Distances, Locations, Ages and Reproduction of Galaxies in our Dynamic Universe

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Abstract

There are many distant Galaxies whose distances are about 30 Giga light years. There are Galaxies which were born just after 400 million years after Bigbang and which were born 6 to 7 billion years after Bigbang. In Dynamic Universe Model all the Galaxies are distributed at different distances and the Universe looks similar as it is now. On 01March2016 the news of the discovery about the observation of most distant Galaxy 'GNZ11 or GN11'having an light travel distance 13.4 Giga light years & co-moving distance of 32 Giga light years and having a red shift z of 11.1 created quite a stir. There are many such Galaxies like EGSY8p7 (with z= 8.68, age =13.2) and EGS-zs8-1 (with z= 7.73, age =13.04). To show that Universe exists further to GNz11, a Galaxy at distance of 100 times 13.4 Billion light years (1.26862E+28 meters) is simulated and named it as GNz11 in this simulation. 132 more galaxies were assumed in the range (3.02001E+26 to 1.26862E+28) meter. Later distance of the first Galaxy was reduced by 50% and found the graphs of Universe become similar in both the simulations after 102 iterations.

Slowly life of the stars and hence subsequently the life of Galaxy will come to end because of their electromagnetic radiation. Galaxies tend to evolve from spiral to elliptical structure and they perish to form Blue clouds known as Galaxy "quenching". Hence we can say that our Universe had reproduction ability, which is a very slow process. Universe produces new Galaxies, and the already formed Galaxies perish slowly. Ours is single universe and is a closed one. In other words, our Universe reproduces its Galaxies, as and when light and other electromagnetic radiation condenses to form enough matter.

Key words: Dynamic Universe Model, SITA Simulations, Methods: N-body simulations-Gravitation-Cosmology

1. Introduction: Sir Jagadish Chandra Bose [37] clearly demonstrated that the Trees, stones etc also behave like other life forms and react to alkalis, acids and poisons like arsenic. The Universe also must have life or some form of intelligence of its own. To demonstrate this, the author wants to show one ability, which is present in any life form called "Reproduction", which the Universe also possesses. The assumption here is that the Galaxies are offspring's of the Universe. The concepts of Dynamic Universe model are used for exhibiting this property.

In Dynamic Universe Model, like in Steady State model, the Universe looks similar as it is now. There is no creation of mater in empty space. The electro-magnetic radiation shifts its frequency near huge gravitating masses. In this model, different Galaxies born and perish according to their own age and life cycle. They will have different birth dates and ages. In other words, they won't have exactly same birth-date for every candidate. This is one of the starting and basic assumptions or axiom of Dynamic

Universe Model. There are many galaxies whose age & light travel distance are near about 13 billion years. Most recently found is GNz-11, it was found 1st March 2016. Details of four of the most distant Galaxies are given below. The positions of these Galaxies are distributed in different directions over the sky.

GN-z11: P. A. Oesch, G. Brammer, [34] and others are the first people discovered and submitted the paper on 1 Mar 2016 about this GNz-11. GN-z11 has a spectroscopic redshift of z = 11.1. This is in the constellation Ursa Major, It existed 13.4 billion years ago, just 400 million years after the Big Bang; and is the oldest Galaxy with a comoving dist = **32 billion ly**.

EGSY8p7 (**EGSY-2008532660**): next distant galaxy, with a spectroscopic redshift of $z = 8.68$ (photometric redshift 8.57), a light travel distance of 13.2 billion light-years from Earth, an age of 13.2 billion years, detected by Adi Zitrin, Ivo Labbe et al July 2015 [44].

EGS-zs8-1: is in the constellation of Boötes and is first spotted by Yale astronomer Pascal Oesch [46] in Hubble Space Telescope images in 2013. It has a redshift z = 7.73, corresponding to a light travel distance and age of about 13.04 billion light years from Earth. The galaxy has a comoving distance of about **30 billion light years** from Earth.

UDFy-38135539 (also known as "HUDF.YD3"): is in the Hubble Ultra Deep Field (UDF) identifier for a galaxy which was calculated as of October 2010 to have a light travel time of 13.1 billion years with a present proper distance **of around 30 billion** light-years.

1.1 About Dynamic Universe Model: In our Dynamic Universe every mass is moving in a direction and goal determined universal gravitational force (UGF) as the indomitable resultant vector of gravitational forces acted by all the other bodies in the Universe. This UGF is not constant force acting in only one direction. This resultant UGF vector force is varying according to ever varying dynamic movements and positions of all the masses in the Universe from time to time. In Dynamic Universe Model, this UGF is the fundamental concept; this model calculates this force "UGF" from moment to moment using its mathematical laws on each and every mass in the SITA simulations. In this way many present-day unsolved physics problems were solved. This method is different from conventional two body problem solution.[10]

This Model is new Cosmological model fundamentally and mathematically different from Bigbang, Steady state model etc. Dynamic Universe Model is based on laws of Newtonian dynamics. It is a simple multi-body problem solution. This Dynamic Universe Model is a singularity free and body-body collision free n-body problem solution based on UGF acting on each and every body with some mass in the Universe. In this model "time" moves in one direction i.e. into future only. 133 masses were used in this setup, and the "same setup" was used for last 25 years on a simple PC without any problem in its SITA simulations. Its SITA simulations can solve many unsolved cosmological problems and successfully published solutions to vast variety of present day scientific problems. The calculations can be done over the particle's entire path throughout time. These calculations can go into future for making predictions. With this model, it was found with uniform mass distribution in space, the masses will colloid. But there are no singularities. With non-uniform mass densities, the masses trend to rotate about each other after some time-steps and they don't colloid. SITA is a simple computer implementable solution of Dynamic Universe Model. Its many predictions came true like existence Blueshifted Galaxies in the universe. Its prediction that there is no dark-matter was experimentally proved later. (Many papers and books were published by the author, Details are available at [41])

Main foundational points of Dynamic Universe Model: No Isotropy; No Homogeneity; No Space-time continuum; Non-uniform density of matter(Universe is lumpy); No singularities; No collisions between bodies; No Blackholes; No warm holes; No Bigbang; No repulsion between distant Galaxies; Non-empty Universe; No imaginary or negative time axis; No imaginary X, Y, Z axes; No differential and Integral Equations mathematically; No General Relativity and Model does not reduce to General Relativity on any condition; No Creation of matter like Bigbang or steady-state models; No many mini Bigbangs; No Missing Mass; No Dark matter; No Dark energy; No Bigbang generated CMB detected; No Multi-verses etc.

1.2 Mathematical Background: The mathematics of Dynamic Universe Model is published and is available in many open access papers hence not repeated here. The following linear tensor equation (1) is the basis for all these calculations.

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

This concept can be extended to still higher levels in a similar way. There are other variations of the mathematics used in some different applications like VLBI explanations. The above Equation 1 is the main resourceful equation, which gives many results that are not possible otherwise today.

1.3. Input data: A Galaxy named GNz11 was assumed at distance of 100 times 13.4 Billion light years (1.26862E+28 meters). 132 more galaxies were assumed in the range of distances 10^25 to 10^28 (3.02001E+26 to 1.26862E+28) meters. The masses were also in the range of Galaxy masses. We allowed the simulation system on self gravitation calculations for 102 Iterations. Then we reduced first Galaxy distance by 50%. Calculations were done for next 100 iterations. We did another set of calculations without reducing the distance of first Galaxy for the comparison.

2.1. Age of Universe: The concepts by Lemaitre, Edwin Hubble and Alexander Friedmann in the 1920s became known as the Big Bang theory, gave the universe some age. Then at that time Hubble constant approximated as 550 km/s/Mpc, the universe had an age as 1.8 billion years which is less than then age of Earth as 2 billion years. The errors by Walter Baade in 1952, and Allan Sandage et al, in 1958 forced a correction in the Hubble constant, to 75 km/s/Mpc. This gave an age as 13.0 billion years, which is much higher than the re-measured age of the Earth of 4.55 billion years. Later the Hubble constant found by Sandage and Gustav Tammann in 1970s gave values around 50–60 km/s/Mpc, give an age of 16-20 billion years, consistent with globular cluster ages. Through Hubble space telescope (HST) [6] got a value of 72 km/s/Mpc + or -10 %. WMAP and Planck spacecraft gave an age of the universe at 13.80 +or – 0.3% billion years. Thus this cosmic age problem was discussed in the last 120 years in various ways and the outcomes of discussions were different in every 20 years. It is most probably Special relativity not applicable or redshift is not a measure of velocity of Galaxy, as distant galaxies are moving away from us at much higher velocities than speed of light.

2.2. Ages of Galaxies : The Galaxy star-formation is highest when ages of Many Galaxies is about 10 billion years, even though it was found that many massive galaxies had age higher than 13.5 billion years (comoving distance of 32 billion light years) or even may be more than 90 billion years. On the other hand many Galaxies were found having lesser age than 8 billion years. We all know that the Bigbang age is about 13.8 billion light years. Traditionally the hierarchical models or "tau models" (for a General explanation see [31]) were used by the astronomers for the last 40 years or so based on probably incorrect assumptions 'the star-formation starts off high and drops off exponentially' and ' a galaxy starts with a fixed reservoir of gas and its star formation must keep dropping as that gas is used up'. Astronomers found the drawback of "tau models" as these models 'globally-averaged cosmic star-formation rate' took place at much lower than the 'peak rate', Now the astronomers started using to infer the age of an individual galaxy from its colors (for a General explanation see [32]). Recent studies have shown that analyzing galaxy using tau models can give very erroneous estimates of star-formation rates and ages, and that adopting different models can improve the estimates. See Lee et al. 2009 [33]. Once the gas in a galaxy contains heavy elements, its ability to cool to form stars is dramatically altered. Most of the stars in any typical galaxy didn't form until billions of years later.

2.3. Galaxies born before Bigbang : We know we can see Galaxies from 32 billion light-years distance, for example GNz-11. See Oesch, P. A. et al. [34] in their paper in March 2016 [34] observed a very bright at Galaxy at z=11.1 measured with HST. This remote galaxy GN-z11, existed only 400 million years after the Big Bang, at a co-moving distance of 32 billion light years. We can see many instances and many Galaxies at very large distances as discussed in the introduction. Most probably these Galaxies are

2.4. Galaxies born after Bigbang: For example, let's consider few cases as discussed below. One can find scores of published papers on this subject.

Rakos, Schombert, and Odell in their paper 'The Age of Cluster Galaxies from Continuum Colors' [35] determined the age of 1,104 galaxies (z = 0.0046 to 0.175) and find that galaxies in clusters can be separated into two groups, an old group with a mean age something similar to the age of Bigbang (12 Gyrs) and a much younger group with a mean age around 9 Gyrs. Here it may please be noted in both the groups deviations from the mean values are there. This can be easily visualized from their fig 1, which shows ages, calculated using PCA method, are shown red are >10 Gyrs vs blue < 10 Gyrs.

PAPOVICH et al in their paper measured the sizes of compact passive galaxies [36], with their Sersic index and found that, at that redshift, in that cluster and around, these passive galaxies have smaller sizes than similar galaxies in the local universe. Hence these galaxies must have born in the subsequent ~10 billion years, and they are having an accelerated growth compared with Galaxies around.

2.5. Early Massive Galaxies : K. I. Caputi et al., in their paper in (2012)[38], have studied 25 extremely red > 4 galaxies in the infrared emission ranges of galaxies at different cosmic distances from Spitzer Space Telescope and compared them with Hubble space telescope images also (but very faint in the HST/CANDELS images), in the UKIDSS Ultra-Deep Survey field. The multi-wavelength analysis of these sources indicates that they are massive galaxies formed in the first two billion years. The observations done in the last decade show that the most massive galaxies basically finished their growth about 8 billion years ago, while less massive galaxies continued forming stars even afterwards.

S. L. Finkelstein et al in 2013 reported a Galaxy at redshift 7.51 and just 700 million years after Bigbang. They found the emission line at a wavelength of 1.0343 micrometres is likely to be Lyman α emission. This galaxy is having significant metal content, implying that galaxy become enriched rapidly with high star-formation rate of about 330 solar masses per year [39]. One can find many examples like this. This way these early massive Galaxies created the additional difficulty for the Bigbang LCDM based models.

3. Galaxy Quenching (Death of Galaxy) : *3.1.1. According to White and Frenk (1991)*, the reproduction of the star populations of galaxies observed in the Universe requires significant energetic feedback to prevent over-cooling and excessive star formation. These words are applicable for some few Galaxies only within a LCDM cosmological paradigm. Process of changing of Star-forming spiral galaxies into elliptical galaxies is done through probably Feedback, which is a process that ejects gas (and metals) and energy into the ISM and IGM, which heats the gas and removes some it from the galaxy, which slows star formation.

3.1.2. Ruth Grützbauch et al: found for a more highly evolved cluster XMMU J2235.3-57 at a redshift of 1.39. They described a "quenching radius", any galaxy within this distance from the cluster is extremely passive, but as you move further out the star formation rate increases.

3.1.3. The Mystery of Galactic Death: How Galaxies Quench: Faber et al in 2007[43] and Faber and Roger 2014 observed that, quenching happens in two ways: Fast track and another is Slow track. Slow-track quenching has two stages, first the central portions become gas poor as the sucked in halo gas reduces and this little amount gas that was sucked in cannot travel to go up to the center, and leaves a central hole. Here the central densemass of the Galaxy looses matter as radiation and does not get replenished. Slowly it leaves a hole at the Galaxy center, as the central densemass cannot hold the external stars together in the Galaxy. Most galaxies in the green valley at late times are on the slow track. In the second stage, these three processes 'AGN feedback, morphological quenching, and galactic winds' act together to fade the outer disks. When the Galaxy mass is at transition mass of 3 x 10^10 solar masses the Galaxy may most probably headed for massive halo quenching. This can be visualized in most GV galaxies, whose inner parts have quenched. These are waiting for their disks to go out due to halo quenching. Total quenching time is several billion years. In Fast track the quenching galaxies quench in the classic merger-starburst-feedback model**.** Due to merger gas will come to center and triggers central starburst. In the first place the density of the inner parts will increase, outer disk destroyed. Total quenching time starting from merger to faded PSB is about 0.5 to1 billion years. Many such papers show that Galaxies will quench

3.2. Shutting Down Star Formation in Galaxies: Faber et al. in 2007[43] demonstrated by evaluating the luminosity function, shows that the density of red galaxies had a fourfold increase after z=1, while density of blue galaxies was not changed. That means in some star forming galaxies, their star formation quenched and they advanced onto the red sequence, and at the same time new star forming galaxies were created.

4.1. Starting Graphs and Last Iteration Graphs: For better visualization the graphs are further sub divided to show 33 Galaxies each (these graphs were not shown here due to page length constraint), in addition to all Galaxies in one single graph. A set of first 10 Galaxies were also shown in the first set of graphs to see the difference in positions more clearly. All the graphs are XY graphs. Here in the first column all the graphs are pertaining to the simulations where GNz11 is taken in its assumed distance. And in the second column all the graphs are pertaining to the simulations where GNz11 is taken as 50% of its assumed distance and in the names a word DC was added to indicate that Distance was Changed. The graphs showing the starting positions are named Start and the graphs showing last iterations are named Last in the graph names.

4.2. Discussion on Resulting Graphs: See the GraphTable1 which contains graphs of starting positions and last positions of first 10 Galaxies used in this simulation that is including GNz11. All these graphs which show starting and last positions are similar except two graphs named ' 1 to 10 DC start XY ' and ' 1 to 33 DC start XY '.On can very easily see that the graphs named ' 1 to 10 DC start XY ' and ' 1 to 33 DC start XY ' are different from all the others , which are showing the starting position of GNz11changed by 50% . And also it may please be noted that SCALES in these start graphs are different to accommodate more clear view. That means the distance changing of Galaxy GNz11 has no effect on the shape of the Universe on the large scales. The other pictures in GraphTable1 and GraphTable 2 are also same and there is NO change in respective starting and last views. That means the distance changing the distance changing has no effect on overall shape of the Universe.

5. Blue shifted Galaxies and Red Shifted Galaxies: There are many verities Blue shifted Galaxies viz., BCGs, LINERs , Seyfert galaxies, QSO (Quasi-Stellar Objects), Quasars, radio-loud quasars , BL Lac objects, Blue shifted Galaxies, Starburst, Blazar, Radio galaxy, BCDs, LIRG, ULIRG, HLIRG, Blue compact galaxies (BCGs) etc. This existence of blue shifted Galaxies also created problem to all the other expanding Universe models. The expanding Universe models like Bigbang consider red shifted Galaxies only. They neglect the existence of Blue shifted and other types of Galaxies and quasars.

6. Discussion: In Section we saw details of different most distant Galaxies and their distances, and saw how they support the basic axioms of Dynamic universe Model. They were born long before Bigbang.

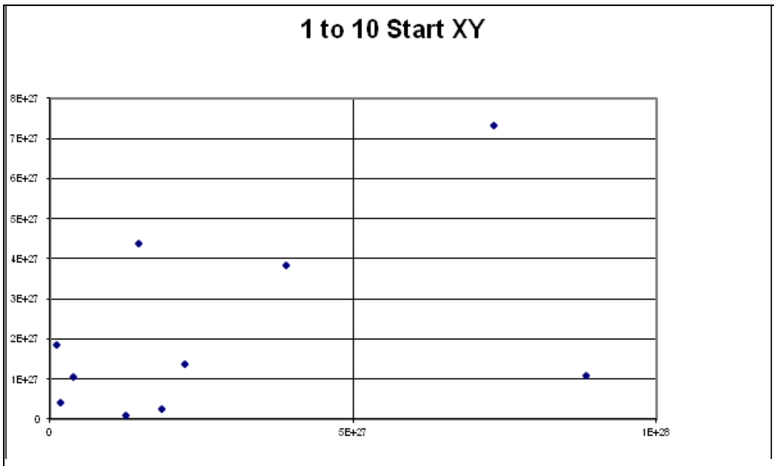
We saw how the estimates of age of Universe varied for every 20 years in the last 120 years depending on Hubble constant in **section 2.1.** We saw that the estimates of age Galaxies vary from more than co-moving distance of 32 billion years to less than 8 billion light years (normal age of 8 billion years). The Galaxies don't have uniform age. Nowadays the age estimates are based on new technique called 'colors of Galaxies' instead of traditional 'tau models' for measuring the star formation data of the Galaxies. Even then the ranges of ages did not alter much. These were discussed in **section 2.2.** We discussed about the Astronomical observations of the Galaxies born much before Bigbang, much later than Bigbang, in the later **sections 2.3 and 2.4**. Massive Galaxies were born almost simultaneously with Bigbang. Explaining massive galaxies at that early time from 400 to 700 million years after Bigbang is difficult as according to Lambda Cold Dark Matter models, as the new born galaxies are embedded in dark matter halos and by consuming the gas had happened much later almost after 3 billion years after Bigbang, as we saw in **section 2.5**. So According to these findings by the astronomers, the Galaxy ages and their date of births are different and are covering wide range of period but not according to expanding universe models.In section 3 we saw the quenching times of the Galaxies. We saw findings of different researchers telling about 'feedback', ''hole in the Galaxy center' etc are some of the reasons for Galaxy quenching. Hole at the center means the central Densemass of the Galaxy is getting dried up. It may please noted if there exists a super-massive Blackhole at the center of the Galaxy, matter will flow into Blackhole making it bigger and bigger, so it will never get dried up.

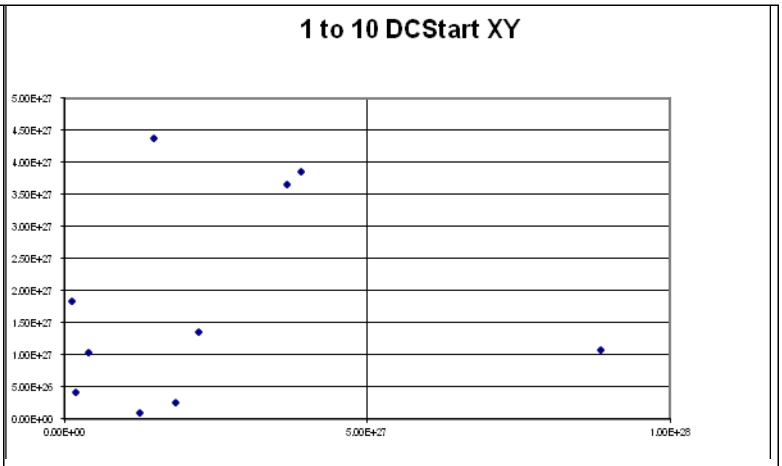
Additionally, we know now that Dark matter is not found experimentally, as many experiments to detect Dark Matter are failing as on today. The validity of the LCDM framework is to be checked.

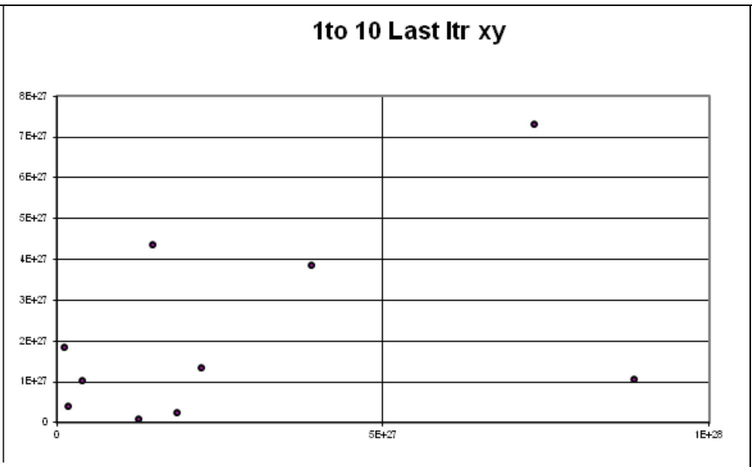
We propose Dynamic Universe model here to solve this problem. By its inherent nature or by the foundational points built into the this Dynamic Universe Model, the Galaxies can take their birth any time anywhere, where sufficient basic ingredients are there like gas accumulation for forming stars and Galaxies exists. Depending on the availability of raw materials and strength of its inherent gravitational bonds between the various masses those Galaxies will live their life and then quench. The cycle followed is the radiation will be generated from stars; this radiation will be converted back into matter when it passes grazingly a huge mass, by the way of frequency shifting. This way energy to matter and matter to energy cycle goes on endlessly and continuously. According to the SITA simulations of this model, same mathematical setup of Dynamic Universe model can be used for Micro level, Solar system level, Oort level, Milkyway parts level, Galaxies level, Universe level…. That means the motion of the any particle in the Universe can be described by the action of Universal gravitational force (UGF) due to all the other masses in the Universe at that moment, next moment, as well as moment by moment later.

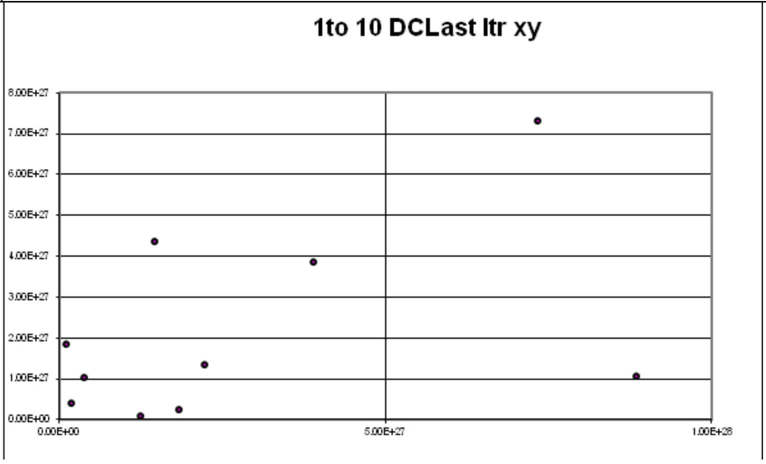
GraphTable1: Contains graphs of starting positions and last positions of first 10 Galaxies used in this simulation that is including GNz11. Only these graphs are shown here due to page length constraint and to visualize the exact differences between all these 4 graphs. On can very easily see that the graph named ' **1 to 10 DC start XY** ' is different from all the others , which is showing the starting position of GNz11changed by 50% . *And also it may please be noted that SCALES in these start graphs are different to accommodate more clear view.*

GNz11 at Normal Distance	GNz11 at 50% Distance



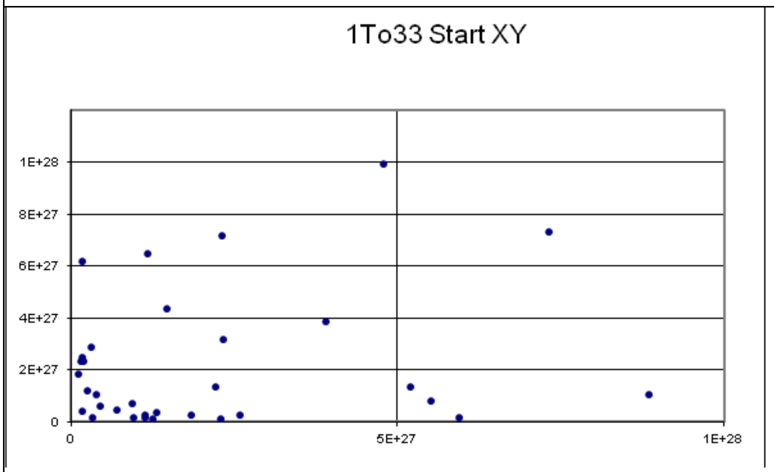




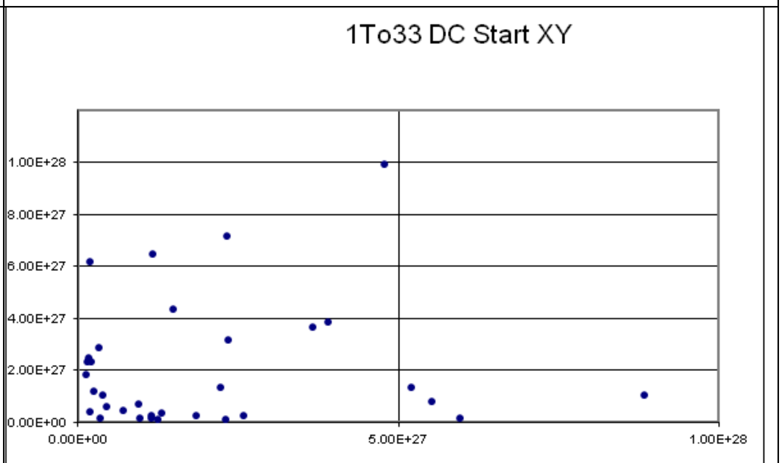


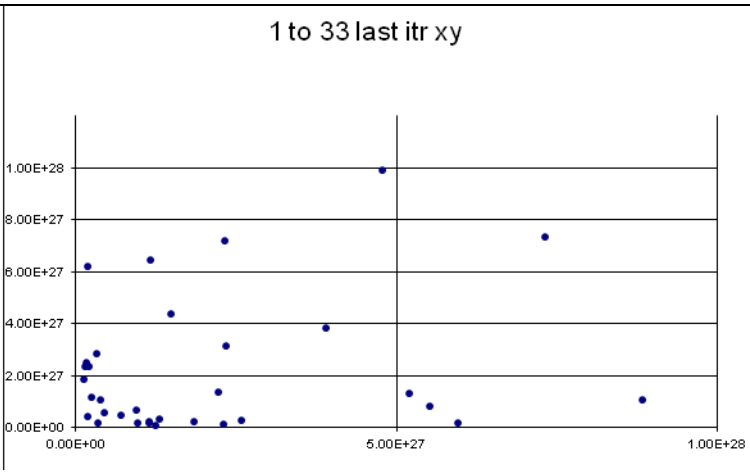
GraphTable2: Contains graphs of starting positions and last positions of first 33 Galaxies used in this simulation that is including GNz11. These graphs are for visualizing the exact differences between all these 4 graphs. On can very easily see that the graph named ' **1 to 33 DC start XY** ' is different from all the others , which is showing the starting position of GNz11changed by 50% .

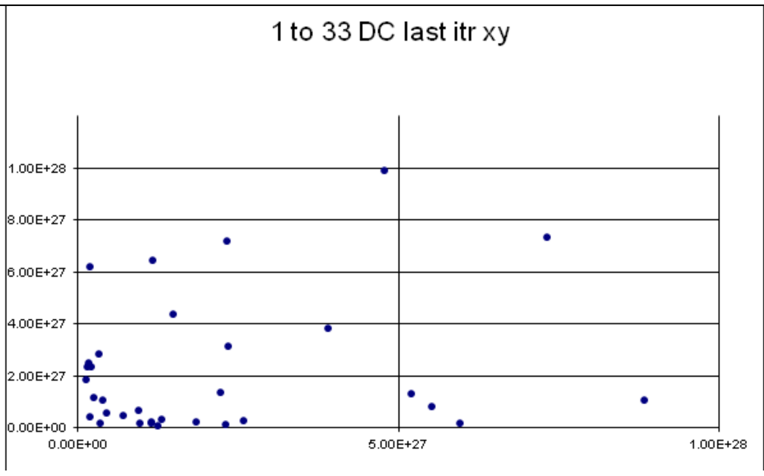
GNz11 at Normal Distance



GNz11 at 50% Distance







8. CONCLUSION: From the end of last iteration graphs as shown in the GraphTable 1 and the GraphTable 2 the Universe looks the same. That means the distance changing of simulated Galaxy GNz11 has no effect on the shape of the Universe on the large scales. That means the distance changing has no effect on overall shape of the Universe. That means Galaxies can be at any distance as decided by the Dynamic Equilibrium of UGF in this model…..

This paper shows the evidences by the way of earlier published papers. The Galaxy GN-z11, born only 400 million years after the Big Bang, exists at a distance of 32 billion light years. Bigbang explains these by co-moving distance. If we don't accept Bigbang then how will you explain these Galaxies at these huge distances? Galaxies born 6 billion years after Bigbang, and massive Galaxies born 300 million years immediately after Bigbang. Many of Galaxies were born about 3 billion years after Bigbang. The present thinking of Bigbang is about 13.8 billion years with the popular λCDM models. Galaxy quenching is happening.

By seeing all these, the author proposes a new idea (not published by him earlier) that the Universe had an ability to reproduce Galaxies.

Here probably the 'a-biological world' learned from the Universe and subsequently the physical systems learnt to pursue the goal of reproduction and formed the "Biological world". Slowly these biological life forms acquired intelligence and now trying to understand Universe! That way probably the goal-oriented behavior is a physical or cosmological trend of the Universe……..

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