Patent Application

Generic title:

A modular apparatus for generating energetic particles, energy conversion, capture, and storage

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CROSS-REFERENCE TO RELATED APPLICATIONS
Reference is given to the text in the application;

STATEMENT REGARDING FEDERALLY SPONSORED RESEARCH OR DEVELOPMENT
Not Applicable

REFERENCE TO SEQUENCE LISTING, A TABLE, OR A COMPUTER PROGRAM LISTING COMPACT DISK APPENDIX
Not Applicable

BACKGROUND OF THE INVENTION

The present invention is in the technical field of generating energetic particles in form of Leptons and Mesons and energy conversion and storage thereof.
Emission problems associated with energy generation from burning fossil fuel and fuel disposal problems from traditional fission nuclear power are significant, while the generation of Leptons and Mesons for processes associated with generating energy from particle interaction are desirable.

Alternate energy conversion methods processes such as Muon-catalyzed fusion, known since the 1935´s, was initially promising although each Muon can only react 52-246 times because of the phenomena known as alpha sticking even in case of tritium-deuterium fusion. Additionally, Muons will decay in about 2.2 Nano seconds.

Exiting methods for producing Leptons and Mesons, such as producing Muons using a Proton accelerator is technological complex and expensive with significant amount of energy required.

Thus simpler more efficient ways of generating Leptons and Mesons is required to progress into utilizing such particle generation for energy conversion. The invention described herein will address such methods for the generation of Leptons and Mesons as well as using and capturing and converting the energy together with method of storing intermediate phases of the hydrogen/deuterium/tritium used in the process.

Cited documents with methods and apparatus the invention is novel to;

Patent; SE 539 684 C2, Leif Holmlid, Apparatus for generating Muons with intended use in a fusion reactor. EP2646245 A1, EP 2680271 A1 XP012199618, US 20080008286, US 20080008286 XP 029387484, DE 102015114749 A1, Holmlid 2007 Mesons from Laser induced processes in ultra dense hydrogen (H0) PLOS ONE 12(1) e 0169895 https://doi.org 10.1345/ Journal Pone 0169895

ABSTRACT

The presented invention is a modular based apparatus for generating and using Leptons and Mesons, comprising a modular apparatus (10) with a dynamic gimbal (1) moving relative to the modular apparatus (10) responding to gravitational force in response to external movements of the modular apparatus (10) or through a controlled movement, allowing multiple field source devices (46) mounted on top and bottom of the modular apparatus (10) to emit pulses hitting and triggering ultra -dense hydrogen forms formed on variable areas on the dynamic gimbal surface undulation (8), or ejection devices (7), whereby such ultra dense hydrogen forms formed through a flow path of hydrogen through an outer catalysts (12) and inner catalyst (2) having a material composition to cause transition of hydrogen from a gaseous phase to an ultra-dense state, ejecting into the upper reaction chamber (4) or lower reaction chamber (5) that is sealed off from each other by a seal system(6) whereby the upper chamber(4) pressure is controlled by outlet upper chamber(14) and lower reaction chamber(5) pressure is controlled by outlet lower chamber (16) and whereby pulse triggering by the field source device (46) of the ultra-dense hydrogen on the surface (8) and ejection device (7) will emit Leptons and Mesons.

SUMMARY OF THE INVENTION

A modular apparatus to generate Leptons and Mesons for non-destructive testing, hydrogen storage applications and for conversion into heat, electricity and for use in Muon Catalysed fusion.

Such modular apparatus has a primary feature to produce Leptons and Mesons in an apparatus with a dynamic gimbal that can move dynamically independent from the apparatus, functionally controlled or as a response to movements of the apparatus. Further to divide the reaction chamber in an upper and lower reaction chamber for a dual Lepton and Meson production increasing the particle radiation sphere, providing redundancy and allowing constant movement of triggered ultra-dens hydrogen/deuterium/tritium reactive area to ensure sufficient regeneration of applicable ultra-dense forms in form of hydrogen/deuterium/tritium clusters.

An inlet on both sides of the apparatus allow hydrogen/deuterium/tritium to flow initially through a set of catalysts with a material selected for a transition of hydrogen/deuterium/tritium into ultra-dense state. The mix of gaseous and ultra dense state of hydrogen/deuterium/tritium is then entering the modular apparatus through a seal system, holding flow to upper and lower reaction chamber separately, for then the flow paths to enter the dynamic gimbal also with a set of catalysts for then to be ejected into the upper and lower reaction chamber respectively through an ejector onto an undulated surface on the dynamic gimbal. Multiple field sources, typically lasers, will through focusing lenses trigger the ultra dense phase formed on the undulated surfaces producing Leptons and Mesons.

The ultra dense state, herein defined as H(0),D(0),T(0) should be understood as hydrogen/deuterium/tritium in form of a quantum material with adjacent nuclei in clusters having a distance less than 35 pm.

The catalytically material is a material or alloy capable of absorbing hydrogen/deuterium/tritium gas molecules H_2 and dissociating these molecules to atomic hydrogen/deuterium/tritium that is catalysed the reaction $H_2 \Rightarrow 2H$. The catalyst has a surface whereby the hydrogen/deuterium/tritium atoms can easily attach to other molecules on the surface. The catalyst, typically porous, shall maintain the feature of transition of the hydrogen into ultra dense state when the atoms are prevented from re-forming covalent bonds. This process is well understood and has been experimentally shown. Catalysts of "styrene" type as well as metallic catalyst such as Iridium and Platinum are commercial available. The catalyst may transfer the

hydrogen/deuterium/tritium 2H directly to ultra dense phase H(0) or via the higher energy phase H(1) into H(0).

The dynamic gimbal has an ejection device and an undulation surface in the upper reaction chamber and an ejection device and an undulation surface in the lower reaction chamber. The undulation may be formed with various slopes and configurations as demonstrated through tests, although surface entrapments in form of circular surface rails holding and or slowing the constant movement/escape of the ultra-dese hydrogen/deuterium/tritium is implemented. The dynamic gimbal further includes injection devices spreading the ultra dens phase hydrogen/deuterium/tritium as well protecting the entrance of such ejection into the upper and lower reaction chamber respectively. The ultra-dense phase-formation on the undulated surface of the dynamic gimbal is a process as function of time, temperature and pressure and material characteristics. Thus both of the catalysts on the flow paths are heated by temperature probes as well as the flow regulated by optimizing inlet flow, pressure and time. Ultra-dense phase of hydrogen/deuterium/tritium on the undulate surface as well as ejection on the dynamic gimbal is pulsed by a field source device such as focused lasers to efficiently convert clusters to particles. The movable gimbal mechanism constantly moving will provide optimum reformation and triggering of hydrogen cluster sizes. The dynamic gimbal is free to move within certain mechanical limitations in response to random or functionally controlled movements versus the modular apparatus containing the field sources such as lasers. Such random movements may occur when used in a mobile application such as in a space shuttle, airplane, missile or vehicle. The movement of the dynamic gimbal may also be controlled by means of a set of magnets mounted on the gimbal interacting with an upper and lower set of electromagnets in the modular apparatus, thus pending electromagnetic field strength of upper versus lower sets of electro magnets may move said dynamic gimbal to wanted position. Typically, such as selecting a time determined random movement.

Field sources, typically two or more lasers lasers in the upper reaction chamber and two in the upper reaction chamber are placed in the modular apparatus and arranged to selectively or simultaneously irradiated hydrogen/deuterium/tritium in ultra-dense state formed on the undulated surface of the dynamic gimbal. Such lasers with focusing lenses irradiate through a field source conduit outfitted with a simple closure valve that allow the laser to be isolated from the relevant chamber and replaced if required during normal operation without opening the upper or lower reaction chamber.

A number of sub-modules are attached to the modular apparatus to utilize the emitted Leptons and Mesons emitted from the upper and lower undulated surface of the dynamic gimbal. Each sub-module is mechanically attached to the modular apparatus and such attachment methods are not further discussed herein as such methods are plentiful and

commonly known. The sub-module is sealed off versus the modular apparatus by means of metallic and or elastomeric seal systems.

One or multiple electric power sub-modules may be attached to the modular apparatus for converting the emitted Leptons and Mesons into electric power. The electric power sub-module can be equipped with a film/barrier, typically aluminium, towards the modular apparatus upper or lower reaction chamber for converting the Leptons and Mesons into charged Muons emitting through electrical coils for the extraction of power. The sub-module chamber may have vacuum or a protective inert gas such as nitrogen to protect the materials in the coils, typically ferrite and avoid particle gaseous interaction. The pressure of the gas is balanced with that of the modular apparatus reaction chambers by means of a pressure/gas barrier compensator allowing one gas in the reaction chamber and an other in the electric sub module although with no pressure differential.

One or multiple gas pressure sub-module with one or multiple chambers with choice of pressure filled with desired gases, typically such as hydrogen, deuterium, tritium in gas or ultra-dense form that allows the Leptons and Mesons being initially be converted through a foil, typically aluminium, into Muons for then to enter the selected gas or ultra-dense for interaction and de-acceleration of the particles to generate heat or to produce Muon catalysed fusion reactions. A method of heat exchange can typically be done with a heat pipe or ribs coiled and formed around each module for effective heat transfer.

One or multiple sub-modules storage of ultra-dens state Hydrogen(H(0) Deuterium D(0) or Tritium T(0) may be attached to the modular apparatus whereby such sub-module has a a chamber isolation valve and an outlet with isolation valve and a pressure compensator/barrier used to ensure no contamination of said sub-module. Whereby the storage module may be filled with ultra-dense Hydrogen H(0) Deuterium D(0) or Tritium T(0) for the purpose of removal and utilization in other reactors, and or fast starting the Lepton and Meson generation process after a shutdown.

One or multiple sub-modules for photon to electron conversion may be attached to the modular apparatus. The photon to electron conversion may not be further enriched herein since such methods are commercially available.

One or multiple sub-modules for radiation of Meson and Leptons or decayed particle forms, to electron conversion may be attached to the modular apparatus. The radiation to electron conversion may not be further enriched herein since several methods are known and available.

One or multiple sub-modules for co-conversion of the Meson and Leptons into Muons by means of a film/barrier typically aluminium. Such Muons may be radiating through items of organic or none organic materials for displaying inner conditions such as factors and or none-homogeneous items. Thus the application may be for non-destructive testing, radiation and detection of humans and animals, radiation and the detection of concealed matters in storage or transportation devices.

DETAILED DESCRIPTION OF CERTAIN PREFERRED EMBODIMENTS

Figure 1 is a functional illustration of the overall apparatus for generating Leptons and Mesons, and the conversion and using energetic particles and resulting decayed particles into energy and or storage of hydrogen/deuterium/tritium in ultra-dense phase.

The apparatus comprising a modular apparatus (10) with a dynamic gimbal (1) moving relative to the modular apparatus (10) responding to gravitational force in response to external movements of the modular apparatus (10) or a functionally controlled movement, allowing multiple field sources (46) mounted on top and bottom of the modular apparatus (10) to annihilate ultra-dense hydrogen. The dynamic surface (8) provides new ultra-dense target clusters at all times through its gimball moving mechanism.

Ultra-dense hydrogen is formed through outer (12) and inner catalysts (2) having a material composition to cause transition of hydrogen from a gaseous phase to an ultra-dense state ejecting it into the upper reaction chamber (4) and or lower reaction chamber (5). The upper reaction chamber (4) and the lower reaction chamber (5) is sealed off from each other by a seal system(6) whereby the upper chamber(4) pressure is controlled by outlet upper chamber (14) and lower reaction chamber(5) pressure is controlled by outlet lower chamber (16). A trigger from device (46) will convert ultra-dense hydrogen into Leptons, Mesons and decaying particles. The particles will by distance and or subject to interaction with a film/barrier decay to charged and neutral Muons. Whereby the seal system(6) typically will allow for a pressure differential between the flow paths from gas inlet (15) or gas inlet (11) and the upper reaction

chamber(4) or lower reaction chamber(5) during injection of hydrogen/deuterium/tritium through the flow paths but normally being balanced when not in use.

Referring back to Figure 1 with modular apparatus (10) whereby such dynamic gimbal (1) is moving relative to the modular apparatus (10) inside said modular apparatus (10) and maintain balanced position relative to effect of natural gravitational forces while modular apparatus (10) is subject to movements, but may also be actively functionally operated by a controlled electromagnetic operation of a set of modular apparatus upper magnets (50) and a set of modular apparatus lower magnets (51) acting on a set of dynamic gimbal magnets (49) whereby any desired movements can be generated within the limitation of the seal system(6). Seal system (6) is sealing off such magnets from the upper reaction chamber (4) and the lower reaction chamber (5)
The modular apparatus (10) with a dynamic gimbal (1) forming and upper reaction chamber (4) and a lower reaction chamber (5) by a dividing seal system (6) sealing off the gaseous flow paths entered to the upper chamber (4) through an upper gas inlet (15) and lower gas inlet (11), whereby both independent gas flow-paths initially enter an outer catalyst (12) that can controllably heated by a heater for outer catalyst (13) for then the flow path to enter an inner catalyst (2) that can be controllably heated by an inner heater (3) from wires (17). The dynamic gimbal (1) may be given an electrical potential from wires (9).

The modular apparatus (10) with a dynamic gimbal (1) will emit ultra dense hydrogen into the upper (5) and lower chamber (4) through the nozzles (7). The field sources (46) with focusing device (47) and a power supply (48) may be disconnected from the modular apparatus during operation of said device. The modular apparatus (10) have field source conduits (19) with a field source isolation valves (18) allowing the unit to be disconnected from the modular apparatus during operation of said device by closing such isolation valves (18). The isolation valves (18) may be formed in different ways and may typically be represented by needle valves (18) being fully retracted when field source (46) is in use and fully made up and engaged for sealing of the field source conduit (19) when field sources (46) is being removed and or replaced.
The modular apparatus (10) is outfitted with one or multiple detachable electric power sub-modules (20) attached to said modular apparatus and sealed off by a metal or elastomeric sub-module seal (23) and equipped with alloy film barrier (22), typically containing aluminum, for converting Leptons and Mesons into Muons, whereby Muons is converted into electricity through coils (24)(21).
The modular apparatus (10) is outfitted with one or multiple detachable gas pressure sub-modules (28) typically loaded with Hydrogen /Deuterium/tritium gas and or ultra-dens form with single or multiple chambers attached to the modular apparatus (10) and sealed off by pressurized sub module seals (32) and an foil arrangement (31) typically aluminum, for interaction and converting energetic particles to Muons for further interaction with

Hydrogen/Deuterium/tritium gas. De- acceleration in gas phases will produce heat which is extracted in the heat pipe system(29).

The modular apparatus (10) is outfitted with one or multiple Photon to electron converting sub-modules (32) that include a converter device (34) and is sealed off by a photon to electron converter sub-module seal (33). The Photon to electron conversion may be done by many principles, although such specific multiple principles are not claimed herein.

The modular apparatus (10) is outfitted with one or multiple ultra dense hydrogen/ deuterium/ tritium storage sub-modules (35) for interim or permanent storage of ultra-dense hydrogen/ deuterium/tritium. The module(35) is sealed off by a storage sub-module seal (36) with an isolation valve (53) on a the pressure conduit (40). The modules are normally closed, but opened when ultra dense hydrogen/deuterium/tritium shall be allowed in or out of the sub-module. Such storage of ultra-dense hydrogen/deuterium/tritium may be utilized for fast startup of a particle generation process or being used for other purposes such as startup of external reactors by transport the storage sub-module(35) and or link the pressure conduit(40) to said external reactor.

The modular apparatus (10) is outfitted with one or multiple PMT (Photomultiplier tube) sub-modules (42) for monitoring and control of the process, while such PMT sub-module is seal off to the modular apparatus(10) by a PMT sub-module seal system (43).
The modular apparatus (10) in accordance with claim 2 is outfitted with one or multiple radiation to power sub-modules (42) for converting radiation to electric power.
The modular apparatus (52) in accordance with claim 2 is outfitted with one or multiple Muon NDT(None Destructive Testing) sub-modules (102) for monitoring and control of the process, while such Muon NDT sub-module is sealed off from the modular apparatus (10) by a Muon NDT sub-module seal (53)

THEORETICAL DISCUSSION AND EXPERIMENTAL RESULTS

The catalyst may transfer the H_2 D_2 T_2 (Gaseous hydrogen/deuterium/tritium) through 2H,2D ,2T directly to the ultra-dense phase H(0) D(0) T(0) or via the higher energy phase H(1) D(1)T(1) into H(0)D(0)T(0). These ultra dense phases are quantum material at room temperature. The mechanism of formation of ultra-dense matter starts with a higher Rydberg matter levels (I=0,1-3) which are formed at the catalyst surface. Thus H(0) D(0) T(0) are formed from Rydberg matter whereby I=1-3 falling down to the ultra-dense state. The electrons in H(0) D(0) T(0) does not have any orbital motion, only spin motion. This spin motion can be interpreted as a motion of the charge.
A high number of studies have investigated the structure of D(0) and also the isotope protium p(0) which show both super conductivity and act like a "superfluid" at room temperature, typically with a D-D and p-p distance of 2.3 pm and less, thus the density of H(0) D(0) T(0) are very high.

The spin motion is centred on the H atoms which give a planar structure for the H-H pairs as in the case of planar clusters for ordinary Rydberg matter. Ordinary Rydberg matter has I>0 for its binding electrons, while H(0) D(0) T(0), ultra dens matter has I=0 and s>0(1,2,3…..) which is the quantum number for the binding electron. This means that the interatomic distance in ordinary matter is $2.9I^2$ a_o being replaced with $d=2.9S^2r_q$ for H(0) D(0) T(0), experimentally verified.
Bohr radius is a_0 and the spin circling charges provides the necessary shielding of the nuclei thereby keeping the material strong bound, similar though to the Rydberg matter but much higher biding energies. The nuclear process that takes place in H(0) D(0) T(0) under high field source impact such as laser pulsing is sill not absolutely known although the experimental results replicated and discussed herein demonstrates the process. The laser induces the transition from s=2 to s=1 in H(0) D(0) T(0). Such process gives Leptons and Mesons eventually decayed to charged Muons such as positive and negative Muons, where negative Muons are required for Muon catalysed fusion. Muon catalysed fusion produces neutrons, which has been detected.

Since we are detecting Muons, Kaons and Pions one route for the particle emission is the following;
$H_N(0)(s=1)\rightarrow \rightarrow (pe)(pe) \rightarrow n\ \bar{n} \rightarrow K^{+/-} + K^0 + \pi^{+/-} \rightarrow decay \rightarrow \mu^-$

Whereby $\bar{n}$ is an anti-neutron formed from the quasi-neutrons (pe) being proton + electron. These Mesons formed are Kaons and Pions and in order to conserved the number of quarks it is likely that three kaons are formed from each $H_N(0)$ particle. The number of quarks is largely unchanged although pairs production of Pions is also possible which does not conserve the number of quarks.
The process is highly exoergic and gives more than 52MeV to the particles ejected from each cluster pair formation of protons. This may be compared to results from D+D catalytic fusion which outputs per pair of deuterons 4-14 MeV depending on parameters such as pressure and temperature.

The catalyst used in the process to produce dense and ultra-dense phase H(0) D(0) T(0), or via H(1) D(1) T(1) is commercially bought catalysts normally used in plastic production industry to

produce styrene from ethylene benzene. The composition and functionality of these catalysts are known and is not included in this patent.

The inventors have demonstrated through testing the principles of such a novel design presented herein, but also through this design replicated aspects of L. Holmlid´s experiments described in patent SE 539 784 C2 by means of a novel and different design configuration.

The typical experimental set up for such testing is given by Figure 2. The experiment is a simplified test representation of the novel invention presented herein of modular based apparatus for generating Leptons and Mesons, comprising a modular apparatus (10) and whereby pulse triggering by the field source device (46) of the ultra-dense hydrogen on the upper and lower gimbal surface undulation (8) will emit Leptons and Mesons.

The demonstrated experiment showed Time Of Flight (TOF) time of 15,2 ns with a time of flight length of 2,77 m. Using the mass of Pion this corresponds to a kinetic energy of 43,27 MeV.

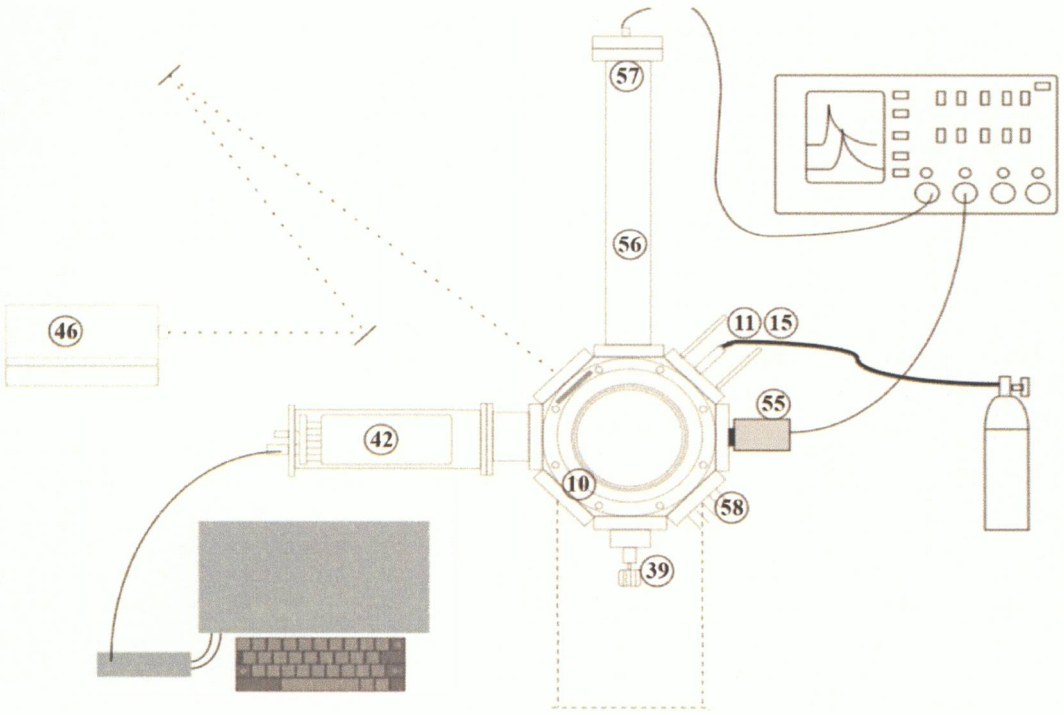

Figure 2 ; Experimental reactor for Ultra Dense Hydrogen showing YAG laser (46), photoelectron multiplier(42), time-of-flight sub-module TOF (56), Initiation TOF triggering sensor (55) TOF sensor element (57), modular apparatus (10), (gas inlet (11)(15), Mechanical adjustable substrate stage, storage submodule isolation valve (39) gimbal undulation (58) Test power and instrumentation interface

Ordinary Rydberg matter H(1) is a condensed phase of interacting Hydrogen Rydberg atoms and molecules, which can later condense to form ultra dense states of Hydrogen D(0) with bond distance of 2,3+/-0,1pm in a reactor setup.

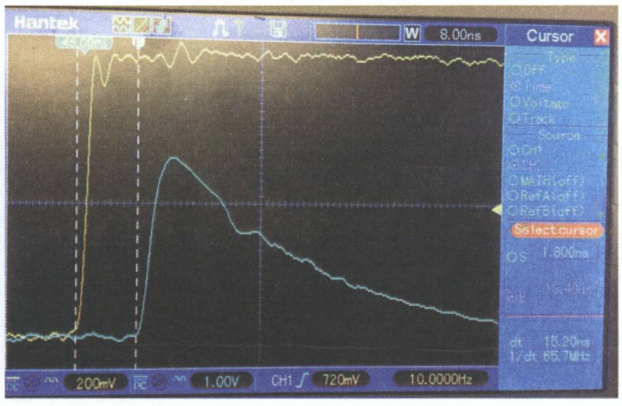

Figure 3 shows TOF with a length of 2.77 meters and time 15.2 Nano seconds and corresponding 43 MeV using the Pion mass.

In addition a coil was placed inside the Time Of Flight (TOF) tube to verify that the particles emitted from the process are charged and that electricity can be produced directly from the process. A voltage of 3,08 V was shown directly from the coil verifying that the particles are charged.

Figure 4 shows the electrical voltage from coil, with 3.08 Volt.

Production and monitoring of Rydberg matter, Ultra Dense Hydrogen and particle production was presented as can be seen from the presented results. The highly energetic charged particles are produced from the process and measured both with time of flight experiments and Muon detectors.

Reference is also given to,

L. Holmlid, Int. J. Modern Phys. E24(2015) 1535026
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