Weekly meeting

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IHEP

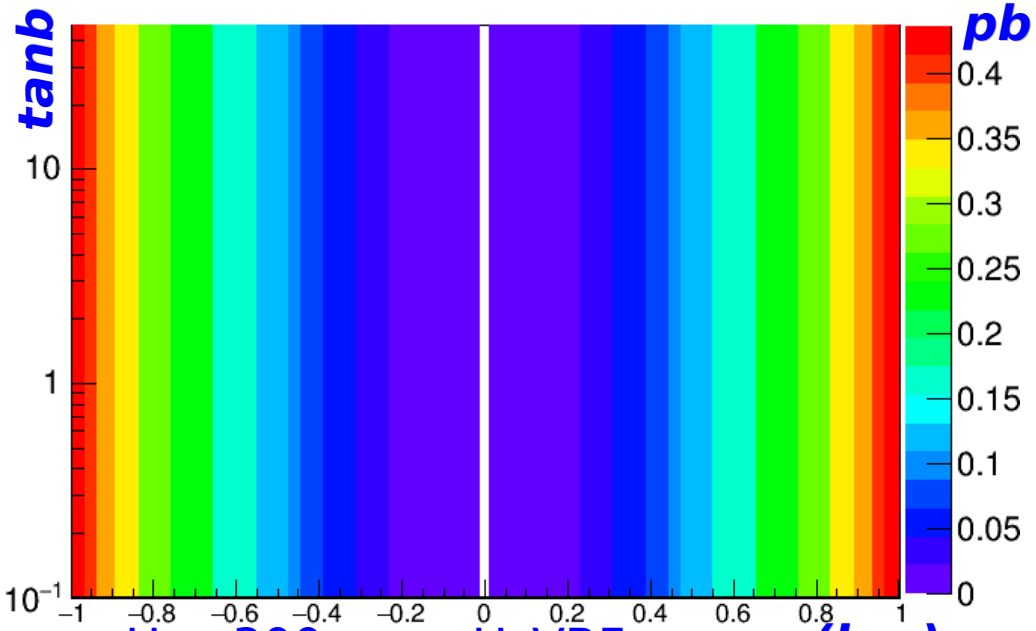
HH MC

- Previously we gave up waiting for theorists to integrate HH NLO model into 2.3.0 so that we can run OTF directly; started to integrate the private code into 2.2.3 by ourselves [ATLMCPROD-2344] (Biagio, Julien, Stefan et al.)
- In parallel we started LO requests for all the uncovered channels [ATLMCPROD-2371], Biagio prepared all JO files and validation is been done in each channel
  - bbyy: 450
  - bbbb: 260, 300, 400, 500, 600, 700, 800, 900, 1000, 1100, 1200, 1300, 1400, 1500, 1600, 1800, 2000, 2250, 2500, 2750, 3000
  - WWyy: 260, 300, 400, 500
  - WWWW: 260, 300, 400, 500, 600, 700, 800
  - yytautau: 260, 300, 400, 500, 600

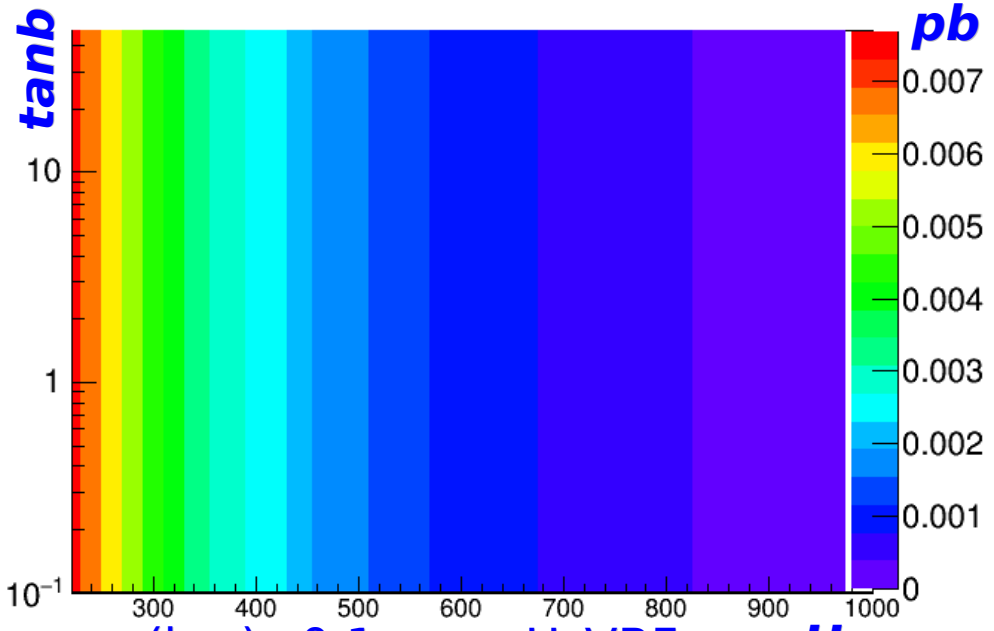
2HDM phase space - VBF

- VBF not ready in 13TeV, now look at 8TeV
- HVV is type-independent ~ cos(b-a)

	2HDM 1	2HDM 2	2HDM 3	2HDM 4
HVV	$c_{\beta-\alpha}$	$c_{\beta-\alpha}$	$c_{\beta-\alpha}$	$c_{\beta-\alpha}$
HQu	$c_{\beta-\alpha} - s_{\beta-\alpha}/t_\beta$	$c_{\beta-\alpha} - s_{\beta-\alpha}/t_\beta$	$c_{\beta-\alpha} - s_{\beta-\alpha}/t_\beta$	$c_{\beta-\alpha} - s_{\beta-\alpha}/t_\beta$
HQd	$c_{\beta-\alpha} - s_{\beta-\alpha}/t_\beta$	$c_{\beta-\alpha} + t_\beta s_{\beta-\alpha}$	$c_{\beta-\alpha} - s_{\beta-\alpha}/t_\beta$	$c_{\beta-\alpha} + t_\beta s_{\beta-\alpha}$
HLe	$c_{\beta-\alpha} - s_{\beta-\alpha}/t_\beta$	$c_{\beta-\alpha} + t_\beta s_{\beta-\alpha}$	$c_{\beta-\alpha} + t_\beta s_{\beta-\alpha}$	$c_{\beta-\alpha} - s_{\beta-\alpha}/t_\beta$



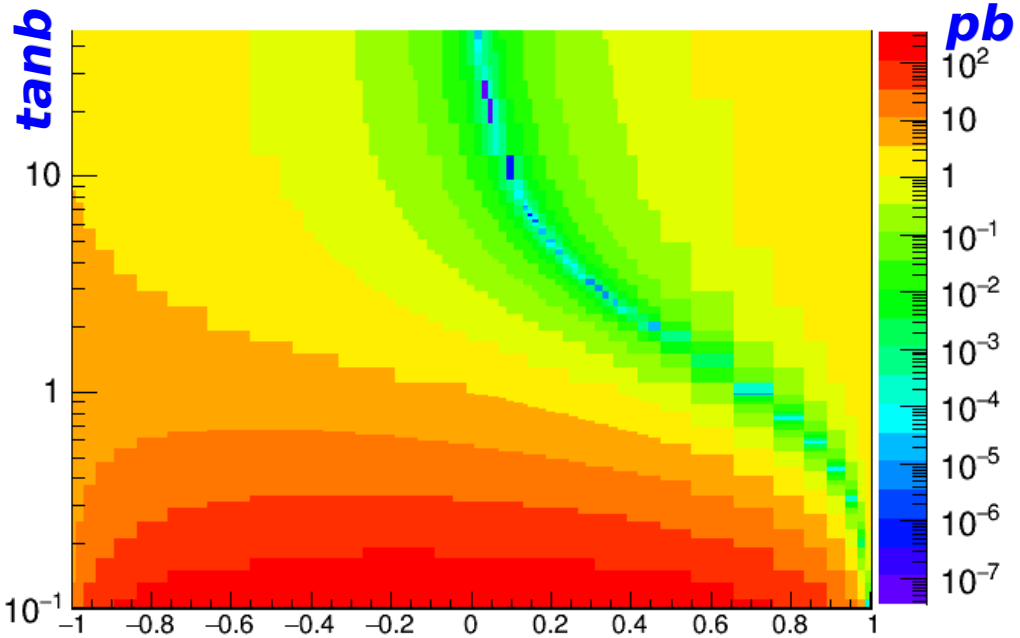
mH = 300 xsec_H_VBF
type I



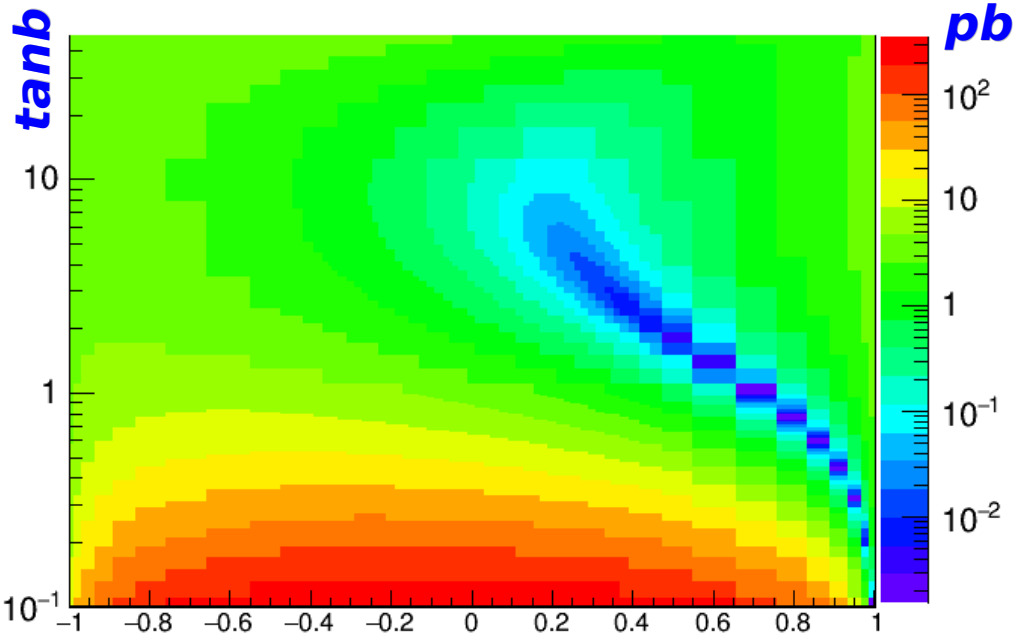
cos(b-a)=0.1 xsec_H_VBF
type I

2HDM phase space - ggF

- consistently look at ggF at 8TeV
- ggF is very large in low tanb
- Here are type I and II,
  - while type III == type I and type IV == type II



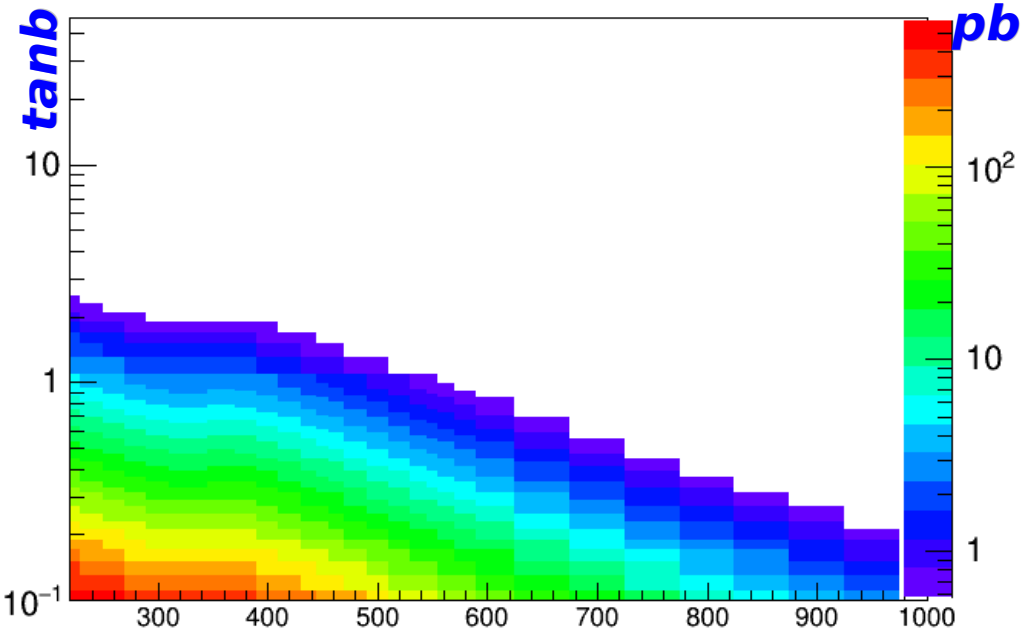
mH = 300 xsec_H_ggF
type I



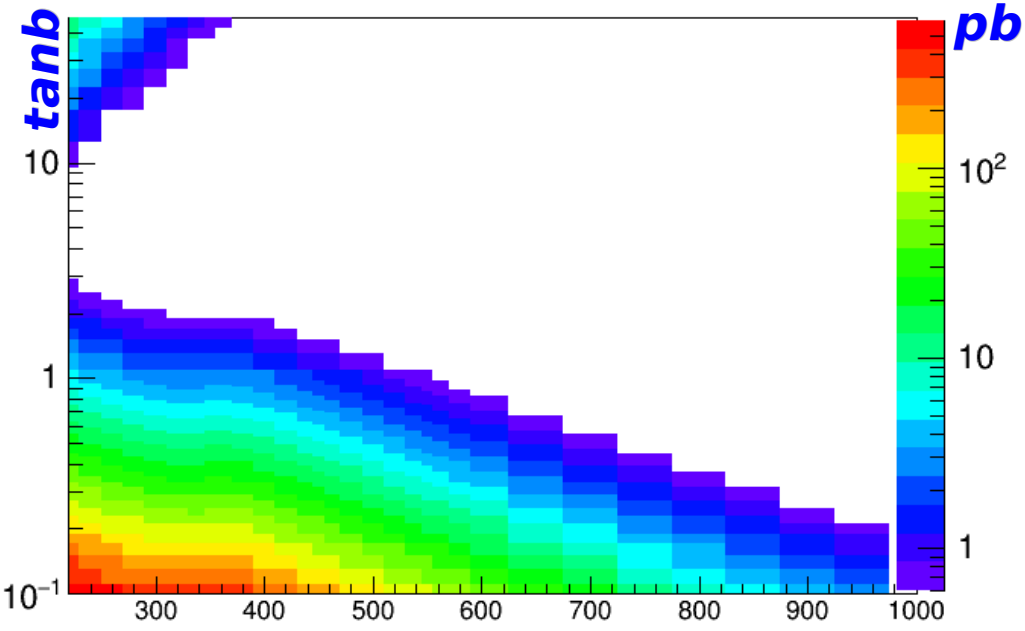
mH = 300 xsec_H_ggF
type II

2HDM phase space - ggF

- Along the mass
- An increase on ggF in high tanb region



type I



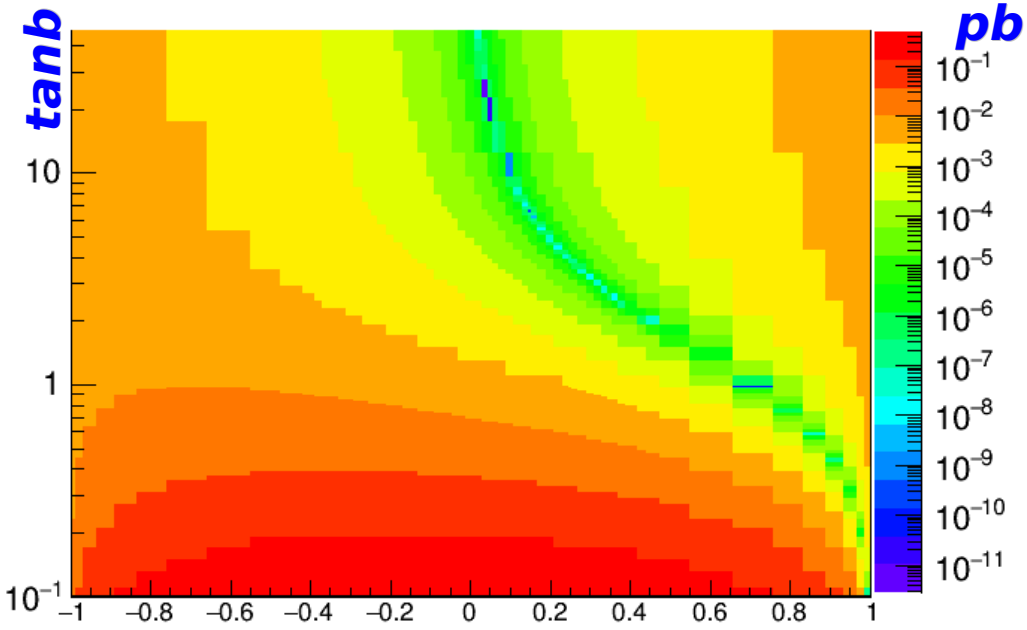
type II

2HDM phase space - bbH

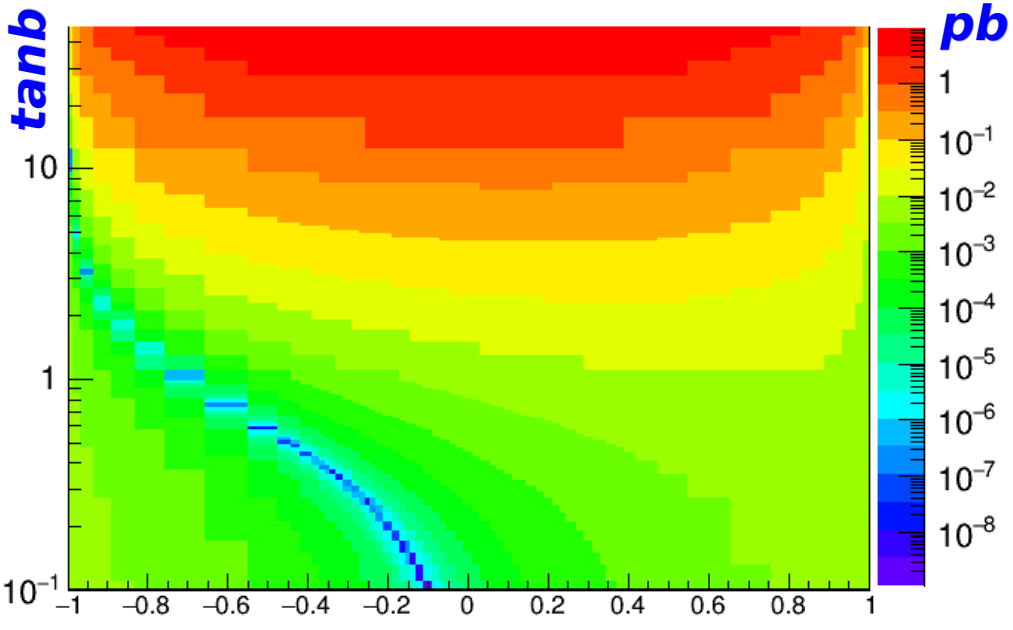
- b-associated production

$$c_{\beta-\alpha} + t_\beta s_{\beta-\alpha}$$

- enhanced down-type quark coupling type II IV
- bbH is very small in low tanb but goes beyond 1 pb in high tanb region (II/IV), complementary to ggH



mH=300 xsec_H_ggF
type I

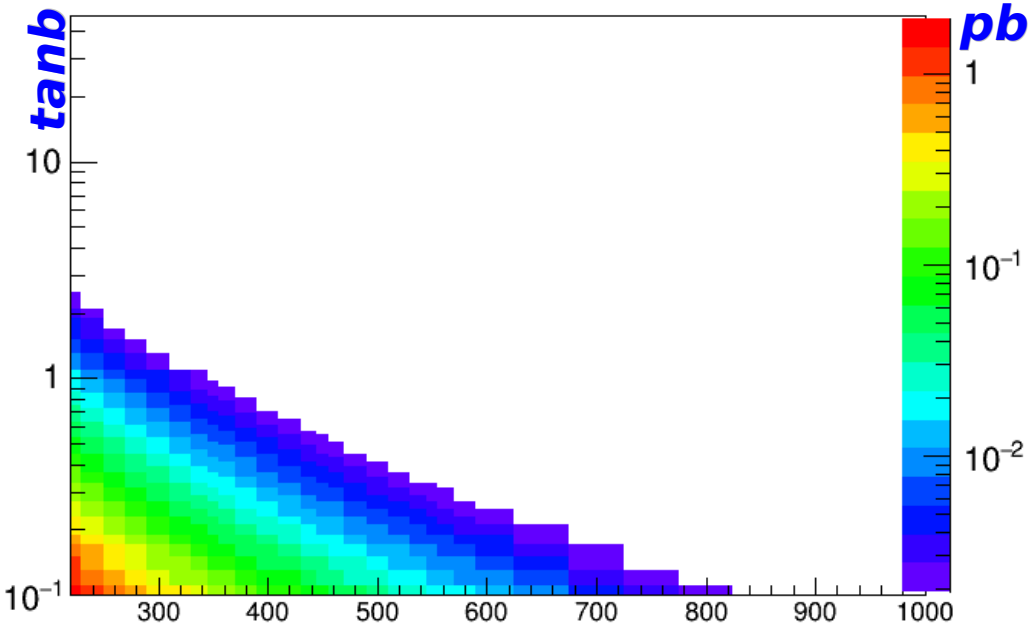


mH=300 xsec_H_ggF
type II

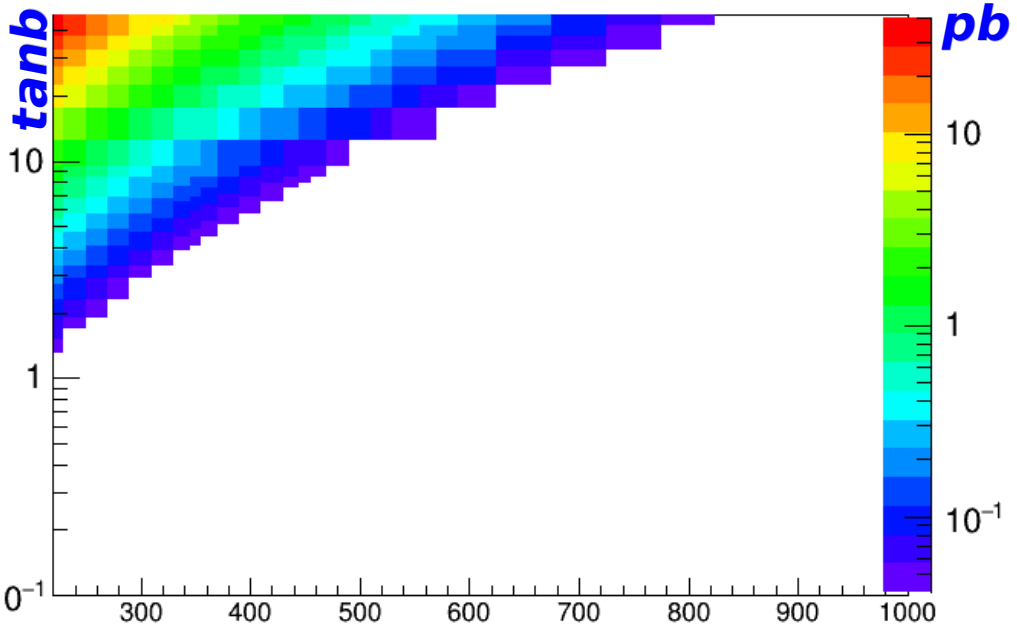
*type III == type I; type IV == type II

2HDM phase space - bbH

- b-associated production along the mass



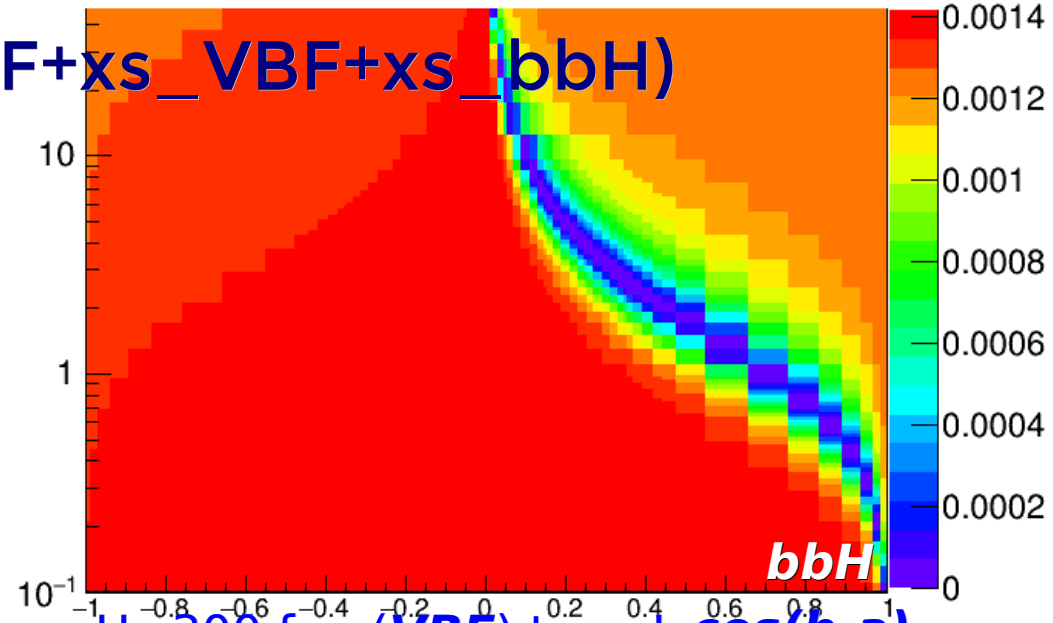
cos(b-a)=0.1 xsec_H_ggF ***cos(b-a)***
type I



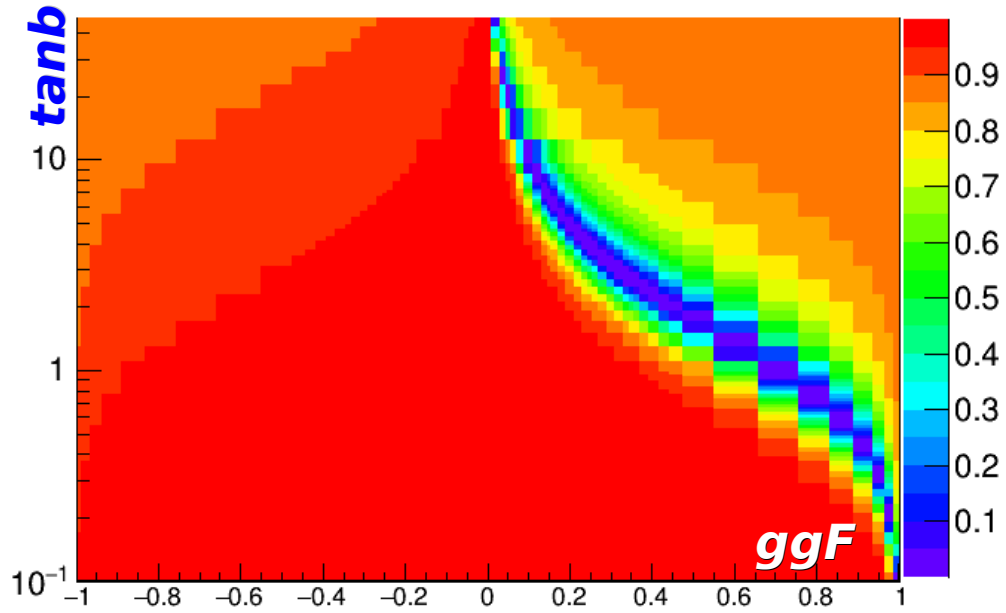
cos(b-a)=0.1 xsec_H_ggF ***cos(b-a)***
type II

2HDM phase space – all modes type I

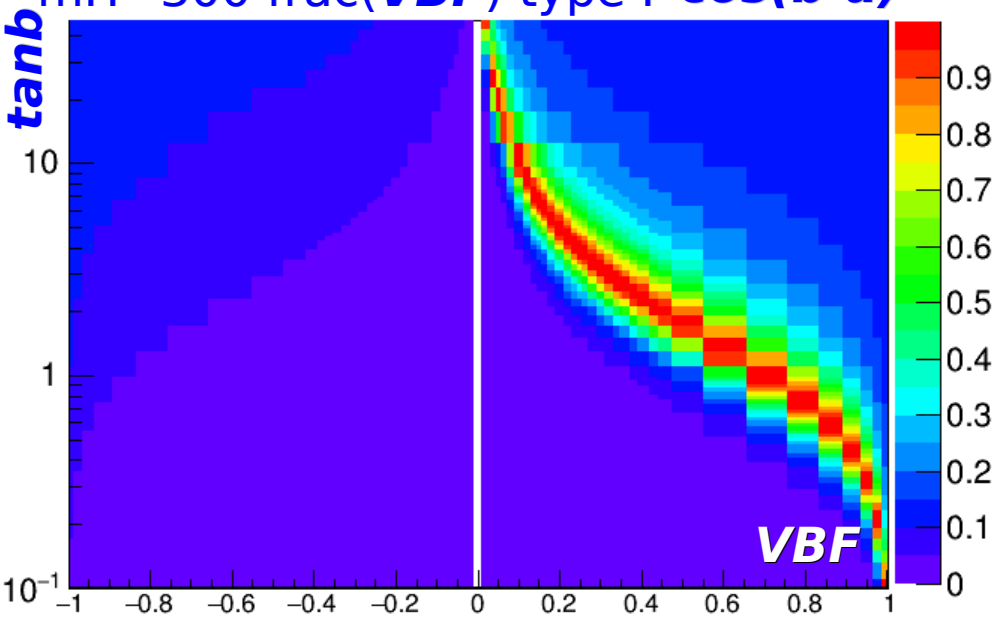
- frac(X) = (xs_X) / (xs_ggF+xs_VBF+xs_bbH)
- ggH takes 80-90%
- VBF takes 10-20%
  - can cover ggF valley
- bbH is negligible



mH=300 frac(***VBF***) type I ***cos(b-a)***



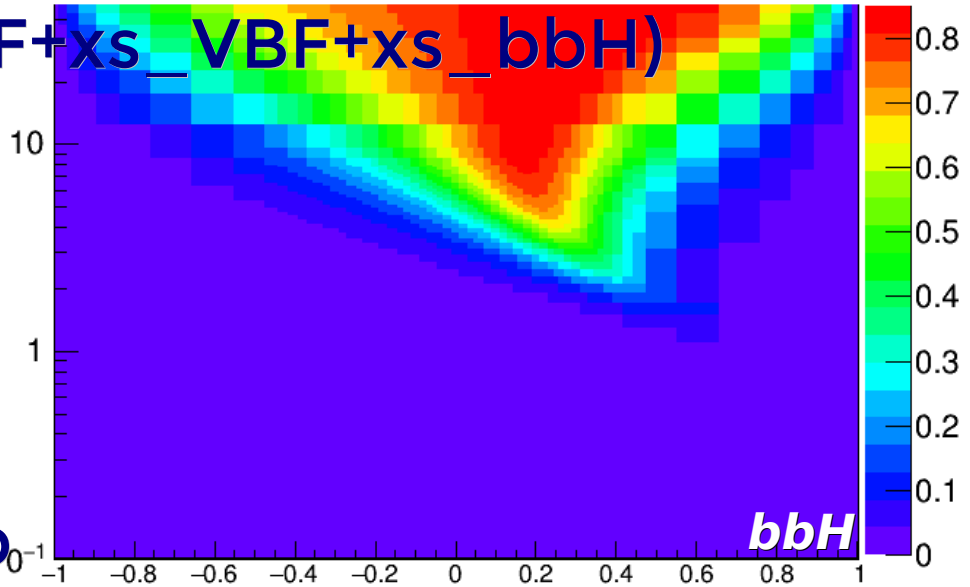
mH=300 frac(***ggF***) type I ***cos(b-a)***



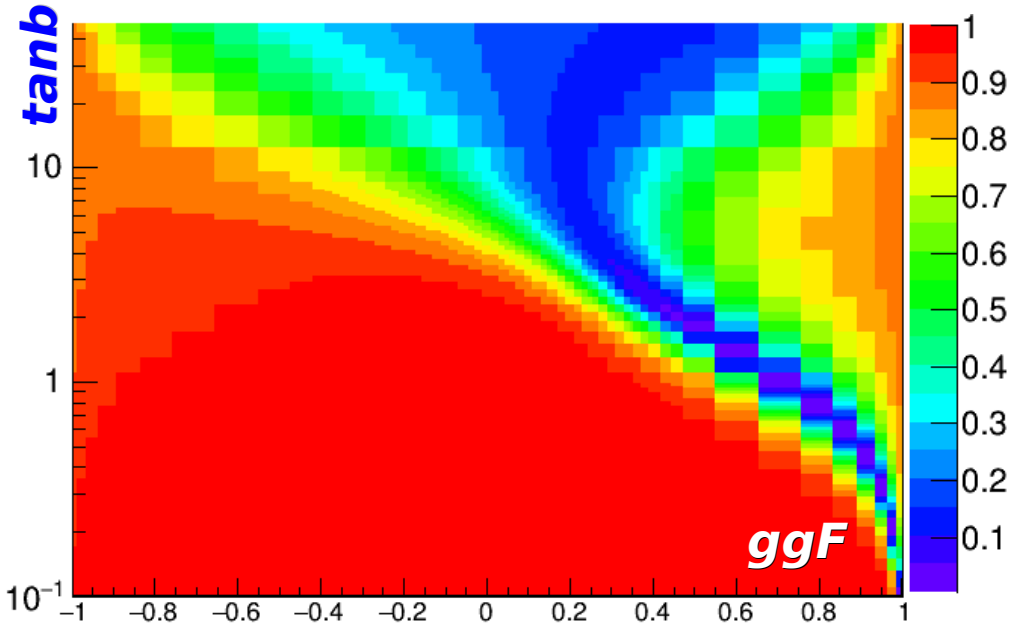
mH=300 frac(***VBF***) type I ***cos(b-a)***

2HDM phase space – all modes type II

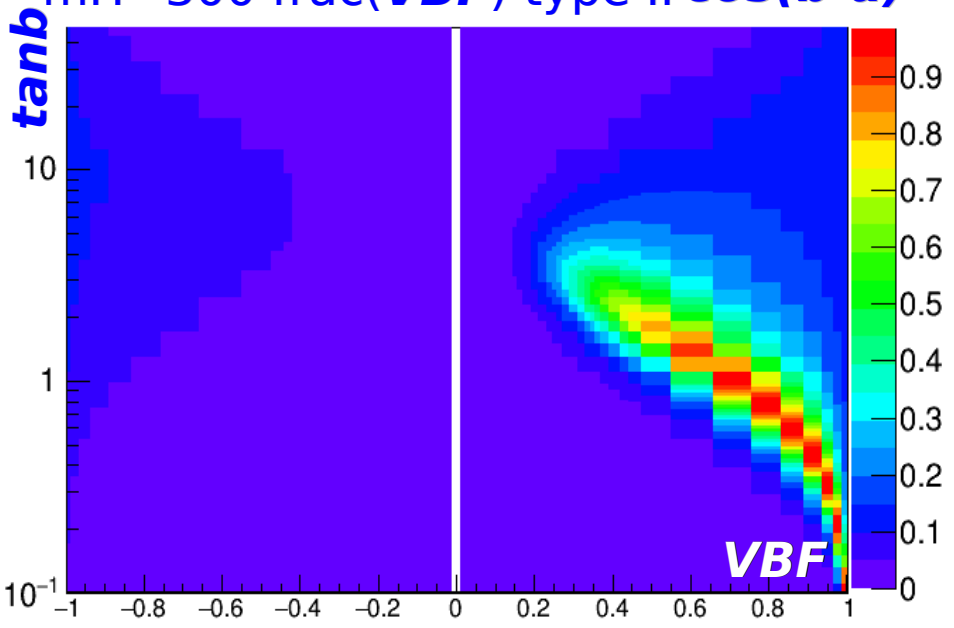
- frac(X) = (xs_X) / (xs_ggF+xs_VBF+xs_bbH)
- ggH takes 80-90%
- VBF is negligible
  - covers valley
- bbH up to 80% in high tb



mH=300 frac(***VBF***) type II ***cos(b-a)***



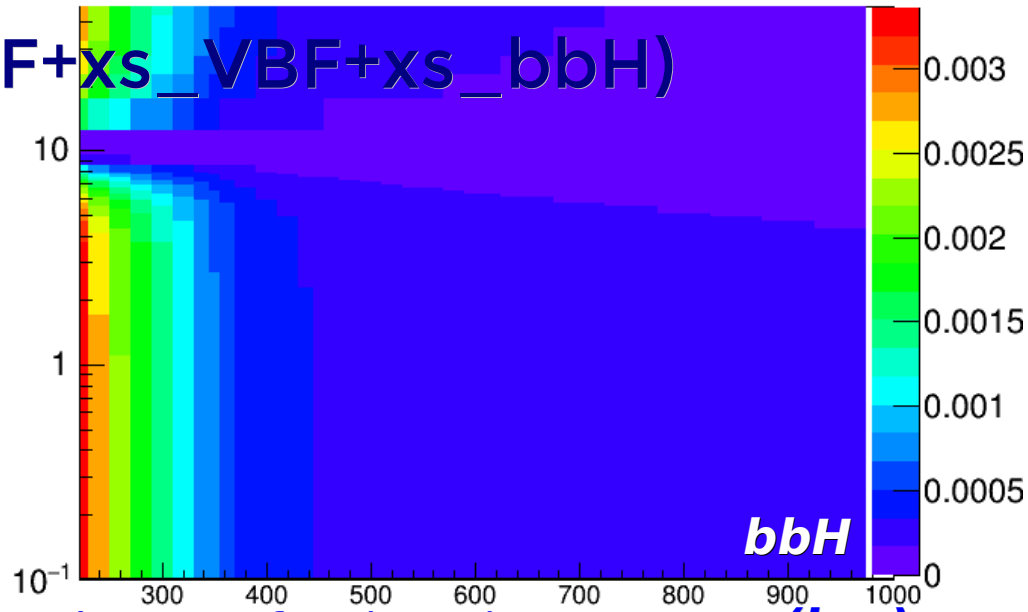
mH=300 frac(***ggF***) type II ***cos(b-a)***



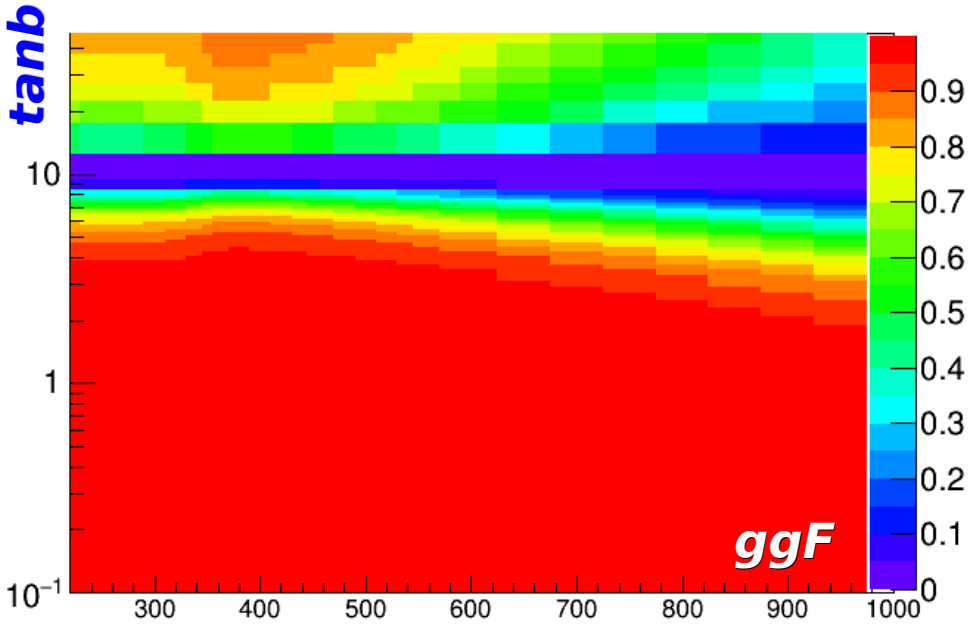
mH=300 frac(***VBF***) type II ***cos(b-a)***

2HDM phase space – all modes type I

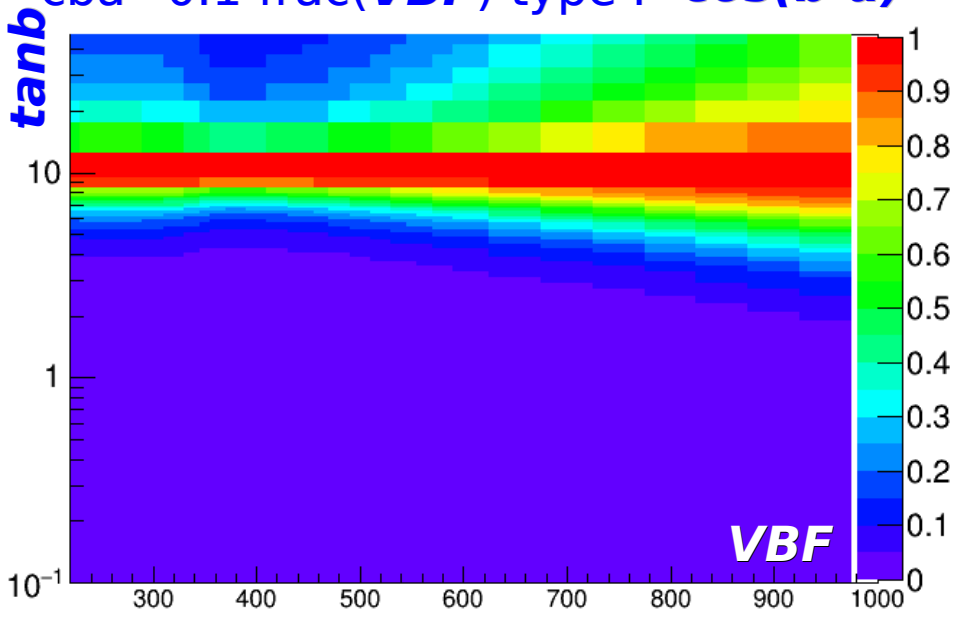
- frac(X) = (xs_X) / (xs_ggF+xs_VBF+xs_bbH)
- ggH takes 80-90%
- VBF covers valley
- bbH is negligible



cba=0.1 frac(***VBF***) type I ***cos(b-a)***



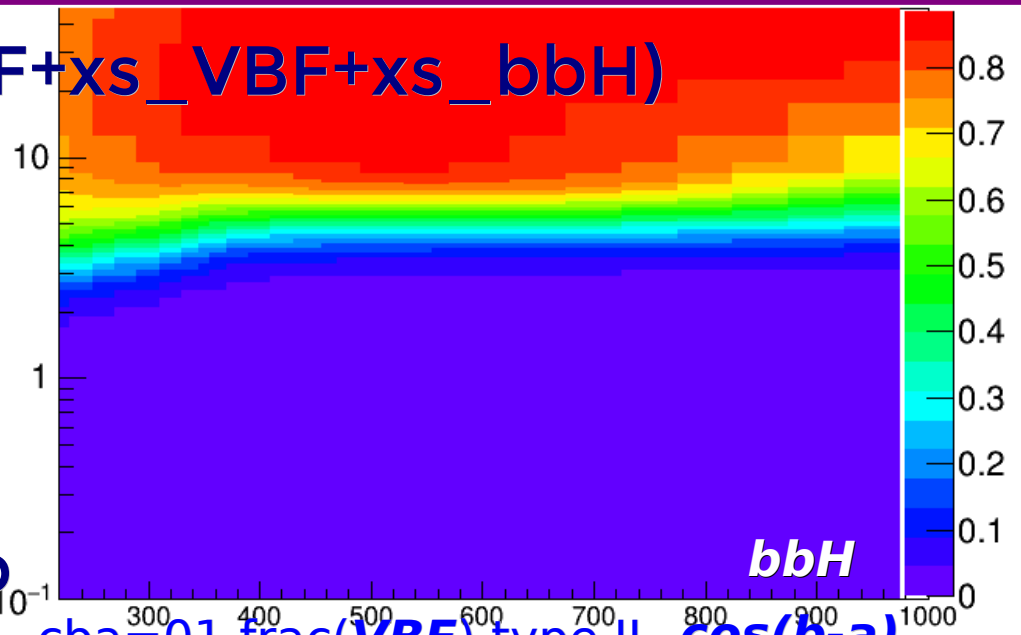
cba=01 frac(***ggF***) type I ***cos(b-a)***



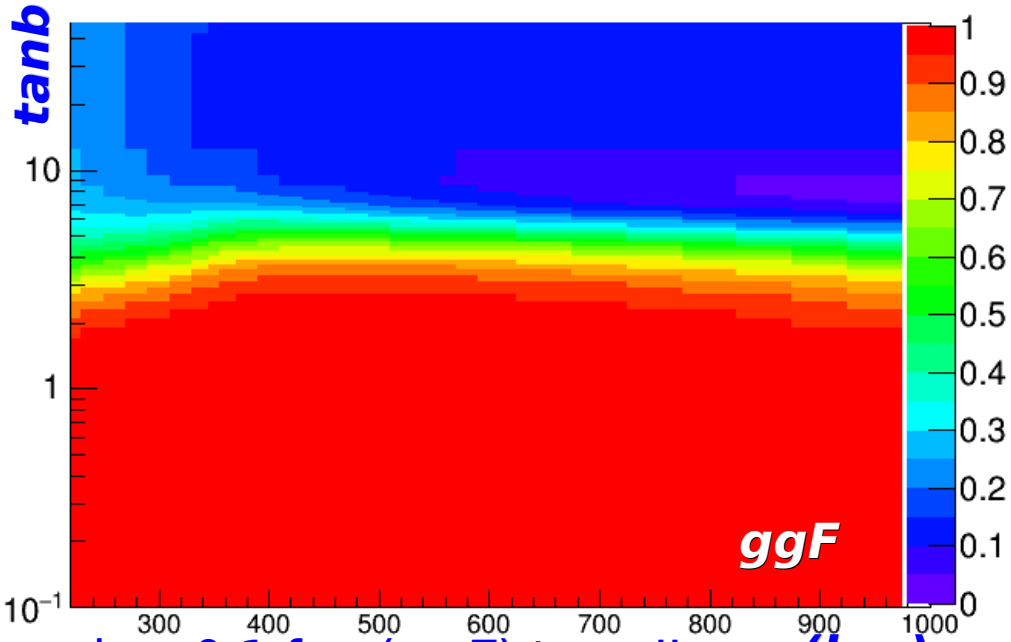
cba=0.1 frac(***VBF***) type I ***cos(b-a)***

2HDM phase space – all modes type II

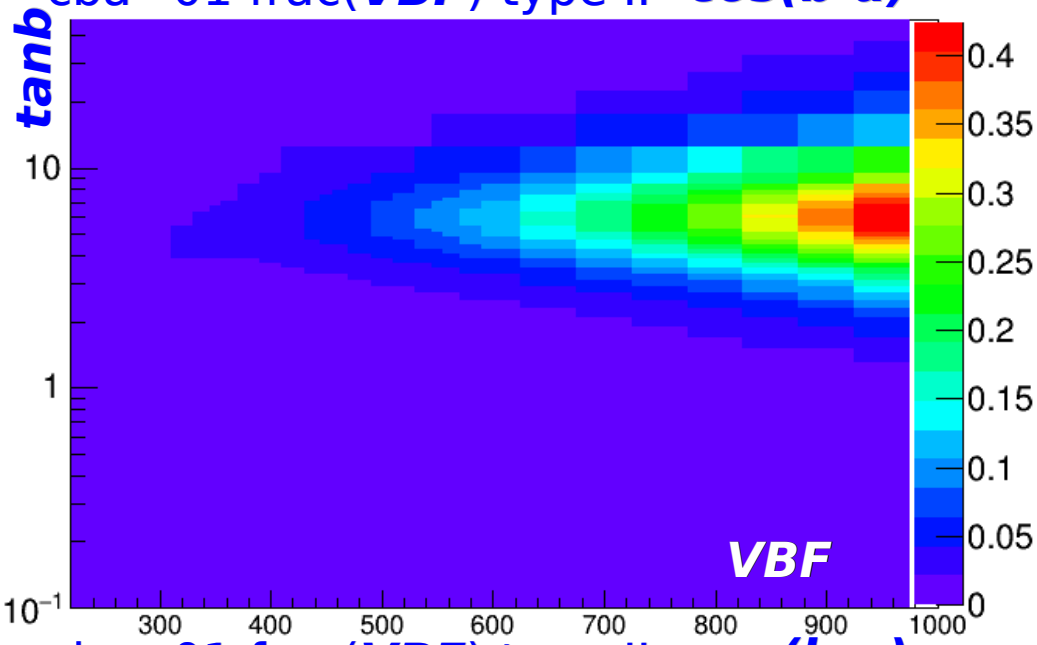
- frac(X) = (xs_X) / (xs_ggF+xs_VBF+xs_bbH)
- ggH takes 80-90%
- VBF is negligible
  - covers part of valley
- bbH up to 80% in high tb



cba=01 frac(***VBF***) type II ***cos(b-a)***



cba=0.1 frac(***ggF***) type II ***cos(b-a)***

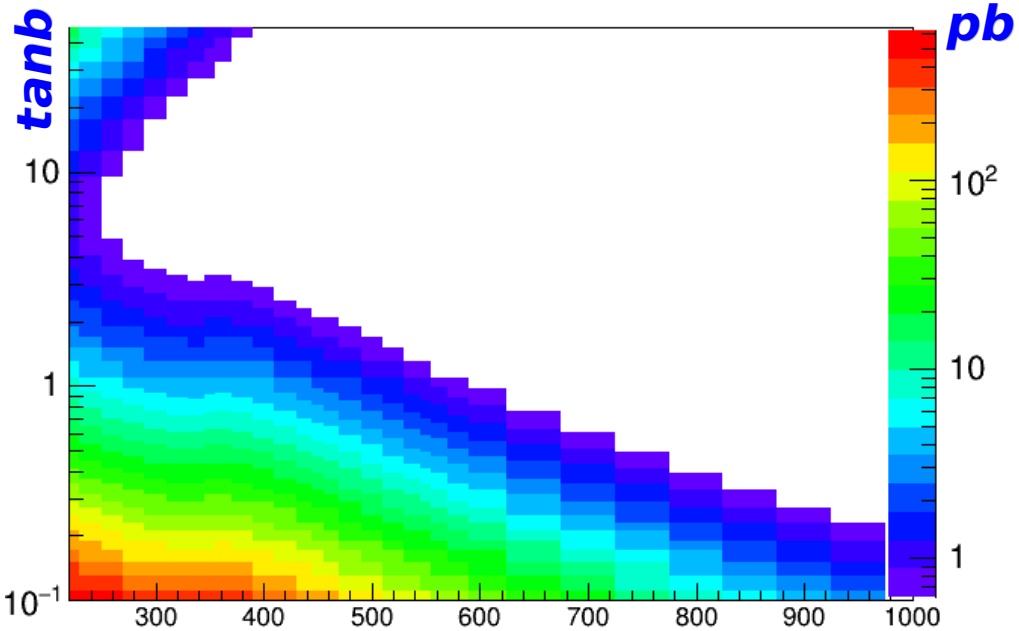


cba=01 frac(***VBF***) type II ***cos(b-a)***

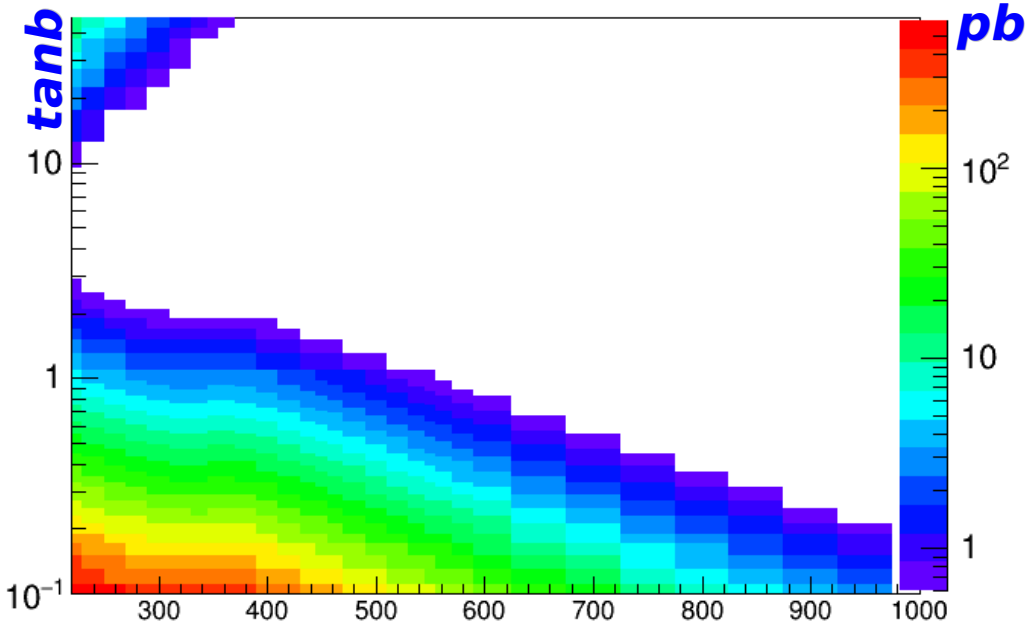
Backup

2HDM phase space - ggF

- An increase on ggF in high tanb region
- compare cos(b-a) = +/- 0.1



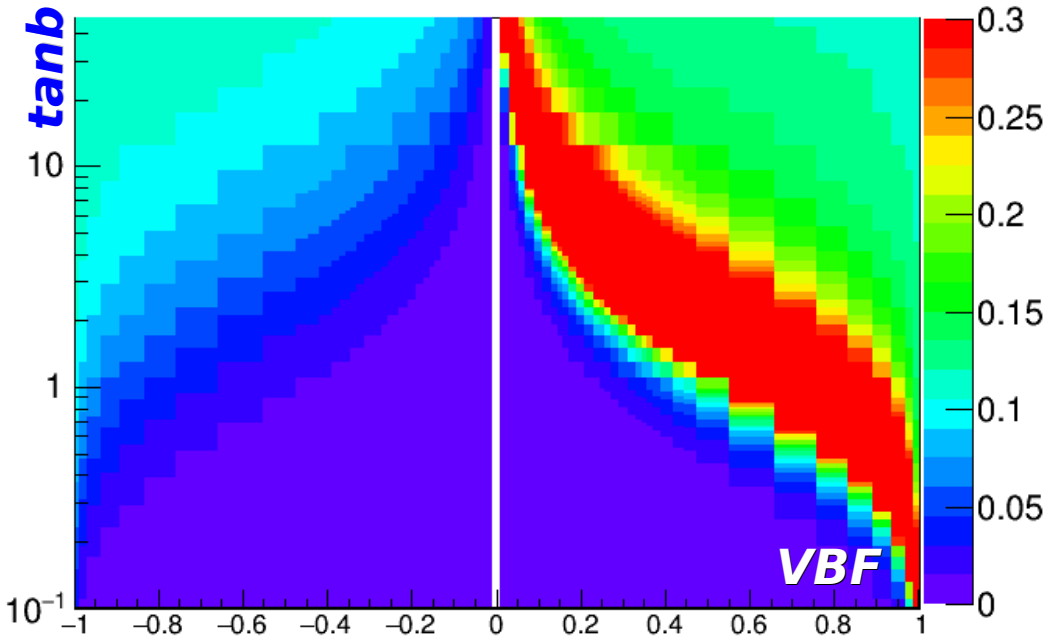
cos(b-a)=**-0.1** xsec_H_ggF ***cos(b-a)***
type II



cos(b-a)=**0.1** xsec_H_ggF ***cos(b-a)***
type II

2HDM phase space – VBF frac type I

- frac(X) = (xs_X) / (xs_ggF+xs_VBF+xs_bbH)
- zoom in 0% - 30% to see clearly frac(VBF)
  - all >30% are marked as 30%
- in high tanb, taking >10%



mH=300 frac(***VBF***) type I ***cos(b-a)***