Quark Matter 2017
Student support application

Educational Background

I did my undergraduate studies at University of Catania from 2007 to 2010. In 2010 I enrolled in the Master's program in Physics in the same University. In 2011 I participated in the summer school program at CERN, Switzerland, where I first joined the ALICE Collaboration working on the electromagnetic calorimeter. I received my Master's in 2012 defending a thesis on jet suppression in Pb-Pb collisions with ALICE. In the fall 2013 I enrolled in the PhD program at Yale University. I completed all the classwork requirements and qualification exams in May 2015 and I am now working on my dissertation research in ALICE.

Description of PhD research

The main focus of my PhD research is the study of hard QCD probes. In the first two years at Yale, I worked on the jet reconstruction in Pb-Pb collisions with ALICE, an analysis that I started during my Master's research project. The paper reporting the nuclear modification factor of jets was published by ALICE at the beginning of 2015. Since then I have been working on the reconstruction of heavy-flavor jets in proton-proton collisions. In particular I am using fully reconstructed D mesons to tag jets with charm content. The study of the charm content of jets is interesting because up to now it has eluded a precise quantitative understanding in the framework of perturbative QCD (pQCD). This is in contrast with other hard processes that are successfully described by pQCD, such as top and bottom production and the inclusive jet cross section. The charm content of jets is known to arise both from prompt production in the process gg (qqbar) -> ccbar, and from the parton shower of gluons and light-flavor quarks. The fragmentation function of charm jet is an observable sensitive to the production mechanism and can therefore help to move towards a more quantitative description in the framework of pQCD. Heavy-flavor jets can also provide important insights into the Quark-Gluon Plasma (QGP) produced in ultra-relativistic heavy-ion collisions, as heavy quarks are predicted to interact with the QGP differently compared to light quarks and gluons. However, their production mechanisms must first be studied in the vacuum, in order to provide a baseline for the observation of possible modifications induced by the presence of the QGP.

The aim of the analysis is to extract both the pT spectrum of the D-tagged jets and z distribution, i.e. the fraction of jet momentum carried by the D mesons. I identify D-meson candidates via their hadronic decay channels using topological selections and particle identification. These D-meson candidates are combined with the other charged tracks reconstructed by the central tracking system, using the anti-kT jet-finding algorithm. The yield of D-tagged jets is extracted through an invariant mass analysis of the D-meson candidates associated with a jet, in bins of jet pT and momentum fraction carried by the D meson. I am finalizing the analysis using the pp data at sqrt(s) = 7 TeV collected by ALICE in 2010. This dataset was chosen because it is one of the largest and best understood minimum bias dataset in ALICE, and therefore could provide a

work bench to test and develop the analysis techniques. I plan to extend the analysis to the 8 and 13 TeV data, which include also jet triggers and electromagnetic calorimeters. This will allow to fully reconstructed jets (including both charged and neutral constituents) and extend the kinematical reach, thanks to the larger luminosity sampled by the jet triggers.

Reason to attend QM2017

I am submitting an abstract for QM2017 on behalf of the ALICE Collaboration to show preliminary results of the D-meson tagged jet spectrum in pp collisions, for which I am the main analyzer. My measurement of D-tagged jets is relatively new in the field, with little theoretical guidance from the literature; hence I look forward to engaging in conversations with theorists and other experimentalists in order to receive comments and suggestions to lead my research more effectively towards addressing the questions and challenges that we face in our field today. I also expect to get inspired by the latest advancements from both theory and experiment to shape the direction of my research in the longer term. Finally the student day has always been a very formative experience, that gives me a unique opportunity to deepen my understanding of fundamental concepts in our field.