Abstract

The future upgrade of the Large Hadron Collider accelerator, the High-Luminosity LHC, has its goal of increasing the beam luminosity by ten times. This will lead to a corresponding growth of the amount of data to be treated by the data acquisition systems, and an increase in radiation. The GigaBit Transceiver ASICs and transmission protocol was developed to provide a high radiation tolerant, high speed, optical transmission line capable of simultaneous transfer of readout data, timing and trigger signals in addition to slow control and monitoring data. The GBT system can be separated into two parts: the on-detector part (GBT custom made ASICs) and the off-detector part (Common Readout Unit).

The primary objective of this thesis has been to design a control interface software for the CRU, along with the design of a PCB that provides physical connection between the CRU and the GBT ASICs. A hardware module was written for the control interface to allow for communication between the software and the CRU. The communication involves an UART and the RS-232 protocol, and the CRU is connected to the PC using an RS232 adapter cable with voltage conversion. The control interface was written in the C-language and is cross-platform compatible. The PCB connects to the CRU using a HSMC contact, and has 10 HDMIs and a SFP-module which allows for connection with the on-detector GBTx ASIC using e-link or fiber-optical connection. The software is not completed, but is well on its way to become usable. The PCB is completed, but some testing remains. In addition, a full system test remains involving the software and PCB together with the GBT ASICs.