Department of Physics and Technology

Master Thesis

Interface Design for the
Gigabit Transceiver Common Readout Unit

Anders Østevik

June 2016

Overview
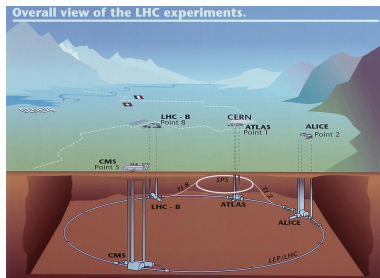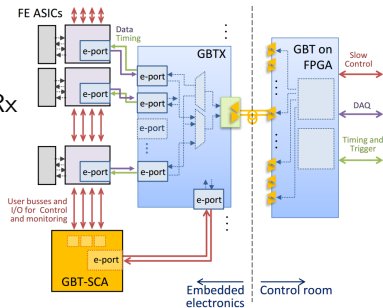
LHC Upgrade

- Large Hadron Collider (LHC)
  - 27 km circular tunnel
  - 13 TeV
- High-Lumiosity LHC
  - 10x beam lumiosity
  - Increase in radiation and amount of data
  - $\rightarrow$ Gigabit Transceiver
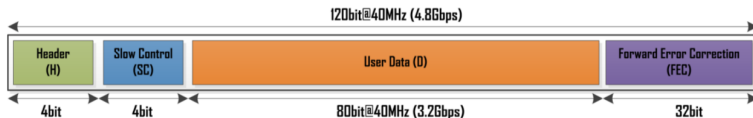

Overall view of the LHC experiments.

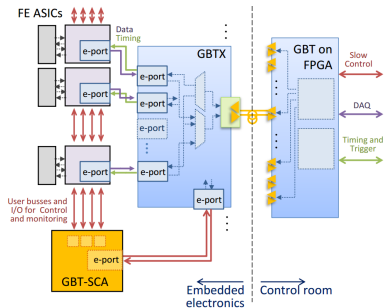# Gigabit Transceiver System

- On-detector - Custom ASICs
  - GBTx, GBT-SCA, VTTx/VTRx
  - E-links
- Off-detector - Control room
  - CRU (FPGA)
  - $> 4.8 \; \mathrm{Gbit/s}$ transceivers
  - GBT-FPGA
- Optical communication

Gigabit Transceiver System

- Encoding modes
  - GBT-Frame
  - 8B/10B
  - Wide-Bus

Bullet Points

- Lorem ipsum dolor sit amet, consectetur adipiscing elit
- Aliquam blandit faucibus nisi, sit amet dapibus enim tempus eu
- Nulla commodo, erat quis gravida posuere, elit lacus lobortis est, quis porttitor odio mauris at libero
- Nam cursus est eget velit posuere pellentesque
- Vestibulum faucibus velit a augue condimentum quis convallis nulla gravida

○○○○●○

Blocks of Highlighted Text

Block 1

Lorem ipsum dolor sit amet, consectetur adipiscing elit. Integer lectus nisl, ultricies in feugiat rutrum, porttitor sit amet augue. Aliquam ut tortor mauris. Sed volutpat ante purus, quis accumsan dolor.

Block 2

Pellentesque sed tellus purus. Class aptent taciti sociosqu ad litora torquent per conubia nostra, per inceptos himenaeos. Vestibulum quis magna at risus dictum tempor eu vitae velit.

Block 3

Suspendisse tincidunt sagittis gravida. Curabitur condimentum, enim sed venenatis rutrum, ipsum neque consectetur orci, sed blandit justo nisi ac lacus.

Multiple Columns

Heading

1. Statement
2. Explanation
3. Example

Lorem ipsum dolor sit amet, consectetur adipiscing elit. Integer lectus nisl, ultricies in feugiat rutrum, porttitor sit amet augue. Aliquam ut tortor mauris. Sed volutpat ante purus, quis accumsan dolor.

Table

Treatments	Response 1	Response 2
Treatment 1	0.0003262	0.562
Treatment 2	0.0015681	0.910
Treatment 3	0.0009271	0.296

Table: Table caption

Theorem

Theorem (Mass–energy equivalence)

$E = mc^2$

Verbatim

Example (Theorem Slide Code)

```
\begin{frame}
\frametitle{Theorem}
\begin{theorem}[Mass--energy equivalence]
$E = mc^2$
\end{theorem}
\end{frame}
```

Figure

Uncomment the code on this slide to include your own image from the same directory as the template .TeX file.

Citation

An example of the \cite command to cite within the presentation:

This statement requires citation [Smith, 2012].

References

John Smith (2012)
Title of the publication
Journal Name 12(3), 45 − 678.

The End