Argonne National Laboratory
HEP Theory Group

Summary of Research Activities

C.E.M. Wagner

Argonne National Laboratory

EFI, University of Chicago

DOE Review, Argonne HEP Division, March 30, 2006

Composition of the Group

- Theory Group has six permanent staff members:

E. Berger (Collider physics, QCD, BSM)

G. Bodwin (QCD, Quarkonium physics)

D. Sinclair (Lattice gauge Theories)

T. Tait (Collider physics, BSM, Cosmology)

C. Zachos (Mathematical Physics)

C. Wagner (Collider Physics, BSM, Cosmology)

- The group also counts regularly with three or four postdoctoral fellows as well as a few students.

Productivity

- Group has been very productive on a broad range of areas of physics. In the last five years, staff members have published 100 articles in refereed journals. This includes many articles published with more than one staff member as a co-author. Independent postdoc articles also quite significant in number (more than 50 articles).

- Theory group is very strong in the areas related to phenomenology of particle physics: Collider physics, QCD, Higgs physics, heavy quarkonia and beyond the standard model phenomenology.

- The group has produced many relevant articles in the areas of cosmology and astroparticle physics, in particular on the questions of dark-matter and baryogenesis, and very recently, dark energy.

- The group is also strong in non-perturbative studies of QCD, as well as the analysis of other non-perturbative configurations, like Skyrmions and instantons in four and five dimensions.

Postdocs

- Activities of the group have been reinforced by several young postdoctoral fellows.
- Most of them have found excellent positions an carry successful careers after their stay at Argonne
- Notable cases are John Campbell, Cheng-Wei Chiang, David Kaplan, Jing Jiang, Michael Klasen, Jungil Lee, Geraldine Servant, Irina Mocioi and Tim Tait.
- Excellent group of postdocs joined us in last years: C. Balazs (collider physics, BSM, dark matter), P. Batra (BSM, phenomenology), B. Lillie (BSM, phenomenology) and P. Nadolsky (QCD, collider physics). C. Balazs is finishing his position at Argonne and we just hired X. Garcia i Tormo (quarkonium physics), who will join us in September.

Contact with the University of Chicago

- One of the staff members, C.W., has a joint position with the University of Chicago and is teaching a course per year. He is now appointed as a full professor there, holding a tenured, half-time position.

- Two students from the UofC, D. Morrissey (last year) and A. Menon, have been working regularly at the Theory Group, and a few more are joining the group. Morrissey moved in October to the Univ. of Michigan, Ann Arbor and A. Medina joined. N. Shah and J. Shu also worked regularly at the group

- Successful Argonne/UofC joint postdoctoral program, mantained for the last four years. All the postdoctoral fellows participating in this program obtained professorships in different Universities around the world, soon after leaving Argonne (Kaplan), or during their stay at the laboratory (Chiang, Servant).

- Recent postdoc (Mocioiu) got a tenure-track position at Penn State . We just hired B. Lillie, a Stanford student, to fill-out the join postdoctoral position.

Organization of Workshops and Schools

- The group has organized seven international workshops at the Argonne HEP Division in the last five years.

- Subjects included
- Higgs, Supersymmetry, extra dimensions (E. Berger, T. Tait and C. Wagner)
- Neutrino Physics (E. Berger, M. Goodman, C. Wagner)
- QCD in extreme environments (D.K. Sinclair)
- Brane Dynamics (C. Zachos)

- It has also hosted Greater Chicagoland Meetings (G. Bodwin, E. Berger, C.Wagner) and Lab-wide Theory Meetings (E. Berger).

- All these activities have greatly increased the visibility of the group.

Other National services

- Ed Berger was the co-Chair of the Executive and Local Organizing Committee of the LC Workshop at Snowmass, August 2005.
- G. Bodwin is a convener of the Quarkonia Working Group
- D. Sinclair is in the NERSC users' group executive committee
- T. Tait was a convener of the TeV4LHC Top and Electroweak Working Groups
- C. Wagner was in the NSF Review panel and in the LBNL DOE Review panel in Feburary, 2006.
- C. Zachos is a Member of the Advisory Panel (in lieu of Editors) of J Phys A: Math Gen (IOP).

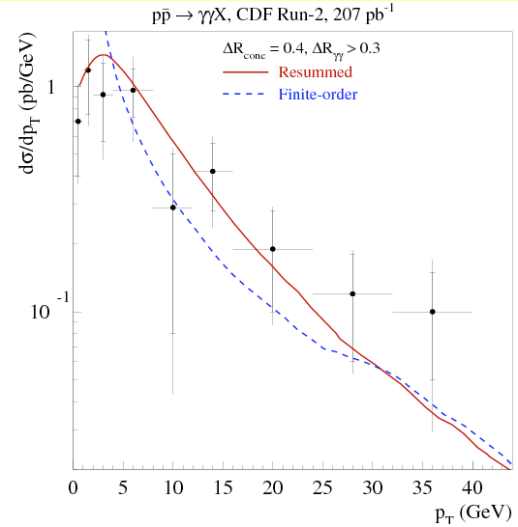
2005--2006

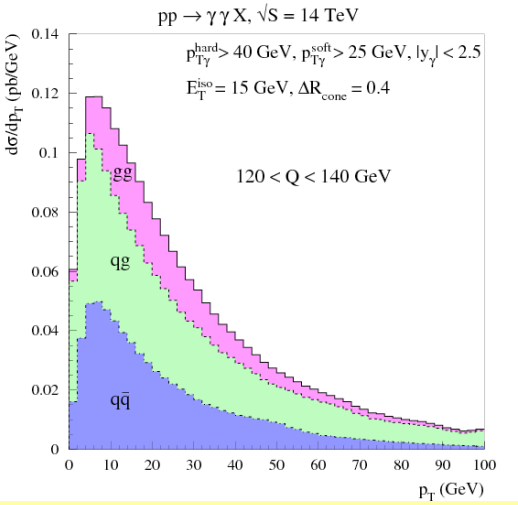
Theory Group Research Highlights

QCD Analyses

All-orders resummation for $\gamma\,\gamma$ production at hadron colliders

C. Balazs, E. Berger, P. Nadolsky, C.-P. Yuan, hep-ph/0603037

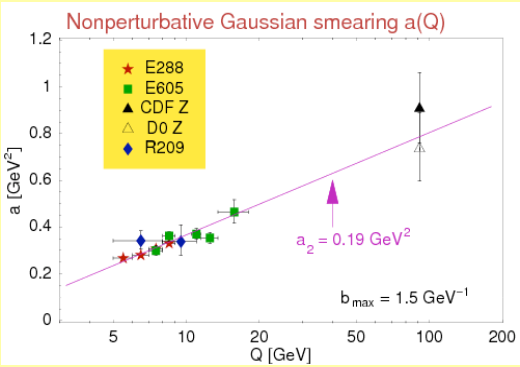




- Next-to-next-to-leading-logarithm p_T resummation for QCD background in the Higgs boson search ($H \to \gamma\,\gamma$) at the LHC
- Predictions for the normalization and shape of p_T distributions as a function of $\gamma\,\gamma$ invariant mass at the Tevatron and LHC
- State-of-the art resummation of perturbative contributions, including 1-loop 5-leg diagrams in the $gg \to \gamma\,\gamma\,X$ channel
- Improved treatment of fragmentation and nonperturbative contributions
- Excellent description of the Tevatron data

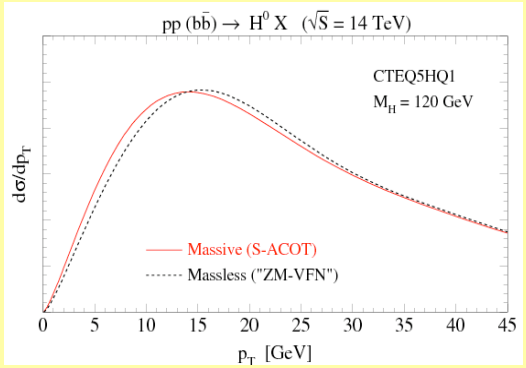
Transverse momentum (p_T) resummation for hadron colliders (*P. Nadolsky*)

- Nonperturbative resummed contributions in Drell-Yan pair and Z boson production *(Konychev, Nadolsky, PL B633, 710 (2006))*



- The analysis of p_T data in the proposed model establishes universality of nonperturbative terms in Drell-Yan-like processes
- Improved predictions for W boson mass measurement at the Tevatron and LHC

- Resummation for c and b-quark scattering *(Berge, Nadolsky, Olness, PRD73, 013002 (2006); Belyaev, Nadolsky, Yuan, hep-ph/0509100)*



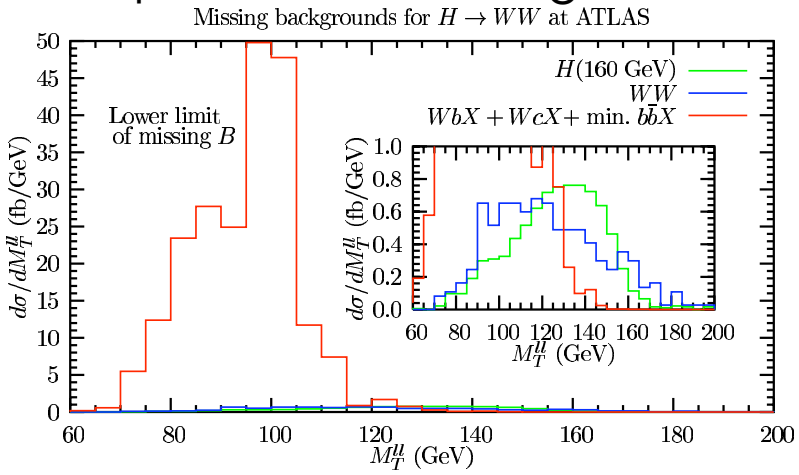
  - New formalism to include dependence on heavy-quark masses $m_{c,b}$ in p_T resummation
  - Computation of $m_{c,b}$ dependence in W, Z production and $b\bar{b}$→Higgs

Heavy flavor backgrounds to Higgs production

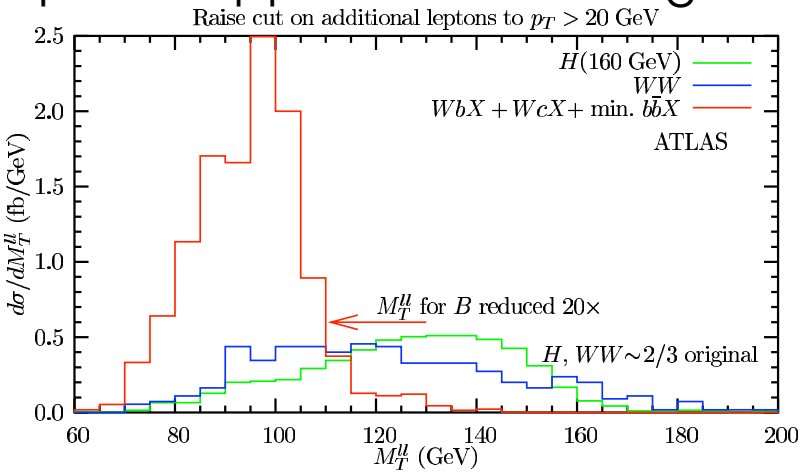
Zack Sullivan (visitor) and Edmond L. Berger (Argonne)

- Contrary to popular lore, isolation cuts do not remove leptons from b and c decays. Almost 1% survive in ALL hadron collider detectors.
- Real rejection (4–8 orders of magnitude) comes from physics cuts.
- We have done full simulations for $b\bar{b}$, $c\bar{c}$, Wc, $Wb\bar{b}$, $Wc\bar{c}$, Wb, and t-/s-channel single-top at DØ, CDF, and ATLAS.

Previously ignored backgrounds swamp the $H \to WW$ signal.



Raising the minimum p_T for 2nd/3rd leptons suppresses this background.



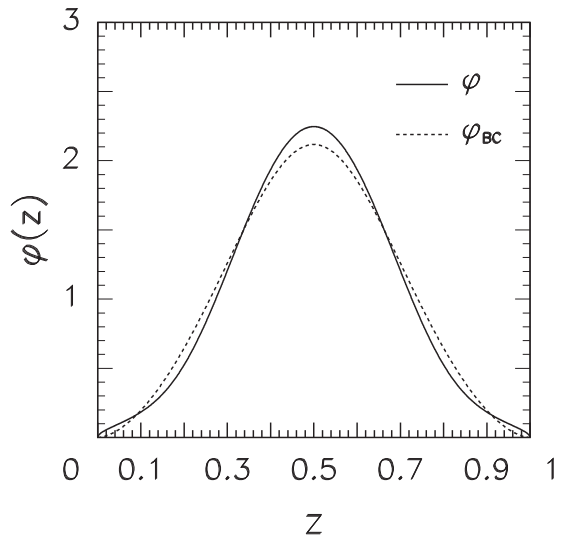
Take away: The minimum lepton p_T will have to be raised in ALL multi-lepton analyses — Higgs, tri-lepton SUSY, etc.

Reconciling the Light-Cone and NRQCD Approaches to Calculating $e^+e^- \to J/\psi + \eta_c$

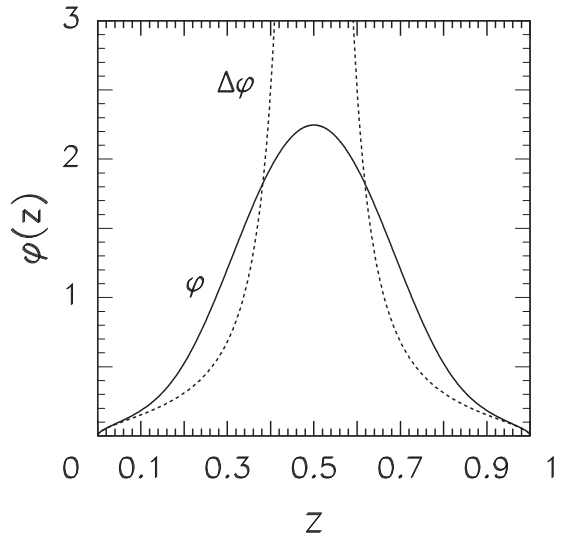
GTB, D. Kang, J. Lee

(hep-ph/0603185)

- Belle: $\sigma(e^+e^- \to J/\psi + \eta_c) \times B_{>2} = 25.6 \pm 2.8 \pm 3.4$ fb.
  BaBar: $\sigma(e^+e^- \to J/\psi + \eta_c) \times B_{>2} = 17.6 \pm 2.8 \pm 2.1$ fb.
- NRQCD:
  $\sigma(e^+e^- \to J/\psi + \eta_c) = 2.31 \pm 1.09$ fb (Braaten-Lee).
  $\sigma(e^+e^- \to J/\psi + \eta_c) = 5.5$ fb (Liu, He, Chao).
- Bondar and Chernyak (BC) have calculated the cross section in the light-cone formalism.
  $\sigma(e^+e^- \to J/\psi + \eta_c) = 33$ fb.
  They attribute the increased cross section to the finite width of the light-cone distribution.
- The NRQCD and light-cone approaches are both believed to be valid approximations in the limit $E >> m_c,\ \Lambda_{\rm QCD}$.
- We have investigated several possibilities to resolve this apparent theoretical conflict.



BC use an *ad hoc* model light-cone dist.
We derived a light-cone dist. from a potential model.
It agrees approximately with the BC model light-cone dist.



The high-momentum tail of the light-cone dist. corresponds to order-α_s corrections to the cross section (potential double-counting issue).
It also lies outside the range of applicability of the potential model.
When we subtract it, the light-cone cross section is reduced by about a factor of 3.

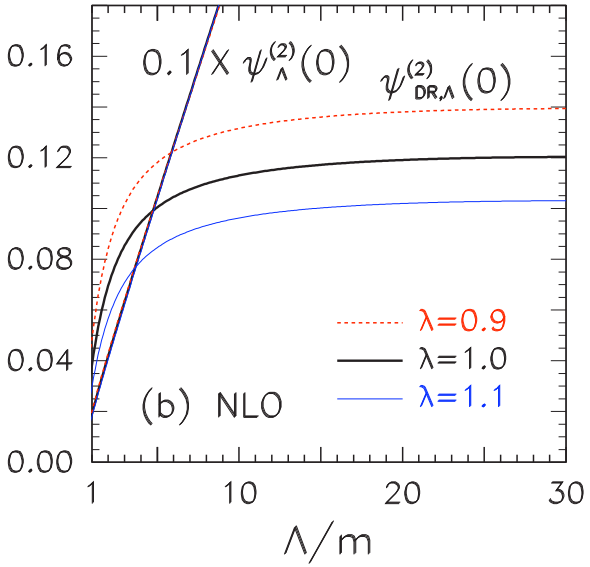
- BC include renormalization factors that have no counterpart in NRQCD.
  When we set them to unity, the cross section is reduced by a further factor of 2.
- After these reductions, the light-cone cross section is comparable to the NRQCD cross section.

Potential-Model Calculation of an NRQCD Matrix Element of Order v^2

GTB, D. Kang, J. Lee

(hep-ph/0603186)

- NRQCD matrix elements that are proportional to $\nabla^2\psi(0)$, appear in the relativistic (order v^2) corrections to many quarkonium decay and production processes.
- Phenomenological, lattice, and Gremm-Kapustin (binding energy) methods to determine $\psi^2(0)$ have been stymied, owing to large uncertainties. Even the sign is not known with confidence.



New Method:
Compute $\psi^2(0)$ in a potential model, using a hard cutoff as an intermediate step to dim. reg.
$\psi^{(2)}_{\Lambda} = -\nabla^2\psi(0)$ for a hard cutoff.
$\psi^{(2)}_{\mathrm{DR},\Lambda} = -\nabla^2\psi(0)$ for dim. reg.
Large cancellations occur in the conversion.
Final result ($\Lambda \to \infty$) is well behaved.

- Result is consistent with the NRQCD v-scaling rules. First reliable calculation of $\nabla^2\psi(0)$.

The universality class of lattice QCD with staggered quarks

D. Sinclair, J. Kogut (DOE)

- Simulate lattice QCD with 2 flavours of massless staggered quarks on $N_s^3 \times 8$ lattices ($N_s = 12, 16, 24$) – finite temperature.
- Use χQCD action to allow $m_q = 0$: needed to study the phase transition.
- Universality class of transition to quark-gluon plasma is expected to be $O(2)$.
- Fits of lattice QCD 'data' to $O(2)$ spin model measurements are consistent with $O(2)$ universality for lattice-QCD finite-temperature transition.
- Extrapolations to infinite volume are unnecessary – fit to spin model, also at finite volume.

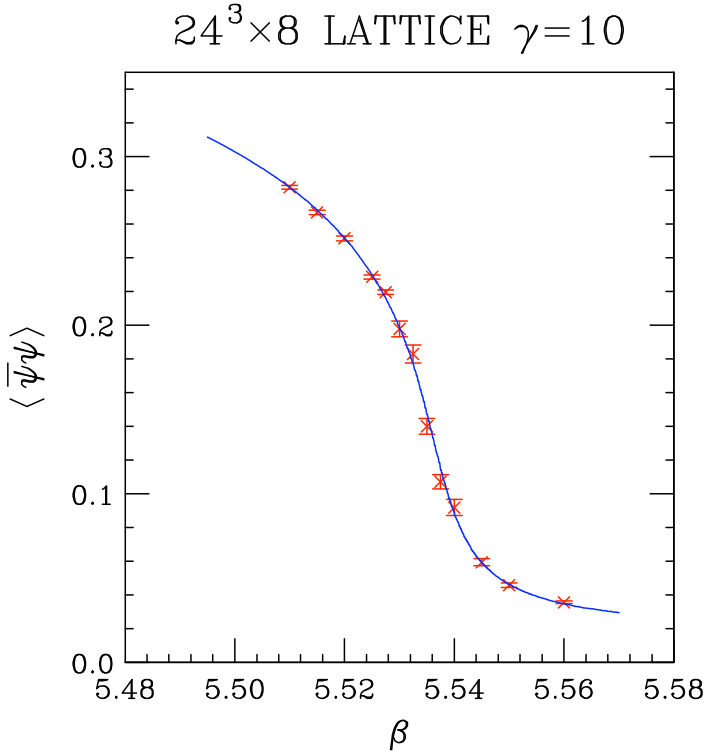


Figure 1: Fit to O(2) spin model

QCD at finite temperature and density

D. Sinclair, J. Kogut (DOE)

- We simulate 3-flavour lattice QCD at finite temperature and small isospin density – closely related to QCD at finite temperature and baryon-number density.
- We search for the critical endpoint at quark mass just above the critical value.
- Early simulations by all groups gave false signals for the critical endpoint.
- Discretization errors in HMD algorithm are much larger than anyone expected.
- We now simulate using the new RHMC algorithm which has no such errors.
- No evidence is found for the critical endpoint. If it exists, it is not related to the critical quark mass, contrary to what others had suggested.

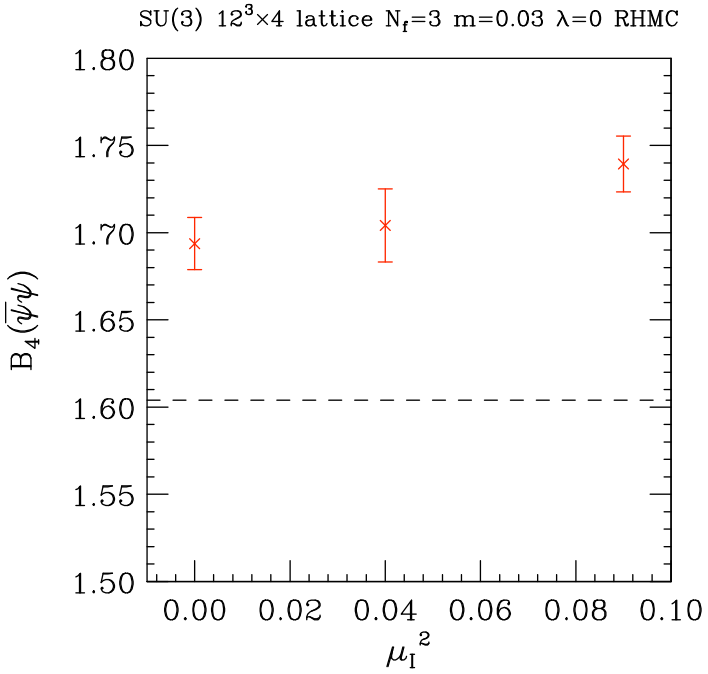


Figure 2: Binder cumulants at T_c

Higgs and Beyond the Standard Model Physics

Searches for non-standard Higgs bosons

M. Carena, S. Heinemeyer, G.Weiglein,C.W, EJPC 45 (2006) 797

- Searches at the Tevatron and the LHC are induced by production channels associated with the large bottom Yukawa coupling.

$$\sigma(b\bar{b}A) \times BR(A \to b\bar{b}) \simeq \sigma(b\bar{b}A)_{\rm SM} \frac{\tan^2\beta}{(1+\Delta_b)^2} \times \frac{9}{(1+\Delta_b)^2+9}$$

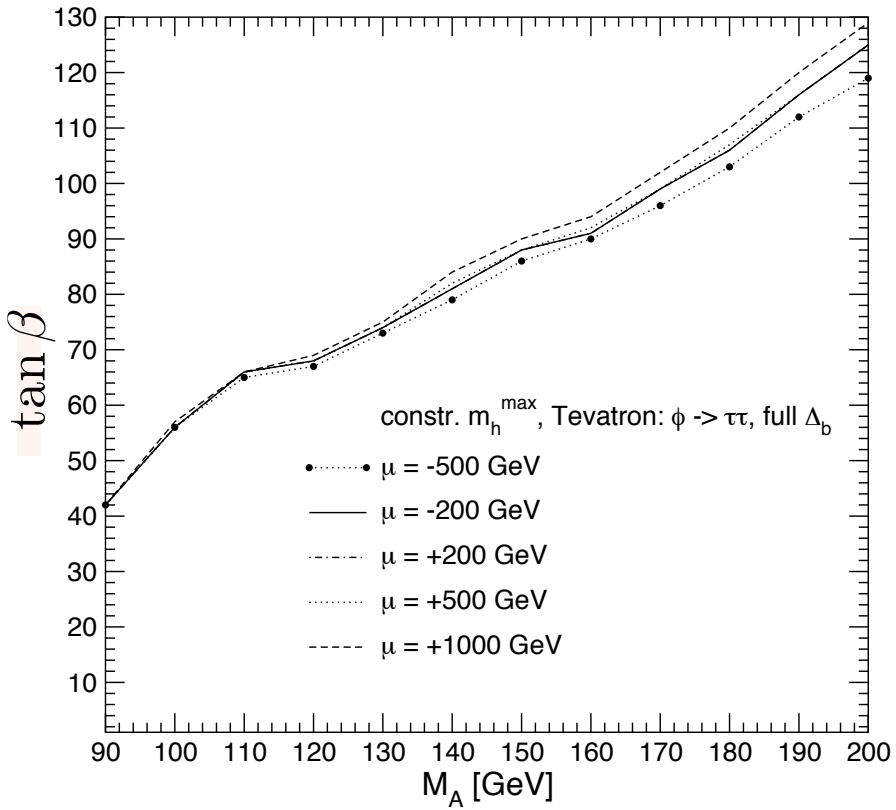
$$\sigma(b\bar{b}, gg \to A) \times BR(A \to \tau\tau) \simeq \sigma(b\bar{b}, gg \to A)_{\rm SM} \frac{\tan^2\beta}{(1+\Delta_b)^2+9}$$

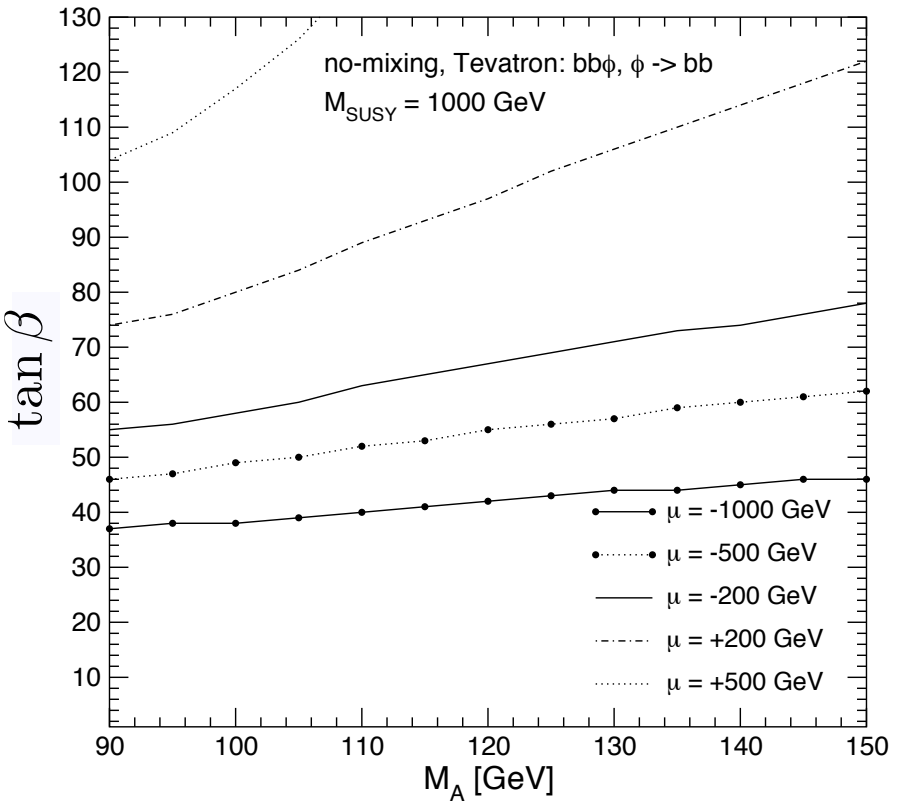
- Since, depending on the parameters, $\Delta_b \simeq \pm\mathcal{O}(1)$ there may be a strong deependence on the parameters in the bb search channel, which is strongly reduced in the tau tau mode.

- The tau mode provides a more stable definition of the bound on $\tan\beta$ as well as of the future reach of the LHC.

Searches for non-standard Higgs bosons at the Tevatron in the bb and tau tau mode.

M. Carena, S. Heinemeyer, G.Weiglein,C.W, EJPC45 (2006) 797





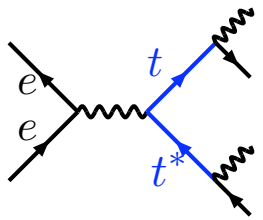
Measuring the W-t-b coupling at the ILC (P. Batra, T. Tait)

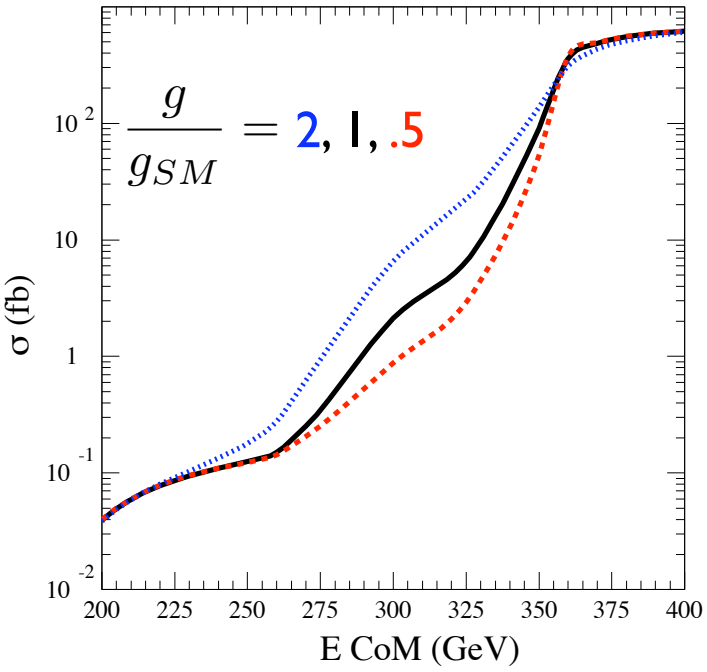
Above threshold, $t\bar{t}$ production is insensitive to the W-t-b coupling

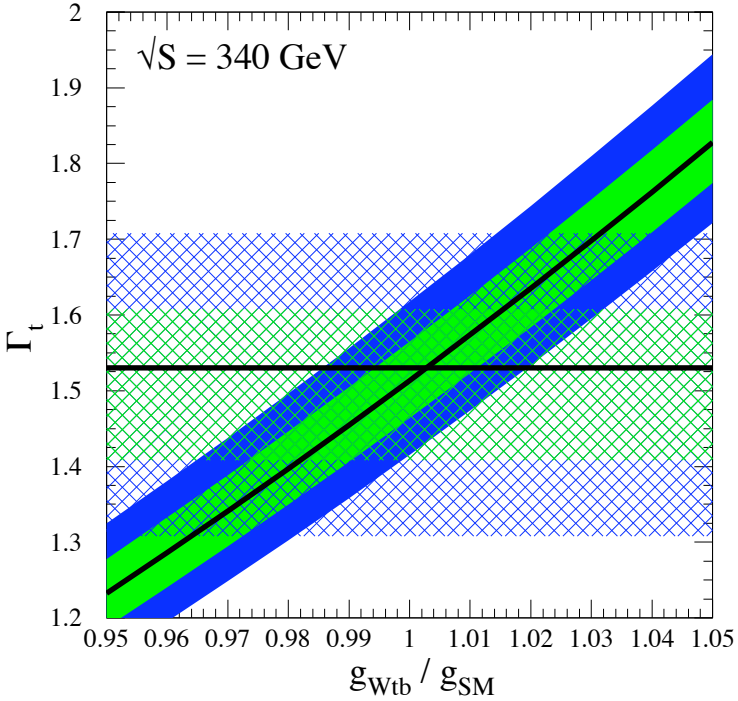
An extended top sector can shift this coupling wtihout opening up new decay channels!
(4th generation, Little Higgs models, Top seesaw, ...)

Crucial test of the Standard Model Electroweak interaction $g\ \bar{t_L}\ \not{W} b_L$

Can go to virtual $t\bar{t}$ production, below threshold, to gain sensitivity.





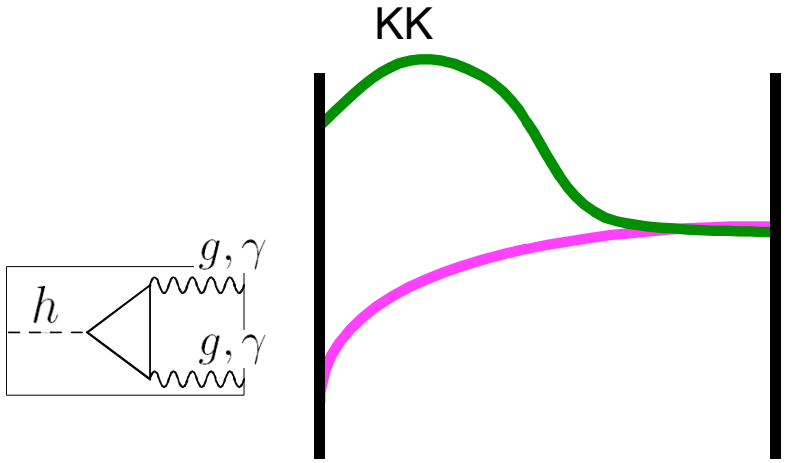


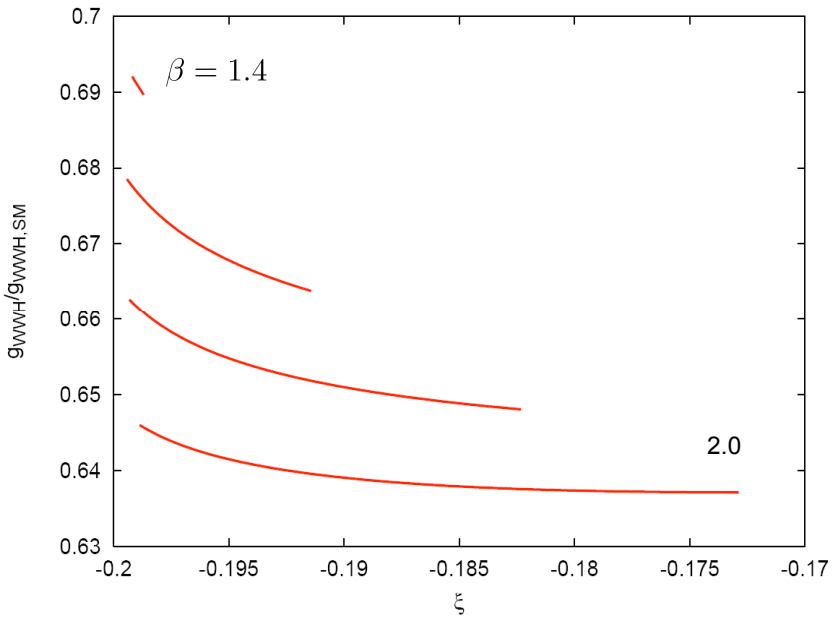
A few percent measurement of the W-t-b coupling is possible!

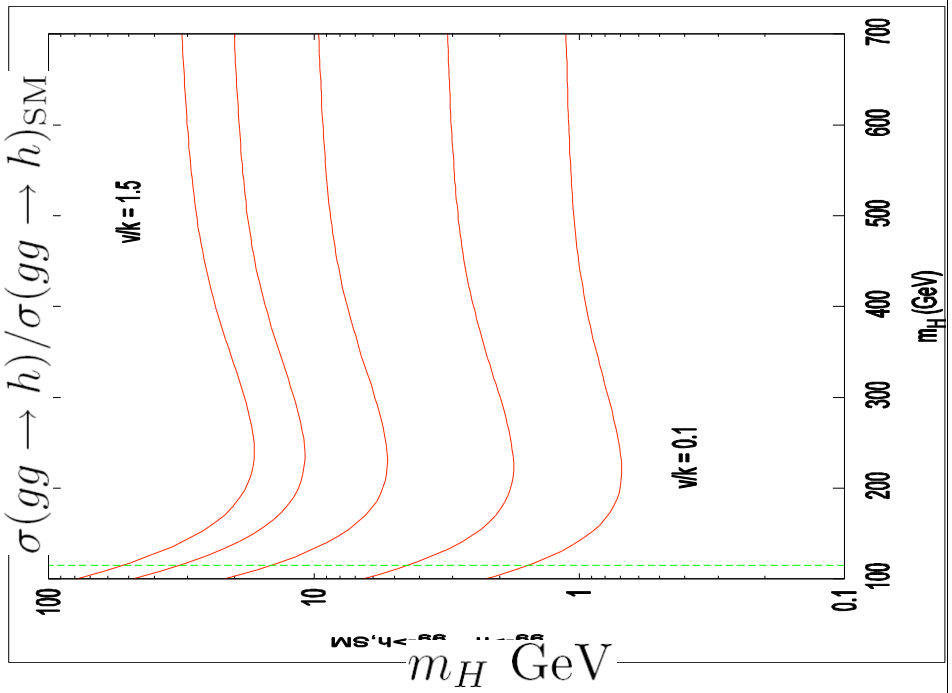
Off-the Wall Higgs in Universal RS scenarios

Corrections to Higgs physics

- Gauge higgs coupling suppressed
- Fermion KK states coupling to Higgs enhanced by $\sqrt{2\log(R'/R)}$
- Expect enhancements to $gg \to h$
- Shifts to $h \to \gamma\gamma$

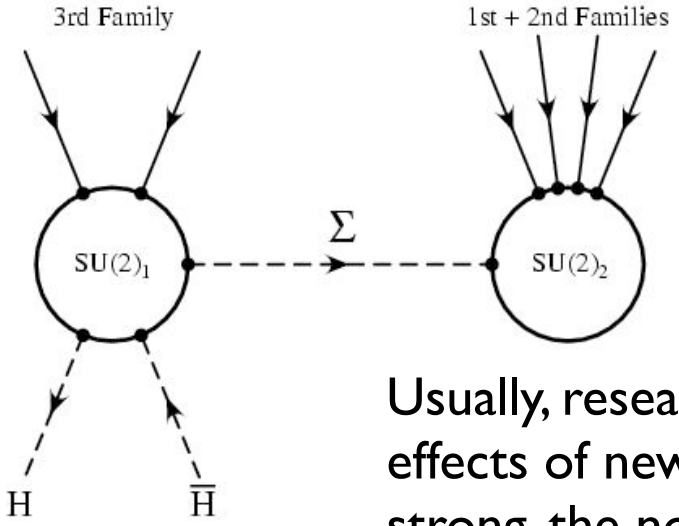






Hewett, Davoudiasl, Lillie, Rizzo'05

Top-flavor Instantons



Many interesting theories have extended EW interactions. In particular, **top-flavor** is a theory in which the third generation has a separate SU(2) weak interaction from the first two generations.

Usually, research emphasizes the perturbative effects of new gauge bosons. But if the coupling is moderately strong, the non-perturbative effects may be interesting as well!

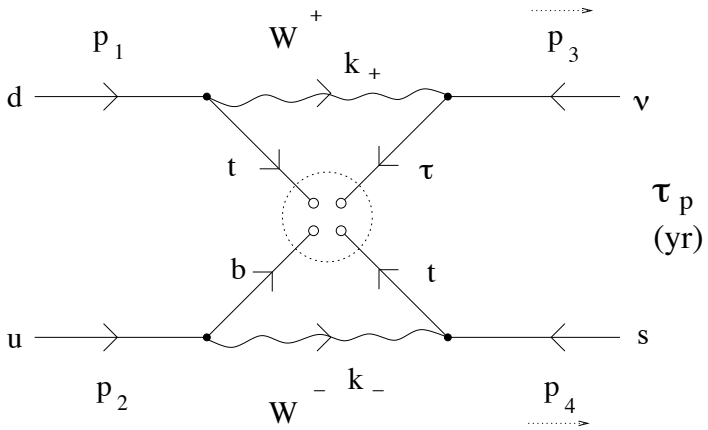
Instantons of the new gauge interactions are unsuppressed when the gauge couplings are large. They mediate baryon-number and lepton-number violating processes of the third family:

$$\mathcal{O}_{\rm eff} = \frac{C}{g_1^8}\, e^{-8\pi^2/g_1^2(\mu)} \left(\frac{1}{4\pi^2}\right)^{b_0/2-1} 2^{b_0/2} \left(\frac{\mu}{\mathcal{V}}\right)^{b_0} \Gamma(1+b_0/2) \left(\frac{\pi^2}{3V_g}\right) \cdot \left(\frac{1}{\mathcal{V}^2}\right) \epsilon^{abc} \left[(u_L^a \cdot e_L)(u_L^b \cdot d_L^c) + (d_L^a \cdot \nu_L)(d_L^b \cdot u_L^c)\right]$$

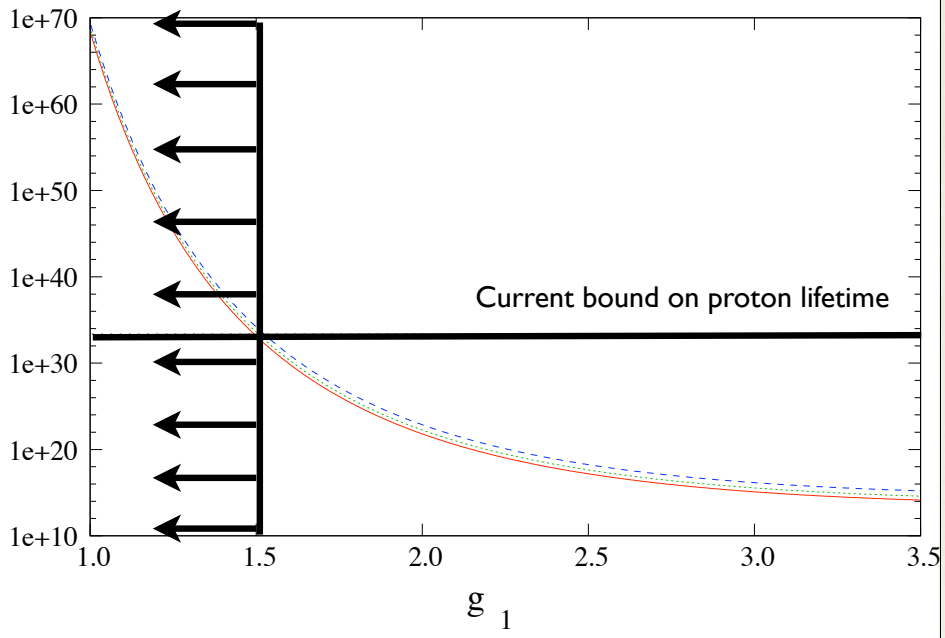
Unsuppressed when g is large!

Proton Decay

Just as in the SM, the instantons mediate very different kinds of processes than occur in perturbation theory, such as proton decay. This allows us to place new kinds of limits on these theories.



D Morrissey, T Tait & C Wagner, PRD72:095003,2005
hep-ph/0508123

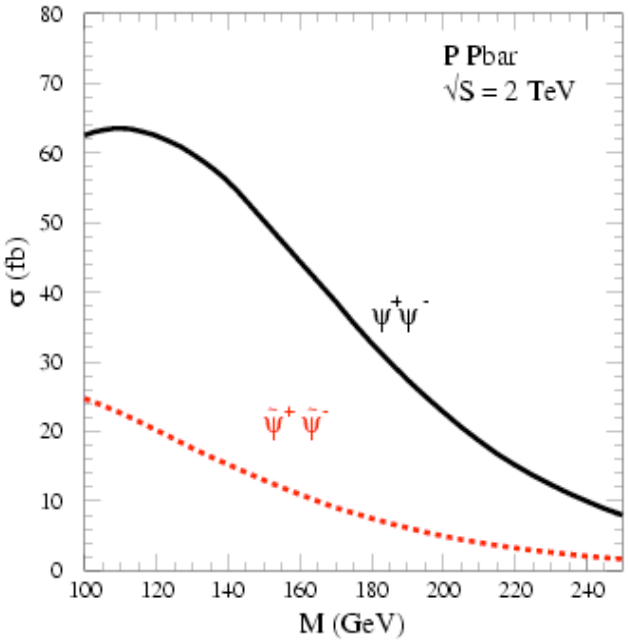


The same operator at tree level mediates the process bb --> t + neutrino: a new kind of single top production!

A Fat Higgs with a Fat Top

- A model which raises the SUSY Higgs mass interprets the strong coupling of the NMSSM as a compositeness scale.
- A theory with a number of preons charged under a confining SU(3) gauge force form composite MSSM Higgs bosons, a Singlet, and the top quark.
- Our understanding of confinement in SUSY gauge theories allows us to compute the low energy effective super-potential exactly.
- The large Higgs mass and heavy top quark arise naturally as residuals of the underlying strong dynamics.
- This removes fine-tuning associated with the large top mass / Higgs mass in the original Fat Higgs models.
- The model leads to exotic charged (heavy) quasi-stable states which can be detected at the Tevatron and LHC for a wide range of masses.
- Run II expects to see charged quasi-stable particles provided their production cross sections are greater than about 10 pb.

A Delgado, T Tait, JHEP0507:023,2005 [hep-ph/0504224]



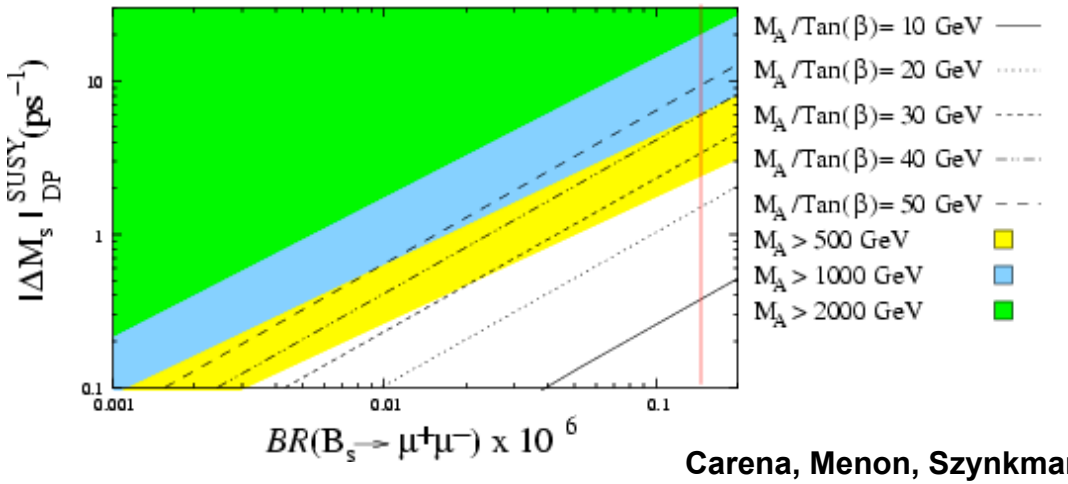
The $B_s \to \mu^+\mu^-$ constraint on double penguin contributions to ΔM_s in MSSM

- For uniform squark masses: $\frac{Br(B_s \to \mu^+\mu^-)}{\Delta M_s} \propto \frac{\tan^2\beta}{M_A^2}$
- Colored contours correspond to the extreme values:

$$\frac{M_3}{2} \approx M_{\tilde{Q}} \approx \frac{\mu}{2} \approx \frac{A_t}{3}$$

- The Experimental bound: $Br(B_s \to \mu^+\mu^-) < 1.5 \times 10^{-7}$

CDF collaboration: hep-ex/0508058



Carena, Menon, Szynkman,Noriega,C.W. hep-ph/0603106

Tight upper bound on $|\Delta M_s|$ within minimal flavor violating SUSY Models. Recent D0 result, hep-ex/0603029, consistent with this result.

The $B_s \to \mu^+\mu^-$ and $b \to s\gamma$ constraints on searches at the Tevatron Collider

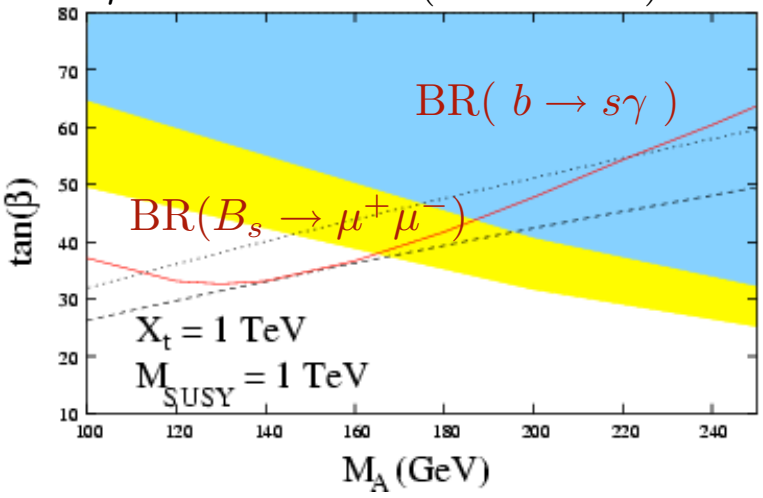
- Theoretical Uncertainties provide the bound:

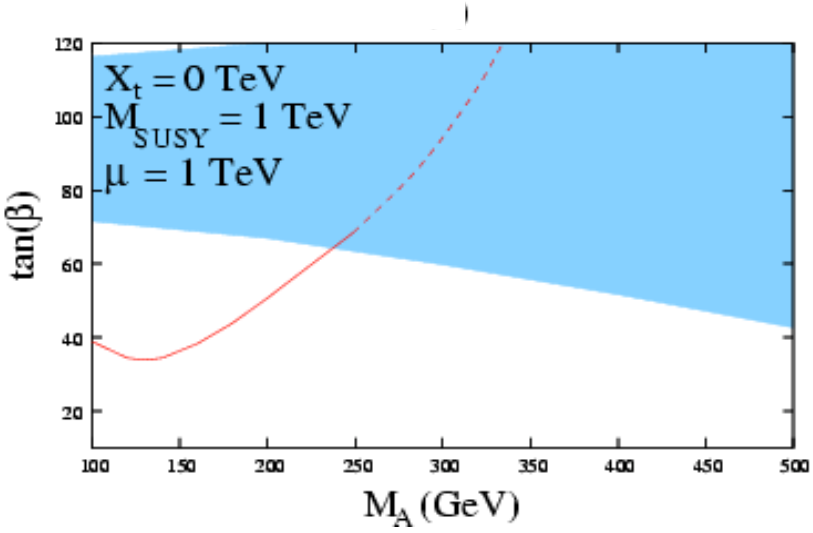
$$| Br(b \to s\gamma) - Br(b \to s\gamma)_{SM} | < 1 \times 10^{-4}$$

Neubert: hep-ph/0408179

- Low Values of $|\mu|$ and moderate X_t or large values of $|\mu|$ and $X_t = 0$ are preferred.

Top (bottom) lines (countors)
$\mu = -100$ GeV $(-200$ GeV)





Carena, Menon, Szynkman,Noriega,C.W.'06
hep-ph/0603106

The holographic Universe

Balazs, Szapudi '06

— Gravity limits ρ because it's holographic! To prove this:

— We assume that the Universe is a holographic quantum system, but

- no gravity will be used to show that it's holography that limits ρ
- ρ is directly related to the entropy (density)

  by the 1st law of thermodynamics: $\rho = \frac{E}{V} = \frac{S\,T}{V}$

  the holographic entropy limit & temperature of the horizon implies:

$$\rho = \frac{E}{V} = \frac{S\,T}{V} \leq \frac{(\pi R_H^2)(2\pi R_H)^{-1}}{4\pi R_H^3/3} = \frac{3}{8\pi}\,\frac{1}{R_H^2}$$

  which holds for any geometry, since the horizon can be curved

$$R_H^2 = 1/(H^2 + k/a^2)$$

— Friedmann's eq. holds as a consequence of holographic thermodynamics

- the cosmological energy density is directly limited by holography
- general relativity gives the correct ρ because it is holographic
- quantum theory fails to predict ρ because it is *not* holographic

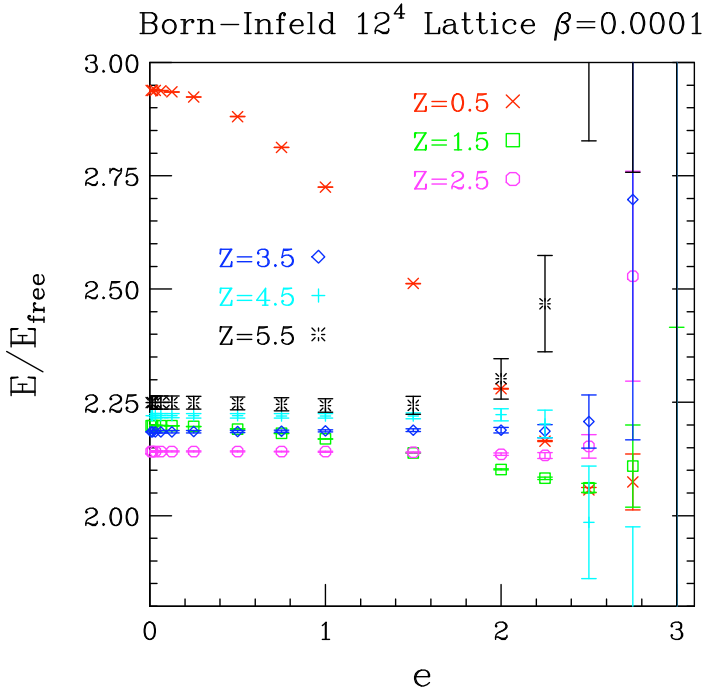
Non-Perturbative Analyses

Lattice Gauge Theory – D. K. Sinclair (with J. B. Kogut (DOE)

Lattice Born-Infeld QED

$$S = b^2 \int d^{n+1}x [1 - \sqrt{-\det(g_{\mu\nu} + b^{-1} F_{\mu\nu})}]$$

- $n = 9$ reduced to $n = p \longrightarrow$ p-brane with $9 - p$ transverse directions.
- Monte-Carlo simulations in 4 dimensions ($n = 3$) with static point charge.
- Lüscher-Weisz method overcomes sign problem associated with charge.
- $\boldsymbol{D} = \partial \mathcal{L} / \partial \boldsymbol{E}$ is identical to Maxwell theory.
- $\boldsymbol{E}$ field is enhanced by quantum fluctuations and shows short-distance screening as in classical case (fig.).
- $b \longrightarrow 0$ (or $a \longrightarrow 0$) limit is a conformal field theory with $\mathcal{L}_E = |\boldsymbol{E} \cdot \boldsymbol{B}|$.



C Hill and C Zachos, Phys Rev D71 (2005) 046002
D Fairlie and C Zachos, Phys Lett B620 (2005) 195-199;
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F & Z [hep-th/0603017]

WZW INTERACTIONS IN DIMENSIONAL DECONSTRUCTION AND ATAVISTIC LIE ALGEBRAS

Dimensional deconstruction reduces higher-dimensional pure gauge theories into 4D matter-coupled gauge theories, such as current models for electroweak interactions.

• Anomaly and topological structure of such pure (mesonless) gauge theories: 5D Chern-Simons terms,

$$\mathcal{L} = \frac{N_c}{48\pi^2}\epsilon^{ABCDE}\,\mathrm{Tr}\Big(A_A\partial_B A_C\partial_D A_E - \frac{3i}{2}A_A A_B A_C\partial_D A_E - \frac{3}{5}A_A A_B A_C A_D A_E\Big)$$

$\rightsquigarrow$ Wess-Zumino-Witten terms in 4D $SU(N)\times SU(N)$ chiral models,

$$\frac{2N_c}{15\pi^2 f_\pi^5}\epsilon_{\mu\nu\rho\sigma}\,\mathrm{Tr}(\tilde\pi\partial^\mu\tilde\pi\partial^\nu\tilde\pi\partial^\rho\tilde\pi\partial^\sigma\tilde\pi) + O(\tilde\pi^7),$$

required in effective QCD, but, so far, enigmatically, inaccessible to deconstruction methods.

• Transition of groups along a link from site to site (brane to brane), leads to the consideration/introduction of an entire class of infinite-dimensional "Atavistic Lie Algebras". Effectively, these encompass **most Lie algebras utilized in physics**, ($GL(N)$, Classical Lie, Moyal, Poisson, Virasoro, Vertex):

$$[J^a_{m_1,m_2}, J^b_{n_1,n_2}] =$$

$$e^{is(m_1 e^{-a} n_2 - m_2 e^a n_1)} J^{a+b}_{m_1+e^a n_1, m_2+e^{-a} n_2} - e^{is(n_1 e^{-b} m_2 - n_2 e^b m_1)} J^{a+b}_{n_1+e^b m_1, n_2+e^{-b} m_2}.$$

• Applications in deconstruction, noncommutative QFT, and possibly twisted CFT.

Conclusions

- Theory Group is very productive on a broad range of areas, including QCD, collider, Higgs, BSM and quarkonia physics, lattice gauge theories, mathematical physics and cosmology.
- The Group has contributed to the formation of numerous postdocs and students, who, in most cases, have carried successful careers after their stay at Argonne.
- It has remained quite active in community services and has very positively contributed to make Argonne the excellent research place it clearly is.

Ed Berger - Community Activities, 2005 - 06

External Activities with Executive Responsibility

1. Co-Chair, Executive Committee, and Co-Chair, Local Organizing Committee, International Linear Collider Workshop, Snowmass, CO, August 13 - 27, 2005.
2. Co-Principal Investigator, Argonne Theory Institute, 2003 – 2005.
3. Co-Organizer, Argonne Theory Workshop on Supersymmetry, Higgs Bosons, and Extra-Dimensions, May 9-13, 2005, High Energy Physics Division, Argonne.

Other External Committees/Community Activities

4. Member, Coordinated Theoretical-Experimental Project on QCD (CTEQ) Collaboration.
5. Adjunct Professor of Physics, Michigan State University, 1997 - present. Reappointed for another three year term effective July 1, 2004.
6. Andrew Gemant Award Committee, American Institute of Physics, 2002 – present. Reappointed in 2005 for a second term.
7. Committee on International Scientific Affairs (CISA), American Physical Society, 2003 – present.

Ed Berger - Community Activities, contd.

8. American Linear Collider Working Group, 2002 – present.
9. Organizing Committee, Workshop on QCD, SURA, Washington, DC, February 10 - 12, 2005.
10. Advisory Committee, 2005 Aspen Winter Meeting on Particle Physics, February 13 - 19, 2005.
11. Scientific Program Organizing Committee, Rencontres de Moriond, QCD and High Energy Hadronic Interactions, La Thuile, Italy, March 12-19, 2005, and March 18-25, 2006.
12. Advisory Board, Frontiers in Contemporary Physics - III, Vanderbilt University, May 23 - 28, 2005.
13. International Advisory Committee, HADRON 2005, Rio de Janeiro, Brazil, August 21 – 26, 2005.
14. International Advisory Committee, 3rd International Conference on Flavor Physics, National Central University, Taiwan, October 3-8, 2005.

Ed Berger - Community Activities, contd

15. Scientific Program Committee, XVIIth International Conference on Particles and Nuclei, PANIC-XVII, Santa Fe, NM, October 24-28, 2005.
16. International Advisory Committee, "Dual Colima-Puebla Institute of High Energy Physics", Universities of Colima and Puebla, Mexico, January, 2006, and January, 2007.
17. Organizing Committee, Argonne Workshop on Collider Physics, May 8 - 13, 2006.
18. Organizing Committee, 9th Conference on the Intersections of Particle and Nuclear Physics (CIPANP 2006), San Juan, Puerto Rico, May 30--June 3, 2006.
19. Scientific Program Committee, 2006 Joint Meeting of the APS Division of Particles and Fields (DPF), the Japan Physical Society (JPS), and the Particle Physicists of the Pacific Region, Honolulu, Hawaii, October 29-November 3, 2006.
20. International Advisory Committee, HADRON 2007, Frascati, Italy, 2007.

Ed Berger - Community Activities, contd

Laboratory-wide Committees at Argonne

20. Scientific Advisory Board, Argonne Theory Institute, 2003 - 2005. (http://www.anl.gov/OPA/theoryinstitute/index.html)

21. Argonne Fellows Committee. Committee to advise the Laboratory Director on the choice of Laboratory-wide Argonne Fellows, 1983 - present.

External Funding Grants

1. "Higgs and Supersymmetry Physics" (E. L. Berger), 2004. Visitor proposal to the Argonne Theory Institute. Awarded $40K in FY'05 to support salary and M&S expenses for Zack Sullivan's visitor appointment.

2. "New Trends in High Energy Physics" (E. L. Berger and C. Wagner), 2004. Workshop proposal to the Argonne Theory Institute. Awarded $20K in FY'05 to fund the May 2005 theory workshop in the high energy physics division.

3. "Joint Institute on High-Energy Collider Physics" (E. L. Berger, H. Frisch, C. Wagner, T. Tait, *et al*), May 2, 2005. Argonne University of Chicago Seed-Grant Proposal for a joint program of students, postdoctoral fellows, visitors, and workshops. $100K awarded for FY'06

G. Bodwin Community Services

Member of the advisory committee and convener of the Heavy Quarks (and Gluonia) section of the conference Quark Confinement and the Hadron Spectrum VII, Azores, Portugal Sept. 2--7, 2006, June 2005-present.

Convener, Quarkonium Working Group, April 2005-present.

Convener, Production Section, Quarkonium Working Group September 2004-present.

Member, author group for Production chapter of the CERN Yellow Report "Heavy Quarkonium Physics", November 2002-June 2005.

Member Quarkonium Working Group, 2002-present.

Note: The Quarkonium Working Group conveners have major responsibilities for organizing the International Workshop on Heavy Quarkonium, Brookhaven National Laboratory, June 27--30, 2006.

D. Sinclair Community Services

Served on NUGEX (NERSC users' group executive committee -- this is an elected position).

Was part of the Lattice SciDAC initiative (Our work will be presented at the Lattice SciDAC meeting at Fermilab 6-7th April).

Member of the Quarkonium Working Group.

T. Tait Community Services

Convenor, TeV4LHC Top & Electroweak Working Group

Convenor, Higgs Working group, Snowmass 2005

Convenor, International Linear Collider Workshop 2006, Bangalore India

Organizer, Workshop on Higgs, Supersymmetry and Extra Dimensions, Argonne, May 2005

Organizer, Workshop on Collider Physics, Argonne, May 2006

Organizer, Workshop on High Energy Physics in Anticipation of the LHC, Aspen, CO, August 2006.

C. Wagner Community Services

- Head, Argonne HEP Theory Group
- Professor, EFI, University of Chicago
- Reviewer, DOE LBNL review, Berkeley, February 2006
- Reviewer, NSF Review panel, January 2006
- Organizer, Workshop on Higgs, Supersymmetry and Extra Dimensions, Argonne, May 2005
- Organizer, Workshop on Collider Physics, Argonne, May 2006
- Organizer, Workshop on High Energy Physics in Anticipation of the LHC, Aspen, CO, August 2006.
- Member, Steering Committee of the LHC Theory Institute Initiative (LHC-TI), May 2005--

C. Wagner, Community Services, Contd.

- Organizer, Enrico Fermi Institute Mini-Symposium on Physics Challenges at the LHC, EFI, Univ. of Chicago, March 14, 2005
- Local Organizer, Kaon 2005 Conference, Northwestern University, Northwestern, IL, July 2005
- Co-Organizer, Les Houches Summer School, Les Houches, France, August 2005
- Scientific Advisory Board, Argonne Theory Institute, October 2004--October 2005
- Member, International Advisory Committee dor the dual Colima-Puebla Institute on High Energy Physics, Colima and Puebla, Mexico, January 2006
- Member, Argonne HEP Director Search Committee, February 2005--July 2005

C. Wagner, Community Services, Contd.

- Member, Univ. of Chicago Colloquium Commitee
- Lecturer, Course on Classical Electrodynamics, University of Chicago, March--June 2005
- Lecturer, Course on Advanced Quantum Field Theory, University of Chicago, March--June 2006

Recently Obtained Funding Awards

- Argonne National Laboratory Theory Insitute, FY2005 on New Trends in High Energy Physics, with Ed Berger, U$20K to organize a Workshop at the HEP Division, May 9--13, 2005
- Principal Investigator, University of Chicago--Argonne Nat. Lab. Seed Grant, July 2005. Co-Principal Investigator: Henry Frisch from the Univ. of Chicago, U$100K to organize a Joint Institute on High Energy Physics.

C. Zachos Community Services

Session organizer (New Ideas/Developments) for the oncoming ``Miami 2005", [CGC 2005], conference on elementary particle physics, astrophysics, and cosmology, 14-18 December, 2005, Key Biscayne, Florida: ``Celebrating a century of physics in the Einstein era".
http://server.physics.miami.edu/%7Ecgc/2005People.html

Member of the Advisory Panel (in lieu of Editors) of J Phys A: Math Gen (IOP).
http://www.iop.org/EJ/journal/-page=extra.1/0305-4470

Member, International Advisory Committee, 26th Int Colloquium on Group Theoretical Methods in Physics, June 26-30, 2006 Graduate center of the city university of New York,
http://web.gc.cuny.edu/physics/gp26/Images/advisory.jpg

Member, International Organizing Committee for
the Memorial Conference dedicated to the 80th Birthday of D.V. Volkov, Kharkov (Ukraine), 2006:
International Conference on ``Supersymmetry and Quantum Field Theory".