Trigger and Data Acquisition at Large Hadron Collider

S. Cittolin   *CERN, Geneva, Switzerland*

Abstract

This document is both a style sheet and a guide for authors who are preparing
papers to be published in the CSC'96 proceedings, with the Word source of this
document serving as template for authors using Word.

Keywords: Template, Word, Proceedings, Technical Papers, Document Preparation

1   General

The design of a trigger and data acquisition system for a general-purpose experiment at the Large Hadron Collider poses a challenge that has no precedent in the history of experimental physics. The physics requirements, the detector characteristics and the high collision rate expected at LHC luminosities of 1032 to 1034 cm-2 s-1 inherently constrain many aspects of the architecture of a high-efficiency data acquisition system. The detector signals must be amplified, shaped and eventually digitized. The analog or digital information for each channel must be held in local buffers during the decision time of the event selection system, operating at the bunch crossing frequency of 40 MHz. Then the data fragments must be synchronized, collected and compressed to form a full event while the rate of storable events is reduced by subsequent trigger levels.

The talk introduces the requirements and the basic concepts of trigger and readout systems at LHC experiments.

- Introduction
- Rates and data at collider experiments
- Multi level trigger systems and readout structures
- Level-1 trigger systems
- Frontend readout
    - Analog to Digital Conversion
    - Digital signal processing
    - Timing, Trigger and Control distribution
- Readout network
    - Event builder and event filter
    - Computing and communication subsystems
- Development plan and conclusions

Note from the Editor:
The author has been unable to produce full documentation and has provided us with
a number of extremely interesting transparencies. However, if these transparencies.
were to be printed in the proceedings, they would be only in black and white and of
insufficient quality. They can be found in colour on the Web, via the URL

http://cmsdoc.cern.ch/ftp/distribution/tridas/CMS-DOC/CernSchool96.pdf