ACOT STATUS & ISSUES

Brief Comments on:

1) K-Factor technique

K-factor issues

THANKS TO: Olek, Ingo, Tzvetalina,

And to Andrii for discussions

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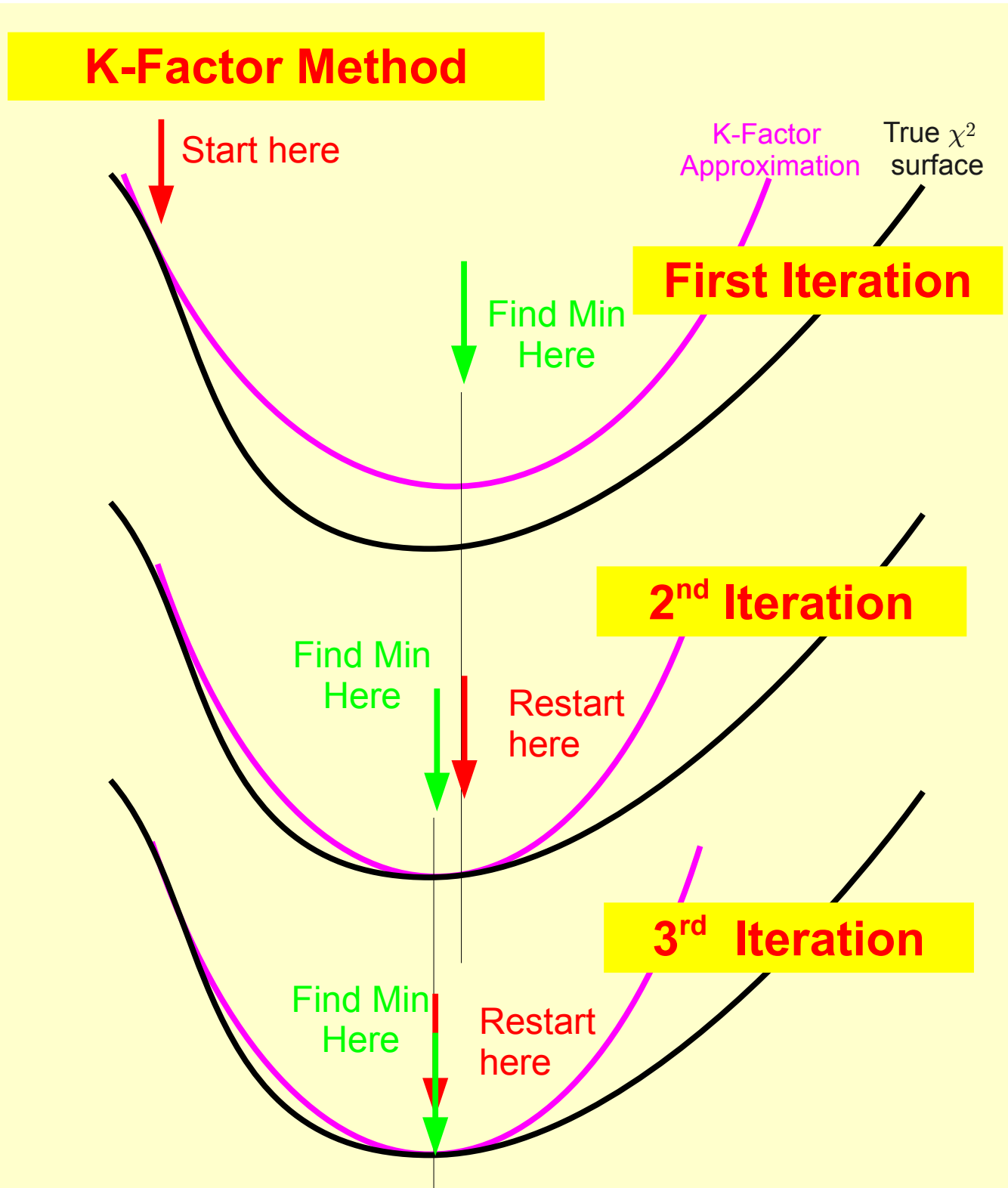
26 March 2013

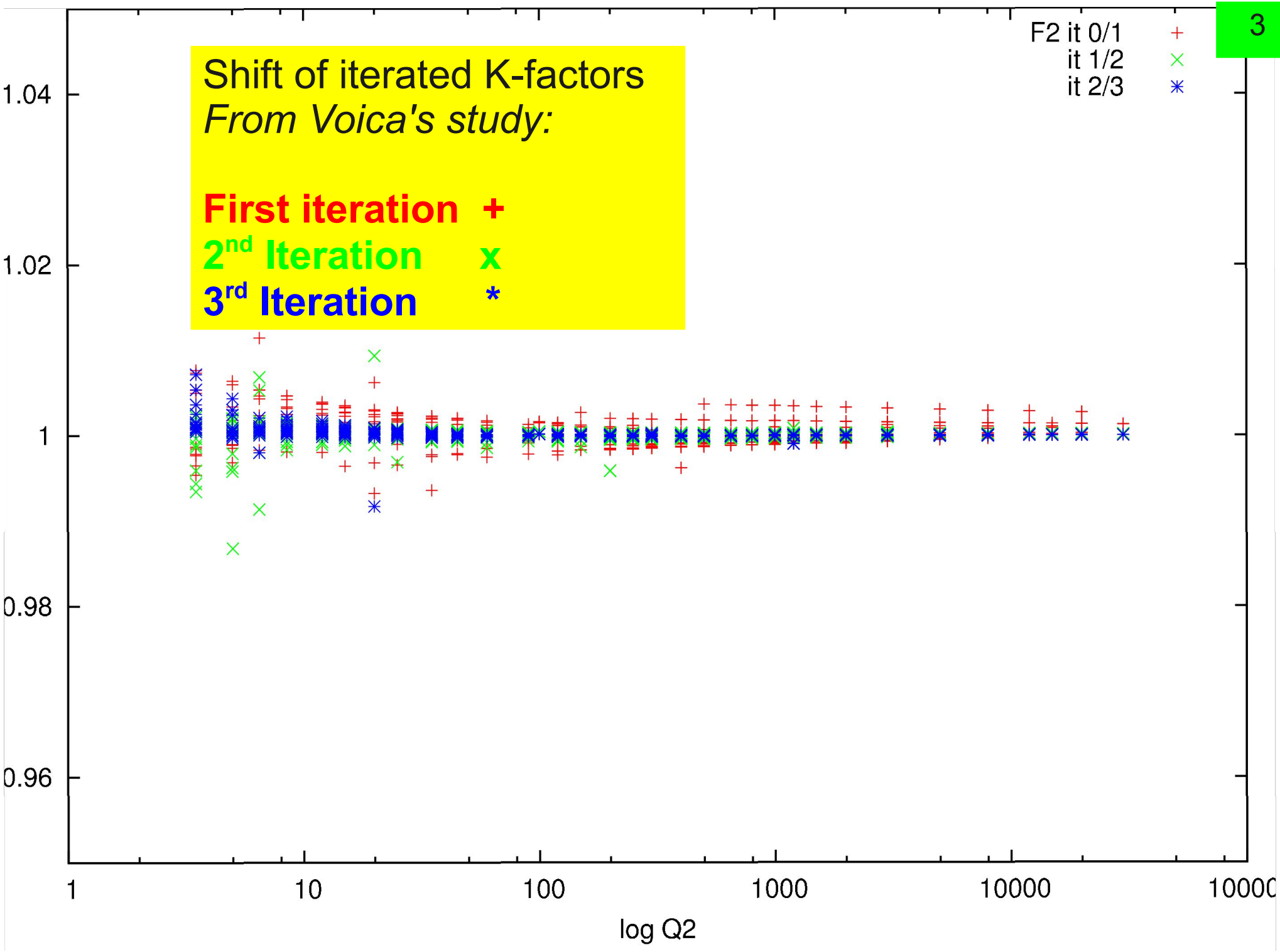
K-Factor Method



$$K = \frac{\sigma^{FULL}}{\sigma^{Approx}}$$

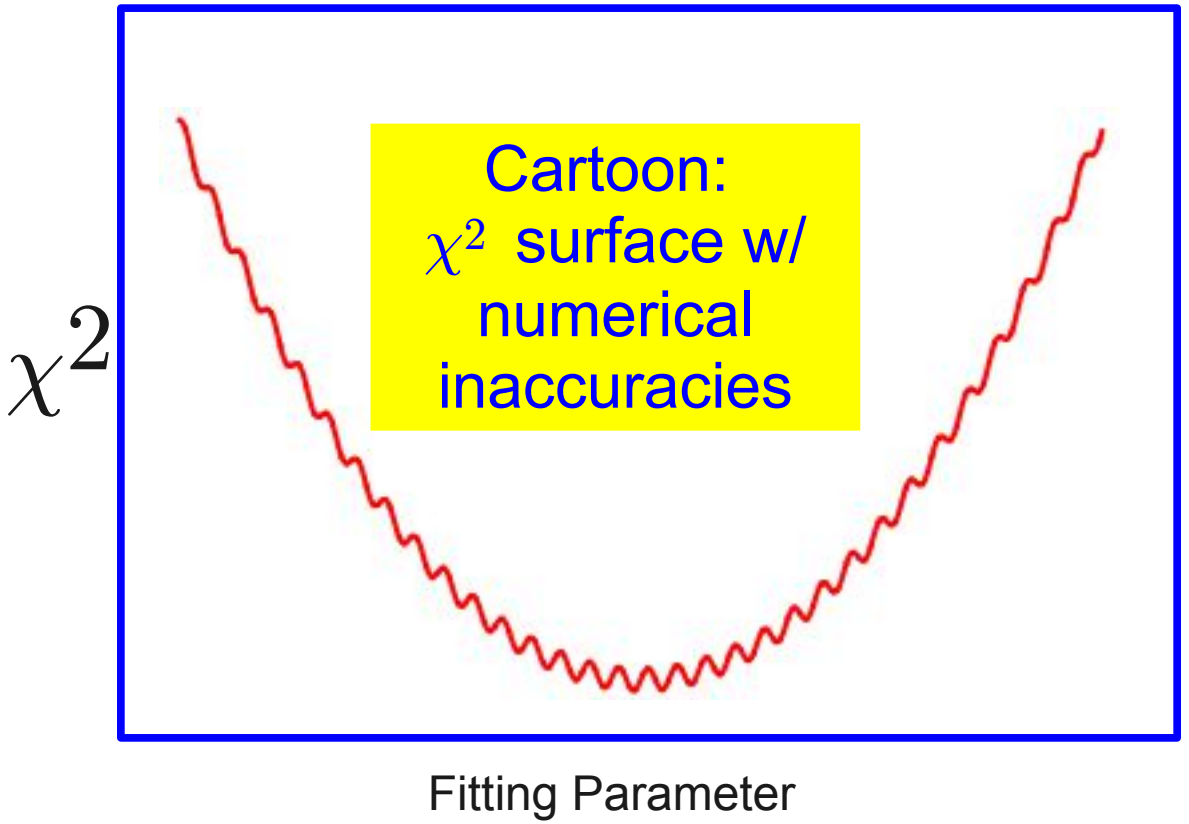
- NOTES:
- K-factor yields <u>exact</u> result at starting point.
- K-factor yields accurate result <u>near</u> starting point.
- K-factor yields less accurate result far from starting point.

- Do not change K-factors in middle of fit
- Different σ^{Approx} yield different K-factors, and could yield different path to minimum, but …
- Stable minimum should be independent of σ^{Approx}
- ∃ option to skip K-factor method (cross check)


Shift of iterated K-factors
From Voica's study:
First iteration +
2nd Iteration x
3rd Iteration *
F2 it 0/1
it 1/2
it 2/3
1.04
1.02
1
0.98
0.96
1
10
100
1000
10000
log Q2

Can we skip the K-Factor approach???

- **∃ option to skip K-factor method (cross check)**



- Using full NLO results avoids K-factor problem.
- BUT: … **slow**, and ...

  Numerical inaccuracies can cause problems.
  - Numerical Integrations
  - Cancelation of +/- terms
- K-factor yields less accurate result far from starting point.
- In principle: could "tune" Minuit step sizes and tolerances to avoid

WOULD BE USEFUL TO DOCUMENT PROBLEM AND SOLUTION

What is implemented now:

	F1	F2	xF3	FL
Total	LO(*m*)	QCDNUM	LO(*m*)	QCDNUM
Charm	LO(*m*)	LO(*m*)	LO(*m*)	LO(*m*)
Bottom	LO(*m*)	LO(*m*)	LO(*m*)	LO(*m*)

LO(m): Leading-Order massive
QCDNUM: NLO QCDNUM massless result

F-Total:

Option to use LO(massive) or NLO-QCDNUM result

(wired for F2 & FL NC; extend for F123L both NC and CC)

F-Charm & F-Bottom: … more complex

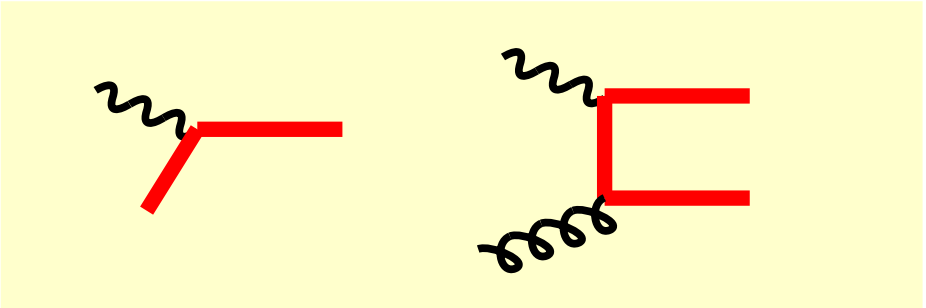
Currently using LO(massive) $\gamma c \rightarrow c$

Can add HQSTF (NLO $\gamma g \rightarrow c c$)

Ideally (Future): use ACOT QCDNUM Package

… includes both charm and gluon initiated processes

… typically, yields smaller renormalization scale depencence



1) K-Factor technique
K-factor issues

TO DO:

For F-Total:
use QCDNUM for F123L *(Trivial, but needs checking)*

For Heavy Flavor:
1) use HQSTF
2) in future, use ACOT package

HERA-FITTER PAPER:
… would be useful to document in upcoming write-up

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