WGB: "Theoretical uncertainties"
Kind of a summary

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" New Physics at the Super Flavor factory "

" New Physics at the Super Flavor factory "

or in other words:

" Let's play the music and not its background! "

Ornette Coleman, Free Jazz

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that sounds kind of interesting, so many people want to do that ... and I can understand why

" WGB: Theoretical uncertainties "

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that sounds kind of less interesting, maybe even boring, so not many people (only two) were willing to contribute at the end

" WGB: Theoretical uncertainties "

or in other words:

" Let's play the background and not the music! "

yet I believe that a good (and hopefully better) understanding of "theoretical uncertainties" aka "the background" is crucial in many cases to make a physics case for Super Flavor Factory

Why? Just a random example:

Mode	Sensitivity		
	Current	10 ab^{-1}	75 ab^{-1}
$\mathcal{B}(B \to X_s\gamma)$	7%	5%	3%
$A_{CP}(B \to X_s\gamma)$	0.037	0.01	0.004–0.005
$\mathcal{B}(B^+ \to \tau^+\nu)$	30%	10%	3–4%
$\mathcal{B}(B^+ \to \mu^+\nu)$	X	20%	5–6%
$\mathcal{B}(B \to X_s l^+ l^-)$	23%	15%	4–6%
$A_{\mathrm{FB}}(B \to X_s l^+ l^-)_{s_0}$	X	30%	4–6%
$\mathcal{B}(B \to K\nu\overline{\nu})$	X	X	16–20%
$S(K^0_S \pi^0 \gamma)$	0.24	0.08	0.02–0.03

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to reach such an accuracy on the theoretical side is "crazy" aka "very difficult"

$B \to X_s\gamma$: Theory status

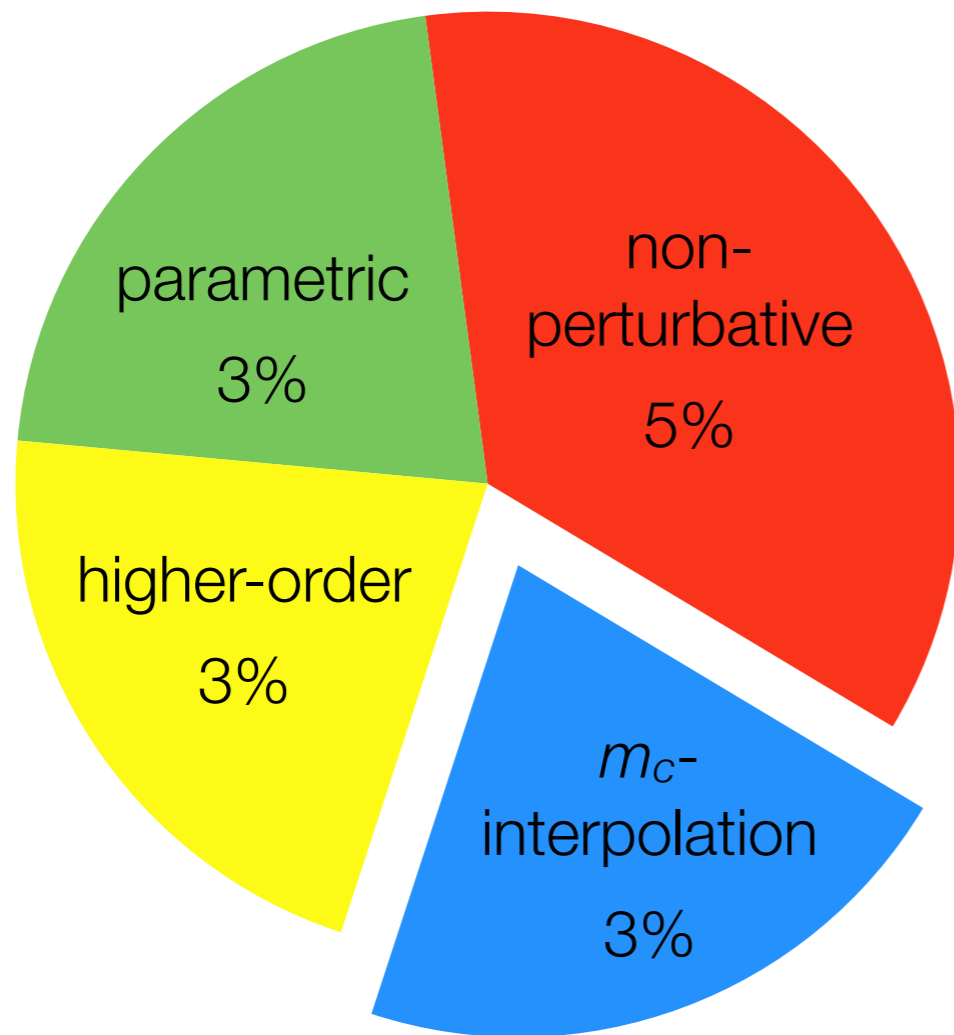$$\mathrm{BR}(B \to X_s\gamma)_{\mathrm{SM}}^{E_\gamma > 1.6 \ \mathrm{GeV}} = (3.15 \pm 0.23) \times 10^{-4}$$
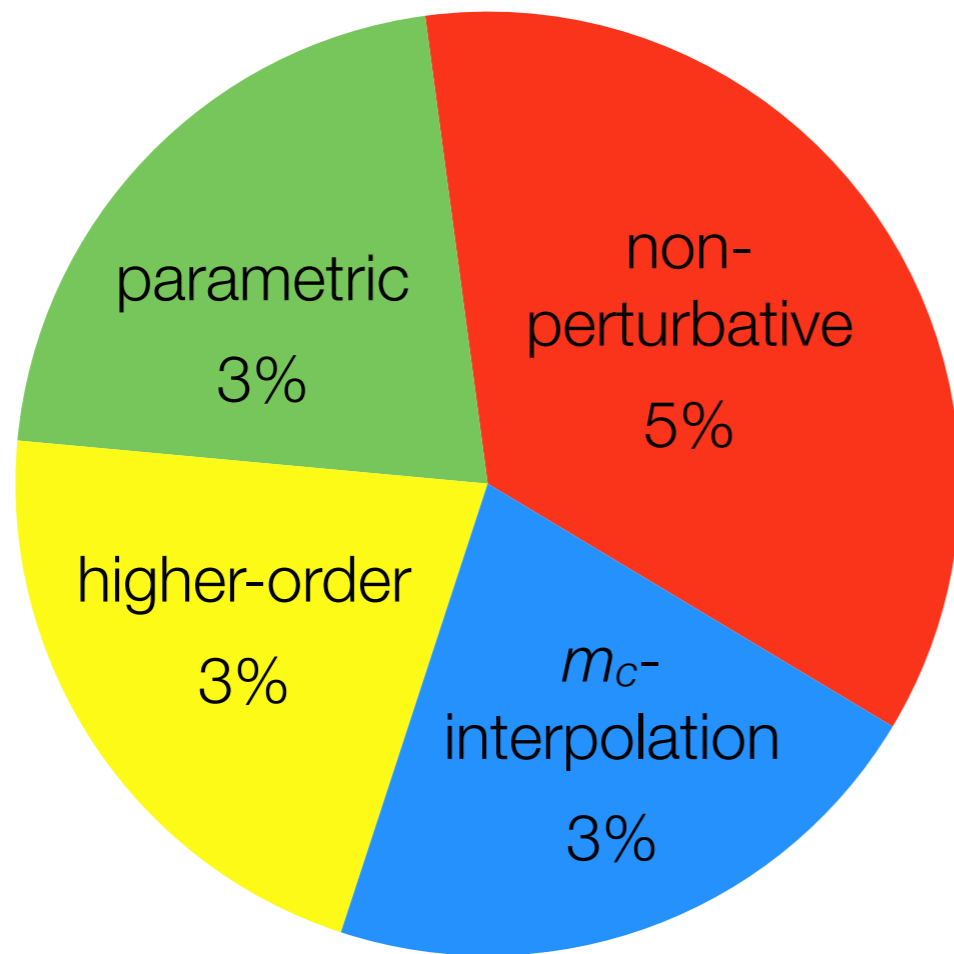
individual errors on BR
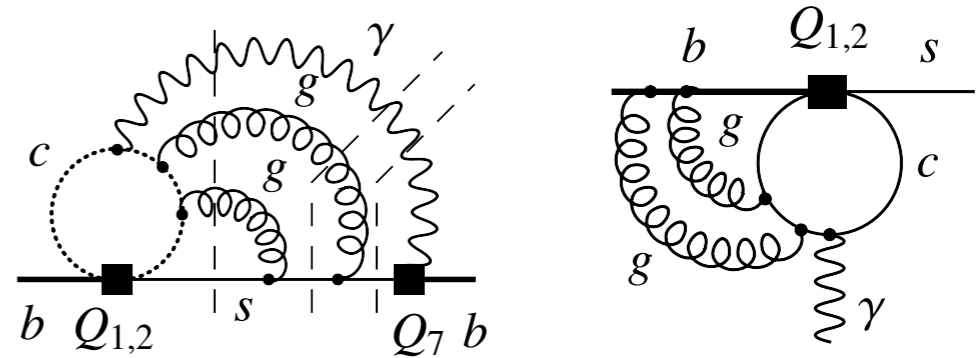
total theory error at the level of 10% depending on how one combines individual uncertainties

$B \to X_s\gamma$: Theory progress (?)

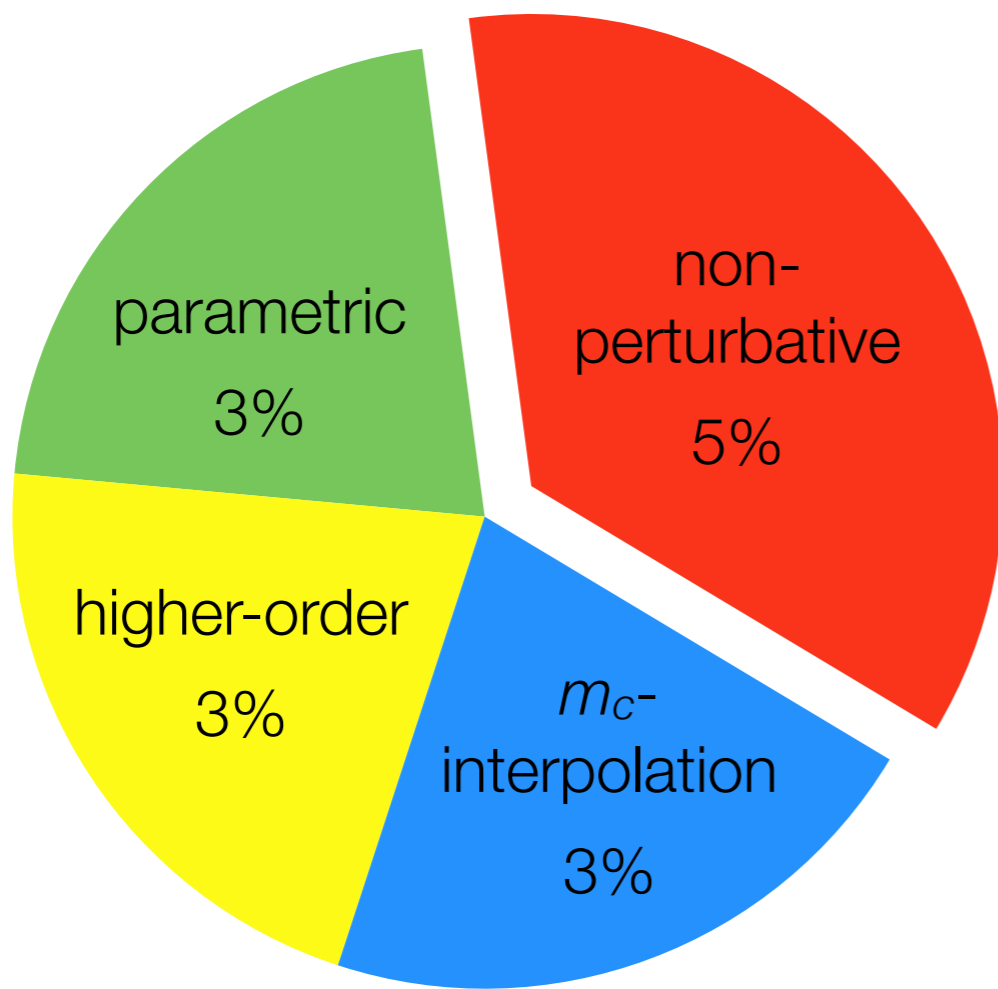$$\mathrm{BR}(B \to X_s\gamma)_{\mathrm{SM}}^{E_\gamma > 1.6 \ \mathrm{GeV}} = (3.15 \pm 0.23) \times 10^{-4}$$
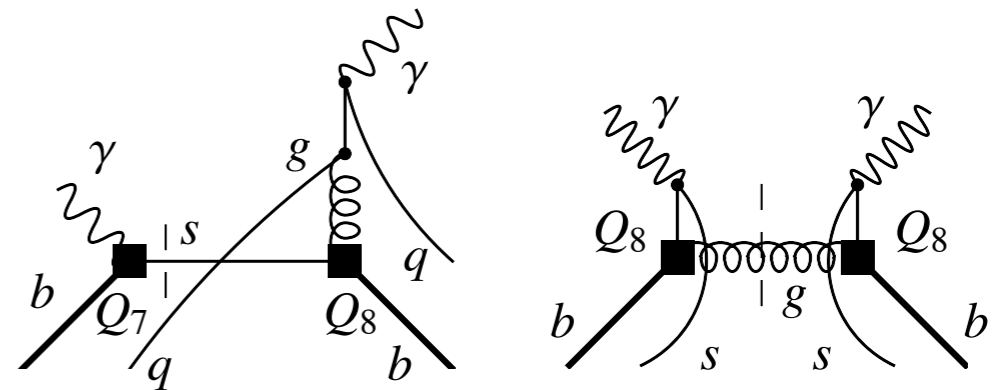

individual errors on BR

"cutting-edge" calculation may be able to get ride of large parts of some of the perturbative error

$B \to X_s\gamma$: Theory progress (?)

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individual errors on BR

non-perturbative effects related to the fact that there is no OPE for $B \to X_s\gamma$ might represent the theoretical "brick wall"

Upshot:

to reach the error on $B \to X_s \gamma$ of 3% "anticipated"
at a Super Flavor Factory with 75 ab^{-1}
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this requires a joint theoretical effort

Finally:
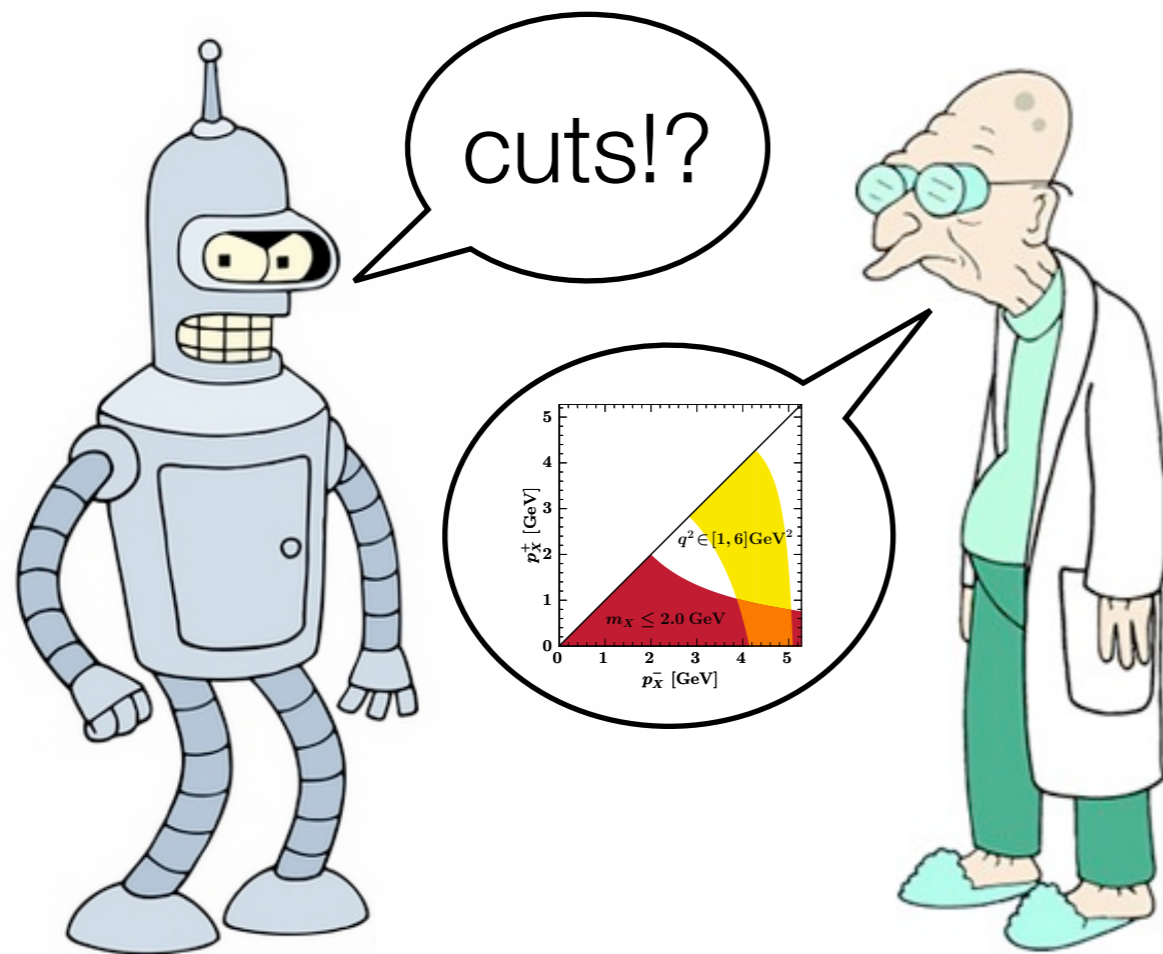
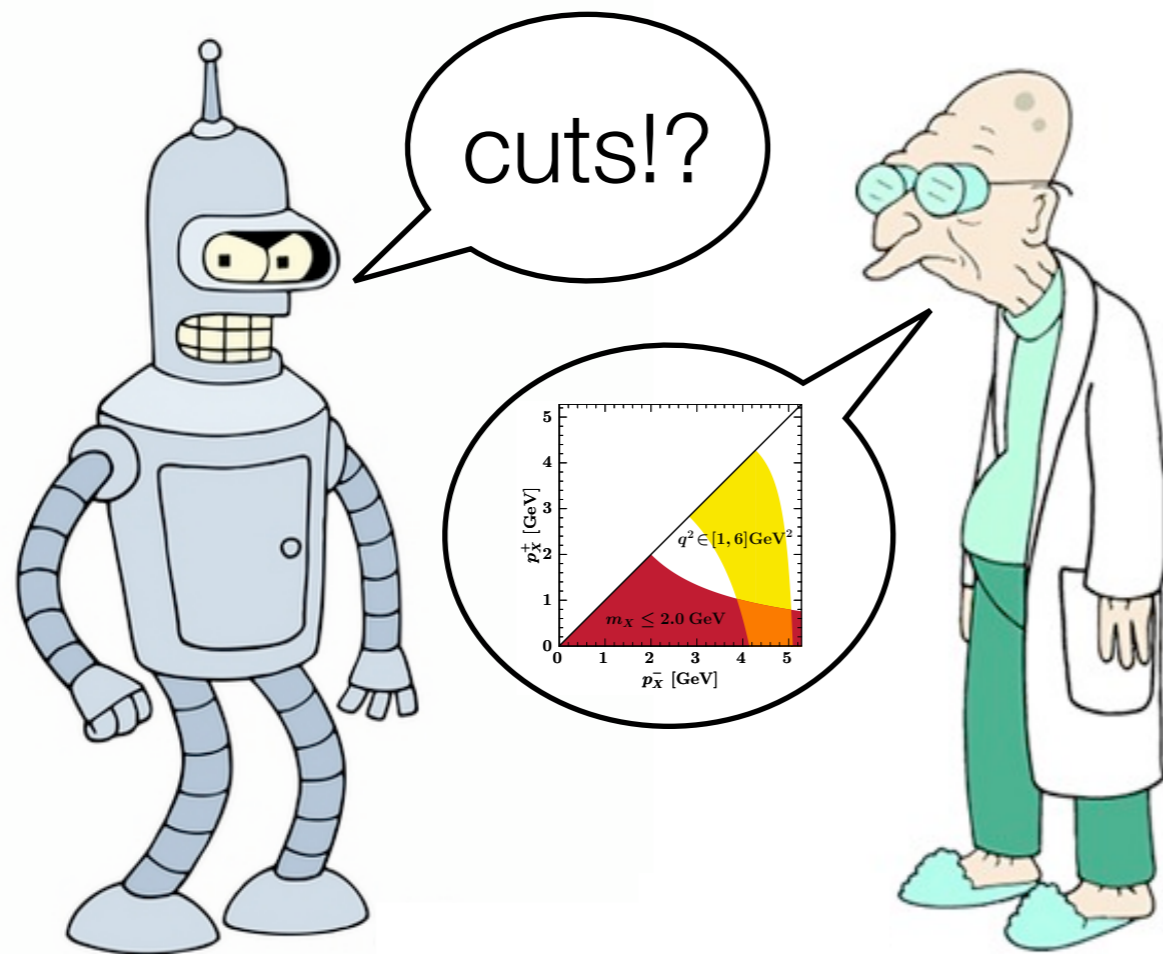more interchange between experimentalist
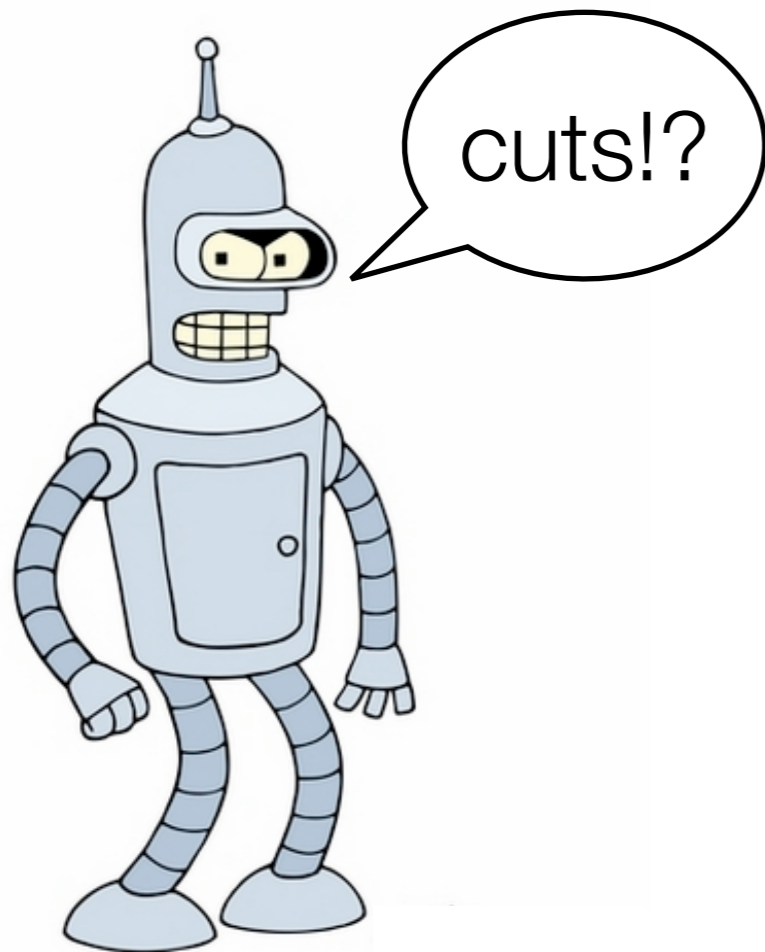
cuts!?

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this can and should be a goal of WGB, as theoretical and experimental errors are often connected