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New Theory to Solve Winding problem of spiral Galaxy

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Abstract: There are many unsolved problems associated with spiral galaxies. One of the biggest unsolved problems of is winding problem. This paper aims at solving the problem by introducing a new theory. It is named as "**Rolling arms theory** of spiral galaxies". It has been explained in detail, considering all the facts about the spiral galaxies. This theory is more appropriate than "standing wave theory". The paper also illustrates a possible reason for brief x-ray bursts found in many spiral galaxies.

Keywords: Spiral galaxy, stars, winding problem, new theory, rolling of arms, neutron stars.

I. INTRODUCTION

There are several types of galaxies. This paper focuses on one important type of Galaxy called "Spiral Galaxy". This type of galaxy is shown in figure-1. (Only 2 arms of one side are shown. There will be more arms around, making it radially symmetrical)

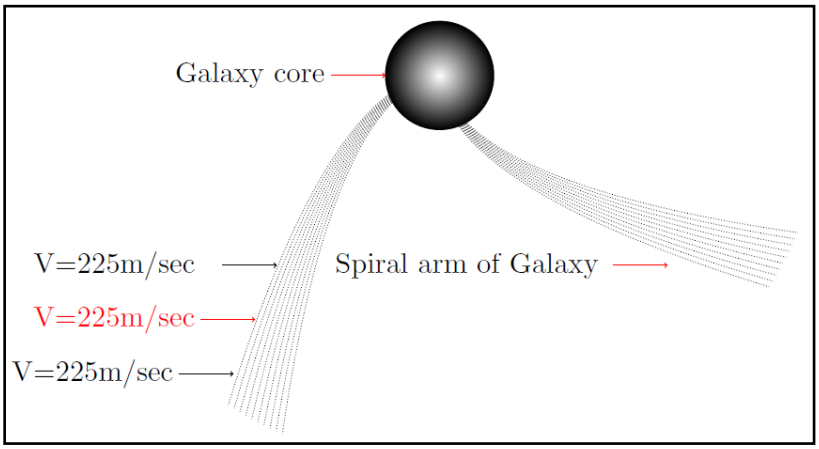

Figure-1. Two arms of Spiral Galaxy

The arm of a Spiral Galaxy consists of thousands of stars, revolving around the galaxy. All the
Stars including those in the arms will rotate and also revolve around the galaxy centre. We can calculate the speed at which each star should rotate for a stable orbit around the galaxy centre, by applying Newton's law of gravitation. As the distance increases, velocity should also increase. In case of galaxies, stars will perfectly follow the law up to some distance of about 20000 light years. Beyond this distance, velocity of star is found to be almost constant. Although there is no perfect explanation for this, MOND theory explains it to a large extent. The constant velocity of all stars beyond 20000 light years is about 225 km/sec in almost all galaxies. Sun is close to this distance and moving around our milky way galaxy at about 222 km/sec. Since all stars beyond 20000 light years are moving at same velocity, the star 1 at 20000 light years away from the centre of galaxy should overtake another star 2, say at 21000 light years. Similarly, star 2 will overtake another star 3, little farther away at say 22000 light years. Due to this, after some thousands of years, the whole spiral arm should have to wind up as shown in figure-2

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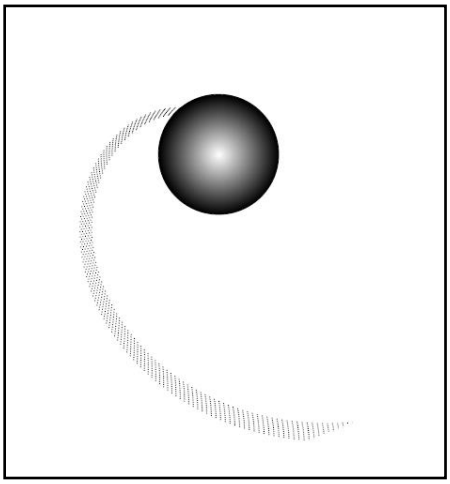

Figure-2. Arm after winding up.

This is known as winding problem of Galaxies. We can find out thousands of old and new galaxies in the universe. But there is no evidence of already wound up Galaxy. Some thinkers are of the strange view that the star at the edge of the arm will somehow vanishes in to 4th dimension and re appears in the next arm! So, there is no proper explanation for winding problem. Some others are supporting another theory called "standing wave theory". This paper gives an explanation by assuming rolling movements of stars within the arm itself. Another problem associated with galaxy is the dark matter problem. Since the velocity of stars beyond 20000 light years is constant, it appears to violate Newton's law. If Newton's law is applied, then outer stars should y away from galaxies. But it is not happening. Therefore dark matter is assumed to surround the galaxy. That is still debatable. This rolling theory will solve that problem by assuming that radial velocity is appearing to be constant but it is having radial and tangential component. This makes the stars to obey Newton's law only and no need of dark matter.

II. ROLLING ARMS THEORY

This is the new theory introduced by this paper. Main assumption of this theory is that stars in the spiral arms roll in the circular path as shown in figure-3. It is like a pin wheel rotating with the axis at the centre of the spiral arm cross section.

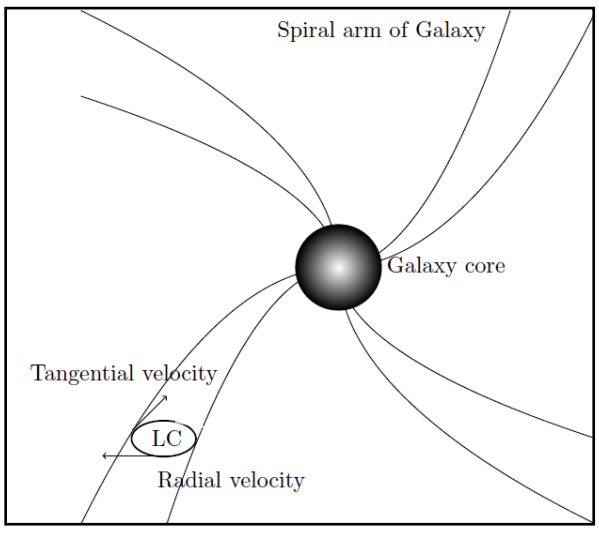

Figure-3. Rolling arms theory.

Figure-4 is the enlarged portion of the cross section of the arm at any particular distance from the centre of the galaxy.The line connecting the centre of the local disc and Galactic centre is the axis of rotation for the disc. In this rolling arms theory, it is assumed that because of the local gravity, the stars in the disc are rotating about local centre.

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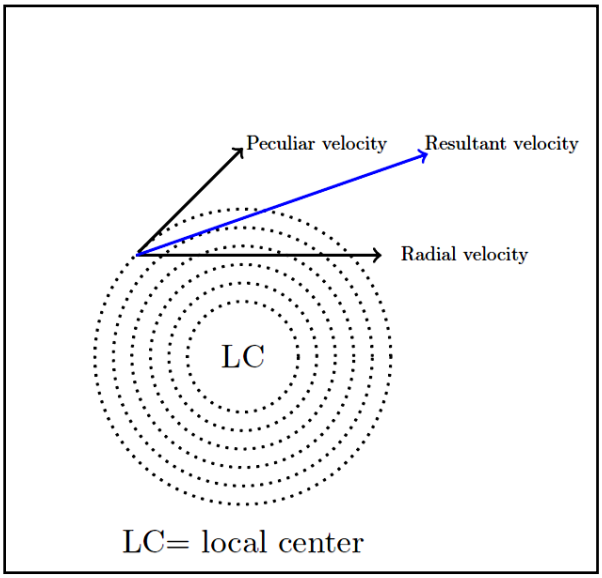

Figure-4. Stars with different velocity components.

The stars at little closer to the centre of the galaxy will be rotating, having same tangential velocity but will be making more revolutions around the local centre. Thus, each star will be in the same arm almost at the same distance, avoiding winding of arms. Even when the stars are moving in opposite direction, the relative velocity will be adequate to give required centrifugal force and thus avoiding falling into the centre of galaxy. This can be realised from Sun-Earth-Moon system, as explained here.

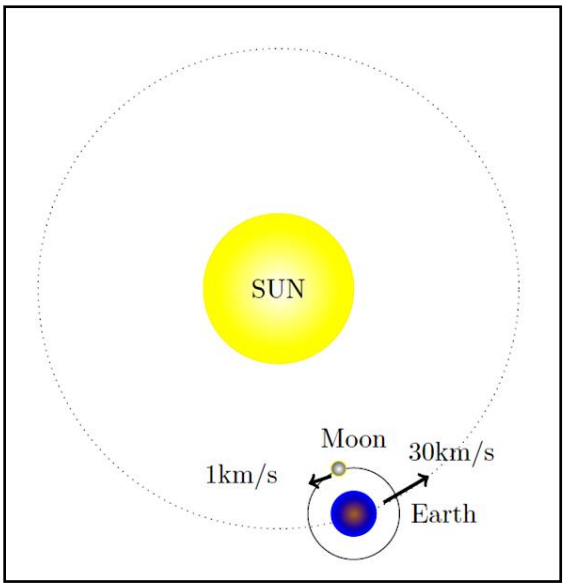

Figure-5.Sun, Earth-Moon System

Both Earth and Moon are revolving around the Sun at about 30km /sec velocity. They are also revolving around their common centre at about 1km/ sec. So, any set of objects in the universe must be having a global centre and local centres. Sun is orbiting our Milky Way Galaxy. Planets orbit the local centre , the Sun. Satellites orbit their local centre as Planets. The important point to be noted here is that even though it appears as if the object like Moon moving in opposite direction as in figure-5, (Sun, Earth-moon system)it will be having the base velocity of about 30km/sec around the Sun always and so it will be in its orbit around the Sun. In case of Galaxy arms, local centres are neutron stars (or black holes in some old galaxies). So, local group of star system as a whole will be moving around the centre of the Galaxy at the required velocity but it is not the same star moving in same path in same speed. So, winding of arms will not happen.

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III. ARRANGEMENT OF STARS IN THE ARM CROSS SECTION

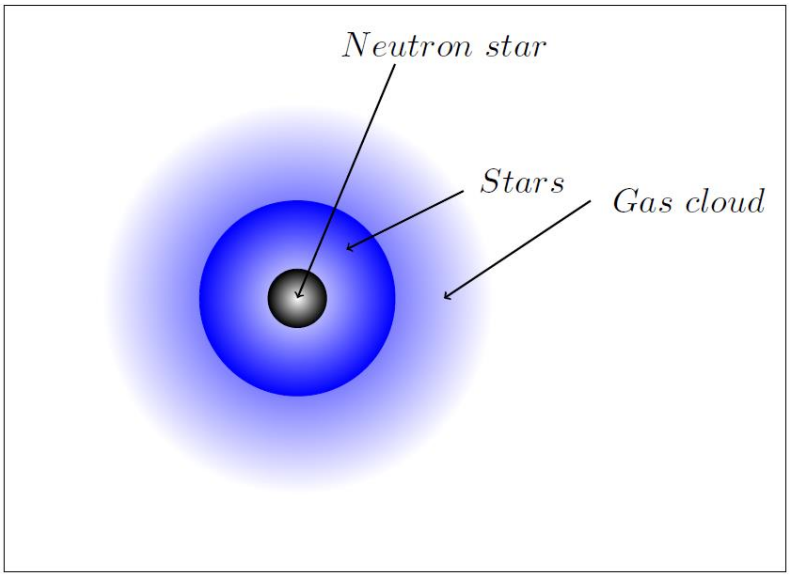

Figure-6. Arrangement of stars in the cross section of the arm.

Arrangements of stars in arms and galaxies are obviously according to the density. Innermost stars in arms must be neutron stars and massive black holes will be at the centre of the Galaxy. So, the arrangement of stars in the cross section of the arm is as shown in Fig-6.

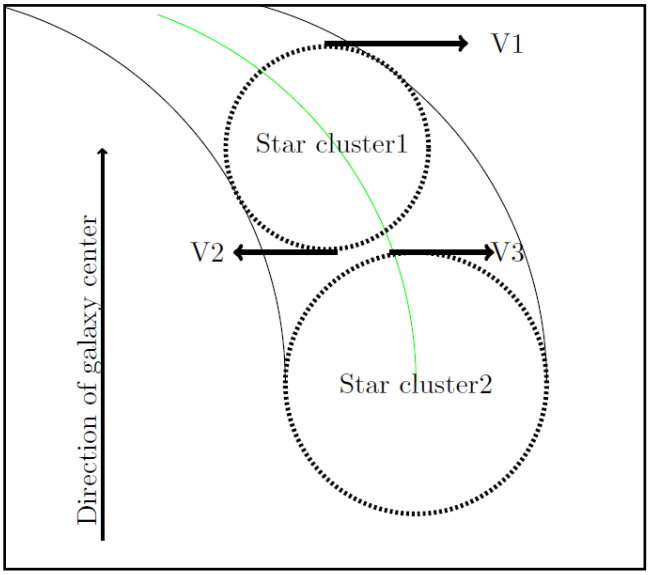

Figure.7. Movement of stars at different cross sections of the arm.

In every arm, the star in the outermost circle tends to move around the local centre. But due to the radial and tangential components of velocities, many stars tend to move in a direction closer to or away from the Galaxy centre. In some cases, many stars may move towards each other and collide, like the star with velocity V2 in cluster 1 and star with velocity V3 in cluster 2, as shown in figure-7. These are the effects of combined local and global gravity in the Galaxy. These collisions may lead to sudden release of large amount of energy, even as x ray bursts. This is the second problem solved by this paper.

Every star in the outer ring will try to occupy the centre position of local centre. By this also, there will be collision of stars of almost neutron stars. After occupying the centre, it becomes more massive after several thousand years and it will also start moving towards the centre of the galaxy. This process will continue till the whole galaxy becomes a big black hole.

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IV. CONCLUSION

1. This paper establishes a new theory of rolling of arms of Galaxy
2. It clearly illustrates why standing wave theory appears to be true but not true
3. It considers local gravity effect in addition to global gravity of the centre of the Galaxy
4. It gives most likely reason for x-ray and FRB emissions from distant galaxies
5. It also establishes the reason for collisions of neutron stars in the arms of the Galaxy.
6. It establishes **"Rolling arms theory",** a better theory compared to standing wave theory.

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BIOGRAPHY

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