BUDGET JUSTIFICATION

Institution : The State University of New York at Buffalo (UB)
PI : Salvatore Rappoccio

Personnel

The requested funds of $578,755 USD (for 3 years starting in 2014) would cover two (2) months of summer salary for Prof. Rappoccio per year for three (3) years ($48,626), the full salary for one (1) postdoctoral fellow, Dr. James Dolen, for three (3) years ($154,224), and salary plus tuition for two (2) graduate students, one in-state (Joshua Kaisen) and one out-of-state (Maral Alyari), totaling $91,812 in salary and $13,740 in tuition.

Travel

This research will require significant travel to CERN. Additionally, this will cover travel costs for Dr. Dolen, Mr. Kaisen and Ms. Alyari for relocation to Fermilab or CERN. Hence, the proposal requests $31,216 in travel funds for the three years of activity.

Facilities and Administration Indirect Costs

The above figures carry an indirect cost percentage of 26% for Dr. Dolen, Mr. Kaisen and Ms. Alyari as they will not be located at the UB campus. The indirect cost for Rappoccio's summer salary is 56%, because he is located at the UB Campus. The total indirect cost is $149,563.

Below is a year-by-year summary of the funding request.

Year One (1-June-2014 – 31-May-2015)

In the first year, Dr. Dolen will perform studies of the boosted-top analyses at CMS to ensure that they will be deployable in a very early timescale in Run 2.

It is expected that the current detectors will be reinserted and incorporated in global commissioning runs collecting cosmic-ray data, followed by collision data early in 2015 for the start of Run 2. The cosmic data can be used to investigate the particle-flow algorithm reconstruction by Mr. Kaisen, as well as to begin deployment of the DQM program by Ms. Alyari. The early collision data will provide the necessary information for any further tuning.

The searches outlined above will be of high interest early in Run 2, and much of the analysis work will be in preparation for the Run 2 startup. These are expected to be designated "High Priority Analyses" (HPA's) for CMS, which means they are expected to be sensitive immediately.

In addition, Dr. Dolen is responsible for testing and commissioning of the FPIX HDI modules while stationed at Fermilab.

Mr. Kaisen will continue his work on adapting the particle-flow algorithm to work in the upgraded detector geometries in the Phase 1 and Phase 2 upgrades of CMS. He is expected to finish his classes in the Spring Semester, 2014, and will move to Fermilab

for 1 year, after which time he will move to CERN. At Fermilab he will partake in further testing and commissioning of the FPIX modules.

Ms. Alyari will primarily focus on data-quality monitoring of the jet reconstruction and jet substructure algorithms. She is expected to finish her classes in the Fall Semester, 2013, and will move to Fermilab for 1-2 years. She is expected to stay at Fermilab for the remainder of her graduate studies.

Since this is the year that the LHC startup will occur, the first public outreach event will be presented.

Year Two (1-June-2015 – 31-May-2016)

Since the LHC Run 2 is expected to be in operation during the second year of this proposal, it is a period of high activity. Thus, it will be necessary to have a high presence of the group at CERN, and as such, it is expected that Dr. Dolen and Mr. Kaisen will relocate there to partake in commissioning activities and in operations for the FPIX detector, as well as to be extremely plugged into the BSM searches that will be of high interest at the time. Ms. Alyari will be located at FNAL during this period. At FNAL, it is expected that she will contribute heavily via the *Remote Operations Center* (ROC) at FNAL in the jet DQM, as well as to participate in the aforementioned BSM searches.

Year Three (1-June-2016 – 31-May-2017)

It is expected that the Run 2 LHC will be fully operational at nominal luminosity in year three of this proposal, and will have collected a large fraction of the expected Run 2 collision data for physics analysis. It is also expected that between years three and four, Run 2 will end, and part of the Phase 1 upgrades of the CMS detector will be implemented. Dolen and Kaisen will be fully engaged in the pixel operation and Phase 1 upgrade preparations, as well as data analysis. Alyari will be performing DQM support and shifts, as well as data analysis.

In addition to the Phase 1 upgrade commissioning, there will be a need to further tune the PF algorithm and the jet reconstruction software to handle the newest detector, and to be ready for startup again for Run 3. The work of Mr. Kaisen and Ms. Alyari will be imperative to the successful usage of the Phase-1 upgraded detector in collisions.