Dark Matter in the Milky Way Halo

Streams of dark matter interacting with rivers of stars could provide astrophysicists with important information about the distribution and make-up of dark matter in the halo of the Milky Way. That's the conclusion of Jo Bovy of the University of Toronto, who has calculated that it should be possible to observe the effects of dark matter on the stellar streams that are known to encircle our galaxy. [17]

Bursts of gamma rays from the center of our galaxy (shown above) are not likely to be signals of dark matter but rather other astrophysical phenomena such as fast-rotating stars called millisecond pulsars, according to two new studies, one from a team based at Princeton University and the Massachusetts Institute of Technology and another based in the Netherlands. [16]

Recent research conducted by scientists from the University of Granada can contribute to determine the nature of dark matter, one of the most important mysteries in physics. [15]

Scientists have detected a mysterious X-ray signal that could be caused by dark matter streaming out of our Sun's core.

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In particle physics and astrophysics, weakly interacting massive particles, or WIMPs, are among the leading hypothetical particle physics candidates for dark matter.

The gravitational force attracting the matter, causing concentration of the matter in a small space and leaving much space with low matter concentration: dark matter and energy.

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Rivers of stars could point to cold dark matter in the Milky Way halo

Streams of dark matter interacting with rivers of stars could provide astrophysicists with important information about the distribution and make-up of dark matter in the halo of the Milky Way. That's the conclusion of Jo Bovy of the University of Toronto, who has calculated that it should be possible to observe the effects of dark matter on the stellar streams that are known to encircle our galaxy.

The theory of cold dark matter (CDM) is one of the cornerstones in our understanding of the evolution of structure in the universe. It posits that the haloes surrounding galaxies such as the Milky Way should be clumpy, with myriad blobs of dark matter held together by gravity. The Milky Way's halo is also home to a swarm of globular star clusters and dwarf galaxies, some of which are being torn apart by gravitational tidal forces to create streams of stars that can stretch halfway around the galaxy.

For more than a decade, astrophysicists have suspected that dark-matter clumps could be detected by observing how their gravitational pull affects the motions of stars in stellar streams. Sceptics, however, point out that the Milky Way's gravity can also stretch the dark-matter clumps into long streams – and it would be much more difficult to observe the effect of such dark-matter streams on stellar streams.

Mapping in 3D

Now, new research by Bovy suggests that streams of dark matter can still be detected through their interactions with stellar streams pulled from globular clusters.

His calculations reveal that careful measurements of the motions of stars within these stellar streams could reveal the presence of dark-matter streams. These dark-matter streams could then be traced back to the clumps of dark matter that feed them. Ultimately, it should be possible to create a 3D map of dark matter in the Milky Way halo, he argues.

"I think it's one of the only ways where we can actually measure whether these little clumps of dark matter truly exist in the haloes of galaxies," Bovy told physicsworld.com. He also says that such measurements provide an excellent opportunity to study the nature of dark matter and work out if dark matter is indeed "cold".

Tiny clumps

CDM refers to hypothetical dark-matter particles that move much slower than the speed of light. This sluggishness should allow gravity to group CDM particles into relatively small clumps. While CDM is currently the most popular description of dark matter, an alternative theory is that dark matter is "warm" and hence moves faster than CDM. Warm dark matter would still be able to form clumps, depending on the energy of the particles, but these clumps would be no smaller than the smallest galaxies.

Bovy points out that the motion of the stellar streams should be able to reveal clumps of dark matter as small as 10 million times the mass of the Sun. If small clumps are found, this would be strong evidence that dark matter is indeed CDM.

"If [Bovy] is correct that the dark-matter clumps can be detected using streams, then that would be terrific," enthuses Kathryn Johnston of Columbia University in New York. In 2002 Johnston was part of a team that first suggested that undisturbed dark-matter clumps could be detected via stellar streams. "Our halo is the one place in the universe where I think we can really test this," she says.

Data deluge

Astronomers have so far discovered about two dozen stellar streams. They are not easy to find because they appear merely as over-densities of background stars in images obtained by the Sloan Digital Sky Survey telescope in New Mexico. The European Space Agency's Gaia mission, which is measuring the positions and motions of a billion stars, will help find new streams, as will the upcoming Large Synoptic Survey Telescope (LSST) currently under construction in Chile.

Johnston says that "the amazing data sets on the horizon from Gaia and LSST" are encouraging astrophysicists to focus on stellar streams. "We have real data coming, which means we must develop robust methods to measure the streams," she says.

Bovy agrees: "I think it's a very exciting area. The next few years, especially with the data from the Gaia satellite, are going to be of particular interest to the greater physics community, as this is one of the ways we can actually learn something new about dark matter."

Bovy's research is described in Physical Review Letters. [17]

Dark Matter Nixed as Source of Massive Bursts from Milky Way's Center

"Either we find hundreds or thousands of millisecond pulsars in the upcoming decade, shedding light on the history of the Milky Way, or we find nothing. In the latter case, a dark matter explanation for the gamma ray excess will become much more obvious," says Christoph Weniger from the University of Amsterdam.

Bursts of gamma rays from the center of our galaxy (shown above) are not likely to be signals of dark matter but rather other astrophysical phenomena such as fast-rotating stars called millisecond pulsars, according to two new studies, one from a team based at Princeton University and the Massachusetts Institute of Technology and another based in the Netherlands.

Previous studies suggested that gamma rays coming from the dense region of space in the inner Milky Way galaxy could be caused when invisible dark matter particles collide. But using new statistical analysis methods, the two research teams independently found that the gamma ray signals are uncharacteristic of those expected from dark matter. Both teams reported the finding in the journal Physical Review Letters this week.

"Our analysis suggests that what we are seeing is evidence for a new astrophysical source of gamma rays at the center of the galaxy," said Mariangela Lisanti, an assistant professor of physics at

Princeton. "This is a very complicated region of the sky and there are other astrophysical signals that could be confused with dark matter signals."

The center of the Milky Way galaxy is thought to contain dark matter because it is home to a dense concentration of mass, including dense clusters of stars and a black hole. A conclusive finding of dark matter collisions in the galactic center would be a major step forward in confirming our understanding of our universe.

"Finding direct evidence for these collisions would be interesting because it would help us understand the relationship between dark matter and ordinary matter," said Benjamin Safdi, a postdoctoral researcher at MIT who earned his Ph.D. in 2014 at Princeton.

To tell whether the signals were from dark matter versus other sources, the Princeton/MIT research team turned to image-processing techniques. They looked at what the gamma rays should look like if they indeed come from the collision of hypothesized dark matter particles known as weakly interacting massive particles, or WIMPs. For the analysis, Lisanti, Safdi and Samuel Lee, a former postdoctoral research fellow at Princeton who is now at the Broad Institute, along with colleagues Wei Xue and Tracy Slatyer at MIT, studied images of gamma rays captured by NASA's Fermi Gamma-ray Space Telescope, which has been mapping the rays since 2008.

Dark matter particles are thought to make up about 85 percent of the mass in the universe but have never been directly detected. The collision of two WIMPs, according to a widely accepted model of dark matter, causes them to annihilate each other to produce gamma rays, which are the highest-energy form of light in the universe.

According to this model, the high-energy particles of light, or photons, should be smoothly distributed among the pixels in the images captured by the Fermi telescope. In contrast, other sources, such as rotating stars known as pulsars, release bursts of light that show up as isolated, bright pixels.

The researchers applied their statistical analysis method to images collected by the Fermi telescope and found that the distribution of photons was clumpy rather than smooth, indicating that the gamma rays were unlikely to be caused by dark matter particle collisions.

Exactly what these new sources are is unknown, Lisanti said, but one possibility is that they are very old, rapidly rotating stars known as millisecond pulsars. She said it would be possible to explore the source of the gamma rays using other types of sky surveys involving telescopes that detect radio frequencies.

Douglas Finkbeiner, a professor of astronomy and physics at Harvard University who was not directly involved in the current study, said that although the finding complicates the search for dark matter, it leads to other areas of discovery. "Our job as astrophysicists is to characterize what we see in the universe, not get some predetermined, wished-for outcome. Of course it would be great to find dark matter, but just figuring out what is going on and making new discoveries is very exciting." [16]

UGR scientists provide new data on the nature of dark matter

In an article published in the prestigious journal Physical Review Letters, Adrian Ayala and her PhD thesis supervisor, Inmaculada Dominguez, both members of the "FQM Stelar Evolution and Nucleosynthesis" research group, have set limits to the properties of one of the particles which aspire to be identified as dark matter: axions.

Researchers in this project also included Maurizio Giannotti (Barry University, USA), Alessandro Mirizzi (Deutsches Elektronen-Synchrotron, DESY, Germany) and Oscar Straniero (National Astrophysics Institute, INAF-Astronomic Observatory in Teramo, Italy). This project is evidence of the increasing collaboration between particle physicists and astrophysicists, which has originated a relatively new type of science 'astroparticle physics.

In this project, scientists have used stars as particle physics labs: thanks to the high temperature inside stars, photons can turn into axions that escape to the exterior, carrying energy with them.

"This loss of energy can have consequences, whether they are observable or not, in some phases of stellar evolution", says Adrian Ayala. "In our research, we have conducted numerical simulations (by computer) of the evolution of a star, since its birth until it exhausts all the hydrogen first and then he helium in its interior, including the processes that produce axions".

Results indicate that the emission of axions can significantly diminish the time for the central combustion of helium, the so called HB (Horizontal Branch) phase: the energy taken by axions is compensated with the energy provided by nuclear combustion, which leads to a much faster consumption of helium.

"Using this influence over the timing that features in this sort of evolution we can determine the emission of axions, since a high emission rate means a quick HB phase, thus diminishing the possibility of watching stars in this phase", says Immaculada Dominguez.

Maximum axion emission rate

The high quality in the recent observation of globular clusters allows for the contrast between the results of the numerical observations conducted in this project with the actual data. "By comparing the amount of stars observed in HB phase with the amount of stars watched in a different phase not affected by axions (such as the so called RGB, Red Giant Branch, phase) we have made an estimation about the maximum axion emission rate.

The production of axions relies on the constant coupling of axion-photon which characterizes the interaction between axion and photons. "We have obtained a maximum limit for this constant which is more restrictive than those established so far, both theoretically and through experiments", these U. of Granada researchers point out. [15]

The Big Bang

The Big Bang caused acceleration created radial currents of the matter, and since the matter is composed of negative and positive charges, these currents are creating magnetic field and attracting forces between the parallel moving electric currents. This is the gravitational force experienced by the matter, and also the mass is result of the electromagnetic forces between the charged particles.

The positive and negative charged currents attracts each other or by the magnetic forces or by the much stronger electrostatic forces!?
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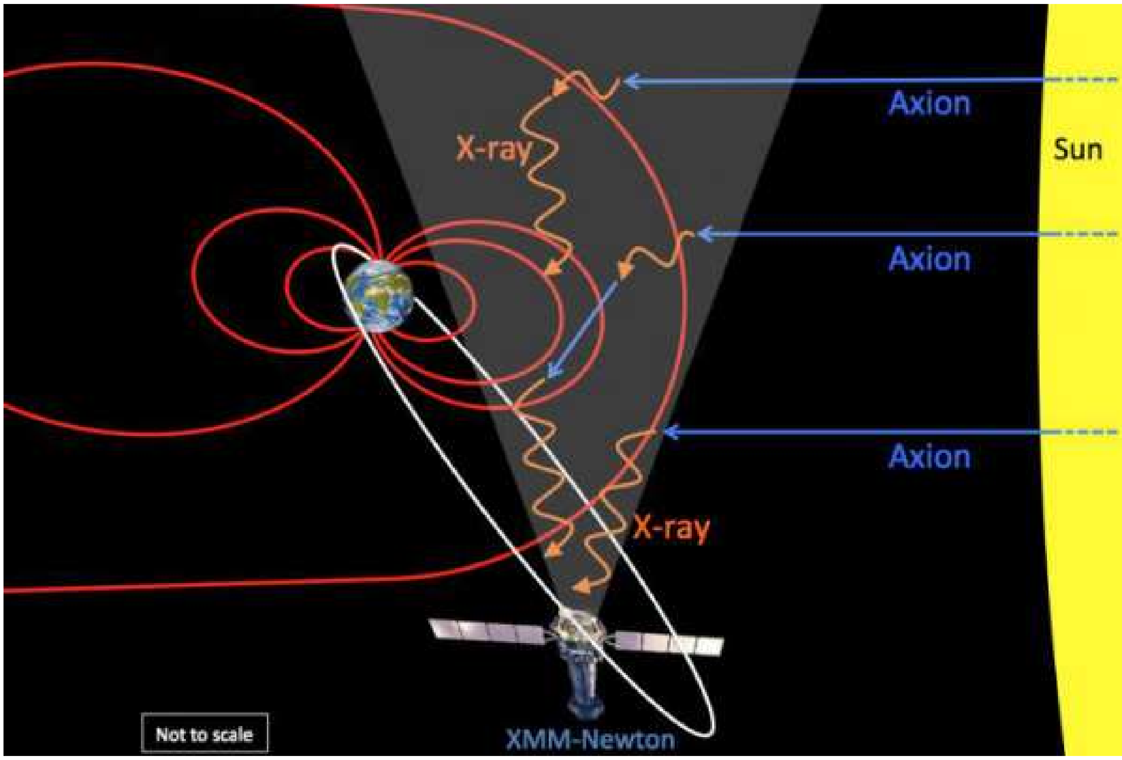
There is an asymmetry between the mass of the electric charges, for example proton and electron, can understood by the asymmetrical Planck Distribution Law. This temperature dependent energy distribution is asymmetric around the maximum intensity, where the annihilation of matter and antimatter is a high probability event. The asymmetric sides are creating different frequencies of electromagnetic radiations being in the same intensity level and compensating each other. One of these compensating ratios is the electron – proton mass ratio. The lower energy side has no compensating intensity level, it is the dark energy and the corresponding matter is the dark matter.

Astronomers may have detected the first direct evidence of dark matter

Scientists have detected a mysterious X-ray signal that could be caused by dark matter streaming out of our Sun's core.
Now scientists at the University of Leicester have identified a signal on the X-ray spectrum which appears to be a signature of 'axions' - a hypothetical dark matter particle that's never been detected before.
While we can't get too excited just yet - it will take years to confirm whether this signal really is dark matter - the discovery would completely change our understanding of how the Universe works.
After all, dark matter is the force that holds our galaxies together, so learning more about it is pretty important.
The researchers first detected the signal while searching through 15 years of measurements taking by the European Space Agency's orbiting XMM-Newton space observatory.
Unexpectedly, they noticed that the intensity of X-rays recorded by the spacecraft rose by about 10% whenever XMM-Newton was at the boundary of Earth's magnetic field facing the Sun - even once they removed all the bright X-ray sources from the sky. Usually, that X-ray background is stable.
"The X-ray background - the sky, after the bright X-ray sources are removed - appears to be unchanged whenever you look at it," said Andy Read, from the University of Leicester, one of the lead authors on the paper, in a press release. "However, we have discovered a seasonal signal in this X-ray background, which has no conventional explanation, but is consistent with the discovery of axions."
Researchers predict that axions, if they exist, would be produced invisibly by the Sun, but would convert to X-rays as they hit Earth's magnetic field. This X-ray signal should in theory be strongest when looking through the sunward side of the magnetic field, as this is where the Earth's magnetic field is strongest.
The next step is for the researchers to get a larger dataset from XMM-Newton and confirm the pattern they've seen in X-rays. Once they've done that, they can begin the long process of proving that they have, in fact, detecting dark matter streaming out of our Sun's core.



A sketch (not to scale) shows axions (blue) streaming out of the Sun and then converting into X-rays (orange) in the Earth's magnetic field (red). The X-rays are then detected by the XMM-Newton observatory. [13]

The axion is a hypothetical elementary particle postulated by the Peccei–Quinn theory in 1977 to resolve the strong CP problem in quantum chromodynamics (QCD). If axions exist and have low mass within a specific range, they are of interest as a possible component of cold dark matter. [14]

Hidden photons

Hidden photons are predicted in some extensions of the Standard Model of particle physics, and unlike WIMPs they would interact electromagnetically with normal matter. Hidden photons also have a very small mass, and are expected to oscillate into normal photons in a process similar to neutrino oscillation. Observing such oscillations relies on detectors that are sensitive to extremely small electromagnetic signals, and a number of these extremely difficult experiments have been built or proposed.

A spherical mirror is ideal for detecting such light because the emitted photons would be concentrated at the sphere's centre, whereas any background light bouncing off the mirror would pass through a focus midway between the sphere's surface and centre. A receiver placed at the centre could then pick up the dark-matter-generated photons, if tuned to their frequency – which is related to the mass of the incoming hidden photons – with mirror and receiver shielded as much as possible from stray electromagnetic waves.

Ideal mirror at hand

Fortunately for the team, an ideal mirror is at hand: a 13 m2 aluminium mirror used in tests during the construction of the Pierre Auger Observatory and located at the Karlsruhe Institute of

Technology. Döbrich and co-workers have got together with several researchers from Karlsruhe, and the collaboration is now readying the mirror by adjusting the position of each of its 36 segments to minimize the spot size of the focused waves. They are also measuring background radiation within the shielded room that will house the experiment. As for receivers, the most likely initial option is a set of low-noise photomultiplier tubes for measurements of visible light, which corresponds to hidden-photon masses of about 1 eV/C^2. Another obvious choice is a receiver for gigahertz radiation, which corresponds to masses less than 0.001 eV/C^2; however, this latter set-up would require more shielding.

Dark matter composition research - WIMP

The WIMP (Weakly interactive massive particles) form a class of heavy particles, interacting slightly with matter, and constitute excellent candidates with the nonbaryonic dark matter. The neutralino postulated by the supersymetric extensions of the standard model of particle physics. The idea of supersymmetry is to associate each boson to a fermion and vice versa. Each particle is then given a super-partner, having identical properties (mass, load), but with a spin which differes by 1/2. Thus, the number of particles is doubled. For example, the photon is accompanied by a photino, the graviton by a gravitino, the electron of a selectron, etc. Following the impossibility to detect a 511 keV boson (the electron partner), the physicists had to re-examine the idea of an exact symmetry. Symmetry is 'broken' and superpartners have a very important mass. One of these superparticules called LSP (Lightest Supersymmetric Particle) is the lightest of all. In most of the supersymmetric theories (without violation of the R-parity) the LSP is a stable particle because it cannot disintegrate in a lighter element. It is of neutral color and electric charge and is then only sensitive to weak interaction (weak nuclear force). It is then an excellent candidate for the not-baryonic dark matter. [11]

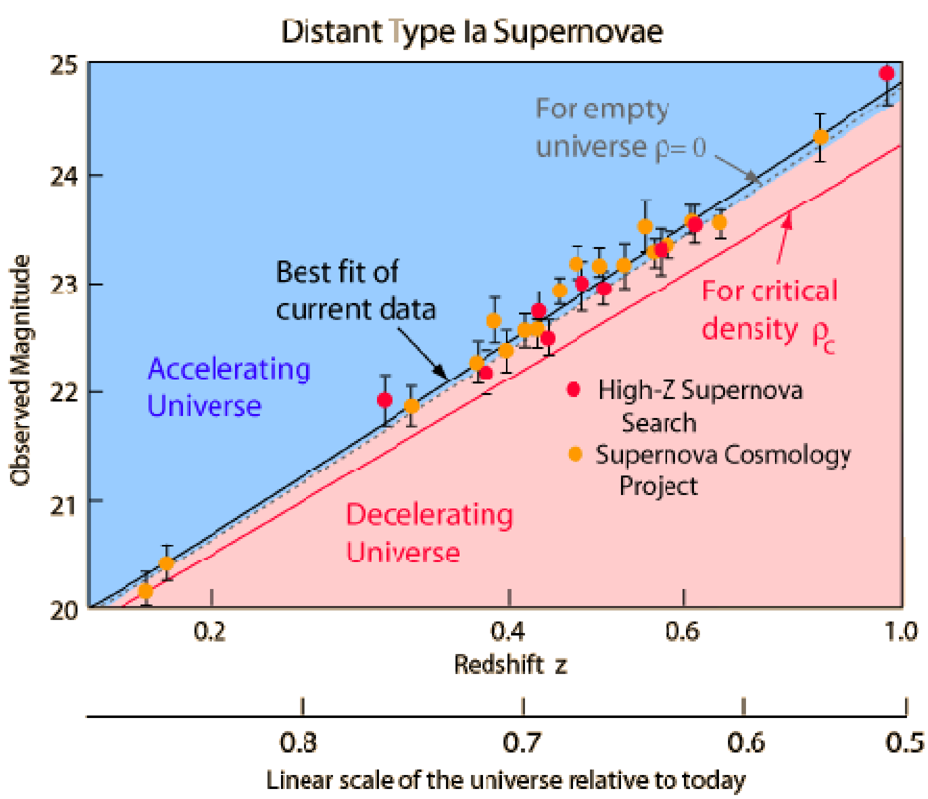
Weakly interacting massive particles

In particle physics and astrophysics, weakly interacting massive particles, or WIMPs, are among the leading hypothetical particle physics candidates for dark matter. The term “WIMP” is given to a dark matter particle that was produced by falling out of thermal equilibrium with the hot dense plasma of the early universe, although it is often used to refer to any dark matter candidate that interacts with standard particles via a force similar in strength to the weak nuclear force. Its name comes from the fact that obtaining the correct abundance of dark matter today via thermal production requires a self-annihilation cross section, which is roughly what is expected for a new particle in the 100 GeV mass range that interacts via the electroweak force. This apparent coincidence is known as the “WIMP miracle”. Because supersymmetric extensions of the standard model of particle physics readily predict a new particle with these properties, a stable supersymmetric partner has long been a prime WIMP candidate. However, recent null results from direct detection experiments including LUX and SuperCDMS, along with the failure to produce evidence of supersymmetry in the Large Hadron Collider (LHC) experiment has cast doubt on the simplest WIMP hypothesis. Experimental efforts to detect WIMPs include the search for products of WIMP annihilation, including gamma rays, neutrinos and cosmic rays in nearby galaxies and galaxy clusters; direct detection experiments designed to measure the collision of WIMPs with nuclei in the laboratory, as well as attempts to directly produce WIMPs in colliders such as the LHC. [10]

Evidence for an accelerating universe

One of the observational foundations for the big bang model of cosmology was the observed expansion of the universe. [9] Measurement of the expansion rate is a critical part of the study, and it has been found that the expansion rate is very nearly "flat". That is, the universe is very close to the critical density, above which it would slow down and collapse inward toward a future "big crunch". One of the great challenges of astronomy and astrophysics is distance measurement over the vast distances of the universe. Since the 1990s it has become apparent that type Ia supernovae offer a unique opportunity for the consistent measurement of distance out to perhaps 1000 Mpc. Measurement at these great distances provided the first data to suggest that the expansion rate of the universe is actually accelerating. That acceleration implies an energy density that acts in opposition to gravity which would cause the expansion to accelerate. This is an energy density which we have not directly detected observationally and it has been given the name "dark energy".

The type Ia supernova evidence for an accelerated universe has been discussed by Perlmutter and the diagram below follows his illustration in Physics Today.



The data summarized in the illustration above involve the measurement of the redshifts of the distant supernovae. The observed magnitudes are plotted against the redshift parameter z. Note that there are a number of Type 1a supernovae around z=.6, which with a Hubble constant of 71 km/s/mpc is a distance of about 5 billion light years.

Equation

The cosmological constant Λ appears in Einstein's field equation [5] in the form of

$$R_{\mu\nu} - \frac{1}{2}R\,g_{\mu\nu} + \Lambda\,g_{\mu\nu} = \frac{8\pi G}{c^4}T_{\mu\nu}\,,$$

where *R* and *g* describe the structure of spacetime, *T* pertains to matter and energy affecting that structure, and *G* and *c* are conversion factors that arise from using traditional units of measurement. When Λ is zero, this reduces to the original field equation of general relativity. When *T* is zero, the field equation describes empty space (the vacuum).

The cosmological constant has the same effect as an intrinsic energy density of the vacuum, ρ_{vac} (and an associated pressure). In this context it is commonly moved onto the right-hand side of the equation, and defined with a proportionality factor of 8π: $\Lambda = 8\pi\rho_{vac}$, where unit conventions of general relativity are used (otherwise factors of *G* and *c* would also appear). It is common to quote values of energy density directly, though still using the name "cosmological constant".

A positive vacuum energy density resulting from a cosmological constant implies a negative pressure, and vice versa. If the energy density is positive, the associated negative pressure will drive an accelerated expansion of the universe, as observed. (See dark energy and cosmic inflation for details.)

Explanatory models

Models attempting to explain accelerating expansion include some form of dark energy, dark fluid or phantom energy. The most important property of dark energy is that it has negative pressure which is distributed relatively homogeneously in space. The simplest explanation for dark energy is that it is a cosmological constant or vacuum energy; this leads to the Lambda-CDM model, which is generally known as the Standard Model of Cosmology as of 2003-2013, since it is the simplest model in good agreement with a variety of recent observations.

Dark Matter and Energy

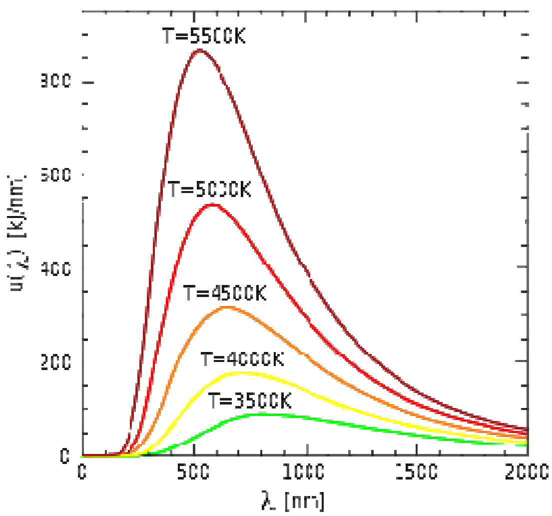
Dark matter is a type of matter hypothesized in astronomy and cosmology to account for a large part of the mass that appears to be missing from the universe. Dark matter cannot be seen directly with telescopes; evidently it neither emits nor absorbs light or other electromagnetic radiation at any significant level. It is otherwise hypothesized to simply be matter that is not reactant to light. Instead, the existence and properties of dark matter are inferred from its gravitational effects on visible matter, radiation, and the large-scale structure of the universe. According to the Planck mission team, and based on the standard model of cosmology, the total mass–energy of the known universe contains 4.9% ordinary matter, 26.8% dark matter and 68.3% dark energy. Thus, dark matter is estimated to constitute 84.5% of the total matter in the universe, while dark energy plus dark matter constitute 95.1% of the total content of the universe. [6]

Cosmic microwave background

The cosmic microwave background (CMB) is the thermal radiation assumed to be left over from the "Big Bang" of cosmology. When the universe cooled enough, protons and electrons combined to form neutral atoms. These atoms could no longer absorb the thermal radiation, and so the universe became transparent instead of being an opaque fog. [7]

Thermal radiation

Thermal radiation is electromagnetic radiation generated by the thermal motion of charged particles in matter. All matter with a temperature greater than absolute zero emits thermal radiation. When the temperature of the body is greater than absolute zero, interatomic collisions cause the kinetic energy of the atoms or molecules to change. This results in charge-acceleration and/or dipole oscillation which produces electromagnetic radiation, and the wide spectrum of radiation reflects the wide spectrum of energies and accelerations that occur even at a single temperature. [8]



Electromagnetic Field and Quantum Theory

Needless to say that the accelerating electrons of the steady stationary current are a simple demystification of the magnetic field, by creating a decreasing charge distribution along the wire, maintaining the decreasing U potential and creating the **A** vector potential experienced by the electrons moving by **v** velocity relative to the wire. This way it is easier to understand also the time dependent changes of the electric current and the electromagnetic waves as the resulting fields moving by c velocity.

It could be possible something very important law of the nature behind the self maintaining **E** accelerating force by the accelerated electrons. The accelerated electrons created electromagnetic fields are so natural that they occur as electromagnetic waves traveling with velocity c. It shows that the electric charges are the result of the electromagnetic waves diffraction.

One of the most important conclusions is that the electric charges are moving in an accelerated way and even if their velocity is constant, they have an intrinsic acceleration anyway, the so called spin, since they need at least an intrinsic acceleration to make possible they movement .

The bridge between the classical and quantum theory is based on this intrinsic acceleration of the spin, explaining also the Heisenberg Uncertainty Principle. The particle – wave duality of the electric charges and the photon makes certain that they are both sides of the same thing. Basing the gravitational force on the accelerating Universe caused magnetic force and the Planck Distribution

Law of the electromagnetic waves caused diffraction gives us the basis to build a Unified Theory of the physical interactions. [4]

Lorentz transformation of the Special Relativity

In the referential frame of the accelerating electrons the charge density lowering linearly because of the linearly growing way they takes every next time period. From the referential frame of the wire there is a parabolic charge density lowering.

The difference between these two referential frames, namely the referential frame of the wire and the referential frame of the moving electrons gives the relativistic effect. Important to say that the moving electrons presenting the time coordinate, since the electrons are taking linearly increasing way every next time period, and the wire presenting the geometric coordinate. The Lorentz transformations are based on moving light sources of the Michelson - Morley experiment giving a practical method to transform time and geometric coordinates without explaining the source of this mystery.

The real mystery is that the accelerating charges are maintaining the accelerating force with their charge distribution locally. The resolution of this mystery that the charges are simply the results of the diffraction patterns, that is the charges and the electric field are two sides of the same thing. Otherwise the charges could exceed the velocity of the electromagnetic field.

The increasing mass of the electric charges the result of the increasing inductive electric force acting against the accelerating force. The decreasing mass of the decreasing acceleration is the result of the inductive electric force acting against the decreasing force. This is the relativistic mass change explanation, especially importantly explaining the mass reduction in case of velocity decrease.

The Classical Relativistic effect

The moving charges are self maintain the electromagnetic field locally, causing their movement and this is the result of their acceleration under the force of this field.
In the classical physics the charges will distributed along the electric current so that the electric potential lowering along the current, by linearly increasing the way they take every next time period because this accelerated motion.

Electromagnetic inertia and Gravitational attraction

Since the magnetic induction creates a negative electric field as a result of the changing acceleration, it works as an electromagnetic inertia, causing an electromagnetic mass.

It looks clear that the growing acceleration results the relativistic growing mass - limited also with the velocity of the electromagnetic wave.

Since $E = h\nu$ and $E = mc^2$, $m = h\nu /c^2$ that is the m depends only on the ν frequency. It means that the mass of the proton and electron are electromagnetic and the result of the electromagnetic induction, caused by the changing acceleration of the spinning and moving charge! It could be that the m_o inertial mass is the result of the spin, since this is the only accelerating motion of the electric charge. Since the accelerating motion has different frequency for the electron in the atom and the proton, they masses are different, also as the wavelengths on both sides of the diffraction pattern, giving equal intensity of radiation.

If the mass is electromagnetic, then the gravitation is also electromagnetic effect caused by the accelerating Universe! The same charges would attract each other if they are moving parallel by the magnetic effect.

The Planck distribution law explains the different frequencies of the proton and electron, giving equal intensity to different lambda wavelengths! Also since the particles are diffraction patterns they have some closeness to each other – can be seen as a gravitational force.

Electromagnetic inertia and mass

Electromagnetic Induction

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Relativistic change of mass

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The frequency dependence of mass

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Electron – Proton mass rate

The Planck distribution law explains the different frequencies of the proton and electron, giving equal intensity to different lambda wavelengths! Also since the particles are diffraction patterns they have some closeness to each other – can be seen as a gravitational force. [1]

There is an asymmetry between the mass of the electric charges, for example proton and electron, can understood by the asymmetrical Planck Distribution Law. This temperature dependent energy distribution is asymmetric around the maximum intensity, where the annihilation of matter and antimatter is a high probability event. The asymmetric sides are creating different frequencies of electromagnetic radiations being in the same intensity level and compensating each other. One of these compensating ratios is the electron – proton mass ratio. The lower energy side has no compensating intensity level, it is the dark energy and the corresponding matter is the dark matter.

Gravity from the point of view of quantum physics

The Gravitational force

The gravitational attractive force is basically a magnetic force.

The same electric charges can attract one another by the magnetic force if they are moving parallel in the same direction. Since the electrically neutral matter is composed of negative and positive charges they need 2 photons to mediate this attractive force, one per charges. The Bing Bang caused parallel moving of the matter gives this magnetic force, experienced as gravitational force.

Since graviton is a tensor field, it has spin = 2, could be 2 photons with spin = 1 together.

You can think about photons as virtual electron – positron pairs, obtaining the necessary virtual mass for gravity.

The mass as seen before a result of the diffraction, for example the proton – electron mass rate Mp=1840 Me. In order to move one of these diffraction maximum (electron or proton) we need to intervene into the diffraction pattern with a force appropriate to the intensity of this diffraction maximum, means its intensity or mass.

The Big Bang caused acceleration created radial currents of the matter, and since the matter is composed of negative and positive charges, these currents are creating magnetic field and attracting forces between the parallel moving electric currents. This is the gravitational force experienced by the matter, and also the mass is result of the electromagnetic forces between the charged particles. The positive and negative charged currents attracts each other or by the magnetic forces or by the much stronger electrostatic forces!?

The Graviton

In physics, the graviton is a hypothetical elementary particle that mediates the force of gravitation in the framework of quantum field theory. If it exists, the graviton is expected to be massless (because the gravitational force appears to have unlimited range) and must be a spin-2 boson. The spin follows from the fact that the source of gravitation is the stress-energy tensor, a second-rank tensor (compared to electromagnetism's spin-1 photon, the source of which is the four-current, a first-rank tensor). Additionally, it can be shown that any massless spin-2 field would give rise to a force indistinguishable from gravitation, because a massless spin-2 field must couple to (interact with) the stress-energy tensor in the same way that the gravitational field does. This result suggests that, if a massless spin-2 particle is discovered, it must be the graviton, so that the only experimental verification needed for the graviton may simply be the discovery of a massless spin-2 particle. [2]

Conclusions

The authors of this research point out that the accuracy in the determination of the coupling constant through the method used "critically depends on the accuracy with which the initial helium content within the stars in the globular cluster can be estimated". [15]
Researchers predict that axions, if they exist, would be produced invisibly by the Sun, but would convert to X-rays as they hit Earth's magnetic field. This X-ray signal should in theory be strongest when looking through the sunward side of the magnetic field, as this is where the Earth's magnetic

field is strongest. The high frequency of the X-ray and the uncompensated Planck distribution makes the axion a good candidate to be dark matter.
Hidden photons are predicted in some extensions of the Standard Model of particle physics, and unlike WIMPs they would interact electromagnetically with normal matter.
In particle physics and astrophysics, weakly interacting massive particles, or WIMPs, are among the leading hypothetical particle physics candidates for dark matter.
The gravitational force attracting the matter, causing concentration of the matter in a small space and leaving much space with low matter concentration: dark matter and energy.
There is an asymmetry between the mass of the electric charges, for example proton and electron, can understood by the asymmetrical Planck Distribution Law. This temperature dependent energy distribution is asymmetric around the maximum intensity, where the annihilation of matter and antimatter is a high probability event. The asymmetric sides are creating different frequencies of electromagnetic radiations being in the same intensity level and compensating each other. One of these compensating ratios is the electron – proton mass ratio. The lower energy side has no compensating intensity level, it is the dark energy and the corresponding matter is the dark matter.
The electric currents causing self maintaining electric potential is the source of the special and general relativistic effects. The Higgs Field is the result of the electromagnetic induction. The Graviton is two photons together. [3]

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