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Progress Report

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Project Aqueous

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Number 6

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School of Physics and Astronomy

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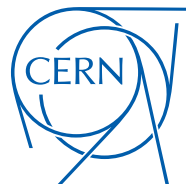
University of Glasgow

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March 2020

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Abstract

13 A brief summary of the report.

Acknowledgements

15 The contributions of Number 2 and Number 1 are acknowledged.

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52 Introduction

53 0.1 Higgs bosons

54 Higgs bosons are particles that arise through electroweak symmetry breaking. A principal
55 motivation for the Large Hadron Collider physics programme was the testing of the theory
56 of electroweak symmetry breaking, through the observation of Higgs bosons. In July of
57 2012, the existence of the Higgs boson was confirmed by the ATLAS and CMS experiments.
58 Following this discovery, further studies have been ongoing in order to examine the character
59 of the particle.

60 Chapter 1

61 A title for chapter 1

62 1.1 Section 1

63 This is content.

64 1.1.1 Time

65 A few time representations follow:

- 66 • 2020-03-10
- 67 • 10 March 2020
- 68 • March 2020
- 69 • 185905
- 70 • 1859
- 71 • 2020-03-10T185905
- 72 • 2020-03-10T1859

73 1.1.2 Units and units typesetting

- 74 • $a^b \text{ m}^2$ – correct unit typesetting (manual siunitx function) (preferred for mathematics
- 75 mode, though note that the function for this is provided by aqueous [see below for
- 76 manual equivalent method not dependent on aqueous])
- 77 • 10 kg – correct unit typesetting (siunitx)
- 78 • 10 kg – incorrect unit typesetting (mathematics, textnormal)
- 79 • 10 kg – incorrect unit typesetting (literally)
- 80 • 10 kgms^{-2} – correct unit typesetting (siunitx)
- 81 • 10^{-28} m^2 – correct unit typesetting, though very manual (siunitx)
- 82 • $a^b \text{ m}^2$ – correct unit typesetting, though manual (siunitx) (preferred for mathematics
- 83 mode)
- 84 • $a^b \text{ m}^2$ – dodgy, manual correct unit typesetting (siunitx)
- 85 • $a^b \text{ m}^2$ (siunitx)
- 86 • The angle is 14° .
- 87 • The temperature is 14°C . – correct unit typesetting (siunitx)

88 1.1.3 Mathematics

89 The following is a referenced equation:

$$E = mc^2 \tag{1.1}$$

90 This is a reference to equation 1.1.

91 This is bold mathematics within non-bold mathematics: $t\bar{t}\mathbf{H}(b\bar{b})$.

92 This is bold mathematics: $t\bar{t}\mathbf{H}(b\bar{b})$.

93 1.1.4 Lists

94 This is a list:

- 95 • function,
- 96 • Job,
- 97 • JobGroup,
- 98 • ParallelJobProcessor and
- 99 • pool.

100 This is a checklist:

101 ✓ item

102 ✓ item

103 ✓ subitem

104 ✓ subitem

105 ✓ subitem

106 ✓ item

107 ✗ item

108 1.1.5 Code

109 This is some code:

110 `Reco_tf.py --inputBSFile data12.1234.RAW --outputESDFile data12.1234.ESD`

111 1.1.6 Images

112 This is a figure set to a defined width:

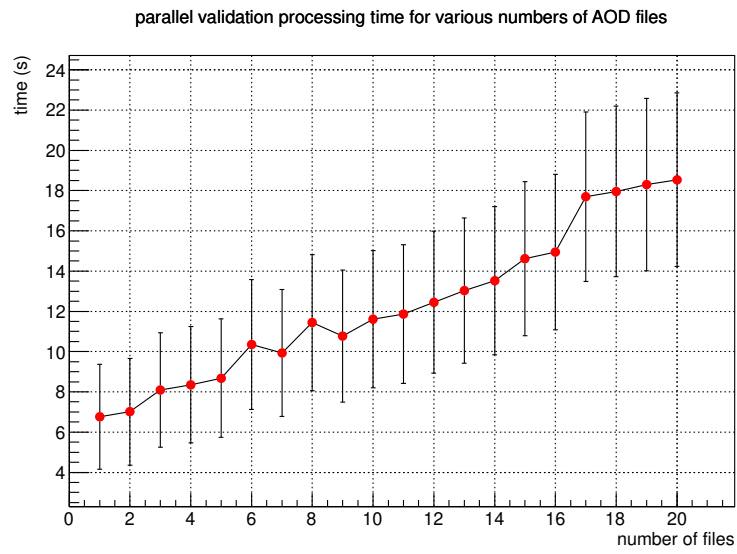


Figure 1.1: Parallel job processor: large efficiency improvement as a result of parallelisation

113 This is a figure set to the text width:

Figure 1.3: Feynman diagram

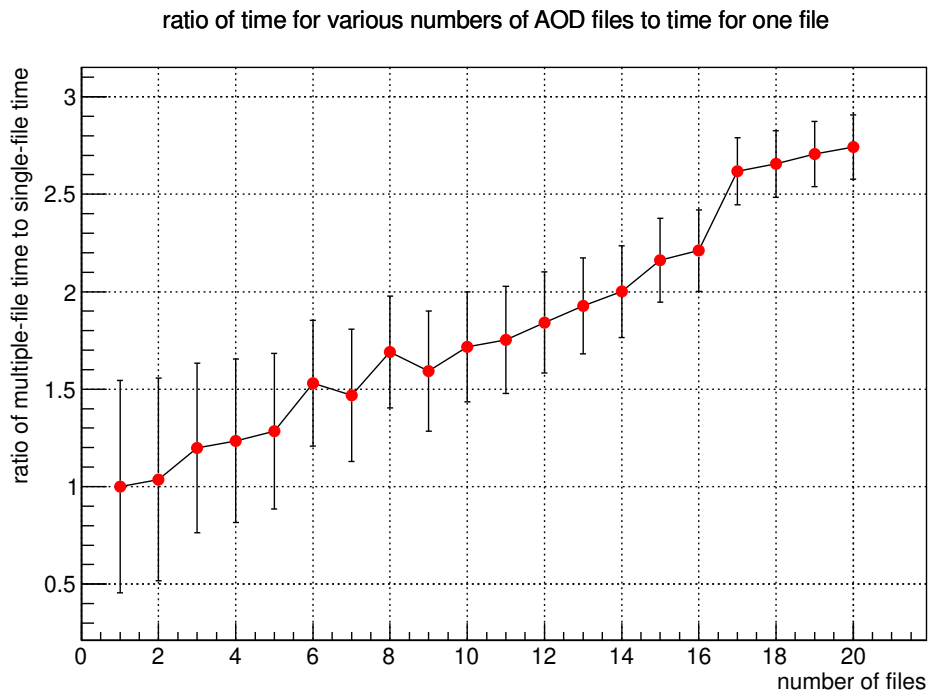


Figure 1.2: parallel job processor

114 Here is a Feynman diagram:

115 1.1.7 References

116 This is a reference to figure 1.2. This is a reference [1]. This is another reference [2]. This
 117 is a URL: <https://github.com/wdbm/aqueous>

119 1.1.8 ROOT

120 ROOT [3] is an object oriented data analysis framework aimed at solving data analysis
121 challenges in high energy physics. While *ROOT* is simply a name, a possible acronym for
122 the system could be “*Rapid Object-Oriented Technology*” [4]. ROOT was developed in the
123 context of the NA49 experiment at CERN. NA49 generated data of approximately 10 TB
124 per run. This rate of data provided a test environment for the development of ROOT, as
125 the next generation of data analysis. ROOT features *Cling*, a C++ interpreter.¹

¹This is a footnote.

1.1.9 Some paragraphs

127 Lorem ipsum dolor sit amet, consectetur adipiscing elit. Ut purus elit, vestibulum ut,
128 placerat ac, adipiscing vitae, felis. Curabitur dictum gravida mauris. Nam arcu libero,
129 nonummy eget, consectetur id, vulputate a, magna. Donec vehicula augue eu neque. Pel-
130 lentesque habitant morbi tristique senectus et netus et malesuada fames ac turpis egestas.
131 Mauris ut leo. Cras viverra metus rhoncus sem. Nulla et lectus vestibulum urna fringilla
132 ultrices. Phasellus eu tellus sit amet tortor gravida placerat. Integer sapien est, iaculis
133 in, pretium quis, viverra ac, nunc. Praesent eget sem vel leo ultrices bibendum. Aenean
134 faucibus. Morbi dolor nulla, malesuada eu, pulvinar at, mollis ac, nulla. Curabitur auctor
135 semper nulla. Donec varius orci eget risus. Duis nibh mi, congue eu, accumsan eleifend,
136 sagittis quis, diam. Duis eget orci sit amet orci dignissim rutrum.

137 Nam dui ligula, fringilla a, euismod sodales, sollicitudin vel, wisi. Morbi auctor lorem non
138 justo. Nam lacus libero, pretium at, lobortis vitae, ultricies et, tellus. Donec aliquet, tortor
139 sed accumsan bibendum, erat ligula aliquet magna, vitae ornare odio metus a mi. Morbi
140 ac orci et nisl hendrerit mollis. Suspendisse ut massa. Cras nec ante. Pellentesque a nulla.
141 Cum sociis natoque penatibus et magnis dis parturient montes, nascetur ridiculus mus.
142 Aliquam tincidunt urna. Nulla ullamcorper vestibulum turpis. Pellentesque cursus luctus
143 mauris.

144 Nulla malesuada porttitor diam. Donec felis erat, congue non, volutpat at, tincidunt tris-
145 tique, libero. Vivamus viverra fermentum felis. Donec nonummy pellentesque ante. Phasel-
146 lus adipiscing semper elit. Proin fermentum massa ac quam. Sed diam turpis, molestie
147 vitae, placerat a, molestie nec, leo. Maecenas lacinia. Nam ipsum ligula, eleifend at, accum-
148 san nec, suscipit a, ipsum. Morbi blandit ligula feugiat magna. Nunc eleifend consequat
149 lorem. Sed lacinia nulla vitae enim. Pellentesque tincidunt purus vel magna. Integer non
150 enim. Praesent euismod nunc eu purus. Donec bibendum quam in tellus. Nullam cursus
151 pulvinar lectus. Donec et mi. Nam vulputate metus eu enim. Vestibulum pellentesque felis
152 eu massa.

153 Quisque ullamcorper placerat ipsum. Cras nibh. Morbi vel justo vitae lacus tincidunt
154 ultrices. Lorem ipsum dolor sit amet, consectetur adipiscing elit. In hac habitasse platea

155 dictumst. Integer tempus convallis augue. Etiam facilisis. Nunc elementum fermentum wisi.
156 Aenean placerat. Ut imperdiet, enim sed gravida sollicitudin, felis odio placerat quam, ac
157 pulvinar elit purus eget enim. Nunc vitae tortor. Proin tempus nibh sit amet nisl. Vivamus
158 quis tortor vitae risus porta vehicula.

input file option	description
--inputHitsFile	input only
--inputBSFile	RAW data (BS = ByteStream), currently input only
--inputRDOFile	
--inputESDFile	
--inputAODFile	
output file option	description
--outputRDOFile valid	if starting from Hits
--outputESDFile valid	if starting from Hits, RDO or BS
--outputAODFile valid	if starting from ESD or anything else upstream
--outputNTUP_XXXFile	can be made from ESD or AOD, BS or RDO

Figure 1.4: Reco.tf.py usage

Chapter 2

Example of the use of bold mathematics in chapter titles while corresponding bold text is used in contents: the Standard Model Higgs boson in $t\bar{t}H$ ($b\bar{b}$)

2.1 Further example of the use of bold mathematics in section titles while corresponding normal text is used in contents: the Standard Model Higgs boson in $t\bar{t}H(H \rightarrow b\bar{b})$

170 Chapter 3

171 A title for future

172 If we can hit that bullseye, the rest of the dominos will fall like a
house of cards. Checkmate!

Zapp Brannigan

You hear the bird's gurgling?

173 Pedro Carolino in *English As She is Spoke* (1883), a book which was
intended as a Portuguese–English phrase book, but which was
written by Carolino using dictionaries as opposed to a
comprehension of the English language, hence it is a sort of 19th
century machine translation.

174 3.1 future plans and considerations

175 These are suggestions and plans for the future.

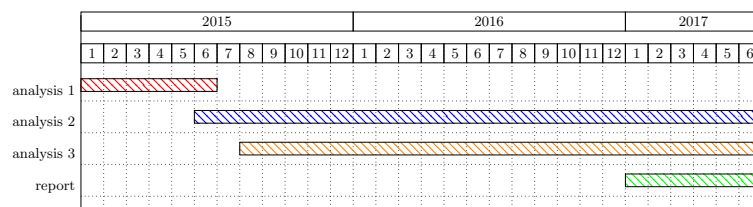


Figure 3.1: Gantt chart of work

References

- [1] L. Li Tianjun, W. Xia, W. You-kai and Z. Shou-hua, *Distinguishing the Color Octet Axial-Vector-like Particle for Top Quark Asymmetry via Color Flow Method at the LHC* (June 2013), arXiv:1306.3586
- [2] W. S. McCulloch and W. Pitts, *A logical calculus of the ideas immanent in nervous activity*, The Bulletin of Mathematical Biophysics, 5 (4), 115–133 (1943)
- [3] *ROOT: A Data Analysis Framework* (November 2012), URL <http://root.cern.ch>
- [4] R. Brun, *Re: What does ROOT stand for?*, RootTalk (May 1998), URL <http://root.cern.ch/root/roottalk/roottalk98/0718.html>