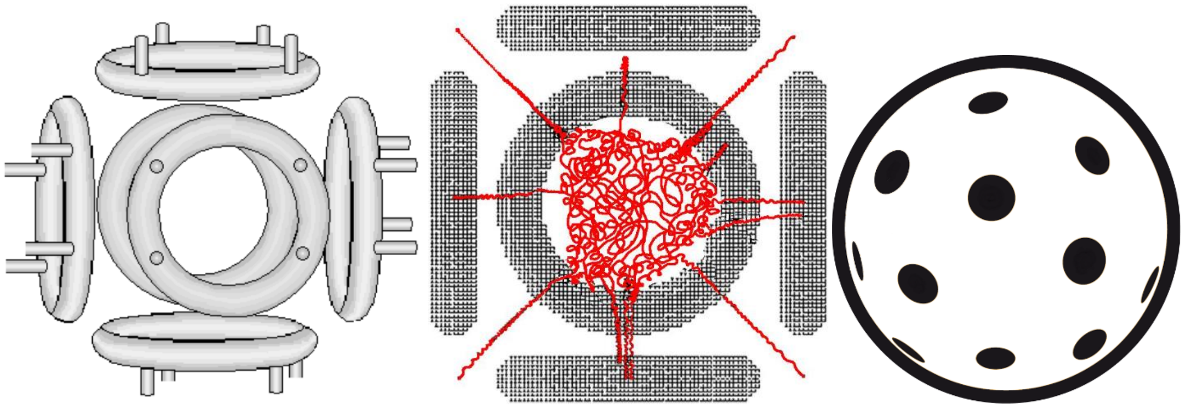
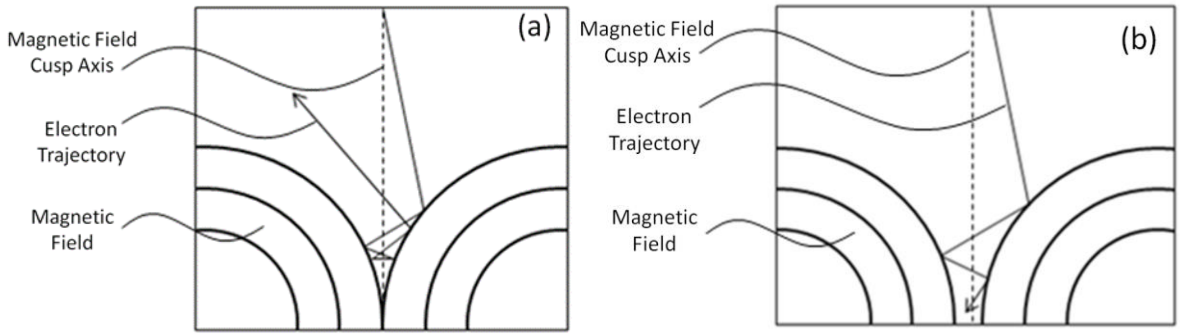
How Does the NESAR Correct the Failue Issues of the Polywell Reactor

Today there are multiple approaches towards achieving a sustainable method of fusion. Since the NESAR is technically a magnetic cusp confinement device, the closest related device to it is the polywell. The polywell is a confinement box with six mirroring magnetic coils in a vacuum chamber. Below is a basic depiction of the polywell concept that came from its Wikipedia page. On the left image is an image of the six mirroring magnetic coils of confinement. In the middle is an image of how the confined electrons, in red, are pulled into the confinements of the polywell. On the right is the theoretical wiffle-ball shape of confined electrons that the polywell is supposed to form.

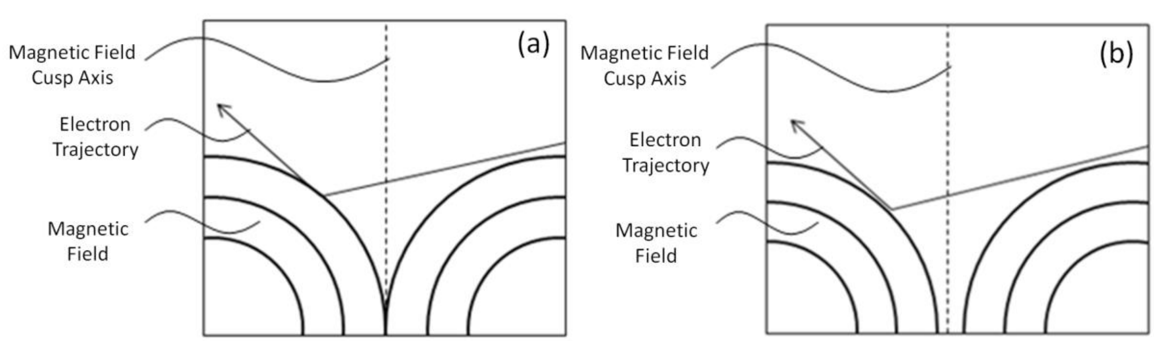


The problem with the Polywell is that it does not confine enough electrons to meet the break event point of fusion because too many electrons escape at the magnetic field cusp axes once the confinement pressure of the electrons increases enough to create an escape path between the confining magnetic fields, called the magnetic cusps. In the previous picture of the theoretical wiffleball shaped confinement of electrons; the black circles on the spherical shape represent the magnetic cusps. Since all of the confined electrons in the polywell are moving independently; a much larger portion of the free moving electrons are interacting more parallel with the magnetic cusps, which are the main areas of possible electron escape. The following diagrams depict how electrons in the polywell escape through the magnetic cusps. The following left diagram depicts an electron being redirected back into the confines of the polywell when the confinement pressure is low. As the confinement of freely moving electrons increases the pressure within the confines will also increase. When the pressure increases enough the space between the magnetic cusps will widen; which is depicted in the following right diagram. In the following right diagram one can see that the more parallel free moving electrons are able to escape the magnetic cusp confinement of the polywell. Through an MIT PhD student doctoral work by Todd Rider in the mid-90s, Todd Rider definitively proved that the design of the polywell at its current design would have too many-electron losses to ever meet a break-even point of sustainable fusion.



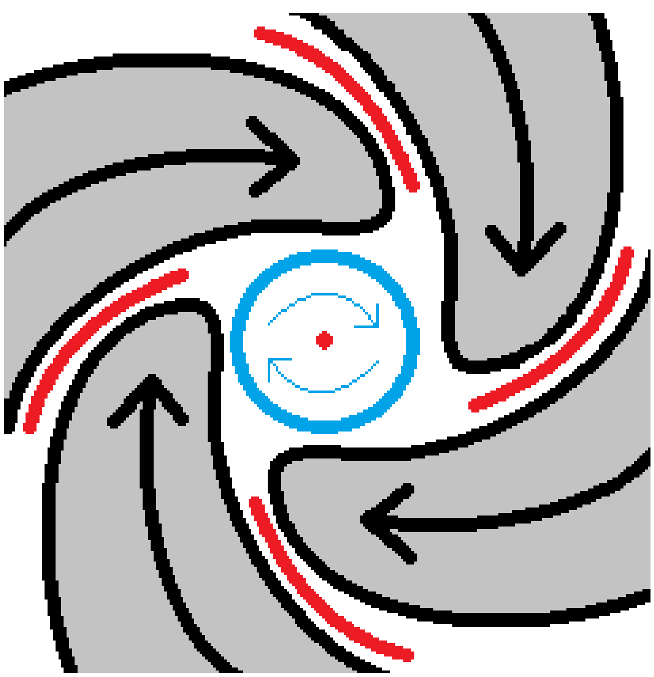
Todd Rider’s works focused on the polywell’s ability to sufficiently perform in trapping, ion-formation, structure, re-circulation, and energy distribution. The polywell sufficiently failed in all of these areas of measurement because it confines an incoherent system of free moving electrons that didn’t provide a solitary location for ions to fuse. In addition to this major issue, the polywell allowed for immense losses of electrons through the magnetic field cusps. So, the rate of fusion could never supersede the amount of energy needed to effectively confine electrons to perpetuate the act of fusion well enough .

To give validity to the possible operational capability of the NESAR, I addressed the same criteria that Todd Rider used to assess the polywell. The greatest improvement that the NESAR has made over the polywell, it’s trapping capability.The NESAR pushes confined electrons in a trajectory that is curved and perpendicular relative to the magnetic field cusps. Below are the depictions of how electrons interact at the cusp more perpendicularly than the polywell. The depiction on the left is showing the general trajectory of electrons interacting at the cusps when the confinement pressure is low. In this depiction the electrons can easily be redirected back into the confines of the NESAR. The depiction on the right is showing the general trajectory of electrons interacting at the cusps as the confinement pressure increases. Unlike the polywell where electrons are able to escape when the distance between the cusps increase. If the NESAR even allows for the widening of cusp distance, electrons are still redirected to confines. In addition, more perpendicular interactions between the confined electrons and the cusps; reduce the amount of direct force from the electrons upon the cusps to allow for the greater confinement of electrons at a much lower magnetic confining current.



I hope it was noticed that I stated in the previous paragraph “If the NESAR even allows for the widening of the cusp distance” because there is a decent probability that in the NESAR that the increased pressure of the confines may force the magnetic field cusps even tighter. The closest thing I can compare this magnetic confinement interaction to is a finger trap for particles. In a finger trap, it is easy to push one's fingers into the biaxial braided cylinder fibers, but once a pulling force between the inserted fingers occur; that force is transferred into the biaxial braids that push upon one another to become a constricting force. This constricting force then restricts the ability to remove the fingers that have been inserted into the braided cylinder.

The confinement of the NESAR operates similarly to this transferring constricting force upon the magnetic field cusps. Once a spherical rotation pattern is established with the confined electrons; electron escape is already almost impossible through the magnetic field cusp. To allow for any of the electrons to escape; the collective direction of the confined spherical rotating electrons would have to be rotating in an impossible opposing direction to the magnetic field cusps. As the confinement of electrons increase, so does the pressure from the confinement of electrons upon the confining magnetic fields. In the diagram below of a top looking down crosssection of the confining magnetic fields, this confinement action is depicted. In this diagram, the rotating electron confinement is depicted in blue rotating around a red dot which is the relative center point. As the confinement of electrons increases, this growing confinement of rotating electrons is also growing in pressure that is placing a greater amount of force upon the confining magnetic fields. Due to the toroidal magnets coils being angled relative to a single location within the confinement apparatus; when the force pressure of the confines increases its outward force pushes upon the confining magnetic fields. This outward force upon the confining magnetic fields is then transferred to a constricting force upon the overlapping magnetic field cusps. This constricting force reduces the chances of an electron escaping from the confines through the magnetic field cusps, even when the pressure of the confined electrons increases. The areas of this constricting effect are depicted below as redlines.



In trapping, which may be the most important criteria where the polywell fails, the NESAR has at least two levels of improvement. First, the NESAR improves upon the polywell by pushing the confined electrons in a way that completely bypasses the magnetic field cusps where electrons can escape.

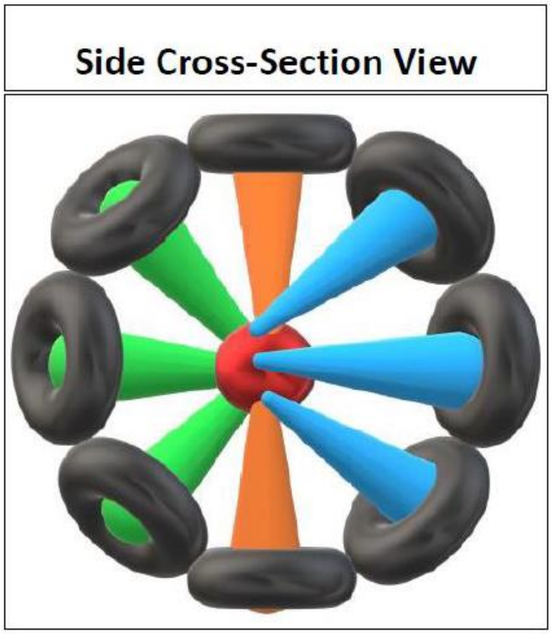
Second, the NESAR has a method to constrict the magnetic field cusps as the pressure of the electron confinement increases. These addressed improvements in trapping alone should place the NESAR as the foremost method for sustainable fusion.

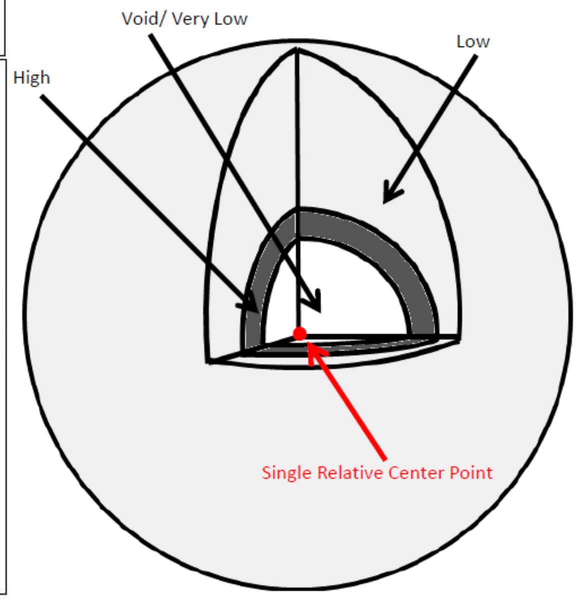
The other major category that the polywell fails to overcome from Todd Rider's assessment was ion-Formation. As deuterium or any other hydrogen isotope gas is used for fusion fuel is heated up by the confined electrons, the electrons from this fusion fuel separates and ions are formed. These ions are then pulled toward the negative well to collide for the fusion process to perpetuate. Since the polywell is an undefined glob of free moving eletrons, it fails to have a definite ion starting location, ion union, ion initial motion, and ion acceleration.

The NESAR, on the other hand, corrects all of the ion formation issues by generating a rotating symmetrical sphere of confinement that obtains a definite collective center point where the negative well is the greatest. Due to this type of confinement, the NESAR improves upon general ion formation much better than the polywell by the following:

1) Ion Starting Location: This is the location within the confines where the hydrogen isotopes interact with the confined electrons and heat up enough to ionize. The NESAR's symmetric and evenly dense confinement allows for the ionization of hydrogen isotopes to occur about the same distance from the center of the confinement.
2) Ion Union: This is the confinement's aptitude to have ions collide for the fusion process to perpetuate. Since the NESAR rotates about a single relative location. There is a single location for ions to accelerate towards and collide. This was the polywell's second-biggest issue because an ununiformed glob didn't allow for ions to efficiently interact for sustainable fusion.
3) Ion Initial Motion: The initial motion is connected to the "Ion Union". If the ions are not sharing a similar initial motion, the system with not allow for ions to efficiently interact for sustainable fusion. The NESAR produces the same common initial motion for all formed ions towards a single relative center to perpetuate fusion.
4) Ion Acceleration: The ion acceleration is connected to the "Ion Initial Motion". If the ions are accelerated towards multiple areas then the ions will not interact efficiently enough to fuse for sustainable fusion. In the NESAR all of the ions are being accelerated towards the same location.

If the NESAR's toroidal magnetic coils are arranged in a similar configuration to the following left diagram; the projected shape and density of the electron confinement should resemble the following right diagram. This type of confinement configuration will yield a rotating spherical confinement of electrons about a single relative center point where the negative well potential is at its maximum. This spherical confinement of electrons should have three different layer densities, with the densest collection located in the middle. Also, this middle layer should obtain the electrons that are rotating at the slowest speeds.





As for Todd Rider's other criteria like structure, re-circulation, and energy distribution its is pretty obvious that the confinement of a symmetrical rotating sphere comprising of uniformly distributed electrons addresses these remaining issues. Sadly due to the massive failures of the initial polywell, most physicists who study fusion and are familiar with the polywell will not even consider another concept of sustainable fusion that obtains any similar features to the polywell. It is for this reason, many of those in the field of fusion would not even consider reviewing this new concept of fusion. Even though the NESAR provides a logical and clear solution to all of the previously held issues with the polywell, hardly anyone would take the time to skim the idea. This routine of being continually ignored may also be due to not being highly specialized in a specific field of particle or theoretical physics. For me, one of the biggest frustrations in trying to obtain a peer review for this new concept from other physicists was convincing them that I was not trying to create a better polywell. I am trying to create a fusion reactor with gravitational effects that is able to operate as similar to our sun as humanly possible.