



WG3 Report

Tau-Charm and Quarkonia
Nora Brambilla, MJ

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Scimemi
Stahlhofen
Reißer
Farrell

Charm

Ananthanarayan

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Roig

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QCD Factorization for Top Quark Mass Reconstruction

André H. Hoang

Max-Planck-Institute for Physics
Munich

Based on:

S. Fleming, S. Mantry, I.W. Stewart, AHH, hep-ph/0703207

I.W. Stewart, AHH, arXiv:0709.3519

S. Fleming, S. Mantry, I.W. Stewart, AHH, arXiv:0709.2079



EuroFlavor 07, Orsay, Nov 14-16, 2007

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EF07, Paris

I. Scimemi, with Ambar Jain and Iain Stewart, MIT, Cambridge

THE JET MASS OF THE TOP QUARK: 2 LOOPS PROPERTIES



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[Tau](#)

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Ultrasoft Renormalization of the potentials in NRQCD

Maximilian Stahlhofen

in collaboration with André Hoang

Max-Planck-Institut für Physik, München



Status of Calculations / Summary

- Ultrasoft NLL running of the potentials V_k, V_r, V_2 is essential for a precise prediction of $\sigma_{\text{tot}}(e^+ e^- \rightarrow t\bar{t})$ at threshold.
- usoft NNLL mixing contributions to c_1 from V_r, V_2 already compensate a bit for the large usoft NNLL nonmixing contribution:
 $\delta c_1 = (-1.9\%, -0.5\%)$ for $\nu = 0.1, 0.2$
- What about V_k (dominant at NLL)? \rightarrow w.i.p.
- Current status of the calculation: $[\alpha_S = \alpha_S(mv), \alpha_U = \alpha_S(mv^2)]$

Contribution	order/ α_S	V_k	V_r	V_2	V_s
soft + usoft LL	$(\alpha_S \ln v)^n, (\alpha_U \ln v)^n$	✓	✓	✓	✓
usoft NLL n_f	$n_f \alpha_U (\alpha_U \ln v)^n$	✓	✓	✓	0
full usoft NLL	$\alpha_U (\alpha_U \ln v)^n$	w.i.p.	✓	✓	0
soft NLL	$\alpha_S (\alpha_S \ln v)^n$	—	—	—	✓

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[Stahlhofen](#)

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[Charm](#)

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[Tau](#)

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Finite lifetime effects in nonrelativistic top pair production

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in collaboration with
Andr  H. Hoang and Pedro Ruiz-Femen a

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Summary

- Threshold scan allows for precise $m_t, y_t, \Gamma_t, \alpha_s$ determination
- Effective theory approach crucial to sum up threshold contributions

Unstable top leads to

- Complex matching conditions
- UV phase space divergencies
- Matching conditions for the $t\bar{t}$ phase space that depend on definition of “threshold top pair event”
- Cutoff involves mild power counting breaking
- Phase space corrections are large (NLO)

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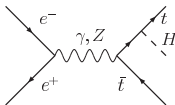
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The Top Yukawa Coupling at 500 GeV



Cailin Farrell

in collaboration with André Hoang

Max-Planck-Institut für Physik, Munich

[hep-ph/0604166], [hep-ph/0504220]

Orsay, 14.11.2007

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Conclusion

The Top
Yukawa
Coupling at
500 GeV

Cailin Farrell

Measurement
Motivation
ILC at 500 GeV

NLL QCD

Polarization

NLL EW

Conclusion

- Top Yukawa coupling for test of EWSB
- ILC at 500 GeV: Phase space is non-relativistic
⇒ vNRQCD
- Completed:
 - Strong and electroweak matching conditions at $\mathcal{O}(NLL)$
 - Effects of e^+e^- polarization
 - Formula for the total cross section
- Increase of total cross section of up to 400%
 - $\delta Y_t/Y_t \approx 10 - 15\%$ might be possible
- Work in progress:
 - Electroweak NLL decay effects
 - Phase space matching

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Puzzles of excited charm meson masses

B. Ananthanarayan
Center for High Energy Physics,
Indian Institute of Science,
Bangalore.

In collaboration with
Sunanda Banerjee, K. Shivaraj, A. Upadhyay,

Physics Letters B 651,124-128, 2007

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[Tau](#)

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1

α_s and the τ hadronic width

Work in **process** (**progress?**) with:

Martin Beneke

All **results** are **preliminary!**



Hadronic Decays of the **TAU** Lepton within RESONANCE CHIRAL THEORY (**R** χ **T**):

$$\tau^- \rightarrow (2K \pi)^- \nu_\tau$$

EuroFlavour '07
 14-16 November 2007
 Univ. Paris-Sud 11, Orsay



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SUMMARY:

- **Hadronic decays** of the τ lepton
- Tools : χ PT, $R\chi$ T, Large N_c (inspired)
- Previous work: $\tau^- \rightarrow (\pi \pi \pi)^- \nu_\tau$ (Gómez Dumm, Pich, Portolés '04)
- $\tau^- \rightarrow (2K \pi)^- \nu_\tau$ (Gómez Dumm, Pich, Portolés, R. '07 to appear)
- Outlook : $\tau^- \rightarrow (h_1 h_2 h_3)^- \nu_\tau$ $h_1 h_2 h_3 = 3K, 2\pi K, 2\pi \eta, K\pi\eta$