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

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

ΛØ asymmetry (O.Piskounova 2017)
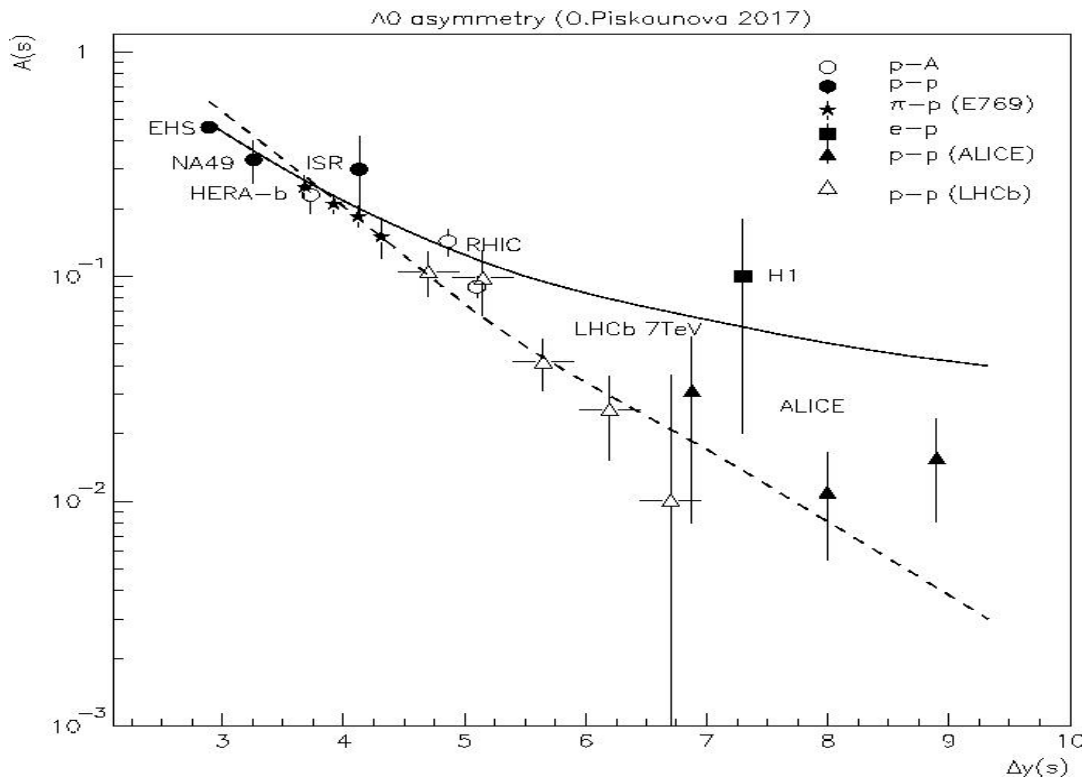
The asymmetry of baryon/antibaryon production has been measured in many proton-proton, pion-proton and electron-proton experiments.

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 √s < 200 GeV. MQGS calculations have been done at 0.5<αSJ(0)<0.9 (O.I. Piskounova, Phys.Atom.Nucl. 70 (2007) 1107-1109).

# SJ fragmentation function and intercept, $\alpha_{SJ}(0)$
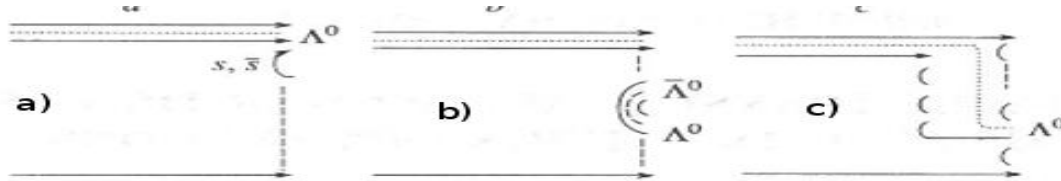
The fragmentation of diquark chain: (a) leading fragmentation into Λ^0, (b) central and (c) fragmentation by string junction.

$$\mathcal{D}_{SJ}^{\Lambda^0}(z) = \frac{a_f^{\Lambda^0}}{a_0^{\Lambda_c} z} z^{1-\alpha_{SJ}(0)} \times (1-z)^{-\alpha_\phi(0)+\lambda+2(1-\alpha_R(0))}$$

SJ fragmentation function depends on the intercept of SJ trajectory, $\alpha_{SJ}(0)$

Toy model with SJ torus as third order pomeron diagram: topological expansion 1975

б) $b=1, h=1$

в) $b=2, h=0$

г) $b=2, h=1$
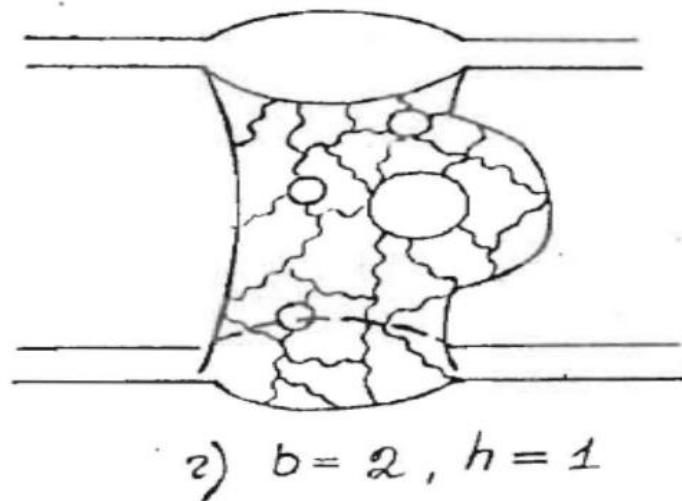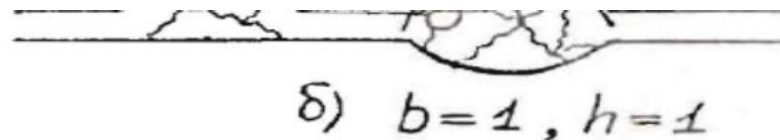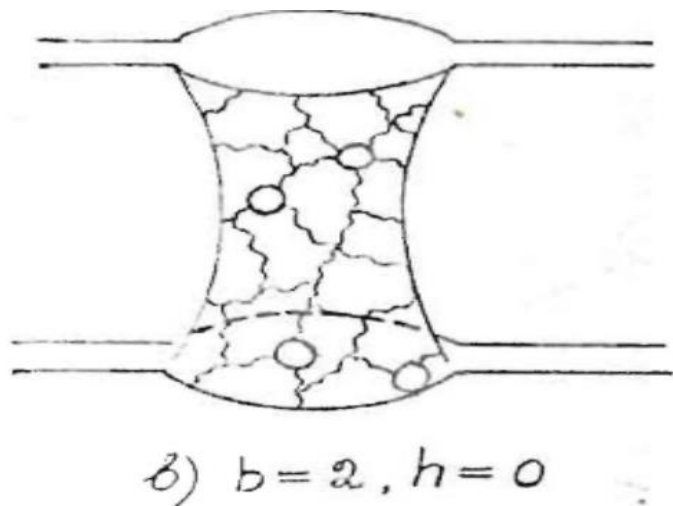
M.Giafaloni, G.Machesini, G. Venesiano, Nucl.Phys. B98 (1975), 472

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

Pomeron "loop" corresponds to the pomeron with handle

$$A \sim (1/Nc)^4$$

double diffraction

} double multiplicity

simple hadroproduction
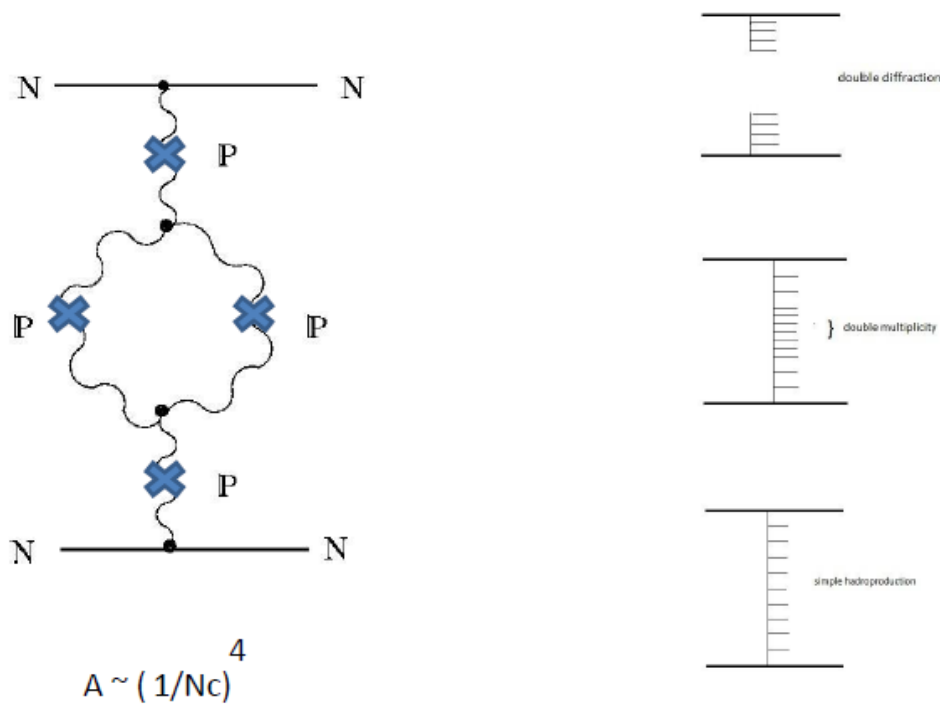
Baryon/antibaryon junction hexagon

The only way to cover the torus with the SJ (string junctions) net is hexagon (honey comb).
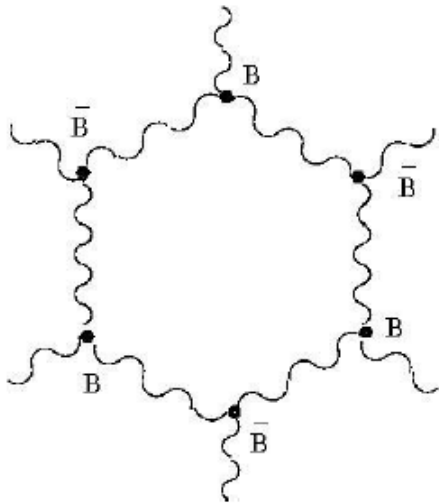
String junction brings the baryon/antibaryon charge

String junction is responsible for baryon/antybaryon 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

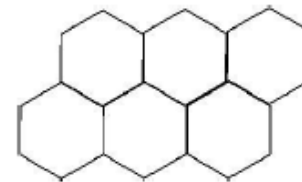The gap in the pomeron exchange with loop may be of discrete values

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

Baryon/antibaryon junction hexagon and hexagon net on the torus

Pomeron torus is covered with gluon exchange net
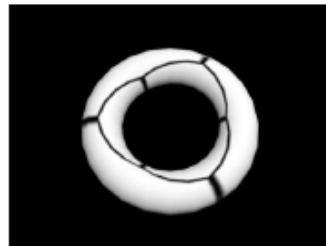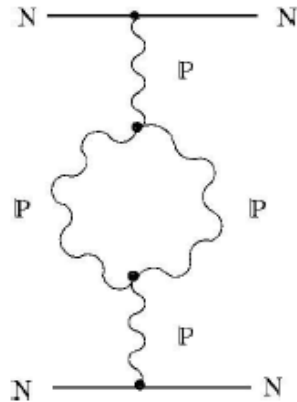
3D view of pomeron loop covered with the gluon net

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

Why hexagons?

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%)
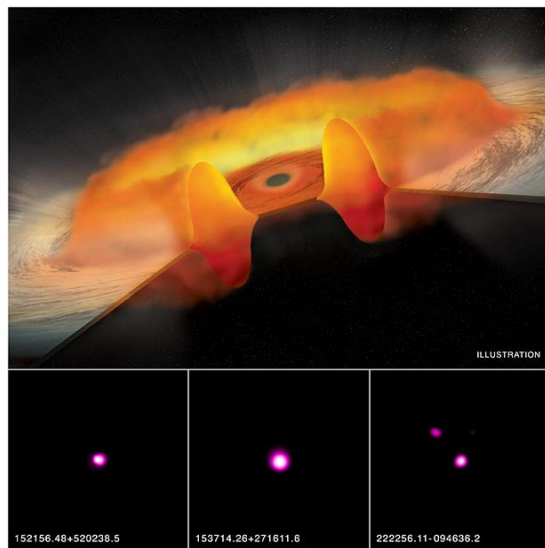
Toroidal structure of jet from radio galaxy NGC6109 (arXiv: 1808.019670) is recent observation of baryon matter in the extremal conditions.
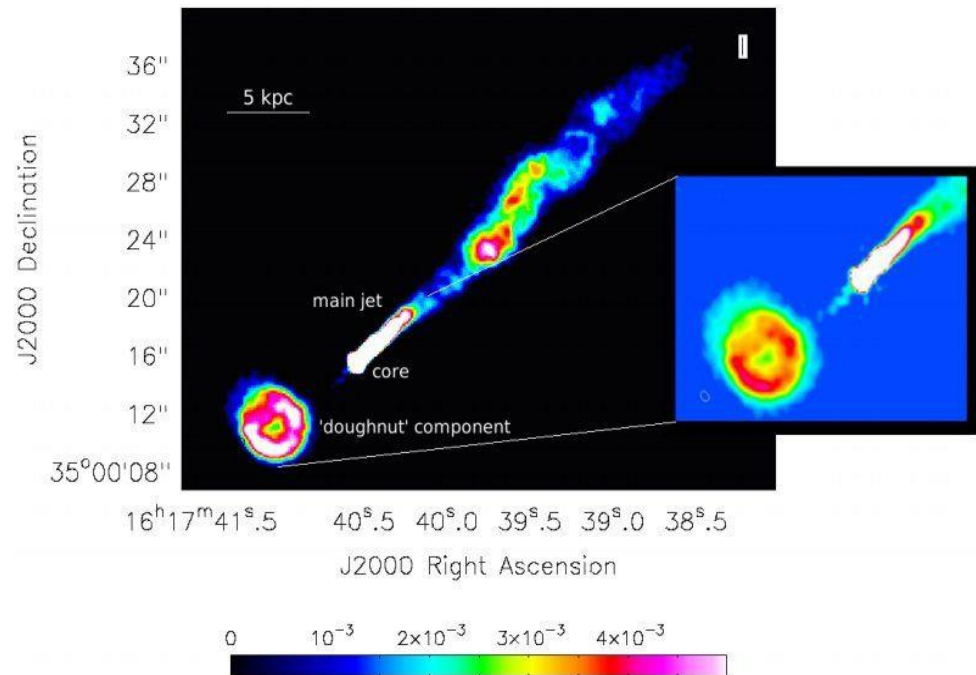
Baryon matter falling under BH horizon should be symmetric, or in other words, has no charge information.

Super Massive Black hole s are throwing out 1/3 of their mass with the jets.

Conclusions

- String Junctions bring baryon charge in the high energy proton-proton collisions

- SJ can be organized with anti SJ in the neutral structures (hexagons) and build SJ torus with the zero baryon charge

- SJ torus has discrete levels of energy (mass)

- Giant toroidal structures are observed near SMBHs

- This toy model can help to deal with "arm wrestling" of BH gravity and QCD matter at the extremely high masses and density.