SOURCES AND DETECTION OF DARK MATTER IN THE UNIVERSE

Workshop on Primordial black holes and Hawking radiation and 3rd International Symposium on Sources and detection of dark matter in the universe, 17–20 February 1998, Marina del Rey, California

edited by

D.B. CLINE

ELSEVIER

AMSTERDAM – LAUSANNE – NEW YORK – OXFORD – SHANNON – TOKYO

Email address of Dr. Klaus Volkamer: dr.volkamer@t-online.de

ELSEVIER

Consequences of recently detected cold dark matter on planetary, solar, galactic, and cosmological levels

Klaus Volkamer and Christoph Streicher[a]*

[a]*Deutsche MERU-Gesellschaft, Heidelberger Ring 21, D-67227 Frankenthal, Germany*

Abstract. Recently a new form of matter was detected with quanta as integer multiples of the Planck mass, exhibiting a spatially extended "field-like" structure complementary to the "point-like" structure of the known elementary particles. The properties of this invisible (i.e., dark) and low energetic (i.e., cold) type of matter characterize its quanta as WIMP candidates of a cosmic background radiation contributing significantly to the mean density Ω of the Universe.

1. Experimental verification of a new form of matter

Experiments were performed to check the law of conservation of mass in a special chemical reaction in which metallic silver is generated from two homogeneous aqueous solutions within thermodynamically closed systems (unused 50 ml glass flasks, closed gas-tight, identical in volume, and 200 g each). Using a comparator (SARTORIUS C 1000) with a reproducibility of $c_R = \pm 2\,\mu$g, the masses of two reference samples, $m_{R1,2}$ (which contained only water) and of two test flasks, $m_{T1,2}$ (which were internally silverplated by the described chemical reaction) were determined automatically under iosthermic conditions (about 5 h after the reaction) for several weeks (see [1]). Following the evaluation given in Figure 1, in baseline tests with four identical samples without chemical reaction, the law of conservation of mass was confirmed within the experimental error (see Figure 1). After silverplating the test flasks, however, and after exclusion of any artifacts, highly significant deviations from the law of conservation of mass were observed (see Figure 1 and Figure 13 in [1]). Under the basic assumption that the law of conservation of energy is still applicable to the systems, the deviations of $\gg |2|\,\mu$g can be interpreted as due to the absorption of a so far unknown form of matter with real mass (and energy) content by the test samples, followed by corresponding emission processes (see [1]). By evaluating the number and size of the stepwise mass changes in several independent tests, distributions result with very clear peaks (see Figure 2), which can be described quantitatively by integer multiples of the Planck mass, modified by S, $m_{P,S} = \sum_{n_S,S} n_S \cdot \sqrt{h \cdot c \cdot S/(2 \cdot \pi \cdot G)} = \sum_{n_S,S} n_S \cdot 21.7 \cdot \sqrt{S}\,\mu$g, with n_S =1, 2, 3 etc., and S = 1/2, 1, 3/2, 2, 5/2, 3, and 7/2, and by a similarly modified "Stoney mass," $m_{St,S} = \sqrt{e^2 \cdot S/(4 \cdot \pi \cdot \varepsilon_0 \cdot G)} = 1.85 \cdot \sqrt{S}\,\mu$g. For comparison, RM and RG of Figure 2 depict similar distributions for four identical metal weights (RM) and glass flasks (RG) from baseline tests, normalized to the same ordinate values at M = 0 μg as the test distributions.

*Acknowledgment: Apparative support from SARTORIUS AG, Göttingen, Germany, is gratefully acknowledged.

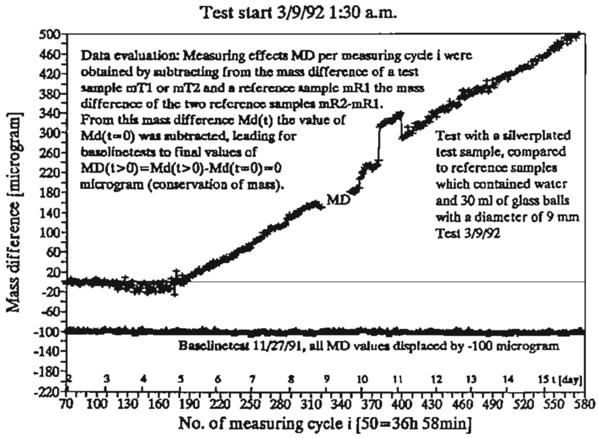

Figure 1: Baseline test and test results.

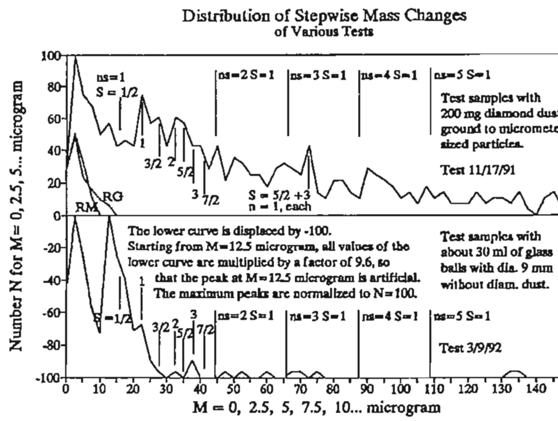

Figure 2: Distribution of mass changes.

These results reveal the existence of free quanta of the new form of matter and associations of such quanta that were absorbed and emitted (stimulated by mechanical shocks [1]) by the test samples. An analysis of the linear mass increases of the test samples (see Figure 1) leads furthermore to mass contents of the new type of matter of $\leq 2\mu$g. If test flasks were cleaned and used again, they showed a memory effect (even in baseline tests), while in subsequent tests quanta with negative masses were observed. The results reveal a spatially extended structure of the new type of cold dark and "**soft**" **ma**tter (soma) with a density of $\varrho \leq 10^{-6}\,$g/cm^3 and a gravitational interaction with normal matter, due to its real mass content, as well as a so-far unknown "topological" (i.e., form-specific) interaction at phase borders (see [1]), which is by a factor of about 15 orders of magnitude stronger than the gravitational one. The results of a comparison of the mass of an internally silverplated 30 ml glass flask, closed gas-tight, with a similar reference flask, using a two pan balance (SARTORIUS M 25 D-V, $c_R = \pm 1\,\mu$g) during a visible moon eclipse and a visible partial sun eclipse are given in Figure 3 and Figure 4.

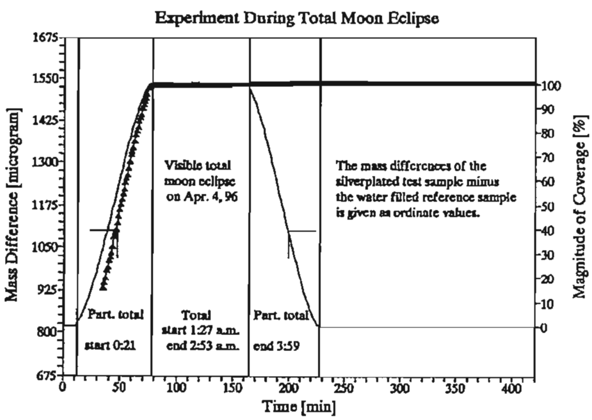

Figure 3: Test results during a moon eclipse.

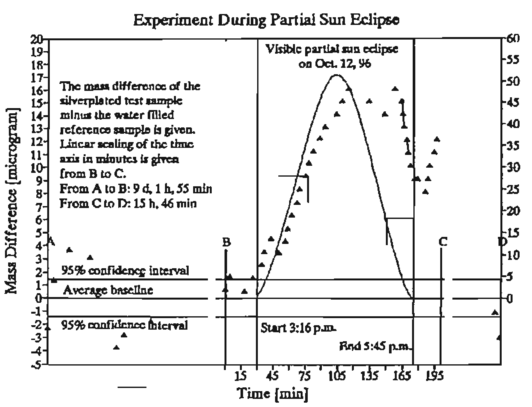

Figure 4: Test results during a sun eclipse.

2. Astrophysical consequences of the new form of cold dark matter

(A) From the observed experimental results it can be predicted that every celestial object should have a gravitationally bound stationary field of the new form of cold dark matter with real mass content around its center of gravity. **(B)** The sun, as every active star, should isotropically radiate quanta of the new form of matter stimulated by its internal mechanical shock dynamics. During a visible sun eclipse, the moon should intensify this radiation by a gravitational lensing effect. This is in agreement with the results of Figure 4, which indicate an amplified real exchange of momentum between such a solar form of radiation and the test sample. **(C)** Such an exchange of momentum between an isotropic, ubiquitous cosmic background radiation of quanta of the new form of matter and normal matter, in general, may explain the phenomenon of gravity as a "macroscopic Casimir effect," according to the "hypothesis of absorption" [2]. **(D)** Under the basic assumption that the behaviour of an assembly $n_S \gg 1$ of quanta of the new form of matter in a bound state obeys Bose statistics, the stationary field of the new form of matter around a celestial body's center of gravity should be describable by quantum mechanical formalisms i.e., by a Schrödinger equation, in which Planck's quantum of action, h, is substituted by a new quantum of action, $A = n_S^2 \cdot \mathrm{h}$, and $e^2/(4 \cdot \pi \cdot \varepsilon_0 \cdot r)$ by $G \cdot m_{star} \cdot (m_{P,S} + \sum_{n_S,S} (n_S \cdot m_{St,S}))/r$ [3]. **(E)** The gravitationally active lobes in a star's rotational axis of the resulting large-scale orbital structures can explain the observed formation of gravitationally driven bipolar outflows and jets (as well as anti-jets and MASERs) during early and late phases of stellar evolution, as well as on other levels [3]. Ring-shaped orbital structures perpendicular to a star's rotational axis allow, for example, the determination of the masses of planets in the solar system [3]. **(F)** Furthermore, such $1s$ (see Nebula IC 3568), $2p$ (NGC 3372, galaxy Cygnus A), $3d_{z^2}$ (hourglass nebulae such as MyCn 18, core of galaxy NGC 4261, galaxy NGC 5128) or $3d_{xy}$ (NGC 5514) orbitals or orbital-superpositions such as $2s + 2p$ (NGC 6826) should gravitationally give shape to emerging planetary nebulae, as observed. **(G)** A new redshift mechanism, in addition to the cosmological redshift interpretation, may result, according to $\Delta\nu/\nu = (G/c^2) \cdot \int_0^R \phi(r) \cdot \varrho(r) \cdot r \cdot dr$, which can explain the present discrepancies in the determination of the Hubble constant, H [4]. $\varrho(r)$ describes the density of the new form of matter as a function of the distance r, and $\phi(r)$ represents the coupling strength of light $(\mathrm{h} \cdot \nu)$ to dark matter relative to its gravitational coupling as well as deviations from the $1/r^2$ dependency. The more distant "standard candles" are observed for the determination of H, the more a gap should arise between "nearby" and "far away" determined values of H if this new redshift mechanism is not taken into consideration. **(H)** Further testable effects at cosmological, solar, global, local or microscopic scales can be expected.

References

[1] K. Volkamer et al., Journal of Scientific Exploration 8 No. 2 (1994) 217; see also K. Volkamer et al., Proceedings of The Eighth Marcel Grossmann Meeting, Hebrew University, Jerusalem, (June 22–27, 1997) papers nos. 1 and 2.
[2] A. K. Assis, Apeiron (Canada) 13 (1992) 3.
[3] K. Volkamer et al., in: F. Krause, ed., The cosmic dynamo, IAU Symp. No. 157, 1992 (Kluwer Academic Publishers, Dordrecht, The Netherlands, 1993) 183.
[4] A. Watson, Science 279 (1998) 981.