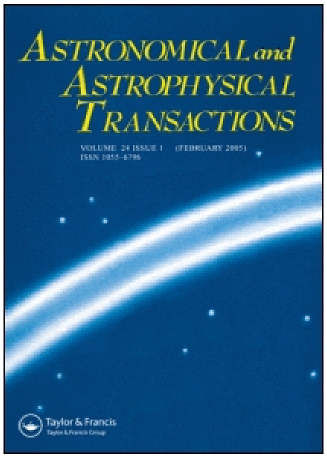

Astronomical & Astrophysical Transactions
The Journal of the Eurasian Astronomical Society
Publication details, including instructions for authors and subscription information:
http://www.informaworld.com/smpp/title~content=t713453505

DETECTING THE DARK ELECTRIC MATTER OBJECTS (DAEMONS)

E. M. Drobyshevski [a]
[a] A. F. Ioffe Physical-Technical Institute, Russian Academy of Sciences, 194021 St. Petersburg, Russia.

Online Publication Date: 01 January 2002
To cite this Article: Drobyshevski, E. M. (2002) 'DETECTING THE DARK ELECTRIC MATTER OBJECTS (DAEMONS)', Astronomical & Astrophysical Transactions, 21:1, 65 - 73
To link to this article: DOI: 10.1080/10556790215563
URL: http://dx.doi.org/10.1080/10556790215563

Astronomical and Astrophysical Transactions, 2002, Vol. 21(1–3), pp. 65–73

DETECTING THE DARK ELECTRIC MATTER OBJECTS (DAEMONS)

E. M. DROBYSHEVSKI*

A. F. Ioffe Physical-Technical Institute, Russian Academy of Sciences, 194021 St. Petersburg, Russia

(Received 20 December 2000)

A month-long observation of two horizontal mutually light-isolated scintillating screens, 1 m^2 in area and located one above the other a certain distance apart, revealed about 15 correlated signals, whose time shift corresponds to an average velocity of only $\sim$10–15 km s^{-1}. We assign the origin of these signals to the negative daemons, *i.e.* electrically charged Planckian particles which supposedly form the DM in the Galactic disc, captured into the near-Earth orbits. As follows from an analysis of the factors accompanying the signals and governing their properties, the key part in the detection of daemons is played apparently by two processes: (i) nucleon decay in the daemon-containing nucleus, and (ii) emission of energetic electrons and nucleons in the capture of a nucleus of atom by a daemon. The first process results in the release by daemons of the heavy nuclei captured by them in traversing the components of the system (S, Fe, Zn, Sn etc.), and the second, in excitation of the main part of the scintillations observed in the ZnS(Ag) phosphor. The flux of slow daemons through the Earth's surface estimated from the measurements is $\sim 10^{-9}\,\mathrm{cm^{-2}\,s^{-1}}$.

Keywords: Black hole physics; Dark matter; Elementary particles; Nuclear reactions; Nucleosynthesis; Proton decay

1 INTRODUCTION: THE DAEMON HYPOTHESIS AND SOME OF ITS IMPLICATIONS

It is presently accepted that our Universe started from Planckian scales. It thus appears only natural to assume that greater part of its matter, *i.e.* its dark matter (DM) also consists of Planckian particles with $M = (\pi\hbar c/4G)^{1/2} \approx 2 \times 10^{-5}$ g and $r_g = 2GM/c^2 \approx 3 \times 10^{-33}$ cm in size. These are elementary black holes that can be stable (Bekenstein, 1994) because of their temperature being equal to the mass, so that they should evaporate particles of the same mass. Multi-dimensional (>4) theories (*e.g.* Chan *et al.*, 1995) allow also the existence on them of a stable electric charge $Ze = G^{1/2}M \approx 10\,e$. If we assume that the DM of the Galactic disk contains such DArk Electric Matter Objects, *i.e.* daemons carrying a negative charge, their buildup inside the Sun is capable of accounting for its energetics through catalysis of proton fusion reactions and for the deficiency of energetic (> 0.5 MeV) electron-capture (^{7}Be, pep) neutrinos (Drobyshevski, 1996b).

In the course of becoming captured by the Sun a daemon traverses it several times along strongly elongated orbits, whose perihelion lies within the Sun. In each passage through the Sun the daemon loses energy because of the braking action of the solar material and its orbit

* E-mail: emdrob@pop.ioffe.rssi.ru

ISSN 1055-6796 print; ISSN 1476-3540 online
DOI: 10.1080/1055679021000017628

contracts, so that eventually it becomes confined inside the Sun. If during its motion in an elongated orbit the daemon crosses the sphere of the Earth's influence, the latter deflects it slightly, with the result that the perihelion of the new orbit will most likely leave the Sun's interior. The daemon moves now along a new, strongly elongated heliocentric orbit, where there is no braking. This is how a stable population of daemons forms, which move in the so-called Earth-crossing orbits. Fairly optimistic estimates yield for the daemon flux onto the Earth $f_{\oplus} \approx 3 \times 10^{-7}\,\mathrm{cm^{-2}\,s^{-1}}$ for a relative velocity $V_{\mathrm{r}} = (3\mathrm{GM}_{\odot}/d_{\odot-\oplus})^{1/2} \approx 52\,\mathrm{km/s}$ (Drobyshevski, 1997). More realistic estimates lower $f_{\oplus}$ by two or three orders of magnitude (Drobyshevski, 2000b). These estimates are based on the lower limit of DM content in the Galactic disc ($\sim 0.07\,\mathrm{M}_{\odot}/\mathrm{pc}^3$ (Bahcall, 1984; Bahcall *et al.*, 1992)). They allow the possibility of the existence among the daemons of a positive and a neutral component, and take into account the noticeable variation of the inclination of the ecliptic with a characteristic time of a few Myr. They include also the possibility of daemon orbits being influenced by gravitational perturbations of the Earth and other planets, as a result of which part of the daemons may escape from a zone of the Earth's influence or even from the Solar system at all, while another part, after several traversals of the Earth, may enter near-Earth almost circular orbits and, some of the daemons, after several traversals of the Earth, even become trapped in geocentric orbits crossing its surface. Eventually such objects may become confined to the Earth.

Daemons can interact with matter on the subnuclear level in two ways:

(i) Having an electric charge up to $Ze \sim 10\,\mathrm{e}$, they are capable of catalyzing the fusion of light nuclei. As a result of internal conversion in the vicinity of a heavy charged particle, the fusion energy becomes usually converted fully to the kinetic energy of the resulting compound nucleus.

We have attempted to use this process for detection of daemons populating elongated heliocentric orbits by an acoustic technique using Li plates (Drobyshevski, 1997; 1999) and by the scintillation method by viewing two sides of 4.5 cm thick Be plates coated by ZnS(Ag) scintillator (Drobyshevski, 2000b). In the first case, it was assumed that the fusion energy released along the daemon trajectory and amounting to $10^3\,\mathrm{erg\,cm^{-1}}$ would generate an acoustic wave. Unfortunately, the damping of acoustic waves in Li at the characteristic frequency $\sim$25 MHz turned out to be so strong that experimentation along these lines had to be stopped.

In the second case, it was expected that the scintillator at the entrance and exit of the daemon trajectory would be excited with a delay of $\sim 0.9\,\mu\mathrm{s}$ by a jet of $^{18}\mathrm{O}$ nuclei ejected from a depth of up to $\sim 5\,\mu\mathrm{m}$ in the sample in amounts of up to $\sim 10^3$. No such effect was observed after an exposure of 300 h (Drobyshevski, 2000b) (which was subsequently prolonged to 500 h). An analysis of the results of this experiment showed that the daemon population flux in elongated orbits (if it does exist) should be $f_{\oplus} \lesssim 3 \times 10^{-8}\,\mathrm{cm^{-2}\,s^{-1}}$.

(ii) A substantial part of the decrease of the probability of detecting daemons from their catalytic properties could be due to the poisoning of the catalyst as the daemon captures a heavy nucleus either from the scintillator or from the bulk of Be; indeed, the content of heavy nuclei as impurities in our Be samples was $\sim$0.1 at %.

Poisoning of the catalytic properties of the daemon by heavy nuclei is not fatal if for no other reason than the possibility for the nucleus to sink under its relativistic horizon (Drobyshevski, 1996a). The details of interaction of a nucleon with a daemon embedded in it are unclear. Nevertheless an analysis of the processes responsible for energy production in the Sun made under the assumption that it is due to daemon-catalyzed proton fusion leads to a conclusion that a daemon recovers its catalytic properties in $\tau_{\mathrm{ex}} \sim 0.1$–$1\,\mu\mathrm{s}$. This can be assigned to daemon-stimulated proton decay (Drobyshevski, 2000a,b). It appears reasonable to suggest that such an event would give rise to emission of particles, for example, pions, recoil nuclei or their fragments, which are capable of exciting scintillations.

It also appears natural that the capture of a nucleus itself, due to great daemon/nucleus binding energy $W = 1.8Z_n ZA^{-1/3}$ MeV (Drobyshevski, 1996a), would excite its internal degrees of freedom with emission of radiation and evaporation of numerous nucleons and their clusters.

The above reasoning served as a basis for developing a new, very simple system for daemon detection.

Besides, on having already started the experiment, we recognized a very important point, namely, that during the daemon originally capturing the nucleus, the atom must emit Auger, refilling, and internal conversion electrons with an energy comparable, in the limit, to the nucleus-daemon binding energy. The latter reaches as high as tens of MeV, so that some of these electrons may well have energies as high as 10^5–10^6 eV (Drobyshevski, 1997; 1999).

2 THE BASIC IDEOLOGY OF DETECTION AND THE DESCRIPTION OF THE SETUP

This time the system did not contain any exotic components like Li, Be etc. We started from the assumption that decay of a daemon-containing nucleon in a heavy nucleus with $Z_n \geq 24/Z$, where the ground daemon's level is less in size than the nucleon, opens new possibilities for daemon detection. One still does not know what radiation accompanies the daemon-stimulated proton decay, and whether this process should entail decay of the nucleus containing this proton, but it may be conjectured that the products of this process should create scintillations. In a favorable case the shape of these scintillations could provide information on the properties of these products.

These considerations served as a basis when developing a setup of four identical modules (Fig. 1). Each module contains two transparent polystyrene plates 4 mm thick and 50×50 cm in size. The distance between the plates could be varied, but in the experiments being described here it was 7 cm. One of the polystyrene plate surfaces was coated by type-B3-s ZnS(Ag) cathodoluminophor powder $\approx 3.5\,\mathrm{mg\,cm^{-2}}$ thick. The average powder grain size is 12 μm. The plates were separated by a sheet of black paper.

To be able to judge the direction of arrival of the possible daemon flux, the ZnS(Ag)-coated surfaces of the polystyrene plates were set facing the same side (down). Each plate was viewed from a distance of 22 cm by one FEU-167 PM tube with a dia. 100-mm photocathode. As a result, the light intercepted by the bottom PM tube was emitted directly from the scintillator surface, while that entering the top PM tube passed also a 4-mm thick layer of transparent polystyrene on the way.

The polystyrene plates and the PM tubes viewing them were placed in a cubic case 51 cm on the edge made of 0.3-mm thick tinned iron sheet, but the upper horizontal case face was made of two sheets of black paper (the surface density of the two sheets was $14\,\mathrm{mg\,cm^{-2}}$). The PM photocathodes were arranged flush with the horizontal case faces. All the four modules were placed side by side in one horizontal plane at a distance of ~ 1.5 m from the floor. Thus the total area of the detecting system was 1 m^2.

The PM tubes were powered by a voltage corresponding to their sensitivity of 10 A/lm. A 4.5-kΩ resistance served as a load. The signal from the load was supplied through a 1 mH inductance and a cable of total capacity 550 pF to an oscilloscope. The purpose of this L-C circuit was to stretch the leading edge of the pulse so as to facilitate discrimination of the long scintillations produced by heavy nonrelativistic nuclei like α-particles against PM tube noise and the scintillations caused by low mass and relativistic particles (cosmic rays etc). Four S9-8 dual-trace digital oscilloscopes were used. Signals from the two PM tubes of the same module were fed for comparison into two inputs of one oscilloscope. The latter

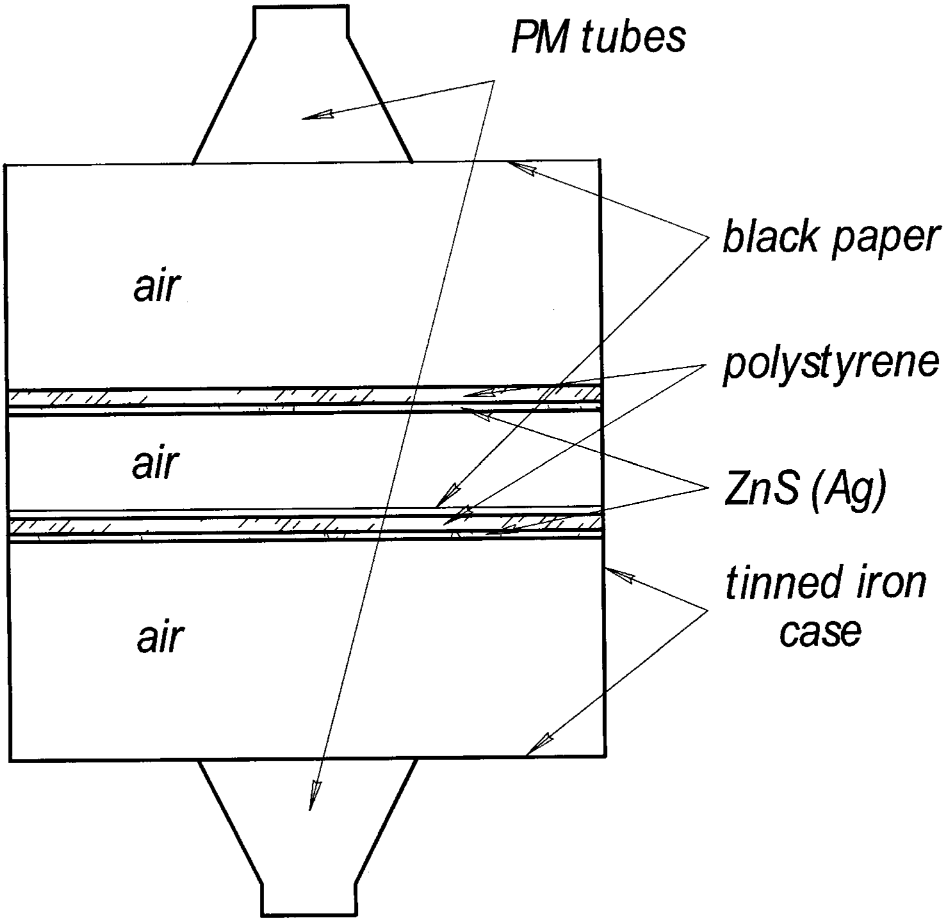

FIGURE 1 Schematic of the scintillation-detecting module.

was triggered by the output signal of the top PM tube if it reached a level $U_1 \approx 2.5$ mV. The signal from the lower PM tube was considered significant if it increased in 0.4–1.5 μs to maximum and its amplitude was $U_2 \geq 0.6$ mV. The signals from the oscilloscopes recorded during -100 μs before the trigger (*i.e.* with a lead) and during $+100$ μs after the trigger (*i.e.* with a delay) were entered into computer memory if they were seen in both traces.

3 THE ASSUMED SEQUENCE OF EVENTS TRIGGERED BY DAEMON PASSAGE THROUGH THE SYSTEM

The system was originally designed to detect daemons impinging on it primarily from above.

Indeed, it was assumed that a daemon propagating through the polystyrene plate from above would capture nuclei from the ZnS(Ag) layer coating it on the back side. If this was a daemon from the population in elongated heliocentric orbits, it would, in passing at a velocity $\approx$52 km s^{-1} in $\tau_{ex} \sim 0.1$–1 μs a path $\sim$0.5–5 cm, cause decay of a proton in the captured nucleus. If the proton decay produces a particle of the type of the pion, the latter will create with a probability $\sim$0.5 a scintillation, which will be detected by the top PM tube. One cannot certainly rule out the possibility that the penetrating radiation produced in the proton decay will propagate downward to excite the scintillator on the bottom plate. One can in principle conceive catalytic fusion reactions of nitrogen and oxygen nuclei captured in air, but the range in air of the heavy products of these reactions $\leq$0.5 cm, so that the probability of their detection after the daemon has traversed the top polystyrene plate appears low. The same applies to carbon and hydrogen, the components of the polystyrene, all the more so that in the subsequent passage through the ZnS(Ag) layer the already captured ^{12}C or ^{1}H nuclei will not have time enough to react outside the plate or will be promoted to higher lying levels and lost in the preferential capture of heavier nuclei in ZnS(Ag).

As we realized later, different type electrons emitted by atoms, as their nuclei are captured by a daemon as well as the nucleon radiation from these highly excited nuclei, is an essential factor increasing the probability of detecting the daemon by the scintillation technique (Drobyshevski, 1997; 1999).

Similar processes take place as the daemon passes through the bottom polystyrene plate, whose lower surface is also coated by a ZnS(Ag) layer and viewed by the second PM tube. Knowing the distance between the scintillator layers (7 cm), one can readily find from the signal delay between the first and second PM tubes the velocity of the particle that has passed through the system. The signal shift for the daemons populating the elongated heliocentric Earth-crossing orbits may be expected to be $\Delta t \approx 1.4\,\mu$s for daemons impinging normally to the plate surface. A tilt of the trajectory would make Δt larger.

4 SOME SPECIFICS OF THE EXPERIMENT

After setting up and preliminary experiments in January–February 2000, the system was put in round-the-clock operation in March 2000, with the total exposure amounting to 700 h $\approx 2.5 \times 10^6$ s. Altogether, $\sim 6 \times 10^5$ oscilloscope triggering events have been recorded, only $\sim 10^4$ of which contained a signal on the second trace and were entered into the computer. About 2/3 'single' triggers contain a tailing signal typical of a heavy-particle scintillation (HPS) (caused, e.g. by the ^{238}Pu α-particle source used for calibration). These signals are most likely due to radioactive background decays. The remaining single triggers are initiated by short signals characteristic of PM tube noise or cosmic-ray relativistic particles (Noise-Like Signals – NLS). The double events are primarily NLSs occurring without any time delay and coinciding in shape (delays $\leq 0.2\,\mu$s). Sometimes these signals appear simultaneously in two, three, and even all four modules. We assign such events to relativistic cosmic-ray particles and the showers they produce. Very infrequently, in only twenty-thirty of all the events recorded, one of the two signals has the characteristics of a HPS (with long rise and decay times).

This experiment was aimed at detecting objects moving with velocities $<100\,\mathrm{km\,s^{-1}}$, Therefore we were interested only in signals shifted one with respect to the other by a time $\geq 1\,\mu$s.

5 RESULTS OF THE EXPERIMENT

The number of events with shifted signals in both traces recorded during the month is Y17. (We disregard the infrequent cases where unshifted signals are accompanied by one more signal on one of the traces.) In the case of purely uncorrelated stochastic generation of signals, no statistically significant clusters of events should appear in the time distribution of second-trace signals.

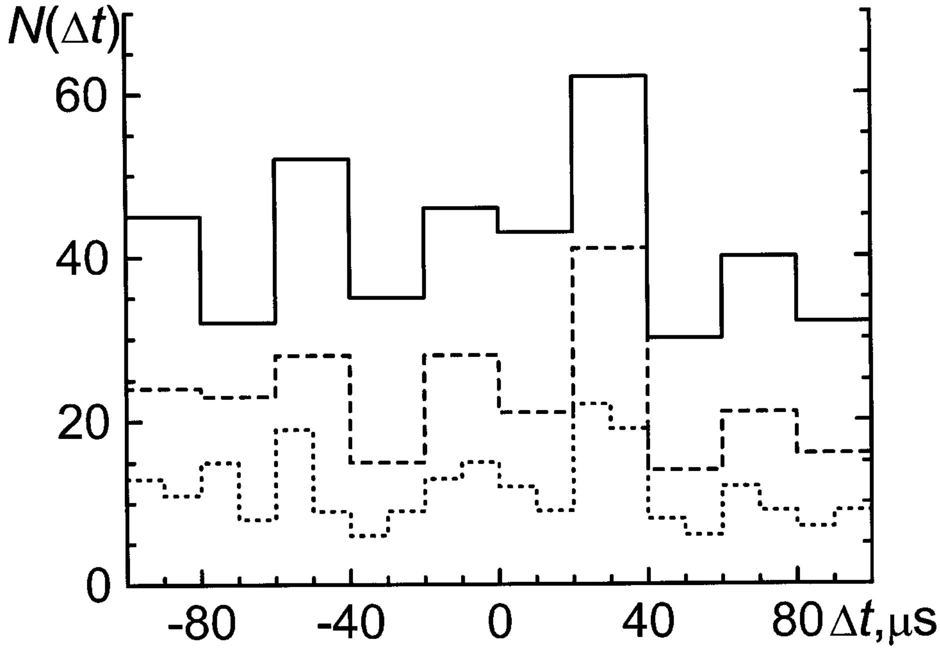

FIGURE 2 (——) Distribution $N(\Delta t)$ of pair scintillation events on their time shift (relative to the upper channel events). (– – –) Similar distribution for the HPS (heavy-particle scintillation) type events only. (. . .) The 10-μs bin HPS distribution.

As already mentioned (Sec. 3), we expected a positive signal shift of $\Delta t \approx 1.4$ μs or somewhat longer. One could expect a similar but statistically less significant maximum to the negative side of the triggering pulse on the first trace (because of the properties of our system being asymmetric relative to the daemon motion). As always, reality introduced substantial corrections into our speculations.

Figure 2 shows an $N(\Delta t)$ distribution of second-trace signals in the time Δt of their shift relative to the onset of the triggering signal on the first oscilloscopic trace. The time interval from -100 μs to $+100$ μs was divided in 10 equal bins. One immediately sees the presence in the distribution of fairly strong extrema, so that one can hardly question the presence of a correlation among a part of the signals and of their being nonrandomly distributed. By the χ^2 criterion, the confidence level of this being not a Δt-independent distribution is not less than 99%.

First of all, there is a maximum in the region of $+30$ μs for an average 41.7 event/bin level. It contains 62 events, which exceeds 3.14 times the statistically allowable scatter $\sigma \approx \pm\sqrt{41.7} \approx \pm 6.46$. An excess over 1σ contains ≈ 15 events. For the area of our detector of 10^4 cm^2 and an exposure time of 2.5×10^6 s, this amounts to a total flux $f_\oplus \approx 0.6 \times 10^{-9}$ cm^{-2} s^{-1}.

6 AN ATTEMPT AT INTERPRETING THE RESULTS

An analysis of the $N(\Delta t)$ distribution displayed in Figure 2 permits certain conclusions both on the nature of the agent responsible for this distribution and on the character of its interaction with matter.

While one cannot rule out a possibility of other interpretations, we shall try to treat the results within the daemon hypothesis.

We note immediately that when compared with the distance between the ZnS(Ag) screens, 7 cm, or the linear dimensions of our whole system, ~25–40 cm, the position of the most significant maximum on the time axis (+30 μs) indicates a fairly low velocity of the objects giving rise to the maximum. In the first case it is 3–5 km s, in the second case this velocity is about 10–15 km s. An object propagating with such a velocity cannot ionize atoms by impact. The fact that oscilloscopic traces typical of data presented in Figure 2 exhibit only one pulse shifted relative to the primary one, and that there is no pulse paired with the trigger (*i.e.* without a shift in time) suggests that the radiation emitted in interaction of the daemon with matter has a low penetrating power. Polystyrene 4 mm thick or iron 0.3-mm thick stop it completely. If these are electrons, their energy is <1 MeV, and for the pions the energy is also <1–2 MeV. (Note, however, that the simplest method of detection employed by us does not yet offer a possibility of unambiguous identification of the particles responsible for the scintillations).

Of the above two possibilities (3–5 or 10–15 km s^{-1}), the first does not allow straightforward explanation within the concepts of celestial mechanics; indeed, these can be only objects populating geocentric orbits, but, if so, why would their velocity be so small? The alternative with ~10–15 km s^{-1} appears preferable. It is easier to understand, if the detected objects fall on the Earth from almost circular near-Earth heliocentric orbits. The objects enter these orbits from strongly elongated heliocentric orbits after a few transits through the Earth's sphere of influence. We shall choose the latter version.

This version suggests that the base to be used to calculate the velocity is the distance of 29 cm between the top scintillator and the bottom lid of the case. Whence it follows immediately that a *downward-moving daemon* gets rid of the Zn or S nucleus captured in the top scintillator not in 0.1–1 μs but in time much longer than it takes the daemon to cross the 7-cm gap, i.e., in $\tau_{ex} > 7$ μs. After the ejection of all atomic-shell electrons in Auger emission, the disintegration of the Zn or S nucleus excited in the capture starts with emission of many (~10) nucleons and their clusters (α-particles etc.) and accompanied emission of refilling and/or internal conversion electrons. All these particles initiate in the ZnS(Ag) layer a strong HPS-type scintillation, which exceeds by far in intensity the usual background signals (due to cosmic rays etc.). Next, the daemon-containing protons in the nucleus start to successively disintegrate. On entering the bottom lid of the case, the daemon loses the light remnant (if its $Z_n < Z$) of the nucleus when capturing a Sn or Fe nucleus. Numerous electrons and nuclear particles are emitted again. But only energetic electrons (>0.5 MeV) can cross the 22-cm air gap to the bottom scintillator and initiate there a scintillation.

It is worth to note that after the transit through the 7-cm gap and decrease of the net daemon/nuclear-remnant charge to less than 0, the daemon is capable, in principle, of capturing a light nucleus from air. However, because of the small size of such a nucleus ($<5 \times 10^{-13}$ cm) and its high excitation potential (2.3 MeV for ^{14}N, 6 MeV for ^{16}O, and 4.4 MeV for ^{12}C), it does not come in contact with the daemon and remains unexcited in Rydberg levels with $n \sim 10^2 - 10^3$ during $\tau_{Ryd} \approx 850 Z_n^2/\chi_{tot}^3$ s – time of excess energy radiating (here χ_{tot} in eV is an energy of total ionization of atom; the initial nucleus-daemon distance r_0 is defined by $ZZ_n e^2/r_0 = \chi_{tot}$). For carbon, nitrogen, and oxygen τ_{Ryd} is as high as $\sim 10^{-5}$ s. That implies inefficiency of organic scintillators and water as sensitive media for the daemon detection (for comparison, $\tau_{Ryd} \sim 10^{-7}$ s for S, and $\tau_{Ryd} \sim 10^{-8}$ s for Zn).

If the *daemon is propagating upward*, it captures immediately a Fe or Sn nucleus on the lower side of the bottom lid. In order to reach the bottom scintillator, the particles emitted in the lid have to pass nearly the 0.3-mm sheet of ion, and after that, the 22-cm air gap. This is possible only for the highest-energy electrons (>0.7 MeV), if they are produced there at all. In continuing to disintegrate the captured nucleus on its way, the daemon enters the bottom ZnS(Ag) later. If the nuclear remnant is small enough, a new Zn or S nucleus will be captured here, with the corresponding excitation of a scintillation. And only if the daemon has traversed the bottom scintillator without capturing here another nucleus, it can do it in the top scintillator (again, under the condition that the remnant of the old nucleus degrades, during passing the 7-cm gap, to a small enough mass). Only in this case, the detection system will be triggered.

Thus, the intentionally introduced asymmetry of our instrument suppresses strongly the detection efficiency for the upward propagating daemon flux compared to that of the daemons moving downward. This accounts for the absence of the maximum in the interval $-40 < \Delta t < -20\,\mu$s.

The small width of the maximum within the interval $20 < \Delta t < 40\,\mu$s can be readily understood if we take into account that the side walls of the case collimate the flux by cutting out a solid angle of $\sim$2 ster. The daemons entering the detector through these walls are poisoned by Sn or Fe nuclei and, therefore, do not capture Zn or S nuclei in the top scintillator, and, hence, do not produce a signal here. Also, if a particle crosses the top sheet of paper at too large an angle to normal and, on having triggered the top scintillator, enters the side wall in the lower half of the case, the particles emitted from the wall (primarily, electrons) will propagate mostly parallel to the plane of the bottom scintillator layer, thus producing in it only a weak signal (if at all). It thus becomes clear that although the instrument itself is intersected by trajectories within a large solid angle, it actually detects daemons which enter it primarily at small angles to normal.

An additional and important information can be obtained by using the $N(\Delta t)$ plot only the events containing HPSs at least in one channel (Fig. 2). While this distribution consists of 231 events only, the C. L. of its being different from $N(\Delta t) = \text{const}$, calculated by the χ^2 criterion, rises to 99.7%. All the events responsible for the maximum near $+30\,\mu$s are concentrated in this distribution. Note that this maximum exceeds the statistically allowed scatter above the mean level by a factor 3.7 (that corresponds to the C.L. 99.98%). The fact of all the significant information being contained in the HPS distribution may mean, indeed, that the emission of electrons in the nucleus capture by a daemon is followed by ejection of nuclear particles from the highly excited heavy captured nucleus.

The remaining distribution, consisting only of the NLSs, does not contain statistically significant features, and therefore we do not present it here. The absence of features in the NLS distribution provides one more argument for the events of interest to us here not being the result of interference or regular instrumental malfunctions. For reference, Figure 2 displays also an HPS distribution for 10-μs wide bins.

7 MAIN CONCLUSIONS

Irrespective of details in a possible interpretation of the results of our fairly simple experiments, it can be maintained that we have detected at a confidence level of not less than 99% an indication of the existence of some indirectly ionizing or nuclear-active corpuscular cosmic radiation, whose objects move with velocities characteristic of astronomic macrobodies comprising a new population of the Solar system.

The main indication of the existence of this superslow radiation is the non-stochastic component in the long time shifts of signals of the two PM tubes viewing simultaneously light-insulated scintillator coatings on two parallel plates arranged one beneath the other. Judging from its manifestations and properties, this radiation can be identified with daemons, *i.e.* hypothetical Planckian objects carrying an electric charge and making up the DM of the

Galactic disk and, possibly, of the Universe. It is a search for such objects that has initiated this experiment.

The experiments on the confirmation and investigation of the properties of the radiation discovered by us will be continued. The main emphasis will be placed on a study of the specific features of the daemon flux, as well as on an unambiguous proof of the existence of daemon-stimulated nucleon decay, which is indirectly supported by the fact that one has to invoke it to interpret in a noncontradictory way the results obtained.

Acknowledgements

The author is greatly indebted to M. V. Beloborodyy, R. O. Kurakin, and V. G. Latypov for providing software and electronics maintainance.

References

Bahcall, J. H. (1984). *ApJ*, **276**, 169–181.
Bahcall, J. H., Flynn, C. and Gould, A. (1992). *ApJ*, **389**, 234–250.
Bekenstein, J. D. (1994). *Phys. Rev. D*, **49**, 1912.
Chan, K. C. K., Home, J. H. and Mann, R. B. (1995). *Nucl. Phys. B*, **447**, 441.
Drobyshevski, E. M. (1996a). *On Interaction of Black Miniholes with Matter.* Preprint PhTI-1663, Ioffe Phys.-Tech. Inst., St. Petersburg.
Drobyshevski, E. M. (1996b). *MNRAS*, **282**, 211–127.
Drobyshevski, E. M. (1997). In: Klapdor-Kleingrothaus, H. V. and Ramachers, Y. (Eds.), *Dark Matter in Astro-and Particle Physics.* World Scientific, Singapore, pp. 417–424.
Drobyshevski, E. M. (1999). In: Spooner, N. J. C. and Kudryavtsev, V. (Eds.), *Proc. 2nd Intnl. Workshop on Identification of Dark Matter.* World Scientific, Singapore, pp. 643–648.
Drobyshevski, E. M. (2000a). *MNRAS*, **311**, L1–L3.
Drobyshevski, E. M. (2000b). *Phys. Atomic Nuclei*, **63**, 1037–1041.