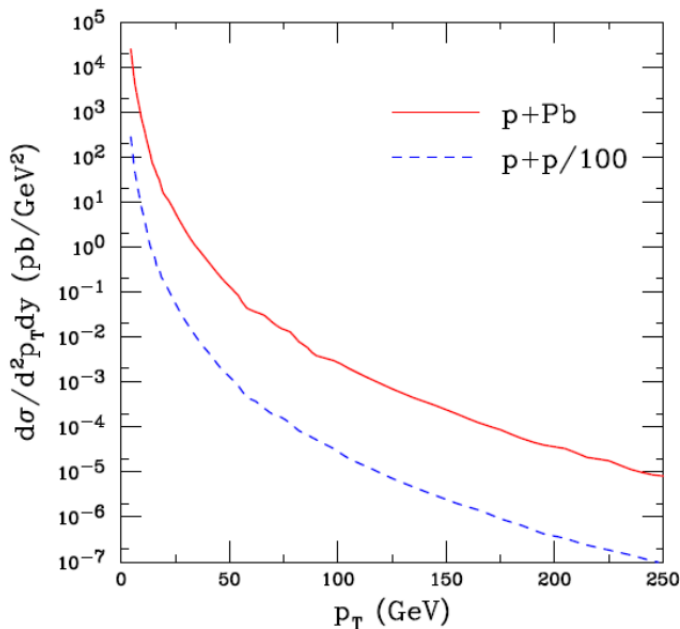


## Predictions for direct photons for the p+Pb run at LHC

R. J. Fries and S. De

Proton-lead collisions are an important part of the program at the Large Hadron Collider. They provide a necessary baseline for Pb+Pb collisions. They also give us information about the partons in the lead nucleus wave function and how they are modified compared to a simple superposition of nucleons. A p+Pb run at 5.0 TeV was conducted at the LHC in early 2013. Members of the LHC experiments have asked the JET collaboration (of which RJF is a member) and other theorists to make predictions in time before the run. Ramona Vogt has compiled our calculations and other predictions in a long article published in [1].

With my collaborator Somnath De we have computed the yield of direct photons from p+Pb collisions at next-to-leading order (NLO) in the strong coupling using EPS09 nuclear parton distributions [2]. The main goal of these calculations is to provide a test for the EPS09 parameterization of nuclear parton distribution functions (nPDFs) and to provide a safe perturbative QCD baseline before any other cold nuclear matter effects (Cronin effect, energy loss, etc.) are taken into account. It will be very difficult to measure the Drell-Yan process (dilepton production) in p+Pb with the detectors available at LHC and thus direct photons are the next best tool to determine nPDFs in terms of purity of the process and theoretical control of the calculation. The figures below show spectra obtained from JETPHOX as a function of photon transverse momentum.



**FIG. 1.** The spectrum  $dN/d^2P_T dy$  at  $y=0$  for direct photons in p+Pb and p+p collisions at LHC at 5.0 TeV calculated at NLO with EPS09 nPDFs.

[1] Rainer J. Fries *et al.*, Int. J. Mod. Phys. E **22**, 1330007 (2013).

[2] K.J. Eskola, H. Paukkunen, C.A. Salgado, J. High Energy Phys. **0904**, 065 (2009).