# FPGA Development for the LHCb Vertex Locator Upgrade

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#### Abstract

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## Contents

1	Intr	roduction	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	Scra	ambling 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	Eve	ent 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		
6	Acknoledgments	5	
Re	References		

## 1 Introduction

#### 1.1 The Standard Model of Particle Physics

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

### 1.2 The LHCb Experiment

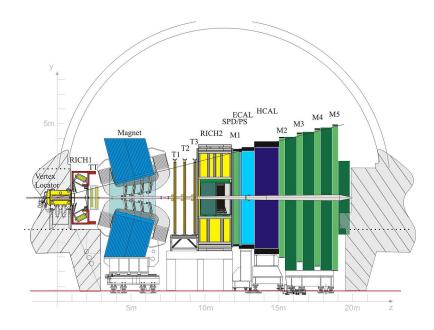


Figure 1: The LCHb Detector along the bending plane.

- 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
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- 2.4 Algorithm Analysis
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- 2.4.2 Results of Analysis
- 2.5 Conclusion

## 3 Event Isolation Flagging

Event Isosation

#### 3.1 Motivation

Motivation

## 3.2 Time Sorting Data

Time Sorting

### 3.3 Bubble Sorting

Bubble Bubble

### 3.4 Isotation 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 Acknoledgments

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

## References

[1] Cern. LCHb Collaboration. 2015. URL: http://lhcb.web.cern.ch/lhcb/ (visited on 11/21/2015).