

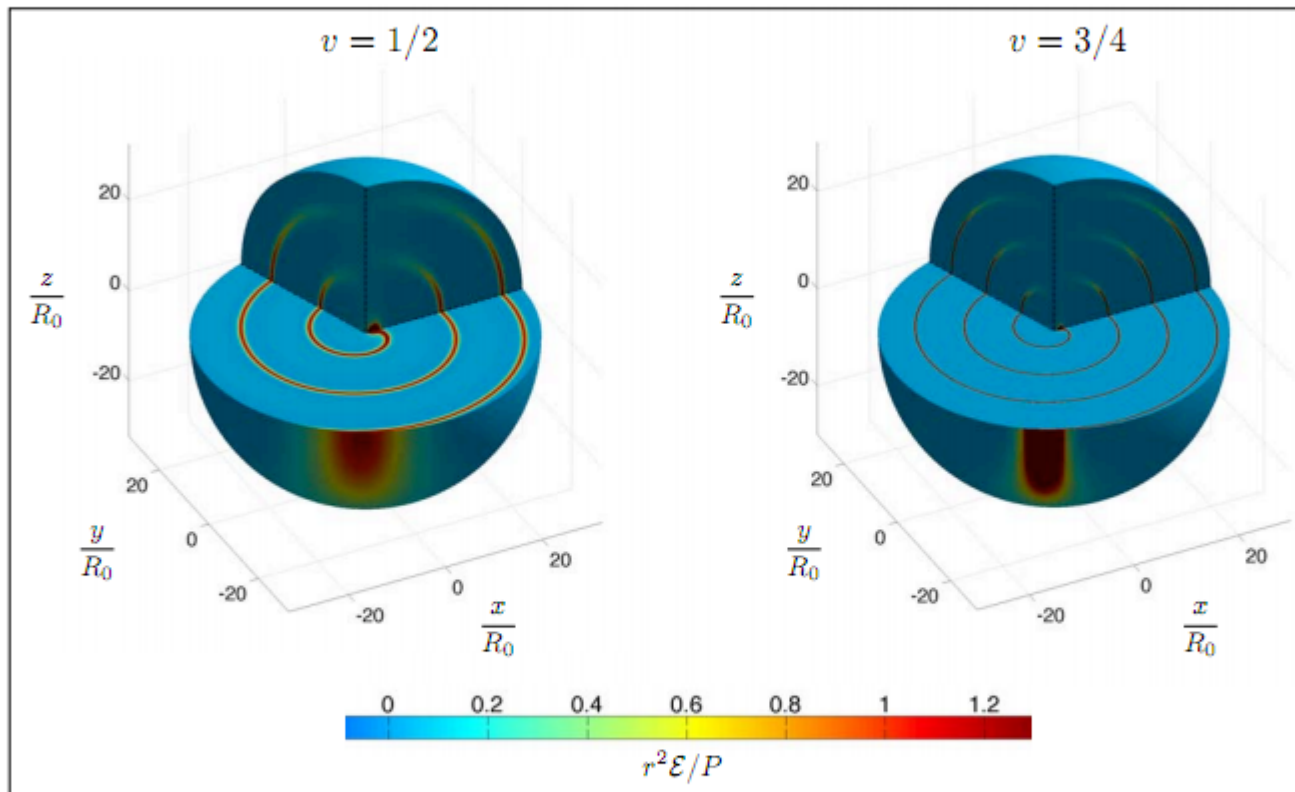
# 22<sup>nd</sup> Quark Matter, Annecy 22-28 May 2011

- 770 HI physicists, said to be “historic” conference
  - 3 LHC experiments now dominate field
  - PHENIX, STAR continue
- Analysis of LHC 2010 Heavy Ion run still leading to new discoveries
  - Upsilon suppression, ... (see CMS Web pages, Bulletin)
- Detailed measurements of electromagnetic cross sections from ALICE ZDC
  - Excellent agreement with predictions (next slide)
- Future session on Saturday
  - C. Salgado, **very strong** interest in p-Pb collisions at LHC (see forthcoming LHC Project Rept 1181, already on [arXiv:1105.3919](#)
    - several papers anticipating it in other sessions
- Various presentations on e-A colliders,
  - Strong interest in LHeC extended reach to low x.

# Theory overview, K. Rajagopal

## Synchrotron Radiation in Strongly Coupled Gauge Theories

Athanasiou, Chesler, Liu, Nickel, Rajagopal; arXiv:1001.3880



Fully *quantum mechanical* calculation of gluon radiation from a rotating quark in a *strongly coupled large  $N_c$  non abelian gauge theory*, done via gauge/gravity duality. “Lighthouse beam” of synchrotron radiation. Surprisingly similar to classical electrodynamics. Now, shine this beam through strongly coupled plasma...

▶ Cross sections for EMD processes have been measured in Pb-Pb collisions at 2.76 A TeV detecting the emitted neutrons with the ZDCs and using the absolute cross section values measured in the Van der Meer scan

	DATA (PRELIMINARY)	RELDIS MODEL
$\sigma^{\text{sEMD}} + \sigma^{\text{had}}$	$(195.6 \pm 0.1 \text{ stat. } ^{+24.2}_{-11.7} \text{ syst.}) \text{ b}$	$(192.9 \pm 9.2 \text{ syst.}) \text{ b}$
$\sigma^{\text{sEMD}} - \sigma^{\text{mEMD}}$	$(176.9 \pm 0.1 \text{ stat. } ^{+21.6}_{-10.6} \text{ syst.}) \text{ b}$	$(179.7 \pm 9.2 \text{ syst.}) \text{ b}$
$\sigma^{\text{mEMD}}$	$(5.7 \pm 0.2 \text{ stat. } ^{+0.7}_{-0.3} \text{ syst.}) \text{ b}$	$(5.5 \pm 0.6) \text{ b}$
$\sigma^{\text{sEMD}}$	$(185.7 \pm 0.2 \text{ stat. } ^{+22.6}_{-11.1} \text{ syst.}) \text{ b}$	$(185.2 \pm 9.2) \text{ b}$

- ▶ Experimental results are in very good agreement with predictions from RELDIS
- ▶ Errors are dominated by preliminary systematic errors on VdM cross section

▶ ALICE ZDCs can provide an independent monitor of the beam luminosity measuring the rate of neutron emission by EMD processes  $\mathcal{L} = R^{\text{mEMD}} / \sigma^{\text{mEMD}}$

A.J. Baltz et al., Physics Reports 458 (2008) 1

▶ EM interactions between colliding ions can cause beam losses due to changes in ion magnetic rigidity ▶ nucleon emission in ultra-peripheral interactions can be studied to test theoretical predictions used in beam losses estimates

R. Bruce et al., Phys.Rev. 12 071002 (2009)



# Conclusions



- high energy AA collisions have entered an era of high precision measurements
  - LHC, RHIC upgrades
  - constrain dynamic and coupling properties of medium
- many ideas we were taking more or less for granted at QM 2009, are now being seriously questioned
  - death of Mach cone and ridge?
  - thermal yields, radiative Eloss are challenged
- the outlook is bright
  - high lumi (5×) Pb-Pb run this year, possibly p-Pb next year
  - there could be some serious paradigm shifting at QM 2012!

F. Antinori, concluding talk