See the Postgraduate Assessment Regulations for Research Degrees:

[www.ed.ac.uk/schools-departments/academic-services/policies-regulations/regulations/assessment](file:///\\ed\dst\shared\SASG\AAPS\T-InformationResources\06-Websites\03-AcademicAffairsWebsite\03-PolopolyUpdate200910\2013Update\www.ed.ac.uk\schools-departments\academic-services\policies-regulations\regulations\assessment)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Name of student: | Jack J. Medley | | UUN | S1231192 |
| University email: | Jack.medley@ed.ac.uk | | | |
| Degree sought: | PhD Theoretical Particle Physics | No. of words in the main text of thesis: | | 42000 |
| Title of thesis: | High Energy Resummation and Electroweak Corrections in Dijet Production at Hadronic Colliders | | | |

Insert the abstract text here - the space will expand as you type.

|  |
| --- |
| QCD final states are ubiquitous at hadron colliders such as the Large Hadron Collider (LHC). Therefore understanding high energy perturbative quantum chromodynamics at these experiments is essential not only as a test of the Standard Model, but also because many of the dominant background to many new physics searches is QCD in nature. One such `standard candle' is the production of a dilepton pair in association with dijets. Here we present a new description of this final state (through Z0 boson and virtual photon). This calculation adds to the fixed-order accuracy the dominant logarithms in the limit of large partonic centre-of-mass energy to all orders in the strong coupling a\_s. This is achieved within the framework of High Energy Jets. This calculation is made possible by extending the high energy treatment to take into account the multiple t-channel exchanges arising from Z0 and gamma\* -emissions off several quark lines. The correct description of the interference effects from the various t-channel exchanges requires an extension of the subtraction terms in the all-order calculation. We describe this construction and compare the resulting predictions to a number of recent analyses of LHC data. The description of a wide range of observables is good, and, as expected, stands out from other approaches in particular in the regions of large dijet invariant mass and large dijet rapidity spans. In addition we also present two new experimental studies. Firstly, we show a comparison of High Energy Jets matched to the ARIADNE parton shower to an ATLAS study of gap activity in dijet events, this is also compared to several other state-of-the-art next-to-leading order (in a\_s) Monte Carlo generators matched with both with PYTHIA and HERWIG parton shower codes. We see that our description agrees well with the data throughout. Secondly, we present a study of Z0/gamma\* plus dijets at 100 TeV. We compare the behaviour of the high energy logarithmic enhancements to the QCD perturbative series at 7 TeV and 100 Tev and see that at any high energy hadronic Future Circular Collider (FCC) the effects described by our resummation become significantly more important. |