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## Plan Overview

*A Data Management Plan created using DMPTool*

**Title:** Data management for the Large Hadron Collider beauty experiment.

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# Data management for the Large Hadron Collider beauty experiment.

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## Data types and sources

The sections in the template outline are based on Suggested Elements of a DMP (see Links tab) provided by DOE, but DMPs are not required to follow this template. For the data types and sources suggested element, a brief, high-level description of the data to be generated or used through the course of the proposed research and which of these are considered digital research data necessary to validate the research findings may be included.

The data generated in this proposed research is composed of 1) technical advantages in instrumentation in a high radiation environment and fast data acquisition and 2) fundamental science advances. Most data will be public, be preserved for future instrumentation applications and further development of particle production in high energy collisions. Sharing of this data will be beneficial for the high energy nuclear field. Exceptions are reserved for technical details and property information of the electronics, which belongs to the LHCb collaboration, and preliminary results reserved to the principal investigator for data checking and reliability.

Technical and scientific results of this research will be published in open search journals, presented in conferences as posters or orally, and be available in the collaboration and LANL web sites. The expected data generated by this proposed research are:

- test results of radiation hardness and light attenuation of scintillator fibers and bars: data will be published in technical reports and journals
- wavelength shifter fiber-clean fiber and clean fiber-SiPM coupling technique: technique will be described in technical reports and journals
- data acquisition performance: result will be available in technical reports and journals, details of the electronic boards are reserved to the LHCb collaboration and may contain property material
- analysis technique to select and measure Compton processes in high energy collisions: will be described in scientific journals
- report on a possible discover of gluon saturation regime or veto kinematic region: scientific information will be available in open scientific journals

## Content and format

A statement of plans for data and metadata content and format including, where applicable, a description of documentation plans, annotation of relevant software, and the rationale for the selection of appropriate standards. (Existing, accepted community standards should be used where possible. Where community standards are missing or inadequate, the DMP could propose alternate strategies that facilitate sharing, and should advise the sponsoring program of any need to develop or generalize standards.)

Annotations during the research can be presented in LHCb and LANL groups for discussions. This includes technical findings, analysis procedures and software developments.

The software produced during this research will be available only for LHCb collaboration and LANL group the principal investigator participates.

According to LANL rules technical and scientific publications may be communicated internally before submission.

## Sharing and preservation

**A description of the plans for data sharing and preservation.**

Transient data will be stored in the LHCb data management system described in the publication linked at <http://iopscience.iop.org/article/10.1088/1742-6596/396/3/032023> and in a more general description of the online system at [http://pos.sissa.it/archive/conferences/239/005/ISGC2015\\_005.pdf](http://pos.sissa.it/archive/conferences/239/005/ISGC2015_005.pdf).

Data stored in the LHCb DIRAC system will be group protected. A decision in share scientific results and procedures will be made in conjunction with LHCb collaboration after internal discussion and approval sessions. Technical findings will be submitted to the LHCb collaboration approval before publication. Internal LHCb and LANL web sites will report the progress of the research. These web pages will be accessed by LHCb collaborators and LANL physics division participants.

Public data corresponding to the result of first analysis of data previously collected by LHCb can start to be available in the first year after the beginning of this project.

Technical results are expected to be reported two years after the beginning of this project.

Property software will be used to program FPGAs in the electronic boards. The FPGA code will be stored in LANL standalone computers. The licenses can be already available at LANL or will be purchased by the project.

Specialized LANL internal sites provides public or group protected access to data produced by the LAB or collaborators. These sites will be used to inform the progress of the project and final results. Journal publications and their websites will be the main procedure to access final findings of this project.

## Protection

**A statement of plans, where appropriate and necessary, to protect confidentiality, personal privacy, Personally Identifiable Information, and U.S. national, homeland, and economic security; recognize proprietary interests, business confidential information, and intellectual property rights; and avoid significant negative impact on innovation, and U.S. competitiveness.**

All computer systems where the data will be managed are user and group protected. Only LHCb collaborators have access to the data storage disks where the transient data will be sitting in. Part of the work will also be stored in the principal investigator computer at LANL with no external access.

## Rationale

**A discussion of the rationale or justification for the proposed data management plan including, for example, the potential impact of the data within the immediate field and in other fields, and any broader societal impact.**

Technical finds can impact how to develop nuclear physics instrumentation in many levels of radiation environments. The analysis techniques developed in this research can be utilized in future experiments in other facilities. The discover of constraints for the gluon saturation regime in proton and nucleus collisions will provide a new tool to calculate and predict nuclear behavior in high energy collisions with unpredictable extensions in the field.

## Software & Codes

Both the Advanced Scientific Computing Research and Fusion Energy Sciences program areas address software and codes. Program specifics are listed below.

- FPGA code used in the readout and front-end electronics
- online monitoring of data acquisition
- offline particle tracking and kinematic reconstruction
- detector and physics simulations
- data reduction, selection and analysis in order to provide the final scientific result