Hhh Combination update

Xiaohu SUN, IHEP, Beijing, 18-02-2014

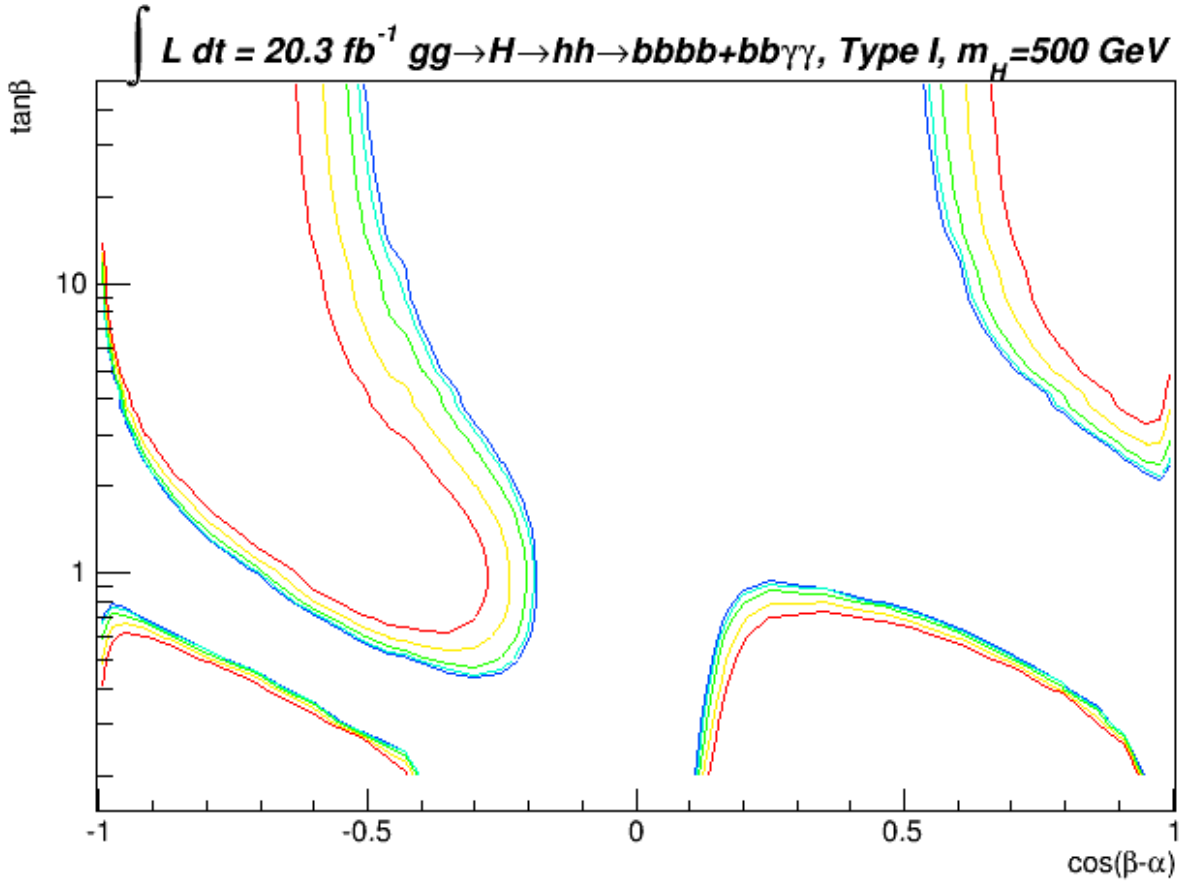
Part I

Check width and VBF production

All made from v160 grid file

Review on the exclusion

- The excluision plot made for mH=500GeV (ggH>0.37pb)
- Based on a temp upper limit set with graviton signal in bbbb and pythia 2HDM signal in bbyy
- https://indico.cern.ch/event/288214/contribution/2/material/slides/0.pdf

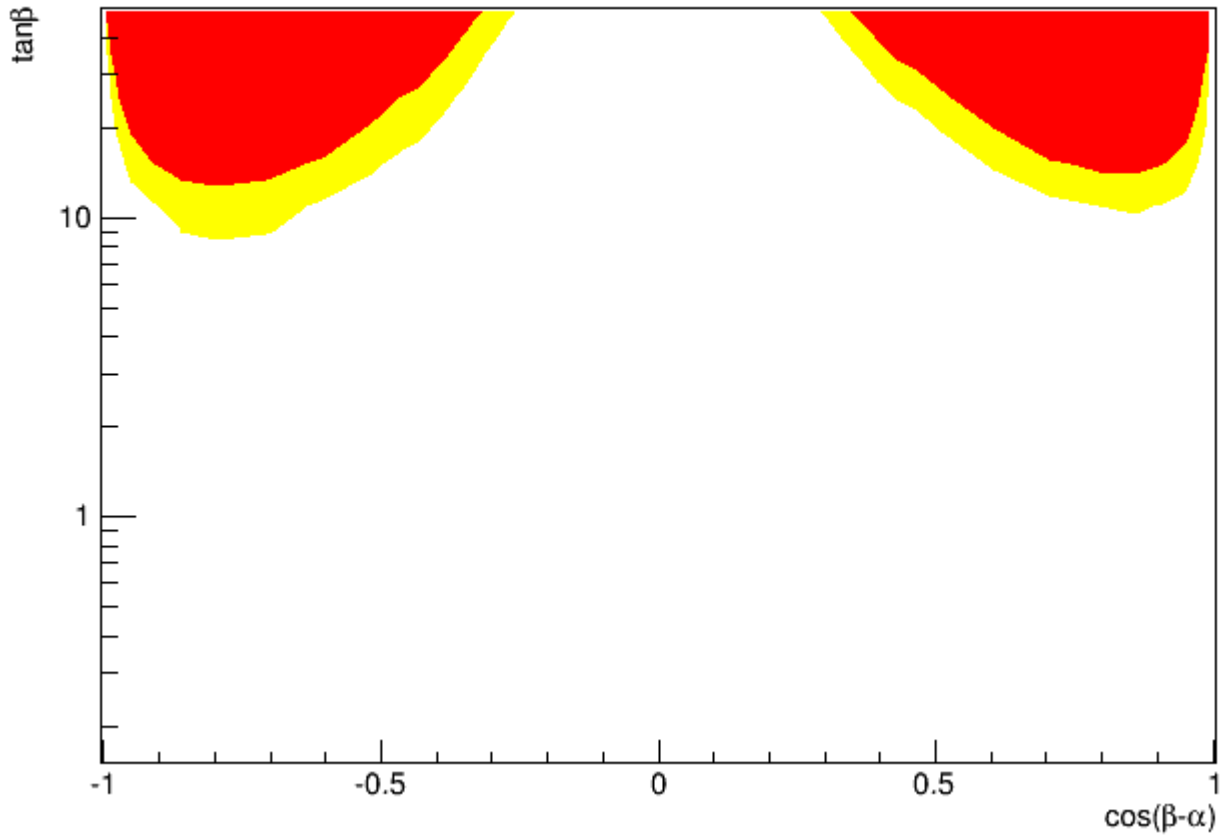


Check on H width

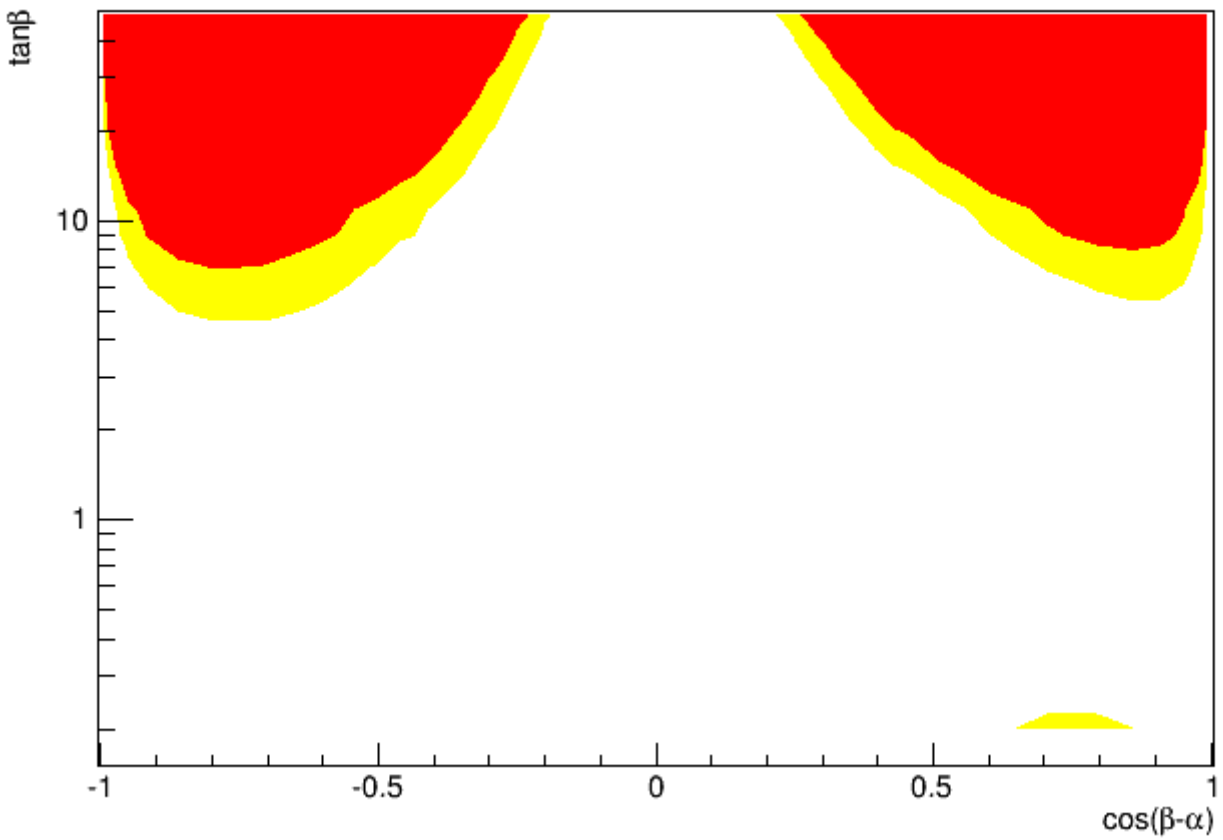
- Make contours of
  - (width_H / mH)
- Legends
  - Set contour area yellow: widthH > 10% mH
  - Set contour area red: widthH > 20% mH

- Checked for type I and type II
  - Type I will be shown, since type II is the same

Check width @ mH=260



Check width @ mH=300



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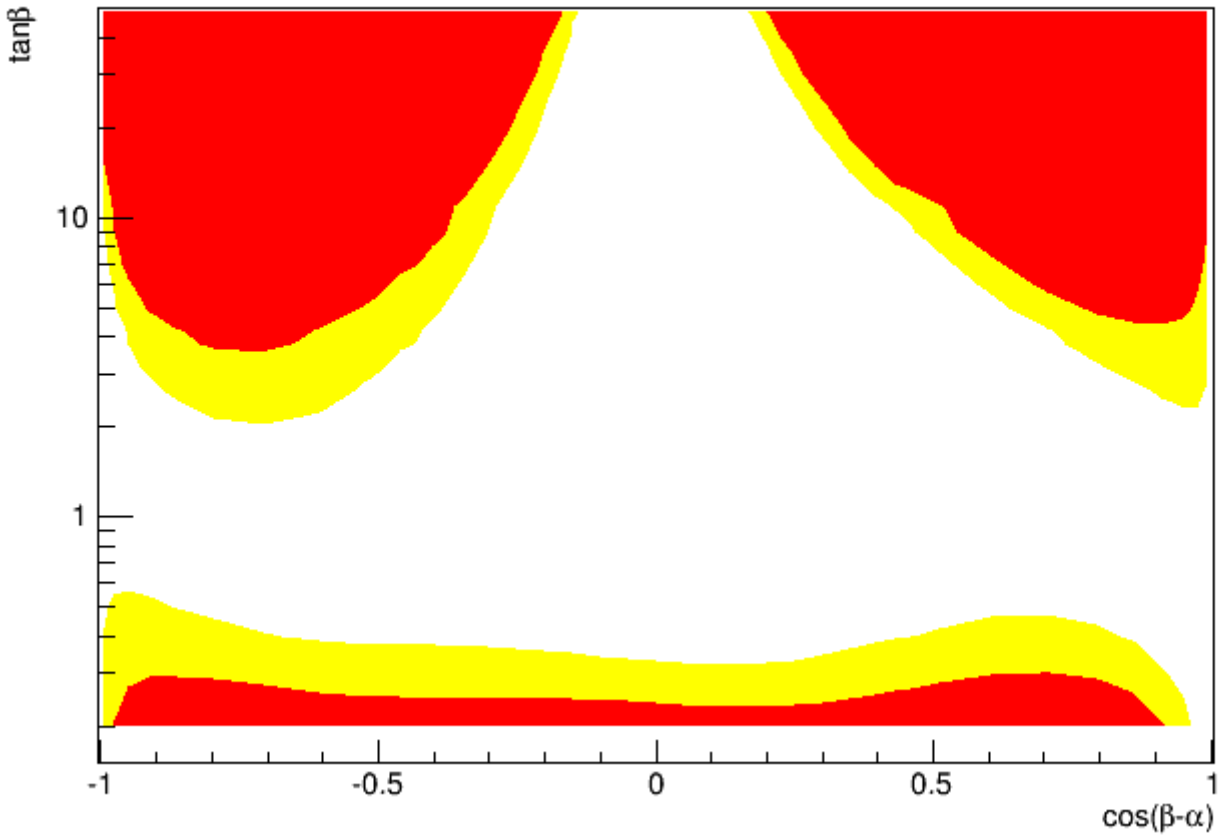

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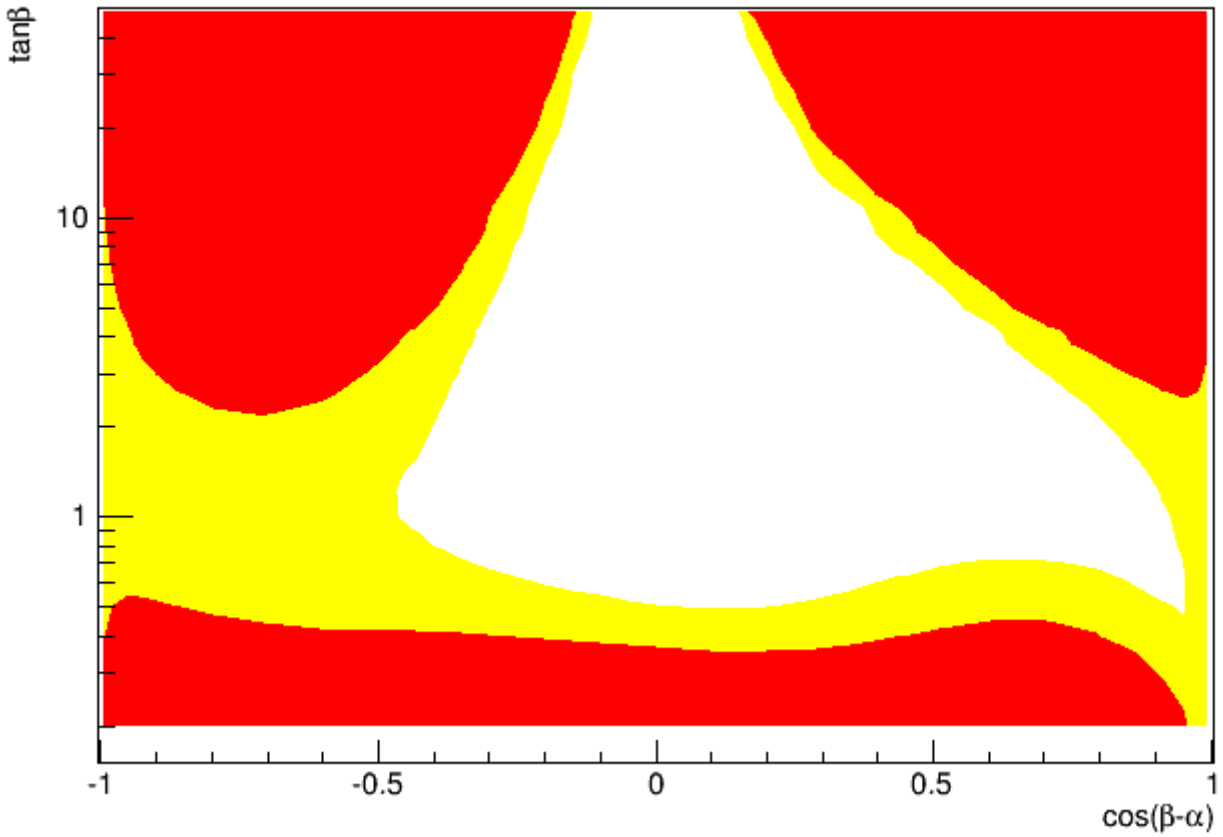

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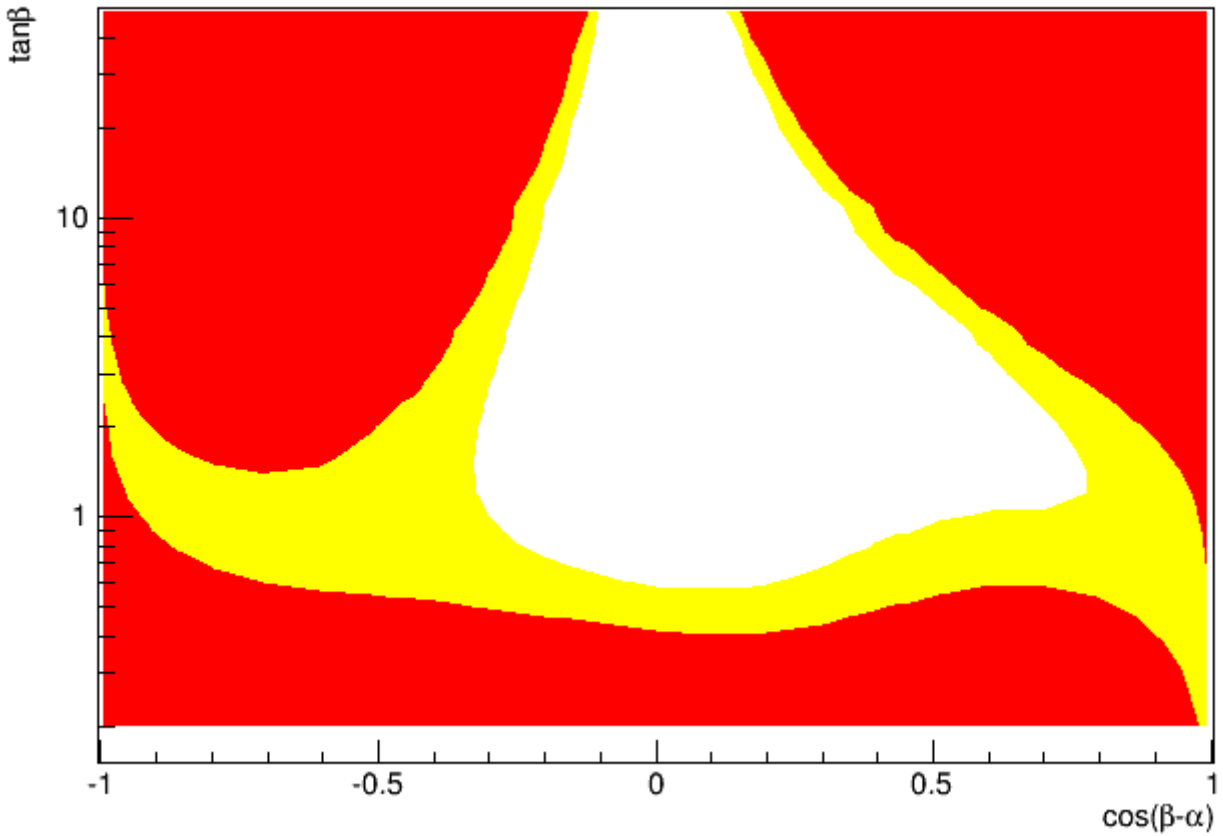
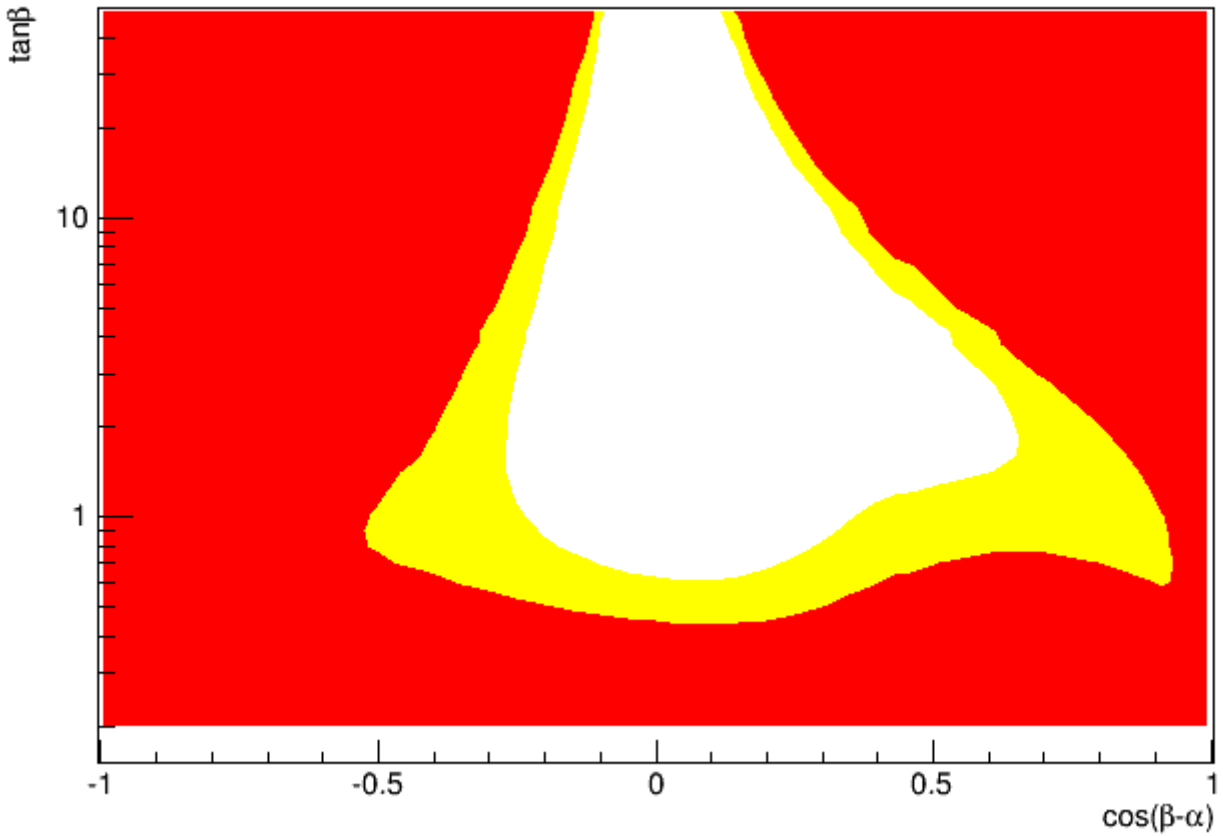


Check width @ mH=700



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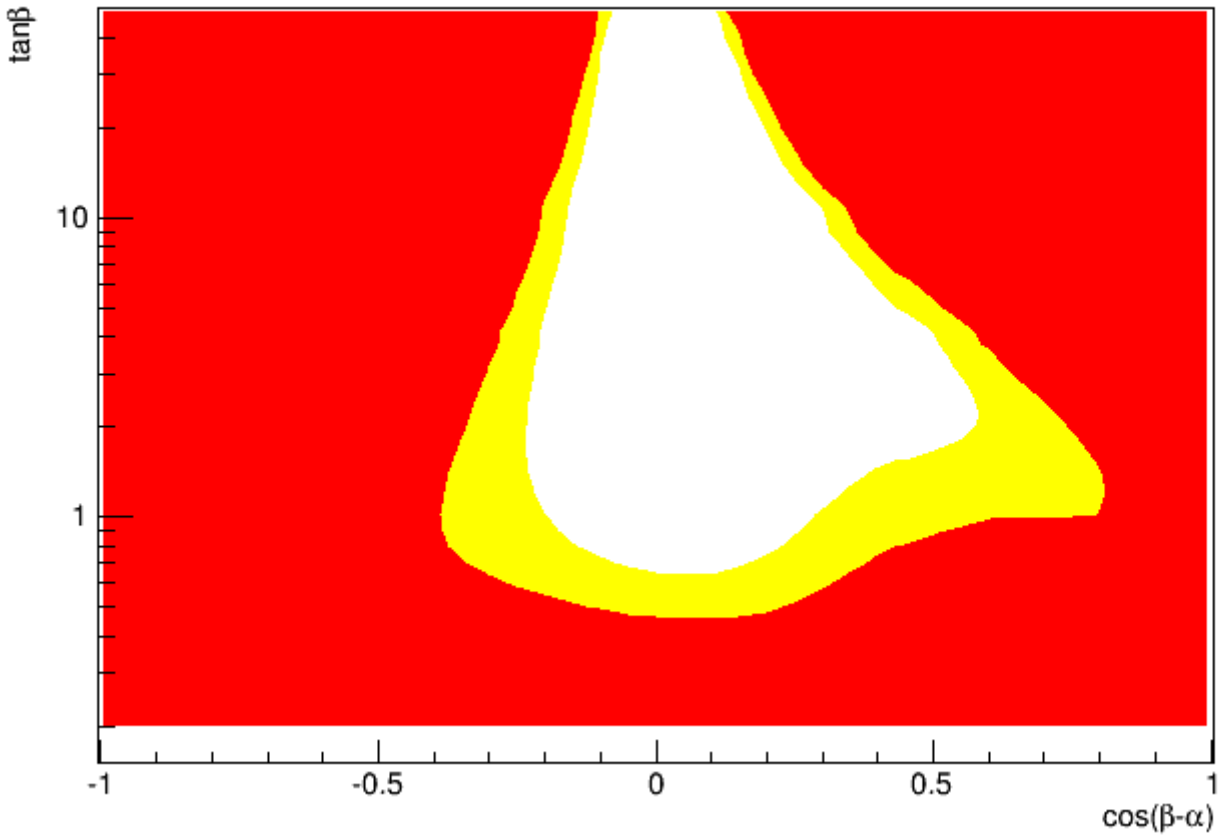

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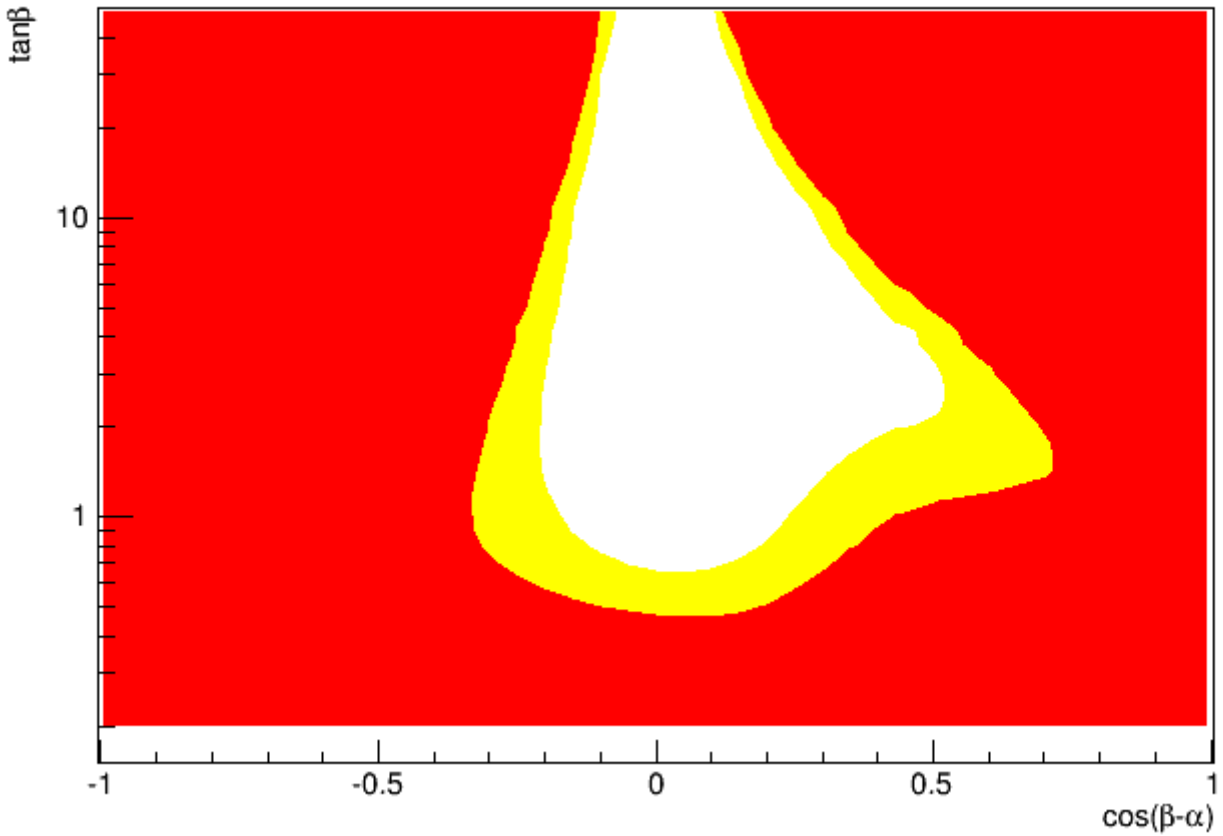

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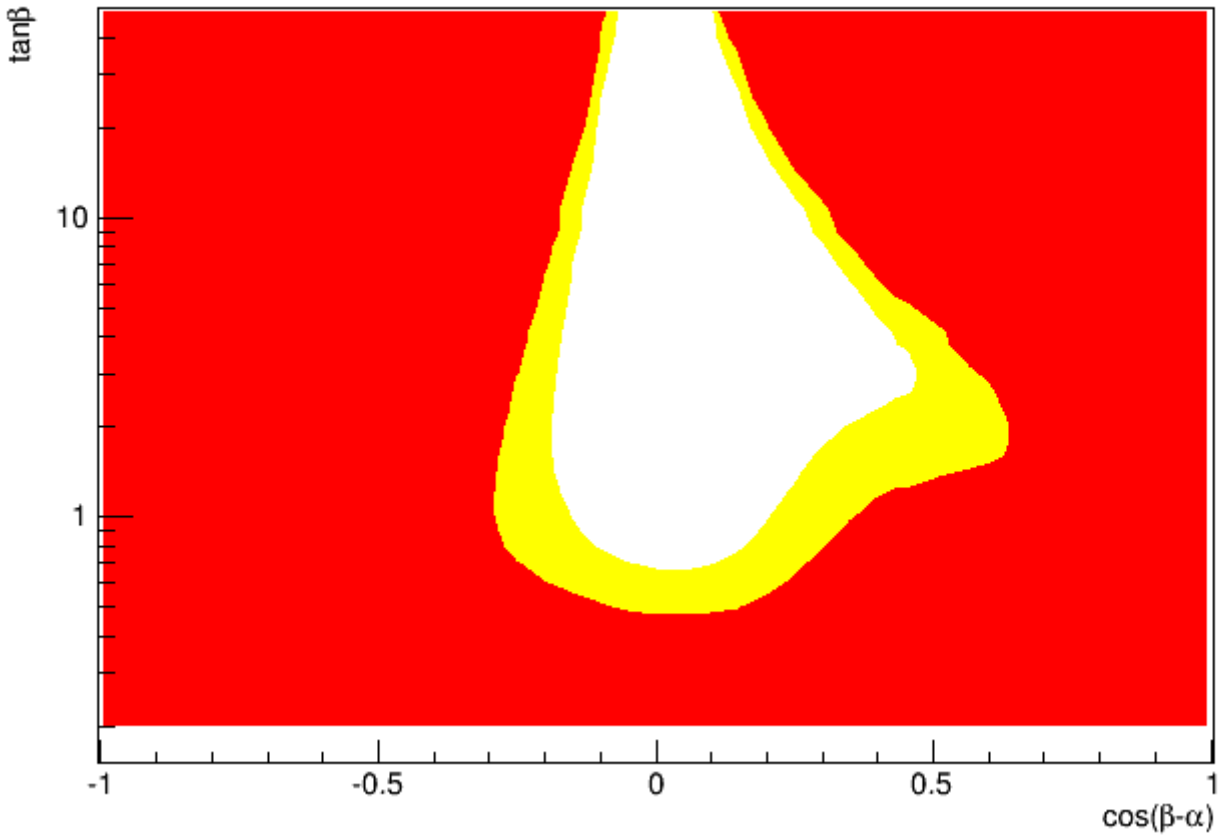
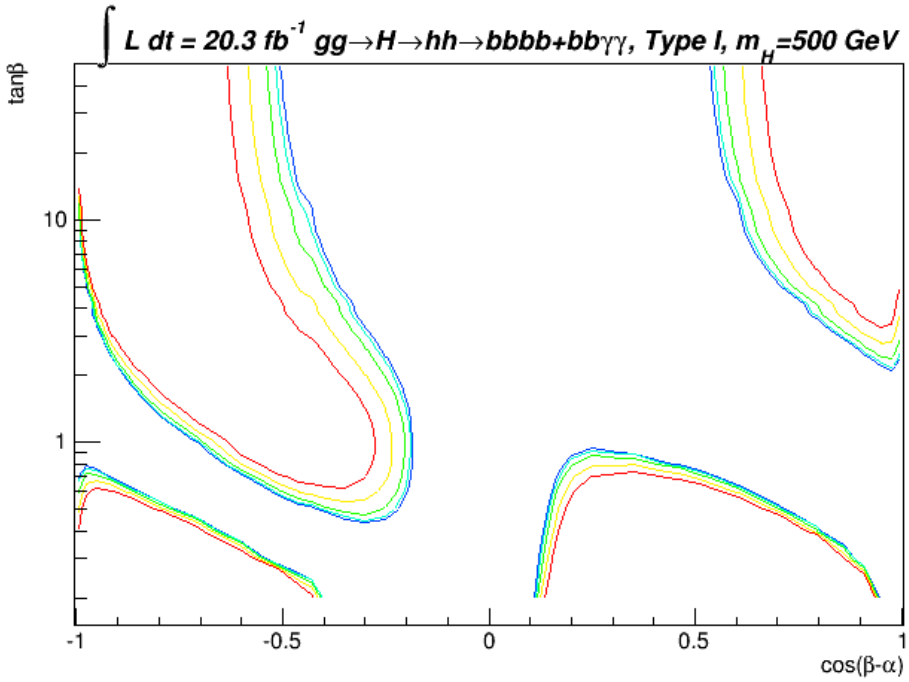
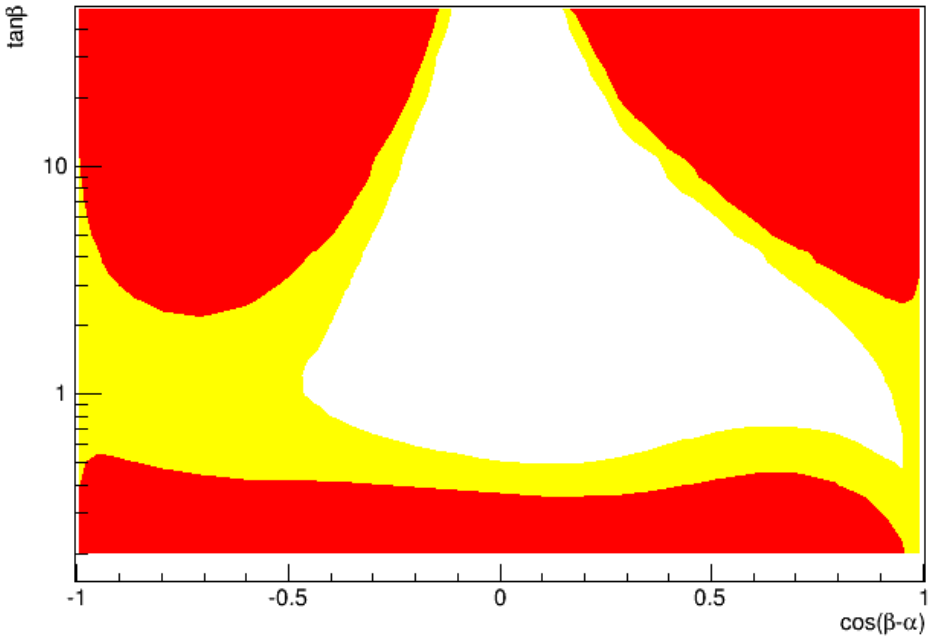


Summary on H width

- Ask both of the analysis groups bbbb and bbyy have to provide studies on the effects from the H width





Check on VBF

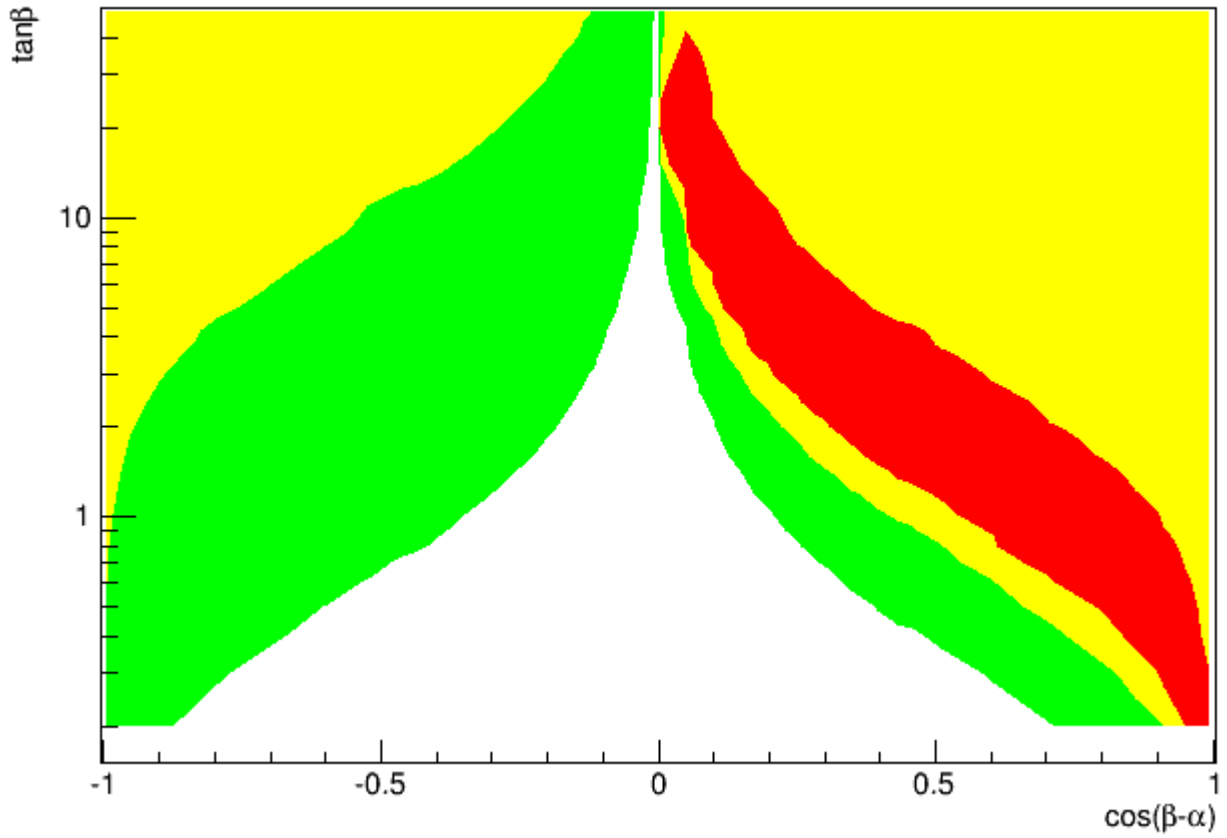
- As the second largest production after ggf, one needs to understand how much it will get in our analyses

- Make contours of
  - (xsec_H_VBF / xsec_H_gg)
- Legends:
  - Set contour area green: VBF/ggH >1%
  - Set contour area yellow: VBF/ggH >10%
  - Set contour area red: VBF/ggH > 50%

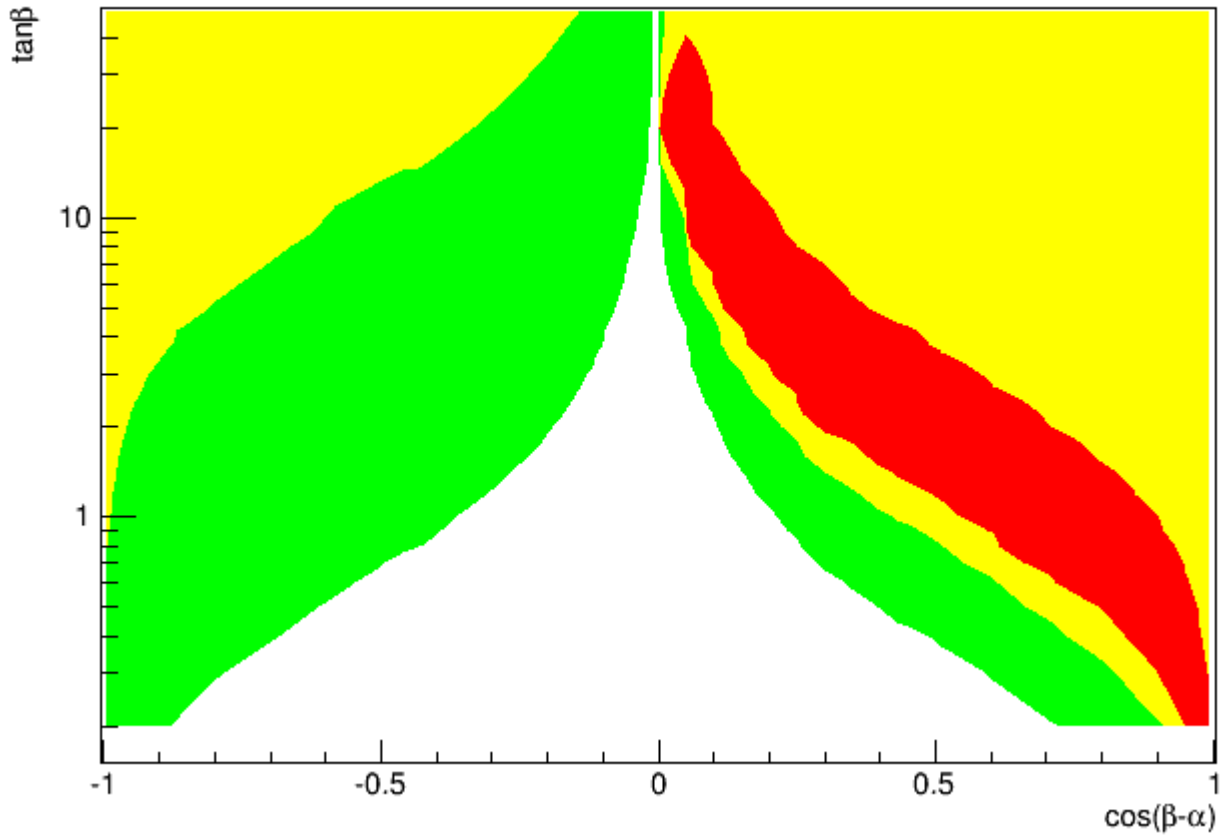
- Checked for type I and type II
- They will be both shown

Type I

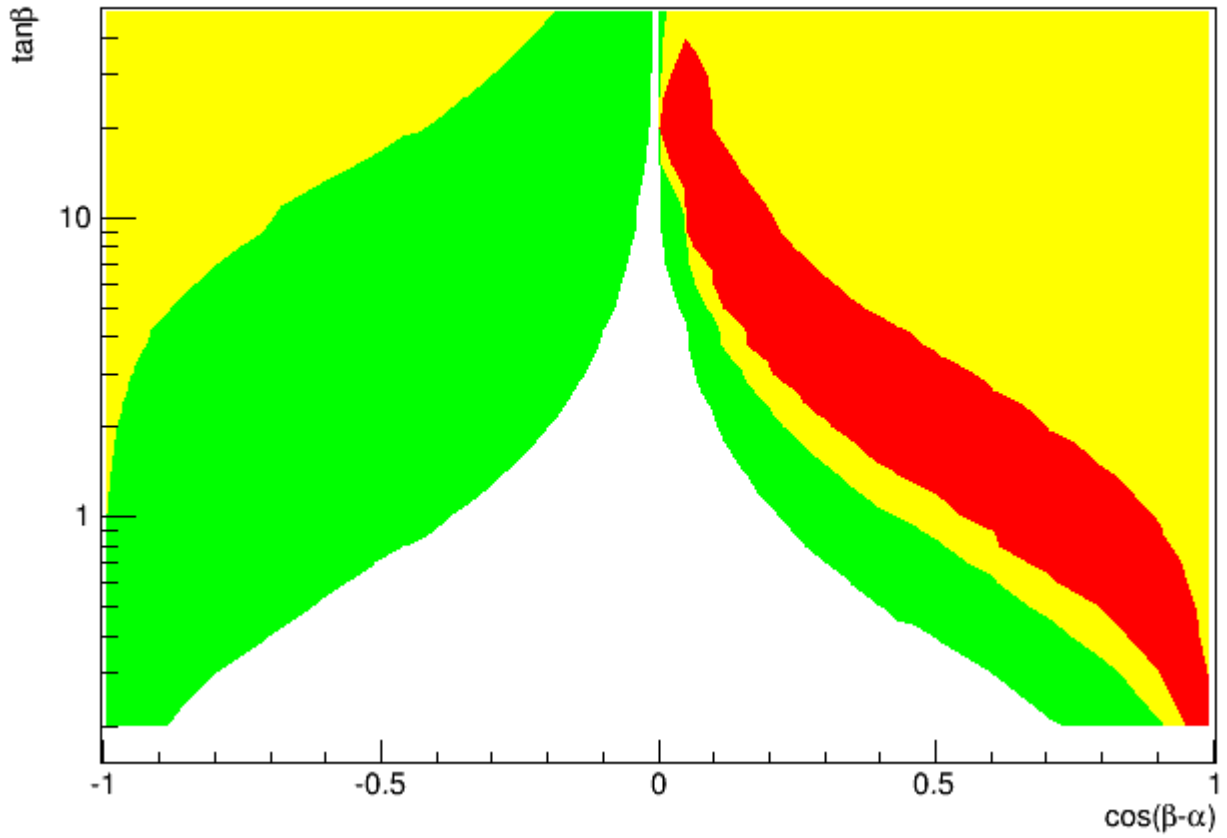
Check width @ mH=260



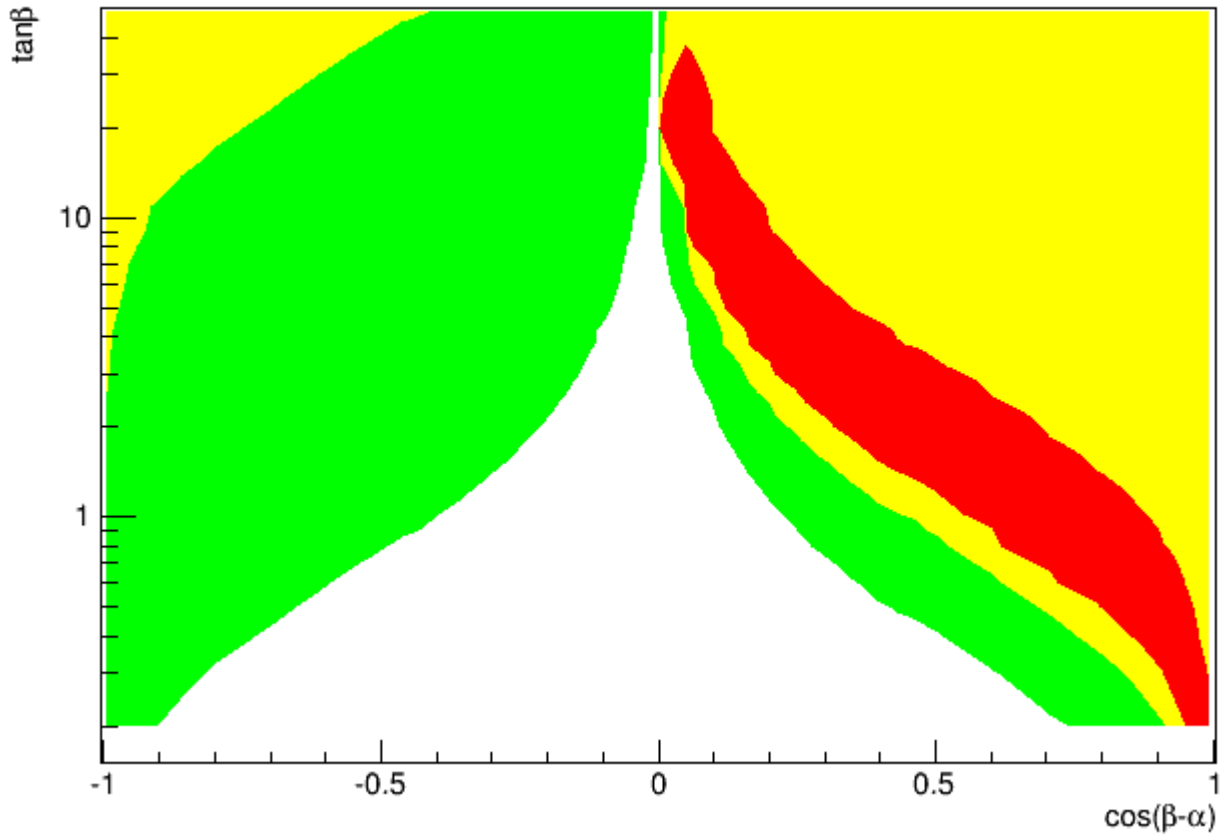
Check width @ mH=300



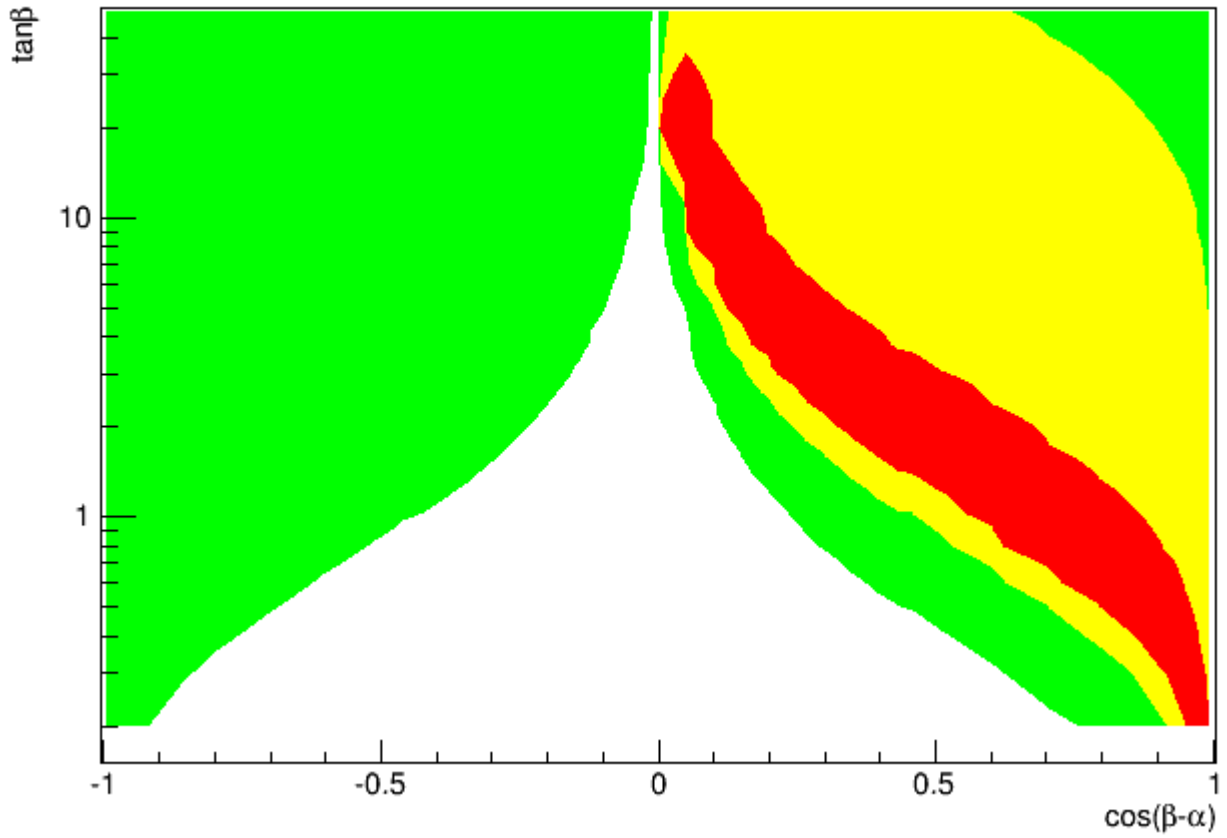
Check width @ mH=320



Check width @ mH=340



Check width @ mH=350



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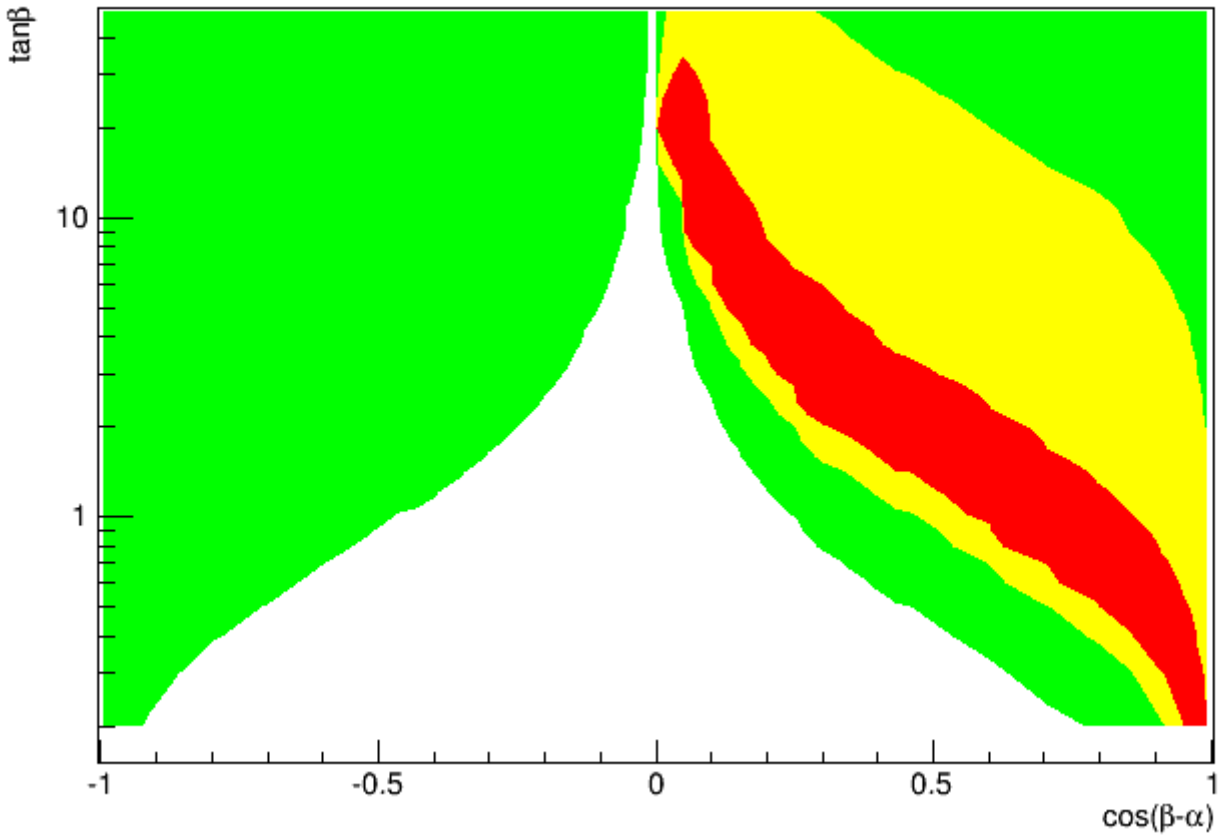
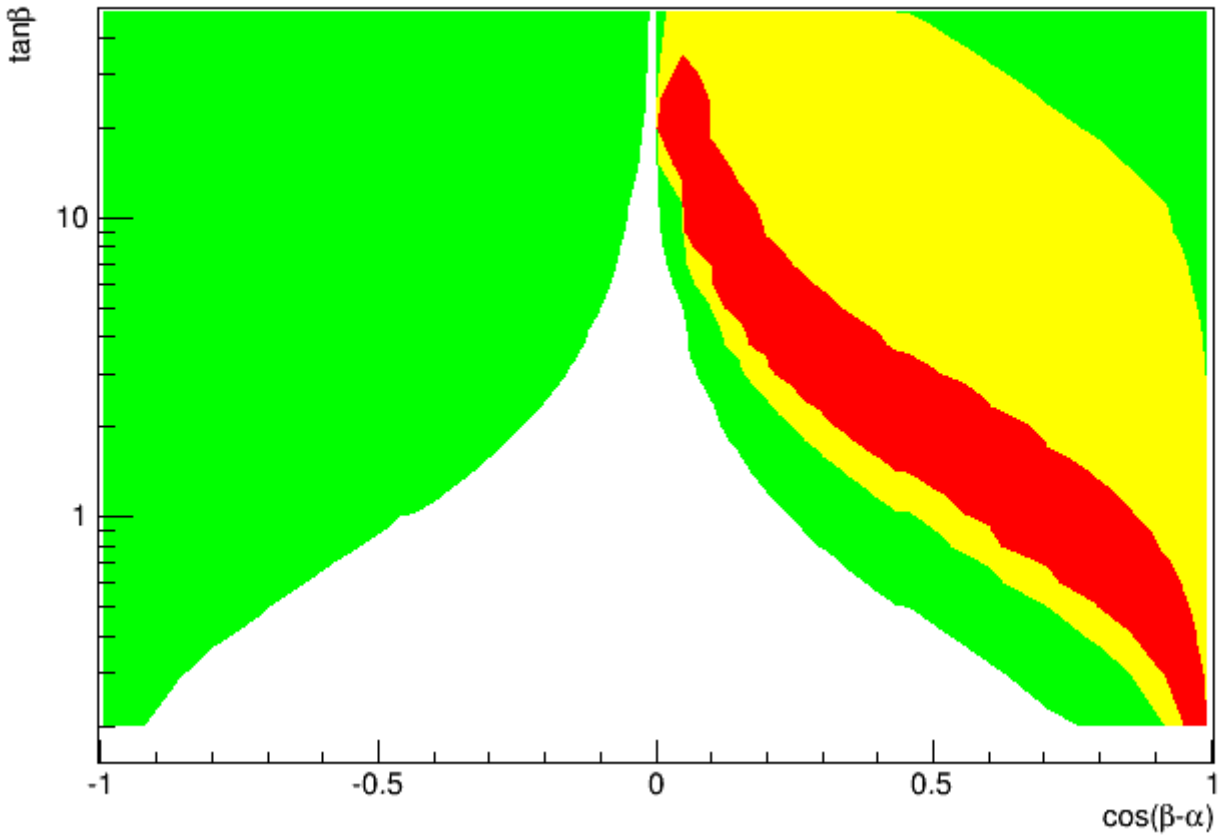
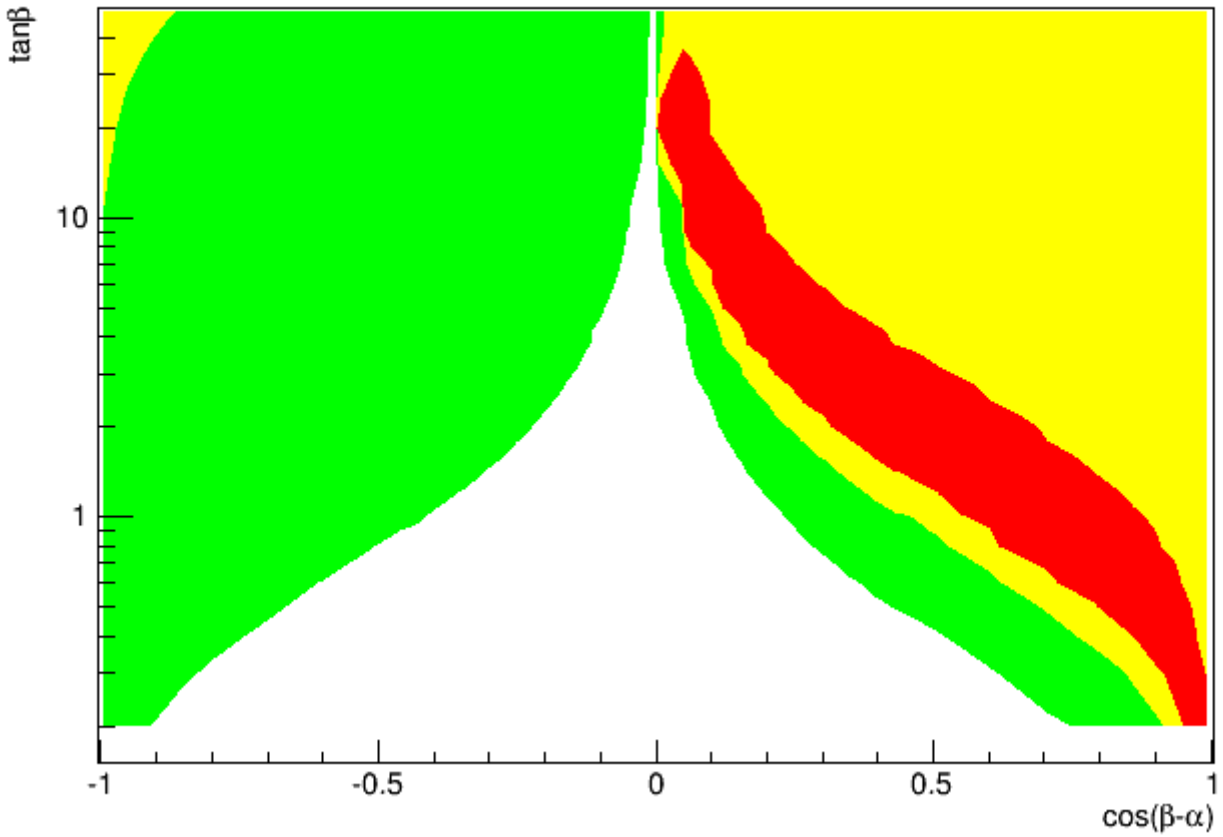


Check width @ mH=420



Check width @ mH=450



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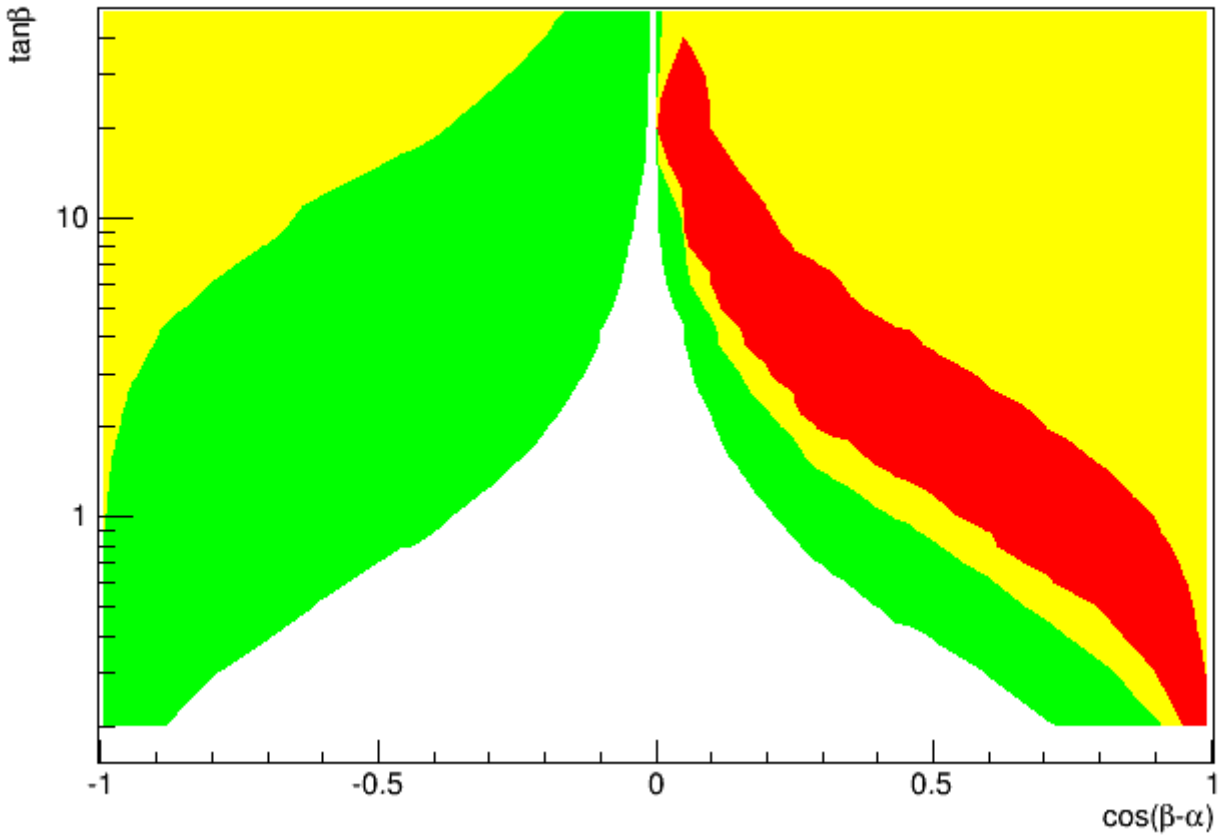
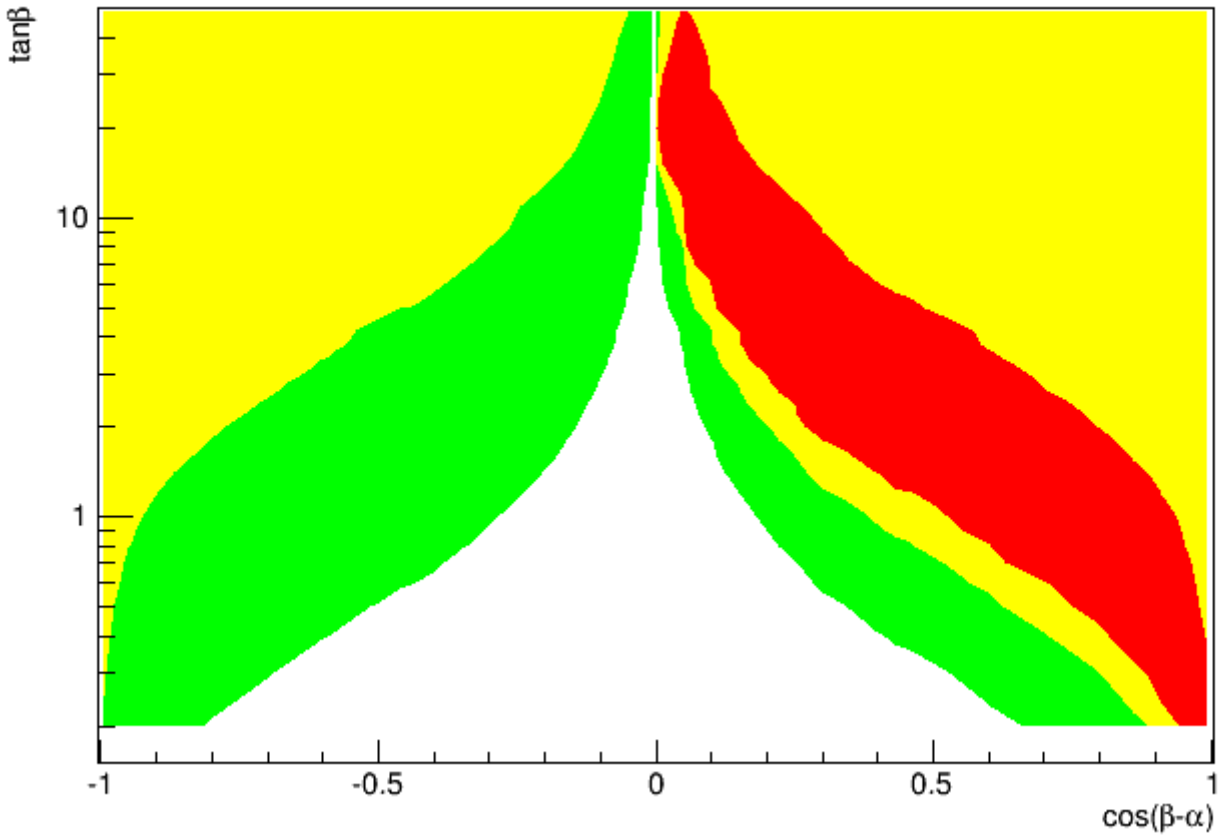
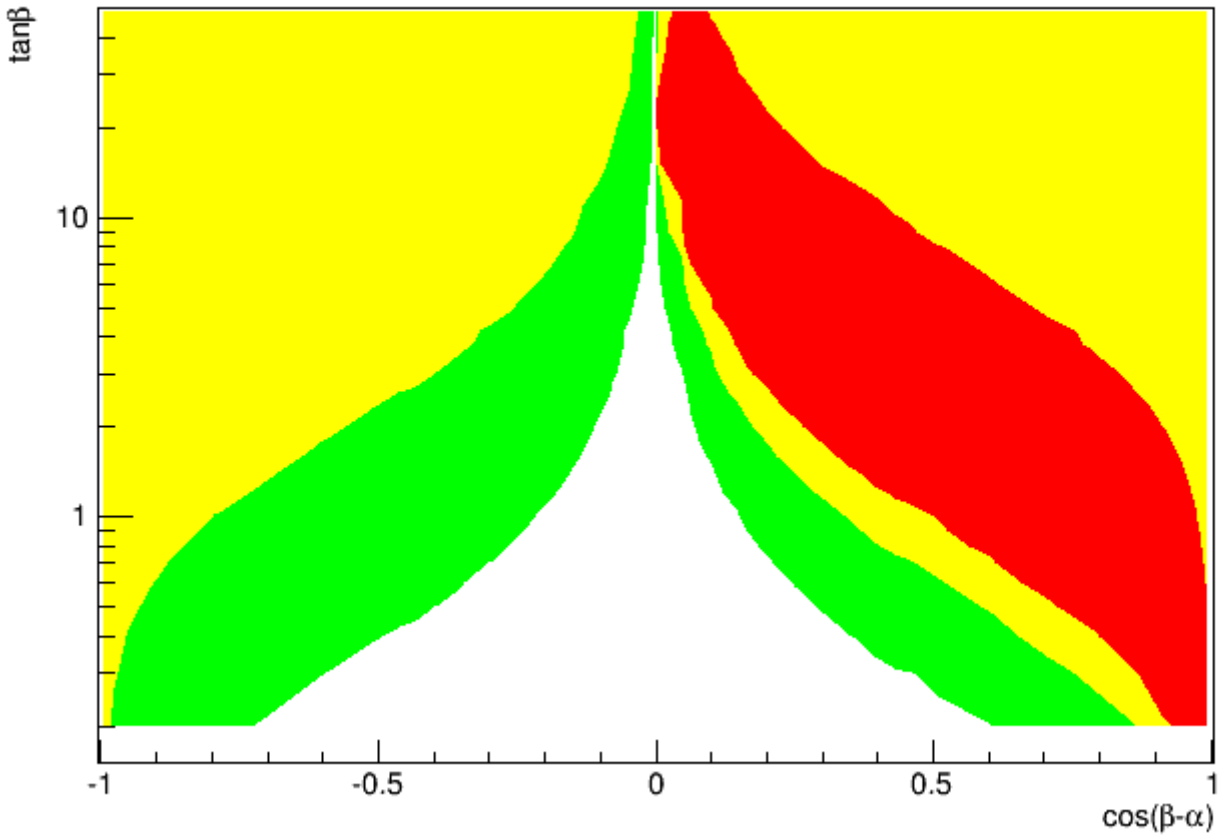


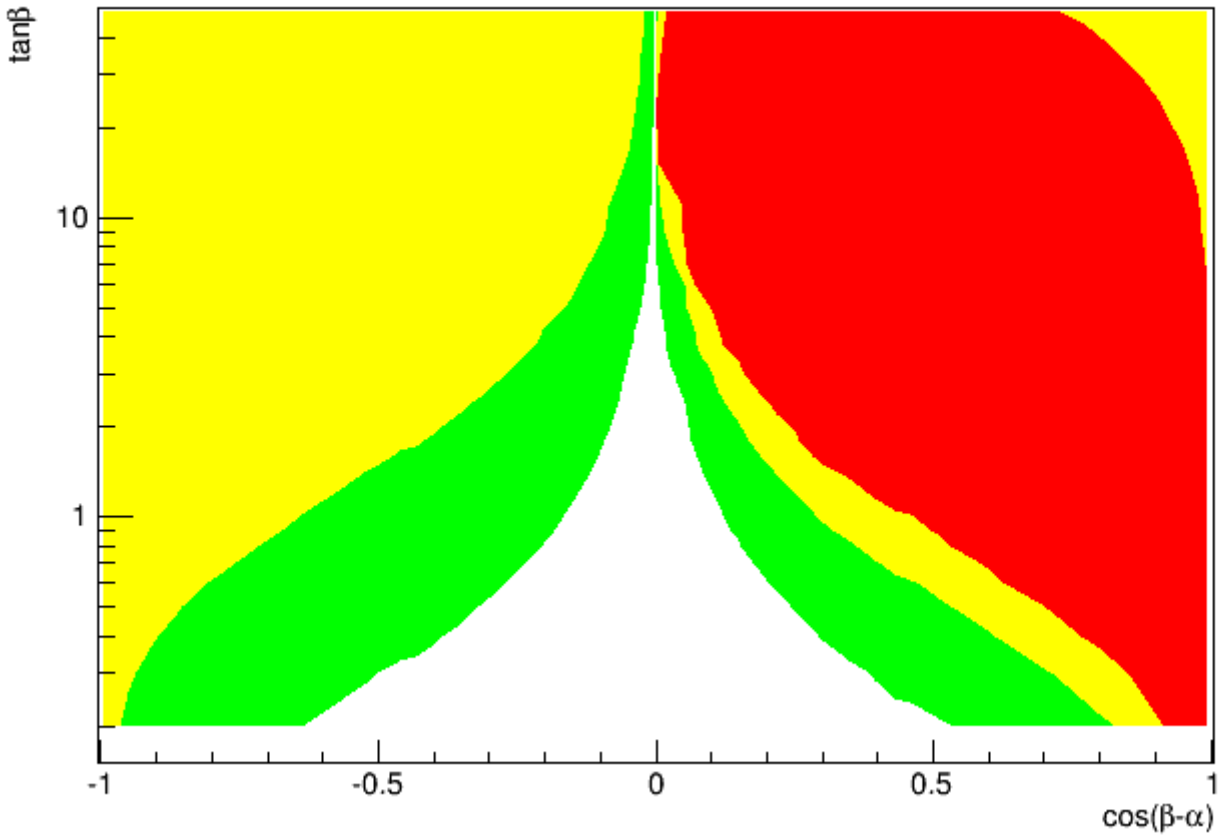
Check width @ mH=600



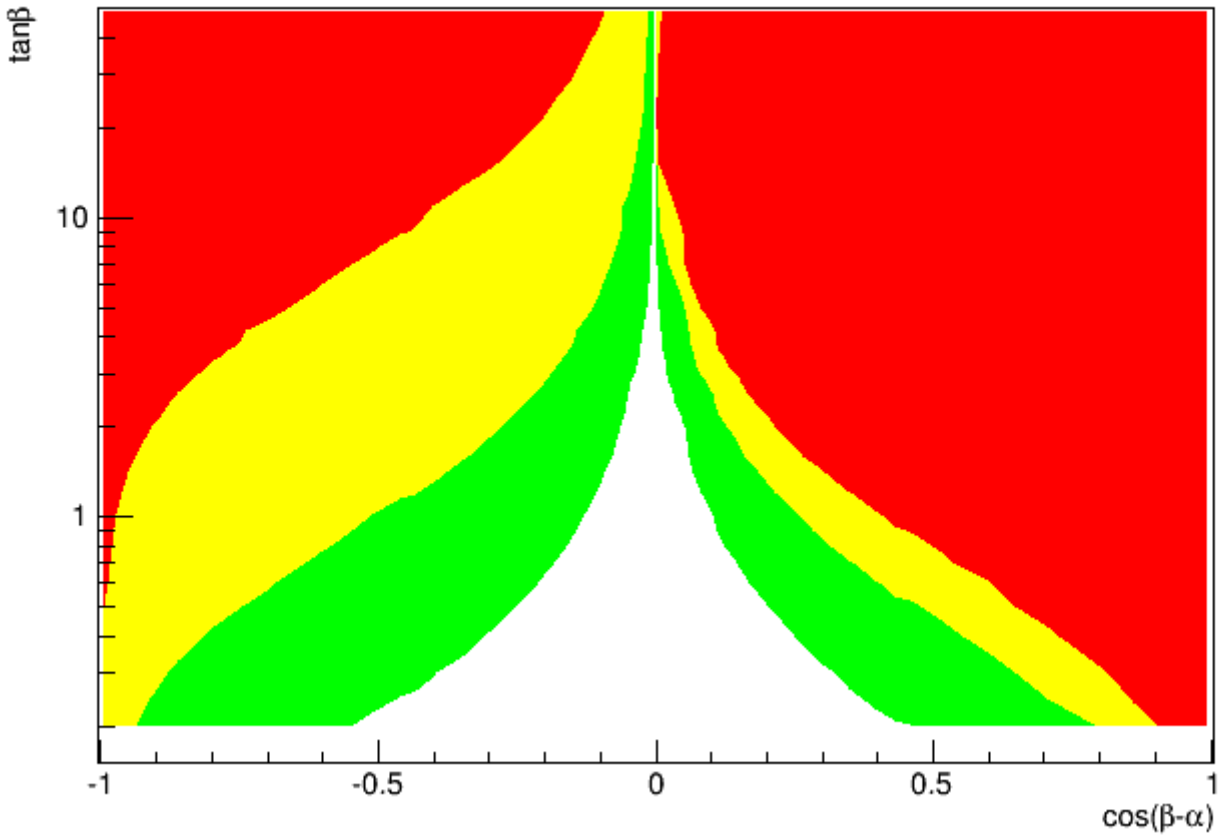
Check width @ mH=700



Check width @ mH=800



Check width @ mH=900



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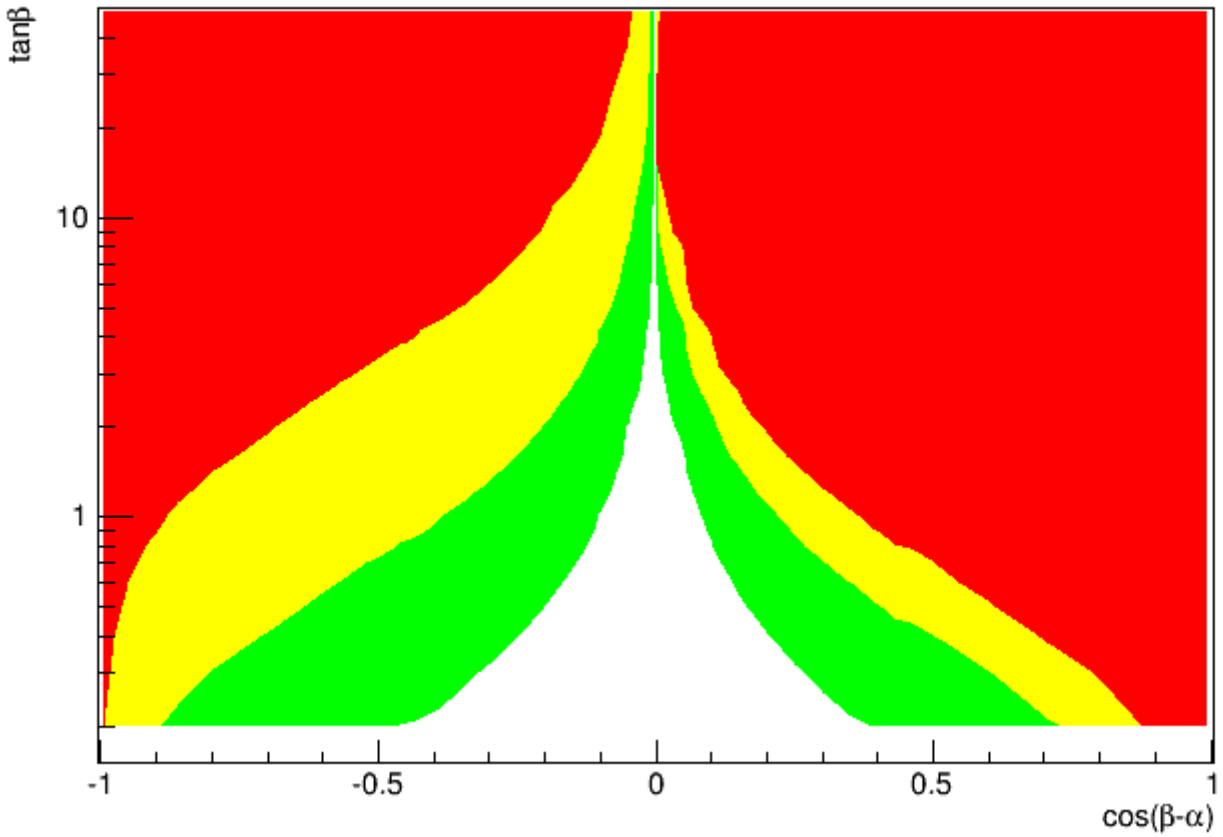
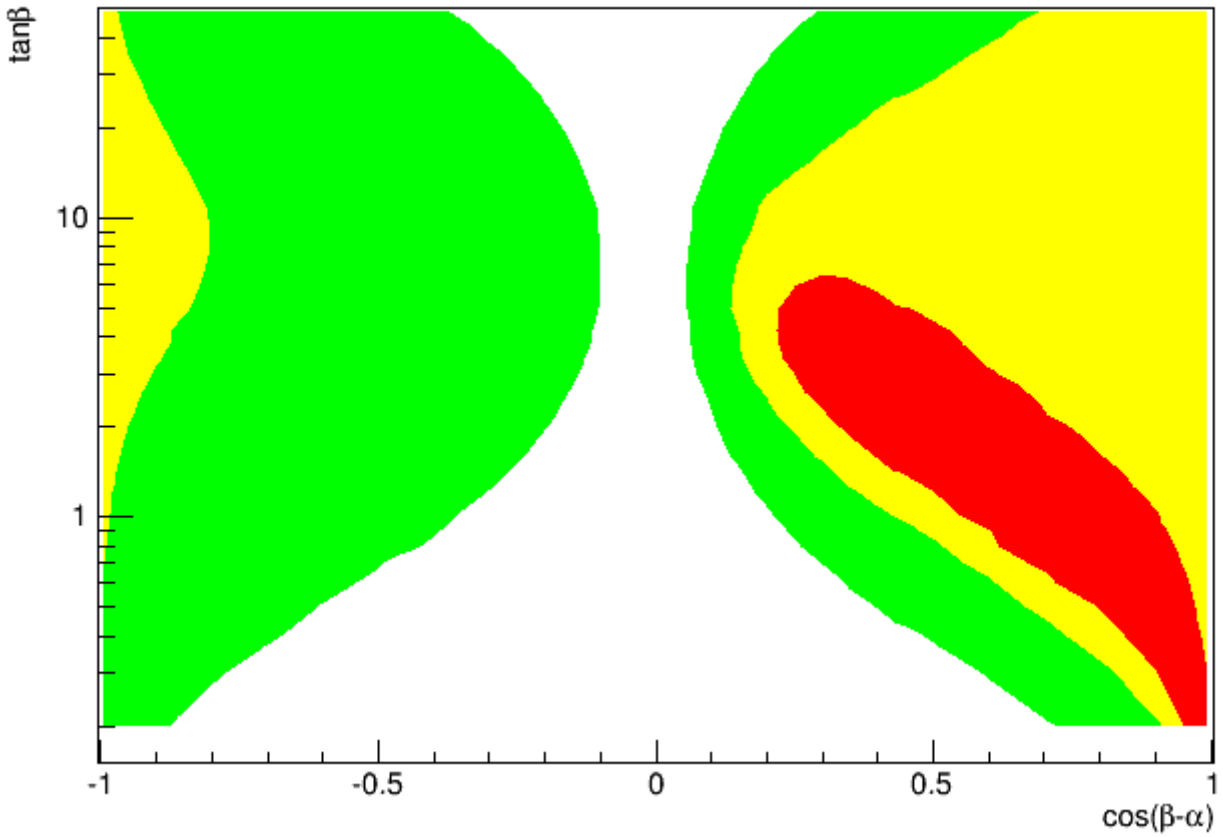
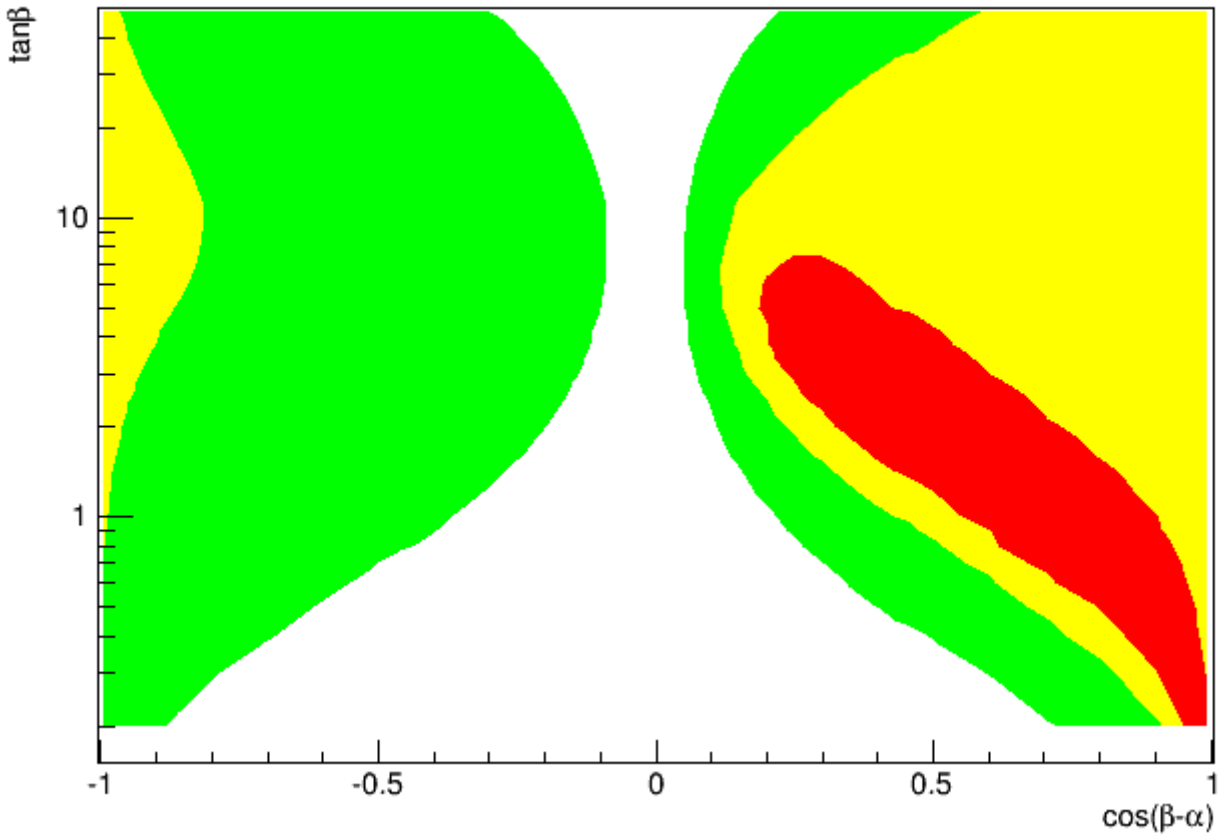


Type II

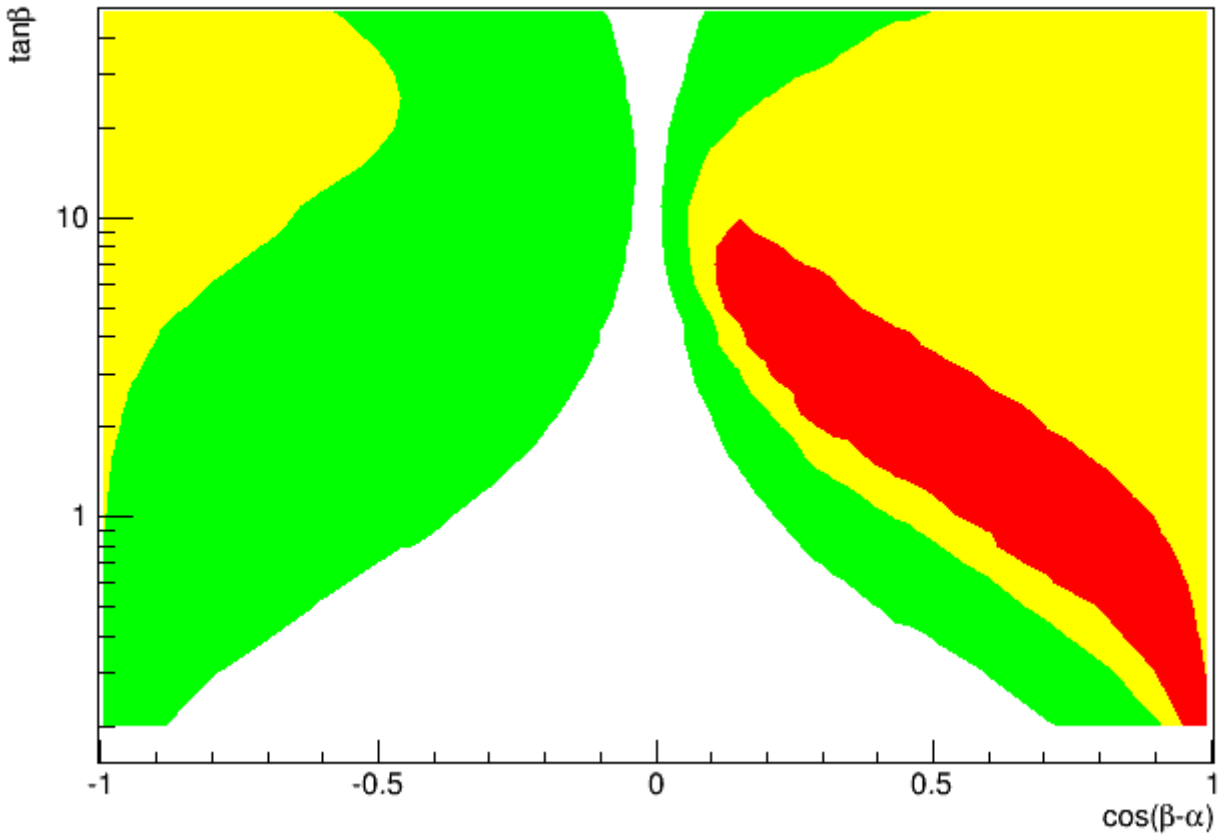
Check width @ mH=260



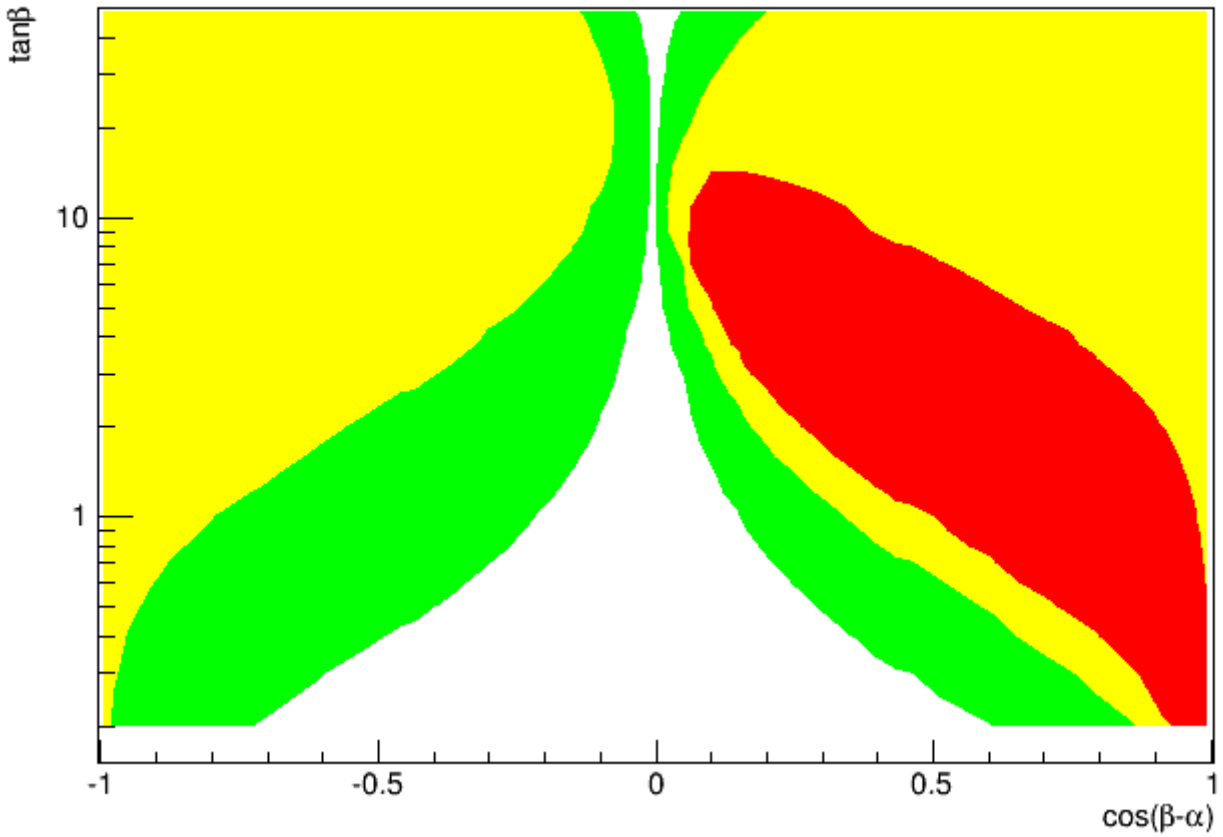
Check width @ mH=300



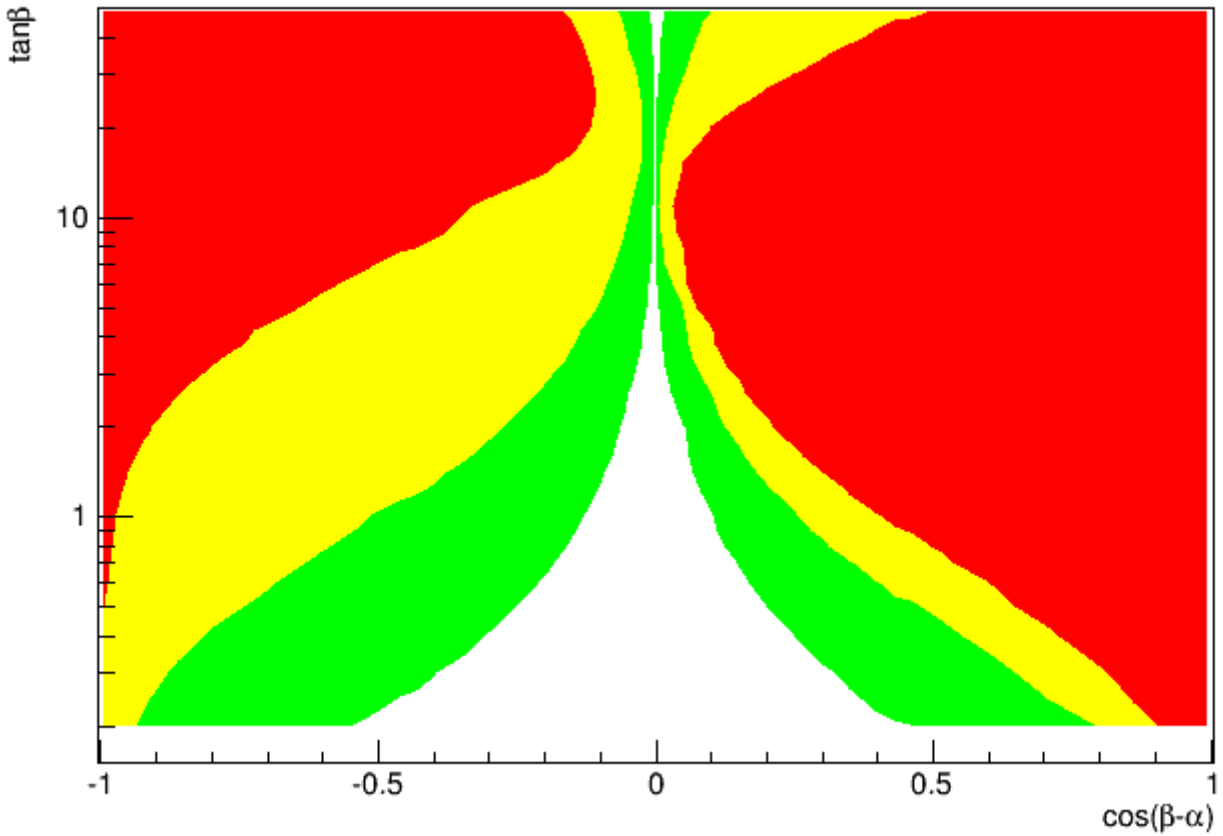
Check width @ mH=500



Check width @ mH=700



Check width @ mH=900



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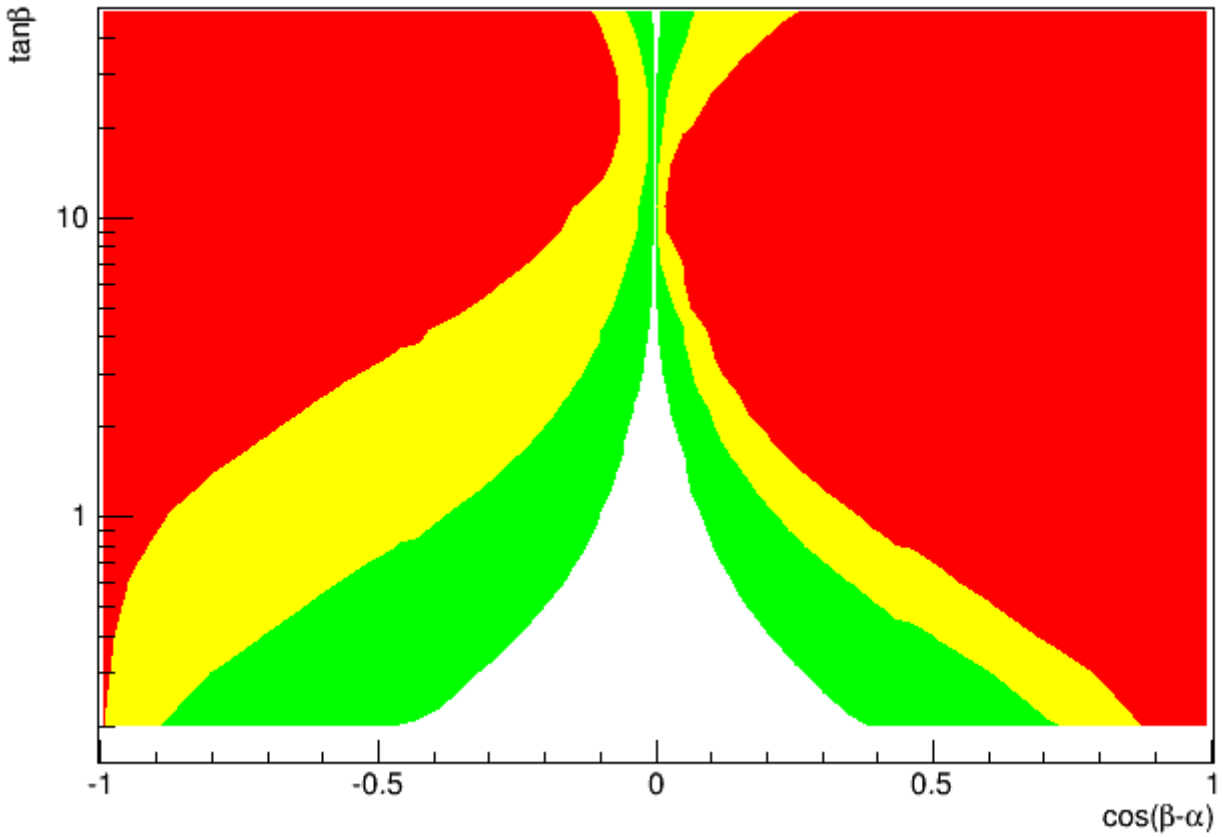
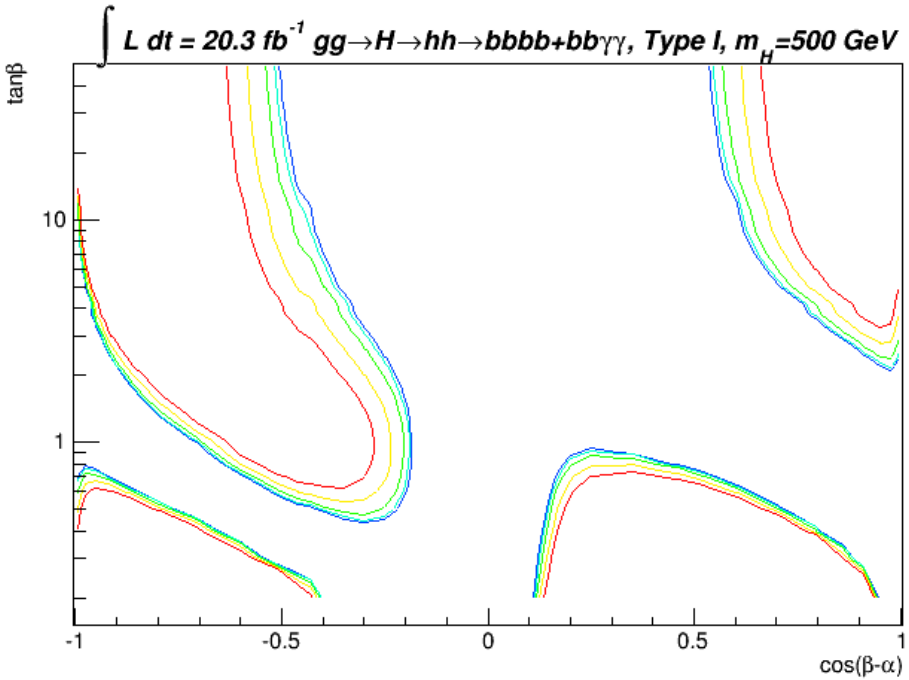
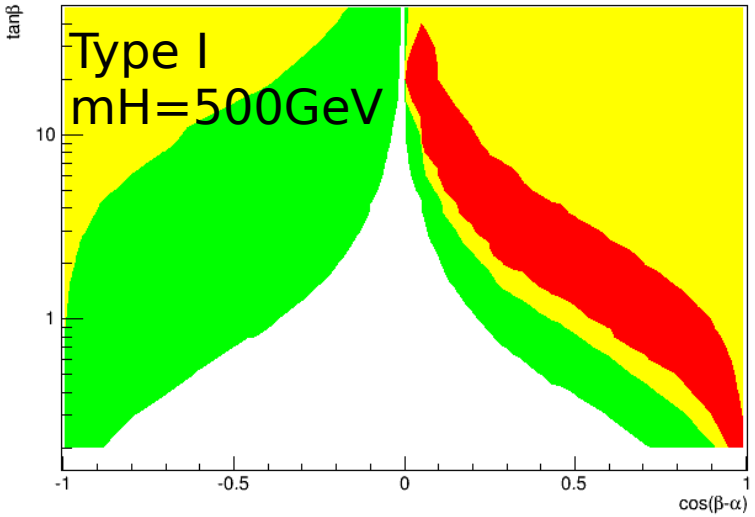
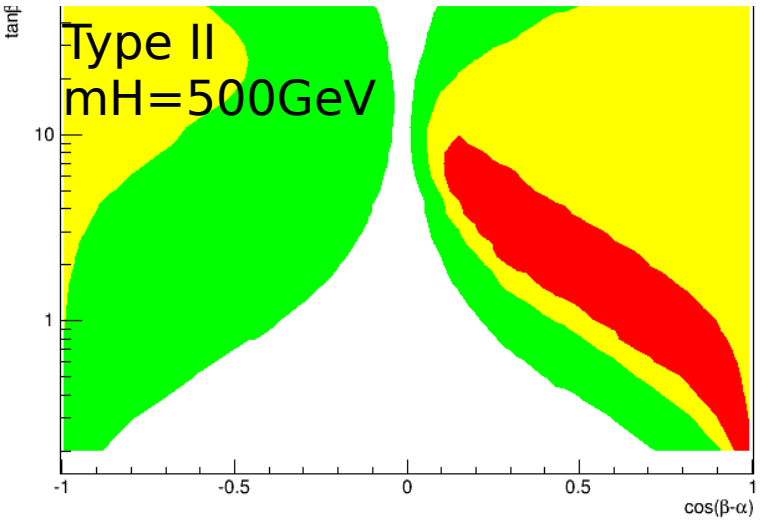


Summary on VBF production

- Seeming to be safe, the region affected by VBF the most is not in our exclusion region
- Still need to check in bbbb/bbyy analyses after including VBF samples





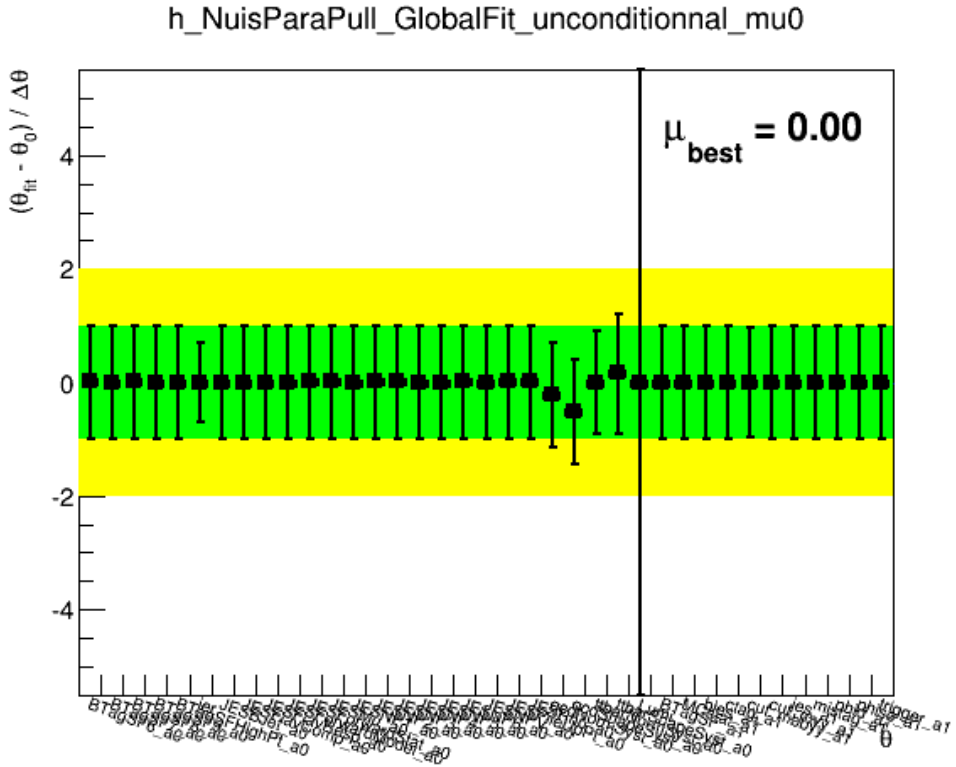


Part II

Nuisance parameters

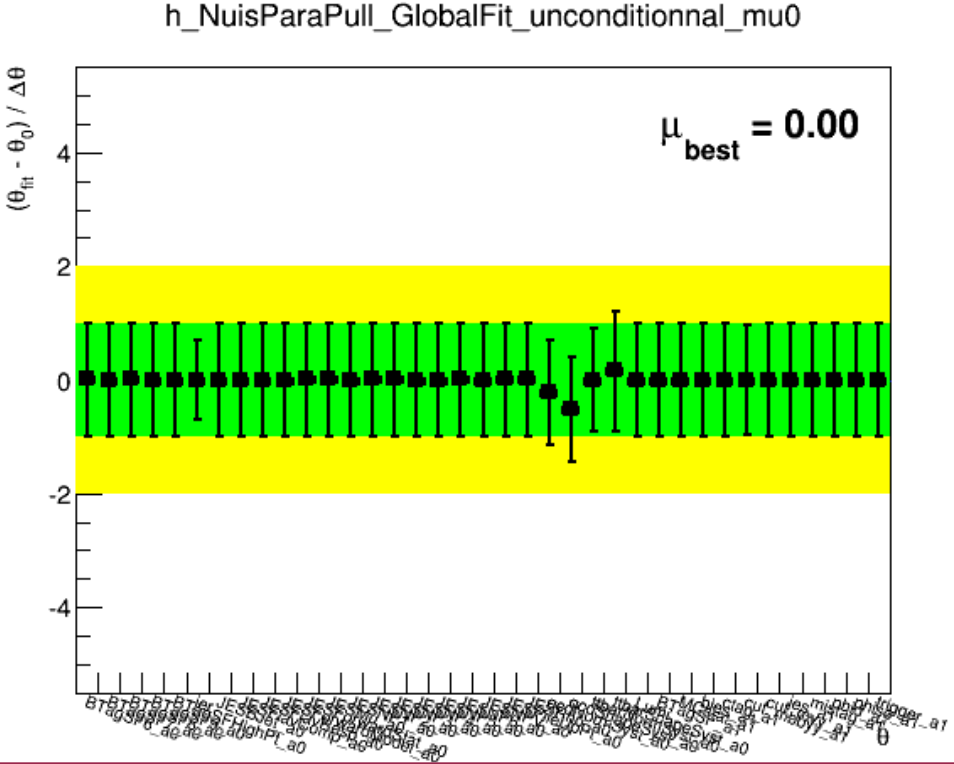
Current status

- The two groups: bbbb is finalizing graviton CONF note for Moriond; bbyy is stuck in Hfitter since last week
- bbbb ws is v1 (updated just before chinese new year); no bbyy
- The inputs are still the same since HSG7 meeting 6 Feb
- From the last time, the nuisance parameter “Lumi” did not pass our pull check, since it gave a huge error bar



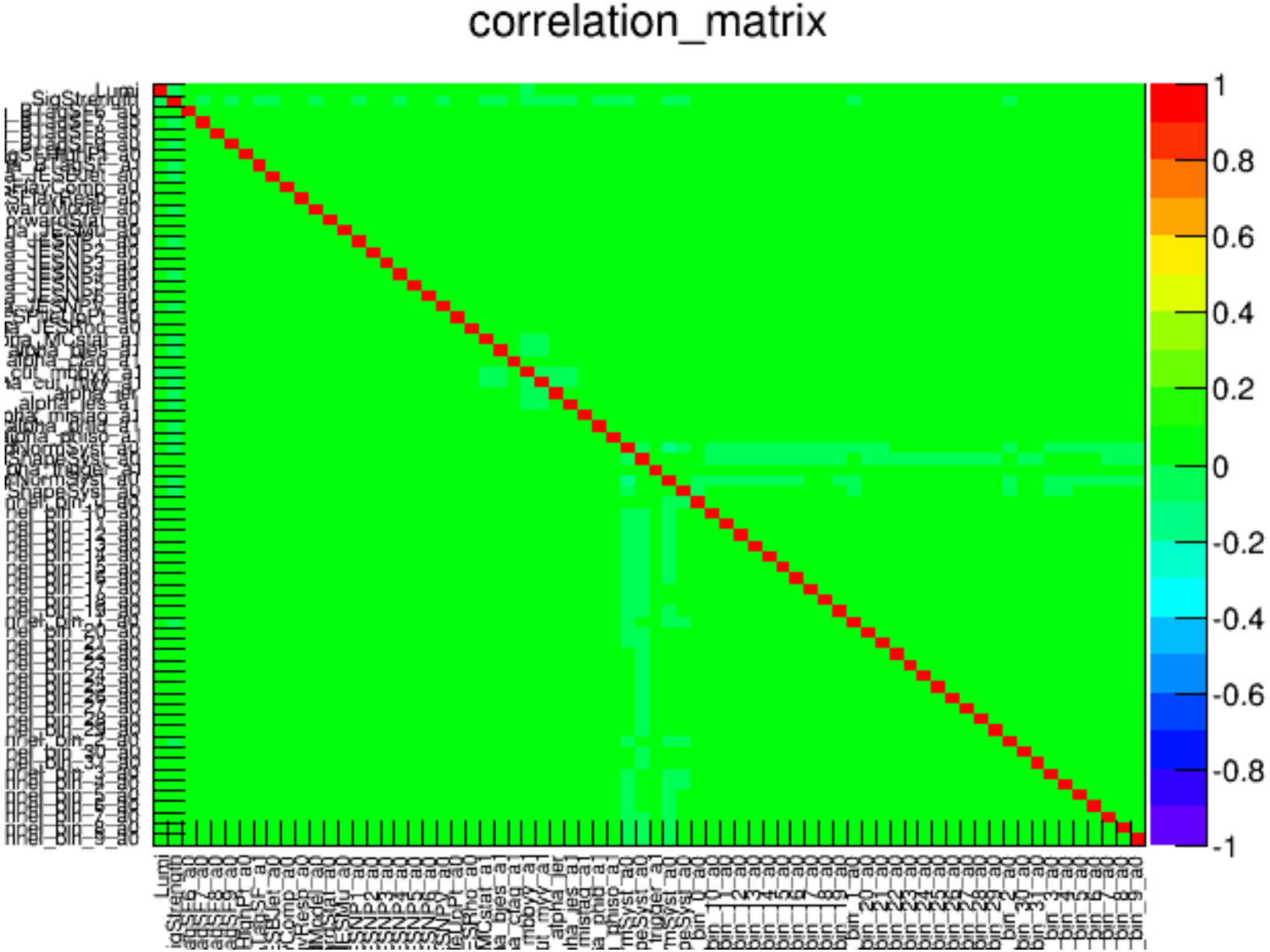
Solve the “Lumi” problem – pull check

- Many checks were done for the combination machinary to search for the reason of the problematic Lumi
- In the end, it turned out that the problem came from the input workspace of bbbb analysis, where they set “Lumi” as a “Constant” in the fit, surprisingly to me
  - Strange, being contacting with them for an explaination
  - Solution, manually reset LUMI as a floating parameter in the combination



Correlation check

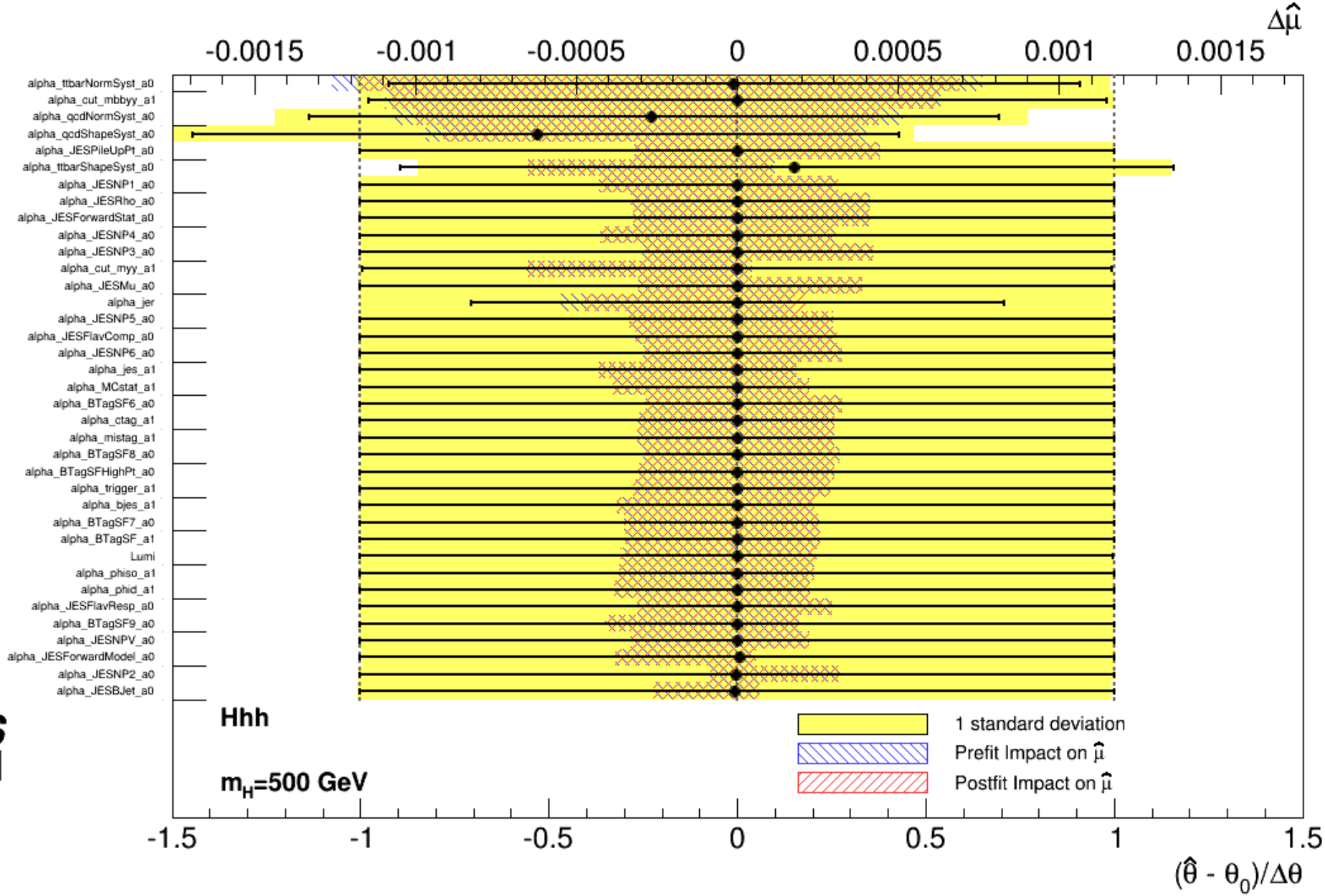
- Correlation matrix seems good



Importance check

- Strongly proposed by Wouter, after checking the correlations and the pull distributions, we need to rank all the nuisance parameters
- The ranking follows the magnitude of the importance of nuisance parameters
- The importance is defined by the influences on POI from a certain parameter
- The importance is calculated for two types
  - Prefit importance by varying nui +-1.0
  - Postfit importance by varying nui +-one sigma
    - where the sigma is estimated by assuming the NLL as a parabolic function of this nuisance parameter

Importance check



ATLAS Internal

Summary

- Width check and VBF check are being reported to bbbb/bbyy, and we need their studies on the effects from wide width as well as non-negligible vbf production
- For the combination, this week the focus is on nuisance parameters checks, which are being implemented in a various ways
  - Correlation check
  - Pull distribution check
  - Importance check

COMING SOON!

- *The next time, I will start a series of lectures on the introduction to statistics, probably 2 to 3 lectures*
  - *The basics of statistics*
  - *Hypothesis testing*
  - *Limit setting*