) are the pictures taken before MRT, (c) and (d) are those taken after one month MRT. Comparing them, we see that the cheek swollen disappeared, large area of cancer-ulcer with liquid oozed on chin healed up.



Fig. 10: MRT Treated Lower Jawbone Cancer

Case 7: MRT Treat Breast Small Cell Cancer

At the beginning the size of cancer block was $14\text{cm} \times 12\text{cm}$ as shown in Fig.11. After one-month MRT ($3 \times 1\text{hour/day}$), the mass in the upper left region disappeared, while the middle portion was charred and necrotic with a cavity being formed as shown in Fig.11. After one year MRT, the cancer tissue carbonized and necrotized into cavities as shown in Fig.11. But the skin around the cancer was without any change, although it suffered one-year MRT as well. This means the MRT can only kill cancer and no affect to normal tissue.



Fig. 11: MRT Treated Breast Small Cell Cancer

Case 8: MRT Treat Prostate Cancer

A 86-year-old man has suffered from prostate cancer for several years. His PSA was 100 ↑ (below 4 normal) on 25.5.2020. The PET-CT photo taken on 2020.6.5 is shown as Fig. 12, where every black point in bone was the cancer metastasis. Since 2020.7.19 he had taken MRT at home (3×1 hour/day). After 5 months MRT the PSA was decreased to 2.1, then stop MRT. However, the PSA was still decreased, two months later decreased to 1.1, then increased, five months later increased to 1.89. Then started MRT again, one month later PSA decreased to 0.431. The PET-CT photo taken in September of 2021 is shown in Fig.12. In terms of this photo, we know lots of bone metastasis disappeared.

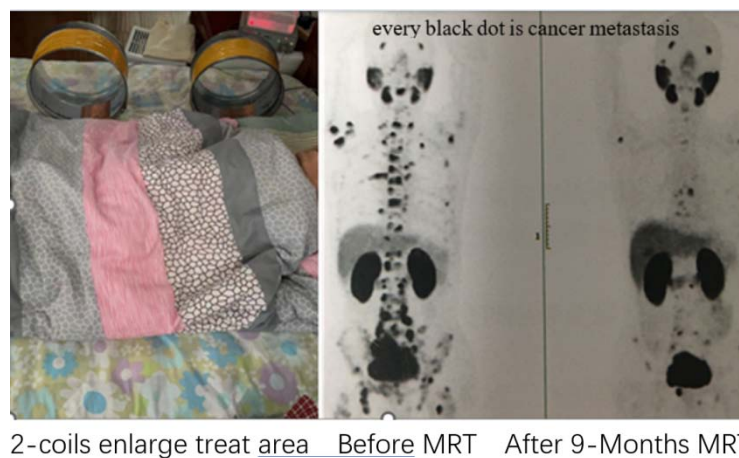


Fig. 12: MRT Treated Prostate Cancer

c) *Prevention and Early-Treatment of Cancer*

MRT can be used not only to treat cancer but also to prevent cancer. Following is an example.

Case 9: A 43-year-old female teacher was tested squamous cancer cells in white deposits on her tongue in 1994. The doctor suggested her to cut part of tongue. She was a teacher; without a complete tongue how could she give lecture? She asked us for help. We gave her one-week MRT (90 minutes/day) at the very beginning, then 3 months MRT (60 minutes per week). Now, 30 years is over, she fulfilled work and retired with wonderful health.

Tumor markers in the blood have exceeded the standard before cancer forms solid tumors. This is the best time for early treatment. MRT can be used as “pre-cancer” treatment, since its device is tiny, its operation is simple, it has no side effect, and it can be used at any place (home, office, class, etc.). Generally, 2 or 3 months later after 3 weeks MRT (3×40 minutes/day) the positive tumor marker can become negative. Following is an example:

Case 10: A 79-year-old academician in physical examination on 2014.12.29 was found that his Squamous Cell Carcinoma (SCC) cell antigen was 12.9 (below 1.5 normal). The doctor in no way helped him, only allowed him to take another test after 3 months. He asked us for help and took 20 days MRT at home from 2015.1.10 to 2015.1.30. After that 3 examinations were performed on 2015.1.30, 2015.3.13, and 2015.4.10. The results were: 8.1; 4.1 and 0.8. Then in 2016, 17, 18, 19 every year he takes one-month MRT. Till now, ten years have been over, his SCC has always been in the normal region.

The essence of MRT is deoxidation, it not only no hazard but benefit to body. Put the device on the bed and turn on it before going to sleep and turn it off after waking up. Doing it like this one month per year can keep cancer away all life.

d) *MRT treat cardio- and brain-vascular diseases*

MRT can be used to treat cardio- and brain-vascular diseases, which are caused by oxidation of cell molecules. Now let us give some cases.

Case 11: 67 years old women suffered from cerebral hemorrhage, after emergency operation, she kept life but left wet brain as shown in Figure 13 (left), so that she couldn't walk, eat and speak. We gave her three months MRT (3×40 minutes/day). After one-month MRT, she could eat meal with chopsticks, go to bathroom freely, and talk fluently. However, there was blood in her brain as shown in Figure 13 (middle). After three months MRT the blood in her brain disappeared. The place where the blood occupied before became empty as shown in Figure 13 (right).

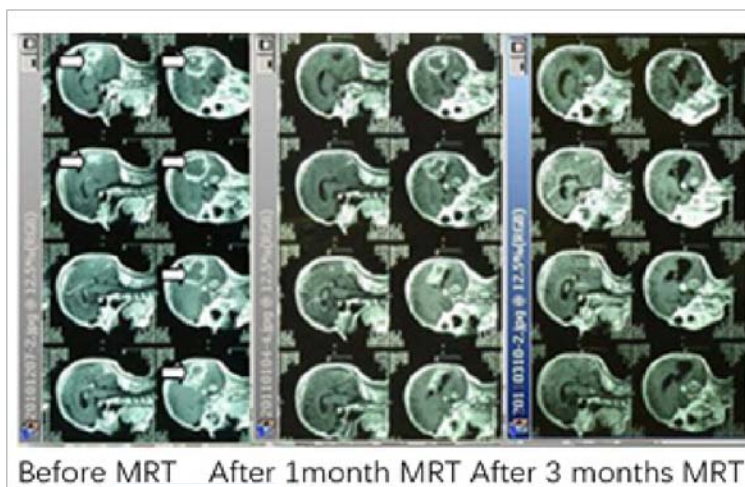


Fig. 13: MRT treated cerebral hemorrhage



Fig.14 arteria peroneal blocked

Case 12: The arteria peroneal of a 76-year-old man was blocked as shown in Fig. 14. Doctor suggested him to take an operation after the other two vascular being blocked. He asked us to help. We gave him 40 minutes MRT in the afternoon. At that night, as he was sleeping, he felt terrible itch on shank and foot. And he thought why there were so many mosquitoes this night. Suddenly, he understood that not mosquito but the blood was flowing through the shank and foot. Nevertheless, we gave him two days MRT again (40 minutes/day) and suggested him to take another test. He said: “no need, I can feel it is very well”. Now he is 90 years old and can walk 500m by push a wheelchair.

Case 13: Prevention of cerebral infarction: One of A 63-year-old man had a precursor to cerebral infarction: dropping chopsticks as eating and speaking incoherently. After 3 days of MRT, the precursor symptoms disappeared. Seven years have passed, and during these years, he has taken MRT regularly, and the condition has been good.

Case 14: Treatment of atrial fibrillation: One of a retired professor had two atrial fibrillations in 2014 and 15, and each time he had two days and three nights of continuous infusion in hospital before returning to normal. In 2016, when he had another attack, he happened to have an MRT device at home, and after one hour of treatment, he returned to normal.

No need for more cases, the efficiency of MRT has been exhibited. Now let us turn to the mechanism of MRT, that is based on Relativistic Effect of Rotation (RER), which was proposed by us in references [2-4]. Since lots of natural laws revealed by RER are unknown for modern physics, we have to give an experiment to prove it first [5].

PART 2. THE RELATIVISTIC EFFECT OF ROTATION

a) Experimental observation of relativistic effect of rotation

It is well known that the tangential velocity v , angular velocity ω , and the radial distance r have the relation of $v=r\omega$. Therefore, any rotation has a corresponding radial distance r_c where v reaches the speed of light c : $r_c=c/\omega$. We call r_c critical radius. All points with their radial distance being r_c form a cylindrical surface called critical cylinder. Almost everyone believes that the tangential velocity Outside Critical Cylinder (OCC) will surpass the speed of light, and superluminal is impossible, so they give-up researching it. However, our experiments demonstrate that there is observable physical phenomena in OCC, which are opposite to those Inside Critical Cylinder (ICC). Now let us show the experiments

The experiment setup and result

A helical electrode is connected to the negative output terminal of a DC high voltage generator (HVG). When the HVG is turned on, an abundance of free electrons will accumulate on the electrode. The electrode is affixed to a resin plate, which is secured in a plastic dish. The two ends of two U-type ferrite cores clamp the electrode, resin plate and the plastic dish together, while the other two ends are inserted into the exciting coils, as shown in Fig. 1. A square wave current generator (SWCG) feeds the coils, producing a magnetic field that is transferred to the electrode via two ferrite cores, causing the free electrons on the electrode to precession. The angular velocity of precession is given by Larmor equation: $\omega=\gamma B$. for electron, its gyromagnetic ratio $\gamma=2.6667\times 10^{10}$ (Hz/Tesla), as $B=0.12$ Tesla, the precession angular velocity is $\omega=2.01\times 10^{10}$ (r/s), the corresponding critical radius r_c is 1.492 cm, approximately 1.5 cm. A 20% carbon ink containing a high concentration of anionic surfactants (negatively charged ions) was utilized as the test charge. To begin, warm water is added to the plastic dish, and a small quantity of ink is injected 1 to 1.3 cm to the right of the electrode.

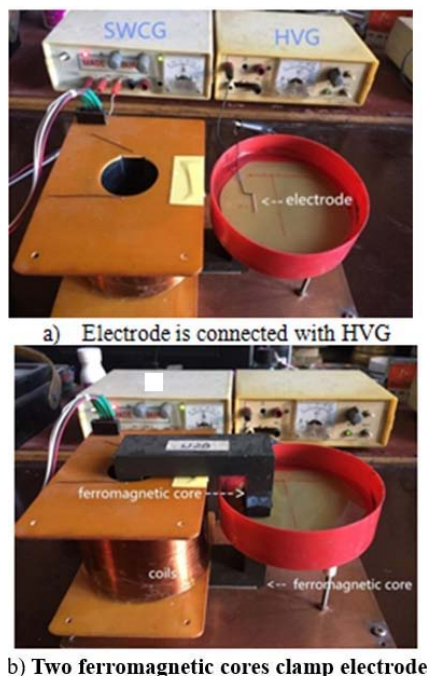


Fig. 1: The experimental device

The HVG is then turned on to recharge electrons on the electrode. The ink is repelled by the electrons, showing a distinct rightward shift as illustrated in the 4 sequential screenshots from the video presented in Figure 2(b).

Once the ink's right edge is repelled to the black mark indicating the resin board's center, the SWCG is activated to induce precession of the electrons. Subsequently, the ink in left side of 1.5cm continues being repelled rightward, whereas the ink in right side of 1.5cm begins being attracted leftward by the precession electrons. Figure 2(c) sequentially presents 6 screenshots from the experimental video depicting this stage of the precession.

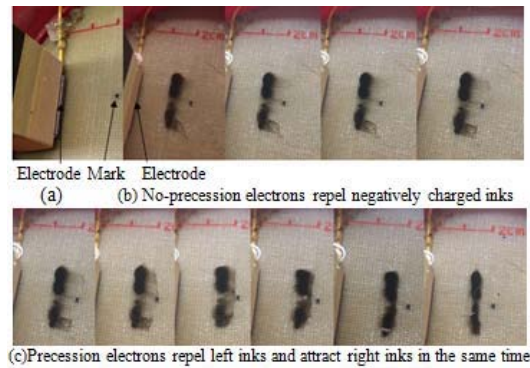
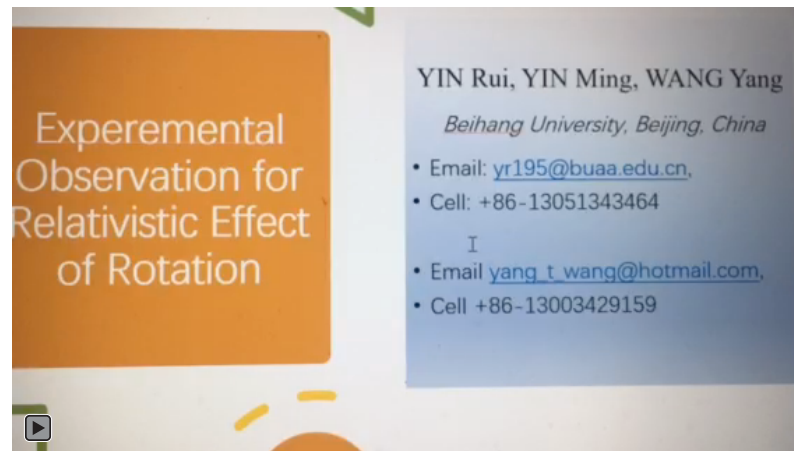


Fig. 2: Ten screenshots of an experimental video

Following is the experiment video: <https://youtu.be/c6YwqfB1KvM>



This experimental result demonstrates following conclusions

1. The electric force of precession electrons exists in OCC but has the opposite direction to that in ICC. This is a relativistic effect of rotation; we term the Critical Cylinder Effect (CCE). CCE reveals the incompleteness of Coulomb's law and Newton's gravitational law.
2. The observed critical radius indicates the precession of electrons possesses definite axis and constant angular velocity, so it is real rotation. Since only a rotating object can create precession when an external torque is applied, the spin of electron must be real rotation, contrary to claims of "not being a real rotation." in quantum spin theory.
3. Furthermore, quantum field theory believes that the electric force is transferred by virtual photons, which means that electrons emit virtual photons and hit the negative ions, causing the momentum change of the negative ions; the rate of momentum change is the force on the negative ions. However, this fails to explain why photon exchanges would exert opposing forces on either side of the critical radius. Electrical force must interact with a medium rotating in sync, i.e. its electric field but not virtual photons. In fact, the strong and weak force, and gravity are the relativistic effect of electromagnetic force, that we will explain in following.
4. There is field force in OCC means the tangential velocity of electric field of the precessing electron does not exceed the speed of light. In OCC, the relation between v and ω of fixed axis rotation is no longer $v=r\omega$, but $v=c^2/(r\omega)$, which has not yet been known for modern physics. Reference (4) has seriously proved it. Now let us give the simple theoretic proof.

b) Space-Time exchange and Tangential Velocity of a Rotation

Suppose frame A' is rotating with a constant angular velocity ω about a fixed axis z (z') relative to frame A . It is well known that substituting the local reference frames of event point P for inertial frames, i.e. substituting (ds, dp, dz, dt) for (x, y, z, t) and $\rho\omega$ for v into the (inverse) Lorentz transformation of inertial frames (1), the (inverse) Lorentz transformation for rotational frames can be got for the area of Inside Critical Cylinder (ICC) as shown in (2):

$$\left\{ \begin{array}{l} x = \gamma(x' + vt') \\ y = y' \\ z = z' \\ t = \gamma(t' + \frac{v}{c^2}x') \end{array} \right. \quad (1) \quad \left\{ \begin{array}{l} ds = \gamma(ds' + \rho\omega dt') \\ d\rho = d\rho' \\ dz = dz' \\ dt = \gamma(dt' + \frac{\rho\omega}{c^2}ds') \end{array} \right. \quad (2)$$

Now, let's extend them to OCC. The $d\rho = d\rho'$ and $dz = dz'$ are kept for OCC too, so we only consider the first and last equations of (2) only. They are:

$$\left\{ \begin{array}{l} ds = \gamma(ds' + \rho\omega dt') \\ dt = \gamma(dt' + \frac{\rho\omega}{c^2}ds') \end{array} \right. \quad (3)$$

Note:

$$\gamma = \frac{1}{\sqrt{1 - \rho^2\omega^2/c^2}} = \frac{ic}{\rho\omega} \frac{\pm 1}{\sqrt{1 - c^2/(\rho^2\omega^2)}} = \frac{ic}{\rho\omega} \gamma' \quad (4)$$

Where,

$$\gamma' = \frac{\pm 1}{\sqrt{1 - c^2/(\rho^2\omega^2)}} = \frac{\pm 1}{\sqrt{1 - \rho_c^2/\rho^2}}, \quad i = \sqrt{-1} \quad (5)$$

Thus, equation (3) can be written as:

$$\left\{ \begin{array}{l} ds = \gamma ds' + \gamma' ic dt' \\ ic dt = \gamma ic dt' - \gamma' ds' \end{array} \right. \quad (6)$$

And can be denoted in complex form: $[ds, ic dt] = [(\gamma ds' + \gamma' ic dt'), (\gamma ic dt' - \gamma' ds')]$ (7)

For ICC, γ is real, γ' is imaginary, $(\gamma ds' + \gamma' ic dt')$ is real, $(\gamma ic dt' - \gamma' ds')$ is imaginary. Taken the real and imaginary parts of the two sides of (7) to be equal respectively, equation (6), i.e. eq. (3) can be got.

For OCC, γ is imaginary, γ' is real, $(\gamma ds' + \gamma' ic dt')$ is imaginary, $(\gamma ic dt' - \gamma' ds')$ is real. Taken the real and imaginary parts to be equal respectively again, following equation (8) can be got.

$$\left\{ \begin{array}{l} ds = \overleftarrow{ICC} = \gamma ds' + \gamma' ic dt' = \overrightarrow{OCC} = ic dt \\ ic dt = \overleftarrow{ICC} = \gamma ic dt' - \gamma' ds' = \overrightarrow{OCC} = ds \end{array} \right. \quad (8)$$

We call this natural law space-time exchange. which has not been recognized by academics till now, It means the space in frame A' will become to space in ICC but to time in OCC of frame A. And the time in frame A' will become to time in ICC but to space in OCC of frame A.

As the event point is fixed at frame A', i. e. $ds' = 0$, these equations become to:

$$\left\{ \begin{array}{l} ds \overleftarrow{ICC} = \gamma' ic dt' = \overrightarrow{OCC} = ic dt \\ ic dt \overleftarrow{ICC} = \gamma ic dt' = \overrightarrow{OCC} = ds \end{array} \right.$$

The tangential velocity of this fixed point of A' relative to frame A is:

$$\text{In ICC: } \frac{ds}{dt} = \frac{\gamma' ic dt'}{\gamma dt'} = \frac{\gamma' ic}{\gamma' ic / (\rho \omega)} = \rho \omega = c \rho / \rho_c,$$

$$\text{In OCC: } \frac{ds}{dt} = \frac{\gamma' ic dt'}{\gamma' dt'} = \frac{\pm |\gamma'| ic}{\gamma' (\rho \omega)} ic = \begin{cases} c^2 / (\rho \omega) = c \rho_c / \rho & \gamma' = -|\gamma'| \vee \\ -c^2 / (\rho \omega) = -c \rho_c / \rho & \gamma' = |\gamma'| \times \end{cases}$$

Both ICC and OCC the direction of rotation must be same, so only $c^2/(\rho \omega) = c \rho_c / \rho$ is the true tangential velocity at OCC. That means γ' must take its minus root.

100 years ago Stern and Gerlach found the electron was spinning, Ulenbeck and Goldsmith proposed that the angular momentum of electron's spin was $L = \pm \hbar / 2$. Then, Lorentz pointed out: if $L = \hbar / 2$, ω should be 10^{26} r/s, then at $\rho = 10^{-14}$ m., the tangential velocity would be $v = \rho \omega = 10^{12}$ m/s, which was 10^4 times of light speed, that was impossible.

Several scientists measured the tangential velocity of electron's spin at the radial distance near $\rho = 10^{-14}$ m, and get the results in the level of 10^4 (m/s), which was one ten-thousandth of light speed only: $v \approx c/10^4$. In terms of these measured results they believed the angular velocity to be $\omega = v/\rho \approx 10^{18}$ r/s, which was far less than 10^{26} r/s, that can create $L = \pm \hbar / 2$.

So, till now the Quantum Mechanics has thought: the spin of charged particle is not rotation, and the angular momentum doesn't come from rotation but intrinsic.

However, according to our equation: $v = c^2/(\rho \omega) = c \rho_c / \rho$ i.e.: $c \rho_c = v \rho / c$, as $\rho = 10^{-14}$ m, $v = c/10^4$ means $\rho_c = 10^{-18}$ m, $\omega = c/\rho_c = 3 \times 10^{26}$ r/s, that can just create $L = \hbar / 2$. On the other hand, only rotational body can create precession as it suffered from external force. Our experiment proves the electron's precession is real rotation, so its spin must be real rotation too. Denying spin to be rotation, unknown the relativistic effect of rotation, quantum spin theory cannot touch the essence of particle world. This is the reason, why the research about particle physics no achievement during last century. Both six quarks model and super string theory cannot introduce the research go ahead. It's the time to correct it.

c) Unification Form of Lorentz Transformations for Rotational Frames

Now we know Outside Critical Cylinder the tangential velocity of a rotation is $v = c^2/(\rho \omega) = c \rho_c / \rho$, $1 - v^2 / c^2 = 1 - \frac{c^2}{\rho^2 \omega^2} = 1 - \frac{\rho_c^2}{\rho^2}$, so the Lorentz factor in OCC is:

$$-|\gamma'| = -(1 - c^2 / \rho^2 \omega^2)^{-1/2} = -(1 - \rho_c^2 / \rho^2)^{-1/2}$$

$$\text{Thus, let } v(\rho) = \begin{cases} c \rho / \rho_c & \rho < \rho_c \\ c \rho_c / \rho & \rho > \rho_c \end{cases} \quad \gamma(\rho) = \begin{cases} (1 - \rho^2 / \rho_c^2)^{-1/2} & \rho < \rho_c \\ -(1 - \rho_c^2 / \rho^2)^{-1/2} & \rho > \rho_c \end{cases}$$

The Lorentz transformations for both ICC and OCC can be uniformly denoted as follows:

$$\begin{cases} ds = \gamma(\rho)(ds' + v(\rho)dt') \\ d\rho = d\rho' \\ dz = dz' \\ dt = \gamma(\rho)(dt' + \frac{v(\rho)}{c^2} ds') \end{cases}$$

In terms of this equation, we can get the transformations of mass (m), energy (w), tangential momentum (p_s), radial force (F_ρ), axial force (F_z) and their resultant (F_R) as follows:

$$m = \gamma(\rho)m'[1 + u_s'v(\rho)/c^2];$$

$$w = \gamma(\rho)(w' + v(\rho)p_s'); \quad p_s = \gamma(\rho)(p_s' + v(\rho)E'/c^2);$$

$$F_{\rho/z/R} = \frac{F'_{\rho/z/R}}{\gamma(\rho)[1 + u_s'v(\rho)/c^2]} = \gamma(\rho)F'_{\rho/z/R}[1 - u_s'v(\rho)/c^2]$$

At OCC $\gamma(\rho)$ taken minus root, so the mass, energy, tangential momentum and force have opposite sign against those at ICC. We call it Critical Cylinder Effect (CCE). The experiment given above proves the radial force in OCC is opposite against that in ICC. That means the relativistic effects of rotation, proposed by us, is correct.

On the other hand, the force transformations given above, related to u_s , which is the tangential component of the acceptor charge's velocity relative to the doner charge's spin. Even if the acceptor charge's velocity is fixed, the u_s is different for different spin axis direction of doner charge. So that the force is related to the direction of spin axis of the doner charge. Different spin axis direction creates different force, the movement of acceptor is different. This is the source of uncertainty in Quantum Mechanics.



PART 3. HOW DOES STRONG INTERACTION CREATE BETWEEN PROTONS

a) Explanation of Experimental phenomenon

i. Before magnetic field being excited

The electron is only spinning with critical radius of: $\rho_{ce} \approx 10^{-18} \text{m}$. Take lab as reference frame A, relative to A take the spin of an electron as A'. In A' this electron is really at rest. The force exerted by this electron upon the anion of ink is the true electrostatic force F_R' . Transform F_R' into lab frame A by the force transformation, we get the force acted by electron on the anion of ink in lab frame:

$$F_R = \gamma_s(R) F_R' [1 - u_s v_s(R) / c^2]$$

In our experiment: $u_s = 0$; and $R \approx 10^{-2} \text{m}$, $\rho_{ce} \approx 10^{-18} \text{m}$, $\gamma_s(R) = -(1 - (\rho_{ce}/R)^2)^{-1/2} = -1$. Thus: $F_R = -F_R'$.

In terms of Coulomb's experiment: $F_R = k(-e)(-q)/R^2 = keq/R^2$ where $-q$ is the charge of anion. So $F_R' = -keq/R^2$,

In general, if the spinning charge is q , the test charge is q_t , the real electrostatic force in the spinning frame of q is: $F_R' = -kqq_t/R^2$

It means the real rest charge attracts the charge with the same sign, which is opposite against the Coulomb's law. And as $u_s = 0$ the force in lab frame is: $F_R = \gamma(R) F_R'$, i.e.

$$F_R / F_R' = \gamma(R) = \begin{cases} [1 - (R/\rho_c)^2]^{-1/2} & R < \rho_c \\ -[1 - (\rho_c/R)^2]^{-1/2} & R > \rho_c \end{cases}$$

We call it the first kind of CCE, as shown in Fig. 3.1(left). It means as R is changed across the critical radius, the force not only change direction but also approach to infinity. This is the source of so-called strong interaction. The strong interaction of protons appears at the level of 10^{-15}m (femto meter: fm), so the critical radius of proton's spin is on the level of fm, we take it is $1 \text{fm} = 1 \times 10^{-15} \text{m}$ to discuss.

More general, if $u_s \neq 0$, $F_R = \gamma_s(R) F_R' - \gamma_s(R) F_R' u_s v_s(R) / c^2 = F_e + F_m$ = electric force + magnetic force.

So, the electrical field of a spinning charge q in lab frame is: $E_s = -\gamma_s(R) kq / R^2$

And the magnetic field of a spinning charge q in lab frame is:

$$B_s = \gamma_s(R) [kq / R^2] [v_s(R) / c^2] = q \gamma_s(R) v_s(R) \mu_0 / (4\pi R^2)$$

For proton $q = +e = 1.602 \times 10^{-19} \text{C}$, its spin magnetic field distribution along radial $R = \rho$ is given in Table 3.1.

Table 3.1: The distribution of $\gamma(\rho)$ and spin magnetic field B of proton

$R = \rho =$	$0.9\rho_c$	$0.999\rho_c$	$\rho_c = 10^{-15} \text{m}$	$1.001\rho_c$	$1.1\rho_c$	10^{-9}m (nm)
$\gamma(\rho) =$	2.3	22.3	$\pm \infty$	-22.4	-2.4	-1
$B(\text{T}) =$	0.12×10^{14}	1.07×10^{14}	$\pm \infty$	-1.08×10^{14}	-0.087×10^{14}	-4.8×10^{-7}

And the direction of both electrical and magnetic field E and B are given in Fig. 3.1(right)

Thus, we know the direction of both electric field and magnetic field of spinning charged particle in OCC is opposite against that in ICC. So, as put this particle in an external magnetic field B , after longitudinal relaxation, the external magnetic field can coincide with either the spin magnetic field in OCC or that in ICC. This is why they define spin quantum number to be $s = \pm 1/2$ in quantum mechanics. And we know that how roughly it is to describe the spin magnetic property of proton by magnetic moment.

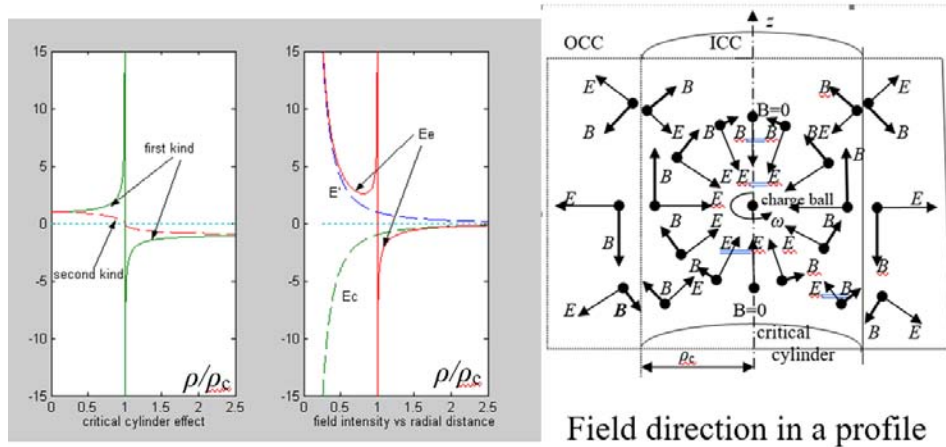


Fig. 3.1: Strength and direction distribution of spinning proton's field

ii. As the magnetic field has been excited

In this case, every electron has two rotations: spin in the angular velocity ω_s and precession with angular velocity of $\omega_m = \gamma B$. Take lab frame as A, the precession of an electron as A', then relative to A' take its spin as A'', then in A'' the force acted on anion of ink by the electron is the real electrostatic force: $F_R'' = -keq/R^2$. Transform F_R'' into A' we have:

$$F_R' = \gamma_s(R) F_R'' [1 - u_s' v_s(R) / c^2] \quad (3.1)$$

Note that both ω_s and ω_m are relative to lab frame A, so the angular velocity of A'' relative to A' is: $\omega_s' = \omega_s - \omega_m$ i.e. $c/\rho_c' = c/\rho_c - c/r_c$, i.e. : $\rho_c' = \rho_c / (r_c - \rho_c)$, so that in equation (3.1)

$$\gamma_s(R) = \begin{cases} [1 - (R/\rho_c')^2]^{-1/2} & R < \rho_c' \approx 10^{-18} m \\ -[1 - (\rho_c'/R)^2]^{-1/2} & R > \rho_c' \approx 10^{-18} m \end{cases}$$

$$v_s(R) = \begin{cases} cR/\rho_c' & R < \rho_c' \\ c\rho_c'/R & R > \rho_c' \end{cases}$$

Then, transform F_R' into A we have:

$$F_R = \gamma_s(R) \gamma_m(R) F_R'' [1 - u_s' v_s(R) / c^2] [1 - u_m v_m(R) / c^2]$$

In our experiment $u_m = 0$, $(0.5 \text{ cm} < R < 2 \text{ cm}) \gg \rho_c = 10^{-18} \text{ m}$. $v_s(R) = c(\rho_c / R) \approx 0$, we have:

$$F_R = \gamma_s(R) \gamma_m(R) F_R''$$

Where:

$$\gamma_m(R) = \begin{cases} [1 - (R/r_c)^2]^{-1/2} & R < r_c = 1.5 \text{ cm} \\ -[1 - (r_c / R)^2]^{-1/2} & R > r_c = 1.5 \text{ cm} \end{cases}$$

So, for $R < \rho_c = 10^{-18} \text{m}$, F_R is attraction; for $\rho_c < R < r_c$, F_R is repulsion; for $R > r_c$, F_R is attraction, which we have observed in our experiment.

b) The strong interaction between two protons

Just like we can think the mass of earth is concentrated in its center, as we discuss the gravity of a body outside the earth, we can think the charge of proton is uniformly distributed in a ball with radius of $b = 0.9194 \text{fm}$, as we discuss the interaction between protons. We will give the detail in part 5 of this paper. Sometimes, for simple, we think the radius of charge ball is 1fm .

For the two protons system, every proton is spinning with critical radius of ρ_c , that creates spin magnetic field B_s , which makes the other proton precession with critical radius of r_c , that creates precession magnetic field B_m . As the spin and precession axis of every proton are coincide, and anti-parallel to the axes of the other proton, and the distance (R) between two protons is greater than both ρ_c and $2r_c$, the two protons will attract to each other. Take lab as A, spin of p_1 as A' , relative to A' take precession of P_1 as A'' . The force exerted on p_2 by p_1 in frame A'' is real electrostatic force $F_R'' = -ke^2/R^2$. Transform it to A' and then to A, we get the force in lab frame as follows

$$F_R = F_R'' \gamma_s(R) (1 - v_s(R) u_s / c^2) \gamma_m(R) (1 - v_m(R) u_m' / c^2) \quad (3.2)$$

Where: u_s is the tangential component of the P_2 's velocity relative to the spin of P_1 in lab frame A

u_m' is the tangential component of the P_2 's velocity relative to the magnetic precession of P_1 in spin frame A'

$$\gamma_s(R) = -[1 - (\rho_c / R)^2]^{-1/2}, \quad v_s(R) = c(\rho_c / R)$$

$$\gamma_m(R) = -[1 - (r_c' / R)^2]^{-1/2}$$

$$v_m(R) = c(r_c' / R), \quad r_c' = r_c \rho_c / (\rho_c - r_c) \quad (3.3)$$

For keeping two protons attract to each other, R must be greater than both ρ_c and r_c' , this means R must be greater than $2r_c$ (accurately $r_c < 0.5002 \text{fm}$). If $r_c > 0.5003 \text{fm}$, then $r_c' > R$, the two protons will repel to each other, the two protons system can not exist.

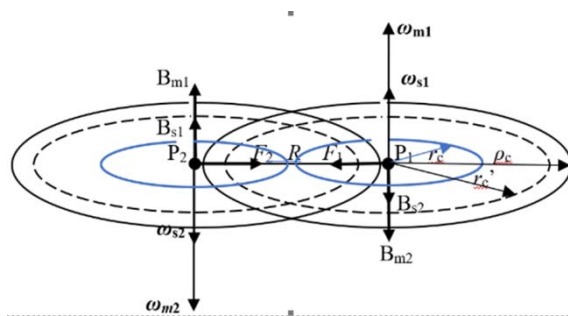


Fig. 3.2: Strong interaction between two protons

In terms of Eq. (3.2), we can get the spin and precession magnetic fields at $\rho = r = R$ as follows:

$$B_s = e[\gamma_m(R) \gamma_s(R)] v_s(R) \mu_0 / (4\pi R^2)$$

$$B_m = e[\gamma_m(R) \gamma_s(R)] v_m(R) \mu_0 / (4\pi R^2)$$

At the stable state, longitudinal relaxation ended, the spin and precession axes are almost coincided for every proton, and are anti-parallel to the axes of the other proton, as shown in Fig. 3.2. In this case the magnetic field passing through every proton is:

$$B = (B_m + B_s) = e\gamma_m(r) \gamma_s(\rho) [v_s(\rho) + v_m(r)] \mu_0 / (4\pi R^2). \quad (3.4)$$

In terms of Larmor equation: $\omega_m = -2\pi\gamma_p B$, where minus sign means the direction of ω_m is opposite against the direction of passing magnetic field B , we can get the angular velocity of proton's precession and its critical radius: $r_c = c / \omega_m$. where, $\gamma_p = 4.257 \times 10^7$ (Hz/T) is the gyromagnetic ratio of proto.

Note: $e = 1.602 \times 10^{-19}$ (C), $\rho_c = 1 \times 10^{-15}$ m ($\omega_s = 3 \times 10^{23}$ r/s), The strongest interaction happens at $R = \rho_c + b = 1.0009194 \times 10^{-15}$ m. At that place $\gamma_s(R) = -23.3363$, $v_s(R) = 2.9972 \times 10^8$ m/s are definite. If $r_c = 0.499 \times 10^{-15}$ m ($\omega_m = 6.012 \times 10^{23}$ r/s), then $\omega_m' = \omega_m - \omega_s = 3.012 \times 10^{23}$ r/s, $r_c' = 0.996 \times 10^{-15}$ m, $\gamma_m(R) = -[1 - (r_c'/R)^2]^{-1/2} = -10.01$, $v_m(R) = cr_c'/R = 2.988 \times 10^8$ m/s. The magnetic field passing through every proton is: $B = e\gamma_s(R)\gamma_m(R)[v_s(R) + v_m(R)]\mu_0/(4\pi R^2) = 2.2563 \times 10^{15}$ T, which can create the precession of proton with angular velocity of $\omega_m = 2\pi\gamma_p B = 6.035 \times 10^{23}$ r/s, corresponding critical radius is $r_{cc} = c/\omega_m = 0.4971 \times 10^{-15}$ m. That means $r_c = 0.499$ fm can not self-sustain, It will be decreased to 0.4971 fm. As it is decreased to [0.49899063, 0.49899062, 0.49899061] fm, the system parameters are shown in table 3.2.

Table 3.2: The stable self-sustain state of two-proton system with strong interaction

$\gamma_s\gamma_m$	F/F''	B	r_c'	r_c set	r_c create
235.0	468.6	2.247727e+015	9.95971e-016	4.9899061e-016	4.989926e-016
235.0	468.6	2.247736e+015	9.95971e-016	4.9899062e-016	4.989906e-016
235.0	468.6	2.247745e+015	9.95971e-016	4.9899063e-016	4.989886e-016

This means $r_c = 0.4989906(2)$ fm can keep the two protons system self-sustain, as given by the middle row of table 3.2. And this self-sustain state is stable. That means as something makes r_c be changed from $r_c = 0.4989906(2)$ fm, the system can make it return, as shown in table 3.2 (The upper and lower rows). By the way, we always use the three rows table to give the stable self-sustain state in our works. We hope readers can follow it. If the two protons are not shift in lab, then $u_s = 0$, $u_m' = -c\rho_c/R$. The interaction between two protons is following:

$$F_R = F_R''\gamma_s(R)\gamma_m(R)(1 - v_s(R)u_s/c^2)(1 - v_m(R)u_m'/c^2)$$

$$= F_R''235(1 - \rho_c r_c'/R^2) = 468.6F_R'' = -468.6ke^2/R^2$$

It is attraction of 468.6 times stronger than the electrostatic force, and appears at $R = \rho_c + b$ only. This is the so-called strong interaction between two protons and is given in table 3.2 by the term of F/F''. However, the two-proton system cannot be without shift in lab frame. We talk it is just as a foundation of following discuss.

c) Strong interaction between more protons

Consider four protons distribute at the vertices of a square with side length of $R = \rho_c + b = 1.9194$ fm. After longitudinal relaxation, the spin axis and magnetic precession axis of every proton are coincided, and they are antiparallel to the axes of two adjacent protons as shown in Fig.3.3.

Thus, the magnetic field passing through every proton is as following:

$$B = 2\gamma_s(R)\gamma_m(R)e[v_s(R) + v_m(R)]\mu_0/(4\pi R^2) - \gamma_s(\sqrt{2}R)\gamma_m(\sqrt{2}R)e[v_s(\sqrt{2}R) + v_m(\sqrt{2}R)]\mu_0/(8\pi R^2)$$

The critical radius of magnetic precession, which can hold the system stable self-sustaining, is $r_c = 0.4953731 \times 10^{-15}$ m. The stable self-sustain state is given in table 3.3.

Table 3.3: The stable self-sustain state of 4-proton system with strong interaction

$\gamma_s\gamma_m$	F/F''	B	r_c'	r_c set	r_c create
119.5	236.7	2.264148e+015	9.8166229e-016	4.9537315e-016	4.953736e-016
119.5	236.7	2.264150e+015	9.8166233e-016	4.9537316e-016	4.953731e-016
119.5	236.7	2.264153e+015	9.8166237e-016	4.9537317e-016	4.953726e-016

If only take $B = 2\gamma_s(R)\gamma_m(R)e[v_s(R) + v_m(R)]\mu_0/(4\pi R^2)$, that means neglect the effect of diagonal proton. The stable self-sustain state is given in table 3.4, which is almost the same as table 3.3

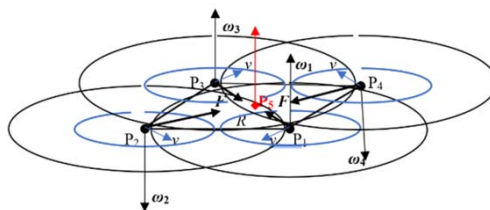


Fig. 3.3: Strong interaction in 4/5-proton system

$\gamma_s\gamma_m$	F/F''	B	r_c'	r_c set	r_c create
119.2	236.0	2.264276e+015	9.8155336e-016	4.9534541e-016	4.953456e-016
119.2	236.0	2.264278e+015	9.8155340e-016	4.9534542e-016	4.953451e-016
119.2	236.0	2.264281e+015	9.8155344e-016	4.9534543e-016	4.953446e-016

Fig. 3.4: The stable self-sustain state of even-proton system with strong interaction

This means that for the multi-proton system distributed in polygon, only the two adjacent protons gives the strong interaction. Thus, we get the force acted on every proton of multi-proton system is as follows

For the proton in 4-proton system $F = 2\sin(\pi/4) \times 236F'' = -334ke^2/R^2$

For the proton in 6-proton system $F = 2\sin(\pi/6) \times 236F'' = -236ke^2/R^2$

For the proton in 8-proton system $F = 2\sin(\pi/8) \times 236F'' = -181ke^2/R^2$

This force is pointed to the center of polygon, which holds the even-proton system stable.

If there is another proton (P_o) located at the center of this polygon, the resultant force exerted by the even protons on P_o is zero. The magnetic field at the center of polygon is zero, so there isn't magnetic precession for P_o . It is only spinning so the force exerted on other even protons is as follows:

For 5-proton system: $F_o = -2\gamma_s(\frac{\sqrt{2}R}{2})ke^2/R^2 = -2.828 ke^2/R^2$ attraction,

For 7-proton system: $F_o = -\gamma_s(R)ke^2/R^2 = 23.3363 ke^2/R^2$ repulsion

For 9-proton system: $F_o = -\gamma_s(\frac{R/2}{\sin(\pi/8)})ke^2/R^2 = 1.5538 ke^2/R^2$ repulsion

For the nuclei with even protons, the magnetic field and angular momentum are cancelled to each other, so there is no spin angular momentum and magnetic moment. And the nuclei with odd protons have only one proton's spin angular momentum and magnetic moment. This conclusion is confirmed by both classical theory and quantum theory. Now we have given its relativistic essence.

d) Sub-strong interaction between protons

As mentioned above, when $R = \rho_c + b > 2r_c$, so that the distance (R) between two protons is greater than both ρ_c and $r_c' = \rho_c / (\rho_c - r_c)$, the interaction between two protons is strong attraction. However, as $R = \rho_c + b$ is less than r_c , so that the magnetic field passing through every proton is in the same direction as its spin axis, and so that the precession axis of every proton is anti-parallel to its spin axis as shown in Fig.3.4.. In other words, the rotating direction of precession is opposite against that of spin. Thus, relative to spin frame A' the angular velocity of precession frame is $\omega_m' = \omega_s + \omega_m$ i.e. $r_c' = \rho_c / (\rho_c + \rho_c)$. And no matter how much is $r_c (> R)$, the r_c' is always less than $\rho_c < R$. This means the force between the two protons is attraction too and can be denoted by following equation as well

$$F_R = F_R'' \gamma_s(R) \gamma_m(R) (1 - v_s(R)u_s/c^2) (1 - v_m(R)u_m'/c^2)$$

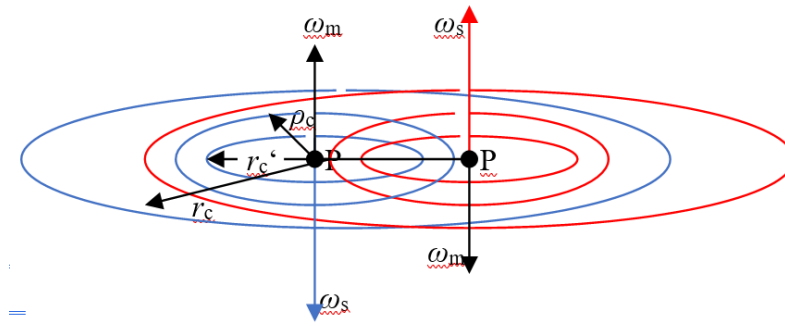


Fig. 3.4: Two protons with sub-strong interaction

Following is the stable self-sustain state of 4-proton system in this case

$\gamma_s \gamma_m$	\bar{F}/F''	B	r_c'	r_c set	r_c create
32.0	10.1	5.1e+014	6.8602333e-016	2.18495e-015	2.18498e-015
32.0	10.1	5.1e+014	6.8602530e-016	2.18497e-015	2.18497e-015
32.0	10.1	5.1e+014	6.8602727e-016	2.18499e-015	2.18496e-015

Fig. 3.5: The stable self-sustain state of 4-proton system with substrong interaction

As the four protons are no shift in lab, then $u_s=0$, $u_m'=-c\rho_r/R$, $v_m(R)=-cr_c'/R$. The force between two protons is:

$F_R = F_R'' \gamma_s(R) \gamma_m(R) (1 - \rho_c r_c' / R^2) = -10.1 ke^2 / R^2$, that is given in table 3.5 by the term of F/F'' .

Thus, we get the force acted on every proton of multi-proton system is as follows

For the proton in 4-proton system $F=2\sin(\pi/4) \times 10.1 F'' = -14 ke^2 / R^2$.

For the proton in 6-proton system $F=2\sin(\pi/6) \times 10.1 F'' = -10 ke^2 / R^2$

For the proton in 8-proton system $F=2\sin(\pi/8) \times 10.1 F'' = -7.7 ke^2 / R^2$

They are pointed to the center of polygon but not so strong. We call them sub-strong interaction, that is unknown by modern physics.

Fortunately, in the free radical oxygen and epoxide, the interaction between protons is sub-strong, but in the oxygen nuclei of normal tissue the interaction between protons is strong, which is dozens of times stronger than the sub-strong interaction. So the Magnetic Resonance Therapy (MRT) can kill cancer and no effect to normal tissue by decomposing epoxide but not oxygen.

PART 4 .NEUTRON AND WEAK INTERACTION

a) The Construction of Neutron

Modern quark theory proposed that the proton is consisted of u-d-u three quarks; neutron is consisted of d-u-d quarks, where u quark carries $+2e/3$ charge, d quark carries $-e/3$ charge. However, now we know the charge distribution in proton as shown in Fig. 4.1(a). There is not any negative charge in proton. This means there is not d quark in proton, and proton is not consisted by u-d-u quarks.

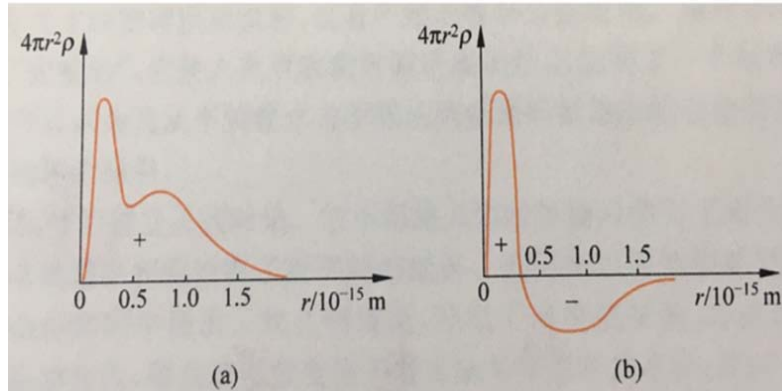


Fig. 4.1: The charge distribution in proton(a) and Neutron(b)

From Fig.4.1 (a) we know that the charge density at 0.25 fm is twice of that at 0.75 fm. That means the proton is consisted of three same charged particles, everyone carries $+e/3$ charge, we call it q quark. And the q quark at 0.75 fm can move from 0.3fm to 1.5fm, that is caused by the measurement. As without measurement, this quark will go back to its original place of 0.3fm, and the three q quarks forms the charge distribution like the part inside 0.3 fm of Fig.4.1 (b). In other words, the part inside 0.3 fm of neutron is just a proton, and the negative charge in neutron must be given by an electron, because the neutron is electricity neutral. It is well known that the neutron can easily decay to proton + electron and neutrino, that is the proof of neutron is consisted of an electron plus a proton.

Now we propose: "the neutron is consisted of a proton and an electron, which is separated from proton by $(0.4 \sim 1.5) \text{ fm}$ ". We take it to be $R = 0.8 \times 10^{-15} \text{ m}$ to discuss, and this is the difference from hydrogen atom. In hydrogen atom the distance between proton and electron is in the level of 10^{-10} m , which is far greater than the spin critical radius of both proton ($\rho_{cp} = 10^{-15} \text{ m}$, i.e. fm) and electron ($\rho_{ce} = 10^{-18} \text{ m}$, i.e. am). Outside the spin critical cylinders, the proton and electron attract to each other and create a rotation around their mass center called system precession with the angular velocity ω_g and critical radius of $l_c = c/\omega_g = 7 \times 10^{-9} \text{ m}$ (we use l to denote the radial of system precession to distinguish from spin (ρ) and magnetic precession r).

However, for neutron the distance between proton and electron is $R = 0.8 \times 10^{-15} \text{ m}$, which is less than $\rho_{cp} = 10^{-15} \text{ m}$. If the critical radius of system precession $l_c > R$, the proton repels electron, system precession can't create. If $l_c < R$ the proton attracts electron, but the mass of electron becomes to negative, since it is outside critical cylinder (OCC) of system precession. Attraction acts on minus mass, the acceleration is centrifugal, the system precession can't create as well. Without system precession, $R = 0.8 \times 10^{-15} \text{ m} < \rho_{cp} = 10^{-15} \text{ m}$, the proton repels the electron with plus mass, the electron will go away. The state can't be stable, the neutron can not exist. However, as the critical cylinder of system precession pass through the charge ball of electron, so that its OCC part suffered from attraction and with minus mass but its ICC part suffered from repulsion and with plus mass. And only as the resultant force is repulsion and the resultant mass is negative, the acceleration of electron is centripetal, the system precession can create and the proton-electron system can be stable, the neutron can exist, as shown in Fig. 4.2.

Now let us give the detail, based on thinking the charge of both proton and electron is uniformly distributed in a ball with radius of $b \approx 1 \times 10^{-18} \text{ m}$, although they are consisted of three quarks.

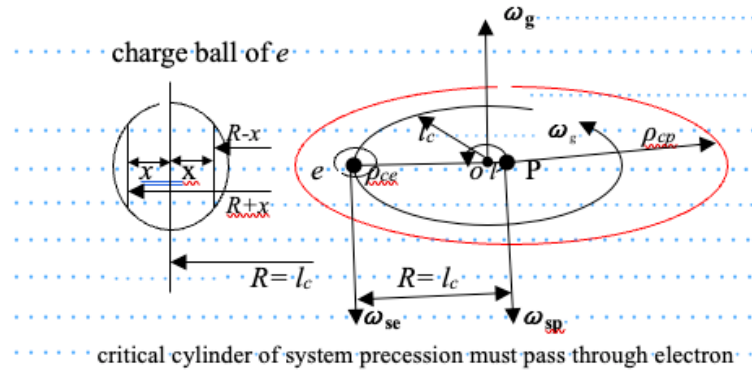


Fig. 4.2: The construction of neutron

Now, let us consider the possibility of this state. Since the critical cylinder of l_c pass through the charge ball of electron, the magnetic field in OCC is opposite against that in ICC, so the magnetic precession of electron can be neglected. On the other hand the critical radius of proton's magnetic precession is on the level of 10^{-13}m , which is far greater than both ρ_{cp} and l_c , and can be neglect as well. There are only spin and system precession two rotations for both proton and electron.

The mass of proton is 1800 times greater than the mass of electron, so the distance from mass center to proton is $l=R/1800=0.4\times 10^{-18}\text{m}$, which is less than the radius of charge ball $b=1\times 10^{-18}\text{m}$. This means the mass center is almost coincided with the proton, the system precession of electron can be thought around the proton, And the R and l_c have the same origin $O=P$.

First let us consider the situation of $R=l_c$, that means the critical cylinder of l_c pass through the charge ball of electron from its center. Take lab as A, system precession as A', in A 'the electron has only spin. Its mass must be distributed in axis symmetry that means the mass m_0 in cross-plate $R-x$ is equal to that in $R+x$. In lab frame they are rotating with tangential velocity of $v(R-x)=c(R-x)/R$ and $v(R+x)=cR/(R+x)$, The mass becomes to

$$m(R-x) = m_0 / \sqrt{1 - (R-x)^2 / R^2} ;$$

$$m(R+x) = -m_0 / \sqrt{1 - R^2 / (R+x)^2} ,$$

Since $R^2 > R^2 - x^2 = (R-x)(R+x)$, i.e., $R/(R+x) > (R-x)/R$,

So $m(R+x) + m(R-x) < 0$, i.e., the resultant mass is negative as $R=l_c$.

As l_c is increased from $l_c=R$ the ICC part, i. e. , the positive mass is increased. As $l_c=R+b$, the total mass is positive. So there must exist l_{c1} : $R < l_{c1} < R+b$, where the resultant mass equals 0. Thus, keep $l_c < l_{c1}$ can keep the resultant mass to be negative.

b) How does weak interaction create

As mentioned above in system precession frame A', both proton and electron are no shift, the force acted on the electron by spinning proton is $F_R' = \gamma_{sp}(R)ke^2/R^2$, Transform it into lab frame A, we have:

$$F_R = \gamma_{gp}(R) F_R' (1 - u_g v_g(R) / c^2) \quad (4.1)$$

Where $\gamma_{gp}(R) = (1 - v_g^2(R)/c^2)^{-1/2}$, u_g is the tangential velocity of electron in lab frame A .and it just is $u_g = v_g(R)$, since the electron is synchronously rotating with the system precession of proton. So the factor $(1 - u_g v_g(R)/c^2) = (1 - v_g^2(R)/c^2) = 1/\gamma_{gp}^2(R)$. Thus, equation (4.1) becomes to,

We call it second kind CCE and shown in Fig. 3.1: As R is changed from less than l_c to greater than l_c , the force will pass through 0 and change direction. Partly because second kind CCE, partly because the forces acted on the two sides of critical cylinder are cancelled to each other, the force acted on electron by proton is very weak. Now let us calculate the force as $R=l_c$.

The charge in this dv is

The total repulsion exerted on electron by proton is:

The total attraction exerted on electron by proton is:

As $R=0.8\text{fm}$ the electrostatic force is $F_c=ke^2/R^2=344.7419\text{ (N)}$, so $F\approx 6/10^6 F_c$ is very weak repulsion.

As l_c is decreased from $R=l_c$, the repulsion F_i is decreased and the attraction F_o is increased. There must exist l_{c2} : $R-b < l_{c2} < R$, where resultant force $F=0$. Keep $l_c > l_{c2}$ can keep the resultant force to be repulsion.

Thus, only if $I_{c1} > I_c > I_{c2}$ the system precession can create, the neutron can stably exist. The magnetic resonance therapy just makes I_c to beyond this scope, so that the neutron will decay and epoxide be damaged.

c) *The Stable State of Neutron* ($l_{c2} < l_c < l_{c1}$)

For proton: The force exerted on proton by electron is: $F = \frac{\gamma_{se}(R) ke^2}{\gamma_{ge}(l) R^2} = -\frac{ke^2}{R^2}$ where l is the distance from mass

center to proton, In terms of $F = ma = \frac{mv^2}{l} = \frac{mc^2 l}{l_c^2}$ we have $l_c^2 = \frac{mc^2 l}{F}$ As $l = 1.532 \times 10^{-18} \text{m}$, $R = 0.8 \text{fm}$ the l_{cp} is

0.8fm For electron: $F = ma = \frac{mv^2}{R} = \begin{cases} mc^2 R / l_c^2 & R < l_c \\ mc^2 l_c^2 / R^3 & R > l_c \end{cases}$ We have $l_c^2 = \begin{cases} mc^2 R / F & R < l_c \\ R^3 F / mc^2 & R > l_c \end{cases}$

We know the decreased force F but do not know the decreased mass m . Suppose the decreased force $F = aF_r$ ($a < 1$), the decreased mass $m = anm_e$ where $F_r = -ke^2 / R^2$, is the electrostatic force $m_e = 9.09 \times 10^{-31} \text{kg}$ is the rest mass of electron. Thus, we have

$$l_c^2 = \begin{cases} nm_e c^2 R / F_r & R < l_c \\ R^3 F_r / (nm_e c^2) & R > l_c \end{cases} \text{ i.e. : } l_{ce} = \begin{cases} c \sqrt{(m_e n R) / F} & R < l_{ce} \\ \sqrt{F R^3 / (m_e n c^2)} & R > l_{ce} \end{cases}$$

Then, take $F = -ke^2 / R^2$, $m_e = 9.09 \times 10^{-31} \text{kg}$, $R = 0.8 \text{fm}$ we get following result:

n	l	ω_p	l_{cp}	l_{cei}	l_{ceo}
3.5170	1.532e-018	3.75e+023	8e-016	7.9999e-016	8.0001e-016
3.5171	1.532e-018	3.75e+023	8e-016	8e-016	8e-016
3.5172	1.532e-018	3.75e+023	8e-016	8.0001e-016	7.9999e-016

That means as $n = 3.5171$ $l_{cp} = l_{cei} = l_{ceo} = 0.8 \times 10^{-15} \text{m} = R$, that is a stable self-sustain state

Different deep of critical cylinder passing though the charge ball, corresponding different n , the stable state is different. As $n = 2.3447$ $R = 1.2 \text{fm}$ the critical radius of stable state is $l_{cp} = l_{cei} = l_{ceo} = 1.2 \times 10^{-15} \text{m}$ as shown in follows:

n	l	ω_p	l_{cp}	l_{cei}	l_{ceo}
2.3444	1.532e-018	2.5e+023	1.2e-015	1.1999e-015	1.2001e-015
2.3447	1.532e-018	2.5e+023	1.2e-015	1.2e-015	1.2e-015
2.3450	1.532e-018	2.5e+023	1.2e-015	1.2001e-015	1.1999e-015

This is why the negative charge can distribute in $[0.5 \sim 1.5] \times 10^{-15} \text{m}$ so wide area in Fig. 4. 1.

d) *The Strong Interaction between Neutrons*

Knowing the neutron is consisted of a proton plus an electron, we know the strong interaction between neutrons just is the strong interaction between their protons. and the influence of the electron to other neutrons can be neglected. Consider four-neutron system, their protons distribute at the vertices of a square with side length of $R = \rho_{cp} + b$, as shown in Fig.4.4. Every proton locates Outside Critical Cylinders of both spin and system precession of the other protons, so the four protons attract to each other. The critical radius of magnetic precession of every proton must be greater than $R = \rho_{cp} + b$ for both r_c (relative to lab) and r_c' (relative to its spin), which is kept by electron's magnetic field and enough big of r_c .

Take lab as A, spin of P_1 is A' the magnetic precession of P_1 as A'', the system precession of P_1 -e₁ as A'''

Then, in A''' P_1 is really at rest, the force acted by P_1 on other proton is the real electrostatic force $F'' = -ke^2 / R^2$. Transform it into A'', then A', then A, we have:

$$F_R = F_R''' \gamma_s(R) \gamma_m(R) \gamma_g(R) (1 - v_s(R) u_s / c^2) (1 - v_m(R) u_m' / c^2) (1 - v_g(R) u_g'' / c^2)$$

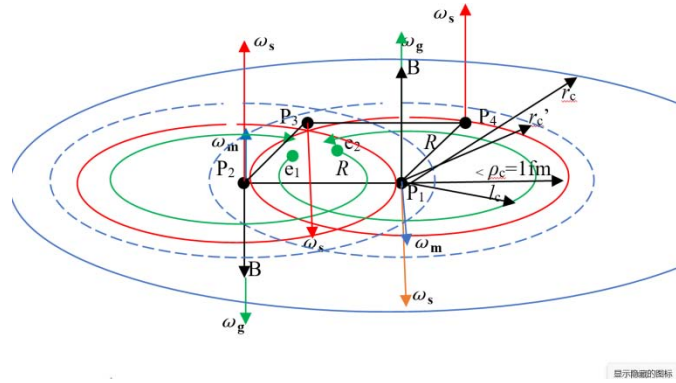


Fig. 4.4: The four-neutron system

The magnetic field passing through every neutron's proton is as follows

$$B_n = 2\gamma_s(R) \gamma_m(R) \gamma_g(R) e [v_s(R) + v_m(R) - v_g(R)] \mu_0 / (4\pi R^2) - ec \mu_0 / (4\pi l_c^2)$$

Where the last term come from: $-\gamma_{se}(l_c) \gamma_g(0) e v_{se}(l_c) \mu_0 / (4\pi l_c^2)$, that is the orbit magnetic field of electron.

The stable self-sustaining state is as follows:

$\gamma_s \gamma_m \gamma_g$	B	l_c'	r_c'	r_c set	r_c create
35.4749	3.656e+014	5.1974e-016	1.484e-015	3.0678e-015, 3.0680e-015	
35.4753	3.656e+014	5.1974e-016	1.484e-015	3.0679e-015, 3.0679e-015	
35.4757	3.656e+014	5.1974e-016	1.484e-015	3.0680e-015, 3.0679e-015	

As the four proton are no shift in lab, $u_s=0$, $u_m'=-c\rho_c/R$, $u_g''=c(\rho_c+r_c)/(1+r_c\rho_c)$,

The attraction between two neutrons is as follows:

$$F_R = F_R''' \gamma_s(R) \gamma_m(R) \gamma_g(R) (1 - v_s(R) u_s / c^2) (1 - v_m(R) u_m' / c^2) (1 - v_g(R) u_g'' / c^2)$$

$$F_R = 35.5 F_R''' (1 + \rho_c / r_c') (1 - \frac{l_c'}{R} (\frac{r_c' + \rho_c}{1 + \rho_c r_c'})) = 29 F_R'''$$

Thus, we get the force acted on every neutron's proton of multi-neutron system is as follows

For the proton in 4-neutron system $F=2\sin(\pi/4) \times 29F''=-41ke^2/R^2$.

For the proton in 6-neutron system $F=2\sin(\pi/6) \times 29F''=-29ke^2/R^2$

For the proton in 8-neutron system $F=2\sin(\pi/8) \times 29F''=-22ke^2/R^2$

This is the strong interaction between multi neutrons. Obviously, it is not so strong as that between multi protons. However, the strong interaction between, say, the system consisted of two protons and two neutrons is in the same level as that of four protons. Following is the stable self-sustain state with strong interaction for 2-proton2-neutron system.

γ_p	γ_n	r_{cp}'	$r_{cp}(\text{set})$	$r_{cp}(\text{create})$	r_{cn}'	r_{cn}	l_c'
117.6	153.5	9.81e-16	4.95209355e-16	4.95212e-16	1.0157e-15	5.03892e-16	4.475e-16
117.6	153.5	9.81e-16	4.95209356e-16	4.95207e-16	1.0157e-15	5.03892e-16	4.475e-16
117.6	153.5	9.81e-16	4.95209357e-16	4.95204e-16	1.0157e-15	5.03891e-16	4.475e-16

As the four protons are no shift in lab frame, the force exerted on every proton by every neutron is as follows:

$$F_p = 153.5 F_R'' \left(1 + \left(\frac{\rho_c}{R} \right) \left(r_{cp}' \frac{1}{R} \right) \right) = 304 F_R''$$

The force exerted on every neutron by every proton is as follows:

$$F_n = 117.6 F_R'' (1 + \rho_c / r_{cn}') (1 - \frac{l_c'}{R} (\frac{r_{cn}' + \rho_c}{1 + \rho_c r_{cn}'})) = 127 F_R''$$

And their stable self-sustain state with sub-strong interaction is as follows

γ_p	γ_n	r_{cp}'	$r_{cp} \text{ set}$	$r_{cp} \text{ create}$	r_{cn}'	r_{cn}	l_c'
49.0	89.4	8.802e-16	7.34920e-15	7.34923e-15, 9.64518e-16,	2.71829e-14	4.69016e-15	
49.0	89.4	8.802e-16	7.34922e-15	7.34922e-15, 9.64518e-16,	2.71830e-14	4.69016e-15	
49.0	89.4	8.802e-16	7.34924e-15	7.34921e-15, 9.64518e-16,	2.71830e-14	4.69016e-15	

As the four protons are no shift in lab frame, the force exerted on every proton by every neutron is as follows:

$$F_p = 89.4 F_R'' (1 - (\rho_c / R) (r_{cp}' / R)) = 10.7 F_R''$$

The force exerted on every neutron by every proton is as follows:

$$F_n = 49 F_R'' (1 - (\rho_c / R) (r_{cn}' / R)) (1 + (l_c' / R)) = 3 F_R''$$

Thus, we know the force acted on neutron is less than that on proton, The MRT just make neutron decay to damage the epoxide to treat cancer. We will give the detail in another paper.

PART 5. HOW DOES QUANTUM PROPERTY CREATE

a) Quantum Property Comes from the CCE of Field Energy

Now, let us discuss the critical cylinder effect (CCE) of Energy and Mass (E-M) of spinning charged particle, based on thinking its charge q to be uniformly distributed in a charge ball of radius b , even though the particle may possess complex internal structure.

For the spinning charged particle, take the laboratory as reference frame A and the spin of the particle as reference frame A' . In frame A' , the particle is indeed at rest, and its electric field is the true electrostatic field. The value of this electrostatic field at a distance r from the center of charge ball is:

$$E_r = \begin{cases} -kqr/b^3, & r < b \\ -kq/r^2, & r > b \end{cases} \quad (5.1)$$

where $k = 1/(4\pi\epsilon_0)$.

The field energy w' at that point is:

$$w'(r) = (\epsilon_0/2)E_r^2 = \begin{cases} (\epsilon_0/2)k^2q^2r^2/b^6 & r < b \\ (\epsilon_0/2)k^2q^2/r^4 & r > b \end{cases} = \begin{cases} (1/8\pi)kq^2r^2/b^6 & r < b \\ (1/8\pi)kq^2/r^4 & r > b \end{cases} \quad (5.2)$$

The total field energy of the charged particle in its spinning reference frame is obtained by integrating the energy density $w'(r)$ over the entire three-dimensional space. When this integral is calculated in the (r, φ, θ) sphere coordinate system, the energy inside charge ball, W'_i , is:

$$W'_i = \frac{\epsilon_0 k^2 q^2}{2b^6} \int_0^{2\pi} d\varphi \int_0^{\pi/2} \sin\theta d\theta \int_b^\infty 2r^4 dr = \frac{kq^2}{10b} \quad (5.3)$$

The energy outside charge ball, W'_o , is:

$$W'_o = \frac{\epsilon_0 k^2 q^2}{2} \int_0^{2\pi} d\varphi \int_0^{\pi/2} \sin\theta d\theta \int_b^\infty \frac{2}{r^2} dr = \frac{kq^2}{2b} \quad (5.4)$$

Similarly, the energy outside the ball with radius of a ($a > b$), W'_{ao} , is:

$$W'_{ao} = \frac{kq^2}{2a} \quad (5.5)$$

If $a = 1000b$, then $W'_{ao} = 0.001W'_o$. This indicates that 99.9% of the energy outside the charged ball is contained within a sphere of radius a equals $1000b$. Conversely, if $a = 2b$, then $W'_{ao} = W'_o/2$, meaning that half of the energy outside the charged ball is located within the spherical shell defined by $b < r < 2b$. The total field energy in the spinning frame, denoted as W' is given by:

$$W' = W'_i + W'_o = \frac{1.2kq^2}{2b} \quad (5.6)$$

For a proton, the charge q is $1.602 \times 10^{-19} \text{C}$. If the radius b is $0.9194 \times 10^{-18} \text{m}$, then the total field energy W' is $1.5053 \times 10^{-10} \text{J}$. This energy corresponds to the rest mass of $m' = \frac{W'}{c^2} = 1.67252 \times 10^{-27} \text{Kg}$, which just is the rest mass of a proton. This leads to the idea that "mass arises from its field energy." This result denotes that the particle's field energy in the spinning frame is a single, definite value, lacking quantum property. Thus, we can think the charge of proton ($e = 1.602 \times 10^{-19} \text{C}$) is uniformly distributed in a ball with radius of $b = 0.6ke^2/W' = 0.9194 \times 10^{-18} \text{m}$, that has been used in part 3 and 4.

In terms of energy-momentum transformation:

$$w = \gamma(\rho)(w' + v(\rho)p'_s) \quad (5.7)$$

Since the momentum in the spinning frame is zero ($p'_s=0$), Consequently, the field energy at $r = \sqrt{\rho^2 + z^2}$ from the center of the charged ball in the laboratory frame A can be expressed as follows:

$$w(\rho) = \begin{cases} \frac{\gamma(\rho)\left(\frac{\epsilon_0}{2}\right)k^2q^2r^2}{b^6} & r < b \\ \frac{\gamma(\rho)\left(\frac{\epsilon_0}{2}\right)k^2q^2}{r^4} & r > b \end{cases} \quad (5.8)$$

where

$$\gamma(\rho) = \begin{cases} \frac{1}{\sqrt{1-(\frac{\rho}{\rho_c})^2}}, \rho < \rho_c \\ -\frac{1}{\sqrt{1-(\frac{\rho_c}{\rho})^2}}, \rho > \rho_c \end{cases}$$

The total field energy of a spinning charged particle in the laboratory frame is obtained by integrating the energy at each point: $w(\rho)$, over the entire three-dimensional space. However, since $w(\rho)$ depends on $\gamma(\rho)$ and the expression of $\gamma(\rho)$ in ICC differs that in OCC, this integration must be divided into four distinct parts:

- (A) W_1 for the region where $b < \rho < \rho_c$
- (B) W_2 for the region where $\rho_c < \rho < \infty$
- (C) W_3 for the region where $\rho < b, z > \sqrt{b^2 - \rho^2}$
- (D) W_4 for the region where $\rho < b, z < \sqrt{b^2 - \rho^2}$

These regions are illustrated in Figure 5.1.

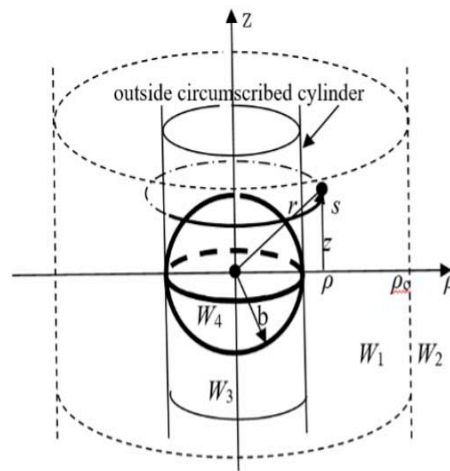


Fig. 5.1: Charge Ball and Critical Cylinder

For the location of $b < \rho < \rho_c$, the energy W_1 is given by

$$W_1 = \frac{\epsilon_0 k^2 q^2}{2} \int_b^{\rho_c} \frac{d\rho}{\sqrt{1-\rho^2/\rho_c^2}} d\rho \int_0^{2\pi} ds \int_0^\infty \frac{2dz}{(\rho^2+z^2)^2} \quad (5.9)$$

Note that: $\int_0^\infty \frac{dz}{(\rho^2+z^2)^2} = \left[\frac{z}{2\rho^2(\rho^2+z^2)} + \frac{\arctan\left(\frac{z}{\rho}\right)}{2\rho^3} \right]_0^\infty$

$$= \frac{\pi(n \pm \frac{1}{2})}{2\rho^3}, n = 0, 1, 2, \dots$$

Thus,

$$W_1 = \frac{kq^2}{4} \pi \left(n \pm \frac{1}{2} \right) \int_b^{\rho_c} \frac{\rho_c d\rho}{\rho^2 \sqrt{\rho_c^2 - \rho^2}}$$

$$= \frac{kq^2\pi}{2b} \left(n \pm \frac{1}{2}\right) \sqrt{1 - \frac{b^2}{\rho_c^2}}, n = 0, 1, 2, \dots \quad (5.10)$$

For the location of OCC where $\rho_c < \rho < \infty$, we have:

$$\begin{aligned} W_2 &= \frac{\varepsilon_0 k^2 q^2}{2} \int_0^{2\pi} ds \int_{\rho_c}^{\infty} -(1 - \rho_c^2/\rho^2)^{-1/2} d\rho \int_0^{\infty} \frac{2dz}{(\rho^2 + z^2)^2} \\ &= \frac{kq^2}{4} \pi \left(n \pm \frac{1}{2}\right) \int_{\rho_c}^{\infty} \frac{-d\rho}{\rho \sqrt{\rho^2 - \rho_c^2}} = -\frac{kq^2 \pi \left(n \pm \frac{1}{2}\right)}{4} \left(\frac{\arccos(\rho_c/\rho)}{\rho_c} \right) \Big|_{\rho_c}^{\infty} \\ W_2 &= -\frac{kq^2 \pi^2}{4\rho_c} \left(n \pm \frac{1}{2}\right) \left(m \pm \frac{1}{2}\right), \quad n = 0, 1, 2, \dots, m = 0, 1, 2, \dots \end{aligned} \quad (5.11)$$

The total energy outside the circumscribed cylinder of the charge ball in the laboratory frame A is:

$$\begin{aligned} W_1 + W_2 &= \frac{kq^2\pi}{2b} \left\{ \sqrt{1 - \frac{b^2}{\rho_c^2}} - \frac{b\pi}{\rho_c} \left(m \pm \frac{1}{2}\right) \right\} \left(n \pm \frac{1}{2}\right), \\ n &= 0, 1, 2, \dots, m = 0, 1, 2, \dots \end{aligned} \quad (5.12)$$

This implies that the energy of a spinning charged particle in the laboratory frame has multiple values, leading to the mass also having multiple values. This characteristic is referred to as the quantum property of a spinning charged particle. Clearly, this quantum property arises from the critical cylinder effect (CCE). The factor $(n \pm 1/2)$, $n=0, 1, 2, \dots$ represents both the principal quantum number n and the spin quantum number $s=\pm 1/2$. Meanwhile, the factor $(m \pm 1/2)$, $m=0, 1, 2, \dots$, accounts for the Zeeman splitting.

Similarly, the energy within the circumscribed cylinder of the charge ball, but outside the charge ball itself, is described by the following expression.

$$W_3 = \frac{\varepsilon_0 k^2 q^2}{2} \int_0^b \gamma(\rho) d\rho \int_0^{2\pi} ds \int_{\sqrt{b^2 - \rho^2}}^{\infty} \frac{2dz}{(\rho^2 + z^2)^2} \quad (5.13)$$

Unfortunately, this expression does not have an analytic solution. However, it must be multivalued because it includes the integral of $\int_{\sqrt{b^2 - \rho^2}}^{\infty} \frac{2dz}{(\rho^2 + z^2)^2}$:

The total energy within the charge ball is given by the following expression, which lacks an analytic solution:

$$W_4 = \frac{\varepsilon_0 k^2 q^2}{2b^6} \int_0^b \frac{2d\rho}{\sqrt{1 - \frac{\rho^2}{\rho_c^2}}} d\rho \int_0^{2\pi} ds \int_0^{(b^2 - \rho^2)^{\frac{1}{2}}} (\rho^2 + z^2) dz \quad (5.14)$$

In addition to spin, charged particles can exhibit other types of rotation, such as magnetic precession and system precession. Each type of rotation has its own CCE, which can result in the energy having multiple values. These variations in energy are the sources of what are known as the magnetic and angular quantum numbers. The presence of these quantum numbers reflects the complex rotational dynamics of charged particles, contributing to their unique quantum properties.

b) The Field Energy and Mass of Proton

For proton, where $\rho_c = 10^{-15} \text{m} \gg b = 0.9194 \times 10^{-18} \text{m}$, neglecting b/ρ_c , following Eq. (5.12)

$$W_1 + W_2 = \frac{kq^2\pi}{2b} \left\{ \sqrt{1 - \frac{b^2}{\rho_c^2}} - \frac{b\pi}{\rho_c} \left(m \pm \frac{1}{2}\right) \right\} \left(n \pm \frac{1}{2}\right)$$

can be expressed as follows:

$$W_1 + W_2 = \frac{kq^2}{2b} \frac{\pi}{2} \left(n \pm \frac{1}{2} \right), n = 0, 1, 2, \dots,$$

The difference between $n=1$ and $n=0$ is called quantum interval, and is $\Delta W = \frac{kq^2}{2b} \frac{\pi}{2}$

Substituting $b=0.9194 \times 10^{-18} \text{m}$, $K=8.988 \times 10^9$, $q=1.602 \times 10^{-19} \text{C}$ the quantum interval of energy for proton is as follows: $\Delta W = \frac{kq^2}{2b} \frac{\pi}{2} = 1.9705 \times 10^{-10} \text{ (J)}$

Note that $\rho_c = c/\omega_s = 10^{-15} \text{m}$ means the spin angular velocity is $\omega_s = c/\rho_c = 3 \times 10^{23} \text{ (r/s)}$, we have.

$$\Delta W / \omega_s = 6.5683 \times 10^{-34} \text{ (Js)}$$

This indicates that the energy quantum interval ΔW is proportional to ω_s , with a proportionality constant of $6.5683 \times 10^{-34} \text{ (Js)}$, which corresponds to Planck's constant: $h = 6.6256 \times 10^{-34} \text{ (Js)}$.

The critical radius associated with the spin of a proton is approximately $\rho_c = 10^{-15} \text{ m}$, which is thousand times larger than b . As result, over 99.9% of the proton's energy or mass is contained within ICC. This significant concentration allows us to neglect the mass present in the OCC and the multivalued property given by $m=0, 1, 2, 3, \dots$

c) The Energy-Mass of electron and Dark Mass

In contrast, the critical radius of an electron's spin is closely aligned with the charge ball's radius. This proximity necessitates considering the field energy of the electron in both ICC and OCC. The total energy in the OCC is not only multivalued but also negative, allowing it to cancel the positive energy in the ICC. Assuming the radius of the electron's charge ball is the same as that of the proton, due to their identical absolute charge, the critical radius for the electron's spin should be $\rho_c = 1.16 \times 10^{-18} \text{ m}$.

In this scenario, for the state characterized by $n=0$, $s=1/2$, and take $(m \pm 1/2)$ to be $1/2$, the total energy in the OCC is:

$$W_2 = -\frac{kq^2\pi^2}{16\rho_c} = -12.266 * 10^{-11} \text{ (J)}$$

The energy outside circumscribed cylinder of charge ball but within critical cylinder is:

$$W_1 = \frac{kq^2}{2b} \frac{\pi}{4} \sqrt{1 - b^2/\rho_c^2} = 5.91145 * 10^{-11} \text{ (J)}$$

The energy within the charge ball can be determined through numerical integration,

$$W_4 = \frac{\epsilon_0 k^2 q^2}{2b^6} \int_0^b \frac{2d\rho}{\sqrt{1-\rho^2/\rho_c^2}} d\rho \int_0^{2\pi\rho} ds \int_0^{(b^2-\rho^2)^{1/2}} (\rho^2 + z^2) dz = 3.01 * 10^{-11} \text{ (J)}$$

Using numerical integration, the energy within the circumscribed cylinder of the charge ball but outside the charge ball itself is calculated as follows:

$$W_3 = \frac{\epsilon_0 k^2 q^2}{2} \int_0^b \gamma(\rho) d\rho \int_0^{2\pi\rho} ds \int_{\sqrt{b^2-\rho^2}}^\infty \frac{2dz}{(\rho^2 + z^2)^2} = 3.35 * 10^{-11} \text{ (J)}$$

Thus, the total energy of a spinning electron in the laboratory frame for the state characterized by $m=0$, $n=0$, $s=1/2$ is as follows:

$$W = W_1 + W_2 + W_3 + W_4 = 8.2 \times 10^{-14} \text{ J.}$$

This energy corresponds to a mass of $m = W/c^2 = 9.1 \times 10^{-31} \text{ Kg}$ that is well known electron's mass.

In spin frame, the mass of an electron is calculated as $0.6ke^2/b = 1.6725 \times 10^{-27} \text{ Kg}$, However, in the laboratory frame, it is $9.1 \times 10^{-31} \text{ Kg}$. The difference of $1.6716 \times 10^{-27} \text{ Kg}$ is referred to as "dark mass," which can be partially "relit" by other types of rotations, such as magnetic precession or system precession.

This understanding not only reveals the source of quantum properties but also elucidates the origins of mass and dark mass. In the laboratory frame, mass is distributed on either side of the critical cylinder with opposite signs, effectively canceling each other out. The so-called rest mass of charged particles in the laboratory frame is merely the remainder after this cancellation, rather than the true rest mass in the spin frame. Therefore, what is termed "dark matter" is simply the portion of mass that is canceled out in the laboratory frame; it exists in spinning frame but remains undetectable in the laboratory frame.

It should be pointed out that the dark matter mentioned here is not the same thing as that mentioned by the academic community.

According to Newton's law, the gravitational pull of a galaxy with mass M on a planet with mass m is $F=GMm/R^2$. The centripetal acceleration produced by the planet under this gravitational pull is $a=v^2/R$, where v is the tangential velocity of the planet. According to $F=ma$, $v=(GM/R)^{1/2}$ can be obtained, that is, the farther the distance, the slower the velocity.

However, when observing the rotation of spiral galaxies, it is found that the tangential velocity of the planets at the edge of the galaxy increases with distance, and according to $v=(GM/R)^{1/2}$, scholars believe that this indicates that the mass M increases with distance, so they propose that there is a kind of "dark matter" that we cannot see around the galaxy. This material exerts an additional gravitational pull on the planets at the edge of the galaxy, causing them to rotate faster.

We don't think such dark matter exists. The original reason of the rotation speed of the planet does not decrease but rises with distance, not the existence of dark matter, but the relativistic effect of rotation. To simplify the discussion, let's consider the force of a central planet with mass M on a marginal planet with mass m , when the central planet spins with ρ_c and rotates with the marginal planet around their mass center with the critical radius of lc . Take lab as frame A, system precession as A', the spin of central planet as A'', then in A'' the force acted by M on m is $F''=GMm/R^2$, but in lab frame it becomes follows

$$F = \gamma_s(R)/\gamma_g(R) \frac{GMm}{R^2} = \frac{\sqrt{1-R^2/l_c^2} M Gm}{\sqrt{1-R^2/\rho_c^2} R^2}$$

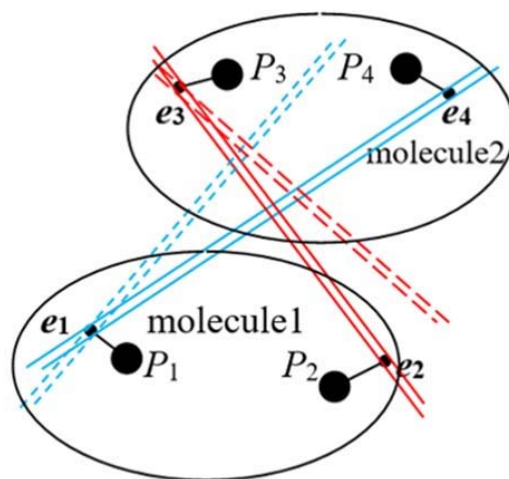
where R is the distance between two planets and when it is far less than lc , this equation can be simplified as:

$$F = \gamma_s(R) \frac{GMm}{R^2} = \frac{M}{\sqrt{1-R^2/\rho_c^2}} \frac{Gm}{R^2} \dots\dots\dots v=(\gamma_s GM/R)^{1/2}$$

When R increases and approaches ρ_c , M does not change but the Lorentz factor γ_s increases, causing the rotational velocity of the marginal planets to increase. This is relativistic effect but not dark matter.

d) How Does Gravitation Create

Mass comes the field energy; the gravitation must be related to electromagnetic force. It comes from the CCE of electron's spin, i.e.: the electron attracts the other electron inside critical cylinder and repels the electron outside critical cylinder.



As the critical cylinder of e_1 including e_4
 e_1 attract both e_4 and P_4
 As the critical cylinder of e_3 including e_2
 e_3 attract both e_2 and P_2

Fig. 5.1: Gravity comes from CCE

Consider the four proton-electron (p-e) pairs located in two molecules as shown in Fig. 5.1 As the spin critical cylinder (SCC) of e_1 doesn't include p_3 - e_3 and p_4 - e_4 , it attracts p_3 p_4 , repels e_3 e_4 , the resultant force is $F=0$. As the SCC of e_1 includes, say, e_4 , it attracts p_3 p_4 and e_4 , repels e_3 , the resultant attraction is $F=-2ke^2/R^2$

Similarly, as the spin critical cylinder (SCC) of e_3 includes e_2 , molecule 2 attracts molecule1 with the same $F=-2ke^2/R^2$. These two attractions are the source of gravitation.

The distance between molecules is on the level of $R=10^{-9}\text{m}$, and the critical radius of electron's spin is $\rho_{ce}=10^{-18}\text{m}$, the probability by which the SCC of e_1 includes e_4 is:

$$\pi\rho_{ce}^2/(4\pi R^2)=10^{-36}/(4\times 10^{-18})=0.25\times 10^{-18}.$$

Similarly, the probability by which the SCC of e_3 includes e_2 is the same 0.25×10^{-18} . The probability of these two events happens in the same time is 6.25×10^{-38} . That means the gravitation is only on the 10^{-38} level of electromagnetic interaction, which is known by modern physics.

Obviously, the gravitation is proportional to the number of electrons in a body. And in the natural body the number of electrons is equal to the number of protons (the neutron is consisted of a proton and an electron), so the number of electrons is proportional to the mass of the body. That made Newton thought the gravitation came from mass.

II. CONCLUSION

1. Cancer and cardio- and brain-vascular diseases are top two killers of mankind. MRT can not only treat but also prevent them. Besides, MRT can treat lots of other diseases caused by oxidation. Once it is popularized into every family, the level of health will be increased.
2. The Relativity for Rotational Frames reveals lots of natural laws, which are unknown for modern physics, such as space time exchange, the tangential velocity for OCC is $c^2/(\rho\omega)$, the critical cylindrical effects, which indicate the force will change direction, as the acceptor is changed from ICC to OCC, and is verified by our experiment
3. Strong, weak and gravity are all electromagnetic interaction suffered from different Critical Cylinder Effects (CCE).
4. Only based on relativity for rotational frames the research about both astronomy and basic particles can touch the essence.
5. The quantum property comes from the CCE of field energy The uncertainty of particle world comes from the stochastic direction of donor's spin axis. We open a way to unify the quantum mechanics with relativity.

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Usability Assessment of the R-Verdict Schema: A New Paradigm for Usage-Centric Design and Evaluation

By Noble Ametame Yao Ahiaklo-Kuz

Technical University of Berlin

Abstract- The R-Verdict Schema, a UI design model based on the principles of Relevance and Relation of UI elements and components to interaction concepts has gained recognition for its simple and decisive approach to interface design. While its theoretical framework has been well received, its practical use impact on designers remains unexplored. This study investigates how a team of novice designers apply the R-Verdict Schema in real design tasks, evaluating its effectiveness in enhancing usability, consistency, and decision-making. Through controlled experiments and qualitative feedback, we assess how the model aids novice designers in structuring interfaces, improving element relationships, and fostering intuitive interactions. The findings reveal that the schema significantly supports beginners in developing cohesive UI layouts and making design choices that align with user expectations. This research contributes to UI/UX education by demonstrating the schema's potential as a guiding framework for early-stage designers, ultimately reinforcing the value of structured design methodologies in digital interface development.

Keywords: *R-Verdict model, usage-centred design, user centred design, user interface, interaction design, intuitive design, user interaction, human computer interaction.*

GJRE-J Classification: *LCC: QA76.9.U83*



USABILITYASSESSMENTOFTHERVERDICTSCHEMAANEWPARADIGMFORUSAGECENTRICDESIGNANDEVALUATION

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Keywords: R-Verdict model, usage-centred design, user centred design, user interface, interaction design, intuitive design, user interaction, human computer interaction.

1. INTRODUCTION

Usability evaluation is a critical component in assessing the effectiveness of design models, particularly in the rapidly evolving field of user interface (UI) design (Allen & Sites, 2012). As UI complexity continues to increase, frameworks that assist designers in structuring and refining interfaces become essential. The R-Verdict Schema, a recently developed UI design model, offers a structured approach based on principles of relevance to interaction concepts and the relational behaviour of UI elements (Ahiaklo-Kuz & Rötting). While initial reception of the model has been positive, a systematic evaluation is necessary to determine its practical usability, especially among novice designers.

According to Ahiaklo-Kuz & Rötting (2024), The R-Verdict Schema aims to bridge the gap between complex design principles and practical application by offering a structured methodology tailored to novice

designers. However, for the model to be widely adopted, it must demonstrate its usability through empirical evaluation. Evaluation is an integral part of every instructional design process, essential for establishing the viability and reliability of development models (Calhoun et al., 2021). The Successive Approximation Model (SAM) was employed in the development of the R-Verdict Schema, entailing a series of iterative formative tests to refine the model before its final release (Elharbaoui et al., 2025). Additionally, a summative usability test (Prince, 2015) was conducted on the final model, which is detailed in this paper. Both formative and summative approaches offer distinct benefits and challenges in the evaluation process.

The primary objective of this study is to assess the usability of the R-Verdict Schema through empirical user testing. By examining factors such as ease of learning, efficacy, error rates, and perceived usability, this research aims to determine whether the schema enhances the design process for novice UI designers. The study employs a mixed-methods approach, integrating both quantitative and qualitative data to gain a comprehensive understanding of the model's effectiveness. To achieve these objectives, task-based usability testing was utilized to measure how efficiently novice designers can complete UI design tasks or evaluate UIs using the schema. This approach provides insights into the practical application of the R-Verdict Schema in real-world design scenarios.

By systematically evaluating the R-Verdict Schema, this study contributes to the broader field of UI design methodology, offering insights into how this structured design model impacts novice designers' effectiveness. The findings will help refine the schema, ensuring that it meets the needs of its intended users while advancing best practices in UI design. Ultimately, this research aims to validate whether the R-Verdict Schema is a viable and user-friendly model that can facilitate more intuitive and effective UI design processes.

This paper primarily details a usability test and its outcome on mainly novices (non-professional UI designers). The study engaged 5 participants in a qualitative study over a period of 2 hours, focusing on three main tasks: Introduction to the model and its use case; Application of the model in planning and self-

Author: Human-Machine Systems, Department of Psychology and Ergonomics, Technical University of Berlin, Marchstr. Berlin, Germany.
e-mails: nah@mms.tu-berlin.de, noblekuz@gmail.com

evaluating a UI; Applying the model in planning and making UI wireframes, followed by peer-reviewing the wireframes using the R-verdict schema. These tasks were designed to ascertain participants' ease of use of the R-verdict schema, helping to understand their perception of usability, clarity of concept, and the schema's effectiveness in guiding them towards achieving minimalistic and intuitive designs.

II. METHODOLOGY

This experiment is qualitative in nature as it deals with exploring and evaluating participants subjective understanding of a subject and analysis of work samples shared in the course of the engagement. Convenience sampling was used in getting participants to participate in the study (Simkus, 2022; Etikan et al., 2016; Dörnyei, 2007). The evaluation process is as outlined:

a) Pre and Post Experiment Surveys

With ethical consideration in place (participant consent and agreements and privacy considerations), the study issued pre-study survey to accrue participant biographic information and post experiment survey to ascertain their perception on the model and its usage. The pre-experiment survey solicited the following information from the participants.

1. *Pre experiment:* Age, Gender, Language preference, highest level of education, current profession, technology proficiency, familiarity with UI design.
2. *Post experiment:* Identification (internal use only), Opinion on model, understanding of model, application of model, overall satisfaction.

III. EXPERIMENT OUTLINE

a) Part 1

1. Introduction of Participants to the R-Verdict Schema with focus group discussion on planning a simple UI (*Duration: 15 minutes*).
2. Choose and plan a simple UI design task (*Duration: 5 minutes*).
 - To do list App
 - Music Player
 - Grocery list app

All design tasks came with a design brief and definition of target audience to limit the scope of design as much as possible. UI components sample sheets were also provided to guide participants.

3. Participants generate simple wireframe of their plan (*Duration: 25 minutes*).

b) Part 2

Participant conduct peer-review of wireframes generated by other participants in Part 1 (*15 minutes*).
The entire session run for 1 hours.

IV. FINDINGS AND DISCUSSIONS

The demographic and experiential profile of the study participants provides valuable context for interpreting the research outcomes. The sample consisted predominantly of young adults, with 80% (n=4) falling within the 25-34 age bracket and 20% (n=1) in the 18-24 range. This age distribution aligns with the typical demographic of early career professionals and advanced students who are likely to engage with UI design tasks (Nielsen, 2013). Gender distribution showed a predominance of female participants (80%, n=4), which may offer insights into potential gender-specific perspectives in UI design interpretation (Burnett et al., 2016).

All participants reported daily internet usage, primarily via laptops and smartphones, indicating a high level of technological engagement consistent with current trends in digital device usage (Pew Research Center, 2021). The participants' familiarity with UI design varied, with the majority (60%, n=3) reporting moderate familiarity. This diversity in UI design experience allows for a range of perspectives, from novice to more experienced users, which is crucial for comprehensive usability testing (Sova & Nielsen, 2003). This comprehensive participant profile and initial engagement provide a solid foundation for the subsequent detailed analysis of the R-verdict schema's effectiveness in UI evaluation and design. The study incorporated both in-person and remote participation, utilizing digital design tools such as Miro board. This approach aligns with contemporary practices in user research, allowing for flexibility and broader participant inclusion (Lazar, Feng, & Hochheiser, 2017).

The introductory session, lasting approximately 15 minutes, served to establish a baseline understanding of UI concepts among participants. This approach is consistent with best practices in usability testing, ensuring participants have a common foundation before engaging with the test material (Rubin & Chisnell, 2008). Participants' initial discussions about UI experiences revealed a common understanding of UI encounters in daily life, mentioning platforms such as Spotify, X (formerly Twitter), banking apps, and various Microsoft products. These observations align with current trends in digital product usage and highlight the ubiquity of UI interactions in modern life (Statista, 2023). Notably, participants emphasized key UI qualities such as speed and intuitiveness, echoing established principles in UI design literature (Norman, 2013). The recognition of the importance of distinguishing between good and bad interfaces demonstrates an awareness of UI quality variability, a critical aspect in user-centered design (Shneiderman et al., 2016).

This comprehensive participant profile and initial engagement provide a solid foundation for the

subsequent detailed analysis of the R-verdict schema's effectiveness in UI evaluation and design.

After introducing the participants, the R-verdict schema, the team engaged in a focus group discussion

on listing and analysing components needed for collectively agreed interface (Elevator control panel). Table 1.1 shows the summary of the outcome.

Table 1.1: Review result from focus group discussion

Suggested Component (Participants)	Group decision (based on R-verdict schema)
Floor buttons	It is relevant to user and to the task of selecting and getting to floors. It also relates to the basic task/function of the elevator. (+ <i>Relevance</i> , + <i>Relation</i>)
Emergency Button (To call for help in case of crisis.)	It is not relevant to the user and task in the performance of the basic task but in emergency situation it is relevant to get support. (+ <i>Relevance</i> , - <i>Relation</i>)
Lighting Switch and Brightness control: This feature allows users to turn on light when its dark and also adjust the light brightness	Lighting is relevant to the environment in case the user uses the elevator at night. The brightness control feature is not necessary. An automated lighting with ambient and presence sensor can work out with users controlling it. (+ <i>Relevant</i> , - <i>Relation</i>)
User manual: To give users information on how to operate the elevator	It is relevant for first-time users, but does not apply predominantly in the general use of the elevator. (+ <i>Relevant</i> , - <i>Relation</i>)
Open and close buttons: For users to be able to personally close and open the elevator	Feature is not necessary if the doors open and close automatically. But it can be there in case the automatic system fails. (+ <i>Relevance</i> , + <i>Relation</i>)
Reset button - use to restore elevator configuration to default in case of a jam.	That does not relevant to end-users. It is also not relevant to end task but Technicians will need. It is relevant in case of troubleshooting but does not relate in the to the task of basic interaction to reach a floor. (+ <i>Relevance</i> , - <i>Relation</i>)
Sportify Connection: With QR Code users can easily connect an account and listen to their preferred music	It is not relevant to the basic task of using an elevator must be removed. (- <i>Relevance</i> , - <i>Relation</i>)
Feature to connect and control Elevator from one's phone: User can have preferred configuration loaded to their phones which should connect and determine their target floor. There could additionally be authentication via phone before user uses the elevator	This feature is just unnecessary burdensome as compared to simply pressing buttons. It is not relevant to the task, user and environment because the time spent in the elevator is very short and most often used by many people. Additionally, authentication would have been good in a security facility, but the problem description does not state it. So that assumption will be unnecessary. (- <i>Relevance</i> , - <i>Relation</i>)
Language Selector: For users to be able to change operation and instructional language of the elevator	This feature is good and relevant in a place where users come from mixed backgrounds (language). It however does apply to the basic task and since the task is basically about selecting numbers, numeric symbols are already universal across languages (+ <i>-Relevance</i> , - <i>Relation</i>)
Elevator status display: This feature is to indicate to user the current floor or action the elevator is doing.	If there is no way to inform the users on which floor the elevator is then it is important to keep it. (+ <i>Relevance</i> , + <i>Relation</i>)

Obviously much of the ideas and analytical inputs into applying the principles come from a recall of participants interaction with similar interfaces. This is however not in contrast to the application of the R-verdict scheme as relying of previous knowledge in designing interface is key to promoting easy recall. The R-verdict schema was more helpful in refining design decisions towards a more simplified concept.

V. WIREFRAME COMPONENT PLANNING AND EVALUATION

All participants completed the second experimental task, which required selecting a design challenge and planning their own interface components. Most participants completed this task in person, with

one exception who participated online and shared their plan sheet digitally for peer evaluation. In this schema, the first symbol in the notation (+/-) indicates relevance to user needs, while the second symbol indicates verdict on the relation principle to overall system functionality, creating four (2^n ; $n = \text{number of principles}$) possible verdicts: ++ (highly suitable), +- (relevant but poorly related), -+ (less relevant but well-related), and -- (unsuitable).

a) To-Do List Application Component Evaluation Summary

Participant 1 (P1) and Participant 4 (P4) developed a component plan for a to-do list application interface. P1 proposed and evaluated 20 interface components, ranging from core functionality elements

(e.g., "check item option box") to advanced features (e.g., "competition with friends"). These components were subsequently peer-reviewed, resulting in 60% consensus between P1's evaluations and the reviewer's

assessments. P4 proposed 7 components and had 100% consensus on the verdict of all 7 components/elements. (See table 1.2)

Table 1.2: Summarizes these proposed components from P1 and P4 with review remarks review

	Element	R-verdict schema	Peer reviewer's remark
Participant 1	Check item option box	++	Accepted
	Add new item	++	Accepted
	Categorize item	-+ / +	Not accepted
	Share list	-+ / +	Accepted
	Delete item	++	Accepted
	Change item name	-+	Accepted
	Group item	-+	Not accepted
	Change item position	++	Accepted
	Add item description	-+	Accepted
	Add item deadline	-, +	Accepted
	Archive of item done	-, -	Not accepted
	Motivation design	-, +	Accepted
	Reminder function	-, +	Not accepted
	Group of lists	-, +	Not accepted
	Statistics of tasks done	-, +	Not accepted
	Competition with friends	-, +	Not accepted
	Personalization (name, color)	-, +	Accepted
	Settings	+, -	Accepted
	Share Item	-, -	Not accepted
	Exit button	-, +	Accepted
Participant 4	Add item to To-do list	+, +	Accepted
	Share button	+, +	Accepted
	Function to push away	-, +	Accepted
	Reward for completed to-dos	-, +	Accepted
	Half-screen function, as the app always remains present as a small window	-, +	Accepted
	Categorize	+, +	Accepted
	Collect function 2B sweet plants for continuous follow-up	-, +	Accepted

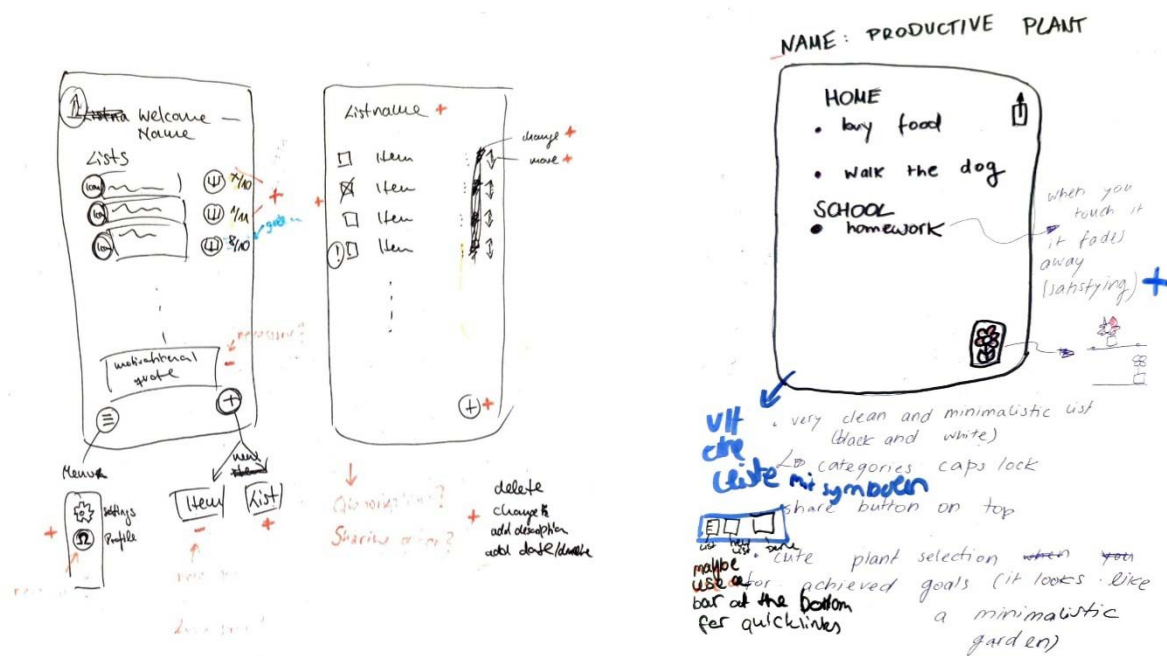


Fig. 1.1: Wireframe by P1

Fig. 1.2: Wireframe by P4

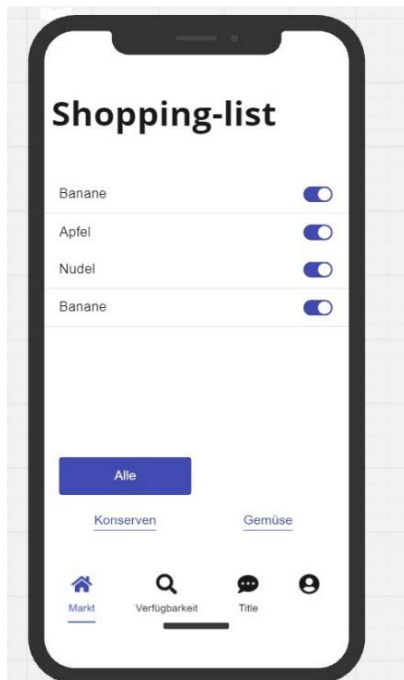


Fig. 1.3: Wireframe by P2

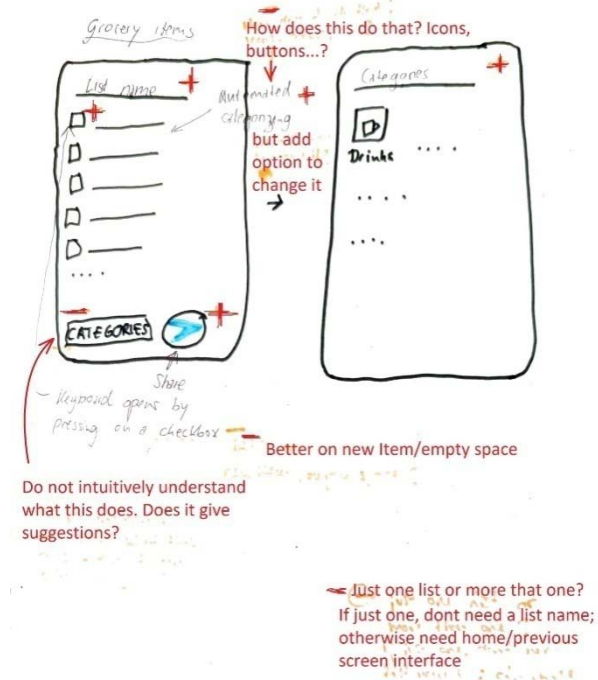


Fig. 1.4: Wireframe by P3



Fig. 1.5: Wireframe by P5

Table 1.3: Summarizes these proposed components from P2, P3 and P5 with review remarks review

Participant	Item (Description)	R-verdict Schema	Peer reviewer's remark
Participant 2 (Online Participants using Miro board)	Categorization by location in the supermarket		
	Prioritization	+,-	
	Multiple user (Useful when living together)	+,-	
	Product list	+,+	
	Checkbox	+,+	
	Reminder	+,-	
	Heading Label (WF)		-,-
	Category buttons (WF)		+,+
	Market - Navigation Icon (WF)		+,+
	Availability/Search- Navigation Icon (WF)		+,+
	Chat- Navigation Icon (WF)		-,-
	Profile- Navigation Icon (WF)		-,-
Participant 3	Checkbox	+,+	Accepted
	Sharing button	+,+	Accepted
	Suggestion for items	-,+	Accepted
	Symbol to visualize Category	-,+	Accepted
	Name box (Editor's name)	-,+	Accepted
	Title option for organization	-,+	Accepted
	Coloring option	-, -	Accepted
	Photo option	-,+	Not accepted
	Price option with link to grocery shop	-,+	Accepted
	Manual	-,+	Accepted
	Category option	+,+	Accepted
	Keyboard option	+,+	Accepted
Participant 5	Add item to To-do list	+,+	Accepted
	Share button	+,+	Accepted
	Function to push away	-,+	Accepted

	Reward for completed to-dos	-, +	Accepted
	Half-screen function, as the app always remains present as a small window	-, +	Accepted
	Categorize	+, +	Accepted
	Collect function 2B sweet plants for continuous follow-up	-, +	Accepted

P2. (WF) - Components reviewed from wireframe but not listed initially in components list sheet

The work samples from P2 did not match the instructed pattern and thus was difficult determining points of consensus under the application of the principles of the R-verdict schema. It was however possible to analyse assessment by both parties independently. Obviously, P2 listed more functional features that UI components for usage context. Consequently, P2 focused more attention of organising UI components made available to participants, thus running into an obvious case of "feature creep" (Pringle, 2017). It is however evident that, P2 was able to self only two of his listed components/features (Product list and Checkbox) were directly related to the usage context (see table 1.3).

b) Usage-Centred Consensus

Components that showed the highest consensus are components that associate with the basic usage scenario. Between P1 and Reviewer is 60% consensus. (elements like "check item option box" and "add new item" receiving unanimous +, + verdicts from both P1 and P4 as well as their corresponding reviews. These components represent essential functionality for a to-do list application and were universally accepted in the final design plan. Although it will be out of place to expect exact use-case and thought pattern between participants and reviewers, the review results from the two cases reveal consensus on the components that can be easily associated with the core usage contexts. The application indicates the tendency of encouraging moderation in the fantasies that come to play in putting UI together and ensuring designers practice restraint towards minimalism.

While P1 gave "categorize item" a-/+, + verdict (indicating uncertain relevance but good relation), the peer reviewer recommended its removal. Similarly, "group items" received a-, + verdict from P1 but was rejected by the reviewer. On the contrary, the same component was proposed by P4 and accepted as relevant and related by reviewer. This pattern suggests differing perspectives on the complexity of functional features instead of UI elements. This disagreements is more evident in features such as "statistics of tasks done" (-, +), "reminder function" (-, +), and "competition with friends" (-, +), all of which were accepted by P1 but rejected by the peer reviewer. This pattern suggests a tendency for designers to include features they find

interesting but that may not be essential for core usage-context, which is also a common challenge in early wireframe development (Rahman & Rokonuzzaman, 2014; Pringle, 2017).

The peer review process effectively reduced feature creep by filtering out non-essential components, steering the design toward a more focused on core functionality. Figure 1.1 and 1.2 shows P1 and P4's wireframe sketched.

On the components for Grocery shopping app, there were several commonly accepted components like checkboxes, sharing buttons, categorization, and prioritization were consistently valued across participants. These commonly listed components are useful in enhancing usability and aligns with app usage needs. Some components like the photo option, chat navigation icon, and profile navigation icon were rejected due to low perceived utility or misalignment with the core purpose of app usage context (See table 1.3). Apart from P2's list and review, there was immense consensus between participants and reviewers on components that obviously owing to their commonality and clear relevance/relation to the usage context. It is however worth noting that, some participants think into extra-ordinary usage contexts or scenarios that are not common. This thought process is the causative factor for the emerging "feature creeps". Consequently, these are either detected by the participants themselves or their peer reviewers as it becomes seemingly difficult to justify the selection or placement of that feature/component by the R-verdict schema.

VI. POST-EXPERIMENT SURVEY

The post-experiment survey was administered to all participants and deployed via web (Google forms). The post-experiment survey was aimed at accumulating data to ascertain the possible areas that might be recommended in this report for improvement through future studies. The survey was classified into four areas and these include: learning experience (overview of the experiment session), Understanding of the model, application of the model (in planning and design and evaluation) and overall satisfaction (with open-ended suggestions or criticisms).

Presented with a 5-scale rating (excellent, good, average, poor and very poor) 20% (1 out of 5) of the

participants rated the training quality excellent. 60% (3 out of 5) rated it as good and 20% (1 out of 5) rated it as average. This reflected a fairly good commendation from the participant. On the clarity of explanation of the model and concept, the outcome was similar to the overall rating. 20% rated it as excellent, 60% rated it as clear 20% again rated it as neutral. On the easy of comprehension (understanding the model) the participants were presented with 5-scale rating with response anchors of "very easy", "easy", "neutral", "difficult" and "very difficult". 80% (4 out of 5 indicated the model was "easy" to understand. 20% indicated model understanding to be neutral. This outcome also reflects a fairly good response in favor of the model. Exploring the perception of participants, 3 participant (60%) indicated that the Relevance principle was the easiest part of the model to understand. 20% (1 participant) pointed to the basic ideas of the model as the easiest part to understand and the remaining participant (20%) pointed to the group task of planning an elevator control panel as the easiest-to-understand part of the model.

On the most difficult part of the model, response from participant indicate 4 (80%) of them identify the relational aspect as the most difficult to comprehend. 1 (20%) indicated the symbol assignment (+/-++-) which is the convention adopted to easily apply the principles throughout the design process. When asked how confident they felt in applying the model to design using a scale with anchors of "very confident, confident, neutral, unconfident, very unconfident, the outcome was fairly positive. 60% acknowledged confidence level to be neutral, 20% indicated confident and 20% indicated very confident. With easy of application the result dropped slightly as compared to the confidence level. 20% indicated it to be very easy to apply, 40% chose easy and 40% indicated neutral.

Participant also gave responses on overall satisfaction with using the model 60% of the participants indicated being satisfied, 20% indicated being very satisfied and 20% indicated neutral for overall satisfaction level. When asked if they would recommend the R-verdict schema to others in the field of UI design, 40% of the participants indicated yes and the remaining 60% indicated "maybe". This can be considered a fair outcome since most of the participant are not active in the UI design field and obviously oblivious to the current state of tools being used in the field. It would therefore be unclear to make an outright judgement of a new model being worth recommending for adoption. Thus the 40% acknowledgement and the 60% uncertainty in this case is statistically reasonable compared the demographic data ascertained from the pre-experiment survey. Interestingly when asked whether the schema should be incorporated into standard UI design practice, the result flipped (compared to them

recommending it for others to use in the UI field). In this case 60% indicated yes and 40% indicated maybe. Finally with the post experiment survey, participants had the chance to give open, assessment and criticisms: Only 3 (60%) of participants gave comments.

When participants shared their thoughts on the model and the session, one key comment stood out. In Comment 3, a participant praised the model for its simplicity and ease of understanding. However, they also pointed out a limitation: the binary decision-making system (using only "+" or "-") felt too restrictive. They suggested that a broader scale or continuum could make it easier to evaluate components that were harder to categorize as purely "accepted" or "rejected." This lack of flexibility might make the model less suitable for people who aren't UI design experts. That said, the binary system is a deliberate feature of the model. Its purpose is to help designers focus on minimalism in UI design by including only essential components. Adding more options to the decision-making process could lead to unnecessary features being included, which goes against the model's goal of simplicity and efficiency. The feedback from this participant—who has some understanding of UI design—actually highlights the strength of the model in promoting minimalism. While the criticism is valid, it also shows that the model is effective in encouraging designers to prioritize only what's truly needed.

VII. CONCLUSION

The R-verdict schema provided a common framework to effectively plan and design UI and additionally provides the same framework to evaluate the UI. As evident from the works churned it by participants (See fig. 1.1, 1.2, 1.3, 1.4, 1.5), it is clear the R-verdict schema makes it easy for both designers and evaluators to think alike in the space of the usage of the product. This is often difficult in the case of current design and evaluation models, as designers plan UI independently, users engage these products independently and even product evaluator get the chance to compose their heuristics and evaluate independent of the other stakeholders. The effect of the schema on the design choices can be seen in the changes each participant makes directly to their initial selection of components. Since the components were selected by the designers, each one of them could simply justify why they opted for the inclusion of a particular component. Evidence of change in decision on some components and sometimes absolute removal from design indicates the effect of the R-verdict schema in regulating the execution of design toward salient components. The standards and yard-stick presented by the R-verdict schema is carried through the whole life span of the product. From idea conception to periodic maintenance that might come in future.

Considering the expertise level of the participant in UI design it is not strange to have a significant number of them point to the relevance principle as the easiest to understand as it deals more with inclusion and exclusion of design elements than creative exploration of arrangements (done by the relational principle). This is reflected in the 80% assertion that the organization (classification) of elements into meaningful order is the most difficult aspect of the process.

Feedback accumulated from the post-experiment survey reveals that the model is indeed capable of guiding designers towards minimalistic decisions in UI design. The plan sheets from participants reveal the broad scope with which various designers approach a task. With individual preferences and even user-persona, there is the tendency of designers sneaking in their preferences that might not really be relevant to the usage. The experiment revealed this reality and how, with the R-verdict schema, the participants actively eliminated these components to simplify their design.

As noticed from the post-experiment survey, there are other models that can comprehensively guide designers in putting together UI. With the end-goal of the r-verdict schema in mind, it will be useful when used in conjunction with existing UI models to help designers filter out relevant from irrelevant components and also classify related and unrelated components. In the context of UI evaluation, usage is key in determining the aptitude of UI. The R-verdict scheme has proven (according to this study) to be a reliable guide to fairly evaluate UI.

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The City as a Stage: The Mirror Reflections of Grand Assemblies in Greece and Australia in the Early 20th Century

By Olga Papazafeiropoulou

The National Kapodistrian University of Athens

Abstract- This study attempts to present and highlight through their theatricality the historical processions, parades and anniversaries of remembrance in the early 20th century that took place respectively in the natural environment of cities in Greece and Australia. Inspired by the ideals of the state, the principles of democracy, but also the evolutionary reflexive dynamics of the correlation of space with the urban environment, the grand Assemblies reflected and underlined important historical turning points, strengthening the spirit of the populations in the early 20th century. Ultimately, as it turns out, the earth marches in parallel steps and the setting of the cities of Athens and Thessaloniki and the megacities of Melbourne and Sydney significantly influenced and emotionally charged the great celebrations.

Keywords: scene, megacities, festive events, Pageant's reflections, greek population, australian nations.

GJRE-J Classification: LCC: GT3405



THE CITY AS A STAGE: THE MIRROR REFLECTIONS OF GRAND ASSEMBLIES IN GREECE AND AUSTRALIA IN THE EARLY 20TH CENTURY

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I. INTRODUCTION

This article aims to present the great gatherings that took place in the natural setting of the cities of Greece and Australia in the context of celebratory events and anniversaries of memory, reflecting critical turning points in history and strengthening the spirit of the people.

The celebratory events of the people are directly related to the semiology of the performing arts and theatricality, which in the early 20th century took place within the city stage, emotionally charging the spaces and creating new data in the theories of theatricality.

As the megacities of the 19th century expanded the landscape of the urban scene with the addition of impressive building volumes, offering a crowded solitude that the previous rural population ignored, new needs were created for the masses of the people to come together and interact with each other but with state structures.¹

Starting from the historical review of major events from antiquity, the Middle Ages, the Renaissance to the early 20th century, it is initially observed that large gatherings, whether driven by religiosity, political goals, carnival events and others, are undoubtedly a great social need of the individual to celebrate with the whole

and to be reflected in front of it. Individuality is expressed through collectivity and the city scene hosts the crowds that celebrate.² Referring to the history of the cities of Athens and Thessaloniki in Greece and Melbourne and Sydney in Australia, the weight of its monuments is observed through the physiognomy of the cities. The places emotionally charge the people who seek through these events to express the principles of democracy and the hope for a better future. At the beginning of the 20th century, the cities of Athens and later Thessaloniki were established and the state mechanisms felt the need to consolidate themselves through cultural events. At the same time, the same thing happened in Melbourne and Sydney where the multicolor of the peoples was linked to the Pageant of Nations. The Parades constitute another strong point in the celebration of national anniversaries of memory. As it is presented, diametrically opposed cities of the two hemispheres operate and react through the same mechanisms, which are reflected in the same mirror.

II. HISTORICAL REVIEW

Since ancient times, the public life of citizens took place in the center of the Athenian city, which functioned as a gathering place for citizens and the holding of rhetorical demonstrations, legal contests and spectacles. The Ancient Athenian Agora was a symbol of freedom of expression. It was a place for the movement of ideas and goods and was in direct visual view of its citizens.³ Public life was constantly visible as a continuous theatrical event, reflections of which were preserved in ancient tragedy and comedy. The perception of the Athenian Agora was reflected in the architecture of the Greek residence where the characteristic atrium was the stage space where the plots of classical plays were played out. Heroes, demigods, kings fought their fate and destiny fiercely, outside their palaces and homes, in plain sight before the dance, as public spaces were part of people's lives in ancient Greek and Roman cities and reflected the

Author: e-mail: olga.papazaf@gmail.com

¹ Stavros Stavridis, *From the Screen City to the Stage City*, Nisos Publications, Athens 2018, pp. 15-27.

² Walter Puchner, *Semilogy of the Theater*, Paradis Publications, Athens 1985, p. 75.

³ Alkistis Kontogianni, "Prologue", *Theatre Polis, Interdisciplinary Journal for Theatre and the Arts*, Department of Theatre Studies, University of the Peloponnese, issue 1, 2014, p. 4.

basic Principles of Democracy. The important events of the daily life of citizens, such as transactions, gatherings, celebrations, took place in plain sight. However, during the Middle Ages, the demarcation of space with the creation of hermetic castles and other fortifications, although it surrounds the public passages and Agora squares with glamour and brightens them conspicuously, closes the limits of the citizen's view.⁴

Although in the Renaissance the open-air space gradually urbanized with the rise of the educational level and the progress of the Sciences and Arts, spectacles that trace their origin to the Middle Ages and were played out in public spaces were revived through general celebrations such as carnival, where disguise and various "attractions" flourished, from jesters, jugglers, etc.⁵ Later, in the 18th century, with the rapid development of economic and social life, the city expanded beyond the boundaries of the wall, the streets and squares became part of a system of axes, and the term public took on its modern meaning, noting that it "included a variety of people." (Senet 1999). The 19th and 20th centuries restructured the concept of the city, as it gradually housed populations of millions of inhabitants. However, collective events, such as celebrations, parades, and theatrical performances, always took place in the public spaces of large cities, as all major historical events were surrounded by a universal character and a public tone. As has been the case from antiquity to the present day, in all urban cities of the world, Humanity has always celebrated or commemorated historical memories, or anniversaries at the Epicenter of Cities. Gatherings and processions, although in primitive societies they were one of the most basic manifestations of communal unity, either as part of a religious ritual (for the expulsion of evil spirits, or for the fertility of the land), or as a demonstration of military power, have retained their main basic characteristics over the centuries. From the processions of the "Anthesteria", to the "Saturnalia" and "Lupercalia", the weddings of Mary Tudor in 1514 and the carnival events in Europe, Asia and America, the ostentatious public procession known as the parade was a kind of Pageant (Callisteia).⁶ The historical representation of Renaissance events found its full expression in 1905, in the first outdoor work of the artist, Louis Napoleon Parker, where the contest of history constitutes "a theatrical timeline in which the social body takes the lead instead of the individual".

Historical pageants were very popular in Britain in the early 20th century. The power and "appeal of non-dramatic display lies in the coordinated visual spectacle", where by linking the past with the present the individual can stand out... as "royal" and placed at the center of promoting the institutions of the state while simultaneously commemorating historical events.⁷

Judith Butler illuminates the dynamics of public assembly under prevailing economic and political conditions, analyzing what it signifies and how. Approaching assemblies as multiple forms of collective action, Butler extends her theory of performativity to argue that precarity, the destruction of the conditions of survival—has been a driving force and theme of today's highly visible protests.⁸

III. THE SETTING OF THE SPACE IN CITIES OF GREECE AND AUSTRALIA

The penetration of an expanded "theatricality" into the urban fabric of cities as well as the interaction that the theatrical element achieves with the wider society, are examined in the present analysis in relation to the cities of Greece and Australia.⁹

Within the natural environment of the Cities, peoples have always celebrated and honored great events of their history, representing them physically, within their real space. The open spaces (parks, gardens, squares), with the corresponding decoration, the monuments or works of art that surrounded them and the combination of the building composition, referred to atypical incidents and events.¹⁰

The setting of the cities has always functioned evocatively, framing the events that took place within it. The urban landscape partly shaped the style of the various spectacles that unfolded in its spaces, as each public urban space, as a creation of society, reflects its perceptions and visions, but mainly its culture.

The architectural appearance of public buildings (houses, parks, avenues, squares) composes the spatial framework within which public life takes place and shapes the cultural foundation of its social structures, reflecting the cultural vision of social structures. As the festive events of the people are directly related to the semiology of the performing arts and theatricality, cities such as Athens, Thessaloniki but also Melbourne and Sydney respectively became the great stages in which the masses starred within them. The particular individuality of people was preserved through ritual participation in the behavior of the crowd.

⁴ One example is the creation of the Uffizi in Florence, a space for a walk over the Arno River for the nobles, which was decorated with unique paintings, as an extension of the natural surrounding space and in order to prevent the nobles from blending in with the common people [History - Visit Uffizi, accessed 2-1-2025].

⁵ "Theater in the Middle Ages", *newspaper Kathimerini*, May 30, 2024.

⁶ Pike E. Ronston, "Encyclopedia of Religion and Religions", *Twentieth Century Encyclopedia*, London 1955, pp. 20, 237, 338.

⁷ Pageant | History, Rules & Benefits | Britannica, accessed 2-1-2025.

⁸ "Judith Butler and the Politics of the Performative", in *Review Essay, Political Theory*, vol 27, August 1999.

⁹ Peter Koch, *Staging urban Europe*, Erasmus Mundus Master Course in Urban Studies, 2015, pp. 1-86.

¹⁰ Giovanni Campus, *The City as Theatre: The performing Space*, Thesis, Università degli studi di Sassari Dipartimento di Architettura, Design e Urbanistica, 2018, pp. 8-65.

Within the natural setting of the Cities, people revived great historical events by representing them naturally, in their real space.

The city of Athens developed gradually until the beginning of the 20th century and preserves monuments of antiquity, the Roman era, Byzantine monuments and later the Ottoman period, which are evident in its historic center.

The city has various architectural periods that have passed through its urban planning and are evident as remnants of other civilizations. The facades of the buildings and their interiors in public buildings with neoclassical influences from late modernism dialogue with its history. Growing gradually from a small settlement at the foot of the Acropolis, Athens acquired its first public buildings when it was chosen in 1832 to become the capital of Greece. Built at the beginning of the 20th century, the well-known Athenian Trilogy, the complex of three public buildings of neoclassical architecture, the Valiane Palace of the National Library of Greece, the main building of the National and Kapodistrian University of Athens and the Academy, the work of the Hansen brothers, was built, while the rock of Lycabettus and the Acropolis, which have dominated since antiquity, reflect the historical importance of the city.¹¹

Accordingly, Thessaloniki presents monuments from the entire spectrum of historical time, with a multitude of ancient, Hellenistic, Roman, early Christian and Byzantine. A well-known symbol of Thessaloniki is the White Tower, while other important monuments are the Roman Agora, the Arch of Galerius and the mausoleum of Rotunda-Agios Georgios, the city walls, many Byzantine churches and monasteries. Since 1912, when the city of Thessaloniki was liberated from the Ottomans, it has received a large number of Greek refugees from Asia Minor and Thracians who shaped its uniqueness, while at the beginning of the 20th century, as part of urban regeneration, Aristotelous Square was created, designed by the French architect and urban planner Ernest Embrar with its main axis perpendicular to the sea.¹²

Since 1851, when Melbourne became the capital of the newly formed colony of Victoria, although it has evolved into a modern metropolis with skyscrapers, large avenues and bridges, and huge business districts, it has maintained its Victorian-style architectural identity and friendly spirit. Melbourne Town Hall is a cornerstone of the city's identity, a blend of history, culture and community that characterizes the city. It is an outstanding example of Victorian Second Empire architecture, with an imposing façade, Corinthian

columns, ornate gables and a distinctive clock tower rising above the cityscape. It was built in the mid-19th century, during a time when the city experienced an economic and population boom due to the Victorian Golden Age, by local architect Joseph Reed. The wealth created by the gold rush is reflected in many magnificent buildings, such as the Royal Exhibition Building, one of the oldest surviving exhibition pavilions in the world, the Block Arcade and Flinders Street Station are iconic examples of Melbourne's Victorian architecture. In the city center, the old colonial buildings are reminiscent of North American cities with their red bricks, while the diversity of its peoples is also strong, with Chinese neighborhoods and Greek suburbs. However, the most important war memorial and perhaps the central landmark of Melbourne is the "Shrine of Remembrance" (Temple of Memories), which honors the soldiers and all those who sacrificed themselves to secure peace in both the First and Second World Wars.¹³

Along with Melbourne, Sydney began to see a large influx of immigrants from 1851. The wealth from gold exports created the conditions for the explosive rise of the city, which grew rapidly, creating its infrastructure of railways, trams, roads, ports, telegraph, schools and civic services. The population of Sydney and its suburbs increased from 95,600 in 1861 to 386,900 in 1891. New sandstone public buildings were erected, including the "University of Sydney" (1854), the "Australian Museum" (1858), the "Town Hall" (1868) and the "General Post Office" (1866), while elaborate palaces, cafes and hotels were built. In districts such as "The Rocks", a part of the old city of Sydney from 1788 is preserved with buildings of special architecture and cobblestone streets, while the life of the first settlers is represented in the museum of the area. In the 20th century, Sydney continues its rapid development, shaping the image of the modern city built on one of the most beautiful natural harbors in the world, with attractions such as the opera house, the harbor bridge and the Royal Botanic Gardens, huge parks, museums, rich cultural history, lively neighborhoods, large suburbs.¹⁴

IV. CELEBRATIONS IN THE CITIES

Theatricality transfers the cosmopolitan image of the square to the city stage. As events of public life are represented in the open air, it is transformed into a space of collective memory, where events that concern the whole of society take place and everyone has the opportunity to access and participate.

¹¹ Thanassis Yohalas, Kafetzaki Tonia, *Athens, Tracking the City with a guide to history and literature*, Estia Publication, 2013, pp. 4-55.

¹² Apostolos Vakalopoulos, *History of Thessaloniki*, Stamoulis Publications, Athens 1983, pp. 220-442.

¹³ Granville Wilson, *Building a City: 100 Years of Melbourne Architecture*, Oxford University Press; 1 ed, 1982, pp. 99-200.

¹⁴ City of Sydney, accessed 3-2-2025.

a) Athens

The first celebration of March 25 in Greece took place in 1838 in Athens, in what is now Klafthmonos Square, in front of Otto's first palace, amidst a general atmosphere of emotion. It was seventeen years after the Greek Revolution that the people poured into the streets with folk instruments, lutes and zournas to celebrate. Guilds and associations paraded in a climate of enthusiasm and set up a dance around the palace.¹⁵

From 1900, school students also began to participate in the parades. In fact, as the press of the time describes, they sang at the same time: "As long as the whole world lives, so long may your name, oh my Greece, and your glory together live".¹⁶

In 1924, the parade was established as a "celebration of democracy," following the model of parades that were already taking place in European capitals, especially in Paris. That year, however, Greece, in addition to its own memories and anniversaries, also honored its philhellenes. At the celebrations of Lord Byron's Centenary in 1924, thousands of his lovers gathered under the moonlight on the Acropolis, while three hundred of the "most beautiful girls in Athens" came twice from the Parthenon and sang Byron's *Maiden of Athens* to the music of Gounod. Recitations of verses from Byron's poems followed, and the festival ended at midnight with the crowd singing "Rule Britannia".¹⁷ The 1930 celebrations in Greece were the culmination of a planned celebration for the centenary of the beginning of the Revolution of 1821, which the complications of the Asia Minor Campaign did not allow for in 1921. The President of the Republic, Alexandros Zaimis, was symbolically placed at its head, while the theme of the celebration shifted to Greek independence and not to the beginning of the Revolution. The celebrations began on March 25 and lasted almost the entire year. However, emphasis was placed on the capital. The grandeur of the celebrations also had a symbolic weight, calling on the people within their national space to unite culturally. At the same time, smaller celebrations were held in the provinces. The formality of the celebrations in Athens included elements already existing since the 19th century, such as cannon shots from Lycabettus, military parades, religious processions. However, new dynamic elements also crystallized that responded to the imposingness that the government wanted to give to the celebration: mass ceremonies at the Panathenaic Stadium – organized either by the Lyceum of Greek Women or by the government itself –, historical reenactments, long processions of a historical nature with the participation of the Army, important institutions and various

associations. Special committees were established with the aim of strengthening the government's work and connecting the glorious historical past with the progress of the state. The Committee on Celebrations and Reenactments was concerned with issues regarding the extent to which it was possible to accurately represent historical events and the contribution of the bodies that would carry them out. The members of the committee were historians, journalists, painters, sculptors, folklorists. Issues were raised regarding whether it was possible to carry the Greek flag in the Panathenaic procession instead of the veil, etc. Although some of the elements of the celebration had already appeared in the past, the magnificent composition attempted by the government was in the context of similar impressive grand celebrations in European cities, such as England and the satellite country of Australia. The impressive ceremonies of the centenary celebration were held with their official opening on March 25 with a doxology at the Metropolis, a ceremony at the University, a military parade in the city center, a crowning of statues at the Propylaea by University professors and a ceremonial session at the Academy. In the evening, the city was illuminated and a torchlight procession was held. Also, the ceremony organized by the Lyceum of Greek Women on April 6 at the Panathenaic Stadium, which is reported to have gathered a crowd many times the capacity of the Stadium. The core of the event was the parade of actors who played fighters and kings and with their entourage presented important figures of the Revolution. This particular ceremony presented as a theme and spectacle an allegorical image with an ideological goal. The same happened at the ceremony organized at the Stadium on April 21st and mainly concerned the "national wars" of 1912-1922. In this celebration, disabled people from the Balkan Wars, the Asia Minor Campaign and the campaign in Ukraine, as well as military units and soldiers in Revolution-era clothing, marched. In addition, the Metropolitan of Athens blessed the banners of the Revolution and Zaimis laid wreaths, making a strong connection between 1821 and the recent wars on a semiotic level, and creating a genealogy of the struggles for the nation. Finally, the procession of April 27th began with a cannon shot and crossed the city center with the Acropolis as its main destination. It presented the entire narrative of Greek history, from Antiquity to the recent "national wars". In addition, it included military units, priests, nurses, scouts, expatriates, etc. Finally, the flag was raised on the Acropolis by Zaimis while the National Anthem was sung. The dramaturgy with which the entire event was staged shows us clear performativity, according to the media of the time. The celebrations certainly had political implications and through the connection of the archaic past with the modern, an attempt was made to stimulate the spirit of Hellenism in a difficult period after the Asia Minor tragedy as

¹⁵ <https://www.cretalive.gr/istoria/1838>, accessed 3-2-2025.

¹⁶ *Newspaper Empros*, 20 March 1900.

¹⁷ *Newcastle Morning Herald and Miners' Advocate* (NSW: 1876 - 1954), Monday 21 April 1924.

Venizelos, in the context of the celebration at the Holy Lavra, emphasized that during the past century, Greece surpassed childhood and entered adolescence.¹⁸

Since 1932, schools have regularly participated in a parade before the officials at the Tomb of the "Unknown Soldier". That year, during the celebration of March 25, the unveiling of the monument with a soldier lying on the ground was also held by Prime Minister Andreas Michalakopoulos with great solemnity and the participation of many foreign delegations. In 1936, the student parade for the first time took on an official and complementary character to the military one, and in March the schools marched at the head of the procession, in front of Metaxas and the king. At the same time, as in Greece, since 1893 in New York, a Greek parade has been held continuously on 5th Avenue.¹⁹

b) Thessaloniki

Thessaloniki, which was later liberated in 1912, had a different military parade, as it had the character of the city's sovereignty. However, this process was not easy. On October 27, due to the threat of the Bulgarians, Hasan Tahsin Pasha was forced to sign the protocol of surrender of Thessaloniki to the Greeks, handing over the city to the Greeks unconditionally, freeing 25,000 prisoners.

On October 27 1912, two battalions of Evzones entered Thessaloniki and the Greek flag was raised at the city's command post, while in the morning King Constantine entered the city with his staff. At the same time, the Bulgarian division was waiting. However, four Greek divisions had already taken strategic positions on the outskirts of the city, preventing any possibility of its capture by the Bulgarians. Thus, thanks to Venizelos' foresight, a national tragedy was averted, namely the occupation of Thessaloniki not by the Greeks, but by the Bulgarians. However, the Greek population of Thessaloniki celebrated and enthusiastically welcomed the Greek army and its leadership, while Athens also celebrated the liberation with 100 cannon shots from the Pnyx.²⁰

c) Melbourne

Although the celebrations in Australia were grand in all cities, we will mention Melbourne and Sydney as examples. "Australia Day" is mentioned in the earliest records as having been celebrated since 1908, with each state of Australia celebrating its founding on a different date. The "appeal of dramatic projection through coordinated visual spectacle" found fertile ground in the historical anniversaries of the founding of

Australia's major cities, which eventually settled on 26 January as the date of celebration. The events and celebrations were impressive and grand, with the arrival of Aboriginal people in the states to participate in the official celebrations.

In Melbourne during the period 1913–1920, the female students' residence in collaboration with all the colleges held events of an archaic nature, the "Pageant of ancient nations", a procession that included all the ancient civilizations. One of the most spectacular, with three-day celebrations, took place in 1914, where the Greek team was led by the poet *Sappho*. The celebrations included ancient Greek-style performances with balls, classical poses and juggling.²¹ In 1918, "Our Boys Day" was celebrated in Melbourne, which aimed to raise money for the Allied War Fund. All the nations presented traditional pavilions where they displayed products from their homeland, including Greece. First prize went to America with the work of architect Griffin, second to New Zealand with an ancient Maori dwelling, and third to Canada with a red-and-white pavilion.

In October 1928, Melbourne Town Hall was the stage for a pageant for 2000 artists, depicting the rise of British culture in Australia and the building of a new free world in the Southern Hemisphere. Australia was emerging from its infancy as a group of colonies that had once been a remote part of the British Empire to a Commonwealth of free nations, with a significant role for all humanity. Facing the new world being rebuilt after the world war, with all nations united so that peace could bring about a creative period in human history, the pageant, entitled "The Call of the World", was held at Melbourne "Town Hall" from 9 to 13 October.²²

The pageant was an appeal to the imagination of young Australia. The groping of ancient civilizations into the light, the unveiling of that light to the world, and the founders of British civilization will be depicted. The pioneers who discovered Australia are brought to light, and the activities that have been carried out to date in the formation of a new world will bring before us the problems of the future.²³

In 1934, the Competition of Nations was held to celebrate the centenary of the founding of Melbourne. A herald announced the entry of *Victoria*, which was presented accompanied by *Peace* and *Prosperity*. Later, *Britain*, *Australia*, along with the states and territories of England, *Scotland*, *Wales*, *Northern Ireland*, entered in succession. The other members of the empire followed: *Canada*, *India*, *the Irish Free State*, *Malta*, *New Zealand* and *South Africa*. The groups of colonists who arrived in the countries finally appeared on stage as a single body, representing the eternal friendship of nations. The Greek group presented the early years of the founding of the

¹⁸ <https://enthemata.wordpress.com>, accessed, 24-2-2025.

¹⁹ <https://info-war.gr>, accessed, 22-1-2025.

²⁰ Spyros Karavas, "One Hundred and One Cannonballs for Thessaloniki", in Anna Mattheou, Stratis Bournazos, Popi Polemi, eds, *In the Orbit of Philip Ilyus: Ideological Uses and Obsessions in History and Politics*, Benaki Museum, Athens 2008, pp. 75-88.

²¹ *The Argus*, 16 April 1914.

²² *Daily Telegraph*, 24 November 1928.

²³ *Rutherglen Sun and Chiltern Valley Advertiser*, 28 September 1928.

Greek state. *Othon, Amalia, the ladies of honor, the goddess Athena* were represented. In the chariot of Peace, a Greek national as the god *Bacchus* offered *Victoria* a basket of grapes, the gift of Greece.²⁴ In 1935, at the International Ball in Sydney, the Greek team represented the various products of Greece. In the same year, the celebrations of the centenary of Melbourne were repeated, which ended equally spectacularly with flashes and illuminations on the Yarra River. On June 25, 1936, an International Ball was organized at the "Palais de Dance", St. Kilda, Melbourne, where national dances were danced. The Greek team presented traditional dances.²⁵

d) Sydney

At the Olympic Ball that took place on 2 October 1923 in the "Town Hall" Sydney hall with the aim of representing Australia in the Olympic Games in Paris, the organization was Greek. Kon. Servetopoulos, was presented as Apollo, with a purple tunic and a laurel wreath. The representation was framed by the sea of corals, the nine muses, Poseidon and the Oceanids. The stage of the "Town Hall" was transformed into an ancient Greek temple, while the contribution of Kon. Servetopoulos was important in terms of the evaluation of the Australian participation in Paris.²⁶

In 1927, at the International Ball of the United Nations at the "Palais Royal" in Sydney, Greece received second prize among England, France, Russia, China, Germany and Mexico, presenting the revolutionary history of Greece and the struggle for freedom. The following year, 1928, the Governor's daughter, de Chair, appeared as the *Queen of Peace* in an allegorical set. At this event, among the other organized sets, the Greek team won first prize.²⁷ In 1929, at the International Ball of the United Nations, the most spectacular event was the goddess *Athena*, the central figure of the Greek set that won among eighteen teams in the competition.²⁸

The sets presented at the Pageant of Nations in Sydney in 1938 were also impressive. Important moments from Sydney's Australian history were reenacted in the celebrations of the 150th anniversary of its founding. Scenes from the landing of Captain Arthur Phillip's fleet, with the Aborigines fleeing and other events were presented in the ceremonies. To cover the footage of the event, an airplane from Melbourne flew over Sydney for aerial photographs, while the following year, 1939, the Pageant of Nations was repeated at "City Hall", as above.

The declaration of World War II marked the beginning of the official celebrations of Greek Day.

During the War, every form of entertainment and artistic events took on a national and patriotic tone. The main goal was to raise money for the needy. In Sydney in 1941 a large procession of infantry platoons of Evzones, old warriors and reservists, passing through all the major streets of the city, ended at the cenotaph where *Greece* (Miss K. Zikos) and *Britain* (Miss Bluebell Heather Searby) stood in a prominent position.²⁹

V. CONCLUSION

As demonstrated in the early 20th century, the cultural wealth of the peoples was recalled and captured on the occasion of festive parades and other events in the cities of Greece and Australia. Despite the asymmetrical sizes of the cities, the differences in their historical memory, in the large gatherings the active participation of the crowd seeking to find its footing after major wars, national tragedies and disasters is impressive. In the *Critique of Critical Power*, Kant formulates a particularly fruitful principle where nature "is beautiful when it resembles art and art is beautiful when it resembles nature".³⁰ Driven by this theory, we conclude that peoples seek beauty and elegance in order to disengage from painful events in their history and to face their future with optimism, while at the same time creating imaginary places and landscapes within their own cities. Although the asymmetry of the magnitudes of reception and inclusion also reflects the aesthetic perception of the event that balances between the two settings of the cities of the country of origin and of one's residence. Theatrical events, when unfolding in the scenic space of the natural environment, are surrounded by the beauty of art combined with the naturalness of the landscape in an informal theater of encounters (of spectators and spectators), as new aesthetic theories illuminate the anthropological basis of the theatrical process. Already, the theatrical phenomenon has been disconnected from its conventional form, while the defining principles of materiality, semioticity and aestheticity already occupy a prominent position in performances, action art, happenings and events of the Fine Arts.³¹

The cultural exchanges of the peoples are an integral part of the mirror of their history, however, they

²⁹ *Daily Telegraph*, 28 February 1941.

³⁰ This principle transforms technique into an essential component of the beauty in nature and freedom into an essential condition of the beauty in art. Kant accepts that beauty is nothing other than nature in the field of technique, freedom in the field of the artistic and in order to visually grasp a quantity with the imagination, two acts of imagination are required: "apprehension" and "comprehension aesthetical". It is the feeling of the inadequacy of the imagination to depict the Ideas of a whole, when it reaches its maximum limit, while in the attempt to expand it it re-immerses itself within itself, in a way that leads to a state of emotional contentment (Immanuel Kant, *Kritik der Urteilskraft*, Hamburg, 2001, pp. 47-81).

³¹ Casey, Maryrose, *Transformative Integration: Cross-Cultural Performance*, Monash University Publishing, 2015.

²⁴ *Daily Telegraph*, 21 December 1935.

²⁵ *Greek Herald*, 26 November 1936.

²⁶ *The Sydney Morning Herald*, 3 October 1923.

²⁷ *The Sun*, 13 July 1927.

²⁸ *Evening News*, 4 September 1929.

are reflected and diffused throughout the length and breadth of the world as a connecting link of the memory of nations. By connecting the past with the present, with events where each individual could stand out by being placed at the center of the whole, the institutions of the state were promoted with the simultaneous celebration of important moments in Australian and Greek history. As is proven, the achievement of social assimilation and cohesion had as a prerequisite the preservation of the cultural difference of the nations. Parallel celebrations in cities of the opposite hemisphere demonstrate that the representation of the theatrical phenomenon through the ideal representation of landscapes of the homeland gradually established new mechanisms and global idols in the transformative dynamics of the festive events. And as the example of Greek and Australian cities mirrors and reflects the need of peoples to celebrate their history, we conclude that perceptions and theories of performance and world theater are being repositioned and redefined through cultural events and rituals.



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Pearson Correlation based Comparison of Shannon Entropy Computed Reliability of Tritium Plasma Graphene Interaction

By Alper Pahsa

Abstract- High-energy ions have the potential to damage the walls of nuclear fusion Tokamak reactors. As a result, it is essential to establish dependable methods for determining whether the materials are still resilient. This investigation examines the most effective methods for assessing the reliability of materials that contain tritium plasma in graphene crystals. The impact of varying energy levels from 5 keV to 35 keV on tritium plasma was investigated using molecular dynamics in a computer simulation to investigate the retention mechanisms. The quantity of tritium retained, Shannon entropy based on kinetic energy, and Shannon entropy are all factors that are used to calculate reliability. A valuable instrument for comparing various categories of tritium plasma on graphene crystals, with kinetic energies ranging from 5 keV to 35 keV, are the Pearson correlation coefficients. The designer can employ Pearson Correlation to ascertain the most efficient structural reliability computation method for a variety of reliability calculations. This research simplifies the process of selecting plasma-resistant materials for nuclear fusion applications and allows designers to enhance the design of reactor walls.

Keywords: *pearson correlation of graphene, reliability with pearson correlation, plasma material interactions, reliability of tritium retention.*

GJRE-J Classification: LCC: QC454.G65



PEARSONCORRELATIONBASEDCOMPARISONOFSHANNONENTROPYCOMPUTEDRELIABILITYOFTRITIUMPLASMAGRAPHENEINTERACTION

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Pearson Correlation based Comparison of Shannon Entropy Computed Reliability of Tritium Plasma Graphene Interaction

Alper Pahsa

Abstract- High-energy ions have the potential to damage the walls of nuclear fusion Tokamak reactors. As a result, it is essential to establish dependable methods for determining whether the materials are still resilient. This investigation examines the most effective methods for assessing the reliability of materials that contain tritium plasma in graphene crystals. The impact of varying energy levels from 5 keV to 35 keV on tritium plasma was investigated using molecular dynamics in a computer simulation to investigate the retention mechanisms. The quantity of tritium retained, Shannon entropy based on kinetic energy, and Shannon entropy are all factors that are used to calculate reliability. A valuable instrument for comparing various categories of tritium plasma on graphene crystals, with kinetic energies ranging from 5 keV to 35 keV, are the Pearson correlation coefficients. The designer can employ Pearson Correlation to ascertain the most efficient structural reliability computation method for a variety of reliability calculations. This research simplifies the process of selecting plasma-resistant materials for nuclear fusion applications and allows designers to enhance the design of reactor walls.

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I. INTRODUCTION

The modification of condensed matter is a significant topic, as evidenced by the extensive corpus of research that is available in the literature, specifically the interaction between plasma and surface materials. In temperature-variable environments, plasma-material interactions modify the surfaces of materials, leading to sputtering, retention, and chemical variations. Interactions between plasma materials in magnetic fusion devices, including nuclear fusion reactors, generate substantial anomalies. The Tokamak configuration exemplifies a nuclear fusion reactor given in figure 1 [1].

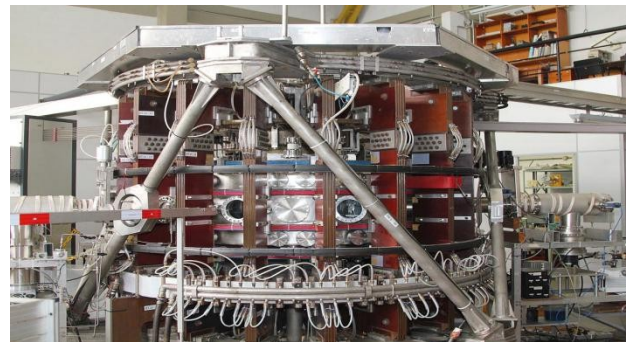


Figure 1: TCABR-Tokamak reactor at USP's Institute of Physics

A diverse array of factors influences the interactions of plasma materials. The retention of tritium in graphite poses a safety concern and reduces recycling efficiency. Fusion neutrons degrade the microstructure of graphite. The concentration of tritium in the universe may result in the restriction of certain areas. It is imperative to conduct a measurement to evaluate the effect of neutron irradiation on the tritium inventory of carbon-based materials.

The way plasma interacts with the walls of the reactor is crucial for building fusion energy reactors, because tritium can get trapped and greatly shorten the life of the wall materials. The fusion reactor's design must consider the life cycle of the reactor wall structures from this perspective. We can achieve these goals by forecasting the reliability parameter of the reactor wall constructions. We can analyze the deformations and defects of the reactor wall surface to predict the reliability risks. The best way to assess how reliable Tokamak fusion reactors are is by using commercial plasma applications that apply surface coatings. Plasma-facing structures located in space must endure radiation and particles to minimize the effects of impacts from space debris [2-15]. The walls of Tokamak nuclear fusion reactors faced a challenge in terms of tritium retention. The depletion of tritium is the consequence of plasma-facing graphene magnetic fusion. The retention of plasma tritium was 40% for JET and 51% for TFTR, respectively. Following the conclusion of the experiments, sanitization of the fusion reactor occurred at a rate of 12–16%. In favor of Recent simulations

Author: Phd, HAVELSAN Inc, Ankara, Turkiye.

Orcid: 0000-0002-9576-5297

e-mail: apahsa@havel-san.com.tr

indicate that the French experimental Tokamak reactor ITER will surpass its tritium threshold after 100 oscillations. The increasing quantities of tritium diminish the duration of the reactor walls, causing them to extend. This effect affects the process of converting thermal energy into electrical energy during fusion. The dependability of the wall material significantly influences its durability. This part is used to study how the tritium plasma behaves on a graphene crystal, with energy levels ranging from 5 keV to 25 keV. Shannon Entropy, tritium retention, and the kinetic energies of the simulated box are calculated at the conclusion of the molecular simulation. We then implement these values as failure data sets to evaluate material reliability in three-parameter Weibull forecasts. The following ten methods are available for FORM: normal, log normal, Weibull, beta, exponential, Gumbel, extreme value type I and II, uniform, and gamma distributions [16-19]. The three-parameter Weibull, log-normal, and exponential distributions are frequently used in structural reliability evaluations due to their capacity to precisely estimate data on material failure distribution. The three-parameter Weibull method is employed in this study due to its advantageous characteristics and simplicity, which make it suitable for modeling failure data with the appropriate skewness. The three-parameter Weibull method is the best choice for making calculations easier and improving results when working with a small amount of data, as shown by previous studies on the reliability of materials used in nuclear reactor walls [20]. By identifying contiguous experimental process periods in the reliability datasets, researchers compare the two calculated reliability statistics against each other. There is a dearth of research on the prediction of reliability for Tokamak fusion reactors in the literature. The experimental reactor design is the primary focus of the fusion reactor methodology, while material reliability prediction is a topic that has only recently emerged. This work outlines a preliminary reliability allocation strategy for fusion facilities, as outlined in [21]. We base this approach on a probabilistic safety evaluation of the International Thermonuclear Experimental Reactor (ITER) initiative in France. As the new reactor engineering phase progresses, this investigation guarantees reliability. We implement the reliability index to assess the system's dependability and ensure the safety of the fusion system during engineering design evaluations. This study fails to adequately depict the reliability of the material structure's placement. The most recent study on the ITER project is primarily concerned with the probabilistic safety assessment of the nuclear fusion reactor [22]. The results suggest that the Probabilistic Safety Assessment (PSA) is a crucial instrument for assessing the safety hazards associated with nuclear power plants (NPPs) from a probabilistic perspective. The investigation focuses on the RAMI strategy, as advocated by the International

Thermonuclear Experimental Reactor (ITER) organization. RAMI is an acronym that stands for Reliability, Availability, Maintainability, and inspection. This method reduces the technical risks associated with fusion devices to a probabilistically acceptable threshold to assess the system's reliability and availability. This investigation has not yet demonstrated the structural reliability of the fusion reactor's materials. Conventional nuclear fission power reactors serve as the foundation for reliability assessments. A publication in [23] introduces a framework for uncertainty analysis and dependability forecasting. We will implement the frame count methodology and the component stress method to predict reliability for a diverse array of equipment types. The publication referenced as [24] serves as an additional investigation into reliability. The study established the safety assessment of nuclear power facilities by utilizing apparatus reliability data. The primary source of reliability data for safety evaluations in the study was the general dependability statistics of mechanical apparatus in nuclear power facilities. [25] is the singular research that validates the reliability of Tokamak reactor walls using the Weibull distribution. This information comes from the behavior of tritium plasma, which experiences a constant electromagnetic force of 3T on a graphene crystal and has kinetic energies between 5 keV and 35 keV. Shannon entropy, kinetic energy-based Shannon entropy, and the results of tritium retention counts form the foundation of the dependability assessment. This research provides a comprehensive example of how material reliability data can be employed to assess the efficacy of nuclear fusion power facilities. We implement the Pearson correlation coefficient to evaluate the dependability of three datasets and to investigate the similarities between the three distinct reliability methodologies. The designer of a nuclear fusion reactor can determine the most effective material reliability strategy for selecting appropriate materials and constructing the reactor wall by analyzing the similarities.

II. METHOD

The Python programming language was initially employed to conduct molecular dynamics simulations. This task was conducted using Spyder, a component of the Anaconda suite, version 6.0.3. The Dell Precision 7680, which is equipped with an Intel Core i7 13th Generation processor and runs Ubuntu 24.10 Linux, was used to perform the calculations. The Python compiler version that was implemented was 3.12.7. The Atomic Simulation Environment (ASE [26]), a Python framework, is used to conduct the molecular dynamics simulation. The retention mechanism was developed by simulating a significant amount of graphite, which contains approximately 1,200 carbon atoms. The results of the simulation suggested that the retention efficacy was

influenced by a variety of parameters, such as the pressure and temperature conditions. The findings have substantial implications for future research on carbon-based materials and their multifaceted applications in a variety of fields. The block was subjected to hydrogen at energy levels ranging from 5 to 35 keV, utilizing a 3T magnetic induction force to facilitate calculations and to replace tritium. The energy levels selected for the simulation were adequate, as demonstrated by the current simulations, which encompass an appropriate range of collision energy, as documented in the literature. In molecular dynamics, a computational framework, the integral of Newton's Second Law of Motion is employed to simulate the motion of a collection of particles (atoms or molecules). The motion of the i -th atom is denoted as follows [27]:

$$F_i = (m_i \cdot d^2 r_i(t)) / dt^2 \quad (1)$$

where $r_i(t)$ is position vector of the i th particle, F_i is the force acting on the i th particle at time t and m_i is the mass of the particle.

The variables in equation (1) represent the mass, the location, and an interatomic potential energy function that characterizes the interactions between atoms and their neighbors. The molecular dynamics modeling of the hcp function in ASE results in the formation of a graphene structure within a large graphite crystal. The hydrogen atoms are arbitrarily distributed throughout the graphite structure, with a starting kinetic energy that ranges from 5 keV to 35 keV. They are subject to an magnetic induction field of 3T. The Velocity-Verlet method is employed in molecular dynamics simulations to simulate the system's dynamics [22-24]. At the conclusion of the simulation, we determine the Shannon entropy of the system, quantify the quantity of tritium stored in the graphene, and determine the kinetic energy of the simulation box. This information is utilized to evaluate the material's reliability. The application's specific failure modes necessitate that reliability engineers select the appropriate parameters, including Shannon entropy, kinetic energy-based Shannon entropy, and tritium retention levels. The introduction section explains the rationale behind the selection of Weibull reliability predictions. In general, Weibull reliability prediction is superior in the calculation of material structural dependability. Three distinct reliability sets are computed using the three-parameter Weibull reliability prediction method, which is based on Shannon entropy, kinetic energy-based Shannon entropy, and tritium retention data. The three-parameter Weibull reliability prediction is expressed by the following formula (2) [25]:

$$R(t) = e^{-\left(\frac{t-\gamma}{\alpha}\right)^\beta} \quad (2)$$

The shape parameter ($\beta > 0$), scale parameter ($\alpha > 0$), location parameter (γ), and irradiation duration ($t \geq \gamma$) are all taken into account. γ is typically presumed to be zero in computations, as it represents the displacement of the origin in the dependability distribution graph. The failure probability function is defined as in (3) and (4):

$$F(t) = 1 - R(t) \quad (3)$$

$$1 - F(t) = e^{-\left(\frac{t}{\alpha}\right)^\beta} \quad (4)$$

where $0 < F(t) < 1$ and $\gamma = 0$. The equation can be expressed in (5) and (6) as follows:

$$\ln\left(\ln \frac{1}{1 - F(t)}\right) = \beta \ln t - \beta \ln \alpha \quad (5)$$

$$y(t) = \ln\left(\ln \frac{1}{1 - F(t)}\right), m = \beta \wedge n = -\beta \ln \alpha \quad (6)$$

The Bernard Approximation for Median Ranks [28] can be employed to estimate the unreliability of each failure in order to deduce an equation in the form $y = mx + n$. The following (7) is the Bernard Approximations for Median Ranks:

$$F(t) = \text{MedianRank} = \frac{\text{Rank} - 0,3}{N + 0,4} \quad (7)$$

The ordinal position is denoted by rank in the dataset table, while N represents the utmost number of orders. The kinetic energy range of 5 keV to 25 keV is applied to the tritium plasma, which is under a steady 3T magnetic induction force on the graphene crystal. Tables 1a, 1b, 1c, and 1d illustrate the varying levels of reliability based on Shannon entropy, kinetic energy-based Shannon entropy, and tritium retention amounts.

Table 1a: Weibull Reliability Calculated Dataset for 5keV Applied Tritium Plasma with constant 3T magnetic induction Force

Process Time (fs)	Reliability of Kinetic Energy based Shannon Entropy	Reliability of Retention of Tritium Amount	Reliability of Shannon Entropy of the Simulation System
0	1	0	1
25	0,206529857	0,377064539	0,521357984
50	0,176563403	0,37905274	0,496981029
75	0,159948474	0,380215617	0,482960909
100	0,148611365	0,381040619	0,473130049
125	0,140090081	0,381680496	0,4655745
150	0,133310901	0,382203283	0,459447947
175	0,127711149	0,382645271	0,454301632
200	0,122960135	0,383028121	0,449869054

Table 1b: Weibull Reliability Calculated Dataset for 15keV Applied Tritium Plasma with constant 3T magnetic induction Force

Process Time (fs)	Reliability of Kinetic Energy based Shannon Entropy	Reliability of Retention of Tritium Amount	Reliability of Shannon Entropy of the Simulation System
0	1	1	1
25	0,198968365	0,290599909	0,610725773
50	0,168116675	0,274979548	0,606079077
75	0,151118198	0,265931567	0,603362753
100	0,139573118	0,259556876	0,601436401
125	0,130928245	0,254639858	0,599942761
150	0,124072886	0,250641167	0,598722747
175	0,118426234	0,247274038	0,597691514
200	0,11364758	0,244367781	0,596798429

Table 1c: Weibull Reliability Calculated Dataset for 25keV Applied Tritium Plasma with constant 3T magnetic induction Force

Process Time (fs)	Reliability of Kinetic Energy based Shannon Entropy	Reliability of Retention of Tritium Amount	Reliability of Shannon Entropy of the Simulation System
0	1	0	1
25	0,18345641	0,367926806	0,442325519
50	0,150723429	0,367937006	0,400401165
75	0,132965227	0,367942972	0,377081129
100	0,121042209	0,367947206	0,361099258
125	0,112197999	0,367950489	0,349031472
150	0,105240905	0,367953172	0,339386732
175	0,099551042	0,367955441	0,331384173
200	0,094766473	0,367957406	0,32456493

Table 1d: Weibull Reliability Calculated Dataset for 35keV Applied Tritium Plasma with constant 3T magnetic induction Force

Process Time (fs)	Reliability of Kinetic Energy based Shannon Entropy	Reliability of Retention of Tritium Amount	Reliability of Shannon Entropy of the Simulation System
0	1	1	1
25	0,205324751	0,352345491	0,525956527
50	0,175198344	0,349034249	0,502644599
75	0,158511436	0,347098006	0,489218329
100	0,147133639	0,345724577	0,479794794
125	0,138586928	0,344659481	0,472546865
150	0,131791019	0,343789383	0,46666612
175	0,126179989	0,343053834	0,461723681
200	0,121421338	0,342416756	0,457464742

The Pearson Correlation method is employed to compare three data sets for each process time at the conclusion of the material reliability data sets for molecular dynamics process times. We assess the reliability of each data set, present the Pearson correlation formula below, and compare them in pairs. The four distinct varieties of Pearson correlation matrices that we present are categorized according to their differing reliability classifications. Three distinct categories of correlation coefficients are produced by the Pearson correlation calculation. The value falls within the range of -1 to +1. The intensity of the negative linear association increases as the value approaches -1. As the value approaches +1, the positive linear association's potency increases. As the value approaches zero, the linear relationship decreases. The Pearson Correlation formula is as follows [15]:

$$r = \frac{n(\sum XY) - (\sum X)(\sum Y)}{\sqrt{1 - F(t)}} \quad (8)$$

This (8) formula denotes Pearson's correlation coefficient by r , the first variable's score by X , and the second variable's score by Y . The number of coupled scores is denoted as n .

III. RESULTS & DISCUSSION

The methods described are employed to compute Pearson correlation coefficients for the

Shannon entropy, the retention quantity of tritium plasma atoms, and the kinetic energy-based Shannon entropy of the simulation system reliability data. Pearson correlation coefficients are calculated for combinations of reliability categories at identical process times in molecular dynamics simulations. The simulations investigate various kinetic energies spanning from 5 keV to 35 keV within a tritium plasma, all while upholding a steady 3T magnetic induction force applied to the graphene crystal. Table 1 presents the data sets utilized to develop four matrices of Pearson correlation coefficients. The Pearson correlation calculation involves determining correlations through the comparison of reliability categories within pairings. The tables for the Pearson correlation coefficient utilize pseudo-coloring due to the application of conditional formatting. The highest value is established at 1, with dark blue indicating a positive correlation through the use of conditional formatting. In order to illustrate a negative correlation of -1, we utilize the color red. The final zero indicates an uncorrelated relationship between two data sets, represented by a white color. Table 3a presents the Pearson correlation among the reliability categories of Shannon entropy, the retention of tritium plasma atoms, and the kinetic energy of the simulation system based on Shannon entropy for tritium plasma at 5 keV applied kinetic energy under a constant 3T magnetic induction force on graphene crystal.

Table 3a: Pearson Correlation Coefficient Matrice of the Reliability for 5keV kinetic energy applied tritium plasma with 3T magnetic induction force graphene crystal

Correlation of Reliability Types For Tritium on Graphene at 5 keV kinetic energy with 3T constant magnetic induction force	Reliability Kinetic Eng Shannon	Reliability Retention	Reliability Shannon Entropy
Reliability Kinetic Eng Shannon	1	-0,99693824	-0,989552796
Reliability Retention	0,978999008	1	-0,993541661
Reliability Shannon Entropy	-0,989552796	-0,993541661	1

Based on the results of table 3a, reliability of tritium plasma with kinetic energy with 5keV application on graphene crystal reliability calculation tritium retention count vs reliability on kinetic energy based Shannon Entropy has a positive correlation. However reliability of kinetic energy based Shannon Entropy reliability vs reliability tritium retention count negative correlation. Reliability with Shannon Entropy vs reliability with kinetic energy based Shannon Entropy and tritium retention count are negatively correlated.



Table 3b: Pearson Correlation Coefficient Matrice of the Reliability for 15keV kinetic energy applied tritium plasma with 3T magnetic induction force on graphene crystal

Correlation of Reliability Types For Tritium on Graphene at 15 keV kinetic energy with 3T constant magnetic induction force	Reliability Kinetic Eng Shannon	Reliability Retention	Reliability Shannon Entropy
Reliability Kinetic Eng Shannon	1	-0,908412836	-0,993884598
Reliability Retention	-0,908412836	1	0,795536481
Reliability Shannon Entropy	-0,993884598	0,795536481	1

According to the table 3b 15keV application of kinetic energy of tritium with constant 3T magnetic induction force to graphene crystal, Shannon Entropy based reliability vs tritium retention count based reliability have positive correlation. Tritium retention amount vs Shannon Entropy based reliability has

positive correlation. Tritium retention count reliability vs kinetic energy based Shannon Entropy reliability, reliability based on Shannon Entropy vs kinetic energy based Shannon Entropy reliability, kinetic energy based Shannon Entropy reliability vs Shannon Entropy based reliability have negative correlation.

Table 3c: Pearson Correlation Coefficient Matrice of the Reliability for 25keV kinetic energy applied tritium plasma with 3T magnetic induction force on graphene crystal

Correlation of Reliability Types For Tritium on Graphene at 25 keV kinetic energy with 3T constant magnetic induction force	Reliability Kinetic Eng Shannon	Reliability Retention	Reliability Shannon Entropy
Reliability Kinetic Eng Shannon	1	0,962776586	-0,992039443
Reliability Retention	0,962776586	1	-0,984894096
Reliability Shannon Entropy	-0,992039443	-0,984894096	1

In table 3c, tritium with a 25keV kinetic energy application with 3T constant magnetic induction force on graphene crystal, reliability of tritium retention amount vs reliability with kinetic energy based Shannon Entropy has a positive correlation. Reliability with kinetic energy

based Shannon Entropy vs Shannon Entropy based reliability, Shannon Entropy reliability vs tritium retention count amount based reliability have a negative correlation.

Table 3d: Pearson Correlation Coefficient Matrice of the Reliability for 35keV kinetic energy applied tritium plasma with 3T magnetic induction force on graphene crystal

Correlation of Reliability Types For Tritium on Graphene at 35 keV kinetic energy with 3T constant magnetic induction force	Reliability Kinetic Eng Shannon	Reliability Retention	Reliability Shannon Entropy
Reliability Kinetic Eng Shannon	1	-0,973958593	-0,98616763
Reliability Retention	-0,973958593	1	0,993914508
Reliability Shannon Entropy	-0,98616763	0,993914508	1

According to the table 3d, 35keV applied kinetic energy affected tritium with constant 3T magnetic induction force on a graphene crystal, reliability based Shannon Entropy vs tritium retention amount reliability has positive correlation. Tritium retention amount reliability vs kinetic energy based Shannon Entropy reliability, Shannon Entropy reliability vs kinetic energy based Shannon Entropy reliability have a negative correlation.

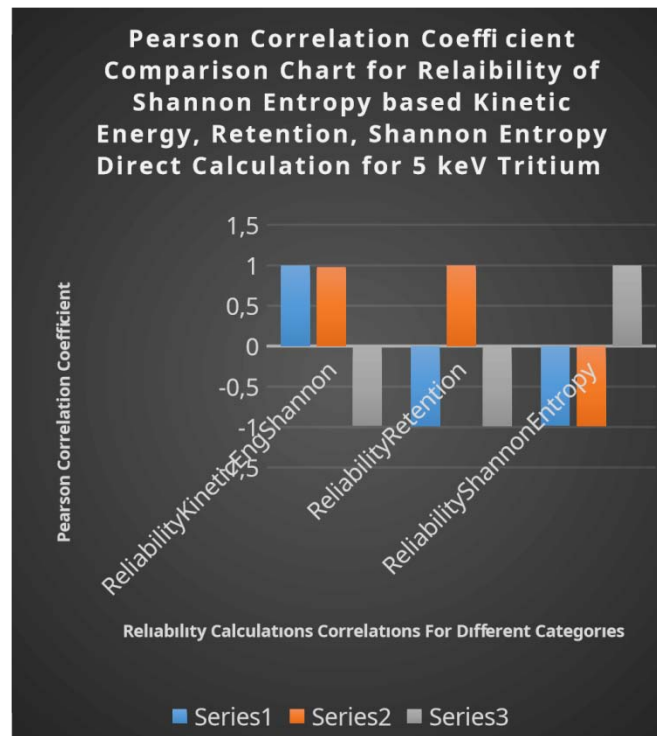


Figure 4: Pearson Coefficient Correlation Comparison Chart for 5keV applied kinetic energy of tritium reliability categories

In figure 4, the Pearson correlation coefficient comparison chart shows results given in table 3a correlation coefficient matrix comparisons as in graphics form.

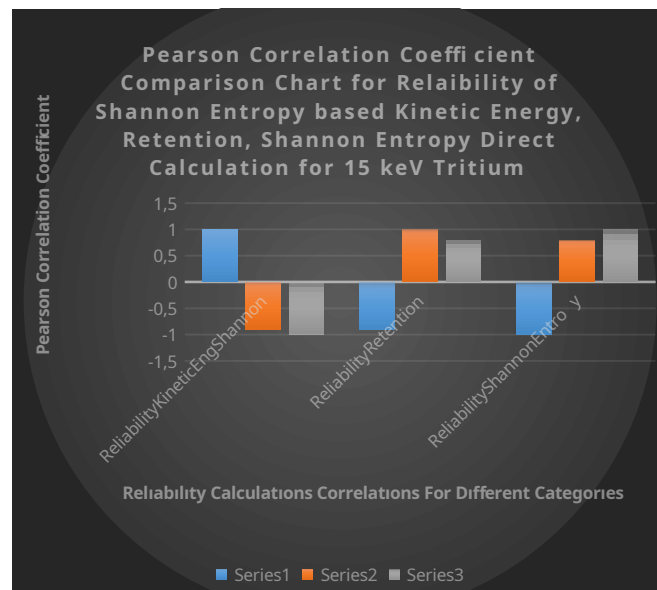


Figure 5: Pearson Coefficient Correlation Comparison Chart for 15keV applied kinetic energy of tritium reliability categories

In figure 5, the Pearson correlation coefficient comparison chart shows results given in table 3b correlation coefficient matrix comparisons as in graphics form.

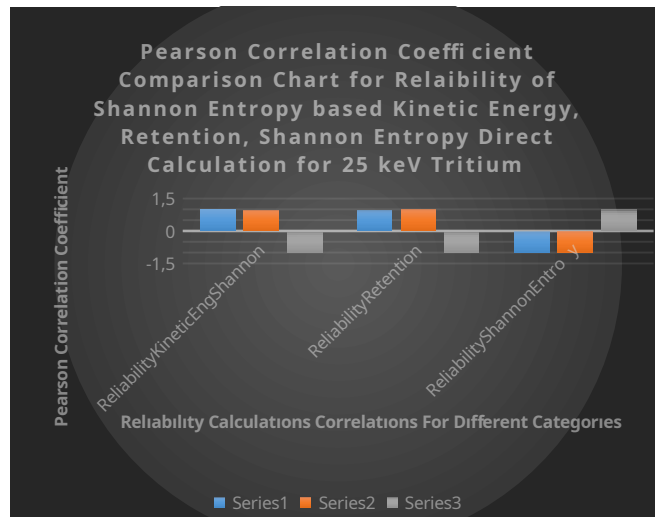


Figure 6: Pearson Coefficient Correlation Comparison Chart for 25keV applied kinetic energy of tritium reliability categories

In figure 6, the Pearson correlation coefficient comparison chart shows results given in table 3c correlation coefficient matrix comparisons as in graphics form.

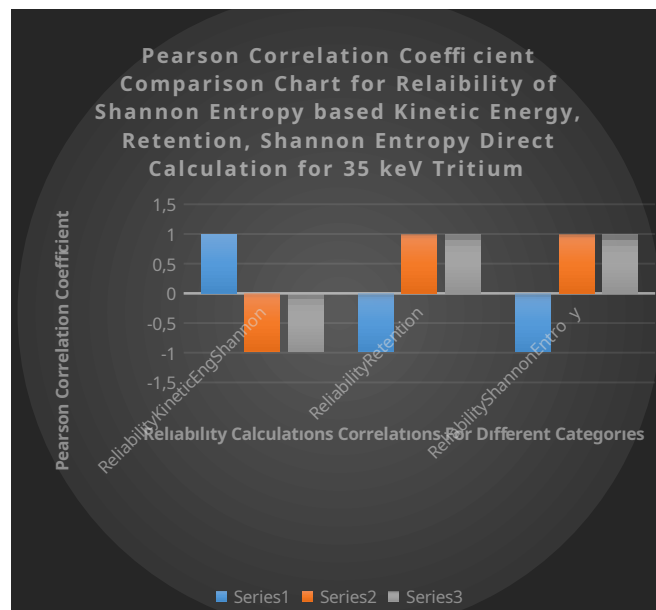


Figure 7: Pearson Coefficient Correlation Comparison Chart for 35keV applied kinetic energy of tritium reliability categories

In figure 7, the Pearson correlation coefficient comparison chart shows results given in table 3d correlation coefficient matrix comparisons as in graphics form.

The above results can be compared to [28] work reliability results in the literature, which show consistency. For instance, table 3a, table 3b, table 3c and table 3d show the similarity trend with the work given in [28], that the plasma-created retention effects as the ion energy increase created a surface deterioration growth on the material surface. These

studies show that physical incidents related to plasma effects on material can be used in reliability predictions.

IV. CONCLUSION

According to the investigation, the most effective method for evaluating the reliability of wall materials in contemporary experimental nuclear fusion reactors is to utilize the quantity of tritium retained and kinetic-based Shannon entropy. The findings indicate that the tritium plasma atoms' energy on the graphene crystal can be used to determine the probability of

failure of the material by examining the Shannon entropy associated with kinetic energy and the tritium plasma concentration. Nevertheless, the failure data can be altered by the use of Shannon entropy for reliability, resulting in a negative correlation between the retention amount and the kinetic energy calculations. Consequently, it is imperative to modify the method by which Shannon entropy is calculated. Nevertheless, the Shannon entropy is a reflection of the entire simulated system. If it were to be applied for reliability, it would affect the failure data and demonstrate a negative correlation with both the retention amount and the kinetic energy-based Shannon entropy calculation. It is imperative to modify the Shannon entropy calculation's configuration. The ratios should be subtracted from the Shannon entropy context in order to substantiate the parameter. Failure data regarding the reliability of the material structures. It is ranked as the third option when material reliability calculations are implemented during the design of the fusion reactor's walls. In research on wall materials that are impacted by tritium plasma retention, the reliability of tritium plasma retention can be the primary criterion for predicting the future reliability of a material. This information is essential for the evaluation of events in which plasma interacts with materials that are associated with structural reliability. AFM data is utilized by the nuclear fission industry to predict the structural reliability of pumps and conduits using the Weibull distribution [21-22]. The Weibull method could be employed in future research to investigate the interactions between plasma and materials on the basis of plasma properties. The Pearson correlation suggests that the values calculated from tritium plasma, such as the kinetic energy-based Shannon entropy or the amount stored, can be used to make predictions using the Weibull distribution to evaluate the reliability of materials. The Weibull distribution is designed to guarantee material dependability by incorporating these parameters of the reliability calculation technique, which is a cost-effective approach to ensuring safe, secure, and efficient operations. The aforementioned methods are employed to evaluate the effectiveness of plasma processing by examining heat and stress control, predicting reliability with Weibull analysis, planning maintenance in advance, and assessing surface roughness for wear and damage. Additionally, the procedure involves the selection of materials. In the future, the Weibull method may be employed to evaluate the utility and predict the reliability of boronization in the walls of nuclear fusion reactors. The reliability of wall materials in the divertor zone will be improved by identifying the optimal material design. It is crucial that personnel in energy system engineering who are involved in the design of nuclear fusion energy reactors in the future refer to this study. When the fusion procedure commences, it is imperative to select the appropriate materials for these designs. The fusion

process is a complex endeavor that involves the interaction of materials with plasma at the atomic level, as well as electromagnetism and the material science required to design the surface where the fusion reaction occurs. This process also involves heat transfer and cooling systems.

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Declarations

The investigation was devoid of any potential conflicts of interest, regardless of whether they were financial or non-financial. Additionally, the investigation conducted in accordance with the ethical standards of globally recognized research and publication standards and did not require informed consent from either human or animal research participants.

Data Availability

The study's conclusions are corroborated by the article and other material files. Upon reasonable request, the author in question can furnish information regarding the necessary study.

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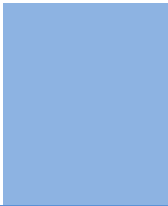
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20. Think technically: Always think technically. If anything happens, search for its reasons, benefits, and demerits. Think and then print: When you go to print your paper, check that tables are not split, headings are not detached from their descriptions, and page sequence is maintained.



21. Adding unnecessary information: Do not add unnecessary information like "I have used MS Excel to draw graphs." Irrelevant and inappropriate material is superfluous. Foreign terminology and phrases are not apropos. One should never take a broad view. Analogy is like feathers on a snake. Use words properly, regardless of how others use them. Remove quotations. Puns are for kids, not grunt readers. Never oversimplify: When adding material to your research paper, never go for oversimplification; this will definitely irritate the evaluator. Be specific. Never use rhythmic redundancies. Contractions shouldn't be used in a research paper. Comparisons are as terrible as clichés. Give up ampersands, abbreviations, and so on. Remove commas that are not necessary. Parenthetical words should be between brackets or commas. Understatement is always the best way to put forward earth-shaking thoughts. Give a detailed literary review.

22. Report concluded results: Use concluded results. From raw data, filter the results, and then conclude your studies based on measurements and observations taken. An appropriate number of decimal places should be used. Parenthetical remarks are prohibited here. Proofread carefully at the final stage. At the end, give an outline to your arguments. Spot perspectives of further study of the subject. Justify your conclusion at the bottom sufficiently, which will probably include examples.

23. Upon conclusion: Once you have concluded your research, the next most important step is to present your findings. Presentation is extremely important as it is the definite medium through which your research is going to be in print for the rest of the crowd. Care should be taken to categorize your thoughts well and present them in a logical and neat manner. A good quality research paper format is essential because it serves to highlight your research paper and bring to light all necessary aspects of your research.

INFORMAL GUIDELINES OF RESEARCH PAPER WRITING

Key points to remember:

- Submit all work in its final form.
- Write your paper in the form which is presented in the guidelines using the template.
- Please note the criteria peer reviewers will use for grading the final paper.

Final points:

One purpose of organizing a research paper is to let people interpret your efforts selectively. The journal requires the following sections, submitted in the order listed, with each section starting on a new page:

The introduction: This will be compiled from reference matter and reflect the design processes or outline of basis that directed you to make a study. As you carry out the process of study, the method and process section will be constructed like that. The results segment will show related statistics in nearly sequential order and direct reviewers to similar intellectual paths throughout the data that you gathered to carry out your study.

The discussion section:

This will provide understanding of the data and projections as to the implications of the results. The use of good quality references throughout the paper will give the effort trustworthiness by representing an alertness to prior workings.

Writing a research paper is not an easy job, no matter how trouble-free the actual research or concept. Practice, excellent preparation, and controlled record-keeping are the only means to make straightforward progression.

General style:

Specific editorial column necessities for compliance of a manuscript will always take over from directions in these general guidelines.

To make a paper clear: Adhere to recommended page limits.

Mistakes to avoid:

- Insertion of a title at the foot of a page with subsequent text on the next page.
- Separating a table, chart, or figure—confine each to a single page.
- Submitting a manuscript with pages out of sequence.
- In every section of your document, use standard writing style, including articles ("a" and "the").
- Keep paying attention to the topic of the paper.



- Use paragraphs to split each significant point (excluding the abstract).
- Align the primary line of each section.
- Present your points in sound order.
- Use present tense to report well-accepted matters.
- Use past tense to describe specific results.
- Do not use familiar wording; don't address the reviewer directly. Don't use slang or superlatives.
- Avoid use of extra pictures—include only those figures essential to presenting results.

Title page:

Choose a revealing title. It should be short and include the name(s) and address(es) of all authors. It should not have acronyms or abbreviations or exceed two printed lines.

Abstract: This summary should be two hundred words or less. It should clearly and briefly explain the key findings reported in the manuscript and must have precise statistics. It should not have acronyms or abbreviations. It should be logical in itself. Do not cite references at this point.

An abstract is a brief, distinct paragraph summary of finished work or work in development. In a minute or less, a reviewer can be taught the foundation behind the study, common approaches to the problem, relevant results, and significant conclusions or new questions.

Write your summary when your paper is completed because how can you write the summary of anything which is not yet written? Wealth of terminology is very essential in abstract. Use comprehensive sentences, and do not sacrifice readability for brevity; you can maintain it succinctly by phrasing sentences so that they provide more than a lone rationale. The author can at this moment go straight to shortening the outcome. Sum up the study with the subsequent elements in any summary. Try to limit the initial two items to no more than one line each.

Reason for writing the article—theory, overall issue, purpose.

- Fundamental goal.
- To-the-point depiction of the research.
- Consequences, including definite statistics—if the consequences are quantitative in nature, account for this; results of any numerical analysis should be reported. Significant conclusions or questions that emerge from the research.

Approach:

- Single section and succinct.
- An outline of the job done is always written in past tense.
- Concentrate on shortening results—limit background information to a verdict or two.
- Exact spelling, clarity of sentences and phrases, and appropriate reporting of quantities (proper units, important statistics) are just as significant in an abstract as they are anywhere else.

Introduction:

The introduction should "introduce" the manuscript. The reviewer should be presented with sufficient background information to be capable of comprehending and calculating the purpose of your study without having to refer to other works. The basis for the study should be offered. Give the most important references, but avoid making a comprehensive appraisal of the topic. Describe the problem visibly. If the problem is not acknowledged in a logical, reasonable way, the reviewer will give no attention to your results. Speak in common terms about techniques used to explain the problem, if needed, but do not present any particulars about the protocols here.

The following approach can create a valuable beginning:

- Explain the value (significance) of the study.
- Defend the model—why did you employ this particular system or method? What is its compensation? Remark upon its appropriateness from an abstract point of view as well as pointing out sensible reasons for using it.
- Present a justification. State your particular theory(-ies) or aim(s), and describe the logic that led you to choose them.
- Briefly explain the study's tentative purpose and how it meets the declared objectives.



Approach:

Use past tense except for when referring to recognized facts. After all, the manuscript will be submitted after the entire job is done. Sort out your thoughts; manufacture one key point for every section. If you make the four points listed above, you will need at least four paragraphs. Present surrounding information only when it is necessary to support a situation. The reviewer does not desire to read everything you know about a topic. Shape the theory specifically—do not take a broad view.

As always, give awareness to spelling, simplicity, and correctness of sentences and phrases.

Procedures (methods and materials):

This part is supposed to be the easiest to carve if you have good skills. A soundly written procedures segment allows a capable scientist to replicate your results. Present precise information about your supplies. The suppliers and clarity of reagents can be helpful bits of information. Present methods in sequential order, but linked methodologies can be grouped as a segment. Be concise when relating the protocols. Attempt to give the least amount of information that would permit another capable scientist to replicate your outcome, but be cautious that vital information is integrated. The use of subheadings is suggested and ought to be synchronized with the results section.

When a technique is used that has been well-described in another section, mention the specific item describing the way, but draw the basic principle while stating the situation. The purpose is to show all particular resources and broad procedures so that another person may use some or all of the methods in one more study or referee the scientific value of your work. It is not to be a step-by-step report of the whole thing you did, nor is a methods section a set of orders.

Materials:

Materials may be reported in part of a section or else they may be recognized along with your measures.

Methods:

- Report the method and not the particulars of each process that engaged the same methodology.
- Describe the method entirely.
- To be succinct, present methods under headings dedicated to specific dealings or groups of measures.
- Simplify—detail how procedures were completed, not how they were performed on a particular day.
- If well-known procedures were used, account for the procedure by name, possibly with a reference, and that's all.

Approach:

It is embarrassing to use vigorous voice when documenting methods without using first person, which would focus the reviewer's interest on the researcher rather than the job. As a result, when writing up the methods, most authors use third person passive voice.

Use standard style in this and every other part of the paper—avoid familiar lists, and use full sentences.

What to keep away from:

- Resources and methods are not a set of information.
- Skip all descriptive information and surroundings—save it for the argument.
- Leave out information that is immaterial to a third party.

Results:

The principle of a results segment is to present and demonstrate your conclusion. Create this part as entirely objective details of the outcome, and save all understanding for the discussion.

The page length of this segment is set by the sum and types of data to be reported. Use statistics and tables, if suitable, to present consequences most efficiently.

You must clearly differentiate material which would usually be incorporated in a study editorial from any unprocessed data or additional appendix matter that would not be available. In fact, such matters should not be submitted at all except if requested by the instructor.



Content:

- Sum up your conclusions in text and demonstrate them, if suitable, with figures and tables.
- In the manuscript, explain each of your consequences, and point the reader to remarks that are most appropriate.
- Present a background, such as by describing the question that was addressed by creation of an exacting study.
- Explain results of control experiments and give remarks that are not accessible in a prescribed figure or table, if appropriate.
- Examine your data, then prepare the analyzed (transformed) data in the form of a figure (graph), table, or manuscript.

What to stay away from:

- Do not discuss or infer your outcome, report surrounding information, or try to explain anything.
- Do not include raw data or intermediate calculations in a research manuscript.
- Do not present similar data more than once.
- A manuscript should complement any figures or tables, not duplicate information.
- Never confuse figures with tables—there is a difference.

Approach:

As always, use past tense when you submit your results, and put the whole thing in a reasonable order.

Put figures and tables, appropriately numbered, in order at the end of the report.

If you desire, you may place your figures and tables properly within the text of your results section.

Figures and tables:

If you put figures and tables at the end of some details, make certain that they are visibly distinguished from any attached appendix materials, such as raw facts. Whatever the position, each table must be titled, numbered one after the other, and include a heading. All figures and tables must be divided from the text.

Discussion:

The discussion is expected to be the trickiest segment to write. A lot of papers submitted to the journal are discarded based on problems with the discussion. There is no rule for how long an argument should be.

Position your understanding of the outcome visibly to lead the reviewer through your conclusions, and then finish the paper with a summing up of the implications of the study. The purpose here is to offer an understanding of your results and support all of your conclusions, using facts from your research and generally accepted information, if suitable. The implication of results should be fully described.

Infer your data in the conversation in suitable depth. This means that when you clarify an observable fact, you must explain mechanisms that may account for the observation. If your results vary from your prospect, make clear why that may have happened. If your results agree, then explain the theory that the proof supported. It is never suitable to just state that the data approved the prospect, and let it drop at that. Make a decision as to whether each premise is supported or discarded or if you cannot make a conclusion with assurance. Do not just dismiss a study or part of a study as "uncertain."

Research papers are not acknowledged if the work is imperfect. Draw what conclusions you can based upon the results that you have, and take care of the study as a finished work.

- You may propose future guidelines, such as how an experiment might be personalized to accomplish a new idea.
- Give details of all of your remarks as much as possible, focusing on mechanisms.
- Make a decision as to whether the tentative design sufficiently addressed the theory and whether or not it was correctly restricted. Try to present substitute explanations if they are sensible alternatives.
- One piece of research will not counter an overall question, so maintain the large picture in mind. Where do you go next? The best studies unlock new avenues of study. What questions remain?
- Recommendations for detailed papers will offer supplementary suggestions.



Approach:

When you refer to information, differentiate data generated by your own studies from other available information. Present work done by specific persons (including you) in past tense.

Describe generally acknowledged facts and main beliefs in present tense.

THE ADMINISTRATION RULES

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CRITERION FOR GRADING A RESEARCH PAPER (COMPILATION)
BY GLOBAL JOURNALS

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Topics	Grades		
	A-B	C-D	E-F
<i>Abstract</i>	Clear and concise with appropriate content, Correct format. 200 words or below	Unclear summary and no specific data, Incorrect form Above 200 words	No specific data with ambiguous information Above 250 words
<i>Introduction</i>	Containing all background details with clear goal and appropriate details, flow specification, no grammar and spelling mistake, well organized sentence and paragraph, reference cited	Unclear and confusing data, appropriate format, grammar and spelling errors with unorganized matter	Out of place depth and content, hazy format
<i>Methods and Procedures</i>	Clear and to the point with well arranged paragraph, precision and accuracy of facts and figures, well organized subheads	Difficult to comprehend with embarrassed text, too much explanation but completed	Incorrect and unorganized structure with hazy meaning
<i>Result</i>	Well organized, Clear and specific, Correct units with precision, correct data, well structuring of paragraph, no grammar and spelling mistake	Complete and embarrassed text, difficult to comprehend	Irregular format with wrong facts and figures
<i>Discussion</i>	Well organized, meaningful specification, sound conclusion, logical and concise explanation, highly structured paragraph reference cited	Wordy, unclear conclusion, spurious	Conclusion is not cited, unorganized, difficult to comprehend
<i>References</i>	Complete and correct format, well organized	Beside the point, Incomplete	Wrong format and structuring



INDEX

A	R
Asctic · 2	Reminiscent · 40
Atrium · 38	Rhetorical · 38
B	S
Boronization · 53	Semioticity · 43
C	Sputtering · 45
Carcinogenic · 1	Squamous · 1, 3, 6
Cenotaph · 43	Stochastic · 28
Conduits · 53	Z
D	Zournas · 41
Demarcation · 39	
E	
Elliptic · 3	
Elucidated · 1	
Entourage · 41	
Expatriates · 41	
H	
Hermetic · 39	
M	
Metastasis · 5	
O	
Ostentatious · 39	



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