Dusty Dark Matter Bubbles of a New Vacuum stopped in Earth and Radiating 3.5 keV X-rays.

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Mysteries concerning Dark Matter

- Why do the Xenon experiments *not* "see" the dark matter ?

  The answer of our model: The dark matter particles get stopped down to too low speed by the atmosphere and the shielding.

- But how can then DAMA "see" the dark matter?

  Our answer: It radiates electrons. DAMA only test that it is dark matter by the seasonal variation, while the Xenon-experiments exclude the electron induced signal.

- Could the Xenon experiments then not look for electrons also?

  Our answer: Yes, and indeed Xenon1T "saw" a little excess of "electron recoil events" of energy about 3.5 keV.

Our Dark Matter and the Problems (Continued)

- But Electrons recoiled by 300 km/s hits only have about 1 eV energy, not keV's !

  Our model answer: Our dark matter particles can be excited so as to radiate 3.5 keV X-rays or electrons.

- How does the dark matter get excited so as to radiate electrons in DAMA and in Xenon1T ?

  Our answer: The dark matter particles get heated up and excited by the interaction with the atmosphere while being stopped.

Our Dark Matter and the Problems (yet contniued)

- But if they get so easily stopped and slowed down, does it not mean that the dark matter is not truly dark?

  Answer: It has an "inverse darkness"

$$\frac{\sigma}{M} = 15m^2/kg \text{ (for velocity } v \rightarrow 0. \text{)} \qquad (1)$$

enough for stopping, but only little noticed in astronomy.
In fact Camilla A. Correa fitted dwarf galaxy star velocites in a model with self interacting dark, SIDA, and got the number $15m^2/kg$ as the low velocity limit of the ratio of the cross section relative to the mass of a dark matter particle. At higher velocities the cross section falls off.

Washing off All But 10^{-4} of the Cross section in Atmosphere

We can even afford to wash off all of the cross section except for a 10000 times smaller cross section in the atmostphere and still have stopping so that the cleaned dark matter pearls can penetrate slowly through the shielding down to say DAMA.

$$\frac{\sigma}{M}|_{v\to 0} = 15m^2/kg(\text{“observed”}, \text{dusty}) \quad (2)$$

$$\frac{\sigma}{M}|_{clean} = 10^{-3}m^2/kg(\text{cleaned, vacuum-bubble}) \quad (3)$$

To compare inverse darkness of atoms:

$$\text{Carbon C: } \frac{\sigma}{M}|_C = \frac{\sigma_C}{12u * 1.66 * 10^{-27}kg/u} = 7.73 * 10^5 m^2/kg$$

$$\text{WIMP say: } \frac{m_W^{-2}}{m_W} \sim \frac{(0.2 * 10^{-17})^2 m^2}{2 * 10^{-27}kg} \sim 10^{-8}m^2/kg \quad (4)$$

Inverse Darknesses: Our Dark Matter dark compared to atoms, but WIMP is darker than ours.

$$\frac{\sigma}{M}|_{v\to 0} = 15 m^2/kg \text{ (``observed'', dusty)}$$

$$\frac{\sigma}{M}|_{clean} = 10^{-3} m^2/kg \text{ (cleaned, vacuum-bubble)}$$

$$\frac{\sigma}{M}|_{v=1000km/s} = 10^{-2} m^2/kg \text{ (``observed'', dusty, big clusters)}$$

$$\text{Carbon C: } \frac{\sigma}{M}|_C = \frac{\sigma_C}{12u * 1.66 * 10^{-27} kg/u} = 7.73 * 10^5 m^2/kg$$

$$\text{WIMP say: } \frac{m_W^{-2}}{m_W} \sim \frac{(0.2 * 10^{-17})^2 m^2}{2 * 10^{-27} kg} \sim 10^{-8} m^2/kg$$

Velocity dependence of cross section over mass $\frac{\sigma}{M}$

Self-interacting d

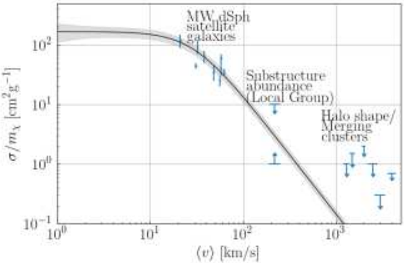
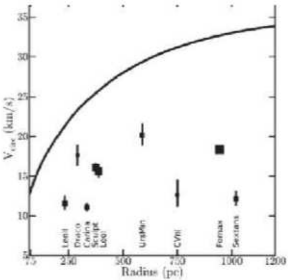


Figure 7. Same as Fig. 6, but extended to cover the range of MW- (~200 km/s) and cluster-size (~1000 – 5000 km/s) haloes' velocities. The figure shows upper and lower limits for σ/m_χ taken for substructure abundance studies (e.g. Volgelsberger et al. 2012 and Zavala et al. 2013), as well as based on halo shape/ellipticity

Plot showing that "only gravitation" interaction for dark matter does not function so well by Simulations on Dwarf galaxies (Correa).



Our Model of Dark Matter in Principle inside the Standard Model

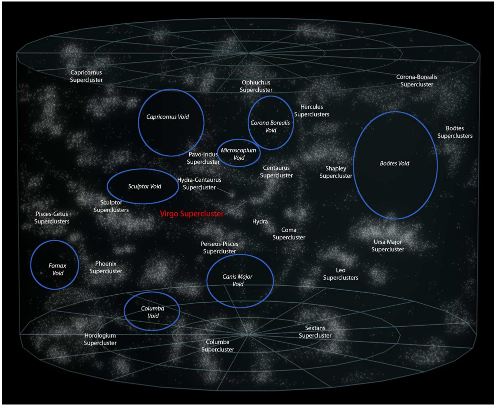
- Why did LHC not see any dark matter?

  Our answer: In our model the dark matter is composed from ordinary stuff like nuclei and electrons being caught into a bubble of a second phase of the vacuum.
  There i no “new physics” in our model, except that we do not know how the two (or more) types of vacua comes about.
  But we speculate that it can appear inside the Standard Model without genuine new physics; only with fine tunings of couplings.
  Presumably: **One vacuum with confinement; another one with QCD color Higgsed to be aligned with a Gellman $SU(3)$.**

Our Present Picture of Dark Matter

- **The Dark Matter Particles Composed of:**
  - A nm-size bubble of a new speculated vacuum filled with atomic highly compressed stuff, say carbon.
  - A surrounding dust particle of "metalicity" material such as C, O, Si, Fe, ..., presumably of some non-integer Hausedorf dimension about 2. This atomic matter is influenced by the electrons being partly in superposition of being inside the bubble of the new vacuum, where there is very high gap between filled and unfilled electron states.
- **It Interacts:**
  - with other dark matter particles,
  - with atomic matter

But we speculate if the new vacuum might be found inside the large voids (galaxy free regions) ? (Same vacuum as inside the dark matter could be in voids?)



kunstmaler lars andersen http://www.23.dk/skak.htm

Lars Andersen

Historiemaler Portrætmaler Provokunstner Om Lars Andersen CV/omtale Kontakt

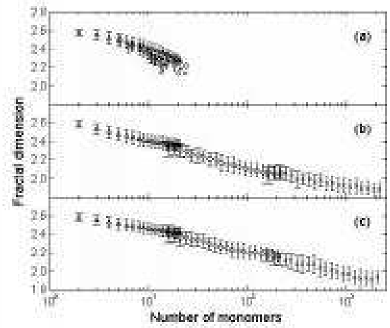
Several degenerate Vacua (MPP) $\sim$ Slush $\Rightarrow 0^0 C$

The X-ray Emission from Dark Matter of 3.5 keV is Crucial for Our Study

Most important suggestion for our model may be that we find the energy number 3.5 keV in **three** different places as a possible favorit level transition energy difference for dark matter:

- The long from dark matter suspected otherwise not understood X-ray line from galaxy clusters, galaxies, and strangely the Tycho supernova remnant.
- As average of the energy of the DAMA dark matter events.
- As an average of the electron recoil excess in the Xenon1T experiment.

Dust easily get of Lower than 3 Dimensions



Picture of Fractal Cosmic Dust Grain

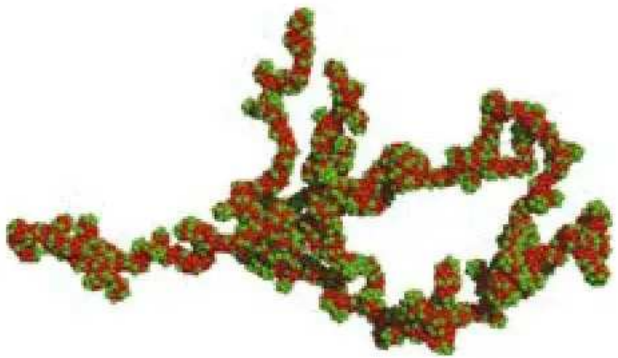


Рис. 3. Фрактальная модель космической пылинки [5]

Our Dark Matter Particle is Bubble with a Dust Grain Around it

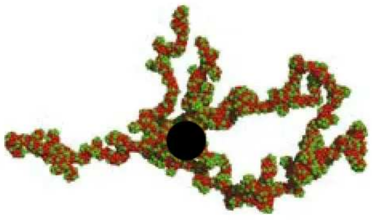


Рис. 3. Фрактальная модель космической пылинки [5]

If grain size $0.1\mu m$ and bubble $1nm = 0.0001\mu m$, then the bubble is about 100 times smaller than the dust grain.

Important achievements of Our Model

- Explain that only DAMA "see" the dark matter by the particles interacting so strongly as to be quite slow and unable to knock at nuclei making them able to make observable signals. In stead the DAMA signal is explained as due to emission of electrons with the "remarkable energy 3.5 keV". Actually Xenon1T saw these electrons from the dark matter particle **decays** as the mysterious electron recoil excess.
- The favorite frequency of electron or photon emission of the dark matter particles is due to a homolumo gap in the material inside the bubble of the new vacuum. This gap should be equal to the 3.5 keV.

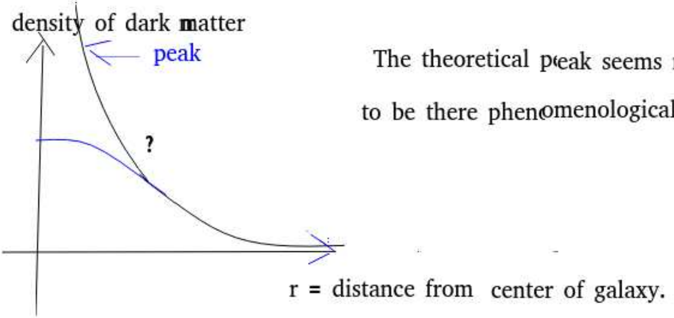
Achievements concerning the X-ray line 3.5 keV

- In a rather complicated calculation of what happens when the bubbles - making up the main part of the dark matter particle - hit each other and the surface/skin/domaine wall contract and how one gets out a part of the energy as 3.5 keV X-rays, we fit with one parameter both the very frequency number 3.5 keV, and the over all intensity of the radiation as fitted by Frye and Cline.
- We explain that - otherwise mysteriously - the 3.5 keV line was seen by Jeltema and Profumo from the Tycho supernova remnant! and probably also problems with the Perseus galaxy cluster 3.5 keV observations. This is by claiming the excitation of the bubbles come from cosmic radiation in the supernova remnant.

Achievements on the Dwarf galaxy lack of Peaks in Dark Matter Distribution

- According to expectations from ideal dark matter that only interacts essentially by gravity there should be e.g in a dwarf galaxy a concentrated peak of dark matter, but that seems not to be true. Correa can fit the dwarf galaxy star velocities by the hypotesis that dark matter particles interact with each other with a cross section over mass increasing for lower velocity. We fit the cross secton over mass velocity dependence of hers. But we need a “hardening ” of the dust around the bubbles.

Theoretically very dark dark matter form a distribution with a peak in the center, NFW



The theoretical peak seems not to be there phenomenologically.

Velocity dependence of cross section over mass $\frac{\sigma}{M}$

Self-interacting d

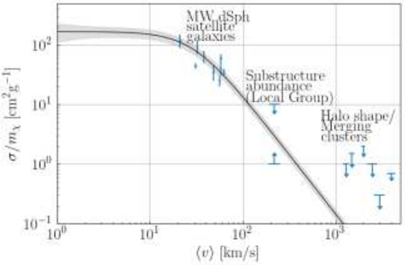


Figure 7. Same as Fig. 6, but extended to cover the range of MW- (~200 km/s) and cluster-size (~1000 – 5000 km/s) haloes' velocities. The figure shows upper and lower limits for σ/m_χ taken for substructure abundance studies (e.g. Volgelsberger et al. 2012 and Zavala et al. 2013), as well as based on halo shape/ellipticity

Illustration of Interacting and Excitable Dark Matter Pearls

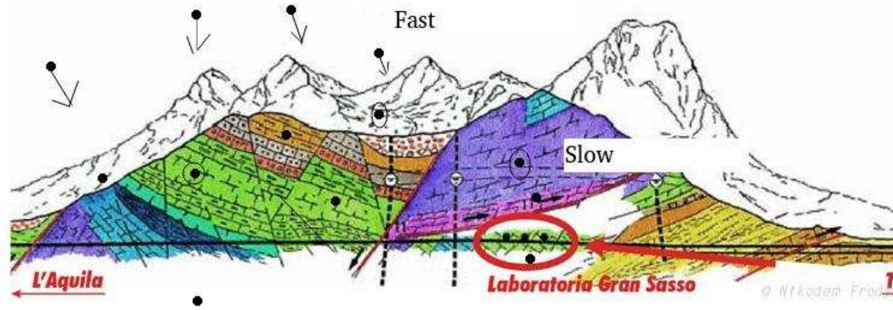


Figure: The mountains above the Gran Sasso laboratories.

The Impact of the Dark Matter Particles.

We imagine that the dark matter pearls loose their dust grain in the atmosphere or at least if not before by the penetration into the earth shielding, and that they at the same time get excited by means of the energy of the breaking of the pearls. A tiny bit of the by this excitation in the pearls deposited energy gets radiated first much later when the pearl has passed through the earth shielding, so as to deliver X-ray radiation just with the characteristic energy 3.55 keV per photon. The energy is delivered we guess by electrons or photons. Thus experiments like the xenon experiments do not "see" it when looking for nucleus-caused events. Only DAMA, which does not notice if it is from nuclei or from electrons do not throw electron-caused events away as something else.

Stopping

The dark matter pearls come in with high speed (galactic velocity), but get stopped down to much lower speed by interaction with the shielding mountains, whereby they also get excited to emit 3.55 keV X-ray or **electrons**.

Over View of Amounts ⇒ Mass ratio

Note some percentages of the matter in the Universe:

- 27% dark matter (while 68% of a form of energy known as dark energy, and 5 % ordinary matter).
- A typical value $8.8 = 12 + log(O/H)$ means $O/H = 10^{-3.2}$. According to table in wikipedia The estimate for the Milky Way the O (=oxygen) is the most abundant "metal"-element making up 10400 ppm, folowed by carbon 4600 ppm, Iron is down to 1090 ppm. The two dominant elements H and He make up 98 %. At fixed stellar mass a galaxy with a higher SFR(= star formation rate) has alower oxygen abundance,

$$12 + log(O/H) \;=\; b + \beta * (log(M*) - \gamma log(SFR), \quad (5)$$

where $b = 4.2$, $\beta = 0.47$, and $\gamma = 0.32$ for metallicities on the Maiolino et al. (2008) scale (Mannucci et al. 2010).

Cross sections for Atoms

$$\text{Hydrogen H: } r_H = 25pm \Rightarrow \sigma_H = \pi r_H^2 = 1963pm^2 \quad (6)$$

$$\text{Helium He: } r_{He} = 30pm \Rightarrow \sigma_{He} = \pi * r_{He}^2 = 2827pm^2 \quad (7)$$

$$\text{Carbon C: } r_C = 70pm \Rightarrow \sigma_C = \pi * r_C^2 = 15394pm^2 \quad (8)$$

$$\text{Silicium Si: } r_{Si} = 110pm \Rightarrow \sigma_{Si} = \pi * r_{Si}^2 = 38013pm^2 \quad (9)$$

"Inverse Darknesses" for Atoms

Using that one atomic unit $1u = 1.66 * 10^{-27} kg$ we get for the inverse darkness ratios for the atoms mentioned:

$$\text{Hydrogen H:} \quad \frac{\sigma_H}{1u * 1.66 * 10^{-27} kg/u} = 1.183 * 10^6 m^2/kg \quad (10)$$

$$\text{Helium He:} \quad \frac{\sigma_{He}}{4u * 1.66 * 10^{-27} kg/u} = 4.26 * 10^5 m^2/kg \quad (11)$$

$$\text{Carbon C:} \quad \frac{\sigma_C}{12u * 1.66 * 10^{-27} kg/u} = 7.73 * 10^5 m^2/kg \quad (12)$$

$$\text{Silicium Si:} \quad \frac{\sigma_{Si}}{28u * 1.66 * 10^{-27} kg/u} = 8.18 * 10^5 m^2/kg \quad (13)$$

Shadowing

In a dust grain say the atoms will typical shodow for each other and thus this ratio “the inverse darkness” will be smaller than if the atoms were all exposed to the collision considered. If we denote the average number of atoms lying in the shadow of one atom by “numberthickness” we will have for the ratio for the full grain say

$$\frac{\sigma}{M}\Big|_{grain} = \frac{\frac{\sigma}{M}\big|_{atom}}{\text{“numberthickness”}} \tag{14}$$

More Dark with a Heavy Core / Bubble

If we insert in the grain a masswise dominating bubble, the whole object will of course get a small ratio due to the higher mass,

$$\frac{\sigma}{M}\Big|_{composed} = \frac{\sigma}{M}\Big|_{grain} * \frac{M_{grain}}{M}, \qquad (15)$$

where M is the mass of the bubble or if it dominates of the whole composed object, the dark matter particlee.

Ratio of Dark Matter to "Metals"

On the average of course the ratio $\frac{M_{grain}}{M}$ of the dust around the bubble and the bubble itself can never be bigger than the amount of dust-suitable mass to dark matter in the universe. So noting that the grain should largely be made by the elements heavier than helium, the so called "methals", and that these make up only of the order of 1 % of the ordinary matter which again is only about 1/6 of the mass of the dark matter, we must have

$$\frac{M_{grain}}{M} \leq 1\%/6 = 1/600. \tag{16}$$

But really of course not all the "methal" has not even reached out to the intergalactic medium, let alone been caught up by the dark matter. So we expect an appreciably smaller value for this ratio of dust caught to dark matter relative to the dark matter itself.

Measured Inverse Darkness, at Low Velocity

Now we have in earlier papers already used the from dwarf galaxy fitted selfinteraction in the low velocity limit gave

$$\frac{\sigma}{M}|_{v-->0} = 15m^2/kg. \quad (17)$$

So we might crudely estimate the amount of dust being collected by 8.4 times bigger density of metals than to day and the 8.9 times younger universe, giving **effective numbers** for the dust settling:

$$\text{“metal density”}_{eff} = 3.71 * 10^{-31} kg/m^3 * 8.4 \quad (18)$$
$$= 3.1 * 10^{-30} kg/m^3 \quad (19)$$
$$= 2.07 * 10^{-4} GeV/c^3/m^3 * 8.4 \quad (20)$$
$$= 1.7 * 10^{-3} GeV/c^2/m^3. \quad (21)$$

For orientation we could first ask how much metal-matter at all could be collected by a dust grain while already of the order of $10^{-7}m$, meaning a cross section of $10^{-14}m^2$ and with a velocity say 300 km/s $= 3 * 10^5 m/s$ during such an effective age of the universe of $1.52 milliard$ years $= 1.52 * 10^9 * 3.14 * 10^7 s = 4.8 * 10^{16} s$.

$$\text{“available “metals” ”}_{for 10^{-14}m^2, 300km/s} = 3 * 10^5 m/s * 4.8 * 10^{16} s * 10$$
$$= 4.4 * 10^{-22} kg$$
$$= 2.4 * 10^5 GeV$$

to be compared to what the mass of $(10^7)m^3$ large dust particle with say specific wieight $1000kg/m^3$ would be, namely $10^{-18}kg$.

So such a "normal" dust size $0.1\mu m$ grain could not collect itself in the average conditions in the universe.
If the grain to be constructed had lower dimension than 3, it would help because then the cross section could be larger for same hoped for volume and thus mass. Decreasing say the thickness in one of the dimensions from the $10^{-7}m$ to atomic size $10^{-10}m$ would for the same collection of matter give need a 1000 times smaller mass and that would bring such a "normal size" grain close to be just reachable.
Our speculated stronger forces than usual due to the big homolumo gap would not help much, because the grain cannot catch the atoms in the IGS which it does not come near enough to touch.

More Corrections on the Ratio of Metals to Dark Matter

We have crudely estimate the amount of dust being collected by 8.4 times bigger density of metals than to day and the 8.9 times younger universe, giving **effective numbers** for the dust settling:

$$\text{"metal density"}_{eff} = 3.71 * 10^{-31} kg/m^3 * 8.4 \quad (25)$$
$$= 3.1 * 10^{-30} kg/m^3 \quad (26)$$
$$= 2.07 * 10^{-4} GeV/c^3/m^3 * 8.4 \quad (27)$$
$$= 1.7 * 10^{-3} GeV/c^2/m^3. \quad (28)$$

Correction for Less "Metals" in the important time for Dirtiing the Dark Matter Bubbles

We estimated that the main period, in which the dirt attached itself to the dark matter bubbles, we had $z = 3.3$ and the time was $t = 1.52$ milliard years. So since the density of "metals" at that time were $10{-}0.3 * 3.3 = 10^{-1}$ times the one today. So the accesible "metals" to be caught by the dark matter composita is rather than $1/600$ becomes

$$\frac{M_{grain}}{M} = 1\%/6/10 = \frac{1}{6000}$$

so that
$$\frac{\sigma}{M}|_{composed} = \frac{\sigma}{M}|_{grain} * \frac{M_{grain}}{M}$$
$$= 7 * 10^5 m^2/kg/6000 (\text{for dimension of dust grain}$$
$$= 1.2 * 10^2 m^2/kg$$

From the Universe Budget of Dark and "Metal" Mass Available

$$\text{Expected ratio} \frac{\sigma}{M}|_{composed} = 120 m^2/kg \quad (34)$$

$$\text{to be compared to } \frac{\sigma}{M}|_{Correa, v\to 0} = 15 m^2/kg. \quad (35)$$

Remarkably Bad Knowledge of the Size of Individual Dark Matter Particles

In the approximation of only graviational interaction of dark matter it is wellknow that only the **mass density** matters, where as the number density or the **mass per particle is not observable.** With other than gravitational interactions one could hope speculate that it would be possible to extract from the fits in say our model, what the particle size should be. But it is rather remarkaable bad the possibility for that is in our model! The Correa mearsurement yeilds the "inverse darkness" ratio

$$\frac{\sigma}{M} = \frac{\text{“cross section”}}{\text{mass}} \tag{36}$$

Our Estimate of the absolute Rate for Dama Crudely

Our estimate for the rate of 3.5 keV for DAMA to see - very crudely - was based on:

- The total kinetic energy of the dark matter hitting the Earth per m^2 per s. (but not on how many particles)
- a main part of that energy gets into 3.5 keV radiation of electrons mainly.
- Estimate of a "suppression" factor for how small a part of this electron radiation come from sufficiently long living excitations to survive down to 1400 m under earth.

No of this depends in our estimate on the size of particles (provided inside a very broad range)!

But if Not events every year, DAMA would have noticed

If the dark matter particles were so heavy that the number density so low that the observation are of about $1m^2$ would not get an event through every year, then it could have been noticed by DAMA, even if the long time average rate were the same.
The rate of dark matter mass hitting a square meter of earth is

$$
\begin{aligned}
\text{Rate} &= 300km/s * 0.3GeV/cm^3 & (37)\\
&= 3*10^5 m/s * 5.34*10^{-22} kg/m^3 & (38)\\
&= 1.6*10^{-16} kg/m^2/s & (39)\\
&= 3*10^7 s/y * 1.6*10^{-16} kg/m^2/s & (40)\\
&= 5*10^{-9} kg/m^2/y & (41)
\end{aligned}
$$

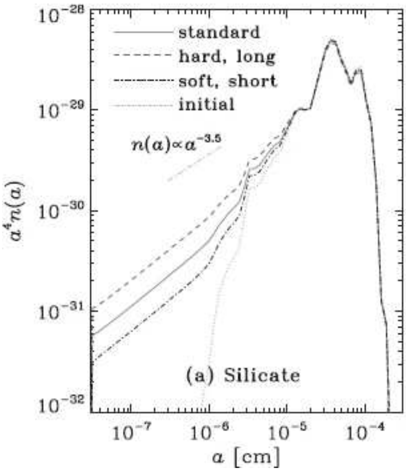
How heavy dark particles to not match Dama

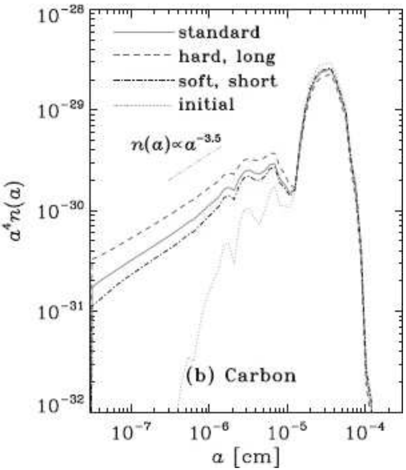
Remember Rate $= 5 * 10^{-9} kg/m^2/y$, in mass.
Taking the DAMA area of observation $\sim 1m^2$ we need to get more than one passage per year

$$M \leq 5 * 10^{-9} kg \quad (42)$$
$$= 3 * 10^{18} GeV \quad (43)$$

Using the bubble internal mass density as estimated from the 3.5 keV the bubble radius $R \leq 10^{-7} m$ from this.

Simulated Size Distributions for Dust grains





We Can Assume a Typical Grain Size $10^{-7}m$, say

Then using the low velocity limit $\frac{\sigma}{M} = 15m^2/kg$ gives

$$M = (10^{-7}m)^2/(15m^2/kg) \quad (44)$$

$$= 7 * 10^{-16}kg \quad (45)$$

But if now the dust grain is less than 2 dimensional, the area for a grain with same wieght as a massive 3 dimensional one with $10^{-14}m^2$. Correcting for this would give a bigger mass M.

Table of Successes

# & exp/th	Quantity	value	related Q.	value
1.	Dwarf Galaxies			
exp	inv. darkness =	$15 m^2/kg$	$\frac{M_{grain}}{M}$	$2 * 10^{-5}$
th	$= \frac{\sigma}{M}\|_{v \to 0}$	$120 m^2/kg$		$1.6 * 10^{-4}$
2.	Dwarf Galaxies			
exp	Velocity par. v_0	$220 km/s$	$4 r_{dust} E$	$8.1 * 10^{13} kg/s^2$
th.	with hardening	$77 km/s$	$4 r_{dust} E$	$1 * 10^{13} kg/s^2$
th.	without hard.	$0.7 cm/s$	$4 r_{dust} E$	$400 kg/s^2$
3.	DAMA-LIBRA			
exp		$0.041 cpd/kg$	suppression	$1.6 * 10^{-10}$
th	air	$0.16 cpd/kg$		$6 * 10^{-10}$
th	stone	$1.6 * 10^{-5} cpd/kg$		$6 * 10^{-14}$
4.	Xenon1T			
exp		$2 * 10^{-4} cpd/kg$	suppression	$6 * 10^{-13}$
th	air	$0.16 cpd/kg$		$6 * 10^{-10}$
th	stone	$1.6 * 10^{-5} cpd/kg$		$6 * 10^{-14}$

Table of Succeses (continued)

# & exp/th	Quantity	value	related Q.	value
5. exp th	Jeltema & P. counting rate	 $2.2 * 10^{-5} phs/cm^2/s$ $3 * 10^{-6} phs/s/cm^2$	 $\frac{\sigma}{M}\|_{Tycho}$ $1\% * \alpha * \frac{\sigma}{M}\|_{nuclear}$	 $5.6 * 10^{-3} cm^2/kg$ $8 * 10^{-4} cm^2/kg$
5. exp th	Intensity 3.5 kev $\frac{N\sigma}{M^2}$	 $10^{23} cm^2/kg^2$ $3.6 * 10^{22} cm^2/kg^2$	$\frac{\xi_{fS}^{1/4}}{\Delta V}$	 $0.6 MeV^{-1}$ $0.5 MeV^{-1}$
7. ast DAMA Xen.	Three Energies line av. en. av. en.	 3. 5 keV 3.4 keV 3.7 keV		

Explanation of Successes in the Table:

- 1. Dwarf Galaxies: Assuming the dust grain arround the second vacuum bubble to have 2 or less Housedorf dimensions and the ratio of the dust grain mass to that of the whole dark matter particle to be given by the amount of metals in the gases in space available relative to dark matter

$$\frac{M_{grain}}{M} = 1.6 * 10^{-4} \quad (46)$$

$$\text{we get "inverse darkness" } \frac{\sigma}{M}|_{v=0,th} = 120 m^/ kg \quad (47)$$

$$\text{to compare to Correa's} \frac{\sigma}{M}|_{v=0,ex} = 15 m^2/kg, \quad (48)$$

$$\text{which would correspond to} \frac{M_{grain}}{M}|_{fitted} = 2 * 10^{-5}. \quad (49)$$

Table of Mass M Bounds and Estimates

Description	R	ΔR	M	ΔM
Faster than year Corrected f.t.y.	$\geq 1.0 * 10^{-9} m$ $\geq 3.1 * 10^{-9} m$		$\geq 2.1 * 10^{-15} kg$ $\geq 6.5 * 10^{-14} kg$	
Dust enough	$\geq 1.0 * 10^{-9} m$		$\geq 2 * 10^{-15} kg$	
Velocity dep. w. E= 400^4	$\approx 10^{-8} m$ $10^{-10} m$	big	$\approx 10^{-13} kg$ $\approx 2 * 10^{-18} kg$	big
DAMA stream	$\leq 10^{-7} m$		$\leq 5 * 10^{-9} kg$	
Size 10^{-7}	$7 * 10^{-10} m$		$7 * 10^{-16} kg$	

Table:

Conclusion

- We have put forward a model for dark matter of being nm size bubbles with mass in $2 * 10^{-15} kg \sim 10^{12} GeV$ of a **new vacuum**, and using apart from this vacuum speculation **only the Standard Model.**
- The interaction of the dark matter particles in outer space - especially in dwarf galaxies where Correa estimated it - is for low velocities given by a **dust grain** sitting around the pearl of new vacuum. Using the relative amount of "metals" to dark matter as also giving the ratio of the masses of the grain of dust to the dark matter in the dark matter particles we get only an order of magnitude wrong value for the by Correa estimate low energy "inverse darkness":

$$\frac{\sigma}{M}_{v-->0} = 120 m^2/kg \quad \text{against Correa:} \quad \frac{\sigma}{M}_{v-->0} = 15 m^2/kg (50)$$

Conclusion (continued)

- Because of the lesser darkness than ideal dark matter (having only gravitational interactions) - i.e. larger inverse darkness $\frac{\sigma}{M} \sim 10^{-3} m^2/kg$ even after blowing off the dust grain attached than "usual" WIMPs - our dark matter particles get **stopped in atmosphere**, and this explains why the Xenon-experiments, which **only look for nuclei recoil events** when expecting dark matter.
- The inside the bubble highly compressed "ordinary matter " (in the new vacuum) has a for usual chemistry very high gap - homolumo gap - between the highest filled state, **HOMO**, and the lowest unoccupied state, **LUMO**, speculated to be just $3.5 keV$ in width leading to a "prefered"**emission energy for photons and electrons of the gap hight** $3.5 kev$.

conclusion (yet continued)

- It is this **emission of 3.5 keV electrons** (and photons) after excitation of the inside bubble "ordinary" material, which is **observed by DAMA** and by the Xenon1T as the electron recoil (mysterious) events.
- It is a remarkable accident supporting our model that both the two direct observation successes **DAMA-LIBRA and Xenon1T** and the **X-ray radiation observed from galaxy clusters and galaxies** supposedly comming form dark matter all **three** have the average **energy** per event of **3.5 keV.**!

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