CP-violatin in gfluon fusion production, EFT analysis Moriond17

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HComb

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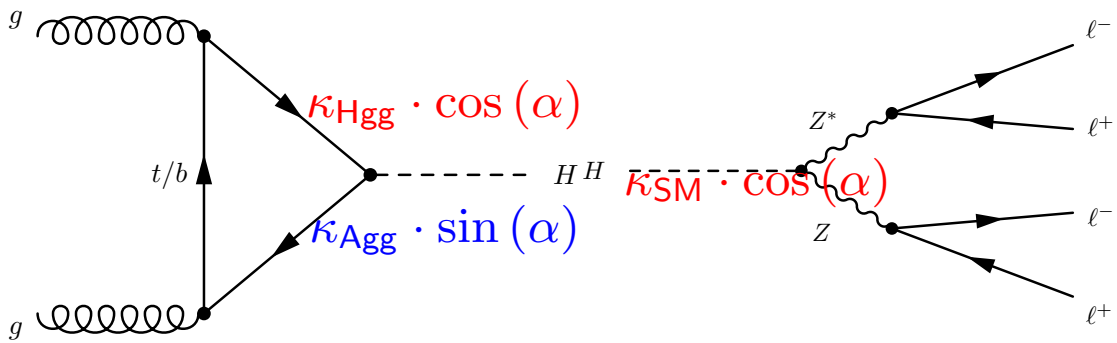
CP-violation in gluon fusion production



ICHEP style analysis: Consider only number of expected events in template cross section framework

- Expected limits for 1D Scan (κ_{Agg}) and 2D scan ($\kappa_{\text{Agg}}, \kappa_{\text{Hgg}}$) for expected Moriond 2017 dataset $\mathcal{L}_{\text{Moriond17}} = 35$ fb^{-1}

- MC samples and statistics sufficient to build signal models in phase space region of interest?

  $\mathcal{L}_{\text{Moriond2017}} \approx 35$ fb^{-1} $\rightarrow N_{\text{exp}} \approx 75$

$\Rightarrow$ Requirement: $\frac{\Delta N}{N} < 12\%$ within region of interest

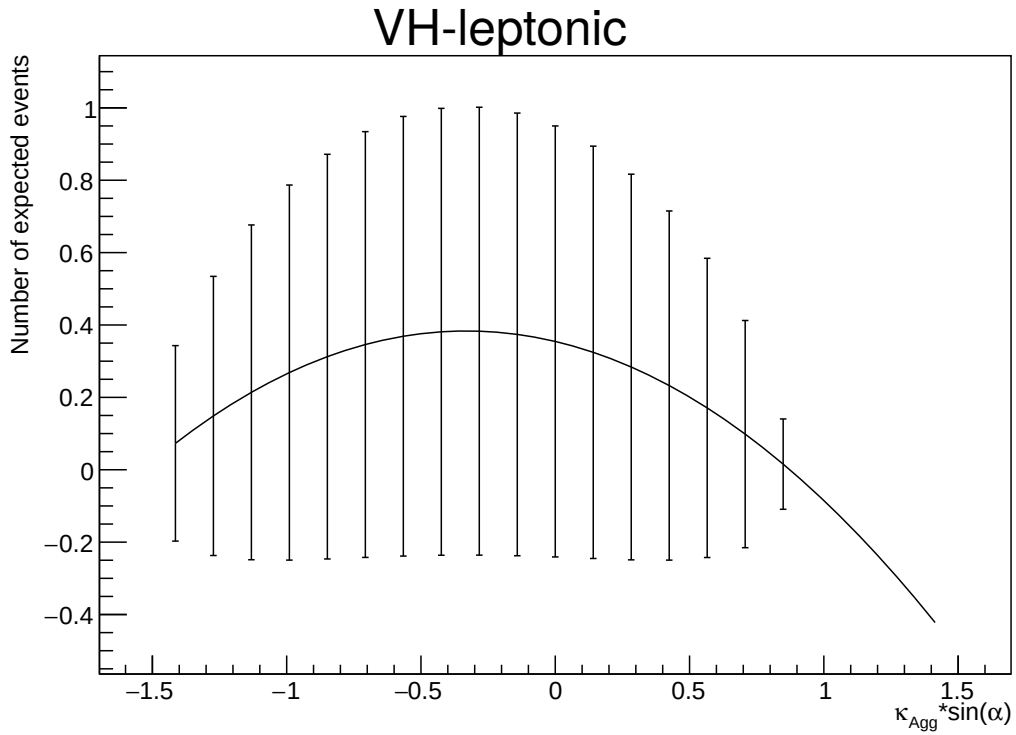
Analysis setup and signal model

Description	DSid	$\cos(\alpha)$	κ_{Hgg}	κ_{Agg}	κ_{SM}	MC stat.
SM	344158	1	1	0	1	200k (500k)
Mixture	344167	$\frac{1}{\sqrt{2}}$	1	0.5	1	100k
Mixture	344168	$\frac{1}{\sqrt{2}}$	1	-0.5	1	100k
Mixture	344169	$\frac{1}{\sqrt{2}}$	$\sqrt{2}$	$\sqrt{2}$	$\sqrt{2}$	50k
pure BSM	344170	$\frac{1}{\sqrt{2}}$	0	1	1	50k

- BSM contribution in ggF production modelled with morphing method: 344158,344167,344168
- Pest prediction scaling to PowHeg ggF+ttH+bbH number of expected events in the SM point is applied
- VBF+VH yields are taken from SM PowHeg samples $\rightarrow$ Flat behaviour over κ_{Agg}
- Reducible and irreducible backgrounds are included
- No systematics included, no width scaling applied

Negative number of expected events in VH-leptonic category

- Problem: Negative number of expected events in VH-leptonic category

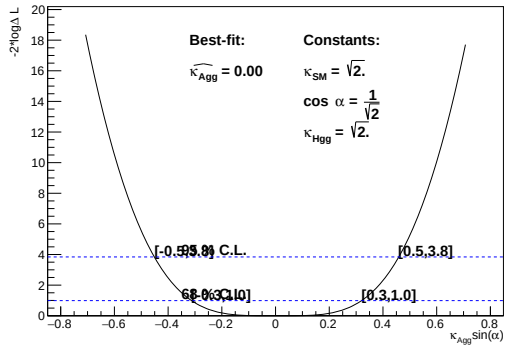


⇒ Known problem: ggF has large negative event weights in this category.
So far, this has been compensated by VBF+VH contribution, but for a kAgg model VBF+VH contribution is flat over kAgg and the total Pdf goes negative.

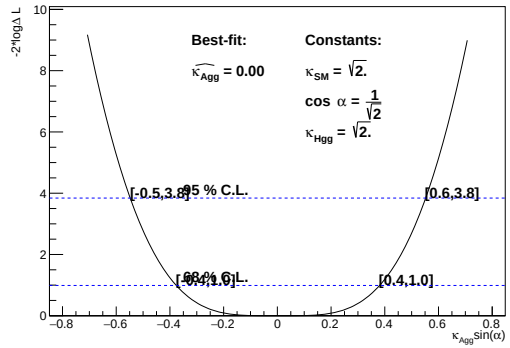
- Short term solution: Remove VH-leptonic category from combined fit

1D scan of κ_{Agg} for $\mathcal{L} = 35$ fb^{-1}

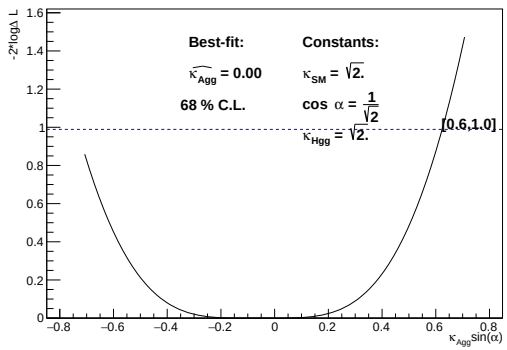
ggF-enriched



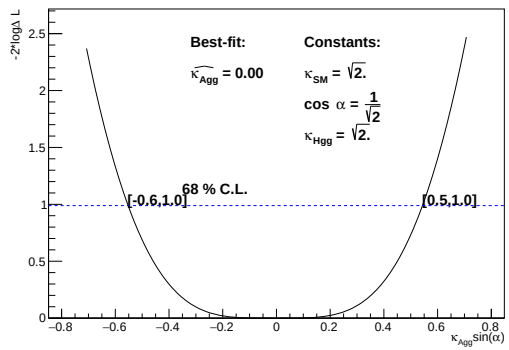
1-jet



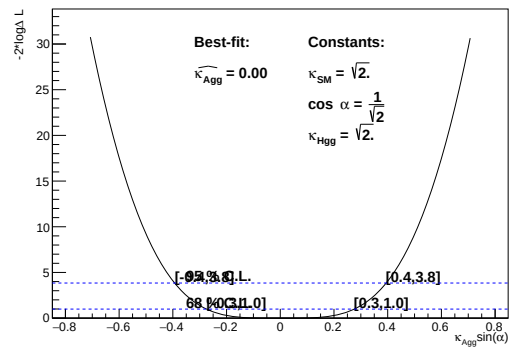
VH-had



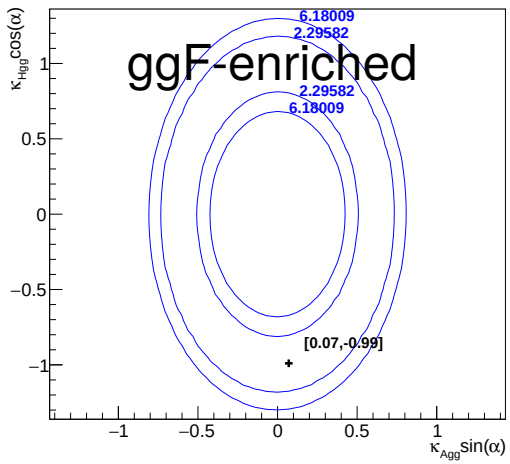
VBF-enriched

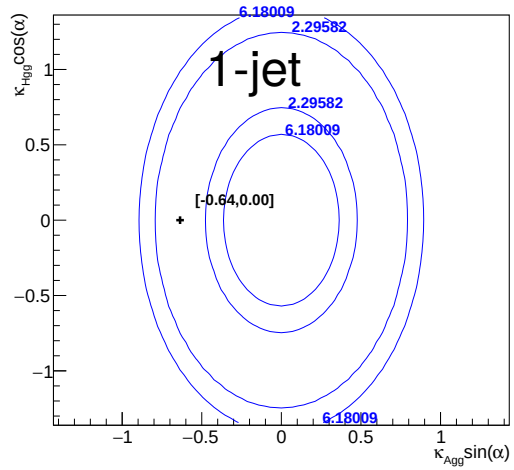


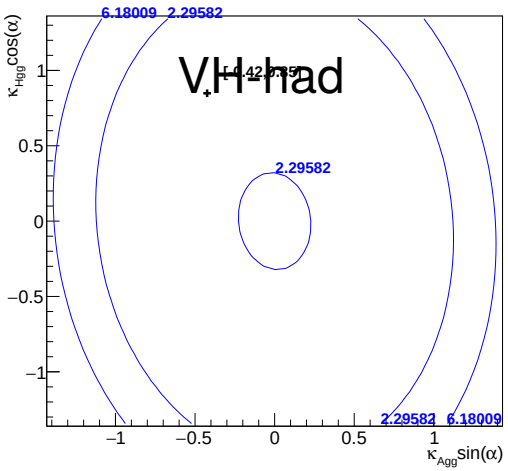
combined

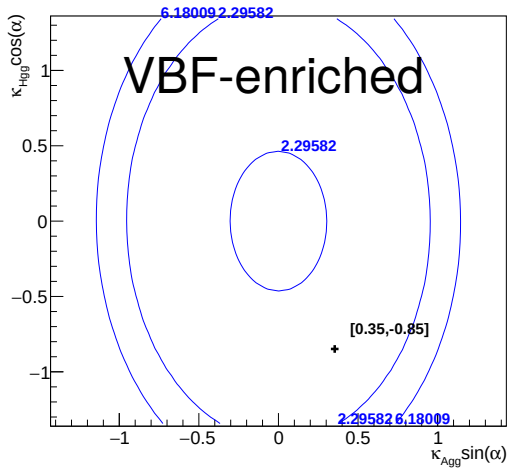


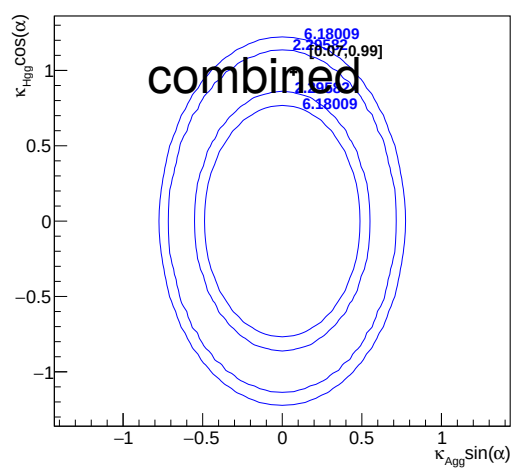
2D scan of κ_{Agg},κ_{Hgg} for $\mathcal{L} = 35$ fb^{-1}



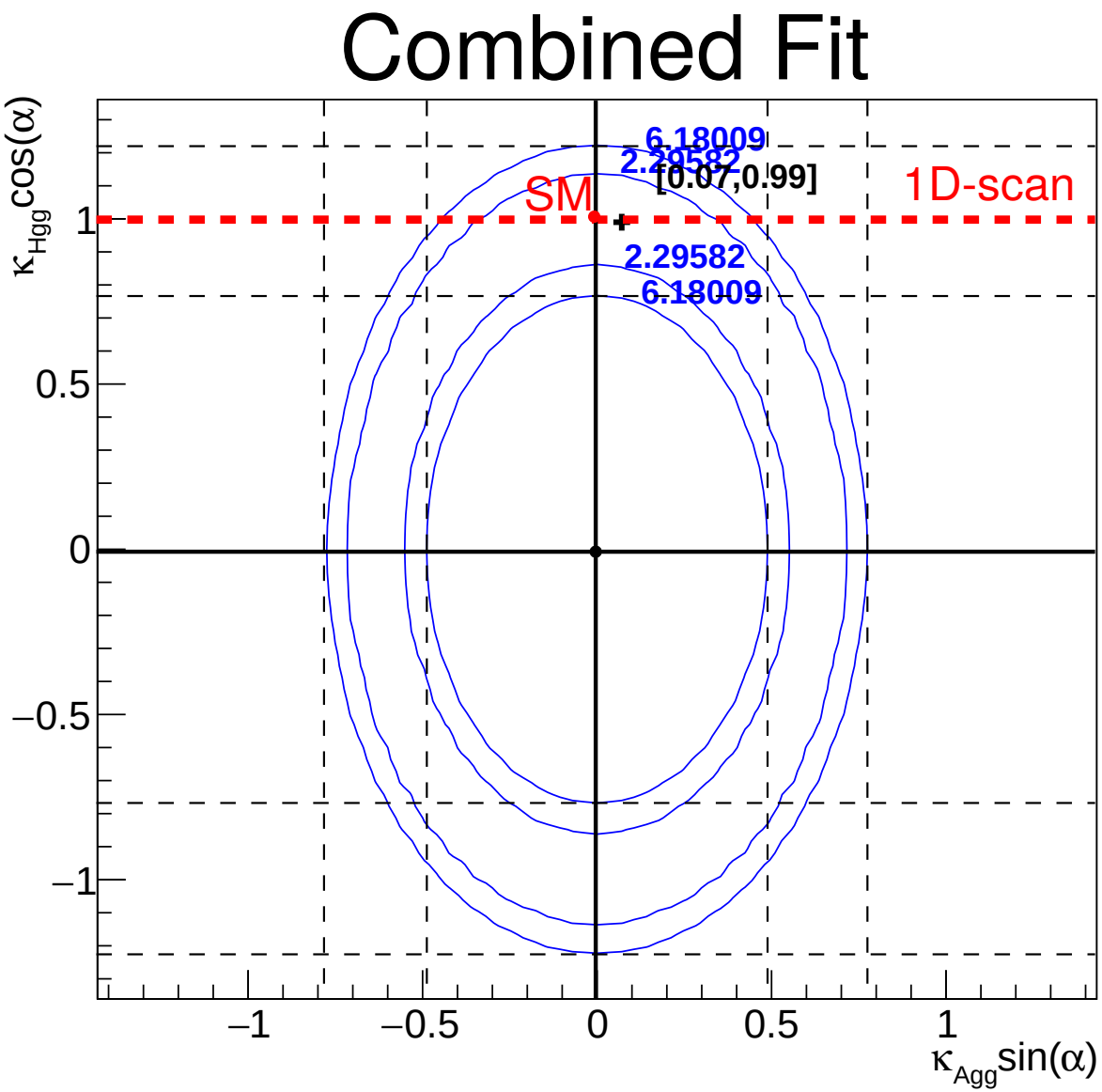








2D scan of κ_{Agg},κ_{Hgg} for $\mathcal{L} = 35$ fb^{-1}



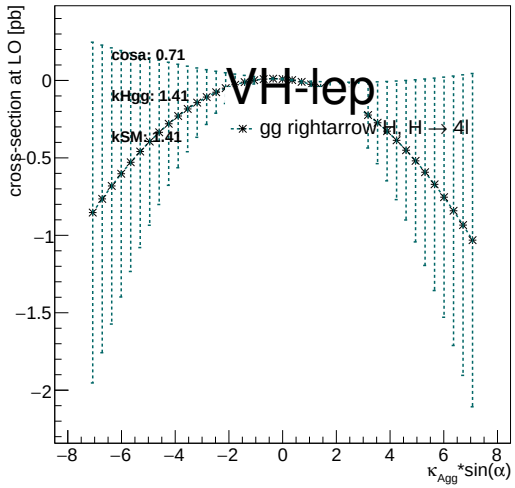
95 % CL limits:

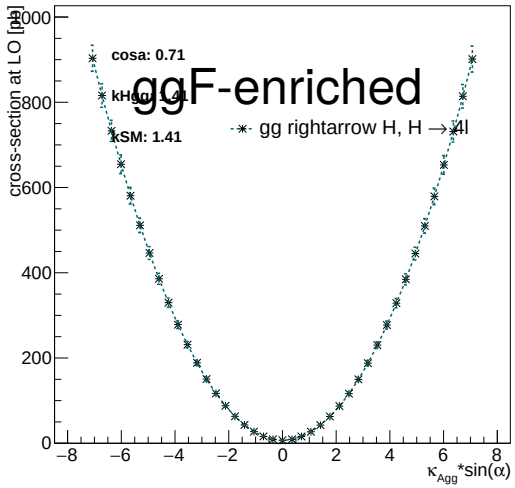
$\frac{g^2_{\text{Agg}}}{a^2} + \frac{g^2_{\text{Hgg}}}{b^2} = 1$

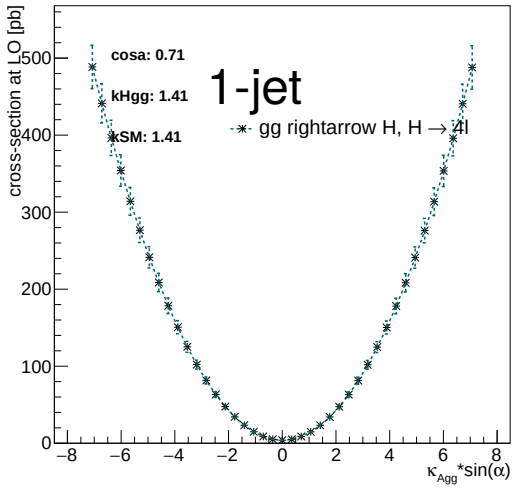
a in $[0.49, 0.79]$

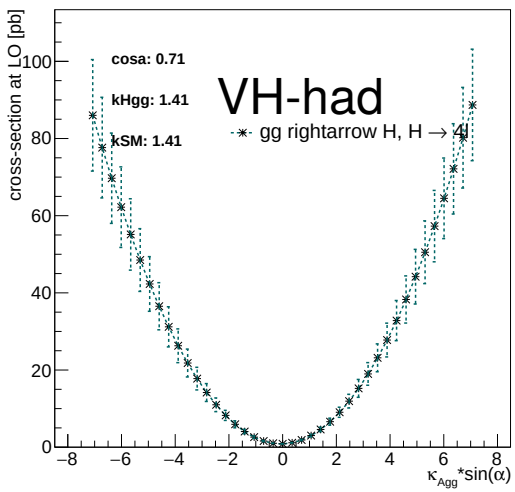
b in $[0.76, 1.21]$

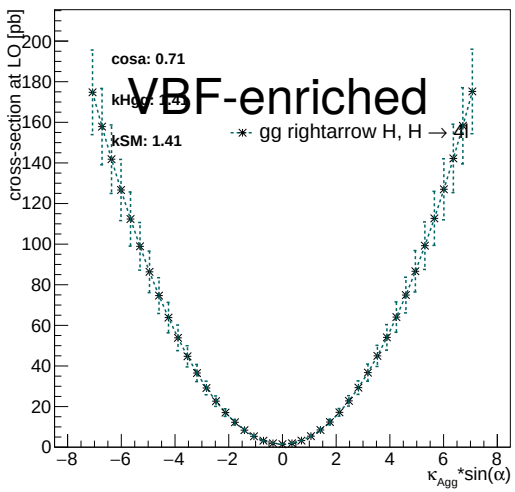
Nexp w. morphing error ($\mathcal{L} = 14$ fb^{-1}): ggF, kAgg

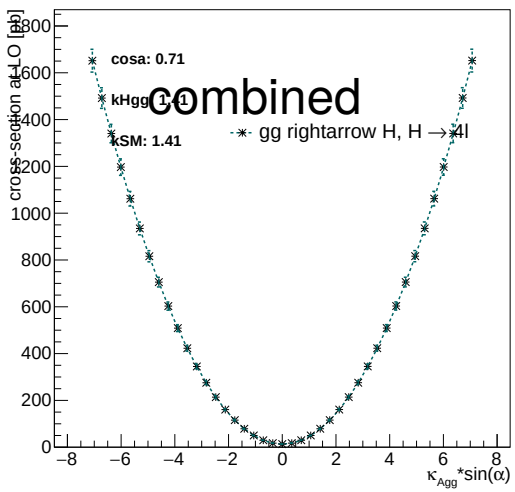
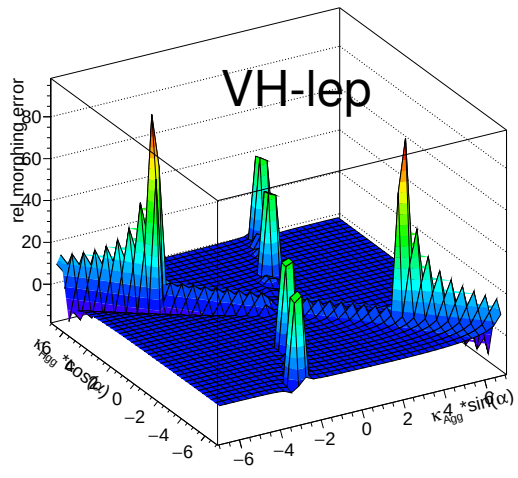
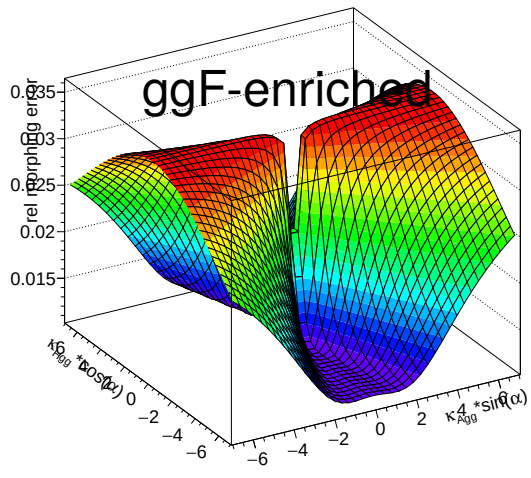
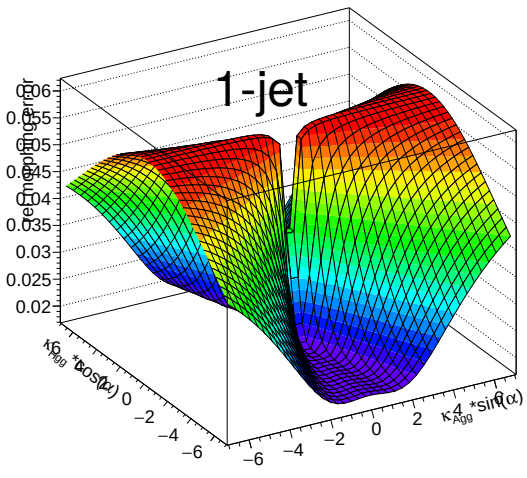
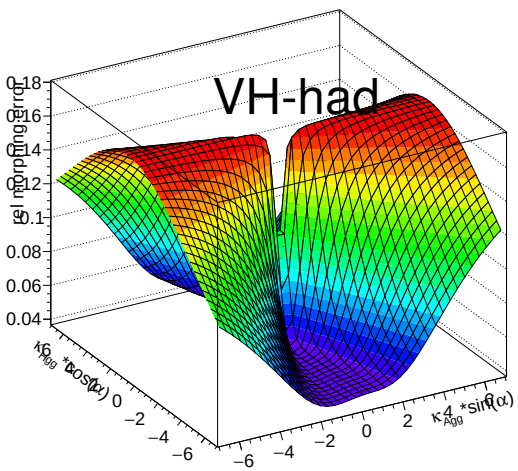
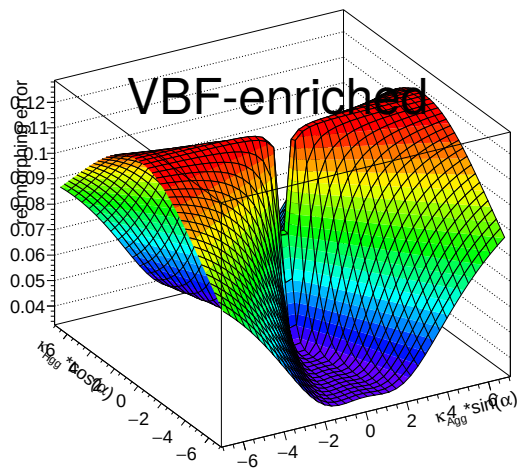
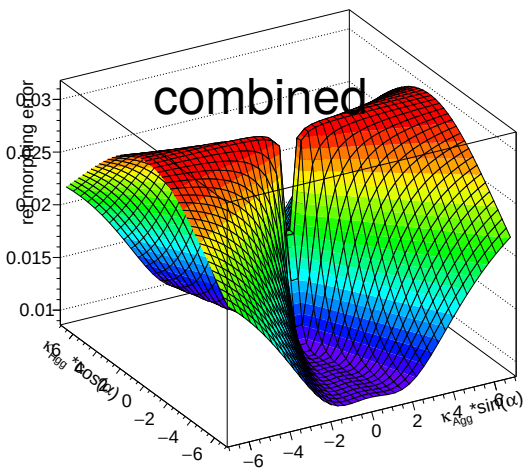












Relative morphing error of ggF signal model in 2D plane κAgg, κ_{Hgg}