DOI: https://doi.org/10.24297/y3jh2n30

Sayed`s Theory on Axion Dark Matter Detection as Nuclear Astrophysics Signature Emphasizes Violation of Einstein Light Speed Limit; $E \neq mc^2$

Sayed A. El Mongy
sayedelmongy@hotmail.com
Ex. V. President of Egypt Nuclear Regulatory Authority (ENRRA)

Abstract

Allah is the Creator; a universe by chance is impossible idea. Dark matter and energy are among the unsolved mysterious of the cosmology. This theory is based on detection of the gamma transition 511 keV for ten months by using array of shielded and unshielded high efficiency semiconductor HpGe detectors. The wavelength and speed of the Axion dark matter were derived taking into consideration the overall cosmic dark matter (DM) to baryonic matter (OM) ratio and transmission factor and cosmic ray (CR) contribution; the derived formula is called Sayed`s dark matter wavelength and speed formula (SDMWF, SDMSF). It was observed that the speed of Axion is in the order of 1.91×10^{18} m/s in clear violation to light speed limit. The Axion dark matter has also very short wavelength of 5.65×10^{-25} m and its ultra-light mass; 2.24×10^{-56} kg, is in very good concordance with some postulated and published range. The Hubble and Gravitational constants were integrated in the derived Sayed`s formula and their calculated values; 2.327×10^{-18} s^{-1} and 6.663×10^{-11} $m^3/kg\ s^2$, were found to be in perfect agreement with the declared values. It may be stated that the Axion dark matter; its produced photons, was experimentally detected in the laboratory and its speed, mass and wavelength were precisely quantified by the equations deduced by this theory.

Keywords: Sayed DM theory/Experimental Axion Dark matter detection/ Derived theoretical formula

I. Introduction

Dark matter (DM) and dark energy (DE) are among the physics puzzles and unsolved debates (1,2,3). Dark Matter, the mysterious invisible mass theorized to account for 85% of matter in the Universe, continues to elude scientists. While there is plenty of indirect evidence for its existence, the rotational curves of galaxies, galactic halos, and gravitational lenses, direct detection and the identification of its constituent particles remain elusive (4). Axions and WIMPs are the two leading Dark Matter particle candidates. Axions are ultra-light elementary particles proposed in 1977 (it is lighter than neutrino and was postulated to solve the strong charge-parity (CP) problem in quantum chromodynamics), while WIMPs are heavy particles linked to the weak nuclear force (5). Up to the time being, there is no direct experimental work representing dark matter detection and assay in the laboratories. The exact astrophysical origin of the radiation 511 keV is still a significant open question and mystery (6). The origin of the 511 keV positron annihilation line observed in the direction of the Galactic Center is a 50-year-long mystery. In fact, scientists still do not understand whether its diffuse large-scale emission is entirely due to a population of discrete sources, or whether dark matter annihilation could contribute to it (7).

This theory introduces an innovative approach based on detection of 511 keV in the laboratory by using array of multiple HpGe spectrometers and derived equations as a function in Axion dark matter signature.

II. Survey and chronology

- Dark matter was proposed by Fritz Zwicky in 1933 and mentioned by Vera Rubin in 1970s through galaxy rotation curves
- DM does not absorb, reflect or emit light, making it extremely hard to be detected
- It works against the dark energy to keep control galaxies and expansion of the universe
- Innovative theories and formulas in astrophysics field were published (8,9,10,11,12)
- The ratio of DM to Dark energy (DE) and Ordinary (Baryonic) matter (OM) can be shown as in the following Table (13,14, 15).

Table 1 : The Ratio of DM to OM and DE in the universe

Item	NASA (13)	Wikepedia (14)	Manahel (15)
Dark energy (DE)	68.3 – 71.4	72.8	72.8
Dark matter(DM)	24 – 26.5	22.7	22.7
Ordinary matter (OM)	4.8 – 5.3	4.5	4.53
DM: OM ratio	**5 : 1**	**5 : 1**	**5 :1**

- The milky way is surrounded by a dark matter halo as shown in the following figure

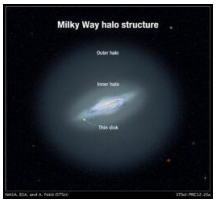

Figure 1: Dark matter Halo of the Milky Way Galaxy (16)

- Dark matter (DM) halos, gravitationally bound concentrations of dark matter, play an essential role in the complex, non-linear processes involved in forming cosmic structures (17).
- The wave-like behavior of "fuzzy DM or ultra light Axion particle could account for the elongated morphology of early galaxies seen by JWST (18).

III. Experimental feature

The hunt for dark matter requires detecting incredibly rare and faint interactions. If these detectors were on the surface, the ambient cosmic rays and natural radioactivity would completely overwhelm the delicate signals they are trying to measure (19).

In this work, four Be and carbon fiber windows Hyper pure Germanium detectors of high efficiency and resolution of ~0.58 keV at 122 keV of ^{57}Co were used for detection the gamma line 511 keV as representative to both cosmic ray (CR) and Axion dark matter (DM). The systems were precisely calibrated before measurements. Very low backgrounds of shielded and unshielded detectors were used for measurements spectra for 1 – 6 days counting period for more than 10 months. A plastic cover was also used to check neutrons contribution. The gamma line 511 keV is known to be produced from many radioactive sources as shown in the following figure 2 and Table 2 (20, 21, 22).

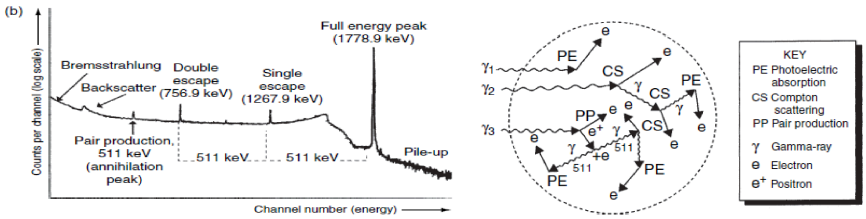

Figure 2: The gamma spectrum of ^{28}Al with 511 keV line and interaction of gamma ray with matter

Table 2: The Gamma Transitions of the 511 keV Peak for some Sources

Energy (keV)	Isotope	$T_{1/2}$
511	$\beta^-\beta^+$ annihilation	- 0.5 ns
511, 1778.97,SE,DE	^{28}Al	2.245 min.
511, 1809	^{26}Al	7.17×10^5 yr.
511, 67.9, 1157	^{44}Ti	63 year

IV. Derivation of Sayed`s Axion Dark Matter Detection and Calculation formulas

It should be mentioned that this theory is based on the following major published facts and data:

- For every 1 kg ordinary matter in the universe, there is 5 kg of dark matter. The overall cosmic ratio of dark matter to ordinary (Baryonic) matter is roughly 5:1 (Wikipedia).
- Dark matter interacts only by gravity and the very weak electromagnetic force
- The interaction of the ultra-light Axion dark matter (Boson, has no spin); with very weak electromagnetic field can produce detectable *photons*. Self-absorption to be considered.
- The cosmic ray (CR) is only interacting with the electromagnetic field. Its gamma signature is well known at the 511 keV annihilation background line of gamma spectrometric analysis
- The Dark matter acts as the invisible glue holding galaxies and the cosmos web together
- The Dark energy to dark matter ratio is a constant and equal π as given reference (3).
- DM annihilation can be the primary source of the 511 keV line emissions without violating constraints from disk emission observations and in-flight positron annihilation with the interstellar medium, provided the disk emission is dominated by an astrophysical source of low-energy positrons (23).

IV.a. The first Approach: Derivation of Axion dark matter speed and wavelength.

As mentioned, the overall cosmic ratio of dark matter to ordinary (Baryonic) matter is roughly 5:1 will be the bases for the following derivations to get a representative formula for dark matter parameters assay and detection:

$$M_{OM} / M_{DM} = 1/5 \quad (1)$$

Where, M_{OM} is the ordinary matter mass and M_{DM} is the dark matter mass. This expression can be rearranged to be:

$$M_{DM} = 5\, M_{OM} \quad (2)$$

By substituting the value of dark matter mass by its corresponding volume (V) and density (ρ in kg/m^3) with supposing the dark matter bombarding and surrounding the galaxy/earth in a spherical form of radius (r) ;

$$(4/3\ \pi\ r^3)\ \rho_{DM} = 5\, M_{OM} \quad (3)$$

Expressing the M_{OM} by Einstein equation; $E=mc^2$ and Planck quantization of energy, $E=hc/\lambda$, one gets;

$$4/3\ \pi\ r^3\ \rho_{DM} = 5\, E/c^2 = 5\, h\, c/\lambda\, c^2 = 5\, h/\lambda\, c \quad (4)$$

Where, c is the speed (m/s), h is the Planck constant (J.s) and r (m) is the radius of DM sphere. The equation 4 can be rearranged to be:

$$\lambda = 15\, h\ /4\ \pi\ c\ r^3\ \rho_{DM}. \quad (5)$$

Using the attenuation law that can be given as;

$$I = I_o\, e^{-\mu x} \quad (6)$$

Where, I is the measured intensity, I_0 is the initial intensity, μ is the linear attenuation coefficient (m^{-1}) and x is the thickness of the absorber or medium (m). It ; eq.6, can be rewritten as

$$Ln (I_o /I) = +\mu x. \quad 7$$

Supposing the x=r for the dark matter radius and merging equation 7 in eq. 5, one gets:

$$\lambda = 15\ h /4\ \pi\ c\ \rho_{DM}. (Ln (I_o /I)/\mu)^3 \quad 8$$

$$\mathbf{\lambda = 3.75\ h\ \mu^3 /\pi\ c\ \rho_{DM}\ (Ln (I_o /I)^3} \quad \mathbf{9}$$

$$\mathbf{c = 3.75\ h\ \mu^3 /\pi\ \lambda\ \rho_{DM}\ (Ln (I_o /I)^3} \quad \mathbf{10}$$

Where, λ and c represent the wavelength and speed of the Axion dark matter. These two formulas are called **Sayed`s dark matter wavelength and speed formula; (SDMWF) and (SDMSF)**. These formulas can also be expressed as follow:

$$Ln (I_o /I)^3 = 3.75\ h\ \mu^3 / \pi\ \lambda\ c\ \rho_{DM} \quad 11$$

$$(I_o /I)^3 = e^{(3.75\ h\ \mu 3\ /\pi\ \lambda\ c\ \rho_{DM})} \quad 12$$

The units' validation of the derived equation 9 or 10 is as follow:

meter (m)= J.s . m^{-3} / (kg/m^3). (m/s) = ($Kg\ m^2/s^2$).s . m^{-3} / (kg/m^3). (m/s) = meter (m)

Cosmology does not define universal "attenuation coefficient" for DM because DM is collision less and interacts primarily through gravity. The universe is virtually transparent to it (24).

IV.b. The second Approach: Correlation of Axion with Gravitational and Hubble constants formula

The correlation of Axion DM wavelength with the gravitational and Hubble constants is to be derived using the abovementioned equations. The dark matter density (ρ_{DM}) is correlated to the ordinary matter, critical density; (ρ_c) and dark matter percentage in the universe (1)

$$\rho_{DM} = Ω\ \rho_{c.} \quad 13$$

$$\rho_c = 3H^2/8\ \pi\ G \quad 14$$

Where, G is the gravitational constant and H is the Hubble constant. By substituting dark matter density with critical density of equation 14 in equation 9 or 10, one gets:

$$\lambda = 11.261\ h\ \mu^3 / \pi\ c\ Ω\ \rho_c \quad 15$$

$$\lambda = 11.261\ h\ \mu^3 / \pi\ c\ Ω\ \rho_c \quad 16$$

$$\lambda = 11.261\ h\ \mu^3 / \pi\ c\ Ω\ (3H^2/8\ \pi\ G) \quad 17$$

$$\lambda = 11.261\ h\ \mu^3\ (8\ \pi\ G) / \pi\ c\ Ω\ (3H^2) \quad 18$$

$$\mathbf{\lambda = 132.33\ h\ \mu^3\ G / c\ H^2} \quad 19$$

This equation correlates the Axion wavelength and speed with the Hubble and gravitational constants; it is called **Sayed`s Axion Hubble and Gravitational formula (SAHGF)**

The equation units were validated as follow;

meter = J.s $m^{-3}(m^3/kg\ s^2)/(m/s).s^{-2}$ = ($kg\ m^2/s^2$).s .m^{-3}.(m3/$kg\ s^2$)/(m/s).s^{-2}= meter

The equation 19 can be rearranged to be used to calculate H and G constants values as follow:

$$H^2 = 132.33\ h\ \mu^3\ G / \lambda\ c \quad (20)$$

$$G = \lambda\ H^2\ c / 132.33\ h\ \mu^3 \quad (21)$$

The gravitational and Hubble constant correlated with the Axion dark matter were calculated by the equations 20 and 21 and given below in the results part of this work.

V. Results and Discussion

V.1. Experimental Assay and Calculation of Axion Dark Matter Parameters

The results of the repeated measurements for continues 1 to 6 days interval for the period of 10 months by detection of the gamma line 511 keV using four efficient and well calibrated Be and carbon fiber windows HpGe detectors are sketched and given in the following diagram (figure 3) and table 3.

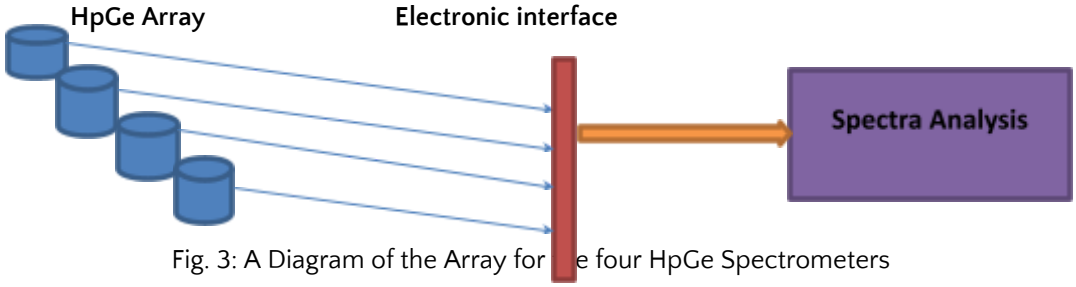

Fig. 3: A Diagram of the Array for the four HpGe Spectrometers

Table 3: The net count rate ratio for the 511 keV Gamma transition peak

Item	Ratio	% uncertainty
HpGe1 (open - Pb shield) Shielded HpGe1 (closed -Pb cover)	2	The maximum uncertainty in the 10 months measurements was observed and found to be less than 2% for the net area of the 511 keV peak
Shielded HpGe2 (opened Pb cover) Shielded HpGe2 (closed Pb cover)	1.89	
HpGe 3(Be /open shield) HpGe 3 (Be /closed shield)	2.02	
HpGe 4(C fibre /open shield) HpGe 4(C fibre /closed shield)	1.95	

The well-known gamma line 511keV is the typical characteristic of the annihilation due to pair production phenomenon of cosmic ray (CR) with the detector material. *While according to this theory, the intensity; count per second (cps) of the 511 gamma line is also due to Axion dark matter candidate/ produced detected photons.* This can be expressed as follow;

Total count rate = cps of the annihilation 511 keV of CR + cps due to 511 keV of axion dark matter

Taking into consideration the experimental measurements, where the $(\mathrm{Ln}\ (I_o / I)^3$ value leads to $\ln 2 = [0.693)^3]$. By substituting this value in equations 9 and 10, one obtains

$$\lambda = 11.261\ h\ \mu^3 / \pi\ c\ \rho_{DM} \quad (22)$$

$$c = 11.261\ h\ \mu^3 / \pi\ \lambda\ \rho_{DM} \quad (23)$$

Considering the equations 22, 23, the speed and wavelength of the candidate's dark matter Axion were calculated and found to be as given in table 4

Table 4: The calculated speed and wavelength of the dark matter representative indicator

Item	Calculated by SDMSF	Observation
Speed (c) of Axion DM	1.91×10^{18} m/s	**Violation; $E \neq mc^2$**
Wavelength (λ) of Axion	5.65×10^{-25} m	

The violation of Einstein speed limit can clearly be observed from the calculated speed of Axion dark matter/ its detectable photons. Using Einstein formula, the mass (m) of Axion was calculated using its calculated speed and given in table 5 as follow:

$m=E/c^2 = (0.511\ eV \times 1.602 \times 10^{-19}\ J\ (kg\ m^2/s^2))/\ (1.91 \times 10^{18}\ m/s)^2 = 2.24 \times 10^{-56}\ kg$

Table 5: The calculated Axion dark matter mass

Item	Calculated mass	Declared value (25)	Observation
Axion mass (Based on the calculated speed 1.912×10^{18} m/s)	2.24×10^{-56} kg	10^{-21}–10^{-22} eV 1.777×10^{-56} kg eV=1.602×10^{-19} J	**Violation; $E \neq mc^2$**

The calculated Axion mass is close to its declared mass value of 10^{-21}–10^{-22} eV (25, 26). In other work, used the galaxy cluster number counts obtained from the first All-Sky Survey (eRASS1) of the SRG/eROSITA mission together with gravitational weak lensing data from the Dark Energy Survey, to constrain the fraction of ultra-light axions in the mass range 10^{-32} eV to 10^{-24} eV. (27). The calculated mass of axion (2.24×10^{-56} kg) is also far less than neutrino mass ; mass of single neutrino must be less than 8×10^{-37} kg (0.45 eV/c^2)(28). Researchers measured singularities in combined light and sound waves moving faster than the speed of light. The findings have implications in fluid dynamics, optics and many other fields (29). A work exemplifies that there should always be a classical analog for axion dark matter effects, extends to other wave (ultralight) dark-matter candidates, and gives a general method to compute the effects of exotic dark-matter states (30).

V.2. Calculation of Hubble & Gravitational constants Correlated with Axion Dark Matter

Using the equation 20, 21, the Hubble and Gravitational constants correlated with SDMSF were calculated and given in the following table 6

Table 6: The calculated Hubble (H) and Gravitational (G) Constants, using SAHGF

Item	Conditions SDMSF, SDMWF	Calculated by SAHGF (Eq. 20, 21)	Published work (1)
Hubble constant	C =1.91×10^{18} m/s	2.327×10^{-18} s^{-1}	2.2×10^{-18} s^{-1}
Gravitational constant	$\lambda = 5.65 \times 10^{-25}$ m	6.663×10^{-11} $m^3/kg\ s^2$	6.67×10^{-11} $m^3/kg\ s^2$

Based on the carried out measurements, the derived Sayed`s formulas and the calculations given in the abovementioned tables 4, 5 and 6, it can be observed the following major points:

- ***The Dark matter Axion is faster than light;* 1.91 x 10^{18} m/s, *violating light speed limit, $E \neq mc^2$***
- ***The dark matter Axion has very short wavelength; $\lambda = 5.65 \times 10^{-25}$ m***
- ***The dark matter Axion has ultra-light mass; 2.24×10^{-56} kg***
- ***The wavelength and speed of Axion dark matter are correlated with the Hubble and Gravitational constants.***

- ***The measured 511 keV gamma transition belongs to axion dark matter (its detectable photons) and cosmic ray annihilation peak with an average ratio of 2.***

Time-varying dark matter density, such as models of decaying dark matter or interacting dark sectors, is indeed a proposed solution to the Hubble tension. It bridges the gap between the inferred from early CMB and the measured locally (31). A team of undergraduate students at the designed and built a cavity detector to look for axions dark matter(32). The experimental constraints of DM detection are given in M.Sc.(33). The Super Cryogenic Dark Matter Search (SuperCDMS) at SNOLAB, Sudbury, Ontario located 6,800 feet underground, a cylindrical made from ultra-pure lead (to blocks ɣ-radiation) and high-density polyethylene (to reduces neutron activity). The detector is also made from Si and Ge to minimal radioactive backgrounds to detect (WIMPs) as the source of dark matter *(19).*

Conclusions

Based on the intensive and long time period ɣ-measurements and the derived Sayed dark matter formulas (SDMSF, SDMWF, SAHGF), it can be observed that Axion dark matter candidate was detected and measured by the 511 keV gamma transition. The Axion DM has ultra-low mass and wavelength of $2.24x10^{-56}$ kg and 5.65 x 10^{-25} m respectively. Its speed; $1.91x10^{18}$ m/s, emphasizes the violation of Einstein light speed limit; $E \neq mc^2$. The measured 511 keV gamma transition belongs to axion dark matter (its detectable photons) and cosmic ray annihilation peak with an average ratio of 2. The derived Sayed`s formulas were fused with Hubbell and gravitational constants and found a correlation between them and Axion dark matter wavelength and speed resulting in values close to the world established ranges.

Statement of conflict

There is no any conflict concerning this article

Acknowledgment

Allah, God; the Creator of everything, there are no words in the dictionaries of the mankind capable to describe your Oneness, Glory, Greatness and mysterious universe.

References

1. Sayed Ali El-Mongy, 2024, " Sayed`s Theory of Dark Energy and Dark Matter Forces Nature", *Journal of Advances in Physics* Vol.22 ISSN: 2347-3487, DOI: https://doi.org/10.24297/jap.v22i.9605
2. Marc S. Seigar, 2015, "Dark matter in the universe", IOP Science, Morgan & Claypool publishers, USA. https://iopscience.iop.org/book/978-1-6817-4118-5.pdf
3. Sayed Ali El-Mongy, 2022, "Creator of the Universe Adjusted the Dark Energy/Dark Matter Ratio and Baryons to be Function In π and eπ: Predicted and Deciphered by Sayed's TheoremII, *Journal of Advances in Physics* Vol.20 ISSN: 2347-3487, DOI: https://doi.org/10.24297/jap.v20i.9223
4. Matthew Williams, 2026, "A New Theory of Dark Matter Could Solve Three Cosmic Mysteries", Universe today, https://www.universetoday.com/articles/a-new-theory-of-dark-matter-could-solve-three-cosmic-mysteries).
5. Paul Sutter, 2021, "WIMPS vs. Axions: What is dark matter?", Universe today, https://www.universetoday.com/articles/wimps-vs-axions-what-is-dark-matter,
6. G. De Cesare , 2011, "Searching for the 511 keV annihilation line from galactic compact objects with the IBIS gamma ray telescope", A&A 531, A56 (2011) DOI: 10.1051/0004-6361/201116516 c ESO 2011 Astronomy & Astrophysics)
7. F. Frontera et al ,2021,"Understanding the origin of the positron annihilation line and the physics of supernova explosions", Experimental Astronomy (2021) 51:1175–1202, https://doi.org/10.1007/s10686-021-09727-7
8. Sayed A. El-Mongy, 2022, "Asymmetry of the Matter-Anti Matter Ratio in the Universe and Violation of $E=mc^2$: "Sayed`s Theory for Matter-Antimatter Chirality and its Correlations", *Journal of Advances in*

Physics Vol 20 (2022) ISSN: 2347-3487 https://rajpub.com/index.php/jap. DOI: https://doi.org/10.24297/jap.v20i.9356

9. Sayed A. El-Mongy, (2021), "Revolutionary Approach for Fusion of the Classic, Relativity and Quantum field Theories: Sayed's Acceleration Equation and Probable Violation of $E=mc^2$ ", Journal of Advances in Physics, Vol 19. DOI: https://doi.org/10.24297/jap.v19i.9048
10. Sayed A. El-Mongy, (2020), "Hawking Radiation is Nothing: Developed Correlation of Entropy with Black Hole Area", *Journal of Advances in Physics* Vol 18. DOI:https://doi.org/10.24297/jap.v18i.8905
11. Sayed Ali El-Mongy, 2022, "Unity of the Universe: New and Global Theory Correlating the Ratio of Hydrogen - Helium to Dark Energy – Matter: Sayed`s Golden Formula (SGF)" *Journal of Advances in Physics* Vol 20 (2022) ISSN: 2347-3487. DOI: https://doi.org/10.24297/jap.v20i.9246
12. Sayed Ali El-Mongy, (2020), —New Theorem and Formula for Circle Arc Length Calculations with Trigonometric Approach Application in Astrophysicsǁ, Journal of Advances in Physics Vol 17 DOI: https://doi.org/10.24297/jap.v18i.8914
13. https://www.nasa.gov/mission_pages/planck/news/planck20130321.html
14. https://en.wikipedia.org/wiki/Wilkinson_Microwave_Anisotropy_Probe (WMAP).
15. Manahel AR Thabet, 2014, "Concepts of dark energy and dark matter: the understanding and calculation of dark energy and dark matter", SSRN Electronic journal, Research Gate).
16. Jiwon Jesse Han et al, 2023, "Dark Halos Are Common and Long-Lived, and Can Warp Galactic Disks,"2023 *ApJL* 957 L24.: doi:10.3847/2041-8213/ad0641, https://aasnova.org/2023/12/04/dark-halos-and-warped-disks/).
17. Jean-Michel Alimi and Rémy Koskas, 2024, "The shape of DM halos: a new fundamental cosmological invariance", Astronomy & Astrophysics manuscript no. main ,arXiv:2406.15947v2 [astro-ph.CO] 8 Aug 2024
18. Robert Lea , 2026, "James Webb Space Telescope could illuminate dark matter in a way scientists didn't realize", https://www.space.com/astronomy/dark-universe/james-webb-space-telescope-could-illuminate-dark-matter-in-a-way-scientists-didnt-realize)
19. *DARREN ORF, 2026, "*Deep Beneath Earth's Surface, a Dark Matter Detector Is Ready to Make History", popular mechanics, https://www.popularmechanics.com/science/a70910660/dark-matter-detector-supercdms/
20. G. F.Knoll, 2010,"Radiation Detection and measurements", John wiley, 4th edition. Summary.
21. P. Mortreau and R. Berndt,2010, "Handbook of gamma spectrometry methods for non-destructive assay of nuclear materials", EUR 19822EN, Joint research center, 4th revision, Ispra, Italy.
22. Gordon R. Gilmore, "Practical Gamma-ray Spectrometry", John Wiley, 2nd edition, UK, 2008.
23. Pedro De la Torre Luque Shyam Balaji Malcolm Fairbairn Filippo Sala'and Joseph Silk, 2025, "511 keV Galactic Photons from a Dark Matter Spike", arXiv:2410.16379v3 [astro-ph.HE] 05 Sep 2025.
24. N. Darvishi et al, 2025," Dark matter attenuation effects: the sensitivity ceilings for spin-dependent and spin independent interactions", Quest-DMC collaboration. arXiv:2502,10251v1[hep-ph] .)
25. CERN Courier, 2026, "Introducing the axion", http://www.cerncourier.com/introducing the axion.,
26. Luca Visinelli , 2025, "Axions as dark matter, dark energy and dark radiation", arXiv:2509.17059v1[hep-ph]21 Sep 2025).
27. S. Zelmer et al, 2025, "The SRG/eROSITA All-Sky Survey Constraints on ultralight axion dark matter through galaxy cluster number counts ",Astronomy & Astrophysics, 704, A346 (2025), 6361/202554045 c , , https://doi.org/10.1051/0004-
28. Joachim Hoffmann, 2025 "Precision scale KATRIN sets record for measuring neutrino mass", KATRIN experiment, Karlsruhe institute of technology. https://www.cmu.edu
29. Damien Pine,2026,"Physicists just witnessed pinpricks of darkness moving faster than the speed of light — without breaking the laws of relativity", Live Science. https://www.livescience.com/physics-mathematics/particle-physics/physicists-just-witnessed-pinpricks-of-darkness-moving-faster-than-the-speed-of-light-without-breaking-the-laws-of-relativity)
30. Yunjia Bao Dhong, Yeon Cheong, Nicholas L. Rodd, Joey Takach, Lian-Tao Wang, and Kevin Zhou, 2025, " Intrinsically Quantum Effects of Axion Dark Matter are Undetectable" https://arxiv.org/abs/2510.05198v1).

31. Andreas Nygaard et al ,2023, https://arxiv.org/html/2307.00418v1
32. SISSA MEDIALAB, 2026, "Students Build Dark Matter Detector and Set New Experimental Limits", SciTechDaily. https://scitechdaily.com/students-build-dark-matter-detector-and-set-new-experimental-limits/.
33. Michael Mancini, 2025,"Theory and phenomenology of dark matter models for the 511 keV galactic photons", M.Sc. physics, School of science, university of Bolongna.

Biography

Professor Sayed Ali El Mongy studied for Ph.D. in Mainz-Germany in the field of INAA for fertile ^{238}U and delayed neutron counting for fissile ^{235}U assay using TRIGA-Mark II reactor. He worked for the IAEA as IRRS mission expert and NSGC member. He has about 130 published articles in the field of nuclear safeguards, forensic analysis and environmental surveillance. He published many theories in the field of nuclear astrophysics, quantum gravity, entanglement, antimatter and others. He participated in meeting, conferences and visits to USA, Canada, IAEA, European states (EU), Arab Atomic energy authority (Arab States league), Korea, Russia and most of Arab states. Currently, He is in a wonderful on-leave to the UAE as scientific supervisor and academic coordinator for radiological analyses and nuclear affairs.