

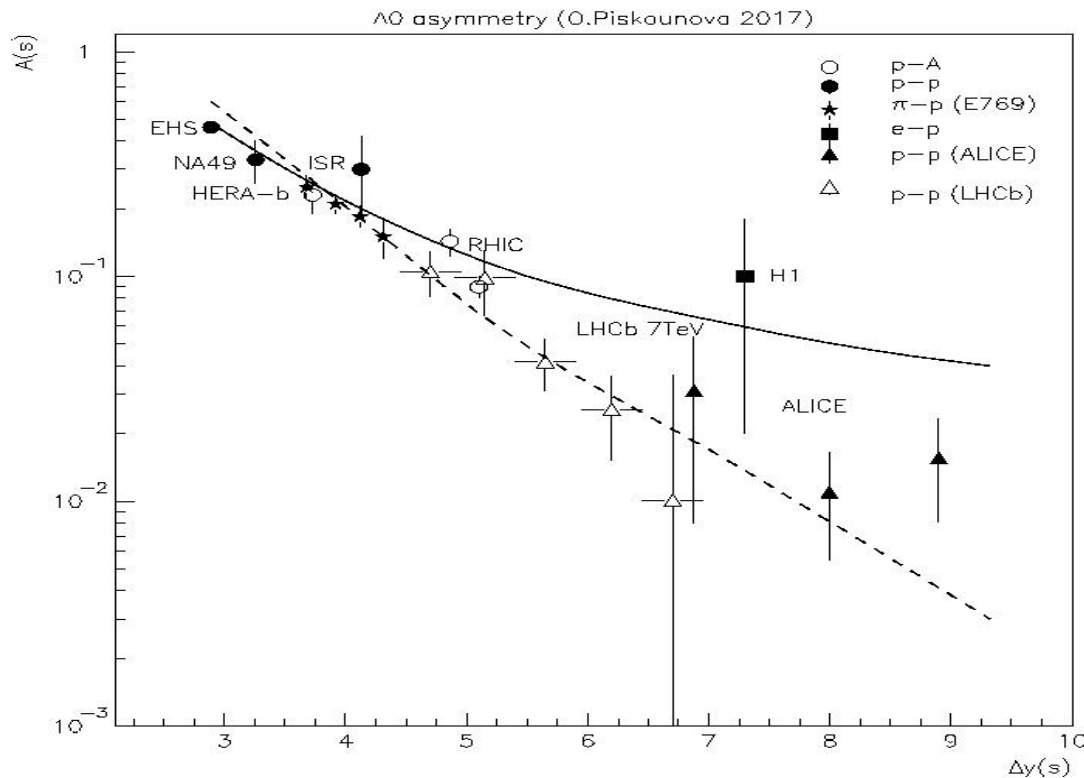
Baryon charge asymmetry at LHC , String Junction transfer in proton reactions and baryonium torus as DM candidate.

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Outline

- Baryon/antibaryon production at proton colliders: baryon charge transfer with SJ
- SJ torus as third order pomeron diagram: neutral baryonium states with $B=0$:
 - a. Topological expansion 1975
 - b. Baryon/antibaryon junction hexagon and hexagon net on the torus
- Experimental expectations for baryonium torus in multi particle production and in double diffraction
- Expected features of baryonium DM
- Toroidal structures at space observations near SMBH, jets
- Conclusions

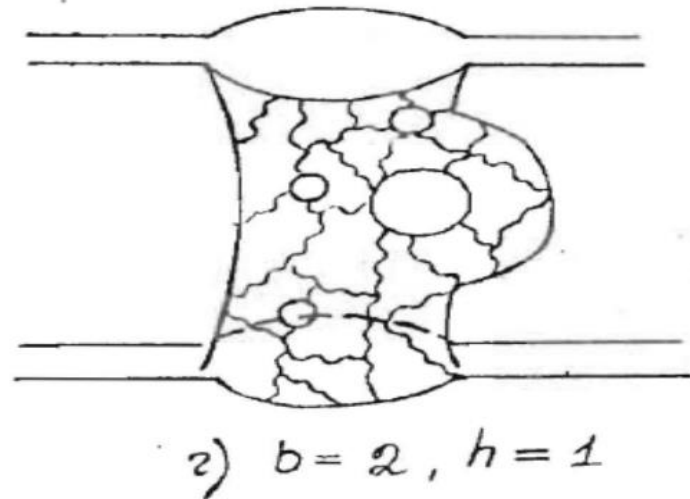
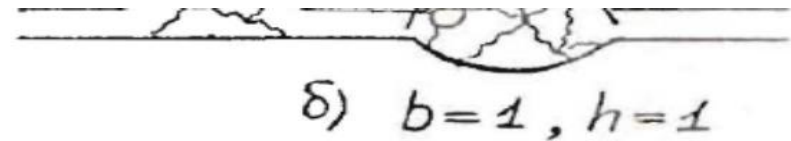
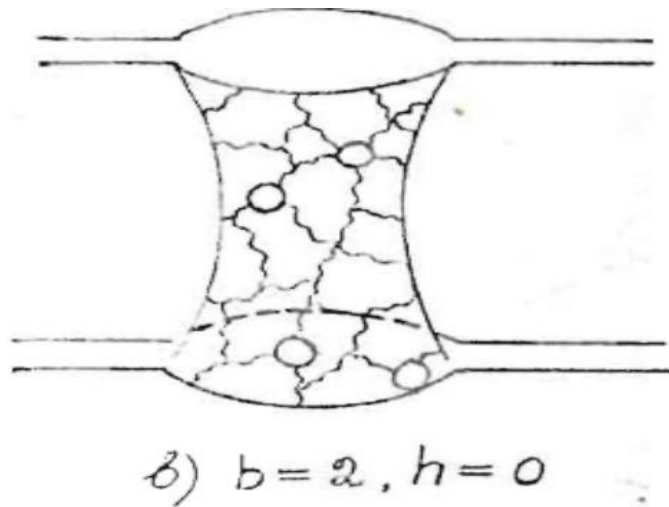
Baryon/antibaryon production at proton colliders: baryon charge transfer with SJ



The asymmetry of baryon/antibaryon production has been measured in many proton-proton, pion-proton and electron-proton experiments.

SJ transfers the baryon charge from proton projectile into the central rapidity region at high energy proton interactions, while the diquarks used to bring positive baryons to $Y=0$ point in the reactions at $\sqrt{s} < 200$ GeV. QGSM calculations have been done at $0.5 < \alpha_{SJ}(0) < 0.9$ (O.I. Piskounova, Phys.Atom.Nucl. 70 (2007) 1107-1109).

SJ torus as third order pomeron diagram: topological expansion 1975

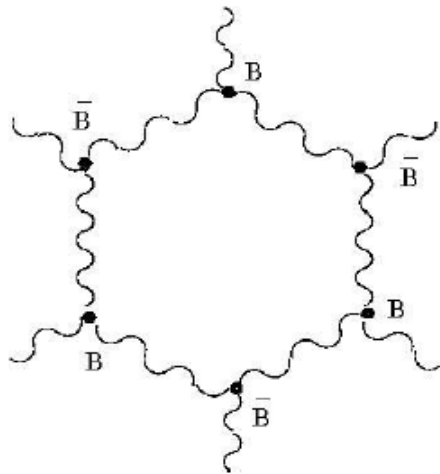


M.Giafaloni, G.Machesini, G. Venesiano, Nucl.Phys. B98 (1975), 472

Figure is from my PhD thesis, 1988

Baryon/antibaryon junction hexagon

The only way to cover the torus with the SJ (string junctions) net is hexagon (honey comb).



String junction brings the baryon/antibaryon charge

String junction is responsible for baryon/antibaryon asymmetry in spectra at LHC

It seems that string junction can not annihilate or disappear (??)

At fixed energy we can cover the pomeron torus with discrete numbers of hexagons

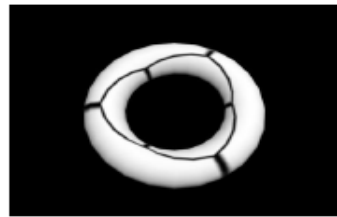
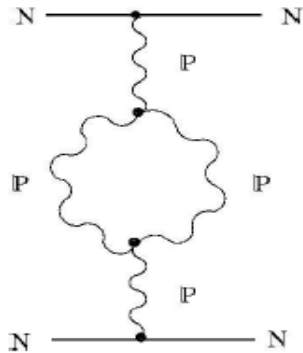
The gap in the pomeron exchange with loop may be of discrete values

We can insert quark-antiquark loops on every side or leg of SJ hexagon

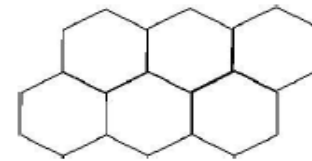
Hexagon net is similar to graphene (graphene tubes etc.)

Baryon/antibaryon junction hexagon and hexagon net on the torus

Pomeron torus is covered with gluon exchange net



3D view of pomeron loop covered with the gluon net



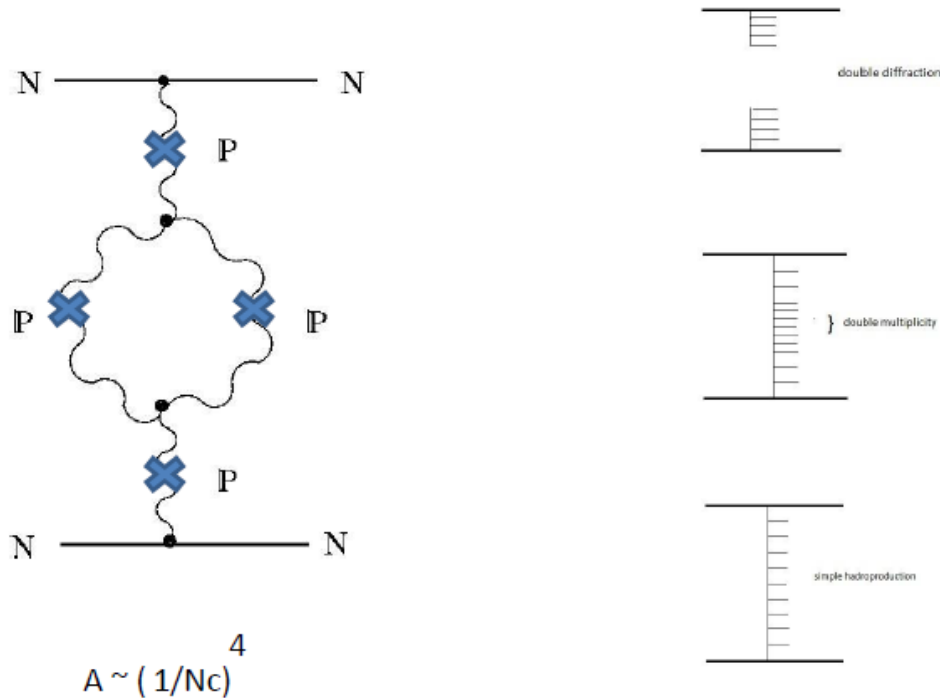
6 - minimal set of hexagon gluon cells to cover the pomeron torus (6 ,16, 30 ...)

Why hexagons?

Number of SJ+antiSJ vs number of hex: 4hex->8SJ; 6hex->12SJ → NSJ=2Nhexagon

Experimental expectations for the SJ torus in multiparticle production and in Double Diffraction

Pomeron "loop" corresponds to the pomeron with handle

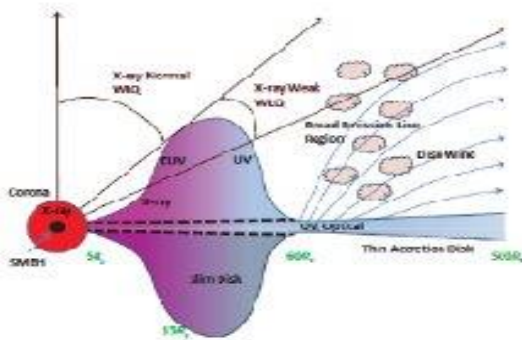


SJ torus as baryonium Dark Matter

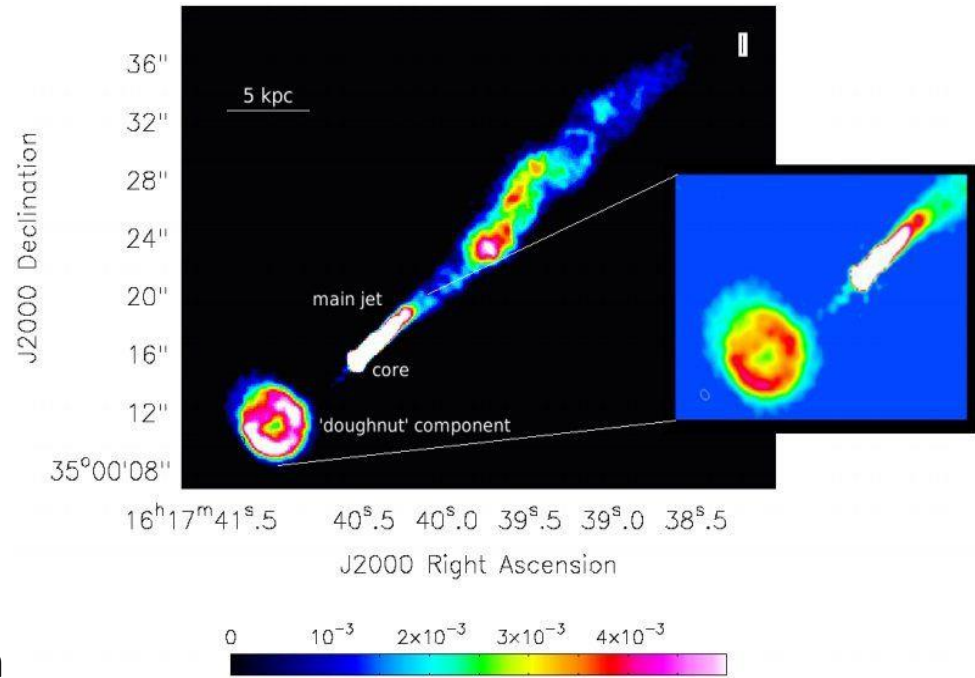
- Can obtain great mass
- No baryon charge, no electric charge
- As more heavy, as more stable
- Compact and penetrative
- Appears in high energy baryon interactions
- Lightest SJT can be absorbed to proton
- Dark matter consists of baryon matter as diamonds consist of carbon!

Toroidal structures at space observations near SMBH

Torus configuration of QCD matter, what has been revealed by Chandra (arxiv:1503.02085) at the event horizon of SMBH, must be such dense "doughnut" that roentgen radiation is screened on 40%)



Toroidal structure of jet from radio galaxy NGC6109 (arXiv: 1808.019670) is recent observation of baryon matter in the extremal conditions .



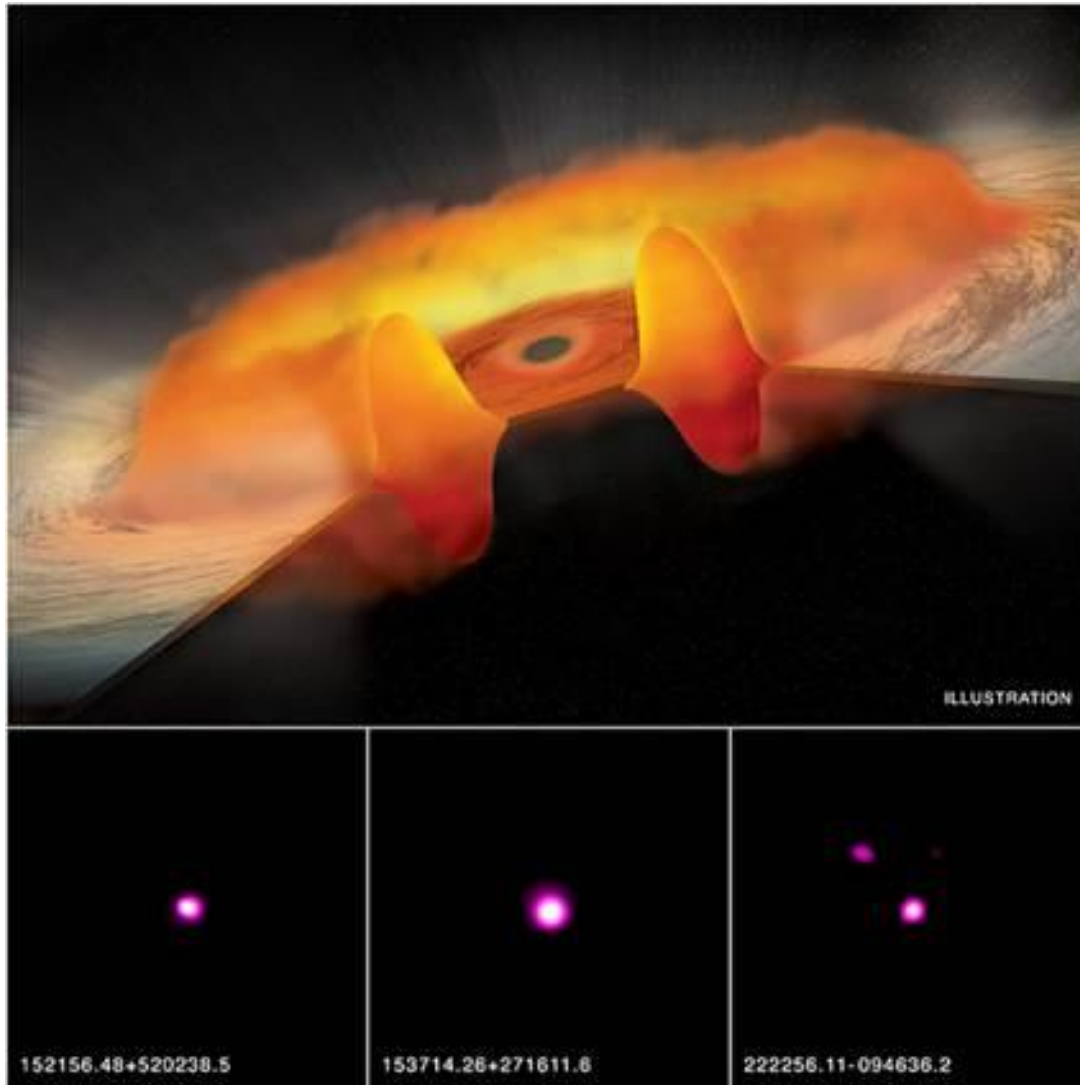
Baryon matter falling under BH horizon should be symmetric, or in other words, brings no charge information.

Super Massive Black Hole injects approximately 1/3 of their mass with the jets.

Conclusions

- String Junctions bring baryon charge at LHC proton-proton collisions up to central rapidity region
- SJ can be organized with anti SJ as the neutral structures (hexagons) and build SJ torus with zero baryon charge – baryonium that is good candidate for DM
- Baryonium DM has discrete levels of energy (or mass)
- Half of DM mass is antimatter, no annihilation
- Giant toroidal structures are observed near SMBHs
- Massive baryonium torus can be squashed due to the gravity pressure and returns to the lower mass level with the release almost 1/3 of mass as two jets
- Protons from jets with the energy $E \sim 10^{12}$ GeV can produce neutrinos of UHE
- As soon as the problem seems solved, a bunch of new questions appear: “are the relativistic jets a catastrophe for SMBH or they are periodical events?” etc.

Thank you for attention!



With such “doughnut” structure SMBH grows rapidly