APPLICATION FOR FUNDING FROM NEW SR2002 RESOURCES

UK CDF Collaboration

Glasgow University, Liverpool University, Oxford University, University College London

INTRODUCTION

The CDF experiment is one of the two experiments at the world's highest energy collider – the Fermilab Tevatron. Until the LHC programme begins, the Tevatron experiments remain the experiments with the potential to discovery new physics beyond the Standard Model at the energy frontier and to make measurements of unprecedented accuracy within the Standard Model. If the mechanism of mass generation is to be elucidated via the discovery of a light Higgs Boson before the LHC then it will be done at the Tevatron.

The Tevatron collider and the CDF experiment have recently completed a substantial upgrade program that is now yielding data of greater quality, at a higher rate and at a higher center of mass energy than previous Tevatron runs. In the next five years the CDF experiment will make some of the most interesting measurements at the forefront of the high-energy particle physics programme. The physics exploitation, successful running and further optimization of the CDF experiment however depend on the UK groups continuing to play a leading role in the experiment. This leading role and the UK's potential to exploit this exciting physics is jeopardized by the recent round of funding cuts.

DELIVERABLES FROM INCREASED FUNDING

An increased level of funding would allow the UK CDF groups to:

- Exploit more fully the CDF physics programme, particularly in the areas of top quark and electro-weak measurements, B physics, searches for physics beyond the Standard Model and the search for the Higgs Boson. At present, the limited funding means that resources we would like to devote to physics exploitation are being used to fulfill our collaborative responsibilities towards the maintenance and running of the CDF detector.
- Reassert leadership roles in the running of the experiment. An increased presence at Fermilab will allow UK group members to increase the UK's influence on important analyses, experimental policy, global computing integration issues, and future upgrades at CDF. This is only possible through increased travel funds.
- Benefit substantially from the computing infrastructure obtained from our successful bid for JIF funds (£ 1.8M) and our leadership of the CDF Grid effort. Additional funding will allow us to capitalise on these computing investments and will give our analyses efforts an edge in a competitive environment, resulting in more timely physics papers being published by UK collaborators.
- Maintain our reputation by honouring our financial commitments to the experiment. We negotiated a payment-in-kind of our CDF membership contributions using this JIF infrastructure. This comes to an end in 2003 when a restoration of M&O is required.

- Better supervise PhD students who are resident at Fermilab. At present adequate supervision at some UK institutes is being maintained through *ad-hoc* arrangements with US collaborators based at Fermilab. This is an unsatisfactory and ultimately unsustainable approach that is exacerbated by the unique time pressure UK students are under. Increased funding would allow more frequent, short term, supervisory trips to be made by advisors and would, in addition to facilitating better supervision, ensure that collaborators ordinarily based in the UK could still play a major analysis role in the experiment.
- Participate fully in the future development of the CDF detector. It is vital to optimize the detector, the analysis tools, and the computing infrastructure if the challenging goal of a Higgs discovery is to be realized.

RESOURCES REQUIRED

In order to deliver on the above objectives additional funding is requested.

We require a 50% increase in travel funds from the current £180K to £270K, a sum which we identified in January 2002 in our report to SCP4 as a critical threshold for physics exploitation. Please refer to this document (attached) for further details. We note that our original allocation for travel in FY2001/2 was equivalent to £250K; our current request is a modest increase on that amount.

We require an increase in M&O of £50K in order to pay our international contribution to the experiment. For the last two years, we have successfully defrayed these expenses by sharing our substantially JIF computing resources with the collaboration. The JIF project ends in 2003 when such an arrangement will no longer be possible.

We also request additional personnel at the universities, to be provided through the rolling grant mechanism. Currently 1.6, 1.4, 0, 1.5 rolling grant posts are deployed at Glasgow, Liverpool, London and Oxford respectively. Cases for additional rolling grant posts on CDF have been made by Glasgow, London and Oxford in the latest grant bid. In particular, we note a critical situation at UCL where a fixed-term ‘Responsive RA’ post is about to end. Without this post, UCL will be unable to fulfill their basic experimental contribution. We request short-term funding to avert this crisis and the consolidation of the situation in the next grant round, since it is more appropriate that such positions be funded in this manner.

SUMMARY

CDF is at the forefront of the high-energy physics programme and is poised to continue its tradition of making landmark measurements at the energy frontier. To fully exploit CDF’s enormous potential requires an increase in funding to replace loss in travel, M&O and personnel. Increased funding of £140K per annum (£90K travel/ £50K M&O) for each year in the period 2004-2007 along with the addition of rolling grant personnel would ensure that the UK can play a full and leading role in one of the world’s key high-energy physics experiments.