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The Black Hole Spray and the Cosmic Web

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Abstract

We propose that the trapped antimatter in super massive black hole ergoregions acts as detonators that triggers black hole to white hole transitions creating huge BHs explosions that generate BH spray that acts as seeds for new galaxies creation. We propose that by mapping and simulating the cosmic web structure, it may be possible to learn if the universe was created in a single big bang that started a single chain of BH explosions mini-creation event cycles, or alternatively, the BH explosions mini-creation event cycles are uncorrelated spacelike events, and the universe had no single primeval atom beginning.

Keywords

Big Bang, Quasi Steady State Cosmology (QSSC), Black Hole (BH), Supper Massive Black Hole (SMBH), White Hole (WH), Ergoregion, Dark Matter (DM), Cosmic Web, Loop Quantum Gravity (LQG)

1. Big Bang and Quasi-Steady-State Cosmology

The big bang cosmology is based on Albert Einstein's general relativity (GR) field equations [1]. Einstein suggested first that the universe was homogenous, isotropic and static. The Russian mathematician Alexander Friedmann suggested in 1924 that the universe may be expanding with no beginning and no end [2] [3]. Georges Lemaitre described the expanding universe independently in 1927 [4]. In 1929, Edwin Hubble announced the velocity-distance relation for galaxies that led a paradigm-shift towards an expanding universe. Lemaitre expressed the idea of singular creation of the expanding universe from a primeval atom in 1933 [5].

In 1948, the big bang cosmology was challenged by Hermann Bondi, Tommy Gold and Fred Hoyle that proposed an alternative steady state cosmology (SSC) [6]. SSC assumes that the universe is homogeneous, isotropic and its energy density remains steady. SSC argues that there was no big bang and no unobservable initial condition of extremely hot phase. The universe is steadily expanding creating new volumes of space that is filled up with new matter continually created where the universe energy density remains steady.

In 1993, the Quasi-Steady-State-Cosmology (QSSC) was presented where matter creation is being triggered locally by mini-creation explosion event cycles [7] [8]. The spacetime geometry of QSSC is described, just as in the Big Bang cosmology, by the Robertson-Walker line element, with the expansion of the universe determined by a dimensionless scale factor S (t), which is however in QSSC, an oscillatory function of time. The QSSC suggests that mini-creation explosion events occur in cycles and play a key role in forming the large-scale structure observed in the universe.

In previous papers [9] [10] [11], we suggested that antimatter plays a principal role in the universe and that antimatter is inseparable from both matter and space. We suggested that a QCD gas comprised of even number of quarks and antiquarks, the $u\tilde{d}d\tilde{u}$ tetraquark, fill space and perform quarks and antiquarks pair exchange reactions with matter particles. We suggested a method to measure and calculate the mass of the QCD gas tetraquark and the dimensionless scale factor equation of state parameter. We further suggested that black hole ergospheres separate matter from antimatter and black hole ergoregions act as matter reactors that separate matter from antimatter and trap the antimatter particles.

In this paper, we suggest that the QSSC mini-creation events may be BHs to WHs transitions as proposed by Haggard and Rovelli [12] and that these transitions may create huge BH explosions, generating BHs spray that acts as seeds for the creation of new galaxies.

2. Black Hole Spray and the Cosmic Web

In 1916 Karl Schwarzschild discovered the first exact solution of Einstein's field equations [13]. In 1960 the Kruskal-Szekeres coordinates removed the Schwarzschild metric event horizon singularity and the result extended Kruskal space-time had 4 regions that describe the interior and exterior of the BH and the spacetime of a white hole [14], which is a time-reversed version of the black hole. Rovelli explained how quantum gravity may spark a transition of a BH to a WH (B2W) [15]. The B2W hole quantum-tunnel transition, however long it may appear to an external observer is short locally since the quantum mechanical bounce will occur when the collapsing star size reaches the quantum gravity region where Einstein's classical field equations are not valid anymore. The BH history may be revealed by the B2W hole transition and hence the BH information loss paradox may be resolved by the Loop Quantum Gravity (LQG) that allows calculating the B2H hole transition amplitude and lifetimes of the BH and the WH (see **Figure 1**) [16].

Here, we propose that the B2W hole quantum tunneling transition may be accelerated crossing the reaction energy barrier by the antimatter trapped in the

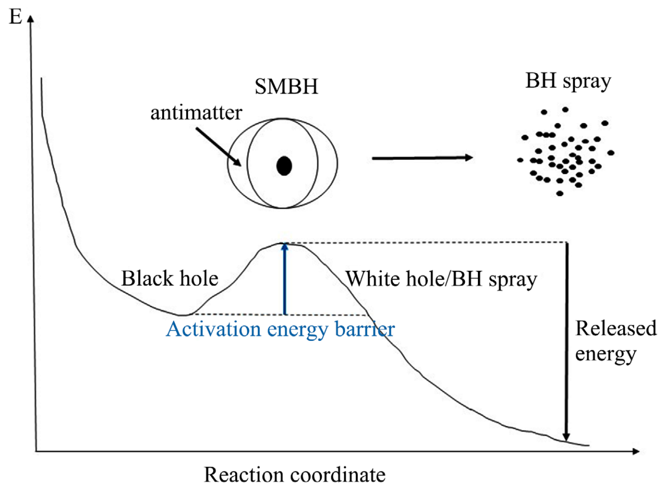

Figure 1. The black hole to white hole transition with the accumulated antimatter in the SMBH ergoregion that act as a detonator creating a huge explosion and a BH spray.

BH ergoregions [9] that act as a detonator releasing a huge amount of mass and heat in the explosion and a BH spray.

The time it takes to accumulate enough antimatter for detonating the BH depends on the BH mass, charge and rotation speed but also on the BH environment, the mass accretion rate from the disc for example. The BH explosions may be the mini-creation event cycles of QSSC [7] where the released energy per cycle may be huge, a big bang scale explosion. In 2020 a huge explosion of a supermassive black hole (SMBH) was recorded [16]. The explosion occurred in the Ophiuchus galaxy cluster and blasted a hole estimated to be about the size of 15 Milky Way galaxies in a row in the cluster plasma, the super-hot gas surrounding the SMBH [17].

In 1976 Hawking suggested that primordial black holes (PBH) may have been created in the Big Bang [18]. Hawking assumed that a first-order phase transitions may have occurred after the big bang that generated the primordial black holes [19]. Ali-Haïmoud calculated in 2017 that if the big bang spawned enough black holes to account for all dark matter, then their merger rate will be thousands of times higher than what LIGO observes [20]. However, Jedamzik, showed in 2020 how a large population of PBHs could result in collisions that match what LIGO observes which mean that PBH could the dark matter [21].

Alternative to the first order phase transition scenario, we suggest that antimatter accumulated in the ergoregion of SMBH act as a detonator and that the SMBH explosion generates a BH spray that act as seeds for the creation of the cosmic web structure. Matter is created continuously by AGN SMBH and is separated from the antimatter by the matter reactors [10] and after the explosion of the SMBH, the BH spray seeds become the centers of new galaxies created from the created matter. The Schwarzschild event horizon radius, r_s, may include an effective mass, the mass difference of the BH matter and antimatter that fell in. We further assume that the BH explosion activation energy barrier shown in **Figure 1** above depends on the mass difference.

$$r_s = \frac{2G\left(M_{matter} - M_{antimatter}\right)}{c^2} \tag{1}$$

The observed cosmic web voids' sizes and the mass of their surrounding galaxy filaments may indicate what were the masses of the exploded SMBH that were at the voids' centers. By mapping and simulating the observed cosmic web [22] [23] it may be possible to learn the history of the QSSC mini-creation event cycles and see if they are chained and point to a spacetime location where it all started, a big bang cosmology model, or alternatively, that the QSSC mini-creation events are uncorrelated spacelike events, indicating that the universe had no single primeval atom beginning.

3. Summary

We suggest that the accumulated trapped antimatter in the BH ergoregions [10] may act as a detonator that triggers B2W holes transition explosions and hence the antimatter plays another central role [11]. We suggest that the huge voids and galaxy filaments of the cosmic web were created by B2W hole explosions in line with the QSSC model and that by mapping and simulating the observed cosmic web structure, it may be possible to confirm that the universe was created in a single big bang that started a chain of QSSC mini-creation events, or alternatively, confirm that the QSSC mini-creation events cycles are uncorrelated spacelike events, and the universe had no single primeval atom beginning.

Conflicts of Interest

The author declares no conflicts of interest regarding the publication of this paper.

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