Part 2: Multiple Nucleus Quasars

Primo Galletti Aldo Aluigi

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The analysis of the graphs carried out by the detector since 1994 up to now has allowed us to discover a series of completely new phenomena occurring in the Universe, among which the existence of particular extramassive *Multiple Nucleus Quasars (MNQs)*, that seem to affect its operating. We will see in particular that [1]:

- positive "forks" represent *(gravitational) collapses of celestial bodies with their "exit" from the Universe*;
- negative "forks" represents the *"entry" into the Universe of the celestial bodies (which "left" before.*

During such events gravitational waves of enormous intensity are generated which propagate through the surrounding space, up to big distances from where they took place, without attenuation and/or distortion.

The analysis of a specific event recorded in summer 1995 allowed us to find the solution of the *"redshift"* problem related to these waves, therefore, the distance from us of the events that have generated them. Furthermore, the comparison with other similar events occurred during the subsequent years, in particular those of high intensity recorded on August 1999, have allowed us to improve the precision of redshift calculations for these waves.

Up to a distance of 2/3 *radius of the visible Universe*, the waves reaching the detector are very clear, while at 3/4 of said radius some distortions, rapidly increasing while the distance increases, can be seen. At more than 9/10 radius waves are practically unrecognizable (even if the instrument continues recording them!). This means that, in terms of volume, the detector is able to "see" very well about $80 \div 90$ % of the visible Universe [2].

Before going on, however, we want to stress the *problem concerning the detector calibration*. It substantially concerns the physical meaning of the voltage signal, measured at the ends of the Wheatstone bridge.

[1] We will come back later on the meaning of the terms "entry" and "exit" the Universe.

[2] What is here indicated as *radius of the visible Universe* is intended as the distance over which it is impossible to "see" anything else, as the leaving speed of the celestial bodies becomes higher than the speed of light.

1 Detector's "K" constant

The k constant of the instrument was defined [3] in terms of relative variation (or percentage) of the anode current I_a, per unit variation of the voltage difference V_{CD} at the ends of the bridge. Namely:

$$k = \frac{I_a - (I_a)_0}{(I_a)_0} \frac{1}{V_{CD}} \tag{1}$$

where subscript "0" indicates the operating values for the sensor.

When a gravitational wave is coming, we observe only variations of voltage V_{CD} which are due to photoresistor resistance variations placed on one of the arms of the bridge. We cannot see anymore, as all other instruments do not record anything else.

Therefore, to calculate the k constant we have at disposal only the variations, by which we can calculate, for example, the photoresistor resistance variations as we know all the other resistances of the bridge.

But the solution of the detector "puzzle" shows us that:

- *the speed of light increase as voltage V_{CD} undergoes through positive values*;
- *the dielectric constant (and the magnetic permeability) decrease proportionally as the speed of light increase*;
- *the electric charge (of electrons and protons) is inversely proportional to the dielectric constant.*

Therefore, it comes out that the anode current and the anode voltage variations (the instruments at our disposal do not allow us to detect!) due to the electric charge variations result as directly proportional to the speed of light variations. That is to say,

$$\frac{c}{c_0} = \frac{I_a}{(I_a)_0} = \frac{V_a}{(V_a)_0} \tag{2}$$

where c_0 indicates the speed of light in absence of waves.

Taking into account of relation (2), the k constant can be written as follows:

$$k = \frac{c - c_0}{c_0} \frac{1}{V_{CD}} \tag{3}$$

therefore, with the Wheatstone bridge balanced, it results that *voltage variations V_{CD} measured at the ends of the bridge correspond, through the k constant, directly to the speed of light variations produced by the gravitational waves*:

$$\Delta c = k\ c_0\ V_{CD} \tag{4}$$

[3] See **Part 1** of *A detector for Gravitational Waves.*

or,

$$\Delta c = K\ V_{CD} \tag{5}$$

where, we have preferred to express the constant of the instrument directly in terms of km/s of speed of light variation per mVolt variation of voltage at bridge terminals [4].

Generally speaking, the value of K is between $25 \div 50$ km/s per mV of voltage variation, depending on the operating time, measured in years, of the instrument. The longer is this time, the larger is K value [5].

For example, from the calibration performed on 29th January 2001, on one of the sensors of the second detector we obtained for the k constant the following value:

$$k = 0.012\ \%\ per\ mV$$

Therefore, on keeping as reference speed of light the value of 300,000 km/s it comes out that:

$$K = k\ c_0 = \frac{0.012}{100}\ 300,000 = 36.0\ km/s\ per\ mV$$

During the following five days (from 01/31/2001 to 02/05/2001), there was a voltage decreased of -36.3 mV. The corresponding variation of the speed of light has been therefore as follows:

$$\Delta c = K\ V_{CD} = -36.0\ 36.3 = -1307\ km/s$$

2 Some (preliminary) energetic considerations

Form the above formula (2) it becomes that the luminous energy $\dot{E}_\nu$, per unit of time, produced by the anode of vacuum diode (and, also, the kinetic energy of electrons) results as:

$$\frac{\dot{E}_\nu}{\left(\dot{E}_\nu\right)_0} = \frac{V_a\ I_a}{\left(V_a\ I_a\right)_0} = \frac{c^2}{{c_0}^2} \tag{6}$$

Namely, the *kinetic energy variations ΔE induced by the gravitational waves on the electrons hitting the anode are proportional to the quadratic variations of the speed of light* [6]:

$$\Delta E \propto c^2 - {c_0}^2 \tag{7}$$

[4]As a barometer, that with no more than a glass tube filled with mercury and a millimeter rod can measure the atmospheric pressure of the point where it is immersed, this instrument can measure speed of light variations in measuring the voltage at the ends of the Wheatstone bridge directly!

[5]The only incertitude in using (3) is that we do nt know if the sensor is completely "formatted" yet. What we can surely declare is that the detector measures speed of light variations that *are lower than the real ones*!

[6]The photoresistor may, therefore, be considered a wattmeter for these waves!

Furthermore, the (gravitational) energy variations ΔU per unit of mass of these waves are:

$$\Delta U \approx c^2 - {c_0}^2 \tag{8}$$

The relation (8) indicates to us that the gravitational waves carry through the space enormous (gravitational) energy, as variations of the speed of light the detector records are quite high.

Finally, it has to be kept in mind that *the intensity I of these waves results as directly proportional to the relative variations of the speed of light*:

$$I \propto \frac{c - c_0}{c_0} \tag{9}$$

namely, in practice, to the *amplitude of the voltage signal recorded directly by the detector* [7].

3 The redshift problem

As mentioned before, the event detected in summer 1995 (see **Graph 1995_6** and **Graph 1995_7**) has been one of the most interesting ones recorded up to now. It was an isolated event, therefore it has been possible to analyze it with much care. It was a lucky event that allowed us to solve completely the *redshift problem* of these waves and, therefore the *distance* from us of events that have generated them [8].

The direct comparison of the waves of 1995 with those recorded in summer 1994 showed a tight relationship between *intensity* and *time duration.* As matter of fact, the "forks" recorded in 1994, however, result narrow and high while those of 1995 are wide and attenuated. This fact indicates that *the events of 1995 happened at a much farther distance than the events of 1994.* Furthermore, the waves of 1995 are not as clear as the previous ones, and this is another proof of the remarkable distance from us of the place where these last events occurred.

Graph 1994_10 reports with details some of the "forks" recorded in summer 1994. The time duration of these single events is about $14 \div 15$ days, while the distance between the two peaks of the "forks", representing somehow the characteristic time of the wave, is always more or less the same, and it results of about 4 days and also correspond to, about, the same distance between the peaks of the reverse "forks".

[7] Formula (7), along with (8), represents one of the main points that has allowed us to conciliate the redshift of these waves with the energy developed by the events generating them.

[8] With the existence of a physical space as communication medium for forces it is necessary to modify expressions for redshifts, distances, time of wave propagation, etc..., in respect with those presently used in Physics. **Appendices A.1** and **A.2** reports some new expressions used to perform these calculations.

The rising front of the waves takes about 6 days, while the amplitude, representing somehow the intensity of these events, is always more or less the same, and it is about $0.50 \div 0.60$ Volt.

Graph 1995_10 shows in details the waves recorded in summer 1995. It is possible to notice that both widening and rise time are about 3 times larger than the ones of the waves of 1994 while their amplitudes are about 2.5 times lower [9].

Comparing these events with those observed in 1994, it was possible to evaluate, for the first time, the redshift of these waves. At that time the result of those calculations gave, for the events of 1994, a redshift of about $z = 1$ while for the events of summer 1995 the redshift was about $z = 5$ (see **Appendix A.3**). With such redshift values, the 1994 events have been placed at a distance of about *1/2 radius of the Visible Universe*, while for those of 1995 the distance have to be of about *5/6 of said radius*.

Later on, comparing said events with other similar ones that took place in the following years, in particular those of high intensity recorded in August 1999, it was possible to improve considerably the precision of calculations. In **Appendix A.3** this analysis is reported with details.

From this analysis, it comes out that 1994 events had a redshift of $z = 1.5$, while 1995 events had a redshift of $z = 9$. With these new values it results that the 1994 events were placed at a distance of *about 2/3 of radius of the visible Universe*, while for those of 1995 the distance was of *about 9/10 of said radius* [10]. Furthermore, according to those calculations, it results that the time took, respectively, *18 billion years* for the events of 1994 and *46 billion years* for the events of 1995, the gravitational waves to reach the detector.

According to present theories, the time of the events of 1995, is *much longer than the age of the Universe*. We will deal later on about this important problem [11].

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[9] At the beginning, for collapses of July and August 1995 an average distance of 12 days had been calculated. That is to say, the first collapse had been identified with the 1st and the 2nd peak and the second collapse with the 3rd and 4th peak. Later on, after comparing these with other collapses it was possible to state that the first collapse consists of the 1st and 3rd peak, while the second collapse is represented by the 2nd and 4th peaks, whose average width is about 16 days.

[10] The redshift values of these events can be obtained in comparing them with those of 1994 (see **Appendix A.4**):

$$z = w_{ratio}\, w_0 - 1$$

where w_0 in the widening of the reference wave (1994) which is equal to $w_0 = 2.5$. Therefore, for the waves of 1995 we obtain:

$$z_1 = w_0 - 1 = 1.5$$

$$z_2 = \frac{16}{4}\, 2.5 - 1 = 9$$

[11] Calculations have been performed by using, for the Hubble constant, a value of 15 km/s per million of light years. Even if we use a different value for that constant, the problem of the

4 Gravitational Waves

What do the positive "forks" recorded by the detector represent? According to the way the detector was built, increasing voltage values represent situations with a *decrease of dielectric constant* and, subsequently, an *increase of the speed of light*.

Owing to this, the *positive "forks" represent gravitational waves where the space is becoming expanded*.

It consists of waves generated by sudden gravitational collapses of an extramassive celestial object, like a quasar or a similar one, that has reached a critical mass and the internal pressure due to its high temperature cannot resist the gravitational contraction. Speed of the matter forming it falling on itself becomes very near the speed of light and locally generates an enormous energy capable to "pierce" (or curve!) the surrounding space and "leave" the Universe.

During contraction a violent gravitational wave is generated, that propagates in the surrounding space and is represented by the rising front of the first peak of the "fork" which lasts 2.4 (real) days footnoteTime correction due to redshift in performed as follows:

$$T_{corrected} = T_{measured}\ \frac{z}{z+1}$$

therefore, for the collapses of 1994 we obtain:

$$T_{corrected} = 4\ \frac{1.5}{1.5+1} = 2.4\ days$$

.

The "exit" from the Universe of the celestial body takes about $14 \div 15$ minutes and is represented by the time duration of the first peak! Once it is out, the celestial body does not exert anymore its gravitational effects and, due to the missing of matter, *the surrounding space "rebounds" again at a high speed*.

In the meantime space, the space that during the collapse phase had started moving to the area where the body has gone out, bumps into itself and causes the rebound generating the second (higher and round) peak of the "fork". At the end the space is back to rest in about $2 \div 3$ (real) days. **Figure 1** represents, schematically, the gravitational wave related by this event.

What do the reversed "forks" recorded by the detector represent? On the contrary, decreasing voltage values show situations with an *increase of dielectric constant* and, subsequently, a *decrease of the speed of light*. Owing to this, the *reversed "forks" represent gravitational waves where the space is becoming contracted*. There is, in this case, the *"entry" into the Universe of a previously collapsed celestial body*!

enormous distance from us of the event of summer 1995 would not change so much!

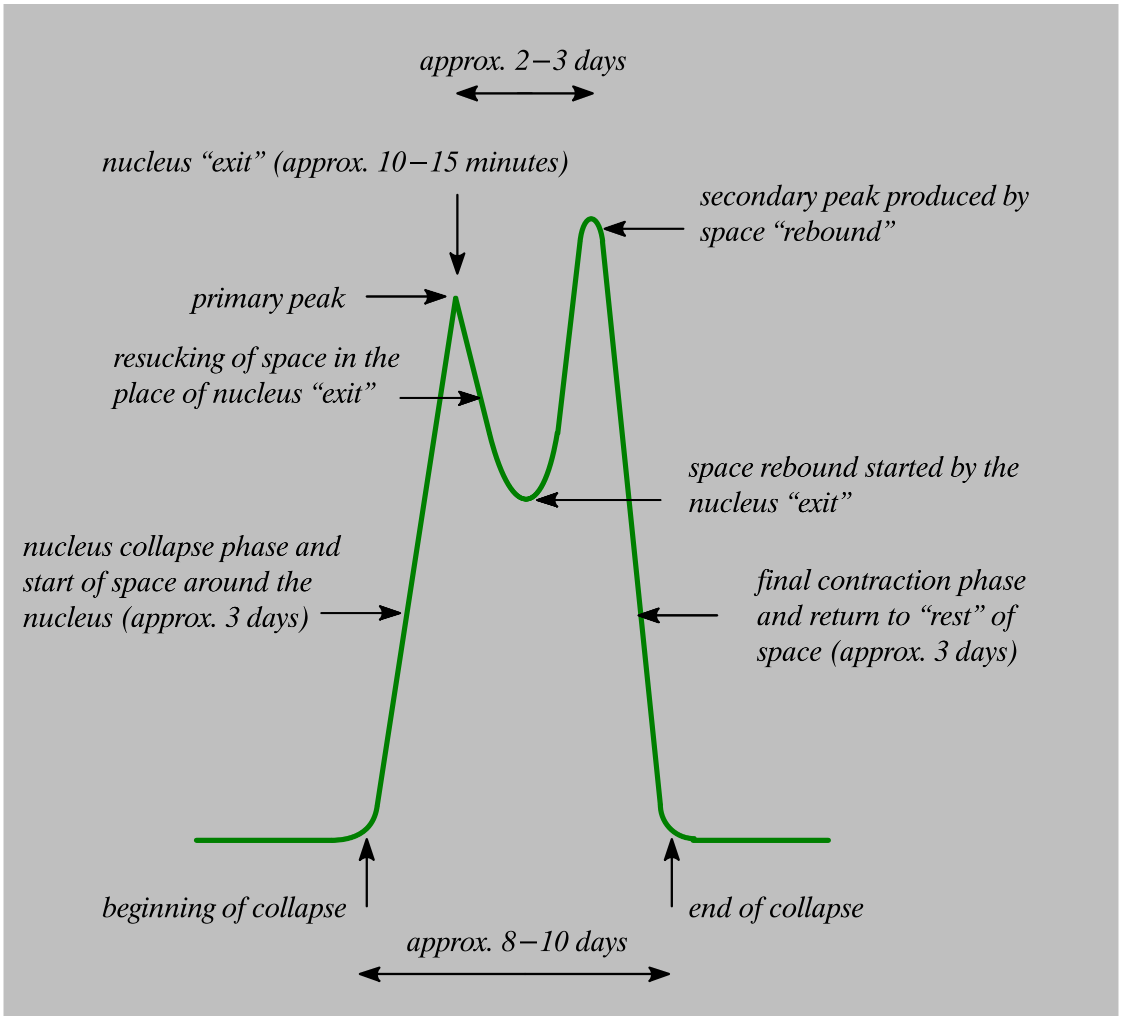

Figure 1: Gravitational Wave generated during the "exit" of a nucleus

As soon as the body "comes" into the Universe its gravitational effects are immediately perceived by the matter just entered, causing a self collapse represented by the negative front of the wave. During this collapse the surrounding space starts to move back and its rebound produces the second (round) peak of the wave. In this case the rebound of space (which occurs around the celestial body!) has less intensity and, therefore, the second peak is less deep than the first one. **Figure 2** represents, schematically, the gravitational wave produced by this event.

Why do we prefer to speak about "entry" instead of an explosion/expansion of the celestial body? The reason is the following. It is very difficult to imagine an explosion/expansion of matter in such a short time and in a place where a strong gravitational field produced by these celestial bodies. Furthermore, following the esplosion/expansion the body could not contract again and so quickly!

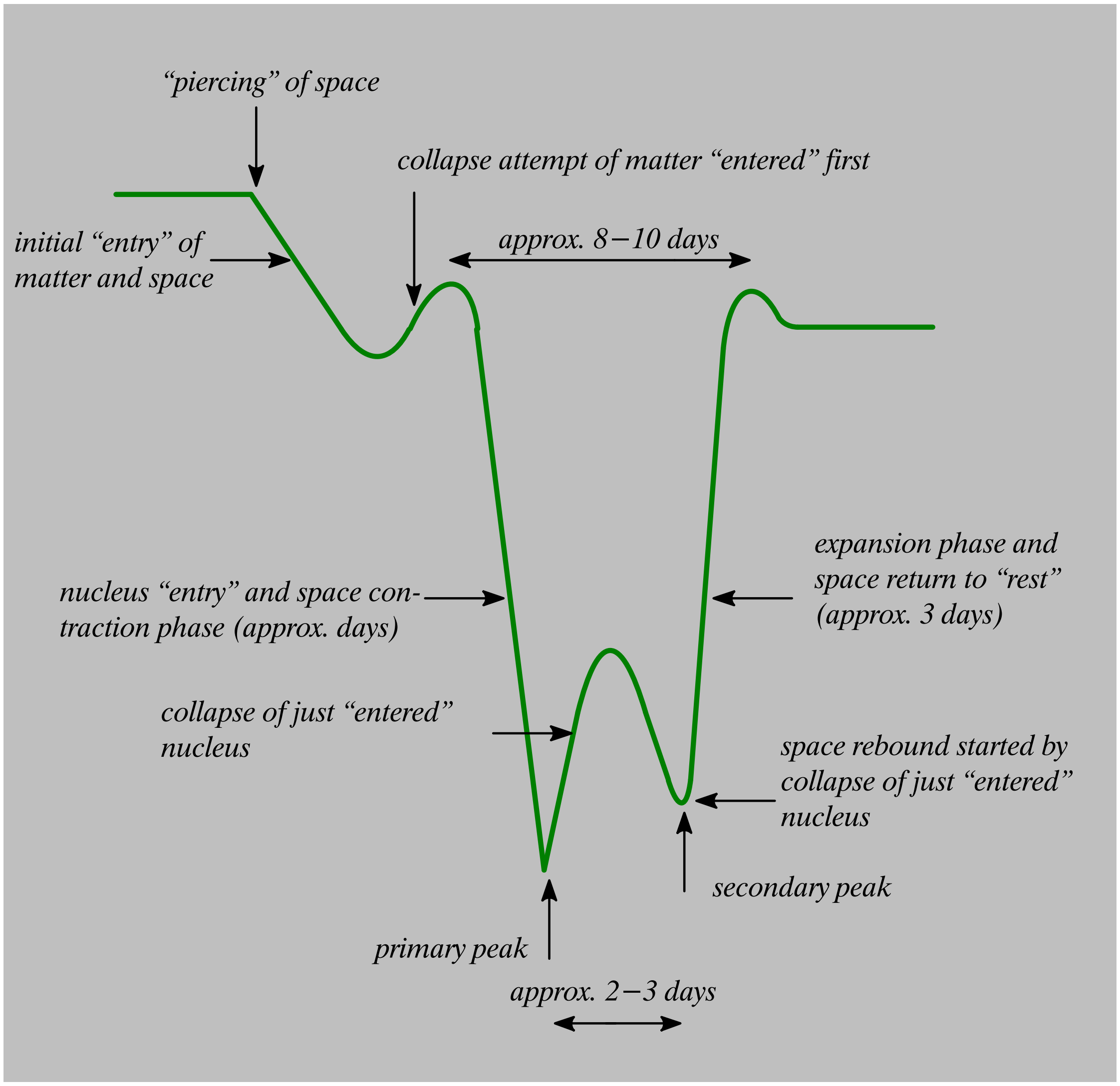

Figure 2: Gravitational wave generated during the "entry" of a nucleus

What does the wave on Graph 1995_3 represent? In this case things went differently. First of all, there was a series of "entries" of matter as shown by the quite high decay of detector voltage. The subsequent *high space oscillations* have started the collapse phase (see circle 13) [12].

The collapsing phase lasted $5 \div 6$ days (see **Graph 1995_3**) at the end of that the object did not had enough energy to "pierce" the space and "exit" from the Universe. Now, one might think, everything could have rebounced back forming, in this case too, a "fork" shaped wave very similar to the others.

Why was there no rebounce? When a collapse had taken place and the celestial

[12] Local space oscillations indicate that the NMQ nuclei could have close contacts, therefore they try to collapse but, being still comparatively small, *do not have sufficient energy to terminate the collapse*. These intense oscillations can cause only the most massive nuclei to collapse.

body had "left" the Universe, this latter, in leaving out, stopped its gravitational effects and, because of that, the surrounding space could close again producing the second rounded peak. On the contrary, in this case *all matter forming the celestial body remained at the same place and continued exerting its gravitational effects* and, therefore, expansion of the body slowed down according to the well known laws of gravitational attraction. It was, at the end, of a *missed collapse*!

What does the big "fork" carried out by the detector between the end of September and the beginning of October 1994 and whose intensity is remarkably larger respect to the others (see Graph 1994_4) represent? In this case the collapse would concern a *more massive body* than the others, which has been recorded with more precision by the detector. It is one of the biggest collapses observed up to now! It is possible to see how voltage in the final part of the first peak had had, in one day only, an increase by about 1.2 V, representing more than 10 % of the overall voltage at the ends of the Wheatstone bridge, with a decrease of more than 20 % of the photoresistor resistance! The corresponding speed of light increase was about 36,000 km/s [13].

If compared with the other collapses, the distance between the two peaks has increased from 4 days to about 7.5 days, while the wave amplitude is about 2.4 V (see **Graph 1994_11**).

As the real size of the celestial body (e.g. radius) is proportional to the rise time of the wave during the collapse phase, the object involved was about $6 \div 7$ times more massive than the others. For this reason the ratio between the respective energies developed should correspond to that value. Namely, as *energy is obtained in multiplying the wave amplitude by its rise time*, it results that this collapse has developed an energy that was $6 \div 7$ times higher than the others.

A similar phenomenon occurred during a series of collapses recorded in summer 1998 which are shown in **Graph 1998_5**, where there is evidence of a "fork", circled with number 5, having a higher intensity than all the others.

How does the "entry" of a celestial body happen? The "entry" of a celestial body into the Unverse, may be caused both by local heavy disturbances in space, and during collapsing of other nuclei.

Sometimes the collapse of just "entered" matter, is so violent, that the subsequent rebound of space (surrounding the body itself), has such an impact, that it causes the body to "exit" again from the Universe. The secondary peak created while leaving, may in its turn cause its further re-emersion. It has been noted, in some cases, that this oscillating phenomenon may last even a few cycles. Circle

[13] As matter of fact, we have:

$$\Delta c = 30\ 1.2\ 10^3 \approx 36,000\ km/s$$

where 30 km/s per mVolt was the value of the K constant at that time.

number 13 of **Graph 1995_3**, circle 2 of **Graph 1998_3** and circle 5 of **Graph 1999_3** and put in evidence some examples of these oscillations.

5 Events recorded by the detector

In **Graph 1994_5** is reported the whole detector activity from the beginning 26th April 1994 until 30th June 1995.

The redshift analysis gives us that *the series of waves recorded in summer 1994 occurred at a given place of the Universe*. Furthermore, single events represented by these waves, *have more or less developed the same energy*.

That means in the region of the Universe where the phenomena took place, there must have been celestial bodies all having *very similar physical characteristics and dimensions*. The graph shows that it is a *whole phenomenon* which started, most probably, at the beginning of 1994 (when the detector was not operating yet).

After the chain of collapses at the beginning and the big collapse of September/October, voltage continued to increase until in November 1994 and it reached the maximum value of 2.4 V. The period that followed immediately after this started with a continuous series "entries" of matter that lasted until the middle of January 1995 (see circles 9, 10, 11 and 12) causing the lowering in the detector's voltage, down to a value of about -0.6 V, after that, the local intense oscillations that followed in space, were a primer to the "missed" collapse of February/March 1995. During this period a lowering of the speed of light by the amount of 120,000 km/s is recorded [14]!

The redshift of these waves corresponds to $z = 1.5$, therefore, the family of waves recorded comes from a single place in the Universe, whose distance from us was corresponding to about *2/3 of the radius of the visible Universe, and whose waves, left about 18 billion years ago*!

Graph 1996_3 shows the activity of the detector from the 1st June 1995 to the 30th September 1996, in comparing more than one year recordings. Also this graph shows *one single phenomenon* that occurred in a specific region of the Universe. The whole event started with the entering of matter in June and July 1995, that was followed by the two previously examined collapses.

The redshift of these waves corresponds to $z = 9$, therefore, the family of waves recorded comes from a single place, whose distance from us was corresponding to *9/10 of the radius of the visible Universe*, and whose waves left about *46 billion years ago*!

During the period following the two collapses of 1995, it is possible to notice a continuous "entries" of matter, that lasted until March 1996 (see circles 4, 5, 6, 7, 8, 9, 10 and 11) which caused a lowering of the detector voltage down to about -1.4 V, which results as the lowest value recorded up to now! The corresponding decrease of the speed of light was of about 84,000 km/s.

[14]The value of the instrument constant, in the mean time, has changed from 30 km/s to 40 km/s per mV.

After reaching this minimum, the detector voltage started increasing again and reached about 0 Volt by mid August 1996. This period is characterized by a sequence of collapses (see circles 12, 13, 14, 15, and 16). In circles 12 and 13 the "fork" shaped wave, whose distance between peaks is about 16 days, is still noticeable, while from circle 14 and later it cannot be well distinguished. There is only a voltage increase, which indicates multiple collapses.

After August 1996, and for about 3 months, voltage remained practically constant, but since the second half of November 1996 there was a quick lowering, which fact indicates a possible departure from the waves' knot that had characterized the aspect of the graph of the previous months.

Since December 1996 (see **Graph 1997_3**), a new phase, whose waves can be seen more clearly has started. The second half of December shows a quick signal growth that terminates with an as quick decrease, indicating the occurring of a collapse. Similar behaviours appear up to the end of March 1997. However, the graph represents a series of collapses in their extinguishing phase where it is difficult to identify "forks" [15].

After the series of peaks recorded in the first months of 1997, from the beginning of June 1997, there is a sudden increase of voltage which reaches a maximum value of about 1.3 V. After that, the instrument starts recording a continuous series of waves.

When observing more carefully the **Graph 1997_4**, it is possible to identify two series of partially overlapped collapses. In particular it is possible to notice a series of collapses having a 9 day distance between the peaks and another series of collapses whose distance between the peaks is of 11 days. More exactly we have [16]:

- circle 2: a single collapse with redshift $z = 4.6$
- circle 3: two collapses partially overlapped, both with redshift $z = 5.9$
- circle 4: a single collapse with redshift $z = 4.6$
- circle 5: a single collapse with redshift $z = 4.6$

When compared with the previous ones, it results that these events happened more recently and in other places of the Universe nearer to us.

Graph 1998_4 shows the recordings carried out from October 1st 1997 to September 30th 1998. During the second half of October, the point of the graph

[15] The detector has no direction related capability. That is to say, it cannot detect waves coming from a specific direction of the Universe.

[16] Namely, for these waves have:

$$z_1 = \frac{9}{4}\,2.5 - 1 = 4.6$$

$$z_2 = \frac{11}{4}\,2.5 - 1 = 5.9$$

marked with circle 1 indicates the beginning of a series of strong local space oscillations, as indicated by circles 2, 3, and 4. It does not seem these indicate the entering of some matter as we cannot notice inverted "forks".

As we will see, these strong disturbances started a series of collapses that lasted during the whole 1998. The first of these collapses is very likely the one circled with number 5, even if it shows very disturbed by the still present oscillations. After this, it is possible to distinguish rather well a chain of collapses (see circles 6, 7, 8 and 9). All secondary peaks of the "forks" can be seen very well notwithstanding the presence of distortions, due to the remarkable distance. The primary peaks are less visible.

The distance between the peaks of these "forks" is about 17 days, with a corresponding redshift of $z = 9.6$. This means that this series of events took place at about 9/10 radius of the visible Universe, whose signal left more than 47 billion years ago. One can notice how round the waves received are, which indicates strong distortions due to their long path.

In the same graph, from July to September 1998, one can also see very well another series of collapses that overlapped the already going on general collapse. Said events occurred in another region of the Universe at a much shorter distance, as shown by the low redshift value and by their higher intensity, that makes them clearly emerge from the underlying waves.

Graph 1998_5 shows the series of collapses occurred from July to September 1998 indicated with more details. Marked with circles 1 and 2, there are two well visible "forks", of as many collapses. The distance between the "forks" is of 4.5 days, corresponding to a redshift of $z = 1.8$. Circle 3 marks another collapse of the same series, while in circle 4 there are two peaks indicating a pair of collapses whose intermediate much bigger one, is the overlap of a primary peak on a secondary one. These collapses too have a redshift of $z = 1.8$. Circle 5 puts very well in evidence a collapse with characteristics very similar to the collapse of September and October 1994. In this case too the object, the latest one to collapse, was much more massive than the others.

Graph 1999_3 compares the gravitational waves the detector received from October 1st 1998 up to June 30th 1999. In October 1998 we notice (see circle 1) a distant collapse followed by another two partially overlapped collapses (see circles 2 and 3), after which there is a quick voltage decrease. The average distance of the peaks is about 11 days, with a corresponding redshift of about $z = 5.9$. Therefore, these collapses do not belong to the previous series and their signals left more than 38 billion years ago. The wave intensity, because of the scale of ordinates used to draw this graph, seems to be low. After these collapses, the voltage decreases by nearly 0.5 V in 15 days. By mid November 1998 (see circle 4) a series of strong local space oscillations began (see circle 5) which have lasted for about 2 months.

During the second half of January 1999 there is the entering of a celestial body, this very likely due to the strong space oscillations taking place at that time. In February 1999 we can notice very well the inverted "fork" concerning this event (see circle 6), whose distance from the peaks is about 13 days. After this, during

March 1999 there was a rather distorted collapse (see circle 7) whose ”fork” shows a distance from the peaks of about 13 days, which correspond a redshift of $z = 7.1$. This event is the first of a collapse chain (see circles 8, 9 and 10) at the end of which voltage had risen to about 1.8 V.

In July and August 1999 other collapses, overlapping the general ongoing collapse (see **Graph 1999_4**). Said events occurred in other regions of the Universe and at much lower distances, as shown by the low redshift value and the higher intensity of these waves, that makes them emerge very clearly from the underlying waves. Very likely, the waves marked with circles 11, 12 and 13 still belong to the general ongoing collapse. However, at the moment we have no more information on that.

Graph 1999_5 shows a magnification of the recordings occurred in July, August and September 1999. In the second half of July a collapse is visible (see circle 1), the distance between the ”fork” peaks is of about 7 days, with a redshift of $z = 3.4$.

By mid August there is another collapse (see circle 2) with the same redshift as the one recorded previous month. The second peak of this collapse is not well visible as, at the same time, there had been another collapse whose ”fork” is clearly emerging (see circle 3). This last collapse occurred at a much lower distance than the two previous ones. From the distance of the two peaks that is of about 2.5 days, it results a redshift of about $z = 0.6$. The amplitude of this wave, not considering the effect of the secondary peak of the previous collapse, should be around 1.0 V. Of all collapses recorded up to now, it is (see **Graph 1999_4**) the nearest, whose distance from us was just 9÷10 billion light-years! The knee, visible while the wave is rising, and marked with circle 6, is the evidence of its partial overlap with the previous collapse. Because of this overlap, the detector signal reached the highest value recorded up to now, which is of about 3.4 V. The corresponding increase of speed of light has been over 120,000 km/s!

In the last days of August the detector has recorded another collapse of the same intensity as the previous one (see circle 4), whose first peak can be clearly distinguished but it seems there is no second peak. We can think about another missed collapse similar to the one observed in 1995 but it is not like this, as confirmed by the quick wave decrease. It is quite sure the second peak occurred at the same time of matter entering (see circle 6).

After the very violent collapses recorded in August 1999, there was a voltage decrease at the ends of the detector that reached, by the end of January 2000, a minimum value of about 1.8 V. Starting from the beginning of March 2000, there was again an increase of voltage, even if it was very slow.

Graph 2000_4 shows the whole activity of the detector during a period going from the 1st January 2000 until the 31st December 2000. In this case too, it is possible to distinguish a chain of collapses that occurred at a remarkable distance from us, nearly at the limits of the visible Universe. The corresponding both positive and negative ”forks” are hardly recognizable. The distance between the peaks should be of about 20 days (see circles 1, 2, 3, 4 and 5), for which reason the redshift is more than $z = 11 \div 12$.

Between the end of August and the beginning of September a collapse was recorded that does not belong to the series already going on. **Graph 2000_5** represent details of the wave recorded, which seems being disturbed by the arrival of other rather low and confused waves. It is impossible to make more exact considerations on this collapse.

6 Multiple Nucleus Quasars

The observed phenomena let us think the recorded events belong to supermassive celestial bodies that form a new kind of *Multiple Nucleus Quasar (MNQ)*. These celestial objects are formed with a large number of nuclei (up to some tens) closely orbitating, one around the other, as the stars of a compact globular cluster do.

The dimension of each nucleus, should be $2 \div 3$ day-light radius, while the average size of these MNQs should be about 3 month-light radius [17].

The operating mechanism of this kind of MNQ seems to be as hereunder indicated. When one of the nuclei has reached a critical mass it collapses because of prevailing of gravitational contraction on internal pressure due to its high temperature. It happens that during contraction, performed at the speed of light, an enormous quantity of energy, that can "pierce" the space and allow the nucleus *to "exit" the Universe*, is generated locally.

The nucleus, once it has left the Universe, remains *"buried" within space* and, because of its isolation, cannot lose its residual energy. But, in the future, can *"emerge" again* from the same point it left.

The graphs analyzed allowed us to observe that when one of the nuclei collapses, it becomes a detonator to the near ones, starting a chain of collapses until the most massive ones are extinguished. During this series of collapses, owing to the local space perturbations produced, some of the previously collapsed nuclei, can re-emerges from space and get back to be within the MNQ, thus contributing to make its life longer. In this case we can speak of *recycling of old matter inside the MNQ* [18].

The phenomenon concerning *matter recycling* is quite well visible in **Graph 1996_3**, in **Graph 1998_4** and in **Graph 1999_4**. The nuclei forming these MNQs had to be some tens.

The time a nucleus takes to collapse depends on the matter it is available around itself. The older the MNQ gets the more his nuclei increase, until it extinguishes galaxies clusters and small quasars it has around and, after this phase, collapses start slowing down.

The 1995/1996 MNQ was very likely also really old and this can be seen very

[17] The dimensions of MNQs can be evaluate by the overall time duration of the event after correcting the redshift.

[18] Here we prefer to speak about *old recycled matter* in order to distinguish it from the entering of new matter, that is to say matter entering for the first time into the Universe.

well in observing **Graph 1996_3**, while MNQ of 1997/1998, instead, had very likely less nuclei [19].

7 Discussion

According to what reported in the previous paragraphs, some questions arise soon.

1. Why are these collapsing bodies not visible with traditional optical and/or electromagnetic instruments in spite of the very high energy developed during these events?

   The collapse speed of a nucleus is very close to the speed of light, therefore it is practically invisible to any observer as its *own redshift* is very high. The collapsing object is seen fading at a very high speed by any observer in the Universe. If we add to this the *redshift caused by the continuous Universe expansion*, it is practically impossible to see them collapsing.

   The only objects that might be seen, are the nuclei re-emergin from the MNQ, as most part of the energy released is formed by highly energetic cosmic rays and equivalent gamma rays. But the presence of the thick high temperature gas shell, enveloping the whole MNQ, does not allow the electromagnetic radiation to come out directly. What we could see of these events is only an increase of the overall electromagnetic energy emitted by the MNQ [20].

2. Why during these events there is no recording of electromagnetic radiations too?

   It is necessary to point out, first of all, that the instrument recordings *only concern gravitational energy.* In the graphs *there is no trace of electromagnetic energy.*

   The electromagnetic portion of this energy will reach the the observer *much later*, as electromagnetic waves travel at an *average speed*, which is lower than that of the gravitational waves, as they undergo deviations and/or distortions during their propagation in space [21].

[19] Why do we judge it is very old? First of all the quantity of nuclei entering is high, and this is a first indication, as these nuclei had previously collapsed. Second, the collapses following these entering have formed a graph showing a high and flat hill that lasts about 7 months which means a high quantity of collapsed nuclei.

[20] We need to keep in mind that when a nucleus re-emerges, it preserves all its mass, but the matter forming it is (almost) without energy as it has lost nearly all of it during the previous collapse.

[21] In the light of the latest telescope observations, some very distant quasars are visible in the Universe, which are peculiar for showing behind them images of galaxies like luminous arcs (see **Abell 2218**). After observing the here reported phenomena, we think it advisable to keep observing them as they might be the future candidates to collapse. Some of these objects might have already collapsed!

The space telescope images show that, in several cases, these arcs are visible up to a distance of hundreds of thousands light-years!

3. What is the energy of these waves?

   If we consider, for example, the "forks" of summer 1994 (see **Graph 1994_10**), when these waves arrived, the variation of the speed of light recorded corresponded to [22] :

$$\Delta c = K\ \Delta V_{CD} \approx 30\ 0.50\ 10^3 = 15,000\ km/s \tag{10}$$

   for which reason, the energy these waves carry on is:

$$\Delta U \approx c^2 - \left(c_0\right)^2 = 315,000,000^2 - 300,000,000^2 \approx 10^{16}\ J/kg \tag{11}$$

   According to what detected, if all this energy is converted into mass, using the well known Einstein's formula, the mass obtained would be of about $10^{28} \div 10^{29}$ solar masses, that is to say a mass several orders of magnitude bigger than that of visible Universe!

   According to this we can think that while a nucleus collapses, not only the matter forming it collapses, but the space the nucleus holds around itself collapses too. Therefore, the enormous quantity of energy of these waves (which we do not perceive at all!) is supplied only for a small part by the collapsing matter and, most of all, by the *space collapsing together with the matter itself.*

4. What is the mass of these nuclei?

   We are now able to estimate the mass of these nuclei quite exactly and its value should be of $2.5 \div 5$ billion solar masses [23].

   Because of their very high mass, these particular MNQs, behave like very powerful attractors as they, literally, suck in all matter around them including galaxies. They only partially take the great quantity of energy they need to live, from matter falling on their surface, transforming it into energy. Most part of the energy they need is supplied by the interaction with the gravitational waves produced by nuclei that re-emerges or collapse on place.

5. What do these intense gravitational waves continuously arriving cause to Earth?

   Gravitational waves interact with the magnetic fields. As the Earth has a magnetic field that is more intensive in depth, when a gravitational wave reaches it, the energy it generates is higher in depth than on the surface. This

[22] This value is obtained from the instrument calibration K constant which value, at that time, was of about 30 km/s per mVolt.

[23] The mass we are talking about is its "proper" or particle mass. Most part of the mass of these nuclei is represented by the gravitational mass which includes also its "proper" mass plus the thickened space around the nucleus. The gravitational mass of these nuclei is about $10^{18} \div 10^{19}$ times larger than its "proper" mass and is also corresponding to the ratio between the energy emitted by the gravitational waves and the energy emitted by the electromagnetic waves.

difference *causes a temporary slip of the Earth nucleus and, consequently, a sliding towards East of the Earth crust*.

When these very intensive gravitational waves reach the Earth, the phenomenon it happens is very similar to what we see happening to the our *magnetic sensor* that has been operating since some years, and it consists of a force generated by the gravitational waves when they pass through a conductor undergoing the action of a magnetic field.

This sliding should be around 1 meter for the big waves during the whole event. At first sight it seems little but, considering the amount of the Earth crust mass, the energy generated is sufficient to cause a series of geological phenomena.

The first of these phenomena concerns *seismic shocks*. During the rise front of the wave, *nearly simultaneously, the whole equatorial band of the Earth is shaken by earthquakes*, as in that area rotation speed is higher while at the poles almost nothing happens.

The very quick rise of the wave that arrived on August 16th 1999 caused several earthquakes that happened simultaneously on the whole Earth surface and repeated again by the end of that month due to the arrival of the second wave.

The second of these phenomena consists of the *reactivation of all those volcanoes having a precarious equilibrium*. This phenomenon is noticeable with few months of delay respect to the first one. As matter of fact, in the following months, all over the world, there was the reactivation of several volcanoes. In Italy, for example, starting from Etna and going up North many volcanoes reactivated with intensive eruptions.

6. What do these gravitational waves cause to the Sun?

   We know the Sun *has a magnetic field many times stronger* than the one present on the Earth. Furthermore, we know the Sun's electric conductivity is very high too. Therefore, in this case, *the heating produced inside the Sun by the arrival of these gravitational waves is by far much higher* and, also because of the high conductivity, it will take this heat a longer time to reach the surface.

   According to what has been possible to observe after the collapses of August 1999, the Earth's volcanic activity diminished only after about $6 \div 8$ months. For what concerns the Sun, up to the moment, we are not in a position to tell anything more.

   For example, we do not know if the intense activity of the Sun recorded lately, was caused by the intense gravitational waves of 1994 or by other ones that had arrived before!

7. Why didn't we use the "relativistic" expression for redshift?

The explanation is very simple. *The "relativistic" formula does not work, while the "classical" formula is in accordance with our observations.*

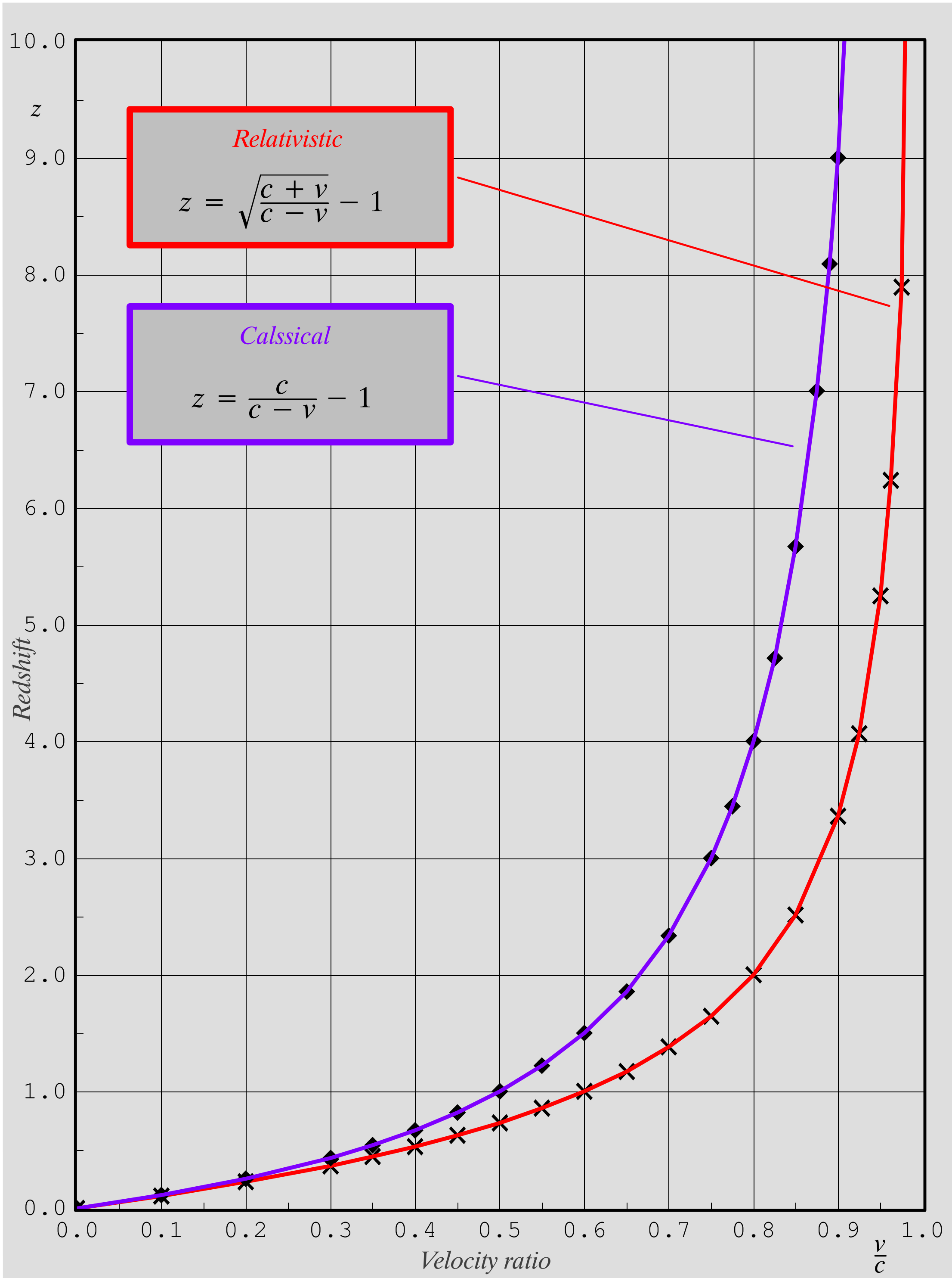

Figure 3: Comparison between "classical" e "relativistic" redshift

For what we are concerned, in our opinion all phenomena (above all gravitational ones) that happen in the Universe, *may be better understood in terms of variable speed of light*. No wonder then, that the relativistic formula may be too poor for these waves.

On the other hand, it is known, that the two expressions for redshift tend to match for low values of redshift $z < 0.5$ and that the relativistic expression, which is very used today for electromagnetic waves, *has given no satisfactory results, up to now, for long distances* $z > 1$. **Figure 3** shows the difference between the two formulas.

8. How is it possible to adapt today Physics to a variable speed of light?

   The explanation given today about Electromagnetism is in terms of constant speed of light. The problem is then that of verifying *if and how Electromagnetism may be compatible with a variable speed of light*.

   But we will see, however, that *Electromagnetism is perfectly compatible with a variable speed of light*! All what is needed is the *existence of a physical space as a means to communicate for the forces (electric, magnetic and gravitational)*.

9. Is it possible to conciliate the phenomena observed and the most credited theories concerning the behaviour of Universe?

   We are quite sure this conciliation is not possible. We can observe very clearly some events that occurred $40 \div 50$ billion years ago, whose protagonists (e.g. the MNQ's nuclei) were already old. All this cannot comply with a Universe that formed for the first time 15 billion years ago!

   We personally prefer to leave aside the present theories and give more credit to the events recorded by the detector. Furthermore, we prefer *simpler and comprehensible* theories about the operating of Universe, where many other phenomena observed in these latest decades, that have not yet obtained the consideration they deserve, can find the right place.

A APPENDICES

A.1 Redshift

The existence of a physical space as a communication medium between forces, makes it necessary to modify the expressions for redshifts, distances, wave travelling times, etc..., compared with those presently used in Physics which are based, essentially, upon the Theory of Relativity.

Hereunder we give some of these new expressions which are used in the calculations. For redshft z of a wave we have:

$$z = \frac{c}{c - v} - 1 \tag{12}$$

from which we obtain a *leave speed* v:

$$v = c\,\frac{z}{z + 1} \tag{13}$$

The *wave width* w is given by,

$$w = z + 1 \tag{14}$$

The distance r_0 from the observer (e.g. the detector) of the place of the event is obtained fron the redshift z by the following expression:

$$r_0 = R_U\;\frac{z}{z + 1} \tag{15}$$

where R_U is the radius of the visible Universe, that is related to Hubble constant H_0 and to the speed of light c according to the following relation:

$$R_U = \frac{c}{H_0} \tag{16}$$

$$\Delta t = t_H\;\ln(z + 1) \tag{17}$$

where t_H is the *Hubble time*, defined as follows,

$$t_H = \frac{R_U}{c} \tag{18}$$

The path r_w it takes the wave to reach the observer thus results:

$$r_w = c\,\Delta t = c\,t_H\;\ln(z + 1) \equiv R_U\;\ln(z + 1) \tag{19}$$

While, the distance r of the celestial object generating the event, in the mean time the wave reaches the observer, is given by:

$$r = r_0\;e^{\frac{\Delta t}{t_H}} \tag{20}$$

Therefore, using (17) into (20) it results that:

$$r = r_0\;\big(z + 1\big) \tag{21}$$

A.2 The redshift of gravitational waves

It is well known that energy $\dot{U}$ carried on per unit of time by a wave results as:

$$\dot{U} = 4\,\pi\,r^2\,I \tag{22}$$

where I means its intensity.

As *intensity I of a gravitational wave is directly proportional to amplitude A measured by the detector*:

$$I \propto \frac{c - c_0}{c_0} \propto A \tag{23}$$

and its propagating into space occurs with very low losses (even for very long distances), we obtain:

$$4\,\pi\,r^2\,I \approx constant \tag{24}$$

Two events (we are going to indicate with subscripts 1 and 2) occurred in different places of the Universe which, however, *have developped the same energy* give the following:

$$\frac{{r_2}^2}{{r_1}^2}\,\frac{A_2}{A_1} \equiv \frac{R_U\ {z_2}^2\ \left(z_1 + 1\right)^2}{R_U\ {z_1}^2\ \left(z_2 + 1\right)^2}\frac{A_2}{A_1} = 1 \tag{25}$$

where, for distances has been used expression (15) previously indicated. If we indicate by:

$$A_{ratio} = \frac{A_2}{A_1}$$

$$w_{ratio} = \frac{w_2}{w_1}$$

we have the followig system of two equations in the respective unknowns z_1 and z_2.

$$w_{ratio} = \frac{z_2}{z_1}\,\sqrt{A_{ratio}} \tag{26}$$

$$w_{ratio} = \frac{z_2 + 1}{z_1 + 1} \tag{27}$$

allowing us, as a result, to obtain the two unknowns.

$$z_1 = \frac{\sqrt{A_{ratio}}}{w_{ratio}}\,\frac{w_{ratio} - 1}{1 - \sqrt{A_{ratio}}} \tag{28}$$

$$z_2 = \frac{w_{ratio} - 1}{1 - \sqrt{A_{ratio}}} \tag{29}$$

Therefore, in case that the two events had the *same energetic intensity*, it is possible to obtain the redshift of both of them, starting from the ratio between amplitude A and widening w of the respective waves.

As the *ratio between the widenings is the same as the ratio between the distances of the "fork" peaks*, therefore it is possible to calculate it quite exactly, thanks to the particular shape of the wave, while the ratio between the amplitudes is more difficult to obtain, mainly because of the overlap of other waves reaching the detector. It is possible to calculate it with sufficient prcision only when the event considered is *isolated*.

A.3 The first redshift calculations

At the beginning of 1996 the first calculations of redshift were performed. These calculations were based mainly in comparing the two waves that had reached the detector in summer 1994 and in summer 1995. Namely, for the waves of 1994 the following parameters had been taken into account:

$$A_1 \approx 0.55\ V\ \ e\ distance\ between\ peaks = 4\ days$$

while for the waves of 1995:

$$A_2 \approx 0.20\ V\ \ e\ distance\ between\ peaks = 12\ days$$

That is to say the positive "forks" of 1995, shown in **Graph 1995_7**, the distance indicated between the peaks was about 12 days, as the first "fork" had been identified as going from the first to the second peak (see circle 2), and the second "fork" (see circle 3), from the third to the fourth peak. The abovementioned paremeters showed that:

$$\sqrt{A_{ratio}} = \sqrt{\frac{0.20}{0.55}} = 0.60$$

$$w_{ratio} = \frac{12}{4} = 3$$

therefore, using the previous relations (28) and (29), the following redshift values had been obtained:

$$z_1 = \frac{0.60}{3}\ \frac{3-1}{1-0.60} = 1$$

$$z_2 = \frac{3-1}{1-0.60} = 5$$

The distances obtained are repported as follows:

$$r_1 = R_U\ \frac{z_1}{z_1+1} = R_U\ \frac{1}{1+1} = \frac{1}{2}\ R_U$$

$$r_2 = R_U \frac{z_2}{z_2+1} = R_U \frac{5}{5+1} = \frac{5}{6} R_U$$

that is to say, the events recorded in 1994, were placed at a distance of *1/2 of the radius of the visible Universe*, while the events of summer 1995, were placed at a distance of *5/6 of said radius*.

Later on, after the highly intensive events recorded in August 1999, a more careful analysis of redshift of these waves was performed, and we could notice that there had been a mistake in identifying the "forks" of 1995: namely, the first "fork" is formed by the first and the third peak while the second "fork" is formed by the second and the fourth peak as it can be easily detected in examining the graph more carefully (where one can notice that the third peak is more rounded than the second one).

A.4 Redshift analysis

We report hereunder the analysis recently performed on the redshift of these gravitational waves.

In combining (28) and (29), it is possible to obtain the following relationship between the amplitude and the widening of a wave:

$$\frac{1}{\sqrt{A_{ratio}}} = \frac{1}{w_0 - 1}\left(w_0 - \frac{1}{w_{ratio}}\right) \tag{30}$$

where,

$$A_{ratio} = \frac{A}{A_0}$$

$$w_{ratio} = \frac{w}{w_0}$$

with A_0 and w_0 are the respective amplitude and width of the reference wave.

If we report on a graph the value of $1/\sqrt{A_{ratio}}$ in function of $1/w_{ratio}$ we should have a straight line, whose intersection with the abscissa we obtain the widening w_0 of the reference wave.

Once w_0 has been determined, it is possible to determine the redshift z of all other waves by using the following formula, which is derived form the (27):

$$z = w_{ratio}\, w_0 - 1 \tag{31}$$

In this respect, we have selected some clear "forks" recorded in these years which were produced by *standard nucleus*.

Wave N. 1. We refer to the collapses of May and June 1994 reported in **Graph 1994_10**. From this graph we have:

$$A_1 \approx 0.55\ V \ \textit{and}\ T_1 = 4\ \textit{days}$$

Wave N. 2. We refer to the two partially overlapped collapses of July and August 1995 and reported in **Graph 1995_10**. From this graph we have:

$$A_2 \approx 0.21\ V\ e\ T_2 = 16\ days\ (average\ of\ the\ two\ collapses)$$

Wave N. 3. We refer to the collapse of July and August 1998 and reported in **Graph 1998_10**. Form this graph we have:

$$A_3 \approx 0.40\ V\ e\ T_3 = 4.5\ days$$

The value of the wave amplitude has been calculated in referring to the round peak, as during collapse a disturbance was present, whose amplitude was rapidly decreasing.

Wave N. 4. It deals about the events of Febrauary and March 1999 and reported in **Graph 1999_10**. The positive "fork" of March 1999 is highly disturbed by space oscillations still present in the place of the collapse. The negative "fork" concerning the entering of matter of February seems, on the contrary, much less disturbed. In this case we have:

$$A_4 \approx 0.23\ V\ e\ T_4 = 13\ days$$

Wave N. 5. We refer about the collapse of July 1999 reported in **Graph 1999_11**. From this graph we have:

$$A_5 \approx 0.32\ V\ e\ T_5 = 7\ days$$

Wave N. 6. We refer about the collapse that started by mid August 1999 and is reported in **Graph 1999_12**.

The real amplitude of this collapse might be slightly higher respect to values of $0.80 \div 0.90$ V as there is an overlap with the secondary peak of the previous collapse. Therefore, for this collapse we have assumed the following parameters:

$$A_6 \approx 1.0\ V\ e\ T_6 = 2.5\ days$$

If we take as reference wave the same wave of 1994, that is to say:

$$A_0 \approx 0.55\ V\ e\ T_0 = 4\ days$$

we obtain the **Table 1**:

Table 1: data concerning the selected waves

Wave N.	Year	A	T	A_{ratio}	w_{ratio}	$1/\sqrt{A_{ratio}}$	$1/w_{ratio}$
1	1994	0.55	4	1.0	1.0	1.0	1.0
2	1995	0.21	16	0.38	4.0	1.62	0.25
3	1998	0.40	4.5	0.73	1.125	1.17	0.889
4	1998	0.23	13	0.42	3.25	1.55	0.308
5	1999	0.32	7	0.58	1.75	1.31	0.571
6	1999	1.0	2.5	1.82	0.625	0.74	1.60

Figure 4 reports the graph with the values on the *Table 1.* This graph shows how all points layout is, with good approximation, a straight line whose interseption with the abscissa gives the following value for the widening of the reference wave:

$$w_0 = 2.5$$

Therefore, for the events of 1994 we obtain a redshift corresponding to:

$$z_1 \equiv w_0 - 1 = 2.5 - 1 = 1.5$$

while, for the events of summer 1995 the redshift obtained is:

$$z_2 = 4\ 2.5 - 1 = 9$$

namely, higher values than those calculated in 1996. The distances from the place of collapse result subsequently as follows:

$$r_1 = 20\ \frac{1.5}{1.5+1} = 12\ billion\ of\ light - years$$

$$r_2 = 20\ \frac{9}{9+1} = 18\ billion\ of\ light - years$$

Therefore, the events recorded in 1994 are, now, situated at a distance of little less than *2/3 of radius of the visible Universe*, while the events of summer 1995, result as situated at a distance of about *9/10 of said radius.* The leave speeds of these collapsing objects were respectively:

$$v_1 = 300,000\ \frac{1.5}{1.5+1} = 180,000\ km/s$$

$$v_2 = 300,000\ \frac{9}{9+1} = 270,000\ km/s$$

while, the time the waves took to reach the detector were respectively:

$$\Delta t_1 = 20\ \ln(1.5+1) = 18\ billion\ of\ years$$

$$\Delta t_2 = 20\ \ln(9+1) = 46\ billion\ of\ years$$

In the **Table 2** the characteristics of the selected waves are reported.

Table 2: characteristics of the selected waves

Wave N.	Year	w_{ratio}	z	w	$r^{(*)}$	$\Delta t^{(**)}$
1	1994	1	1.5	2.5	12.0	18.3
2	1995	4	9	10.0	18.0	46.1
3	1998	1.125	1.8	2.8	12.9	20.5
4	1998	3.25	7.1	8.1	17.5	41.8
5	1999	1.75	3.4	4.4	15.5	29.6
6	1999	0.625	0.6	1.6	7.5	8.9

(*) distance in billion of light-years
(**) time in billion of years

It is worth to underline that the analysis method used here, is completely independent from the choice of the reference wave. **Figure 4**, for example, shows the graph formed by using **Wave N. 5** as reference. The value of $w_0 = 4.3$ obtained in this case allows us to verify easily that results quite the same as shown in **Table 2**.

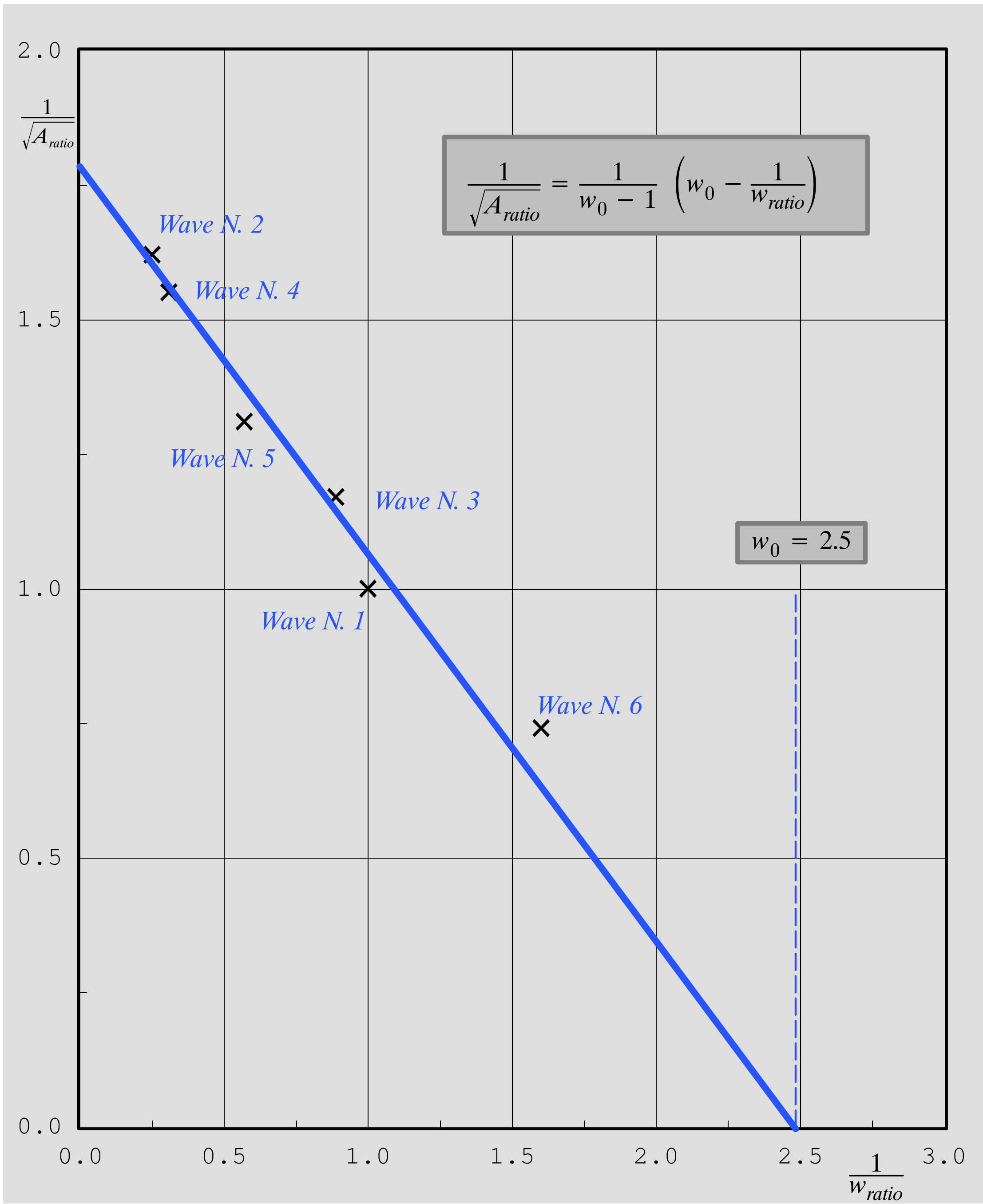

Figure 4: Redshift analysis (ref. **Wave N. 1**)

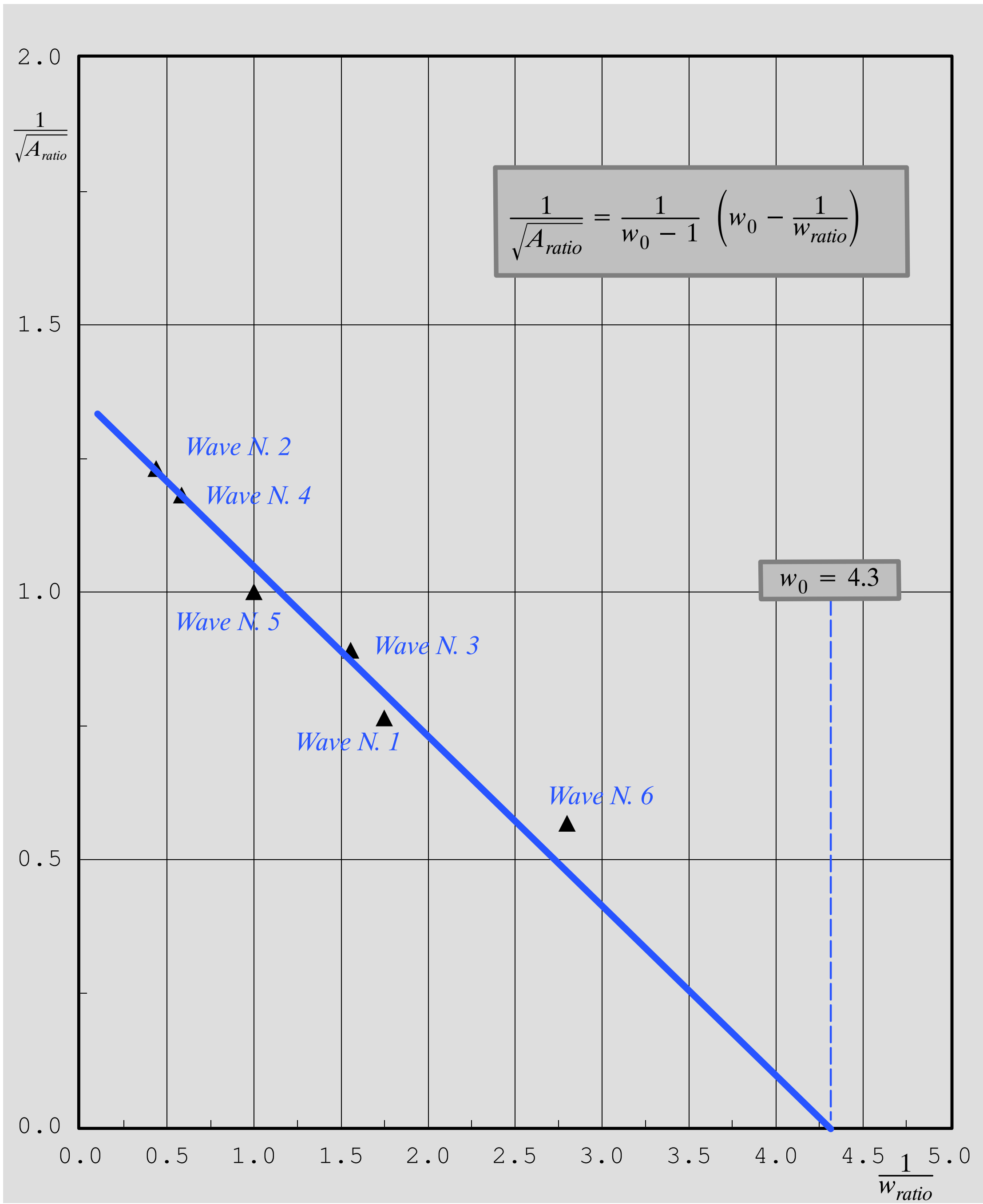

Figure 5: Redshift analysis (ref. **Wave N. 5**)