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Dynamic Universe Model Explains the Variations of Gravitational Deflection Observations of Very-Long-Baseline Interferometry

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Abstract

This paper explains the reasons behind the wide range of values of gravitational deflection (bending) results of Very Long Baseline Interferometry (VLBI) observations, using SITA calculations of Dynamic Universe Model. These higher ranges in VLBI results are beyond explainable values of general relativistic predictions as well as with parameterized post-Newtonian (PPN) formalism, even after accounting for the standard errors. Dynamic Universe model's built in capabilities of considering simultaneous and dynamic gravitational effect of Sun, planets, local stars etc., makes these discrepancies comprehendible. For doing so, the abilities of Dynamic Universe Model are extended into micro world i.e., the masses of light photons and radio wavelength photons, Neutrinos, electrons and protons etc., by extending from the original mathematical formulation for Dynamic Universe model viz., for planets, stars, Galaxies etc. Later 76 theoretical experiments on grazing radio photons were conducted with different initial xyz coordinates in different directions and with the same status of solar system as on 01.01.2000@00.00:00 hrs, for all these experiments. The resulting bending angles of all these experiments were plotted in a graph against solar elongation angle, which confirms that 'gravitation of all planets etc.,' is to be considered as suggested by many researchers for explaining the discrepancies of VLBI observations. This work is a theoretical and computational work and the overall combined results as shown are consolidated in this paper.

Keywords: Dynamic Universe Model, SITA programming, micro particle world, VLBI Very Long Baseline Interferometry, gravitational deflection (bending): PPN formalism, tensors, singularity-free cosmology, dark matter

1. Introduction

1.1 Gravitational Deflection (Bending) Observations of Very Long Baseline Interferometry (VLBI)

In Very-long-baseline interferometry (VLBI), a type of astronomical interferometry in astronomy, a signal from an astronomical radio source, such as a quasar or a man made satellite, is collected at multiple radio telescopes on Earth and analyzed for delays. From early 1960s, VLBI researchers/Physicists are calculating the gravitational deflection (bending) of radio waves near huge masses like Sun or Jupiter. These VLBI techniques are used all over the world, also in the field of Radio astronomical observations of quasars, Galaxies etc. There is a large variation in the observational Gravitational deflection (bending) results of VLBI. The statistical variations in their observed results in comparison with General Relativistic predictions are noticeable. This variation is clearly visible when the solar gravitational bending/deflection angle is plotted against Solar Elongation angle. Additionally many people have observed variations; some plotted these with respect to season, frequency etc.

Why is there such variation amongst different measurements? Basically what the scientific community is calculating is the gravitational influence of Sun only on the radio waves/light. As observed by physicists Shapiro et al. (2004) and Heinkelmann et al. (2009), etc., there are other influencing factors other than Sun and other planets are also to be accounted for. About these authors and many more will be discussed later in this paper. Being a singularity free N-body problem solution Dynamic Universe Model offers an answer for the above problem, as it can consider mutual gravitational effect of simultaneously and dynamically changing planets, stars, Milkyway center, other parts of Milkyway and other Galaxies etc.

Just considering gravitation of the Sun alone is not correct. For example anybody may think when he is sitting on

earth; he can neglect the Gravitational forces of Sun and Moon on him because of the strong gravitational force of earth here. But it is not true. He can see the high tides on seas and oceans on earth which are visual indication of gravitational effect of Sun and Moon on Earth. For solving such problems, Dynamic Universe Model can be used by solving a singularity free 3- body or 4 body problems.

1.2 What Different Authors Say About VLBI (Some Main Points)?

Shapiro et al. (2004) gave one such typical large compilation of data. They gave a large number of observations, which were made all over the world to the tune of 2 million observational experiments in the line of VLBI by many Physicists from 1979 to 1999. The distribution of the solar elongation angles of the sources observed is shown in a graph in their paper in the page 121101-2. Overlaid on this plot is a solid line showing the relationship between solar elongation angle and predicted deflection angle (right-hand scale). That means PPN formalism predicts a variable deflection angle unlike General Relativity. Another important visualizing graph shown by Shapiro et al., in the same paper is a plot in page 121101-4 indicating "differences between global estimates of γ and GR's prediction as a function of minimum source elevation angle εmin; and minimum solar elongation angle Φmin; for positive declination sources and negative declination sources". This clearly indicates the variation in the Gravitational deflection (bending) angle of light/radio waves near a huge gravitational mass like Sun from the variation of γ also. That means the observed variations are not just purely dependent on ϕ, the solar elongation angle alone. There are some more additional factors, in other than γ and ϕ like positive declination sources and negative declination sources, etc.

Heinkelmann and Schuh (2009) in their paper have concluded: "Besides the Sun and the Earth, the gravitational time delays of Jupiter, Saturn, Venus, and the Moon will have to be considered in standard VLBI 2010 analyses".

Let us examine the work done by other Physicists who reported this phenomenon in section 4 of this paper. Many of them felt the need for considering the gravitational effect of other Planets in the Solar system on the radio wave photons.

1.3 PPN and VLBI

Such variations formulated as parameterized post-Newtonian (PPN) formalism (see, Books by Misner et al., 1973, and Will, 1993, for example). The angle θ calculated PPN formalism by which an electromagnetic ray from a distant source is deflected by the Sun, and is given approximately by, "$(1+\gamma)$ G M $(1+\cos\phi)/bc^2$". Where G is the universal gravitational constant, c is the speed of light in vacuum, M is the mass of the Sun, b is the minimum distance of path of ray/particle to the center of Sun, ϕ is the solar elongation angle, and γ is the PPN parameter for the space curvature to gravitational deflection. Here ϕ is the main factor for explaining the observed variations, introduced in this PPN formalism. However, the range of observed variations overshoots possible theoretical variations.

1.4 Using Dynamic Universe Model for VLBI

Now let us see how to explain the variations in the Gravitational deflection (bending) angle as plotted against solar elongation angle Φ, using Dynamic Universe Model. For doing so, the capabilities of Dynamic Universe Model are extended into Micro world or the Photon/Particle zoo. Micro world is nothing but the masses of light photons and radio wavelength photons, Neutrinos, electrons and protons etc. That is, this micro world is a subset of Quantum Mechanics, dealing with masses only. Dynamic Universe model can calculate the simultaneous gravitational effect of many gravitating bodies like Sun, planets, local stars etc., while considering their dynamic movements. The required additional mathematics is in the mathematical section along with the original set. Using these extended capabilities into SITA programming, the setup of solar system was as on 01.01.2000@00.00:00 hrs. Using Heliocentric ecliptic xyz values and try sending the radio photon from different directions i.e., in different solar elongation angle Φmin and trace the path of radio photon. Here 76 different xyz coordinates and different directions were taken for radio photons with the same status of solar system as on 01.01.2000@00.00:00 hrs. The only change from experiment to experiment is the initial position and direction of the photon. All these theoretical experiments were designed in such a way, the photon goes grazingly near Sun or at the minimum distance from the center of Sun at the moment of time as on 01.01.2000@00.00:00 hrs. precisely. That means all the Solar system setup was kept constant and changed the Solar Elongation Angle only, taking into account all the dynamic movements of planets and the their gravitational fields on the fast moving photon. Each of these computationally intensive theoretical experiments took a time 15 min at the lowest to 5 hours at the highest, on a recent HP Laptop, depending on the number of iterations. This paper was presented as a talk at COSPAR-12 (H0.2-0010-12). Dynamic universe model explains discrepancies of Pioneer anomaly, published by *Nonlinear Studies*, a mathematical Journal from USA, (SNP Gupta, JVS Murty, & SSV Krishna, 2014). Now let us see what Dynamic Universe Model of Cosmology is …

2. Mathematical Background

All the mathematical formulations (viz. Equations 1 to 31) for Dynamic Universe Model were previously published (Papers are available in open source, SNP. Gupta, 2013, 2014). Only Equation 25 is being repleated below with its explanatory text….

$$\Phi_{ext}(\alpha) = -\sum_{\substack{\beta=1 \\ \alpha\neq\beta}}^{N^{\gamma}} \frac{Gm_{\beta}^{\gamma}}{\left|x^{\gamma\beta} - x^{\gamma\alpha}\right|} - \sum_{\substack{\beta=1 \\ \alpha\neq\beta}}^{N^{\delta\gamma}} \frac{Gm_{\beta}^{\delta\gamma}}{\left|x^{\delta\gamma\beta} - x^{\delta\gamma\alpha}\right|} \tag{25}$$

With this tensor math setup, SITA calculations in Lotus 123 (later transported to excel sheet) was prepared for tensor in equation 25 about 20 years back. SITA is one of the simplest formations for this equation. There are many other types of calculations possible for this Equation 25. This Equation 25 gives many results that are not possible otherwise today. This tensor can be subdivided into 21,000 small equations without any differential equations or integral equations. Hence, this set up gives a unique solution of Cartesian X, Y, Z components of coordinates, velocities and accelerations of each point mass in the setup for that particular instant of time. A point to be noted here is that the Dynamic Universe Model never reduces to General relativity on any condition. It uses tensor mathematics based on Newtonian physics. This mathematics used here is simple and straightforward. All the mathematics and the Excel based software details are explained in the three books published by the author (SNP. Gupta, 2010, 2011a, 2011b). In the first book, the solution to N-body problem-called Dynamic Universe Model (SITA) is presented; which is singularity-free, inter-body collision free and dynamically stable. This is the Basic Theory of Dynamic Universe Model published in 2010. The second book in the series describes the equations and SITA software in EXCEL emphasizing the singularity free portions. It explains more than 21,000 different equations (2011). The third book describes the SITA software in EXCEL in the accompanying CD/DVD emphasizing mainly HANDS ON usage of a simplified version in an easy way. The third book contains explanation for 3000 equations instead of earlier 21,000 (2011). With this same SITA setup, many physical problems were solved, which are otherwise not possible. For using this SITA, we have to give the initial values of Masses and Cartesian X Y Z "coordinates of Positions, Velocities, & Accelerations". Feeding accelerations is not compulsory. Velocities are also not very important, after few iterations of calculations, all the three dimensional Velocities and accelerations will be formed automatically.

Now let's see how the Dynamic Universe Model extends into Micro world mathematically.

2.1 Additional Mathematical Formulation Allowing for the Micro World: Into the Micro World

In addition to previously published mathematical formulation the following new equations are added to enable this model for operating into Micro world. The earlier published mathematics of Dynamic Universe Model was not repeated here.

Combining both 3 and 25 (Newly introduced in this paper)

$$F_{\alpha} = \sum_{\substack{\alpha=1 \\ \alpha\neq\beta}}^{N} F_{\alpha\beta} - m_{\alpha}\nabla_{\alpha}\left[-\sum_{\substack{\beta=1 \\ \alpha\neq\beta}}^{N^{\gamma}} \frac{Gm_{\beta}^{\gamma}}{\left|x^{\gamma\beta} - x^{\gamma\alpha}\right|} - \sum_{\substack{\beta=1 \\ \alpha\neq\beta}}^{N^{\delta\gamma}} \frac{Gm_{\beta}^{\delta\gamma}}{\left|x^{\delta\gamma\beta} - x^{\delta\gamma\alpha}\right|} \right] \tag{32}$$

So …

$$F_{\alpha} = \sum_{\substack{\alpha=1 \\ \alpha\neq\beta}}^{N} F_{\alpha\beta} + m_{\alpha}\nabla_{\alpha}\left[\sum_{\substack{\beta=1 \\ \alpha\neq\beta}}^{N^{\gamma}} \frac{Gm_{\beta}^{\gamma}}{\left|x^{\gamma\beta} - x^{\gamma\alpha}\right|} + \sum_{\substack{\beta=1 \\ \alpha\neq\beta}}^{N^{\delta\gamma}} \frac{Gm_{\beta}^{\delta\gamma}}{\left|x^{\delta\gamma\beta} - x^{\delta\gamma\alpha}\right|} \right] \tag{33}$$

Interchanging $\sum$ $and\nabla$ operations:

$$F_{\alpha} = \sum_{\substack{\alpha=1 \\ \alpha\neq\beta}}^{N} F_{\alpha\beta} + m_{\alpha}\left[\sum_{\substack{\beta=1 \\ \alpha\neq\beta}}^{N^{\gamma}} \nabla_{\alpha} \frac{Gm_{\beta}^{\gamma}}{\left|x^{\gamma\beta} - x^{\gamma\alpha}\right|} + \sum_{\substack{\beta=1 \\ \alpha\neq\beta}}^{N^{\delta\gamma}} \nabla_{\alpha} \frac{Gm_{\beta}^{\delta\gamma}}{\left|x^{\delta\gamma\beta} - x^{\delta\gamma\alpha}\right|} \right] \tag{34}$$

Or

$$F_\alpha = \sum_{\substack{\alpha=1 \\ \alpha\neq\beta}}^{N} F_{\alpha\beta} + \sum_{\substack{\beta=1 \\ \alpha\neq\beta}}^{N^\gamma} \nabla_\alpha \frac{Gm_\alpha m_\beta^\gamma}{\left|x^{\gamma\beta} - x^{\gamma\alpha}\right|} + \sum_{\substack{\beta=1 \\ \alpha\neq\beta}}^{N^{\delta\gamma}} \nabla_\alpha \frac{Gm_\alpha m_\beta^{\delta\gamma}}{\left|x^{\delta\gamma\beta} - x^{\delta\gamma\alpha}\right|} \tag{35}$$

The above Equation 35 means the force on αthpoint mass will be a sum of three components i.e., the summation of attraction forces due to point masses from its own system, ensemble and aggregate. This is the key result that can be applied to point masses or subatomic particles or can be combined in any fashion together. The Equations 34 & 35 are important, simple & straightforward results.

The theoretical Circular velocities are different to that of observed, the missing mass (Dark matter) arises due to Calculation error, there is no other reason and dark matter does not exist in reality (SNP Gupta, 2005b). In a present paper, about "there is no dark matter" it was shown that concepts like *relative constant Mass, variable mass and missing mass* etc., are not required. And the details of earlier publications, in books as well as papers are available in the same paper. One can refer to the same paper for main foundations and a general introduction for Dynamic Universe Model (SNP Gupta, 2014). One can see the references in this paper for the details...

Let us apply the above equations to some practical situations like radio waves that are going grazingly near Sun from an artificial satellite and are coming to Earth (VLBI). Let us use SITA algorithm for calculation.

3. Initial Values

3.1 Initial Value of Mass of Photon:

Here in this paper the radio photon mass was taken as 1.1 e-52 kg which is much smaller than Neutrino mass = 1.5 eV/c^2 = 2.685 e-36 kg. Or Radio wave photon mass = 9.019 e-46 kg etc. The behaviour shown by such a mass will be experienced by higher mass also. Every mass behave in the similar way.

3.2. Initial Values Table and Other Tables

Full set of initial values are shown in Table 1 web version. '**Vak Table 1 and 2 PLB Initial values Full set.xls**', Tab: Table 1. … The summary of all the 76 experiments conducted and reported in this paper can be seen in Table 2 in 13 columns.

76 theoretical experiments were conducted in Dynamic Universe Model with various initial conditions all with 0.1 sec time step and with number of iterations ranging from 20 to 3000. For all these experiments the starting coordinates are heliocentric ecliptic xyz values in our solar system as on 01.01.2000@00.00:00 hrs with masses in Kg and distances are in Metre. The execution times were ranging from 20 minutes to 24 hours on this modern laptop (Hp make, with Intel core i5 processor, 8 Gb Ram, 650 Gb HDD, NVIDIA display Hp pavilion dv6).

Full set of initial values are shown in Table 1 web version. This Table 1 gives the initial values of all the point masses, their respective masses in Kg, and their x y z Cartesian positions. Please refer the Table 1 in the web with name: **'Table 1.xls'.** … The summary of all the 76 experiments conducted and reported in this paper can be seen in Table 2 in 13 columns. The various filenames, Time step values, Number of iterations, initial position, and final position of the Photon, General relativistic deflection (bending) angle, Calculated Solar elongation angle in degrees, SITA Deflection etc., are mentioned in the web with name: **'Table 2.xls'.** This Table 2 is the summary and condensed from the Table 3, where there are 71 columns. So the finer differences between each experiment can be found from main Table 3 easily. This Table 3 is uploaded into web along with main file. File name is **'Vak Table 3 Results 71 columns.xls'.** There are 76 data records of final iteration data for each file in 71 columns in a single Excel sheet. The header rows for all the data is in the 3rd and 4th rows. … As a result of SITA calculations, there is an assortment of xyz positions, velocities and accelerations in all iterations at each time step for every one of the 133 point masses. It is possible to track any one of these values for every time step throughout the experiment as needed. The Table 4 contains all the individual iteration outputs i.e., for each iteration of the 76 experiments. This data is in an XLS file and uploaded in Web. There are 19681 lines in total in these files in 55 columns. There will be additional blank rows before the next file data. Each data set varies in number of data rows depending on number of iterations. Each row represents a set of data for that time step. Number of data rows from file to file varies from 40 to 3000. Refer file name: **Vak Table 4 Consolidation of Iteration Results.xls**. Any further additional details can be obtained by contacting the author. All these tables are available in the webpage which can be down loaded. These **1. Table 1.xls, 2. Table 2.xls, 3. Vak Table 3 Results 71 columns.xls and 4. Vak Table 4. Consolidation of Iteration Results.xls** is attached with this paper**.**

Table 1. Helio centric ecliptic XYZ values of positions as on 01.01.2000@00.00:00 hrs in Metre

Sl.No.	Name	Mass (kg)	xecliptic	yecliptic	zecliptic
1	Photon (The initial Position vary with experiment)	1.10E-52	200000000	696000000	650947504.6
2	Mercury	3.30E+23	50644179263	8540296134	-3949485753
3	Venus	4.87E+24	69657878862	82614198079	-2889306238
4	Earth	5.97E+24	-29565785818	1.44E+11	-2869446.398
5	Mars	6.42E+23	-3275068912	-2.18E+11	-4484946284
6	Jupiter	1.90E+27	4.09E+11	-6.46E+11	-6473185584
7	Saturn	5.68E+26	-1.36E+12	3.40E+11	48167461412
8	Uranus	8.68E+25	2.98E+12	-4.32E+11	-40141525477
9	Neptune	1.02E+26	3.61E+12	-2.67E+12	-28350290138
10	Pluto	1.27E+22	69315882273	-4.70E+12	4.83E+11
11	Moon	7.35E+22	-29191657344	1.44E+11	16609650.17
12	SUN	1.99E+30	0	0	0
13	near star	3.98E+29	-3.07E+16	-2.48E+16	5.99E+15
14	near star	1.89E+30	-1.70E+16	-4.50E+13	3.79E+16
15	near star	2.19E+30	-1.72E+16	-1.53E+14	3.79E+16
16	near star	7.95E+29	-1.86E+15	1.64E+15	-5.61E+16
17	near star	8.95E+29	9.03E+15	-7.13E+15	-7.78E+16

4. VLBI Discussion

Here in this paper the capabilities of Dynamic Universe Model are extended into Micro world or the Photon/Particle zoo. Then the question comes how to test this solution. There are many papers on VLBI which discussed about variation of solar deflection (bending) angle, and let us see some of the views expressed by different authors.

1) Shapiro et al. (2004), in their paper 'Measurement of Solar Gravitational Deflection of VLBI data of Radio waves, shown their data set as consisting of measurements from observations in about 2500 _24-hour sessions ("experiments") spanning the years 1979–1999. The experiments that they used in this study involved 87VLBI sites and 541 radio sources, yielding a total of more than 1.7×10^6 ionosphere-corrected group-delay measurements. Their overall observations clearly the variation in the Gravitational deflection angle of light near a huge gravitational mass like Sun with respect to solar elongation angle.

2) The authors Sovers, Fanselow, and Jacobs (1998), also mentioned in their results about the variation, their 83 page paper is very good for beginners on the VLBI. They gave a detailed description of different experiments, a good history and the experiments that gave higher accuracies for angular positioning for point-like extragalactic radio sources at the sub-milliarcsecond (nanoradian) level.

3) The authors Fomalont et al. in 2009 observed position changes with respect to session and Frequency in their paper. *One can infer the reason for the observed position changes is the effect of Universal Gravitational force (Let's call this as UGF). This UGF varies as the configuration of the experimental set up varies from session to*

session. Here configuration means the positions of Earth, Sun, the observing satellite and the occulting planet etc., at the time of observation.

4) In other words, Ed Fomalont et al. in 2010 reported a larger error which cannot be explained by conventional methods… In their own words as explanation for their "Figure 3"… "The Residual Differential Separation between Cassini and J1127+0555: The separation between the two sources, after removal of the best-fit offset, velocity and acceleration from the measured offsets. The predicted gravitational deflection (bending) of Cassini and J1127+0555 has been removed, so the difference should be zero if the GR prediction is correct. The left plot is the east-west difference; the right plot is the north-south difference. The position difference estimates were obtained for the three 2.5-hour intervals on each day, and the error are the one-sigma errors expected from signal-to-noise considerations alone" Additionally in the text also… "If we further remove the radial and aberration deflection prediction by GR, then the resultant relative position of Cassini with respect to J1127 + 0555 should be zero. This position difference with the above adjustments is shown in the paper. The departure of the residuals from zero has an error of about 0.01 mas E/W, and 0.02 mas N/S (this resolution is twice as poor). Since the aberrational deflection is 0.07 mas at closest encounter on February 10, this experiment may be a more accurate measure of the aberration deflection than that of the 2002 Jupiter experiment Fomalont and Kopeikin (2003)." *Ed Fomalont is telling about large errors.*

5) Lebach et al. (1995), estimated γ from each of the single-day data subsets that included one days' data from before the solar occultation of quasar 3C279 and one from after. These pair wise estimates ranged from $\gamma = 0.9440 \pm 0.0350$ to $\gamma = 1.0214 \pm 0.0338$ (SSEs : statistical standard error); six of these estimates deviated from $\gamma = 1$ by more than 1.5 SSEs, and only one ($\gamma = 0.9903 \pm 0.0035$), which is based on 2 and 23 GHz data from 4 and 11 October, deviated by $\gamma = 1$ by more than 2.5 SSEs. *The overall estimates of γ by Lebach et al. (1995) from different data subsets may not show statistically unusual deviation. But what they are showing us are the data subsets at the extreme limits where deviation from the calculated value using GR is very high. Here also the reason is the effect of UGF varies on the radio photon, which depends on the configuration of universe at the time of observation.*

6) The conclusion of Heinkelmann and Schuh (2009) that gravitation of other planets (6 bodies viz., Sun, Earth, Jupiter, Saturn, Venus, and the Moon) will have to be considered in VLBI is an important factor for consideration." Scientific community know that 3-body problem is not solvable for the last 500 years in the conventional methods. Dynamic Universe model is a singularity free 3-body or 7 body or general n-body problem solution. *Dynamic universe model considers Newtonian gravitational effect of 133 bodies (or of any arbitrary N bodies) without using General Relativity. Hence such problems can be solved easily.*

7) The authors "S. B. Lambert and C. Le Poncin-Lafitte" in 2009 also concluded… "we wish to mention that, although current VLBI appears to not be competitive with spacecraft systems for relativistic experiments, the huge number of VLBI measurements, in all directions and at a large number of epochs, constitutes an interesting potential for testing other theories than the PPN formalism. *Here Lambert &. Le Poncin-Lafitte are inviting other types of theories…*

8) There are a large number of papers/literature available on VLBI, giving similar conclusions by other Physicists, which I could not mention here.

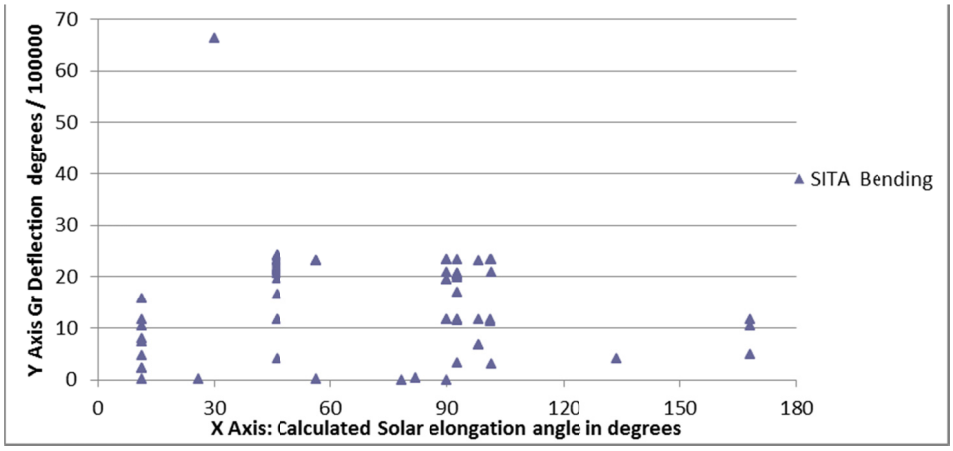

Figure 1. SITA gravitational deflection (bending) results

5. Resulting Graph

Figure 1 shows the gravitational deflection (bending) angles calculated from the 76 theoretical experiments, using Dynamic Universe Model's SITA software. Here the setup of solar system was taken as was on 01.01.2000@00.00:00 hrs for all these experiments, but the incoming radio photon direction was different in all these experiments. Some deflection angles (the angle between incoming and outgoing ray of radio wave) from SITA experiments were higher than the GR prediction and others have different values. It may please be noted that GR predicts only one deflection angle for all the incident angles of the ray and does not depend on solar system configuration at that time. PPN formalism also cannot explain fully about these variations (see figure given by Shapiro et al. (2004), for details see the text of paper).

6. Discussion on Results

Many physicists require some other additional factors to be considered, like simultaneous and dynamical gravitation effects of other planets. Now let us summarize what the other physicists concluded on VLBI. Shapiro et al. showed the variation in the Gravitational deflection angle with respect to solar elongation angle. Fomalont et al. (2009) observed position changes with respect to session and Frequency. Fomalont et al. (2010) reported larger errors which cannot be explained by conventional methods and difference should be zero if the GR prediction is correct. Lebach et al. (1995), in their study of the occultation of quasar 3C279 concluded that the error gone up by more than 2.5 times the statistical standard error. Heinkelmann and Schuh (2009) in their paper have concluded: "Besides the Sun and the Earth, the gravitational time delays of Jupiter, Saturn, Venus, and the Moon will have to be considered in standard VLBI2010 analyses. Lambert and Le Poncin-Lafitte' in 2009, also concluded… "We wish to mention that, although current VLBI appears to not be competitive with spacecraft systems for relativistic experiments, the huge number of VLBI measurements, in all directions and at a large number of epochs, constitutes an interesting potential for testing other theories than the PPN formalism.

The resulting Gravitational deflection (bending) angles from Dynamic Universe model's SITA software are in line with the thinking of present day VLBI physicists as we saw in the paper. The results are plotted and shown in a graph in Figure 1. This graph shows the Gravitational deflection angle of Radio wave/particles near SUN, which was calculated using Dynamic Universe Model and SITA algorithms plotted against the solar elongation angle (angle between the Sun and the source as viewed from Earth). For explaining such variation, even after taking the help of PPN formalism General relativity could not provide satisfactory explanation. Here it is not necessary. All these variations in angle, some of which are more than GR predictions and some are less than spread over solar elongation angle, are direct calculations of Dynamic Universe Model using Universal Gravitational Force calculated for the setup of Universe at that instant.

7. Conclusions

Dynamic Universe model gives better results compared to GR. GR gives only one value irrespective of positions of solar system and angle of incidence. The observed deflection values are sometimes more and sometimes less than GR predicted values.

In this paper, a set of theoretical simulations were done, in which, the setup of solar system was taken as on 01.01.2000@00.00:00 hrs, and Heliocentric ecliptic xyz values were used for all the theoretical experiments. The only difference between experiments is the direction of the ray of radio photon in the starting (angle of incidence of the ray). In other words the radio photon was sent in different solar elongation angles (Φmin). And Dynamic Universe model is used for tracing the path of this radio photon. Here 76 different xyz coordinates and different directions were taken for radio photons with the same status of solar system as on 01.01.2000@00.00:00 hrs.

All these final deflection angles are different in value. These results indicate that the structure of our universe is continuously changing dynamically, and depending on Universal Gravitation Force (UGF) on the radio photon in that path, the trajectory of the ray radio wave is different. The UGF on the particles of the ray is based positions and distances of Planets, stars, Galaxies etc., relative to radio photon and varies the dynamically. In addition, it is observed all the point masses follow their own fixed trajectory irrespective of its own mass. That means by changing only value of mass under consideration, the trajectory followed by it will not change by keeping all the other things constant.

Hence, it can be concluded that the gravitational deflection near SUN will depend not only on incident angle of the incoming ray but also dynamic positions of the planets at that time and various other mass positions in the Universe and Universal Gravitational Force. For explaining, the Very Long Baseline Interferometry (VLBI) gravitational deflection (bending) observations, Dynamic Universe Model can be successfully used. This become possible as the capabilities of Dynamic Universe Model could be extended into micro world in the mathematical

section, by extending the original mathematical formulation. It can be safely concluded that Dynamic Universe Model is better over PPN formalism for explaining variations in VLBI solar deflection observations. By taking actual values of positions, and velocities planets and stars etc., we can calculate the real values of deflections.

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Appendix

SNP. Gupta web the following very big tables, whose names are given below, needed along with main paper.

1. Table 1.xls
2. Table 2.xls
3. Vak Table 3 Results 71 columns.xls
4. Vak Table 4 Consolidation of Iteration Results.xls

These files are available at the web page for all the above full tables:
https://skydrive.live.com/#cid=485CC4B593A12043&id=485CC4B593A12043%213522