

TOTAL CROSS SECTION

FOR $e^+e^- \rightarrow t\bar{t}$

with

QCD & ELECTROWEAK CORRECTIONS

(away from threshold)

EW HAHN, SCHAPRACHER,
QCD HARLANDER

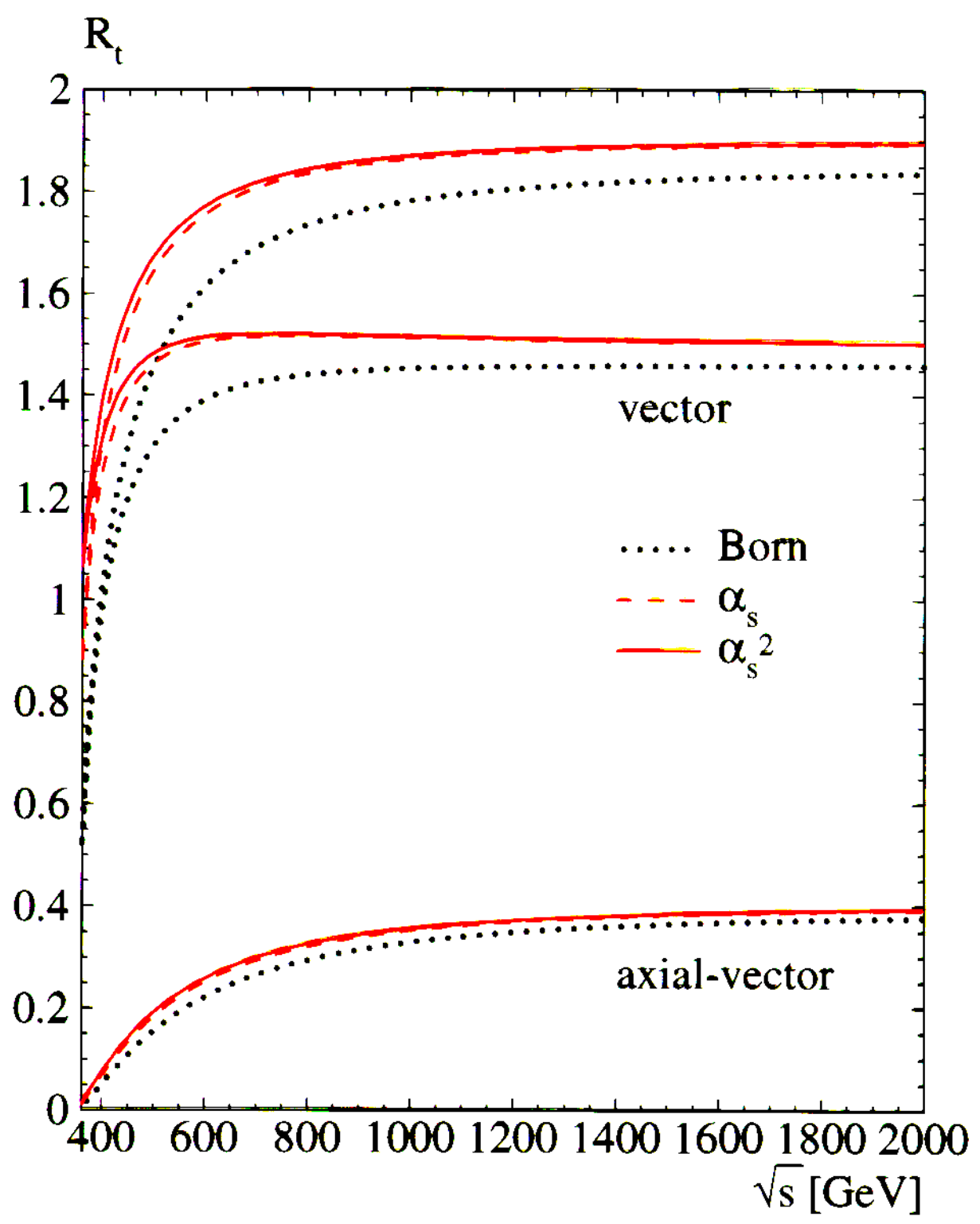
KÜHN
KARLSRUHE

- 1) QCD
- 2) ELECTROWEAK
- 3) COMBINED

earlier work:

EW : K, Stuart; Beenakker+Hollik

QCD Chetyrkin, K, Steinhauser, Hoang, Teubner;



small residual uncertainty
 [terms of $O(\alpha_s^3 \begin{Bmatrix} m^0 \\ m^2 \\ m^4 \end{Bmatrix})$ for
 large energies available ;
 not considered in plots .

very close to threshold
 \Rightarrow Greens function technique

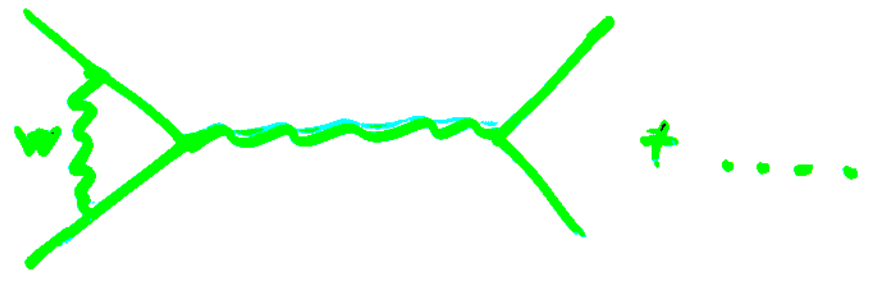
2) WEAK CORRECTIONS

[input : α, G_F, M_Z]

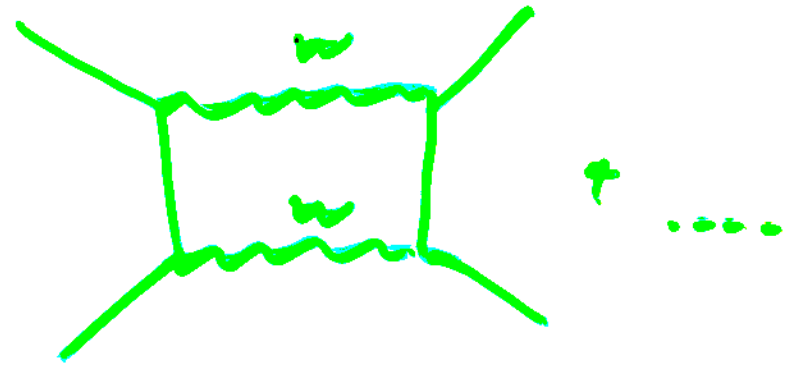
self energies



vertices



boxes

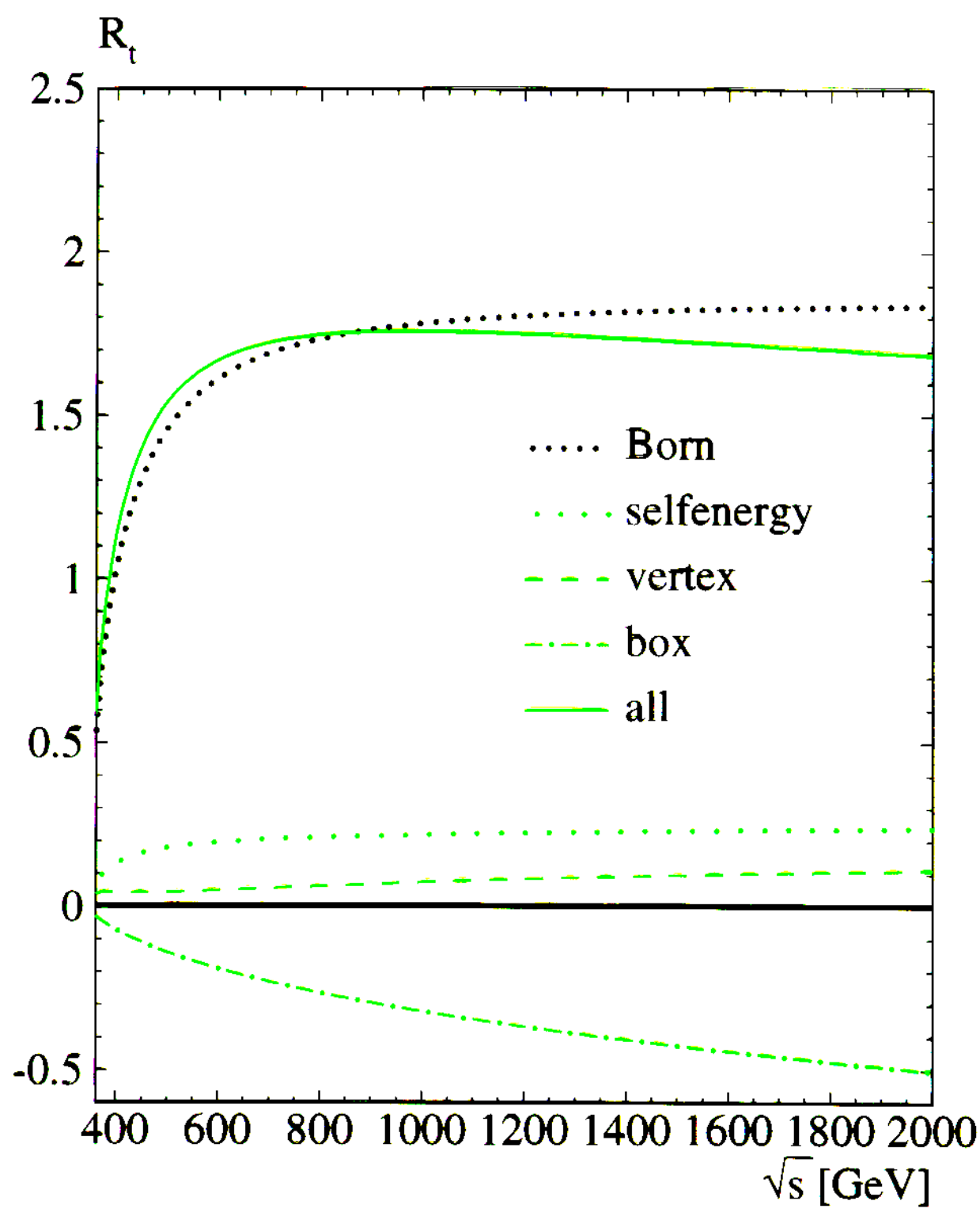


positive corrections from self energies (running α !)

negative corrections from boxes $\sim g^2 \ln^2 m_W^2 / s$
[to be compensated by W radiation]

Fig

negative corrections for large s !



3) QCD * EW

[approximate treatment]

QCD corrections for vector and axial correlator known!

⇒ split e-w corrected amplitudes accordingly.

easy for self energy and electron vertex corrections

close to threshold effective local vertices even for boxes and tF vertex corrections.

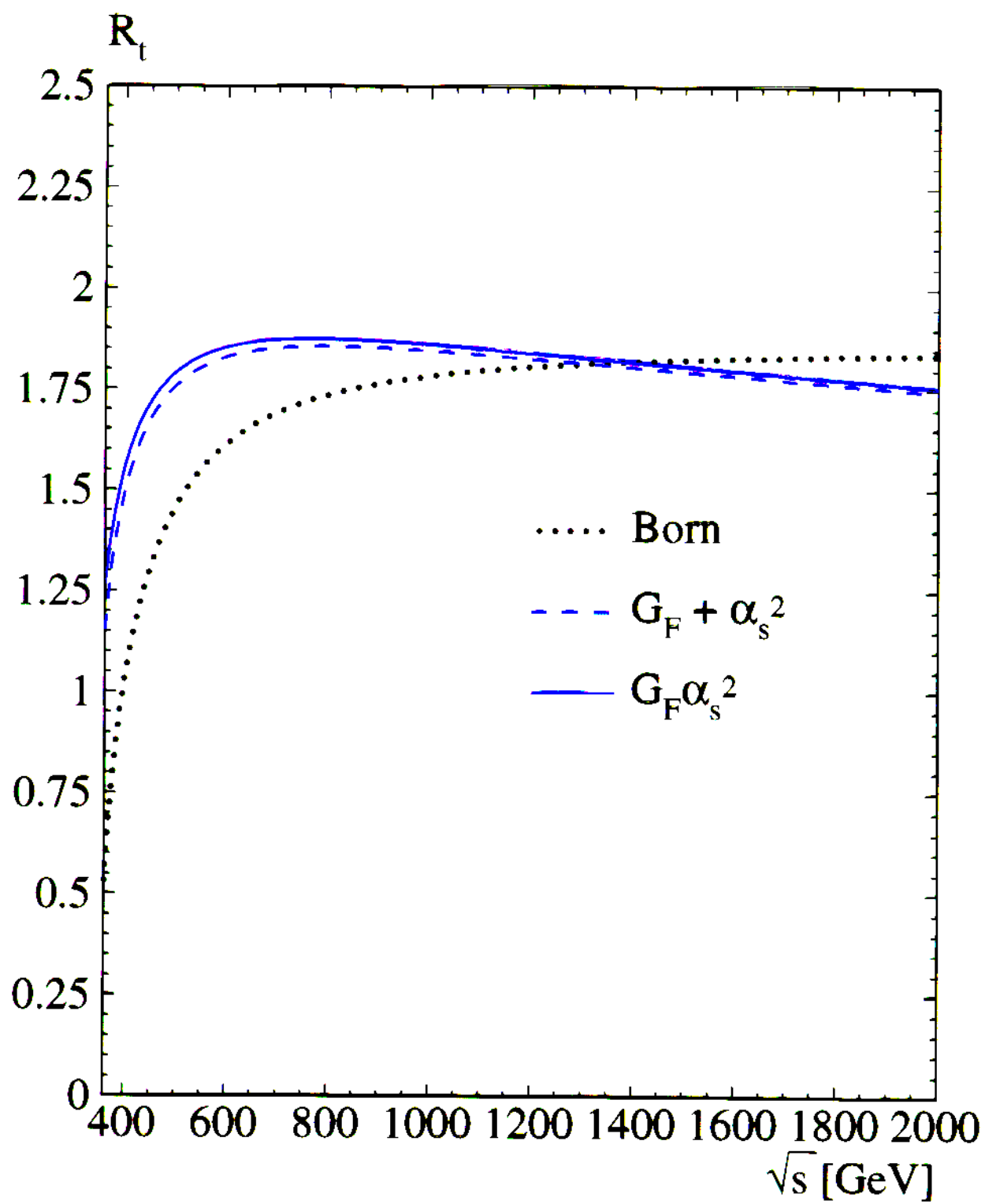
suggestion: $|\mathcal{M}_V^{\text{Born}}|^2 R_V^{\text{QCD}} + |\mathcal{M}_A^{\text{Born}}|^2 R_A^{\text{QCD}}$
 $+ 2 \text{Re}(\mathcal{M}^{(1\text{Loop})} \cdot \mathcal{M}_V^{\text{Born}}) \cdot R_V^{\text{QCD}}$
 $+ 2 \text{Re}(\mathcal{M}^{(1\text{Loop})} \cdot \mathcal{M}_A^{\text{Born}}) \cdot R_A^{\text{QCD}}$

Fig

difference between

$G_F * \alpha_s^2$ and $G_F + \alpha_s^2$

⇒ estimate of uncertainty.



SUMMARY

$\alpha_s + \alpha_s^2$
 G_F } corr. are known!

individually large !

first steps towards
combination !?