

Comments to the second draft of CDF 10903, Higgs search in the MET + jets channel,

November 13, 2012 single column with line number version

Diego Tonelli, Peter Renton, Jonathan Rosner and Giorgiob, November 26, 2012

GENERAL COMMENT

The draft is in a good shape. Most SPRG concerns on draft 1 have been addressed. The serious effort made for understanding the origin of the different limits obtained in this analysis relative to the previous one is appreciated. The conclusion is that it must be statistical in essence. However, these studies cannot possibly determine the range of plausible statistical fluctuations as the Monte Carlo simulations suggested in the SPRG comments to Draft 1 would be able to. We maintain that such a study, even with simplified assumptions, would offer a more convincing proof that what we are seeing can indeed be a statistical fluctuation. As the publication of this interesting result does not appear to be urgent, we suggest considering again performing such simulation studies. The risk will be avoided that the publication be slowed down by the Publisher.

LINE-BY-LINE

Abstract.

Line 1. Suggest "...Higgs boson produced in association with..."

Line 4. Suggest "...inclusion of an algorithm for the identification of jets originated from bottom quarks specifically optimized..."

Line 5. Suggest "Across the searched for Higgs-boson...."

Page 2.

Line 9. Suggest "...a massive scalar boson called the Higgs particle." (avoid repetition of "boson").

Lines 13 to 15. "of this particle" is repeated three times in three lines. Try to avoid this repetition.

Line 15. Suggest "...are important in understanding whether it is the SM Higgs boson or another state ("whether" needs an alternate option, otherwise use "if").

Lines 16 and 17. Suggest "...sensitivities ...are primarily provided...". Suggest "provided" rather than "influenced".

Line 19. Suggest "...is provided largely by decays..."

Line 21. Suggest "...yet known if this excess..."

Line 26. "QCD" is undefined. You may consider defining it here by using quotation marks.

Lines 31, 32. "...and larger acceptance of signal-like events that in direct..." Are you alluding to acceptance of b-pairs in the Higgs mass range? Why their acceptance should be larger than in inclusive production?

Line 34. "improves"? Relative to what? Relative to an inclusive search? Is there any credible reason for b-jets being rarer in associated QCD production than in inclusive jet production?

Line 35. Suggest "...most sensitive channel..."

Line 38. Suggest "...search channel [5]. The same..."

Page 3

Line 41. Suggest "...collected in p-pbar collisions at a center-of-mass.. ."

Line 42. Suggest adding before "Calorimeter..." a brief sentence outlining the structure of the detector, like "It features a cylindrical silicon detector and drift wire tracking system in a superconducting solenoid, surrounded by projective calorimeters and muon detectors."

Line 45. Suggest "inner tracking system"

Line 46. Suggest "with track segments in the outer muon detector [12]."

Line 50. Suggest "In the analysis, we further require..."

Line 54. "charged-particle momentum determination" (tracks don't have momentum).

Line 58. Delete "therefore".

Line 61. Suggest "...second and (if present) third jet's directions are required..."

Line 62. Suggest "...are reconstructed within the silicon detector acceptance...". Note that "silicon detector" was not mentioned before. This is in part the reason for the proposed sentence on line 42.

Line 64. Suggest "...an artificial neural network discriminant that incorporates..."

Line 69. Suggest "...assigns a scalar value to each..."

Page 4

Line 73. The variable v was not defined. Suggest defining it in lines 71-72 as "...tend to cluster at values close to $v = 1$...near $v = -1$."

Line 74. Add reference after "previous analysis". Suggest "...accept events classified according to three categories..."

Line 77. "The differences in tag categories...". Actually, the difference is in nomenclature. Suggest "The tag categories selected in ref 5 and in this analysis are compared in table I".

Line 80. Can delete "In addition to...events" and just start with "Other..."

Line 90. Please add the formula for H_T , or say which objects participate in this sum of transverse energies.

Line 91. "charge fraction" should be defined.

Line 92. As commented on draft 1 it is necessary to say why you add the "number of reconstructed vertices" (there is an explanation for each one of the other new input variable).

Page 5.

Line 94. "muon...". Not all jets are bound to contain a muon. Suggest making this clear.

Line 103. Suggest "...and the corresponding combined background prediction...".

Line 104. Suggest "...which are included in a second stage as inputs..."

Line 111. Suggest specifying what are the training samples for NN_{QCD} .

Line 113. Delete "then"

Line 114. Can remove "for a given tag category", since it was made clear at the start of sentence.

Line 116. "...each of which is well validated...". What do you mean with "well validated"? Please expand.

Page 7.

Fig 1. Rather than just saying "Events/bin", suggest including the bin-width information in the vertical axis labels. E.g., "Events per 8 GeV/c²", and so on.

Line 126. Suggest using a period: "...events. They were..."

Lines 133, 134. Suggest "...combined likelihood is formed for each category from..."

Page 8.

Lines 137 to 144. Please add some justification for the values of each of the systematic uncertainties quoted. This is important for being credible.

Page 9.

Lines 153, 155, "roughly" → "approximately" (three times).

Line 158. "is performed" (one should use the present tense when referring to this work).

Line 161. "we observe".

Line 167. "are rejected".

Line 168. "they fail".

Line 170. "are assigned".

Line 173. "by approximately half standard deviation".

Page 10.

Lines 175, 176. "are investigated".

Line 179. Suggest dropping "respectively", as inessential.

Line 182. "we track".

Line 187. Suggest removing the comma after "untagged events".

Line 188. "...or untagged events." The observation that some previously untagged events are now found TT is amazing. This raises suspects on our b-tagging codes.

Line 190. "...resulting in an approximately one-standard-deviation deficit...". Please add uncertainty on 42.4.

Line 191. "relative to the expected background" is unnecessary. Suggest "For SS events passing the same NN_{SIG} threshold..."

Line 195. "...corresponding approximately to one-standard-deviation excess [18]."

Line 196. Suggest removing "in the double-tight tag categories", since the two categories being considered are mentioned one line below.

Line 198. Suggest removing "as well".

Page 11.

Line 210. "...approximately one half..."

Line 212. This sentence cannot be maintained. The claim that this gives "some of the most sensitive limits..." seems incompatible with the statement on Lines 20-21, that there is evidence for $H \rightarrow b\bar{b}$

from CDF-D0. This paper results in a limit of $3xSM$. Suggest finding a more balanced statement for qualifying the merits of this work.

Page 13.

Line 245. The author of the last paper is C.S. Hill.

Line 259. Please use correct NIM reference, rather than arxiv number
(<http://www.sciencedirect.com/science/article/pii/S0168900212010686>)