Stockholm University

Calibration of Hadronic Calorimeter Cells and New Physics Searches at the ATLAS experiment

Alessandro Montella

Licentiate Thesis in Experimental Particle Physics at Stockholm University, Sweden 2025

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List of Papers

The following papers are included in the thesis. They are referred to by their Roman numerals in the text.

I Authors, *Title*, [1706.07806]

II Authors, *Title*, [1708.07833]

III Authors, *Title*, [1703.07787]

The following papers are complementary and not included in the thesis. They are quoted as ordinary references in the main text.

IV Authors *Title*, [1706.00787]

V Authors, *Title*, [1710.06434]

VI Authors, *Title*, [1409.1909]

The chronological order of the papers is ...

Contents

Illustrations

List of Figures

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Preface

This licentiate thesis is a thesis by publication consisting of two major parts: introductory chapters comprising a summary of the scientific results, and the corresponding papers published or submitted for publication.

. . .

Contribution to papers

Paper I. contributions...

Paper II. contributions...

Paper III. contributions...

Paper IV. contributions...

Paper V. contributions...

Paper VI. contributions...

Acknowledgments

My deepest gratitude goes to ...

Alessandro Montella
Stockholm, 2025-02-12

Abbreviations

AdS	anti-de Sitter [**?**]
.	.
.	.
.	.
SM	The Standard Model of particle physics

Chapter 1

Introduction

The outline of the thesis that is a comprehensive summary of papers (optional items are given italic)

- Front matter
    1. Title page, recto
    2. Printing info (*abstract*), verso
    3. *Dedication page*, recto
    4. List of papers, recto
    5. Table of Contents, recto
    6. *List of Figures/Tables*, recto
    7. *Preface*
       (including author's contribution and acknowledgments), recto
    8. *Abbreviations*, recto
- Part I. Comprehensive summary
    1. Chapter 1. Introduction
    2. Chapter 2, . . .
    3. Summary
    4. Svensk sammanfattning (A short summary in Swedish should be be included if the thesis is written in a foreign language.)
    5. References
- Part II. Papers
    1. Paper 1, . . .
    2. Paper 2, . . .

Typography, A4

- Paper: 210 mm × 297 mm
- Text: 140 mm × 211 mm
- Font: 12 pt
- Inner offset: 8 mm
- Margins:
  T = 40, B = 46, T+B = 96
  I = 38, O = 32, I+O = 70

Typography, S5

- Paper: 165 mm × 242 mm
- Text: 140 mm × 211 mm
- Font: 11 pt
- Margins: T = 17.5, B = 17.5, T+B = 35
  I = 22.5, O = 22.5, I+O = 45

S5 output

By default, the output is A4 (with 12 pt font). To generate S5:

1. Uncomment `\Spapertrue` flag in `parameters.tex`.
2. Compile `lic-thesis.tex`
3. Compile `lic-thesis-S5.tex`

The output `lic-thesis-S5.pdf` will be in the S5 format.

By enabling `\Spapertrue` flag, the margins of the master are prepared to be scaled to S5. Namely, the master pdf (coming out from `lic-thesis.tex`) is scaled by `lic-thesis-S5.tex` so the original 12 pt font will be scaled down to 11 pt in the resulting S5 output.

Caution: If you want to continue working with the A4 output, do not forget to comment `\Spapertrue` flag in `parameters.tex`.

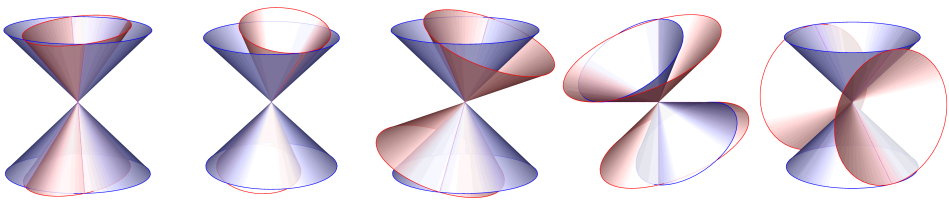
Included PDFs

You can include PDFs of the included papers by enabling `\IncludePDFstrue` flag in `parameters.tex`. By default, the inclusion is disabled (as it slows done the compilation).

The page numbers of the included PDF will be overwritten by the page numbers of the thesis. The included papers will be then marked by twofold page numbers. For instance, the folio `Paper II - 5 (81)` marks a page from Paper II having the internal (article) page number 5 and the overall (thesis) page number 81. To modify the position of the page numbers, see the arguments `#5` and `#6` in `\paperSection`. To debug the positions, you can temporarily enable the flags `\ShowLayouttrue` and `\ShowGridtrue` in `parameters.tex`. The macro `\overlayPaperFolio` is responsible for emitting the thumb marks and page numbers on each page of the PDF. It can be found in `preamble.tex`.

Chapter 2

Main results



Type I Type IIa Type IIb Type III Type IV

Figure 2.1: Allowed null cone configurations.

Table 2.1: Allowed local metric configurations.

Type	diag(g)	diag(f)	diag($g^{-1}f$)
I	$(-1,1,1,1)$	$(-\lambda_1,\lambda_2,\lambda_3,\lambda_4)$	$(\lambda_1,\lambda_2,\lambda_3,\lambda_4)$
IIa	$(\pm\begin{pmatrix}0&1\\1&0\end{pmatrix},1,1)$	$(\pm\begin{pmatrix}0&\lambda\\\lambda&1\end{pmatrix},\lambda_2,\lambda_3)$	$(\begin{pmatrix}\lambda&1\\0&\lambda\end{pmatrix},\lambda_2,\lambda_3)$
IIb	$(\pm\begin{pmatrix}0&1\\1&0\end{pmatrix},1,1)$	$(\pm\begin{pmatrix}b&a\\a&-b\end{pmatrix},\lambda_2,\lambda_3)$	$(\begin{pmatrix}a&-b\\b&a\end{pmatrix},\lambda_2,\lambda_3)$
III	$(\begin{pmatrix}0&0&1\\0&1&0\\1&0&0\end{pmatrix},1)$	$(\begin{pmatrix}0&0&\lambda\\0&\lambda&1\\\lambda&1&0\end{pmatrix},\lambda_2)$	$(\begin{pmatrix}\lambda&1&0\\0&\lambda&1\\0&0&\lambda\end{pmatrix},\lambda_2)$
IV	$(-1,1,1,1)$	$(\lambda,-\lambda,\lambda_2,\lambda_3)$	$(-\lambda,-\lambda,\lambda_2,\lambda_3)$

Chapter 3

Applications

Chapter 4

Summary and outlook

The results of Paper I are relevant for ...

Svensk sammanfattning

A short summary in Swedish should be be included if the thesis is written in a foreign language.

Paper I

Authors, *Paper title*, [1708.07833]

Paper II

Authors, *Paper title*, [1708.07833]

Paper III

Authors, *Paper title*, [1708.07833]

[Placeholder for abstract]

This is a coverpage template for Lic Thesis.

See: `cover/cover-page.tex`

Usage:

There are many flags to turn on/off:

- `\Debugtrue` = Show debug frames
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Regards,
Mikica Kocic

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Stockholm University