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FPGA Development for the LHCb Vertex Locator Upgrade

Nicholas Mead

8064141

School of Physics and Astronomy
University of Manchester

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Abstract

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Contents

1	Introduction	1
1.1	The Standard Model of Particle Physics	1
1.2	The LHCb Experiment	1
1.2.1	The Detector	1
1.2.2	Physics Studied at LHCb	1
1.2.3	VELO Upgrade	1
1.3	FPGAs in Particle Detectors	1
1.3.1	Field Programable Gate Arrays	1
1.3.2	The Role of FPGA's in the VELO Upgrade	1
2	Scrambling Algorithms	2
2.1	The Role of Scrambling Data in the VELO	2
2.2	Additive and Multiplicative Scramblers	2
2.3	The Different Options for Scrambleing Algorithms	2
2.4	Algorithm Analysis	2
2.4.1	Messurements of the Algorithms	2
2.4.2	Results of Analysis	2
2.5	Conclusion	2
3	Event Isolation Flagging	3
3.1	Motivation	3
3.2	Time Sorting Data	3
3.3	Bubble Sorting	3
3.4	Isotation Checking	3
3.5	Conclusion	3

4	Future Development	4
4.1	LHCb 2020 Upgrade	4
4.2	Further Development of FPGA's in the VELO	4
5	Conclusion	5
6	Acknowledgments	5

1 Introduction

1.1 The Standard Model of Particle Physics

$$E^2 = M^2c^4 + P^2c^2 \quad (1)$$

1.2 The LHCb Experiment

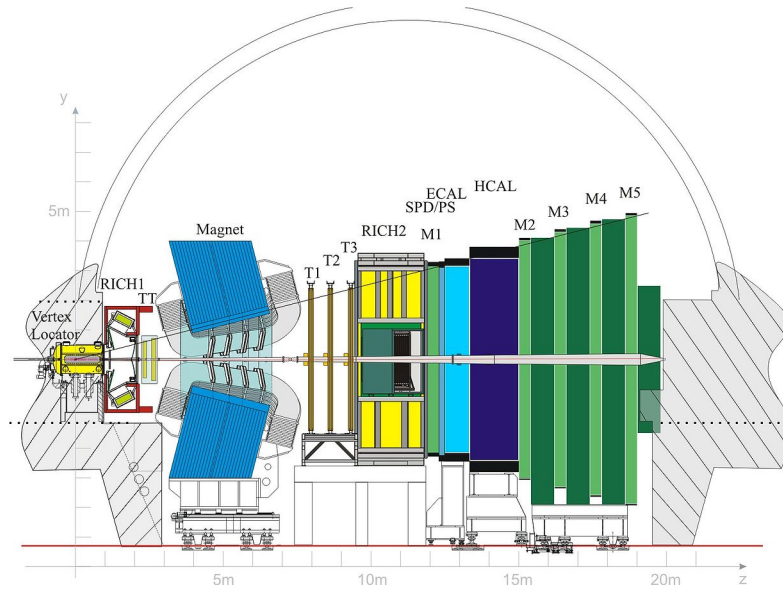


Figure 1: The LCHb Detector along the bending plane.

1.2.1 The Detector

1.2.2 Physics Studied at LHCb

1.2.3 VELO Upgrade

1.3 FPGAs in Particle Detectors

1.3.1 Field Programable Gate Arrays

1.3.2 The Role of FPGA's in the VELO Upgrade

2 Scrambling Algorithms

2.1 The Role of Scrambling Data in the VELO

2.2 Additive and Multiplicative Scramblers

2.3 The Different Options for Scrambling Algorithms

2.4 Algorithm Analysis

2.4.1 Measurements of the Algorithms

2.4.2 Results of Analysis

2.5 Conclusion

3 Event Isolation Flagging

Event Isolation

3.1 Motivation

Motivation

3.2 Time Sorting Data

Time Sorting

3.3 Bubble Sorting

Bubble Bubble Bubble

3.4 Isolation Checking

Isolation Checking

3.5 Conclusion

In Conclusion, Nick is Awesome

4 Future Development

This is future dev

4.1 LHCb 2020 Upgrade

2020 upgrade

4.2 Further Development of FPGA's in the VELO

fpga in velo

5 Conclusion

This is the Conclusion

6 Acknowledgments

I would like the Acknowledge Pablo Rodriguez and Marco Gersabeck for there continued support and supervision.