

# Strangeness enhancement in dense systems in Pythia8/Angantyr

Smita Chakraborty

smita.chakraborty@thep.lu.se

With Leif Lönnblad, Gösta Gustafson and Christian Bierlich

*Department of Astronomy & Theoretical Physics  
Lund University*

*Quark Matter 2022*

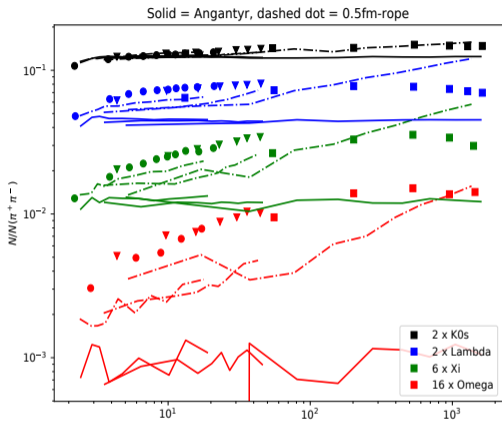


**LUND**  
UNIVERSITY



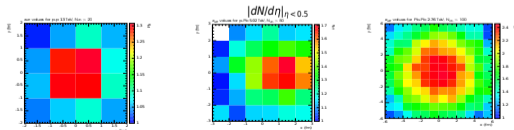
Krakow, 8<sup>th</sup> April 2022

# Rope hadronization gives enhanced strangeness across systems



Preliminary.  
 p-p 7 TeV,  
 p-Pb 5.02 TeV,  
 Pb-Pb 2.76 TeV

Data: ALICE  
 Collaboration,  
 Nature Phys. 13  
 (2017) 535-539.



## Rope hadronization in the *parallel* frame

- Wider colour flux tubes for two transversely close strings  
→ Resultant higher string tension  $\kappa_{eff}$
- Release of energy when a rope breaks  
→ excess energy is available for the tunnelling process through  $\kappa_{eff}$
- From lattice calculations: Tension in an isolated static rope is proportional to the quadratic Casimir operator  $C_2$

- $s$ -suppression wrt  $u$   
 $= \exp\left(-\frac{\pi}{\kappa_{eff}}(m_s^2 - m_u^2)\right)$

- Relative strength of “rope tension”:  
 $\frac{C_2(p,q)}{C_2(1,0)} = \frac{1}{4}(p^2 + pq + q^2 + 3p + 3q)$

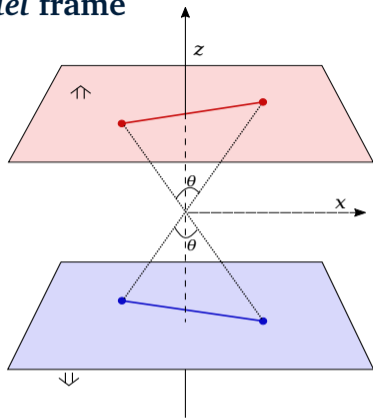
- Effective string tension:

$$\{p + 1, q\} \mapsto \{p, q\}$$
$$\kappa_{eff} = \frac{2p+q+4}{4} \kappa$$

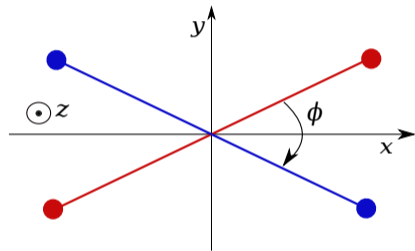
---

<sup>1</sup>Bierlich C., Chakraborty S., Gustafson G., Lönnblad, L., Jet modifications from colour rope formation in dense systems of non-parallel strings, arXiv:2202.12783.

## The *parallel* frame

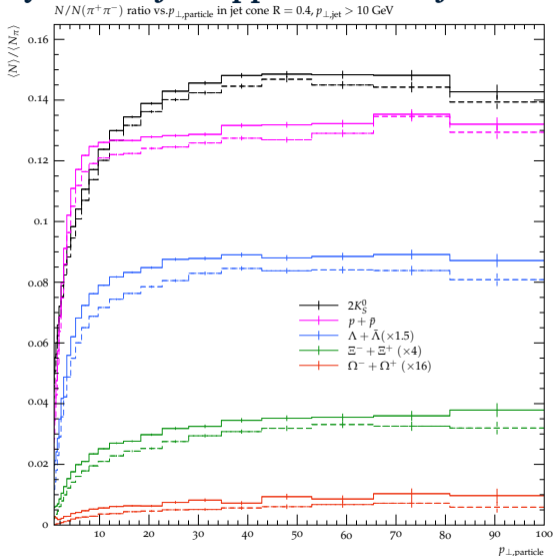


✓ Non-parallel strings  
 $\implies$  heavy-ion events  
 $\implies$  Jets



<sup>2</sup>Bierlich, C., Chakraborty, S., Gustafson, G., Lönnblad, L., Setting the string shoving picture in a new frame, J. High Energ. Phys. 2021, 270 (2021)

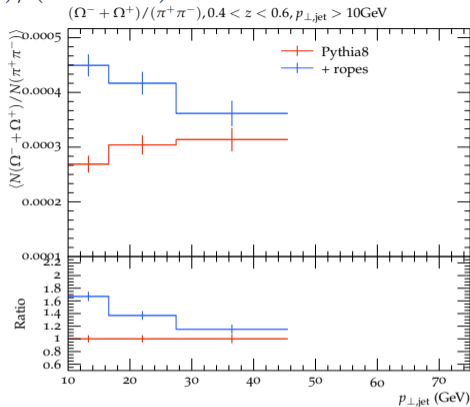
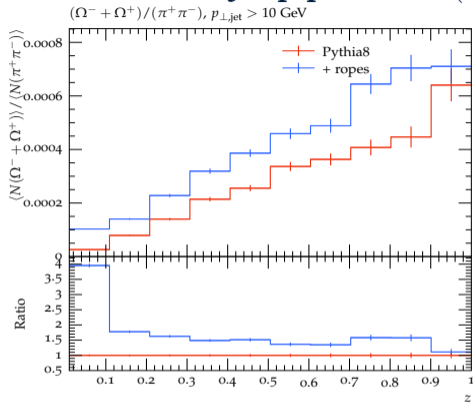
# Strangeness yields in jets: pp 13 TeV Z+ jet events



Anti- $k_{\perp}$   $R=0.4$ ,  
 $p_{\perp,\text{jet}} > 10$  GeV/c,  
 $|\eta_{\text{jet}}| < 2.1$ ,  
 $|\eta_{\text{particle}}| < 1.9$ ,  
 $\Delta\Phi_{\text{jet,particle}} > 2\pi/3$

dashed-dot:  
 Pythia8  
 solid: + ropes,  $R = 0.5$  fm

# Yield ratio in Z+jet p-p events: $(\Omega^- + \Omega^+)/(\pi^- + \pi^+)$



$$0.4 < z < 0.6$$

$$z = p_{\perp,\text{part}}/p_{\perp,\text{jet}}$$