Part 4: The Detector "puzzle"

Primo Galletti   Aldo Aluigi

Rome, 31 August 2001

After more than two years (1996) testings about the operating of the detector and checking the graphs produced by same, our conclusions about the detector behaviour indicate that *it is impossible to find any justification in the present Laws of Physics*. In other words, it is impossible to give a *simple* and *satisfactory* explanation of its behaviour, without rejecting some of the principles that form the basis of today's Physics.

Furthermore, it is our conviction that for such a *simple* instrument, which is able to detect so strong voltage variations, there must be a *simple* explanation as well!

We limit ourselves in conjecturing hereunder a possible explanation. The main points at the basis of this explanation are the following:

1. *it is necessary to give up the idea of an "empty" space, and admit the existence of a "physical" space, which behaves like any other dielectric substance when an electric field is present, and whose physical characteristics (dielectric constant, magnetic permeability, speed of light, refraction index, etc.), vary in a remarkable way according to its density*;

2. *the energy variations by which electrons hit the anode of the vacuum tube are due to the variations of the electric charge produced by variations of the dielectric constant of space*;

3. *the physical dimensions of the bodies plunged into space varies according to its density.*

It results that, very likely, the detector works in the following way. *When in a certain place of the Universe some matter collapses (or re-emerges), an expansion (or contraction) gravitational wave is generated, that propagates into the surrounding space and causes local variations of its density, which are responsible for the variations of the dielectric constant (and of the magnetic permeability as well) that in its turn, causes variations in the electric charge of the electrons (and protons).*

Therefore, space density variations causes *variations of the speed of light* too.

Why do the instruments controlling the anodic current, the electron acceleration voltage and the intensity of light not record any variations, but the cadmium sulphide photoresistor only is in a position to record such variations?

The reply to this question might be the following. *While the speed of light is varying, the physical dimensions of bodies are varying too.*

We will see later on how the above conjecturing can be looked over in a more general context, which will show the evidence of a link among the electric field, the magnetic field and the gravitational fields, where the "physical" space plays the main role as a "mediator" among these *three basic forces of Nature*, for which it is no more necessary to believe to an "action from a distance".

1 The detector behaviour

The starting point for the solution of this "puzzle" is the observed sensor behaviour, where we have seen that *to set the Wheatstone bridge voltage back to zero, it is necessary to change the photoresistor resistance R_{phr} in a way that it is inversely proportional to the square of the anodic current, I_a, through the vacuum diode*:

$$\frac{R_{phr}}{\left(R_{phr}\right)_{zero}} = \frac{\left({I_a}^2\right)_{zero}}{{I_a}^2} \tag{1}$$

Now, inside the vacuum diode, the filament emits a number of electrons that is constant in time, as the anodic current, I_a, is kept constant too. The electrons are accelerated with an anodic voltage, V_a, which is also kept constant, to hit then the phosphorous screen (anode). This latter one emits a luminous energy, E_ν, directly proportional to the kinetic energy, E_e, of the electrons:

$$\dot{E}_\nu \propto \dot{E}_e \tag{2}$$

which, as well known, depends both on the number of electrons emitted per unit of time by the filament and by the acceleration anodic voltage V_a:

$$\dot{E}_e = \dot{n}_e \; e \; V_a \tag{3}$$

where $\dot{n}_e$, is the number of electrons emitted per unit of time and e is the electron charge.

According to *Coulomb Law*, we know that the acceleration voltage, V_a, is directly proportional to the total electric charge that is present on the anode:

$$V_a \propto N_a \; e \tag{4}$$

where N_a is the number of electric charges on the anode. If we put (4) into (3), as kinetic energy for the electrons we obtain the following expression:

$$\dot{E}_\nu \propto \dot{n}_e \; N_a \; e^2 \tag{5}$$

The relation (5) gives us a first important indication: *the kinetic energy by which the electrons hit the anode results as directly proportional to the square of the electric charge.*

The photoresistor resistance, R_{phr}, is inversely proportional to the quantity of luminous energy, $\dot{E}_\nu$, reaching it per unit of time [1]:

$$R_{phr} \propto \frac{1}{\dot{E}_\nu} \tag{6}$$

If we use (5) into (6), we obtain:

$$R_{phr} \propto \frac{1}{\dot{n}_e \; N_a \; e^2} \tag{7}$$

As the *number of electrons emitted by the filament of the vacuum diode per unit of time is unchanged, it is the electron electric charge that must be changed*! Therefore, we will obtain the following:

$$R_{phr} \propto \frac{1}{e^2} \tag{8}$$

The comparison between the observed sensor behaviour as expressed in (1) and the just calculated expression (8) allows us to state the following:

1st Conjecturing: *The anodic current variations (increase/decrease), needed to balance the Wheatstone bridge of the detector, are necessary to compensate the variations (decrease/increase) of the electric charge produced by gravitational waves.* To be more precise, we have:

$$electrical\ charge\ of\ the\ electron \propto \frac{1}{dielectric\ constant\ of\ the\ space}$$

Variations of the dielectric constant of space cause, therefore, variations of the electrons (and protons) electric charge [2].

We want, to underline since now that to explain the detector behaviour, we must admit also that *the electric charge variations must be inversely proportional to the variations of the dielectric constant.* That is to say, the increase of the dielectric constant must correspond to a decrease of the electric charge [3].

In which way, does the arrival of a gravitational wave cause these electric charge variations. In this respect we state the following:

[1] This relationship seems to be quite correct, at least after "formatting" the photoresistor.

[2] We will see that it is the electric charge that must vary! In case it does not change, the controlling instruments would notice it immediately as there would be a change in the voltage and current on the anode and, therefore, since a long time gravitational waves would have been noticed!

[3] It seems this is contradicting with Electrostatics, which indicates us that *the electric charge is directly proportional to the dielectric constant.* However, we will see that things are not like this!

2nd Conjecturing: *"Empty" space and, therefore, the space inside the detector vacuum tube, is a "physical entity" behaving like any dielectric substance plunged into an electric field. The presence of a gravitational wave causes a local variation of its density which is responsible for the variations of the dielectric constant.* To be more precise, we have:

$$dielectric\, constant\ of\ the\ space \propto \big(density\ of\ the\ space\big)^{1/3}$$

It happens, very likely, that owing to variations of the density variations of space, kinetic energy variations are produced as a consequence of electron elecric charge, because electrons hit the anode of the vacuum tube, so that variations of the luminous energy emitted by phosphoruses occur!

A satisfactory reply to the following questions is also needed:

- Why do the instruments controlling the anodic current and the acceleration voltage of the electrons not record any variation?
- Why do a photometer or our own eyes not detect either any intensity (energy) variations or frequency (colour) variations of the radiation emitted by the phosphoruses of the vacuum diode?

To be able to give a satisfactory reply to these two questions, too, we state the following:

3rd Conjecturing: *The varying of space density causes the bodies plunged into a corresponding variation of their "physical" dimension* [4]:

$$(linear)\ physical\ dimensions\ of\ the\ bodies \propto \left(\frac{1}{density\ of\ the\ space}\right)^{1/3}$$

2 An experiment with the interferometer

One of the most evident consequences of what stated in the previous paragraph is that, *when space density changes, as the dielectric constant varies, the speed of light too undergoes remarkable variations.* That is to say, *the speed of light varies at the varying of space density.*

How is it possible to conciliate a remarkably varying speed of light with the experiments that have been made in the past and are still made today with interferometer [5]?

There is a *very simple reply* to this question based on a (fundamental) experiment made by one of us (P. Galletti) with an interferometer.

[4]This is, very likely, the main reason for which it is not possible to detect the presence of gravitational waves with the usual measuring instruments we dispose of!

[5]Interferometers, today, are used a lot to try to detect gravitational waves. The results obtained up to now are rather deceiving.

The experiment used is a Fabri-Perót interferometer, operating with a laser light, with a 16 meter light beam and multiple reflections between the mirrors, stabilized both for what concerns voltage and temperature. The stability of the wave emitted by the laser was about 1 of 10^9 for a time duration of $2 \div 3$ hours [6].

The instrument was placed on a turning table (1 turn every 5 minutes).

To perform the experiment, we awaited the arrival of a very intensive gravitational wave detected both by the cadmium sulphide detector and by our *magnetic sensor*. In this case, there were two *different* instruments signalling the presence of the gravitational wave.

This experiment, has allowed us to establish that *in the presence of a very intensive gravitational wave, no meaningful displacement of the interference fringes of the interferometer are recorded.*

The (negative) result of this experiment, is interpreted as hereunder indicated. If the interference fringes are not modified on arrival of the gravitational waves, it means that *there is no variation of the number of waves contained in the arm of the interferometer*. As the speed of light, c, is no more constant, the only possible explanation is that the wave length, λ, of light emitted by the laser, results as proportional to the length, L, of the interferometer arm.

$$\lambda \propto L \tag{9}$$

We know, however, that the wave length, λ, is directly related to the speed of light and inversely related to frequency, ν:

$$\lambda = \frac{c}{\nu} \tag{10}$$

Therefore, it comes out that, length L of the interferometer arm must be directly proportional to the speed of light:

$$L \propto \lambda \propto c \tag{11}$$

Furthermore, this interpretation is in compliance with the fact that *no variations of frequency of the light waves have been detected* (for the waves emitted by a laser as well as the waves of the vacuum diode phosphoruses of the detector)! Namely, if on the arm of the interferometer the number of waves keeps constant, it means that *a clock counting the number of waves (or the number of emitted electrons in the case of the vacuum diode) does not undergo any change on arrival of a gravitational wave*, no matter how strong this one may be [7].

We can summarize the results of the experiment made with the interferometer in the following way:

---

[6]The precision of these measurements was very high (8 orders of magnitude of the detector and more than 9 orders of magnitude of the interferometer, which makes a total of 17 orders of magnitude).

[7]Things are quite different when the clock moves in an inertial field! We know that, thanks to the experiments performed within accelerators, the higher is the speed the higher results its slowing down.

- the physical (linear) dimensions of the interferometer modify in a directly proportional way to the speed of light;

  What is now obtained is the (important) relationship that *the speed of light results as being inversely proportional to the cubic root of density of space*:

$$speed\ of\ light \propto \left(\frac{1}{density\ of\ the\ space}\right)^{1/3}$$

- Frequency, ν, of the light emitted by the laser does not change when a gravitational wave is present.

3 The solution of the "puzzle"

What does it happen then inside the sensor? Let's suppose a gravitational wave (e.g. contraction wave), is such to increase by 1,000 times the space density. It results that:

1. the dielectric constant of space and, therefore, that of the space inside the vacuum tube too, *increases* by 10 times;
2. consequently, the electric charge of electrons hitting the anode of the vacuum diode, *reduces* by 10 times;
3. the velocity of electrons through the vacuum tube *decreases* by 10 times. Therefore, both the kinetic energy gained by the electrons and the luminous energy emitted by the phosphoruses, *reduce* by 100 times [8];
4. the speed of light and, therefore, also the speed of light emitted by the phosphoruses of the vacuum diode *reduces* by 10 times;
5. the physical dimensions of bodies (and, therefore, also the dimensions of the instruments placed to check the detector) *reduces* by 10 times;
6. light takes the same time to travel from the phosphoruses to the photoresitor therefore, *the frequency of the luminous waves emitted by a laser does not change* so that, in the unit of time, the photoresistor is hit by the *same number* of waves;

[8]In fact, kinetic energy T_e, gained by electrons in going through the vacuum diode is given by:

$$T_e = \frac{1}{2}\, m_e\, v^2 \equiv e\ V \propto e^2$$

In case of an increase of space density by 1,000 times electrons, at the moment of their impact with the phosphorescent anode, have 10 times less charge, therefore their speed is 10 times lower.

7. the physical dimensions of the light emitted by the vacuum diode (that is to say its wave length), *reduces* by 10 times.

Because of the energy of the light waves has become 100 times lower, *the luminous waves further than getting 10 times shorter (as propagation speed is 10 times lower) have also become 10 times smaller in their amplitude*. That is to say the area of the wave, that is proportional to the energy, has become 100 times smaller!

Also the physical dimensions of the photoresistor reduce by 10 times and for this, its surfaces which is sensitive to light, reduces by 100 times! However, if the sensitive surface of the photoresistor has reduced by 100 times and the luminous energy hitting it has reduced by 100 times too, the photoresistor should always see the same *luminous intensity* and, therefore, its resistance should always keep constant!

Why is the *test photometer* not recording any luminous intensity variation, while the cadmium sulphide photoresistor is working in such a good and satisfactory way?

The answer to this question might be the following. The photoresistor must not be seen as a resistance but, at the end of the "formatting" time, it has to be considered as a true wattmeter, that is to say as an instrument measuring the *luminous energy really emitted* per unit of time by the vacuum diode phosphoruses, while the photometer, instead, measures the luminous intensity emitted by the phosphoruses.

In other words, it is very likely the photoresistor behaves like a true *"external" observer*! An *"internal" observer* (e.g. the sample rod, the photometer, his eyes, etc...), on the contrary, might not notice anything because its dimensions have also reduced [9]!

4 The "formatting" process of the photoresistor

What is and how does "formatting" work which, even if there is no explanation to it, in the end solves the puzzle?

In carefully observing the sensor behaviour since it was first activated, we remarked a constant increase of its resistance day by day. Then after some months this growth had elapsed until the resistance value stabilized to a constant value and, at the same time, the instrument *began to "see" voltage variations due to gravitational waves* which about *two years after it was first activated*, were very clear.

[9] As "external" observer, we intend an observer who is in a "rest" space, that is to say in a space where there are no fields and, therefore, there are no density variations and consequently no dimension variations. As "internal" observer, we intend an observer who is plunged into the same space where the experiment takes place.

It is necessary to be very careful in using the observer respectively from outside or inside. Said use is correct in case of (static) gravitational field produced by a mass, as it is possible to go in and out from the field, but for a gravitational wave there is only one observer.

What did it happen in the meantime to the photoresistor? It seems that during all this time when it has been exposed to a constant light source, the photoresistor has got free from the *conducting part* to give way to the *photoconducting part*, which is sensitive to the real luminous energy emitted by the vacuum diode phosphoruses (see **Figure 1**).

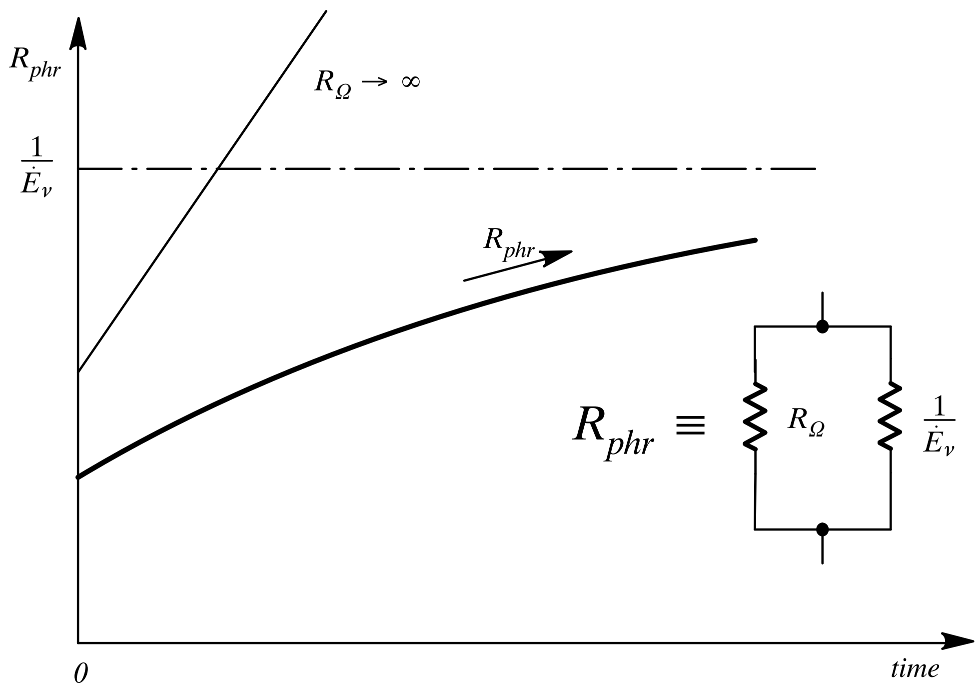

Figure 1: The photoresistor "formatting" process

As the photoresistor after a formatting period behaves like a measuring instrument of the *real luminous energy emitted by the vacuum diode* and becoming a true "external" observer, all the other instruments *"adapt" to the speed of light*. That is to say they modify in a way such that:

$$physical\ dimensions\ (linear) \propto speed\ of\ light$$

What we can say about this fact is that the measuring instruments, when a gravitational wave is present, *modify according to the speed of light* (that is to say apparently do not vary because of the presence of a gravitational wave, but they adapt to it).

On this point of view *the interferometer can be considered the instrument that most of all varies according to the speed of light* [10]!

[10] It seems this kind of instruments (the interferometers) are not in a position to measure gravitational waves!

One can imagine ”formatting” as a process similar to what our eyes, used to light, might undergo in case they suddenly find themselves in a dark room. As our eyes gradually learn to see better and better in the darkness, the detector tearns to ”see” gravitational waves.

5 Consequences for Physics

The explanation given for the detector behaviour, needs a *thorough revision of the present framework of Physics*. We intend to indicate hereunder some of the most important consequences.

1. *It is not the electric field that modifies the physical characteristics of space, but it is the space density that, through its dielectric constant (and its magnetic permeability), modifies the characteristics of the electric (and magnetic) field.*

2. *The experiment with the interferometer gives the most important contribution to explain how the detector works.* The interpretation of its behaviour given in the past *in terms of constant of the speed of light* had stated the death of space (ether). The new interpretation *based on the proportionality between speed of light and physical dimensions*, on the contrary, very likely confirms its existence!

3. *The speed of light is no more a constant but it varies according to the varying of space density, that is to say the gravitationl field.*

4. The laser interferometer *does not undergo any frequency change on the arrival of a gravitational wave, and the time the light emitted by the vacuum diode needs to reach the photoresistor does not change as well* [11].

5. *The presence of a gravitational wave causes no variation in clock frequency* and there is no variation, too, when a (static) gravitational field, as it is on the surface of a celestial body, is present.

6. Therefore, the *gravitational redshift does not exist*! The bending of the light beams that exists around massive objects (see **Abell 2218**) might be produced by the refraction index variations that also depends on the density of space (the more one approaches a celestial body, the more its refraction index increases).

7. The explanation of the detector ”puzzle” shows us the link existing among electric, magnetic and gravitational fields. These three fundamental fields

[11] Also the behaviour of electrons inside the vacuum diode results being very similar to that of an electromagnetic wave. In fact, as the linear dimensions of the diode and the distance travelled by the electrons are 10 times smaller, may a gravitational wave be present or not, the electrons always need the same time to pass through the vacuum diode.

are, very likely, "mediated" by the "physical" space (intended as *communicating medium* among these fundamental forces of Nature for which it is not necessity to suppose any "action from a distance").

8. Electromagnetism can still work properly provided that its fundamental "constants":

    - dielectric constant
    - magnetic permeability
    - speed of light

    are, respectively, "replaced" by:

    - capacity
    - inductance
    - resistance

    That is to say, in the presence or not of a gravitational wave (or a gravitational field), capacity C of a condenser, inductance L of an inductor and resistance R of a resistor *do nor vary*. For this reason an oscillator LC (inductance-capacity) as well as an RC oscillator (resistance-capacity) oscillate at a *constant frequency* [12].

All this, however, will be discussed more deeply later on.

[12] Such oscillators are, therefore, "standards" of time and frequency.