

nuclear fusion: a different approach

by Oscar S. De Rus

author's preliminary note:

I'm an independent researcher, whatever the word "independent" may mean.

in relation to the nuclear fusion problem, my concern is with the creative process itself, mainly in its psychological dimension as a complementary factor to the commonly shared points of view on creativity applied to science, and this is why I try to follow other pathways.

though I show this project in a more or less similar form to a scientific paper, I know it is a very unorthodox work, since it doesn't fulfill the usual prerequisites of scientific documents because it is not based on previous papers or researches, but in a different way of gathering and interconnecting very diverse information to give place to new and untested insights.

it's easy to notice that I'm not a scientist, and this is why I lack arguments reasonable enough to defend my hypotheses and proposals. but I'm afraid reason must be rather a good discriminating principle for our service than the ultimate goal to explain absolutely everything, though this is what it seems to be always pretending, since if this were the case everything could be easily and mechanically explained. in this sense, I think it would be necessary to remember the difference between the objective physical data we obtain and our subjective interpretation of them, since the latter may be excessively conditioning our decisions with too much frequency.

I believe we as thinking human beings are fortunately far more complex and capable than what our own limited reason can explain, and this is why I try to be always open-minded to new and unexpected possibilities, though some of them may not coincide with our culturally established standards.

abstract

this brief paper tries to outline some connections only that could probably lead from the current linear models to the single-pointed magnetic confinement model for a nuclear fusion reactor, because of the coherence of the latter with the stars working structure and constitution, due to the close similarity of this magnetic confinement model with the natural gravitational confinement produced inside of them. the ideas here proposed and the questions here raised are founded on some available data for a non-specialized understanding, and this is why its author cannot claim nor pretend to be authoritative when dealing with some general concepts on nuclear physics, but only suggestive to the open-minded research with no academic prejudices. the sections included in this document have no other intention than to offer a general insight and introduce some new questions about this subject, and this is why they are not so expanded here as it would be possible with a deeper exposition.

introduction

the analogical way of thinking, not concerned with particular ideas only but with the possible relations (analogies) between them, seems to provide a wider range of connections to understand how Nature works, just like Bionics proceeds "asking" Nature about her solutions to her biological problems, trying to find out then how we can apply them to our technical necessities. this kind of *reverse engineering*, turned towards Nature in its widest sense instead, seems to be the most secure way to face our technical challenges when trying to reproduce the internal conditions of a star on Earth. whether this is simply to proceed by observing similar natural structures as constructive metaphors or as "silent advices of the Book of Life for the waking reader" could be the subject for an additional approach. however, the question arising now in mind is the following one: are we wiser than Nature when trying to reproduce a nuclear fusion reaction by artificial means? the answer is clear and simple, and perhaps we should consider this initial condition before of trying to create something like this on our own means.

1 fractal vs. euclidean geometry

this seems to be a superficial contradiction. from a deeper point of view, the euclidean mathematical interpretation of space founded upon the three basic dimensions (x, y, z) is a constructive metaphor of the human body, a mental representation of its basic physical structure, an intellectual projection of itself just like, in a more material way, a pencil is a physical projection for the finger or a computer is for the brain. on the other hand, the fractal interpretation provides a wider perspective, though not so attached to the apparent structure of the human body, when trying to understand other possible manifestations of Nature attending to the careful observation of other ordered structures, some of them clearly represented by the complexity of multiple natural patterns that may present, for example, scalar self-similarity and other properties not easily described in traditional euclidean geometric language. however, there is only Space, and fractal or euclidean are simply different relative interpretations of the same undifferentiated reality which essential absoluteness is not altered by them, and we need to understand their relativity to be able of an even wider conception of this spatial aspect of the Universe.

2 the linear concept

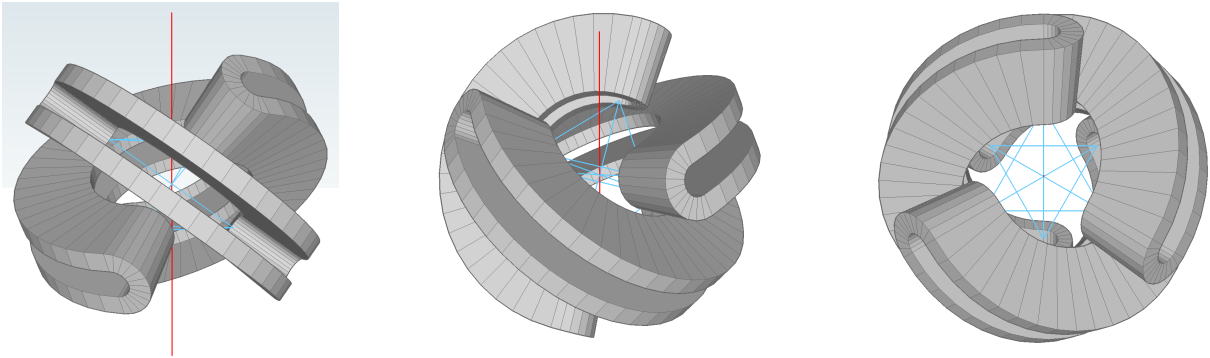
from the first experimental field reversed models and some magnetic mirror configurations to the current toroidal devices, with the only exception of inertial electrostatic confinement models (from Fusor to Polywell) and some inertial confinement attempts using high-energy beams of laser light, there seems to be a certain progression (Tokamak, JET, ITER, Stellarator) leading to consider the linear magnetic confinement concept as the only possible or best, though it doesn't seem to correspond to the apparent working structure of stars. to focus laser beams inwards, for example, is not coherent with the natural model they provide. they proceed by gravitational confinement, their natural way to achieve a higher internal density by means of a physical compression that *then* produces a fusion reaction at their core and, therefore, a huge outburst of energy, light and heat outwards. however, if we transcend the limitations determined by all these previous models, if we go beyond these preconceived ideas and have a look at how universal Nature works, the single-pointed magnetic confinement concept will arise sooner or later in our mind, not as another possibility only, but as a necessary object to study much more coherent with the natural working structure of stars. and, from this different perspective, other models can be designed according to this concept, just like, for example, the following ones.

3 the single-pointed concept

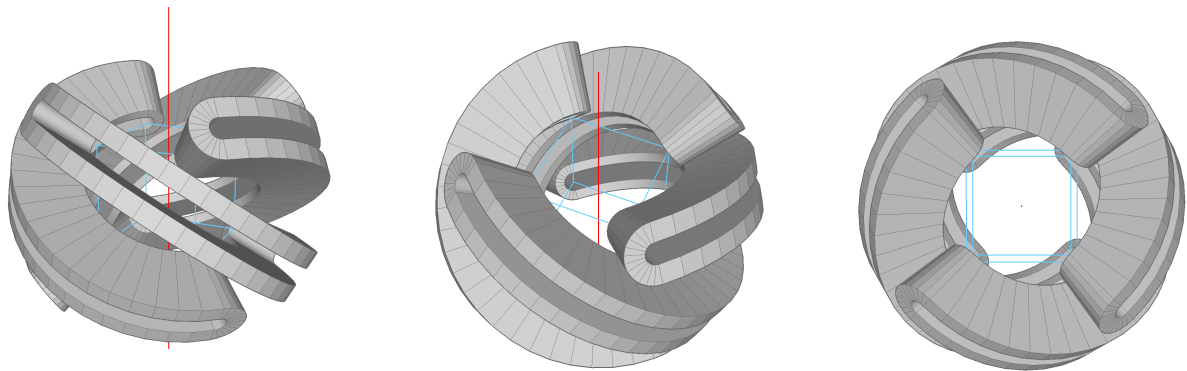
these are three models (see the nine images below) for a same constructive system. they can be designed by means of euclidean geometry, the standard mode preloaded on every software for design purposes, but they cannot be conceived initially by simply thinking "on screen" or using any other bidimensional means, because of the impossibility to think at first in the usual views for doing it so. ground plans, elevations, sections, mostly one-sided views, are not possible to think before their design process, because it's necessary to conceive them directly on 3D terms for a better understanding. however, this is not the main feature of this constructive system, but just abandoning temporarily the cartesian standard and going beyond the basic concept of the "three coordinate axes" (x , y , z), predetermined in our minds too. according to this euclidean interpretation of space, a main vertical axis (commonly the main rotation axis too) coincides always with one of these three virtual lines, thus *conditioning and restricting* our constructive capabilities because of the limitations imposed by this preconceived idea. but instead of this, if we make to coincide this main verticality (rotation axis) with the alternative virtual line (red in the first model) described by the points where always $x = y = z$ and $-x = -y = -z$, this becomes the basic concept that makes possible to conceive and design, for example, the **A 3.0** model and it also enables us to conceive and design the other two models **A 4.0** and **A 5.0** as a consequential progression of the same constructive procedure. then, the coincidence of the main vertical axis with one of the three coordinate axes initially predetermined by the euclidean interpretation of space is already not so determinative to properly understand all the constructive possibilities of this system.

but are these models simply anachronistic because of referring to the magnets formerly designed for a tandem mirror reactor now regarded as an outdated concept? not necessarily, because those magnets, though initially conceived as end stoppers to minimize leakage of positive particles from the ends of a center mirror cell, were also designed to provide an easier manner for achieving a higher concentration of their magnetic fluxes on a central area, a very necessary condition for a good single-pointed confinement device, though the way to arrange them is different now and the coils polarity too, as it is explained in the following sections.

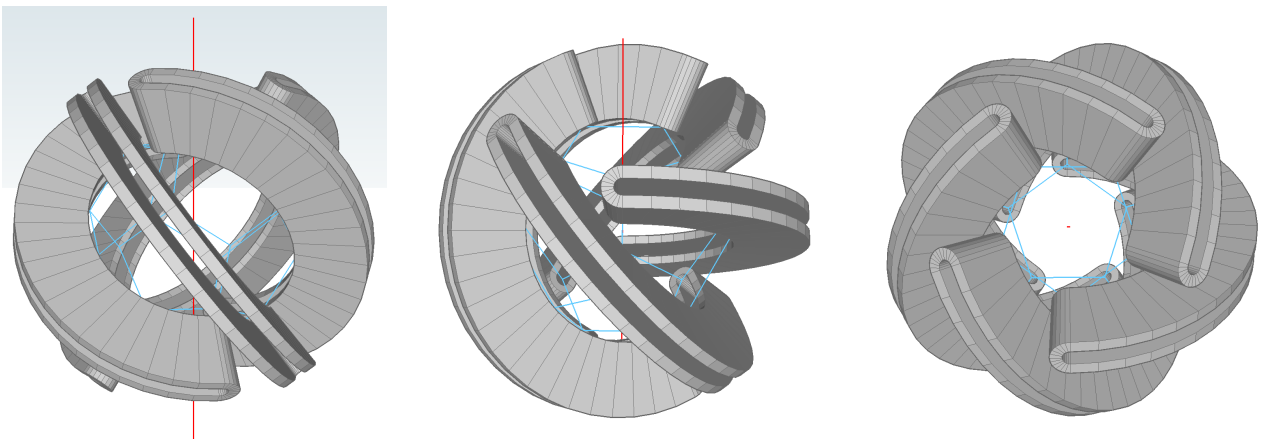
Model A 3.0



Model A 4.0



Model A 5.0

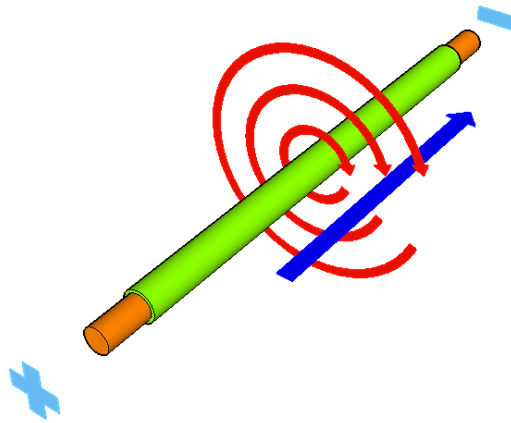


it could be argued these configurations lack axisymmetry, but this term refers to an object having cylindrical symmetry only (no change when rotating about one axis). however, rotational symmetry of order n , also called n -fold rotational symmetry or discrete rotational symmetry of the n th order, with respect to an axis means that rotation by an angle of $360^\circ/n$ (120° , 90° and 72° for the A models) does not change the object either (1). do we really know what would happen inside of these devices and which would be the effects produced with these new configurations?

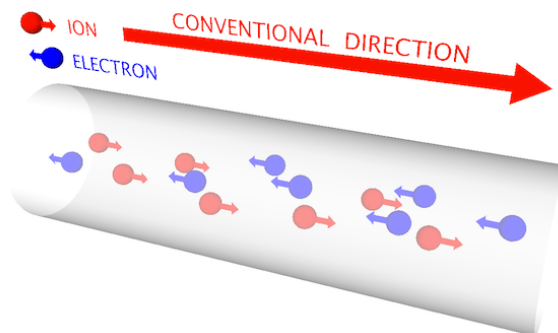
at this point, it is imperative to remember we are not only constructing a physical object, a single-pointed magnetic confinement reactor, but *shaping* the magnetic fields produced inside of it, and to know the effects of their resulting magnetic field is probably the most difficult question this proposal tries to put forward.

4 the coils

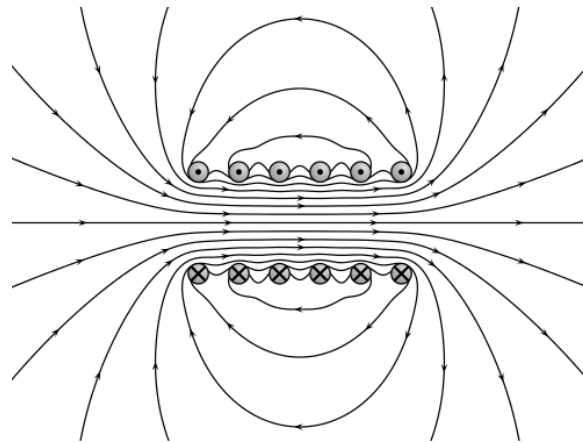
even at the risk of seeming childish, let's restart from the very basis of this subject to obviate nothing. an electric current (blue arrow) flowing through a wire produces a magnetic field (red arrows) whose magnetic field lines form concentric circles around the wire. the direction of this magnetic field is perpendicular to the wire and is in the direction the fingers of your right hand would curl if you wrapped them around the wire with your thumb pointing in the direction of the current (2). in other words, this magnetic field is in a clockwise direction as seen from the positive pole. this is known as the right-hand rule, a conventional tool to determine the direction of the magnetic field lines produced around an electrified wire.



according to the right-hand rule, a necessary agreement, it was established that current flows from the positive terminal to the negative terminal because the direction of conventional current was defined arbitrarily to be the direction of the flow of positive charges, though it was later discovered that the positive charges are immobile in a metal conductor and the negative charges (electrons) are the charge carriers (3) and, due to this fact, the electron motion is in the direction opposite to that of conventional (or electric) current. however, this is only applied to metal conductors and it does not apply to free magnetic fields where both types of charged particles can move with no appreciable resistance.



then, if we consider that the magnetic flux is analogous to the electric current and the magnetomotive force is analogous to the electromotive force and may be considered the factor that sets up the flux (4), an electrified coil produces a magnetic flux whose polarity depends on the winding direction as well as the direction of the electric current flowing through the wire. these two factors determine the direction of the magnetic field lines in a coil. it seems to be a scalar difference only, though now the ions can move freely inside the coil in the conventional direction because they are separated from their electrons in the ionized D-T mixture and the magnetic field is not a metal conductor, but a dynamic fluid.



cylindrical coil

http://commons.wikimedia.org/wiki/File:VFpt_cylindrical_coil_real.svg

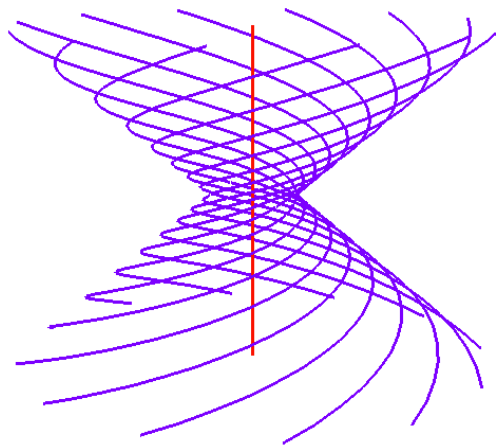
therefore, according to the right-hand rule too, if we would want to concentrate several combined magnetic fields on a single central point to drive and confine as best as possible the positively charged nuclei at the core of a reactor, just like one of the **A** models, we should dispose the same magnetic field direction for the all the magnets involved in the process, and this means we should determine a clockwise direction, as seen from above of the devices, for all of them. probably, this would generate a complex interaction area between their magnetic fields not so easy to preview and understand beforehand. moreover, secondary virtual coils would be produced between the external parts of the magnets too, though with an opposite polarity and an apparently lesser magnetic strenght. however, it doesn't seem to be very clear whether these secondary coils would prevent the concentrated magnetic confinement of the ions at the focussing area or they would facilitate a recirculation of the induced particles. but if we consider these magnetic fields as magnetic fluxes and we apply the characteristics of fluid dynamics probably analogous to them, just like, for example, the venturi effect according to which a fluid's velocity must *increase* as it passes through a constriction area to satisfy the principle of continuity or, implicitly, *decrease* in the opposite case, some questions may arise in our mind that cannot be easily resolved without testing and observation, because both coil types (the main ones and the secondary ones) don't work with equal constriction areas.

5 the dance of the particles

this is the most unconventional part of this proposal, and this is why it must be simply taken as a highly speculative "theory" (if it may be called this way), because it is justified by no rational or linear thought process and it consists in no mathematic calculation or scientific observation, but in a sort of analogical way of thinking that is not the object here to explain more detailedly.

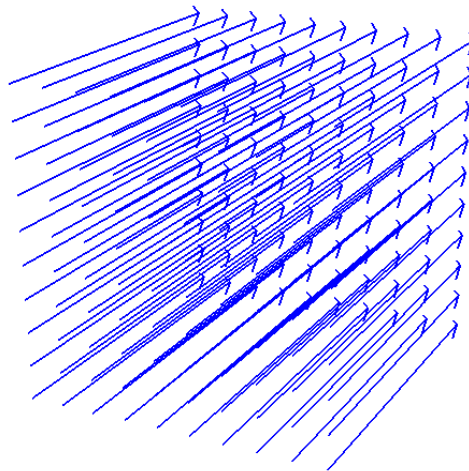
at first sight, it seems very hard to imagine or discern the resulting interaction between several magnets whose magnetic fluxes are concentrated at a single central area with an variable polarity, precisely when each of their magnetic fields is complex enough by itself as to require the more complicated calculation capabilities. however, from an intuitive analysis, if possible, it seems that in the models here proposed the particles cannot move in a rectilinear way towards the central focussing area, but in a vortex-shaped way which rotation direction directly depends on the the magnets inclination with respect to the main vertical axis (red in the **A** models). moreover, this single-pointed confinement model would seem to produce a certain radial ionization of the D-T mixture separating the particles into two groups of charged particles where the ions, being much bigger and heavier than the electrons, would be radially accelerated towards the core of the reactor because of their positive charge and the concentrated magnetic strength acting over them, while the electrons would be probably kept somehow appart because of their negative charge and their much smaller mass, again a much more coherent concept with the natural model of gravitational confinement produced inside of the stars.

but as far as we could be able to imagine, it seems to occur another phenomenon due to the complex interaction between the magnetic fields of the three, four or five combined magnets as they are shown above. something that seems to be probably produced by a curvature of their main magnetic fields near the focussing area while they interact with each other, something like an "extreme compression" as a result of the magnetic fields interaction at the equatorial plane of the central area, because of the same rotation direction for both vortical magnetic fields (clockwise as seen from above the devices), produced by a spiral with what it seems to be a "area of collision" at the core of the reactor and leading approximately to the following trajectory (violet) for the induced particles:



right or wrong, this image cannot be regarded as an accurate view on what could happen inside of these devices, but as a necessary conceptualization only, though better understood when compared with the **A 5.0** model (shown at section **3 the single pointed concept**) where the generation of both converging vortexes seems to be more clearly produced. could this be a fractal pattern? the answer is blowin' in the wind, but for wakin' minds only (well, just joking). in any case, it would be really interesting to see an equatorial cross-section of the magnetic fields interaction with a good simulation software. in this respect we should consider that we probably need to obtain an active simulation of the magnetic vectors only, since the trajectories of the particles are much more difficult to calculate because of their irregularity and this may be unnecessary at first as they would probably behave in a more or less similar way to that of the magnetic vectors, that's following at the end the direction induced by these latter ones. however, to simplify even more this process and also to reduce the calculation capabilities needed for the initial purpose of getting an approximate notion on what could happen inside of these devices when using a proper simulation

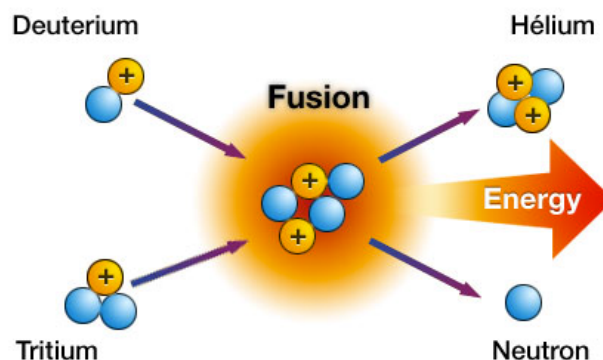
software, we could choose a medium density (see, for example, the image below) for the magnetic vectors produced by the coils, since this could make much easier the first calculations of their complex interactions as the simulation software may include the calculation of their average distances of separation while it advances in the process of constructing a visual representation.



vectors density: 10x10 square mm

6 electrons, why?

as it's been explained before (**4 the coils**), the ions always move in the same direction than the magnetic flux produced by the coils while the electrons move in the opposite direction. then, what's the real use of electrons in a D-T nuclear fusion process (see the image below) that they seem just to be preventing when constantly colliding at random with the accelerated ions in a linear confinement model with closed magnetic field lines like a toroidal device, while moving all of them in contrary directions into the circular magnetic field and producing in this way a considerable waste of energy? why not to take the previously ionized mixture and separate the ions from the electrons, as it seems we already can do, before of introducing them into the magnetic chamber, whichever its design could be, excluding the electrons from the reaction process? as it has been suggested before, in addition to ionization a single-pointed confinement model would seem to produce a *radial separation* of positive and negative charges by means of a concentrated magnetic confinement thus facilitating the fusion reaction, but this is a very weak hypothesis yet.



nuclear fusion reaction
<http://fusionforenergy.europa.eu/understandingfusion/>

when compared with the magnetic confinement system here proposed, the inertial confinement models, though single-pointed too, where the nuclear fusion reactions are initiated by heating and

compressing a fuel target, typically in the form of a pellet also containing a mixture of deuterium and tritium, seem to produce no separation of ions and electrons from the mixture, just the second step probably necessary to take after ionization to facilitate the reaction process. furthermore, as it has been explained before, trying to reproduce the internal conditions of matter inside of the stars, not only their thermal conditions but mainly their core density, using powerful laser beams doesn't seem to be comparable to the powerful gravitational forces produced inside of them (the natural model), because in spite of achieving some interesting results it requires a high and increasing input of energy for it, thus delaying the break-even to a continuously farther point. a renowned laboratory for laser energetics (5), for example, has recently reported on being able to achieve nearly 20 million grades of temperature with a compressive force around thousands of millions atmospheres and a peak of 30 terawatts per one millionth of a second. it seems like feeding an ever bigger horse with an ever higher amount of food to make him run a bit faster. sooner or later we will realize this is not the best way to overcome the limitations imposed by his own nature. it seems clear enough it is not a question of ever bigger devices and ever higher inputs of energy, but rather a matter of design concept where the solution may be concealing from us.

7 concluding...

obviously, all what has been said here demonstrates nothing, and this is why the author of this paper cannot claim nor pretend having found "the solution" to this problem. but it could be a first step only in a new direction which results we cannot know a priori, because that would be proceeding from theoretical deduction rather than through observation or experience, and because many unknown aspects of a single-pointed confinement model would probably raise in our minds from the careful, systematic and skeptical (questioning and doubting are not always the same) examination of its processes aided, if it were possible someday, by the powerful simulation software that is necessary to test this concept. however, before any computational work, a small group of open-minded researchers would be good enough to start an always healthy reexamination of the tacit and unspoken scientific agreements generally established at the basis of this subject, free spirits ready to engage in a dispassionate and unprejudiced discussion about this matter with a brainstorming attitude founded on an always renewing combination of imagination and as coherent as possible technical premises available. to do this, it is not only necessary to continue going forward for gathering additional data, that's always being done, but to go backward too and to subject the fundamentals at the beginning of the design process itself to a deep analysis and revision. in fact, and regardless of the proposal outlined here, this is the main reason for the present approach.

some researchers may consider it a good opportunity to share new ideas on this subject. but on the other hand, it's easy to foresee it's going to find a severe denial as the only automatic reaction on the side of many scientists actively involved in this field of research because this author lacks the necessary arguments or, in some cases, because of their highly hierarchic mentality so widespread nowadays by all kind of institutional structures and the self-defensive "ivory towers" they use to create in this way, while there's no attack or offensive intention in simply thinking by oneself. it's indeed a great hindrance, but if many are trained to think that way, what can we do? will some of them be slightly different someday? Time seems to favor colossal investments in reproducing old schemes instead of promoting creativity about this subject, and this is why new insights must go on their own discrete labour by themselves alone.

after all, since we have already achieved 190.000.000g (acceleration of a proton in the Large Hadron Collider) and 8.900.000.000.000.000.000g (acceleration from a wakefield plasma accelerator) (6) and considering that the solar core density is about 150 grams / cm³, about 10 times the density of gold or lead (7) and simply about 150 times the relative density (specific gravity) of liquid water at sea level (8), something sounds strange. it's somehow difficult to believe

we cannot achieve this density, for example, focussing several magnetic fluxes on a single point with a concentrated magnetic confinement device which design concept is much closer to the natural gravitational model of stars, excluding the electrons from the previously ionized D-T mixture to facilitate the overcoming of the repulsive electrostatic forces that prevent the fusion of the positively charged nuclei. attending to our technical capabilities these days, it seems feasible to consider that, most probably, we already have advanced technology enough to reproduce on earth the compressive forces occurring inside of the stars by means of a single-pointed magnetic confinement device, whichever its design could be, but it seems we have not found yet the proper way to arrange the magnets. what has been shown here is nothing more than another proposal which main intention is to encourage and promote a deep rethinking on why we still have not found a solution to this problem at the present time, since from a certain point of view it doesn't seem to be very clear whether we cannot do it because of technical limitations or because of a strong psychological barrier deeply rooted in our minds, a predetermined and misleading way of thinking at the basis of the *know how* to tackle this problem with our current knowledge.

8 objections to this approach

from a pragmatic point of view, it wouldn't be fair to exclude from this paper the most probable problems that could arise in our minds when subjecting any of the **A** models to progressive analyses. since everything has to be said to weigh the pros and cons of this project, now it is time to play the role of a harsh "devil's advocate" to give some prominence to the negative aspects of the present work in favour of a clearer conclusion about all what has been already put forward before, because many doubts may appear from a careful examination of the ideas proposed in this document. let's see some of the reasons we could find in opposition to this single-pointed magnetic confinement concept, because some of them may be very helpful to elucidate what could come out of all this mass of hypotheses and speculations.

— in the very hypothetical case that some of the three **A** models were to produce a thermonuclear fusion reaction at their core because the induced particles were to follow very approximately the magnetic vectors generated by these devices, none of these reactors would be capable of confining the plasma at their central area because the magnetic field lines are continuous vectors, since they are naturally uninterrupted lines that converge into the core of these devices and they diverge from it afterwards due to the radial constitution of their design.

— even if some nuclear fusion reaction were to be produced inside of these devices, they would not be able to reach the break-even point where the input and the output of energy are equal. therefore, there would be no heating power enough to drive steam turbines, thus adding the configurations here proposed to those of other reactors capable of achieving nuclear fusion but incapable to produce a higher output of energy.

— the radial magnetic confinement is not comparable to the gravitational confinement produced inside of the stars, though the latter is radial too, because the gravitational field lines have indeed starting and ending points, since they are naturally interrupted as they converge linearly towards the central mass of the stars where the particles end their trajectories of attraction colliding with each other and producing in this way a natural fusion reaction.

— the repulsive forces between the ions would make them to find much easier to recirculate through the secondary virtual coils produced between the external parts of the magnets, because of their opposite polarity and in spite of their apparently lesser magnetic strength, instead of fusing at the core of the devices, producing in this manner an always unconcluded movement with no predictable nuclear fusion reaction.

— when reconsidering the confinement strategy proposed in this paper, it is perhaps a great mistake to take too much for granted the effects of the converging magnetic field lines while ignoring the effects of these same field lines as they diverge following their uninterrupted trajectory outwards after reaching the central area of the devices.

— though the radial geometry of the three **A** models may seem more interesting than, for example, that of the Polywell, though this uses an inertial electrostatic confinement strategy, the latter, as well as many other configurations, are much more technically advanced than those proposed in this document.

— though we can probably learn something from each of our mistakes whichever they are, we must consider the possibility that this might be no more than a "believing machine" among many others, and that this kind of things tend to produce a sustained state of acceptance of them as "false promises" our minds tend to follow in a permanent attempt to find their always impossible materialization. in fact, many people have fallen in these kind of traps in the past when looking for what they called perpetual movement.

— this paper cannot convince anybody for testing the approach here put forward because its author is an insignificant being when compared with the research teams currently at work in much more feasible projects, with astronomical sums of money invested in them, because they have far more complicated and perfectly proven arguments to put the Sun into a box.

9 some interesting replies

however, we could answer to some of this technical objections adding to them some few questions that could probably lead to a very different point of view:

— what would happen inside of these radial magnetic confinement reactors if we would apply to each of their magnets an alternating current with an as high as possible frequency for them, following a circular input sequence (clockwise as seen from above the devices) of multi-phase electric power with different wave patterns?

— what would happen to the positively charged nuclei if we would directly inject them into the central area of these devices while previously applying to their magnets a sustained moderate strength?

— would the induced particles tend to be driven towards the most external magnetic field lines as it seems to occur in any other coil whatever the electric current applied to it?

— would this mean that the particles would tend to be driven towards the central area of the devices since this is the most distant part respecting to the magnets, where their magnetic field is weaker, and the multi-phase alternating current seems to prevent the particles from flowing outwards through the secondary virtual coils?

— would the charged particles be positioned and relatively confined in this way at the core of the reactor?

— what would happen to the confined particles if then we were to increase the power applied to the magnets?

— would the magnets generate a higher radial compression producing in this way the nuclear fusion of the confined ions?

— would the multi-phase alternating current produce in addition some *plasma spin* as a result of the circular sequence of energy input applied to the magnets, driving in this way the charged particles to a fusion state with a roughly spherical form, since they are trapped in the magnetic vectors nearest to the central area?

— how could we really know whether or not this is a feasible project? could we subject it to preliminary testing with some simulation software?

further details in the **addendum** at the end of this paper: **some technical details**

10 to finish

there are very different creative attitudes, not always concerned with standard thinking and simple rationality like that of the conventional scientific method, that seem to provide much more interesting results when looking for solutions to difficult problems by other means, though they also involve the possibility of committing mistakes and this is why a very sharp discrimination is always necessary to come into play to constantly clarify them. from this point of view, if there's some solution to the nuclear fusion problem it seems clear enough it will be an idea before and a fact afterwards with the corresponding scientific formulation. given that new ideas don't seem to come from the blind application of already known ones, creativity seems to be the capricious flow of a third psychological factor not concerned with already known natural phenomena only, but something that tries to see possible relations between them (analogical thinking) and then it looks for the way to materialize them in the form of a new phenomenon. in other words, it's something that arranges already known things in a different way to create a new thing. and if this seems to be the way Nature works slowly and patiently over Time to ensure the evolution of Life and Mind towards ever higher levels of Consciousness capable of a greater understanding, complexity and creativity, some of us may try to follow this same pathway.

in spite of opinions, life has always been a fascinating adventure we can only choose either to face or to face. there seems to be no choice when dealing with challenges. and if we consider that, in matter of science, the idea precedes always the proof because the proof can be only the demonstration of the idea, it seems clear enough we will never find the solution to a completely new physical challenge, whatever it was, just before conceiving the idea of its solution. and if we don't consider all possibilities, though they can be reasonably questionable at first, we may be leaving some fresh ideas apart which value we cannot judge beforehand without subjecting them to practical testing for validation or definitively dismiss them as a worthless thing. to succeed or to fail in this quest doesn't probably depend on us so much as we could desire it. but, as we already know, we are able to learn from our failures too. in fact, this is one of our most distinctive features as an evolutionary species, since evolution and progress have always proceeded in this way. according to this natural rule, in this long and difficult quest to bring the power of stars to this troubled world, we can only learn from empirical observation to obtain new unexpected data rather than from sterile theories or pure logic only, that's through action and experimentation. but what's the nature of those new ideas that sometimes appear in our minds, before of any physical proof of their existence, as a play of imagination and knowledge? are creativity and originality founded upon technical information only or is there something more that precedes and determines the creative activity by itself? are new discoveries the result of the merely rational and mechanical application of a set of fixed and unmovable laws and methods as if we were to follow a stone handbook? aren't we really missing something so subtle and important as to be able to lead to a new design concept for a potential source of unlimited energy?

on the other hand, all this approach might be no more than a huge foolishness coming from a bizarre way of thinking, and its author is very aware of it, but... why not to share it? I don't know whether something would happen inside of these devices but, since a single-pointed magnetic

confinement model has been never tested, who knows which would be the result? at least, it would be a first attempt. moreover, the general idea has been already detailed enough with this paper and this new insight has reached a point where it would be unproductive to continue elaborating more theoretical work without a computational simulation to get some physical feedback.

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please, excuse me for any possible mistake in this text, since english is not my native language.
thank you.

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references

- 1 - Wikipedia - Rotational symmetry - 1.1 n-fold rotational symmetry
http://en.wikipedia.org/wiki/Rotational_symmetry
- 2 - Magnet Lab - National High Magnetic Field Laboratory
<http://www.magnet.fsu.edu/education/tutorials/java/fieldlines/index.html>
- 3 - NDT - Nondestructive Testing Resource Center -
a word of caution about the right-hand rule
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- 4 - Encyclopædia Britannica, "magnetic circuit."
Encyclopædia Britannica Ultimate Reference Suite.
Chicago: Encyclopædia Britannica, 2012.
- 5 - University of Rochester - Laboratory for Laser Energetics (citation needed)
- 6 - Wikipedia - g Force - 6 Typical examples
<http://en.wikipedia.org/wiki/G-force>
- 7 - NASA - Solar Physics
Sun Facts <http://solarscience.msfc.nasa.gov/>
The Solar Interior - The Core <http://solarscience.msfc.nasa.gov/interior.shtml>
Wolfram Alpha - solar core density
<http://www.wolframalpha.com/input/?i=solar+core+density>
- 8 - Wolfram Alpha <http://www.wolframalpha.com/input/?i=specific+gravity+water>

images

- cylindrical coil

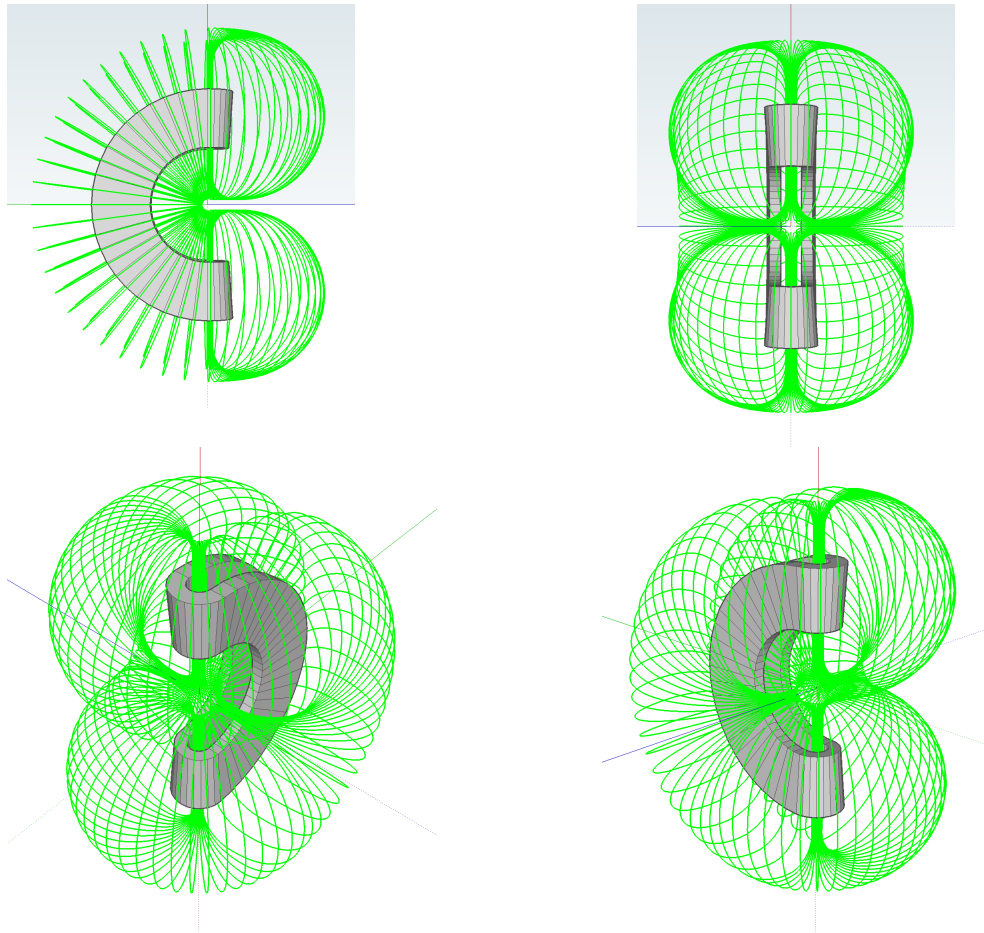
third image at Section "4 the coils" by Geek3 using VectorFieldPlot software.
license: Creative Commons Attribution-Share Alike 3.0 Unported (June 2010)
gallery: <http://commons.wikimedia.org/wiki/User:Geek3/Gallery>
software: <http://commons.wikimedia.org/wiki/User:Geek3/VectorFieldPlot>

- nuclear fusion reaction

single image at Section "6 electrons, why?" by courtesy of Fusion for Energy.
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main website: <http://fusionforenergy.europa.eu/>

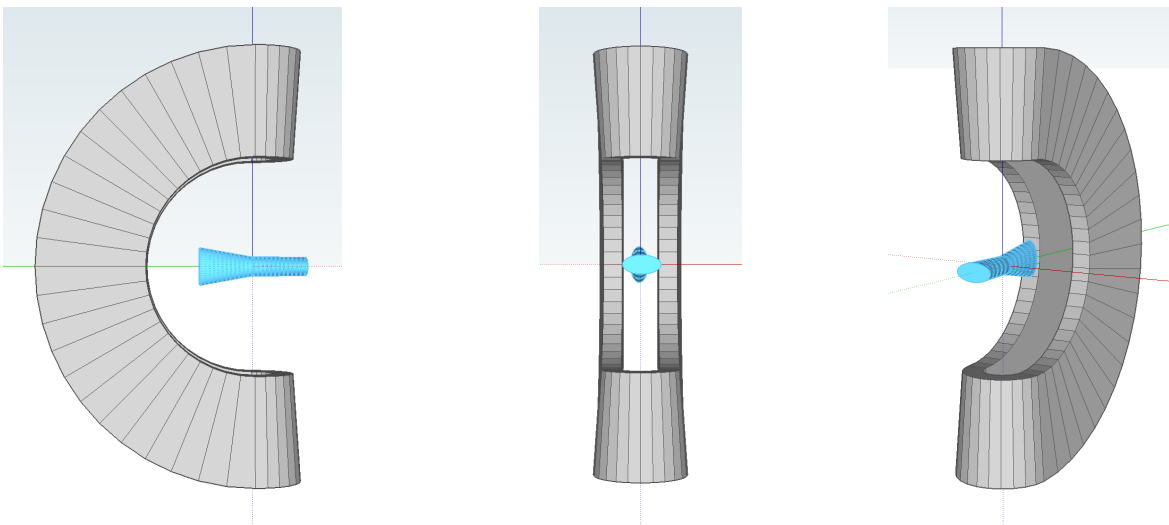
- the rest of images and 3D models are made by the author of this paper.

some technical details



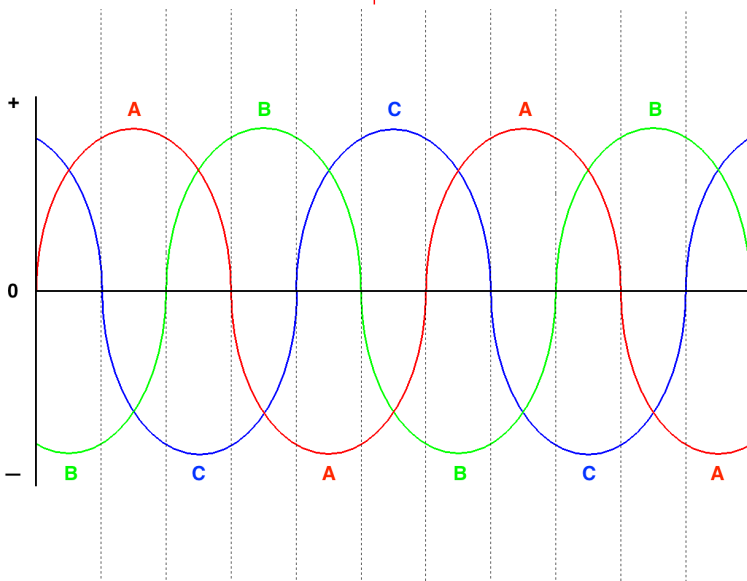
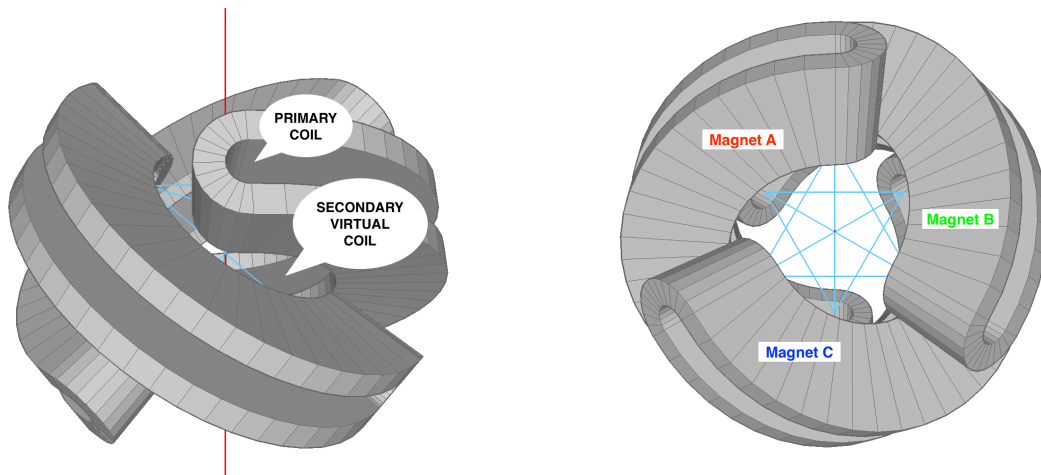
one single layer of magnetic field lines in an isolated magnet.
(conceptualized)

though this is a bent dipole magnet, there's no null field in the center because of its asymmetry respecting two dipole magnets facing each other like in a simple biconic cusp configuration.



the resulting magnetic flux is concentrated at the central area, where the magnetic field is weaker, a very necessary condition for the "low field seeking particles". (conceptualized)

Model: **A 3.0**



magnets input sequence: **A B C**
conceptualized wave pattern

circular input sequence (clockwise as seen from above the device) of *three-phase alternating current*.

inner primay coils: (see first image above)

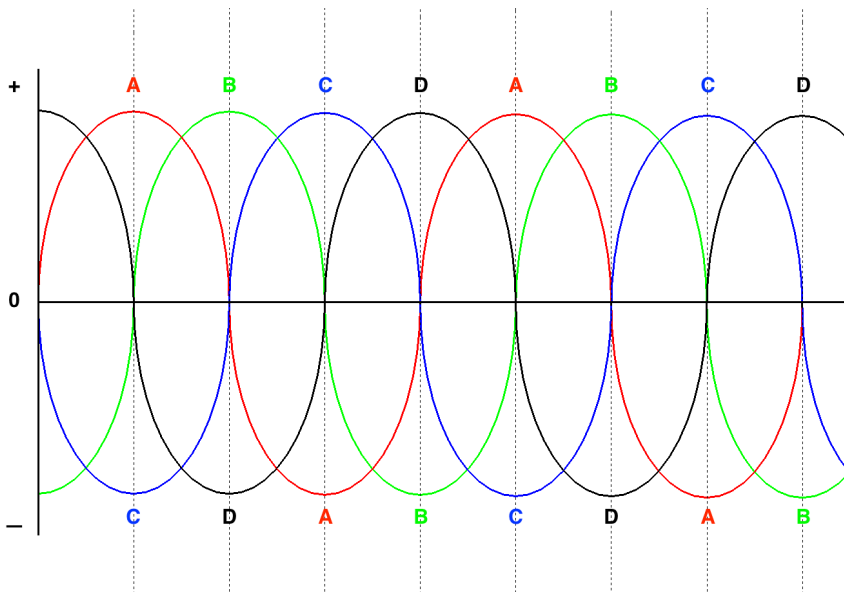
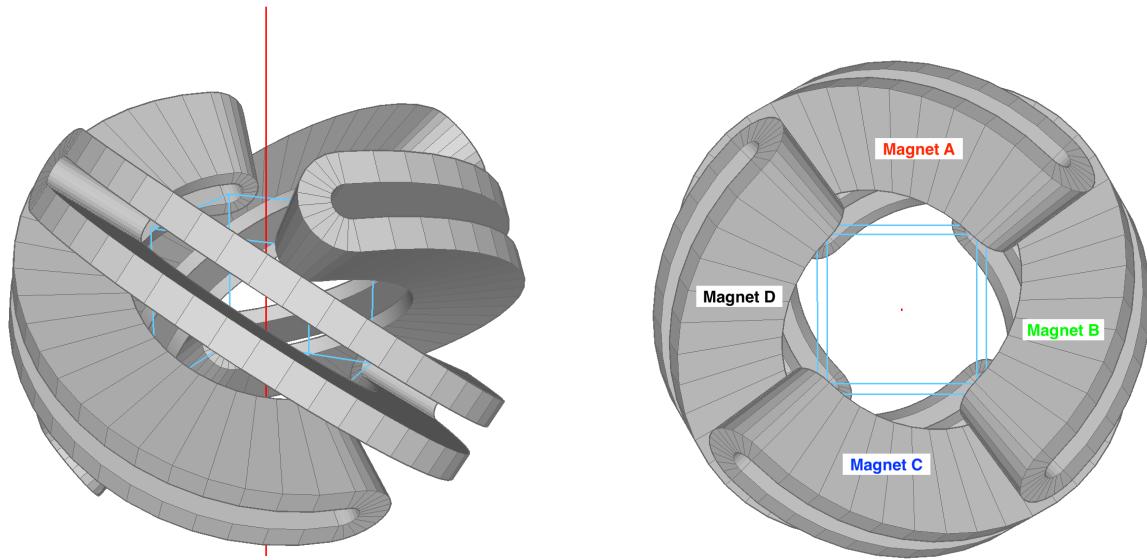
balanced and symmetrical inner B-field lines, though with alternating polarity and variable magnetic strenght.

external secondary virtual coils:

imbalanced and asymmetrical inner B-field lines, since they are “shared coils” that depend on two different magnets with different phases of energy input.

due to the difference between the inner B-field lines of the three primary coils (stable, balanced and symmetrical) and those of the three secondary virtual coils (unstable, imbalanced and asymmetrical), it seems that this device cannot work in the same way as a conventional hexapole, though this is its apparent configuration, because of the three-phase alternating current applied to its magnets in a circular sequence and the different effects produced in this way over the interactions of their magnetic fields.

Model: **A 4.0**



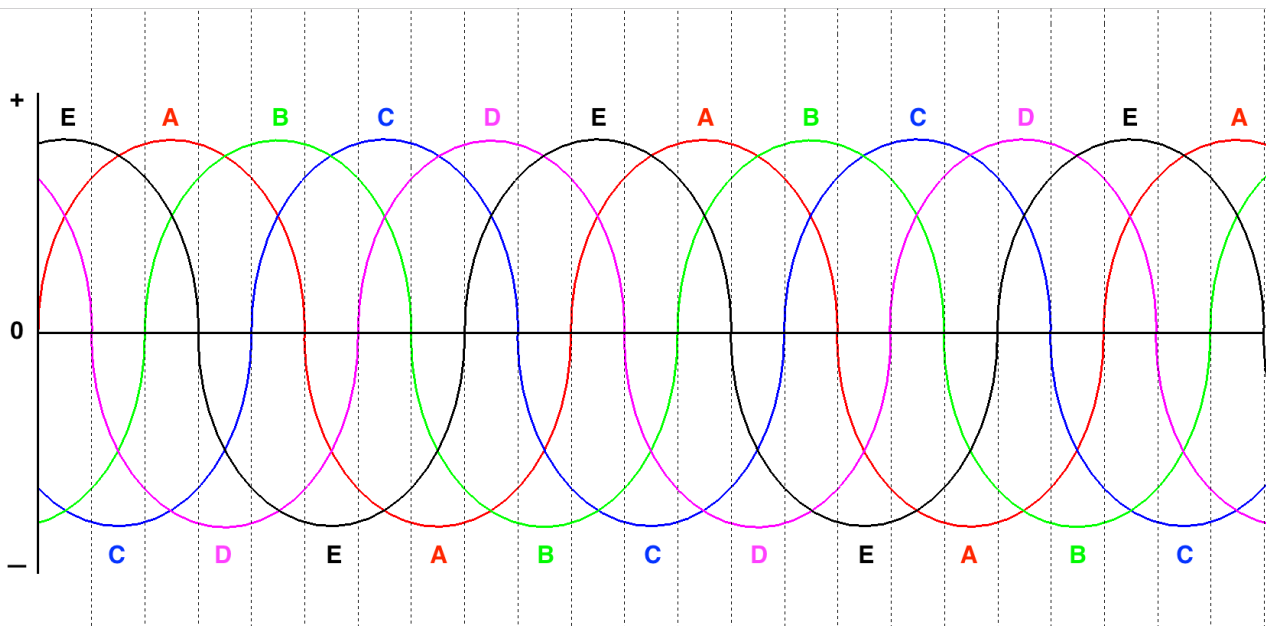
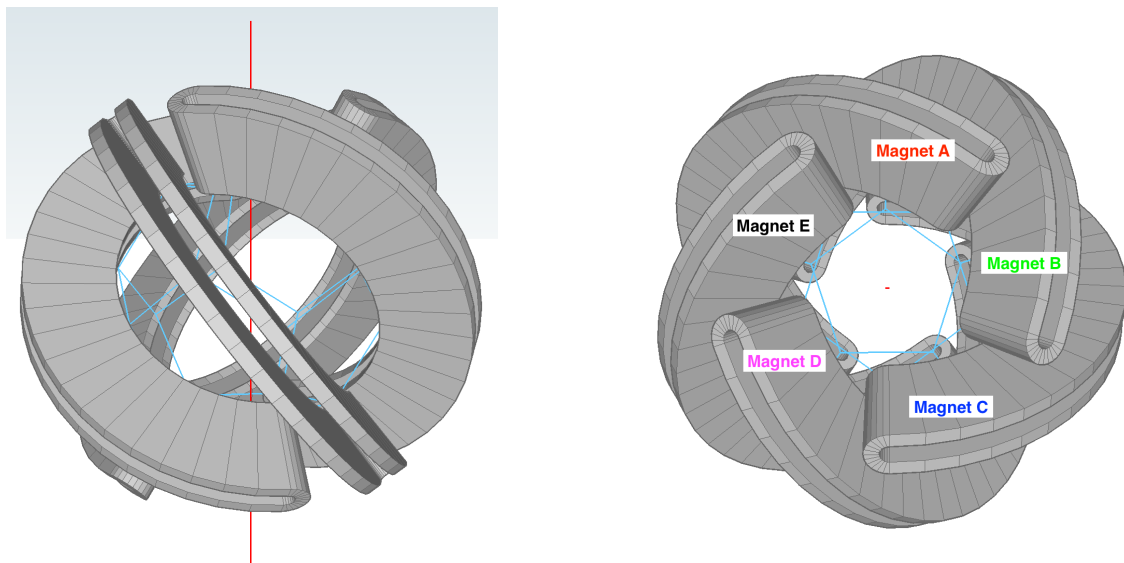
magnets input sequence: **A B C D**
conceptualized wave pattern

same than previous Model A 3.0

the only difference in this configuration is that a *four-phase alternating current* is applied to the magnets to produce a similar result.

due to the alternating interaction of pairs of magnets, this model seems to behave like two combined quadrupoles in a rotating configuration.

Model: **A 5.0**



magnets input sequence: **A B C D E**
conceptualized wave pattern

same than previous models A 3.0 and A 4.0

five-phase alternating current is the main difference for this configuration.

though this is a much more complex frequency pattern, just like in the two previous models (**A 3.0** wave pattern is easier to analyze in comparison) it seems there's a constant alternating combination of positive pulses for every combination of negative pulses, and vice versa. therefore, since this occur in a fast circular sequence, which could be the resulting B-field at the center of these devices? and which could be the trajectories of the charged particles into these magnetic fields, considering that they have a mass and an inertial movement as a result of their magnetically induced speed?

low hypotheses

since these are very complex configurations designed to work with multi-phase wave patterns of alternating current, some unforeseen magnetic interactions could still appear to hinder their operation. moreover, while lacking of some testing and physical feedback for a deeper analysis, we can only manage with weak suppositions, just like, for example, the following ones:

— a multi-phase alternating current allows to increase the wave lenght for each phase while keeping a good frequency of energy input for the whole system, and this may be needed to relatively counteract the magnets inductance.

— the charged particles would be driven towards the central area of these devices, since this is where their magnetic field is weaker, and a multi-phase alternating current would provide a rotating magnetic pulse seeming to prevent the ions from flowing outwards through the secondary virtual coils because of their asymmetrical inner B-field lines respecting to those of the primary coils.

— in these configurations, the plasma would be like a *free rotor*, while the magnets would be like a *helicoïdal stator* with a double function: to ensure the confinement of the ions at the central area of these configurations where their magnetic field is weaker and to compress the mixture of charged particles to overcome their repulsive electrostatic forces. however, these devices could provide not a compressive strategy with the huge amount of necessary energy input to work, but an inertial strategy based on the radial acceleration of the positive nuclei and their constant change of direction due to the ac applied to the magnets, probably leading in this way the charged particles to collision.

— a multi-phase alternating current would produce in addition a *plasma spin*, as a result of the circular sequence of energy input applied to the magnets, driving in this way the positive nuclei to a fusion state with a roughly spherical form.

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