Metric of Universe

The Causes of Red Shift.

ELKIN IGOR.

ielkin@yandex.ru

Annotation

Poincare and Einstein supposed that it is practically impossible to determine one-way speed of light, that's why speed of light in different ways may differ. They also supposed that till there is no the experiment which would depend on the value of one-way speed of light, it is possible to consider that all one-way speeds of light are equal to two-way speed of light. It is offered the explanation of the experiment connected with "Red shift" with the aid of one-way speed of light, therefore it is shown the dependence on magnitude of one-way speed of light. Mechanics is set up based on the unidirectional speeds of light. For example, the experiment of Michelson-Morley is explained with the aid of this mechanics. The cause of the inception of Fitzgerald contraction is explained.

Key-words.

One-way speed of light, two-way speed of light, Red shift, the Fitzgerald contraction, the metric of the universe.

Part one. The Red Shift.

Introduction.

For the beginning we'd most like to remind, how Einstein came to the idea of the inalterability of the speed of light in any direction. The secret is in the accepted clock synchronization, which as it was considered makes undetectable difference of the one-way speeds of light. Inasmuch as the synchronization converts to the moving from some point (with time on the clock "0") of the synchronized light signal and with transmission of this signal into another synchronized point by the setting in this point of time on the clock. Time on the clock in this another point is fixed equal to the half of the time of signal transmission of the way to this another point (from starting point) and by the way of the getting back returned signal into the initial point. That's why it isn't important with what one-way speed the light-signal moved on either side, just middle speed is important. The procedure of length measurement, set up on the basis of this clock synchronization, made possible a lot of experiments, where different one-way speeds of light are possible and we may trace them to the analogical experiments with two-way speeds of light. Einstein suggested that if experiments lead to the two-way speeds of light and there is no dependence on the one-way speeds of light, there is no sense to consider them. That time a postulate was taken which tells that all one-way speeds of light are equal and they are equal to two-way speed of light.

Let’s try to receive with the aid of different one-way speeds of light (“to observer” and “from observer“) generally known experimental fact, precisely: emission spectrum comes shifted into the red side from the distant galaxy, and as this galaxy is on the longer distance, as the shift becomes bigger.

P 1. The Red Shift – Real Cause.

Let’s consider our galaxy and some distant galaxy. We take it that two-way speeds of light are unchangeable everywhere, it means that emission in these two galaxies in relation of two-way speed of light is unchangeable and it has one wave-length, we mark it as: ΔL. It is really so, because a metre is mensurated with two-way speed of light. That’s why as this speed of light will be changed, a metre will be also changed and it’ll be impossible to fix this change. Now we consider that the light that comes to our direction from the side of distant galaxy at speeds of c^{-} < **c** where **c** – is two-way speed of light.

Difference in time of arrival of fore and back wave front

$\Delta t = \frac{\Delta L}{c^{-}}$, but as it is known on the Earth we conceive this time as coming by light-signal some way with two-way speed of light. Or else at short distances one-way speeds of light less differ from the two-way speeds of light than at long distances. That’s why, we on the Earth, consider that the wave-length of the light-signal is $\Delta l = c\Delta t = \Delta L(\frac{c}{c^{-}})$**.** In other words wave-length was increased. Correspondingly the frequency was decreased and we received **“The Red Shift”**.

The data of these researches may help estimate one-way speed in the distance of one megaparsec. By estimate of cosmologists, it’s nearly:

$c^{-} = c - 70$ km/sec

Now we’ll mark $k = \frac{c^{-}}{c^{+}}$

Than we’ll find the correlations on the way **h**:
We should mention that these formulas are taken for the estimation of one-way speeds of light, more proximate formulas we may use after numerical calculations of metrics – this is in item 2 part 2.

$T_1 = \frac{h}{c^{-}}$, $T_2 = \frac{h}{c^{+}}$ at this case mid-speed on the way **2h** is: $c = \frac{2h}{T_1 + T_2} = \frac{2c^{-}c^{+}}{c^{+} + c^{-}}$

or

$$c = c^{-}\frac{2}{1+k} = c^{+}\frac{2k}{1+k} \qquad (1)$$

Or

$$(1+k)=2\frac{c^-}{c^+}=2(1-\frac{70}{300000})$$

Or roughly:

$$\mathrm{k}=1-0{,}0005$$

We haven't received yet the dependence of shift on the distance. It is deducted a bit more complicated. Let's think back that clock synchronization initiated by Poincare and then transformed by Einstein uses two-way speed of light as synchronizing signal. Though Einstein wrote that it is possible to use any signal, but the speed should be fixed and measured by some way. That's why at any case clock setting in total comes into synchronization by the light signal with two-way speed.

The dependence of wave-length of incoming signal on the one-way speed of light, received so elementary, put in doubt that one-way speeds of light can't influence on the result of any experiment and it is possible at any case to put in two-way speed of light. As far as this hypothesis may be accompanied by serious mistakes and loss of real causes of events is also possible, - that is observed in Physics. As far as the setting of "synchronism" in two points is fixed, so:

Synchronization: let's consider that with light signal output (or analogical to it signal) zero is set and with coming of light signal zero is also set in the correspondent point – for the given process. The moving in some concrete direction is considered as the given process. At this case there is a necessity to consider all the processes separately from each other.

This synchronization changes the concept of simultaneity, and also type of time coordinate. And if the time coordinate is changed the type of interval is also changed, and type of metric tensor is changed too. It may mean that space metrics is also changed. We'll try to investigate this question.

Item 2. New Time Coordinate. Metrics of the Universe .

We consider it in the context of new synchronization. If we mark material point at the beginning of the coordinates – M_0, and the other arbitrary point - M_1, time coordinate of the point M_1 - t_{M1} would depend on the direction of the signal by this way:

1) $t_{M_1}=t_{M_0}-\frac{R^+}{c^+}$ - in the case of sending of the signal from M_0 to M_1.

2) $t_{M_1}=-t_{M_0}+\frac{R^-}{c^-}$ - in the case of sending of the signal M_1 to M_0.

Where c^+ and c^- are correspondingly the speeds of light in the concrete side (we'll mark it), t_{M0} is the time coordinate of the point M_0.

I'll explain a bit: it's understandable that in 1) from the usual consideration of time at the point M_1 time for overcoming with light the distance between the points is just taken off.

It is analogically in 2), just in this case usual for us time is at the point M_0 is taken with minus, as far as in the case of slower synchronizing signal than light we receive information about the object from more distant past.

R^+ and R^- – Euclidean distance (length) between the considered points, in units of speeds c^+ and c^- respectively**.**

R is the length, in units of two-way speed of light **c**.

For simplicity we'll mark $t_{M1} = q_x$, $t_{M0} = q$. Then:

1) $q_x = q - \frac{R^+}{c^+}$ moving from zero.

2) $q_x = -q + \frac{R^-}{c^-}$ moving to zero.

Let's now consider moving to zero. Let's admit there is a dependence of one-way speed of light on **X**-coordinate. We'll search for the dependence like this:

$$\frac{c^-}{c} = f = f(x^-) \qquad (2)$$

X-coordinate is defined in two-way speed of light, coordinate x^- is defined in two-way speed of light for approximating.

For Minkowski space in two-way speeds of light the next interval is known:

$$dS^2 = c^2 dt^2 - dx^2 \qquad (3)$$

$$dx = \frac{c}{c}\frac{c^-}{c^-}dx = (\frac{c^- dx}{c})\frac{c}{c^-} = \frac{c}{c^-}dx^- = \frac{dx^-}{f} \qquad (4)$$

In terms of

$q_x = -q + \frac{x^-}{c}$ for event space (which is corresponded to Minkowski space) letter **q** means time at the observing point, in other words **t**, so, it means that in the coordinates of one-way speed of light time:

$$t = \frac{x^-}{c} - q_x = \frac{1}{f}\frac{x^-}{c} - q_x \quad \text{or}$$

$$dt = -\frac{f'}{f^2}dx^- \frac{x^-}{c} + \frac{1}{f}\frac{dx^-}{c} - dq_x \qquad (5)$$

substitute in (3) formulae (4) and (5). And we consider just space part of interval:

$$dS^2 = c^2 (\frac{1}{f}\frac{dx^-}{c})^2 (1 - \frac{f'}{f}x^-)^2 - (\frac{dx^-}{f})^2$$

$$dS^2 = \frac{1}{f^2}(dx^-)^2 \frac{f'}{f^2}(x^-)[(x^- f' - 2f] \qquad (6)$$

(factor out and product of difference of squares)

We'll seek the solution using the method of Occam's razor. It's understandable that the most simple type of interval is at this case: $f' = A = \text{const}$, I'll remark, that then formula:

$$f = Ax^{-} + B, \text{ where } B = \text{const}$$

Can be easily taken in the form of a bit changed Hubble's law, which is easily explained for the case of different one-way speeds of light. This law works in case that:

$A = -\frac{H}{c^2}$ and $B = 1$, where **H** – Hubble constant. In other words one-way speed of light is decreased when the distance is increased. Or

$$f = 1 - \frac{H}{c^2} x^{-}$$

Square brackets in formula of interval will be simplified by this way:

$$[(x^{-} f' - 2f] = -2\frac{H}{c^2} x^{-} - 2 + \frac{H}{c^2} x^{-} = -(2 - \frac{H}{c^2} x^{-})$$

The interval will contain just space components, in other words it will be metrics of space on this direction.

$$dr^2 = \frac{H}{c^2}(x^{-}) \frac{(2 - \frac{H}{c^2} x^{-})(dx^{-})^2}{[1 - \frac{H}{c^2}(x^{-})]^4} \qquad (7)$$

It is understandable that the *Pythagorean theorem* doesn't work, in other words one-sided metrics in unilateral coordinates is non-Euclidean. This metrics is of the form of space which is described by Lobachevskian geometry.

Formula (1) proves that, one-way speeds of light are connected with two-way speed of light asymmetrically. That's why metrics will be different on the direction "from the observer" and "to the observer". The non-Euclideanism of metrics explains the changes of one-way speed of light. As far as metre in the space with non-Euclidean, metrics isn't invariant. In other words, subpaths of light signal which are equal for the space with non-Euclidean metrics will be of different length, because length – is Euclidean metric. And light, of course, when moving may use just the characteristics of the space (in non-Euclidean metric), but not foolish theories of the scientific men, who require fixed speed of light in the metrics of another's space.

Part 2. The Causes of the Contraction in the Direction of Motion.

Item.1 Michelson-Morley Experiment.

In the result of getting new clock synchronization and researching of different one-way speeds of light "to the observer" and "from the observer" space metrics of Universe was received. Formulae are elementary and after simplification they easily transfer into short and understandable ones. That's why their original long and boring states shouldn't distract.

I'll recollect shortly:

The following formulae were received:

$$dt = -\frac{f'}{f^2}(dx^-)\frac{x^-}{c} + \frac{dx^-}{fc} - dq_x \tag{8}$$

$$dx = \frac{cc^-}{cc^-}dx = \frac{c^-dx}{c}\frac{c}{c^-} = \frac{dx^-}{f} \tag{9}$$

Where

c^- - one-way speed of light to the "observer",

$\frac{c^-}{c} = f = f(x^-)$ - the dependence of one-way speed of light on x^--coordinate.

x -coordinate is defined in two-way speed of light,

coordinate x^- is defined in one-way speed of light for approximating,

q – means time at the point of observer,

q_x - means time at the observed point.

Formula of interval:

$$dS^2 = c^2dt^2 - dx^2 \tag{10}$$

If we put (8), (9) in (10), we'll receive interval in one-way speeds:

$$dS^2 = c^2dq_x^2 - c^2\left(\frac{1}{fc} - \frac{f'}{f^2}\frac{x^-}{c}\right)dx^-dq_x + \frac{1}{f^2}(dx^-)^2\frac{f'}{f^2}(x^-)[(x^-)f' - 2f]$$

Or

$$dS^2 = cdq_x^2[c - \frac{dx}{dq_x}\frac{1}{f}(1 - \frac{f'}{f}(x^-)] + (dx^-)^2\frac{f'}{f^4}(x^-)[(x^-)f' - 2f] \tag{11}$$

With regard:

$$f = 1 - \frac{H}{c^2}(x^-) \tag{12}$$

$$dS^2 = cdq_x^2\left(c - \frac{dx}{dq_x}\frac{1}{[1 - \frac{H}{c^2}(x^-)]^2}\right) + \frac{H}{c^2}(x^-)\frac{(dx^-)^2(2 - \frac{H}{c^2}(x^-))}{[1 - \frac{H}{c^2}(x^-)]^4} \tag{13}$$

This long formula just proves that for long distances space metrics is Lobachevsky metrics.

It's not difficult to check that for the speed of light to the observer we'll receive analogical formula (just space coordinate will be x^+ and it is defined with the speed of light for moving off).

We clarified with recession of galaxies in the first article. (reference in the beginning). It's understandable that only the magnitude of one-way speed of light impacts on the red shift. And there is no universal red shift. Now Michelson-Morley experiment and physical meaning of the length contraction in the direction of motion are interesting. In fact STR doesn't give physical causes and physical meaning of this contraction and it is not understandable what for fields (and space) should reduce their length. We can explain it even with the aid of the magnitude from other ISO as far as the procedure of the length determination by Einstein wouldn't afford it.

The interval becomes easier in short distances:

$$dS^2 = cdq_x^2(c - \frac{dx^-}{dq_x}) + a*(x^-)*(dx^-)^2 \qquad (14)$$

Where

$$a = \frac{H}{c^2}$$

In this case, the space part of the interval will give us space metrics (for the simplicity we'll use instead of x^- - $\boldsymbol{x}$):

$dr^2 = ardx^2$ or

a - is scale number, it's understandable, that further it can be counted as equal to unity element.

$$dr = \sqrt{x}dx \qquad (15)$$

This formula shows what metrics should be accounted in short distances. Ordinary scale number takes into account numbers of dimensions.

The formula itself means that metrics, in other words, the distance between two points is equal to

$\sqrt{x}$ numbers of unit elements of equal open intervals of coordinates or just the same – the unit of measurement of coordinate of one-way speed of light. Under condition, that one point is at the beginning of the coordinates with the

coordinate , and the other point has the **x** - coordinate.

Of course, we'll not follow verbal proof (all the subpaths of light signal in coordinates, measured by light are described in

thousands of works) and we'll write at once formula with light clock? Moving from the observer with a speed . Coordinate is measured with the corresponding speed of light, in this case, we'll take into **account formula (8) for each interval** (clock length **L**):

$$\sqrt{ct_1} = \sqrt{Ut_1} + \sqrt{L}$$

It is understandable, that all the meanings are taken in absolute magnitude.

or

$t_1 = \frac{L}{(\sqrt{c} - \sqrt{V})^2}$, by analogy with motion into another direction:

$$t_2 = \frac{L}{(\sqrt{c}+\sqrt{V})^2}$$, total time of the motion of the signal:

$$t = t_1 + t_2 = \frac{2L}{(c-U)}\frac{(c+U)}{(c-U)} \qquad (16)$$

Now by analogy we'll consider known formula with cross collocating of light clock.

$$\sqrt{L^2} = \sqrt{(ct_3)^2} - \sqrt{(Ut_3)^2}$$

So, we receive total time:

$$t = 2t_3 = \frac{2L}{(c-U)} \qquad (17)$$

We can see, that total time formula (16) and formula (17) differs by multiplier:

$$N = \frac{(c+U)}{(c-U)} \qquad (18)$$

We can begin to lie as in STR, that this is a feature of space and it is reduced by unknown ways, and L is reduced with it too, or we may analyze what the time part of the interval can give us, because we consider time in motion.

It is understandable that interval (14) in short distances as for cosmological measures, and at steady speed of the moving of the mirror (moving of ISO) time part of the interval will be:

$dq^2 = cdq_x^2(c-U)$, what gives (for approximating):

$$dq_- = dq_x\sqrt{c(c-U)} \qquad (19)$$

It's understandable that the same time interval with the speed of light for deleting gives:

$$dq_+ = dq_x\sqrt{c(c+U)} \qquad (20)$$

It's also clear that the motion of light signal and ISO are taken to consideration in each case that's why for the experiment with light clock (or the same one with the experiment of Michelson-Morley), the necessary for us intervals will look like:

$$dq_1 = dq_x\sqrt{c(c+U)}$$
$$dq_x = dq_2\sqrt{c(c-U)} \qquad (21)$$

$$dq_2 = dq_x\frac{1}{\sqrt{c(c-U)}} \qquad (22)$$

And formula, describing time of absolute signal transmission, will be (I shan't describe it, because it is easy for understanding):

$$dq_{sum} = dq_x\frac{\sqrt{c(c+U)}}{\sqrt{c(c-U)}} = dq_x\frac{\sqrt{c+U}}{\sqrt{c-U}} \qquad (23)$$

So, it appears that there is the increasing of the unit of time in the direction of the motion in the moving ISO.

And if there is change like that and there is the definition of metre, connected with the unit of time. It is obtained that metre in moving ISO also increases in corresponded number of times, that’s why our light clock obtains less of these metres (and the arm in Michelson–Morley experiment respectively). So:

$$L' = L\frac{\sqrt{c-U}}{\sqrt{c+U}} \tag{24}$$

That’s why if in the formula (16) instead of **L** we’ll write **L'** and put the meaning by formula (24), multiplier **n** will be left:

$$n = \frac{\sqrt{c+U}}{\sqrt{c-U}} \tag{25}$$

The value of transmission time with light signal over the way in fore-and-aft and cross direction differ on this multiplier. And this multiplier is explained with the difference of time metrics in fore-and-aft and cross direction. In other words without contrive, causative «space contraction» we can easily explain the difference of transmission time with light-signal of fore-and-aft and cross direction. And short explanation:

In ISO moving at speed **U** relatively stationary observer, we can observe anisotropy of timing metrics in the direction of moving. Because stationary observer is going to observe in moving ISO. And only in Einstein variant of the course of events location of observer doesn’t matter, in our variant we should take into account this location.

Anisotropy of metric units occurs due to anisotropy, timing metrics in this ISO in the context of stationary observer (because metre is observed by the speed of light and time. These both factors clean the difference in transmission time with the signal fore-and-aft and cross direction in light clock (and correspondingly in Michelson–Morley experiment).

Item.2. Correlation of one-way and two-way speed of light.

I get back to the question of the formula for the middle speed of light. It is important because in case of determination the measurement of the way of light signals with the aid of two-way speed of light there is some delimitation below the measurements of the one-way speeds. This delimitation contains the formula:

$$c_{cp} = \frac{2c^{+}c^{-}}{c^{+}+c^{-}}$$

As far as the delimitation is below in the measurement of one-way speed of light it couldn’t be the arbitrary relation of wave-length (due to the given theory) in the emissions of distant and close galaxies. But these very correlations are observed.

Practically we should arise from the examination of the middle speed and we should estimate the distances in one-way speeds as it was doing for Michelson–Morley experiment:

$$S_{+} = \sqrt{x^{+}} = \sqrt{c^{+}dt}$$

$$S_{-} = \sqrt{x^{-}} = \sqrt{c^{-}dt}$$

Next,

$$c = \frac{S_+ + S_-}{\frac{S_+}{c^+} + \frac{S_-}{c^-}} = \sqrt{c^+ c^-} \qquad (26)$$

- this formula has no delimitations below for the one-way speeds of light and the correlations of wave-length is not fixed. Consequently there are no discrepancies of the experiment and theoretical hypothesis now.

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